FIBER TESTING BEST PRACTICES

Reference Guide

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Introduction

With the introduction of low loss fiber optic components such as connectors and LC/MPO cassettes, loss budgets (test limits) are becoming increasingly smaller. As a result, installers are finding out that previous methods and assumptions about fiber testing no longer hold true. Consultants and cabling vendors alike are now starting to specify loss budgets based on component performance, not standards. The allowable slack in testing practices has disappeared. To stay current, installers need to re-evaluate their test equipment and procedures.

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

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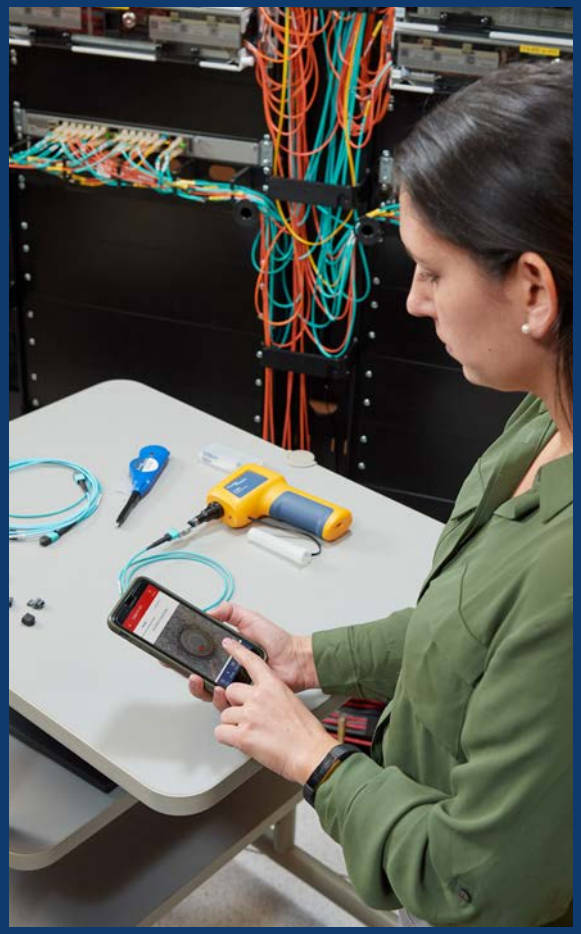
Whether you handle fiber on a regular basis or just occasionally, this reference guide will serve as a useful tool to ensure you never miss a critical step during your fiber testing or troubleshooting.

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.



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Best Practice 1 • Fiber Inspection and Cleaning

When should you do it?

Prior to making 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. Contaminated end faces may damage the fiber they are mated to, increasing reflectance which can cause errors or a total failure of high speed links.

What instruments should you use?

- A Video Microscope with autofocus/autocentering capability for real time imaging.
- For individual fibers, the ability to certify to the industry standard IEC 61300-3-35 for automated Pass/Fail acceptance testing of fiber end faces.
- For inspecting MPO's, capability to have total endface visibility and ability to zoom-in on individual end faces.
- A range of cleaning materials for end faces and ports.

Fluke Networks Fiber Inspection and Cleaning Solutions

Fiber Optic Cleaning Kit

FiberInspector™ Micro

FiberInspector™ Ultra

FiberInspector™ Pro

Inspection and Cleaning Procedure

1 Inspect the fiber end face (or port) using a video microscope to identify contamination. If clean, it's ready to connect. If contaminated, follow steps below.

2 Remove dust with a Quick Clean™ cleaner.

3 Inspect again. If still contaminated, use the following “wet” procedure:

   a Dab the contaminated end face with a solvent-dampened wipe (or swab).

   b Hold the fiber perpendicular to the cleaning wipe and drag it from wet to dry once.

   c Re-inspect the fiber end face with the video microscope to ensure that all the contamination has been removed.

   d Repeat above process if some contamination is still visible.

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Best Practice 2 • Loss-Length Fiber Testing (Basic/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, consultants and/or cabling vendors.

Why should you do it?

To ensure a prompt cabling vendor acceptance of the test results for warranty purposes and for error-free operation of the application.

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What instruments should you use?

- Optical Loss Test Set (OLTS), (automated, measures a duplex fiber in both directions - preferred)

  - or -

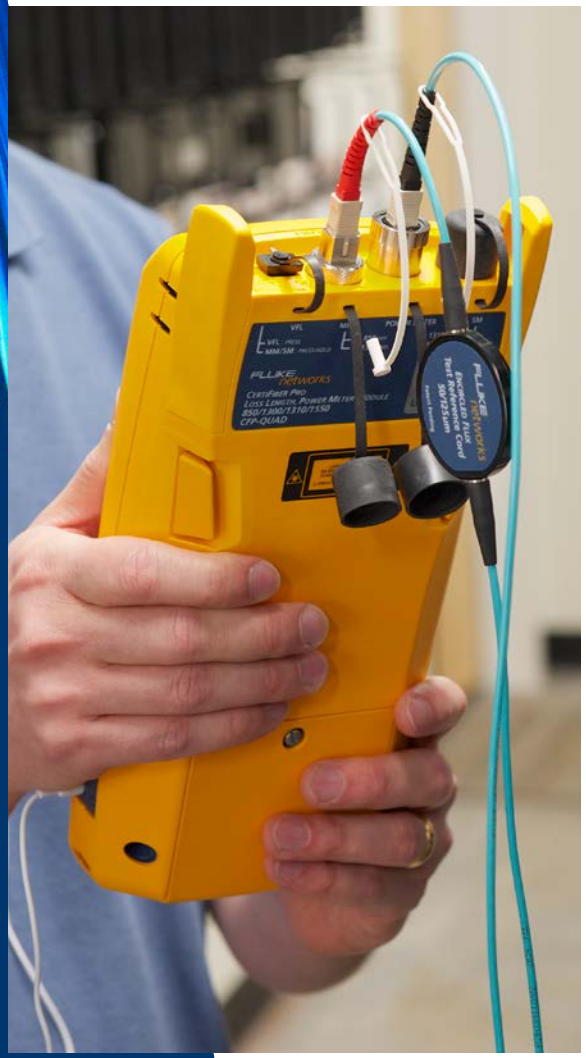
- Light Source / Power Meter (LSPM) Set and Visual Fault Locator (manual, measures the insertion loss of a single fiber path)

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

CertiFiber™ Pro Optical Loss Test Set (OLTS)

MultiFiber™ Pro MPO (12 fibers) Tester

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



Tier 1 Fiber Certification Procedure

Note: CertiFiber Pro's Set Reference Wizard automatically guides you through steps 1-4.

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 SM) 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”. An PMLS 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 (for polarity checking), fiber length meter, and manual calculations are required.

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Best Practice 3A • Fiber Plant Characterization and Troubleshooting

When should you do it?

This Tier 2/Extended certification should be executed after the loss-length Tier 1/Basic certification is completed, 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.

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What instrument should you use?

An Optical Time Domain Reflectometer (OTDR). This performs a single-ended test that will tell you the distance to any events on a fiber.

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

OptiFiber™ Pro OTDR

Fiber QuickMap™

VisiFault™

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Tier 2 Fiber Certification Procedure

1 In order to accurately measure the first and last connector on a fiber link you will need to use a launch and tail fiber. (Note: If you don’t need to know the loss of the first connection, perhaps you just want to know the distance to where the fiber is open, you won’t need a launch fiber.)

2 Bi-directional OTDR testing is required to calculate the correct event loss values of the link-under-test due to “directivity” that results from differences in diameter, backscatter, numerical aperture, and index of refraction of the link and launch and tail fibers.

3 Before you start, run a test with your launch and tail fibers to check that they and their connectors are in good condition. You should not see more than 0.25 dB of loss for them. Also, check the port quality, it should be pegged all the way to the right ("Good").

4 Connect the OTDR to one end of the fiber link-under-test using a launch fiber. Attach a tail fiber to the connector at the far end.

5 Configure or select the appropriate limits to test against. It is recommended to use a limit with an “RL” value which will check that the connections have good reflectance properties.

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Best Practice 3B • Outside Plant Fiber Characterization and Troubleshooting

When should you do it?

After loss has been determined with a simple Light Source and Power Meter, or with an OLTS unit put into a “Far End Source Mode”, to measure upstream loss and reflectance of events or when troubleshooting a failure to quickly pinpoint its source.

Why should you do it?

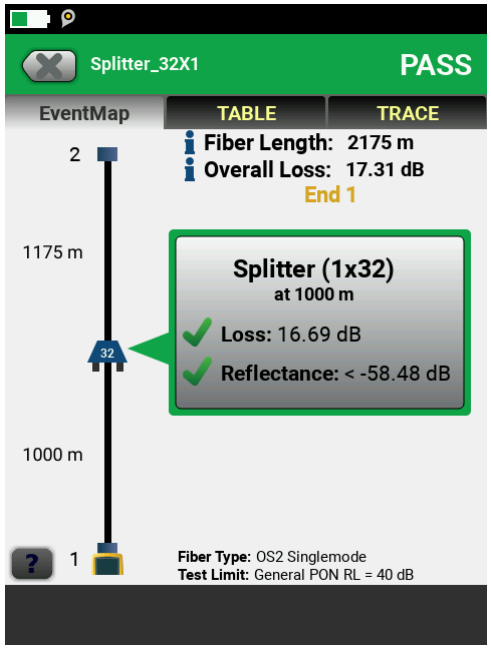
As fiber networks evolve, the need to test in more locations has increased. OTDRs are now needed “outside“ as well, like for PON and FTTx, to test and document the performance of splitters.

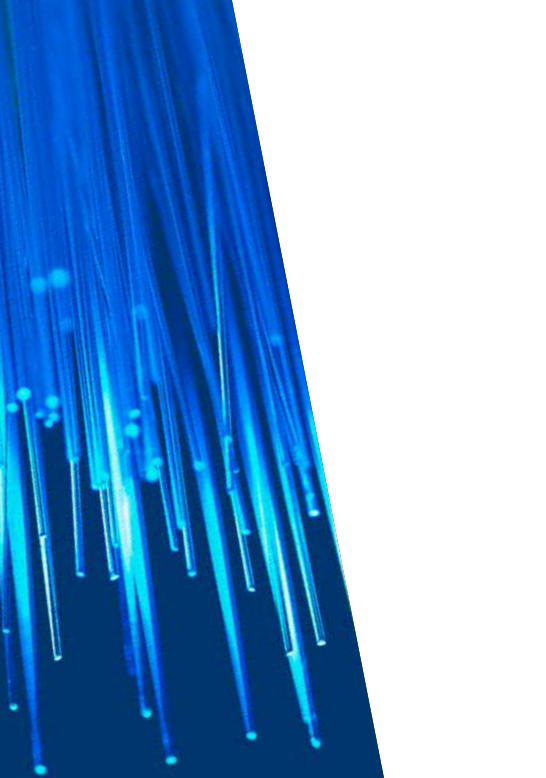
What instrument should you use?

An OTDR capable of delivering a short pulse ≤ 20ns. Requires a launch and tail cord that have a backscatter coefficient that is close to the link under test. The launch fiber ensures that the first connector in the link is tested.

Fluke Networks Outside Plant Fiber Characterization and Troubleshooting Solution

OptiFiber™ Pro HDR (PON) OTDR





Outside Plant Fiber Characterization Procedure

1 In the world of Outside Plant Testing it is often necessary to manually adjust the setup to obtain more visibility, detail, or information.

2 Make sure the PON modes are activated on the OTDR. This will allow the OTDR to correctly identify splitters on the line.

Outside Plant Fiber Troubleshooting Procedure

1 When troubleshooting a connectivity issue you need to be able to connect into a live system with an OTDR. This lets you troubleshoot without disturbing the system and without the POLAN signals interfering with the OTDRs measurements.

2 A 1625 nm Live Fiber Filter allows the OTDR to use an out-of-band 1625 nm test wavelength to meet this purpose. 1625 nm will not interfere with the active POLAN signals.

3 The filter blocks the 1310 nm, 1490 nm and 1550 nm wavelengths from entering the OTDR port, preventing them from interfering with the measurement.

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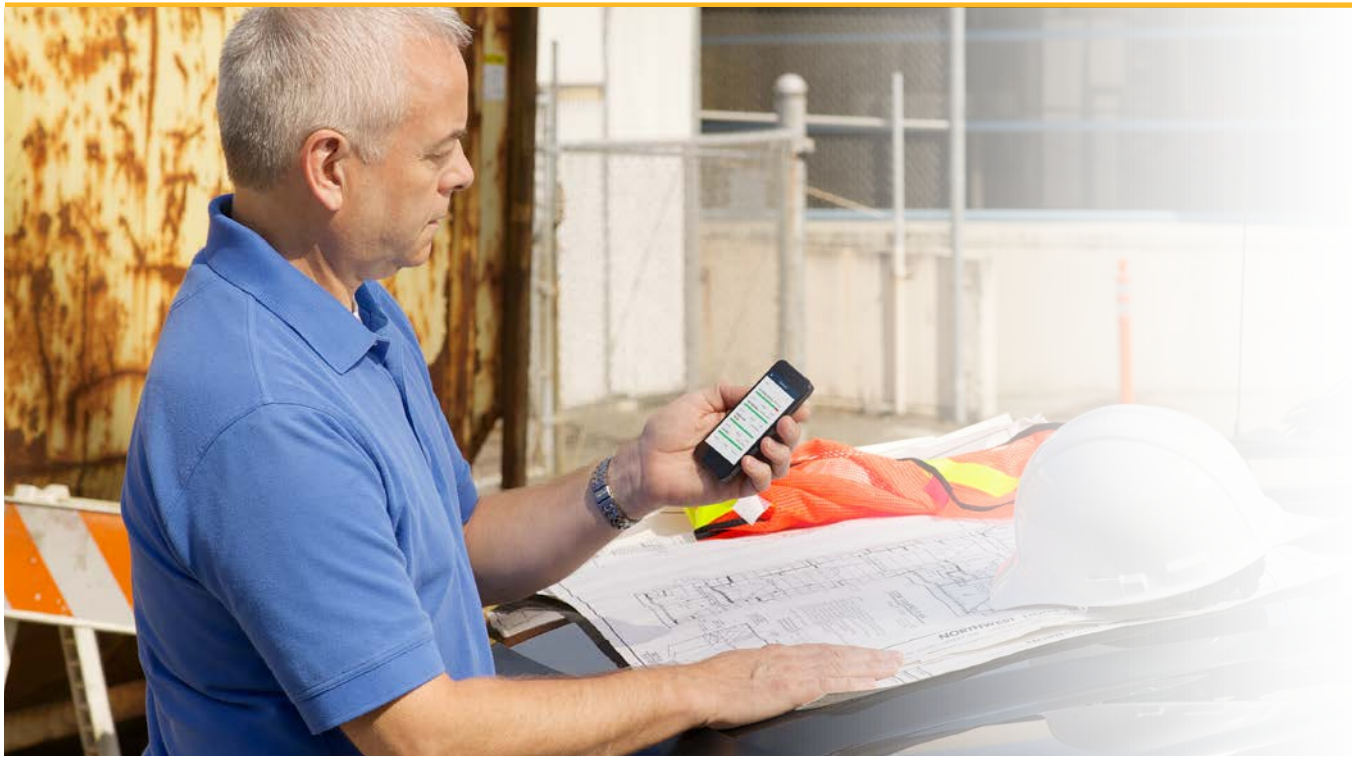
Best Practice 4 • Documentation

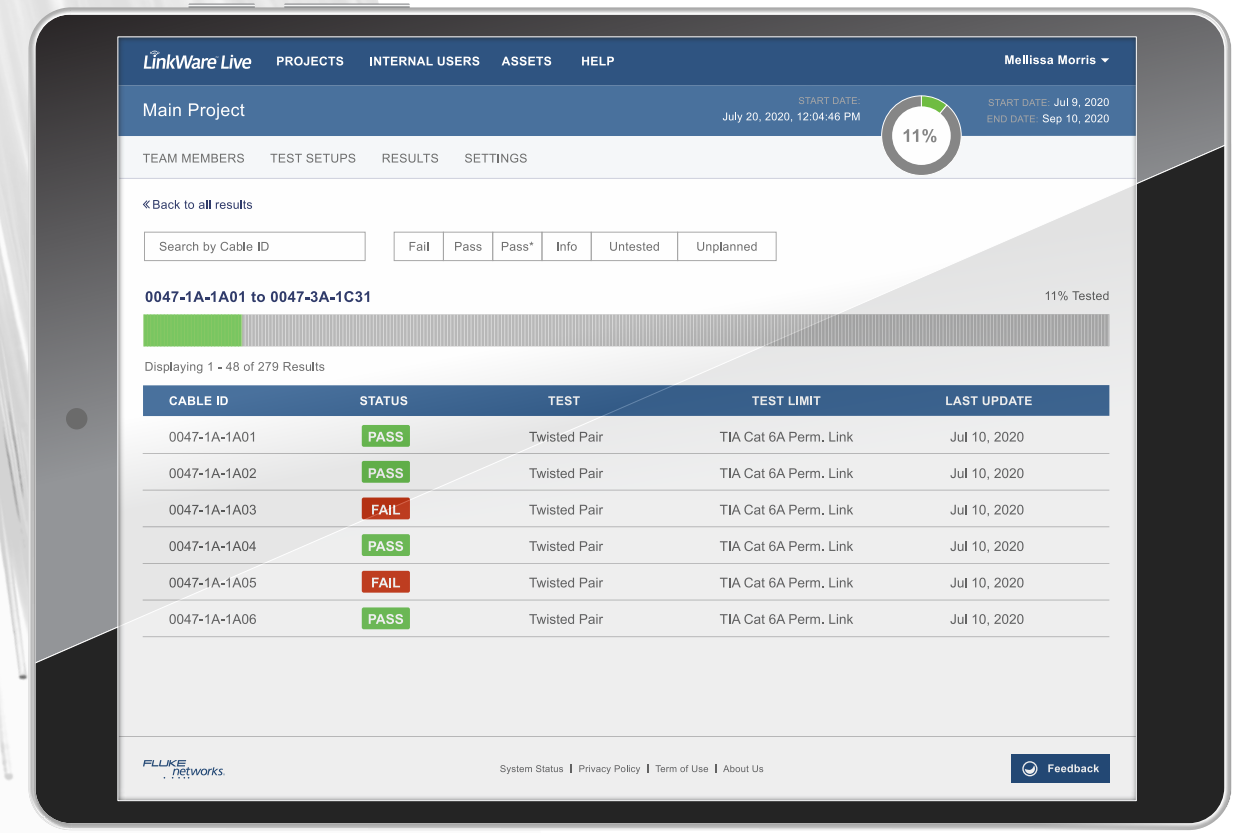


When should you do it?

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.



LinkWare™ Live interface

What documentation software should you use?

LinkWare™ PC Cable Test Management Software lets you manage all the results from multiple testers using one PC application. It works with LinkWare™ Live, a cloud 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. LinkWare also integrates all test types (Tier 1, Tier 2, and Inspection) into a single report; simplifying documentation.

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Documentation Procedure

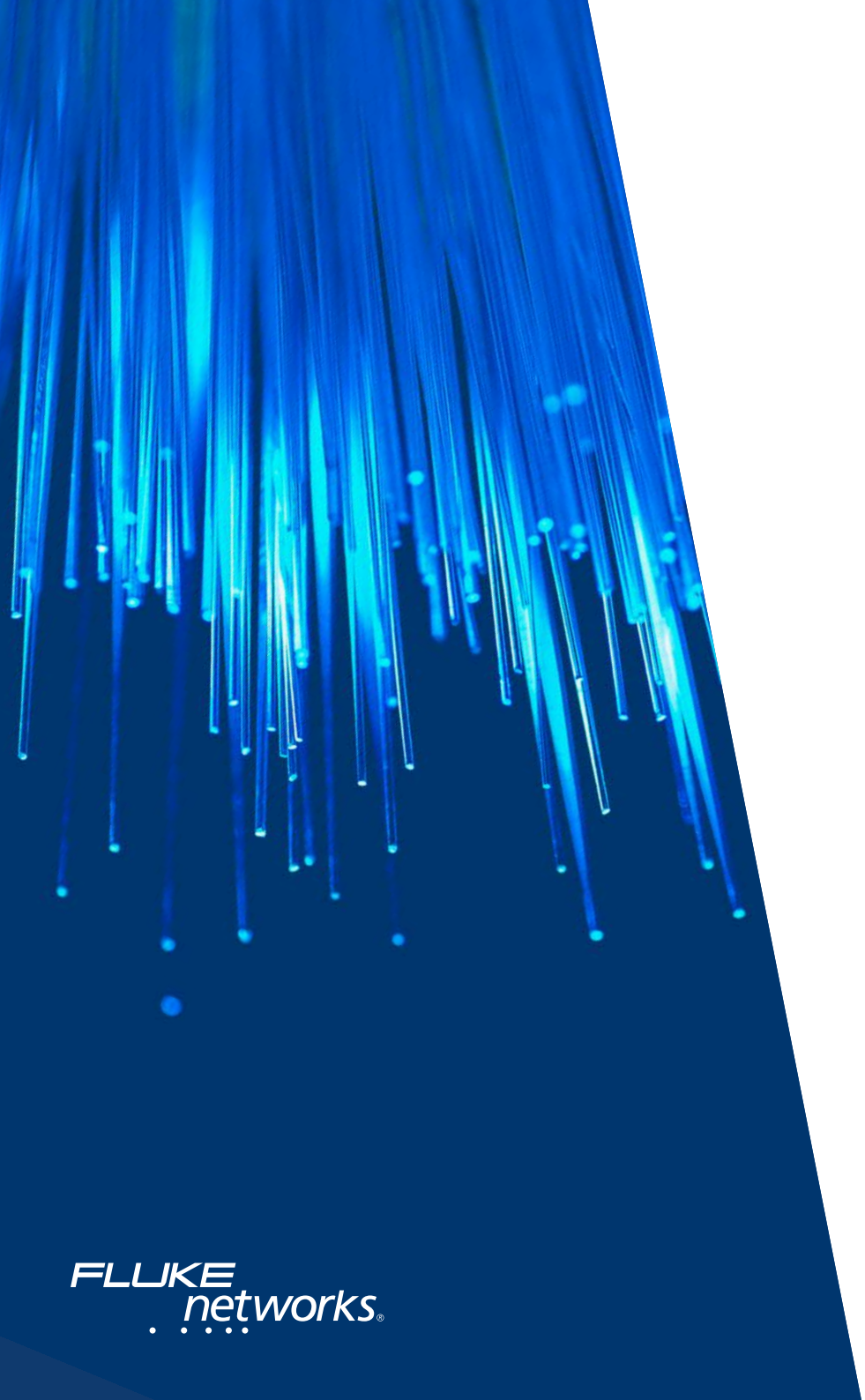
1 Save the results after each measurement.

2 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.

3 Once test results are downloaded into LinkWare™ PC you can generate professional reports in a common format (such as PDF) or share results using the secure "FLW" file format.

Fluke Networks fiber test and troubleshooting instruments

	Inspection and Cleaning				MPO Testing	Loss Length Testing (Tier 1 Certification)		Plant Characterization and Troubleshooting (Tier 2 Certification)			
											
	FI-500 FiberInspector™ Micro Fiber Inspection Scope	FI-3000 FiberInspector™ Ultra Video Microscope	FI-7000 FiberInspector™ Pro Video Microscope	Fiber Optic Cleaning Kits	MultiFiber™ Pro MPO Tester	SimpliFiber™ Pro Power Tester and Fiber Test Kits	CertiFiber™ Pro Optical Loss Test Set	VisiFault™ Visual Fault Locator	Fiber QuickMap™	OptiFiber™ Pro OTDR	OptiFiber™ Pro PON/FTTx HDR OTDR
Check end-face contamination or damage	✓	✓	✓				✓ i-version			✓ i-version	✓ i-version
End-face inspection grading		✓	✓				✓ i-version			✓ i-version	✓ i-version
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					EF compliant at the bulkhead	with EF TRC's	✓				
Pinpoint faults								✓	✓	✓	✓
Tier 2 certification										✓	✓
Pass/fail results		✓	✓		✓		✓			✓	✓
Document test results		✓	✓		✓	✓	✓			✓	✓
Fiber types supported	Multimode Single-mode	Multimode Single-mode, MPO	Multimode Single-mode, MPO	Multimode Single-mode, MPO	MPO (Multimode and Single-mode)	Multimode Single-mode	Multimode Single-mode	Multimode Single-mode	850 nm Multimode	Multimode Single-mode	Single-mode (1310, 1490, 1550 & 1625 nm)
Source type					LED, FP Laser	LED, FP Laser	LED, FP Laser	Laser	Laser	LED, FP Laser	Laser



Get your questions answered by our team of experts:

www.flukenetworks.com/contact

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