



Network Monitoring at the Physical Layer

Fast Fiber Fault Finder (F4) Micro-OTDR (uOTDR)™

Executive Overview from Optical Zonu Corporation



SFC F4 uOTDR Smart SFC Transceivers

- ✓ Micro-OTDR *Fast Fiber Fault Finder™*
- ✓ Reflection Immune Operation RIO™
- ✓ Up to 27 dB Optical Link Budget
- ✓ 55 dB Dynamic Range for the uOTDR
- ✓ 100 mSec Response to Fiber Fault
- ✓ Full Duplex, Single Wavelength
- ✓ Gigabit Ethernet / SONET

Applications

- ✓ Network Security / Maintenance
- ✓ "Cloud" Data Center Uplinks
- ✓ Metro-Ethernet Direct
- ✓ Wireless Backhaul
- ✓ Central Office Cross-Connect
- ✓ Electric Power Utilities

Benefits

- ✓ Rapid Response / Improved SLAs
- ✓ Reduced Operating Expenses
- ✓ Lower Overall Cost
- ✓ Simplified Installation

Savings

- ✓ Replace Expensive OTDR Monitors
- ✓ Half the Fiber / Half the Passives
- ✓ Installation and Maintenance Labor

SFP for CWDM with uOTDR – SFC F4 uOTDR™

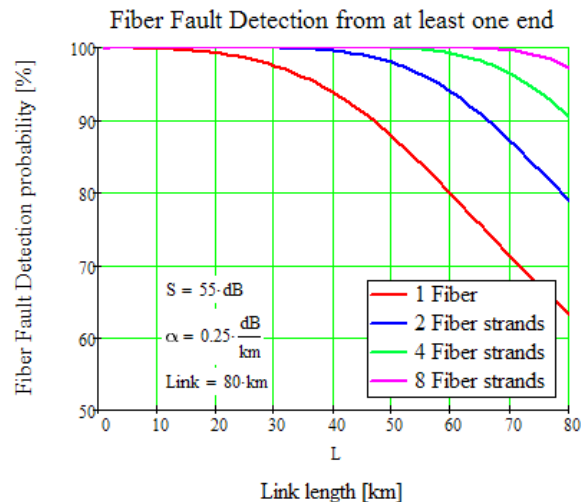
Automatically Detects, Locates and Reports Optical Fiber Faults Capabilities

The **SFC F4 uOTDR** functions as a normal Single Fiber, Full Duplex, CWDM Transceiver, automatically operating as a Micro-OTDR capable of detecting, locating and reporting optical fiber faults. Reflection Immune Operation solves all the implementation problems associated with single λ operation.

SFC F4 uOTDR Transceivers transmit and receive at the same wavelength, enabling Optical Fiber Fault Detection. The **SFC F4 uOTDR** transmitter is switched to operate in Micro-OTDR mode, emitting optical power pulses ($> +13$ dBm). The receiver will detect any reflected pulses at least down to -42 dBm optical power.

The **SFC F4 uOTDR** monitors the time delay between the transmitted and reflected pulses, such that the position of the fault is calculated, with an accuracy of 100 meters or better.

When optical fiber cable is broken multiple individual strands are randomly broken. The reflected optical power from a broken fiber end can vary over more than a 40 dB range. Extensive measurements have repeatedly confirmed that the distribution probability of the reflection is a well known statistical distribution.



ORL of a "Blue" UPC Connector Network is about 14 dB. Micro-OTDR Mode (with an optical power detection budget of more than 55 dB) can detect an open fiber fault up to the full reference link distance (including 4-Ch or 8-Ch Mux/Dmux), depending upon the network topology and overall link optical attenuation.

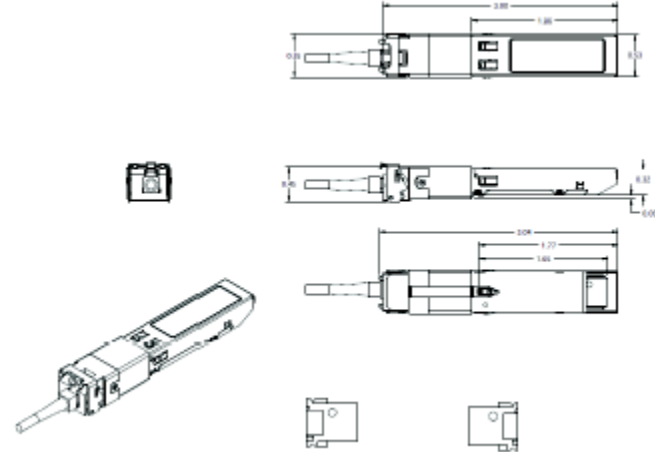
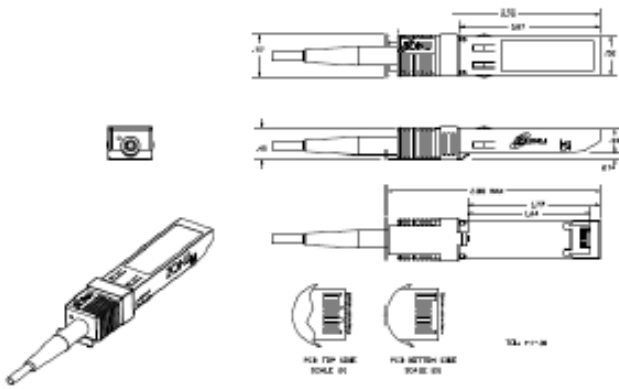
The fault location data is instantly available to the host switch/router via the **SFC F4 uOTDR** DDM function over the industry standard IIC bus. This allows the immediate targeted response necessary to support enhanced Network Security and deliver superior Service Levels.

With only very minor firmware reprogramming, virtually ANY OEM Host Network Equipment may be upgraded to utilize the full benefits of the SFC F4 uOTDR!

Reflection Immune Operation resolves self-reflection from an open connector and/or other reflectors. Only remote data is transferred into the host equipment. Both the Micro-OTDR and RIO are patent pending.

Fiber Pigtail Configuration

LC Receptacle Configuration (LC Jumper Cable Inserted)



Micro-OTDR Mode Characteristics (-20°C to +70°C)					
Parameter	Sym	Min	Typ	Max	Units
Tx Peak Pulse Power	P _{PP}	13	15		dBm
Rx Peak Pulse Sensitivity	P _{PP}	-32	-35		dBm

Pin Assignments

Pin #	Pin Name	Pin Function
1	VeeT	Transmitter Ground
2	TX Fault	Transmitter Fault Indication
3	TX Disable	Transmitter Disable
4	MOD-DEF2	Module Definition 2
5	MOD-DEF1	Module Definition 1
6	MOD_DEF0	Module Definition 0
7	NC	(No Connection)
8	LOS	Loss of Signal
9	VeeR	Receiver Ground
10	VeeR	Receiver Ground
11	VeeR	Receiver Ground
12	RD-	Inverted Received Data Out
13	RD+	Received Data Out
14	VeeR	Received Ground
15	VccR	Receive Power
16	VccT	Transmitter Power
17	VeeT	Transmitter Ground
18	TD+	Transmitted Data In
19	TD-	Inverted Transmit Data In
20	VeeT	Transmitter Ground

Absolute Maximum Ratings				
Parameter	Sym	Min	Max	Units
Storage Temperature (Case)	T _s	-40	85	°C
Operating Temperature (Case)	T _o	-20	70	°C
Relative Humidity	RH	5	95	%
Power Supply Voltage	V _{cc}	0	3.6	V
Input Voltage		GND	V _{cc}	V

Channel / CWDM Wavelength ZonuColor / Part Number Codes

ITU Ch	λ (nm)	ZColor	xx
3	1311		31
11	1471	GRA	47
12	1491	BLU	49
13	1511	WHT	51
14	1531	RED	53
15	1551	BLK	55
16	1571	ORA	57
17	1591	YEL	59
18	1611	BRN	61

Ordering Information / Allowable Standard Part Numbers / Descriptions

AF4-1xxY-MD-W Medium Reach	AF4-1xxY-MD-W Long Reach	Plain Language Description
AF4-1xxC-MD		SFC GbE 1xx1 nm DFB 18 dB DDM SC/APC PT w Micro-OTDR
AF4-1xxS-MD		SFC Dual-Rate 1xx1 nm DFB 21 dB DDM SC/APC PT w Micro-OTDR
AF4-1xxM-MD		SFC Multi-Rate 1xx1 nm DFB 21 dB DDM SC/APC PT w Micro-OTDR
AF4-1xxC-MD-L		SFC GbE 1xx1 nm DFB 18 dB DDM LC/APC Receptacle w Micro-OTDR
AF4-1xxS-MD-L		SFC Dual-Rate 1xx1 nm DFB 21 dB DDM LC/APC Receptacle w Micro-OTDR
AF4-1xxM-MD-L		SFC Multi-Rate 1xx1 nm DFB 21 dB DDM LC/APC Receptacle w Micro-OTDR
	AF4-1xxC-LD	SFC GbE 1xx1 nm DFB 23 dB DDM SC/APC PT w Micro-OTDR
	AF4-1xxS-LD	SFC Dual-Rate 1xx1 nm DFB 25 dB DDM SC/APC PT w Micro-OTDR
	AF4-1xxC-LD-L	SFC GbE 1xx1 nm DFB 23 dB DDM LC/APC Receptacle w Micro-OTDR
	AF4-1xxS-LD-L	SFC Dual-Rate 1xx1 nm DFB 25 dB DDM LC/APC Receptacle w Micro-OTDR

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