# 800G/400G Power Blazer

## MULTISERVICE TEST MODULE


EXFO TFv
Test Function Virtualization

EXFO Connect
Compatible

iOptics

EXFO | MULTILINK

SPEC SHEET

**Most compact 400G multiservice test modules for lab and field applications**

## KEY FEATURES AND BENEFITS

- 400G/200G/100G Ethernet testing capabilities based on the IEEE 802.3bs and IEEE 802.3ba standard
- State-of-the-art Open Transceiver System (OTS) design for full flexibility with current and future transceivers
- Flex Ethernet (FlexE) testing capabilities with low and high speed Ethernet clients supported on 4xQSFP28 ports
- Flexible solution that uniquely supports current CFP8, QSFP-DD and OSFP interfaces as well as next-gen interfaces (e.g., coherent, CFP2-DCO, ZR) without adapters
- Compatible with EXFO's LTB-8 Rackmount Platform featuring hot-swap capability for lab use and best-in-class 400G port density with up to two modules running simultaneously
- Compatible with the portable FTB-4 Pro Platform for the most compact 400G solution—ready for the lab-to-field transition
- OTUCn/FlexO BER testing capabilities supporting 419G mapped in ODUflex over four PHYs FOIC1.4 interfaces
- Supports quick optical transceiver validation and sanity check using iOptics, an intelligent pluggable optics test application
- Unframed BERT capabilities including the most important patterns: PRBS31Q, PRBS13Q and SSPRQ
- Pre-emphasis and RX equalization tools to modify the waveform for better eye opening at the destination
- PAM4 histogram: provides a graphic view from PAM4 eye diagram per lane, including PAM4 levels

## RELATED PRODUCTS AND ACCESSORIES

**Rackmount Platform**
LTB-8

**Platform**
FTB-4 Pro

**Multi-User Interface**
EXFO Multilink

EXFO

## 400G TO THE RESCUE

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. Network equipment manufacturers (NEMs) continue to push the limits of technology, developing increasingly innovative 400G solutions. Service providers are constantly expanding their networks, looking for more efficient and cost-effective ways to deploy those high-speed circuits. 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. In the upcoming 400G world, transceiver testing is of critical importance whenever we are talking about QSFP-DD, OSFP, or even COBO.

The industry is moving forward with smaller, advanced transceivers for shorter wavelengths and with lower power consumption. EXFO offers 400G solutions that are ready for today's 400G transceivers while being future-proof. 400G switches are migrating quickly to advanced technologies with interfaces that will allow them to increase the port density in a 1RU at minimal cost.

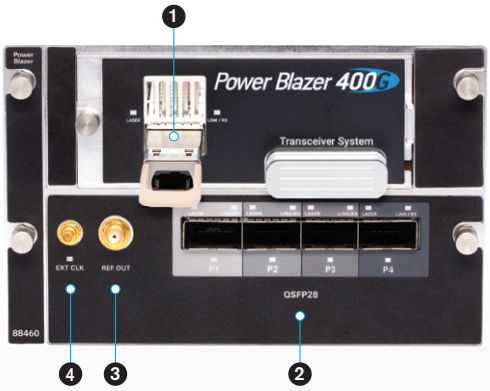
## COMPATIBLE WITH PORTABLE AND RACKMOUNT PLATFORMS

The new, compact FTBx-88460 Power Blazer module offer 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-88460 module can be inserted into the FTB-4 Pro. The module can also serve for rackmount applications, where not only one but two modules can be inserted into the high-performance LTB-8 rackmount chassis to deliver up to 800G of Ethernet traffic. The LTB-8 rackmount platform provides users with added versatility and power for today's complex networks.

### 400G TESTING MODULE

**FTBx-88460 Power Blazer**

The FTBx-88460 offers powerful and advanced 400G ecosystem testing. The addition of the Open Transceiver System makes it uniquely suited to adjust to the specific transceiver required for the test.




*FTBx-88460 Power Blazer*

## DESIGNED FOR FLEXIBILITY

The Open Transceiver System 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.

The FTBx-88460 can also be configured with only a filler for FlexE and FlexO testing applications.

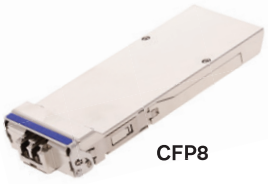
1. **400G/200G/100G transceiver**
2. **4 x QSFP28 ports supporting FlexE and OTUCn/FlexO up to 400G**
3. **REF CLOCK OUT SMA interface**
4. **Synchronixation SMB interface (input 1PPS, 10 MHz or 2 MHz)**


QSFP-DD


QSFP56


QSFP28


OSFP


CFP8

| INTERFACES | | |
|---|---|---|
| QSFP28 | SR4/LR4/CWDM4/CLR4/PSM4 | 100 Gbit/s QSFP quad form-factor plugglable |
| CFP8 | FR8/LR8 | 400 Gbit/s SMF (400GAUI-8) optical 8 x 50G PAM-4 |
| QSFP-DD | FR8/LR8/FR4/DR4 | 400 Gbit/s SMF (400GAUI-8) optical 8 x 50G /4 x 100G PAM-4 |
| QSFP56 | FR4/DR4 | 200 Gbit/s SMF (200GAUI-4) 4 x 50G |
| OSFP | FR8/LR8/FR4/DR4 | 400 Gbit/s SMF (400GAUI-4) optical 8 x 50G /4 x 100G PAM-4 |

## TESTING UP TO 800G ETHERNET LINKS SIMULTANEOUSLY

### Multiple configurations available

- 2 x QSFP-DD/ 2 x QSFP56
- 2 x OSFP
- 2 x CFP8
- 1 x QSFP-DD / 1 x OSFP
- Up to 8 x QSFP28 FlexE testing


## RAPID EVOLUTION OF TRANSCEIVERS

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

With that in mind, the latest addition to the Power Blazer family of test modules–the FTBx-88460–comes with a new design concept using Open Transceiver System 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.



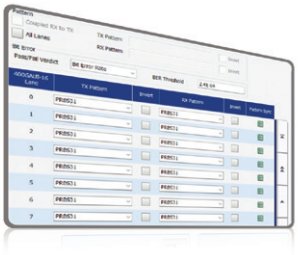
## 400G/200G ETHERNET

400G Ethernet is the promising replacement for 100G Ethernet. 400G is becoming the next client rate in the Ethernet ecosystem as the industry ramps up to handle the massive demands of hyperscale data centers, service providers and business users. The FTBx-88460 offers advanced Ethernet testing capabilities, including forward error correction monitoring and validation.

### 400G/200G framed/unframed Ethernet testing capabilities

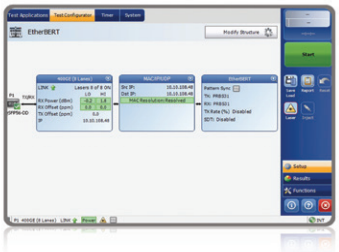
- 400G/200G Ethernet MAC PCS/PMA/PMD layer testing
- FEC RS (544,514) decoding and error correction
- Test pattern monitoring
- MDIO read/write
- Alarms/errors generation and monitoring
- Per lanes PRBS unframed testing with pass/fail verdict
- CMIS 3.0 and CMIS 4.0 support with loopback testing

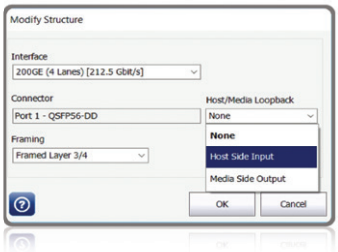
### Unframed BERT



### Advanced testing capabilities


- 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
- PAM4 histogram
- Host and media side configuration






## iOptics

iOptics is an intelligent pluggable optics test application and first-alert test that can be used in the field or lab environment to efficiently evaluate the proper operation of an optical interface, with minimal user configuration required. iOptics performs the 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 including 400G/100G transceivers, AOC and DAC cables. iOptics now offers loopback settings for internal transceiver fault isolation.

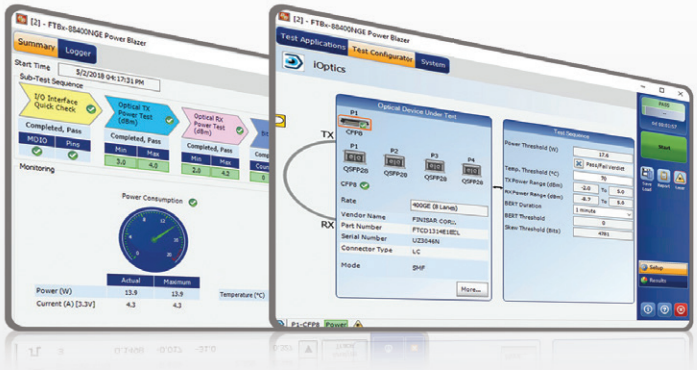
**100G: QSFP28**

**100G: AOC cables**

**400G: CFP8**

**400G: QSFP-DD**

**400G: DAC cables**

## FlexE (Flex ETHERNET)

The Flex Ethernet (FlexE) supports one or more bonded 100GBASE-R PHYs supporting multiple and mixed Ethernet MAC clients operating at rates of 5, 10, 25, 40, 50, 100 or up to 400 Gbit/s. Flex Ethernet is a key technology for data centers, helping them deliver links that are faster than emerging 400G solutions. It will also support sub-rate links i.e., 10G, 25G and 50G, which are essential for data centers but also for carriers that need to isolate their traffic.

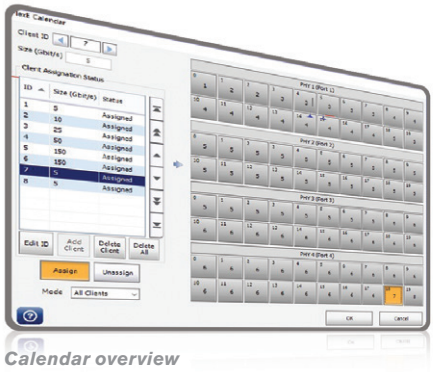
FlexE BERT

### FlexE testing capabilities

- FlexE group
- Mixed Ethernet client types
- Client ID edition
- FlexE shim configuration
- FlexE alarms/errors generation and monitoring
- Alignment marker corruption and substitution
- Full client to calendar slot assignment edition capabilities

*Ethernet multiclients*

*400GE single client*

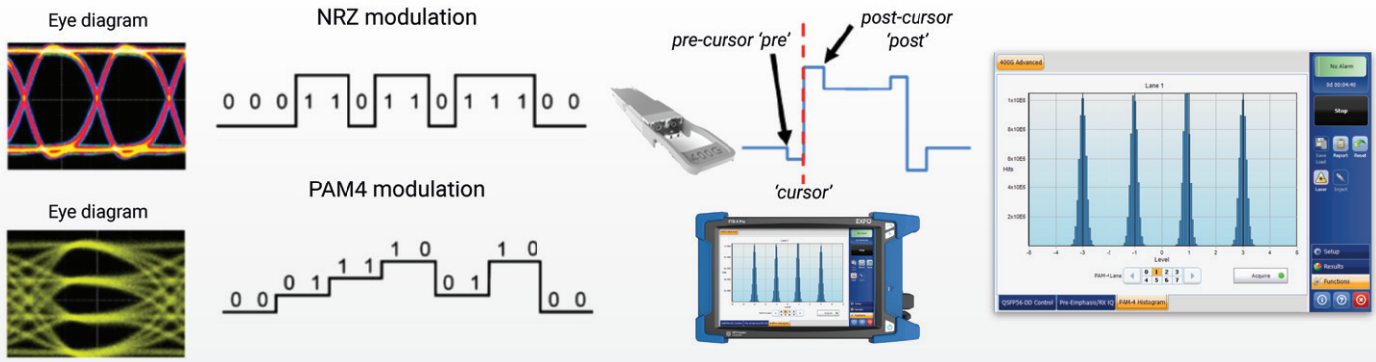


*Calendar overview*

## IMPROVING THE TRANSMISSION SIGNAL

The adoption of PAM-4 (which stands for pulse amplitude modulation) as the new modulation for current and future interfaces on the high speed market brings new challenges, PAM-4 electrical eyes are smaller in comparison to the typical modulation used for 100G non-return-to-zero (NRZ) technologies.

The characteristics of this modulation may generate a less efficient OSNR. Lab technicians require tools to manipulate the transmission signal and improve the eye diagram making it more visible.




Pre-emphasis and RX equalizer tools help users adjust and manipulate the signal characteristics for TX (cursor and eye location) and RX (including different types of DSP modes) validating each lane of the pluggable under test. Once these parameters are modified, users need to identify the impact these parameters have over the PAM4 eye diagram. Our PAM4 histogram tool provides a detailed graphical view of each lane diagram directly on the screen of the tester, showing values for each PAM4 level.

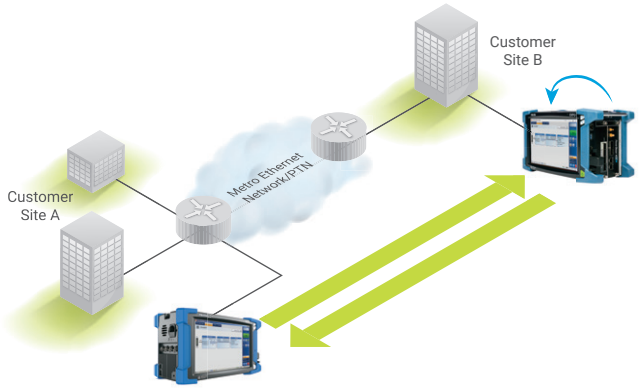
## RFC 2544

As 400G market moves from lab to field (the first 400G deployments are around the corner), ensuring service quality at turn-up is becoming key. Portable 400G/200G 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, the 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.

**RFC2544 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 allows to 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.

## OTUCn/FlexO

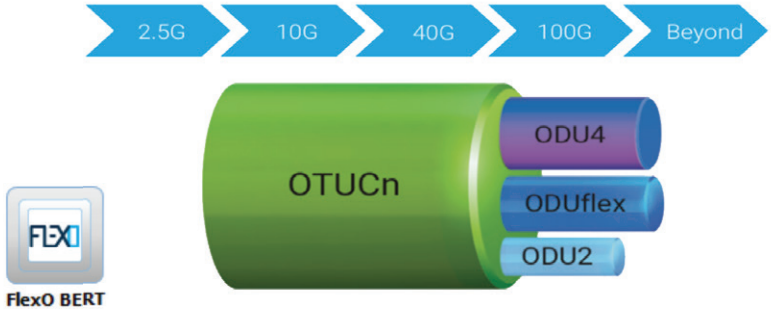
OTN is a key transport technology for several applications (e.g., metro, core) that continues to evolve and adapt to bandwidth challenges. The adoption of the OTUCn/FlexO standard (part of ITU G.709) enables OTN to become more flexible and evolve more efficiently as future Ethernet standards and transport technologies emerge.

The aim is to provide a long-term evolution of this protocol that can carry, in a flexible manner, payload based on bandwidth demands.

EXFO's OTUCn/FlexO BER solution supports testing up to 419G mapped in ODUflex over four PHY FOIC1.4 interfaces. With powerful tools for injecting and monitoring OTUCn/FlexO alarms and errors, network equipment manufacturers, data centers and carrier labs are now equipped to validate transport elements including this new standard of the 400G ecosystem.

### OTUCn/FlexO capabilities:

- OTUC4 419G CBR client mapped into ODUflex
- OTUCn alarm/error monitoring and injection
- OTUCn trace/payload type configuration and monitoring
- FlexO group mapped over FOIC1.4 interfaces
- FlexO alarm/error monitoring and injection
- Excessive skew alarms are reported for FlexO Instances and FOIC1.4 lanes in the Alarms/Errors pages
- FOIC1.4 lane alignment marker monitoring



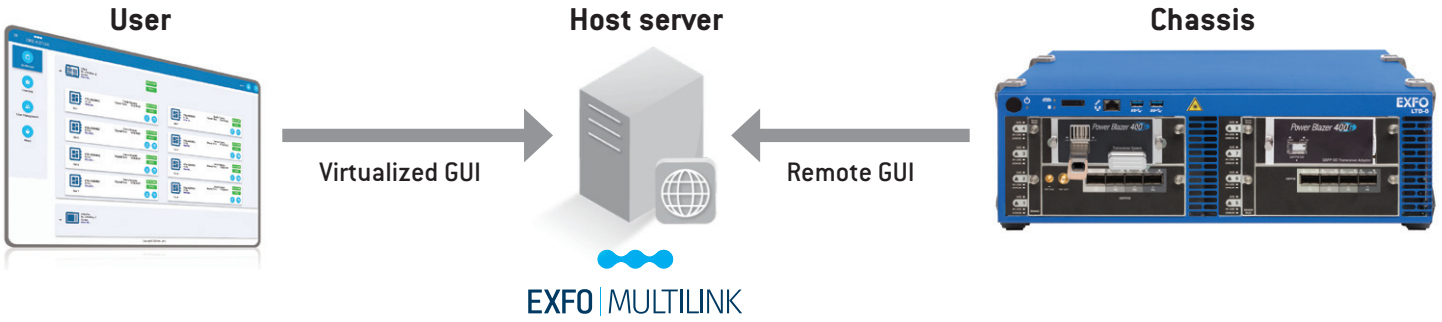

## SOFTWARE TEST TOOLS

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

| SOFTWARE APPLICATIONS | |
|---|---|
| ConnectorMax2 | 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. |

# EXFO | MULTILINK

The value of connectivity comes from the ability to connect your platform anywhere, at any time. The EXFO Multilink **multi-module**, **multi-user** and **multi-chassis** application enables the remote control access of each chassis and module through a centralized network.



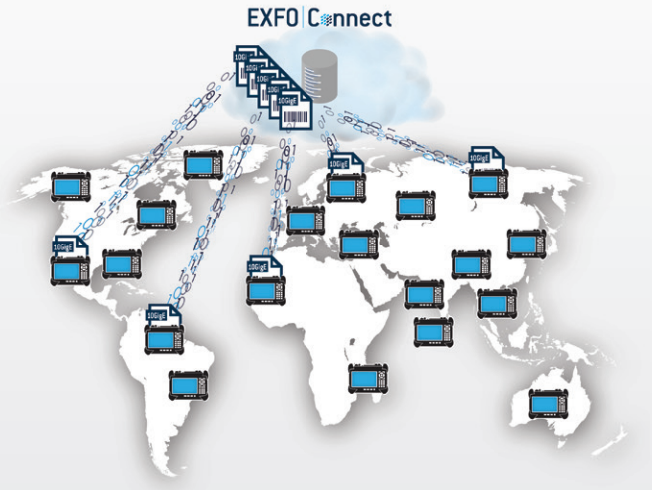

# EXFO | Connect

## EXFO CONNECT MAKES YOUR DATA MEAN BUSINESS

EXFO Connect completely redefines integrated testing with its cloud-hosted solution. Equipped with powerful database and application technologies, EXFO Connect provides an automated, secure environment that links together your EXFO test instruments and centralizes your test reports.

### Test Equipment Manager

EXFO Connect's Test Equipment Manager is an automated application that centralizes the management of all EXFO test instruments. A repository for software loads, licenses and platform profiles, it helps managers handle the constant demand for software updates. It also keeps track of equipment and ensures field technicians are equipped with up-to-date capabilities.


### FTB Anywhere: Floating Test Licenses

FTB Anywhere™ is a shared test-license capability for the award-winning FTB Ecosystem. This unique approach to delivering advanced test applications enables network operators to purchase a specific number of cloud-hosted licenses that can be shared instantly with their technicians, wherever they happen to be.

## MECHANICAL AND ENVIRONMENTAL SPECIFICATIONS

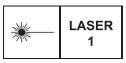
| | | FTBx-88460 Power Blazer module |
|---|---|---|
| Size (H x W x D) | | 101 mm x 159 mm x 175 mm (4 in x 6 1/4 in x 6 7/8 in) |
| Weight | | 1.70 kg 3.75 lb [a] |
| Temperature | Operating | 0 °C to 40 °C (32 °F to 104 °F) |
| | Storage | –40 °C to 70 °C (–40 °F to 158 °F) |

## 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) |

**Note**

a. With filler




| | |
|---|---|
| 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 4 x 25G QSFP28 transceivers<br>AOC QSFP28 cable support<br>CFP MSA management interface specification version 2.6 (R06a)<br>QSFP-DD MSA revision 4.0, 8 x 50G and 4 x 100G<br>OSFP MSA revision 2.0, 8 x 50G and 4 x 100G<br>DAC cables support |
| Line rate | 425/212.5/103.125 Gbit/s |
| 400G ecosystem support | 400/200GbE, FlexE and OTUCn and FlexO |
| Robust physical-layer validation | 400GAUI lane-error generation and monitoring<br>PCS lane mapping and monitoring capability<br>Per-lane skew generation and measurement<br>PCS error generation and monitoring per lane<br>Full MDIO/I2C read/write access |
| Transceiver and cable validation | QSFP28, CFP8, QSFP56, QSFP-DD and OSFP |
| iOptics | Optical-device I/O interface quick check<br>Optical TX power-level test<br>Optical RX signal-presence and level test<br>Stress test<br>Excessive skew test<br>Temperature and power consumption monitoring<br>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 |
| BERT | BERT framed and unframed testing using different parameters |
| 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<br>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<br>IP TOS/DSP configuration available<br>UDP source and destination port configuration available |
| RFC 2544 | Throughput, back-to-back, frame loss and high-resolution latency measurements according to RFC 2544;<br>frame size: RFC-defined or user-configurable |
| 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 |
| 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 |
| PAM4 histogram | Provides a graphic view from PAM4 eye diagram per lane, including PAM4 levels |
| Pre-emphasis | Pre-/main-/post- cursor, lower/upper eye and swing (%) options to improve electrical waveform |
| IP tools | Performs ping and traceroute functions |
| Advanced filtering | Configure up to 10 filters, each with four fields that can be combined with AND/OR/NOT operations;<br>a mask is also provided for each field value with IPV4 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 |

| UNFRAMED BER TEST | |
|---|---|
| Pattern configuration | 16 unframed 400GAUI-16 lanes, 16 unframed 400GAUI-8 lanes, 8 unframed 400GAUI-8 lanes, 4 unframed 200GAUI-4 lanes and 8 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 |

| Flex ETHERNET | |
|---|---|
| Compliance | Compliant to OIF |
| Multi-interface support | Four QSFP28 ports available to configure FlexE traffic up to 400G |
| RS-FEC support | RS-FEC capabilities per port |
| Skew monitoring | Graphical skew monitoring per port |
| Skew insertion | Per-port skew generation and measurement range 0 to 2047 |
| PHY number | FlexE PHY number per port edition available |
| Group number | FlexE group number edition available |
| Client | Client ID and Mac address edition available per client |
| Calendar type | Calendar A/B configuration and monitoring |
| Calendar edition | Graphical calendar configuration per slot/client/clients for FlexE bonding, sub-rate and channelization |
| Clients available | Different client configuration included 5GE, 10GE, 40GE, 50GE, 100GE, 150GE, 200GE, 250GE, 300GE, 350GE and 400GE |
| Ports capacity | Display the calendar used, unused and assigned capacity in Gbit/s |
| Client statistics | Size, TX and RX rate in Gbit/s, frame count |
| BERT | Selectable FlexE client bit error rate analysis using a specific pattern |
| BER error injection | Manual, rate and continuous (maximum rate) |
| Error/alarms monitoring and injection | Per port FlexE PHY, per FlexE group and per client |

| OTUCn/FlexO | |
|---|---|
| Compliance | ITU-T G.709, ITU-T G.709.1 and ITU-T G.798 |
| Multi-interface support | Four FOIC1.4 (QSFP28) ports available testing up to 419G |
| RS-FEC support | RS FEC error monitoring and injection per PHY |
| FlexO Instance ID | ID number selection, monitoring and and mismatch detection |
| FlexO Group ID | Group ID number selection, monitoring and mismatch detection |
| FOIC1.4 | FOIC1.4 per lane alignment marker monitoring and error injection |
| Skew | Skew alarm monitoring on PHYs and skew values reported per FlexO instance |
| BERT | Bit error analisys using PRBS31 supporting alarm/error monitoring and injection |
| BER error injection | Manual, rate and continuous (maximum rate) |
| OTUCn Frame | OTUCn level alarms/error monitoring and injection |
| ODUCn/ODUk | ODUCn level alarms/error monitoring and injection |
| OTUCn | Trace configuration and monitoring |
| ODUCn/ODUk | Trace/payload type configuration and monitoring |

**EXFO Headquarters** > Tel.: +1 418 683-0211 | Toll-free: +1 800 663-3936 (USA and Canada) | Fax: +1 418 683-2170 | info@EXFO.com | **www.EXFO.com**

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



SP400GPOWERBLAZERSERIES.4AN  Printed in Canada 20/05