2.048 Mb/s (E1) Line Interface

Agilent Technologies Broadband Series Test System

E4201A

Product Features

- Cell based implementation
- Operates in Terminal, Monitor, Near-end Loopback, Far-end Loopback and Drop-and-Insert modes
- Provides physical layer measurements as well as error and alarm generation
- Internal traffic generator has 1 foreground channel and up to 100 background channels

A line interface for the modular Broadband Series Test System, the E4201A generates and analyzes ATM cell streams contained within an E1 framing format.

The Agilent Technologies E1610A 34 Mb/s (E3) Line Interface generates and analyses ATM cell streams contained within a E3 framing format. It is a single-slot module that provides test capability at the physical and ATM cell layers for the Agilent E4200/E4210 Broadband Series Test System.

The E1610A is capable of the following mappings:

- G.832 framing as defined in ITU-T COM 13-5-E, Rec. G.832
- G.751 PLCP framing as defined in ETS 300-337 and ETS 200-214
- G.751 ATM Transmission Convergence framing as defined in ETS 300-337 and ITU-T recommendation I.432
- Pure-cell with no framing as per ITU-T recommendation I.432

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Key Features

Generate Normal or Abnormal Test Traffic

Create and detect erroneous test traffic on demand to test the robustness of a protocol implementation. Sophisticated protocol data unit builder, sequencing, and library functions let you easily create complex and realistic traffic. You can generate test traffic in the foreground channel, and use up to 100 background channels to simulate loading effects.

Cell Error, Loss & Delay Measurements

Bit error rate testing is done by placing PRBS patterns in cells, and looping these cells back through a system under test. The received cells are analyzed to detect PRBS errors. These errors can then be used as a trigger to capture data.

Cell delay, interarrival time, and loss measurements are easily accomplished with the BSTS. Timestamps are inserted in cells transmitted by the line interface. These cells can then be captured, and graphs for both cell delay and cell interarrival time displayed.

Sequence numbers are transmitted in ATM cells and looped back through a system under test. The lost cells can then be detected and counted with statistics or used as a trigger to capture data.

You can generate physical layer errors and alarms. Real-time statistics can be gathered for the physical, convergence and cell layers. Statistics can be reported as errored seconds, event counts, or as error ratios.

Traffic Capture & Playback

Traffic can be captured with a large capture memory. Complete control is available -- continuously capture with memory buffer overlapping, or trigger on user-defined events. Captured traffic can be played back with automatic decoding into an English-language display. Terminology from standards documents is used wherever possible.

Since high-speed networks carry considerable volumes of traffic, you can increase your test productivity by using filters and triggers to display or capture only traffic of interest. Filters let you select virtual channels or paths of interest. Triggers can be used to capture data matching a specific pattern. For example, triggers can be used to capture cells with header errors or sequence number errors, upon changes in convergence layer frame bytes, or to trap intermittent conditions.

Configuration

Line interface modules can perform physical layer testing with a minimal BSTS configuration consisting of a line interface module and chassis. A complete range of test software applications and dedicated test modules is available to perform upper layer testing.

The E4209 Cell Protocol Processor provides monitoring and simulation test functions at the ATM and adaptation layers by executing optional protocol testing software applications. The CPP performs many functions in hardware that are usually done in software -- such as an automatic segmentation and reassembly engine for sophisticated real-time ATM, AAL and other higher layer protocol testing.

Warranty & Support Options

All BSTS hardware components are warranted for a period of 3 years. Products must be returned to an authorized Agilent service center for service. At the time of purchase you may select warranty option W01, a no-charge option which converts the standard 3-year return to Agilent warranty to a 1-year on-site warranty.

Support option UK6, available at time of purchase, is a standards-compliant calibration which ensures that your BSTS test system operates within specified tolerances. A certificate of calibration is issued for compliance with ISO 9000 standards which require that records documenting the calibration of measuring and test equipment are maintained. Certificates of calibration are not available for products which do not contain components requiring calibration (such as software).

Two other types of calibration, commercial and standards-complaint, are available at any time from your local Agilent service center. Both provide test data and a certificate for your records. With a commercial calibration, any problems are resolved as they are detected, and test data reflecting performance of your calibrated test system is provided. The standards-compliant calibration provides comprehensive before and after test data to document problem resolution.

If you should have an out-of-warranty test system, you can arrange for service simply by contacting your local Agilent sales office.

Technical Specifications

Modes

When using the coaxial front panel connectors, three modes are available.

Terminal	• Used when connecting the BSTS as an end device to the system under test; complete traffic generation and analysis capabilities are available
Monitor	• Used when the BSTS is desired to be a passive tap; the received signal is re-transmitted (physical layer loopback)
Near-End Loopback	• The transmitted signal is electrically looped back to the receiver

The receiver and transmitter signals can be independently routed for several connection options when using the TE or NT Symmetrical front panel connectors. Five modes are available.

Terminal	• Used when connecting the BSTS as an end device to the system under test; complete traffic generation and analysis capabilities as available • Both the transmitted and received signals are active on to the same connector (either TE or NT)
Monitor	• Used when the BSTS is desired to be a passive tap; the received signal from one connector is re-transmitted on other connector • Signals moving in either direction can be monitored
Near-End Loopback	• Used to provide a local loopback to the BSTS; the BSTS's transmitter signal is electrically looped back to the BSTS's receiver • The transmitter signal can be routed to either TE or NT connector
Far-End Loopback	• Used to provide a remote loopback to the system under test; the BSTS's received signal is electrically looped back to the system under test • The received signal can be monitored by the receiver
Drop and Insert	• The BSTS's transmitter generates a signal on one connector, while the BSTS's receiver analyzes the signal received on the other connector • The received signal from the active transmitter connector is re-transmitted on the other connector

ATM Cell Generation

The transmitted cell stream can contain ATM cells generated internally by the E4201A, and ATM cells generated by an optional E4209 Cell Protocol Processor module. ATM cells generated on-board can consist of one foreground channel to stimulate the channel under test, and up to one hundred background channels for loading purposes. Fill cells are used to occupy unused bandwidth.

Total Bandwidth	• 1.920 Mb/s
Modes	• User-Network Interface (UNI) or Network-Node Interface (NNI)
HEC	• Automatic generation
Fill Cells	• Idle or unassigned
Channel Priority Order	• Foreground, background, CPP (highest to lowest priority)
Channel Control	• VCI • VPI • GFC • Payload Type • Cell Loss Priority
SAR-PDU Support	• AAL-0 • AAL-1

Foreground Channel

Bandwidth	• 100 b/s to 1.920 Mb/s
Accuracy	• +/- 0.02 ppm
Distribution	• Off • Single burst • Periodic (according to the specified bandwidth)
Channel Depth	• 1500 cells (variable)
Cell Payload	• Timestamp • Single cell PRBS • Cross cell PRBS • Data pattern • Byte access

Background Channels

Number of Channels	• Up to 100
Bandwidth	• 3 kb/s to 1.920 Mb/s
Accuracy	• +/- 10 ppm
Distribution	• Off • Periodic
Channel Density	• Bandwidth and cell distribution for each background channel is individually assignable up to maximum bandwidth
Channel Depth	• 16 cells
Cell Payload	• Single cell PRBS • Data pattern • Byte access

Cell Payload Contents

Payloads	• Timestamp (32-bit departure timestamp value with 100 nanosecond resolution) • Cross cell PRBS-9 • PRBS-15 (inverted and not inverted) • PRBS-23 • Single cell PRBS-9 • Data pattern or byte access
Data Patterns	• User byte • AA55h or FF00h • Incrementing (value of each successive byte is incremented by 1)
Byte Access	• Payload of all cells in the selected channel can be edited by the user in an active channel environment, or off-line as a sequence of PDUs • AAL-1 automatically inserts first payload byte containing SN/SNP values and CSI bit

Erroring Control

Error conditions can be introduced to simulate alarm signals and signal stressing. Error stressing is used to generate incorrect bytes in a test signal.

Error Stressing Control	• Off • On • Pulse On (error condition is normally off; pulses on) • Pulse off (normally on; pulses off) • Sequence On (normally off; alternates on/off/on) • Sequence Off (normally on; alternates off/on/off)
ATM Error Injection	• Cell header or payload bytes with bit error masking
Cell Loss	• Sequence Number in the SAR-PDU is skipped and a fill cell is inserted
PRBS Error Add	• Single bit error add to the PRBS pattern in the cell payload

E1 Stressing

Alarm Generation	• AIS • RAI
Error Injection	• bit errors (1e-3 to 1e-9 rate)

ATM & E1 Measurements

Measurements are sampled every 100 milliseconds and accumulated over the user-specified measurement period. Results from the most recent complete measurement period are retained.

Measurement Period	• Ranges from 1 second to 3 days in resolutions of 1 second
Result Types	• Cumulative or latched (based on most recent measurement period)
Result Formats	• Count • Ratio • Seconds
ATM Cell Measurements	• HEC errors • Corrected headers • Cell count • Cell bandwidth • Select Cell Not Received (SCNR) • Seconds
Cell Delay Measurements	• Cell delay • Inter-arrival time • Cell delay variation
Virtual Channel Errors	• AAL-1 SN/SNP errors • Cell loss PRBS errors • PRBS sync loss alarm seconds
E1 Measurements	• Coding errors • CRC-4 errors • FEBE errors • Framing errors • Loss of signal alarm seconds • Out-of-frame alarm seconds • AIS alarm seconds • RAI alarm seconds • E1 multiframe count

Traffic Capture & Playback

Provides capture of 1500 cells from the selected ATM cell stream. Capture is manual or event triggered. Manual triggering captures 1500 cells after the trigger. Event triggering captures 749 cells pre-trigger, 1 trigger cell, and 750 cells post-trigger.

Manual	• Triggered on user request
ATM Cell Triggers	• Cell loss • Header error • PRBS error • SN/SNP byte error

Front Panel Connectors & Indicators

E1 Symmetrical Input and Output (TE)	• RJ45 connector • 120 ohm impedance symmetrical • 2.048 Mb/s • 0 dB (low level) or 20 dB (high level) for input • -4 dB (low level) or 0 dB (high level) for output • Internal (stratum 3), External, and Recovered clock modes
E1 Symmetrical Input and Output (NT)	• RJ45 connector • 120 ohm impedance symmetrical • 2.048 Mb/s • 0 dB (low level) or 20 dB (high level) for input • -4 dB (low level) or 0 dB (high level) for output • Internal (stratum 3), External, and Recovered clock modes
E1 Coaxial Input	• BNC connector • 75 ohm impedance • 2.048 Mb/s • 0 dB (low level) or 20 dB (high level)
E1 Coaxial Output	• BNC connector • 75 ohm impedance • 2.048 Mb/s • -4 dB (low level) or 0 dB (high level) • Internal (stratum 3) External and Recovered clock modes
External Clock Input	• SMB connector • TTL input • Nominal 50 ohm impedance
Tx and Rx Trigger Outputs	• SMB connectors • TTL output • Nominal 50 ohm impedance
LED Indicators	• Failed • Error • Access • Gating • Signal • OOF • AIS • BIP • Yellow • SCNR • Reference Clock

Size, Weight & Power Dissipation

Size	• 1 slot C-size VXI card
Weight	• 1.3 kg (2.9 lb) nominal
Power Dissipation	• 25 Watts (max)

Applicable Standards

ATM Cells	• ITU-T Recommendation I.361 1995 B- ISDN ATM layer specification • Bellcore TA-NWT-001113 1993 Asynchronous Transfer Mode and ATM Adaptation Layer (AAL) Protocols Generic Requirements
E1 Frames	• ITU-T G.703 1991 Physical/Electrical Characteristics of Hierarchical Digital Interfaces • ITU-T G.704 1988 Synchronous frame structures used at primary and secondary hierarchical levels • ITU-T G.804 1993 ATM cell mapping into plesiochronous digital hierarchy • ISO/IEC 10173 1991 Information Technology - Integrated Services Digital Network (ISDN) primary access connector at reference point S and T
PRBS Patterns	• PRBS-9 as per ITU-T O.153 1992 • PRBS-23 as per ITU-T O.151 1992
EMC	• Meets FTZ 1046/1984 (CISPR11, EN 55011)

Product Numbers

- **E4201A** 2.048 Mb/s (E1) Line Interface
- **E4200B** BSTS Form-7 Transportable Chassis
- **E4210B** BSTS Form-13 Mainframe Chassis
- **E4209B** Cell Protocol Processor
- **E4219B** ATM Network Impairment Emulator

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Agilent Technologies Broadband Series Test System

The Agilent Technologies BSTS is the industry-standard ATM/BISDN test system for R&D engineering, product development, field trials and QA testing. The latest leading edge, innovative solutions help you lead the fast-packet revolution and reshape tomorrow's networks. It offers a wide range of applications:

- ATM traffic management and signalling
- Packet over SONET/SDH (POS)
- switch/router interworking and performance
- third generation wireless tesing
- complete, automated conformance testing

The BSTS is modular to grow with your testing needs. Because we build all BSTS products without shortcuts according to full specifications, you'll catch problems other test equipment may not detect.

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Specifications subject to change.

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