

Experiment 10-

Opto Music Transmitter

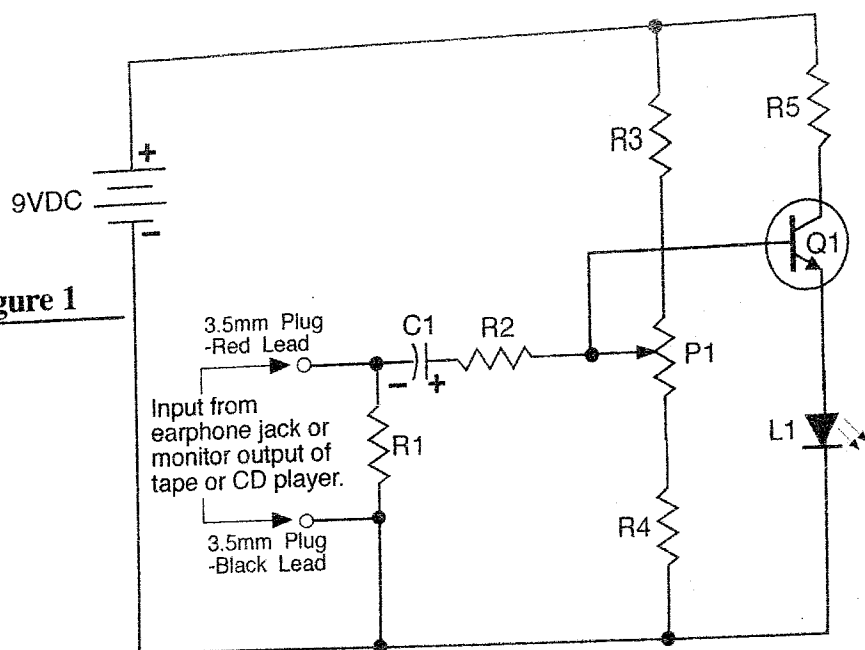
In this experiment you will build an opto music transmitter that emits an amplitude modulated light beam that carries the audio signal (music) produced from a tape recorder, CD player, or MP3 player. We will use the opto receiver built on experiment 5 to detect and amplify the information (music) carried 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 light beam which varies in amplitude following the variations of the audio signal from the audio source. Due to the relatively high frequency of the audio signal (between 50Hz to 15,000Hz 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 R5 limits the value of the current flowing through the LED L1 to a safe value.

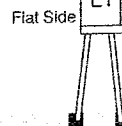
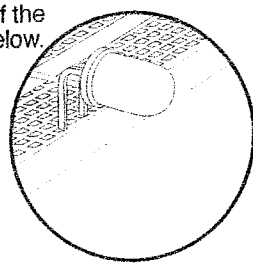
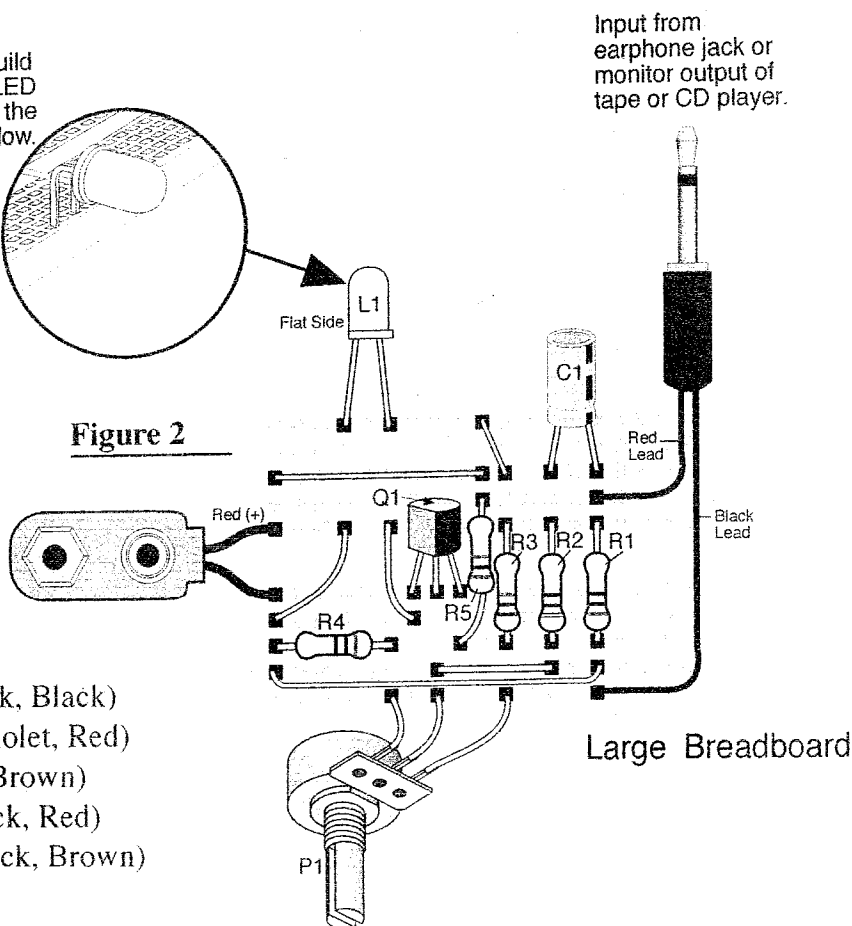
Procedure:

- Assemble the circuit of this experiment according to figures 1 and 2. Be sure to install the 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 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 its snap.
- Align both boards in such manner that the LED of the transmitter (experiment 10) is facing the phototransistor of the receiver (experiment 5). Insert the 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 any of the boards as you will need both boards for experiment 11.

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: 10Ω Resistor (Brown, Black, Black)

R2: 4.7KΩ Resistor (Yellow, Violet, Red)

R3: 220Ω Resistor (Red, Red, Brown)

R4: 1KΩ Resistor (Brown, Black, Red)

R5: 100Ω Resistor (Brown, Black, Brown)

P1: 50KΩ Potentiometer

C1: 4.7μF Electrolytic Capacitor

L1: Clear LED with mark on the case

Q1: NPN Transistor: 2N3904

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