Temp Sensor/VOC Sensor

Installation Manual 2.9

March 2023

We forgot to put something on this page.

Thank You!

We appreciate you putting your trust in 3D UPfitters to deliver on a new concept in 3D printing. Yeah, it's just a touchscreen data logger, but we've put a lot of care, countless hours, and money into taking something we enjoy using and making it available to everyone.

This is a work in progress, and we welcome feedback on how to make operation and installation as seamless as possible. We depend on customer feedback to help shape this product's future directions.

Installation and Configuration

Power Cable

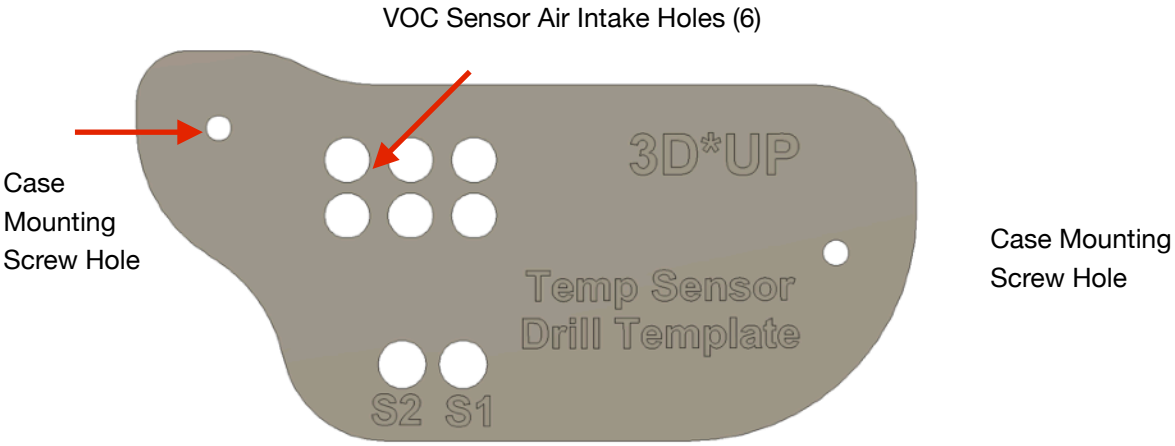
Ain't nothing gonna happen 'til you plug it in. The touchscreen comes with a USB-C to USB-A connector. The USB-C side plugs into the bottom of the case, as shown below. We don't provide a wall wart as we highly recommend purchasing power strips with built-in USB power. **It's crucial that when you start up the touchscreen, the air is clean, and no 3D prints are running.** The VOC sensor will calibrate that level of VOC as the baseline.

Mounting the Case

Installation depends on what exactly you want to do with the touchscreen. The first release has two separate temperature sensors on long wires. The simplest thing is to lay the touchscreen on the table for testing purposes and use a cable access port to bring the cables inside the enclosure. However, the air quality VOC meter should be close to the top of the enclosure to get a good reading. We've had good luck mounting the case near the top of the sides on the left or right.

If you purchase a 3D UPfitters enclosure, it can come pre-cut to place the touchscreen case at either the top left or top right near the front.

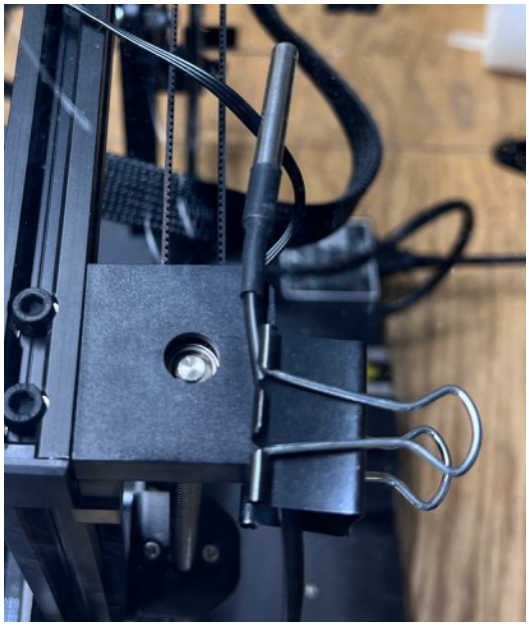
If you'd like to mount the touchscreen on your enclosure, the STL for a drill template is available at the bottom of the main product page. The holes labeled S1 and S2 will enable you to bring the sensor cables into the enclosure hidden behind the case for a cleaner look.



Note that holes will be added to the fan controller in future versions. While we don't like having to drill holes, this is the least bad of the available solutions. We will make every effort not to change the holes' location; future directions force later versions to not be compatible with this hole pattern. If you are squeamish about leaving holes in your enclosure, you'll probably want to wait until later versions are released in the latter half of 2022.

Sensor Placement

Two binder clips are provided to help position the sensors inside the enclosure, or you can DIY your solution. The VOC sensor is inside the case, which can be exposed to air inside the 3D printer enclosure.

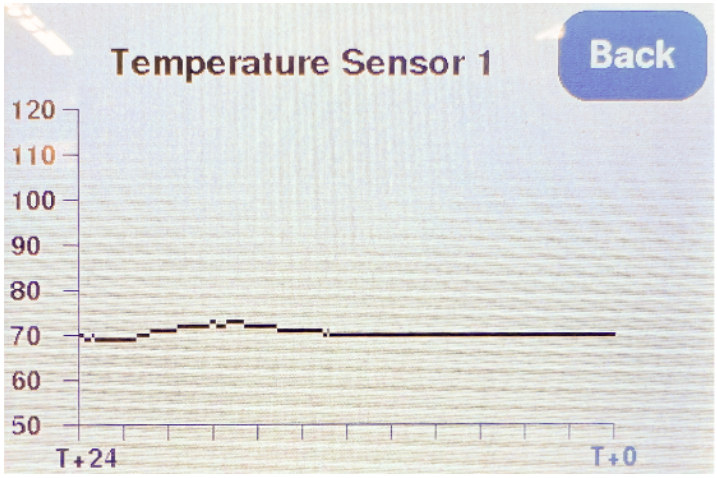


Basic Operation

Temperature Sensors

There are two temperature sensors. The main screen shows both of the temperature values in Farenheight. We can add Celcius in the future if people tell us they want it, but we kept the initial release simple in case customers wanted us to go in a different direction.

To view the historical time for each sensor, tap on one of the blue buttons:



VOC Sensor Calibration

Warning: Do not place touchscreen in direct sunlight! It is designed to be used indoors. You can calibrate outdoors as long as its in the shade.

The button in the middle is the air quality reading from the SGP30 air quality sensor board, which measures TVOC (total volatile organic compound). Typically we see values of up to 500 ppb (parts per billion) inside an enclosure when printing ABS and half that when printing PLA depending on the particular brand of filament.

The VOC sensor uses a MOS (Metal Oxide Semiconductor) sensor to track VOC levels. A MOS sensor is a small metal plate coated in various materials which allow it to attract or repel specific types of molecules. A constant charge is applied to one side of the MOS plate, and the resulting resistance is read on the other side. Resistance temporarily increases as molecules bounce off the plate, and this change in resistance is logged and fed into an algorithm to calculate the VOC parts per million.

When you start the touchscreen for the first time, the VOC sensor will go into calibration mode for 12 hours and assume that the surrounding air is a clean baseline, i.e., no 3D printing, laser cutting, or other air pollutants. Why is the first 12-hour calibration necessary? The first time your device is powered on, it has no preexisting baseline, so it must find one. Because each sensor has atomic-level differences due to the manufacturing processes, each has a unique baseline resistance. Running the sensor for 12 hours initially allows it to come into contact with ordinarily occurring VOCs (and other molecules regularly found in its environment). So it will not register those molecules as VOCs when logging begins.

VOC Sensor Recalibration

Why might be recalibration necessary? Over time, as molecules bounce off the MOS plate, the coating slowly degrades, and molecules may become 'stuck' to the plate. The molecules gradually increase the resistance by sticking to the MOS plate, which reduces sensor accuracy. To counteract this, recalibration is occasionally required. By recalibrating the VOC sensor, a new baseline will be created, and all future values will be compared to that baseline and adjusted accordingly. Recalibration should only be run while the air is as VOC-free as possible. To recalibrate the sensor, go to the Info Page (press the 'i' in the top-right of the screen), and then press the "Recalibrate" button - it should flash green. For the next 12 hours, the main page's VOC button will display "Calibrating."

When should I recalibrate? We recommend recalibrating your touchscreen once every two-three weeks; however, the device can be recalibrated at any time.

What if power is lost? If the device is powered down during calibration, the calibration will need to be restarted (for a total of 12 hours). If the device is powered down after an initial calibration, it will restart with the previous baseline values.

Note: On power up, with pre-existing baseline, it may take up to ten minutes before the VOC sensor warms up and displays accurate values.

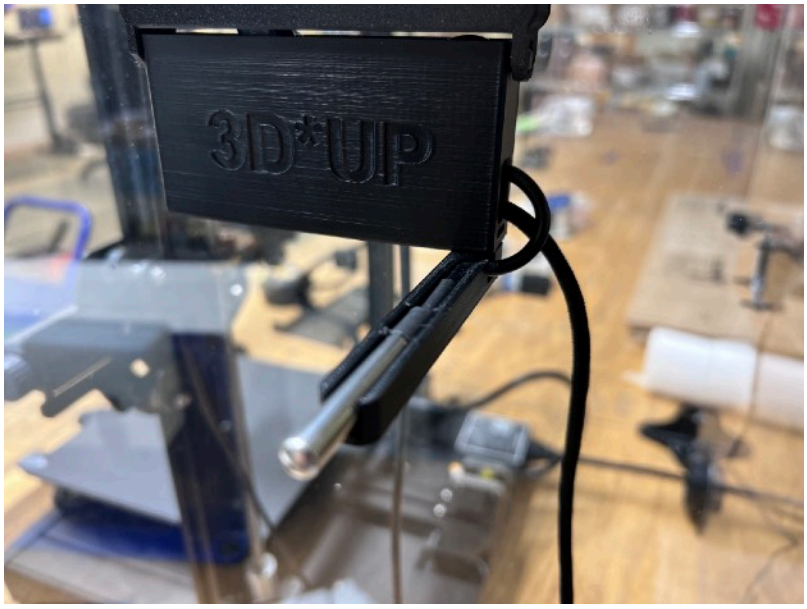
What readings are “good” and what are “bad”? Air quality is a big subject and requires a lot of background knowledge, and even then is pretty complicated. When we were testing the device, the readings didn’t make sense at first, as the values didn’t seem to correlate to the 3D printing process, and then we discovered the laser exhaust wasn’t working correctly. The point here is that the 3D printer is only one source of poor indoor air quality, so keep that in mind when interpreting the readings.

When the sensor is in the fresh air, it typically reads about 50, so for us, that is the baseline of “good air.” Some sources suggest that 200 ppb is acceptable, but it's unclear if that is for 24/7 or only occasional exposure. We prefer to err on the side of caution, but the important thing is to arm yourself with actual measurements.

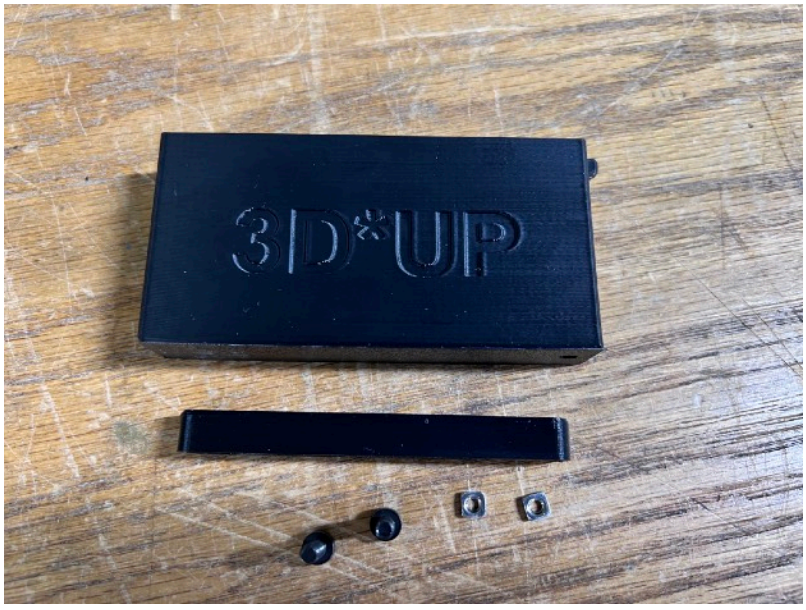
Optional Cable Box

If your main use case is to use one of the sensors to measure the room temperature outside the enclosure, then an optional sensor wire box is provided. This tidies up the exterior cable AND allows you to mount the sensor away from the enclosure, so the radiant heat doesn't affect the reading.

The provided screws fit into the square nuts, inserted into two slots in the box. While these instructions



are decidedly terse, hopefully, the pictures will give enough information.



Raw Data

The raw temperature data points in Fahrenheit are logged every hour to text files on the SDCARD named “sensor1.txt” and “sensor2.txt”. To read or parse the files move the SDCARD to your computer and view them using your favorite text editor. Temp values are logged every hour, with T+0 (the latest values) at the bottom of the file.

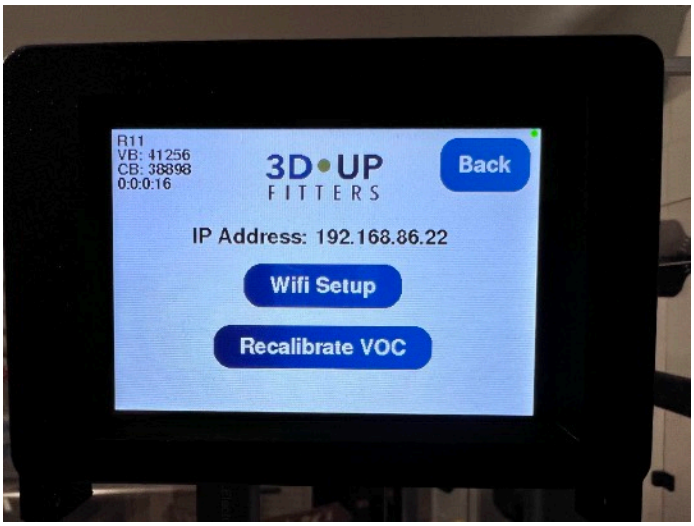
The VOC values are a bit different. The values in the graph are capped at 200 ppb, but the actual RAW sensor values are captured on the SDCARD. Again, refer to the documentation for the SGP30 for more information.

Wifi/Octoprint

The temperature and air quality values can optionally be displayed in real-time in Octoprint. If you want to run Octoprint, that’s beyond the scope of this manual, but there are plenty of online resources on how to hook your 3D printer to Octoprint. These instructions will focus on connecting this device to an existing Octoprint installation.

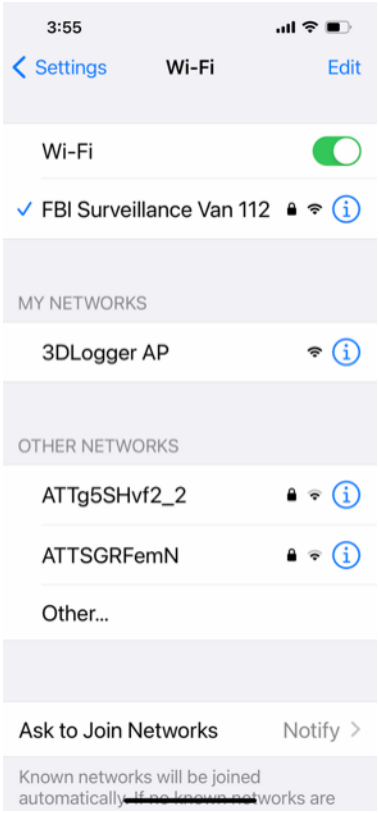
Touchscreen Network Configuration

The first step is configuring the device for Wifi by following the instructions on the touchscreen. To initiate a WiFi configuration touch the “i” symbol in the top-right-hand corner.

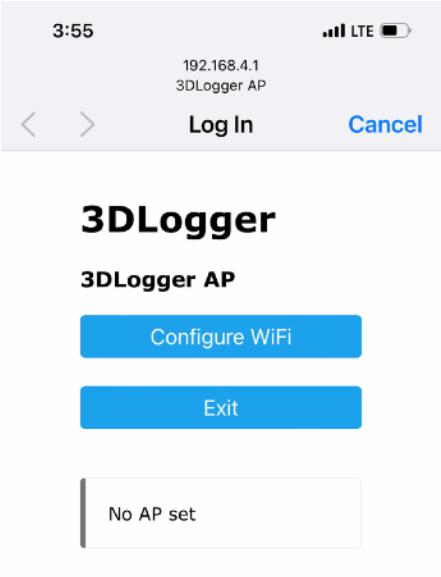


Tap on “Wifi Setup” to configure the touchscreen’s network. This will initiate a special configuration process through a private Wifi connection to the touchscreen.

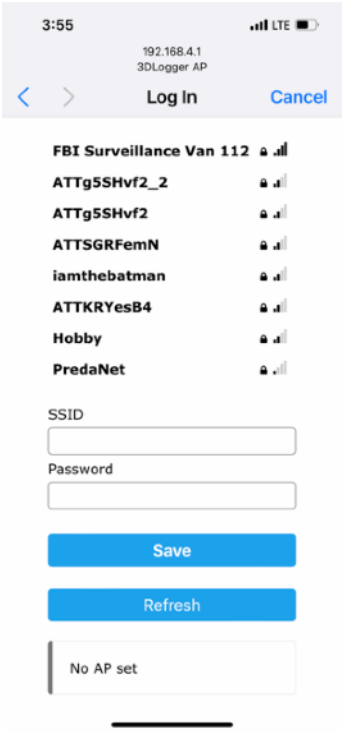
Open your phone and go to the list of open Wifi sources. iPhone is shown below, but the process is similar for Android. Select the “3DLogger AP” network. No password is required.



The following configuration screen will appear where you can tap on “Configure Wifi”.

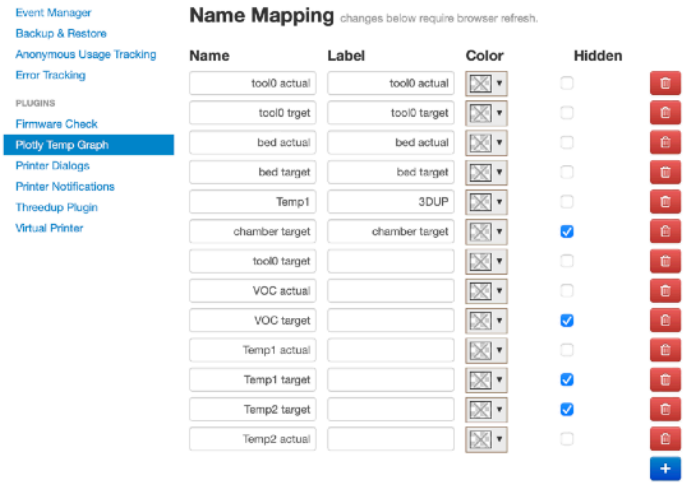


You can then select the Wifi network that is shared by both the Octoprint device and the touchscreen. Tap on the network name to popular the SSID field, enter the network's password in the field named "Password", and then tape "Save".

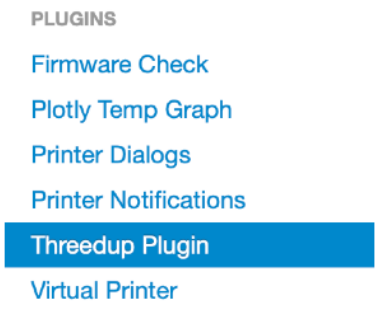


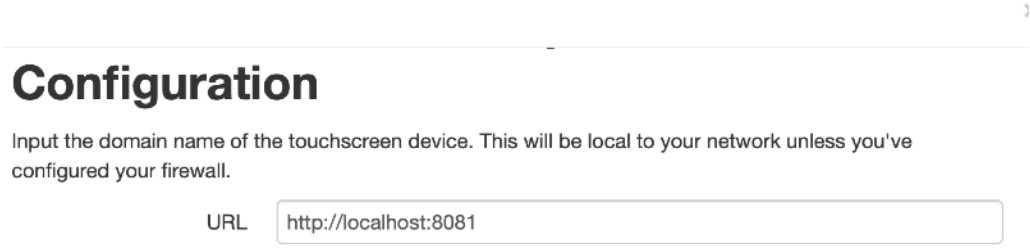
Octoprint Configuration

Once Wifi is configured, the next step is to configure Octoprint. The 3DUPfitters plugin depends on another plugin called Plotly. Please search for this plugin and add it to the Plugin Manager.

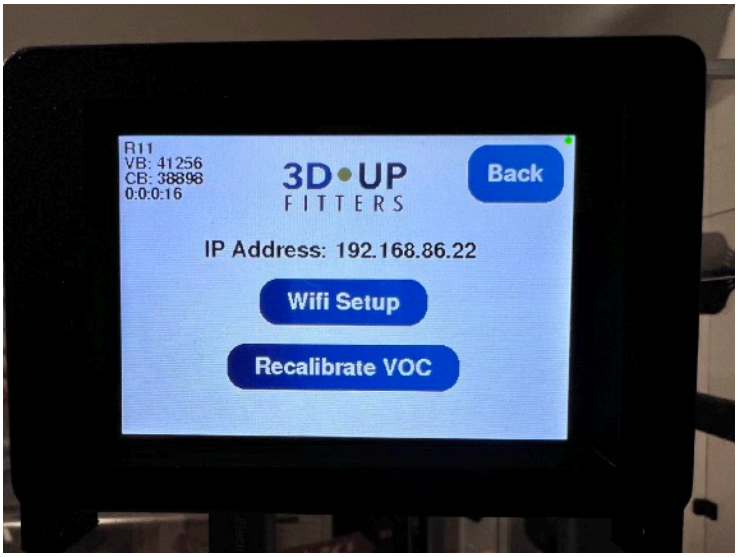


Next, look for the link to the latest 3D UPfitters plugin on the product page and install that. You'll need to use the touchscreen to find the URL and then configure the plugin:

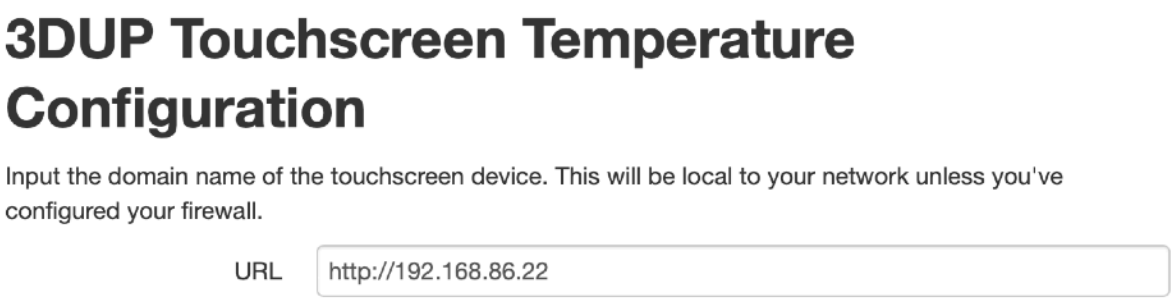




Note that you'll replace "localhost:8081" above with the IP address of the actual touchscreen. To find the touchscreen IP address tap on the "i" on the top-right-hand corner.



In the example above, the plugin URL should read “http://192.168.86.22” as shown below:



Once you start a print, the display will include the values from the two temperature sensors and the VOC sensor.