Basic Software

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

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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

Back Panel

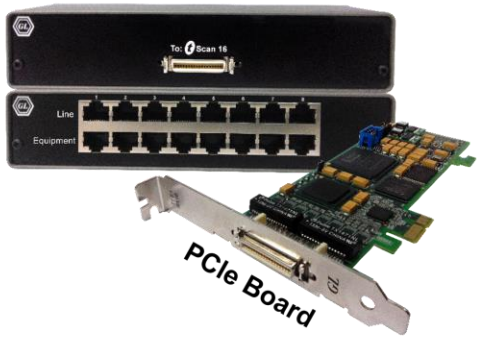
Front Panel

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

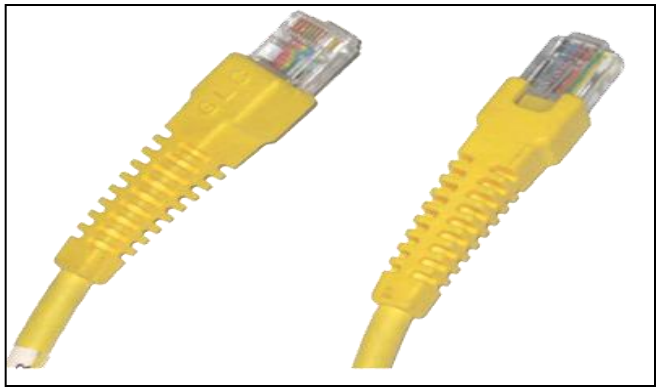
tScan16™ with
16-port T1 E1 Breakout Box



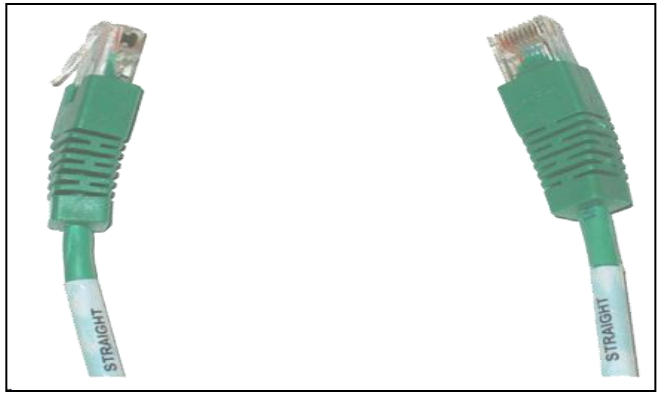
Cables, Y-bridges

Y-Bridge cable

Cross-over cable



Straight cable



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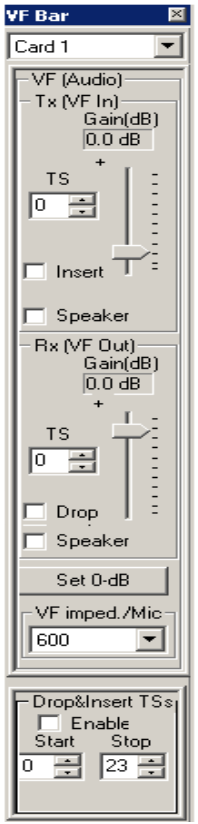
T1 E1 Configurations and VF Options

VF Options

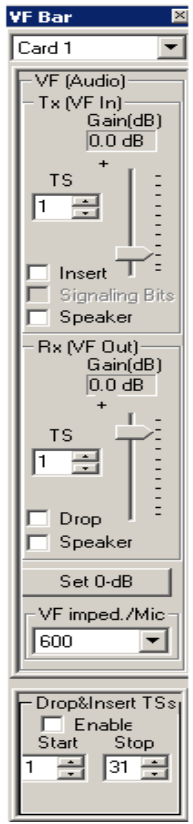
- A single (selected) timeslot can be encoded (VF Input); analog gain may be applied prior to the encoding
- A single (selected) timeslot can be decoded to audio (VF Output); analog gain may be applied prior to output
- The VF Output may be fed to the PC speaker for greater fidelity and volume
- The 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

T1



E1



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VF Drop and Insert Capabilities

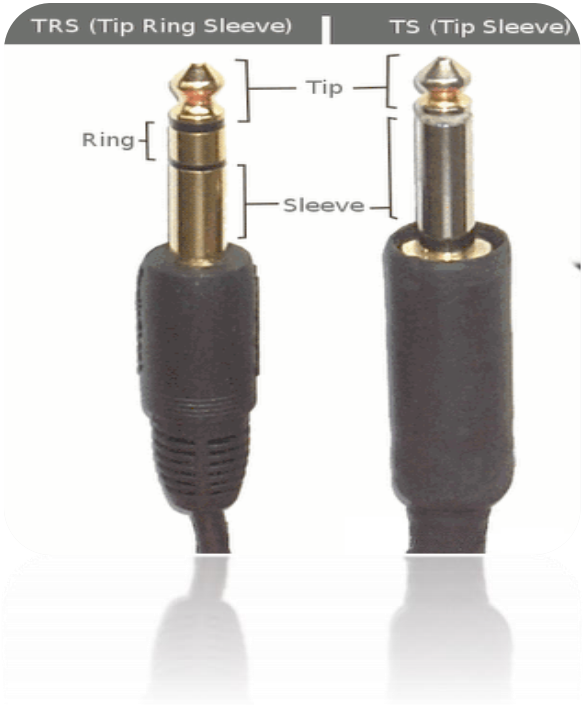
- VF Input/Output interfaces are provided for the following platforms:
  - **USB based tProbe™ T1 E1 Unit -** supports only 3.5mm balanced (stereo) analog interfaces with varying impedances
- Input signal is digitized (at 8 Khz, uLaw/A-Law) and inserted into selected timeslot of T1 E1
- An output audio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

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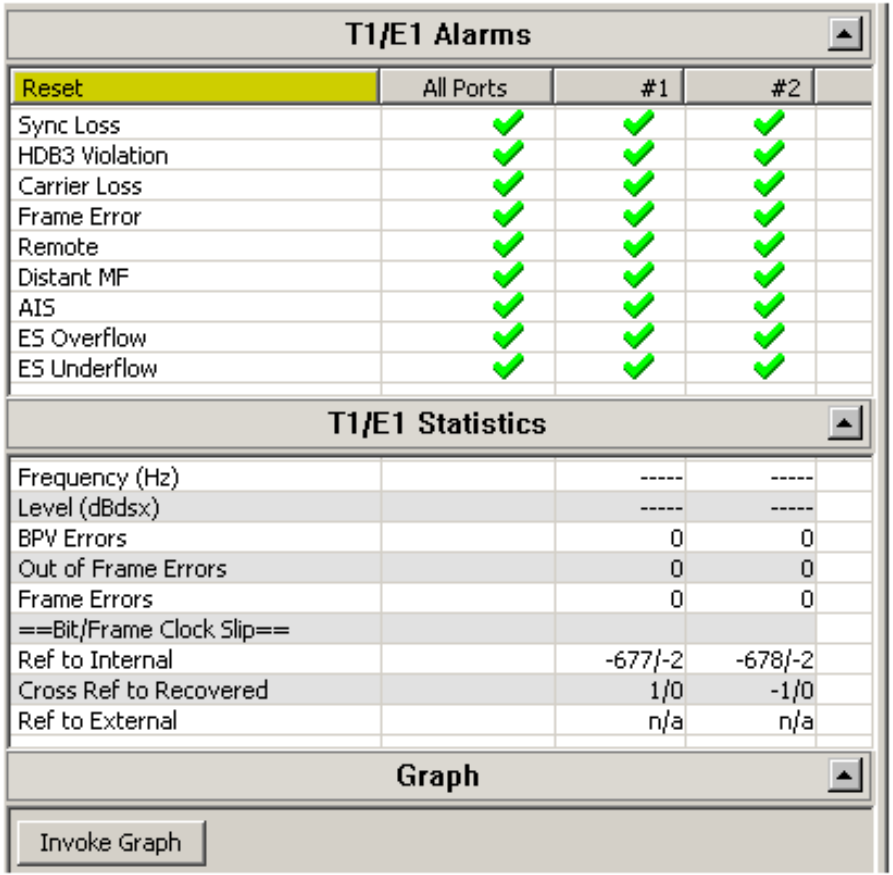
Monitor T1 E1 Lines

- 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



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Monitor T1 E1 Lines (Contd.)

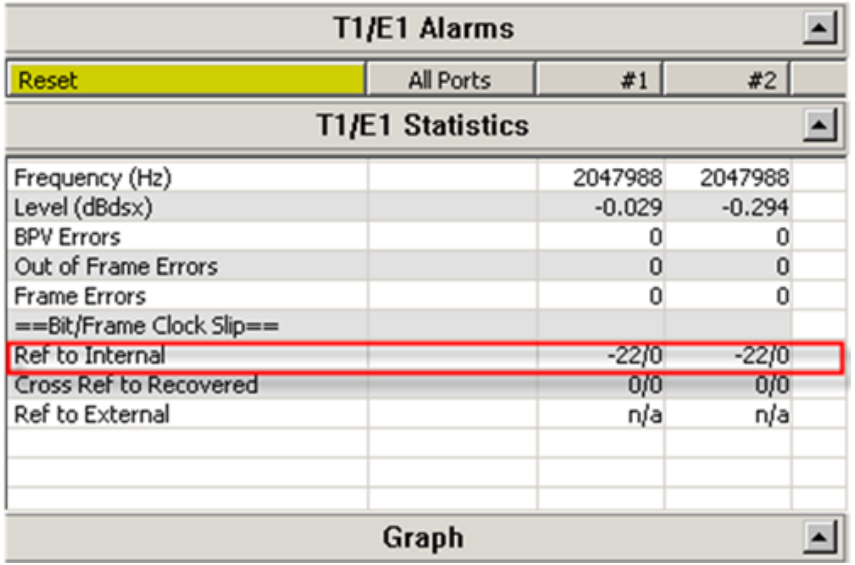
- T1 E1 Alarms:
  - **Line Sync Loss**: This will flash when a receiver resync is in progress
  - **HDB3 Violations**: It is a ternary transmission code in which the number of consecutive zeros, which may occur, is restricted to three, to ensure adequate clock recovery at the receiver
  - **Carrier loss 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?

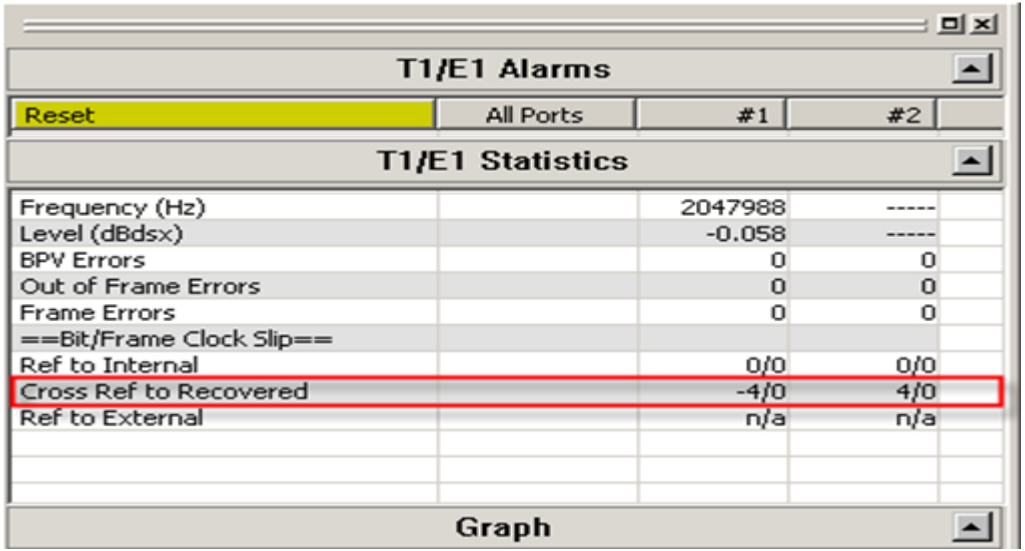
- Clock Slips are a count of the difference between a reference T1 E1 clock and another T1 E1 signal being measured
- A Clock Slip is a one-second-interval measurement (accuracy of the timing slips is +/- 1 count) that arise because of phases differences or frequency differences of the incoming signal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

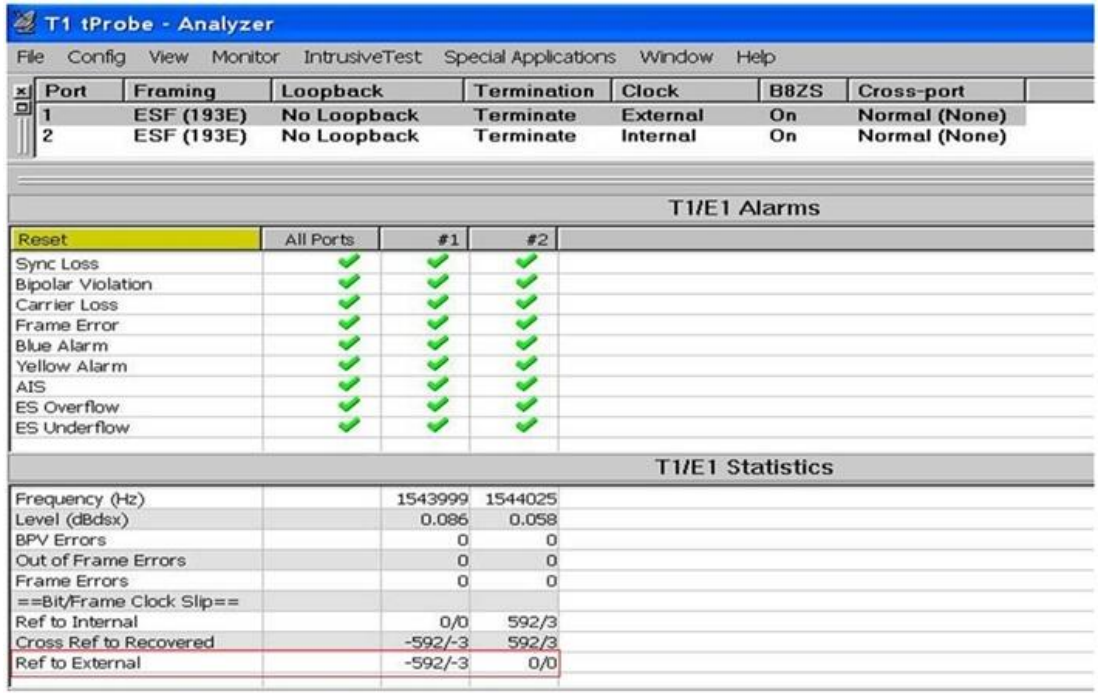


Crossport Clock Slips



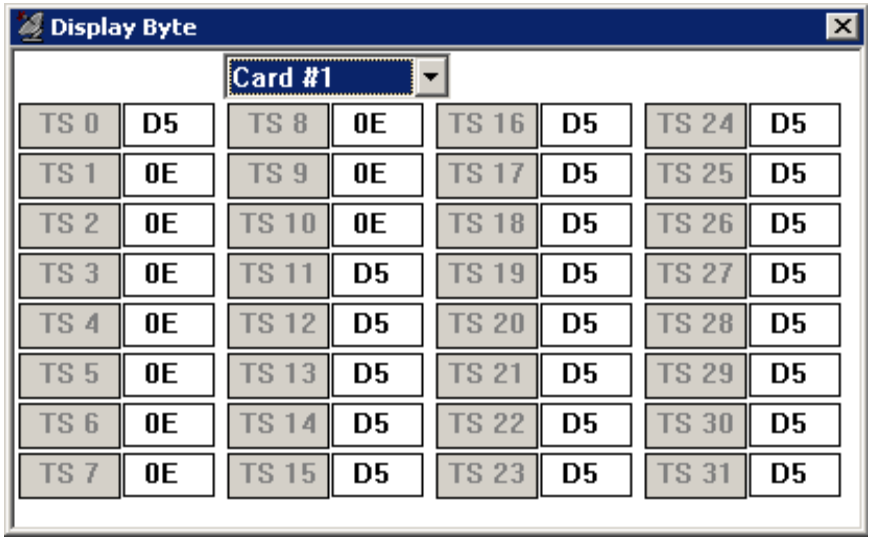
- This Clock Slips measurement compares the incoming receive clock from port #1 against the incoming receive clock from port #2 using the Recovered clock on port #1 and Recovered clock on Port #2

External Clock Slips



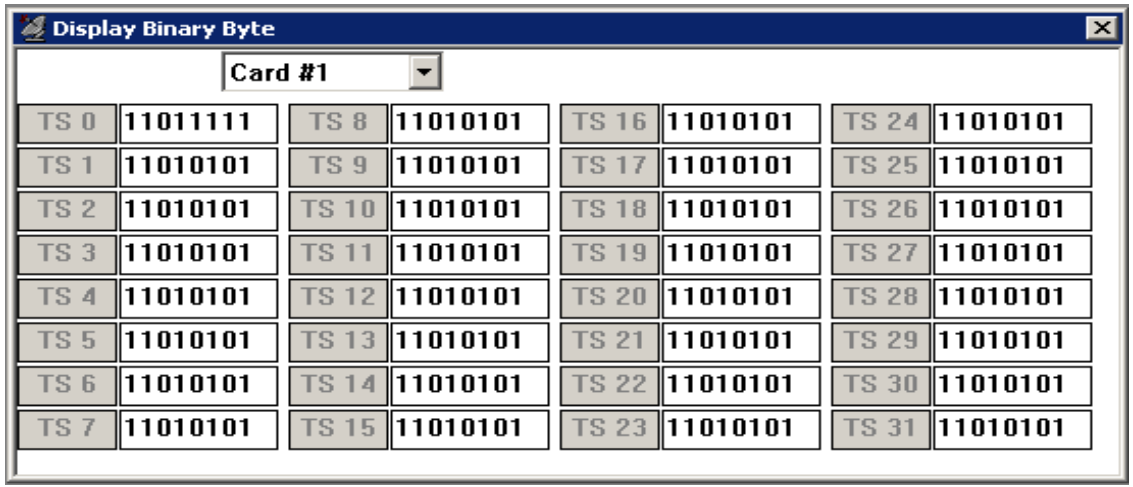
- This Clock Slip measurement compares the incoming receive clock using the Recovered clock of port 1 or 2 against the external clock provided on the external clock input

Byte Values



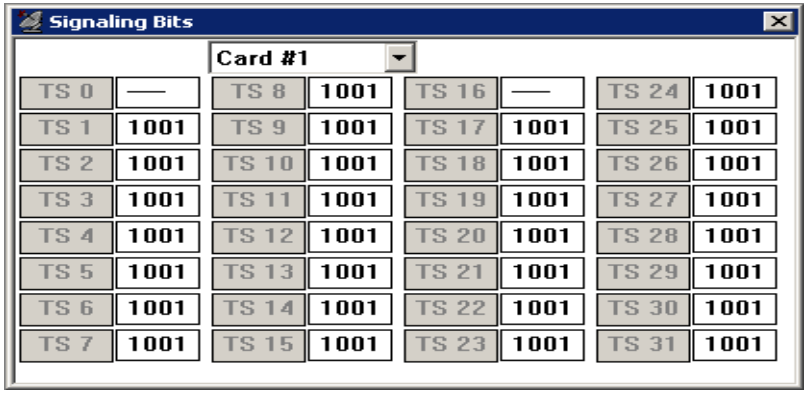
- Displays the data values for each time slot in HEX data format

Binary Byte Values



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

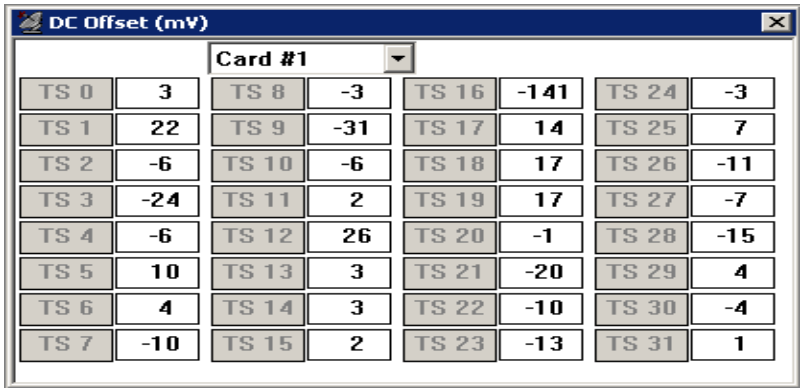
Signalling Bits, Power Level, DC Offset, Frequency



Signaling Bits

Card #1

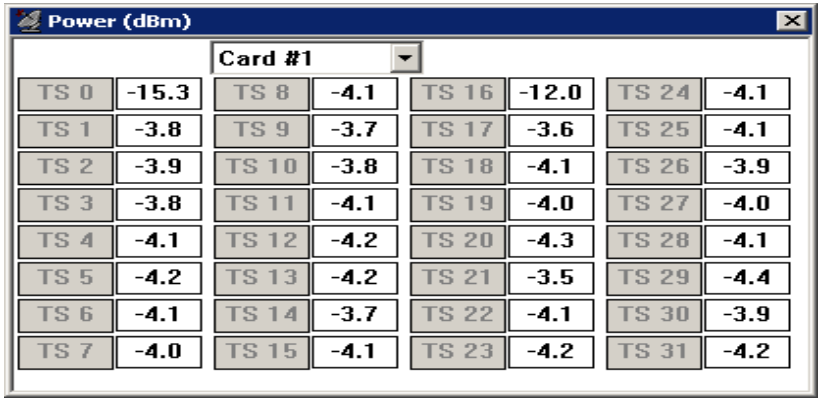
TS 0	——	TS 8	1001	TS 16	——	TS 24	1001
TS 1	1001	TS 9	1001	TS 17	1001	TS 25	1001
TS 2	1001	TS 10	1001	TS 18	1001	TS 26	1001
TS 3	1001	TS 11	1001	TS 19	1001	TS 27	1001
TS 4	1001	TS 12	1001	TS 20	1001	TS 28	1001
TS 5	1001	TS 13	1001	TS 21	1001	TS 29	1001
TS 6	1001	TS 14	1001	TS 22	1001	TS 30	1001
TS 7	1001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



DC Offset (mV)

Card #1

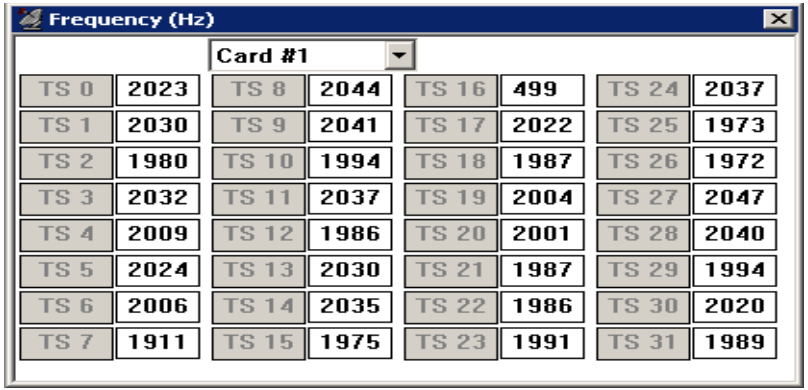
TS 0	3	TS 8	-3	TS 16	-141	TS 24	-3
TS 1	22	TS 9	-31	TS 17	14	TS 25	7
TS 2	-6	TS 10	-6	TS 18	17	TS 26	-11
TS 3	-24	TS 11	2	TS 19	17	TS 27	-7
TS 4	-6	TS 12	26	TS 20	-1	TS 28	-15
TS 5	10	TS 13	3	TS 21	-20	TS 29	4
TS 6	4	TS 14	3	TS 22	-10	TS 30	-4
TS 7	-10	TS 15	2	TS 23	-13	TS 31	1



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



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

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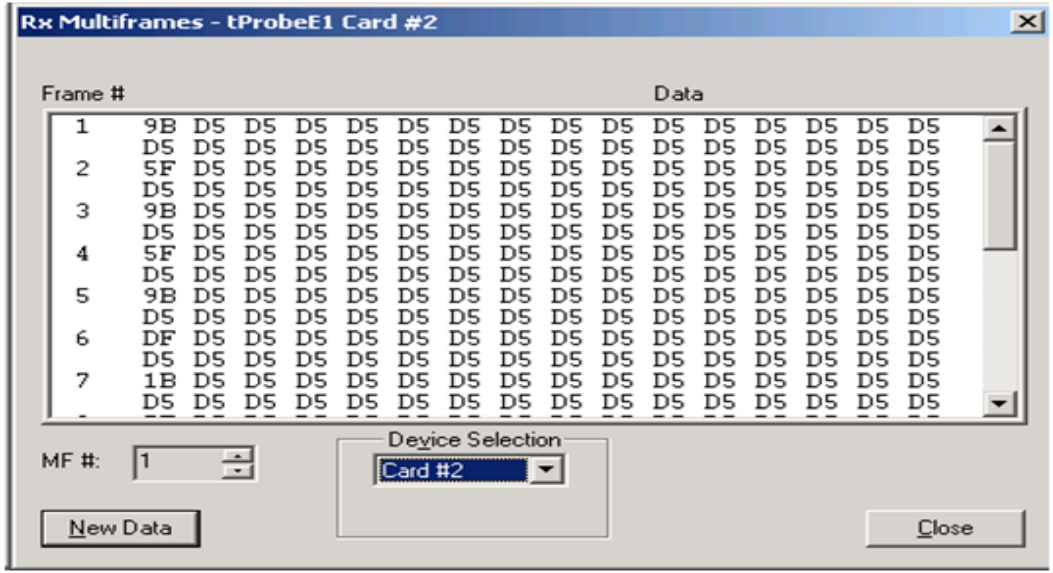
Signaling Bits, Power Level, DC Offset, Frequency

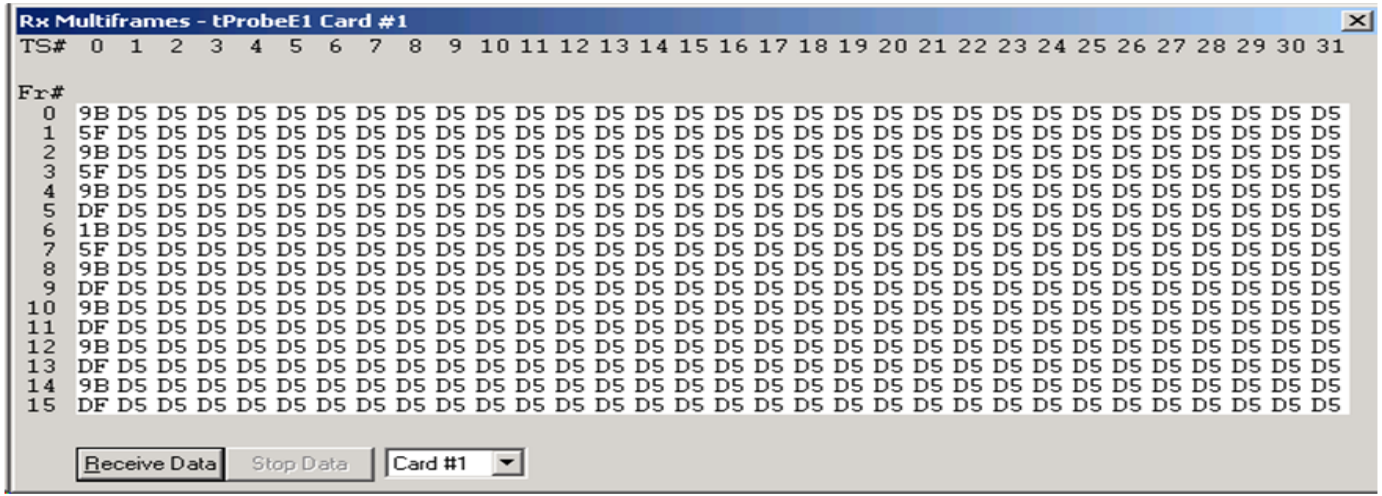
- Signaling Bits, Power Level (in dbm), DC Offset, Frequency associated with each timeslot are displayed in real-time
- Multiple instances can be opened simultaneously for monitoring purposes

Multiframes



- 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

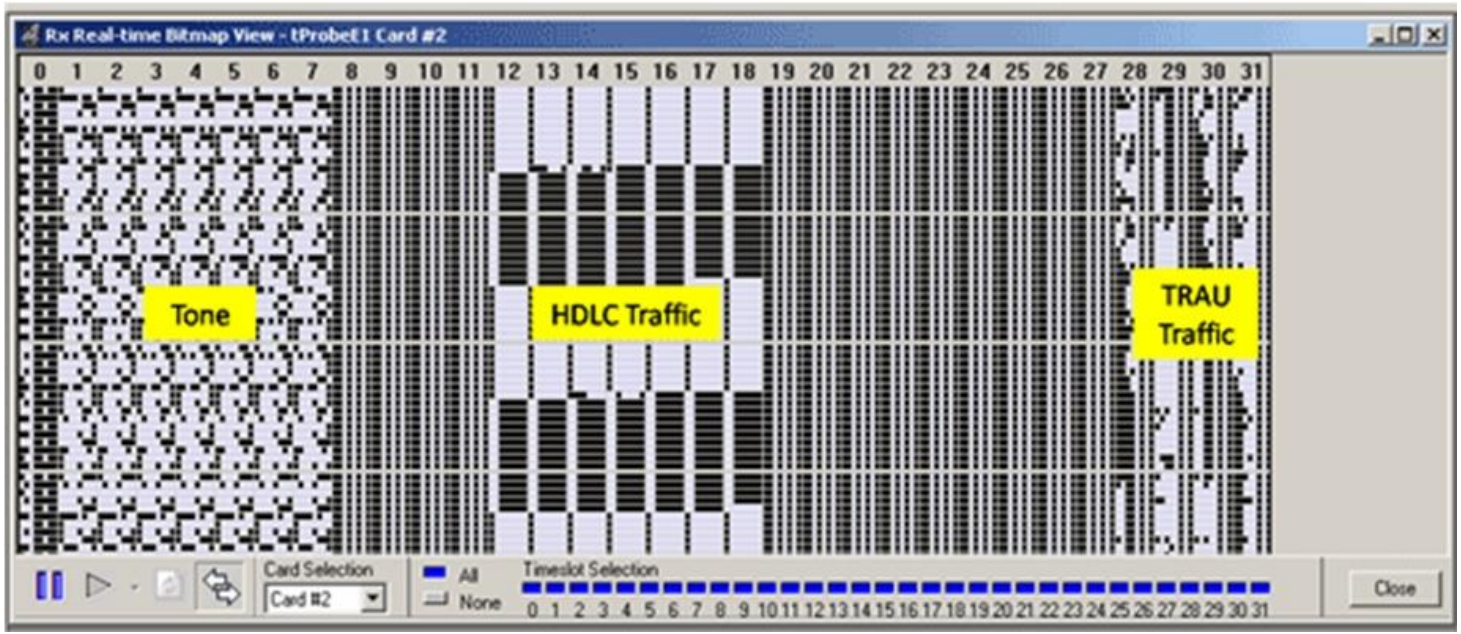
Real-time Multiframes



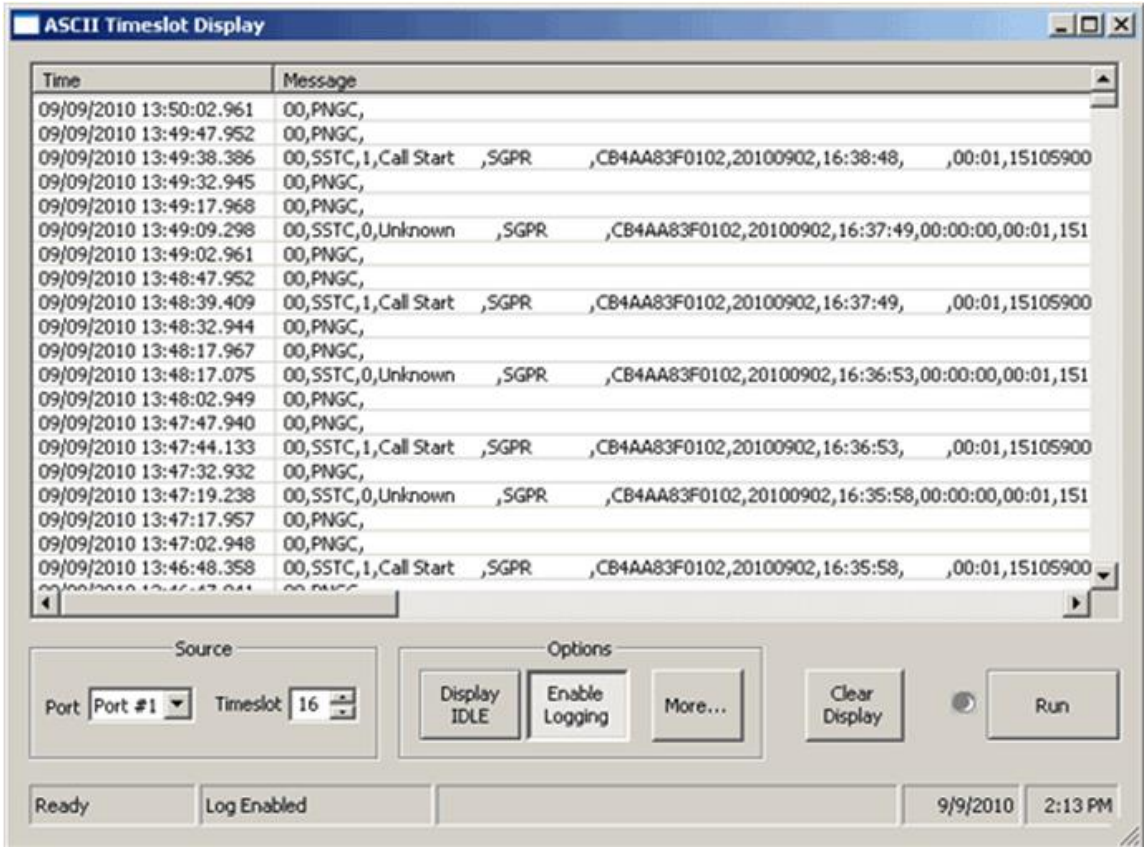
- Identifies the data in each frame with the data being refreshed automatically every second
- For T1 systems, twelve frames are displayed per multiframe in D4 (193S) framing format
- Twenty-four (24) frames are displayed in ESF (193E) framing format
- For E1 systems, 16 frames are displayed per multiframe

T1 Data As Real-Time Bitmap

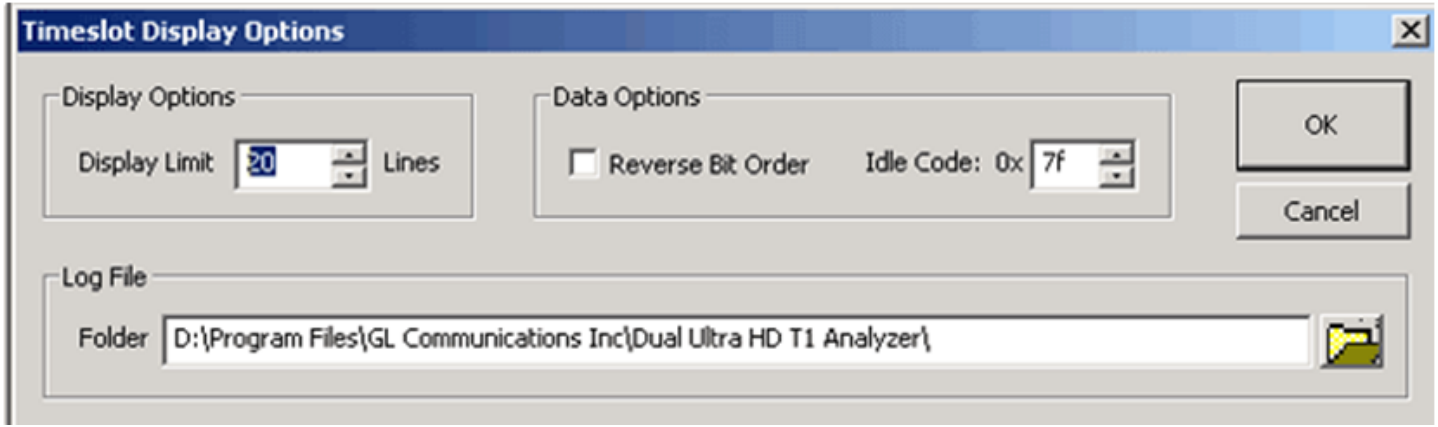
- Provides a graphical view of multi-frames and is rendered as a pixel map with zeros represented by white dots and ones represented by black dots



ASCII Timeslot Display

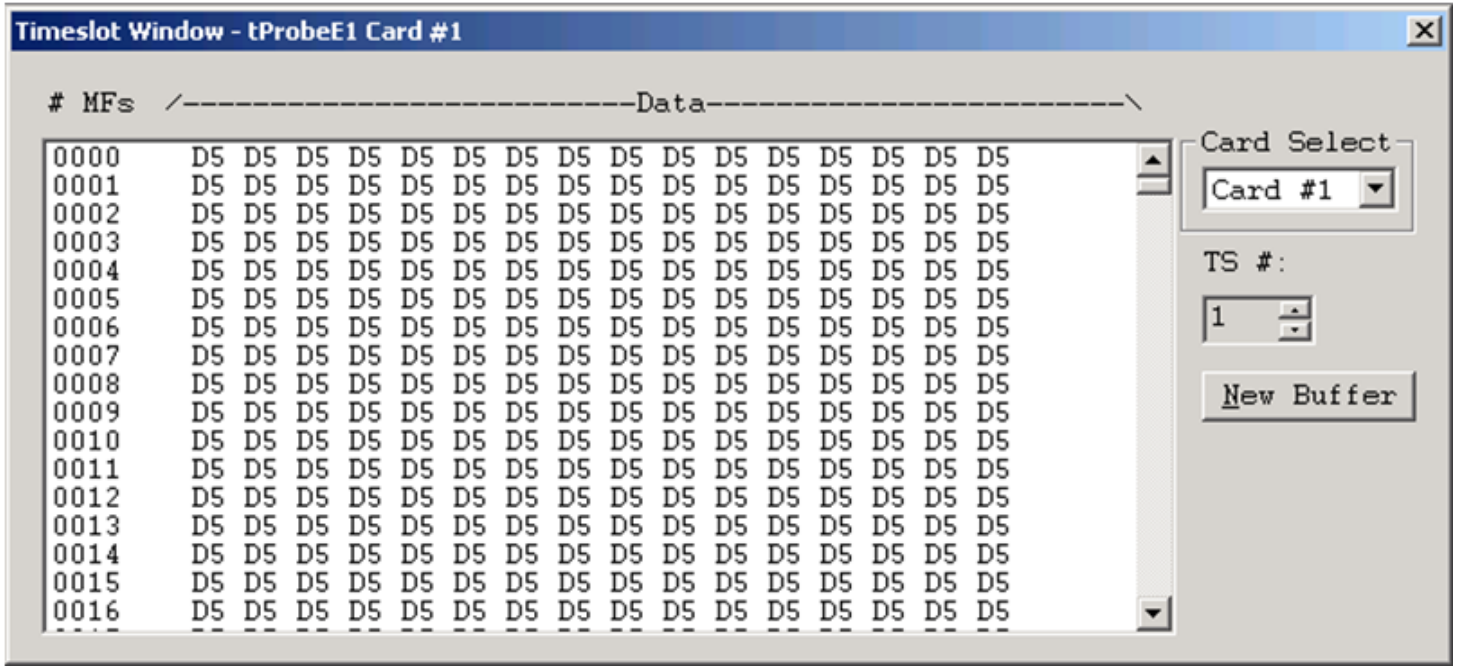


ASCII Timeslot Display (Contd.)



- 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

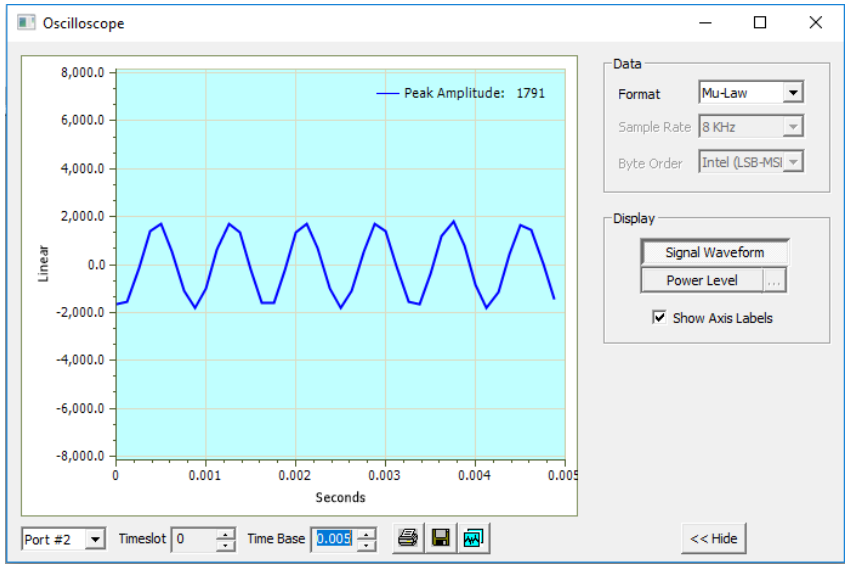
Timeslot Window



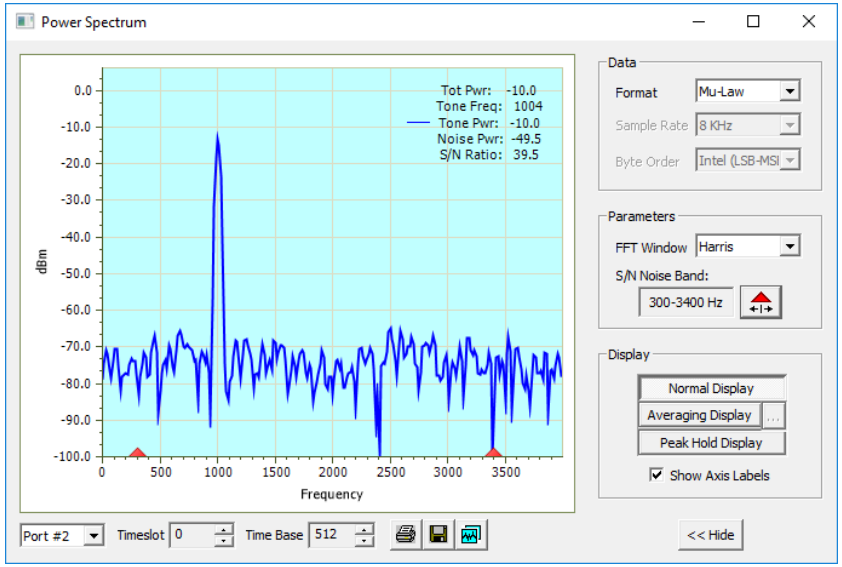
- Displays the timeslot values on a desired timeslot for one-second duration

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

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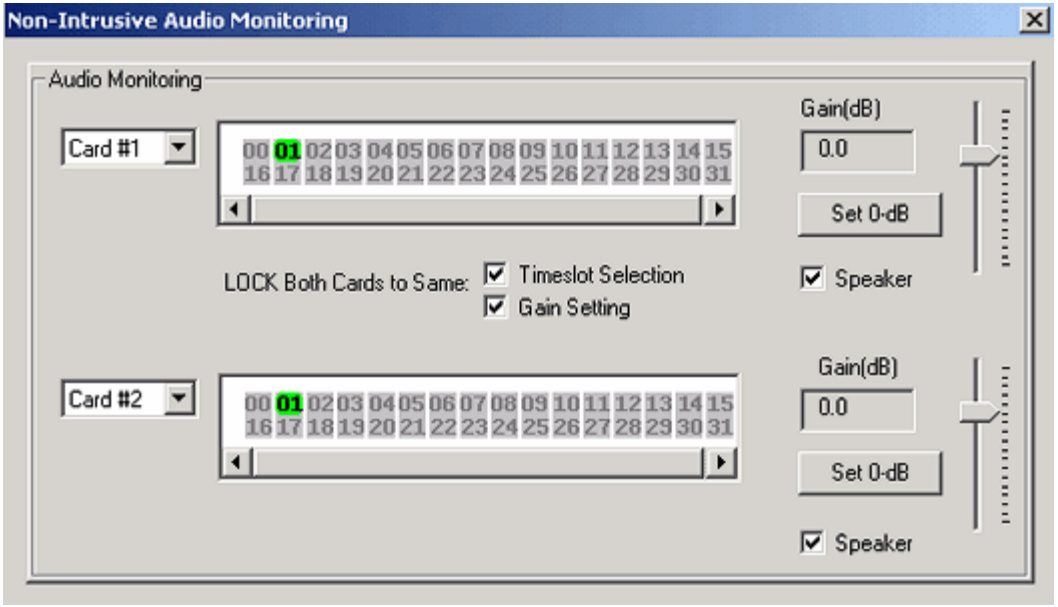
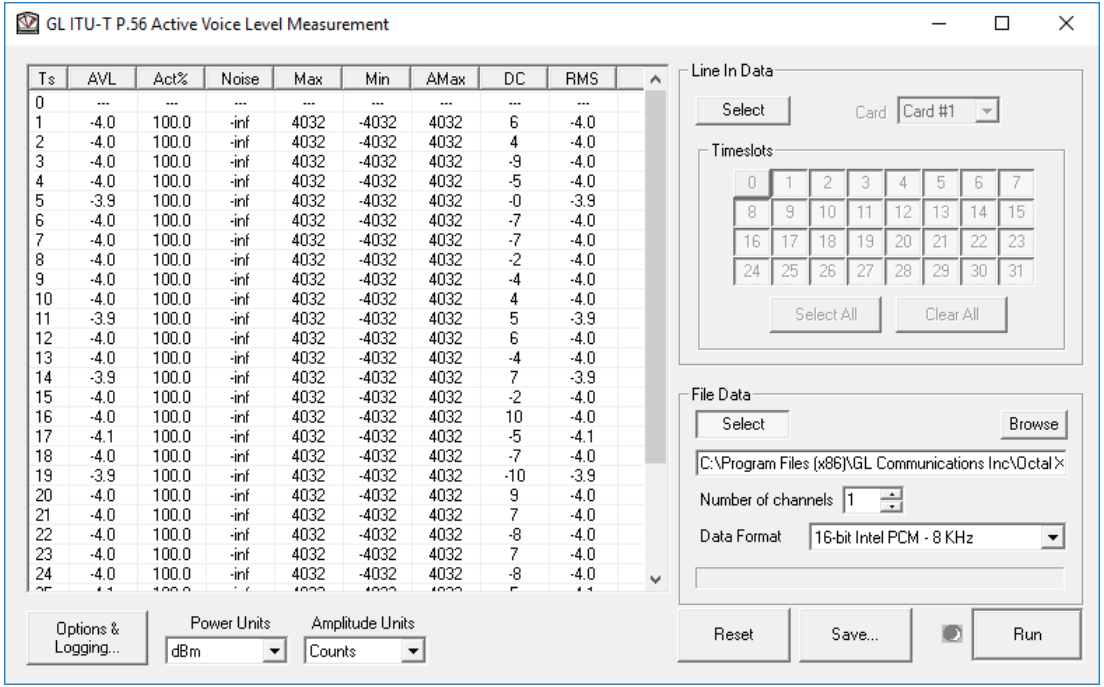
Audio Monitoring



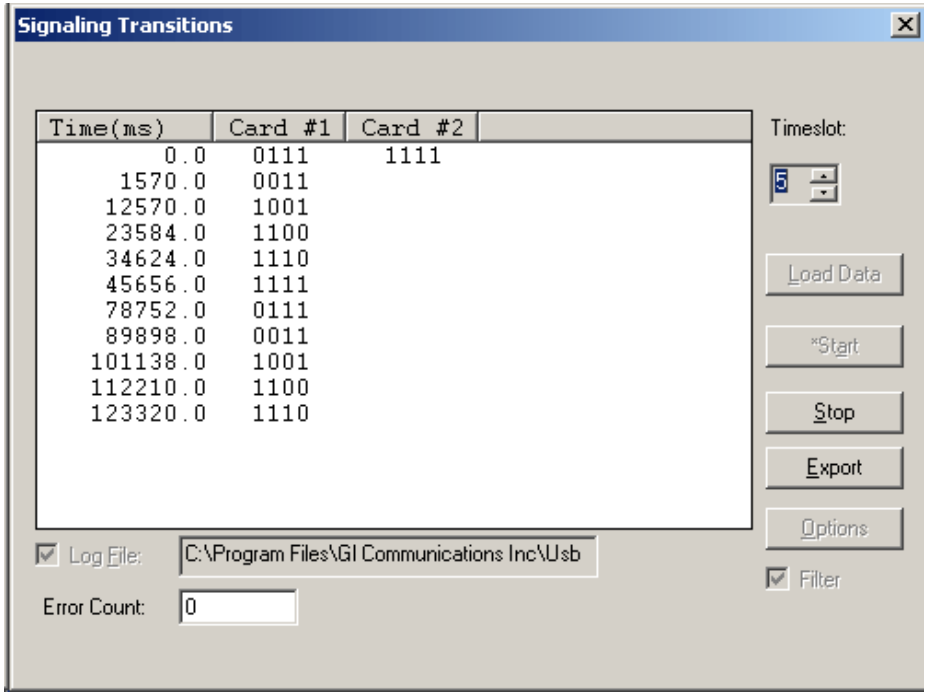
- Control audio level of VF output (speaker) of all cards connected to a PC with a single program

Active Voice Level



- 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



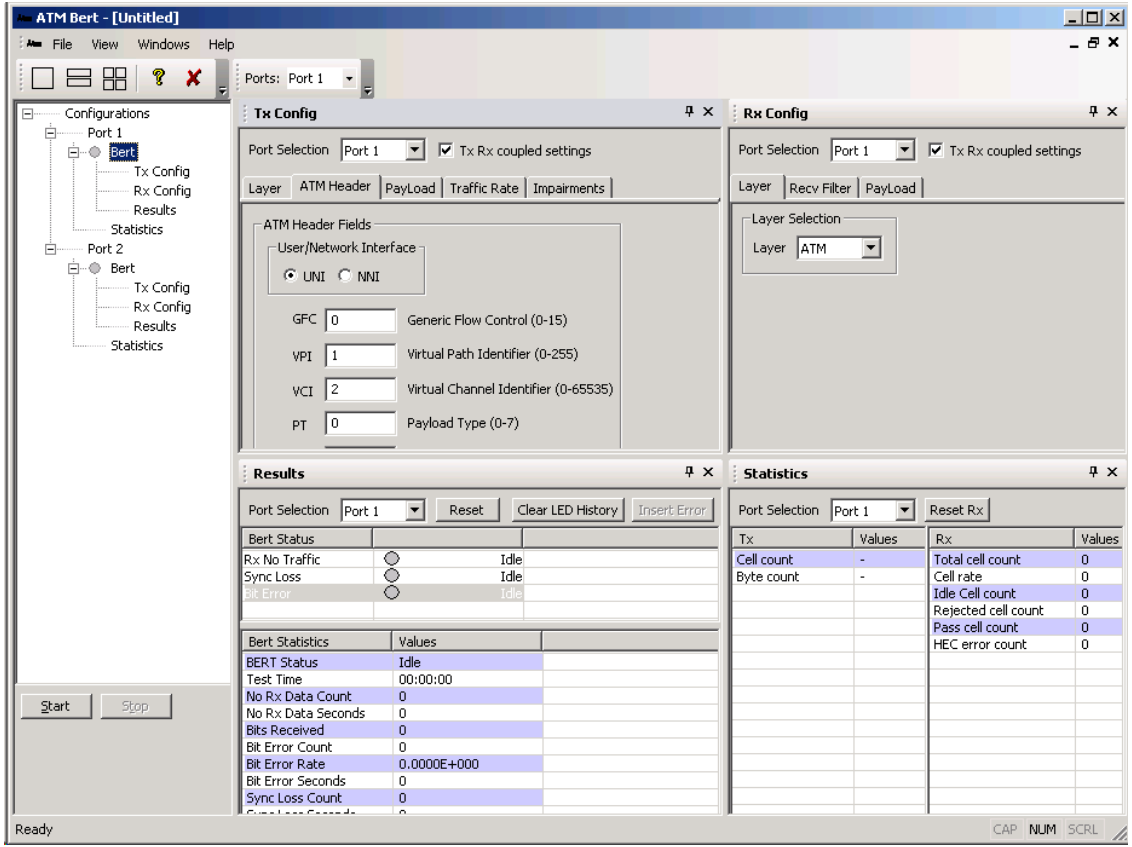
- Continuous full-duplex recording of signaling bits for any or all channels
- Permits detailed analysis of recorded signaling bits

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

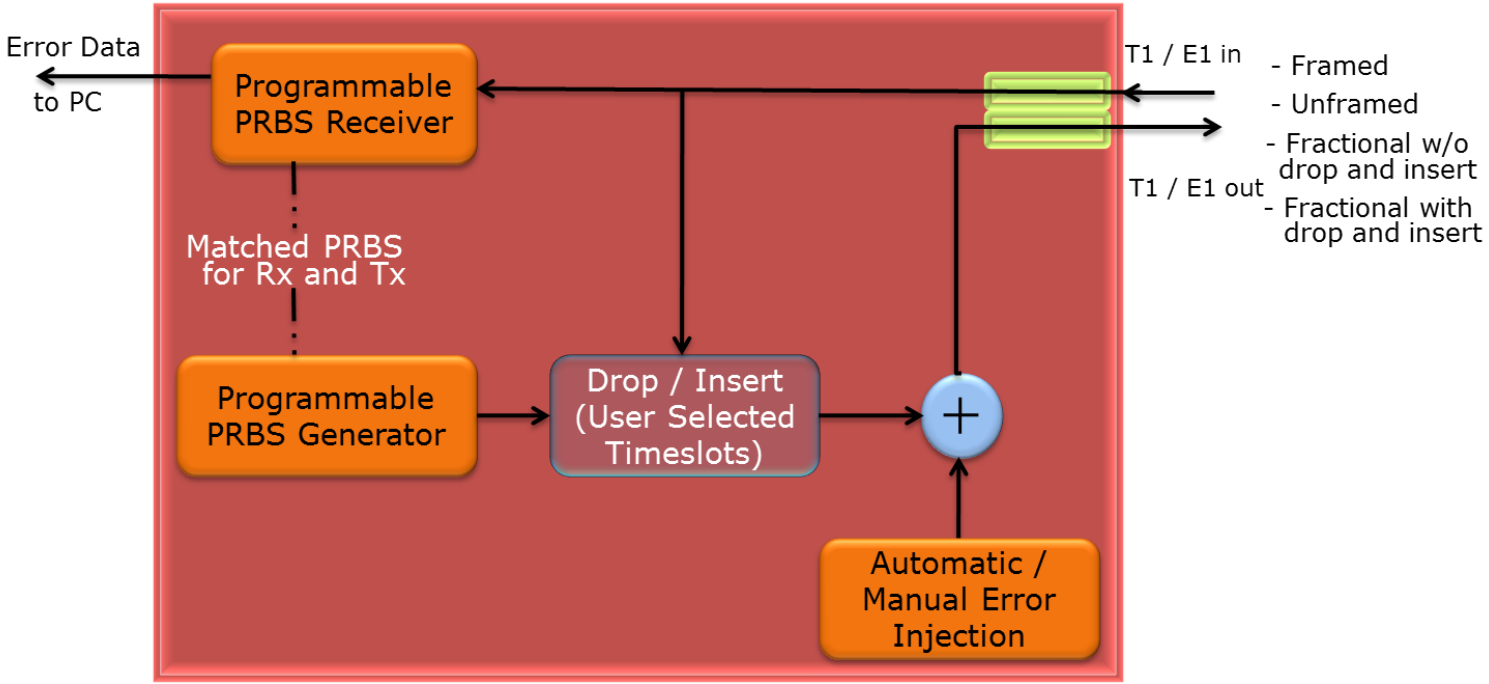

ATM Bert - [Untitled]
File View Windows Help
Ports: Port 1
Configurations
Port 1
Bert
Tx Config
Rx Config
Results
Statistics
Port 2
Bert
Tx Config
Rx Config
Results
Statistics
Start
Stop
Tx Config
Port Selection Port 1
Tx Rx coupled settings
Layer ATM Header PayLoad Traffic Rate Impairments
ATM Header 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
Port Selection Port 1
Tx Rx coupled settings
Layer Recv Filter PayLoad
Layer Selection
Layer ATM
Results
Port Selection Port 1
Reset
Clear LED History
Insert Error
Bert Status
Rx No Traffic Idle
Sync Loss Idle
Bit Error Idle
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
Port Selection Port 1
Reset Rx
Tx Values
Cell count -
Byte count -
Rx Values
Total cell count 0
Cell rate 0
Idle Cell count 0
Rejected cell count 0
Pass cell count 0
HEC error count 0
Ready
CAP NUM SCRL

ATM BERT

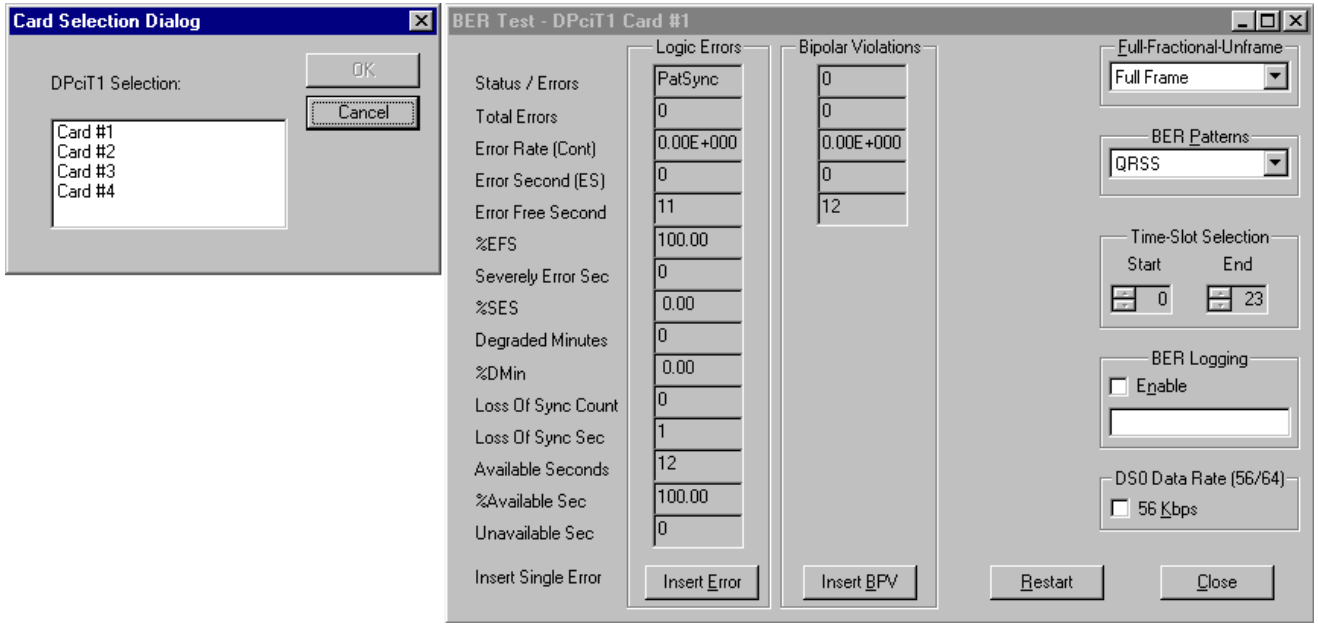
- User-defined header configuration supported
- User-defined traffic rate to the accuracy of 0.001% of total bandwidth
- Payload configuration to different PRBS patterns, All one's, All zero's, alternate 1's and 0's, or user defined pattern. 1:1, 1:7, user-defined pattern length can be 2 to 32 bits in 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



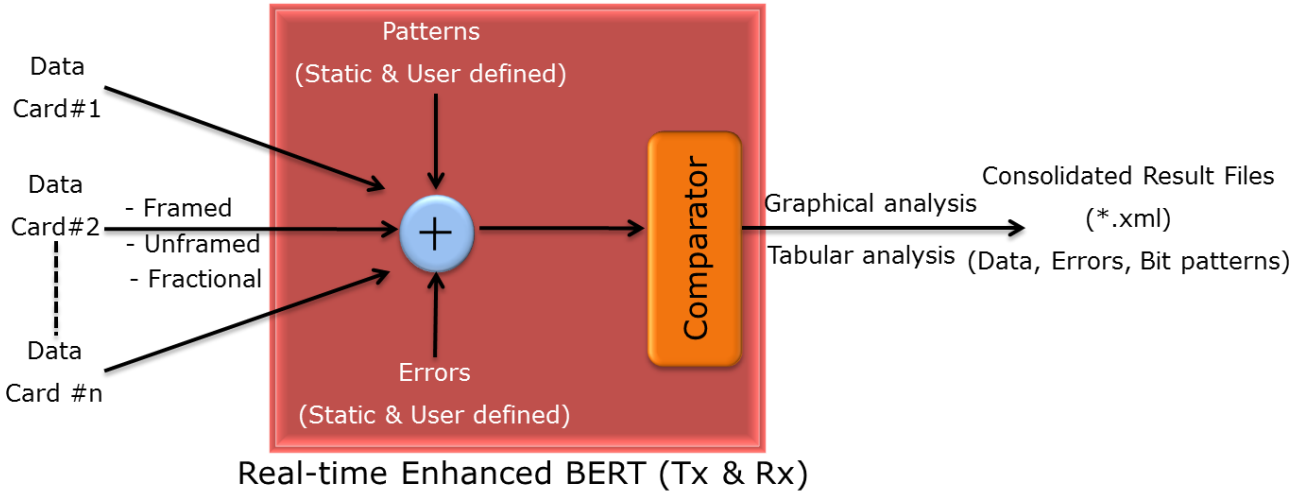
Bit Error Rate Tester (Contd.)



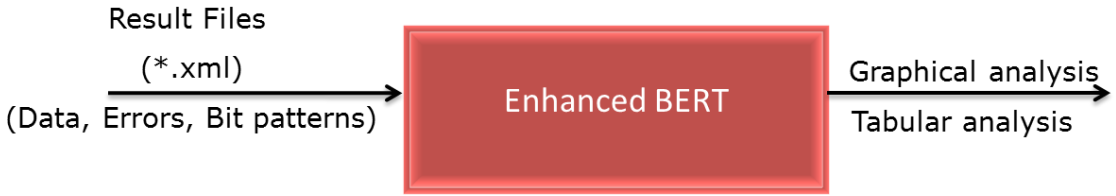
- Measure the correctness of data received on E1 lines
- Test Full / Fractional / Framed / Unframed bits with drop and insert
- Variety of standard data patterns are available for test purposes including static patterns

Enhanced BER Testing

Intrusive Tests



Real-time Enhanced BERT (Tx & Rx)



Offline Enhanced BERT

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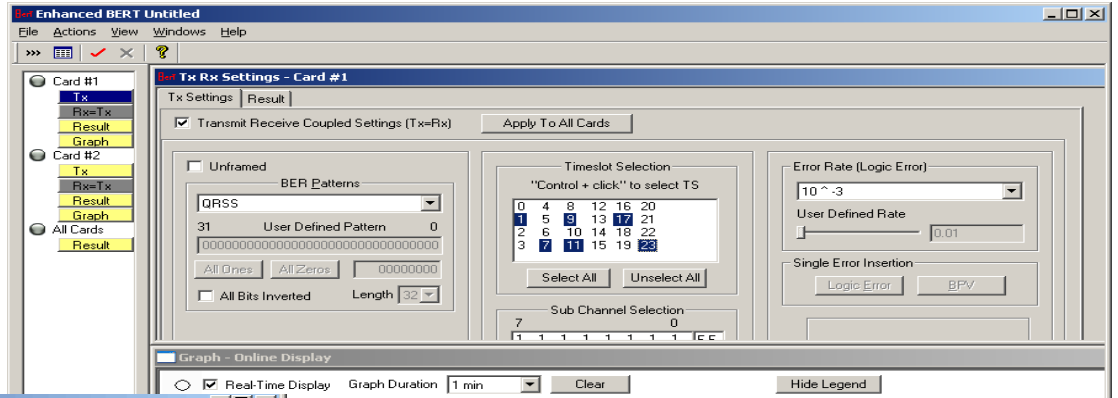
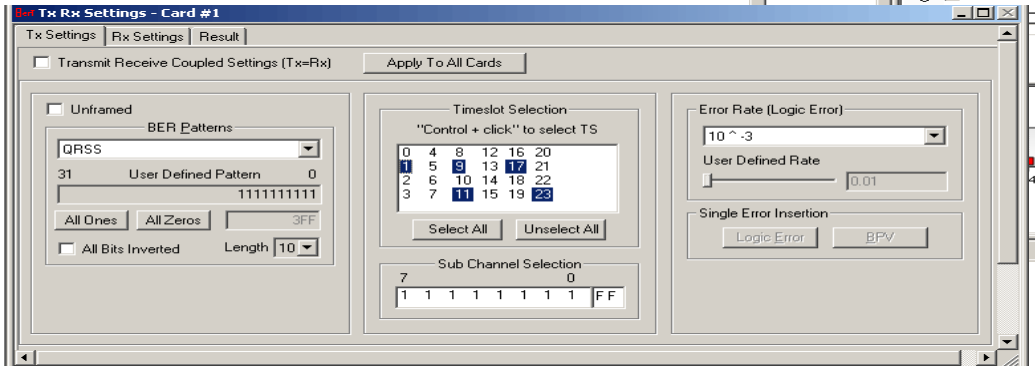
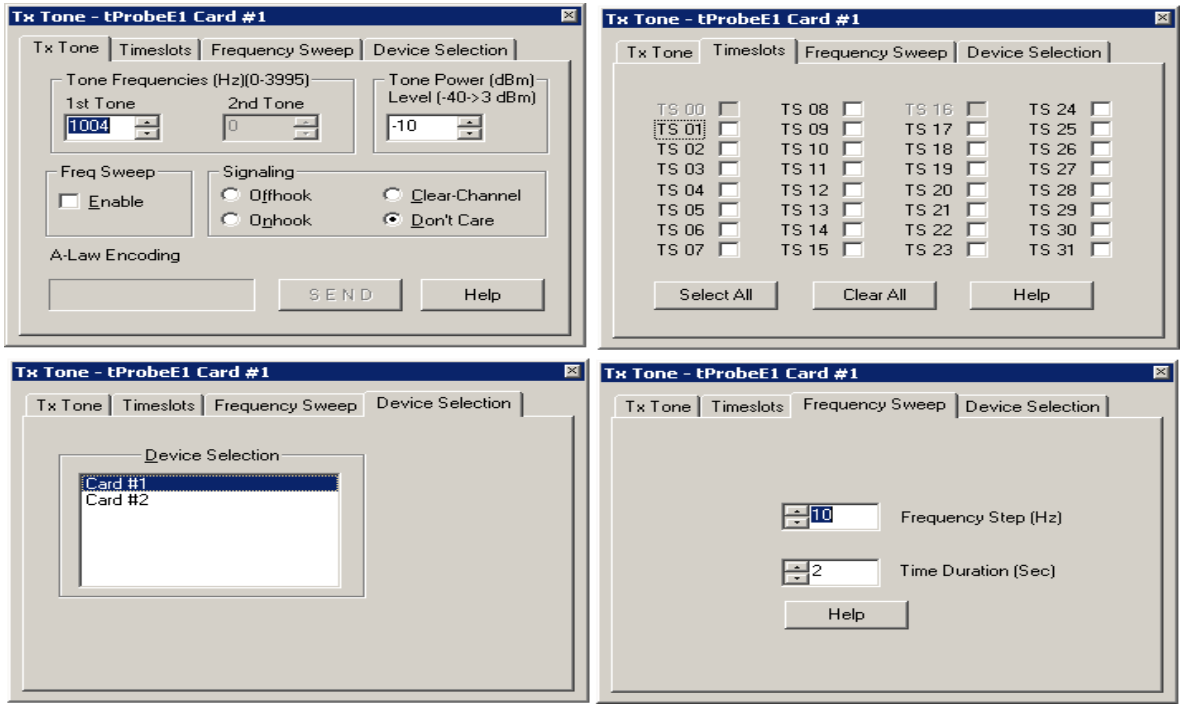
Enhanced BER Testing (Contd.)

- 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)



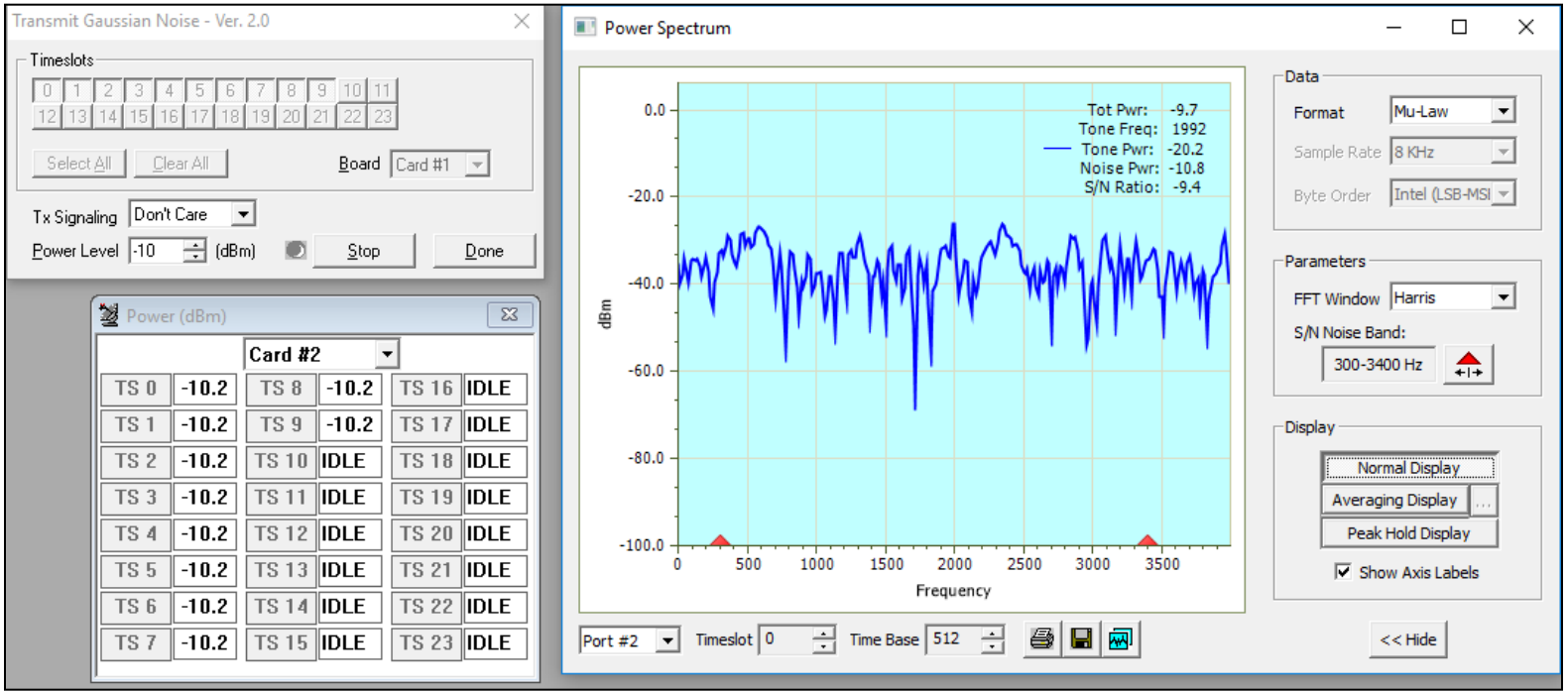


Transmit Tones



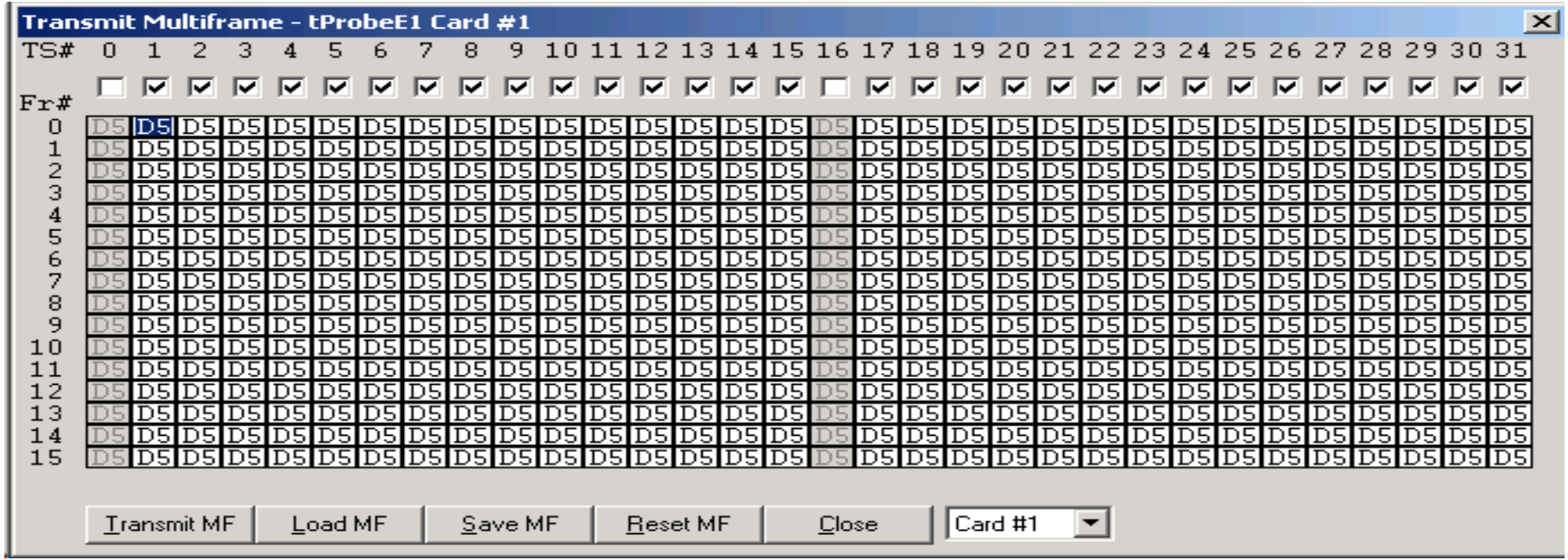
- Transmit Tones into any or all timeslots with frequency and power level control

Transmit Gaussian Noise



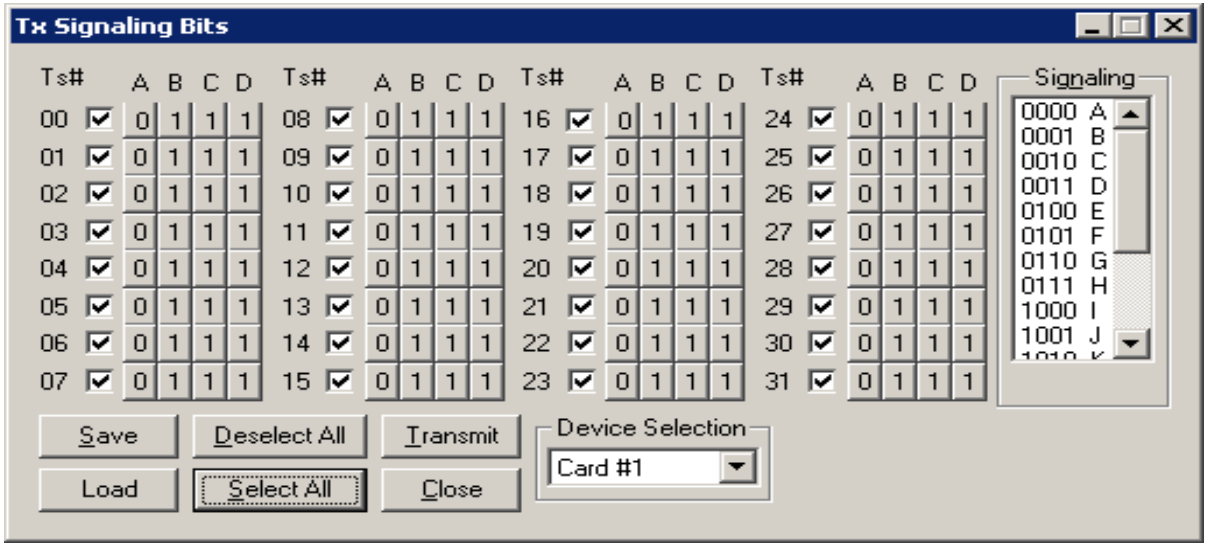
- Transmit Gaussian Noise into any or all timeslots with frequency and power level control

Transmit Multiframe



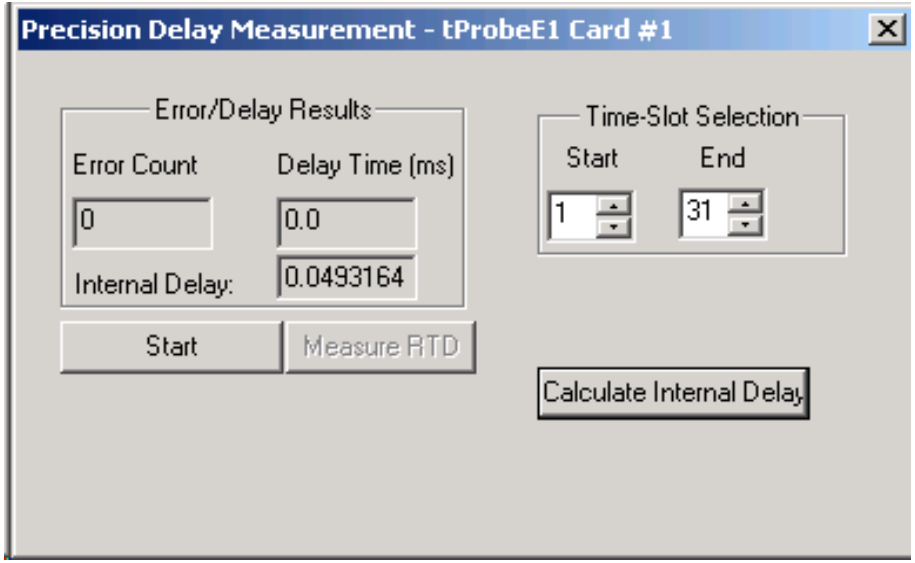
- Transmit user-defined multi frames on one or more timeslots

Transmit Signaling Bits



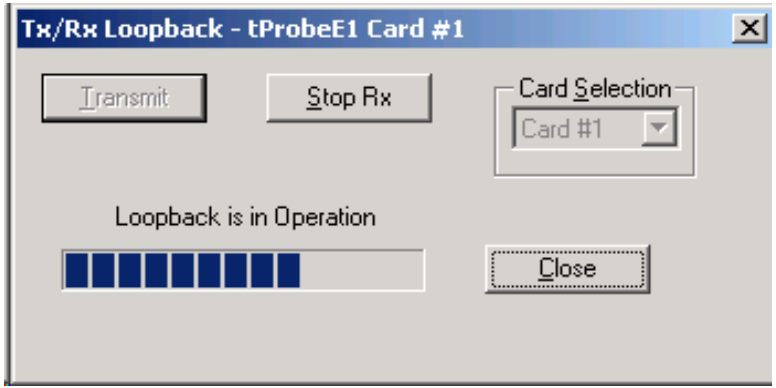
- Transmit user-defined signaling bits on one or more timeslots

Precision Delay Measurement



- 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 Multiframes
  - ➢ 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

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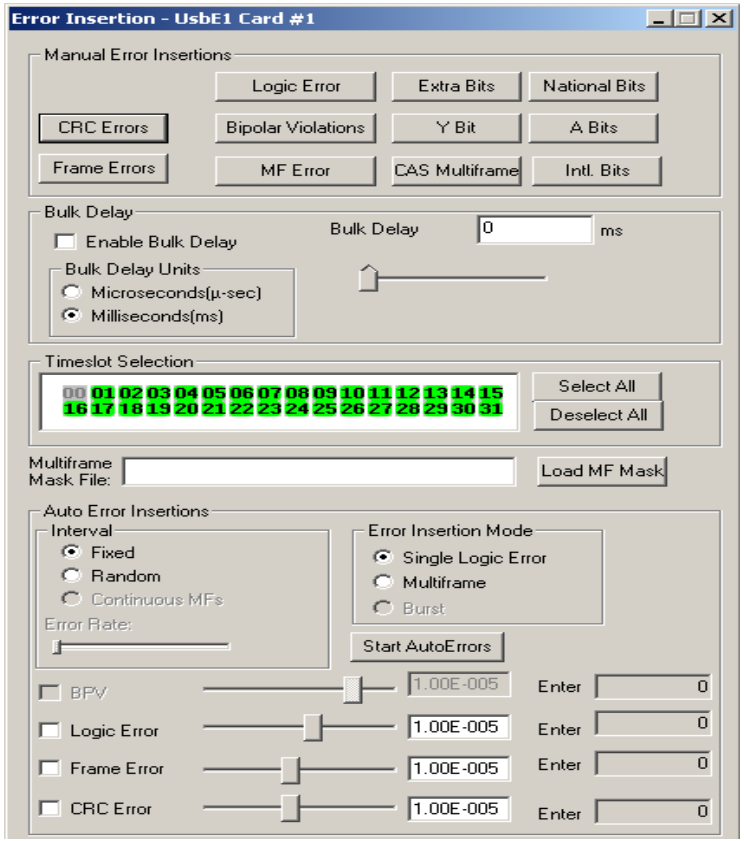
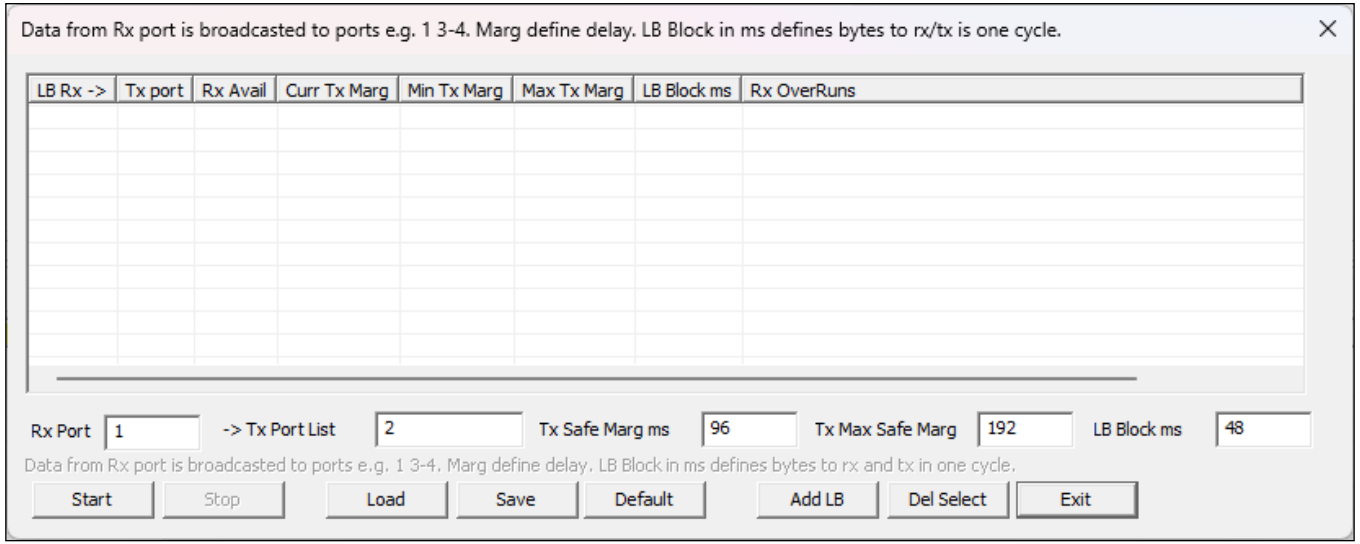


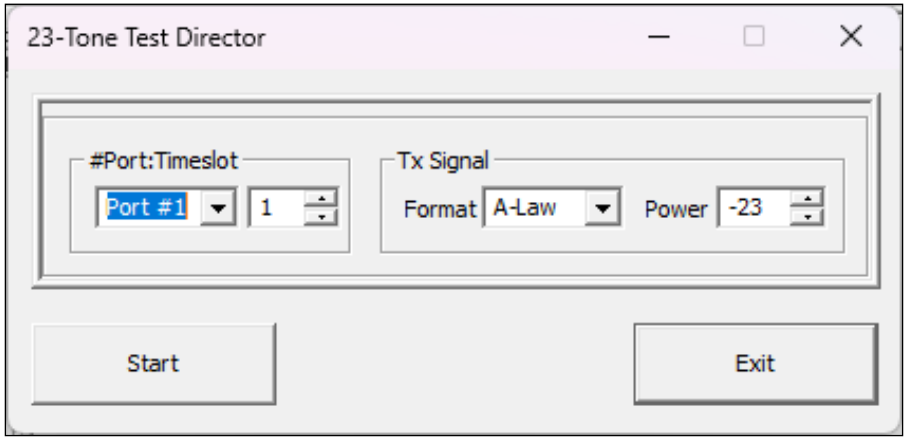
Precision Loopback, Broadcast

- 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



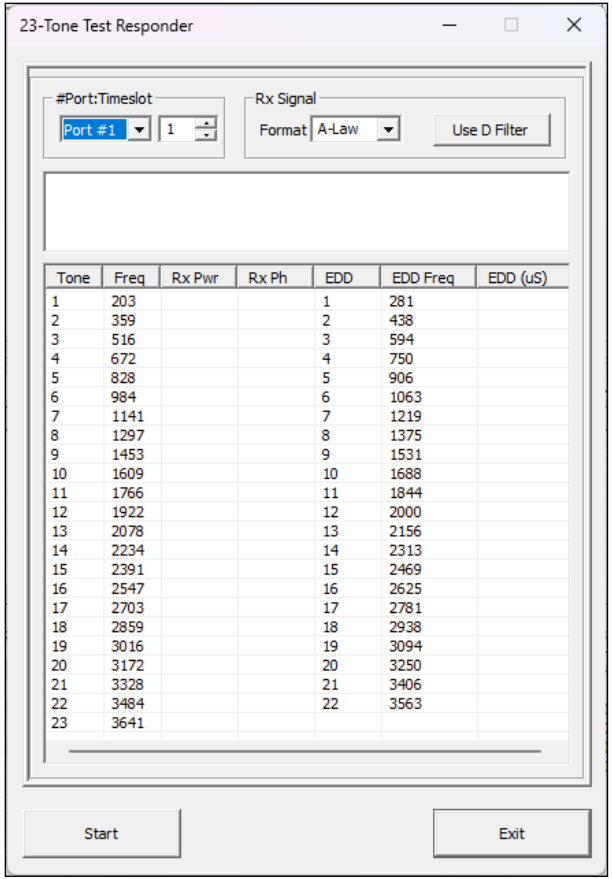
23-Tone Test - Director (Tx)

- 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

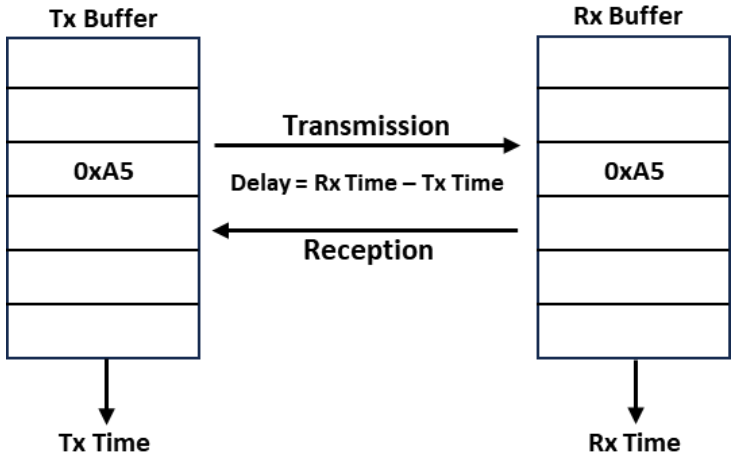


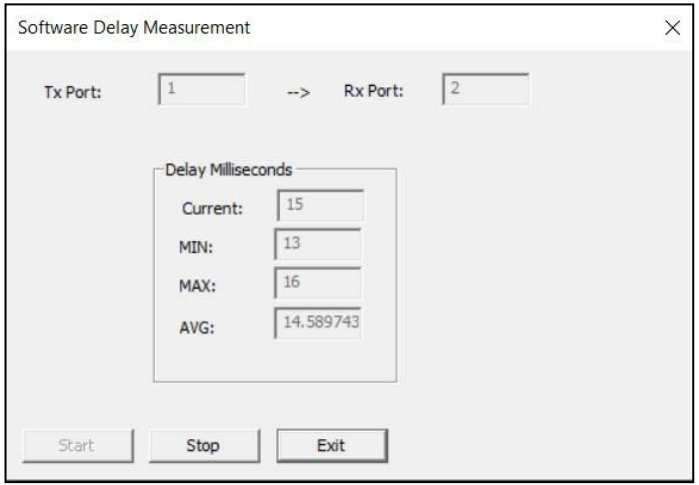
Tone	Freq	Rx Pwr	Rx Ph	EDD	EDD Freq	EDD (uS)
1	203			1	281	
2	359			2	438	
3	516			3	594	
4	672			4	750	
5	828			5	906	
6	984			6	1063	
7	1141			7	1219	
8	1297			8	1375	
9	1453			9	1531	
10	1609			10	1688	
11	1766			11	1844	
12	1922			12	2000	
13	2078			13	2156	
14	2234			14	2313	
15	2391			15	2469	
16	2547			16	2625	
17	2703			17	2781	
18	2859			18	2938	
19	3016			19	3094	
20	3172			20	3250	
21	3328			21	3406	
22	3484			22	3563	
23	3641					

GL Communications

Software Delay Measurement

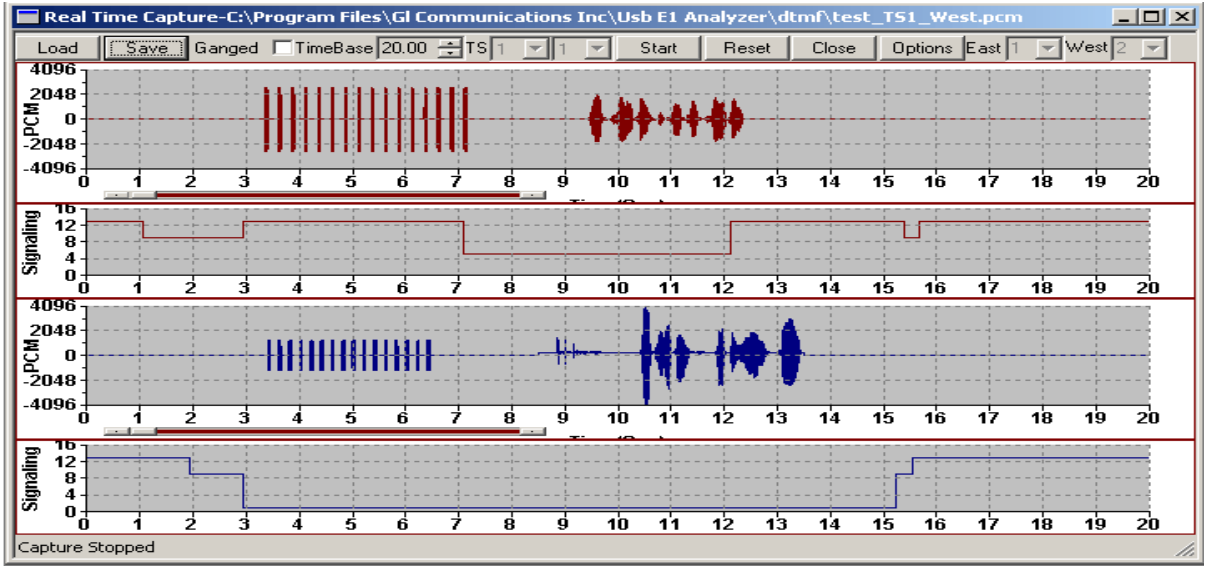
- Operates with both hardware-based and software-based T1 E1 analyzers
- Measures delay using the precise computer timestamp at Tx and Rx ports
- A special byte mark is inserted in the Tx buffer and tracked at the Rx buffer
- Helps analyze transmission delay across communication paths
- Maximum measurable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





Real-time Stripchart

Stripchart GUI

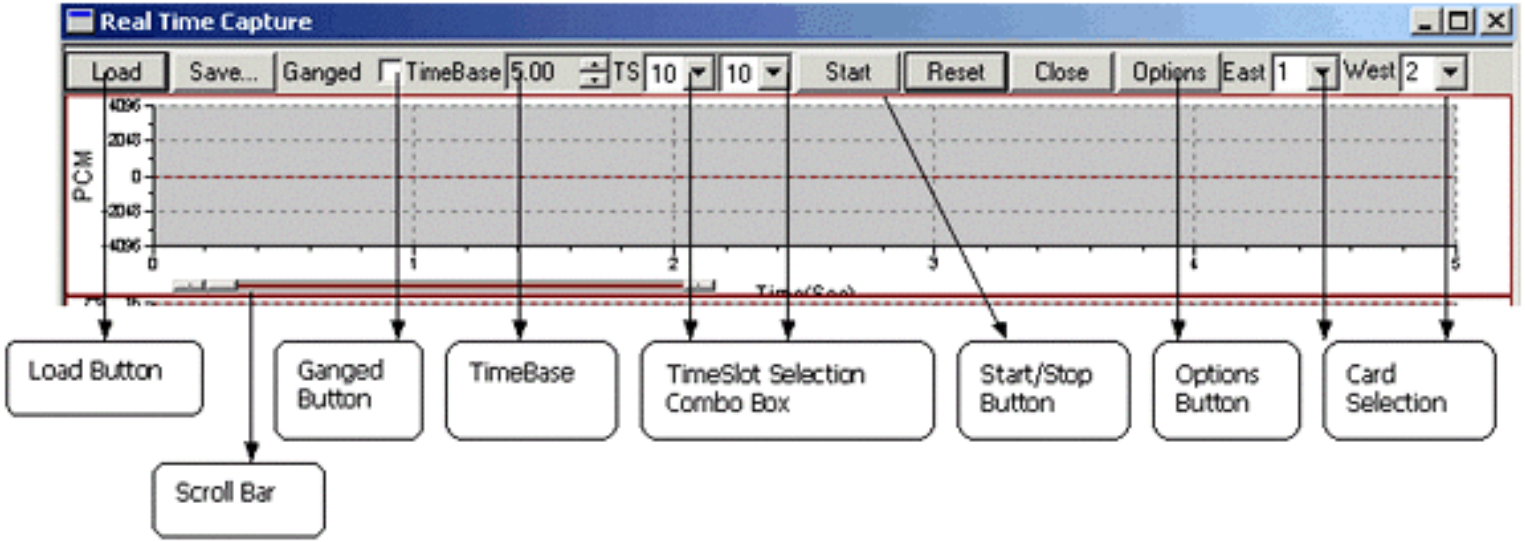


- Real-time Stripchart application is optional software for analysis of CAS signaling with GL Communications' T1 E1 analyzers
- Stripchart application enables non-intrusive capturing of PCM data and signaling, and subsequent plotting of the same onto a strip chart format

Main Features

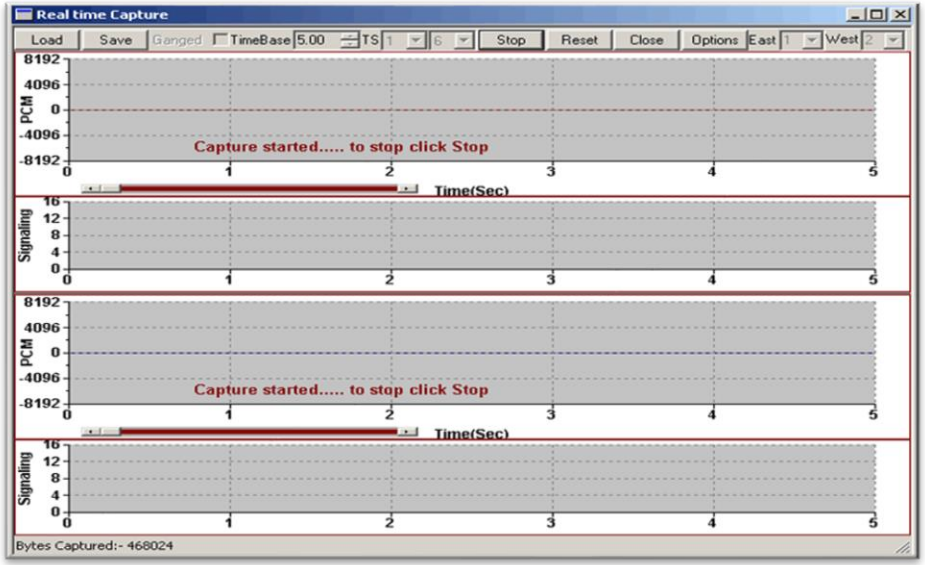
- Supports Real-time capturing and off-line analysis of PCM Data as well as Signaling
- View data graphically with exact transitions of signals with time
- Ability to capture PCM and signaling data on any of the-specified time slots
- Grid based Canvas / Background display enabling ease of locating / 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



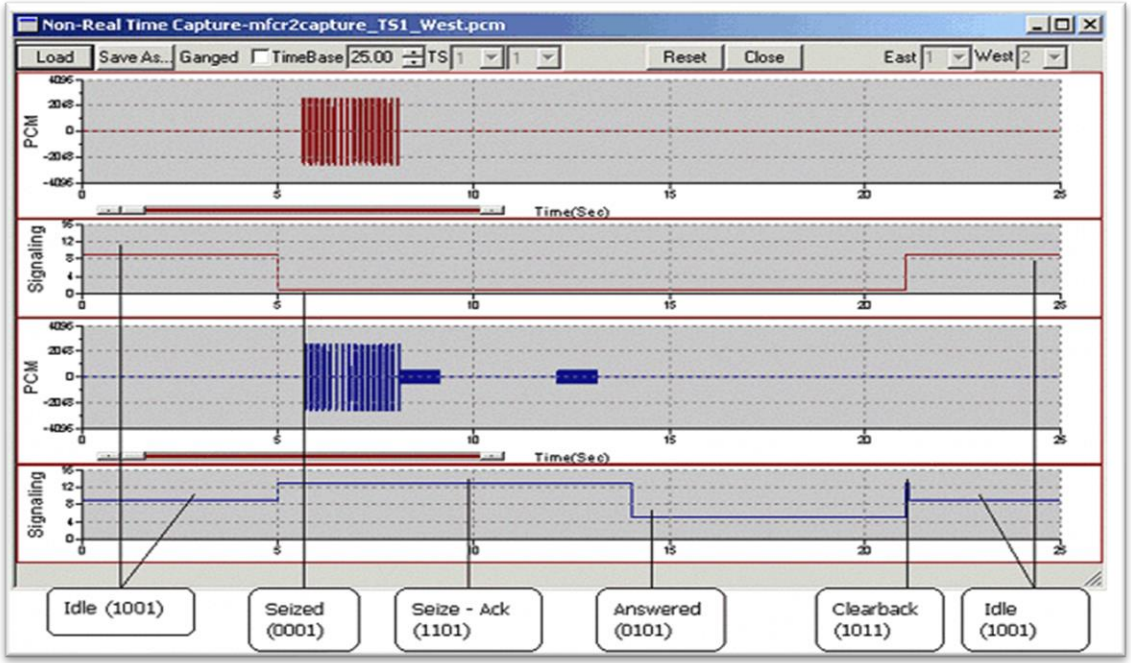
- This application works with T1 E1 analyzer hardware
- At any given point of time, data (PCM and Signaling) can be captured from a maximum of any two T1 E1 ports

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

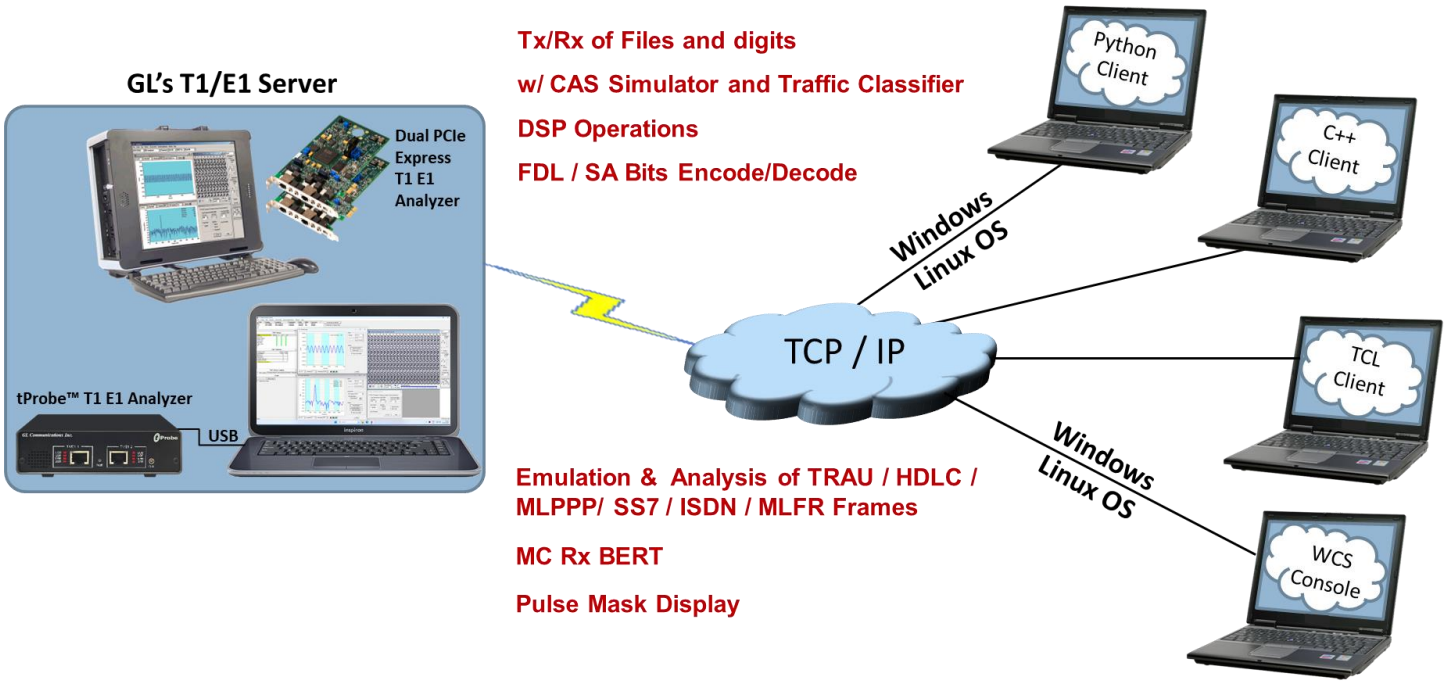
Off-line Viewing



- 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)

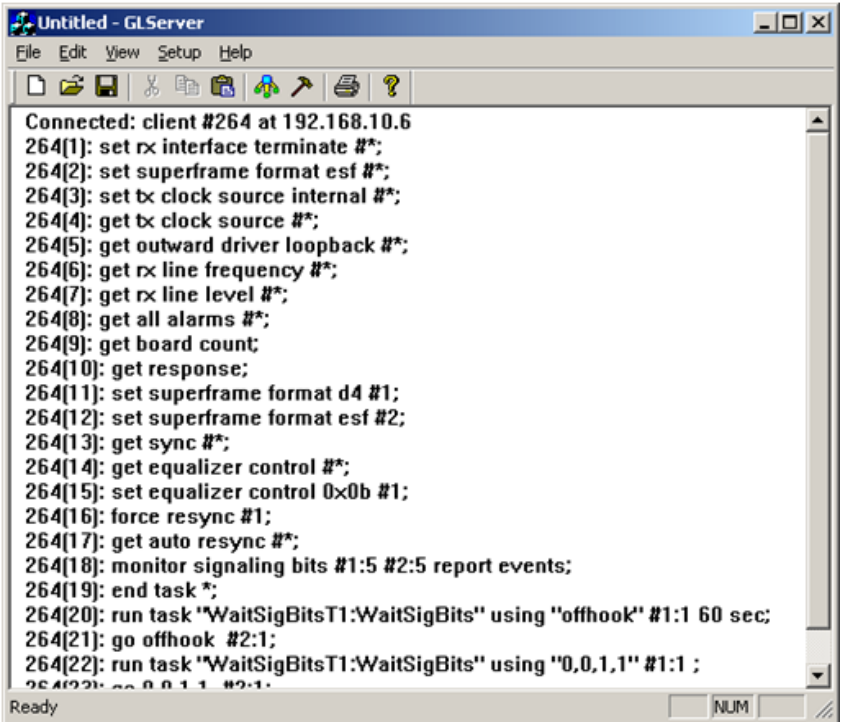
Windows Client Server



- 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



GL Communications

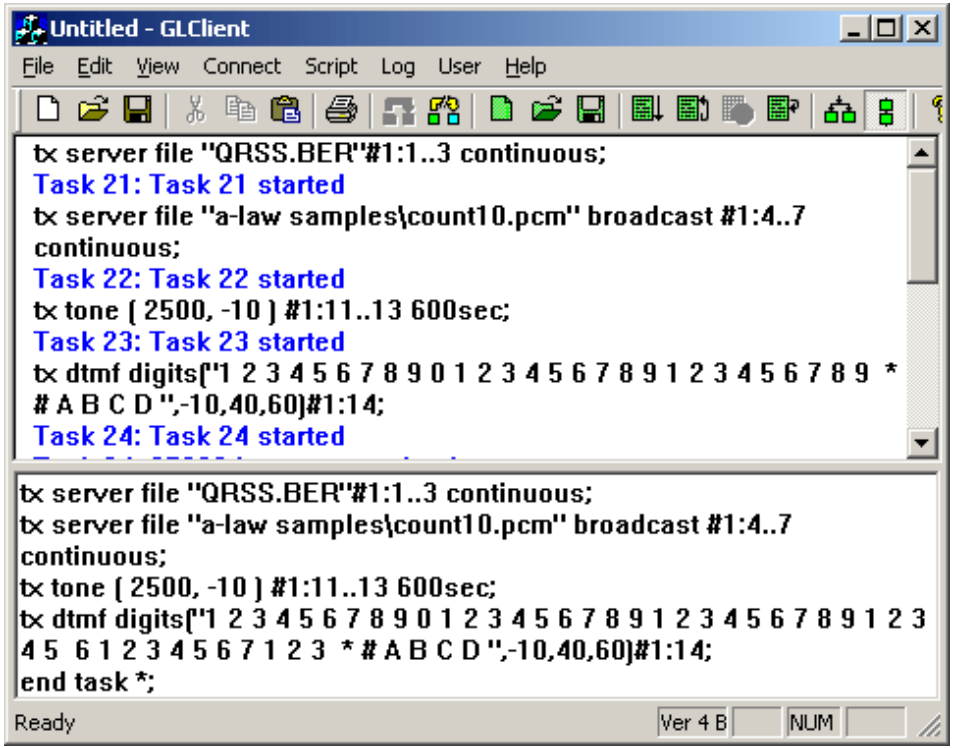
Applications

- 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

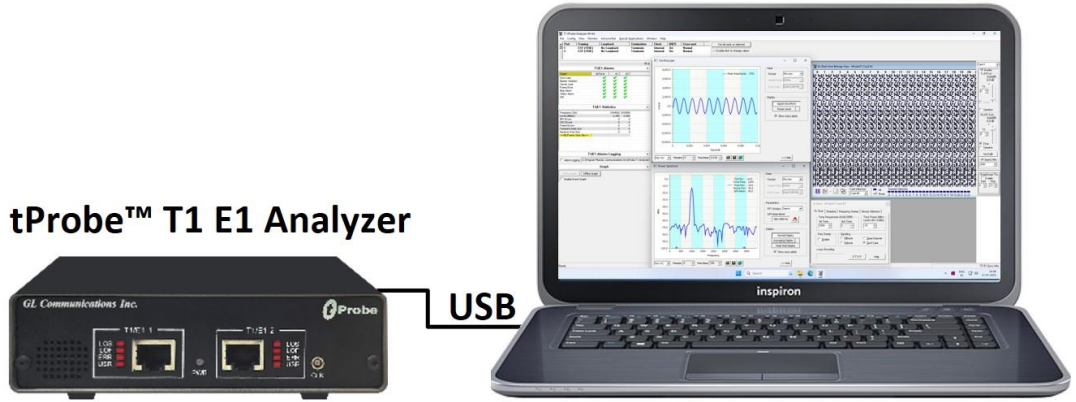
Features

- 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 Framerelay) 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

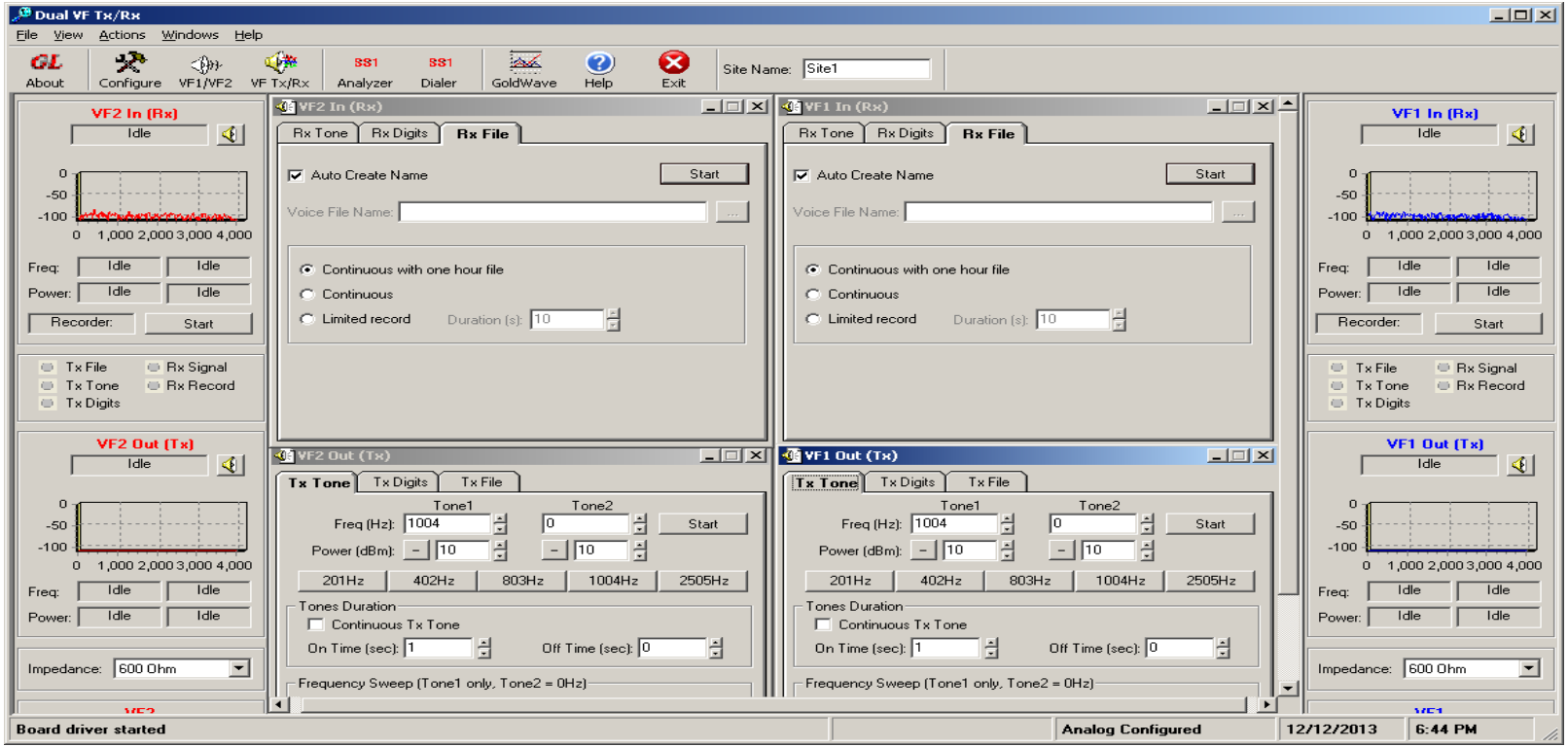


Dual VF Tx Rx



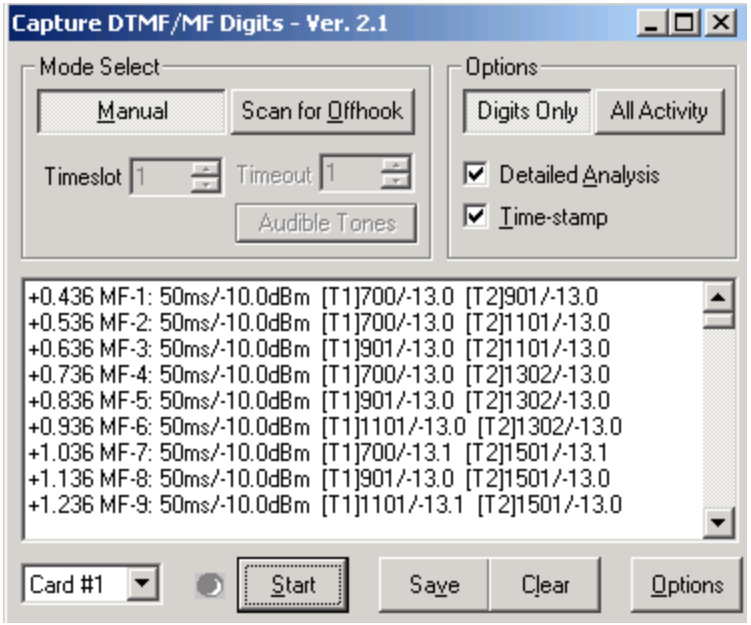
- Bantam Interface Connectivity for VF- Inputs and VF- Outputs
- Support two VF interfaces per card
- Each VF interface supports independent Tx/Rx
- Multiple cards supported per system
- Mode 1: VF1 (Tx/Rx) and VF2 (Tx/Rx)
- Mode 2: VF Tx and VF Rx

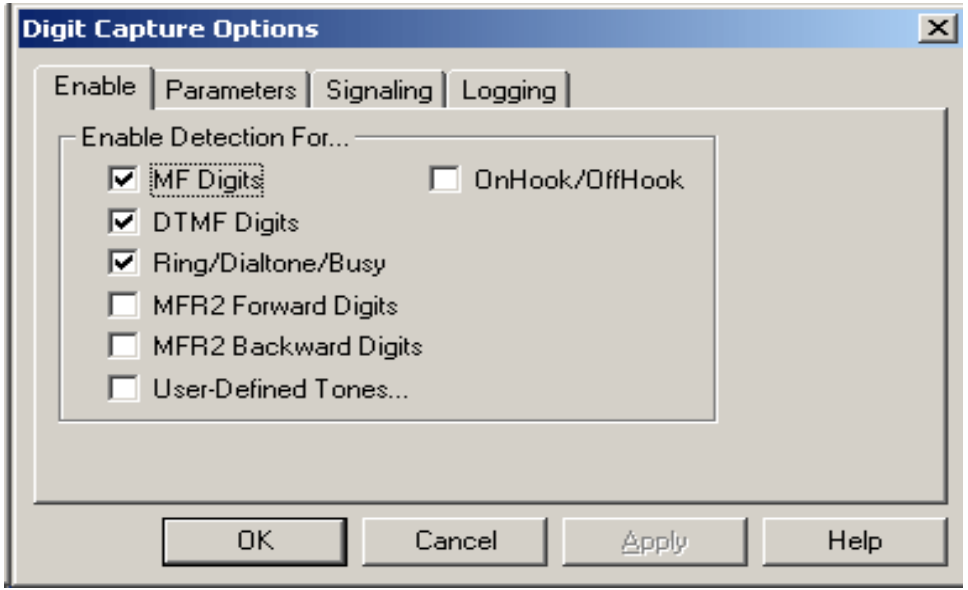
Dual VF Tx Rx GUI



Transmit and Capture Digits

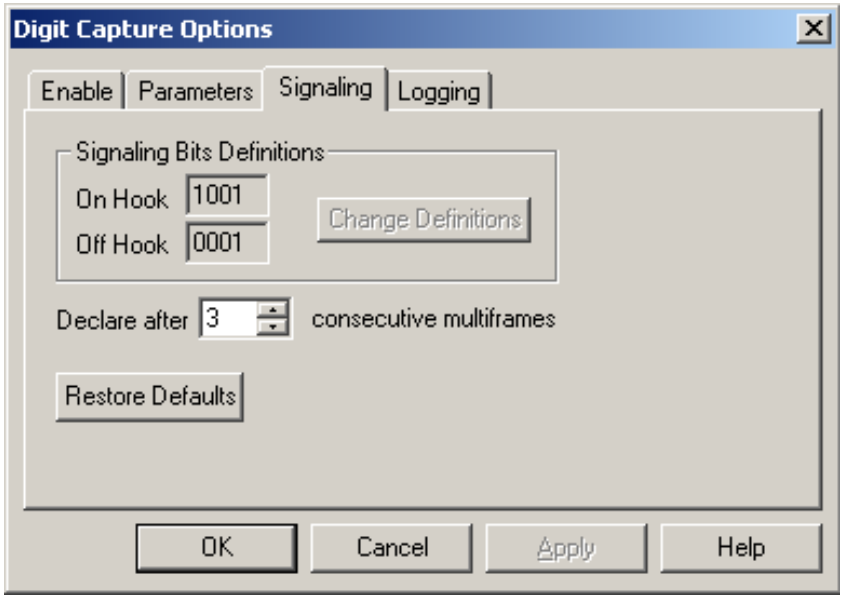
Capture Dialed Digits

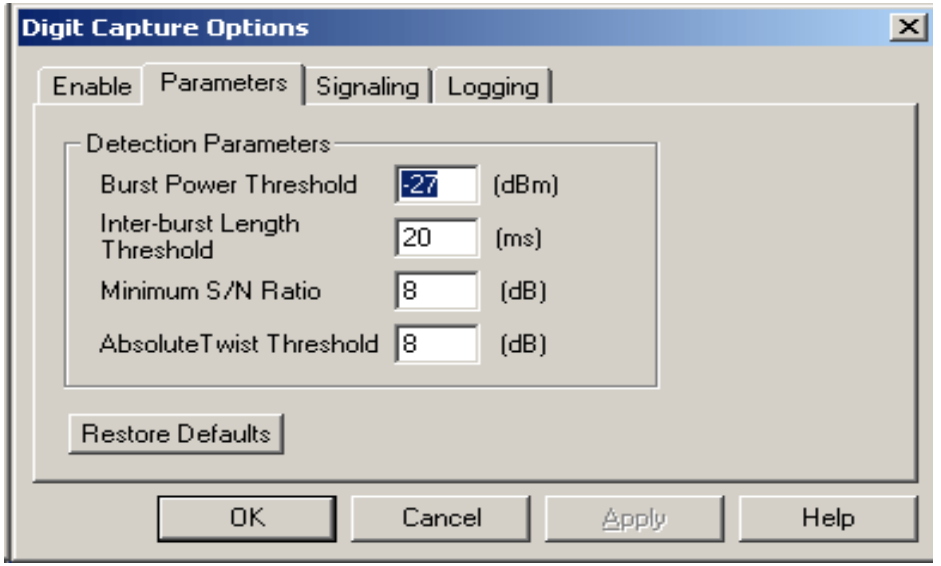




- Capture and display DTMF, MF, and User-defined tones

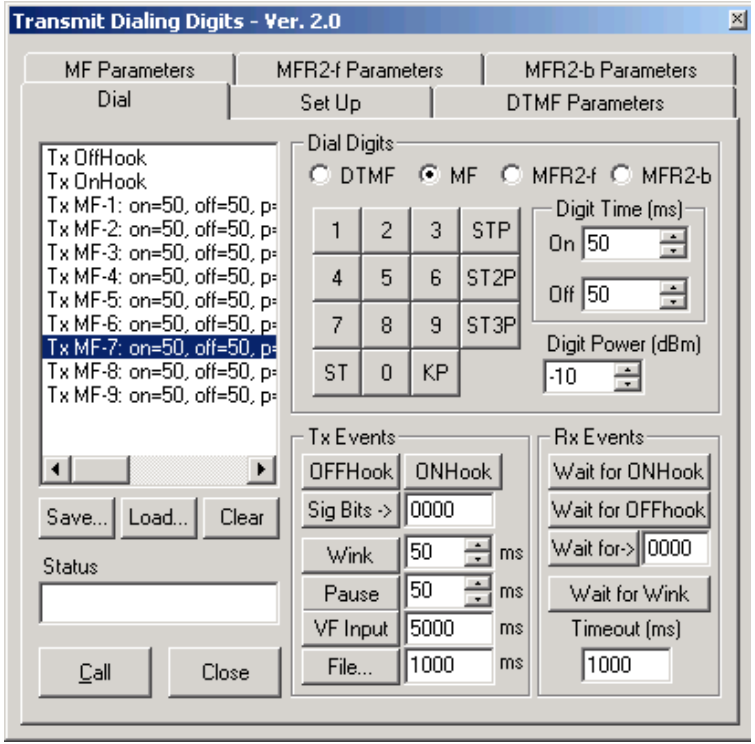
Parameters and Signaling





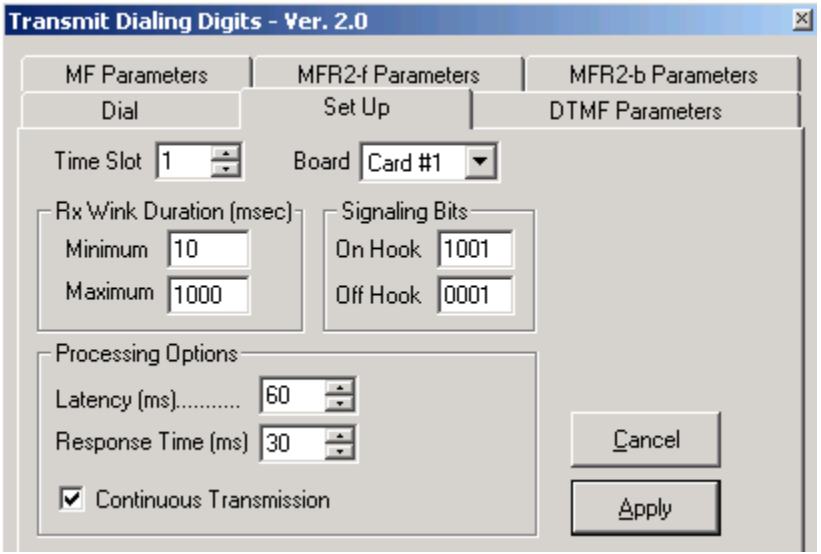
- Multiple instances of the application may be invoked, each with different operating modes and options

Transmit Dialing Digits



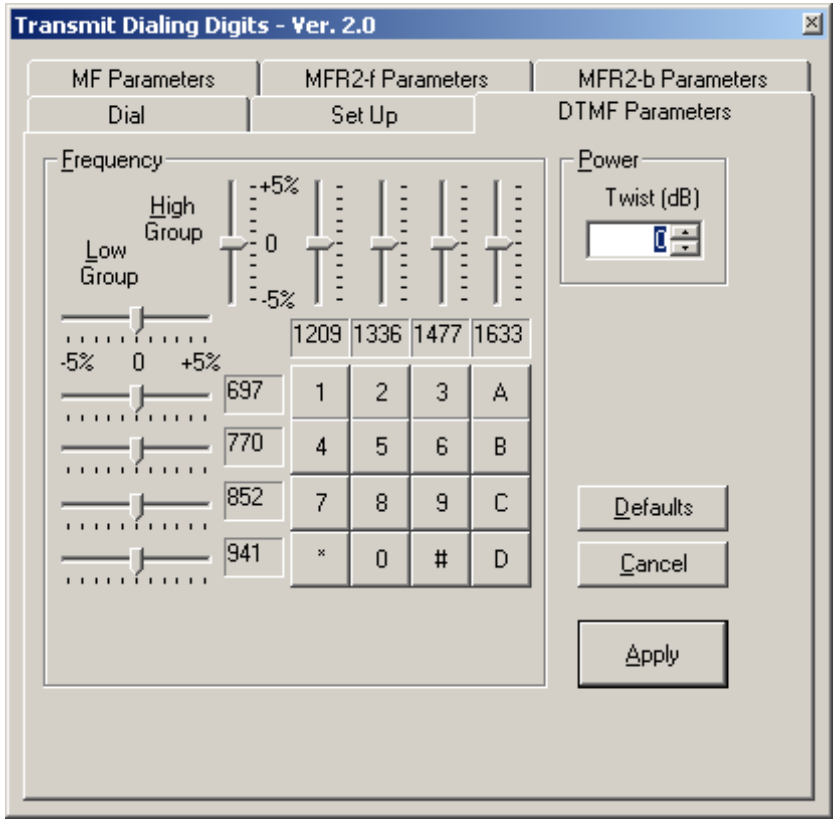
- Transmit DTMF, MF, MFR2-f, and MFR2-b digits, signal data from external files or from the GL boards VF input

Setup



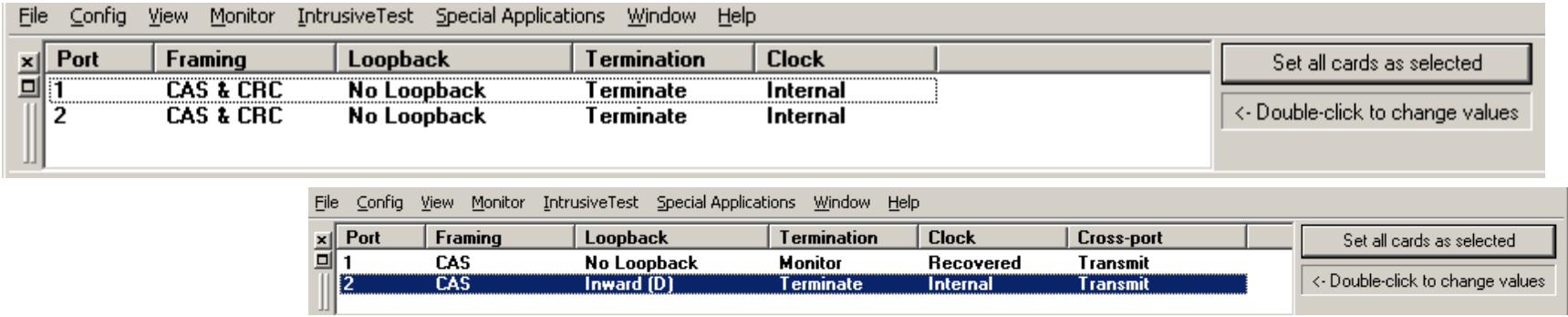
- Select time slots and the card on which the user can transmit
- Define signaling bits, along with the maximum and minimum Rx wink duration (time within which a wink should occur from the other end)
- Set processing modes for latency and/or continuous execution of the built script

DTMF/MF Parameters



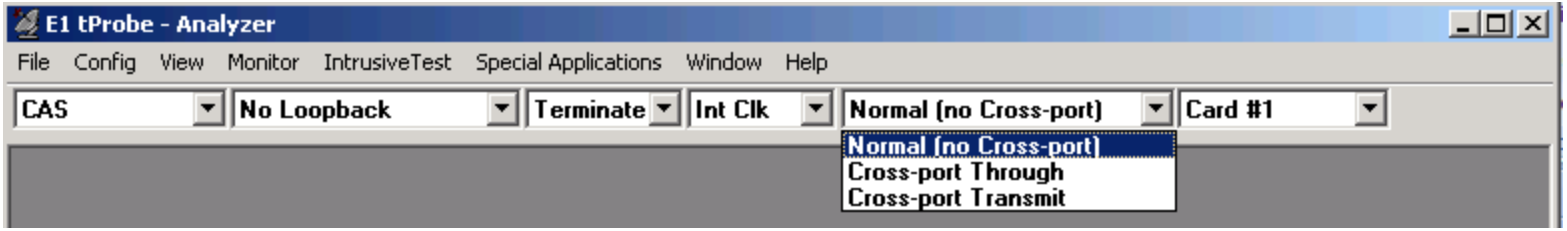
Card Settings Across Different Platforms

Card settings for USB T1 E1 Analyzer



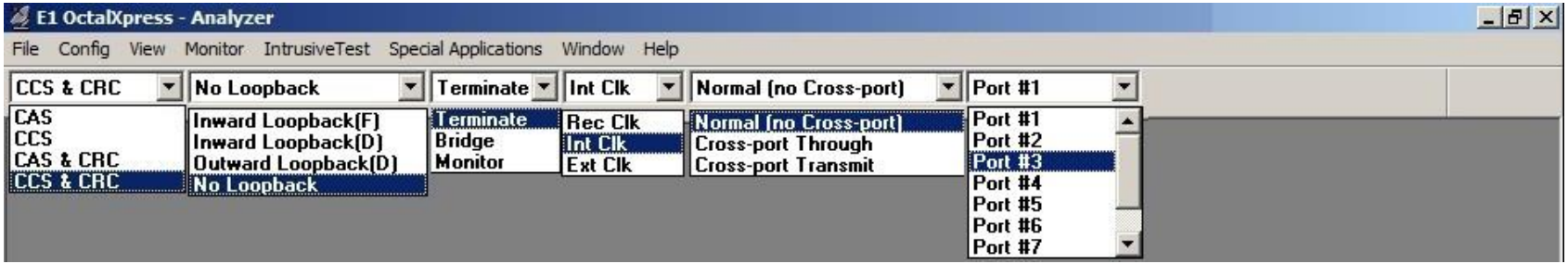
- Loopback options
  - Inward, Outward, No Loopback conditions
- Connection Options: Terminate, Bridge, Monitor
  - Input signal (the signal connected to the "T1 E1 In" jack) may be terminated using impedance, monitored, or bridged depending on user requirements
- Clock options: Internal, External, and 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

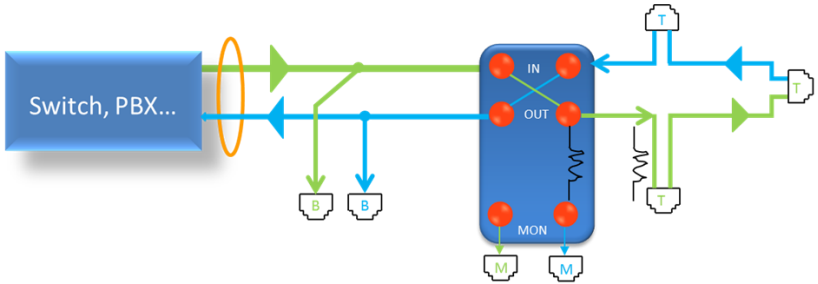


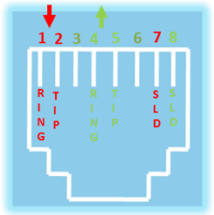
- Loopback options
  - ➢ Inward, Outward, No Loopback, Cross-port Through, and Cross-port Transmit Mode Loopback conditions
- Connection Options: Terminate, Bridge, Monitor
  - ➢ Input signal (the signal connected to the "T1 E1 In" jack) may be terminated using impedance, monitored, or bridged depending 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

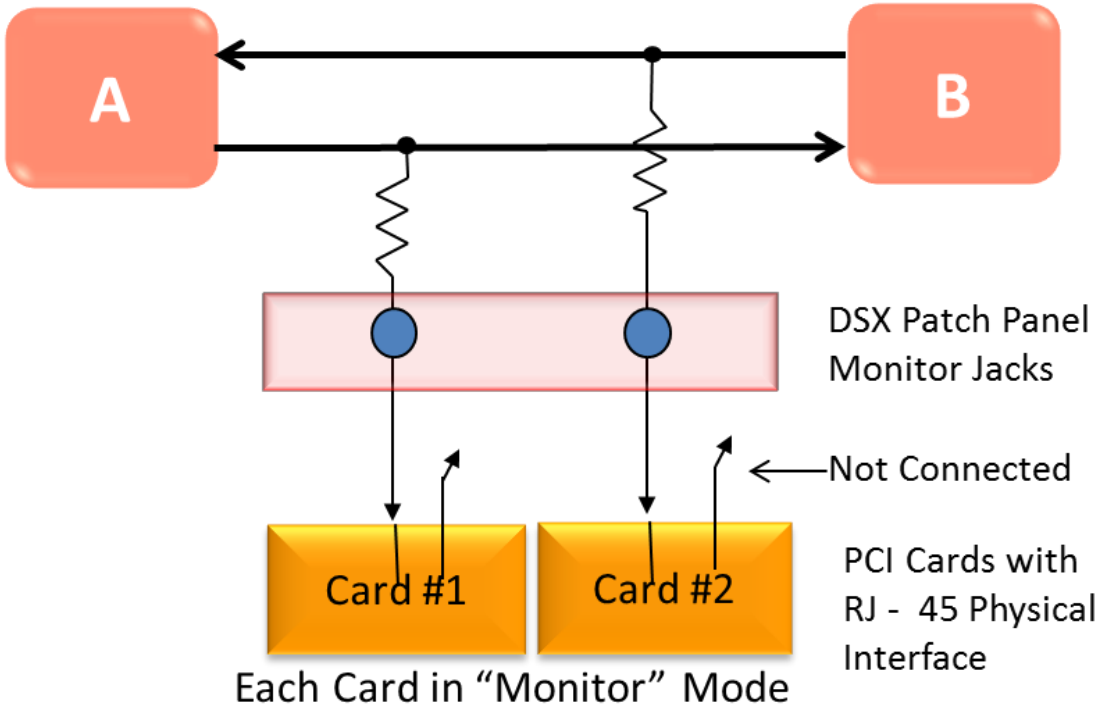
- Series Connection
  - RJ-45
  - Bantam
- Monitor/ Bridge Connection
  - DSX Patch Panel
  - Using RJ-45 Bridge Taps
  - Alternative For RJ-45
- Terminate Mode
  - Through Mode and Cross-port Loopback Modes (in Octal/Quad boards, tProbe™ only)



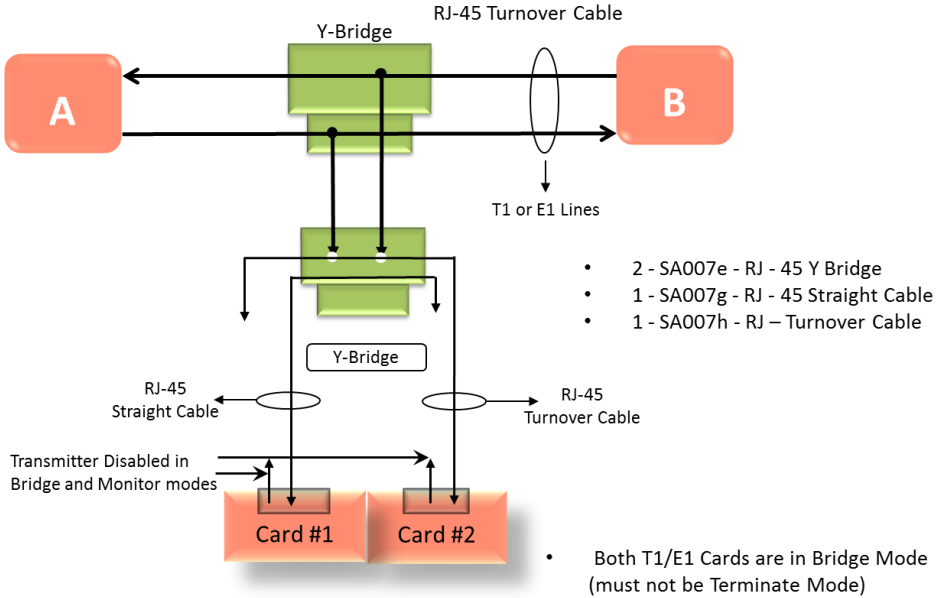


M - Monitor Mode
T - Terminate Mode
B - Bridge Mode

Monitor from a DSX-Patch Panel



Bridge Mode Monitoring

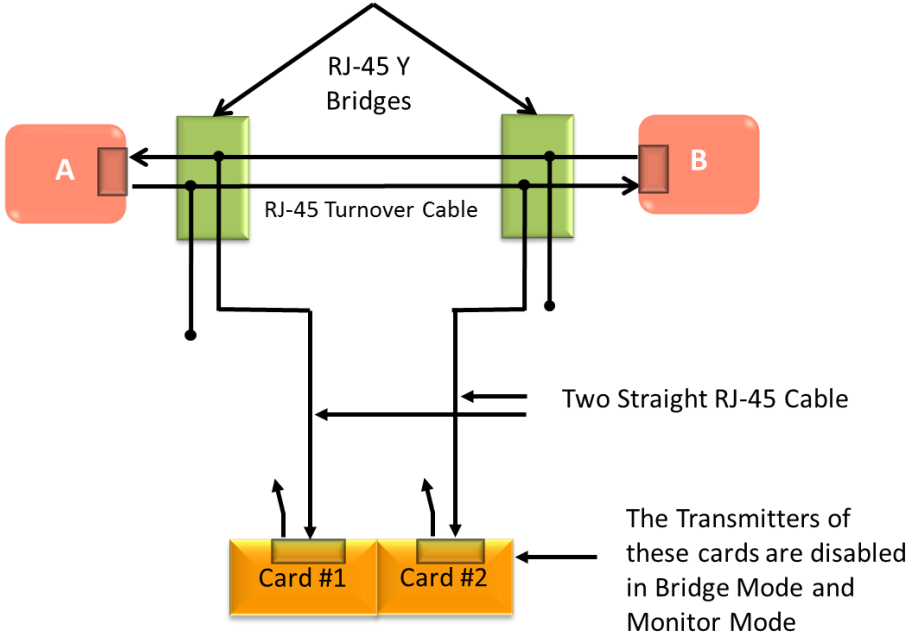


- 2 - SA007e - RJ - 45 Y Bridge
- 1 - SA007g - RJ - 45 Straight Cable
- 1 - SA007h - RJ – Turnover Cable

- Both T1/E1 Cards are in Bridge Mode (must not be Terminate Mode)
- Two RJ-45 Y Bridges are required
- One RJ-45 Straight Cable is required
- One RJ-45 Turnover Cable is required

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

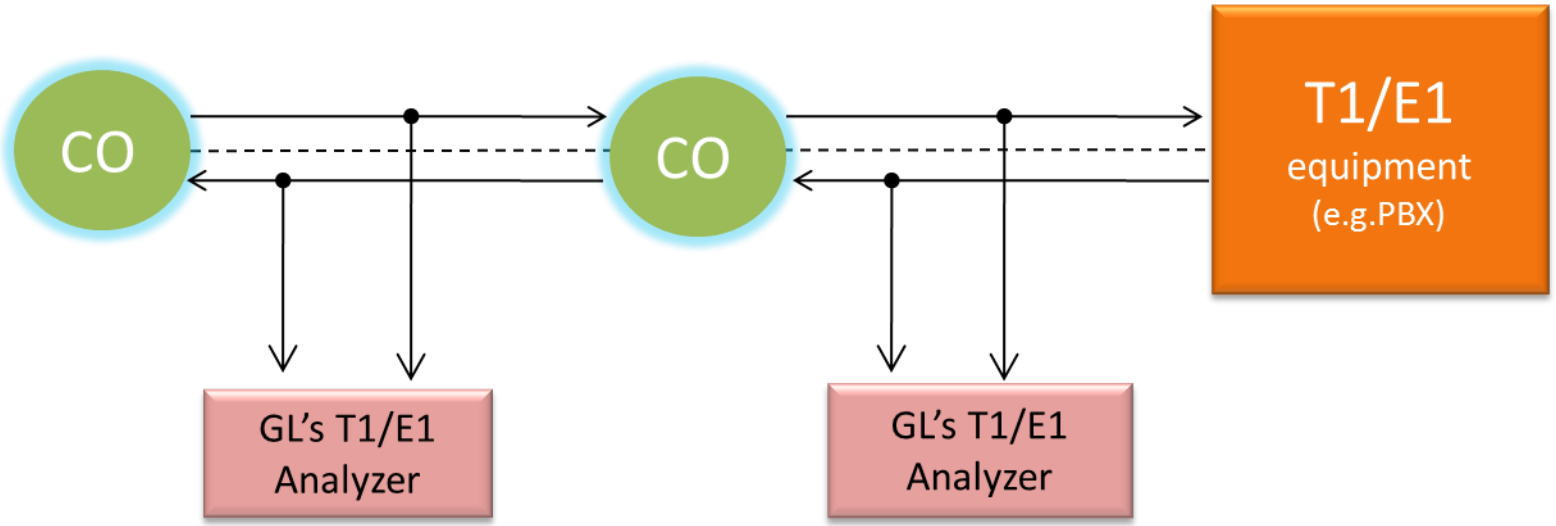
Alternative Method



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

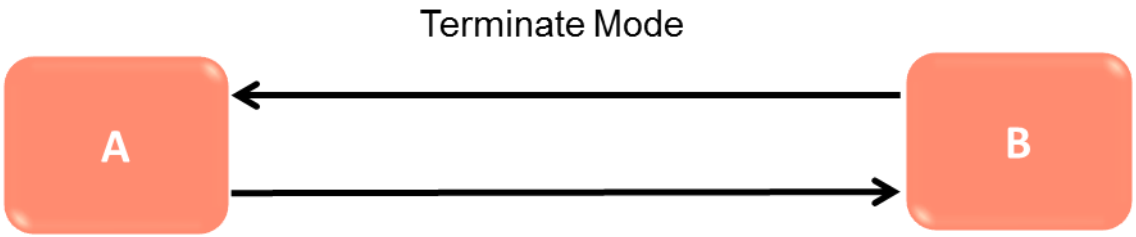
Non-Intrusive Line Monitoring

(Monitor and Bridge Modes)

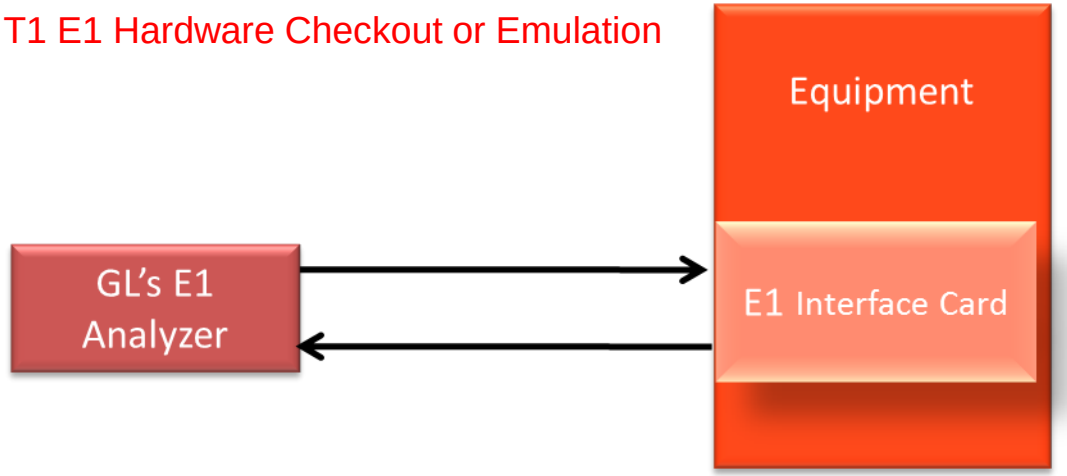


- Bridge and Monitor modes are used for non-intrusive monitoring on T1 E1 connection

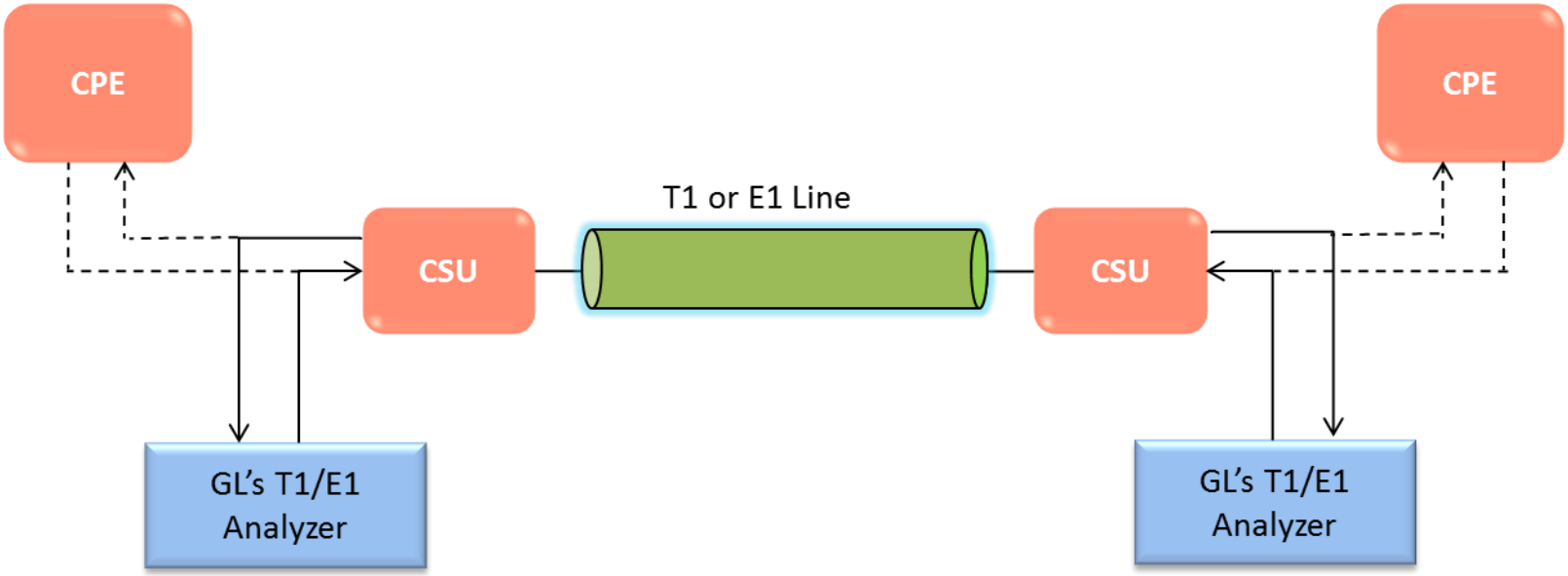
Simple Connection



T1 E1 Hardware Checkout or Emulation



Intrusive Line Monitoring

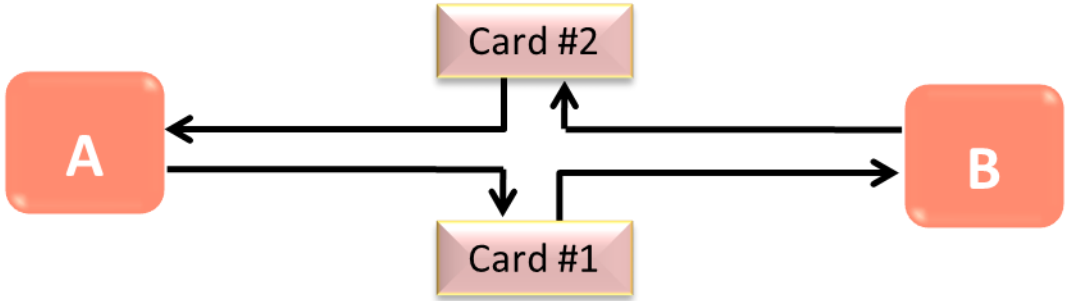


CPE = Customer Premise Equipment
CSU = Channel Service Unit

Series Connections

Series Connection

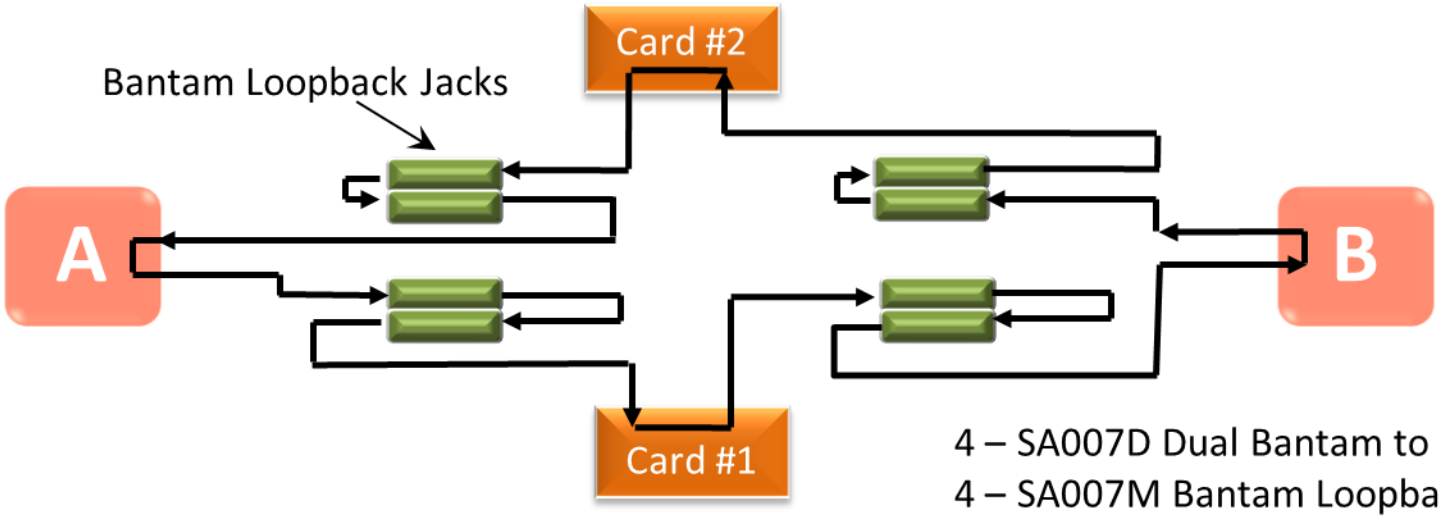
Series Connection using Bantam Cards



Dual Laptop or 2 Ultra Cards

GL Communications

Series Connection using RJ-45

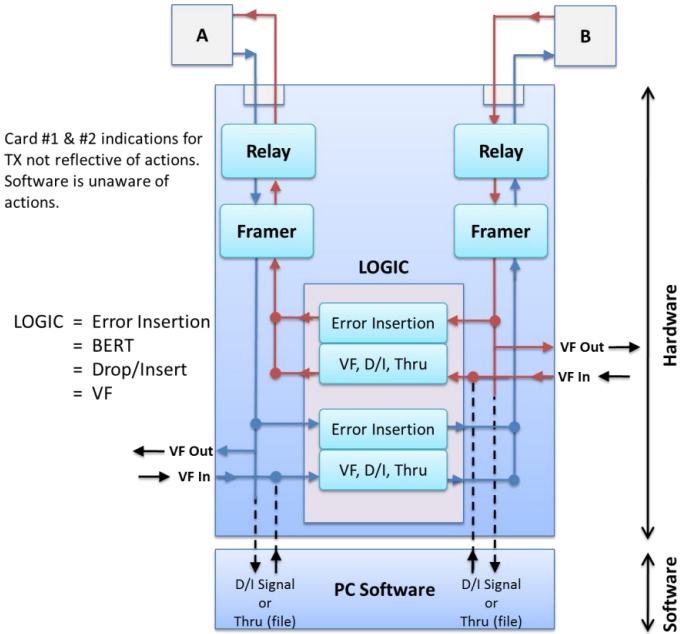


Dual Laptop or 2 Ultra Cards

4 – SA007D Dual Bantam to RJ - 45 Cables
4 – SA007M Bantam Loopback Jacks

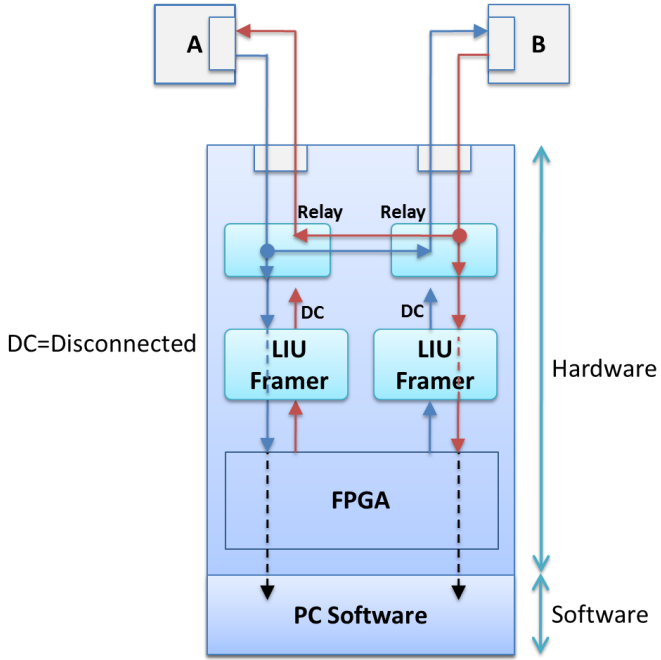
GL Communications

Cross-port Transmit Mode



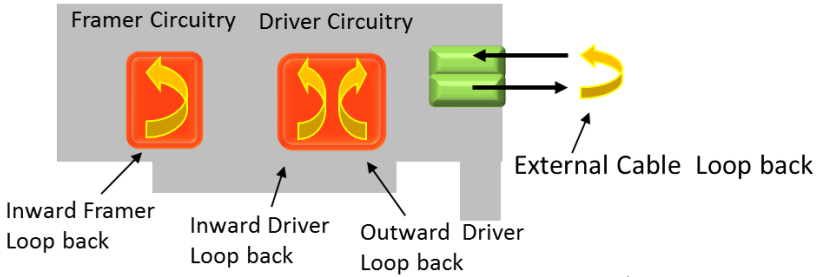
- Used for Drop and Insert applications in which the board analyzes the traffic running between two pieces of T1 E1 equipment

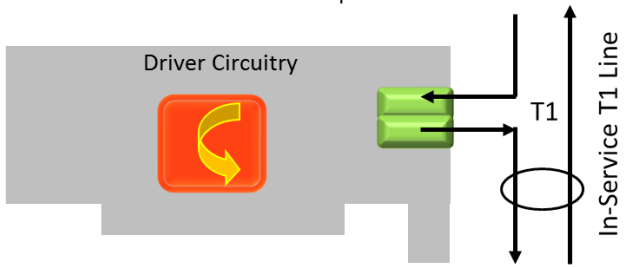
Cross-port Through Mode



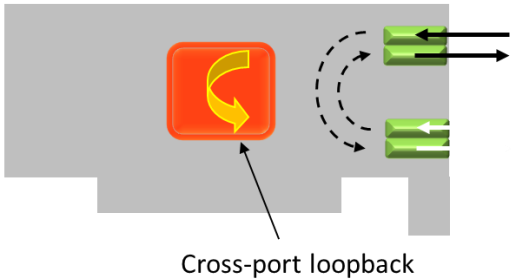
- This mode is similar to the standard “Outward Loopback” which allows monitoring T1 E1 lines “in-line” while still being protected from loss of power to the board

Loopbacks





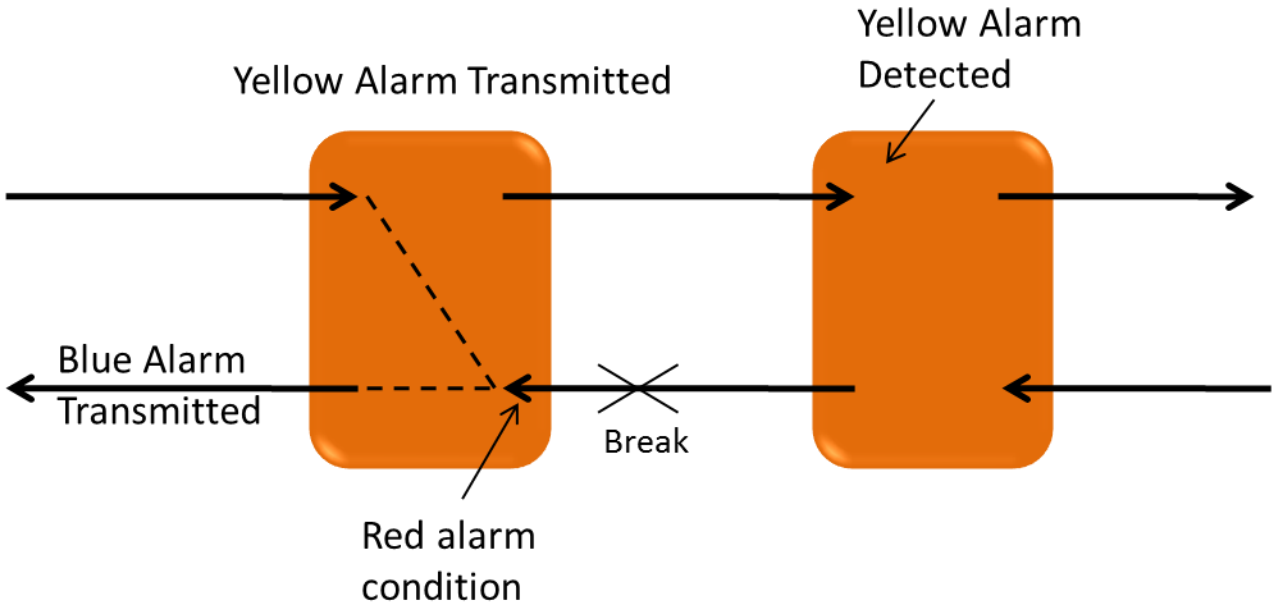
Use of remote loop back when a monitor signal is not available



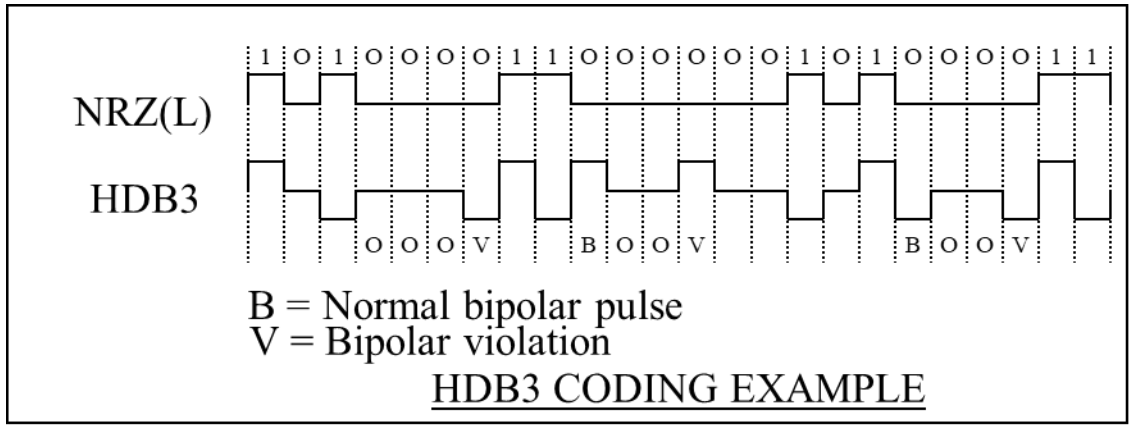
Cross-port Loopback
Signal received on Card #1 is transmitted out on Card #2 and vice versa. The hardware defaults to this mode when the board is unpowered.

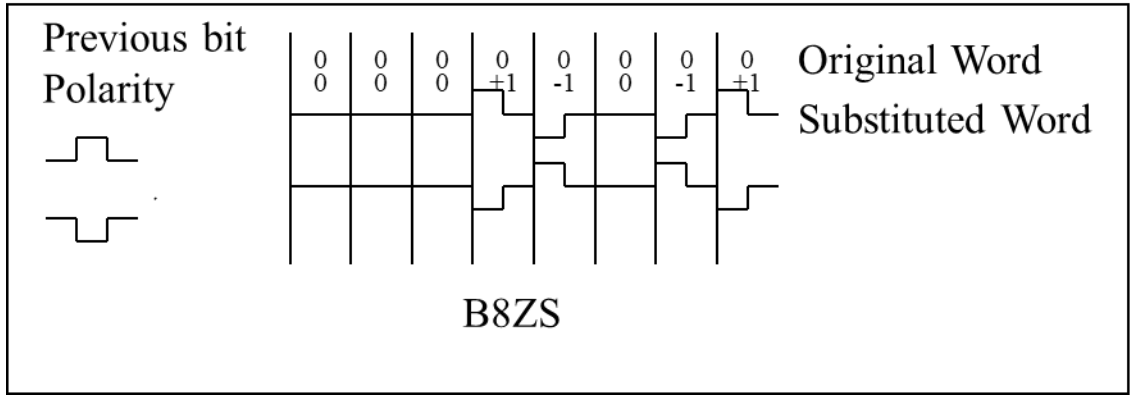
GL Communications

Blue, Yellow and Red Alarms



Line Coding


1 0 1 0 0 0 0 1 1 0 0 0 0 0 0 1 0 1 0 0 0 0 1 1
NRZ(L)
HDB3
0 0 0 V B 0 0 V B 0 0 V
B = Normal bipolar pulse
V = Bipolar violation
HDB3 CODING EXAMPLE


Previous bit
Polarity
0 0 0 0 0 0 0 0
0 0 0 +1 -1 0 -1 +1
Original Word
Substituted Word
B8ZS

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

Host Computer with GL Application Software

USB Interface Cable

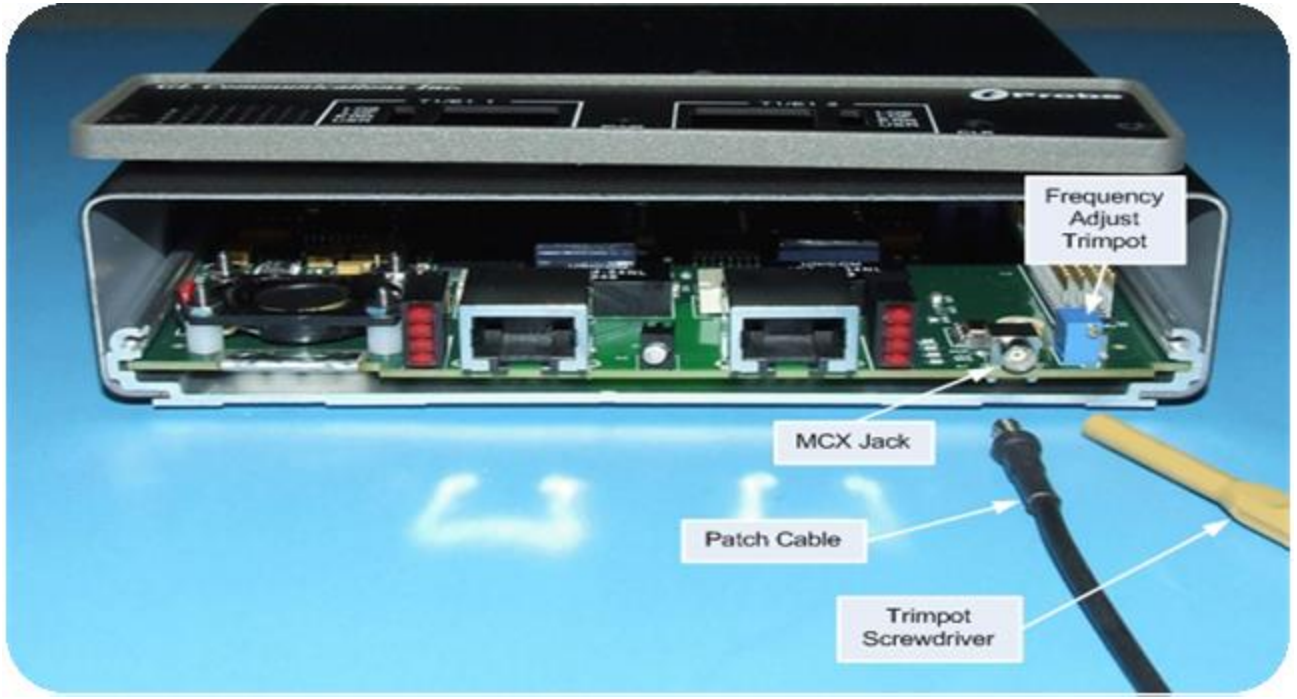
DUT

Frequency Patch Cable

Frequency Counter

Calibrating GL Hardware

Location of MCX Jack and Trimpot for tProbe™



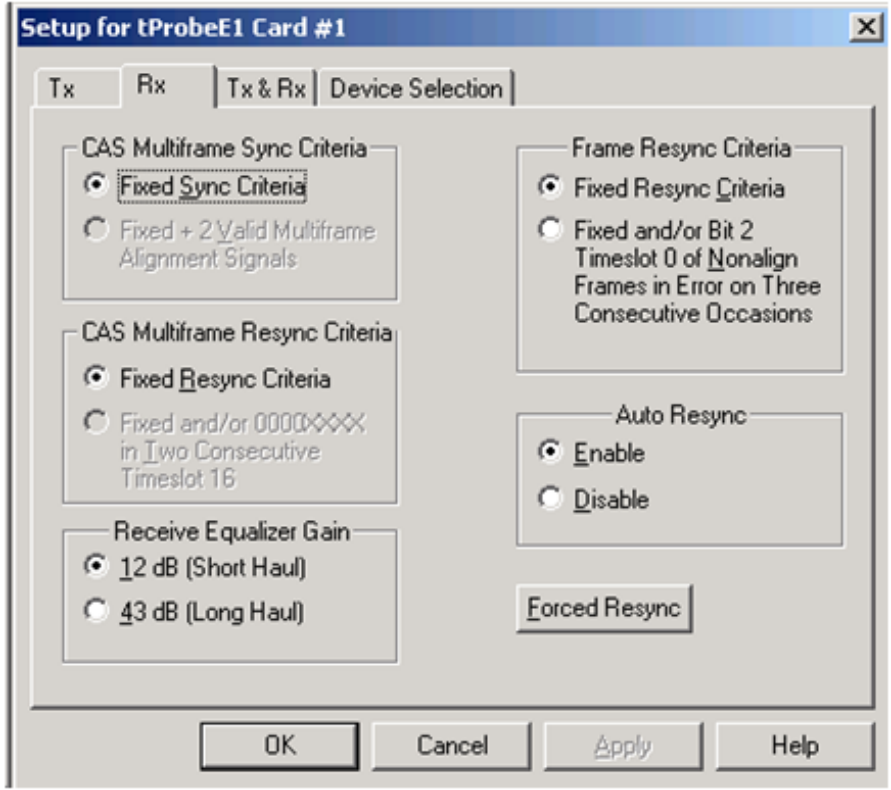
Calibrating GL Hardware

- 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

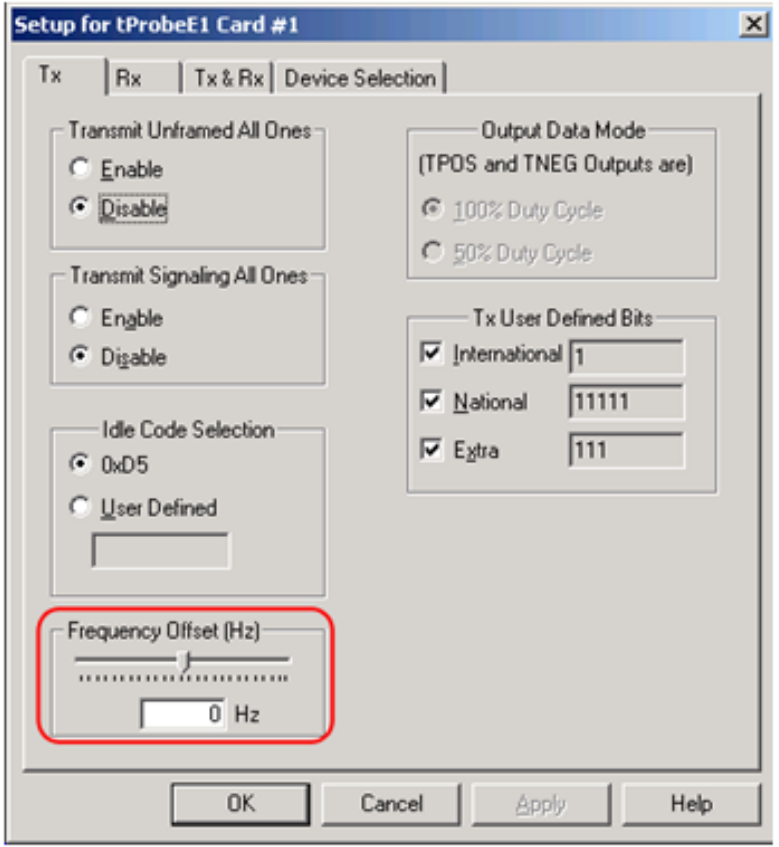
Rx Parameters Configuration

- 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



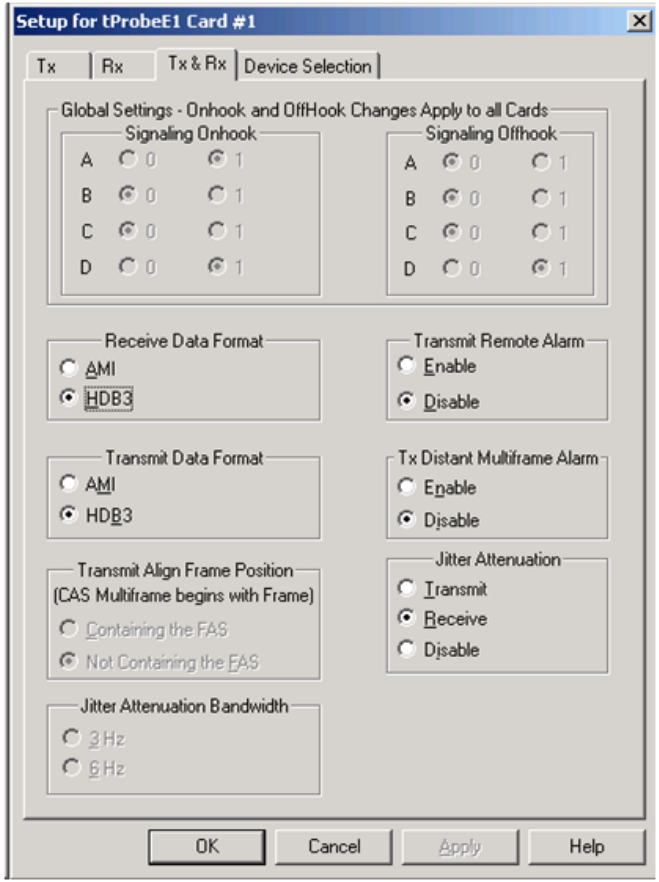
Tx Parameters Configuration

- 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



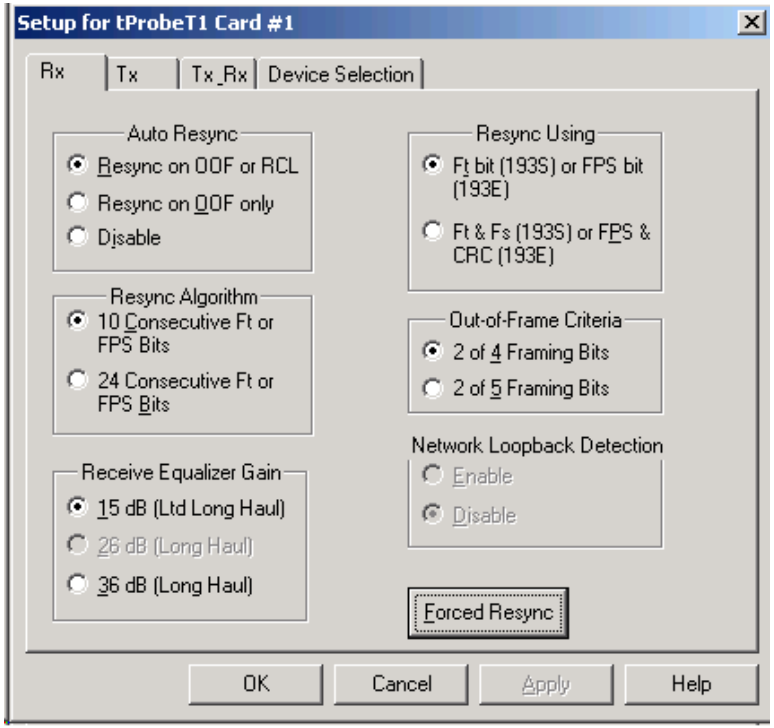
Tx Rx Parameters Configuration

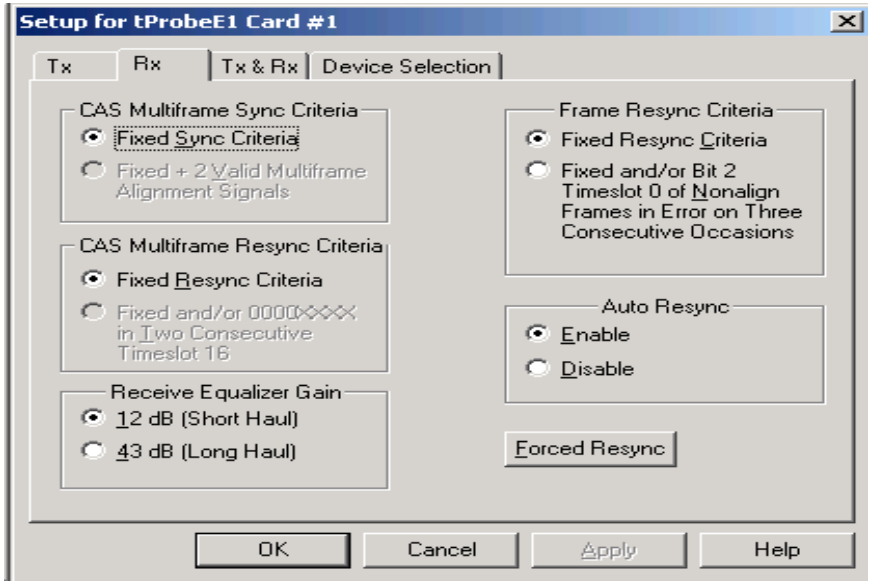
- Provides configuration options to define signaling Onhook/Offhook options by configuring ABCD signaling bits
- Receive and transmit data formats
- Transmit align frame positions
- Transmit remote alarm; loss of multi-frame alarm
- Enable or disable the jitter attenuation block from the 'transmit and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



T1 and E1 Configuration Setup

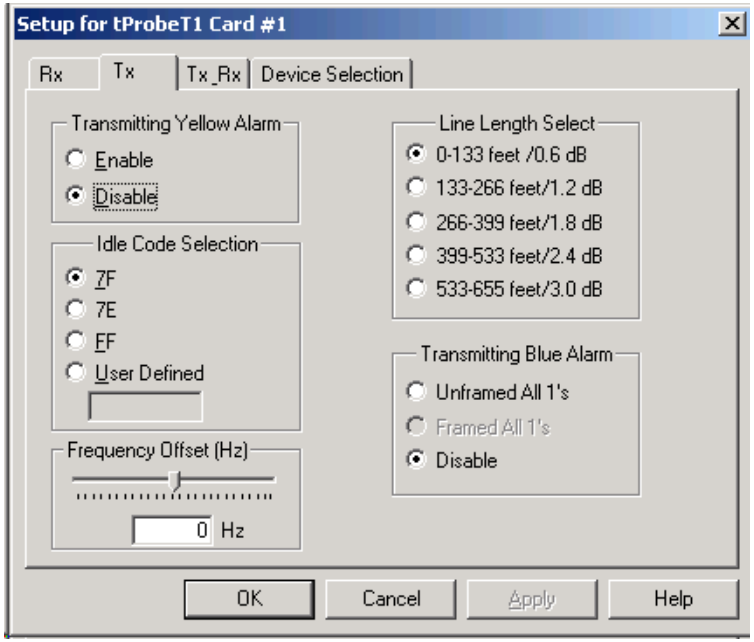
Rx Tab in T1 and E1 Cards

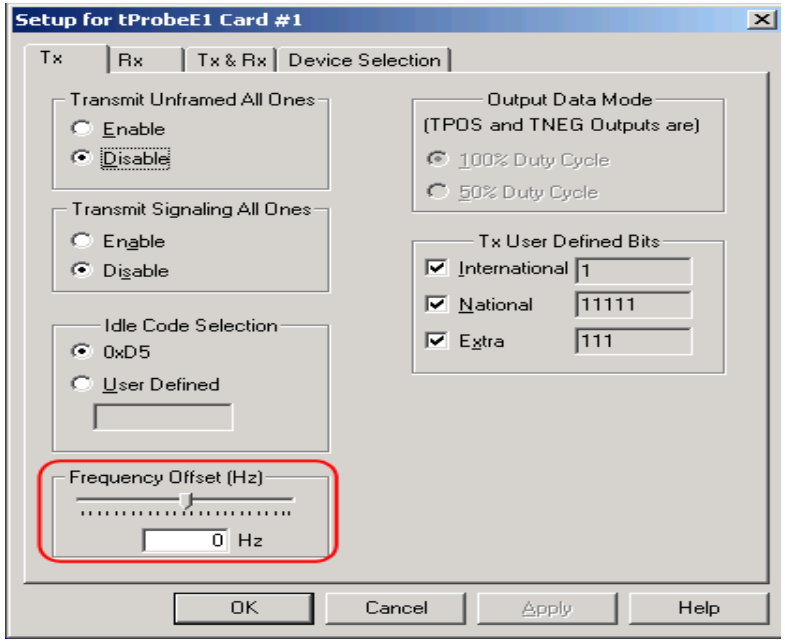




T1 and E1 Configuration Setup

Tx Configuration Tab in T1 and E1 Cards

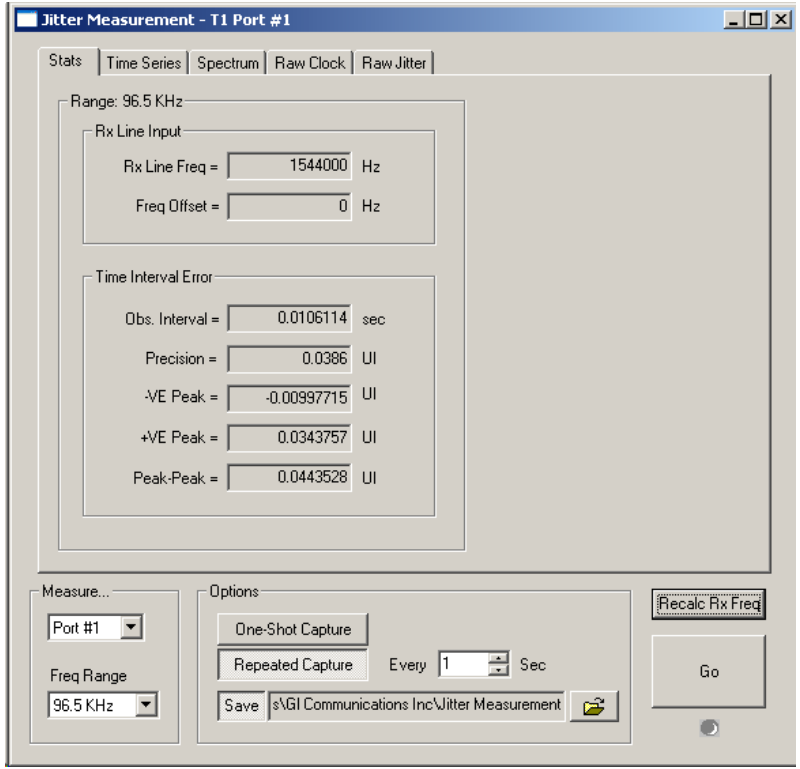




Jitter Measurement

- 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

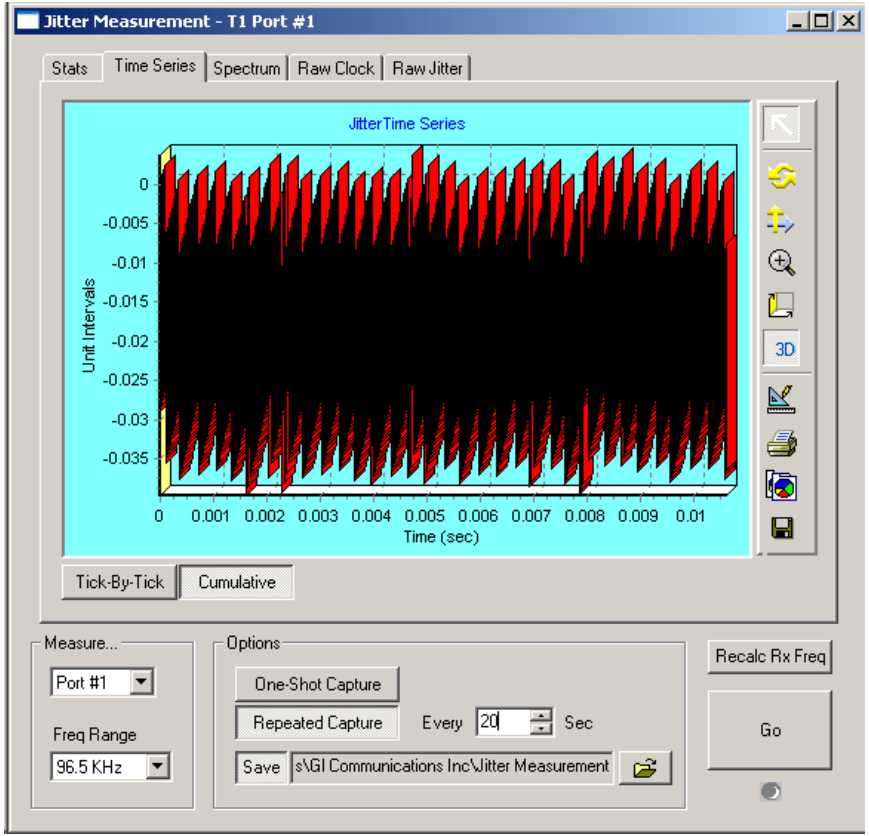
Statistics Tab



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

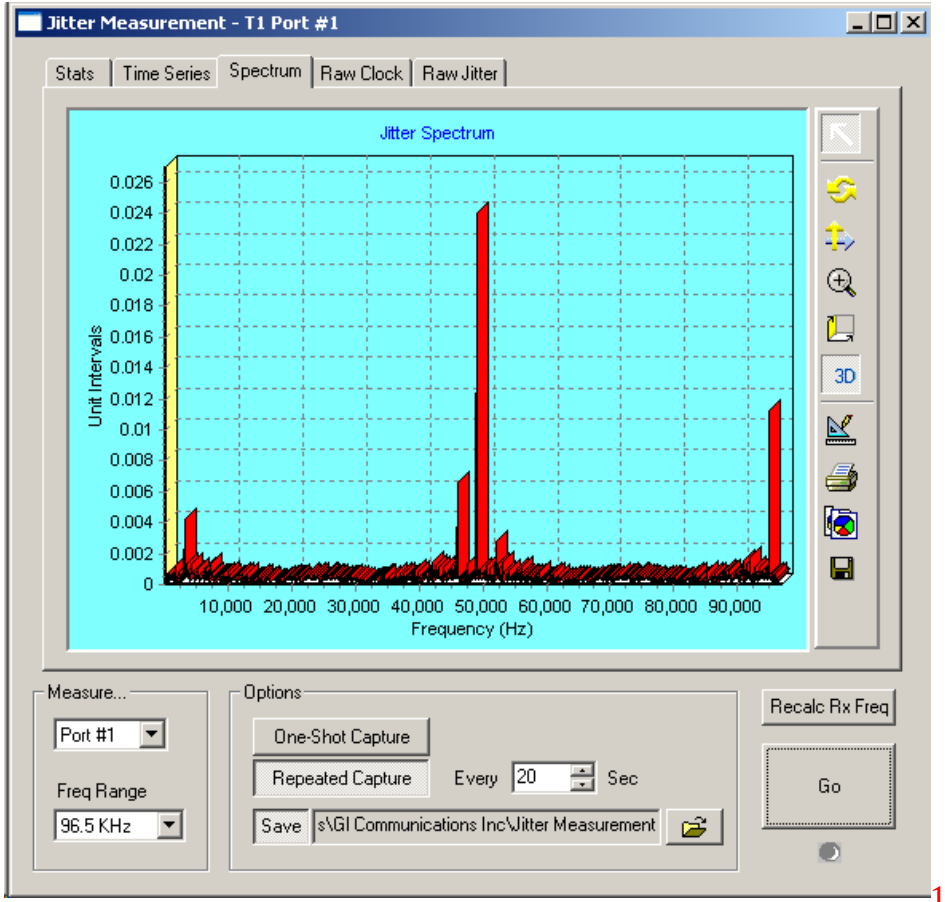
Time Series

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



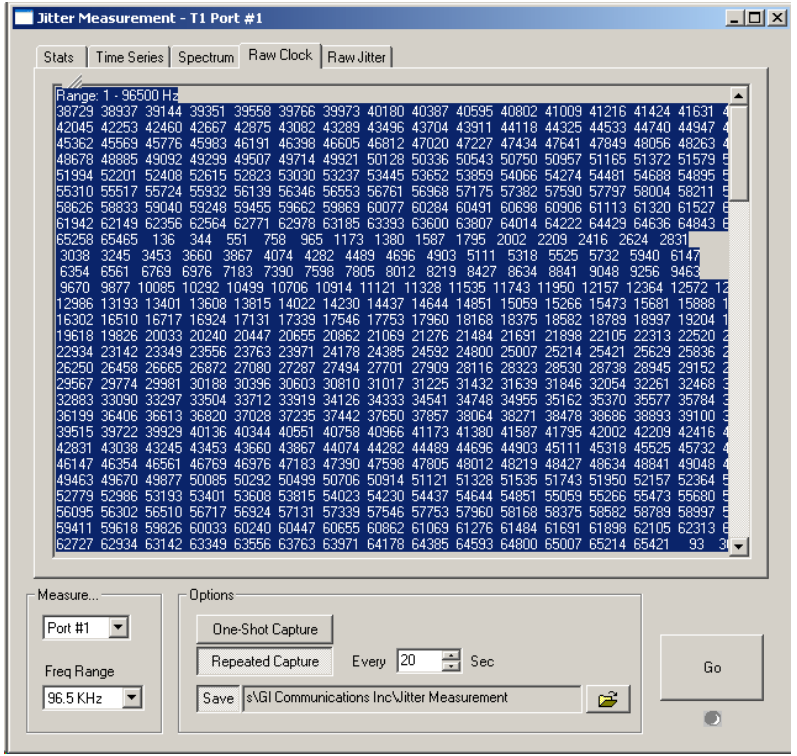
Spectrum

- 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



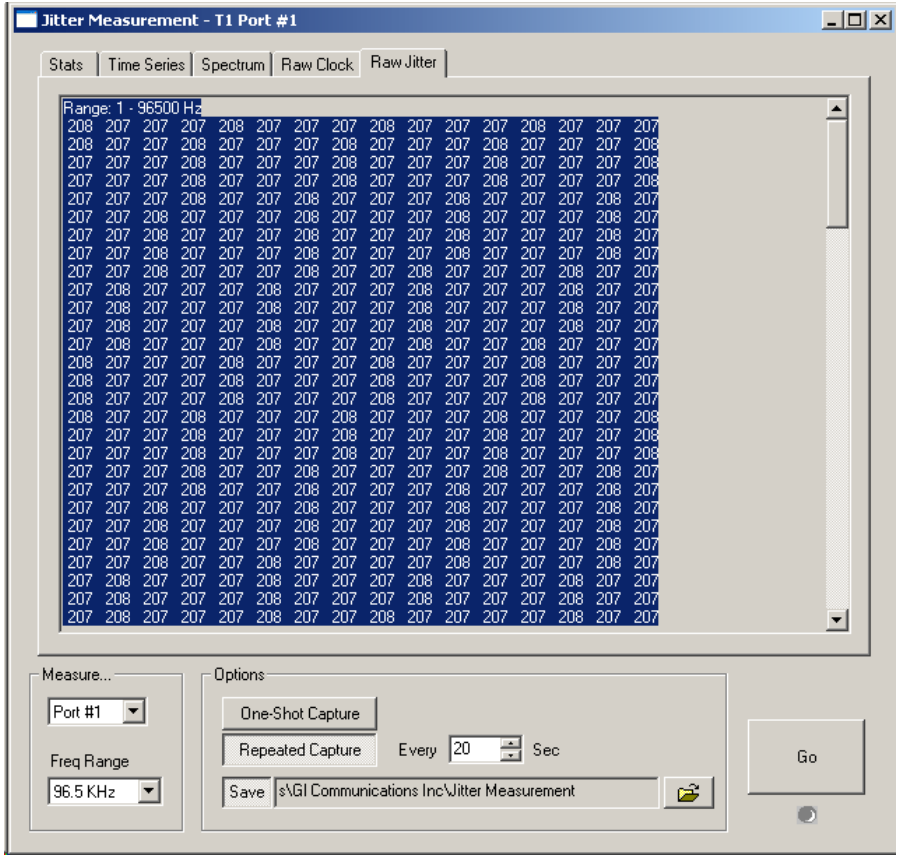
Raw Clock Page

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

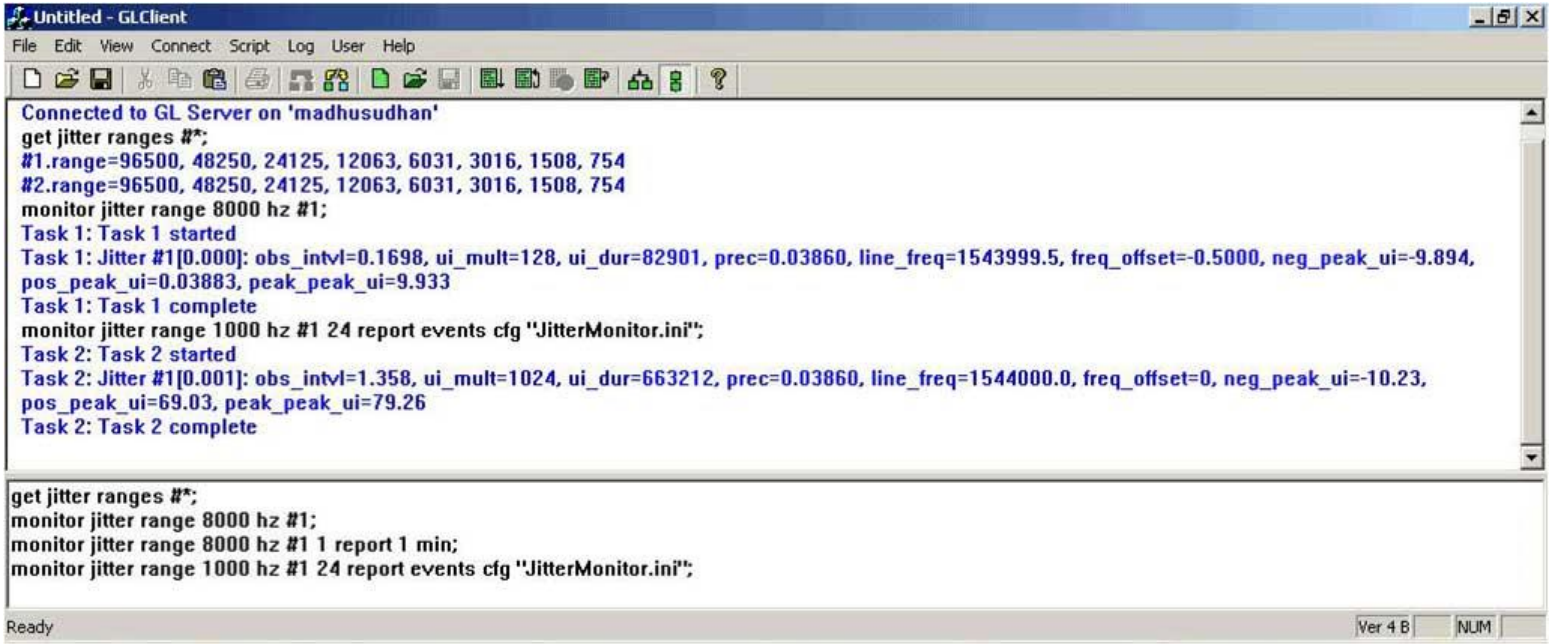


Raw Jitter Page

- 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



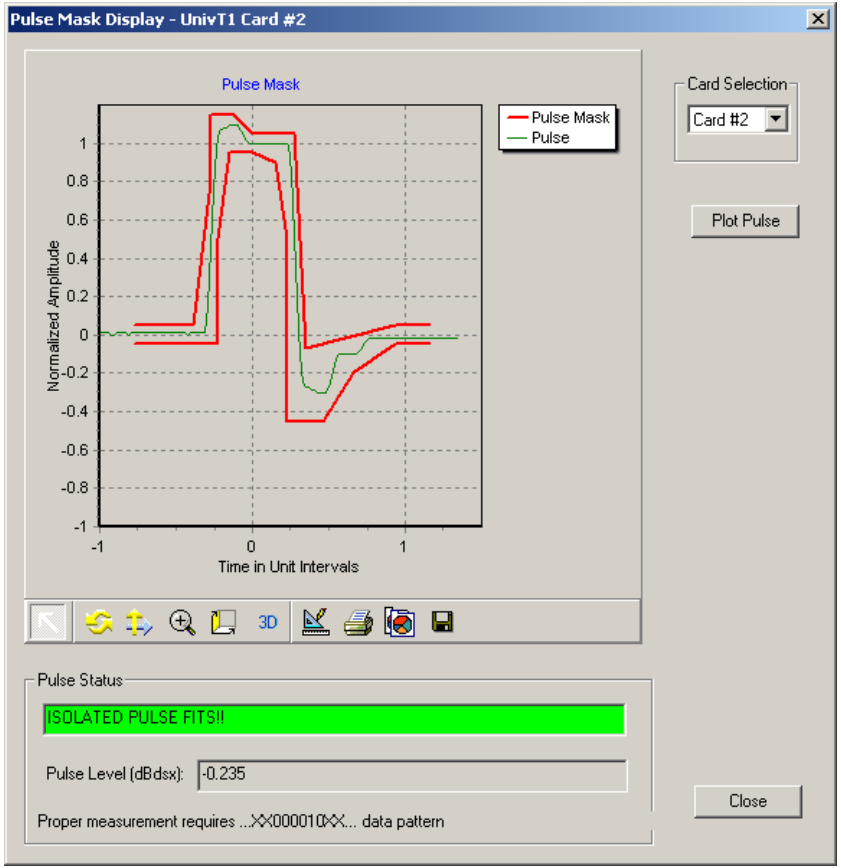
- Monitor Jitter ranges and perform Jitter measurement through simple commands with Windows Client-Server application

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

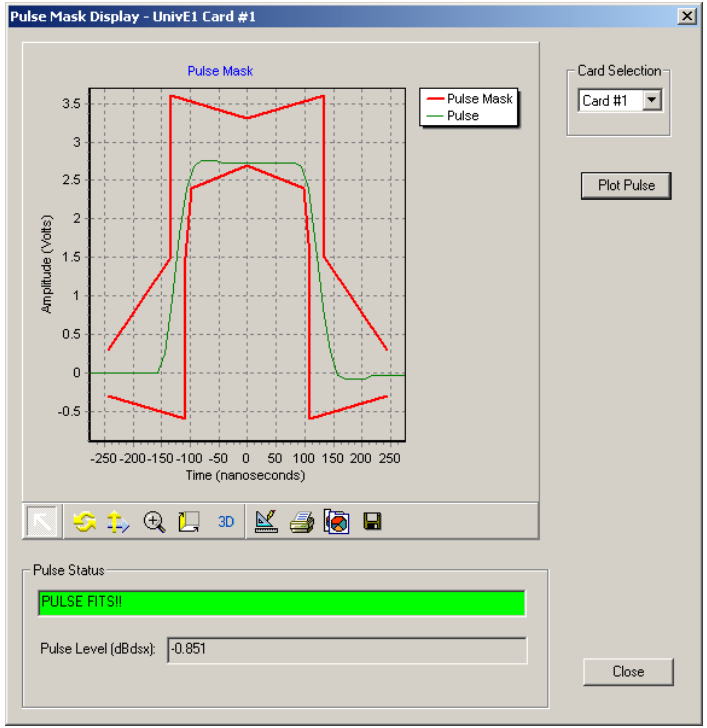
T1 Pulse Mask

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



E1 Pulse Mask

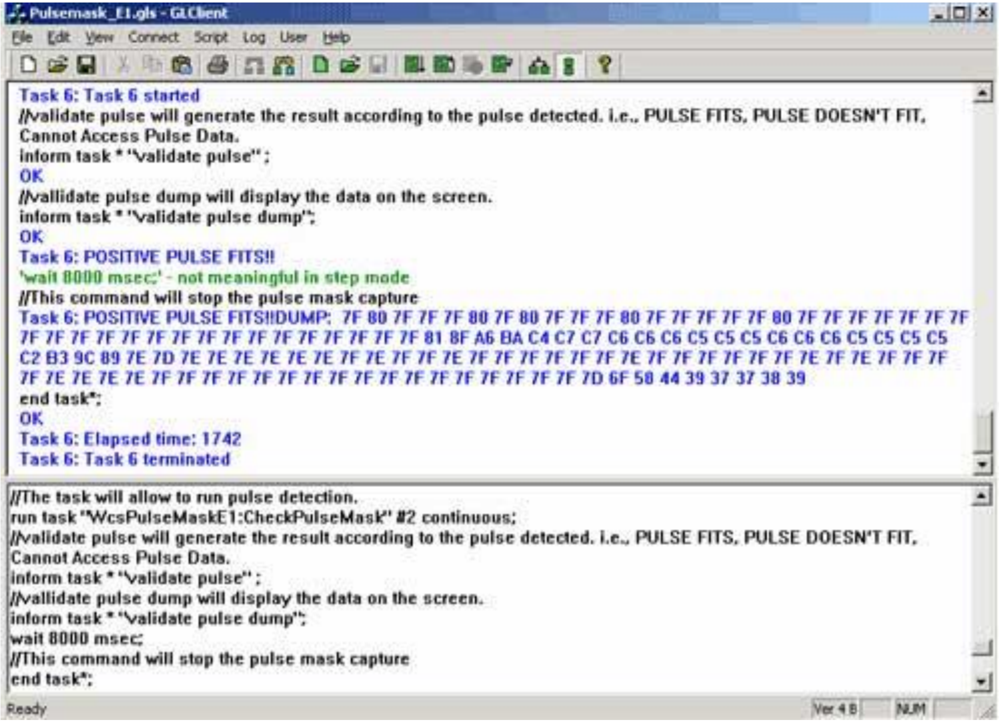
Pulse Mask Compliance Testing



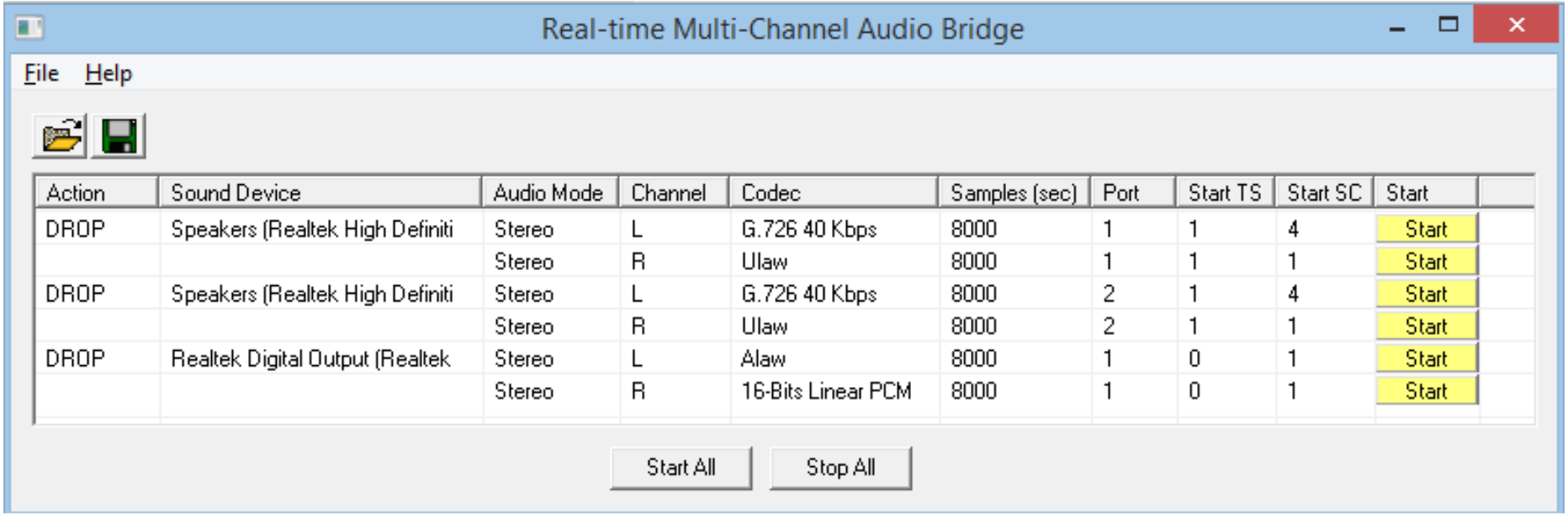
GL Communications

WCS Pulse Mask

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



Real-time Multichannel Audio Bridge



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

Thank you