

SwitchDoc Labs

The SkyWeather2 WeatherProofing and Test Manual

December 2020
Version 1.1

The logo for SkyWeather2 features a black dot with three red curved lines radiating from it, resembling a Wi-Fi signal icon, positioned above the letter 'i' in the word 'Weather'.

SkyWeather2

Y O U R W E A T H E R O N T H E C L O U D

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Errata

Cautions when building and using SkyWeather2

- 1) Keep all water away from the electronics and power supply at all times!**
- 2) This is not a toy! Keep it out of reach of young children and pets.**
- 3) SwitchDoc Labs assumes no liabilities in the use of this kit, beyond the refund of the purchase price.**

What is The SkyWeather2 System?

Easy to build. Easy to learn about the IOT (Internet Of Things) and the Raspberry Pi.

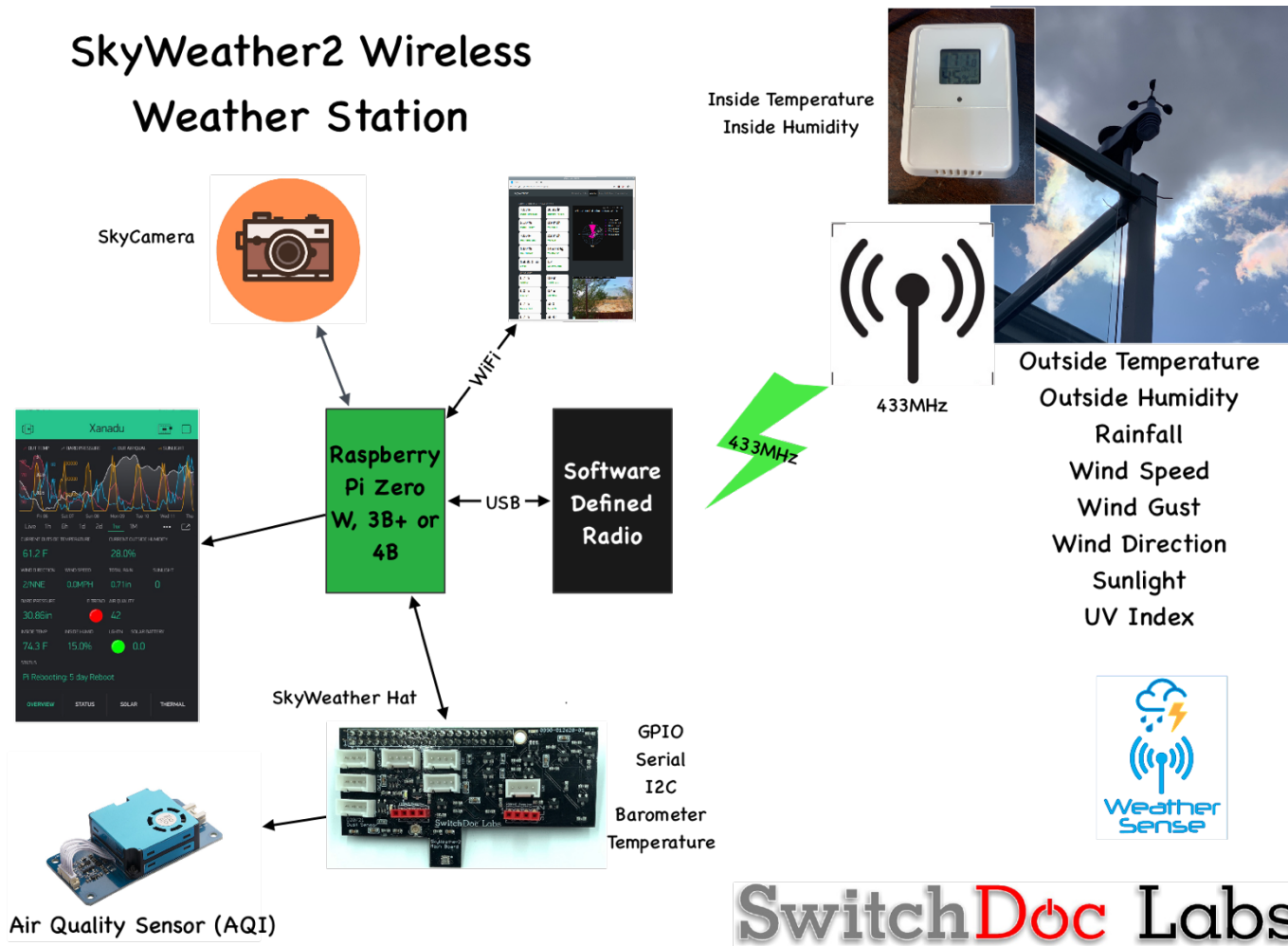
The **heart** of the new SkyWeather2 project is our new custom made wireless Weather Sensor package called the WeatherRack2.



The **SkyWeather2** kit is so simple that even middle school children can build it with just a little adult help for configuration and installation.



SkyWeather2 Wireless Weather Station



SwitchDoc Labs

Full Open Source Python3 Software that you can Modify.

We provide the Python3 software all open source with the kit. The Pure Python software can be modified to add new sensors, support new cloud software and connect up to your own projects and software.

Quick Start of your SkyWeather2 System

This manual assumes that you have completed the assembly and testing of your SkyWeather23 as described in the “SkyWeather Assembly and Testing Manual”. If you haven’t completed the assembly and testing, go back and complete it now. Your Pi is connected to your WiFi network.

The first thing to figure out is what your Raspberry Pi IP address is. Follow the procedures here:

<https://learn.pimoroni.com/tutorial/raspberry-pi/finding-your-raspberry-pi>

Update Your SkyWeather2 Software

Update SkyWeather2 to the latest version. Type the following commands into a terminal window.

```
cd
cd SDL_Pi_SkyWeather2
git pull
```

You will see something like this:

```
pi@SwitchDocLabs:~/SDL_Pi_SkyWeather2 $ git pull
remote: Enumerating objects: 19, done.
remote: Counting objects: 100% (19/19), done.
remote: Compressing objects: 100% (2/2), done.
remote: Total 12 (delta 10), reused 12 (delta 10), pack-reused 0
Unpacking objects: 100% (12/12), done.
From https://github.com/switchdoclabs/SDL_Pi_SkyWeather2
   f2193a0..c98a45c  master    -> origin/master
Updating f2193a0..c98a45c
Fast-forward
 README.md           | 2 ++
 SkyCamera.py        | 2 +-
 SkyWeather2.py      | 2 +-
 pclogging.py        | 12 ++++++-----
 state.py            | 3 +++
 testWirelessSensors.py | 18 ++++++-----
 6 files changed, 22 insertions(+), 17 deletions(-)
```

Or, if your software is up to date:

```
pi@SwitchDocLabs:~/SDL_Pi_SkyWeather2 $ git pull
Already up to date.
```

Initial Testing of your SkyWeather2 System

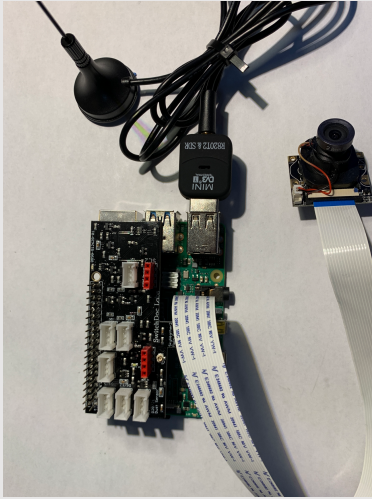
Please refer to the “Testing SkyWeather2” in the “SkyWeather2 Assembly and Test Manual”.

Parts List

Note: you can print your own 3D Printed parts with the STL files located here:

https://github.com/switchdoclabs/SDL_STL_SkyWeather2

Part A
Assembled SkyWeather2 System



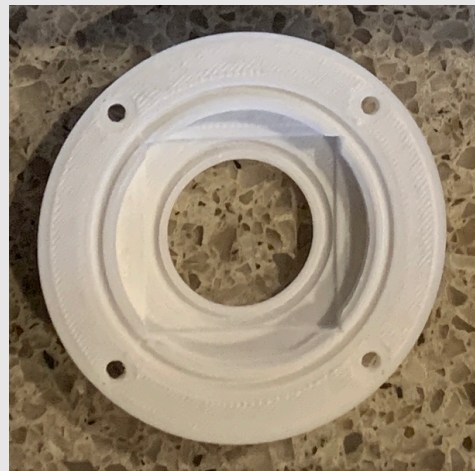
Part B
SkyWeather2 Base Unit



Part C
SkyWeather2 Top



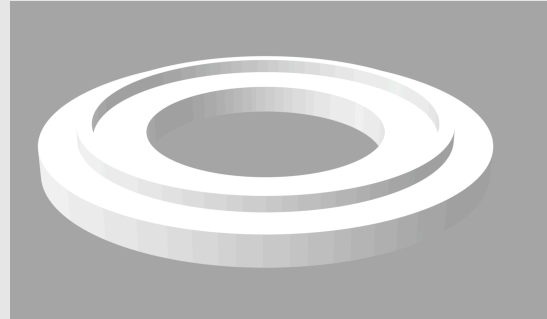
Part D
SkyWeather Camera Cover



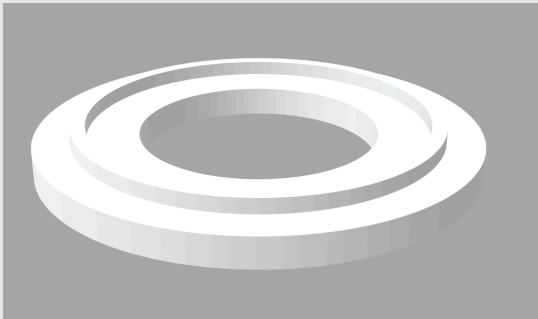
Part E
SkyWeather2 Camera Cover Insert



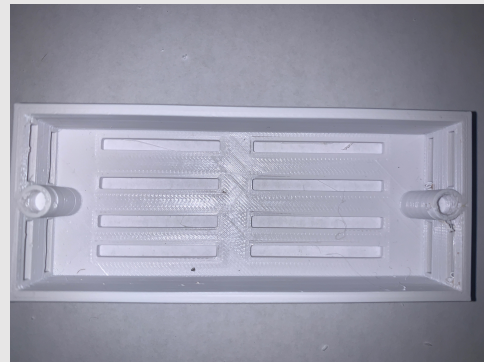
Part F
SkyWeather2 USB C Washer



Part G
SkyWeather2 USB C Washer



Part H
Laser AQI Housing



Part I
Laser Air Quality Sensor (Optional)



Part J
20cm Grove Cable (Optional)



Needed Tools and Other Parts Not Supplied

Tools

Drill

Small Screwdrivers

Small files

Super Glue

To assemble, you will need the following additional hardware:

14 - M3 Threaded Brass Inserts

Amazon - <https://amzn.to/39Rf9iL>

4 - 20mm M3 screws (we use Steel Button Heads)

8 - 11mm M3 Screws (we use Steel Button Heads)

Amazon - <https://amzn.to/2K200QC>

6 - 5mm M2 Plastic screws (or threaded posts)

<https://shop.switchdoc.com/products/140pcs-box-m2-nylon-hex-thread-assortment-kit>

1 - USB Type A Female Waterproof Socket (for Raspberry Pi ZeroW, A+, 3B+)

EBay - <https://www.ebay.com/itm/USB-female-socket-plug-panel-mount-adapter-USB-3-0-waterproof-connector-IP67-rSU-/373133327431?hash=item56e07abc47>

Amazon - <https://amzn.to/37NdurE>

OR

1 - USB Type C Female Waterproof Socket (for Raspberry Pi 4B) – includes internal cable

Amazon - <https://amzn.to/39Ngd7j>

Short (10 inch or less) USB Micro (for Raspberry Pi ZeroW, A+, 3B+) Cable for internal wiring. The cable is built into the socket for the Raspberry Pi 4B)

Amazon - <https://amzn.to/3mTHfgW>

You will also want a **30mmx30mmx1mm quartz window** for the front:

<https://shop.switchdoc.com/products/double-side-polished-far-uv-fused-silica-quartz-glass-sheets-plate-30-30-1mm>

1 Package – Screen Spline – 0.140in (0.36cm)

Amazon - <https://amzn.to/2LdpoUd>

Any Hardware Store

1 Package of Duct Seal (for covering holes and screws)

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Amazon - <https://amzn.to/33SMkyE>

Any Hardware Store

1 O-Ring - 023 Silicone O-Ring, 70A Durometer, Red, 1-1/16" ID, 1-3/16" OD, 1/16" Width

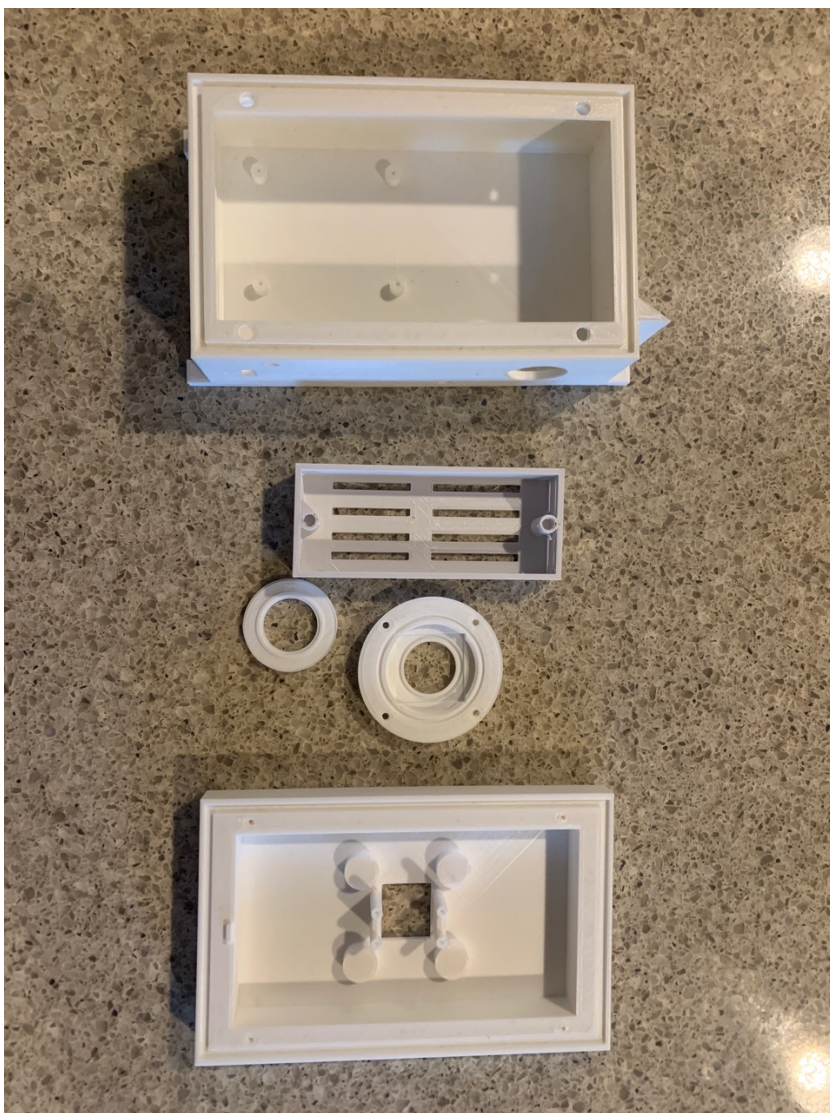
Amazon - <https://amzn.to/33PQI1p>

1 O-Ring - 031 Silicone O-Ring, 70A Durometer, Red, 1-3/4" ID, 1-7/8" OD, 1/16" Width

Amazon - <https://amzn.to/36X3zkn>

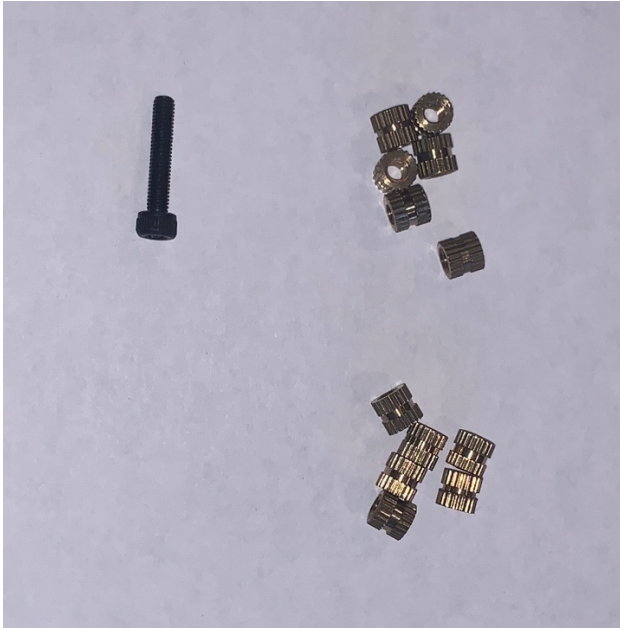
Step By Step Assembly

Step 1: Layout all of your 3D Printed Parts



Note: The optional USB C Spacers are not shown in the above picture.

Step 2: Set out 12 Brass Inserts and a 20mm 3M Screw



Step 3: Thread a M3 20mm Screw partially through a Brass Insert (the helps position the Brass Insert for insertion)



Step 4: Add super glue around the edge of each of the four top holes in the SkyWeather2 Base Unit (Part B)



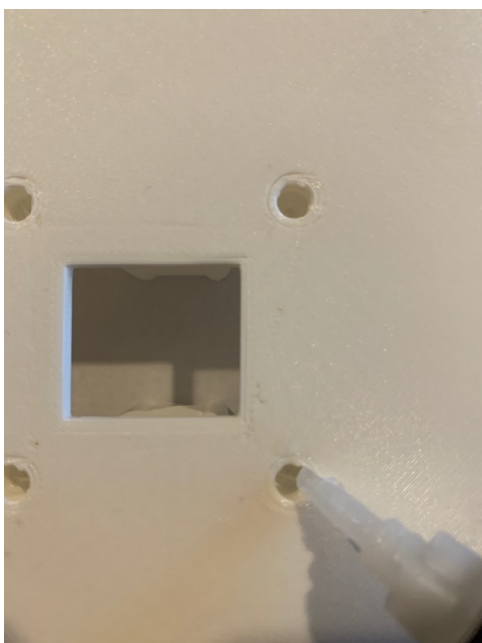
Step 5: Push the Brass Insert Screw Assembly (from Step 4) into the hole in the top of the SkyWeather2 Base Unit (Part B). Remove the screw and repeat for the other three holes of the SkyWeather2 Base Unit (Part B).



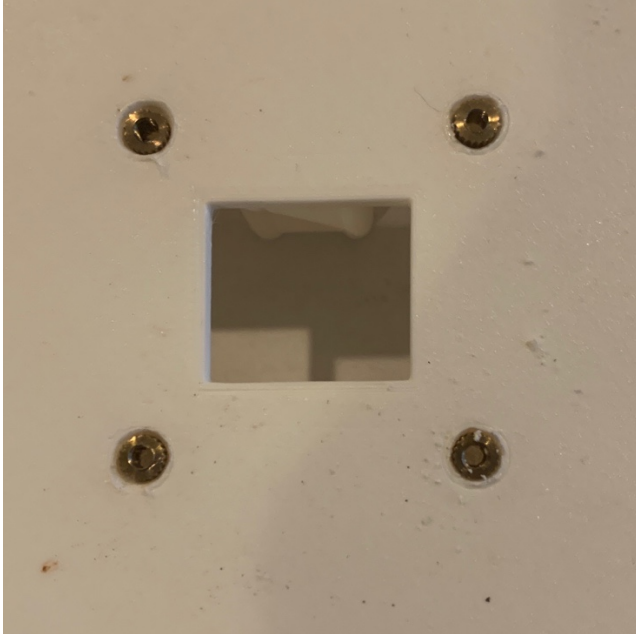


Step 6: Check the fit of the Brass Inserts in the SkyWeather Top (Part C) using the 20mm M3 Screw technique as above. If they don't fit, then use a file to slightly enlarge the holes.

Step 7: Take your SkyWeather2 Top (Part C) and apply small amounts of super glue around the hole edges in preparation to insert four Brass Inserts in the top of Part C.



Step 8: Insert four Brass Inserts into the SkyWeather2 Top (Part C) using the M3 20mm Screw technique as in Step 3 above.



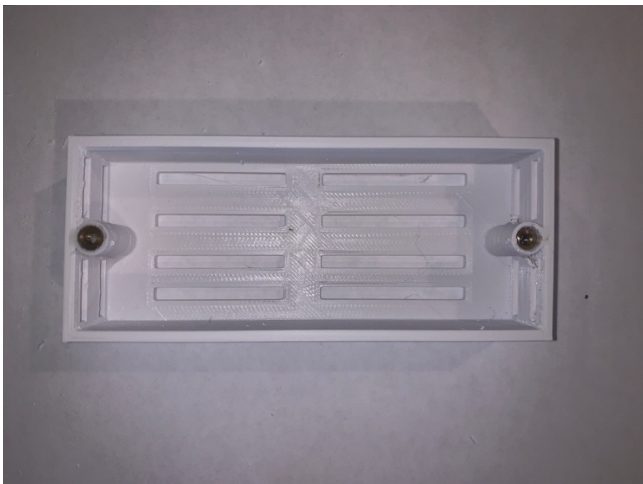
Step 9: Return to the SkyWeather2 Base Unit (Part B) and place two Brass Inserts in the Laser AQI Mounting Holes on the side using the fit check first and then gluing in the Inserts as above.



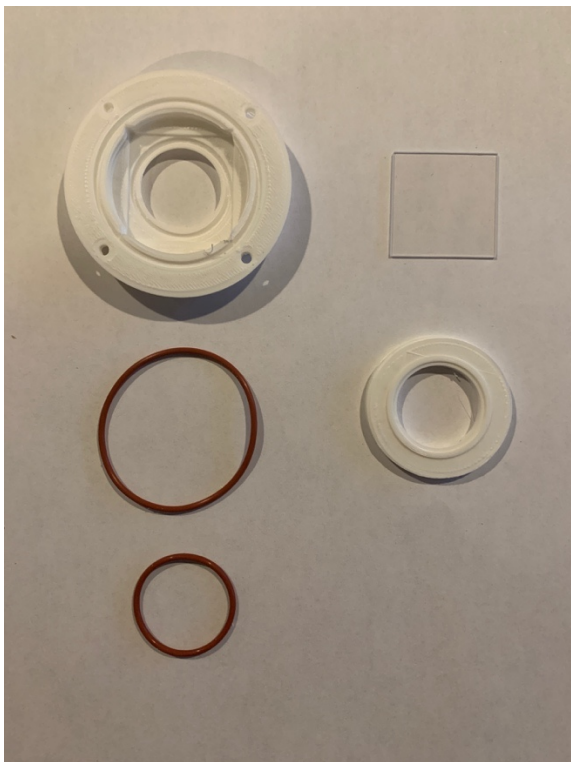
Step 10: Take the SkyWeather Top (Part C) and push a screw driver through to clear the top screw holes. Try to screw a 20mm M3 through the holes (or screw them in). If you can't do that, the use a drill and a small drill (0.115 inches – 2.87mm) to clear the holes.



Step 11: Take the Laser AQI Housing (Optional) and using the same techniques as above insert the Brass Inserts in both mounting holes.



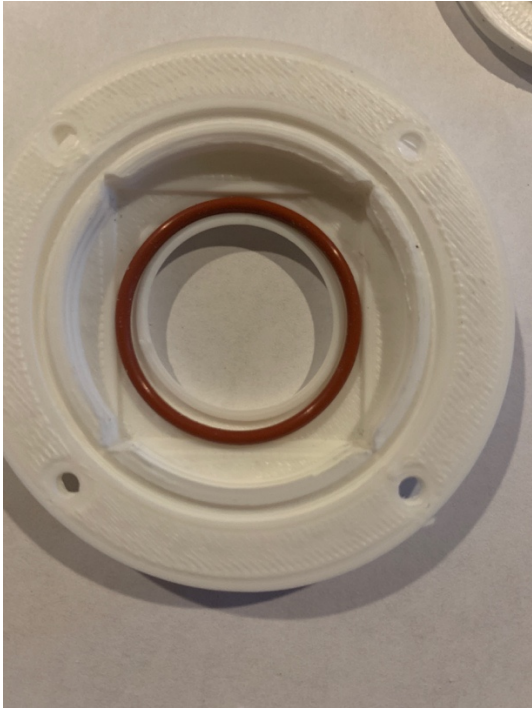
Step 12: Now layout the parts for the Camera Housing as below:



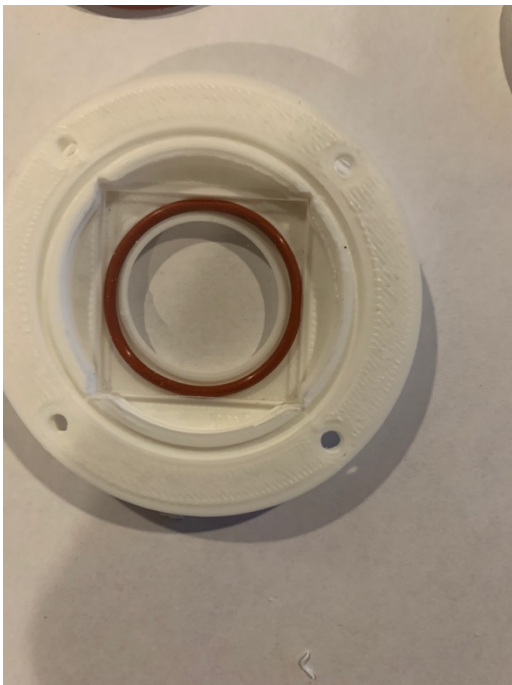
Step 13: Gently check the fit of the 30mm x 30mm x 1mm quartz window in the Camera Housing (Part D). Don't force it. It should fit, but not too tight. Use a file to shave any corners if necessary. Don't break the window! After it fits, remove the quartz window from the Camera Housing (Part D).



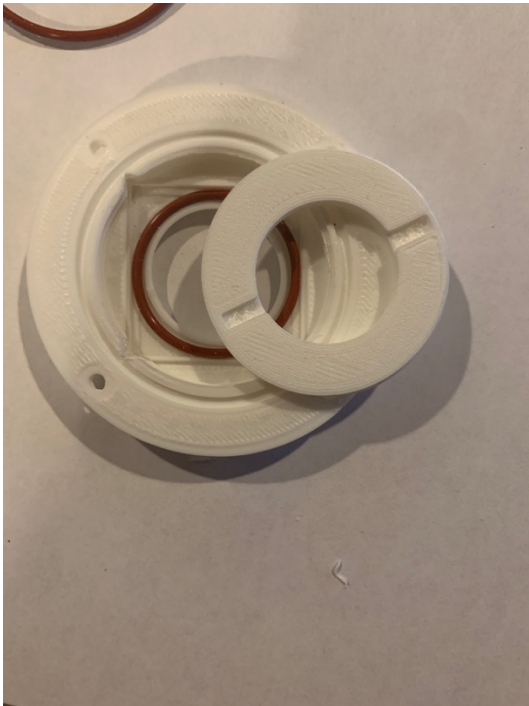
Step 14: Place the smaller O-Ring in the Camera Housing (Part D). It does not need to fit perfectly, but put as much of it the ring slot as possible.



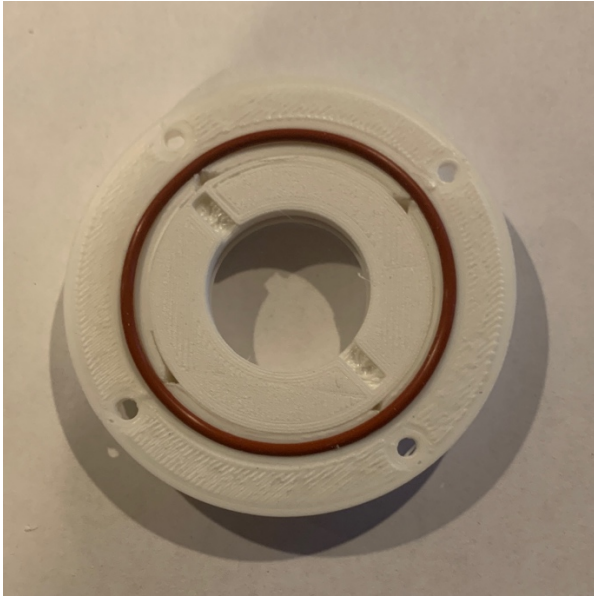
Step 15: Now gently push the quartz window into the Camera Housing (Part D). Make sure it is resting on top of the O-ring.



Step 16: Now take the Camera Housing Insert (Part E) and screw it into the Camera Housing (Part D). Do not over screw this insert into the Camera Housing (Part D). You could break the quartz window. Make it snug to flatten the O-ring inside. Make sure the insert is at least flush with the back of the Camera Housing.



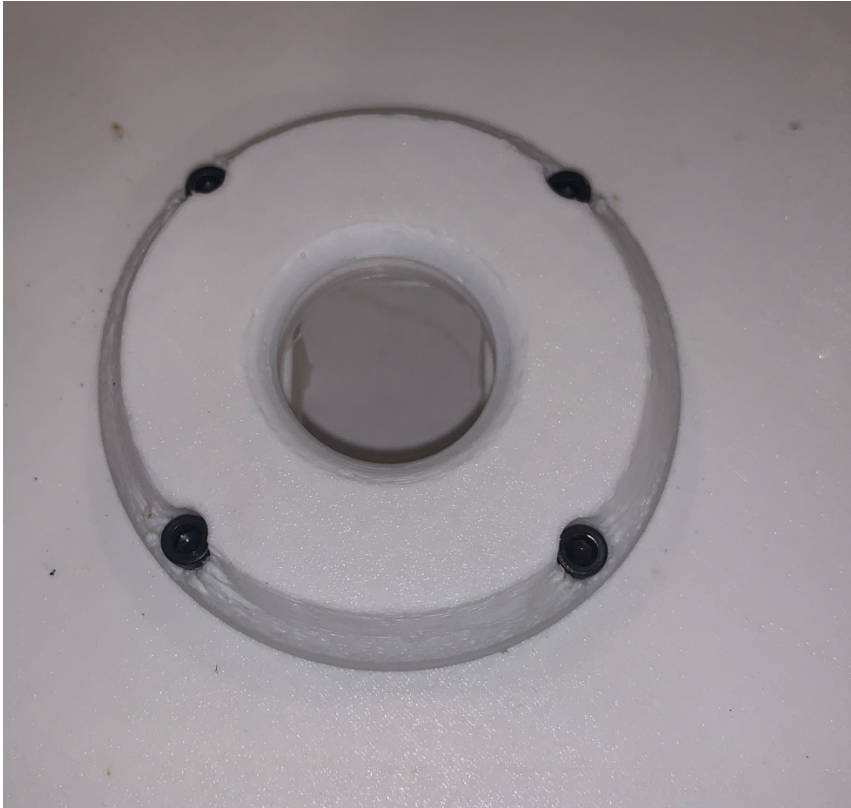
Step 17: Now place the larger O-Ring on the ring in the Camera Housing (Part D). Make as much fit of the O-Ring in the housing ring as possible.



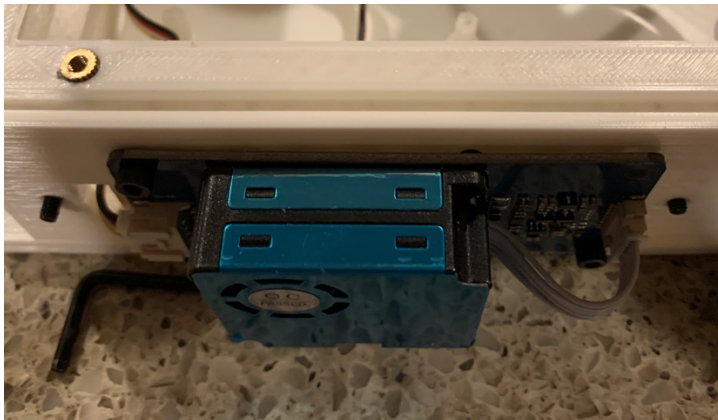
Step 18: Return to the SkyWeather2 Base Unit (Part B) and take small nylon M2 stands and insert them in the Raspberry Pi Mounts in the bottom of the Base Unit. Use 14 mm M2 stands. If they won't screw into the posts, enlarge the holes. Use a small amount of super glue if necessary.



Step 19: Now secure the Camera Mount Housing Assembly (Parts D and E) with four 11mm M3 Screws. Put all four in the housing and make sure they are all started into the threads before tightening the screws. Make them tight, but don't over tighten them. You don't want to pull the Brass Inserts out of the housing.



Step 20: (Optional) Mount the Laser Air Quality Sensor (Part I) on the outside oriented as shown and route the Grove cable (Part J (plugged into the Laser Air Quality sensor) into the SkyWeather2 Base Unit (Part B) using 11mm M3 screws.



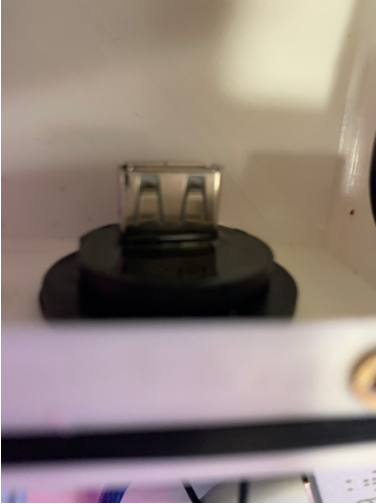
Step 21: (Optional) Now mount the Laser Air Quality Housing on the side of the SkyWeather2 Base Unit by using 11mm M3 screws from the inside of the box. The left screw is the tough one! Connect the Grove cable into the Grove Connector on the SkyWeather2 Hat board marked “D20/D21 Dust Sensor”.



Step 22: If you are using an USB Type C Female Waterproof Socket (for Raspberry Pi 4B), then place one of the USB C Spacers (Parts F and G) on each side of the Base Housing (Part B) (rib toward the box) and tighten it down with the cable towards the inside of the housing.



Step 23: If you are using an USB Type A Female Waterproof Socket (for Raspberry Pi ZeroW, A+, 3B+), install the waterproof USB connector as shown.



Step 24: Unplug the antenna from the USB Dongle plugged into your Raspberry Pi and route it from the outside of the SkyWeather2 Base Unit (Part B) through the hole on the left side of the housing. You can snap the antenna into the slot on the top of the SkyWeather2 Base Unit (Part B)



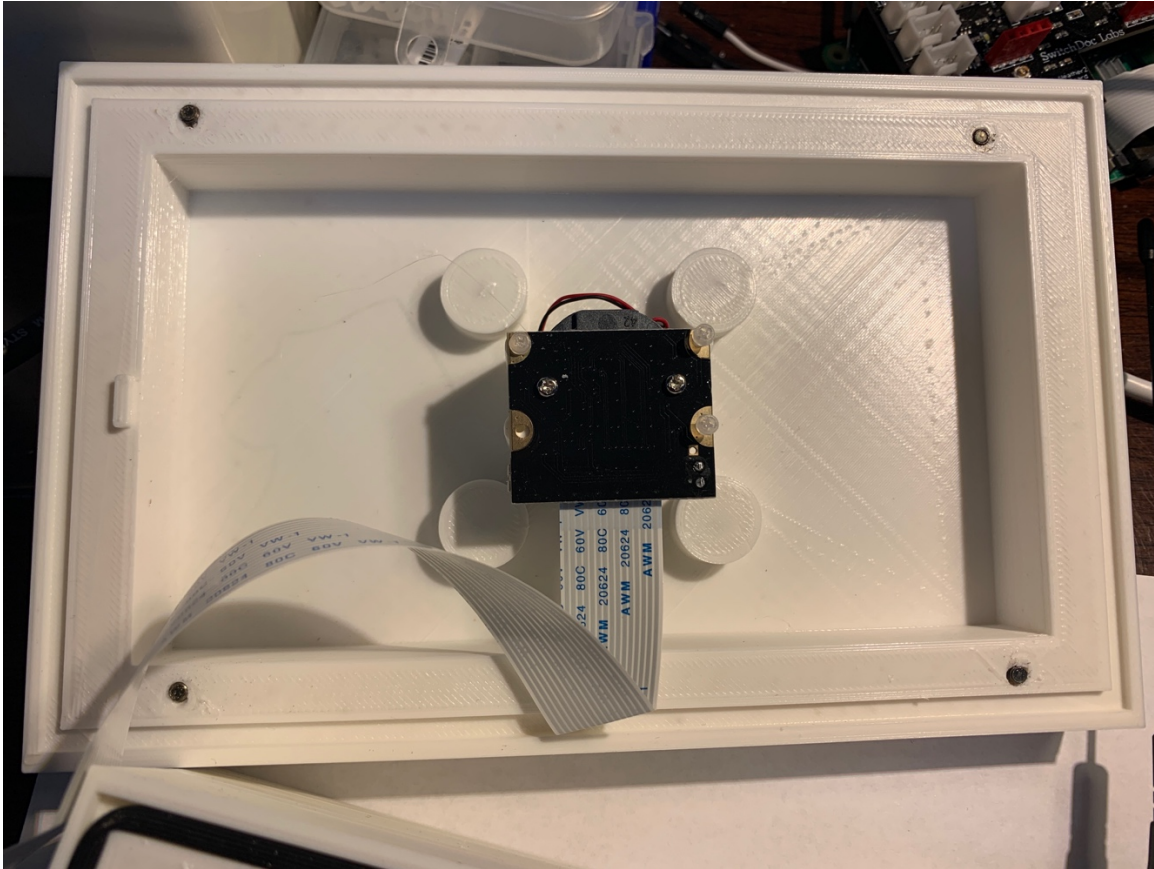
Step 25: Raspberry Pi 4B Instructions: Plug the cable coming from the Waterproof USB C connector into the Raspberry Pi 4B power connector inside the box.

Step 26: Raspberry Pi non-4B instructions. Plug the short USB Micro cable into the Raspberry Pi and into the inside Type AI plug on the Waterproof USB connector.

Step 27: Now place your Raspberry Pi on the nylon standoffs inside the SkyWeather2 Base Unit and secure the Pi with two nylon standoffs or screws on the front two holes. Don't bother with the ones in the back. We like standoffs for their ease of attachment.



Step 28: Now install the Camera on the back of the SkyWeather2 Top using at least two M2 nylon screws. Note the notch is to the right. Don't worry too much about getting the orientation correct. It can be adjusted in software to rotate 90, 180, or 270 degrees.



Step 29: Plug the antenna into the USB SDR dongle.



Step 30: Now, plug in your power supply and verify that your Raspberry Pi still boots up. Repeat the tests in the “SkyWeather2 Assembly and Test Manual”.

Final Assembly

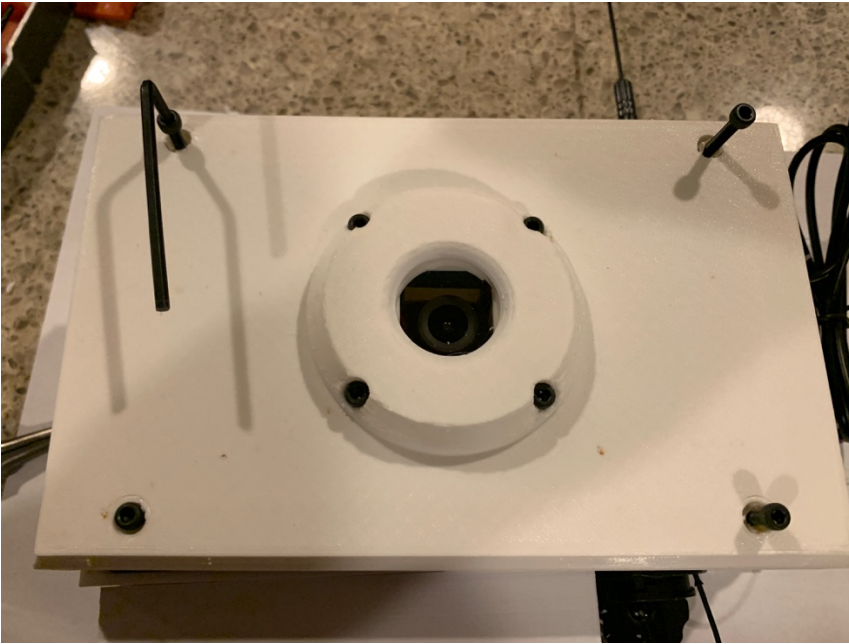
Step 1: Measure out a 21.5 inch (550mm) length of screen door spline and start pushing it into the spline slot in the SkyWeather2 Base Unit (Part B) starting in the bottom middle of the Base Unit. When you have finished going all around the box, trim off the excess.



Step 2: Carefully place the camera cable inside the box Don't pinch any wires or cables!

Step 3: Place the SkyWeather2 Top (Part C) on top of the Base (Part B) with the tab on the right side of the Base Unit (Part B). Again, if you reverse it the camera orientation can be fixed in software.

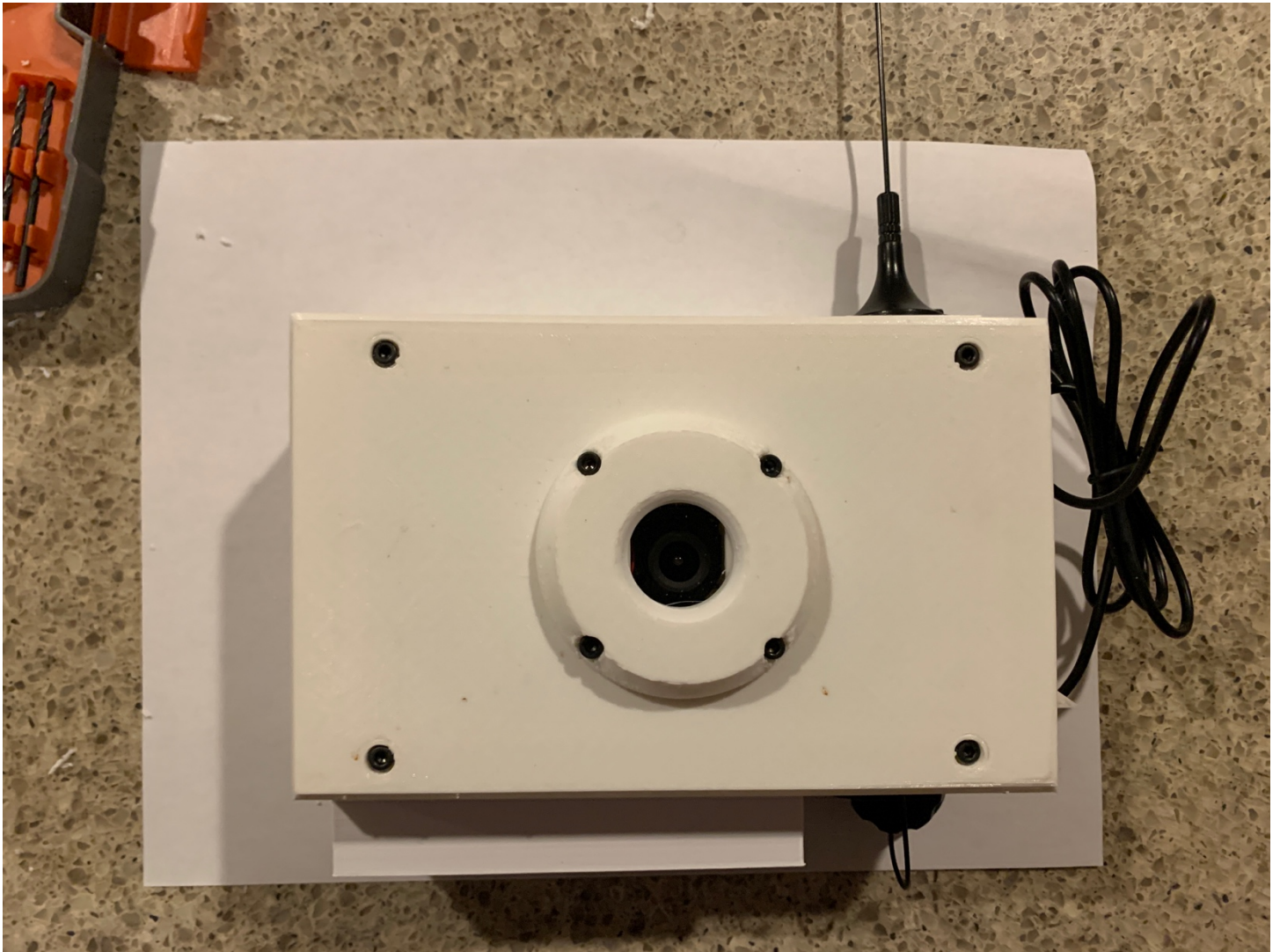
Step 4: Take the four M3 20mm screws and screw or push them so they just come out the bottom of the Top (Part C). Align these with the Brass Inserts in the SkyWeather Base Unit (Part B) and get each one of them to bite into the inserts. This can be a little tricky. Tighten each one a few turns before moving around in a clockwise manner. Like tightening the lug nuts on a tire.



Step 5: Now that the screws are tight (but don't over tighten them!) use some of your Duct Seal and cover the screws to finish sealing them. This can be removed later if you need to get in the box and it won't discolor the way silicon caulking will. You can optionally cover the screws on the camera housing, but with the O-rings, there should be no path for water to get into the box.



Congratulations! Your Weatherproofing and SkyWeather Assembly is complete!





Disclaimer

SwitchDoc Labs, LLC takes no responsibility for any physical injuries and possession loss caused by those reasons which are not related to product quality, such as operating without following the operating manual and cautions, natural disasters or force majeure.

SwitchDoc Labs, LLC has compiled and published this manual which covers the latest product description and specification. The contents of this manual are subject to change without notice.