

Random Number Generator Explanation

By Yusuf Masood

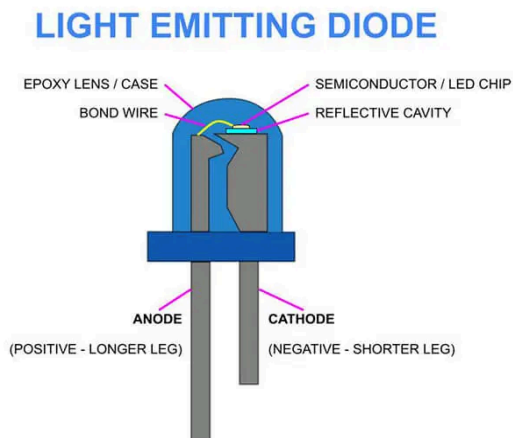
The Random Number Generator is a DIY Kit that is designed to help a person learn to solder. This generator lights up a random LED upon pressing the button to indicate the randomly generated number (from 1 - 10).

This kit comprised of the following components:

Component Name	Quantity
Metal Resistor	4
Aluminum Electrolytic Capacitor	2
Ceramic Capacitor	1
Red LED	10
Transistor	1
Black Tactile Button	1
555 Timer (NE555)	1
Pulse Clock (CD4017)	1
AA*2 Battery Box	1
PCB	1

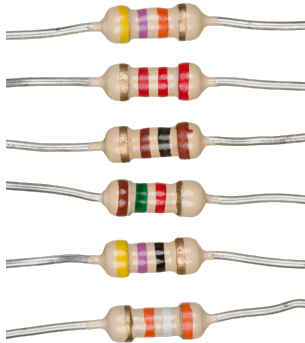
A background of the components used:

LED



LED stands for Light-Emitting Diode. LEDs are semiconductor devices that emit light when current is passed through them. IN the random number generator circuit, the LEDs are being used to display the generated number, as well as display an animation that cycles between all the lights.

Resistor



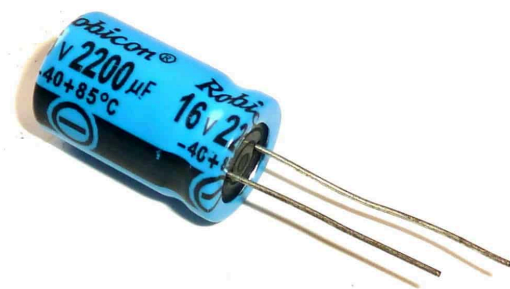
Resistors are electrical components that regulate the flow of current in a circuit. This resistance limits the flow of electrons through a circuit. In our circuit, the resistors are controlling the current that is flowing through the random number generator. This keeps the other components from short circuiting.

Button



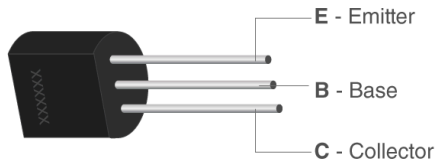
Buttons complete the electrical circuit when pressure is applied to them. When released, the current flow is disconnected. In the random number generator, the button is directing the flow of electrons towards the integrated circuit to generate a new random number.

Capacitor



A capacitor is a component that can temporarily store an electrical charge, and quickly release it. A capacitor discharges much faster than a battery. The random generator circuit utilizes aluminum electrolytic capacitors as well as ceramic capacitors. In our circuit, the capacitor is releasing its charge to slow down the LEDs as they cycle through. This creates the animation that we can see when we push the tactile button.

PARTS OF A TRANSISTOR

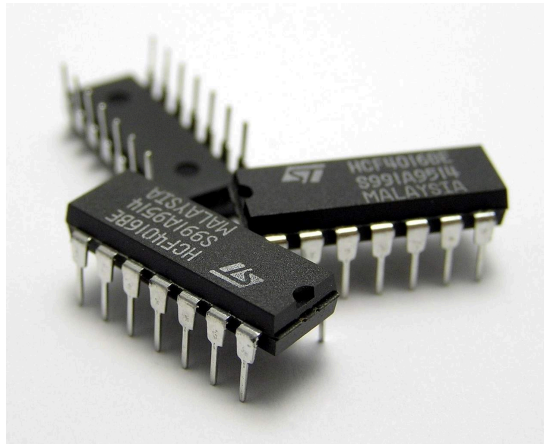


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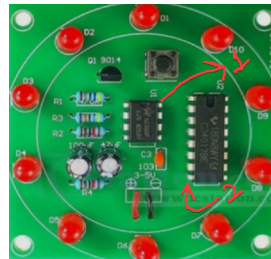
Transistor

Transistors are miniature semiconductors that can amplify and switch electrical signals and power. In our circuit, the transistor is directing the flow of electrons to the desired LED when the tactile button is clicked.

Integrated Circuits



Integrated circuits (or ICUs) are able to process and store information. They are a collection of various electronic components such as resistors, transistors, capacitors, etc. all stuffed and connected into a small chip.



In our circuit, ICU #1 is a timer and ICU #2 is a pulse clock. ICU #2 has 10 outputs that each correlate to the internal count. When the internal count reaches 9,

the next count becomes 0. ICU #1 is a 555 timer that internally has three resistors which divides the current into three paths. These three voltages are then compared to the input voltage which sets or resets an internal flip-flop. A flip-flop is able to store small bits of information.

My circuit diagnosis

When I had finished soldering my components onto my circuit board and I attempted to turn it on via supplying the battery pack with two 2 AA batteries, I noticed that my generator never displayed any sign of life on the LEDs. When I applied voltage via a power supply, the lights turned on and the generator was working. The next day, I decided to desolder the battery holder and attach a new one, as perhaps I had a defective component. Upon desoldering and attempting to see if the circuit worked with a power supply, I realized something had gone wrong as the generator was once no longer working. Using a multimeter, I checked the voltage drop across various components and noticed that each was being supplied a sufficient voltage. The only issue I could imagine is that while placing my circuit into the bag at the end of class, an LED's connection became loose which might have broken the light animation, due to them being connected in series.