
T3 E3 Optional Applications



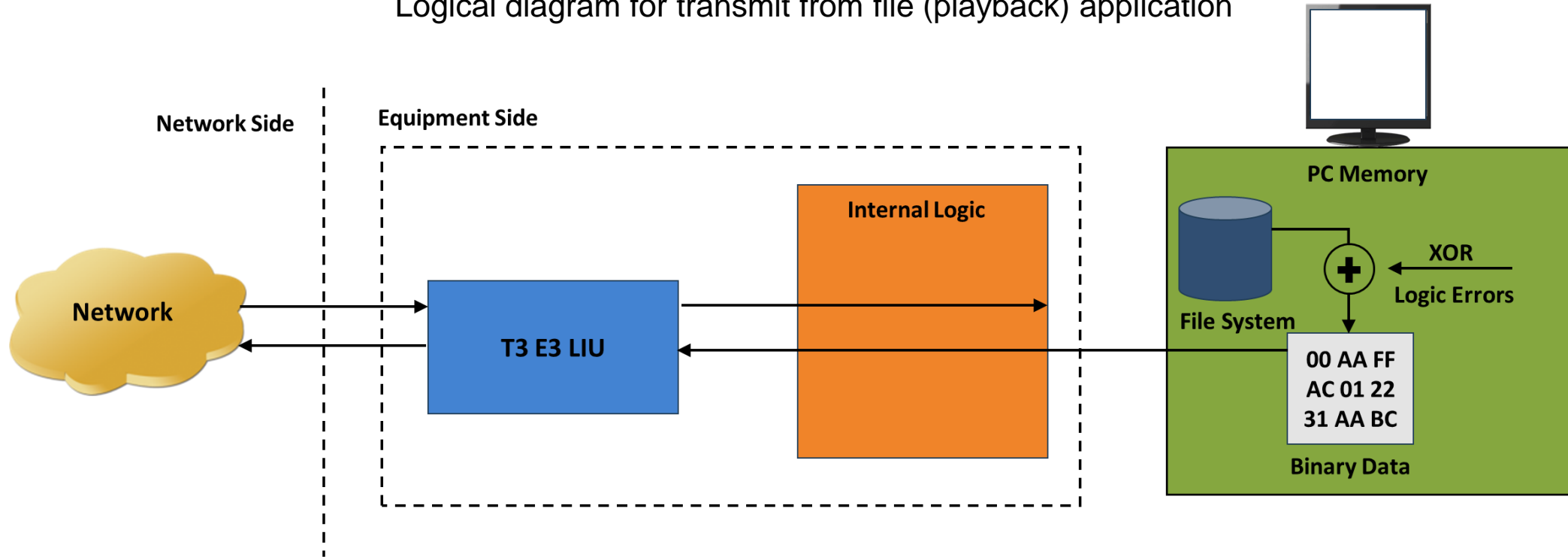
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Optional Applications

- Scripting and Automation
- Record and Playback Software
 - Playback (Transmit from File)
 - Record (Capture to File)
- Protocol Analysis
 - HDLC, PPP, ATM, Frame Relay
- Protocol Emulation
 - HDLC, PPP
- T1/E1 Send/Receive Server
- Channelized USB T3 E3
- Client and Server

Playback (Transmit from File)

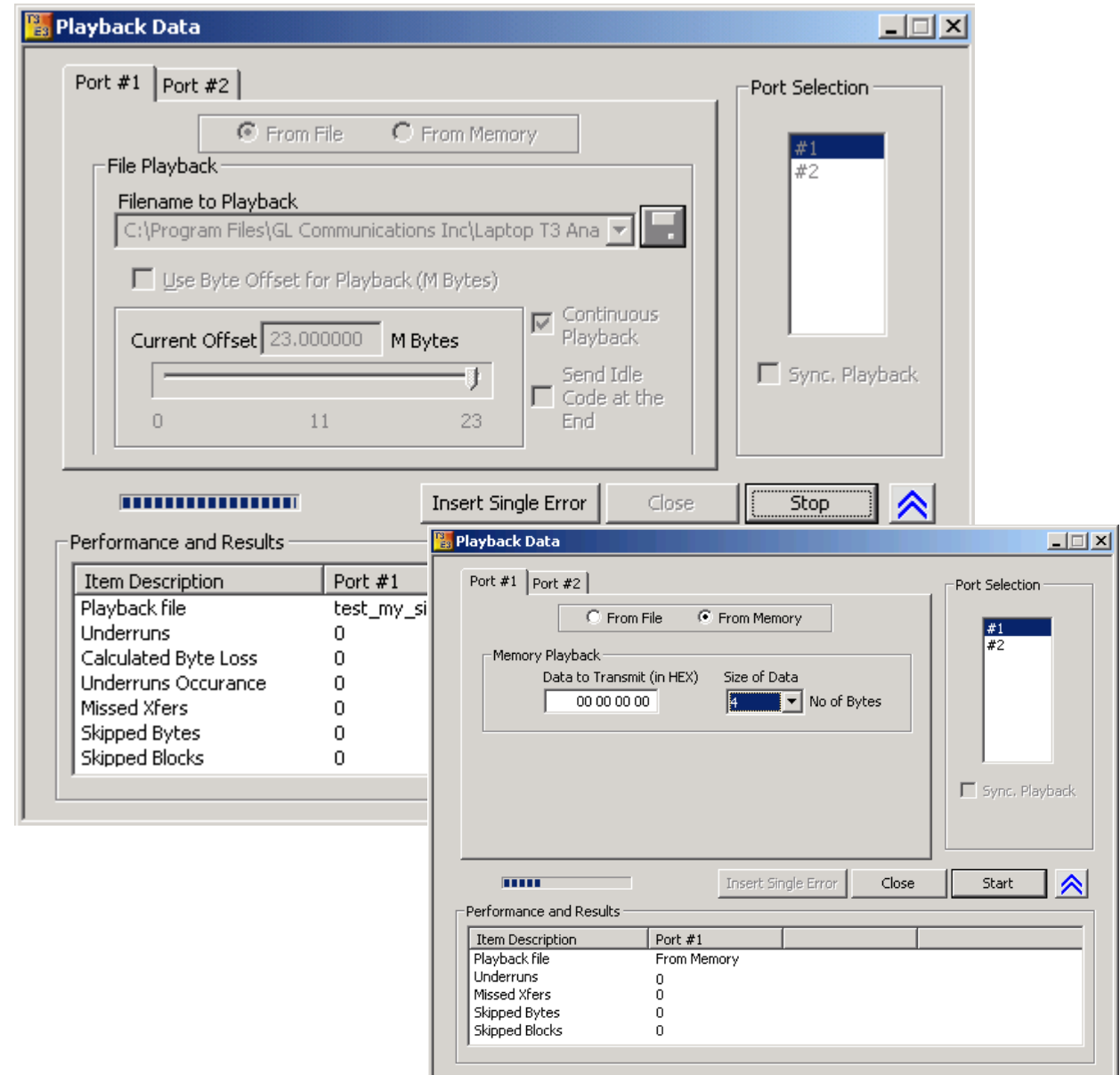
Logical diagram for transmit from file (playback) application



- The transmit file application permits transmission of a file of any length or transmission of data from memory in hex format

Playback (Transmit from File) GUI

- User Interface for transmit from file/memory (playback) application
- From Memory and /or File Playback –
 - In file playback, files of any length can be transmitted continuously (without loss)
 - In memory playback, data to be transmitted (in HEX) with maximum size of 4 bytes

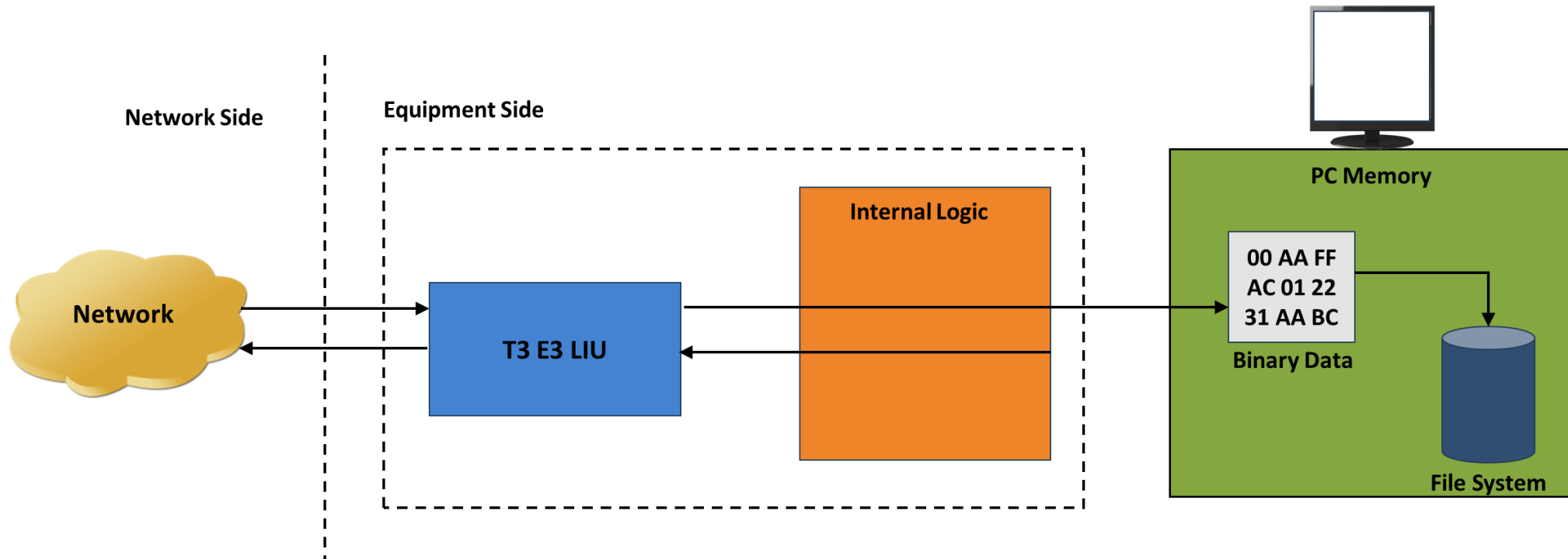


Playback (Transmit from File) (Contd.)

- Transmit flat binary file or user selected file over T3 E3
- Playback over framed or unframed T3 E3
- Continuous playback or single instance playback
- Manual insertion of single error along with the data stream play back
- Statistics such as Underruns, MissedXfer, Skipped Bytes and Blocks can be observed for the selected port

Record (Capture to File)

Logical diagram for capture (record) application

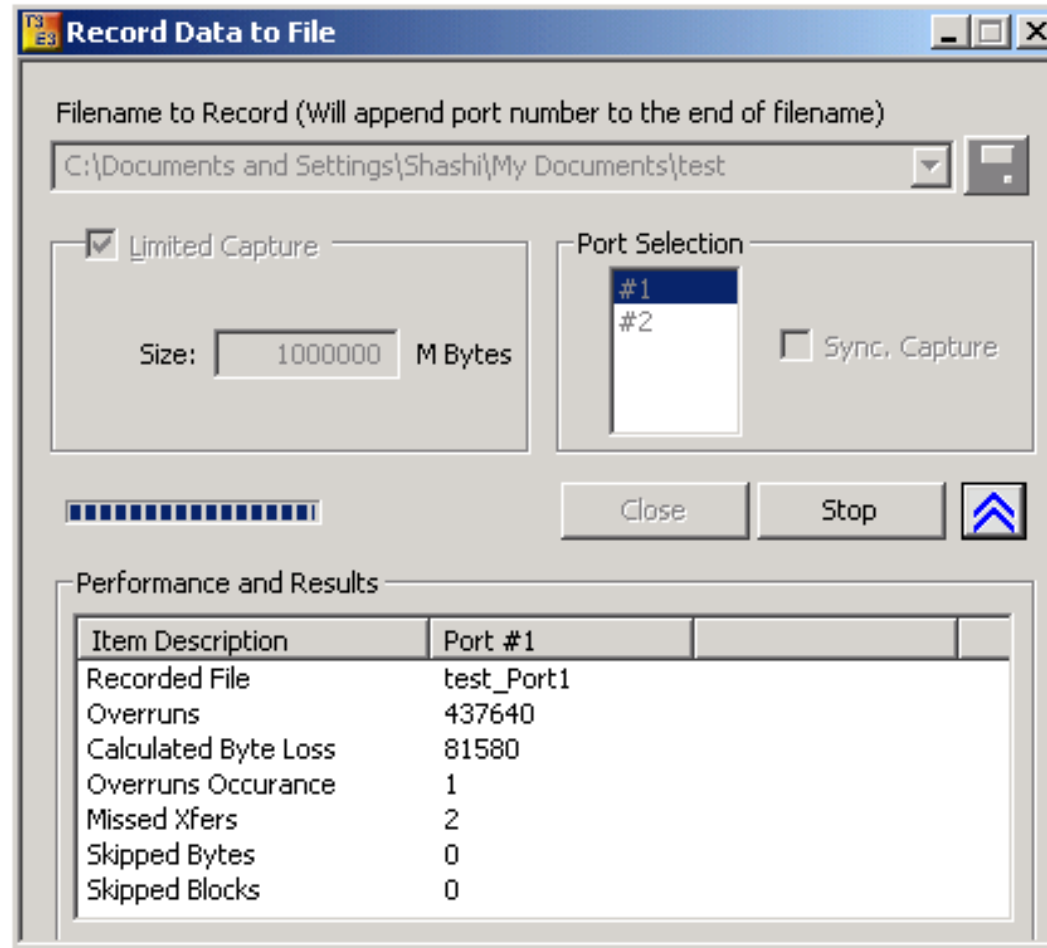


- Permits continuous or limited capture of data on the T3 E3 lines
- Save the captured data in binary file format
- Supports synchronized capture for multiple cards

Record (Capture to File)

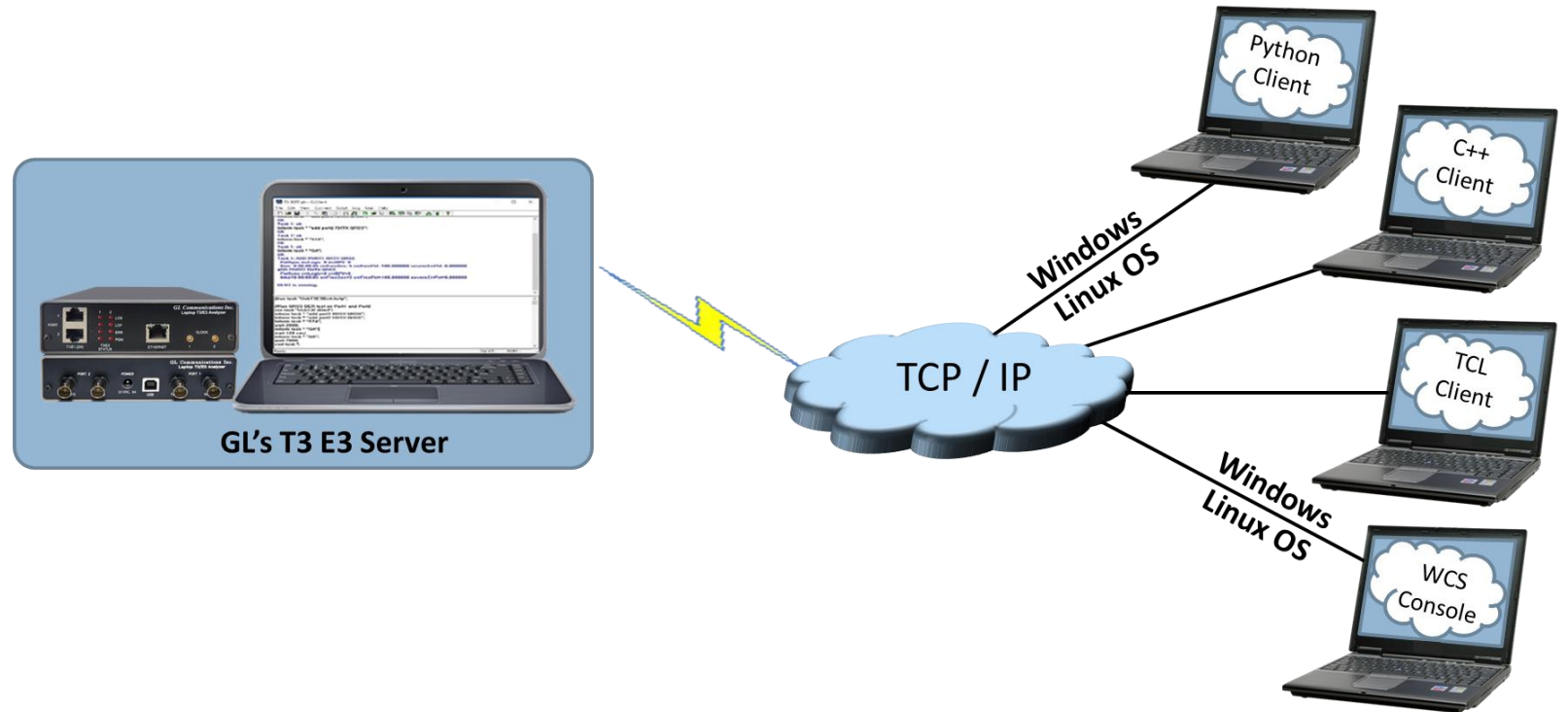
User Interface for capture (record) application

- Capture incoming data into binary flat file
- Synchronized capture from both ports
- Unframed T3 E3 or Framed T3 E3 Capture
- Limited Capture (specific number of Megabytes)



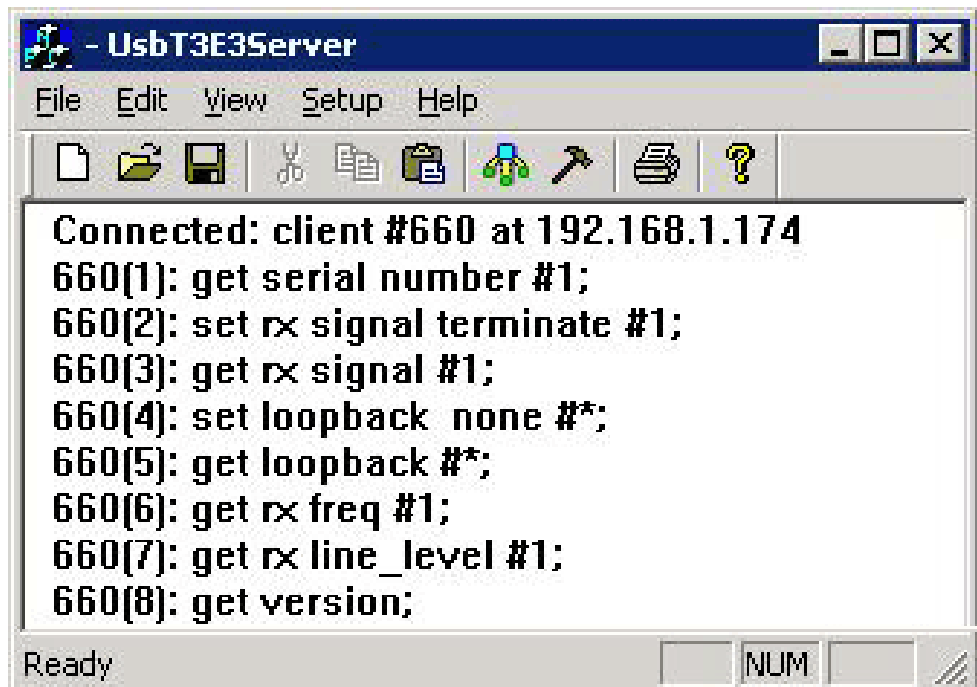
Windows Client Server Scripting and Automation

- GL's Windows Client/Server software is a non-GUI based program for remote, scripted, and automated control of T3 E3 configuration, capture, transmission and more
- Supported clients are C++, C#, Windows TCL, and Windows/Linux Python on Windows® and Linux® operating systems



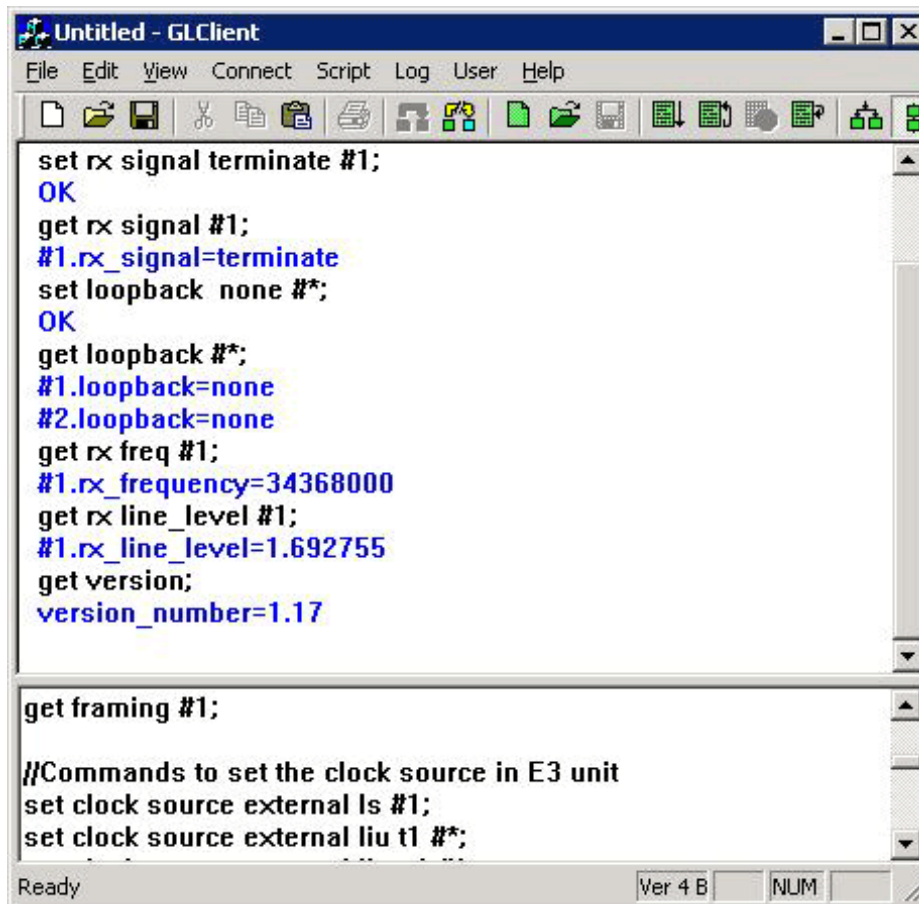
Windows Server and Client Interface

Server Interface



```
- UsbT3E3Server
File Edit View Setup Help
[Icons]
Connected: client #660 at 192.168.1.174
660(1): get serial number #1;
660(2): set rx signal terminate #1;
660(3): get rx signal #1;
660(4): set loopback none #*;
660(5): get loopback #*;
660(6): get rx freq #1;
660(7): get rx line_level #1;
660(8): get version;
Ready [NUM]
```

Client Interface



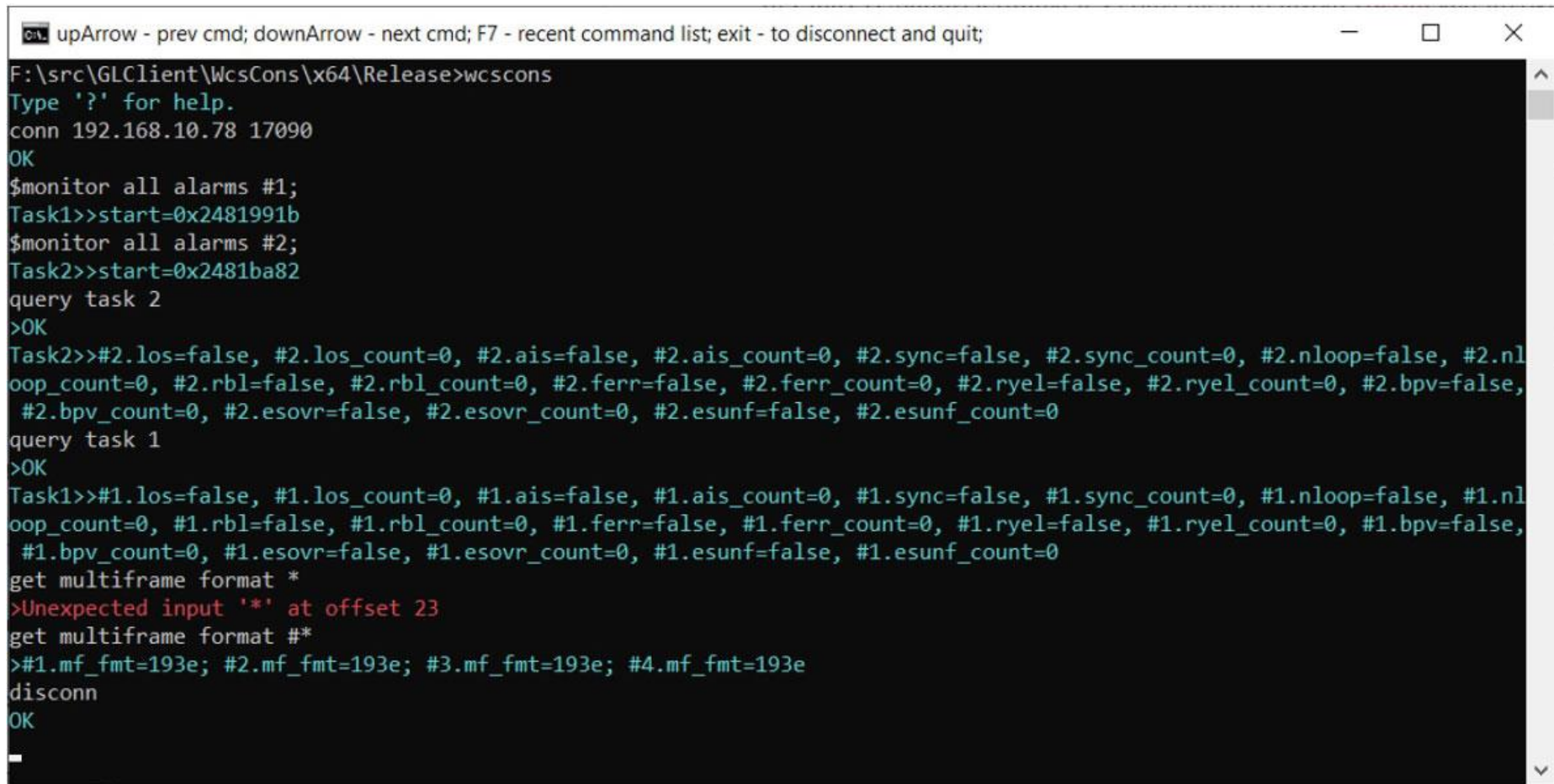
```
Untitled - GLClient
File Edit View Connect Script Log User Help
[Icons]
set rx signal terminate #1;
OK
get rx signal #1;
#1.rx_signal=terminate
set loopback none #*;
OK
get loopback #*;
#1.loopback=none
#2.loopback=none
get rx freq #1;
#1.rx_frequency=34368000
get rx line_level #1;
#1.rx_line_level=1.692755
get version;
version_number=1.17

get framing #1;

//Commands to set the clock source in E3 unit
set clock source external ls #1;
set clock source external liu t1 #*;
Ready Ver 4 B [NUM]
```

Windows/Linux Client Console

- Windows/Linux Client (WLC) is a Command Line Interface (CLI) application that issues commands to T1 E1 WCS server and display replies into Console/PowerShell/Terminal Windows. WLC works in Windows® and Linux® versions. However, through SSH or another remote access terminal it can be used on any operating system. WLC is a portable Windows/Linux WCS client communication library compatible with WCS server



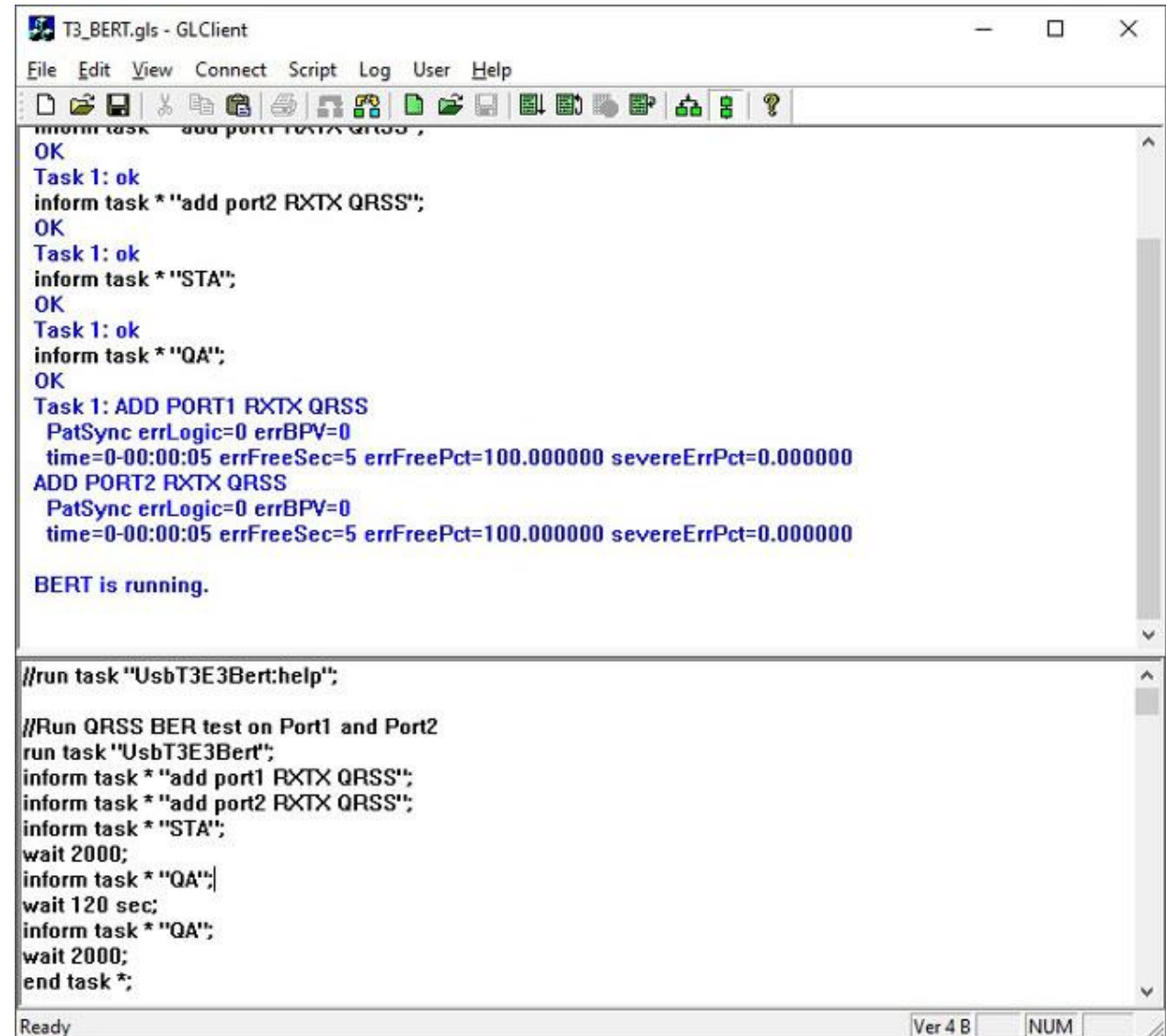
```
upArrow - prev cmd; downArrow - next cmd; F7 - recent command list; exit - to disconnect and quit;
F:\src\GLClient\WcsCons\x64\Release>wcscons
Type '?' for help.
conn 192.168.10.78 17090
OK
$monitor all alarms #1;
Task1>>start=0x2481991b
$monitor all alarms #2;
Task2>>start=0x2481ba82
query task 2
>OK
Task2>>#2.los=false, #2.los_count=0, #2.ais=false, #2.ais_count=0, #2.sync=false, #2.sync_count=0, #2.nloop=false, #2.nloop_count=0, #2.rbl=false, #2.rbl_count=0, #2.ferr=false, #2.ferr_count=0, #2.ryel=false, #2.ryel_count=0, #2.bpv=false, #2.bpv_count=0, #2.esovr=false, #2.esovr_count=0, #2.esunf=false, #2.esunf_count=0
query task 1
>OK
Task1>>#1.los=false, #1.los_count=0, #1.ais=false, #1.ais_count=0, #1.sync=false, #1.sync_count=0, #1.nloop=false, #1.nloop_count=0, #1.rbl=false, #1.rbl_count=0, #1.ferr=false, #1.ferr_count=0, #1.ryel=false, #1.ryel_count=0, #1.bpv=false, #1.bpv_count=0, #1.esovr=false, #1.esovr_count=0, #1.esunf=false, #1.esunf_count=0
get multiframe format *
>Unexpected input '*' at offset 23
get multiframe format #*
>#1.mf_fmt=193e; #2.mf_fmt=193e; #3.mf_fmt=193e; #4.mf_fmt=193e
disconn
OK
```

WCS Module -TT3600/EE3600

Bit Error Rate Test (BERT)

BERT on framed or unframed unchannelized T3 E3 (UsbT3E3Bert) is an optional WCS Server side module that:

- Performs BERT on pseudo random patterns such as QRSS, 2^6-1 , 2^9-1 , $2^{11}-1$, $2^{15}-1$, $2^{20}-1$, $2^{23}-1$, etc.
- Single or continuous Bit Error insertion for Logic and BPV errors
- Capability of remote operation, automation, and multi-site connectivity



```
T3_BERT.gls - GLClient
File Edit View Connect Script Log User Help
inform task "add port1 RXTX QRSS";
OK
Task 1: ok
inform task * "add port2 RXTX QRSS";
OK
Task 1: ok
inform task * "STA";
OK
Task 1: ok
inform task * "QA";
OK
Task 1: ADD PORT1 RXTX QRSS
PatSync errLogic=0 errBPV=0
time=0-00:00:05 errFreeSec=5 errFreePct=100.000000 severeErrPct=0.000000
ADD PORT2 RXTX QRSS
PatSync errLogic=0 errBPV=0
time=0-00:00:05 errFreeSec=5 errFreePct=100.000000 severeErrPct=0.000000

BERT is running.

//run task "UsbT3E3Bert:help";

//Run QRSS BER test on Port1 and Port2
run task "UsbT3E3Bert";
inform task * "add port1 RXTX QRSS";
inform task * "add port2 RXTX QRSS";
inform task * "STA";
wait 2000;
inform task * "QA";
wait 120 sec;
inform task * "QA";
wait 2000;
end task *;

Ready Ver 4 B NUM
```

WCS Module - XX610

File Transmission and Reception

Tx/Rx Files on unframed unchannelized T3 E3 (UsbT3E3FileXmit) is a WCS Server side module that:

- Transmits data read from files
- Receives data to files
- Capability of remote operation, automation, and multi-site connectivity

Example:

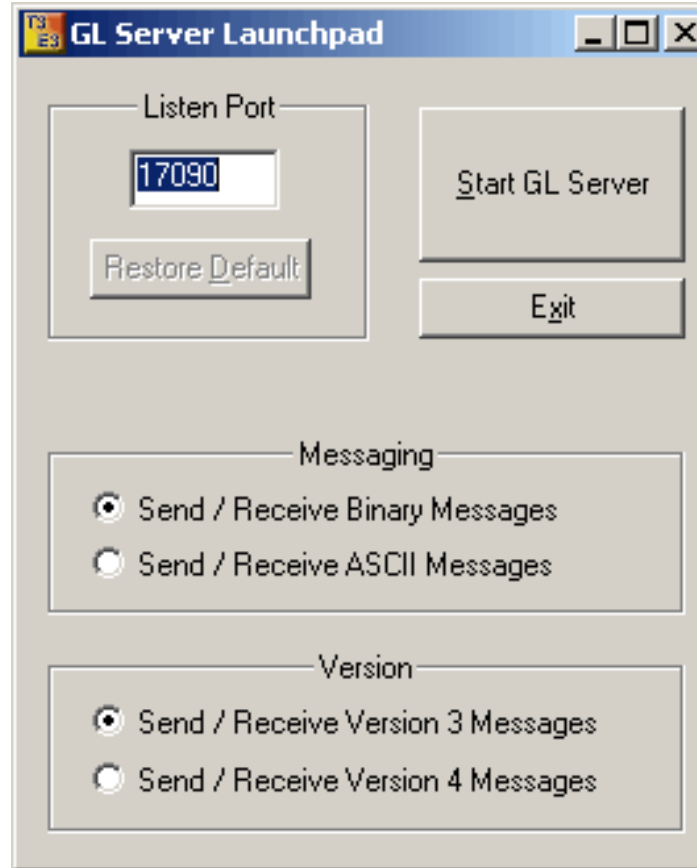
```
run task "UsbT3E3FileXmit" using "QEND";  
inform task * "tx #1 'c:\seqhdl.dat' LIMIT 200000";  
inform task * "start";
```

The above example transmits 200000 bytes from file 'c:\seqhdl.dat' and then stops.

Features

- Intrusive/Non-Intrusive T3 E3 Testing
- Performance monitoring and testing of multiple site locations from a single client
- Shared use of T3 E3 test equipment from multiple client locations
- Simultaneous testing of high capacity T3 E3 systems through a single client
- Integration of T3 E3 testing into more complex testing systems
- Capability of remote operation, automation, and multi-site connectivity
- Wild card and sequential operators available in the command syntax, allows to configure and control multiple elements of the test set using a fewer lines of commands
- Custom TCP/IP clients could be developed in any programming language to seamlessly integrate into existing testing program

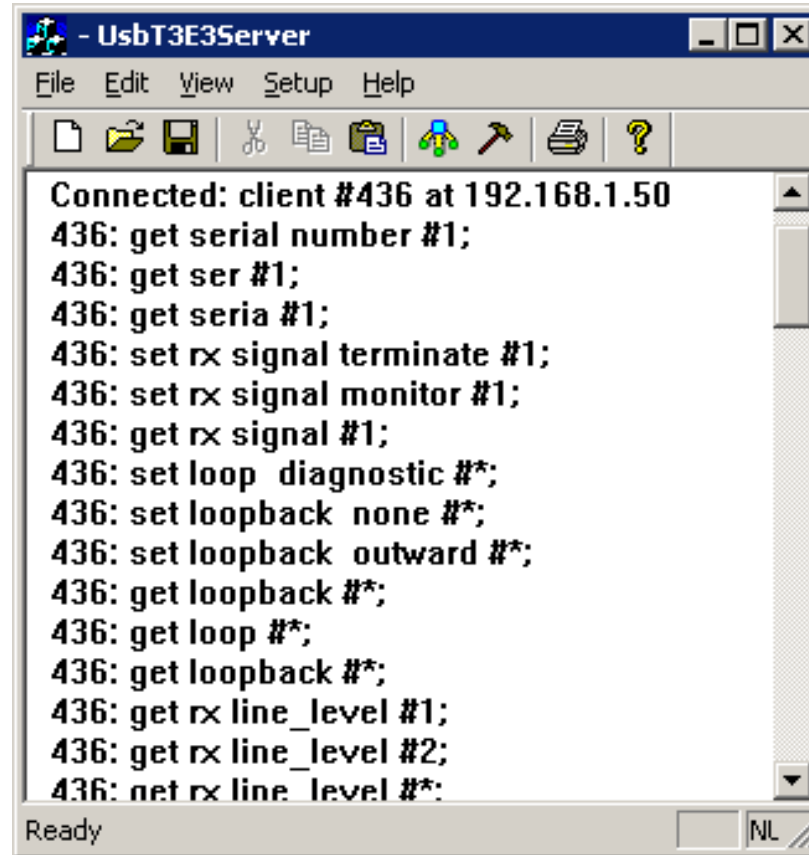
Server Initialization



- Specifies which TCP/IP port should be used to listen for incoming connection requests from clients, as well as the messaging options (ASCII or binary, version 3 or 4)

Server Interface

Server



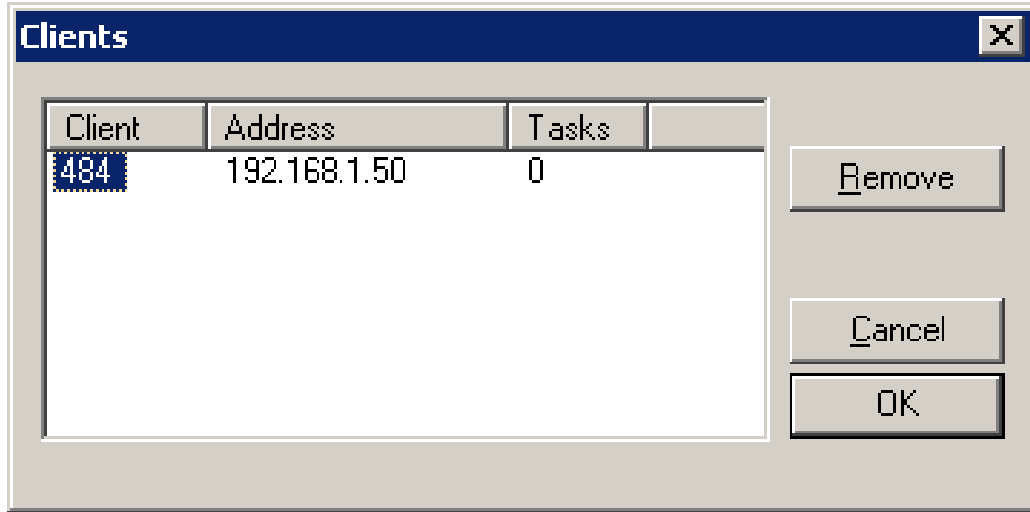
- The display area in server is read-only, and normally shows a record of transactions of various types

Server Functions

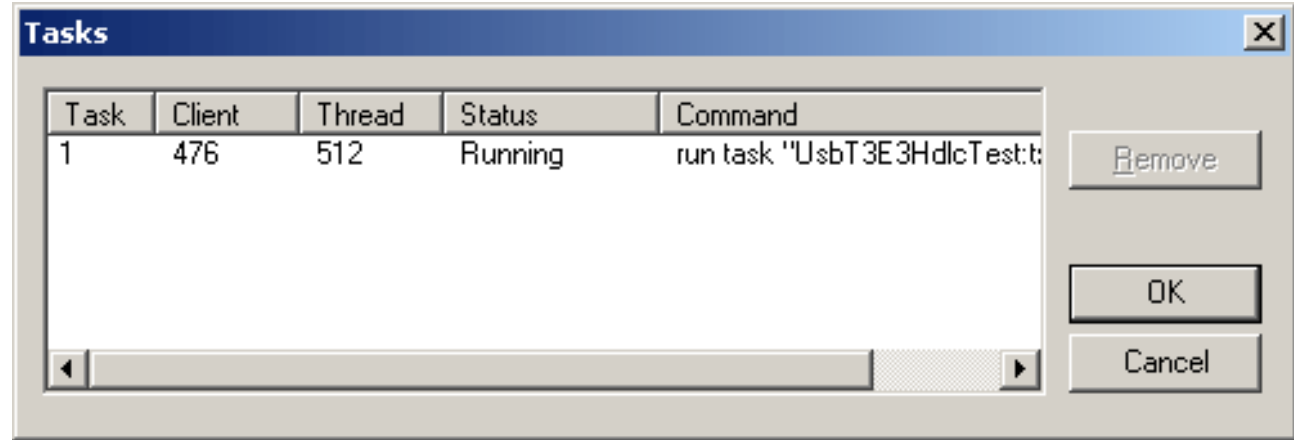
- The server performs 'actions' and 'tasks'
- An 'action' is in response to a 'command' initiated by a client. The server performs the action immediately and notifies the client of the result
- A 'task' involves real time generation and processing of data. Multiple tasks can be initiated without completion of previous tasks
- The server informs the client on tasks: started, status, complete, and so on
- Typical actions are - Get Software version, Rx Signal Settings, Loopback Settings, Alarm Monitoring, Tx Rx Framing Formats, Clock Source Settings, Mode Selection, Insert Errors and Get Error Counts, FEAC messages, Line Level and Signal Frequency and others

Client and Task Administration

Client Administration



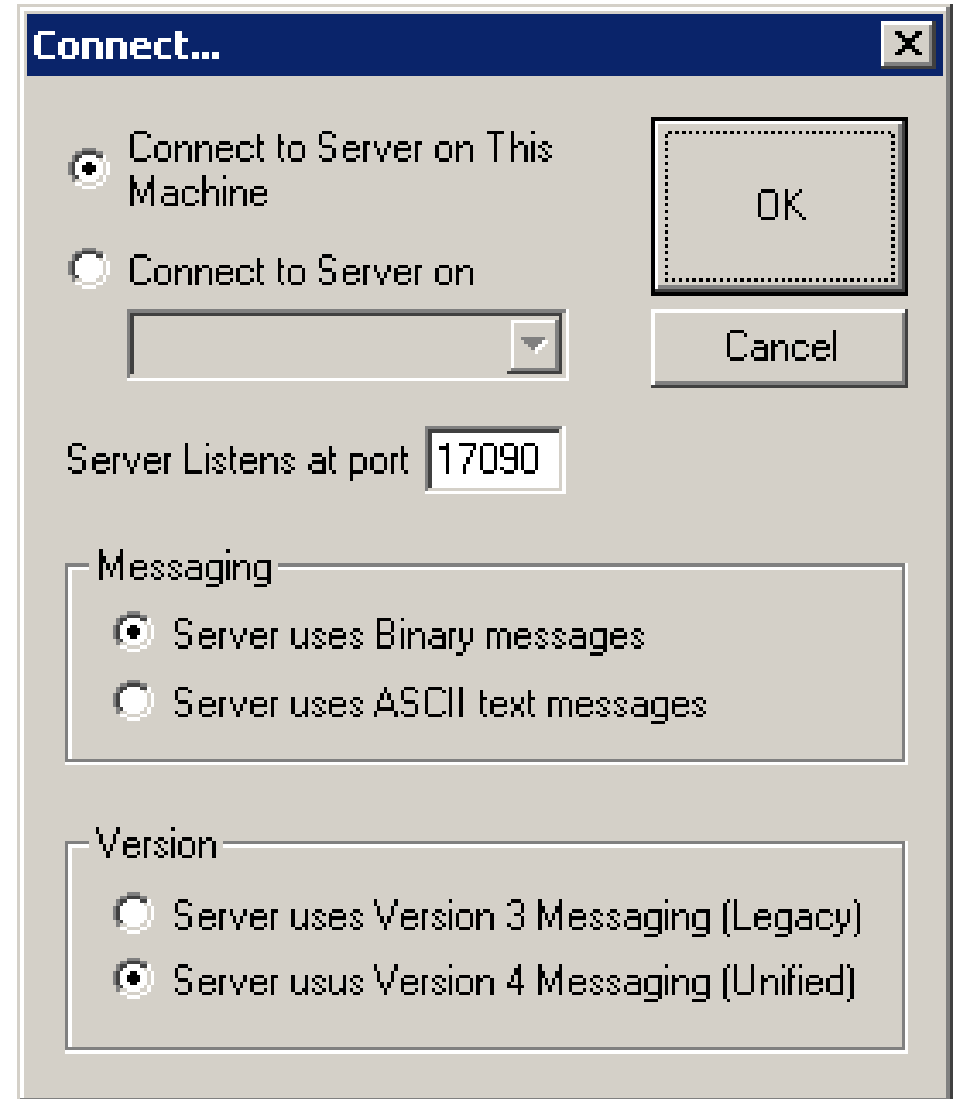
Server Task Administration



- Client Administration allows you to obtain the list of currently connected clients
- Task Administration allows you to obtain the list of current tasks being executed on the task list

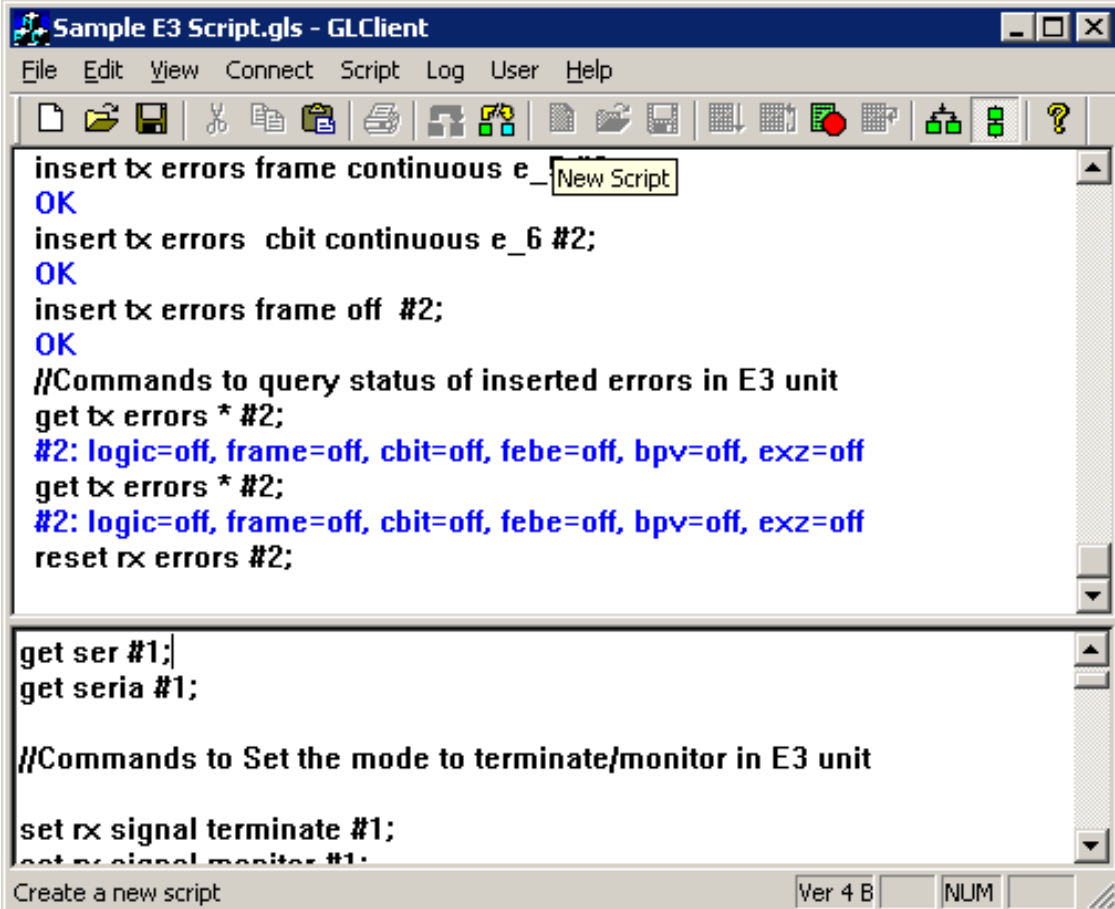
Client Connection

- Client connects and disconnects from servers, load and save batches of commands, and manage its log file through simple user controls
- Client software accepts text interactively from the user or from a previously saved file and forwards the text, line by line to the server
- Accepts notification messages from the server and displays the text field of the message



Client Interface

- T3 E3 Client is a Windows-based application (GLClient.exe) that is distributed freely along with T3 E3 Server. The T3 E3 unit in server mode can be easily controlled through several software clients at remote or local sites
- The workspace may be used to interactively enter and edit commands. The log area is a read-only that displays connects and disconnects, commands, and notifications in this window



The screenshot shows a Windows application window titled "Sample E3 Script.gls - GLClient". The window has a menu bar with "File", "Edit", "View", "Connect", "Script", "Log", "User", and "Help". Below the menu bar is a toolbar with various icons for file operations and application control. The main area is divided into two panes. The top pane contains a script with the following text:

```
insert tx errors frame continuous e_6 #2;
OK
insert tx errors cbit continuous e_6 #2;
OK
insert tx errors frame off #2;
OK
//Commands to query status of inserted errors in E3 unit
get tx errors * #2;
#2: logic=off, frame=off, cbit=off, febe=off, bpv=off, exz=off
get tx errors * #2;
#2: logic=off, frame=off, cbit=off, febe=off, bpv=off, exz=off
reset rx errors #2;
```

The bottom pane contains the following text:

```
get ser #1;
get seria #1;

//Commands to Set the mode to terminate/monitor in E3 unit

set rx signal terminate #1;
set rx signal monitor #1;
```

At the bottom of the window, there is a status bar with the text "Create a new script" on the left and "Ver 4 B" and "NUM" on the right.

Client Functions

- Compatible with Windows® and Linux® Operating Systems
- All commands are simple and self-explanatory
- Commands can be customized to implement interactive menu options to set Tx Rx Framing Formats, Clock Source, getting FEAC messages, Line level, signal frequency and so on
- Values returned from the server can be easily accessed and stored as user-defined variables
- Streamlines both the source script and the output by executing only the messages that user requests
- Multiple clients can access a single server simultaneously

Windows Client Server (WCS) Module

- WCS module XX635– PPP Emulation and Analysis

The PPP Tx/Rx Test is an optional WCS Server side module that:

- Sends PPP frames with or without impairments
- Receives PPP frames and logs the events
- Generated & received PPP traffic on each individual PPP link using source type
 - Sequence numbers
 - Hex string frame
 - Binary flat files
 - GL HDL trace files
 - Network traffic (routing & bridging)
- Impairments can be applied on individual PPP links
 - Frame duplication
 - CRC Error
 - Frame Error
 - Logical Error (AND, OR, and XOR)
- Capability of remote operation, automation, and multi-site connectivity

Sample Scripts

//Commands to set & get FEAC messaging

```
set tx feac 0x1D cont #1;  
get tx feac #2;
```

//Command transmit 100 frames on each card.

```
run task "UsbT3E3HdlcTest:tx" using "QEND";  
inform task 1 "#1..2 FRAMES 100";  
inform task 1 "start";
```

//Commands to insert same Errors on both the cards

```
run task "UsbT3E3HdlcTest:tx";  
inform task 1 "#1,2 SEQNUM FIXLEN 8 FRAMES 1200000 FLAGS 200";  
inform task 1 "error rep 1000 skip 9 offs 3 xor f5";  
inform task 1 "start";
```

Sample Scripts (Contd.)

//Command for receive function operation

```
run task "UsbT3E3HdlcTest:rx" using "LOG  
'c:\rx.log";  
inform task 1 "#2 FRAMES 1000 SEQNUM MSB2 ";  
inform task 1 "start";
```

//Command to playback file

```
run task "UsbT3E3FileXmit" using "QEND";  
inform task 1 "tx #1 'c:\usb_t3e3.bit' EOF";  
inform task 1 "start";
```

//Command to record a limited number of frames

```
run task "UsbT3E3FileXmit" using "QEND";  
inform task 2 "rx #2 'c:\rxdat' LIMIT 1000000";  
inform task 2 "start";
```

//Command to playback file

```
run task "UsbT3E3FileXmit" using "QEND";  
inform task 1 "tx #1 'c:\usb_t3e3.bit' EOF";  
inform task 1 "start";
```

//Command to record a limited number of frames

```
run task "UsbT3E3FileXmit" using "QEND";  
inform task 2 "rx #2 'c:\rxdat' LIMIT 1000000";  
inform task 2 "start";
```

HDLC Protocol Analysis

Protocol Testing and Analysis

- GL's T3 (DS3) /E3 analyzer supports protocol decoding and analysis of ATM, Frame Relay, PPP, and HDLC
- All the protocol analyzers are based on similar architecture and supports sophisticated filtering, statistics and real-time capture options

The screenshot displays the HDLC Protocol Analysis LAPD software interface. At the top, there is a menu bar (File, View, Capture, Statistics, Database, Configure, Help) and a toolbar with various icons. Below the toolbar is a table of captured frames. The table has columns for Dev, TS..., Su..., Frame#, TIME (Relative), Len, Error, C/R, SAPI, TEI, CTL, P/F, and N(S). Frame 3 is highlighted in blue. Below the table, there is a detailed view of the selected frame (Frame 3) showing the HDLC Frame Data + FCS and the Hex Dump of the Frame Data.

Dev	TS...	Su...	Frame#	TIME (Relative)	Len	Error	C/R	SAPI	TEI	CTL	P/F	N(S)
✓ 2	23		0	00:00:00.000000	6		Co...	0	0	Super...	1	
✓ 2	23		1	00:00:09.980000	6		Co...	0	0	Super...	1	
✓ 2	23		2	00:00:19.960000	6		Co...	0	0	Super...	1	
✓ 2	23		3	00:00:27.031875	38		Co...	0	0	Inform...	0	24
✓ 2	23		4	00:00:27.037125	38		Co...	0	0	Inform...	0	25
✓ 2	23		5	00:00:27.043500	38		Co...	0	0	Inform...	0	26
✓ 2	23		6	00:00:27.048875	38		Co...	0	0	Inform...	0	27

```
Card2 TimeSlot=23 Frame=3 at 00:00:27.031875 OK Len=38
HDLC Frame Data + FCS
----- LAPD Layer -----
C/R          = .....0. Command(User), Response(Netw
SAPI         = 000000.. (0)
TEI          = 0000000. (0)
Ctl          = .....0 Information
N(S)         = 0011000. (24)
P            = .....0 (0)
N(R)         = 1000110. (70)

Hex Dump of the Frame Data
+-----+-----+-----+-----+-----+-----+-----+-----+
00 01 30 8C 08 02 30 00 05 04 03 90 90 A2 18 03      0| 0  ||c
A9 83 81 70 0B A1 35 30 38 33 30 32 31 31 31 31      @||p i5083021111
7D 02 91 84 6F 48                                   } '|oH
```

Off-line Viewing F:\Program Files\GL Communicat 195 Frames

ATM Protocol Analysis

- Asynchronous Transfer Mode (ATM) is a flexible network, which carries voice, video, and data in the same way, i.e., fixed length cells
- Displays Summary, Detail, Hex-dump, Statistics, and Call Trace Views

The screenshot displays the ATM Protocol Analysis software interface with the following sections:

- Summary View:** A table showing captured frames with columns for Device, Frame#, Time, Length, Error, VPI, VCI, PT, HEC, DSF, AAL Type, Frame Type, IMA, and IMA IE.
- Detail View:** A text-based representation of the ATM frame data, including fields like GFC, VPI, VCI, and PT.
- Hex Dump View:** A hex dump of the frame data, showing hexadecimal values and their corresponding ASCII characters.
- Statistics View:** A table summarizing the frame counts for each device and frame type.
- Call Detail Record View:** A table for recording call details, including Call ID, Call Status, Calling Num, Called Num, Call Start Date & Time, Call Duration, and Release Complete Cause.

Summary View

Detail View

Hex Dump View

Statistics View

Call Detail Record View

Frame Relay Protocol Analysis

- Frame Relay is commonly used data link protocol based on packet switching technology
- It is mainly incorporated by the corporate data networks due to its cost-effective data transmission, and flexible bandwidth
- Displays Summary, Detail, Hex-dump, Statistics, and Call Trace Views

The screenshot displays the Frame Relay Protocol Analysis LAPF software interface. The main window is divided into several sections:

- Summary View:** A table showing a list of frames with columns for Dev, SubCh, Frame#, TIME, Len, Error, DLCI, DE, BECN, FECN, CTL, Sequence Number, and Sequence.
- Detail View:** A section showing HDLC Frame Data + FCS and LAPP Layer details, including fields like EA, C/R, DLCI, EA, and DE.
- Hex Dump View:** A section showing the Hex Dump of the Frame Data, with hex values and their corresponding ASCII characters.
- Statistics View:** A table showing statistics for Device #, C/R, Frame Count(Device #), and Frame Count(C/R).
- Call Detail Record View:** A table showing Call ID, Call Status, Calling Num, Called Num, Call Start Date & Time, Call Duration, Release Complete Cause, and De.

→ Summary View

→ Detail View

→ Hex Dump View

→ Statistics View

→ Call Detail Record View

PPP Protocol Analysis

- It provides useful analysis of the PPP, MLPPP, and MC-MLPPP protocols which includes distribution of protocols, protocol fields, frame lengths and frame status

The screenshot displays the PPP Protocol Analysis software interface. At the top, there is a menu bar (File, View, Capture, Statistics, Database, Configure, Help) and a toolbar with various icons. Below the toolbar is a table listing captured frames:

Dev	SubCh	Frame#	TIME (...)	Len	Error	PPP Layer3Protocol	Mppp Seq No
✓ 2		0	00:00:...	402		Internet Protocol	
✓ 2		1	00:00:...	174		Internet Protocol	
✓ 2		2	00:00:...	236		Internet Protocol	
✓ 2		3	00:00:...	70		Internet Protocol	
✓ 2		4	00:00:...	70		Internet Protocol	

Below the table, the details for the selected frame (Frame 0) are shown:

```
Ctl = 00000011 (3)
Protocol = 00000000 00100001 Internet Protocol
----- IP Layer -----
Version = 0100..... (4)
Internet Header Length (In 32 bit words) = .....0101 (5)
Type of Service =
  Precedence = 000..... Routine
  Delay = ....0..... Normal Delay
  Throughput = ....0... Normal Throughput
  Reliability = .....0... Normal Reliability
```

The Hex Dump of the Frame Data is as follows:

```
+-----+-----+-----+-----+-----+-----+
FF 03 00 21 45 00 01 8E DE 88 40 00 36 06 EC 59  y !E |P|@ 6 iY
48 25 C9 91 CA AE 9C 22 E8 9F 06 B8 4C 96 B7 F8  H%E'É@|"è| ,L|·ø
00 44 EE 79 80 18 16 D0 74 F4 00 00 01 01 08 0A  Diy| Đtó
02 53 69 BA 02 73 17 46 03 00 01 5A 08 02 76 D1  Si° s F Z vN
05 04 03 80 90 A3 6C 0E 01 83 39 36 35 39 34  ||l |966594
32 39 37 36 37 39 70 0C 81 39 32 35 33 33 33 31  297679  |9253331
```

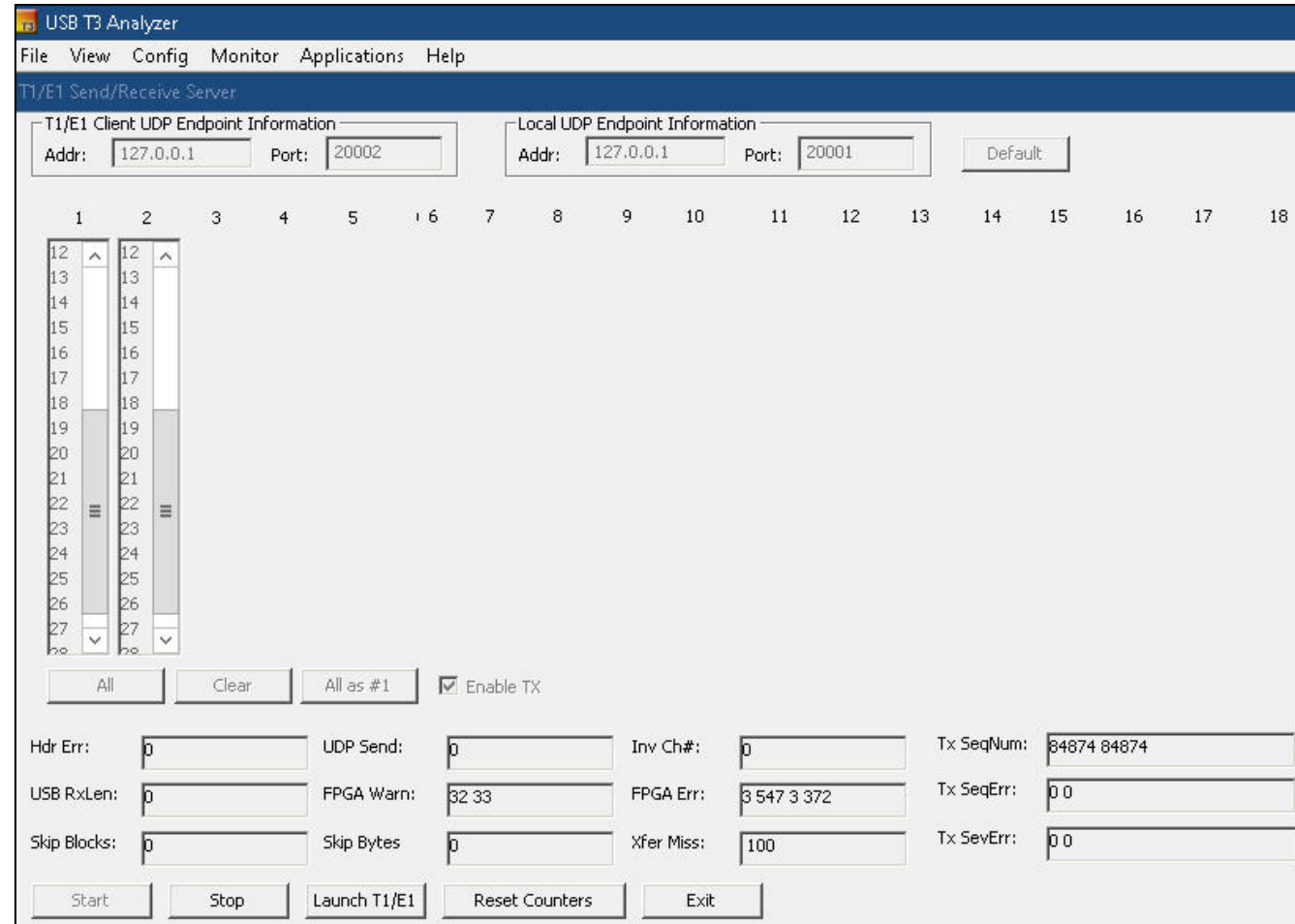
At the bottom, there is a summary table:

Address	Ctl	Protocol
255	3	Internet Protoc...
total 255	total 3	total Internet P...

The status bar at the bottom indicates "Off-line Viewing" and the file path "C:\Program Files\GL Communications In 11 938 Frames".

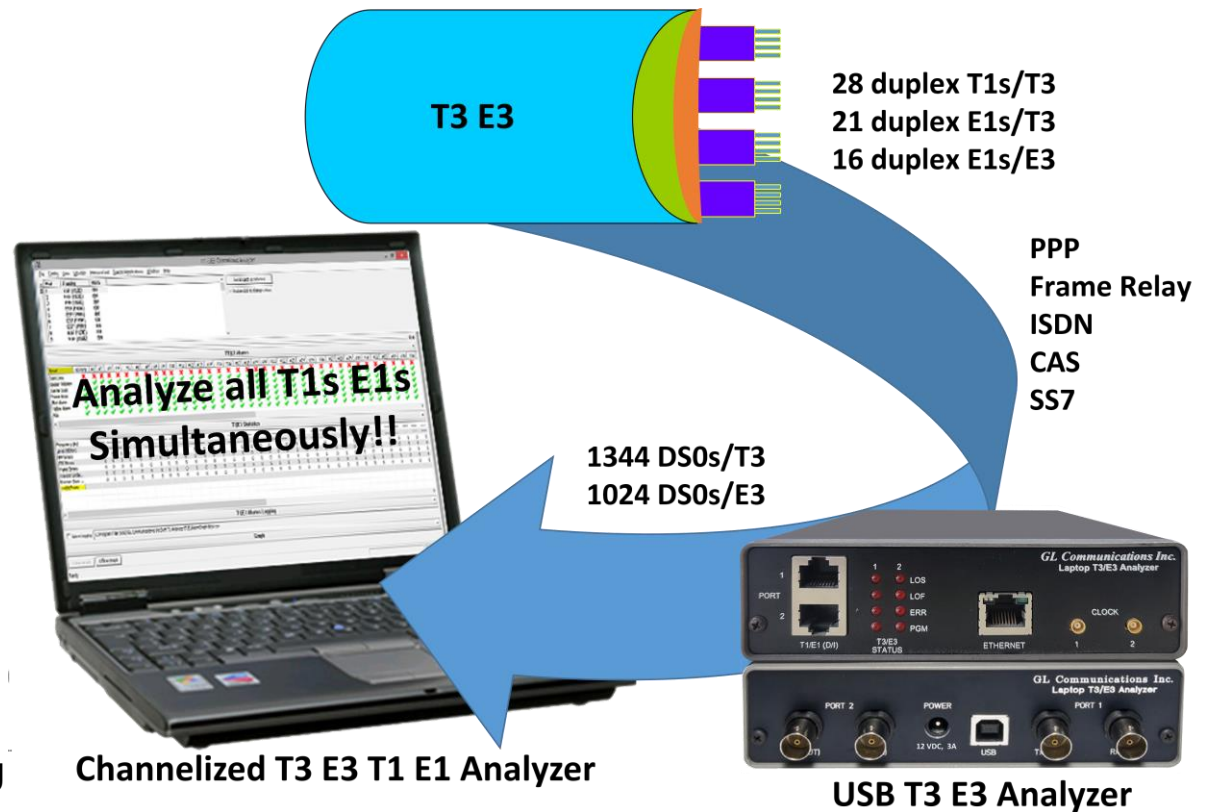
T1/E1 Send/Receive Server

- Runs as a service and performs channelization of a T3 E3 signals
- The T1/E1 Send/ Receive Server application within USB T3 E3 Analyzer acts as software based Multiplexer- Demultiplexer application capable of channelization of a T3 signal into 56 independent T1 channels, or 42 independent E1 channels and an E3 signal into 32 E1 channels



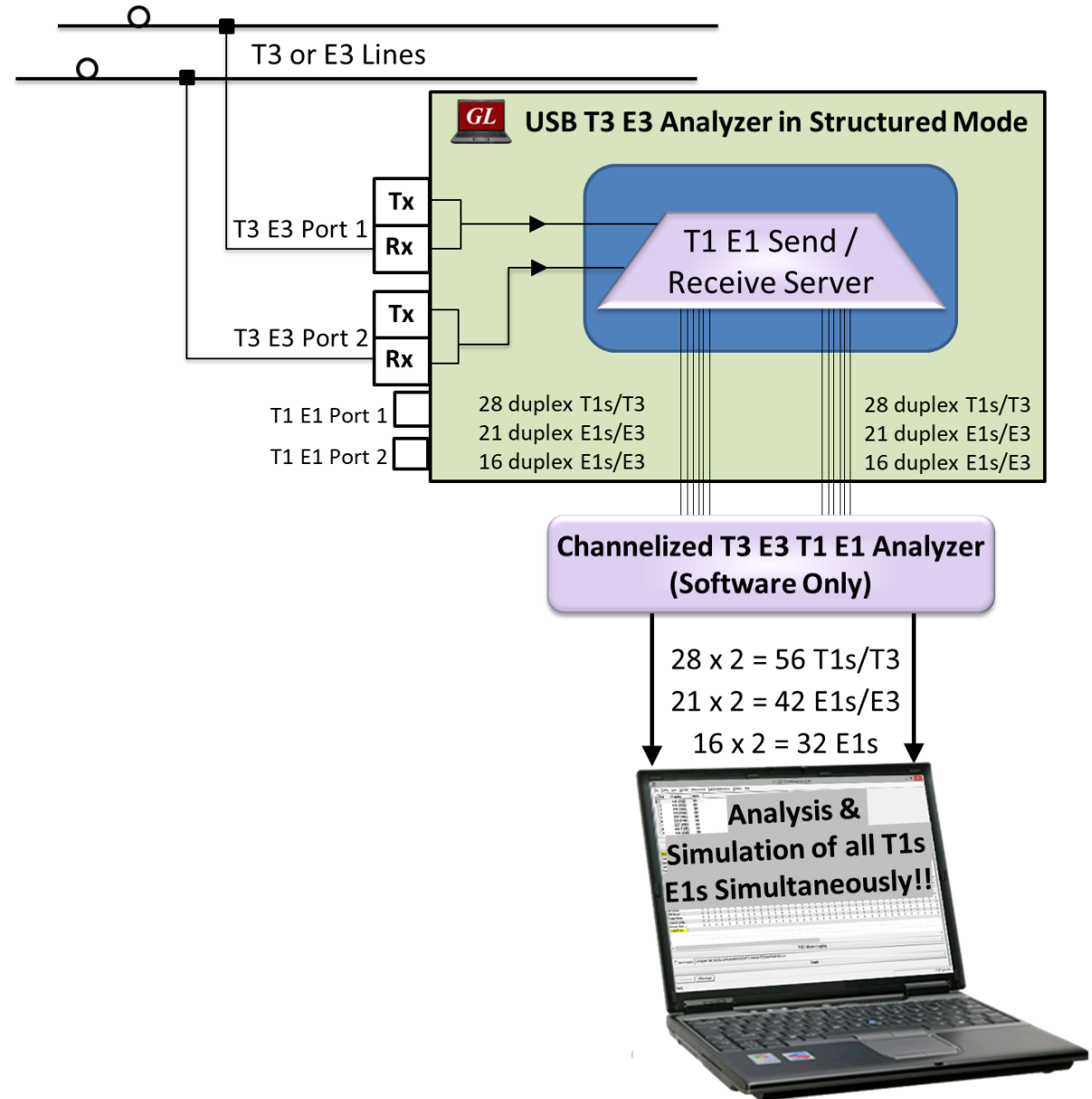
Channelized USB T3 E3 T1 E1 Analyzer

- Provides support for channelized T3 E3 to T1 E1
- Supports up to 56 T1s and 32 E1s channels per T3 E3 port
- Analysis of all 56 T1s (1.544 Mbps), E1 each), or 32 E1s (2.048 Mbps), each)
- Analysis of Fractional T1s and E1s, N x T1s or N x E1s
- Analysis of any combination of DS0s (64 kbps each) within the T1s or E1s, 56 x 24 = 1,344 DS0s for T1 or 32 x 32 = 1024 DS0s
- Supports structured and unstructured T1 E1 transmission and reception
- Supports all "basic applications" and "special applications" for T1 or E1 channels
- Supports Protocol Analysis of structured protocols – HDLC, ISDN, CAS, and more
- Supports carrying T1 E1 alarms in channelized T3 E3 lines
- Comprehensive analysis / emulation of Voice, Data, Fax, Protocol, Analog, and Digital signals, including echo and voice quality testing
- Extracting T1s E1s from multiple T3 E3 ports
- User selectable T1 and E1 channels to multiplex. The channel numbering is same as in De-multiplexing
- Unused channels will be treated as unequipped
- Broadcasts the selected T1 E1 channel data on all the 32 E1's or 56 T1's



Working Principle

- Channelized T3 E3 Analyzer software can capture, record, and monitor multiple T1 or E1 channels over Channelized T3 E3 links
- The analyzer can perform analysis and emulation of various types including Voice, Digits, Tones, Fax and Raw data

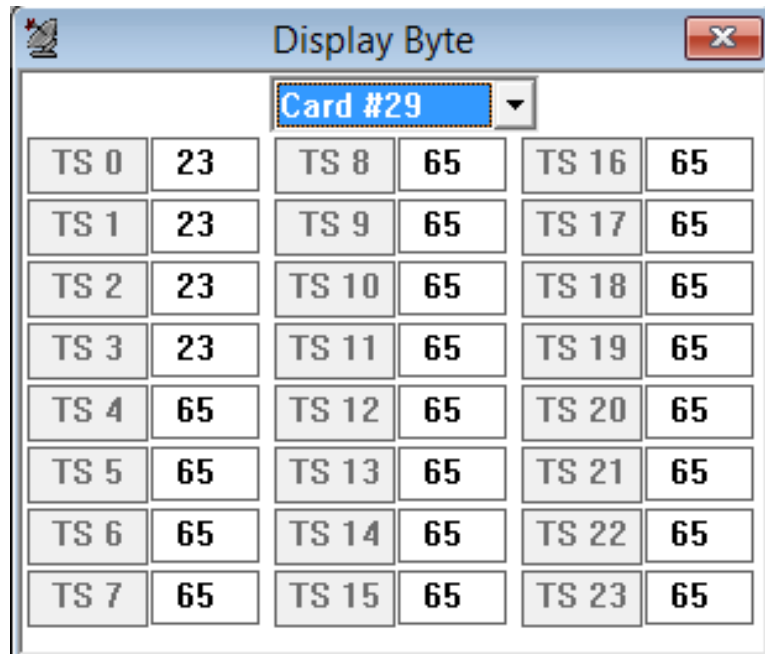


Basic and Optional Applications in Channelized T3 E3 Analyzer

Basic Monitoring Applications	Optional Monitoring Applications
<ul style="list-style-type: none">• Byte Values• Binary Byte Values• Signaling Bits• DC Offset• Frequency• Power Level• Multi-frame Data• Timeslot Displays• ASCII Timeslot Display• Oscilloscope• Power Spectral• Audio (VF) and Active Voice Level Monitoring• Oscilloscope and Spectral Displays provide graphical analysis of signals <p>For more details, refer to Basic Applications</p>	<ul style="list-style-type: none">• Capture Dialed Digits• Playback and Record• Automated Record/Playback (ARP)• Automated Continuous Capture (ACC)• Call Capture and Analysis• Multiple Call Capture & Analysis• Call Data Records• Voice Band Analyzer (VBA) <p>For more details, refer to Optional Monitoring Applications</p>

Byte Hex and Byte Binary Values

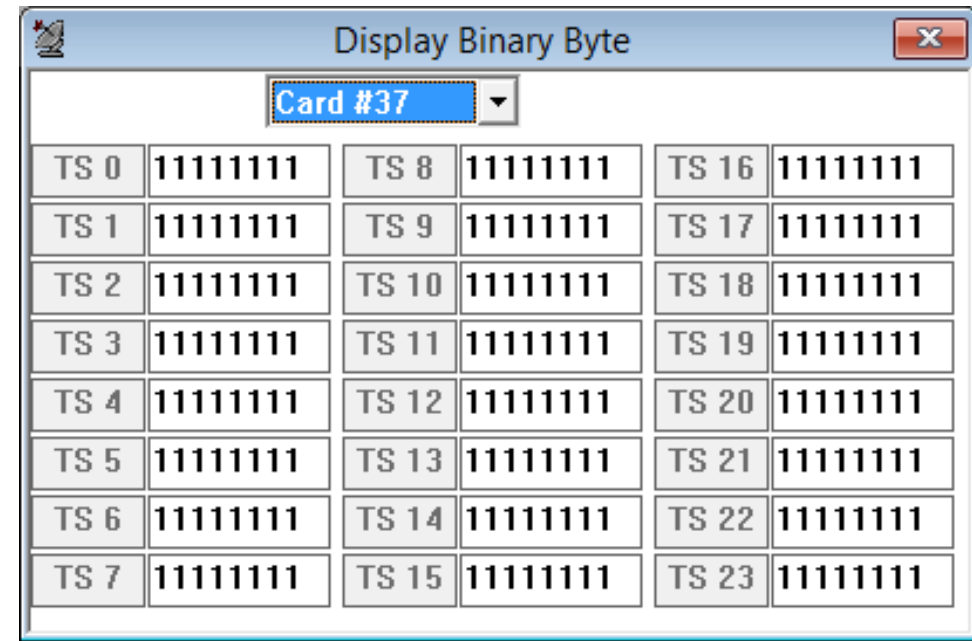
Byte Value



A screenshot of a software window titled "Display Byte" for "Card #29". The window contains a 4x4 grid of data points. Each point consists of a "TS" label and a numerical value. The values are 23 for TS 0-3 and 65 for TS 4-23.

TS 0	23	TS 8	65	TS 16	65
TS 1	23	TS 9	65	TS 17	65
TS 2	23	TS 10	65	TS 18	65
TS 3	23	TS 11	65	TS 19	65
TS 4	65	TS 12	65	TS 20	65
TS 5	65	TS 13	65	TS 21	65
TS 6	65	TS 14	65	TS 22	65
TS 7	65	TS 15	65	TS 23	65

Binary Byte Value



A screenshot of a software window titled "Display Binary Byte" for "Card #37". The window contains a 4x4 grid of data points. Each point consists of a "TS" label and a binary value (11111111).

TS 0	11111111	TS 8	11111111	TS 16	11111111
TS 1	11111111	TS 9	11111111	TS 17	11111111
TS 2	11111111	TS 10	11111111	TS 18	11111111
TS 3	11111111	TS 11	11111111	TS 19	11111111
TS 4	11111111	TS 12	11111111	TS 20	11111111
TS 5	11111111	TS 13	11111111	TS 21	11111111
TS 6	11111111	TS 14	11111111	TS 22	11111111
TS 7	11111111	TS 15	11111111	TS 23	11111111

- Display the data values for each time slot in HEX data format
- Display the data values for each time slot in binary data format

Signaling Bits, Power Level, DC Offset, Frequency

TS 0	1111	TS 8	1111	TS 16	1111
TS 1	1111	TS 9	1111	TS 17	1111
TS 2	1111	TS 10	1111	TS 18	1111
TS 3	1111	TS 11	1111	TS 19	1111
TS 4	1111	TS 12	1111	TS 20	1111
TS 5	1111	TS 13	1111	TS 21	1111
TS 6	1111	TS 14	1111	TS 22	1111
TS 7	1111	TS 15	1111	TS 23	1111

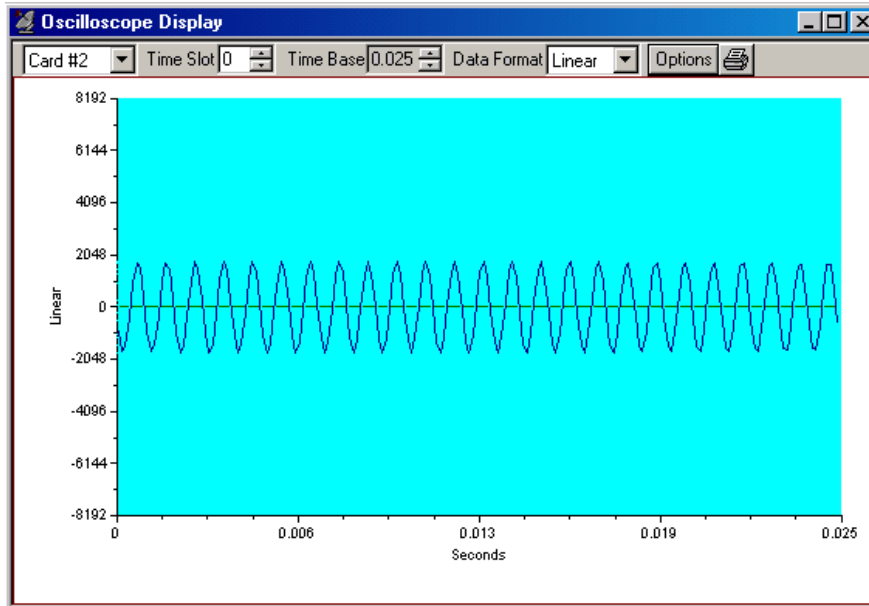
TS 0	-28.4	TS 8	-28.4	TS 16	-28.4
TS 1	-28.4	TS 9	-28.4	TS 17	-28.4
TS 2	-28.4	TS 10	-28.4	TS 18	-28.4
TS 3	-28.4	TS 11	-28.4	TS 19	-28.4
TS 4	-28.4	TS 12	-28.4	TS 20	-28.4
TS 5	-28.4	TS 13	-28.4	TS 21	-28.4
TS 6	-28.4	TS 14	-28.4	TS 22	-28.4
TS 7	-28.4	TS 15	-28.4	TS 23	-28.4

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

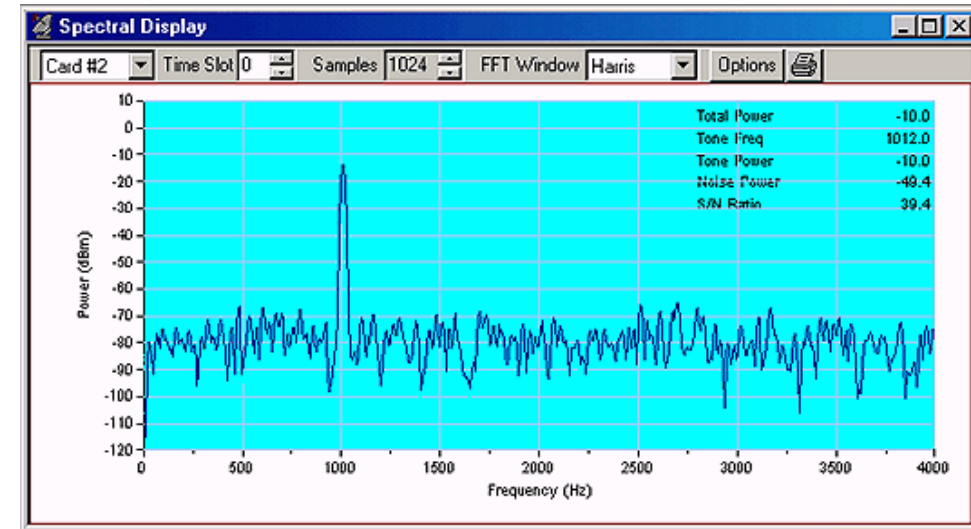
TS 0	904	TS 8	904	TS 16	904
TS 1	904	TS 9	904	TS 17	904
TS 2	905	TS 10	905	TS 18	904
TS 3	905	TS 11	905	TS 19	905
TS 4	905	TS 12	905	TS 20	905
TS 5	905	TS 13	905	TS 21	905
TS 6	904	TS 14	904	TS 22	905
TS 7	904	TS 15	904	TS 23	904

Oscilloscope and Spectral Display

Oscilloscope Display



Spectral Display



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

Call Capture and Analysis (CCA)

T1 T3E3 Channelized Analyzer

File Config View Monitor IntrusiveTest Special Applications Window Help

Port	Framing	B8ZS
1	ESF (193E)	Off
2	ESF (193E)	Off

Set all cards as selected
<- Double-click to change values

Multiple Call Capture - T3E3ChT1 Card #1 and #...

File Capture Settings

Capture Directory: C:\CCA\ISDN120321161826

Capture File 1: Card #1 - 'North'
5551234_5551000_Mar21_w0100_256_2016_0321_182

Bytes Captured: 22536

Capture File 2: Card #29 - 'South'
5551234_5551000_Mar21_E2900_256_2016_0321_182E

Bytes Captured: 22536

Signaling File: 5551234_5551000_Mar21_00_256_201E

Timeslot Activity: 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15
16 17 18 19 20 21 22 23

ISDN Message	Elapsed Time	CRV	TS	Card	Called Number
ALERTING	322.6250	5632		29	
ALERTING	327.6250	5888		29	

Error Type	Card #1	Card #...
Underruns	0	0
Ok Frames	69	69
Frame Errors	0	0
CRC Errors	0	0

Multiple Call Capture - T3E3ChT1 Card #2 and #...

File Capture Settings

Capture Directory: C:\CCA\ISDN20321161826

Capture File 1: Card #2 - 'East'
5551234_5551000_Mar21_w0200_256_2016_0321_182

Bytes Captured: 16944

Capture File 2: Card #30 - 'West'
5551234_5551000_Mar21_E3000_256_2016_0321_182E

Bytes Captured: 16944

Signaling File: 5551234_5551000_Mar21_00_256_201E

Timeslot Activity: 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15
16 17 18 19 20 21 22 23

ISDN Message	Elapsed Time	CRV	TS	Card	Called Number
ALERTING	325.6250	5632		30	
ALERTING	330.6250	5888		30	

Error Type	Card #2	Card #...
Underruns	0	0
Ok Frames	69	69
Frame Errors	0	0
CRC Errors	0	0

Multiple Call Capture - T3E3ChT1 Card #28 and #...

File Capture Settings

Capture Directory: C:\CCA\ISDN30321161826

Capture File 1: Card #28 - 'Node28'
5551234_5551000_Mar21_w2800_256_2016_0321_182

Bytes Captured: 22536

Capture File 2: Card #56 - 'Node56'
5551234_5551000_Mar21_E5600_256_2016_0321_182E

Bytes Captured: 22536

Signaling File: 5551234_5551000_Mar21_00_256_201E

Timeslot Activity: 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15
16 17 18 19 20 21 22 23

ISDN Message	Elapsed Time	CRV	TS	Card	Called Number
ALERTING	319.6250	5632		56	
ALERTING	324.6250	5888		56	

Error Type	Card #...	Card #...
Underruns	0	0
Ok Frames	69	69
Frame Errors	0	0
CRC Errors	0	0

Enable Event Graph

SS7 Analyzer

T1 T3E3 Channelized Analyzer

SS7 Protocol Analysis SS7 ITU

File View Capture Statistics Database Call Detail Records Configure Help

Dev	TSlot	SubCh	Frame#	TIME (System)	Len	Error	OPC MTP3	DPC MTP3	Message Type ISUP	Circuit Identification Code ISUP	Called Address Signal ISUP	Calling Address Signal ISUP
✓ 50	23		21	18:32:54.300375	38		1.1.1	2.2.2	Initial address	1	4265375001	5674532001
✓ 51	23		22	18:32:54.300375	38		1.1.1	2.2.2	Initial address	1	4265375001	5674532001
✓ 52	23		23	18:32:54.300375	38		1.1.1	2.2.2	Initial address	1	4265375001	5674532001
✓ 53	23		24	18:32:54.300375	38		1.1.1	2.2.2	Initial address	1	4265375001	5674532001
✓ 54	23		25	18:32:54.300375	38		1.1.1	2.2.2	Initial address	1	4265375001	5674532001
✓ 55	23		26	18:32:54.300375	38		1.1.1	2.2.2	Initial address	1	4265375001	5674532001
✓ 56	23		27	18:32:54.300375	38		1.1.1	2.2.2	Initial address	1	4265375001	5674532001
✓ 30	23		28	18:32:54.302250	38		1.1.1	2.2.2	Initial address	2	4265375002	5674532002
✓ 31	23		29	18:32:54.302250	38		1.1.1	2.2.2	Initial address	2	4265375002	5674532002

Card56 TimeSlot=23 Frame=27 at 18:32:54.300375 OK Len=38 *** Right click to SHOW/HIDE layer details or copy ***

HDLC Frame Data + FCS

```

===== MTP2 Layer =====
0000 BSN = .0000001 (1)
0000 BIB = 1..... (1)
0001 FSN = .0000010 (2)
0001 FIB = 1..... (1)
0002 LI = ..100001 MSU Format
===== MTP3 Layer =====
0003 Service Indicator = ....0101 ISDN User Part
0003 Priority Code = ..00.... Priority Code 0
0003 Sub-service field = 10..... National Network
0004 DPC = 2.2.2(00010010 ..010000)
0005 OPC = 1.1.1(01..... 00000010 ....0010)
0007 Signalling Link Code = 0001 (1)
  
```

Call ID	Call Status	Disp	Calling Num	Called Num	Call Start Date & Time	Call Duration	Release Complete Cause	DevNo	TS	OPC	DPC	CIC	Lin
4	C	1	5674532005	4265375005	2016-03-21 18:32:54.317625	00:01:01.230250	Normal call clearing	30	23	1.1.1	2.2.2	5	
5	C	1	5674532006	4265375006	2016-03-21 18:32:54.322625	00:01:01.237625	Normal call clearing	30	23	1.1.1	2.2.2	6	
6	C	1	5674532007	4265375007	2016-03-21 18:32:54.327500	00:01:01.234625	Normal call clearing	44	23	1.1.1	2.2.2	7	
7	C	1	5674532008	4265375008	2016-03-21 18:32:54.333125	00:01:01.230875	Normal call clearing	30	23	1.1.1	2.2.2	8	
8	C	1	5674532009	4265375009	2016-03-21 18:32:54.338000	00:01:01.233875	Normal call clearing	30	23	1.1.1	2.2.2	9	

Running. Utilization 58.72% C:\Java1\Temp.Hdl Captured 3 220 frames

Ready T1/E1 Sync Info

ISDN Analyzer

T1 T3E3 Channelized Analyzer

File Config View Monitor IntrusiveTest Special Applications Window Help

Port Framing B8ZS Set all cards as selected

ISDN Protocol Analysis Q.93x

File View Capture Statistics Database Call Detail Records Configure Help

0 GoTo

Dev	TSlot	SubCh	Frame#	TIME (Date)	Len	Error	Message Type Q.93x	Call Reference Value Q.93x	Channel Number Q.93x	Called Number Digits Q.93x	Calling Number Digits Q.93x
✓ 19	23		36	2016-03-21 18:29:29.868000	41		SETUP	512	2	5551234	5552000
✓ 20	23		37	2016-03-21 18:29:29.868000	41		SETUP	512	2	5551234	5552000
✓ 22	23		38	2016-03-21 18:29:29.868000	41		SETUP	512	2	5551234	5552000
✓ 23	23		39	2016-03-21 18:29:29.868000	41		SETUP	512	2	5551234	5552000
✓ 25	23		40	2016-03-21 18:29:29.868000	41		SETUP	512	2	5551234	5552000
✓ 26	23		41	2016-03-21 18:29:29.868000	41		SETUP	512	2	5551234	5552000
✓ 28	23		42	2016-03-21 18:29:29.868000	41		SETUP	512	2	5551234	5552000
✓ 30	23		43	2016-03-21 18:29:29.870500	16		CALL PROCEEDING	256	1		
✓ 31	23		44	2016-03-21 18:29:29.870500	16		CALL PROCEEDING	256	1		
✓ 35	23		45	2016-03-21 18:29:29.870500	16		CALL PROCEEDING	256	1		
✓ 37	23		46	2016-03-21 18:29:29.870500	16		CALL PROCEEDING	256	1		
✓ 38	23		47	2016-03-21 18:29:29.870500	16		CALL PROCEEDING	256	1		
✓ 39	23		48	2016-03-21 18:29:29.870500	16		CALL PROCEEDING	256	1		
✓ 44	23		49	2016-03-21 18:29:29.870500	16		CALL PROCEEDING	256	1		

Card28 TimeSlot=23 Frame=42 at 2016-03-21 18:29:29.868000 OK Len=41 *** Right click to SHOW/HIDE layer details or copy ***

HDLC Frame Data + FCS

```

===== LAPD Layer =====
0000 C/R = .....1. Response(User) Command(Network)
0000 SAPI = 000000.. (0)
0001 TEI = 0000000. (0)
0002 Ctl = .....0 Information
0002 N(S) = 0000001. (1)
0003 P = .....0 (0)
0003 N(R) = 00000000. (0)
===== Q.93x Layer =====
0004 Protocol Discriminator = 00001000 Q931/I.451 user-network call control
0005 Call Reference Length = ....0010 (2)
0006 Call Reference Value = 512 (.0000010 00000000)
0006 Call Reference Flag = 0..... FROM side that originated callref
    
```

Running. Utilization 0.28% C:\Program Files (x86)\GL Communications Inc\Soft T1 Captured 5 096 frames

Ready T1/E1 Sync Info

Thank you