

## JDSU FST-2510a TestPad

### High-Speed Optical Analyzer



#### Key Features

- Smallest and lightest solution for DS1 to 10-Gbps testing at 13 lb
- Optical testing at OC-3/12/48/192, STM-1/4/16/64, and electrical testing at E1/DS1/DS3/STS-1 rates
- Configurable for 1310 nm, 1550 nm or both wavelengths for 10-Gbps and 2.5G/622M/155M test interfaces
- SONET and SDH tributary mappings analysis from STS-192c to DS1 and AU-4-64c to AU-3
- Terminate, Monitor, and Through modes of operation to analyze circuits
- Easy-to-use touch screen and graphical user interface (GUI) simplifies and expedites testing

The JDSU FST-2510a TestPad, formerly known as the JDSU 10-Gigabit Services Module (2510), is an all-in-one test solution that performs multi-rate transmission testing in metro networks at SONET, SDH and T/E-carrier. Its scalable configuration and upgradeability to multiple technologies accommodates evolving test needs now and in the future.

Designed for mobile use, the rugged FST-2510a provides DS1 to 10-Gbps capability in a conveniently sized package for mobile applications and comprehensive test capability for in-depth central office testing.

The breadth of testing functionality that the FST platform supports illustrates why it is the standard for metro networks. Providers can now test T/E-carrier, wireless, Ethernet, SONET/SDH, DWDM, copper and DSL technologies with one standard platform.

## Features

In metro networks, the increasing deployment of high-speed optical services and multiservice provisioning platforms has created the need for a compact, multirate, transmission test solution. The FST-2510a enables the efficient turn-up and maintenance of these networks

### DS1/E1 to 10-Gbps BER testing

Perform BER testing on all line interfaces in end-to-end or loopback applications. Insert errors and alarms to verify network element conformance and connectivity. Measure bit error rate to ensure quality of service.

### Overhead byte manipulation

Using the overhead byte manipulation and analysis capabilities of the FST-2510a, technicians can modify K1 and K2 bytes to test APS; specify and identify user-configurable path trace messages and payloads.

### Round-trip delay

Immediately identify network latency with the round-trip delay pattern, at all line rates.

### Through mode capability

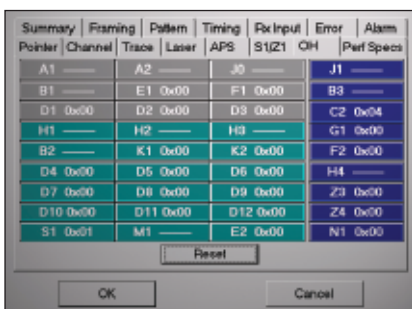
Access to SONET/SDH circuits can be gained even when no test access is provided. Through mode capability at all rates allows advanced SONET/SDH circuits to be monitored nonintrusively by channeling network traffic through the FST-2510a.

### Signal power and transmit frequency variation

Optical power and transmit frequency offset ensure that received signals are within acceptable error limits and network elements' thresholds are within manufacturers' specifications.

### VT100 emulation

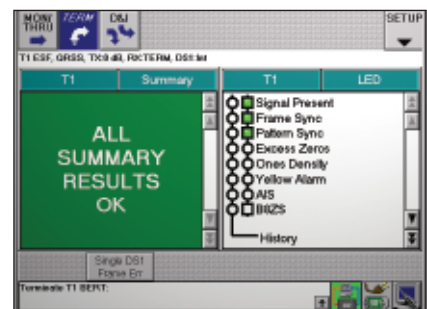
Direct connection to network elements allows users to provision network elements and monitor available statistics.



SOH expert setup menu



SONET OC-192 test with path trace message displayed



DS1 test results summary and LED display

## Applications

The FST-2510a offers an easy-to-use intuitive interface that streamlines the process of analyzing DS1 to 10G signals.

### Turn-up and maintain OC-192/STM-64 rings and tributary service

As OC-192/STM-64 rings are deployed to carry traffic along capacity-starved routes, technicians can qualify SONET/SDH rings and tributary services with a traffic-simulating BERT pattern. The FST-2510a also tests lower-rate tributaries running within the OC-192/STM-64 ring, including STS-48/12/3, AU-4-16c to AU-3, STS-1/DS3, and DS1/E1.

### Qualify 10-gigabit signals over DWDM networks

When DWDM networks are deployed, wavelengths carrying a 10-gigabit SONET/SDH link must be qualified for traffic. Qualify channels by using the FST-2510a to terminate test patterns over each wavelength via a BER test.

### Verify end-to-end network performance

The FST-2510a stresses the SONET/SDH link under test through a pseudorandom BER test pattern (a randomized bit sequence that simulates live data), offering  $2^{23}-1$  and  $2^{31}-1$  BERT patterns.

### Perform network analysis under simulated abnormal conditions

Generate and analyze a comprehensive range of errors and alarms to simulate abnormal conditions.

### Conduct in-service monitoring of optical and electrical signals

Monitor/Through mode allows visibility into the SONET/SDH signal while it carries revenue-generating customer traffic. Troubleshoot and sectionalize network problems by analyzing the overhead and payload – without incurring costs for downtime.

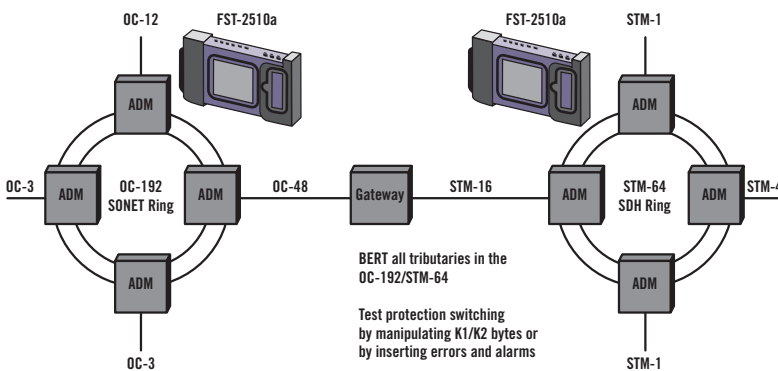


figure 1 Test tributaries inside 10-Gig signal

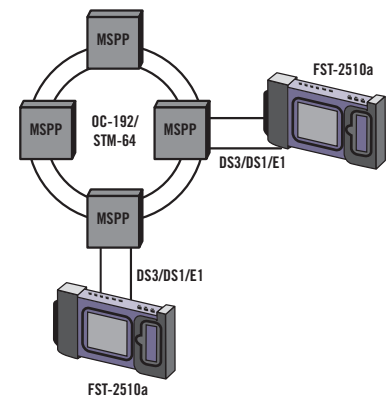


figure 2 End-to-end network performance

**Specifications**

**General specifications**

Overall dimensions	8.5 x 13.5 x 5.0 in (21.6 x 34.3 x 12.7 cm)
Overall weight	13 lb (5.7 kg), with battery

**Environment**

Operating temperature range	32° to 104°F 0° to 40°C
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Storage	-4° to 158°F, -20° to 70°C
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Shock and vibration	Meets IEEE-743
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**Power requirements**

AC adapter	24 VDC, 5.4 amps 100 to 240 VAC, 47 to 63 Hz
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**Display**

6-inch diagonal graphic LCD color	
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**Optical specifications for OC-192/STM-64**

**Optical connectors**

1 10-Gig Receive – FC or SC
1 1310 nm 10-Gig transmit – FC or SC
1 1550 nm 10-Gig transmit – FC or SC

**Transmitter**

Singlemode fiber compatible	
Wavelength	1310 nm and/or 1550 nm
Clock frequency accuracy	±3 ppm
1310 nm power TX output	-1.0 dBm to -6.0 dBm
1550 nm power TX output	+2 dBm to -1 dBm

**Receiver**

Singlemode/multimode fiber compatible	
Rx wavelength range	1100 to 1600 nm
Rx clock frequency	±3 ppm
Rx level sensitivity	-1.0 dBm to -14.0 dBm
APD Rx level sensitivity	-9 dBm to -23dBm

**Optical specifications for OC-48/12/3 and STM-16/4/1**

**Optical connectors**

1 2.5-Gig Receive – FC, SC, or ST
1 1310 nm 2.5-Gig Transmit – FC, SC, or ST
1 1550 nm 2.5-Gig Transmit – FC, SC, or ST

**Transmitter**

Singlemode fiber compatible	
Wavelength	1310 nm or 1550 nm
Clock frequency accuracy	±3 ppm
1310 nm power TX output	+3.0 dBm to -2.0 dBm
1550 nm power TX output	+3.0 dBm to -2.0 dBm

**Receiver**

Singlemode/multimode fiber compatible	
Rx wavelength range	1100 to 1600 nm
Rx clock frequency	±3 ppm
Rx level sensitivity	-8.0 dBm to -28.0 dBm
Rx shutdown	-6.0 dBm or higher

**Electrical specifications for DS3 AND STS-1**

Connector type	BNC
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**Transmitter**

High	Nominal 1.2 Vp; signal meets ANST T1.102-1993 and ITU-T G.703 when subject to 450 ft of cable loss
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DSX	Nominal 0.61 Vp; signal meets ANSI T1.102-1993 and ITU-T G.703
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Low	Nominal 0.31 Vp
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Output impedance	75 ohms nominal, unbalanced to ground
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Jitter tolerance	per TR-TSY-000499
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Frequency	44.736 MHz ±10 ppm
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STS-1 freq	51.84 MHz ±3 ppm ±1 ppm per year
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Line code	B3ZS
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Framing	Unframed, M13 and C-Bit Parity
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**Receiver**

High	Accepts nominal 1.2 Vp, 0 ft of cable from high source
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DSX	Accepts nominal 0.6 Vp, 450 ft of cable from high source
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Low	Accepts nominal 0.3 Vp, 900 ft of cable from high source
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Maximum signal level without errors with 1.7 Vp	
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Minimum signal level without errors with 0.025 Vp	
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Maximum input signal level with 2.5 Vp	
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Input impedance	75 ohms nominal, unbalanced to ground
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Jitter tolerance	Exceeds TR-TSY-000499
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**Electrical specifications for E1**

Connector	RJ-45 and BNC 75 ohm unbalanced and 120 ohm balanced
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**Transmitter**

Frequency	2.048 MHz ±50 ppm
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Internal timing	±4.6 ppm ±1 ppm per year
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Line codes	HDB3 and AMI
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**Receiver**

Impedance	
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Bridge	120 ohms minimum
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Term	120 ohms ±5%
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DSX	120 ohms ±5%
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Range	
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Bridge	+3.0 to -32.0 dBdsx
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Term	+3.0 to -32.0 dBdsx
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DSX	+3.0 to -32.0 dBdsx
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Jitter tolerance	ITU-T G.823
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**Electrical specifications for DS1**

Connector type	Bantam jack
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**Transmitter**

Frequency	1.544 MHz ±50 ppm
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Internal timing	±4.6 ppm ±1 ppm per year
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Line codes	AMI or B8ZS
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Pulse shape	Per applicable specifications
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**Receiver**

*Impedance*

Bridge	100 ohms minimum
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Term	100 ohms ±5%
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DSX	100 ohms ±5%
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*Range*

Bridge	+6 to -35.0 dBdsx
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Term	+6 to -35.0 dBdsx
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DSX	-10 to -26.0 dBdsx of resistive loss
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Jitter tolerance	Per Bell Pub 62411-1990
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**Accuracy**

Receive level measurement	
From 6 dBdsx to -15 dBdsx, accuracy of ±1 dB	
From -16 dBdsx to -30 dBdsx, accuracy of ±2 dB	
From -31 dBdsx to -40 dBdsx, accuracy of ±3 dB	

Simplex current measurement	±2% or ±2 mA to 60 mA ±3% or ±3 mA from 61 mA to 175 mA
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Frequency measurement accuracy	±3 ppm ±1 ppm/year
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**Measurement types**

APS time	Criteria for measurement: AIS and analysis rate Maximum measurable switch-over time: 127 ms Resolution: 1 ms
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Round-trip delay	1 microsecond to 5 seconds
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Transmit frequency offset	Resolution: ±1 ppm Maximum: ±50 ppm
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ITU-T Recommendation G.826	EB, ES, SES, and EBB
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ITU-T Recommendation G.828	EB, ES, SES, and EBB
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ITU-T Recommendation G.829	EB, ES, SES, and EBB
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**Results display specifications**

Event log	Displays all alarm and error events with a time stamp 50 ms resolution of error events and parameters 500-line memory capacity
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Numerical display	Display of count (absolute) and rate (relative) values of error types
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Display update rate	1 second
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Results printout	Manually triggered or timed print
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Serial	V.24/RS 232
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Result export	Results can be stored on a PCMCIA card in ASCII format
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## Compliance

### ANSI

T1.101-1999	Synchronization interface standards for digital networks
T1.102-1993	Digital hierarchy –electrical interfaces
T1.102.01-1996	Digital hierarchy – VT1.5 electrical interface
T1.105-1995	Synchronous optical network (SONET) – basic description including multiplex structure, rates and formats
T1.105.01-2000	Synchronous optical network (SONET) – automatic protection
T1.105.02-1995	Synchronous optical network (SONET) – payload mappings
T1.105.03-1994	Synchronous optical network (SONET) – jitter at network interfaces
T1.105.03a-1995	Synchronous optical network (SONET) – supplement to T1.105.03-1994
T1.105.04-1995	Synchronous optical network (SONET) – data communication channel protocol and architectures
T1.105.05-1994	Synchronous optical network (SONET) – tandem connection maintenance
T1.105.06-1996	Synchronous optical network (SONET) – physical layer specifications
T1.105.07-1996	Synchronous optical network (SONET) – sub-ST5-1 interface rates and formats specification
T1.105.09-1996	Synchronous optical network (SONET) – network element timing and synchronization
T1.107-1995	Digital hierarchy – formats specifications
T1.107a-1990	Supplement to T1.107
T1.107b-1991	Supplement to T1.107
T1.231-1997	Layer 1 in-service digital transmission performance monitoring
T1.404-1994	Network (carrier)-to-customer installation – DS3 metallic interface
T1.404a-1996	Supplement T1.404 ATT Pub 62508 high capacity digital special access service transmission parameters, limits and interface combinations
GR-253-CORE, Issue 3	Transport systems generic requirements: common requirements

### ITU

ITU-T Rec. G.703-1998	Physical/electrical characteristics of hierarchical digital interfaces
ITU-T Rec. G.707-2000	Network node interface for the synchronous digital hierarchy (SDH)
ITU-T Rec. G.709-2001	Network node interface for the optical transport network (OTN)
ITU-T Rec. G.783-2000	Characteristics of synchronous digital hierarchy (SDH) equipment functional blocks
ITU-T Rec. G.813-1996	Timing characteristics of SDH equipment slave clocks (SEC)
ITU-T Rec. G.825-2000	The control of jitter and wander within digital networks which are based on the synchronous digital hierarchy
ITU-T Rec. G.957-1999	Optical interfaces for equipment and systems relating to the synchronous digital hierarchy
ITU-T Rec. G.958-1994	Digital line systems based on the synchronous digital hierarchy for use on optical fiber cables
TU-T Rec. O.150-1996	General requirements for instrumentation for performance measurements on digital transmission equipment
ITU-T Rec. O.181-1996	Equipment to assess error performance on STM-N interfaces
ITU-T Rec. G.826-1999	Error performance parameters and objectives for international, constant bit rate digital paths at or above the primary rate
ITU-T Rec. G.828-2000	Error performance parameters and objectives for international constant bit rate and synchronous digital path
ITU-T Rec. M.2100-1995	Bringing-into-service of international PDH paths, sections and transmission systems and SDH paths and multiplex sections
ITU-T Rec. M.2101.1-1997	Performance limits for bringing-into-service and maintenance of international SDH paths and multiplex sections
ITU-T Rec. M.2101-2000	Performance limits for bringing-into-service and maintenance of international SDH paths and multiplex sections
ITU-T Rec. G.829-2000	Error performance parameters and objectives for international constant bit rate and synchronous digital path

## Ordering information

### User Interface Module

Description	Part number
FST-2000 color display	2000-V6

### Package descriptions

Description	Part number
1550 nm 10-Gig only	2510a-P1-IR2
1310 and 1550 nm 10-Gig only	2510a-P2-IR2
1310 nm 2.5-Gig to DS1	2510a-P3-LR2
1310 and 1550 nm 2.5-Gig to DS1	2510a-P4-LR2
1550 nm 10-Gig and 1310 nm	
2.5-Gig to DS1	2510a-P5-IR2
1310 and 1550 nm 10-Gig and 1310 nm	
2.5-Gig to DS1	2510a-P6-IR2
1310 nm 10-Gig and 1310 and 1550 nm	
2.5-Gig to DS1	2510a-P7-IR2
1310 and 1550 nm 10-Gig and 1310 and 1550 nm	
2.5-Gig to DS1	2510a-P8-IR2

NOTE: High sensitivity receiver option available for all packages

### Additional JDSU Testpad application modules available

Description	Part number
T1/T3 Wireless Module	FST-2207
T1/T3 Module	FST-2209
SONET Services Module	FST-2310
SDH Services Module	FST-2416
DSL Broadband Services Module	FST-2357
Copper Analyzer Module	FST-2109
E1 Data Communications Module	FST-2230
Gigabit Ethernet Services Module	FST-2802
Base Station and Air Interface Test Module	BAT-2700

### Other related products

JDSU T-BERD Communications Analyzer 310  
JDSU ANT-20 Advanced Network Tester

### Optional accessories

Description	Part number
Carrying case, multimodule, soft	CC-45158

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