Fiber Optic Communication Line Code Experiment Report



Overview

Lab manual for optical communication experiments: fiber optic links, propagation loss, numerical aperture. College/university level.

Key Takeaways

A Fiber Optic Communication Line Code Experiment demonstrates the transmission of digital and analog signals over optical fiber using various line coding and modulation techniques. 1.

Aim

To study and analyze the transmission of digital signals over a fiber optic communication link using line coding techniques, and to observe the relationship between input and received signals. 2.

Apparatus Required

Fiber optic trainer kit (e.g., ST2501/ST2502)Optical fiber cable (plastic or glass)Function generator (for digital/analog signals)Oscilloscope (20 MHz dual trace recommended)Optical transmitter (LED or laser source)Optical receiver (photodiode or phototransistor)Comparator (for digital signal recovery)Connecting probes, power supply, and headphones (optional for analog signals) 3.

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Theory

Fiber optic communication uses light as a carrier for information. A typical fiber optic link consists of a transmitter, optical fiber, and receiver. The transmitter converts electrical signals into optical signals using LEDs or lasers.

The optical fiber guides the light to the receiver, where it is converted back into electrical signals. Line coding is the process of converting digital data into a specific waveform suitable for transmission. Common line coding techniques include: Unipolar NRZ (Non-Return-to-Zero)Polar NRZManchester codingBipolar RZ (Return-to-Zero) These coding schemes help in synchronization, error detection, and reducing DC bias in the transmitted signal.

Fiber optic links can transmit both analog and digital signals, with digital signals often modulated using amplitude, frequency, or pulse width modulation. 4.

Procedure

Setup the fiber optic link: Connect the optical transmitter to the input signal source and the optical receiver to the oscilloscope. Generate input signal: Use the function generator to produce a digital pulse train or analog waveform. Apply line coding: Encode the digital signal using the chosen line coding technique.

Transmit through fiber: Send the encoded signal through the optical fiber. Observe received signal: Use the oscilloscope to compare the received signal with the input. Measure performance: Record signal amplitude, distortion, and any attenuation.

For analog signals, note the frequency response and 3 dB bandwidth. Optional tests: Study bending loss, pulse width modulation, or frequency modulation effects on signal quality. 5.

Observations

Input signal waveform (digital/analog)Received signal waveform at the receiverSignal attenuation or distortionMaximum frequency transmitted without significant loss (3 dB point)Effects of fiber bending or connector misalignment on signal quality 6.

Results

Comparison of input and output waveformsMeasured amplitude and frequency responseObserved line coding performance (e.g., timing errors, DC bias)Notes on signal integrity and noise immunity7.

Conclusion

The experiment demonstrates that fiber optic links can effectively transmit digital signals using line coding techniques. Proper line coding ensures accurate signal recovery, reduces errors, and maintains synchronization.

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Ds are suitable for amplitude modulation, while lasers are preferred for frequency or phase modulation due to their stable frequency output. The experiment also highlights practical considerations such as fiber bending loss, connector quality, and the importance of proper alignment. 8.

Precautions

Avoid sharp bends in the optical fiber to prevent signal loss. Ensure connectors are clean and properly installed. Do not exceed the maximum input amplitude to prevent distortion.

Handle optical components carefully to avoid damage. This structured report format can be adapted for different fiber optic communication experiments, including analog and digital modulation, pulse width modulation, and frequency modulation studies.

Article Content

Optical Communication Lab Manual

Lab manual for optical communication experiments: fiber optic links, propagation loss, numerical aperture. College/university level.

LabManual

This information is provided by The Fiber Optic Association, Inc. as a benefit to those interested in teaching, designing, manufacturing, selling, installing or using fiber optic communications systems or

ECE4333 Lab Manual: Experiment 2

• To design and simulate optical links using NRZ and RZ line coding schemes. • To study how coding format affects B ER, Q-factor, Eye Diagram, and Received P ower. • To compare syst em

Fiber Optic Communication Experiments

The document outlines a series of experiments related to fiber optic communication, including setting up analog and digital links, measuring numerical aperture, propagation loss, and audio signal transmission.

FOC 2024-25 Laboratory Manual: Fiber Optic Communication Practices

Explore practical experiments in Fiber Optic Communication and Satellite Systems through this comprehensive laboratory manual, designed for engineering

LABORATORY MANUAL COMMUNICATION SYSTEMS LAB (S7 T)

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The most significant features of LEDs, which are used for optical communication, include high modulation rate capability, high radiance, high reliability and emission wavelengths restricted to the

Laboratory Manual

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

Fibre Optic Communications Lab Report

The document reports on an experiment characterizing the components of a fibre optic telecommunications system. It describes building a point-to-point link and assessing its performance

Optical Fiber Communication ECE Practical File.pdf

This document summarizes 10 experiments on optical fiber communication: 1. Studying a 650mm fiber optic analog link and the relationship between input and received signals. 2. Achieving amplitude

FIBER OPTICAL COMMUNICATIONS (R17A0418) Lecture Notes

In fiber optic communications, a glass or plastic fiber is the channel. Desirable characteristics of the information channel include low attenuation and large light acceptance cone angle.

Lab9_Fiber.doc

Fiber optics have many advantages over wires. First, since there is no electrical signal, the security of communications is quite good. It''s practically impossible to "tap" a fiber optic line without generating

MergedFile

In telecommunication, an optical time domain reflectometer (OTDR) is an optoelectronic instrument used to characterize an optical fiber. An OTDR is used for purposes like: fiber optic testing in fiber optic

OptiSystem in Optical Fiber Communication

The document describes an experiment using OptiSystem software to simulate an optical fiber communication system. It discusses the basic components of the system, including an optical

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LabManual

The FOA Textbook, The Fiber Optic Technicians Manual, is one choice, but at a college level, a text with more theory, such as Fiber Optic Communications by Jim Downing or Jeff Hecht''s Understanding

Fiber Optics Communication Lab Manual

This experiment involves setting up a fiber optic analog link to transmit an audio signal. A fiber optic transmitter converts an electrical input signal into optical energy that is transmitted through the fiber

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Fiber Optic Digital Link Experiment

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