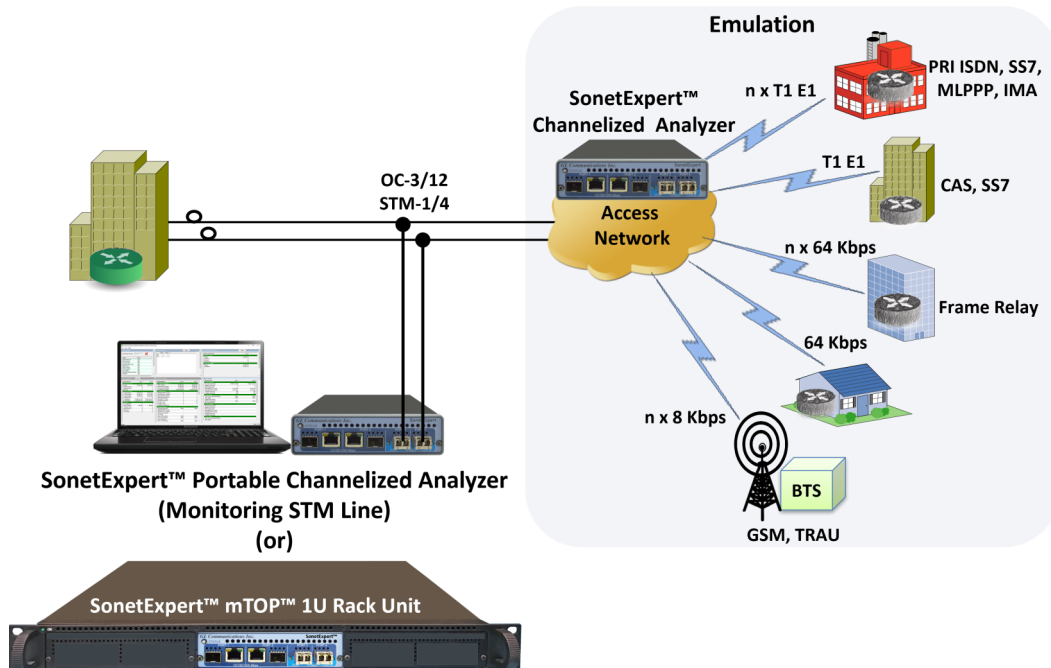


SonetExpert™ Channelized (SEC) Analyzer



Overview

A majority of the backbone transport for voice, video and data applications continues to be SONET and SDH optical transmission networks. SONET and SDH transmission network also continue to be used for conventional channelized traffic – carrying many TDM T1, E1, T3, and E3 pipes.

GL's SonetExpert™ application has the following variants of OC-3/STM-1 and OC-12/STM-4 Analyzers:

- SonetExpert™ Channelized Analyzer
- SonetExpert™ Unchannelized Analyzer

GL's SonetExpert™ Channelized Analyzer comprises of hardware and software. The hardware receives and transmits data using SONET/SDH traffic which transfers the traffic in to the GL's Soft T1 E1 analyzer application. The T1 E1 Analyzer application provides the same functionality as GL hardware based T1 E1 Analyzers with the difference that T1 E1 frames are multiplexed into SONET/SDH frames and transmitted over optical lines.

GL's SonetExpert™ hardware platform (USB unit) is capable of OC-3/12 and STM-1/4 wire-speed processing on two optical ports (Port 1 and Port 2) are designated for SONET/SDH channelized data carrying many independent unframed/framed T1 or E1 streams.

USB 3.0 interface is used to connect with a Notebook PC for portability. The hardware is FPGA based making it easy to upgrade in the field for application versatility. A unique feature of the unit is the capability to capture, transmit and process at wirespeed to/from applications on all interfaces. Also, can save the captured traffic to the hard disk and playback.

GL's [SonetExpert™ Unchannelized Analyzer](#) is capable of SONET/SDH testing over OC-3/STM-1, OC-12/STM-4, OC-48/STM-16 and OC-192/STM-64 transports. It is based on the PacketExpert™/SonetExpert™ hardware platform. PacketExpert™/SonetExpert™ is a versatile hardware platform that supports both Ethernet (up to 10G) and SONET/SDH (up to OC-192/STM-64) testing, two ports support SONET/SDH testing.

For more information, refer to [SonetExpert™ Channelized \(SEC\) Analyzer](#) page.



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Main Features

- Allows direct access to everything on SONET / SDH – Framing and Payload, including structured traffic (T1, E1, STS-1 etc.)
- Analyze or emulate voice, data, fax, protocols, analog and digital signals, including echo and voice quality
- Pluggable SFPs allow Single-mode (SM), and Multi-mode (MM) fiber optic non-intrusive tap
- Comprehensive protocol analysis and emulation - HDLC, SS7, ISDN, CAS, PPP, Frame Relay, ATM, UMTS, and more
- Capture and transmit at wirespeed to/from hard disk on all interfaces. Also capture traffic for off-line analysis and playback the captured traffic
- Direct access to any or all T1s and E1s
 - 2x Channelized OC-3 STM-1/OC-12 STM-4 SONET/SDH interfaces per SonetExpert™ for simulating and monitoring in both directions
 - Configure the number of T1 E1 channels to be multiplexed or demultiplexed to/from OC-3/12 STM-1/4
 - Broadcasts the selected T1 E1 channel data on all the 252 E1's or 336 T1's
 - Direct access to any or all T1s and E1s
 - ⇒ 2 x 336 T1's x 24 DS0s = 16,128 DS0s
 - ⇒ 2 x 252 E1's x 31 DS0s = 15,624 DS0s
- Provides Loss of Signal and Loss of Frames Hardware Alarms indication, Service logging, External Clock , Line and Diagnostic Loopback options, Through mode and Port Swap Cross-port options
- Scans the received STM-4/STM-1 traffic and identifies the mapping, tributary type [T1 E1], equipped/unequipped status of the tributaries
- Broadcasts the selected T1 E1 channel data on all the 252 E1's or 336 T1's
- Supports any combination of DS0/64/56/16/8 kbps fractional T1 E1, and N x T1 E1 interface definitions (a total of 252 E1s or 336 T1s – in each port)
- Supports multiplexing multiple T1 or E1 channels to a single channelized OC-3/12 STM-1/4 line
- User configurable OC-3/12 STM-1/4 mapping – allows user-defined T1 and E1 channels to multiplex. The channel numbering is same as in demultiplexer
- User configurable idle code to fill the channels when the user added channels do not have data to multiplex
- Provides an option to restart the SEC service automatically

Working of SonetExpert™ - Analysis and Emulation

As depicted in the figure below, the SEC service uses SonetExpert™ device to transmit and receive data over optical lines using SONET/SDH protocols. The service demultiplexes T1 E1 frames received from the SONET/SDH and sends them using User Datagram Protocol (UDP) to GL's Soft T1 E1 Analyzer. It also multiplexes T1 E1 frames into SONET/SDH frames and transmits over optical lines using SonetExpert™ hardware.

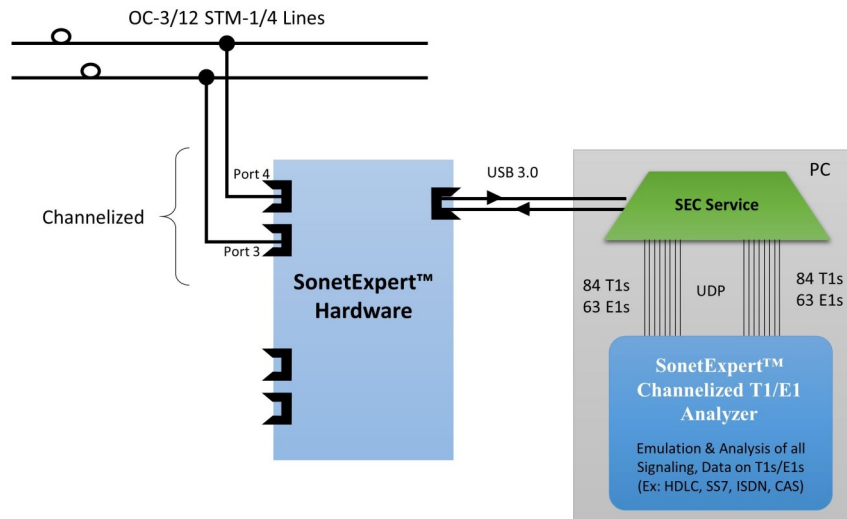


Figure: Architecture of SonetExpert™ Channelized Analyzer

GL's SonetExpert™ Channelized Analyzer supports direct access to all or user-defined 2 x 336 T1s or 2 x 252 E1s per unit for analysis and simulation – all within a one PC. With this hardware, any combination of DS0/64 kbps, fractional T-1/E-1, and N x T1 E1 interface definitions (a total of 126 E1s or 168 T1s – each port supporting 84 T1s or 63 E1s) can be accessed.

Supports analysis and simulation of various TDM and wireless protocols in real-time / remote / offline. The following are the available protocol analyzers:

- HDLC, SS7, ISDN, CAS, GSM, TRAU, SS1
- Sa Bits HDLC, SSM, V5.x, DCME
- FDL (T1 Interface only)
- ML-PPP, ML-Frame Relay
- ATM IMA
- GPRS (Gb and IP Gx)
- UMTS

Also available is the MAPS protocol emulators such as TRAU, ISDN, SS1, ISUP, MAP, CAS, GSM, HDLC, and MC-MLPPP for real-time simulation of corresponding networks.

SDH Mapping in GL's SonetExpert™

The below diagram depicts various T1 E1 to STM-1 signal mapping possibilities in SDH. The paths coloured in green are currently supported on the GL's SonetExpert™ Channelized Analyzer hardware.

Various T1 E1 mapping in SDH

- STM-4 -> STM-1 -> AUG-1 -> AU-3 -> VC-3 -> TUG-2 -> TU-12 -> E1
- STM-4 -> STM-1 -> AUG-1 -> AU-4 -> VC-4 -> TUG-3 -> TUG-2 -> TU-12 -> E1
- STM-4 -> STM-1 -> AUG-1 -> AU-3 -> VC-3 -> TUG-2 -> TU-11 -> T1
- STM-4 -> STM-1 -> AUG-1 -> AU-4 -> VC-4 -> TUG-3 -> TUG-2 -> TU-11 -> T1

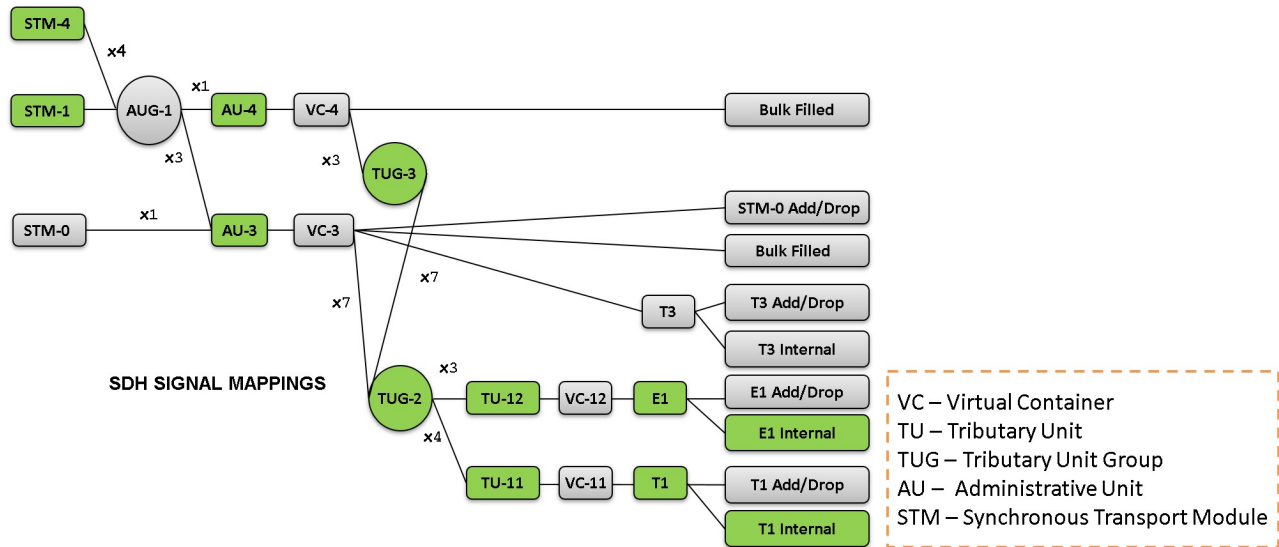


Figure: SDH Mappings

SONET Mapping in GL's SonetExpert™

The below diagram shows various T1 E1 to OC-12 mapping possibilities in SONET. The paths colored in green color are supported on GL's SonetExpert™ hardware.

The T1 and E1 mappings for OC-3/12 in SONET are as below:

- STS-12 --> OC-12 --> STS-3 --> STS-1 --> VT-Group --> VT2 --> E1
- STS-12 --> OC-12 --> STS-3 --> STS-1 --> VT-Group --> VT1.5 --> T1

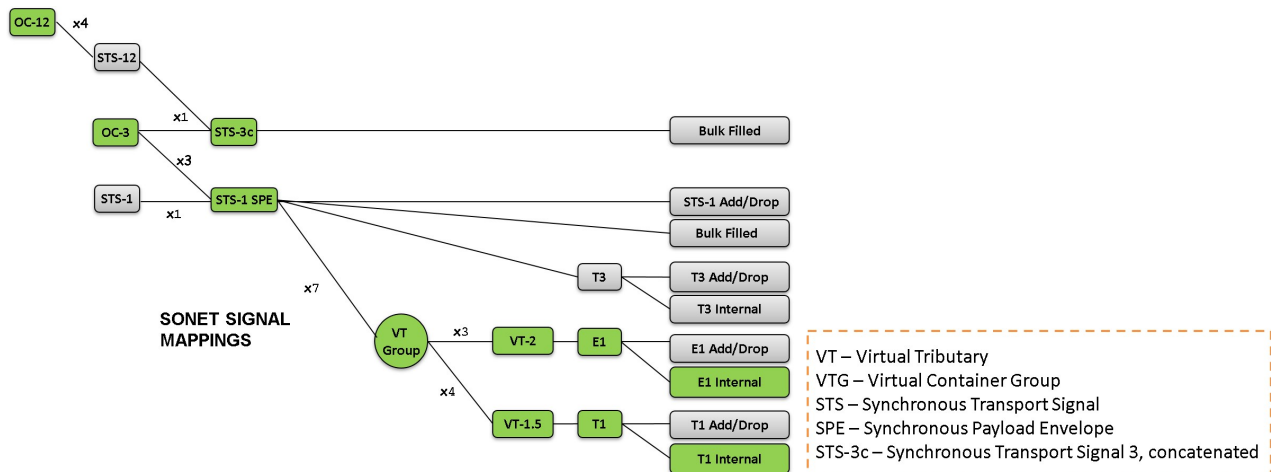


Figure: SONET Mappings

SonetExpert™ Channelized Monitor and Control

The GUI based SonetExpert™ Channelized Analyzer T1 E1 Service Monitor provides users with the following functionalities:

- Starting and stopping the SEC service
- Configuring the SEC service
- Launching STEAs
- Viewing and clearing the SEC service Log
- Displaying alarms, error counters and operational statistics

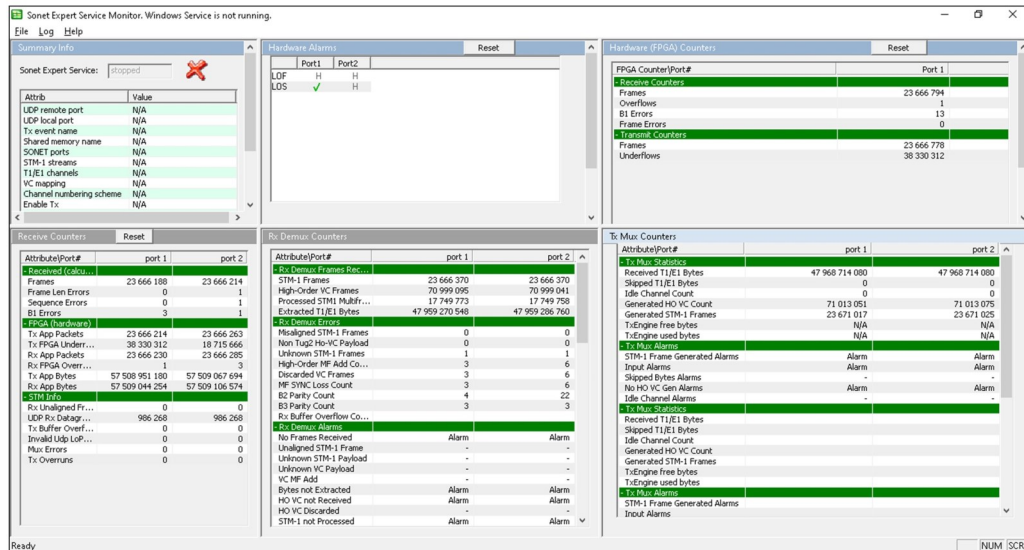


Figure: SEC Monitor and Control

SonetExpert™ Channelized Configuration Utility

The utility configures SONET/SDH parameters, UDP endpoints for T1 E1 frame data transfer between GL's Soft T1 E1 Analyzer and SEC service, T1 E1 channels used and clock setting of SONET/SDH ports.

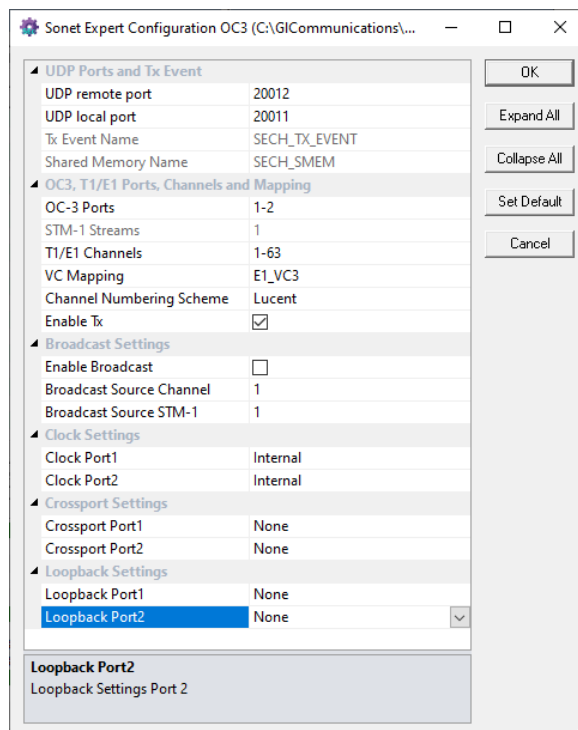


Figure: SEC Configuration Utility

Accompanying Basic Software / Features

Almost all the basic applications and optional applications supported by T1 E1 Analyzers are also supported by SonetExpert™ Channelized Analyzer. For example, capturing and transmitting an entire OC-3 / STM-1, and OC-12 / STM-4 signals simultaneously, or performing ISDN, or SS7 analysis, can be performed using the software accompanying the channelized SonetExpert™.

Basic Applications

Configuration

Allows to switch between μ -law and a-law encoding formats. Provides options to set the WCS Server to start with default values at analyzer start-up.

Monitoring Applications

Multiple applications are offered to monitor information received over T1 E1 lines. They cover information such as 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.

Intrusive Test Applications

The analyzers use a variety of intrusive testing applications to verify the working of T1 E1 lines such as Transmit Tone, Transmit Gaussian Noise, Transmit Multi-frame, Transmit Signaling Bits, and Rx-to Tx loopback.

Optional Applications

- Capture/Transmit Dialed Digits
- Transmit (Playback) and Record
- Automated Record/Playback (ARP)
- Automated Continuous Capture (ACC)
- Call Capture and Analysis
- Multiple Call Capture and Analysis
- Call Data Records
- Voice Band Analyzer (VBA)
- Protocol Analysis and Emulation
- Protocol Identifier
- Signaling transition
- Echo Test Solution
- Multi-channel Bit Error Rate testing
- Real-time Multi channel Audio Bridge
- Multiplex/Demultiplex
- Fax Emulation/Analysis

Applications of SonetExpert™

The solution offered by GL's SonetExpert™ for direct access to T1 or E1 channels on OC-3/12 STM-1/4 is by far the most simplest solution offered so far in the industry. Enterprise and service providers this can take advantage of this simplest solution to reduce cost and to provision new services to customers. Some of the applications are listed below—

- Test Transition of ATM to TDM in a 3G GSM Network
- Monitoring SS7 Signaling and Bearer Channels over OC-3/12 STM-1/4.
- Monitoring Abis over OC-3/12 STM-1/4

Hardware Specifications of SonetExpert™ Analyzer

SonetExpert™ contains 4 ports out of which two ports are designated for SONET/SDH channelized data carrying many independent unframed/framed T1 or E1 streams. The other two ports support Ethernet testing at 1 Gbps rate.

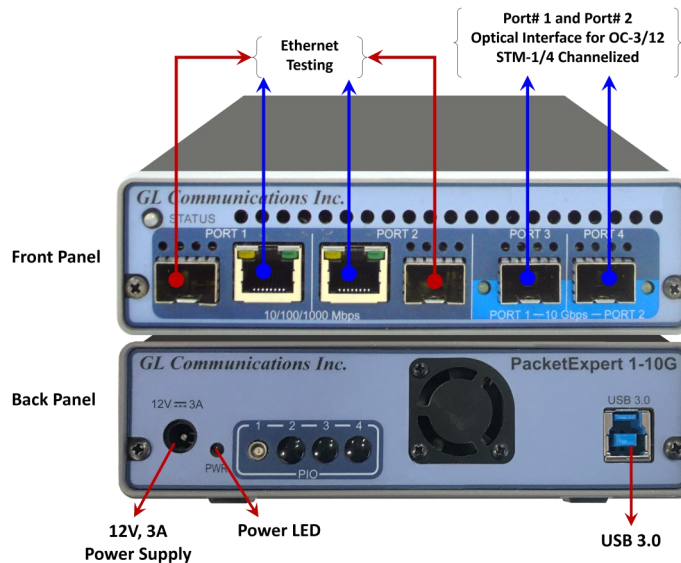


Figure: SonetExpert™ Hardware Unit (Front and Back Panel)

Interfaces	• 2 x Channelized Ports (STM-1/STM-4) • Single Mode or Multi Mode Fiber SFP support with LC connector • USB 3.0 Port • External Clock: Input Port 1, Port 2 and Output Port 1, Port 2
T1 E1	• Sync Loss, HDB3 Violation, Carrier Loss, Frame Error, Remote, Distant MF, AIS, BPV Errors, CRC Errors, Frame Errors, Transmit Under Run, Receive Over Run
Dimensions	• Length: 8.45 in. (214.63 mm) • Width: 5.55 in. (140.97 mm) • Height: 1.60 in (40.64 mm)
External Power Supply	• +12 Volts (Medical Grade), 3 Amps

Connecting the optical SFPs to the fiber optic ports, the 2 channelized ports (Optical Port 1, Port 2) on the unit are available for OC-3/12 STM-1/4 testing.

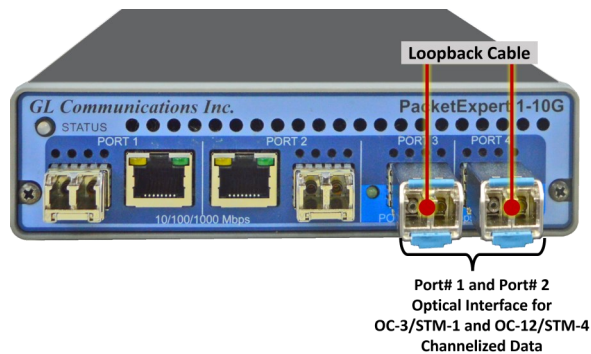


Figure: SonetExpert™ with Optical SFP's Plugged In

SonetExpert™ mTOP™ Probe Specifications

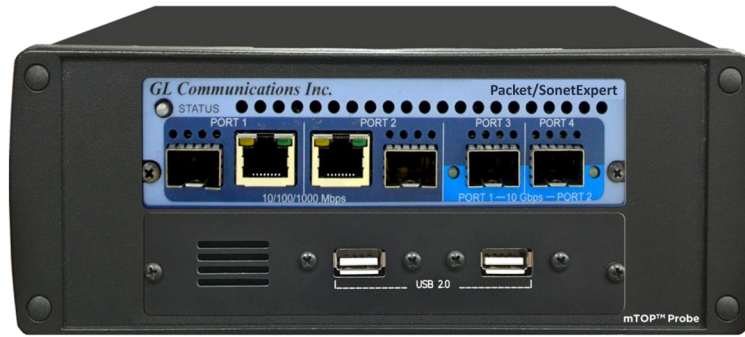
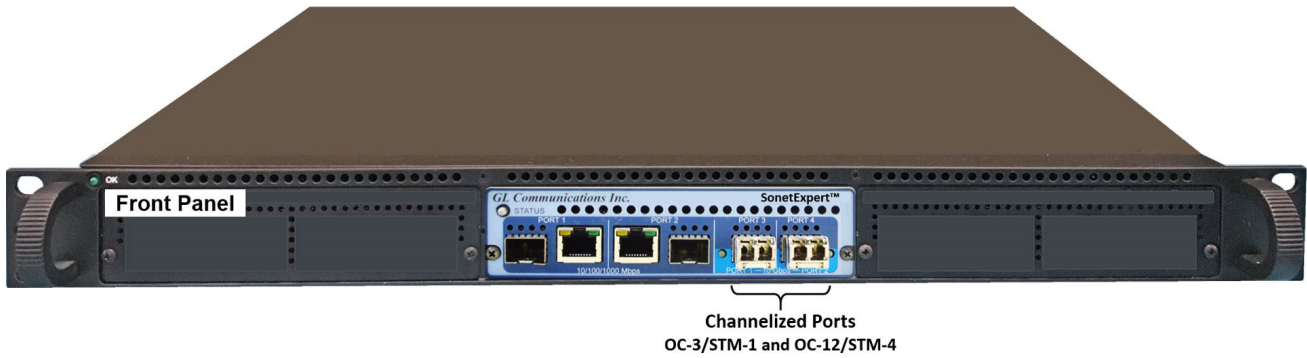


Figure: SonetExpert™ mTOP™ Probe unit

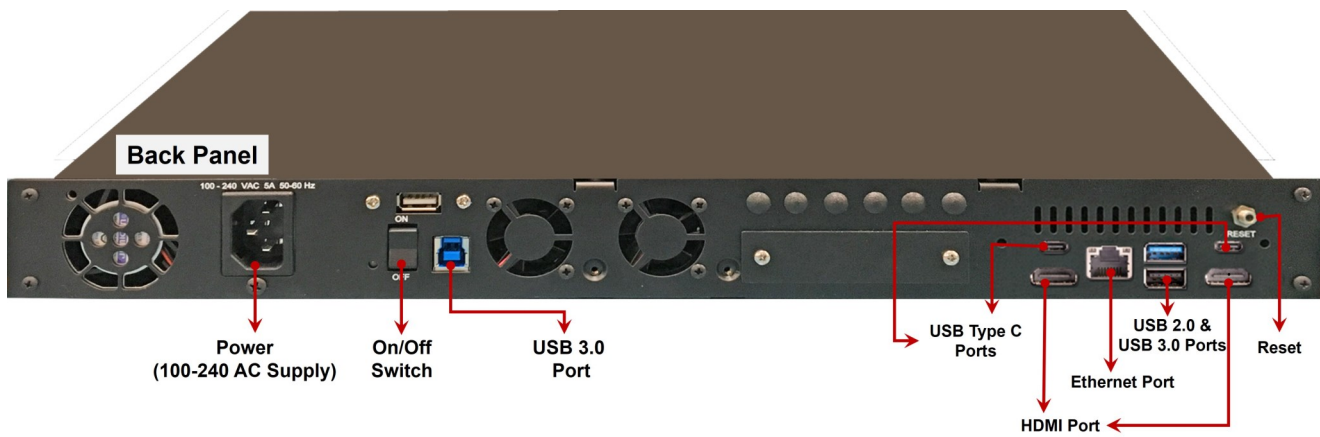
[PacketExpert™](#) hardware is used for both Packet/SonetExpert™.

Physical Specifications	• Height: 3.0 Inches (76.2 mm) • Length: 10.4 Inches (264.16 mm) • Width: 8.4 Inches (213.36 mm) • Optional 4-Port SMA Jack Trigger Board (TTL Input/Output) • External USB based Wi-Fi adaptor
SonetExpert™ interfaces (1 unit)	• 4x 1G Base-X Optical OR 10/100/1000 Base-T Electrical • 2x 10G Base-SR, -LR -ER Optical option • 2 x 100 Mbps Base-FX optical interface • Two channelized Ports (STM-1/STM-4) • Single Mode or Multi Mode Fiber SFP support with LC connector
External Power Supply	• +12 Volts (Medical Grade), 3 Amps
SBC Specifications	• AMD Ryzen 9 Series Processor or Intel Core i9 Equivalent, Windows® 10 and above 64-bit Pro Operating System • USB 2.0 or and USB 3.0 Ports, 12v/ 3A Amps Power Supply • USB Type C ports, Ethernet 2.5GigE port • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports for display

SonetExpert™ mTOP™ 1U Rack Solution Specifications



SonetExpert™ mTOP™ 1U rack solution (Front Panel View)



SonetExpert™ mTOP™ 1U rack solution (Back Panel View)

Physical Specifications	• Height: 1U Rack • Length: 16 Inches • Width: 19 Inches • mTOP™ System (embedded SBC, 1x SonetExpert™)
SonetExpert™ interfaces (1 unit)	• Two channelized Ports (STM-1/STM-4) • Single Mode or Multi Mode Fiber SFP support with LC connector
SBC Specifications	• AMD Ryzen 9 Series Processor or Intel Core i9 Equivalent, Windows® 10 and above 64-bit Pro Operating System • USB 2.0 or and USB 3.0 Ports, ATX Power Supply • USB Type C ports, Ethernet 2.5GigE port • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports for display

Buyer's Guide

Item No	Product Description
SEUE02	SonetExpert™ Channelized Analyzer (OC-3/STM-1)
SEUT02	SonetExpert™ Channelized Analyzer (OC-12/STM-4)
SEE001/SET001	SonetExpert™ OC-3/STM-1 Basic E1 Software /SonetExpert™ OC-3/STM-1 Basic T1 Software
SEU110	SonetExpert™ Upgrade to PXN100
SEU120	SonetExpert™ Upgrade to PXN101
PXN100	PacketExpert™ 10GX
PXN101	10G option for PXN100
PXN00	Optical Multiport Tap/Repeater
PXN01	Multi-rate Multimode SFPs and FO Cables
PXN02	Multi-rate Singlemode SFPs and FO Cables
MT001	mTOP 1U Rack Mount Enclosure w/SBC (intel core i3)
MT001E	mTOP™ Rack Mount Enclosure w/SBC (intel core i7)

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

For more information, refer to [SonetExpert™ Channelized \(SEC\) Analyzer](#) page.



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