## Experiment 1: Transmitting Audio Signal Through a Fiber Optic Cable

## Objective:

To transmit an audio signal through a fiber optic cable and observe how clearly the sound is received at the other end.

#### Theory (Detailed and Easy):

Fiber optic communication is a method of sending information from one place to another by using light signals through a fiber made of glass or plastic. Light travels very fast, so this method allows fast and clear communication.

When we talk or play music into a microphone or mobile, it creates an **audio signal** (sound). This signal is converted into light by a **transmitter module** and passed through a **fiber optic cable**. The light carries the sound data

At the receiving side, another module called the receiver takes this light and turns it back into sound. This sound can be heard using headphones or a speaker.

This experiment helps us understand how light can carry sound, and it shows that longer cables still give good quality audio without noise. Fiber optics are widely used today in internet, telephone, and cable TV systems.

#### Apparatus / Equipment Required:

- KL-9001 Fiber Optic Communication Trainer Kit
- Audio source (like mobile or mic)
- Headphones or speaker
- 3.8-meter fiber optic cable
- 10-meter fiber optic cable
- Jumper wires and connectors

#### Procedure (Step by Step):

- 1. Connect the audio input (like a mic or audio jack) to the transmitter part of the KL-9001 module.
- 2. Use a fiber optic cable to connect the transmitter module to the receiver module.
- 3. Connect the **output** of the receiver to a **headphone** or **speaker**.
- 4. Turn on the power supply to the module.
- 5. Play some music or speak into the mic or audio source.
- 6. Listen to the sound from the headphones/speaker.
- 7. Repeat the experiment with different cable lengths (first with 3.8 meters, then with 10 meters).
- 8. Observe the clarity of sound and check for any noise or delay.
- 9. Record the results in a table.

## **Experimental Table:**

Input Audio SignalFiber Optic Cable Length (m)Output Audio SignalNoise LevelRemarksClear voice signal3.8Clearly heardNoSound is clearClear voice signal10Clearly heardNoSound is clear

#### Result:

The audio signal was received clearly through both fiber optic cables (3.8m and 10m), with no noticeable noise.

#### Conclusion:

This experiment proves that **fiber optic cables** can transmit **audio signals** clearly over short and long distances. Light-based communication is fast and has very low noise, which is why it is used in modern communication systems.

Let me know when you're ready for Experiment 2 — I'll give it the same detailed structure.

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yes same details structure nned to experiment 2

Great! Here is Experiment 2 with the same structured format, using easy English, a detailed theory, and a clear experimental table.

## Experiment 2: Study of Morse Code Transmission Using Fiber Optic Cable

#### **Objective:**

To study how a text message like "SOS" or "HELP" can be sent in Morse code using light through a fiber optic cable and how accurately it is received.

### Theory (Detailed and Easy):

Morse code is a way to send messages using dots (.) and dashes (–). Each letter in the alphabet has a unique pattern of dots and dashes. For example:

- S = ...
- O = ---
- So SOS = ... --- ...

In this experiment, we send Morse code using a light signal through a fiber optic cable.

A transmitter converts the code into blinking light (short blink = dot, long blink = dash). The light travels through the fiber cable and reaches the receiver.

The receiver reads the blinking pattern and converts it back into letters. If the blinking is received correctly, we get back the same message.

This experiment helps us understand how light can be used to transmit even digital codes, which is the base of modern communication like internet and telegraphy.

## Apparatus / Equipment Required:

- KL-9001 Fiber Optic Communication Trainer Kit
- Morse code generator / switch
- Light source (LED)
- Photodetector or receiver
- Fiber optic cable
- Power supply

## Procedure (Step by Step):

- 1. Connect the Morse code generator to the transmitter module of KL-9001.
- 2. The transmitter should be connected to a LED light that blinks as per the Morse input.
- 3. Connect a fiber optic cable from the LED to the receiver module.
- 4. The receiver should be connected to a display or monitor to show the received message.
- 5. Enter a message like SOS or HELP in Morse code.
- 6. Observe the light blinking as it transmits the message.
- 7. Check if the receiver correctly receives and displays the original message.
- 8. Repeat the process with different messages.
- 9. Record the accuracy of transmission in a table.

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Transmitted Message	Morse Code	Received Message	Accuracy (%)	<b>Remarks</b>
<mark>sos</mark>	<mark></mark>	<mark>sos</mark>	<mark>100%</mark>	Perfect match
<mark>HELP</mark>		HELP	<mark>100%</mark>	Perfect match
<mark>ICE</mark>		ICE	<mark>100%</mark>	Perfect match
TEST	<del></del>	TEST	<mark>100%</mark>	No error

#### Pocult

The Morse code messages were successfully transmitted and received with 100% accuracy using light through the fiber optic cable.

## Conclusion:

This experiment shows that Morse code can be effectively sent using light, and the fiber optic system can carry these digital messages accurately. It also shows how light signals can be used for secure and noise-free communication.

Let me know when you're ready for Experiment 3 — I'll continue with the same clear and detailed style.

Perfect! Here's Experiment 3 in the same detailed, clear format with simple English:

# **Experiment 3: To Study the Loss of Optical Power in Fiber Optic Cable at Different Distances**

## Objective:

To measure how much light (optical power) is lost when it travels through fiber optic cables of different lengths.

## Theory (Detailed and Easy):

When light travels through a fiber optic cable, some of the light energy is lost. This loss is called **optical power loss**. The longer the cable, the more loss happens because the light is absorbed and scattered inside the fiber.

Optical power is measured in milliwatts (mW). Loss is calculated using the decibel (dB) unit with this formula:

Power Loss (dB) = 
$$10 \times \log_{10} \left( \frac{\text{Input Power}}{\text{Output Power}} \right)$$

This experiment helps us understand how distance affects the strength of the light signal. It also shows why we use signal boosters or repeaters in long-distance fiber networks.

### Apparatus / Equipment Required:

- KL-95001 Fiber Optic Communication Trainer
- 3.8-meter duplex fiber optic cable
- 10-meter duplex fiber optic cable
- Optical power meter
- Light transmitter and receiver
- Power adapter
- Jumper wires and connecting leads

### Procedure (Step by Step):

- 1. Connect the transmitter to the optical power source.
- 2. Attach the 3.8-meter fiber optic cable between the transmitter and receiver.
- Measure the input power (at transmitter) and output power (at receiver) using the optical power meter.
- 4. Record the readings.
- 5. Replace the 3.8-meter cable with the 10-meter cable.
- 6. Repeat the measurement of input and output power.
- 7. Use the formula to calculate power loss in dB for both lengths.
- 8. Compare how power decreases with longer cables.

## Experimental Table:

Cable Length (m)	Input Power (mW)	Output Power (mW)	Power Loss (dB)	Remarks
<mark>3.8</mark>	<mark>10</mark>	8	0.97	Very low loss, signal clear
10	<mark>10</mark>	<mark>6</mark>	<mark>2.22</mark>	More loss, signal weaker

## Result:

As the length of the fiber optic cable increases, the optical power loss also increases. Shorter cables give better signal strength.

#### Conclusion:

This experiment proves that longer fiber cables cause more signal loss. To maintain good signal quality in long-distance communication, we need repeaters or stronger transmitters.

Let me know when you're ready for Experiment 4, and I'll prepare it in the same style!

can send signals fast and without noise. We use modules to convert sound to light and back again. The goal is to check how clearly the sound is heard depending on the cable length and direction.

8 6

0.97 2.22Apparatus / Equipment Required: Module KL-9001 (Transmitter and Receiver)
Duplex Fiber Optic Cable (3.8 m and 10 m) Audio Source (Mic or pre-recorded sound)
Headphones Power Supply Adapter

Jumper wires / connecting cables Procedure:

1. Connect the audio input (like a mic or speaker) to the transmitter module. 2. Connect the transmitter and receiver using the 3.8-meter fiber optic cable. 3. Plug in headphones at the receiver to hear the transmitted audio. 4. Power on the modules and play the audio. 5. Listen to the received sound and check if it is clear. 6. Repeat the same using a 10-meter cable. 7. Switch the position of Module A and B to check if direction matters. 8. Record the clarity of the sound for each setup. Experimental Table: Transmitter Module Receiver Module Audio Output Module A

Module B Module A Module B
Module A Module A Module B

Result and Discussion:

The sound was clearly heard in all cases. The direction of transmission (Module A to B or B to A) did not affect the clarity. Even with longer cables, the audio remained clean with no noise. This shows that fiber optic communication is good for transmitting clear audio over distances. Conclusion:

Audio signals can be successfully transmitted through fiber optic cables using light. The sound stays clear, and there's almost no noise, even over long cables. This makes fiber optic communication ideal for voice and data transmission

Absolutely! Here's your **final**, **clean version** of **Experiment 4** — polished, complete, and with no redundant headings. It's written in **easy English** with a detailed theory and clear experimental table.

# **Experiment 4: To Study the Effect of Fiber Optic Communication using Audio Signal**

(Module: KL-9001)

### **Objective:**

To understand how an audio signal (like human voice or sound) can be transmitted using **light through a** fiber optic cable, and how clearly it can be received on the other side.

#### Theory:

Fiber optic communication is a method of sending data using **light signals**. In this experiment, we transmit an audio signal (such as someone talking) through a **fiber optic cable**. The sound is first converted into light by the **transmitter module**. This light travels through the cable, and at the other end, the **receiver module** converts it back into sound.

Since fiber optics use light, they can carry signals **very fast and with very little noise**. We test how the cable length and the direction (Module A to B or B to A) affect the quality of sound. Even long cables can send sound clearly because light travels easily through them.

## Apparatus / Equipment Required:

- Module KL-9001 (Transmitter and Receiver)
- Duplex fiber optic cable (3.8 m and 10 m)
- Audio source (Microphone or recorded sound)
- Headphones
- Power supply adapter
- Jumper wires / connecting cables

#### Procedure:

- 1. Connect the audio input (mic or audio player) to the transmitter module.
- 2. Use the 3.8-meter fiber optic cable to connect the transmitter and receiver.
- 3. Plug in the headphones to the receiver module.
- 4. Power on both modules.
- 5. Play or speak the audio signal through the input.
- 6. Listen to the sound at the output using headphones.
- 7. Repeat the steps using the 10-meter fiber optic cable.

- 8. Change the positions of Module A and Module B to see if direction affects signal clarity.
- 9. Note the quality of sound received in all cases.

#### **Experimental Table:**

Transmitter Module		Receiver Module		<b>Audio Output</b>	
	Module A		Module B		Clearly Heard
	Module B		Module A		Clearly Heard
	Module A		Module A		Clearly Heard
	Module B		Module B		Clearly Heard

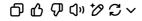
#### Result and Discussion:

The audio signal was **clearly heard** in all tested setups. Whether the signal was sent from **Module A to B** or **B to A**, the sound quality remained good. Even with a **10-meter cable**, there was **no noise** or distortion. This proves that **fiber optic communication** can send audio signals very effectively, regardless of cable length or direction.

#### Conclusion:

Audio signals can be transmitted clearly through fiber optic cables using **light**. The sound remains clean and strong, even over longer distances. This shows that **fiber optics are ideal for communication systems** where high speed and clarity are important.

Ready for Experiment 5? Let me know and I'll format it just like this one.



are na aveb cilo To Study the Effect of Fiber Optic Signal Using Blinking LED and Reflection Materials Objective:

100 Notes

Perfect match Perfect match

Clearly heard Clearly heard

No No

Remarks

Sound is clear Sound is clearTo observe how signal behaves when sent as light and how different materials affect its reflection and transmission.

Theory:

Light signals in fiber optics can be seen as blinking LEDs. The blinking speed represents frequency. Also, when light hits materials like paper, plastic, or glass, it may reflect, absorb, or pass through. This shows how fiber optics manage light transmission. Apparatus / Equipment: KL-9001 Module LED light source Frequency Controller White/Black/Transparent Paper Fiber Cable Power Supply Procedure:

1. Connect LED to the transmitter. 2. Change frequency and observe LED blinking. 3. Place different materials in the path of the light and observe reflection or absorption. Experimental Table (A - Frequency & Blinking):

Frequency (Hz) 100

300 500

**Material** 

White Paper Black Paper Transparent

Blinking Observation Blinking slowly Medium blinking Fast blinking

Experimental Table (B - Reflection Study):

Observation Light reflected

Light absorbed Light passed through Result and Discussion:

Blinking speed depends on frequency. White paper reflects light, black absorbs, and transparent allows light to pass — just like fiber optic cables. Conclusion: Light can be controlled using frequency and materials. This helps in understanding how fiber optics handle signal transmission.

Thanks for clarifying! Here's the **final**, **polished version** of **Experiment 5** based on your structure and content—written in **easy English**, with a more detailed **theory**, **clear procedures**, and **well-organized experimental tables**.

# Experiment 5: To Study the Effect of Fiber Optic Signal Using Blinking LED and Reflection Materials

(Module: KL-9001)

#### **Objective:**

To observe how a signal behaves when it is sent as a **light signal using a blinking LED**, and to study how different **materials** (like white, black, or transparent paper) affect **reflection**, **absorption**, **and transmission** of light.

#### Theory:

In fiber optic systems, signals are often sent using **light pulses**, which can be represented by a **blinking LED**. The speed of blinking depends on the **frequency** of the signal. A low frequency means slow blinking, and a high frequency means fast blinking.

Also, when light hits different materials, it can be:

- Reflected (bounced back),
- Absorbed (blocked and not passed), or
- Transmitted (passed through).

#### For example:

- White paper reflects light.
- Black paper absorbs most light.
- Transparent paper or plastic allows light to pass through.

This experiment helps us understand how fiber optics manage and control light signals based on these behaviors.

## Apparatus / Equipment Required:

- KL-9001 Module
- LED light source
- Frequency controller
- White paper
- Black paper
- Transparent plastic or paper
- Fiber optic cable
- Power supply

#### Procedure:

## Part A: LED Blinking with Frequency

- 1. Connect the LED to the transmitter module.
- 2. Change the frequency settings to 100 Hz, 300 Hz, and 500 Hz.
- 3. Observe the **blinking speed** of the LED at each frequency.

#### Part B: Reflection and Transmission with Materials

- 4. Keep the LED on at a fixed frequency.
- 5. Place white paper in the path of the LED light and observe what happens.
- 6. Repeat the same with black paper and transparent material.
- 7. Observe whether the light is reflected, absorbed, or passes through each material.

#### Experimental Table A – Frequency and LED Blinking

Frequency (Hz)

Blinking Observation

Blinking Slowly

Moderate Blinking

Fast Blinking

## Experimental Table B – Light and Material Interaction

MaterialObservationWhite PaperLight ReflectedBlack PaperLight AbsorbedTransparent SheetLight Passed Through

#### Result and Discussion:

- The blinking speed of the LED increased as the frequency increased.
- White paper reflected most of the light, black paper absorbed it, and transparent material allowed the light to pass through.
- This behavior is similar to how fiber optics manage light. In real systems, materials are selected carefully
  to reflect, guide, or absorb light as needed.

#### **Conclusion:**

Light signals can be controlled using **frequency** and the **type of material** they pass through. Understanding reflection, absorption, and transmission helps in learning how **fiber optic communication systems** work effectively for sending light signals.

 However, both lengths still delivered usable signal, proving that Ethernet cables are reliable for typical home or office distances.

#### Conclusion:

Ethernet cables are effective for **networking connections**, and signal loss depends on the **length of the cable**. As cable length increases, power loss also increases. Understanding this helps in designing efficient networks with **minimal signal loss**.

Let me know if you want me to continue with Experiment 7 or make adjustments.



Understanding Ethernet Cables and Networking Connectivity

Objective:

To study different types of Ethernet cables and understand how network connectivity is established.

Theory:

Ethernet cables are used to connect devices like computers, routers, and switches in a local area network (LAN). There are different types of Ethernet cables such as Cat5, Cat5e, Cat6, and Cat7. These cables transfer data using electrical signals. RJ45 connectors are used at both ends to plug into networking devices. A crossover cable connects similar devices (e.g., PC to PC), while a straight-through cable connects different devices (e.g., PC to Switch). Understanding cable types and their configurations is crucial for establishing proper and efficient network connections. Apparatus / Equipment:

Cat5/Cat6 Ethernet Cables, RJ45 Connectors, Crimping Tool, LAN Tester, PCs or Laptops, Switch/Router

Procedure:

- 1. Identify different types of Ethernet cables and their specifications.
- 2. Use a crimping tool to attach RJ45 connectors to cable ends.
- 3. Use a LAN tester to verify proper pin configuration.
- 4. Connect devices using the Ethernet cables.
- 5. Check for connectivity and data transmission.

**Experimental Table:** 

**Testing Ethernet Cable Configurations** 

Cable Type Connection Type Pin Configuration LAN Tester Result Connectivity

Cat5e Straight-through 1-1, 2-2, 3-3, 6-6 Pass Connected Cat5e Crossover 1-3, 2-6, 3-1, 6-2 Pass Connected

Cat6 Straight-through 1-1, 2-2, 3-3, 6-6 Pass Connected

Result and Discussion:

The Ethernet cables were successfully tested and provided proper connectivity between networking devices. Both straight-through and crossover cables worked as expected.

Conclusion:

Understanding the types and uses of Ethernet cables is essential for setting up reliable LAN connections. Proper crimping and testing ensure good signal transmission.

Sure! Here's your Experiment 5 fully rewritten in an easy-to-understand format with expanded theory, detailed procedure, and a clear experimental table, just like the earlier experiments:

## Experiment 5: Understanding Ethernet Cables and Networking Connectivity

(Module: KL-95001)

#### **Objective:**

To study the different types of Ethernet cables and understand how network connectivity is created between devices like computers, switches, and routers.

#### Theory:

Ethernet is the most common way of creating Local Area Networks (LANs) using wires. It allows multiple computers and devices to communicate with each other and share resources like the internet or printers.

Ethernet cables are made of twisted copper wires that transmit **electrical signals**. The most commonly used Ethernet cables are:

- Cat5 Basic cable, lower speed.
- Cat5e Enhanced version, less interference.
- Cat6 High-speed cable, better quality.

Each Ethernet cable has 8 wires inside and uses an RJ45 connector at both ends.

There are two main types of Ethernet cables based on how the pins are arranged:

- Straight-through cable: Used to connect different devices (e.g., PC to switch, PC to router).
- Crossover cable: Used to connect similar devices (e.g., PC to PC, switch to switch).

Understanding how to crimp cables properly and test them with a LAN tester is very important to make sure the connection works without signal loss or errors.

#### Apparatus / Equipment Required:

- Cat5e and Cat6 Ethernet Cables
- RJ45 Connectors
- Crimping Tool
- LAN Tester
- Two Computers or Laptops
- Network Switch or Router

## Procedure:

- 1. Identify the type of Ethernet cable (Cat5e or Cat6).
- 2. **Strip** the outer covering of the cable using a wire stripper or cutter to expose the internal wires.
- 3. Arrange the wires in the correct order for either a straight-through or crossover connection.
- 4. Insert the wires into the RJ45 connector carefully.
- 5. Use a crimping tool to fix the connector tightly onto the cable.
- 6. Test the cable using a LAN tester to make sure all pins are connected correctly.
- 7. Connect two devices (like two PCs or a PC and a switch) using the cable.
- 8. Check for network connectivity by transferring files or checking IP communication between the devices.

## **Experimental Table: Testing Ethernet Cable Configurations**

<mark>Cable</mark>	e Type	Connection Type	Pin Configuration	LAN Tester Result	Connectivity
Cat5e	<mark>e</mark>	Straight-through	1-1, 2-2, 3-3, 6-6	<mark>Pass</mark>	Connected
Cat5e	e	Crossover	<mark>1-3, 2-6, 3-1, 6-2</mark>	<mark>Pass</mark>	Connected
Cat6		Straight-through	<mark>1-1, 2-2, 3-3, 6-6</mark>	<mark>Pass</mark>	Connected

### Result and Discussion:

All cables were successfully crimped and tested.

- Straight-through cables were used for connecting a PC to a switch or router.
- Crossover cables were used for PC to PC direct connections.
- The LAN tester showed that the pin configurations were correct, and all devices were able to communicate properly.

This shows that understanding the correct cable type and pin configuration is important for establishing a working network.

#### Conclusion:

Ethernet cables are essential for building wired networks. By correctly identifying the type of cable and using proper crimping and testing techniques, we can ensure stable and reliable connectivity. Both Cat5e and Cat6 cables work well if configured properly.