

White paper submitted by Livingston

Fibre Optic Test Tools

Whether you are installing new fibre or commissioning an existing dark fibre, there are a number of different test tools available that will carry out a range of different tests. What you will require to complete your own job will depend on what you are actually doing.

Before carrying out any testing, it is essential that you know what is in the network you are testing and if there are any sources, what class they are. Provided the sources are class 1, then there will be no risk to yourself or any operators. If there are sources in the network that are not class 1, then additional safety procedures need to be observed. This is not within the scope of this article, but we would recommend that any staff working with optical sources are suitably trained in the safe procedures for the use of optical sources.

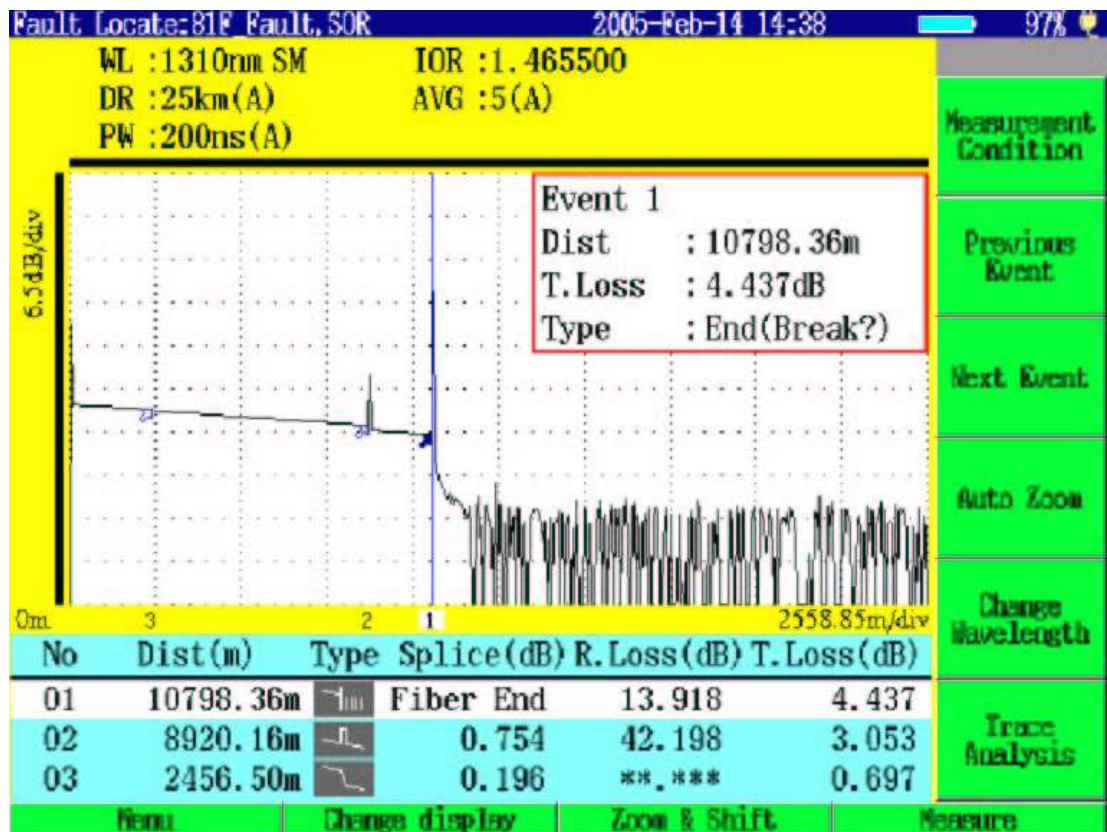
In all instances where you are carrying out testing, it is essential that you know what type of fibre you are testing and at what wavelength the network is to be operated at. If you have a singlemode fibre, testing it with a multimode test tool will give erroneous results.

The most basic tools are normally used when installing fibres within a building for a local network. Any network will consist of a number of fibres that are connected together by either connectors or by physical splices. The performance of the network will rely on the quality of these interconnections and also the way that the fibre has been laid down. All fibres have a specified minimum bend radius, and exceeding these can damage the fibre and increase losses.

There are two basic methods for testing the quality of the interconnects and the fibres within a Network:-

1. **Optical Source and Power Meter.** With these products you can measure the basic loss between two points in your network. This is the simplest of methods and also requires the lowest skills set. An alternate product that combines these two items into a single item is the Optical Loss Test Set. These may also combine a talk set that will allow the operators to talk to each other using the network they are testing. This will give you a single measurement for the total losses in the circuit that you are measuring
2. **Optical Time Domain Reflectometer (OTDR).** With this tool, you can not only measure the total loss of the section of the network you are looking at, but you can also see exactly where the losses are occurring. The other advantage with an OTDR is that the measurement is single ended, and does not require access to both ends of the fibre

to make the measurements. The OTDR will then give you an overview of the loss per meter/kilometre in the fibre and the losses in any splices or connections. It will also enable you to identify exactly where in a circuit a fault may exist. The main disadvantages of the OTDR as a test tool is that it requires a trained operator to interpret the results and that it has an initial dead zone where measurements are not possible. The size of the dead zone is dependant on the OTDR being used and the pulse size. Normally the longer the range of the OTDR the larger the dead zone.



Typical OTDR display showing total losses in a 10km fibre of 4.437dB. The 2nd event is either a splice or connection at 8.9km. (Image courtesy of Anritsu)

Where you are working on a fibre network that has already been installed, a useful tool is the fibre identifier. Ensure that the fibre identifier you are using is a class 1 product to ensure that it will not present a safety hazard to the user. This product will then enable you to be able to identify the two ends of a single fibre chain when there are multiple fibres in the circuit.

If you are installing long haul fibres, or commissioning dark fibres on long haul circuits, it may be necessary to recharacterise the performance of the fibres. This may include the use of PMD (Polarisation Mode Dispersion) and CD (Chromatic Dispersion) Analysers. This may be required when the fibre is to be used to carry the higher data rates such as 10 Gigabit. This is not a simple measurement, and the operator will normally need to be trained in the use of these test tools to ensure accurate measurement of the parameters.

All of these products are supplied by most of the prime test equipment manufacturers such as Acterna, Agilent, Anritsu, Exfo, Noyes, Nettest and Perkin Elmer.

Livingston, as an independent supplier, is able to offer these test tools for the periods that you require, without bias to any specific manufacturer.