FG-750 Node iOLM

Powered by LINK AWARE™ TECHNOLOGY

The EXFO Link-Aware™ technology, which uses spectrally selective high-reflection demarcation filters, is protected by Canadian patent no. 2,737,974, by pending US application no. 13/124,455, and by corresponding pending applications in Australia, China, the EC, India, Japan and Korea.

SPEC SHEET

The first practical FTTx line quality assessment solution from the node.

KEY FEATURES AND BENEFITS

Remotely control fiber line quality, length(s) and connectivity in link certification, drop-cable installation and service activation with fixed test equipment

Using EXFO's Link-Aware™ technology, conduct PON or P2P fiber line testing with the power of an OTDR without the skill sets required—then turn it into a troubleshooting and monitoring tool

Measure end-to-end fiber attenuation at 1650 nm with a traceable test method using a reflective filter in the field and test equipment at the node

Monitor up to a demarcation point (e.g., customer premises terminal) independent from PON equipment

Measure short- and long-term link degradation with higher resolution and larger dynamic range than with PON equipment

Detect and localize fiber fault at 1625 nm comparing past to current situations in a fully automated way

Interface it to any management system using an open and fully documented resource-based web-services architecture that uses HTTP and XML (REST)

PART OF THE FG-700 FIBER GUARDIAN SERIES

Test Access Module Kit

Node Optical Test Access Unit

EXFO Assessing Next-Gen Networks

AN EXFO LINK-AWARE™ PRODUCT

The Node iOLM provides intelligent test automation in addition to being a specialized OTDR for access network testing. Unlike EXFO's other portable iOLM solutions, the Node iOLM can define and test point-to-multipoint (P2MP) fibers, as well as test downstream from the node or central office to any passive optical network line type. Essentially, what this means is that the Node iOLM can test before and after splitters. It is a node-based, fixed asset designed to expose test resources as web services so it can serve multiple workflows similarly to how a website supports multiple users.

By querying the test equipment with a topology template of the line, the application can define and run a series of OTDR acquisitions. It then assembles the information into a single XML dataset, merging the queried topological information, test results and quality assessment information associated with the discovered elements.

A FIBER GUARDIAN SERIES PRODUCT AND APPLICATION

The Node iOLM application is built on a specialized node OTDR, which is designed for in-service testing, monitoring and troubleshooting from the node. This means that a test can be conducted from the field while the instrument is at the central office. The solution is hosted on Carrier-class hardware that is scalable, flexible and always available. Access to the various services is gained via a server that allows calls to be placed over IP in every network configuration.

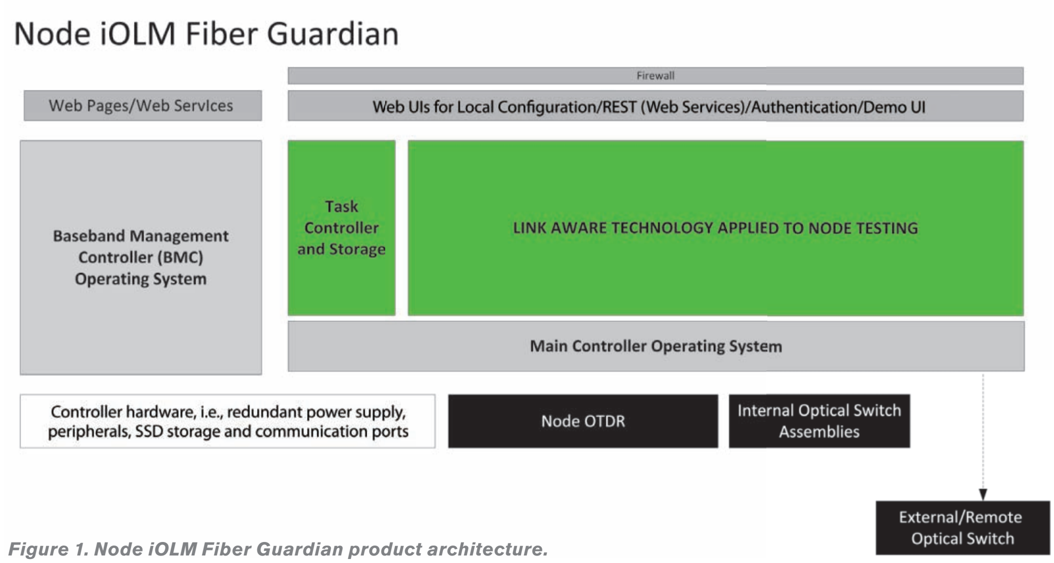


Figure 1. Node iOLM Fiber Guardian product architecture.

This product is typically interfaced with solutions dealing with inventory or quality control, with the management systems of active transmission equipment, or any network management system designed to provide access to optical test resources for PON or point-to-point networks. The product is a stand-alone, intelligent solution capable of mapping a line and producing structured and documented data (XML format) of all measurable elements using best-in-class OTDR technology. The elements discovered on the transport fiber are tested against pass/fail criteria, with loss/reflectance and distance values included in the same structured data. Reflective filters can also be used during testing to position and assess the quality of each branch beyond the splitter(s).

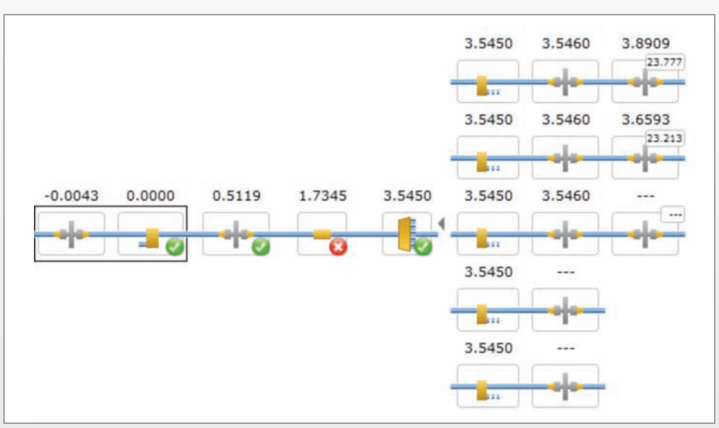


Figure 2. Schematic representation of an XML dataset.

The elements discovered on the F1 portion of a PON include a splitter. By programmatically adding elements on F2/F3 to the structured data, the end-to-end attenuation can be tested at different PON locations. This allows an online and dynamic pass/fail test to be set against the actual planning of the link in terms of splices, connectors, splitters and consumed fiber length. Represented schematically here, the XML dataset is a simple and fully structured dataset that can be easily parsed, edited and stored in a master database.

END-TO-END LOSS (EEL) MEASUREMENT

A key function of the Node iOLM is its ability to measure end-to-end loss or optical attenuation between the OTDR's location, in this case the central office, and any connector port downstream—even when a port is beyond a series of splitters. By simply splicing or inserting a high-reflectance demarcation (HRD) filter and using a mobile access tool, a field technician or supervisor can confirm the key information and values below:

- Connectivity confirmation–proper upstream connectivity
- Loss in absolute dBs–delta of the measured loss and the expected or typical loss at this point
- Optical fiber length–correlation with network documentation

In Figure 3, the attenuation is measured from the node to any connection terminal using the Node iOLM and HRD filter. This is triggered by a field technician who is testing on every port of a second-stage splitter during network installation or when certifying a contractor's work.

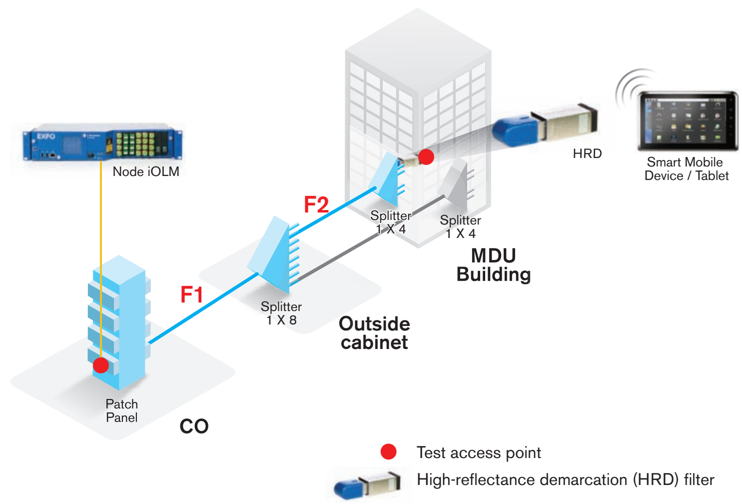


Figure 3. Link certification in a PON architecture with end-to-end connectivity.

TRANSPORT (F1) FIBER DISCOVERY AND DIAGNOSIS

By simply using a generic configuration (e.g., single stage 1 x 32 split), the Node iOLM discovers all elements connected downstream: TAMs or WDMs, patch panel connectors, cross-connects, splice points and a first-stage splitter. It measures their optical parameters, mainly their position from the test access module (WDM or coupler), and the induced loss and reflectance, if any. It applies pass/fail thresholds and provides an at-a-glance analysis to quickly determine whether or not the transport fiber meets the specifications and if the connectivity corresponds to the as-planned documentation. This baseline is then used for fault discovery in the troubleshooting phase.

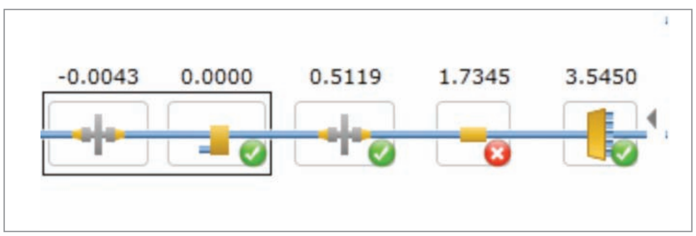


Figure 4. F1 test from the node.

The F1 test performed from the node, with the link start as the TAM/coupler output, checks all connectors and splices against pass/fail criteria. Their position is also reported and the splitter is identified.

HRD DETECTION, MEASUREMENT AND MANAGEMENT

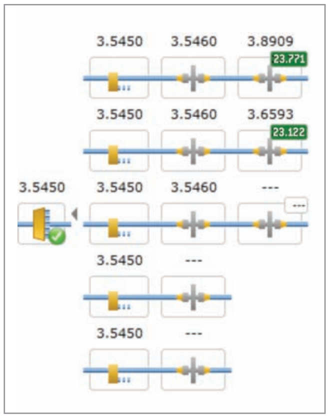


Figure 5. Detected and confirmed HRDs.

The Node iOLM offers a full set of test functions designed to confirm the presence of a newly inserted HRD, measure it and manage its lifecycle.

HRDs are inserted one by one and the link attenuation value, upon detection, is compared to the typical loss budget in order to provide a pass/fail outcome for the particular point being tested. Further testing will compare the past to the current and change the status to "failed" when attenuation increases beyond a programmable threshold.

FAULT ISOLATION AND LOCATION ON F1, F2, F3

By acquiring multipulse OTDR traces and comparing them to their respective baselines, the Node iOLM can detect, isolate and locate degradations, both on demand and automatically, when at least one HRD has failed. If multiple HRDs are present on the P2MP line, they will first be used to isolate faults before or beyond upstream splitters. The Node iOLM uses multi-HRD analysis to detect small line degradations, which is typically not possible through active/PON equipment network management because of its very high dynamic range and attenuation resolution, which is required for proactive network monitoring.

The accuracy of the fault-finding algorithm has been greatly enhanced compared to other OTDR test methods thanks to EXFO's 2-lambda test method, which uses 1650 nm for HRD testing and 1625 nm (or any other out-of-band wavelength) for RBS fault-finding. Given the nature of the Fiber Bragg grating (FBG) filters used, all signals except 1650 nm will pass transparently through. This enables standard Rayleigh backscattering testing at 1625 nm without the dead zones created by the strong reflectance at the FBG filters' central wavelength (1650 nm).

In figure 6, there is a fault–fiber cut at the F2 second-stage splitter location. It is therefore added to the PON line topology as an unexpected element, which means that all HRDs on that branch show a failed status.

As a general rule, the accuracy of the PON (P2MP) fault location function is a few meters on transport/F1 and from a few meters to 100 m on the distribution, depending on fiber impairment, type and topology.

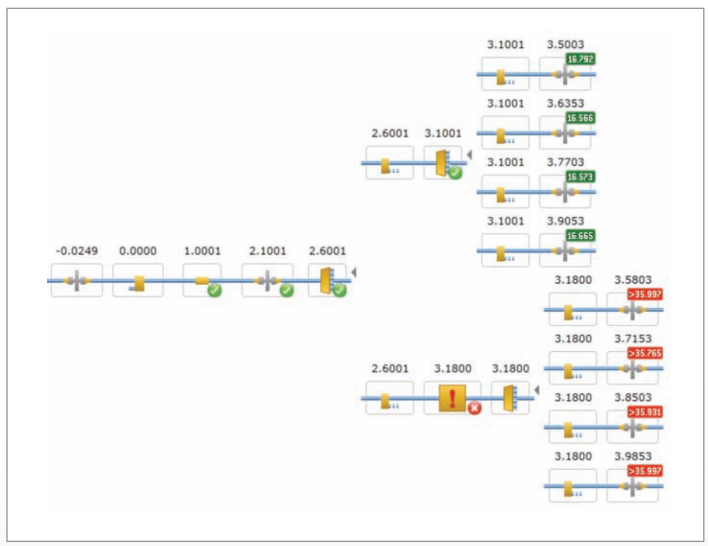


Figure 6. Fault-finding for proactive network monitoring.

SPECIAL DIAGNOSIS ON OPTICAL LINES AND ELEMENTS

Specific analysis and reports are generated and can be read directly from the test result data. Actions may be recommended to the technician for the entire line being tested or for a specific element considered as failed. An example of this is when an overlapping situation occurs after adding a new HRD to the line; the Node iOLM will provide hints on how to resolve the issue. It should be noted that a conflict status will be created if one HRD is added at less than 50 cm optical distance from a filter that is already present and detected on the line.

FIBER GUARDIAN SPECIFICATIONS–FG-750ST/EX

OTDR module (see below) Field exchangeable	Node iOLM for access/PON application	
Standard model–number of optical ports [a]	SC-APC or FC-APC	1/4/8/12 ports
Expandable model–number of optical ports	4-port SC-APC optical switch cassette (OSC) 8-port LC-APC OSC 12-port MTP-APC OSC Maximum eight (8) OSCs per unit Scalable, modular construction Field configurable	8 to 96 ports [b]
Internal optical switch type	MEMs [c]	
First stage internal 1 X 8 optical switch insertion loss (typ.)	0.8 dB	
Internal optical switch lifetime (minimum number of cycles)	1 000 000 000 (10^9)	
External optical switch (1 x n) [d]	High number of ports	576/720 ports
Wired network interfaces–two standard CAT-5 cables	10/100/1000 Base-T Ethernet IP-V4 and V6, one dedicated to local access	
Unit status front LEDs	5	
Storage type	1 (solid state drive)	
Data storage	16 GB (standard) or 32 GB (optional)	
Dual, hot-swappable and redundant power supplies (AC or DC)	Rear swap	VAC 100 – 240, 50 / 60 Hz VDC –40/–57
Power consumption steady state (fully loaded with 96 ports)	DC AC	30 W 30 W
Fan	Field replaceable Front loading	1
Rack type	Drawer on rail	
Supported browsers for unit configuration and status view	MS Internet Explorer™ Mozilla FireFox™ Google Chrome™	
Operating temperature	0 ˚C to 40 ˚C	
Size (for 19”, ETSI or 23” racks) (H x W x D)	Fits in 300 mm deep ETSI rack with cabling (DC model) connected	89 mm (2U) x 435 mm x 260 mm 3 ½ in (2U) x 17 in x 10 ¼ in
Product Compliance	CE, CSA, RoHS	
Wireless network interface option	Integrated wireless communication module with external antenna (SIM not included, some conditions such as level of signal inside premises apply)	3G

NOTES

a. One port is without internal MEMs switch for connection to external OTAU.

b. 96 ports with MTP-type OSCs.

c. Micro-electro-mechanical system.

d. Optomechanical type optical switch.

NODE OTDR MODULE SPECIFICATIONS [a]

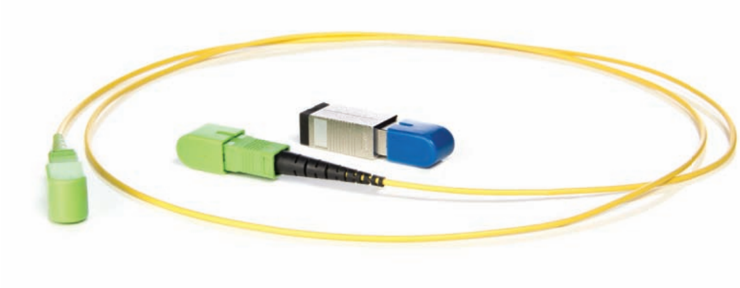
Fiber type	Singlemode
Type (internally filtered)	In service
Maximum nominal traffic channel (nm)	1610
OTDR wavelengths (nm)	1625±3/1650±4
Event dead zone (m) (typ.) [b]	0.5
Pulse width range (ns)	3 to 20 000
Minimum attenuation when measured with HRD (dB) (typ.) [c, d]	10
Maximum attenuation for HRD detection (5 km/20 km ranges) (dB) (typ.) [c, d]	32/30.5
Maximum measurable attenuation with HRD (dB) (typ.) [c]	35
Attenuation measurement uncertainty (dB) (typ.) [e]	0.6
Attenuation measurement repeatability (dB)	0.1
Attenuation measurement display resolution (dB)	0.01
Dynamic range (RBS) at 1625 nm for 1 µs pulse, 45 s averaging SNR = 1 (dB) (typ.)	27
Dynamic range (RBS) at 1650 nm for 20 µs pulse, 180 s averaging SNR = 1 (dB) (typ.)	35
Minimum optical separation for HRD (m) (typ.) [f]	0.5
HRD distance measurement (m) [c, g]	±(0.8 + 0.0025 % x distance)
Maximum first-to-last HRD separation length (m) (typ.) [h]	8 000
Sampling resolution (m)	0.04 to 10
Sampling memory size	256 000 pts

NOTES

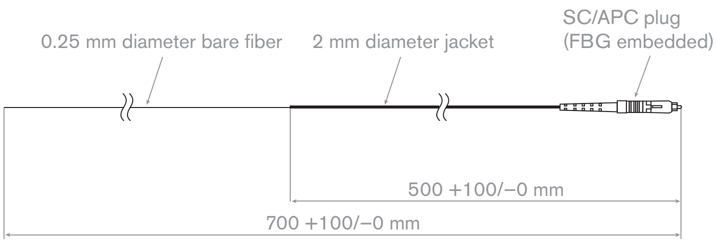
a. Specification valid at an operating temperature of 23 °C ± 2 °C.
b. With 3 ns pulse.
c. From OTDR port.
d. Guaranteed specification for maximum measurable attenuation for new HRD placement/detection is 30.4 dB for a 5 km (or less) range from the OTDR.
e. For attenuation levels between 15 and 30 dB with EXFO-qualified HRD filters.
f. For two HRDs connected to the same splitter or at similar attenuation points.
g. Does not include uncertainty due to fiber index.
h. Maximum length between first and last HRD placed at any distance from OTDR.

HIGH-REFLECTANCE DEMARCATION FILTERS

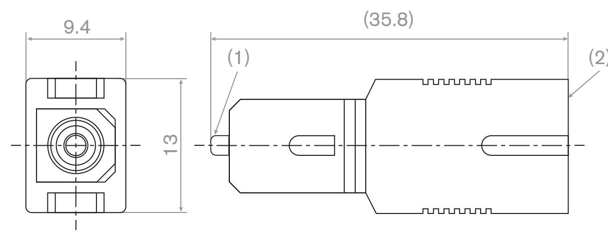
Two models are available: pigtail and adapter. In both cases, the filters have to be inserted in the proper direction in order to measure attenuation. Pigtails are bare fiber on the network side (upstream), whereas HRD is in an SC connector, inside ferrule, on the customer side. For plug type or adaptor type, the male side connects toward the ONT/terminal. On request, HRDs are also available in a field-assembly connector type.



Pigtail type:



Plug jack/adapter type:



HRD FILTER SPECIFICATION (PIGTAIL TYPE) [a]		
Passband (nm)	1260 to 1360	
Reflect band (nm)	1645 to 1655	
Fiber type	Corning SMF-28	
Insertion loss (dB) [b]	1310 nm ± 20 nm 1550 nm ± 20 nm	≤ 1.3
Isolation (dB)	1650 nm ± 5 nm	≥ 21
Return loss (dB)	1310 nm ± 20 nm 1550 nm ± 20 nm	≥ 35 ≥ 33
Reflectance (dB)	1650 nm ± 5 nm	≥ -1.1

Notes

a. Specification valid at an operating temperature of 23 °C ± 2 °C.

b. Including 1 connector with a nominal loss of 0.4 dB.

ORDERING INFORMATION

FG-750ST-Node-iOLM-XX-XX-XX-XX

Model
FG-750ST-Node-iOLM = Node iOLM Fiber Guardian

Port option
01 = 1 port (no internal optical switch)
04 = 4 ports
08 = 8 ports
12 = 12 ports

Connectors
58 = FC-APC
88 = SC-APC

Storage option
SSSD = Standard 16 GB solid-state disk storage
ESSD = Extra 32 GB solid-state disk storage capability for external large port count switch

Communication interface option
00 = Without communication interface
3G = Internal 3G broadband interface

Example: FG-750ST-Node-iOLM-04-58-3G-SSSD

FG-750EX-XX-XX-XX-XX-XX

Models
Node-iOLM = Node iOLM Fiber Guardian (Expandable)
OTAU = Optical Test Access Unit (Expandable)

Cassette connector option
88 = SC-APC
92F = MTP-APC
104 = LC-APC

Storage option
SSSD = Standard 16 GB solid-state disk storage
ESSD = Extra 32 GB solid-state disk storage capability for external large port count switch

Communication interface option
00 = Without communication interface
3G = Internal 3G broadband interface

Cassette port
SC00 = No cassette with 8-port (SC-APC)
SC12 = Three 4-port cassettes (SC-APC)
SC16 = Four 4-port cassettes (SC-APC)
SC24 = Six 4-port cassettes (SC-APC)
SC32 = Eight 4-port cassettes (SC-APC)
LC08 = One LC-APC 8-port cassette
LC16 = Two LC-APC 8-port cassettes
LC24 = Three LC-APC 8-port cassettes
LC32 = Four LC-APC 8-port cassettes
LC48 = Six LC-APC 8-port cassettes
LC64 = Eight LC-APC 8-port cassettes
MTP12 = One MTP-APC 12-port cassette
MTP24 = Two MTP-APC 12-port cassettes
MTP48 = Four MTP-APC 12-port cassettes
MTP72 = Six MTP-APC 12-port cassettes
MTP96 = Eight MTP-APC 12-port cassettes

Example: FG-750EX-Node-iOLM-88-SC12-3G-SSSD

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