Project Report: Traffic Light Signal using IC 555

Introduction:

The aim of this project is to design and construct a model traffic lights circuit using two 555 timer ICs and a few other electronic components. The circuit is capable of simulating the operation of traffic lights, with the green LED turning on for a specific duration, followed by the yellow LED for a brief moment, and finally the red LED for a duration similar to that of the green LED. This cyclic pattern then repeats.

Components Required:

1. 2 x 555 Timer ICs
2. LEDs: 1 Red, 1 Yellow, 1 Green
3. Resistors: 100K, 47K, 2 x 330R, 180R
4. Capacitors: 2 x 100uF
5. Breadboard
6. Few Breadboard Connectors
7. (5-12)V Power Supply

Circuit Diagram:

A detailed circuit diagram for the model traffic lights circuit can be found in the provided 4image. It showcases the connections between the components, ICs, LEDs, and the necessary resistors and capacitors.
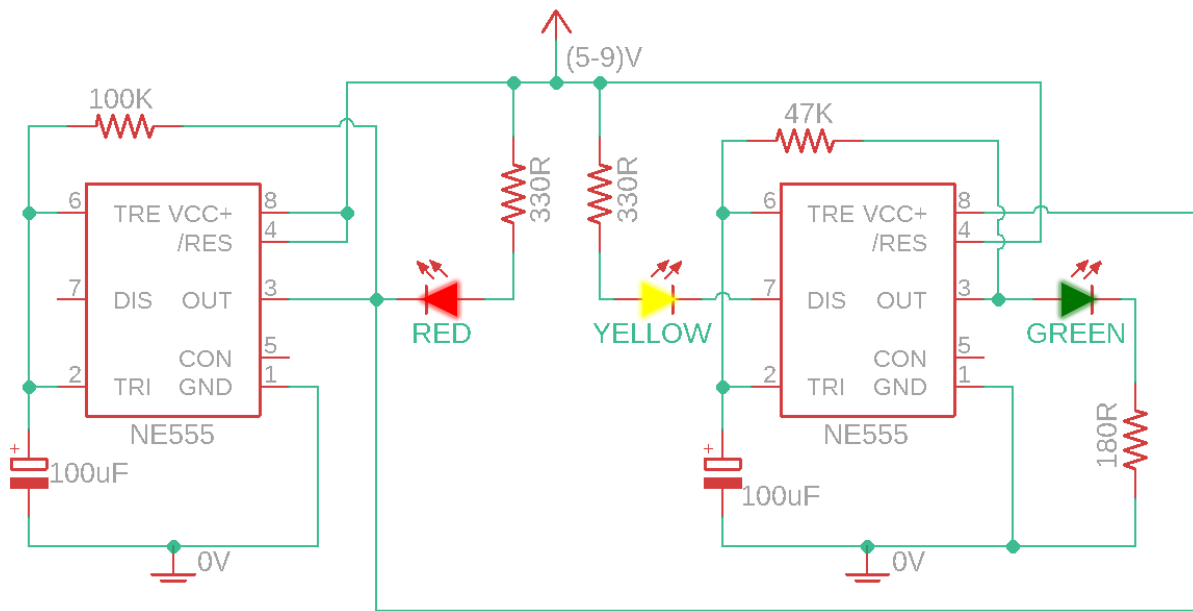
Circuit Operation:

The circuit consists of two 555 timer ICs, capacitors, resistors, and three LEDs (red, yellow, and green). Let's analyze the circuit's operation step-by-step:

- The circuit utilizes two astable circuits, with the first astable circuit powering the second. The second 555 timer IC is only powered if the output of the first 555 timer IC is on.

- The red LED is connected in such a way that it turns on only when the output of the first 555 timer IC is at 0V. This is achieved by connecting the other terminal of the red LED to a positive voltage source. Therefore, when the first 555 timer IC's output is high, the red LED remains off.

- During the discharge mode of the second 555 timer IC, the yellow LED turns on. This occurs when the discharge pin of the second 555 timer IC is activated.

- The green LED turns on whenever the output of the second 555 timer IC is at a positive voltage.

- Upon initially powering on the circuit, the output of the first 555 timer IC is in the ON state. This is because the voltage at PIN-3 (Trigger Pin) is less than 1/3rd of the supply voltage. At this point, the red LED cannot turn on, but the second 555 timer IC is powered, resulting in the green LED turning on.

- The capacitor of the second 555 timer IC gradually charges, and when it reaches 2/3rd of the supply voltage (Threshold Voltage), the output of the second 555 IC turns off. This activates the discharge pin, causing the yellow LED to glow.

- Typically, the yellow LED would turn on for the same duration as the green LED. However, even before the capacitor of the second 555 timer IC reaches 1/3rd of the supply voltage, the voltage across the capacitor of the first 555 timer IC reaches 2/3rds of the supply voltage. Consequently, the output of the first 555 IC turns off, resulting in the yellow LED turning off and the red LED turning on.

- This cycle of operation repeats continuously, simulating the behavior of a traffic light system.

Conclusion:

In conclusion, the model traffic lights circuit using 555 timer ICs provides a simple yet effective simulation of a traffic light system. By utilizing two 555 timer ICs, the circuit accurately controls the timings of the LEDs to mimic the sequential operation of traffic lights. This project serves as a practical and educational demonstration of the functionality of the 555 timer IC and its application in designing traffic light systems.