EXP NO: 12 SETTING UP A FIBER OPTIC DIGITAL LINK

12.1 OBJECTIVE:

1. To set up 650 nm and 850 nm digital link.
2. To measure the maximum bit rates supportable on the links.

12.2 HARDWARE REQUIRED:

Optical fiber trainer kit, Two channel 20 MHz oscilloscope, Function generator (1Hz – 10MHz)

12.3 INTRODUCTION:

The OFT can be used to set up two fiber optic digital links, one at a wavelength of 650 nm and the other at 850 nm. LED 1, in the optical TX1 block, is an 850 nm LED, and LED 2, in the optical TX2 block, is a 650 nm LED.

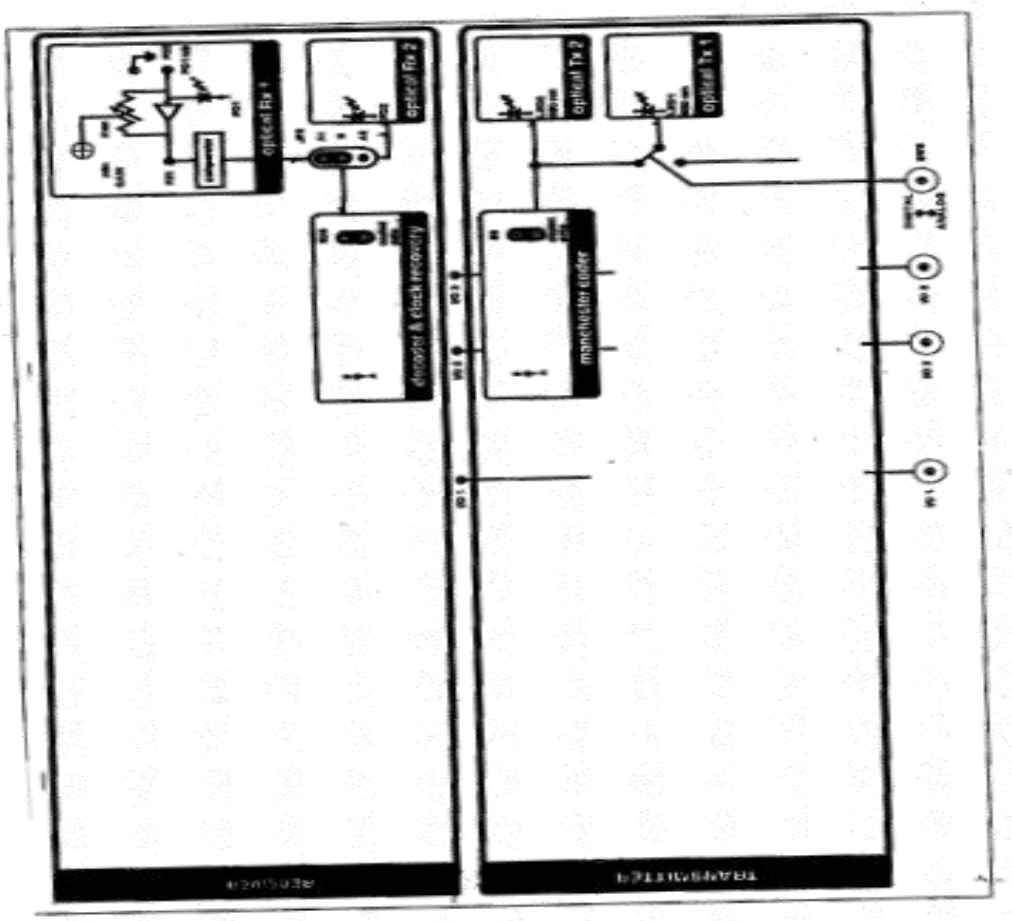
PD1, in the optical RX1 block, is a PIN detector which gives a current proportional to the optical power falling on the detector. The received signal is amplified and converted to a TTL signal using a comparator. The GAIN control plays a crucial role in this conversion.

PD2, in the optical RX2 block, is another receiver which directly gives out a TTL signal. Both the PIN detectors can receive 650nm as well a 850nm signals, though their sensitivity is lower at 650nm.

12.4 PRELAB QUESTIONS:

1. What is a TTL signal?
2. Compare Analog and Digital transmitter
3. Define sensitivity
4. What are the modulation formats used in optical Communication
5. What is a Trans impedance receiver.

12.5 LAYOUT DIAGRAM:

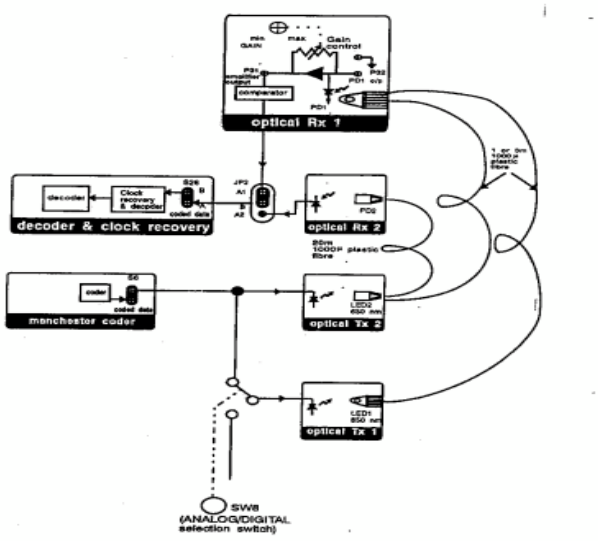


12.6 PROCEDURE:

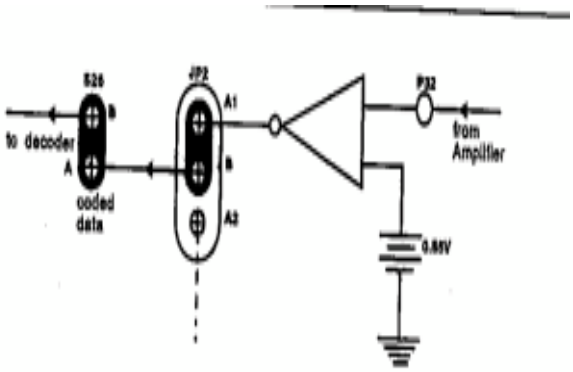
1. Set the switch SW8 to the digital position.
2. Connect a 1m optical fiber between LED1 and the PIN diode PD1.
3. Ensure that the shorting plug of jumper JP2 is across the posts B &A1.
4. Feed a TTL signal of about 20 KHz from the function generator to post B of S6. Observe the received analog signal at the amplifier post P_{31} on channel 1 of the oscilloscope. Note the signal at P_{31} gets cutoff above 3.5V. Increase and decrease the Gain and observe the effect.
5. Observe the received signal at post A of S26 on channel 2 of the oscilloscope while still observing the signal at P_{31} on channel 1.
6. Set the gain such the signal at P_{31} is about 2 V. Observe the input signal from the

function generator on channel 1 and the received TTL signal at post A of S26 on channel 2. Vary the frequency of the input signal and observe the output response.

7. Repeat steps 4, 5, and 6 with 3 m fiber.



COMPARATOR TO CONVERT RECEIVED SIGNAL INTO A TTL SIGNAL:



Frequency	TON	TOFF

Data Rate:_____

12.7 POSTLAB QUESTIONS:

1. What is a Digital Link?
2. What are the advantages of digital link over analog link?
3. What is a high impedance receiver?
4. A digital optical fiber communication system operating at a wavelength of 1 μm requires a maximum bit error rate of 10-9. What is the theoretical quantum limit at the receiver in terms of the quantum efficiency of the detector and the energy of an incident photon?

12.8 RESULT:

Hence, the Digital link is established in fiber optic link.