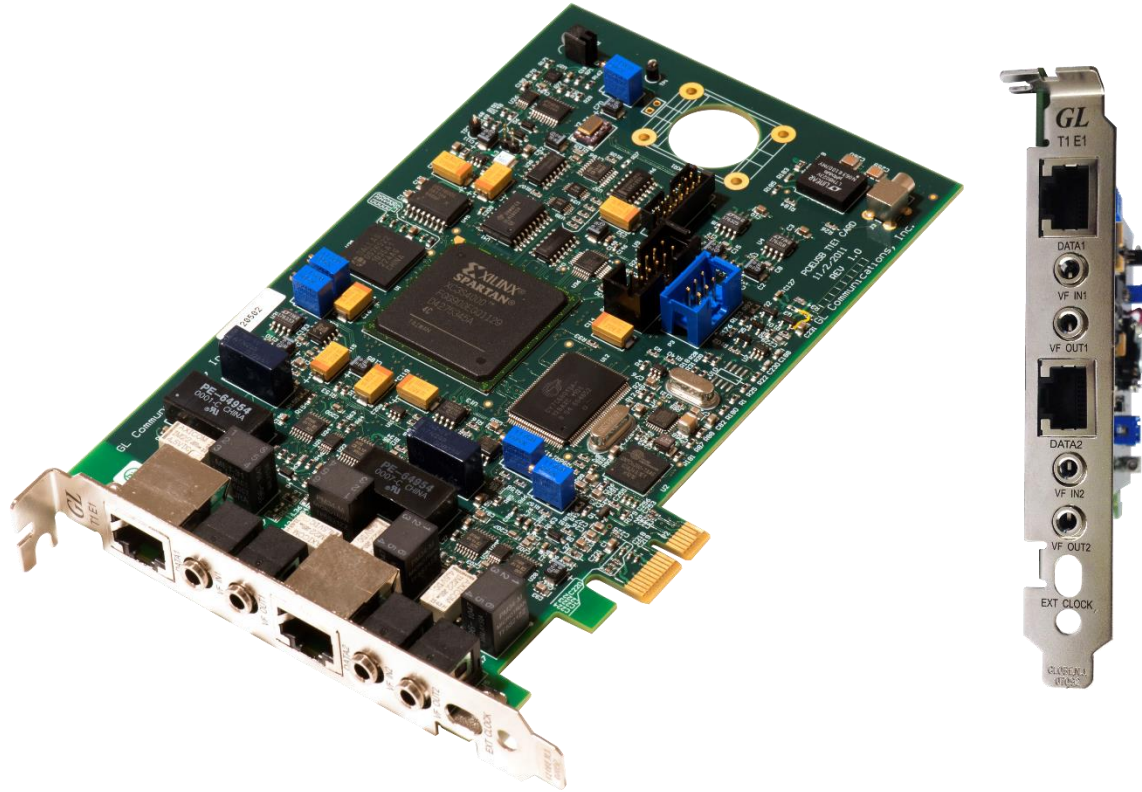

Dual T1 E1 Express (PCIe) Analysis and Emulation Boards



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>

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

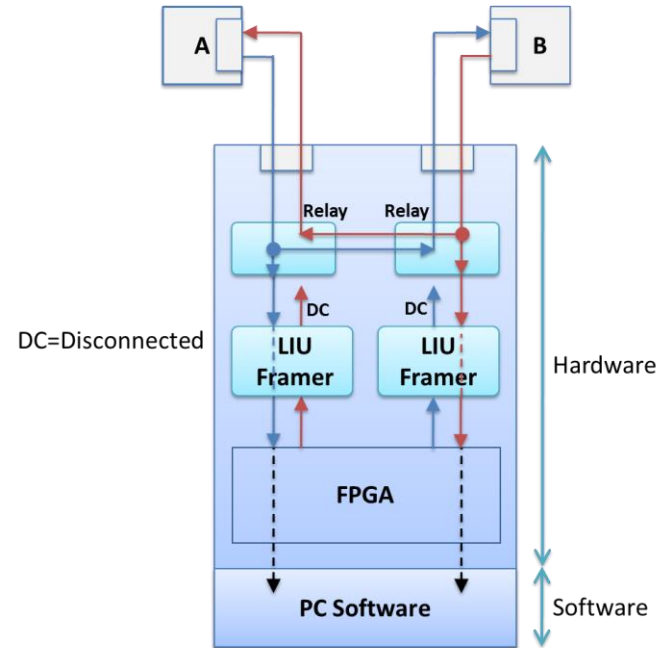
- T1 or E1 interfacing – Software Selectable
- TDM, ISDN, SS7 – High Density Voice. VoIP, Frame Relay, Multi-Link Frame Relay, PPP and Multi Link PPP, HDLC
- Most all “[basic applications](#)” and “[special applications](#)” are available for Dual T1 E1 Express boards Comprehensive Analysis / Emulation 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>Quad, Octal T1 E1 Boards</u>	<u>Dual T1 E1 Express (PCIe) Boards</u>
Number of Ports	4, 8	2
PCI Slot Type	PCI Express x1 Bus/ Connector	PCI Express x1 Bus / Connector
Speaker (on board)	No speakers	Supported
Cross-port and Through Modes	Supported	Supported
Pulse Mask Application	Not Supported	Supported
Jitter Generation and Measurement	Not Supported	Supported
External Clock Mode	No clock port connector	Supported
Clock Offset Capability	All ports at the same time	1 Port at a time
VF Interface and Impedance	Not Supported	Supported; 135/150/600/900/High
VF Interface for Mic/Headset	Not Supported	Supported
Drop and Insert (VF and T1/E1)	No VF connectors; Digital Drop/Insert supported	Supported
Onboard RAM	Not Supported	Supported

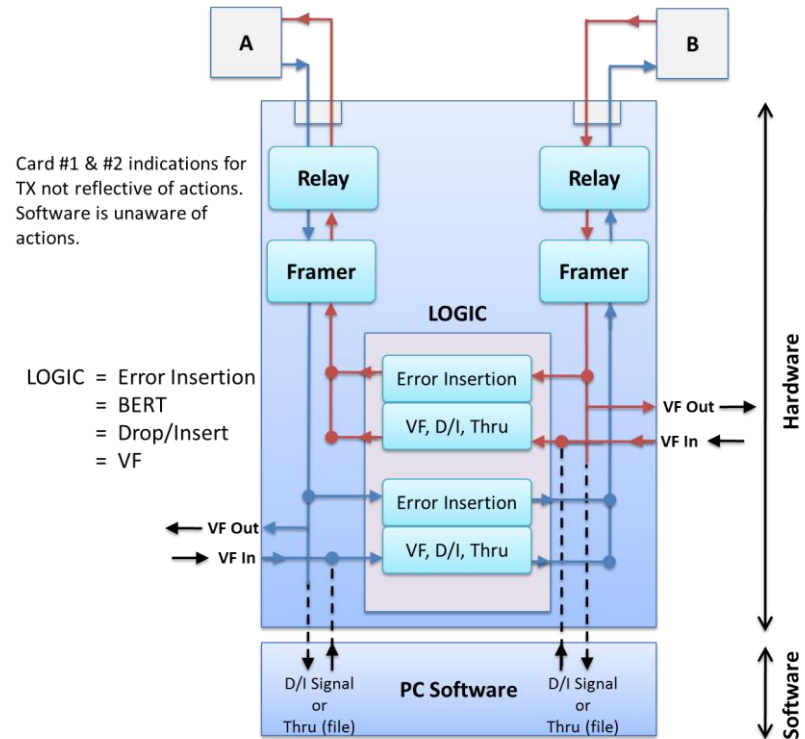
Cross-port Through Loopback

- 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

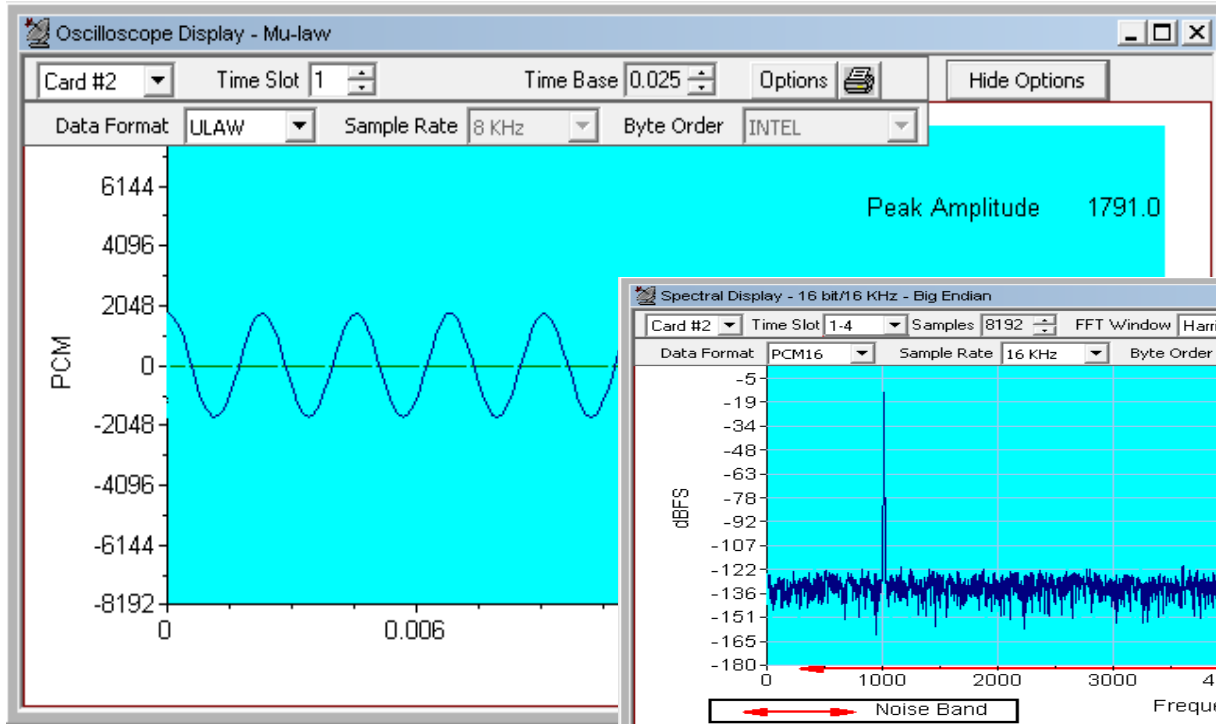
- T1 E1 Basic Software
 - Monitoring Options
 - Intrusive Testing
 - Windows Client / Server
 - Remote access to T1/E1 server
 - Clients - Python
- VF Options
 - Speaker
 - Drop and Insert
 - VF In / Out TS settings
- Monitoring Features
 - Monitor T1 or E1 Line
 - Byte Values & Binary Byte Values
 - Signaling bits, Power Level, DC Offset, & Frequency
 - Multiframe, and Real-time Multiframe
 - T1/E1 Data as Real-time Bitmap
 - Time-slot Window

T1 / E1 Basic Software (Contd.)

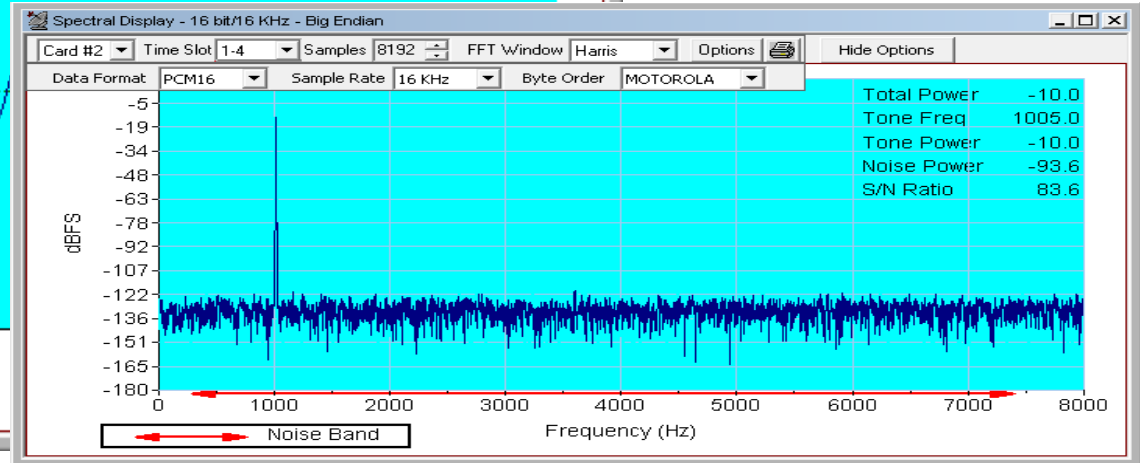
- Monitoring Features
 - ASCII Timeslot Display
 - Oscilloscope & Power Spectral
 - Audio Monitoring
 - Active Voice Level
 - Jitter Measurement
 - Pulse Mask Display
 - Capture Dialed Digits
 - Realtime Strip Chart
 - Realtime Multichannel Audio Bridge
 - Signaling Bit Transitions
- Intrusive Tests
 - 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

Monitoring Features

Oscilloscope Display

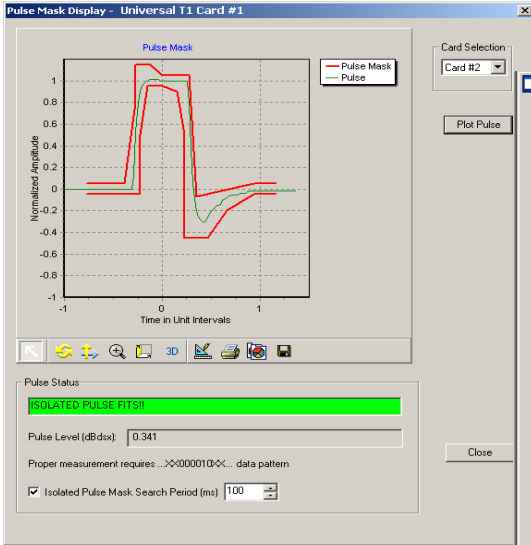


Spectral Display

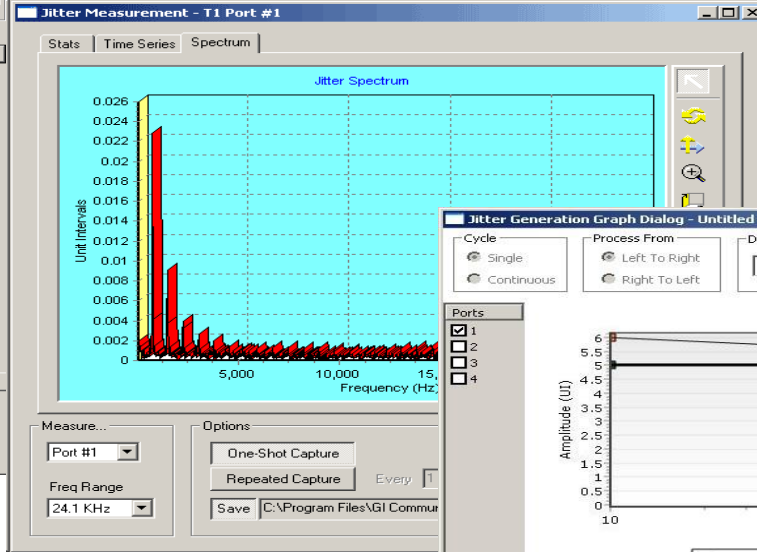


Jitter Measurement and Pulse Mask

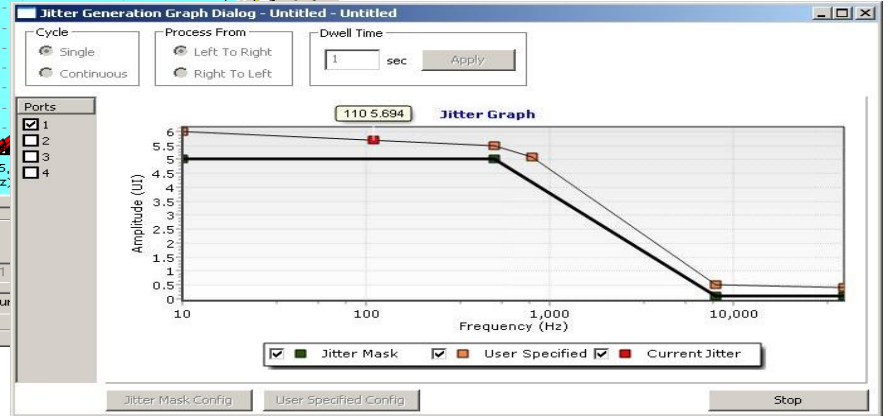
Pulse Shape Display



Jitter Measurement



Jitter Generation



Enhanced BERT and TX Signaling BITS

Enhanced BERT

The screenshot shows the 'Enhanced BERT Untitled' application window. The 'Tx Rx Settings - Card #1' dialog is open, displaying various configuration options for BERT testing. The 'BER Patterns' section shows a QRSS pattern of 31 zeros. The 'Timeslot Selection' section shows a grid of timeslots (0-23) with columns A, B, C, and D. The 'Error Rate (Logic Error)' is set to 10^-3, and the 'User Defined Rate' is 0.01. The 'Graph - Online Display' section shows a 'TeeChart' with a legend for LOGIC_ERROR (red), BPV (green), and FRAME_ERROR (blue). The graph shows a series of red bars representing errors over time from 10:24:30 to 10:25:10.

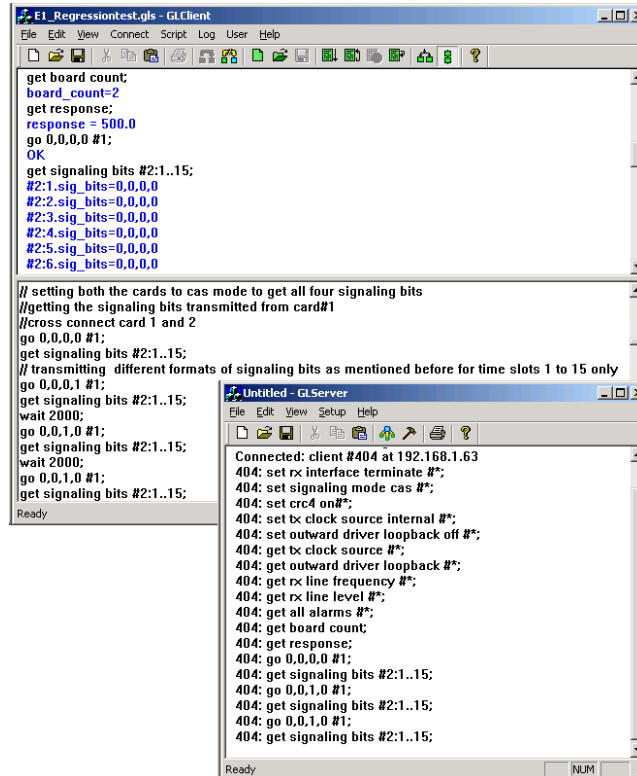
Transmit Signaling BITS

The 'Tx Signaling Bits' dialog box displays a grid of 24 timeslots (Ts# 00-23) with columns A, B, C, and D. Each cell contains a checkbox and a 4-bit binary value (e.g., 0101). A 'Signaling' list on the right shows the selected bit patterns for each timeslot, with '0101 E' highlighted. Below the grid are buttons for 'Save', 'Deselect All', 'Transmit', 'Load', 'Select All', and 'Close', along with a 'Device Selection' dropdown set to 'Card #1'.

The 'Signaling Bits' dialog box for 'Card #2' shows a grid of 24 timeslots (TS 0-23) with columns A, B, C, and D. Each cell contains a checkbox and the binary value '0101'. The 'Signaling' list on the right shows the bit patterns for each timeslot, with '0101 E' highlighted.

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



```
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

// 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 0,0,1,0 #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;
Ready
```

```
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;
Ready
```

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

T1 or E1 Special Applications (Contd.)

- 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

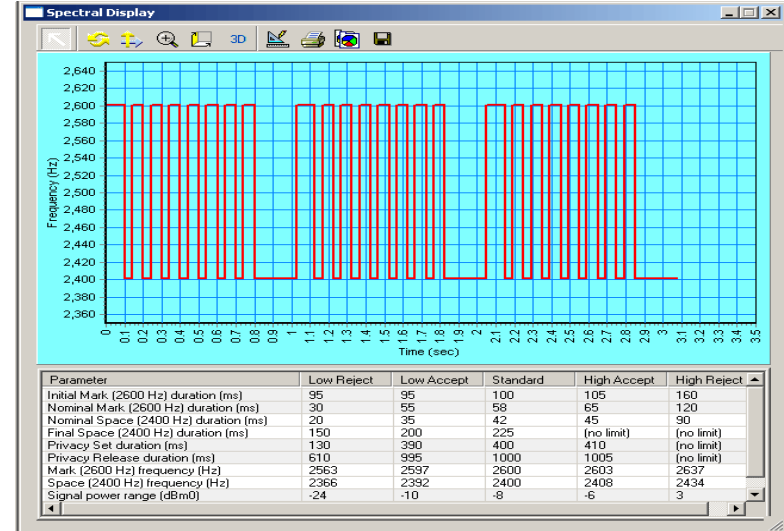
T1 or E1 Special Applications

Protocol Identifier

The screenshot shows the PC Protocol Classifier interface. The 'Protocol Set' is set to 'TRAU'. The main window displays a table with two columns for 'Port 1' and 'Port 2', each with sub-channels 1-8. A 'Protocol Color Selection' dialog box is open, listing 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). The 'Default' button is visible at the bottom of the dialog.

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

SS1 Analyzer and Emulator



Call Capture and Analysis

Call Capture and Analysis

Multiple Call Capture - UsbE1 Card #1 and #2

File Capture Settings

Capture Directory
D:\CapturedFiles\ManualCall\1210091146

Capture File #1
Dec10W01.000
Bytes Captured: 17024

Capture File #2
Dec10E01.000
Bytes Captured: 17024

Signaling File: Dec1001.000.000

Timeslot Activity

01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
16	17	18	19	20	21	22	23	24	25	26	27	28	29	31

Multiple Call Capture and Analysis

Timeslots	Storage Location	Trigger Option	Action
0-23	C:\Program Files\GL Communications Inc\Dual Ultra HD T1 Analyzer	Edit	Abort
0-23	C:\Program Files\GL Communications Inc\Dual Ultra HD T1 Analyzer	Edit	Abort
0-23	C:\Program Files\GL Communications Inc\Dual Ultra HD T1 Analyzer	Edit	Abort
0-23	C:\Program Files\GL Communications Inc\Dual Ultra HD T1 Analyzer	Edit	Abort

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

CCA Details Timeslots Map

Protocol Analysis

PPP Protocol Analysis

The screenshot shows the 'PPP Protocol Analysis' window. The top part is a table of captured packets:

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	00:00:00.008825	14		Link Control	Echo-Request		
✓ 1	1-31		3	00:00:00.0092000	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	00:00:10.083000	14		Link Control	Echo-Reply		

Below the table, the 'Hex Dump of the Frame Data' is shown:

```
Hex Dump of the Frame Data
+-----+-----+-----+-----+-----+-----+
FF 03 C0 21 09 AC 00 08 09 DC 19 2E 85 63      y A l ~ U . i c
```

PPP Packet Data Analysis

The screenshot shows the 'Traffic Analyzer - Summary View' window. The top part is a table of call statistics:

Call #	SSRC	Payload	Packet Received	Conversat MDS/R...	Listening MDS/R...	Packets Discard...	Missing Packets...	Duplicate Packets...	Out Of Sequen...	Average Gap(ms)	Average Delay	Average Jitter	Average Interac...
Call#000001	Caller:0001@192.168.40.245	Callee:0001@192.168.20.20	CallId:GLPG1413613128143612	Call StartTime:2011-11-23 09:56:52.064	Call C...								
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

Below the table is an 'Active Calls' graph showing the number of active calls over time. The graph shows a series of red bars representing active calls, with a peak of 1 call at 10:04:33 and another peak of 1 call at 10:11:11.

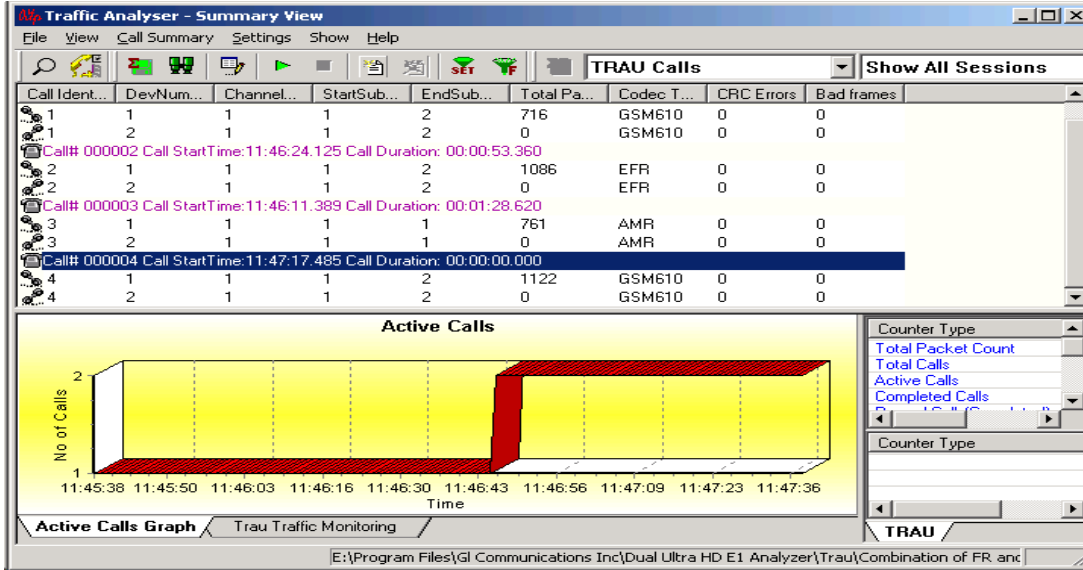
On the right side, there are two counter tables:

Counter Type	Count
Total Packet Count	8472
Total Calls	67
Active Calls	0
Completed Calls	24
Byrned Calls(Completed)	0

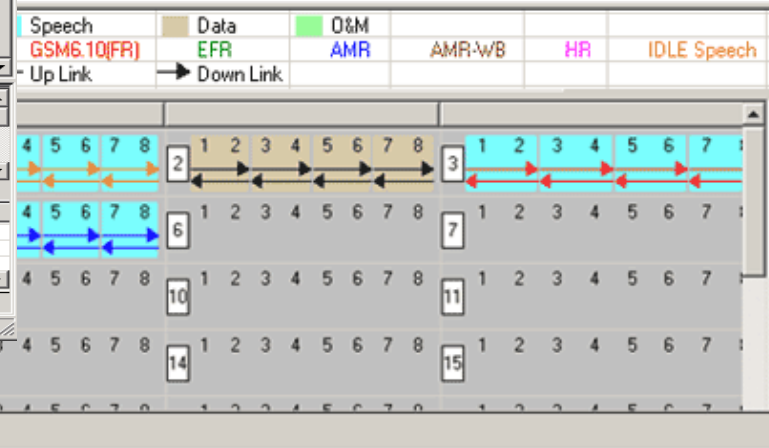
Counter Type	Counters
Total SIP Packets	2904
SIP Calls	67
SIP Active Calls	0

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		Pass	Infinite	0
2	BSC_MTC_Ce...	Pro1.xr...	0x22222222	Start		None		Pass	1	0
3	BSC_MTC_Ce...	Pro2.xr...	0x33333333	Start		None		Pass	Infinite	0
4	BSC_MTC_Ce...	Pro3.xr...	0x44444444	Abort		None				
5	BSC_MTC_Ce...	Pro4.xr...	0x55555555	Start		None				
6	BSC_MTC_Ce...	Pro5.xr...	0x66666666	Abort		None				
7	BSC_MTC_Ce...	Pro6.xr...	0x77777777	Abort		None				
8	BSC_MTC_Ce...	Pro7.xr...	0x88888888	Abort		None				

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

Message Sequence Diagram (MAPS ↔ DUT):

- 11:44:13.296000: PAGING CoMmanD

Legend:

- T-bit
- Messa
- Chann
- IE I
- Chan
- Time
- Pagin
- IE I
- Pagi
- MS Id
- IE I
- Leng
- Type
- Odd/

Navigation: 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		Pass
2	MTC.gls	9341141851	Completed	Establishing TRAU session	None		Pass
3	RX_Channel Activat...	4	Completed		None		Pass
4	MTC.gls	9341141852	Abort	Transmitting File	Terminate		Pass
5	RX_Channel Activat...	4	Completed		None		Pass
6	MTC.gls	9341141853	Abort	Transmitting File	Terminate		Pass
7	RX_Channel Activat...	4	Completed		None		Pass
8	MTC.gls	9341141854	Abort	Transmitting File	Terminate		Pass
9	RX_Channel Activat...	4	Completed		None		Pass
10	RX_Channel Activat...	4	Completed		None		Pass
11	MTC.gls	9341141855	Abort	Transmitting File	Terminate		Pass
12	RX_Channel Activat...	4	Completed		None		Pass
13	MTC.gls	9341141856	Abort	Transmitting File	Terminate		Pass
14	MTC.gls	9341141857	Completed	RR Connection Failed	None		Unknow

Buttons: Abort, Auto Trash, Trash

Message Sequence Diagram (MAPS ↔ DUT):

- 11:41:58.421000: PAGING CoMmanD
- 11:41:58.421000: CHANnel ReQuireD
- 11:41:59.515000: Immediate Assignment
- 11:41:59.515000: PAGING RESPONSE
- 11:41:59.859000: AUTHENTICATION REQUEST

Legend (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

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

Thank you