
Basic Software

(tProbe™, Octal/Quad, Dual PCIe, and tScan16™ Analyzer)



818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878
Phone: (301) 670-4784 Fax: (301) 670-9187 Email: info@gl.com
Website: <https://www.gl.com>

Basic Functions

- Non-Intrusive and Intrusive Testing of T1 E1 Lines
- Analysis and Emulation of Various Signal Types
- T1 E1 PCM Signal Visualization, Capture and Storage

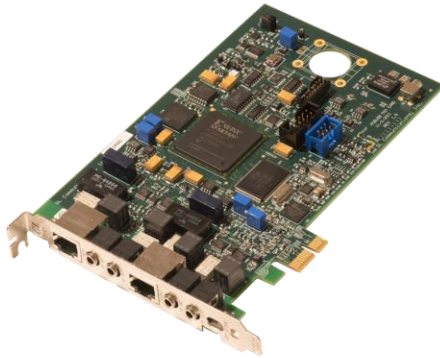
T1 E1 Hardware Platforms



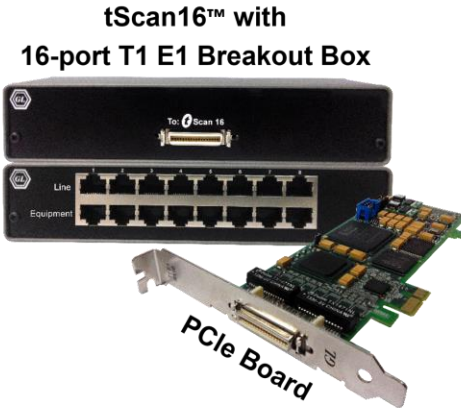
**tProbe™ - Portable USB based T1 E1 VF
FXO FXS and Serial Datacom Analyzer**



Quad / Octal T1 E1 PCIe Card



Dual T1 E1 Express (PCIe) Board



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

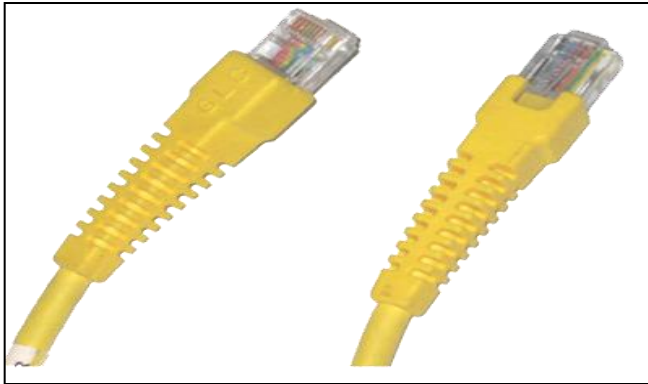
PCIe Board

Cables, Y-bridges

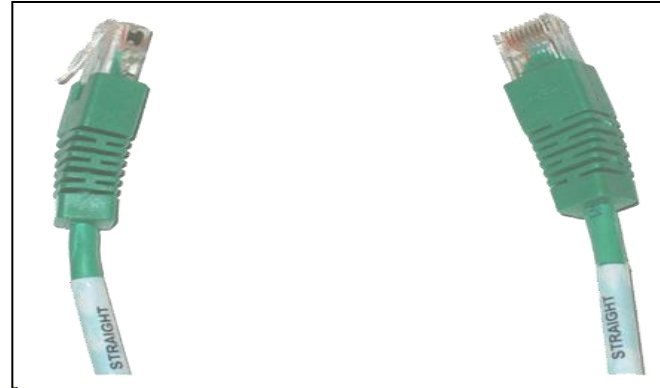
Y-Bridge cable



Cross-over cable



Straight cable

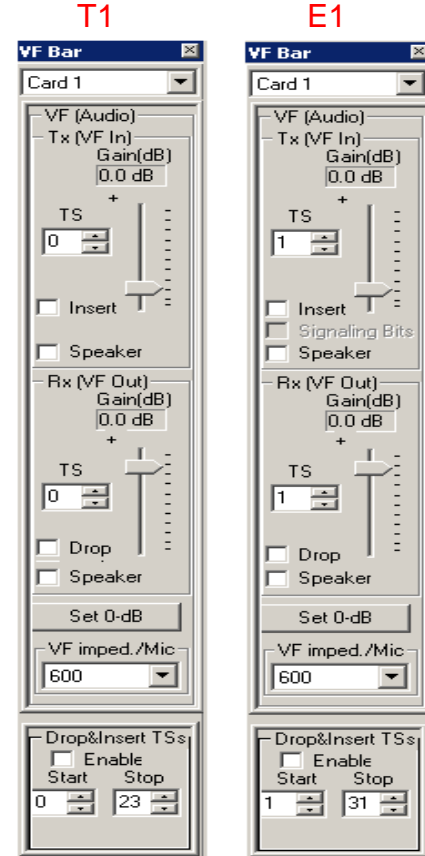


T1 E1 Configurations and VF Options

VF Options

- A single (selected) timeslot can be encoded (VF Input); analog gain may be applied prior to the encoding
- A single (selected) timeslot can be decoded to audio (VF Output); analog gain may be applied prior to output
- The VF Output may be fed to the PC speaker for greater fidelity and volume
- The drop and insert loops incoming data back to the output except for the selected timeslots that are dropped

Note: VF Bar is not applicable for OctalXpress T1 E1 Boards



VF Drop and Insert Capabilities

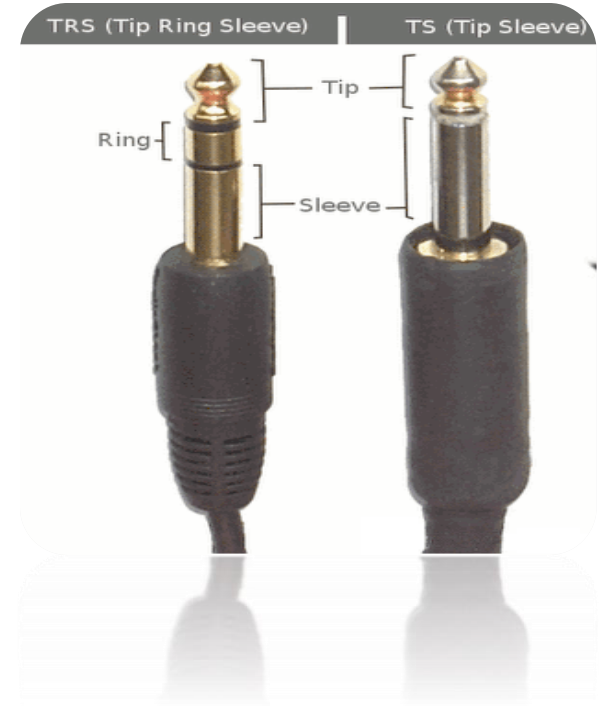
- VF Input/Output interfaces are provided for the following platforms:
 - **USB based tProbe™ T1 E1 Unit** - supports only 3.5mm balanced (stereo) analog interfaces with varying impedances
- Input signal is digitized (at 8 Khz, uLaw/A-Law) and inserted into selected timeslot of T1 E1
- An output audio signal is dropped from the selected timeslot of T1 E1

Typical Applications

- Connecting Telephony Audio Equipments
- Connecting Old Telephony Audio Equipments
- Connecting VF Input and Output to Sound Card
- Non-Intrusively Bridge over VF Line
- Connecting Headset with Microphone for communication over T1 E1 Timeslot
- Wideband Copper Equipments

VF Drop and Insert Capabilities – USB E1

- VF interfaces on GL's tProbe™ E1 Analyzer unit are balanced interface, which means that analog signal is presented and expected on Tip and Ring of the connector and shield (sleeve) is grounded to chassis
- VF interfaces on these GL's USB E1 Analyzer unit are unbalanced (mono) interfaces, which means that analog signal presented and expected on Tip and Shield of the connector and Ring is not used (unconnected)
- Analyzer allows users to select various VF terminations, gain, drop, and insert options within VF Dialog bar



VF Gains - tProbe™ E1

VF Tx Gains	Supports: -12 dB to +59 dB in 0.5dB Steps Gain (0.1 dB steps can also be accommodated in tProbe™)
VF Rx Gains	Supports: -63.5 dB to +9 dB in 0.5dB Steps Attenuation (0.1 dB steps can also be accommodated in tProbe™)

VF Gains and Impedance – E1

VF Tx Gains	Range: -7.2dB to +18.2dB selectable gain in 0.1dB steps Level: 0.0dBm \pm 0.1dBm
VF Rx Gains	Range: -18.0 dB to +7.3 dB selectable gain in 0.1dB steps

User Setting	Receive Setting	Transmit Setting
600Ohms	600Ohms	Calibrated to 600Ohms

Monitoring Applications

Monitoring Features

- Line Monitoring
- Byte Values
- Binary Byte Values
- Signaling bits
- Power Level
- DC Offset
- Frequency
- Multiframe
- Real-time Multiframe
- E1 Data as Real-time Bitmap
- Timeslot Window
- ASCII Timeslot Display
- Oscilloscope
- Power Spectral
- Audio Monitoring
- Active Voice Level
- Realtime MultiChannel Audio Bridge
- Real-time Strip Chart
- DTMF / MF Capture
- Pulse Mask Display
- Jitter Measurement

Monitor T1 E1 Lines

- The Line status window indicates if the E1 line is either up, or down
- The Alarms section exactly shows what type of problem maybe present on the line. The presence of any alarms indicates a serious problem on the line
- The Statistics section provides the exact measurements of framing errors, Clock Slips, or line code violation

T1/E1 Alarms				
Reset	All Ports	#1	#2	
Sync Loss	✓	✓	✓	
HDB3 Violation	✓	✓	✓	
Carrier Loss	✓	✓	✓	
Frame Error	✓	✓	✓	
Remote	✓	✓	✓	
Distant MF	✓	✓	✓	
AIS	✓	✓	✓	
ES Overflow	✓	✓	✓	
ES Underflow	✓	✓	✓	

T1/E1 Statistics				
Frequency (Hz)		----	----	
Level (dBdsx)		----	----	
BPV Errors		0	0	
Out of Frame Errors		0	0	
Frame Errors		0	0	
==Bit/Frame Clock Slip==				
Ref to Internal		-677/-2	-678/-2	
Cross Ref to Recovered		1/0	-1/0	
Ref to External		n/a	n/a	

Graph				
Invoke Graph				

Monitor T1 E1 Lines (Contd.)

- T1 E1 Alarms:
 - **Line Sync Loss:** This will flash when a receiver resync is in progress
 - **HDB3 Violations:** It is a ternary transmission code in which the number of consecutive zeros, which may occur, is restricted to three, to ensure adequate clock recovery at the receiver
 - **Carrier loss alarm:** It is declared when 128 ± 1 consecutive zeros are detected
 - **Frame Error:** This will flash whenever a framing bit is in error
 - **Remote Alarm:** This will flash when a remote alarm is detected
 - **Distant Multiframe:** This indication will flash when a distant multi-frame alarm is detected

What is a Clock Slip?

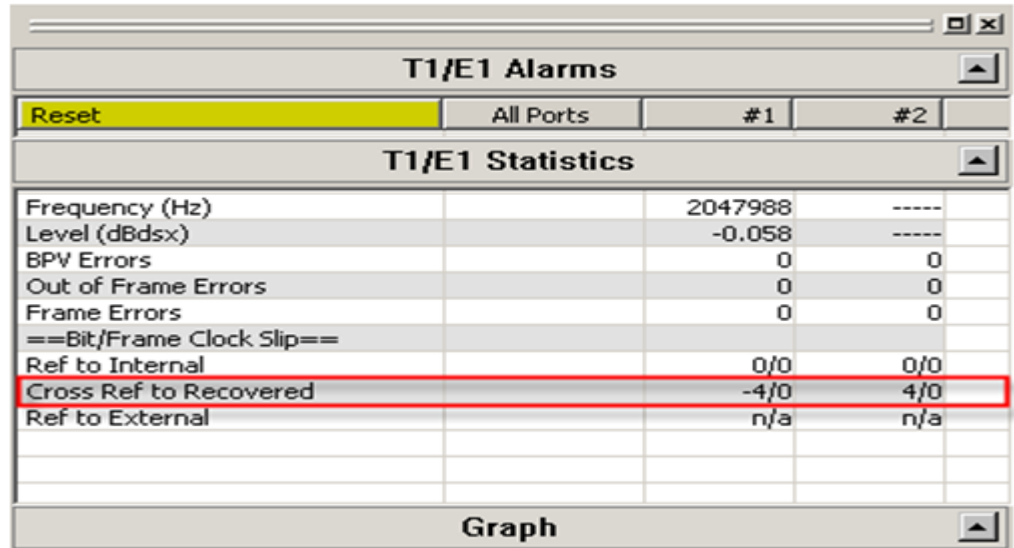
- Clock Slips are a count of the difference between a reference T1 E1 clock and another T1 E1 signal being measured
- A Clock Slip is a one-second-interval measurement (accuracy of the timing slips is +/- 1 count) that arise because of phases differences or frequency differences of the incoming signal vs. the outgoing signal timing (the reference)

Internal Clock Slips

- Compares the incoming receive clock from the port against the internal clock provided by the unit
- The software compares the internal counter to the recovered clock counter by storing these counts

T1/E1 Alarms			
Reset	All Ports	#1	#2
T1/E1 Statistics			
Frequency (Hz)		2047988	2047988
Level (dBdsx)		-0.029	-0.294
BPV Errors		0	0
Out of Frame Errors		0	0
Frame Errors		0	0
==Bit/Frame Clock Slip==			
Ref to Internal		-22/0	-22/0
Cross Ref to Recovered		0/0	0/0
Ref to External		n/a	n/a
Graph			

Crossport Clock Slips



The screenshot shows a window titled "T1/E1 Alarms" with a "Reset" button highlighted in yellow. Below it is a "T1/E1 Statistics" table with columns for "All Ports", "#1", and "#2". The table contains the following data:

	All Ports	#1	#2
Frequency (Hz)	2047988	----	----
Level (dBdsx)	-0.058	----	----
BPV Errors	0	0	0
Out of Frame Errors	0	0	0
Frame Errors	0	0	0
==Bit/Frame Clock Slip==			
Ref to Internal	0/0	0/0	0/0
Cross Ref to Recovered	-4/0	4/0	
Ref to External	n/a	n/a	

At the bottom of the window is a "Graph" section.

- This Clock Slips measurement compares the incoming receive clock from port #1 against the incoming receive clock from port #2 using the Recovered clock on port #1 and Recovered clock on Port #2

External Clock Slips

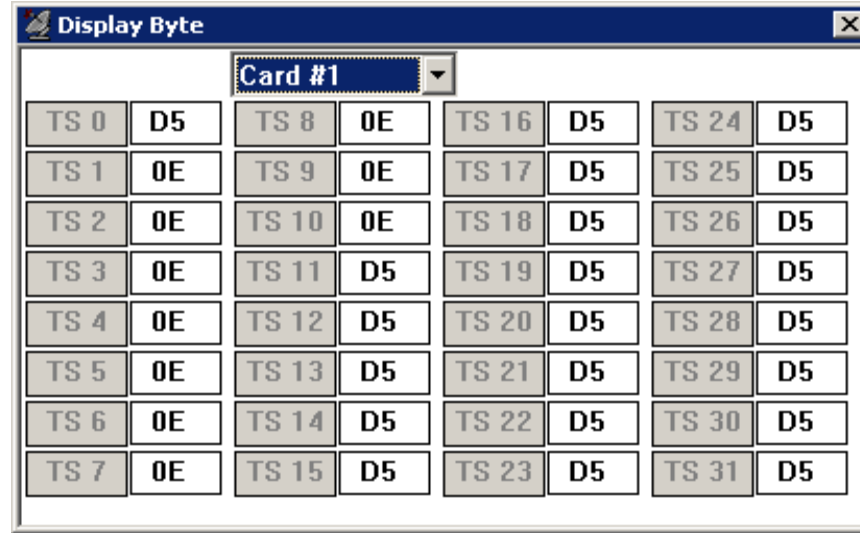
T1 tProbe - Analyzer							
Port	Framing	Loopback	Termination	Clock	BBZS	Cross-port	
1	ESF (193E)	No Loopback	Terminate	External	On	Normal (None)	
2	ESF (193E)	No Loopback	Terminate	Internal	On	Normal (None)	

T1/E1 Alarms				
Reset	All Ports	#1	#2	
Sync Loss	✓	✓	✓	
Bipolar Violation	✓	✓	✓	
Carrier Loss	✓	✓	✓	
Frame Error	✓	✓	✓	
Blue Alarm	✓	✓	✓	
Yellow Alarm	✓	✓	✓	
ATS	✓	✓	✓	
ES Overflow	✓	✓	✓	
ES Underflow	✓	✓	✓	

T1/E1 Statistics			
Frequency (Hz)		1543999	1544025
Level (dBdsx)		0.086	0.058
BPV Errors		0	0
Out of Frame Errors		0	0
Frame Errors		0	0
==Bit/Frame Clock Slip==			
Ref to Internal		0/0	592/3
Cross Ref to Recovered		-592/-3	592/3
Ref to External		-592/-3	0/0

- This Clock Slip measurement compares the incoming receive clock using the Recovered clock of port 1 or 2 against the external clock provided on the external clock input

Byte Values

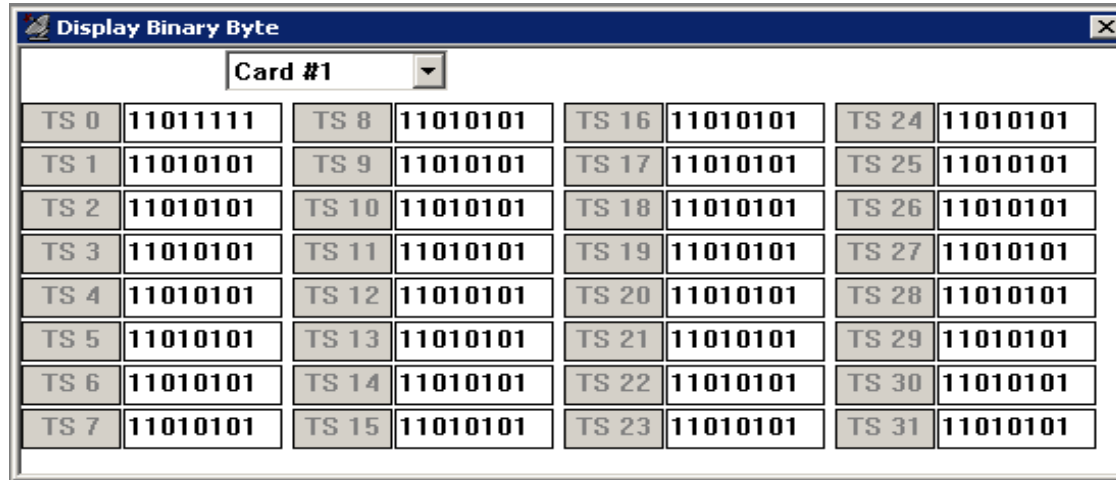


The screenshot shows a window titled "Display Byte" with a dropdown menu set to "Card #1". Below the menu is a grid of 32 data points, each consisting of a time slot (TS) and a data value in hexadecimal format. The values are: TS 0: D5, TS 1: 0E, TS 2: 0E, TS 3: 0E, TS 4: 0E, TS 5: 0E, TS 6: 0E, TS 7: 0E, TS 8: 0E, TS 9: 0E, TS 10: 0E, TS 11: D5, TS 12: D5, TS 13: D5, TS 14: D5, TS 15: D5, TS 16: D5, TS 17: D5, TS 18: D5, TS 19: D5, TS 20: D5, TS 21: D5, TS 22: D5, TS 23: D5, TS 24: D5, TS 25: D5, TS 26: D5, TS 27: D5, TS 28: D5, TS 29: D5, TS 30: D5, TS 31: D5.

TS	Value	TS	Value	TS	Value	TS	Value
TS 0	D5	TS 8	0E	TS 16	D5	TS 24	D5
TS 1	0E	TS 9	0E	TS 17	D5	TS 25	D5
TS 2	0E	TS 10	0E	TS 18	D5	TS 26	D5
TS 3	0E	TS 11	D5	TS 19	D5	TS 27	D5
TS 4	0E	TS 12	D5	TS 20	D5	TS 28	D5
TS 5	0E	TS 13	D5	TS 21	D5	TS 29	D5
TS 6	0E	TS 14	D5	TS 22	D5	TS 30	D5
TS 7	0E	TS 15	D5	TS 23	D5	TS 31	D5

- Displays the data values for each time slot in HEX data format

Binary Byte Values



The screenshot shows a software window titled "Display Binary Byte" with a close button in the top right corner. Below the title bar is a dropdown menu labeled "Card #1". The main area contains a grid of 32 time slots, each with a label (TS 0 to TS 31) and a binary value (11011111 for TS 0, and 11010101 for all other slots).

TS 0	11011111	TS 8	11010101	TS 16	11010101	TS 24	11010101
TS 1	11010101	TS 9	11010101	TS 17	11010101	TS 25	11010101
TS 2	11010101	TS 10	11010101	TS 18	11010101	TS 26	11010101
TS 3	11010101	TS 11	11010101	TS 19	11010101	TS 27	11010101
TS 4	11010101	TS 12	11010101	TS 20	11010101	TS 28	11010101
TS 5	11010101	TS 13	11010101	TS 21	11010101	TS 29	11010101
TS 6	11010101	TS 14	11010101	TS 22	11010101	TS 30	11010101
TS 7	11010101	TS 15	11010101	TS 23	11010101	TS 31	11010101

- Displays the data values for each time slot in binary data format

Signalling Bits, Power Level, DC Offset, Frequency

Signaling Bits							
Card #1							
TS 0	—	TS 8	1001	TS 16	—	TS 24	1001
TS 1	1001	TS 9	1001	TS 17	1001	TS 25	1001
TS 2	1001	TS 10	1001	TS 18	1001	TS 26	1001
TS 3	1001	TS 11	1001	TS 19	1001	TS 27	1001
TS 4	1001	TS 12	1001	TS 20	1001	TS 28	1001
TS 5	1001	TS 13	1001	TS 21	1001	TS 29	1001
TS 6	1001	TS 14	1001	TS 22	1001	TS 30	1001
TS 7	1001	TS 15	1001	TS 23	1001	TS 31	1001

Power (dBm)							
Card #1							
TS 0	-15.3	TS 8	-4.1	TS 16	-12.0	TS 24	-4.1
TS 1	-3.8	TS 9	-3.7	TS 17	-3.6	TS 25	-4.1
TS 2	-3.9	TS 10	-3.8	TS 18	-4.1	TS 26	-3.9
TS 3	-3.8	TS 11	-4.1	TS 19	-4.0	TS 27	-4.0
TS 4	-4.1	TS 12	-4.2	TS 20	-4.3	TS 28	-4.1
TS 5	-4.2	TS 13	-4.2	TS 21	-3.5	TS 29	-4.4
TS 6	-4.1	TS 14	-3.7	TS 22	-4.1	TS 30	-3.9
TS 7	-4.0	TS 15	-4.1	TS 23	-4.2	TS 31	-4.2

DC Offset (mV)							
Card #1							
TS 0	3	TS 8	-3	TS 16	-141	TS 24	-3
TS 1	22	TS 9	-31	TS 17	14	TS 25	7
TS 2	-6	TS 10	-6	TS 18	17	TS 26	-11
TS 3	-24	TS 11	2	TS 19	17	TS 27	-7
TS 4	-6	TS 12	26	TS 20	-1	TS 28	-15
TS 5	10	TS 13	3	TS 21	-20	TS 29	4
TS 6	4	TS 14	3	TS 22	-10	TS 30	-4
TS 7	-10	TS 15	2	TS 23	-13	TS 31	1

Frequency (Hz)							
Card #1							
TS 0	2023	TS 8	2044	TS 16	499	TS 24	2037
TS 1	2030	TS 9	2041	TS 17	2022	TS 25	1973
TS 2	1980	TS 10	1994	TS 18	1987	TS 26	1972
TS 3	2032	TS 11	2037	TS 19	2004	TS 27	2047
TS 4	2009	TS 12	1986	TS 20	2001	TS 28	2040
TS 5	2024	TS 13	2030	TS 21	1987	TS 29	1994
TS 6	2006	TS 14	2035	TS 22	1986	TS 30	2020
TS 7	1911	TS 15	1975	TS 23	1991	TS 31	1989

Signaling Bits, Power Level, DC Offset, Frequency

- Signaling Bits, Power Level (in dbm), DC Offset, Frequency associated with each timeslot are displayed in real-time
- Multiple instances can be opened simultaneously for monitoring purposes

Multiframes

Frame #	Data
1	9B D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
2	5F D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
3	9B D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
4	5F D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
5	9B D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
6	DF D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
7	1B D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
.	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5

- Multiframes - Identifies the data in each frame
- For T1 systems, twelve (12) frames are displayed per multi-frame in D4 (193S) framing format, and twenty-four (24) frames in ESF (193E) framing format
- For E1 systems, 16 frames are displayed per multi-frame

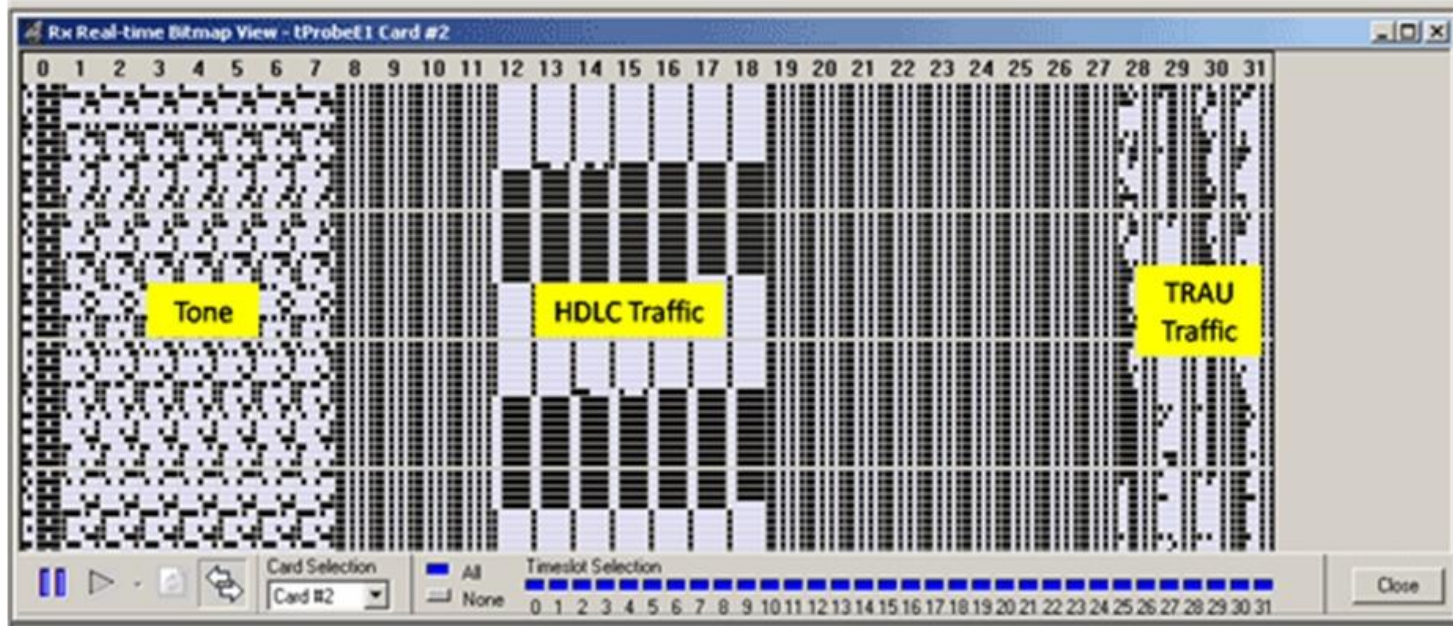
Real-time Multiframes

TS#	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Fr#	0	9B	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
1	5F	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
2	9B	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
3	5F	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
4	9B	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
5	DF	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
6	1B	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
7	5F	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
8	9B	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
9	DF	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
10	9B	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
11	DF	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
12	9B	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
13	DF	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
14	9B	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	
15	DF	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	D5	

- Identifies the data in each frame with the data being refreshed automatically every second
- For T1 systems, twelve frames are displayed per multiframe in D4 (193S) framing format
- Twenty-four (24) frames are displayed in ESF (193E) framing format
- For E1 systems, 16 frames are displayed per multiframe

T1 Data As Real-Time Bitmap

- Provides a graphical view of multi-frames and is rendered as a pixel map with zeros represented by white dots and ones represented by black dots



ASCII Timeslot Display

The screenshot shows the 'ASCII Timeslot Display' application window. It features a table with two columns: 'Time' and 'Message'. The messages are log entries with timestamps and technical details. Below the table is a control panel with 'Source' and 'Options' sections. The 'Source' section includes a 'Port' dropdown set to 'Port #1' and a 'Timeslot' dropdown set to '16'. The 'Options' section contains buttons for 'Display IDLE', 'Enable Logging', 'More...', 'Clear Display', and 'Run'. At the bottom, there are status indicators for 'Ready', 'Log Enabled', the date '9/9/2010', and the time '2:13 PM'.

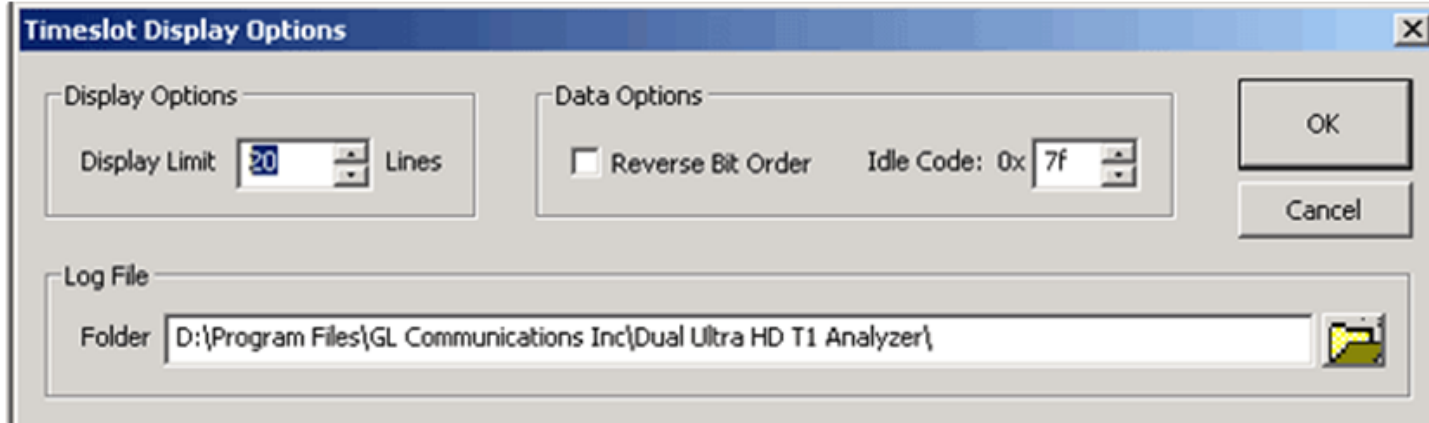
Time	Message
09/09/2010 13:50:02.961	00,PNGC,
09/09/2010 13:49:47.952	00,PNGC,
09/09/2010 13:49:38.386	00,SSTC,1,Call Start ,SGPR ,CB4AA83F0102,20100902,16:38:48, ,00:01,15105900
09/09/2010 13:49:32.945	00,PNGC,
09/09/2010 13:49:17.968	00,PNGC,
09/09/2010 13:49:09.298	00,SSTC,0,Unknown ,SGPR ,CB4AA83F0102,20100902,16:37:49,00:00:00,00:01,151
09/09/2010 13:49:02.961	00,PNGC,
09/09/2010 13:48:47.952	00,PNGC,
09/09/2010 13:48:39.409	00,SSTC,1,Call Start ,SGPR ,CB4AA83F0102,20100902,16:37:49, ,00:01,15105900
09/09/2010 13:48:32.944	00,PNGC,
09/09/2010 13:48:17.967	00,PNGC,
09/09/2010 13:48:17.075	00,SSTC,0,Unknown ,SGPR ,CB4AA83F0102,20100902,16:36:53,00:00:00,00:01,151
09/09/2010 13:48:02.949	00,PNGC,
09/09/2010 13:47:47.940	00,PNGC,
09/09/2010 13:47:44.133	00,SSTC,1,Call Start ,SGPR ,CB4AA83F0102,20100902,16:36:53, ,00:01,15105900
09/09/2010 13:47:32.932	00,PNGC,
09/09/2010 13:47:19.238	00,SSTC,0,Unknown ,SGPR ,CB4AA83F0102,20100902,16:35:58,00:00:00,00:01,151
09/09/2010 13:47:17.957	00,PNGC,
09/09/2010 13:47:02.948	00,PNGC,
09/09/2010 13:46:48.358	00,SSTC,1,Call Start ,SGPR ,CB4AA83F0102,20100902,16:35:58, ,00:01,15105900

Source: Port Port #1, Timeslot 16

Options: Display IDLE, Enable Logging, More..., Clear Display, Run

Status: Ready, Log Enabled, 9/9/2010 2:13 PM

ASCII Timeslot Display (Contd.)



- Permits viewing of real-time ASCII events that are present on the E1
- Capable to display the ASCII events for a particular port and timeslot
- Each event is properly time-stamped for tests that require time correlation
- Logging real-time events to the hard drive is also possible. This is useful during overnight or long-term testing

Timeslot Window

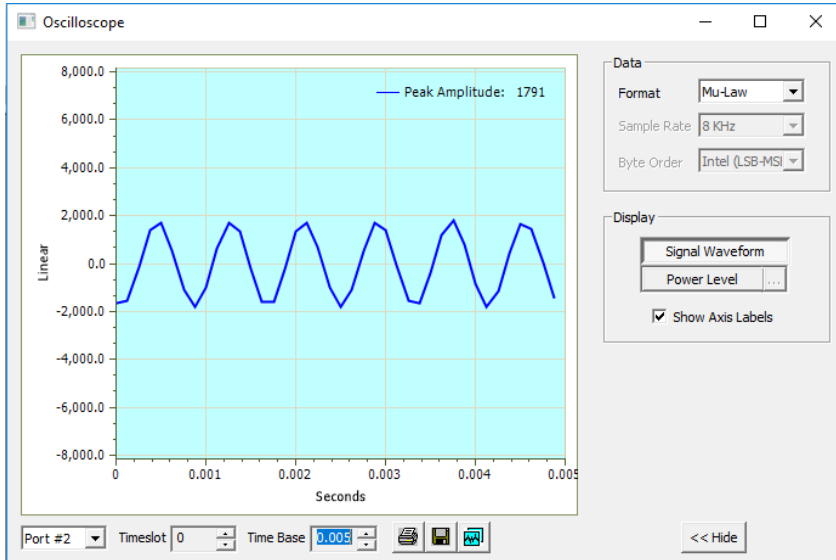
The screenshot shows a software window titled "Timeslot Window - tProbeE1 Card #1". The window contains a table with two columns: "# MFs" and "Data". The "# MFs" column lists values from 0000 to 0016. The "Data" column contains a sequence of 16 "D5" values for each MF. To the right of the table is a control panel with a "Card Select" dropdown menu set to "Card #1", a "TS #" dropdown menu set to "1", and a "New Buffer" button.

# MFs	Data
0000	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0001	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0002	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0003	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0004	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0005	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0006	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0007	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0008	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0009	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0010	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0011	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0012	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0013	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0014	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0015	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5
0016	D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5 D5

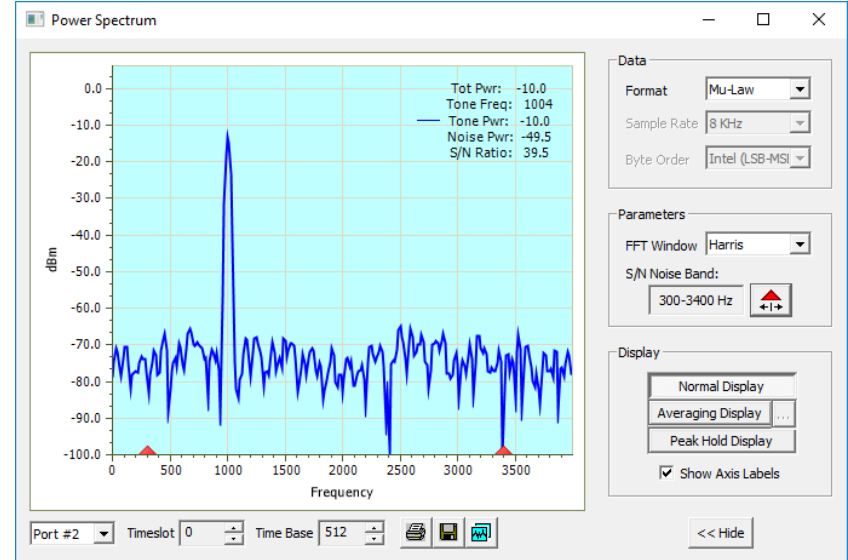
- Displays the timeslot values on a desired timeslot for one-second duration

Oscilloscope and Spectral

Oscilloscope

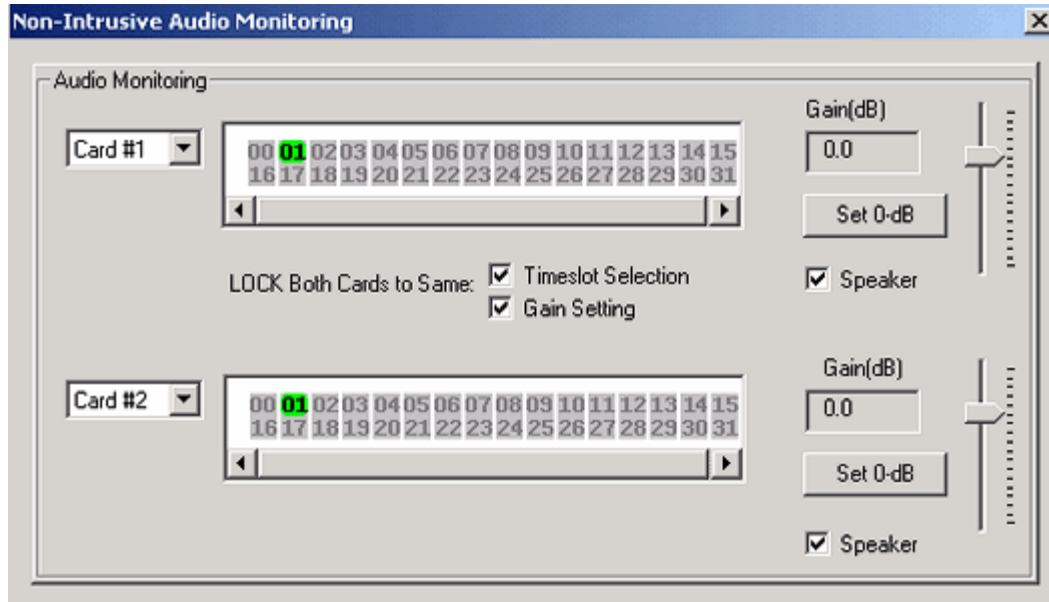


Spectral



- Oscilloscope - Displays received data in real-time graphically as a function of time
- Spectral Display - Data received is displayed as a function of frequency

Audio Monitoring



- Control audio level of VF output (speaker) of all cards connected to a PC with a single program

Active Voice Level

The screenshot shows the 'GL ITU-T P.56 Active Voice Level Measurement' software interface. The main window contains a table with the following columns: Ts, AVL, Act%, Noise, Max, Min, AMax, DC, and RMS. The data rows show measurements for time slots 0 through 24. The AVL values are consistently -4.0, Act% is 100.0, and Noise is -inf. The Max, Min, and AMax values are 4032, -4032, and 4032 respectively. The DC and RMS values vary slightly, ranging from -10 to 6.

Ts	AVL	Act%	Noise	Max	Min	AMax	DC	RMS
0	---	---	---	---	---	---	---	---
1	-4.0	100.0	-inf	4032	-4032	4032	6	-4.0
2	-4.0	100.0	-inf	4032	-4032	4032	4	-4.0
3	-4.0	100.0	-inf	4032	-4032	4032	-9	-4.0
4	-4.0	100.0	-inf	4032	-4032	4032	-5	-4.0
5	-3.9	100.0	-inf	4032	-4032	4032	-0	-3.9
6	-4.0	100.0	-inf	4032	-4032	4032	-7	-4.0
7	-4.0	100.0	-inf	4032	-4032	4032	-7	-4.0
8	-4.0	100.0	-inf	4032	-4032	4032	-2	-4.0
9	-4.0	100.0	-inf	4032	-4032	4032	-4	-4.0
10	-4.0	100.0	-inf	4032	-4032	4032	4	-4.0
11	-3.9	100.0	-inf	4032	-4032	4032	5	-3.9
12	-4.0	100.0	-inf	4032	-4032	4032	6	-4.0
13	-4.0	100.0	-inf	4032	-4032	4032	-4	-4.0
14	-3.9	100.0	-inf	4032	-4032	4032	7	-3.9
15	-4.0	100.0	-inf	4032	-4032	4032	-2	-4.0
16	-4.0	100.0	-inf	4032	-4032	4032	10	-4.0
17	-4.1	100.0	-inf	4032	-4032	4032	-5	-4.1
18	-4.0	100.0	-inf	4032	-4032	4032	-7	-4.0
19	-3.9	100.0	-inf	4032	-4032	4032	-10	-3.9
20	-4.0	100.0	-inf	4032	-4032	4032	9	-4.0
21	-4.0	100.0	-inf	4032	-4032	4032	7	-4.0
22	-4.0	100.0	-inf	4032	-4032	4032	-8	-4.0
23	-4.0	100.0	-inf	4032	-4032	4032	7	-4.0
24	-4.0	100.0	-inf	4032	-4032	4032	-8	-4.0

The interface also features a 'Line In Data' panel with a 'Select' button, a 'Card' dropdown menu set to 'Card #1', and a 'Timeslots' grid. The 'Timeslots' grid is a 4x7 grid of buttons labeled 0 through 31. Below the grid are 'Select All' and 'Clear All' buttons. The 'File Data' panel includes a 'Select' button, a 'Browse' button, a file path field showing 'C:\Program Files (x86)\GL Communications Inc\Octal X', a 'Number of channels' spinner set to 1, and a 'Data Format' dropdown menu set to '16-bit Intel PCM - 8 KHz'. At the bottom of the interface are 'Options & Logging...', 'Power Units' (set to 'dBm'), 'Amplitude Units' (set to 'Counts'), 'Reset', 'Save...', and 'Run' buttons.

- Obtain and analyze the source signal in real-time from T1 E1 timeslots
- Process signal data captured to files as an offline process

Signaling Transitions

The screenshot shows a software window titled "Signaling Transitions". It features a table with the following data:

Time(ms)	Card #1	Card #2
0.0	0111	1111
1570.0	0011	
12570.0	1001	
23584.0	1100	
34624.0	1110	
45656.0	1111	
78752.0	0111	
89898.0	0011	
101138.0	1001	
112210.0	1100	
123320.0	1110	

Below the table, there is a "Log File:" checkbox checked, with the path "C:\Program Files\GL Communications Inc\Usb" entered in the text box. An "Error Count:" field shows "0". On the right side, there are several buttons: "Load Data", "*Start", "Stop", "Export", and "Options". A "Timeslot:" dropdown menu is also present, and a "Filter" checkbox is checked at the bottom right.

- Continuous full-duplex recording of signaling bits for any or all channels
- Permits detailed analysis of recorded signaling bits

Intrusive Test Menu

Intrusive Tests

- Bit Error Rate Test
- Enhanced BERT
- ATM BERT
- Transmit Tone
- Transmit Gaussian Noise
- Transmit Multiframe
- Transmit Signaling Bits
- Precision Delay Measurement
- Rx-to-Tx Loop back
- Error Insertion
- Precision Loopback, Broadcast
- 23-Tone Test - Director (Tx)
- 23-Tone Test - Responder (Rx)
- Software Delay Measurement
- Jitter Generation

ATM BERT

The screenshot displays the ATM BERT software interface, which is used for testing ATM network equipment. The interface is divided into several main sections:

- Configurations:** A tree view on the left shows the hierarchy of configurations for Port 1 and Port 2, including Tx Config, Rx Config, Results, and Statistics.
- Tx Config:** This panel allows for configuring the transmission side. It includes:
 - Port Selection: Port 1
 - Tx Rx coupled settings:
 - Layer Selection: ATM Header, PayLoad, Traffic Rate, Impairments
 - ATM Header Fields:
 - User/Network Interface: UNI, NNI
 - GFC: 0 (Generic Flow Control 0-15)
 - VPI: 1 (Virtual Path Identifier 0-255)
 - VCI: 2 (Virtual Channel Identifier 0-65535)
 - PT: 0 (Payload Type 0-7)
- Rx Config:** This panel allows for configuring the reception side. It includes:
 - Port Selection: Port 1
 - Tx Rx coupled settings:
 - Layer Selection: Recv Filter, PayLoad
 - Layer Selection: Layer ATM
- Results:** This panel shows the current status and statistics for the transmission side. It includes:
 - Port Selection: Port 1
 - Buttons: Reset, Clear LED History, Insert Error
 - Bert Status: Idle
 - Rx No Traffic: Idle
 - Sync Loss: Idle
 - Bit Error: Idle
 - Bert Statistics table:

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
Sync Loss Count	0
- Statistics:** This panel shows the current status and statistics for the reception side. It includes:
 - Port Selection: Port 1
 - Buttons: Reset Rx
 - Statistics table:

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

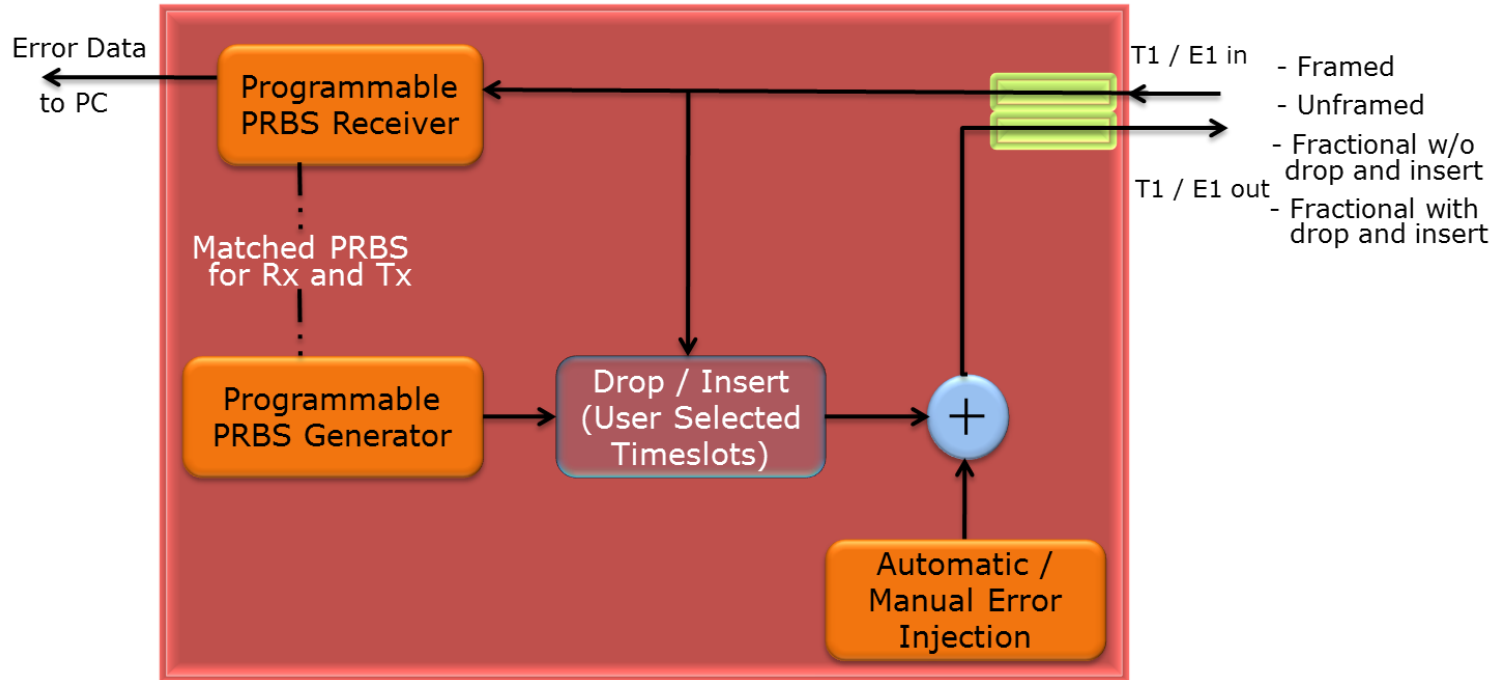
At the bottom left, there are 'Start' and 'Stop' buttons. The status bar at the bottom indicates 'Ready' and 'CAP NUM SCRL'.

ATM BERT

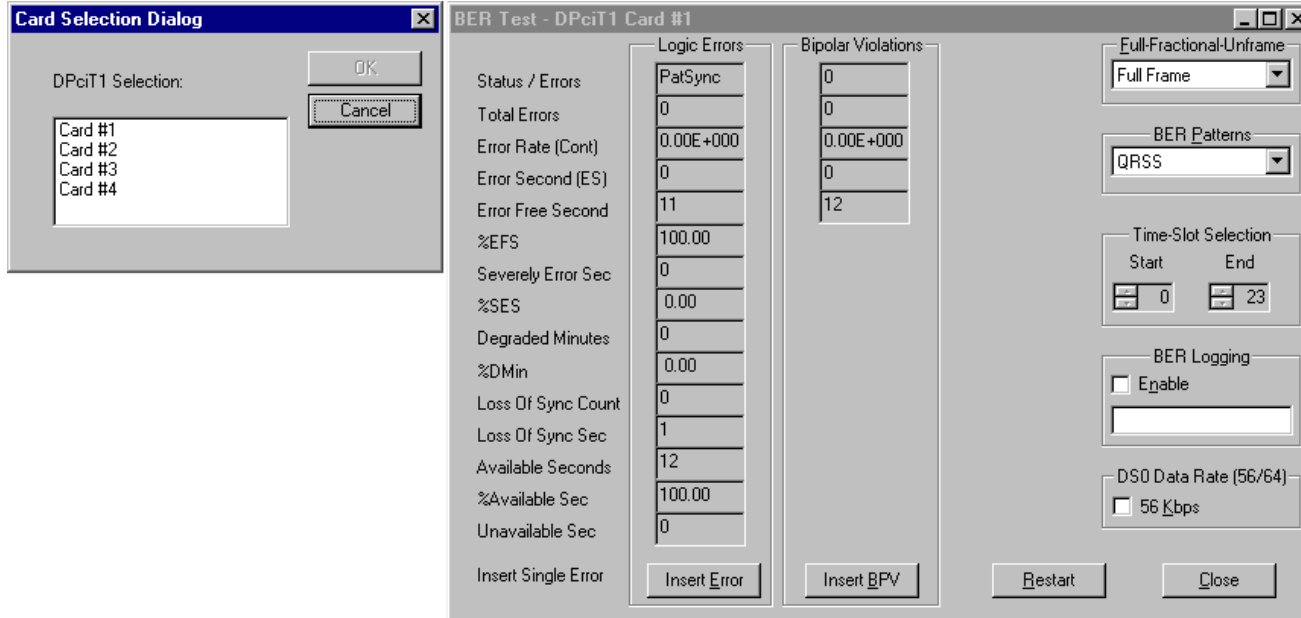
- User-defined header configuration supported
- User-defined traffic rate to the accuracy of 0.001% of total bandwidth
- Payload configuration to different PRBS patterns, All one's, All zero's, alternate 1's and 0's, or user defined pattern. 1:1, 1:7, user-defined pattern length can be 2 to 32 bits in length
- Supports, inverting payload data, single bit error insertion, and error rate insertion
- Supports scrambling of the data
- Statistics - Rx/Tx cell count, total cell count, rejected cell count, pass cell count, idle cell count, 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
- Supports save and load configuration

Bit Error Rate Tester

PRBS = Pseudo-Random-Bit-Sequence



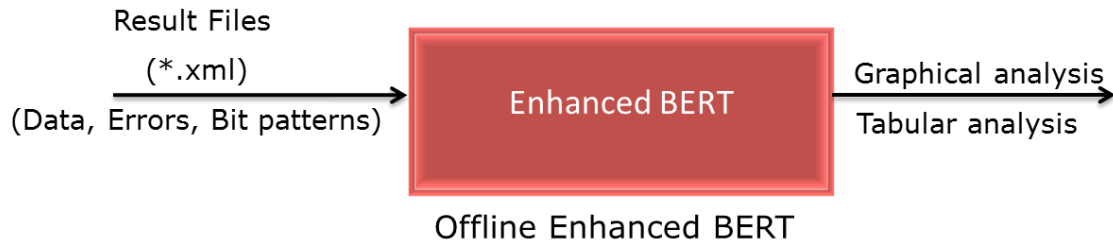
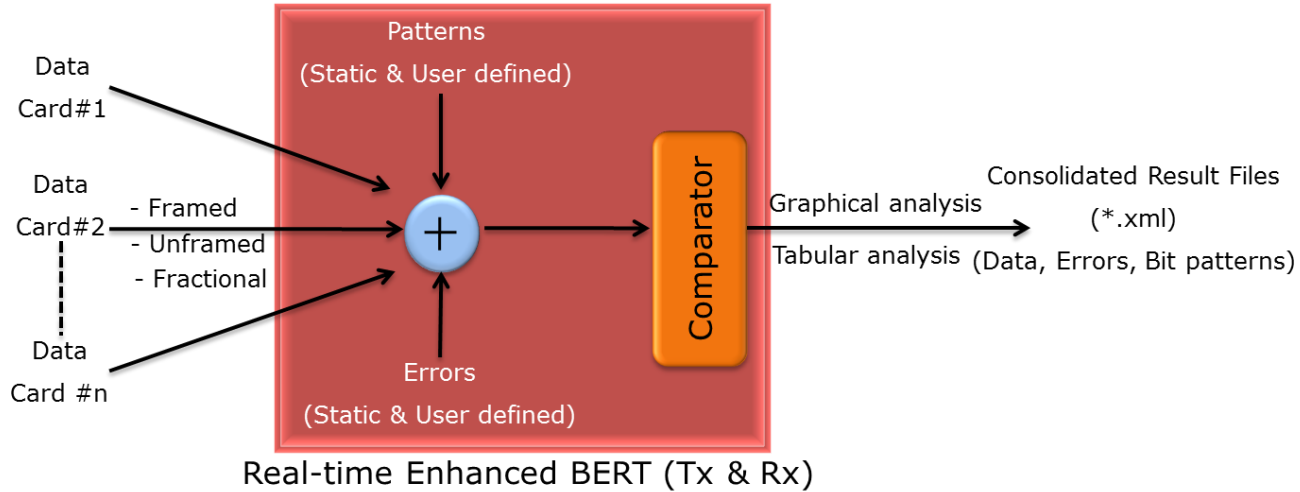
Bit Error Rate Tester (Contd.)



- Measure the correctness of data received on E1 lines
- Test Full / Fractional / Framed / Unframed bits with drop and insert
- Variety of standard data patterns are available for test purposes including static patterns

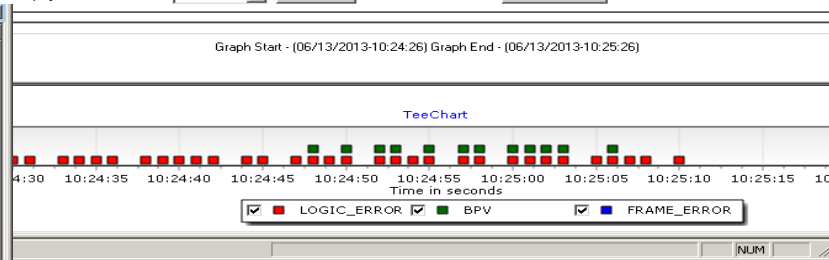
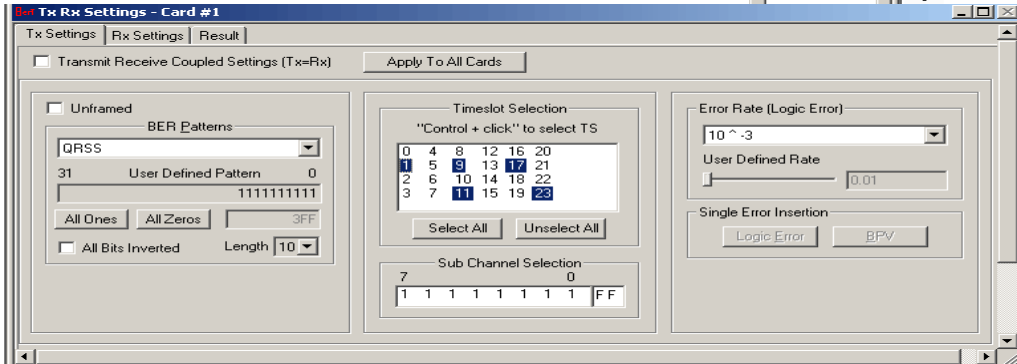
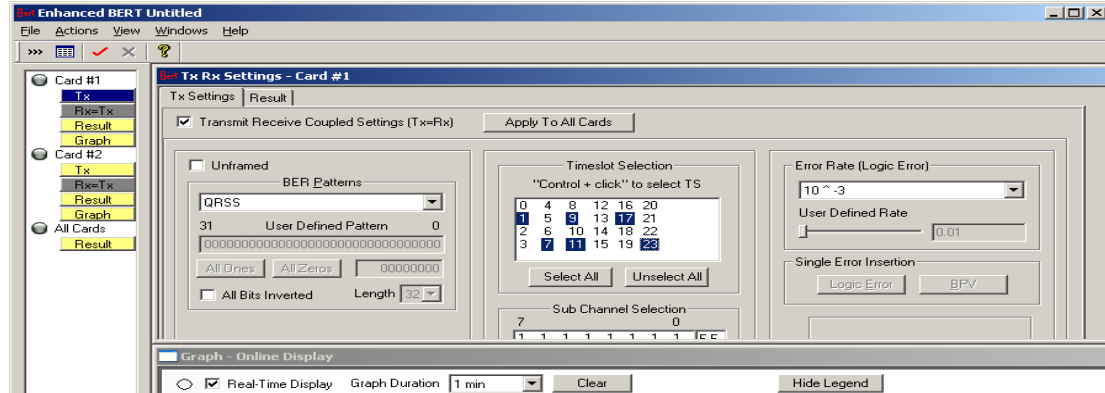
Enhanced BER Testing

Intrusive Tests

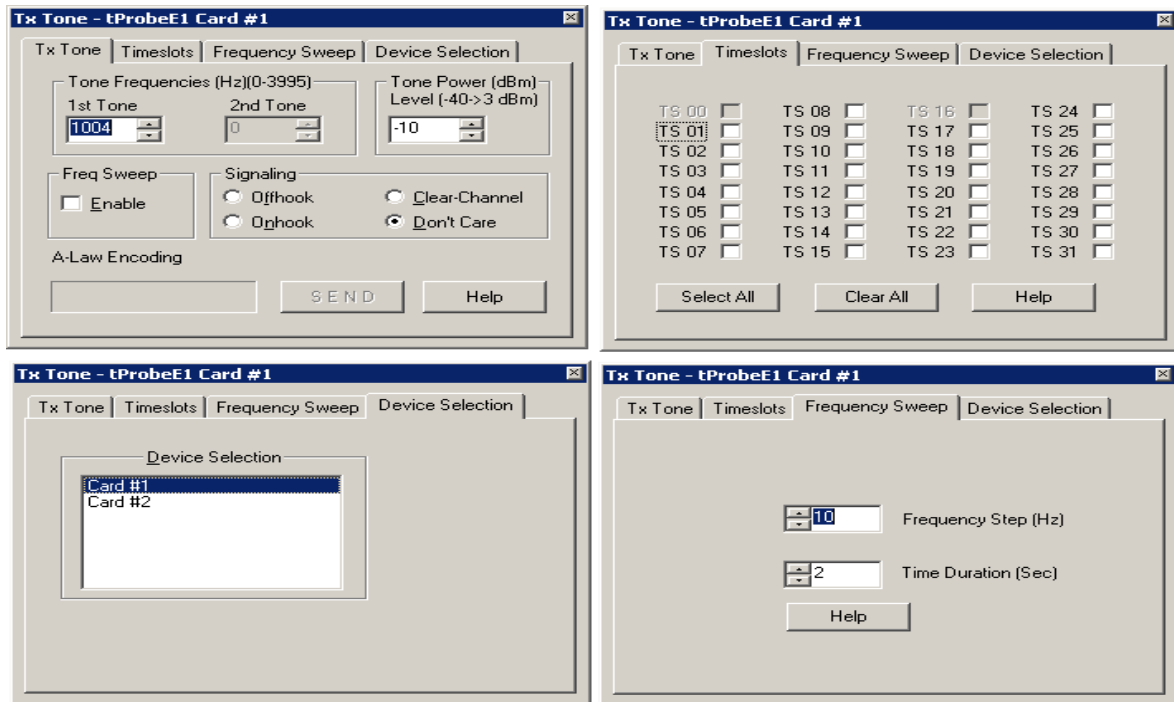


Enhanced BER Testing (Contd.)

- Contiguous and non-contiguous timeslot selection (Fractional BERT)
- Testing on multiple cards
- Error Rate Insertion (Static and User-defined)
- Bit Patterns (Static and User-defined)

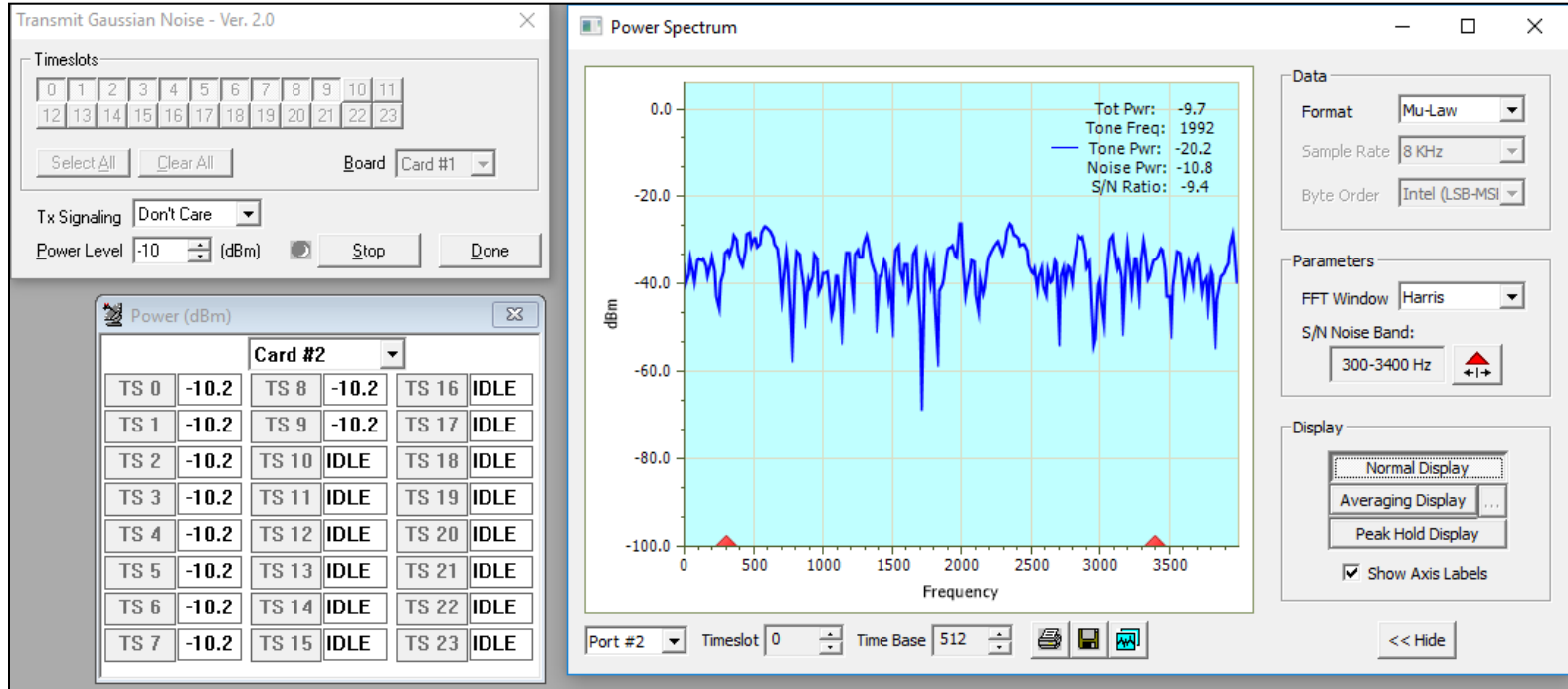


Transmit Tones



- Transmit Tones into any or all timeslots with frequency and power level control

Transmit Gaussian Noise



- Transmit Gaussian Noise into any or all timeslots with frequency and power level control

Transmit Multiframe

Transmit Multiframe - tProbeE1 Card #1

TS#	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
Fr#	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>			
0	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS		
1	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
2	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
3	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
4	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
5	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
6	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
7	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
8	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
9	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
10	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
11	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
12	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
13	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
14	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	
15	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS	DS

Transmit MF Load MF Save MF Reset MF Close Card #1

- Transmit user-defined multi frames on one or more timeslots

Transmit Signaling Bits

Ts#	A	B	C	D	Ts#	A	B	C	D	Ts#	A	B	C	D	Ts#	A	B	C	D
00	0	1	1	1	08	0	1	1	1	16	0	1	1	1	24	0	1	1	1
01	0	1	1	1	09	0	1	1	1	17	0	1	1	1	25	0	1	1	1
02	0	1	1	1	10	0	1	1	1	18	0	1	1	1	26	0	1	1	1
03	0	1	1	1	11	0	1	1	1	19	0	1	1	1	27	0	1	1	1
04	0	1	1	1	12	0	1	1	1	20	0	1	1	1	28	0	1	1	1
05	0	1	1	1	13	0	1	1	1	21	0	1	1	1	29	0	1	1	1
06	0	1	1	1	14	0	1	1	1	22	0	1	1	1	30	0	1	1	1
07	0	1	1	1	15	0	1	1	1	23	0	1	1	1	31	0	1	1	1

Signaling

- 0000 A
- 0001 B
- 0010 C
- 0011 D
- 0100 E
- 0101 F
- 0110 G
- 0111 H
- 1000 I
- 1001 J
- 1010 K

Buttons: Save, Deselect All, Transmit, Load, Select All, Close

Device Selection: Card #1

- Transmit user-defined signaling bits on one or more timeslots

Precision Delay Measurement

The screenshot shows a software window titled "Precision Delay Measurement - tProbeE1 Card #1". The window is divided into two main sections: "Error/Delay Results" and "Time-Slot Selection".

Error/Delay Results:

Error Count	Delay Time (ms)
0	0.0
Internal Delay:	0.0493164

Below the results table are two buttons: "Start" and "Measure RTD".

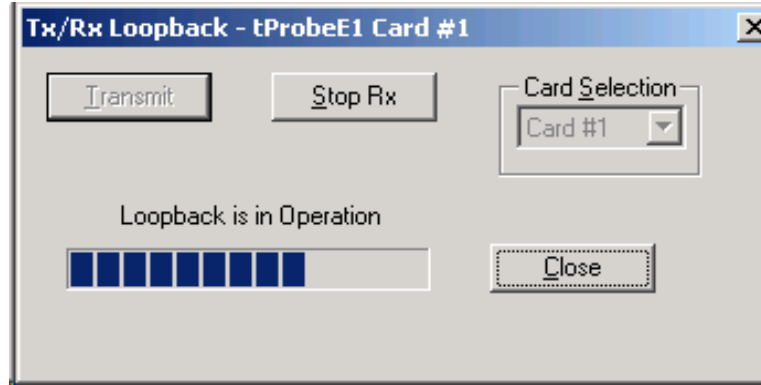
Time-Slot Selection:

Start	End
1	31

Below the time-slot selection table is a button labeled "Calculate Internal Delay".

- Measure delay in transmission of signals and the Round-trip delay of a system

Rx to Tx Loop back



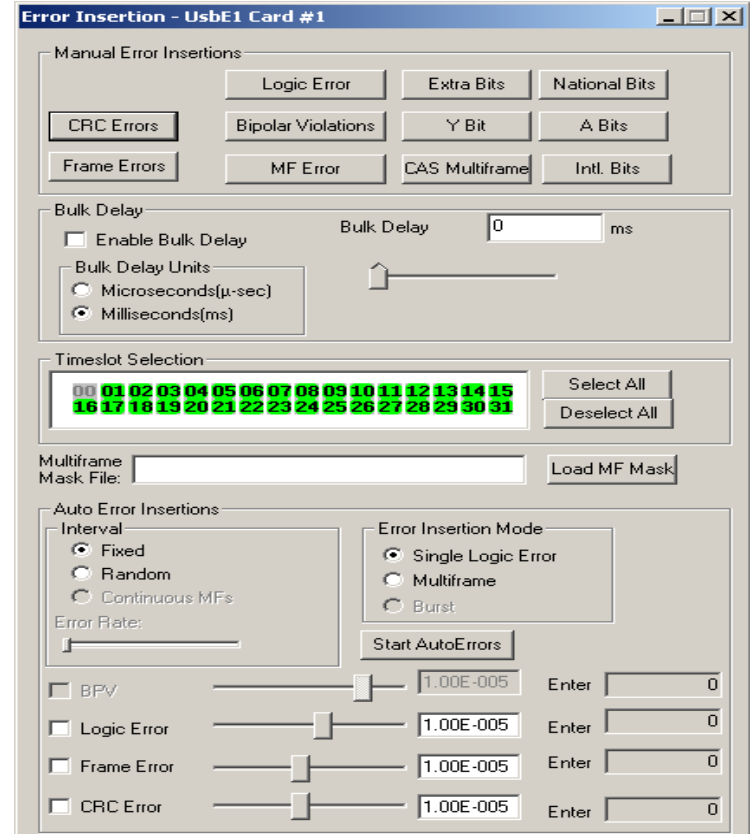
- Loop backs the received data from all timeslots back to the transmitting port
- Used in conjunction with a Bit Error Rate Tester to verify the operation of analyzer

Error Insertion

- Supports Auto and Manual Error Insertions
 - Auto Error Insertion - Single logic error, and Multiframe
 - Manual Error Insertion - Logic Errors, Bipolar Violations, MF Errors, and CRC Errors
- Bulk delay feature supports delay on the entire T1 E1 trunk (full multi-frame) of 1.544Mbps (T1) pipe or 2.048 Mbps (E1) pipe

Error Insertion

- Supports Auto and Manual Error Insertions
 - Auto Error Insertion - Single logic error, and Multiframe
 - Manual Error Insertion - Logic Errors, Bipolar Violations, MF Errors, and CRC Errors
- Bulk delay feature supports delay on the entire T1 E1 trunk (full multi-frame) of 1.544Mbps (T1) pipe or 2.048 Mbps (E1) pipe



Precision Loopback, Broadcast

- Enables broadcasting data from a selected Rx port to single or multiple Tx ports
- Supports configuration of timing margins, block sizes, and safe margins
- Ensures accurate loopback and reliable data transmission
- Monitors key parameters like transmission delays, data availability, and buffer overruns

Data from Rx port is broadcasted to ports e.g. 1 3-4. Marg define delay. LB Block in ms defines bytes to rx/tx is one cycle. X

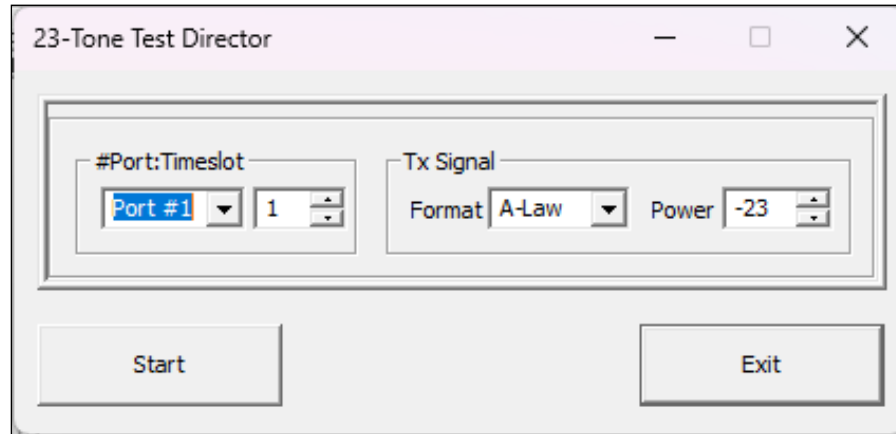
LB Rx ->	Tx port	Rx Avail	Curr Tx Marg	Min Tx Marg	Max Tx Marg	LB Block ms	Rx OverRuns

Rx Port -> Tx Port List Tx Safe Marg ms Tx Max Safe Marg LB Block ms

Data from Rx port is broadcasted to ports e.g. 1 3-4, Marg define delay, LB Block in ms defines bytes to rx and tx in one cycle.

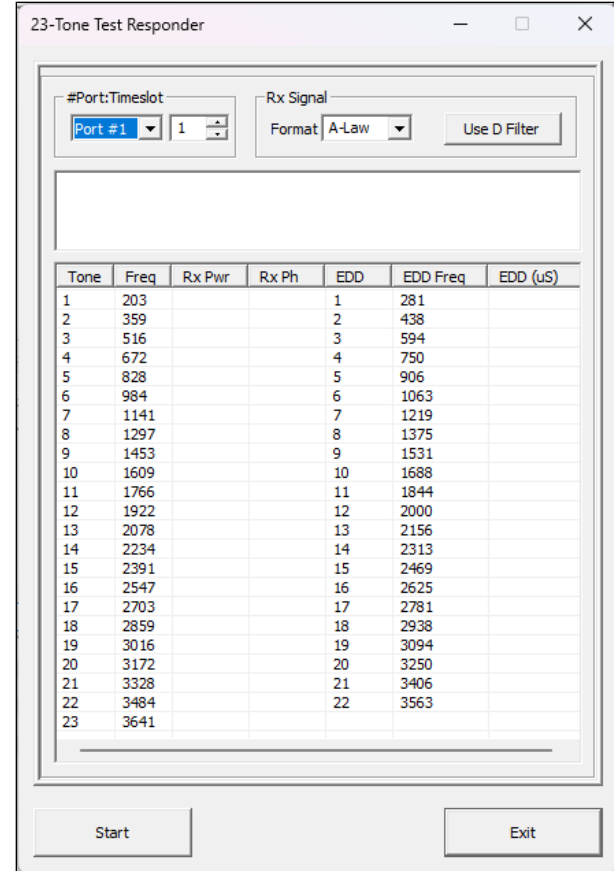
23-Tone Test - Director (Tx)

- Generates and transmits 23 distinct test tones
- Serves as a reference signal for channel performance evaluation
- Helps assess **frequency response**, **distortion**, and **noise levels**
- Ensures accurate analysis by providing a consistent signal to the receiver



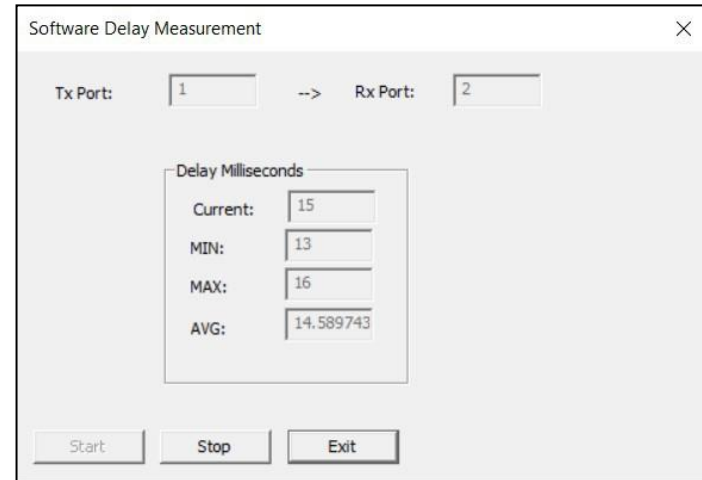
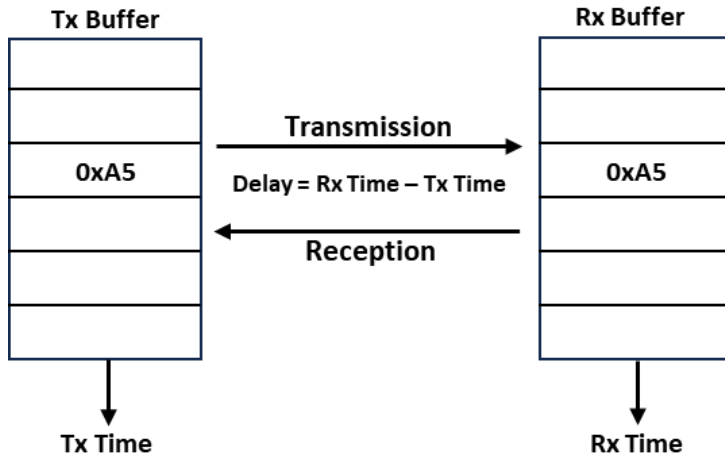
23-Tone Test - Responder (Rx)

- Captures and analyzes the 23 test tones after transmission
- Compares received tones with the original transmission to detect deviations
- Identifies impairments such as distortion, phase shifts, noise, and attenuation
- Helps ensure communication channel meets quality and reliability standards
- Determines if the channel requires adjustments or is functioning optimally



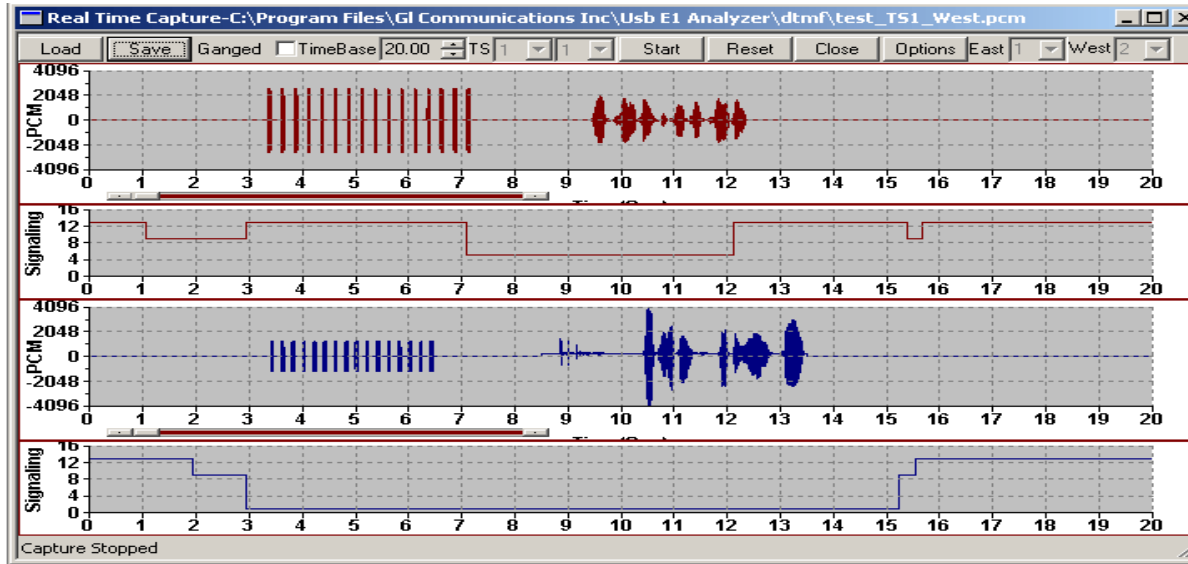
Software Delay Measurement

- Operates with both hardware-based and software-based T1 E1 analyzers
- Measures delay using the precise computer timestamp at Tx and Rx ports
- A special byte mark is inserted in the Tx buffer and tracked at the Rx buffer
- Helps analyze transmission delay across communication paths
- Maximum measurable delay is limited to 2 seconds (twice the global buffer size)



Real-time Stripchart

Stripchart GUI

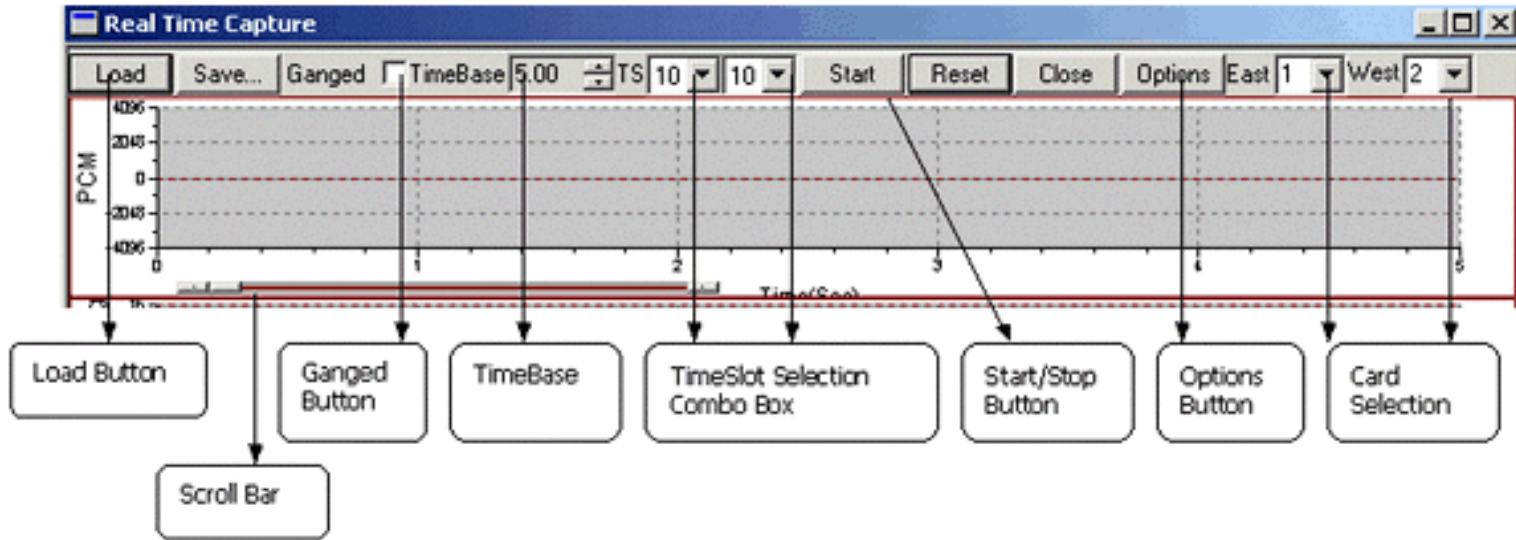


- Real-time Stripchart application is optional software for analysis of CAS signaling with GL Communications' T1 E1 analyzers
- Stripchart application enables non-intrusive capturing of PCM data and signaling, and subsequent plotting of the same onto a strip chart format

Main Features

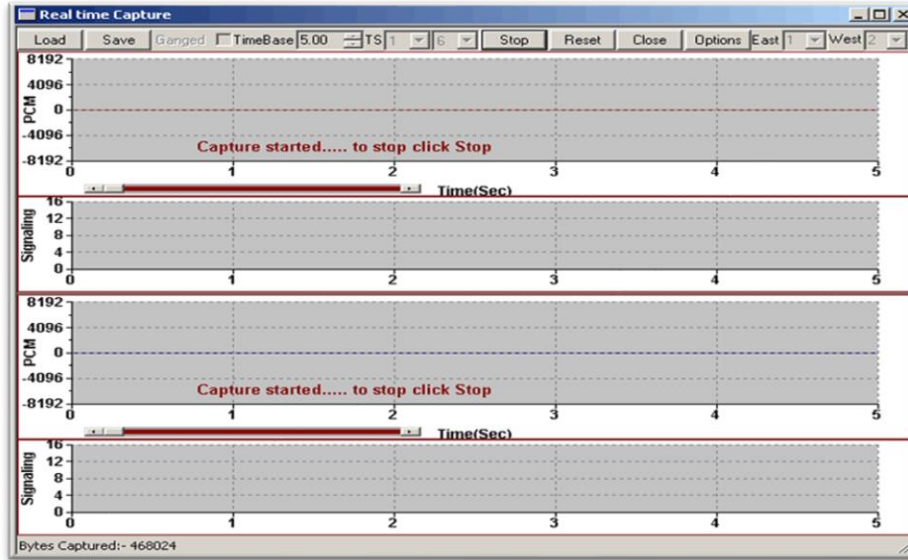
- Supports Real-time capturing and off-line analysis of PCM Data as well as Signaling
- View data graphically with exact transitions of signals with time
- Ability to capture PCM and signaling data on any of the-specified time slots
- Grid based Canvas / Background display enabling ease of locating / reading data points
- Option to choose specific T1 E1 ports in case of more than two port systems
- Loading of previously captured PCM and Signaling files, for off- line viewing
- Zoom-in and Zoom-Out of data based on the time-base settings. The time base varies between 0.01 till 25. Easy intermediate zooming features without resetting to zero
- Selection of Timer Interval to capture data
- Ganged option synchronizes (both PCM and Signaling) data on the graphic display
- Automated naming convention for saving PCM and Signaling file based on timeslots for loading the captured files in the appropriate timeslots

Stripchart Configuration



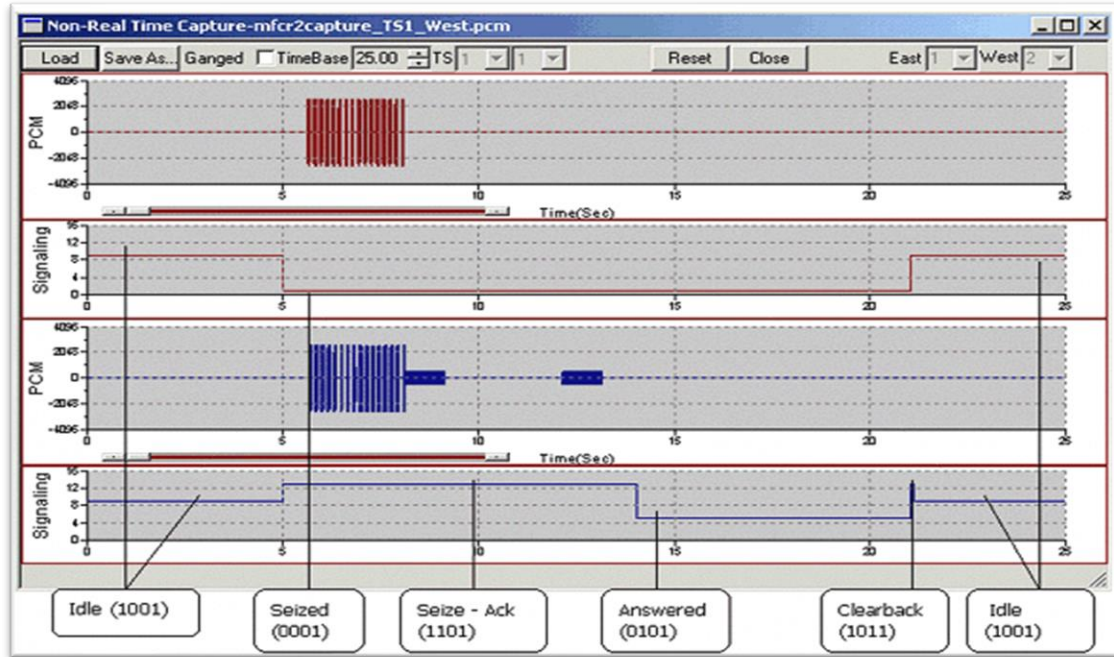
- This application works with T1 E1 analyzer hardware
- At any given point of time, data (PCM and Signaling) can be captured from a maximum of any two T1 E1 ports

Real-time Capture



- Stripchart application window is always invoked in Real-time mode
- The ongoing capturing process can be seen at the Status Bar in the form of total captured bytes (for both East and West Cards)
- Previously selected rate of capturing can be altered even during the capturing process

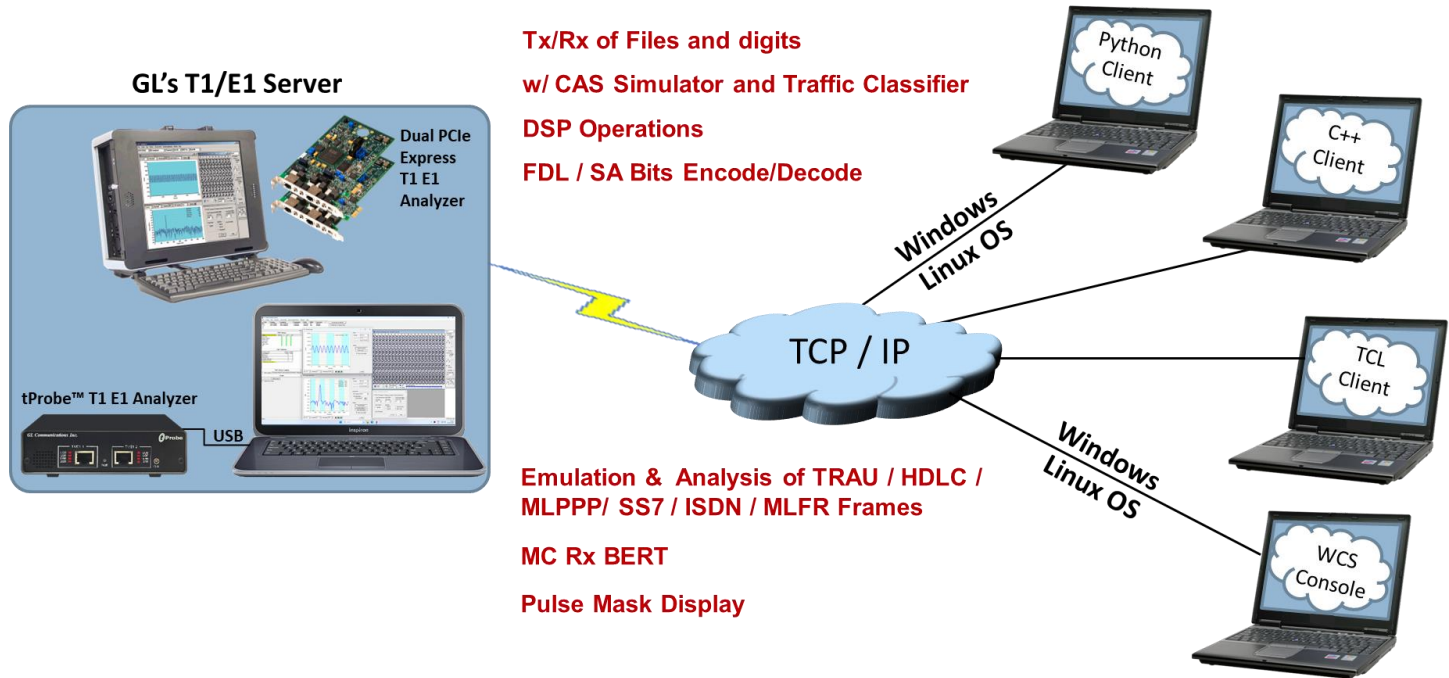
Off-line Viewing



- Previously captured PCM data along with corresponding Signaling information is displayed in this mode
- In case of E1 systems, when the user chooses PCM files, the corresponding Signaling files automatically get picked up and displayed

Windows Client Server (WCS)

Windows Client Server

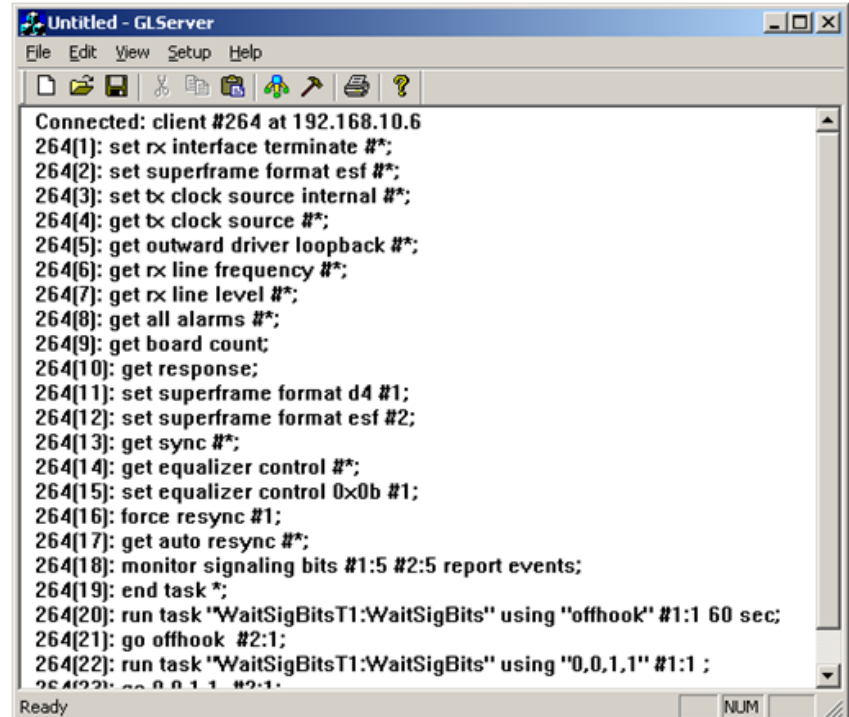


- GL's Windows Client/Server software allows the user of T1 E1 analyzers, the capability of remote operation, automation, and multi-device connectivity

Windows Client / Server Software

T1 E1 Server

- The log display area is read-only, and normally shows a record of transactions of various types
- Commands and tasks from the client are logged



The screenshot shows a Windows application window titled "Untitled - GLServer". The window has a menu bar with "File", "Edit", "View", "Setup", and "Help". Below the menu bar is a toolbar with various icons. The main area of the window is a text display showing a log of commands and tasks. The log starts with "Connected: client #264 at 192.168.10.6" and lists 23 numbered tasks. The tasks include setting and getting various parameters like interface terminate, superframe format, clock source, loopback, line frequency, line level, alarms, board count, response, sync, equalizer control, resync, signaling bits, and running tasks. The window status bar at the bottom shows "Ready" and a "NUM" button.

```
Connected: client #264 at 192.168.10.6
264[1]: set rx interface terminate #*;
264[2]: set superframe format esf #*;
264[3]: set tx clock source internal #*;
264[4]: get tx clock source #*;
264[5]: get outward driver loopback #*;
264[6]: get rx line frequency #*;
264[7]: get rx line level #*;
264[8]: get all alarms #*;
264[9]: get board count;
264[10]: get response;
264[11]: set superframe format d4 #1;
264[12]: set superframe format esf #2;
264[13]: get sync #*;
264[14]: get equalizer control #*;
264[15]: set equalizer control 0x0b #1;
264[16]: force resync #1;
264[17]: get auto resync #*;
264[18]: monitor signaling bits #1:5 #2:5 report events;
264[19]: end task *;
264[20]: run task "WaitSigBitsT1:WaitSigBits" using "offhook" #1:1 60 sec;
264[21]: go offhook #2:1;
264[22]: run task "WaitSigBitsT1:WaitSigBits" using "0,0,1,1" #1:1 ;
264[23]: go 0,0,1,1 #2:1;
```

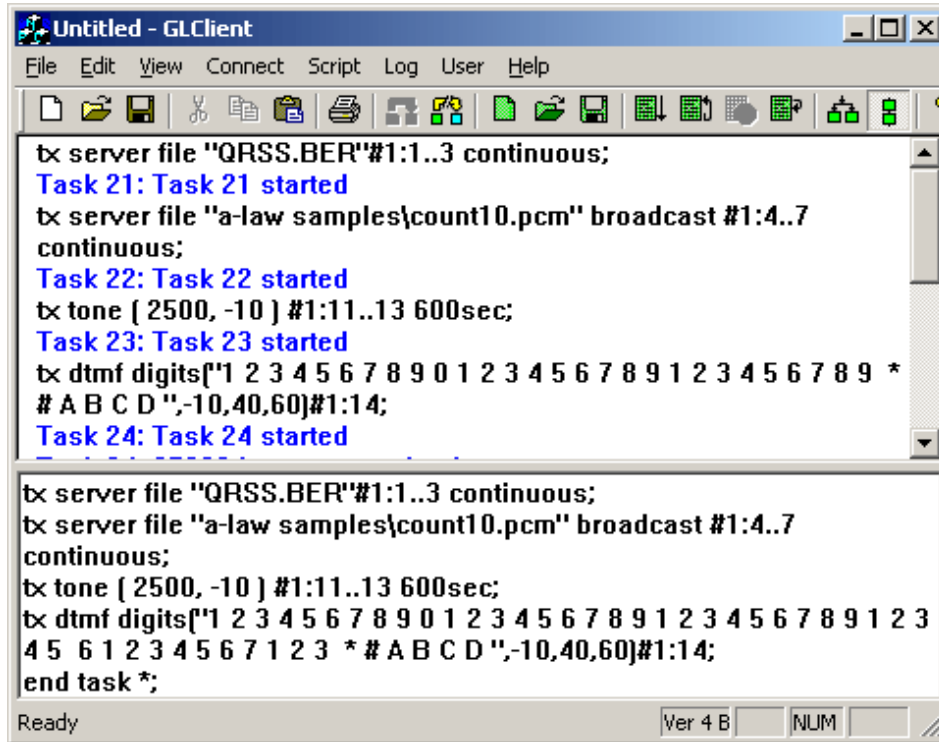
Applications

- Easy control of T1 E1 servers through software clients via TCP/IP sockets
- Server software can run multiple tasks simultaneously
- Intrusive / Non-intrusive T1 E1 testing
- Monitoring multiple site locations from a single client
- Shared use of tprobe™ devices from multiple client locations
- Automated factory testing on production lines
- Simultaneous testing of high capacity T1 E1 systems through a single Client
- Integration of T1 E1 testing into more complex testing systems

Features

- Simple modifiable scripts may be developed to perform simple to complex testing
- Collection of call records from remote locations based on signaling (SS7, CAS, ISDN)
- Perform G.168 EC compliance tests, protocol analysis (HDLC, ISDN, SS7, FDL, MLPPP)
- Perform error insertion, and BERT on selected timeslots involving multiple paths simultaneously
- Monitor, report, and record alarms at various sites every two seconds or as they occur
- Detect and report DTMF/MF/MFC-R2 digits on channels as they occur
- Remote Protocol Analyzers (SS7, ISDN, GR303, V5, HDLC, and Framereelay) can be integrated with Windows Client Server to remotely analyze protocols
- Scripted simulation of host of protocols over T1 or E1 – HDLC, PPP, Multi-link PPP, TRAU, SS1, Multi-link Frame Relay, MTP2, ISDN, SS7, CAS

Sample script-based transmission of QRSS BER pattern, Tone, DTMF Digits

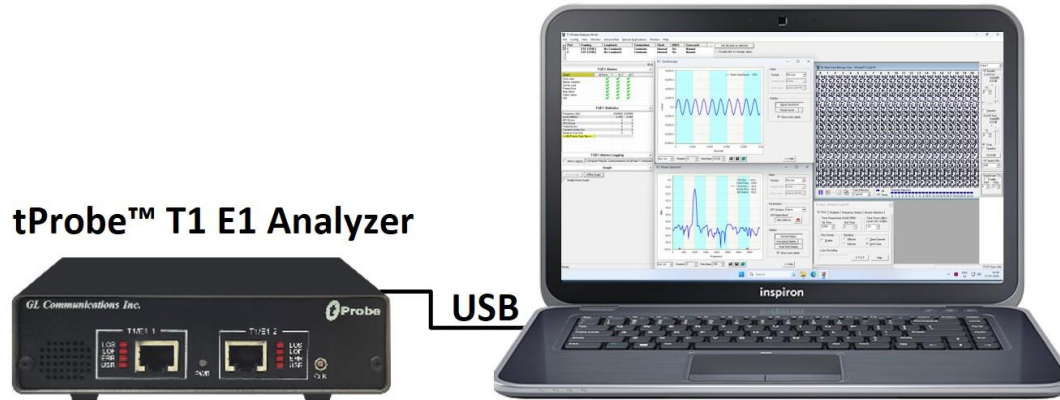


The screenshot shows the GLClient software interface with a menu bar (File, Edit, View, Connect, Script, Log, User, Help) and a toolbar. The main window contains a script with the following content:

```
tx server file "QRSS.BER"#1:1..3 continuous;  
Task 21: Task 21 started  
tx server file "a-law samples\count10.pcm" broadcast #1:4..7  
continuous;  
Task 22: Task 22 started  
tx tone [ 2500, -10 ] #1:11..13 600sec;  
Task 23: Task 23 started  
tx dtmf digits["1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 1 2 3 4 5 6 7 8 9 *  
# A B C D",-10,40,60)#1:14;  
Task 24: Task 24 started  
.....  
tx server file "QRSS.BER"#1:1..3 continuous;  
tx server file "a-law samples\count10.pcm" broadcast #1:4..7  
continuous;  
tx tone [ 2500, -10 ] #1:11..13 600sec;  
tx dtmf digits["1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 1 2 3  
4 5 6 1 2 3 4 5 6 7 1 2 3 * # A B C D",-10,40,60)#1:14;  
end task *;
```

At the bottom of the window, the status bar shows "Ready" and "Ver 4 B NUM".

Dual VF Tx Rx



- Bantam Interface Connectivity for VF- Inputs and VF- Outputs
- Support two VF interfaces per card
- Each VF interface supports independent Tx/Rx
- Multiple cards supported per system
- Mode 1: VF1 (Tx/Rx) and VF2 (Tx/Rx)
- Mode 2: VF Tx and VF Rx

Dual VF Tx Rx GUI

The screenshot displays the 'Dual VF Tx/Rx' software interface. At the top, a menu bar includes 'File', 'View', 'Actions', 'Windows', and 'Help'. Below the menu is a toolbar with icons for 'About', 'Configure', 'VF1/VF2', 'VF Tx/Rx', 'Analyzer', 'Dialer', 'GoldWave', 'Help', and 'Exit'. A 'Site Name' field contains 'Site1'.

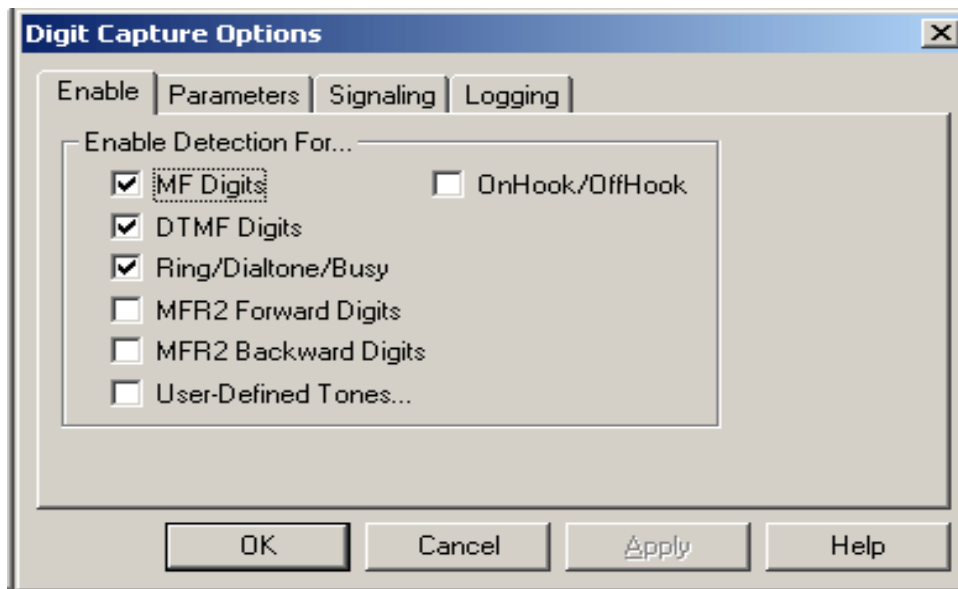
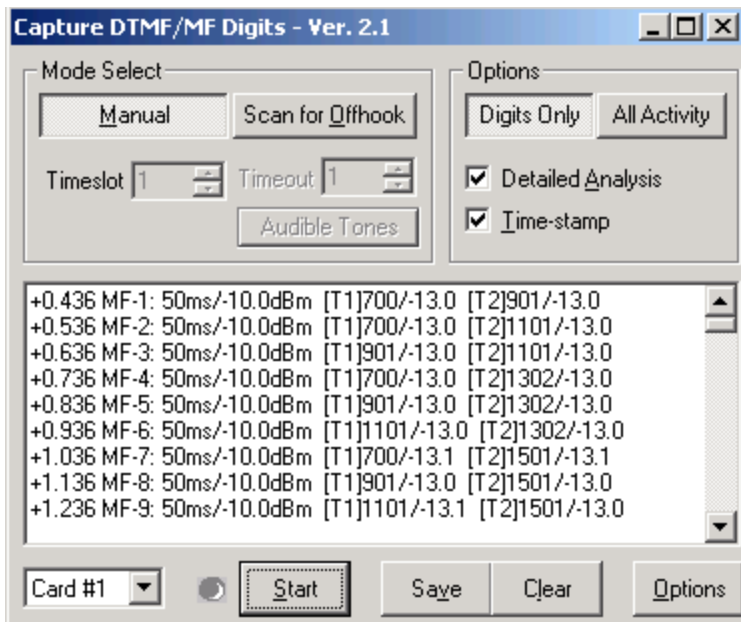
The main workspace is divided into four quadrants, each with a plot and control panels:

- Top-Left (VF2 In (Rx)):** Shows a plot of received signal for VF2. The plot shows a noisy signal around -100 dBm. Controls include 'Recorder' (Start) and buttons for 'Tx File', 'Rx Signal', 'Tx Tone', 'Rx Record', and 'Tx Digits'.
- Top-Right (VF1 In (Rx)):** Shows a plot of received signal for VF1. The plot shows a noisy signal around -100 dBm. Controls include 'Recorder' (Start) and buttons for 'Tx File', 'Rx Signal', 'Tx Tone', 'Rx Record', and 'Tx Digits'.
- Bottom-Left (VF2 Out (Tx)):** Shows a plot of transmitted signal for VF2. The plot is mostly flat at -100 dBm. Controls include 'Recorder' (Start) and buttons for 'Tx File', 'Rx Signal', 'Tx Tone', 'Rx Record', and 'Tx Digits'. Below the plot is an 'Impedance' dropdown set to '600 Ohm'.
- Bottom-Right (VF1 Out (Tx)):** Shows a plot of transmitted signal for VF1. The plot is mostly flat at -100 dBm. Controls include 'Recorder' (Start) and buttons for 'Tx File', 'Rx Signal', 'Tx Tone', 'Rx Record', and 'Tx Digits'. Below the plot is an 'Impedance' dropdown set to '600 Ohm'.

The bottom status bar contains the following information from left to right: 'Board driver started', 'Analog Configured', '12/12/2013', and '6:44 PM'.

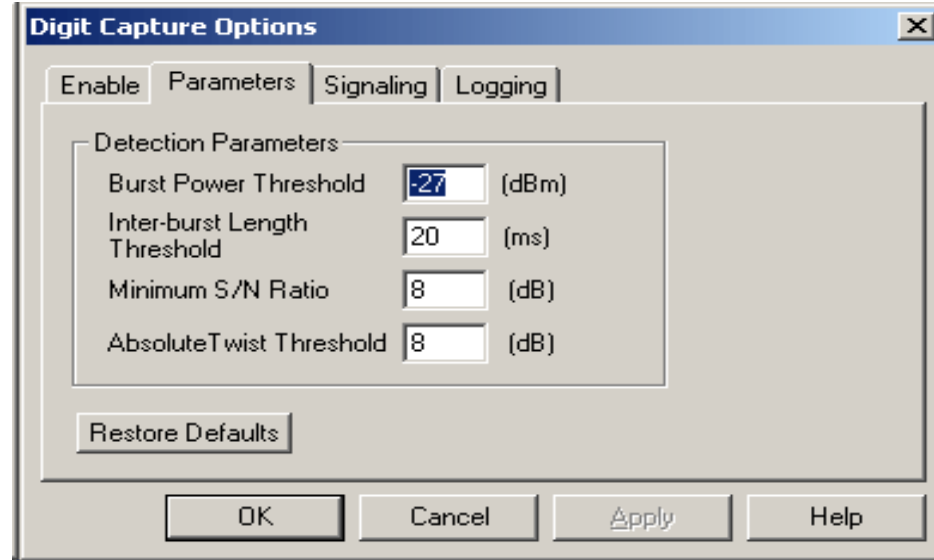
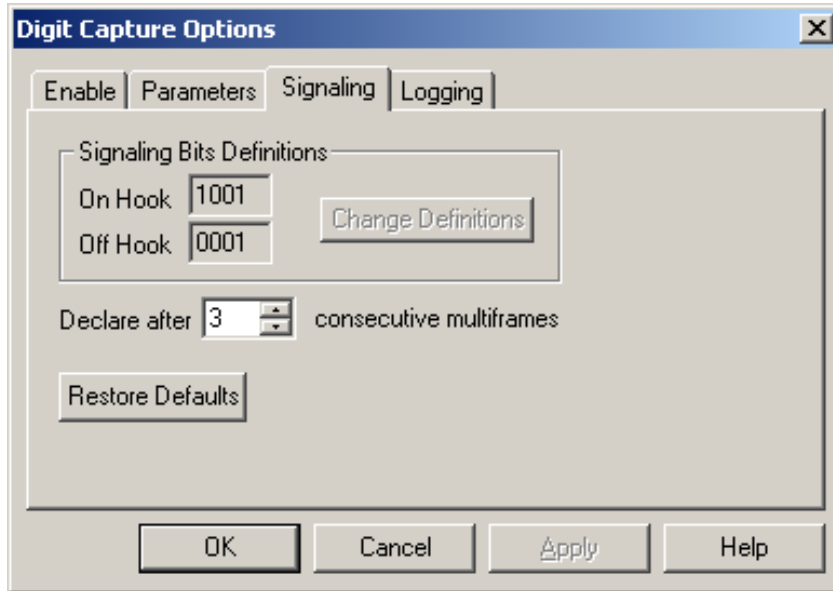
Transmit and Capture Digits

Capture Dialed Digits



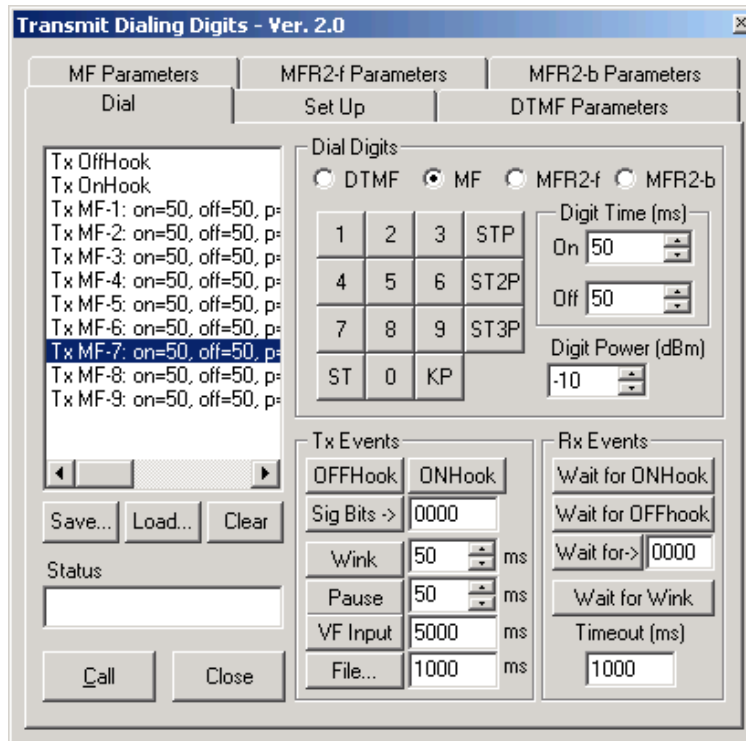
- Capture and display DTMF, MF, and User-defined tones

Parameters and Signaling



- Multiple instances of the application may be invoked, each with different operating modes and options

Transmit Dialing Digits



- Transmit DTMF, MF, MFR2-f, and MFR2-b digits, signal data from external files or from the GL boards VF input

Setup

Transmit Dialing Digits - Ver. 2.0

MF Parameters | MFR2-f Parameters | MFR2-b Parameters

Dial | Set Up | DTMF Parameters

Time Slot: 1 | Board: Card #1

Rx Wink Duration (msec):
Minimum: 10 | Maximum: 1000

Signaling Bits:
On Hook: 1001 | Off Hook: 0001

Processing Options:
Latency (ms): 60 | Response Time (ms): 30

Continuous Transmission

Cancel | Apply

- Select time slots and the card on which the user can transmit
- Define signaling bits, along with the maximum and minimum Rx wink duration (time within which a wink should occur from the other end)
- Set processing modes for latency and/or continuous execution of the built script

DTMF/MF Parameters

Transmit Dialing Digits - Ver. 2.0

MF Parameters MFR2-f Parameters MFR2-b Parameters

Dial Set Up DTMF Parameters

Frequency

High Group

Low Group

+5% 0 -5%

1209 1336 1477 1633

697	1	2	3	A
770	4	5	6	B
852	7	8	9	C
941	*	0	#	D

Power

Twist (dB)

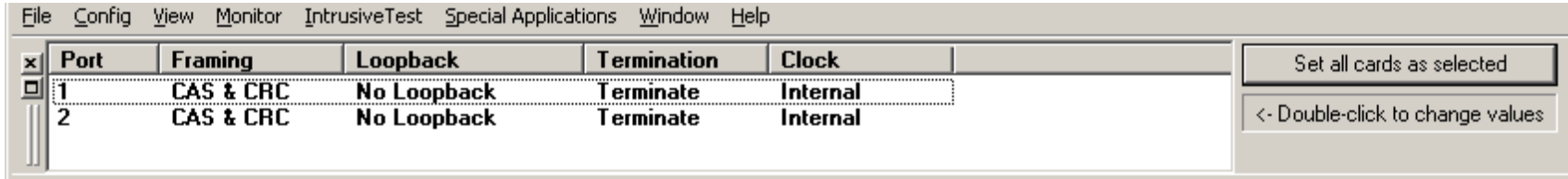
Defaults

Cancel

Apply

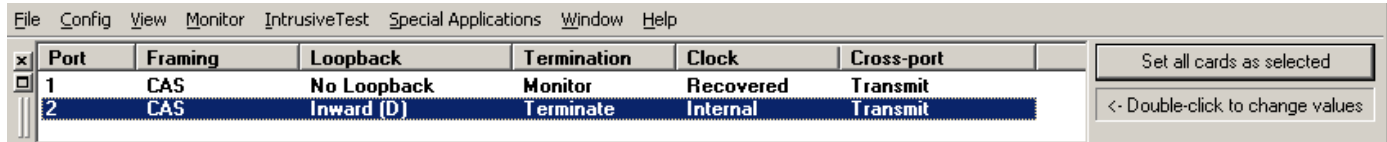
Card Settings Across Different Platforms

Card settings for USB T1 E1 Analyzer



The screenshot shows the 'Config' window of the USB T1 E1 Analyzer. It features a menu bar with 'File', 'Config', 'View', 'Monitor', 'IntrusiveTest', 'Special Applications', 'Window', and 'Help'. Below the menu is a table with columns: Port, Framing, Loopback, Termination, and Clock. Two rows are visible, representing Port 1 and Port 2. To the right of the table are two buttons: 'Set all cards as selected' and '<- Double-click to change values'.

Port	Framing	Loopback	Termination	Clock
1	CAS & CRC	No Loopback	Terminate	Internal
2	CAS & CRC	No Loopback	Terminate	Internal

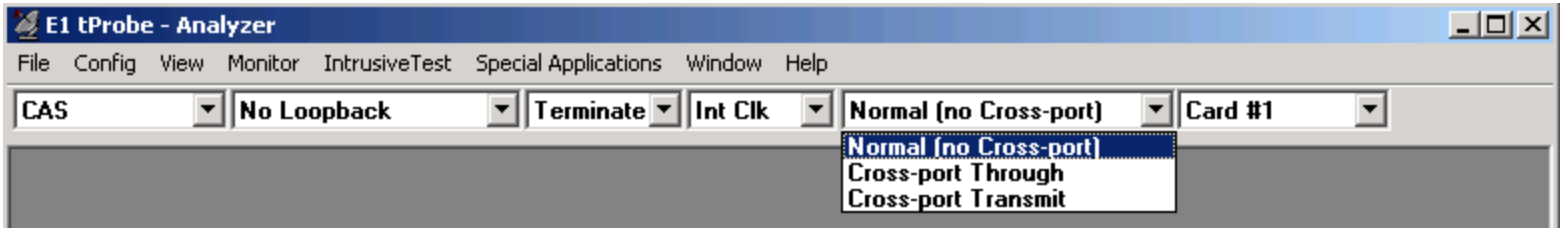


This screenshot is similar to the one above, but it includes an additional 'Cross-port' column. Port 2 is highlighted in blue, indicating it is the selected card. The 'Cross-port' column shows 'Transmit' for both ports.

Port	Framing	Loopback	Termination	Clock	Cross-port
1	CAS	No Loopback	Monitor	Recovered	Transmit
2	CAS	Inward (D)	Terminate	Internal	Transmit

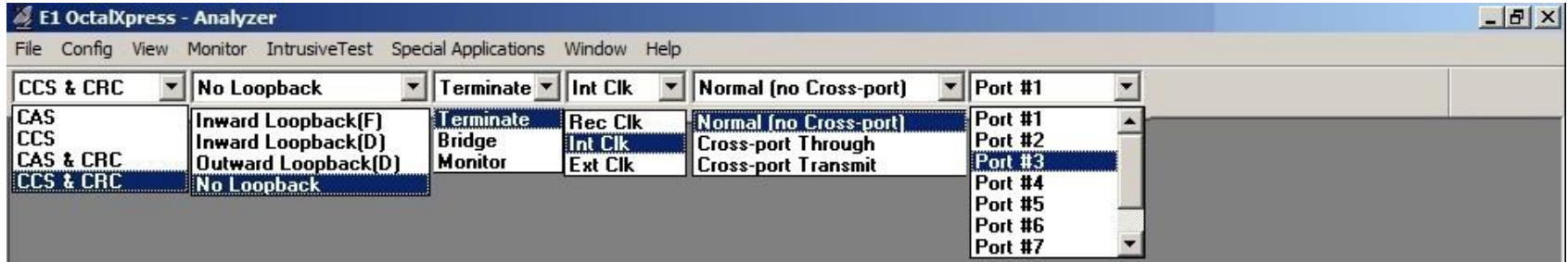
- Loopback options
 - Inward, Outward, No Loopback conditions
- Connection Options: Terminate, Bridge, Monitor
 - Input signal (the signal connected to the "T1 E1 In" jack) may be terminated using impedance, monitored, or bridged depending on user requirements
- Clock options: Internal, External, and Recovered
 - 3 clock options - Internal clock, Recovered clock, and an external clock
 - A 1.544 MHz clock for T1 or a 2.048 MHz clock for E1 is applied

Card Settings for tProbe™ T1 E1 Analyzer



- Loopback options
 - Inward, Outward, No Loopback, Cross-port Through, and Cross-port Transmit Mode Loopback conditions
- Connection Options: Terminate, Bridge, Monitor
 - Input signal (the signal connected to the "T1 E1 In" jack) may be terminated using impedance, monitored, or bridged depending on user requirements
- Clock options: Internal, External, and Recovered
 - 3 clock options - Internal clock, Recovered clock, and an external clock
 - A 1.544 MHz clock for T1 or a 2.048 MHz clock for E1 is applied

Card settings for Octal/Quad T1 E1 Analyzer

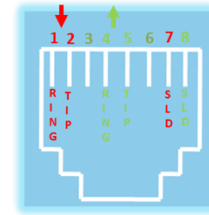
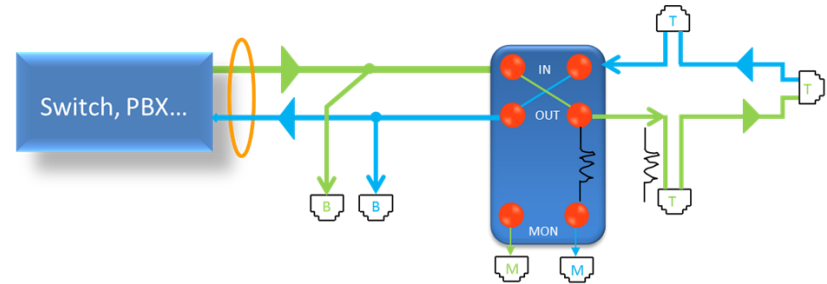


- Loopback options
 - Inward, Outward, No Loopback, Cross-port Through, and Cross-port Transmit Mode Loopback conditions
- Connection Options: Terminate, Bridge, Monitor
 - Input signal (the signal connected to the "T1 E1 In" jack) may be terminated using impedance, monitored, or bridged depending on user requirements
- Clock options: Internal and Recovered
 - A 1.544 MHz clock for T1 or a 2.048 MHz clock for E1 is applied

Connections

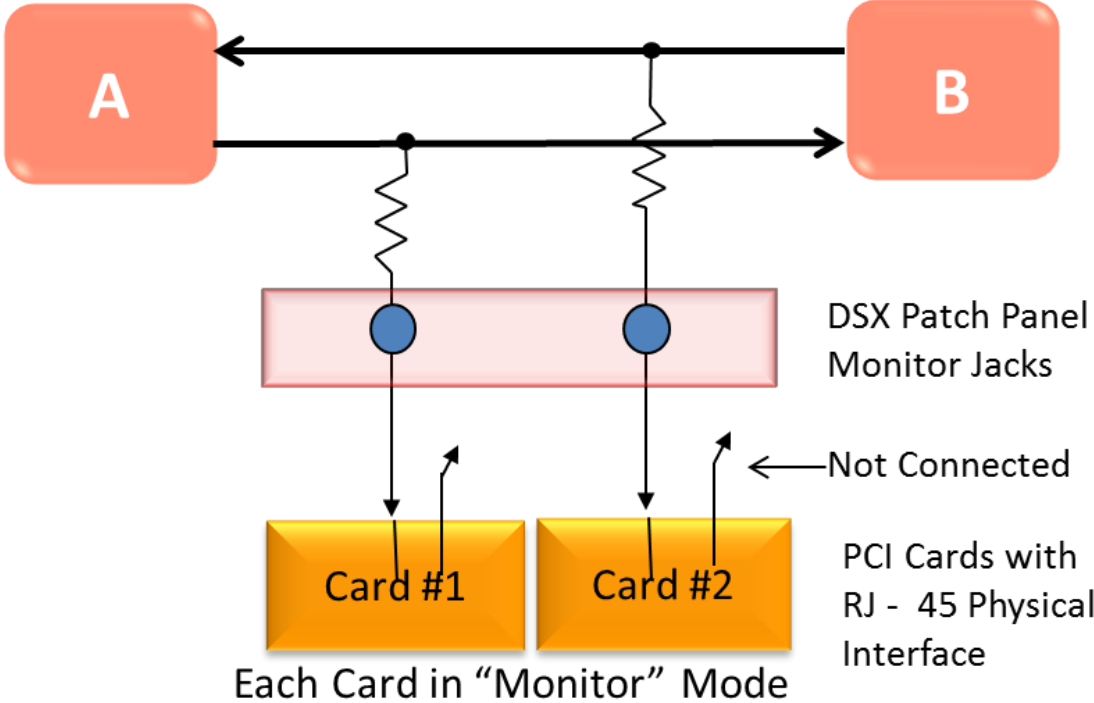
Connections

- Series Connection
 - RJ-45
 - Bantam
- Monitor/ Bridge Connection
 - DSX Patch Panel
 - Using RJ-45 Bridge Taps
 - Alternative For RJ-45
- Terminate Mode
 - Through Mode and Cross-port Loopback Modes (in Octal/Quad boards, tProbe™ only)

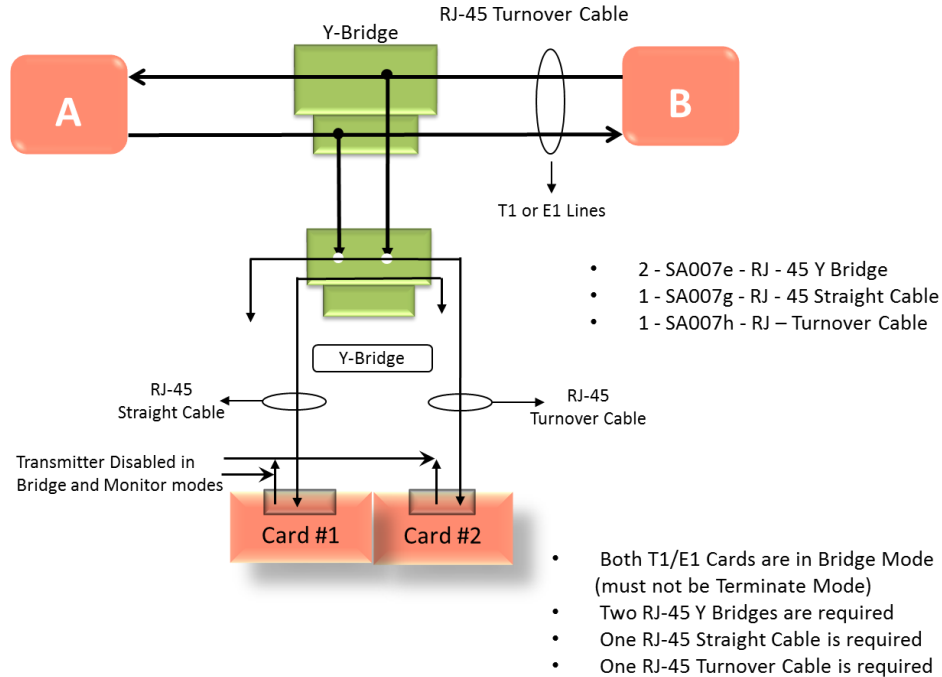


M - Monitor Mode
T - Terminate Mode
B - Bridge Mode

Monitor from a DSX-Patch Panel

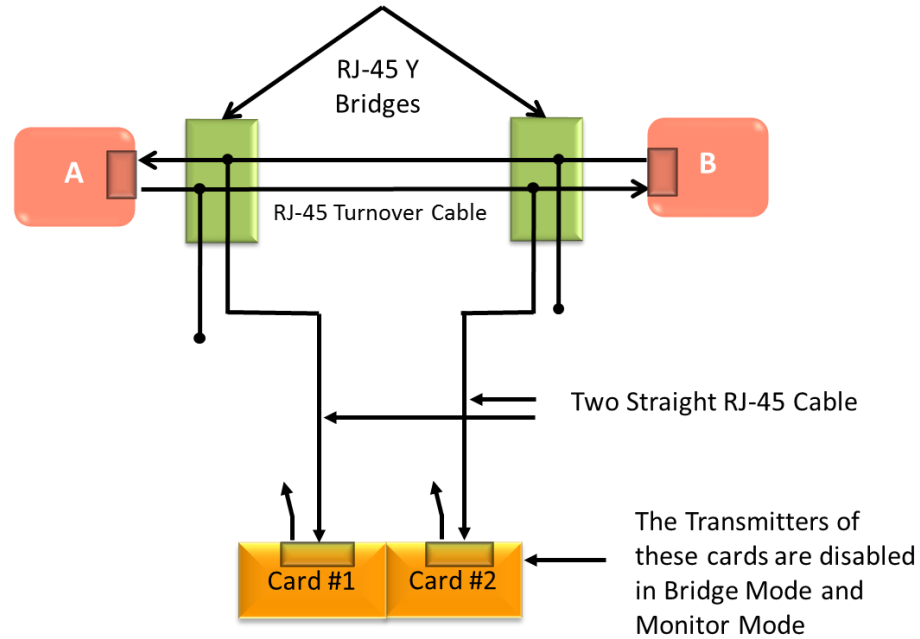


Bridge Mode Monitoring



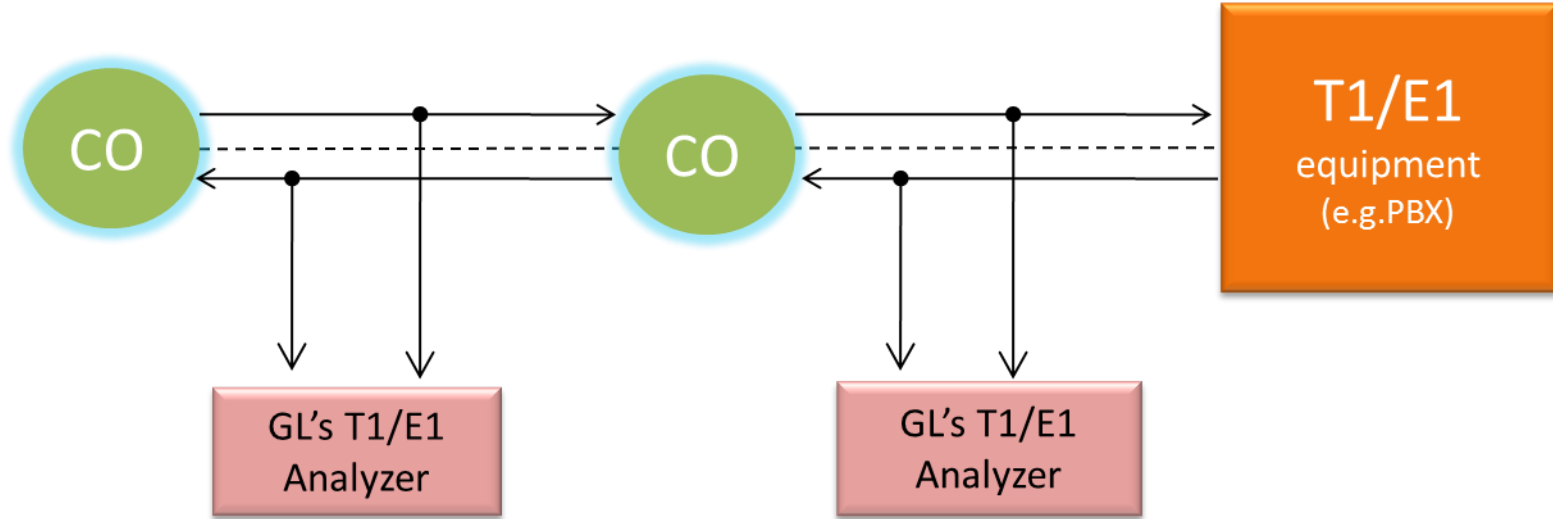
- Bridge Mode Connections for Monitoring T1 E1 Signals for RJ-45

Alternative Method



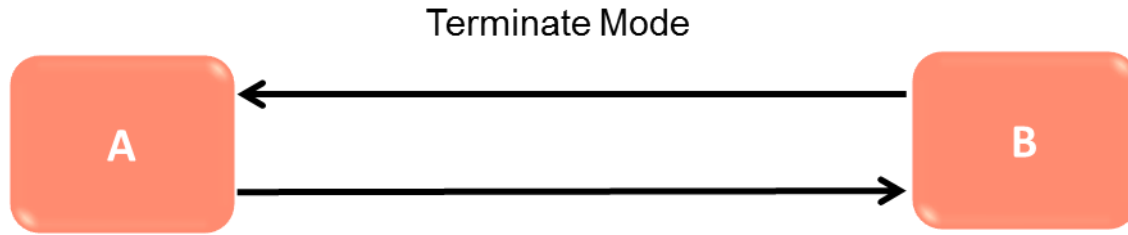
- Both PCI T1 E1 Cards in Bridge Mode (must not be in Terminate Mode)
- Two RJ-45 Y Bridges are required

Non-Intrusive Line Monitoring (Monitor and Bridge Modes)

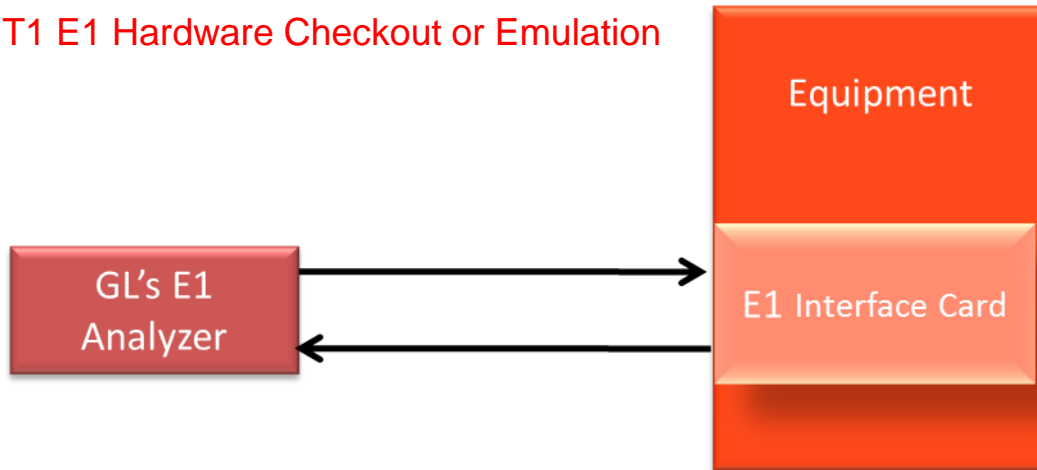


- Bridge and Monitor modes are used for non-intrusive monitoring on T1 E1 connection

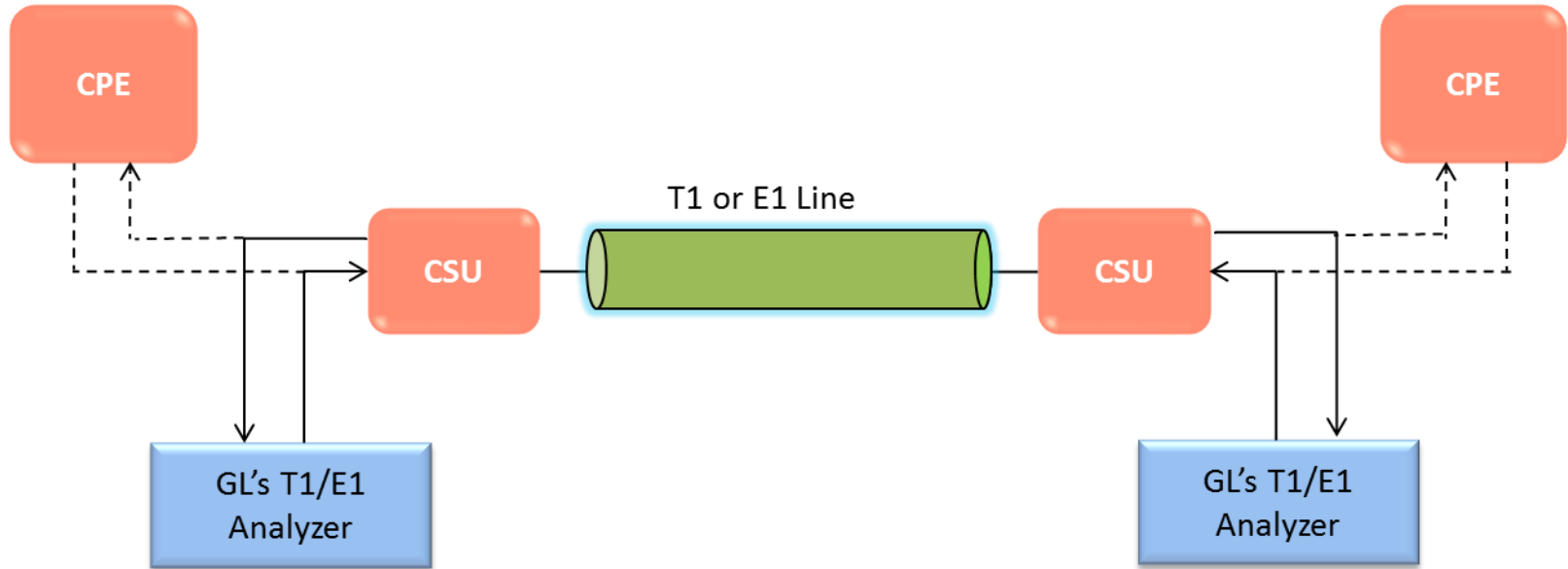
Simple Connection



T1 E1 Hardware Checkout or Emulation



Intrusive Line Monitoring



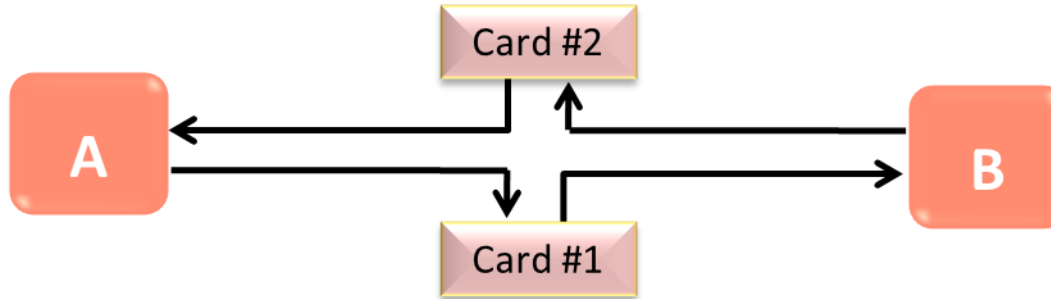
CPE = Customer Premise Equipment
CSU = Channel Service Unit

Series Connections

Series Connection

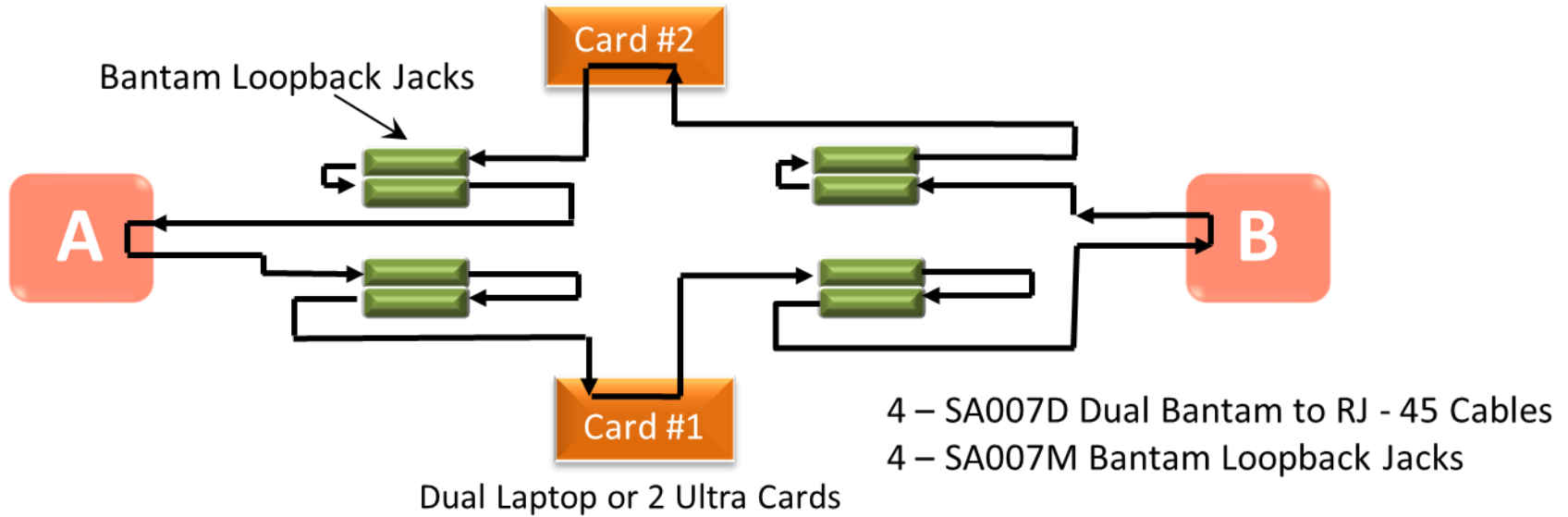


Series Connection using Bantam Cards

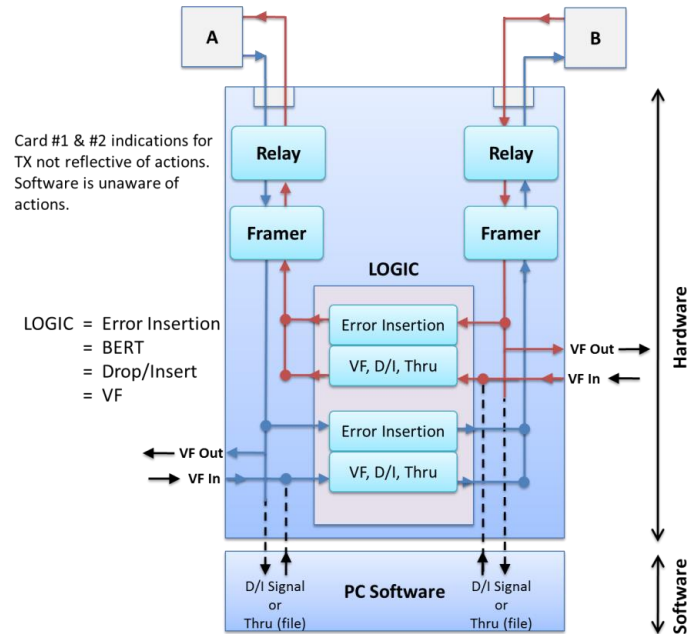


Dual Laptop or 2 Ultra Cards

Series Connection using RJ-45

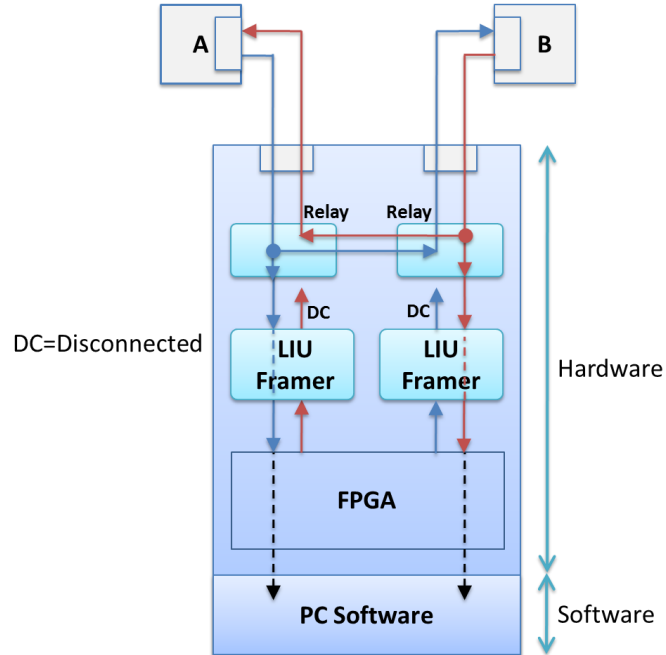


Cross-port Transmit Mode



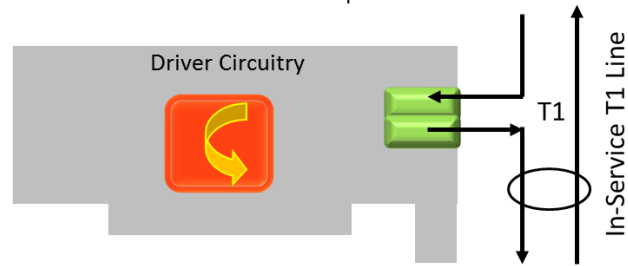
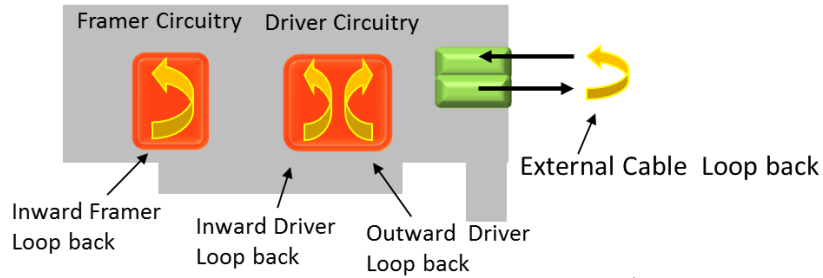
- Used for Drop and Insert applications in which the board analyzes the traffic running between two pieces of T1 E1 equipment

Cross-port Through Mode

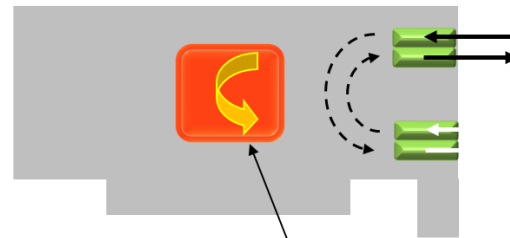


- This mode is similar to the standard “Outward Loopback” which allows monitoring T1 E1 lines “in-line” while still being protected from loss of power to the board

Loopbacks



Use of remote loop back when a monitor signal is not available

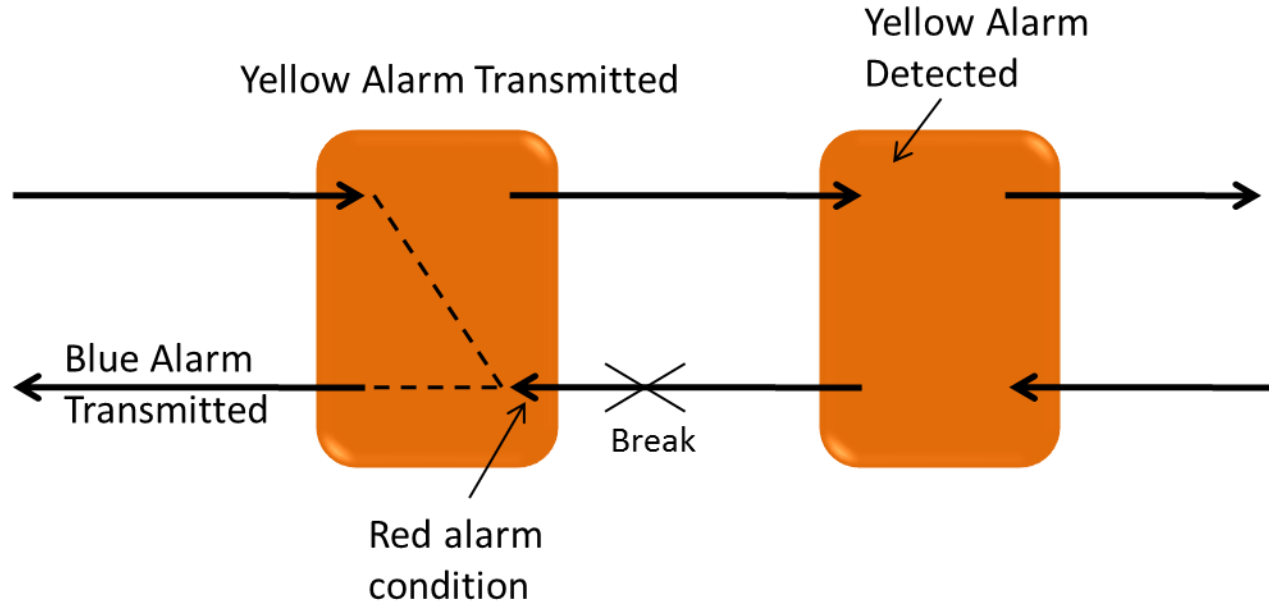


Cross-port loopback

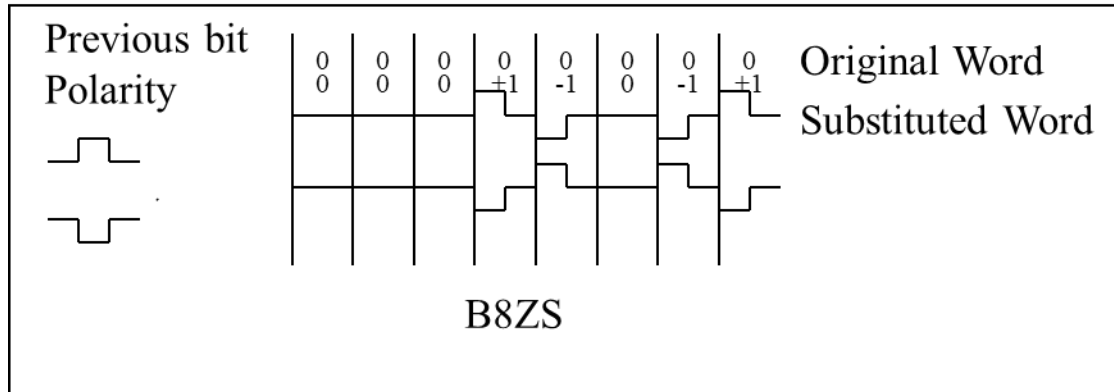
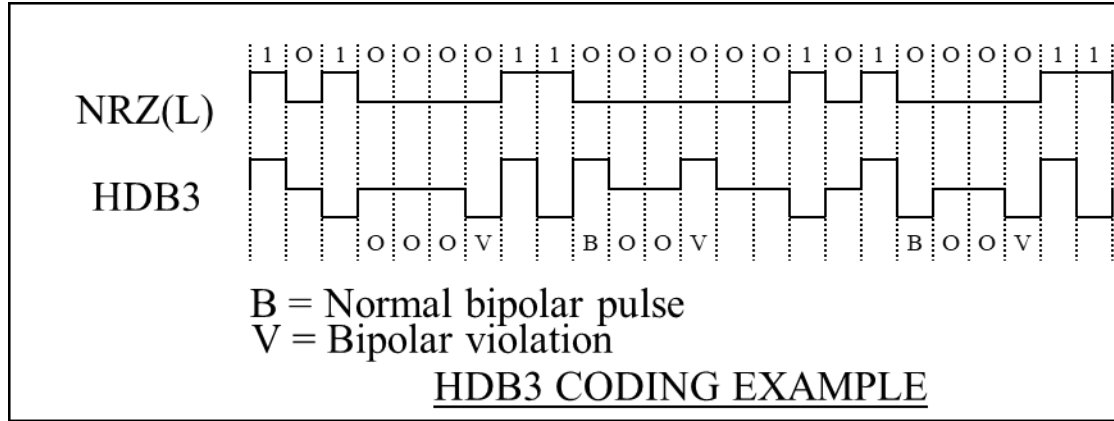
Cross-port Loopback

Signal received on Card #1 is transmitted out on Card #2 and vice versa. The hardware defaults to this mode when the board is unpowered.

Blue, Yellow and Red Alarms



Line Coding



Frequency Calibration

Calibrating GL Hardware

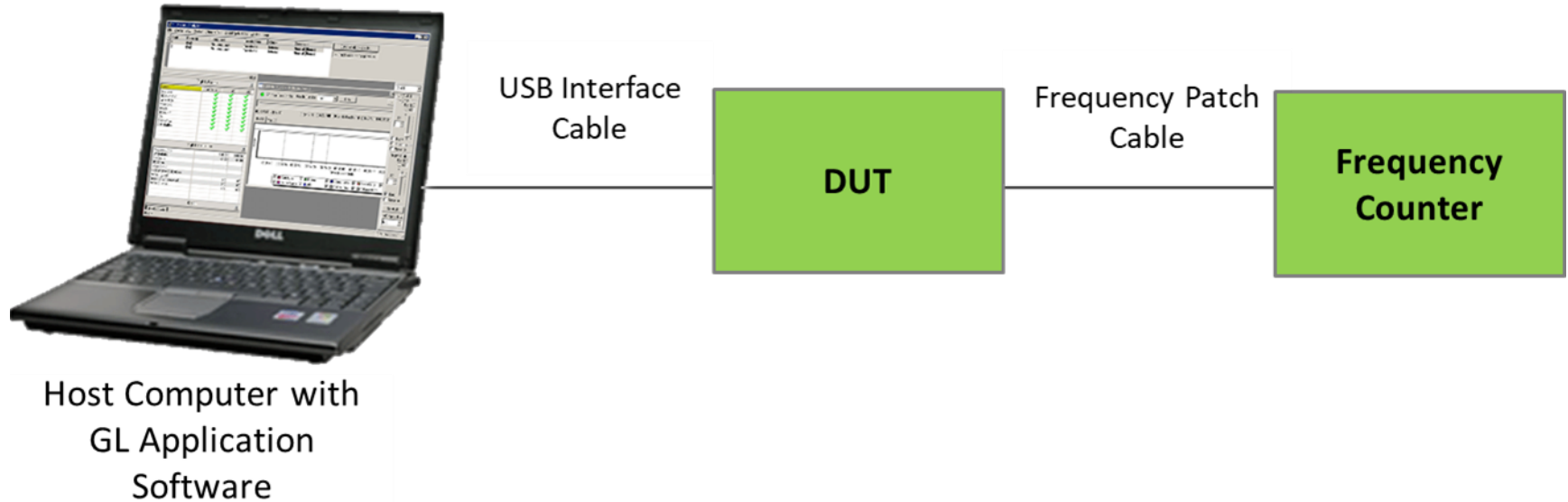
- Calibrating any GL product containing an adjustable oscillator to the fundamental frequency
- Requires –
 - Device Under Test (DUT) - GL Hardware
 - Frequency Counting Standard (calibrated and accurate to 0.1Hz or better)
 - Host PC with GL Application software installed
 - Patch Cable; DUT connection (MCX plug) to Frequency Counter (typically a BNC connector)
 - Trimpot screwdriver (or equivalent)

Calibrating GL Hardware

- Connection Procedure -
 - Turn on the frequency counter at least 30 minutes before conducting the test. This will allow the unit to come to thermal equilibrium
 - Gain access to and locate the frequency adjustment potentiometer (trimpot) for the DUT
 - Install the DUT and power up, again allowing 30 minutes warm up time for the unit
 - Connect the patch cable between the DUT and the Frequency Counter
- Open the appropriate GL Application software, and set the following parameters:
 - Clock - INT CLK (Internal Clock)
 - Apply to All Cards (ports)

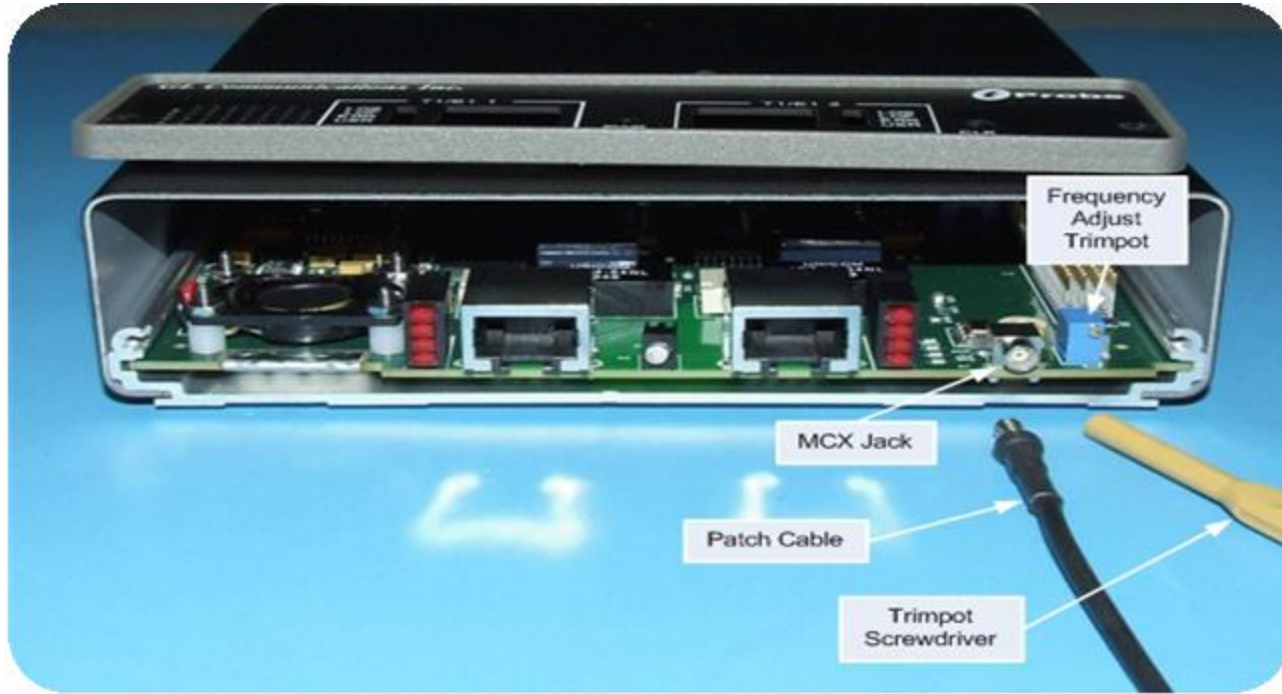
Calibrating GL Hardware

Connecting DUT to Frequency Counter



Calibrating GL Hardware

Location of MCX Jack and Trimpot for tProbe™



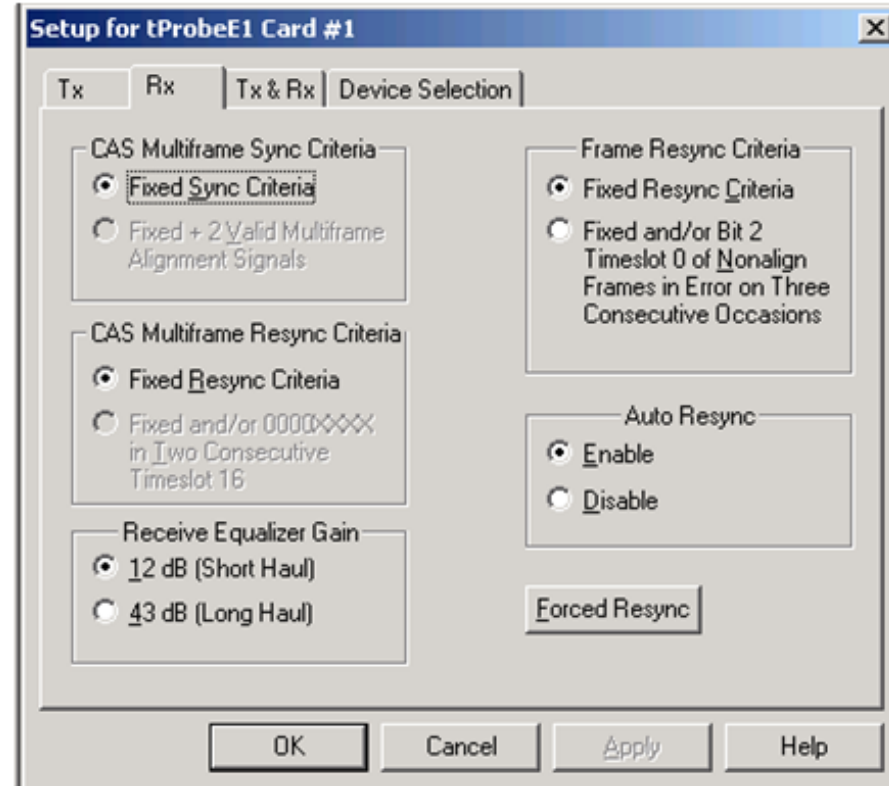
Calibrating GL Hardware

- At this point if the hardware has been properly setup and the application is open and configured correctly the Frequency Counter should be displaying the oscillator frequency output from the DUT
- If not, go back through the previous steps to insure all is set up correctly
- Once the Frequency Counter is reporting the target frequency continue to allow the display to update several more times to ensure the target frequency is stable
- Target frequency for T1 is 1.544 MHz for E1 2.048MHz (tolerance ± 1 Hz)
- Calibration is complete when the displayed value is constant

Configurations

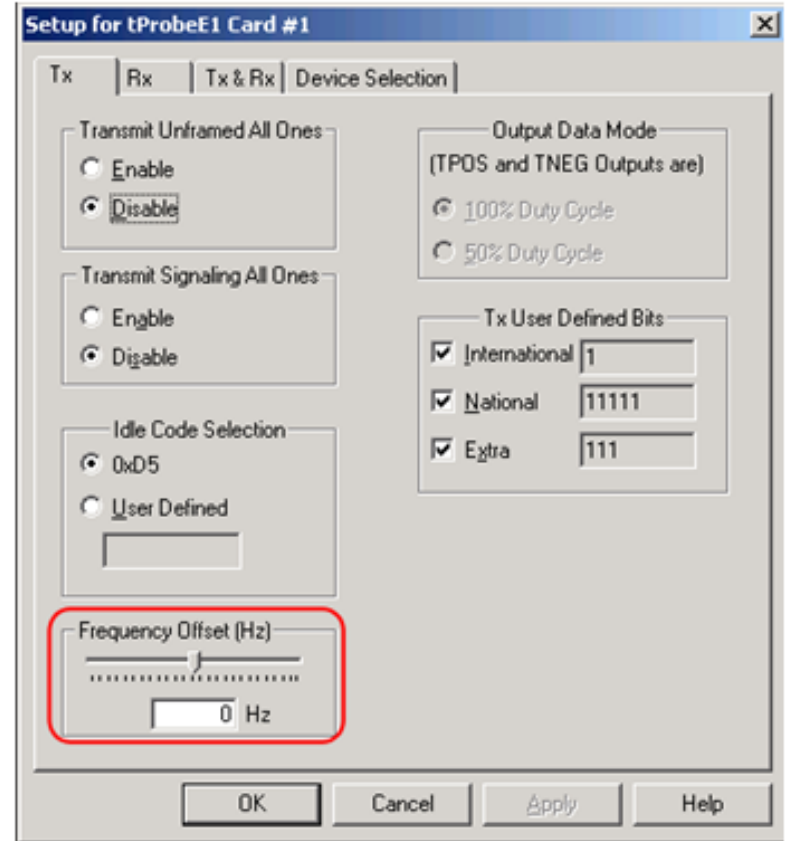
Rx Parameters Configuration

- Provides configuration options to detect the proper alignment of CAS multi-frames
- Automatically initiates frame search whenever CAS multi-frame alignment words are received in error
- Adjust receive signal level, auto and forced resync options to maintain the current framing position



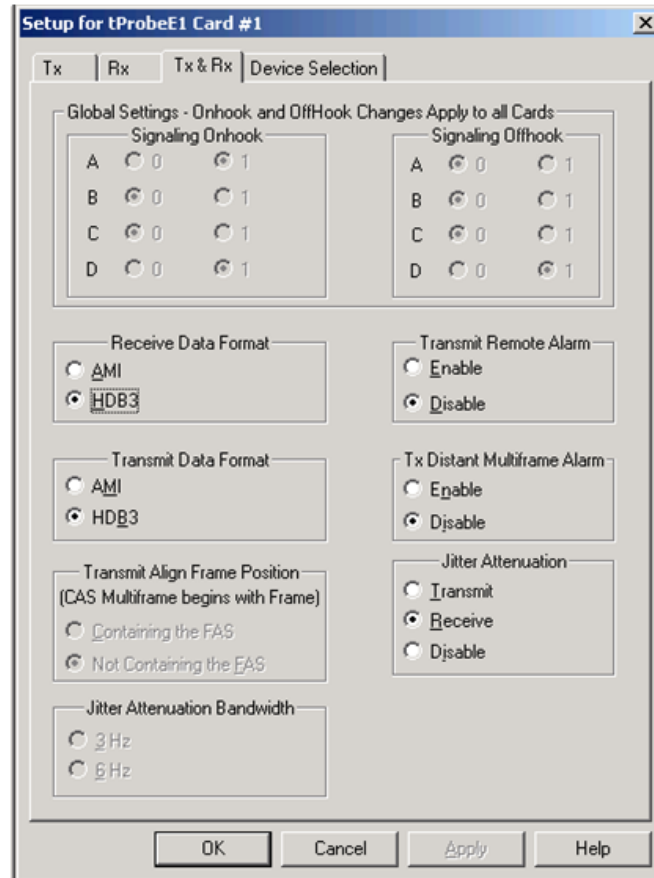
Tx Parameters Configuration

- Provides adjustable transmit clock frequency for testing frequency lock sensitivity of E1 equipment
- Transmission of unframed all ones, signaling all ones, and selection of output duty cycle
- Option to select the bit type such as international, national, and extra bits on outgoing bit stream



Tx Rx Parameters Configuration

- Provides configuration options to define signaling Onhook/Offhook options by configuring ABCD signaling bits
- Receive and transmit data formats
- Transmit align frame positions
- Transmit remote alarm; loss of multi-frame alarm
- Enable or disable the jitter attenuation block from the 'transmit and receive' sides of the line interface



T1 and E1 Configuration Setup

Rx Tab in T1 and E1 Cards

Setup for tProbeT1 Card #1

Rx | Tx | Tx_Rx | Device Selection

Auto Resync

- Resync on DOF or RCL
- Resync on DOF only
- Disable

Resync Using

- Ft bit (193S) or FPS bit (193E)
- Ft & Fs (193S) or FPS & CRC (193E)

Resync Algorithm

- 10 Consecutive Ft or FPS Bits
- 24 Consecutive Ft or FPS Bits

Out-of-Frame Criteria

- 2 of 4 Framing Bits
- 2 of 5 Framing Bits

Receive Equalizer Gain

- 15 dB (Ltd Long Haul)
- 25 dB (Long Haul)
- 36 dB (Long Haul)

Network Loopback Detection

- Enable
- Disable

Forced Resync

OK Cancel Apply Help

Setup for tProbeE1 Card #1

Tx | Rx | Tx & Rx | Device Selection

CAS Multiframe Sync Criteria

- Fixed Sync Criteria
- Fixed + 2 Valid Multiframe Alignment Signals

CAS Multiframe Resync Criteria

- Fixed Resync Criteria
- Fixed and/or 0000XXXX in Two Consecutive Timeslot 16

Receive Equalizer Gain

- 12 dB (Short Haul)
- 43 dB (Long Haul)

Frame Resync Criteria

- Fixed Resync Criteria
- Fixed and/or Bit 2 Timeslot 0 of Nonalign Frames in Error on Three Consecutive Occasions

Auto Resync

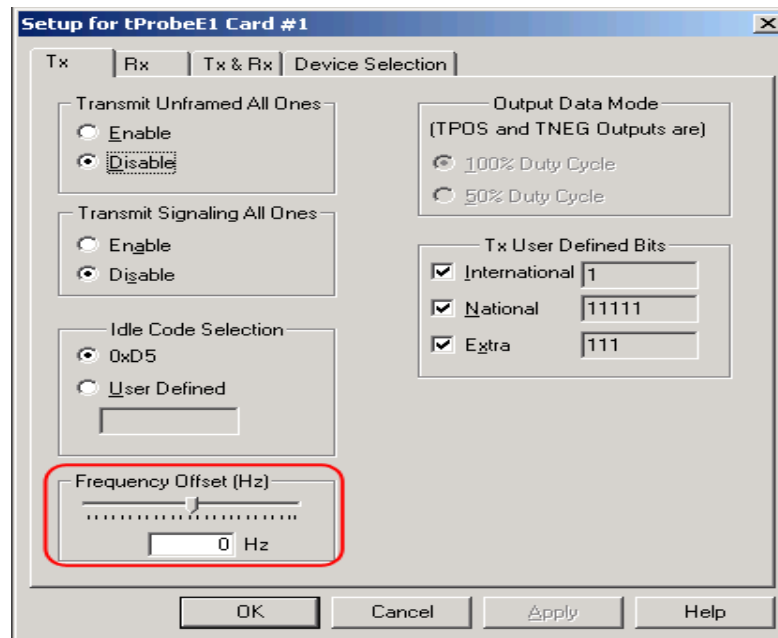
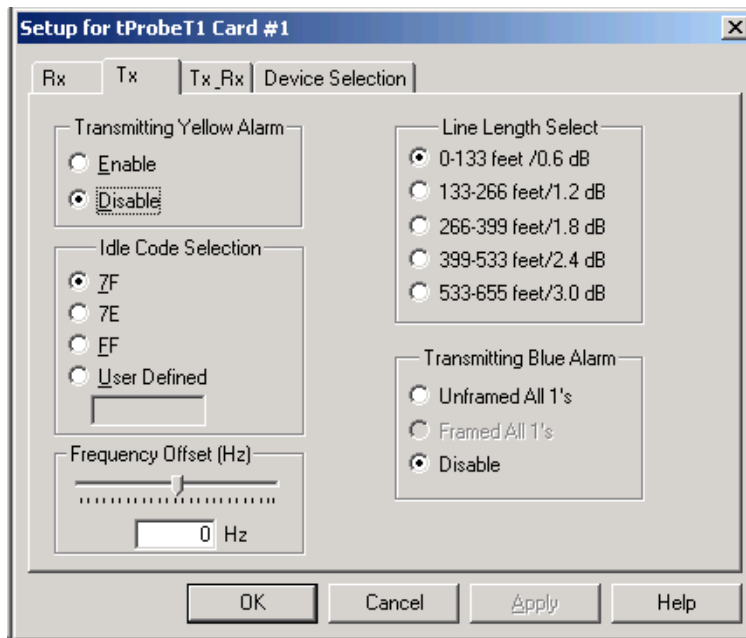
- Enable
- Disable

Forced Resync

OK Cancel Apply Help

T1 and E1 Configuration Setup

Tx Configuration Tab in T1 and E1 Cards



Jitter Measurement

- Allows one to accurately measure jitter associated with T1 or E1 signals
- Easy, accurate, visual pulse shape and jitter measurement for T1 E1 signals (only available with T1 E1 cards)
- Provides an option to select T1 or E1 port for monitoring and the frequency range of interest
- Supports One-shot capture, Repeated Capture, and Save options for jitter measurement
- CSV files are generated for further analysis using spreadsheet – one containing the raw clock counts, and raw jitter counts, the other file containing the FFT data which can be used within a data analysis tool to plot the jitter frequency spectrum
- Graphs generated can be saved to a file, zoomed-in/zoomed-out, printed, and more

Statistics Tab

Jitter Measurement - T1 Port #1

Stats | Time Series | Spectrum | Raw Clock | Raw Jitter

Range: 96.5 KHz

Rx Line Input

Rx Line Freq = 1544000 Hz

Freq Offset = 0 Hz

Time Interval Error

Obs. Interval = 0.0106114 sec

Precision = 0.0386 UI

-VE Peak = -0.00997715 UI

+VE Peak = 0.0343757 UI

Peak-Peak = 0.0443528 UI

Measure...
Port #1
Freq Range
96.5 KHz

Options

One-Shot Capture

Repeated Capture Every 1 Sec

Save s:\GI Communications Inc\Jitter Measurement

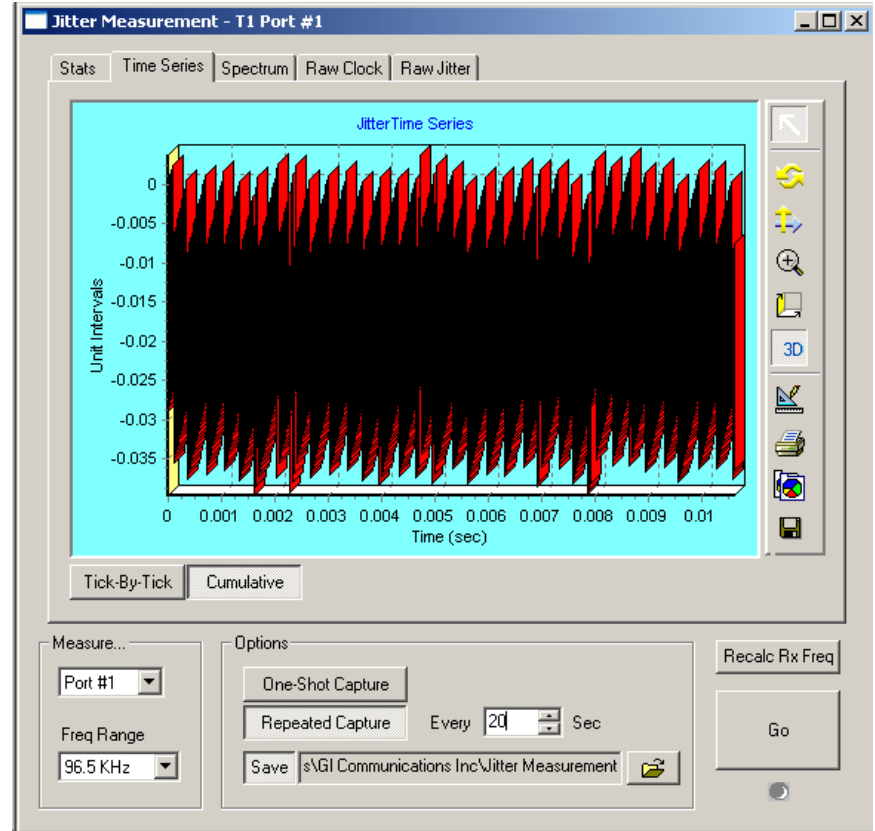
Recalc Rx Freq

Go

- Constitutes the observation interval, T1 E1 Precision value, +/- VE Peak value, and peak-to-peak value for measurement purposes

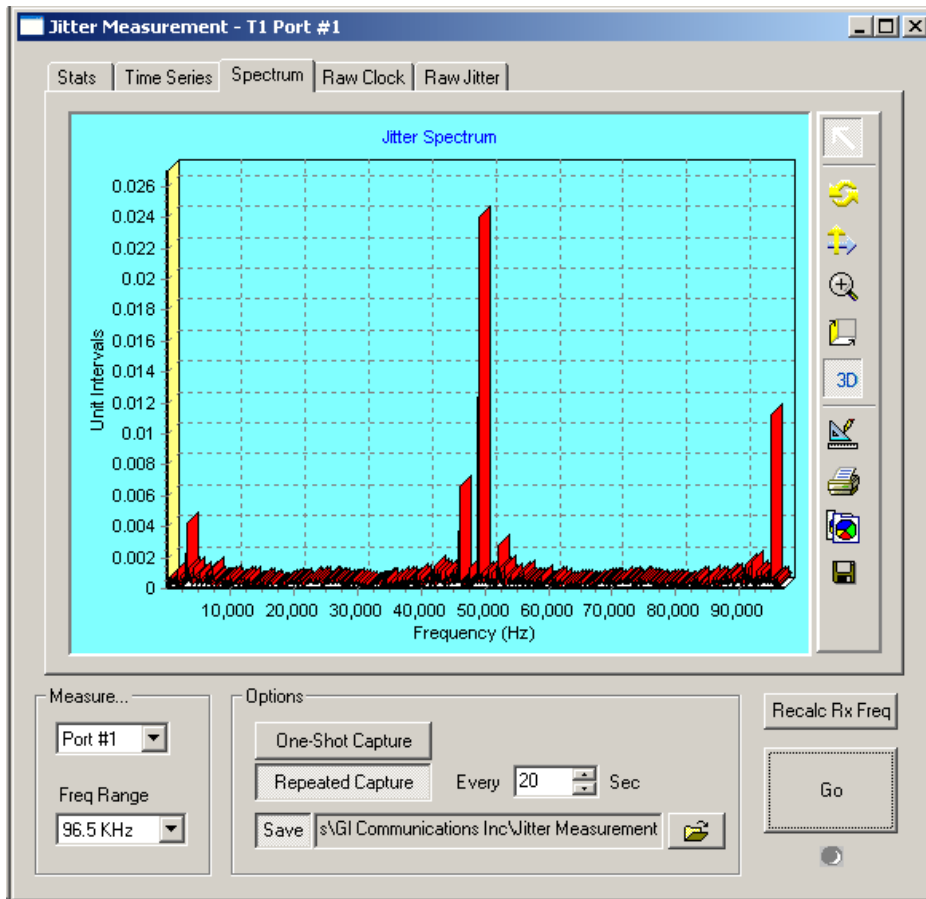
Time Series

- Displays the captured jitter values on either a cumulative or tick-by-tick basis



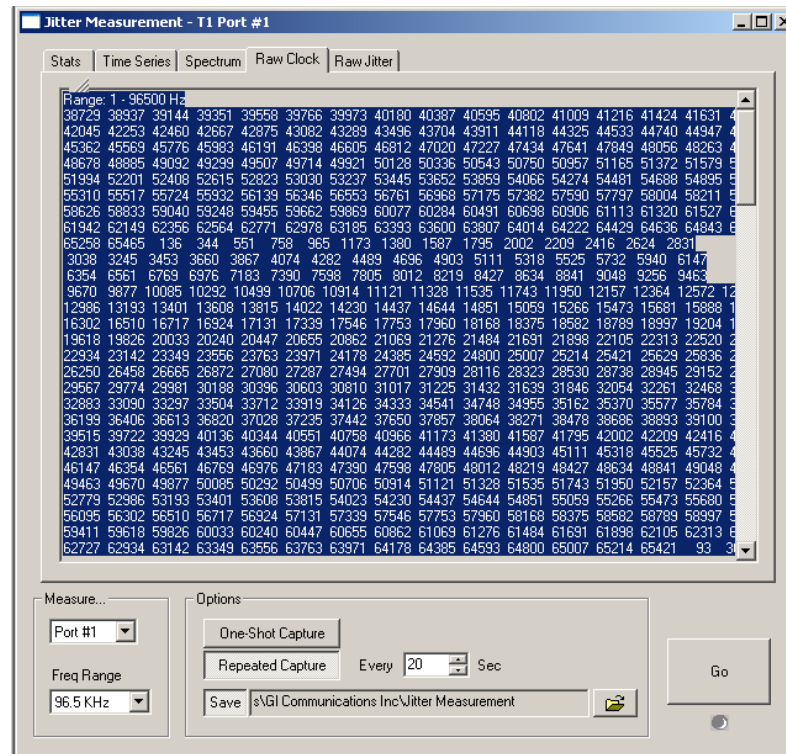
Spectrum

- The frequency spectrum of the captured jitter values will be displayed in the spectrum page
- The peak-to-peak jitter is displayed as a function of jitter frequency



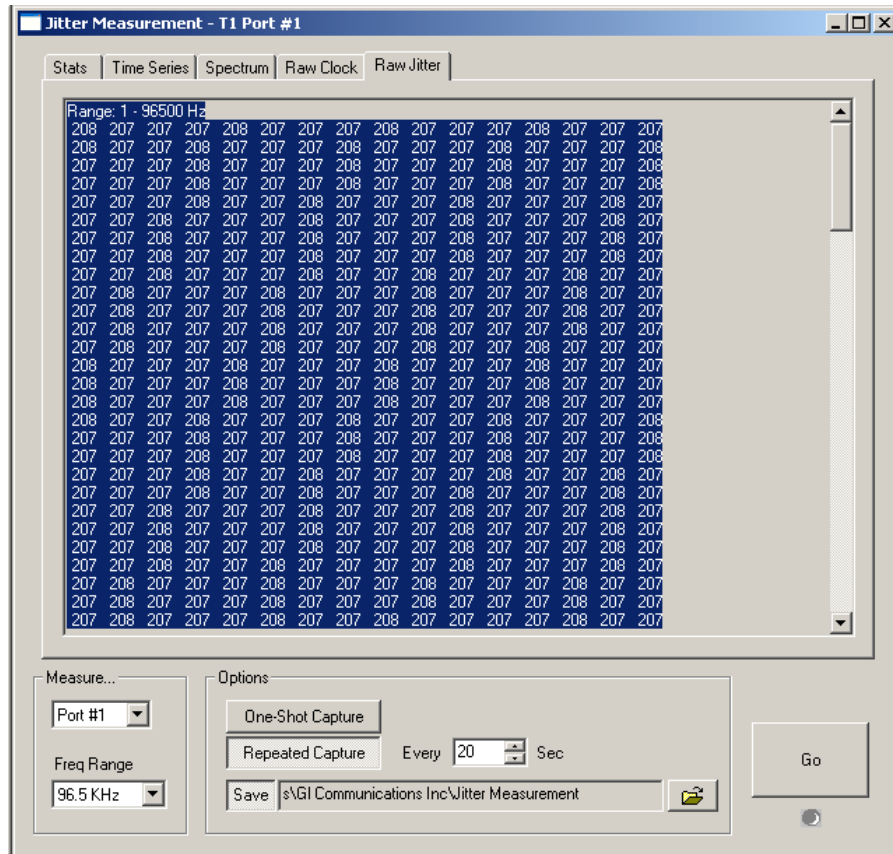
Raw Clock Page

- It displays raw reference clock values in integer format
- The reference clock value for each nominal clock tick is read and recorded

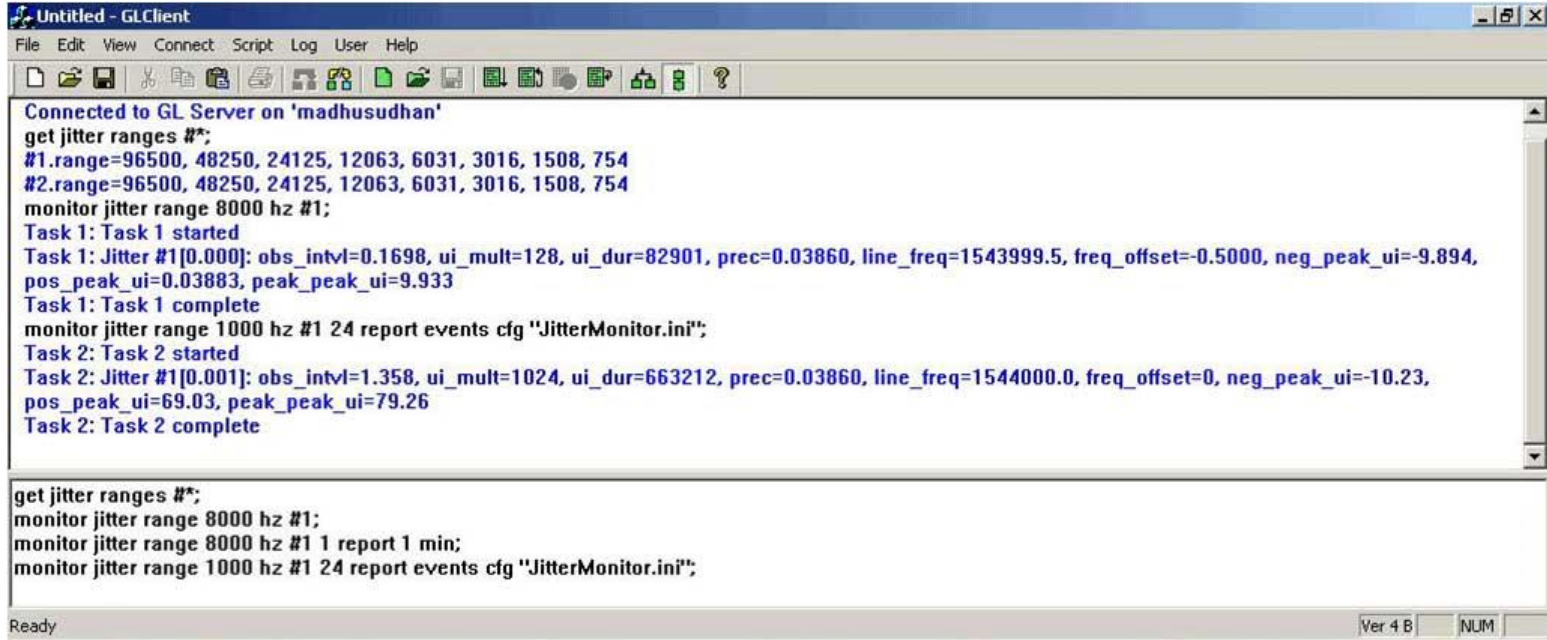


Raw Jitter Page

- It displays the number of reference clock ticks for each successive tick of the clock under test (the nominal clock)
- The tick values are displayed in decimal format. Read the values from left to right



WCS Jitter Measurement



The screenshot shows a Windows application window titled "Untitled - GLClient". The window has a menu bar with "File", "Edit", "View", "Connect", "Script", "Log", "User", and "Help". Below the menu bar is a toolbar with various icons. The main area of the window displays terminal output in a monospaced font. The output shows the client connected to a GL Server on 'madhusudhan' and executing several commands to get jitter ranges and monitor jitter. The output includes task status messages and detailed jitter measurement parameters.

```
Connected to GL Server on 'madhusudhan'  
get jitter ranges #*;  
#1.range=96500, 48250, 24125, 12063, 6031, 3016, 1508, 754  
#2.range=96500, 48250, 24125, 12063, 6031, 3016, 1508, 754  
monitor jitter range 8000 hz #1;  
Task 1: Task 1 started  
Task 1: Jitter #1[0.000]: obs_intvl=0.1698, ui_mult=128, ui_dur=82901, prec=0.03860, line_freq=1543999.5, freq_offset=-0.5000, neg_peak_ui=-9.894,  
pos_peak_ui=0.03883, peak_peak_ui=9.933  
Task 1: Task 1 complete  
monitor jitter range 1000 hz #1 24 report events cfg "JitterMonitor.ini";  
Task 2: Task 2 started  
Task 2: Jitter #1[0.001]: obs_intvl=1.358, ui_mult=1024, ui_dur=663212, prec=0.03860, line_freq=1544000.0, freq_offset=0, neg_peak_ui=-10.23,  
pos_peak_ui=69.03, peak_peak_ui=79.26  
Task 2: Task 2 complete  
  
get jitter ranges #*;  
monitor jitter range 8000 hz #1;  
monitor jitter range 8000 hz #1 1 report 1 min;  
monitor jitter range 1000 hz #1 24 report events cfg "JitterMonitor.ini";
```

Ready Ver 4 B NUM

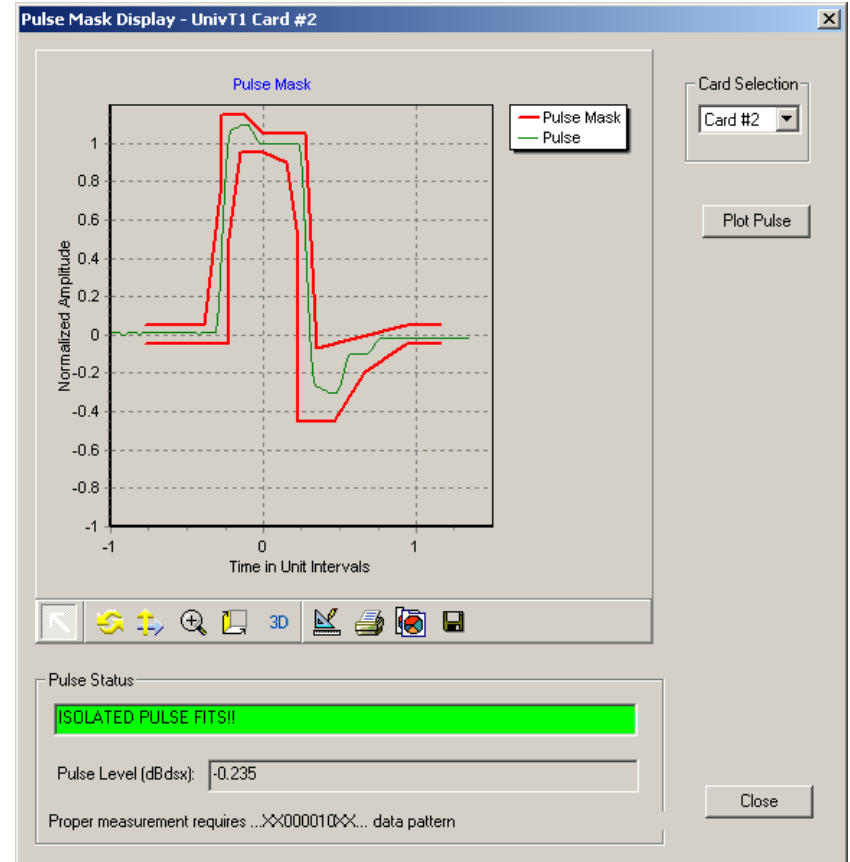
- Monitor Jitter ranges and perform Jitter measurement through simple commands with Windows Client-Server application

Pulse Mask Compliance Testing

- Plots the pulse measured within a predefined template
- Compares the incoming T1 E1 pulses against the pulse mask display
- For T1 pulses, the x-axis measures time in unit intervals (UI), while for E1 pulse, the x-axis measures time in nanoseconds (ns)
- The y-axis measures the normalized amplitude in volts
- The Pulse Mask image can be saved to a file, zoomed-in/zoomed-out, printed, and more

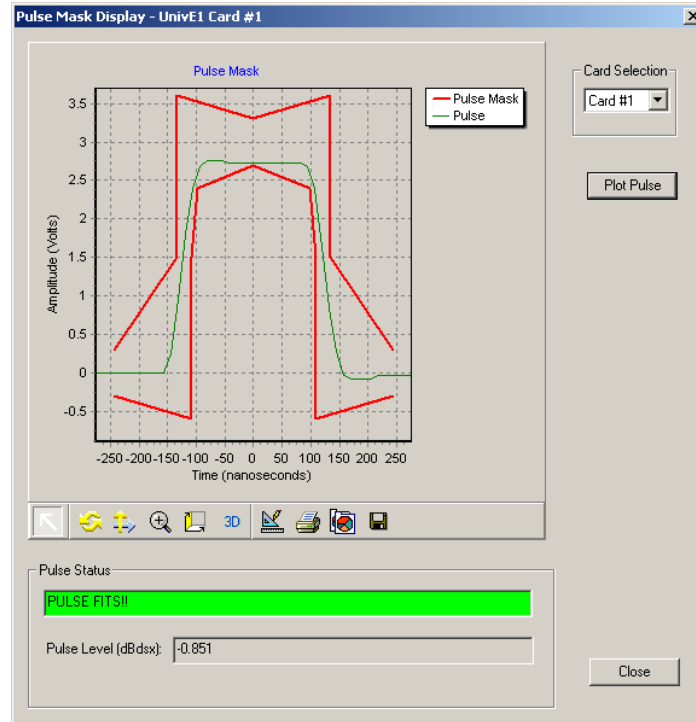
T1 Pulse Mask

- The pulse mask application provides control buttons to perform various actions like zoom in and zoom out, edit, save graph



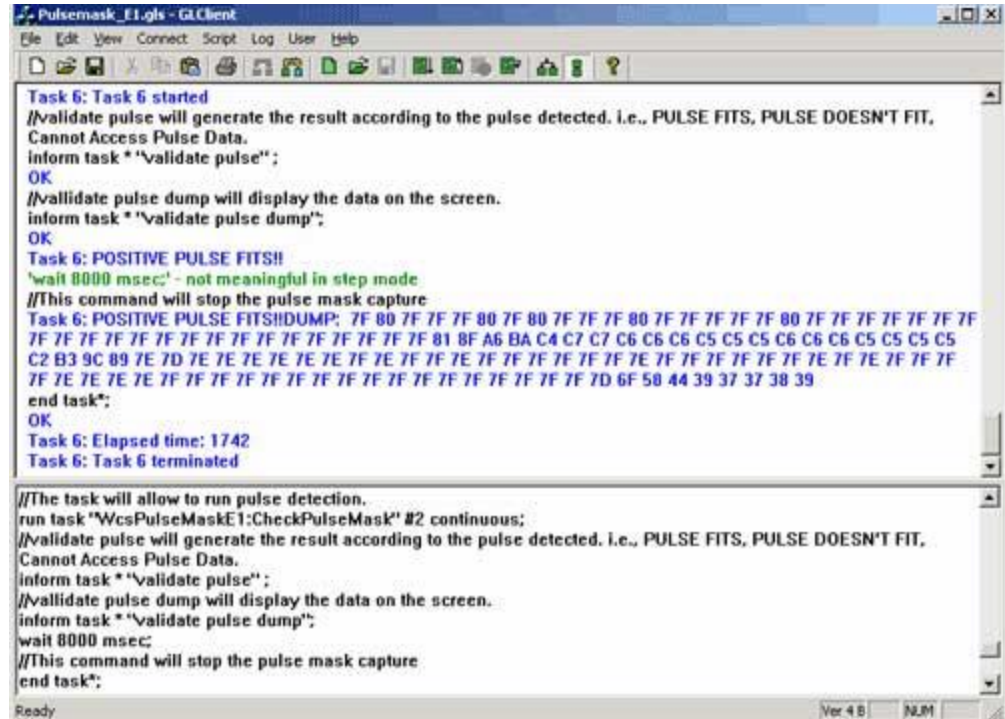
E1 Pulse Mask

Pulse Mask Compliance Testing



WCS Pulse Mask

- Perform Pulse Mask compliance testing through Windows Client-Server commands
- Commands supported are Check Pulsemask, Validate pulse, Stop pulse mask validation



```
Pulsemask_E1.gls - GLClient
File Edit View Connect Script Log User Help
Task 6: Task 6 started
//validate pulse will generate the result according to the pulse detected. i.e., PULSE FITS, PULSE DOESN'T FIT,
Cannot Access Pulse Data.
inform task * "validate pulse";
OK
//validate pulse dump will display the data on the screen.
inform task * "validate pulse dump";
OK
Task 6: POSITIVE PULSE FITS!!
'wait 8000 msec;' - not meaningful in step mode
//This command will stop the pulse mask capture
Task 6: POSITIVE PULSE FITS!!DUMP: 7F 80 7F 7F 7F 80 7F 80 7F 7F 7F 80 7F 7F 7F 80 7F 7F 7F 7F 80 7F 7F 7F 7F 7F
7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 7F 81 8F A6 BA C4 C7 C7 C6 C6 C6 C5 C5 C5 C6 C6 C6 C5 C5 C5 C5
C2 B3 9C 89 7E 7D 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E
7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7E 7D 6F 50 44 39 37 37 38 39
end task*;
OK
Task 6: Elapsed time: 1742
Task 6: Task 6 terminated

//The task will allow to run pulse detection.
run task "WcsPulseMaskE1:CheckPulseMask" #2 continuous;
//validate pulse will generate the result according to the pulse detected. i.e., PULSE FITS, PULSE DOESN'T FIT,
Cannot Access Pulse Data.
inform task * "validate pulse";
//validate pulse dump will display the data on the screen.
inform task * "validate pulse dump";
wait 8000 msec;
//This command will stop the pulse mask capture
end task*;

Ready Ver 4 B NUM
```

Real-time Multichannel Audio Bridge

Action	Sound Device	Audio Mode	Channel	Codec	Samples (sec)	Port	Start TS	Start SC	Start
DROP	Speakers (Realtek High Definiti	Stereo	L	G.726 40 Kbps	8000	1	1	4	Start
		Stereo	R	Ulaw	8000	1	1	1	Start
DROP	Speakers (Realtek High Definiti	Stereo	L	G.726 40 Kbps	8000	2	1	4	Start
		Stereo	R	Ulaw	8000	2	1	1	Start
DROP	Realtek Digital Output (Realtek	Stereo	L	Alaw	8000	1	0	1	Start
		Stereo	R	16-Bits Linear PCM	8000	1	0	1	Start

- Ability to send / receive from a sound card directly to T1 E1 timeslots

Thank you