

AN-112

Testing Insertion Loss and Return Loss on Ribbon Fiber Fanouts with OPL-MAX

Overview

Measuring Insertion Loss and Return Loss on Ribbon Fiber Fanouts, like the MTP® to LC cable shown in figure 1 below, can be a streamlined process when using the right equipment and automation software.

For the methods described in this Application Note, only a multichannel IL/RL Tester (**OP940**) fitted with large area detector (**RIN**) or integrating sphere (**OP-SPHR**) is needed. This setup can greatly reduce testing time and inaccuracies caused by additional reference cables and multiple detectors. For even further efficiency in testing, using **OPL-MAX** software will automate and store all test results.

For measuring IL and RL on an MTP to MTP ribbon cable, please see Application Note **AN-104**.



Figure 1: Example cable to be tested: Twelve fiber MPO breakout cable.

Launching OPL-MAX Software

Prior to launching the software, ensure that the remote head detector or integrating sphere is connected and that the **OP940** is turned on. Upon starting the **OPL-MAX** software, the .ini File Check screen will pop up. From the **Selected Setup** drop-down menu, select the appropriate setup file. It will automatically populate the rest of the fields with the saved sequences and descriptions. Once the proper setup is selected, click **Launch Application**.

Testing the MTP® Side

This method of testing MTP fanout cables requires an MTP-to-FC/APC fanout cable **A** connected to the source and two large area detector adapters: In this example, MTP and LC **B**.

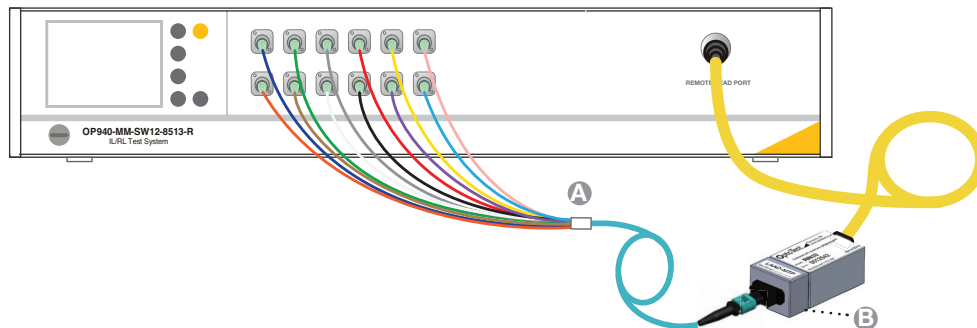
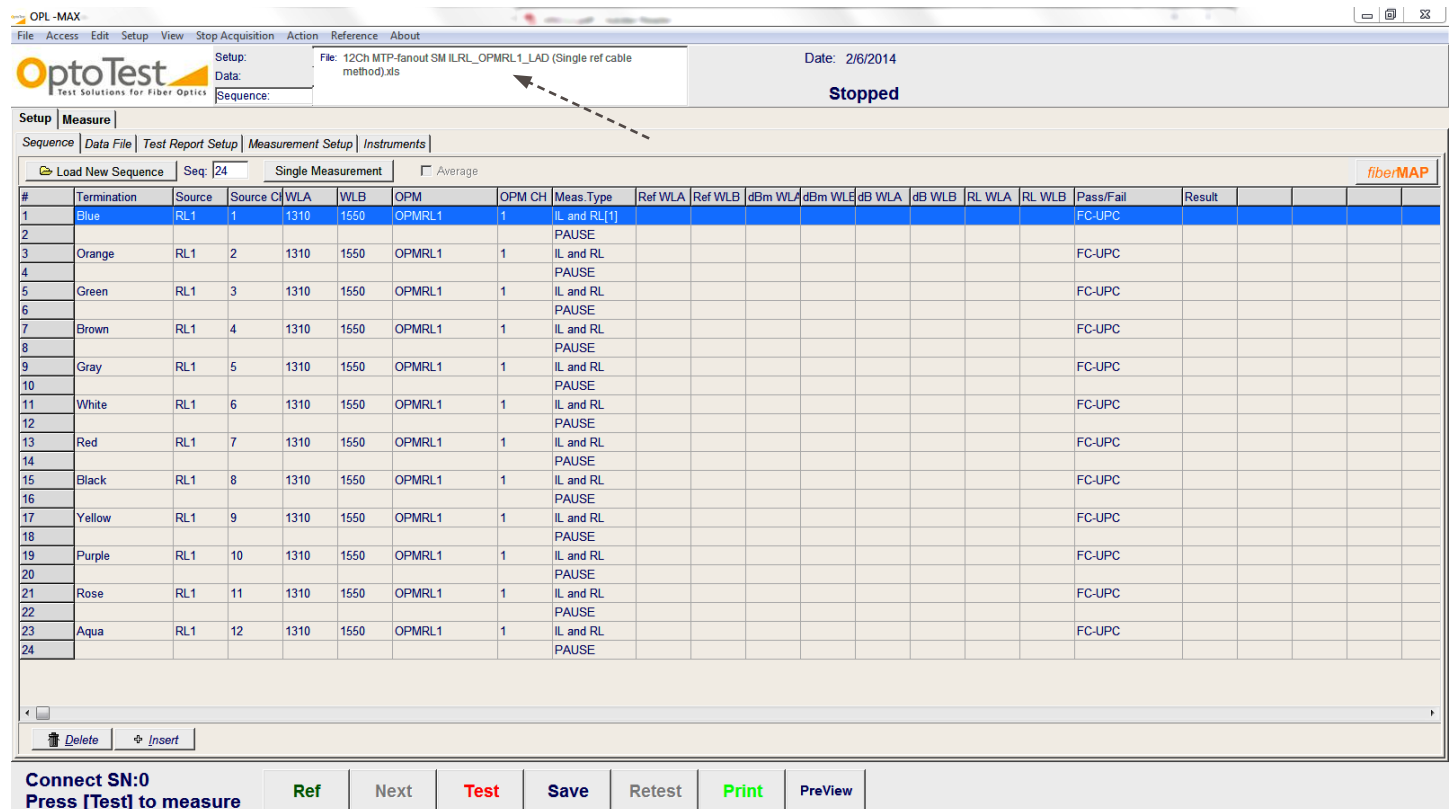


Figure 2: An OP940 with an HPR cable plugged into the remote head power meter for insertion loss reference.

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Sequence Setup

This section of the Application Note will make use of the following sequence file to perform the references and measurements described.



OPL-MAX

File Access Edit Setup View Stop Acquisition Action Reference About

OptoTest
Test Solutions for Fiber Optics

Setup: File: 12Ch MTP-fanout SM ILRL_OPMRL1_LAD (Single ref cable method).xls Date: 2/6/2014
Data: Stopped
Sequence:

Setup Measure

Sequence Data File Test Report Setup Measurement Setup Instruments

Load New Sequence Seq: 24 Single Measurement Average fiberMAP

#	Termination	Source	Source Cl	WLA	WLB	OPM	OPM CH	Meas. Type	Ref WLA	Ref WLB	dBm WLA	dBm WLB	dB WLA	dB WLB	RL WLA	RL WLB	Pass/Fail	Result
1	Blue	RL1	1	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
2								PAUSE										
3	Orange	RL1	2	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
4								PAUSE										
5	Green	RL1	3	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
6								PAUSE										
7	Brown	RL1	4	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
8								PAUSE										
9	Gray	RL1	5	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
10								PAUSE										
11	White	RL1	6	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
12								PAUSE										
13	Red	RL1	7	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
14								PAUSE										
15	Black	RL1	8	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
16								PAUSE										
17	Yellow	RL1	9	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
18								PAUSE										
19	Purple	RL1	10	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
20								PAUSE										
21	Rose	RL1	11	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
22								PAUSE										
23	Aqua	RL1	12	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
24								PAUSE										

Delete Insert

Connect SN:0
Press [Test] to measure

Ref Next Test Save Retest Print PreView

For these breakout cables, you will notice a **<Pause>** in each step of the sequence allowing the operator time to switch fibers on the fanout side of the DUT.

This can also be edited and viewed in **Excel** through **Edit > Edit Sequence in Excel** on the toolbar.

OPMRL1 refers to the large area detector associated with the **OP940**. This sequence shows that insertion loss referencing and testing will be performed on the same large area detector. After getting the sequence properly configured, save the file and go back into **OPL-MAX**. Click the **Load New Sequence** button and select the newly created sequence.

In the **Setup** menu, select the **Data File** tab to select the proper data file for the test report and go to the **Measure** tab to configure the test report headers.

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Insertion Loss Reference

Connect the FC/APC connectors of your high performance reference cable (HPR) to the outputs of the OP940 **A** and the MTP connector into the large area detector **B**. When the reference setup is configured, press the **Ref** button **C** and the software will perform the reference cycle.

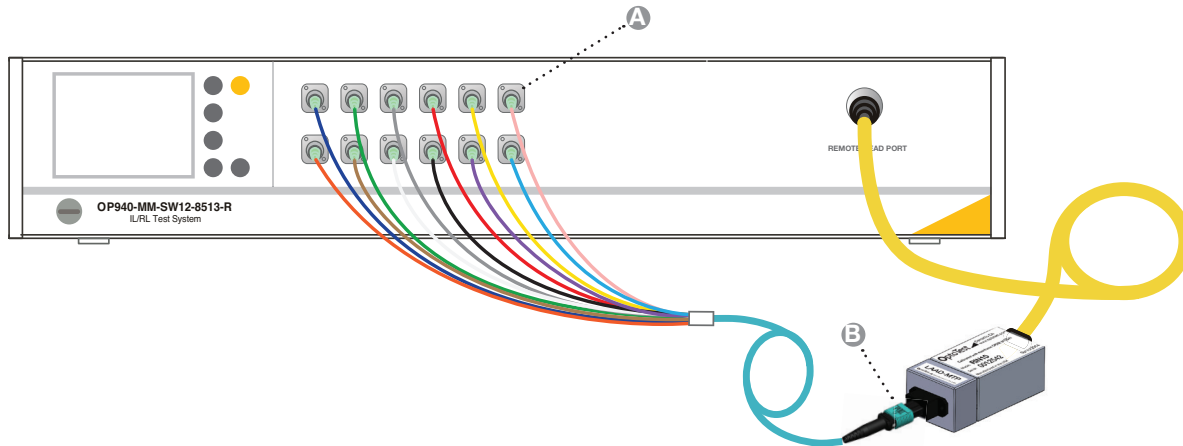
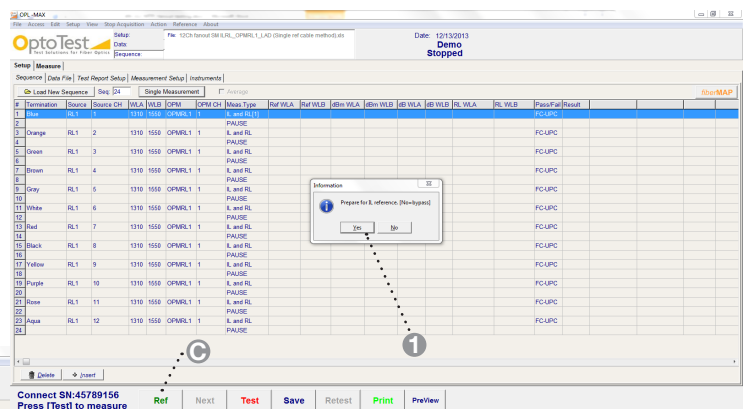
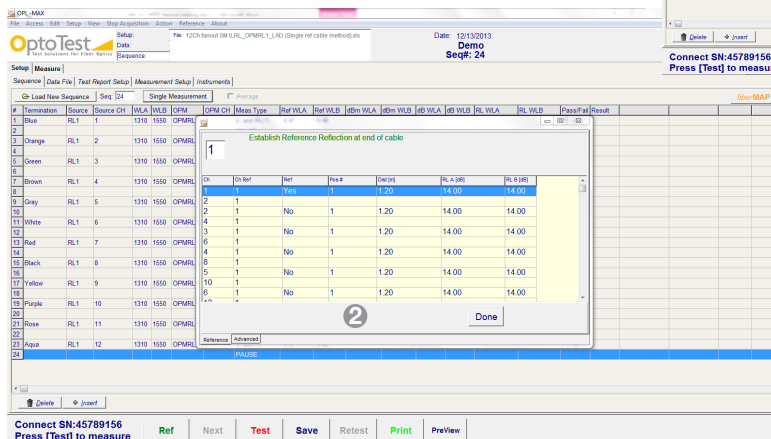


Figure 3: An OP940 with an HPR cable plugged into the remote head power meter for insertion loss reference.

Return Loss Reference

When insertion loss referencing is completed, the user will be prompted to take a return loss reference. Upon clicking **Yes** **1** a popup screen will be shown which will guide the operator through return loss referencing **2**.



Note that only the first channel is going to be referenced. The rest of the channels will copy this reference, saving valuable time when all channels are the same length. If desired, the software has the capability to reference each of the channels individually.

Measuring the Device Under Test (DUT)

After referencing, connect the MTP fanout cable under test as pictured below. The MTP connector of the DUT should connect to the MTP connector of the reference cable and the fanout side of the cable should connect to the large area detector via the appropriate adapter.

Note: Ensure the gender of the MTP DUT and HPR are compatible.

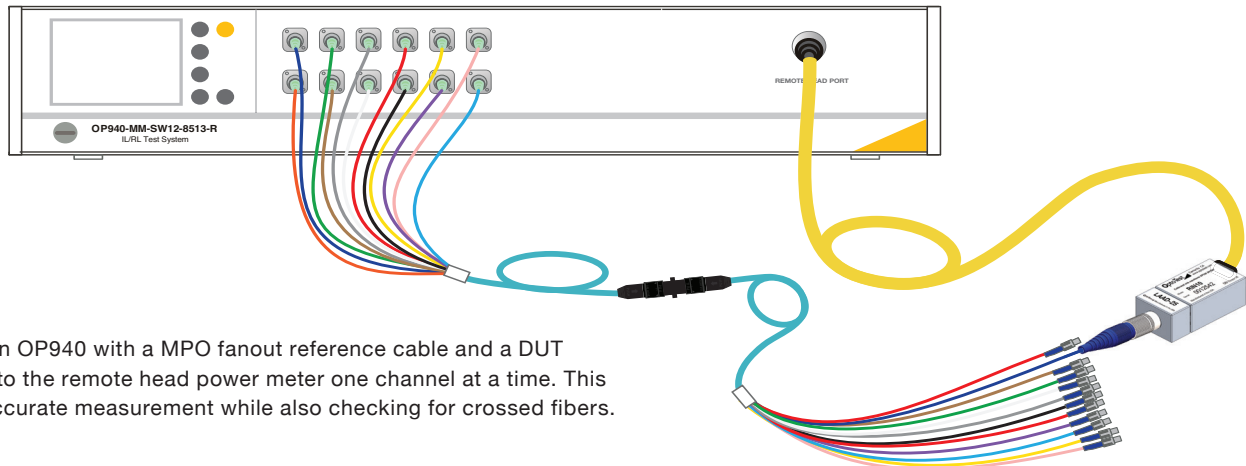


Figure 4: An OP940 with a MPO fanout reference cable and a DUT plugged into the remote head power meter one channel at a time. This gives an accurate measurement while also checking for crossed fibers.

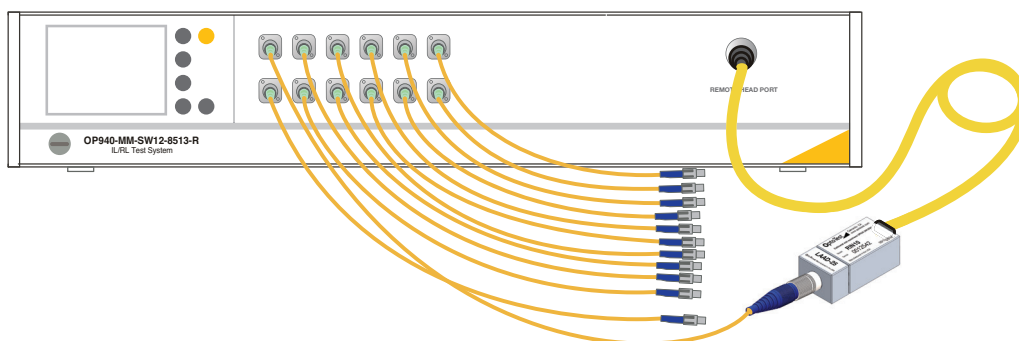
Pressing **Test** in **OPL-MAX** will begin the measurement process and the system will step from channel 1 to channel 12, measuring the insertion loss and return loss of the MTP connector of the DUT. The pauses in the sequence will allow the operator to switch between the channels of the fanout side of the DUT.

Measuring the Simplex or Fanout Side

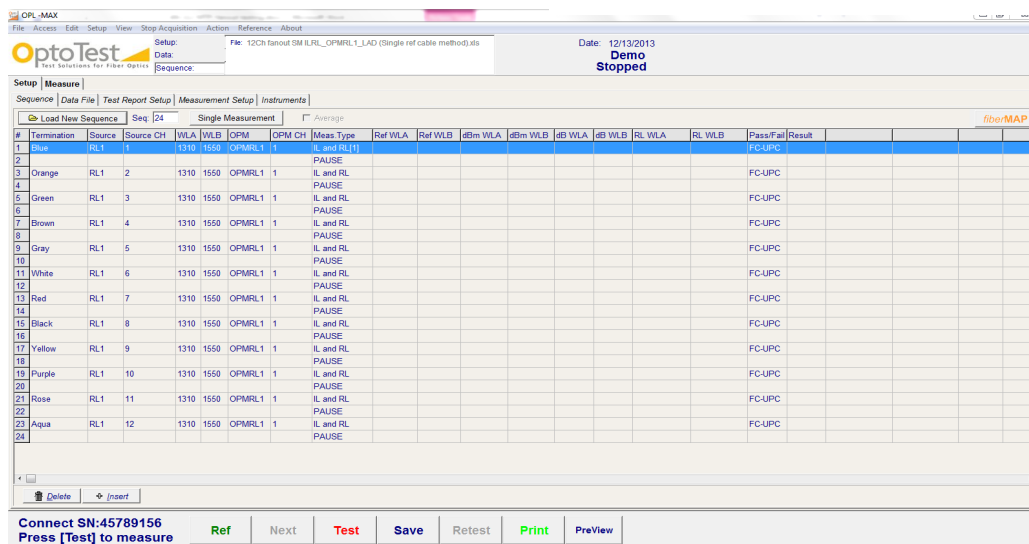
In order to test the simplex side of an MTP fanout cable, a new set of reference cables will be needed. This setup requires one simplex **HPR cable**. As before, the large area detector will be used for both reference and testing.

Insertion Loss Reference

Connect the reference side of the reference cable to the large area detector using the appropriate adapter. The pauses in the sequence will allow the user to copy the reference values for each step in the sequence. See Figure 6.



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#	Termination	Source	Source CH	WLA	WLB	OPM	OPM CH	Meas. Type	Ref WLA	Ref WLB	dBm WLA	dBm WLB	dB WLA	dB WLB	RL WLA	RL WLB	Pass/Fail	Result
1	Blue	RL1	1	1310	1550	OPMRL1	1	IL and RL [1]									FC-UPC	
2								PAUSE										
3	Orange	RL1	2	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
4								PAUSE										
5	Green	RL1	3	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
6								PAUSE										
7	Brown	RL1	4	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
8								PAUSE										
9	Gray	RL1	5	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
10								PAUSE										
11	White	RL1	6	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
12								PAUSE										
13	Red	RL1	7	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
14								PAUSE										
15	Black	RL1	8	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
16								PAUSE										
17	Yellow	RL1	9	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
18								PAUSE										
19	Purple	RL1	10	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
20								PAUSE										
21	Rose	RL1	11	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
22								PAUSE										
23	Aqua	RL1	12	1310	1550	OPMRL1	1	IL and RL									FC-UPC	
24								PAUSE										

Figure 6: Pause step in sequence file.

Return Loss Reference

The same procedure outlined in the section for referencing RL on the MTP side should be used for referencing return loss on the fanout side of the cable.

Testing

On the large area detector, replace the simplex adapter with the LAAD-MTP. Connect the fanout side of the DUT to the reference cables and connect the MTP side to the large area detector. To begin taking measurements, click **Test** in the software. Step from channel 1 to channel 12 and measure insertion loss and return loss on the simplex connectors.

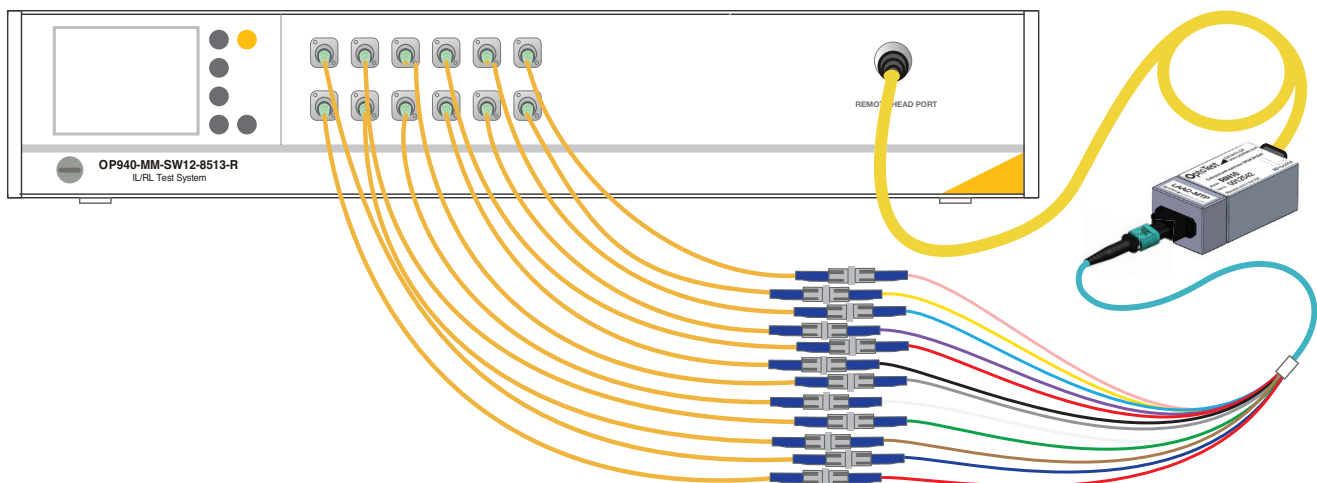


Figure 7: After referencing to the simplex connector, connect the DUT between the

Verifying Polarity on MTP® Fanout Cables

Although this method of testing insertion loss and return loss already rules out crossed fibers with passing results, there are two options to explicitly verify the polarity of an MPO fanout cable; one involves using a visible light source, such as the **OP280MT**, to visually determine that the fibers map to the correct locations; the other method uses a multichannel **OP940** and an **OP710** multichannel optical power meter with individual detectors in combination with **OPL-MAX**'s FiberMAP feature.

Using the OP280MT to Verify Polarity

The **OP280MT** can be used to easily verify the polarity of an MPO fanout cable. Simply connect the DUT to the **OP280MT**'s source port and either step through each channel manually or use one of the programmed sequences. Verify that the ferrules on the fanout side light up in the proper order. For more information about the **OP280MT**, contact OptoTest Sales.

Using the OP710 and OPL-MAX to Verify Polarity

OPL-MAX's FiberMAP feature allows the user to quickly and easily test for polarity using an **OP710** and an **OP940**. The individual detectors on the **OP710** allow the software to discern exactly which channels are active at one time, and will provide a visual output of where each source channel maps to. For more information on using FiberMAP, consult our Application Note **AN-109** Verifying Continuity with FiberMAP.