

Experiment No. 5

Aim: To measure bending loss in optical fiber.

Objectives: i) To observe transmission and reception of signals through bend fiber of different loop diameters.

ii) To Plot a graph of the received signal amplitude through bend fiber v/s loop diameter.

Equipments/Components: kit1, kit2, 1MHz Function Generator, 20 MHz Dual Trace Oscilloscope, Fiber Cable, etc.

Circuit/Block Diagram:

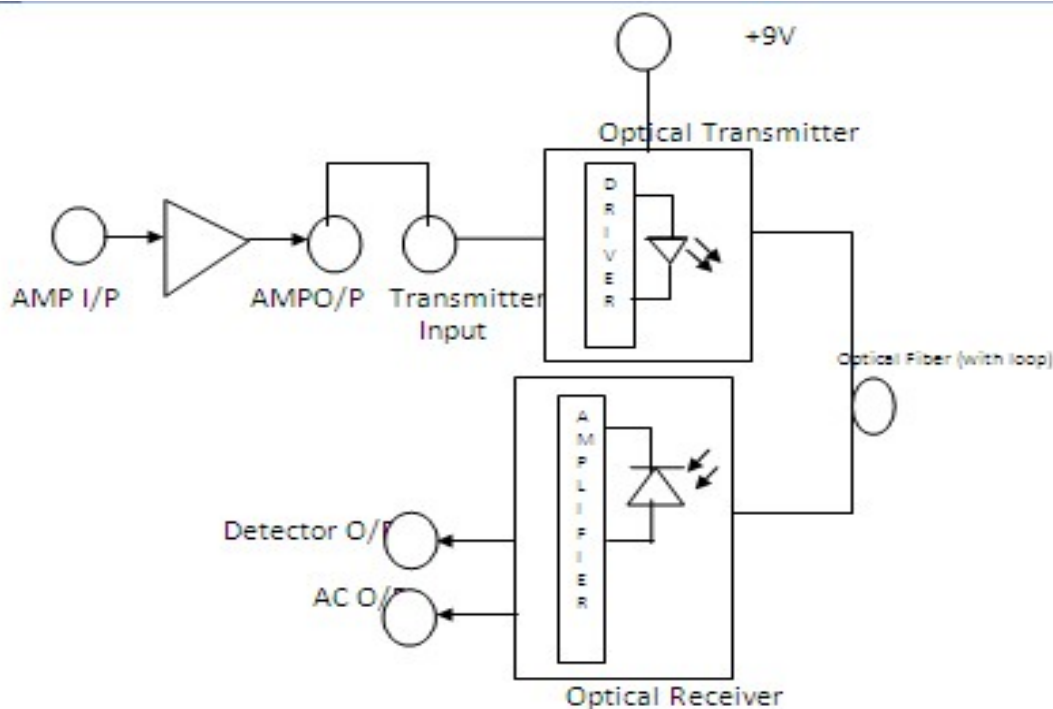


FIG-1 BLOCK DIAGRAM FOR BENDING LOSS MEASUREMENT

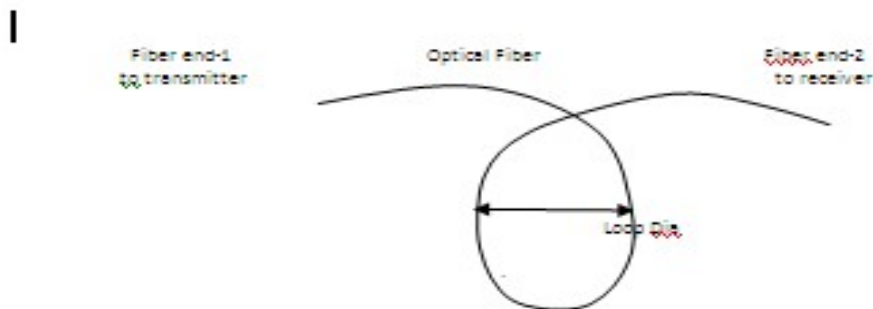


FIG-2 FIBER LOOP FOR BENDING LOSS MEASUREMENT

Theory: Optical fibers are available in different variety of materials. These materials are usually selected by taking into account their absorption characteristics for different wavelengths of light. In case of optical fiber, since the signal is transmitted in the form of light which is completely different in nature as that of electrons, one has to consider the interaction of matter with the radiation to study the losses in fiber. Losses are introduced in fiber due to various reasons. As light propagates from one end of fiber to another end, part of it is absorbed in the material exhibiting absorption loss. Also part of the light is reflected back or in some other directions from the impurity particles present in the material contributing to the loss of the signal at the other end of the fiber. In general terms it is known as propagation loss. Plastics fibers have higher loss of the order of 180 db/km. whenever the condition for angle of incidence of the incident light is violated the losses are introduced due to refraction of light. This occurs when fiber is subjected to bending. Lower the radius of curvature more is the loss. Other losses are due to the coupling of fiber at LED & photo detector ends.

Procedure:

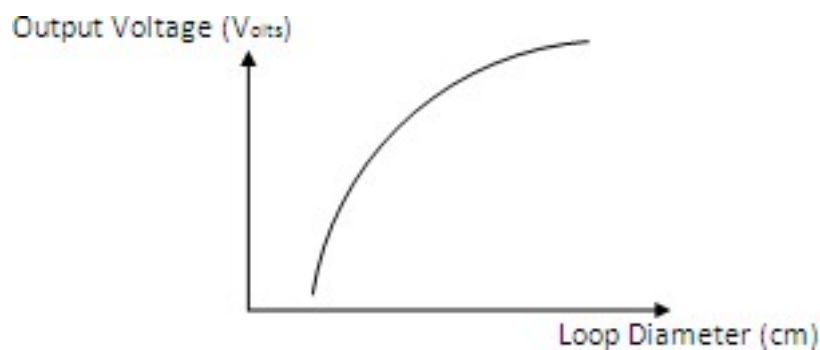
1. Slightly unscrews the cap of IR LED SFH 450v from kit 1. Do not remove the cap from the connector. Once the cap is loosened, insert the fiber into the cap and assure that the fiber is properly fixed. Now tighten the cap by screwing it back.
2. Connect the power supply cables with proper polarity to kit 1 and kit 2 while connecting this, ensure that the power supply is off.
3. Connect the signal generator between the AMP input and GND posts in kit 1 to feed the analog signal to the preamplifier.
4. Keep the signal generator in sign wave mode and the select the frequency of 1KHz with amplitude of 2VP-P (Max input level is 4 VP-P).
5. Switch on the power supply and signal generator.
6. Check the output signal of the pre-amplifier at the post AMP output in kit 1. It should be same as that of the applied input signal.
7. Now rotate the Optical Power Control pot P1 located below power supply connector in kit 1 in anticlockwise direction. This ensures minimum current flow through LED.
8. Short the following posts in kit 1 with links provided.
 - a) -9V and -9V . This ensures supply to the transmitter.
 - b) AMP Output and Transmitter Input.

9. Connect the other end of the fiber to detector SFH250V in kit 2 very carefully as per the instruction in step 1.
 10. Ensure that the jumper located just above IC U1 in kit 2 is shorted to pin 2 and pin 3. Shorting of the jumper allows the connection of PIN diode to trans- impedance amplifier stage.
 11. Observe the output signal on CRO at AC OUTPUT post in kit2.
 12. Then bend the fiber in a loop. (as shown in fig-1)
 13. Measure the amplitude/voltage of the received signal.
 14. Keep reducing the diameter of fiber to about 2cm and take corresponding output voltage readings (**Do not reduce loop diameter less than 2cm**).
- Plot a graph of the received signal amplitude v/s loop diameter.

Observation Table:

Sr.No.	LoopDiameter(cm)	OutputVoltage(Volts)
1		
2		
3		
4		
5		

Nature of graph:



Result:

Conclusion: