SPEC SHEET

FTBx-88480

COMPACT, DUAL-PORT 400G FIELD TESTER

- Most flexible and future-proof 1G to 400G dual-port test solution for lab and field applications, supporting current and next-gen pluggables.

iOptics

EXchange

KEY FEATURES AND BENEFITS

1G to 400G Ethernet testing capabilities based on IEEE standards

Test twice as fast: validate two circuits simultaneously with dual-port testing (1G up to 400G)

Complete Ethernet 1G to 400G test suite including EtherBERT, RFC 2544, EtherSAM Y.1564, smart loopback, dual-port traffic generation and monitoring

State-of-the-art Open Transceiver System (OTS) design for full flexibility with current and future transceivers

Flexible solution that uniquely supports current SFP-DD and QSFP-DD interfaces as well as next-gen technologies (e.g., digital coherent optics like 400G ZR, Open ZR+)

Compatible with the portable FTB-1 Pro Platform for the most compact, dual-port 400G solution—ready for the lab-to-field transition

Supports quick optical transceiver validation and sanity check using iOptics, an intelligent pluggable optics test application

Pre-emphasis and Rx equalization tools to modify the waveform for better definition of the eye diagram

RELATED PRODUCTS AND ACCESSORIES

Platform
FTB-1v2 HPDC

Rackmount platform
LTB-8

Platform
FTB-2 Pro

Platform
FTB-4 Pro

EXFO

400G MAKING ITS WAY TO THE FIELD

Network infrastructure planners must deal with skyrocketing demands for more bandwidth, including in the data center interconnect (DCI) or even in core and metro networks. Service providers and hyperscale companies are constantly expanding their networks, looking for more efficient and cost-effective ways to deploy those high-speed circuits and migrate to higher rates. High-speed transceivers (pluggables) are being designed to be smaller and consume less power in order to meet the requirements of delivering high port density at a low cost. That is the reason why operation teams and field technicians look for future-proof test solutions designed to handle both current and upcoming high-speed transceiver technologies as they are developed and deployed.

The jump from 100G to 400G is a necessity, but due to its complexity it is not without challenges. Moving to 400G everywhere requires special considerations, as much for data centers as for metro and core backbone networks. The FTBx-88480 enables today's field technicians to move smoothly and expertly between testing different rates, interfaces and technologies—all within a single, compact platform designed for the field.

TEST TWICE AS FAST WITH DUAL-PORT TESTING

The ability to test two 400G ports simultaneously—including 1G, 100G, 200G and more—means technicians can do more in a day. With the sheer volume of ports in play, fast and accurate testing is critical. Furthermore, using dual-port testing, technicians can validate main and backup links simultaneously, and under consistent conditions—speeding up the process while reducing the potential for network failures.

COMPATIBLE WITH PORTABLE AND RACKMOUNT PLATFORMS

The FTBx-88480 module offers a complete suite of 400G ecosystem testing capabilities, addressing early adopters' requirements from in-lab innovation to testing in the field. In addition, when portability is needed the FTBx-88480 module can be inserted into the FTB-1 Pro. The module can also serve for rackmount applications, where not only one but four modules can be inserted into the high-performance LTB-8 rackmount chassis to deliver up to 3.2T of Ethernet traffic. The LTB-8 rackmount platform provides users with added versatility and power for lab validations.

DESIGNED FOR FLEXIBILITY

The OTS design provides enhanced flexibility and CAPEX protection to the end user; one test module can support various types of transceivers. A flexible solution that can adapt and adjust to the fast evolution of transceivers while providing multirate support.

1. 2x QSFP-DD ports supporting 400G/200G/100G Ethernet rates as well as coherent optics.
2. SFP-DD port supporting SFP28/SFP56
3. REF CLOCK OUT SMA interface
4. Synchronixation SMB interface (input 1PPS, 10 MHz or 2 MHz)
5. Built-in GNSS/GPS: SMA, SMB (EXT CLK and 1PPS)
6. Open Transceiver System module interface, supporting SFP28, QSFP28, CFP4

MULTIPORT CAPABILITIES

FTB-1 Pro high-power dual-carrier (HPDC)

The high-power, dual carrier configuration is the FTB-1 Pro platform's most flexible solution, allowing simultaneous dual-port 400G testing. This platform is completely field-focused, with features built specifically for today's technicians.

LTB-8 rackmount platform

The LTB-8 is a powerful, scalable eight-slot rack-mount platform designed for advanced lab and manufacturing applications. The LTB-8 can support 4 x FTBx-88480 test modules, allowing for the **simultaneous testing of 8 x 400G ports**.

Combine the FTBx-88480 with other best-in-class test tools (e.g., OSA, optical switches and variable attenuators) for a full-suite of advanced testing capabilities.

RAPID EVOLUTION OF TRANSCEIVERS

A shared challenge in the telecom industry today is the wide variety of pluggable transceivers available and the rapid rate at which new types of transceivers are being launched. This growing challenge impacts both equipment manufacturers trying to keep up, and network operators/data centers trying to integrate new transceivers into their networks.

With that in mind, the latest addition of test modules—the FTBx-88480—comes with the innovative OTS design which allows users to customize the type of interfaces on the module according to their needs, without using adapters, while also ensuring the future-proof capacity to test new transceivers as they become available, by simply changing the transceiver system instead of having to purchase a new test unit.

OPEN TRANSCEIVER SYSTEM		SUPPORTED INTERFACES	FEATURES	NUMBER OF TEST PORTS
	**SFP28**	SFP, SFP+, tunable SFP+, SFP28 and bidirectional SFP	10M to 25G data rates Dual-port capability	2
	**QSFP28**	QSFP+, QSFP28	40G / 50G / 100G data rates Dual-port capability AOC cables	2
	**CFP4**	CFP4, SMA (REF OUT)	100G data rate Ref out for eye diagram analysis	1

HIGH SPEED ETHERNET TESTING

400G Ethernet is the promising replacement for 100G Ethernet. 400G is making its way to the field as the industry ramps up to handle the massive demands of hyperscale data centers, 5G applications, service providers and business users. The FTBx-88480 offers advanced Ethernet testing capabilities, including forward error correction monitoring and validation.

1G to 400G framed/unframed BERT testing capabilities

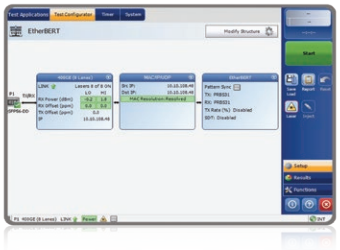
- 1G to 400G Ethernet MAC PCS/PMA/PMD layer testing
- 400G/200G FEC RS (544, 514) decoding and error correction
- Test pattern monitoring
- MDIO/I2C for all interfaces read/write
- Alarms/errors generation and monitoring
- Per lanes PRBS unframed testing with pass/fail verdict
- CMIS support with loopback testing

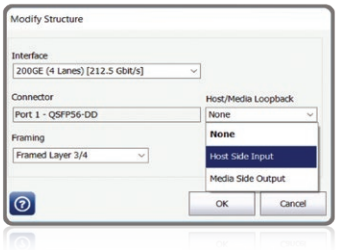
Advanced testing capabilities

EtherBERT

- Skew measurement per lane
- FEC testing
- BER monitoring
- Advanced error analysis
- SDT measurement
- Ethernet traffic filtering
- Unframed BER testing (including PRBS31Q, PRBS13Q and SSPRQ patterns)
- Pre-emphasis and Rx equalizer for the capability to modify the signal for better eye opening
- Host and media side configuration

Unframed BERT





iOptics

iOptics is an intelligent pluggable optics test application and first-alert test that can be used in the field or lab to efficiently evaluate the proper operation of an optical interface, with minimal user configuration required. iOptics performs validation using several subtests, monitors power consumption and temperature and reports an individual verdict for each subtest and monitoring task. iOptics now supports the latest high-speed pluggables from 1G to 400G transceivers, AOC and DAC cables. iOptics now offers loopback settings for internal transceiver fault isolation.

SFP/SFP+/SFP28

QSFP+/QSFP28

QSFP56/QSFP-DD

iOptics

AOC cables

DAC cables

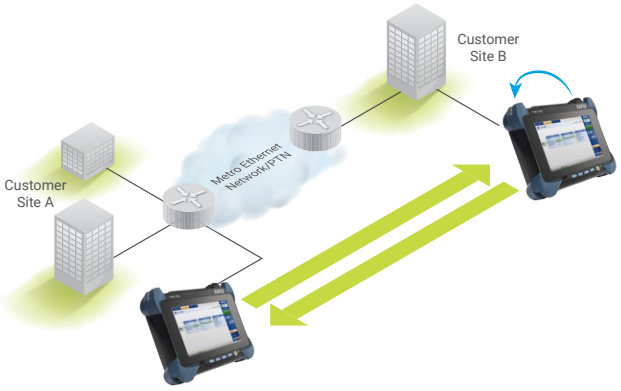
RFC 2544

As 400G moves from the lab to the field (the first 400G deployments are imminent), ensuring service quality at turn-up is becoming key. Portable 1G to 400G test equipment will enable field technicians and contractors to immediately capture test results and demonstrate that the Ethernet service meets SLAs. These tests may also serve as a performance baseline for future reference.

From a laboratory and benchmarking perspective, RFC 2544 methodology is ideal for automated measurement and reporting. From a service turn-up and troubleshooting perspective, RFC 2544 provides an out-of-service benchmarking methodology for evaluation of network/device performance using four subtests with up to 10 configurable frame sizes, each validating a specific portion of an SLA. RFC 2544 provides engineers and network technicians with a common language and results format.

RFC 2544 includes the following subtests:

1. Throughput
2. Back-to-back (Burstability)
3. Frame loss
4. Latency



SMART LOOPBACK

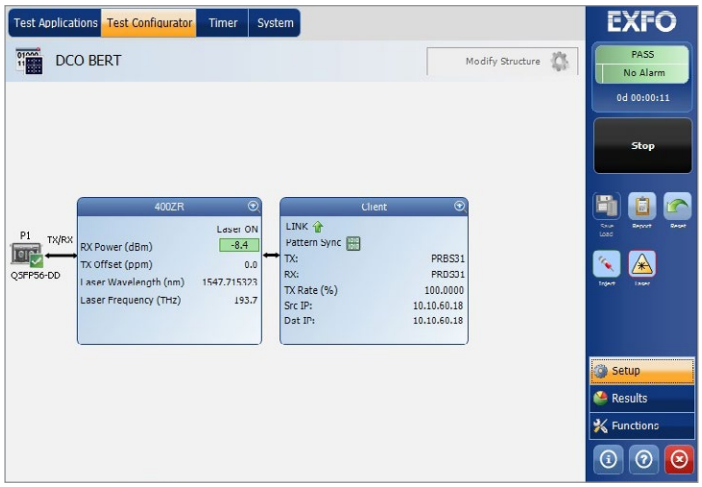
EXFO smart loopback is a unique functionality that enables loopback Ethernet traffic at all rates from a user-datagram protocol (UDP) or transmission-control-protocol (TCP) layer, or all the way down to a completely promiscuous mode (transport loopback). The modules can adjust to all loopback situations where the remote unit will return traffic to the local unit by swapping packet overhead up to layer 4 of the OSI stack.

DIGITAL COHERENT PLUGGABLES

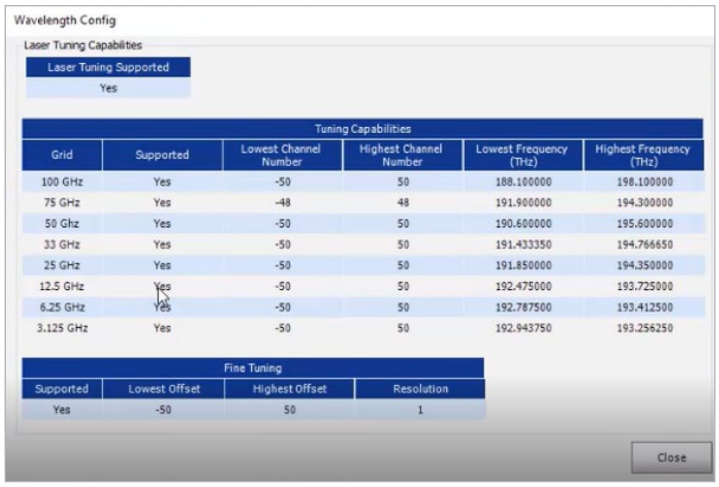
The OIF MSA standard has introduced a few WDM interfaces that leverage digital coherent optics (DCO). OIF 400ZR and OpenZR+ are the most popular ones, used for optimal connectivity in data center interconnect and metro applications. These transceivers support long-distance interconnections (see figure below with test configurations). The most popular rates for these transceivers are 100G, 200G, 300G and 400G.

EXFO's FTBx-88480 advanced DCO capabilities include:

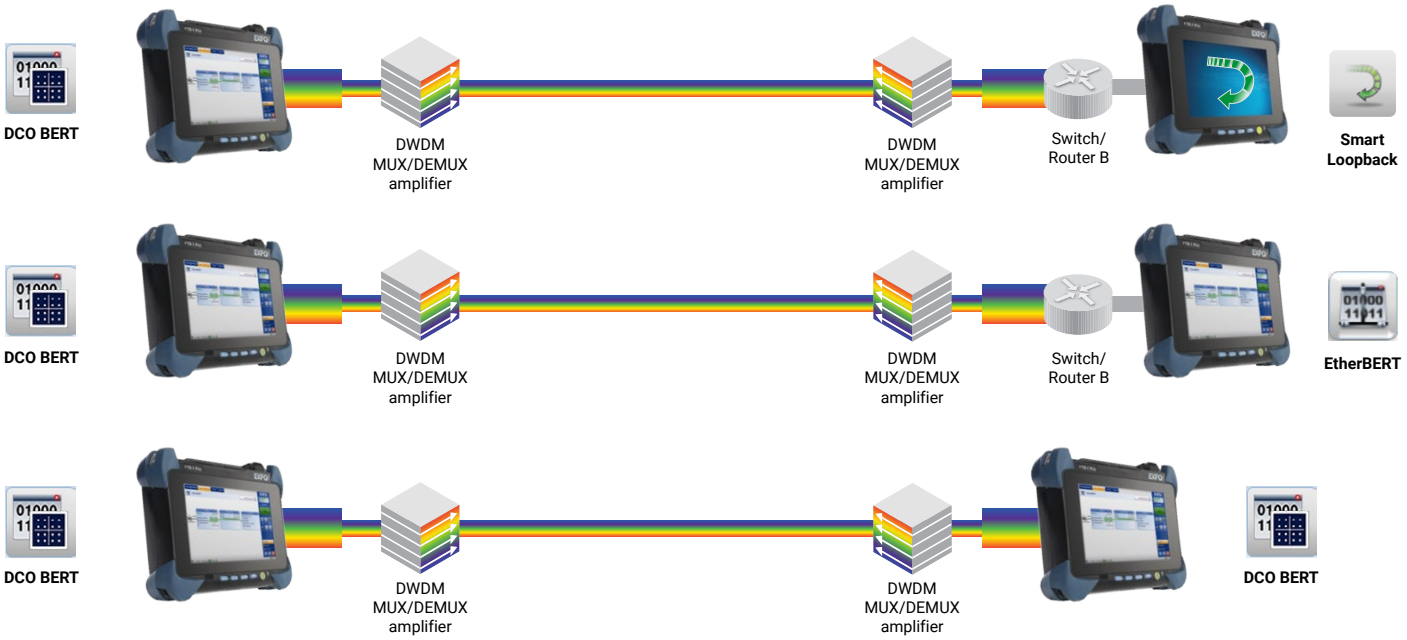
- Configurable Tx power
- Configurable wavelength
- Display from pluggable optical metrics like CD, OSNR, etc.
- 400G client L2 to L4 configuration capabilities
- Media Rx FEC alarm and error monitoring
- And more



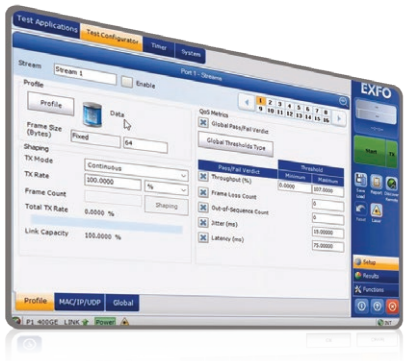
DCO Bert generation and analysis



Wavelength tuning



ETHERNET TRAFFIC GENERATION AND MONITORING



Data services carried over high-speed networks are making a significant shift towards a variety of applications. Multiservice offerings, such as triple-play services have fueled the need for QoS testing to ensure the condition and reliability of each service, and qualify SLA parameters. With traffic generation and monitoring, high-speed modules allow service providers to simultaneously simulate and qualify different applications. Up to 16 streams can be configured 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.

In addition, the modules support monitoring of multiple VLAN streams through the Traffic Scan functionality. In the same line, a MAC flooding capability is available for switch-addressable memory testing, where the range of MAC addresses can be cycled, forcing the switch to learn every single one. The modules offer the flexibility to define one configuration profile and apply it to as many streams as required. From there, it is just a matter of tweaking them to each stream. They also simultaneously measure throughput, latency, packet jitter (RFC 3393), frame loss and out-of-sequence errors in all streams, yielding fast and in-depth qualification of all SLA criteria. Results are displayed in tabular format and on analog visual gauges to ensure that test outcomes are quickly and easily interpreted.

EtherSAM: ITU-T Y.1564 ETHERNET SERVICE ACTIVATION

With more and more Ethernet services being activated today, the ITU-T Y.1564 standard addresses the growing demand for turning up and troubleshooting Carrier Ethernet services. The Power Blazer modules support Ethernet client services, including validation of critical SLA criteria, such as packet jitter and quality-of-service (QoS) measurements, as well as faster time-to-service. 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. EtherSAM 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:

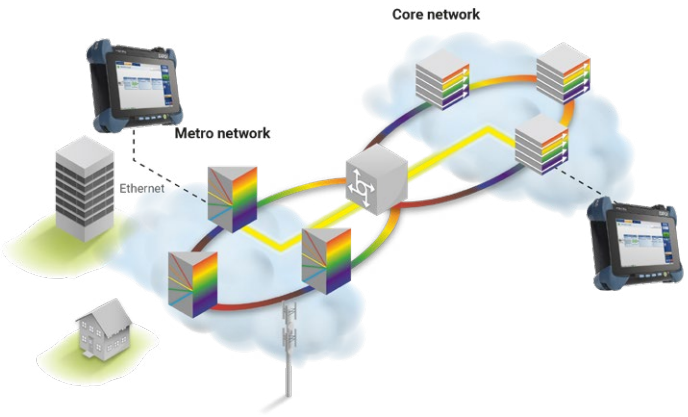
1. Service configuration test
2. Service performance test

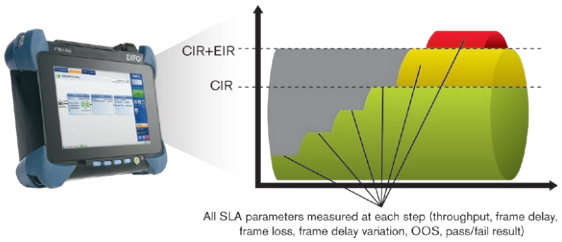
Service configuration test

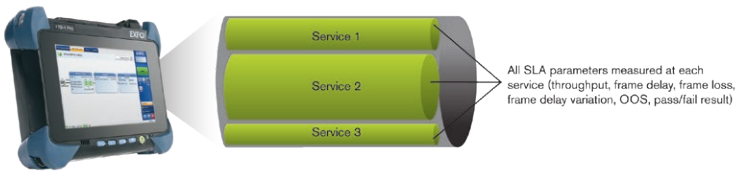
The service configuration test consists of sequentially testing each service. It validates that the service is properly provisioned and that all specific KPIs or SLA parameters are met.

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. In addition, EtherSAM's approach proves even more powerful as it executes the complete ITU-T Y.1564 test bidirectionally. 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.







SOFTWARE TEST TOOLS

These platform-based software testing tools enhance the value of the FTB-1v2, FTB-2 Pro, FTB-4 Pro and LTB-8 platforms, providing additional monitoring and inspection testing capabilities.

ConnectorMax

Providing lightning-fast results in the first step of fiber link testing, ConnectorMax2 is a powerful platform-based, automated inspection application. It delivers quick pass/fail assessment of connector endfaces and is designed to save time and money, in the field and in the lab.

Remote control

The Windows-based design enables remote operation through TeamViewer, Remote Desktop (RDP), Virtual Network Computing (VNC), Microsoft Teams and the free remote software, EXFO Remote Toolbox:

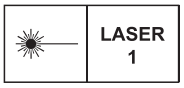
- Perform tests and evaluations remotely
- Enjoy easy remote access by connecting to a fixed/wireless Ethernet network or hotspot—no need to connect to the customer network
- Perform automation tasks using SCPI and Python in an automated test environment

SPECIFICATIONS

MECHANICAL AND ENVIRONMENTAL SPECIFICATIONS		
Size (H x W x D)		51 mm x 159 mm x 187 mm (2 in x 6 1/4 in x 7 3/8 in)
Weight		0.85 kg (1.87 lb)
Temperature	Operating Storage	0 °C to 40 °C (32 °F to 104 °F) -40 °C to 70 °C (-40 °F to 158 °F)

REF-OUT INTERFACE	
Tx pulse amplitude	200 mVpp to 1300 mVpp, depending on frequency
Transmission frequency	155 MHz to 3.50 GHz
Output configuration	AC-coupled
Load impedance	50 Ω
Connector type	SMA
External cable	Maximum 1 meter cable length (RG178 cable with 3.1 dB/m attenuation at 3.5 GHz)

LASER SAFETY



Module: The host unit that you use with your module may have different laser classes. Refer to the host unit documentation for exact information.

SUMMARY OF KEY FEATURES	
Detailed compliance testing	IEEE 802.3ba and IEEE 802.3bs standard
Multi-interface support	Pluggable MSA-compliant 2x QSFP28 transceivers AOC QSFP28/QSFP-DD cable support CFP MSA management interface specification version 2.6 (R06a) QSFP-DD MSA revision 4.0, 8 x 50G and 4 x 100G 400G DAC cables support Pluggable, MSA-compliant QSFP+ transceivers Pluggable, MSA-compliant SFP28 optical transceiver Pluggable, MSA-compliant SFP/SFP+ optical transceivers
Line rate	425/212.5/106.25 (single lambda)/103.125/53.125/41.25 Gbit/s, 100G SRBD, 50G, 25G, 1G, OIF DCO Coherent QSFP DD ZR and ZR+
Robust physical-layer validation	400GAUI lane-error generation and monitoring PCS lane mapping and monitoring capability Per-lane skew generation and measurement PCS error generation and monitoring per lane Full MDIO/I2C read/write access
Transceiver and cable validation	SFP, SFP+, SFP28, QSFP+, QSFP28, QSFP56, QSFP-DD
iOptics	Optical-device I/O interface quick check Optical Tx power-level test Optical Rx signal-presence and level test Stress test Excessive skew test Temperature and power consumption monitoring Host and media loopback
Power measurement	Optical channel power measurement with color indicators per lane
Frequency measurements	Allow users to measure the received frequency per wavelength (in Hz) in the used of parallel optics
Frequency offset	Offsetting of the transmitted signal's clock on a selected interface, and monitoring
Transceiver non-blocking analysis	Enables a step-by-step monitoring of the transceiver boot-up sequence
BERT	BERT framed and unframed testing using different parameters different frame sizes, including EMIX
Service disruption time (SDT)	Service disruption time measurements based on no-traffic mode, with statistics including longest disruption time, shortest, last, average, count, total and pass/fail thresholds
Latency measurements in BERT	High-resolution delay measurements integrated in the BER with statistics including current, average, maximum, minimum, count, total and pass/fail thresholds
Error injection mode	Manual, rate and continuous (maximum rate)
Layer 2	MAC address and Ether type edition available Q-in-Q capability with the ability to go up to three layers of stacked VLANs
Layer 3/4	Source and destination IP address configuration available IP TOS/DSP configuration available UDP source and destination port configuration available
RFC 2544	Throughput, back-to-back, frame loss and high-resolution latency measurements according to RFC 2544; frame size: RFC-defined or user-configurable
EtherSAM	Simplified ITU-T Y.1564 test that performs service configuration and service performance tests using remote loopback or dual test set mode for bidirectional results
Traffic generation and monitoring	Traffic generation and shaping of up to 16 streams of Ethernet and IP traffic, including the simultaneous monitoring of throughput, frame loss, packet jitter, latency and out-of-sequence frames, including MAC flooding for source and destination MAC addresses
Smart loopback	Return Ethernet traffic to the local unit by swapping packet overhead up to layer 4
Rx frame-size analysis	< 64, 65 - 127, 128 - 255, 256 - 511, 512 - 1023, 1024-1518 and > 1518
Rx rate	Line utlization (%), Ethernet BW (Mbit/s), frame rate (frame/s), and frame count
Ethernet alarms	Link down, local fault detected, local fault received, remote fault, LOA
Ethernet errors	FCS, jabber, runt, undersize and oversize
Higher layer error analysis	UDP checksum
PCS lane alarms and errors	LOS, LOC-lane, LOAML, excessive skew, Inv. Marker, Pre-FEC SYMB and Pre-FEC-bit
Skew insertion	Per-lane skew generation and measurement range 0 to 10550

SUMMARY OF KEY FEATURES (CONTINUED)	
PCS logical lane mapping	Manual and random
FEC	Generation and analysis of FEC correctable and uncorrectable errors, local and remote degraded SER monitoring
FEC statistics	Number of symbol errors per correctable codeword, number of pre-FEC symbol errors and bit statistics, codeword count (error-free and uncorrectable) and percentage
IP tools	Performs ping and traceroute functions
IPv4 and IPv6 testing	Performs the following tests up to 400G over IPV4 and IPv6, RFC 2544, BERT, traffic generation and monitoring, EtherSAM, ping and traceroute
Advanced filtering	Configure up to 10 filters, each with four fields that can be combined with AND/OR/NOT operations; a mask is also provided for each field value with IPv4 or IPv6 capabilities
Remote access	Supported via EXFO Remote ToolBox, Remote Desktop, VNC and EXFO Multilink for multiuser support
Automation	Wide range of commands available per application to allow test automation
Reporting	Test results are included in a report that can be generated in different formats: pdf, html and json

UNFRAMED BER TEST	
Pattern configuration	8 unframed 400GAUI-8 lanes, 4 unframed 200GAUI-4 lanes
PRBS patterns per lane	Allow users to configure different PRBS patterns on different 400GAUI lanes
Patterns	PRBS 2E31-1, PRBS 2E23-1, PRBS31Q, PRBS13Q, SSPRQ capability to invert patterns
Error measurement	Mismatch 0, mismatch 1, bit error and pattern loss per 400GAUI/200GAUI lane displayed in seconds, count and rate
Alarm injection	Capabilities to inject pattern loss and LOS per 400GAUI/200GAUI lane continuously

COHERENT OPTICS	
Compliance	OIF 400ZR, IEEE 802.3cw, OpenZR+
Tx power	Optical power Tx transceiver configuration
Wavelength	Tranceiver grid configuration
Optical metrics	Test set displays the following optical metrics CD (ps/nm), CFO (MHz), DGD (ps), OSNR (dB), PDL (dB), SOPCR (Krad/s), SOPMD (ps2)
Client configuration	Ethernet client L2/3 and L4 configuration
Ethernet frame	Client Ethernet frame configuration fixed or EMIX
Ethernet client BERT	Bit error analysis using PRBS31 supporting alarm/error monitoring and injection
FED	User can enable FEC excessive degrade alarm monitoring
FDD	User can enable FEC detected degrade alarm monitoring
FEC alarms	FED and FDD alarms monitoring
FEC error monitoring	FEC-UNCOR-FR and FEC-COR-BITS monitoring
Ethernet alarms	Link down, L Fault Det, L Fault Rcd, Remote fault LOA alarms
Ethernet errors	66B Block, FEC-UNCOR-FR, FEC-COR-BITS, FCS, Jabber, runt and undersize errors
Error and alarm injection	User can inject Interface, Ethernet, PCS and BERT errors and alarms
DCO Tx alarms	Tx LOA, Tx OOA, Tx CMU LOL, Tx RefClk LOL, Tx Deskew LOL, Tx FIFO
DCO Rx alarms	Rx LOF, Rx LOM, Rx Demod LOL, Rx CDC LOL, Rx LOA, Rx OOA, Rx Deskew LOL, Rx FIFO

EXFO headquarters **T** +1 418 683-0211 **Toll-free** +1 800 663-3936 (USA and Canada)

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Printed in Canada 22/11