

# LightPULSE Fiber Health Management



## Centralized Monitoring Pinpoints Fiber Cuts and Degradations

Fiber failures cause service outages, so it is imperative to locate and repair failures as soon as possible. LightPULSE uses distributed OTDR (Optical Time Domain Reflectometry) to monitor the physical health of a fiber, including the integrity of all splices along the fiber path, from the convenience of a network control center. It locates degradations and failures to within a few meters, and can be combined with a GPS system to dispatch repair crews with pinpoint accuracy.

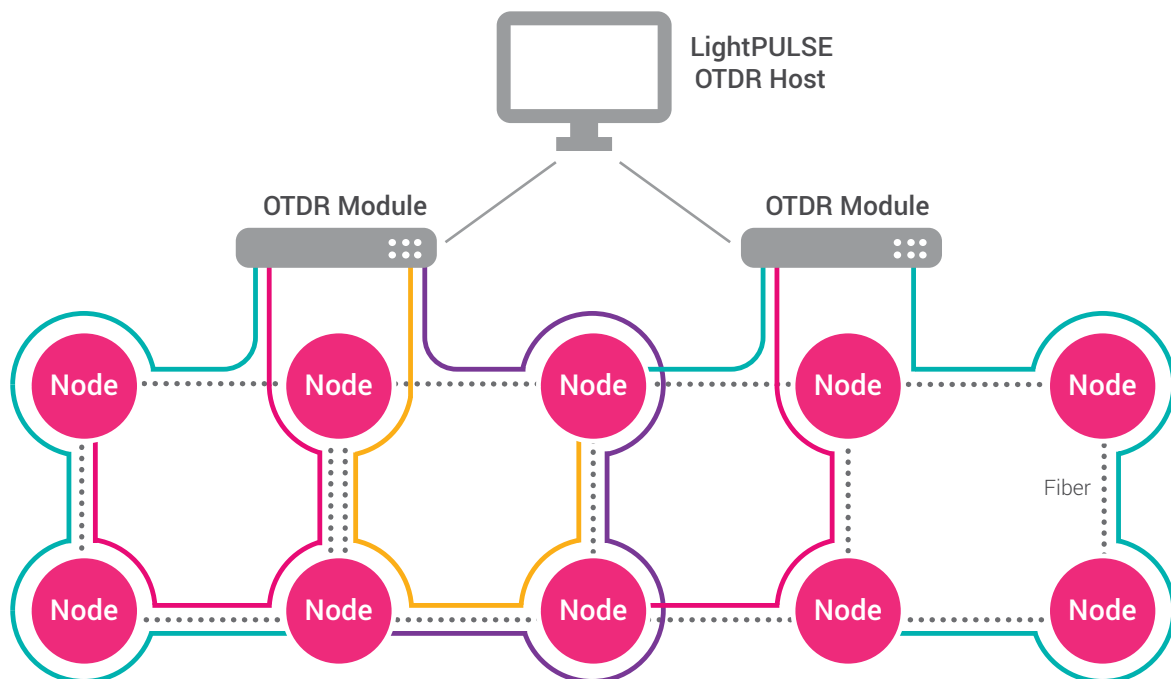
LightPULSE OTDR monitors fiber health without affecting services traffic, and can be installed on any fiber network, whether it is supporting packet or optical networking gear from Ribbon or another provider. LightPULSE OTDR pays for itself quickly in operational savings and customer satisfaction.

**In-service  
Monitoring of any  
Fiber Network**

**Locates Failures  
to within Meters,  
Whether In-building  
or Outside Plant**

**Finds Degradations  
before they  
become Failures**

**Eliminates  
Multiple Truck  
Rolls**

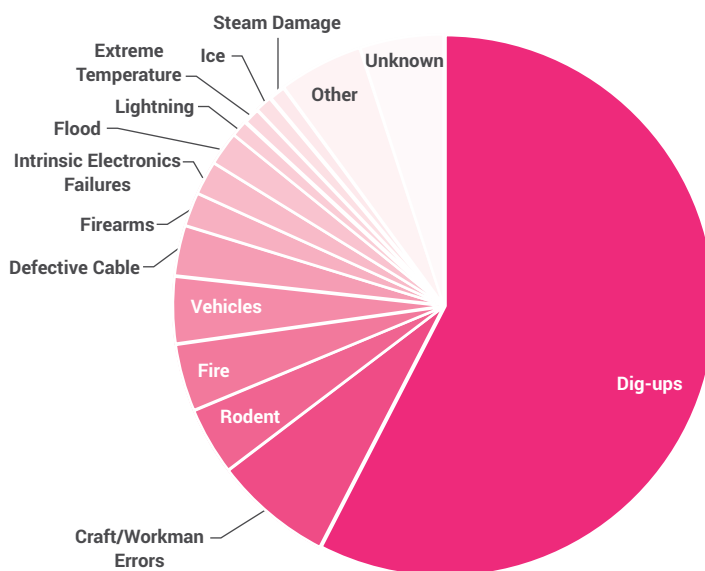


### Fiber Failures Happen

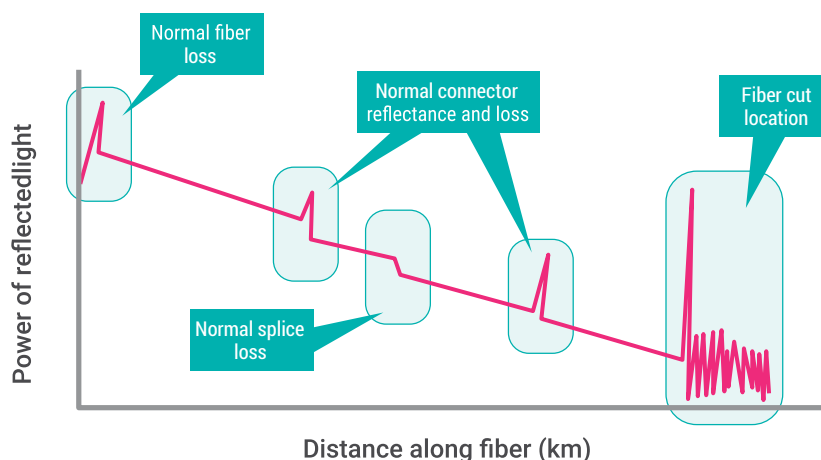
Fibers by their nature are the most exposed part of a network. They span huge distances in territories beyond the control of a network operator, underground, under water, on aerial cables, and often popping up in equipment huts. While perhaps not intuitive, studies have shown that underground fiber is the most susceptible to harm, with the most frequent failure mode being dig-ups<sup>1</sup>.

Typically, a failure leads to multiple truck rolls, to:

- 01** Determine the location and nature of the failure
- 02** Perform a temporary repair to restore service, with an average repair time of 5 hours<sup>2</sup>
- 03** Perform a permanent repair, with an average repair time of 14 hours



However, average repair time statistics are misleading. The real pain comes from a small percentage of problems that seemingly take forever to locate and repair. Being able to locate degradations before they become service affecting, or quickly pinpointing the location of hard failures, reduces outage and repair times significantly. It saves on truck roll costs and repair crew man-hours (usually with overtime), and increases customer satisfaction with higher service availability.



### LightPULSE Integrated OTDR

OTDR is a classic technique to characterize and locate problems on a physical fiber. It injects a pulse of light into a fiber, and then analyzes the power of the reflected signal in time. Expected characteristics, as well as abnormalities and hard breaks all show up instantly to a technician.

In the past, OTDR has been exercised mainly with handheld devices. When a problem occurs, a technician is dispatched to the approximate area; he or she then finds a location like an equipment hut to patch into the fiber with the handheld OTDR, and proceeds with the diagnosis. The downsides of this approach is that it is reactive and time-consuming.

<sup>1</sup> Reliability of Fiber Optic Cable Systems: Buried Fiber Optic Cable, Optical Groundwire Cable, All Dielectric Self-Supporting Cable, Alcoa Fujikura, May 2001.

<sup>2</sup> V. Hou, "Update on Interim Results of Fiber Optic System Field Failure Analysis", NFOEC Proceedings, pp. 539-545. April 1991. (Note: While these are older references, they are still widely cited because the nature of fiber failures and repair has not changed significantly over time.)

# LightPULSE Fiber Health Management

LightPULSE OTDR makes fiber health management easy with a centralized solution. Its has two elements:

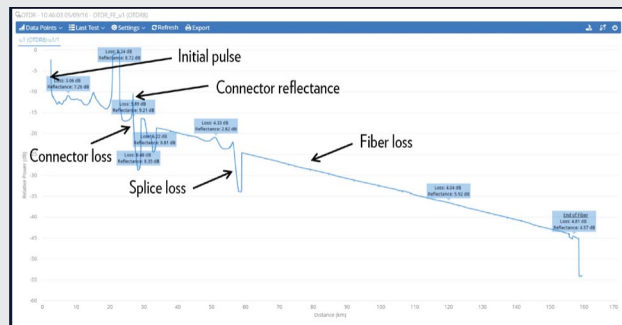


## OTDR1610\_8S Module

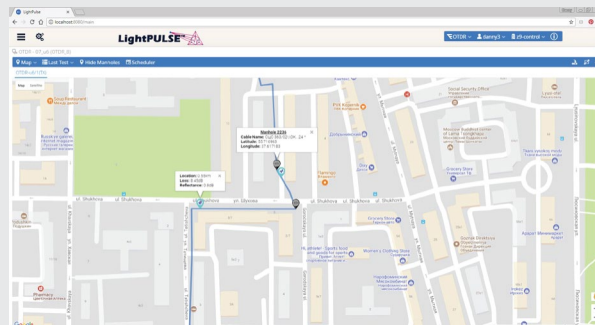
This single slot card fits any of Ribbon's Apollo 9600 series optical networking platforms, including the compact 9603 2RU platform. It can be deployed stand-alone or in conjunction with other Apollo optical transport gear like transponders and ROADMs. The OTDR module operates at 1610nm, outside the bands used for optical services transmission, and each module can monitor up to eight individual fibers.

## LightPULSE Host

This centralized application and GUI controls the OTDR modules, reports OTDR measurements, and stores results for historical trend analysis. It also interfaces with a LightPULSE Geographic Information System (GIS) to translate distance down a fiber to a problem to geographical X and Y coordinates.



LightPULSE OTDR Trace



LightPULSE Geographic Mapping



### Dramatic Reduction in Truck Rolls

Centralized monitoring dramatically reduces truck rolls previously required in dealing with fiber problems. One LightPULSE OTDR network operator reports a 4X reduction in truck rolls from 100s to less than a 100 per year.



### Complete Network Coverage

Each OTDR module can monitor up to eight fibers. By distributing the modules around the network, it is straightforward to cover all fibers. Moreover, fibers can be monitored bi-directionally, providing even greater insights.



### Fault Detection with Pinpoint Accuracy

LightPULSE OTDR is accurate to within about 0.01% of fiber length. For example, for spans up to 30km, breaks can be identified to within 3m, or to within 12m for spans as long as 120km.



### Can Sectionalize Faults between Owned and Leased Fiber

Many network operators rely on a combination of owned and leased fiber. LightPULSE OTDR's mapping feature makes it easy to determine in whose jurisdiction the problem lies, and who is responsible for the repair.



### Early Fault Detection Through Trend Analysis

LightPULSE OTDR enables comparing snapshots of a fiber's characteristics over time to identify problems before they become service affecting, such as a splice that is deteriorating.



### Works on any Fiber Network

LightPULSE OTDR can be deployed in conjunction with Ribbon supplied networking gear, or as an overlay to an existing packet or optical network, or a mix of the two.

## About Ribbon

Ribbon Communications (Nasdaq: RBBN) delivers communications software, IP and optical networking solutions to service providers, enterprises and critical infrastructure sectors globally. We engage deeply with our customers, helping them modernize their networks for improved competitive positioning and business outcomes in today's smart, always-on and data-hungry world. Our innovative, end-to-end solutions portfolio delivers unparalleled scale, performance, and agility, including core to edge software-centric solutions, cloud-native offers, leading-edge security and analytics tools, along with IP and optical networking solutions for 5G. We maintain a keen focus on our commitments to Environmental, Social and Governance (ESG) matters, offering an annual Sustainability Report to our stakeholders. To learn more about Ribbon visit [rbbn.com](https://rbbn.com).

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Contact us to learn more about Ribbon solutions.