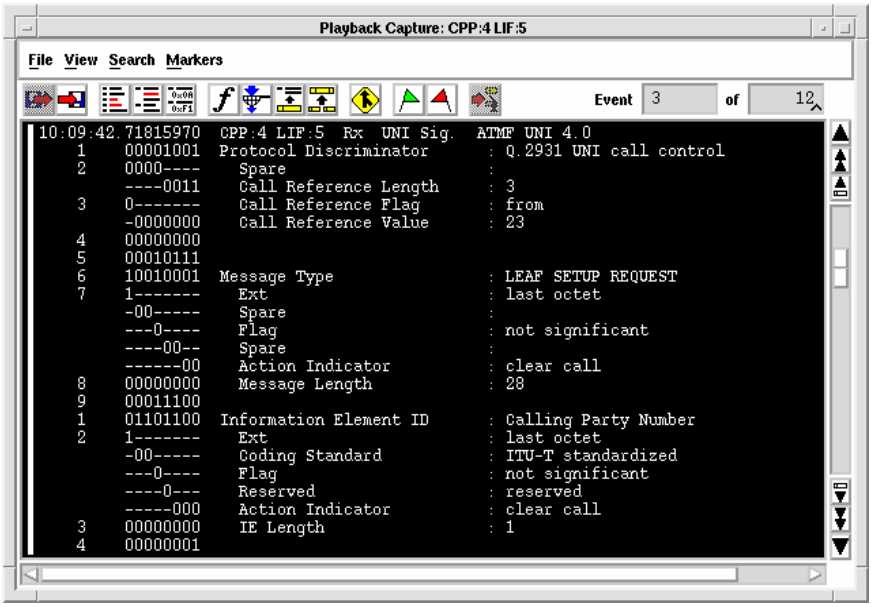
Enhanced UNI Signalling Test Software

Agilent Technologies Broadband Series Test System

E4214B



ATM Forum UNI 4.0 Leaf Initiated Joins are fully decoded and displayed.

Product Features

- Emulation support for ATM Forum UNI version 3.0/3.1/4.0 and ITU-T Q.2931 with Ammendment 1, Q.2971 and Capability Set 2.1
- Includes Point-to-Multipoint and Leaf Initiated Join Emulation
- Abbreviated display option highlights key signalling data, including called/calling numbers and VPI/VCIs
- Supports up to 4096 simultaneous calls with full control over all PDU field contents
- Supplementary Service support including DDI and subaddressing
- Build and store custom information elements for network and vendor specific services

The Agilent Technologies E4214B B-ISDN UNI Signalling Test Software is Agilent's enhanced solution for testing the critical User-Network Interface (UNI) signalling protocol, through which terminal or endpoint equipment dynamically establishes, maintains, and clears connections across public or private ATM networks.

Designed for the Agilent Broadband Series Test System (BSTS), this version supports testing of signalling capabilities defined by both the ATM Forum (UNI Version 4.0) and the ITU-T (Q.2931 with Ammendment 1, Q.2971 and Capability Set 2.1). The ATM Forum's UNI Version 4.0 adds a number of new features, such as ABR (Available Bit Rate) and expanded point-to-multipoint capabilities, including LIJ (Leaf Initiated Join), and supports the ITU-T's Capability Set (CS) 2.1, which defines supplementary services, such as Direct Dialing In (DDI, Q.2951)

Similarly, product capabilities related to the ITU-T's Q.2931 UNI signalling specification have been enhanced to support Capability Set 2.1 and point to multipoint signalling defined in Q.2971.

Network equipment and CPE manufacturers can use the E4214B to verify implementation of these latest UNI signalling protocols in their equipment. The software is also useful for network operators seeking to verify the interoperability of UNI products from different vendors. This product complements the comprehensive family of available BSTS ATM signalling applications and conformance test suites.

Key Features

The E4214B has been significantly upgraded to keep pace with evolving standards. In addition to providing emulation, decode and display and trigger capabilities for Layer 2 (SAAL), UNI 3.0/3.1, and Q.2931 that were previously supported by the E4214A, the product includes the following new features:

UNI 4.0 Emulation

The E4214B can emulate all UNI 4.0 signalling functions, including:

- Point-to-Multipoint, as defined in Q.2971, including LIJ
- Anycast capability
- Connection negotiation
- Signalling of QOS parameters
- ABR support

Additionally, the emulation can support up to 4096 simultaneous calls, and users can define all fields in PDUs transmitted by the emulation.

Decode and Display

UNI 4.0 and CS 2.1 signalling messages can be displayed in an abbreviated format which abstracts key signalling information. SETUP messages, for example, clearly display both the calling and called-party numbers, as well as the VPI/VCI assigned to the call. The complete format display option allows viewing of all fields in the signalling message. All decodes can be viewed in real time via the Live Data Viewer or captured and viewed off-line, via the Playback Viewer, for more detailed analysis.

Supplementary Services Support

The product now supports the following supplementary services as defined in CS 2.1:

- Direct Dialing In
- Multiple Subscriber Number
- Calling Line Identification Presentation/Restriction
- Connected Line Identification Presentation/Restriction
- Subaddressing
- User to User Signalling

Enhanced PDU Builder

The product's PDU Builder has been enhanced to support construction of UNI 4.0 and CS 2.1 PDUs including editing of all Information Elements (IEs) including the following:

- Connected Number and Subaddress IE
- User-user IE
- ATM traffic descriptor IE
- Point-to-Multipoint messages and IEs

In addition, user-encoded PDUs can be named and stored in an IE library for easy reference and re-use. This feature facilitates testing of proprietary manufacturer and network Information Elements.

Configuration & Use With Other BSTS Line Interfaces, Hardware Modules & Test Software

The E4214B B-ISDN UNI Signalling Test Software requires a minimal Broadband Series Test System configuration consisting of a chassis, E4209A or E4209B Cell Protocol Processor, and any ATM cell-based line interface. Two cell protocol processor/line interface pairs are recommended for monitoring a bi-directional stream; two receivers are required to capture both sides of the protocol exchange across the UNI. The E4214B requires the E4212A AAL Test Software.

A related product, the E6273B ILMI Emulation Test Software, provides ILMI address registration, keep alive, and MIB test functions across the UNI. A complete set of executable test suites are available to test UNI 3.0 signalling on network equipment (E7823A), UNI 3.1 signalling on both network and terminal equipment (E7833C and E7834A) and UNI 4.0 signalling on both network and terminal equipment (E7844A and E7845A). Using these test suites will help to ensure the correct implementation of equipment to the UNI signalling standards.

Product Numbers

- **E4212A/B** AAL Test Software
- **E4214B** UNI Signalling Test Software
- **E6273B** ILMI Emulation Test Software
- **E7823A** ATM Forum UNI 3.0 Signalling Conformance Test Suite for the Network Side
- **E7833C** ATM Forum UNI 3.1 Signalling Conformance Test Suite for the Network Side
- **E7834A** ATM Forum UNI 3.1 Signalling Conformance Test Suite for the User Side
- **E7844A** ATM Forum UNI 4.0 Core Signalling Conformance Test Suite for the Network Side
- **E7845A** ATM Forum UNI 4.0 Core Signalling Conformance Test Suite for the User Side

Warranty & Support Options

Agilent Broadband Series Test System software and firmware products are supplied on transportable media such as disk, CD-ROM or integrated circuits. The warranty covers physical defects in the media, and defective media is replaced at no charge during the warranty period. When installed in an Agilent Broadband Series Test System, the software/firmware media has the same warranty period as the product

This test software has no components requiring calibration.

Technical Specifications

Monitoring Features

Multiport Monitoring	• Single- or dual-port capability • Synchronized timestamps correlate events from two physical ports • Merged live protocol viewer, or playback of captured data, shows activity from both ports integrated into one display • Large 16 MB capture buffer (with E4209B)
Decode Displays	• Summary mode; displays up to 3 lines description for each PDU • Detailed mode; displays a multi-line description of each event with field-by-field decoding; includes header/trailer and payload options • Hex mode; displays the entire PDU in hexadecimal • Timestamps; toggle on/off the display of timestamps • Port identifier; toggle on/off the display of the VXI slot number of the Cell Protocol Processor and line interface module from which the data was captured; also indicates whether the captured data was transmitted or received
Summary Display Contents	• UNI Signalling: displays message type, call reference value, call reference flag and other fields depending on type • SSCOP: PDU types and N(S) • AAL-5: length • AAL-3/4 CPC: length • AAL-3/4 SAR: MID, segment type, and sequence number • ATM: VPI and VCI
UNI Signalling Decode Errors	• Missing expected octet • Illegal repeated items • Message or IE length too short • Message or IE length too long • Unnecessary IE or format present • Mandatory IE or format missing • Invalid field value
UNI Signalling Filters	• Filtered message type • Call reference value • Call reference flag • Any of the above decode errors
SSCOP Decode Errors	• PDU too short • Unknown PDU type • PDU alignment error • PDU length error • Non-zero reserved field • Information field too long • SSCOP-UU field too long
SSCOP PDU Data Filters	• Filtered PDU type • Any of the above decode errors
AAL-5 PDU Data Filters	• Invalid CRC-32 • Length field not equal to received length • Frame length larger than maximum • Frame length smaller than minimum • Incorrect pad length • Filtered field • Any of the above decode errors
ATM Cell Data Decode Errors	• Incorrect header error control (HEC) • Zero VCI but non-zero VPI • Invalid OAM
ATM Cell Data Filters	• Filtered cell type • Filtered cell field • Generic flow control value • Virtual path identifier (VPI) • Virtual channel identifier (VCI) • Payload type • Cell loss priority • Invalid cell type • Any of the above decode errors
Bit String Filters	• Filter pattern editor allows you to select octets which you wish to match, and enter individual data patterns for each selected octet

Protocol Simulation

Smart Message Editors	• UNI 3.0/3.1/4.0 signalling messages • Q.2931 signalling messages with Ammendment 1 (06/97) • Q.2110 SSCOP PDUs • Q.SAAL1 SSCOP PDUs • Q.2971
Signalling Messages Fields	• Message set • Direction • Protocol discriminator • Call reference • Message type • Message length • Information elements and all associated content fields

Q.2110 SSCOP PDU Fields	• SSCOP-UU • Information • List elements (STAT messages) • Pad • Pad length • Reserved bits • N(MR) • N(PS) • N(R) • N(S) • N(SQ) • Source
Q.SAAL1 SSCOP PDU Fields	• N(UU) • Information • List elements (STAT messages) • Pad • Pad length • Reserved bits • N(MR) • N(PS) • N(R) • N(S) • N(SQ) • Source

Layer 2 Emulation

Layer 2 Response	• Automatic response, or direct control of the SSCOP and SSCF state machines
SSCOP Services	• Establish request • Establish response • Release • Send data • Resynchronize request • Resynchronize response • Recover Response
SSCF Services	• Establish • Release • Send sequenced data • Send unit data
Configuration Parameters	• MaxCC; specifies number of times an unacknowledged connection control PDU can be sent • MaxPD; specifies how many SD PDUs are sent before a POLL PDU is sent • Maximum SSCOP information field length • Maximum length of the UU field in Q.2110 SSCOP PDUs
Receive Window Size	• Sets the window size of the SSCOP receiver
Protocol Behavior	• Repeat USTAT; toggles on/off the optional transmission of a second USTAT PDU when a new sequence gap is detected as per Q.SAAL1 • USTAT Response to Poll; toggles on/off the optional transmission of a USTAT PDU in response to a POLL PDU if a new sequence gap is detected as per Q.SAAL1 • Poll after retransmission; toggles on/off the optional forced expiry of the POLL timer due to the reception of a USTAT as per Q.SAAL1
Modifiable Timers	• CC; ensures that the system under test acknowledges a connection control PDU in time; set from 1 to 9,999 sec • POLL; specifies the time between POLL transmissions; set from 10 to 99,9999 msec • KEEP-ALIVE; measures the time between a final POLL and the STAT response before entering the IDLE phase; set from 1 to 9,999 sec • IDLE; measures a period in the idle phase during which the tester does not poll the system under test; set from 1 to 9,999 sec • NO RESPONSE; used to detect broken layer 2 connections; set from 1 to 9,999 sec
Diagnostic Trace Statements	• On state change • On timer expiry • On protocol violation • On signal trace
Signalling Emulation Performance	• Two signalling virtual channels per CPP • Up to four CPPs can be cascaded to a single line interface to support eight signalling virtual channels on a single line interface • Approximately 700 to 900 PDUs/s at the SSCOP/SSCF layer

Layer 3 Emulation

Layer 3 Response	• Automatic emulation, or interactive control
Interactive Functions	• Call setup including Leaf Initiated Join Emulation • Add/drop channels to a point-to-multipoint connection • Restart channels which have been set up • Establish/release SSCOP link • Sending arbitrary messages for an active call (e.g. STATUS ENQUIRY)
Protocol Behavior	• Toggle optional Q.2931 symmetric call operation on or off • Toggle optional SETUP message responses (CALL PROCEEDING AND ALERTING) on or off, specify delay and response message • Toggle optional STATUS ENQUIRY message each time a link is reset on or off (as per Q.2931 and UNI 3.1)
Call Acceptance Control	• Accept all call setup requests, or only those from specified ATM addresses or range of addresses • Specify which VPI/VCI virtual channels are assigned to SVCs (network side) • Add a value from 0 to 65,535 ms to the Q.2931 transit delay information element • increment (24 bits) μs peak-to-peak value
Modifiable Timers	• T301 (Q.2931,UNI 4.0); time in which CONNECT must be made after ALERT received • T303; Tracks the time during which a Q.2931 ALERTING, CONNECT RELEASE COMPLETE or CALL PROCEEDING message must be received after a SETUP message is sent • T308; tracks the time during which a RELEASE or RELEASE COMPLETE message must be received after a RELEASE message is sent • T309; tracks the time during which the layer 2 connection must be re-established after the SAAL connection terminates • T310; tracks the time during which an ALERTING, CONNECT or RELEASE message must be received after a CALL PROCEEDING message is received • T313 (user side); Tracks the time during which a CONNECT ACKNOWLEDGE must be received after a CONNECT message is sent • T316; tracks the time during which a RESTART ACKNOWLEDGE must be received after a RESTART message is sent • T322; tracks the time during which a STATUS, RELEASE or RELEASE COMPLETE message must be received after a STATUS ENQUIRY message has been sent • T331 (UNI 4.0); time in which SETUP, ADD PARTY or LEAF SETUP FAILURE must be received after LEAF SET UP REQUEST sent
Modifiable Point-to-Multipoint Timers & Delays	• T397 (Q.2971); time in which ADD PARTY ACKNOWLEDGEMENT must be received after ALERTING or ADD PARTY ALERTING received • T398; tracks the time during which a DROP PARTY ACKNOWLEDGE or RELEASE message must be received after a DROP PARTY message is sent • T399; tracks the time during which an ADD PARTY ACKNOWLEDGE, ADD PARTY REJECT or RELEASE message must be received after an ADD PARTY message is sent • Delay before sending an ACKNOWLEDGEMENT or REJECT response after receiving an ADD PARTY message can be set from 0.0 to 99.9 seconds
Timer Controls	• Set maximum number of T316 expiries • Set maximum number of T322 expiries • Toggle Retransmit SETUP on T303 expiry on/off • Toggle Send Cause IE on T308 or T398 expiry on/off • Toggle UNI 3.0 T309 implementation on/off
Delays	• ADD PARTY response delay; from 0.0 to 99.9 seconds • SETUP message response delay • LEAF SETUP REQUEST message and response delay
Negotiation Parameters	• ABR • Connection characteristics
Diagnostic Trace Statements	• On state change • On timer expiry • On protocol violation • On signal receipt
Active SVC Table	• Table display shows assigned VPI/VCI, call reference, number of active parties in point-to-multipoint call, and call state for each channel • Up to 4096 bytes; typical UNI signalling messages are usually well below 256 byte
Signalling Emulation Performance	• Two signalling virtual channels per CPP • Up to four CPPs can be cascaded to a single line interface to support eight signalling virtual channels on a single line interface • Automatic traffic shaping of emulation responses, user- selectable from 16 kb/s or 38 cells/second to full line rate, or send 100% line rate burst of AAL-5 frames

Call Generation

- The E4214's robust call generation capability allows you to load as witch or other device to determine its signalling processing delay, throughput, and other performance characteristics.

Call Set-Up Capacity	• Up to 90 calls per second with a 60MHz processor, higher with more powerful processors • Up to 216,000 busy hour call attempts with a 60 MHz processor and higher with more powerful processors
Call Set-Up Distributions	• Continuously • Burst
Options	• Number of active calls to be maintained at one time • Interval between last call release and new call set-up
Call Set-Up Sequences	• Create call set-up sequences using the PDU Builder • Each sequence can contain more than 1,000 call set-up messages • Up to 4046 active calls can be maintained • Set up multipoint calls to as many as 128 addresses
Statistics	• Number of call attempts • Number of successful calls

Applicable Standards & Recommendations

Signalling AAL	• ITU-T Recommendation Q.2100, B-ISDN Signalling ATM Adaptation Layer (SAAL) Overview Description, 1994 • ITU-T Recommendation Q.2110, B-ISDN ATM Adaptation Layer - Service Specific Connection Oriented Protocol (SSCOP), 07/94 • ITU-T Recommendation Q.2130, B-ISDN Signalling ATM Adaptation Layer - Service Specific Coordination Function for Support of Signalling at the User Network Interface (SSFC at UNI), 07/94 • ITU-T Recommendation Q.SAAL.0, B-ISDN Signalling ATM Adaptation Layer Overview Description, 05/93 • ITU-T Recommendation Q.SAAL.1, Service Specific Connection Oriented Protocol (SSCOP) Specification, 05/93 • ITU-T Recommendation Q.SAAL.2, Service Specific Coordination Function (SSCF) for Signalling at the User-to-Network Interface (UNI), 06/93 • ITU-T Recommendation Q.2931, Amendment 1 Broadband ISDN application protocols for access signalling - Digital Subscribe Signalling System No.2 (DSS 2). User-to-Network Interface (UNI) Layer 3 specification for Basic Call/Connection Control, Amendment 1 • ITU-T Recommendation Q.2951, Stage 3 Description for Number Identification Supplementary Services Using B-ISDN - Digital Subscriber Signalling System No. 2 (DSS 2). Basic Call (clauses 1 to 6 and 8), 02/95 • ITU-T Recommendation Q.2957, Stage 3 Description for Additional Information Transfer Supplementary Services Using B-ISDN - Digital Subscriber Signalling System No. 2 (DSS 2). Basic Call Clause 1 - User-to-user signalling (UUS), 02/95 • ITU-T Recommendation Q.2961, Broadband Integrated Services Digital Network (B-ISDN) - Digital Subscriber Signalling System No. 2 (DSS 2) - Additional Traffic Parameters, 10/95
Layer 3 UNI Signalling	• ITU-T Q.2931, Broadband Integrated Services Digital Network (B- ISDN) - Digital Subscriber Signalling System No. 2 (DSS 2) - User-Network Interface (UNI) - Layer 3 Specification for Basic Call/Connection Control, 10/94 • ITU-T Recommendation Q.2971, Broadband Integrated Services Digital Network (B-ISDN) - Digital Subscriber Signalling System No. 2 (DSS 2) - User-Network Interface (UNI) Layer 3 Specification for Point-to-Multipoint Call/Connection Control, 02/95 • ATM User-Network Interface (UNI) Specification Version 3.0, The ATM Forum, 09/93 • ATM User-Network Interface (UNI) Specification Version 3.1, The ATM Forum, 09/94 • ATM User-Network Interface (UNI) Specification Version 4.0, The ATM Forum, 07/96

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.

www.Agilent.com/comms/BSTS

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) 547-9999

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) 267-4245
Fax: (305) 267-4286

Asia Pacific:
Agilent Technologies
19/F, Cityplaza One, 1111 King's Road,
Taikoo Shing, Hong Kong, SAR
Tel: (852) 2599-7889
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

Specifications subject to change.

5965-9078E 03/00 Rev B

Agilent Technologies
Innovating the HP Way