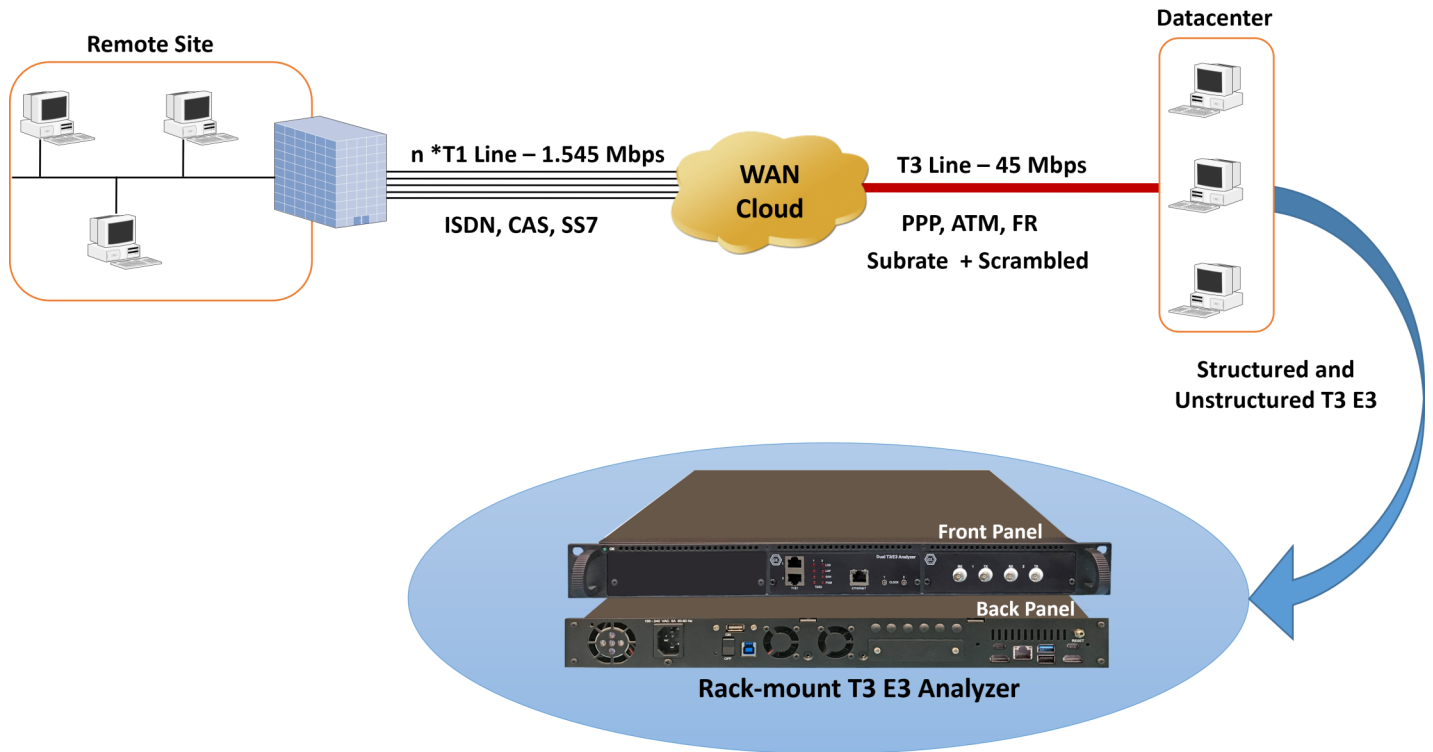


USB T3 or E3 Analyzer (Portable and Rack)



Overview

GL's **USB T3 E3 Analyzer** is available as portable as well as rackmount system. A portable USB-based unit support 2 T3 E3 ports per unit. An 1U rack can support 4 T3 or E3 ports (2 * 672 DS0s) and 2U Rack supports 12 T3 or E3 ports (6 * 672 DS0s) per unit. Multiple rack units can be stacked together for greater scalability. The analyzer software supports monitoring up to 12 T3 or E3 lines (2x Rack units or 6x Portable units) simultaneously for all T3 or E3 alarms, T1 or E1 alarms and frame errors. With additional applications, such as record-only, one can also record traffic at DS0 levels.

A T3 line is an ultra-high-speed signal capable of transmitting data at rates up to 44.736 Mbps. An E3 signal is situated at the third level within the Plesiochronous Digital Hierarchy (PDH) and has a bit rate of 34.368 Mbps.

T3 (DS3) or E3 has two flavours channelized (structured) and unchannelized (unstructured).

- In Channelized (Structured), a T3 (DS3) consists of 7 T2s (DS2) and each T2 consists of 4 T1s (DS1), thus a total of 28 T1s, or 672 full duplex voice channels are provided at the rate of 1.544 Mbps. Similarly, an E3 consists of 4 E2s and each E2 consists of 4 E1s, thus a total of 16 E1s, or 480 full duplex voice channels are provided at the rate of 2.048 Mbps
- In Unchannelized (Unstructured), T2s or T1s or E2s or E1s DO NOT exist within T3 or E3. Instead, most of the capacity within 44.736 Mbps for T3 and 34.368 Mbps for E3 is used for data, with a small amount for overhead. With the advent of the internet, T3 (DS3) and E3 can be used to transport not only data, but also packetized voice, and packetized video. Example protocols include Asynchronous Transfer Mode (ATM), PPP, HDLC, and Frame Relay

GL's mTOP™ rack can include multiple USB based Channelized T3 E3 Analyzer hardware units to form high-density form factor. The latest mTOP™ Probe unit includes single USB T3 E3 Analyzer hardware unit with necessary PC interface in a single box making it suitable for field testing.

For more information, refer to [USB T3 E3 Analyzer \(Portable and Rack\)](#) webpage.



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Main Features

- One of the smallest and lightest T3 (DS3) /E3 analysis platforms with dual data stream capture capability
- Multiple interfaces for analysis (T3 (DS3) /E3, T1 E1 and Ethernet) and control (USB and Ethernet) to support a wide array of testing scenarios
- Plug and Play through USB 2.0 control interface
- Software Selectable T3 (DS3) and E3 interface along with T1 and E1 Drop and Insert
- Dual T3 (DS3) /E3 Receivers and Transmitters for non-intrusive and intrusive testing of both eastbound and westbound signals at the same time
- Channelized (Structured) Testing
 - With Drop and Insert Functionality –
 - Uses the Dual T1 E1 ports on the hardware
 - Multiplex / De-multiplex T1 (DS1) /E1 signals (Drop and Insert)
 - Receivers for bidirectional monitoring with Dual T1 (DS1)/E1 drop
 - Transmit multiplexed externally inserted or internally generated T1 E1 streams into T3 (DS3)/E3
 - Stress test M13 (E13) multiplexers and 3/1 Digital cross connect systems
 - Dual channel drop and insert of T1/E1 signals from any one of the T3 (DS3) /E3 signals
 - Broadcast or Loopback Individual T1s/E1s received from T3 (DS3) /E3
- With T1 E1 Tx/Rx Server Software –
 - T1 or E1 frames are transmitted by the T1 E1 Transmit Server over T3 or E3 lines
 - T3 or E3 Data is received by the T1 E1 Send/Receive Server, which demultiplexes the data to T1 or E1 Channels
 - Send/Receive 28 T1 Channels per port from T3 signal
 - Receive 21 E1 Channels per port (G.747 Mapping) per port from T3 signal
 - Receive 16 E1 Channels per port from E3 signal
 - Supports monitoring of framed and unframed T1 E1 (Rx Only)
 - Simultaneous analysis of all 56 T1s (1.544 Mbps each), or 32 E1s (2.048 Mbps each)
 - Analysis of Fractional T1s and E1s, N x T1s or N x E1s
 - Analysis of any combination of DS0s (64 kbps each) within the T1s or E1s, $56 \times 24 = 1,344$ DS0s for T1 or $32 \times 32 = 1024$ DS0s
 - Supports Protocol Analysis of all structured protocols – HDLC, ISDN, CAS, and many more
 - Monitoring of T1 E1 Alarms, Payload, and Framing structure
- Unchannelized (Unstructured) Testing
 - WAN Testing
 - Analysis and simulation of Physical layer, ATM, PPP, HDLC, and Frame Relay protocols
 - Transmit / Verify HDLC frames with user defined headers
 - Supports [scrambling and subrate](#) for the following DSU vendors' algorithms for T3 interface: Digital Link, Larscom, Verilink, and Adtran
- BIT Error Rate Test (BERT)
 - Perform BERT on T3 E3 channels simultaneously
 - Enhanced to support BERT through Windows Client Server Commands (WCS)
- Flexible clocking - internal, recovered (from T3 or E3, T1 or E1) and external
- Scripting and Automation through GL's well-known Windows Client Server (WCS) approach
- WCS clients are available for Windows® and Linux® operating system via console/terminal Command Line Interface and accessible remotely through SSH
- WCS commands can be issued in Python scripts running in Windows® and Linux® operating system
- Includes HDL File Conversation utility to convert ethereal format file (*.PCAP, *.CAP, and *.PCAPNG) to GL's file format (*.HDL) and vice-versa

Basic T3 E3 Applications

BERT (Full Frame and Unframed)

- Test Patterns:
 - PRBS: QRSS, 2^6-1 , 2^9-1 , $2^{11}-1$, $2^{15}-1$, $2^{20}-1$, $2^{23}-1$
 - Static: All 1s, All 0s, 1010, 1 in 7, 3 in 24., CSU Loop-Up, CSU Loop-Down, NIU Loop-Up, NIU Loop-Down
 - User Defined: 1 bits to 32-bits
- Performance Analysis: ITU-T G.82, G.826, M.2100, M.2110, M.2120
- Bit Error Insertion: Single Manual error, Automated error rate 10-2 through 10-9, User defined error rate
- Graphical Display

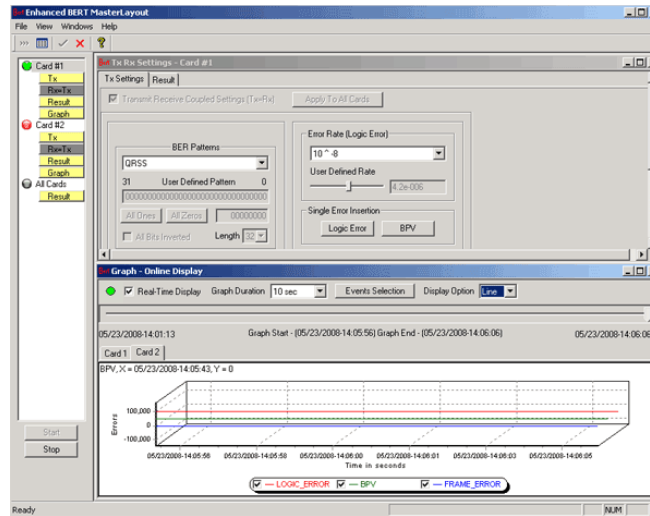


Figure: Enhanced BERT

Tx Rx Memory Loopback

This application is used for diagnostic purposes. It loops all the received data from the memory back to the transmitting port. Memory Loopback application can be run on one port, along with Bit Error Rate Test on the other port to verify the operation of this analyzer unit.

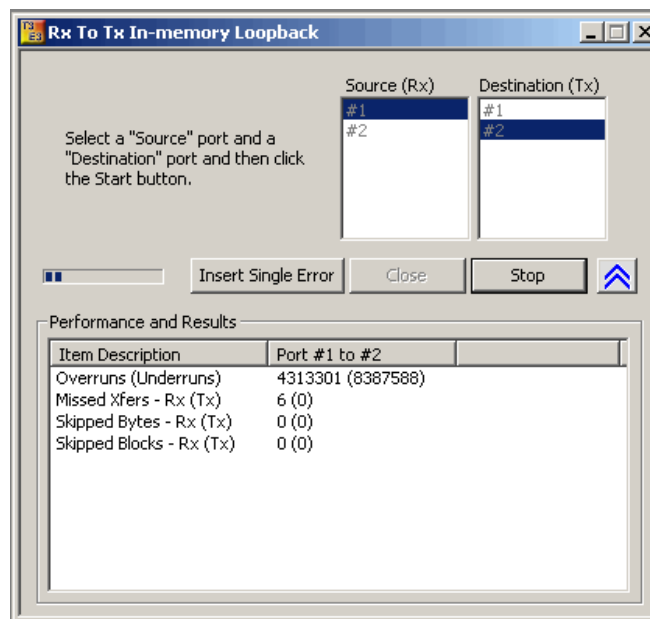


Figure: Rx to Tx Memory Loopback

Basic T3 E3 Applications (Contd.)

Alarm Generation and Error Injection

This application internally generates various types of errors and / or alarms and transmits them on the outgoing T3 (DS3)/E3 stream. The application can automatically insert errors at regular intervals of time (secs) or insert single bit errors.

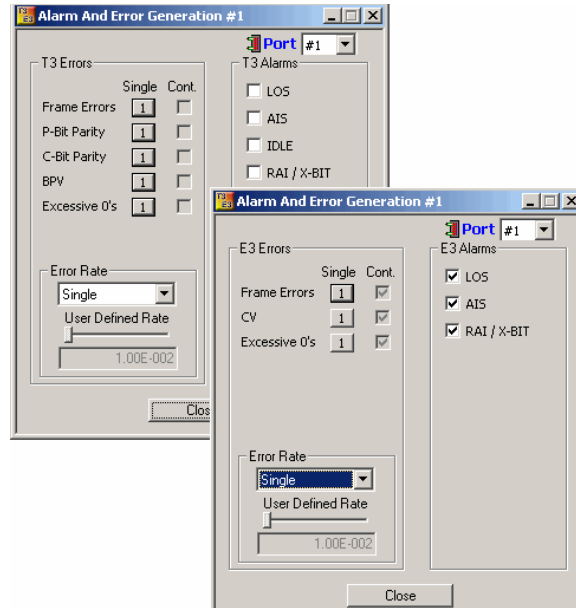


Figure: Alarm Generation and Error Injection

DSU Subrate Configuration

Subrate allows DSU manufacturers to control bandwidth from service provider end and sell user specific bandwidth. USB T3 E3 Analyzer supports DSU DS3 Subrate configuration for Digital Link, Larscom, Verilink, and Adtran as shown in the figure.

For more information, please visit [T3 \(DS3\) Subrate and Scrambling](#) webpage.

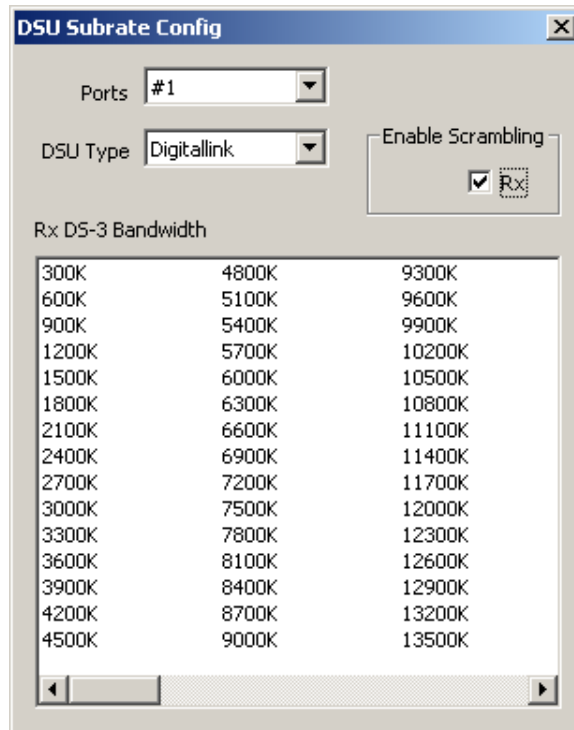


Figure: Data Service Unit

Basic T3 E3 Applications (Contd.)

Multiplex and Demultiplex T1 E1 Signals

Up to two users' selected T1 (or E1) channels can be externally inserted using the T1 E1 input/output interface into any one of the transmitted T3 (DS3) or E3 signal. The inserted T1 or E1 signal can be selectively transmitted through one or more of the T1 E1 transmit channels or broadcasted through all the T1 E1 channels. Similarly up to two user selected T1 E1 channels can be dropped.

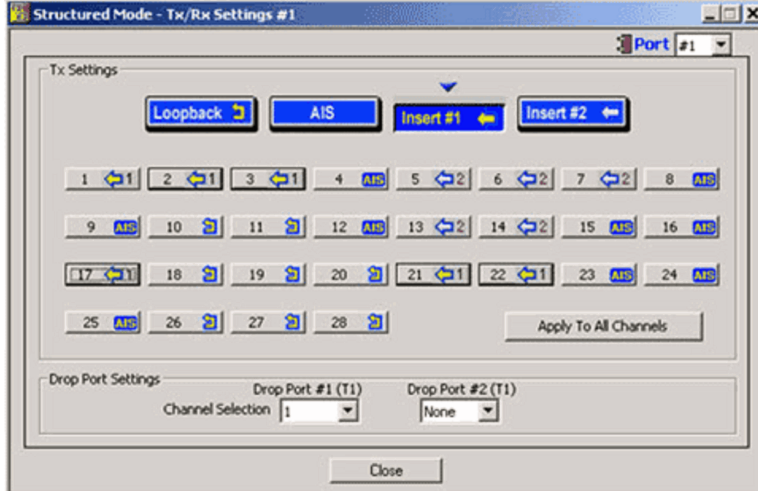


Figure: Multiplex and Demultiplex

Optional T3 E3 Applications

Channelized T1 E1 Analyzer (DeMux)

The USB T3 E3 hardware with T1/E1 Send/Receive Server application and Channelized T3 or E3 T1 or E1 Analyzer software (requires additional license) can now send T1 or E1 frames over T3 or E3 lines and generate, capture, record, and monitor multiple T1 or E1 channels over Channelized T3 or E3 links. The T1/E1 Send/Receive Server, runs as a service and performs channelization of a T3 E3 signals. The channelized streams containing T1 or E1 frames are forwarded to Channelized T3 or E3 T1 or E1 Analyzer software. The analyzer can then perform analysis of various signal types including voice, digits, tones, fax, modem, and raw data.

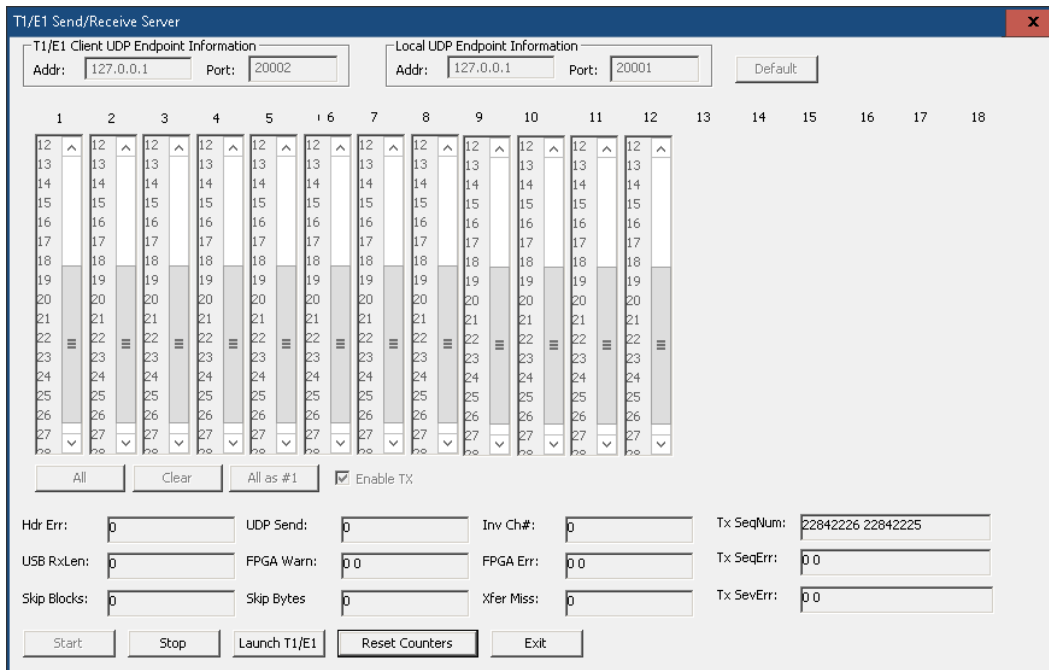


Figure: T1/E1 Send/Receive Server

Optional T3 E3 Applications (Contd.)

Record Data to File (Raw)

- Capture incoming data into binary flat file
- Each T3 E3 Signal is captured into separate files
- Synchronized capture from both ports
- Unframed T3 E3 or Framed T3 E3
- Capture up to user selected size or manually stop

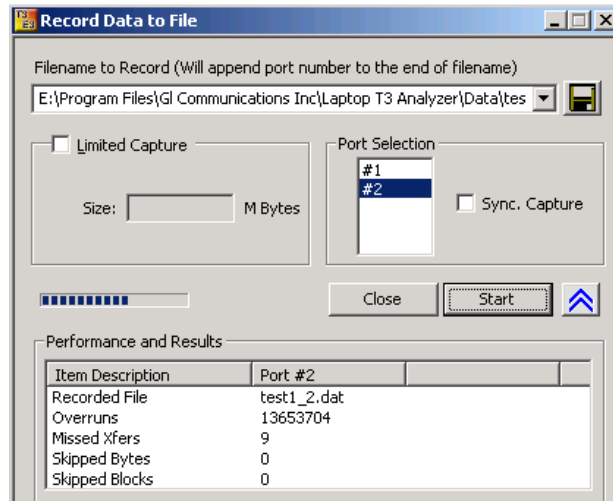


Figure: Record Data to File

HDLC Tx/Rx Test

- Transmit HDLC at wire speed
 - Generate HDLC frames of varying length
 - HDLC frames contain sequence numbers
 - User controllable flags in between frames
 - User selectable HDLC frame size
 - Option for CRC16 or CRC32 bits
 - Allows pre-pending user-defined frame header for each HDLC frame, which allows to create PPP, Frame-relay simulation
- Receive and analyze HDLC at wire speed
 - Verify received HDLC frames for integrity
 - Analyzer receives frames and counts CRC errors, frame errors, length error and sequence errors

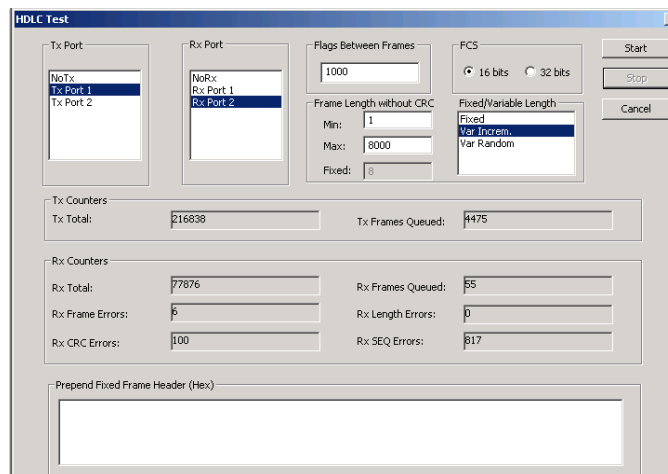


Figure: HDLC Tx/Rx Test

Optional T3 E3 Applications (Contd.)

Playback Data (Raw file)

- Playback flat binary file over T3 E3
- User selected file without any size constraints
- Playback over framed or unframed T3 E3
- Option for continuous playback or single shot
- Allows manual insertion of bit error

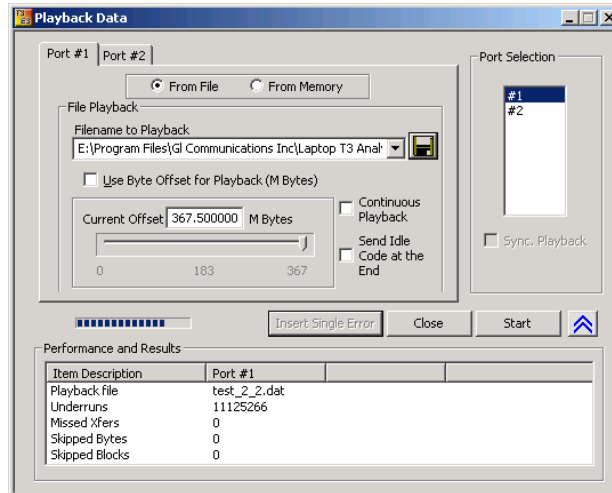


Figure: Playback Data

Protocol Analyzers

- HDLC Protocol Analyzer - Analyze HDLC over bidirectional T3 E3
- Frame Relay Protocol Analyzer - Analyze Frame Relay over bidirectional T3 E3
- PPP Protocol Analyzer - Analyze PPP over bidirectional T3 E3
- ATM Protocol Analyzer - Analyze Direct-Mapped ATM over bidirectional T3
- Physical Layer Analyzer
 - Captures LOS, LOF, AIS, IDLE, RAI/X-BIT, Excessive 0's alarms at T3 E3 level
 - Captures Sync Loss, Carrier Loss, AIS, Blue, Yellow, Distance MF, Frame Error alarms at T1 E1 level

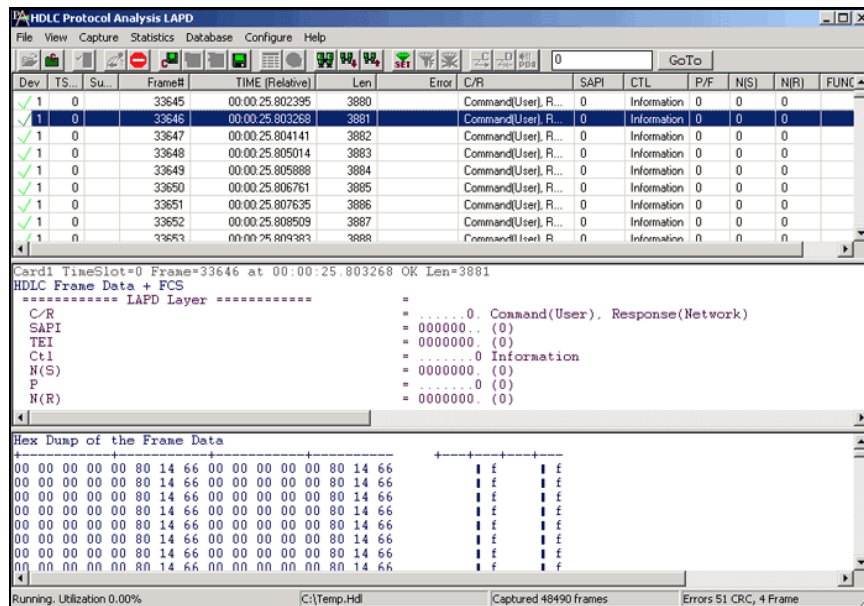


Figure: HDLC Analysis

SNMP DS3 traps (Requires Additional License)

Alarms monitored at the DS3 level are packetized and sent via TCP/IP to central database. These alarms can be sent in the form of SNMPv2c Traps via Simple Network Management Protocol (SNMP) to network operation center. The SNMP option with GL's Protocol Analysis is extremely useful for a large and dynamic networks with equipment from multiple vendors. Typically SNMP agents for alarms contains loopback, failure, received alarms and transmitted alarms information. Using SNMP monitoring you can monitor network availability, critical errors and alarms on your network.

Unchannelized T3 Analyzer supports Management Information Base (MIB) modules that is compliant to the **SNMP v2c** for DS3 as per RFC 3896. It includes **SnmpDS3.ini** configuration file to configure SNMP DS3 traps, which can be sent to one or more SNMP notification receivers like **HP OpenView**.

For more information, please visit [SNMP Alarm Monitoring for Telecom Networks](#) webpage.

The screenshot displays the MIB Browser interface. On the left, the 'SNMP Agent' tree is expanded to show the 'snmp' MIB module. The right pane shows a list of 'Trap [V2]' notifications received on port 162. The first trap is highlighted, and red arrows point to specific fields: '192.168.12.186' (labeled 'T3 Alarm Indication'), '162' (labeled 'T3 Port Number'), and '608' (labeled 'T3 Alarm'). The notification details include: Community String = TrapComm1, Request = 1004, sysUpTime.0 = 0-17:6:50.00, snmpTrapOID.0 = dsx3LineStatusChange, dsx3LineStatus.2 = 1, and dsx3LineStatusLastChange.2 = 0-17:6:50.00. The status bar at the bottom indicates 'Notification Received on port 162'.

Figure: SNMP Monitoring in MIB Browser

Connectors for USB T3 E3 Analyzer

T3 E3	2x DS3/E3 75Ω BNC (Tx, Rx) Ports
T1 E1	2x DS1/E1 RJ-48-c (Tx, Rx) for Drop/Insert
External Clock	2x MCX External Clock Ports
PC Interface	1x USB 2.0 for PC Interface
External Power	12 Volts (Medical Grade), 3 Amps
Ethernet	1x 1000 Mbps Ethernet Ports

Connectors for Rack T3 E3

T3 E3	Up to 6 Pairs of DS3/E3 75Ω BNC (Tx, Rx) Ports
T1 E1	Up to 6 Pairs of DS1/E1 RJ-48-c (Tx, Rx) for Drop/Insert
External Clock	6x MCX External Clock Ports
PC Interface	3x USB 2.0 Connected to a USB HUB
External Power	Internally powered by Power Supply
Ethernet	3 x 1000 Mbps Ethernet Port

T3 E3 Line Interface

Output Amplitude	800mV +/- 50mV
Input Impedance	75 Ohms unbalanced (BNC)
Line Code	B3ZS (T3), HDB3 (E3)
Terminate Input Level	0.09Vp – 0.85Vp
Monitor Input Level	0.025Vp – 0.08Vp
Clock Source	Internal- +/- 1 PPM @25C [+/- 4.5 ppm (includes ageing, stability)]
Recovered	Clock recovered from receiver
External	TTL Level signal High Speed: (T3 E3 Rate) Low Speed: (2KHz, 8KHz, 2MHz, 1.5MHz) Recovered from Inserted T1 E1

T3 E3 Receiver

T3 Framing Format:	M13 (ANSI T1-107 – 1995), C-bit (ANSI T1-107 – 1990), Unframed, Structured (Channelized), and Unstructured (Unchannelized)
E3 Framing Format:	E13, Unframed, Structured (Channelized), and Unstructured (Unchannelized)
Channel Structure:	T1/E1 (ITU-T G.747)
Framed T3 E3 Unstructured Payload:	Raw Data Captured to File, ATM Analysis (only for T3), HDLC Frames Analysis, BERT Patterns Measurement
Framed T3 E3 Structured Payload:	Raw Data Captured to File, BERT Patterns Measurement, Drop Selected T1(s)/E1(s)

T3 E3 Transmitter

T3 E3 Payloads:	Framed T3 E3 Data, Unframed T3 E3, Idle, AIS
T3 Framing Modes:	Unframed, M13 (ANSI T1-107 – 1995) - Structured (Channelized), and Unstructured (Unchannelized) C-bit (ANSI T1-107 – 1990) - Structured (Channelized), and Unstructured (Unchannelized) Unchannelized T3 supports subrate and scrambling formats for Digital Link, ADC/Kentrox, Larscom, Adtran, and Verilink data service units (DSUs)
E3 Framing Modes:	Unframed, E13 (for E3) - Structured (Channelized), and Unstructured (Unchannelized)
Framed T3 E3 Unstructured Payload:	Raw Data from File, ATM Cells (only for T3), HDLC Frames, BERT Patterns
Unframed E3 Payload:	Raw Data from File, BERT Patterns
Channel Structure:	T1, E1 (ITU-T G.747)
BERT Patterns:	QRSS, 2 ⁶ -1, 2 ⁹ -1, 2 ¹¹ -1, 2 ¹⁵ -1, 2 ²⁰ -1, 2 ²³ -1, User Defined up to 32 -bits, other static patterns
T1 Payload:	Inserted T1, AIS, Loopback, BERT Patterns
E1 Payload:	Inserted E1, AIS, Loopback, BERT Patterns
Loopbacks:	Complete T3 E3 Signal, Selected T1s/E1s from incoming T3 E3

T1/E1 Transmit / Receiver

- Bit error rate testing (BERT) pattern generation and detection per channel
- Transmit Tone, Transmit Gaussian Noise, Transmit Multiframe
- Transmit Signaling Bits, and Rx-to-Tx loopback

Compliance	G.703 Physical/Electrical Characteristics GR-499-CORE Physical/Electrical Characteristics G.821 Bert Analysis G.742 Multiplexing G.751 Multiplexing
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Supported Protocols

Channelized Protocols	High-Level Data Link Control (HDLC) Point-to-Point Protocol (PPP), RFC 1662, Multilink PPP (MLPPP), RFC 1990 Frame Relay, RFC 1490 Multilink support over Frame Relay (FRF.12) and MLPPP ATM IMA GSM, TRAU, GPRS, UMTS over ATM SS7, ISDN, CAS, SS1, SSM V5.x, DCME, FDL (T1 Interface only)
UnChannelized Protocols (Unstructured)	PPP, ATM, Frame Relay

Hardware Platforms



Figure: Stacked 1U mTOP™ Rack T3 E3 Analyzer

Dimensions	19 inch (width), 16 inch (Length), 1U (height)
Weight	11 lbs
Power Supply	ATX Power Supply
Operating temperature	0 C deg to 40 C deg
Storage temperature	10 C deg to 70 C deg
Relative humidity	10 % min, 90 % max, non-condensing



Figure: Portable USB T3 E3 Analyzer

Dimensions	1.6" high, 9.25" deep, 5.5" wide
Weight	1.75 lbs
Power Supply	Input: 12 Volts (Medical Grade), 3 Amps
Operating temperature	0 C deg to 40 C deg
Storage temperature	10 C deg to 70 C deg
Relative humidity	10 % min, 90 % max, non-condensing

Hardware Platforms (Contd.)



Figure: mTOP™ Probe T3 E3 Analyzer (Front Panel View)



Figure: mTOP™ Probe T3 E3 Analyzer (Rear Panel View)

Dimensions	8.4 inches (width), 10.4 inches (Length), 3 inches (height)
USB T3 E3 interfaces	<ul style="list-style-type: none"> • DS3/E3 75Ω BNC (Tx, Rx) Ports • DS1/E1 RJ-48-c (Tx, Rx) for Drop/Insert • MCX External Clock Ports • USB 2.0 Connected to a USB HUB • Internally powered by Power Supply • 1000 Mbps Ethernet Port • External USB based Wi-Fi adaptor
SBC specifications	<ul style="list-style-type: none"> • Intel Core i3 or optional i7 NUC Equivalent, Windows® 11 64-bit Pro Operating System • USB 2.0 and USB 3.0 Hub, (2) USB Type C Ports • 12V/3A Power Supply • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports (Optional VGA to HDMI interface)

Functional Specifications

- DS3/E3 multiplexing from T1 E1
- DS3/E3 Playback and Capture
- DS3/E3 Protocol Analysis
- DS3/E3 Bert Analysis
- Sending DS3/DS1 SNMP Traps to Network Operation Center (NOC)

T3 E3 Signal for USB Analyzer

- Up to 56 T1 per unit (or 2* 28)
- Up to 42 E1 per port (or 2* 21)
- For E3 Signal - Up to 32 E1 (or 2* 16)

T3 E3 Signal for Rack

- Up to 168 T1 per unit (or 3*2* 28)
- Up to 126 E1 per port (or 3*2* 21)
- For E3 Signal - Up to 96 E1 (or 3*2* 16)

Miscellaneous

T3 E3 Line Rate Offset:	+/- 50 PPM in 1 ppm Steps
Level Measurement:	Supported
Frequency Measurement:	+/- 1 PPM
T3 Error Add:	Payload Bit, Frame Errors, P-bit, C-bit, EXZ (for T3)
E3 Error Add:	Payload Bit, Frame Errors, Code Violation (CV) Error, EXZ, FAS
T3 Alarm Generation:	LOS, OOF, AIS, RAI (X-bit), Idle, FEAC Codes (Loopback and alarm/status codes)
E3 Alarm Generation:	LOS, OOF, RAI (X-bit);
E3 Alarm Monitoring:	LOS, LOF, AIS, RAI (X-bit), EXZ
T3 FEAC Codes:	Alarm status codes, loopback codes with channel indicator for T1
LED Indicators:	LOS, LOF, ERR, PGM
T1E1 Alarm Generation	Sync Loss, HDB3 Violation, Carrier Loss, Frame Error, Remote, Distant MF, AIS, BPV Errors, CRC Errors, Frame Errors, Transmit Under Run, Receive Over Run

Buyer's Guide

Item No	Product Description
TE3001/EE3001	Portable (USB) Dual T3 E3 / T1 E1 Hardware Unit - requires TT3001 or EE3001
TT3200	Channelized T3 License for T1
TT3210	Channelized T3 License for E1
EE3200	Optional Channelized E3 license for E1
TT3600	T3 Basic Client Server Scripted Control Software
EE3600	E3 Basic Client Server Scripted Control Software
XX617	T3 E3 WCS Client Python Module

For more information, refer to [USB T3 E3 Analyzer \(Portable and Rack\)](#) webpage.



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