
APPLICATION NOTE: FIBER OPTIC CONNECTORS

This application note provides an introduction to the most widely used connectors in single-mode fiber optical systems.

DEFINITION OF TERMS

Return Loss (RL):

In an optical fiber, the loss that takes place at any discontinuity of refractive index, especially at an air-glass interface such as a fiber end face, at which a fraction of the optical signal is reflected back toward the source.

Insertion Loss (IL):

In an optical fiber system, the total optical power loss caused by insertion of an optical component, such as a connector, splice, or coupler

WIDELY USED CONNECTORS

FC Connector



- The FC connector is the most widely used fiber optic connector in the telecommunications industry.
- The FC connector is a fiber optic connector with a threaded body which was designed for use in high-vibration environments.
- Its threaded coupling design accommodates a reliable and durable connection to optical networks, especially suitable for advanced fiber optic systems requiring exceptional stability and low reflections.

SC Connector



- The SC connector is another popular 2.5 mm ferrule connector.
- The SC connector is a fiber optic connector with a push-pull latching mechanism which provides quick insertion and removal while also ensuring a positive connection.



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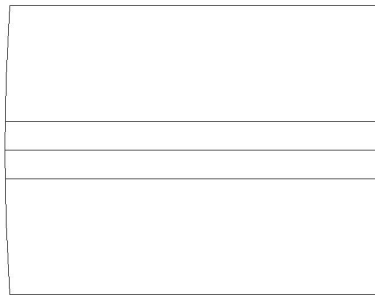
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- The SC connector was developed by NTT and is now used in distribution, datacom and telecom applications.
 - Thanks to its push-pull mechanism, SC connector does not require as much assembly space around it in the module fiber panel as the threaded FC connector.

END-FACE POLISH

- The combination of a connector and ferrule end-face polish is written in the form connector/polish, e.g. FC/APC.
- PC and APC ferrules should be mixed in the system as a combination of the two will result in an air gap in the connector interface due to the angle in APC. This leads to significant insertion loss.

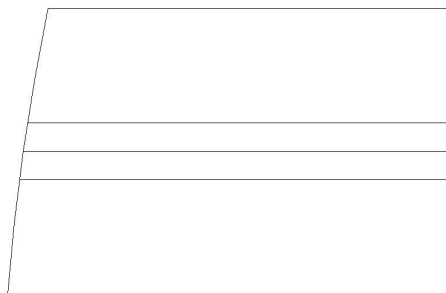
Physical Contact (PC)

In the PC ferrule the end faces are polished to be slightly curvy or spherical. The back reflection is about -40 dB. This type of ferrule is used in most applications.



Angled Physical Contact (APC)

The end faces are rounded as in PC ferrules but also angled an industry-standard 8°. This reduces back reflection to about -70 dB. This type of ferrule is preferred in CATV and analog systems.



CARE AND HANDLING

- Unprotected connector ends can experience damage by impact, airborne dust particles, or excess humidity or moisture.
- It is important to cover a fiber optic connector when it is not in use.



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- Fiber end face and ferrule must be absolutely clean before connector is inserted into a transmitter or receiver. Fiber optic connectors need to be cleaned every time they are mated and unmated.
 - One should never clean an optical connector attached to a fiber that is carrying light. Even rather low optical power levels may cause an explosive ignition of the cleaning material when it contacts the end of the optical connector.
 - For connector end-face cleaning, use dedicated commercial fiber optic cleaning cartridge or cleaning card, strictly following manufacturer's instructions. Alternatively use lens-grade, lint-free non-synthetic wipe or swab, preferably cleanroom grade. You can check the cleaning result using an optical microscope. If dry clean does not help, use wet clean with wipe saturated with industrial grade 99% pure isopropyl alcohol, and dry air.
 - Always maintain the minimum bending radius of the fiber.



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