

# FTB-8115

## Transport Blazer

NETWORK TESTING—TRANSPORT AND DATA COM



### Fully integrated test solution supporting SONET/SDH test functions

- DS0/E0 to OC-48/STM-16 testing in a single module
- Supports SONET, SDH, DS<sub>n</sub> and PDH
- SmartMode automatic signal structure discovery with real-time alarm/error/pointer movement monitoring
- Intuitive, feature-rich user interface with available automated test scripting and multi-user remote management capabilities
- Supported on FTB-200 and FTB-400 platforms, optimizing capital expenditures

### Platform compatibility

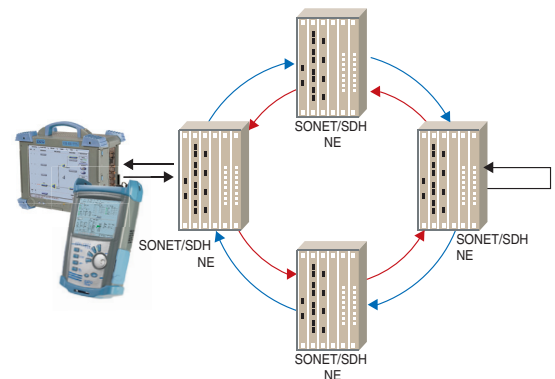
- FTB-200 Compact Platform
- FTB-400 Universal Test System



# Advanced SONET/SDH Access and Metro Testing

EXFO's FTB-8115 Transport Blazer test module combines advanced DS<sub>n</sub>/PDH and SONET/SDH test functions in a single unit, eliminating the need for multiple, purpose-built test platforms for the commissioning or troubleshooting of T1/E1 to OC-48/STM-16 circuits. The extensive list of DS<sub>n</sub>, SONET, PDH and SDH features available on the FTB-8115 Transport Blazer allows users to perform a wide range of tests from simple bit-error-rate (BER) analysis to more advanced network characterization and troubleshooting. These functions include:

- Mixed and bulk payload generation and analysis from 64 Kbit/s to 2.5 Gbit/s
- High-order mappings: STS-1/3c/6c/9c/12c/24c/48c and AU-3/AU-4/AU-4-2c/3c/4c/8c/16c
- Low-order mappings: VT1.5/2/6, TU-11/12/2/3
- Section, line, high-order (HO) and low-order (LO) path overhead manipulation and monitoring
- Section, line, high-order and low-order path alarm/error generation and monitoring
- High-order and low-order pointer generation and monitoring
- Performance monitoring: G.821, G.826, G.828, G.829, M.2100, M.2101
- Frequency analysis and power measurement
- Frequency offset generation
- Automatic protection switching and service disruption time measurements
- Round-trip delay measurements
- Dual DS1/DS3 receiver testing
- Independent transmitter and receiver testing
- Through mode analysis
- DS1 FDL and loopcodes
- Fractional T1/E1 testing
- Tandem connection monitoring

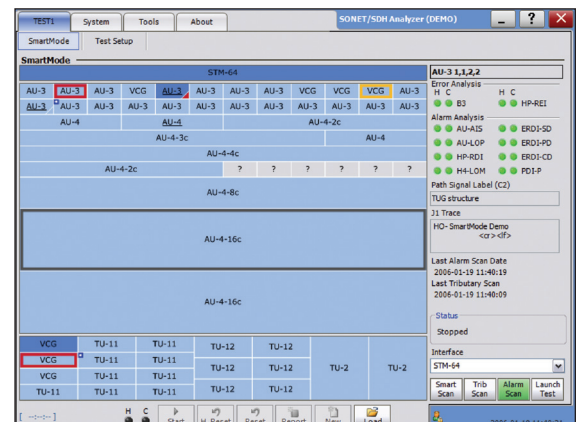


Housed in either the FTB-400 or FTB-200 platform, the FTB-8115 module enables field circuit turn-up and troubleshooting.

## SmartMode: Real-Time Signal Structure Discovery and Monitoring

EXFO's FTB-8115 Transport Blazer supports a unique feature called SmartMode. This provides users with full visibility of all high-order (STS/AU) and low-order (VT/TU) mixed mappings within the incoming SONET/SDH test signal.

SmartMode automatically discovers the signal structure of the OC-*n*/STM-*n* line, including mixed mappings. In addition to this in-depth multichannel visibility, SmartMode performs real-time monitoring of all discovered high-order paths and user selected low-order paths simultaneously, providing users with the industry's most powerful SONET/SDH multichannel monitoring and troubleshooting solution. Real-time monitoring allows users to easily isolate network faults, saving valuable time and minimizing service disruption. SmartMode also provides one-touch test case start, allowing users to quickly configure a desired test path.



FTB-8115 SmartMode: multichannel signal discovery with real-time alarm scan (shown in the FTB-400 user interface).

# Unsurpassed Configuration and Operational Flexibility

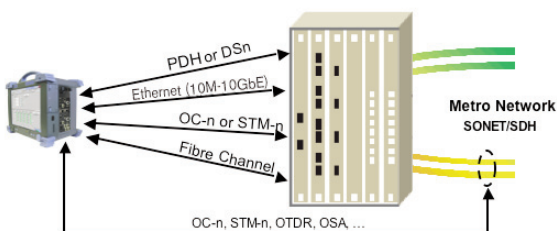
## Multiplatform Support and Versatility

The FTB-8115 Transport Blazer module is supported and interchangeable on both the FTB-400 Universal Test System and the FTB-200 Compact Platform. This cross-platform support provides users with added flexibility by enabling them to select the appropriate platform that suits their testing needs. EXFO is the first and only test solution provider to offer this versatility, delivering single to multi-application test solutions with the same hardware module, which in turn dramatically reduces capital expenditures.

Inserted in the FTB-200 Compact Platform, the FTB-8115 Transport Blazer module delivers SONET/SDH test functions in a small, lightweight platform, ideal for field technicians' installation and commissioning needs. When combined with the FTB-200's optional integrated high-precision power meter, visual fault locator and fiber scope, this solution provides all the critical test tools required for day-to-day activities, eliminating the need to carry and manage multiple test sets.



The FTB-8115 module is supported on both the FTB-200 and the FTB-400 platforms.



With its modular, multislot design, the FTB-400 platform enables users to configure and upgrade their systems in the field according to their testing needs, minimizing capital expenditures.

## Automated Test Scripting

When configured for the FTB-400 platform, the FTB-8115 Transport Blazer comes with a built-in macrorecorder, allowing users to easily record their test actions and automatically create test scripts. This also allows them to build standard test routines that can be easily accessed and run by field technicians with little or no manual intervention.

## Test Logger and Reporting

EXFO's FTB-8115 Transport Blazer module supports a detailed test logger and test reporting tools, enabling users to view any errors/alarms that occurred during the test interval, which can then be used for post-processing of results or SLA conformance validation.

The FTB-400 platform configuration—used with either the four-slot (GP-404) or eight-slot (GP-408) receptacle—provides users with an all-in-one solution supporting a mix of Transport Blazer modules, Packet Blazer modules (FTB-8510G 10 Gigabit Ethernet, FTB-8510B Ethernet, FTB-8520 Fibre Channel) and optical-layer test modules, making it the industry's first truly integrated network testing platform. The resulting modularity enables users to upgrade their systems in the field according to their testing needs. This multiservice test platform is the ideal solution for field, central office and lab applications.

## Hardware Upgradability

Part of the Transport Blazer family of products, the FTB-8115 module can be factory upgraded to support 10 Gbit/s operation. In addition, the upgrades can include Next-Generation Ethernet-over-SONET/SDH test functions, such as generic framing procedure (GFP), virtual concatenation (VCAT) and link capacity adjustment scheme (LCAS).

## Remote Management

The FTB-8115 Transport Blazer module allows users to perform remote testing and data analysis, as well as remote monitoring via standard Ethernet or remote dial-up connections.

Total Events				
17				View Details
ID	Date/Time	Data Path	Event	Duration
1	00:00:00	TEST 1	StartEvent	
2	00:00:01	Optical	AlarmLos	00:01:31
3	00:00:01	STS-1	AlarmLop	00:00:01
4	00:01:32	OC-12	AlarmLoF	00:00:01
5	00:01:53	Optical	AlarmFrequency	00:00:08
6	00:02:13	STS-1	AlarmLoF	00:00:01
7	00:02:13	OC-12	AlarmLoF	00:00:05
8	00:03:34	STS-1	ErrorB3	00:00:05
9	00:03:49	STS-1	AlarmAis	00:00:09
10	00:06:46	STS-1	ErrorB3	00:00:01
11	00:07:36	OC-12	ErrorB1	00:00:06
12	00:07:42	STS-1	AlarmLoF	00:00:01
13	00:07:42	OC-12	AlarmLoF	00:00:03
14	00:07:54	STS-1	AlarmLoF	00:00:01
15	00:07:54	OC-12	AlarmLoF	00:00:02
16	00:08:02	STS-1	AlarmLoF	00:00:01
17	00:08:02	OC-12	AlarmLoF	Pending.

Test logger: a detailed, time-stamped list of all events occurring during test execution.

# Electrical Interfaces

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

	DS1	E1/2M	E2/8M	E3/34M	DS3/45M	STS-1e/STM-0e/52M	E4/140M	STS-3e/STM-1e/155M			
<b>Tx Pulse Amplitude</b>	2.4 to 3.6 V	3.0 V	2.37 V	2.37 V	1.0 ± 0.1 V	0.36 to 0.85 V	1.0 ± 0.1 Vpp	0.5 V			
<b>Tx Pulse Mask</b>	GR-499 Figure 9.5	G.703 Figure 15	G.703 Figure 15	G.703 Figure 16	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 4-14/22, 23
<b>Tx LBO Preamplification</b>	Power dBdsx +0.6 dBdsx (0-133 ft) +1.2 dBdsx (133-266 ft) +1.8 dBdsx (266-399 ft) +2.4 dBdsx (399-533 ft) +3.0 dBdsx (533-655 ft)					0 to 225 ft 225 to 450 ft	0 to 225 ft 225 to 450 ft	0 to 225 ft			
<b>Cable Simulation</b>	Power dBdsx -22.5 dBdsx -15.0 dBdsx -7.5 dBdsx 0 dBdsx					450 to 900 (927) ft	450 to 900 (927) ft				
<b>Rx Level Sensitivity</b>	For 772 kHz: TERM: ≤ 26 dB (cable loss only) at 0 dBdsx Tx DSXMON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB) Bridge: ≤ 6 dB (cable loss only) Note: measurement units = dBdsx	For 1024 kHz: TERM: ≤ 6 dB (cable loss only) MON: ≤ 25 dB (20 dB resistive loss + cable loss ≤ 6 dB) Bridge: ≤ 6 dB (cable loss only) Note: measurement units = dBm	For 1024 kHz: TERM: ≤ 6 dB (cable loss only) MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB) Bridge: ≤ 6 dB (cable loss only) Note: measurement units = dBm	For 4224 kHz: TERM: ≤ 6 dB (cable loss only) MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB) Note: measurement units = dBm	For 17.184 MHz: TERM: ≤ 12 dB (coaxial cable loss only) MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB) Note: measurement units = dBm	For 22.368 MHz: TERM: ≤ 10 dB (cable loss only) DSXMON: ≤ 26.5 dB (21.5 dB resistive loss + cable loss ≤ 5 dB) Note: measurement units = dBm	For 25.92 MHz: TERM: ≤ 10 dB (cable loss only) MON: ≤ 25 dB (20 dB resistive loss + cable loss ≤ 5 dB) Note: measurement units = dBm	For 70 MHz: TERM: ≤ 12 dB (coaxial cable loss only) MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB) Note: measurement units = dBm	For 78 MHz: TERM: ≤ 12.7 dB (coaxial cable loss only) MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB) Note: measurement units = dBm		
<b>Transmit Bit Rate</b>	1.544 Mbit/s ± 4.6 ppm	2.048 Mbit/s ± 4.6 ppm	2.048 Mbit/s ± 4.6 ppm	8.448 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		
<b>Receive Bit Rate</b>	1.544 Mbit/s ± 140 ppm	2.048 Mbit/s ± 100ppm	2.048 Mbit/s ± 100ppm	8.448 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		
<b>Measurement Accuracy</b>	<b>Frequency</b>	± 4.6 ppm	± 4.6 ppm	± 4.6 ppm	± 4.6 ppm	± 4.6 ppm	± 4.6 ppm	± 4.6 ppm	± 4.6 ppm		
	<b>Electrical Power</b>	DSX range: ± 1.0 dB DSXMON range: ± 2.0 dB	NORMAL: ± 1.0 dB MONITOR: ± 2.0 dB	NORMAL: ± 1.0 dB MONITOR: ± 2.0 dB	NORMAL: ± 1.0 dB MONITOR: ± 2.0 dB	NORMAL: ± 1.0 dB MONITOR: ± 2.0 dB	DSX range: ± 1.0 dB DSXMON range: ± 2.0 dB	DSX range: ± 1.0 dB DSXMON range: ± 2.0 dB	NORMAL: ± 1.0 dB MONITOR: ± 2.0 dB	NORMAL: ± 1.0 dB MONITOR: ± 2.0 dB	
<b>Peak-to-Peak Voltage</b>	±10% down to 500 mVpp	±10% down to 500 mVpp	±10% down to 500 mVpp	±10% down to 400 mVpp	±10% down to 200 mVpp	±10% down to 200 mVpp	±10% down to 200 mVpp	±10% down to 200 mVpp	±10% down to 200 mVpp		
<b>Frequency Offset Generation</b>	1.544 Mbit/s ± 140 ppm	2.048 Mbit/s ± 70 ppm	2.048 Mbit/s ± 70 ppm	8.448 Mbit/s ± 50 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		
<b>Intrinsic Jitter (Tx)</b>	ANSI T1.403 section 6.3 GR-499 section 7.3	G.823 section 5.1	G.823 section 5.1	G.823 section 5.1	G.823 section 5.1 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 GR-253 section 5.6.2.2		
<b>Input Jitter Tolerance</b>	AT&T PUB 62411 GR-499 section 7.3	G.823 section 7.1	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 G.751 section 3.3	G.825 section 5.2 GR-253 section 5.6.2.3		
<b>Line Coding</b>	AMI and B8ZS	AMI and HDB3	AMI and HDB3	HDB3	HDB3	B3ZS	B3ZS	CM1	CM1		
<b>Input Impedance (Resistive Termination)</b>	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 ± 5%, unbalanced	75 ohms ± 10%, unbalanced	75 ohms ± 5%, unbalanced		
<b>Connector Type</b>	BANTAM and RJ-48C	BANTAM and RJ-48C	BNC	BNC	BNC	BNC	BNC	BNC	BNC		

## SYNCHRONIZATION INTERFACES

	External Clock DS1/1.5M	External Clock E1/2M	External Clock E1/2M	2 MHz
<b>Tx Pulse Amplitude</b>	2.4 to 3.6 V	3.0 V	2.37 V	0.75 to 1.5 V
<b>Tx Pulse Mask</b>	GR-499 figure 9.5	G.703 figure 15	G.703 figure 15	G.703 figure 20
<b>Tx LBO Preamplification</b>	Typical power dBdsx +0.6 dBdsx (0-133 ft) +1.2 dBdsx (133-266 ft) +1.8 dBdsx (266-399 ft) +2.4 dBdsx (399-533 ft) +3.0 dBdsx (533-655 ft)			
<b>Rx Level Sensitivity</b>	TERM: ≤ 6 dB (cable loss only) (at 772 KHz for T1) DSXMON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB) Bridge: ≤ 6 dB (cable loss only)	TERM: = ≤ 6 dB (cable loss only) MON: ≤ 26 dB (20 dB resistive loss + cable loss ≤ 6 dB) Bridge: ≤ 6 dB (cable loss only)	TERM: = ≤ 6 dB (cable loss only) MON: ≤ 26 dB (resistive loss + cable loss ≤ 6 dB) Bridge: ≤ 6 dB (cable loss only)	≤ 6 dB (cable loss only)
<b>Transmission Bit Rate</b>	1.544 Mbit/s ± 4.6 ppm	2.048 Mbit/s ± 4.6 ppm	2.048 Mbit/s ± 4.6 ppm	
<b>Reception Bit Rate</b>	1.544 Mbit/s ± 140 ppm	2.048 Mbit/s ± 100 ppm	2.048 Mbit/s ± 100 ppm	
<b>Intrinsic Jitter (Tx)</b>	ANSI T1.403 section 6.3 GR-499 section 7.3	G.823 section 6.1	G.823 section 6.1	G.703 table 11
<b>Input Jitter Tolerance</b>	AT&T PUB 62411 GR-499 SECTION 7.3	G.823 section 7.2 G.813	G.823 section 7.2 G.813	
<b>Line Coding</b>	AMI and B8ZS	AMI and HDB3	AMI and HDB3	
<b>Input Impedance (Resistive Termination)</b>	75 ohms ± 5%, unbalanced	75 ohms ± 5%, unbalanced	75 ohms ± 5%, unbalanced	75 ohms ± 5%, unbalanced
<b>Connector Type</b>	BNC <sup>a</sup>	BNC <sup>a</sup>	BNC	BNC

**Note**

a. Adaptation cable required for BANTAM.

## Optical Interfaces

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

	OC-3/STM-1o				OC-12/STM-4o				OC-48/STM-16o				
	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	
Level Tx	-5 to 0 dBm	-2 to +3 dBm	-5 to 0 dBm	-2 to +3 dBm	-5 to 0 dBm	-2 to +3 dBm	-5 to 0 dBm	-2 to +3 dBm	-5 to 0 dBm	-2 to +3 dBm	-5 to 0 dBm	-2 to +3 dBm	
Rx Level Sensitivity	-18 to 0 dBm	-27 to -9 dBm	-18 to 0 dBm	-28 to -9 dBm	-18 to 0 dBm	-27 to -9 dBm	-18 to 0 dBm	-28 to -9 dBm	-18 to 0 dBm	-27 to -9 dBm	-18 to 0 dBm	-28 to -9 dBm	
Transmit Bit Rate	155.52 Mbit/s ± 4.6 ppm				622.08 Mbit/s ± 4.6 ppm				2.48832 Gbit/s ± 4.6 ppm				
Receive Bit Rate	155.52 Mbit/s ± 100 ppm				622.08 Mbit/s ± 100 ppm				2.48832 Gbit/s ± 100 ppm				
Operational Wavelength Range	1260 to 1360 nm		1430 to 1580 nm		1274 to 1356 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 from center)				< 1 nm (-20 dB from center)				< 1 nm (-20 dB from center)				
Frequency Offset Generation	155.52 Mbit/s ± 50 ppm				622.08 Mbit/s ± 50 ppm				2.48832 Gbit/s ± 50 ppm				
Measurement Accuracy	Frequency	± 4.6 ppm				± 4.6 ppm				± 4.6 ppm			
	Optical Power	± 2 dB				± 2 dB				± 2 dB			
Maximum Rx before damage <sup>a</sup>	± 3 dB				± 3 dB				± 3 dB				
Jitter Compliance	G.957 (SDH) GR-253 (SONET) G.958 (SDH)				GR-253 (SONET) G.958 (SDH)				GR-253 (SONET) G.958 (SDH)				
Line Coding	NRZ				NRZ				NRZ				
Eye Safety	SFP/XFP transceivers comply with IEC 60825 and 21 CFR 1040.10 (except for deviations pursuant to Laser Notice No. 50, dated July 2001), for Class 1 or 1M lasers.												
Connector <sup>b</sup>	Dual LC				Dual LC				Dual LC				
Transceiver Type	SFP				SFP				SFP				

### Notes

- a. In order not to exceed the maximum receiver power level before damage, an attenuator must be used.
- b. SFP compliance: The FTB-8115 selected SFP shall meet the requirements stated in the "Small Form-Factor Pluggable (SFP) Transceiver Multisource Agreement (MSA)".  
The FTB-8115 selected SFP shall meet the requirements stated in the "Specification for Diagnostic Monitoring Interface for Optical Xcvrs".

FUNCTIONAL SPECIFICATIONS

SONET and DSn		SDH and PDH	
<b>Optical interfaces</b>	OC-3, OC-12, OC-48	<b>Optical interfaces</b>	STM-1, STM-4, STM-16
Available wavelengths (nm)	1310, 1550	Available wavelengths (nm)	1310, 1550
<b>Electrical interfaces</b>	DS1, DS3, STS-1e, STS-3e	<b>Electrical interfaces<sup>a</sup></b>	1.5M (DS1), 2M (E1), 8M (E2), 34M (E3), 45M (DS3), 140M (E4), STM-0e, STM-1e
DS1 framing	Unframed, SF, ESF	2M framing	Unframed, PCM30, PCM31, PCM30 CRC-4, PCM31 CRC-4
DS3 framing	Unframed, M13, C-bit parity	8M, 34M, 140M framing	Unframed, framed
Clocking	Internal, loop-timed, external (BITS), inter-module	Clocking	Internal, loop-timed, external (MTS/SETS), 2 MHz, inter-module
<b>Mappings</b>		<b>Mappings</b>	
VT1.5	Bulk, DS1	TU-11-AU-3, TU-11-AU-4	Bulk, 1.5M
VT2	Bulk, E1	TU-12-AU-3, TU-12-AU-4	Bulk, 2M
VT6	Bulk	TU-3-AU-4	Bulk, 34M, 45M
STS-1	Bulk, DS3	TU-2-AU-3, TU-2-AU-4	Bulk
STS-3c/6c/9c/12c/24c/48c	Bulk	AU-4	Bulk, 140M
		AU-4-2c/3c/4c/8c/16c	Bulk
<b>SONET overhead analysis and manipulation</b>	A1, A2, J0, E1, F1, D1-D12, K1, K2, S1, M0, E2, J1, C2, G1, F2, H4, Z3, Z4, Z5, N1, N2	<b>SDH overhead analysis and manipulation</b>	A1, A2, J0, E1, F1, D1-D12, K1, K2, S1, M0, E2, J1, C2, G1, F2, F3, K3, N1, N2
<b>Error insertion</b>		<b>Error insertion</b>	
DS1	Framing bit, BPV, CRC-6, bit error	E1 (2M)	FAS, CV, CRC-4, E-bit, bit error
DS3	BPV, C-bit, F-bit, P-bit, FEBE, bit error	E2 (8M), E3 (34M), E4 (140M)	FAS, CV, bit error
STS-1e, STS-3e	Section BIP (B1), line BIP (B2), path BIP (B3), BIP-2, REI-L, REI-P, REI-V, BPV, 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, bit error
OC-3, OC-12, OC-48	Section BIP (B1), line BIP (B2), path BIP (B3), BIP-2, REI-L, REI-P, REI-V, bit error	STM-1, STM-4, STM-16	RS-BIP (B1), MS-BIP (B2), HP-BIP (B3), MS-REI, HP-REI, LP-BIP-2, LP-REI, bit error
<b>Error measurement</b>		<b>Error measurement</b>	
DS1	Framing bit, BPV, CRC-6, excess zeros, bit error	E1 (2M)	FAS, CV, CRC-4, E-bit, bit error
DS3	BPV, C-bit, F-bit, P-bit, FEBE, bit error	E2 (8M), E3 (34M), E4 (140M)	FAS, CV, bit error
STS-1e, STS-3e	Section BIP (B1), line BIP (B2), path BIP (B3), BIP-2, REI-L, REI-P, REI-V, BPV, 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, bit error
OC-3, OC-12, OC-48	Section BIP (B1), line BIP (B2), path BIP (B3), BIP-2, REI-L, REI-P, REI-V, bit error	STM-1, STM-4, STM-16	RS-BIP (B1), MS-BIP (B2), HP-BIP (B3), MS-REI, HP-REI, LP-BIP-2, LP-REI, bit error
<b>Alarm insertion</b>		<b>Alarm insertion</b>	
DS1	LOS, RAI, AIS, OOF, pattern loss	E1 (2M)	LOS, LOS Mframe, LOS CRC 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	LOS, LOF, 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	LOS, LOF, OOF, MS-AIS, MS-RDI, AU-AIS, AU-LOP, H4-LOM, HP-PDI, ERDI-PSD, ERDI-PCD, ERDI-PPD, HP-UNEQ, TU-AIS, LP-RFI, LP-RDI, ERDI-VCD, ERDI-VPD, ERDI-VSD, LP-RFI, LP-UNEQ, pattern loss
<b>Alarm detection</b>		<b>Alarm detection</b>	
DS1	LOS, loss of clock (LOC), RAI, AIS, OOF, pattern loss	E1 (2M)	LOS, LOS Mframe, LOS CRC 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	LOS, LOC, LOF, SEF, TIM-S, AIS-L, RDI-L, AIS-P, LOP-P, LOM, PDI-P, RDI-P, ERDI-PCD, ERDI-PPD, ERDI-PSD, PLM/SLM-P, UNEQ-P, TIM-P, AIS-V, LOP-V, RDI-V, ERDI-VCD, ERDI-VPD, ERDI-VSD, RFI-V, UNEQ-V, TIM-V, PLM/SLM-V, pattern loss	STM-0e, STM-1e, STM-1, STM-4, STM-16	LOS, LOF, LOC, OOF, RS-TIM, MS-AIS, MS-RDI, AU-AIS, AU-LOP, H4-LOM, HP-RDI, ERDI-PSD, ERDI-PCD, ERDI-PPD, HP-PLM/SLM, HP-UNEQ, HP-TIM, TU-AIS, LP-RFI, LP-RDI, ERDI-VCD, ERDI-VPD, ERDI-VSD, LP-RFI, LP-UNEQ, LP-TIM, LP-PLM/SLM, pattern loss
<i>Frequency alarm on all supported interfaces.</i>			
<b>Patterns</b>		<b>Patterns</b>	
DS0	2E9-1, 2E11-1, 2E20-1, User defined	E0 (64K)	2E9-1, 2E11-1, 2E20-1, User defined
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, QRSS, 1-in-8, 1-in-16, 3-in-24, 32 bit programmable (inverted or non-inverted), bit errors	E2 (8M), 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 <sup>b</sup> , 32 bit programmable (inverted or non-inverted), bit errors
VT1.5/2/6	2E9-1, 2E11-1, 2E15-1, 2E20-1, 2E23-1, 2E31-1, 1100, 1010, 1111, 0000, QRSS, 1-in-8, 1-in-16, 32 bit programmable (inverted or non-inverted), bit errors	TU-11/12/2/3	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/6c/9c/12c/24c/48c	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/AU4-2c/3c/4c/8c/16c	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

*LSS (loss of pattern) 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).

## ADDITIONAL TEST AND MEASUREMENT FUNCTIONS

<b>Power measurements</b>	Supports power measurements, displayed in dBm (dBdsx for DS1), for optical and electrical interfaces.
<b>Frequency measurements</b>	Supports clock frequency measurements (i.e., received frequency and deviation of the input signal clock from nominal frequency), displayed in ppm and b/s (bps), for optical and electrical interfaces.
<b>Frequency offset generation</b>	Supports offsetting the clock of the transmitted signal on a selected interface to exercise clock recovery circuitry on network elements.
<b>Dual DS<sub>n</sub> receivers</b>	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-8115.

ITU-T recommendation	Performance monitoring statistics
G.821	ES, EFS, EC, SES, UAS, ESR, SESR, DM
G.826	ES, EFS, EB, SES, BBE, UAS, ERS, SESR, BBER
G.828	ES, EFS, EB, SES, BBE, SEP, UAS, ESR, SESR, BBER, SEPI
G.829	ES, EFS, EB, SES, BBE, UAS, ESR, SESR, BBER
M.2100	ES, SES, UAS, ESR, SESR
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.703

Generation	Analysis
<ul style="list-style-type: none"> <li>• Pointer increment and decrement</li> <li>• Pointer jump with or without NDF</li> <li>• Pointer value</li> </ul>	<ul style="list-style-type: none"> <li>• Pointer increments</li> <li>• Pointer decrements</li> <li>• Pointer jumps (NDF, no NDF)</li> <li>• Pointer value and cumulative offset</li> </ul>

<b>Service disruption time measurements</b>	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.
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<b>Round-trip delay measurements</b>	The round-trip delay test tool measures the time required for a bit to travel from the FTB-8115 transmitter back to its receiver after crossing a far-end loopback. Measurements are supported on all supported FTB-8115 interfaces and mappings. Measurements: last RTD time, minimum, maximum, average, measurement count (no. of successful RTD tests), failed measurement count.
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<b>APS message control and monitoring</b>	Ability to monitor and set up automatic protection switching messages (K1/K2 byte of SONET/SDH overhead).
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<b>Synchronization status</b>	Ability to monitor and set up synchronization status messages (S1 byte of SONET/SDH overhead).
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<b>Signal label control and monitoring</b>	Ability to monitor and set up payload signal labels (C2, V5 bytes of SONET/SDH overhead).
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<b>Through mode</b>	Ability to perform Through mode analysis of any incoming electrical (DS <sub>n</sub> , PDH) and optical line (OC-3/12/48, STM-1/4/16).
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<b>M13 mux/demux</b>	Ability to multiplex/demultiplex a DS1 signal into/from a DS3 signal. (Note: E1 to DS3 mux/demux available with G.747 software option.)
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<b>DS1 FDL</b>	Support for DS1 Facility Data Link testing.
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<b>DS1 loopcodes</b>	Support for generation of DS1 in-band loopcodes.
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<b>Tandem connection monitoring (TCM)<sup>a</sup></b>	Tandem connection monitoring (TCM), option 2 <sup>b</sup> , is used to monitor the performance of a subsection of a SONET/SDH path routed via different network providers. The FTB-8115 supports transmitting and receiving alarms and errors on a TCM link; also, transmission and monitoring of the tandem connection (TC) trace can be generated to verify the connection between TCM equipment.
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Error generation: TC-IEC, TC-BIP, TC-REI, OEI

Error analysis: TC-IEC, TC-REI, OEI, TC-VIOL

Alarm generation: TC-RDI, TC-UNEQ, ODI, TC-LTC, TC-IAIS

Alarm analysis: TC-TIM, TC-RDI, TC-UNEQ, ODI, TC-LTC, TC-IAIS

## ADDITIONAL FEATURES

<b>Scripting</b>	The built-in scripting engine and embedded macro-recorder provide a simple means of automating test cases and routines. Embedded scripting routines provide a powerful means of creating advanced test scripts. Available for the FTB-400 platform.
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<b>Reports</b>	Supports generation of test reports in .html, .csv, .txt, .pdf formats. Contents or reports are customizable by the user.
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<b>Power-up and restore</b>	In the event of a power failure to the unit, the active test configuration and test logger are saved and restored upon bootup.
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<b>Store and load configurations</b>	Ability to store and load test configurations to/from non-volatile memory.
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<b>Alarm hierarchy</b>	Alarms are displayed according to a hierarchy based on root cause. Secondary effects are not displayed. This hierarchy serves to facilitate alarm analysis.
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<b>Configurable test views</b>	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.
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<b>Configurable test timer</b>	Provides the ability for a user to set pre-defined test start and stop times.
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<b>Remote control</b>	Remote management software. This allows users to remotely monitor and control the FTB-8115 module via standard Ethernet connection.
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### Notes

a. HOP and LOP supported.

b. G.707 option 2.

### SPECIFICATIONS

#### FTB-8115

SONET/SDH 155 Mbit/s, 622 Mbit/s and 2.5 Gbit/s  
Analyzer module supporting up to OC-48/STM-16 optical rates, as well as electrical DSn/PDH interfaces

#### Test Interfaces

SONET: STS-1e, STS-3e, OC-3, OC-12, OC-48  
SDH: STM-0e, STM-1e, STM-1, STM-4, STM-16  
DSn: DS1, DS3, Dual DS1 Rx, Dual DS3 Rx  
PDH: E1, E2, E3, E4

### GENERAL SPECIFICATIONS

FTB-8115	
Weight (without transceiver)	0.9 kg (2.0 lb)
Size (H x W x D)	51 mm x 96 mm x 288 mm (2 in x 3 3/4 in x 11 3/8 in)
Temperature	
operating	0 °C to 40 °C (32 °F to 104 °F)
storage	-40 °C to 60 °C (-40 °F to 140 °F)

### ORDERING INFORMATION

#### FTB-8115-XX-XX-XX-XX

#### Model ■

#### Test options ■

SONET = SONET-BASE-SW  
SDH = SDH-BASE-SW  
SONET-SDH = Option for combined SONET/SDH functionality

#### Rate options ■

155 = 155 Mbit/s (OC-3/STM-1)  
622 = 622 Mbit/s (OC-12/STM-4)  
2.5G = 2.5 Gbit/s (OC-48/STM-16)

#### Example

FTB-8115-SONET-155-622-8194-DUAL RX

#### Options <sup>a</sup>

G.747 <sup>b</sup>  
DS1-FDL  
DUAL RX  
TCM = Tandem connection monitoring  
Smart mode

#### Test options

00 = Without SFP modules  
8190 = SFP modules 155 Mbit/s to 2.7 Gbit/s at 1310 nm, 15 km  
8191 = SFP modules 155 Mbit/s to 2.7 Gbit/s at 1310 nm, 40 km  
8192 = SFP modules 155 Mbit/s to 2.7 Gbit/s at 1550 nm, 80 km  
8193 = SFP modules 155 Mbit/s to 2.7 Gbit/s at 1550 nm, 40 km  
8194 = SFP modules 155/622 Mbit/s at 1310 nm, 15 km  
8195 = SFP modules 155/622 Mbit/s at 1310 nm, 40 km  
8196 = SFP modules 155/622 Mbit/s at 1550 nm, 80 km

#### Notes

- Multiple options can be purchased to suit the required test application.
- Enables E1/2M in DS3/45M analysis and generation, as per ITU-T G.747 recommendation.

## Complementary Products

### FTB-8080 Sync Analyzer


The FTB-8080 Synchron Analyzer is a comprehensive test solution for telecom network synchronization assurance, monitoring and troubleshooting applications. It offers a full range of wander and sync testing functionalities, including graphical display of TIE, MTIE and TDEV parameters, as well as comparison to ITU/ANSI/TS standards and user-definable masks. The companion Sync View software suite allows remote data retrieval and test case setup, eliminating the need to visit test sites during prolonged monitoring periods. The FTB-8080 can be used in conjunction with the FTB-8105, FTB-8115 and/or FTB-8120/8130 modules to provide wander measurements up to OC-192/STM-64 rates.

For more information on the FTB-8080, please refer to its detailed product specification sheet at <http://documents.EXFO.com/specsheets/FTB-8080-ang.pdf>

### FTB-8120/8130 Transport Blazer Next-Generation SONET/SDH Test Modules


The FTB-8120 (2.5/2.7 Gbit/s) and FTB-8130 (10/10.7 Gbit/s) Transport Blazer test modules combine advanced DSn/PDH, SONET/SDH, next-generation SONET/SDH and optical transport network (OTN) test functions, eliminating the need for multiple purpose-built test platforms when commissioning or troubleshooting SONET/SDH, OTN and new data-aware SONET/SDH circuits. These modules offer DS0/E0 to OC-192/STM-64 testing in a single unit, and they perform Ethernet-over-SONET/SDH (EoS) testing via optional support for GFP, VCAT and LCAS. Thanks to the SmartMode functionality, they also enable signal structure discovery for rates of up to 10 Gbit/s, with simultaneous monitoring of all discovered STS/AU and user selected VT/TU channels.

For details on the FTB-8120/8130 modules, please refer to the detailed product specification sheet at <http://documents.EXFO.com/specsheets/FTB-8120-8130-ang.pdf>



**Rugged Handheld Solutions**

<ul style="list-style-type: none"> <li>— OPTICAL</li> <li>— OTDRs</li> <li>— OLTSs</li> <li>— Power meters</li> <li>— Light sources</li> <li>— Talk sets</li> </ul>	<ul style="list-style-type: none"> <li>— COPPER ACCESS</li> <li>— ADSL/ADSL2+, SHDSL, VDSL test sets</li> <li>— VoIP and IPTV test sets</li> <li>— Ethernet test sets</li> <li>— POTS test sets</li> </ul>
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**Platform-Based Solutions**

<ul style="list-style-type: none"> <li>— OPTICAL FIBER</li> <li>— OTDRs</li> <li>— OLTSs</li> <li>— ORL meters</li> <li>— Variable attenuators</li> </ul>	<ul style="list-style-type: none"> <li>— DWDM TEST SYSTEMS</li> <li>— OSAs</li> <li>— PMD analyzers</li> <li>— Chromatic dispersion analyzer</li> </ul>	<ul style="list-style-type: none"> <li>— TRANSPORT AND DATACOM</li> <li>— Next-generation SONET/SDH and OTN testers</li> <li>— SONET/DSn (DS0 to OC-192) testers</li> <li>— SDH/PDH (64 kbit/s to STM-64) testers</li> <li>— T1/T3, E1 testers</li> <li>— 10/100 Mbit/s and Gigabit Ethernet testers</li> <li>— Fibre Channel testers</li> <li>— 10 Gigabit Ethernet testers</li> </ul>
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