**Aim ↬ To implement an LED blinking circuit.**

## Equipment Required ↬

Power supply, LED, resistors, capacitors, breadboard, connecting wires, 555 Timer IC, and jumper wires.

## Theory ↬

An LED blinking circuit, often referred to as the "Lighthouse," involves the periodic turning on and off of an LED, simulating the flashing effect seen in lighthouses. This experiment introduces the concept of time-dependent control in electronics, typically achieved through the use of components like transistors, capacitors, and, most commonly, a 555 timer IC.

A 555-timer IC is an integrated circuit used for timing, pulse generation, and oscillator applications. In an LED blinking circuit, the 555 timer operates in astable mode, where it continuously switches between high (on) and low (off) states, causing the LED to blink at a specific frequency. The timing for this on-off cycle is determined by external components, specifically resistors and a capacitor.

When configured in astable mode, the 555 timer outputs a continuous square wave, alternating between high and low states. The frequency of the blinking LED is controlled by the values of two resistors and a capacitor. The time period for one complete cycle (on + off) is given by the formula:

$$T = 0.0693 \times (R_1 + R_2) \times C$$

The blinking frequency f is:

$$f = \frac{1}{T}$$

In this circuit:

- $R_1$ controls the time the LED is on,
- $R_2$ controls the time the LED is off,
- The capacitor C determines how quickly the circuit charges and discharges, setting the overall timing.

## Procedure ↬

1. Place the 555 timer IC on the breadboard.
2. Connect pin 1 to ground and pin 8 to the positive rail.
3. Attach resistor R1 between pins 7 and 8, and resistor R2 between pins 7 and 6.

4. Connect capacitor C between pin 6 and ground.
5. Link pins 6 and 2 with a jumper wire.
6. Connect the LED in series with a current-limiting resistor from pin 3 (output) to ground.
7. Connect pins 4 and 8 together.
8. Power the circuit and observe the LED blinking.

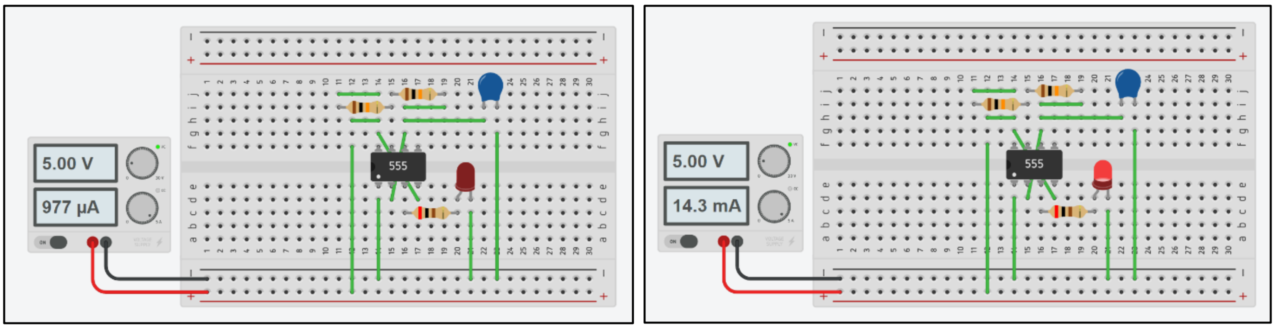


Fig. i) LED Blinking

The impact of the supply voltage is significant; increasing the supply voltage generally increases the current flowing through the LED, leading to a brighter light output until the LED reaches its maximum rated forward current. Conversely, lowering the voltage reduces brightness.

## Calculation ↬

Equipment Values - $R_1 = 10k\Omega,\ R_2 = 10k\Omega,\ C = 100\mu F$

$$T = 0.0693 \times (10 + 10) \times 10^3 \times 100 \times 10^{-6}$$

$$Time\ Period[T] = 0.1386\ sec$$

$$f = \frac{1}{0.1386}$$

$$Blinking\ Frequency[f] = 7.215\ Hz$$

## Result ↬

The LED successfully blinked at regular intervals, demonstrating the use of a 555 timer in astable mode to create a continuous on-off cycle. The blinking frequency depended on the values of the resistors and capacitors.

## Conclusion ↬

This experiment effectively demonstrated the operation of a 555 timer IC in astable mode, where it generates a periodic square wave that controls the blinking of an LED. By adjusting the resistor and capacitor values, the timing and frequency of the LED's blinking can be modified, showcasing the basic principles of timing control in electronics.

## Precautions ↬

- Ensure correct orientation of the 555 timer IC and proper connections.
- Use a suitable current-limiting resistor for the LED to avoid exceeding its maximum current rating.
- Double-check connections to avoid short circuits or incorrect wiring.