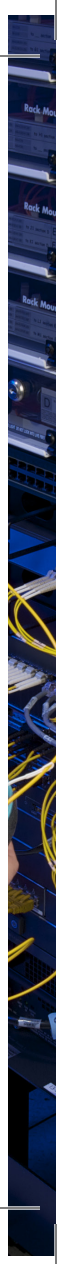


Fiber Testing Best Practices



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, preferably, one 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 mechanical dry 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



FI-500
FiberInspector™
Micro



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-D, 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 -
- Power Meter/Light Source (PMLS) Set and Visual Fault Locator (manual, measures a single fiber path)

Tier 1 Fiber Certification Procedure

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

(Note: When using an PMLS (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®
(PMLS) & VisiFault™
Visual Fault Locator

Best Practice #3: Fiber Plant

Characterization & Troubleshooting (Tier 2 Certification)

A technician in a blue button-down shirt is shown in profile, looking at a yellow handheld device. The device's screen displays a green and white graph, likely representing fiber test results. The technician is standing in front of a server rack. Inside the rack, a blue SCILC (Serviceable Component Interchangeable Limited Component) device is mounted, with several blue fiber optic cables plugged into it. The background shows a typical office environment with glass partitions and ceiling lights.

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.

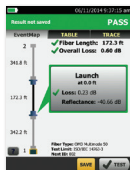
(Note: OptiFiber Pro’s SmartLoop™ technology can perform bi-directional testing of fiber pairs without moving the tester to the far end.)

- Review the average loss of the two results for every individual occurrence in the link and review pass or fail results (OptiFiber Pro’s SmartLoop calculates these automatically). Results are best understood in EventMap™ format (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

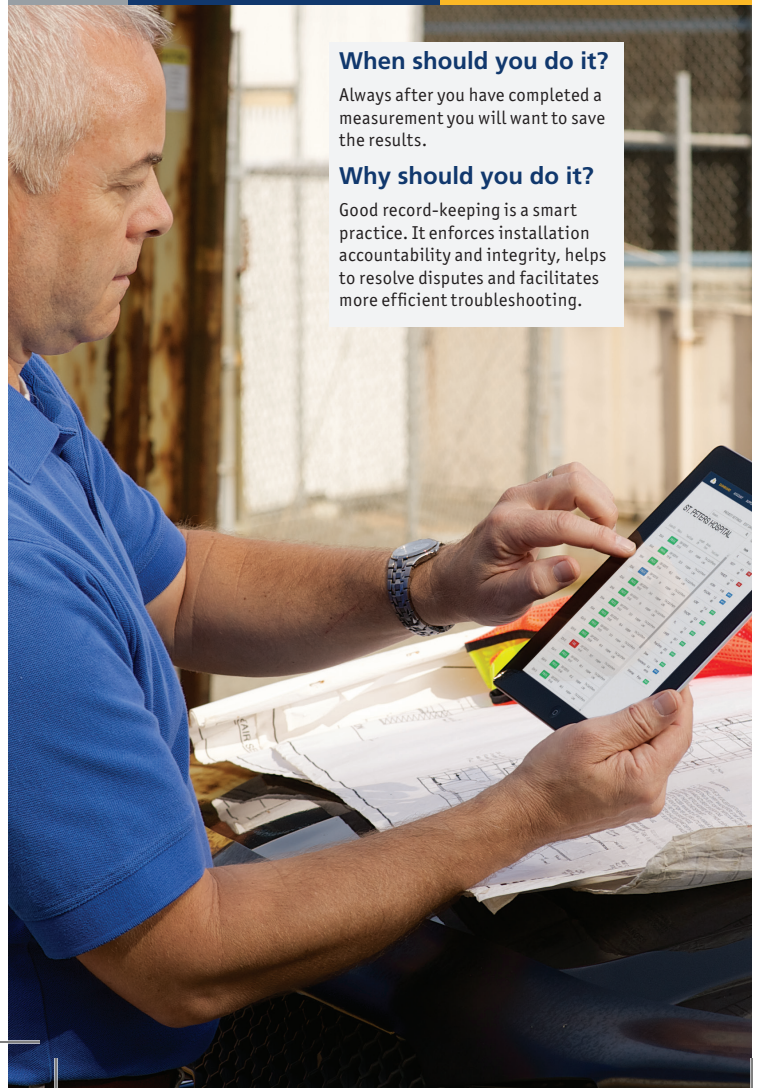
Best Practice #4: Documentation

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.



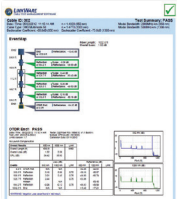
What documentation software should you use?

LinkWare™ Cable Test Management Software that lets you manage all the results from multiple testers using one PC application. It works with LinkWare Live, a service from Fluke Networks that allows you to upload results over Wi-Fi, track tester status and location, and set up tests from your PC or tablet.

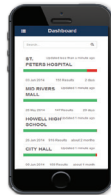
Documentation Procedure

- 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

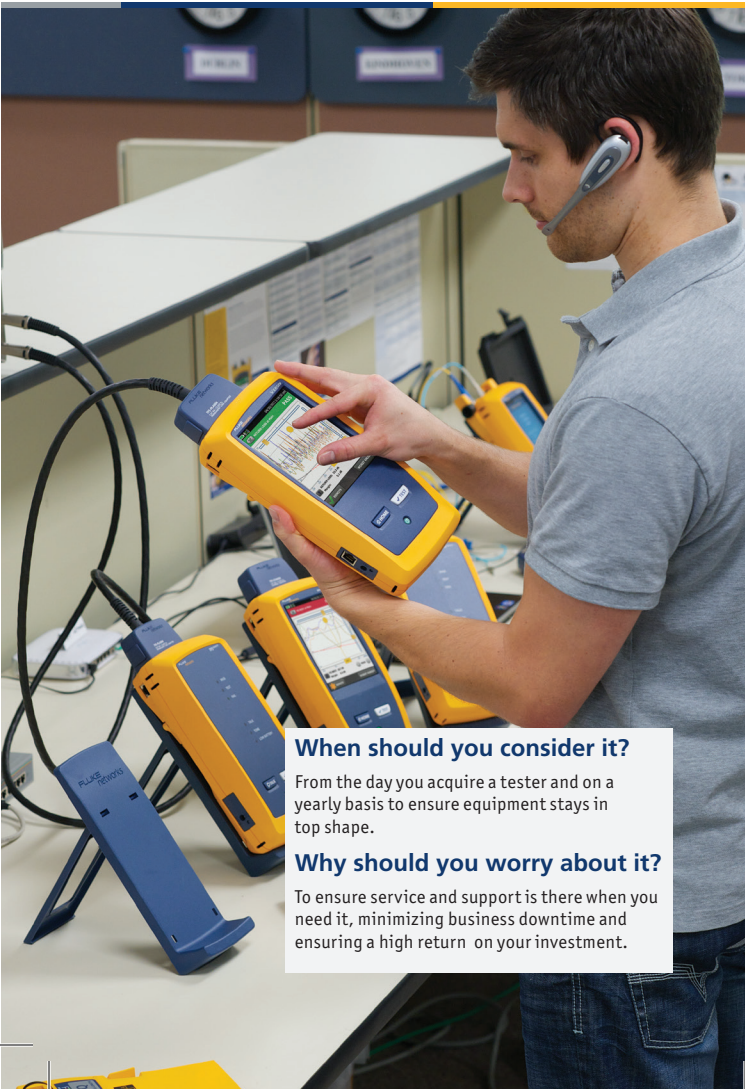


LinkWare Report



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**		✓
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

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	Inspection & Cleaning			Loss (Tier 1)	Le Ce
	 FI-500 FiberInspector™ Mini Fiber Inspection Scope	 FI-7000 FiberInspector™ Pro Video Microscope	 Fiber Optic Cleaning Kits	 SimpliFiber Pro Power Meter & Fiber Test Kits	Ca C
Check end-face contamination or damage	✓	✓			
End-face inspection grading		✓			
Port Illumination	✓				
Auto-focus	✓				
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 EFTRC's	
Locate faults					
Tier 2 certification					
Pass/fail results		✓			
Document test results		✓		✓	
Fiber types supported	Multimode Singlemode	Multimode Singlemode, MPO	Multimode Singlemode, MPO	Multimode Singlemode	M S
Source type				LED, FP Laser	LE

Troubleshooting Instruments

	Length Testing (Certification)	MPO Testing	Plant Characterization & Troubleshooting (Tier 2 Certification)		
er Pro ter & Kits	 Certifier Pro Optical Loss Test Set	 MultiFiber Pro MPO Tester	 VisiFault Visual Fault Locator	 Fiber OneShot™ PRO and Fiber QuickMap™	 OptiFiber Pro OTDR
	✓				✓
	✓				✓
	✓	✓	✓		✓
	✓	✓	✓		
	✓	✓			
	✓				✓
	✓	✓			
TRC's	✓	EF compliant at the bulkhead			
			✓	✓	✓
					✓
	✓	✓		✓	✓
	✓	✓			✓
ode ode	Multimode Singlemode	MPO (Multimode & Singlemode)	Multimode Singlemode	Multimode Singlemode	Multimode Singlemode
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.



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

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