Musical Lasers:

Build Your Own Optical Communication Link!

Materials you will need:

1 red laser diode

1 blue LED

1 USB cable (cut)

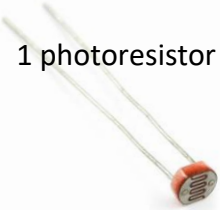
8 wires with clips

1 pair of earbuds

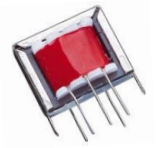
1 audio jack (cut)

1 AA battery

1 photoresistor



1 audio transformer



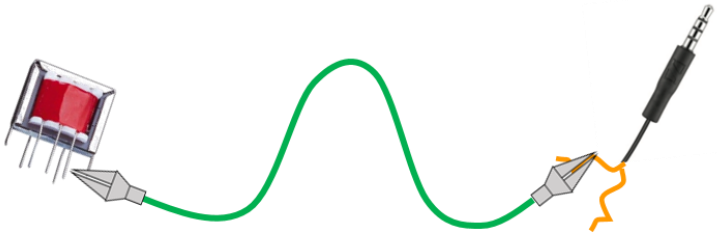
A few pieces of tape

……and your favorite music!

Part 1: Build the transmitter

- ☐ Using one of your 8 wires, connect one of the bare wires of the cut audio jack cable to pin #4 of your audio transformer (see figure 1)

  *Tip: To connect two components, clip one end of a wire to the first part and the clip at the other end of the wire to the second part, like so:



- ☐ Now connect the other audio cable wire to pin #6

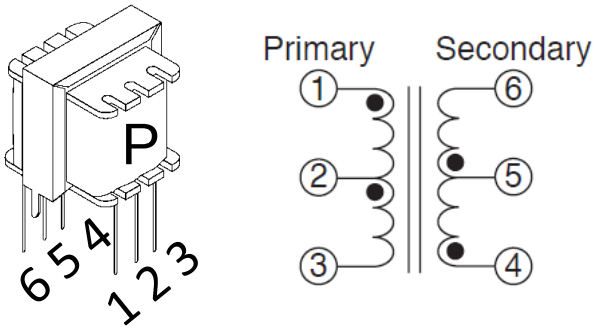


Figure 1. The “primary” side of your audio transformer has a “P” printed on it.

- ☐ Connect the negative wire of the USB cable (black in figure 2) to pin #1

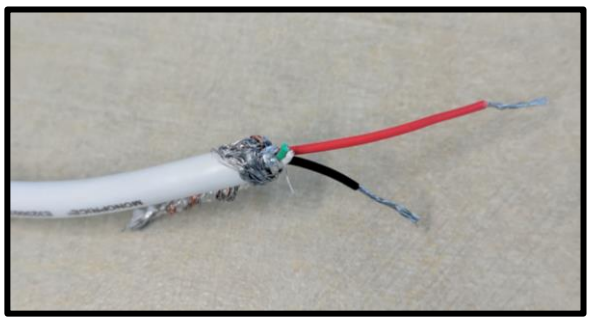


Figure 2. The positive (red) and negative (black) wires of the USB cable.

- Connect the negative wire of the laser diode (blue) to pin #3
- Connect the positive wire of the laser diode (red) to positive wire of the USB cable (red wire in figure 2)
- Plug the USB connector in to the provided adapter – your laser should turn on!

CAUTION: Do not point the laser directly at your eye! Do not point the laser at anyone else!

Part 2: Build the receiver

- Connect one of the photoresistor pins to the negative side of the AA battery (use some tape to secure the clip against the battery contact

  *Tip: Make sure the tape is very tight or a good connection will not be made!

- Now connect the other photoresistor pin to the negative contact on the audio jack on your **earphones** (see figure 3)
- Connect the positive side of the earphone jack to the positive end of the AA battery

  *Tip: make sure your clips at the earphones' audio jack are not touching one another!

Figure 3. Earphone connections.

Part 3: Play that funky music!

- Plug the transmitter audio jack into your music playing device and pop in those earphones
- Point the laser at the photoresistor and turn the volume on your music player to maximum
- If the volume is very low, try a different (brighter) laser diode or switch to the blue LED which is much brighter

  *Tip: If the LED does not turn on when you connect it to your circuit, try swapping the connections to the leads (wires coming out of the LED)

Troubleshooting tips:

- Check to make sure that all connections are in proper contact
- Check that nothing is in contact that shouldn't be (shorted)
- Tape your parts down to the table if it helps to keep things in place
- If the laser will not turn on, try a new one
- If the receiver is not working, try a new audio transformer or photoresistor
- Make sure the connections to your AA battery are very secure – if they are not tight enough, a good connection will not be made. To check this, press on the ends of the battery with your forefinger and thumb and listen for music or static. If you can hear anything in the earphones, your battery is connected correctly.

Experiments you can try!

- How far away from the photoresistor can you take the laser and still hear your music?
- Try hooking up and LED in place of the laser and repeat the above experiment. How do the laser and LED compare?