

## FIBER OPTIC TRAINING SYSTEM

**FO-00** Fiber Optics Training System covers all the fundamental of fiber optics topics including properties of transmitter and receiver, characteristics of fiber opticable, LEDs and detectors, various types of Modulation/ Demodulation and Multiplexing/ Demultiplexing techniques and PC to PC Communication by serial method. A wide range of experiments can be performed with this lab by referring to the exhaustive manual provided with the system. This manual contain excellent documentation on each and every experiment, data sheets of optical components used and circuit diagram of the complete system.



The Training System **FO-00** consists of four separate modules: two of these modules are used to perform analog type experiments and other two modules are used to perform digital communication experiments using optical fiber. Separate power supplies are provided so that simultaneously two or more batches of students can perform experiments on the following different modules:

1. **FO-01/A: Analog Transmitter / receiver modules modules (2)**
2. **FO-02/D: Digital Transmitter / Digital Receiver module**
3. **FO-03/S: Advanced Digital Communication module**

### MAIN TECHNICAL SPECIFICATIONS

#### Transmitter Section:

- **Transmitter** : Three Nos. Siemens Fiber Optic LEDs.
- **Transmitter FO-01/A** : Peak wavelength of emission 950 nm infrared (SFH V).
- **Transmitter FO-02/D** : Peak wavelength of emission 950 nm Infrared (SFH 450 V)
- **Transmitter FO-03/S** : Peak wavelength of emission 660 nm Red visible (SFH 756 V)

#### Receiver Section:

- **Receiver** : Three Nos. Siemens Photo Detector
- **Receiver FO-01/A** : Pin Photo Diode - response of 0.3 micro-Amp/micro-Watt (SFH-250V)
- **Receiver FO-02/D** : Photo detector with TTL logic output (SFH 551 V)
- **Receiver FO-03/S** : Photo detector with TTL logic output (SGH 551 B)

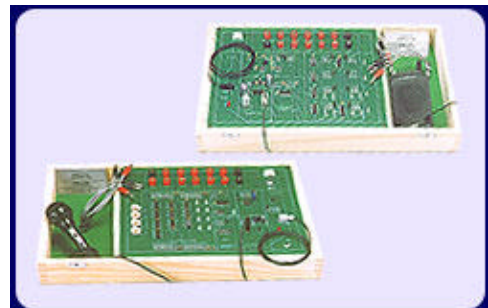
#### Modulation Techniques Used :

- Pulse Amplitude Modulation (PAM),
- Pulse Code Modulation (PCM),
- Pulse Width Modulation (PWM),
- Pulse Position Modulation (PPM).

- **No. of Channels** : 16 No. of Channels. Time Division Multiplexed, with data rate 64 KB/Sec. per channel and Five expansion channels.
- **Frame Marker** : Two 8 Bit user selectable markers in alternate frames.
- **Line Coding / Decoding** : Manchester Coding / Decoding Technique.
- **Total Data Rate** : 1.024 MBits /Sec.
- **Audio Channels**: Two numbers, Telephone hand sets to generate audio Signal, CODEC IC to perform ADC and DAC Operations .
- **Analog Bandwidth**: 3.75 KHz.
- **Voice Communication**: Fiber Optic Voice Link using dynamic Mike and Speaker.
- **PC to PC Communication**: PC to PC Comm. using 950 nm LED through RS 232 port
- **RS-232 Port Type**: standard 9 pin D Type Connector.
- **Baud Rate**: Maximum 9.600 Baud.
- **Sine Wave Generator**: 2KHz, 1KHz, 500Hz, 250Hz
- **Fiber Optic Cable Type**: Plastic Optical Cable, Step Index, Multimode.
- **Core Refractive Index -n1** : 1.492
- **Clad Refractive Index -n2** :1.406
- **Numerical Aperture**: 0.50
- **Acceptance Angle**: 60 degrees
- **Fiber Diameter** : 1000 microns
- **Out Diameter**: 2.2 mm
- **Fiber Lengths** : 1,3 and 10 Meters.
- **Power Supply** : +/-5V, +/-9V, 3 NOs.

### FO-01/A: ANALOG COMMUNICATION MODULES

It is an Analog Transmitter module contains 950 nm fiber optic LED and Modulation circuits. **FO-01/A** is Analog Receiver contains Pin Photo Diode with transimpedance amplifier fiber optic Detector and demodulation circuits. **FO-01/A** modules are used to perform only analog experiments.



### Topics

- Forming simple fiber optic analog link using 950 nm LED, one meter fiber cable and photo diode detector. Also to study the frequency response of the detector.
- Study of losses in optical fiber:
  - a) Measurement of propagation loss
  - b) Measurement of bending loss
- Study of characteristics of fiber optic LED and photo diode detector.
- Forming simple fiber optic voice link using Mike & Speaker.
- Study of Pulse Amplitude Modulation (PAM) of analog signal, transmission of this modulated signal over optical fiber and study of demodulation of PAM signals.
- Study of Four channel Time Division Multiplexing of analog signals.

### FO-02/D: DIGITAL TRANSMITTER / RECEIVER MODULE

The module contains 950 nm fiber optic transmitter, logic output photo detector in Receiver, Modulation and Demodulation circuits and interface for PC to PC communication.

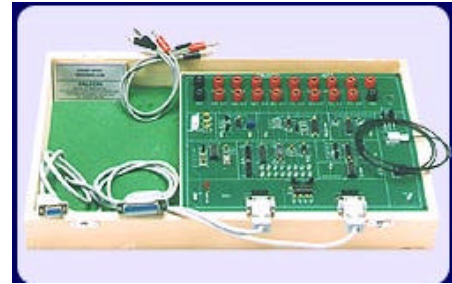
#### Topics

Forming simple fiber optic digital link using 950 nm LED, fiber cable and logic output Photo Detector.

Study of Pulse Width Modulation (PWM), its transmission over fiber link and Demodulation to receive original signal.

Study of Pulse Position Modulation (PPM).

Forming PC to PC communication link using optical fiber link and RS232 interface.



### MODULE FO-03/S: ADVANCED DIGITAL COMMUNICATION

The module is Advanced Digital Transmitter/ Receiver designed to perform digital communication experiments using optical fiber as transmission medium for data. It uses 660 nm red visible LED and Logic Type Output Photo Diode as high speed optical sensor. Optical link is designed to handle data rate of 1.024 M Bits/Sec.

#### Topics

- Forming simple analog link at 660 nm.
- Forming simple digital link at 660 nm. Time Division Multiplexing using 16 data channels.
- Framing in Time Division Multiplexing.
- Study of Marker in Time Division Multiplexing.
- Study of Manchester coding and decoding.
- Study of PCM voice coding and frequency response of a CODEC.
- Measurement of Numerical Aperture.

