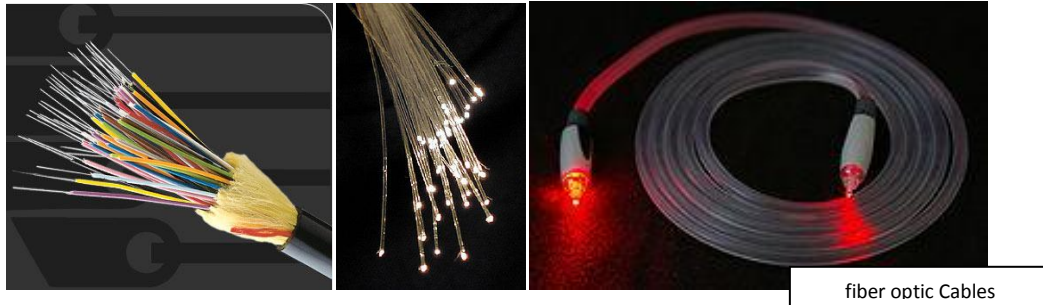


Experiment 1:

Background on Fiber Optics

Definition of Fiber Optics :

Fiber optics is a new technology that offers ¹greater data rates ²over longer distances at ³lower costs than copper wire systems. It is the branch of optical technology concerned with the transmission of radiant power through fibers.



Two types of optical sources : LEDs and laser diodes.

Fiber Optic Data Links:

Fiber Optic data links have *three basic functions* :

1. Converting an electrical signal to an optical signal
2. To send the optical signal over an optical fiber
3. To convert the optical signal back to an electrical signal.

Fiber optic Data link **consists of three parts** :

1. **Transmitter** : Needed to convert electrical input signal to an optical signal and launch the data-containing light down the optical fiber.
2. **Optical Fiber Cable**
3. **Receiver**: Is required to transform this optical signal back into its original form. Consists of 2 parts: 1. *Optical Detector* (detects optical signal). 2. *Signal conditioning circuit* (conditions output signal so it matches original input signal), it should amplify and process the signal without signal distortion (caused by noise).

i.e. This means **Output electrical signal \equiv input electrical signal.**

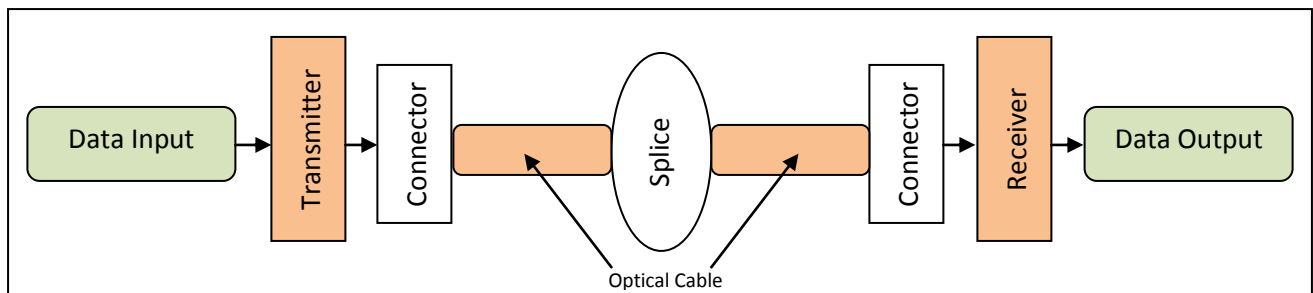


Fig 1-1 Parts of a fiber optic Cable data link

Noise is Any disturbance that obscures or reduces the quality of the signal (can cause the distortion if receivers electrical output signal).

Optical signals in fiber optic cables are *weakened* because of **scattering**, **absorption** and **dispersion** mechanisms.

Absorption - Loss of power in a fiber optic cable resulting from conversion of optical power into heat. This is principally caused by impurities, such as transition metals and hydroxyl ions. It is also caused by exposure to nuclear radiation.

Dispersion - A general term for those phenomena that cause a broadening or spreading of light as it propagates down a fiber optic cable. This is the major cause of bandwidth limitations with fiber optic cable

Scattering - A property of glass which causes light to deflect from the fiber optic cable and contributes to losses.

Advantages of fiber Optics:

- Greatly increased bandwidth and capacity.
- Lower signal attenuation (loss)
- Immunity to Electrical Noise & Radio Interference.
- No Crosstalk
- Lower Bit Error rates
- Signal Security
- No Common ground required
- Reduced cable size and weight
- Environmental protection
- Resistance to changes in temperature
- Overall System Economy
- Low per-channel cost

Disadvantages:

Components are expensive, and transmitters and receivers are relatively expensive compared to electrical interfaces.

Sources:

- http://en.wikipedia.org/wiki/Fiber_optic#Optical_fiber_cables
- Fiber Optic Cabling TR 230 Notes - First Edition September 2007
- <http://www.telebyteusa.com/foprimer/fofull.htm>