

**Part Number :** FK-FA1412

**Product Name :** MULTI-FUNCTION 6-LED AND 6-BOTTON SHIELD

This circuit board is for LED Driver Shield experiment as the fundamental program controlling. It can be used to connect with sensors such as Temperature Controller, Moisture Indicator, Infrared Receiver Module, Ultrasonic Module. This circuit is adaptable and is able to upgrade to the other form of circuit such as Distance measurement circuit, Moisture Indicator.

### Specification

1. Power Supply direct from Microcontroller Board.
2. The circuit can be used with Microcontroller Board such as Arduino UNO R3.
3. The circuit board is composed with 3 sets which are 6 sets of LED, 6 Switches and Sensor Connector such as Temperature Controller, Moisture Indicator, Infrared Receiver Module.
4. PCB dimension : 2.80"x2.07"

### Circuit Function

The circuit is composed with 3 main sections:

**Section1** is There are 6 switches in Switch circuit connected with the port A1,P2,P4,P7,P8 and P12.

**Section2** is LED Driver circuit. We will use the port P3,P5,P6,P9,P10 and P11.

**Section3** is for connecting with Sensor Connectors;

- CON1 is used to connect with Moisture Indicator DHT11, DHT22 or Ultrasonic Module HC-SR04 through the port P2 and P3. To connect CON1 with Moisture Indicator, jump the jumper JP4 and JP5 but if we want to connect with Ultrasonic Module, remove the jumpers of JP4 and JP5.

- CON2 is used to connect with Moisture Indicator such as 18B20 through the port A4.

- CON3 is used to connect with Infrared Receiver Module trough the port A5.

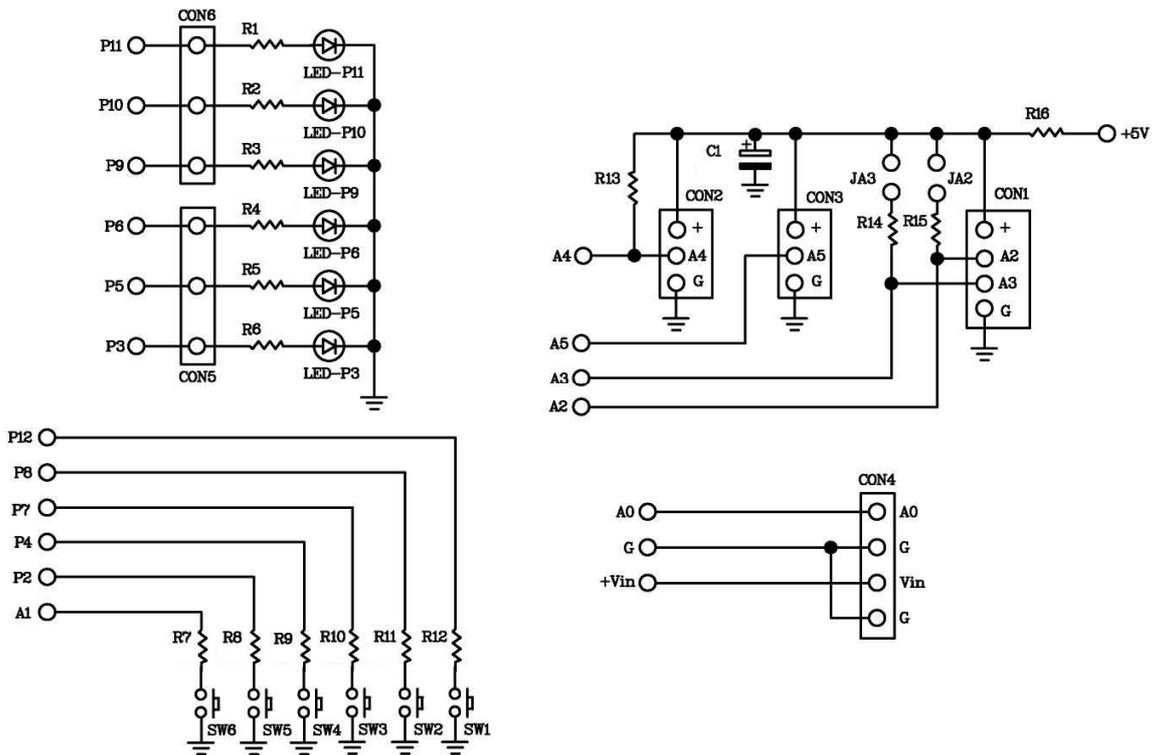


Figure 1. Function of FK1412

### Circuit Assembling

According to Figure 2, the easy assembling should be started with putting the smallest part on the circuit which is resistor. Caution, all parts must be on the right electrodes such as LED. Please see Figure 3 for putting parts on electrodes. As for soldering, use a soldering iron max. 40 watts and tin/lead at 60/40 with flux. After assembling and soldering, re-check the positions of each part. In case some parts are on the wrong positions, use solder suction or solder wick to correct the positioning of those parts.

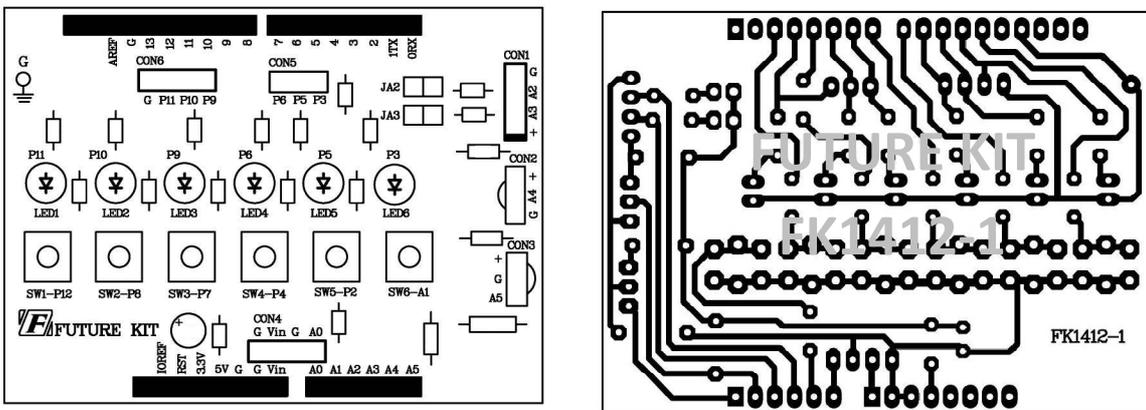


Figure 2. The positions for assembling and PCB copper line.

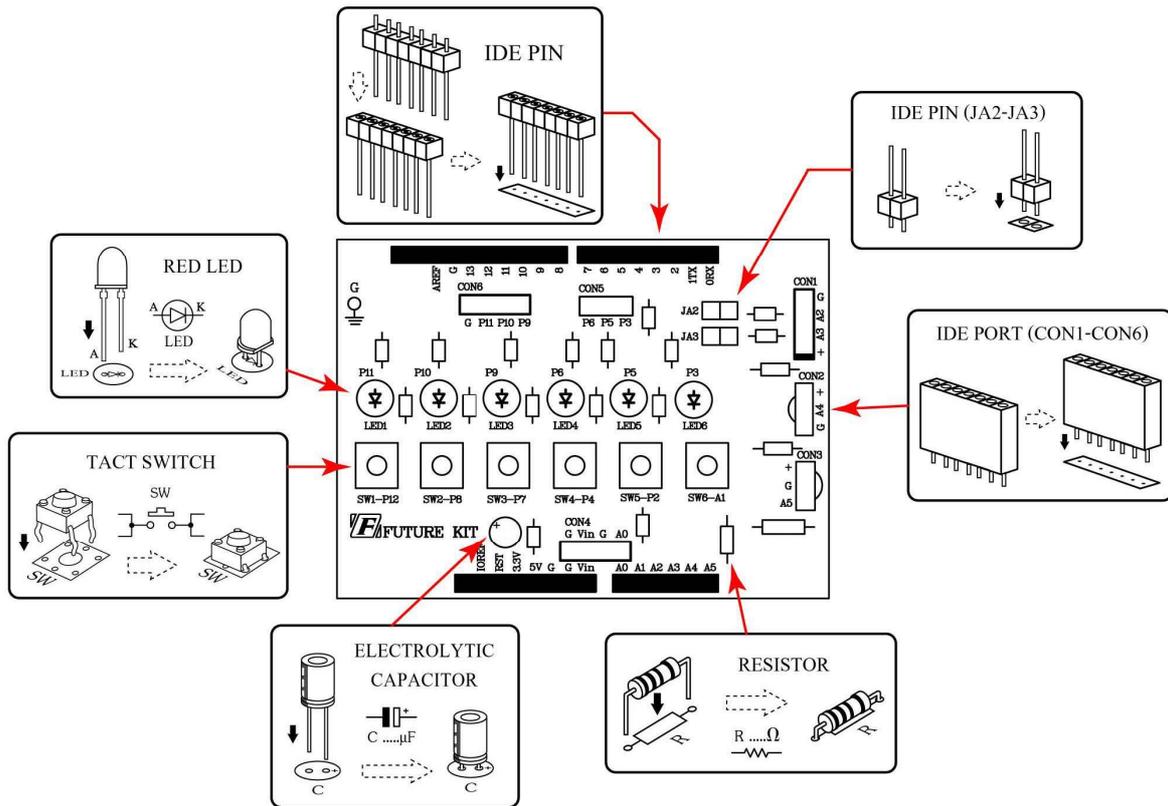


Figure 3. Positioning the parts on PCB

### Programming instrument for the experimental board

1.FK-FA1412 MULTI-FUNCTION 6-LED AND 6-BOTTON SHIELD	1	set
2. Microcontroller Board ex. Arduino UNO R3	1	set
3. USB Cable	1	Piece
4. Computer Set	1	Set
5. Arduino Software	1	Piece

### Testing Arduino UNO R3 Board

1. Connect USB cable with USB port of computer and USB port of Arduino UNO R3 Board.



Figure 4. Connecting USB cable with USB port of Arduino Board

2. Open Arduino program by double-click on Arduino icon. Go to the menu bar and click on File and choose Open. Afterwards, go to "EX" folder and open "TEST" folder. Then click on "Test" file.



Figure 5. Opening Arduino program

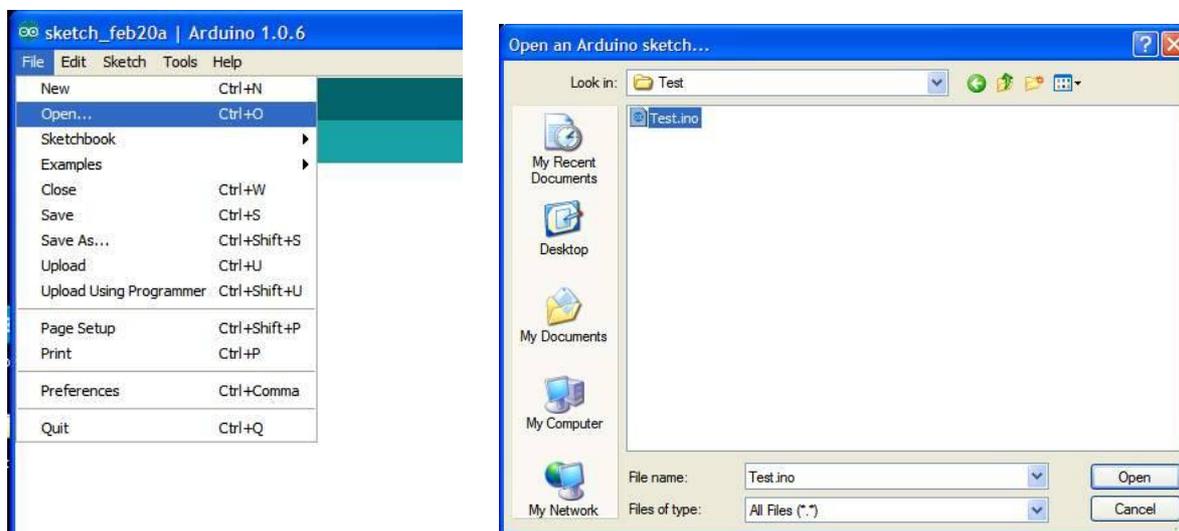


Figure 6. TEST Program

3. Download TEST program to Arduino Board.



Figure 7. Downloading TEST program

4. After downloading, the LED L on Arduino Board will blink which means Arduino board is working.



Figure 8. The position of LED L on Arduino Board circuit

### The details of TEST program, Flashing Light Program, Arduino UNO R3 experiment.

```
void setup() {  
  pinMode(13, OUTPUT);    // Set the pin 13 is OUTPUT pin.  
}  
  
void loop() {  
  digitalWrite(13, HIGH); // LED at the pin 13 is light-on.  
  delay(1000);           // delay time 1 second  
  digitalWrite(13, LOW); // LED at the pin 13 is light-off.  
  delay(1000);          // delay time 1 second  
}
```

### The method to connect the circuit with Arduino UNO R3 board

Connect FK1412 board with Arduino UNO R3 board by following Figure 9.

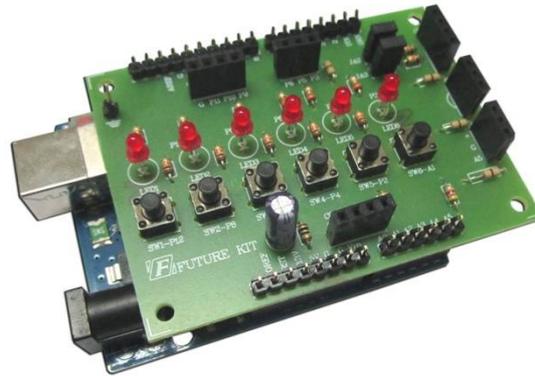


Figure 9. Connecting FK1412 board with Arduino UNO R3 board

### Programming

1. Connect Arduino UNO R3 board with experimental board by following the instruction of the method to connect the circuit with Arduino UNO R3 board.
2. Connect the USB cable with USB port of computer and USB port of Arduino UNO R3 board.

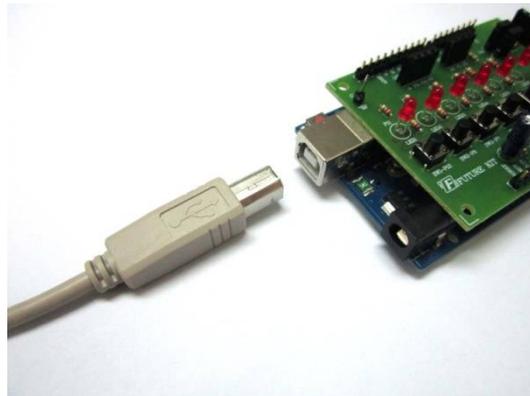


Figure 10. Wiring the USB cable

3. Double-click on Arduino icon to open Arduino program. Go to "File" in menu bar and choose "Open". Then click on "Ex" folder, choose "FK1412" folder, choose "LAB1412-1" folder and click on "LAB1412-1" file.



Figure 11. Open Arduino Program

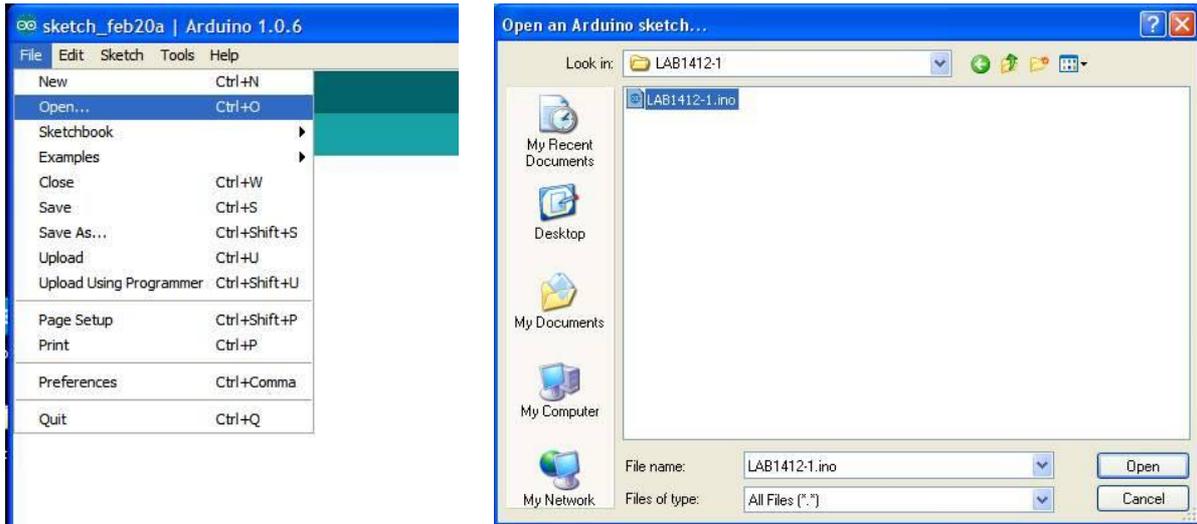


Figure 12. LAB1412-1 program

4. Download LAB1412-1 program to Arduino board.



Figure 13. Downloading LAB1412-1 program

5. After completing downloading, the LED at FK1412 board will be running light-on. The LED circuit section is good working.

6. Connect LED TEST to CON3 point with the pin at resistor of LED TEST. Connect to G point and the other pins of LED TEST and connect to A5 point. Open LAB1412-2 program from "FK1412" folder and then download LAB1412-2 program to Arduino board. LED TEST will blink. Move LED TEST from CON3 point at A5 to CON2 point at A4, LED TEST will blink. Then move LED TEST to CON4 at A0 position with the pin no connecting with the resistor and connect to A0 point. Afterwards, move to CON1 at A2 and A3 position. If LED blinks, the sensor circuit section is good working.

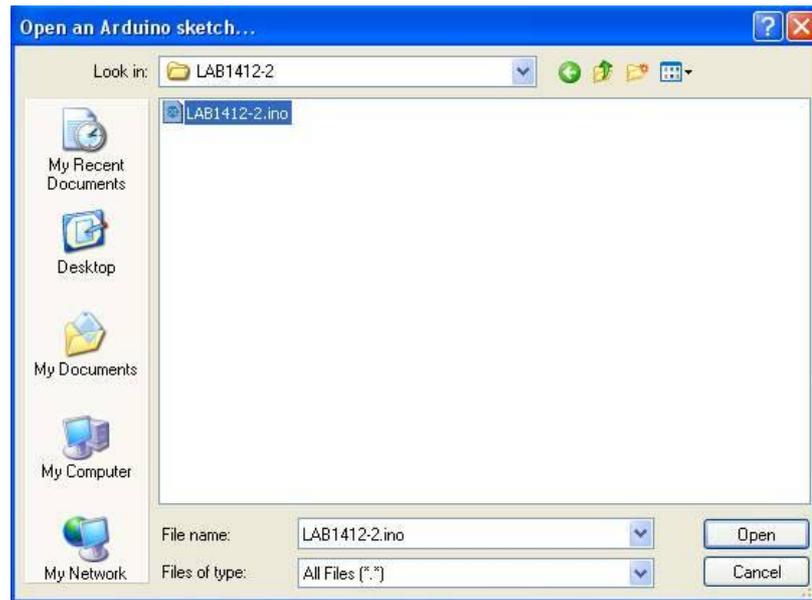


Figure 14. Opening LAB1412-2 program



Figure 15. Downloading LAB1412-2 program

8. Open LAB1412-3 in folder "FK1412" and download this program to Arduino UNO R3 board.

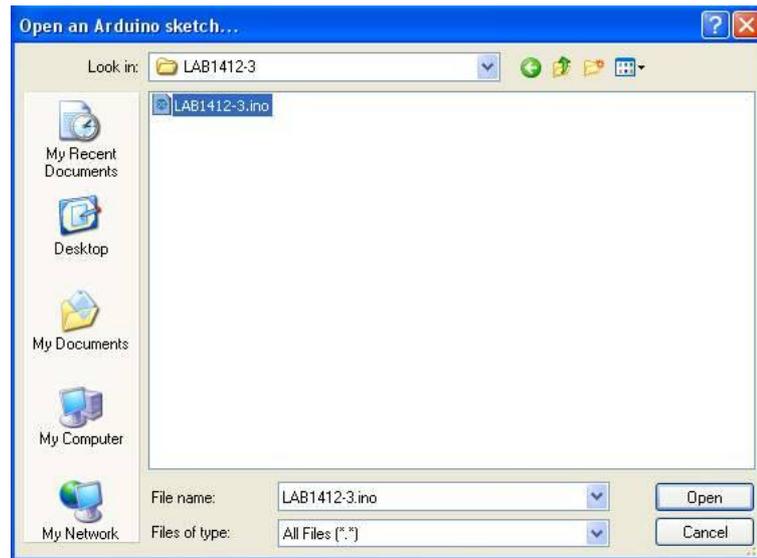


Figure 16. Opening LAB1412-3 program

9. Press and hold switch SW1, LED1 P11 will be light-on, release switch SW1, LED1 P11 will be light-off.

10. Press and hold switch SW2, LED2 P10 will be light-on, release switch SW2, LED2 P10 will be light-off.

11. Press and hold switch SW3, LED3 P9 will be light-on, release switch SW3, LED3 P9 will be light-off.

12. Press and hold switch SW4, LED4 P6 will be light-on, release switch SW4, LED4 P6 will be light-off.

13. Press and hold switch SW5, LED5 P5 will be light-on, release switch SW5, LED5 P5 will be light-off.

14. Press and hold switch SW6, LED6 P3 will be light-on, release switch SW6, LED6 P3 will be light-off.

15. If the test in step 9 to step 14 works, it means the circuit is functional.

### **The details of LAB1412-1 LED BLINKING program**

```
void setup() {  
  
  pinMode(11, OUTPUT);    // Set the pin 11 is OUTPUT pin.  
  
  pinMode(10, OUTPUT);    // Set the pin 10 is OUTPUT pin.  
  
  pinMode(9, OUTPUT);     // Set the pin 9 is OUTPUT pin.  
  
  pinMode(6, OUTPUT);     // Set the pin 6 is OUTPUT pin.  
  
  pinMode(5, OUTPUT);     // Set the pin 5 is OUTPUT pin.  
}
```

```
pinMode(3, OUTPUT);    // Set the pin 3 is OUTPUT pin.
}
void loop() {
digitalWrite(11, HIGH); // LED at the pin 11 is light-on.
delay(1000);           // delay time 1 second
digitalWrite(11, LOW); // LED at the pin 11 is light-off.
delay(1000);           // delay time 1 second
digitalWrite(10, HIGH); // LED at the pin 10 is light-on.
delay(1000);           // delay time 1 second
digitalWrite(10, LOW); // LED at the pin 10 is light-off.
delay(1000);           // delay time 1 second
digitalWrite(9, HIGH); // LED at the pin 9 is light-on.
delay(1000);           // delay time 1 second
digitalWrite(9, LOW); // LED at the pin 9 is light-off.
delay(1000);           // delay time 1 second
digitalWrite(6, HIGH); // LED at the pin 6 is light-on.
delay(1000);           // delay time 1 second
digitalWrite(6, LOW); // LED at the pin 6 is light-off.
delay(1000);           // delay time 1 second
digitalWrite(5, HIGH); // LED at the pin 5 is light-on.
delay(1000);           // delay time 1 second
digitalWrite(5, LOW); // LED at the pin 5 is light-off.
delay(1000);           // delay time 1 second
digitalWrite(3, HIGH); // LED at the pin 3 is light-on.
delay(1000);           // delay time 1 second
digitalWrite(3, LOW); // LED at the pin 3 is light-off.
```

```
delay(1000);           // delay time 1 second  
  
}
```

### Function of LAB1412-1 program

The program will determine pin 3, pin 5, pin 6, pin 9, pin 10 and pin 11 as OUTPUT pin. It will light up the first LED at pin 3 at 1 second and will extinguish at 1 second. Afterwards, LED at pin 5, pin 6, pin 9, pin 10 and pin 11 step by step, the program will start repeating the LED at pin 3.

**Remark:** In case we want LED ON/OFF frequently, we can reduce the value in the parentheses by commanding “delay”. The unit of the digit is millisecond.

### The details of LAB1412-2 CON1 to CON4 CONNECTOR TEST

```
void setup() {  
  
  pinMode(A0, OUTPUT);           // Set the pin A0 is OUTPUT pin.  
  pinMode(A2, OUTPUT);           // Set the pin A2 is OUTPUT pin.  
  pinMode(A3, OUTPUT);           // Set the pin A3 is OUTPUT pin.  
  pinMode(A4, OUTPUT);           // Set the pin A4 is OUTPUT pin.  
  pinMode(A5, OUTPUT);           // Set the pin A5 is OUTPUT pin.  
  
}  
  
void loop() {  
  
  digitalWrite(A0, HIGH);        // LED at the pin A0 is light-on.  
  digitalWrite(A2, HIGH);        // LED at the pin A2 is light-on.  
  digitalWrite(A3, HIGH);        // LED at the pin A3 is light-on.  
  digitalWrite(A4, HIGH);        // LED at the pin A4 is light-on.  
  digitalWrite(A5, HIGH);        // LED at the pin A5 is light-on.  
  
  delay(1000);                   // delay time 1 second  
  
  digitalWrite(A0, LOW);         // LED at the pin A0 is light-off.  
  digitalWrite(A2, LOW);         // LED at the pin A2 is light-off.  
  digitalWrite(A3, LOW);         // LED at the pin A3 is light-off.  
  
}
```

```
digitalWrite(A4, LOW);           // LED at the pin A4 is light-off.

digitalWrite(A5, LOW);           // LED at the pin A5 is light-off.

delay(1000);                     // delay time 1 second

}
```

### Function of LAB1412-2 program

The program will determine pin A0, A2 to A5 as OUTPUT pin. It will light up the LED at pin A0, A2 to A5 at 1 second and will extinguish at 1 second continuously.

**Remark:** In case we want LED ON/OFF frequently, we can reduce the value in the parentheses by commanding “delay”. The unit of the digit is millisecond.

### The details of LAB1412-3 SWITCH TEST program

```
void setup() {

  pinMode(11, OUTPUT);           // Set the pin 11 is OUTPUT pin.

  pinMode(10, OUTPUT);           // Set the pin 10 is OUTPUT pin.

  pinMode(9, OUTPUT);            // Set the pin 9 is OUTPUT pin.

  pinMode(6, OUTPUT);            // Set the pin 6 is OUTPUT pin.

  pinMode(5, OUTPUT);            // Set the pin 5 is OUTPUT pin.

  pinMode(3, OUTPUT);            // Set the pin 3 is OUTPUT pin.

  pinMode(12, INPUT_PULLUP);     // Set the pin 12 is INPUT pin and using the PULL UP
function.

  pinMode(8, INPUT_PULLUP);      // Set the pin 8 is INPUT pin and using the PULL UP
function.

  pinMode(7, INPUT_PULLUP);      // Set the pin 7 is INPUT pin and using the PULL UP
function.

  pinMode(4, INPUT_PULLUP);      // Set the pin 4 is INPUT pin and using the PULL UP
function.

  pinMode(2, INPUT_PULLUP);      // Set the pin 2 is INPUT pin and using the PULL UP
function.

}
```

```
pinMode(A1, INPUT_PULLUP);      // Set the pin A1 is INPUT pin and using the PULL UP
function.
}
void loop() {
int SW6 = digitalRead(A1);      // Set "SW6" word is the variable of value at pin A1.
int SW5 = digitalRead(2);      // Set "SW5" word is the variable of value at pin 2.
int SW4 = digitalRead(4);      // Set "SW4" word is the variable of value at pin 4.
int SW3 = digitalRead(7);      // Set "SW3" word is the variable of value at pin 7.
int SW2 = digitalRead(8);      // Set "SW2" word is the variable of value at pin 8.
int SW1 = digitalRead(12);     // Set "SW1" word is the variable of value at pin 12.
if (SW6 == LOW) { digitalWrite(3, HIGH); } else { digitalWrite(3, LOW); }
// If press the switch SW6 (LOW status), LED at pin 3 will be light-on. But if no press the
switch SW6 (HIGH status), LED at pin 3 will be light-off.
if (SW5 == LOW) { digitalWrite(5, HIGH); } else { digitalWrite(5, LOW); }
// If press the switch SW5 (LOW status), LED at pin 5 will be light-on. But if no press the
switch SW5 (HIGH status), LED at pin 5 will be light-off.
if (SW4 == LOW) { digitalWrite(6, HIGH); } else { digitalWrite(6, LOW); }
// If press the switch SW4 (LOW status), LED at pin 6 will be light-on. But if no press the
switch SW4 (HIGH status), LED at pin 6 will be light-off.
if (SW3 == LOW) { digitalWrite(9, HIGH); } else { digitalWrite(9, LOW); }
// If press the switch SW3 (LOW status), LED at pin 9 will be light-on. But if no press the
switch SW3 (HIGH status), LED at pin 9 will be light-off.
if (SW2 == LOW) { digitalWrite(10, HIGH); } else { digitalWrite(10, LOW); }
// If press the switch SW2 (LOW status), LED at pin 10 will be light-on. But if no press the
switch SW2 (HIGH status), LED at pin 10 will be light-off.
if (SW1 == LOW) { digitalWrite(11, HIGH); } else { digitalWrite(11, LOW); }
// If press the switch SW1 (LOW status), LED at pin 11 will be light-on. But if no press the
switch SW1 (HIGH status), LED at pin 11 will be light-off.
}
```

### **Function of LAB1412-3 program**

The program will determine pin 3, pin 5, pin 6, pin 9, pin 10 and pin 11 as OUTPUT pin and pin 1, pin 2, pin 4, pin 7, pin 8 and pin 12 as INPUT pin. Besides INPUT pin, pin 1, pin 2, pin 4, pin 7, pin 8 and pin 12 can be used for activating the function PULL UP as well.

Press and hold switch SW6 at pin A1, LED6 will light up, release switch SW6, LED6 will be light-off.

Press and hold switch SW5 at pin 2, LED5 will light up, release switch SW5, LED5 will be light-off.

Press and hold switch SW4 at pin 4, LED4 will light up, release switch SW4, LED4 will be light-off.

Press and hold switch SW3 at pin 7, LED3 will light up, release switch SW3, LED3 will be light-off.

Press and hold switch SW2 at pin 8, LED2 will light up, release switch SW2, LED2 will be light-off.

Press and hold switch SW1 at pin 12, LED1 will light up, release switch SW1, LED1 will be light-off.