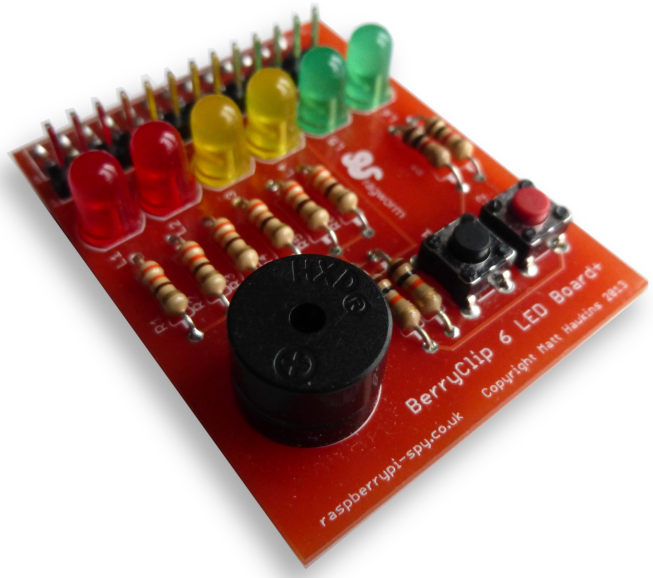


BerryClip+

6 LED Buzzer Board

The quick and easy way to experiment with the Raspberry Pi

Introduction

The BerryClip+ is an enhanced version of the popular BerryClip add-on board. It is a simple, cheap and easy to use addition to the Raspberry Pi. It plugs directly onto the Pi's GPIO header and provides 6 coloured LEDs, 1 Buzzer, 2 Switches and a 13 pin header. It can be controlled using any programming language that can manipulate the GPIO pins and this includes Python and C. The 13 pin header allows additional components and sensors to be added.

Parts

The kit of parts includes :

- 1 Circuit board
- 2 Red LEDs
- 2 Yellow LEDs
- 2 Green LEDs
- 6 330 ohm resistors
- 2 1K ohm resistors
- 2 10K ohm resistors
- 1 Buzzer
- 2 Switches
- 1 26 way header connector
- 1 13 way pin header
- 1 Rubber bumper

Resistor Colour Codes

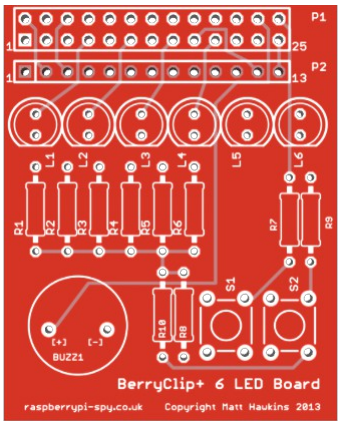
The value of a resistor is indicated by bands of colour. The resistors on the BerryClip+ will have the following colour codes :

- 330 ohm **Orange-Orange-Brown**
- 1K ohm **Brown-Black-Red**
- 10K ohm **Brown-Black-Orange**

The PCB

The PCB is labelled to identify where each component should be placed.

P1	26-way header
P2	13-way pin header
BUZZ1	5v buzzer
S1	Micro-switch
S2	Micro
R1-R6	330 ohm (Orange-Orange-Brown)
R7,R9	1K ohm (Brown-Black-Red)
R8,R10	10K ohm (Brown-Black-Orange)
LED1,2	Red LEDs
LED3,4	Yellow LEDs
LED5,6	Green LEDs
Bumper	Rubber bumper



- Take care to ensure the 1K and 10K resistors are placed in the correct positions.
- Take a look at the photos to ensure you solder the two headers onto the correct side of the board.
- The LEDs have a short leg (Cathode) and long leg (anode). Make sure the long leg is inserted into the hole nearest the P1 Header. The short leg should be inserted into the hole nearest the resistor.

Assembly & Soldering

If you have never soldered before or you need a quick refresher then I can recommend the "Soldering Is Easy" comic :

http://mightyohm.com/files/soldercomic/FullSolderComic_EN.pdf

or this SparkFun page :

http://www.sparkfun.com/tutorials/106

Recommended Soldering Sequence :

- Solder 1 26-way header
- Solder 8 resistors
- Solder 6 LEDs
- Solder 1 switch
- Solder 1 buzzer
- Solder 13-way pin header

When soldering the headers make sure you don't use too much solder or you may short-circuit the pins underneath the PCB.

Once the components are soldered :

- Visually check your solder joints and ensure there are no stray blobs or splashes of solder that might short-circuit any pins.
- Remove the label on the buzzer.
- Stick rubber bumper to underside of board so it will rest on large silver capacitor (C6) on the Raspberry Pi.
- If possible use a multimeter to check there are no short-circuits between adjacent header pins.

Plug the board onto your Raspberry Pi. Stand back and admire your work.

Software Setup

To start with you will need a working SD card. I would recommend starting with a fresh copy of Raspbian. This image can be downloaded from from raspberrypi.org/downloads

Once you've got an SD card prepared put it in your Pi, power it up and login with default user name and password ('pi' and 'raspberry')

You will now be located in the 'pi' user home directory ('/home/pi/').

Type the following commands pressing the Enter key at the end of each line :

```
mkdir berryclip_plus
cd berryclip_plus
wget https://bitbucket.org/MattHawkinsUK/rpispy-berryclip-plus/get/master.tar.gz
tar -xvf master.tar.gz --strip 1
```

The above lines perform the following functions :

- Makes a new directory called 'berryclip_plus'
- Navigates into that directory
- Grabs an archive of all the files from the BitBucket.org website
- Extracts the files to your Pi

The script will download an instruction file and a set of example Python scripts.

To list the downloaded files type :

```
ls -l
```

You can use the following command to remove the gz archive as we don't need that now we have extracted the files :

```
rm master.tar.gz
```

Run Some Example Python Scripts

The following example Python scripts are available :

- berryclip_01.py – Test LEDs only
- berryclip_02.py – Test Buzzer only
- berryclip_03.py – Test Switches only
- berryclip_04.py – Test LEDs and Switches
- berryclip_05.py – Test LEDs, Buzzer and Switches
- berryclip_06.py – LED sequence
- berryclip_07.py – Dice Simulator
- berryclip_08.py – Reaction time game
- berryclip_09.py – Random LEDs
- berryclip_10.py – Multiple LED sequences in a loop
- berryclip_11.py – Traffic light simulator
- berryclip_12.py – Morse code generator

To run a script you can use the following command :

```
sudo python berryclip_01.py
```

To quit a running Python script use [CTRL-C].

To view a text file or Python script you can use the command :

```
cat berryclip_01.py
```

Modifying Scripts

Once you have tested your BerryClip+ and tried the example scripts you can start to develop your own examples. You can use any text editor you prefer to edit the scripts but here are some quick tips.

Copy an existing scripts to a new file by using :

```
cp berryclip_01.py myfile.py
```

Edit a script in the nano text editor using :

```
nano myfile.py
```

Make your changes and save using CTRL+O .You can quit nano by pressing CTRL+X.

Adjusting the time.sleep() statements is a good thing to start with. Or maybe adding additional print statements.

Additional Information

The following information is provided for those that are simply curious or are looking to modify their BerryClip+.

Hardware Reference

Here is a list of components, the header pins (P1) they connect to and the GPIO reference you can use you control them :

LED 1	P1-07	GPIO4
LED 2	P1-11	GPIO17
LED 3	P1-15	GPIO22
LED 4	P1-19	GPIO10
LED 5	P1-21	GPIO9
LED 6	P1-23	GPIO11
Buzzer	P1-24	GPIO8
Switch 1	P1-26	GPIO7
Switch 2	P1-22	GPIO25

13 Pin Header (P2)

P2-01	3.3V	P1-01	3.3V
P2-02	5V	P1-02	5V
P2-03	Ground	P1-06	Ground
P2-04	GPIO2	P1-03	GPIO2 I2C0_SDA
P2-05	GPIO3	P1-05	GPIO3 I2C0_SDA
P2-06	GPIO14	P1-08	GPIO14 Serial TX
P2-07	GPIO15	P1-10	GPIO15 Serial RX
P2-08	GPIO18	P1-12	GPIO18
P2-09	GPIO27	P1-13	GPIO27
P2-10	GPIO23	P1-16	GPIO23
P2-11	GPIO24	P1-18	GPIO24
P2-12	3.3V	P1-17	3.3V
P2-13	Ground	P1-25	Ground

Be aware that some of the GPIO assignments are different on Raspberry Pi Rev 1 and Rev 2 boards. Rev 1 boards do not have the two large mounting holes in the PCB.

Rev 1 GPIO0 = Rev 2 GPIO2
Rev 1 GPIO1 = Rev 2 GPIO3
Rev 1 GPIO21 = Rev 2 GPIO27

LED Currents

The LED current limiting resistors are 330Ω. The voltage provided by the GPIO pins is 3.3V. The LEDs drop approximately 2-2.2V. This leaves the resistor dropping 1.1-1.3V. The resistors have a tolerance of 5% so could vary in value between 310Ω and 350Ω.

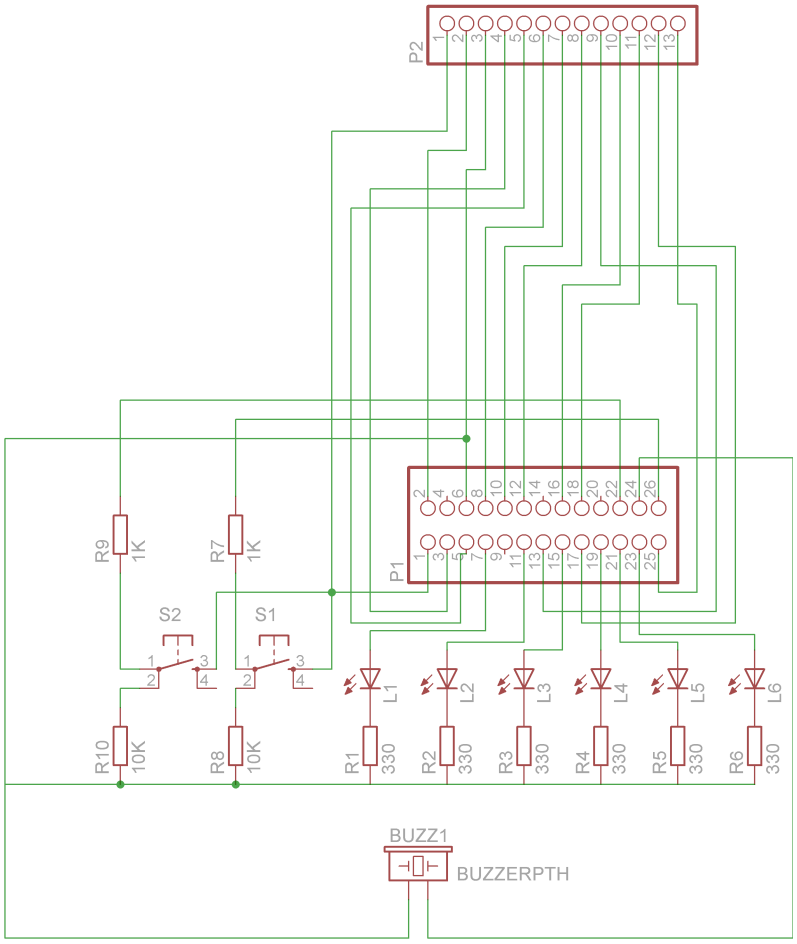
So using Ohm's Law :

$$V = IR \qquad I = \frac{V}{R}$$

we can calculate that the LEDs each draw between 3.1mA and 4.2mA.

Circuit Diagram

Here is a circuit diagram showing how the LEDs, switches and buzzer are connected to the GPIO header via the resistors.



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