Measu-
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Devices

OptoTest
Test Solutions for Fiber Optics

LASER
COMPONENTS®

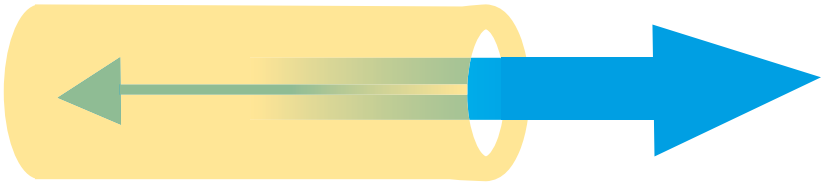
AN128

Ensuring Accurate Return Loss Measurement

Overview

As fiber optic networks move towards higher data rates and lower loss, connectors with increased performance (low insertion and return loss) have become the standard. Return loss requirements on connectors have begun to approach the physical limitations of the polishing process and, as such, any error in the measurement can cause poor connectors to pass or good connectors to fail.

When the return loss criteria for a connector is -55dB and the measurement yields -55.5dB, 1dB of error could mean that the connector could measure anywhere from -54.5dB to -56.5dB. There is a chance that the connector actually does not meet the required specification. During the return loss referencing process, much of this error can be subtracted out and accounted for.



For an open flat connector, 4% of the light launched through the exposed endface is reflected back towards the source. This quantity is known as return loss.

14dB and the Importance of Referencing RL Measurements

Optical return loss test sets are typically internally calibrated, so external losses (e.g. front panel mating, interconnects between the unit and the reference connector, passive components) affect how the units see the reflection. From the perspective of the unit, high loss makes reflections appear smaller and vice versa.

To confirm that the reference setup is correct and has low loss, it is necessary to verify the return loss calibration. The easiest method of doing this is to measure an open flat connector. **If this measures approximately 14dB, then the setup is confirmed to be correct and ready to proceed with measurements.**

Some OTDR-based systems saturate at about 25dB to 30dB of return loss, making it very difficult to verify that the setup has low loss. When measuring an open PC connector with such a system the 14dB reflection will measure at the saturation level of 25dB to 30dB. OptoTest's OP940 has a calibrated linearity from 12dB to 80dB, so it can accurately measure a 14dB reflection.

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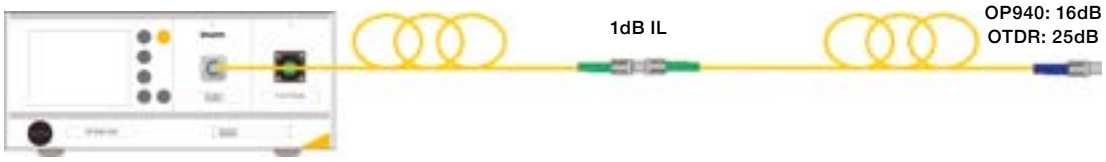
Improved Accuracy on an OptoTest OP940

With an open flat connector, the return loss should read 14dB on an OP940, but may read around 25dB on other OTDR-based RL test sets.



If you connect another cable between the first cable and the front panel of the unit and introduce 1dB of IL, the return loss will be reported at 16dB (every 1dB of IL adds 2dB of RL) on an OP940, informing the operator that the RL needs to be corrected down by 2dB. If an RL meter cannot measure beyond 25dB, it would measure the same value in this case and in the first case and the operator would not be aware that there is added loss in the system.

Note: This 2dB of error will propagate through all measurements performed with this setup. As a 14dB reflection measures 16dB, so will a 45dB reflection measure 47dB and so on.

After connecting the device under test, both test sets will determine that the connector measures about the same (e.g. 57dB). However, the operator of the OP940 will know to correct the return loss to 55dB whereas the operator of another system might assume that the reported value is correct.

Note: The OP940 as well as the supporting software allow for the user to automatically correct for this error, so that it does not need to be corrected by the operator manually.

For more Application Notes, detailed Testing Instructions, and the most up-to-date OptoTest News go to ***www.optobuzz.com***

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