FTB-8140
Transport Blazer

The industry’s most compact, portable 40/43 Gigabit test solution, built for field commissioning and troubleshooting

- OC-768/STM-256 testing with STS-1/AU-3 granularity
- Supports OTN testing at the OTU3 level including forward error correction (FEC) as per ITU-T G.709
- Supports single and dual stage optical channel data unit ODU multiplexing with SONET/SDH and Ethernet mapped client signals
- Offers ODU0 (1.25 Gbit/s) container with Gigabit Ethernet and SONET/SDH client signals for qualifying newly and efficiently mapped transport and datacom services over OTN
- Supports circuit and packet ODUflex testing capabilities for OTN bandwidth optimization
- Intuitive, feature-rich user interface with automated test scripting and multi-user remote management capabilities
- Compatible with any of EXFO’s FTB-500 supported modules, including its industry-leading 40 Gbit/s fiber characterization modules

Platform Compatibility

- FTB-500 Platform
Increased demand for data and video services continues to put a strain on existing networks, driving the need for higher performance metro and core networks. As a result, the shift from 10 gigabit- to 40 gigabit-enabled networks has accelerated over the last year, and will continue at a strong pace, allowing service providers to ensure their next-generation SONET/SDH networks are scaled to meet these growing bandwidth demands.

This upgrade to 40 Gbit/s transmission creates new challenges for service providers, driving the need for 40 gigabit field test equipment to ensure that new network deployments meet industry standards and offer the required service quality and reliability.

EXFO’s FTB-8140 Transport Blazer test module, the industry’s most compact 40/43 gigabit field tester, provides advanced SONET/SDH and OTN test functions in a single module. This module is compatible with the FTB-500 Platform, which also supports 40 Gbit/s physical layer modules such as CD, PMD and OSA, ensuring that field technicians have a truly portable solution that meets every testing requirement.

**SONET/SDH Testing Reaches New Level**

The FTB-8140 Transport Blazer offers a wide range of SONET/SDH test functions ranging from simple bit-error-rate (BER) testing to advanced characterization and troubleshooting procedures. These functions include:

- Mixed and bulk payload generation and analysis from 51.84 Mbit/s to 40 Gbit/s
- High-order mappings: STS-1/3c/12c/48c/192c/768c
  and AU-3/AU-4/AU-4-4c/16c/64c/256c
- Unframed optical signal testing at 40 Gbit/s rate
- Section/RS, Line/MS and high-order (HO) path overhead manipulation and monitoring
- Section/RS, Line/MS and high-order (HO) path alarm/error generation and monitoring
- High-order (HO) pointer generation and monitoring
- K1/K2 OH byte capture
- Frequency analysis and power measurement
- Frequency offset generation
- Automatic protection switching (APS) and service disruption time (SDT) measurements
- Round-trip delay (RTD) measurements
- Intrusive and transparent Through mode analysis
- Programmable error/alarm injection
- Independent transmitter and receiver testing
- Payload block and replace
Optical Transport Network (OTN) Testing
Prevalent in 10 Gbit/s networks, OTN has become a necessity for 40 Gbit/s transmission due to its forward error correction capabilities; critical for high bandwidth transmission applications. The FTB-8140 Transport Blazer offers optional OTN test capabilities for verifying compliancy with ITU-T G.709 standards.

OTN as per ITU-T G.709 has recently introduced two new concepts: ODU0 and ODUflex. ODU0 is a new virtual container of 1.25 Gbit/s bandwidth specifically defined for efficiently mapping Gigabit Ethernet services over OTN. As for ODUflex, it is the most efficient sub-wavelength bandwidth management capability for transport line rates of 10 Gbit/s, 40 Gbit/s and upcoming 100 Gbit/s. ODUflex allows providers to interconnect routers in ways that enable efficient bandwidth growth in steps of 1.25 Gbit/s, eliminating the need to allocate a full fixed-rate ODU container to each connection and allowing service providers to transport efficiently and seamlessly across lower-cost optical infrastructures. Tests include:

- OTU3 (43 Gbit/s) bit rate (framed and unframed)
- Synchronous mapping of SONET/SDH signals within OTN as well as synchronous/asynchronous demapping
- Forward error correction (FEC) testing—error insertion and monitoring
- Service disruption time (SDT) measurements
- Round-trip delay (RTD) measurements
- OTU, ODU, OPU overhead manipulation and monitoring
- OTU, ODU (including ODU TCM), OPU layer alarms/errors generation and analysis
- OTU, ODU (including ODU TCM) trace messages
- Intrusive and transparent Through mode analysis
- Multiplexing/demultiplexing of ODU13, ODU23, ODU123, ODU03, ODU013 and ODU0123 with capability of mapping SONET/SDH, Gigabit Ethernet and 10 Gigabit Ethernet client signals into ODU0, ODU1 and ODU2
- ODU0 (1.25 Gbit/s) container with Gigabit Ethernet and SONET/SDH client signals mapping
- ODUflex with SONET/SDH and Ethernet client signal mapping

Unsurpassed Configuration and Operational Flexibility

The FTB-500 platform configuration with eight-slot (GP-408) receptacle provides users with an all-in-one solution supporting a mix of SONET/SDH, OTN, Ethernet, Fibre Channel and optical-layer test modules, making it the industry’s first truly integrated network testing platform. This modularity enables users to upgrade their systems in the field according to their testing needs. This multitechnology test platform is the ideal solution for field, central office and lab applications.

Combining the FTB-8130NGE module with the FTB-8140 provides a multiservice portable test solution that addresses SONET/SDH and OTN testing needs from DS0/E0 to OC-768/STM-256/OTU3 as well as Ethernet testing needs from 10 Mbit/s to 10 GigE LAN/WAN and Fibre Channel 1x/2x/4x/10x.

Combined with EXFO’s optical CD, PMD and OSA modules, the FTB-8140 is a unique portable solution addressing all 40 Gbit/s testing requirements from the physical to the transmission layer.

Product Option Flexibility
The FTB-8140 Transport Blazer provides customers with the flexibility to purchase SONET/SDH-only configurations and upgrade to OTN test functions via software options to meet evolving needs—reducing hardware and/or platform retrofits, and significantly decreasing capital and training expenses.

Remote Management
Through its optional Visual Guardian Lite™ management software, the FTB-8140 Transport Blazer allows you to perform remote testing, monitoring and data analysis via standard Ethernet.

Automated Test Scripting
The FTB-8140 Transport Blazer comes with a built-in macro recorder enabling users to easily record test actions and automatically create test scripts. This functionality also allows them to build standard test routines that can be accessed and run by field technicians with little or no manual intervention.
Electrical Interfaces

The following section provides detailed information on all supported electrical interfaces.

<table>
<thead>
<tr>
<th>SYNCHRONIZATION INTERFACES</th>
<th>External Clock DS1/1.5M</th>
<th>External Clock E1/2M</th>
<th>External Clock E1/2M</th>
<th>2 MHz (Trigger)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tx pulse amplitude</strong></td>
<td>2.4 to 3.6 V</td>
<td>3.0 V</td>
<td>2.37 V</td>
<td>0.75 to 1.5 V</td>
</tr>
<tr>
<td><strong>Tx pulse mask</strong></td>
<td>GR-499 figure 9.5</td>
<td>G.703 figure 15</td>
<td>G.703 figure 15</td>
<td>G.703 figure 20</td>
</tr>
<tr>
<td><strong>Tx LBO preamplification</strong></td>
<td>Typical power dBdsx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+0.6 dBdsx (0-133 ft)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+1.2 dBdsx (133-266 ft)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+1.8 dBdsx (266-399 ft)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+2.4 dBdsx (399-533 ft)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>+3.0 dBdsx (533-655 ft)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Rx level sensitivity</strong></td>
<td>TERM: ±8 dB (cable loss only)</td>
<td>TERM: ±8 dB (cable loss only)</td>
<td>TERM: ±8 dB (cable loss only)</td>
<td>±6 dB (cable loss only)</td>
</tr>
<tr>
<td></td>
<td>(at 772 kHz for T1)</td>
<td>(20 dB resistive loss + cable loss ≤ 6 dB)</td>
<td>(20 dB resistive loss + cable loss ≤ 6 dB)</td>
<td>(20 dB resistive loss + cable loss ≤ 6 dB)</td>
</tr>
<tr>
<td></td>
<td>resistive loss + cable loss ≤ 6 dB)</td>
<td>(cable loss only)</td>
<td>(cable loss only)</td>
<td>(cable loss only)</td>
</tr>
<tr>
<td><strong>Transmission bit rate</strong></td>
<td>1.544 Mbit/s ± 4.6 ppm</td>
<td>2.048 Mbit/s ± 4.8 ppm</td>
<td>2.048 Mbit/s ± 50 ppm</td>
<td>2.048 Mbit/s ± 50 ppm</td>
</tr>
<tr>
<td><strong>Reception bit rate</strong></td>
<td>1.544 Mbit/s ± 50 ppm</td>
<td>2.048 Mbit/s ± 50 ppm</td>
<td>2.048 Mbit/s ± 50 ppm</td>
<td>2.048 Mbit/s ± 50 ppm</td>
</tr>
<tr>
<td><strong>Intrinsic jitter (Tx)</strong></td>
<td>ANSI T1.403 section 6.3</td>
<td>G.823 section 7.3</td>
<td>G.823 section 7.1</td>
<td>G.703 table 11</td>
</tr>
<tr>
<td><strong>Input jitter tolerance</strong></td>
<td>AT&amp;T PUB 62411</td>
<td>G.823 section 7.2</td>
<td>G.823 section 7.2</td>
<td>G.813</td>
</tr>
<tr>
<td><strong>Line coding</strong></td>
<td>AMI and B8ZS</td>
<td>AMI and HDB3</td>
<td>AMI and HDB3</td>
<td></td>
</tr>
<tr>
<td><strong>Input impedance (resistive termination)</strong></td>
<td>75 Ω ± 5 %, unbalanced</td>
<td>75 Ω ± 5 %, unbalanced</td>
<td>75 Ω ± 5 %, unbalanced</td>
<td>75 Ω ± 5 %, unbalanced</td>
</tr>
<tr>
<td><strong>Connector type</strong></td>
<td>BNC a</td>
<td>BNC a</td>
<td>BNC</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REF-OUT INTERFACE</th>
<th>SONET/SDH</th>
<th>OTN</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parameter</strong></td>
<td>Value</td>
<td>Value</td>
</tr>
<tr>
<td>Tx pulse amplitude</td>
<td>600 ± 200 mVpp</td>
<td>600 ± 200 mVpp</td>
</tr>
<tr>
<td>Transmission frequency</td>
<td>2.48832 GHz</td>
<td>2.66665 GHz</td>
</tr>
<tr>
<td>Output configuration</td>
<td>AC coupled</td>
<td>AC coupled</td>
</tr>
<tr>
<td>Load impedance</td>
<td>50 Ω</td>
<td>50 Ω</td>
</tr>
<tr>
<td>Maximum cable length</td>
<td>1 m</td>
<td>1 m</td>
</tr>
<tr>
<td>Connector type</td>
<td>SMA</td>
<td>SMA</td>
</tr>
</tbody>
</table>

**NOTE**

a. Adaptation cable required for BANTAM.
SONET/SDH and OTN Optical Interfaces

The following section provides detailed information on all supported SONET/SDH and OTN optical interfaces.

### OC-768/STM-256/OTU3

<table>
<thead>
<tr>
<th>Feature</th>
<th>OC-768/STM-256/OTU3</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Line coding</strong></td>
<td>NRZ</td>
<td></td>
</tr>
<tr>
<td><strong>Level Tx (dBm)</strong></td>
<td>0 to 3</td>
<td></td>
</tr>
<tr>
<td><strong>Rx operating range (dBm)</strong></td>
<td>-5 to 3</td>
<td></td>
</tr>
<tr>
<td><strong>Transmit bit rate</strong></td>
<td>39.81312 Gbit/s ± 4.6 ppm</td>
<td></td>
</tr>
<tr>
<td><strong>Receive bit rate</strong></td>
<td>39.81312 Gbit/s ± 4.6 ppm</td>
<td></td>
</tr>
<tr>
<td><strong>Operational wavelength range (nm)</strong></td>
<td>1530 to 1565</td>
<td></td>
</tr>
<tr>
<td><strong>Frequency offset generation</strong></td>
<td>39.81312 Gbit/s ± 50 ppm</td>
<td></td>
</tr>
<tr>
<td><strong>Measurement accuracy (uncertainty)</strong></td>
<td>±4.6</td>
<td></td>
</tr>
<tr>
<td><strong>Rx overload (dBm)</strong></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Rx damage level (dBm)</strong></td>
<td>6</td>
<td></td>
</tr>
<tr>
<td><strong>Jitter compliance</strong></td>
<td>GR-253 (SONET)</td>
<td></td>
</tr>
<tr>
<td><strong>Line coding</strong></td>
<td>NRZ-DPSK</td>
<td></td>
</tr>
<tr>
<td><strong>Level Tx (dBm)</strong></td>
<td>0 to 3</td>
<td></td>
</tr>
<tr>
<td><strong>Rx operating range (dBm)</strong></td>
<td>-5 to 3</td>
<td></td>
</tr>
<tr>
<td><strong>Transmit bit rate</strong></td>
<td>43.01841 Gbit/s ± 4.6 ppm</td>
<td></td>
</tr>
<tr>
<td><strong>Receive bit rate</strong></td>
<td>43.01841 Gbit/s ± 4.6 ppm</td>
<td></td>
</tr>
<tr>
<td><strong>Operational wavelength range (nm)</strong></td>
<td>1528.77 to 1563.86</td>
<td></td>
</tr>
<tr>
<td><strong>Frequency offset generation</strong></td>
<td>39.81312 Gbit/s ± 50 ppm</td>
<td></td>
</tr>
<tr>
<td><strong>Measurement accuracy (uncertainty)</strong></td>
<td>±4.6</td>
<td></td>
</tr>
<tr>
<td><strong>Rx overload (dBm)</strong></td>
<td>3</td>
<td></td>
</tr>
<tr>
<td><strong>Rx damage level (dBm)</strong></td>
<td>10</td>
<td></td>
</tr>
<tr>
<td><strong>Jitter compliance</strong></td>
<td>GR-253 (SONET)</td>
<td></td>
</tr>
<tr>
<td><strong>Line coding compliance</strong></td>
<td>G.693 VSR 2000 compliant</td>
<td></td>
</tr>
</tbody>
</table>

**Connectors:**
- SC, FC, LC, ST

### SONET/SDH Functional Specifications

#### SONET

**Optical interfaces:**
- OC-768
- STM-256

**Clocking:**
- Internal, loop-timed, external (BITS), backplane

**Mappings:**
- STS-1: Bulk
- STS-3c: Bulk

**SONET overhead analysis and manipulation:**
- A1, A2, J0, E1, F1, D1-D12, K1, K2, S1, M0, E2, J1, C2, G1, F2, H4, Z3, Z4, N1, N2

**Error insertion:**
- Section BIP (B1), line BIP (B2), path BIP (B3), REI-L, RB-P, FAS, bit error
- STS-256

**Error measurement:**
- Section BIP (B1), line BIP (B2), path BIP (B3), REI-L, RB-P, FAS, bit error
- STS-256

**Alarm insertion:**
- STS-256

**Alarm detection:**
- STS-256

**Patterns:**
- STS-1: 2E1-1, 2E1-1, 2E1-1, 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

### SDH

**Optical interfaces:**
- OC-768
- STM-256

**Clocking:**
- Internal, loop-timed, external (MTS/SETS), 2 MHz, backplane

**Mappings:**
- A1, A2, J0, E1, F1, D1-D12, K1, K2, S1, M0, E2, J1, C2, G1, F2, H4, Z3, Z4, N1, N2

**SDH overhead analysis and manipulation:**
- A1, A2, J0, E1, F1, D1-D12, K1, K2, S1, M0, G1, F2, P3, K1, N1, N2, E2, J1, C2, H4

**Error insertion:**
- RS-BIP (B1), MS-BIP (B2), MS-REI, HP-REI, FAS, bit error
- STS-256

**Error measurement:**
- RS-BIP (B1), MS-BIP (B2), MS-REI, HP-REI, FAS, bit error

**Alarm insertion:**
- STS-256

**Alarm detection:**
- STS-256

**Patterns:**
- AU-3/AU-4/AU-4c/AU-16c/AU-64c/AU-256c: 2E1-1, 2E1-1, 2E1-1, 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

**Error insertion and measurement:**
- OC-768/STM-256
- Frequency, optical power, Rx overload, Rx damage level

**Frequency alarm:**
- On all supported interfaces

**Patterns:**
- OC-768/STM-256
- Programmable (inverted or non-inverted)

**Alarm detection:**
- OC-768/STM-256
- LOS, LOF, LOC, OOF, MS-AIS, MS-RDI, AU-AIS, AU-RDI, ERDI-SD, ERDI-CD, ERDI-PD, HP-UNEQ, pattern loss
**ADDITIONAL TEST AND MEASUREMENT FUNCTIONS**

<table>
<thead>
<tr>
<th>Power measurements</th>
<th>Supports power measurements, displayed in dBm, for optical interfaces.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency measurements</td>
<td>Supports clock frequency measurements (i.e., received frequency and deviation of the input signal clock from nominal frequency), displayed in ppm and bit/s, for optical and electrical interfaces (external clock).</td>
</tr>
<tr>
<td>Frequency offset generation</td>
<td>Supports offsetting the clock of the transmitted signal on a selected interface to exercise clock recovery circuitry on network elements.</td>
</tr>
<tr>
<td>Performance monitoring</td>
<td>The following ITU-T recommendations, and corresponding performance monitoring parameters, are supported on the FTB-8140 module.</td>
</tr>
<tr>
<td>ITU-T recommendation</td>
<td>Performance monitoring statistics</td>
</tr>
<tr>
<td>G.821</td>
<td>ES, EFS, EC, SES, UAS, ESR, SFSR, BM</td>
</tr>
<tr>
<td>G.828</td>
<td>ES, EFS, EB, SES, BB, SEP, UAS, ESR, SESR, BBER, SEP</td>
</tr>
<tr>
<td>G.829</td>
<td>ES, EFS, EB, SES, BB, UAS, ESR, SESR, BBER</td>
</tr>
<tr>
<td>M.2100</td>
<td>ES, SES, UAS, ESR, SESR</td>
</tr>
<tr>
<td>M.2101</td>
<td>ES, SES, BB, UAS, ESR, SESR, BBER</td>
</tr>
<tr>
<td>Pointer adjustment and analysis</td>
<td>Generation and analysis of HO/AU pointer adjustments as per GR-253 and ITU-T G.707.</td>
</tr>
<tr>
<td>Generation</td>
<td>Analysis</td>
</tr>
<tr>
<td>• Pointer increment and decrement</td>
<td>• Pointer increments</td>
</tr>
<tr>
<td>• Pointer jump with or without NDF</td>
<td>• Pointer decrements</td>
</tr>
<tr>
<td>• Pointer value</td>
<td>• Pointer jumps (NDF, no NDF)</td>
</tr>
<tr>
<td>• Pointer value and cumulative offset</td>
<td>Programmable error/alarm injection</td>
</tr>
<tr>
<td>Service disruption time (SDT) measurements</td>
<td>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.</td>
</tr>
<tr>
<td>User-selectable triggers: all supported alarms and errors.</td>
<td></td>
</tr>
<tr>
<td>Measurements: last disruption, shortest disruption, longest disruption, average disruption, total disruption, and service disruption count.</td>
<td></td>
</tr>
<tr>
<td>Round-trip delay (RTD) measurements</td>
<td>The round-trip delay test tool measures the time required for a bit to travel from the FTB-8140 transmitter back to its receiver after crossing a far-end loopback.</td>
</tr>
<tr>
<td>Measurements are supported on all supported FTB-8140 interfaces and mappings.</td>
<td></td>
</tr>
<tr>
<td>Measurements: last RTD time, minimum, maximum, average, measurement count (number of successful RTD tests), failed measurement count.</td>
<td></td>
</tr>
<tr>
<td>APS message control and monitoring</td>
<td>Ability to monitor and set up automatic protection switching messages (K1/K2 byte of SONET/SDH overhead).</td>
</tr>
<tr>
<td>Synchronization status</td>
<td>Ability to monitor and set up synchronization status messages (S1 byte of SONET/SDH overhead).</td>
</tr>
<tr>
<td>Signal label control and monitoring</td>
<td>Ability to monitor and set up payload signal labels (C2 byte of SONET/SDH overhead).</td>
</tr>
<tr>
<td>Through mode</td>
<td>Ability to perform intrusive and transparent Through mode analysis of any incoming optical line (OC-768/STM-256, OTU3).</td>
</tr>
<tr>
<td>Payload block and replace</td>
<td>Ability to terminate and analyze a specific high-order path element and replace it with a PRBS pattern on the TX side.</td>
</tr>
<tr>
<td>K1/K2 OH byte capture</td>
<td>Ability to capture K1/K2 OH byte value transitions.</td>
</tr>
</tbody>
</table>

**OTN Functional Specifications**

**OTN**
- Interfaces: OTU3 (43 Gbit/s)

**OTU Layer**
- Errors: OTU-FA, OTU-MFA, OTU-BAE, OTU-BIP, OTU-BAE
- Alarms: LOF, LOF, XCA, OTU-AS, OTU-IAE, OTU-BAE
- Traces: 64-bytes Trail Trace Identifier (TTI) as defined in ITU-T G.709

**ODU TCM Layer**
- Errors: TCMi-BIP, TCMi-BEI (i = 1 to 6)
- Alarms: TCMi-LTC, TCMi-TIM, TCMi-BEI
- Traces: 64-bytes Trail Trace Identifier (TTI) as defined in ITU-T G.709

**ODU Layer**
- Errors: ODU-BIP, ODU-BAE
- Traces: Generates 64-bytes Trail Trace Identifier (TTI) as defined in ITU-T G.709
- FTL: a. As defined in ITU-T G.709

**OPU Layer**
- Errors: OPU-PLM, OPU-CSF, OPU-AIS
- Payload type (PT) label: Generates and displays received PT value
- GMP errors: Cm CRC-8, Ox CRC-5

**Forward Error Correction (FEC)**
- Errors: FEC-Correctable (Codeword), FEC-Uncorrectable (Codeword), FEC-Correctable (Symbol), FEC-Correctable (Bit), and FEC-Stress (Codeword)

**ODU Multiplexing**
- Mappings: ODU13, ODU23, ODU123, ODU0, ODUflex
- Alarms: OPU-MSIM, ODU-LOFLG
- Client: PRBS pattern, STS-3c/12c/48c/192c/768c, AU-4-4c/16c/64c/256c

**ODU0**
- Muxing: ODU0 into ODU3, ODU0 into ODU13, ODU0 into ODU23
- Client types: Pattern, OC-3/STM-1, OC-12/STM-4, GigE using GFP-T
- GFP-T errors: SB Correctable, SB Uncorrectable, 10B_ERR
- GFP-F alarms: Client forward defect indication (FDI), client reverse defect indication (RDI), client defect clear indication (DCI)

**NOTE**
- a. Fault type and fault location.
**OTN Functional Specifications (continued)**

### ADDITIONAL FUNCTION

<table>
<thead>
<tr>
<th>Test Tool</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service disruption time (SDT) measurements</td>
<td>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. User-selectable triggers: all supported alarms and errors. Measurements: last disruption, shortest disruption, longest disruption, average disruption, total disruption, and service disruption count.</td>
</tr>
<tr>
<td>Round-trip delay (RTD) measurements</td>
<td>The round-trip delay test tool measures the time required for a bit to travel from the FTB-8140 transmitter back to its receiver after crossing a far-end loopback. Measurements are supported on all supported FTB-8140 interfaces and mappings. Measurements: last RTD time, minimum, maximum, average, measurement count (number of successful RTD tests), failed measurement count.</td>
</tr>
</tbody>
</table>

### Additional Features

- **Scripting**: Wide range of SCPI commands powerful enough to provide repeatable testing of complex configuration, yet simple enough to create a 40 gigabit BERT in as little as six commands. The FTB-8140 also includes an intuitive macro recorder enabling users to easily record test actions and automatically create test scripts in VB.Net.
- **Reports**: Supports generation of test reports in .html, .csv, .txt, .pdf formats. Contents of reports are customizable by the user.
- **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 bootup.
- **String and load configurations**: Ability to store and load test configurations to/from non-volatile memory.
- **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.
- **Configurable test views**: This allows users to customize their test views, i.e., to dynamically insert or remove test tabs/windows, in addition to creating new test windows, so as to accurately match their testing needs.
- **Configurable test timer**: Provides the ability for a user to set pre-defined test start and stop times.
- **Remote access**: Available with Windows-based remote management software known as Visual Guardian Lite (optional software package). This allows users to remotely monitor and control the FTB-8140 module via standard Ethernet connection.

### Additional Specifications

**FTB-8140**

SONET/SDH 40 Gbit/s and OTN 43 Gbit/s (optical rates)

**Test Interfaces**

- OTN: OTU3 (43 Gbit/s)
- SONET: OC-768
- SDH: STM-256

**GENERAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>FTB-8140</th>
<th>Typical weight</th>
<th>2.5 kg (5.5 lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size (H x W x D)</td>
<td>96 mm x 152 mm x 292 mm (3 ¾ x 6 x 11 ½ in)</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>Operating</td>
<td>0 °C to 40 °C (32 °F to 104 °F)</td>
</tr>
<tr>
<td>Storage</td>
<td>-40 °C to 60 °C (-40 °F to 140 °F)</td>
<td></td>
</tr>
</tbody>
</table>
**FTB-8140**

40/43 Gigabit SONET/SDH/OTN Test Module

**ORDERING INFORMATION**

**Model**
- FTB-8140-NRZ  = SONET/SDH test module with 40/43 Gbit/s, 1550 nm, NRZ 2 km transponder
- FTB-8140-DPSK  = SONET/SDH test module with 40/43 Gbit/s, tunable DPSK transponder

**Connector**
- 89 = FC/UPC
- 90 = ST/UPC
- 91 = SC/UPC
- 101 = LC/UPC

**Software options**
- SONET = SONET-BASE-SW
- SDH = SDH-BASE-SW
- SONET-SDH = Combined SONET/SDH

**Other software options**
- 00 = Without other options
- ODUMUX = ODU multiplexing functionality
- ODU0 = ODU0 mapping
- OTU3 = OTN 43 Gbit/s (G.709/OTU3)
- OTN-INTR-THRU = Intrusive OTN Through mode
- INTR-THRU-MODE = SONET/SDH intrusive Through mode

**Rate option**
- 40G = 40 Gbit/s (OC-768/STM-256)

Example: FTB-8140-NRZ-91-SONET-40G-OTU3

**NOTES**

a. Must be combined with the OTU3 option.
b. Must be combined with ODUMUX option.
c. Included as standard for FTB-8140.

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EXFO is certified ISO 9001 and attests to the quality of these products. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. EXFO has made every effort to ensure that the information contained in this specification sheet is accurate. However, we accept no responsibility for any errors or omissions, and we reserve the right to modify design, characteristics and products at any time without obligation. Units of measurement in this document conform to SI standards and practices. In addition, all of EXFO’s manufactured products are compliant with the European Union’s WEEE directive. For more information, please visit www.EXFO.com/recycle. Contact EXFO for prices and availability or to obtain the phone number of your local EXFO distributor.

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