

## Complete Guide to 40G Optical Modules



### Overview

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### Key Takeaways

A 40G optical module, such as a QSFP+, is a hot-swappable transceiver that aggregates four 10G channels into a single 40G link, requiring proper installation, cabling, and polarity management for effective network operation. Understanding 40G Optical Modules

40G QSFP+ modules are high-density, hot-pluggable transceivers that combine four independent 10Gbps channels into a single 40Gbps link, supporting standards like Ethernet, Fibre Channel, and InfiniBand . They come in short-range (SR4) and long-range (LR4/ER4) variants, optimized for multimode or single-mode fiber, with LR4 capable of transmitting up to 10 km over single-mode fiber using Wavelength Division Multiplexing (WDM) . Modules can connect directly to another 40G QSFP+ or break out into four 10G SFP+ links .

#### Installation Steps

- **Hot-Swap the Module:** Insert the QSFP+ module into the switch or router port. Ensure the module is aligned with the port and fully seated; it is hot-swappable, so the device does not need to be powered down .
- **Check Compatibility:** Verify the module type matches your network requirements (SR4 for short distances, LR4 for long distances) and that the fiber type (single-mode or multimode) is compatible .

- **Connect Fiber Cables:** Use MPO patch cords for parallel transmission modules like 40G-SR4. Ensure correct polarity using Type A, B, or C MPO cords depending on your network configuration . For LR4 modules, duplex LC connectors are used, and only PC or UPC flat-polished cables are supported; APC angled cables are not compatible .

#### MPO Cabling and Polarity Management

- **Type A (Key up–Key down):** Straight-through fiber bundle; fibers maintain the same positions at both ends.

- **Type B (Key up–Key up):** Full-cross fiber bundle; fibers are reversed at both ends.

- **Type C (Key up–Key down):** Pair-wise cross; adjacent fiber pairs are reversed at the far end . Correct polarity ensures that transmit channels on one module align with receive channels on the other. Two common connection methods exist: one using a combination of Type A and Type B cords with adapters, and another using only Type B cords and adapters for simpler polarity management .

#### Practical Tips

- **Breakout Option:** Some QSFP+ modules allow breakout into four 10G SFP+ ports for flexible deployment .
- **Check End-Face Type:** Ensure MPO or LC connectors match the module's end-face type (UPC or PC) to avoid signal loss .
- **Data Center Deployment:** 40G modules are widely used in spine-and-leaf architectures for high-speed uplinks, providing higher port density and lower power per bit than four separate 10G modules . By following these steps—selecting the correct module, ensuring proper cabling and polarity, and installing the module correctly—you can effectively deploy a 40G optical module in your network infrastructure.

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