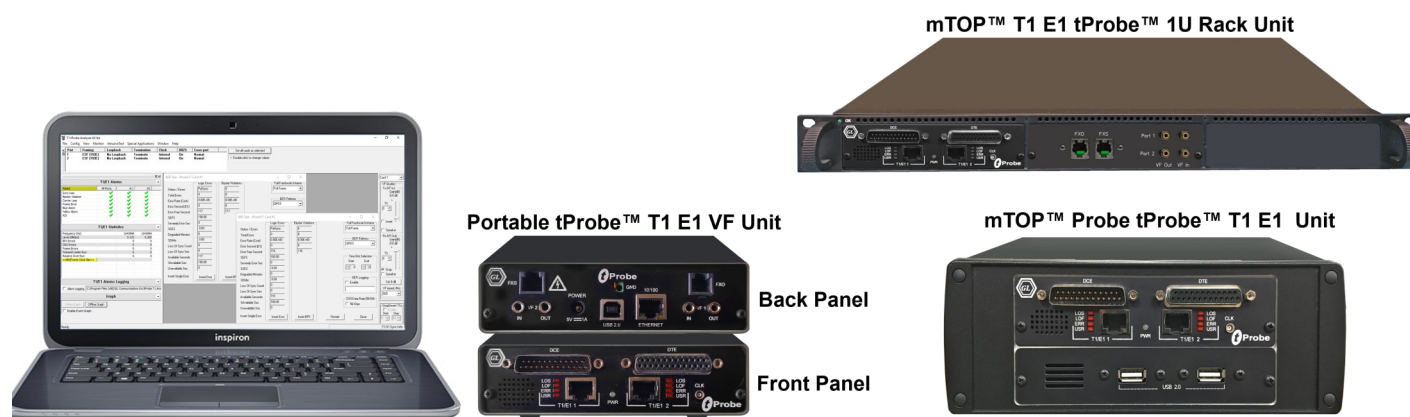


# tProbe™ - T1 E1 VF Serial Data Analysis and Emulation Hardware



## Overview

GL's tProbe™ is an enhanced version of our popular USB-based T1 E1 VF Analyzer/Emulator. This hardware incorporates all the features of the previous analyzer such as portability, USB interface, remote accessibility, scripting, and a vast collection of optional applications. 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

tProbe™ was introduced with the following important enhancements:

- T1 E1 Pulse Shape, Jitter Measurement Analysis and Jitter Generation
- Software selectable T1 or E1 interface along with Drop and Insert
- [tProbe™ FXO and FXS board](#) – Allows simulating FXO and FXS ports; FXO port to simulate a two-wire FXO device such as a telephone or a fax machine and the FXS port on tProbe™ to emulate a 2-wire FXS service such as a telephone wall jack
- [tProbe™ Datacom Analyzer board](#) – Supports V.24, V.35, V.36, RS-449, RS-232C, RS-485, EIA-530 and EIA-530A interfaces and can be configured as DTE or DCE to test Channel Service Unit (CSU) and Data Service Unit (DSU) entities
- Capable of simulating as well as decoding and demodulating fax calls over T1 or E1 lines using [Fax Simulator](#) and [FaxScan™](#)
- TDM, ISDN, SS7 – High Density Voice
- VoIP, Frame Relay, Multi Link Frame Relay, PPP and Multi-Link PPP, HDLC
- Windows® and Linux Drivers for Open Source Applications
- “Cross-port Through” and “Cross-port Transmit” Modes – these configurations make cabling with Drop/Insert and Fail-Safe Inline Monitoring very easy
- Improved circuitry for very accurate Digital Line Level measurements
- Ethernet Interface for future standalone operation and easy calibration
- Forward thinking hardware design for future daughter board expansion applications
- Enhanced [VF Drop and VF Insert Capabilities](#) using 3.5mm Balanced (stereo) or Unbalanced (Mono) physical connections

## Main Features

- User friendly real-time software. Compatible with Windows® 10 and above operating system
- Most all “**Basic Applications**” and “**Special Applications**” are available for tProbe™ T1 E1 analyzer including comprehensive Analysis/ Emulation of Voice, Digits, Tones, Fax, Modem, Raw Data, Protocol, Analog, Digital, and Echo Testing
- Call Recording, Generation, and Monitoring for hundreds to thousands of calls in one platform
- Lightweight (1.24 lbs) and small footprint (6.05" x 5.55" x 1.60")

For more details, visit [tProbe™ - T1 E1 VF and Serial Data Analysis and Emulation Hardware](#) webpage.



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## Basic Software

- **VF Options**
  - Speaker
  - Drop and Insert
  - VF In / Out TS settings
- **Monitoring Options**
  - 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
  - Time-slot Window
  - ASCII Timeslot Display
  - Oscilloscope and Power Spectral
  - Active Voice Level
- **Intrusive Testing**
  - Bit Error Rate Test
  - Enhanced Bit Error Rate
  - ATM BERT
  - Transmit Tone
  - Transmit Gaussian Noise
  - Transmit Multiframe
  - Transmit Signaling Bits
  - Precision Delay Measurement
  - Rx-to-Tx Loop back
  - Error Insertion
- **Windows Client / Server**
  - w/ Remote access to T1 E1 server using Python client
  - Dual VF Tx/Rx

## Optional Software

- **Protocol Analysis**
  - ISDN, HDLC, SS7, CAS, GSM, GPRS, UMTS, GR303,
  - Frame Relay, ATM, PPP, TRAU, CDMA, DCME, T1,
  - E1 Maintenance Data Link (SaHDLC and SSM), SS1
  - Facility Data Link , V5.x , Fax, Modem
- **Protocol Emulation**
  - ISDN, SS7, ISUP Conformance Scripts, GSM Abis,
  - GSM A, MAP, FXO FXS, CAP, INAP, MLPPP, CAS
  - TRAU, SS1, Multi-link Frame Relay Emulation
  - Inverse Multiplexing over ATM
- **WCS Modules**
  - Tx/Rx files, digits, Protocol Emulation
  - Multi-channel BERT,
  - DSP operations, Dynamic DSP capability
  - FAX Emulation over T1 E1 and Analog Lines
  - FXO FXS Simulation
- **Record / Playback Files**—Manual, Automated
- **Capture, Analysis, and Emulation** - DTMF / MF / MFCR2, Digits, Tones, Voice, Fax, Modem, Raw Data
- **Voice Band Analysis Software**
- **Call Data Records**
- **Multi-Channel BERT**
- **Jitter** Generation, Jitter Measurement, and Pulse Mask
- **Protocol Identifier, Traffic Classifier**
- **Echo Cancellation Testing / Compliance** -Manual, Semi-automated, and Automated –G.168, G.160, G.169
  - Measure Loop Delay/ERL
  - Delay Attenuate Timeslots
  - Digital Echo Canceller Simulator
  - Audio Processing Utility (APU)
- **Signaling Transitions Recording**
- **Real-time Strip Chart**
  - Real-time Multichannel Audio Bridge
  - Multiplex / Demultiplex Software
  - Network Surveillance, Voice Quality Testing

## tProbe™ Specifications

### Physical Interface

USB Connector	(1) USB TYPE B Jack
Ethernet Connector	(1) RJ-45 10/100 Ethernet Jack
T1 E1 Connectors	(2) RJ-48c Jacks
Audio Connectors	(4) 3.5 mm Balanced (Stereo) or Unbalanced (Mono) Audio Jacks (Tx and Rx)
External Clock Connector	(1) MCX Coaxial Jack
External Power Connector	(1) Coaxial DC Power Jack (mates with 5.5mm x 2.1mm coaxial plug)
Onboard RAM	SDRAM – 512MB

### Physical Dimensions

Dimensions	6.05 inches (153.67mm) (L) 5.55 inches (141.224mm) (W) 1.60 inches (40.64mm) (H)
Operating Temperature	<b>Temperature</b> 0° C to 50° C 10%-95% Humidity, Non-condensing <b>Storage</b> 20° C to 70° C 10%-95% Humidity, Non-condensing
Altitude	10,000 Feet
Acoustic Noise	NA

### External Power Requirements

Power Adapter Requirements	+5V @ 2A Max Power to the Center Ring
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## tProbe™ Specifications (Contd.)

### Optional Boards

2-Wire Daughter Board (One FXO, One FXS)	FXO - RJ-11 2W Call/Answer Caller ID T1 to 2W FXO Drop 2W FXO Insert to T1 PC to 2W FXO Drop 2W FXO Insert to PC FXS - RJ-11 2W FXS Ring Voltage Battery Voltage Generation T1 to 2W FXS Drop 2W FXS Insert to T1 PC to 2W FXS Drop
Datcom Daughter Board	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.

### T1 E1 Line Interface

Framing Formats	Unframed, D4 (T1) , ESF(T1), ESF(J1), CAS(E1), FAS(E1), CRC4 Hardware Compliant: SLC96, T1ESF ZBTSI
Line Code format	AMI, B8ZS (T1) or HDB3 (E1)
Internal Clock Specification	Standard: +/- 3ppm Optional: +/- 1ppm
Output Clock Source	Internal (+/- 1 ppm or 3 ppm), Recovered, External Clock
T1 Output Level	T1: 3.0V Base to Peak Selectable 0-655Ft Pulse Equalization Setting; Tx Capability - DSX-1 Outputs (to 655 feet)
E1 Output Level	E1: 3.0V ± 0.3V Base to Peak
Input Level	75 mV to 6V base to peak or -30 dBsx to -6 dBsx
Line Built Out Selections	0dB, -7.5dB, -15dB, -22.5dB – for T1 only
Loopback	Normal (Outward and Inward) Cross-Port Transmit Loopback Cross-Port Through Loopback

## tProbe™ Specifications (Contd.)

### Transmit

T1 E1 Interface Hardware Compliance	ANSI: T1.403.1995, T1.231-1993, T1.408 AT&T: TR54016, TR62411 ITU: G.703, G.704, G.706, G.736, G.775, G.823, G.932, I.431, O.151, Q.161 ITU-T: Recommendation I.432-03/93 B-ISDN User-Network Interface-Physical Layer Spec ETSI: ETS 300 011, ETS 300 166, ETS 300 233, CTR12, CRT4 Japanese: JTG.703, JTI.431, JJ-20.11 (CMI Coding Only)
BERT Pattern Generation	Pseudorandom patterns: (63) $2^6-1$ , (511) $2^9-1$ , (2047) $2^{11}-1$ , (32767) $2^{15}-1$ , (1048575) $2^{20}-1$ , (8388607) $2^{23}-1$ , QRSS. Hardware Compliant: T1 In-Band Loop Code Generation and Detection Fixed patterns: All Ones, All Zeros, 1:1, 1:7, 3 in 24, User Defined 24- Bits Hardware Compliant: User pattern of up to 32 bits in length
Alarm Insertion	Blue, Yellow, Remote, Distant Multiframe Hardware Compliant: Bit 7 Zero Suppression D4 Yellow: 1 in S bit of frame 12 AIS-CI Code, ESF-RAI CI Code Receive Carrier Loss: 0's for 2047 or 255 bits (For E1 only)
Error Insertion	BPV, Bit Error, Frame Error, CRC Errors, Burst Frames, Fixed Error Rate, Random Error Rate, auto logic from $10^{-2}$ to $10^{-9}$ for selectable 56K or 64Kps channels
Drop and Insert	Any contiguous set of digital timeslots and/or audio input
Facility Data Link	T1 ESF Mode: Transmit/Receive Messages, Bit-Oriented Messages, and Files
Zero Suppression	B7 Stuffing, Transparent, and B8ZS (T1)
Signaling	Robbed-Bit or Clear Channel
Frequency Offset	T1: +/- 615Hz E1: +/- 615Hz

## tProbe™ Specifications (Contd.)

### Receive

Input Impedance	100 ohms for Terminate and Monitor (T1) 120 ohms for Terminate and Monitor (E1) > 1K ohms for Bridge
Terminations	Terminate, Monitor, Bridge
T1 Input Frequency	1.544MHz +/- 20 KHz
E1 Input Frequency	2.048Mhz +/- 20 KHz
Frequency Measurement	+/- 1ppm
Error Detection	Frame Error, CRC Error, BPV Error, Logic Error, Frame Alignment Error Hardware Compliant: * 10 or 24 bits for sync time * 2/4, 2/5, or 2/6 frame bit in error frame select * Frame error bit corruption for 1 or 3 frame bits * E-Bit Error * Line Code Violation
Alarm Detection	T1 - D4 Yellow Alarm, ESF Yellow Alarm Yellow Alarm (B2 Suppressed-2nd MSB) Yellow Alarm (S-Bit) Yellow Alarm (00FF in FDL) Blue Alarm (Framed or Unframed All Ones) E1 - Remote Alarm Distant Multi-Frame Alarm Signaling All Ones Unframed All Ones Hardware Compliant: J1 Yellow Alarm
Intrinsic Jitter	Meets Jitter Tolerance: Meets AT&T TR 62411 (Dec. 90) ITU-T G.823 Jitter Transfer: Meets AT&T TR 62411 (Dec. 90)
Input Range	T1: Terminate, 0 to 36dB (Long Haul), DSX Monitor, Bridge Hardware Compliant: Terminate, 0 to 15dB (Limited Long Haul), DSX Monitor 20 dB, 26 dB, 32dB E1: Terminate, 0 to 43dB (Long Haul), DSX Monitor, Bridge Hardware Compliant: Terminate, 0 to 13 dB (Short Haul), DSX Monitor 20 dB, 26 dB, 32 dB

## tProbe™ Specifications (Contd.)

### Display and Logging

BERT	Bit Errors, Bit Error Rate, Error Seconds, Error Free Seconds, %EFS, Severely Error Seconds, % SES, Degraded Minutes, %Dmin, Loss Pattern Sync Count, Loss of Sync Seconds, Available Seconds, %Available Seconds, Unavailable Seconds, Bipolar Violations, BPV Rate, BPV Seconds, BPV Free Seconds, Frame Errors, FE Rate, FE Seconds, FE Free Seconds, with Detailed logging into disk file
Alarms	Resync In Progress, Loss of Signal, Blue Alarm, Change of Frame Alignment, Bipolar Violation, Frame Error, Carrier Loss, Yellow Alarm, Out of Frame Events Counter, Error Super frame Counter, Bipolar Violations, Remote Alarm, Distant Multiframe Alarm, Signaling All Ones, CAS Multiframe Error, CRC4 Error

### VF Drop and Insert

Rx Termination	High Impedance (>50K Ohms) for Non-Intrusive Testing Software selectable 135, 150, 600, 900 Ohms for Intrusive Testing. Provisional for external Microphone (Mic/HS) on VF ports connection
Tx Termination	135, 150, 600, 900 Ohms
Sampling Rates	8KHz, 16 kHz
Data width (bits)	Supports 8, 16, 20, 24, 32 Bit Data
VF Tx Gains	Supports -12 dB to +59 dB in 0.5dB Steps Gain (0.1 dB steps can also be accommodated in tProbe™)
VF Rx Gains	Supports -63.5 dB to +9 dB in 0.5dB Steps Attenuation (0.1 dB steps can also be accommodated in tProbe™)
Connectors	(4) 3.5 mm Balanced (Stereo) or Unbalanced (Mono) Audio Jacks (Tx & Rx)

## 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  $\leq 16\text{A}$  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  $\leq 16\text{ A}$  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



## 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 configurable 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

## 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

## mTOP™ Rack Specifications



Figure: mTOP™ T1 E1 tProbe™ 1U Rack Unit

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

## mTOP™ Probe Specifications



Figure: mTOP™ Probe T1 E1 tProbe™ (Front Panel)



Figure: mTOP™ Probe T1 E1 tProbe™ (Back Panel)

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

## Buyer's Guide

Item No	Product Description
<a href="#">PTE001</a>	tProbe™ T1 E1 Base Unit
<a href="#">PTA001</a>	tProbe™ Basic T1 Software (includes XX600, XX605)
<a href="#">MT001</a>	mTOP™ 1U Rackmount Enclosure w/SBC (Intel i3 Core)
<a href="#">MT001E</a>	mTOP™ 1U Rackmount Enclosure w/SBC (Intel i7 Core)
<a href="#">MT002</a>	mTOP™ 1U Rackmount Enclosure w/o SBC
<a href="#">MT005</a>	mTOP™ Probe (Portable Stand-alone unit) (Intel NUC i3 Core)
<a href="#">MT005E</a>	mTOP™ Probe (Portable Stand-alone unit) (Intel NUC i7 Core)

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, visit [tProbe™ - T1 E1 VF and Serial Data Analysis and Emulation Hardware](#) webpage.



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