

Fiber Testing Best Practices

Pocket Guide





Time and resources are constantly in demand for enterprises. With the consolidation of networks combined with server and network virtualization, data centers are becoming increasingly complex. Testing plays a key role in ensuring the fiber optic cables that make up the network are running efficiently. Controlling network loss is becoming an increasingly important task for network engineers as loss budgets get smaller and demands on networks increase and intrinsic to this is testing and inspection of fibers.

This Fiber Testing Best Practices pocket guide was designed by Fluke Networks to educate about important optical fiber handling best practices, including:

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

Whether you handle fiber on a regular basis or just occasionally, this pocket guide will serve as a useful tool to ensure you never miss a critical step during your fiber testing or troubleshooting.

Why are Fiber Testing Best Practices so important?

To minimize costly installer or contractor callbacks, network technician troubleshooting time, and unnecessary network downtimes, fiber-handling best practices should always be followed.

Best Practice #1: Fiber Inspection and Cleaning

When should you do it?
Prior to any fiber connection

Why should you do it?

Dirty end-faces are the #1 cause of fiber link failure, but are the easiest to prevent. Damaged end-faces, in the form of scratches, pits, cracks, or chips, can also bring a fiber network down, and are often the result of poor terminations or mated contamination.

What instruments should you use?

- A Video Microscope that can certify to the industry standard IEC 61300-3-35 for automated Pass/Fail acceptance testing of fiber end-faces
- Non-IPA fiber-optic solvent for effective, residual-free cleaning
- Lint-free, non-static wipes for end-face cleaning or swabs for port-cleaning

Inspection and Cleaning Procedure

- ❑ Inspect the fiber end-face (or port) using a video microscope to identify contamination.
- ❑ If only dust needs to be removed, use a OneClick Cleaner
- ❑ If you see grease or oil from skin contact, use the following "wet" procedure:
 - ❑ Dab the contaminated end-face with a solvent-dampened wipe (or swab).
 - ❑ Swipe the fiber end-face perpendicularly one time against a dry wipe.
 - ❑ Re-inspect the fiber end-face (or port) with the video microscope to ensure that all the debris has been removed.
 - ❑ If contamination is still observed, repeat the cleaning process until all contamination is removed.

Fluke Networks Fiber Inspection and Cleaning Solutions



Fiber Optic
Cleaning Kit



FT500
FiberInspector Mini



FI-7000
FiberInspector™ Pro

Best Practice #2: Loss-Length Fiber Testing (Tier 1 Certification)

When should you do it?

After any fiber-link installation to ensure the job meets the fiber-loss budgets as specified by the cabling infrastructure standards.

Why should you do it?

It is required by internationally recognized standards such as TIA-568-C, ISO/IEC-11801 and ISO/IEC 14673-3 to ensure a quality installation.

What instruments should you use?

- Optical Loss Test Set (OLTS), (automated, measures a duplex fiber in both directions - preferred) - or -
- Light Source/Power Meter (LSPM) Set and Visual Fault Locator (manual, measures a single fiber path)

Tier 1 Fiber Certification Procedure

1. Before testing, connect the stabilized source to the meter with a test reference cord (TRC), a patch cord with a known negligible loss.
2. Set and record a reference power level from the source as the baseline for the subsequent power-loss measurement.
3. Disconnect the TRC from the meter and connect a second TRC to the meter port. Connect the two TRCs together with a precision bulkhead adapter.
4. Measure the loss to ensure your TRCs are good (≤ 0.15 dB for MM, ≤ 0.25 dB for 5M) and save the test.
5. Disconnect at the bulkhead adapter and connect to the link under test and measure the loss.
6. An OLTS will display results as a "Pass" or "Fail" based on standards and the measured length. An LSPM will only measure the loss (limits and margins need to be calculated manually).

(Note: When using an LSPM (instead of OLTS such as the CertiFiber Pro), a visual fault locator, fiber length meter, and manual calculations are also required.)

Fluke Networks Loss-Length Fiber Testing (Tier 1 Certification) Solutions



CertiFiber® Pro
Optical Loss Test Set
(OLTS)



Encircled Flux
Test Reference Cords
(required per standards)



SimpliFiber Pro®
(LSPM) & VisiFault™
Visual Fault Locator

Best Practice #3: Fiber Plant Characterization & Troubleshooting (Tier 2 Certification)

When should you do it?

After loss-length testing (Tier 1 certification) to document and verify that the cabling and connections are installed correctly or when troubleshooting a failure to quickly pinpoint its source.

Why should you do it?

Fiber networks have very tight loss budgets and less room for error, so network owners and designers are setting not only overall loss budgets, but also loss budgets for individual splices and connectors. An Optical Time Domain Reflectometer (OTDR) is required to make these measurements.

What instrument should you use?

OTDR with launch and tail fibers - test leads that overcome OTDR dead zone limitations to measure the loss and reflectance of the first and last connector in the link

Tier 2 Fiber Certification Procedure

- ❑ Bi-directional OTDR testing is required to calculate the correct event loss values of the link-under-test and due to "directivity" that results from differences in diameter, backscatter, numerical aperture and index of refraction of the link and launch and tail fibers.
- ❑ Connect the OTDR to one end of the link using a launch fiber. Attach a tail fiber to the connector at the far-end.
- ❑ Configure or select the appropriate limits.
- ❑ Shoot a trace of the link. Disconnect the OTDR from the link, leaving launch and tail fibers in place. Connect the OTDR to the far-end tail fiber. Shoot a 2nd trace for giving results in the opposite direction.

(Note: OptiFiber Pro's SmartLoop™ technology can perform bi-directional testing of fiber pairs without moving the tester to the far end.)

- ❑ Calculate the average loss of the two results for every individual occurrence in the link and review pass or fail results. Results are best understood in a tabular or EventMap™ format (see below).
- ❑ Compare to the limits being tested against the loss budget to ensure that the components are within specified limits.

Fluke Networks Fiber Plant Characterization and Troubleshooting (Tier 2 Certification) Solutions



OptiFiber® Pro OTDR



OptiFiber® Pro EventMap

Best Practice #4: Documentation

When should you do it?

Always after you have completed a measurement you will want to save the results.

Why should you do it?

Good record-keeping is a smart practice. It enforces installation accountability and integrity, helps to resolve disputes and facilitates more efficient troubleshooting.

What documentation software should you use?

LinkWare™ Cable Test Management Software that lets you manage all the results from multiple testers using one PC application

Documentation Procedure

- ❑ After each measurement save the results.
- ❑ Upon completion of the job or at any desired moment you can either upload the results from the tester via a direct connection to the PC or via LinkWare Live, a SaaS (Software as a Service) solution from FlukeNetworks.
- ❑ Once test results are downloaded into the LinkWare Cable Test Management Software you can generate professional reports in a common format (such as PDF).

Fluke Networks Documentation Solutions



LinkWare Report



LinkWare Live
SmartPhone Interface

Best Practice #5: Maintenance and Technical Support

When should you consider it?

From the day you acquire a tester and on a yearly basis to ensure equipment stays in top shape.

Why should you worry about it?

To ensure service and support is there when you need it, minimizing business downtime and ensuring a high return on your investment.

What kind maintenance and support agreement do you need?

One that is like insurance. A comprehensive support and maintenance program that covers all products and accessories as well as access to technical specialists 24/7.

Versiv Maintenance & Support Solutions












Benefits	Standard Warranty	Gold Support
Live technical support with exclusive phone number		✓
FREE Annual Calibration and Factory Refresh		✓
FREE Repair with "first on bench" turnaround service		✓
Loaner Equipment Service*		✓
FREE Accessory Replacements**		✓
Lifetime Buyback Guarantee		✓
Member Only Promotions		✓
Tech Support Response Time	< 24 Hours	< 2 Hours
Support – Phone and Email	Working hours	24 x 7 x 365
Software and Firmware upgrades	✓	✓
Online training video and Knowledge Base access	✓	✓

*Available in certain geographies

**Applies to accessories in the original product purchase

Gold support provides similar benefits for other products – contact your Fluke Networks representative for details.

Fluke Networks Fiber Test and Troubleshooting Instruments

	Inspection & Cleaning			Loss (Tier 1)	Length Testing Certification)	MPO Testing	Plant Characterization & Troubleshooting (Tier 2 Certification)		
									
Check for fiber end-face contamination or damage	✓	✓			✓				✓
End-face inspection grading		✓			✓				✓
Clean contamination			✓						
Check connectivity				✓	✓	✓	✓	✓	✓
Check polarity				✓	✓	✓	✓	✓	
Verify loss over entire link to ensure loss budget not exceeded				✓	✓	✓			
Dual-fiber loss testing					✓				
Singlemode Tier 1 certification				✓	✓	✓			
Multimode Encircled Flux Compliant Tier 1 Certification				with EF TRC's	✓	EF compliant at the bulkhead			
Locate faults							✓		✓
Tier 2 certification									✓
Pass/fail results		✓			✓				✓
Document test results		✓		✓	✓	✓			✓
Fiber types supported	Multimode Singlemode	Multimode Singlemode	Multimode Singlemode	Multimode Singlemode	Multimode Singlemode	MPO only (Multimode & Singlemode)	Multimode Singlemode	Multimode Singlemode	Multimode Singlemode
Source type				LED, FP Laser	LED, FP Laser	LED, FP Laser	Laser	Laser	LED, FP Laser

Ensure the fiber-based network goes up and stays up!

Visit www.flukenetworks.com/FiberBP
for additional resources to help you establish
Fiber Testing Best Practices.

Fluke Networks
P.O. Box 777, Everett, WA USA 98206-0777

Fluke Networks operates in more than 50 countries worldwide. To find your local office contact details, go to www.flukenetworks.com/contact.

©2014 Fluke Corporation. All rights reserved.
12/2014 3790462D