Test 12 V Relay and Photo Resistor

1. Place the relay on the breadboard, add five short wires for the coil, Common, NC (Normally Closed), and NO (Normally Open).
2. Connect a DMM (set to Ohm measurement) across the coil as shown in Figure 1. Record the measured coil resistance.

\[ R_{\text{coil}} = \quad \text{Ohms} \]

![Figure 1. Relay coil](image)

3. Turn on power supply, then adjust power supply (0 to 20V) to 12 V, and then turn off the power supply.
4. Connect the relay coil to + and – output of the 12V power supply, then turn on the power supply, as shown in Figure 1. Observe the relay clicking to note that the relay is working.
5. Turn off the power supply, then change the + and – supplying wires connected to the relay. Turn on the power supply. Observe the relay clicking to note that the relay is functioning.
6. Turn off the power supply. Add a mA meter in between the + terminal of power supply and one side of the coil, as shown in Figure 2.
7. Set the DMM to Ohm measurement; connect the two probes to the CdS Photo resistor, as shown in Figure 3. Then cover the CdS to measure the dark resistance, then remove the cover to measure the light resistance.

8. Turn off power supply, connect the CdS, 20 kΩ resistor, and 25 kΩ pot as shown in Figure 4 on the bread board, then turn on the power to measure dark voltage $V_{th}$, and light voltage $V_{th}$.

**Figure 2. Relay coil current measurement**

**Figure 3. Photo Resistor – dark and light resistance measurement**

**Figure 4. Diagram showing connection of CdS, resistor, and potentiometer**
Configure and Photo Switch
1. Study the Photo Switch as shown in Figure 5.
2. Place all the part on the bread board to form the circuit of Figure 5.
   a) Make sure light is on the surface of the CdS. If relay is not energized, increase R2 to turn relay on. Measure light voltage Vth = ______ volts,
   b) Make sure light is not on the surface of the CdS. If relay is energized, decrease R2 to turn relay off. Measure dark voltage Vth = ______ volts.
3. Remove power supply, disconnect emitter and power supply to the 12 V relay coil. Then connect one end of the CdS to ground, as shown in Figure 6. Make sure the same light is on the surface of the CdS. Measure the \( R_{TH} = \) ______ Ohms.

Figure 5. Photo Switch Circuit – Rth measurement during light on condition

4. Form the equivalent circuit as shown in Figure 7 for the situation where the light is on the CdS.

Figure 7. Equivalent Circuit of Photo Switch – when light is on the surface of the CdS

a) Compute input current \( I_B = \) ______ mA. Using light on Vth from previous measurement, \( V_{BE} = 0.7 \) V, and the input equation \( Vth = I_B R_{TH} + V_{BE} \) to compute \( I_B \),

b) Verify output equation \( V_{cc} = I_c R_{COIL} + V_{CE} \)