

## Signal Loss in Multimode and Single-Mode Fiber-Optic Cable for the M40e Router

Multimode fiber is large enough in diameter to allow rays of light to reflect internally (bounce off the walls of the fiber). Interfaces with multimode optics typically use LEDs as light sources. LEDs are not coherent sources, however. They spray varying wavelengths of light into the multimode fiber, which reflects the light at different angles. Light rays travel in jagged lines through a multimode fiber, causing signal dispersion. When light traveling in the fiber core radiates into the fiber cladding, higher-order mode loss (HOL) results. Together these factors limit the transmission distance of multimode fiber compared to single-mode fiber.

Single-mode fiber is so small in diameter that rays of light can reflect internally through one layer only. Interfaces with single-mode optics use lasers as light sources. Lasers generate a single wavelength of light, which travels in a straight line through the single-mode fiber. Compared with multimode fiber, single-mode fiber has higher bandwidth and can carry signals for longer distances. It is consequently more expensive.

The router uses optical lasers for SONET/SDH PIC single-mode interfaces. These optics comply with IR-1 of Bellcore GR-253-CORE Issue 2, December 1995 and ANSI TI.105.06.

For information about the maximum transmission distances and wavelength ranges supported by multimode and single-mode (ATM and SONET/SDH) PIC interfaces, see the *M40e Multiservice Edge Router PIC Guide*. Exceeding the maximum transmission distances can result in significant signal loss, which causes unreliable transmission.

- Related Topics**
- Fiber-Optic and Network Cable Specifications for the M40e Router
  - Attenuation and Dispersion in Fiber-Optic Cable on M Series, MX Series, and T Series Routers
  - Calculating Power Budget for Fiber-Optic Cable for M Series, MX Series, and T Series Routers
  - Calculating Power Margin for Fiber-Optic Cable for M Series, MX Series, and T Series Routers

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