# How to measure a six-core multimode optical fiber

## Overview

AEN 135, Revision 4 This Applications Engineering Note (AEN 135) explains and recommends standard measurement methods for characterizing optical fiber system performance.

## Key Takeaways

Measuring a six-core multimode optical fiber involves assessing each core's optical loss, modal distribution, and core diameter using standardized test methods and appropriate light sources. 1.

### Preparation and Equipment

To measure a multimode fiber accurately, you need: Light sources: LEDs or VCSELs at 850 nm or 1300 nm, depending on fiber type (OM1–OM5)Power meter: To measure output power from each fiber corePatch cords: Matching the multimode fiber type for consistent couplingMode-conditioning devices: Loops or mode scramblers to achieve equilibrium modal distribution (EMD) for reproducible results Ensure the fiber ends are clean and connectors are properly polished to avoid measurement errors. 2.

### Measuring Insertion Loss

Insertion loss quantifies the optical power loss through the fiber: Connect the light source to one end of the fiber core. Connect the other end to a calibrated power meter. Record the output power for each core individually.

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Use a Coupled Power Ratio (CPR) method to compare multimode fiber performance against a reference single-mode fiber, which helps account for modal spreading and source differences. Repeat for all six cores to obtain individual loss values. 3.

### Modal Distribution Considerations

Multimode fibers support multiple propagation modes, and higher-order modes experience more attenuation. To ensure reproducibility: Use mode scramblers or loops to achieve equilibrium modal distribution (EMD)Keep patch cords straight and avoid tight bends, which can alter modal power distribution This ensures that measurements reflect the fiber's true performance rather than variations caused by modal effects. 4.

### Core Diameter Measurement

The physical core diameter can be measured using: Near-field scanning: Imaging the fiber endface and analyzing the intensity profileSpeckle correlation method: Illuminating the fiber with coherent light and analyzing the speckle pattern to determine the minimum speckle size, which correlates with core diameter For six-core fibers, repeat the measurement for each core to verify uniformity. 5.

### Additional Tips

Test each core separately to account for variations in loss and modal behavior. Use consistent light sources for design, fabrication, and testing to avoid discrepancies in measured loss. Document all measurements, including wavelength, source type, and environmental conditions, for reproducibility.

By following these steps, you can accurately characterize a six-core multimode optical fiber in terms of insertion loss, modal distribution, and core diameter, ensuring reliable performance for network or instrumentation applications.

## Article Content

Fiber Optic System Testing Tutorial

AEN 135, Revision 4 This Applications Engineering Note (AEN 135) explains and recommends standard measurement methods for characterizing optical fiber system performance.

The FOA Reference For Fiber Optics

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How To Measure The Insertion Loss of A Multimode Fiber Optical

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