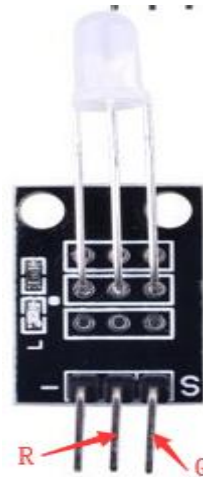


## Two-Color LED (3mm or 5mm)



3mm LED



5mm LED

## Overview

Two-color LEDs contain two separate light-emitting diodes (LEDs) in two colors (red, green). In different intensities, these two colors combine to produce a limited spectrum of colors, and are often used as status indicator lights in a variety of consumer electronics (PDAs, MP3 players, headphones, digital cameras, etc.). In this experiment, you'll learn to connect and program a two-color LED to produce a flashing sequence of alternating colors.

## Experimental Materials

Raspberry Pi	x1
Breadboard	x1
Two-color LED	x1 (either 3mm or 5mm version)
Resistors (330Ω)	x2
Dupont jumper wires	

## Experimental Procedure

1. If you have not done so already, prepare your development system by installing the Python interpreter, RPi.GPIO library, and wiringPi library as described in READ\_ME\_FIRST.TXT.

2. Install the two-color LED in your breadboard and use resistors and Dupont jumper wires as illustrated in the Wiring Diagram below.
3. Execute the sample stored in this experiment's subfolder.  
If using C, compile and execute the C code:

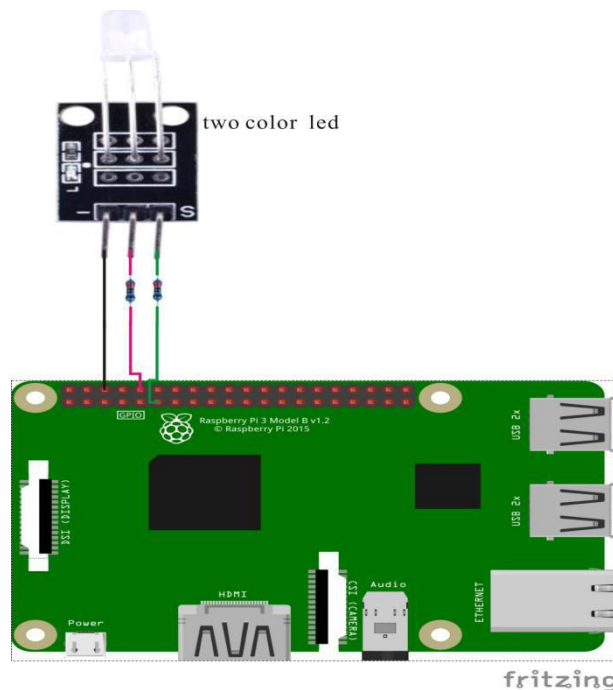
```
cd Code/C
gcc 2colorLED.c -o 2colorLED.out -lwiringPi
./2colorLED.out
```

If using Python, launch the Python script:

```
cd Code/Python
python 2colorLED.py
```

4. Make experimental observations. The LED should alternately flash red and green.

## Wiring Diagram



Three-color LED pin position:

- "S" (right) ↔ Raspberry Pi pin 11 (through resistor)
- " " (middle) ↔ Raspberry Pi pin 10 (through resistor)
- "-" (left) ↔ Raspberry Pi GND

## Sample Code

### Python Code

```
#!/usr/bin/env python
import RPi.GPIO as GPIO
import time

colors = [0xFF00, 0x00FF]
pins = {'pin_R':10, 'pin_G':11} # pins is a dict

GPIO.setmode(GPIO.BOARD) # Numbers GPIOs by physical location
for i in pins:
    GPIO.setup(pins[i], GPIO.OUT) # Set pins' mode is output

p_R = GPIO.PWM(pins['pin_R'], 2000) # set Frequece to 2KHz
p_G = GPIO.PWM(pins['pin_G'], 2000)

p_R.start(0) # Initial duty Cycle = 0(leds off)
p_G.start(0)

def map(x, in_min, in_max, out_min, out_max):
    return (x - in_min) * (out_max - out_min) / (in_max - in_min)
    + out_min

def setColor(col):
    R_val = (col & 0xFF00) >> 8
    G_val = (col & 0x00FF) >> 0

    R_val = map(R_val, 0, 255, 0, 100)
    G_val = map(G_val, 0, 255, 0, 100)

    p_R.ChangeDutyCycle(R_val) # Change duty cycle
    p_G.ChangeDutyCycle(G_val)

try:
    while True:
        for col in colors:
            setColor(col)
            time.sleep(0.5)
```

```
except KeyboardInterrupt:
    p_R.stop()
    p_G.stop()
    for i in pins:
        GPIO.output(pins[i], GPIO.HIGH)    # Turn off all leds
    GPIO.cleanup()
```

## C Code

```
#include <wiringPi.h>
#include <softPwm.h>
#include <stdio.h>

typedef unsigned char uchar;

#define LedPinRed    16
#define LedPinGreen  0

void ledInit(void)
{
    softPwmCreate(LedPinRed,  0, 100);
    softPwmCreate(LedPinGreen,0, 100);
}

uchar map(uchar val, uchar in_min, uchar in_max, uchar out_min,
uchar out_max)
{
    uchar tmp = 0;
    tmp = (val - in_min) * (out_max - out_min) / (in_max - in_min)
+ out_min;

    return tmp;
}

void ledColorSet(uchar r_val, uchar g_val)
{
    uchar R_val, G_val;
    R_val = map(r_val, 0, 255, 0, 100);
    G_val = map(g_val, 0, 255, 0, 100);
    softPwmWrite(LedPinRed,  R_val);
    softPwmWrite(LedPinGreen, G_val);
}

int main(void)
```

```
{
    int i;
    if(wiringPiSetup() == -1)
    {
        printf("setup wiringPi failed !\n");
        return -1;
    }
    ledInit();
    while(1)
    {
        ledColorSet(0xff,0x00);    //red
        delay(500);
        ledColorSet(0x00,0xff);    //green
        delay(500);
    }
    return 0;
}
```

## Technical Background

The 5mm two-color LED and 3mm two-color LED both use the same wiring diagram and sample code. Their physical parameters are slightly different:

<ul style="list-style-type: none"> <li>◆ Diameter: 5mm</li> <li>◆ Emission Color: Green + Red</li> <li>◆ Wavelength:G:571nM R:625nM</li> <li>◆Luminous Intensity: G:20mcd-40mcd; R:60mcd-80mcd</li> <li>◆Forward Voltage: G:3.0V-3.2V; R:2.0V-2.2V</li> <li>◆ Use Current:15~ 20mA</li> <li>◆ Package Color: None</li> <li>◆ Stand Type: Long Leg</li> </ul>	<ul style="list-style-type: none"> <li>◆ Diameter: 3mm</li> <li>◆ Emission Color: Green + Red</li> <li>◆ Wavelength: G:571nM R:644nM</li> <li>◆ Luminous intensity: G: 20mcd-40mcd; R:40mcd-80mcd</li> <li>◆ Forward Voltage: G:2.0V-2.2V R:2.0~2.2</li> <li>◆ Use Current: 10mA</li> <li>◆ Package Color: None</li> <li>◆ Stand Type: Long Leg</li> </ul>
--	--