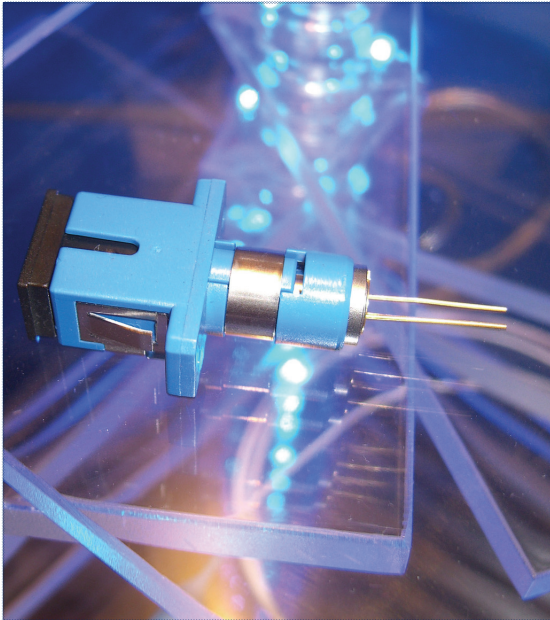


The  
**LIGHT BRIGADE**<sup>®</sup>

Your Fiber Optic Resource.

# Fiber Optic Active Devices

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## From component level to installed systems

This DVD examines the wide array of active devices that are available for fiber optic communications systems, as well as related topics such as thermal noise, loss budgets, optical sub-assemblies, component and system analysis and bit error rate testing.

Electronics play an important role in all fiber optic systems because they provide an interface between the optical fiber and transmission equipment. Many of these components contain both optical and electronic elements, and are thus called "optoelectronic". Electro-optic components fall into two broad categories: devices that convert signals between optical and electrical formats, such as transmitters and receivers; and devices that manipulate light but are powered or controlled by electronic circuits, such as optical amplifiers and modulators.

Active devices are electronic components made up of semiconductor materials that actively manipulate electrons to perform the intended function. They require a source of energy to operate and have an output that is a function of present and past input signals. Types of active devices include controlled power supplies, transistors, light sources, amplifiers, and transmitters.

## Chapter Selections

### Introduction – 9:26

This chapter introduces active components along with issues such as wavelength, attenuation, and dispersion that must be considered when working with these vital devices.

### Basic Theory – 6:54

This chapter covers atomic structure, electron flow, and the energy level transitions that produce different wavelengths of light in semiconductor materials. Learn how the PN junction generates and receives light and the role of spontaneous and stimulated emission.

### Light-emitting Diodes – 4:42

This chapter studies the various types of light-emitting diode (LED), including surface and edge-emitters, their wavelengths, and how they are used with different types of optical fiber.

### Laser Diodes – 20:25

This chapter teaches how stimulated emission is used to produce a laser beam in semiconductor materials. See the different types of diode lasers including Fabry-Perot, DFB and VCSEL. Learn the differences between LEDs and laser diodes as well as applications and key points for manufacturers, technicians and users.

### Tunable Lasers – 6:07

Wavelength tunability is desirable in communication systems and test equipment. This chapter discusses tunable lasers and the challenges of manufacturing these specialized products.

### Detectors – 10:11

The photodetector is the heart of the optical receiver. This chapter covers detector types including PIN, PIN-FET and APD, how and where they operate, and the packaging and materials used in their construction.

### Transmitters and Receivers – 8:24

This chapter describes how these components are manufactured and integrated together. Key elements for system operation include data rate, signal modulation, bandwidth, wavelength, fiber type, performance levels, source and detector selection, and integration.

### System Loss Budgets – 18:41

This chapter explains how to perform loss budgets for singlemode and multimode systems. Details include examples of sources, detectors, wavelengths and fiber types for short to long haul, point to point, FTTx, ITS, and WDM systems.

### Optical Amplifiers – 12:34

When it's necessary to amplify optical signals, users must understand the three types of optical amplifiers available. EDFAs, SOAs and Raman amplifiers are designed to operate at specific wavelengths for different applications. This chapter provides an insight on the basic fundamentals of each type.

### Design and Packaging – 13:25

This chapter focuses on design and packaging, clock and data recovery, multiplexing and demultiplexing, heat sinks and transponders. Signal control, bias, jitter, monitoring, and protocol link fault management are covered at a primer level. Packages include TOSA, ROSA, MSA, XENPACK, X2, XPAK, SFP, and XFP.

### Testing and Test Equipment – 10:32

From the component level to installed systems, active devices require test equipment to verify their performance, quality and operation. Some types of test equipment measure optical power levels and characterize components, while other types measure noise and performance levels. Learn the role of optical spectrum analyzers, wavelength and power meters, and component and system analyzers.

**Bonus Materials** – Acronym list, glossary, and quizzes in Word format, with both student and instructor versions.