ETHERNET TEST MODULE

FTB-8510 Packet Blazer

NETWORK TESTING – TRANSPORT AND DATACOM

Platform Compatibility

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

Fully integrated test solution for assessing the performance of Ethernet transport networks

- Throughput, back-to-back, latency and frame loss measurements as per RFC 2544
- Packet-jitter measurement for assessing the capability of Ethernet transport networks to transmit delay-sensitive traffic such as voice over IP (VoIP) and video
- EtherBERT™ test functionality for assessing the integrity of Ethernet services running on WDM networks
- Multiple-stream generation and analysis, allowing QoS verification through VLAN and TOS/DSCP prioritization testing
- TCP throughput measurements for assessing application data transmission over a TCP connection

Assessing the Performance of Ethernet Services

EXFO's FTB-8510 Packet Blazer™ brings performance assurance to Ethernet-based services. Its wide range of test functionalities provides all the necessary measurement tools for verifying service-level agreements (SLAs) between service providers and their customers.

The FTB-8510 module tests connectivity in its native format: 10/100/1000Base-T, 1000Base-SX, 1000Base-LX and 1000Base-ZX for LAN-to-LAN services delivered via ATM, frame relay, Next-Generation SONET/SDH, SONET/SDH hybrid multiplexers, switched Ethernet, VLANs, dark fiber, WDM, FTTx systems or other means.

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

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

The FTB-8510 Packet Blazer Ethernet Test Module is compatible with the FTB-400 Universal Test System, EXFO's rugged, all-in-one portable platform. Also shown in the platform, the FTB-8510G Packet Blazer 10 Gigabit Ethernet Test Module and the FTB-8130 Next-Generation SONET/SDH Test Module.

KEY FEATURES

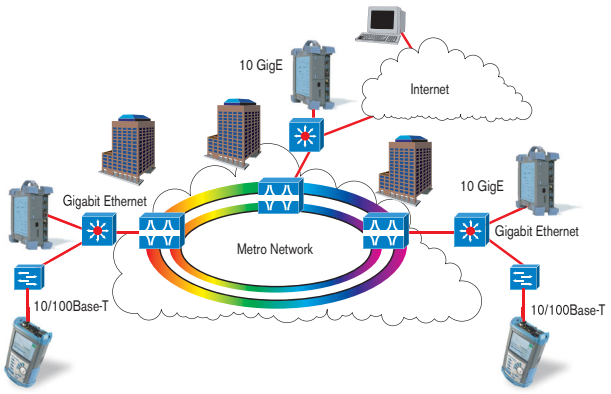
- Measures throughput, back-to-back, latency and frame loss as per RFC 2544
- EtherBERT™ for bit-error-rate testing of 10, 100 and 1000 Mbit/s Ethernet circuits
- TCP throughput measurements that provide performance indicators relevant to the transmission of application data over a reliable TCP connection
- 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 voice over IP (VoIP) and video
- Simultaneous traffic generation and reception at 100% wire speed for 10/100/1000Base-T, 1000Base-SX, 1000Base-LX or 1000Base-ZX full-duplex networks at all packet sizes
- Transmits and analyzes multiple streams, perfect for installing, commissioning and maintaining Ethernet networks
- Q-in-Q capability with the ability to go up to three layers of stacked VLANs
- UDP, TCP and IP header integrity validation
- Dual port capability for 10/100/1000Base-T and optical GigE
- Dual test set for end-to-end, bidirectional performance testing (as required by leading standards bodies)–remote Packet Blazer controlled via the LAN connection under test
- Dual test set
- Easy-to-use Smart User Interface (SUI) for configurable screens, customization of test suites, as well as real-time and historical performance reporting
- Remote control capability through the Visual Guardian Lite and VNC software

Ethernet Performance Validation

The Internet Engineering Task Force (IETF) has put together a test methodology to address the issues of performance verification at the layer 2 and 3 level. 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).

When these measurements are performed, they provide a baseline for service providers to define SLAs with their customers. They enable service providers to validate the quality of service (QoS) delivered and can provide them with a tool 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.

The SLA criteria defined in RFC 2544 can be precisely measured using specialized test instruments. The performance verification is usually done when the installation is completed. The measurements are done out-of-service to make sure that all parameters are controlled.



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

RFC 2544 Test Suite

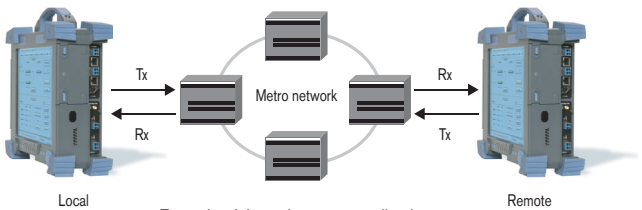
The FTB-8510 Packet Blazer can perform the RFC 2544 test suite for 10/100/1000Base-T and optical GigE interfaces at all frame sizes and at full line rate, in order to allow the provider to certify that the circuit is efficient and error-free at 100% utilization.

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. Separate measurements should be made for routed and bridged data in those devices that can support both. If there is a checksum in the received frame, full checksum processing should be done.

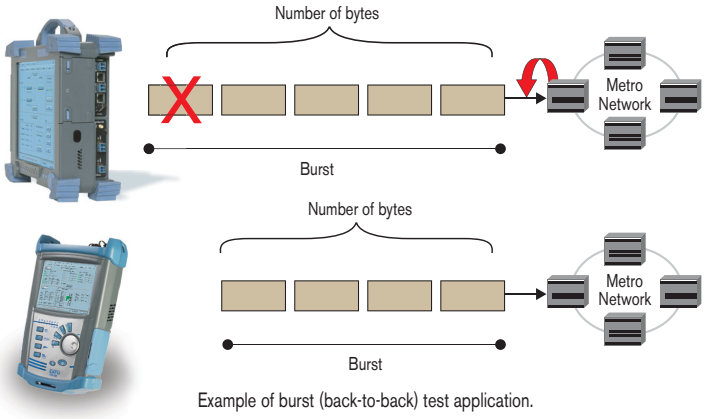


Example of throughput test application.

Ethernet Performance Validation (Cont'd)

Burst (Back-to-Back)

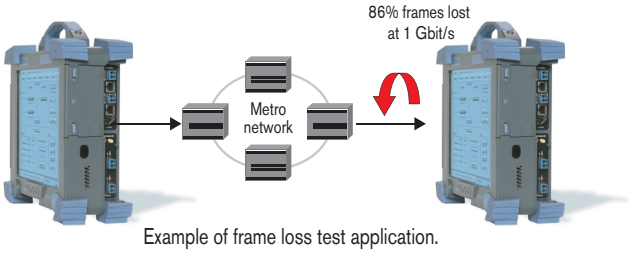
In this test, fixed-length frames are presented at a rate such that there is the minimum legal separation for a given medium between frames over a configurable period of time, starting from an idle state. The back-to-back value is the number of frames in the longest burst that the DUT/NUT will handle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



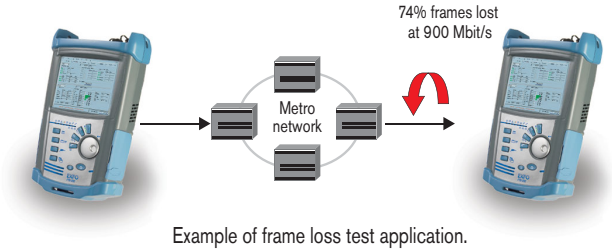
Example of burst (back-to-back) test application.

Frame Loss

Frame loss is the percentage of frames that should have been forwarded by a network device 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.



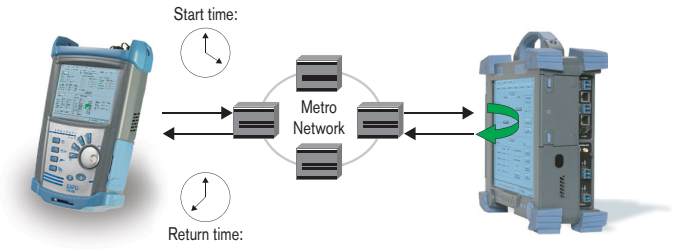
Example of frame loss test application.



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.

TCP Throughput

The Internet protocol (IP) and transmission control protocol (TCP) together form the essence of TCP/IP networking. While IP deals with the delivery of packets, TCP provides the integrity and assurance that the data packets transmitted by one host are reliably received at the destination. Applications such as hypertext transfer protocol (HTTP), e-mail or file transfer protocol (FTP) depend on TCP as their delivery assurance mechanism within networks.

Customers deploying such applications expect not only physical and link level SLAs from their service providers, but assurance that their TCP traffic requirements will be supported across the network. The TCP Throughout feature on the Packet Blazer™ offers Ethernet service providers the capability of measuring and validating that the services offered to their customers support the TCP traffic performance they expect.

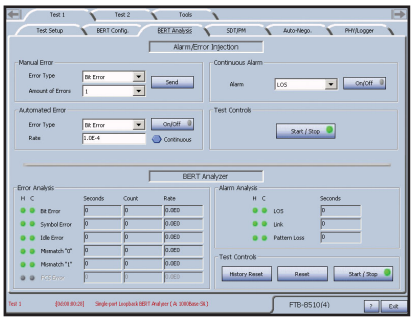
Efficient Testing Leads to Reliable Performance

BERT over Ethernet

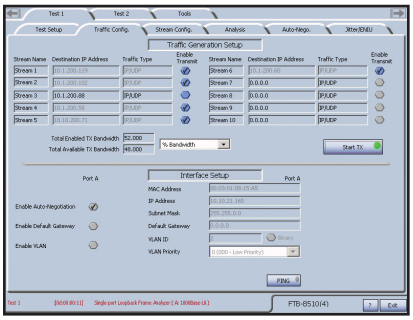
Because the transparent transport of Ethernet services over physical media is becoming common, Ethernet is increasingly carried across a variety of layer 1 media over longer distances. This creates a growing need for the certification of Ethernet transport on a bit-per-bit basis, which can be done using 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 the 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:

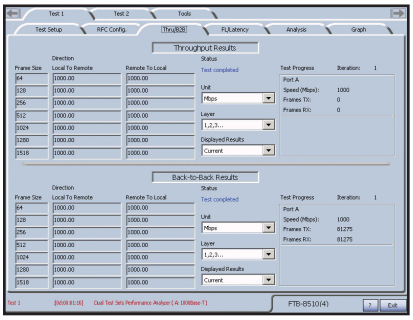
- Ethernet-over-DWDM
- Ethernet-over-CWDM
- Ethernet-over-dark fiber
- Ethernet-over-switched networks



BERT analysis screen



RFC configuration screen



Throughput results screen

Ethernet and IP QoS Testing

Data services are making a significant shift towards supporting a variety of applications on the same network. This shift has fuelled the need for quality of service (QoS) testing to ensure the condition and reliability of services. Service providers need to assign different qualities of service to each type of service they offer. 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-8510 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-8510 lets service providers efficiently benchmark transport networks when it comes to delay-sensitive traffic such as voice and video over IP.

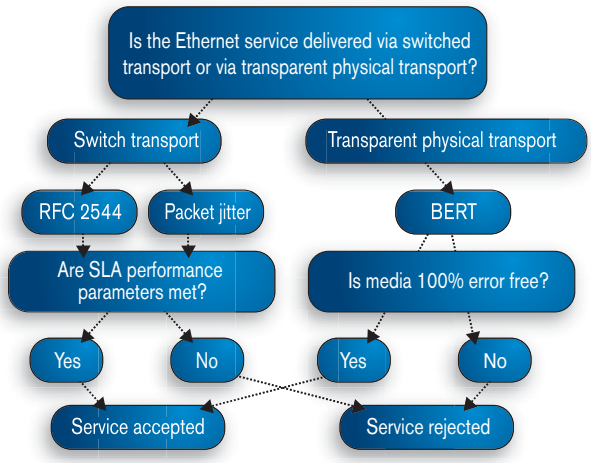
Flexible End-to-End Testing

With the FTB-8510 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 Service Acceptance Testing

The type of testing required for Ethernet service acceptance testing depends on how the service is carried on the network. The opposite figure shows how to test switched transport or transparent physical transport using either RFC 2544 tests or BERT over Ethernet.

All of the tests that are part of the service-level agreement can be performed on either part of the network (end-to-core) or on all of it (end-to-end). For both switched transport and transparent physical transport, end-to-end testing can be performed by using two portable units and testing from one end to the other. Another way of doing this is to send a technician to one site and test, using a second test device that is mounted in the network (e.g., in a central office). This type of testing is useful when two technicians cannot be sent at the same time or when the service provider is providing access to the Internet.



Functional Specifications

OPTICAL INTERFACES

Optical interfaces	Two ports at 1 GigE		
Available wavelengths (nm)	850, 1310 and 1550		
	1000Base-SX	**1000Base-LX**	**1000Base-ZX**
Wavelength (nm)	850	1310	1550
Tx level (dBm)	–9 to –3	–9.5 to –3	0 to +5
Rx level sensitivity (dBm)	–20	–22	–22
Maximum reach	550 m	10 km	80 km
Transmission bit rate (Gbit/s)	1.25	1.25	1.25
Reception bit rate (Gbit/s)	1.25	1.25	1.25
Tx operational wavelength range (nm)	830 to 860	1270 to 1360	1540 to 1570
Measurement accuracy			
Frequency (ppm)	±4.6	±4.6	±4.6
Optical power (dB)	±2	±2	±2
Maximum Rx before damage (dBm)	+6	+6	+6
Jitter compliance	IEEE 802.3	IEEE 802.3	
Ethernet classification	IEEE 802.3	IEEE 802.3	
Laser type	VCSEL	FP	DFB
Eye safety	CLASS 1	CLASS 1	CLASS 1
Connector	LC	LC	LC
Transceiver type	SFP	SFP	SFP

ELECTRICAL INTERFACES

Electrical interfaces	Two ports 10/100BaseT half/full duplex, 1000BaseT full duplex. Straight/crossover cable selection.		
	10Base-T	**100Base-T**	**1000Base-T**
Tx bit rate	10 Mbit/s	125 Mbit/s	1 Gbit/s
Tx accuracy (ppm)	±100	±100	±100
Rx bit rate	10 Mbit/s	125 Mbit/s	1 Gbit/s
Rx measurement accuracy (ppm)	±4.6	±4.6	±4.6
Duplex mode	Half and full duplex	Half and full duplex	Full duplex
Jitter compliance	IEEE 802.3	IEEE 802.3	IEEE 802.3
Connector	RJ-45	RJ-45	RJ-45
Maximum reach (m)	100	100	100

TESTING

RFC 2544	Throughput, back-to-back, frame loss and latency measurements according to RFC 2544. Frame size: RFC-defined sizes, user-configurable.
BERT	Unframed layer 1 and layer 2. Layer 2 supported 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, CRPAT, CSPAT, CJTPAT, Short CRTPAT, Long CRTPAT and up to 10 user patterns. Capability to invert patterns.
Error insertion (BERT)	FCS, bit, symbol.
Error measurement	Jabber/giant, runt, undersize, oversize, FCS, symbol, idle, carrier sense, alignment, collision, late collision, excessive collision, UDP, TCP and IP header checksum.
Error measurement (BERT)	Bit error, symbol error, idle error, bit mismatch 0, bit mismatch 1, performance monitoring (G.821 and G.826).
Alarm insertion (BERT)	LOS, pattern loss.
Alarm detection	LOS, link down, pattern loss, no traffic.
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 (N-Frames, Burst, N-Burst, Ramp, N-Ramp and Continuous), MAC source/destination address, VLAN ID, VLAN priority, IP source/destination address, ToS field, DSCP field, TTL, UDP source/destination port and payload.
VLAN stacking	Capability to generate streams with up to three layer of VLANs (including IEEE802.1ad QinQ tagged VLAN) and to filter received traffic by VLAN ID or VLAN priority at any of the stacked VLAN layers.

Functional Specifications (Cont'd)

TESTING

Traffic analysis	Capability to analyze the incoming traffic and provide statistics according to a set of up to 10 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 and 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	Packet pause time.
Flow control statistics	Pause time, last pause time, max. pause time, min. pause time, paused frames, abort frames, frames Tx, frames Rx.
Advanced auto-negotiation	Capability to auto-negotiate the rate, duplex and flow control capabilities with another Ethernet port. Configurable auto-negociation parameters. Display of link partner capabilities. Fault injection: offline, link failure, auto-negotiation error.
Remote ENIU configuration	Capability to support the operation, administration and maintenance (OAM) layer between a Packet Blazer and ADC ENIUs. This includes detection of ENIUs in the network and sending loopback commands.

ADDITIONAL TEST AND MEASUREMENT FUNCTIONS

Power measurement	Supports optical power measurement, displayed in dBm.
Frequency measurement	Supports clock frequency measurements (i.e., received frequency and deviation of the input signal clock from nominal frequency).
Frequency offset measurement	Range: ± 150 ppm Resolution: 1 ppm Accuracy: ± 4.6 ppm
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.
Smart Loopback	Capability to return traffic to the local unit by swapping packet overhead up to layer 4 of the OSI stack.
TCP throughput measurements [e]	Capability to evaluate TCP throughput and to provide performance results and statistics: window size with corresponding throughput, number of transmitted and re-transmitted segments, round-trip time.

ADDITIONAL FEATURES

Expert mode	Ability to set thresholds in RFC 2544 and BERT mode to provide a pass/fail status.
Scripting [a]	The built-in PERL 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 [a]	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 [a]	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.
Report generation	Ability to generate test reports in the following user-selectable formats: .pdf, .html, .txt and .csv.
Screen capturing [d]	Capability to gather a snap-shot of the screen for future use.
Logger printing [d]	Capability to send logger messages to a supported local printer.
Graph	Allows to graphically display the test statistics of the performance (RFC 2544) and frame analysis tests.
Configurable test timer	Allows the user to set a specific start and stop time for tests.
Remote control	Remote control through Visual Guardian Lite software or VNC.
Test favorites	Capability to select and load from predefined or user-modified test configurations.

SPECIFICATIONS [b]

	FTB-8510 [c]	FTB-8510-1 [c]	FTB-8510-2
Ports	Two 10/100Base-T	Two 10/100Base-T and one Gigabit Ethernet	Two 10/100Base-T and two Gigabit Ethernet
Connector types	RJ-45 (ISO 8877)	RJ-45 (ISO 8877) and LC	RJ-45 (ISO 8877) and LC
Connect speed (Mbit/s)	10/100	10/100/1000	10/100/1000
Duplex mode	Full/half duplex Auto-negotiation	Full/half duplex Auto-negotiation	Full/half duplex Auto-negotiation
Maximum port capacity (Mbit/s)	200 (bidirectional)	2000 (bidirectional)	2000 (bidirectional)
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)	25 mm x 96 mm x 280 mm (1 in x 3 3/4 in x 11 in)
Weight (without transceivers)	0.5 kg (1.1 lb)
Temperature	
operating	0 °C to 40 °C (32 °F to 104 °F)
storing	–40 °C to 60 °C (–40 °F to 140 °F)

NOTES

a. Available on FTB-400 platform only.

b. Similar specifications apply to the IQS-8510 Packet Blazer module, designed for the IQS-500 platform.

c. Upgrade kit also available for FTB-8510 Packet Blazer, providing one or two Gigabit Ethernet ports.

d. Available on the FTB-200 Compact Platform only.

e. Available as an option.

ORDERING INFORMATION

MODULE

FTB-85XX-XX-XX

Model
FTB-8510
FTB-8510-1
FTB-8510-2

Software
A-1.8.0 = Packet Blazer software release 1.8.0
A-1.9.0 = Packet Blazer software release 1.9.0
A-1.1.0.0 = Packet Blazer software release 1.1.0.0
A-2.0.0 = Packet Blazer software release 2.0.0

Other options
00 = Without other options
TCP = TCP throughput measurement
IPTV_MON = Enable TCP throughput testing [a]

Example: FTB-8510-2-TCP-A-2.0.0
For Gigabit Ethernet optical interfaces, FTB-859x Transceivers have to be ordered separately.

NOTE
a. FTB-200 software only.

TRANSCEIVER

FTB-8590 = 1000Base-SX (850 nm) LC connectors; optical SFP transceiver module for FTB-8510 Packet Blazer
FTB-8591 = 1000Base-LX (1310 nm) LC connectors; optical SFP transceiver module for FTB-8510 Packet Blazer
FTB-8592 = 1000Base-ZX (1550 nm) LC connectors; optical SFP transceiver module for FTB-8510 Packet Blazer

Complementary Products

FTB-8510G Packet Blazer 10 Gigabit Ethernet Test Module

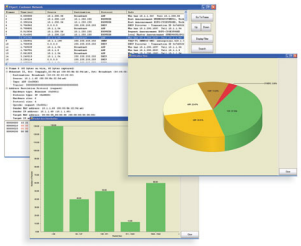
Housed in the FTB-400 portable test platform, the FTB 8510G module tests connectivity in its native format: 10GBASE-xR or 10GBASE-xW used for transport of Ethernet-based LAN-to-LAN services. It can also be used to test Next-Generation SONET/SDH, hybrid multiplexers, dark fiber or xWDM networks running 10 Gigabit Ethernet interfaces. For more information on the FTB-8510G, please refer to its detailed spec sheet at http://documents.exfo.com/specsheets/FTB-8510G-ang.pdf.

FTB-8520 Packet Blazer SAN Fibre Channel Test Module

Housed in the FTB-400 platform, the FTB-8520 Packet Blazer™ SAN Fibre Channel Test Module brings FC-0, FC-1 and FC-2 logical layer testing to services delivered via transport protocols, such as DWDM, SONET/SDH and dark fiber. It provides valuable timing information and buffer credit estimation for Fibre Channel network deployment. The FTB-8520 Packet Blazer enables the testing of both telecom and Fibre Channel services, and it lets you conduct end-to-end latency testing. For more information on the FTB-8520, please refer to its detailed spec sheet at http://documents.exfo.com/specsheets/FTB-8520-ang.pdf.

EXpertNPA Network Protocol Analyzer

EXFO's EXpertNPA Network Protocol Analyzer software is a simple and powerful tool that enables identification and detailed assessment of complex network problems. EXpertNPA supports a wide range of key applications, including the determination of the baseline trend of network bandwidth utilization, as well as the identification of a network's top talkers, the source and cause of broadcast storms, the source of network overload troubles, and the source of network attacks. For more information on the EXpertNPA software, please refer to its detailed spec sheet at http://documents.exfo.com/specsheets/EXpertNPA-ang.pdf.



Rugged Handheld Solutions

OPTICAL
- OTDRs
- OLTSs
- Power meters
- Light sources
- Talk sets

COPPER ACCESS
- ADSL/ADSL2+, SHDSL, VDSL test sets
- VoIP and IPTV test sets
- Ethernet test sets
- POTS test sets

Platform-Based Solutions

OPTICAL FIBER
- OTDRs
- OLTSs
- ORL meters
- Variable attenuators

DWDM TEST SYSTEMS
- OSAs
- PMD analyzers
- Chromatic dispersion analyzer

TRANSPORT AND DATACOM
- Next Generation SONET/SDH and OTN testers
- SONET/DSn (DS0 to OC-192) testers
- SDH/PDH (64 kbit/s to STM-64) testers
- T1/T3, E1 testers
- 10/100 M and Gigabit Ethernet testers
- Fibre Channel testers
- 10 Gigabit Ethernet testers

Find out more about EXFO's extensive line of high-performance portable instruments by visiting our website at **www.EXFO.com**.

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