

OTDR Theory and Operation

W-6D-121 • ISBN 978-0-9754542-1-3 • 86 minutes • Released in August 2004



Operating an OTDR is more than just pressing buttons...

Since optical fiber was first suggested, the effective speed at which information can be transmitted has increased from kilohertz rates to multi-gigabit rates. Along with increased transmission speeds comes the need to test the optical medium through which the signals are passed. To verify that fibers are able to transmit light reliably, a variety of commercial instruments have been developed for certification, maintenance, and restoration of fiber systems.

The OTDR is an instrument used to test the light-transmission ability of an optical fiber cable or span, and it can also determine the location and magnitude of a problem. The OTDR has become the most widely used and versatile instrument for testing optical cables during installation, maintenance, and restoration. The OTDR can determine the length of a fiber and its end-to-end loss as well as the amount of reflected light and loss from various discrete components within the fiber.

Modern OTDRs can locate and evaluate the losses of fusion splices, optical splitters and connectors and can even report whether each location and loss is within certain specification tolerances. Among all electronic test instruments, the OTDR is truly unique in its combination of extremely high dynamic range, rapid acquisition capabilities, and high resolution. No other instrument used for any test application can boast over 200 dB of electrical dynamic range together with nearly 1 GHz of bandwidth and a 10-MHz sampling rate, all in the same package.



Chapter Selections

Introducing the OTDR – 3:27

This chapter introduces the role of the OTDR and what makes it unique when used for manufacturing, installation, maintenance and troubleshooting of optical fibers, cables and various passive components.

How the OTDR Works – 9:51

The OTDR incorporates both optical and electrical components in order to detect and measure reflections. Signatures are explained, along with their causes and tendencies. Understanding these signatures is critical for proper testing.

OTDR Evolution – 4:01

The OTDR has evolved from the benchtop model of the late 1970s to today's portable and powerful platform OTDR. Review its progress including mainframes, the mini-OTDR and fault finders.

Platform OTDRs – 11:57

As technology changed, so did the role of the OTDR. In recent years, the OTDR has become a platform that offers a variety of testing options including dispersion, spectrum analysis, visual inspection and optical switching.

OTDR Settings and Menus – 9:33

Using an OTDR requires that the operator understand and set up the instrument for the task at hand using the many features and capabilities the OTDR provides. Explore OTDR menus and their application in testing fiber optic spans.

Specialty OTDRs – 2:34

A variety of specialty OTDRs have been created for specific needs, such as military or aerospace applications. Learn how these variations are used to measure optical components in optical subassemblies and systems.

Acceptance Testing – 14:24

An OTDR's key role is the acceptance testing of optical fibers and cables. Proper preparation, cleaning and termination are demonstrated along with settings, cursor placement, and automatic versus manual operations.

Measuring Splice Losses – 2:45

A key task for users is identifying and measuring splices in the optical cable span. Learn how and where to place cursors for accurate measurements and why bi-directional and dual wavelength testing is recommended.

Measuring ORL – 4:00

Reflectance is recognized today as a limitation of high-performance systems. Explore the components that cause reflection and how the OTDR uses pulsewidth, deadzone boxes and optical terminators to measure connector reflectance.

Testing the Outside Plant – 3:54

This chapter focuses on the final measurements necessary after a singlemode fiber span has been installed, spliced and terminated. Learn how this test defines future maintenance documentation in your fiber network.

Testing Local Area Networks – 11:55

This chapter focuses on short-distance and LAN applications. As network speeds grew, so did the need for full documentation. This chapter focuses on the OTDR's role to inspect, measure and verify span performance.

Testing Optical Splitters – 6:53

Newer applications that involve optical splitters require a specific OTDR setup to identify and measure. This chapter reviews the instrument adjustments necessary for these tasks.

Bonus Materials – Quiz in Word format, with both student and instructor versions.