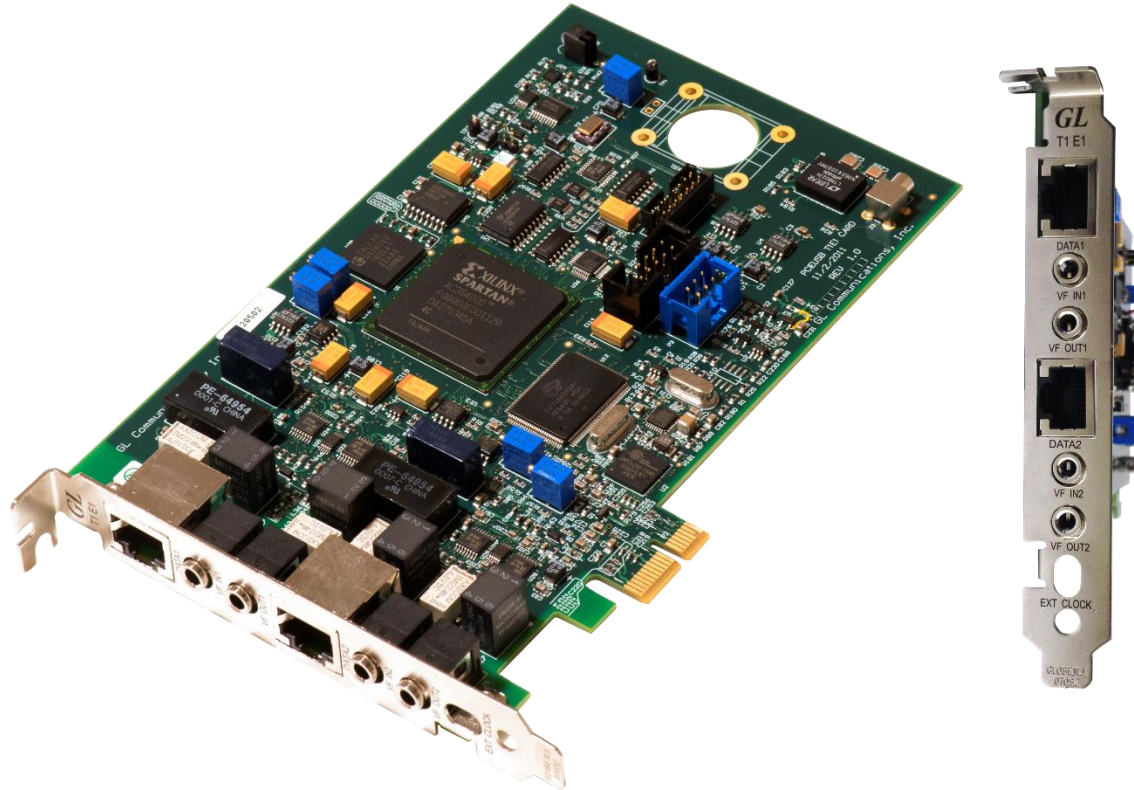

Dual T1E1 Express (PCIe) Analysis and Emulation Boards



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

PCIe based Dual Express T1 E1 Board



What is this hardware superior?

- High Density and High Speed – The boards (with Direct Memory Access) are significantly faster and significantly more efficient.
- Supports high performance voice and data applications.
- PCI Express x1 Lane/Board.

Main Features

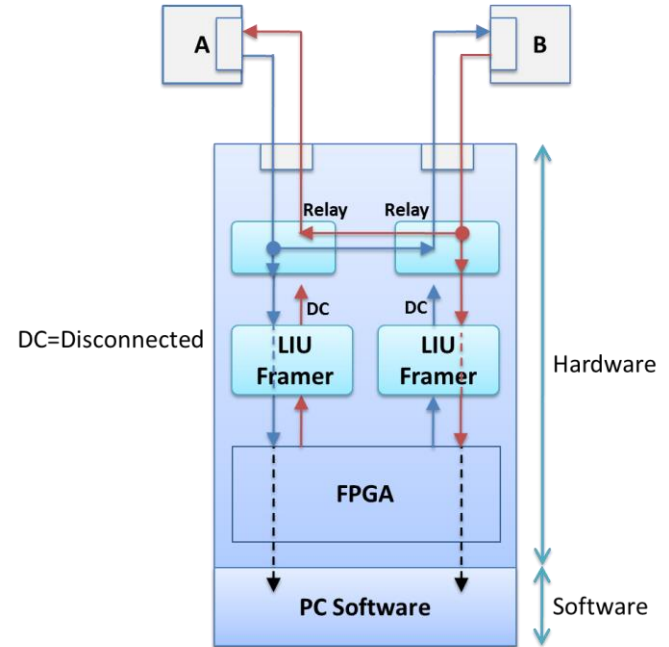
- T1 or E1 interfacing – Software Selectable.
- TDM, ISDN, SS7 – High Density Voice. VoIP, Frame Relay, Multi-Link Frame Relay, PPP and Multi Link PPP, HDLC.
- Most all [“basic applications”](#) and [“special applications”](#) are available for Dual T1 E1 Express boards Comprehensive Analysis / Emulation of Voice, Data, Fax, Protocol, Analog, and Digital signals, including Echo and Voice Quality testing.
- Supports [T1 E1 Pulse Mask](#) and [Jitter Generation](#) and [Measurement Analysis](#).
- “Cross-Port Through” and “Cross-Port Transmit” Modes – these configurations make cabling with Drop/Insert and Fail-Safe Inline Monitoring very easy.
- Enhanced [VF Drop and VF Insert Capabilities](#) using 3.5mm Balanced (Stereo), or Unbalanced (Mono) physical connections.
- The VF Tx and Rx impedance for Dual T1 E1 Express (PCIe) Card analyzer supports software selectable 135, 150, 600, or 900 Ohm terminations.
- Supports software selectable VF Tx and Rx impedances - 135, 150, 600, or 900 Ohm terminations. Additionally, the VF Rx impedance supports New High Impedance Monitor Termination (>50K Ohms), and external Microphone and Headset (Mic/HS) impedance.

Comparison with other PCI based GL's T1 E1 Cards

Feature	<u>Universal Dual T1 E1 Boards</u>	<u>Quad, Octal T1 E1 Boards</u>	<u>Dual T1 E1 Express (PCIe) Boards</u>
Number of Ports	2	4, 8	2
PCI Slot Type	PCI Bus / Connector	PCI Express x1 Bus/ Connector	PCI Express x1 Bus / Connector
Speaker (on board)	Supported	No speakers	Supported
Cross-port and Through Modes	Supported	Supported	Supported
Pulse Mask Application	Supported	Not Supported	Supported
Jitter Generation and Measurement	Supported	Not Supported	Supported
External Clock Mode	Supported	No clock port connector	Supported
Clock Offset Capability	2 Ports Independent	All ports at the same time	1 Port at a time
VF Interface and Impedance	Supported ; 600 Ohms	Not Supported	Supported; 135/150/600/900/High
VF Interface for Mic/Headset	Not Supported	Not Supported	Supported
Drop and Insert (VF and T1/E1)	Supported	No VF connectors; Digital Drop/Insert supported	Supported
Onboard RAM	Not Supported	Not Supported	Supported

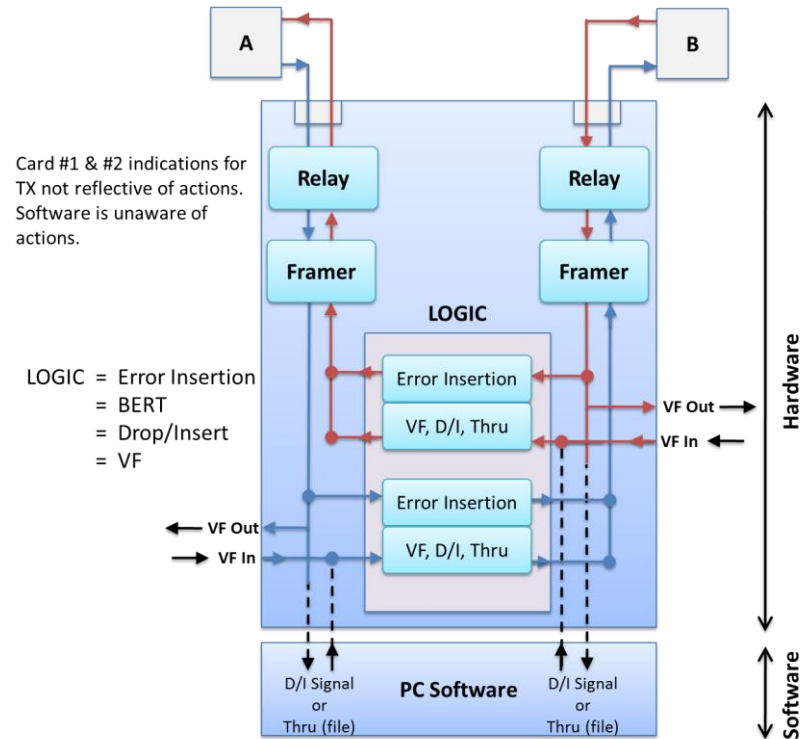
Cross-port Through Loopback

- Allows monitoring T1 or E1 lines in-line while still being protected from loss of power to the board.
- It is implemented entirely thru relays and eliminates complex cabling.
- The signal received on Card 2 (Port 2) is transmitted out onto Card 1 (Port 1).



Cross-port Transmit Mode Loopback

- The data that would normally be transmitted on Card 1 (Port 1) is diverted and transmitted on Card 2 (Port 2).
- The data that would normally be transmitted on Card 2 (Port 2) is diverted and transmitted on Card 1 (Port 1).
- It is useful for Drop and Insert and Error Injection applications in which the board analyzes and may insert traffic running between two pieces of T1 or E1 equipment.



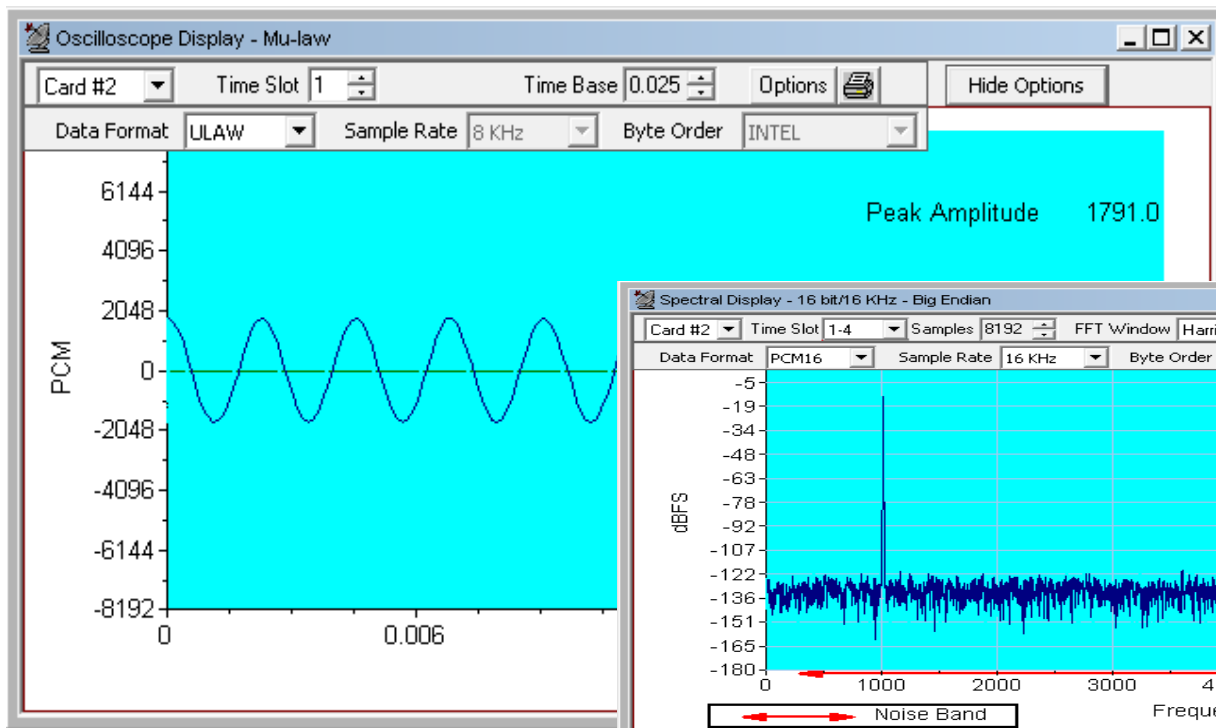
T1 / E1 Basic Software

- T1 E1 Basic Software
 - Monitoring Options
 - Intrusive Testing
 - Windows Client / Server
 - Remote access to T1/E1 server
 - Clients - C++, Java, TCL

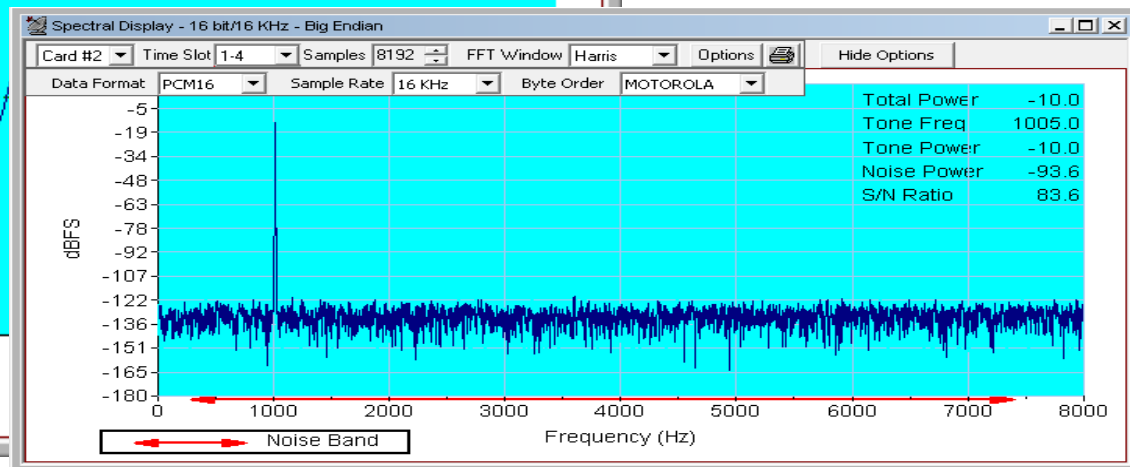
- VF Options
 - Speaker
 - Drop and Insert
 - VF In / Out TS settings
- Monitoring Features
 - Monitor T1or E1 Line
 - Byte Values & Binary Byte Values
 - Signaling bits, Power Level, DC Offset, & Frequency
 - Multiframes, and Real-time Multiframes
 - T1/E1 Data as Real-time Bitmap
 - Time-slot Window
- Monitoring Features...
 - ASCII Timeslot Display
 - Oscilloscope & Power Spectral
 - Audio Monitoring
 - Active Voice Level
 - Jitter Measurement
 - Pulse Mask Display
 - Capture Dialed Digits
 - Realtime Strip Chart
 - Realtime Multichannel Audio Bridge
 - Signaling Bit Transitions

Monitoring Features

Oscilloscope Display

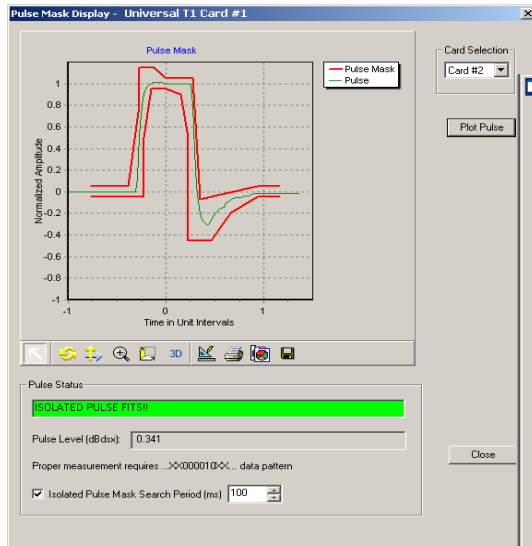


Spectral Display

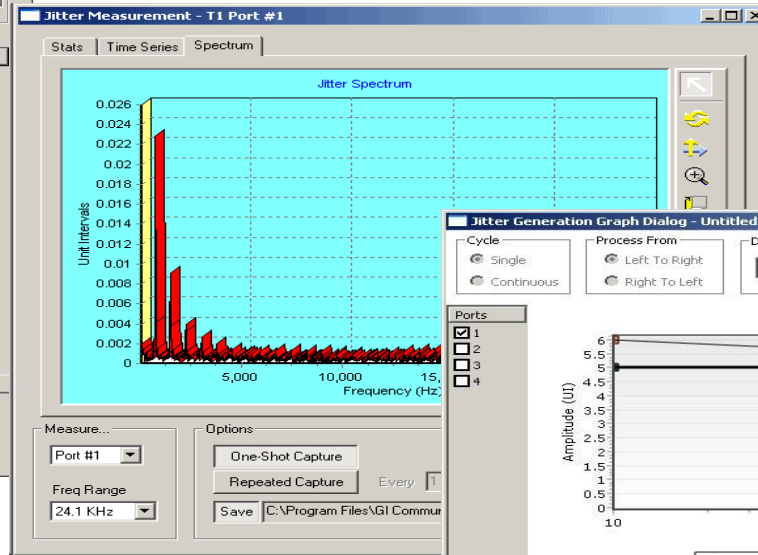


Jitter Measurement and Pulse Mask

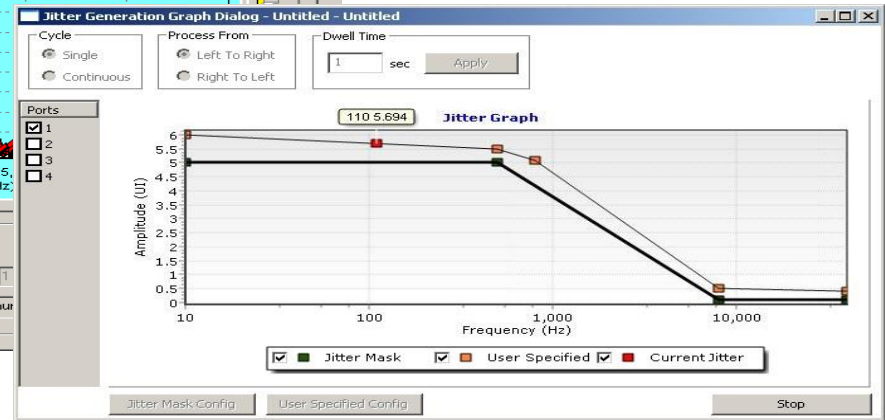
Pulse Shape Display



Jitter Measurement



Jitter Generation



- Intrusive Tests
 - Bit Error Rate Test
 - Enhanced Bit Error Rate
 - ATM BERT
 - Transmit Tone
 - Transmit Gaussian Noise
 - Transmit Multiframe
 - Transmit Signaling Bits
 - Precision Delay Measurement
 - Rx-to-Tx Loop back
 - Error Insertion
 - Jitter Generation

Enhanced BERT and TX Signaling BITS

Enhanced BERT

The screenshot shows the 'Enhanced BERT' software interface. The main window is titled 'Tx Rx Settings - Card #1'. It features several configuration panels:

- Unframed BER Patterns:** Includes a 'QRSS' dropdown set to '31', a 'User Defined Pattern' field with '0', and a 'Length' dropdown set to '32'. There are buttons for 'All Ones', 'All Zeros', and '00000000'.
- Timeslot Selection:** A table for selecting timeslots. The table shows timeslots 0-15 with checkboxes. Timeslots 1, 2, and 3 are checked. Below the table are 'Select All' and 'Unselect All' buttons.
- Error Rate (Logic Error):** A dropdown menu set to 10^{-3} and a 'User Defined Rate' slider set to '0.01'.
- Single Error Insertion:** Buttons for 'Logic Error' and 'BPV'.
- Sub Channel Selection:** A dropdown menu set to '0'.

At the bottom, there is a 'Graph - Online Display' section with a 'TeeChart' showing error counts over time. The x-axis is 'Time in seconds' from 10:24:30 to 10:25:10. The y-axis is 'Errors'. The legend indicates three error types: LOGIC_ERROR (red), BPV (green), and FRAME_ERROR (blue). The graph shows a steady stream of red and green bars, with a few blue bars appearing around 10:24:50.

Transmit Signaling BITS

The screenshot shows the 'Tx Signaling Bits' software interface. It displays a grid of signaling bit patterns for 24 timeslots (Ts# 00 to 23). Each timeslot has a 4-bit pattern (A, B, C, D) and a checkbox. All checkboxes are checked. The bit patterns are as follows:

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

On the right side, there is a 'Signaling' list with a scrollable dropdown menu showing bit patterns from '0000 A' to '1001 J'. The '0101 F' pattern is currently selected. At the bottom, there are buttons for 'Save', 'Deselect All', 'Transmit', 'Load', 'Select All', and 'Close'. A 'Device Selection' dropdown is set to 'Card #1'.

The screenshot shows the 'Signaling Bits' software interface for 'Card #2'. It displays a grid of signaling bit patterns for 24 timeslots (TS 0 to 23). Each timeslot has a 4-bit pattern (A, B, C, D) and a dropdown menu. All dropdown menus are set to '0101'. The bit patterns are as follows:

TS	Pattern
TS 0	0101
TS 1	0101
TS 2	0101
TS 3	0101
TS 4	0101
TS 5	0101
TS 6	0101
TS 7	0101
TS 8	0101
TS 9	0101
TS 10	0101
TS 11	0101
TS 12	0101
TS 13	0101
TS 14	0101
TS 15	0101
TS 16	0101
TS 17	0101
TS 18	0101
TS 19	0101
TS 20	0101
TS 21	0101
TS 22	0101
TS 23	0101

Client Server

- Allow the user (with an appropriate client) to operate analyzers remotely, write scripts for automation, or provide multi client connectivity to a single T1 or E1 analyzer.

The image shows two windows from a software application. The top window is titled "E1_Regressiontest.gls - GLClient" and contains a script with the following content:

```

get board count;
board_count=2;
get response;
response = 500.0;
go 0,0,0,0 #1;
OK;
get signaling bits #2:1..15;
#2:1.sig_bits=0,0,0,0
#2:2.sig_bits=0,0,0,0
#2:3.sig_bits=0,0,0,0
#2:4.sig_bits=0,0,0,0
#2:5.sig_bits=0,0,0,0
#2:6.sig_bits=0,0,0,0

```

Below the script, there are several comments and commands:

```

// setting both the cards to cas mode to get all four signaling bits
//getting the signaling bits transmitted from card#1
//cross connect card 1 and 2
go 0,0,0,0 #1;
get signaling bits #2:1..15;
// transmitting different formats of signaling bits as mentioned before for time slots 1 to 15 only
go 0,0,0,1 #1;
get signaling bits #2:1..15;
wait 2000;
go 0,0,1,0 #1;
get signaling bits #2:1..15;
wait 2000;
go 0,0,1,0 #1;
get signaling bits #2:1..15;

```

The bottom window is titled "Untitled - GLServer" and shows the server's response to the client's commands:

```

Connected: client #404 at 192.168.1.63
404: set rx interface terminate #*;
404: set signaling mode cas #*;
404: set crc4 on#*;
404: set tx clock source internal #*;
404: set outward driver loopback off #*;
404: get tx clock source #*;
404: get outward driver loopback #*;
404: get rx line frequency #*;
404: get rx line level #*;
404: get all alarms #*;
404: get board count;
404: get response;
404: go 0,0,0,0 #1;
404: get signaling bits #2:1..15;
404: go 0,0,1,0 #1;
404: get signaling bits #2:1..15;
404: go 0,0,1,0 #1;
404: get signaling bits #2:1..15;

```

The status bar at the bottom of the server window shows "Ready" and "NUM".

T1 or E1 Special Applications

- Protocol Analysis
 - ISDN, HDLC, SS7, Frame Relay, TRAU, CDMA, DCME, T1 Facility Data Link.
 - E1 Maintenance Data Link, UMTS, PPP, ATM, GSM, V5.x, GPRS, GR303, SS1.
- Protocol Emulation
 - ISDN, HDLC, MLPPP, MLPPP Conformance, CAS, TRAU, SS7, SS7 conformance.
 - GSM A, GSM Abis, MAP, CAMEL, Frame Relay, ATM IMA, SS1.
- Capture, Analysis, & Emulation
 - MCBER, Playback.
 - Manual and Automated Record / Playback files.
 - Call Capture and Analysis (CCA).
 - Multiple Call Capture and Analysis.

- Voice Band Analysis Software
 - Call Data Records (CDR)
 - Voice Band Analyzer (VBA)
 - Fax Emulation and Analysis
- Fax Simulator
 - Fax Analysis using GLInsight™ or FaxScan™
- Echo Cancellation Testing / Compliance
 - Manual
 - Semi-automated
 - Automated
- WCS Modules
 - Transmission/reception of files/digits
 - Multi-channel BERT
 - DSP operations, Dynamic DSP capability
 - SA Bits/ FDL/ HDLC/ TRAU/ MC-MLPPP/ SS7/ ISDN / ML Frame Relay
- Signaling Transitions Recording
- Protocol Identifier
- Multiplex / Demultiplex Software
- Real-time Strip Chart
- Network Surveillance

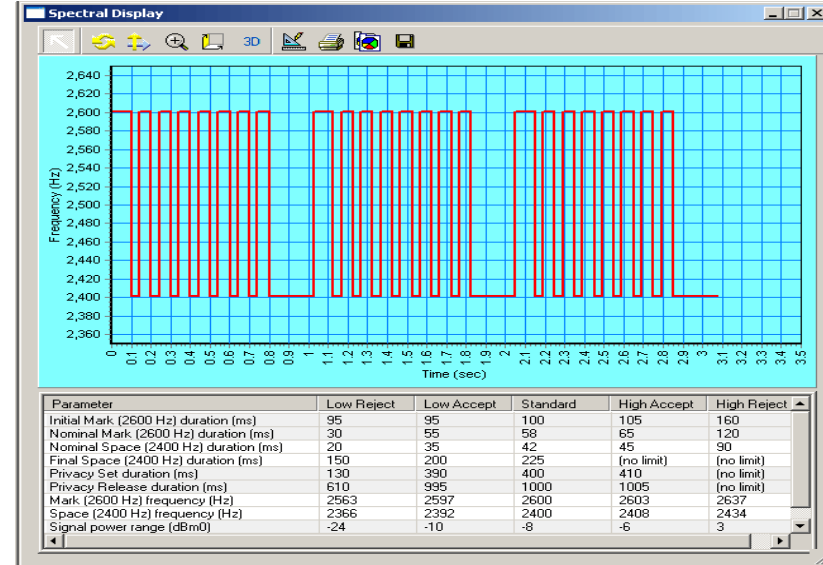
T1 or E1 Special Applications ...

Protocol Identifier

The screenshot shows the 'PC Protocol Classifier' software interface. It features a menu bar with 'Config', 'Views', and 'Help'. Below the menu bar are icons for a globe, a speech bubble, and a document. The main area is divided into two columns for 'Port 1' and 'Port 2', each with a 'SubChannel' header and a grid of 8 sub-channels. A 'Protocol Sel' dropdown is set to 'TRAU'. A 'Protocol Color Selection' dialog box is open, showing a list of protocols with corresponding color swatches: ALL (yellow), TRAU (orange), ATM (light blue), HDLC (blue), MTP2 (red), LAPD (pink), SS7 (brown), PPP (grey), ISDN (cyan), GSM (green), GSMABIS (light blue), and FRAMERELAY (grey). A 'Default' button is at the bottom of the dialog. The main interface has 'Reset', 'Stop', and 'Refresh' buttons at the bottom.

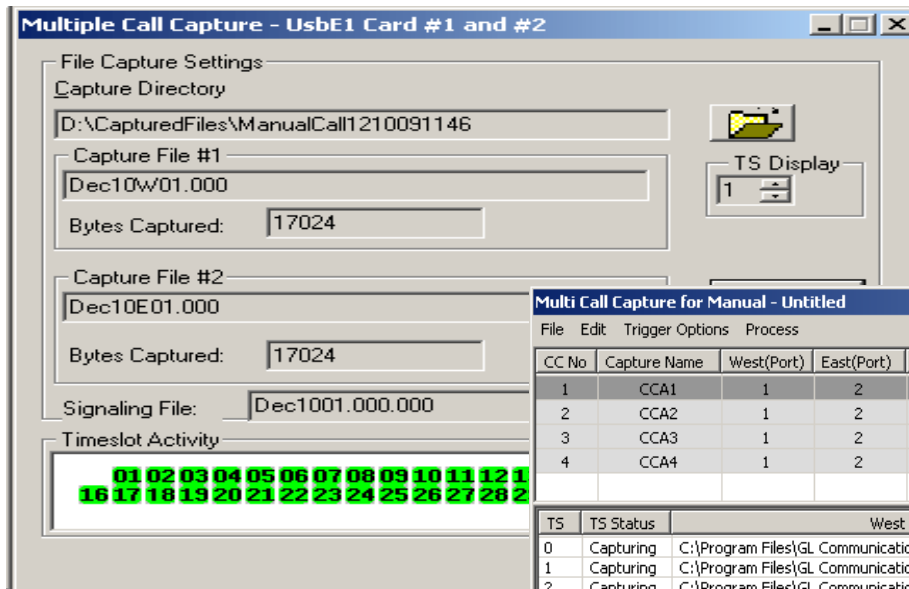
TS	Port 1	Port 2
0		
1	ISDN	ISDN
2	FRAMERELAY	FRAMERELAY
3	TRAU	SS7
4	TRAU	SS7
5	TRAU	PPP
6		TRAU
7		TRAU
8		TRAU
9		
10	HDLC	HDLC
11		
12	MTP2	HDLC
13		
14		
15		
16	HDLC	LAPD

SS1 Analyzer and Emulator



Call Capture and Analysis

Call Capture and Analysis



Multiple Call Capture and Analysis

CC No	Capture Name	West(Port)	East(Port)	Timeslots	Storage Location	Trigger Option	Action
1	CCA1	1	2	0-23	C:\Program Files\GL Communications Inc\Dual Ultra HD T1 Analyzer	Edit	Abort
2	CCA2	1	2	0-23	C:\Program Files\GL Communications Inc\Dual Ultra HD T1 Analyzer	Edit	Abort
3	CCA3	1	2	0-23	C:\Program Files\GL Communications Inc\Dual Ultra HD T1 Analyzer	Edit	Abort
4	CCA4	1	2	0-23	C:\Program Files\GL Communications Inc\Dual Ultra HD T1 Analyzer	Edit	Abort

TS	TS Status	West Filename	Bytes Captured(West)	East Filename	Bytes Captured(East)
0	Capturing	C:\Program Files\GL Communications In...	742224	C:\Program Files\GL Communications Inc\Dual Ultra ...	742224
1	Capturing	C:\Program Files\GL Communications In...	742224	C:\Program Files\GL Communications Inc\Dual Ultra ...	742224
2	Capturing	C:\Program Files\GL Communications In...	742224	C:\Program Files\GL Communications Inc\Dual Ultra ...	742224
3	Capturing	C:\Program Files\GL Communications In...	742224	C:\Program Files\GL Communications Inc\Dual Ultra ...	742224
4	Capturing	C:\Program Files\GL Communications In...	742224	C:\Program Files\GL Communications Inc\Dual Ultra ...	742224
5	Capturing	C:\Program Files\GL Communications In...	742224	C:\Program Files\GL Communications Inc\Dual Ultra ...	742224

CCA Details Timeslots Map

Protocol Analysis

PPP Protocol Analysis

PPP Protocol Analysis PPP

File View Capture Statistics Database Configure Help

Dev	TSlot	SubCh	Fram.	TIME (Relative)	Len	Error	PPP Laye..	LCP Code	IPCP Code	BCF
✓ 1	1-31		0	00:00:00.000000	14		Link Control	Echo-Request		
✓ 2	1-31		1	00:00:00.000625	14		Link Control	Echo-Reply		
✓ 2	1-31		2	00:00:00.088625	14		Link Control	Echo-Request		
✓ 1	1-31		3	00:00:00.092000	14		Link Control	Echo-Reply		
✓ 1	1-31		4	00:00:09.993996	14		Link Control	Echo-Request		
✓ 2	1-31		5	00:00:09.994625	14		Link Control	Echo-Reply		
✓ 2	1-31		6	00:00:10.082625	14		Link Control	Echo-Request		
✓ 1	1-31		7	00:00:10.080000	14		Link Control	Echo-Reply		

Card1 TimeSlots=1-31 Frame=0 at 00:00:00.000000 OK Len=14
HDLC Frame Data + FCS

```

===== PPP Link Layer =====
Address                = 11111111 (255)
Ctl                    = 00000011 (3)
Protocol               = 11000000 00100001 Link Control
===== Link Control Layer =====
Code                  = 00001001 Echo-Request
Identifier            = 172 (xAC)
Length                = 8 (x0008)
  
```

Hex Dump of the Frame Data

```

FF 03 C0 21 09 AC 00 08 09 DC 19 2E 85 63
  
```

Off-line Viewing D:\misc\MLPPP.hdl 23 726 Frames

PPP Packet Data Analysis

Traffic Analyzer - Summary View

File View Call Summary Settings Help

Sip Calls Show All Sessions

Call #	SSRC	Payload	Packet Received	Conversat MOS/R..	Listening MOS/R..	Packets Discard..	Missing Packets...	Duplicate Packets...	Out Of Sequen...	Average Gap(ms)	Average Delay	Average Jitter	Averac Inter A...
1	22145...	PCMU...	1	0.00 / 0	0.00 / 0	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0.00	0.00	0.00	0
1	22117...	PCMU...	1	0.00 / 0	0.00 / 0	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0.00	0.00	0.00	0
2	22141...	PCMU...	1	0.00 / 0	0.00 / 0	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0.00	0.00	0.00	0
2	22194...	PCMU...	1	0.00 / 0	0.00 / 0	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0.00	0.00	0.00	0
3	22137...	PCMU...	1	0.00 / 0	0.00 / 0	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0.00	0.00	0.00	0
3	22168...	PCMU...	1	0.00 / 0	0.00 / 0	0 / 0.00	0 / 0.00	0 / 0.00	0 / 0.00	0.00	0.00	0.00	0

Active Calls

Counter Type Counters

Total Packet Count	8472
Total Calls	67
Active Calls	0
Completed Calls	24
Purged Calls(Completed)	0

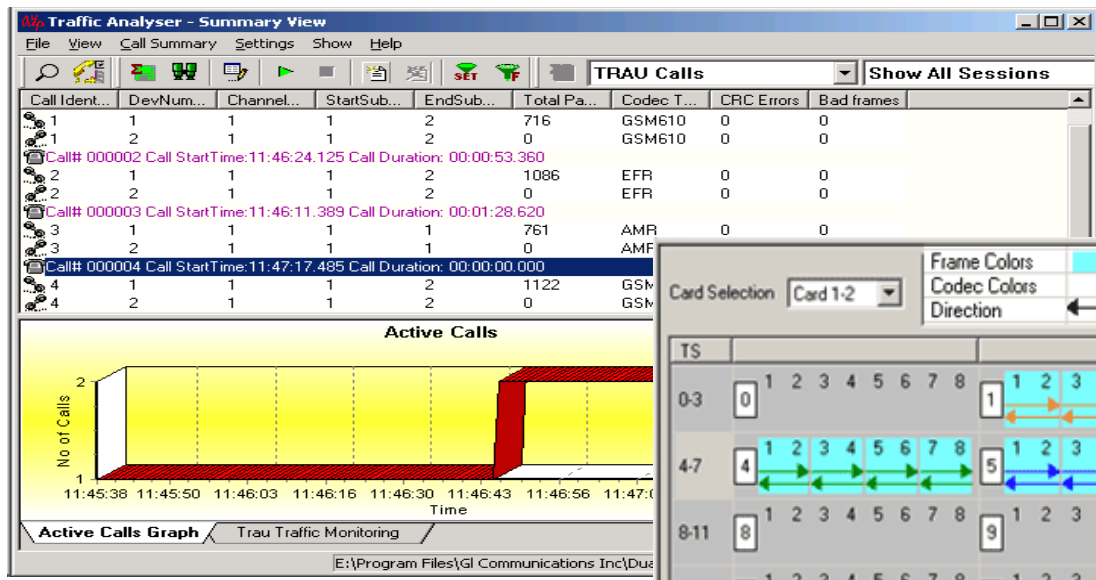
Counter Type Counters

Total SIP Packets	2904
SIP Calls	67
SIP Active Calls	0

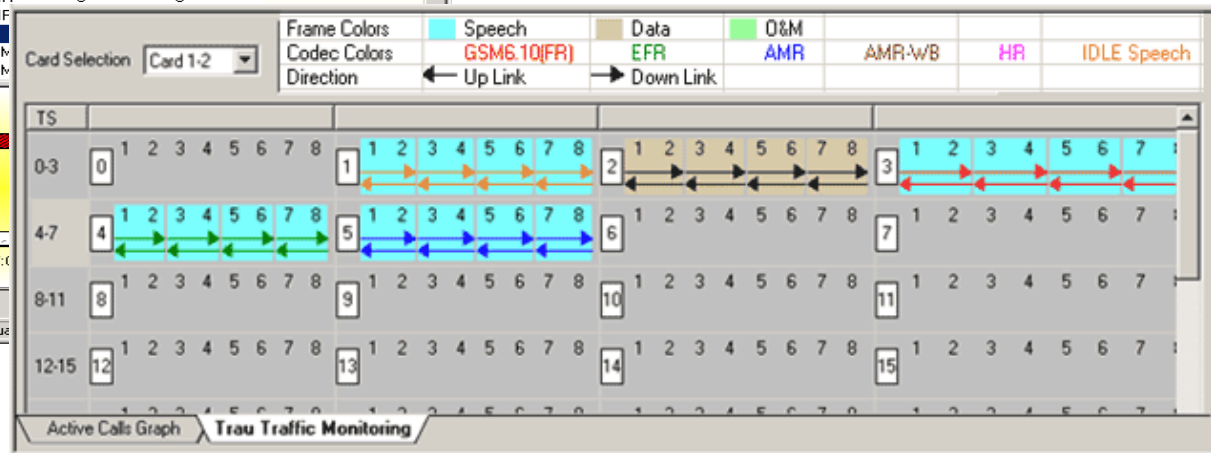
Active Calls Graph Average Jitter Distribution E-Model RTP Packets Graph SIP \ H323 \ RTP \ MEGACO

Protocol Analysis

TRAU Packet Data Analysis - Active Calls Graphs



TRAU Traffic Monitoring



Protocol Emulation

GSM Call Generation

Call Generation - MTC_BulkCall

Sr No	Script Name	Profile	Call Info	Script Execution	Status	Events	Events Profile	Result	Total Iterations	Completed Iterations
1	BSC_MTC_Ce...	Pro0.xr...	0x99999999	Abort	None	None	Pass	Infinite	0	
2	BSC_MTC_Ce...	Pro1.xr...	0x22222222	Start	None	None	Pass	1	0	
3	BSC_MTC_Ce...	Pro2.xr...	0x33333333	Start	None	None	Pass	Infinite	0	
4	BSC_MTC_Ce...	Pro3.xr...	0x44444444	Abort	None	None	Pass	Infinite	0	
5	BSC_MTC_Ce...	Pro4.xr...	0x55555555	Start	None	None	Pass	Infinite	0	
6	BSC_MTC_Ce...	Pro5.xr...	0x66666666	Abort	None	None	Pass	Infinite	0	
7	BSC_MTC_Ce...	Pro6.xr...	0x77777777	Abort	None	None	Pass	Infinite	0	
8	BSC_MTC_Ce...	Pro7.xr...	0x88888888	Abort	None	None	Pass	Infinite	0	

Buttons: Add, Delete, Insert, Start, Abort, Refresh, Start

Sequence Diagram (MAPS vs DUT):

```

sequenceDiagram
    participant MAPS
    participant DUT
    Note over MAPS, DUT: PAGING CoMmanD
    DUT->>MAPS: 11:44:13.296000
  
```

Scripts | **Message Sequence** | Event Config | Script Flow | Profile

GSM Call Reception

Call Reception

Sr No	Script Name	Call Info	Script Execution	Status	Events	Events Profile	Results
1	MTC.gls	9341141850	Abort	Transmitting File	Terminate	None	Pass
2	MTC.gls	9341141851	Completed	Establishing TRAU session	None	None	Pass
3	RX_Channel Activat...	4	Completed	Transmitting File	None	None	Pass
4	MTC.gls	9341141852	Abort	Transmitting File	Terminate	None	Pass
5	RX_Channel Activat...	4	Completed	Transmitting File	None	None	Pass
6	MTC.gls	9341141853	Abort	Transmitting File	Terminate	None	Pass
7	RX_Channel Activat...	4	Completed	Transmitting File	None	None	Pass
8	MTC.gls	9341141854	Abort	Transmitting File	Terminate	None	Pass
9	RX_Channel Activat...	4	Completed	Transmitting File	None	None	Pass
10	RX_Channel Activat...	4	Completed	Transmitting File	None	None	Pass
11	MTC.gls	9341141855	Abort	Transmitting File	Terminate	None	Pass
12	RX_Channel Activat...	4	Completed	Transmitting File	None	None	Pass
13	MTC.gls	9341141856	Abort	Transmitting File	Terminate	None	Pass
14	MTC.gls	9341141857	Completed	RR Connection Failed	None	None	Unknow

Buttons: Abort, Auto Trash, Trash

Sequence Diagram (MAPS vs DUT):

```

sequenceDiagram
    participant MAPS
    participant DUT
    Note over MAPS, DUT: PAGING CoMmanD
    DUT->>MAPS: 11:41:58.421000
    MAPS->>DUT: CHANnel ReRequireD
    DUT->>MAPS: 11:41:58.515000
    MAPS->>DUT: PAGING RESPONSE
    DUT->>MAPS: 11:41:59.859000
    MAPS->>DUT: AUTHENTICATION REQUEST
  
```

Scripts | **Message Sequence** | Event Config | Script Flow | Profile

BTSM Layer:

```

T-bit = ...
Message Group = 000C
Message Type = 0001
Channel number = ...
IE Identifier (Ch No) = 000C
Channel Type = 1001
Time Slot # = ...
Paging Group = ...
IE Identifier (PGr) = 000C
Paging Group = 000C
MS Identity = ...
IE Identifier (MSId) = 000C
Length Of MS Identity = 5
  
```

Thank You