

# AN-114

## RL Testing for APC Terminated Cables

### Overview

When referencing return loss, the OP930 scans a length of fiber and looks for a large reflection (~14dB or a 4% reflection). However, a reference cable that has an APC endface will not give a reflection large enough to trigger the OP930 to reference. To fix this issue and to be able to measure DUTs with APC endfaces, two methods will be discussed below that will allow the OP930 to perform a proper reference measurement.

### Using an APC-PC Replacement Cable as Reference

The first method uses a PC-terminated cable which is the same length as the APC-terminated reference cable to reference return loss.

*Note: The APC-PC cable **must** be the same length (+/-0.1m) as the APC-APC cable in order to be substituted.*

#### Return Loss Reference

Connect the APC endface of the APC to PC substitute cable to the OP930 front panel and leave the PC endface unmated. Navigate to the **RL** screen by pressing the right arrow button twice from the **OPM** screen and press and hold **Ref**. The unit will then begin to look for the largest reflection and then it will begin taking measurements from that distance. The reference measurement should be approximately 14 dB. The length will be displayed above the measurements. If using an APC-APC, the **RL** screen would read **Error**.

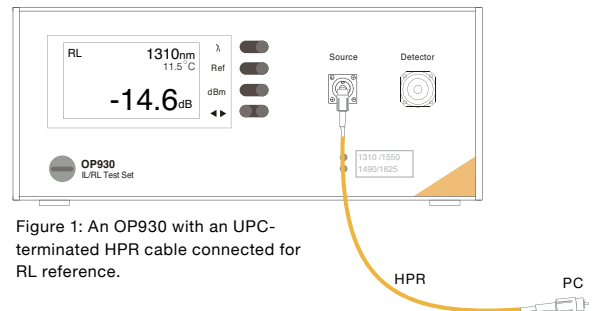


Figure 1: An OP930 with an UPC-terminated HPR cable connected for RL reference.

Now that the return loss reference distance has been found, the APC-PC cable can be switched for the APC-APC reference cable.

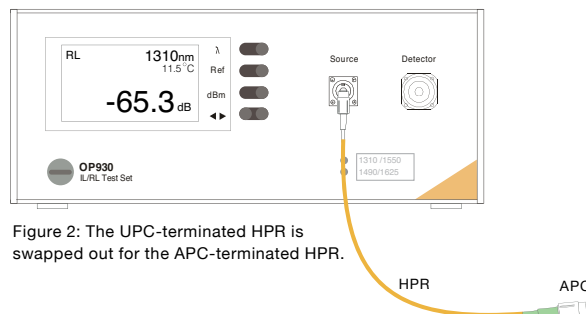


Figure 2: The UPC-terminated HPR is swapped out for the APC-terminated HPR.

\* HPR: High Performance Reference Cable

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### Insertion Loss Reference

With the APC-APC launch cable connected to the source, insertion loss can now be referenced. Since insertion loss does not need a PC endface for reference, simply connecting the unmated side of the cable to the detector will gather sufficient data. Navigate from the **RL** screen to the **IL** screen (press the left arrow button once) and press **Ref**. This will take absolute reference in dBm of all wavelengths and display relative wavelength in dB on the screen. The absolute reference value will be displayed in smaller text above the relative measurements.

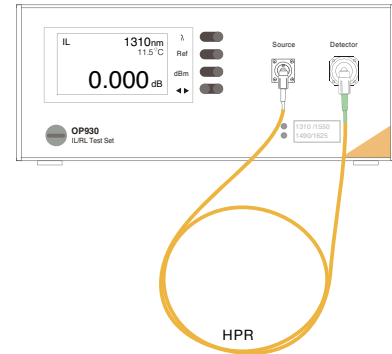


Figure 3: The APC-terminated HPR is then connected to the detector for the IL reference. After this step is completed, the DUT can be connected as normal.

### Using an APC-APC Cable as Reference

The second method uses a very short APC-to-PC (3 to 6in) cable connected to the APC-terminated reference cable to produce a large enough reflection to reference return loss.

### Return Loss Reference

Connect one endface of the reference cable to the OP930 front panel and connect the other end to the APC endface of the reference reflector, leaving the PC endface of the reference reflector unmated. Navigate to the RL screen by pressing the right arrow button twice from the OPM screen and press and hold Ref. The unit will then begin to look for the largest reflection and then it will begin taking measurements from that distance. The reference measurement should be approximately 14 dB. The length will be displayed above the measurements.

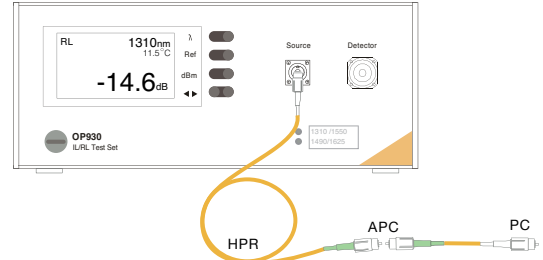


Figure 4: Instead of using a substitute cable, this method utilizes a short reflector stub to create a large reflection near the end of the HPR.

Now that the return loss reference distance has been found, the reference reflector can be removed from the APC-APC reference cable.

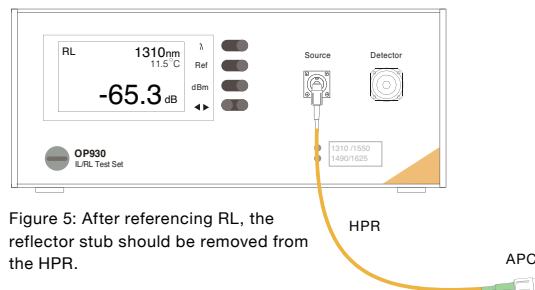


Figure 5: After referencing RL, the reflector stub should be removed from the HPR.

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### Insertion Loss Reference

With the reference reflector removed, simply connect the unmated APC endface of the cable to the detector to reference insertion loss. Navigate from the RL screen to the IL screen (press the left arrow button once) and press Ref. This will take absolute reference in dBm of all wavelengths and display relative wavelength in dB on the screen. The absolute reference value will be displayed in smaller text above the relative measurements.

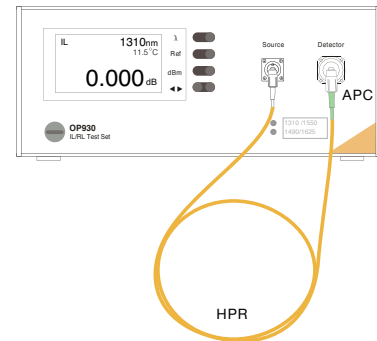


Figure 6: Once the reflector stub is removed, the HPR can be connected to the detector for an IL reference.

### Testing

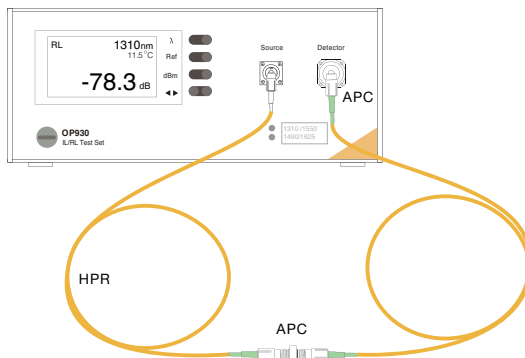


Figure 7: After the IL reference has been completed, the DUT can be connected as normal.

A DUT can now be attached between the launch cable and the OPM and testing can begin. The OP930 automatically begins taking measurements as soon as a reference is found.

To view insertion loss and return loss measurements simultaneously for one wavelength, navigate to the ILRL screen by pressing the right button once from the RL screen. To view insertion loss measurements for two wavelengths at the same time, navigate to the IL2 screen by pressing the right button twice from the RL screen. To view insertion loss and return loss measurements simultaneously for two wavelengths, navigate to the ILRL2 screen by pressing the right button three times from the RL screen.

### Using a Multifiber APC-APC Cable with Reference Reflector

The same principles can be applied to multifiber cables as with simplex cables; both the replacement cable method and the reference reflector method work, but it is suggested that the reference reflector method be used. A multifiber reference reflector will provide a much more accurate reference than the replacement cable because the possible variation in the cable lengths within the fiber ribbon. For more information on MTP reference reflectors, please see our Application Note AN-115 Referencing Return Loss Using the MTP Reference Reflector.

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