

# AMERICAN INTERNATIONAL UNIVERSITY- BANGLADESH

Faculty of Engineering

## Lab Report



### Experiment # 03

### Experiment Title: Timers: Implementation of a traffic control system

<b>Course Title:</b>	MICROPROCESSOR AND EMBEDDED SYSTEMS LAB		
<b>Course Code:</b>	COE3104	<b>Section:</b>	A
<b>Semester:</b>	Spring 2022-23	<b>Degree Program:</b>	BSc in CSE/BSc in EEE
<b>Course Teacher:</b>	Md. Ali Noor		

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## **Abstract**

The main goal of this experiment is to familiarize with timers in micro-controllers to study the blink test using and implement a traffic control system. In this experiment, the software named Arduino IDE and Tinkercad was used. The first one was done with the help of Arduino IDE software with hardware set up in the lab session. Another method was done by Tinkercad software at home. By using Tinkercad software, the simulation was conducted.

## **Objectives**

The objectives of this experiment are to-

1. Familiarize with timers in micro-controller
2. Implement a simple traffic control system using timers.

## **Equipment List**

1. Arduino Uno
2. Breadboard
3. LED lights (red, yellow, green)
4. Jumper wires
5. Resistors(220 ohms)
6. Arduino IDE
7. Tinkercad

## Circuit Diagram

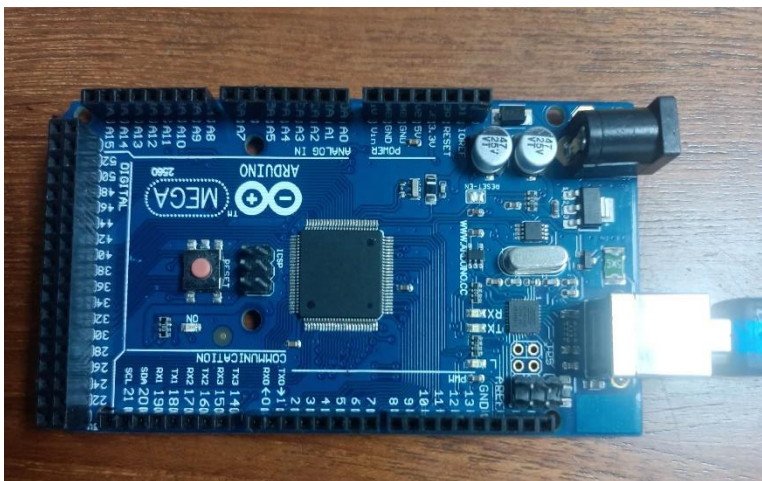


Figure 1: Arduino Board

## Hardware Setup

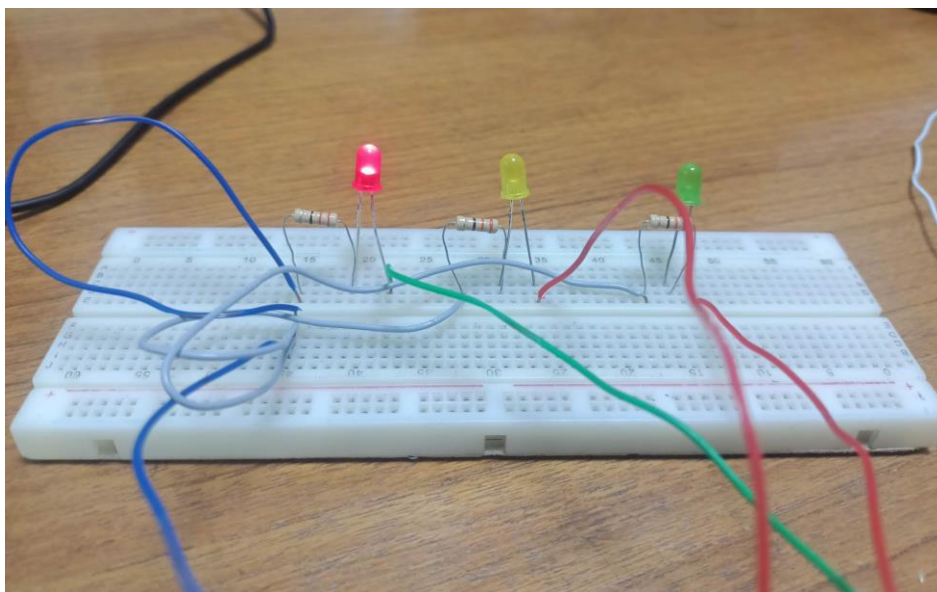


Figure 2: When the Red light is ON

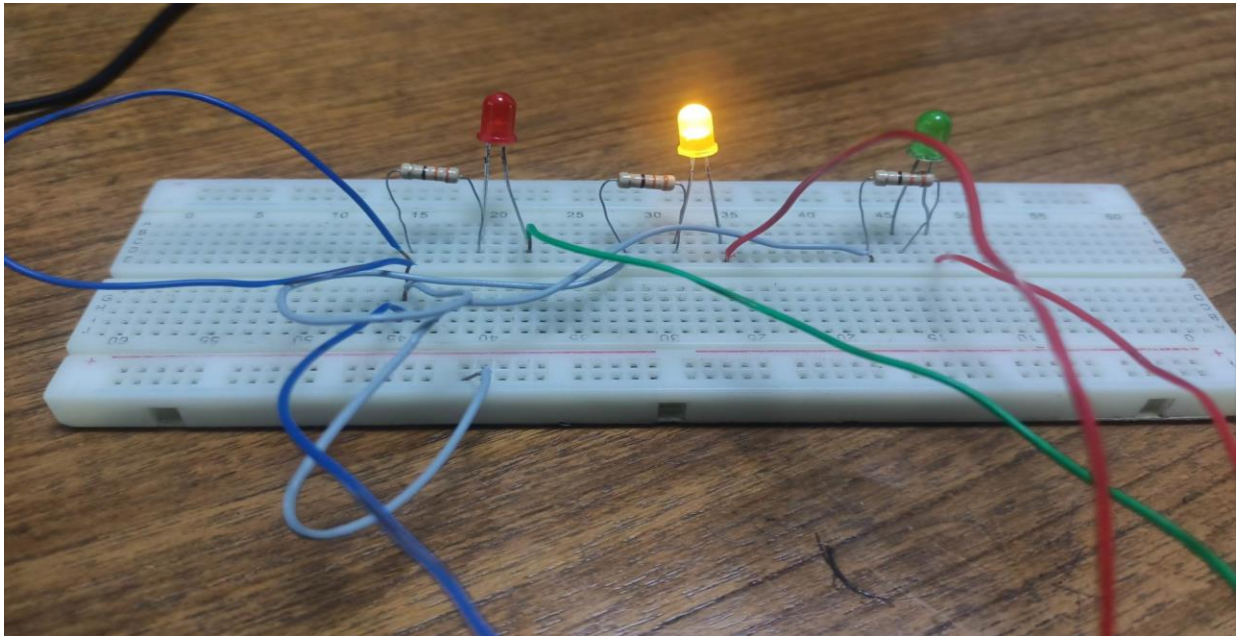


Figure 3: When Yellow light is ON

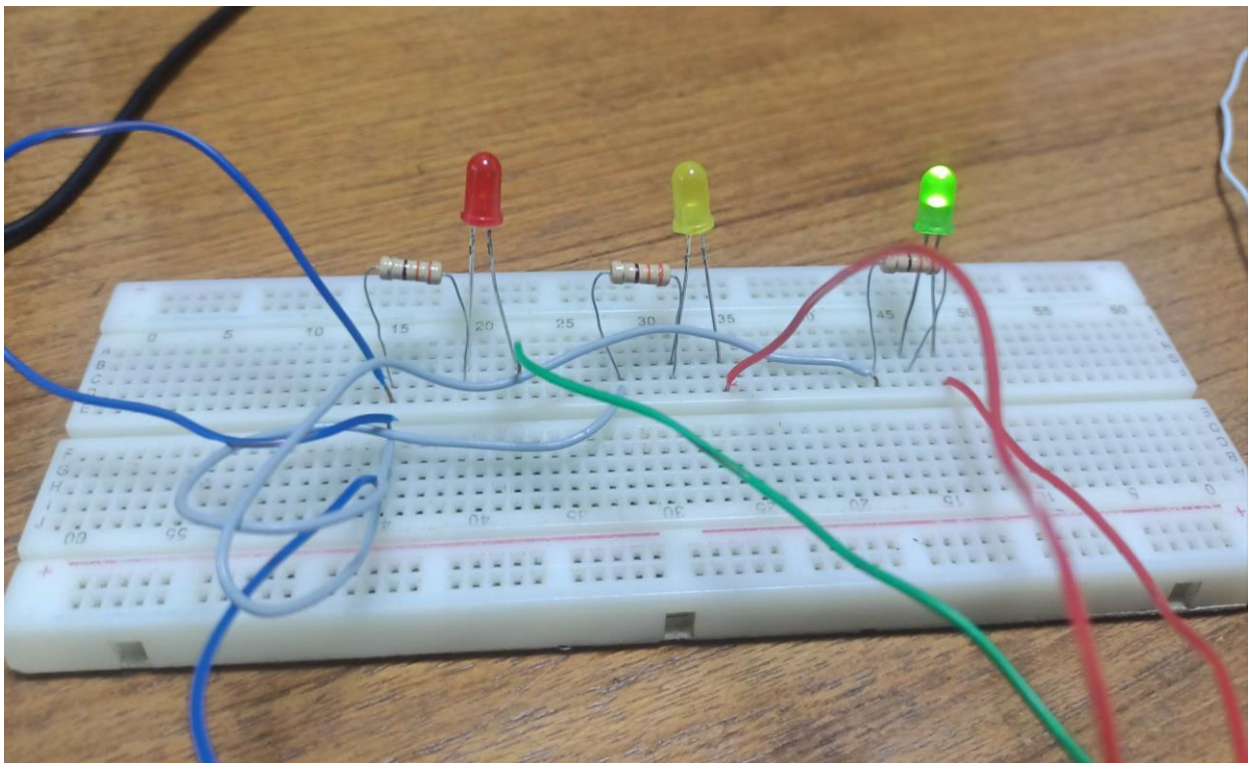


Figure 4: When Green light is ON

## Explanation Of Code

```
#define RED_PIN 8 //define name of pins used

#define YELLOW_PIN 10

#define GREEN_PIN 12

//define the delays for each traffic light color

int red_on = 3000; //3s delay

int red_yellow_on = 1000; //1s delay

int green_on = 3000; //3s delay

int green_blink = 500; //5s delay

int yellow_on = 1000; //1s delay

int delay_timer (int milliseconds)

{

    int count = 0;

    while(1)

    {

        if(TCNT0 >= 15) // Checking if 1 millisecond has passed

        {

            TCNT0=0;

            count++;

            if (count == milliseconds) //checking if required milliseconds delay has passed

            {

                count=0;

                break; // exits the loop

            }

        }

    }

    return 0;
```

```

}

void setup() {

  //define pins connected to LEDs as outputs

  pinMode(RED_PIN, OUTPUT);

  pinMode(YELLOW_PIN, OUTPUT);

  pinMode(GREEN_PIN, OUTPUT);


  //set up timer

  TCCR0A = 0b00000000;

  TCCR0B = 0b00000101; //setting pre-scaler for timer clock

  TCNT0=0;

}

void loop() {

  //to make red LED on

  digitalWrite(RED_PIN, HIGH);

  delay_timer(red_on);

  //to turn yellow LED on

  digitalWrite(YELLOW_PIN, HIGH);

  delay_timer(red_yellow_on);

  //turning off RED_PIN and YELLOW_PIN, and turning on greenLED

  digitalWrite(RED_PIN, LOW);

  digitalWrite(YELLOW_PIN, LOW);

  digitalWrite(GREEN_PIN, HIGH);

  delay_timer(green_on);

  digitalWrite(GREEN_PIN, LOW);


  //for turning green Led on and off for 3 times

  for(int i = 0; i < 3; i = i+1)

```



```

{
delay_timer(green_blink);

digitalWrite(GREEN_PIN, HIGH);

delay_timer(green_blink);

digitalWrite(GREEN_PIN, LOW);

}

//for turning on yellow LED

digitalWrite(YELLOW_PIN, HIGH);

delay_timer(yellow_on);

digitalWrite(YELLOW_PIN, LOW);

}

```

## Simulation Results

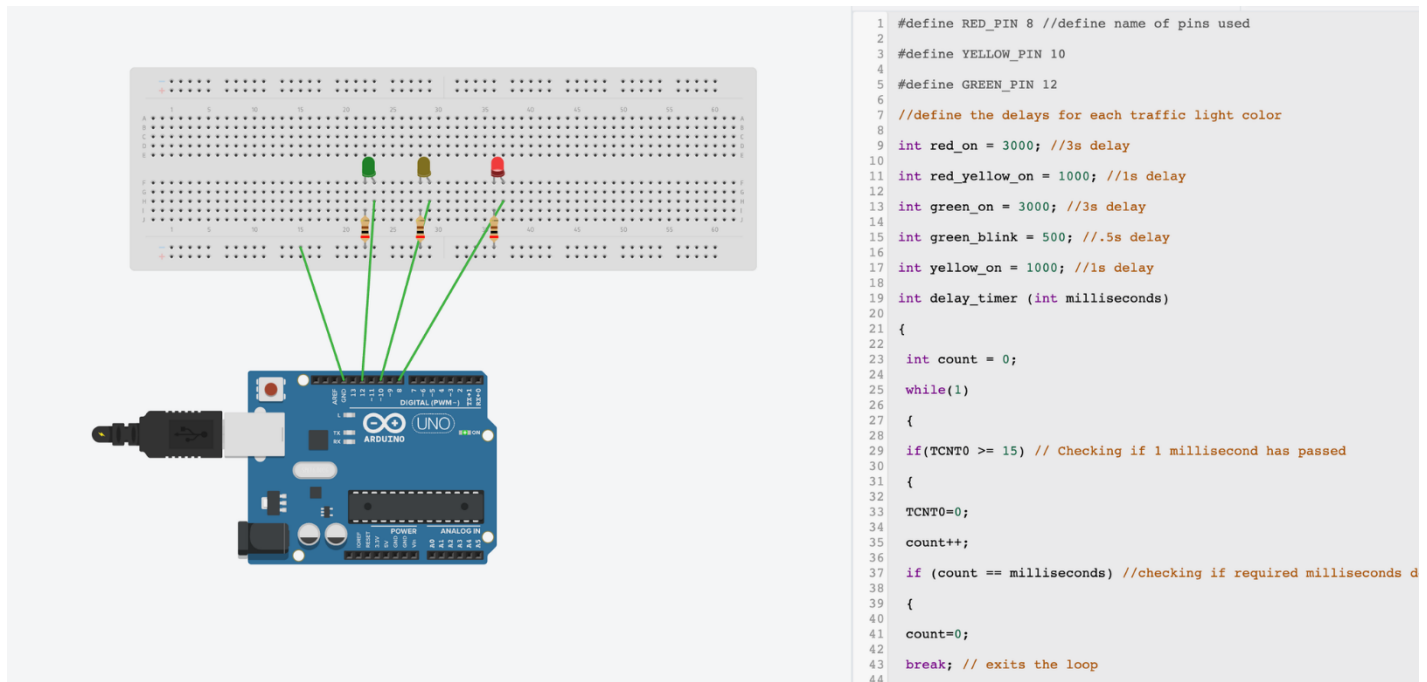


Figure 5: When Red Light ON



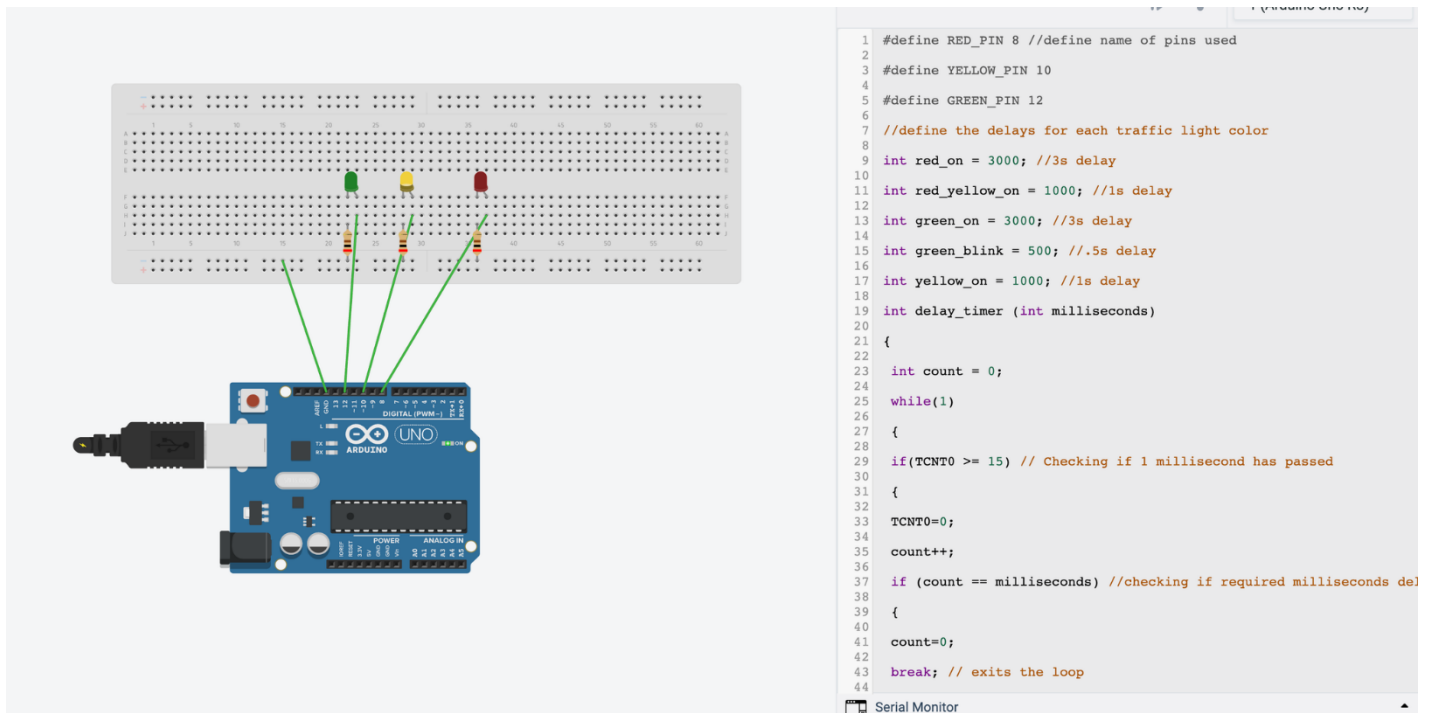


Figure 6: When yellow Light ON

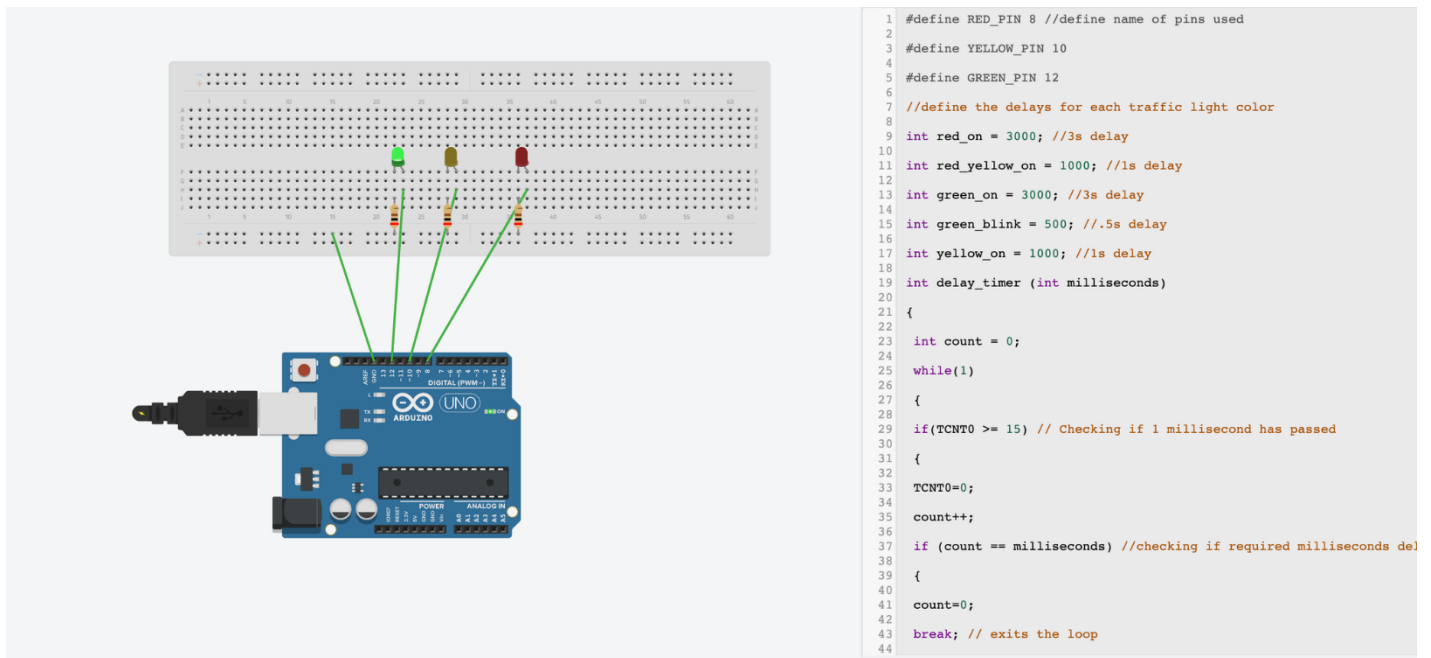


Figure 7: When green Light ON

## Discussion

This experiment was carried out in two ways. First, by using an Arduino board, three colored animated LED lights (red, yellow, and green), three resistors breadboard, and connecting wires, the traffic control system were created. After that, the LED lights (red, yellow, and green) were connected to ports 8, 10, and 12. Then some code was written for the traffic control system on Arduino IDE with timers. Then the Arduino board was connected to the computer and the code was run to get the traffic light result. Another way this experiment was done was with the help of Tinkercad software. At the time of doing this experiment, some issues were faced. The issues were some pin configuration mistakes and some errors in code. But these issues were solved with the help of a lab manual and the internet. In both ways, the result for the traffic system was obtained successfully.

## References

- 1) American International University Bangladesh-(AIUB) Lab Manual.
- 2) <https://youtu.be/m0Np5J6MMI0>
- 3) <https://www.avrfreaks.net/forum/tut-c-newbies-guide-avr-timers>
- 4) <http://maxembedded.com/2011/06/avr-timers-timer0>