Fiber Best Practice: Fiber Plant Characterization and Troubleshooting (Tier 2 Certification)

Introduction to fiber best practices

The Fiber Best Practice Series was designed by Fluke Networks to educate about important optical fiber best practices, including:

- *Fiber inspection and cleaning*
- *Loss-length (Tier 1) fiber certification*
- *Fiber plant characterization and troubleshooting (Tier 2 certification)*

This white paper details the best practice of fiber plant characterization and troubleshooting (Tier 2 certification).

With 40G/100G infrastructure deployments in the datacenter quickly becoming reality, the shrinking loss budgets of optical fiber cabling due to increasing bandwidth demands mean that reliable and efficient initial installations are now more important than ever. To minimize costly installer or contractor callbacks, network technician troubleshooting time, and unnecessary network downtimes, fiber-handling best practices should always be followed.

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Why you should care

In gaining full visibility into the fiber plant's attenuation, insertion loss, and reflectance at connectors, splice locations, and unanticipated loss events, an optical time domain reflectometer (OTDR) provides valuable insight into a fiber installation that cannot be obtained from an optical loss test set (OLTS), despite its primary value as a certification instrument. More basic and simple-to-use Fiber Troubleshooters provide similar visibility into a channel's connectivity by locating common causes of fiber failures such as high loss or reflectance incidents and fiber breaks – without the common OTDR hassles of setting testing parameters or analyzing traces.

Such an ability to pinpoint events is critical for troubleshooting and rooting out potential cabling component problems in the fiber plant to prevent or minimize costly network downtime. Although currently considered a complementary test by industry standards such as Telecommunication Industry Association's (TIA) TIA-568-C.0 and International Organization for Standardization's (ISO) ISO 14763-3, it has long been considered a best practice by fiber experts.

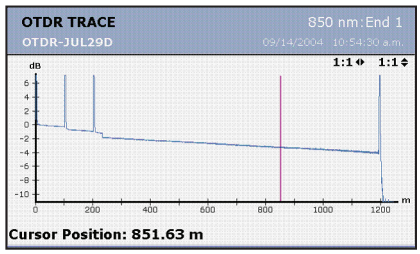

Figure 1. Depiction of a typical OTDR trace.

How it works

An OTDR measurement & analysis reports loss, reflectance, and locations of events by shooting pulses of light into one end of a fiber link and using a photodetector to sense reflections from connectors, splices, and bends. These occurrences are often referred to as "events" - some of which are expected and others, unexpected. When a pulse of light travels down the fiber, most of it continues in the direction of the link. However, due to the inherent composition of the glass fiber, a small fraction of the light, called "backscatter", is dispersed in different directions. Some of this backscatter makes its way back to the sensitive detectors at the OTDR source, which is analyzed before being graphically displayed to depict the link-under-test. Such a characterization of the fiber link is displayed via a trace, plotting the measured reflectance and loss over distance.

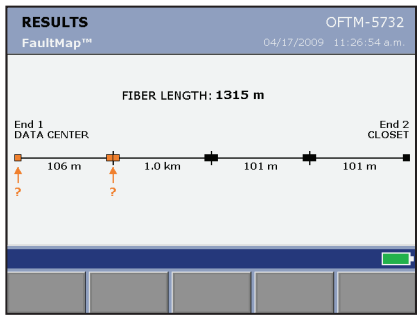

Figure 2. Advanced troubleshooting capability, such as highlighting questionable connectors in the link-under-test.

Fiber Troubleshooters use loss and reflectance measurements – but without the advanced analysis and potentially confusing data. As effective, yet simple troubleshooting tools, they digitally displays distances to connections, breaks, and high loss and high reflective incidents without requiring the user to interpret any traces, event tables, etc.

Fiber plant characterization and troubleshooting procedures

- Connect[1] the OTDR or Fiber Troubleshooter to one end of the fiber link-under-test.
- Configure or select the appropriate limits to test against (not required for a Fiber Troubleshooter).
- Test the fiber optic link.
- Review the testing results for any passes or failures. OTDR Results are conveyed in a graphical plot or event table format. (Fiber Troubleshooters show distances to various incidents of interest and are displayed in digital format).
- Compare to the limits being tested against to ensure that the component measurements are within the specified limits.

Figure 3. Depiction of a Fiber Troubleshooter showing reflection and loss limits exceeded.

For more information on the Fiber Best Practices of inspection and cleaning and loss-length certification, visit **www.flukenetworks.com/fiberbestpractices**

[1] Similar to using test reference cords between the source and meter in an OLTS, ensure a launch fiber is used to connect the OTDR or Fiber Troubleshooter to the channel and a receive fiber is connected to the far end of the channel. Launch and receive fibers are test leads that enable the tester to overcome deadzone limitations to measure the loss and reflectance of the first and last connectors in the cabling.

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