NOYES®

Testing "Live" Point-to-Point Fibers using FLX380-103 or OFL280-103

Introduction

When troubleshooting an optical network, a test technician may utilize a 1625 nm Live PON OTDR to test a point-to-point fiber to which an active transmitter is still attached. Under most circumstances, the 1625 nm Live PON OTDR included in FLX380-103 and OFL280-103 FlexTesters may be used to test such "live" fibers. However, a few considerations must be taken into account.

This Application Note identifies the issues which may be encountered. It provides a procedure for testing an out-of-service point-to-point fiber with an active source attached, using either the FLX380-103 or OFL280-103 FlexTester.

Application

When service is disrupted on a point-to-point link, and a fault is believed to have been introduced in the optical network, a maintenance technician may wish to troubleshoot the point-to-point link using an OTDR. If the technician is at the receive end of the link, they will disconnect the receiver, and connect the fiber to the OTDR. It may be inconvenient to disconnect the transmitter at the far end of the point-to-point link. Additionally, the technician may not be aware a far-end transmitter is still sourcing a "live" signal into the failed link, as shown in Figure 1. The far-end TX may be transmitting at 1310, 1490, 1550 nm, or some other wavelength.

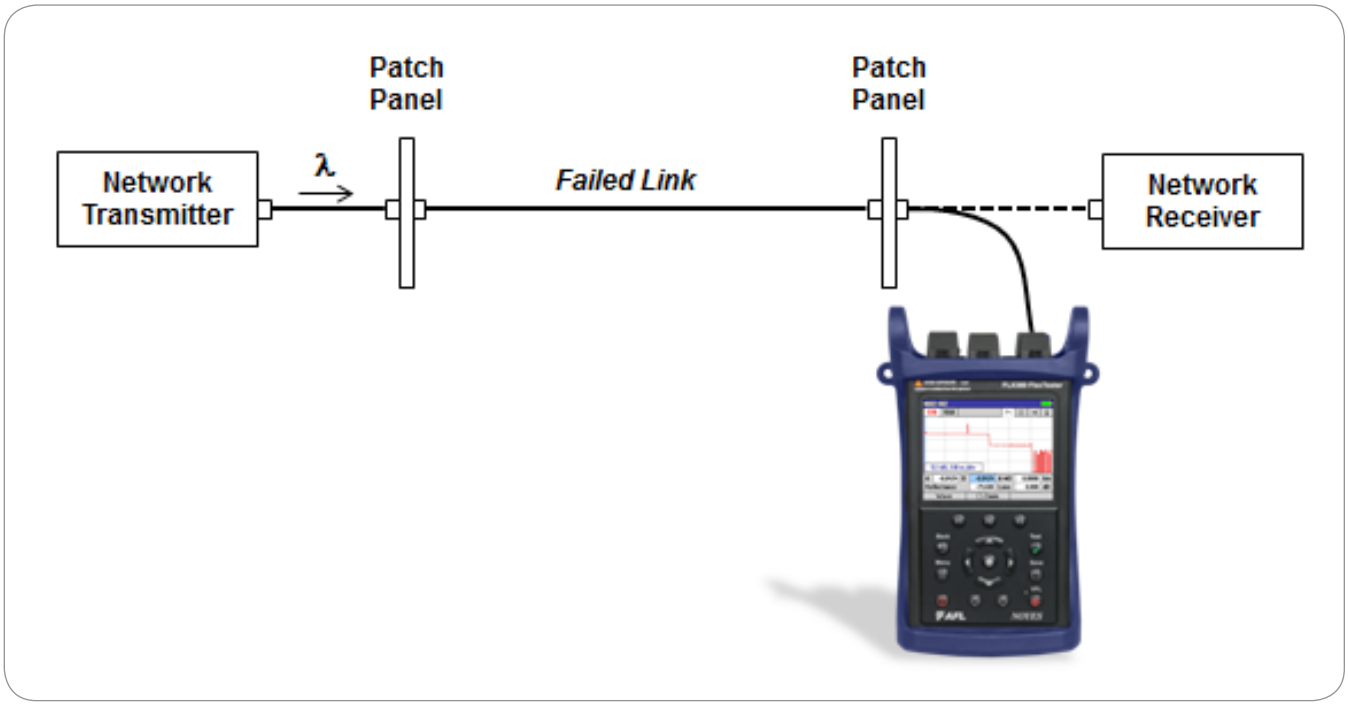

Figure 1: Out-of-service point-to-point link may be connected to an active transmitter.

The AFL NOYES FLX380-103 and OFL280-103 FlexTester OTDRs are designed specifically to support OTDR testing on a Live PON using an out-of-band 1625 nm wavelength. These OTDRs automatically detect and measure downstream 1490 and/or 1550 nm signals in a Live PON. If traffic is detected, the FlexTester will only allow testing to proceed using the out-of-band 1625 nm OTDR. The Live PON OTDRs filter out 1490 and/or 1550 nm signals, preventing downstream traffic from swamping the 1625 nm OTDR's detector.

Users may wish to utilize a FLX380-103 or OFL280-103 FlexTester to detect the presence of a traffic source on a failed point-to-point link, limiting an OTDR test to using the filtered 1625 nm OTDR when a live signal is detected.

Issues

Two issues may arise when attempting to perform an OTDR test using a FlexTester on a point-to-point link in which a live signal is being transmitted from the far-end:

1. FLX380-103 and OFL280-103 FlexTesters detect and measure live downstream signals at 1490 and/or 1550 nm. They are not designed to detect a downstream signal at 1310 nm, since this is only used as an upstream signal in an FTTx PON.

   If the FlexTester is configured to test at 1310 and/or 1550 nm, and a live 1310 nm signal is present, the FlexTester will likely not detect the live signal, allowing a user to initiate an OTDR test at 1310 and/or 1550 nm. The detector of the 1310/1550 nm OTDR will be overwhelmed by the live 1310 nm, and will fail to produce the expected OTDR trace. The trace may appear as a flat line, or as initial backscatter with a significant undershoot beyond the end of the fiber.

2. The FLX380-103 and OFL280-103 are also designed to test an in-service FTTx PON when downstream 1490 and/or 1550 nm signals are present which are at or below the overload threshold of GPON or EPON Optical Network Terminals (ONTs). The minimum downstream overload threshold of a GPON ONT is -4 dBm, per ITU-T G.983.2. For an EPON ONT, minimum overload threshold is -3 dBm, per IEEE802.3 Clause 60.

   FTTx PONs always include a high loss splitter between the Optical Line Terminal (OLT) in the central office and the subscriber's ONT. In a point-to-point link, this high loss splitter is not present, and the received signal level from a far-end active transmitter may exceed the overload threshold of a PON ONT receiver. Even if the far-end source in the point-to-point network is transmitting at 1490 or 1550 nm, excess levels may not be blocked completely enough to prevent interfering with the 1625 nm OTDR.

Live Point-to-Point fiber testing using FLX380-103, OFL280-103, or CS260-10

The two issues identified above may prevent the FLX380-103 or OFL280-103 FlexTester from detecting a live 1310 nm signal and/or obtaining useful OTDR results on a point-to-point link with an active transmitter at the far-end. However, there are steps you can take to detect a live 1310 nm signal and troubleshoot a point-to-point link with an active far-end transmitter. Here is a recommended procedure:

1. If you do not know if the fiber-under-test is carrying an active signal, clean and connect the fiber to the FlexTester's Optical Power Meter (OPM) port, as shown in Figure 2.
2. From the FlexTester's main menu, select the "Light Source and Power Meter" mode. The OPM will display a wavelength and a received optical power level.

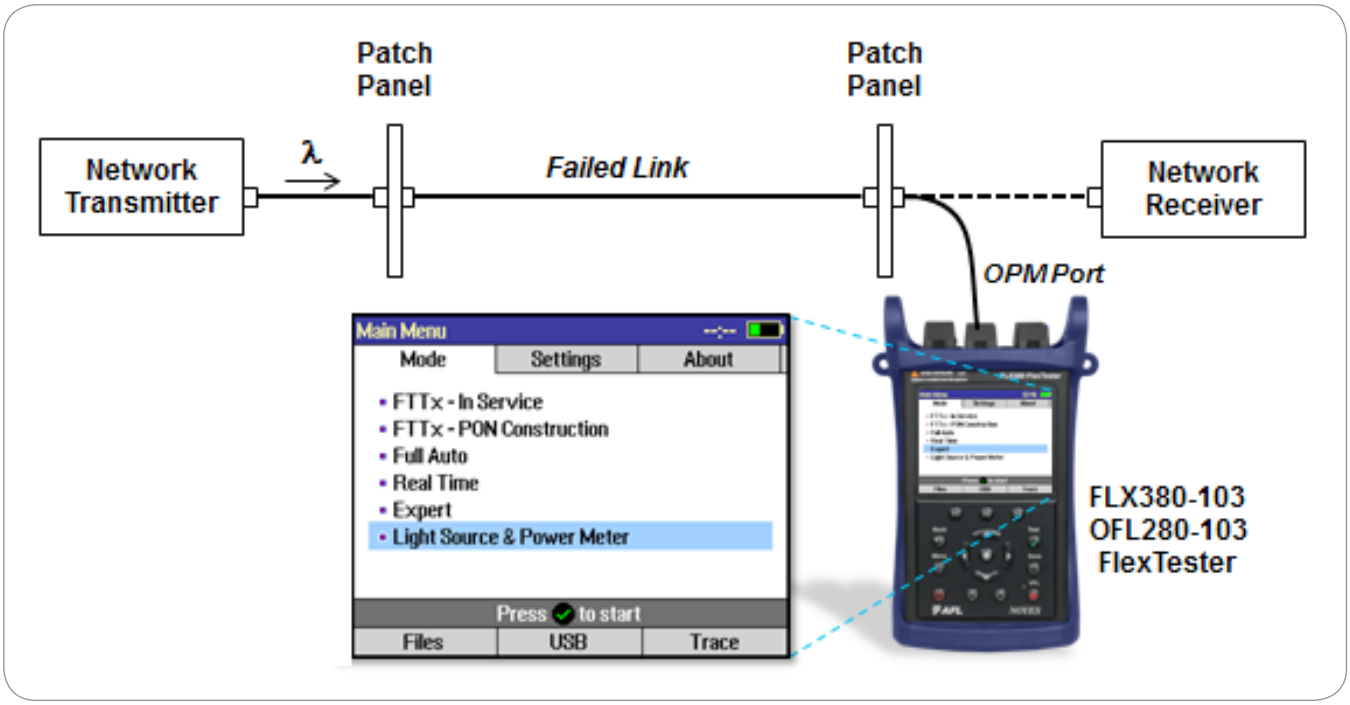

Figure 2: Connect Fiber-under-test to OPM Port and select "Light Source and Power Meter".

3. If the received level reads "Low," as shown in Figure 3, no measurable power is being detected at any wavelength. The fiber is not carrying a live signal, and the fiber may be tested at 1310, 1550, or 1625 nm using either the Full Auto or Expert OTDR modes.

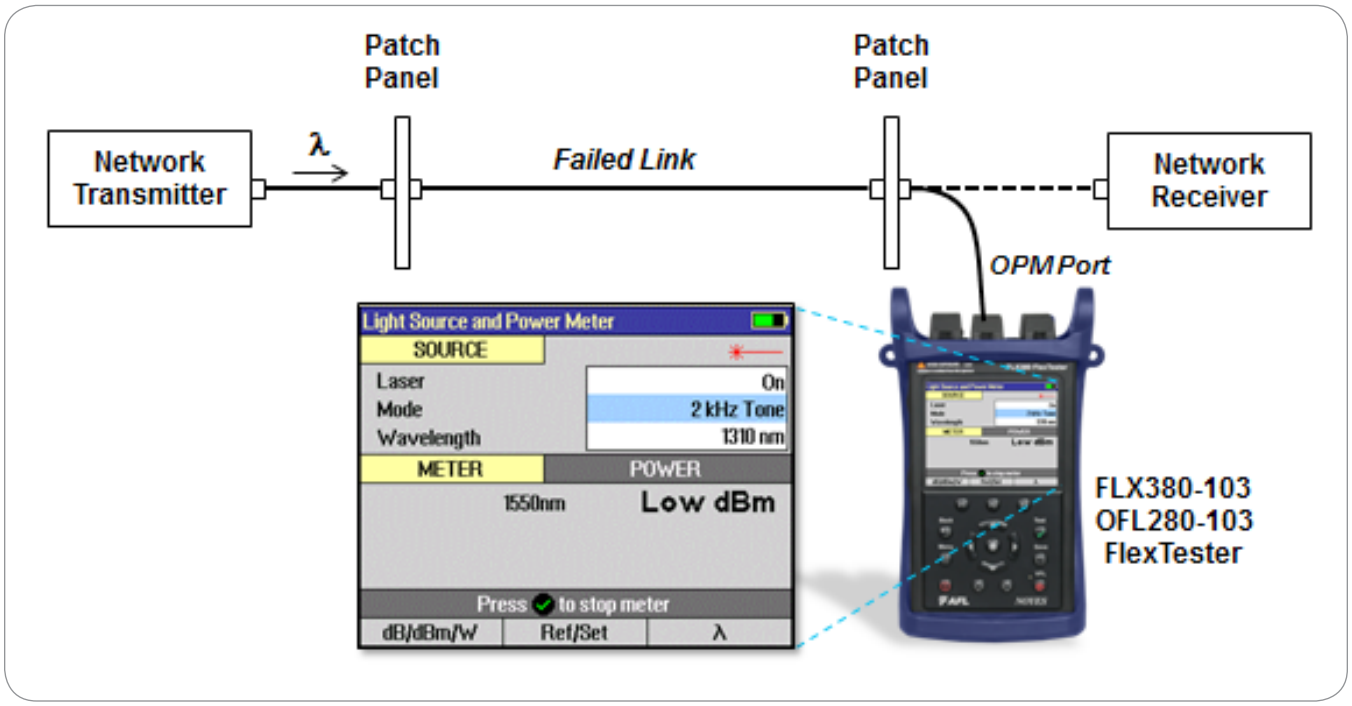

Figure 3: "Low" power level indicates fiber-under-test is dark.

4. If measurable light is received at one or more wavelengths, the OPM will measure the received signal level using the currently selected and displayed wavelength calibration factor. The FlexTester's standard OPM cannot automatically determine the wavelength of the received light. If you know the wavelength of the received signal, press the "λ" softkey to set the OPM's wavelength calibration factor to match the received wavelength and accurately measure the received power level.

   If you do not know the received wavelength, set the OPM wavelength calibration factor to either 1310 or 1550 nm. The displayed measurement will provide an estimate of actual received power level typically accurate to within 1-2 dB, depending on the actual wavelength.

5. If the displayed power level exceeds the PON overload threshold (-3 dBm), the transmitter at the other end of the active fiber must be turned off or disconnected before an OTDR test can be initiated.

6. If the received power level is less than the PON overload threshold, the FlexTester's 1625 nm OTDR can be used to test the live fiber for faults such as fiber breaks, poor splices, micro- or macro-bends, and damaged or dirty connectors. To do so, disconnect the fiber-under-test from the FlexTester's OPM and connect it to the OTDR port. From the main menu, select either the Full Auto or Expert OTDR mode and press the "Select" key ◉, as shown in Figure 4.

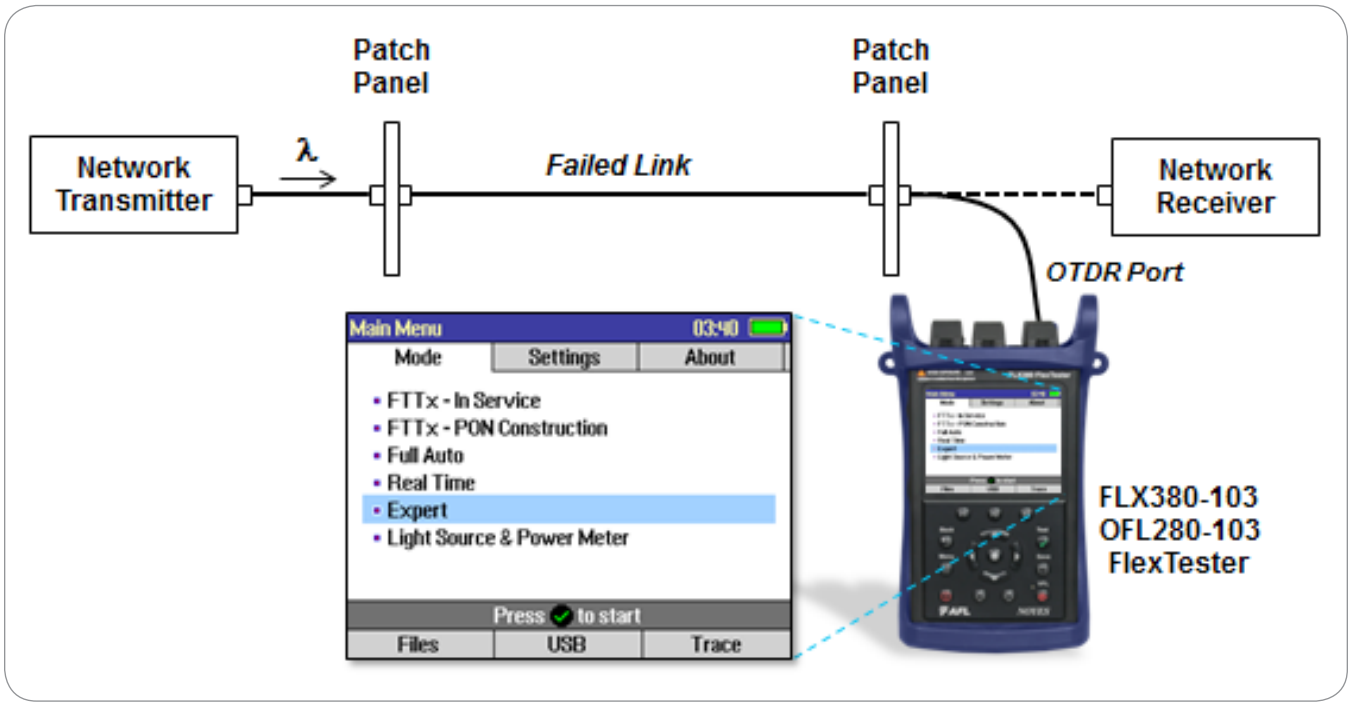

Figure 4: Connect fiber-under-test to OTDR port and select Full Auto or Expert mode.

7. If Full Auto mode is selected, set the test Wavelength to 1625 nm and press "Test."
8. If Expert mode is selected, set the test Wavelength to 1625 nm, configure other Expert mode settings for the appropriate Range, Pulse width and Averaging time, then press "Test."
9. If the wavelength of the downstream signal is 1490 and/or 1550 nm, the FlexTester will display the Live fiber screen, measure and display the received 1490 and 1550 nm signal levels, and prompt to press "Test" again to initiate a test (see Figure 5). If the received power level at both wavelengths is below -3 dBm, press test to initiate the OTDR test using the filtered 1625 nm Live PON OTDR.

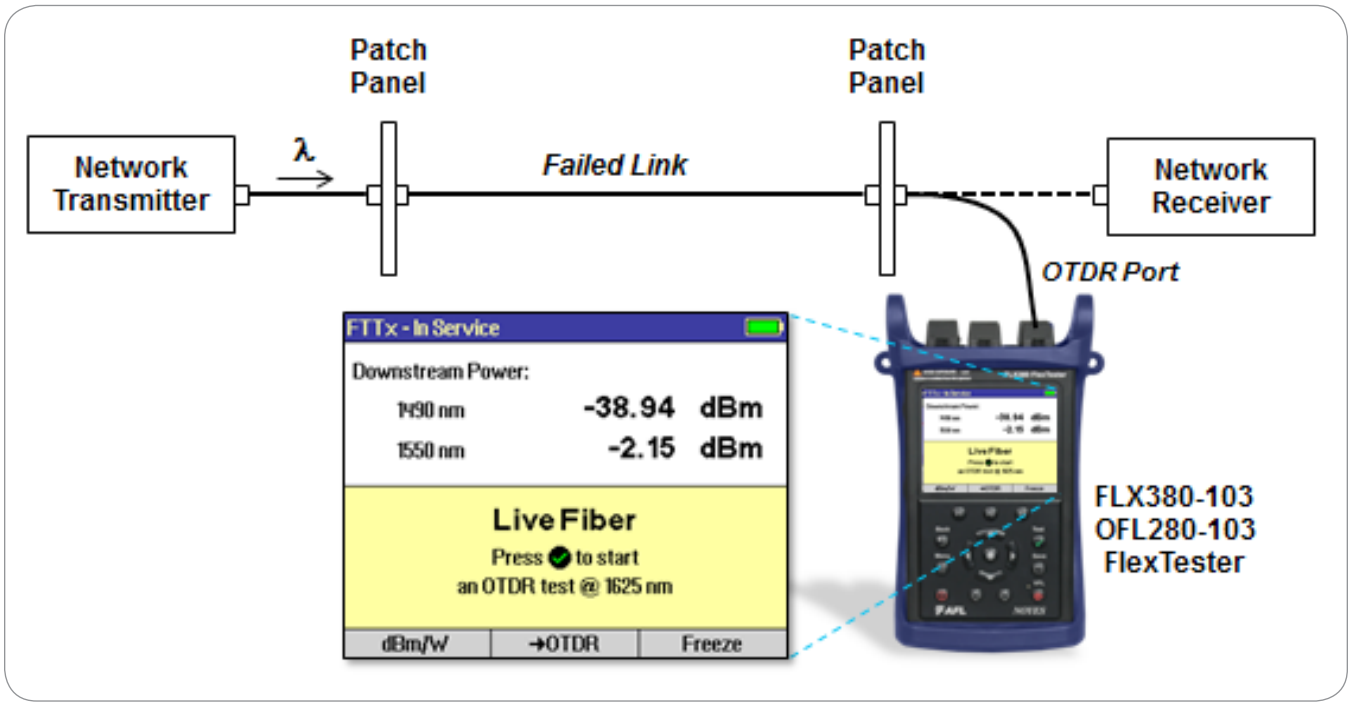

Figure 5: "Live Fiber" detected and displayed when OTDR test initiated on active fiber.

10. If the wavelength of the downstream signal is 1310 nm, the FlexTester will not report Live Fiber, but will immediately initiate the OTDR test using the filtered 1625 nm Live PON OTDR.

Conclusion

AFL's FLX380-103 and OFL280-103 FlexTesters include a 1625 nm Live PON OTDR capable of testing in-service FTTx PONs. This Live PON OTDR may be used to test point-to-point fibers to which a live source is attached. However, certain precautions are necessary to ensure the 1625 nm filtered OTDR will be used, and that the live signal will not interfere with the OTDR.

This Application Note summarizes the conditions under which an active point-to-point fiber may be tested and provides a procedure for completing a 1625 nm OTDR test on the active fiber using either the FLX380-103 or OFL280-103 FlexTester.