SMesh Mega
V2

Objectives

- Describe the electronics and construction where they different with build standard 1
- Mega is
  - LiIon battery
  - PM sensor, BME but no INA
  - Solar charging option
  - RPi Z Logger with shutdown switch included
- It is useful for
  - Prototype for drone sensor
  - Diagnostics in the field and lab
  - Short duration deployments

INA was needed to monitor 12V battery power. Meshtastic has built-in monitor for LiIon.

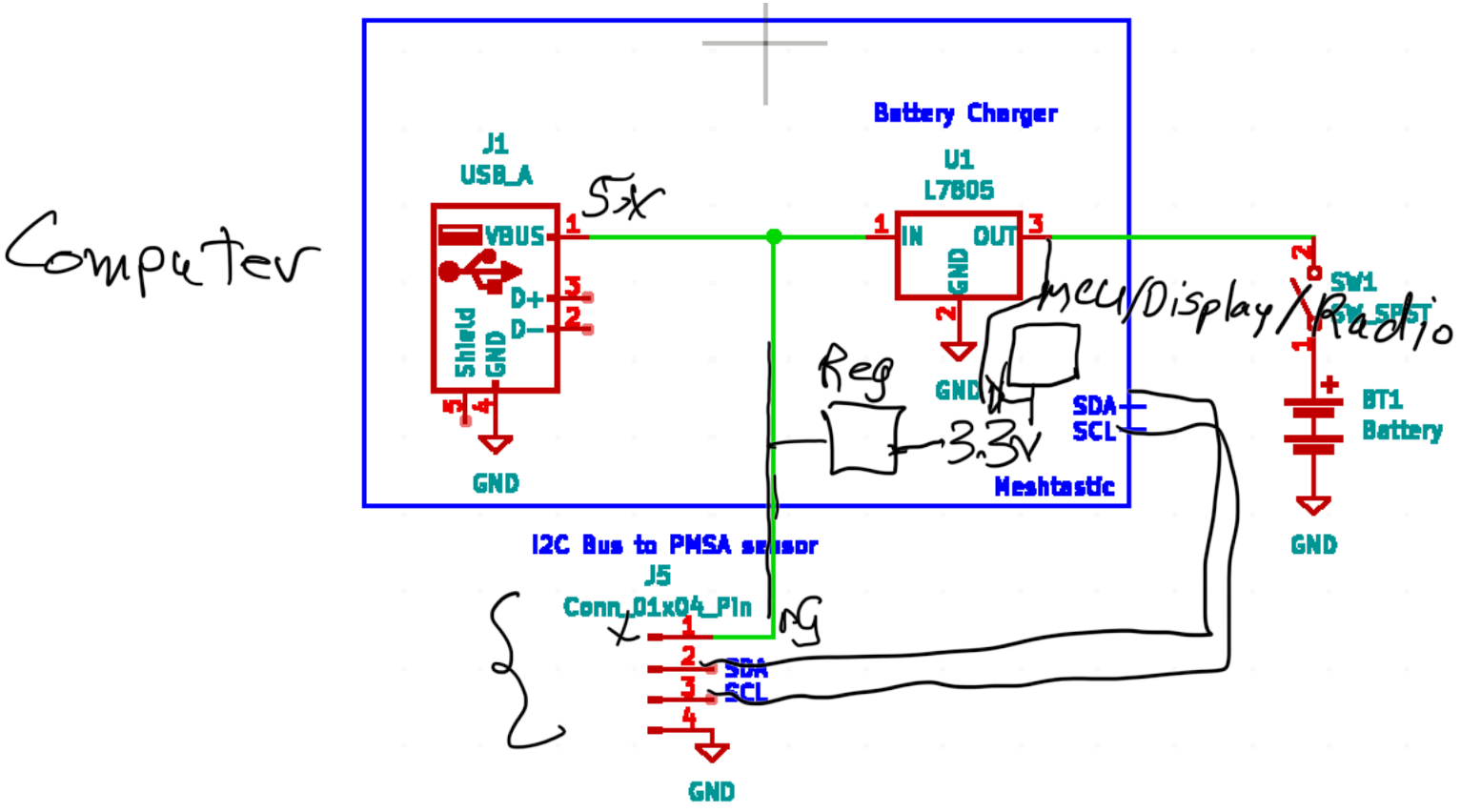
Battery Capacity and Voltage

- LiIon batteries are about 10 Ah and 3.7 to 4.2 V
- Battery life in hours is Capacity in Ah divided by average current drawn from battery in amperes.
- The Meshtastic radio/computer/display and the BME are 3.7V
- The PM sensor and RPi, and battery charging from Meshtastic, require 5V
- The battery supplies 3.7V and a 3.7 → 5V DC-DC converter is used to provide 5V.
  - Switching power supply has 90%+ efficiency
  - Input current does not equal output current
  - More about switchers <here>

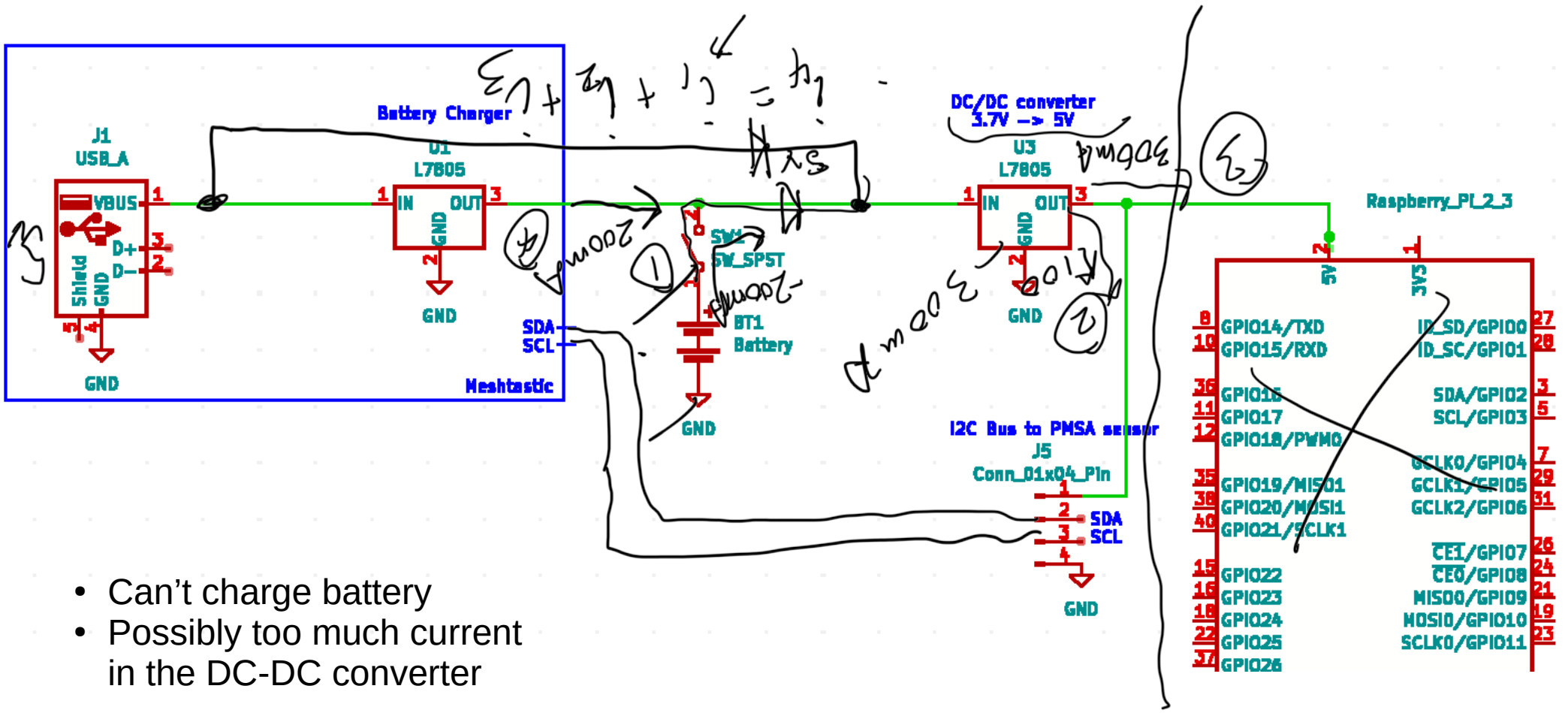
Solar Charger

- Mega’s battery is somewhat undersized:
  - 10 Ah * 3 LiIon batteries = 30 Ah
  - Average current draw is 0.5 A with the logger on
  - It can run for almost 3 days
- Solar panels can extend battery life
- Connect via a schottky diode to the 5V Meshtastic input and there is a battery charger on the Meshtastic which prevents overcharging.
- More about solar chargers <here>

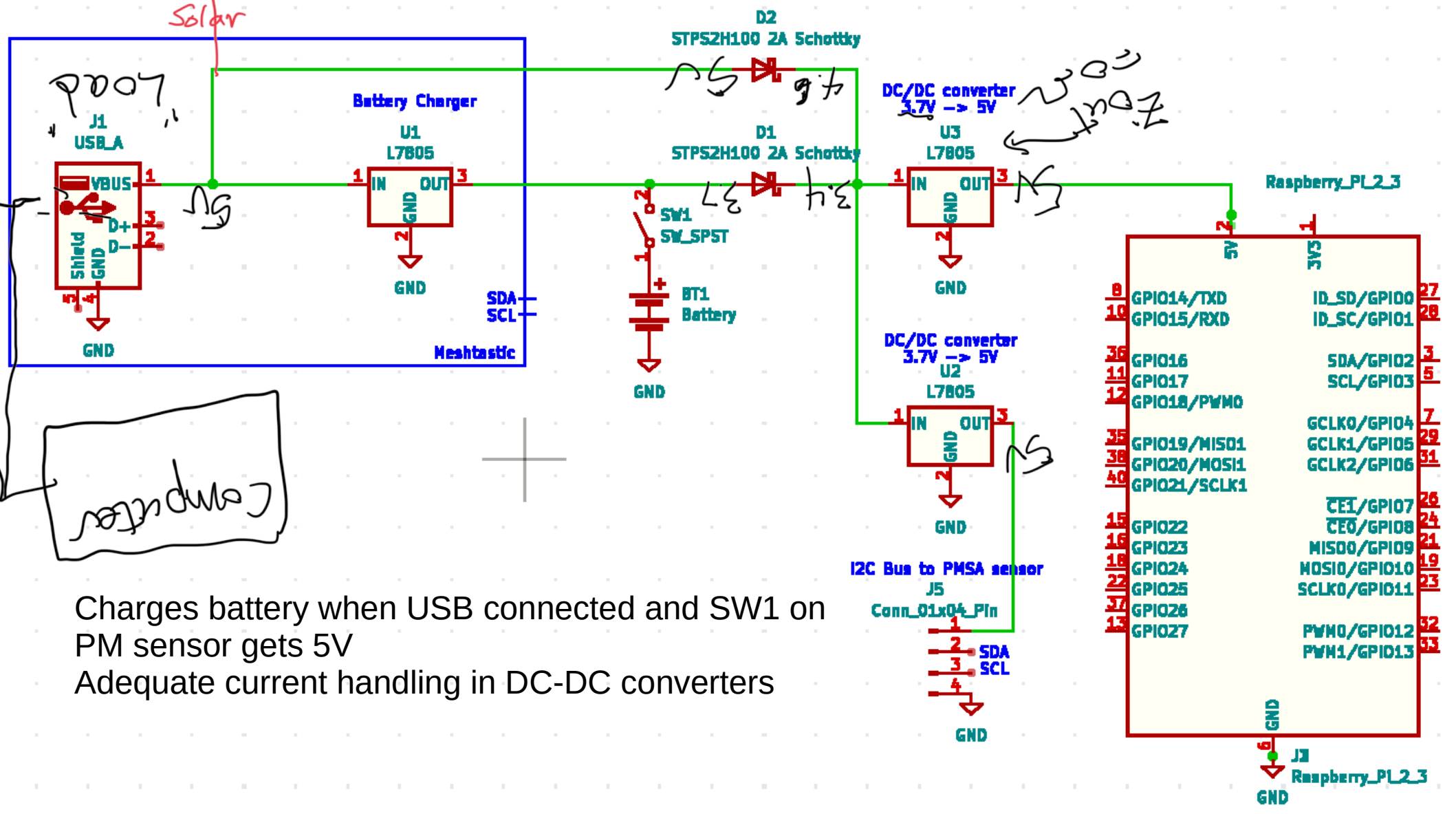
Mega: PM sensor works only when powered by USB



Add RPi, 5V power for PM sensor



- Can’t charge battery
- Possibly too much current in the DC-DC converter



Charges battery when USB connected and SW1 on
PM sensor gets 5V
Adequate current handling in DC-DC converters

Schottky Diodes

- We use them for lower forward voltage drop, which has lower power loss.
- The two diodes we use form a “wired or” circuit. Power for the 5V DC-DC converters comes from either the battery or the USB .. without connecting them together.
- More information about “Schottkys” is <here>
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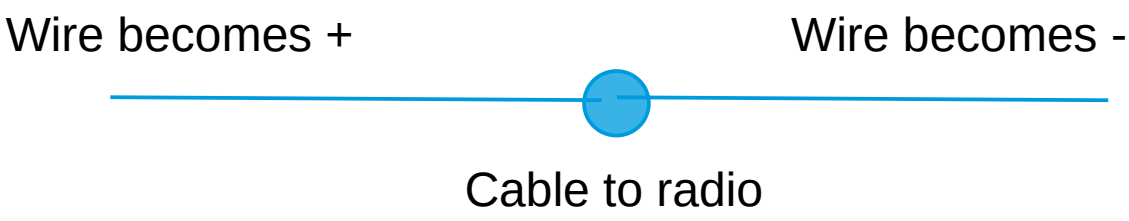
Dipole Antenna

- Best to always connect an antenna when powering up a Meshtastic, as no antenna has been known to occasionally destroy the transmitter.
- The simplest form of an antenna is a dipole. One side becomes positive in voltage, one side becomes negative as the electromagnetic wave passes through on receive, or is generated on transmit

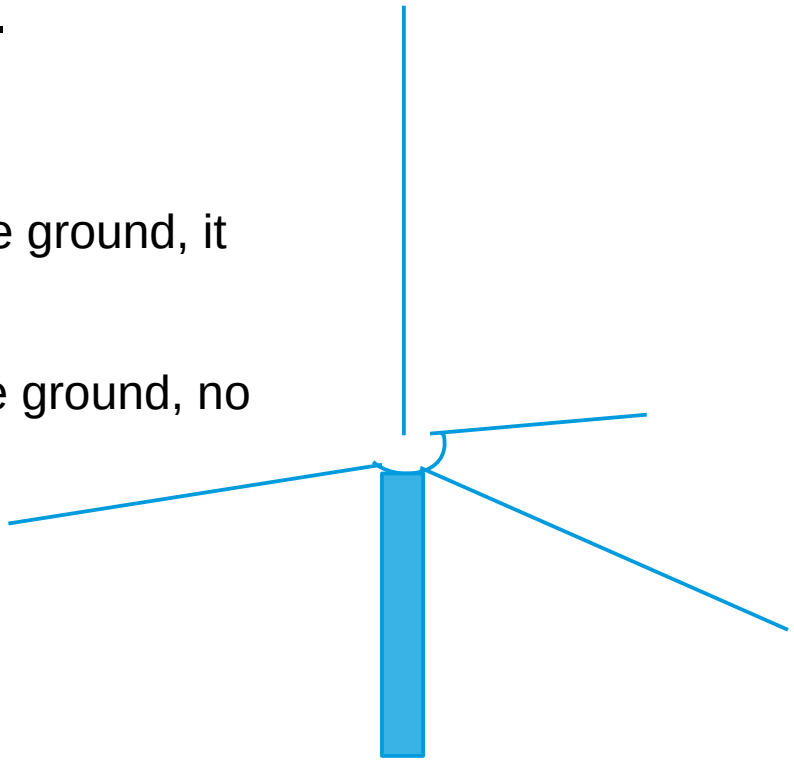


Ground Plane antenna

- Also possible to reflect one side over a ground plane, which acts like a mirror.

In the plane above the ground, it behaves like a dipole

In the plane below the ground, no antenna is visible.



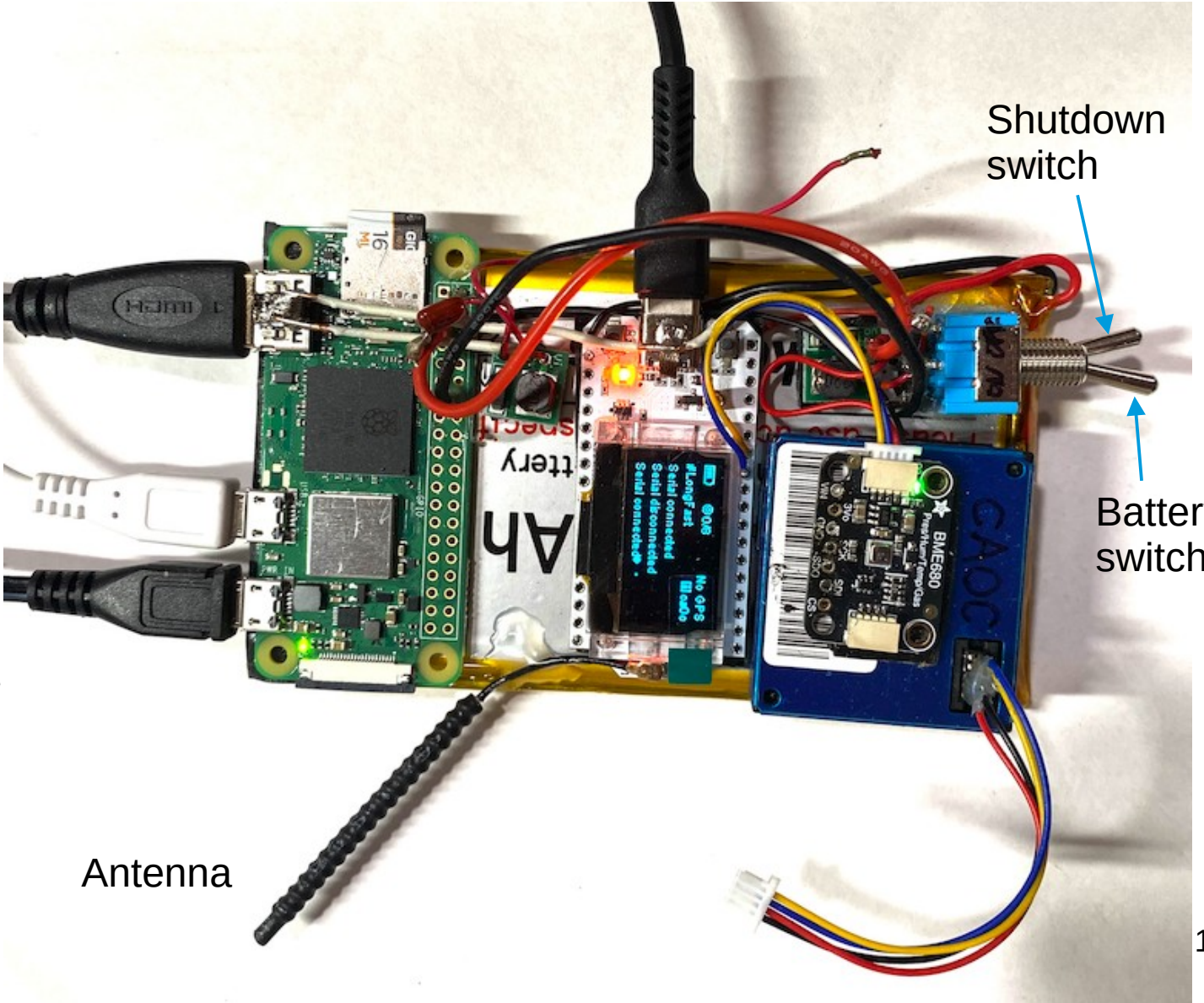
---Ground Plane --

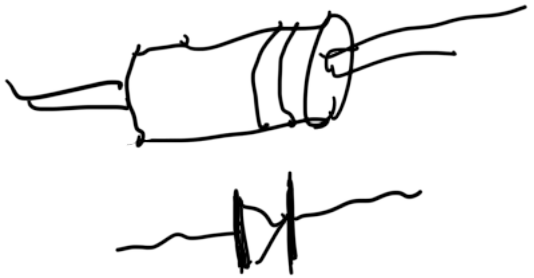
Cable to radio

Approximation of ground plane

- Just a wire coming from the radio serves as the monopole, while the radio and battery themselves form the ground plane, albeit imperfect
- Instead of straight wires, the antenna can be made physically shorter by coiling the wire.

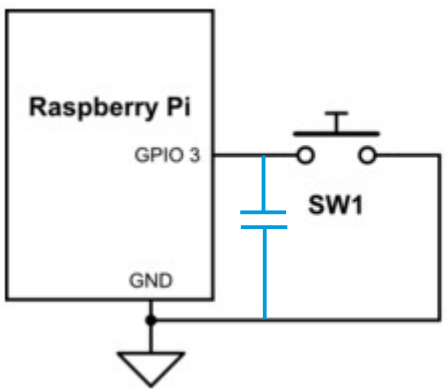
Mega2





The shutdown switch

- The RPi, and most cached file systems, require notification before shutdown
  - Directories and files are cached in RAM for speed
  - At shutdown, the OS writes them to disk



OPERATION: SW1 acts as an "ON-OFF TOGGLE SWITCH" when wired as shown when the dtoverlay is declared. Press SW1 once to perform a shutdown, press it again to startup/boot the RPi.

Capacitor reduces sensitivity to local electrical noise

```
sudo nano /boot/firmware/config.txt
dtoverlay=gpio-shutdown,gpio_pin=3
```

More info about the shutdown switch