

# Reconfigurable Optical Add/Drop Multiplexers—Testing Issues

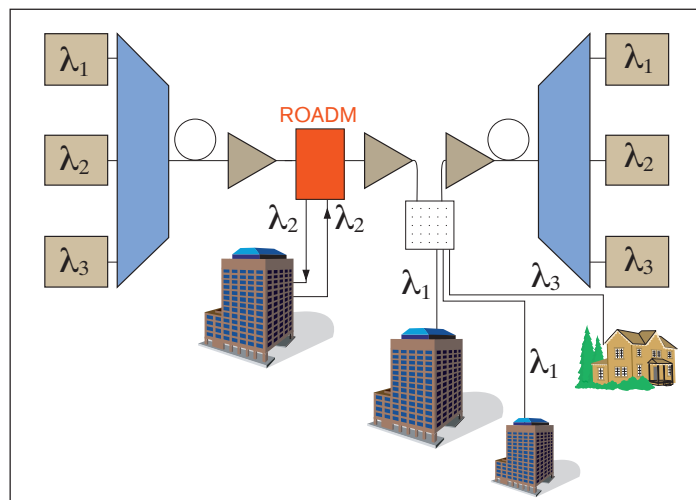
Networks using ROADMs are somewhat different from standard systems. A simple little glitch on a live network – operating at many wavelengths and at high data rates – can cause the system to lose a considerable amount of data, gravely affecting not only overall quality of service (QoS) but costs as well. The following are some of the main things to keep in mind when testing networks containing ROADMs:

- OSNR must be measured in-band
- EDFAs are required to reamplify the signal
- No reshaping is performed; therefore, it's important to compensate for dispersion
- The total optical link length is longer, so the dispersion levels are also higher
- Unforeseen bit errors and/or other anomalies on the SONET and/or Ethernet layers can cause significant impairments to real-time traffic (e.g., video) traversing the network

## EXFO's ROADM Kit What makes it unique?

- It provides you with all the flexibility you need, without compromising on accuracy
- It is a one-box, future-proof solution for OSA, CD, PMD, Ethernet and next-generation SONET
- It is in-band OSNR measurement ready: new functionality
- It is complete: characterization, qualification, turn-up, validation and post-installation testing of ROADMs
- It addresses multiple layers physical, optical, transport and datacom and supports simultaneous testing of these layers
- It comes with dedicated EXFO sales, technical support and customer service teams

Note: EXFO's OSA in-band OSNR is field upgradeable.

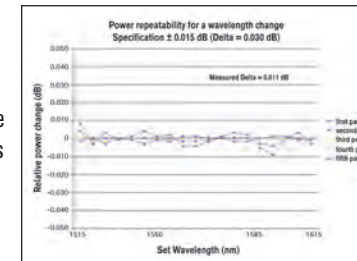


# Stand-Alone Instruments

## FLS-2600B Tunable Laser Source

The FLS-2600B is an ideal test instrument for complete characterization of ROADMs.

- Compact benchtop with a 1 pm resolution and tuning range of >100 nm covering both the C and L bands
- Excellent wavelength accuracy and repeatability
- Supports continuous and step-by-step sweep functions
- **Rugged** design and precision-encoded DC motor, ensuring that the source will deliver consistent results, test after test, pass after pass



## FVA-60B Variable Attenuator

This convenient handheld unit is perfect for precisely controlling the output power of the FLS-2600B Tunable laser source, thanks to its superior linearity, resolution and repeatability specifications.



## FIP-USB Video Fiber Inspection Probe

This essential device, connected directly into the FTB-400 Universal Test System and the FTB-200 Compact Platform, offers innovative technology for clear, sharp images of termination dirt and damage.



Looking for a time-proven solution for ROADM characterization?

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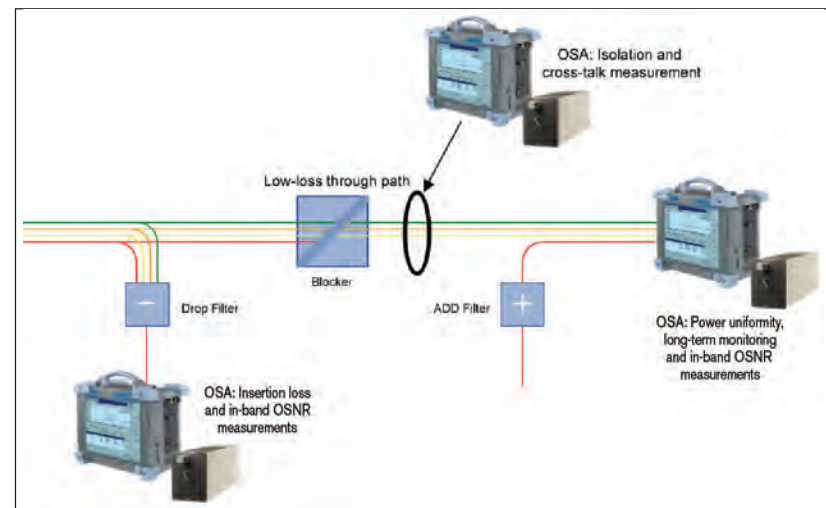
# Platform and Modules Package

## In-band OSNR measurements for ROADM testing: Get the true picture

The FTB-5240 and FTB-5240B Optical Spectrum Analyzers enable polarization diversity detection (patent-pending technique), allowing in-band optical signal-to-noise ratio (OSNR) measurements for reconfigurable optical add/drop multiplexer (ROADM) applications. Additionally, they can test per-wavelength power, which is the most accurate way to actually ensure appropriate power balance in ROADMs. These units are also valuable tools when adding or dropping wavelengths: they check if a channel is already being used and perform an after-drop test that verifies filter isolation and ensures that the ROADM process remains optimum.

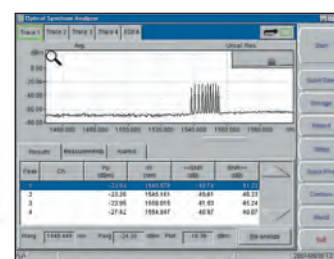
## EXFO's optical spectrum analyzers:

- Identify, analyze and monitor the state of the signals traveling through a fiber-optic network, display an overall view of the network and perform power vs. wavelength measurements and long-term drift analyses
- Offer the indispensable in-band OSNR ROADM testing feature
- Are flexible enough to adapt to various environments, such as at the edge of the network, at the ROADM, or deeper in the metro core
- Are portable and easy to use
- Are 40 Gbit/s-ready



## FTB-5240\* and FTB-5240B\* Optical Spectrum Analyzers

\* Protected by US Patent 6,636,306 and foreign equivalents.



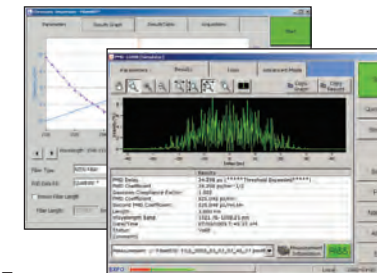
FTB-5240B Optical Spectrum Analyzer

## Addressing dispersion

ROADMs increase the total optical distance; therefore, it is important to precisely characterize both chromatic dispersion (CD) and polarization mode dispersion (PMD). EXFO's dispersion measurement solutions not only offer accuracy, but speed as well. Other benefits include:

### FTB-5500B and FTB-5800 Dispersion Kit

- Test through amplifiers – including through erbium-doped fiber amplifiers (EDFAs), dispersion compensating fibers (DCF), etc.
- The PMD unit uses the general interferometric approach – the only link-characterization technique recommended for all types of links, including amplified and non-amplified links, plus for aerial, underground and submarine applications
- The CD unit uses the phase-shift approach with 950 test points – with this many test points, speed and accuracy go hand in hand, even for complex layouts
- The only 40 Gbit/s-ready PMD and CD testers on the market
- A single light source can be used for CD and PMD, reducing testing time and shipping costs
- Ideal for ultra-long-haul, 40 Gbit/s applications or with several cascaded ROADMs



FTB-5500B and FTB-5800 Dispersion Kit

### FTB-5700 Single-Ended Dispersion Analyzer

- Provides exclusive single-ended testing technology
- Enables one technician to test both CD and PMD
- Requires only one training session
- Minimizes manual interventions for fail-safe results
- Reduces required connections to just one
- Saves valuable processing time – one GUI, one results file, one report
- Meets all your 10 Gbit/s needs, and more



FTB-5700 Single-Ended Dispersion Analyzer

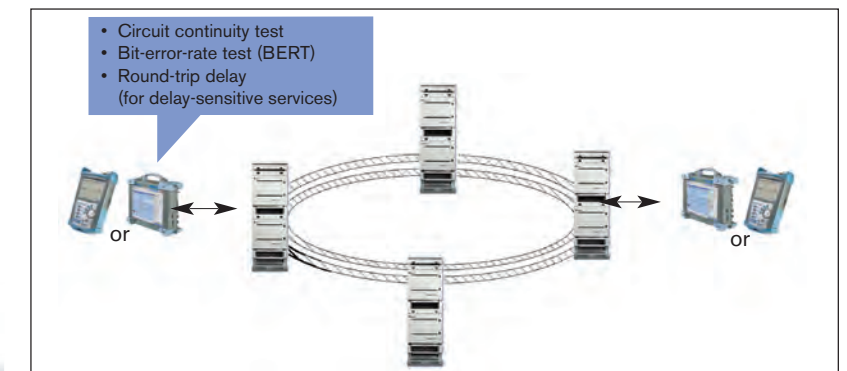
## Turning up and validating ROADM transponder cards

Service interfaces available on ROADM include, among others, 100M and 1000M Ethernet, as well as OC-3 through OC-192 SONET interfaces. These high-speed transponder cards must be tested to ensure error-free operation prior to final qualification of an ROADM network element. EXFO's FTB-8510B Packet Blazer, FTB-8130NG Transport Blazer and FTB-8130NGE Power Blazer modules can help you make sure that client service transponder cards are functioning properly without exhibiting unforeseen bit errors or other anomalies.



## End-to-end circuit testing: post-installation

Once ROADM network elements have been qualified at each site location, the next step is to turn up new transponder cards (and corresponding wavelengths) to transport required services from one CO to another. In these instances, the modules mentioned below are used to perform site-to-site BER tests to ensure that the circuit is error-free over the desired test interval.

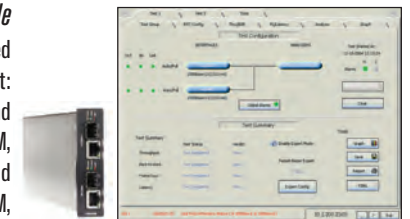


## Verifying end-to-end service is error-free!

Be it for turn-up, validation or post-installation testing of transponders, the FTB-8510B, the FTB-8130NG and the FTB-8130NGE offer all the necessary test functions and simple-to-use interface. It's really all you need.

### FTB-8510B Packet Blazer Ethernet Test Module

Delivers performance assurance for Ethernet-based services. Tests connectivity in its native format: 10/100/1000Base-T, 1000Base-SX, 1000Base-LX and 1000Base-ZX for LAN-to-LAN services delivered via ATM, frame relay, next-gen SONET, SONET, hybrid multiplexers, switched Ethernet, VLANs, dark fiber, WDM, FTx systems or other means.



FTB-8510B Packet Blazer Ethernet Test Module

### FTB-8130NG Transport Blazer Next-Generation SONET Test Module

T1 to OC-192 test interfaces, including support for next-generation SONET and optical transport network (OTN) test functions in a single unit.



FTB-8130NG Transport Blazer Next-Generation SONET Test Module

### FTB-8130NGE Power Blazer Next Generation Multiservice Test Module

SONET and Ethernet test functions in the industry's smallest and most efficient form factor – a new standard for multiservice field testing.



FTB-8130NGE Power Blazer Next Generation Multiservice Test Module



## FTB-400 Universal Test System

Offered with an eight-slot module receptacle and compound rubber bumpers, the tough, powerful FTB-400 is an advanced portable platform built for real-life test conditions. This guarantees that your modules will survive the inevitable bumps and drops in the field or from a lab bench. It houses all the modules listed in this document, and many more.

## FTB-200 Compact Platform

The FTB-200 combines 10 Gbit/s Ethernet and SONET testing – all in a smaller, two-slot modular platform for your Carrier Ethernet and multiservice test applications. It houses the Ethernet and SONET test modules shown above as well as CD/PMD, OTDR, OLTS and other Ethernet and SONET test modules.

