T3 T1 E3 E1 – mTOP™ Test Platforms

2U mTOP™ with T3 E3 and T1 E1 Units

mTOP™ Probe with T1 E1 Unit

2U mTOP™ with 6x T3 E3 USB units

Overview

GL offers multi-interface (TDM Optical and Packet/IP) test solution in two variants- mTOP™ 1U/2U rack enclosure and mTOP™ Probe unit.

- The **mTOP™ 1U/2U rack enclosure** can be stacked with multiple T3 T1 E3 E1 USB units to provide high density form factor solution. Provides space efficiency, but also account for easier scalability and reduced licensing cost per port
- The **mTOP™ Probe** variant is an all-in-one self-contained test instrument, which includes single T3 T1 E3 E1 USB unit along with necessary PC interface in a single box. The comprehensive mTOP™ Probe is designed for easier portability and convenient for drive testing

T3 T1 E3 E1 – mTOP™ Rackmount Systems, supports 6 T3s (6 * 672 DS0s) or 6 E3s (6 * 480 DS0s). Multiple rack units can be stacked together for greater scalability. A T3 (DS3) consists of a total of 28 T1s, or 672 full duplex voice channel. Similarly, an E3 consists of a total of 16 E1s, or 480 full duplex voice channels.

A customized 2U rack tProbe™-T1 E1 / Datacom-Analog and T3 E3 units shown above serve the purpose of handling multiple communications lines and test complex functionalities.

For more details, visit T3 E3 Analyzer webpage.

Main Features

- Analysis / Emulation of T3 (44.736 Mbps) and E3 (34.368 Mbps)
- Analysis / Emulation of ATM, PPP, HDLC, and Frame Relay signaling
- Record / Playback of entire T3 or E3
- Monitoring , generating alarms, and error insertion
- Analysis of all 28 T1s (1.544 Mbps each) per T3 port, or 16 E1s (2.048 Mbps each) per E3 port in Channelized mode
- 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 (for example, each T3 port has 28 x 24 = 670 DS0s for T1 or 21 x 32 = 672 DS0s for E1) with additional applications, such as record-only, one can even record traffic at DS0 levels
- Monitor the T1 / E1 line conditions such as frame errors, violations, alarms, frequency, power level, and clock (or frame/bit) slips
- Comprehensive Analysis / Emulation of Voice, Data, Fax, Protocol, Analog, and Digital signals, including Echo and Voice Quality testing
- Supports Datacom interfaces - V.35, X.21, RS-232C, RS-449, RS-485, EIA-530 and EIA-530A
- Flexibility in running multi-interface test from within a single mTOP™ equipment
- mTOP™ probe solution for easier portability and convenient field testing

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T3 E3 Specifications

Output Amplitude	800mV ± 50mV
Input Impedance	75 Ohms unbalanced (BNC)
Line Code	B3ZS (T3), HDB3 (E3)
Terminate Input Level	0.09Vp – 0.85Vp
Monitor Input Level	0.025Vp – 0.08Vp

Clock Source

Internal	± 1 PPM @25C [± 4.5 ppm (includes ageing, stability)]
Recovered	Clock recovered from receiver
External	TTL Level signal High Speed (T3 (DS3) / E3 Rate) Low Speed (2KHz, 8KHz, 2MHz, 1.5MHz) Recovered from Inserted T1 or E1

T3 (DS3) / E3 Transmitter

T3 (DS3) / E3 Payloads	Framed T3 (DS3) / E3 Data, Unframed T3 (DS3) / E3, Idle, AIS
T3 Framing Modes	Unframed M13 (ANSI T1-107 – 1995) Structured (Channelized), and Unstructured (Unchannelized) C-bit (ANSI T1-107 – 1990) - Structured (Channelized), and Unstructured (Unchannelized) Unchannelized T3 supports subrate and scrambling formats for Digital Link, ADC/Kentrox, Larscom, Adtran, and Verilink data service units (DSUs)
E3 Framing Modes	Unframed, E13 (for E3) - Structured (Channelized), and Unstructured (Unchannelized)
Framed T3 (DS3) / E3 Unstructured Payload	Raw Data from File, ATM Cells (only for T3), HDLC Frames, BERT Patterns
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
T3 (DS3) / E3 Payloads	Framed T3 (DS3) / E3 Data, Unframed T3 (DS3) / E3, Idle, AIS
Unframed E3 Payload	Raw Data from File, BERT Patters
Channel Structure	T1, E1 (DS1) (ITU-T G.747)

T3 E3 Specifications

T3 (DS3) / E3 Transmitter (*Contd.*)

Framed T3 (DS3) / E3 Unstructured Payload	Raw Data Captured to File, ATM Analysis (only for T3), HDLC Frames Analysis, BERT Patterns Measurement
Framed T3 (DS3) / E3 Structured Payload	Raw Data Captured to File, BERT Patterns Measurement, Drop Selected T1(s) / E1(s)

T1 E1 Transmit or Receive

	Bit Error Rate Testing (BERT) pattern generation and detection per channel
	Transmit Tone, Transmit Gaussian Noise, Transmit Multiframe
	Transmit Signaling Bits, and Rx-to-Tx loopback
Compliance	G.703 Physical/Electrical Characteristics GR-499-CORE Physical/Electrical Characteristics G.821 Bert Analysis G.742 Multiplexing G.751 Multiplexing

Supported Protocols

T3 (DS3) / E3 Payloads	Framed T3 (DS3) / E3 Data, Unframed T3 (DS3) / E3, Idle, AIS
Channelized Protocols	High-Level Data Link Control (HDLC) Point-to-Point Protocol (PPP), RFC 1662, Multilink PPP (MLPPP), RFC 1990 Frame Relay, RFC 1490 Multilink support over Frame Relay (FRF.12) and MLPPP ATM IMA GSM, TRAU, GPRS, UMTS over ATM SS7, ISDN, CAS, SS1, SSM V5.x, DCME, FDL (T1 Interface only)
Unchannelized Protocols (Unstructured)	PPP, ATM, Frame Relay

T3 E3 Specifications

Other Specifications

T3 (DS3) / E3 Line Rate Offset	± 50 PPM in 1 ppm Steps
Level Measurement	Supported
Frequency Measurement	± 1 PPM
T3 (DS3) Error Add	Payload Bit, Frame Errors, P-bit, C-bit, EXZ (for T3);
E3 Error Add	Frame Errors, Code Violation (CV) Error, EXZ, Payload Bit
T3 (DS3) Alarm Generation	LOS, AIS, RAI (X-bit), Idle, FEAC Codes (Loopback and alarm/status codes)
T3 (DS3) Alarm Monitoring	LOS, LOF, AIS, Idle, RAI (X-bit), EXZ
E3 Alarm Monitoring	LOS, LOF, AIS, RAI (X-bit), EXZ
T3 (DS3) FEAC Codes	Alarm status codes, loopback codes with channel indicator for T1
LED Indicators	LOS, LOF, ERR, PGM

Mechanical

Power Supply	100-240V, 5A, 50/60Hz
Operating temperature	0° C to 40 ° C
Storage temperature	10° C to 70 ° C
Relative humidity	10 % min, 90 % max, non-condensing

Functional Specifications

- DS3/E3 multiplexing from T1/E1
- DS3/E3 Playback and Capture
- DS3/E3 Protocol Analysis
- DS3/E3 Bert Analysis
- Sending DS3/DS1 SNMP Traps to Network Operation Center (NOC)

tProbe™ Basic and Optional Applications

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 Clients - C++, TCL, C#
  - 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

External Power Requirements

Power Adapter Requirements	+5V @ 2A Max Power to the Center Ring

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

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 Frequency Offset	Robbed-Bit or Clear Channel T1: +/- 615Hz E1: +/- 615Hz

tProbe™ Specifications

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

Physical Dimensions

Dimensions	6.05 inches (153.67mm) (L) 5.55 inches (141.224mm) (W) 1.60 inches (40.64mm) (H)
Weight	1.24 lbs. (0.56 kg)

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
Datawidth (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 and Rx)

tProbe™ Datacom-Specifications

Physical Dimensions

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)

External Power Requirements

Power Adapter Requirements	+5V @ 2A Max Power to the Center Ring

Monitoring Options

- Monitoring Datacom option
- Multi-frames
- Real-time Multi-frames

Intrusive Testing

- Bit Error Rate Test
- Enhanced Bit Error Rate
- Precision Delay Measurement
- Rx-to-Tx Loop back
- Error Insertion

Encoding Options

- Sync, Async
- 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

Optional Software

Protocol Analysis

- HDLC, PPP

Record / Playback Files—Manual, Automated

Supported Line interfaces

- V.35, X.21, RS-232C, RS-449, RS-485, EIA-530 and EIA-530A

Emulation Mode

- DTE or DCE emulation mode

mTOP™ Probe T1E1 Datacom Specifications

Figure: mTOP™ T1 E1 Datacom Probe Tester (Front Panel)

Space Requirements	Height: 3 Inches Length: 10.4 Inches Width: 8.4 Inches
Embedded PC Specifications	Intel Core NUC i3 or optional i7 equivalent, Windows® 10 64-bit Pro Operating System USB 2.0 or 3.0 ports, 12V/3A Power Supply 256GB Hard drive, 8G Memory (Min) Two HDMI ports (Optional VGA to HDMI interface)
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.

mTOP™ Probe Specifications

Figure: mTOP™ T3 E3 Probe (Front Panel)

Space Requirements	Length: 10.4 in. Height: 3 in. Width: 8.4 in
Embedded PC Specifications	Intel Core NUC i3 or optional i7 equivalent, Windows® 10 64-bit Pro Operating System USB 2.0 or 3.0 ports, 12V/3A Power Supply 256GB Hard drive, 8G Memory (Min) Two HDMI ports (Optional VGA to HDMI interface)
USB T3 E3 Interfaces	DS3/E3 75O BNC (Tx, Rx) Ports DS1/E1 RJ-48-c (Tx, Rx) for Drop/Insert MCX External Clock Ports USB 2.0 Connected to a USB HUB Internally powered by Power Supply 1000 Mbps Ethernet Port

mTOP™ Rack Specifications

Figure: mTOP™ Rackmount T3 T1 E3 E1

Space Requirements	Height: stacked 2U Rack unit [Total space—2U] Length: 16 Inches Width: 19 Inches
Embedded PC Specifications	Intel Core i3 or optional i7 equivalent , Win10 Pro OS 64 bit USB 2.0 or 3.0 ports, ATX Power Supply Min 240 GB SSD, 8GB RAM Two HDMI ports (Optional VGA to HDMI interface)
USB T3 E3 Interfaces	DS3/E3 75O BNC (Tx, Rx) Ports DS1/E1 RJ-48-c (Tx, Rx) for Drop/Insert MCX External Clock Ports USB 2.0 Connected to a USB HUB Internally powered by Power Supply

Buyer's Guide

Item No	Product Description
TE3001	Dual T3 E3 / T1 E1 Hardware USB Base Unit
MT001	mTOP™ 1U Rack Mount Enclosure w/SBC (Intel i3 Core)
MT001E	mTOP™ 1U Rack Mount Enclosure w/SBC (Intel i7 Core)
MT002	mTOP™ 1U Rack Mount Enclosure w/o SBC
MT003	mTOP™ 2U Rack Mount Enclosure w/SBC
MT004	mTOP™ 2U Rack Mount 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)
PTE001	tProbe™ T1 E1 Base Unit

Order information of 6 x T3 E3 System

Item No	Product Description
TE3005	Rack Enclosure for T3/E3 System – up to 6 T3/E3s. 2U - 19" Rack Enclosure, Power Supply, Fans, 4 Port USB Hub, Cables and Accessories, Accommodates three (3) Dual T3/E3 USB Units
SA005z	19" 1U Rack Mount PC w/o Monitor, but with Keyboard, Mouse, Xeon 8 GB, 500 GB

For more details on product list, refer to T1 E1 product list and T3 E3 product list.

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