Improve cable assembly testing throughput with combined polarity, insertion loss and return loss

Application Note AN-106 Rev 1

Topics

- The need to test cable assemblies
- Measuring polarity
- A unique feature: combine polarity with IL/RL
- Simplified process and improved accuracy
- Typical setup examples

The backbone of any optical network are the thousands of optical fibers and their connections, namely patch cords. Having good quality cables is essential for efficient communication. This means testing the performance of three key parameters must be done on 100% of cables sold. Those parameters are polarity (also known as fiber mapping), insertion loss (IL) and return loss (RL).

In the last decade, cable assembly manufacturers have mostly shifted towards using the light source power meter (LSPM) method to measure IL and optical time domain reflectometry (OTDR) to measure RL thanks to being “mandrel-free”. However, two different methods are still used for verifying polarity.

Legacy Method 1: using a separate polarity tester before testing IL/RL

Pros	Cons
Non-contact method possible	Additional step
Extremely fast (< 2 sec for 48ch*)	
No effect on IL/RL testing	
Well suited for very high channel counts and complex mappings	

*using Santec’s PTM-100

Legacy Method 2: using a receive switch during IL/RL testing

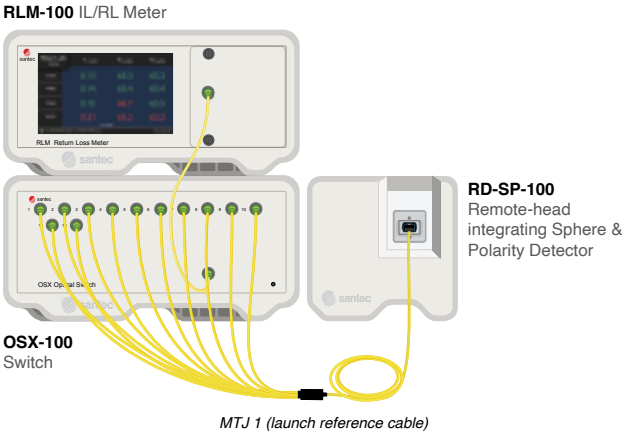
Pros	Cons
No additional step	Complex referencing and added uncertainty in IL accuracy
	Cannot measure ILA and ILB separately
	More expensive, especially on higher channel counts

Newly released in 2024, Santec's award winning RD-SP-100 combines the ability to measure polarity and IL in a single remote-head detector, simplifying your test setup and increasing your throughput. For the operator, the process is effectively the same as when measuring only IL and RL. The unique addition of the polarity detector in the same enclosure as the integrating sphere detector is what allows the RD-SP to do both in a single step.

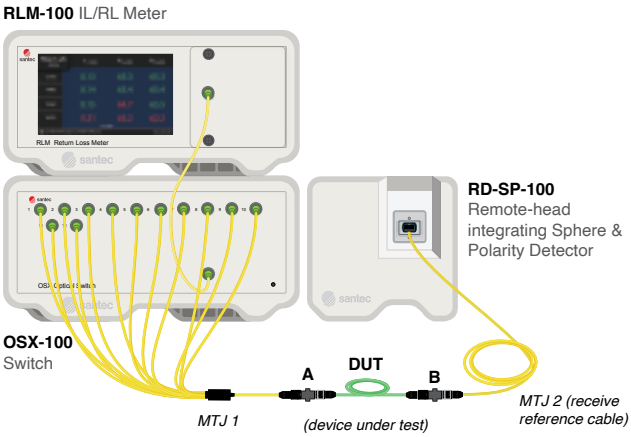
For most applications, the test procedure depends on whether you need to measure IL_A and IL_B separately or if IL_{Total} is sufficient. If measuring IL_{Total} only, the simpler *Dual MTJ* (master test jumper) method is recommended. This is often used for incoming quality inspection or short cables and cassettes. However, if the loss at each connector must be measured separately, the *Single MTJ* method is the most accurate procedure.

Dual MTJ Method

Step 1. Reference IL and length on the launch MTJ only

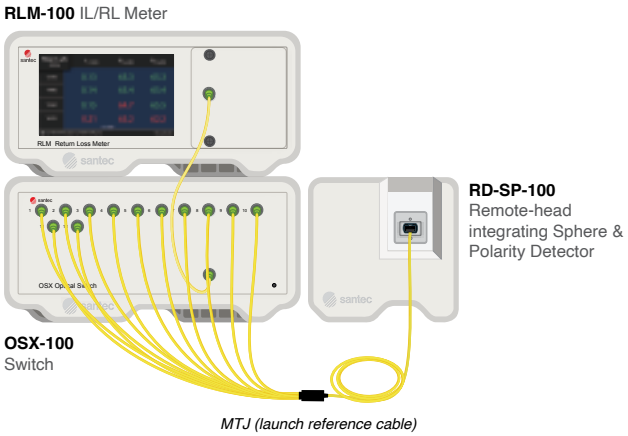


Step 2. Connect the DUT and the receive MTJ then measure Polarity, IL_{Total}, RL_A, RL_B and RL_{Total}

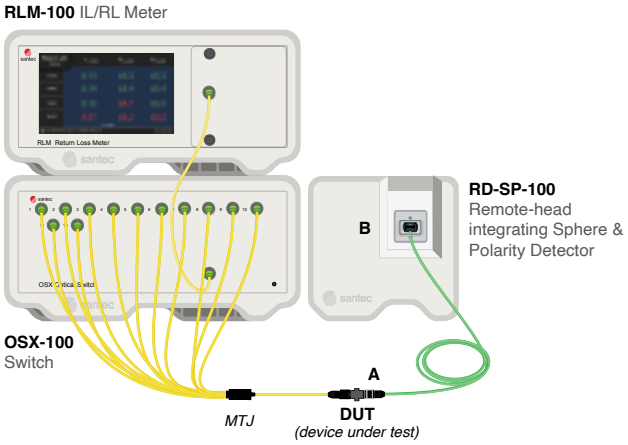


Single MTJ Method

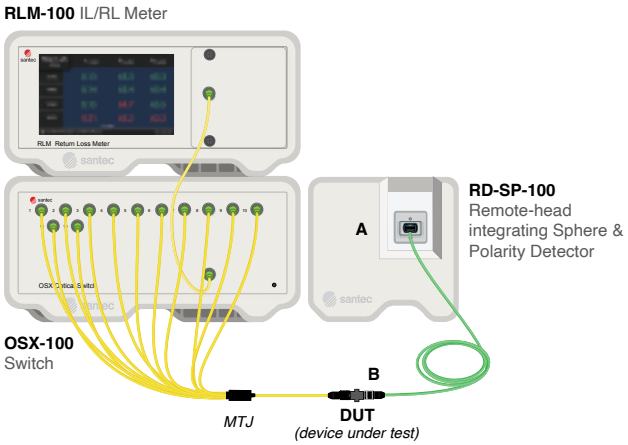
Step 1. Reference IL and length on the MTJ



Step 2. Connect the DUT then measure Polarity, IL_A and RL_A



Step 3. Flip the DUT then measure IL_B and RL_B



Note: you can configure the test plan to check polarity before IL/RL to get a quick pass/fail on polarity in the first few seconds. If polarity is good, the software automatically continues without any operator intervention. This fast fail method makes your testing efficient, so you don't waste time measuring IL/RL on a cable with incorrect mapping.

Santec's RD-SP-100 offers an efficient solution for cable assembly testing by integrating polarity measurement with IL/RL in a single step. This innovative approach not only reduces the testing process complexity but also enhances throughput, providing a streamlined experience for operators. Cable assembly manufacturers can now achieve faster testing cycles and maintain high-quality standards, ultimately supporting the reliable performance of optical networks.