

Lab no 01: Traffic Light Prototype LEDs and Seven-segments display Interfaces

The purpose of this Lab is to learn interfaces with light-emitting diodes (LEDs) and seven-segments display. To do that, you are required to build a prototype for traffic lights using Arduino.

Parts: -

- 1. Install Arduino IDE.
- 2. Interface light-emitting diodes and code Arduino to control LEDs.
- 3. Interface the seven-segments display and code Arduino to control them.
- 4. Integrate LEDs with the seven-segments display to build a prototype for a traffic light system.



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(a	application.exe). Do	uble-click the i	con to start tl	ne IDE.			
 Once the software starts, you have two options – Create a new project. 							
	• Open an existing project example.						
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To avoid any error while uploading your program to the board, you must select the correct Arduino board name, which matches with the board connected to your computer.

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	Board: "Arduino Uno"	+		Arduino Mega 2560 or Mega ADK	
	Serial Port	•		Arduino Mega (ATmega1280)	
	USB Type	+		Arduino Leonardo	
	CPU Speed	+		Arduino Esplora	
	Keyboard Layout	•	►	Arduino Micro	
	Programmer	•		Arduino Mini w/ ATmega328	
	Burn Bootloader			Arduino Mini w/ ATmega168	
				Arduino Ethernet	
				Arduino Fio	
				Arduino BT w/ ATmega328	
				Arduino BT w/ ATmega168	
				LilyPad Arduino USB	
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4				LilyPad Arduino w/ ATmega168	
				Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega3	
				Arduino Pro or Pro Mini (51/ 16 MHz) w/ ATmenal	

Go to Tools \rightarrow Board and select your board.

5 Select the serial device of the Arduino board. Go to $Tools \rightarrow Serial Port menu$. This is likely to be COM3 or higher (COM1 and COM2 are usually reserved for hardware serial ports). To find out, you can disconnect your Arduino board and re-open the menu, the entry that disappears should be of the Arduino board. Reconnect the board and select that serial port.



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		Serial Monitor	Ctrl+Shift+M		
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6 Before explaining how we can upload our program to the board, we must demonstrate the function of each symbol appearing in the Arduino IDE toolbar.



- A Used to check if there is any compilation error.
- B Used to upload a program to the Arduino board.
- C Shortcut used to create a new sketch.
- D Used to directly open one of the example sketch.
- E Used to save your sketch.



F – Serial monitor used to receive serial data from the board and send the serial data to the board.

Now, simply click the "Upload" button in the environment. Wait a few seconds; you will see the RX and TX LEDs on the board, flashing. If the upload is successful, the message "Done uploading" will appear in the status bar.

```
-----
```

Part 2. Interface LEDs.

a) <u>Connection</u>

Requirements

- 1. Red and green LEDs.
- 2. A breadboard.
- 3. Connecting wires.
- 4. 3 x 10k ? resistor



Connect the anode (long leg) of each LED to digital pins eight, nine, and ten (via a 220? resistor). Connect the cathodes (short leg) to Arduino ground.



b) Arduino Code

```
int red = 10;
int green = 11;
void setup() {
  pinMode(red, OUTPUT);
  pinMode(green, OUTPUT);
  }
void loop() {
    digitalWrite(red, HIGH);
    digitalWrite(green, LOW);
    delay(20000);
    digitalWrite(red, LOW);
    digitalWrite(green, HIGH);
    delay(40000);
}
```

Part 3. Interface the seven-segments display.



Common anode vs common Cathode



a) <u>Connection</u>



b) Connect the pins as described below:

- 1. Arduino Pin 2 to Pin 9.
- 2. Arduino Pin 3 to Pin 10.
- 3. Arduino Pin 4 to Pin 4.
- 4. Arduino Pin 5 to Pin 2.
- 5. Arduino Pin 6 to Pin 1.
- 6. Arduino Pin 8 to Pin 7.
- 7. Arduino Pin 9 to Pin 6.
- 8. GND to Pin 3 and Pin 8 each connected with 220 ohm resistors.



```
c) Arduino Code
int a = 2;
int b = 3;
int c = 4;
int d = 5;
int e = 6;
int f = 8;
int q = 9;
void setup() {
 pinMode(a, OUTPUT); //A
 pinMode(b, OUTPUT); //B
 pinMode(c, OUTPUT); //C
 pinMode(d, OUTPUT); //D
 pinMode(e, OUTPUT); //E
 pinMode(f, OUTPUT); //F
 pinMode(q, OUTPUT); //G
}
void displayDigit(int digit)
{
 //Conditions for displaying segment a
 if(digit!=1 && digit != 4)
 digitalWrite(a,HIGH);
 //Conditions for displaying segment b
 if(digit != 5 && digit != 6)
 digitalWrite(b,HIGH);
 //Conditions for displaying segment c
 if(digit !=2)
 digitalWrite(c,HIGH);
```

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```
//Conditions for displaying segment d
 if(digit != 1 && digit !=4 && digit !=7)
digitalWrite(d, HIGH);
 //Conditions for displaying segment e
 if (digit == 2 || digit ==6 || digit == 8 || digit==0)
 digitalWrite(e,HIGH);
 //Conditions for displaying segment f
if(digit != 1 && digit !=2 && digit!=3 && digit !=7)
digitalWrite(f,HIGH);
 if (digit!=0 && digit!=1 && digit !=7)
digitalWrite(g,HIGH);
void turnOff()
{
 digitalWrite(a,LOW);
 digitalWrite(b,LOW);
 digitalWrite(c,LOW);
 digitalWrite(d,LOW);
 digitalWrite(e,LOW);
 digitalWrite(f,LOW);
  digitalWrite(g,LOW);
void loop() {
 for(int i=0;i<10;i++)</pre>
 { displayDigit(i);
   delay(1000);
 turnOff();
```



Part4. Integrate LEDs and seven-segments display to build <u>a traffic light prototype</u>

Build a prototype for a traffic light system where:

- The red LED turns on for 20 seconds then the green LED turns on for 40 seconds.
- Seven-segments displays seconds.

```
int red = 10;
int green = 11;
int count=0;
int a = 2;
int b = 3;
int c = 4;
int d = 5;
int e = 6;
int f = 8;
int q = 9;
void setup() {
 pinMode(a, OUTPUT);
 pinMode(b, OUTPUT);
 pinMode(c, OUTPUT);
 pinMode(d, OUTPUT);
  pinMode(e, OUTPUT);
 pinMode(f, OUTPUT);
  pinMode(g, OUTPUT);
  pinMode(red, OUTPUT);
  pinMode(green, OUTPUT);
```



```
}
void displayDigit(int digit)
{
 if(digit!=1 && digit != 4)
 digitalWrite(a,HIGH);
 if(digit != 5 && digit != 6)
 digitalWrite(b,HIGH);
 if(digit !=2)
 digitalWrite(c,HIGH);
 if(digit != 1 && digit !=4 && digit !=7)
 digitalWrite(d,HIGH);
 if(digit == 2 || digit ==6 || digit == 8 || digit==0)
 digitalWrite(e,HIGH);
 if(digit != 1 && digit !=2 && digit!=3 && digit !=7)
 digitalWrite(f,HIGH);
 if (digit!=0 && digit!=1 && digit !=7)
 digitalWrite(g,HIGH);
```



```
void turnOff()
{
  digitalWrite(a,LOW);
  digitalWrite(b,LOW);
  digitalWrite(c,LOW);
  digitalWrite(d,LOW);
  digitalWrite(e,LOW);
  digitalWrite(f,LOW);
  digitalWrite(g,LOW);
}
void loop() {
 if(count<=2)
 {
   digitalWrite(red, HIGH);
 digitalWrite(green, LOW);
 }
 else
 {
 digitalWrite(red, LOW);
 digitalWrite(green, HIGH);
 }
    if(count==6)
```



```
{
    count=0;
    }
for(int i=0;i<10;i++)
{
    displayDigit(i);
    delay(1000);
    turnOff();
}
count++;
}</pre>
```