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W h i t e P a p e r

The Method Behind The Magic – Multifiber Testing

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Table of Contents

TIA Specified Polarity Methods	3
C.L.I.C. Before You Connect	5
Conducting 40G Multifiber Testing	
Testing Method 1: Any Source to Standard LC	6
Testing Method 2: 40G MTP-to-MTP® Testing	8
Testing Method 3: 40G MTP-to-10G Duplex Testing	9
Maintaining a Competitive Edge	9

By 2017, 40GbE speeds will be in significant demand, becoming almost commonplace as we start to see more 100GbE networks being regularly deployed near 2020. Multifiber installation and testing best practices will be critical to maintaining a competitive edge as network migration strategies evolve.

While the idea of multifiber testing is intimidating, having the right training, tools, and methods will simplify the process and provide the forward-thinking strategies needed to help grow your business and reputation. Once you have a better understanding of the tools and processes needed to efficiently conduct multifiber testing, you'll be able to certify network performance while minimizing time spent on site — providing an edge over the competition.

Standards governing the deployment and testing of 40G fiber have been in effect since January 2010. Testers used to confirm 10G channels are capable of conducting 40G testing. However, testing with these older devices requires considerably more time, includes more steps in the process, and increases the probability for human error. Most multifiber testers can get the job done 15 times faster than standard LC testers, and by reducing the number of testing steps you minimize the likelihood of human error. Plus, the same tools and methods recommended for 40G multifiber testing also apply to 100G multifiber testing. By becoming familiar with these methods now, you can stay competitive while maintaining your capability to assist customers with future migrations.

Multifiber Testers:

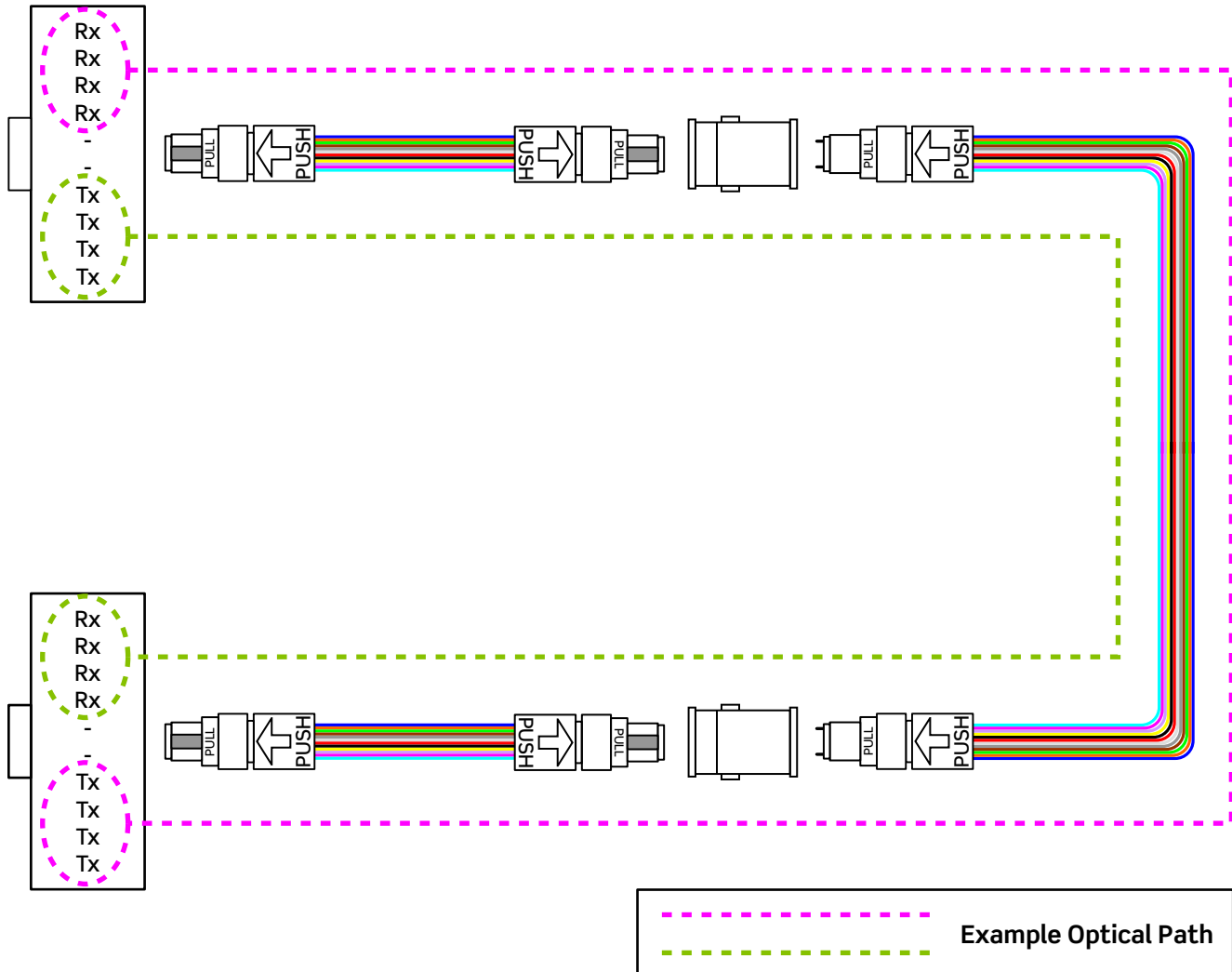
- Require less setup, shorten testing time, and reduce time spent on site
- Provide actual test reports, minimizing the need for documentation
- Reduce the number of patch cords and harnesses needed for testing
- Support better verification of the polarity method for tested channels

TIA Specified Polarity Methods

TIA polarity methods A, B, and C are each implemented differently, but achieve the same purpose. Each method creates an optical path from the transmit port(s) of one device to the receive port(s) of another device.

	Method A	Method B	Method C
Cassettes ▶	Same	Different	Same
Trunks ▶	Straight Through	Straight Through	Pair Flipped
Patch Cords ▶	Different	Same	Same
	The transmit-to-receive flip occurs in the patch cords. The trunk cable is a straight-through transmission with key up on one end, and key down on the opposite end.	The polarity flip occurs in the cassette. Keys are in an up position at both ends of the trunk cable, but the fiber at position 1 in one connector is in position twelve at the opposite end, and the fiber in position 12 at the originating end is in position 1 at the opposite end.	Adjacent pair of fibers at one end are flipped at the other end.

Below is an example of a **Parallel Optic Fiber Circuit**, which simultaneously transmits and receives for the channel. In this eight-fiber channel, one side is the transmit end and the other side is the receive end, for four transmit and four receive channels. Fibers are paired for assurance that fiber number 1 is connected to fiber number 12 for transmit and receive, and simultaneously 2 to 11, 3 to 10, and 4 to 9.



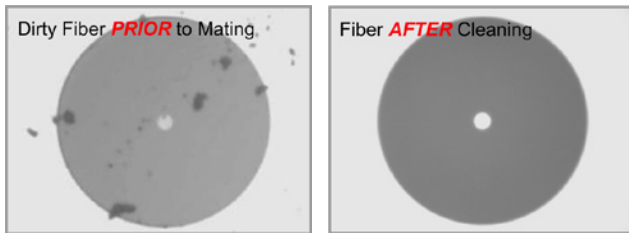
CL.I.C. Before You Connect ► Clean, Inspect, Connect

Before any testing is done, it's important to ensure the physical contact area is free of contamination.

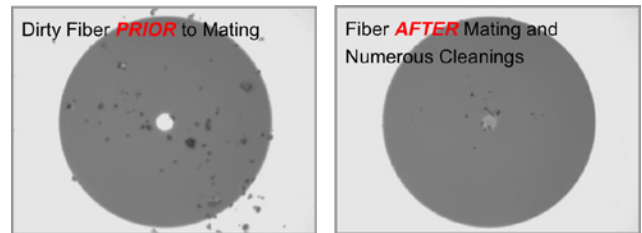
Dust, dirt, oil, cleaning product waste, and air gaps can all be sources of contamination, leading to high insertion loss. If there is not a clean physical connection, the light path is disrupted and the connection is compromised.

Once the physical contact area is free of contamination, proactively inspect the fiber connections at every stage of handling before mating. If fibers need to be cleaned, it will be easier to do so prior to mating, before debris has a chance to be embedded into the fiber.

Proactive Inspection:

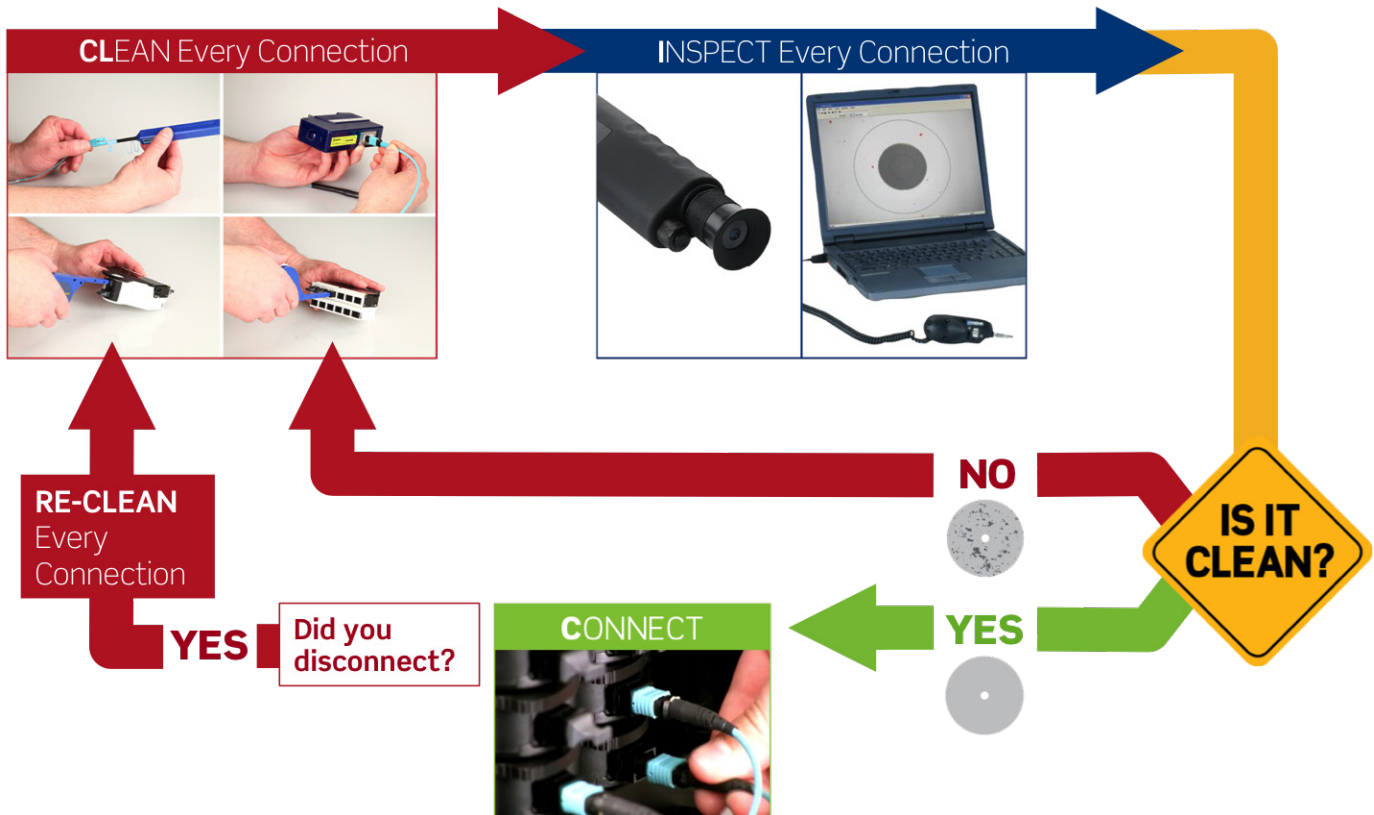


Reactive Inspection:



If you only inspect fiber connections after a problem is discovered (during troubleshooting), you risk permanent damage to the connectors and other equipment.

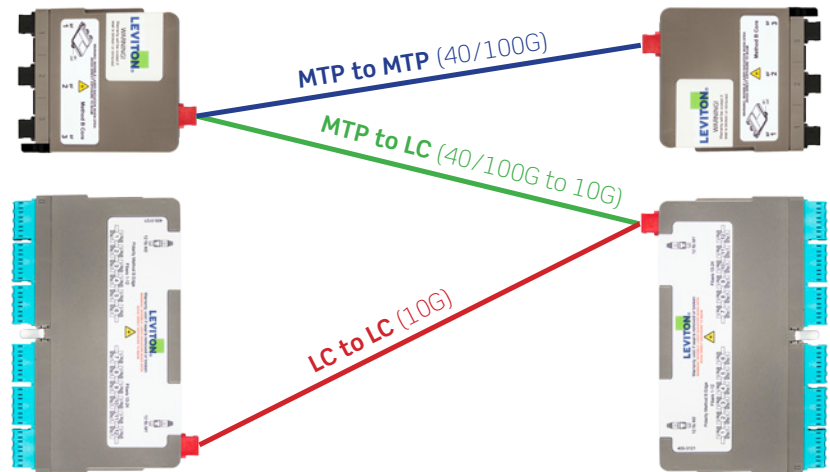
To avoid contamination during testing be sure you **Clean** and **Inspect** before you **Connect** (CL.I.C.).



Conducting 40G Multifiber Testing

40G multifiber testing can be conducted in a number of ways. In the examples below we examine three common testing methods, highlight the benefits and drawbacks of each, and identify preferred 40G testing methods.

To test MTP to MTP, you will need a source and a meter connected together for reference. Verify the first MTP test cord to ensure it is working and the gender is correct. Next, repeat the process for the second MTP test cord, verifying the same issues. Then, set the reference.



Testing Method 1 ► Any Source to Standard LC (Not Recommended)

The first method of testing requires one end to be attached to the simplex power meter. On the other end, attach any source. This method is **not recommended** as set up and testing can take up to 15 times longer than when using a multifiber tester, which will keep you tethered to the job site and significantly impact your bottom line. Additionally, polarity has to be understood by the customer or they won't be able to interpret the results.

Additional tools needed include: multiple test reference cords (TRC), single-mode bulkhead adapter, field-calibration cord, fan-out (hydra) cables, and MTP trunk cable.

After following the testing manufacturer's setup process, perform the following steps:

Step 1:

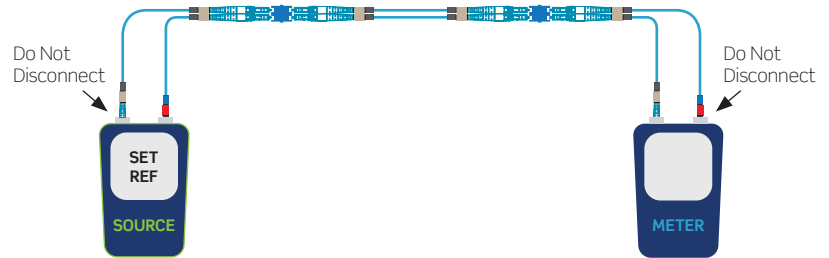
Add in a field calibration cord or TRC.

Step 2:

Ensure the loss is ≤ 0.15 dB (≤ 0.25 dB for single-mode).

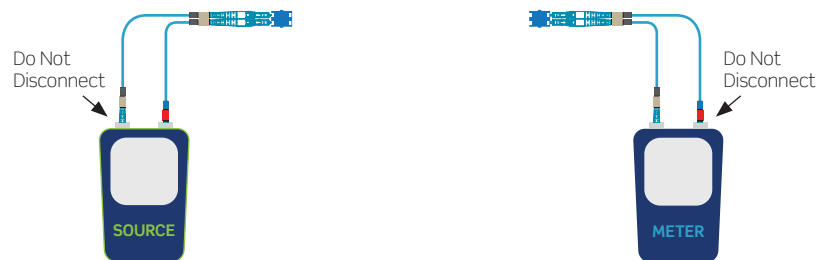
Step 3:

Set a reference.



Step 4:

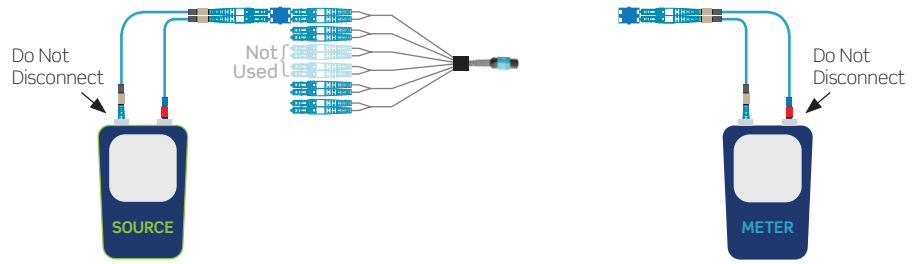
Remove the "field calibration cord" or TRC.



Testing Method 1 ▶ Any Source to Standard LC
(continued)

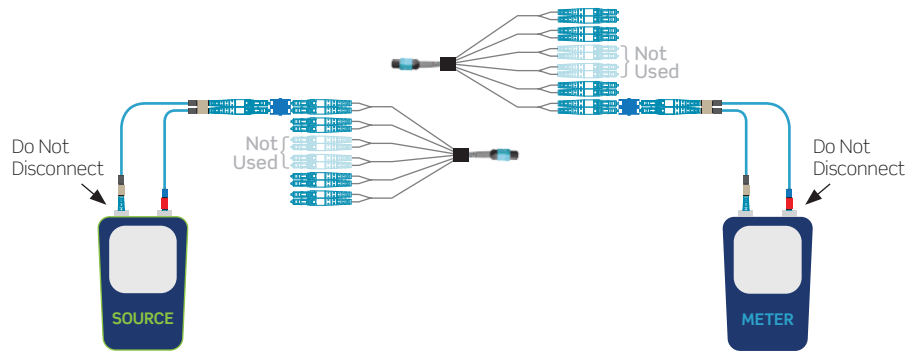
Step 5:

Connect a hydra (fan-out) TRC-grade cable at the near end.



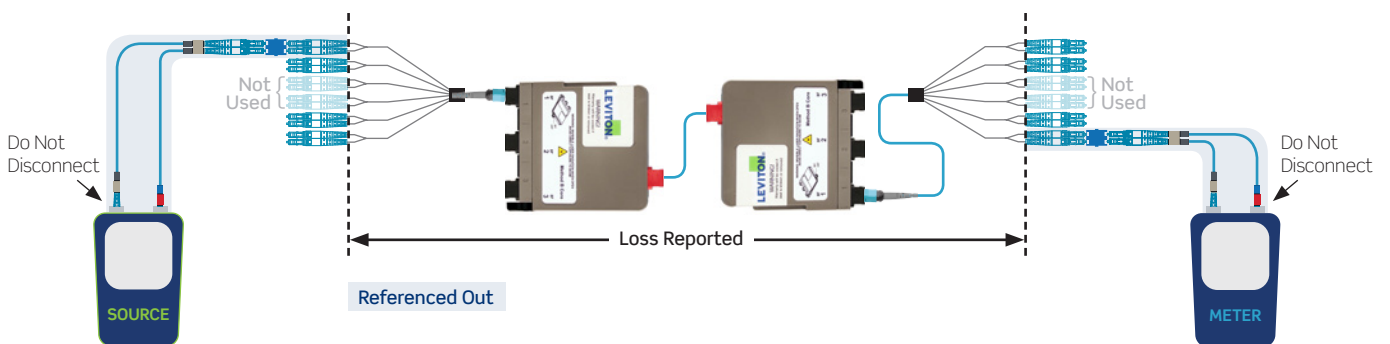
Step 6:

Connect a hydra (fan-out) TRC-grade cable at the far end.



Step 7:

Connect the MTP[®] trunk cable and test.



Step 8:

Move to the next pair and repeat the previous step until you have completed four tests for each port.

Note: This step needs to be repeated 12 times.

Testing Method 2 ► 40G MTP-to-MTP Testing (Preferred)

The second method of testing use a multifiber tester with MTP-to-MTP[®] connector interfaces. Setup is easy and testing is conducted quickly —typically in less than 10 seconds. This is the easiest method for conducting 40G multifiber testing of a permanent link trunk to ensure polarity and loss, and it is **one of two preferred testing strategies**. Plus, depending on the model of tester you select, you can turn off specified testing lanes. This allows you to use the same tester for single-channel testing, giving you greater flexibility on site.

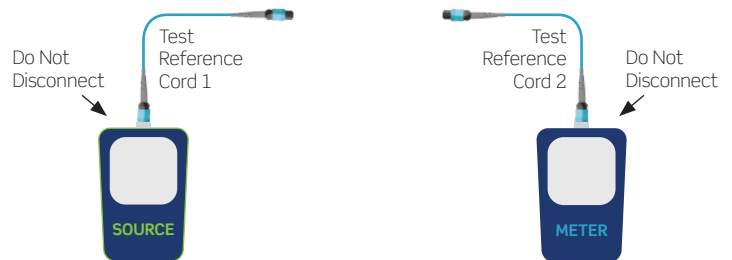
No additional tools needed.

Note: Most MTP testers will automatically recognize 12 fibers, but some testers can be configured for 2-12 fibers.

After following the tester manufacturer's setup process, perform the following steps:

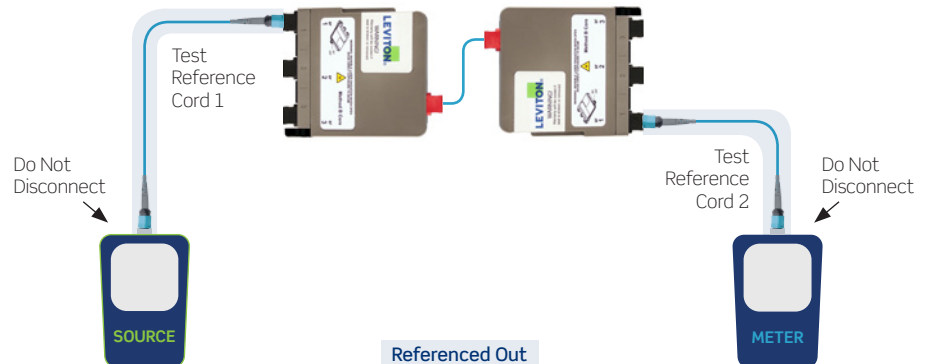
Step 1:

Insert the test cord into the “meter” port.



Step 2:

Connect the “source” and “meter” test cords to the 40G link and test.



Note: No additional steps are required.

Testing Method 3 ► 40G MTP-to-10G Duplex Testing (Preferred)

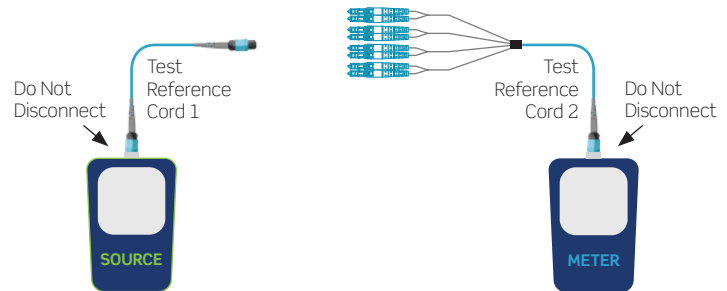
For this method of 40G multifiber testing, **another preferred testing method**, use 40G MTP-to-10G Duplex connector interfaces. This method is ideal for testing from MTP to fan-outs or cassettes, testing end-to-end trunks for 10G to QSFP, or mapping fiber from MTP to LC/SC connectors.

No additional tools needed.

After following the tester manufacturer's setup process, perform the following steps:

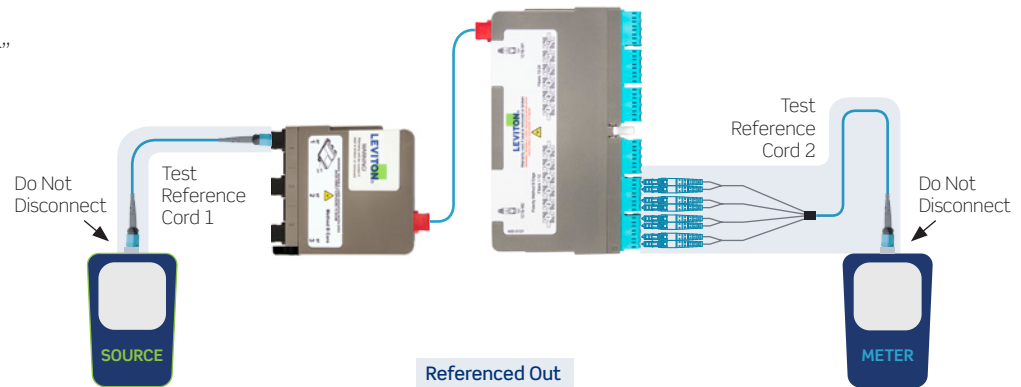
Step 1:

Insert a hydra (fan-out) TRC-grade cable into the “meter” port.



Step 2:

Connect the “source” and “meter” to the 40G link and test.



Note: No additional steps are required.

Using a multifiber tester requires less time to set up and minimizes the number of patch cords, harnesses, and other hardware needed for testing. Overall, it's a far simpler process, allowing you to test multiple fibers at once and significantly reducing the time spent on site. Time which quickly translates into dollars saved.

When comparing the 20-step process in Method 1 to the two-step process in Methods 2 and 3, it's easy to see why using a duplex tester is not a preferred testing method. While a duplex tester can minimize short-term expense, the time spent on site testing each fiber individually significantly outweighs any savings in the long term. Plus, if you want to stay on the competitive edge, you will need to become familiar with a multifiber tester in the near future. Wait too long and risk falling behind.

Maintaining a Competitive Edge

While becoming familiar with multifiber testing and the right testing hardware will help you maintain a competitive edge, it is also important to stay abreast of the latest industry standards and trends. Knowing how current standards affect network deployment will preserve a keen skill set and help you better meet customer needs. Being prepared to facilitate 40/100G migrations will solidify a foundation of trust built with key clientele.

When upgrading a network, it's important to acquire assistance from experts who understand the evolution of the data center environment and fabric design architecture. Leviton works closely with many leading equipment manufacturers, is active in all next-generation standards developments, and can advise on their best possible migration strategy.

For more information or assistance, contact Leviton's technical support team at appeng@leviton.com.

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