What is the working principle of fiber optic patch cord processing



Overview

Fiber Optical Patch Cord itself does not generate signals; its core function is to transmit light signals with low loss.

Key Takeaways

Fiber optic patch cords transmit light signals through total internal reflection, and their processing involves precise cutting, connectorization, polishing, and testing to ensure low-loss, high-quality optical connections.

Optical Transmission Principle

Fiber optic patch cords function as passive devices that transmit light signals without generating them. The core of the fiber has a higher refractive index than the surrounding cladding, allowing light to propagate through the core via total internal reflection. Electrical signals from a transmitter (like a laser diode) are converted into light pulses, which travel through the fiber core and are received by a photodetector at the other end, converting them back into electrical signals.

This process ensures high-speed, low-loss data transmission over short to medium distances, with performance measured by insertion loss and return loss (smaller insertion loss and higher return loss indicate better performance).



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Fiber Optic Patch Cord Processing Steps

Fiber Preparation: The fiber cable is cut to the required length, and the outer jacket and buffer coating are stripped to expose the bare fiber. The fiber is then cleaned with alcohol to remove dust and residues. Connector Assembly: Epoxy is injected into the connector ferrule, and the cleaned fiber is inserted.

The assembly is cured in an oven to secure the fiber within the ferrule. Connector housings and strain relief boots are then attached. Polishing: The ferrule end-face is polished using automated machines to achieve a smooth, flat surface, which minimizes signal reflection and insertion loss.

Ultrasonic cleaning ensures the end-face is free of contaminants. Inspection: The polished end-face is examined under a microscope (typically 400x magnification) to detect scratches, chips, or contamination that could degrade performance. Testing: Each patch cord undergoes insertion loss (IL) and return loss (RL) testing using calibrated equipment to ensure it meets performance standards.

MPO/MTP patch cords may require additional multi-fiber alignment and testing. Performance ConsiderationsHigh-quality patch cords are designed to maintain low insertion loss (≤0. 3 dB) and high return loss (≥55 dB for UPC, ≥60 dB for APC), ensuring reliable signal transmission.

They are also tested for durability, withstanding multiple plug/unplug cycles without performance degradation.

Summary

The working principle of fiber optic patch cord processing combines optical physics (total internal reflection for signal transmission) with precision manufacturing techniques (cutting, connectorization, polishing, inspection, and testing) to produce reliable, low-loss connections essential for modern high-speed communication networks.

Article Content

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Fiber Optical Patch Cord itself does not generate signals; its core function is to transmit light signals with low loss. The working process is based on the principle of total internal reflection of

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