SPEC SHEET

Multiprotocol transport and datacom solutions

SMARTER TESTING ACROSS YOUR ENTIRE NETWORK UP TO 400G

EXFO leads the 5G revolution with the most complete testing portfolio in the industry, featuring automated, versatile and future-proof solutions. With support for multiple technologies—including Ethernet, Fibre Channel, Transport, CPRI, eCPRI, and more—EXFO solutions validate network performance from the lab to the field quickly, easily and with first-time-right results.

COMPATIBLE WITH FXchange



BUSINESS ETHERNET AND TRANSPORT

Activate services fast and intelligently

Multitechnology, multiport testing from 56K to 400G complete feature set: Ethernet, OTN, SONET, SDH, DSn, PDH, ISDN, synchronization

Service activation using EXFO's unique iOptics and iSAM, making testing intelligent, simpler and faster

Portable 4×100GE test set unique in the industry

Full suite of Fibre Channel testing from 1X to 64X

5G, FRONTHAUL, MIDHAUL AND BACKHAUL

Install, validate and troubleshoot your 5G and 4G networks

iORF: the only intelligent application for RF spectrum analysis over CPRI in the industry

iOptics: intelligent pluggable optics test application

eCPRI, CPRI up to option 10 (24.3G), OBSAI, synchronization tools, Grand Master emulator and up to 100G Ethernet testing

Integrated and intelligent fiber testing

DATA CENTER

Speed up transceiver validation

iOptics: powerful and easy-to-use transceiver testing tool for AOC cables, QSFP28, SFP28, QSFP+, CFP4, SFP+, SFP, bidirectional SFP

Portable quad port solution to test multiple circuits simultaneously: 4×100G, 4×25G, 4×10G

Intelligent applications provide a complete test suite in a single-page configuration for quick test results

Industry leader in high-accuracy latency measurements

NEMS AND LABS

Validate the design and the features of network elements

Optical transport system validation up to 400G: Ethernet, OTN, SONET/SDH, Fibre Channel, CPRI/OBSAI, eCPRI

Advanced OTN testing: single and multistage mappings, ODUflex, ODU0, OTN overhead read/write capabilities

Full transceiver validation

Wireless 5G transport validation

CHOOSE THE TESTING SOLUTION THAT MEETS YOUR REQUIREMENTS

For solutions up to 400G, consult the specification sheets for the **FTBx-88460** and the **FTBx-88480**.

FEATURES	FTBx-8870	FTBx-8880	FTBx-88260
iOptics	•	•	•
iSAM	•	•	•
iORF	•[a]	•[a]	•[a]
Ethernet			
Dual-port Ethernet testing	•	•	•
BERT (framed and unframed)	•	•	•
RFC 2544	•	•	•
Smart loopback	•	•	•
ITU-T Y.1564 testing (EtherSAM)	•	•	•
Traffic generation and monitoring	•	•	•
RFC 6349 (up to 10G)	•	•	•
RFC 6349 (25G, 40G and 100G)			•
LLDP neighbor information	•	•	•
Dual test set (asymmetrical tests)	•	•	•
100G DR/LR1/FR1 support			•
Layer 2 transparency	•	•	•
Tunable SFP+	•	•	•
10M to 10G (including electrical 2.5G and 5G)	•	•	•
25G, 40G, 50G, 100G			•
Transport			
OTN OTU1/2	•	•	•
OTN OTU3/4			•
ODU Mux, EoOTN, ODU0, ODUflex	•	•	•
FlexE clients / FlexE 2.1			•
OTN GCC BERT (Power OTN OH analysis)	•	•	•
DSn/PDH (DS1/E1)	•	•	
DSn/PDH (DS3, E3 and E4)		•	
ISDN PRI	•[b]	•[b]	
SONET/SDH	•	•	•
Synchronization			
1588 PTP/SyncE	•	•	•
Grand Master emulator (1G, 10G, 25G and 100G)			•
Wander and time error		•	•
Packet time error			•
Fibre Channel			
Fibre Channel (1X, 2X, 4X, 8X and 10X)	•	•	•
Fibre Channel 16X and 32X			•
Wireless			
eCPRI 10G	•	•	•
eCPRI 25G and 100G			•
Dual-port eCPRI			•
CPRI 1.2 Gbit/s to 10.1 Gbit/s	•	•	•
CPRI 24.3 Gbit/s			•
OBSAI 1.5 Gbit/s, 3.1 Gbit/s and 6.1 Gbit/s	•	•	•
Dual-port CPRI	•	•	•

a. Available on FTB-1 Pro, FTB-2 Pro and FTB-4 Pro platforms.

b. Available on FTB-1 Pro platform only.

FIELD TESTING: FTB-1 PRO

Choose the portable platform that meets your field testing needs

FTB-1 Pro modular platforms are the most flexible solutions because they allow users to build a test set that includes the tools they really need. The unique advantage of this design is twofold. First, it allows engineers and field technicians to easily change the test module in the field so that the right test is performed during infrastructure deployment, service activation or troubleshooting. Second, it protects the investment in test instruments. This is particularly valuable in light of all the new testing needs coming with 5G.

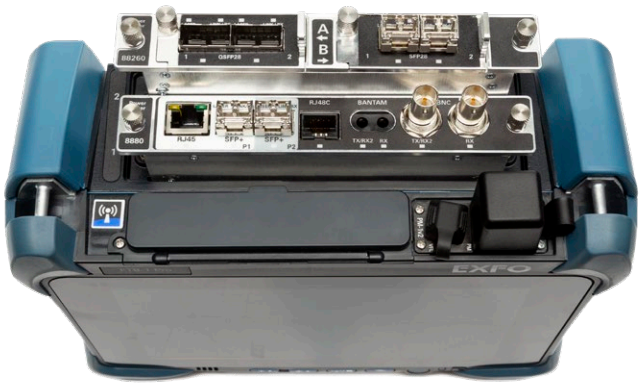
5G standards are currently being developed. Only flexible, future-proof solutions will help MSOs, data centers, service providers and NEMs invest properly in their fleet of test instruments and minimize acquisition costs.

The modular FTB-1 Pro platform is available in three configurations.

FTB-1 Pro single-carrier (SC)

This configuration offers engineers and field technicians the most compact and flexible one-slot test solution. The platform can host either an OTDR module or a 10G module for transport and Ethernet testing. It provides optical and electrical interfaces from 56K to 10G to easily turn-up, validate and troubleshoot OTN, SONET/SDH, DSn/PDH, ISDN/PRI, CPRI/OBSAI, Fibre Channel and Ethernet services, including dual port 10G multiservice testing.

FTB-1 Pro dual-carrier (DC)



	CONFIGURATIONS		
Test module support	**Single-carrier**	**Dual-carrier**	**High-power dual-carrier**
FTBx-8880 (10G module)	•	•[a]	•[a]
FTBx-8870 (10G module)	•	•[a]	•[a]
FTBx-88260 (100G module)		•[b]	•[c]

a. Platform with two modules enables quad 10GE testing.
b. Platform can host one 100G module at a time.
c. With two modules, it enables quad 100GE testing.

The dual-carrier configuration offers engineers and field technicians multiple configurations by hosting two modules allowing simultaneous optical, Ethernet and transport testing, depending on the modules used in the platform. It provides optical and electrical interfaces from 56K to 100G to easily turn-up, validate and troubleshoot transport technologies (OTN, SONET/SDH, DSn/PDH, ISDN), 5G and fronthaul (eCPRI, CPRI, OBSAI, Intelligent Optical RF (iORF)), Fibre Channel and Ethernet services, including quad-port 10G multiservice testing. The dual-carrier platform can host an OTDR and a transport and datacom (T&D) module and, as a result, offers the most compact and flexible all-in-one solution on the market. Combined with EXFO's intelligent test applications such as iOLM, iSAM, iOptics and iORF, the FTB-1 Pro dual-carrier not only protects the investment on field test equipment but has a direct impact on reducing the operational costs of MSOs, service providers, wireless network operators and webscale companies.

The dual-carrier configuration supports concurrent dual-module operation when using OTDRs and 10G T&D modules. When equipped with a 100G module (FTBx-88260), the platform supports operation of one module at a time and 2×100G testing.

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

The high-power dual-carrier configuration features the FTB-1 Pro platform's most flexible solution, allowing simultaneous dual-module operation of all modules supported by the platform. The high-power version of the dual-carrier configuration offers simultaneous quad 100GE testing, which makes it the most compact 4×100GE field tester on the market when housing 2×100G test modules (FTBx-88260).

LAB TESTING

Select the most suitable platform for your lab or benchtop operation



LTB-8 rackmount

The LTB-8 is 3U-high platform that offers rackmount or benchtop operation for both lab and production environments plus eight slots that can be accessed individually. It can host optical and T&D FTBx modules such as FTBx-8880, FTBx-8870 and FTBx-88260.

When equipped with 8×FTBx-88260, this multiservice, multitechnology solution can test up to 16×100GE simultaneously.



LTB-2 rackmount

The LTB-2 rackmount solution is a more compact version of the LTB-8 platform and occupies one rack unit. It can host two single-slot modules that run concurrently and independently. When equipped with 2×FTBx-88260, this solution can test up to 4×100 GE simultaneously.



FTB-4 Pro modular platform

The FTB-4 Pro offers four slots to house different optical and T&D modules: FTBx-8880, FTBx-8870 and FTBx-88260. This platform is the most suitable portable lab solution in a test scenario that requires optical spectrum analysis, OTDR validation and multiservice multitechnology service verification.

When equipped with 4×FTBx-88260, the FTB-4 Pro can test up to 8×100GE circuits running simultaneously.



FTB-2 Pro modular platform

EXFO's most compact modular lab-focused portable platform features two slots that can house optical and T&D modules.

When equipped with 2×FTBx-88260, the FTB-2 Pro enables 4×100GE testing.

EXFO | MULTILINK

EXFO Multilink test environment

EXFO Multilink is a multi-user, multimodule and multiplatform software application that enables remote control access of each platform and module through a centralized dashboard featuring an easy-to-use, web-based graphical user interface. The multilink environment is controlled by a virtual server available on LTB-8 platforms and the environment can manage LTB-2, LTB-8, FTB-4 Pro and FTB-2 Pro platforms.

CHOOSE THE TRANSPORT AND DATACOM MODULE THAT MEETS YOUR TESTING REQUIREMENTS

FTBx-88260: 10M, 100M, 1G, 2.5G, 5G, 10G, 25G, 40G, 50G and 100G testing with swappable transceiver interfaces

Today's wide variety of pluggable transceivers and the rapid rate at which new types of transceivers are being launched complicates telecom industry investment decisions. Whether we consider SFP and SFP+ (for rates up to 10G), look at QSFP28 and CFP4 (for 100G rates) or start adding SFP28 (for 25G rates) and PAM4 QSFP28 for 50GE transmissions, it becomes clear that integrating all these into the network is a challenge. With the imminent arrival of even more transceiver types (e.g., SFP56, SFP-DD, QSFP-56), NEMs will struggle to keep up while data centers and network operators will have difficulty integrating them in their networks.

With those challenges in mind, EXFO has introduced the FTBx-88260 T&D test module. This customizable unit is built with EXFO's open transceiver system (OTS), an innovative evolutionary design concept that enables users to match the module's interfaces with their specific testing needs. It's future-proof, so as new transceivers are developed and launched, testing them will be as simple as changing an OTS insert in the test module rather than having to purchase an entirely new test unit.

The FTBx-88260 offers two OTS slots (A and B) that can each house any of the options below:



FTBx-88260

CERTIFIED FUTURE PROOF Industry leader

OPEN TRANSCEIVER SYSTEM		SUPPORTED INTERFACES	FEATURES	NUMBER OF TEST PORTS
	**SFP28**	SFP, SFP+, tunable SFP+, SFP28, copper SFP, SFP+ and bidirectional SFP	• 10M to 25G data rates • FC 1X to FC 32X data rates • Dual-port capability	2
	**QSFP28**	QSFP+, QSFP28	• 25G / 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 • Dual-port offered with extra OTS	1
	**SYNC**	SMA[a], SMB (EXT CLK and 1PPS)	• Built-in GNSS/GPS[a] • Ideal solution for one-way delay • Ready for next-gen timing applications[a]	1[b]

a. For more information, please contact EXFO.

b. With 1 PPS as test port

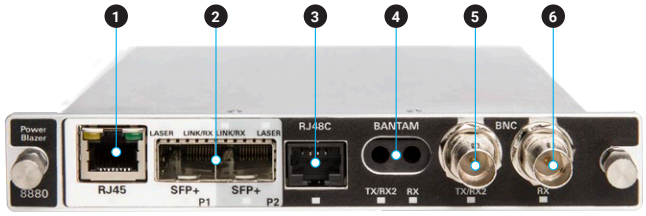
FTBx-8880/8870: comprehensive 10G testing

This series of modules provides a full suite of testing capabilities for multiple technologies from 56K to 10G, addressing different test applications both in field and lab scenarios: legacy testing (DSn/PDH), metro and longhaul Ethernet network, transport technology (OTN), fronthaul/backhaul, data centers, 5G deployment, etc.

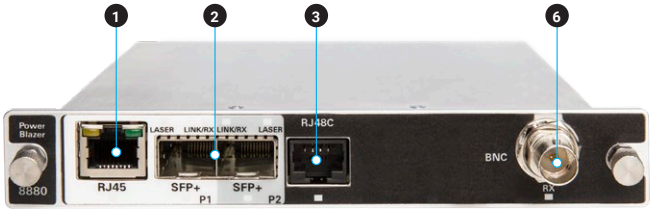
PHYSICAL INTERFACES	FTBx-8870	FTBx-8880
RJ45	•	•
RJ48C	•	•
BNC	•[a]	•
Bantam		•
SFP/SFP+	•[b]	•[b]

a. BNC connector for input clock only.

b. Supports tunable SFP+ and copper SFP+.



FTBx-8880



FTBx-8870

1 **RJ45**
Ethernet 10/100/1000BASE-T

2 **SFP+**
CPRI 1.2G to 10.1G
OBSAI 1.5G to 6.1G
10G eCPRI
SONET/SDH up to OC-192/STM-64
OTN up to OTU2 including overclock
Ethernet up to 10G
10/100/1000BASE-T with copper SFP
FC up to 10X
RF spectrum over CPRI

3 **RJ48C**
DSn/PDH
EXT CLK
Wander

4 **BANTAM**
DSn/PDH
RX2: DS1
EXT CLK

5 **BNC**
Electrical
SONET/SDH
DSn/PDH
TX/RX2: DS1/DS3
EXT CLK
Wander

6 **BNC**
DSn/PDH
RX: DS1
EXT CLK

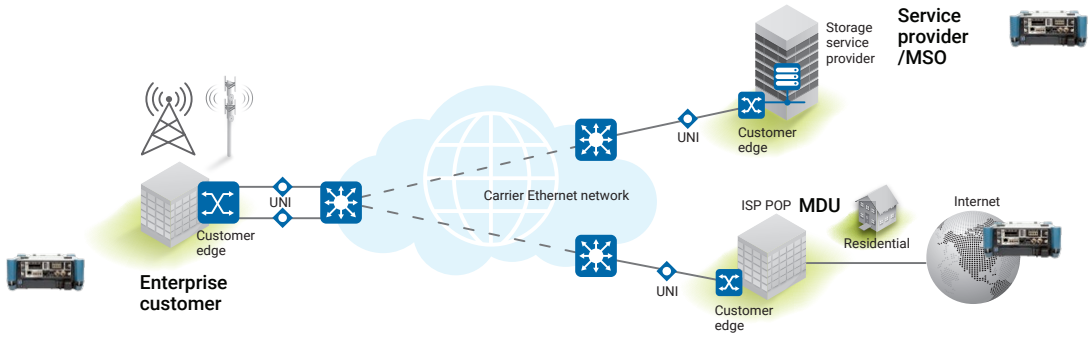
BUSINESS ETHERNET AND TRANSPORT

Key benefits

EXFO's industry-leading products are designed to make service turn-up and troubleshooting activities easy and fast. Service providers, system operators and contractors prefer these innovative solutions for both business Ethernet service and transport testing. The FTBx-88260 module is the latest addition to a constant stream of innovation geared towards industry needs. There's more—our OTS investments in testing equipment by providing the capability of interchanging transceivers as tests become fully standardized.

Our T&D test sets and modules cover all the typical Ethernet standard testing applications including BERT, RFC 2544, EtherSAM (ITU-T Y.1564) and RFC 6349 L4 TCP with an enhanced algorithm. EXFO's iSam regroups all cutting-edge standards tests under one user-friendly service turn-up and troubleshooting tool. From a transport perspective, our solutions cover legacy TDM DSn/PDH and ISDN PRI all the way to SONET/SDH and full-blown OTN testing up to OTU4.

Service providers and MSOs can expedite service activation by taking advantage of EXFO's unique quad port 100GE solution. Technicians can simultaneously validate 4×100G services using one portable tester: the quad port 100G kit. It enables faster deployment of multiple 100GE services and more productive use of test set fleets, which lowers both OPEX and CAPEX. The LTB-2 rackmount platform also features up to 4×100GE simultaneous testing. MSOs can have a universal test device located in central offices, promoting execution of standardized test procedures. (For 400G test solutions and Fibre Channel 64X, consult the specification sheets for the **FTBx-88460** and the **FTBx-88480**).



ETHERNET BUSINESS SERVICES APPLICATIONS				
Physical interfaces	**RFC 2544**	**EtherSAM (Y.1564)**	**RFC 6349**	**iSAM (Y.1564 & RFC 6349)**
Single service: layer 2/3/4 SLA issues Metrics: throughput, latency, frame loss	•	•		•
Multiple services: layer 2/3 SLA issues Metrics: throughput, latency, jitter, frame loss		•		•
Stateful layer 4 TCP troubleshooting Metrics: BDP, window size, buffer delay, TCP efficiency, number of connections, min./max./average RTT			•	•
Layer 2, 3, 4 (Stateful) turn-up and troubleshooting Metrics: all of the above including MEF pass/fail benchmarking				•

Recommended test kits

Service provider/MSO/Managed services kit



FTB-1 Pro DC
FTBx-88260
FTBx-8880

Benefits:

- The OTS system future-proofs your investment
- Complete Ethernet and transport feature set
  - Dual-port Ethernet up to 100G
  - DSn/PDH/ISDN/SONET/SDH
  - OTU1 to OTU4 and Fibre Channel 1X to 32X
  - Synchronization: 1588 PTP, SyncE, wander and time error

Simultaneous quad port 100G kit



FTB-1 Pro HPDC
2×FTBx-88260

Benefits:

- Unlimited dual-port capability
  - 2×OTU4 multistage mapping and FEC
- 4×100G BERT tests
  - Minimizes testing time required, reducing OPEX and improving technician efficiency
- ZERO overheating issues

1G turn-up kit



EX1

Benefits:

- Turn-up via Speedtest® by Ookla®
- Business/Residential turn-up via
  - GPON emulation
  - LAN
  - Optical SFP
  - WiFi

5G, FRONTHAUL, MIDHAUL AND BACKHAUL

Laying the foundation for 5G while strengthening your existing 4G network

As the industry migrates to 5G stand-alone, latency, power loss and bit-error rate performance will become major concerns due to increasingly demanding fronthaul, midhaul and backhaul requirements. Fronthaul networks will be required to support speeds of up to 25 Gbit/s, 50 Gbit/s, even 100 Gbit/s with higher traffic loads and more demanding services. Deploying a rock-solid network that's massively scalable and able to support any new service demanded by customers can be challenging—unless you have the right test tools and procedures in place.

Test smarter with the FTB 5GPro test solution: Following standardized, field-proven procedures and using intelligent, flexible test solutions take the guesswork out of setup, execution and analysis—leading to high-quality networks, delivered on time and able to address any foreseeable service requirements.

INSTALLATION

Fiber connector inspection

- Detect dirty or damaged connectors (at each connection point)
- Clean or replace damaged connectors, as required

Fiber link characterization

- Detect issues on the fiber span potentially impacting total budget loss (dB), such as macrobends, splices, bad connectors and fiber breaks

Transport validation

- CPRI link validation from 1.2 Gbit/s to 24.3 Gbit/s using BER and latency testing
- eCPRI 10G and 25G link validation using BER and QoS metrics like latency testing

ACTIVATION

Site commissioning

- Test RRH/RU functionality from the bottom of the tower or at the C-RAN hub by emulating the base station
- Verify if the 5G equipment located at the top of the tower is operational via eCPRI 10G/25G/100G link validation
- Validate proper installation of mobile network equipment before handover to MNO

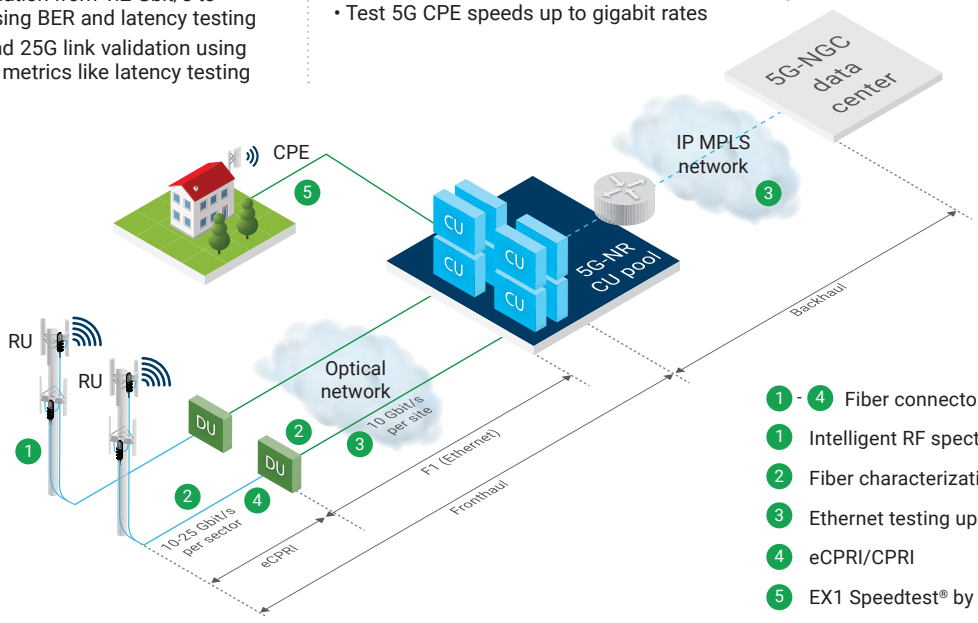
5G CPE commissioning

- Verify 4G LTE and 5G coverage in residential areas
- Test 5G CPE speeds up to gigabit rates

MAINTENANCE & TROUBLESHOOTING

Find and mitigate RF interference

- Access the RF signal at the BBU location either at the bottom of the tower or at the C-RAN hub via CPRI link
- Track down and mitigate interference sources
- Additional timing and synchronization capabilities are described in the Timing and Synchronization specification sheet



1 - 4 Fiber connector inspection
1 Intelligent RF spectrum analysis over CPRI
2 Fiber characterization (OTDR/iOLM, LS/OM)
3 Ethernet testing up to 100G
4 eCPRI/CPRI
5 EX1 Speedtest® by Ookla®

Recommended test kit: FTB 5GPro



FTB-1v2 DC
FTBx-88260
FTBx-720C



FIP-435B or FIP-500



EX1

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DATA CENTER

Ever-increasing growth in bandwidth-hungry applications flooding data centers and the struggle to provide enhanced levels of performance inside cloud networks are driving migrations to higher data rates. Deploying fiber and network infrastructure inside data centers as quickly and efficiently as possible is the challenge. At the same time, new technologies are emerging, and data centers are struggling to keep pace. Hard choices must be made.

EXFO's unique data center portfolio helps data center managers and technicians keep up with both the explosion of data and the pace of technology change with its unique flexibility and powerful easy-to-use applications, allowing them to optimize deployment and troubleshooting times. (For 400G test solutions, please consult the **FTBx-88460** and the **FTBx-88480**).

Ultimate flexibility and interface support

FTBx-88260



CFP4
QSFP+
AOC cables
SFP/SFP+/SFP28
QSFP28 (CWDM4, LR4, SR4, PSM4, etc.)
Sync interface

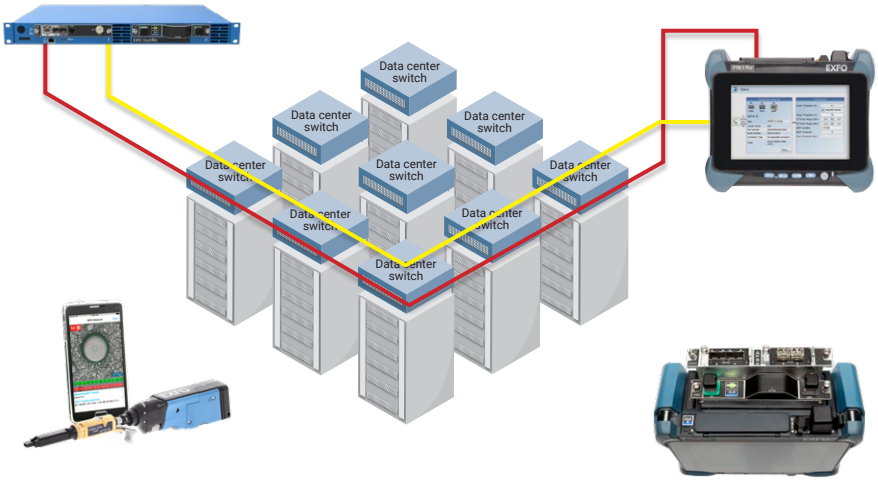
Before deployment



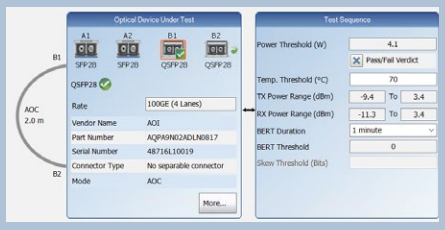
Optimize transceiver validation time up to 4×QSFP28, 4×SFP28 and 2 AOC cables

After deployment

Optimize deployment and troubleshooting times inside data centers with comprehensive solutions



iOptics



iOptics is an intelligent pluggable optics test application that offers a complete, powerful and easy-to-use tool for validating any type of 100M to 100G transceiver or AOC cable. It is a first-alert test that can be used in your data center to efficiently evaluate the proper operation of an optical transceiver device with minimal user configuration. The automated testing sequence includes:

- Monitoring the pluggable's internal temperature
- Monitoring transceiver power consumption and current
- Validating the MDIO/I2C and hardware-pin operation from the transceiver or AOC cable tested
- Validating communication per channel
- Stress test: automated solution that validates the bit-error performance of the optical interface
- Skew test: measures the skew associated to each physical coding sublayer (PCS) lane

In the event of a fail verdict during the execution of any of the previous tests, the faulty area is highlighted and the associated errors/alarms are saved on a test report.

Recommended test kits



1 FTB-1v2 HPDC
2×FTBx-88260





2 FTB-1v2 DC
FTBx-88260
FTBx-720C
FIP-500





3 LTB-2
FTBx-88260
FTBx-720C
FIPT-400-MF



NETWORK EQUIPMENT MANUFACTURERS (NEMs) AND LABS

Network equipment manufacturers (NEMs) and high-speed labs are currently facing increasing pressure to ramp up and optimize their production lines to launch high-quality products as fast and efficiently as possible. Remote and synchronous access for different teams of developers around the world has become a must. Today's challenge is to acquire the right equipment while making the right long-term technology investment.

EXFO provides NEMS with a powerful, versatile and scalable test and measurement solution that incorporates rackmount (LTB-8/LTB-2) and portable (FTB-4 Pro/FTB-2 Pro) platforms with a wide variety of modules, providing unique flexibility. The OTS enables interface mix-and-match, which allows users to maximize the life of the tester and, at the same time, be ready for future standards.

Multilink provides easy-to-use remote access and automation tools for EXFO's rackmount and portable solutions. Together, these solutions help NEMs to not only boost productivity and agility but also to accelerate their time to market while keeping CAPEX in check. (For 400G test solutions, please consult the **400G Power Blazer Series specification sheet**).



Network system design and validation/verification

- Standard-based testing
- Multirate testing from 10M to 400G
- Client testing: Ethernet, FC, OTN, SONET and SDH

Transceiver validation: optical and electrical test

- iOptics
- Transceiver stress test
- Power and temperature monitoring
- Read/Write transceiver registers

Transceiver validation spectral analysis

- Optical spectrum analyzer for SMSR testing on transceiver production floor

5G wireless and core validation

- eCPRI validation up to 25G
- eCPRI QoS measurement and dual-port
- CPRI/OBSAI link validation and BERT

Ethernet and FlexE testing

- BERT
- Unframed BERT per lane
- Traffic generation
- Service validation
- Synchronization tools
- Service disruption time evaluation
- Support for FlexE 2.1 G.mtn Path OAM APS including connectivity verification and bidirectional delay measurement

OTN advanced tools

- OTN, multistage mapping
- Ethernet over OTN, ODU0 and ODUflex

EXFO | MULTILINK

Remote access and automation

- Remote access
- Automation tools
- Inventory management

Recommended test kit



FTB-4 Pro



FTBx-88260



FTBx-5243-HWA



TA-SYNC/TA-SYNC Premium

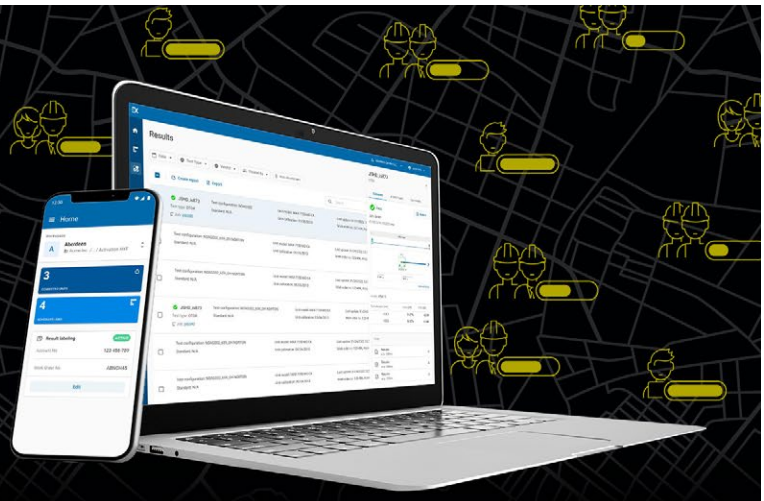
TA-CFP4

TA-SFP28

TA-QSFP28

EXchange

SHARE TEST RESULTS. BOOST COMPLIANCE. UNLOCK INSIGHTS.



Cloud-hosted solution for sharing test results and ensuring compliance.

Paired with EXFO's leading test instruments, EXFO Exchange drives an entire ecosystem, while integrating seamlessly with existing operation processes.

KEY BENEFITS

- **Automate test results management**
- **Boost compliance and efficiency**
- **Improve collaboration and visibility**
- **Access comprehensive reporting**
- **Unlock insights to see what matters**

SIMPLE SETUP IN THREE STEPS

1

Create your free EXFO Exchange account

Begin your journey by creating an EXFO Exchange account. Setting up your account is quick and easy.

Create an account

2

Install the mobile app

Download the EXFO Exchange app to allow test data from compatible EXFO devices to be uploaded securely to the cloud (free of charge).

GET IT ON Google Play | Download on the App Store

For MaxTester and FTB users, install the native app.

Access the Native app

3

Save time and boost efficiency

Once your account created—and the mobile app installed and paired with compatible EXFO devices—all test results will be sent to the cloud. On the web app, you will see field test results from all invited testers.

Get **started >**

EXFO

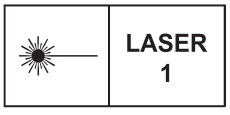
SUMMARY OF KEY FEATURES

KEY FEATURES	
Detailed compliance testing	• IEEE 802.3 - 2022 standard • CFP MSA CFP4 Hardware Specification Revision 1.1 18 Mar 2015 • CFP MSA Management Interface Specification Version 2.4 (R06b) • ITU-T G.709, G.798 and G.872
Multi-interface support	• Pluggable, MSA-compliant QSFP+ transceivers • Pluggable, MSA-compliant CFP4 and QSFP28 transceivers • Pluggable, MSA-compliant SFP28 optical transceiver • Pluggable, MSA-compliant SFP/SFP+ electrical and optical transceivers • External timing reference (DS1/E1/2 MHz/10 MHz) • Low-speed and high-speed reference clock output for eye diagram measurements • SRBIDI support • Active optical cable support • Single lambda support QSFP28 (DR/FR1/LR1) • Tunable SFP+ and complete ITU-T grid with 100 GHz and 50 GHz spacing
Robust physical-layer validation	• CAUI-4/XLAUI 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
PRBS patterns per lane	Allows users to configure different PRBS patterns on different CAUI-4/XLAUI lanes in 40G/100G, and on physical lanes in OTU3/OTU4 unframed configurations; typically used to identify crosstalk issues when looking at the eye diagram
Per-wavelength power measurement	Allows users to measure the received optical power per wavelength CFP4 and QSFP+/QSFP28 transceivers
iOptics	• Optical-device I/O interface quick check • Optical TX power-level test • Optical RX signal-presence and level test • BERT and frequency offset standard • Framed excessive skew test • Temperature and power consumption monitoring
Layer 2/3/4 Ethernet testing	• Unframed BERT up to 100G • EtherBERT at 10M, 100M, 1G, 2.5G, 5G, 10G, 25G, 40G, 50G and 100G using fixed frames (up to 16000 bytes) or EMIX • Round-trip latency measurements with pass/fail verdict up to 100G • Dual-port Ethernet testing capabilities from 10M to 100G, including 25G, 40G and 50G • 100 GigE through mode testing • RFC 2544, including throughput, back-to-back, latency and frame loss with dual test set for bidirectional measurements • EtherSAM (ITU-T Y.1564) with dual test set for bidirectional measurements. Multi-source MAC address configuration when testing at Layer 2. • RFC 6349 with enhanced algorithm: Performs TCP testing with single or multiple TCP connections from 10BASE-T up to 100G; discovers the MTU, RTT, actual and ideal TCP throughput; user can apply suggested window size boost factor to optimize test results or perform multiple client iPerf tests against the RFC 6349 iPerf Server mode of operation • 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; an additional, completely automated RFC 6349 test can be run in conjunction with the EtherSAM (Y.1564) tests, or on its own to perform layer-4 TCP testing, with the inclusion of discovering the maximum transmission unit (MTU) and round-trip time (RTT), as well as the actual and ideal TCP throughput of the circuit under test • Layer-2 control protocol testing offers the most complete set of predefined L2 protocols in the industry (38 different protocols including all MEF 45 and CISCO L2CP frames) in addition to 8 user-defined protocols • Intelligent autodiscovery of EXFO modules or third-party devices allowing single user to perform end-to-end testing by looping up and looping down remote devices (EXFO and third-party units) up to layer 4. • Traffic generation and shaping of up to 16 streams of Ethernet and IP traffic, and monitoring of throughput, latency, packet jitter, frame loss and out-of-sequence. Multi-source MAC address configuration when testing at Layer 2. • Q-in-Q capability with the ability to go up to three layers of stacked VLANs • VLAN CoS and ID preservation • Discover up to three levels of VLAN tagged traffic (C-/S-/E-VLAN) including their ID and priority, as well as the total VLAN tagged frame count and associated bandwidth • Ping and traceroute functions; user can configure up to 1000 ping messages • Advanced filtering capability for in-depth network troubleshooting • Smart loopback • Flow control injects or monitors pause frames, including frame counts of pause, abort frames and total, last, maximum and minimum pause time • IPv6 protocol generation and analysis • Service disruption time (SDT) • Ethernet MAC flooding • Frame size sweep • Traffic scan allow the identification of up to 128 different streams based Q-in-Q VLAN • Link layer discovery protocol (LLDP) neighbor information collected at all supported rates: 10M to 100G
Synchronization	• Validates 1588 PTP packet network synchronization services, emulates PTP clients (up to 10G), emulates Grand Master (on FTBx-88260: 1G, 10G, 25G and 100G) and generates and analyzes messages between master/clients, clock quality level and IPDV • Validates SyncE frequency, ESMC messages and clock quality levels • Ability to perform time error analysis and wander measurement; evaluation if the signal under test meets multiple standardized masks (MTIE, TDEV) • Ability to perform packet-based time error analysis for 1G, 10G, 25G and 100G optical ports
MPLS	Generates and analyzes streams with up to two layers of labels
Carrier Ethernet OAM	Fault-management and performance-monitoring Ethernet and MPLS-TP OAM protocols, including Y.1731, 802.1ag, MEF, Link OAM (802.3ah) and G.8113.1 OAMs
Advanced filtering	Ability to 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 and IPv6 capabilities

KEY FEATURES (CONT'D)

Packet capture	• Ethernet packet capture up to 4 Mbit, depending on the rate • Configurable triggers including errors and header fields • Data capture in packet capture (PCAP) format; read through Wireshark
OTN testing	• OTU4 (112 Gbit/s), OTU3 (43 Gbit/s), OTU3e1 (44.57 Gbit/s), OTU3e2 (44.58 Gbit/s), OTU2 (10.71 Gbit/s), OTU2e (11.10 Gbit/s), OTU2f (11.32 Gbit/s), OTU1 (2.67 Gbit/s), OTU1e (11.05 Gbit/s) and OTU1f (11.27 Gbit/s) unframed and framed BER tests • FEC testing: error insertion and monitoring • OTL 3.4 and 4.4: alarm and error generation and monitoring • OTL lane mapping, skew generation and measurement • OTU, ODU, OPU overhead manipulation and monitoring • OTU, ODU (including ODU TCM), OPU layer alarm/error generation and analysis • OTU, ODU (including ODU TCM) trace messages • Round-trip delay (RTD) measurement • OTN SDT measurement • OTN through and OTN intrusive through mode testing • Multiplexing/demultiplexing of ODU13, ODU23, ODU123, ODU03, ODU013, ODU0123, ODU04, ODU24, ODU34, ODU14 and ODU12 with PRBS pattern and GigE and 10 GigE client mappings into OPU payloads. ODUflex at ODU2 and ODU3 rates with full flexibility to configure the required bandwidth based on n x 1.25 Gbit/s tributary time slots with a PRBS pattern into the ODUflex payload; 40 GigE client mapping into ODU3 into ODU4 • Performance monitoring: G.821, M.2100 • Frequency analysis and offset generation including frequency sweep • Power OTN OH analysis for BERT and synchronization testing of multiple fields in the OTN OH, including GCC0/1/2
Ethernet mapping over OTN	• Ethernet mapping over OTN respectively, with GMP support • 40G transcoding capability with alarms, errors and statistics • GMP alarms, errors and statistics • GigE mapping into ODU0 using GFP-T, 10 GigE mapping into ODU2 using GFP-F, direct 10 GigE mappings into ODU1e/2e in different ODU multiplexing structures, and 40 GigE client mapped into ODU3/ODU4 • Flexibility to map up to a 10G Ethernet client signal into ODUflex
SONET/SDH mapping over OTN	• OC-768/STM-256 mapping in ODU3 • OC-192/STM-64 mapping in ODU2 • OC-48/STM-16 mapping in ODU1 • OC-12/STM-4 and OC-3/STM1 mapping in ODU0
SONET/SDH testing	• PRBS pattern payload generation and analysis down to STS-1/AU-3 granularity • High-order mappings: STS-1/3c/12c/48c/192c and AU-3/AU-4/AU-4-4c/16c/64c • Section/RS, Line/MS and high-order (STS/AU) path overhead manipulation and monitoring • Section/RS, Line/MS and high-order (STS/AU) path alarm/error generation and monitoring • Single, rate and burst error insertion modes • High-order (STS/AU) pointer generation and monitoring • Performance monitoring: G.821, G.828, G.829, M.2100, M.2101 • Frequency analysis and offset generation • Automatic protection switching (APS) and SDT measurements • Round-trip delay (RTD) measurements • Tandem connection monitoring
Fronthaul	• CPRI layer-2 link validation for BBU or RRH from 1.2G to 24.3G. CPRI option 10 (24.3G) can be tested with either SFP28 or QSFP28 on the FTBx-88260. • OBSAI layer-2 link validation for BBU or RRH from 1.5G to 6.1G • eCPRI BER testing: unframed and framed L2/3/4 BER measurement, bit error injection, one-way/round-trip delay measurement, QoS metrics and Pass/Fail verdict for 10G/25G rates. eCPRI 25G can be tested with either SFP28 or QSFP28 on the FTBx-88260. • iORF: intelligent spectrum analysis over CPRI. Automated analysis and detection of interference and PIM issues at the push of one button
iORF	The most powerful real-time high-resolution RF spectrum analysis over CPRI. Quickly identify issues such as RF interference and passive intermodulation (PIM) from the BBU site
Remote access	Supported via EXFO Remote ToolBox, EXFO Multilink, VNC or Web VNC
Report generation	Test reports generated in PDF, HTML and JSON (for some applications). Reports are easily customizable and can be automatically generated at the conclusion of each test.

LASER SAFETY



IEC 60825-1:2014-05

Laser Class 1 applies only to modules and their TAs and which may vary from that of platform

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