Transmission Media

By

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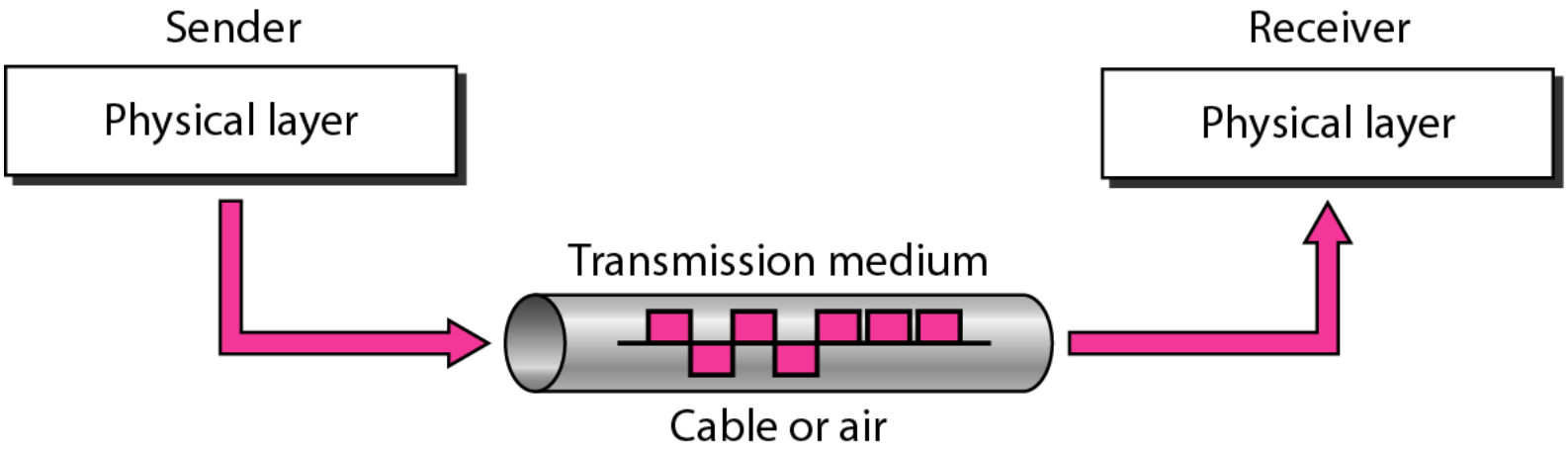
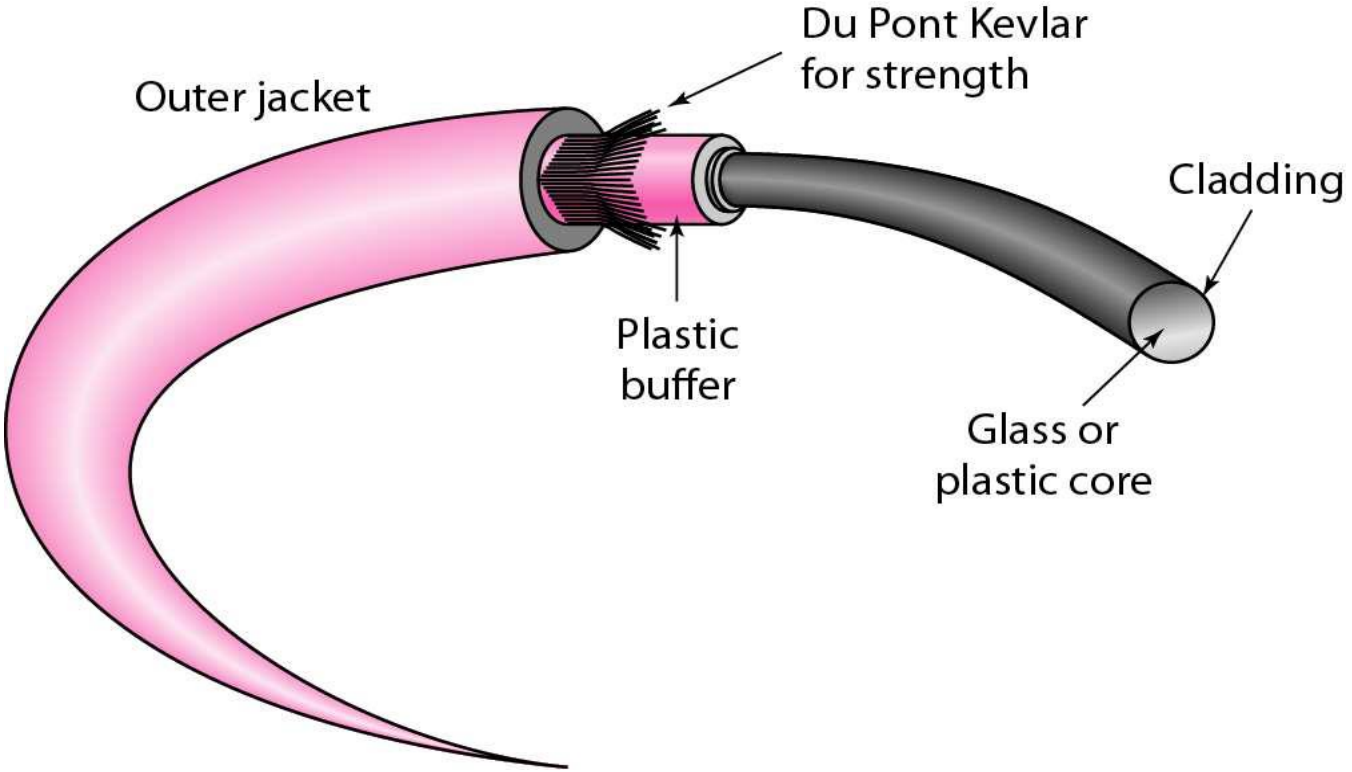
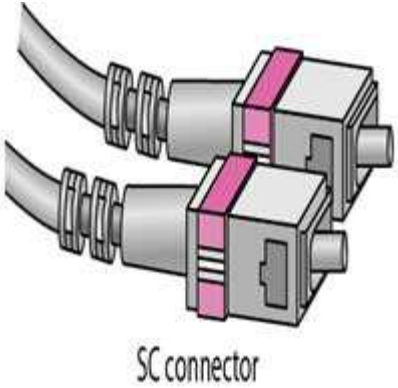
What is a Transmission Media ?



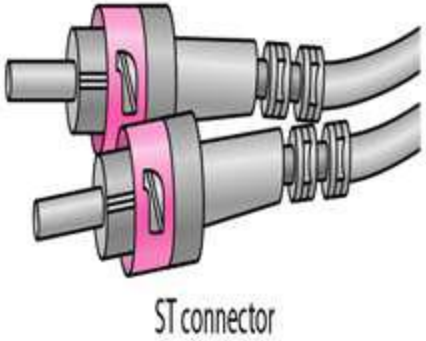
Fiber Optic Cables



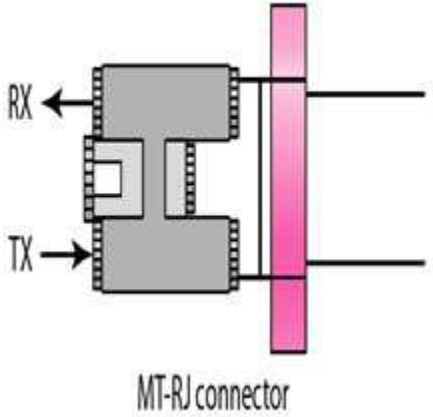
Fiber Optic Cables Connectors



Subscriber Channel (SC) Connecter

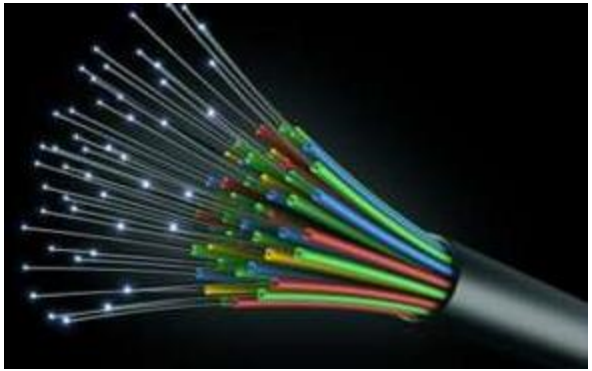


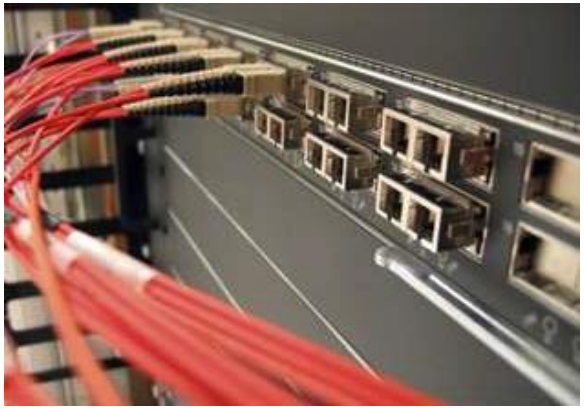
Straight-Tip (ST) Connecter



Same szie as RJ45 connector

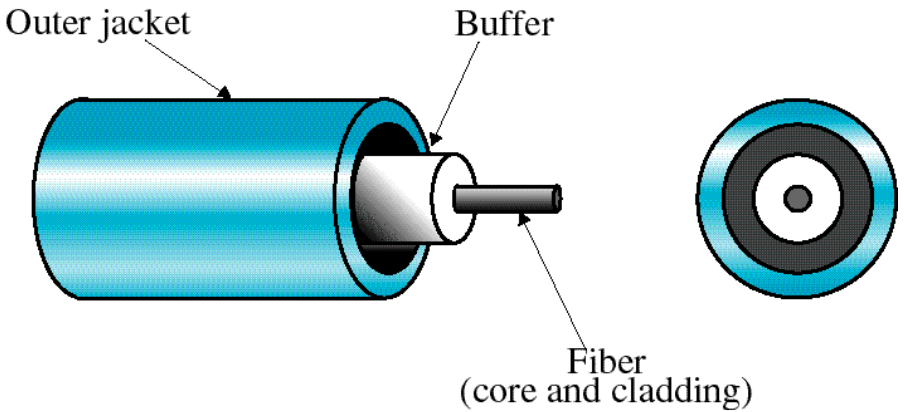
Fiber Optic Cables





Fiber Optic Cables

- ✓ An optical fiber cable has a cylindrical shape
- ✓ It consists of three concentric sections
- ✓ The core
- ✓ The cladding
- ✓ The jacket(outer part)



Fiber Optic Cables

Nature of light

- ✓ Light travels in a straight line
- ✓ If light goes from one substance to another then the ray of light changes Direction
- ✓ Ray of light changes direction when goes from more dense to a less dense Substance

Fiber Optic Cables

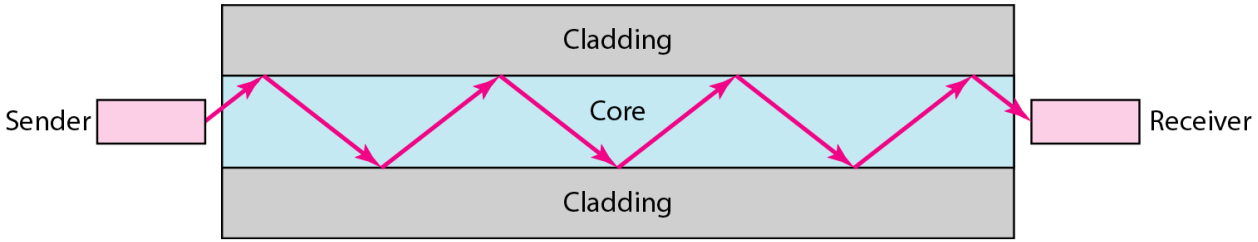
- ✓ Fiber optic cable is used for long distance network connection
- ✓ Through this cable data transmission is done through «Light ray signal transmission» rather than electrical signal transmission
- ✓ It has inner core is made up of glass or plastic like material that conducts light. This inner core is surrounded by cladding
- ✓ Cladding is nothing but layer of glass material that reflects light back into the core
- ✓ Each fiber is then surrounded by plastic sheath

Fiber Optic Cables

- ✓ Uses total internal reflection to transmit light
  effectively acts as wave guide for 1014 to 1015 Hz

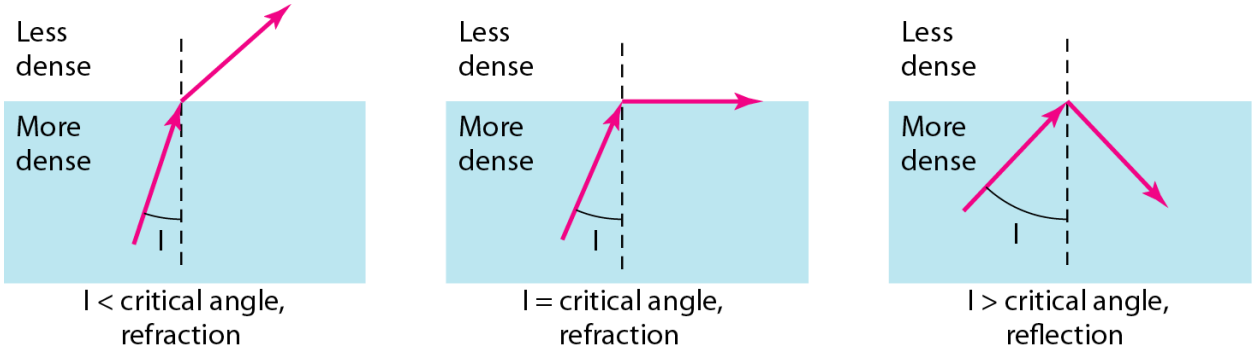
- ✓ Uses several different light sources
  - ✓ Light Emitting Diode (LED)
    - ✓ Cheaper, wider operating temp range, lasts longer
  - ✓ Injection Laser Diode (ILD)
    - ✓ More efficient, has greater data rate

Fiber Optic Cables



- ✓ Light is Passed from the Source
- ✓ Light is Reflected within the channel and passed to Receiver end
- ✓ Core is of glass or plastic surrounded by Cladding
- ✓ Cladding is of less dense glass or plastic

Fiber Optic Cables



- ✓ Angle of Incidence (I): The angle the ray makes with the line perpendicular to the interface between the two substances

- ✓ Critical Angle: The angle of incidence which provides an angle of refraction of 90-degrees

Fiber Optic Cables - Applications

- ✓ Telecommunications
- ✓ Local Area Networks
- ✓ Cable TV
- ✓ CCTV
- ✓ Medical Education

Fiber Optic Cables - Advantages

- ✓ Greater capacity

  Example: Data rates at 100 Gbps

- ✓ Smaller size & light weight

- ✓ Lower attenuation

Fiber Optic Cables - Advantages

- ✓ Electromagnetic isolation
- ✓ More resistance to corrosive materials
- ✓ Greater repeater spacing facility

  Example: After every 10s of km at least

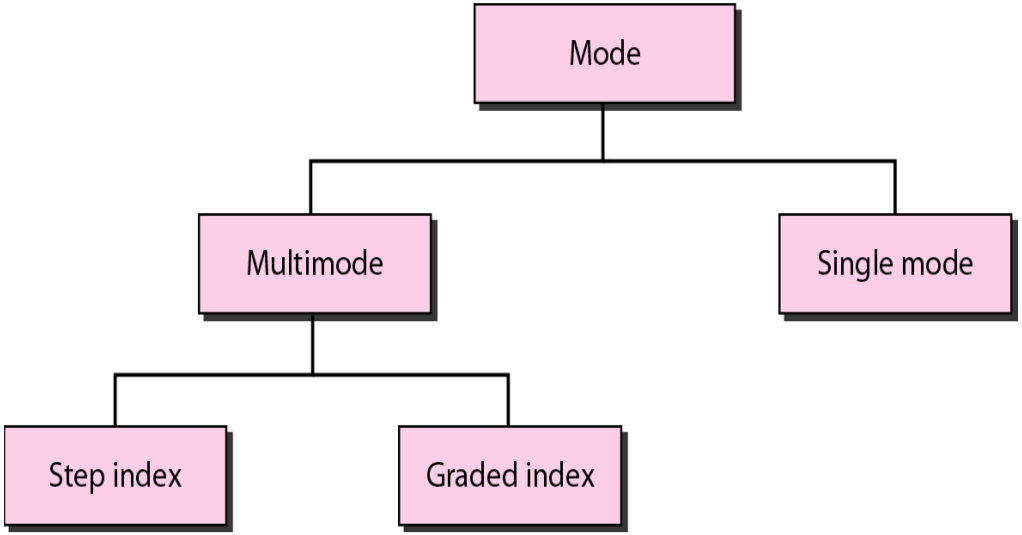
Fiber Optic Cables - Disadvantages

- ✓Installation and maintenance need expertise
- ✓Only Unidirectional light propagation
- ✓Much more expensive

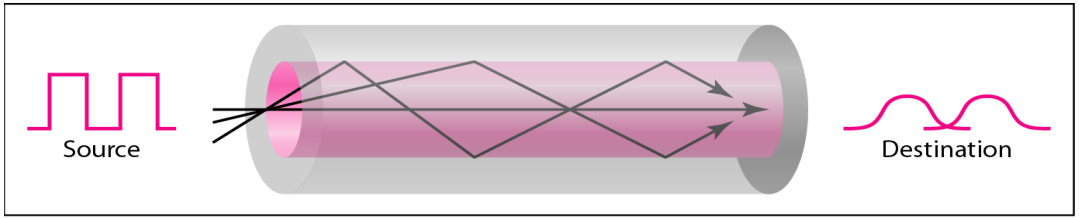
Fiber Optic Cables – Propagation Modes

When signal goes from one point to another there are need for propagation modes

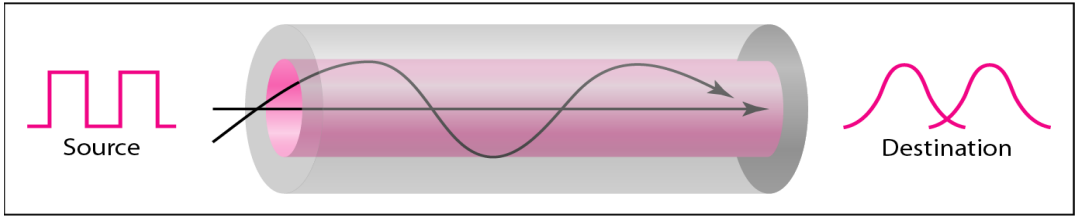
Fiber Optic Cables - Categories



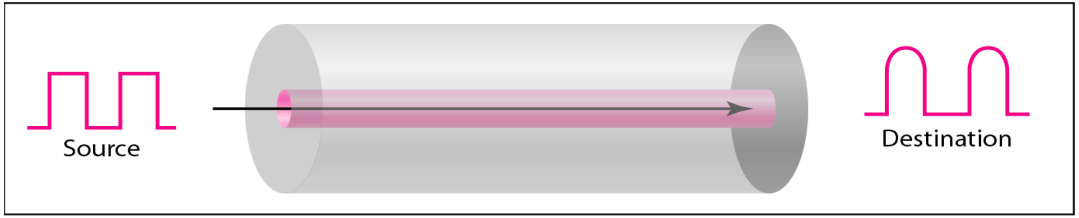
Fiber Optic Cables - Categories



a. Multimode, step index



b. Multimode, graded index



c. Single mode

Fiber Optic Cables - Categories

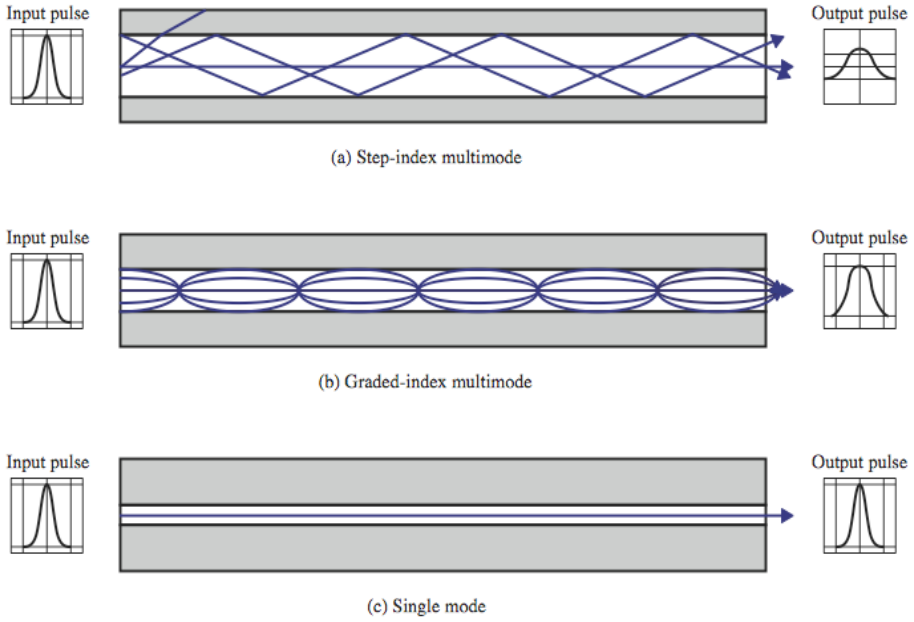


Figure 4.4 Optical Fiber Transmission Modes

Fiber Optic Cables - Applications

Wavelength (in vacuum) range (nm)	Frequency Range (THz)	Band Label	Fiber Type	Application
820 to 900	366 to 333		Multimode	LAN
1280 to 1350	234 to 222	S	Single mode	Various
1528 to 1561	196 to 192	C	Single mode	WDM
1561 to 1620	192 to 185	L	Single mode	WDM

Comparisons of Physical Media

Table 8-1 Comparison of physical media

Media	Throughput Potential	Cost of Installation and Maintenance	Security	Scalability	Noise Immunity
Coaxial cable	Up to 10 Mbps	More expensive than twisted-pair cable, but less expensive than fiber	Fair security	In most cases, can extend longer than twisted-pair, but not as long as fiber optic cable before requiring repeaters (depending on transmission method used)	More noise-resistant than twisted-pair, but less noise-resistant than fiber
Shielded twisted-pair (STP)	Up to 1 Gbps, though typically used for up to 100 Mbps	Less expensive than coaxial cable or fiber, but more expensive than UTP	Fair security (not as good as coaxial cable, but better than twisted-pair)	Can extend farther than unshielded twisted-pair networks, but not as far as fiber optic networks	More noise-resistant than UTP, but less noise-resistant than coaxial cable or fiber

Comparisons of Physical Media

Table 8-1 Comparison of physical media (Continued)

Media	Throughput Potential	Cost of Installation and Maintenance	Security	Scalability	Noise Immunity
Unshielded twisted-pair (UTP)	Depending on the Category rating, from 128 Kbps to 1 Gbps, though typically used for up to 100 Mbps	The least expensive network medium	The poorest security of all wireline media	Can extend the shortest distance of all media before requiring a repeater; however, due to network design, adding nodes is usually simple	The least noise-resistant medium
Single-mode fiber optic cable	The highest throughput potential of all media; can handle fastest network speed available, 1 Gbps, and more	The highest cost of all network media	Excellent security	Can extend the longest of all media before requiring repeaters; can accommodate more nodes than coaxial or twisted-pair cable	Unaffected by noise
Multimode fiber optic cable	High throughput potential, but not as high as single-mode fiber; can handle fastest network speed available, 1 Gbps, and more	High cost media, second only to single-mode fiber	Excellent security	Can extend longer than twisted-pair or coaxial cable, but not as long as single-mode fiber before requiring repeaters; can accommodate more nodes than coaxial or twisted-pair cable	Unaffected by noise

References

- ✓ Book: Data communication and Networking
  Fourth edition
  By : BEHROUZ A FOROUZAN

- ✓ various relevant websites

Thank you