

# 2.5+ GIGABIT MULTIRATE TRANSCEIVER

# 6000

## EPX6000

R & D AND MANUFACTURING

- Process all channels simultaneously
- Mix any valid combination of mappings
- 2.5+ Gb/s testing
- Support for multiple rates



# Continuing Evolution of Multichannel, Multirate Testing

Introducing the EPX6000 2.5+ Gigabit Multirate Transceiver, the next step in the EXFO-pioneered modular approach to optical test and measurement. Housed in the EPX Multichannel Test System, the EPX6000 takes multichannel, multi-user, multirate testing to another level.

With a scalable, fully reprogrammable design, the EPX6000 provides a breadth and depth of testing. It can process multiple rates as well as generate and monitor all channels simultaneously. It also enables you to mix payloads of any valid combination from STS-1 through STS-192c, including STS-6c, STS-9c and STS-24c subrates.

## Meeting New Testing Challenges

The next wave of technology for networking is increasing the functionality of existing standards and equipment. With the new technologies come changes in testing in all phases of the product life cycle.

For example, with multiservice provisioning platforms (MSPPs), simultaneous testing of all channels is a must. Testing alarm and error handling, service disruption as well as payloads across all channels is necessary for quality assurance. Such testing requires more traffic simulation, which means more test heads. With the ability to generate and analyze all channels, the one-slot EPX6000 transceiver meets these challenges.



The EPX6000 test module is housed in the EPX multichannel test platform.

## KEY FEATURES

- Generate and receive OC-48, OC-12 or OC-3 signals
- Mix payloads of any valid combination from STS-1 to STS-48c
- Use STS-6c, STS-9c and STS-24c payloads
- Monitor service disruption for all channels
- Configure thresholds for starting and stopping service disruption
- Hot swap any compatible SFP optical interface
- Reconfigure modules for different applications

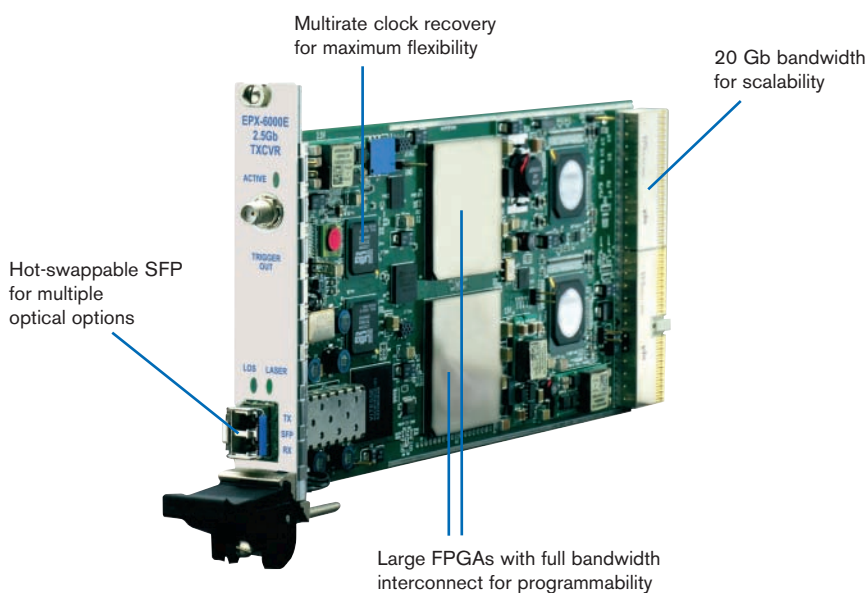
## Designed for Flexibility

Next-generation optical networks are meant to be flexible and reconfigurable. Test equipment should therefore allow you to meet changing test demands. EXFO's EPX6000 Multirate Transceiver is designed for such flexibility: it can use multiple rates and mixed payloads to suit a wide variety of test applications.

### Open Design

Testing needs are constantly evolving, and they differ from one user to another. Because today's requirements might not be tomorrow's, a single product can hardly cover all needs, unless it is highly customizable and flexible. The EPX6000 is the entry of a new EPX product family; its design enables it to support multiple features and protocols. Rather than force you to purchase new hardware for the latest transport technology, EXFO's EPX6000 is updated with new software, giving you test equipment that is renewed, not replaced.

EXFO's EPX6000 Multirate Transceiver uses the largest FPGA chips available today, with all signal processing being fully programmable. The EPX backplane allows ganging of multiple EPX6000 transceivers, providing scalability for larger applications. The EPX6000 generates and receives from 155 Mb/s to 2.67 Gb/s.



### Flexible Optical Interfaces

The EPX6000 uses the small form-factor pluggable (SFP) interface compliant with multisourcing agreement (MSA). This enables the hot swapping of interfaces, letting you easily configure test equipment in the field and get the required wavelength, power rates and connector types, whenever you need them. The SFP interface also allows growth for future technology and lowers test equipment cost of ownership.

The SFP interface extends the flexible, modular values of EPX test systems, because you can choose any compliant interface that meets your requirements. Available OC-48 wavelengths include 1310 and 1550 nm, which comply with SONET SR, IR-1, IR-2, LR-1 and LR-2. Contact vendors for exact specifications.

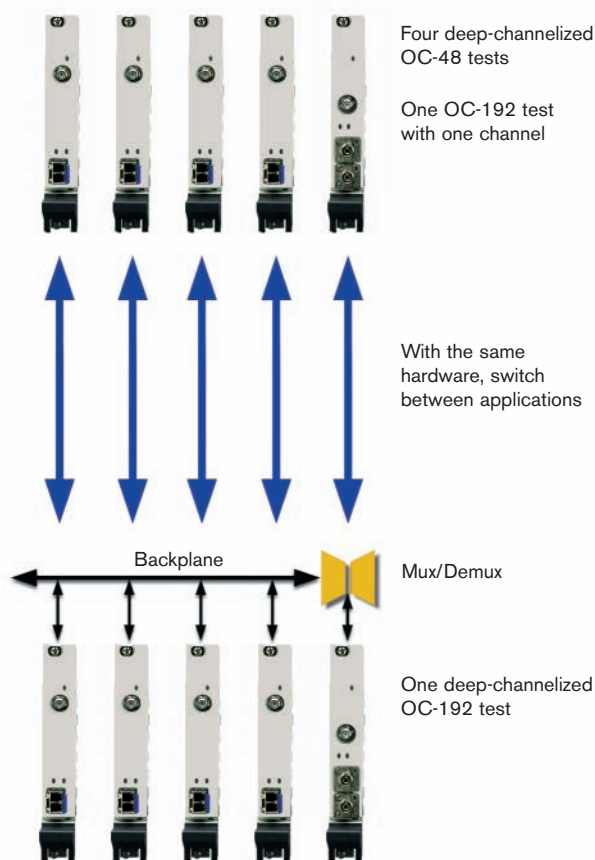
The EPX6000's graphical interface displays SFP data, such as vendor information, laser wavelength, voltage, temperature and power.

## Application Scalability

Modular equipment can keep testing costs to a minimum, but what if you could use modules in multiple applications to increase processing potential? EXFO's next-generation modules are designed for true scalability. The EPX6000 transceiver can scale from OC-3 testing to a deep-channelized OC-48 test solution. The reuse you get with the EPX6000 transceiver is like having twice the normal test module at half the cost.

### Stand-Alone /Deep OC-48 Processing

Each EPX6000 2.5+ Gigabit Multirate Transceiver can process transport overhead, as well as generate and analyze as many as 48 channels simultaneously.



### Configuration Guide

Application	Total Modules Required
OC-48/12/3: all channels	1 EPX6000 per test

The enhanced EPX16e platform is required for backplane deep channelization applications. Current EPX16 platforms can be upgraded. Contact your sales representative for details.

## Easy-to-Use Software

The EXP6000's graphical interface has been designed specifically to make multichannel testing easy. From the high-level graphical view, you can easily monitor all the channels simultaneously. You can then view the details for a payload channel that has a defect, enable or disable monitoring and service disruption measurements for any or all channels, and monitor only select channels, including the ability to filter selected channels from data collection.

### Configuring Multiple Channels in a Snap

Payloads can be set to match the generated payload or the received signal. Channels can be configured independently or in multiples. The payload setup window also lets you know when you have an invalid payload mapping. If you want to convert several channels to another mapping, only the valid options are displayed. You can configure a channel and then copy that configuration to other channels, even to other modules.

### Recovering from Power Interruptions

With Checkpoint/Resume, recovering from a power failure is easy. Module setup and test data are saved at intervals that you can define. When the system is restarted following a power failure, tests are resumed with minimal data loss.

### Creating Customized Interfaces

You can also create custom graphical user interfaces (GUIs) that are specific to your test application. Simply add the controls and monitors to a virtual desktop that is shared with all users. Create and save multiple custom GUIs.

The screenshot displays the EXP6000 software interface with several overlapping windows. The main window shows a 'Test' status of '90:00:00:00' and a 'Setup' tab with 'TXRX' and 'Custom' options. A 'Payload' window shows a grid of green cells. An 'Alarms' window displays a table of alarm types and modes. An 'Errors' window shows a table of error counts and rates. A 'Transmit Error Injection' window is open, showing configuration for three path injectors. A 'Receive Perf. Mon.' window displays a table of performance metrics for near and far STS-Nt channels.

STS-Nt	Alarm Type	Mode
1	LPS	Off
2	LPS	Off
3	LPS	Off
13	LPS	Off
14	LPS	Off
23	LPS	Off
48	LPS	Off

STS-Nt	Count	Rate	Count
0	0	0.00e+000	0
1	0		
2	0		
3	0		
9	0		
10	0		
19	0		
48	0		

Near STS-Nt	CVP	ESP	SESP	UASP	FCP	PPJC	PNJC	JCS
1	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0
48	0	0	0	0	0	0	0	0

Far STS-Nt	CVRE	ESL	SESL	UASL	FCL
0	0	0	0	0	0
1	0	0	0	0	N/A
2	0	0	0	0	N/A
3	0	0	0	0	0
9	0	0	0	0	0
10	0	0	0	0	0
19	0	0	0	0	0
48	0	0	0	0	0

### Scaling to Test Applications

Like the hardware, the software is also scalable, down to VT1.5/VC12 or up to more complex applications. As the application scales, the software presents a unified interface to make testing easy. Several EPX6000 modules—presented as one interface—can be combined in an OC-48 deep-channelized test setup. While physically separate, the modules are logically performing as a single test solution.

## SONET SPECIFICATIONS

### Payload

Mappings	Homogenous or mix of any valid combination
SONET	STS-48c, STS-24c, STS-12c, STS-9c, STS-6c, STS-3c, STS-1
Stuff bytes	Fixed or payload pattern
Pattern	True and inverted PRBS: 2 23 -1; live traffic monitoring
Configuration	Detect and match received payload settings Duplicate settings across paths and modules

### Defects

Alarm types	SONET: LOS, LOF, SEF, AIS-L, RDI-L, TIM-S, LOP, RDI-P, UNEQ, AIS-P, PLM-P, PDI-P, TIM-P, LPS
Alarm insertion	Inject all channels simultaneously; synchronized injection across paths and modules
Alarm monitoring	Monitor all channels simultaneously; squelch monitoring for selected channels
Error types	SONET: B1, B2, B3, REI-L, REI-P, payload bit, physical (random)
Error insertion	Inject a single error, a burst of errors or rates of errors for all channels simultaneously; synchronized injection across paths and modules, precise, smooth error injection: x.yE-Z
Error monitoring	Monitor all channels simultaneously; squelch monitoring for selected channels
Statistics	Error counts and ratios
Performance	Monitor all channels simultaneously
Section	ES, SES, UAS, SEFS, CV
Line near-end	ES, SES, UAS, CV, FC
Line far-end	ES, SES, UAS, CV, FC
Path near-end	ES, SES, UAS, CV, FC, PPJC, PNJC, PJS
Path far-end	ES, SES, UAS, CV, FC

### Service Disruption

All channels	Longest and shortest service disruptions, most recent disruption
Selected	Longest, shortest, most recent and history of service disruptions
Triggers	LOP, UNEQ, AIS-P, PDI-P, LPS, Bit: set soak in/out for triggering service disruption
Log file	Save most recent 20 000 STS-Nc events for all channels to a text file

### Overhead

Byte values	Set and monitor for section, line and path for all channels
Sequence	Transmit sequence of user-defined values for section, line and path (one channel) bytes; continuous sequencing or 1-256 iterations
Delay	Delay transmitting section, line and path (one channel) bytes for user-defined frames
S1	Value and message encode and decode
Pointer	Increment, decrement, move with NDF, move without NDF and set SPE/AU pointer value; counts of all actions
Trace messages	J0 and J1 (all channels); 64 byte messages; encode and decode for all channels simultaneously
K1/K2 APS	Encode and decode for all channels simultaneously
Mode	Encode and decode linear (GR-253) or ring (GR-1230) messages
Messages	Linear: K1 channel, K2 channel, K1 request, K2 operation, K2 architecture; ring: K1 request, destination, source, long/short, status
Monitor	Capture changes and frame count

## EPX6000 SPECIFICATIONS

## EPX6000

Rates	OC-48 (2.488 Gb/s), OC-12 (622.08 Mb/s), OC-3 (155.52 Mb/s)
Optical interface	Small form-factor pluggable (SFP)
Timing reference	BITS accuracy (via EPX100 Clock Module), ± 4.6 ppm (via EPX100 Clock Module) or ± 20 ppm (via on-board oscillator)
Frequency offset	2 ppm intervals; ± 50 ppm
Data modes	Normal (terminal), line loopback or intrusive through mode (Regenerate B1, B1/B2 or B1/B2/B3)
Frequency counter	1 Hz resolution from reference frequency, received
Optics monitor	3 dB accuracy

## G0081-S1

	Maximum	Minimum	Typical
Output power <sup>1</sup> (dBm)	-3	-9.5	
Output wavelength (nm)	1340	1285	
Extinction ratio (dB)		9	
Input wavelength (nm)	1600	1270	
Maximum input (dBm)	-3		
Sensitivity			
OC-48 (dBm)	-18		-22
OC-12 (dBm)	-23		
OC-3 (dBm)	-23		
Dimensions	MSA SFP-compliant		

## G0081-I1

	Maximum	Minimum	Typical
Output power (dBm)	0	-5	-3
Output wavelength (nm)	1360	1266	1310
Extinction ratio (dB)		8.2	
Input wavelength (nm)	1600	1100	
Maximum input <sup>3</sup> (dBm)	0		
Sensitivity <sup>3</sup> (dBm)		-19	-21
Dimensions	MSA SFP-compliant		

## G0081-L1

	Maximum	Minimum	Typical
Output power <sup>1</sup> (dBm)	+3	-2	
Output wavelength (nm)	1335	1280	
Extinction ratio (dB)		9	
Input wavelength (nm)	1600	1270	
Maximum input (dBm)	-9		
Sensitivity			
OC-48 <sup>2</sup> (dBm)	-27		
OC-12 <sup>2</sup> (dBm)	-28		
OC-3 <sup>2</sup> (dBm)	-34		
Dimensions	MSA SFP-compliant		

## G0081-L2

	Maximum	Minimum	Typical
Output power <sup>1</sup> (dBm)	+3	-2	
Output wavelength (nm)	1580	1500	
Extinction ratio (dB)		9 dB	
Input wavelength (nm)	1600	1270	
Maximum input (dBm)	-9		
Sensitivity			
OC-48 <sup>2</sup> (dBm)	-28		
OC-12 <sup>2</sup> (dBm)	-28		
OC-3 <sup>2</sup> (dBm)	-34		
Dimensions	MSA SFP-compliant		

## Notes

- Class 1 laser safety per FDA/CDRH and IEC-825-1 regulations.
- With worst-case extinction ratio. Measured with PRBS 2 31 -1 test pattern.
- Measured at 2.48832 Gb/s and 1300 nm wavelength with PRBS 2 31 -1 test pattern.

## ORDERING INFORMATION

G0079-XX

**Optical Types**

- S1** = 2.5+ Gigabit Multirate Processor Module with 1310 nm short-reach optical interface  
**I1** = 2.5+ Gigabit Multirate Processor Module with 1310 nm intermediate-reach optical interface  
**L1** = 2.5+ Gigabit Multirate Processor Module with 1310 nm long-reach optical interface  
**L2** = 2.5+ Gigabit Multirate Processor Module with 1550 nm long-reach optical interface

**Accessories**

- G0081-0S1 = EPXSFP optical interface, 1310 nm, short-reach, multirate  
 G0081-0I1 = EPXSFP optical interface, 1310 nm, intermediate-reach, multirate  
 G0081-0L1 = EPXSFP optical interface, 1310 nm, long-reach, multirate  
 G0081-0L2 = EPXSFP optical interface, 1550 nm, long-reach, multirate

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