

**Part Number** FK-FA1411

**Product Name** MULTI-FUNCTION RGB LED DRIVER SHIELD

This circuit board is for RGB LED Driver Shield experiment as the fundamental programming to control the LED RGB screen. 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. (For LED RGB Driver circuit, can be used the 12VDC external power supply)
2. Maximum LED driving current is 16 mA.
3. The circuit can be used with Microcontroller Board such as Arduino UNO R3.
4. The circuit board is composed with 3 sets which are 1 piece of LED RGB Driver, 3 pieces of Switch and Sensor Connector such as Temperature Controller, Moisture Indicator, Infrared Receiver Module.
5. PCB Dimension: 2.17"x2.05"

### Circuit Function

The circuit is composed with 3 main sections:

**Section 1** is 3 Switches connected with the port P7, P8 and P12.

**Section 2** is LED Driver circuit. We will use Transistor to drive LED, connect with the port P9, P10 and P11

**Section 3** is for connecting with Sensor Connectors;

- CON1 is used to connect with Moisture Indicator DHT11, DHT22 or Ultrasonic Module HC-SR04 through the port P4 and P5. 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 P3.
- CON3 is used to connect with Ultrasonic Module through the port P2.

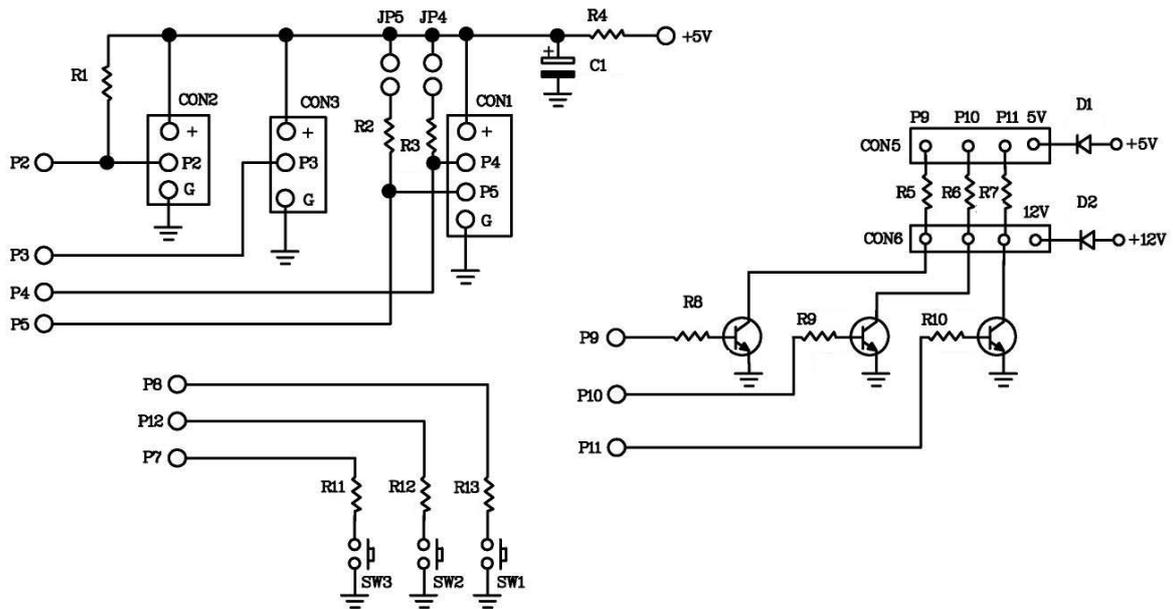


Figure 1. Function of FK1411

### 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.

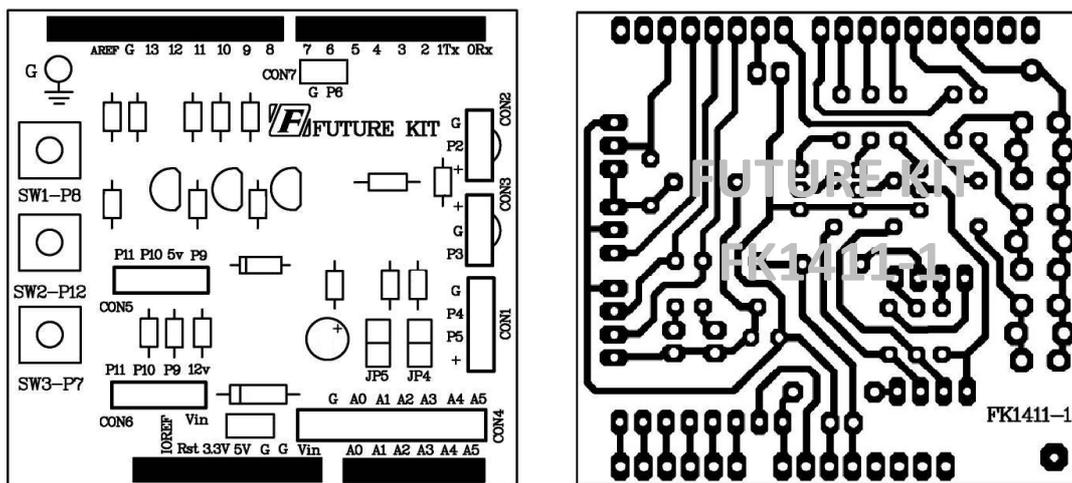


Figure 2. The positions for assembling and PCB copper line.

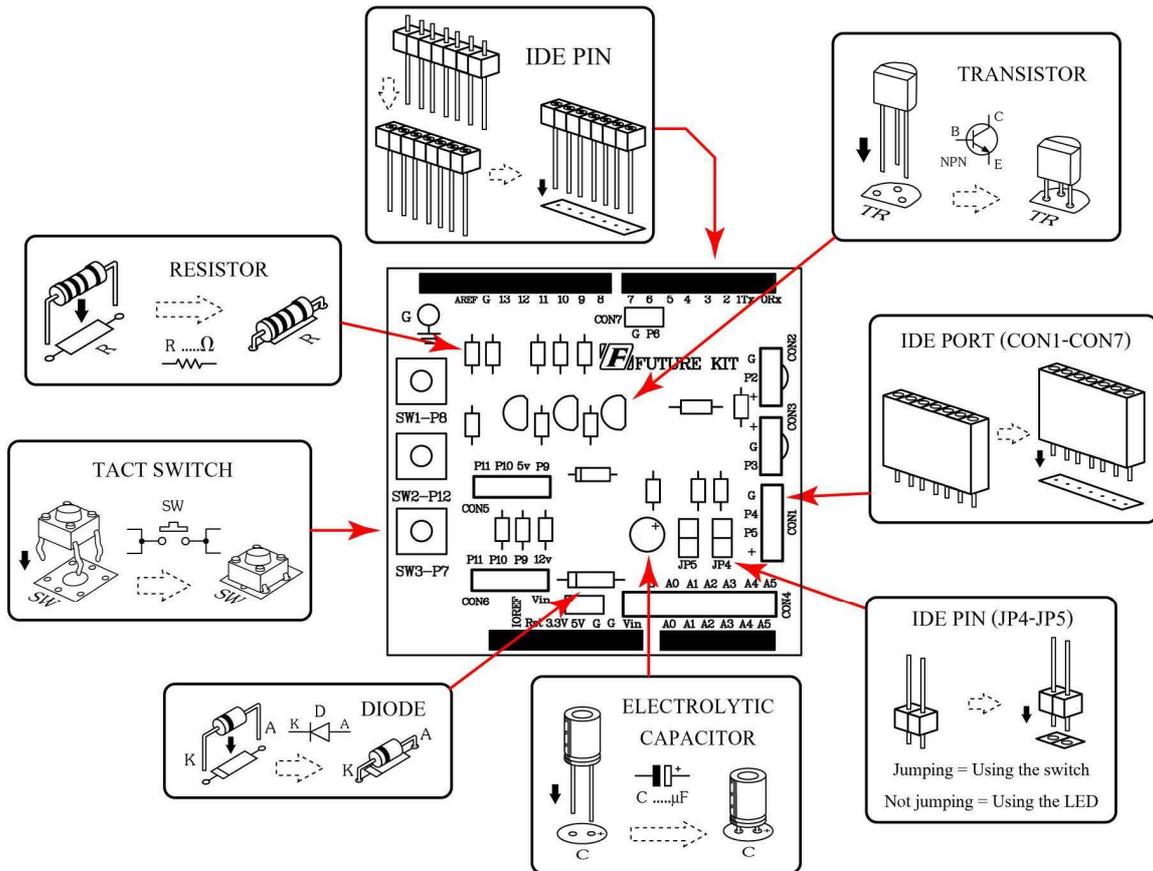


Figure 3. Positioning the parts on PCB

**Programming instrument for the experimental board**

- |  |   |       |
|--|---|-------|
| 1.FK-FA1411 MULTI-FUNCTION RGB LED DRIVER SHIELD | 1 | set   |
| 2. Microcontroller Board ex. Arduino UNO R3      | 1 | set   |
| 3.12VDC 500mA. Power Adaptor                     | 1 | piece |
| 4. USB Cable                                     | 1 | piece |
| 5. Computer Set                                  | 1 | set   |
| 6. 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.

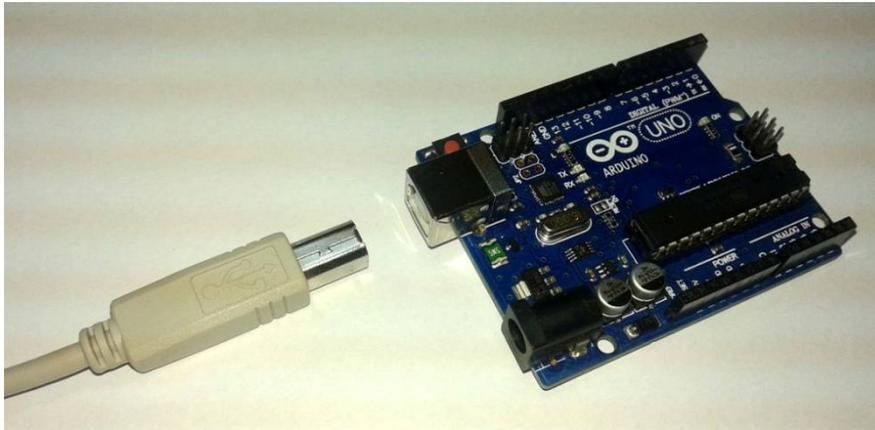


Figure 4. Connecting USB cable with USB port of Arduino Board

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

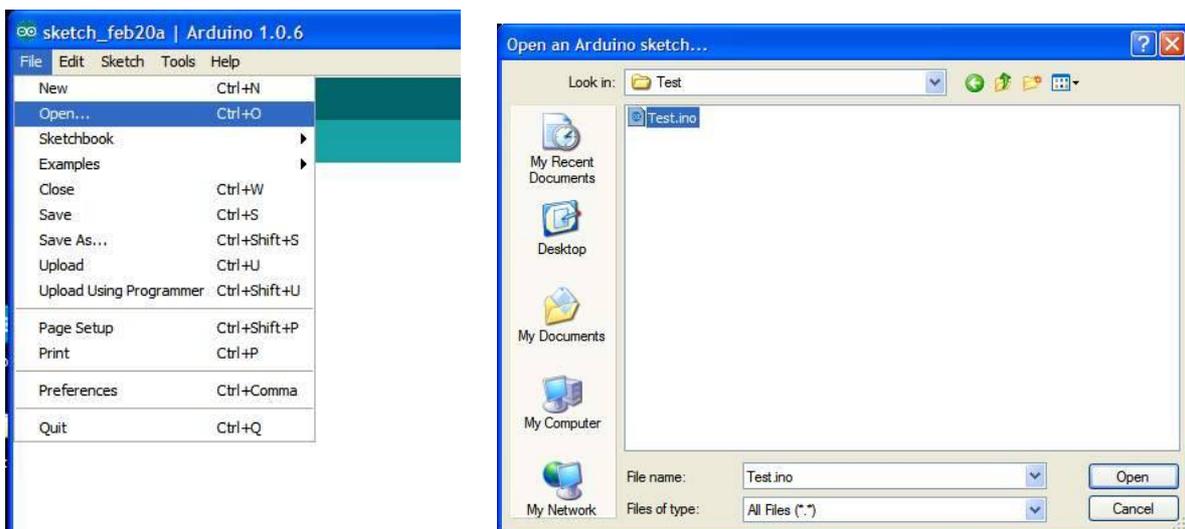


Figure 6. TEST Program

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 detail 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 FK1411 board with Arduino UNO R3 board following Figure 9.

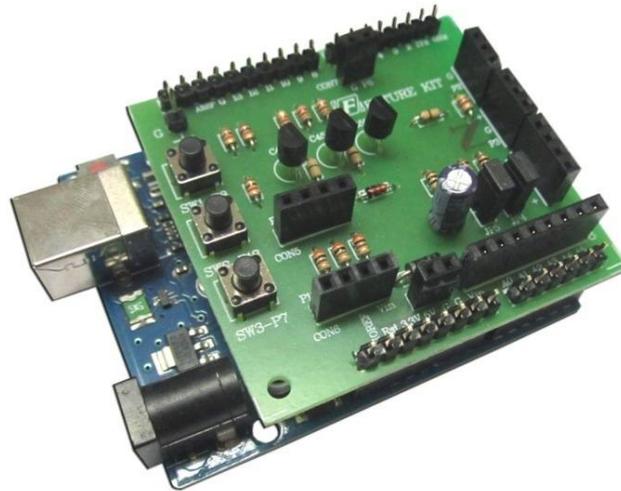


Figure 9. Connecting FK1411 board with Arduino UNO R3 board

### 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 and then connect LED RGB at CON5 point (turn the long pin of LED RGB to position 5V).

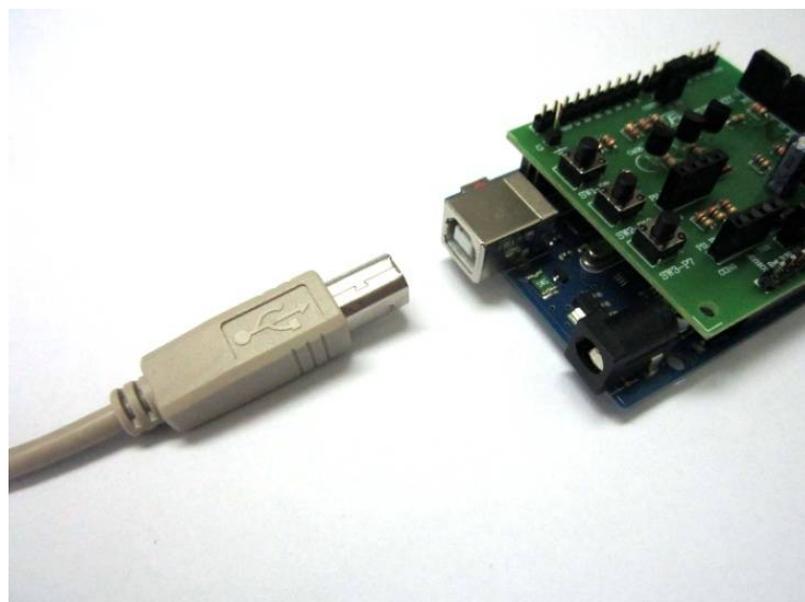


Figure 10. Wiring the USB cable

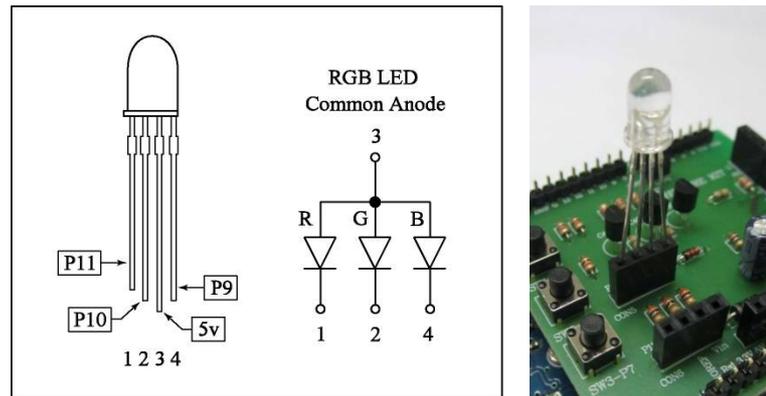


Figure 11. Connecting LED RGB with FK1411 board

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 “FK1411” folder, choose “LAB1411-1” folder and click on “LAB1411-1” file.



Figure 12. Opening Arduino Program

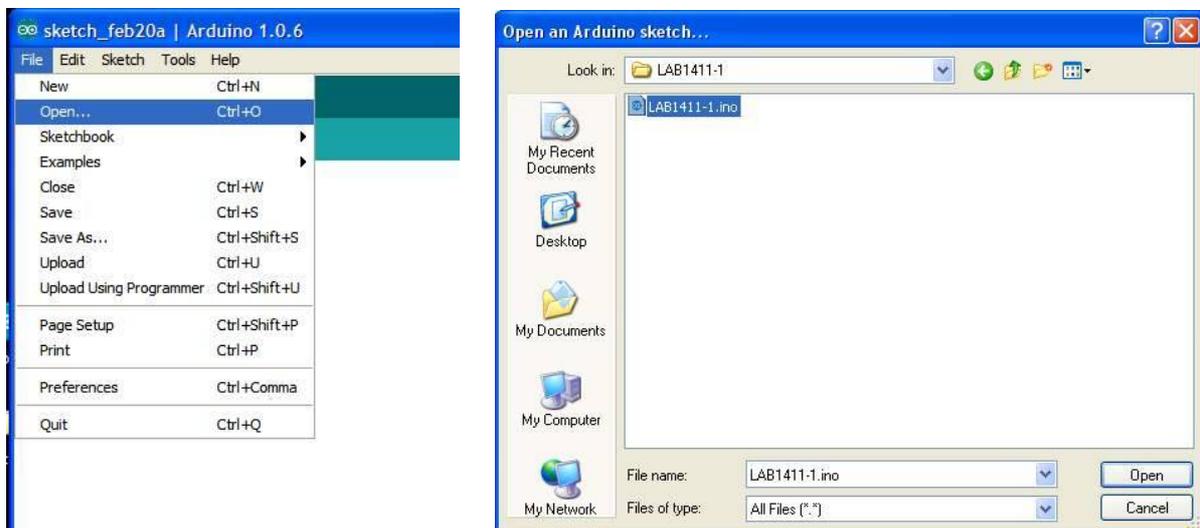


Figure 13. LAB1411-1 program

4. Download LAB1411-1 program to Arduino board.



Figure 14. Downloading LAB1411-1 program

5. After completing downloading, LED RGB will run light-on start from blue color, red color and green color. The LED driver circuit section is good working.

6. Remove LED RGB from FK1411 board and connect LED RGB MODULE at CON6 point by turning the yellow wire to 12V point of FK1411 board. Supply the power adaptor to the jack adaptor on Arduino UNO R3 board according to Figure 15. LED RGB MODULE will be lighted-on start from blue color, red color and green color. The LED driver circuit section is good working.

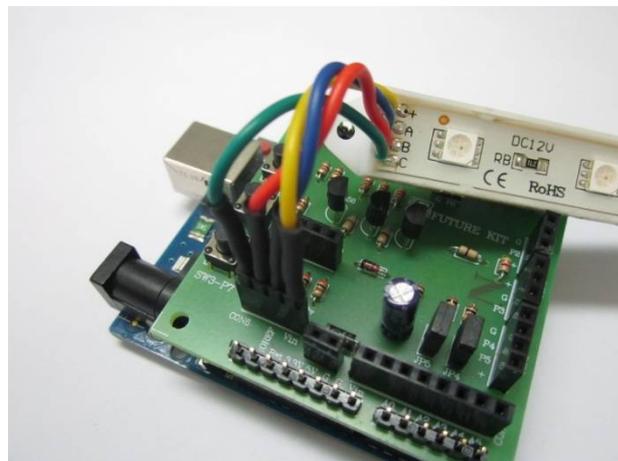


Figure 15. Connecting LED RGB MODULE with FK1411 board

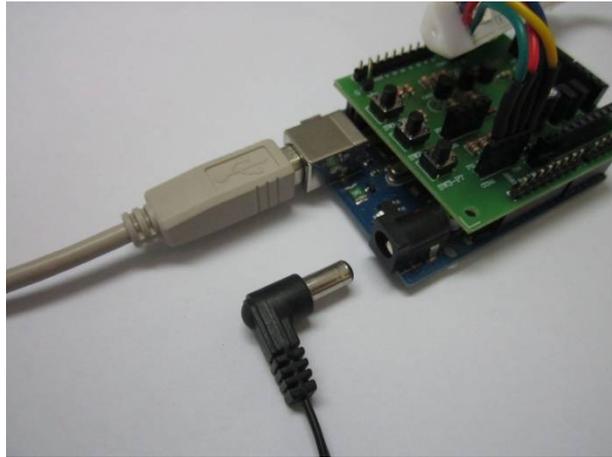


Figure 16. Connecting the power adaptor with Arduino UNO R3 board

7. Remove LED RGB MODULE and the power adaptor from both boards. Put LED TEST in the CON2 point. The pin of resistor must be connected with G point and the other pins of LED TEST must be connected with P2 point. Open the program LAB1411-2 program from “FK1411” folder. Afterwards, download LAB1411-2 program to Arduino board, LED TEST will blink. Then move LED TEST from CON2 point to CON3 point, LED TEST will blink. Move LED TEST from CON3 to CON1. The pins which are not being connected with the resistor must be put in P4 point and P5 point. If LED blinks, the sensor circuit section is good working.

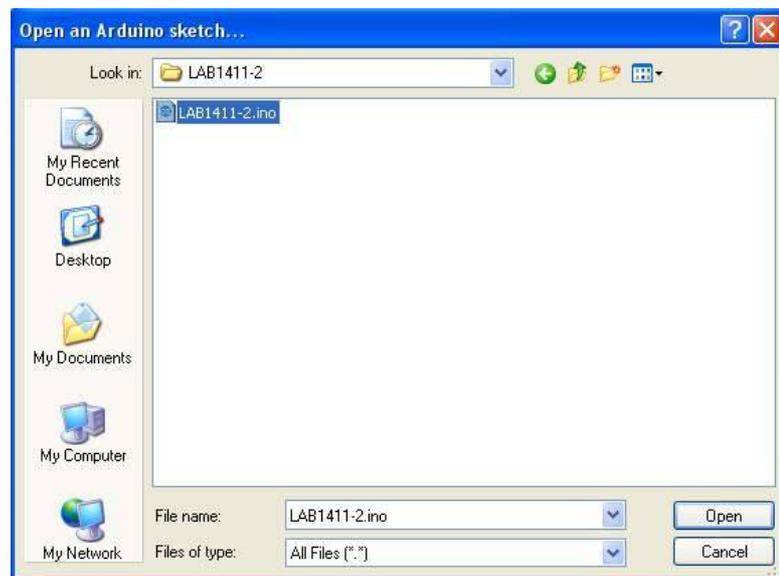


Figure 17. Opening LAB1411-2 program



Figure 18. Downloading LAB1411-2 program

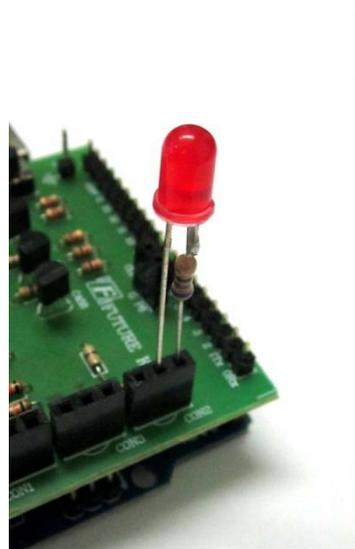


Figure 19. Connecting LED TEST to FK1411 board

8. Open LAB1411-3 in "FK1411" folder and download this program to Arduino UNO R3 board. Connect LED TEST at CON2 point with the pin at resistor of LED TEST, connect to G point and the other pins of LED TEST must be connected with P2 point.

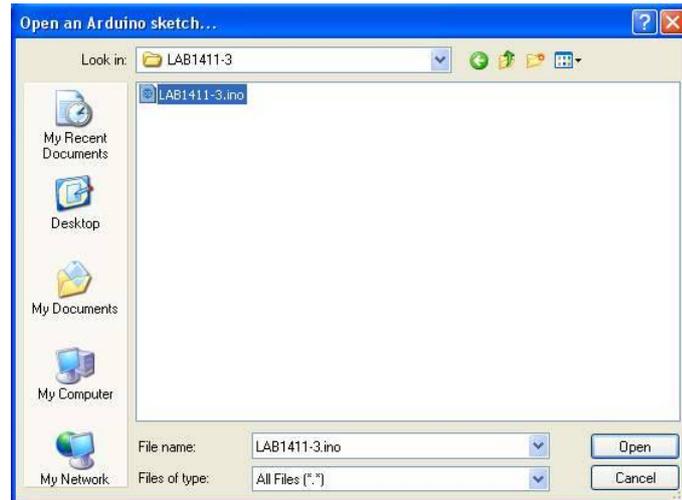


Figure 20. Opening LAB1411-3 program

9. Press and hold switch SW1, LED TEST will light-on, release switch SW1, LED TEST will light-off.
10. Press and hold switch SW2, LED TEST will light-on, release switch SW2, LED TEST will light-off.
11. Press and hold switch SW3, LED TEST will light-on, release switch SW3, LED TEST will light-off.
12. If the test in step 9 to step 11 works, it means the circuit is functional.

### **The details of LAB1411-1 LED RGB Flash Light program**

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

}
```

### **Function of LAB1411-1 program**

The program will determine pin 9 to pin 11 as OUTPUT pin. It will light up the LED at pin 9 at 1 second and will extinguished at 1 second. Afterwards, LED at pin 10 will work at 1 second and will be extinguished at 1 second. The program will relay until the LED at pin 11. After the LED at pin 11, the program will start repeating the LED pin 9.

**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 LAB1411-2 CONNECTOR CON1-CON3 TEST**

```
void setup() {

  pinMode(2, OUTPUT); // Set the pin 2 is OUTPUT pin.

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

  pinMode(4, OUTPUT); // Set the pin 4 is OUTPUT pin.

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

}

void loop() {

  digitalWrite(2, HIGH); // LED at the pin 2 is light-on.

  digitalWrite(3, HIGH); // LED at the pin 3 is light-on.

  digitalWrite(4, HIGH); // LED at the pin 4 is light-on.

  digitalWrite(5, HIGH); // LED at the pin 5 is light-on.

}
```

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

digitalWrite(2, LOW);  // LED at the pin 2 is light-off.

digitalWrite(3, LOW);  // LED at the pin 3 is light-off.

digitalWrite(4, LOW);  // LED at the pin 4 is light-off.

digitalWrite(5, LOW);  // LED at the pin 5 is light-off.

delay(1000);           // delay time 1 second

}
```

### Function of LAB1411-2 program

The program will determine pin 2 to pin 5 as OUTPUT pin. It will light up the LED at pin 2 to pin 5 at 1 second and will extinguished at 1 second continues.

**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 LAB1411-3 SWITCH TEST program

```
void setup() {

  pinMode(2, OUTPUT);           // Set the pin 2 is OUTPUT pin.

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

  pinMode(12, INPUT_PULLUP);    // // Set the pin 12 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.

}

void loop() {

  int SW3 = digitalRead(7);      // Set “SW3” word is the variable of value at pin 7.

  int SW2 = digitalRead(12);     // Set “SW2” word is the variable of value at pin 12.

  int SW1 = digitalRead(8);      // Set “SW1” word is the variable of value at pin 8.

  if (SW3 == LOW) { digitalWrite(2, HIGH); } else { digitalWrite(2, LOW); }
```

// If press the switch SW3 (LOW status), LED at pin 2 will be light-on. But if no press the switch SW3 (HIGH status), LED at pin 2 will be light-off.

```
if (SW2 == LOW) { digitalWrite(2, HIGH); } else { digitalWrite(2, LOW); }
```

// If press the switch SW2 (LOW status), LED at pin 2 will be light-on. But if no press the switch SW2 (HIGH status), LED at pin 2 will be light-off.

```
if (SW1 == LOW) { digitalWrite(2, HIGH); } else { digitalWrite(2, LOW); }
```

// If press the switch SW1 (LOW status), LED at pin 2 will be light-on. But if no press the switch SW1 (HIGH status), LED at pin 2 will be light-off.

```
}
```

### **Function of LAB1411-3 program**

The program will determine pin 2 as OUTPUT pin and pin 7, pin 8 and pin 12 as INPUT pin. Besides INPUT pin, pin 7, pin 8 and pin 12 can be used for activating the function PULL UP as well.

Press and hold switch SW3 at pin 8, LED TEST will light up, release switch SW3, LED TEST will be light-off.

Press and hold switch SW2 at pin 12, LED TEST will light up, release switch SW2, LED TEST will be light-off.

Press and hold switch SW1 at pin 7, LED TEST will light up, release switch SW1, LED TEST will be light-off.