

NetBlazer V2 Series Multitechnology Handheld Tester

SMARTER TESTING FOR ALL THINGS 10G



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 V2 Series is the industry's smallest portable 10G Quad-port test solution. Maximize the tasks of your field techs by running up to four 10G tests simultaneously.

KEY FEATURES AND BENEFITS

Platform Highlights

- Windows 8.1 (bring your own device, install what you want)
- Custom-designed platform with 128 GB of onboard memory including Micro SD card interface (massively expand the memory)
- Ultra-bright 8-inch multitouch screen
- Built-in connectivity—choose between Gigabit interface, Wi-Fi, Bluetooth and 3G or 4G LTE via USB dongle
- Lightweight and portable solution designed for field engineers or cell technicians installing, troubleshooting, and maintaining OTN, SONET/SDH, DSn/PDH Carrier Ethernet networks and next-generation mobile backhaul or fronthaul networks

FTTA Testing

- CPRI base-station (BTS) emulation from 1.2G to 9.8G rates
- CPRI remote-radio-head (RRH) emulation from 1.2G to 9.8G rates
- CPRI framed and unframed BER from 1.2G to 9.8G rates with PRBS stress patterns and latency measurements

Transport Testing

- OTN testing OTU-1/2, OTU-1e/2e
- Optical SONET and SDH testing up to 10G
- Electrical SONET and SDH testing STS-1e/3e and STM-0e/1e
- DSn testing DS1, DS3, dual DS1/DS3 RX

- PDH testing E1, E3 and E4
- ISDN PRI for DS1 or E1
- Automatic protection switching and service disruption on all interfaces and mappings
- Round-trip delay on all interfaces and payload mappings
- Service disruption on all interfaces and payload mappings
- Overhead monitoring and modification for all timeslots
- Pointer adjustment

Ethernet/Fibre Channel Testing

- Dual-port or quad-port testing up to 10G
- iSAM ultra-simple multiservice activation
- 10G multisession TCP testing with bidirectional RFC 6349
- Power-over-Ethernet validation within cable test
- EtherSAM, RFC 2544, traffic generation, EtherBERT, Through mode, Smart Loopback, second-port loopback tool
- Packet synchronization including IEEE 1588v2 PTP and SyncE
- Carrier Ethernet OAM including ITU-T Y.1731, IEEE 802.1ag and MEF standards
- Packet capture and advanced filtering up to 10G
- Fibre Channel 1X, 2X, 4X, 8X, 10X support

PLATFORM COMPATIBILITY



Platform
FTB-1 Pro



CHOOSE THE RIGHT NETBLAZER FOR YOU

| NETBLAZER V2 MODULES | FTB-870V2 | FTB-880V2 | FTB-870Q | FTB-880Q |
|--|-----------|-----------|----------|----------|
| DSn/PDH (DS1/E1) | • | • | • | • |
| DSn/PDH (DS3, E3, E4) | | • | | • |
| OTN | • | • | • | • |
| SONET/SDH (up to 10G) | • | • | • | • |
| SONET/SDH (electrical) | | • | | • |
| Fibre Channel (1x, 2x, 4x, 8x, 10x) | • | • | • | • |
| 1588 PTP/SyncE | • | • | • | • |
| Carrier Ethernet OAM | • | • | • | • |
| RFC 6349 (up to 10G TCP) | • | • | • | • |
| ExacTCP (up to 1G TCP) | • | • | • | • |
| CPRI (1.2G up to 9.8G) | • | • | • | • |
| Dual-port testing | • | • | • | • |
| Quad-port testing | | | • | • |
| Simultaneous transport/datacom testing | | | • | • |



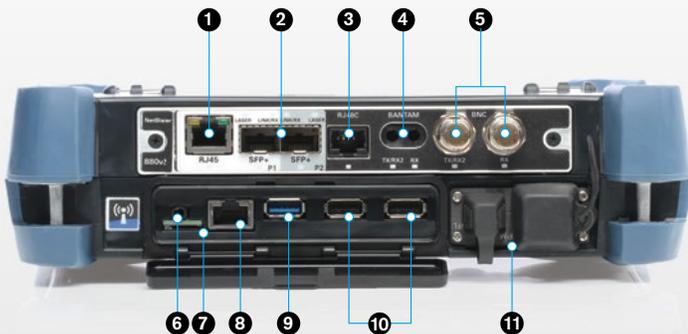
FTB-880V2 NetBlazer

The FTB-880V2 NetBlazer is the field technicians' go-to solution that covers all things 10G. Fully loaded Ethernet testing includes iSAM and RFC 6349 with GigE and 10 GigE dual ports, OTN, SONET/SDH, DSn/PDH, ISDN PRI, FTTA, Fibre Channel and packet synchronization.

FTB-880Q NetBlazer

Double up everything the FTB-880V2 NetBlazer has to offer and you get the FTB-880Q NetBlazer. The FTB-880Q is designed for maximum field-technician efficiency by speeding up all processes to run up to four simultaneous tests, as well as completely independent tests with zero restrictions. The FTB-880Q is the only handheld tester to offer quad-port 10 GigE and quad-port 10 GigE.

STREAMLINED FOR EASE OF USE



- | | | |
|--|--|--|
| <p>1 Ethernet 10 to 1000 Base-T</p> <p>2 Optical Ethernet Up to 10 Gbit/s 1000 Base-T CPRI 1.2 to 9.8G OBSAI 3.1G Fibre Channel 1X, 2X, 4X, 8X, 10X SONET/SDH up to 10G OTN OTU1/2</p> | <p>3 DSn/PDH EXT CLK</p> <p>4 DSn/PDH RX2: DS1 EXT CLK</p> <p>5 Electrical SONET/SDH RX2: DS1/DS3 EXT CLK</p> | <p>6 Mic/Headset jack</p> <p>7 Micro SD card slot</p> <p>8 1 GigE port</p> <p>9 One USB 3.0 port</p> <p>10 Two USB 2.0 ports</p> <p>11 Power meter and VFL</p> |
|--|--|--|

THE ULTRA-PORTABLE CHOICE FOR MULTISERVICE TESTING

The ongoing transition towards a converged network infrastructure for legacy DSn/PDH, ISDN, SONET/SDH, OTN, Fibre Channel, CPRI and packet-based Ethernet services requires a test tool that can cover a wide range of interfaces and rates, without sacrificing portability, speed or cost. Leveraging the powerful, intelligent FTB-1 Pro handheld platform, the NetBlazer V2 Series streamlines processes and empowers field technicians to test and validate DSn/PDH, ISDN, SONET/SDH, OTN, Fibre Channel, CPRI and Ethernet circuits efficiently.

Powerful and Fast

The NetBlazer V2 Series offers a fully integrated DSn/PDH, ISDN, SONET/SDH, OTN, Fibre Channel, CPRI and Ethernet handheld tester, and an 8-inch multitouch screen with unprecedented configuration simplicity. Platform connectivity is abundant via Wi-Fi, Bluetooth, Gigabit Ethernet and USB ports, making it accessible in any environment.

DSn/PDH, ISDN SONET/SDH, OTN, FIBRE CHANNEL AND CARRIER ETHERNET UP TO 10G

NetBlazer V2 Series Interfaces

- › RJ-45 Port for Electrical 10/100/1000M Ethernet
- › SFP+ Port 1 for OTU1, OTU2, OTU1e, OTU2e, OTU1f, OTU2f, OC-1, 3, 12, 48, 192 or STM-0/1/4/16/64 or Fibre Channel 1X, 2X, 4X, 8X, 10X or CPRI 1.2, 2.4, 3.1, 4.9, 6.1, 9.8 Gbit/s or OBSAI 3.1 Gbit/s and 100/1000M, 10G Ethernet and 1000 Base-T (Using Mushroom SFP)
- › SFP+ Port 2 for Fibre Channel 1X, 2X, 4X, 8X, 10X or CPRI 1.2, 2.4, 3.1, 4.9, 6.1, 9.8 Gbit/s or OBSAI 3.1 Gbit/s and 100/1000M, 10G Ethernet and 1000 Base-T (using Mushroom SFP)
- › RJ-48C port for DS1/1.5M, E1/2M and Clock In/Out: DS1/1.5M/E1/2M/2MHz
- › Bantam port for TX: DS1/1.5M, E1/2M, RX2: DS1/1.5M and Clock In/Out: DS1/1.5M/E1/2M/2MHz
- › BNC TX: E1/2M, E3/34M, DS3/45M, STS-1e/STM-0e/52M, E4/140M, STS-3e/STM-1e/155M
RX2: DS1/1.5M, DS3 and Clock Out: DS1/1.5M/E1/2M/2MHz
- › BNC RX: E1/2M, E3/34M, DS3/45M, STS-1e/STM-0e/52M, E4/140M, STS-3e/STM-1e/155M

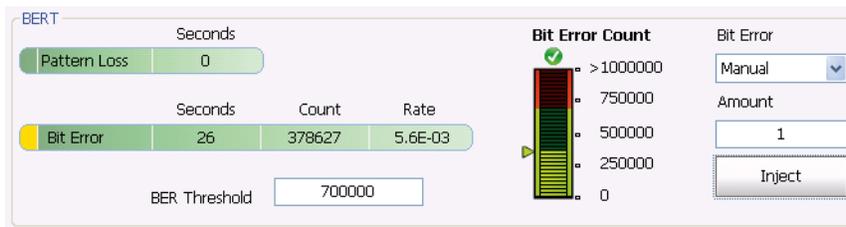
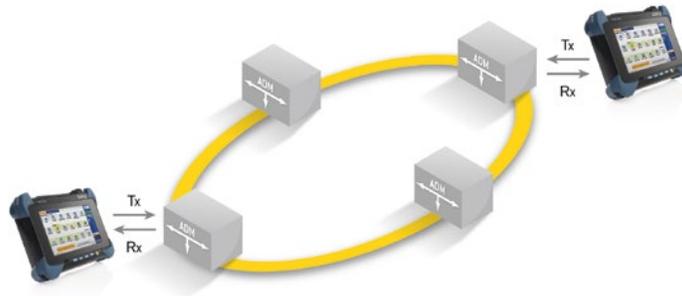
Key Testing Benefits

- › Up to 10G SONET/SDH
- › OTN BER testing with configurable threshold settings
- › Coupled, Decoupled and Through mode testing
- › Error and alarm insertion and monitoring
- › Overhead monitoring and manipulation
- › High-order and low-order mappings
- › Tandem connection monitoring (TCM)
- › Pointer manipulation, including pointer sequence testing as per Telcordia GR-253, ANSI T1.105-03 and ITU G.783
- › Performance monitoring as per G.821, G.826, G.828, G.829, M.2100, M.2101
- › Frequency analysis and offset generation
- › Automatic protection switching
- › Service-disruption time measurements
- › Round-trip delay measurements
- › DS1/DS3 and E1/E3/E4 testing
- › Dual DS1/DS3 receiver (Rx) support
- › DS1/DS3 autodetection of line code, framing and pattern
- › DS1 loop codes and NI/CSU emulation
- › DS1 automated multipattern BER
- › DS1/DS0 monitoring including ABCD signaling bits
- › DS1 FDL and DS3 FEAC
- › Fractional T1/E1 testing
- › ISDN PRI for DS1 or E1 interfaces
- › External clock support
- › 10 Base-T to 10 GigE testing
- › Quad-port testing (8XXQ module only)
- › Dual-port testing
- › 10G TCP throughput testing as per RFC 6349
- › TCP throughput testing up to 1 GigE
- › iSAM ultra-simple ITU-T Y.1564
- › EtherSAM, RFC 2544, traffic generation and monitoring, EtherBERT
- › 1588 PTP and SyncE
- › Through mode, Smart Loopback
- › Cable testing including power over Ethernet
- › Full line-rate packet capture and advanced filtering from 10M to 10G
- › IPv6 testing
- › VLANs including E-VLAN, S-VLAN and C-VLAN
- › MPLS
- › Asymmetrical testing with dual test set (EtherSAM, RFC 2544, iSAM)
- › Carrier Ethernet OAM (MEF, 802.1ag, Y.1731 and G.8813.1 MPLS-TP)
- › Fibre Channel 1X, 2X, 4X, 8X, 10X
- › Framed CPRI BTS and RRH emulation from 1.2 Gbit/s to 9.8 Gbit/s
- › Unframed and framed CPRI BER from 1.2 Gbit/s to 9.8 Gbit/s with RTD

Key DSn/PDH and SONET/SDH Features

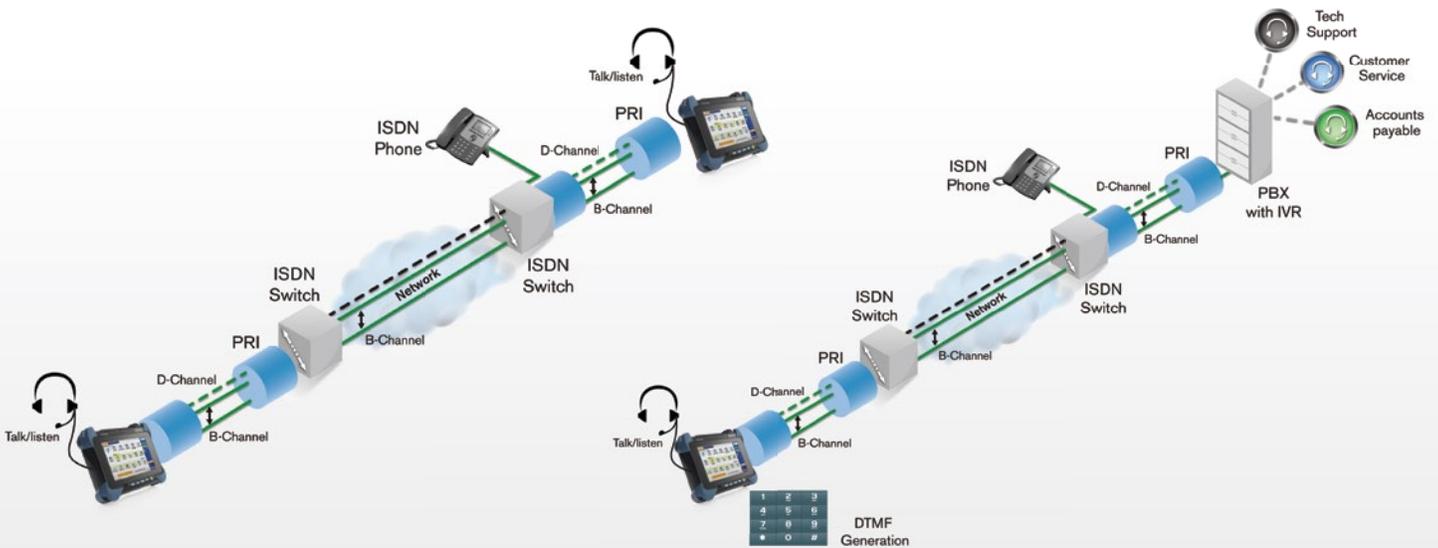
Simplified BER Testing

The NetBlazer V2 Series provides the ability to pre-configure bit-error-rate (BER) thresholds that are user-defined prior to running the test. This allows for a simple pass/fail verdict at the conclusion of the test, leaving no room for misinterpretation of the test results.



KEY ISDN FEATURES

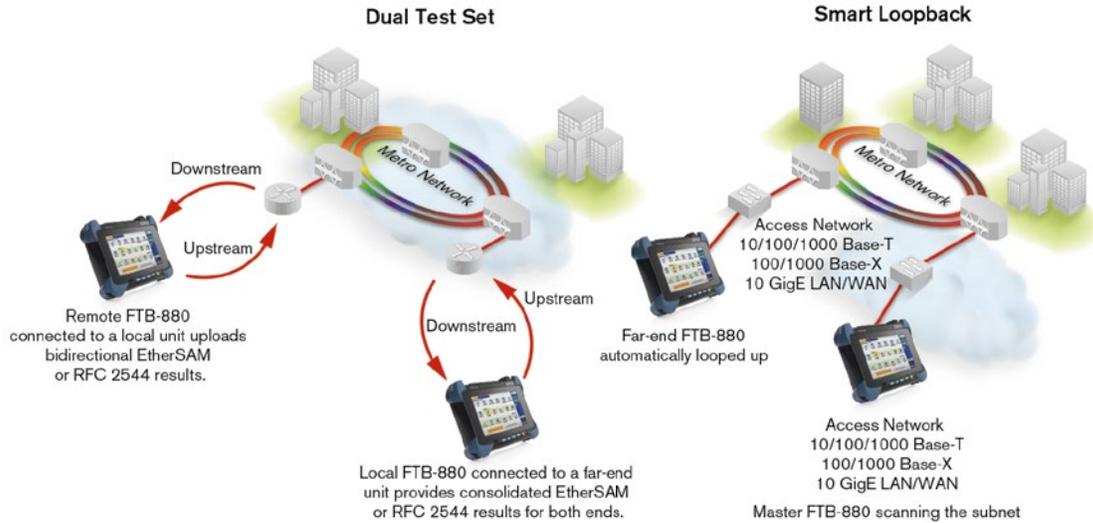
The NetBlazer V2 Series lets you test and troubleshoot North American or European ISDN PRI configurations. It offers best-in-class ISDN PRI testing by allowing field technicians to call one or all 23 DS1 or 31 E1 PRI channels. Once connected, the user can go channel by channel to perform a BER test on individual or all channels as well as talk and listen via a headset.



Key Ethernet Features

Intelligent Network Discovery Mode

Using the NetBlazer V2 Series, 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, RFC 6349 or RFC 2544 results. No more need for an additional technician at the far end to relay critical information—the NetBlazer V2 Series takes care of it all.



Smart Loopback Flexibility

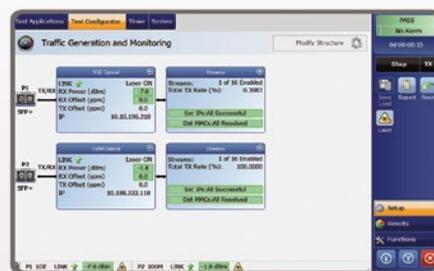
The Smart Loopback functionality has been enhanced to offer five distinct loopback modes. Whether you are looking to pinpoint loopback traffic from a UDP or TCP layer, or all the way down to a completely promiscuous mode (Transparent Loopback mode), the NetBlazer V2 Series has the flexibility to adjust for all unique loopback situations.

Dual-Port and Through Mode Testing

With dual-port testing, one technician can use a single NetBlazer V2 Series module to launch either EtherSAM or RFC 2544 and have bidirectional results with using only one module. With Traffic Generation and monitoring and EtherBERT tests the technician can setup two distinct tests: one test on port 1 and another on port 2. Both ports can also be different interfaces (e.g.: 10 Base-t Electrical on port 1 and 10 GigE on port 2).

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 V2 Series supports virtual local area network (VLAN) tags, Q-in-Q VLAN tags and multiprotocol label switching (MPLS).





ETHERSAM: THE NEW STANDARD IN ETHERNET TESTING

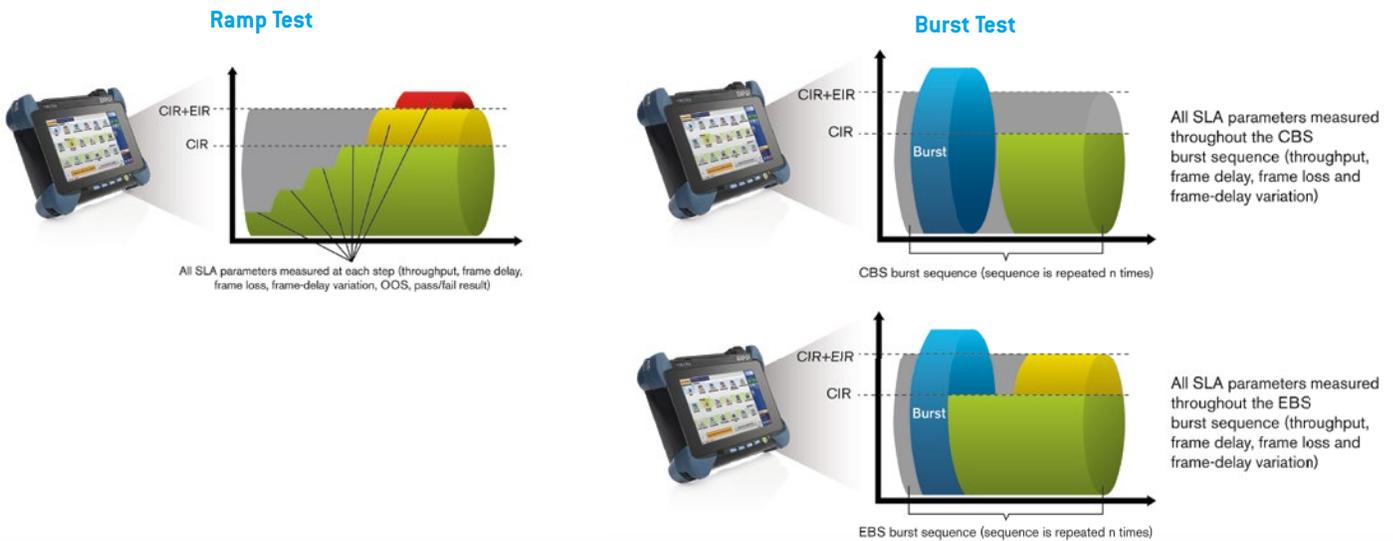
RFC 2544 used to be the most widespread Ethernet testing methodology. However, it was designed for network-device testing in the lab, not for service testing in the field. ITU-T Y.1564 is the new standard for turning up and troubleshooting Carrier Ethernet services. It has a number of advantages over 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 in sequentially testing each service in order to validate that each is properly provisioned and that all specific KPIs or SLA parameters are met. A ramp test and a burst test are performed to verify the committed information rate (CIR), excess information rate (EIR), committed burst size (CBS) and excess burst size (EBS).



Service Performance Test

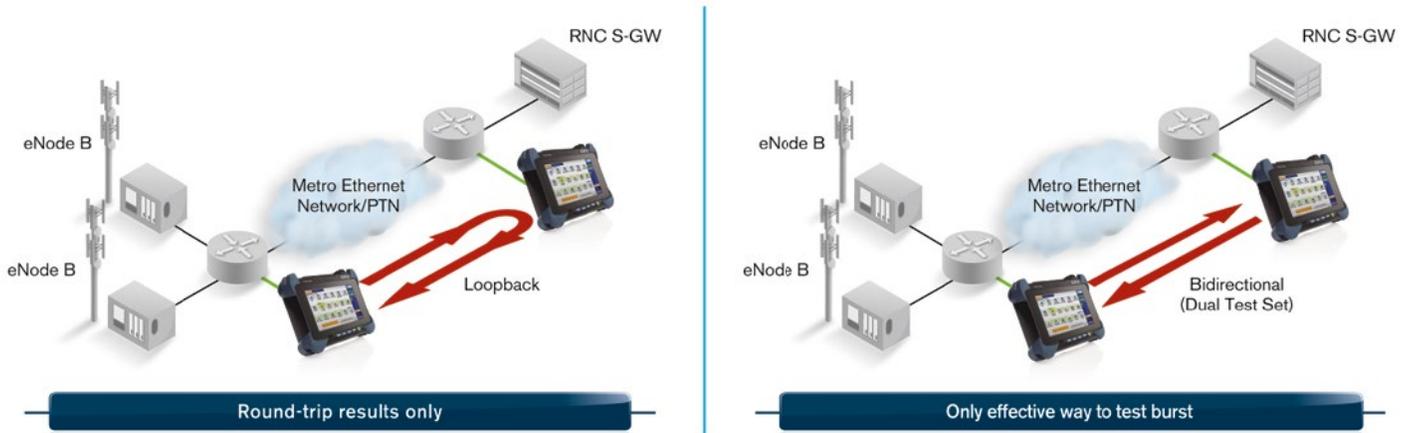
Once the configuration of each individual service is validated, the service performance test simultaneously validates the quality of all the services over time.





ETHERSAM BIDIRECTIONAL RESULTS

EXFO's EtherSAM approach proves even more powerful as it executes the complete ITU-T Y.1564 test with bidirectional measurements. Key SLA parameters are measured independently in each test direction, thus providing 100% first-time-right service activation—the highest level of confidence in service testing.



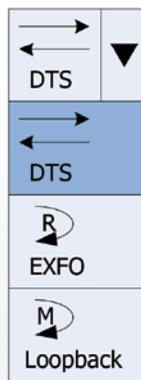
With iSAM the focus is on minimalism and simplicity, to make Y.1564 as simple as possible for all users. This is a big contrast from the current situation in the Test and Measurement market today. One key aspect of iSAM's simplicity is the number of steps it takes to actually setup, run and receive valid test results. EXFO's iSAM simply cuts to the chase.

The core objective of iSAM is to remove friction between the user and the testing solution. The end goal is to make any field tech able to setup and run an iSAM test. All of this done within a one-page setup.

The innovation does not stop here. iSAM also takes the lead in delivering the latest standards of test and measurement. iSAM marks an industry first by introducing actual MEF standards and thresholds to enable and guarantee service providers, mobile network operators and multisystem operators that they are testing against the latest MEF 23.1 standard.



One-page setup



Multiple modes of connection

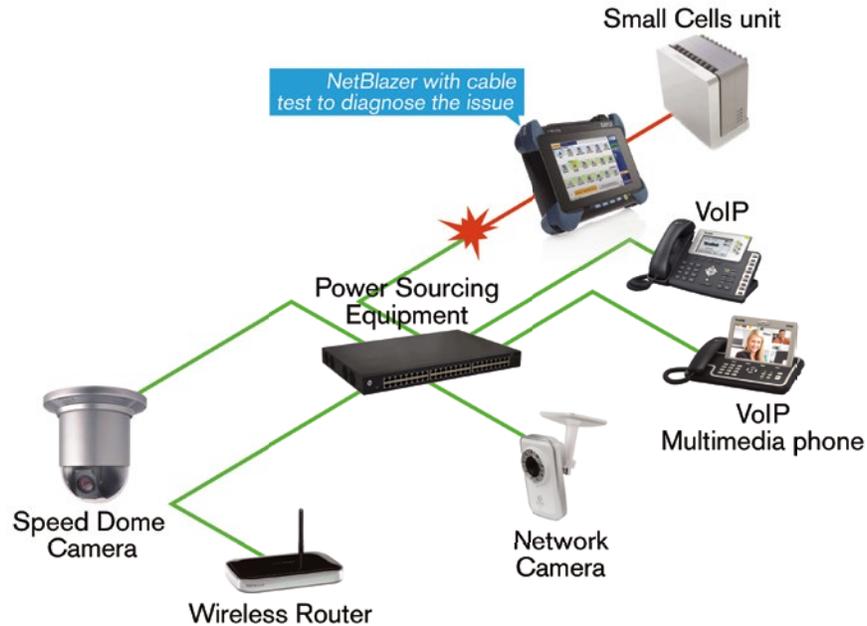


One-page results



CABLE TEST WITH POWER OVER ETHERNET (PoE)

The cable test helps field technicians to quickly and efficiently detect cable issues. With this feature, technicians can troubleshoot any cabling or installation issues by using the NetBlazer V2 Series to check the cables actual pin-out, wire map, cable length, distance to fault and propagation delay. With the addition of PoE, technicians can check for the following: presence of power, the power supplying equipment type, power class rating, voltages, current and the power in watts. Whether a technician needs to validate a basic component like a VoIP-PoE-powered phone or all the way to an actual PoE-powered Small Cells, the NetBlazer V2 Series fits the bill from basic to critical devices.





FTTA TESTING

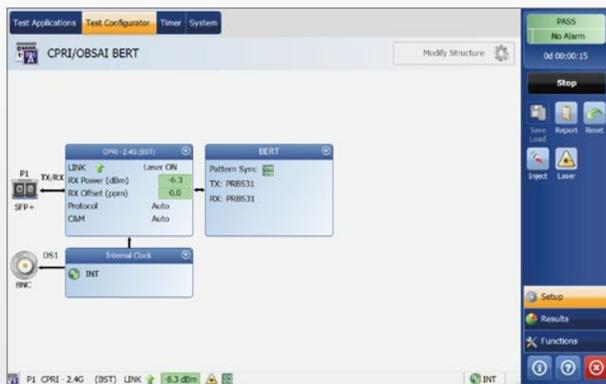
With the NetBlazer V2 Series modules, field technicians can carry out a variety of FTTA tests. For instance, when installing a remote radio head (RRH), it is critical that all equipment be verified before the riggers have finished the construction phase. The NetBlazer V2 Series' CPRI protocol feature verifies that the RRH is fully operational and that the correct small form-factor pluggable (SFP) transceivers are installed and connected correctly.

Using the NetBlazer V2 Series enabled with the layer-2 CPRI protocol, technicians can easily connect to the RRH without having to climb the cell tower. Regardless of whether the cell site's basestation (BTS) is connected to the RRH, the NetBlazer V2 Series is always ready to emulate a CPRI-enabled BTS. Once connected to the RRH, the NetBlazer is able to supply the field technician with a complete analysis of vital CPRI statistics that includes the following: optical power levels, protocol version, frequency and frequency offset, hyperframe and code word counts, the negotiated Ethernet or HDLC control and maintenance channels.

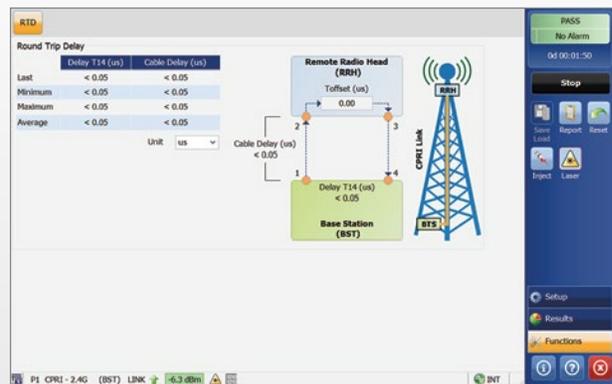
Having this information readily accessible enables field technicians to ensure that the RRH is working at the correct, specified line rate, and that it is timed and fully transmitting continuous frames from the top to the bottom of the tower. In addition, the reverse verification can be made by using the NetBlazer V2 Series to emulate the RRH in order to validate the CPRI link with the BTS.

Moving closer towards CPRI-enabled infrastructures, a significant challenge arises as a result of human errors made between the RRH and the BTS: faulty configurations, bad wiring and incorrect SFPs can lead to problems when trying to initialize the CPRI start-up sequence between the BTS and RRH. The NetBlazer V2 Series test suite better equips field technicians to decipher and solve these basic yet very costly human errors.

Finally with the NetBlazer V2 Series modules, field technicians can perform an unframed and framed layer-2 CPRI BER test from 1.2 Gbit/s all the way up to 9.8 Gbit/s. The NetBlazer V2 Series modules are able to validate that the fiber from the BTS located at the base of the tower or kilometers away in a Cloud-RAN environment are running with the expected latency and are error free.



Framed CPRI BER Test



CPRI Round-trip Delay

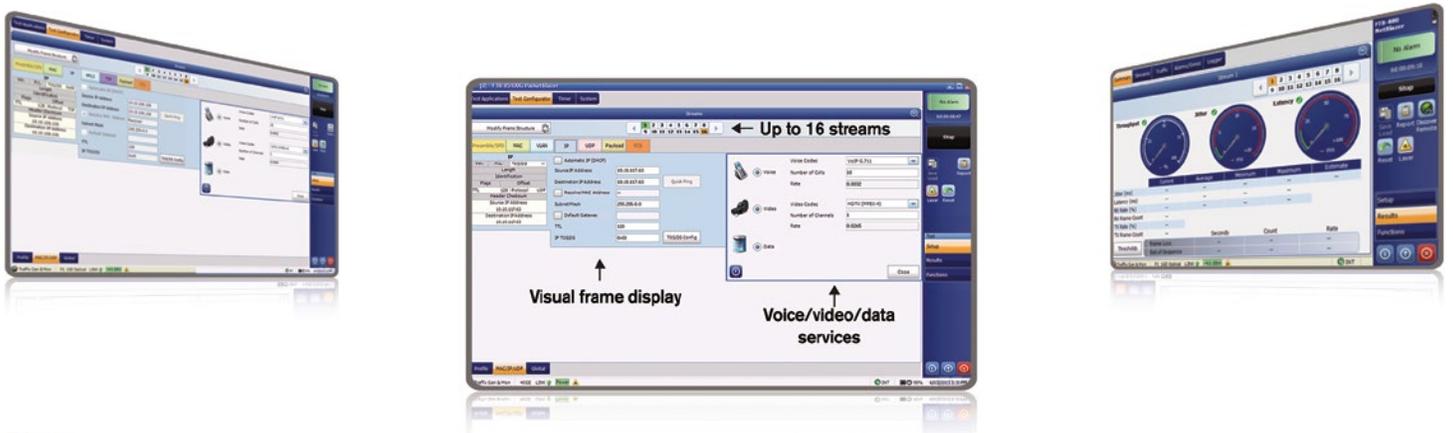


TRAFFIC GENERATION AND MONITORING

The NetBlazer V2 Series surpasses the multistream offerings of typical handheld Ethernet testing devices. Up to 64 streams of traffic (available on 870Q or 880Q modules) can be configured by a technician to test just about any frame format: Ethernet II, 802.3 SNAP, IPv4, IPv6, 3 levels of VLANs, MPLS, UDP and TCP. Each stream has an analog visual gauge and user-definable pass/fail thresholds that instantly show whether the test traffic is in or out of the expected ranges of the service level agreement.

Layer-2 Transparency Testing

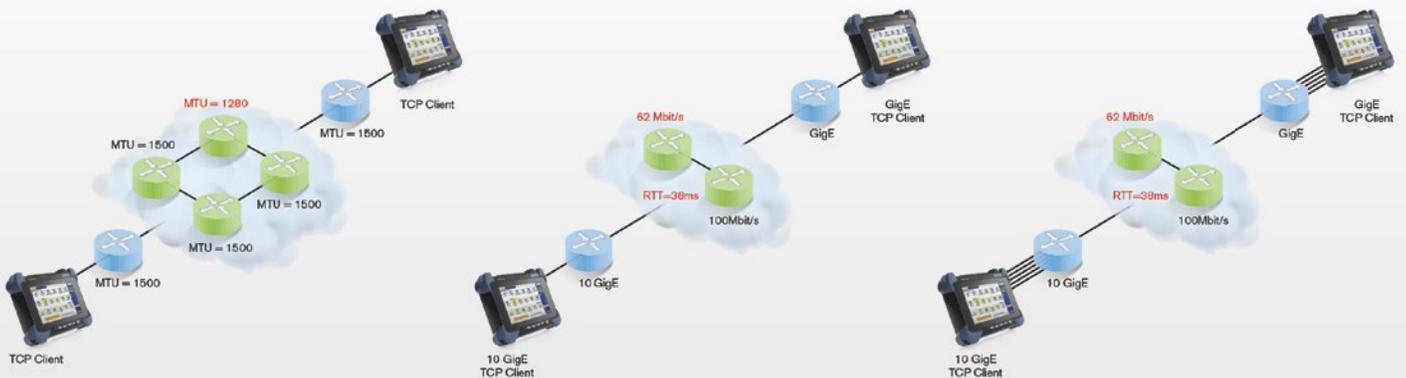
The NetBlazer V2 Series uses a new virtual frame display that allows field techs to easily configure multiple streams and their parameters, including the ability to modify the source MAC address, Ethertype, etc. This makes it possible to test layer-2 protocols such as CDP, VTP and LLDP. For added simplification, there are also predefined factory configurations capable of automatically loading up to ten layer-2 protocols simultaneously.



RFC 6349

The Internet Engineering Task Force (IETF) ratified RFC 6349 as a new method for validating an end-to-end TCP service. This new TCP throughput test methodology provides a repeatable standards-based test that validates TCP applications such as Web browsing, file transfer, business applications, streaming video and more. After running the RFC 6349 test, service providers will have all the metrics needed to optimize TCP performance from within their networks or customer-premises equipment.

The RFC 6349 test is important as it includes the following steps that help locate and diagnose TCP issues correctly. The first step consists of finding the maximum MTU size. This ensures that the network is not fragmenting the traffic. The second step aims to determine the baseline round-trip delay, which means letting the tech know that this latency value is the best case scenario that the network under test can deliver. The third step uses either single or multiple TCP connections to fill the pipe and then report back the actual TCP throughput. Once the test is complete, all TCP metrics are clearly laid out. If changes are required to optimize the TCP performance, the tech has all the values to rectify the situation. In the end, the RFC 6349 test helps to resolve any potential discrepancies that occur between the service provider network and the customer-premises equipment.



PATH MTU discovery

Baseline RTT and bandwidth to determine ideal window size

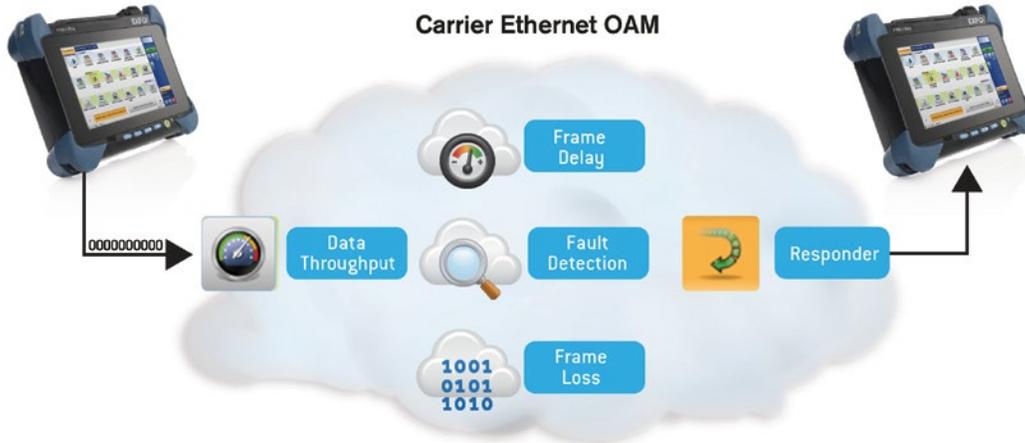
Single or multiple TCP connections to enable full pipe testing



CARRIER ETHERNET OAM

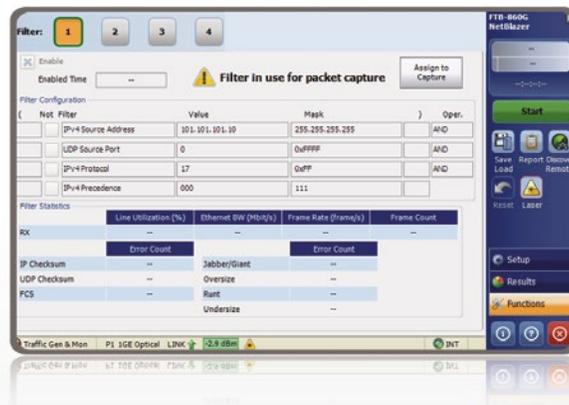
Ever since the introduction of metro Ethernet networks, there has been a need to ensure “five nines” level of availability, reliability and 50-millisecond recovery times from failures. Just as PDH, TDM and SONET/SDH, OAM has become a crucial network component that has enabled the same quality for carrier-class Ethernet.

The NetBlazer V2 Series offers a new application that validates the mechanics of the service operation, administration and maintenance (S-OAM) tools, which covers Y.1731, 802.1ag, G.8113.1 (MPLS-TP) and MEF modes. The features of this application include continuity check generation and monitoring, loopback testing, frame loss, synthetic loss and frame delay. There is also an S-OAM link trace and responder.



Packet Capture

The capturing power of EXFO's NetBlazer V2 Series extends far beyond basic capabilities. The NetBlazer V2 Series adds extra features and functionalities to boost test cycle efficiency and provides more value. Its packet capture tool offers comprehensive filtering, triggering and truncation methods to target specific traffic and quickly pinpoint issues in the lab and in the field.



Advanced Traffic Filtering

In some cases, troubleshooting only concerns a particular traffic flow. The advanced traffic-filtering capability of the NetBlazer V2 Series allows you to restrict traffic by using up to four matching fields and operands (and, or, not). A complete set of triggers is available, such as MAC, IP and TCP/UDP fields, as well as VLAN, MPLS fields.

EFFICIENTLY ASSESSING PERFORMANCE OF FIBRE CHANNEL SERVICES

The NetBlazer V2 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 V2 Series modules provide full wire-speed traffic generation at the FC-2 layer, which allows for BER testing for link integrity measurements. The NetBlazer V2 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 the processing time inside each piece of network equipment. Latency is the total accumulation of delays between two endpoints. 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 V2 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 V2 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.

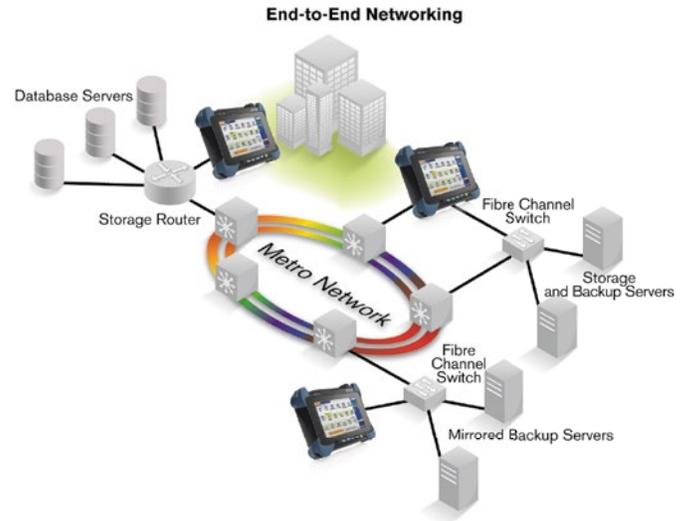
Login Testing

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 V2 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 NetBlazer V2 Series 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 TFv
Test Function Virtualization

EXFO TFv

EXFO TFv—Test Function Virtualization is a cloud-based suite of defined offerings for service providers who are looking to scale their testing requirements to their specific needs. Under the EXFO TFv umbrella are FTB Anywhere floating licenses, and the newly launched FTB OnDemand time-based software licenses.

FTB Anywhere: Floating Test Licenses

FTB Anywhere is an EXFO Connect-enabled offering that allows FTB platform users to share floating test licenses and get the required functionality—anywhere, anytime. In short, the customer owns the software licenses and can share them between FTB platforms.

FTB OnDemand: Time-Based Software Licenses

FTB OnDemand allows customers to activate time-based software licenses covering a wide range of test functionalities (e.g., 100G testing) to match their exact needs. FTB OnDemand enables users to obtain a license for specific test for a specific module for a specific period of time. FTB OnDemand is available for a number of best-in-class EXFO test modules. For a complete list of all the available modules, visit our FTB OnDemand Web page.

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 PRO PLATFORM

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

| EXpert TEST TOOLS | |
|-------------------------------|--|
| EXpert VoIP TEST TOOLS | <p>The EXpert VoIP Tools generate a voice-over-IP call directly from the test platform to validate performance during service turn-up and troubleshooting.</p> <ul style="list-style-type: none"> • 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 | <p>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.</p> <ul style="list-style-type: none"> • 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 | <p>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.</p> <ul style="list-style-type: none"> • Real-time video preview • Analyzes up to 10 video streams • Comprehensive QoS and QoE metrics, including MOS score |



SPECIFICATIONS

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 and rate |
| Error measurement | Bit error, symbol error, oversize error, crc error, undersize error and block error (10x only) |
| Alarm detection | LOS, pattern loss, link down, local and remote fault (10x only) |
| Buffer-to-buffer credit testing | Buffer-to-buffer credit estimation based on latency |
| Latency | Round-trip latency |

DS_N/PDH AND SONET/SDH TEST FEATURES

| | |
|---|---|
| Frequency measurements | Supports clock frequency measurements (i.e., received frequency and deviation of the input signal clock from nominal frequency), displayed in ppm, for optical and electrical interfaces. Measurements are performed using a local oscillator. |
| Frequency offset generation | Supports offsetting the clock of the transmitted signal on a selected interface to exercise clock recovery circuitry on network elements. |
| Dual DS _N receivers | Supports two DS1 or DS3 receivers, allowing users to simultaneously monitor two directions of a circuit under test in parallel, resulting in quick isolation of the source of errors. |
| Performance monitoring | The following ITU-T recommendations, and corresponding performance monitoring parameters, are supported: ITU-T recommendation G.821 G.826 G.828 G.829 M.2100 M.2101 Performance monitoring statistics ES, EFS, EC, SES, UAS, ESR, SESR, DM ES, EFS, EB, SES, BBE, UAS, ESR, SESR, BBER ES, EFS, EB, SES, BBE, SEP, UAS, ESR, SESR, BBER, SEPI ES, EFS, EB, SES, BBE, UAS, ESR, SESR, BBER ES, SES, UAS ES, SES, BBE, UAS |
| Pointer adjustment and analysis | Generation and analysis of HO/AU and LO/TU pointer adjustments as per GR-253, and ITU-T G.707 Generation <ul style="list-style-type: none"> › Pointer increment and decrement › Pointer jump with or without NDF › Pointer value Analysis <ul style="list-style-type: none"> › Pointer increments › Pointer decrements › Pointer jumps (NDF, no NDF) › Pointer value and cumulative offset |
| Service disruption time (SDT) measurements | The service disruption time test tool measures the time during which there is a disruption of service due to the network switching from the active channels to the backup channels. Measurements: last disruption, shortest disruption, longest disruption, average disruption, total disruption, and service disruption count. |
| Round-trip delay (RTD) measurements | The round-trip delay test tool measures the time required for a bit to travel from the NetBlazer transmitter back to its receiver after crossing a far-end loopback. Measurements are provided on all supported NetBlazer interfaces and mappings. Measurements: last, minimum, maximum, average; measurement count: no. of successful RTD tests and failed measurement count. |
| APS message control and monitoring | Ability to monitor and set up automatic protection switching messages (K1/K2 byte of SONET/SDH overhead). |
| Synchronization status | Ability to monitor and set up synchronization status messages (S1 byte of SONET/SDH overhead). |
| Signal label control and monitoring | Ability to monitor and set up payload signal labels (C2, V5 byte of SONET overhead). |
| Tandem connection monitoring (TCM) ^a | Tandem connection monitoring (TCM) is used to monitor the performance of a subsection of a SONET/SDH path routed via different network providers. The NetBlazer supports transmitting and receiving alarms and errors on a TCM link; also, transmission and monitoring of the tandem connection (TC) trace can be generated to verify the connection between TCM equipment. Error generation: TC-IEC, TC-BIP, TC-REI, TC-OEI Error analysis: TC-IEC, TC-REI, TC-OEI, TC-VIOL (non-standardized alarm) Alarm generation: TC-RDI, TC-UNEQ, TC-ODI, TC-LTC, TC-IAIS Alarm analysis: TC-TIM, TC-RDI, TC-UNEQ, TC-ODI, TC-LTC, TC-IAIS |
| Pointer sequence testing | Perform pointer sequence testing as per G.783, GR253 and T1.105-3 standards. |
| M13 mux/demux | Ability to multiplex/demultiplex a DS1 signal into/from a DS3 signal. (Note: E1 to DS3 mux/demux available with G.747 software option.) |
| DS1 FDL | Support for DS1 Facility Data Link testing. |
| DS1 loopcodes | Support for generation of DS1 in-band loopcodes with the availability of up to 10 pairs of user-defined loopcodes. |
| NI/CSU loopback emulation | Ability to respond to DS1 in-band/out-of-band loopcodes. |
| DS3 FEAC | Support for DS3 far-end alarms and loopback code words. |
| DS1/DS3 autodetection | Ability to automatically detect DS1/DS3 line coding, framing and test pattern. |
| DS1 multipattern | BER test that includes 5 automated patterns: all ones, 1 in 8, 2 in 8, 3 in 2, QRSS |
| DS1 signaling bits | Ability to monitor the ABCD signaling bits for all 24 DS0 channels |
| Through mode | Perform Through mode analysis of any incoming electrical (DS _N , PDH, SONET, SDH) and optical line (OC-1/STM-0, OC-3/STM-1, OC-12/STM-4, OC-48/STM-16, OC-192/STM-64) transparently. |

Note

a. HOP and LOP supported as per ITU G.707 option 2.

| OTN TEST FEATURES | | |
|---------------------------------------|-------------------------|---|
| OTN | Standards compliance | ITU-T G.709, ITU G.798, ITU G.872 |
| | Interfaces | OTU1 (2.6660 Gbit/s), OTU2 (10.7092 Gbit/s), OTU1e (11.0491 Gbit/s), OTU2e (11.0957 Gbit/s), OTU1f (11.2701 Gbit/s), OTU2f (11.3176 Gbit/s) |
| OTU Layer | Errors | OTU-FAS, OTU-MFAS, OTU-BEI, OTU-BIP-8 |
| | Alarms | LOF, OOF, LOM, OOM, OTU-AIS, OTU-TIM, OTU-BDI, OTU-IAE, OTU-BIAE |
| | Traces | 64-bytes Trail Trace Identifier (TTI) as defined in ITU-T G.709 |
| ODU TCM Layer | Errors | TCMi-BIP-8, TCMi-BEI (i = 1 to 6) |
| | Alarms | TCMi-LTC, TCMi-TIM, TCMi-BDI, TCMi-IAE, TCMi-BIAE |
| | Traces | 64-bytes Trail Trace Identifier (TTI) as defined in ITU-T G.709 |
| ODU Layer | Errors | ODU-BIP-8, ODU-BEI |
| | Alarms | ODU-AIS, ODU-OCI, ODU-LCK, ODU-TIM, ODU-BDI, ODU-FSF, ODU-BSF, ODU-FSD, ODU-BSD |
| | Traces | Generates 64-bytes Trail Trace Identifier (TTI) as defined in ITU-T G.709 |
| | FTFL ^b | As defined in ITU-T G.709 |
| OPU Layer | Alarms | OPU-PLM, OPU-AIS, OPU-CSF |
| | Payload type (PT) label | Generates and displays received PT value |
| Forward Error Correction (FEC) | Errors | FEC-Correctable (Codeword), FEC-Uncorrectable (Codeword), FEC-Correctable (Symbol), FEC-Correctable (Bit), and FEC-Stress (Codeword) |
| Pattern | Patterns | 2E-9, 2E-15, 2E-20, 2E-23, 2E-31, NULL, 32-bit programmable (inverted or noninverted) |
| | Error | Bit error |
| | Alarm | Pattern loss |

| ADDITIONAL OTN FUNCTION | | | |
|--|---|--|--|
| Frequency measurements | Supports clock frequency measurements (i.e., received frequency and deviation of the input signal clock from nominal frequency), displayed in ppm. Measurements are performed using a local oscillator. | | |
| Frequency offset generation | Supports offsetting the clock of the transmitted signal on a selected interface to exercise clock recovery circuitry on network elements. | | |
| Performance monitoring | The following ITU-T recommendations and corresponding performance monitoring parameters are supported: <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> ITU-T recommendation G.821 M.2100 </td> <td style="width: 50%; vertical-align: top;"> Performance monitoring statistics ES, EFS, EC, SES, UAS, ESR, SESR, DM ES, SES, UAS </td> </tr> </table> | ITU-T recommendation G.821 M.2100 | Performance monitoring statistics ES, EFS, EC, SES, UAS, ESR, SESR, DM ES, SES, UAS |
| ITU-T recommendation G.821 M.2100 | Performance monitoring statistics ES, EFS, EC, SES, UAS, ESR, SESR, DM ES, SES, UAS | | |
| Service disruption time (SDT) measurements | The service disruption time test tool measures the time during which there is a disruption of service due to the network switching from the active channels to the backup channels. Measurements: last disruption, shortest disruption, longest disruption, average disruption, total disruption, and service disruption count. | | |
| Round-trip-delay (RTD) measurements | The round-trip-delay test tool measures the time required for a bit to travel from the transmitter back to its receiver after crossing a far-end loopback. Measurements are supported on all interfaces and mappings. Measurements: last RTD time, minimum, maximum, average, measurement count (number of successful RTD tests) and failed measurement count. | | |
| Through mode | Performs Through mode analysis of any incoming OTN signal transparently. | | |

| ISDN PRIMARY RATE INTERFACE TEST FEATURES | | | |
|---|--|-------------------|---|
| Supported interfaces | DS1: bantam or RJ48C (SF or ESF) E1: bantam, RJ48C or BNC (PCM31 with or without CRC-4) | Headset support | Talk/listen through a selectable connected voice or 3.1 kHz B-channel |
| Supported switch types | DS1: national ISDN, Nortel DMS and AT&T 4/5ESS E1: euro ISDN, euro VN6 and Q.SIG | D-channel control | D-channel timeslot configuration Rate (64K or 56K) HDLC mode (Normal or Inverted) |
| Emulation modes | Terminal equipment (TE) Network termination (NT) | Statistics | Call status, CRV, incoming or outgoing calls, call duration BERT (bit error count and rate) with graphical BERT meter on a per B-channel (data) basis Performance monitoring statistics: UAS, EFS, ES and SES Active calls (data, voice, 3.1 kHz) Total call count (connected, cleared, failed/rejected, placed) Frequency (Rx, offset, max +/-max – offset) |
| Call types/rates | Data (64K or 56K), voice or 3.1 kHz (audio) | Alarms | DS1: LOS, frequency, LOC, AIS, OOF, RAI, D-channel down E1: LOS, frequency, LOC, AIS, LOF, RAI, D-channel down Pattern loss (per B-channel injection) |
| BER test | Configurable test pattern Provides simultaneous BER testing on multiple B-channels configured with data traffic | Errors | DS1: BPV, EXZ, framing bit, CRC-6, D-channel FCS E1: CV, FAS, CRC-4, E-bit, D-channel FCS Bit error (per B-channel injection) |
| Call setting | Calling party (numbering type, numbering plan and number up to 30 digits) Called party (number type, numbering plan and number up to 30 digits) Network (network transit selection code of up to four digits, and operator system access: None, Principal or Alternate) > All parameters are configurable on a per-call basis > Highlights missing calls or called party numbers | ISDN logger | Logs layer-2 (Q.921) and layer-3 (Q.931) messages Filter: All, layer 2 or layer 3 Information: ID, time, message type, direction, channel number, called number, call type, cause values/definition, status and progress |
| Call control | Call origination > Establishment of calls prior to starting the test > Automatically initiate single, multiple or all configured calls upon starting a test Call reception > Auto-Answer mode, Auto-Reject or prompt Call release > Hang up individual or all channels | Pass/fail verdict | BERT, call establishment and termination |
| DTMF injection | Generate DTMF tones for all standard digits, including 0-9, # and * as per Q.23/G.224 Available for one of the connected voice or 3.1 kHz B-channel | Phone book | Easy access to phone book to manage names and associated numbers. Save/load functions to update the phone book and import/export to exchange the phone book with other NetBlazer |

ETHERNET TEST FEATURES

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|-----------------------------------|---|
| EtherSAM (ITU-T Y.1564) | Perform service configuration and service performance tests as per ITU-T Y.1564 including EBS, CBS and EMIX. Tests can be performed using remote loopback or dual test set mode for bidirectional results. |
| iSAM | Simplified Y.1564 test that performs service configuration and service performance tests that 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. |
| RFC-6349 | Perform TCP testing up with single or multiple TCP connections from 10 Base-T up to 10G. Discovers the MTU, RTT, actual and ideal TCP throughput |
| 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. Also includes the ability to generate fixed, random and frame size sweep, as well as MAC flooding. |
| Carrier Ethernet OAM | Supports four S-OAM modes, MEF, Y.1731, G.8113.1 (MPLS-TP) and 802.1ag. CCM generation and monitoring, loopback, test, frame loss, synthetic loss and frame delay. Alarm generation: AIS, RDI, LCK, CSF(C-LOS, C-RDI, C-FDI, C-DCI). Alarm monitoring: RDI, AIS, LCK, CSF, loss of continuity, mismerge, unexpected MEP, unexpected MEG/MD level, unexpected period supports S-OAM responder, S-OAM link trace, ping and trace route, filters and packet capture. |
| Packet capture and filters | Ability to perform 10BASE-T all the way up to 10 GigE full line-rate packet capture and decode. Ability to configure filter full line-rate data capture and decoding up to 10G; configuration of capture filters and triggers as well as capture slicing parameters. |
| 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 2E9-1, PRBS 2E11-1, PRBS 2E15-1, PRBS 2E20-1, PRBS 2E23-1, PRBS 2E31-1 and one user pattern. Capability to invert patterns. |
| Error measurement (BERT) | Bit error, bit mismatch 0, bit mismatch 1. |
| VLAN stacking | Generate up to three levels of VLANs (including IEEE 802.1ad and Q-in-Q tagged VLAN). |
| VLAN preservation | Validate that CE-VLAN tags classes of service (CoS), and that ID is passed transparently through the network. |
| MPLS | Generate and analyze streams with up to two layers of MPLS labels. |
| Cable testing | The cable test application provides test functions to diagnose UTP cables transmitting Ethernet over twisted pair. It verifies connectivity errors and evaluates cabling performance. The cable test can optionally simulate a PoE powered device to verify if a PoE power sourcing equipment is capable to deliver adequate power prior to connecting a powered device. |
| PoE | Applicable rates: 10M to 1000M electrical, meets 802.3at (802.3 Section 33) unloaded and loaded testing, identification of cable pairs carrying power and polarity, voltage/current/power measurement on each pair, user-configurable power class (0 to 4). |
| Service disruption time (SDT) | Includes statistics such as longest, shortest, last, average, count, total and pass/fail thresholds. |
| IPv6 testing | Perform the following tests up to 10G over IPv6, EtherSAM, RFC 2544, BERT, traffic generation and monitoring, Through mode, intelligent auto discovery, 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, REI-P. |
| TCP throughput | True wire speed, TCP throughput test for undisputable SLA reinforcement for Ethernet services. |
| One-way delay | Measurement of the one-way frame delay at up to 10G as part of EtherSAM (Y.1564) and RFC 2544. |
| Error measurement | Jabber/giant, runt, undersize, oversize, FCS, symbol, alignment, collision, late collision, excessive collision, IP checksum, UDP checksum, TCP checksum and 10G block error. |
| Alarm detection | LOS, link down, pattern loss, frequency, LOC, 10G local/remote fault. |
| Flow control | Inject or monitor pause frames, including frame counts of pause, abort frames and total, last, maximum and minimum pause time. |
| Batch configuration | Ability to automatically set a specific source IP address, subnet mask, default gateway, DHCP, destination MAC address or destination IP address to one or all EtherSAM services or traffic generation streams. |
| Dual Port | Dual-Port testing with EtherSAM (ITU-T Y.1564), RFC2544 and traffic generation and monitoring when using 10/100/1000 Base-t, 100 BaseX, GigE and 10 GigE. |

ADDITIONAL FEATURES

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|-------------------------------|--|
| CPRI layer-2 protocol testing | Supports BTS and RRH emulation modes by supporting start-up sequence states, autodetection of protocols, negotiated parameters for control and maintenance, Ethernet and HDLC channels, hyperframe and code word counts, injection and monitoring of layer-1 alarms and frequency. |
| CPRI BER testing | Includes unframed and framed BER measurement, bit error injection, round-trip delay measurement, and pass/fail verdicts for 1.2 to 9.8 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. |
| Power measurement | Supports power measurement at all times, displayed in dBm (dBdsx for DS1 and DS3), for optical and electrical interfaces. |
| Power-up and restore | In the event of a power failure to the unit, the active test configuration and test logger are saved and restored upon boot-up. |
| 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, based on bit error rate and/or service disruption time. |
| Alarm hierarchy | Alarms are displayed according to a hierarchy based on root cause. Secondary effects are not displayed. This hierarchy serves to facilitate alarm analysis. |
| Report generation | Generate test reports with customizable selections, company logos and clear pass/fail color-coded analysis, in both HTML and PDF formats, and save them directly on the unit, on a USB stick or via EXFO Connect. |
| 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. |
| Remote loopback | Detects other NetBlazer/PowerBlazer units and sets them to Smart Loopback mode. |
| Dual test set | Detects and connects to other NetBlazer/PowerBlazer units to perform bidirectional RFC 2544 and EtherSAM testing. |
| Dual-port mode | Enables any Ethernet test, such as EtherSAM, RFC 2544, traffic generation and monitoring, or BERT to run directly to itself using one self-contained unit with loopback. |
| IP tools | Perform ping and traceroute functions. |
| Smart loopback | Return Ethernet traffic to the local unit by swapping packet overhead up to layer 4. |
| Test timer | Select a pre-defined duration or enter start and stop times. |

UPGRADES

| | | |
|-----------------------------------|----------------------|---|
| SFP upgrades | FTB-8590 | SFP module GigE/FC/2FC, CPRI/OBSAI 2.45/3.07 Gbit/s at 850 nm, MM, <500 m |
| | 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-8190 | 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 |
| | FTB-8192 | SFP module; rates: 155/622 Mbit/s, 2.5/2.7 Gbit/s, GigE/FC/2FC; 1550 nm, LC connector, 80 km reach |
| | FTB-8193 | SFP module; rates: 155/622 Mbit/s, 2.5/2.7 Gbit/s, GigE/FC/2FC; 1550 nm, LC connector, 40 km reach |
| | 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-85915 | SFP modules GigE/FC/2FC/4FC at 1550 nm, <50 km |
| | FTB-85919 | SFP Copper, Multirate 10/100/1000 BASE-T, Cat5 UTP 100m reach |
| | SFP+ upgrades | SFP-8600 |
| SFP-8601 | | SFP+ 10G (1.25 Gbit/s to 10.3125 Gbit/s) CWDM at 1471 nm, LC SMF, 10 km |
| SFP-8602 | | SFP+ 10G (1.25 Gbit/s to 10.3125 Gbit/s) CWDM at 1511 nm, LC SMF, 10 km |
| FTB-8690 | | SFP+ modules 10FC/10 GigE at 850 nm, MM, 300 m |
| FTB-8691 | | SFP+ modules 10 GigE at 1310 nm, 10 km |
| FTB-8693 | | SFP+ modules 9.953-10.709/11.3, 8FC/10FC/10 GigE at 1310 nm, SMF, 10 km |
| FTB-8694 | | SFP+ modules 8FC/10FC/10 GigE at 1550 nm, 40 km |
| FTB-8695 | | SFP+ modules 8FC/10FC/10 GigE at 1550 nm, 80 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 |

GENERAL SPECIFICATIONS

| MODULE VERSIONS | FTB-880V2 | FTB-870V2 | FTB-880Q | FTB-870Q |
|--------------------------|--|-------------------|---|-------------------|
| Size (H x W x D) | 210 mm x 254 mm x 55 mm (8 ¼ in x 10 in x 2 ¾ in) | | 210 mm x 254 mm x 75 mm (8 ¼ in x 10 in x 3 in) | |
| Weight (without battery) | 0.91 kg (2 lb) | 0.85 kg (1.85 lb) | 2.1 kg (4.65 lb) | 1.84 kg (4.06 lb) |
| Operating temperature | 0 °C to 50 °C (32 °F to 122 °F) up to 2000 m (6561 ft) | | | |
| Relative humidity | 0 % to 95 %, non-condensing | | | |
| Battery duration | Over two hours | | Over one hour | |
| Battery charging time | Two hours | | | |
| Languages | English, Chinese, Japanese and Korean | | | |

ORDERING INFORMATION

FTB-880V2-XX-XX-XX-XX-XX-XX-XX

Test options ■

SONET = SONET testing
 SDH = SDH testing
 SONET-SDH = SONET and SDH testing

Transport rate options ■

52M = 52 Mbit/s (OC-1/STM-0)^a
 155M = 155 Mbit/s (OC-3/STM-1)
 622M = 622 Mbit/s (OC-12/STM-4)
 2488M = 2.5 Gbit/s (OC-48/STM-16)
 9953M = 10 Gbit/s (OC-192/STM-64)

Software options ■

DS3-G747 = G.747 test capability
 DS1-FDL = DS1 FDL test capability
 DUAL-RX = DS1/DS3 dual Rx testing
 DS3-FEAC = DS3 FEAC test capability
 TCM = Tandem connection monitoring
 DS_n = DS_n test capability
 PDH = PDH test capability
 ISDN-PRI = ISDN primary rate interface
 NI-CSU = NI-CSU loopback emulation
 Cable_test = Cable test
 IPV6 = Internet protocol version 6
 ETH-THRU = Through mode capability
 CPRI-OBSAI = Enables 1.2G to 3.1G CPRI, and 3.1G OBSAI^b
 MPLS = Enables MPLS
 1588PTP = Generates and analyzes 1588 PTP
 SyncE = Generates and analyzes SyncE protocol
 TCP-THPUT = TCP throughput
 ETH-OAM = Enables Y.1731, G.8113.1 (MPLS-TP), 802.1ag and MEF
 ADV-FILTERS = Advanced filtering
 ETH-CAPTURE = Full line-rate packet capture
 DUAL-PORT = Dual port testing for any enabled Ethernet rate
 iSAM = Enables simplified Y.1564 test
 RFC6349 = Enables TCP testing as per RFC 6349
 POE = Enables Power over Ethernet capability

CPRI rate options

CPRI-4.9G^c
 CPRI-6.1G^c
 CPRI-9.8G^c

OTN rate options

OTU1 = OTN optical rate 2.666 Gbit/s
 OTU2 = OTN optical rate 10.709 Gbit/s
 OTU2-1e-2e = OTN optical rates 11.049/11.096 Gbit/s
 OTU2-1f-2f = OTN optical rates 11.270/11.318 Gbit/s

Fibre Channel rate options

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

Ethernet rate options

100optical = 100 Mbit/s optical
 GigE = 1000 Mbit/s optical and electrical
 10GigE = 10G LAN and 10G WAN

Example: FTB-880V2-SONET-155M-DSn-GigE

Notes

- Always included.
- Requires purchase of SFP.
- Requires purchase of SFP+.

ORDERING INFORMATION

FTB-870V2-XX-XX-XX-XX-XX-XX-XX

Test options

- SONET = SONET testing
- SDH = SDH testing
- SONET-SDH = SONET and SDH testing

Transport rate options

- 52M = 52 Mbit/s (OC-1/STM-0)^a
- 155M = 155 Mbit/s (OC-3/STM-1)
- 622M = 622 Mbit/s (OC-12/STM-4)
- 2488M = 2.5 Gbit/s (OC-48/STM-16)
- 9953M = 10 Gbit/s (OC-192/STM-64)

Software options

- DS1-FDL = DS1 FDL test capability
- TCM = Tandem connection monitoring
- DSn = DSn test capability
- PDH = PDH test capability
- ISDN-PRI = ISDN primary rate interface
- NI-CSU = NI-CSU loopback emulation
- Cable_test = Cable test
- IPV6 = Internet protocol version 6
- ETH-THRU = Through mode capability
- CPRI-OBSAI = Enables 1.2G to 3.1G CPRI, and 3.1G OBSAI^b
- MPLS = Enables MPLS
- 1588PTP = Generates and analyzes 1588 PTP
- SyncE = Generates and analyzes SyncE protocol
- TCP-THPUT = TCP throughput
- ETH-OAM = Enables Y.1731, G.8113.1 (MPLS-TP), 802.1ag and MEF
- ADV-FILTERS = Advanced filtering
- ETH-CAPTURE = Full line-rate packet capture
- DUAL-PORT = Dual port testing for any enabled Ethernet rate
- ISAM = Enables simplified Y.1564 test
- RFC6349 = Enables TCP testing as per RFC 6349
- POE = Enables Power over Ethernet capability

CPRI rate options

- CPRI-4.9G^c
- CPRI-6.1G^c
- CPRI-9.8G^c

OTN rate options

- OTU1 = OTN optical rate 2.666 Gbit/s
- OTU2 = OTN optical rate 10.709 Gbit/s
- OTU2-1e-2e = OTN optical rates 11.049/11.096 Gbit/s
- OTU2-1f-2f = OTN optical rates 11.270/11.318 Gbit/s

Fibre Channel rate options

- FC1X = 1x Fibre Channel interface^b
- FC2X = 2x Fibre Channel interface^b
- FC4X = 4x Fibre Channel interface^b
- FC8X = 8x Fibre Channel interface^c
- FC10X = 10x Fibre Channel interface^c

Ethernet rate options

- 100optical = 100 Mbit/s optical^b
- GigE = 1000 Mbit/s optical and electrical^b
- 10GigE = 10G LAN and 10G WAN^c

Example: FTB-870V2-SONET-155M-IPV6-GigE-FC1X-OTU1

Notes

- a. Always included.
- b. Requires purchase of SFP.
- c. Requires purchase of SFP+.

ORDERING INFORMATION

FTB-880Q-XX-XX-XX-XX-XX-XX-XX

■ **Test options**

- SONET = SONET testing
- SDH = SDH testing
- SONET-SDH = SONET and SDH testing

■ **Transport rate options**

- 52M = 52 Mbit/s (OC-1/STM-0)^a
- 155M = 155 Mbit/s (OC-3/STM-1)
- 622M = 622 Mbit/s (OC-12/STM-4)
- 2488M = 2.5 Gbit/s (OC-48/STM-16)
- 9953M = 10 Gbit/s (OC-192/STM-64)

■ **Software options**

- DS3-G747 = G.747 test capability
- DS1-FDL = DS1 FDL test capability
- DUAL-RX = DS1/DS3 dual Rx testing
- DS3-FEAC = DS3 FEAC test capability
- TCM = Tandem connection monitoring
- DSn = DSn test capability
- PDH = PDH test capability
- ISDN-PRI = ISDN primary rate interface
- NI-CSU = NI-CSU loopback emulation
- Cable_test = Cable test
- IPV6 = Internet protocol version 6
- ETH-THRU = Through mode capability
- CPRI-OBSAI = Enables 1.2G to 3.1G CPRI, and 3.1G OBSAI^b
- MPLS = Enables MPLS
- 1588PTP = Generates and analyzes 1588 PTP
- SyncE = Generates and analyzes SyncE protocol
- TCP-THPUT = TCP throughput
- ETH-OAM = Enables Y.1731, G.8113.1 (MPLS-TP), 802.1ag and MEF
- ADV-FILTERS = Advanced filtering
- ETH-CAPTURE = Full line-rate packet capture
- DUAL-PORT = Dual port testing for any enabled Ethernet rate
- ISAM = Enables simplified Y.1564 test
- RFC6349 = Enables TCP testing as per RFC 6349
- POE = Enables Power over Ethernet capability

■ **CPRI rate options**

- CPRI-4.9G^c
- CPRI-6.1G^c
- CPRI-9.8G^c

■ **OTN rate options**

- OTU1 = OTN optical rate 2.666 Gbit/s
- OTU2 = OTN optical rate 10.709 Gbit/s
- OTU2-1e-2e = OTN optical rates 11.049/11.096 Gbit/s
- OTU2-1f-2f = OTN optical rates 11.270/11.318 Gbit/s

■ **Fibre Channel rate options**

- FC1X = 1x Fibre Channel interface^b
- FC2X = 2x Fibre Channel interface^b
- FC4X = 4x Fibre Channel interface^b
- FC8X = 8x Fibre Channel interface^c
- FC10X = 10x Fibre Channel interface^c

■ **Ethernet rate options**

- 100optical = 100 Mbit/s optical
- GigE = 1000 Mbit/s optical and electrical
- 10GigE = 10G LAN and 10G WAN

Example: FTB-880Q-SONET-155M-DSn-DUAL-PORT-GigE

Notes

- a. Always included.
- b. Requires purchase of SFP.
- c. Requires purchase of SFP+.

ORDERING INFORMATION

FTB-870Q-XX-XX-XX-XX-XX-XX-XX

Test options ■

SONET = SONET testing
 SDH = SDH testing
 SONET-SDH = SONET and SDH testing

Transport rate options ■

52M = 52 Mbit/s (OC-1/STM-0)^a
 155M = 155 Mbit/s (OC-3/STM-1)
 622M = 622 Mbit/s (OC-12/STM-4)
 2488M = 2.5 Gbit/s (OC-48/STM-16)
 9953M = 10 Gbit/s (OC-192/STM-64)

Software options ■

DS1-FDL = DS1 FDL test capability
 TCM = Tandem connection monitoring
 DS_n = DS_n test capability
 PDH = PDH test capability
 ISDN-PRI = ISDN primary rate interface
 NI-CSU = NI-CSU loopback emulation
 Cable_test = Cable test
 IPV6 = Internet protocol version 6
 ETH-THRU = Through mode capability
 CPRI-OBSAI = Enables 1.2G to 3.1G CPRI, and 3.1G OBSAI^b
 MPLS = Enables MPLS
 1588PTP = Generates and analyzes 1588 PTP
 SyncE = Generates and analyzes SyncE protocol
 TCP-THPUT = TCP throughput
 ETH-OAM = Enables Y.1731, G.8113.1 (MPLS-TP), 802.1ag and MEF
 ADV-FILTERS = Advanced filtering
 ETH-CAPTURE = Full line-rate packet capture
 DUAL-PORT = Dual port testing for any enabled Ethernet rate
 iSAM = Enables simplified Y.1564 test
 RFC6349 = Enables TCP testing as per RFC 6349
 POE = Enables Power over Ethernet capability

CPRI rate options

CPRI-4.9G^c
 CPRI-6.1G^c
 CPRI-9.8G^c

OTN rate options

OTU1 = OTN optical rate 2.666 Gbit/s
 OTU2 = OTN optical rate 10.709 Gbit/s
 OTU2-1e-2e = OTN optical rates 11.049/11.096 Gbit/s
 OTU2-1f-2f = OTN optical rates 11.270/11.318 Gbit/s

Fibre Channel rate options

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

Ethernet rate options

100optical = 100 Mbit/s optical
 GigE = 1000 Mbit/s optical and electrical
 10GigE = 10G LAN and 10G WAN

Example: FTB-870Q-SONET-155M-DS_n-DUAL-PORT-10GigE

Notes

- a. Always included.
- b. Requires purchase of SFP.
- c. Requires purchase of SFP+.



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