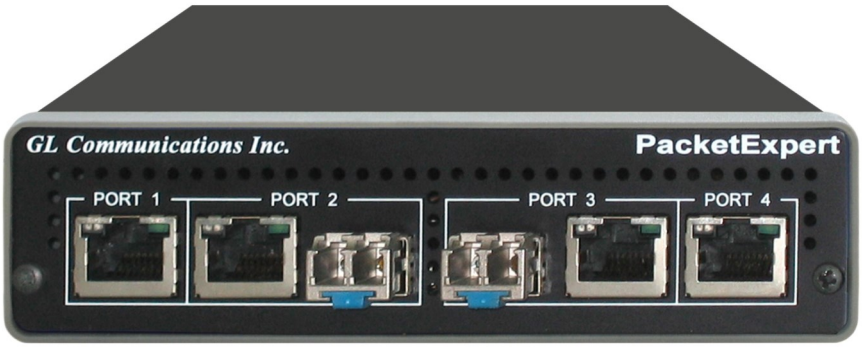
PacketExpert™ 1G - Optical and Ethernet Tester



- Bit Error Rate Testing
- RFC 2544
- Loopback
- ITU-T Y.1564
- Multi-stream traffic generator
- RFC 6349
- Record and playback traffic
- Wirespeed network tap

Overview

PacketExpert™ is a portable (USB based) Quad Port Ethernet / VLAN / MPLS / IP / UDP tester with 4 Electrical Ethernet ports, 2 of the 4 ports can be Electrical or Optical ports, enabling testing on optical fiber links as well. The electrical ports support 10/100/1000 Mbps, and optical ports support 1000 Mbps using SFP. Each GigE port provides independent Ethernet / VLAN / MPLS / IP / UDP testing at wire speed for applications such as Bit Error Rate Testing, RFC 2544, Loopback, Capture and Playback, Multi-Stream UDP/TCP Traffic Generator and Analyzer, and ITU-T Y.1564 testing for verifying service level agreements.

It truly takes confusion out of Ethernet / IP testing at all protocol layers from Layer1 frames to IP / UDP packets. It can be used as a general purpose Ethernet to IP performance analysis tool for 10 Mbps, 100 Mbps and 1 Gbps Ethernet Local Area Networks (LAN) and Wide Area Networks (WAN).

It can perform Wire speed Bit Error Rate Testing BERT on all ports simultaneously over Framed Ethernet (Layer2), Stacked VLAN (Q-in-Q), Stacked MPLS (Layer 2.5), IP and UDP. It can generate and receive various BER patterns, including PRBS patterns, to properly test the Ethernet to IP link.

With the capability to generate or receive traffic with stacked VLAN (Q-in-Q) and stacked MPLS PacketExpert™ finds useful in testing a wide range of networks from testing individual links or switches, testing local Ethernet or IP networks (LAN), end-to-end testing of Wide Area Networks (WAN), testing Core or MPLS networks, and much more.

Similar to BERT, RFC 2544 can be done over Framed Ethernet (Layer2), Stacked VLAN (Q-in-Q), Stacked MPLS, IP or UDP. Supported tests such as Throughput, Latency, Frame Loss, and Back to Back tests as specified in RFC 2544 can also be performed. The RFC 2544 test can be done on single or dual electrical or optical ports. In single port, the test can be run on either Port #2 or Port #3 at a time. In dual port, the test can be run on both Port #2 and Port #3 simultaneously.

PacketExpert licensing (PXE100) also supports Loopback testing it includes layer-wise Loopback as well as Smart Loopback testing types on All ports or 2 ports on the hardware unit.

GL also offers other Ethernet / IP tester variants such as –

PacketExpert™ 1G - mTOP™ rack enclosure - a higher density 12/24 GigE ports form factor solution.

mTOP™ Probe with PacketExpert™ 1G Multi-Port Ethernet– a hardware unit designed for easier portability and convenient for field testing.

For more details, refer to PacketExpert™ webpage.

GL Communications Inc.

818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A

(Web) www.gl.com - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) info@gl.com

Main Features

Operations

- Control multiple hardware units from a single GUI, multiplying the number of ports available per system
- Capability of remote operation, and automation using C#, Python scripts and MAPS CLI (client-server) architecture

Wire speed BERT

- Traffic options lets technicians to generate Ethernet to IP frames with user-configurable frame length, and frame size with varying traffic rates
- Option to disable Auto-negotiation for 1000Base-T (1000 Mbps Electrical)
- Added additional 1000Base-T Interface parameters when Auto Negotiation is disabled
- Enhanced to support burst mode traffic generation ability
- Supports industry standards PRBS patterns 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1, 2^{29}-1, and 2^{31}-1, and constant patterns like all ones, all zeroes, alternate ones-zeroes and user-defined test patterns ranging between 1 to 32 bits
- Single as well as constant rate Bit Error and FCS Error Insertion
- Optional sequence number insertion allows to detect out-of-sequence packets and packet loss
- Support for frame lengths from 64 bytes to Jumbo frames (up to 2048 bytes)
- User-defined header parameters for MAC, VLAN, MPLS, IP and UDP layers
- Testing with stacked VLAN (Q-in-Q) and MPLS – up to 3 levels

Loopback

- Both smart loopback (auto layer detection) and layers-wise loopback capabilities for incoming traffic

RFC 2544

- Throughput, back-to-back, latency and frame loss testing supporting uni-directional and bi-directional traffic between ports
- Supports RFC 2544 on single or dual electrical / optical ports
- User-defined configuration parameters such as frame size, trial duration, number of trials, etc.
- Added measured Latency display for both Store/Forward and Bit Forward methods

ExpertSAM™

- ExpertSAM - ITU-T Y.1564 Complete validation of Ethernet service-level agreements (SLAs) in a single test
- Supports Service Configuration and Service Performance tests in compliance with ITU-T Y.1564 standard
- Supports multiple services (up to 12 services) with varying performance requirements that meets full load conditions
- KPIs like Information Rate (IR) or Throughput, Frame Loss Ratio (FLR), Frame Transfer Delay (FTD) or Latency, and Frame Delay Variation (FDV) or Jitter, measured simultaneously for multi streams, and Pass/Fail verdict declared

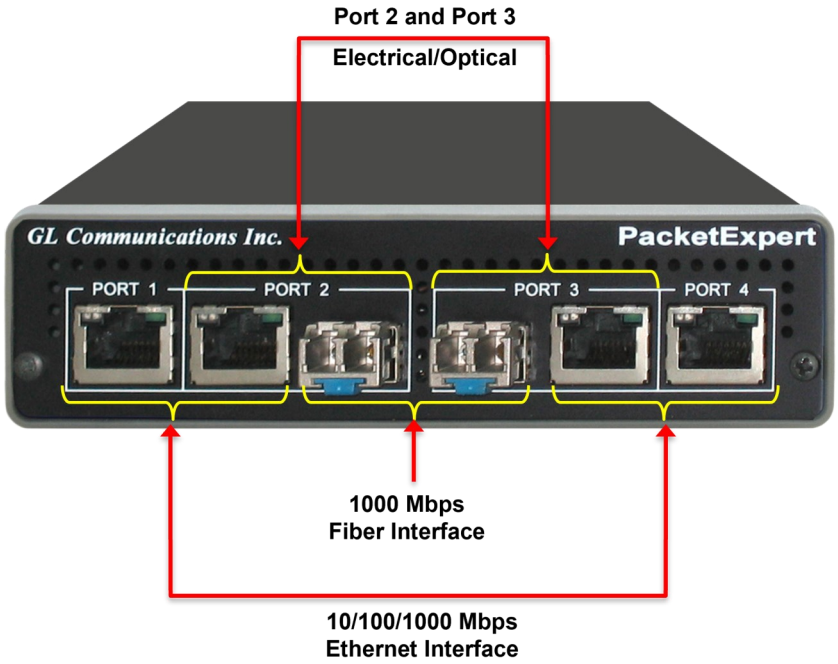
Statistics and Graphs

- Detailed test result reports in PDF and CSV file formats
- Detailed frame statistics in tabular format for all the ports
- Provides various vital measurements such as Bit Error Rate, Bit Error Count, Sync Loss Count, Sync Loss Seconds, and Error Free Seconds
- Real time graphical representation of the combined Throughput and Bit Error rate, plotted over time for BERT testing
- Graphs and Statistics for all the RFC 2544 tests
- Link (P2-P3 / P3-P2) statistics and Port (P2, P3) statistics

Optional Applications

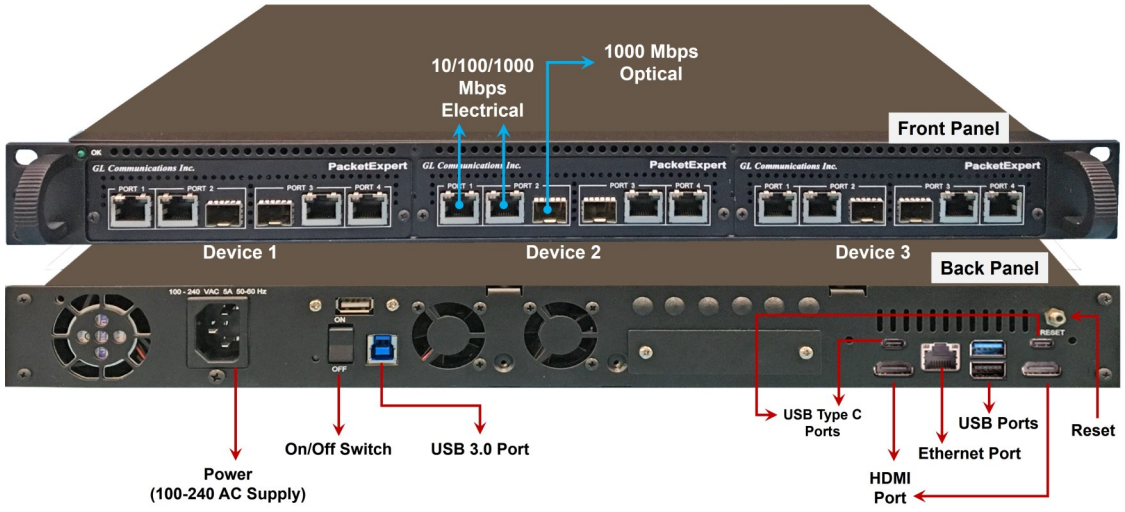
- Capture/Playback - Wirespeed Packet Capture, Filter, Drop (for real-time analysis) and Storage (for offline analysis)
- PacketBroker - Capture packets non-intrusively with advanced features like Filters, Aggregation, Packet Modification, and Output traffic
- Multi-Stream UDP/TCP Traffic Generator and Analyzer - Generates and analyzes up to 12 user defined streams of varying packet length traffic

Portable PacketExpert™ 1G Specifications



Interfaces	• 2 x 10 / 100 / 1000 Base-T Electrical only • 2 x 100 Base-FX Optical only • 2 x 1000 Base-X Optical OR 10/100/1000 Base-T Electrical • Single Mode or Multi Mode Fiber SFP support with LC connector
Protocols	• RFC 2544 compliance
Bus Interface	• USB 2.0 or USB 3.0
Power	• +12 Volts (Medical Grade), 3 Amps
Temperature	• Operating Temperature: +5 to +40C • Non-Operating Temperature: -30 to +60C
Humidity	• Operating Humidity: 0% to 80% RH • Non-Operating Humidity: 0% to 95% RH
Altitude	• Operating Altitude: Up to 10,000 feet • Non-Operating Altitude: Up to 50,000 feet
Physical Specification	• Length: 8.45 in. (214.63 mm) • Width: 5.55 in. (140.97 mm) • Height: 1.60 in (40.64 mm) • Weight: 1.66 lbs. (0.75 kg)

mTOP™ PacketExpert™ 1G Rack Specifications



1U mTOP™ Rack Based 1G Hardware Unit (3 PXE100s)

Interfaces	12 Total Ethernet Ports (HD-PacketExpert-12) • mTOP™ System (embedded SBC, 3x PXE100) • PacketExpert™ 1G (PXE100) interfaces - – 6x 1000 Base-X Optical OR 10/100/1000 Base-T Electrical – 6x 100 Base-FX Optical only – 6x (10/100/1000) Base-T Electrical 24 Total Ethernet Ports (HD-PacketExpert-24) • mTOP™ System (embedded SBC, 6x PXE100) • PacketExpert™ 1G (PXE100) interfaces - – 12x 1000 Base-X Optical OR 10/100/1000 Base-T Electrical – 12x (10/100/1000) Base-T Electrical
SBC Specifications	• Intel Core i3 or optional i7 NUC Equivalent, • Windows® 11 64-bit Pro Operating System • USB 3.0 and USB 2.0 Ports, ATX Power Supply • USB Type C Ports, Ethernet 2.5GigE port • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports
External Dimension	• Length: 16 Inches • Width: 19 Inches • Height: 2x 1U mTOP™ (HD-PacketExpert-24) or 1U mTOP™ (HD-PacketExpert-12)
Power Supply	• ATX Power Supply
Order Information	• PXE100 - PacketExpert™ Options • MT001/MT001E (1U) • MT001+MT002/ MT001E+MT002 (Stacked 1U)

mTOP™ 1G Probe Specifications

mTOP™ Probe with 1G Hardware Unit + SBC

Interfaces	• 4x Total Ethernet ports • 2 x 10/100/1000 Base-T Electrical only • 2 x 100 Base-FX Optical only • 2 x 1000 Base-X Optical OR 10/100/1000 Base-T Electrical • Single Mode or Multi Mode Fiber SFP support with LC connector
SBC Specifications	• Intel Core i3 or optional i7 NUC Equivalent, • Windows® 11 64-bit Pro Operating System • USB 3.0 and USB 2.0 Ports, 12/3A Power Supply • USB Type C Ports, Ethernet 2.5GigE port • 256 GB Hard drive, 8G Memory (Min) • Two HDMI ports
External Dimension	• Length: 10.4 inches • Height: 3 inches • Width: 8.4 inches
Power Supply	• 12 Volts (Medical Grade), 3 Amps
Order Information	• PXE100 • MT005/MT005E

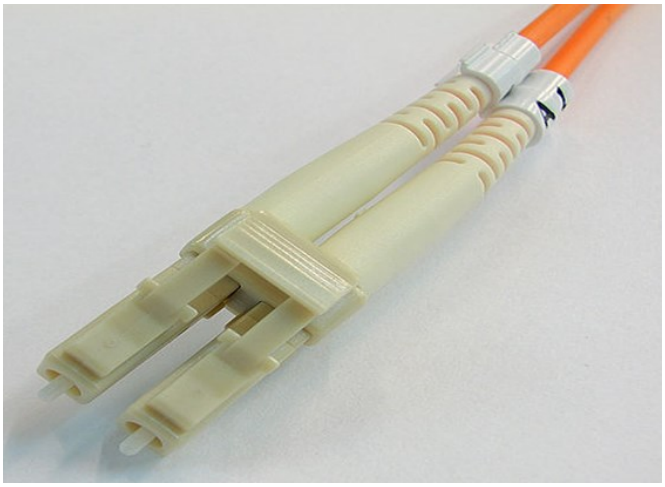
Pelican Carry On Case

Supported SFP Modules

PacketExpert™ supports LC connectors and 850/1310 nm SFP (Small Form-Factor Pluggable) modules. For users with different connector types, appropriate adapters such as LC-to-SC, LC-to-FC, or their reverse equivalents are required.

The following SFP modules are supported in 1G:

- **1000BaseLX** - Long range, MM and SM
- **1000BaseSX** - Short range, MM and SM
- **1000BaseT** - Copper and many more

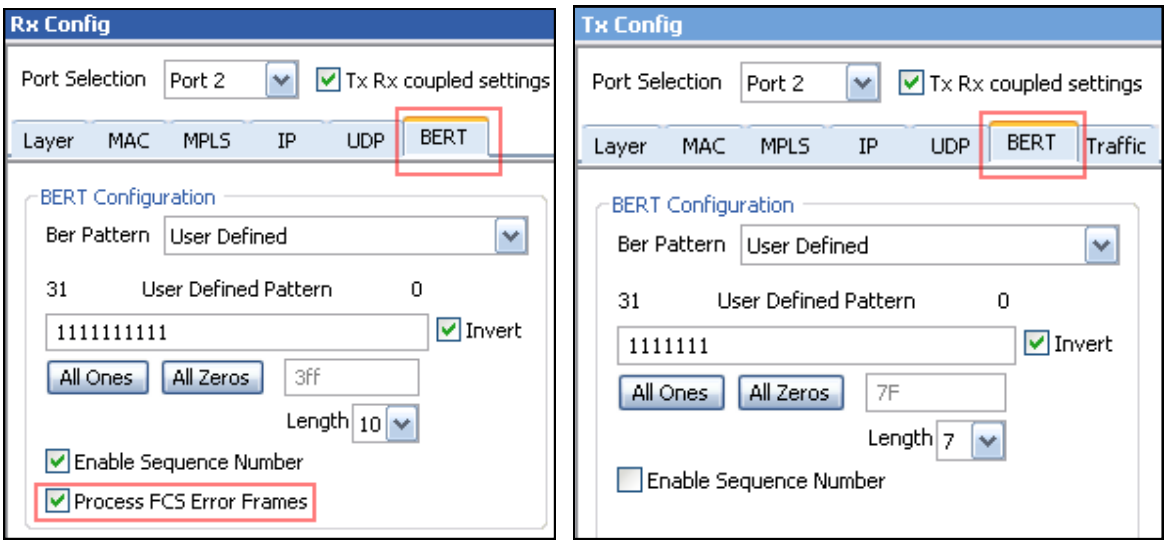


LC Connectors

850/1310 nm SFP Module

Wire-speed BER Testing with Traffic Generation

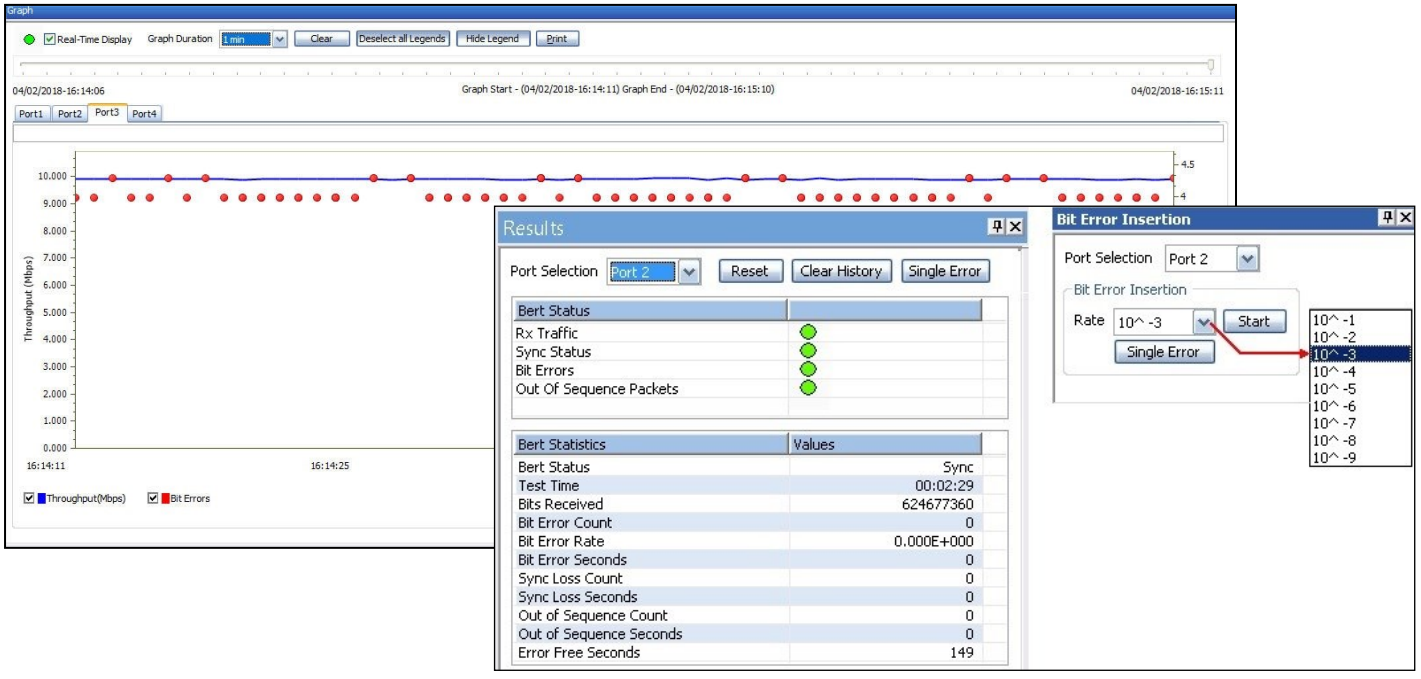
Wire-speed BERT measures Bit Error Rate on Framed Ethernet, Stacked VLAN, Stacked MPLS (Layer 2.5), IP and UDP layers. Supports generating various PRBS patterns such as 2^9-1, 2^{11}-1, 2^{15}-1, 2^{20}-1, 2^{23}-1, 2^{29}-1, 2^{31}-1, including constant patterns such as All Ones, All Zeroes, Alternate Ones-Zeroes and user-defined test patterns ranging from 1 bit to 32 bits. Selection of optional sequence number insertion allows detection of out-of-sequence packets and packet loss. The Rx Config includes an option to process received packets for FCS errors. BERT can run simultaneously on all ports or can be combined with Loopback to run BERT. In addition, the PacketExpert™ also allows sending traffic of specific frame length and rate.



BERT payload with various PRBS patterns

Wire speed BERT Results (with LEDs and Graph)

PacketExpert™ analyzes the received BER pattern and provides various vital measurements such as Bit Error Rate, Bit Error Count, Bit Error Seconds, Sync Loss Count, Sync Loss Seconds, Error Free Seconds, No Rx Data Count/Seconds, and Bert Status. It also gives a real time graphical representation of the Throughput and Bit Error rate, plotted over time as shown in figure below. Supports Test Report Generation in PDF and CSV file formats.



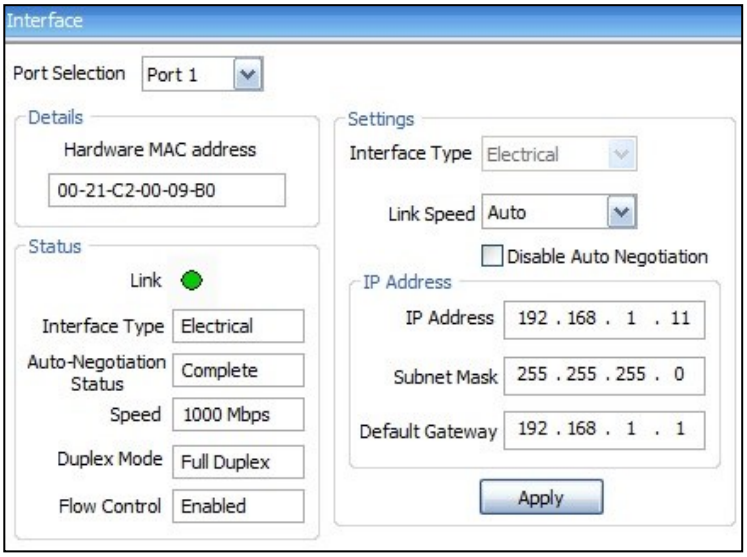
BERT Results (with LEDs) and Graph

Link Status and Configuration

Hardware Interface details are displayed independently per port. It includes:

- Hardware MAC address
- Link status
- Current Operating Mode (Electrical / Optical)
- Auto Negotiated Status and Link Speed
- Duplex Mode
- Flow Control

Users can plug in to the port either Electrical or Optical operating mode. Also, users can opt for Auto negotiated speed or force the speed to one of 10 / 100 /1000 Mbps. Default IP address settings for the port can be configured. Send Pause Frame feature to send user-defined Quanta of pause frames at a time manually on each port independently.

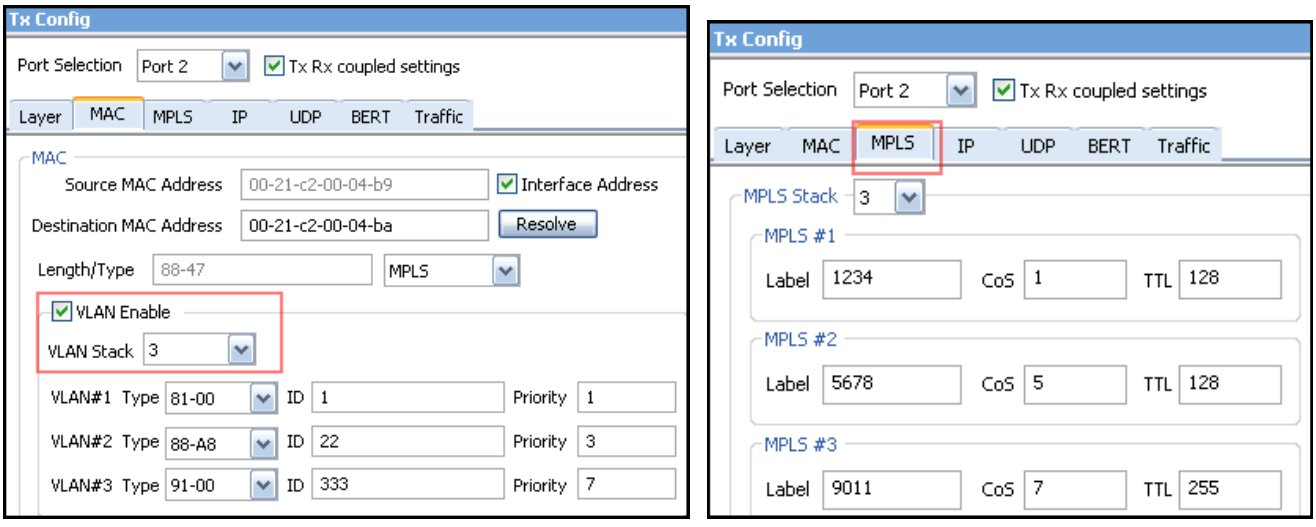


Interface Dialog & Link Status

Packet Configuration Stacked VLAN (Q- in-Q), MPLS

BERT and RFC2544 testing over Ethernet and MPLS allows configuration of various layer parameters.

PacketExpert™ supports up to 3 level stacked VLANs (Q-in-Q) headers and stacked MPLS headers. For each VLAN tag, user can specify the VLAN Type Field, VLAN Id and Priority. User can specify MPLS Label ID, Class of service (CoS) bits and TTL field for each MPLS level (MPLS #1, MPLS #2 and MPLS #3).



Stacked VLAN and MPLS Configurations

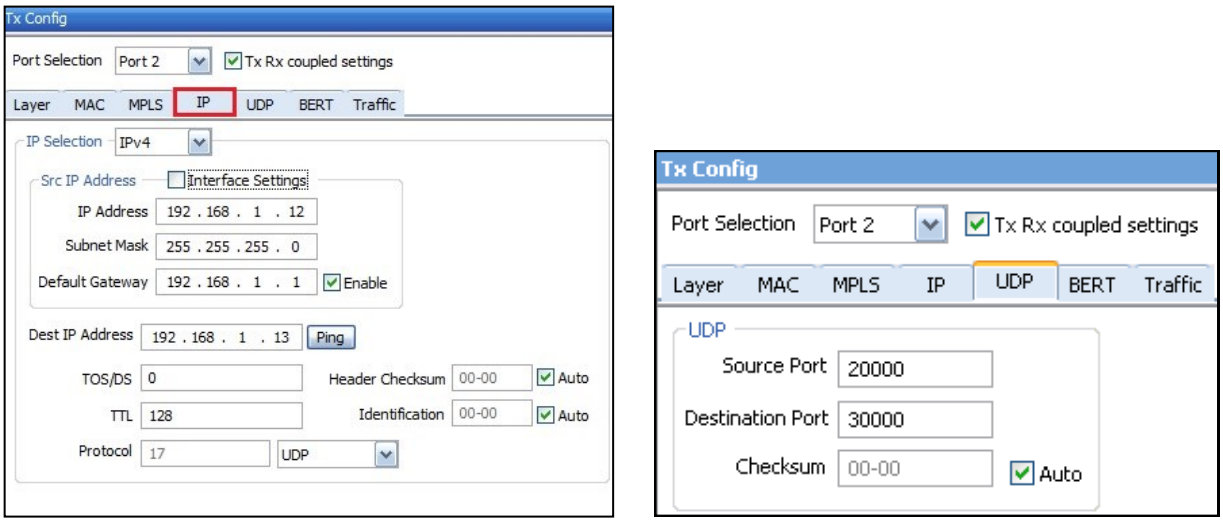
Packet Configuration over IP and UDP

PacketExpert™ allows users to configure Ethernet /MPLS / IP / UDP header parameters, including stacked VLAN IDs, stacked MPLS labels, Frame Size, and Rate.

Users can edit various packet header parameters at Layer2 (framed Ethernet), Layer 2.5 (stacked MPLS), Layer3 (IP) and Layer4 (UDP) for both BERT and RFC 2544 testing.

[Layer 3] - IP - allows Source and Destination IP Addresses. Users can configure various IP header fields like TOS, TTL, Protocol, Header Checksum, and Identification field.

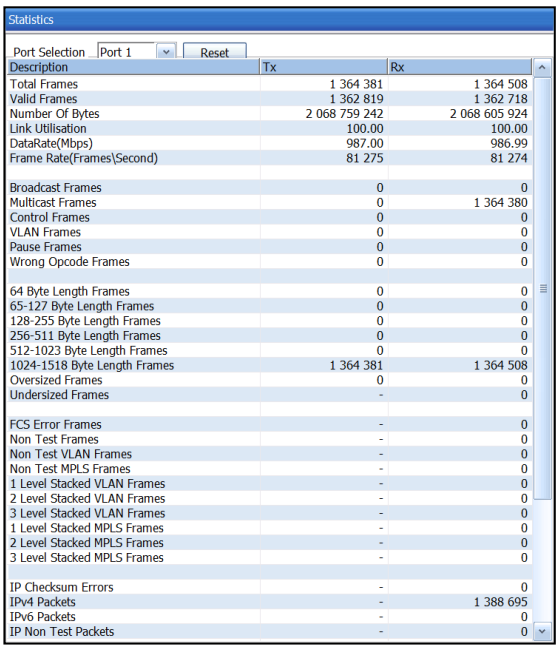
[Layer 4] - UDP - allows Source and Destination UDP ports to be defined. User can allow hardware to calculate / verify checksum or provide a fixed value.



IP and UDP Layers Configuration

Tx and Rx Frame Statistics

Detailed statistics per port are provided. In addition to statistics like Frame Count, Frame Rate, Link Utilization, others are provided based on various categories like Frame Type (Unicast/Broadcast/Multicast, VLAN), frame lengths (64, 65-127, 1024-1518, Oversized, Undersized), Protocol Type (IPv4, IPv6, UDP, TCP, ICMP, IGRP, etc.). VLAN Statistics (per Stack position), MPLS Statistics (per stack position) are also displayed for the configured stacks.



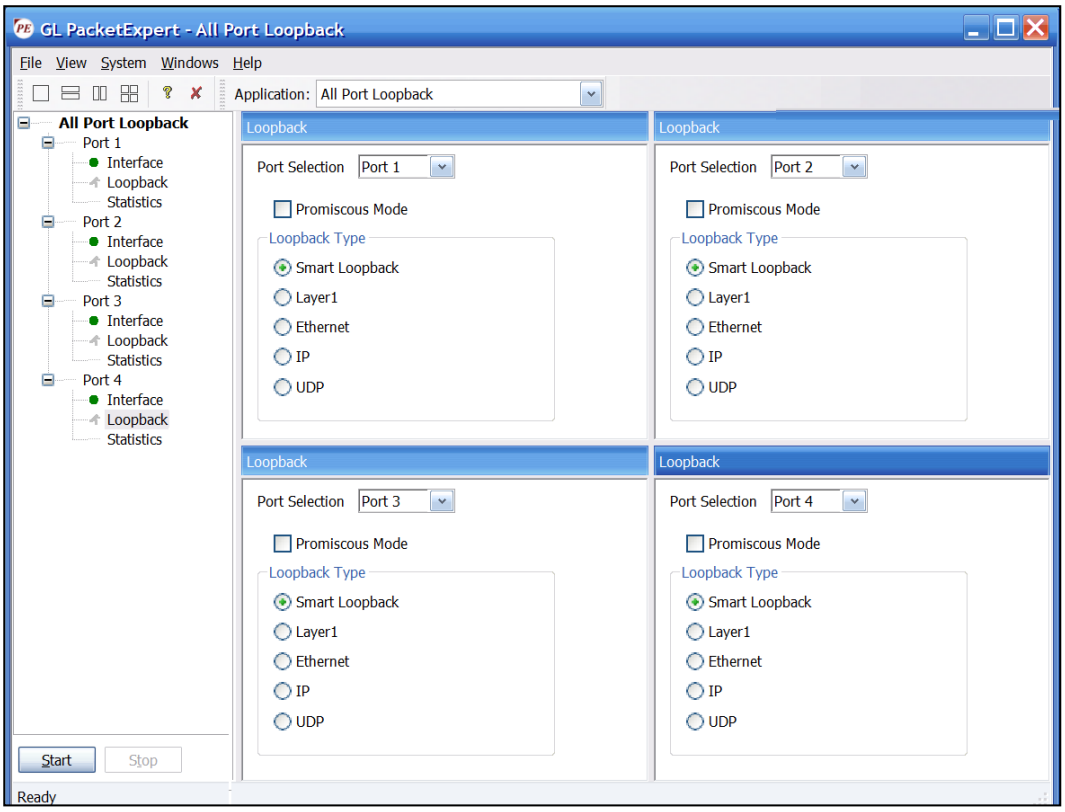
Description	Tx	Rx
Total Frames	1 364 381	1 364 508
Valid Frames	1 362 819	1 362 718
Number Of Bytes	2 068 759 242	2 068 605 924
Link Utilisation	100.00	100.00
DataRate(Mbps)	987.00	986.99
Frame Rate(Frames\Second)	81 275	81 274
Broadcast Frames	0	0
Multicast Frames	0	1 364 380
Control Frames	0	0
VLAN Frames	0	0
Pause Frames	0	0
Wrong Opcode Frames	0	0
64 Byte Length Frames	0	0
65-127 Byte Length Frames	0	0
128-255 Byte Length Frames	0	0
256-511 Byte Length Frames	0	0
512-1023 Byte Length Frames	0	0
1024-1518 Byte Length Frames	1 364 381	1 364 508
Oversized Frames	0	0
Undersized Frames	-	0
FCS Error Frames	-	0
Non Test Frames	-	0
Non Test VLAN Frames	-	0
Non Test MPLS Frames	-	0
1 Level Stacked VLAN Frames	-	0
2 Level Stacked VLAN Frames	-	0
3 Level Stacked VLAN Frames	-	0
1 Level Stacked MPLS Frames	-	0
2 Level Stacked MPLS Frames	-	0
3 Level Stacked MPLS Frames	-	0
IP Checksum Errors	-	0
IPv4 Packets	-	1 388 695
IPv6 Packets	-	0
IP Non Test Packets	-	0

General Port Statistics

Loopback Testing

PacketExpert™ has All ports / 2 ports Loopback capability. PacketExpert™ supports Layer-wise Loopback as well as Smart Loopback. Supported Loopback types are -

- **Smart Loopback** - Analyzes incoming traffic, automatically detects and swaps Source and Destination MAC, IP, and UDP addresses before sending back the packet
- **Layer-wise Loopback -** Swaps Source and destination MAC/IP/UDP addresses before sending back the packet and loops back the incoming packets



Loopback Testing

Command Line Interface (CLI)

PacketExpert™ is enhanced to support Command Line Interface (CLI) with additional CXE100 license to access all the functionalities remotely using , Python client ,C# client and MAPS™ CLI Server.

The CLI supports all the PacketExpert™ test modules including All Port Bert, Bert Loopback, All Port Loopback, RFC 2544, Record / Playback, PacketBroker, ExpertSAM™, and Multi-Stream Traffic Generation and Analysis.

Buyer's Guide

Item No	Product Description
PXE100	PacketExpert™ 1G
CXE100	CLI support for PXE100

Item No	Related Hardware
PXE104	PacketExpert™ - SA (4 ports) 1G
PXE112	PacketExpert™ - SA (12 Ports) 1G
PXE124	PacketExpert™ - SA (24 Ports) 1G

Item No	Related Software
PXE105	Wire speed Record/Playback 1G
PXE107	PacketBroker™ 1G
PXE108	Multi-Stream UDP/TCP Traffic Generator and Analyzer

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

For more details, refer to PacketExpert™ 1G webpage.

GL Communications Inc.
818 West Diamond Avenue - Third Floor, Gaithersburg, MD 20878, U.S.A
(Web) www.gl.com - (V) +1-301-670-4784 (F) +1-301-670-9187 - (E-Mail) info@gl.com