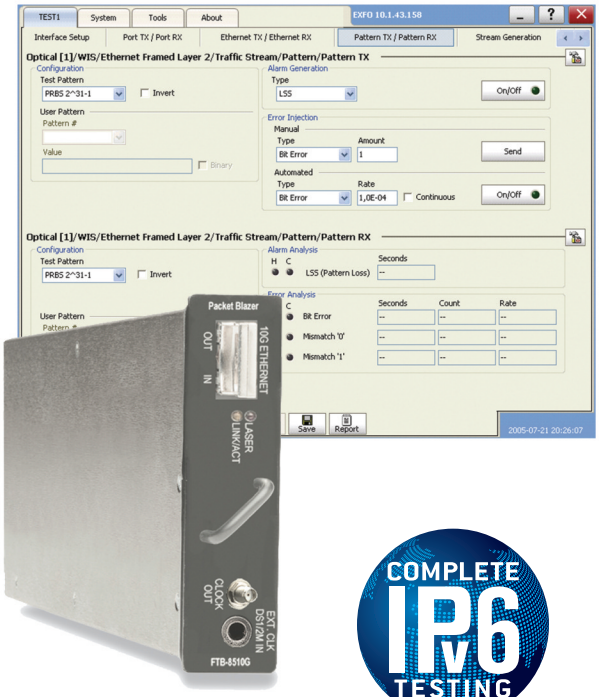
FTB-8510G

Packet Blazer

NETWORK TESTING–TRANSPORT AND DATACOM



Performance assurance for Ethernet-based services

- LAN and WAN PHY capability in a single module
- Fully integrated functionality for assessing the performance of Ethernet transport networks
- Packet jitter measurement to qualify Ethernet transport networks for transmission of delay-sensitive traffic such as video and voice-over-IP (VoIP)
- Throughput, back-to-back, latency and frame loss measurements as per RFC 2544 (bidirectional)
- EtherBERT™ test functionality for assessing the integrity of 10 Gigabit Ethernet running on WDM networks
- Multistream generation and analysis, allowing quality of service (QoS) verification through VLAN and TOS/DSCP prioritization testing
- MPLS and PBB-TE support for complete carrier Ethernet validation

Platform Compatibility

- FTB-500 Platform
- FTB-400 Universal Test System
- FTB-200 Compact Platform

Next-Generation Network Assessment

MEF
METRO ETHERNET FORUM

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EXPERTISE REACHING OUT

The Choice for 10 Gigabit Ethernet Performance Assurance

EXFO's FTB-8510G Packet Blazer™ offers performance assurance for 10 Gigabit Ethernet-based services. Its suite of test applications provides all the measurements required for validating service-level agreements (SLAs) between service providers and their customers. Housed in the FTB-500 Platform, FTB-400 Universal Test System or FTB-200 Compact Platform, the FTB-8510G module tests connectivity in its native format: 10GBASE-xR or 10GBASE-xW used for transport of Ethernet-based LAN-to-LAN services. It can also be used to test next-generation SONET/SDH, hybrid multiplexers, dark fiber or xWDM networks running 10 Gigabit Ethernet interfaces.

Combined with its rack-mounted manufacturing/R&D-environment counterpart, the IQS-8510G Packet Blazer, the FTB-8510G simplifies and speeds up the deployment of Ethernet services.

The FTB-8510G Packet Blazer 10 Gigabit Ethernet Test Module can be housed in the FTB-200 Compact Platform. Also shown in the platform, is the FTB-8510B Ethernet Test Module.

The FTB-8510G Packet Blazer 10 Gigabit Ethernet Test Module is also compatible with the FTB-400 Universal Test System and FTB-500 Platform. Shown in the FTB-400, are the FTB-8510B Packet Blazer Ethernet Test Module and the FTB-8130 Transport Blazer Next-Generation SONET/SDH Test Module.

Key Features

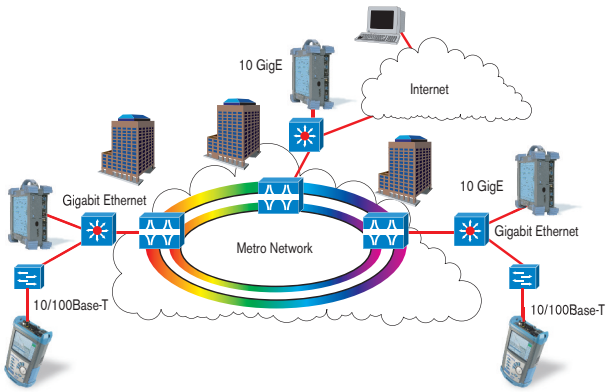
- Measures throughput, back-to-back, latency and frame loss as per RFC 2544 (bidirectional results through dual test set)
- EtherBERT™* for bit-error-rate testing of 10 Gigabit Ethernet circuits
- Performs packet jitter measurement (IP packet-delay variation as per RFC 3393) to qualify Ethernet transport networks for transmission of delay-sensitive traffic such as video and voice-over-IP (VoIP)
- Q-in-Q capability with the ability to go up to three layers of stacked VLANs
- LAN PHY and WAN PHY available in a single module
- Simultaneous traffic generation and reception at 100 % wire speed for 10GBASE-SR, -ER, -LR, -SW, -EW or -LW full-duplex interfaces at all valid frame sizes
- Transmits and analyzes up to 10 streams, perfect for installing, commissioning and maintaining Ethernet networks
- UDP, TCP and IP header integrity validation
- Expert mode capability for defining test pass/fail thresholds
- Easy-to-use smart user interface (SUI) for configurable screens, customization of test suites, as well as real-time and historical performance reporting
- Capability to remote control the Packet Blazer test module with the Visual Guardian Lite software or VNC
- Advanced filtering capability for in-depth network troubleshooting
- PBB-TE and MPLS support for carrier Ethernet
- Smart Loopback
- Service disruption time measurement
- Internet protocol version 6 (IPv6 testing)

* Patent-pending

Ethernet Performance Validation

The Internet Engineering Task Force (IETF) has put together a test methodology to address the issues of layers 2 and 3 performance verification. RFC 2544, a "Benchmarking Methodology for Network Interconnect Devices," specifies the requirements and procedures for testing throughput (performance availability), back-to-back frames (link burstability), frame loss (service integrity) and latency (transmission delay).

These measurements provide a baseline for service providers to define customer SLAs. They enable service providers to validate quality of service (QoS), allowing them to create value-added services that can be measured and demonstrated to customers. For example, these tests provide performance statistics and commissioning verification for virtual LANs (VLANs), virtual private networks (VPNs) and transparent LAN services (TLS), all of which use Ethernet as an access technology.



Testing can be performed end-to-end or end-to-core, depending on the SLA. Remote testing is also possible.

RFC 2544 Test Suite

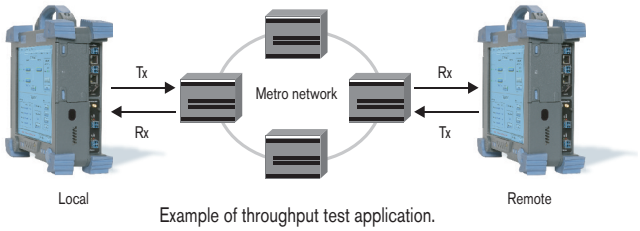
The FTB-8510G Packet Blazer can perform the RFC 2544 test suite for 10 GbE LAN/WAN interface at all frame sizes and at full line rate, allowing the provider to certify that the circuit is efficient and error-free at 100 % utilization.

The Packet Blazer supports automated RFC 2544 testing, which helps ensure repeatable results. Automation also provides ease of use for field technicians by enabling accurate, efficient measurements and results through a clear and simple pass/fail indication. In addition, the Packet Blazer delivers reports that can be given to customers for future reference related to their specific SLAs.

Throughput

Throughput is the maximum rate at which none of the offered frames are dropped by the device under test (DUT) or network under test (NUT). For example, the throughput test can be used to measure the rate-limiting capability of a switch. The throughput is essentially equivalent to the bandwidth.

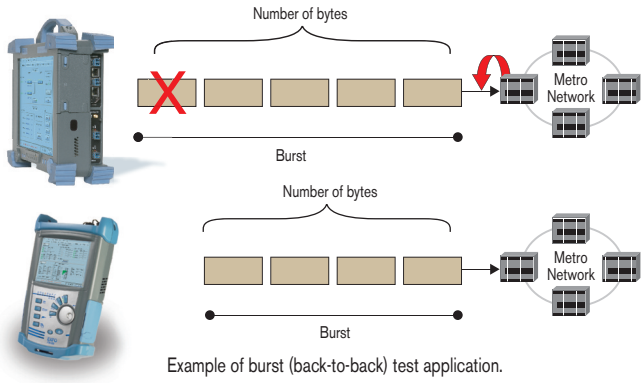
The throughput test allows vendors to report a single value, which has proven to be useful in the marketplace. Since even the loss of one frame in a data stream can cause significant delays while waiting for the higher level protocols to time out, it is useful to know the actual maximum data rate that the device can support. Measurements should be taken over an assortment of frame sizes.



Example of throughput test application.

Burst (Back-to-Back)

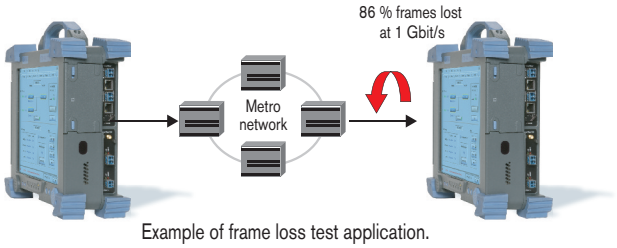
In this test, fixed-length frames are presented at a rate such that there is the minimum legal separation for a given medium between frames over a configurable period of time, starting from an idle state. The back-to-back value is the number of frames in the longest burst that the DUT/NUT will handle without the loss of any frames.



Example of burst (back-to-back) test application.

Frame Loss

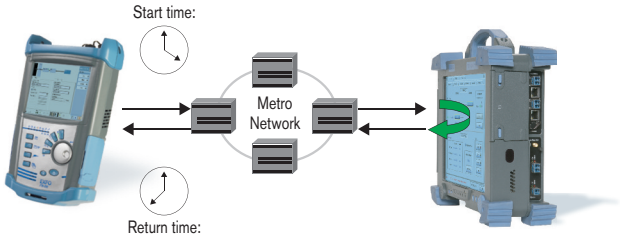
Frame loss is the percentage of frames that should have been forwarded by a DUT/NUT under steady state (constant) loads that were not forwarded due to lack of resources. This measurement can be used in reporting the performance of a network device in an overloaded state. This can be a useful indication of how a device would perform under pathological network conditions such as broadcast storms.



Example of frame loss test application.

Latency

Round-trip latency is the time it takes a bit (cut-through devices) or a frame (store and forward devices) to come back to its starting point. Variability of latency can be a problem. With technologies like voice- and video-over-IP, a variable or long latency can cause significant degradation in quality.



Example of latency test application.

Efficient Testing Leads to Reliable Performance

PBB-TE and MPLS: Carrier Ethernet Transport Solution Testing

As technologically-sophisticated business and residential consumers continue to drive demand for premium, high-bandwidth data services such as voice and video, service providers worldwide are evolving their transport infrastructures to support these bandwidth and quality intensive services. No longer is an all-IP core sufficient; providers must now expand their IP convergence to the edge/metro network, in a cost-effective, quality-assured manner. Ethernet has long been accepted as an inexpensive, scalable data networking solution in LAN environments. The stringent quality of service expectations require solutions that tap into the cost-effectiveness of Ethernet without sacrificing the benefits of connection-oriented (albeit it costly) TDM solutions such as SONET/SDH.

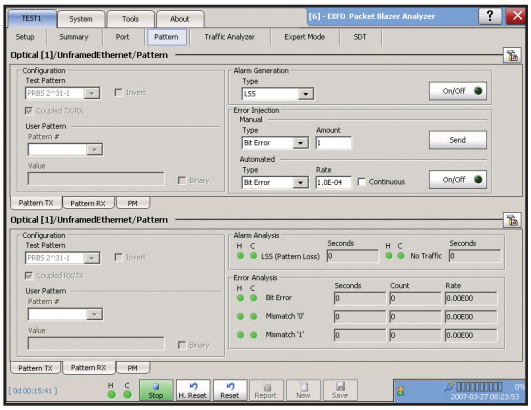
Two Ethernet tunneling technologies address these requirements: provider backbone bridge-traffic engineering or PBB-TE (also referred to as PBT) and transport MPLS. These two technologies enable connection-oriented Ethernet, providing carriers with a means of offering scalable, reliable and resilient Ethernet services. The PBB-TE and MPLS options on the FTB-8510G Packet Blazer offer service providers a comprehensive field tool to efficiently qualify Ethernet services from end to end, validating metro and core tunneling technologies.

EtherBERT™

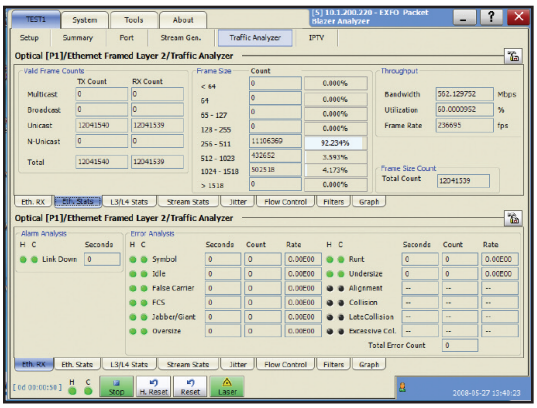
Ethernet is increasingly carried across a variety of layer 1 media over longer distances. This creates a growing need for the certification of Ethernet transport on a bit-per-bit basis, which can be done using bit-error-rate testing (BERT).

BERT uses a pseudo-random binary sequence (PRBS) encapsulated into an Ethernet frame, making it possible to go from a frame-based error measurement to a bit-error-rate measurement. This provides the bit-per-bit error count accuracy required for acceptance testing of physical-medium transport systems. BERT-over-Ethernet should usually be used when Ethernet is carried transparently over layer 1 media, in cases such as:

- Ethernet-over-DWDM
- Ethernet-over-CWDM
- Ethernet-over-dark fiber



BERT analysis screen.

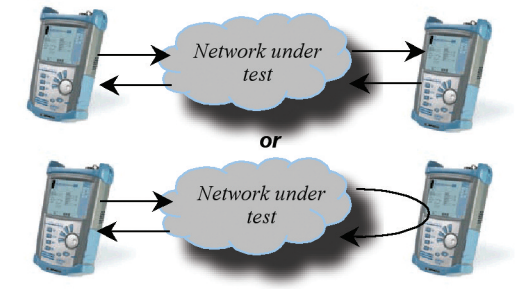


Ethernet statistics screen.

Ethernet and IP QoS Testing

Data services are making a significant shift toward supporting a variety of applications on the same network. This shift has fuelled the need for QoS testing to ensure the condition and reliability of services. By providing the ability to configure different Ethernet and IP QoS parameters such as VLAN ID (802.1Q), VLAN priority (802.1p), VLAN stacking (802.1ad Q-in-Q), ToS and DSCP on multiple streams, the Packet Blazer allows service providers to simulate and qualify different types of applications running over their Ethernet network.

This FTB-8510G Packet Blazer frame analysis feature enables multistream traffic generation and analysis allowing for the troubleshooting of Ethernet circuits as well as customer-traffic analysis and error identification. Thanks to its packet jitter measurement capability (RFC 3393), the FTB-8510G lets service providers efficiently benchmark transport networks when it comes to delay-sensitive traffic such as voice- and video-over-IP.



End-to-end testing options.

Flexible End-to-End Testing

With the FTB-8510G Packet Blazer, the user can perform end-to-end testing through control of the remote unit via the LAN connection under test. This unique approach gives service providers access to test results for each direction of test, which is essential to fully qualify Ethernet services. It is also possible to perform end-to-end testing by using the Smart Loopback mode where the remote unit will return traffic to the local unit by swapping packet overhead up to layer 4 of the OSI stack.

Ethernet Advanced Troubleshooting

The FTB-8510G provides a number of advanced features essential for in-depth troubleshooting in the event of network failures or impairments. The advanced filtering option allows the user to configure up to ten filters with each up to four operands, which will be applied to the received Ethernet traffic. Detailed statistics are available for each configured filter providing the user with critical information required to pinpoint specific problems.

Functional Specifications

OPTICAL INTERFACES

	10GBASE-SW	10GBASE-SR	10GBASE-LW	10GBASE-LR	10GBASE-EW	10GBASE-ER
Wavelength	850 nm Multimode	850 nm Multimode	1310 nm Singlemode	1310 nm Singlemode	1550 nm Singlemode	1550 nm Singlemode
Tx level (802.3ae-compliant)	–7.3 to –1 dBm	–7.3 to –1 dBm	–8.2 to 0.5 dBm	–8.2 to 0.5 dBm	–4.7 to 4.0 dBm	–4.7 to 4.0 dBm
Rx level sensitivity	–9.9 to –1.0 dBm	–9.9 to –1.0 dBm	–14.4 to 0.5 dBm	–14.4 to 0.5 dBm	–15.8 to –1.0 dBm	–15.8 to –1.0 dBm
Transmission bit rate	9.95328 Gbit/s ± 4.6 ppm*	10.3125 Gbit/s ± 4.6 ppm*	9.95328 Gbit/s ± 4.6 ppm*	10.3125 Gbit/s ± 4.6 ppm*	9.95328 Gbit/s ± 4.6 ppm*	10.3125 Gbit/s ± 4.6 ppm*
Reception bit rate	9.95328 Gbit/s ± 150 ppm	10.3125 Gbit/s ± 150 ppm	9.95328 Gbit/s ± 150 ppm	10.3125 Gbit/s ± 150 ppm	9.95328 Gbit/s ± 150 ppm	10.3125 Gbit/s ± 150 ppm
Tx operational wavelength range (802.3ae-compliant)	840 nm to 860 nm	840 nm to 860 nm	1260 nm to 1355 nm	1260 nm to 1355 nm	1530 nm to 1565 nm	1530 nm to 1565 nm
Measurement accuracy (uncertainty)						
frequency	±4.6 ppm	±4.6 ppm	±4.6 ppm	±4.6 ppm	±4.6 ppm	±4.6 ppm
optical power	±2 dB	±2 dB	±2 dB	±2 dB	±2 dB	±2 dB
Maximum Rx before damage	0 dBm	0 dBm	1.5 dBm	1.5 dBm	4.0 dBm	4.0 dBm
Jitter compliance	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae
Ethernet classification	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae
Laser type	VCSEL	VCSEL	DFB	DFB	EML	EML
Eye safety	Class 1 laser; complies with 21 CFR 1040.10 and IEC 60825-1	Class 1 laser; complies with 21 CFR 1040.10 and IEC 60825-1	Class 1 laser; complies with 21 CFR 1040.10 and IEC 60825-1	Class 1 laser; complies with 21 CFR 1040.10 and IEC 60825-1	Class 1M laser; complies with 21 CFR 1040.10 and IEC 60825-1	Class 1M laser; complies with 21 CFR 1040.10 and IEC 60825-1
Connector	Duplex LC	Duplex LC	Duplex LC	Duplex LC	Duplex LC	Duplex LC
Transceiver type (compliant with XFP MSA)	XFP	XFP	XFP	XFP	XFP	XFP

* When clocking is in internal mode

SYNCHRONIZATION INTERFACES

DS1/E1 external input clock interface

Parameter	DS1	E1
Rx level sensitivity (short haul only)	For 772 kHz: TERM: 6 dB (cable loss only)	For 1024 kHz: TERM: 6 dB (cable loss only)
Reception bit rate	1.544 Mbit/s ± 50 ppm	2.048 Mbit/s ± 50 ppm
Input jitter tolerance	AT&T PUB 62411, GR-499 section 7.3	G.823 section 7.2
Line coding	AMI and B8ZS	HDB3 and AMI
Input impedance (resistive termination)	100 ohms ± 5 %, balanced	120 ohms ± 5 %, balanced
Connector type	BANTAM	BANTAM

Clock out interface

Parameter		Value	
Tx pulse amplitude		600 mVpp ± 130 mV	
Transmission frequency		LAN	WAN
	Clock divider = 16	644.53 MHz	622.08 MHz
	Clock divider = 32	322.266 MHz	311.04 MHz
	Clock divider = 64	161.133 MHz	155.52 MHz
Output configuration		AC coupled	
Load impedance		50 ohms	
Maximum cable length		3 meters	
Connector type		SMA	

Functional Specifications (Cont'd)

OPTICAL INTERFACES

Optical interfaces	10 GigE LAN and 10 GigE WAN [a]	
Available wavelengths	850, 1310 and 1550 nm	

ELECTRICAL INTERFACES

Electrical interfaces	External clock DS1/E1 and clock output	
External clock DS1/E1	Line coding	DS1: AMI and B8ZS E1: AMI and HDB3
	Termination mode	DS1/E1: Term
	Framing	DS1: SF and ESF E1: PCM30, PCM30CRC, PCM31 and PCM31CRC
	Clocking	Internal, external (BITS) and recovered
Clock output	Clock out	Clock out divider: 16, 32 and 64

TESTING

RFC 2544	Throughput, back-to-back, frame loss and latency measurements according to RFC 2544. Frame size: RFC-defined sizes, user-configurable (bidirectional).
BERT	Unframed layer 1 up to layer 4 with or without VLAN Q-in-Q.
Patterns (BERT)	PRBS 2E9-1, PRBS 2E11-1, PRBS 2E15-1, PRBS 2E20-1, PRBS 2E23-1, PRBS 2E31-1, and up to ten user patterns.
Error insertion (BERT)	FCS, bit, 64B/66B Block.
Error measurement	LAN/WAN: jabber/giant, runt, undersize, oversize, FCS, 64B/66B Block. WAN: B1, B2, B3, REI-L, REI-P, UDP, TCP and IP header checksum.
Error measurement (BERT)	Bit error, bit mismatch 0, bit mismatch 1, performance monitoring (G.821 and G.826).
Alarm insertion	LOS, link down, local fault, remote fault, LSS (BERT). WAN: SEF, LOF, AIS-L, RDI-L, AIS-P, RDI-P, LCD-P, LOP-P, ERDI-PSD, ERDI-PCD, ERDI-PPD, UNEQ-P.
Alarm detection	LOS, link down, local fault, remote fault, frequency offset, LSS (BERT). WAN: SEF, LOF, AIS-L, RDI-L, AIS-P, RDI-P, LCD-P, LOP-P, ERDI-PSD, ERDI-PCD, ERDI-PPD, PLM-P, UNEQ-P, Link (WIS).
Service disruption time measurement (BERT)	Defect or No Traffic mode. Disruption time statistics include shortest, longest, last, average, total and count.
Multistream generation	Capability to transmit up to 10 streams. Configuration parameters are: packet size, transmission mode (burst, ramp or continuous), MAC source/destination address, VLAN ID, VLAN priority, IP source/destination address, ToS field, DSCP field and UDP source/destination port.
VLAN stacking (Q-in-Q)	Capability to generate streams with up to three layers of VLAN (including IEEE802.1ad QinQ tagged VLAN) and to filter received traffic by VLAN ID or VLAN priority at any of the stacked VLAN layers.
Traffic analysis	Capability to analyze the incoming traffic and provide statistics according to a set of up to ten configurable filters. Filters can be configured for MAC source/destination address, VLAN ID, VLAN priority, IP source/destination address, ToS field, DSCP field, TCP source/destination port and UDP source/destination port. VLAN filtering can be applied to any of the stacked VLAN layers.
Ethernet statistics	Multicast, broadcast, unicast, N-unicast, pause frame, frame size distribution, bandwidth, utilization, frame rate, frame loss, out-of-sequence frames, in-sequence frames.
Jitter statistics	Generation: packet jitter simulation: VoIP G.711, VoIP G.723.1, G.729, user-defined. Analysis: delay variation statistics (ms): min., max., last, average, number of samples, jitter measurement estimate.
Flow control injection (frame analyzer)	Packet pause time.
Flow control statistics (frame analyzer and RFC 2544)	Pause time, last pause time, max. pause time, min. pause time, paused frames, abort frames, frames Tx, frames Rx.
Advanced filtering [a]	Capability to configure up to ten filters of four fields each that can be combined with AND/OR/NOT operations. A mask is also provided for each field value to allow for wildcards. Complete statistics are gathered for each defined filter.
PBB-TE [a]	Capability to generate and analyze streams with PBB-TE data traffic, including configuration of B-MAC (source and destination), B-VLAN and I-tag (as per 802.1ah), and to filter received traffic by any of these fields.
MPLS [a]	Capability to generate and analyze streams with up to two layers of MPLS labels and to filter received traffic by MPLS label or COS.
IPv6 [a]	Capability to perform BERT, RFC 2544, traffic generation and analysis and Smart Loopback tests over IPv6.

ADDITIONAL TEST AND MESUREMENT FUNCTIONS

Power measurement	Supports optical power measurement, displayed in dBm.
Frequency measurement	Supports clock frequency offset generation and measurements (i.e., received frequency and deviation of the input signal clock from nominal frequency).
Frequency offset generation	
Range	±120 ppm
Resolution	±1 ppm
Accuracy (uncertainty)	±4.6 ppm
Frequency offset measurement	
Range	±150 ppm
Resolution	±1 ppm
Accuracy (uncertainty)	±4.6 ppm
Signal label control and monitoring	Ability to configure and monitor J0 trace, J1 trace and payload signal label C2 (WAN).
Dual test set	Performs end-to-end, bidirectional performance testing (as required by leading standards bodies)–remote Packet Blazer controlled via the LAN connection under test.
DHCP client	Capability to connect to a DHCP server to obtain its IP address and subnet mask to connect to the network.
Smart Loopback	Capability to return traffic to the local unit by swapping packet overhead up to layer 4 of the OSI stack.

ADDITIONAL FEATURES

Expert mode	Ability to set thresholds in RFC 2544 and BERT mode to provide a PASS/FAIL status.
Scripting [b]	The built-in Visual Basic .NET scripting engine and embedded macrorecorder provide a simple means of automating test cases and routines. Embedded scripting routines provide a powerful means of creating advanced test scripts.
Event logger	Supports logging of test results, and the ability to print, export (to a file), or export the information contained in the logging tool.
Power up and restore [b]	In the event of a power failure to the unit, the active test configuration and results are saved and restored upon bootup.
Save and load configuration	Ability to store and load test configurations to/from non-volatile memory.
Configurable test views [b]	Allows users to customize their test views, i.e., to dynamically insert or remove test tabs/windows, in addition to creating new test windows, so as to accurately match their testing needs.
Configurable test timer	Allows a user to set a specific start and stop time for tests.
Test favorites	Capability to select and load from predefined or user-modified test conditions.
Report generation	Ability to generate test reports in the following user-selectable formats: .pdf, .html, .txt and .csv.
Graph	Allows to graphically display the test statistics of the performance (RFC 2544) and frame analysis tests.
Screen capturing	Capability to gather a snap-shot of the screen for future use.
Logger printing [c]	Capability to send logger messages to a supported local printer.
Remote control	Remote control through Visual Guardian Lite software or VNC.

NOTES

a. Available as an option. b. Available on the FTB-200 platform only. c. Available on the FTB-400, FTB-500, IQS-500 and IQS-600 platforms only.

MODULE SPECIFICATIONS

	FTB-8510G-LAN	FTB-8510G-WAN	FTB-8510G-LAN/WAN
Port	One 10 Gigabit Ethernet port	One 10 Gigabit Ethernet port	One 10 Gigabit Ethernet port
Connector type	LC	LC	LC
Optical transceiver	850 nm optics (10GBASE-SR) 1310 nm optics (10GBASE-LR) 1550 nm optics (10GBASE-ER)	850 nm optics (10GBASE-SW) 1310 nm optics (10GBASE-LW) 1550 nm optics (10GBASE-EW)	850 nm optics (10GBASE-SR/-SW) 1310 nm optics (10GBASE-LR/-LW) 1550 nm optics (10GBASE-ER/-EW)
Port capacity	Full-line-rate traffic generation and analysis	Full-line-rate traffic generation and analysis	Full-line-rate traffic generation and analysis
Ethernet testing	RFC 1242, RFC 2544, RFC 3393, multistream traffic generation and analysis, EtherBERT	RFC 1242, RFC 2544, RFC 3393, multistream traffic generation and analysis, EtherBERT	RFC 1242, RFC 2544, RFC 3393, multistream traffic generation and analysis, EtherBERT

GENERAL SPECIFICATIONS

Size (H x W x D)	96 mm x 25 mm x 280 mm	(3 ¾ in x 1 in x 11 in)
Weight (without transceiver)	0.5 kg	(1.2 lb)
Temperature		
operating	0 °C to 40 °C	(32 °F to 104 °F)
storage	–40 °C to 60 °C	(–40 °F to 140 °F)

ORDERING INFORMATION

MODULE

FTB-8510G-XX-XX

Model

FTB-8510G-LAN = Packet Blazer 10 GigE, 1 port 10 Gigabit Ethernet LAN PHY (10.3125 Gbit/s)

FTB-8510G-WAN = Packet Blazer 10 GigE, 1 port 10 Gigabit Ethernet WAN PHY (9.953 Gbit/s)

FTB-8510G-LAN/WAN = Packet Blazer 10 GigE, 1 port 10 Gigabit Ethernet LAN and WAN PHY (10.3125 and 9.953 Gbit/s)

Example: FTB-8510G-LAN-MPLS

Other options

00 = Without other options
PBB-TE = PBB-TE testing
MPLS = MPLS testing
Adv_filtering = Advanced filtering capabilities
IPv6 = IPv6 testing capabilities

TRANSCEIVER

FTB-85900 = 10GBase-SR/-SW (850 nm, LAN/WAN PHY) LC connectors; optical XFP transceiver module for 8510G Packet Blazer

FTB-85901 = 10GBase-LR/-LW (1310 nm, LAN/WAN PHY) LC connectors; optical XFP transceiver module for 8510G Packet Blazer

FTB-85902 = 10GBase-ER/-EW (1550 nm, LAN/WAN PHY) LC connectors; optical XFP transceiver module for 8510G Packet Blazer

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