

SwitchDoc Labs

The SmartGarden3 Hydroponics Turbidity and pH Manual

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Version 1.1



Smart Garden3

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Cautions when building and using The SmartGarden3

- 1) **Keep all water away from the electronics and power supply at all times!**
- 2) **The SmartGarden3 is designed for indoor use only and should be placed in a dry environment where no water or rain can reach to avoid short circuiting the electronics**
- 3) **Insert the moisture sensor into the CENTER of the flower pot, and keep it near the center of the plant and away from the water coming out of the holes cut in the watering pipe.**
- 4) **This is not a toy! Keep it out of reach of young children and pets.**
- 5) **SwitchDoc Labs assumes no liabilities in the use of this kit, beyond the refund of the purchase price.**

Errata

What is The SmartGarden3?

Did you ever want to build your own remote monitoring and management system for your indoor or outdoor garden? Do you want to share your garden and the weather world wide? This project is for you. You can learn the Raspberry Pi and how to connect to the real world through this easy to build **no-soldering** kit. You can measure soil moisture and then use that as feedback to provide your plant or garden just the right amount of water.

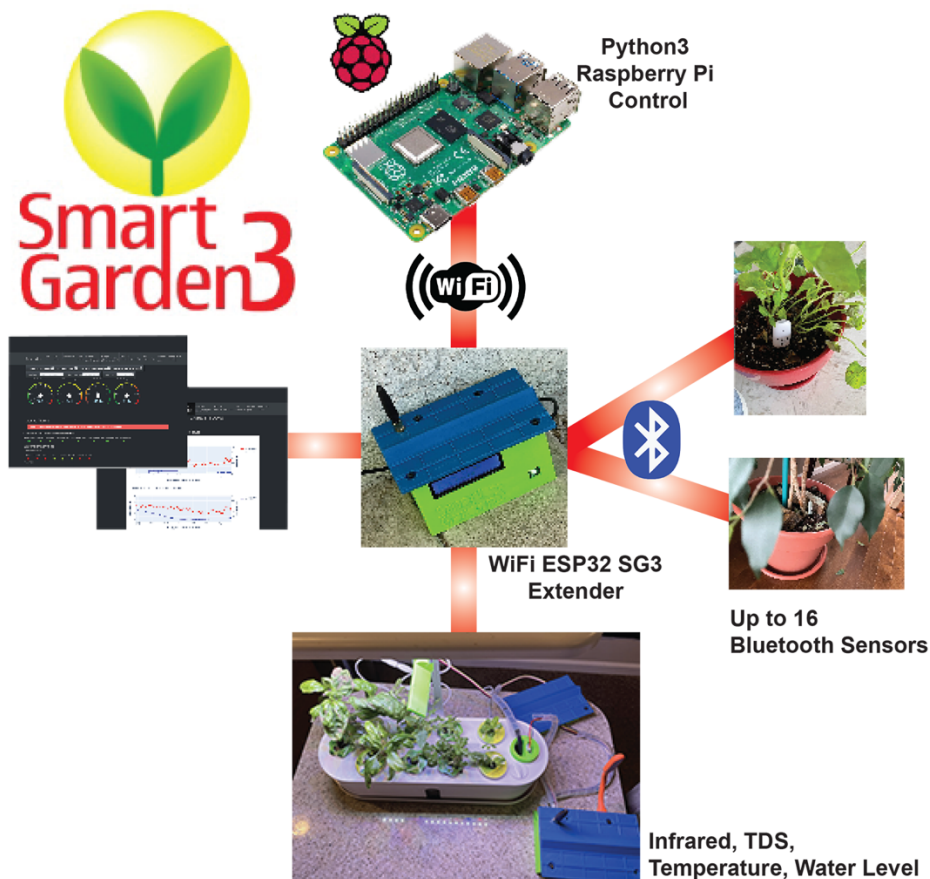
Highly expandable! You can have your Raspberry Pi Base Unit inside your house and have multiple wireless control units in your outdoor garden, greenhouse or in the upstairs bedroom. Up to 250 wireless control units can be connected up to one Raspberry Pi base unit. This allows you to control your truly MASSIVE garden. Or your small one. Either way!

This is a perfect highly expandable project kit for kids with some help from the adults and for adults trying to learn some new things. This project has **no soldering** involved and uses Grove connectors to wire everything up! You can't reverse them and blow things up. [Here is our tutorial on the Grove system.](#)

The SmartGarden3 Features

- Control Valves, Pumps and Lights
- Measure your Soil Moisture
- Measure your Sunlight
- Show your results on the Internet and your Phone

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



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Preparing and Learning your Raspberry Pi

The SmartGarden3 requires a working Raspberry Pi. You can use virtually any Raspberry Pi (3B+, 4B+, ZeroW, etc.) but you do need to set it up before starting the process of building The SmartGarden3.

Initial setup of your Raspberry Pi and connecting to it on your network is well beyond the scope of this manual. There are just too many variables in how you might set up your Raspberry Pi. Consider visiting the Raspberry Pi Foundation for suggestions.

SwitchDoc Labs provides an SD Card that has the Raspberry Pi operating system, version Buster, and all the SmartGarden3 software installed. <https://shop.switchdoc.com/products/32gb-sd-card-with-stretch-smart-garden-system-groveweatherpi>

The SDCard also has a provisioning system that allows easy connection to your network. See the SD Card Product page.

Once you have your Raspberry Pi setup up, running and can access a command line window (terminal) then you are ready to go with this manual.

This is the reason that we consider The SmartGarden3 an advanced beginners kit, rather than a beginners kit (like the OurWeather Weather Station).

Here are some resources to get you set up and running as quickly as possible.

Helpful Getting Started Videos:

<https://www.raspberrypi.org/help/videos/>

Helpful Getting Started Written Tutorial:

<https://www.raspberrypi.org/wp-content/uploads/2012/12/quick-start-guide-v1.1.pdf>

If you want to set up a headless (no monitor, keyboard, mouse) Raspberry Pi, it is more complicated. Here are some links to tutorials for that process.

<http://www.circuitbasics.com/raspberry-pi-basics-setup-without-monitor-keyboard-headless-mode/>

<http://blog.self.li/post/63281257339/raspberry-pi-part-1-basic-setup-without-cables>

Many, many more tutorials are available on the web.

If you have the SDL SD Card, please check the product page for directions about setting up your Pi to your network.

<https://shop.switchdoc.com/products/16gb-sd-card-with-stretch-smart-garden-system-groveweatherpi>

Once you have it set up, take a brief tutorial about using the terminal window and the very powerful Raspberry Pi Command Line.

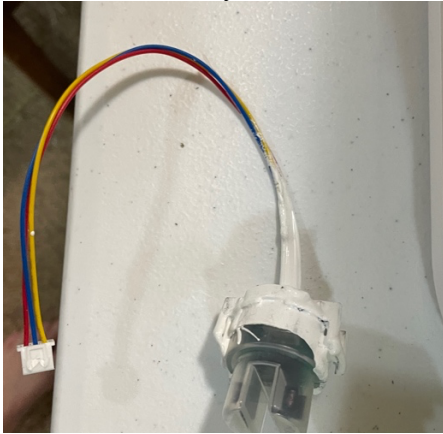
<https://www.raspberrypi.org/blog/learning-the-command-line/>

<https://www.raspberrypi.org/blog/learn-to-love-the-command-line-with-the-magpi/>

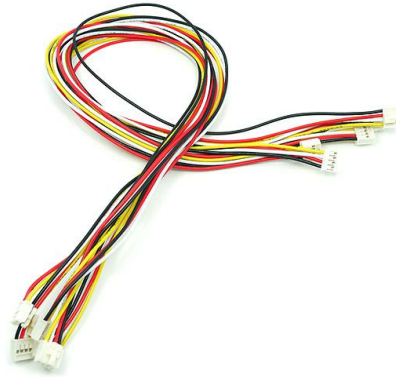
You don't need to know a lot about the command line to enjoy building and running The SmartGarden3, but you do need a bit of knowledge.

Parts List

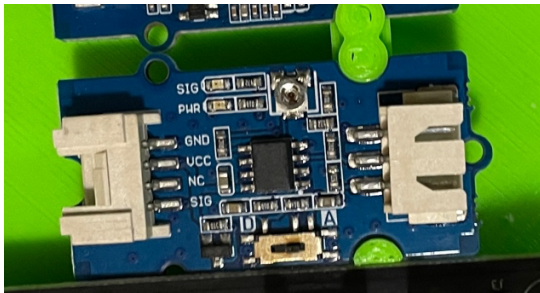
Part A – Turbidity Sensor



Part B – 50cm Grove Cable (one)



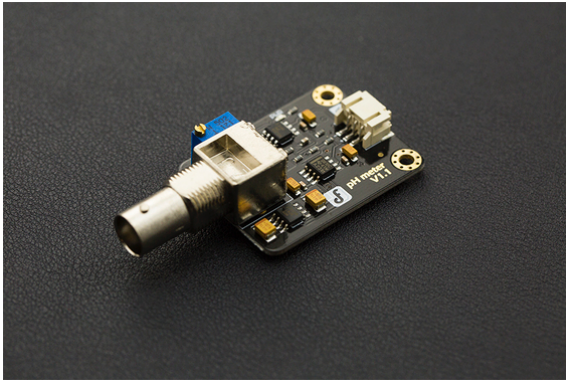
Part C – Turbidity Sensor Board



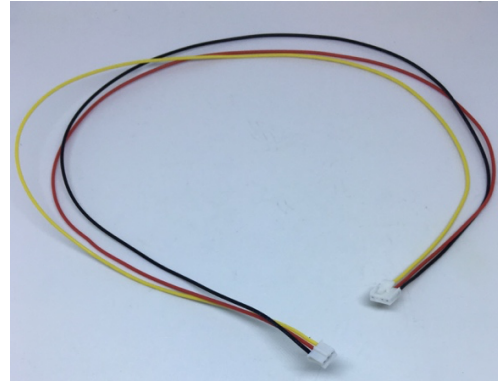
Part D – pH Sensor



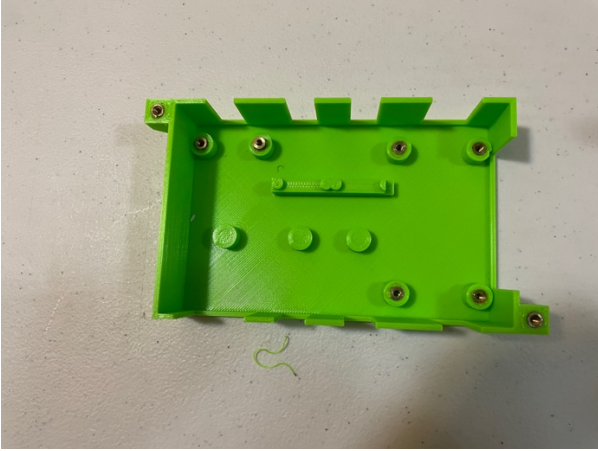
Part E – pH Sensor Board



Part F – 3 pin Gravity Plug to Grove Plug



Part G – 3D Printed Hydroponics Wire Hub Base (Optional)



Part L – 3D Printed Hydroponics Hub Top (Optional)



Parts Not Included

For your convenience, we have a SG3 Hardware Kit that has the M3 and M2 screws and brass inserts necessary for assembly of the SG3 Hydroponics Wireless Hub.

Brass Inserts (to assemble the 3D Prints):

<https://amzn.to/3AwvgNV>



You will need a box of M3 screws (to assemble the 3D Prints) and nuts such as this (on Amazon or shop.switchdoc.com):

<https://amzn.to/3FSgNNp>



Step by Step Assembly

Cautions: Keep your static charge to a minimum during your assembly and operation. Touch metal before handling parts. Avoid shuffling your feet. Before starting assembly, layout all the parts above and familiarize yourself with the various parts.

NOTE: There is no water anywhere in the system while you assemble it. Do not fill they hydroponics tank until the end of the assembly instructions.

What are we doing here?

We are adding the pH and Turbidity sensors to your SmartGarden3 Hydroponics Kit

While we recommend you buy or print a 3D enclosure, you can also use a Tupperware or other plastic enclosure to protect the SmartGarden3 Hydroponics Hub from water.

Adding the Turbidity Sensor and pH Sensor to the SmartGarden3 Hydroponics Unit

Step 1) Assemble and test the SmartGarden3 Wireless Extender unit as shown in the “Step-By-Step Assembly and Test Manual for SmartGarden3”. You must complete this manual and procedure before continuing.

Step 2) Assemble and test the SmartGarden3 Hydroponics Unit as shown in the manual “Step-By-Step Assembly and Test Manual for the SmargGarden3 Hydroponics Kit”

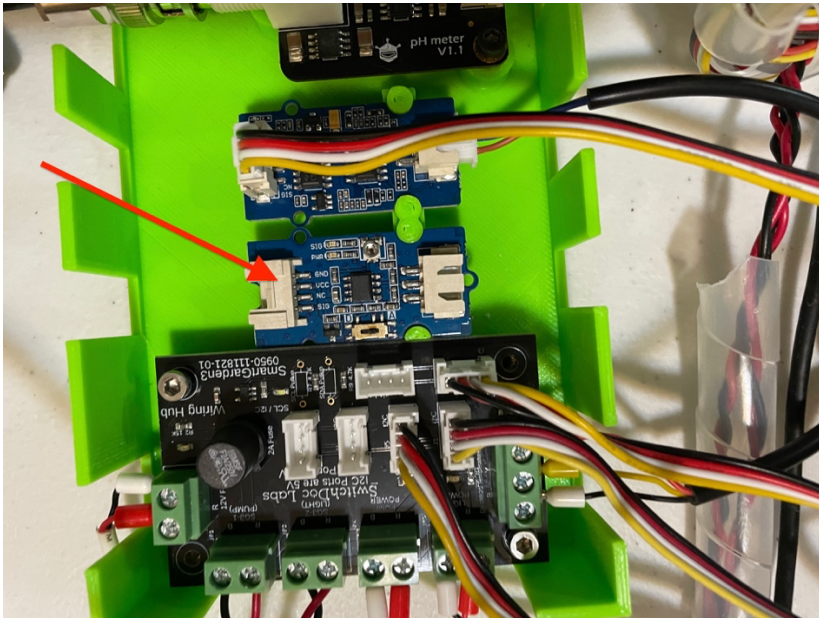
Step 3) **NOTE:** These instructions are written for use with the 3D Prints which you can print yourself from the STL files or buy optionally from SwitchDoc Labs.

STL Files: https://github.com/switchdoclabs/SDL_STL_SmartGarden3

3D Prints: <https://shop.switchdoc.com/products/3d-print-for-smart-garden-hydroponics>

If you don't have the Turbidity Sensor skip to the pH Sensor Assembly Step 9.

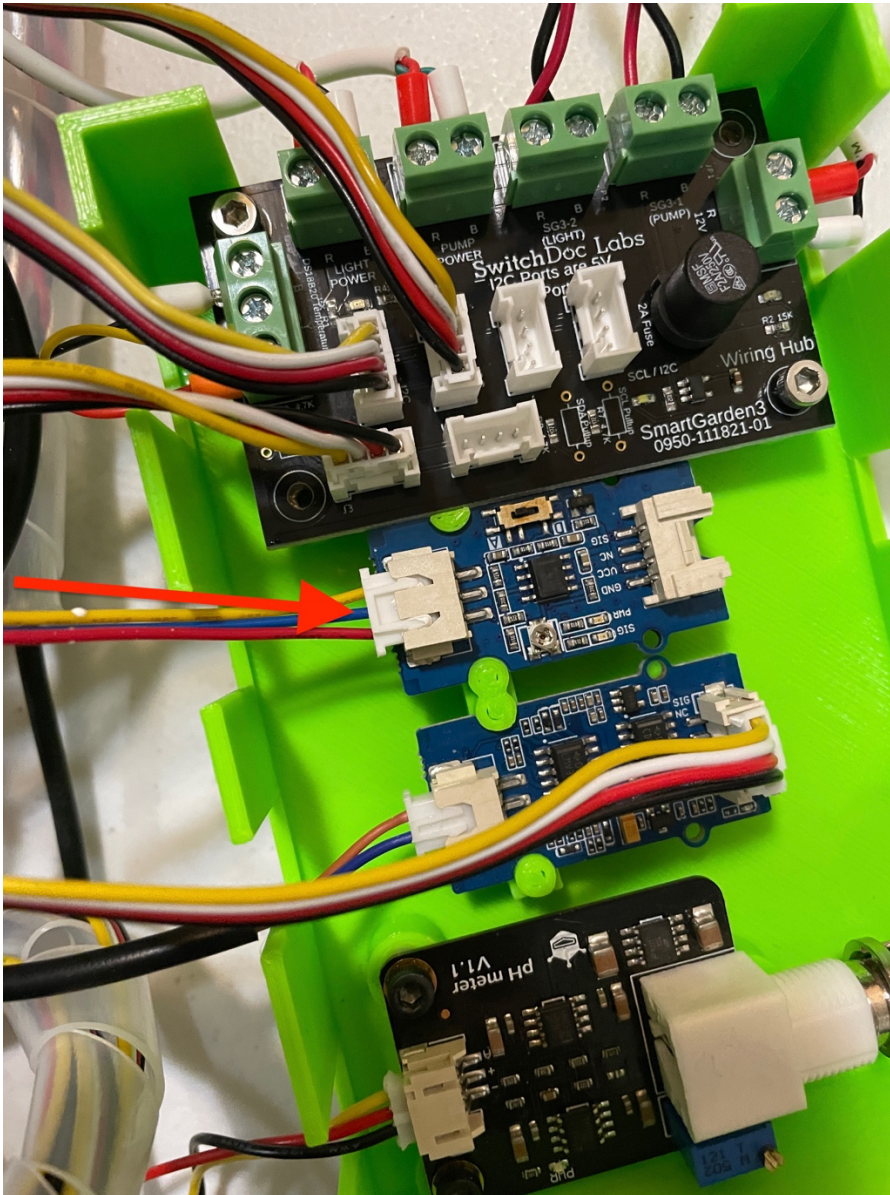
Step 4) Push the Turbidity Sensor Board (Part C) onto the posts in the 3D Printed Hydroponics Wire Hub Base (Part G) as shown. If it is loose use a tiny bit of super glue on the large post, push the board down and let dry.



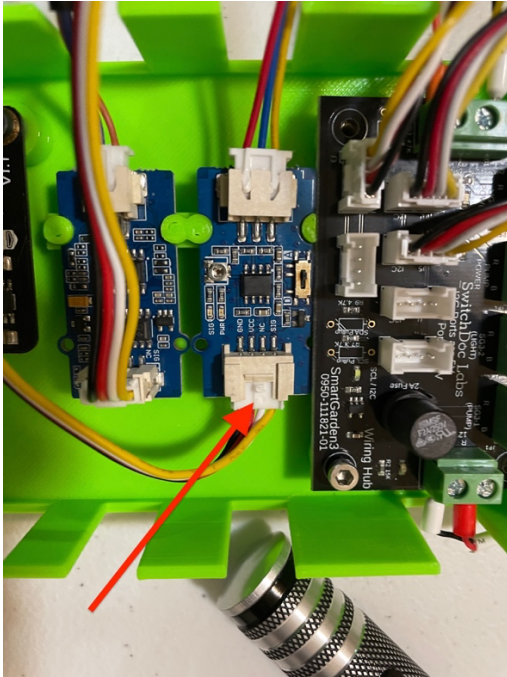
Step 5) Take the Turbidity Sensor (Part A), place it in the Hydroponics Tank and route the cable up through the 3D Printed Hydroponics Sensor Mount as shown.



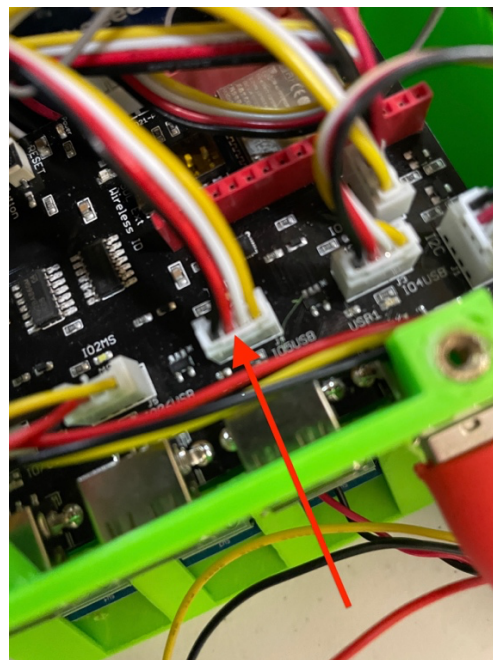
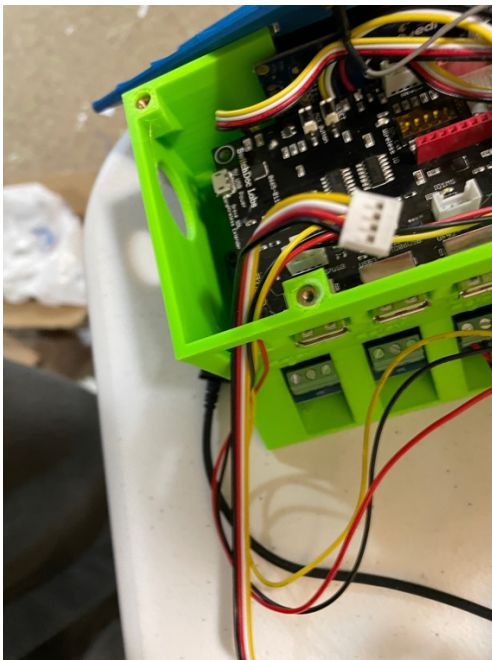
Step 6) Plug the cable on the end of the Turbidity Sensor (Part A) into the 3 Pin connector on the Turbidity Sensor Board (Part C) as shown.



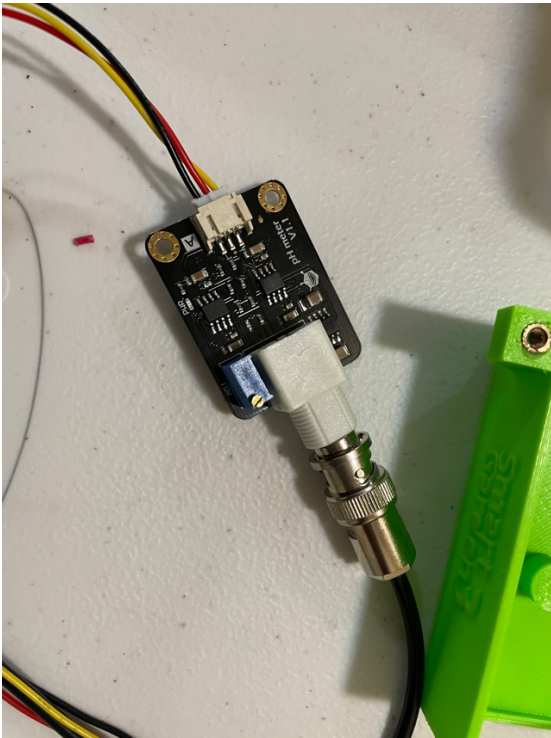
Step 7) Take a 50cm Grove Cable (Part B) and plug one end in the Grove connector on the Turbidity Sensor Board (Part C).



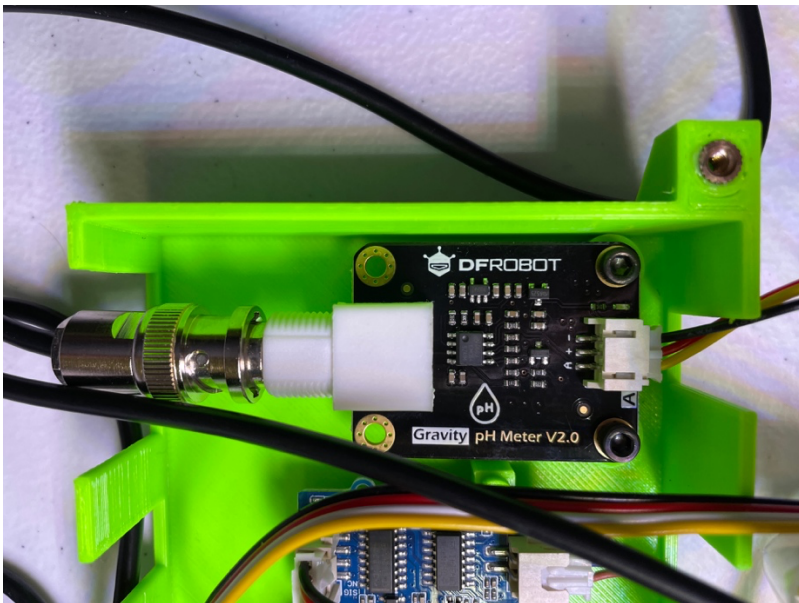
Step 8) Take the other end of the 50cm Grove Cable (Part B) from Step 7 route it through the right hole (looking at the front of the SmartGarden3 Extender) and plug it into Grove Connector marked MS2 on the Extender Board as shown.



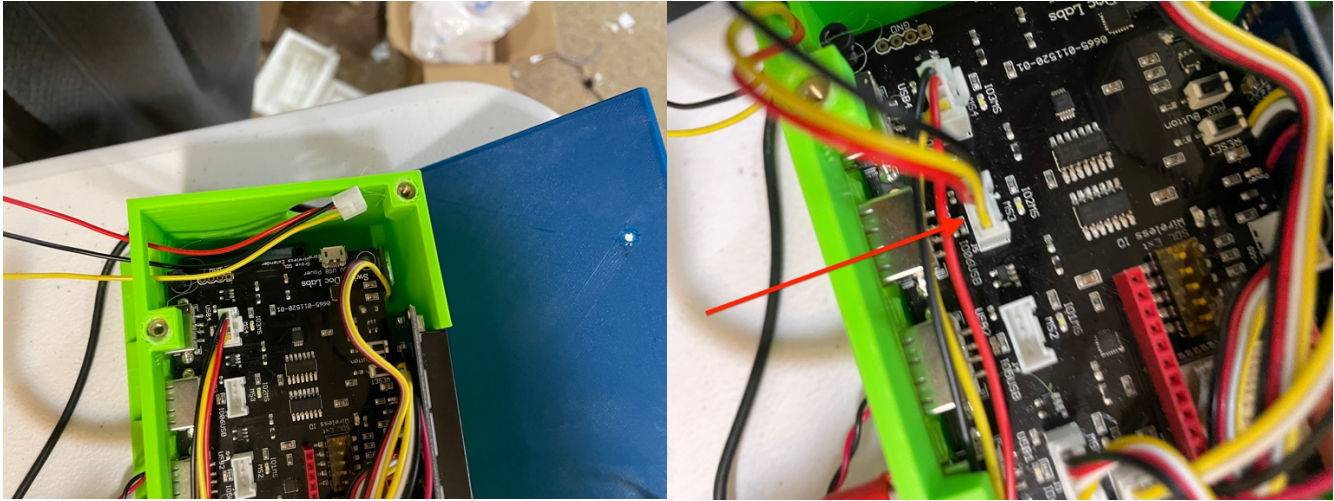
Step 9) Plug BNC Screwdown cable from the pH Sensor (Part D) into the pH Sensor Board (Part E). Then take the 3 Pin Gravity Plug to Grove Plug (Part F) and plug it into the 3 pin connector on the pH Sensor Board (Part E).



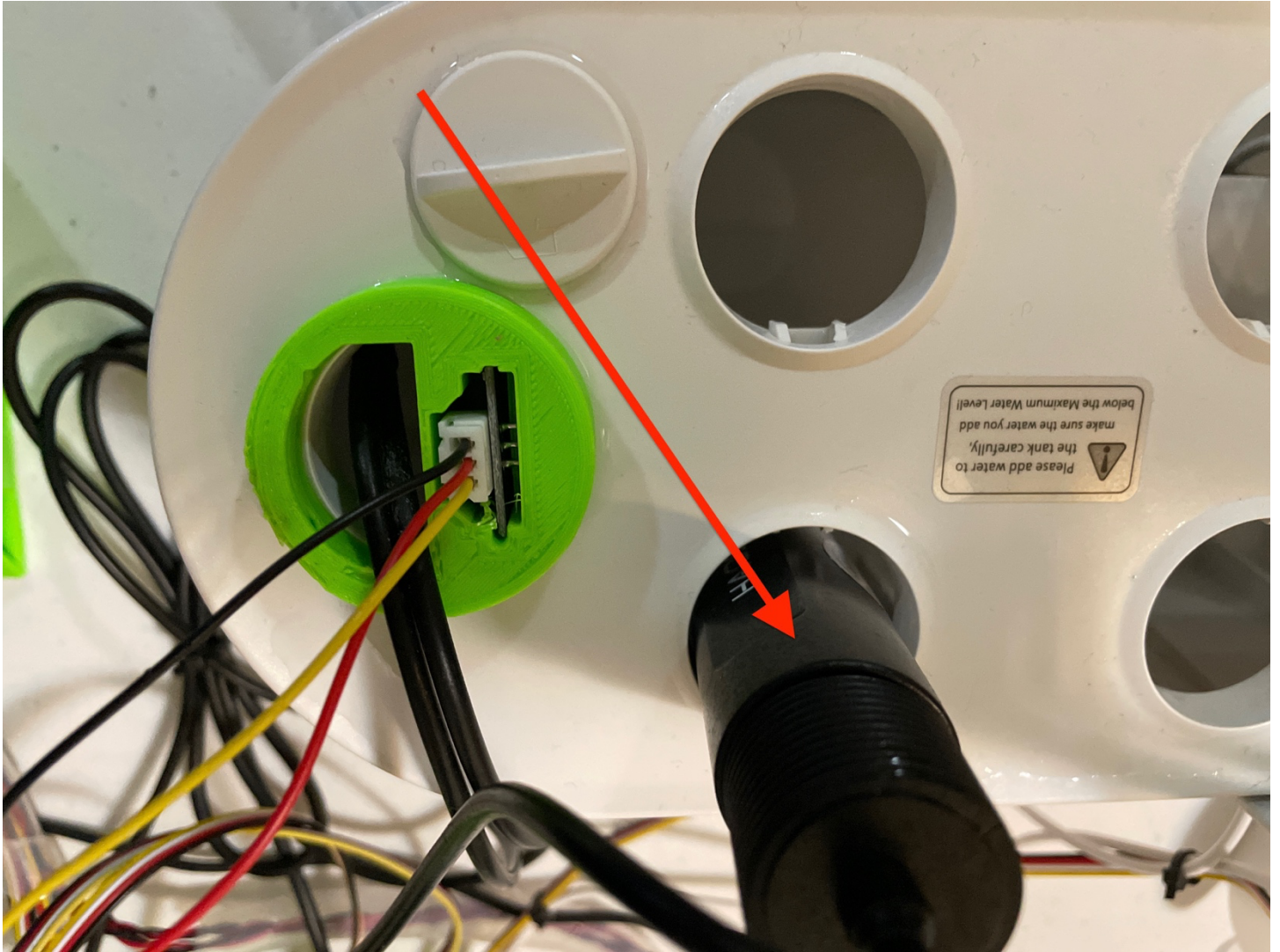
Step 10) Screw down the pH Sensor Board (Part E) into the shown location and orientation in the 3D Print Hydroponics Wire Base (Part G).



Step 10) Take the other end of the 3 Pin Gravity Plug to Grove Plug (Part F), route it through the hole on the right side (as seen from the front) of the SmartGarden 3 Extender and plug it in the Grove connector marked MS3 on the Extender Board as shown.



Step 11) Take the pH Sensor, unscrew the cap covering the sensor on the bottom, and place it in one of the open holes in the top of the Hydroponics unit.



**Congratulations! You have now completed the initial assembly of the SmartGarden3 Turbidity and .
On to testing!**

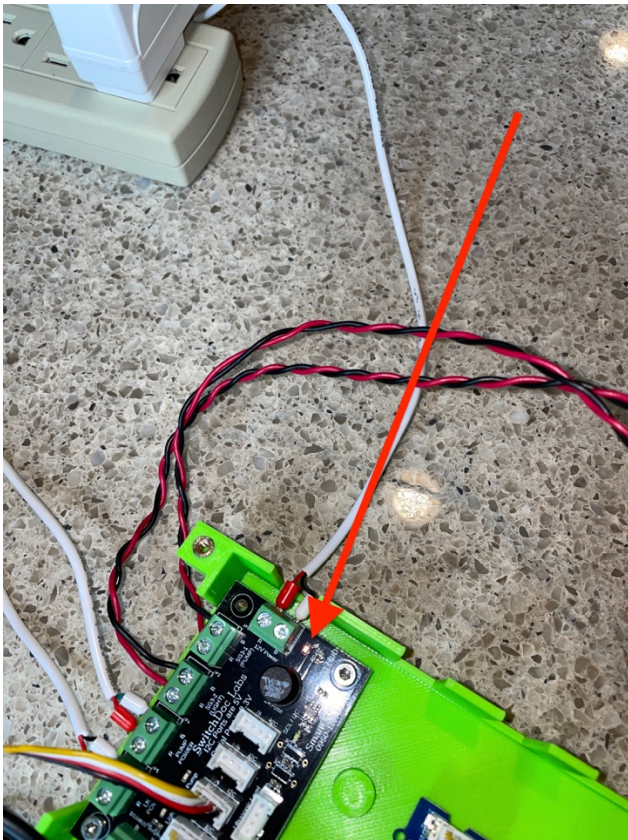
Testing your Smart Garden3 Turbidity and pH Sensors

This section assumes you have completed the SmartGarden3 Extender testing and configuration and Hydroponics testing and configuration. Go back to those two manuals if you have not done this.

- [Step-By-Step Assembly and Test Manual for SmartGarden3](#)
- [Operations and Configuration Manual for SmartGarden3](#)
- [Step-By-Step Assembly and Test Manual for the SmargGarden3 Hydroponics Kit](#)

Make sure you have started SG3.py and the dash_app as shown in the Operations Manual.

Step 1) Plug in the Power for the Hydroponics Unit (Part A). In a few seconds, you should see a red light labeled “12V Power”. If you don’t see this light, immediately unplug your unit and check all the wiring. Especially the wiring for the 12V Power.



Step 2) Plug power into your SmartGarden3 Wireless Extender and wait 2 minutes while the unit powers up. You should see the I2C Access LED light flash periodically.

Step 3) Open your dash_app On your Raspberry Pi:

<http://127.0.0.1:8010/>

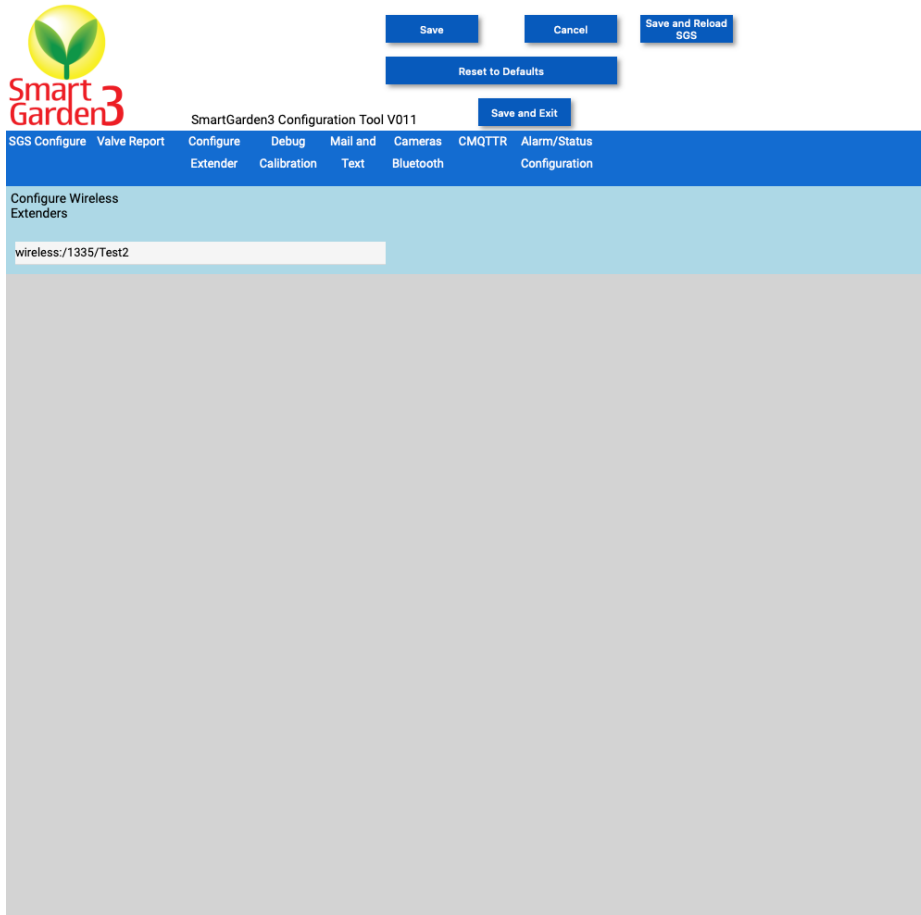
Or on another computer type:

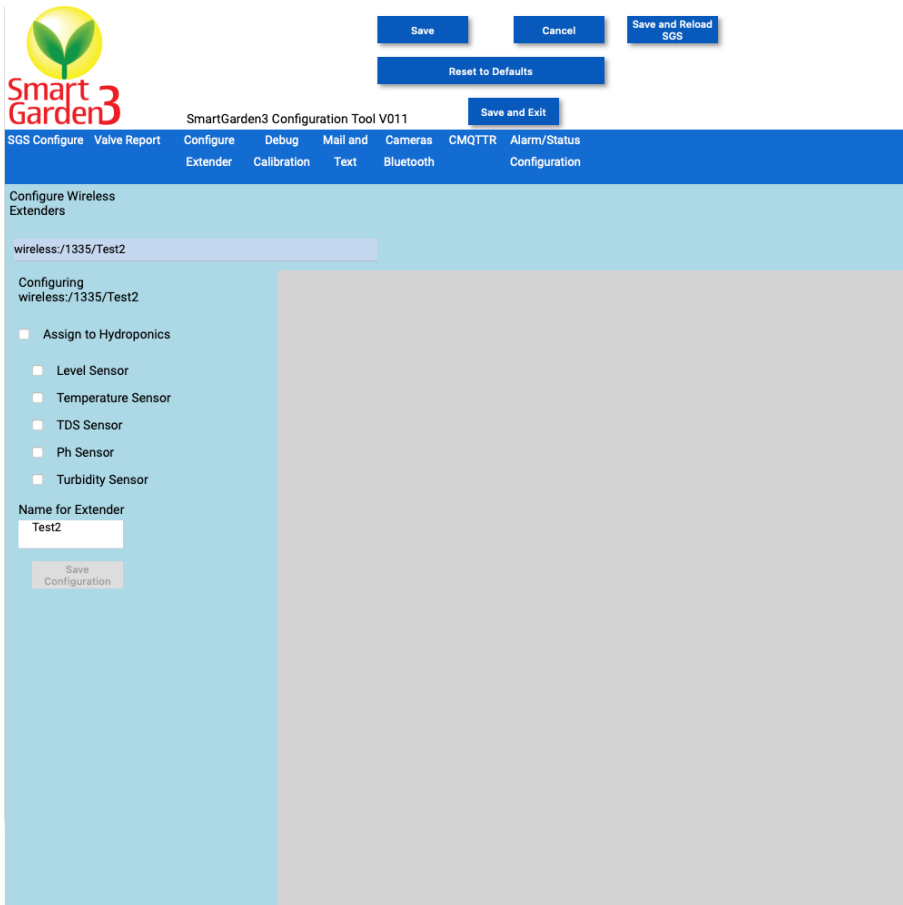
<http://xxx.xxx.xxx.xxx:8010/>

Where “xxx.xxx.xxx.xxx” is the IP address of your Raspberry Pi that you wrote down during configuration of your Raspberry Pi.

Step 5) Start your SG3Configuration program and go to the Configure Extender Tab.

The Configure Extender tab is used to configure your Wireless Extender. Click on the name of the extender to bring up the configuration column.





Step 6) Check the “Assign to Hydroponics”, the “Level Sensor”, “Temperature Sensor”, “TDS Sensor” and most importantly, the “Ph Sensor” and “Turbidity Sensor” boxes. You can rename your Extender at this time too. Hydroponics might be a good name!

Now unplug your Wireless Extender, plug it in again and wait two minutes.

Step 7) Wait an additional 15 minutes and then check out the Hydroponics page. You should see something like this (we know, not very interesting yet). This page was grabbed after the system had been running for a few hours. If it is not showing anything yet, hit refresh on your browser.

SmartGarden3 | SG3 Status | SG3 Cameras | Hydroponics | Valve Graphs | Bluetooth Temp/Moisture Sensor Graphs | Bluetooth Light/Conductivity Sensor Graphs | Next Events | P/V Programming | Alarm Programming | Bluetooth Sensor Status | Manual Control | Logs

Hydroponics Instruments

Extender: 149D Updated at:2022-02-11 15:37:46

- 100.0 %** Water Level
- 68.1 F** Temperature
- 125.71 ppm** Total Dissolved Solids
- 796.0 NTU** Turbidity
- 8.27** Ph

Garden Cam
11-Feb-2022 15:37:47
MinTemp: 17.0C MaxTemp: 22.0C

Infrared Cam

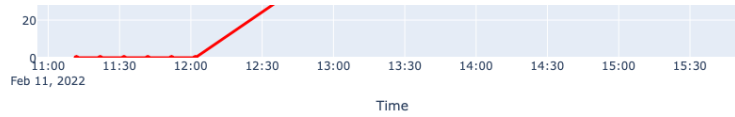
Hydroponics Level

Time	Level (%)	24 Hour Average Level (%)
11:00	100	0
11:30	100	0
12:00	100	0
13:00	100	30
14:00	100	100
15:00	100	100
15:30	100	100

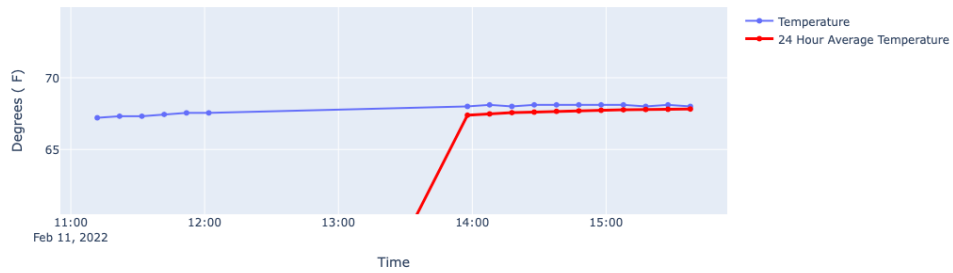
Hydroponics Temperature

Time	Temperature (F)	24 Hour Average Temperature (F)
11:00	68	65
11:30	68	65
12:00	68	65
13:00	68	68
14:00	68	68
15:00	68	68
15:30	68	68

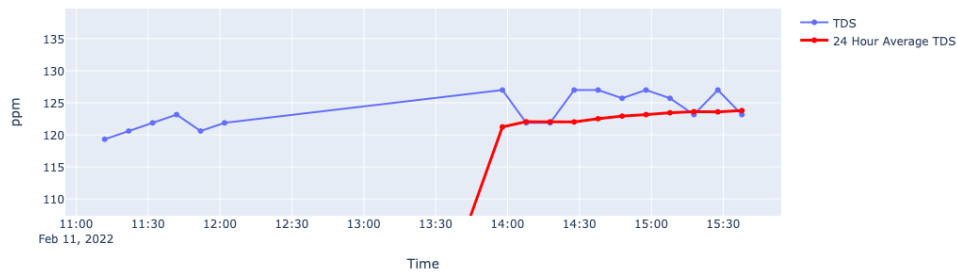
Step 8) Scroll down to see the rest of your sensors. Note how the pH sensor bounces around. This is normal. To make decisions on what your pH actually is, look at the included 24 Hour average of pH readings.



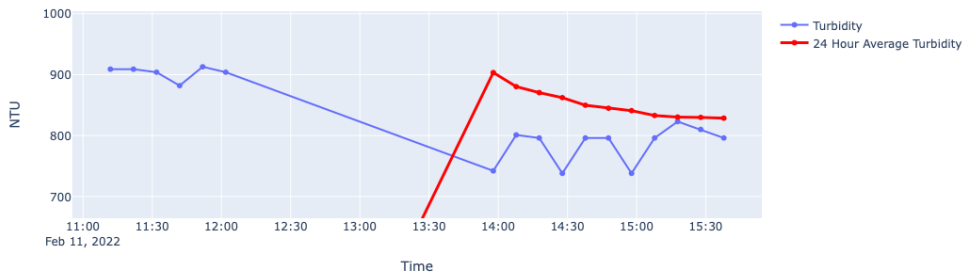
Hydroponics Temperature



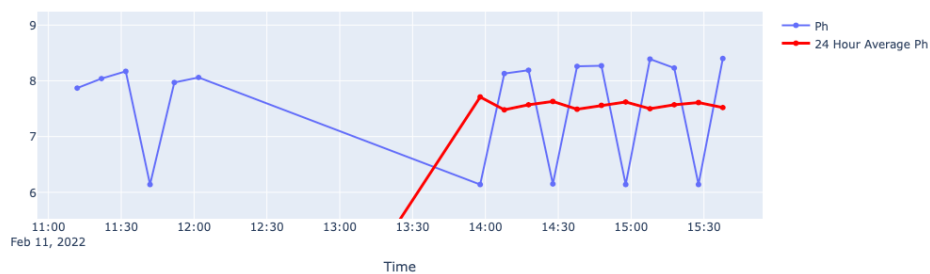
Hydroponics TDS



Hydroponics Turbidity



Hydroponics Ph



If you don't see information from your temperature sensor or aren't seeing a very low water level, go back and check your wiring. It is normal that the TDS sensor reads 0.0ppm with no water in the unit.

Congratulations. You have tested your SmartGarden3 New Turbidity and pH Sensors.

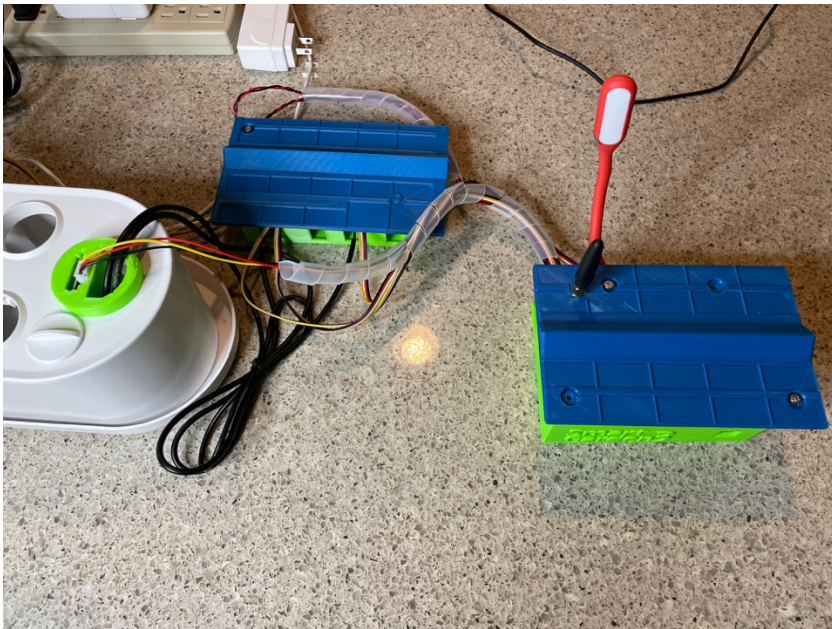
See the www.switchdoc.com Blog to calibrate your pH sensor if you feel it is not reading correctly with factory settings.

Final Assembly

Unplug your Hydroponics unit and your SmartGarden3 Wireless Extender unit.

Step 1) Attach the Top of the Wire Hub Assembly (Part L) to the base of the Wire Hub (Part J) with two M3 screws.

Step 2) Attach the Top of the Smart Garden Wireless Extender to the Wireless Extender base with 4 M3 screws.



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.