



# COMMUNICATOR



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## **THREE** Essential Fiber Optic Test Devices You Should Have In Your Tool Box

With the need for higher bandwidth constantly growing, today's fiber optic networks need to be performing at their best to transmit the ever increasing amount of data flowing through them. Here is a brief overview of basic fiber optic testing devices.

### 1. Visual Fault Locator (VFL)

This device injects visible laser light into a fiber optic link. Excessive bends or breaks in a fiber will cause the light to escape through the cable jacket, providing a visual indication of where optical loss is occurring. This test is suitable for cables that do not have a dark colored outer cable jacket. Problem connectors can sometimes be identified using this device.

A visual fault locator can help you locate a specific loss event, but it won't provide information about cumulative losses in a fiber optic link. To measure loss you will need a power meter and light source.



### 2. Power Meter and Light Source

Testing involves injecting light from the light source into one end of the fiber, and measuring the amount of optical power (expressed in decibels), at the other end of the fiber using the power meter. The test includes all the components in the fiber link - (connectors, splices, etc...) where loss could occur.

The fiber link should be tested in both directions and the test results averaged together to provide the most accurate results. If the tests indicate that there is enough optical loss to affect system performance, you will need to locate where these losses are occurring by using an OTDR.



### 3. OTDR - Optical Time Domain Reflectometer

This device injects pulsed laser light into one end of a fiber optic link, and measures the light reflected back to the OTDR from splices, connectors, excessive bends or fiber breaks. This device is ideal for testing outside plant applications where fiber links can be many miles in length.

An OTDR has a screen where the trace is displayed. A trace is a graphical representation of the location, type and severity of loss events, as well as the length of the fiber link itself.



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# Customer Spotlight Series

## Precision Contracting Services (PCS) Inc.



This Communicator issue features a long time customer of FIS, Precision Contracting Services (PCS) Inc. They are a Certified Women Business Enterprise (WBE) founded in 1990 by Sara, Cindy and Bruce Boyd, all who are still very active owners and managers of the business. PCS provides professional services including asset mapping, design, installation, integration and maintenance services for fiber optic, wireless and low voltage infrastructures. Headquartered in the Southeast, PCS has engineering and corporate offices in Jupiter, Orlando and Tampa, Florida as well as regional offices in Vero Beach, Coconut Creek, Jacksonville, Florida and Fayetteville North Carolina. Their relationship with FIS kindled as a result of extensive work in fiber optics providing splicing, termination, testing, troubleshooting and maintenance of broadband fiber optic networks. PCS has recognized certifications from BICSI with on staff RCDD's and is licensed to work in several states.

PCS invests heavily in their technicians offering them continuing education programs. They recently hosted the FIS fiber optic focused training course for surrounding contractors, integrators and installers at their new premier training facilities located at their corporate office in Florida. On a recent visit of the new building Kirk Donley, Director of Sales and Robert Licari, Test Equipment Product Line Manager, met with President of PCS, Cindy Boyd. They walked through the training room which features the latest technology for instruction, including giant screens for videos and power points, a full whiteboard wall in the room for drawing out further explanations of networks and a full size room lab with ladder racks, cabinets and cabling for network testing. The room is bright, big and has some awesome chairs for a comfortable learning environment. The room provides seating for up to 50 students and features

Cindy Boyd provided a guided tour which further demonstrated the value to its customers and the fiber industry with stock on cable, cabinets, and equipment, as well as a brand new fleet vehicle for installations both aerial and burial, to execute fiber splicing and new networks. Ms. Boyd can quickly defuse any doubts of working with PCS with her extensive knowledge and work in the field in the splicing of optical fiber. Highly regarded by customers, it's no wonder PCS is doing so well and receiving referrals in the expansion of fiber networks across the US.

FIS is often asked by new or existing customers for a referral to fiber contractors, highly experienced in all aspects of fiber optics. We have no hesitation providing a contact at PCS.

Thank you PCS for your continued business and commitment. We will set the bar high! Check them out at [www.pcsfiber.com](http://www.pcsfiber.com).

**Fiber Instrument Sales, Inc.**

## Field Verification of Optical Return Loss

Reflective performance is of special importance as the FTTH market grows. This is because of the high data rates required for digital video, and the sensitivity of analog video signals and transport components.

### OTDR vs. ORL Tester for Back Reflection

An OTDR uses controlled pulses of light to measure reflections and attenuation as a function of distance in fibers. Therefore, the OTDR will display a representation of the relative return loss in a link or event. Some OTDR's will even calculate and display a specific value. However, due to the pulsed source and the special phenomena of dead zones on OTDR's, an accurate ORL for connectors cannot be calculated. A true ORL tester uses a continuous laser source and measurement process that does not have a reflective dead zone.

### Connector Reflectance

Polished connectors for singlemode systems come in two main types, Ultra Physical Contact (UPC) and Angled Physical Contact (APC) polish. UPC surface finish and geometry yield a return loss in the -55dB or better range for two mated connectors. However, the ORL of a disconnected UPC connector will only be about -15dB due to the high refractive index difference between the glass fiber and the air.

APC connectors increase the ORL per degree to 8 degrees. The angle created by the polish is directed out of the fiber core instead of back towards the source. This provides a return loss better than -65dB and will still remain stable over time.

### Testing ORL

Whenever turning on an ORL tester a reference jumper is used. This ensures that the output power of the source is considered when calculating the results. A reference jumper and the meter will measure the reflections in the system, to measure the return loss. Optical isolation is frequently performed by terminating the cable by scattering the light towards the source.

The diameter of the mandrel wrap is critical for singlemode systems, the shaft of the mandrel. For most of the light is scattered from the mandrel at wavelengths like 1310nm and subsequent multiple connections is to be considered.



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performance by creating a UPC-like polish on a slight angle - typically  
 mated APC connectors will cause any incidental reflected light to be  
 l of straight back up the fiber. The effective ORL of APC connectors is  
 n high even when the connectors are not mated.

and connecting the test jumper, it is important to perform a reference.  
 of the meter and the quality of the initial connection are properly  
 ults. Once referenced, simply connect the cable under test to the  
 display the ORL. Because the measured ORL is the result of all back  
 the individual ORL of a connector, it is necessary to optically isolate it.  
 med by a tight mandrel wrap of the cable. The mandrel wrap effectively  
 e light launched into it and preventing it from being reflected back

dependent on the wavelength used and the type of fiber. Typically,  
 a ballpoint pen is sufficient. Several wraps of the mandrel ensures that  
 e core of the fiber. The wraps may need to be slightly tighter for shorter  
 uently looser for the longer wavelengths like 1550nm. If the reflection of  
 ered, mandrel wrap the cable after the last connector to be tested.

# Featured Product

## EXFO MaxTester 940/945 Telco OLTS NEW! Bidirectional FasTesT™ Analysis

### APPLICATIONS

- FTTx construction
- Telecommunications and outside plant networks testing
- Data centers
- Enterprise structured cabling



### FEATURES

- Unmatched FasTesT™ performances: 100 % automated bidirectional test at two wavelengths under 5 seconds
- 100 % automated fiber inspection: one-step process with pass/fail analysis at both fiber ends
- On-board assistant and diagnosis to eliminate reference errors and negative loss
- Improved short fiber measurement
- On-board professional PDF reporting
- Bright, 7-inch high resolution touch screen display— the biggest in the market
- Best-in-class singlemode distance range of 200 km
- EXFO Connect-ready for cloud-based test assets management
- Wi-Fi and Bluetooth connectivity (optional)

The EXFO MaxTester 940/945 Telco OLTS is the first tablet-inspired multifunction optical loss test set (OLTS) measuring insertion loss (IL), optical return loss (ORL) and fiber length at two wavelengths in 5 seconds via fully automated bidirectional FasTesT™ analysis.

## UPCOMING EVENTS

### 2019 Trade Show and Training Schedule

- April 6 - 11 | NAB, Las Vegas, NV
- April 8 - 9 | FISU Fiber Optic I & II Training, Jackson, MS
- April 8 - 11 | Broadband Communities Summit, Austin, TX
- April 10 - 11 | FISU Fiber Optic I & II Training, New Orleans, LA
- April 15 - 17 | CommTech East Show, Mississauga, ON
- April 23 - 24 | FISU Fiber Optic I & II Training, Baltimore, MD
- April 29 | Federal Direct Access Show, BFS, Parkersburg, WV
- May 6-7 | FISU Fiber Optic I & II Training, Nashville, TN
- May 8-9 | FISU Fiber Optic I & II Training, Atlanta, GA
- May 8 | Federal Direct Access Show, Fort Drum, Watertown, NY
- May 9 | Federal Direct Access Show, Rome Labs/Griffiss Park, Rome, NY
- May 21-22 | FISU Fiber Optic I & II Training, Atlantic City, NJ
- May 22 | Federal Direct Access Show, Scott AFB, Fairview Heights, IL
- May 28-30 | CommTech West Show, Calgary, AB, Canada
- June 3-5 | FISU Fiber Optic I & II Training, Brightside, Raquette Lake, NY
- June 3-5 | FiberConnect, Orlando, FL
- June 5 | Federal Direct Access Show, Joint Base Lackland, San Antonio, TX
- June 12-14 | InfoComm, Orlando, FL
- June 17-19 | FISU Fiber Optic I & II Training, Brightside, Raquette Lake, NY
- June 17-21 | UTC Telecom, Fort Worth, TX

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# Ask Bruno

Vice President of Technical Services



**Can unused connectorized legs on a fiber splitter/coupler increase my back reflections?**

Yes they can. When using an optical coupler/splitter any connectorized legs, whether they are in use or not, will affect your overall system ORL (Optical Return Loss). As we know, back reflections or ORL can be a significant problem in a singlemode system. When we use a bidirectional splitter/coupler, it will split the optical signal evenly to whatever number of legs there are, whether they are used or unused. The unused legs will then return some of this power as ORL.

A typical UPC connection has -55dB ORL when mated to another UPC connector. When this same connector is unmated (not plugged into another UPC connector) the ORL is between -14dB and -18dB. This is very significant and can be extremely detrimental to equipment.

So how can we reduce the back reflections from these unused ports? There is an easy answer to this problem. It is recommended that a terminator connector be plugged into any unused ports. The terminator connector will absorb most of the back reflections from the coupler connector. By mating to the terminator connector, the ORL will be reduced to the acceptable -55dB standard that is required with UPC connections. Terminator connectors are available in UPC and APC polishes.

Visit us online to view our full library of instructional videos!



# TECH TALK Corner



**with Fiber Instrument Sales**

## Loss Budget Analysis - Be Conservative!

A loss budget is a figure, typically expressed as decibels, which indicates the total acceptable amount of optical loss that a fiber optic link can have. If losses exceed this amount, the system does not meet design parameters and may not function properly.

Loss budgets are usually formulated in the system design stage, to help ensure that connectors, splices, couplers and equipment in the installed system will not consume too much optical power. If they do, transmitters and receivers at each end of the fiber link will be unable to communicate with one another.

Attenuation and bandwidth are the two most important factors when doing a budget loss analysis. Specific considerations include fiber type, wavelength, routing, system length, transmitter power and receiver sensitivity.

Various charts are available which provide loss estimates for various connectors, splices, fibers and so forth. Keep in mind that these numbers represent typical losses. To be on the safe side when estimating a loss budget, assume there will be more loss than these figures suggest.

For example, some system degradation occurs over time, such as that caused by environmental factors or dirty connectors that are reopened for testing purposes. Also, LED's within transmitters can lose power as they age, and additional system loss will result from restoration as splices are added to the link.

You should allow +/-0.2 to 0.5dB for the possibility of imprecise measurements. Finally, don't forget to include the first and last connectors on each end of the system in your loss estimate.

# What's New *with Fiber Instrument Sales*

**We would like you introduce to you, two new additions to our sales team!**



Sierra Quinn  
**Sales Associate**  
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Ext. 2119  
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Hi, I am Sierra Quinn and I started out at FIS in 2015 as a customer service rep. I have just recently joined the domestic sales team and I am excited for this new journey. When I am not working you can find me hanging out with my family and my pup, Lola. If you are needing a Sales Rep in the region 1 or 2 area please feel free to get a hold of me.



Cassey Weissmuller  
**Sales Associate**  
Region 3 & 4  
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cweissmuller@fissales.com

Hello there! I am Casey Weissmuller, a new sales representative at Fiber Instrument Sales. I just recently completed the Fiber Optic I and II training course here at FIS. As a growing industry, fiber optics is a great field to be involved in, allowing great opportunity. I am happy to assist you with all of your fiber optic needs.

**1-800-5000-FIS(347)**  
**We are here and ready to help you!**