# FTB-810 NetBlazer Series Transport Tester

## COMPLETE, FAST, INTUITIVE TRANSPORT TESTING


SPEC SHEET

Comprehensive, yet simple test suites for field technicians to easily turn up, validate and troubleshoot transport circuits covering DSn/PDH, ISDN and SONET/SDH interfaces up to 10 Gbit/s.

## KEY FEATURES AND BENEFITS

- Complete test suite for DSn/PDH, ISDN and SONET/SDH interfaces up to 10 Gbit/s
- Complete ISDN solution for testing and troubleshooting DS1 or E1 primary rate interfaces (PRI)
- Simplified BER testing with pass/fail indicators based on user-defined thresholds
- Unprecedented configuration simplicity with hybrid touchscreen/keypad navigation and data entry
- No data interpretation errors with revolutionary new GUI on 7-inch TFT screen, historical event logger, visual gauges and 3D-icon depictions of pass/fail outcomes
- Simpler reporting with integrated Wi-Fi and Bluetooth connectivity capabilities
- Centralized support for injection/monitoring of errors and alarms, trace messaging, overhead monitoring/manipulation and performance monitoring statistics
- Extended field autonomy with a compact, lightweight platform equipped with a long-duration battery pack
- **EXFO Connect-compatible**: Automated asset management; data goes through the cloud and into a dynamic database

## PLATFORM COMPATIBILITY

**Platform**
FTB-1

EXFO Connect

EXFO Assessing Next-Gen Networks

# THE ULTRA-PORTABLE CHOICE FOR DSn/PDH AND SONET/SDH TESTING

With a large, installed base, testing DSn/PDH, ISDN and SONET/SDH circuits, both in access and metro networks, continues to be a daily need that requires a test unit that is comprehensive, without sacrificing portability, speed or cost. Leveraging the powerful, intelligent FTB-1 handheld platform, the FTB-810 NetBlazer series streamlines processes and empowers field technicians to test and validate DSn/PDH, ISDN and SONET/SDH circuits efficiently.

## Powerful and Fast

Available in two hardware models (FTB-810 and FTB-810G), the FTB-810 NetBlazer series delivers fully integrated DSn/PDH, ISDN and SONET/SDH testing and offers the industry's largest touch screen with unprecedented configuration simplicity via hybrid touchscreen/keypad navigation. Platform connectivity is abundant via Wi-Fi, Bluetooth, Gigabit Ethernet or USB ports, making it accessible in any environment.

### The Testing You Need for Any ISDN, DSn/PDH or SONET/SDH Application

- Installation, commissioning and maintenance of access and metro networks
- Turn-up of DSn/PDH, ISDN or SONET/SDH circuits
- Performance assessment and troubleshooting
- Performance monitoring of DSn/PDH, ISDN and SONET/SDH circuits
- Round-trip delay assessment of transport circuits
- BER testing up to OC-192/STM-64
- ISDN PRI testing and troubleshooting

## FTB-810G: ISDN, DSN/PDH AND SONET/SDH UP TO 10 Gbit/s

If the need is for transport testing at all rates up to 10 Gbit/s, then the FTB-810G is the perfect solution.

- SFP port for OC-3/12/48 or STM-1/4/16
- SFP+ port for OC-192 or STM-64
- RJ-48C and bantam ports for DS1 or E1
- BNC port for DS3, E1/E3/E4, STS-1e/STS-3e or STM-0e/STM-1e
- Bantam/RJ-48C for DS1 ISDN PRI; bantam, RJ-48C, BNC for E1 ISDN PRI

- DS1/DS3 and E1/E3/E4 testing
- OC-3/12/48/192 and STM-1/4/16/64 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
- Dual DS1/DS3 receiver (Rx) support
- DS1 loop codes and NI/CSU emulation
- DS1/DS3 autodetection of line code, framing and pattern
- DS1 FDL and DS3 FEAC
- Fractional T1/E1 testing
- ISDN PRI for DS1 or E1 interfaces
- External clock sync support

## FTB-810: ISDN, DSN/PDH AND SONET/SDH UP TO 2.5 Gbit/s

If the need is only for transport testing at all rates up to 2.5 Gbit/s, then the FTB-810 is the answer.

- SFP port for OC-3/12/48 or STM-1/4/16
- RJ-48C and bantam ports for DS1 or E1
- BNC port for DS3, E1/E3/E4, STS-1e/STS-3e or STM-0e/STM-1e
- Bantam/RJ-48C for DS1 ISDN PRI; bantam, RJ-48C, BNC for E1 ISDN PRI

- DS1/DS3 and E1/E3/E4 testing
- OC-3/12/48 and STM-1/4/16 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
- Dual DS1/DS3 receiver (Rx) support
- DS1 loop codes and NI/CSU emulation
- DS1/DS3 autodetection of line code, framing and pattern
- DS1 FDL and DS3 FEAC
- Fractional T1/E1 testing
- ISDN PRI for DS1 or E1 interfaces
- External clock sync support

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

The FTB-810 NetBlazer's intelligent situational configuration setup feature guides technicians through complete, accurate testing processes (suggestion prompts, help guides, etc.). It reduces navigation by combining associated testing functions on a single screen.

### Dedicated Quick-Action Buttons

- Laser on/off
- Test reset to clear the results and statistics while running a test
- Report generation
- Save or load test configurations
- Quick error injection

### Streamlined Navigation

- Testing status can be maximized to fill the entire screen by simply clicking on the Alarm Status button; whether the unit is in your hand or across the room, test results can easily be determined with a simple glance at the display screen
- Simplified test structure definition using task-based test application selection, signal configuration front end and smart timeslot selection
- Centralized functions: error/alarm management, performance monitoring and overhead manipulation/monitoring

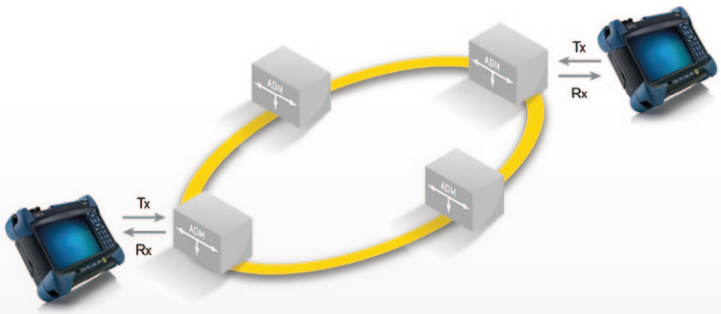
### Assorted Notifications

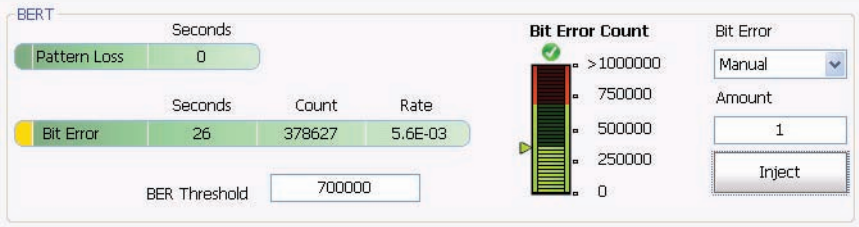
- Optical power status available at all times
- Pass/fail indication at all times
- Pattern and clock synchronization
- Electrical/optical power monitoring with valid-range color indicator (optical interface)
- Frequency offset with valid-range color indicator
- Overhead overwrite indicator
- Error/alarm injection
- Alarm hierarchy pinpointing the root-cause (when possible)

## Key Features

### Simplified BER Testing

The FTB-810 NetBlazer series provides the ability to preconfigure 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.



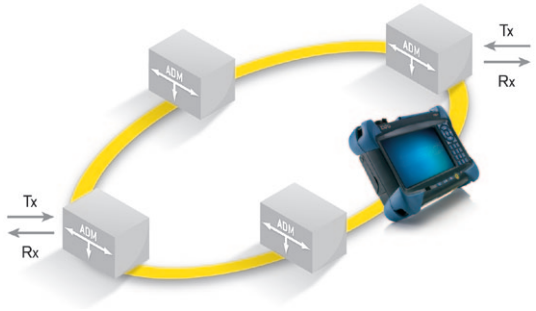



## Decoupled Mode

The Decoupled mode enables the user to independently configure the Tx and Rx ports of the FTB-810 NetBlazer module. This is required for testing the mapping and demapping functionality of a network element or at cross-connect points in the network.

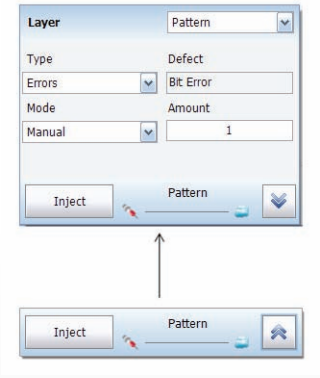

## Through Mode

This mode is required for in-service monitoring of the network. The FTB-810 NetBlazer can be inserted in-line on a specific link, and can then monitor and analyze the errors and alarms on that link while remaining nonintrusive.




## Simplified Error Injection

This FTB-810 feature enables the user to inject errors with a single click, from any screen. This allows technicians to ensure circuit continuity prior to starting a test. Furthermore, the error injection functionality can be preprogrammed for any given type of error, and not just for bit errors.



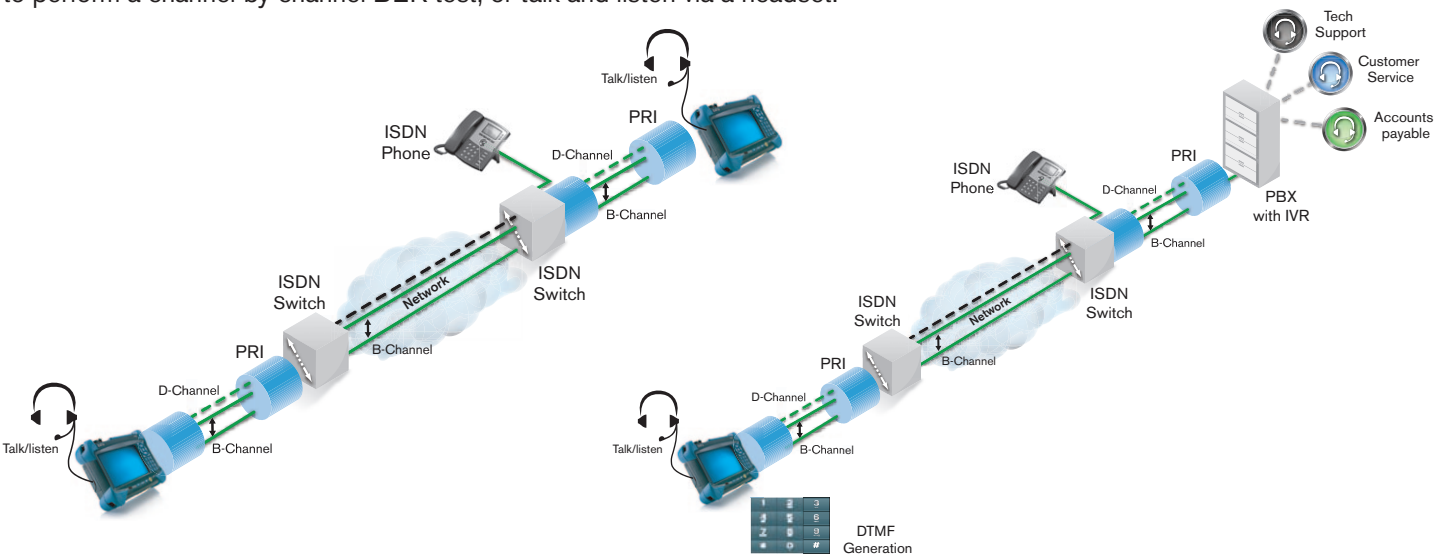


## Complete Overhead Monitoring

The FTB-810 NetBlazer offers access to the entire set of SONET/SDH overhead (OH) bytes from a single page. Furthermore, by selecting any given OH byte, the user can retrieve additional detailed information about that byte without having to switch pages.

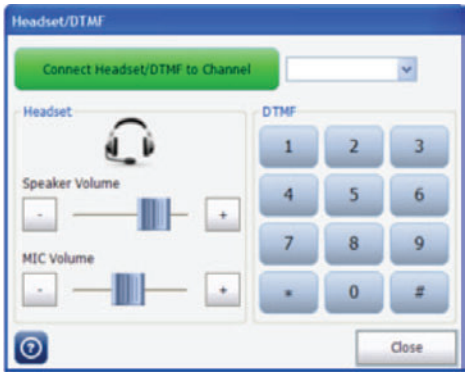
## KEY ISDN FEATURES

The FTB-810/810G lets you test and troubleshoot North American or European ISDN PRI configurations, and offers best-in-class ISDN PRI testing that allows field technicians to call one or all 24 DS1 or 31 E1 PRI channels. Once connected, the user can go to perform a channel-by-channel BER test, or talk and listen via a headset.




### Talk? Listen? Inject DTMF?

With one click, field technicians can talk and listen with simplicity–no need for a clumsy butt set. The FTB-1 platform allows the use of a handy, lightweight headset, which can be controlled via software to inject DTMF tones or speaker and microphone levels.

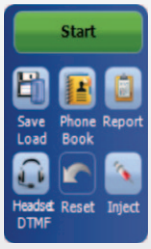



### Who's Calling? What Type of Calls?

As the calls come in or leave the ISDN primary rate interface, the summary results screen shows a crystal-clear analysis with its own unique call monitoring grid. With one glance, users see all call information: types of calls, stats such as idle, voice, 3.1 kHz, ringing, alerts, in error, BER, pass or fail.


### Centralized Control

As applies to all NetBlazer modules, field technicians have complete control at their fingertips at all times, whether it's a question of phone book, headset activation, DTMF injection, error injection, report generation, or save and load configurations. These utilities are always a finger's touch away from activation.



## EXFO Connect

EXFO Connect

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

EXFO Connect pushes and stores test equipment and test data content automatically in the cloud, allowing you to streamline test operation from build-out to maintenance.

## EXpert TEST TOOLS

EXpert VoIP TEST TOOLS

EXpert VoIP generates a voice-over-IP call directly from the test platform to validate performance during service turn-up and troubleshooting.

- Supports a wide range of signaling protocols, including SIP, SCCP, H.248/Megaco and H.323
- Supports MOS and R-factor quality metrics
- Simplifies testing with configurable pass/fail thresholds and RTP metrics

EXpert IP TEST TOOLS

EXpert IP integrates six commonly used datacom test tools into one platform-based application to ensure that field technicians are prepared for a wide range of testing needs.

- Rapidly performs debugging sequences with VLAN scan and LAN discovery
- Validates end-to-end ping and traceroute
- Verifies FTP performance and HTTP availability

EXpert IPTV TEST TOOLS

This powerful IPTV quality assessment solution enables set-top-box emulation and passive monitoring of IPTV streams, allowing quick and easy pass/fail verification of IPTV installations.

- Real-time video preview
- Analyzes up to 10 video streams
- Comprehensive QoS and QoE metrics, including MOS score

# SPECIFICATIONS

## SFP OPTICAL INTERFACES

| | OC-3/STM-1 | | | | OC-12/STM-4 | | | | OC-48/STM-16 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Reach and wavelength | 15 km; 1310 nm | 40 km; 1310 nm | 40 km; 1550 nm | 80 km; 1550 nm | 15 km; 1310 nm | 40 km; 1310 nm | 40 km; 1550 nm | 80 km; 1550 nm | 15 km; 1310 nm | 40 km; 1310 nm | 40 km; 1550 nm | 80 km; 1550 nm |
| Tx level (dBm) | –5 to 0 | –2 to 3 | –5 to 0 | –2 to 3 | –5 to 0 | –2 to 3 | –5 to 0 | –2 to 3 | –5 to 0 | –2 to 3 | –5 to 0 | –2 to 3 |
| Rx operating range (dBm) | –23 to –10 | –30 to –15 | –23 to –10 | –30 to –15 | –22 to 0 | –27 to –9 | –22 to 0 | –29 to –9 | –18 to 0 | –27 to –9 | –18 to 0 | –28 to –9 |
| Transmit bit rate | 155.52 Mbit/s ±4.6 ppm | | | | 622.08 Mbit/s ±4.6 ppm | | | | 2.48832 Gbit/s ±4.6 ppm | | | |
| Frequency offset generation (ppm) | ±50 | | | | ±50 | | | | ±50 | | | |
| Receive bit rate | 155.52 Mbit/s ±100 ppm | | | | 622.08 Mbit/s ±100 ppm | | | | 2.48832 Gbit/s ±100 ppm | | | |
| Operational wavelength range | 1261 to 1360 nm | 1263 to 1360 nm | 1430 to 1580 nm | 1480 to 1580 nm | 1270 to 1360 nm | 1280 to 1335 nm | 1430 to 1580 nm | 1480 to 1580 nm | 1260 to 1360 nm | 1280 to 1335 nm | 1430 to 1580 nm | 1500 to 1580 nm |
| Spectral width | 1 nm (–20 dB) | | | | 1 nm (–20 dB) | | | | 1 nm (–20 dB) | | | |
| Measurement accuracy (uncertainty)<br>Frequency (ppm)<br>Optical power (dB) | <br>±4.6<br>±2 | | | | <br>±4.6<br>±2 | | | | <br>±4.6<br>±2 | | | |
| Maximum Rx before damage (dBm) [a] | 3 | | | | 3 | | | | 3 | | | |
| Jitter compliance | GR-253 (SONET)<br>G.958 (SDH) | | | | GR-253 (SONET)<br>G.958 (SDH) | | | | GR-253 (SONET)<br>G.958 (SDH) | | | |
| Line coding | NRZ | | | | NRZ | | | | NRZ | | | |
| Eye safety | Class 1 | | | | Class 1 | | | | Class 1 | | | |
| Connector [b] | Dual LC | | | | Dual LC | | | | Dual LC | | | |
| Transceiver type [c] | SFP | | | | SFP | | | | SFP | | | |

**Notes**

a. In order not to exceed the maximum receiver power level before damage, an attenuator must be used.

b. External adaptors can be used for other types of connectors.

c. SFP compliance: The FTB-810 selected SFP shall meet the requirements stated in the "Small Form-Factor Pluggable (SFP) Transceiver Multisource Agreement (MSA)". The FTB-810 selected SFP shall meet the requirements stated in the "Specification for Diagnostic Monitoring Interface for Optical Xcvrs".

## SFP+ OPTICAL INTERFACES

| | OC-192/STM-64 | OC-192/STM-64 | OC-192/STM-64 |
|---|---|---|---|
| Wavelength (nm) | 1310 | 1550 | 1550 |
| Tx level (dBm) | −6 to −1 | −1 to 2 | 0 to 4 |
| Rx level sensitivity (dBm) | −11 to 0.5 | −14 to −1 | −24 to −7 |
| Maximum reach | 10 km | 40 km | 80 km |
| Transmission bit rate (Gbit/s) | 9.95328 ±4.6 ppm | 9.95328 ±4.6 ppm | 9.95328 ±4.6 ppm |
| Frequency offset generation (ppm) | ±50 | ±50 | ±50 |
| Reception bit rate (Gbit/s) | 9.95328 ±100 ppm | 9.95328 ±100 ppm | 9.95328 ±100 ppm |
| Tx operational wavelength range (nm) | 1260 to 1355 | 1530 to 1565 | 1530 to 1565 |
| Measurement accuracy (uncertainty)<br>Frequency (ppm)<br>Optical power (dB) | <br>±4.6<br>±2 | <br>±4.6<br>±2 | <br>±4.6<br>±2 |
| Maximum Rx before damage (dBm) [a] | 5 | 5 | 3 |
| Jitter compliance | GR-253 (SONET)<br>G.825 (SDH) | GR-253 (SONET)<br>G.825 (SDH) | GR-253 (SONET)<br>G.825 (SDH) |
| Eye safety | Class 1 | Class 1 | Class 1 |
| Connector [b] | LC | LC | LC |
| Transceiver type [c] | SFP+ | SFP+ | SFP+ |

**Notes**

a. In order not to exceed the maximum receiver power level before damage, an attenuator must be used.

b. External adaptors can be used for other types of connectors.

c. SFP+ compliance: The FTB-810 selected SFP+ shall meet the requirements stated in the SFP-8431 “Enhanced Small Form-Factor Pluggable Module SFP+” Transceiver Multisource Agreement (MSA)”. The FTB-810 selected SFP+ shall meet the requirements stated in the “Specification for Diagnostic Monitoring Interface for Optical Xcvrs”.

## DSN/PDH AND SONET/SDH ELECTRICAL INTERFACES

| | DS1 | E1/2M | | E3/34M | DS3/45M | | STS-1e/STM-0e/52M | E4/140M | STS-3e/STM-1e/155M | |
|---|---|---|---|---|---|---|---|---|---|---|
| Tx pulse amplitude | 2.4 to 3.6 V | 3.0 V | 2.37 V | 1.0 ±0.1 V | 0.36 to 0.85 V | | | 1.0 ±0.1 Vpp | 0.5 V | |
| Tx pulse mask | GR-499 Figure 9.5 | G.703 Figure 15 | G.703 Figure 15 | G.703 Figure 17 | DS-3 GR-499 Figure 9-8 | 45M G.703 Figure 14 | GR-253 Figure 4-10/4-11 | G.703 Figure 18/19 | STS-3e GR-253 Figure 4-12, 4-13, 4-14 | STM-1e/155M G.703 Figure 22 and 23 |
| Tx LBO preamplification | 0-133 ft<br>133-266 ft<br>266-399 ft<br>399-533 ft<br>533-655 ft | | | | 0 to 225 ft<br>225 to 450 ft | | 0 to 225 ft<br>225 to 450 ft | | 0 to 225 ft | |
| Cable simulation | −22.5 dB<br>−15.0 dB<br>−7.5 dB<br>0 dB | | | | 450 to 900 (927) ft | | 450 to 900 (927) ft | | | |
| Rx level sensitivity | For 772 kHz:<br>TERM: ≤ 26 dB (cable loss only) at 0 dBdsx Tx<br>DSX-MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB)<br>Bridge: ≤ 6 dB (cable loss only) | For 1024 kHz:<br>TERM: ≤ 6 dB (cable loss only)<br>MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB)<br>Bridge: ≤ 6 dB (cable loss only) | For 1024 kHz:<br>TERM: ≤ 6 dB (cable loss only)<br>MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB)<br>Bridge: ≤ 6 dB (cable loss only) | For 17.184 MHz:<br>TERM: ≤ 12 dB (coaxial cable loss only)<br>MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 8 dB) | For 22.368 MHz:<br>TERM: ≤ 10 dB (cable loss only)<br>DSX-MON: ≤ 26.5 dB (21.5 dB resistive loss + cable loss ≤ 5 dB) | | For 25.92 MHz:<br>TERM: ≤ 10 dB (cable loss only)<br>MON: ≤ 25 dB (20 dB resistive loss + cable loss ≤ 5 dB) | For 70 MHz:<br>TERM: ≤ 12 dB (coaxial cable loss only)<br>MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB) | For 78 MHz:<br>TERM: ≤ 12.7 dB (coaxial cable loss only)<br>MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB) | |
| Transmit bit rate | 1.544 Mbit/s ±4.6 ppm | 2.048 Mbit/s ±4.6 ppm | 2.048 Mbit/s ±4.6 ppm | 34.368 Mbit/s ±4.6 ppm | 44.736 Mbit/s ±4.6 ppm | | 51.84 Mbit/s ±4.6 ppm | 139.264 Mbit/s ±4.6 ppm | 155.52 Mbit/s ±4.6 ppm | |
| Frequency offset generation | 1.544 Mbit/s ±140 ppm | 2.048 Mbit/s ±70 ppm | 2.048 Mbit/s ±70 ppm | 34.368 Mbit/s ±50 ppm | 44.736 Mbit/s ±50 ppm | | 51.84 Mbit/s ±50 ppm | 139.264 Mbit/s ±50 ppm | 155.52 Mbit/s ±50 ppm | |
| Receive bit rate | 1.544 Mbit/s ±140 ppm | 2.048 Mbit/s ±100 ppm | 2.048 Mbit/s ±100 ppm | 34.368 Mbit/s ±100 ppm | 44.736 Mbit/s ±100 ppm | | 51.84 Mbit/s ±100 ppm | 139.264 Mbit/s ±100 ppm | 155.52 Mbit/s ±100 ppm | |
| Measurement accuracy (uncertainty)<br>Frequency (ppm)<br>Electrical power (dB) | <br>±4.6<br>±1.5 | <br>±4.6<br>±1.5 | <br>±4.6<br>±1.5 | <br>±4.6<br>±1.5 | <br>±4.6<br>±1.5 | | <br>±4.6<br>±1.5 | <br>±4.6<br>±1.5 | <br>±4.6<br>±1.5 | |
| Peak-to-peak voltage | ±10 % down to 500 mVpp | ±10 % down to 500 mVpp | ±10 % down to 500 mVpp | ±10 % down to 500 mVpp | ±10 % down to 200 mVpp | | ±10 % down to 200 mVpp | ±10 % down to 200 mVpp | ±10 % down to 200 mVpp | |
| Intrinsic jitter (Tx) | ANSI T1.403 section 6.3<br>GR-499 section 7.3 | G.823 section 5.1 | G.823 section 5.1 | G.823 section 5.1<br>G.751 section 2.3 | GR-449 section 7.3 (categories I and II) | | GR-253 section 5.6.2.2 (category II) | G.823 section 5.1 | G.825 section 5.1<br>GR-253 section 5.6.2.2 | |
| Input jitter tolerance | AT&T PUB 62411<br>GR-499 section 7.3 | G.823 section 7.1 | G.823 section 7.1 | G.823 section 7.1 | GR-449 section 7.3 (categories I and II) | | GR-253 section 5.6.2.2 (category II) | G.823 section 7.1<br>G.751 section 3.3 | G.825 section 5.2<br>GR-253 section 5.6.2.3 | |
| Line coding | AMI and B8ZS | AMI and HDB3 | AMI and HDB3 | HDB3 | B3ZS | | B3ZS | CMI | CMI | |
| Input impedance (resistive termination) | 100 ohms ±5 %, balanced | 120 ohms ±5 %, balanced | 75 ohms ±5 %, unbalanced | 75 ohms ±5 %, unbalanced | 75 ohms ±5 %, unbalanced | | 75 ohms ±5 %, unbalanced | 75 ohms ±10 %, unbalanced | 75 ohms ±5 %, unbalanced | |
| Connector type | BANTAM and RJ-48C | BANTAM and RJ-48C | BNC | BNC | BNC | | BNC | BNC | BNC | |

## SYNCHRONIZATION INTERFACES

| | External Clock DS1/1.5M | External Clock E1/2M | External Clock E1/2M | Trigger 2 MHz |
|---|---|---|---|---|
| Tx pulse amplitude | 2.4 to 3.6 V | 3.0 V | 2.37 V | 0.75 to 1.5 V |
| Tx pulse mask | GR-499 figure 9.5 | G.703 figure 15 | G.703 figure 15 | G.703 figure 20 |
| Tx LBO preamplification | Typical power dBdsx<br>+0.6 dBdsx (0-133 ft)<br>+1.2 dBdsx (133-266 ft)<br>+1.8 dBdsx (266-399 ft)<br>+2.4 dBdsx (399-533 ft)<br>+3.0 dBdsx (533-655 ft) | | | |
| Rx level sensitivity | TERM: ≤ 6 dB (cable loss only)<br>(at 772 kHz for T1) DSX-MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB)<br>Bridge: ≤ 6 dB (cable loss only) | TERM: ≤ 6 dB (cable loss only)<br>MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB)<br>Bridge: ≤ 6 dB (cable loss only) | TERM: ≤ 6 dB (cable loss only)<br>MON: ≤ 26 dB (resistive loss + cable loss ≤ 6 dB)<br>Bridge: ≤ 6 dB (cable loss only) | ≤ 6 dB (cable loss only) |
| Transmission bit rate | 1.544 Mbit/s ± 4.6 ppm | 2.048 Mbit/s ± 4.6 ppm | 2.048 Mbit/s ± 4.6 ppm | |
| Reception bit rate | 1.544 Mbit/s ± 50 ppm | 2.048 Mbit/s ± 50 ppm | 2.048 Mbit/s ± 50 ppm | |
| Intrinsic jitter (Tx) | ANSI T1.403 section 6.3<br>GR-499 section 7.3 | G.823 section 6.1 | G.823 section 6.1 | G.703 table 11 |
| Input jitter tolerance | AT&T PUB 62411<br>GR-499 section 7.3 | G.823 section 7.2<br>G.813 | G.823 section 7.2<br>G.813 | G.823 section 7.1<br>G.751 section 3.3 |
| Line coding | AMI and B8ZS | AMI and HDB3 | AMI and HDB3 | |
| Input impedance (resistive termination) | 75 ohms ± 5 %, unbalanced | 75 ohms ± 5 %, unbalanced | 75 ohms ± 5 %, unbalanced | 75 ohms ± 5 %, unbalanced |
| Connector type | BNC[a] | BNC[a] | BNC | BNC |

**Note**

a. Adaptation cable required for BANTAM.

| FUNCTIONAL SONET AND DSN SPECIFICATIONS | | FUNCTIONAL SDH AND PDH SPECIFICATIONS | |
|---|---|---|---|
| Optical interfaces | OC-3, OC-12, OC-48, OC-192 | Optical interfaces | STM-1, STM-4, STM-16, STM-64 |
| Available wavelengths (nm) | 1310, 1550 | Available wavelengths (nm) | 1310, 1550 |
| Electrical interfaces | DS1, DS3, STS-1e, STS-3e | Electrical interfaces [a] | 1.5M (DS1), 2M (E1), 34M (E3), 45M (DS3), 140M (E4), STM-0e, STM-1e |
| DS1 framing | Unframed, SF, ESF, SLC-96 | 2M (E1) framing | Unframed, PCM30, PCM31, PCM30 CRC-4, PCM31 CRC-4 |
| DS3 framing | Unframed, M13, C-bit parity | 8M (E2), 34M (E3), 140M (E4) framing | Unframed (not applicable to E2), framed |
| Clocking | Internal, loop-timed, external (BITS) | Clocking | Internal, loop-timed, external (MTS/SETS), 2 MHz |
| **Mappings** | | | |
| VT1.5 | Bulk, DS1 | AU-3-TU-11, AU-4-TU-11 | Bulk, 1.5M, |
| VT2 | Bulk, E1 | AU-3 -TU-12, AU-4-TU-12 | Bulk, 1.5M, 2M |
| STS-1 SPE | Bulk, DS3 | AU-3-Bulk, 34M, 45M, TU-3-AU-4 | Bulk, 34M, 45M |
| STS-3c | Bulk | AU-4 | Bulk, 140M |
| STS-12c/48c/192c, SPE | Bulk | AU-4-4c/16c/64c | Bulk |
| SONET overhead analysis and manipulation | A1, A2, J0, E1, F1, D1-D12, K1, K2, S1, M0, M1, E2, J1, C2, G1, F2, H4, Z3, Z4, Z5, N1, N2, Z6, Z7 | SDH overhead analysis and manipulation | A1, A2, J0, E1, F1, D1-D12, K1, K2, S1, M0, M1 G1, F2, F3, K3, N1, N2, K4, E2, J1, C2, H4 |
| **Error insertion** | | | |
| DS1 | Framing bit, BPV, CRC-6, bit error, EXZ | E1 (2M) | Bit error, FAS, CV, CRC-4, E-bit |
| DS3 | BPV, C-bit, F-bit, P-bit, FEBE, bit error, EXZ | E2 (8M), E3 (34M), E4 (140M) | Bit error, FAS, CV (not applicable to E2) |
| STS-1e, STS-3e | Section BIP (B1), line BIP (B2), path BIP (B3), BIP-2, REI-L, REI-P, REI-V, BPV, FAS, CV, bit error | STM-0e, STM-1e | RS-BIP (B1), MS-BIP (B2), HP-BIP (B3), MS-REI, HP-REI, LP-BIP-2, LP-REI, CV, FAS, bit error |
| OC-3, OC-12, OC-48, OC-192 | Section BIP (B1), line BIP (B2), path BIP (B3), BIP-2, REI-L, REI-P, REI-V, FAS, bit error | STM-1, STM-4, STM-16, STM-64 | RS-BIP (B1), MS-BIP (B2), HP-BIP (B3), MS-REI, HP-REI, LP-BIP-2, LP-REI, FAS, bit error |
| **Error measurement** | | | |
| DS1 | Framing bit, BPV, CRC-6, EXZ, bit error | E1 (2M) | Bit error, FAS, CV, CRC-4, E-bit |
| DS3 | BPV, C-bit, F-bit, P-bit, FEBE, bit error, EXZ | E2 (8M), E3 (34M), E4 (140M) | Bit error, FAS, CV (not applicable to E2) |
| STS-1e, STS-3e | Section BIP (B1), line BIP (B2), path BIP (B3), BIP-2, REI-L, REI-P, REI-V, BPV, FAS, CV, bit error | STM-0e, STM-1e | RS-BIP (B1), MS-BIP (B2), HP-BIP (B3), MS-REI, HP-REI, LP-BIP-2, LP-REI, CV, FAS, bit error |
| OC-3, OC-12, OC-48, OC-192 | Section BIP (B1), line BIP (B2), path BIP (B3), BIP-2, REI-L, REI-P, REI-V, FAS, bit error | STM-1, STM-4, STM-16, STM-64 | RS-BIP (B1), MS-BIP (B2), HP-BIP (B3), MS-REI, HP-REI, LP-BIP-2, LP-REI, FAS, bit error |
| **Alarm insertion** | | | |
| DS1 | LOS, RAI, AIS, OOF, pattern loss | E1 (2M) | LOS, LOS Mframe, LOF, AIS, TS16 AIS, RAI, RAI Mframe, pattern loss |
| DS3 | LOS, RDI, AIS, OOF, DS3 idle, pattern loss | E2 (8M), E3 (34M), E4 (140M) | LOS, LOF, RAI, AIS, pattern loss |
| STS-1e, STS-3e, OC-3, OC-12, OC-48, OC-192 | LOS, LOF-S, SEF, AIS-L, RDI-L, AIS-P, LOP-P, LOM, PDI-P, RDI-P, ERDI-PCD, ERDI-PPD, ERDI-PSD, UNEQ-P, AIS-V, LOP-V, RDI-V, ERDI-VCD, ERDI-VPD, ERDI-VSD, RFI-V, UNEQ-V, pattern loss | STM-0e, STM-1e, STM-1, STM-4, STM-16, STM-64 | LOS, LOF, OOF, MS-AIS, MS-RDI, AU-AIS, AU-LOP, H4-LOM, HP-ERDI-CD, HP-ERDI-PD, HP-ERDI-SD, LP-ERDI-CD, LP-ERDI-PD, LP-ERDI-SD, HP-UNEQ, TU-AIS, LP-RFI, LP-RDI, LP-RFI, LP-UNEQ, pattern loss |
| **Alarm detection** | | | |
| DS1 | LOS, LOC, RAI, AIS, OOF, pattern loss | E1 (2M) | LOS, LOS Mframe, LOC, LOF, AIS, TS16 AIS, RAI, RAI Mframe, pattern loss |
| DS3 | LOS, LOC, RDI, AIS, OOF, DS3 idle, pattern loss | E2 (8M), E3 (34M), E4 (140M) | LOS, LOC, LOF, RAI, AIS, pattern loss |
| STS-1e, STS-3e, OC-3, OC-12, OC-48, OC-192 | LOS, LOC, LOF-S, SEF, TIM-S, AIS-L, RDI-L, AIS-P, LOP-P, LOM, PDI-P, RDI-P, ERDI-PCD, ERDI-PPD, ERDI-PSD, PLM-P, UNEQ-P, TIM-P, AIS-V, LOP-V, RDI-V, ERDI-VCD, ERDI-VPD, ERDI-VSD, RFI-V, UNEQ-V, TIM-V, PLM-V, pattern loss | STM-0e, STM-1e, STM-1, STM-4, STM-16, STM-64 | LOS, RS-LOF, LOC, RS-OOF, RS-TIM, MS-AIS, MS-RDI, AU-AIS, AU-LOP, H4-LOM, HP-RDI, HP-ERDI-CD, HP-ERDI-PD, HP-ERDI-SD, LP-ERDI-CD, LP-ERDI-PD, LP-ERDI-SD, HP-PLM, HP-UNEQ, HP-TIM, TU-AIS, LP-RFI, LP-RDI, LP-RFI, LP-UNEQ, LP-TIM, LP-PLM, pattern loss |
| *Frequency alarm on all supported interfaces* | | | |
| **Patterns** | | | |
| DS0 | 2E9-1, 2E11-1, 2E20-1, 1100, 1010, 1111, 0000, 1-in-8, 1-in-16, 3-in-24, 32 bit programmable (inverted or non-inverted), bit errors | E0 (64K) | 2E9-1, 2E11-1, 2E20-1, 1100, 1010, 1111, 0000, 1-in-8, 1-in-16, 3-in-24, 32 bit programmable (inverted or non-inverted), bit errors |
| DS1 | 2E9-1, 2E11-1, 2E15-1, 2E20-1, 2E23-1, 2E31-1, 1100, 1010, 1111, 0000, QRSS, 1-in-8, 1-in-16, 3-in-24, 32 bit programmable (inverted or non-inverted), T1-DALY, 55-octet, bit errors | E1 (2M) | 2E9-1, 2E11-1, 2E15-1, 2E20-1, 2E23-1, 2E31-1, 1100, 1010, 1111, 0000, 1-in-8, 1-in-16, 3-in-24, 32 bit programmable (inverted or non-inverted), bit errors |
| DS3 | 2E9-1, 2E11-1, 2E15-1, 2E20-1, 2E23-1, 2E31-1, 1100, 1010, 1111, 0000, 1-in-8, 1-in-16, 3-in-24, 32 bit programmable (inverted or non-inverted), bit errors | E3 (34M), E4 (140M) | 2E9-1, 2E11-1, 2E15-1, 2E20-1, 2E23-1, 2E31-1, 1100, 1010, 1111, 0000, 1-in-8, 1-in-16, 3-in-24 [b], 32 bit programmable (inverted or non-inverted), bit errors |
| VT1.5/2 | 2E9-1, 2E11-1, 2E15-1, 2E20-1, 2E23-1, 2E31-1, 1100, 1010, 1111, 0000, 1-in-8, 1-in-16, 32 bit programmable (inverted or non-inverted), bit errors | TU-11/12/3 | 2E9-1, 2E11-1, 2E15-1, 2E20-1, 2E23-1, 2E31-1, 1100, 1010, 1111, 0000, 1-in-8, 1-in-16, 32 bit programmable (inverted or non-inverted), bit errors |
| STS-1, STS-3c/12c/48c/192c | 2E9-1, 2E11-1, 2E15-1, 2E20-1, 2E23-1, 2E31-1, 1100, 1010, 1111, 0000, 1-in-8, 1-in-16, 32 bit programmable (inverted or non-inverted), bit errors | AU-3/AU-4/AU-4-4c/16c/64c | 2E9-1, 2E11-1, 2E15-1, 2E20-1, 2E23-1, 2E31-1, 1100, 1010, 1111, 0000, 1-in-8, 1-in-16, 32 bit programmable (inverted or non-inverted), bit errors |
| *Pattern loss and bit-error generation and analysis supported on all patterns* | | | |

**Notes**

a. 1.5M (DS1) and 45M (DS3) interfaces described under SONET and DSn column.

b. Not supported for E4 (140M).

## DSn/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 DSn 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 on the FTB-810.<br>**ITU-T Recommendation** — **Performance monitoring statistics**<br>G.821 — ES, EFS, EC, SES, UAS, ESR, SESR, DM<br>G.826 — ES, EFS, EB, SES, BBE, UAS, ERS, SESR, BBER<br>G.828 — ES, EFS, EB, SES, BBE, SEP, UAS, ESR, SESR, BBER, SEPI<br>G.829 — ES, EFS, EB, SES, BBE, UAS, ESR, SESR, BBER<br>M.2100 — ES, SES, UAS, ESR, SESR<br>M.2101 — ES, SES, BBE, UAS, ESR, SESR, BBER |
| Pointer adjustment and analysis | Generation and analysis of HO/AU and LO/TU pointer adjustments as per GR-253, and ITU-T G.707<br>**Generation**<br>› Pointer increment and decrement<br>› Pointer jump with or without NDF<br>› Pointer value<br>**Analysis**<br>› Pointer increments<br>› Pointer decrements<br>› Pointer jumps (NDF, no NDF)<br>› 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.<br>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 FTB-810 transmitter back to its receiver after crossing a far-end loopback.<br>Measurements are provided on all supported FTB-810 interfaces and mappings.<br>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.<br>The FTB-810 supports the transmitting and receiving of alarms and errors on a TCM link, and transmission and monitoring of the tandem connection (TC) trace can be generated to verify the connection between TCM equipment.<br>Error generation: TC-IEC, TC-BIP, TC-REI, TC-OEI<br>Error analysis: TC-IEC, TC-REI, TC-OEI, TC-VIOL (non-standardized alarm)<br>Alarm generation: TC-RDI, TC-UNEQ, TC-ODI, TC-LTC, TC-IAIS<br>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 auto detection | Ability to automatically detect DS1/DS3 line coding, framing and test pattern. |
| Through mode | Perform Through mode analysis of any incoming electrical (DSn, PDH, SONET, SDH) and optical line (OC-3/STM-1, OC-12/STM-4, OC-48/STM-16, OC-192/STM-64) transparently. |

**Notes**

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

## ISDN PRIMARY RATE INTERFACE TEST FEATURES

| | |
|---|---|
| Supported interfaces | DS1: bantam or RJ-45C (SF or ESF)<br>E1: bantam, RJ-45C or BNC (PCM31 with or without CRC-4) |
| Supported switch types | DS1: national ISDN, Nortel DMS and AT&T 4/5ESS<br>E1: Euro ISDN, Euro VN6 and Q.SIG |
| Emulation modes | Terminal equipment (TE)<br>Network termination (NT) |
| Call types/rates | Data (64K or 56K), voice or 3.1 kHz (audio) |
| BER test | Configurable test pattern<br>Provides simultaneous BER testing on multiple B-channels configured with data traffic |
| Call setting | Calling party (numbering type, numbering plan and number up to 30 digits)<br>Called party (number type, numbering plan and number up to 30 digits)<br>Network (network transit selection code of up to four digits, and operator system access: None, Principal or Alternate)<br>› All parameters are configurable on a per-call basis<br>› Highlights missing calling or called party numbers |
| Call control | Call origination<br>› Establishment of calls prior to starting the test<br>› Automatically initiate single, multiple or all configured calls upon starting a test<br>Call reception<br>› Auto-Answer mode, Auto-Reject or prompt<br>Call release<br>› Hang up individual or all channels |
| DTMF injection | Generate DTMF tones for all standard digits, including 0-9, # and * as per Q.23/G.224<br>Available for one of the connected voice or 3.1 kHz B-channel |
| Headset support | Talk/listen through a selectable connected voice or 3.1 kHz B-channel |
| D-channel control | D-channel timeslot configuration<br>Rate (64K or 56K)<br>HDLC mode (Normal or Inverted) |
| Statistics | Call status, CRV, incoming or outgoing calls, call duration<br>BERT (bit error count and rate) with graphical BERT meter on a per B-channel (data) basis<br>Performance monitoring statistics: EFS, ES and SES<br>Active calls (data, voice, 3.1 kHz)<br>Total call count (connected, cleared, failed/rejected, placed)<br>Frequency (Rx, offset, max +/max – offset) |
| Alarms | DS1: LOS, frequency, LOC, AIS, OOF, RAI, D-channel down<br>E1: LOS, frequency, LOC, AIS, LOF, RAI, D-channel down<br>Pattern loss (per B-channel injection) |
| Errors | DS1: BPV, EXZ, framing bit, CRC-6, D-channel FCS<br>E1: CV, FAS, CRC-4, E-bit, D-channel FCS<br>Bit error (per B-channel injection) |
| ISDN logger | Logs layer 2(Q.921) and layer 3 (Q.931) messages<br>Filter: All, layer 2 or layer 3<br>Information: ID, time, message type, direction, channel number, called number, call type, cause values, cause definition, status and progress |
| Pass/fail verdict | BERT, call establishment and termination |
| Phone book | Easy access to phone book to manage names and associated numbers.<br>Save/load functions to update the phone book and import/export to exchange the phone book with other FTB-880 or FTB-810 units |

## ADDITIONAL FEATURES

| | |
|---|---|
| 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 on the unit or exported via USB. |
| Event logger | Log test results with absolute or relative time and date, details and duration of events, color-coded events and pass/fail outcome. |
| Remote control | Remote control through VNC. |

## UPGRADES

| | | |
|---|---|---|
| **SFP upgrades** | FTB-8190 | SFP module; rates: 155/622 Mbit/s, 2.5/2.7 Gbit/s, GigE/FC/2FC; 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; 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-8194 | SFP module; rates: 155/622 Mbit/s; 1310 nm, LC connector, 15 km reach |
| | FTB-8195 | SFP module; rates: 155/622 Mbit/s; 1310 nm, LC connector, 40 km reach |
| | FTB-8196 | SFP module; rates: 155/622 Mbit/s; 1550 nm, LC connector, 80 km reach |
| **SFP+ upgrades** | FTB-8693 | SFP+ modules, 9.953-10.709/11.3, 1310 nm, SMF, 10 km |
| | FTB-8694 | SFP+ modules, 8.5 9.953-10.709/11.1, 1550 nm, SMF, 40 km |
| | FTB-8695 | SFP+ modules, 8.5 9.953-10.709/11.1, 1550 nm, SMF, 80 km |

## GENERAL SPECIFICATIONS

| | |
|---|---|
| Size (H x W x D) | 130 mm x 252 mm x 56 mm (5 1/8 in x 9 15/16 in x 2 3/16 in) |
| Weight (without battery) | 0.97 kg (2.1 lb) |
| Temperature<br>Operating<br>Storage | <br>0 °C to 50 °C (32 °F to 122 °F)<br>–40 °C to 70 °C (–40 °F to 158 °F) |
| Relative humidity | 0 % to 93 %, noncondensing |
| Battery life (typical usage) | Over 4 hours |
| Battery charging time | 2 hours from full discharge to full charge |
| Languages | English, Chinese, Japanese |

## ORDERING INFORMATION

### FTB-810-XX-XX-XX

**Test options**
SONET = SONET testing
SDH = SDH testing
SONET-SDH = SONET and SDH testing

**Rate options**
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)

**Software options**
00 = Without 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

Example: FTB-810-SONET-155M-Dual-Rx

### FTB-810G-XX-XX-XX

**Test options**
SONET = SONET testing
SDH = SDH testing
SONET-SDH = SONET and SDH testing

**Rate options**
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**
00 = Without 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

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# Инструменты для тестирования IP – EXpert IP

## ПРОГРАММНОЕ ОБЕСПЕЧЕНИЕ ДЛЯ ТЕСТИРОВАНИЯ


**Незаменимый набор инструментов тестирования IP для любого вида измерений**

ОПИСАНИЕ

## КЛЮЧЕВЫЕ ОСОБЕННОСТИ И ПРЕИМУЩЕСТВА

EXpert IP TEST TOOLS

Набор инструментов включает:

- Ping
- Traceroute
- Сканирование VLAN
- Обнаружение LAN
- Производительность FTP
- Доступность HTTP

Общий набор инструментов и интерфейс тестирования для всех платформ

Доступен для платформ FTB-1 и FTB-200 v2

# ШЕСТЬ ИНСТРУМЕНТОВ – ОДНО ПРИЛОЖЕНИЕ

Инструменты для тестирования EXpert IP представляют собой программное приложение для платформ, которое позволяет получить шесть наиболее часто используемых инструментов в одном приложении. Это облегчает работу техперсонала, который сталкивается со сложной средой тестирования в современных сетях. Широко известно, что готовность ко всяким неожиданностям является ключом к успеху, позволяющим успешно преодолевать и разрешать возникающие затруднения.

Независимо от задачи, набор инструментов EXpert IP всегда поможет Вам разрешить возникшее затруднение – будь то проверка IP-подключения к маршрутизатору с использованием утилиты ping, поиск проблем с VLAN при помощи утилиты VLAN Scan или проверка сервиса передачи файлов (FTP) с использованием инструмента проверки производительности FTP. Этот набор инструментов поддерживается на платформах FTB-1 и FTB-200 v2 и представляет собой незаменимый измерительный комплекс, который всегда под рукой в любом месте и в любое время, когда Вы работаете с платформами EXFO – независимо от установленных и работающих модулей.

| КЛЮЧЕВЫЕ ФУНКЦИИ |
| --- |
| Обнаружение LAN |
| Сканирование VLAN |
| Ping |
| Traceroute |
| Производительность FTP |
| Доступность HTTP |
| Статистика Ethernet-порта |

# ОСОБЕННОСТИ ПРОДУКТА

## Обнаружение LAN

Обнаружение LAN активно опрашивает сетевые устройства для получения информации о подключенных компьютерах, серверах, коммутаторах и маршрутизаторах. Обнаруженные устройства, подключенные к сети, выводятся в списке вместе с дополнительной информацией о каждом устройстве (например, IP-адрес, доменное имя, предоставляемые сервисы, администратор, расположение и т.п.). Предоставляемые метрики включают IP-адрес обнаруженных компьютеров вместе с их сетевыми адресами, MAC-адресами и информацией SNMP.

## Сканирование VLAN

Функция сканирования VLAN выводит список всех присутствующих VLAN в IP-сети, к которой подключен тестер. Он позволяет определить наличие вложенных VLAN до трех уровней вглубь. Результат заключается в выдаче номера VLAN, приоритета и количества кадров. Этот инструмент полезен для обнаружения настроенных для данного порта VLAN и использования полосы пропускания для каждой VLAN, а также даёт возможность обнаружения ошибок в настройке VLAN.

## Ping

Инструмент ping проверяет наличие IP-соединения к другому, работающему на протоколе IP устройству, с помощью отправки эхо-запроса ICMP в сторону конечного устройства и ожидания ICMP-ответа для проверки соединения между оконечными точками. Дополнительно также предоставляется информация о времени прохождения туда-обратно (задержки) для пакетов, отправленных локальным устройством в сторону устройства на удаленном конце. Другая информация включает отправленные и потерянные пакеты.

## Traceroute

Тест Traceroute представляет собой инструмент для поиска неисправностей, который позволяет выявить маршрут, по которому проходит IP-пакет в IP-сети. Этот инструмент идентифицирует узлы (hops), которые пакет пересекает, перемещаясь к адресату. Информация, которая предоставляется данным инструментом, включает: IP-адреса узлов и количество прыжков до этого узла, а также общее количество узлов до устройства назначения. Примером использования утилиты traceroute может послужить идентификация маршрутизаторов на пути для обнаружения проблем с маршрутизацией или выявление проблем со шлюзами безопасности, которые могут блокировать пакеты ICMP.

### Тестирование производительности FTP

FTP позволяет передавать файлы между локальным ПК и удаленным FTP-сервером. Используя FTP, Вы можете подключиться к FTP-серверу и положить файлы на сервер или загрузить файлы с сервера. Передача файла включает в себя установление двух видов соединения: контрольное и «передача данных».

Типичным использованием инструмента измерения производительности FTP является измерение доступности и времени ответа FTP-сервера. Этот тест может быть настроен для загрузки файла на сервер, скачивания с сервера или выполнения обеих задач. Файл генерируется тестом и передается в указанное место.

### Доступность HTTP

Тестирование доступности HTTP позволяет измерить доступность и время ответа HTTP-сервера с помощью загрузки web-страницы. Результаты включают время установки TCP-соединения, общее время загрузки страницы, количество перенаправлений и время перенаправления.

## ТЕХНИЧЕСКИЕ ХАРАКТЕРИСТИКИ

| КОНФИГУРАЦИИ ИНТЕРФЕЙСА LAN |
|---|
| IP-адрес (статический или DHCP) |
| Маска подсети |
| Шлюз по умолчанию |
| DNS-сервер |
| VLAN |

| СТАТИСТИКА ПОРТА/ETHERNET | |
|---|---|
| Статус линии | Кадров отправлено/получено |
| Скорость линии | Байтов отправлено/получено |
| Доменное имя | Отброшенных кадров |
| | Tx коллизий |
| | Кадров с ошибками |

| ИНСТРУМЕНТЫ ТЕСТИРОВАНИЯ IP | |
|---|---|
| Обнаружение LAN | IP-узла, MAC-адрес, доменное имя, предоставляемые сервисы, SNMP- информация |
| Сканирование VLAN | Номер VLAN, приоритет и счетчик кадров |
| Ping | Время туда-обратно (минимальное/максимальное/среднее), отправлено пакетов и потерянные пакеты |
| Traceroute | IP-адрес узла, количество прыжков, общее количество прыжков до места назначения |
| Производительность FTP | IP-адрес сервера, начальное время приветствия, время логина, время загрузки на сервер, пропускная способность для загрузки, время скачивания, пропускная способность скачивания, размер |
| Доступность HTTP | Время подключения, общее время загрузки страницы, количество перенаправлений и время перенаправления |

## ИНФОРМАЦИЯ ДЛЯ ЗАКАЗА

EXpert IP = Набор тестов для IP/Ethernet
Включает: Производительность FTP, Доступность HTTP, Сканирование VLAN, Обнаружение LAN, Ping, Traceroute, Статистика порта IP/Ethernet
Одна лицензия для платформ FTB-1 и FTB-200 v2

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SPEXpertIPTestTools.1RU  Напечатано в Канаде 10/09

EXFO | Тестирование сетей Следующего Поколения

# Инструменты для тестирования VoIP – EXpert VoIP

## ПРОГРАММНОЕ ОБЕСПЕЧЕНИЕ ДЛЯ ТЕСТИРОВАНИЯ


**Всегда доступный набор инструментов контроля качества VoIP-звонка, специально созданный для обслуживания и эксплуатации**

ОПИСАНИЕ

## КЛЮЧЕВЫЕ ОСОБЕННОСТИ И ПРЕИМУЩЕСТВА

- Инструмент для генерации звонков VoIP, для тестирования, активации и поиска неисправностей
- Интуитивный интерфейс пользователя для быстрой оценки качества сервисов VoIP
- Настраиваемые пороги для упрощенного тестирования с оценкой по критерию «годен/негоден»
- Поддерживается широкий выбор протоколов сигнализации, включая SIP, SCCP, H.248/Megaco и H.323, для работы с большинством приложений
- Включает полный диапазон метрик RTP для поиска неисправностей
- Поддерживает метрики качества MOS и R-фактор
- Единый набор инструментов и интерфейс тестирования для всех платформ
- Доступен для платформ FTB-1 и FTB-200 v2

EXpert VoIP TEST TOOLS

# ПРОВЕРКА ПРОИЗВОДИТЕЛЬНОСТИ СЕРВИСА VoIP

Инструменты для тестирования VoIP Expert VoIP представляют собой программное приложение для платформ EXFO, которое позволяет проводить оценку производительности приложений VoIP при активации сервисов, поиске и устранении неисправностей в сетях предприятий и провайдеров. Поддерживаемое на платформах FTB-1 и FTB-200 v2, с поддерживающей EXpert VoIP-платформы, приложение генерирует один звонок VoIP, который отправляется или на другую платформу EXFO, или на любой VoIP-телефон. Тестовый звонок может быть голосовым или может использовать предназначенный для этого аудиофайл для генерации тестового трафика. EXpert VoIP поддерживает несколько технологий сигнализации, включая SIP, SCCP, H.323 и H.248, для обеспечения совместимости с большинством VoIP-сред, которые используются в отрасли.

EXpert VoIP обладает исключительно гибкой средой настройки, которая обеспечивает максимальный контроль над параметрами теста, и при этом сохраняет удобство пользования. Интуитивный пользовательский интерфейс оснащен самой современной концептуальной моделью EXFO, которая позволяет даже неопытному пользователю быстро настроить и запустить тест. Все тесты поддерживают стандартный набор метрик качества, которые включают среднюю субъективную оценку качества (MOS), R-фактор и полный набор метрик потерь протокола реального времени (RTP). Метрики могут быть скомбинированы с настраиваемыми пороговыми значениями для упрощения проверки сервиса или ускорения поиска неисправностей.

Тесты выполняются между двумя платформами с EXpert VoIP или в сторону оконечной точки VoIP (такой, как прокси-сервер SIP, программный телефон или телефон, например, ATA). Платформа, которая запускает тест, инициирует звонок, настраивает медиа-канал, передает медиа-данные и выдает статистическую информацию. В зависимости от типа оконечного оборудования, оно отвечает на звонок, передает медиа-данные и собирает статистику. Тесты сервиса могут опросить оконечное оборудование для определения доступности или для установки звонка.


## КЛЮЧЕВЫЕ ОСОБЕННОСТИ

- Интуитивный пользовательский интерфейс для быстрой проверки качества голоса в сервисах VoIP
- Настраиваемые пороговые значения для упрощенной оценки по критерию «годен/негоден»
- Поддержка широкого диапазона протоколов сигнализации, включающих SIP, SCCP, H.248/Megaco и H.323, для большинства приложений
- Поддержка полного диапазона RTP-метрик для поиска и устранения неисправностей
- Поддержка метрик качества: MOS и R-фактор
- Конфигурации теста могут быть предварительно настроенными и сохраненными для быстрого повторяющегося тестирования
- Доступны подробные отчеты для отслеживания и документирования изменений в сервисе
- Доступно для работы с приложениями в среде FTB-1 и FTB-200 v2
- Единообразный набор инструментов и интерфейсов для всех платформ

# ОСОБЕННОСТИ ПРОДУКТА

## Тестирование сети RTP

Тест сети VoIP RTP является основным тестом приложения EXpert VoIP. Это тест, который проводится между двух VoIP-устройств с помощью отправки RTP-пакетов, позволяет измерить все относящиеся к VoIP параметры. Вся поддерживаемая функциональность этого теста соответствует рекомендациям RFC 1889. Тест RTP-сети симулирует VoIP-трафик, отправляя RTP-пакеты между тестером, который инициирует поток, и респондентом, который инициирует отправку собственного потока в сторону контролирующего измерение тестера.

## Протоколы сигнализации

Приложение EXpert VoIP было создано для поддержки большого разнообразия VoIP-сред, для обеспечения максимальной универсальности работы. Таким образом, приложение может быть настроено для использования некоторых наиболее часто используемых протоколов сигнализации звонка VoIP, включая SIP, SCCP, H.248/Megaco и H.323.

## Измерение качества голоса

Приложение EXpert VoIP включает полный набор метрик качества голоса, включающих MOS, R-фактор и факторы деградации, которые основываются на кодеке, задержке и потерях пакетов. Все это помогает изолировать проблемы с качеством голоса в сети. Функция измерения качества голоса, разработанная EXFO, рассчитывает R-фактор (еще один стандартизованный параметр качества передачи) для звонка, основанного на расширениях G.107 E-model. Эти расширения, такие как взрывная потеря пакетов, позволяют более точно предсказать субъективную оценку качества, которую слушающий мог бы присвоить для этого звонка. R-фактор затем конвертируется в значение EXFO MOS для получения значения разговорного качества.

Используемый в приложении алгоритм EXFO MOS основан на рекомендации ITU-T P.800, которая позволяет получить объективное измерение на основе субъективного тестирования. Корпорация EXFO инвестировала значительные ресурсы в развитие и отладку алгоритма EXFO MOS, и он успешно прошел сравнительные испытания с известными коммерчески доступными алгоритмами.

# ТЕХНИЧЕСКИЕ ХАРАКТЕРИСТИКИ

| КОНФИГУРАЦИИ LAN-ИНТЕРФЕЙСА |
|---|
| IP-адрес (статический или DHCP) |
| Маска подсети |
| Шлюз по умолчанию |
| DNS-сервер |
| VLAN |

| ПРОТОКОЛЫ СИГНАЛИЗАЦИИ |
|---|
| SIP |
| SCCP |
| H.323 |
| H.248/Megaco |

| КОДЕКИ |
|---|
| G.711 |
| G.722 |
| G.723 |
| G.726 |
| G.728 |
| G.729 (A, B и AB) |

## МЕТРИКИ КАЧЕСТВА ГОЛОСА

| | |
|---|---|
| Разговорный MOS | Деградация из-за кодека |
| Пользовательский R-фактор | Деградация из-за задержки |
| | Деградация из-за потерянных пакетов |

## МЕТРИКИ RTP

| | |
|---|---|
| Счетчик пакетов | Пакеты, пришедшие не по порядку |
| Потерянные пакеты | Дублирующиеся пакеты |
| Опоздавшие пакеты | Количество периодов с потерями |
| Пришедшие раньше пакеты | Размер периода с потерями (минимальный/максимальный/средний) |
| Общее количество утерянных пакетов (счетчик/%) | Тип потерь пакетов |
| | Потеря аудио |

## НАСТРАИВАЕМЫЕ ПОРОГИ «ГОДЕН/НЕГОДЕН»

- Максимальный джиттер
- Максимальная задержка
- Максимальная потеря пакетов
- Максимальный разговорный MOS
- Минимальный пользовательский R-фактор

## ИНФОРМАЦИЯ ДЛЯ ЗАКАЗА

EXpert VoIP = Программное обеспечение, основанное на тестировании RTP-звонка, включающее анализ потерь пакетов, джиттер и полные метрики контроля качества

**Опции**
EXpert SIP = Поддержка сигнализации звонка SIP для EXpert VoIP
EXpert SCCP = Поддержка сигнализации звонка SCCP для EXpert VoIP
EXpert H.323 = Поддержка сигнализации звонка H.323 для EXpert VoIPP
EXpert H.248 = Поддержка сигнализации звонка H.248/Megaco для EXpert VoIP

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# EXpert Test Tools

## PLATFORM SOFTWARE TOOLS FOR TESTING IP-BASED SERVICES


SPEC SHEET

**Comprehensive triple-play test suite for FTTx/FTTH and commercial deployments.**

### EXpert IP TEST TOOLS

- Combines six of the most common IP test tools into one: ping, traceroute, HTTP availability, FTP performance, VLAN scan and LAN discovery
- Tests connectivity, throughput and response time
- Automatically detects up to 100 VLANs on a link
- Platform compatibility: FTB-1 and FTB-200

### EXpert VoIP TEST TOOLS

- Generates VoIP calls
- Fast verification of voice quality, thanks to intuitive user interface
- Configurable pass/fail thresholds for simplified testing
- Supports most common signaling protocols: SIP, H.323, H.248, SCCP
- Supports MOS, R-factor and RTP metrics
- Platform compatibility: FTB-1 and FTB-200

### EXpert IPTV TEST TOOLS

- Powerful solution for IPTV quality assessment
- Set-top-box emulation and passive monitoring of IPTV streams
- Real-time video preview
- Analyzes up to 10 video streams
- Comprehensive QoS and QoE metrics including MOS score
- Platform compatibility: FTB-1 and FTB-200

EXFO | Assessing Next-Gen Networks

## COMBINE ALL TOOLS FOR FULL TRIPLE-PLAY TESTING, OR GET THEM INDIVIDUALLY

With the EXpert IP, EXpert VoIP and EXpert IPTV Test Tools, the FTB-1 and FTB-200 platforms are now equipped with triple-play testing capabilities. This allows technicians to test their voice, video and data services at residential and business premises with one test unit.

The combination of EXpert test applications and EXFO's FTB-1 OTDR test modules brings to the industry the most comprehensive and powerful triple-play solution in a portable device designed for growing FTTH deployments worldwide.


## PLATFORM APPLICATIONS THAT SPEED UP NETWORK DEPLOYMENTS, AVAILABLE THROUGH THE FTB ECOSYSTEM

EXFO's FTB Ecosystem* is software-scalable. What this means is that from the moment you purchase your solution, you know that its productivity will always be improved with apps, software upgrades and updates–a truly future-proof approach. EXpert Test Tools are merely one of the many applications provided through the FTB Ecosystem.

* The FTB Ecosystem gathers EXFO's family of portable platforms and modules, the EXFO Connect cloud-based test management environment, and a growing offering of software applications.


## TRY ANY OF THE EXPERT TOOLS FOR FREE ON YOUR FTB PLATFORM

EXFO gives you the opportunity to download the latest EXpert Tools and try them for free for a limited time. Simply log on to www.EXFO.com/EXFO-Store and download the applications to find out just how easy it is to add new functions and upgrades to your FTB platform.

# EXpert VoIP TEST TOOLS

## VoIP SERVICE PERFORMANCE VALIDATION

EXpert VoIP Test Tools is an EXFO platform-based software application that provides voice-over-IP (VoIP) performance validation for service turn up and troubleshooting in enterprise and service provider networks. Supported on the FTB-1 and FTB-200 platforms, the application generates a single VoIP call from an EXpert VoIP-enabled platform to another EXFO platform supporting the application or any IP phone. The test calls can either be “live” or use a predefined audio file for test traffic. EXpert VoIP supports several signaling technologies including SIP, SCCP, H.323 and H.248 to ensure compatibility with the majority of VoIP environments currently used in the industry.

EXpert VoIP boasts a highly configurable test interface to maximize control over the test parameters yet maintains a strong emphasis on usability. The intuitive user interface features EXFO’s latest generation framework that allows even the uninitiated user the ability to quickly set up and run tests. All tests support a uniform set of quality metrics that include opinion score (MOS), R-factor and a full range of real-time protocol (RTP) loss metrics, which combine with configurable thresholds to simplify service validation or accelerate troubleshooting.

Tests are executed between two EXpert VoIP-enabled platforms or to a VoIP endpoint (such as a SIP proxy server, soft phone or telephone, i.e., ATA). The platform that launches the test initiates a call, sets up a media channel, transmits media and reports statistics. Depending on the endpoint, it answers the call, transmits media and gathers statistics. Service tests can query the endpoint to determine availability or to set up a call.

## PRODUCT HIGHLIGHTS

### RTP Network Test

The VoIP RTP Network test is the base test of the EXpert VoIP Test Tools application. This peer-to-peer test measures VoIP-related parameters by streaming RTP packets between two endpoints. All supported functionality for this test conforms to RFC 1889. The RTP Network test simulates VoIP traffic by streaming RTP packets between a controller test set, which initiates the packet stream, and a responder endpoint that initiates its own stream to the controller test set.

### Signaling Protocols

EXpert VoIP has been designed to support a wide variety of VoIP environments to ensure the maximum utility of the tools. As such the application can be configured to use some of the most frequently used VoIP call signaling protocols including SIP, SCCP, H.248/Megaco and H.323.

### Voice Quality Metrics

The EXpert VoIP Test Tools base application includes a full set of voice quality metrics including MOS, R-factor and degradation factors based on codec, latency and packet loss to help pinpoint the source of any voice quality issues. EXFO’s voice quality measurement agent calculates R-factor (another standardized transmission quality rating) for a call based on the G.107 E-model extensions. These model extension factors such as packet loss burst to more accurately predict the subjective score a listener would assign that call. The R-factor is then converted to an EXFO MOS score. The EXpert VoIP tests report the raw R-factor and EXFO’s MOS voice quality results for conversational call quality.

The EXFO MOS algorithm used in the application is based on the ITU-T P.800 recommendation, which provides an objective measurement to subjective testing. EXFO has invested significant resources into developing and refining the EXFO MOS algorithm and it has been successfully benchmarked against leading commercially available algorithms.

# EXpert IP TEST TOOLS

## SIX TOOLS, ONE APPLICATION

EXpert IP Test Tools is an EXFO platform-based software application that brings together six commonly used test tools into one application to help field technicians deal with the complex testing environments of today's networks. As any technician knows, being prepared for the unexpected is key to successfully getting through the day and solving customer issues.

Whether it is to verify IP connectivity to a router or customer endpoint using the Ping tool, debugging VLAN issues with VLAN Scan or verifying a file transfer protocol (FTP) service using the FTP performance tool, EXpert IP Test Tools has you covered. Supported on the FTB-1 and FTB-200 test platforms, it is an indispensable test kit that is always available for use anywhere and anytime you are using EXFO's test platforms–regardless of the specific module in use.

## PRODUCT HIGHLIGHTS

### LAN Discovery

LAN Discovery actively interrogates network devices to learn about attached hosts, servers, switches and routers. The discovered devices connected to the network are listed and additional details about each device are provided such as IP address, domain name, services provided, administrator, location, etc. Metrics provided include the IP address of the discovered hosts along with the network address, MAC address and SNMP information.

### VLAN Scan

VLAN Scan detects and lists all the VLANs present on the IP network the test set is connected to. It can support the detection of nested VLANs on up to three layers. Results include the VLAN number, priority, and frame count. This tool is useful to discover configured VLANs on a port and bandwidth utilization per VLAN as well as providing the ability to detect VLAN configuration errors.

### Ping

The Ping tool validates if there is IP connectivity to another IP-enabled device (host) by sending control message protocol (ICMP) echo request packets to the destination device and waiting for an ICMP response to validate the end-to-end connection. In addition, it also provides a round-trip time (latency) for packets sent by the local device to the destination far-end device. Other metrics include sent and lost packets.

### Traceroute

The Traceroute test is a troubleshooting tool that discovers the path taken by IP packets across an IP network. It identifies the nodes or "hops" that the packet traversed on its way to the destination. The information provided by the tool includes the IP address of the nodes and the number of hops to that node and the total hops to reach the destination node. An example of how the traceroute tool can be used is to identify the routers along a data path to discover routing problems or to highlight firewall issues that may be blocking ICMP packets.

### FTP Performance Test

FTP allows the transfer of files between a local PC and a remote FTP server. Using FTP, you can connect to an FTP server and transfer files in either direction by uploading a file to or downloading a file from an FTP server. File transfer involves two types of connections, a control connection and a data connection.

A typical use of the FTP Performance test tool is to measure the availability and response time of an FTP server. This test can be configured to upload a file to the server, download a file from the server or perform both tasks. The file is generated by the test and transferred to the specified location.

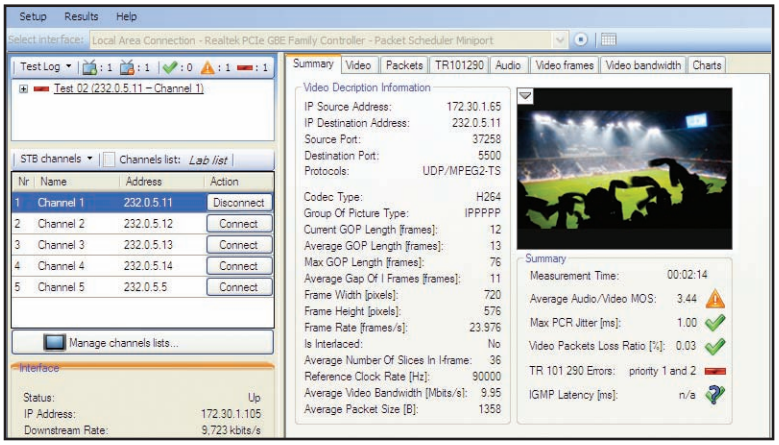
### HTTP Availability

The HTTP Availability test measures the availability and response time of a hypertext transfer protocol (HTTP) server by downloading a web page. Results include the TCP connection time, the total page download time, the number of redirects and the redirect time.

# EXpert IPTV TEST TOOLS

## POWERFUL IPTV ANALYZER

The EXpert IPTV application enables FTB-1 and FTB-200 platform users to quickly and easily perform pass/fail verification of IPTV installations. It also reduces the amount of service calls by detecting and clearly identifying through simple pass/fail indications any degrading conditions during service turn-up, ensuring subscribers' quality of experience. EXpert IPTV can emulate a set-top box and display a real-time video preview, allowing the technician to determine video and audio quality before any other equipment is installed.




### Set-Top-Box Emulation

The EXpert IPTV Test Tools allow technicians to emulate an actual set-top box. When operating in that mode, the application can join and leave live IPTV channels. The user can connect and view one or several standard-definition or high-definition videos simultaneously, or request a specific one.

### Passive or Promiscuous Mode

The Passive mode allows the Expert IPTV Test Tools application to seamlessly discover, view and provide metrics for any IPTV stream available on a specific link. No application configuration is required, and the user can run the test without being familiar with the application.

### Multiple Video Streams Analysis

The EXpert IPTV application can analyze up to 10 video streams simultaneously. It also allows joining (so the user can view the stream) and leaving the discovered and selected streams simultaneously. This time-saving feature can be used for STB emulation as well as in Passive mode.

### Video-on-Demand

The video-on-demand (VoD) feature of the EXpert IPTV Test Tools allows the user to request a specific video channel and connect to it. Valuable video metrics and analysis are then provided as well as a live view of the stream.

## TECHNICAL SPECIFICATIONS

| | |
|---|---|
| Interface | 10/100/1000 Ethernet |
| Platforms | FTB-1 and FTB-200 |
| EXpert IP Test Tools | Ping<br>Traceroute<br>FTP performance<br>HTTP availability<br>VLAN scan<br>LAN discovery |
| EXpert VoIP Test Tools | SIP, H.323, SCCP, H.248/Megaco<br>MOS and R-factor<br>RTP metrics<br>G.711, G.722, G.723, G.728 G.729 (A and B) |
| EXpert IPTV Test Tools | IGMP versions 2 and 3<br>MPEG2, MPEG4 part 2&10 (H.264), Mediaroom/MS-IPTV<br>Live video preview<br>Up to 10 simultaneous streams<br>Transport packet metrics<br>RTP packet metrics<br>Video perceptual quality metrics<br>Audio description information<br>MPEG2-TS TR101290 Priority 1 and Priority 2 |

## ORDERING INFORMATION

EXpert IP = IP/Ethernet test tool suite
Includes: FTP performance, HTTP availability, VLAN scan, LAN discovery, ping, traceroute, IP/Ethernet port statistics
Single license for the FTB-1 and FTB-200 platforms

EXpert VoIP = RTP base call testing software application including packet loss analysis, jitter measurement and complete voice quality metrics

**Options**
EXpert SIP = SIP call signaling support for EXpert VoIP
EXpert SCCP = SCCP call signaling support for EXpert VoIP
EXpert H.323 = H.323 call signaling support for EXpert VoIP
EXpert H.248 = H.248/Megaco call signaling support for EXpert VoIP

EXpert IPTV = IPTV test tool suite
Single software to support all IPTV features on the FTB-1 and FTB-200 platforms

EXpert TPP Bundle = Triple-play bundle for voice, video and data testing on the FTB-1 and FTB-200 platforms
Includes: EXpert IP Test Tools, EXpert IPTV Test Tools, EXpert VoIP Test Tools and EXpert SIP

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