QUAID-E-AWAM UNIVERSITY OF ENGINEERING SCIENCE & TECHNOLOGY, NAWABSHAH.
DEPARTMENT OF ELECTRONIC ENGINEERING
LASER AND FIBER OPTICS 05ES (2nd Term, Final Year)
Lab Experiment # …….

Name: _____ Roll No: _____ Date: _____

AMPLITUDE MODULATION OF AN ANALOGICAL SIGNAL USING OPTICAL FIBER

PERFORMANCE OBJECTIVES

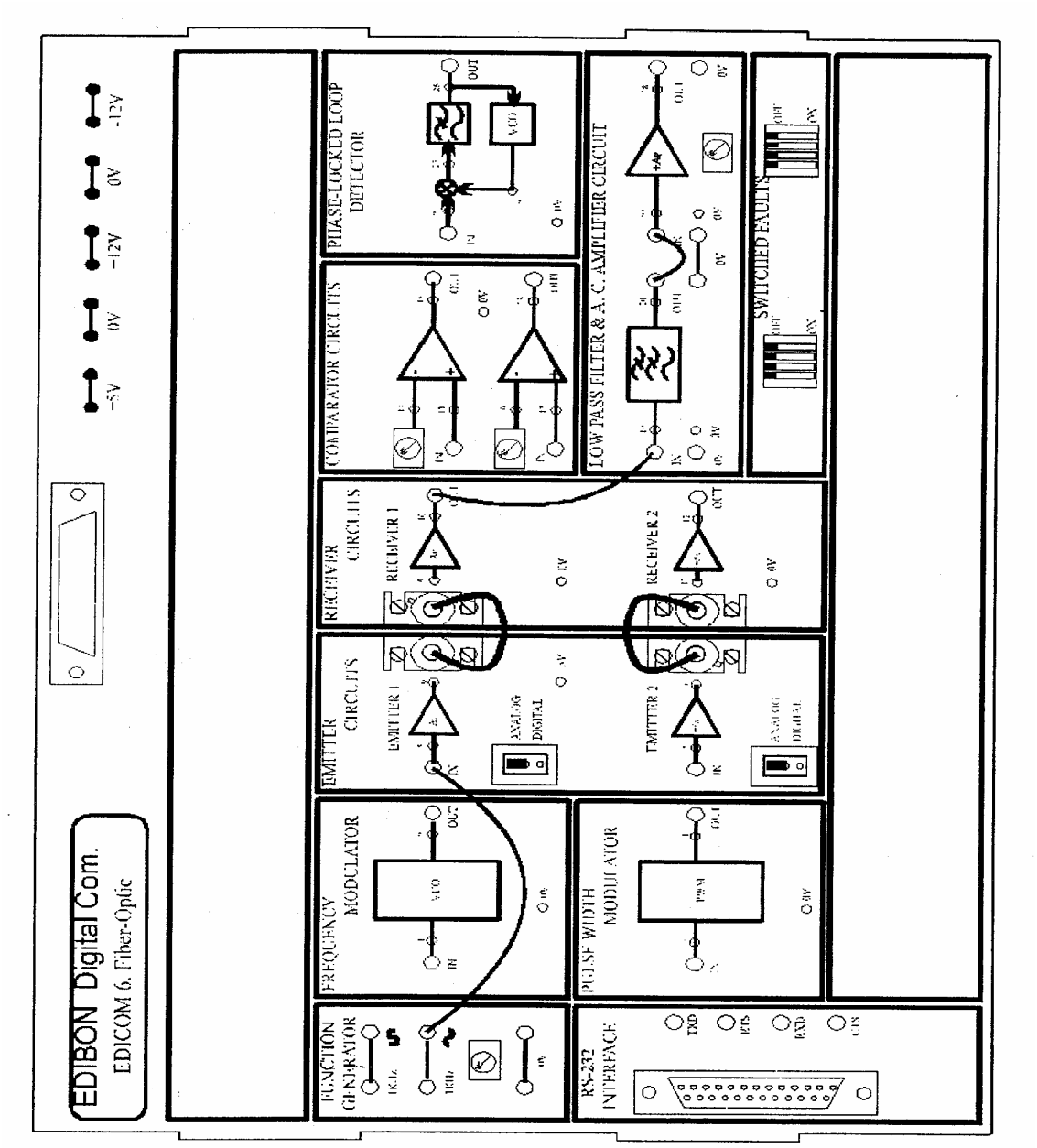
The aim of this lab is to see how the amplitude modulation of a beam of light is carried out using optical fiber as a medium.

HARDWARE REQUIREMENTS

- Module Kit: EDIBON Digital Com., EDICOM 6, Fiber-Optics
- Base Unit EBC-100 or independent power supply(5V,±12V,500mA for each output and four leads with pins of 2mm)
- Set of connecting leads.
- Multimeter
- Oscilloscope

DISCUSSION

Optical fiber (or "fiber optic") refers to the medium and the technology associated with the transmission of information as light pulses along a glass or plastic wire or fiber.
Optical fibers are widely used in fiber-optic communication, which permits transmission over longer distances and at higher data rates than other forms of communications. Fibers are used instead of metal wires because signals travel along them with less loss, and they are immune to electromagnetic interference
Amplitude modulation (**AM**) is a technique used in electronic communication, most commonly for transmitting information via a radio carrier wave. AM works by varying the strength of the transmitted signal in relation to the information being sent. For example, changes in the signal strength can be used to reflect the sounds to be reproduced by a speaker, or to specify the light intensity of television pixels.
The digital communication board EDICOM6, (figure) is designed to illustrate the modulation techniques of a light source and the subsequent recuperation of the original signal.
The board generates two internal signals, one sinusoidal and the squared. This allows us to check the advantages of digital signals over analogical ones, when they are transmitted using optical fiber as the medium.
We shall also see that on carrying out the modulation, for AM and FM, the use of a carrying signal is not necessary, as this operation is performed by the transmitter diodes, since they transfer signal to higher frequency values.
The transmitting and receiving diodes are designed to work together as a set, as they have the same wavelength.



Due to possible interference problems between the two optical fiber channels, it is better if they do not work together except when it is specifically indicated. Close attention must therefore be paid to the instructions concerning the position of the switches that appear on the board.

PROCEDURE

1. Carry out the assembly specified in figure. Use the fiber optic cable that is 30cm long.
2. Make sure that all fault switches are in the position OFF.
3. Set the mode switch of the emitting circuit in the position ANALOG.
4. To feed the board, turn on the switch in the console or, if there is not one, turn on by using the switch of the power source used.
5. Using an oscilloscope, visualize the sinusoidal signal to be transmitted, turn the potentiometer gain of the sinusoidal signal until the output is about 2V peak to peak. This potentiometer is situated below the outputs of the sinusoidal signal.

6. Follow the evolution of this signal, visualizing it in test socket 5, 6,9,10,19,20,27, and also the signal recuperated at the output of the filter, test socket 28. If the signal received is very weak, turn the potentiometer of the output amplifier in an anticlockwise direction until you obtain the desired amplitude.
7. Continue visualizing the output signals while, at the same time, increasing and decreasing the gain of the input signal. Check that there is a minimum input threshold value at which the system begins to work, and also a maximum value at which the modulator becomes saturated.
8. Once again, set the input signal at a value of 2V peak to peak, and once more visualize the output signal.
9. Move the optical fiber cable with your hand and notice how this affects the quality of the signal received. This is due to the fact that the transmission quality of analogical signal through optical fibers depends on the curvature radius of the fiber.

Note: On carrying out this exercise, take care that the curvature radius of the optical fiber cable is never less than 15mm. a radius inferior to this could cause the fiber to break.

Take down the amplitude of the output signal and substitute the fiber cable for the one of 1m long. Check that the amplitude of the output signal has decreased. This is because the amplitude of the analogical signal decreases, when they are transmitted using an optical fiber medium, in relation to the length of the fiber.

OBSERVATIONS

S. No.	Test Sockets	30cm long fiber cable	1m long fiber cable
		Amplitude of the Signal. (Volts)	Amplitude of the Signal. (Volts)
1.	5		
2.	6		
3.	9		
4.	10		
5.	19		
6.	20		
7.	27		
8.	28		

EXERCISES

(a) Draw the output signal of a function generator (in test socket 5).

_____
_____
_____
_____

(b) Draw the input signal of a low pass filter (in test socket 19).

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(c) Draw the output signal of a low pass filter (in test socket 20).

(d) Draw the output signal of a Amplifier circuit (in test socket 28).

REVIEW QUESTIONS

1. Define Amplitude Modulation (AM).
2. Define Optical fiber.
3. What are the advantages of using Fiber Optics as a medium?