UNIT – II LASER AND FIBER OPTICS

TOPIC – VIII: Fibre Optical Communication system

An optical fiber communication system uses light as a carrier. It is used to transfer a message from a source to a distant recipient.

Principle

The basic principle of optic fiber communication is the transmission of information over the required distance by the propagation of optical signal through optical fibers. It involves deriving an optical signal from electrical signal at the transmitting end and converting the optical signal back to electrical signal at the receiving end.

Description

A basic block diagram of a fiber optic communication system is shown in Fig 14. The main parts of a fiber optic communication system are

1. *Information signal source*
2. *Transmitter*
3. *Light source*
4. *Propagation medium*
5. *Photo detector*
6. *Receiver*

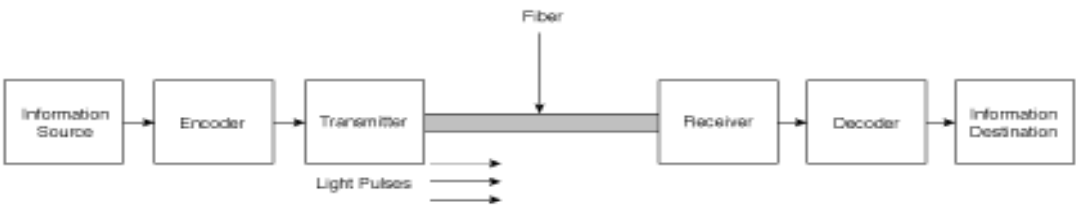

Fig 14 Block diagram of Fiber optic communication system

1. Information signal source

The information signal source may be voice, music, digital data or analog voltage and

video signals. Here it is an analog information

2. Transmitter

The transmitter includes a modulator, switches and drive circuits. It transforms an electrical signal (information signal) to be transmitted into an optical signal.

3. Light source

The optical light source generates optical energy that serves as the information carrier. Laser or LED may be used for light sources.

4. Propagation medium

The optical fiber is used as a propagation medium.

5. Photo detector

It detects optical energy and converts it into an electrical signal.

6. Receiver

It consists of a photo detector, an amplifier and a signal - restoring circuit. Its converts an optical signal back into an electrical signal.

Working

An analog information such as the voice of a telephone user produces electrical signals in analog form. This analog signal is converted in digital signal which is in the form of electrical pulses. These electrical pulses are transformed into an optical signal with the help of optical transmitter.

The electrical signal is modulated and carried by the light emitted by an optical source (such as an LED or laser diode). Now, this optical signal is fed into the fiber.

At the receiving end, the optical signal traveling through the fiber is fed into a photo detector. The photo detector detects the optical signal and converts it into pulses of electric current. This digital signal is once again converted into analog signal. This analog signal contains the same information, voice as transferred from the transmitting end.

Advantages of Fiber Optic Communication

(i) Extremely high bandwidth : In an optical fiber system, a greater volume of information can be carried out. The rate of transmission of information is directly proportional to signal frequency. The light has higher frequencies than radio wave or micro wave frequencies.

(ii) Ease of handling : Due to small diametre and light weight, optical fibers may be used more easily than copper cables.

(iii) Less cross talk: In optical fibers, cross talk is negligible.

(iv) Noise - free transmission: Optical fiber communication is noise free.

(v) Economical: Optical fiber communication is economical. It delivers signals at low cost.

(vi) Safety: Optical fibers conduct light signals that are harmless. On the other hand, copper cables conduct electricity, which sometimes becomes dangerous.

(vii) Longer life span: Optical fibers have a life span of 20 - 30 years while copper cables have a lige span of 12 - 15 years.

(viii) Ease of maintenance: Optical fibers are more reliable and can be maintained easily than copper cables