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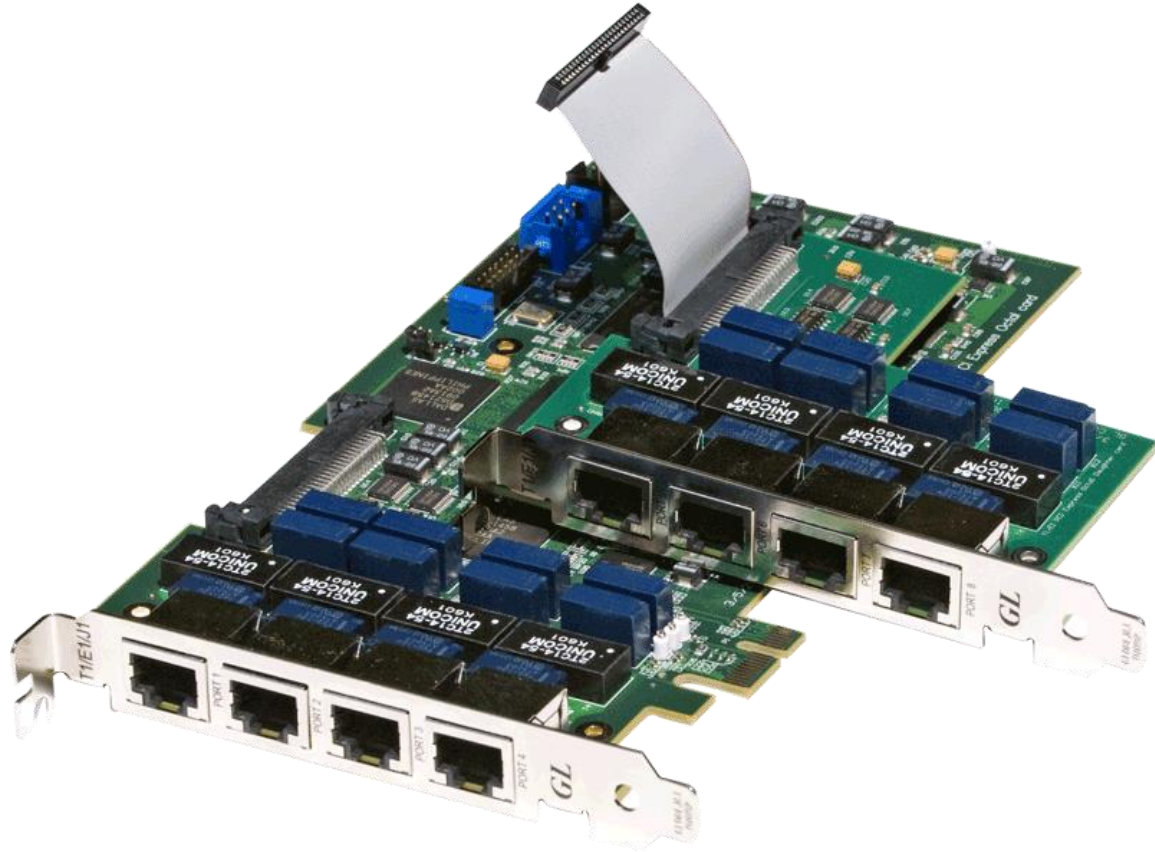
# T1E1 Quad and Octal Port Analyzer

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

# PCIe based Octal and Quad T1 E1 Board



# Octal T1 E1 Board on Rack PC



- High density Performance
- Provides Four (4) or Eight (8) RJ-48 T1 E1 ports and multiples thereof. For example, configurations of 8, 12, 16, 64 T1 E1s in a single rack are possible

# 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
- Reduces hardware costs and power consumption

# Main Features

- T1 or E1 interfacing – Software Selectable
- User friendly GUI for Windows® 10 OS
- Windows and Linux Drivers for Open Source Applications
- 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 Quad and Octal T1 E1 cards including Comprehensive Analysis / Emulation of voice, digits, tones, fax, modem, raw data, and Echo Testing
- Call Recording, Generation, and Monitoring for hundreds to thousands of calls in one platform
- Capable of simulating as well as decoding and demodulating fax calls over T1 E1 lines using Fax Simulator and FaxScan™

# Main Features (contd.)

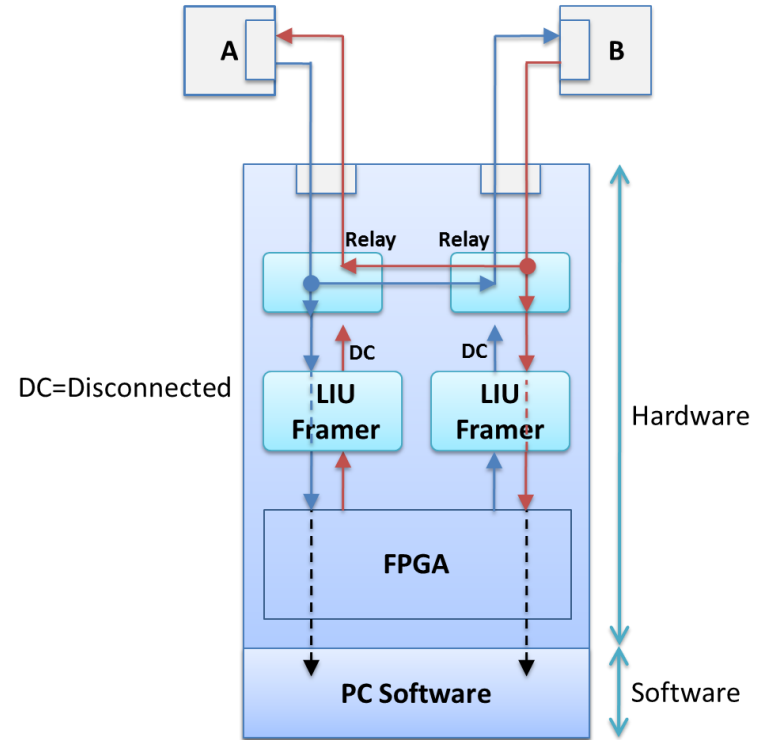
- Router with Multi T1 E1 WAN Interfaces i.e. MLPPP (Multi Link PPP)
- Media (VoIP) Gateway, IP PBX, and IVR Applications i.e. Asterisk (TM)
- “Cross-Port Through” and “Cross-Port Transmit” Modes – these configurations make cabling with Drop/Insert and Fail-Safe Inline Monitoring very easy
- Compatible with dual, quad, and higher core motherboards and software that simulate dual and quad cores (hyper-threading)

# Quad and Octal Cards over Dual T1 E1 Express (PCIe) Cards

	Dual T1 E1 Express (PCIe) Boards	Quad, Octal T1 E1 Boards
Number of Ports	2	4, 8
PCI Slot Type	Uses a PCI Express x1 Bus / Connector	Uses a PCI Express x1 Bus / Connector
Pulse Mask Application	Supported	Not Supported
Jitter Generation and Measurement	Supported	Not Supported
External Clock Mode	Supported	No clock port connector
VF Drop and Insert	Supported	No VF connectors; Digital Drop/Insert supported
Speaker (on board)	Supported	No speakers

# Cross-port Through Loopback

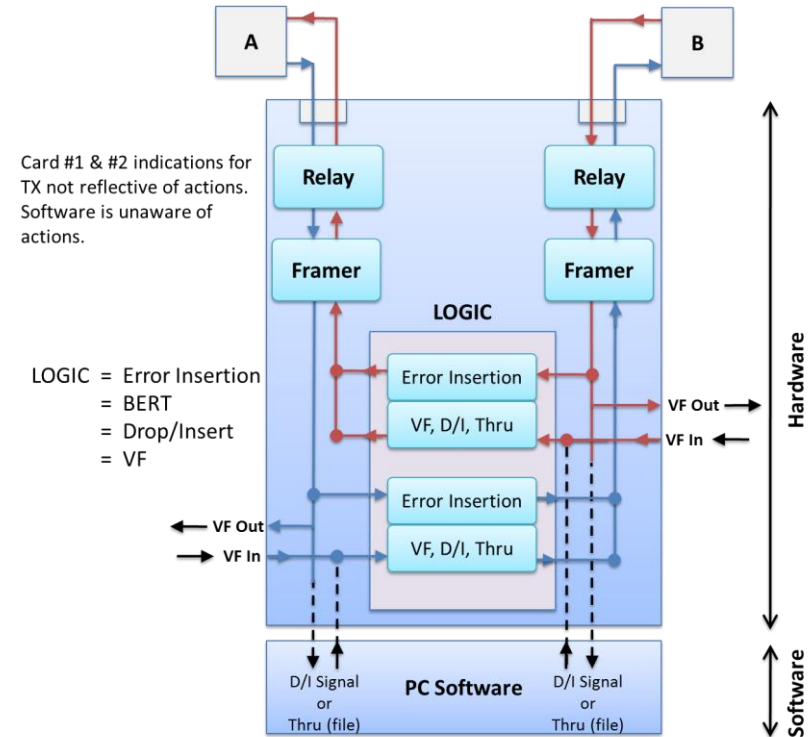
- Allows monitoring T1 E1 lines in-line while still being protected from loss of power to the board
- It is implemented entirely through relays and eliminates complex cabling
- The signal received on Card 2 (Port 2) is transmitted out onto Card 1 (Port 1)





# 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 E1 equipment



# T1 E1 Basic Software

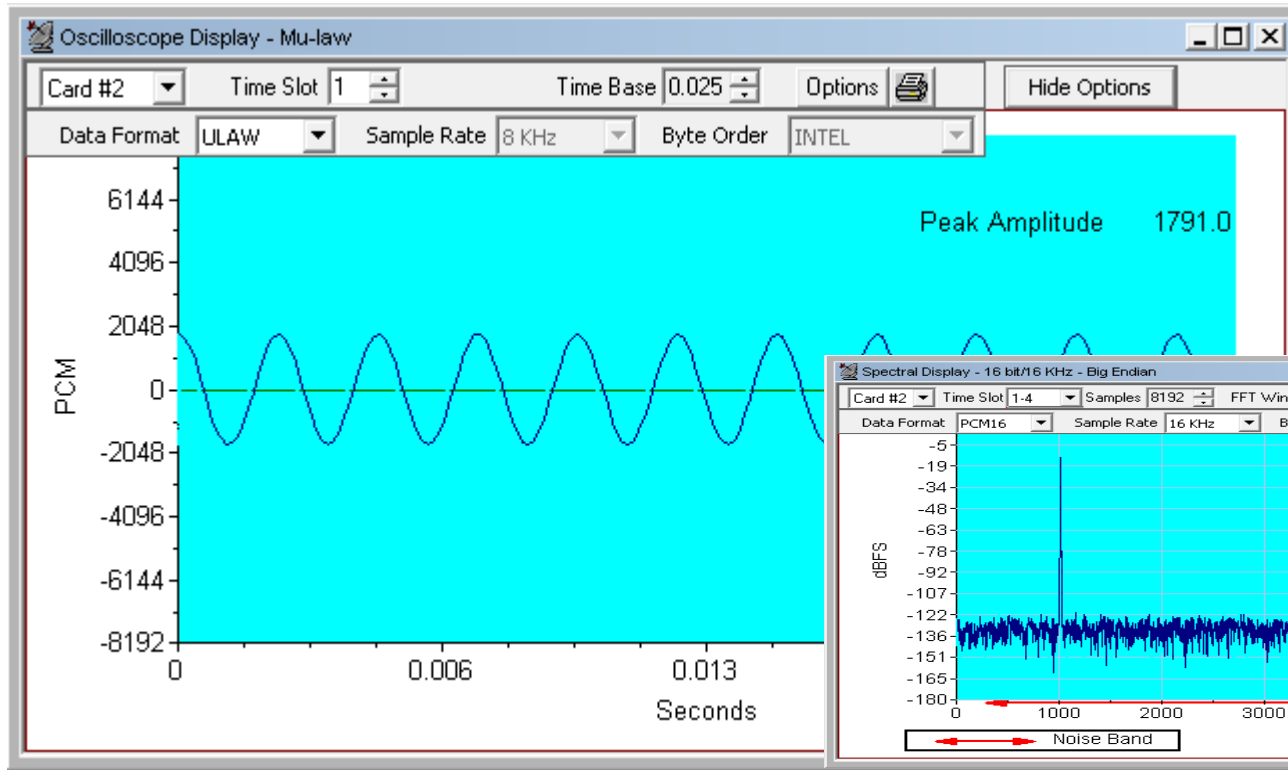
- T1 E1 Basic Software
  - Monitoring Options
  - Intrusive Testing
  - Windows Client / Server
    - Remote access to T1 E1 server
    - Clients - C++, Java, TCL

# Monitoring Features

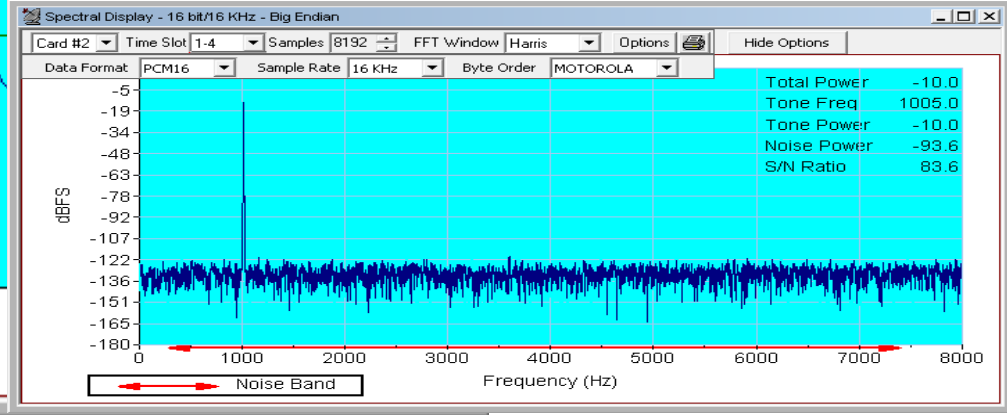
- Monitor T1 E1 Line
- Byte Values and Binary Byte Values
- Signaling bits, Power Level, DC Offset, and Frequency
- Multi-frames, and Real-time Multi-frames
- T1 E1 Data as Real-time Bitmap
- Timeslot Window
- ASCII Timeslot Display
- Oscilloscope and Power Spectral
- Audio Monitoring and Active Voice Level

# Monitoring Features

## Oscilloscope Display



## Spectral Display



# Intrusive Testing

- Drop and Insert
- Bit Error Rate Test
- Enhanced Bit Error Rate
- Transmit Tone
- Transmit Gaussian Noise
- Transmit Multi-frame
- Transmit Signaling Bits
- Precision Delay Measurement
- Rx-to-Tx Loop back
- Error Insertion
- DTMF / MF Capture
- Real-time Multichannel Audio Bridge
- Real-time Strip Chart

# Enhanced BERT and TX Signaling BITS

## Enhanced BERT

The screenshot shows the 'Enhanced BERT Untitled' application window. The 'Tx Rx Settings - Card #1' panel is active, displaying various configuration options:

- Unframed** section: Includes 'BER Patterns' (set to QRSS), 'User Defined Pattern' (0), and 'All Ones'/'All Zeros' fields.
- Timeslot Selection**: A grid for selecting timeslots (0-23) with a 'Control + click' instruction.
- Error Rate (Logic Error)**: Set to  $10^{-3}$  with a 'User Defined Rate' of 0.01.
- Sub Channel Selection**: Set to 7.

The 'Graph - Online Display' section shows a 'Real-Time Display' graph with a duration of 1 minute. The graph displays 'Errors' over time, with a legend for LOGIC\_ERROR (red), BPV (green), and FRAME\_ERROR (blue). The graph shows a series of red and green bars indicating error occurrences between 10:24:30 and 10:25:10.

## Transmit Signaling BITS

The screenshot shows the 'Tx Signaling Bits' application window. It features a grid for configuring signaling bits for 24 timeslots (Ts# 00 to 23). Each timeslot has a checkbox and four columns (A, B, C, D) for bit selection.

Ts#	A	B	C	D	Ts#	A	B	C	D	Ts#	A	B	C	D			
00	<input checked="" type="checkbox"/>	0	1	0	1	08	<input checked="" type="checkbox"/>	0	1	0	1	16	<input checked="" type="checkbox"/>	0	1	0	1
01	<input checked="" type="checkbox"/>	0	1	0	1	09	<input checked="" type="checkbox"/>	0	1	0	1	17	<input checked="" type="checkbox"/>	0	1	0	1
02	<input checked="" type="checkbox"/>	0	1	0	1	10	<input checked="" type="checkbox"/>	0	1	0	1	18	<input checked="" type="checkbox"/>	0	1	0	1
03	<input checked="" type="checkbox"/>	0	1	0	1	11	<input checked="" type="checkbox"/>	0	1	0	1	19	<input checked="" type="checkbox"/>	0	1	0	1
04	<input checked="" type="checkbox"/>	0	1	0	1	12	<input checked="" type="checkbox"/>	0	1	0	1	20	<input checked="" type="checkbox"/>	0	1	0	1
05	<input checked="" type="checkbox"/>	0	1	0	1	13	<input checked="" type="checkbox"/>	0	1	0	1	21	<input checked="" type="checkbox"/>	0	1	0	1
06	<input checked="" type="checkbox"/>	0	1	0	1	14	<input checked="" type="checkbox"/>	0	1	0	1	22	<input checked="" type="checkbox"/>	0	1	0	1
07	<input checked="" type="checkbox"/>	0	1	0	1	15	<input checked="" type="checkbox"/>	0	1	0	1	23	<input checked="" type="checkbox"/>	0	1	0	1

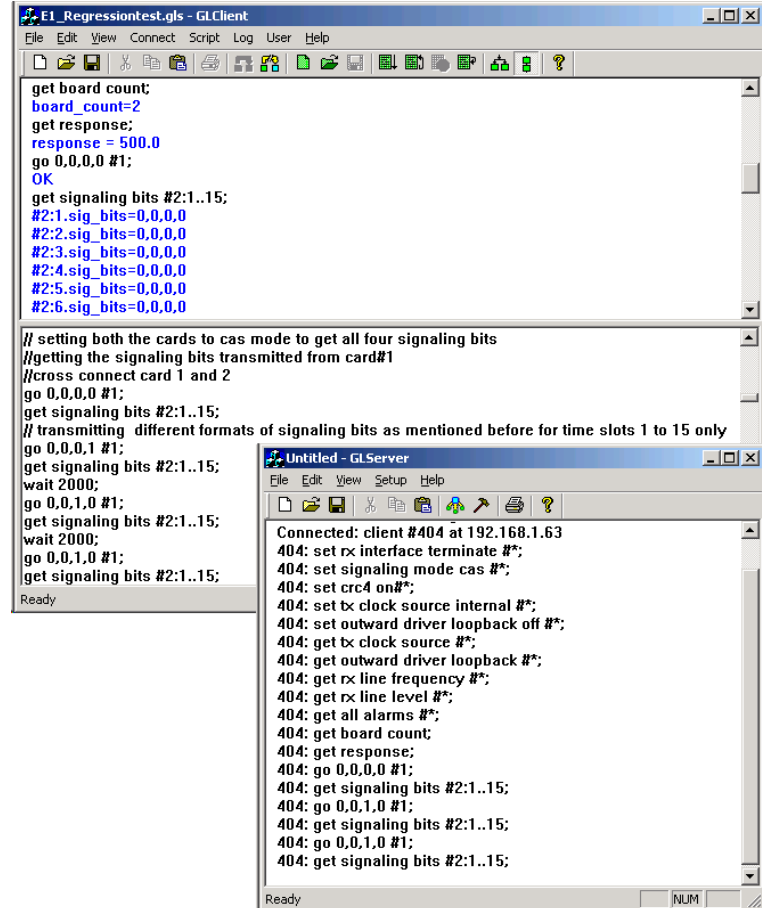
Below the grid are buttons for 'Save', 'Deselect All', 'Transmit', 'Load', 'Select All', and 'Close'. A 'Device Selection' dropdown is set to 'Card #1'.

The screenshot shows the 'Signaling Bits' application window for 'Card #2'. It displays a grid of signaling bits for 24 timeslots (TS 0 to 23), where each cell contains a timeslot number and its corresponding signaling bit pattern (0101).

TS	Signaling	TS	Signaling	TS	Signaling
TS 0	0101	TS 8	0101	TS 16	0101
TS 1	0101	TS 9	0101	TS 17	0101
TS 2	0101	TS 10	0101	TS 18	0101
TS 3	0101	TS 11	0101	TS 19	0101
TS 4	0101	TS 12	0101	TS 20	0101
TS 5	0101	TS 13	0101	TS 21	0101
TS 6	0101	TS 14	0101	TS 22	0101
TS 7	0101	TS 15	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 E1 Analyzer



```
E1_Regressiontest.gls - GLClient
File Edit View Connect Script Log User Help
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 0,0,0,1 #1;
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

Untitled - GLServer
File Edit View Setup Help
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;
404: go 0,0,1,0 #1;
404: get signaling bits #2:1..15;
NUM
```

# T1 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, and Emulation
    - BER, Playback
    - Manual and Automated Record / Playback files
    - Call Capture and Analysis (CCA)
    - Multiple Call Capture and Analysis



# T1 E1 Special Applications

- 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
- Multi-Channel BERT
- Multiplex / Demultiplex Software
- Real-time Strip Chart
- Network Surveillance

# T1 E1 Special Applications

## Protocol Identifier

The PC Protocol Classifier window displays a table of protocol identifications for two ports (Port 1 and Port 2) across 17 time slots (TS). The protocols are color-coded and organized into sub-channels. A 'Protocol Color Selection' dialog box is open, showing a list of protocols with corresponding color swatches.

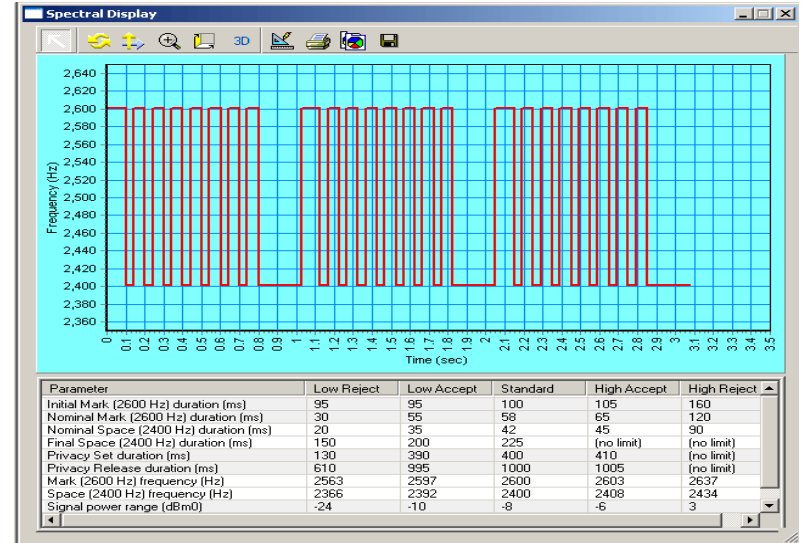
TS	Port 1	Port 2
0	SubChannel 1-8	SubChannel 1-8
1	ISDN	ISDN
2	FRAMERELAY	FRAMERELAY
3	TRAU	SS7
4	TRAU	SS7
5	TRAU	PPP
6		TRAU
7		TRAU
8		TRAU
9		
10	HDLCL	HDLCL
11	MTP2	HDLCL
12		
13		
14		
15		
16	HDLCL	LAPD

**Protocol Color Selection**

- ALL
- TRAU
- ATM
- HDLCL
- MTP2
- LAPD
- SS7
- PPP
- ISDN
- GSM
- GSMABIS
- FRAMERELAY

Buttons: Reset, Stop, Refresh

## SS1 Analyzer and Emulator



# Call Capture and Analysis

## Call Capture and Analysis

The screenshot displays the 'Multiple Call Capture' software interface. The main window is titled 'Multiple Call Capture - UsbE1 Card #1 and #2'. It features several configuration sections:

- File Capture Settings:** Includes a 'Capture Directory' field with the path 'D:\CapturedFiles\ManualCall1210091146', a 'Capture File #1' field with 'Dec10w01.000', and a 'Bytes Captured' field with '17024'. There is also a 'TS Display' control set to '1'.
- Capture File #2:** Includes a field with 'Dec10E01.000' and a 'Bytes Captured' field with '17024'.
- Signaling File:** A field with 'Dec1001.0'.
- Timeslot Activity:** A grid showing timeslots 01 through 23. Slots 01-07 and 16-22 are highlighted in green, indicating active capture.

Overlaid on the main window is a smaller window titled 'Multi Call Capture for Manual - Untitled'. It contains a table with the following data:

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

Below this table is another table showing detailed capture information:

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

The bottom of the window shows tabs for 'CCA Details' and 'Timeslots Map'.

## Multiple Call Capture and Analysis

# Protocol Analysis

## PPP Protocol Analysis

**PPP Protocol Analysis PPP**

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	00:00:10.083000	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)  
Magic Number = 165410310 (x00C103E)

Hex Dump of the Frame Data  
FF 03 C0 21 09 AC 00 08 09 DC 19 2E 85 63      ÿ Å ~ Ü Ìc

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

## PPP Packet Data Analysis

**Traffic Analyzer - Summary View**

Sip Calls      Show All Sessions

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 Inter Ar...
Call#H000001	Caller:0001@192.168.40.245	Callee:0001@192.168.20.20	CallId:GLPG1413613128143612	Call StartTime:2011-11-23 09:56:52.064	Call E								
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
2	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
Call#H000002	Caller:0001@192.168.40.245	Callee:0001@192.168.20.20	CallId:GLPG1421035128143618	Call StartTime:2011-11-23 09:56:59.475	Call E								
1	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
Call#H000003	Caller:0002@192.168.40.245	Callee:0002@192.168.20.20	CallId:GLPG1428645128143624	Call StartTime:2011-11-23 09:57:07.082	Call E								
1	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      Count

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

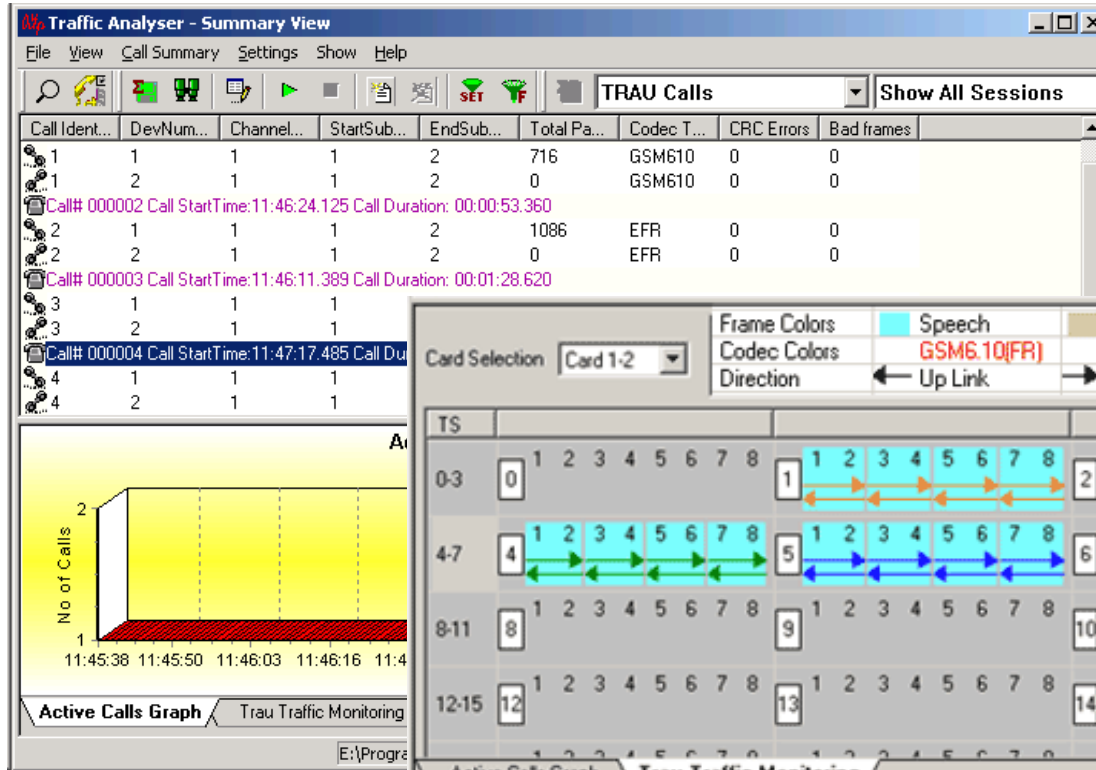
Counter Type      Counters

Total SIP Packets	2904
SIP Calls	67
SIP Active Calls	0

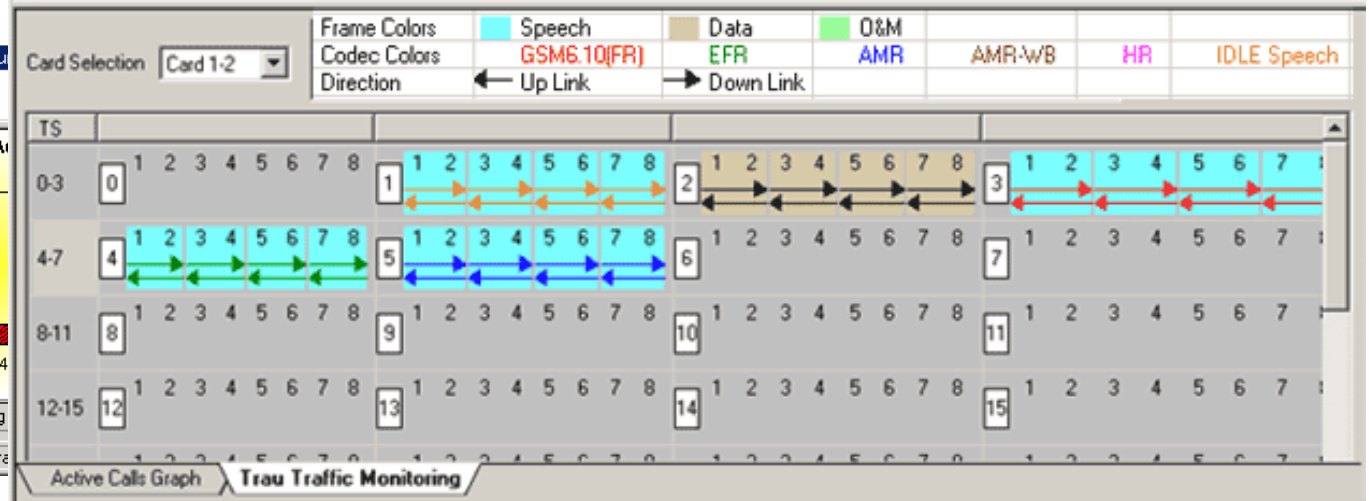
Active Calls Graph      Average Jitter Distribution      E-Model      RTP Packets Graph      SIP / H323 / RTP / MEGACO

# 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.xrn	0x99999999	Abort		None		Pass	Infinite	0
2	BSC_MTC_Ce...	Pro1.xrn	0x22222222	Start		None		Pass	1	0
3	BSC_MTC_Ce...	Pro2.xrn	0x33333333	Start		None		Pass	Infinite	0
4	BSC_MTC_Ce...	Pro3.xrn	0x44444444	Abort		None		Pass	Infinite	0
5	BSC_MTC_Ce...	Pro4.xrn	0x55555555	Start		None		Pass	Infinite	0
6	BSC_MTC_Ce...	Pro5.xrn	0x66666666	Abort		None		Pass	Infinite	0
7	BSC_MTC_Ce...	Pro6.xrn	0x77777777	Abort		None		Pass	Infinite	0
8	BSC_MTC_Ce...	Pro7.xrn	0x88888888	Abort		None		Pass	Infinite	0

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

MAPS DUT

PAGING CoMmand → 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		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		Unknown

Buttons: Abort, Auto Trash, Trash

MAPS DUT

PAGING CoMmand ← 11:41:58.421000

CHANnel ReQuireD → 11:41:58.421000

Immediate Assignment ← 11:41:59.515000

PAGING RESPONSE → 11:41:59.515000

AUTHENTICATION REQUEST ← 11:41:59.859000

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**