

# CMPT 433 Project How To - BeagleBulb

## Group Info

Team Awesome!!!

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## Introduction

This how to guide will guide the user on setting up the hardware aspects of BeagleBulb. We will also go through how to change the colour of the LEDs with the API from the command line.

### 1. Hardware requirement

You need

- RGB LED common anode

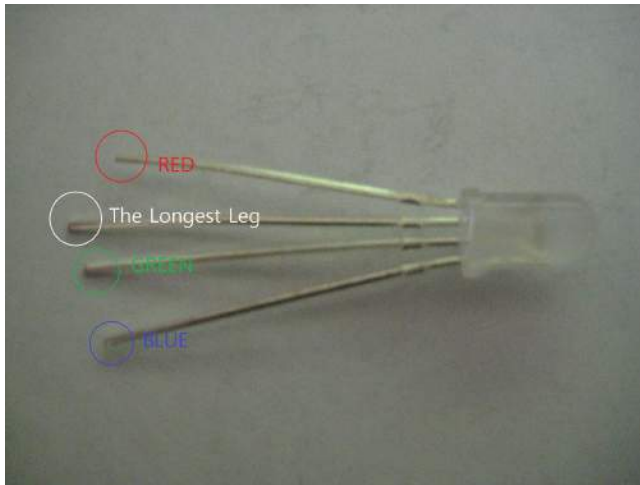


Figure 1.1

- 430 $\Omega$  resistor



Figure 1.2

- breadboard

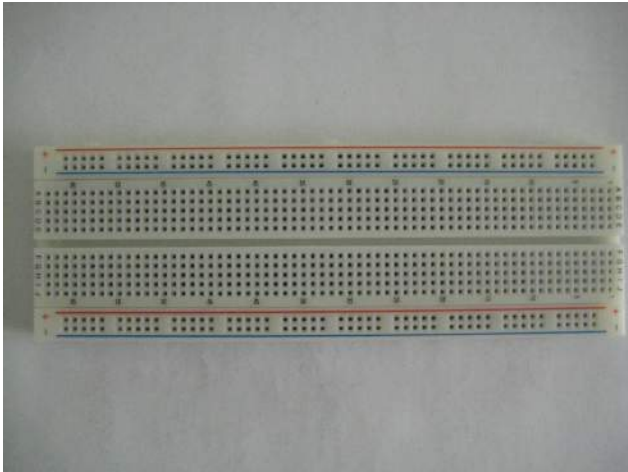


Figure 1.3

- wires



Figure 1.4

- BeagleBone Black
  - Note: The pin number starts at the top left corner of the P9 with pin value 1. Pin 2 is at the top right corner, and number will increase by 1 all the way to the bottom right corner of the P9 with pin value p46. See figure 1.5.

P9 Pin Values

1	2
3	4
5	6
43	44
45	46

Figure 1.5

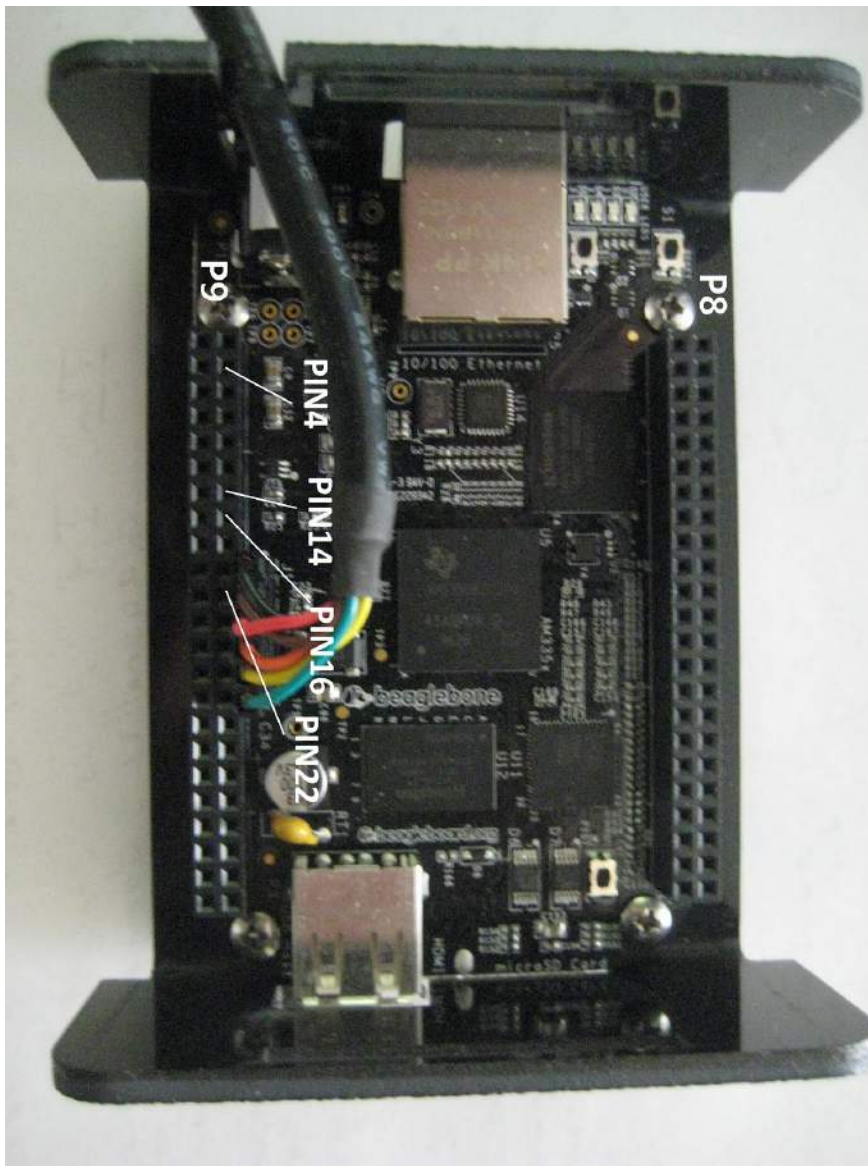


Figure 1.6

## 2. Connecting the components

2.1. Connect resistors and wire into the breadboard. The direction of resistors and wire is not important.

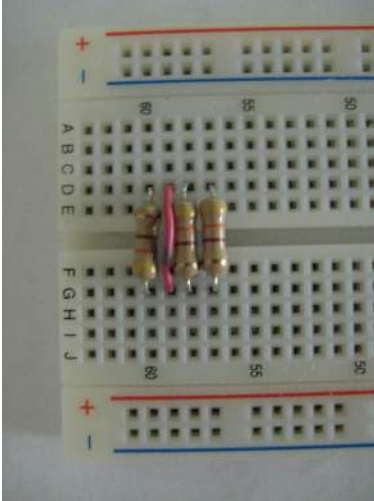


Figure 2.1

2.2 Connect the LED into the breadboard. **The direction of LED is very important.** The longest leg of the LED must be placed above the red wire. You also have to match the RGB color of the LED.

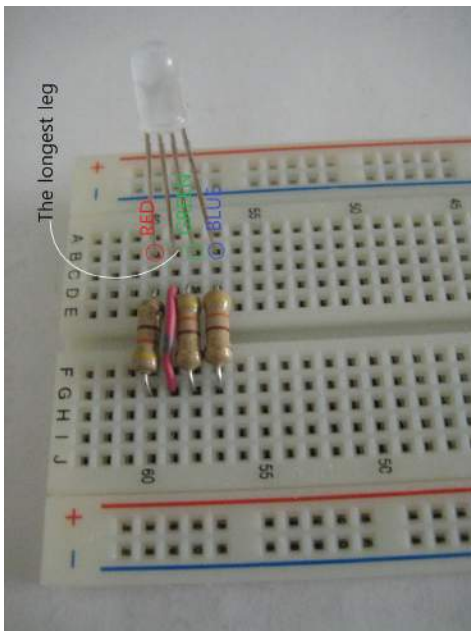


Figure 2.2

2.3 Connect the breadboard and the BeagleBone Black with wires. Connect the red lead of the LED to P9\_14. Connect the green lead of the LED to P9\_16. Connect the blue lead of the LED to P9\_22. Connect the positive(+) lead of the LED to P9\_4.

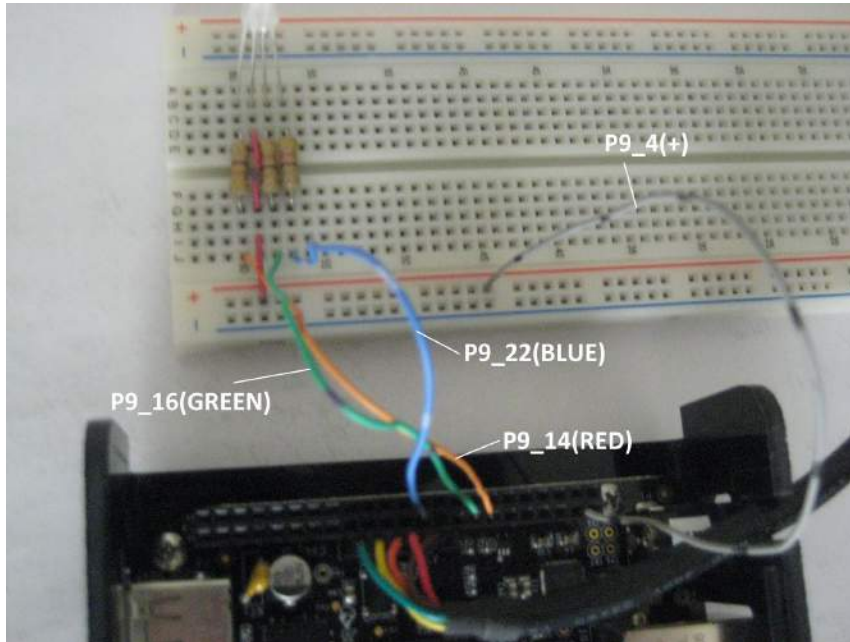


Figure 2.3

#### 2.4. Troubleshooting

- Make sure the LEDs are pointing the right way.

### 3. Setting up PWM of GPIO

3.1 After boot up, PWM is not set up, so we have to manually set it up on the target machine

```
root@ccc30-beagle:~# cat /sys/devices/bone_capemgr.*/slots
0: 54:PF---
1: 55:PF---
2: 56:PF---
3: 57:PF---
4: ff:P-O-L Bone-LT-eMMC-2G,00A0,Texas Instrument,BB-BONE-EMMC-2G
5: ff:P-O-L Bone-Black-HDMI,00A0,Texas Instrument,BB-BONELT-HDMI
```

3.2 Enable PWM of GPIO manually

```
root@ccc30-beagle:~# echo am33xx_pwm >/sys/devices/bone_capemgr.*/slots
root@ccc30-beagle:~# echo bone_pwm_P9_14 >/sys/devices/bone_capemgr.*/slots
root@ccc30-beagle:~# echo bone_pwm_P9_16 >/sys/devices/bone_capemgr.*/slots
root@ccc30-beagle:~# echo bone_pwm_P9_22 >/sys/devices/bone_capemgr.*/slots
```

### 3.3 After enabling PWM, your output should look like this

```
root@ccc30-beagle:~# cat /sys/devices/bone_capemgr.*/slots
0: 54:PF---
1: 55:PF---
2: 56:PF---
3: 57:PF---
4: ff:P-O-L Bone-LT-eMMC-2G,00A0,Texas Instrument,BB-BONE-EMMC-2G
5: ff:P-O-L Bone-Black-HDMI,00A0,Texas Instrument,BB-BONELT-HDMI
7: ff:P-O-L Override Board Name,00A0,Override Manuf,am33xx_pwm
8: ff:P-O-L Override Board Name,00A0,Override Manuf,bone_pwm_P9_14
9: ff:P-O-L Override Board Name,00A0,Override Manuf,bone_pwm_P9_16
10: ff:P-O-L Override Board Name,00A0,Override Manuf,bone_pwm_P9_22
```

### 3.4 Troubleshooting

- In section 3.2, when you echo bone\_pwm\_\*\*P9\*\*\_{gpio-pin-num}, make sure you enter uppercase P, not lowercase p.

## 4. Testing LED

4.1 We can turn on the red, green and blue color with some brightness. This can be done by changing the duty cycle of the gpio. Setting up large values to the duty cycle will result in brighter LEDs, and small values to the duty cycle will result in dimmer LEDs. Passing in 0 to the duty cycle will turn off the light.

### 4.2 Turn on the red color - we can control the colour red through P9\_14

```
root@ccc30-beagle:/sys/class/gpio# cd /sys/devices/ocp.3/pwm_test_P9_14.15/
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_14.15# ls
driver  duty  modalias  period  polarity  power  run  subsystem  uevent
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_14.15# cat duty 0
0
cat: 0: No such file or directory
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_14.15# cat duty
0
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_14.15# echo 100000 > duty
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_14.15# cat duty
100000
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_14.15# echo 0 > duty
```

### 4.3 Turn on the green color - we can control the colour green through P9\_16

```
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_14.15# cd ../pwm_test_P9_16.16/
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_16.16# cat duty
0
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_16.16# echo 7000 > duty
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_16.16# cat duty
7000
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_16.16# echo 0 > duty
```

#### 4.4 Turn on the blue color - we can control the colour blue through P9\_22

```
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_16.16# cd ../pwm_test_P9_22.17/
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_22.17# cat duty
0
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_22.17# echo 200000 > duty
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_22.17# cat duty
200000
root@ccc30-beagle:/sys/devices/ocp.3/pwm_test_P9_22.17# echo 0 > duty
```

#### 4.5 Troubleshooting

- If light is not turning on, make sure that you connect the breadboard with the correct gpio pins. See figure 1.5, 1.6 and 2.3.
- If light is not turning on, check the breadboard and BeagleBone Black are not loosely wired.
- If the colour that turned on is not the correct colour, check the direction of the LED. See figure 1.1 and 2.1.
- If the colour that turned on is not the correct colour, check the wiring. See figure 1.6 and 2.3.