# Raspberry Pi Zero W Setup

1. Download Raspbian Stretch Lite: <https://www.raspberrypi.org/downloads/raspbian/>
2. Download etcher: <https://www.balena.io/etcher/>
3. Plug in the SD card into your computer and use etcher to write the Raspbian image to the SD card.
4. Edit the image to allow for ssh:
   1. $ cd /Volumes/boot
   2. Create an empty file called “ssh”
   3. Add the following line to config.txt: dtoverlay=dwc2
   4. Add the following to cmdline.txt, one space after “rootwait”: modules-load=dwc2,g\_ether
5. Plug in the SD card into the pi, plug into USB, and boot it. Make sure the USB is plugged into the center-most port NOT the Power port.
6. $ ssh pi@raspberrypi.local
   1. if there is an error, run “ssh-keygen -R raspberrypi.local” and try again
7. (Optional) Change the password:
   1. $ passwd
   2. type in the original password (raspberry) and change to the new one (mangrove)

**To get internet access:**

1. $ sudo iwlist wlan0 scan | grep ESSID
   1. Look for the name of the network to connect to
2. Write the following into /etc/wpa\_supplicant/wpa\_supplicant.conf (the \n indicates a newline, don’t copy and paste that in):

network={

ssid=”Name of network in quotes”

psk=”password of network”

}

1. $ sudo reboot
2. $ ifconfig
   1. verify there is an IP address under wlan0

**Install required libraries, and set up configurations:**

1. $ sudo apt update
2. $ sudo raspi-config
   1. navigate to Interfacing Options -> P1 Camera -> Enable
   2. Navigate to Interfacing Options -> P5 I2C -> Enable
3. While the pi is OFF, plug in the camera
4. Reboot
5. $ sudo apt-get install python-pip git vim
6. $ git clone <https://github.com/UCSD-E4E/mangrove-special-.git>
7. $ sudo pip install flask picamera smbus simplejson

**To initialize database:**

1. $ cd mangrove-special-/canopy\_height/code
2. $ python create\_database.py

**To delete all data from the database table:**

1. $ cd mangrove-special-/canopy\_height/code
2. $ python delete\_tables.py
3. You will need to reinitialize the database by running:
   1. $python create\_database.py

**Set up the Pi as an access point:**

1. $ sudo apt install dnsmasq hostapd
2. Enter the following into /etc/dhcpcd.conf:

interface wlan0

static ip\_address=192.168.4.1/24

nohook wpa\_supplicant

1. $ sudo systemctl restart dhcpd
2. $ sudo mv /etc/dnsmasq.conf /etc/dnsmasq.conf.orig
3. Add the following to a new /etc/dnsmasq.conf:

interface=wlan0

dhcp-range=192.168.4.2,192.168.4.20,255.255.255.0,24h

1. $ sudo systemctl reload dnsmasq
2. Add the following to /etc/hostapd/hostapd.conf:

interface=wlan0

driver=nl80211

ssid=E4E

hw\_mode=g

channel=7

wmm\_enabled=0

macaddr\_acl=0

auth\_algs=1

ignore\_broadcast\_ssid=0

wpa=2

wpa\_passphrase=mangrove

wpa\_key\_mgmt=WPA-PSK

wpa\_pairwise=TKIP

rsn\_pairwise=CCMP

1. Open /etc/default/hostapd and replace the line beginning with #DAEMON\_CONF with:

DAEMON\_CONF="/etc/hostapd/hostapd.conf"

1. $ sudo systemctl unmask hostapd
2. $ sudo systemctl enable hostapd
3. $ sudo systemctl start hostapd
4. Open /etc/sysctl.conf and uncomment the line “net.ipv4.ip\_forward=1”
5. $ sudo iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE
6. $sudo sh -c "iptables-save > /etc/iptables.ipv4.nat"
7. Open /etc/rc.local and add the following line just before “exit 0”

iptables-restore < /etc/iptables.ipv4.nat

**To Connect After Setup:**

1. Connect to the E4E WiFi, with password mangrove
2. $ ssh pi@raspberrypi.local

**To enable automatic startup of the web server:**

1. Enter the following into /etc/rc.local, just before “exit 0”:

su pi -c ‘cd /home/pi/mangrove-special-/mangrove-special-/canopy\_height/code && FLASK\_APP=main flask run --host=0.0.0.0 &’

# Build Steps

1. Follow the steps in the Raspberry Pi Zero W Setup section
   1. At this point, you should have the Pi connected with the camera.
2. Attach pin headers to both row of the Raspberry Pi Zero W. The inner row’s pins should point downwards to poke through your permanent breadboard.
   1. Solder the Pi onto the permboard with these downward-facing pins.
3. Attach a downward-facing pin header to the altimeter.
   1. On the upper-left of the permboard, solder the altimeter to the board with downward facing pins.
4. Thread a screw through the hole at the top of the breadboard, using a nut to secure the pin and provide a small gap.
   1. Thread the screw through the hole near the charging port of the power boost adapter, and tighten another nut to secure the adapter to the board.
5. Solder wires connecting the 5V input of the Pi to the 5V output of the power boost adapter, and the Pi’s ground pin to the power boost adapter’s ground.
6. Solder wires connecting the SDA, SCL, VIN, and GND pins on the altimeter to the corresponding pins on the Pi.
7. Affix the battery to the back of the breadboard (we used tape for prototyping).

# Usage

Power on the Pi by flipping the switch on the back of the breadboard.

Charge the system by plugging in a micro USB cable to the power boost adapter on the back of the breadboard.

Files may be transferred from the Pi through ssh or through transfer of the SD card.

* To ssh into the Pi, power it on, connect to the E4E WiFi (password: mangrove), and enter “ssh pi@raspberrypi.local” (password: mangrove).

To connect to the system once it has booted up, open a web browser on any device (note that Chrome may have issues with video display). In the search bar, enter “<http://raspberrypi.local:5000>”

* You should see the following main screen: