

Experiment 7-

Infrared Opto Transmitter

In this experiment you will build an infrared opto (optical) transmitter that uses an infrared LED to emit a pulse modulated infrared light beam. This transmitter uses a similar circuit to the one used in experiment 6. The 555 IC (IC1) is used to generate the pulses which modulate the light. The infrared LED used in this experiment, emits an infrared beam of light that your eyes can not see. The receiver built for experiment 5 will be used to detect and process (amplify) the information modulated in the infrared light beam.

The schematic diagram of this experiment is shown in figure 1. In this circuit, we use the 555 IC timer, working as a clock, to generate pulses. The frequency of the pulses is controlled by the values of R1, P1, R2, and C1, and it can be adjusted with potentiometer P1. The larger these values, the lower the frequency of the pulses, and viceversa. Capacitor C2 is connected between pin 5 and negative to add frequency stability to the circuit. The output of the 555 IC (pin 3) is connected through resistor R3 to the infrared LED, which will light up, even though you cannot see it, with every pulse produced by IC1. You will not be able to see the light emitted by the LED as human eyes can not see the infrared light spectrum.

Procedure:

- In this experiment you will not have to build the transmitter circuit shown on figure 2 from the beginning. Instead, you can modify the transmitter you built in experiment 6 by replacing the clear LED with the infrared LED. Notice the location of the flat side of the IR LED shown in figure 2. When done, connect a fresh 9V battery to the transmitter. You will not be able to see the light from the LED, as it is in the infrared spectrum.

- Take the breadboard with the opto receiver that you assembled in experiment 5. Connect a fresh 9V battery to its snap.

- Align both boards in such manner that the IR LED of the transmitter (experiment 7) is facing the phototransistor of the receiver (experiment 5). Insert the IR LED and the phototransistor in the supplied tubing, as shown in figure 4. As you do this, you will hear a tone, produced by the transmitter and carried in the infrared light beam, reproduced by the speaker of the receiver. Adjust potentiometer P1 to vary the frequency of the tone.

- Remove the tubing and observe the circuit operation through open air, as shown in figure 5. Interrupt the light beam with a piece of paper and observe how the transmission stops. Remove the paper and separate the transmitter and receiver and observe how the intensity of the audio signal decreases with the distance.

Note: After completing this experiment do not disassemble the board of the optoreceiver of experiment 5, as you will need it in the next experiments.

Parts List:

R1: 4.7K Ω Resistor (Yellow, Violet, Red)

R2: 1K Ω Resistor (Brown, Black, Red)

R3: 100 Ω Resistor (Brown, Black, Brown)

P1: 50K Ω Potentiometer

C1: .1 μ F Disc Capacitor (104)

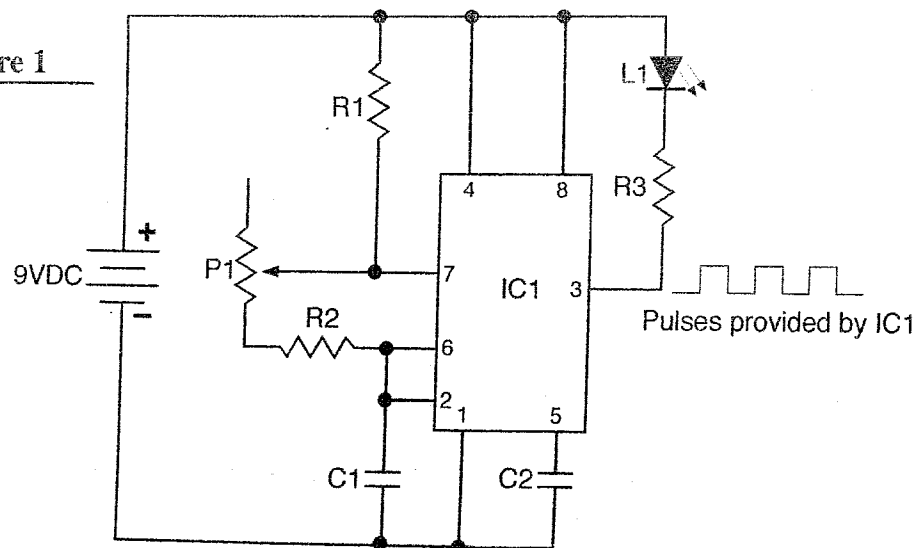
C2: .01 μ F Disc Capacitor (103)

IC1: 555 IC

L1: Infrared LED (Clear LED)

Misc: Battery snap, breadboard, wires, piece of plastic tube, and assembled experiment 5.

Figure 1



IMPORTANT NOTE: Build this project so that the LED extends over the end of the protoboard as shown below.

Figure 2

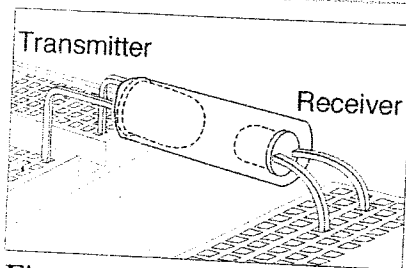
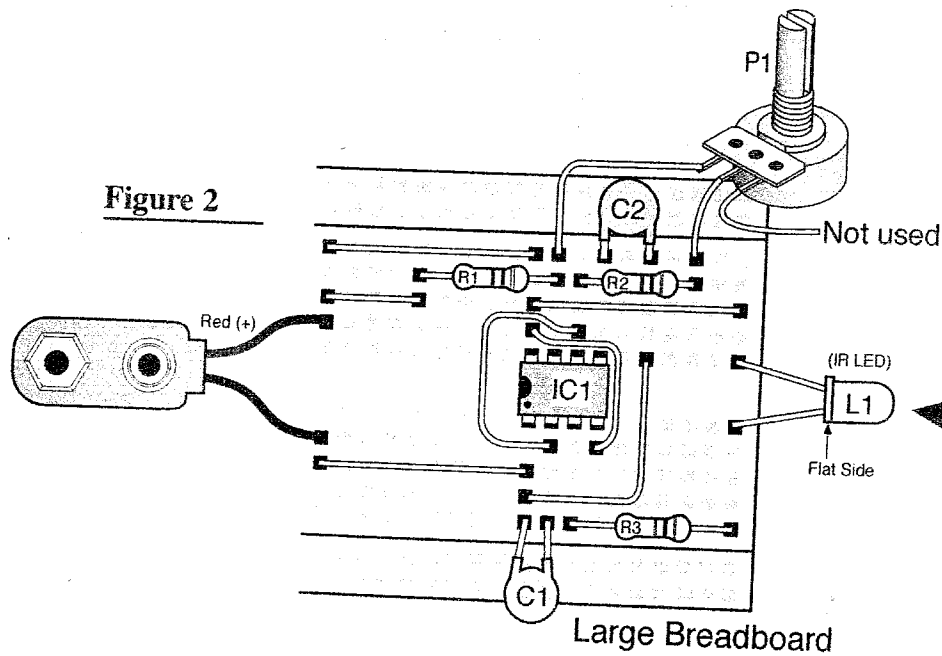


Figure 3

Use the supplied tubing to align the transmitter (Exp. 7) and receiver (Exp. 5) circuits.

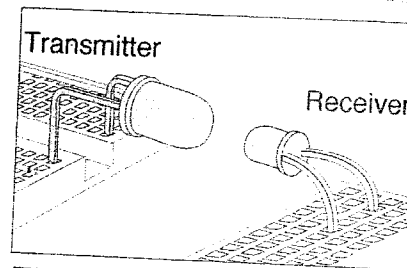


Figure 4

Remove tubing and observe circuit operation through open air.