Making the SpiderPi

# Setting up the Raspberry pi

Flash a headless raspberry pi image onto micro sd card (at least 8GB, I used 32GB) using raspberry pi imager software or equivalent. There’s lots of tutorials online on how to do this.

Unplug and replug micro sd card into computer. Add a blank <ssh> file to boot to enable ssh.

Plug pi into ethernet and ssh to raspberrypi using <ssh pi@raspberrypi.local> It will then ask for a password, which is set to <raspberry> as a default. Then use <sudo raspi-config> to open the pi settings. Here you can add the necessary Wi-Fi information.

If not able to use ethernet, edit wpa\_supplicant.conf file while adding ssh file to boot to add Wi-Fi information directly. This must be done before powering the raspberry pi the first time with the micro sd card. <https://raspberrypihq.com/how-to-connect-your-raspberry-pi-to-wifi/> or <https://www.raspberrypi.org/documentation/computers/configuration.html>. I found this method to be prone to errors. Use ethernet if possible.

# Building the LCD Screen w/buttons

Follow instructions at <https://learn.adafruit.com/adafruit-16x2-character-lcd-plus-keypad-for-raspberry-pi>. This website also has instructions on how to set up the software to use the Adafruit LCD screen.

# Setting up the software

Install Pygame Library

* python3 -m pip install pygame==2.0.0
* sudo apt-get install git curl libsdl2-mixer-2.0-0 libsdl2-image-2.0-0 libsdl2-2.0-0 libsdl2-ttf-2.0-0
* <https://www.raspberrypi.org/forums/viewtopic.php?t=291180>

Install GitPython Library

* <https://gitpython.readthedocs.io/en/stable/intro.html>
* This process may need debugging, I don’t remember if I used something else (update).

Clone GitHub repo to SpiderPi

* <https://github.com/OSU-LRAM/SpiderPi>

Setup launch Script using crontab to start GUI when SpiderPi is powered:

* <https://www.instructables.com/Raspberry-Pi-Launch-Python-script-on-startup/>

# Parts List

## Electronics Needed to Function

* 1 Raspberry Pi (4 B)
* 1 Micro SD Card

<https://www.amazon.com/Silicon-Power-Speed-MicroSD-Adapter/dp/B07Q384TPK?tag=georiot-us-default-20&ascsubtag=tomshardware-us-6454569509847805000-20&geniuslink=true>

* 1 X LCD + keypad Kit for Raspberry Pi from Adafruit

<https://www.amazon.com/Adafruit-White-Keypad-Raspberry-ADA1115/dp/B00N973FZI/ref=sr_1_1?dchild=1&keywords=Adafruit+LCD%2BKeypad+Kit&qid=1621909463&sr=8-1>

* 1 x stacking header for pin access (header was too short in the kit from Adafruit)

<https://www.adafruit.com/product/1112>

* cheap earbuds with large speaker radius
* extra wiring
* 1 X Audio Amplifier Chip <https://www.amazon.com/HiLetgo%C2%AE-PAM8403-Digital-Amplifier-2-5-5V/dp/B00LODGV64/ref=asc_df_B00LODGV64/?tag=hyprod-20&linkCode=df0&hvadid=312154678244&hvpos=&hvnetw=g&hvrand=5191437459944121002&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9027836&hvtargid=pla-634475605665&psc=1>

## Case Components

* 1X waterproof case

<https://sixfab.com/product/raspberry-pi-ip54-outdoor-iot-project-enclosure/>

* 1X set of silicone rubber push button covers

<https://www.ebay.com/itm/224145008728?chn=ps&norover=1&mkevt=1&mkrid=711-117182-37290-0&mkcid=2&itemid=224145008728&targetid=1288994547794&device=c&mktype=pla&googleloc=1024429&poi=&campaignid=11613469917&mkgroupid=117473130610&rlsatarget=pla-1288994547794&abcId=9300455&merchantid=8233684&gclid=CjwKCAjw-qeFBhAsEiwA2G7Nl8LDyeOwPTJKYqnbdavzQloUIuyVgsUNL7y5E-2T5mca_JcrWwzH8hoCDx4QAvD_BwE>

* 1 X set of standoff fasteners

<https://www.amazon.com/iUniker-Raspberry-Installation-Standoff-Accessories/dp/B096ZMN8W7/ref=sr_1_1_sspa?dchild=1&keywords=raspberry+pi+standoff&qid=1626194642&s=electronics&sr=1-1-spons&psc=1&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUFJTTJaM1gzMUIwSTImZW5jcnlwdGVkSWQ9QTA1MjUxMjIyVzlHU0FKM0JDVkxCJmVuY3J5cHRlZEFkSWQ9QTAyMzc2NDIyQklCUDE5SzAxUDMmd2lkZ2V0TmFtZT1zcF9hdGYmYWN0aW9uPWNsaWNrUmVkaXJlY3QmZG9Ob3RMb2dDbGljaz10cnVl>

* 1 X Lipo Battery
* <https://www.adafruit.com/product/353>
* 1 X battery charger chip

<https://www.adafruit.com/product/2465>

* 1 X battery charger cable

<https://www.adafruit.com/product/1995>

* 1 X waterproof power switch

<https://www.amazon.com/TWTADE-Waterproof-Momentary-Stainless-YJ-GQ16BH-M-W/dp/B07YKV9M8M/ref=sr_1_2?dchild=1&keywords=waterproof%2Billuminated%2Bbutton&qid=1627409880&s=industrial&sr=1-2&th=1>

* 1 X 3d printed lcd base

* 5 X 3d printed pushbutton pins
* 1 X 3d printed battery base

# Case Assembly

Use 3d printed lcd base and 3d printed battery base as guides on where to drill holes through the case lid. The button holes need to be countersunk on the inside to make room for the silicone pushbuttons. The outer ring of the buttons was glued into the countersunk holes. Once the holes have been drilled and the silicone buttons glued in, the LCD screen board can be screwed on. The standoff fasteners will bridge the gap between the board and the board base.

The battery charging chip mounts to the underside of the battery on the 3d printed battery base. The chip must be mounted to the printed base before the battery and base are screwed to the lid.

## Wiring the charging chip to the pi and the power switch

The battery chip’s GND and EN pins need to be wired to the power switch’s NC and C pins, respectively. The G and 5V pins need to be wired to the Ground and 5V Power pins on the Raspberry Pi, respectively.

The pushbutton switch also needs 5V and Ground from the Raspberry Pi to its + and – pins respectively. The 5v to + pin needs a resistor between the two, just like a typical led would. 1K ohms works fine.

The Audio Amplifier chip also needs 5V and ground from the Raspberry Pi to its 5V + and – pins. The Audio Amplifier chip needs the + and minus of one side of the Audio jack to connect to its L and Ground pins. Finally, the Speaker pins need to connect to the + and – from the Amplifier chip.