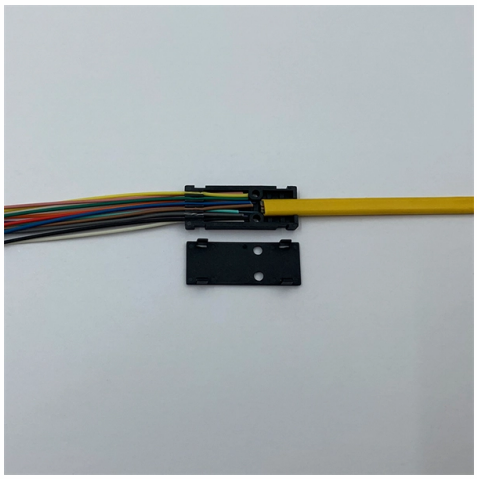
How to select optical modules for fiber optic network cards



Overview

A media converter does not solve incompatibilities between optical modules or mismatched fiber infrastructures.

Key Takeaways

Choosing the right optical module requires matching your network's speed, distance, fiber type, and hardware compatibility to ensure reliable and efficient connectivity.Key Factors to Consider

1. Network Requirements Determine the bandwidth and data rate your network needs. Optical modules support speeds from 1 Gbps to 400 Gbps and beyond. Consider both current and future requirements to avoid over- or under-provisioning . 2. Distance and Reach Optical modules are designed for specific transmission distances:

• Short Reach (SR): 850 nm wavelength, multimode fiber (OM3/OM4), typically 300–400 meters, ideal for intra-building or data center links .

• Long Reach (LR): 1310 nm wavelength, single-mode fiber, up to ~10 km, suitable for campus or metropolitan networks .

• Extended Reach (ER): 1550 nm wavelength, single-mode fiber, distances beyond 40 km, for long-haul or inter-building connections . 3. Fiber Type Compatibility

• Multimode fiber (MMF): Larger core, supports SR modules, shorter distances, cost-effective for data centers .

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• Single-mode fiber (SMF): Smaller core, supports LR and ER modules, longer distances, suitable for campus or regional networks . 4. Form Factor Choose a module that fits your NIC or switch:

• SFP / SFP+ / SFP28: Common for 1–25 Gbps

• QSFP / QSFP28 / QSFP-DD: 40–400 Gbps Ensure the NIC or switch supports the selected form factor . 5. Hardware Compatibility Check the vendor compatibility list for your NIC, switch, or router. Incompatible modules may result in ports remaining down or error messages, even if physically compatible . 6. Environmental and Budget Considerations Consider operating conditions (temperature, airflow) and cost. Direct attach cables (DACs) are cheaper and low-latency for short distances, while active optical cables (AOCs) offer flexibility for medium distances . 7. Standards and Certifications Ensure modules comply with MSA (Multi-Source Agreement) standards and IEEE Ethernet specifications to guarantee interoperability .
Practical Selection Steps
• Identify required speed and future growth.

• Determine link distance and select SR, LR, or ER accordingly.

• Match fiber type (single-mode or multimode) with module specifications.

• Verify NIC or switch compatibility with the module's form factor and vendor support.

• Consider environmental factors and budget constraints.

• Purchase modules from reputable vendors to ensure reliability and warranty support. By following these steps, you can select optical modules that optimize performance, minimize errors, and ensure long-term network scalability .

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