
USB Based T3 E3 Basic Applications

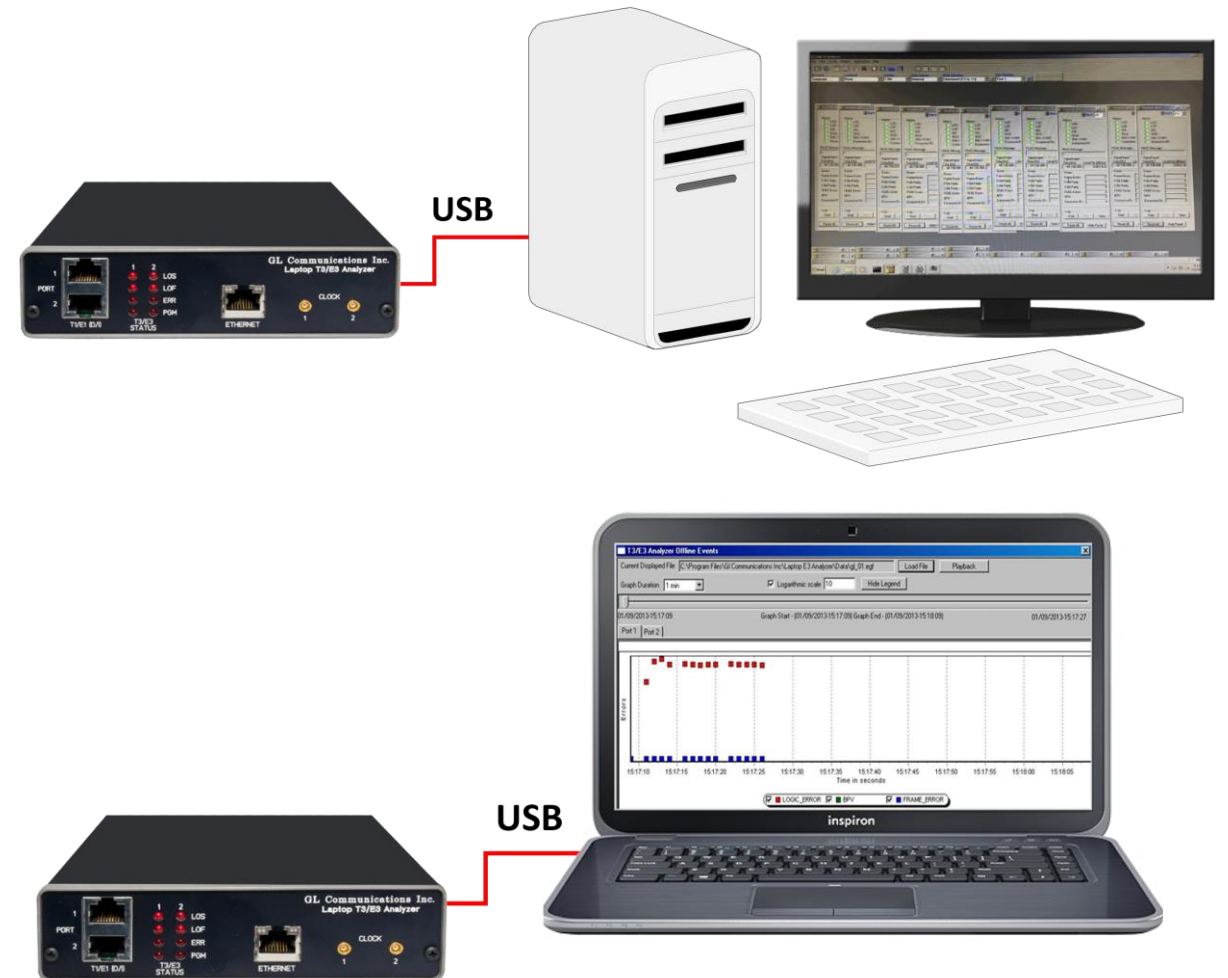


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Website: <https://www.gl.com>

USB Based T3 E3 Analyzer

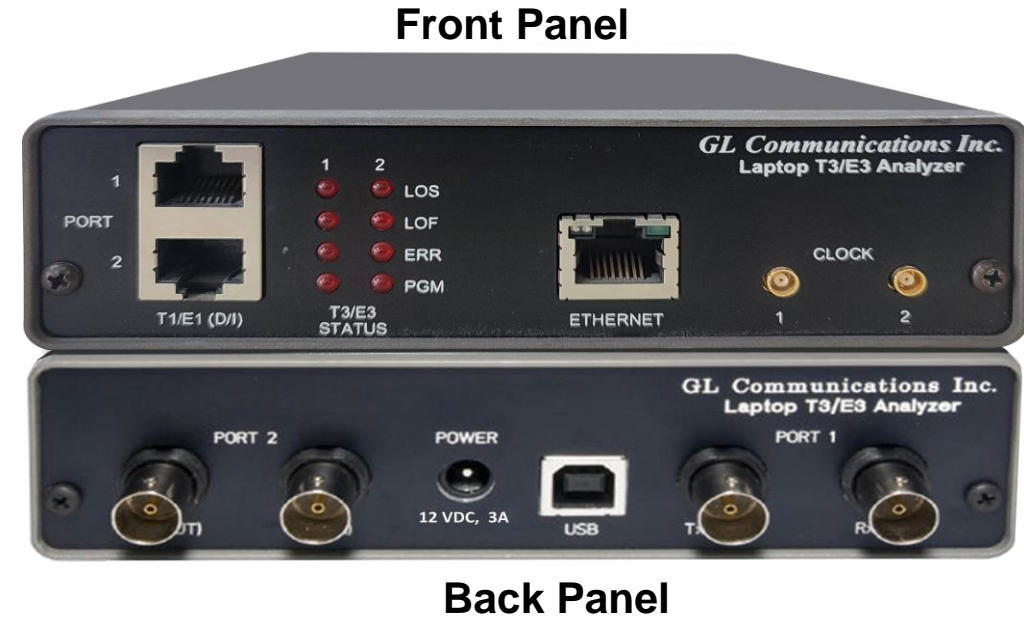
T3 E3 Analyzer unit can work with a Desktop or with a Laptop PC

- Lightest (1.75 pounds) unit available in the market
- Small footprint, easy to carry in the pouch of a Notebook PC - perfect for air travel
- Cost Effective
- Connects to a PC via a USB 2.0 port
- T3, E3, T1, E1, interfaces supported. Ethernet interface will be supported in future
- Remote access for controlling and monitoring will be provided in future



Front and Rear Views of the Analyzer

- Used for installation, test, and troubleshooting of T3 E3 T1 E1 Ethernet lines
- Dual data stream capture capability
- Dropping and inserting T1 or E1
- Full Ethernet analysis
- HDLC, ATM, FR, and PPP analysis
- Used with GL's portable T1 E1 analyzer for individual T1, E1 analysis



Summary of Features & Benefits

- Software selectable T3 (DS3)/E3 interface along with T1 (DS1) and E1 Drop and Insert
- Dual T3 or E3 Receivers and Transmitters for non-intrusive and intrusive testing of both eastbound and westbound signals at the same time
- Simultaneously record/playback the entire T3 (DS3)/E3 in framed or unframed modes up to hard disk capacity
- Flexible clocking - internal, recovered (from T3 (DS3)/E3, T1 (DS1) or E1) and external

Summary of Features & Benefits (Contd.)

- General T3 (DS3)/E3 signal testing capabilities
 - Alarms – monitoring and logging
 - Monitor T3 (DS3)/E3 frequency, line level and various errors.
 - Alarm generation and error injection
 - Decode and simulate Far End Alarm Channel (FEAC) messages.
 - T3 (DS3)/E3 error counters
 - Dual BERT and G.821 Analysis
- Scripting and automation through GL's Windows Client Server (WCS) approach
- Monitor/manage the analyzer remotely via Ethernet port

Summary of Features & Benefits (Contd.)

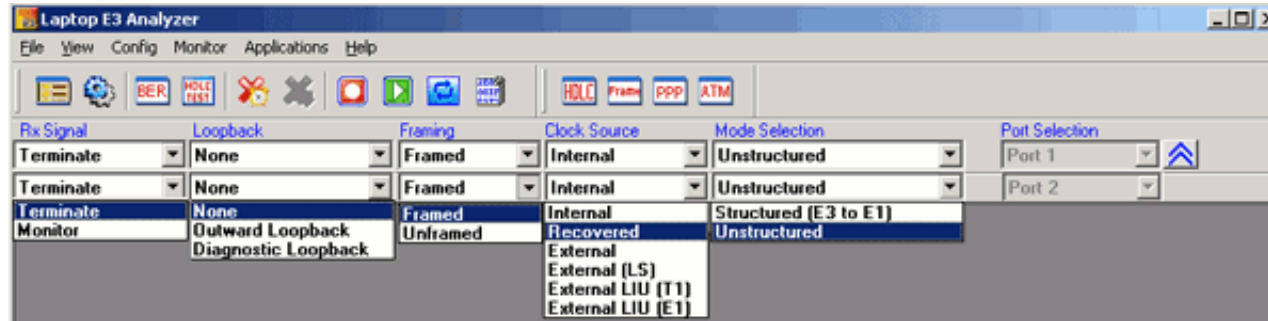
- Channelized (Structured) Testing
 - Multiplex / De-multiplex T1 (DS1)/E1 signals (Drop and Insert)
 - Receivers for bidirectional monitoring with Dual T1 (DS1) / E1 drop
 - Transmit multiplexed externally inserted or internally generated T1 E1 streams into T3 (DS3) /E3
 - Stress test M13 (E13) multiplexers and 3/1 Digital cross connect systems
 - Dual channel drop and insert of T1 or E1 signals from any one of the T3(DS3)/E3 signals
 - Broadcast or loopback individual T1s/E1s within the T3 (DS3)/E3
 - Generates 28 T1s or (21 E1s) signals within the T3 (DS3) or 16 E1s within E3 output
- Unchannelized (Unstructured) Testing
 - WAN Testing
 - Protocol testing for ATM, PPP, HDLC, and Frame Relay
 - Transmit / Verify HDLC frames with user defined headers

Basic Applications

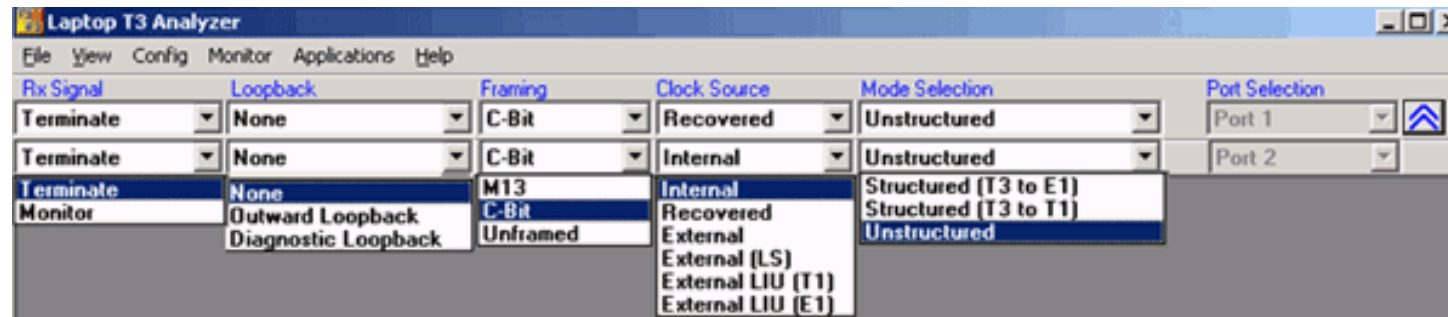
- Bit Error Rate Test (BERT)
- Loopback Modes, Clock, Framing Formats, Structured/Unstructured Modes
- Transmit and Receive Configuration
- Monitor T1 or E1 Frames over T3 or E3 Lines
- Alarm Generation and Error Injection
- Tx Rx Memory Loopback
- Monitor Received Data
- Multiplex and De-multiplex T1 or E1 signals

Loopback Modes, Clock, Framing Formats, Structured/Unstructured Modes

E3 Interface Configuration Parameters

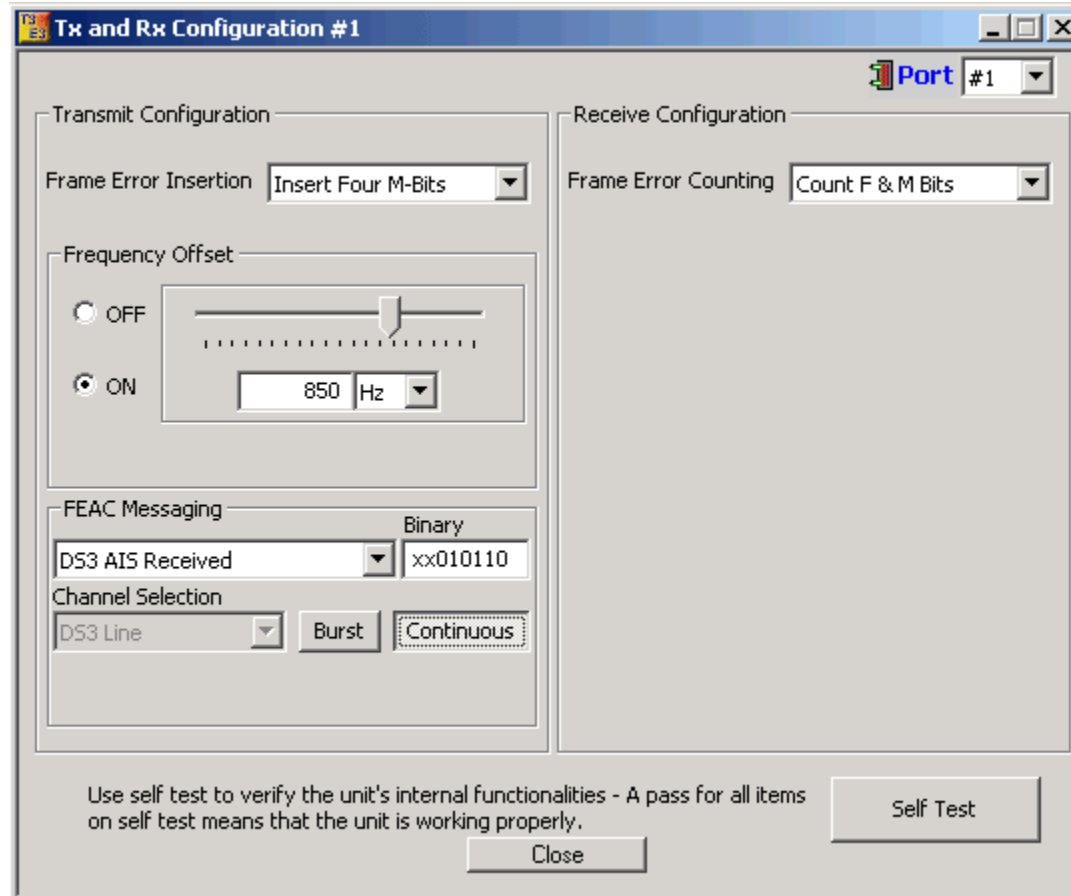


T3 Interface Configuration Parameters



Transmit and Receive Configurations

Tx/Rx parameters for the T3 signal



Tx and Rx Configuration #1 Port #1

Transmit Configuration

Frame Error Insertion: Insert Four M-Bits

Frequency Offset

OFF

ON 850 Hz

Receive Configuration

Frame Error Counting: Count F & M Bits

FEAC Messaging Binary

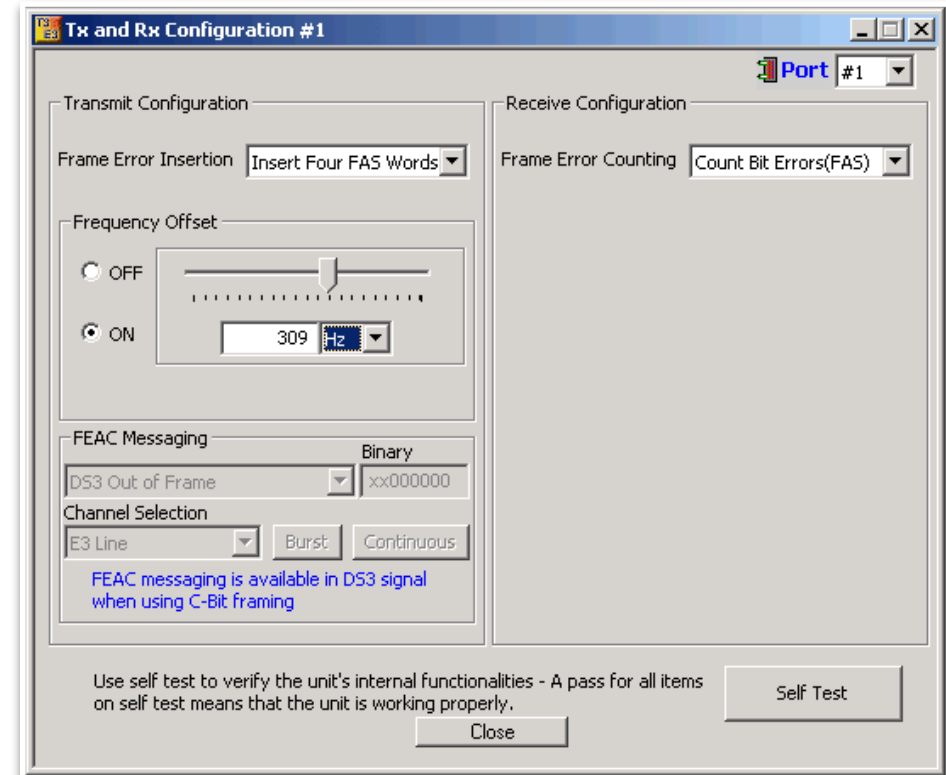
DS3 AIS Received: xx010110

Channel Selection: DS3 Line Burst Continuous

Use self test to verify the unit's internal functionalities - A pass for all items on self test means that the unit is working properly.

Self Test Close

Tx/Rx parameters for the E3 signal



Tx and Rx Configuration #1 Port #1

Transmit Configuration

Frame Error Insertion: Insert Four FAS Words

Frequency Offset

OFF

ON 309 Hz

Receive Configuration

Frame Error Counting: Count Bit Errors(FAS)

FEAC Messaging Binary

DS3 Out of Frame: xx000000

Channel Selection: E3 Line Burst Continuous

FEAC messaging is available in DS3 signal when using C-Bit framing

Use self test to verify the unit's internal functionalities - A pass for all items on self test means that the unit is working properly.

Self Test Close

Transmit and Receive Configurations (Contd.)

- Possible frame error insertions in T3
 - Single FAS word (1111)
 - Single FAS word (0000)
 - Four FAS words (1100)
 - Four FAS words (0011)
- Possible frame error insertions in T3
 - Single F Bits
 - Single M Bits
 - Four F Bits
 - Four M Bits
- Frequency Offset ranging from +50 to -50 ppm for the internal clock source
- Standard and User-defined FEAC Message transmission (only for T3 Systems with C-Bit Parity Framing Format)
- Frame Error Counting
 - E3 - Bit Errors (FAS), Word Errors (FAS)
 - T3 - F & M Bits , F Bits , M Bits
- Self Test the unit

Transmit and Receive Configurations (Contd.)

FEAC Message (only for T3 Systems with C-Bit Parity Farming Format)

- Using the FEAC channel, alarm or status information from the far-end terminal can be sent back to the near-end terminal
- The Monitor T3 Line indicates the incoming FEAC message

The image shows two software windows. The left window, titled 'Tx and Rx Configuration #1', has two main sections: 'Transmit Configuration' and 'Receive Configuration'. In the 'Transmit Configuration' section, 'Frame Error Insertion' is set to 'Insert Four M-Bits'. The 'Frequency Offset' section has 'ON' selected with a slider set to 850 Hz. The 'FEAC Messaging' section has a dropdown menu set to 'DS3 AIS Received' and a 'Binary' field containing 'xx010110'. The 'Channel Selection' section has a dropdown set to 'DS3 Line' and buttons for 'Burst' and 'Continuous'. The right window, titled 'Monitor #1', shows 'Port #1' selected. Under 'Alarms', several status indicators are shown as green circles. The 'FEAC Message' section is circled in red and shows 'DS3 AIS Received'. Below this, 'Signal Input' shows 'Freq (Hz)' as 44736000 and 'Level (Vp)' as 1.40. An 'Errors' section shows counts for 'Frame Errors', 'P-Bit Parity', 'C-Bit Parity', 'FEBE Errors', 'BPV', and 'Excessive 0's', all set to 0. At the bottom, there is a 'Log Alarms' checkbox which is checked, and buttons for 'Reset All' and 'Hide Panel'.

Alarm & Error Display for T3 (DS3) & E3

T3 Monitoring

Monitor #2

Port #2

Alarms

- LOS
- LOF
- AIS
- IDLE
- RAI / X-BIT
- Excessive 0's

FEAC Message

Signal Input

Freq (Hz)	Level (Vp)
44736000	1.22

Errors

Frame Errors	5
P-Bit Parity	2
C-Bit Parity	0
FEBE Errors	1
BPV	2
Excessive 0's	0

Log Alarms

Reset All Hide Panel

E3 Monitoring

Monitor #1

Port #1

Alarms

- LOS
- LOF
- AIS
- RAI / X-BIT
- Excessive 0's

FEAC Message

Signal Input

Freq (Hz)	Level (Vp)
34368000	1.69

Errors

Frame Errors	0
CV	0
Excessive 0's	0

Log Alarms

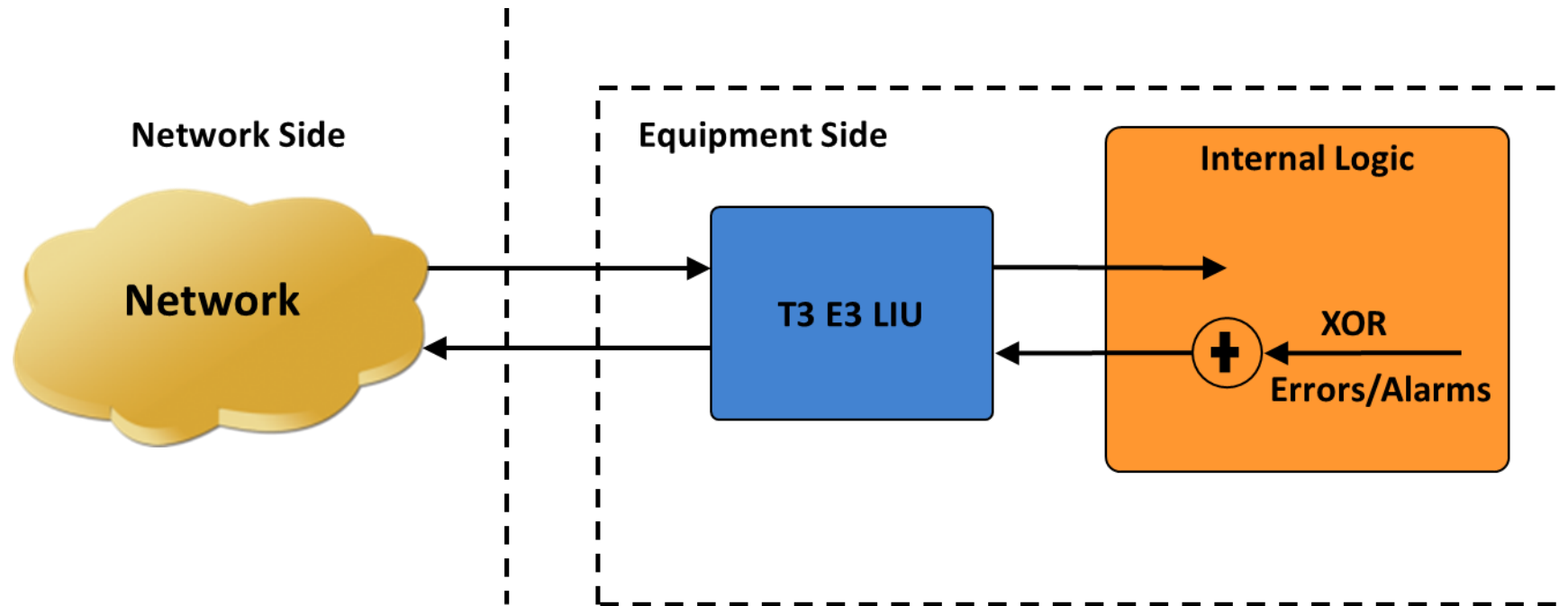
Reset All Hide Panel

Alarm and Error Display for T3 (DS3)

- Available alarms are –
 - LOS - (Loss of Signal)
 - LOF - (Loss of Frames)
 - AIS - (Alarm Indication Signal)
 - Idle
 - RAI/X-Bit
 - Excessive 0's
- Error Indications
 - Frame
 - P- Bit parity
 - C-Bit parity
 - FEBE
 - BPV
 - CV
 - Excessive zeros

The screenshot displays the 'Laptop T3 Analyzer' software interface. The main window has a menu bar (File, View, Config, Monitor, Applications, Help) and a toolbar with various icons. Below the toolbar, there are configuration sections for 'Rx Signal', 'Loopback', 'Framing', 'Clock Source', 'Mode Selection', and 'Port Selection'. The 'Rx Signal' and 'Loopback' sections are set to 'Terminate' and 'None' respectively. 'Framing' is set to 'C-Bit', 'Clock Source' to 'Internal', and 'Mode Selection' to 'Unstructured'. 'Port Selection' is set to 'Port 1' and 'Port 2'. The main area contains two monitors, 'Monitor #1' and 'Monitor #2', each displaying a list of alarms and error counts. The 'Alarms' section for both monitors shows: LOS (green), LOF (green), AIS (green), IDLE (red), RAI / X-BIT (green), and Excessive 0's (green). The 'FEAC Message' field is empty. The 'Signal Input' section shows 'Freq (Hz)' as 44 736 000 and 'Level Vp (dBdsx)' as 0.78 (0.9) for Monitor #1 and 0.87 (1.9) for Monitor #2. The 'Errors' section shows counts for Frame Errors, P-Bit Parity, C-Bit Parity, FEBE Errors, BPV, and Excessive 0's, all of which are 0. The 'Log' section has 'Start', 'Stop', and 'View' buttons. At the bottom, there are 'Reset All' and 'Hide Panel' buttons. The status bar at the bottom right shows 'NUM'.

Alarm Generation and Error Injection



- Internally generates various types of errors and / or alarms and transmits them on the outgoing T3 (DS3)/E3 stream
- Automatically inserts single bit errors or at regular intervals of time (secs)

Alarm Generation and Error Injection (Contd.)

The screenshot shows the 'Alarm And Error Generation #1' dialog box for E3 configuration. The 'Port' dropdown is set to '#1'. The 'E3 Errors' section has a table with 'Single' and 'Cont.' columns. The 'E3 Alarms' section has a list of checkboxes. The 'Error Rate' section has a dropdown set to '10^-3' and a 'User Defined Rate' slider set to '1.00E-002'. A 'Close' button is at the bottom.

	Single	Cont.
Frame Errors	1	<input checked="" type="checkbox"/>
CV	1	<input checked="" type="checkbox"/>
Excessive 0's	1	<input checked="" type="checkbox"/>

E3 Alarms

- LOS
- AIS
- RAI / X-BIT

Error Rate

10⁻³

User Defined Rate

1.00E-002

Close

The screenshot shows the 'Alarm And Error Generation #1' dialog box for T3 configuration. The 'Port' dropdown is set to '#1'. The 'T3 Errors' section has a table with 'Single' and 'Cont.' columns. The 'T3 Alarms' section has a list of checkboxes. The 'Error Rate' section has a dropdown set to '10^-3' and a 'User Defined Rate' slider set to '1.00E-002'. A 'Close' button is at the bottom.

	Single	Cont.
Frame Errors	1	<input type="checkbox"/>
P-Bit Parity	1	<input checked="" type="checkbox"/>
C-Bit Parity	1	<input type="checkbox"/>
FEBE Errors	1	<input type="checkbox"/>
BPV	1	<input type="checkbox"/>
Excessive 0's	1	<input type="checkbox"/>

T3 Alarms

- LOS
- LOF
- AIS
- IDLE
- RAI / X-BIT
- Excessive 0's

Error Rate

10⁻³

User Defined Rate

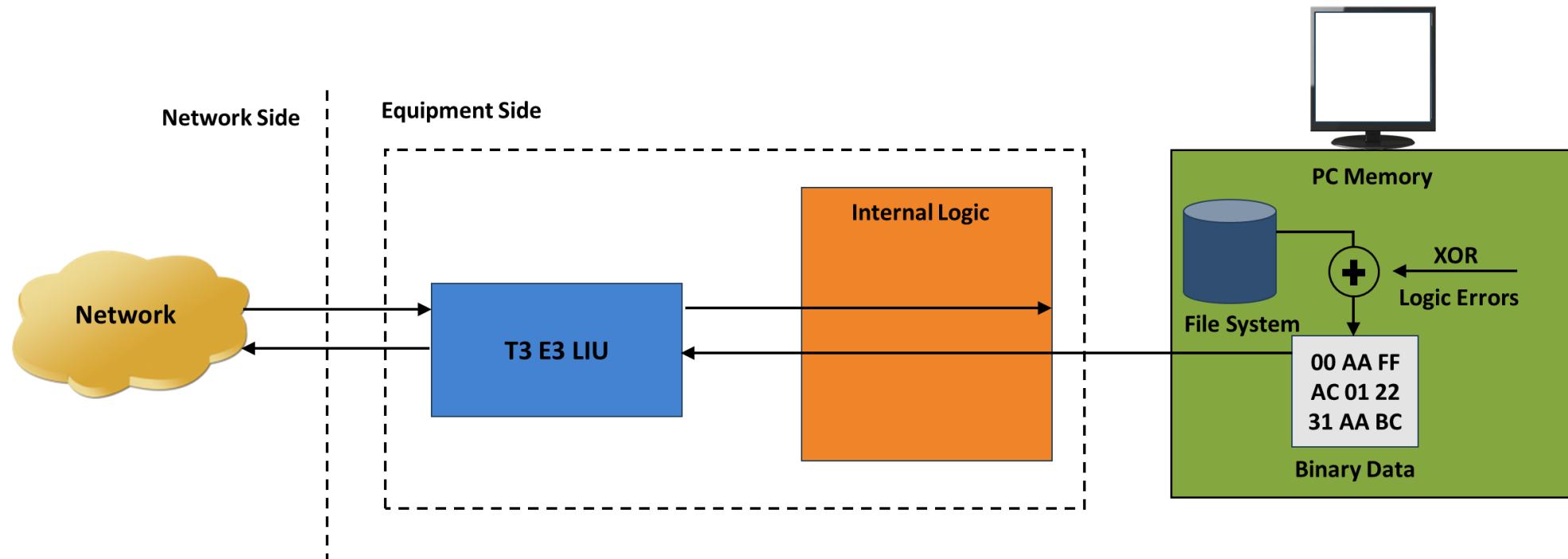
1.00E-002

Close

- Alarms - LOS (Loss of Signal), LOF (Loss of Frames), AIS (Alarm Indication Signal), Idle, RAI/X-Bit, Remote Alarm Indication (RAI)
- Errors – Frame, P-Bit Error (T3 Only), C-Bit Error (T3 Only), FEBE Error (Far End Block Errors) (T3 Only), BPV - BiPolar Violation (T3 Only), Excessive 0's, CV Errors (E3 Only)

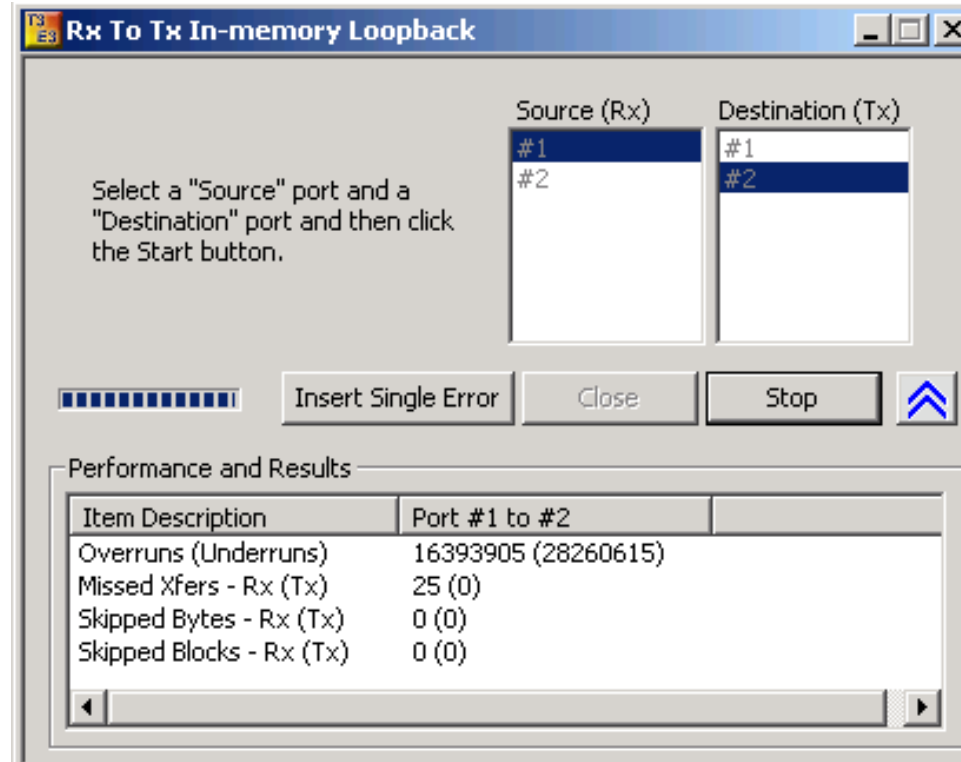
Tx Rx Memory Loopback

Logical Diagram for Transmit and Receive Memory Loopback for T3 (DS3)/E3 Analyzers



- With the loopback, the data received from the network is retransmitted back via the PC memory
- Optionally logic errors (XOR) can be inserted into the loopback stream during loopback
- Allows insertion of single bit errors manually

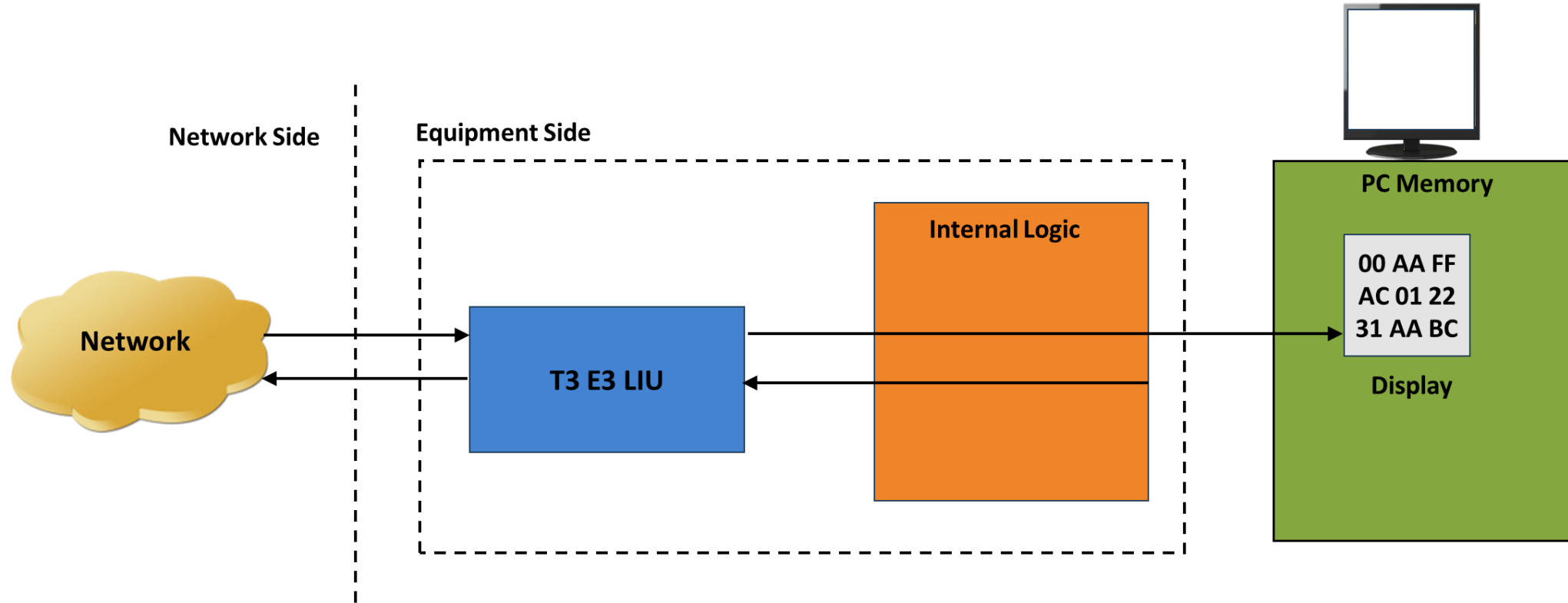
Tx Rx Memory Loopback (Contd.)



- Used for diagnostic purposes
- Memory Loopback and Bit Error Rate Test applications can be run on two different ports simultaneously to verify the operation of the analyzer unit

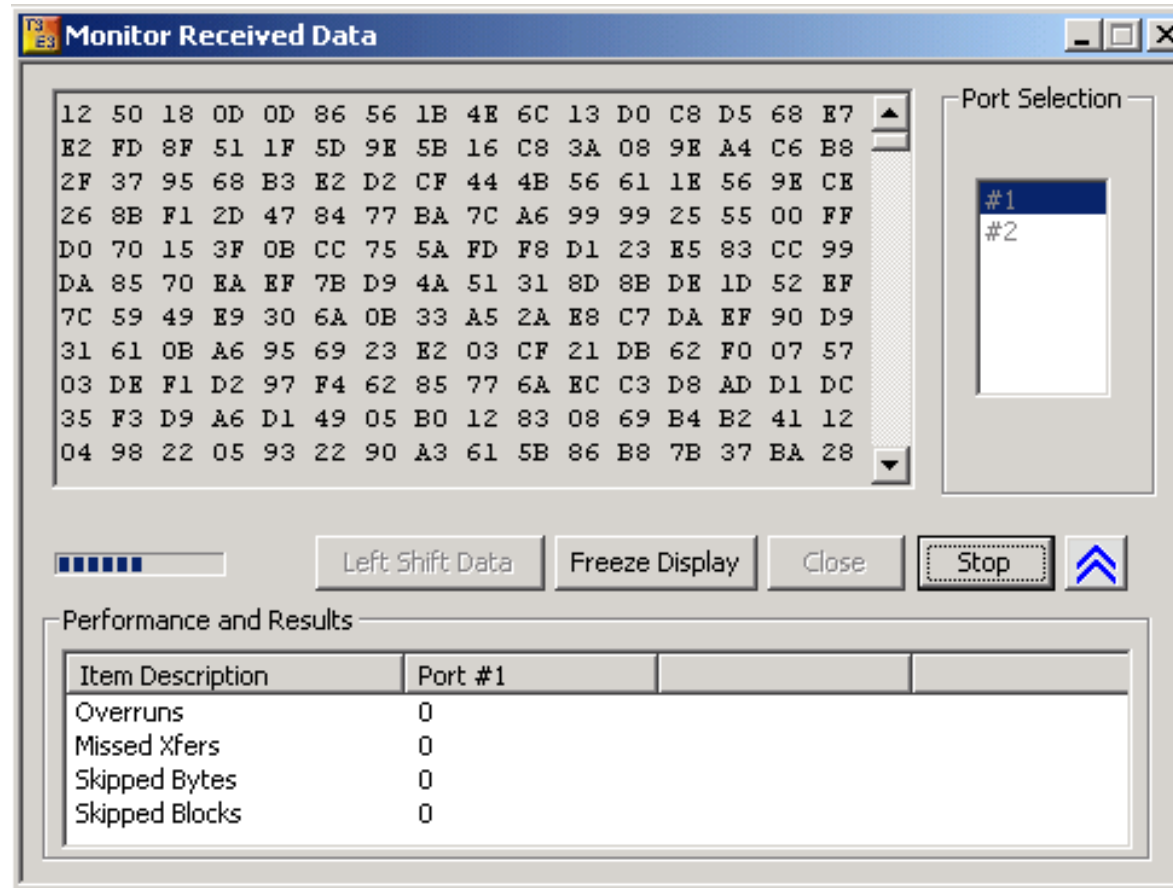
Monitor Received Data

Logical diagram for the Monitor Received Data application



- This application can monitor raw bit values on the selected ports. The raw bytes received from the network at the T3 interface are monitored and displayed on the selected ports

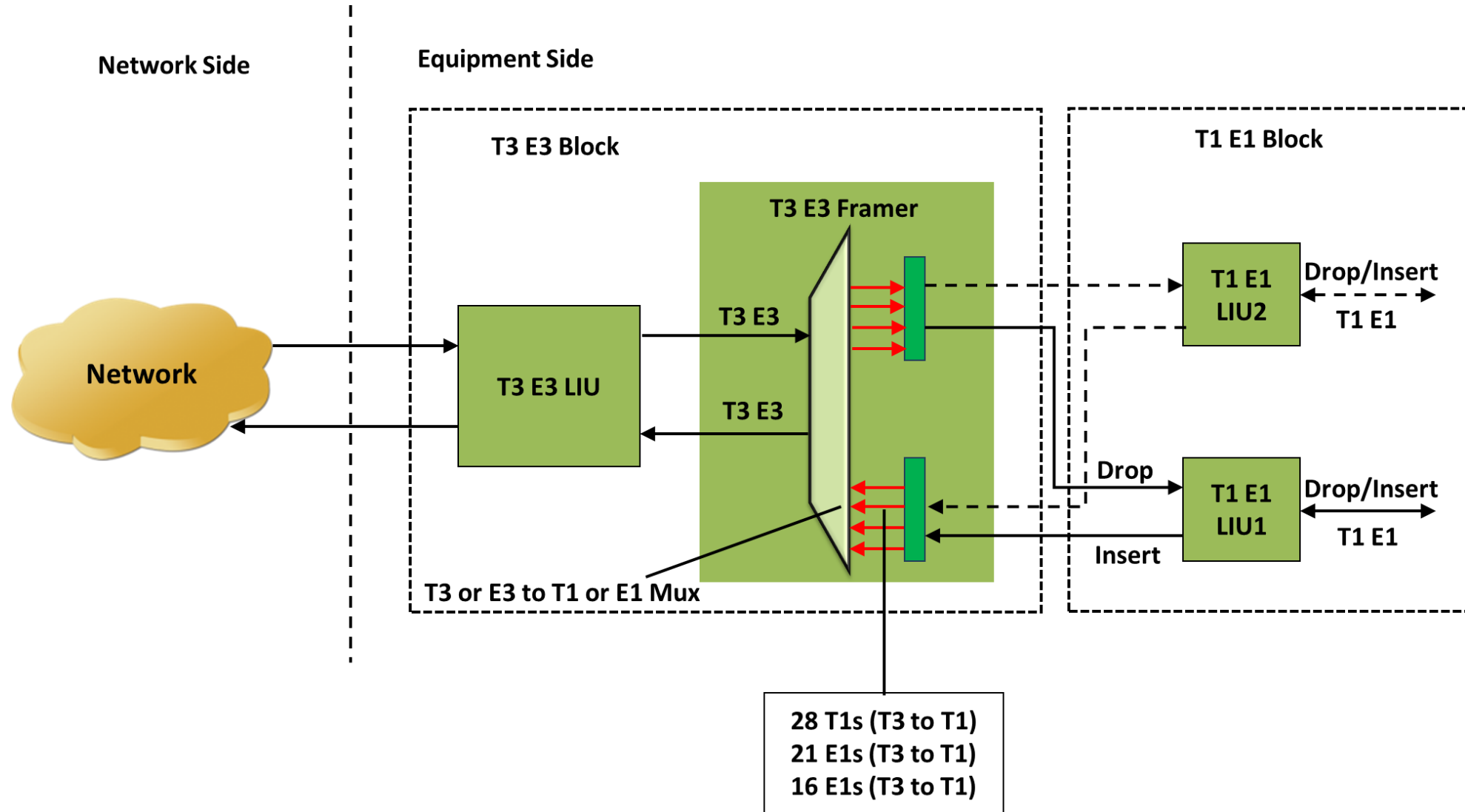
Monitor Received Data (Contd.)



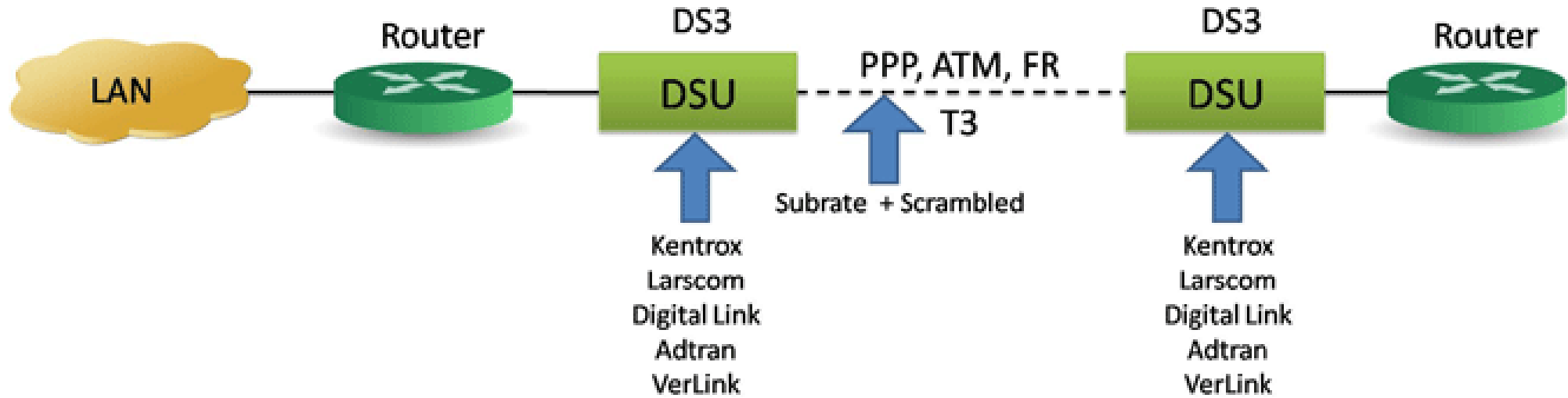
- Used for quickly testing the byte alignment of the received data
- Underruns, MissedXfer, Skipped Bytes, and Skipped Blocks display provides the receive data pipe performance

Multiplex and De-multiplex T1 or E1 signals

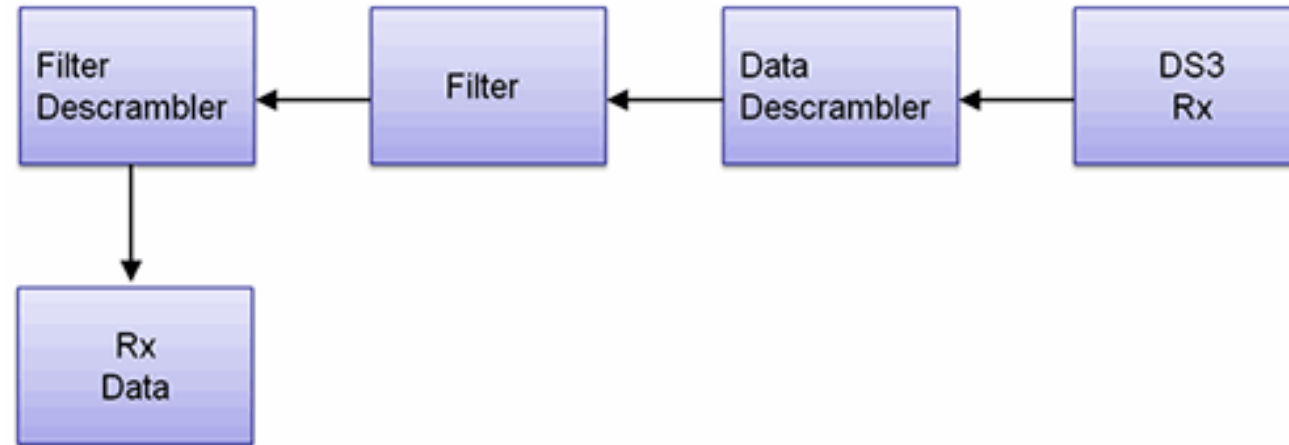
Logical Diagram for Drop and Insert Structured Mode



T3 (DS3) Subrate and Scrambling



DS3 Subrate Block Diagram



Auto Config

DSU Subrate Config [X]

Ports: #1 [v] Apply to all Ports

DSU Type: Digitallink [v] Enable Scrambling Rx

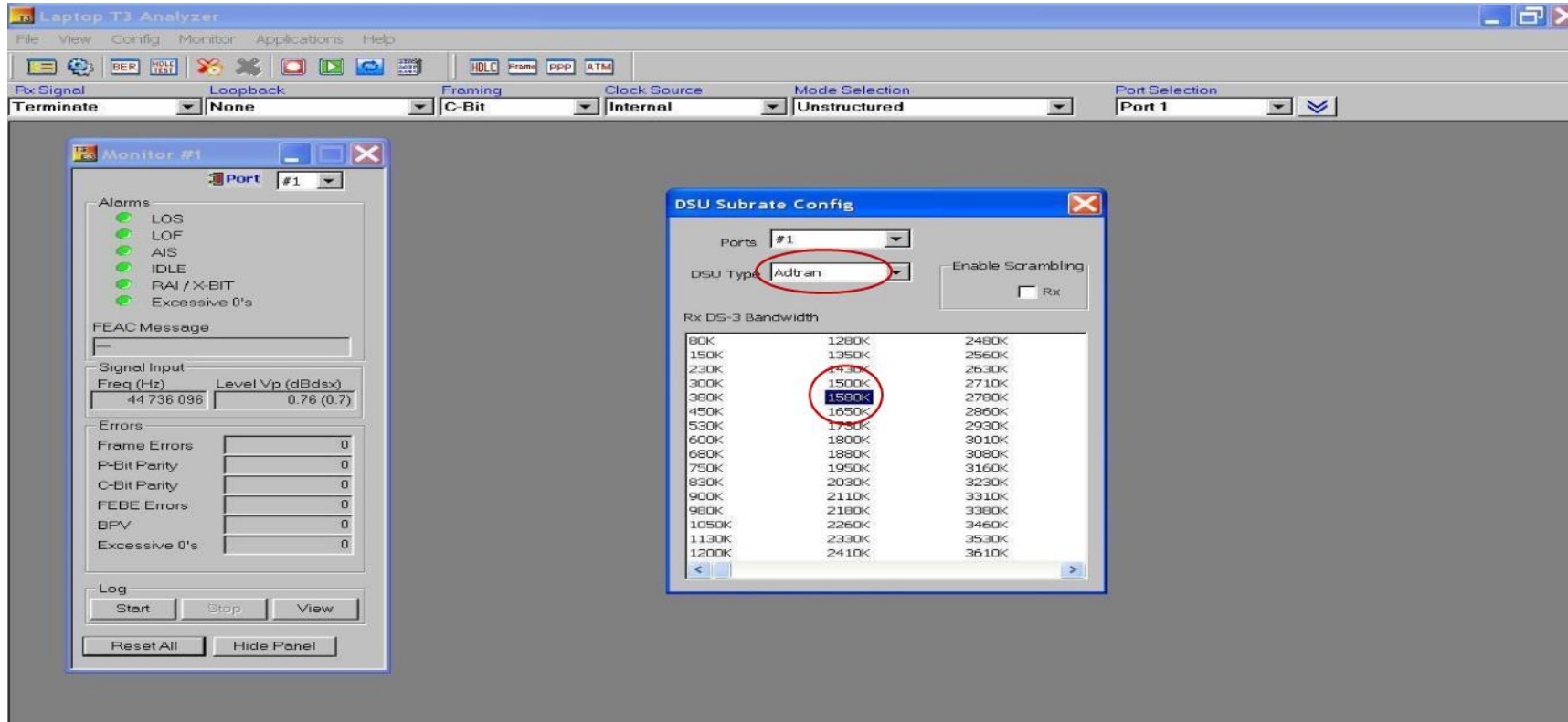
Rx DS-3 Bandwidth

300000K	3900000K	7500000K
600000K	4200000K	7800000K
900000K	4500000K	8100000K
1200000K	4800000K	8400000K
1500000K	5100000K	8700000K
1800000K	5400000K	9000000K
2100000K	5700000K	9300000K
2400000K	6000000K	9600000K
2700000K	6300000K	9900000K
3000000K	6600000K	10200000K
3300000K	6900000K	10500000K
3600000K	7200000K	10800000K

Auto Config

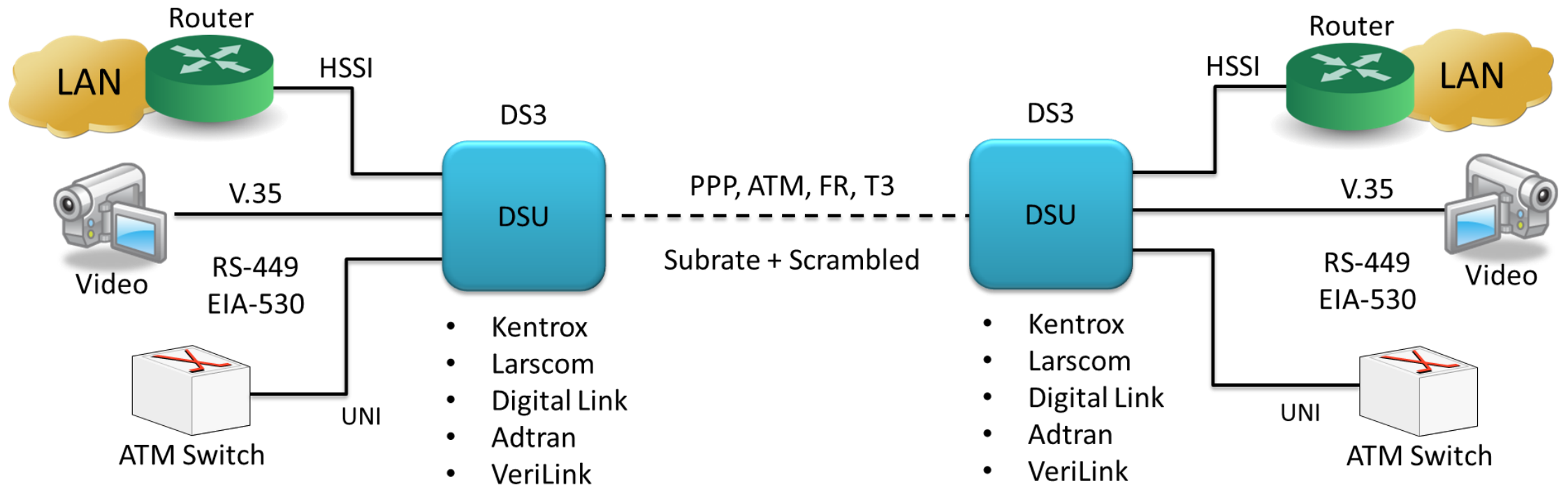
Trying Port#1, Adtran, 44130000 [Abort]

DS3 Subrate Configuration Setup



- The user has the ability with the USB T3 E3 unit to configure the DSU and the rate using the DS3 Subrate Config window as shown in the screen capture

Scrambling and Subrate



- For Data, Packetized Voice, and Video and other Unchannelized Uses
- Generally, not for 28 T1s

DSU Types

Digital Link Subrate

DSU Subrate Config

Ports: #1

DSU Type: Digitalink

Enable Scrambling: Rx

Rx DS-3 Bandwidth

300K	4800K	9300K
600K	5100K	9600K
900K	5400K	9900K
1200K	5700K	10200K
1500K	6000K	10500K
1800K	6300K	10800K
2100K	6600K	11100K
2400K	6900K	11400K
2700K	7200K	11700K
3000K	7500K	12000K
3300K	7800K	12300K
3600K	8100K	12600K
3900K	8400K	12900K
4200K	8700K	13200K
4500K	9000K	13500K

Larscom Subrate

DSU Subrate Config

Ports: #1

DSU Type: Larscom

Enable Scrambling: Rx

Rx DS-3 Bandwidth

3200K
6300K
9500K
12600K
15800K
18900K
22100K
25300K
28400K
31600K
34700K
37900K
41100K
44210K

Verlink Subrate

DSU Subrate Config

Ports: #1

DSU Type: Verlink

Enable Scrambling: Rx

Rx DS-3 Bandwidth

1600K	25300K
3200K	26800K
4700K	28400K
6300K	30000K
7900K	31600K
9500K	
11100K	
12600K	
14200K	
15800K	
17400K	
18900K	
20500K	
22100K	
23700K	

Adtran Subrate

DSU Subrate Config

Ports: #1

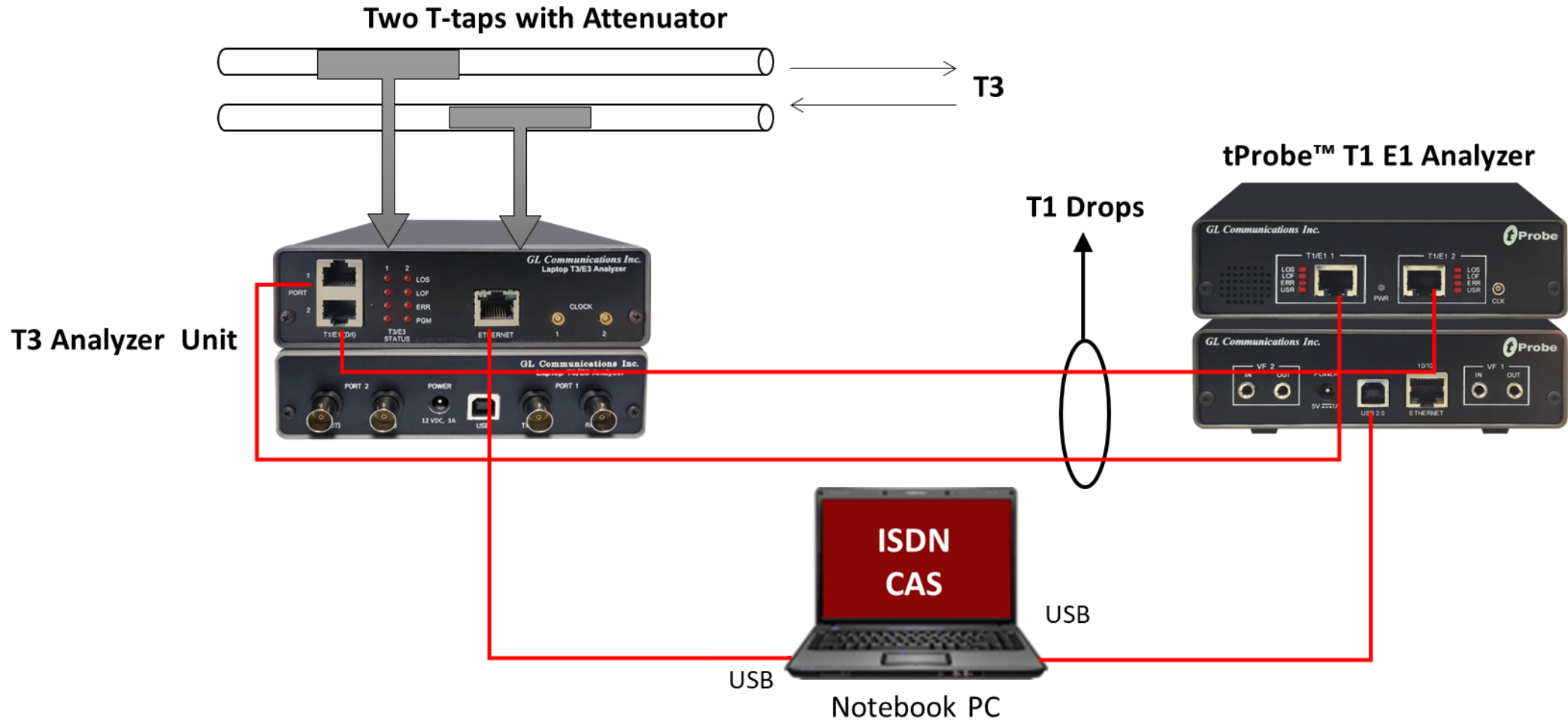
DSU Type: Adtran

Enable Scrambling: Rx

Rx DS-3 Bandwidth

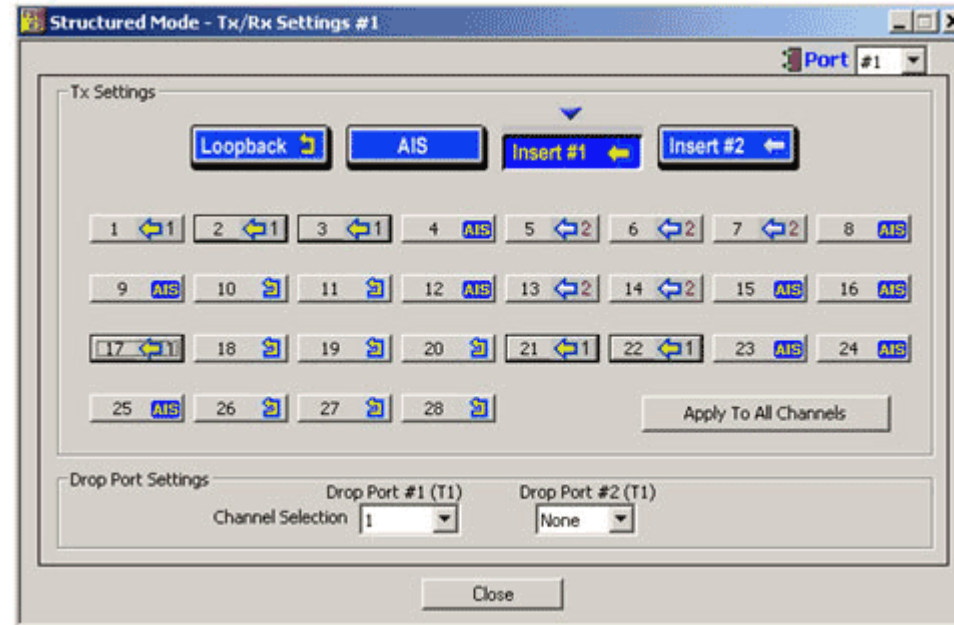
80K	1200K	2330K
150K	1280K	2410K
230K	1350K	2480K
300K	1430K	2560K
380K	1500K	2630K
450K	1580K	2710K
530K	1650K	2780K
600K	1730K	2860K
680K	1800K	2930K
750K	1880K	3010K
830K	1950K	3080K
900K	2030K	3160K
980K	2110K	3230K
1050K	2180K	3310K
1130K	2260K	3380K

T3-T1



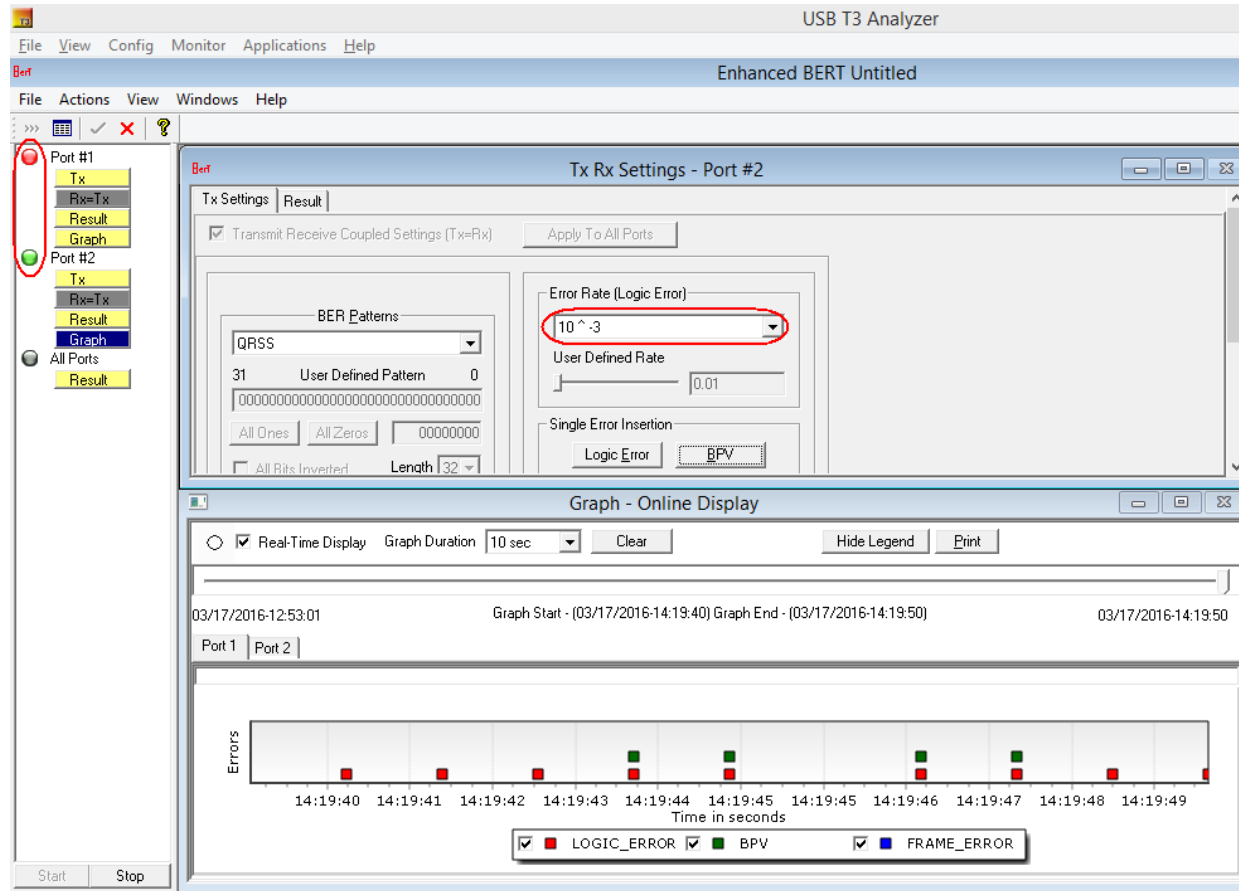
Multiplex and De-multiplex T1 E1 Signals

User interface for the Structured Mode (Drop / Insert) Settings



- Up to two user 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
- Up to two user selected T1 or E1 channels can be dropped

Bit Error Rate Test - BERT (Full Frame & Unframed)

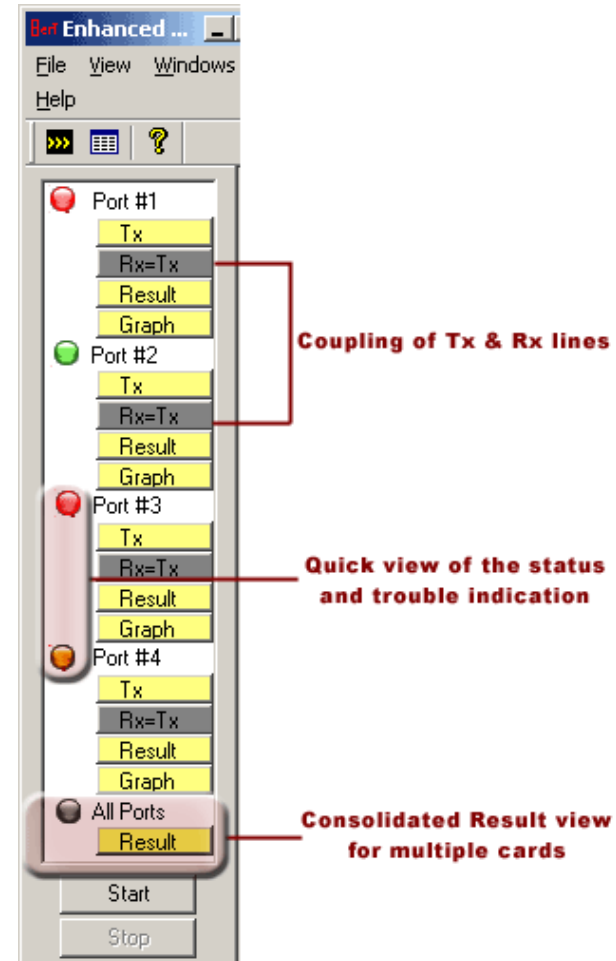


- GL's T3 E3 Bit Error Rate Tester application measures the correctness of data received on T3 E3 channels for a repetitive fixed or pseudorandom pattern for the given transmission

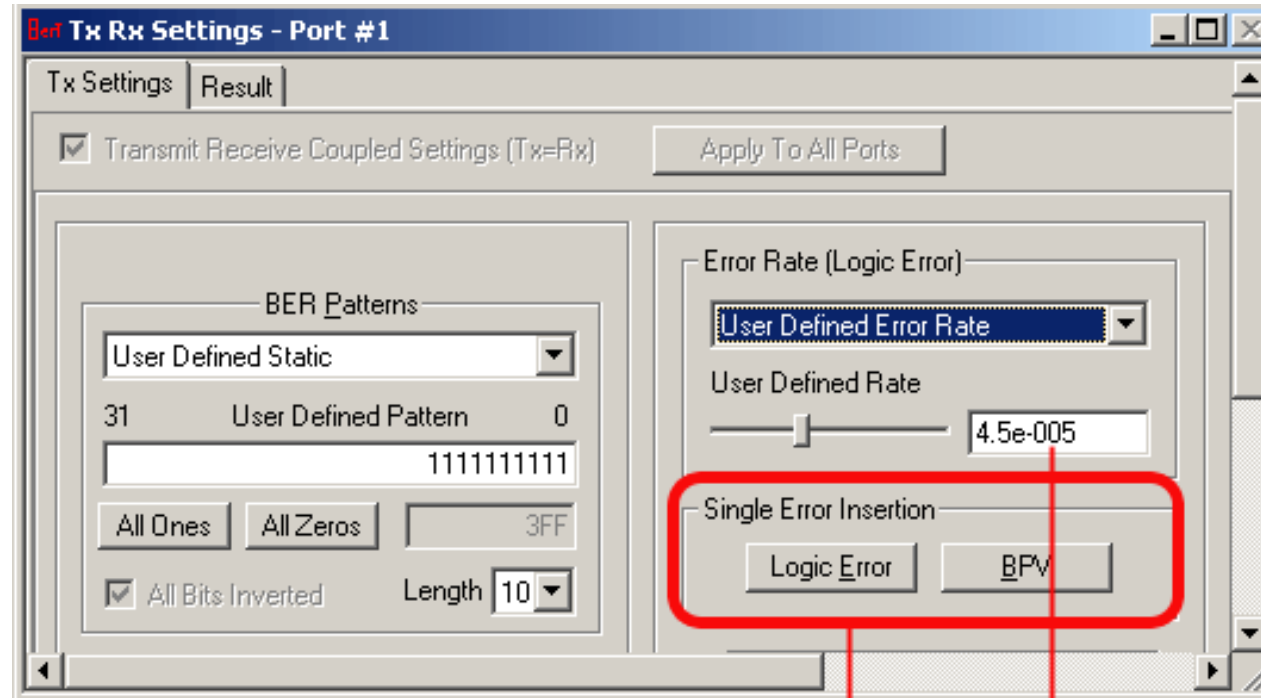
Selection of Port – View Error Status, Results

Bit Error Rate Test - BERT

- Quick view of the status and trouble indication
- Supports testing on multiple ports simultaneously with consolidated result view
- Tx and Rx settings for multiple ports can be independently controlled or they can be coupled (Apply to All) from a single card to all cards



Error and Bit Patterns Insertion

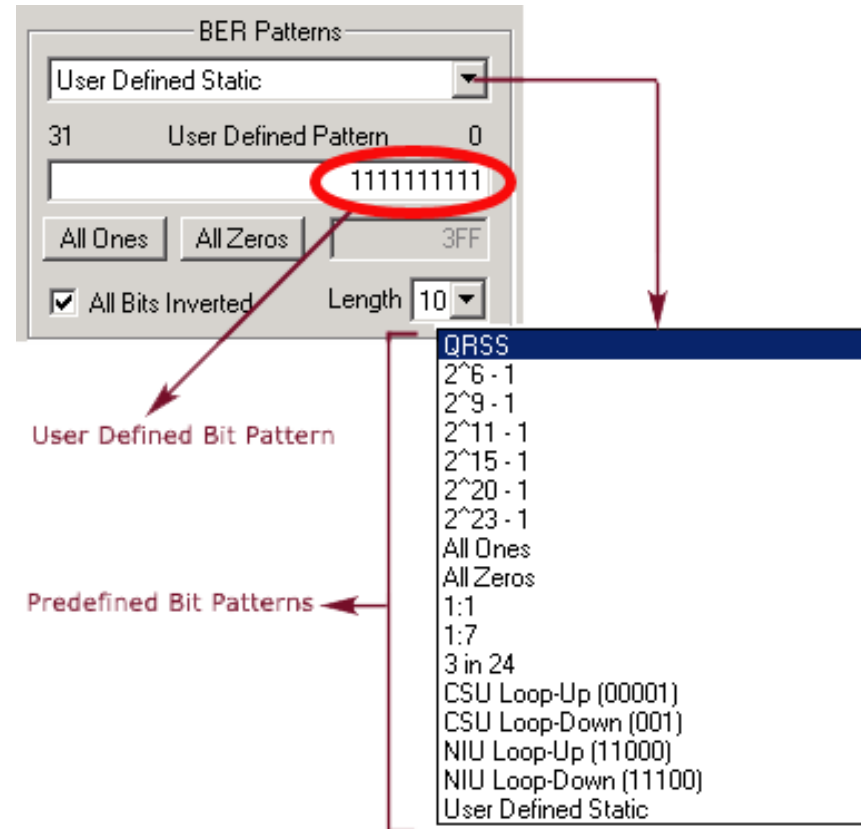


Single Error
Insertion

User-defined
Rate

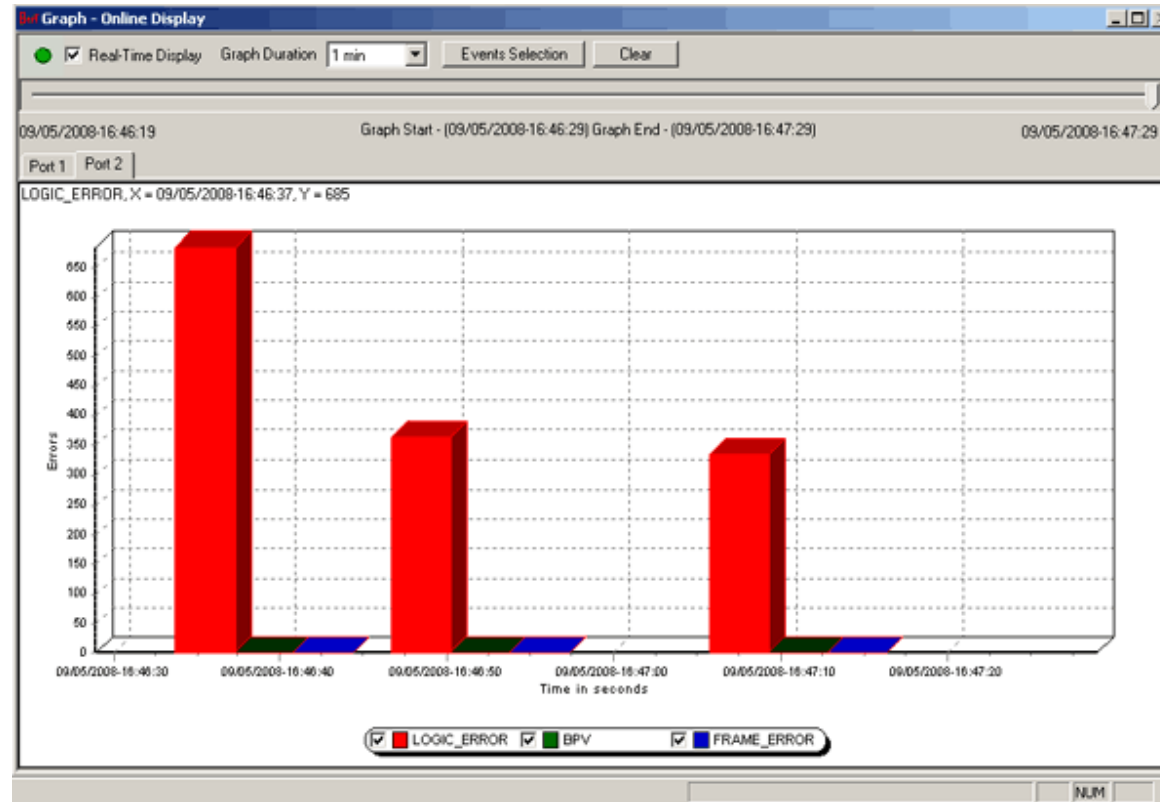
- Supports pre-defined and user defined error insertion rate ranging from 10^{-2} to 10^{-9} (0.01 to $1e-009$)
- Automatic insertion of Logic and BPV errors at regular intervals of time (secs) or just insert single bit errors into the transmit stream

Static and User-Defined Pattern Selection



- Generates standard static bit patterns such as - QRSS, 2⁵-1, All ones, All zeros, 1:1, CSU Loop-Up (0001), CSU Loop-down (001), NIU Loop-UP (11000), NIU Loop-Down (11100), and more
- Generates user-defined static patterns of size up to 32 bits

Graphical Result



- The Error Count Vs Time graph of the bit error test results is displayed
- For real-time graph, the predefined or the user defined bit pattern and the errors can be inserted
- Offline graph display the saved (*.xml) files are loaded for analysis
- Any of the events such as LOGIC_ERROR, BPV, or FRAME_ERROR can be set for the display

Thank you