

Portable USB-based Optical and Ethernet/IP Tester

4 Electrical (10/100/1000Mbps) & 2 Optical Ports (1000Mbps)

BERT and RFC 2544 over Layer2 through Layer4

Wire Speed BERT on all Ports

Industry Standard PRBS Patterns (2^9-1 to $2^{31}-1$)

Throughput, Latency, Frame Loss Rate, & Back-to-Back Measurements - RFC 2544

Supports Stacked VLAN (Q-in-Q) up to 3 Levels

Supports Stacked MPLS (up to 3 Levels)

User-defined VLAN ID, and MPLS Labels

Report Generation in PDF & CSV Formats

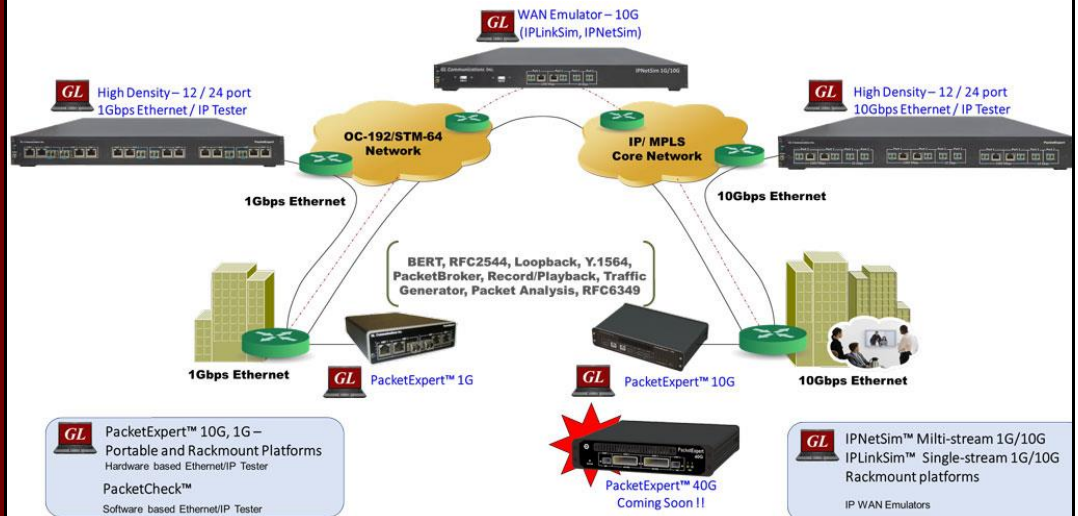
Layer-Wise and Smart Loopback

ITU-T Y.1564 ExpertSAM

Graphical Display for Easy to Visualize Test Results

Console based, GL's WCS based, and TCL based CLI Interfaces

PacketExpert™ 1G - Optical and Ethernet Tester



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 BERT, RFC 2544, Loopback, [Capture and Playback](#), [ExpertSAM](#), [PacketBroker](#), [Multi-Stream UDP/TCP Traffic Generator and Analyzer](#), and [ExpertTCP™](#)

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 and Wide Area Networks (WAN).

It can perform **Wire speed BERT (Bit Error Rate Testing)** on all ports simultaneously over Layer1, 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 various PRBS patterns, to properly test the Ethernet to IP link. With the capability to generate/receive traffic with stacked VLAN (Q-in-Q) and stacked MPLS, PacketExpert™ finds use in testing a wide range of networks – from testing individual links/switches, testing local Ethernet/IP networks (LAN), end-to-end testing of Wide Area Networks (WAN), testing Core/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 are - Throughput, Latency, Frame Loss and Back to Back tests as specified in RFC 2544.

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

GL also offers other Ethernet/IP tester variants such as - [HD-PacketExpert™](#) - a higher density 12/24 GigE ports form factor solution, [PacketExpert 10G™](#) - portable device with 10G optical ports, and WAN Emulators - [JPLinkSim™](#) and [IPNetSim™](#) for testing GigE switches, routers and network conditions.

For detailed information on PacketExpert™, visit <http://www.gl.com/optical-and-ethernet-testing-packetexpert.html>

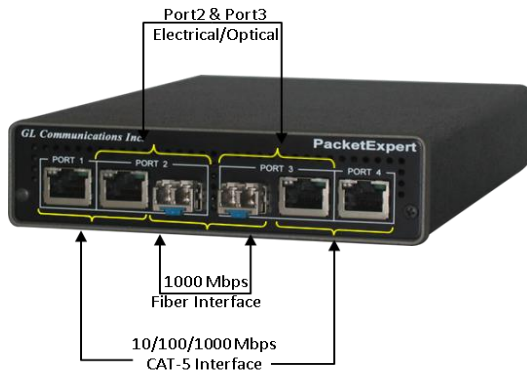


GL Communications Inc.

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Specifications



Interfaces	<ul style="list-style-type: none"> • 2 x 10/100/1000 Base-T Electrical 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	<ul style="list-style-type: none"> • RFC 2544 compliance
Bus Interface	<ul style="list-style-type: none"> • USB 2.0 or USB 3.0
Power	<ul style="list-style-type: none"> • +9 volts, 2.2 Amps
Temperature	<ul style="list-style-type: none"> • Operating Temperature: +5 to +40C • Non-Operating Temperature: -30 to +60C
Humidity	<ul style="list-style-type: none"> • Operating Humidity: 0% to 80% RH • Non-Operating Humidity: 0% to 95% RH
Altitude	<ul style="list-style-type: none"> • Operating Altitude: Up to 10,000 feet • Non-Operating Altitude: Up to 50,000 feet
Physical Specification	<ul style="list-style-type: none"> • 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)

Main Features

Operations	<ul style="list-style-type: none"> • Control multiple hardware units from a single GUI, multiplying the number of ports available per system. • Capability of remote operation, and automation using TCL and MAPS CLI (client-server) architecture
Wire speed BERT	<ul style="list-style-type: none"> • Traffic options lets technicians generate Ethernet to IP frames with user-configurable frame length, and frame size with varying traffic rates. • Supports industry standards PRBS patterns 2^9-1, $2^{11}-1$, $2^{15}-1$, $2^{20}-1$, $2^{23}-1$, $2^{29}-1$, and $2^{31}-1$, constant patterns like all ones, all zeroes, all 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 detecting 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	<ul style="list-style-type: none"> • Both smart loopback (auto layer detection) and layers-wise loopback capabilities for incoming traffic.
RFC 2544	<ul style="list-style-type: none"> • 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.
Statistics and Graphs	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • ExpertSAM - ITU-T Y.1564 Complete validation of Ethernet service-level agreements (SLAs) in a single test • Capture/Playback - Wirespeed Packet Capture, Filter, Drop (for real-time analysis) & 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 Analyses of up to 12 user defined streams of varying packet length traffic.



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Wire-speed BER Testing with Traffic Generation

Wire-speed BERT measures Bit Error Rate on Layer1, Framed Ethernet (Layer2), Stacked VLAN (Q-in-Q), 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. Rx Config includes an option to process received packets for FCS errors. BERT can be 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.

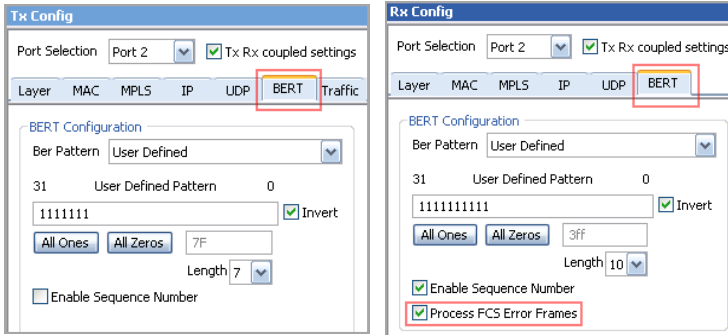


Figure: BERT payload with various PRBS patterns

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.

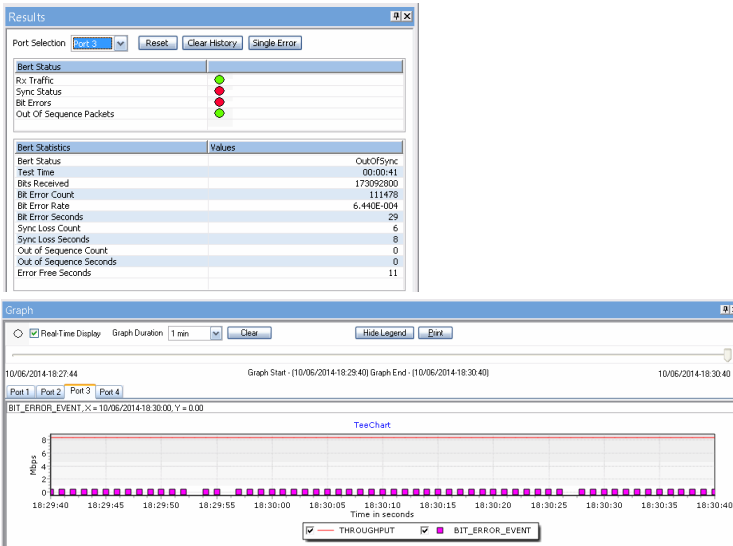


Figure: BERT Results (with LEDs) and Graph

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 put the port to 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.

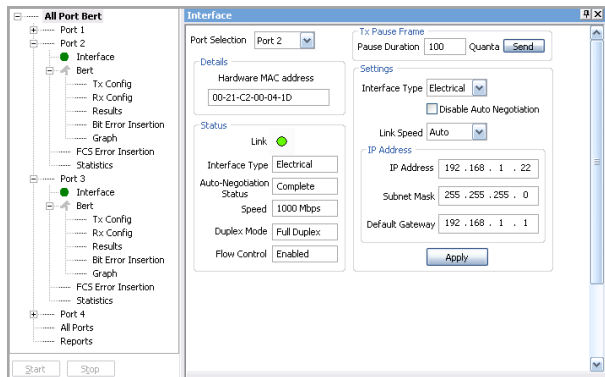


Figure: Interface Dialog & Link Status

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

BERT and RFC2544 testing over Ethernet [Layer 2] and MPLS [Layer 2.5] allows configuration of various layer parameters.

PacketExpert™ supports up to 3 level stacked VLANs (Q-in-Q) headers and stacked MPLS headers [Layer 2.5]. For each VLAN tag, user can specify the VLAN Type Field, VLAN Id and Priority. User can specify MPLS Label ID, CoS (*class of service*) bits and TTL field for each MPLS level (MPLS #1, MPLS #2 and MPLS #3).

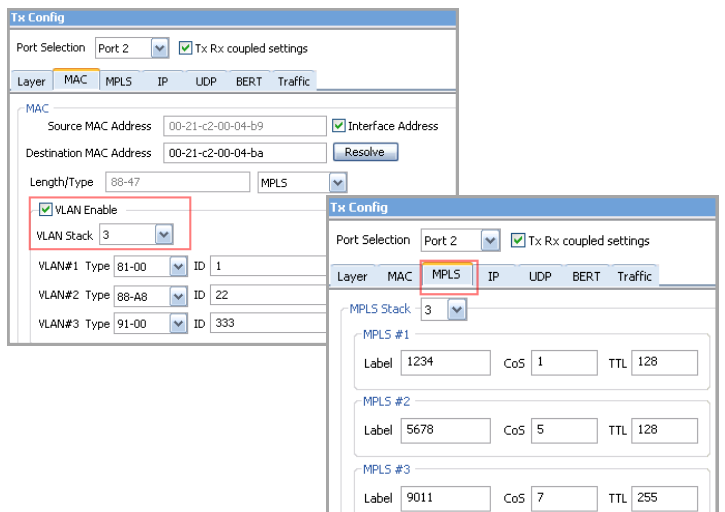


Figure: Stacked VLAN and MPLS Configurations



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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) & 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 choose to allow hardware to calculate/verify checksum or provide a fixed value.

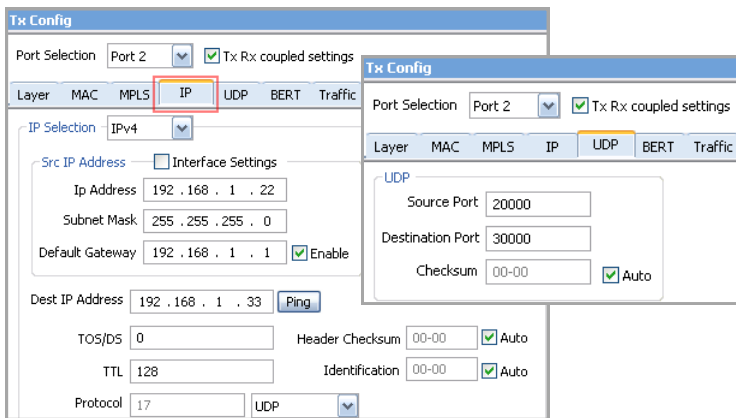


Figure: IP & UDP Layers Configuration

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.

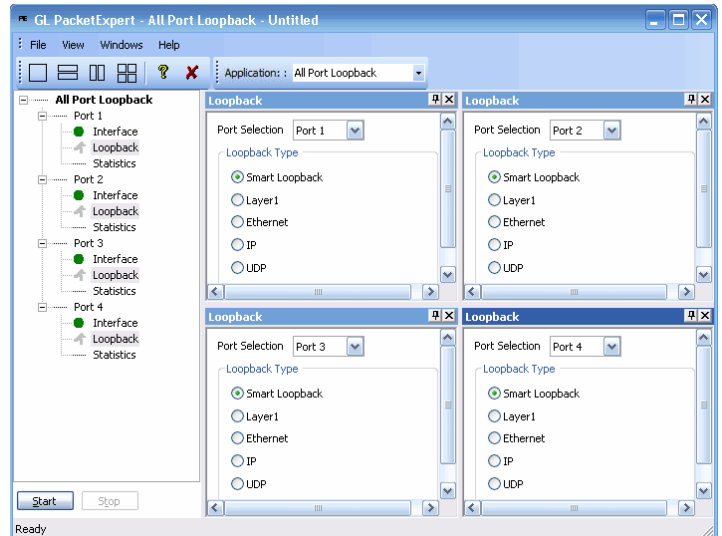
Description	Tx	Rx
Total Frames	1226255	1315204
Valid Frames	1226255	1315147
Number of Bytes	1861459798	1996383232
Link Utilization(%)	100.000	100.000
Data Rate (Mbps)	98.711	98.709
Frame Rate (Frames/Sec)	8128	8128
Broadcast Frames	1	1
Multicast Frames	0	9
Control Frames	0	9
VLAN Frames	0	0
Pause Frames	0	9
Wrong Opcode Frames	0	0
64 Byte Length Frames	0	9
65-127 Byte Length Frames	0	2
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	1226306	1315193
Oversized Frames	0	0
Undersized Frames	0	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	-	1449132
IPv6 Packets	-	0
IP Non Test Packet	-	0
IP in IP Packet	-	0
UDP in IP Packet	-	1449161
TCP in IP Packet	-	0
ICMP in IP Packet	-	0
IGMP in IP Packet	-	0
IGRP in IP Packet	-	0
Other Protocols in IP Packet	-	0
UDP Checksum Errors	-	0
UDP Packets	-	1449189
UDP Non Test Packets	-	0

Figure: 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** - Analyses 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 as is.



Command Line Interface (CLI)

PacketExpert™ is enhanced to support Command Line Interface (CLI) to access all the functionalities remotely using TCL 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

[PX100](#) – PacketExpert™ 1G

Related Hardware

[PX104](#) - PacketExpert™ - SA (4 ports) 1G

[PX112](#) - PacketExpert™ - SA (12 Ports) 1G

[PX124](#) - PacketExpert™ - SA (24 Ports) 1G

Related Software

[PX105](#) - Wire speed Record/Playback 1G

[PX106](#) - ExpertSAM™ 1G

[PX107](#) - PacketBroker™ 1G

[PX108](#) - Multi-Stream UDP/TCP Traffic Generator and Analyzer

For complete list, refer <http://www.gl.com/optical-and-ethernet-testing-packetexpert.html>



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