Datacom Analyzer

mTOP™ tProbe™ Datacom T1 E1 Analyzer 1U Rack

mTOP™ Probe T1 E1 tProbe™ (Front Panel)

Overview

Data Communications refers to the transmission of digital information over a communication channel. The data transmission types include either parallel or serial type transfer. When data transmission is required over long haul, it is feasible to use serial type transfer as it allows high data rates with cost efficiency. Serialized data can be of asynchronous or synchronous in nature.

GL's **Datacom Emulator / Analyzer** is an optional board available with GL's tProbe™ T1 E1 Datacom Analyzer USB unit. The portable tProbe™ T1 E1 and Datacom Analyzer is designed for test and verification of data communications equipment and circuits – specifically serial interfaces that provide clock, data, and control signals.

These are commonly encountered in military links, satellite circuits, WAN, and data modem interfaces. Provides software selectable modes to analyze and emulate DTE and DCE interface. Non-intrusive monitoring for both synchronous (sync), and asynchronous (async) modes. Various cables are provided for these interfaces to make testing convenient.

GL offers two versions of the tProbe™ T1 E1 Datacom Analyzer.

- The first version is designed for domestic use and operates with AC mains power
- The second version, CE approved, is powered by USB 3.0

Datacom Analyzer / Emulator is enhanced to support the Windows Client / Server (WCS), providing the capability of remote operation, automation, and multi-site connectivity.

For more details, refer to Datacom Analyzer webpage.

GL Communications Inc.

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Main Features

- Supported Line interfaces - V.24, V.35, X.21, RS-449, RS-485, EIA-530 and EIA-530A
- DTE or DCE emulation mode
- Allows user to define custom frequency data rate for all encoding options
- Supports PPP, HDLC, and Frame Relay Protocol Analysis
- Supports HDLC Tx/Rx Test and HDLC Impairment Utility
- Sync BER from 300 b/s to 16.384 Mbps
- Async BER from 75 b/s to 115.2 Kbps
- Supports NRZ, FM0, FM1 and Differential Manchester encoding schemes
  - Manchester IEEE BER from 75 b/s to 1.024 Mbps
  - Manchester GE Thomas BER from 75 b/s to 1.024 Mbps
  - NRZI BER from 0.5 Mbps to 10 Mbps
  - Differential Manchester BER from 75 b/s to 1.024 Mbps
  - Manchester FM0 and FM1 BER from 75 b/s to 1.024 Mbps
- SYNC clock source and sense selection

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 settings.

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 that. 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.

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ASYNC and SYNC Modes of Operation

Async Mode of Operation

- Data is transmitted without the clock
- Adds the start, stop, and parity check bits to the data and 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

- Serial communication implies sending data bit by bit over a single wire
- Requires the clock signal to be transmitted from the source along with the data
- Transmitter and receiver share a common clock
- Data rate for the link is same for the transmitter and receiver

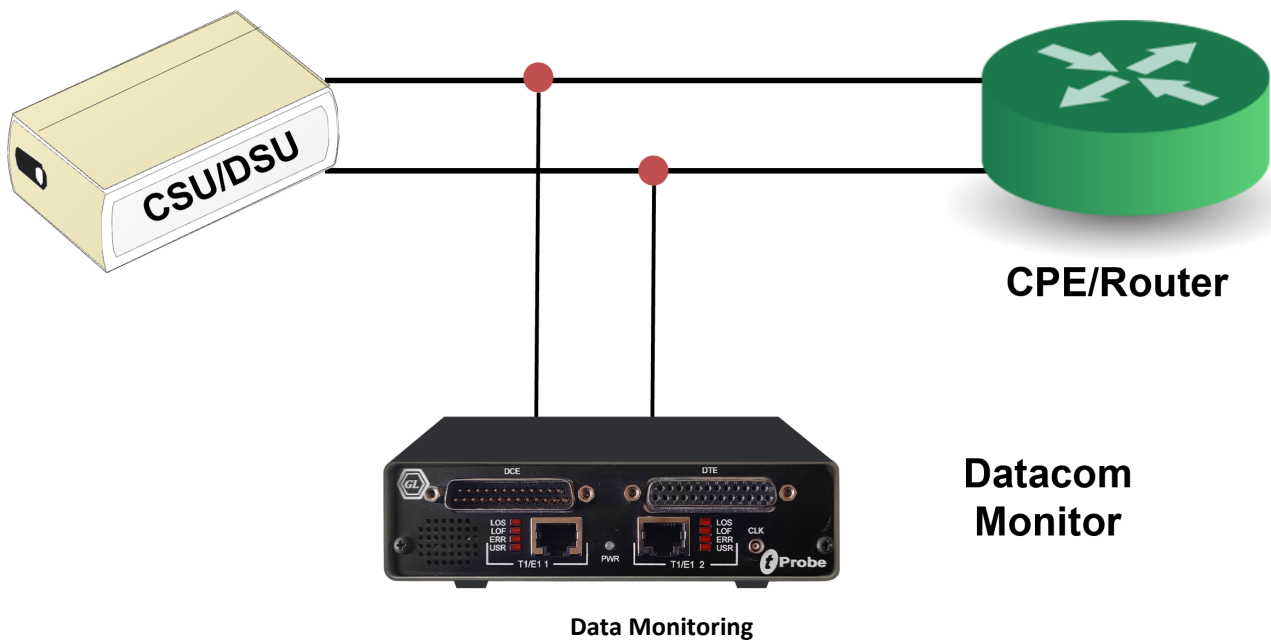| Mode	Frequency	
	Low	High
Async	75 bps	115.2 Kbps
Sync	300 bps	16.384 Mbps
Manch IEEE	75 bps	1.024 Mbps
ManchGE T	75 bps	1.024 Mbps
NRZI	0.5 Mbps	10 Mbps
ManchDiff	75 bps	1.024 Mbps
ManchFM0	75 bps	1.024 Mbps
ManchFM1	75 bps	1.024 Mbps

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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
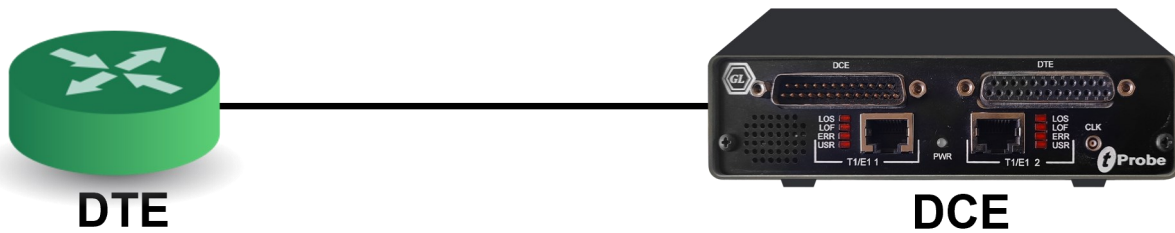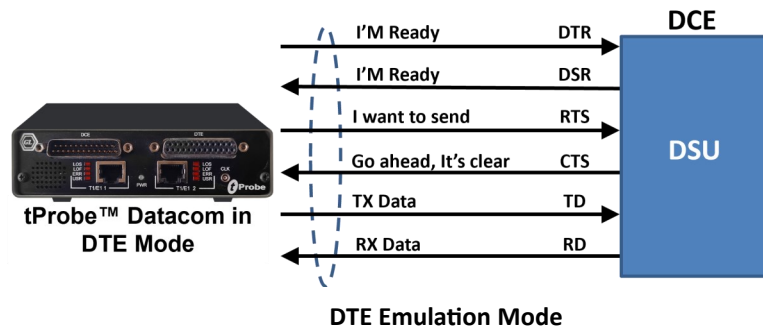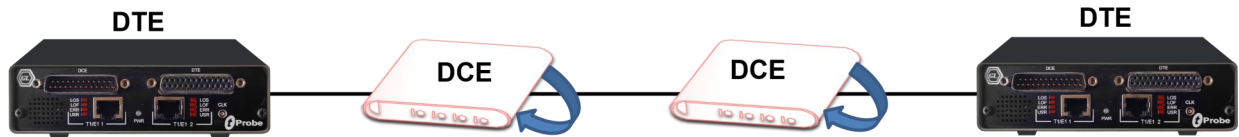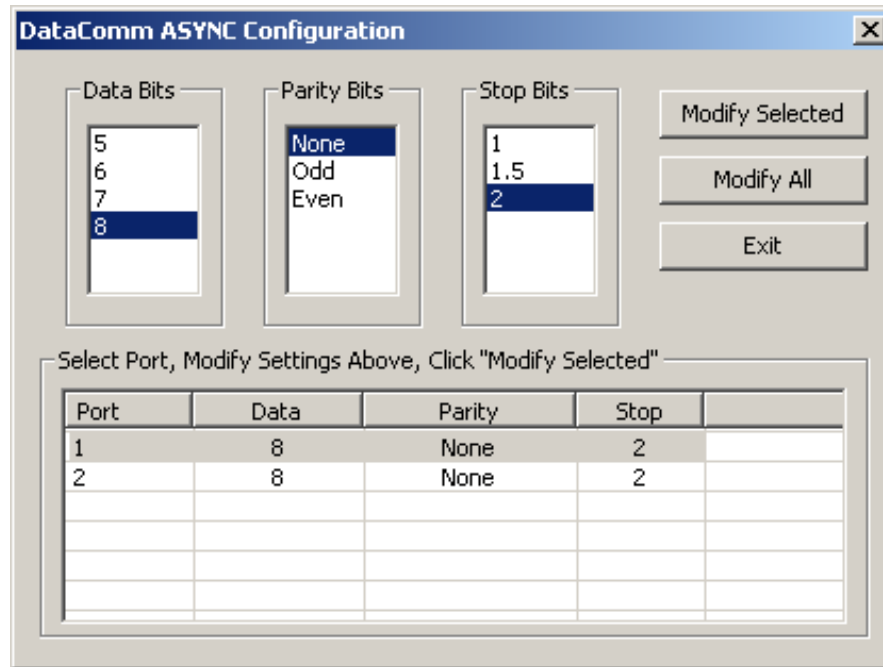

DTE Emulation Mode

DCE Emulation Mode

- Verifying end-to-end transmission through DCE or DTE

Data Monitoring

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

Displays the following signal activity on the Datacom DCE and DTE interfaces along with the frequency measurements for each port.

RXD: (Received Data) - This is the serial encoded data received by a DTE from a DCE which 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.
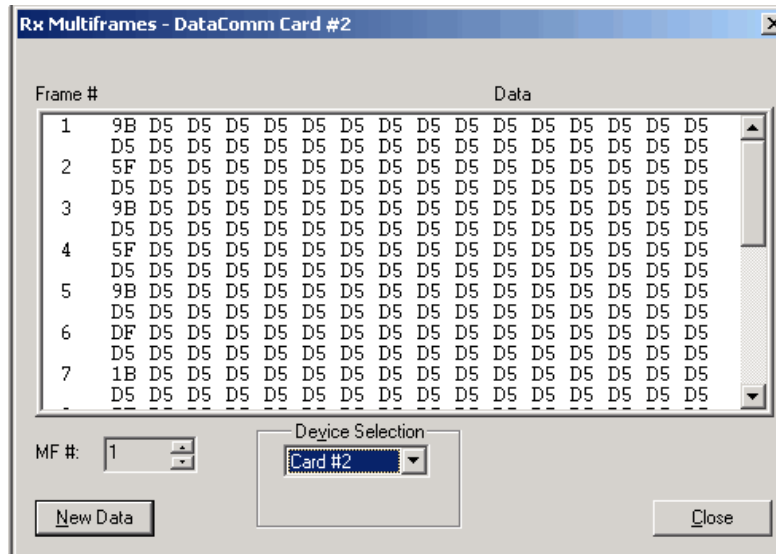
Frequency: Displays operating Frequency in Hertz.

Monitoring Datacom Status

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Monitoring Multiframes

This application permits viewing unframed data on a Datacom port. Approximately 2 seconds of data is captured for viewing.

Monitoring Multiframes

Intrusive Test Applications Bit Error Rate Test

The Bit Error Rate Test (BERT) application generates / detects Pseudo Random Bit Sequence (PRBS) for testing performance of data communication circuits.
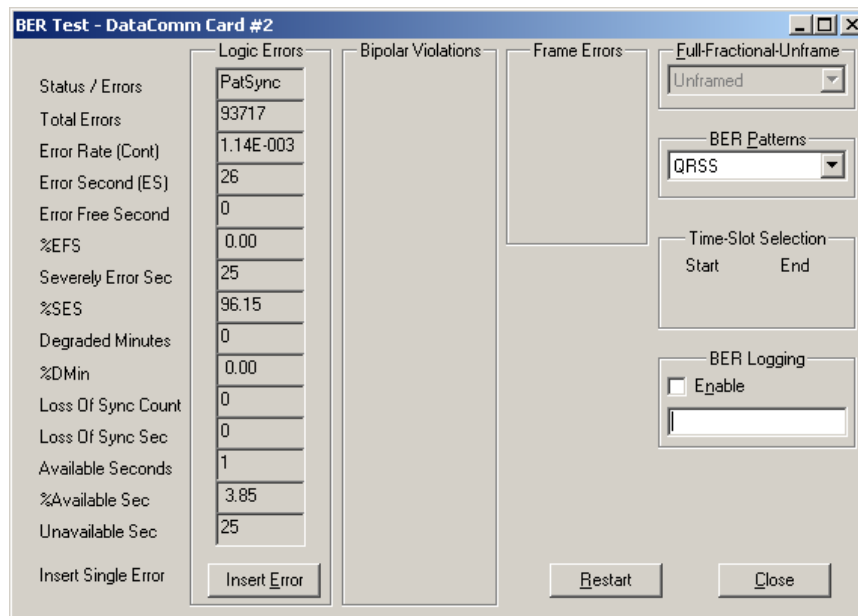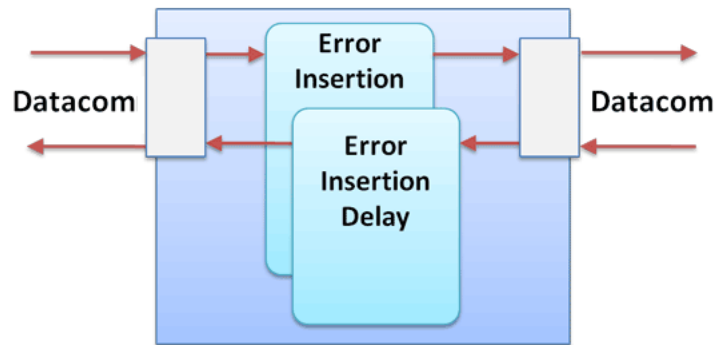

Bit Error Rate Test

Precision Delay Measurement

Precision Delay Measurement measures the Round Trip Delay of a system. Sending a BER pattern with the insertion of an error bit and timing the reception of the error bit do the Round Trip Delay measurement. Measurement is precise and accurate to the microsecond level. A delay up to 8 seconds can be measured.

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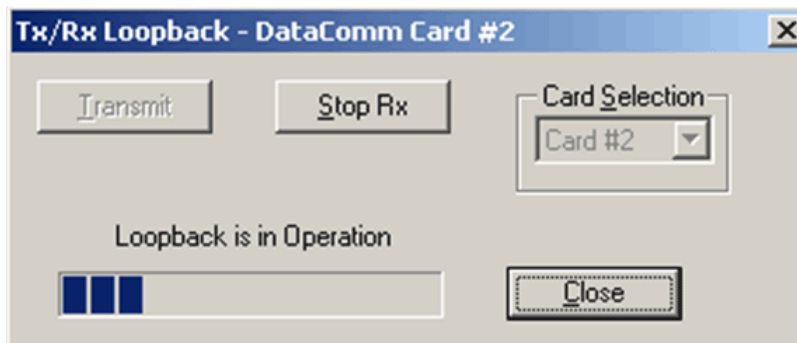
Error Insertion

The Error Insertion application permits inserting single, fixed, automatic, random, and burst error into the incoming or outgoing bit stream.

Block Diagram of Error Insertion

Rx to Tx Loop back

This application is used in conjunction with a Bit Error Rate Test to verify the operation of Cards and Laptop units.

Enhanced Bit Error Rate Test

Transmit and Playback Applications

Playback and Record Applications

This optional software (XX020) permits record / playback to / from file across DTE / DCE interfaces. The applications provided are: Playback from File, Record Data to File, Record from Multiple Cards, and Automated Record/Playback.

Automated Record / Playback (ARP) is an extremely versatile application that runs several transmit or receive operation tasks simultaneously.

| 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

Playback From File

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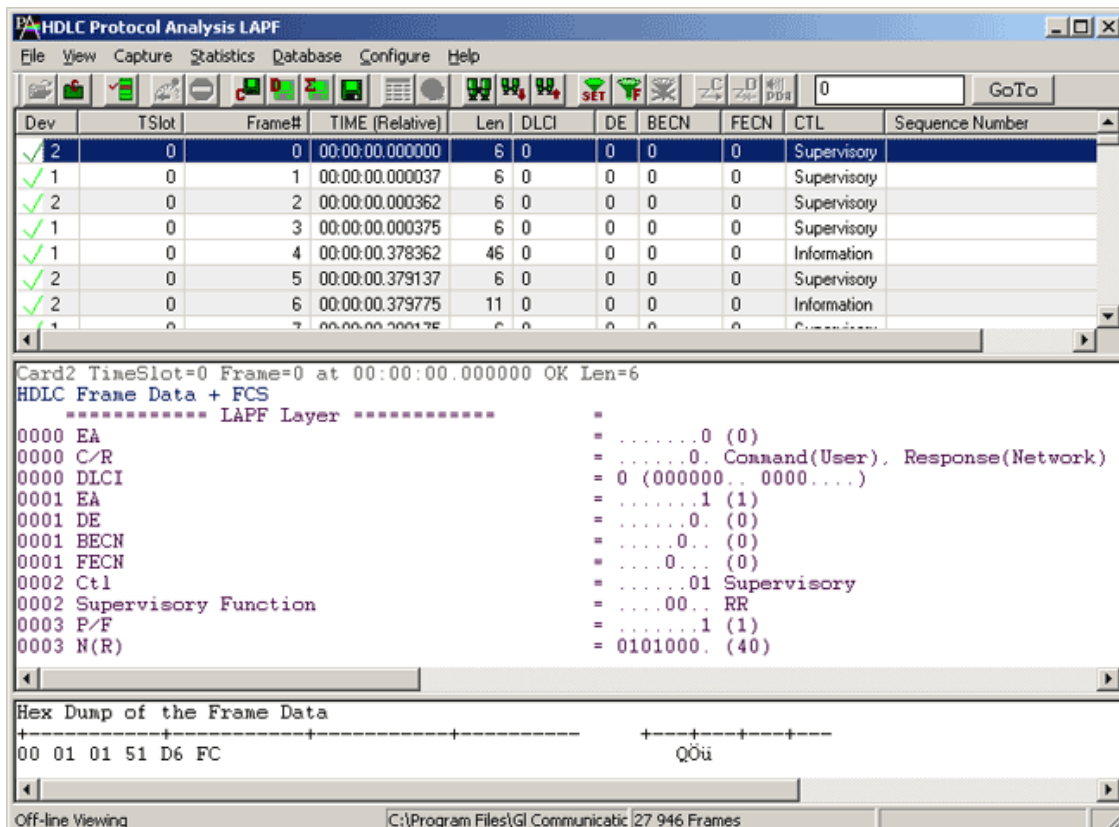
WCS based Simulation Modules

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, which measures the correctness of data received on Datacom against a repetitive fixed or pseudorandom pattern for the given transmission.
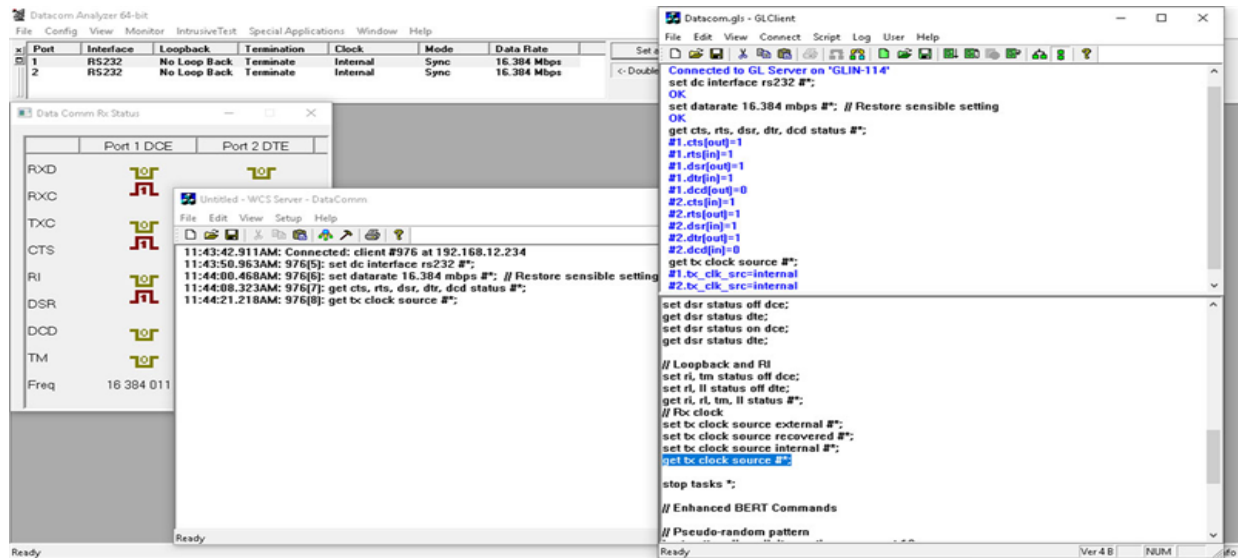
Client / Server Application

Protocol Analysis

GL's Datacom Analyzer supports following protocol analyzers-HDLC, PPP, and Frame Relay. GL's protocol analyzers can monitor signaling interactions on data communication networks and provide detailed decodes and statistics.

HDLC Protocol Analysis

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mTOP™ Rack Specifications

mTOP™ T1 E1 tProbe™ 1U Rack Unit

Space Requirements	Height: 1U Rack unit
	Length: 16 Inches
	Width: 19 Inches
	mTOP™ System (embedded SBC, 1x USB T1 E1 Datacom, 1x USB FXO FXS units)
Embedded PC Specifications	Intel Core NUC i3 or optional i7 equivalent, Windows® 11 64-bit Pro operating system
	USB 2.0 and 3.0 ports, (2) USB Type C ports, (1) 2.5 GigE Ethernet port, ATX Power Supply
	(2) HDMI ports, Min 256 GB SSD, 8GB RAM
USB tProbe™ Datacom T1 E1 interfaces	(2) RJ-48c T1 E1 Connectors
	(1) MCX Coaxial External Clock Connector
	(1) RJ-45 10/100 Ethernet Jack
USB FXO FXS interfaces	(2) RJ-11 2-wire FXO FXS ports
	(4) 3.5 mm Balanced (Stereo) or Unbalanced (Mono) Audio Jacks (Tx and Rx)
Datacom Interface	Dual DB25 Connectors Support:
	DTE/DCE
	RS-232/V.28
	X.21/V.11
	RS-449/V.36 /V.10/V.11
	EIA-530/V.10/V.11
	EIA-530A/V.10/V.11
	V.35/V.28.

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mTOP™ Probe Specifications

mTOP™ Probe T1 E1 tProbe™ (Front Panel)

mTOP™ Probe T1 E1 tProbe™ (Back Panel)

Space Requirements	Length: 10.4 in. Height: 3 in. Width: 8.4 in
SBC Specifications	Intel Core NUC i3 or optional i7 equivalent, Windows® 11 64-bit Pro Operating System USB 2.0 and 3.0 ports, (2) USB Type C ports, (1) 2.5 GigE Ethernet port, 12V/3A Power Supply 256GB Hard drive, 8G Memory (Min) (2) HDMI ports External USB based Wi-Fi adaptor
USB tProbe™ T1 E1 Interfaces	(2) RJ-48c T1 E1 Connectors (1) MCX Coaxial External Clock Connector Power LED
Datacom Interfaces	Dual DB25 Connectors Support: DTE/DCE RS-232/V.28 X.21/V.11 RS-449/V.36 /V.10/V.11 EIA-530/V.10/V.11 EIA-530A/V.10/V.11 V.35/V.28.

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Environmental Impact

Device Certification

Device is RoHS compliant and the tests were conducted by an independent laboratory.

Council Directive:

- EMC 2014/30/EU
- LVD 2014/35/EU

Safety Standards:

- EN61326-1: Ed. 2.0 (2012-07) {EN 61326-1: 2013}: Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements

- CISPR 11:2015, Limits and methods of measurement of electromagnetic disturbance characteristics of industrial, scientific and medical (ISM) radio-frequency equipment, Amendment 1:2016

- IEC 61000-3-2:2014, Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤ 16A per phase)

- IEC 61000-3-3:2013, Electromagnetic compatibility (EMC) – Part 3-3: Limits – Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection

- IEC 61000-4-2:2008, Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test

- IEC 61000-4-3:2006, Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radiofrequency, electromagnetic field immunity test, Amendment 1:2007, Amendment 2:2010

- IEC 61000-4-4:2004, Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement

- IEC 61000-4-5:2006, Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test

- IEC 61000-4-6:2008, Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields

- IEC 61000-4-11:2004, Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests

- IEC 61010-1:2010 CE Marking -LVD

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Environmental Impact (*Contd.*)

Product Technical Comparison

Feature	Requirement	mTOP™ T1 E1 Datacom Rackmount
Portability	Portable or Fixed location	Rackmount
Physical Connection	No of EIA-530 ports	2
Port Configuration	I/O interface	V.35, EIA_530, RS232, EIA_530A, RS449/RS-442 and X21
	DCE/DTE	DTE/DCE
	Manual RTS and DTR	Compliant
	Data inversion	Compliant
	Line termination	Compliant
System Configuration	Full duplex Half duplex Self loop	Full Duplex – Compliant Half Duplex – Device supports Monitor and Bridge mode Self Loop – Compliant
Data Rates	Async: 50 to 20k	Async: 75 bps to 115.2 Kbps and user con-figurable frequency
	Sync: 50 to 10M	Sync: 300 bps to 16.384 Mbps and user configurable frequency
Test Path	End-to-End	Compliant
	Loopback	Compliant
	Monitoring	Compliant
Test Patterns	Fixed patterns: MARK SPACE 1:1 1:7 1:16 2:8 3:24	Supported Patterns : All Ones, All Zeros, 1:1, 1:7, 3 in 24, CSU Loop-Up (00001), CSU Loop-Down (001), NIU Loop-Up (11000), NIU Loop-Down (11100) and User Defined Pattern (3 bits to 32 bits)
	Pseudo random patterns: 63 (2^6-1) 511 (2^9-1) 2047 (2^{11}-1) 32,767 (2^{15}-1) 1,048,575 (2^{20}-1) 8,388,607 (2^{23}-1) QRSS	Supported Patterns : 2^6-1, 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1 and QRSS
Error Insertion	Manual	Compliant
	Automated	Single Single at time intervals (1 sec resolution) 10^{-2} to 10^{-9} bit error rate

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Environmental Impact (*Contd.*)

Product Technical Comparison (*Contd.*)

Feature	Requirement	mTOP™ T1 E1 Datacom Rackmount
Messages	User message: Up to 1024 bits	Compliant
	Binary/ASCII	Compliant
Test Interval	Continuous and 10 to 100M bits	Ability to test continuously with the BERT application and BERT timed test with WCS
Line Data Encoding	Line encoding: FM0 FM1 Manchester Differential Manchester	Manchester IEEE – 75 bps to 1.024 Mbps Manchester GE Thomas – 75 bps to 1.024 Mbps NRZI – 0.5 Mbps to 10 Mbps Manchester Differential – 75 bps to 1.024 Mbps Manchester FM0 – 75 bps to 1.024 Mbps Manchester FM1 – 75 bps to 1.024 Mbps
Timing	Jitter measurement	Not Compliant
	External clock	Compliant
	Internal clock accuracy: +5ppm	+/- 1 ppm Internal Clock
	Internal clock drift +5ppm/yr	+/- 1 ppm Internal Clock
	Data clock: Synchronous Recovered	Compliant

Environmental Impact (*Contd.*)

Product Technical Comparison (*Contd.*)

Feature	Requirement	mTOP™ T1 E1 Datacom Rackmount
Round Trip Delay (RTD)	RTD: 1 microsecond or better	Micro Second Precision
User Interface	Display	Windows based software application
	Displays; RTS CTS DTR DSR LOS	Supported
External Links	Ethernet	Supported
	USB	Supported
	Wireless	Not Supported
Internal Battery	N/A	Not Compliant
Environmental Impact	RoHS REACH	RoHS Compliant
Operating Environment	Temperature: 0oC to 35oC	0° C to 50° C
	Humidity: 20% to 90%	10%-95% Humidity, Non-condensing
	EMC/EMI: EN55032 EN55035	EMC 2014/30/EU LVD 2014/35/EU
	Safety: AS/NZS 60950-1 AS/NZS 62368-1	IEC 61010-1:2010 CE Marking -LVD
	Operating voltage: 230VAC nom	Operates on USB 2.0 and External Power supply 5V.2A

Buyer's Guide

Item No	Product Description
PTE001	tProbe Analyzer (Dual Ports)
PTE025	Data Communications Board for Interfaces RS-232, RS-449, EIA-530, V.35, and many others
PTE002	Datacom Only Analyzer (with DTE and DCE Ports)
PTA001	tProbe™ Basic T1 Software (includes XX600, XX605)
MT001	mTOP™ 1U Rackmount Enclosure w/SBC (Intel i3 Core)
MT001E	mTOP™ 1U Rackmount Enclosure w/SBC (Intel i7 Core)
MT002	mTOP™ 1U Rackmount Enclosure w/o SBC
MT005	mTOP™ Probe (Portable Stand-alone unit) (Intel NUC i3 Core)
MT005E	mTOP™ Probe (Portable Stand-alone unit) (Intel NUC i7 Core)

Item No	Related Software
PTE020	Record/Playback File Software (Including Automated Continuous Capture and Automated Record Playback Software)
PTE090	Datacom Real-time HDLC Decode / Store Software
PTE135	Datacom PPP Analyzer
PTE130	Datacom Real-time Frame Relay Analyzer

Buyer's Guide (*Contd.*)

Item No	Related Hardware
PTE025	Data Communications Board for Interfaces RS-232, RS-449, EIA-530, V.35, and many others
PTE001	tProbe™ Analyzer (Dual Ports)
PTE002	Datacom Only Analyzer Software for tProbe™ (with DTE and DCE Ports) requires PTE025; Basic T1 or E1 software is NOT required
PTE020	Datacom Record/Playback File Software (Including Automated Continuous Capture and Automated Record Playback Software)
PTE090	Datacom T1 or E1 Real-Time HDLC Decode/Store/Impairment/Rx-Tx Test Applications
PTE130	Datacom Real-time Frame Relay Analysis
PTE135	Datacom T1 or E1 PPP Analyzer

Item No	Related Accessories
DBC001	DB25 3 FT MALE TO MALE
DBC002	DB25 3 FT FEMALE TO FEMALE
DBC004	DB25 FEMALE TO DB37 FEMALE 3FT
DBC005	DB25 MALE TO DB37 MALE 3FT
DBC006	DB25 FEMALE TO V.35 FEMALE 3 FT
DBC007	DB25 MALE TO V.35 MALE 3 FT
DBC008	DB25 FEMALE TO DB15 FEMALE 3 FT
DBC009	DB25 MALE TO DB15 MALE 3 FT
	Pelican Carry Case to carry the portable devices and accessories. **Pelican Carry Case**

Note: PCs which include GL hardware/software require Intel or AMD processors for compliance.

For more details, refer to Datacom Analyzer webpage.

◈ GL Communications Inc.

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