

Marty Electronics Instructions

Hello Super Early Adopters!

You requested some extra information about the electronics for Marty and how to wire them all up, so here it is! Please note that this is not the final production electronic setup for Marty, our custom control board will provide all of this functionality and more (e.g. Battery Charging, Wireless).

Below are a list of the electronics you need and how to connect them. You can obtain similar results with different alternatives to these electronics, but we recommend the ones we have tried and tested (Because we know they work!).

An electronic switch and extra set of cables between the battery and the voltage regulators is recommended for ease of connecting/disconnecting the battery from the voltage regulators for recharging.

If anything is not clear or super obvious, we are here to help, do not risk your electronics ;)

Ask us at robotical support: support@robotical.io

Or our forums: <https://groups.google.com/forum/#!forum/robotical-users>

Have fun!

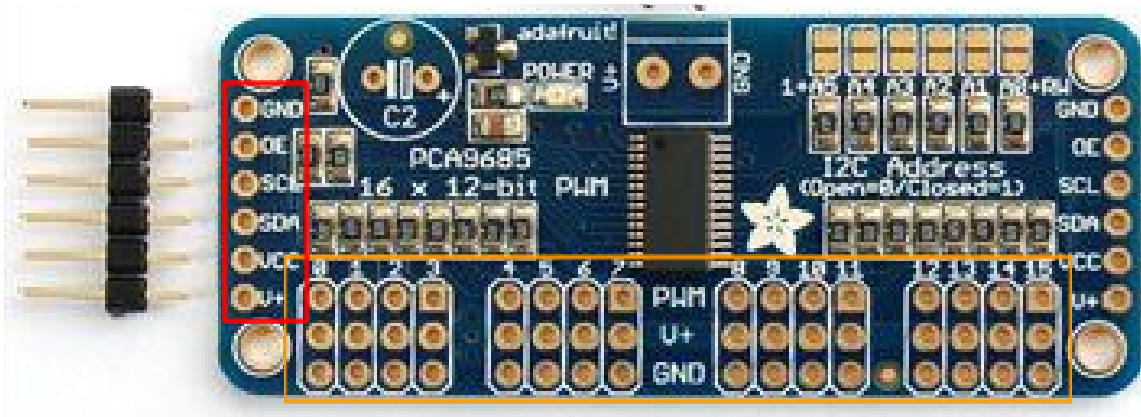
With lots of love,
Robotical

List of Materials

- 1 x Servo Control Board ([Adafruit 16 Channel Board](#))
- 1 x Raspberry Pi ([Zero, 2 or 3](#))
- 1 x 5V/3.5A Voltage Regulator ([UBEC U3 Pro](#))
- 1 x 5V/5A Voltage Regulator ([UBEC X5 Pro](#))
- 7.4V Battery ([Lithium Polymer 2 Cell 1500mAh](#))
- [Any SPST Switch rated for 5A](#) [Optional]
- [2S LiPo Battery Monitor](#) [Optional]

Adafruit Servo Board

The Adafruit 16 Channel board is used for controlling all of Marty's servo motors. It receives I2C commands from the RaspberryPi and sends the appropriate PWM signal to each servo. Whereas servos come with their own connection leads, the RaspberryPi I2C connection needs to be made manually (4 Cable header from RaspberryPi to Adafruit Board).



1. **RaspberryPi Connection:** The RaspberryPi provides an I2C communication interface (see picture below), with **four** pins that need to be connected with the Adafruit:
 - 1.1. **GND:** Ground pin, needed to synchronise grounds with the Adafruit Board.
 - 1.2. **VCC:** Logic voltage pin, needed to synchronise vcc with the Adafruit Board.
 - 1.3. **SDA:** Serial Data Line, part of the I2C communication setup.
 - 1.4. **SCL:** Serial Clock Line, part of the I2C communication setup.

The 4 cables Have to be connected to the RaspberryPi pins GND, VCC, SDA and SCL or [9, 1, 3, 5] respectively.

2. **Servo Connections:**
 - 2.1. **PWM:** Pulse Width Modulation signal, used to tell the servo where to go
 - 2.2. **V+:** Voltage, providing power to the servo motor.
 - 2.3. **GND:** Ground, necessary for connecting the servo.

Each servo must be plugged in the correct port, make sure the black or GND pin goes on the GND pin of the Adafruit line. The default [servo id configuration](#) of our MartyPi code is as follows (Subject to change, please check the actual code!):

CH_LHIP = 0	CH_RTWIST = 4	CH_EYES = 8
CH_LTWIST = 1	CH_RKNEE = 5	CH_AUX1 = 9
CH_LKNEE = 2	CH_LARM = 6	CH_AUX2 = 10
CH_RHIP = 3	CH_RARM = 7	CH_AUX3 = 11

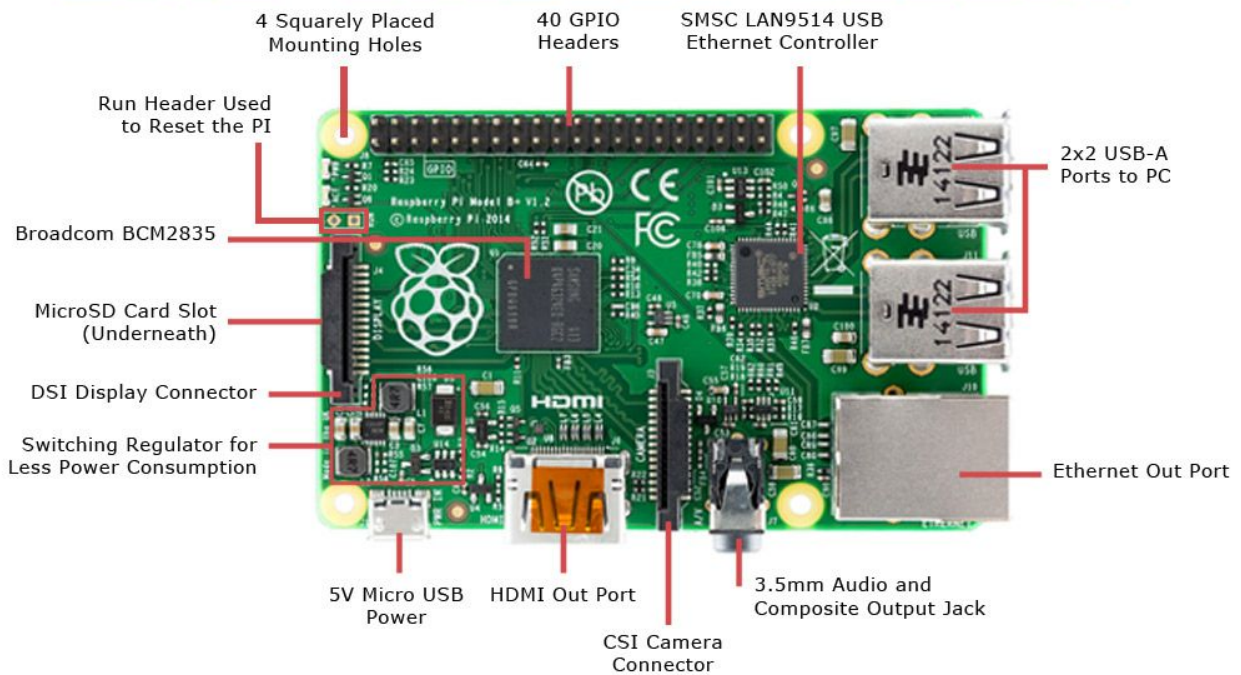
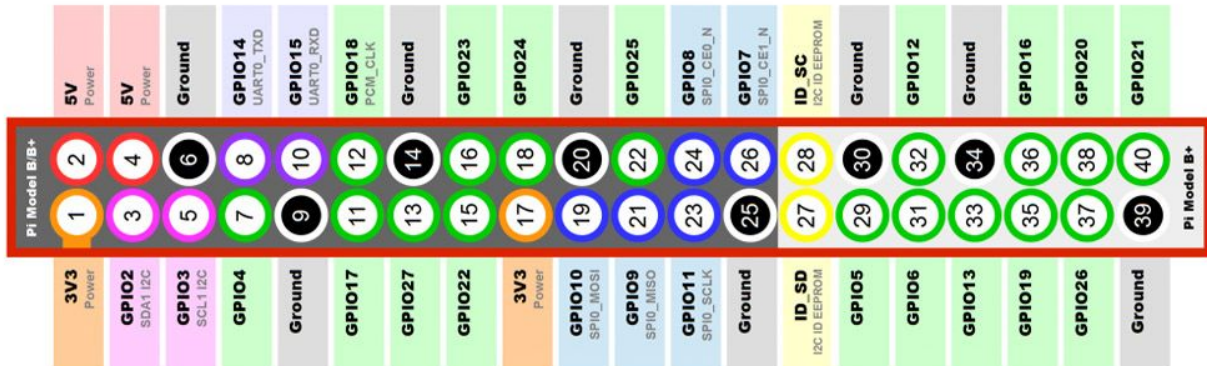
AUX channels are for extra expansion ports, not servos in the default Marty configuration. Check which servo is which before plugging into the Adafruit (With a servo tester or if you remember from when assembling your Marty).

RaspberryPi

A RaspberryPi 3 is used for reference, but earlier versions have the same I2C interface setup

WARNING: Pin numbers may vary. Please check carefully before plugging things in.

GPIO Pinout Diagram



Raspberry Pi 3 (Same I2C interface as Pi Zero or Pi 2)

Voltage Regulators

In order to provide power to both the RaspberryPi and the Adafruit (and servos), a couple of voltage regulators are required (To provide 5V and enough power from the 7.4V battery to the rest of electronics).

DO NOT PLUG IN THE BATTERY DIRECTLY TO ANYTHING EXCEPT THE REGULATORS!

Otherwise the battery will damage the electronics with lower voltage levels. It is recommended to connect the battery to the regulators through a switch, and then split the connection into two in order to connect both voltage regulators:

1. 5V/3.5A UBEC U3 Pro:

Input V+ (Red) and GND (Black) from Battery

Output 5V (Red) and GND (Black) to RaspberryPi Pins [4,6]

2. 5V/5A UBEC X5 Pro:

Input V+ (Red) and GND (Black) from Battery

Output 5V (Red) and GND (Black) to Adafruit Board (Any spare Servo V+/GND ports)



UBEC U3 Pro



UBEC X5 Pro

7.4V Battery



2 Cell 7.4 Volt Lithium Polymer Battery

As described above, connect the thick Red/Black (V+/GND) to the inputs of both voltage regulators, ideally via a switch. Always be aware of the correct health and safety procedures when using / charging Lithium Polymer batteries (Or otherwise) since they may become dangerous if used improperly.