

## Experiment 11-

### Infrared Opto Music Transmitter

In this experiment you will build an infrared opto music transmitter that emits an amplitude modulated light beam that carries the audio signal (music) produced from a tape recorder or CD player. This transmitter uses similar circuitry to the one used in experiment 10, with the only difference 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 on experiment 5 to detect and amplify the information (music) carried in the light beam.

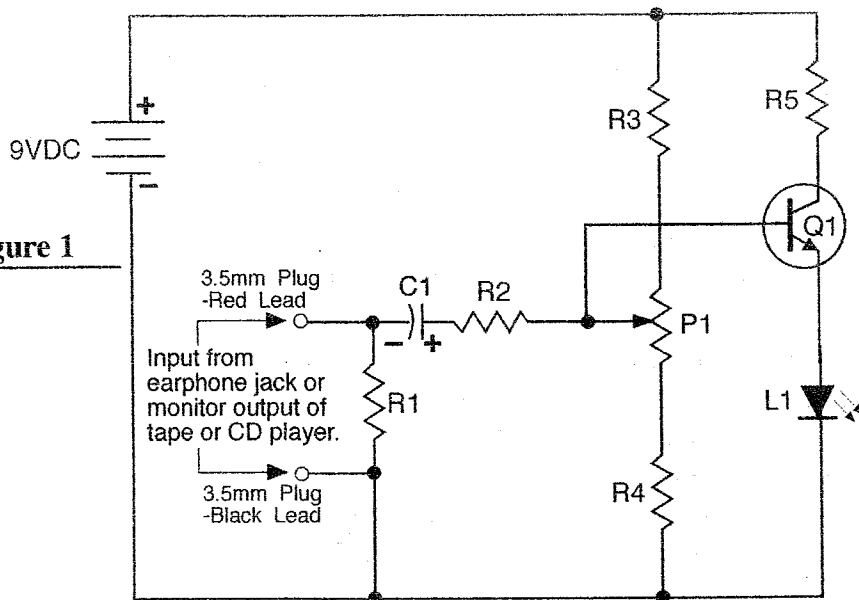
The schematic diagram of this experiment is shown in figure 1. The audio signal from the tape recorder is applied across resistor R1 and sent through capacitor C1 and resistor R2 to the base of transistor Q1. Resistors R3, R4 and potentiometer P1, are used to supply a bias voltage to the base of Q1. 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 from the audio source. Your eyes will not be able to see the light beam produced by the transmitter. Finally, resistor R5 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. Instead, you can modify the transmitter you built in experiment 10 by replacing the clear LED with the infrared LED (IR 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 a tape recorder, CD player, or MP3 player. Insert a cassette/CD, or select a song and play the music. Set the volume control to its middle position. Connect the plug of the transmitter to the earphone output of your audio source, as you do this, you will not hear the music anymore as it is redirected to the earphone output instead of the speaker.
- Take the breadboard with the opto receiver that you assembled in experiment 5. Connect a fresh 9V battery to the snap.
- Align both boards in such manner that the IR LED of the transmitter (experiment 11) is facing the phototransistor of the receiver (experiment 5). Insert the IR LED and the phototransistor into the supplied tubing, as done in previous experiments.
- Set potentiometer P1 of the transmitter in the middle of its range. Adjust potentiometer P1 for maximum volume and minimum distortion. Also adjust the volume control on the player for minimum distortion.

**Note:** After completing this experiment do not disassemble the receiver of experiment 5 as you will need it in future experiments.

Figure 1



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

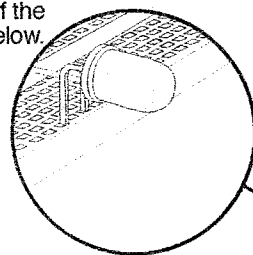
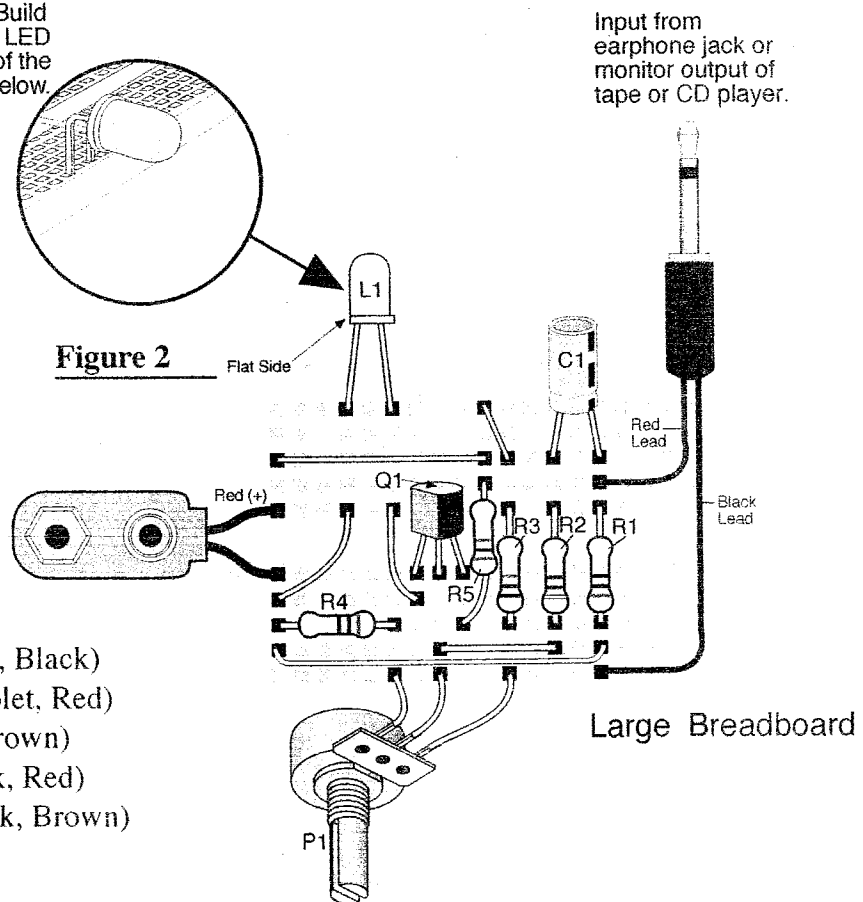


Figure 2



#### Parts List:

- R1:** 10 $\Omega$  Resistor (Brown, Black, Black)
- R2:** 4.7K $\Omega$  Resistor (Yellow, Violet, Red)
- R3:** 220 $\Omega$  Resistor (Red, Red, Brown)
- R4:** 1K $\Omega$  Resistor (Brown, Black, Red)
- R5:** 100 $\Omega$  Resistor (Brown, Black, Brown)
- P1:** 50K $\Omega$  Potentiometer
- C1:** 4.7 $\mu$ F Electrolytic Capacitor
- L1:** Infrared LED (clear LED)