JDSU

Application Note

Fiber Coding Management in a Mesh Network Configuration

In metropolitan networks, where the cost of ground construction drastically increases the cost of an optical network, the ability to construct new fiber optic cable routes from the existing infrastructure is becoming a necessity.

In these areas, there is often an abundance of fiber in the ground that is not used for active service. Therefore, it is becoming more and more common to have new routes built with different types of cables jointed together. This solution is very cost effective for the construction crew, but rapidly becomes a nightmare for the measurement crew when documenting test results is concerned.

Fiber Optic Cable Acceptance Test

Traditional acceptance tests of a fiber optic link require the use of OTDR and/or insertion loss testing. Due to the OTDR principle regarding the use of a backscattered level, two measurement traces from each end of a fiber optic link are required in order to measure accurate link and splice losses, the "true splice loss". Bi-directional analysis is a technique used to minimize the effect of backscatter coefficient differences along a fiber optic link. These effects include different core diameters and different backscattering coefficients and can cause erroneous splice readings. Bi-directional analysis is used when either accurate baseline data on the span is desired or when accurate splice measurements, often performed by subcontractors, are desired during acceptance testing.

Network Configurations

In the 1990s, most of the fiber optic cables laid and commissioned were dedicated to building telecommunication routes between major cities where copper cables were initially used for Access networks. All routes used the same fiber origin, fiber end, naming conventions, and fiber coding structure. This type of network can be termed a "conventional" network configuration.

Meanwhile, the increased demand for bandwidth in the late 1990s has necessitated the use of fiber cables more and more to carry the telecommunications bandwidth closer and closer to the customer. This has created a complex route configuration where different fiber optic cables are connected to one another. In this case, telecommunication routes can have different codes for fiber origin and fiber end. This type of network can be termed a "mesh" network configuration.

These two network configurations cannot be managed in the same way when performing acceptance testing and commission reporting.

The Conventional Configuration

In a conventional network configuration (Figure 1), the cable structure is exactly the same from one end to the other, and Fiber #1 Bl/Bl (according to TIA/EIA-598-A color coding standard) arrives as Fiber #1 Bl/Bl at the far end. In this case, documenting the OTDR traces from both ends is not an issue. They are identical. Therefore, the cable documentation can be extracted from only one test instrument configuration.

Bi-directional OTDR association is not required since all of the information is common to both end traces.

Figure 1: Conventional configuration with identical fiber end structure.

The Mesh Configuration

In a mesh network configuration (Figure 2), cable structures are different from fiber origin to fiber end. If a given route composed of multiple cable/fiber assemblies is considered, then the origin Fiber #1 Bl/Bl could become Fiber #6 Bl/Wh at the far end. Consequently, documenting OTDR traces for bi-directional analysis is difficult. The difficulty lies in how to associate both end traces when the configuration and cable documentation are different. That is, which origin-to-end (O⟶E) trace corresponds to which end-to-origin (E⟶O) trace?

In the past, technicians had to manually edit the information because no instrument was able to provide this fiber coding structure.

JDSU's Solution for Documenting Measurement Results in Any Configuration

Due to its long-standing experience in physical layer testing and the close relationship it has to major telephone companies and fiber installers, JDSU has developed a state-of-the-art, unique solution to this problem. JDSU's solution takes into consideration different cable structures from each end of the link. From one end, the technician can document both ends of the link and associate this information with each OTDR trace. This advanced function offers a versatile and simple way to increase productivity during acceptance testing. It also considerably simplifies test report generation and the identification of the link configuration, especially in a mesh network.

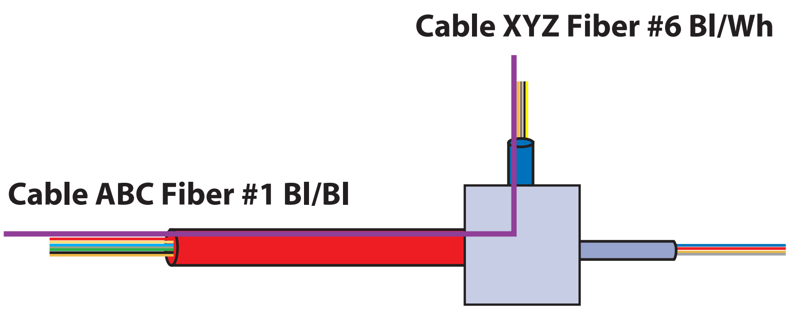

Figure 2: A complex network with different ends in a mesh configuration.

Complex Documentation Management

JDSU's MTS/T-BERD platforms offer the ability to document both ends of the link using just one instrument. Using the MTS/T-BERD platforms, both end configurations and their corresponding information is saved with each OTDR trace (Figure 3). Therefore, the trace association of bi-directional analysis is no longer an issue. It is as simple as it is for a conventional fiber optic link configuration.

Because a powerful solution is never complete without automation, the MTS/T-BERD platforms enable technicians to exchange information through the fiber in order to acquire information from both ends directly on their instruments (Figure 4). This exchange is available even if usual communication means are not possible or when a non-standard cable structure is required (proprietary color coding, for example).

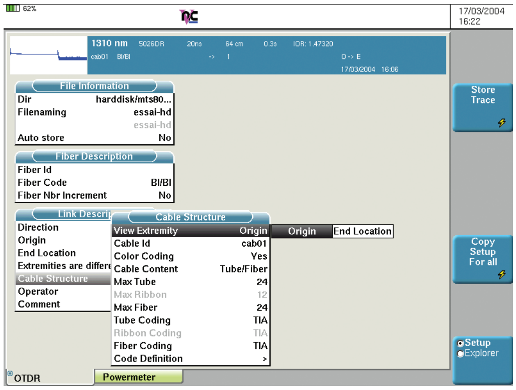

Figure 3: Documentation using the MTS/T-BERD Platforms

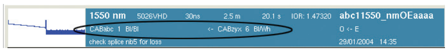

Figure 4: The information at both ends is transferred and saved onto each OTDR trace.

Report Generation

In order to optimize this solution, JDSU's OFS-200 Optical Fiber Cable Software takes this information into consideration in order to generate a cable acceptance test report, including different fiber end structures with color coding and fiber identification. This enables the technician to generate a cable acceptance test report without the time-consuming task of documenting each individual OTDR trace.

Conclusion

A more effective documentation management system provides a more detailed and professional acceptance test report. From a single OTDR trace to complete cable report generation, it enables the technician to clearly identify the link under test and its associated ends.

JDSU's MTS/T-BERD platforms provide all of the required information that technicians need to easily generate cable reports in a quick, snap shot fashion regardless of the route configuration.

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