

Objective: The objective of this lab was to become familiarized with the Arduino system, the Arduino IDE, and the proper way to measure time on the Arduino.

Prelab: Code was uploaded to the canvas prior to the lab.

Part 1) First program was debugged and executed in the lab. The goal of part 1 was to create a program on the Arduino that would flash a light every second. This was done by setting a variable, `LedTimer = millis()`. `millis()` is the number of milliseconds since the program began. Next, the program would check if the value of `millis - LedTimer` was greater than 1000 milliseconds (One second) and then toggle the output on the pin accordingly. The lab instructor verified the pulsing led. The debugged code is included in Appendix A.

Part 2) The program was adapted to also blink a second pin, pin 12, every three seconds by creating a second `LedTimer` value and setting it equal to `millis()`. This required a second if statement to check if `millis() - LedTimer3` had a value of 3000 or greater before changing the value of pin 12. The debugged code is included below in Appendix B.

Appendix A: Code for Part 1.

unsigned long LedTimer; // => creates an unsigned long and names it LedTimer, it does not have a value yet.

// => start of a method named setup that does not return a value

void setup() {

pinMode(13, OUTPUT); // => Specifies pin 13 as an output pin

LedTimer = millis(); // => sets the value of LedTimer to the value of millis. The value of millis is the number of milliseconds since the Arduino board began running the current program.

} // => This marks the end of the method

void loop() { if(millis() - LedTimer >= 1000) { // => if the number of milliseconds since the Arduino board began running the current program (millis) - the value of the LedTimer >= 1000 then the value of this statement will evaluate to true, else false

if(digitalRead(13) == HIGH) { // => reads the value from pin thirteen and checks if it is HIGH
digitalWrite(13, LOW); // => if the pin is high, it will change the value of pin 13 to LOW

}

else { // => if the value of pin 13 is not high this block of code will be ran

digitalWrite(13, HIGH); Will write a high output to pin 13

} // => marks the end of the else block of code

```
    LedTimer += 1000; // => adds 1000 to the value of LedTimer

    } // => end of if statement (millis() - LedTimer >= 1000

} // => end of loop method
```

Appendix B: Code for Part 2.

```
unsigned long LedTimer;

unsigned long LedTimer3;

// =>

void setup() {

    pinMode( 13, OUTPUT ); // =>

    pinMode( 12, OUTPUT );

    LedTimer = millis(); // =>

    LedTimer3 = millis();

} // =>


// =>

void loop()

{

    if ( millis() - LedTimer >= 1000 )

    { // =>

        if( digitalRead(13) == HIGH )

        { // =>

            digitalWrite( 13, LOW ); // =>

        }

        else

        { // =>

            digitalWrite( 13, HIGH );

        } // =>

    }

}
```

```
if (millis() - LedTimer3 >= 3000) {  
    if( digitalRead(12) == HIGH )  
    { // =>  
        digitalWrite( 12, LOW );    // =>  
    }  
    else  
    { // =>  
        digitalWrite( 12, HIGH );  
    }  
}  
  
LedTimer += 1000; // =>  
  
LedTimer += 1000;  
} // =>  
  
} // =>
```