

## Experiment 8-

### Opto Voice Transmitter

In this experiment you will build an opto voice transmitter that emits an amplitude modulated light beam that carries the audio signal (voice) captured by a microphone. We will use the opto receiver built in experiment 5 to detect and amplify the information (voice) carried in the light beam.

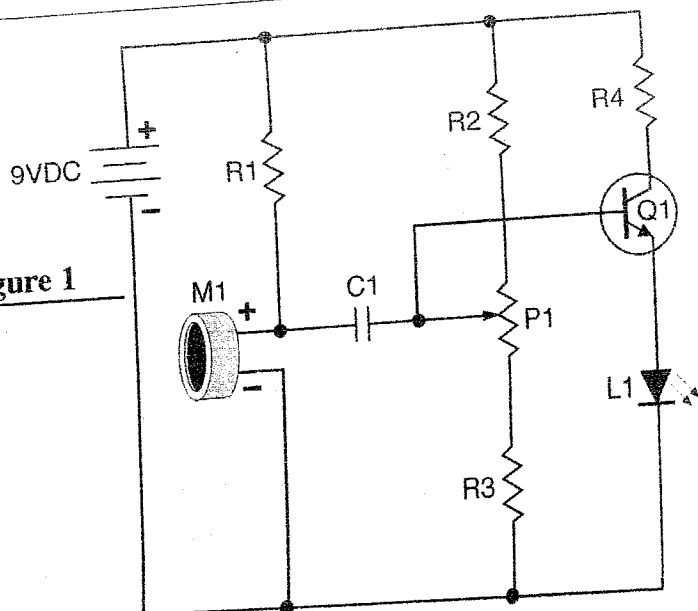
The schematic diagram of this experiment is shown in figure 1. Resistor R1 supplies the electret microphone M1 with positive voltage needed to operate. The audio signal produced by microphone M1 is sent to the base of transistor Q1 through capacitor C1. Resistors R2, R3 and potentiometer P1, are used to supply a bias voltage to the base of Q1. With potentiometer P1 we will adjust the bias of Q1 for proper operation. Transistor Q1 amplifies the audio signal present on its base producing a large current flowing through its emitter-collector circuit proportional to the audio signal. The flow of this current through LED L1, creates the light beam which varies in amplitude following the variations of the audio signal captured by the microphone. Due to the relatively high frequency of the audio signal (between 100Hz to 10,000Hz approximately) your eyes will not be able to see the variations in the intensity of the light beam. All you will see is a steady light beam going from the transmitter to the receiver. Finally, resistor R4 limits the value of the current flowing through the LED L1 to a safe value.

#### Procedure:

- Assemble the circuit of this experiment according to figures 1 and 2. Be sure to install transistor Q1 and the LED L1 with their flat side in the proper direction, as shown in figure 2. When done, verify that the assembly is correct and install a fresh 9V battery to the snap.
- 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 LED of the transmitter (experiment 8) is facing the phototransistor of the receiver (experiment 5). Insert the LED and the phototransistor in the supplied tubing, as shown in figure 3.
- Set potentiometer P1 of the transmitter in the middle of its range. Start the testing by blowing into the microphone with your lips close to it. It might take a few seconds until you hear the sound from the speaker of the receiver. Adjust potentiometer P1 for maximum volume.

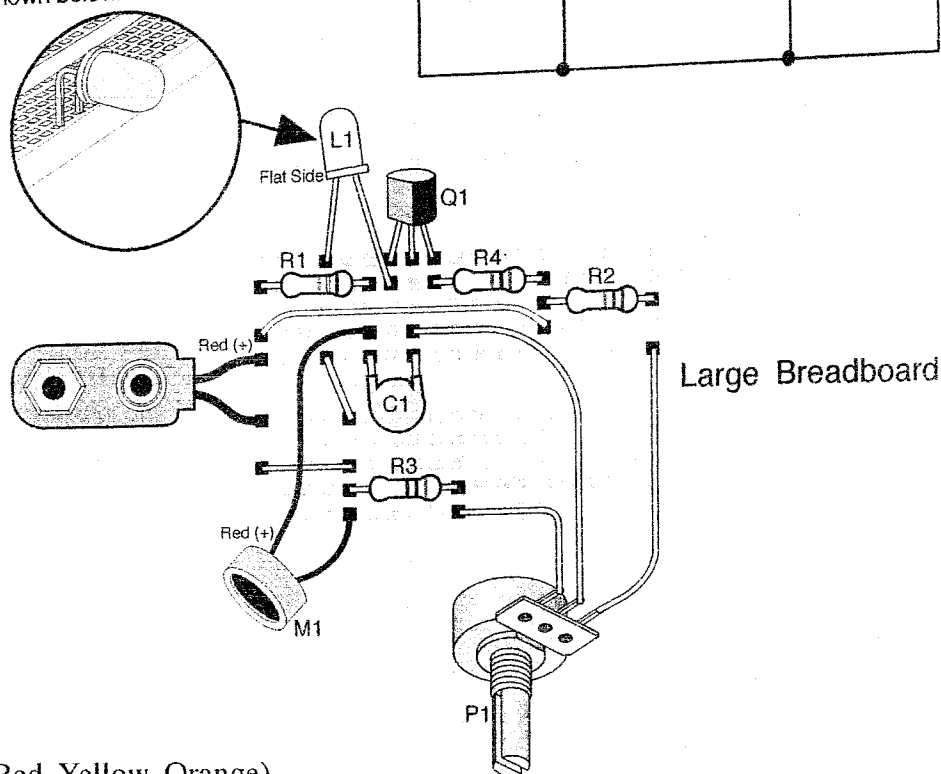
**Note:** After completing this experiment do not disassemble any of the boards as you will need both boards for experiment 9.

Figure 1



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

Figure 2



### Parts List:

**R1:** 24K $\Omega$  Resistor (Red, Yellow, Orange)

**R2:** 220 $\Omega$  Resistor (Red, Red, Brown)

**R3:** 1K $\Omega$  Resistor (Brown, Black, Red)

**R4:** 100 $\Omega$  Resistor (Brown, Black, Brown)

**P1:** 50K $\Omega$  Potentiometer

**M1:** Electret Microphone

**C1:** .1 $\mu$ F Disc Capacitor (104)

**L1:** Clear LED with mark on the case

**Q1:** NPN Transistor: 2N3904

**Misc:** Battery snap, breadboard, wires, and assembled experiment 5.

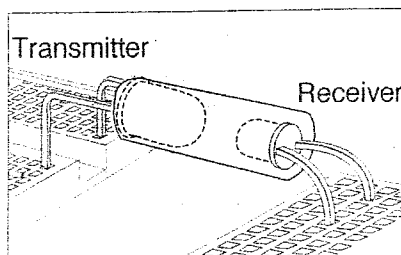


Figure 3

Use the supplied tubing to align the transmitter (Exp. 8) and receiver (Exp. 5) circuits.

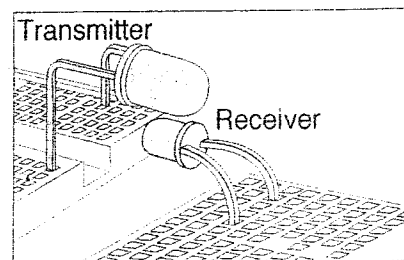


Figure 4

**NOTE:** You may have to place the LEDs on top of each other like this.