tProbe™ Serial Data Communication Analyzer (Datacom Analyzer)

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tProbe™ with Datacom Analyzer

Portable tProbe™ Datacom T1 E1 Analyzer

Back Panel

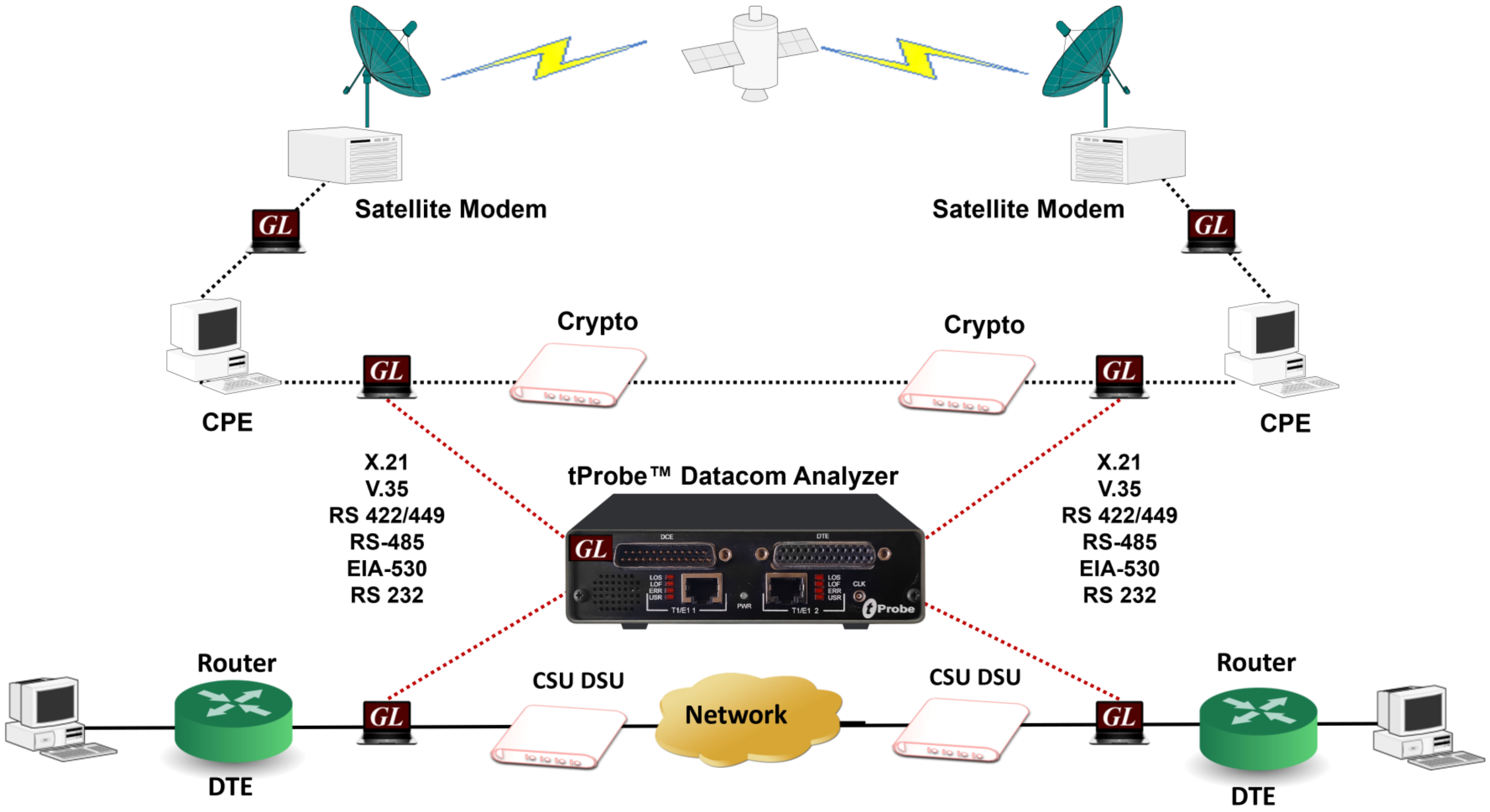
Front Panel

mTOP™ 1U Rack tProbe™ Datacom T1 E1 Analyzer

mTOP™ Probe tProbe™ T1 E1 Analyzer (Front Panel)

mTOP™ Probe tProbe™ T1 E1 Analyzer (Back Panel)

Introduction



- The tProbe™ T1 E1 and Datacom analyzer is designed for test and verification of data communications equipment and circuits
- Software selectable modes are provided to emulate DTE, DCE and non-intrusive monitoring for both synchronous (Sync), and asynchronous (Async) modes

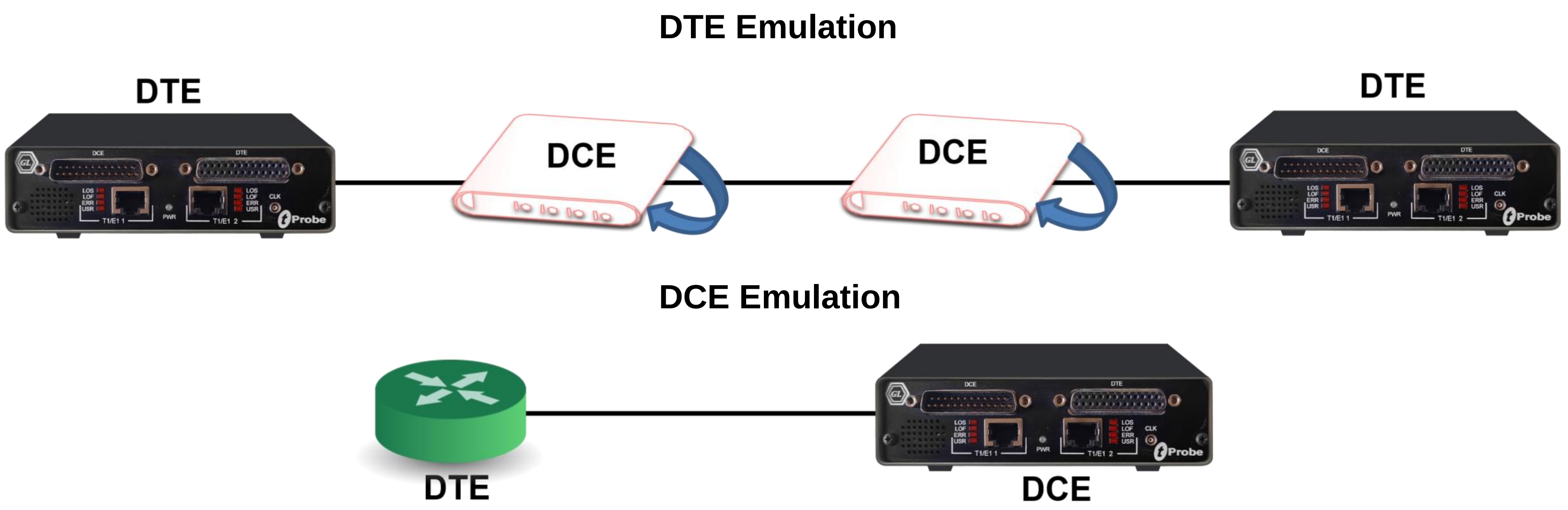
Main Features

- Supported Line interfaces – V.24, V.35, X.21, RS-232, RS–449, EIA-530 and EIA–530A
- Allows user to define custom frequency data rate for all encoding options
- Supports Frequency Measurement, PPP Analysis, and HDLC Analysis
- Sync BER from 300 b/s to 16.384Mbps - very wide dynamic range
- Async BER from 75 b/s to 115.2Kbps
- DTE or DCE emulation mode
- SYNC clock source and sense selection
- Windows Client / Server provides the capability of remote operation, automation, and multi-site connectivity
- Client Server (WCS) module also supports Enhanced BER testing

Main Features (Contd.)

- Supports NRZ, FM0, FM1 and Differential Manchester encoding schemes
  - Manchester IEEE BER from 75 b/s to 115.2Kbps
  - Manchester GE Thomas BER from 75 b/s to 115.2Kbps
  - Differential Manchester BER from 75 b/s to 115.2Kbps
  - Manchester FM0 and FM1 BER from 75 b/s to 115.2Kbps
  - NRZI BER from 0.5Mbps to 10Mbps
- Real time View of Data
- Record Playback of Files
- Delay and Impairment of Data
- Protocol Analysis for HDLC and PPP

Typical Application



- Bidirectional monitoring with Y-adapter cable
- Monitor control leads, frequency
- DTE / DCE emulation for end-to-end testing of data networks, bidirectional monitoring for a greater level of troubleshooting for data networks
- Verifying end-to-end transmission through DCE or DTE

Frequencies

Interface	Mode	Frequency	
		Low	High
RS-232 V.35 EIA_530 EIA_530A RS-449 X.21	Async	75 bps	115.2 Kbps
	Sync	300 bps	16.384 Mbps
	Manch IEEE	75 bps	1.024 Mbps
	ManchGE T	75 bps	1.024 Mbps
	NRZI	0.5 Mbps	10 Mbps
	ManchDiff	75 bps	1.024 Mbps
	ManchFM0	75 bps	1.024 Mbps
	ManchFM1	75 bps	1.024 Mbps

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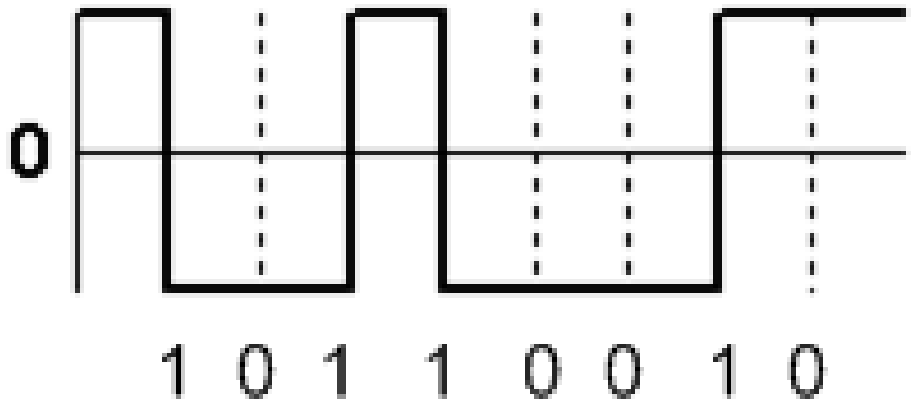
Async Mode of Operation

- Data is transmitted without the clock
- Adds the start, stop, and parity check bits to the data. The start bit is used to start the process
- Asynchronous transmission is easy to implement but less efficient as it requires an extra 2–3 control bits for every 8 data bits
- This method is usually used for low volume transmission
- Transmitters and receivers extract the data using their own clock, and they do not share the common clock as in serial communication mode

Sync Mode of Operation

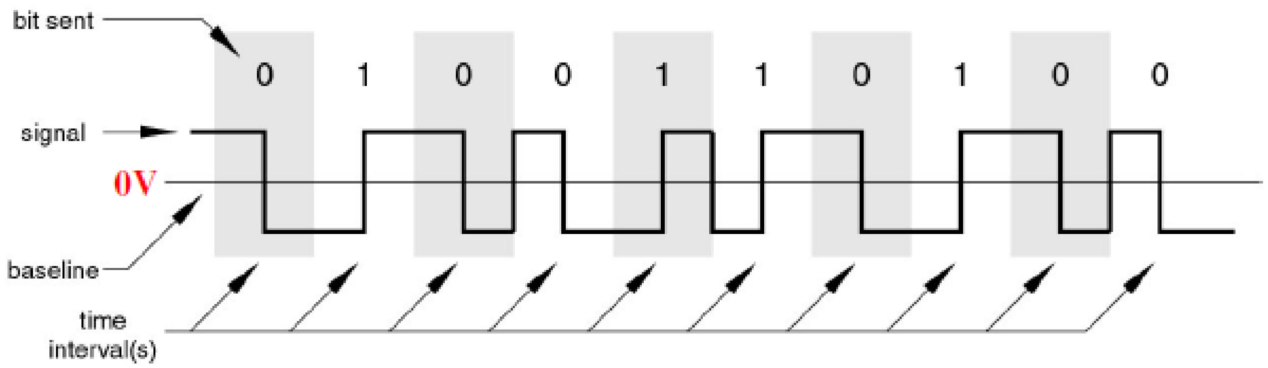
- Requires the clock signal to be transmitted from the source along with the data
- Data rate for the link is same for the transmitter and receiver
- Transmitter and receiver share a common clock

NRZ (Nonreturn to Zero-Level) Coding



- Uses two different voltage levels (one positive and one negative) as the signal elements for the two binary digits.
- A change in the signal level occurs every time a "one" occurs, but when a "zero" occurs, it remains the same, i.e., no transition occurs

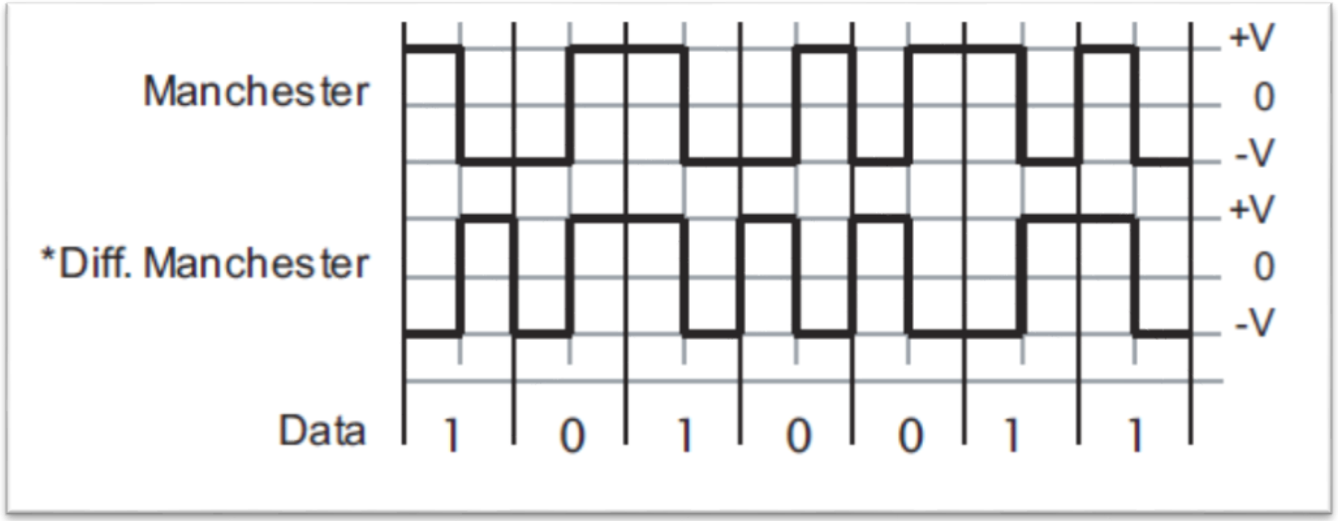
Manchester Coding



- Transition occurs at the **middle** of each bit period
- Transition serves as **clock and data**
- Low to high represents binary 1
- High to low represents binary 0
- Used by IEEE 802.3 (Ethernet)

- Encode data by their direction (positive-negative is one value, negative-positive is the other).
- Transition occurs at the middle of each bit period
- The advantage over normal NRZ is that is has more transition density which improves the timing recovery at the receiver

Differential Manchester



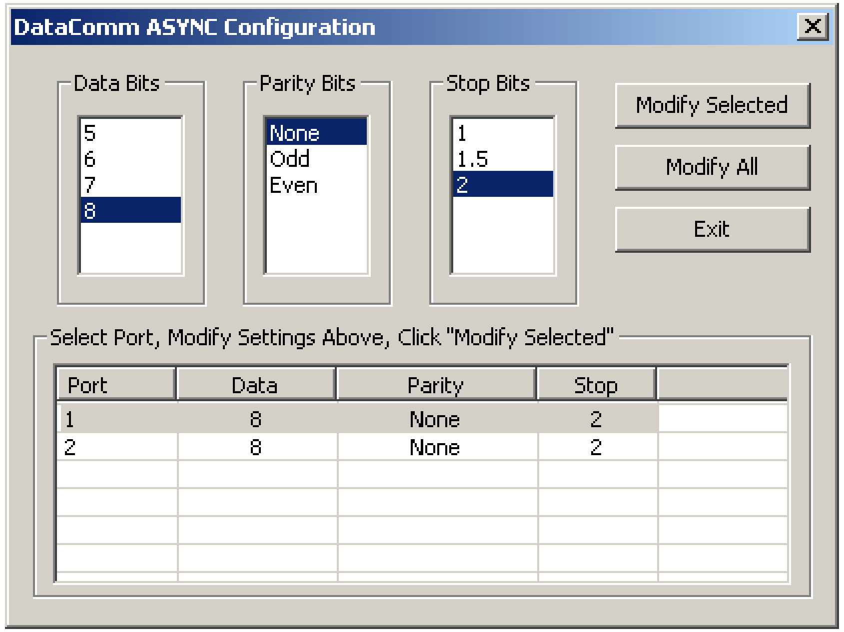
- Uses the presence or absence of transitions to indicate logical value
- In differential Manchester encoding, if a "1" is represented by one transition, then a "0" is represented by two transitions and vice versa. It is a differential encoding

Datacom Interfaces

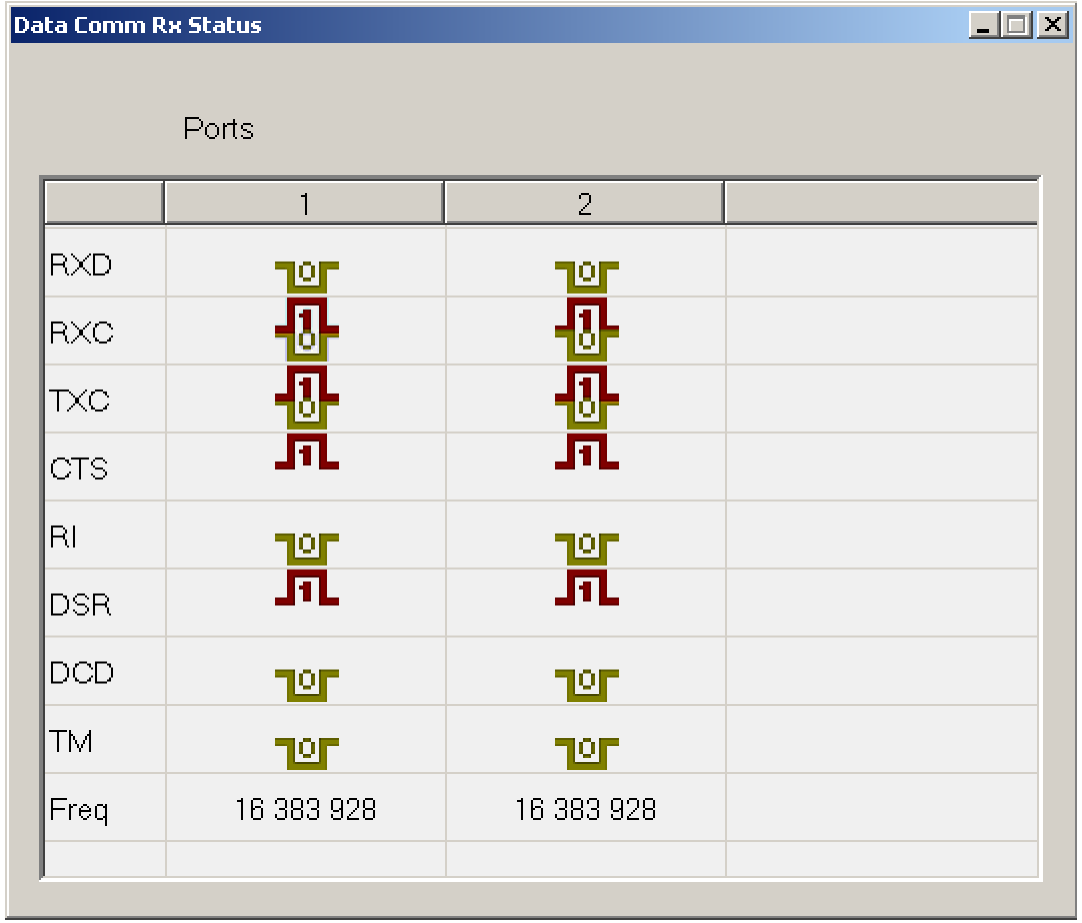
- **RS232C**: It is a standard interface for serial data for connecting DTE to DCE computer serial ports
- **RS-423**: It is a higher speed unbalanced interface similar to RS-232C. The Datacom board supports this with RS-232C interface setting
- **RS-449**: It is a high speed serial data communication interface. This interface used unbalanced or pairs of signals to transmit and receive clock and data. This interface typically uses a 37 pin connector
- **RS-422/RS-485**: It is similar to the RS-449 standard with changes only to the logic levels. This is sometimes used with a multi drop configuration of up to 10 receivers with 1 transmitter. Difficult to setup but can fill low cost reliable data communications
- **V.35**: It is another high speed serial data communication interface. This interface also uses unbalanced or pair of signals to transmit and receive clock and data. This interface typically uses a 35 pin connector
- **RS-530**: It is another high speed serial data communication interface. It is a common interface used to replace a 25 pin connector instead of using the RS-449 DB-37 or V.35 connectors

ASYNC Configuration

Configuration functionality allows to configure various Tx/Rx parameters such as Data Bits, Parity Bits, and Stop Bits



Monitoring of Control Signals and Frequency



Monitoring of Control Signals and Frequency (Contd.)

- **RXD**: (Received Data) -This is the serial encoded data received by a DTE from a DCE which has in turn received from another source
- **RXC**: (Receive Complete) -The RXC bit will be set to HIGH(1) when data is received and is available in the buffer
- **TXC**: (Transmit Complete) -The TXC bit is set to HIGH(1) when a transmission is completed and there is no other data to send
- **CTS: (Clear to Send) -** This is set to HIGH(1) by a DCE to allow/ prevent the DTE to transmit data
- **RI**: (Ring Indicator) -This signal is used for auto answer applications. DCE raises when incoming call detected
- **DSR**: (Data Set Ready) -This should be set to HIGH(1) by a DCE whenever it is powered on. It can be used by the DTE to determine that the DCE is on line
- **DCD**: (Data Carrier Detect) - This is set to HIGH(1) by a DCE when it detects the data carrier signal on the datacom line
- **Frequency**: Displays operating Frequency in Hertz
- **TM**: Test Mode

Datacom Cables

RS-530 Male to Female Cable


RS530 Male to RS530 Female

- The RS-530 is a standard high speed data communications serial interface which can be used with external cables to support different serial interface connectors

RS530 Female to Female

RS530 Female to RS530 Female

RS530 Male to Male

RS530 to RS530 Male

RS232C

- This is a standard interface for serial data for connecting DTE to DCE computer serial ports
- It is used for slower data communications due to the logic and interface used

RS449

- This is a high-speed serial data communication interface
- This interface uses unbalanced (RS-423) and balanced (RS-422) to transmit and receive clock and data
- This interface typically uses a 37 pin connector

RS449 DCE to RS530

RS530 to RS449 DTE

V.35

- This is a high-speed serial data communication interface
- Uses unbalanced or pair of signals to transmit and receive clock and data
- This interface typically uses a 35 pin connector

V.35 Mate to RS530 Male

RS530 Female to V.35 DCE

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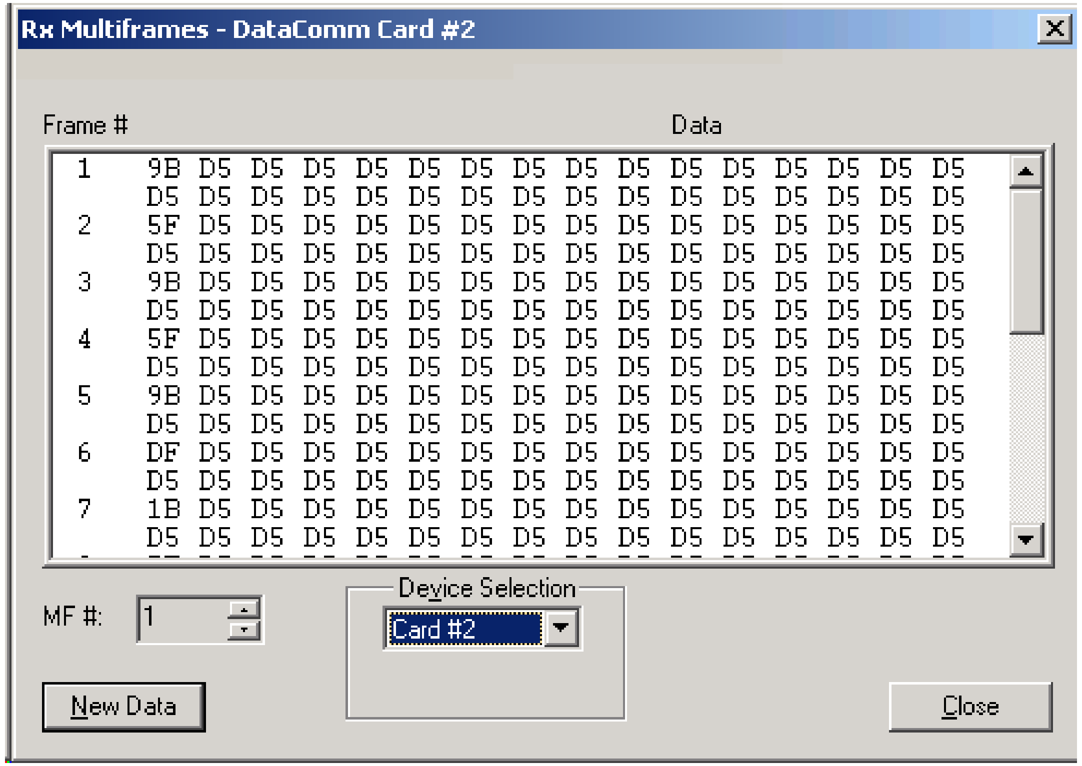
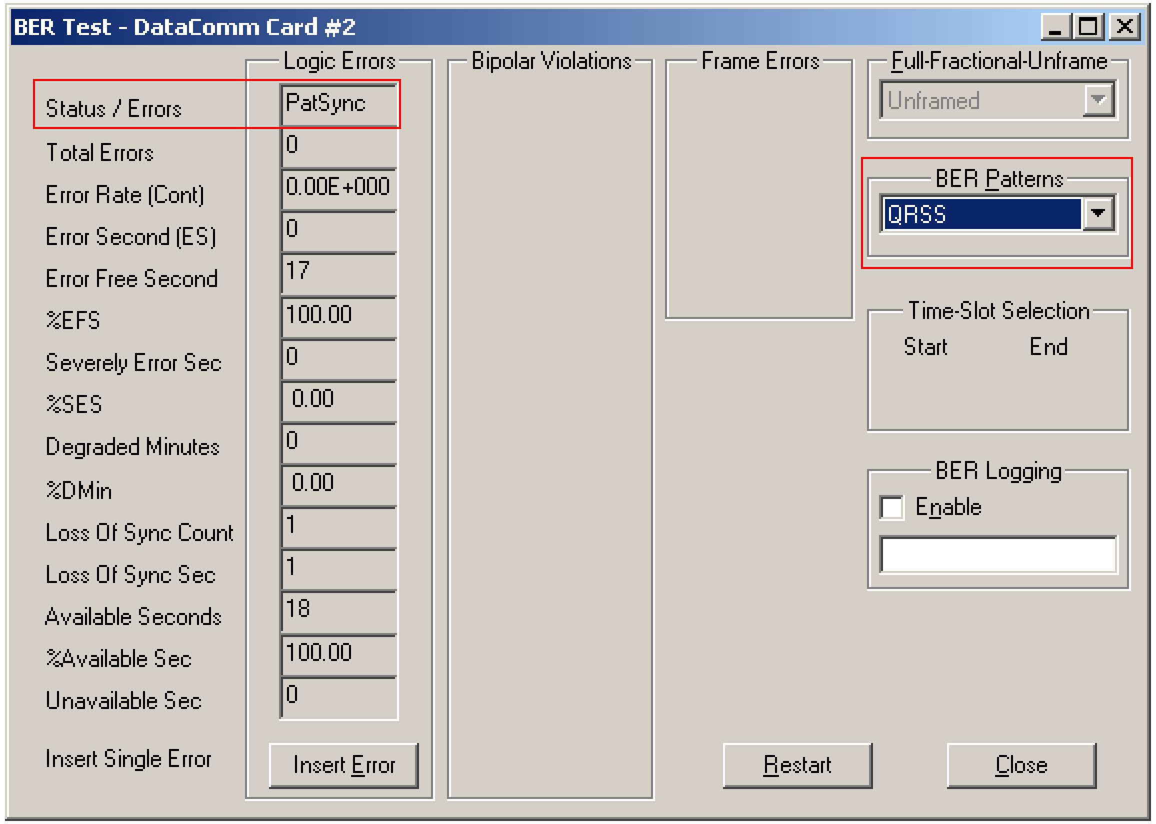
Monitoring Data in Realtime

- This application permits viewing data on a Datacom port – both directions simultaneously
- Approximately 2 seconds of data is captured for viewing



Bit Error Rate Test for Async and Sync

- The Bit Error Rate Test (BERT) application for Datacom Analyzer generates/detects data that are defined in Pseudo Random Bit Sequence (PRBS)



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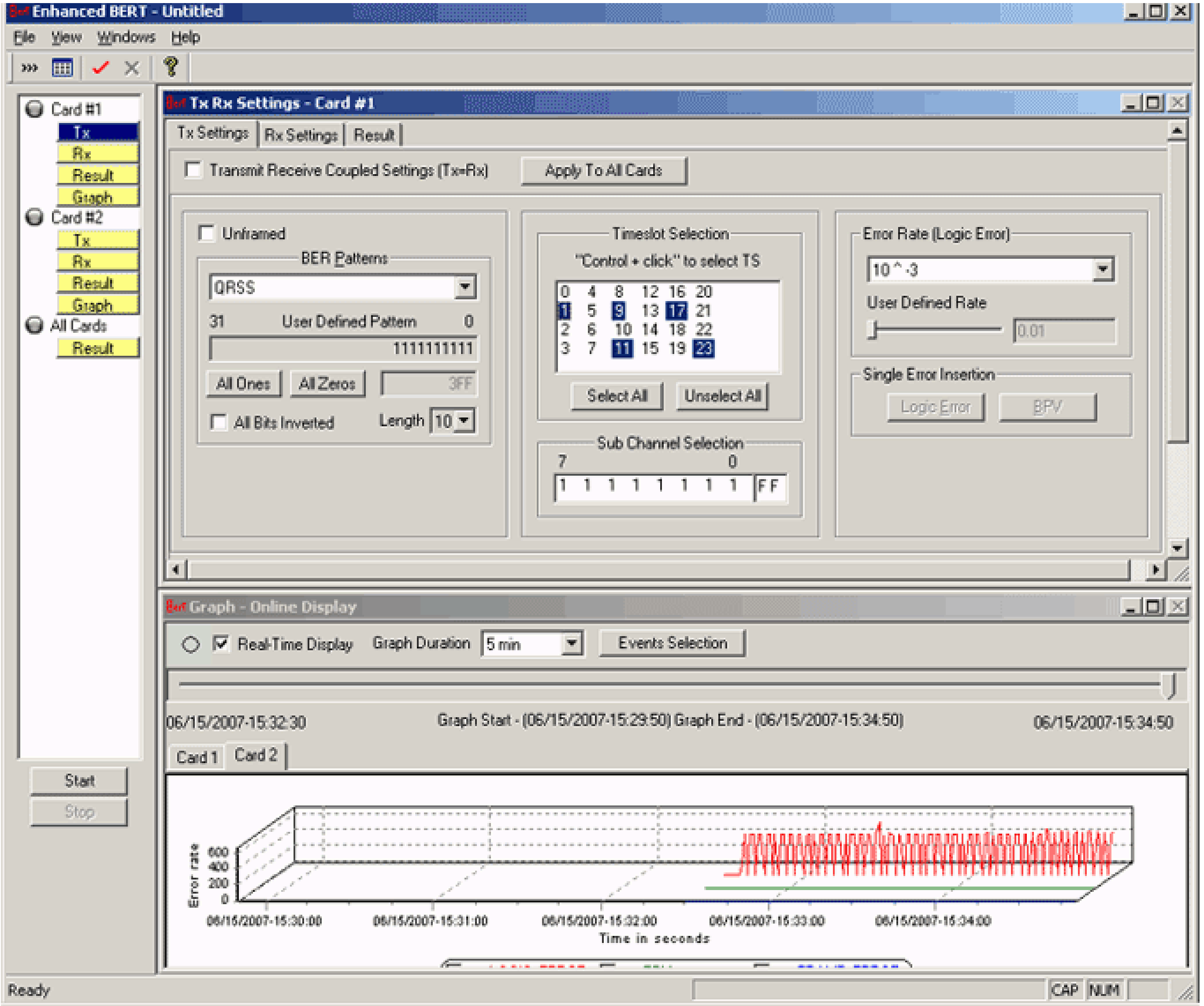
Enhanced Bit Error Rate Test

- The enhanced features include support for multiple ports, with a consolidated result view for all ports
- The Tx and Rx settings for all the cards can be independently controlled or coupled as per the convenience of the user
- The Enhanced BERT measures the correctness of data received on datacom according to the repetitive pattern file for a given transmission



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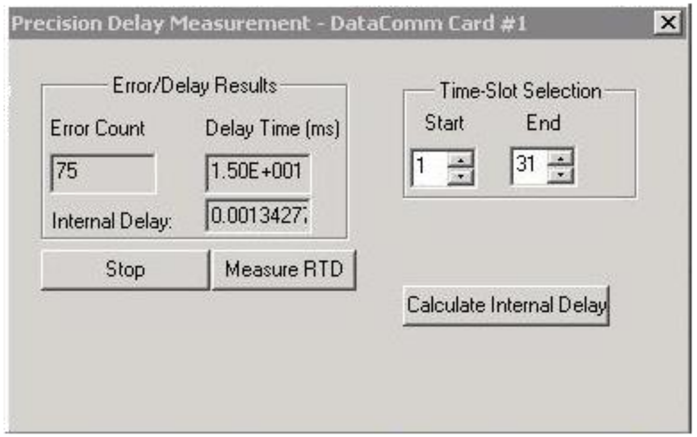
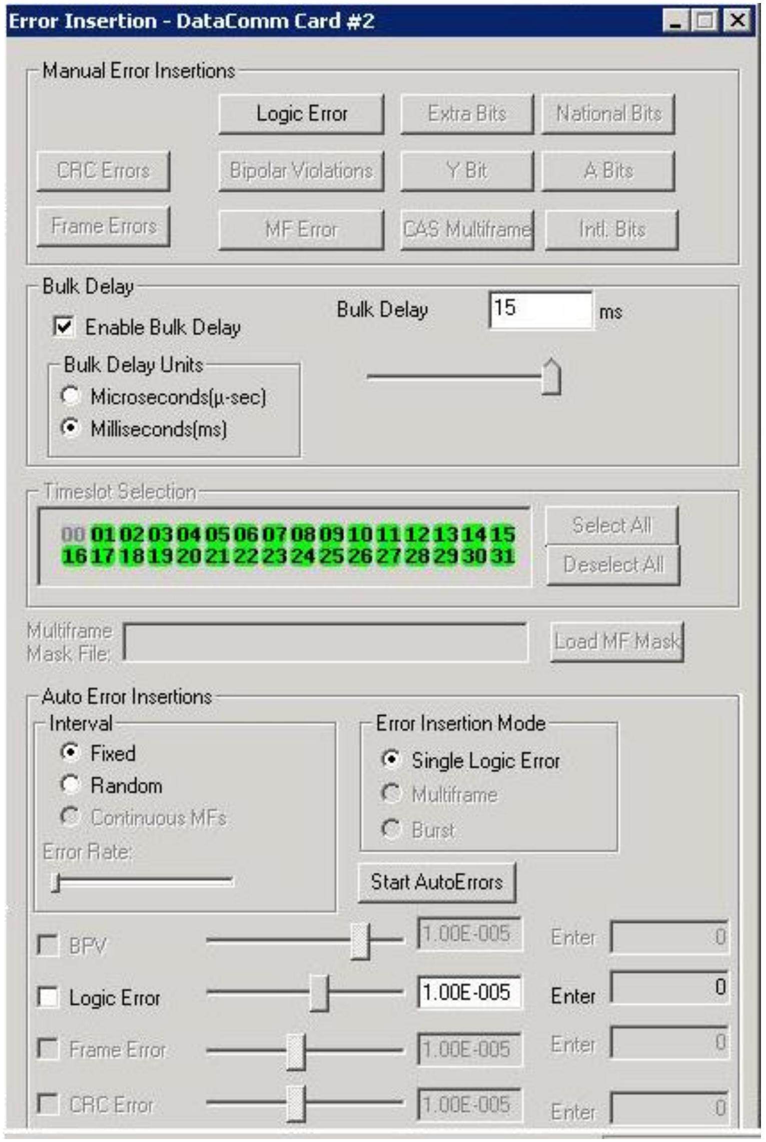
Precision Delay Measurement

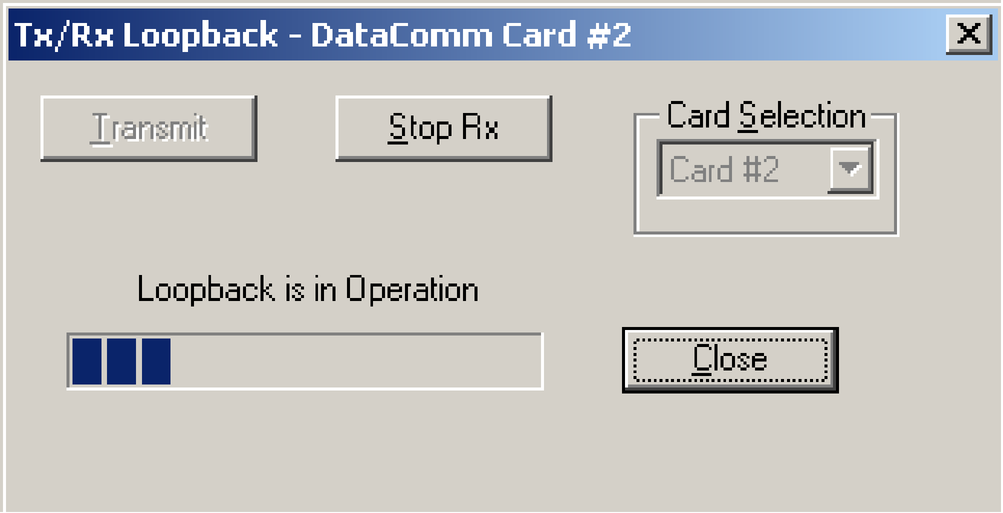
- Precision Delay Measurement measures the Round-Trip Delay of a system



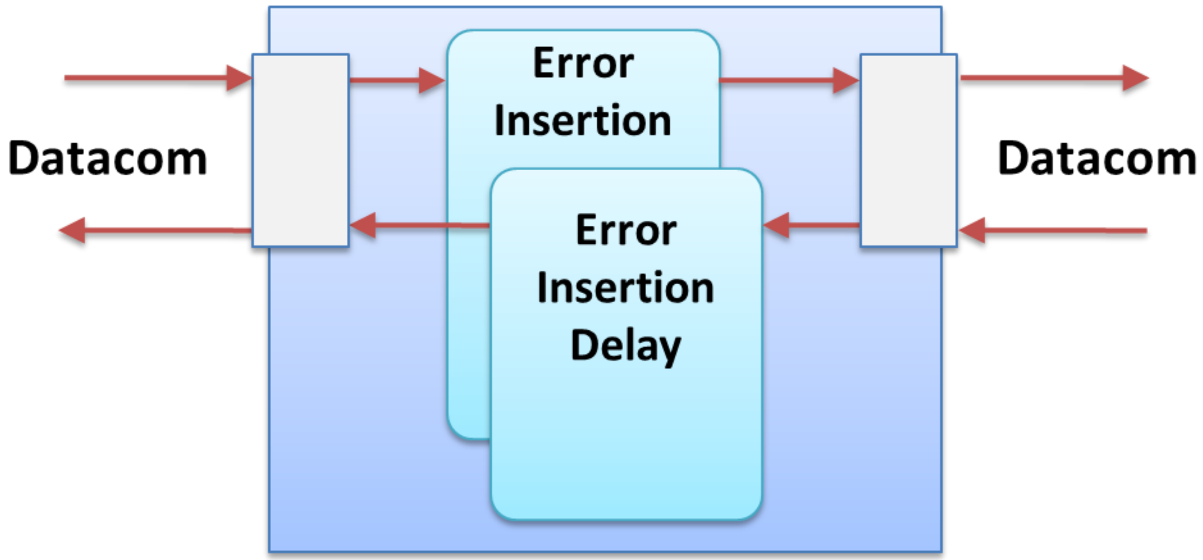


Rx to Tx Loop back

- Loop backs the received data from back to the transmitting port
- Used in conjunction with a Bit Error Rate Tester to verify the operation of analyzer

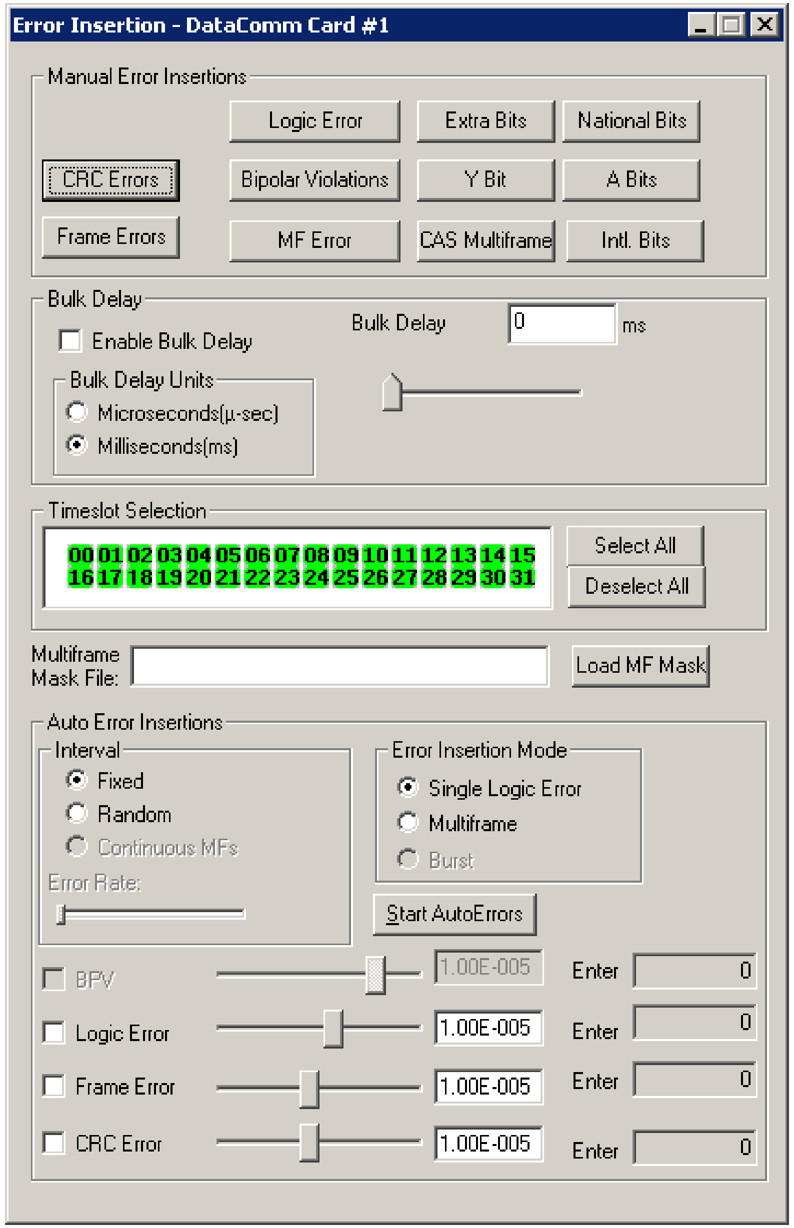


Error Insertion



- Permits inserting single, fixed, automatic, random, and burst error into the incoming bit stream

Manual Error Insertion



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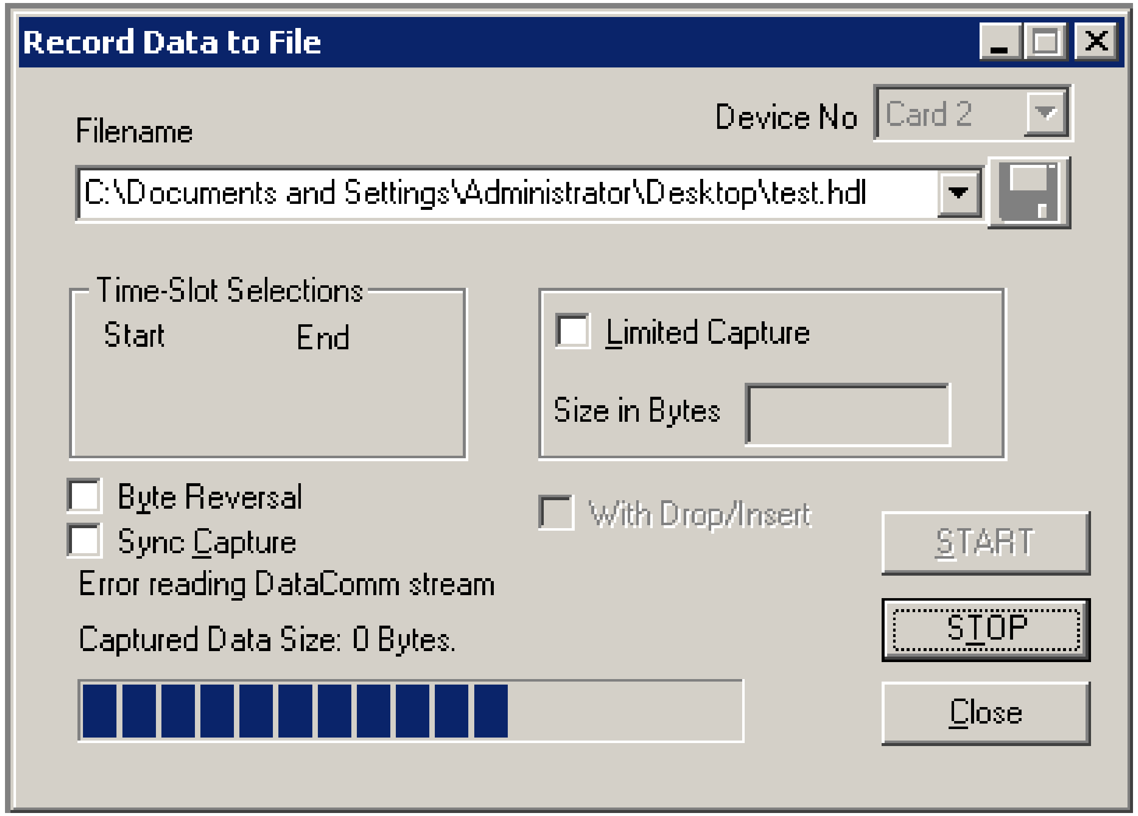
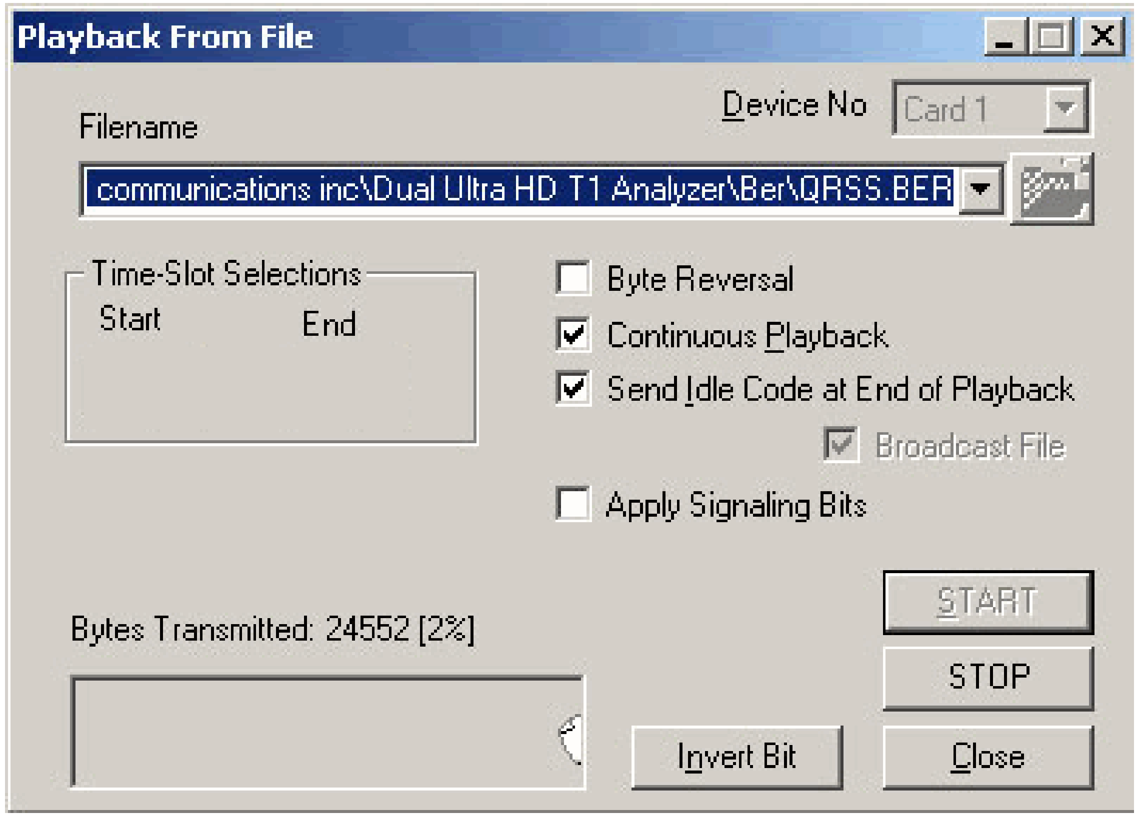
Loopback Testing

- No Loopback – This option disables any existing loopback conditions
- Outward Loopback – In this configuration the data sent from the CSU are received by the Datacom interface and are immediately retransmitted to the CSU
- Diagnostic (Input + Output) Loopback – Loops the internal transmit clock and data to the internal receive clock and data along with looping the external clock and data back to the incoming device
- Cross-port Loopback – It takes the Rx data from the DTE and places it on the Rx of the DCE. It also takes Rx data from the DCE and places it on the Tx of the DTE

Optional Applications

Record / Playback Applications

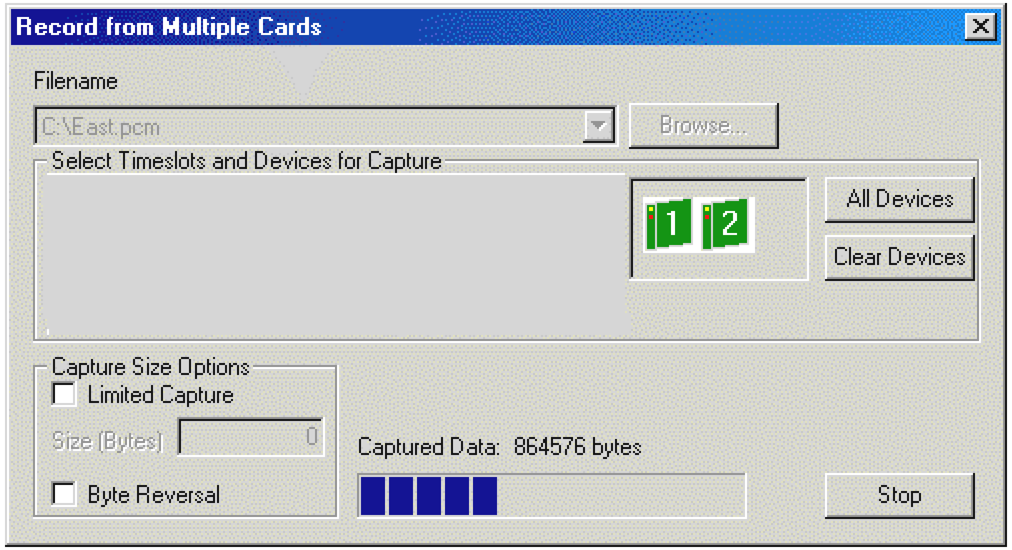




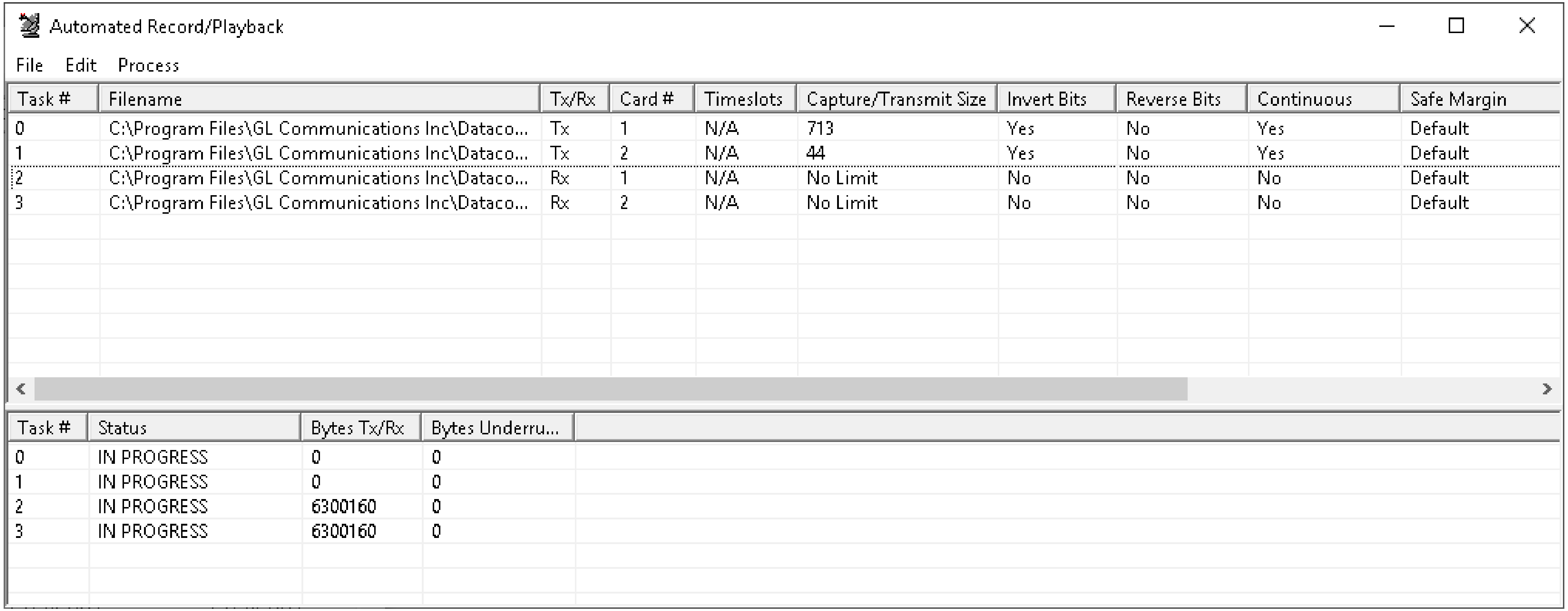
- Record / Playback Disk Files: This application permits capture of data being transmitted on the Datacom ports to / from a file

Record from Multiple Cards

- This application permits capture of data being transmitted on (any one or all) Datacom ports to a file
- Bytes may be captured in reverse order or normal order
- Limit captured (specific number of bytes) data to files



Automated Record/Playback (ARP)



Task #	Filename	Tx/Rx	Card #	Timeslots	Capture/Transmit Size	Invert Bits	Reverse Bits	Continuous	Safe Margin
0	C:\Program Files\GL Communications Inc\Dataco...	Tx	1	N/A	713	Yes	No	Yes	Default
1	C:\Program Files\GL Communications Inc\Dataco...	Tx	2	N/A	44	Yes	No	Yes	Default
2	C:\Program Files\GL Communications Inc\Dataco...	Rx	1	N/A	No Limit	No	No	No	Default
3	C:\Program Files\GL Communications Inc\Dataco...	Rx	2	N/A	No Limit	No	No	No	Default

Task #	Status	Bytes Tx/Rx	Bytes Underru...
0	IN PROGRESS	0	0
1	IN PROGRESS	0	0
2	IN PROGRESS	6300160	0
3	IN PROGRESS	6300160	0

- Provide various menus to transmit/receive data simultaneously
- Comprises of various columns to display the status of parameters for any given data file
- Comprises of various columns to display the status of all tasks queued in the Task Status Viewer

List of Available Protocol Analyzer

- HDLC Analysis
- Frame Relay Analysis
- PPP Analyzer

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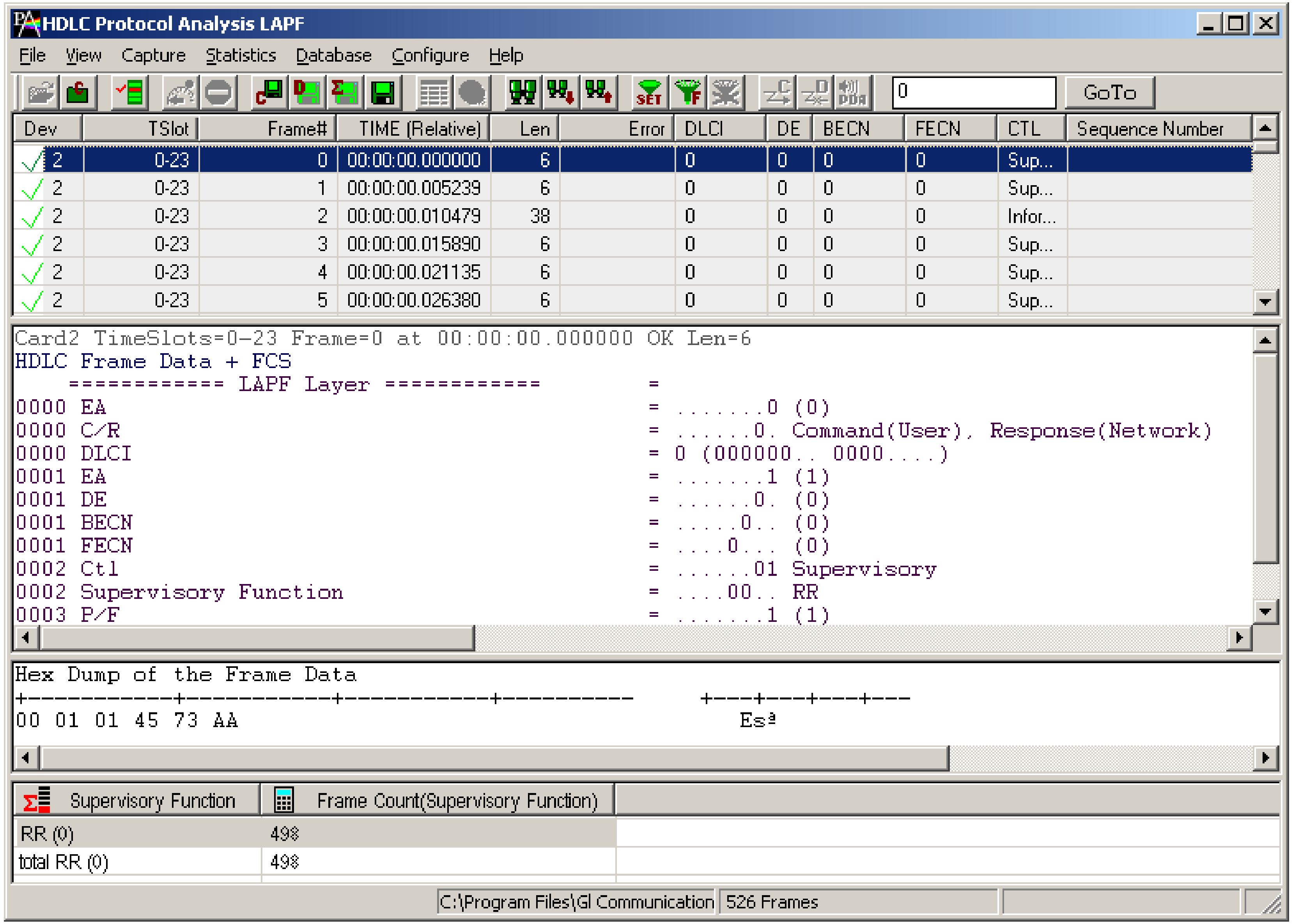
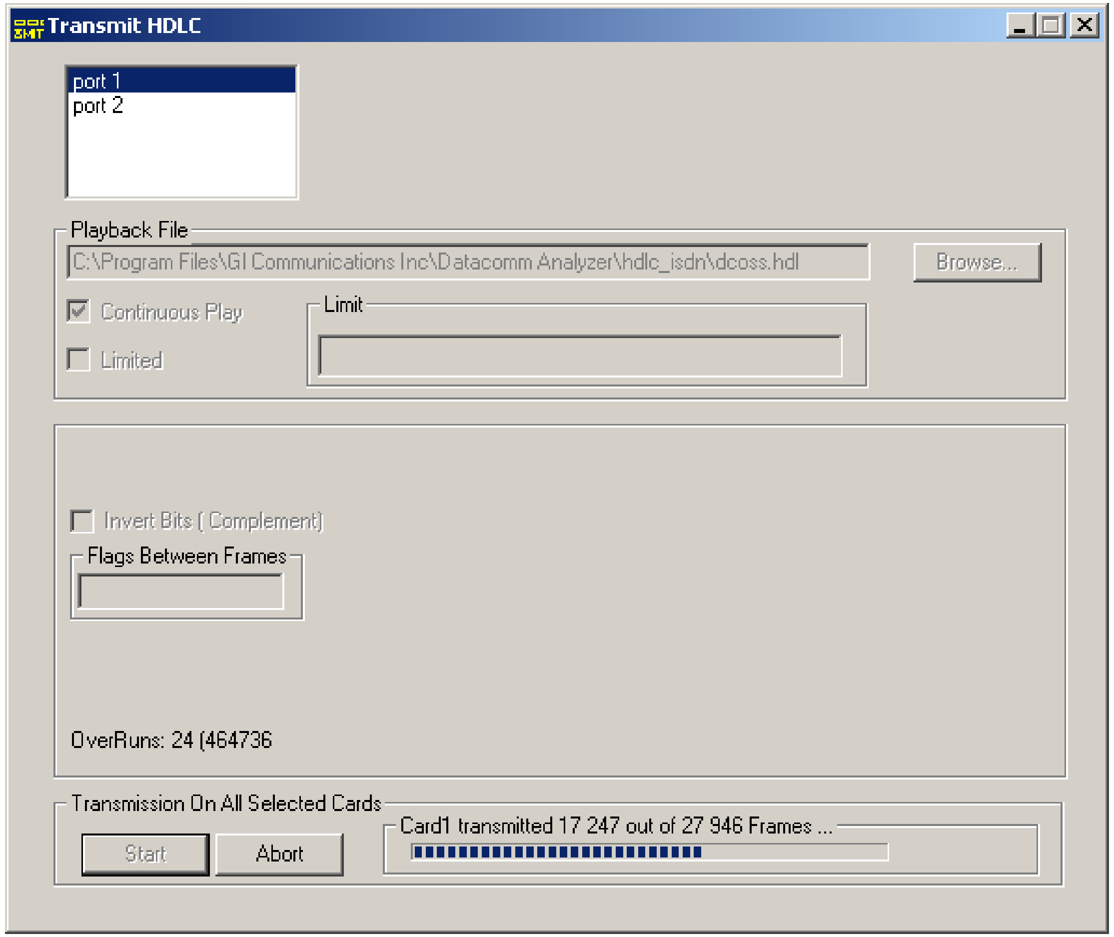
HDLC Analysis

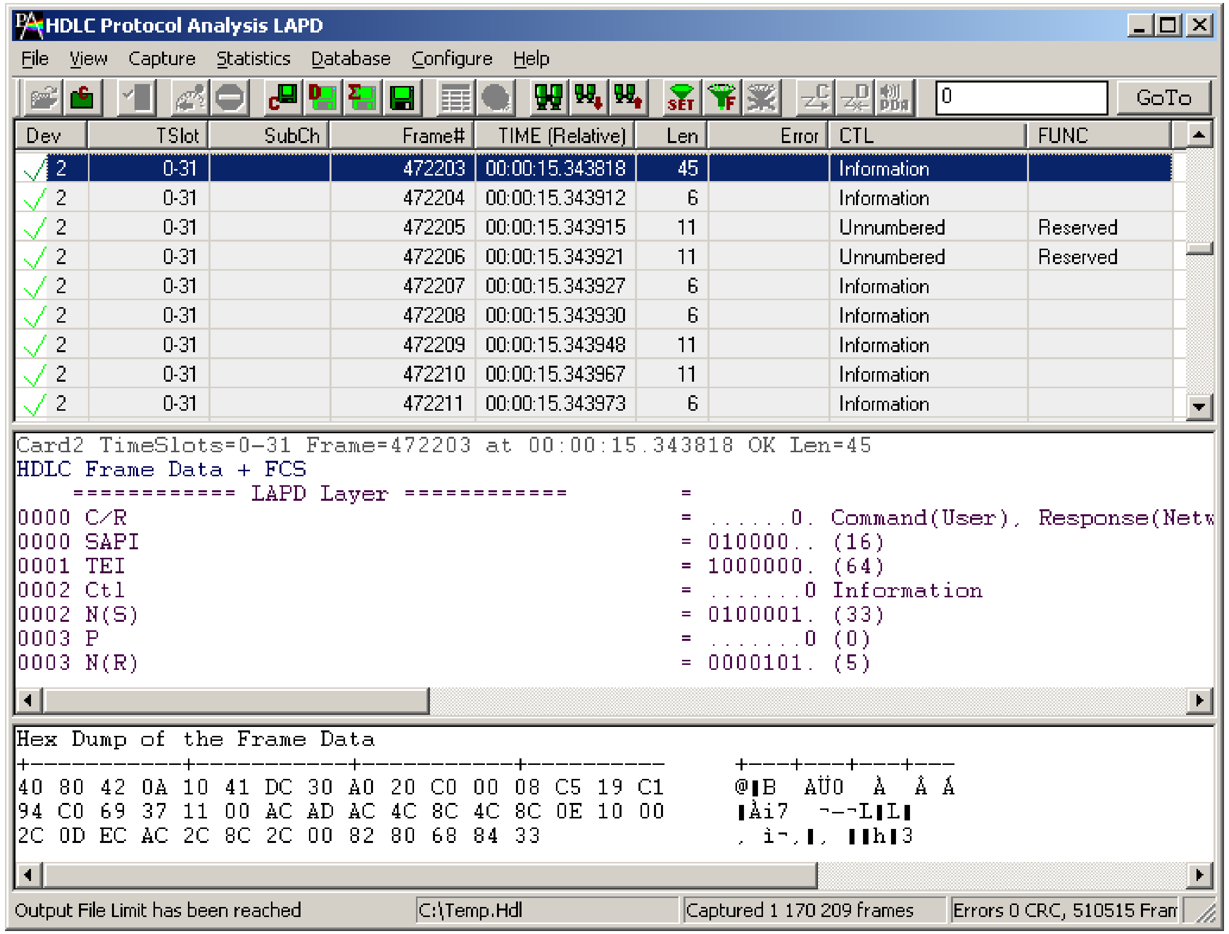


Supported Protocols

- LAPD
- LAPF
- IP
- TCP
- UDP
- ICMP
- STUN
- DNS
- HTTP
- FTP
- SNMP
- Cisco HDLC
- ARP
- LAPB
- DHCP

HDLC Playback





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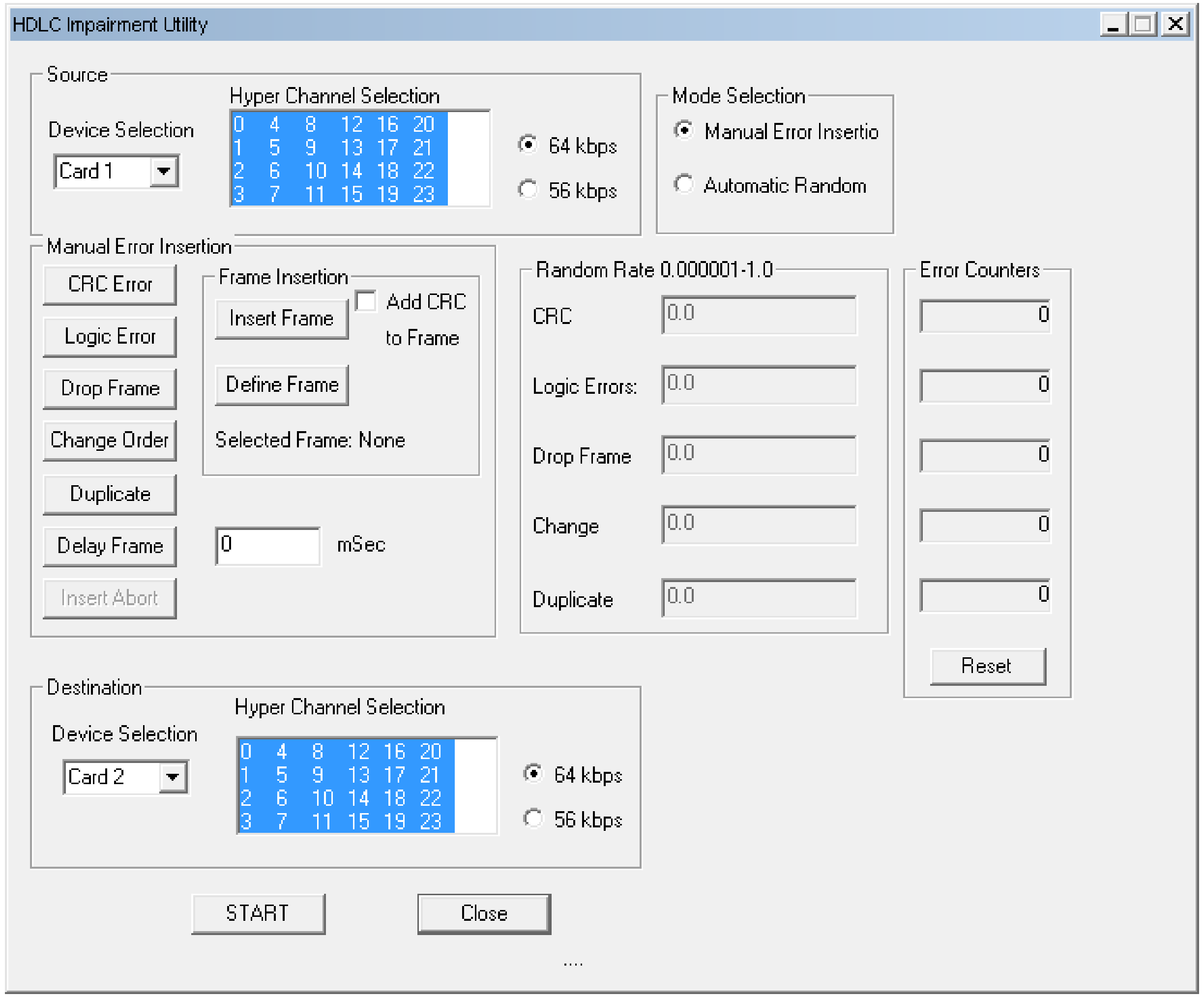
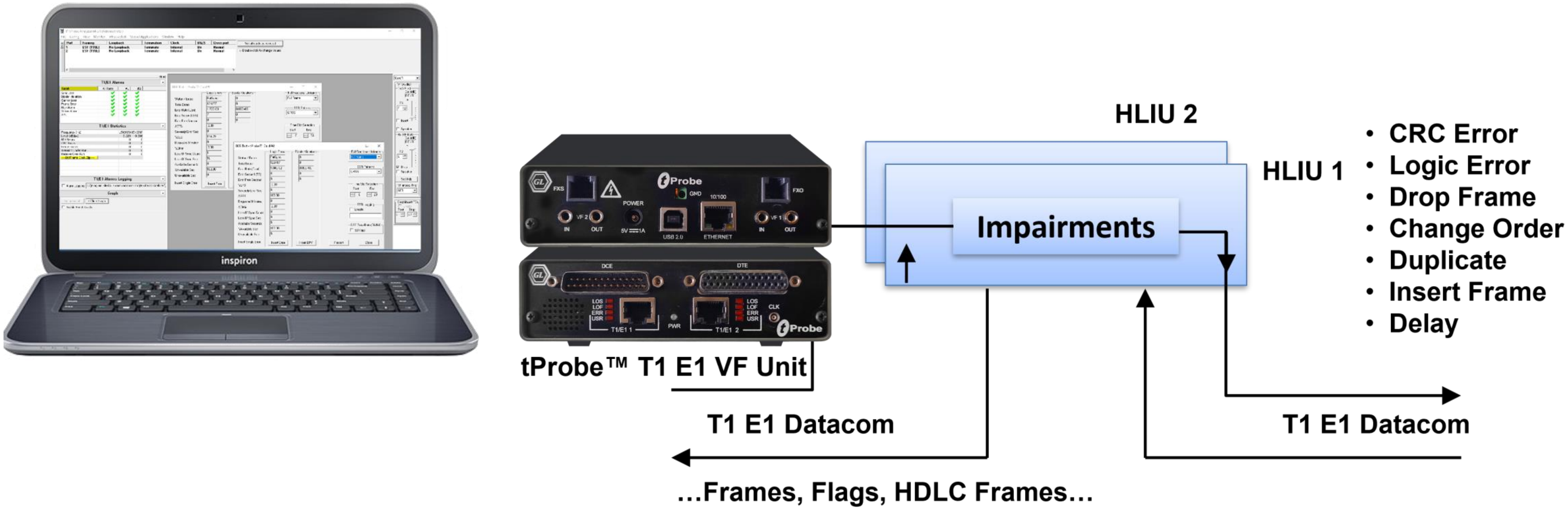
HDLC Link Impairment Utility (HLIU)

Features

- Provides flexible option to select Manual Error Insertion or Automatic Random Error Insertion Mode to inject errors as per requirement
- The HLIU application has the following features: Logic Errors, CRC Errors, Drop a Frame, Change Order of Frames, Duplicate a Frame, Insert a Frame, and Delay Frames
- Impairments can be introduced manually or automatically with a specified random rate,
  e.g. 1x10E-04, or one in 10,000
- This application helps us:
  - ➢ Understand the Delay a network can handle
  - ➢ Simulate Inline Error Insertion with ability to transmit / receive on different ports and allow hyper channel / timeslot selection
  - ➢ Control the error rate to correct the network
  - ➢ Error counters display the total number of CRC, Logic, Drop Frame, Change, and Duplicate errors impaired to an HDLC frame



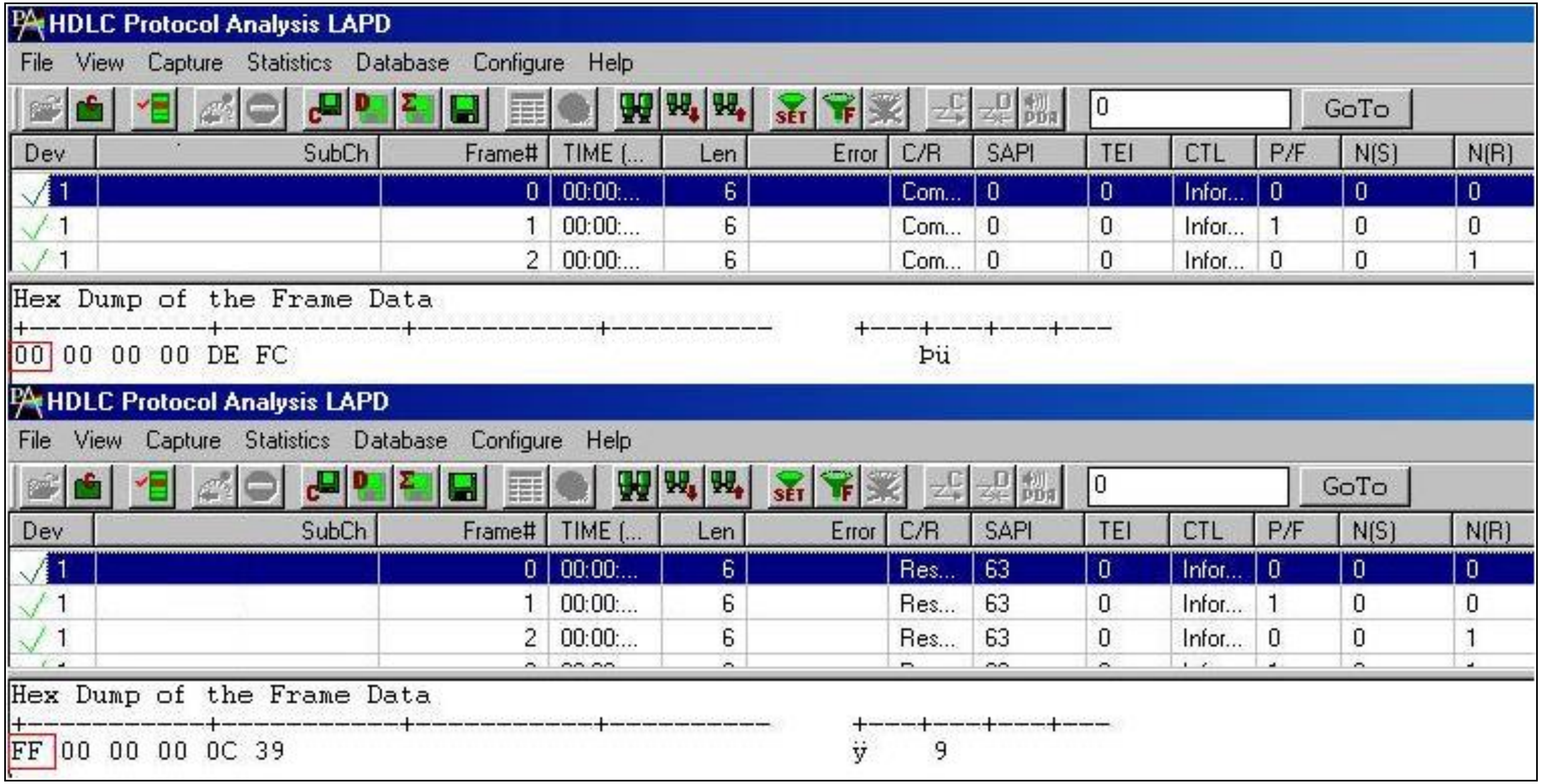
HLIU with T1 E1



- Input stream of HDLC frames is contained in a “single” stream
- The output stream of HDLC frames is contained in a similar structure
- The output stream of HDLC frames may be on a different card or the same card as the input

Logic Error

- The first byte of the frame #1 changed from “00” to “FF”



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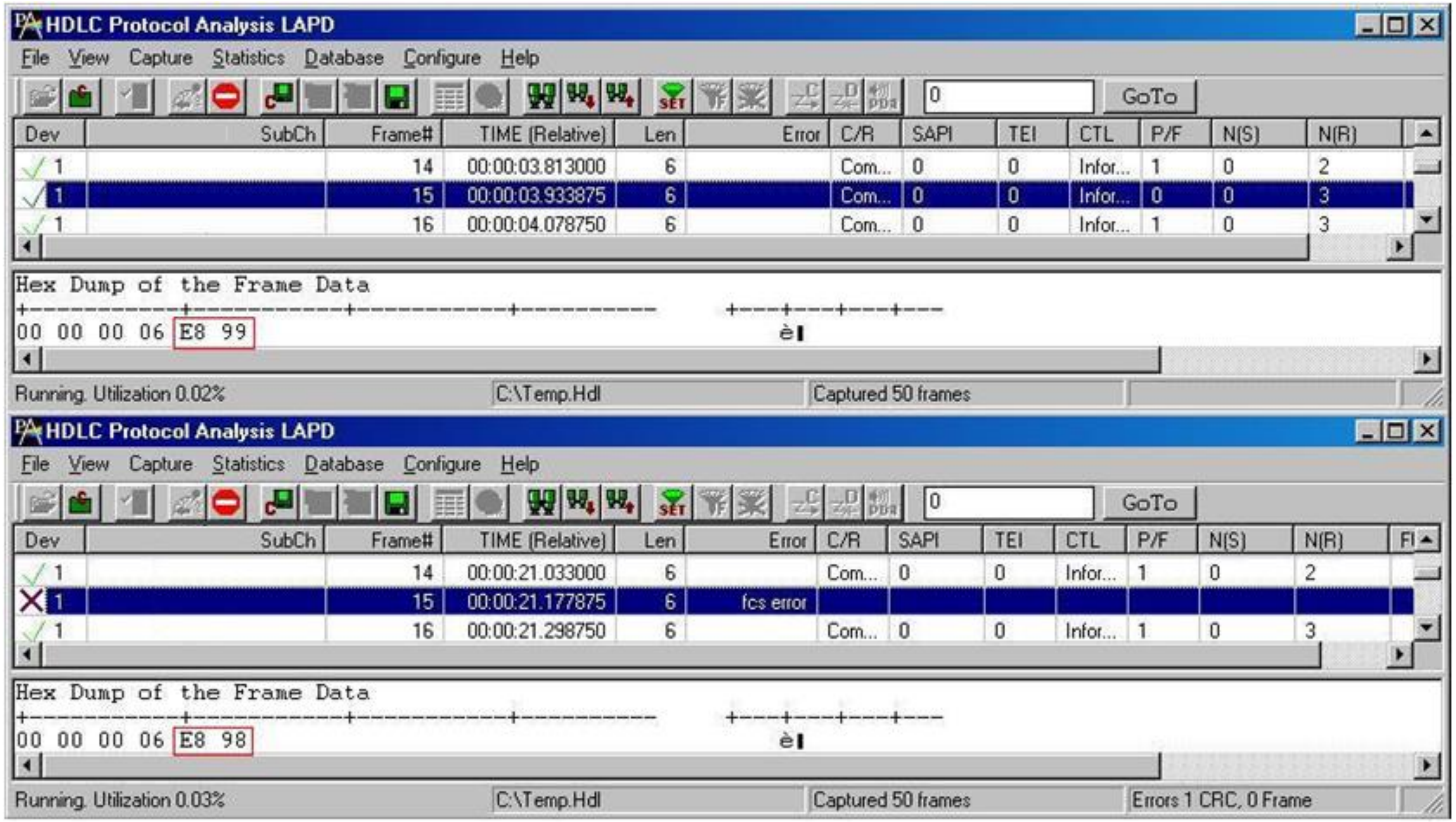
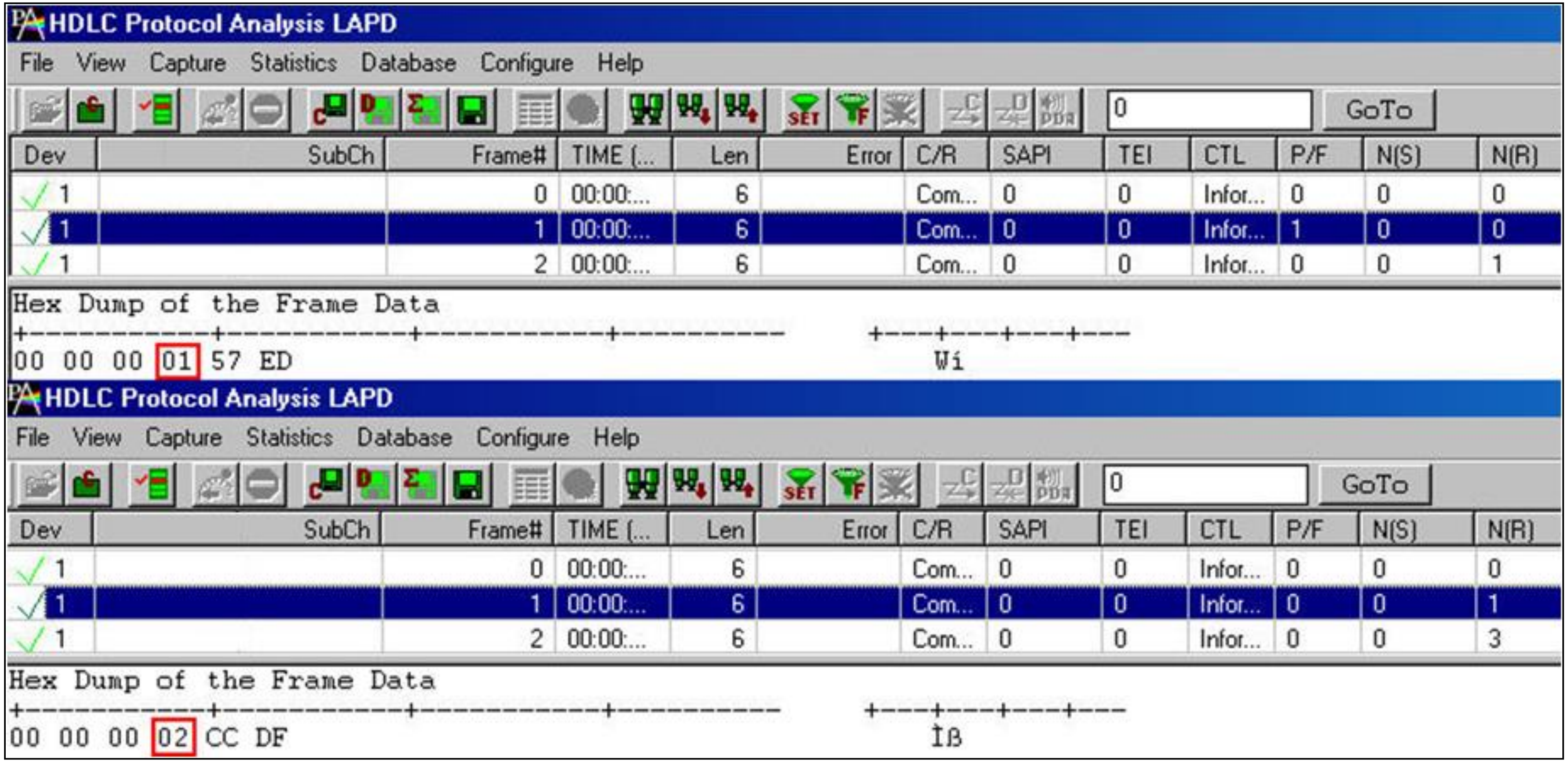
CRC Error

- The CRC error inserted on frame #15 and the CRC value is decremented from "E899" to "E898"
- HLIU application can insert a Single Shot or Random Rate CRC Error into an HDLC frame

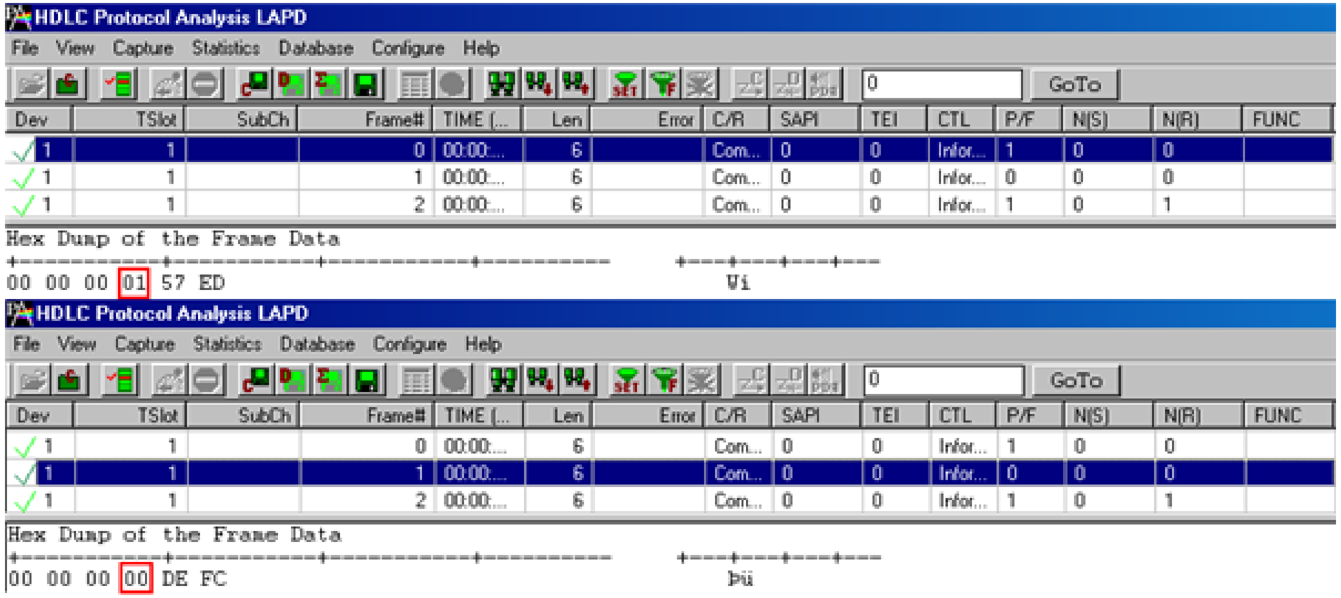


Drop a Frame

- The frame # 1 order number changed from '01' to '02' due to a dropped frame

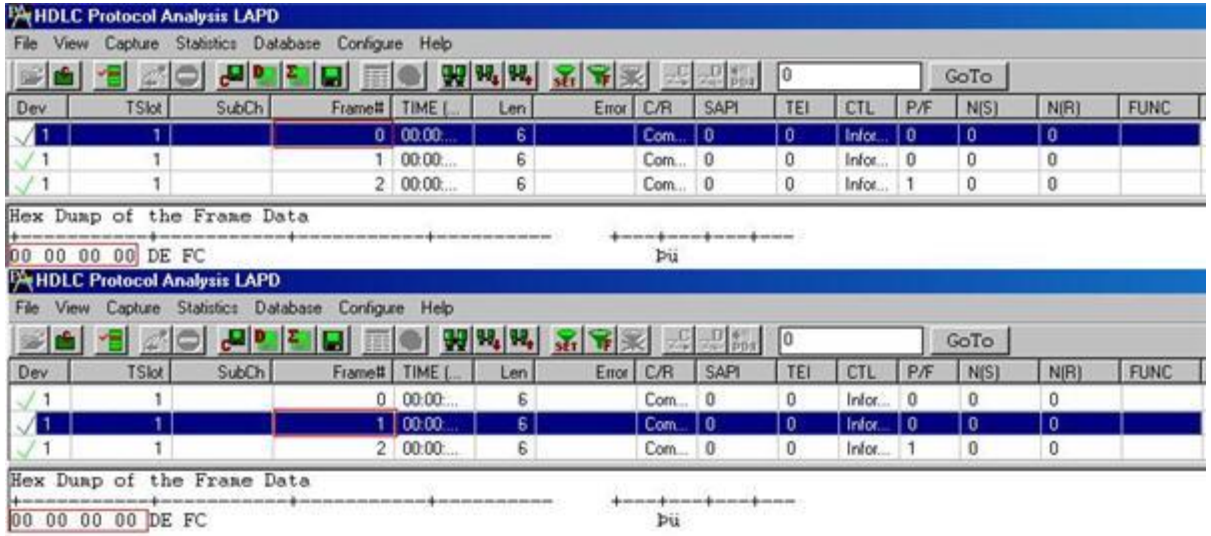


Change Order



- The frame # 0 order number is changes from '00' to 01', the frame # 1 order number is changes from '01' to 00'

Duplicate a Frame



- The frame # 0 duplicated as frame # 1

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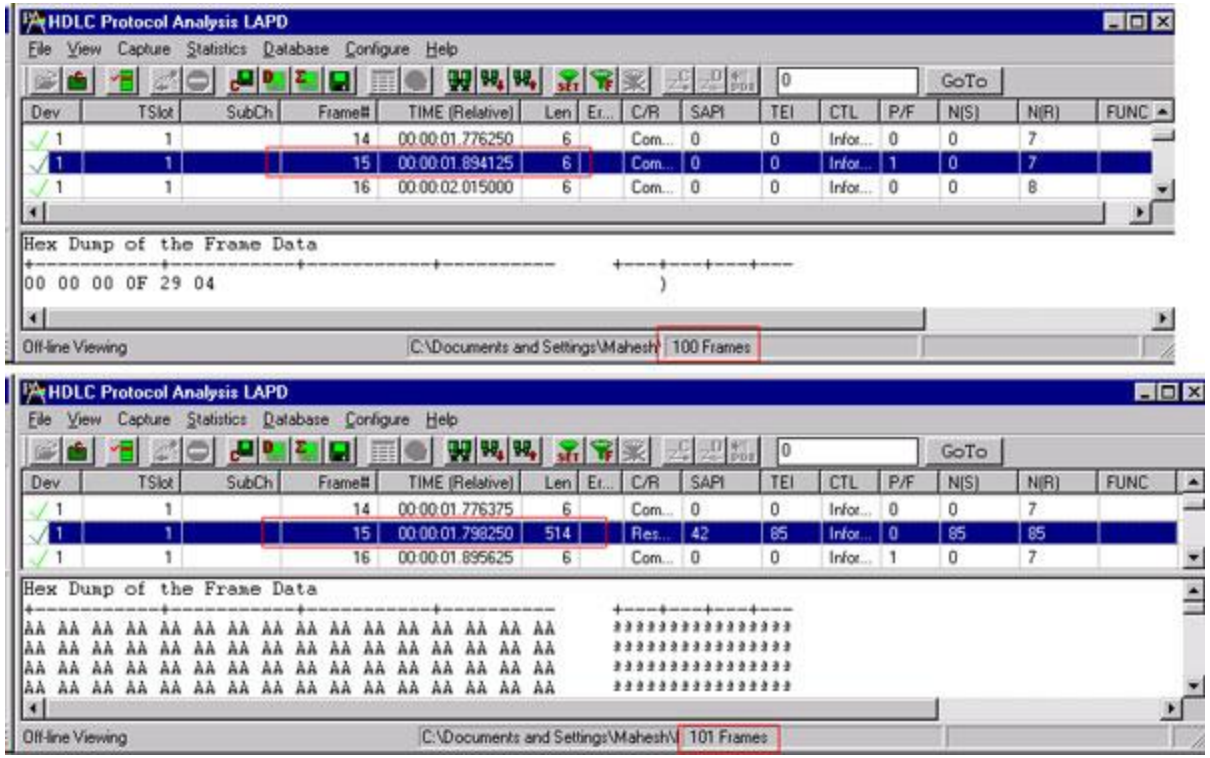
Insert Frame



- At the end of file transmission, a predefined frame is being inserted and the total frame count is incremented by ‘1’

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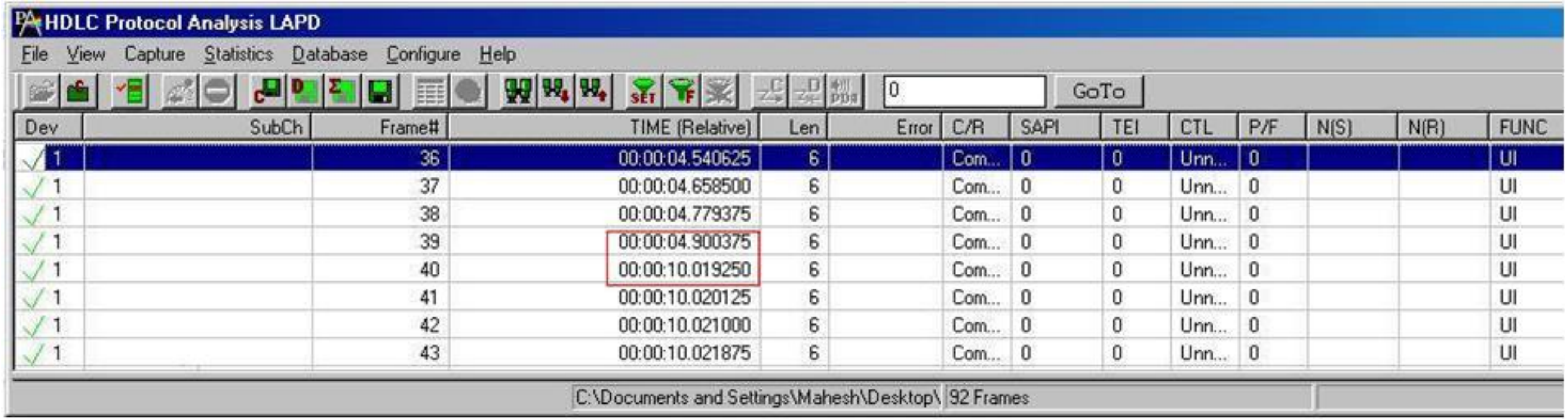
Delay Frame



Dev	SubCh	Frame#	TIME (Relative)	Len	Error	C/R	SAPI	TEI	CTL	P/F	N(S)	N(R)	FUNC
1		36	00:00:04.540625	6		Com...	0	0	Unn...	0			UI
1		37	00:00:04.658500	6		Com...	0	0	Unn...	0			UI
1		38	00:00:04.779375	6		Com...	0	0	Unn...	0			UI
1		39	00:00:04.900375	6		Com...	0	0	Unn...	0			UI
1		40	00:00:10.019250	6		Com...	0	0	Unn...	0			UI
1		41	00:00:10.020125	6		Com...	0	0	Unn...	0			UI
1		42	00:00:10.021000	6		Com...	0	0	Unn...	0			UI
1		43	00:00:10.021875	6		Com...	0	0	Unn...	0			UI

- The delay of 5 secs inserted between frame # 39 and frame # 40

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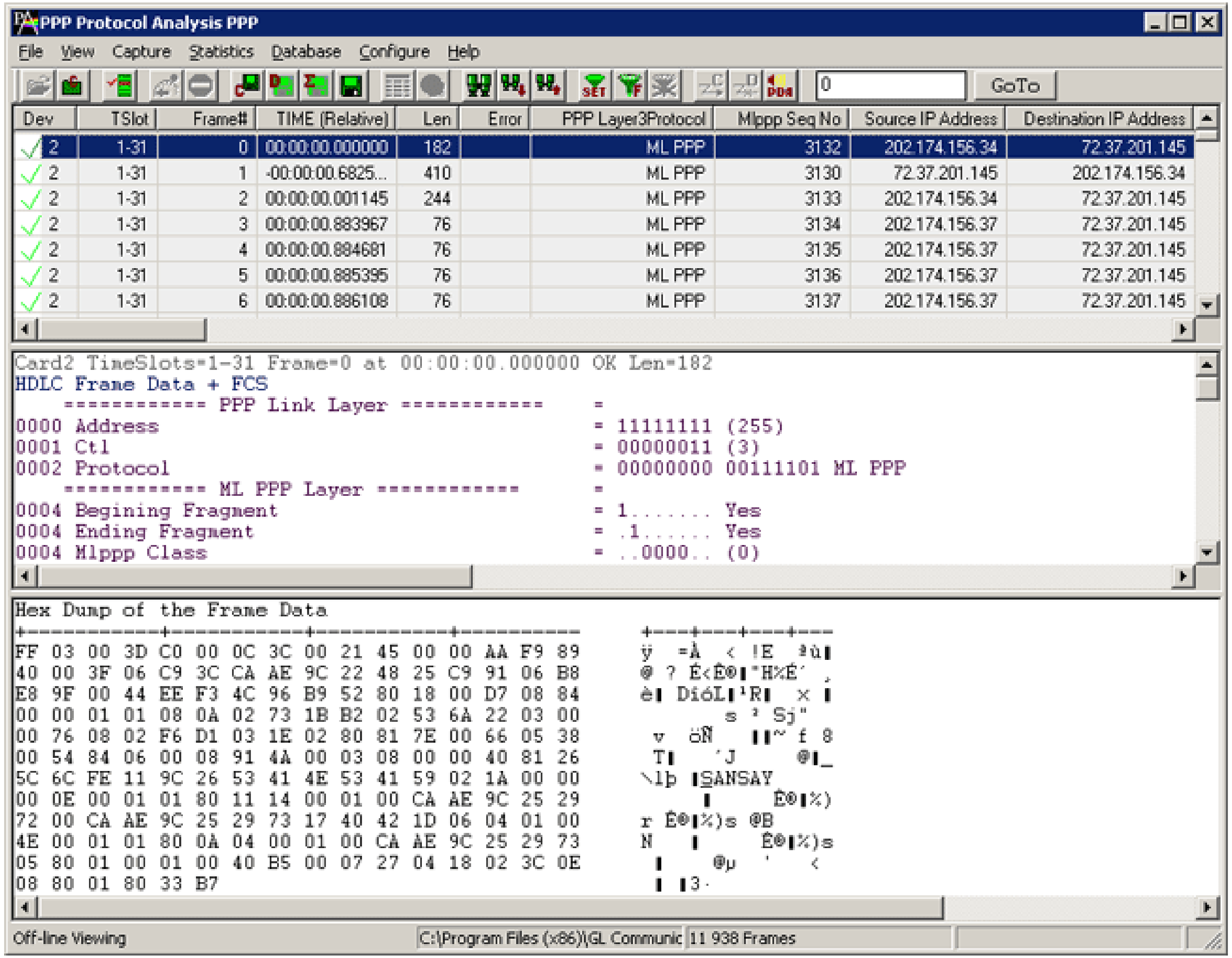
Supported Protocols for Frame Relay Analysis

- LAPF
- Multi-Protocol Encapsulation
- IP
- TCP
- UDP
- SMTP
- POP3
- STUN
- FTP
- SNMP
- DNS
- DHCP
- HTTP
- RIP
- NBNS (NetBIOS Name Service)
- IPM Reg (IPv4 Registration Message)
- Q933FRel
- SNAP
- PPP over Frame Relay
- FRF.12, FRF12.1, FRF.15
- LCP
- SVC Signaling
- LMI Signaling

PPP Analysis

- Encapsulates other network layer protocols like IP for transmission on synchronous (like T1 or E1) and asynchronous communications lines



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Supported Protocols for PPP Analysis

- Link Control Protocol (LCP)
- Bridging PDU (BPDU)
- PPP, Multiplexed PPP
- Multi-class extension to MLPPP
- Multi-link PPP
- Network Control Protocol (NCP)
    - Internet Protocol Control Protocol (IPCP)
    - Bridging Control Protocol (BCP)
    - PPP Mux CP
- Cisco HDLC decodes
- STUN, SNMP, RIP
- Link Quality Report (LQR)
- DHCP, DNS, ICMP
- Van Jacobson TCP/IP compression decodes
- IPHC
- IP, TCP, UDP
- IEC
- PAP, CHAP
- SIP, MGCP, MEGACO
- RTP, CRTP, RTCP
- H.263, H.264, H.450
- ISDN H.225, MPEG2
- T.38
- RAS, SCTP
- M2UA, M2PA, M3UA
- ISUP, SCCP
- SUA, IUA, TUP
- Test & Network Management Messages

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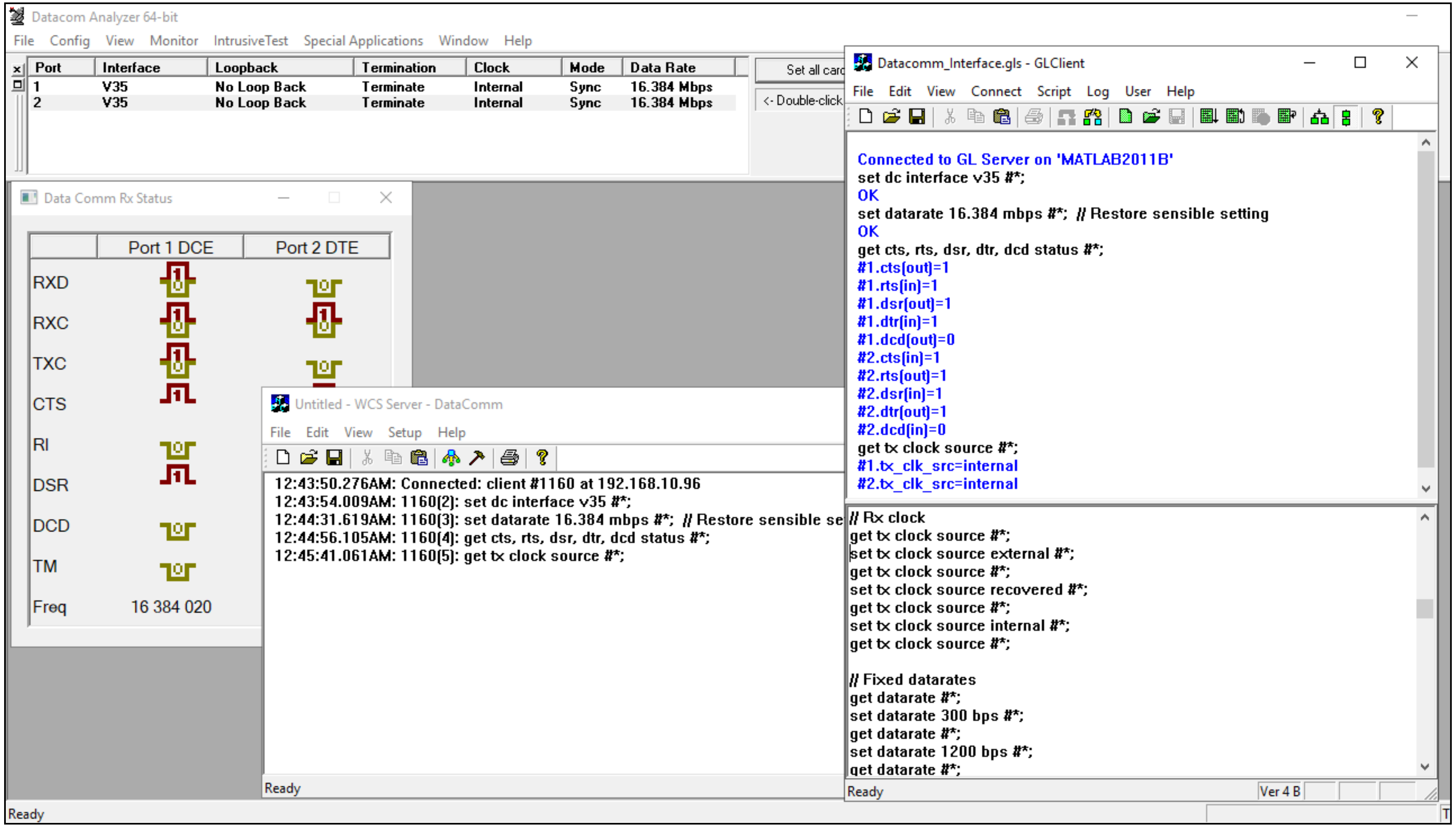
WCS Modules

- Windows Client / Server applications allow the user to operate analyzers remotely, write scripts for automation, or provide multi-client connectivity to a single Datacom analyzer
- WCS supports Enhanced BERT functionality



Pin Configurations on Datacom Units

RS-530 Connections (DCE) Male Connector

Pin	Signal	Direction	Description
1	CHGND	Chassis Ground	Chassis Ground
2	RD -	Input to tProbe	Receive Data -
3	TD -	Output from tProbe	Transmit Data -
4	CTS -	Input to tProbe	CTS Receive -
5	RTS -	Output from tProbe	RTS Transmit -
6	DTR -	Output from tProbe	DTR Transmit -
7	GND	Signal Ground	Ground
8	DCD -	Output from tProbe	DCD Transmit -
9	TT +	Output from tProbe	Transmit Clock +
10	DCD +	Output from tProbe	DCD Transmit +
11	RT +	Input to tProbe	Receive Clock +
12	ST +	Output from tProbe	Secondary Timing +
13	RTS +	Output from tProbe	RTS Transmit +
14	RD +	Input to tProbe	Receive Data +
15	ST -	Output from tProbe	Secondary Timing -

RS-530 Connections (DCE) Male Connector (Contd.)

Pin	Signal	Direction	Description
16	TD +	Output from tProbe	Transmit Data +
17	TT -	Output from tProbe	Transmit Clock -
18	TM	Input to tProbe	Test Mode
19	CTS +	Input to tProbe	CTS Receive +
20	DSR -	Input to tProbe	Data Set Ready -
21	RI	Input to tProbe	Ring Indicator
22	DTR +	Output from tProbe	DTR Transmit +
23	DSR +	Input to tProbe	Data Set Ready +
24	RT -	Input to tProbe	Receive Clock-
25	LL	Output from tProbe	Local Loop

RS-530 Connections (DTE) Female Connector

Pin	Signal	Direction	Description
1	CHGND	Chassis Ground	Chassis Ground
2	TD -	Output from tProbe	Transmit Data -
3	RD -	Input to tProbe	Receive Data -
4	RTS -	Output from tProbe	RTS Transmit -
5	CTS -	Input to tProbe	CTS Receive -
6	DSR -	Input to tProbe	Data Set Ready -
7	GND	Signal Ground	Ground
8	DCD -	Input to tProbe	DCD Receive -
9	RT +	Input to tProbe	Receive Clock +
10	DCD +	Input to tProbe	DCD Receive +
11	TT +	Output from tProbe	Transmit Clock +
12	RTC +	Input to tProbe	Secondary Receive Clock+
13	CTS +	Input to tProbe	CTS Receive +
14	TD +	Output from tProbe	Transmit Data +
15	RTC -	Input to tProbe	Secondary Receive Clock-

RS-530 Connections (DTE) Female Connector (Contd.)

Pin	Signal	Direction	Description
16	RD +	Input to tProbe	Receive Data +
17	RT -	Input to tProbe	Receive Clock -
18	LL	Output from tProbe	Local Loop
19	RTS +	Output from tProbe	RTS Transmit +
20	DTR -	Output from tProbe	DTR Transmit -
21	RL	Output from tProbe	Remote Loop
22	DSR +	Input to tProbe	Data Set Ready+ or Remote Indication
23	DTR +	Output from tProbe	DTR Transmit +
24	TT -	Output from tProbe	Transmit Clock -
25	TM	Input to tProbe	Test Mode

Thank you