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# BERT Analysis and Emulation

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# Platforms

- T1/E1 Platform
  - Basic BERT
  - Multi-Channel BERT
  - Enhanced BERT
  - ATM BERT
- T3/E3 Platform
  - Enhanced BERT
- OC3/12 STM1/4 Platform
  - PoS BERT
  - ATM BERT

# T1 E1 Platforms



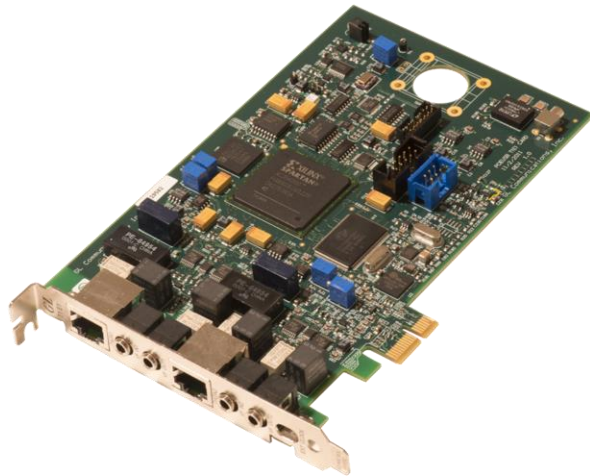
Front Panel

Back Panel

**tProbe™ - Portable USB based T1 E1 VF FXO FXS and Serial Datacom Analyzer**

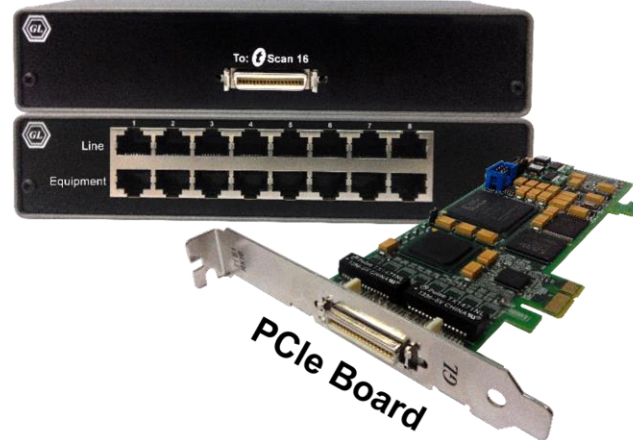


**Quad / Octal T1 E1 PCIe Card**



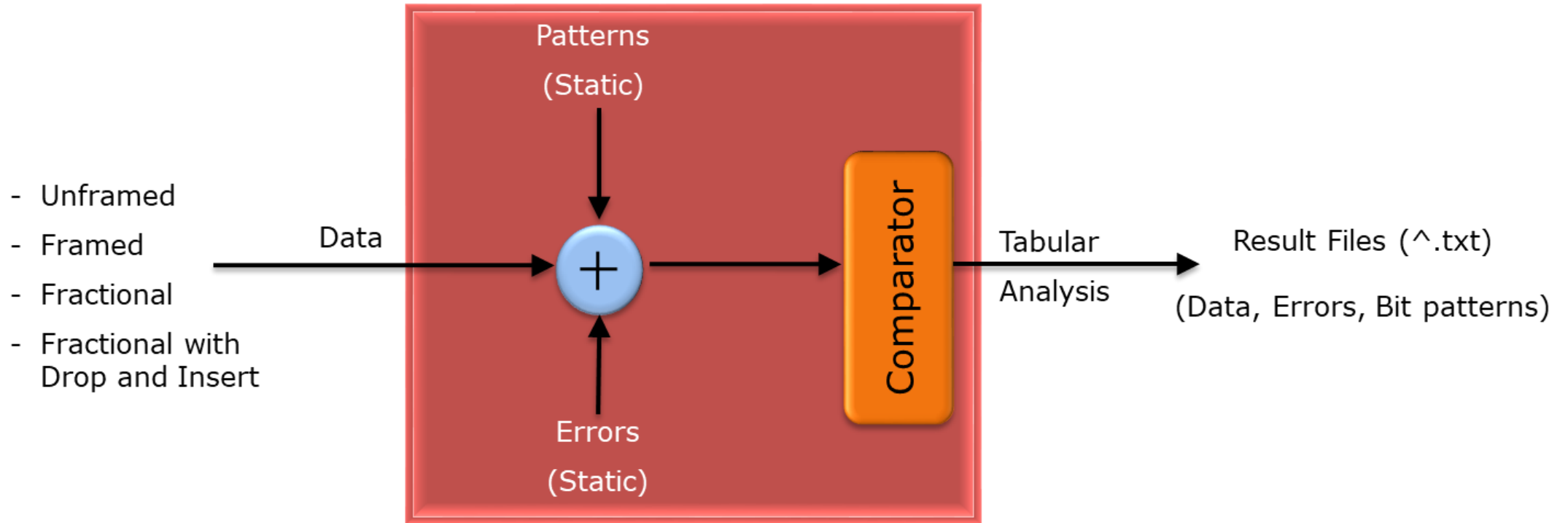
**Dual T1 E1 Express (PCIe) Board**

**tScan16™ with  
16-port T1 E1 Breakout Box**



**PCIe Board**

# Basic Bit Error Rate Test (BERT)



- Measures the correctness of data received on a single unframed, framed, and fractional T1/E1 channel using fixed Pseudo Random Bit Sequence (PRBS) patterns
- Provides drop and insert capability
- Variety of standard data patterns are available for test purposes including static PRBS patterns

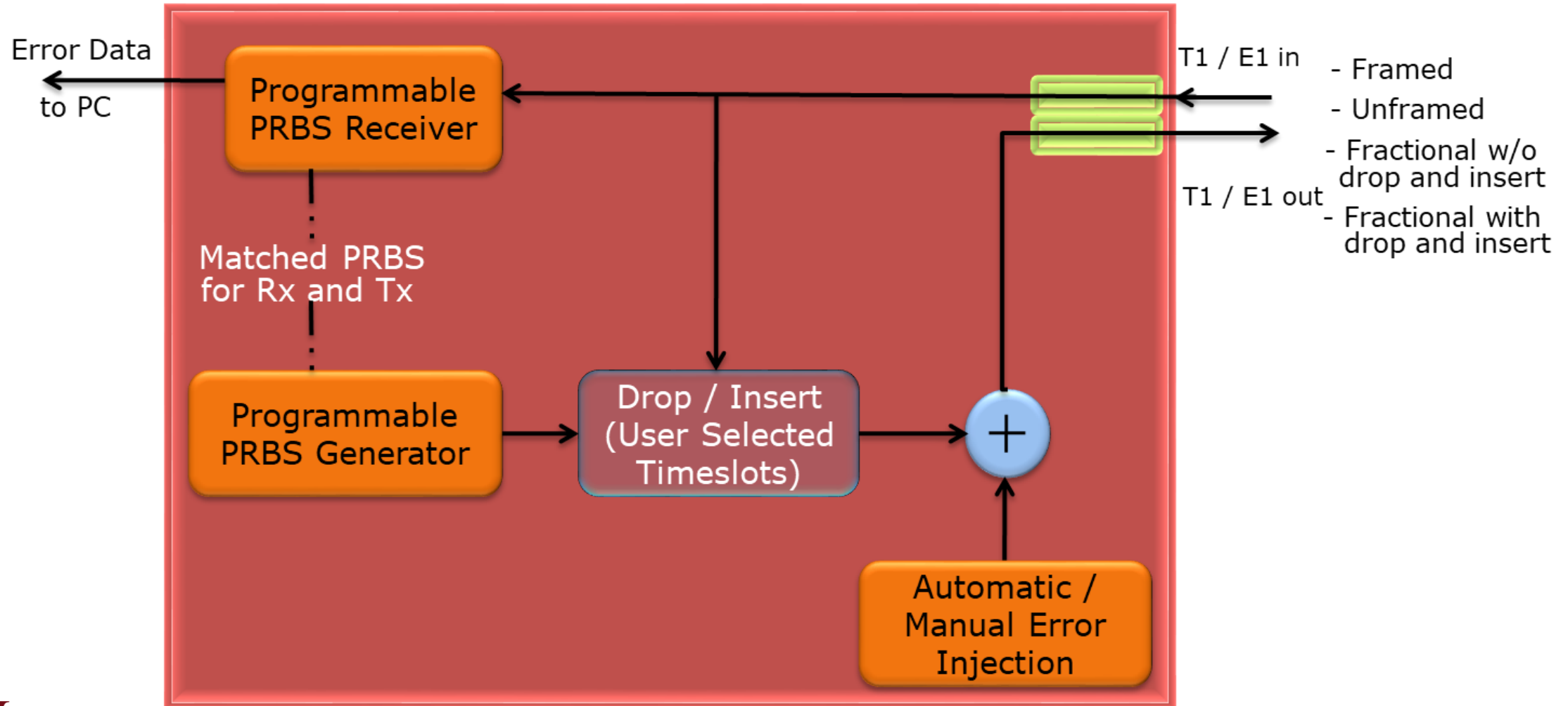
# Basic BERT

**BER Test - UsbE1 Card #1**

Status / Errors	PatSync	Logic Errors	0	Bipolar Violations	0	Frame Errors	0	Full-Fractional-Unframe	Full Frame
Total Errors	0		0		0		0	BER Patterns	QRSS
Error Rate (Cont)	0.00E+000		0.00E+000		0.00E+000		0.00E+000	Time-Slot Selection	
Error Second (ES)	0		0		0		0	Start	End
Error Free Second	4		4		4		4	1	31
%EFS	100.00								
Severely Error Sec	0								
%SES	0.00								
Degraded Minutes	0								
%DMin	0.00								
Loss Of Sync Count	0								
Loss Of Sync Sec	0								
Available Seconds	4								
%Available Sec	100.00								
Unavailable Sec	0								
Insert Single Error	Insert Error	Insert BPV	Restart	Close					

# Real-time Generation and Detection of Patterns

PRBS = Pseudo-Random-Bit-Sequence



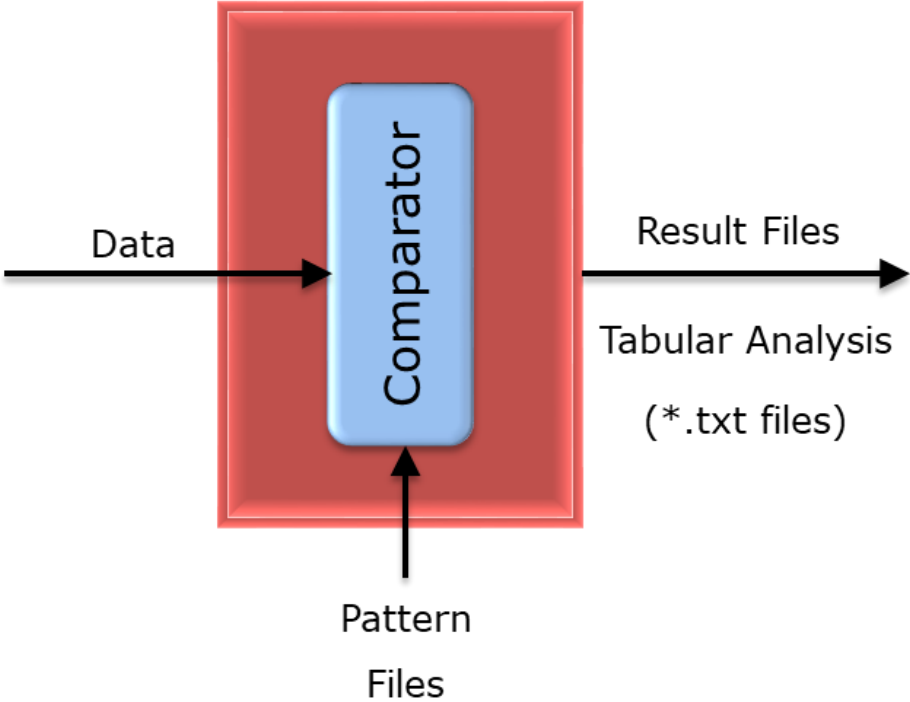
# Real-time Generation and Detection of Patterns (Contd.)

- Supported data patterns –
  - Quasi Random Signal Source
    - $2^6-1$  (63)
    - $2^9-1$  (511)
    - $2^{11}-1$  (2047)
    - $2^{15}-1$
    - $2^{20}-1$
    - $2^{23}-1$
  - CSU (Channel Service Unit) Loop Up Code
  - CSU Loop Down Code
  - NIU Loop Up and Loop Down
  - All Ones
  - All zeros
  - 1:1
  - 1:7
  - 3 in 24

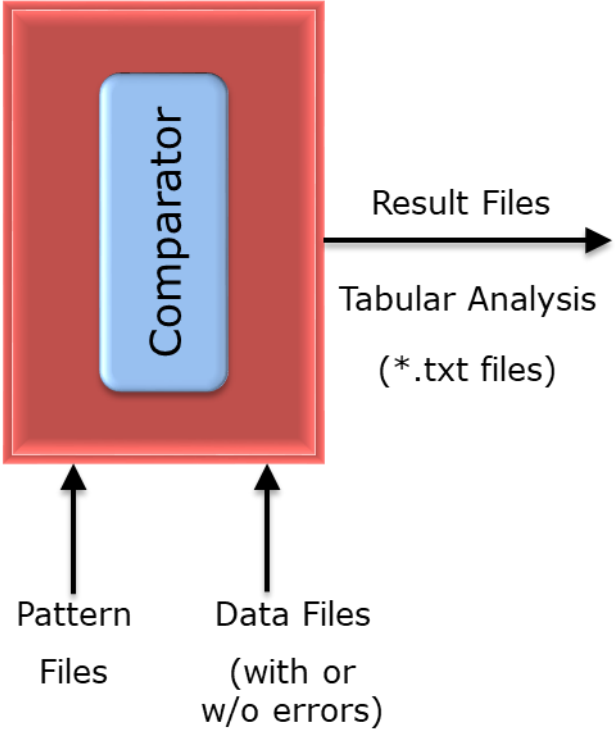
# Results

- Provide the following statistics for all Errors (Logic, BPV, Frame errors)
  - BERT Status – No Sync, Pat Sync
  - Error Count
  - Error Rate
  - Error Seconds
  - Error Free Seconds
- Additionally following statistics are displayed for Logic Errors
  - Loss of Sync Count
  - Loss of Sync Seconds
  - Available Seconds
  - Unavailable Seconds
  - Degraded Minutes
  - Severely Error Seconds

# MC BERT

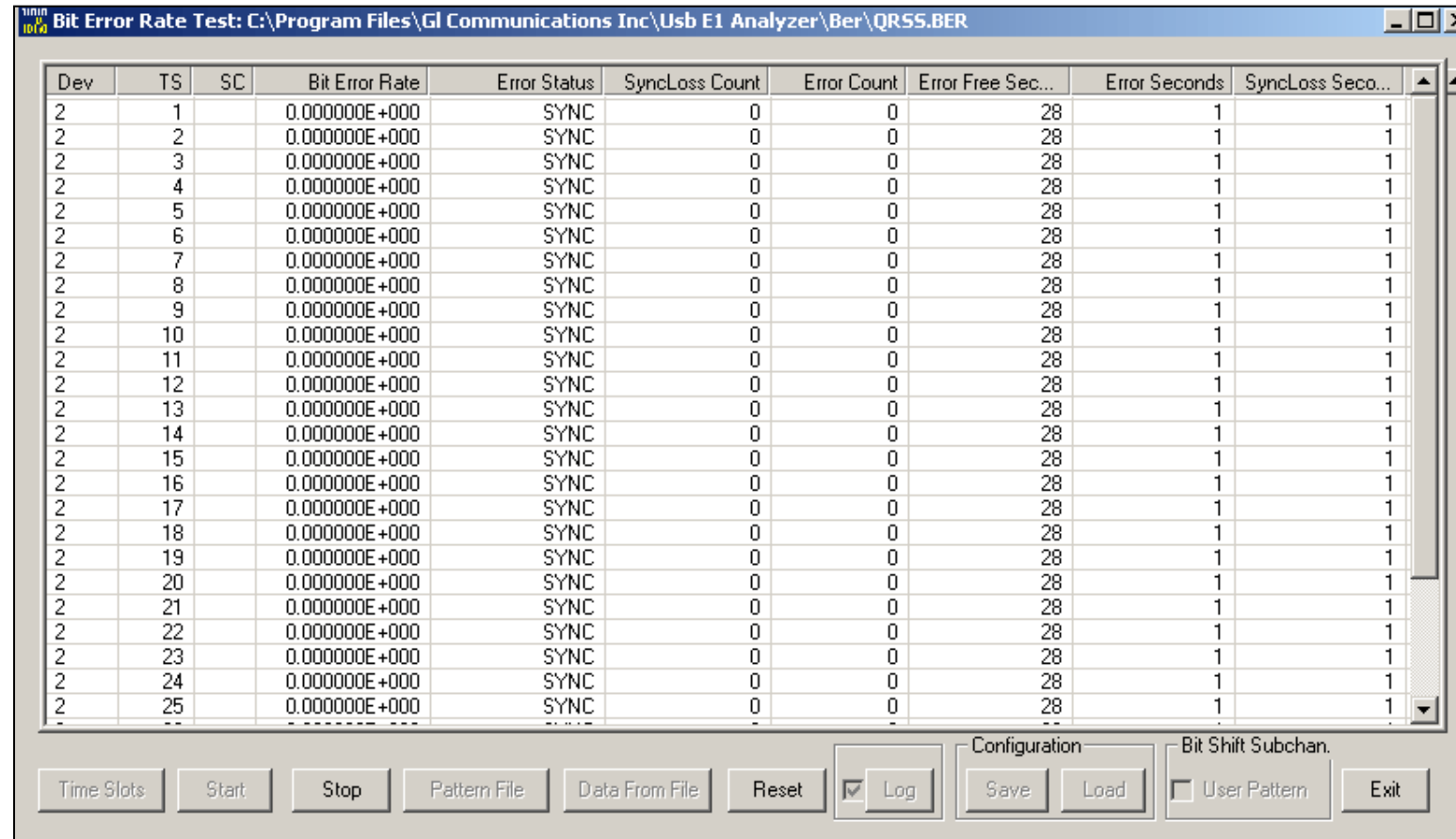


**Real-time MC BERT**



**Offline MC BERT**

# Real-time Analysis



The screenshot shows the 'Bit Error Rate Test' application window. The title bar indicates the file path: 'C:\Program Files\GL Communications Inc\Usb E1 Analyzer\Ber\QR55.BER'. The main area contains a table with the following columns: Dev, TS, SC, Bit Error Rate, Error Status, SyncLoss Count, Error Count, Error Free Sec..., Error Seconds, and SyncLoss Seco... The table lists 25 rows of data, all showing a Bit Error Rate of 0.000000E+000 and an Error Status of SYNC. The Error Free Sec... column shows 28 for all rows, and the Error Seconds and SyncLoss Seco... columns show 1 for all rows. Below the table is a control panel with buttons for 'Time Slots', 'Start', 'Stop', 'Pattern File', 'Data From File', 'Reset', 'Log' (checked), 'Save', 'Load', 'User Pattern' (unchecked), and 'Exit'. There are also 'Configuration' and 'Bit Shift Subchan.' tabs.

Dev	TS	SC	Bit Error Rate	Error Status	SyncLoss Count	Error Count	Error Free Sec...	Error Seconds	SyncLoss Seco...
2	1		0.000000E+000	SYNC	0	0	28	1	1
2	2		0.000000E+000	SYNC	0	0	28	1	1
2	3		0.000000E+000	SYNC	0	0	28	1	1
2	4		0.000000E+000	SYNC	0	0	28	1	1
2	5		0.000000E+000	SYNC	0	0	28	1	1
2	6		0.000000E+000	SYNC	0	0	28	1	1
2	7		0.000000E+000	SYNC	0	0	28	1	1
2	8		0.000000E+000	SYNC	0	0	28	1	1
2	9		0.000000E+000	SYNC	0	0	28	1	1
2	10		0.000000E+000	SYNC	0	0	28	1	1
2	11		0.000000E+000	SYNC	0	0	28	1	1
2	12		0.000000E+000	SYNC	0	0	28	1	1
2	13		0.000000E+000	SYNC	0	0	28	1	1
2	14		0.000000E+000	SYNC	0	0	28	1	1
2	15		0.000000E+000	SYNC	0	0	28	1	1
2	16		0.000000E+000	SYNC	0	0	28	1	1
2	17		0.000000E+000	SYNC	0	0	28	1	1
2	18		0.000000E+000	SYNC	0	0	28	1	1
2	19		0.000000E+000	SYNC	0	0	28	1	1
2	20		0.000000E+000	SYNC	0	0	28	1	1
2	21		0.000000E+000	SYNC	0	0	28	1	1
2	22		0.000000E+000	SYNC	0	0	28	1	1
2	23		0.000000E+000	SYNC	0	0	28	1	1
2	24		0.000000E+000	SYNC	0	0	28	1	1
2	25		0.000000E+000	SYNC	0	0	28	1	1

- Multi-channel Bit Error Rate Testing (MCBERT) measures correctness of data received on T1/E1 lines/timeslots with stored data in a reference file
- Application can work in real-time with data currently being received on T1/E1 lines/timeslots, or off-line with data stored in a file

# Real-time Analysis (Contd.)

- Real-time T1/E1 testing can be done on full or fractional T1/E1 timeslots
- The following independent streams can be compared in real time to a chosen pattern file:
  - Multiple 64kbps (56kbps) independent stream channels (need NOT be contiguous)
  - A hyper channel per T1/E1 (n x 64kbps timeslots, where n = 1..24 T1, 1..32 E1; contiguous timeslots) line/trunk
  - Multiple subchannels n x 8kbps (8k, 16k, ..., 56k)
  - For example, for T1 it could be up to 24 x 8 separate 8kbps subchannels (eight subchannels per timeslot)

Card/Timeslot/Subchannel Selection

Card and Time Slot Selection

Card1	Card2
00	00
01	01
02	02
03	03
04	04
05	05
06	06
07	07
08	08
09	09
10	10
11	11

Data Transmission Rate

64 kbps

56 kbps

n x 64 kbps (hyperchann

Subchannels 8-56 kbps

8

16

24

32

40

48

56

8k Subchannels

1

2

3

4

5

6

7

8

All

None

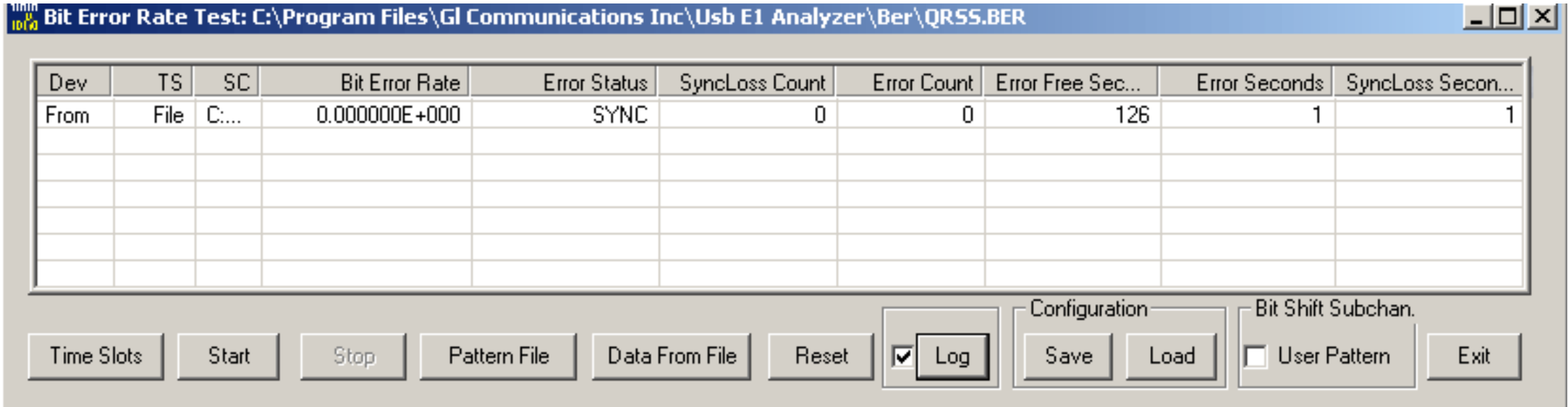
All TS

Clear TS

OK

Cancel

# Offline Viewing



The screenshot shows the 'Bit Error Rate Test' application window. The title bar indicates the file path: C:\Program Files\GL Communications Inc\Usb E1 Analyzer\Ber\QR55.BER. The main area contains a table with the following data:

Dev	TS	SC	Bit Error Rate	Error Status	SyncLoss Count	Error Count	Error Free Sec...	Error Seconds	SyncLoss Secon...
From	File	C:...	0.000000E+000	SYNC	0	0	126	1	1

Below the table is a control panel with several buttons: 'Time Slots', 'Start', 'Stop', 'Pattern File', 'Data From File', 'Reset', 'Log' (with a checked checkbox), 'Configuration' (containing 'Save' and 'Load' buttons), 'Bit Shift Subchan.' (containing a 'User Pattern' checkbox), and 'Exit'.

- Performs offline analysis by selecting BER pattern from 'Data from File' option and the reference file is selected using 'Pattern File' option
- Data From File compares the data of already captured file with that of the pattern file to do the following:
  - Reading the data from file
  - Comparing to pattern
  - Displaying the results

# T1 E1 Enhanced BERT

- Measures the correctness of data received on lines (T1/E1/T3/E3) against a repetitive fixed or pseudorandom pattern for the given transmission
- Support for multiple cards, with a consolidated result view
- Non-contiguous timeslots for fractional BER testing, and sub-channel selections for BER testing within a timeslot (applicable to T1/E1 only)
- Bit Error Rate provides a figurative measurement of the number of erroneous bits received for the total number of bits transmitted
- Tx & Rx settings for all the cards can be independently controlled or coupled as per the convenience of the user
- Provides graphical view of the comparison
- Sophisticated logging of events

The screenshot displays the 'Enhanced BERT - Untitled' software interface. The main window is titled 'Tx Rx Settings - Card #1' and is divided into several sections:

- Card Selection:** A sidebar on the left shows 'Card #1' and 'Card #2' with sub-options for 'Tx', 'Rx', 'Result', and 'Graph'.
- Tx Settings:** Includes a 'BER Patterns' dropdown set to 'QRSS', a 'User Defined Pattern' field with '1111111111', and a 'Length' of '10'. There are also buttons for 'All Ones', 'All Zeros', and '3FF', and a checkbox for 'All Bits Inverted'.
- Timeslot Selection:** A grid for selecting timeslots (0-23) with a 'Select All' and 'Unselect All' button. Some slots (1, 9, 17, 21, 11, 19, 23) are highlighted.
- Sub Channel Selection:** A grid for selecting sub-channels (0-7) with a 'Select All' and 'Unselect All' button. Sub-channel 7 is highlighted.
- Error Rate (Logic Error):** A dropdown menu set to  $10^{-3}$  and a 'User Defined Rate' slider set to 0.01.
- Single Error Insertion:** Buttons for 'Logic Error' and 'BPV'.

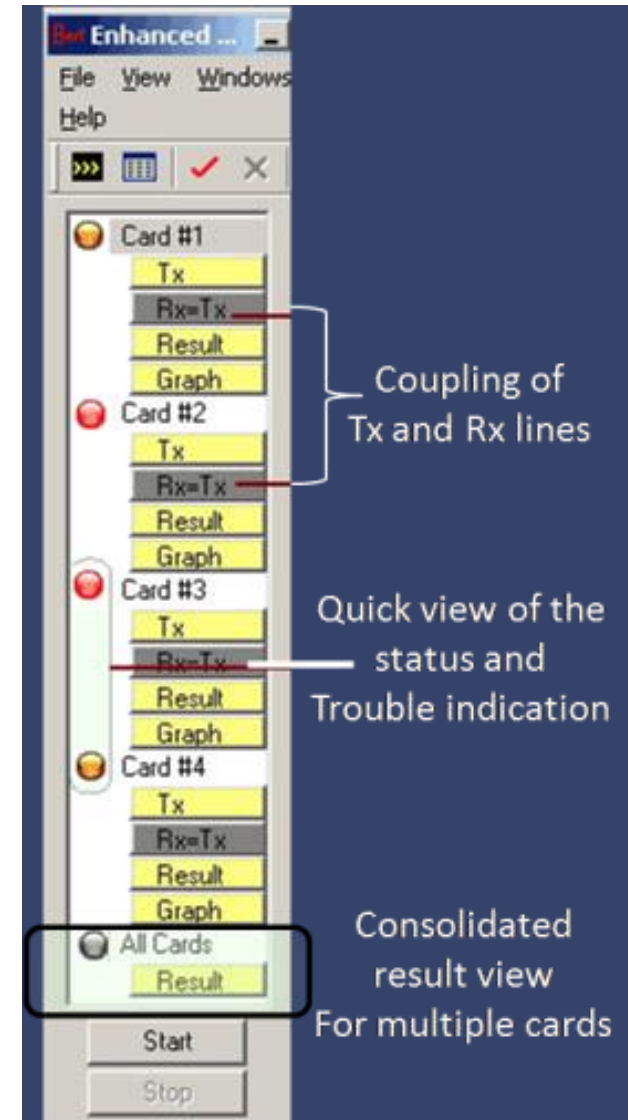
Below the settings is the 'Graph - Online Display' window, which shows a real-time plot of 'Error rate' (y-axis, 0 to 600) versus 'Time in seconds' (x-axis, 06/15/2007-15:30:00 to 06/15/2007-15:34:00). The graph shows a baseline error rate of zero until approximately 15:33:00, where it spikes significantly, reaching a peak of about 600. The interface also includes a 'Start' button, a 'Stop' button, and a status bar at the bottom showing 'Ready' and 'CAP NUM'.

# T3 /E3 Enhanced BERT (Contd.)

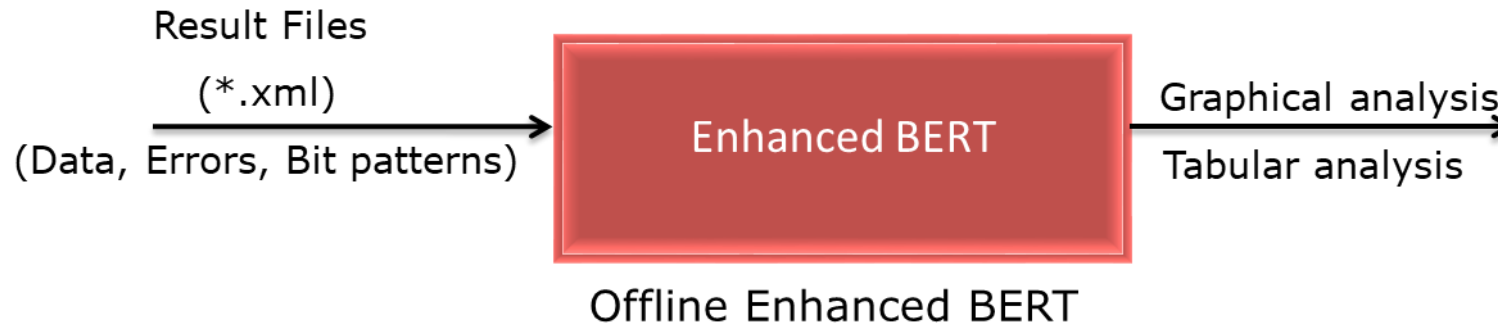
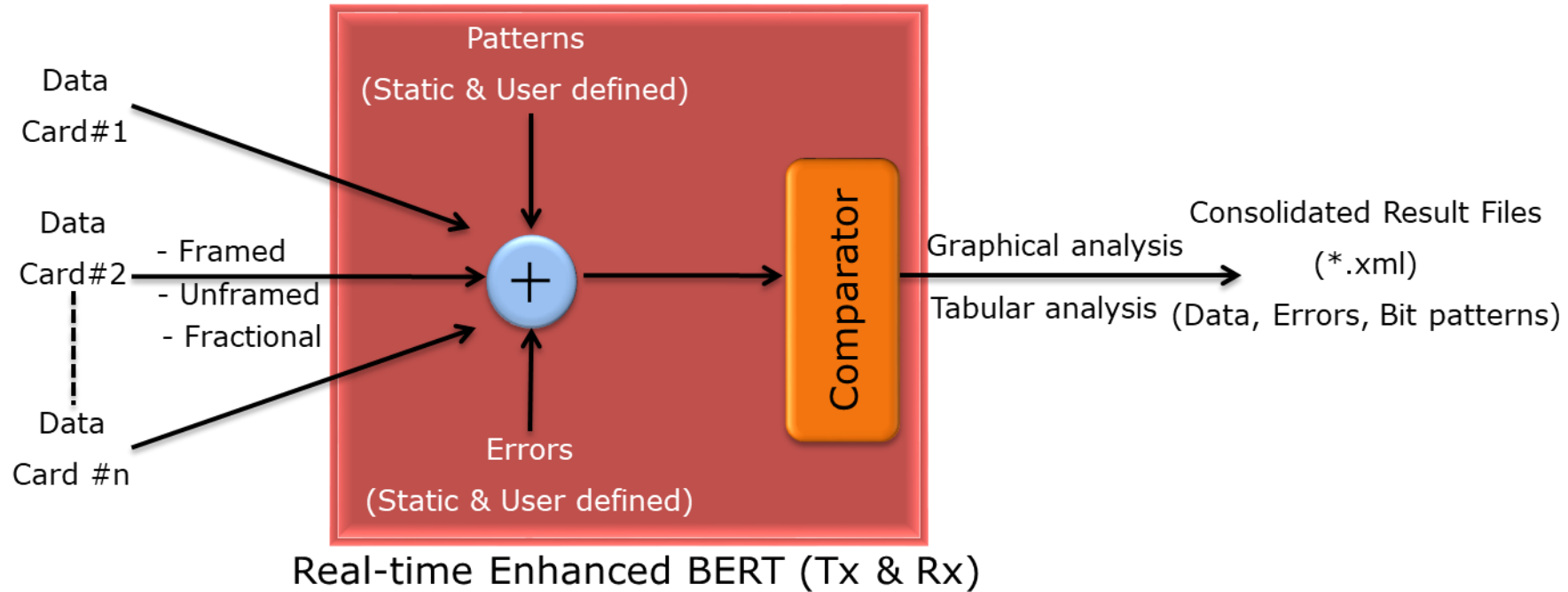
The screenshot displays the Enhanced BERT software interface. On the left, a sidebar shows port configurations for Port #1 and Port #2, with 'Tx' selected for Port #1. The main window is titled 'Tx Rx Settings - Port #2' and is divided into 'Tx Settings' and 'Result' tabs. Under 'Tx Settings', the 'BER Patterns' section shows 'GRSS' selected. The 'Error Rate (Logic Error)' section has a dropdown menu set to  $10^{-3}$ , which is circled in red. Below this, there is a 'User Defined Rate' slider and a 'Single Error Insertion' section with 'Logic Error' and 'BPV' buttons. The 'Graph - Online Display' window is open, showing 'Real-Time Display' checked and a 'Graph Duration' of 1 min. The graph area shows a 3D bar chart with a prominent red bar at 09/05/2008-16:16:37, labeled 'LOGIC\_ERROR'. The legend at the bottom indicates that LOGIC\_ERROR (red), BPV (green), and FRAME\_ERROR (blue) are all checked.

# Consolidated View

- Supports testing on multiple cards simultaneously with consolidated result view
- Tx and Rx settings for multiple cards can be independently controlled or coupled
- Quick view of the status and trouble indication
- Save and Load configuration settings

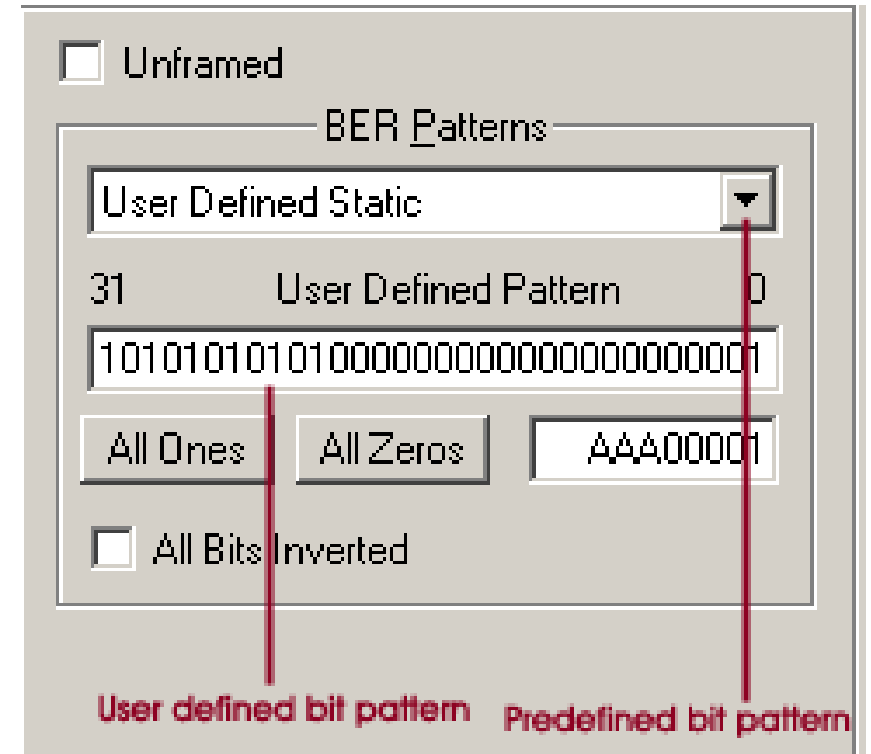


# Real-time Generation and Detection



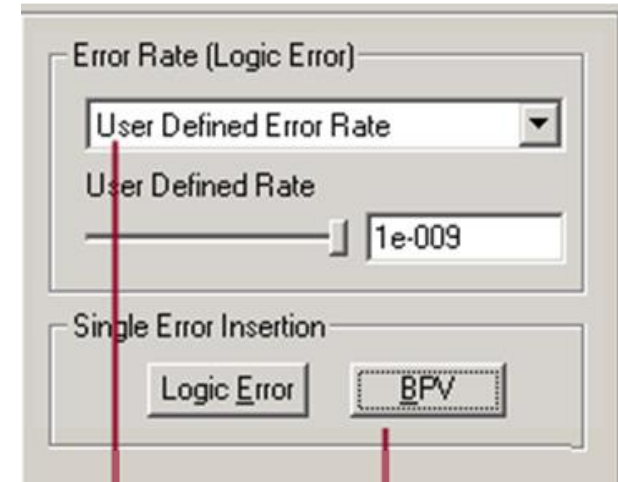
# BER Patterns

- Supports Static and User-defined bit patterns
- Generates various static bit patterns such as - QRSS,  $2^5-1$ ,  $2^9-1$ ,  $2^{11}-1$ ,  $2^{15}-1$ ,  $2^{20}-1$ ,  $2^{23}-1$ , All ones, All zeros, 1:1, 1:7, 3 in 24, CSU Loop-Up (0001), CSU Loop-down (001), NIU Loop-UP (11000), and NIU Loop-Down (11100), and user-defined patterns of size up to 32 bits



# Error Insertion

- Insert logic and BPV errors at regular intervals of time (secs)
- Insert just single bit errors into the incoming stream
- Predefined error rate can range from  $10^{-2}$  to  $10^{-9}$  and user defined error rates can range from 0.01 to  $1e-009$

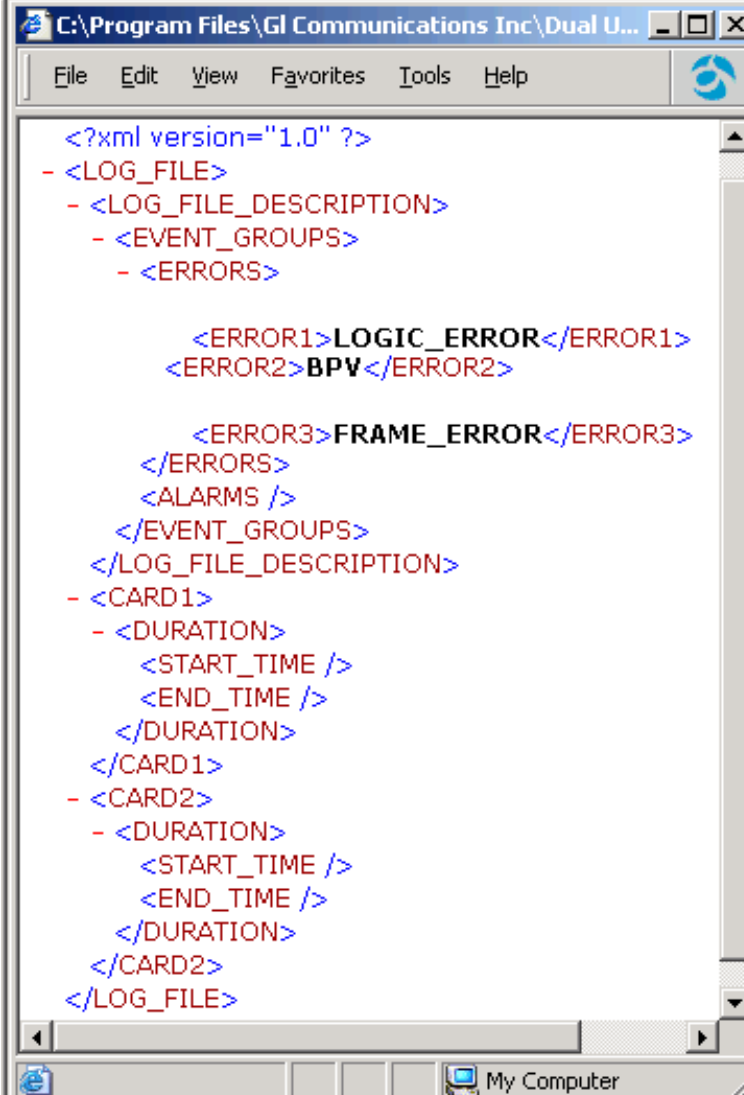


User defined  
Error Rate

Single Error  
Insertion

# BER Test Logging

- Logs the events for extended periods
- Information is recorded in XML file formats
- Online (real-time) view of events and offline view of saved events are supported through a powerful graphic event viewer application

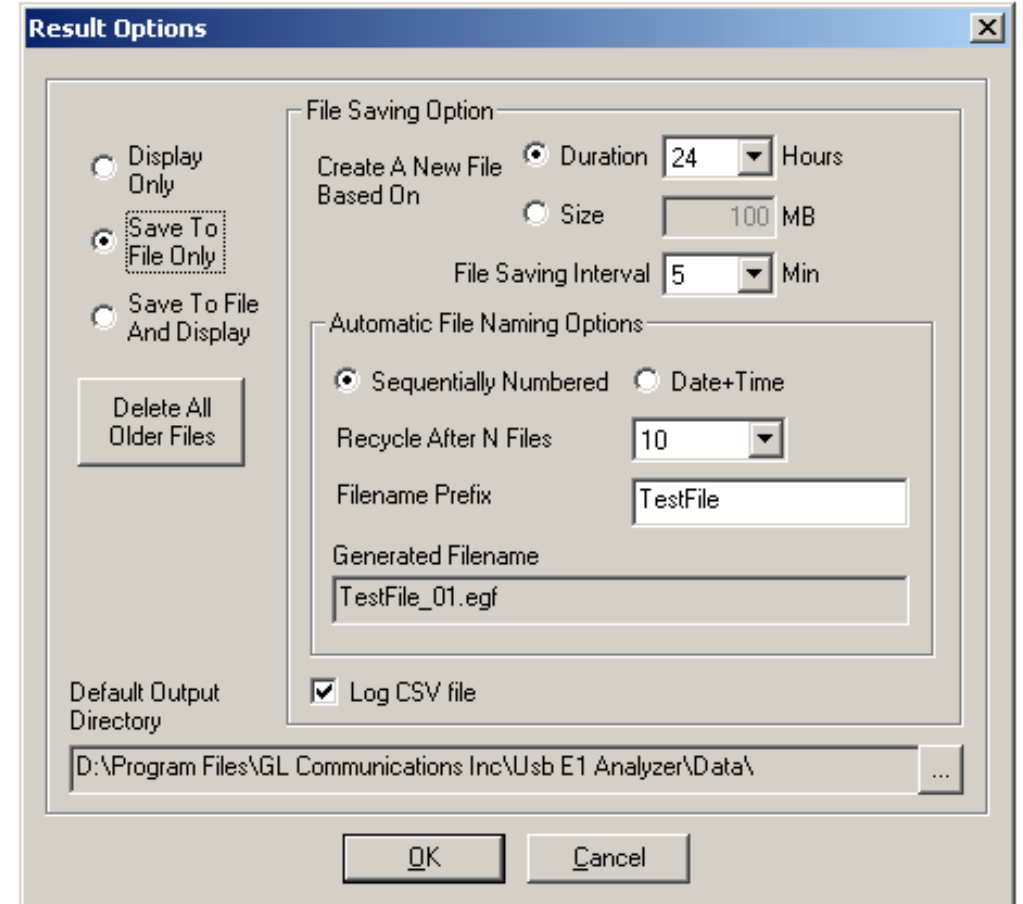


The screenshot shows a Windows application window titled "C:\Program Files\GL Communications Inc\Dual U...". The window contains an XML document with the following structure:

```
<?xml version="1.0" ?>
- <LOG_FILE>
  - <LOG_FILE_DESCRIPTION>
    - <EVENT_GROUPS>
      - <ERRORS>
        <ERROR1>LOGIC_ERROR</ERROR1>
        <ERROR2>BPV</ERROR2>
        <ERROR3>FRAME_ERROR</ERROR3>
      </ERRORS>
    <ALARMS />
  </EVENT_GROUPS>
</LOG_FILE_DESCRIPTION>
- <CARD1>
  - <DURATION>
    <START_TIME />
    <END_TIME />
  </DURATION>
</CARD1>
- <CARD2>
  - <DURATION>
    <START_TIME />
    <END_TIME />
  </DURATION>
</CARD2>
</LOG_FILE>
```

# Result Options

- Various options are available to save the transmitted BER patterns and the error rates -
  - Only display the events in real-time
  - Only save the events to a file in \*.xml format
  - Save the events to a file and also display in real-time
- Options are available for limiting the length of the file with either the time duration or the file size are also available



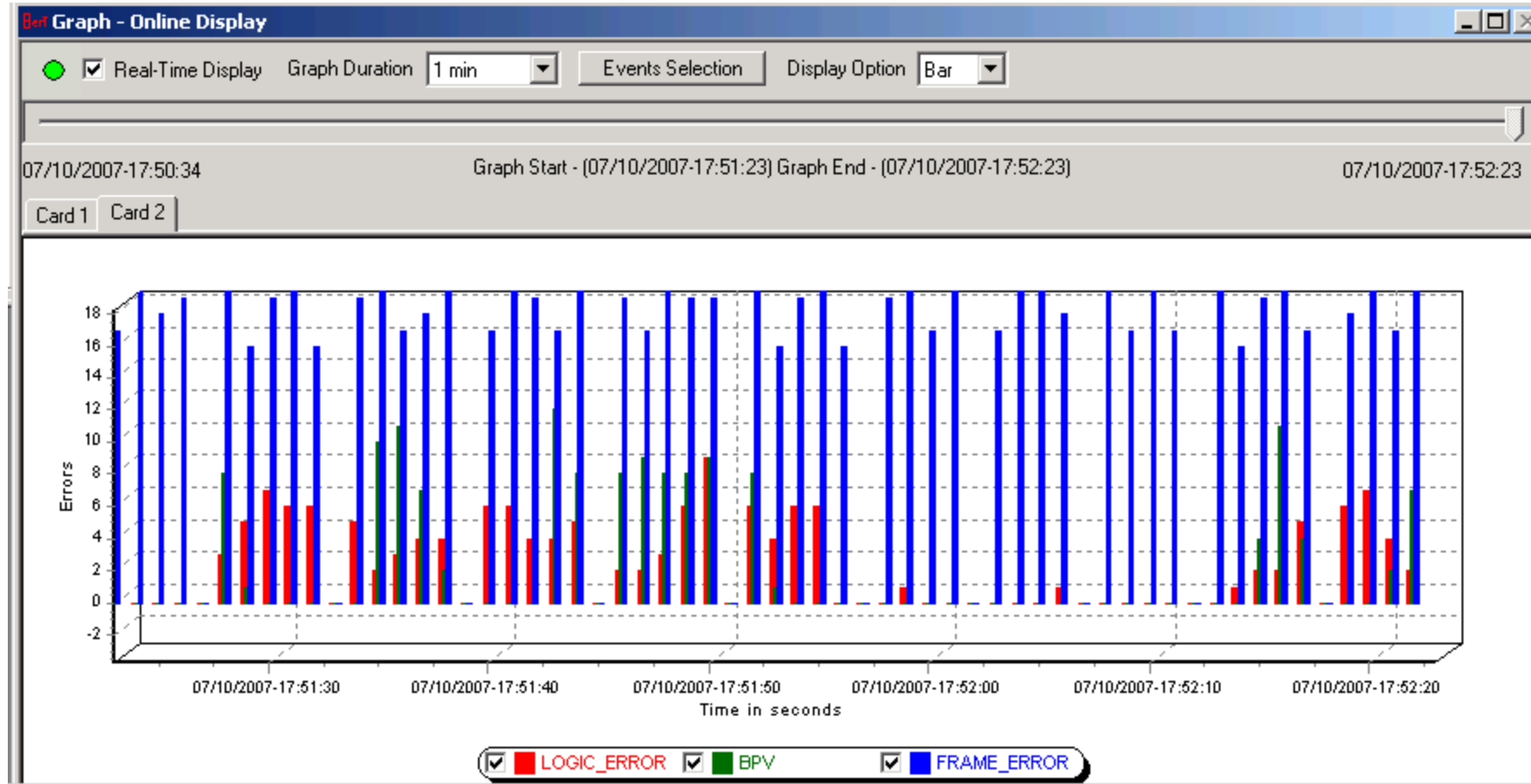
# Results – Tabular

The screenshot shows a software window titled "Tx Rx Settings - Card #1". It has two tabs: "Tx Settings" and "Result". The "Result" tab is active. Below the tabs are several controls: a "Custom View" dropdown menu, a "Configure Custom View" button, a "Reset" button, and an "Insert Errors" section containing a "Card #1" dropdown menu, a "Logic Error" button, and a "BPV" button. The main area of the window is a table with the following data:

	Logic Errors	Bipolar Violations	Frame Errors
Status / Errors	PatSync	0	0
Total Errors	1	3	0
Error Rate (Cont)	1.68E-008	5.05E-008	0.00E+000
Error Second (ES)	1	2	0
Error Free Second	26	25	27
Loss Of Sync Count	0		
Loss Of Sync Sec	3		
Start Time	11/25/2010 - 12:16:45		
Elapsed Time	00 - 00:00:00		

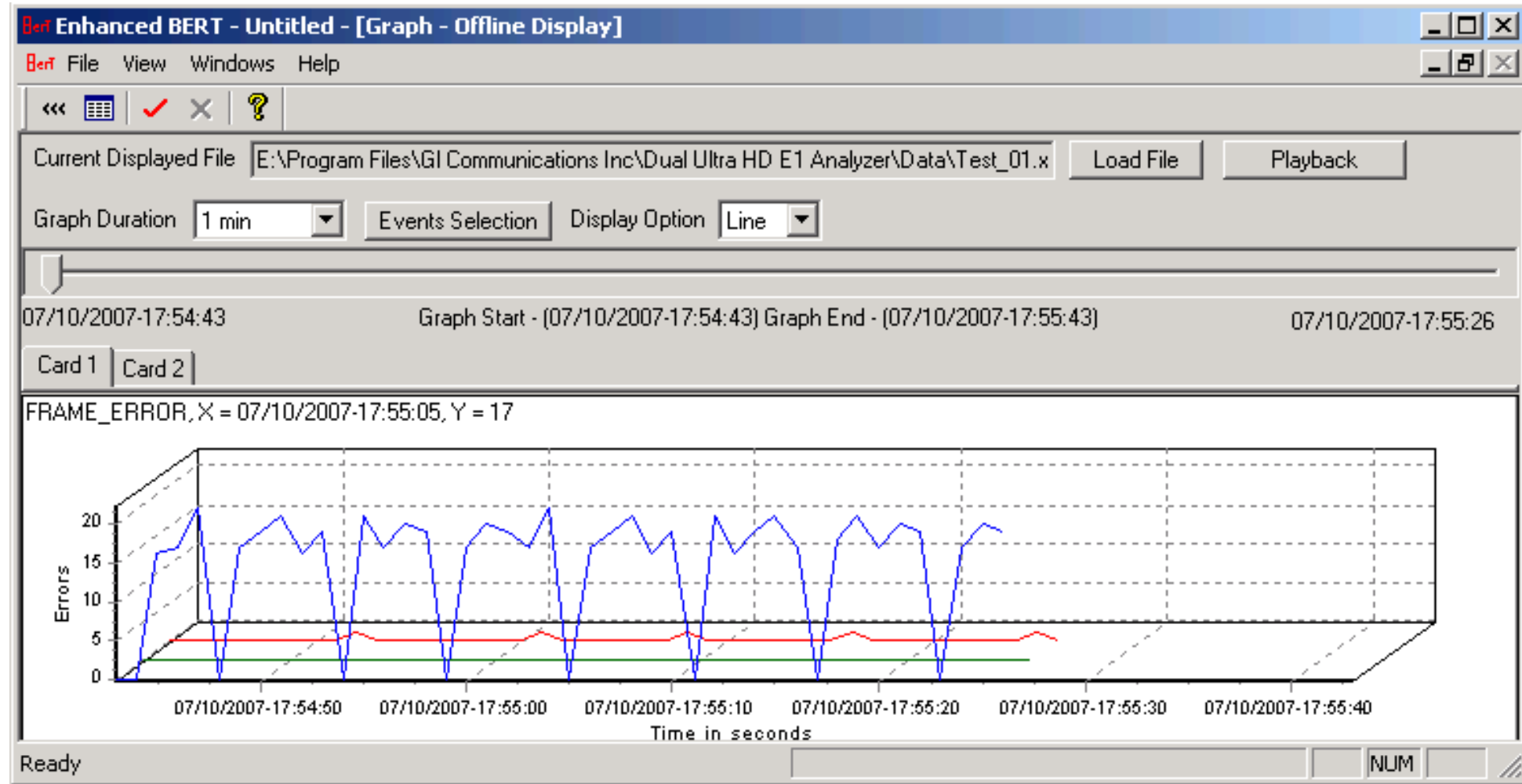
- Displays the status / errors of the BER test along with the total errors, error rate, error second, error free second, loss of sync count, loss of sync sec, start time, and elapsed time
- Also, gives the BPV, logic error and frame count on card 1 and card 2

# Results – Real-time Graph



- Displays the Error Rate Vs Time graph of the bit error test results in real-time

# Results - Offline Graph



# Comparison

Features	BERT	Enhanced BERT	ATM BERT	MC BERT
Frame Format	Framed Unframed Fraction with or without D & I	Framed Unframed Fractional	Framed	
Tx and Rx settings	Internally Coupled	User-selectable	User-selectable	
Support Multiple Card	✗	✓	✓	✗
Timeslots	Contiguous Timeslots	Contiguous & Non- contiguous timeslots, Sub-channels from 00 to FF		Contiguous & Non- contiguous timeslots, Hyperchannels , Subchannels 8 -56 kb/s
Offline Analysis			✗	✓
BER Patterns	16 static PRBS patterns	8 static BER patterns and User-defined Patterns	11 static BER patterns and User-defined pattern	Pattern File Option

# Comparison (Contd.)

Features	BERT	Enhanced BERT	ATM BERT	MC BERT
Error insertion	Logic error BPV errors	Logic error BPV errors  User-defined error insertions ranging from 0.01 to 1e-009	Single error User-defined error insertions ranging from 0.01 to 1e-009	
Traffic Rate	x	x	✓	x
ATM Headers Configuration	x	x	✓	x
Scrambling of data	x	x	✓	x
Data inversion	x	✓	✓	x
Results	Tabular analysis	Tabular analysis Real-time and offline Graphical analysis	Tabular analysis	Tabular analysis
Logging	Logs in *.txt files	Logs in *.xml files	x	Logs in *.txt files

# Packet over SONET (PoS) BERT

BERT application permits test to run over PPP, IP, or UDP

layers.

- User-defined header configuration
- User-defined traffic rate to the accuracy of 0.001% of total bandwidth
- Payload configuration to different PRBS patterns or user-defined patterns. User-defined pattern length can be 2 to 32 bits in length
- User-definable pre-sync achieve, sync loss bits, and sync loss declare options
- Supports sequence number insertion, invert payload data, single bit error insertion, and error rate insertion
- Provides detail statistics, such as Rx/Tx packet count, bit error count, IP and UDP checksum error count
- Provides throughput details, error and alarm LEDs for easy analysis

The screenshot displays the 'Pos Bert - [Untitled]' application window. The interface is divided into several panels:

- Configurations:** A tree view on the left showing a hierarchy for Port 1 and Port 2, each containing BERT, Tx Config, Rx Config, Results, and Statistics.
- Tx Config:** A panel for configuring transmission. It includes 'Port Selection' (Port 1), 'Tx Rx coupled settings' (unchecked), and tabs for Layer (PPP, IP, Payload), Traffic Rate, and Impairments. The 'PPP' tab is active, showing 'Protocol Type' set to IP.
- Rx Config:** A panel for configuring reception. It includes 'Port Selection' (Port 1), 'Tx Rx coupled settings' (unchecked), and tabs for Layer (PPP, IP, Payload). The 'PPP' tab is active, showing 'Layer' set to PPP.
- Results:** A panel showing 'BERT Status' (Idle) and 'BERT Statistics' table.
- Statistics:** A panel showing 'Tx' and 'Rx' statistics tables.

The 'BERT Statistics' table is as follows:

Bert Statistics	Values
BERT Status	Idle
Test Time	00:00:00
No Rx Data Count	0
No Rx Data Seconds	0
Bits Received	0
Bit Error Count	0
Bit Error Rate	0.0000E+000
Bit Error Seconds	0
Out Of Seq. Count	0
Sync Loss Count	0
Sync Loss Seconds	0
Error Free Seconds	0

The 'Statistics' panel shows the following data:

Tx	Values	Rx	Values
Frame count	-	Total frame count	0
Byte count	-	IPv4 frame count	0
		IP checksum error count	0
		IPv6 frame count	0
		Non-IP test frame count	0
		IP data over IP layer frame count	0
		UDP data over IP layer frame count	0
		TCP data over IP layer frame count	0
		ICMP data over IP layer frame count	0
		IGMP data over IP layer frame count	0
		IGRP data over IP layer frame count	0
		Other data over IP layer frame count	0
		UDP checksum error frame count	0
		UDP frame count	0
		Non-UDP test frame count	0

# IP Layer

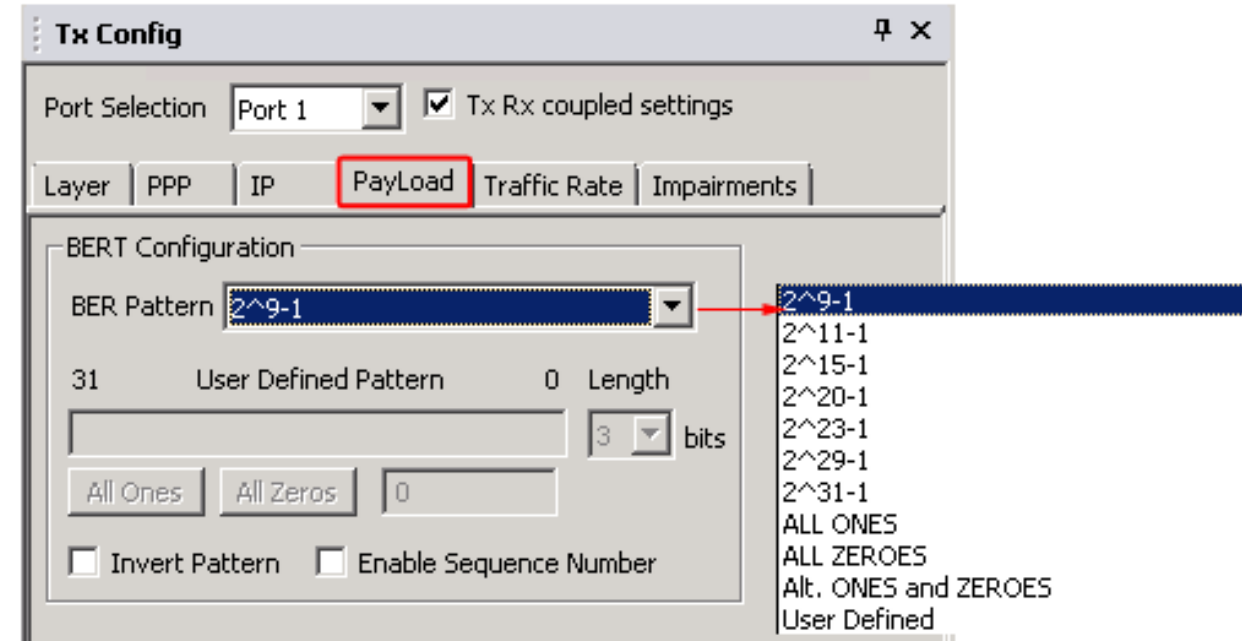
The screenshot shows a 'Tx Config' dialog box with the following settings:

- Port Selection: Port 1
- Tx Rx coupled settings
- Layer: PPP, **IP**, PayLoad, Traffic Rate, Impairments
- IP Selection: IPv4
- Src IP Address: 192 . 168 . 1 . 63
- Dest IP Address: 192 . 168 . 1 . 50
- Auto Inc Dest IP:  Range: 10
- TOS/DS: 3
- TTL: 128
- Protocol: 17
- Reserved: Reserved
- Header Checksum: 00-00
- Auto Compute
- Identification: 00-00
- Auto Increment

- POS BERT support IPv4 version providing header and data field settings
- Option to configure Src / Dest IP Address, Auto Inc Dest IP, TOS/DS, TTL, Protocol, Header Checksum, and Identification

# Tx Payload Configuration

- Payload option to select specific Bit Error Rate test pattern for transmission
- Support various BERT patterns; PRBS ( $2^9-1$ ,  $2^{11}-1$ ,  $2^{15}-1$ ,  $2^{20}-1$ ,  $2^{23}-1$ ,  $2^{29}-1$ ,  $2^{31}-1$ ), fixed patterns all ones, all zeros, alternate 1s and 0s, and user-defined patterns
- Rx configuration use these patterns to verify the incoming BERT pattern
- Pattern Sync is achieved only if BERT pattern matches configuration patterns, configurable header lengths and header information
- Invert pattern selection and Sequence Number option are also provided



# Rx Payload Configuration

- For Sync status, BERT pattern selection in Rx configuration should match with the BERT pattern in Tx configuration
- Provides Sync Declare Settings such as Sync Achieve Declare Count, Sync Loss Declare Status, Sync Loss Declare Count

The screenshot shows a software window titled "Rx Config" with a standard Windows-style title bar (minimize, maximize, close buttons). The window is divided into several sections:

- Port Selection:** A dropdown menu is set to "Port 1". To its right is a checked checkbox labeled "Tx Rx coupled settings".
- Layer Selection:** A row of four buttons: "Layer", "PPP", "IP", and "Payload". The "Payload" button is highlighted with a red rectangular border.
- BERT Configuration:**
  - A dropdown menu for "BER Pattern" is set to "2^9-1".
  - Below it, the text "31 User Defined Pattern 0 Length" is displayed.
  - A text input field is empty, followed by a dropdown menu set to "3" and the text "bits".
  - Below the input field are three buttons: "All Ones", "All Zeros", and "0".
  - At the bottom of this section are two unchecked checkboxes: "Invert Pattern" and "Enable Sequence Number".
- Sync Declare Settings:**
  - "Sync Achieve Declare Count" is set to "64".
  - "Sync Loss Declare Count" is set to "1".
  - "Sync Loss Declare Window" is set to "1000".
  - A "Restore Default" button is located at the bottom of this section.

# Traffic Rate

The Traffic Rate for **PoS BERT** can be configured with the following –

- Frame Length in bytes, ranging from 29 bytes to 1788 for normal frame sizes
- Rate configuration options -
  - % - Bandwidth in Percentage of the Link Speed  
**Eg:** If the link speed is 1000 Mbps, then 1% would be 10 Mbps
  - Fps – Frames/Sec

The screenshot shows a 'Tx Config' dialog box with the following settings:

- Port Selection: Port 1
- Tx Rx coupled settings
- Layer: PPP
- IP
- PayLoad
- Traffic Rate** (highlighted with a red box)
- Impairments

Under the Traffic Rate tab, the following configuration is visible:

- Frame Size: 64 Bytes (29-1788)
- Rate: 10.00
- Unit: % (selected in the dropdown menu, with 'Fps' also visible)

# Results

- Displays both BERT Status with LEDs and BERT Statistics
- BERT statistics includes BERT status, Test Time, no rx data, no rx data seconds, bits received, bit errors, bit error rate/seconds, Out-of-Seq Count, sync loss count/seconds, and error free seconds
- BERT Status provides a quick view of the test status in the form of Alarm LEDs

The screenshot shows a software window titled "Results" with a port selection dropdown set to "Port 1" and buttons for "Reset", "Clear LED History", and "Insert Error".

Bert Status		
Rx No Traffic		Not Active
Sync Loss		Not Active
Bit Error		Active
Out of Sequence Packet		Idle

Bert Statistics	Values
BERT Status	SYNC
Test Time	00:06:59
No Rx Data Count	0
No Rx Data Seconds	0
Bits Received	56218416
Bit Error Count	1898901474
Bit Error Rate	4.3641E-001
Bit Error Seconds	351
Out Of Seq. Count	0
Sync Loss Count	29
Sync Loss Seconds	98
Error Free Seconds	0

# Statistics

Port Selection: Port 1 [v] Reset Rx

Tx	Values	Rx	Values
Frame count	-	Total frame count	16600298
Byte count	-	IPv4 frame count	0
		IP checksum error count	0
		IPv6 frame count	0
		Non IP test frame count	0
		IP data over IP layer frame count	0
		UDP data over IP layer frame count	0
		TCP data over IP layer frame count	0
		ICMP data over IP layer frame count	0
		IGMP data over IP layer frame count	0
		IGRP data over IP layer frame count	0
		Other data over IP layer frame count	0
		UDP checksum error frame count	0
		UDP frame count	0
		Non UDP test frame count	0

- Displays Tx and Rx statistics of the PoS BER test
- Rx statistics includes Total Frame Count, IPv4 Frame Count, IP checksum error count, IPv6 Frame Count, Non IP Test Frame Count, IP data over IP layer, UDP, TCP, ICMP, IGMP, IGRP, Other data over IP layer frame count, UDP checksum error frame count, UDP frame count, Non UDP test frame count

# ATM BERT

- Capable of generating /receiving traffic
- Support user-defined ATM header configuration for GFC, VPI, VCI, PT, CLP
- User-defined traffic rate to the accuracy of 1% of total bandwidth
- Supports different QRSS, PRBS patterns  $2^9-1$ ,  $2^{11}-1$ ,  $2^{15}-1$ ,  $2^{20}-1$ ,  $2^{23}-1$ , All one's, All zero's, alternate 1's and 0's, 1:1, 1:7, and User -defined pattern (ranging between 3 to 32 bits)
- Supports inverting, and scrambling payload data. Scrambling is according to ITU-T G.804
- Supports single bit error insertion, and error rate insertion
- Provides ATM QoS measurement (bit error count/ rate/seconds, sync Loss, no rx data,... )
- Provides ATM Statistics (total cell count, rejected / pass / idle cell counts, cell rate, and HEC error count)
- Provides throughput details, error, and alarm LEDs for easy analysis
- Supports testing on multiple cards simultaneously with consolidated result view
- Tx and Rx settings for multiple cards can be independently controlled or coupled
- Capable to save and load the configuration settings

The screenshot displays the ATM BERT software interface with the following sections:

- Configurations:** A tree view on the left showing settings for Port 1 and Port 2, including Tx Config, Rx Config, Results, and Statistics.
- Tx Config:**
  - Port Selection: Port 1
  - Layer: ATM Header
  - ATM Header Fields: User/Network Interface (UNI or NNI), GFC (0), VPI (1), VCI (2), PT (0), CLP (0).
- Rx Config:**
  - Port Selection: Port 1
  - Layer: Recv Filter
  - BERT Configuration: BER Pattern (QRSS), User Defined Pattern (000), Length (3 bits).
  - Timeslot Selection: A grid for selecting timeslots (TS).
  - Sub Channel Selection: A grid for selecting sub-channels.
- Results:**
  - Port Selection: Port 1
  - Bert Status: Rx No Traffic, Sync Loss, Bit Error (all Not Active).
  - Bert Statistics Table:

Bert Statistics	Values
BERT Status	SYNC
Test Time	00:00:06
No Rx Data Count	0
No Rx Data Seconds	0
Bits Received	91145
Bit Error Count	0
Bit Error Rate	0.0000E+000
Bit Error Seconds	0
Sync Loss Count	0
Sync Loss Seconds	0
Error Free Seconds	6
- Statistics:**
  - Port Selection: Port 1
  - Rx Statistics Table:

Tx	Values	Rx	Values
Cell count	-	Total cell count	48810
Byte count	-	Cell rate	483
		Idle Cell count	43944
		Rejected cell count	0
		Pass cell count	4885
		HEC error count	0

Thank you