

# Encircled Flux (EF) Test Solutions

SPSB-EF LAUNCH MODE CONDITIONER AND FLS-600-NS1548 LIGHT SOURCE  
DESIGNED FOR CONTROLLED MULTIMODE LOSS TESTING



EF COMPLIANT

Tier-1/2 solutions with controlled source launch conditions for maximum accuracy and repeatability designed to remove uncertainty from multimode fiber testing.

## KEY FEATURES

EF-compliant as per TIA-526-14-C and IEC 61280-4-1 Ed. 2.0 at 50  $\mu$ m, 850/1300 nm guaranteed

Optimized for multimode loss testing

Tier-1/2 testing of multimode fibers as recommended in TIA-568

Reference-grade UPC connectors for maximum precision and repeatability

Built-in-EF-compliant light source—no extra equipment to manipulate

## APPLICATIONS

Data center/high-speed links

Enterprise and private networks

## COMPLEMENTARY PRODUCTS AND OPTIONS



Access OTDR  
MAX-720C-Q1/QUAD



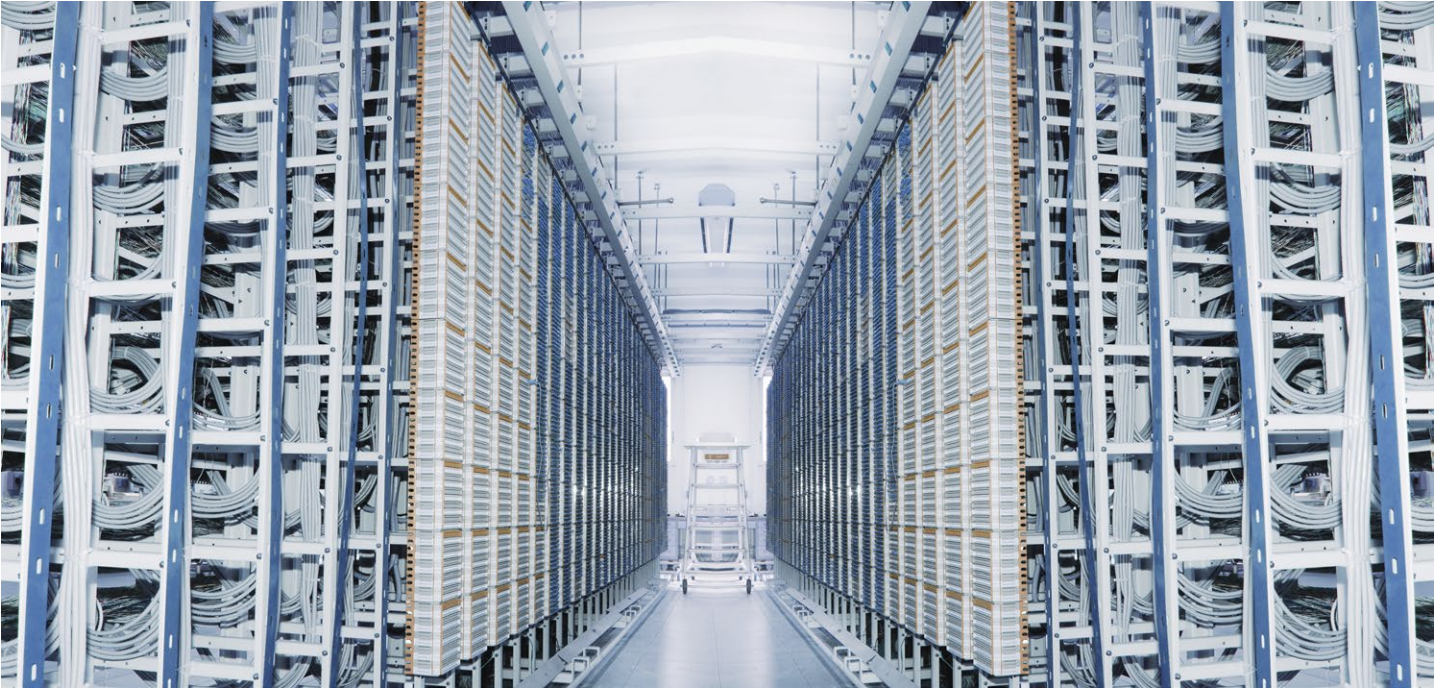
Visual Fault Locator  
FLS-140

FastReporter

Data Post-Processing Software  
FastReporter

EXFO

## UNDERSTANDING EF



Encircled Flux (EF) is a new standard that defines how to control the source launch conditions as specified in TIA-526-14-C and IEC 61280-4-1 Ed. 2.0.




Whether for an expanding enterprise business or a large-volume data center, the new high-speed data networks built with multimode fibers are running under tighter tolerances than ever before.

These MM fibers are the trickiest links to test because the results depend greatly on each device's output conditions. Testing with different equipment often returns different test results, sometimes higher than the budget loss itself. This may mislead the technician or make it impossible to locate the fault, resulting in unsuccessful turn-ups or a longer network downtime. Now, cable installers can rely on their Tier-1 loss results and Tier-2 troubleshooting can be performed with maximum accuracy and utmost confidence of finding the actual problem.

## CONSISTENCY AND REPEATABILITY

Whether built-in or packaged in the external launch conditioner, EXFO tunes each EF-compliant device to perfection in-house, ensuring that every unit meets the EF templates for both 850 and 1300 nm at 50  $\mu$ m. This allows technicians and contractors to obtain reliable, consistent and repeatable results during construction, thus eliminating doubts and uncertainty. The test documentation that is generated will also help future-proof networks. When upgrades are needed, it will become easier and faster to know which circuits have to be activated, thereby saving time and troubles down the line.

## TWO FIELD SOLUTIONS TO CHOOSE FROM

	MULTIMODE LIGHT SOURCE FOR CONSTRUCTION (TIER-1 BASIC)		MULTIMODE OTDR FOR TROUBLESHOOTING (TIER-2)
			
<b>EF-Compliant Test Solutions</b>	<b>FLS-600-NS1548</b>	<b>FLS-600</b>	<b>MAX-720C and FTBx-720C LAN/WAN Access OTDR</b>
<b>EF launch conditions</b>	Built-in with reference grade jumper	Paired with External Mode Conditioner (SPtSB-EF-C30)	Paired with External Mode Conditioner (SPSB-EF-C30)
<b>Key benefit</b>	<ul style="list-style-type: none"> <li>› No extra tool to carry</li> <li>› No need to use mandrels</li> </ul>	<ul style="list-style-type: none"> <li>› Leverage your existing FLS-600</li> <li>› Get EF compliance with low cost of ownership</li> </ul>	<ul style="list-style-type: none"> <li>› Compatible with iOLM multimode troubleshooting tool</li> <li>› New or existing EXFO OTDRs can be retrofitted with equipment in the field</li> </ul>
<b>Results</b>	Accurate and repeatable insertion loss (IL) measurement for successful turn-ups		Undoubtful and accurate fault location for quicker link repair, reducing mean time to recovery (MTTR)
<b>Description</b>	Like all EXFO portable instruments, the FLS-600 is built for the harshest test conditions. It features a keypad with LCD backlight, for easy operation in darker environments. Combined with an FPM-600 power meter, it automatically selects the testing wavelengths and sends the reference power value to ensure accurate results.		Packaged in a soft, light and convenient carrying case, it is compatible with EXFO OTDRs and the FLS-600 series. It includes 30 m of fiber to be used as a launch cable with OTDR.
<b>Key features</b>	<ul style="list-style-type: none"> <li>› EF-compliant for basic Tier-1 certification at 50 <math>\mu</math>m, 850/1300 nm guaranteed</li> <li>› Four wavelengths on two ports: 850/1300 nm and 1310/1550 nm</li> <li>› 3-year warranty for low cost of ownership</li> <li>› Error-free, time-saving test features</li> </ul>		<ul style="list-style-type: none"> <li>› Covers OTDR dead zones, enabling loss measurement on the first and last connections of a fiber under test</li> <li>› Increases the life of the source connector by reducing the number of matings on the connector</li> <li>› Supports LC/UPC and SC/UPC connectors</li> <li>› EF-compliant for extended Tier-2 certification at 50 <math>\mu</math>m, 850/1300 nm guaranteed</li> </ul>
<b>Outcome</b>	Build and maintain a future-proof multimode fiber network with utmost reliability and accuracy.		

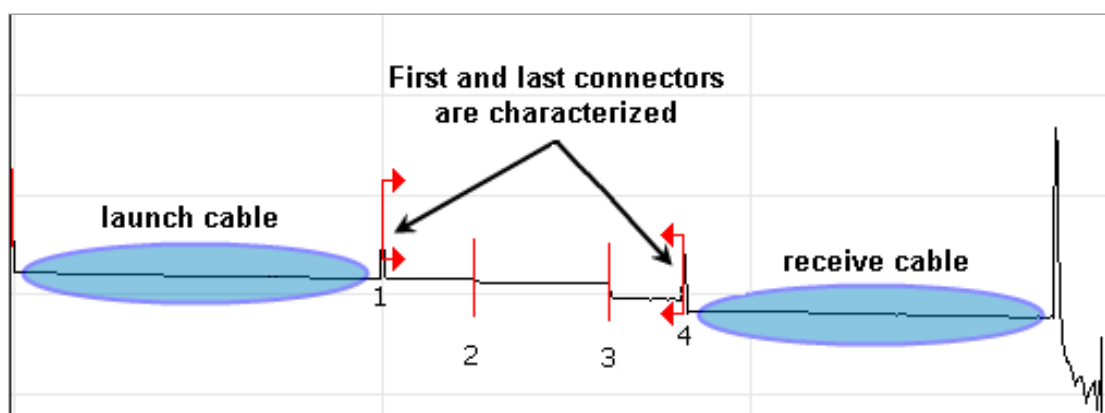
**Note:** EF-compliant launch conditions with SPSB-EF external launch conditioner can only be achieved when paired with EXFO products as listed in this table. This may not be possible with OTDRs or light sources from other manufacturers.

## THE NECESSITY OF LAUNCH AND RECEIVE CABLES

Link characterization is often performed using an OTDR. However, despite the fact that an OTDR has the shortest dead zones, the way loss is measured in a link means that to characterize the first and last connectors, an OTDR needs a launch cable, also called a pulse suppressor box.

The reason for this is that the loss associated with an event is the difference between the backscattering levels measured before and after the event. To account for the dead zone, a backscattering level must be obtained before the first connector. This requires inserting a length of fiber between the OTDR port and the first connector of the fiber under test. At the other end, the same length of fiber is inserted after the last connector.

In order to measure the loss of the first and last connectors, it is important to use launch and receive cables. The SPSB-EF has an internal 30-meter fiber that allows complete end-to-end loss while still maintaining the EF launch conditions up to the first connector of the link. By complying with the EF standards, faulty connectors are easily located when troubleshooting high-speed multimode links.



**Note:** To measure the loss in the first connector with the SPSB-EF launch cable, the OTDR pulse width should be 100 ns or shorter and the connection to the OTDR port should have a reflection value of  $-45$  dB or better. A 50  $\mu$ m test link must also be selected.




## FLS-600-NS1548 SPECIFICATIONS

TECHNICAL SPECIFICATIONS <sup>a</sup>		
Model	12C	23BL
Central wavelength (nm)	850 ± 25 1300 +50/-20	1310 ± 20 1550 ± 20
Spectral width <sup>b, c</sup> (nm)	50/135	≤5
Launch conditions <sup>c</sup>	Encircled Flux compliant at 50 µm, 850/1300 nm (guaranteed)	
Auto-switching	Yes	Yes
Tone generation	270 Hz, 1 kHz, 2 kHz	270 Hz, 1 kHz, 2 kHz
Battery life (hours) (typical in Auto mode)	50	50
Warranty (years)	3	3

GENERAL SPECIFICATIONS		
Size (H x W x D)	190 mm x 100 mm x 62 mm (7 ½ in x 4 in x 2 ½ in)	
Weight	0.48 kg (1.1 lb)	
Temperature	operating	-10 °C to 50 °C (14 °F to 122 °F)
	storage	-40 °C to 70 °C (-40 °F to 158 °F)
Relative humidity	0 % to 95 % non-condensing	

STANDARD ACCESSORIES
User guide, Certificate of Calibration, instrument stickers in six languages, AC adapter/charger, lithium ion battery, shoulder strap, carrying case.

## LASER SAFETY



IEC 60825-1:2007  
21 CFR 1040.10

VISIBLE LASER RADIATION  
AVOID DIRECT EYE EXPOSURE  
CLASS 3R LASER PRODUCT

$\lambda$ : 650  $\pm$  10 nm,  $P_{out}$  max. < 5mW  
(into free space)

The label features a black triangle with a yellow border containing a black sunburst symbol. The text is printed in black on a yellow background.

### INVISIBLE LASER RADIATION

VIEWING THE LASER OUTPUT WITH CERTAIN OPTICAL INSTRUMENTS (FOR EXAMPLE, EYE LOUPES, MAGNIFIERS AND MICROSCOPES) WITHIN A DISTANCE OF 100 MM MAY POSE AN EYE HAZARD

CLASS 1M LASER PRODUCT

## SPSB-EF SPECIFICATIONS

EXTERNAL LAUNCH MODE CONDITIONER TECHNICAL SPECIFICATIONS		
Model	SPSB-EF-C30	
Total insertion loss (dB) <sup>d</sup>	< 1	
Fiber length <sup>e</sup>	34 m (112 ft)	
Launch conditions <sup>c</sup>	Encircled Flux compliant at 50 µm, 850/1300 nm (guaranteed)	
Optical source for EF compatibility	FLS-600-12D, MAX-720C-Q1/QUAD, FTBx-720C-Q1/QUAD, FTB-720C-Q1/QUAD	
Available connectors	SC to LC SC to SC	FC to FC FC to LC

GENERAL SPECIFICATIONS		
Size (H x W x D)	165 mm x 165 mm x 40 mm (6 ½ in x 6 ½ in x 1 ⅞ in)	
Weight	0.3 kg (0.7 lb)	
Temperature	operating	-10 °C to 50 °C (14 °F to 122 °F)
	storage	-40 °C to 70 °C (-40 °F to 158 °F)
Relative humidity	0 % to 95 % non-condensing	

### Notes

- Guaranteed unless otherwise specified. All specifications valid at 23 °C ± 1 °C.
- RMS for FP lasers; and -3 dB width for LEDs (typical values for LEDs).
- Compliant with TIA-526-14-C and IEC 61280-4-1 Ed. 2.0.
- Using a 50 µm fiber at the input of the SPSB-EF.
- To measure the first connector loss, reflection value of OTDR port must be -45 dB or better and a maximum pulse width of 100 ns must be used.

## ORDERING INFORMATION

### FLS-600-NS1548-XX-XX-XX

#### Model ■

12C = 850/1300 nm LED source 50/125 µm

#### Multimode Connector with reference grade jumper <sup>a</sup> ■

EI-EUI-91-1 = UPC/SC with TJ-CR-91-91 (SC/UPC – SC/UPC)

EI-EUI-91-2 = UPC/SC with TJ-CR-91-101 (SC/UPC – LC/UPC)

EI-EUI-91-3 = UPC/SC with TJ-CR-91-90 (SC/UPC – ST/UPC)

EI-EUI-91-4 = UPC/SC with TJ-CR-91-89 (SC/UPC – FC/UPC)

#### Source option ■

00 = Without source option

23BL = 1310/1550 nm laser source 9/125 µm

#### Singlemode Connector <sup>b</sup> ■

EI-EUI-28 = UPC/DIN 47256

EI-EUI-76 = UPC/HMS-10/AG

EI-EUI-89 = UPC/FC narrow key

EI-EUI-90 = UPC/ST

EI-EUI-91 = UPC/SC

EI-EUI-95 = UPC/E-2000

EI-EUI-98 = UPC/LC

EA-EUI-28 = APC/DIN 47256

EA-EUI-89 = APC/FC narrow key

EA-EUI-91 = APC/SC

EA-EUI-95 = APC/E-2000

EA-EUI-98 = APC/LC

Example: FLS-600-NS1548-12C-EI-EUI-91-2-23BL-EI-EUI-91

### SPSB-EF-XX-XX

#### Model ■

C30 = Encircled flux external launch conditioner,  
multimode fiber 50/125 µm, 34 meters including pigtails

#### Connector ■

89-89 (FC/UPC to FC/UPC)

89-101 (FC/UPC to LC/UPC)

91-91 (SC/UPC to SC/UPC)

91-101 (SC/UPC to LC/UPC)

Example: SPSB-EF-C30-91-101

#### Notes

a. For multimode port, UPC/SC connector is mandatory.

b. For singlemode port. Only available if 23BL source option is selected.

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