FIBER OPTIC FIELD GUIDE

Fiber Testing Field Guide

A practical look at what fiber testing actually demands in the field. Why we test, what each tool is for, and when each one earns its keep. Written by a working tech, for working techs.

Johnstone Technical Services · https://johnstonetechs.com/guides/fiber-testing

Why we test fiber

Before you pick up an OTDR, you need to know why you're out there. It sounds obvious. But it's the step new techs skip, and it's the one that determines everything else you do that day. The reason you're testing decides which tools you reach for, which direction you shoot, how tight your numbers need to be, and what a pass actually looks like. Show up without knowing the why and you'll either run a full battery on a job that only needed one measurement, or blow through a job that needed careful documentation.

Here are the reasons we test, and what each one actually asks of you.

Finding damage

There's an outage. Someone put a backhoe through a fiber, a storm took down a span. The network's down and the clock is running. Your only job is distance. You need to know how far it is to that cut so you can get a crew to the right spot and get it repaired. You're not chasing pretty numbers, you're not running the full battery. Shoot one direction, read the distance to the break, call it in. Fast and dirty is the right move.

Acceptance testing

This is where you prove the work was done right. The construction crew, the installers, the splicers all finished their job, and now you're the one showing engineering that the fiber meets spec and is ready to go into service. This is the full battery, and it's where you slow down and get it right. Every number matters here because your signature is what puts the link in service.

Incoming reel testing

You've got a new reel of cable that needs to be checked before it goes in the ground. Straightforward job. You're confirming the cable is undamaged, the length matches the reel tag, and nothing got hurt in shipping or handling. Catch a problem now while the cable is still on the reel, not after it's plowed in and spliced.

Troubleshooting degraded service

This one is different from a hard cut. The fiber is still lit, the customer is still up, but something is wrong. High error rates, intermittent drops, a link that passed at turn-up and is slowly getting worse. You're hunting a soft fault: reflectance creeping up at a connector, a macrobend where somebody stepped on a drop, water working its way into a splice. This takes more patience than a clean cut because the trace doesn't hand you the answer.

Restoration verification

After a repair, shoot the link again to confirm the splice is in spec before you close the job. Some techs fold this into acceptance testing, but in the field it's its own step and worth treating that way. Don't pack up until the repair reads clean.

Baseline documentation

This is the one techs skip and regret later. At turn-up, shoot a clean reference trace and keep it. Two years from now when something drifts, that baseline is what you compare against. Without it you're guessing whether that 0.3 dB event was always there or showed up last week.

The tools and tests, and when each one earns its keep

You've got a range of tools, and part of being good at this is knowing which one the job calls for. Pulling out the OTDR for every task is like grabbing a torque wrench to hang a picture. Here's what's in the kit and when each one is the right call.

Red light test (visual fault locator)

The simplest test in the bag. Shine a red laser down the fiber and look at the other end to see if it comes through. If light comes out the far end, you've got continuity. It's also useful up close for finding a break or a bad bend in a patch cord or a splice tray, because the light leaks out right at the fault and you can see it. No numbers, no loss measurement, just a quick yes or no on continuity. Before you connect your launch cord, inspect and clean the end face. A dirty connector on a light source smears contamination onto everything it touches.

End-face inspection

Before you connect anything, you inspect it. This is not optional and it's not something you skip when you're in a hurry. A dirty or damaged end face is the most common cause of high loss and ORL failures on an otherwise good link. You can do everything else right and still fail an acceptance test because of a connector that was never cleaned.

You need a fiber inspection probe or a video inspection scope. You're looking at the end face magnified, typically 200x to 400x, checking the core, the cladding, and the contact zone. IEC 61300-3-35 defines the pass/fail criteria by zone. The short version: anything on or near the core is a problem.

Contamination is what you'll find most of the time. Oils from handling, dust, debris left behind from a previous cleaning. The process is clean first, then inspect. A one-click cleaner handles most contamination on the first pass. If the end face still doesn't pass after cleaning, clean it again. If there's a scratch across the core or a chip in the glass, cleaning won't fix it. That connector needs to be replaced or re-polished.

Inspect both ends before you mate them. A contaminated connector transfers debris to a clean one the moment they touch. Get both sides clean and passing before you make the connection. It takes an extra minute and it saves you from chasing loss problems that should never have been there.

Light source and power meter

Two separate instruments, and on their own they're your everyday field loss tools. Put a known light source on one end of the fiber, read the power meter at the other end, and the difference is your loss. It's manual, often a two-person job with one tech at each end, and it's the right tool for a quick single-wavelength loss check, troubleshooting a span, or verifying a patch cord. Inspect and clean your launch cords before you reference them. A contaminated launch cord carries that error into every reading that follows.

One method worth knowing, especially on FTTH builds: you can put a light source on a dark network to simulate light, then walk the power meter to the terminals and verify loss at each one. On a new build there's often no active light on the network yet because the crew is still splicing. Dropping a source on at the head end gives the splicers something to read against at the taps and terminals as they go, so they can verify their work before the network is ever turned up.

OLTS (optical loss test set)

Same idea as the light source and power meter, taken up to certification grade. An OLTS is still a source and a meter, but instead of two loose instruments and two techs calling each other on the radio, it's a pair of integrated units that handshake, run the test bidirectionally, hit multiple wavelengths automatically, store the results, and give you a documented pass or fail against a loss budget. This is the acceptance-grade tool. When you need the true end-to-end loss and ORL on a link you're putting your name to, this is what you reach for.

Before you set your reference, inspect and clean the reference cords. The reference procedure zeros out the launch cord loss, but it does not zero out contamination that gets transferred to the fiber under test when you make the connection. Clean connectors before every mate, every time.

The OLTS is the accurate measurement for both loss and ORL. You're sending from one unit and measuring on a separate unit at the far end, so you're reading the light that actually made it through the fiber. That's a direct measurement of what the link delivers. The OTDR, by contrast, calculates loss from the light that reflects back to it. It's a useful measurement, but it's an inference, and inferences can be fooled. When you need the real numbers, the OLTS is the one to trust.

OTDR

This is the one that maps the whole link. Instead of a single end-to-end loss number, the OTDR sends pulses down the fiber and listens to what comes back, and from that it builds a picture of every event along the span. Every splice, every connector, every bend, with distance and loss at each one. This is what locates a fault, characterizes every splice, and shows you the shape of the link. It's the most powerful tool in the kit and also the easiest one to misread. Inspect and clean your launch cable before you connect it to the OTDR port. Dead zone length depends on a clean reflection at the launch connector, and a dirty one distorts the events near the front of the trace.

Traffic identifier

This clamps onto a bare fiber and tells you whether there's live traffic on it without breaking the connection. Two main uses. First, before you cut or disconnect anything, you clamp it on to make sure you're not about to take down a live customer. Second, paired with a light source, it's how you find the right fiber in a large

bundle. Put a tone or signal on the source end, walk to the other end, and clamp around fibers until you find the one carrying it. Saves you from guessing and from cutting the wrong strand.

Why OLTS and OTDR go together for acceptance

The OTDR and the OLTS don't measure the same thing, and one can pass while the other fails. The OLTS gives you the true end-to-end loss and ORL because it's an actual source-to-meter measurement, while the OTDR's numbers are calculated from reflected light and can be thrown off by things like mismatched fiber or a gainer at a splice. For acceptance testing you run both. The OLTS confirms the link's real loss budget. The OTDR proves every individual event along the span is in spec and in the right place. A pass on one is not a pass on the job.

CD and PMD (chromatic dispersion and polarization mode dispersion)

These only come up on long-haul, high-speed routes, and as a field tech you may never touch them, but you should know what they are and why the engineers ask for them. Chromatic dispersion is the spreading of the light pulse over distance because different wavelengths travel at slightly different speeds. PMD is a similar smearing caused by the fiber's own physical imperfections affecting different polarizations of light. On a short link none of this matters. On a long, fast link it absolutely does, because too much of either one blurs the pulses into each other until the receiver can't tell them apart. The engineers use CD and PMD numbers to pick the right optics for the route and determine what data rates the fiber can support. You're gathering the data; they're making the optics decision off it. For the full picture, see the CD and PMD Testing Overview, the PMD Testing Deep Dive, and the Chromatic Dispersion Testing Deep Dive.