# How to label the transmission distance of an optical module



## Overview

Understand SR/LR optical designations, transmission distances, compatibility, and installation best practices for efficient network performance.

## Key Takeaways

Optical module transmission distance is labeled using standard designations like SR, LR, ER, and ZR, based on fiber type, wavelength, and maximum effective range.

### Understanding Transmission Distance

The transmission distance of an optical module depends on several factors: Fiber Type: Multi-mode fibers (MMF) are used for short distances, typically under 500 meters, while single-mode fibers (SMF) support medium to long distances, often several kilometers. Wavelength: Common wavelengths include 850nm for short-range MMF, 1310nm for medium-range SMF, and 1550nm for long-range SMF. Optical Power and Sensitivity: The transmitted optical power and the receiver's sensitivity determine how far the signal can travel before attenuation makes it unreliable.

Fiber Attenuation: Loss per kilometer varies with fiber type and wavelength (e.g., 0. 35 dB/km at 1310nm, 0. 22 dB/km at 1550nm for G.

652 SMF),. The limit transmission distance can be calculated using the formula: Distance = (Transmitting Power − Receiving Sensitivity) / Fiber Attenuation. Real-world distances are usually shorter due to additional losses from splicing, connectors, and bending.

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## Standard Labeling Conventions

Optical modules are labeled with distance codes that indicate their typical maximum reach: SR (Short Range): Up to 300–500 meters on MMF.

D

R (Datacenter Reach): Up to 500 meters on parallel SMF.

F

R (Fiber Reach): Around 2 km on CWDM SMF.

L

R (Long Reach): Up to 10 km on SMF.

E

R (Extended Reach): Up to 40 km on SMF.

Z

R (Ze Best Range): Up to 80 km on SMF. The number following the letter often indicates the number of parallel fibers or WDM channels (e.g., 100GBASE-SR10 uses 10 optical channels),.

## Practical Labeling Tips

Check the module's wavelength and fiber compatibility: Ensure SR modules are used with MMF and LR/ER/ZR modules with SMF. Consider real-world conditions: Account for connector loss, splicing, and bending, which reduce effective distance compared to theoretical limits. Use standard codes in documentation: Label modules with SR, LR, ER, or ZR along with the supported distance in meters or kilometers for clarity.

Include data rate if relevant: While distance is primarily optical, noting the module's data rate (e.g., 1G, 10G, 100G) helps in network planning. By combining technical calculation with industry-standard labeling, you can accurately specify the transmission distance of an optical module for design, deployment, and maintenance purposes.

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## Article Content

Understanding SR/LR Optical Designations and Distances

Understand SR/LR optical designations, transmission distances, compatibility, and installation best practices for efficient network performance.

How to Estimate an Optical Module''s Transmission Distance | FiberMall

Short-distance transmission usually refers to distances below 2km, medium distances range from 10-20km, and distances greater than or equal to 30km are considered long-distance

Optical Module Pull Tab Colors: The Ultimate Guide to SFP, QSFP,

Description: Decode optical module pull tab colors for SFP, QSFP+, BIDI, and CWDM modules. Learn how color identifies fiber type, wavelength, and transmission distance to simplify data

SFP Distance Explained: Real-World Range, Limits, and Optics

Understand SFP distance, fiber optic range, and real-world limits of SR/LR modules. Learn how wavelength, fiber type, and optics affect performance.

Transmission Distance of an Ethernet Module

Common distances are as follows: K stands for backplane. The module is used for signal transmission with the backplane. C stands for copper. The module is used for high-speed cable (copper cable)

What Information Is Provided on the Label Attached on an Optical

Generally, a distance of less than 2 km is considered a short transmission distance, a distance of 10 km to 20 km is considered a medium transmission distance, and a distance beyond 20 km is considered

Meaning of SR, LR, LRM, ER, and ZR in Transceiver Modules

When you are looking at these terms SR, LRM, LR, ER, ZR used in fiber optic communications that stand for the transmission distance of these modules. Here we have considered

How to Identify Optical Transceiver Wavelengths by Pull-Tab Color:

One of the most effective and widely used methods is through the pull-tab color on transceiver modules. This simple visual system helps technicians quickly determine the module''s

Relationship Between Link Budget And Transmission Distance In

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In practice, additional losses occur during transmission, such as bending loss and connector loss. Therefore, the actual transmission distance of the optical module will be shorter than

(LR2V) 6X 10G SFP+ Module 10GbE Copper SFP Modules Optical

6X 10G SFP+ Module 10GbE Copper SFP Modules Optical Port Turn to RJ45 Ethernet Port Gigabit 1000M Transceiver Module10G Transmission Distance: 30 MetersAttention: 10G SFP+ module

How to Estimate an Optical Module''s Transmission Distance | FiberMall

Optical modules distinct from one another in their transmission distance, a feature that should be taken into account in addition to other specifications like data rate when selecting fiber

Exploring the Correlation Between Optical Module Wavelength and ...

This article delves into the correlation between optical module wavelength and transmission distance, shedding light on the complexities that impact the efficiency of data transmission.

Basic Knowledge Of Optical Module Transmission Distance

Generally, short-range modules can reach up to 2 km, medium-range modules range from 10 km to 20 km, and long-range modules can exceed 20 km. Q: How do I choose the right optical module? A:

Explanation of Optical Module Parameters

When we receive an optical module, we can observe some basic parameters of the optical module from the label, such as the encapsulation form, rate, wavelength, and transmission

Optical module transmission distance and related classification

However, the transmission distance of the optical module is not as far as possible, and appropriate solutions should be adopted in due course. The long-distance applications are mainly in

Wavelength and Transmission Distance of Optical Transceiver Modules

The price of the optical sources and signal converters that are paired with 850nm optical transceiver modules is far lower than the prices of 1310nm and 1550nm devices, making it a very economical

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What are the factors that affect the transmission distance of optical ...

The quality of the optical module''s conversion of optical and electrical signals depends greatly on its internal light source. Typically, a higher light source can provide a greater transmission

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