

FTB-860 NetBlazer Series Ethernet Testers

POWERFUL, FAST, INTUITIVE ETHERNET AND FIBRE CHANNEL TESTING



EtherSAM

EXFO Connect Compatible



Bluetooth™



FTB Anywhere™

Feature(s) of this product is/are protected by one or more of patent appl. US 2012/0307666 A1 and equivalents in other countries.

The NetBlazer series offers field technicians comprehensive, yet simple test suites to quickly and easily turn up, validate and troubleshoot Ethernet, Fibre Channel and SyncE/1588 PTP services, with full EtherSAM capabilities, from 10 Mbit/s to 10 Gbit/s.

KEY FEATURES AND BENEFITS

Accelerate Ethernet service activation with bidirectional EtherSAM (ITU-T Y.1564) and RFC 2544 test suites, multistream traffic generation, Through mode and bit-error-rate (BER) testing

Efficiently assess Fibre Channel networks with best-in-class coverage via 1x, 2x, 4x, 8x and 10x interfaces

Packet synchronization turn-up and troubleshooting (SyncE/1588 PTP)

FTTA validation (CPRI and OBSAI) at up to 3.1 Gbit/s via BER testing

Experience unprecedented configuration simplicity with hybrid touchscreen/keypad navigation and data entry

Increase technician autonomy and productivity with intelligent discovery of remote EXFO Ethernet testers, as well as in-service testing via dual-port Through mode

Eliminate errors in data interpretation with revolutionary new GUI on 7-inch TFT screen, historical event logger, visual gauges and 3D-icon depictions of pass/fail outcomes

Simplify reporting with integrated Wi-Fi and Bluetooth connectivity capabilities

Integrated applications to test VoIP services, and additional IP test utilities including VLAN scan and LAN discovery via EXPert VoIP and EXPert IP test tools

Extend field testing operations with a compact, lightweight platform equipped with a long-duration battery pack

EXFO Connect-compatible: automated asset management; data goes through the cloud and into a dynamic database

PLATFORM COMPATIBILITY



Platform
FTB-1



Assessing
Next-Gen Networks

THE ULTRA-PORTABLE CHOICE FOR HIGH-SPEED ETHERNET AND FIBRE CHANNEL TESTING

The ongoing deployment of GigE and 10 GigE circuits across access and metro networks demands a testing solution that seamlessly adapts to either operating environment—without sacrificing portability, speed or cost—to guarantee the performance and quality of service (QoS) metrics of these services.

Since most storage area networks (SANs) cover large distances and Fibre Channel has stringent performance requirements, it is imperative to test at each phase of network deployment.

Powerful and Fast

The NetBlazer series is a portfolio of fully integrated 10 Mbit/s to 10 Gbit/s and 1x, 2x, 4x, 8x, 10x Fibre Channel handheld testers. Available in three hardware configurations, each FTB-860x offers the industry's largest TFT screen with unprecedented configuration simplicity via hybrid touchscreen/keypad navigation. Platform connectivity is abundant via Wi-Fi, Bluetooth, Gigabit Ethernet or USB ports, making it accessible in any environment.

The testing you need for any Ethernet application

- › Performance assessment of Carrier Ethernet services
- › Installation, activation and maintenance of metro Ethernet networks
- › Deployment of active Ethernet (point-to-point) access services
- › In-service troubleshooting of live traffic

The testing you need for any Fibre Channel application

- › Installation
- › Activation
- › Maintenance of Fibre Channel networks

FTB-860G: 10 Mbit/s TO 10 Gbit/s

If the need is for full Ethernet or complete Fibre Channel coverage the FTB-860G has all the bases covered

- › Two 100/1000 optical ports
- › Two 10/100/1000 electrical ports
- › One 10 GigE port (LAN/WAN software option)
- › One Fibre Channel 1x, 2x, 4x, 8x, 10x port
- › One 2.5 and 3.1 Gbit/s port

- › 10 Base-T to 10 gigabit testing
- › EtherSAM (bidirectional)
- › RFC 2544 (bidirectional)
- › Traffic generation and monitoring
- › Through mode
- › Dual-port testing
- › Intelligent autodiscovery
- › IPv6 testing
- › Ping/traceroute
- › Cable testing
- › Dual Test Set mode
- › Smart loopback
- › Fibre Channel BERT
- › FTTA BERT

FTB-860: GIGABIT ETHERNET

If the need is purely for Gigabit Ethernet and basic Fibre Channel coverage, then the FTB-860 is your tester—offering the same testing capability as the FTB-860G minus the higher-end Fibre Channel and 10 GigE interfaces

- › Two 100/1000 optical ports
- › Two 10/100/1000 electrical ports
- › One Fibre Channel 1x, 2x, 4x port
- › One 2.5 and 3.1 Gbit/s port

- › 10 Base-T to 1 gigabit testing
- › EtherSAM (bidirectional)
- › RFC 2544 (bidirectional)
- › Traffic generation and monitoring
- › Through mode
- › Dual-port testing
- › Intelligent autodiscovery
- › IPv6 testing
- › Ping/traceroute
- › Cable testing
- › Dual Test Set mode
- › Smart loopback
- › Fibre Channel BERT
- › FTTA BERT

FTB-860GL: 10 Mbit/s TO 10 Gbit/s LOOPBACK ONLY

Combined with the FTB-860G or FTB-860, the FTB-860GL is the most cost-effective solution for GigE and 10 GigE intelligent loopback testing; it supports bidirectional EtherSAM and RFC 2544 testing and offers five loopback modes.

- › One 100/1000 optical port
- › One 10/100/1000 electrical port
- › One 10 GigE port

- › 10 Base-T to 10 gigabit loopback
- › EtherSAM (bidirectional partner)
- › RFC 2544 (bidirectional partner)
- › Traffic generation loopback
- › BERT loopback
- › Intelligent autodiscovery
- › IPv6 testing
- › Ping/traceroute
- › Cable testing
- › Smart loopback

Setting a New GUI Standard: Unprecedented Simplicity in Configuration Setup and Navigation

Intelligent Situational Configuration Setup

- › Guides technicians through complete, accurate testing processes (suggestion prompts, help guides, etc.)
- › Reduces navigation by combining associated testing functions on a single screen
- › Intelligent autodiscovery allows a single technician to perform end-to-end testing

Dedicated Quick-Action Buttons

- › Remote discovery to find all the other EXFO units
- › Laser on/off
- › Test reset to clear the results and statistics while running a test
- › Report generation
- › Save or load test configurations
- › Quick error injection

Assorted Notifications

- › Clear indication of link status for single or dual ports
- › Negotiated speed display for single or dual ports
- › Optical power status available at all times for single or dual ports
- › Pass/fail indication at all times for all tests

Streamlined Navigation

- › Remote discovery button available at all times; no reason to leave your current location to scan for a remote unit
- › Testing status can be maximized to fill the entire screen by simply clicking on the alarm status button; whether the unit is in your hand or across the room, test results can be easily determined with a simple glance at the display screen
- › RFC 2544 configuration is maximized in a single page; no need to navigate through multiple screens to configure individual subtests
- › RFC 2544 results and graphs are also maximized in a single page; no need to navigate through multiple screens to view individual RFC subtest results

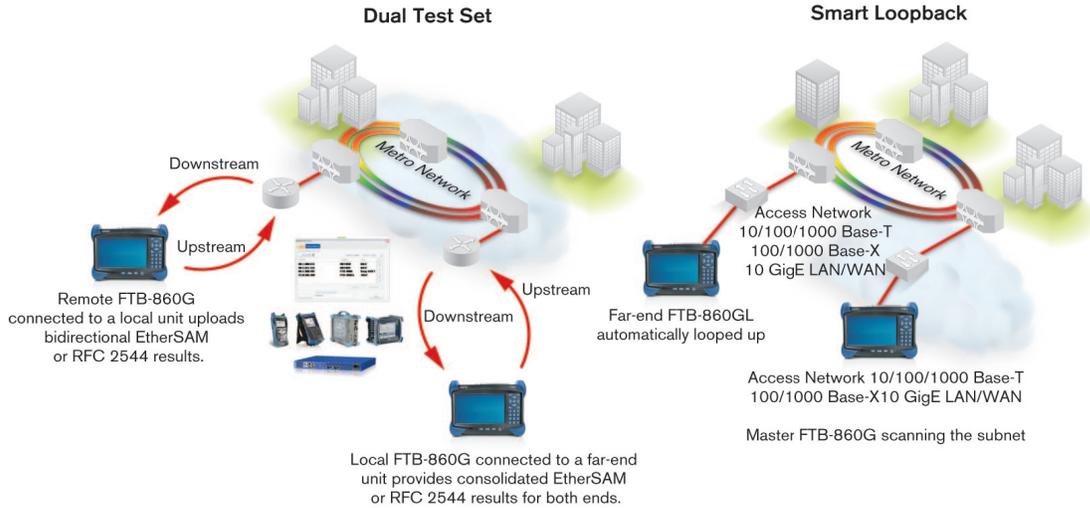


RAPID, ACCURATE TEST RESULTS AT YOUR FINGERTIPS

Key Features

Intelligent Network Discovery Mode

Using any NetBlazer series test set, you can single-handedly scan the network and connect to any available EXFO datacom remote tester. Simply select the unit to be tested and choose whether you want traffic to be looped back via Smart Loopback or Dual Test Set for simultaneous bidirectional EtherSAM and RFC 2544 results. No more need for an additional technician at the far end to relay critical information—the NetBlazer products take care of it all.



Smart Loopback Flexibility

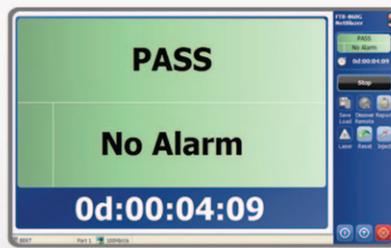
The Smart Loopback functionality has been enhanced to offer five distinct loopback modes. Whether you are looking to pinpoint loopback traffic from a UDP or TCP layer, or all the way down to a completely promiscuous mode (Transparent Loopback mode), NetBlazer has the flexibility to adjust for all unique loopback situations.

Global Pass/Fail Analysis

The NetBlazer series provides real-time pass/fail status via text or icons. Clicking on the pass/fail indicator maximizes this important status to full screen, providing instant, easily understood notification of whether the unit is in the technician's hands or across the room.

VLAN/MPLS

Today's networks are expected to deliver high performance. To match such high expectations, service providers must rely on various mechanisms such as Ethernet tagging, encapsulation and labeling. Thanks to these additions, service providers can enhance security, scalability, reliability and performance. The NetBlazer series supports virtual local area network (VLAN) tags, Q-in-Q VLAN tags and multiprotocol label switching (MPLS).



Traffic Generation

Unparalleled analog visual gauges combined with user-defined thresholds show instantaneously whether or not the test traffic is in or out of expected ranges.

Additionally, bandwidth and frame size can be modified on-the-fly without navigating away to a different page, giving technicians instantaneous reaction on the gauges. Traffic generation brings together over 10 critical stats in a very visual and organized fashion, ensuring that technicians can quickly and easily interpret the outcome of the test.

The screenshot shows the 'Summary' page of the NetBlazer interface. It features three large analog gauges for Throughput, Jitter, and Latency, each with a green needle and a red threshold line. Below these are digital readouts: Throughput at 5000.000 Mbit/s, Jitter at < 0.015 ms, and Latency at < 0.015 ms. A 'Frame Loss' section shows 'Out-Of-Sequence' notifications. A 'Traffic' table displays RX and TX rates and counts. On the right, a sidebar shows a 'PASS' status, 'No Alarm', and various control buttons like 'Stop', 'Save Load', and 'Remote Report'.

Annotations with arrows point to specific features:

- Throughput, jitter and latency with visual pass/fail thresholds, analog gauges and digital readouts.** (Points to the three gauges)
- Frame loss and out-of-sequence notification.** (Points to the 'Frame Loss' section)
- Overall pass/fail assessment.** (Points to the 'PASS' status in the sidebar)
- Real-time bandwidth and frame-size adjustment.** (Points to the 'TX Rate' and 'Frame Size' input fields)

The analog gauges are lined with Green and Red layers to represent the expected thresholds.

Multistream Configuration

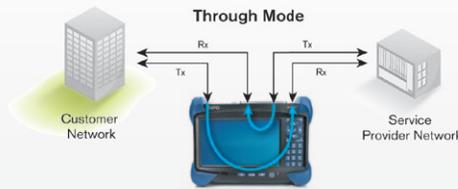
Configuring multiple streams with proper COS and QOS bits can be a complex task. NetBlazer makes it simpler, with all streams easily selectable and configurable from one location. With large icons located throughout the stream pages, configuration becomes as simple as a touch of a finger. Technicians can define one configuration profile and apply it to all the background streams simultaneously. From there, it is just a matter of making slight tweaks as needed rather than complete configuration profiles per stream.

Dual-Port and Through Mode Testing

The NetBlazer series is equipped for both Through mode or dual-port testing. Through mode allows traffic to pass through either of the NetBlazer's two electrical or optical ports for in-service troubleshooting of live traffic between the carrier/service provider network and the customer's network. This allows technicians to access circuits under test without the need for a splitter. With dual-port testing, the technician can use a single NetBlazer module to launch the test and perform the loopback. With two NetBlazer series modules, the dual-port feature also enables users to run two simultaneous tests to maximize time and efficiency.

Supporting 10 Gigabit Ethernet

The 10 Gigabit Ethernet interface is available in both 10 GigE LAN and 10 GigE WAN modes via a single SFP+ transceiver. All Ethernet testing applications—from BER testing to the full EtherSAM suite—are available for both IPv4 and IPv6. Unique to the 10 GigE WAN interface is the ability to send and monitor SONET/SDH J0/J1 traces and the path signal label (C2). The WAN interface can also monitor SONET and SDH alarms and errors.



ETHERSAM: THE NEW STANDARD IN ETHERNET TESTING

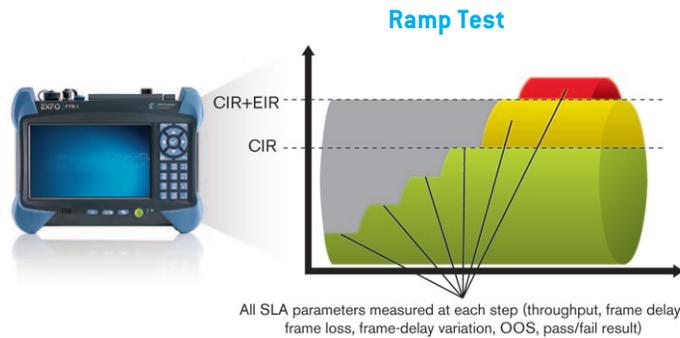
RFC 2544 used to be the most widespread Ethernet testing methodology. However, it was designed for network-device testing in the lab, not for service testing in the field. ITU-T Y.1564 is the new standard for turning up and troubleshooting Carrier Ethernet services. It has a number of advantages over 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.

EXFO's EtherSAM test suite—based on the ITU-T Y.1564 Ethernet service activation methodology—provides comprehensive field testing for mobile backhaul and commercial services.

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 better troubleshooting, more accurate validation and much faster deployment. EtherSAM is comprised of two phases, the service configuration test and the service performance test.

Service Configuration Test

The service configuration test consists of 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 is performed to verify the committed information rate (CIR), excess information rate (EIR) and traffic policing.



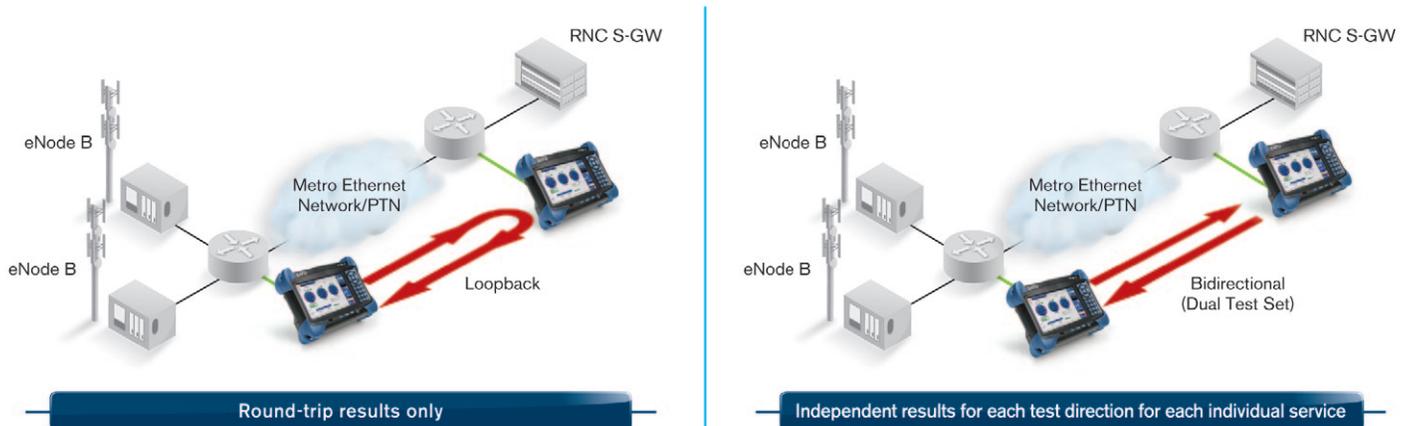
Service Performance Test

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—the highest level of confidence in service testing.

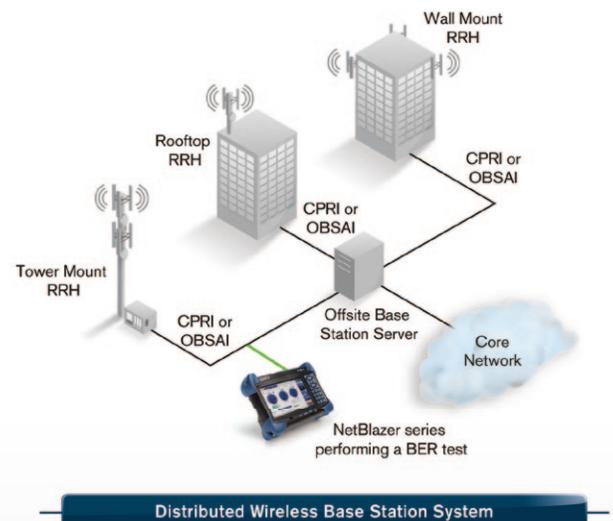


FTTA TESTING

The times are constantly changing and the telecommunications industry is rapidly evolving to keep pace. This is especially true when it comes to mobile network operators (MNOs) and the delivery of their services. Bandwidth-hogging applications like high-definition video, media-rich content and interactive mobile applications are being introduced at an ever-increasing rate. The wireless infrastructure has to be modernized to keep up with this continuous, high bandwidth growth and to minimize latency. To meet these expectations, MNOs are now switching their infrastructures from legacy "copper to the antenna" to fiber-to-the-antenna (FTTA). With the introduction of FTFA, MNOs can offer better performance with lower base-station costs. One key component of evolving to FTFA requires the addition of either the common public radio interface (CPRI) or the open base station architecture initiative (OBSAI).

Incorporating either CPRI or OBSAI, the actual base stations can be placed in much less challenging locations, where size, climate and availability of power are much more easily managed. In addition, wireless network providers can maximize the base-station output by having multiple antennas per offsite base station.

With the NetBlazer series of modules, field technicians can perform FTFA tests (CPRI or OBSAI). Whether the need is for 2.5 or 3.1 Gbit/s, the NetBlazer modules can perform a BER test that validates the fiber from the remote base station all the way to the remote radio head.



Distributed Wireless Base Station System

EFFICIENTLY ASSESSING PERFORMANCE OF FIBRE CHANNEL SERVICES

The NetBlazer Series modules provide comprehensive testing capabilities for Fibre Channel network deployments, supporting multiple Fibre Channel interfaces.

APPLICATIONS

Since most storage area networks (SANs) cover large distances and because Fibre Channel has stringent performance requirements, it is imperative to test at each phase of network deployment to ensure appropriate service levels. EXFO's NetBlazer series modules provide full wire-speed traffic generation at the FC-2 layer, which allows BER testing for link integrity measurements. The NetBlazer series also supports latency, buffer-to-buffer credit measurements for optimization as well as login capabilities.

Latency

Transmission of frames in a network is not instantaneous, and is subject to multiple delays caused by the propagation delay in the fiber and by the processing time inside each piece of network equipment. Latency is the total accumulation of delays between two end points. Some applications, such as VoIP, video and storage area networks, are very sensitive to excess latency.

It is therefore critical for service providers to properly characterize network latency when offering Fibre Channel services. The NetBlazer series modules estimate buffer-to-buffer credit value requirements from the performed latency measurement.

Buffer-to-Buffer Credit Estimation

In order to regulate traffic flow and congestion, Fibre Channel ports use "buffers" to temporarily store frames. The number of frames a port can store is referred to as a "buffer credit". Each time a frame is received by a port, an acknowledgement frame is sent. The buffer-to-buffer credit threshold refers to the amount of frames a port can transmit without receiving a single acknowledgement.

This is a crucial configuration parameter for optimal network performance. Usually, network administrators calculate the value by taking the traveled distance and the data rate into consideration; however, since latency issues are not considered, poor accuracy is to be expected. The NetBlazer series modules are capable of estimating buffer credit values with respect to latency by calculating the distance according to the round-trip latency time. This value can then be used by network administrators to optimize the network configuration.

Login Testing

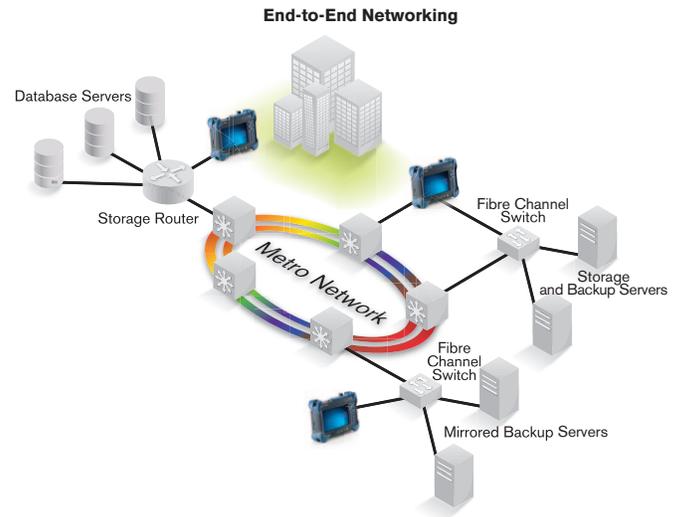
Most new-generation transport devices (xWDM or SONET/SDH mux) supporting Fibre Channel are no longer fully transparent; they also have increased built-in intelligence, acting more as Fibre Channel switches. With switch fabric login ability, the NetBlazer series modules support connections to a remote location through a fabric or semitransparent network.

The login process not only permits the unit to connect through a fabric, but it also exchanges some of the basic port characteristics (such as buffer-to-buffer credit and class of service) in order to efficiently transport the traffic through the network.

The login feature allows automatic detection of port/fabric login, login status (successful login, in progress, failure and logout) and response to remote buffer-to-buffer advertised credit.

COMPLETE SUITE OF FIBRE CHANNEL INTERFACES

Interface	Signal Rate (Gbit/s)	Data Rate (MB/s)
1x	1.0	100
2x	2.1	200
4x	4.2	400
8x	8.5	800
10x	10.5	1200



Thanks to end-to-end network testing capabilities, EXFO's FTB-860 enables fast deployment and configuration of Fibre Channel networks. Communication between the transport network, interconnection devices and end nodes can be validated with features such as BER testing, latency measurement, buffer-to-buffer credit estimation and port login capabilities.

EXFO Connect

EXFO | Connect

AUTOMATED ASSET MANAGEMENT. PUSH TEST DATA IN THE CLOUD. GET CONNECTED.

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.

EXPERT TEST TOOLS ON THE FTB-1 PLATFORM

EXpert Test Tools is a series of platform-based software testing tools that enhance the value of the FTB-1 platform, providing additional testing capabilities without the need for additional modules or units.

EXpert TEST TOOLS

EXpert VoIP TEST TOOLS

The EXpert VoIP Tools generate 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 IP TEST TOOLS

The EXpert IP Tools integrate 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 perform debugging sequences with VLAN scan and LAN discovery
- Validate end-to-end ping and traceroute
- Verify 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



SPECIFICATIONS

SFP ETHERNET OPTICAL INTERFACES							
	Two ports: 100M and GigE						
Available wavelengths (nm)	850, 1310 and 1550						
Model	FTB-85910	FTB-85911	FTB-8590	FTB-8190	FTB-8192	FTB-8596	FTB-8597
Transceiver type	100 Base-FX	100 Base-LX	1000 Base-SX	1000 Base-LX	1000 Base-ZX	1000 Base-BX10-D	1000 Base-BX10-U
Wavelength (nm)	1310	1310	850	1310	1550	Tx: 1490 Rx: 1310	Tx: 1310 Rx: 1490
Tx level (dBm)	-20 to -15	-15 to -8	-9 to -3	-9.5 to -3	0 to 5	-9.5 to -3	-9.5 to -3
Rx level sensitivity (dBm)	-31	-28	-20	-22	-22	-20	-20
Maximum reach	2 km	15 km	550 m	10 km	80 km	10 km	10 km
Transmission bit rate (Gbit/s)	0.125	0.125	1.25	1.25	1.25	1.25	1.25
Reception bit rate (Gbit/s)	0.125	0.125	1.25	1.25	1.25	1.25	1.25
Tx operational wavelength range (nm)	1280 to 1380	1261 to 1360	830 to 860	1270 to 1360	1540 to 1570	1480 to 1500	1260 to 1360
Measurement accuracy (uncertainty)							
Frequency (ppm)	±4.6	±4.6	±4.6	±4.6	±4.6	±4.6	±4.6
Optical power (dB)	±2	±2	±2	±2	±2	±2	±2
Maximum Rx before damage (dBm)	3	3	6	6	6	6	6
Jitter compliance	ANSI X3.166	IEEE 802.3	IEEE 802.3	IEEE 802.3		IEEE 802.3ah	IEEE 802.3ah
Ethernet classification	ANSI X3.166	IEEE 802.3	IEEE 802.3	IEEE 802.3		IEEE 802.3ah	IEEE 802.3ah
Laser type	LED	FP	VCSEL	FP	DFB	DFB	FP
Eye safety	Class 1	Class 1	Class 1	Class 1	Class 1	Class 1	Class 1
Connector	LC	LC	LC	LC	LC	LC	LC

SFP+ ETHERNET OPTICAL INTERFACES (10G)			
Transceiver type	10G Base-SR/SW	10G Base-LR/LW	10G Base-ER/EW
Wavelength (nm)	850	1310	1550
Model	FTB-8690	FTB-8691	FTB-8692
Tx level (dBm)	-5 to -1	-8 to 0.5	-4.7 to 4.0
Rx level sensitivity (dBm)	-11.1	-12.6	-14.1
Maximum reach	300 m	10 km	40 km
Tx bit rate (Gbit/s)	9.95 to 10.3	9.95 to 10.3	9.95 to 10.3
Rx bit rate (Gbit/s)	9.95 to 10.3	9.95 to 10.3	9.95 to 10.3
Tx operational wavelength range (nm)	840 to 860	1260 to 1355	1530 to 1565
Measurement accuracy (uncertainty)			
Frequency (ppm)	±4.6	±4.6	±4.6
Maximum Rx before damage (dBm)	6	5	5
Jitter compliance	IEEE 802.3ae	IEEE 802.3ae	IEEE 802.3ae
Laser type	VCSEL	DFB	CML
Eye safety	Class 1	Class 1	Class 1
Connector	LC	LC	LC

SFP FIBRE CHANNEL INTERFACES

FC-1x/2x/4x

Wavelength (nm)	850	1310	1310	1550
Model	FTB-85912	FTB-85913	FTB-85914	FTB-85915
Tx level (dBm)	-9 to -2.5	-8.4 to -3	0 to 5	1 to 5
Rx level sensitivity (dBm)	-15 at FC-4 -18 at FC-2 -20 at FC-1	-18 at FC-4 -21 at FC-2 -22 at FC-1	-18 at FC-4 -21 at FC-2 -22 at FC-1	-16.5 at FC-4 -20.5 at FC-2 -22 at FC-1
Maximum reach	500 m on 50/125 µm MMF 300 m on 62.5/125 µm MMF	4 km	30 km	40 km
Transmission bit rate (Gbit/s)	1.06/2.125/4.25	1.06/2.125/4.25	1.06/2.125/4.25	1.06/2.125/4.25
Reception bit rate (Gbit/s)	1.06/2.125/4.25	1.06/2.125/4.25	1.06/2.125/4.25	1.06/2.125/4.25
Tx operational wavelength range (nm)	830 to 860	1260 to 1350	1285 to 1345	1544.5 to 1557.5
Measurement accuracy (uncertainty)				
Frequency (ppm)	±4.6	±4.6	±4.6	±4.6
Optical power (dB)	±2	±2	±2	±2
Max Rx before damage (dBm)	3	3	3	3
Jitter compliance	ANSI FC-PI-2	ANSI FC-PI-2	ANSI FC-PI-2	ANSI FC-PI-2
FC classification	ANSI FC-PI-2	ANSI FC-PI-2	ANSI FC-PI-2	ANSI FC-PI-2
Laser type	VCSEL	Fabry-Perot	DFB	DFB
Eye safety	Class 1	Class 1	Class 1	Class 1
Connector	LC	LC	LC	LC

SFP+ FIBRE CHANNEL INTERFACES

FC-8x/10x

Wavelength (nm)	850	850	1310	1550	1550
Model	FTB-8696	FTB-8690	FTB-8693	FTB-8694	FTB-8695
Tx level (dBm)	-8.2 to -2	-5 to -1	-6 to -1	-1 to 2	0 to 4
Rx level sensitivity (dBm)	-11.1 to 0	-11.1 to 0.5	-14.4 to 0.5	-14 to -1	-24 to -7
Maximum reach	150 m on OM3 MMF	300 m on OM3 MMF	10 km	40 km	80 km
Transmission bit rate (Gbit/s)	8.5	10.5	8.5/10.5	8.5/10.5	8.5/10.5
Reception bit rate (Gbit/s)	8.5	10.5	8.5/10.5	8.5/10.5	8.5/10.5
Tx operational wavelength range (nm)	840-860	840-860	1260 to 1355	1530 to 1565	1530 to 1565
Measurement accuracy (uncertainty)					
Frequency (ppm)	±4.6	±4.6	±4.6	±4.6	±4.6
Optical power (dB)	±2	±2	±2	±2	±2
Max Rx before damage (dBm)	+5	+5	+5	+5	+3
Jitter compliance	ANSI FC-PI-4	ANSI FC-PI-3	ANSI FC-PI-3	ANSI FC-PI-3	ANSI FC-PI-3
FC classification	ANSI FC-PI-4	ANSI FC-PI-3	ANSI FC-PI-3	ANSI FC-PI-3	ANSI FC-PI-3
Laser type	VCSEL	VCSEL	DFB	CML	EML
Eye safety	Class 1	Class 1	Class 1	Class 1	Class 1
Connector	LC	LC	LC	LC	LC

SFP FTTA INTERFACES

CPRI/OBSAI 2.4576/3.072 Gbit/s

Wavelength (nm)	850	1310	1310	1550
EXFO product number	FTB-8590	FTB-8190	FTB-8191	FTB-8192
Tx level (dBm)	-9 to -3	-5 to 0	-2 to 3	-2 to 3
Rx level sensitivity (dBm)	-18 to 0	-18 to 0	-27 to -9	-28 to -9
Maximum reach	300 m on OM3 MMF	15 km	40 km	80 km
Transmission bit rate (Gbit/s)	2.4576/3.072	2.4576/3.072	2.4576/3.072	2.4576/3.072
Reception bit rate (Gbit/s)	2.4576/3.072	2.4576/3.072	2.4576/3.072	2.4576/3.072
Tx operational wavelength range (nm)	830-860	1270-1360	1280 to 1355	1500 to 1580
Measurement accuracy (uncertainty) Optical power (dB)	±2	±2	±2	±2
Max Rx before damage (dBm)	+5	+5	+3	+3
Jitter compliance	IEEE 802.3	GR-253 (SONET) G-958 (SDH)	GR-253 (SONET) G-958 (SDH)	GR-253 (SONET) G-958 (SDH)
Laser type	VCSEL	DFB	DFB	CML
Eye safety	Class 1	Class 1	Class 1	Class 1
Connector	LC	LC	LC	LC
Transceiver type	SFP	SFP	SFP	SFP

ELECTRICAL INTERFACES

Two ports: 10/100 Base-T half/full duplex, 1000 Base-T full duplex
Automatic or manual detection of straight/crossover cable

Transceiver type	10 Base-T	100 Base-TX	1000 Base-T
Tx bit rate	10 Mbit/s	125 Mbit/s	1 Gbit/s
Tx accuracy (uncertainty) (ppm)	±4.6	±4.6	±4.6
Rx bit rate	10 Mbit/s	125 Mbit/s	1 Gbit/s
Rx measurement accuracy (uncertainty) (ppm)		±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

GENERAL SPECIFICATIONS

Size (H x W x D)	130 mm x 252 mm x 36 mm (5 1/8 in x 9 15/16 in x 1 7/16 in)
Weight (with battery)	0.58 kg (1.3 lb)
Temperature Operating Storage	0 °C to 50 °C (32 °F to 122 °F) -40 °C to 70 °C (-40 °F to 158 °F)
Relative humidity	0 % to 93 %, non-condensing
Battery life (extended)	Up to four hours
Battery life (standard)	Up to two hours
Battery charging time	Two hours from full discharge to full charge
Languages	English, Chinese and Japanese

TESTING	
EtherSAM (ITU-T Y.1564)	Capability to perform the service configuration test and the service performance test as per ITU-T Y.1564. Tests can be performed using remote 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 between 1-7 sizes.
Traffic generation and monitoring	Generate, shape and monitor Ethernet and IP traffic with throughput, frame loss, sequencing, packet jitter, latency, frame size, traffic type and flow control.
Multistream background traffic	Transmit and monitor up to nine additional streams over Ethernet and IP networks. Configurable per-stream analysis and capability to set packet size, MAC source/destination address, VLAN ID, VLAN priority, IP source/destination address, ToS field, DSCP field, TTL, UDP source/destination port and payload.
Through mode	Sectionalize traffic between a service provider's network and customer premises equipment.
BER testing	Up to layer 4 supported with or without VLAN Q-in-Q.
Patterns (BERT)	PRBS 2E31-1, 2E23-1, 2E20-1, 2E15-1, 2E11-1, 2E9-1, one user-defined pattern and capability to invert patterns
Error measurement (BERT)	Bit error, bit mismatch 0, bit mismatch 1.
Error measurements	Jabber/giant, runt, undersize, oversize, FCS, symbol, alignment, collision, late collision, excessive collision, 10G block error.
Alarm detection	LOS, link down, pattern loss, frequency, 10G local/remote fault.
VLAN stacking	Generate streams with up to two layers of VLAN (including IEEE 802.1ad Q-in-Q tagged VLAN) traffic by VLAN ID or VLAN priority at any of the stacked VLAN layers.
MPLS	Capability to generate and analyze streams with up to two layers of MPLS labels, including the ability to autodetect the incoming MPLS labels.
Cable testing	Category 5 cable (or better), 100 UTP/STP cable, ≤120 meters.
Service disruption time (SDT)	Includes statistics such as longest, shortest, last, average, count, total and pass/fail thresholds.
IPv6 testing	Includes BERT, RFC 2544, traffic generation and monitoring, background streams, Smart Loopback, Remote Loopback, ping and traceroute.
10 GigE WAN testing	Includes WAN interface sublayer, J0/J1 trace and C2 label generation, J0/J1 trace and C2 label monitoring.
10 GigE WAN alarm monitoring	Includes SEF, LOF, AIS-L, RDI-L, AIS-P, RDI-P, LCD-P, LOP-P, PLM-P, UNEQ-P, ERDI-P, WIS link down, B1, B2, B3, REI-L and REI-P.
FTTA BER testing	Includes BER measurement, bit-error injection, round-trip delay measurement and pass/fail verdict for 2.5 and 3.1 Gbit/s rates.
1588 PTP	Validates 1588 PTP packet network synchronization services, emulates PTP clients, generates and analyzes messages between master/clients, clock quality level and IPDV.
SyncE	Validates SyncE frequency, ESMC messages and clock quality levels.

FIBRE CHANNEL FUNCTIONAL SPECIFICATIONS

TESTING 1x, 2x, 4x, 8x, 10x

BERT	Framed FC-2
Patterns (BERT)	PRBS 2E31-1, 2E23-1, 2E20-1, 2E15-1, 2E11-1, 2E9-1, one user-defined pattern and capability to invert patterns
Error insertion	Bit error, amount
Error measurement	Bit error, mismatch "0", mismatch "1", symbol error, FCS error, undersize error, oversize error and block error (10x only)
Alarm detection	LOS, pattern loss, link down, Frequency, No Traffic, undersize, oversize, local and remote fault
Buffer-to-buffer credit testing	Buffer-to-buffer credit estimation based on latency
Latency	Round-trip latency

ADDITIONAL FEATURES

Optical power measurement	Supports optical power measurement at all times; displayed in dBm.
Remote Loopback	Detects other AXS-200/850 and FTB-860x units and sets them into Smart Loopback mode.
Dual test set	Detects and connects to any of EXFO's datacom testers to perform bidirectional RFC 2544 and EtherSAM testing.
Dual-port mode	Enables any Ethernet test, such as EtherSAM, RFC2544, Traffic Generation and monitoring, or BERT to run directly to itself using one self-contained unit with loopback.
Save and load configuration	Store and load test configurations to/from a non-volatile USB memory stick or internal flash.
Pass/fail analysis	Provides a pass/fail outcome with user-adjustable thresholds for all test results.
IP tools	Perform ping and traceroute functions.
Smart Loopback	Return traffic to the local unit by swapping packet overhead up to layer 4.
Report generation	Generate test reports on the unit or exported via USB.
Event logger	Log test results with absolute or relative time and date, details and duration of events, color-coded events and pass/fail outcome.
Remote control	Remote control via VNC or Remote Desktop.

UPGRADES

SFP upgrades	FTB-8590	SFP modules GigE/FC/2FC at 850 nm, MM, <500 m
	FTB-8591	SFP modules GigE/FC/2FC at 1310 nm, 10 km
	FTB-8592	SFP modules GigE/FC/2FC at 1550 nm, 90 km
	FTB-85910	SFP modules 100 Base-FX, 1340 nm, MM, 2 km
	FTB-85911	SFP modules 100 Base-LX10, 1310 nm, SM, 15 km
	FTB-85912	SFP modules GigE/FC/2FC/4FC at 850 nm, <500 m
	FTB-85913	SFP modules GigE/FC/2FC/4FC at 1310 nm, 4 KM
	FTB-85914	SFP modules GigE/FC/2FC/4FC at 1310 nm, 30 km
	FTB-8590	SFP module GigE/FC/2FC, CPRI/OBSAI 2.45/3.07 Gbit/s at 850 nm, MM, <500 m
	FTB-8590	SFP module; rates: 155/622 Mbit/s, 2.5/2.7 Gbit/s, GigE/FC/2FC, CPRI/OBSAI 2.45/3.07 Gbit/s at 1310 nm, LC connector, 15 km reach
FTB-8191	SFP module; rates: 155/622 Mbit/s, 2.5/2.7 Gbit/s, GigE/FC/2FC; CPRI/OBSAI 2.45/3.07 Gbit/s at 1310 nm, LC connector, 40 km reach	
SFP+ upgrades	FTB-8690	SFP+ modules 10 GigE at 850 nm, MM, 300 m
	FTB-8691	SFP+ modules 10 GigE at 1310 nm, SM, 10 km
	FTB-8692	SFP+ modules 10 GigE at 1550 nm, SM, 40 km
	FTB-8693	SFP+ modules 8FC/10FC/10 GigE at 1310 nm, 10 km
Bidirectional SFP upgrades	FTB-8596	SFP modules bidirectional 1490 Tx 1310 Rx 1000 BASE-BX10
	FTB-8597	SFP modules bidirectional 1310 Tx 1490 Rx 1000 BASE-BX10
	FTB-8598	SFP modules bidirectional 1310 Tx 1490/1550 Rx 1000 BASE-BX
	FTB-8599	SFP modules bidirectional 1550 Tx 1310 Rx 1000 BASE-BX

ORDERING INFORMATION

FTB-860G-XX-XX-XX-XX

Models

FTB-860G-1 = Ethernet 10/100/1000 Base-T electrical and GigE optical
 FTB-860G-10 = Ethernet 10 GigE LAN/WAN including 10/100 Base-T
 FTB-860G-100 = Ethernet 10/100/1000 Base-T electrical, GigE optical and 10 GigE LAN/WAN

Interface options

100 OPTICAL = 100 Mbit/s optical^a
 GigE = 1000 Mbit/s optical and electrical^a
 10G LAN = 10 GigE LAN interface^b
 10G WAN = 10 GigE WAN interface^b

Example: FTB-860G-100-IPV6-ETH-THRU

Fibre Channel rate options

FC1X = Enabled 1x Fibre Channel interface^a
 FC2X = Enables 2x Fibre Channel interface^a
 FC4X = Enables 4x Fibre Channel interface^a
 FC8X = Enables 8x Fibre Channel interface^b
 FC10X = Enables 10x Fibre Channel interface^b

Software options

00 = Without software option
 Cable_test = Cable test
 MULTIPLE_STREAMS = Multiple streams
 IPV6 = Internet protocol version 6
 ETH-THRU = Enables Through mode capability
 CPRI-OBSAI = Enables 2.5 and 3.1 Gbit/s^a
 MPLS = Enables MPLS
 1588PTP = Generates and analyzes 1588 PTP
 SyncE = Generates and analyzes SyncE protocol

FTB-860-XX-XX-XX-XX

Models

FTB-860 = Ethernet 10/100/1000 Base-T electrical and GigE optical

Interface option

100 OPTICAL = 100 Mbit/s optical^a

Software options

00 = Without software option
 Cable_test = Cable test
 MULTIPLE_STREAMS = Multiple streams
 IPV6 = Internet protocol version 6
 ETH-THRU = Enables Through mode capability
 CPRI-OBSAI = Enables 2.5 and 3.1 Gbit/s^a
 MPLS = Enables MPLS
 1588PTP = Generates and analyzes 1588 PTP
 SyncE = Generates and analyzes SyncE protocol

Example: FTB-860-IPV6-ETH-THRU

FTB-860GL-XX-XX

Models

FTB-860GL = Ethernet 10/100/1000 electrical, GigE optical and 10 GigE LAN/WAN

Interface option

100 OPTICAL = 100 Mbit/s optical^a

Software options

00 = Without software option
 Cable_test = Cable test
 IPV6 = Internet protocol version 6

Example: FTB-860GL-IPV6-Cable_test

Notes

- a. Requires purchase of SFP.
- b. Requires purchase of SFP+.

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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.

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