CMPT 433 - Wire Tri-Colour LED and Magnetic Contact Switch

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Introduction

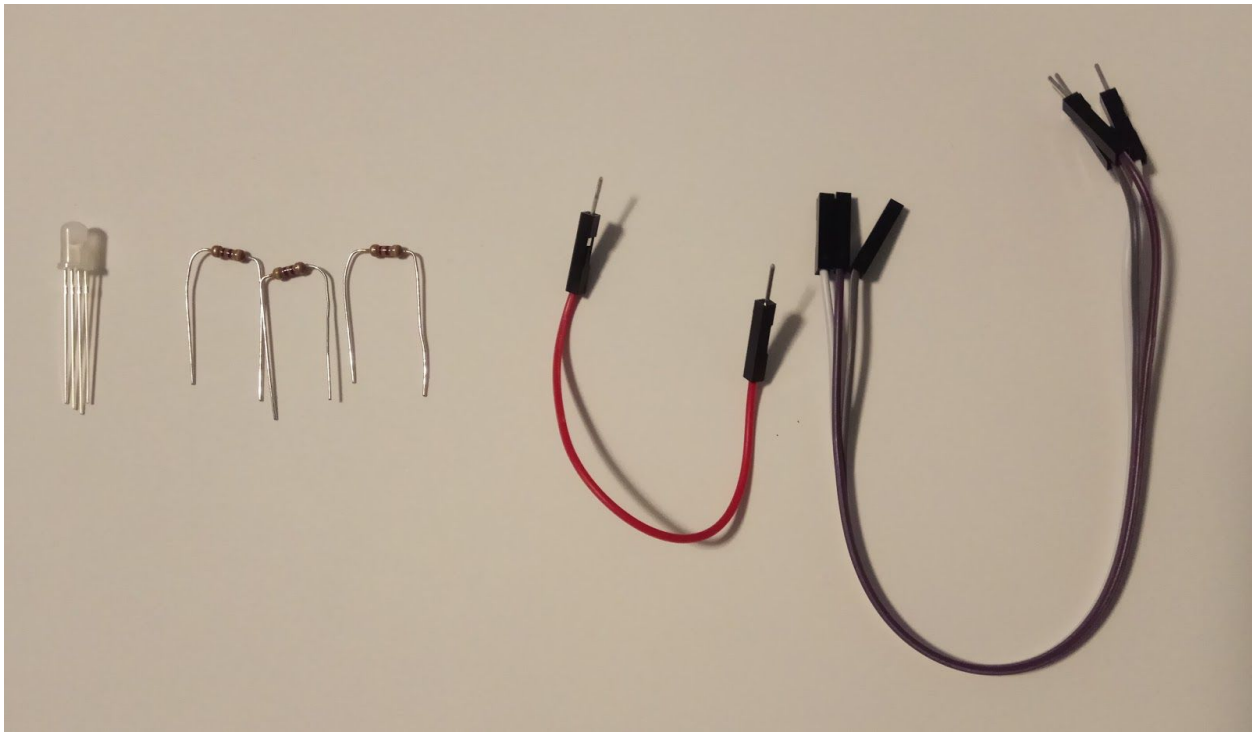
This guide will walk through wiring up a tri-colour LED and magnetic contact switch, and demo through the terminal.

This differs from existing tri-colour LED guides as it handles the LEDs through GPIO instead of PWM.

Materials

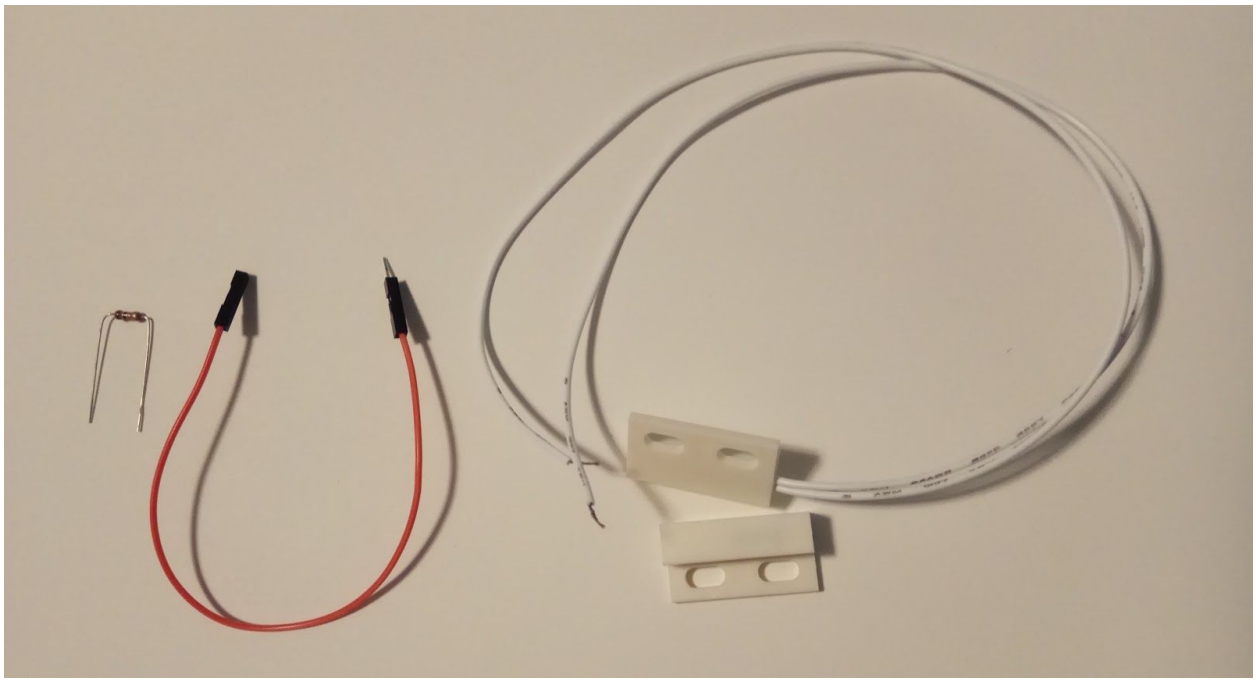
LED Setup:

- 1 tri-colour LED
- 3 470 Ω resistors
- 1 M-M jumper wire
- 3 M-F jumper wires



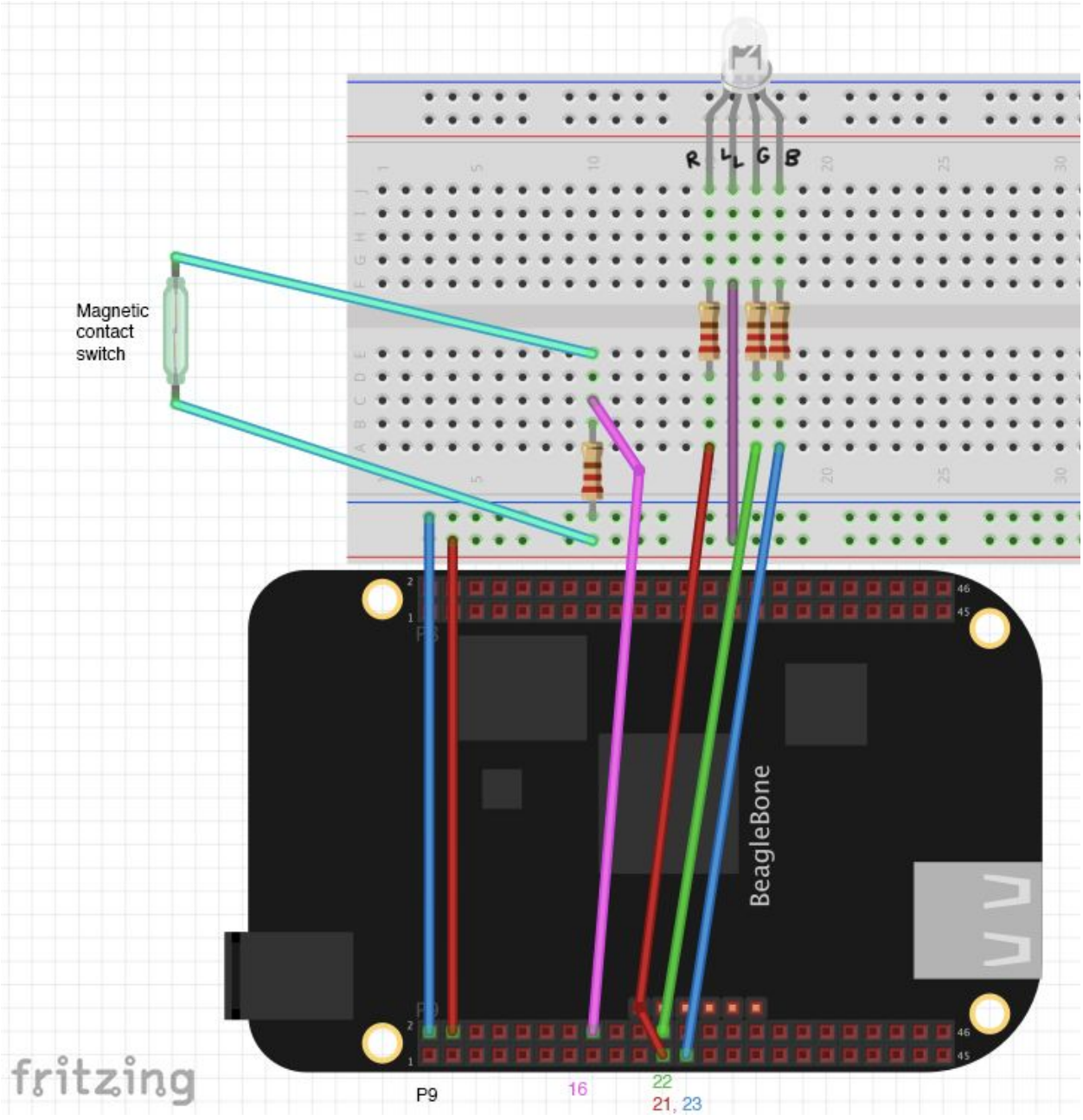
Magnetic Contact Switch Setup:

- 1 magnetic contact switch
- 1 10 kΩ resistor
- 1 M-F jumper wire



Wiring

After wiring, your setup should resemble this (instructions below).



Wiring the LED

1. Insert the tri-colour LED into the breadboard. Remember which lead is the longest lead (marked LL in the diagram).

2. Connect the longest lead (LL) to the red power bar of the breadboard using a M-M jumper wire. (Purple wire in the diagram.)
3. Insert the three 470 Ω resistors that cross the middle divider of the breadboard, with one end in the same 5-slot column of the R, G, and B leads of the LED.
4. Use a M-F jumper wire to connect the red lead to GPIO pin P9_21. (Red wire in the diagram.)
5. Similarly, connect the green lead to P9_22 (green wire in the diagram), and the blue lead to P9_23 (blue wire in the diagram)
6. Double check your wiring matches the diagram.

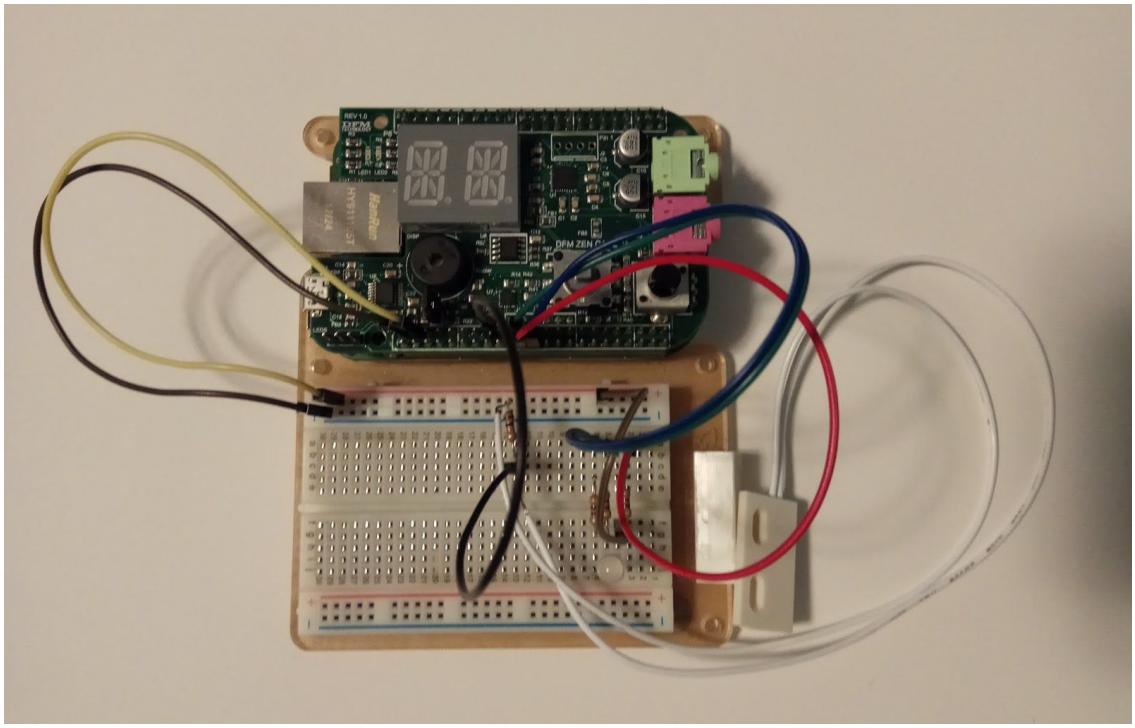
Wiring the Contact Switch

1. Connect one end of the magnetic switch to the breadboard's red power bar. (Cyan in diagram.)
2. Connect the other end of the magnetic switch to a 5-slot column. (Cyan in diagram.)
3. Use a 10 kΩ resistor to connect the 5-slot column to the breadboard's blue ground bar.
4. Use a M-F jumper wire to connect the 5-slot column to GPIO pin P9_16 (Pink wire in the diagram.)
5. Double check your wiring matches the diagram.

Finally,

1. Connect the breadboard's blue ground bar to P_2 (Leftmost blue wire in the diagram).
2. Connect the breadboard's red power bar to P_4 (Leftmost red wire in the diagram).

End result:



Troubleshooting

- When powered on, the LED should emit a faint glow to indicate it has power.
    - If LED isn't lit up, make sure the breadboard's red power bar is connected to the correct pin on the beaglebone
- Double check the LED wiring by following the circuit
    - Beaglebone's 3.3V (P9_4) is connected to the breadboard's red power bar
    - LED's longest lead is connected to power via jumper wire
    - LED's R, G, and B leads are connected to resistors that connect to GPIO pins
    - R is connected to P9_21 (Not P8)
    - G is connected to P9_22
    - B is connected to P9_23
- Double check the switch wiring by following the circuit
    - Beaglebone's 3.3V (P9_4) is connected to the breadboard's red power bar
    - Switch is connected to the red power bar on one end
    - On the other end, the switch is connected to a GPIO pin and a resistor
    - The GPIO pin is P9_16
    - The resistor connects to the breadboard's blue ground bar
    - The groud bar is connected to the beaglebone's ground (P9_2)

Demo

1. Export all pins.

Beaglebone Pin Number	Linux Pin Number	Usage
P9_16	51	Magnetic switch
P9_21	3	LED Red
P9_22	2	LED Green
P9_23	49	LED Blue

```
# echo 51 > /sys/class/gpio/export
# echo 3 > /sys/class/gpio/export
# echo 2 > /sys/class/gpio/export
# echo 49 > /sys/class/gpio/export
```

LEDS

2. Set all LED pins' directions to "out". All three colours of the LED may turn on at this point, emitting a very bright white colour.

```
echo out > /sys/class/gpio/gpio3/direction
echo out > /sys/class/gpio/gpio2/direction
echo out > /sys/class/gpio/gpio49/direction
```

3. Turn off the LED.

```
echo 1 > /sys/class/gpio/gpio3/value
echo 1 > /sys/class/gpio/gpio2/value
echo 1 > /sys/class/gpio/gpio49/value
```

4. Turn the LED red by writing 0 to gpio3/value, and off again by writing 1.

```
echo 0 > /sys/class/gpio/gpio3/value
echo 1 > /sys/class/gpio/gpio3/value
```

5. Turn the LED green by writing 0 to gpio2/value, and off again by writing 1.

```
echo 0 > /sys/class/gpio/gpio2/value
echo 1 > /sys/class/gpio/gpio2/value
```

6. Turn the LED blue by writing 0 to gpio49/value, and off again by writing 1.

```
echo 0 > /sys/class/gpio/gpio49/value
echo 1 > /sys/class/gpio/gpio49/value
```

Magnetic switch

7. Set the magnetic switch direction to "in". If using poll (or similar) in your C program to detect events on the switch, set edge to "both" to detect both opening and closing the switch.

```
-# echo in > /sys/class/gpio/gpio51/direction
-# echo both > /sys/class/gpio/gpio51/edge
```

8. Put the two magnets together to close the circuit.

9. Cat the value of the pin.

```
root@amwhite-beagle:~# cat /sys/class/gpio/gpio51/value
1
```

10. Separate the magnets, then cat again.

```
root@amwhite-beagle:~# cat /sys/class/gpio/gpio51/value
0
```

Troubleshooting

- LED
    - Double check the correct RGB leads are connected to the correct GPIO pins (see previous section).
    - Ensure all wires and pins are fully pressed in. Jumper wires come loose easily.
    - Ensure all steps are taken for each R, G and B pins, and that you enter the correct pin numbers (R = 3, G = 2, B = 49)
- Magnetic switch
    - Ensure the switch is connected to the breadboard properly. You may need to strip the wires a couple millimeters to be able to get it in far enough.