Ethernet optical modules with different wavelengths

Article Overview

Ethernet optical modules typically operate at wavelengths of 850 nm, 1310 nm, or 1550 nm, depending on the module type and fiber used.

Common Wavelengths by Module Type

o Short-Range (SR) Modules: Usually operate at 850 nm over multimode fiber (MMF), suitable for distances up to a few hundred meters .
o Long-Range (LR) Modules: Typically use 1310 nm over single-mode fiber (SMF), supporting distances up to 10 km or more .
o Extended Long-Range (ER) or Ultra Long-Range Modules: Often operate at 1550 nm, optimized for distances beyond 40 km .
o Wavelength Division Multiplexing (WDM) Modules: Use multiple distinct wavelengths within the same fiber. Coarse WDM (CWDM) modules have center wavelengths spaced 20 nm apart, while Dense WDM (DWDM) modules use much narrower spacing, often in the 1525-1565 nm range .

Example: QSFP28 Optical Modules

o QSFP28 SR4: Center wavelengths per lane are around 840-860 nm for short-range multimode fiber .
o QSFP28 LR4: Center wavelengths per lane are in the 1294-1310 nm range for single-mode fiber, supporting up to 10 km .

Technical Notes

o The wavelength is the optical carrier frequency used to transmit data as light pulses, with "on" representing a 1 and "off" representing a 0 .
o Selection of wavelength depends on fiber type, link distance, and network standard (e.g., 10GBASE-SR, 10GBASE-LR, 100GBASE-SR4, 100GBASE-LR4).
o Using the correct wavelength ensures signal integrity, minimal dispersion, and compatibility with existing fiber infrastructure . In summary, Ethernet optical modules operate primarily at 850 nm, 1310 nm, or 1550 nm, with WDM modules using multiple wavelengths within these bands to maximize fiber utilization. The exact wavelength depends on the module type, fiber type, and intended transmission distance.

Wavelength-division multiplexing (WDM) technology combines multiple wavelengths into a single optical

Ethernet optical modules with different wavelengths

Perle Protocol and Rate-transparent Media Converters provide conversion between different wavelengths, multimode and single

In practical terms, CWDM SFP modules are widely used when organizations need to increase bandwidth efficiently, control

This article continues the series on legacy optical transmission standards and legacy transceivers, moving from older formats to

Optical Multiplexing This guide gives a top level understanding of Wavelength Division Multiplexing, Coarse Wavelength Division

Fiber optic systems can transmit data across tens of kilometers without repeaters, while copper connections are

Authoritative SFP wavelength guide: compare 850nm, 1310nm, 1550nm applications, link-budget implications,

What Is an Optical Module and Its FAQs (V200) Describes what an optical module is and FAQs, including the fundamentals,

Wavelength Division Multiplexing (WDM) is a technique in fiber optics that enables simultaneous transmission of

Understand what wavelengths are, their key role in fiber optics, common optical bands like O-Band and C-Band, and

Explore the ultimate guide to optical modules. Learn types, functions, performance metrics & how to choose the right

Optical networks utilize specific wavelengths of light to transmit data efficiently over fiber-optic cables. The

Explore the full spectrum of optical wavelength bands (O, E, S, C, L, U) used in fiber optic communication. Learn how

Introduction Optical modules are critical components in fiber optic communications, enabling the conversion between

Wavelength division multiplexing is a kind of frequency division multiplexing -- a technique where optical signals with different

Ethernet optical modules with different wavelengths

In optical networking, Coarse Wavelength Division Multiplexing (CWDM) and Dense Wavelength Division Multiplexing (DWDM) are

Web: https://www.morwarreconst.co.za