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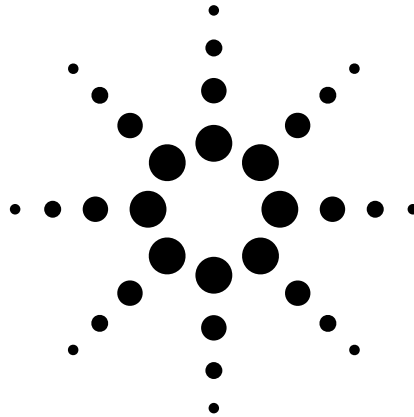
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Agilent RouterTester

P48/2 Test Module

E7901A

Technical Datasheet



- Enables Internet-scale testing of gigabit and terabit routers
- Two OC-48c/STM-16c (2.488 Gb/s) Packet over SONET/SDH (POS) interfaces per test module
- Generates and analyzes IP packets at wire-speed when used with RouterTester IP Performance Test Software
- Measurements between multiple modules are synchronized
- Verifies SONET/SDH interfaces
- Verifies PPP/HDLC interfaces



Agilent Technologies

Technical Specifications

System Specifications

Physical Interface

Connector	<ul style="list-style-type: none"> 2 x Simplex (transmit and receive) SC female connectors (Interchangeable adapters available for other types)
Optical interface	<ul style="list-style-type: none"> 1310 nm single-mode PIN based receiver 1310 nm Class 1 single mode laser Compliant with: <ul style="list-style-type: none"> Telcordia Technologies GR-253-CORE (Issue 2, Rev. 2, Jan. 99 1999 - SR short reach OC-48 interface specification), and ITU-T G.957 (June, 1999) I-16 intra-office STM-16 interface specification
Input sensitivity	<ul style="list-style-type: none"> -18.5 dBm (min)
Maximum input power	<ul style="list-style-type: none"> -3.0 dBm
Average output power	<ul style="list-style-type: none"> -3.0 dBm (max), -9.5 dBm (min)
Transmit clock source	<p>The transmit clock source can be:</p> <ul style="list-style-type: none"> Internally generated, Recovered from the received SONET/SDH signal, or Generated by an external reference clock

External Reference Clock

Connector	<ul style="list-style-type: none"> SMB connector
Specification	<ul style="list-style-type: none"> 0 dBm (nominal) terminated in 50 ohm to ground input
Signal	<ul style="list-style-type: none"> 19.44 MHz (nominal)
Duty cycle	<ul style="list-style-type: none"> 50 +/- 5%

Measurement System

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

Packet over SONET/SDH Layer Specifications

Framing

Encapsulation	<p>IP datagrams are encapsulated using:</p> <ul style="list-style-type: none"> PPP in HDLC-like framing, as per IETF RFC 1662, or Cisco HDLC (Ethernet protocol field)
FCS	<ul style="list-style-type: none"> 32 bit FCS length Negotiated between test port and device under test
Frame spacing	<ul style="list-style-type: none"> Frames can be transmitted continuously with a minimum one flag octet between frames
PPP	<ul style="list-style-type: none"> Supports the Link Control Protocol and the IP Control Protocol Rejected packets are counted by protocol type <p>Configurable parameters:</p> <ul style="list-style-type: none"> Restart Timer (default 3 seconds) Max-terminate (default 2) Max-configure (default 10) Max-failure (default 5) <p>LCP negotiation parameters:</p> <ul style="list-style-type: none"> Maximum-Receive-Unit (default 1500) Magic-Number (default is randomly chosen) FCS (32 bit supported only) <p>IPCP negotiation parameters:</p> <ul style="list-style-type: none"> IP Address
Scrambling/Descrambling	<p>$1 + X^{43}$, after HDLC framing. Scrambling can be enabled or disabled</p>

Minimum frame size	<p>13 octets for HDLC, so as to encapsulate a minimum PPP frame size of 6 octets</p> <p>29 octets for IP, so as to encapsulate a minimum-IP frame size of 20 octets</p>
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HDLC Real-Time Transmit Statistics

Frames transmitted	<ul style="list-style-type: none"> Count of total frames transmitted
Maximum frames transmitted	<ul style="list-style-type: none"> The maximum sample value measured during the current measurement interval
Octets transmitted (before octet stuffing)	<ul style="list-style-type: none"> Count of octets transmitted prior to the escape sequence transparency octets being inserted
Maximum octets transmitted (before octet stuffing)	<ul style="list-style-type: none"> The maximum sample value measured during the current measurement interval
Octets transmitted (after octet stuffing)	<ul style="list-style-type: none"> Count of octets transmitted, including transparency octets
Maximum octets transmitted (after octet stuffing)	<ul style="list-style-type: none"> The maximum sample value measured during the current measurement interval
HDLC transparency efficiency (percentage)	<ul style="list-style-type: none"> The maximum sample value measured during the current measurement interval

HDLC Real-Time Receive Statistics

Frames received	• Count of all HDLC frames received, including FCS errors, aborted frames and invalid frames
Maximum frames received	• The maximum sample value measured during the current measurement interval
Octets received (before destuffing)	• Count of octets received including all octets between flag sequence octets before removal of escape sequence octets
Maximum octets received (before destuffing)	• The maximum sample value measured during the current measurement interval
Octets received (after destuffing)	• Count of octets received after removal of flag and escape sequence octets
Maximum octets received (after destuffing)	• The maximum sample value measured during the current measurement interval
FCS errors	• Count of HDLC frames received with an invalid FCS
Aborted frames	• Count of HDLC frames that end with the frame abort sequence 0x7D 0x7E
Invalid frames	• Count of HDLC frames received with an address field or control field not equal to the preset values, or length too short (i.e. less than or equal to 8 octets)

SONET/SDH Layer Specifications**Framing Formats**

SONET	• STS-48c as per ANSI T1.105 and Telcordia Technologies GR-253-CORE (Issue 2, Rev. 2, Jan. 1999 1999 - SR short reach OC-48 interface specification)
SDH	• STM-16c as per ITU-T Rec. G.708/G.709, 1993

Scrambling

Frame synchronous scrambler	• Can be enabled or disabled
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Section/Regenerator Section Overhead Octet Generation

A1, A2	• Set to 0xF628 (for all STS-Ns/STM-Ns)
J0/Z0	• In Section Growth mode (Default), J0 = 1 and each Z0 octet set based on position in the STS-N frame (e.g. Z0 ₂ =2, ... Z0 ₄₈ = 48 for STS-48c) • In Section Trace mode, J0 set to 64 byte message (ASCII string, CRLF terminated), Z0 unused, set to zero
B1	• Automatically calculated
E1, F1, D1...D3	• Unused, set to zero
Undefined octets	• Unused, set to zero

Line/Multiplexer Section Overhead Octet Generation

H1...H3	• Automatically calculated, including concatenation indicators
B2	• Automatically calculated (for all STS-Ns)
K1/K2	• User-definable 16 bit field, default zero
D4...D12	• Unused, set to zero
S1	• Least significant 4 bits can be set to predefined values, default zero
Z1, Z2	• Unused, set to zero
M1	• Automatically calculated
E2	• Unused, set to zero
All Other Line Overhead Octets	• Unused, set to zero

Path Overhead Octet Generation

J1	• Can be set to a 64 byte message (ASCII string, CRLF terminated)
B3	• Automatically calculated
C2	• Automatically calculated as per framing and scrambling format, or user defined
G1	• Path REI bits are automatically calculated (count of errors from B3); path RDI bits are set as per alarm generation
F2	• Unused, set to zero
H4	
Z3 (SONET)/F3 (SDH)	
Z4 (SONET)/K3 (SDH)	
Z5 (SONET)/N1 (SDH)	

Alarms

Alarm detection	• Alarm conditions are detected in real-time <ul style="list-style-type: none"> – Current alarm 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)
Alarm generation	• Alarm conditions can be invoked, one type at a time
SONET alarm types	• LOS • LOF • LOP • AIS-L • RDI-L • AIS-P • RDI-P

SDH alarm types	<ul style="list-style-type: none"> • LOS • LOF • LOP • MS-AIS • MS-RDI • AU-AIS • Path-RDI
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Error Monitoring

Section BIP-8 (B1) errors	• Number of occurrences reported
Line BIP-8 (B2) errors	• Number of errored seconds reported
Path BIP-8 (B3) errors	

Overhead Octet Real-Time Decode

Automatic Protection Switching (APS) octets (K1/K2)	• Received 16 bit value is displayed in hex
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Synchronization status (S1) value	• Received octet values are decoded for display
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Path signal label (C3) value

Section trace (J0) message	• Trace messages are decoded and displayed as 64 byte strings (ASCII text, CRLF terminated)
Path trace (J1) message	

Mechanical Specifications

Module Details

Size	• 441 mm (width) x 390 mm (depth) x 44 mm (height)
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Weight	• 4.8 kg
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Supply voltage	• 100 to 240 Volts AC only
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Supply frequency	• 50 to 60 Hz
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Power consumption	• 150 watts maximum
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Input current	• Less than 3.0 amps RMS, measured at 85 VAC
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Input protection	• Non-user serviceable, internally located 5 amp, anti-surge AC input line fuse
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Inrush current	• 35 amps peak (Vin = 230 VAC, one cycle, 25°C.). Current internally limited by thermistor
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Power factor	• 0.95 W/VA (Per EN61000-3-2)
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Rear connectors	<ul style="list-style-type: none"> • Ethernet: <ul style="list-style-type: none"> – RJ-45 • Clock line connectors (input/output): <ul style="list-style-type: none"> – SMA • Event lines (input/output): <ul style="list-style-type: none"> – Twin BNC • External trigger input/external trigger output: <ul style="list-style-type: none"> – BNC
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Front Panel LED Indicators

Power	• Green when module has power
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Status	• Yellow to indicate module start-up, green to indicate that a test application is running, red to indicate a module error
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Module	• Numerical module identifier
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Laser	• Red when output laser is on
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Signal	• Green when a valid optical receive signal is detected (opposite of LOS condition)
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LOF/LOP	• Yellow when a Loss of Frame or Loss of Pointer condition exists at the receiver
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AIS/RDI	• Yellow when a Line/MS AIS, Line/MS RDI, Path AIS or Path RDI condition exists at the receiver
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Tx	• Green when a HDLC frame is transmitted. Does not indicate integrity of the transmitted SONET SPE
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Rx	• Green when a HDLC frame is received. Indicates integrity of the SONET SPE and HDLC framing
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Environmental Operating Conditions

Operating temperature	• 0° C to 50° C
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Storage temperature	• -40° C to 70° C
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Humidity	• 50% to 95% relative humidity at 5° C to 40° C
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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 measurement 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
- EN 61000-4-11:1994 / IEC 1000-4-11:1994, Section 11: Voltage dips, short interruptions, voltage variations 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	<ul style="list-style-type: none"> Telcordia Technologies GR-253-CORE (Issue 2, Rev. 2, Jan. 99 1999 - SR short reach OC-48 interface specification) ITU-T G.957 (June, 1999) I-16 intra-office STM-16 interface specification
SONET/SDH	<ul style="list-style-type: none"> SONET STS-48c as per ANSI T1.105 and Telcordia Technologies Telcordia Technologies GR-253-CORE (Issue 2, Rev. 2, Jan. 1999 - SR short reach OC-48 interface specification) SDH STM-4c as per ITU-T Rec. G.707/G.708/G.709, (03/1996)
Packet Over SONET/SDH	<ul style="list-style-type: none"> IETF RFC 2615, PPP over SONET/SDH
PPP/HDLC	<ul style="list-style-type: none"> IETF RFC 1662, PPP in HDLC-like Framing
Link Control Protocol	<ul style="list-style-type: none"> IETF RFC 1661, The Point-to-Point Protocol (PPP)
IP Control Protocol	<ul style="list-style-type: none"> IETF RFC 1332, The PPP Internet Protocol Control Protocol (IPCP)

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