

## Experiment 9-

### **Infrared Opto Voice Transmitter**

In this experiment you will build an infrared opto voice transmitter that emits an amplitude modulated infrared light beam, which carries an audio signal (voice) captured by a microphone. This transmitter uses a similar circuitry to the one used in experiment 8. The only difference is that in this experiment we use an infrared LED. This LED produces an infrared light beam that your eyes will not be able to see.

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 infrared light beam which varies in amplitude following the variations of the audio signal captured by the microphone. You will not be able to see the infrared light beam produced by L1. Finally, resistor R4 limits the value of the current flowing through the LED L1 to a safe value.

#### **Procedure:**

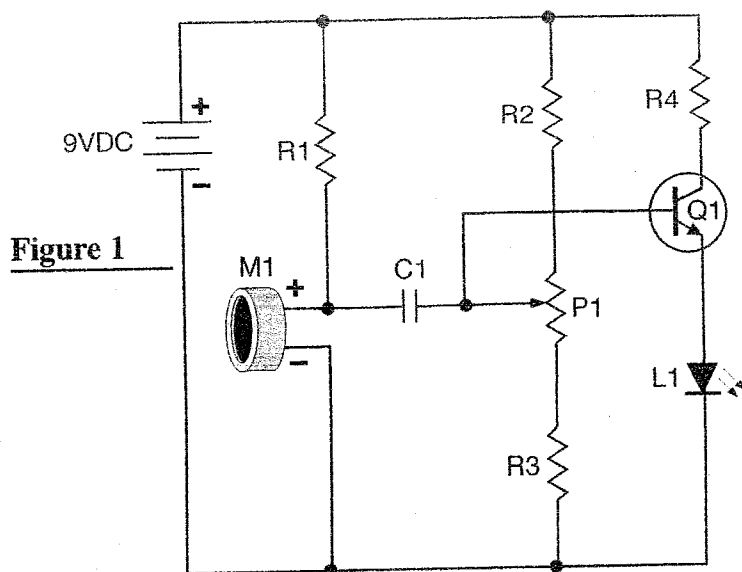
- In this experiment you will not have to build the transmitter circuit shown in figure 2 from the beginning. Instead, you can modify the transmitter you built in experiment 8 by replacing the clear red LED with the infrared LED. Notice the location of the flat side of the IR LED shown in figure 2. When done connect a fresh 9V battery to the battery 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 9) is facing the phototransistor of the receiver (experiment 5). Insert the LED and the phototransistor in the supplied tubing, as shown in figure 3.

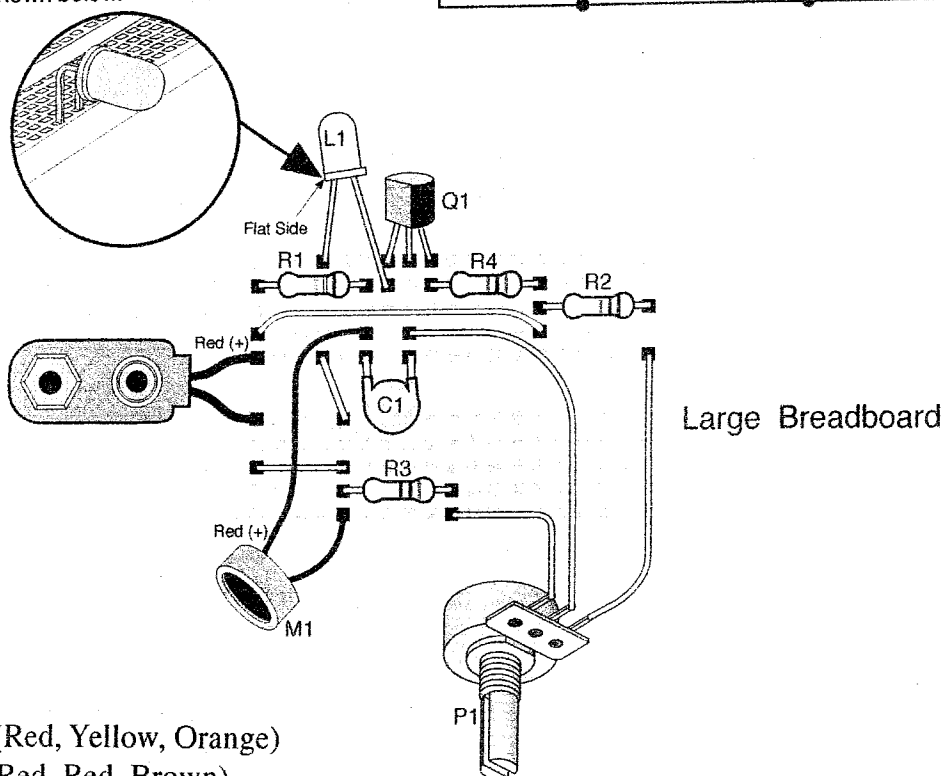
- Set potentiometer P1 of the transmitter in the middle of its range. Start the testing by blowing into the microphone with your lips close to it. It might take a few seconds until you hear the sound from the speaker of the receiver. Adjust potentiometer P1 for maximum volume.

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



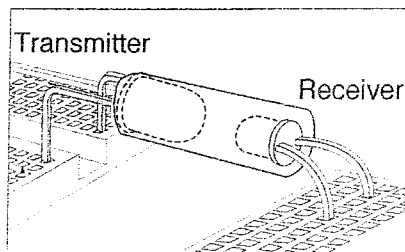
**IMPORTANT NOTE:** Build this project so that the LED extends over the side of the proto-board as shown below.

**Figure 2**



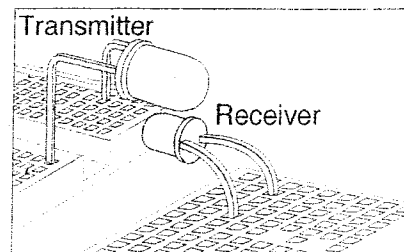
### Parts List:

- 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:** Infrared LED (clear LED)
- Q1:** NPN Transistor: 2N3904
- Misc:** Battery snap, breadboard, wires, and assembled experiment 5.



**Figure 3**

Use the supplied tubing to align the transmitter (Exp. 9) and receiver (Exp. 5) circuits.



**Figure 4**

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