Performance assurance for Ethernet-based services

- Complete EtherSAM (ITU-T Y.1564) test suite. EtherSAM is the new standard for turning up and troubleshooting mobile backhaul and business Ethernet 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).
- Multistream generation and analysis, allowing quality of service (QoS) verification through VLAN and ToS/DSCP prioritization testing.
- Up to 10 Gbit/s full-line-rate data capture and decode.
- MPLS, MPLS-TP, PBB-TE and IPv4/IPv6 support for complete Carrier Ethernet validation.
- EXFO Connect-compatible: automated asset management; data goes through the cloud and into a dynamic database.

Platform Compatibility

- FTB-500 Platform
- FTB-200 Compact Platform

Feature(s) of this product is/are protected by one or more of patent appl. US 2012/0307666 A1 and equivalents in other countries.
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 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 remote test unit counterpart, RTU-310, the FTB-8510G simplifies and speeds up the deployment of Ethernet services.

**Key Features**

- Complete EtherSAM (ITU-T Y.1564) test suite allowing full validation of today’s Ethernet services (bidirectional results through dual test set)*
- Measures throughput, back-to-back, latency and frame loss as per RFC 2544 (bidirectional results through dual test set)
- Multistream generation and analysis, providing per-stream measurements for throughput, latency, frame loss and packet jitter
- LAN PHY and WAN PHY available in a single module
- Simultaneous traffic generation and reception at 100 % wire speed for 10BASE-SR, -ER, -LR, -SW, -EW or -LW full-duplex interfaces at all valid frame sizes
- Transmits and analyzes up to ten streams, perfect for installing, commissioning and maintaining Ethernet networks
- UDP, TCP and IP header integrity validation
- 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
- Configurable advanced filters for in-depth network troubleshooting
- PBB-TE and MPLS support for Carrier Ethernet
- Up to 10 Gbit/s full-line-rate data capture and decode
- Smart Loopback
- Service disruption time measurement
- Internet protocol version 6 (IPv6 testing)

* Patent pending
EtherSAM: The New Standard in Ethernet Testing

ITU-T Y.1564 is the new standard for turning up and troubleshooting Carrier Ethernet services. This methodology is completely adapted to today’s Ethernet services especially mobile backhaul and commercial services. Up to now, RFC 2544 has been the most widely used methodology. However, it was designed for network device testing in the lab, not for services testing in the field. ITU-T Y.1564 is the first testing standard developed for the field. It has a number of advantages over the RFC 2544 including validation of critical SLA criteria such as packet jitter and QoS measurements. This methodology is also significantly faster, therefore saving time and resources while optimizing QoS.

Contrary to other methodologies, EtherSAM supports new multiservice offerings. It can simulate all types of services that will run on the network and simultaneously qualify all key SLA parameters for each of these services. Moreover, it validates the QoS mechanisms provisioned in the network to prioritize the different service types, resulting in more accurate validation and much faster deployment and troubleshooting. EtherSAM is comprised of two phases, the service configuration test and the service performance test.

Service Configuration Test

The service configuration test consists in sequentially testing each service. It validates that the service is properly provisioned and that all specific KPIs or SLA parameters are met. A ramp test and a burst test are performed to verify the committed information rate (CIR), excess information rate (EIR), committed burst size (CBS) and excess burst size (EBS).

Service Performance Test

Once the configuration of each individual service is validated, the service performance test simultaneously validates the quality of all the services over time.

EtherSAM Bidirectional Results

EXFO’s EtherSAM approach proves even more powerful as it executes the complete ITU-T Y.1564 test with bidirectional measurements. Key SLA parameters are measured independently in each test direction, thus providing 100 % first-time-right service activation—that is the highest level of confidence in service testing.
RF 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, including throughput, latency, burst (back-to-back) and frame loss. 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 generates reports that can be given to customers for future reference related to their specific SLAs.

Efficient Testing Leads to Reliable Performance

MPLS, MPLS-TP and PBB-TE: 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 QoS expectations require solutions that tap into the cost-effectiveness of Ethernet without sacrificing the benefits of connection-oriented (albeit costly) TDM solutions such as SONET/SDH.

Ethernet tunneling technologies such as Provider Backbone Bridge-Traffic Engineering or PBB-TE (also referred to as PBT) and transport MPLS address these requirements. These 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, CWDM or dark fiber.

Ethernet QoS Measurements

Data services are making a significant shift toward supporting a variety of applications on the same network. Multiservice offerings such as triple-play services have fuelled the need for QoS testing to ensure the condition and reliability of each service and fully qualify SLA parameters. The FTB-8510G Packet Blazer allows service providers to simultaneously simulate and qualify different applications through its multistream application. The user has the capability to configure up to ten streams with 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. Specific stream profiles to transmit VoIP, video and data can be selected for each stream. Throughput, latency, frame loss and packet jitter (RFC 3393) measurements are also available simultaneously for each stream, allowing fast and in-depth qualification of all SLA criteria.

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. Additionally, the FTB-8510G supports a traffic scan feature that allows quick identification and monitoring of VLAN and MPLS flows on the network. This can help clearly identify top bandwidth users.

The FTB-8510G also supports full-line-rate data capture and decode. This key troubleshooting tool enables field technicians to easily identify complex network issues. The comprehensive capture feature includes the capability to configure capture filters and triggers to quickly zero-in on network events.
EXpert Test Tools on the FTB-200 Platform
EXpert Test Tools is a series of platform-based software testing tools that enhance the value of the FTB-200 platform, providing additional testing capabilities without the need for additional modules or units.

<table>
<thead>
<tr>
<th>EXpert TEST TOOLS</th>
<th>AUTOMATED ASSET MANAGEMENT. PUSH TEST DATA IN THE CLOUD. GET CONNECTED.</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXFO Connect</td>
<td>EXFO Connect pushes and stores test equipment and test data content automatically in the cloud, allowing you to streamline test operation from build-out to maintenance.</td>
</tr>
</tbody>
</table>

**EXpert VoIP TEST TOOLS**
- Generates a voice-over-IP call directly from the test platform to validate performance during service turn-up and troubleshooting.
  - Supports a wide range of signaling protocols, including SIP, SCCP, H.248/Megaco and H.323
  - Supports MOS and R-factor quality metrics
  - Simplifies testing with configurable pass/fail thresholds and RTP metrics

**EXpert VoIP TEST TOOLS**
- Integrates six commonly used datacom test tools into one platform-based application to ensure that field technicians are prepared for a wide range of testing needs.
  - Rapidly performs debugging sequences with VLAN scan and LAN discovery
  - Validates end-to-end ping and traceroute
  - Verifies FTP performance and HTTP availability

**EXpert IPTV TEST TOOLS**
- This powerful IPTV quality assessment solution enables set-top-box emulation and passive monitoring of IPTV streams, allowing quick and easy pass/fail verification of IPTV installations.
  - Real-time video preview
  - Analyzes up to 10 video streams
  - Comprehensive QoS and QoE metrics including MOS score
## Functional Specifications

### OPTICAL INTERFACES

<table>
<thead>
<tr>
<th>10GBASE-SW</th>
<th>10GBASE-SR</th>
<th>10GBASE-LW</th>
<th>10GBASE-LR</th>
<th>10GBASE-EW</th>
<th>10GBASE-ER</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wavelength</strong></td>
<td>850 nm</td>
<td>850 nm</td>
<td>1310 nm</td>
<td>1310 nm</td>
<td>1550 nm</td>
</tr>
<tr>
<td><strong>Tx level (802.3ae-compliant)</strong></td>
<td>–7.3 to –1 dBm</td>
<td>–7.3 to –1 dBm</td>
<td>–8.2 to 0.5 dBm</td>
<td>–8.2 to 0.5 dBm</td>
<td>–4.7 to 4.0 dBm</td>
</tr>
<tr>
<td><strong>Rx operating range</strong></td>
<td>–9.9 to –1.0 dBm</td>
<td>–9.9 to –1.0 dBm</td>
<td>–14.4 to 0.5 dBm</td>
<td>–14.4 to 0.5 dBm</td>
<td>–15.8 to –1.0 dBm</td>
</tr>
<tr>
<td><strong>Tx operational wavelength range</strong></td>
<td>840 nm to 860 nm</td>
<td>840 nm to 860 nm</td>
<td>1260 nm to 1355 nm</td>
<td>1260 nm to 1355 nm</td>
<td>1530 nm to 1565 nm</td>
</tr>
</tbody>
</table>

* When clocking is in internal mode

### SYNCHRONIZATION INTERFACES

#### DS1/E1 external input clock interface

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

#### Clock out interface

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tx pulse amplitude</td>
<td>600 mVpp ± 130 mV</td>
</tr>
<tr>
<td>Transmission frequency</td>
<td></td>
</tr>
<tr>
<td>Clock divider = 16</td>
<td>LAN</td>
</tr>
<tr>
<td>Clock divider = 32</td>
<td>LAN</td>
</tr>
<tr>
<td>Clock divider = 64</td>
<td>LAN</td>
</tr>
<tr>
<td>Output configuration</td>
<td>AC coupled</td>
</tr>
<tr>
<td>Load impedance</td>
<td>50 ohms</td>
</tr>
<tr>
<td>Maximum cable length</td>
<td>3 meters</td>
</tr>
<tr>
<td>Connector type</td>
<td>SMA</td>
</tr>
</tbody>
</table>
**Optical Interfaces**

- **Available wavelengths:** 10 GbE LAN and 10 GbE WAN

**Electrical Interfaces**

- **External clock DS1/E1**
  - Line coding: E1: AMI and BB8
  - Termination mode: DS1/E1: Term
  - Framing: DS1: SF and ESF
  - Clocking: E1: PCM30, PCM30CRC, PCM31 and PCM31CRC

- **Clock output**
  - Clock out: Clock out driver 1, 3 and 4

**Testing**

- **EtherSAM (ITU-T Y.1564)**
  - Capability to perform the service configuration test, including the ramp and burst tests, and service performance test as per ITU-T Y.1564. Tests can be performed to a loopback or dual test set mode for bidirectional results.

- **RFC 2544**
  - Throughput, back-to-back, frame loss and latency measurements according to RFC 2544. Frame size: RFC-defined sizes, user-configurable (bidirectional).

- **IP tools**
  - Capability to perform ping and traceroute functions.

- **Smart Loopback**
  - Capability to return traffic to the local unit by swapping packet overhead up to layer 4 of the OSI stack.

**Advanced Filtering**

- **Multistream generation**
  - Capability to transmit up to ten 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/TCP/destination port and payload. Selectable predefined stream profiles for voice, video and data streams. VoIP codecs [G.711, G.723.1, G.729], video [MPEG-2 SDTV, MPEG-2 HDTV, MPEG-4 HDTV].

- **Multistream analysis**
  - Capability to analyze packet jitter, latency, throughput, frame loss and octet/sequence frame statistics.

- **VLAN stacking (Q-in-Q)**
  - Capability to generate streams with up to three layers of VLAN (including IEEE802.1ad Q-in-Q tagged VLAN) and to filter received traffic by VLAN ID or VLAN priority at any of the stacked VLAN layers.

- **Traffic filtering**
  - 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, UDP/TCP/destination port and UDP source/destination port. VLAN filtering can be applied to any of the stacked VLAN layers.

- **Ethernet statistics**
  - Multicast, broadcast, unicast, fragment, pause frame, frame size distribution, bandwidth, utilization, frame rate, frame loss, out-of-sequence frames, r-frame sequences.

- **Packet filter statistics**
  - Delay variation statistics (ms): min., max., last, average, jitter measurement estimate.

- **Flow control injection (frame analyzer)**
  - Packet pause time.

- **Flow control status**
  - Frame analyzer and RFC 2544

**Advanced Filtering**

- **Advanced filtering**
  - 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.

- **Data capture**
  - Capability to perform 10G full-line-rate data capture and decode. Capability to configure detailed capture filters and triggers as well as capture slicing parameters.

- **Traffic scanning**
  - Capability to scan incoming live traffic and auto-discover all VLAN/VLAN Priority and MPLS/ID/COS flows. Capability to provide statistics for each flow including frame count and bandwidth.

- **PBB-TE**
  - Capability to generate and analyze streams with PBB-TE data traffic, including configuration of I-MAC (source and destination), B-VLAN and Htag (as per 802.1ah), and to filter received traffic by any of these fields.

**ULPS**

- **ULPS**
  - 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**
  - Capability to perform BERT, RFC 2544, traffic generation and analysis and Smart Loopback tests over IPv6. Ping, traceroute, neighbor discovery and stateless auto-configuration.

**Additional Test and Measurement Functions**

- **Power measurement**
  - Supports optical power measurement, displayed in dBm.

- **Frequency measurement**
  - Supports clock frequency offset measurement 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): ±24.6 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 loading standards bodies)–remote Packet Blazer controller via the LAN connection under test.

- **DHCP client**
  - Ability 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.

- **IP tools**
  - Ability to perform ping and traceroute functions.

**Additional Features**

- **Expert mode**
  - Ability to set thresholds in RFC 2544 and BERT mode to provide a PASS/FAIL status.

- **Scripting**
  - The built-in Visual Basic .NET scripting engine and embedded macro/recorder provide a simple means of automating test cases and routines. Embedded scripting routines provide a powerful means of creating advanced test scripts.

- **Event logger**
  - Enables 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**
  - 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**
  - Allows users to customize their test views, i.e., to dynamically edit or remove test tabs/windows, in addition to creating new test windows, so as to accurately match their testing needs.

- **Configurable test time**
  - Allows a user to set a specific start and stop time for tests.

- **Failures**
  - Ability 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, .xml and .csv.

- **Graph**
  - Allows to graphically display the test statistics of the performance RFC 2544 and frame analysis tests.

- **Screen capturing**
  - Capability to capture a snapshot of the screen for future use.

- **Logger printing**
  - Capability to send logger messages to a supported local printer.

- **Remote control**
  - Remote control through Visual Guardian Lite software or VNC.
MODULE SPECIFICATIONS

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

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**: 0 °C to 60 °C (40 °F to 140 °F)

ORDERING INFORMATION

**MODULE**

- **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
  - EtherSAM = EtherSAM (ITU-T Y.1564) testing capabilities
  - Data_Capture = Data capture and decode capabilities
  - TRAFFIC-SCAN = VLAN/MPLS traffic scan

**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

EXFO serves over 2000 customers in more than 100 countries. To find your local office contact details, please go to www.EXFO.com/contact.

EXFO is certified ISO 9001 and attests to the quality of these products. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. EXFO has made every effort to ensure that the information contained in this specification sheet is accurate. However, we accept no responsibility for any errors or omissions, and we reserve the right to modify design, characteristics and products at any time without obligation. Units of measurement in this document conform to SI standards and practices. In addition, all of EXFO’s manufactured products are compliant with the European Union’s WEEE directive. For more information, please visit www.EXFO.com/recycle. Contact EXFO for prices and availability or to obtain the phone number of your local EXFO distributor.

For the most recent version of this spec sheet, please go to the EXFO website at http://www.EXFO.com/specs.

In case of discrepancy, the Web version takes precedence over any printed literature.