Making with Meaning exercise guide

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Username – pi
Password - makingwithmeaning

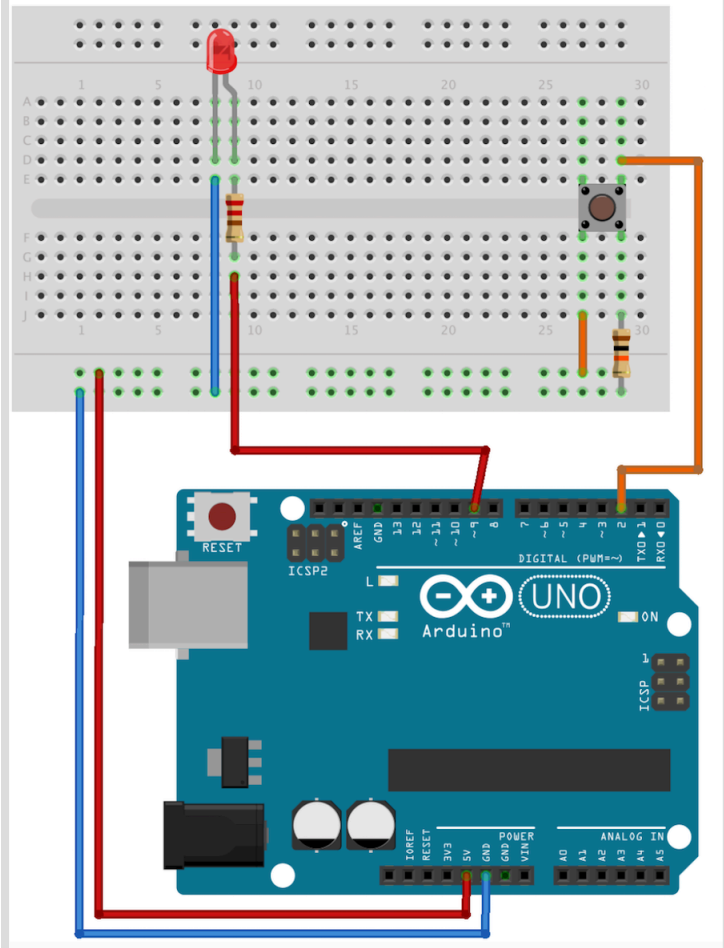
Making with meaning exercise 1: turning LED on and off

Introduction

In this exercise we will be showing you how to create a on off switch for the Arduino.
For this excerise you will need:

- Arduino
- Bread board
- 6 leads
- 2 1K Ω Resister
- LED
- Switch

Plug in the Arduino and breadboard so that it looks like this:



Plug in the Arduino into the power and it you will be able to demonstrate the voltage.

Source code:

```
// constants won't change. They're used here to set pin numbers:
const int buttonPin = 2;     // the number of the pushbutton pin
const int ledPin =  9;      // the number of the LED pin

// variables will change:
int buttonState = 0;         // variable for reading the pushbutton status

void setup() {
  // initialize the LED pin as an output:
  pinMode(ledPin, OUTPUT);
  // initialize the pushbutton pin as an input:
  pinMode(buttonPin, INPUT);
}

void loop() {
  // read the state of the pushbutton value:
  buttonState = digitalRead(buttonPin);

  // check if the pushbutton is pressed. If it is, the buttonState is HIGH:
  if (buttonState == HIGH) {
    // turn LED on:
    digitalWrite(ledPin, HIGH);
  } else {
    // turn LED off:
    digitalWrite(ledPin, LOW);
  }
}
```

Making with Meaning exercise 2: Raspberry pi Time-lapse Camera

Introduction

In this exercise we will be showing you how to build your own time lapse camera on the raspberry pi. This camera will take a photo every 30 seconds and will save the image to the raspberry pi, a pause button and status lights.

For this project you will need:

- Raspberry pi and power supply
- SD Card (16gb or larger)
- Raspberry pi camera unit
- 3 1K Ω Resister
- 3 LED (We are using red, green and blue).
- A microswitch
- 6 cables
- Breadboard
- A computer running either:
    - Windows 7 or newer with putty (free download)
    - Linux running Debian, Ubuntu, Red Hat, Fedora or SUSE
    - macOS 10 or newer
    - Running Microsoft Visual Studio Code (free download)

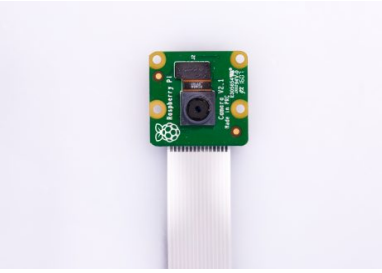
What does each part do?

Raspberry Pi

[5]

The raspberry pi is a a £30 computer that is designed to teach people how to program. The raspberry pi has a 1.4ghz 64 bit processor, 1gb of RAM, 40 pin GPIO header and a HDMI port. [1] The parts that go into a raspberry pi are the same that you would find in a 2015 smartphone, which allows them to be cheap. (For example most smart phones today have more than 2GB of RAM. It uses a SD card as its storage, making it very easy to program.
Our models will be running the Raspbian operating system which is based off Linux, the same operating system that android uses. We wont be using a monitor for these although we will be contacting to them by the terminal (or putty for windows).

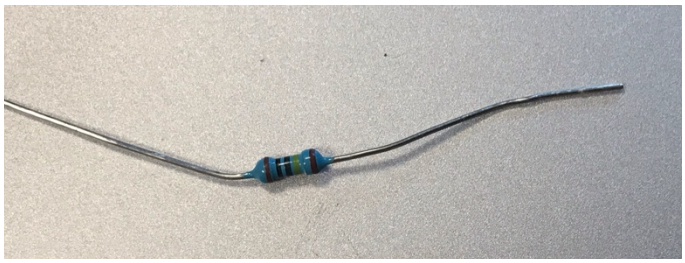
Raspberry pi username – pi



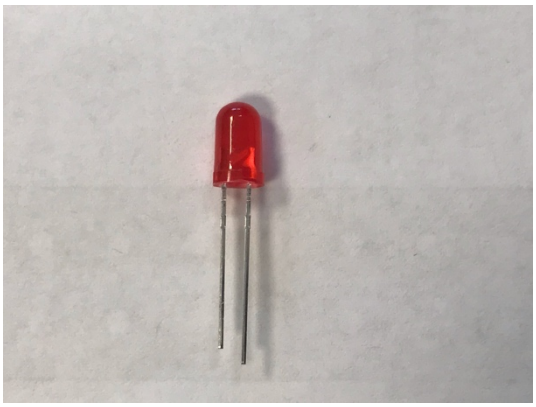
Raspberry pi Camera

The raspberry pi camera module is a 5mp camera that can also film in 1080p (HD quality). It contains a 15cm ribbon cable that's connects to its own port on the raspberry pi [3]

Resistors



A resistor limits the flow of current through a circuit. Think of the circuit as a pipe, we need to bring down the voltage (pressure) as otherwise it will damage the LED. For our circuit we will be using a fixed resistor at 1K Ω (omega). You can say which resistor which by their colours. For example 1K Ω resistors have brown, 2 black followed by 2 red stripes on them as can be seen in the picture.
A diagram showing how to read the voltage of a resistor is available in the apendix

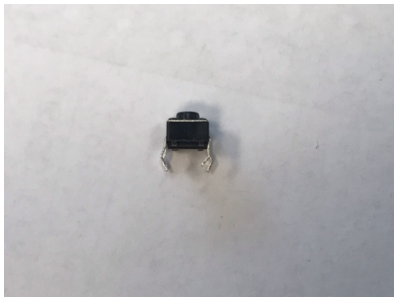


LED

An LED (or Light Emitting Diode) is a semiconductor light source. It is a very efficient light source and is also used in light bulbs, TV remotes, Screens, heart rate sensors and in hundreds of other places. LED can only work if plugged in the right way (longest leg is positive), but placing it the wrong way will not damage them. LED come in several colours and we will be using green, red and blue for our LED.

The green LED will be used to show when the raspberry pi is running our program, red will show when it's not paused and blue will come on 3 seconds before a picture is taken.

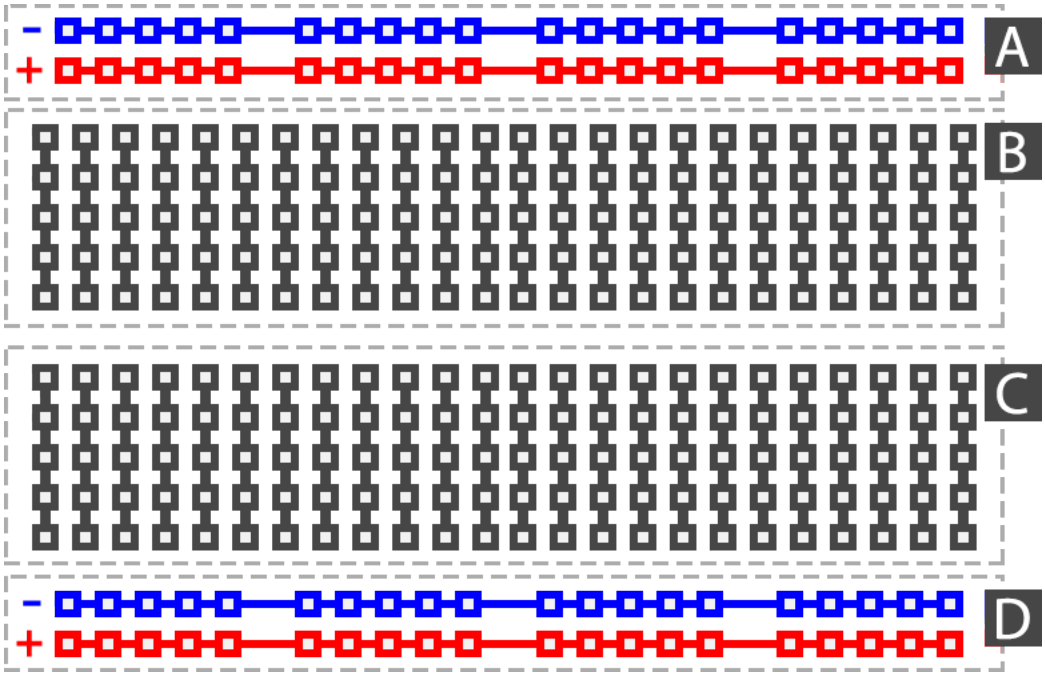
Micro switch



A micro switch is a switch that we will be using to control whether the camera will be paused or not. A micro switch works by allowing or breaking a circuit that the raspberry pi can detect and then tell us that whether its pressed or not. We will be using a while loop in our program that will hold the program until the switch is pressed twice.

Bread Board

A bread board is a board that we use to wire up our components without having to to solder to it. This means that it is easy for us to build things quickly without having to solder.



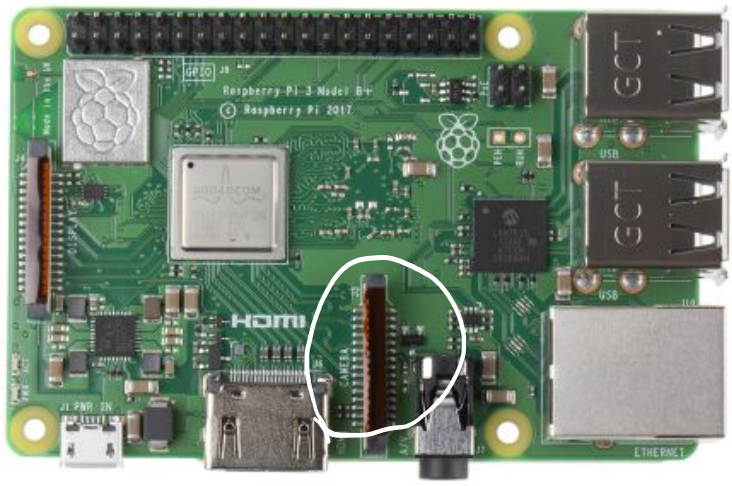
On both sides, there is two rails (for positive and negative) that run parallel. There are then 2 larger rails that run the power horizontally. Below you can see how the bread board cables run. [4]

Computer

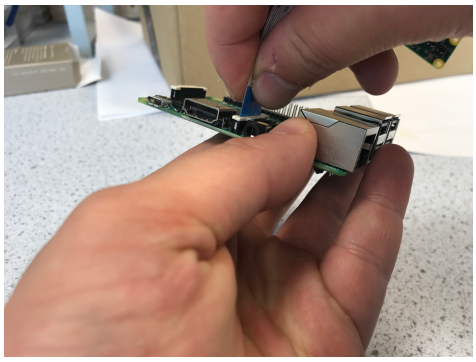
The computer we will be using will be used to connect to the raspberry pi easily. This makes it easier to set up the raspberry pi. This is because the raspberry pi isn't that powerful and many software tools require more power.
We won't need to plug anything into the raspberry pi as we are going to connect to the raspberry pi through our own network.
We can use a piece of software SSH to access the raspberry pi. This is built into macOS and Linux but for Windows we will need to use putty. It's is accessible by the command line.

How to build the time laps camera

1. First of all plug in the camera strip into the raspberry pi. It plugs the white port on the Center of the raspberry pi

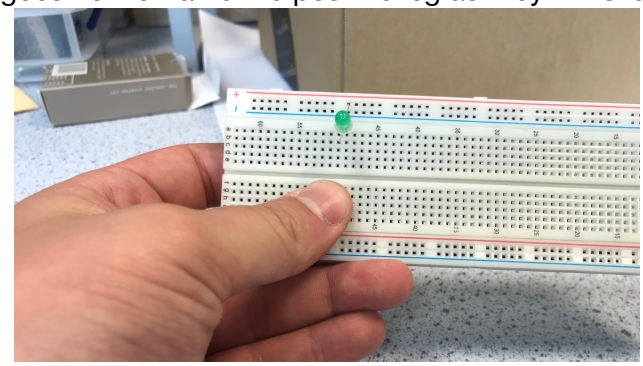


Insert as such:



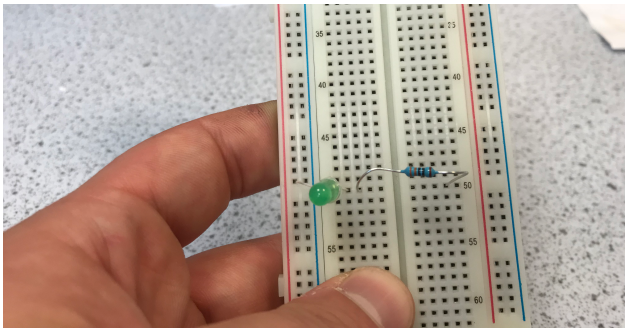
Push it in until the connectors are all in and secure. The raspberry pi will now start taking time lapse when turned on.

2. Insert LED - insert the positive leg into the “A” column of the rail and insert the negative leg into the “+” or “-“ column of the breadboard. It does not matter whether the negative leg goes horizontal to the positive leg as they will share a common

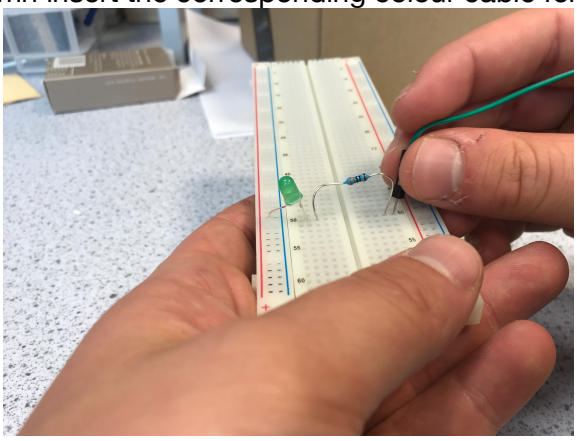


negative cable back to the pi.

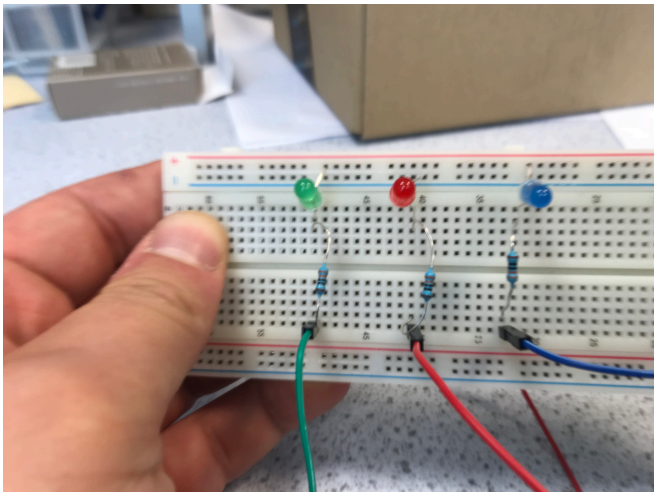
3. Insert the resistor horizontal to the LED on the breadboard into the “B” and “I” column. It does not matter what way that it faces unlike the LED.



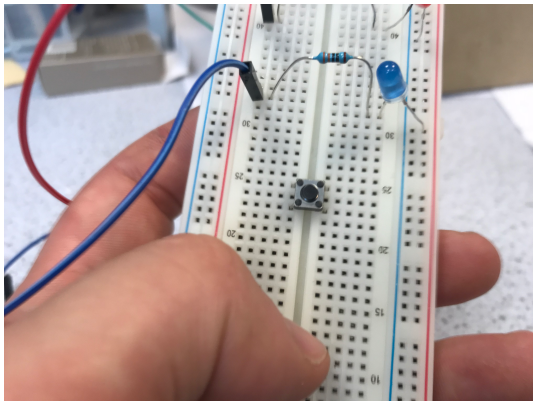
4. In the “J” column insert the corresponding colour cable for the LED.



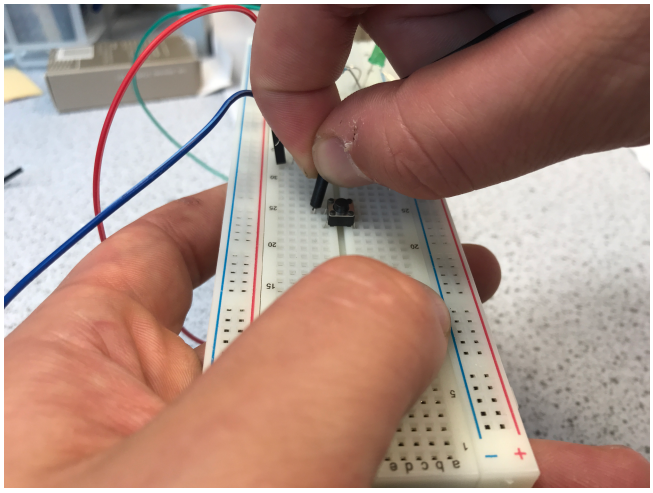
5. Repeate Stage 2-4 for the rest of the LED until you have something that looks like this:



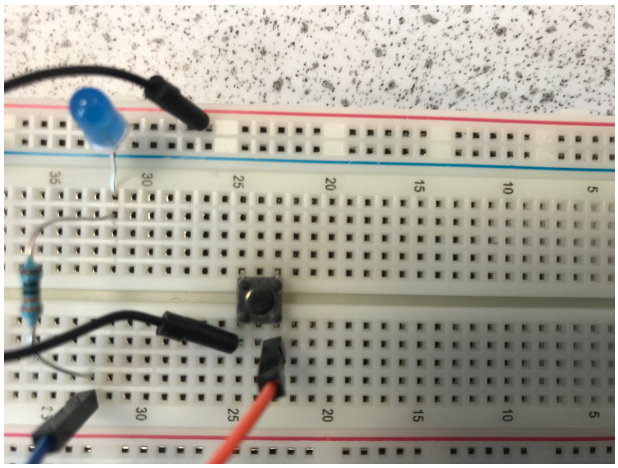
6. Insert the switch so that the 4 legs fit into the bread board between column “e” and “f” where the bent legs face the end of the board. It should look like this:



7. Plug in a black cable into port “g” horizontal to one of the legs. Plug the other end into the ground leg.

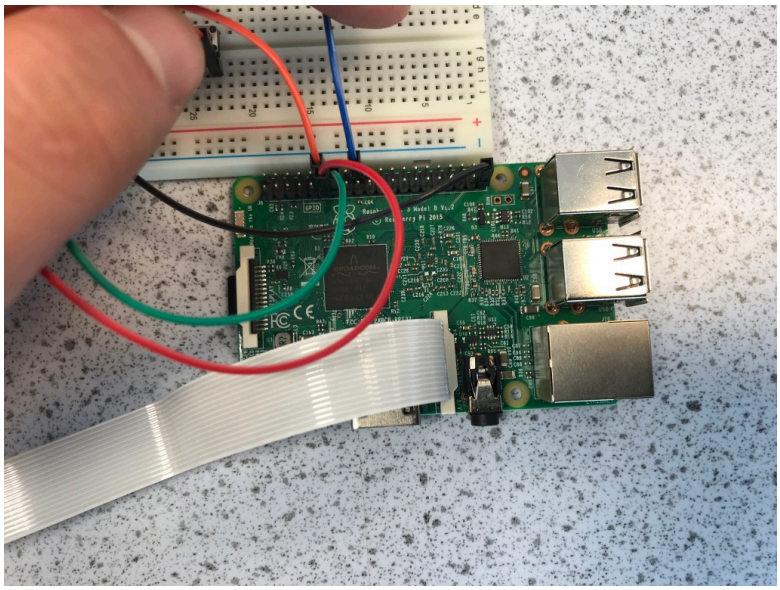


8. On column “G’ plug the cable horizontally to the other leg of the switch. You should end up with the switch laid out such as:



9. Place a black cable from the “+” or “-.” This will then connect to ground.

10. We now need to wire these cables into the raspberry pi. We should end up wire them up like this:

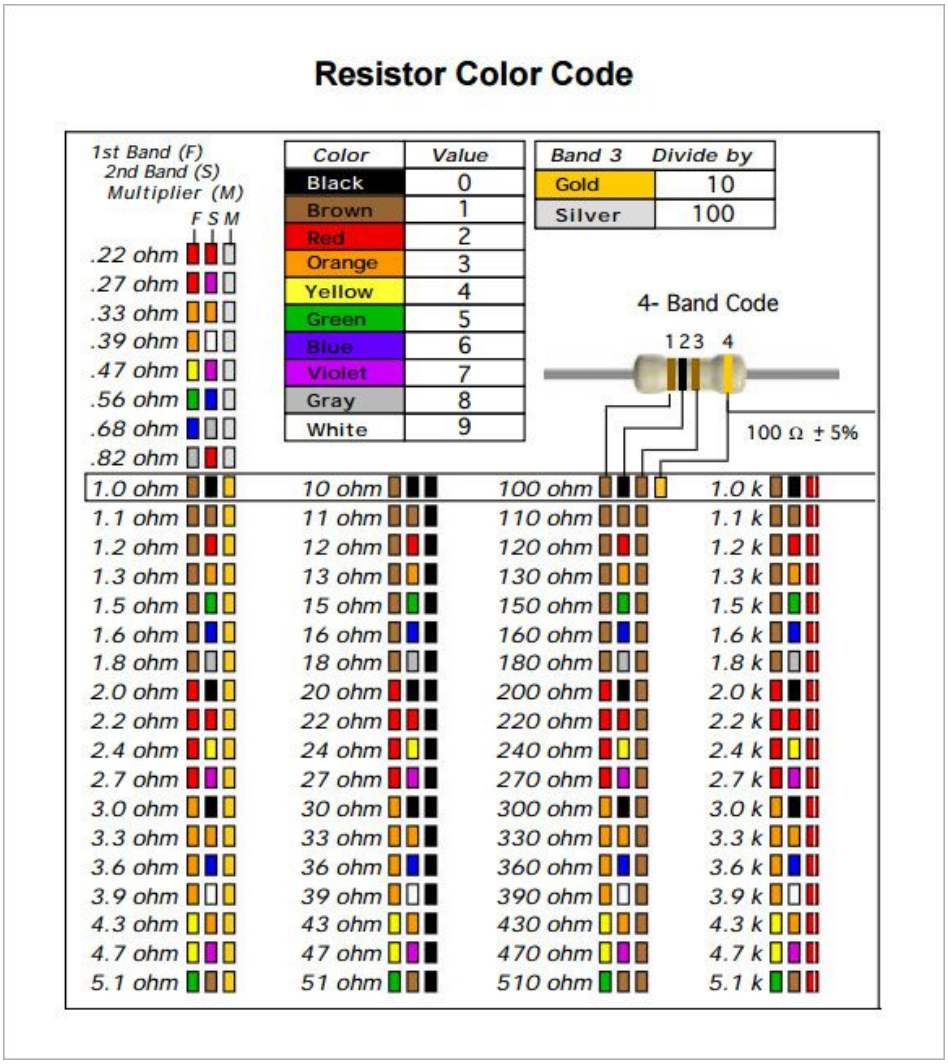


We want ground (black cable) to go to pin 39, switch to pin 12, green cable to pin 13, red to pin 11 and blue to pin 18. A diagram of the pin layouts is available in the appendix of this document.

Plug the Raspberry Pi in and it should work

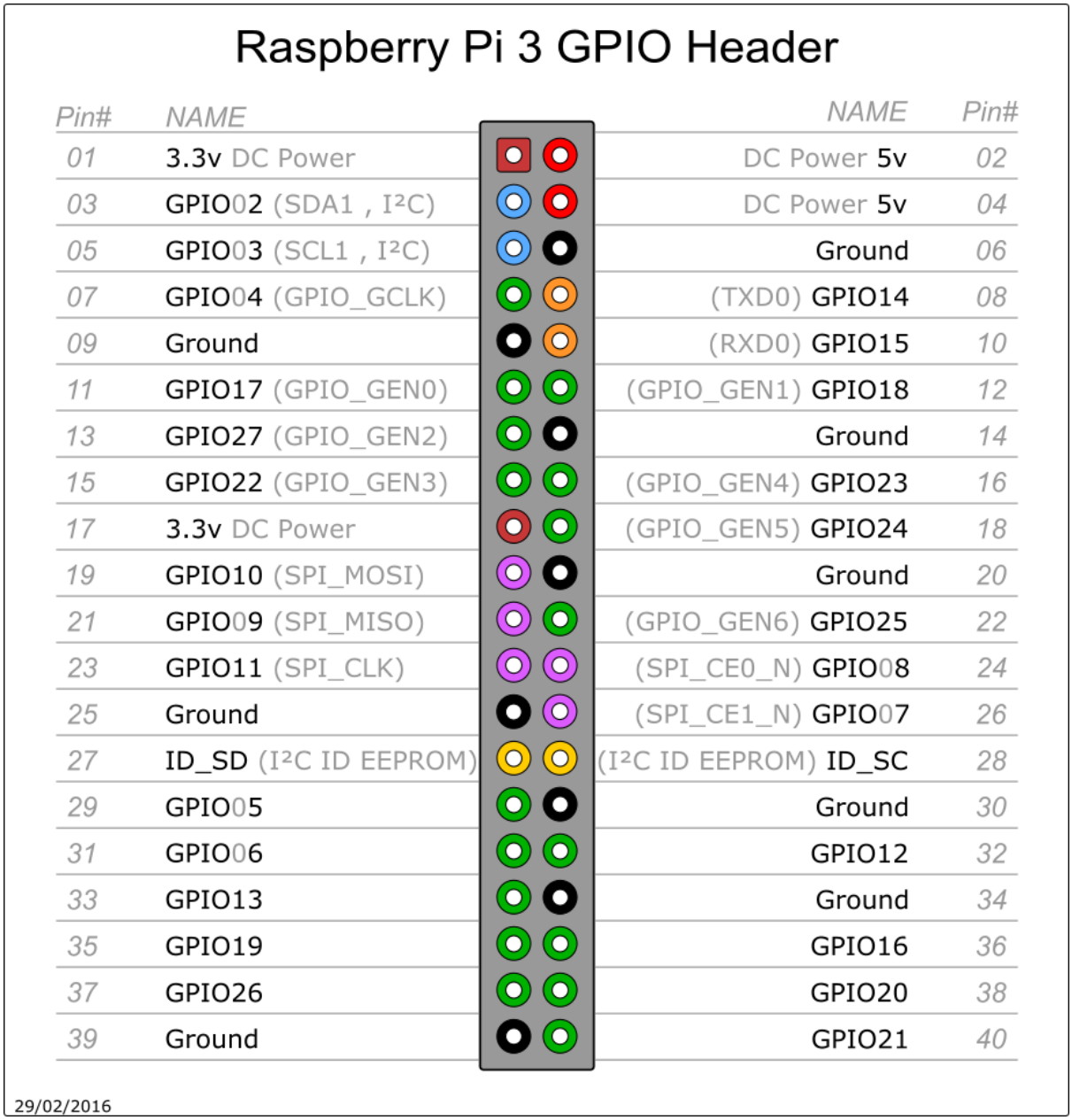
Appendix:

Resistor colour code:



[5]

Raspberry Pi GIPO header:



[6]

References

[1] https://www.raspberrypi.org/products/raspberry-pi-3-model-b-plus/
[2] https://uk.rs-online.com/web/p/products/1373331/?grossPrice=Y&cm_mmc=UK-PLA-DS3A-_-google-_-PLA_UK_EN_Case_Studies-_-Raspberry-_-PRODUCT+GROUP&matchtype=&pla-306036484078&gclid=CjwKCAjwns_bBRBCEiwA7AVGHgRmgTsS5Cl2rkRV3YlabOkQ-6YMwDOt2xi_CB1Ic2AMntvGuITs1RoC1m0QAvD_BwE&gclsrc=aw.ds
[3] https://www.raspberrypi.org/products/camera-module-v2/
[4] https://www.tweaking4all.com/hardware/breadboard/
[5] https://www.pinterest.co.uk/pin/549861435734862920/
[6] https://myelectronicslab.com/raspberry-pi-3-gpio-model-b-block-pinout/