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Agilent RouterTester

P3/2 Test Module

E7905A

Technical Datasheet



- **Enables Internet-scale testing of gigabit and terabit routers — scaling up to 32 modules, providing up to 64 ports at wire-speed!**
- **Dual port OC-3c/STM-1 (155 Mb/s) Packet over SONET/SDH (POS) interfaces**
- **Generates and analyzes IP packets at wire-speed**
- **Measurements between multiple modules are synchronized**
- **Verifies SONET/SDH interfaces**
- **Verifies PPP/HDLC interfaces**

Agilent Technologies

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Technical Specifications

System Specifications

Clock and timestamp system

Resolution	• 10 nanoseconds
Accuracy	• 20 nS +/— 10 PPM
Transmit clock source	• The transmit clock source can be: – internally generated, – recovered from the received SONET/SDH signal, or – based upon an external signal received via the external clock connector
Module synchronization	• All measurements are synchronized across all modules within the test system

External Reference Clock

Connector	• SMB connector
Specification	• 0 dBm (nominal) terminated in 50 ohm to ground input
Signal	• 19.44 MHz (nominal)
Duty cycle	• 50 +/— 5%

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 period	• Range: 1 second to 7 days • Sampling period: the sampling period can range from 1 second to 1 hour

Optical Interface

Connector	• Duplex (transmit and receive) SC female connector
Optical interface	• 1310 nm single-mode PIN based receiver • 1310 nm Class 1 single mode laser compliant with: – Telcordia Technologies GR-253-CORE (Issue 2, Rev. 2, Jan. 99) – ITU-T G.957 (July, 1995) intermediate reach specifications
Input sensitivity	• -28 dBm (min)
Maximum input power	• -8 dBm
Average output power	• -8.0 dBm (max), -15 dBm (min)
Safety	• Complies with the Optical safety standards listed in the Regulatory Compliance section (page 9)

Packet over SONET/SDH Layer Specifications

Physical Interface

Interface	• Packet over SONET/SDH: RFC 1619, PPP over SONET/SDH • Cisco HDLC (Ethertype protocol field)

Framing

Encapsulation	• IP datagrams are encapsulated using: – PPP in HDLC-like framing, as per IETF RFC 1662, or – Cisco HDLC (Ethertype protocol field)
FCS	• 16 or 32 bit FCS length (user selection) • Negotiated between test port and device under test
Frame spacing	• Frames can be transmitted continuously with a minimum one flag octet between frames
PPP	• Supports the Link Control Protocol and the IP Control Protocol • Rejected packets are counted by protocol type • Configurable parameters: – Restart Timer (default 3 seconds) – Max-terminate (default 2) – Max-configure (default 10) – Max-failure (default 5) • Negotiated parameters: – Maximum-Receive-Unit (default 1500) – Magic-Number (default is randomly chosen) – FCS (16 and 32-bit supported only)
Scrambling/descrambling	• 1 + X43, after HDLC framing • Scrambling can be enabled or disabled
Minimum frame size	• 11 octets for HDLC, so as to encapsulate a minimum PPP frame size of 6 octets with FCS-16 • 47 octets for IP, so as to encapsulate a minimum-IP frame size of 40 octets with FCS-16

HDLC Real-Time Transmit Statistics

Frames transmitted	• Count of total frames transmitted
Maximum frames transmitted	• The maximum sample value measured during the current measurement interval
Octets transmitted (before octet stuffing)	• Count of octets transmitted prior to the escape sequence transparency octets being inserted
Octets transmitted (after octet stuffing)	• Count of octets transmitted, including transparency octets

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Maximum octets transmitted (after octet stuffing)	• The maximum sample value measured during the current measurement interval
HDLC transparency efficiency (percentage)	• Octets transmitted (before octet stuffing) divided by octets transmitted (after octet stuffing)

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 (eg. less than 8 octets with FCS-32)

Frame Transmitter/Receive

Frame transmit	• Frames can be transmitted at up to wire speed (398,000 packets per second FCS-16), with a minimum of one flag octet between frames and 40 byte IP frame
Frame receive	• Frames can be received an analyzed at wire speed (398, 000 packets per second FCS-16), at full bandwidth with minimum sized (40 octet) IP frames

SONET/SDH Layer Specifications

Framing Formats

SONET	• STS-3c as per ANSI T1.105 and Telcordia Technologies GR-253-CORE (Issue 2, Rev. 2, Jan. 1999)
SDH	• SDH STM-1 as per ITU-T Rec. G.707/G.708/G.709, (03/1996)

Scrambling

SONET	• Frame synchronous scrambler as per ANSI T1.105 and Telcordia Technologies GR-253-CORE (Issue 2, Rev. 2, Jan. 1999) • Scrambling can be enabled or disabled
SDH	• STM-1 as per ITU-T Rec. G.708/G.709, 1993 • Scrambling can be enabled or disabled

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. Z02=2, ... Z03 = 3 for STS-3c) • 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

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F2 H4 Z3 (SONET) / F3 (SDH) Z4 (SONET) / K3 (SDH) Z5 (SONET) / N1 (SDH)	• Unused, set to zero

SONET/SDH Alarm Generation

LOS LOP AIS-L (SONET) MS-AIS (SHD) RDI-L (SONET) MS-RDI (SDH) AIS-P (SONET) AU-AIS (SDH) RDI-P (SONET) Path-RDI (SDH)	• Can be set to on or off

SONET/SDH Real-Time Measurement

SONET/SDH alarms are reported to the user. An Errored Seconds statistic counts the number of one second intervals in which the condition was reported at least once.

Automatic Protection Switching (APS) octets (K1/K2) Synchronization status (S1) value Section trace (J0) message Path trace (J1) message Path signal level value (C2)	• Values are decoded and displayed
Section BIP-8 (B1) errors Line BIP-8 (B2) errors Path BIP-8 (B3) errors	• Number of occurrences reported • Number of errored seconds reported
LOS LOF LOP AIS-L/MS-AIS RDO-L/MS-RDI) AIS-P/AU-AIS RDI-P/Path RDI	• Alarm is detected and indicated • Number of errored seconds

Mechanical Specifications

Module Details

Size	• 441 mm (width) x 390 mm (depth) x 44 mm (height)
Weight	• 4.8 kg
Supply voltage	• 100 to 240 Volts AC only
Supply frequency	• 50 to 60 Hz
Power consumption	• 120 watts maximum
Input current	• Less than 3.0 amps RMS, measured at 85 VAC
Input protection	• Non-user serviceable, internally located 5 amp, anti-surge AC input line fuse
Inrush current	• 35 amps peak (Vin = 230 VAC, one cycle, 25°C.) • Current internally limited by thermistor
Power factor	• 0.95 W/VA (Per EN61000-3-2)
Rear connectors	• Ethernet: – RJ-45 • Clock line connectors (input/output): – SMA • Event lines (input/output): – Twin BNC • External trigger input / external trigger output: – BNC

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
Laser	• Red when output laser is on
Signal	• Green when a valid optical receive signal is detected (opposite of LOS condition)
LOF/LOP	• Yellow when a Loss of Frame or Loss of Pointer condition exists at the receiver
AIS/RDI	• Yellow when a Line/MS AIS, Line/MS RDI, Path AIS or Path RDI condition exists at the receiver
TX	• Green when a HDLC frame is transmitted. Does not indicate integrity of the transmitted SONET SPE
RX	• Green when a HDLC frame is received. Indicates integrity of the SONET SPE and HDLC framing

Environmental Operating Conditions

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

- EN 60825-1:1994 + A1:1997, Part 1: Equipment Classification, Requirements and User's Guide
- FDA Standard 21 CFR Ch1, 1040.10 & 1040.11 (laser safety)

Environmental

- ETM757, Temperature Tests.
- ETM758, Humidity Tests.
- ETM754, Thermal Profile Mapping.

Shock and Vibration

ETM759 Vibration	• Operational Functional: Class B2 Random Vibration • Survival, Swept Sine: Class B2 Swept Sine • Survival, Random Vibration: Class B2
ETM760 Shock	• End Use Handling: Class B2 • Transportation Environment: Type 1
ETM package Performance	• Vibration: Swept Sine Type 1 • Random Vibration • Impact: Type 1

Applicable Standards

Optical transmitter and receiver	• Telcordia Technologies GR-253-CORE (Issue 2, Rev. 2, Jan. 99) • ITU-T G.957 (07/95) intermediate reach specifications
SONET/SDH	• SONET STS-3c as per ANSI T1.105 and Telcordia Technologies GR-253-CORE (Issue 2, Rev. 2, Jan. 1999) • SDH STM-1 as per ITU-T Rec. G.707/G.708/G.709, (03/1996)
IP over Packet Over SONET/SDH	• Packet over SONET/SDH according to IETF RFC 1619, PPP over SONET/SDH
PPP/HDLC	• IETF RFC 1662, PPP in HDLC-like Framing
Link Control Protocol	• IETF RFC 1661, The Point-to-Point Protocol (PPP)
IP Control Protocol	• IETF RFC 1332, The PPP Internet Protocol Control Protocol (IPCP)

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