APS-300 Series User's Guide

Congratulations on acquiring a Pollen Sense Automated Particle Sensor! Before you begin, read through this guide in its entirety to familiarize yourself with the device and procedures that will help you get the best airborne particulate data in near real-time.

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Specifications

Device physical dimensions (excluding mounting hardware)	(L x W x H) (in / mm) (lbs.) 13.65 x 11.65 x 0.06 in. 346.71 x 295.91 x 1.52 mm 23 lbs shipping weight
Power requirements	90~264V AC into external moisture-proof DC adapter USA or EU plugs available 2.1mm barrel jack 12VDC, 6A to device
Network interfaces	Internet access required Wireless 102.11 b, g, n, ac Ethernet - 10/100/1000Mb Cable: RJ45 - locking waterproof
Internet requirements	● Outgoing connections on: ○ TCP port 443 (SSL) ○ TCP/UDP port 53 (DNS) ○ UDP ports 67-68 (DHCP) - locally ● DHCP required for IP, gateway, and DNS address setup
Suggested temperature operation range	0-43C (-20-110F)
Chassis features	Material: polycarbonate (Flame Retardant & UV Stabilized) UV rating: f1 2 x Pad lock pins (padlocks not included) Color: light gray/beige
Maintenance requirements	~1mo: change tape (depending on the density of airborne particulate matter) Periodic dust cleaning and checking of inlet and outlet tubes. Excepting the above, there are no user-serviceable components.
Environmental Limitations	● Excess vibration impairs effective imaging ● Heavy saturation of airborne particulates (ex: during or after a recent dust storm)

Climate	The device contains sensitive instruments. It should be disconnected and sheltered during harsh conditions (e.g. harsh winter, hurricane…).

Site Preparation

Outdoor Site Selection

- Your Pollen Sense device needs unhampered exposure to ambient air. Considerations should be made for buildings, large fans and heavy foliage which can adversely alter the flow of air to the device. Place it in as open an area as practical.
- Security measures to protect the device against theft and vandalism should be implemented.
- Sources of artificial airflow are to be avoided. Dryer vents and air-conditioning condensers are examples.
- Avoid areas that might be exposed to bottom-up spraying or splashing, such as near a sprinkler system head.
- Heat sources like hot, sunlit pavement and highly reflective surfaces like architectural mirrored windows are to be avoided to help prevent overheating of the device.

Outdoor Ambient Site Selection

- Installations are required to be at least 35 feet from any obstacles to clear airflow. Trees, heating and cooling equipment, and solid walls that are above the level of the device are examples of barriers that should be avoided. Chain link fences with an exposed mesh do not present a problem.
- The Pollen Sense device needs unhampered exposure to ambient air. Considerations should be made for buildings, large fans and heavy foliage which can adversely alter the flow of air to the device. Place it in as open an area as practical.
- Height above ground level - as a rule, the higher the sensor is mounted above the ground foliage, the more the air is mixed and therefore the data results represent a larger area. Lower sensors are more subject to biases caused by the variation of nearby foliage.

Outdoor Agricultural Site Selection

- Wind - the device should be mounted downwind of the area to be monitored
- Note that there can be significant variation in pollen and spore levels between sensors mounted below the level of the plant canopy, and just above.
- The sensor should not be placed in a location that will receive excess dust or spray, or at least should be covered during such conditions.

Indoor Site Selection

- Airflow - the device should be mounted such that the air flows first past the area to be monitored before reaching the sensor

Mounting Requirements

- Installations are required to be at least 3 feet above the ground.
- Rooftop installations should be as near to external walls or internal bearing walls as possible to provide the greatest rigidity and least degree of vibration from movement inside the building caused by shifting loads and machinery.
- Rigid poles and other commercial mounting options may work for your application, or a TV stand like shown to the right. Vibration and obstructions to airflow are primary considerations.

- Vehicle traffic, birds, and other sources of vibration will disrupt the device's sensitive microscope. Though there are some anti-vibration measures built into the device, it is still important to select a solid, rigid pole and reinforce it with cables to create an effective stand. Bird spikes–which do not hurt birds and deter them from landing on the device–are also recommended.
- In excessively hot environments, a sun-shield should be installed above the device, but care should be taken to avoid hampering airflow from every direction.
- Accommodations required by building codes for lightning arrestors should be investigated and implemented as advised by the owner of the device and/or building.
- The latches can be secured with a lock (not provided) of your choosing.
- The following links could prove useful if you wish to review engineering dimensions/specifications and as you plan to acquire mounting hardware for the enclosure:

- Enclosure: https://www.polycase.com/yh-141206
- Pole mounting hardware: https://www.polycase.com/pk-160 (vertical pole) and https://www.polycase.com/pk-120 (horizontal pole), both require poles with diameters over 2-½”
- Non-penetrating Square-base mounts, 2”x72” mast EZ NP-72-200: Amazon
- Weather station tripod: Amazon
- Guy wire hardware: https://www.ambientweather.com/amweezguywik.htm
- TV stand tripod: https://www.amazon.com/gp/product/B07PRFD7LF/ref=ppx_yo_dt_b_asin_title_o05_s01?ie=UTF8&psc=1

We’ve used the stainless steel latch option with mounting feet for our device enclosures. On the details tab are mounting kit options. Given that mounting circumstances differ from user to user, it is your responsibility to determine what solution will work best for your situation. Review the suggestions for site selection.

Utilities

Power

Devices are powered by a 12v DC power supply, which connects to standard AC power. For outdoor or wet environment usage, ensure that all portions of the power connection to the provided supply are weatherproof.

Internet

Wifi, or outdoor-rated CAT5+ cable with an RJ45 jack that connects to the internet through an ethernet router is required.
Wireless internet connection is available, so long as there is a bluetooth dongle with the computer. If there is not, contact Pollen Sense about getting one. With the bluetooth dongle, connecting the sensor to the internet using the Particle Sense App (Android and iOS) is possible.

Figure 1: Bluetooth Dongle Attached to computer

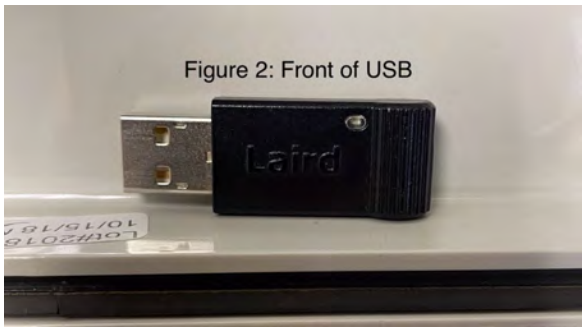
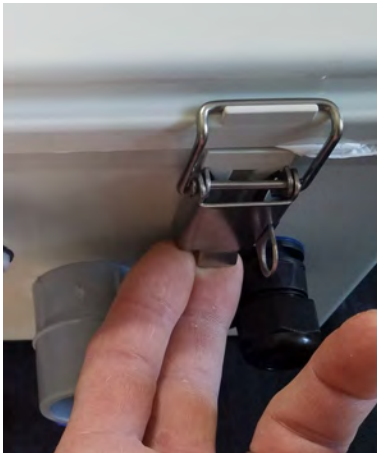


Figure 2: USB Unplugged, with LED visible

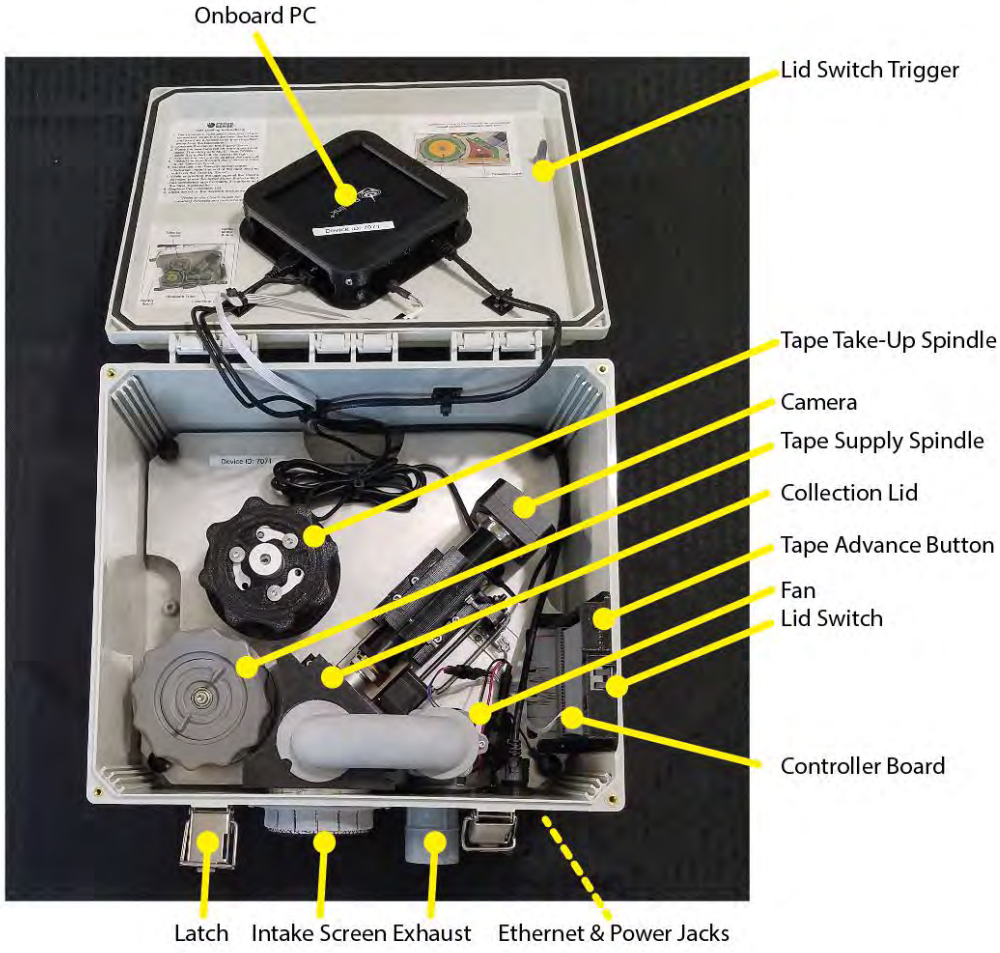
Cellular data is also an option. You can either purchase your own and have your own plan, though all setup and troubleshooting will be your responsibility. Pollen Sense does have a cellular hotspot option that is weatherproof that can be purchased for an additional fee. This will also require an approximately $50/month cellular data charge (Subject to change).

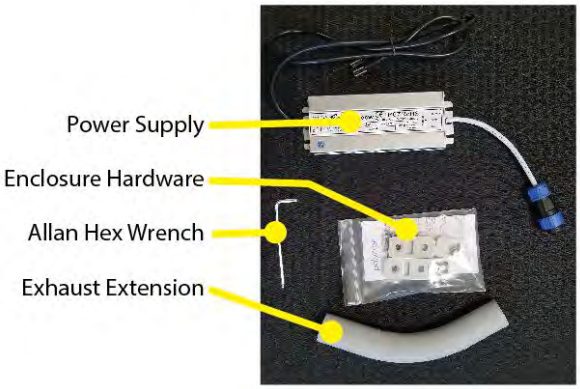
Unpacking

	Examine the shipment for breakage. If you detect rough handling, loose or broken parts, it's critical that you take photographs and email us immediately: info@pollensense.com. Place the box on the floor with the shipping information face up. Gently open the cardboard box and remove the protective padding around the enclosure. Prepare a table large enough to accommodate the device when it lays flat with its lid open. Consider protecting the table's surface from scratches.
	Locate the other bag(s) that contain accessories, supplies and tools. Set aside.
	The side closest to you has two metal latches on either side of a metal tube. Flip them open and gently open the lid and allow it to rest on the table. It will be heavier than you expect because it has a computer mounted to it.

	Gently remove the padding and place it in the shipping box for future use.
	Gently close the lid without twisting it or the enclosure. **WARNING:** DO NOT FORCE THE LID SHUT! Check for cables, or other items that might be interfering if the lid does not easily close. Re-clasp the latches

Pollen Sense APS 3XX Parts Diagram

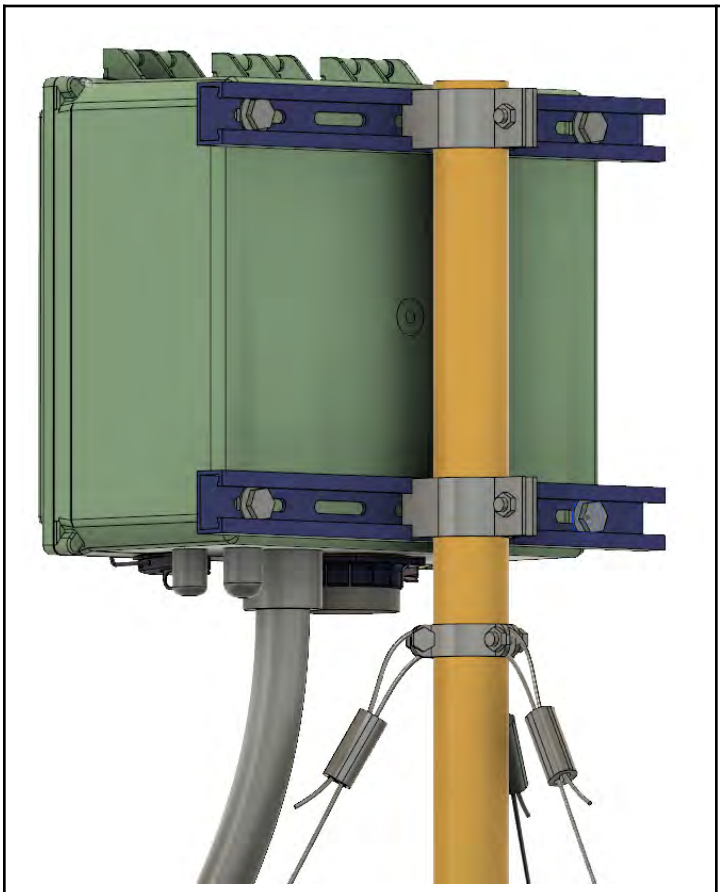
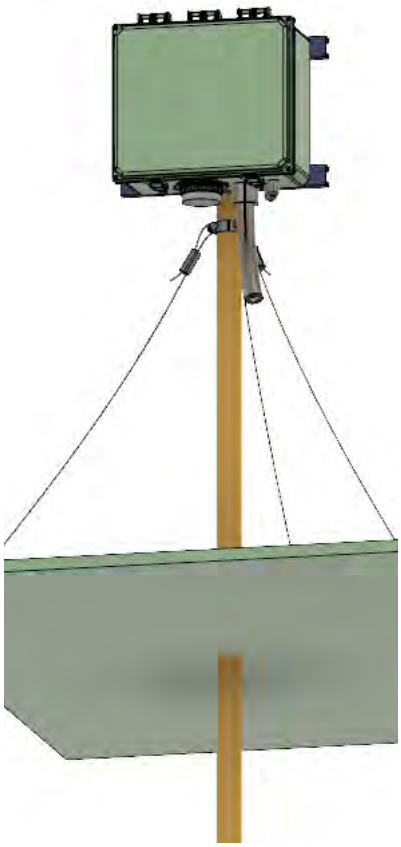


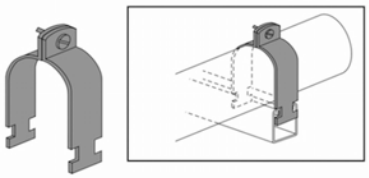


(*Colors and exact layout may vary.)

Device Mounting

Mount the device to a rigid pole. Mounting opportunities and conditions will vary based on location. Reference the *Mounting Requirements* above, including the links to the enclosure manufacturer, for ideas. The primary concern with any mounting process is that vibration be reduced to an absolute minimum to provide the best conditions for steady microscopy.

	
Strut channel, pole clamps and guy wire hardware. Use cable turnbuckles and ground anchors to make the guy wires tight.	2” min pole cemented into 18” deep hole in firm soil, or use a commercially available tripod.

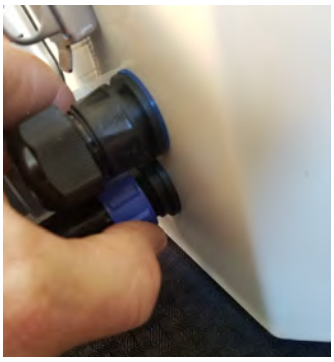
	**Slotted Metal Framing Strut Channel** Commonly available at hardware and electrical supply stores and online
	**For poles with diameters over 2-½":** https://www.polycase.com/pk-160 (vertical pole) and https://www.polycase.com/pk-120 (horizontal pole)
	**For poles with diameters under 2-½":** Strut Pipe Clamp (available at stores where Slotted Metal Framing Strut Channel is sold) https://www.techlinemfg.com/strut-clamps.html for example. Make sure to purchase the correct size for the diameter of pipe you select (at least 2" is recommended).
	**Adjustable 3-Way Guy Wire Clamp** Available at Amazon.com and places where antenna supplies are sold. Make sure to purchase the correct size for the diameter of pipe you select (at least 2" is recommended).

	**Commercially available tv stands**

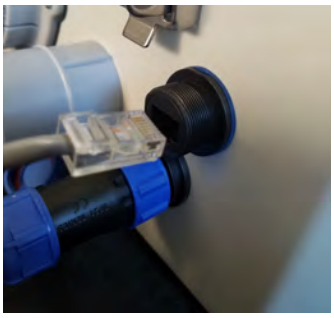
Use

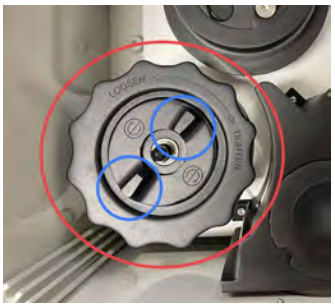
Once the device is securely mounted, power is available, and optional ethernet cable with internet service active is available, you are ready to finalize preparations:

	Plug the power supply into the device. *Note that the slots and tabs must align before you can fully insert the plug into its jack*. *Note: Some sensors ship with a 2-prong plug in the sensor, while other will ship with a 5-prong plug. The corresponding connector is shown in the next rownh*

	
  	Once it's seated firmly, twist the section connected to the cord between the power supply and closest to the device until it is hand-tight. **Do not overtighten or use tools!** Some sensors ship with a 2-pronged connector while others have a 5 prong connector (shown on next page)

	Plug the device into your receptacle or cord that's connected to household AC current. It's up to you to make sure that this connection is weatherproof. **Image shows an example from an independent vendor at CableOrganizer.com. Pollen Sense has not tested nor endorses this component and only shows it here as one possible solution.*
	**Note that the weatherproof ethernet connector may look slightly different from the one pictured below.* Unscrew and set aside the sections of the waterproof ethernet connector *that are farthest from the enclosure*. **Do not unscrew the portion that abuts the enclosure!**
	Double-check the *Internet* requirements above to make sure your particular cable will work.Thread the end of your ethernet cable through the connector parts you just removed from the enclosure.
	**Gently** push the flexible gasket into the fingers of the connector.*This image shows the beginning of this process.*
	Seat it completely inside the connector so the fingers are flush with the face of the gasket as shown in the image. Screw the nut on to the threads of the connector and gently but firmly tighten. **Do not use tools, hand-tighten only!**

	Plug the end of the ethernet cable into the exposed jack on the enclosure.
	Push the parts of the connector together and gently hand-tighten them. The gasket should remain seated flush with the plastic fingers. **Do not overtighten or use tools!**
	Insert the curved PVC *Exhaust Extension* into its fitting on the bottom of the enclosure. Gently give it a small twist while pushing upward so that the end of the exhaust is pointing down and to the left, away from the *Intake Screen*. Its friction fit will be adequate to hold it in place. **Do not overtighten or use adhesive or tools!**
	Open the latches and lift the lid enough that it will remain open on its own.
	Locate the *Tape Supply Spindle* in the bottom left corner. While holding the tabs stationary (blue circles), gently twist the knurled ring (red circle) clockwise to make sure it's firmly screwed against

 	the core of the roll of tape. To replace the tape, unscrew in the direction that says loosen. *(Note that the collection lid has been removed for clarity)*
	During shipping, it's possible that the tape between the *Tape Supply Spindle* and the *Tape Take-Up Spindle* may have loosened a little. To tighten it, press and hold the *Tape Advance Button* (highlighted in blue in the image) until the *Tape Take-Up Spindle* begins to turn. In a moment the *Tape Supply Spindle* will begin slowly turning and the slack in the tape should be removed. Lift your finger from the button once this happens.
	Check the cable connections at the *Onboard PC.* If they have loosened, re-insert them. Similarly check the cables at the *Controller Board (shown on following page).*

	
	Gently close the lid without twisting it or the enclosure. **WARNING:** DO NOT FORCE THE LID SHUT! Ensure that there are no cables or other obstructions preventing lid closure. Re-clasp the latches and use a lock in the latch holes, if desired.

Software

Most features of the sensor can be accessed both in the Particle Sense App or the Pollen Sense web portal. The App is required, however, in order to set up wifi on the sensor, while the web portal has some features that the app doesn't.

Setting up the Particle Sense App

The Particle Sense - Sensor Manager app allows you to control the sensor from your mobile device, including connecting to the internet (see 'Internet' section for details of requirements to provision a sensor using the app).

Download from Google Play:
https://play.google.com/store/apps/details?id=com.PollenSense.ParticleSense.SensorManager
Download from the App Store:
https://apps.apple.com/us/app/particlesense-sensor-manager/id1549554629

Particle Sense requires a Pollen Sense account (the same account used for the portal or for the Pollen Wise app, also made by Pollen Sense). If you do not have an account you can create one inside of the app.

If a sensor is already provisioned to your account: tap the sensor number in navigation bar and tap the button to set up a new sensor

If you do not have a sensor provisioned to your account: the app will by default walk you through a brief setup guide, including the steps necessary to provision the sensor.

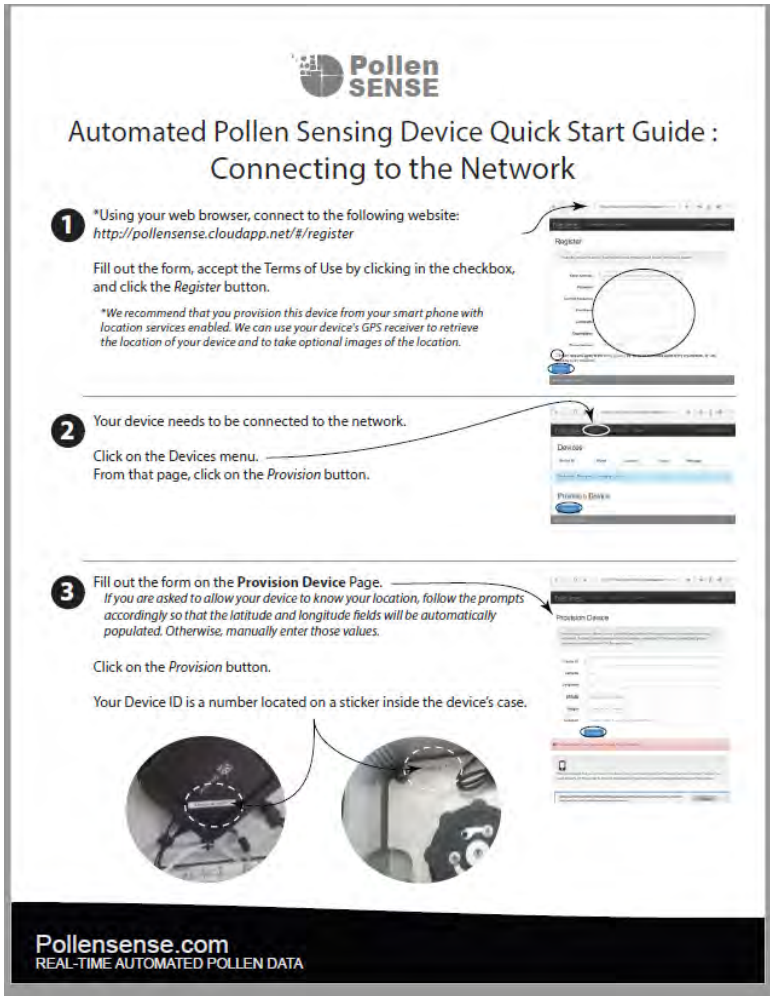
Common issues:

- Bluetooth dongle is missing or not plugged in properly. Try unplugging and plugging back in the dongle, or restart the sensor.
- You may not have given the app location permissions or permission to use bluetooth, depending on the manufacturer and platform of your smartphone.
- Our sensors only support WPA2 and open networks. Enterprise networks are currently unsupported. Static IP configurations on the sensor itself are also not supported (but a reserved DHCP address will work).

Connect to the Portal

Your device was shipped with instructions that guide you through the process of making this connection. Follow these instructions in order to use on the portal (portal.pollensense.com) to:

1. Register as a user
2. Provision the device



Pollen SENSE

Automated Pollen Sensing Device Quick Start Guide : Connecting to the Network

1. *Using your web browser, connect to the following website: *http://pollensense.cloudapp.net/#/register*

   Fill out the form, accept the Terms of Use by clicking in the checkbox, and click the *Register* button.

   **We recommend that you provision this device from your smart phone with location services enabled. We can use your device's GPS receiver to retrieve the location of your device and to take optional images of the location.*

2. Your device needs to be connected to the network.

   Click on the Devices menu.
   From that page, click on the *Provision* button.

3. Fill out the form on the **Provision Device** Page.
   If you are asked to allow your device to know your location, follow the prompts accordingly so that the latitude and longitude fields will be automatically populated. Otherwise, manually enter those values.

   Click on the *Provision* button.

   Your Device ID is a number located on a sticker inside the device's case.

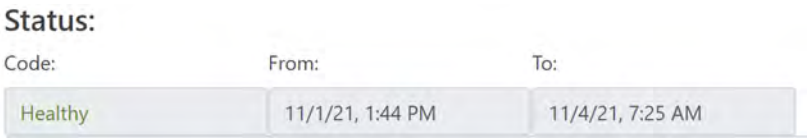
Pollensense.com
REAL-TIME AUTOMATED POLLEN DATA

Set the device to Online:

1. After you login to the portal (if you are not already), you will see a list of provisioned sensor devices.
2. Click on the appropriate device to navigate to the device detail page. The status tab should be the default.
   a. You will see a configured mode, either online or offline, and a last reported status as well as a status/error log.
   b. When the device is able to make a connection to the internet, it will connect to our cloud service and you will see an updated status report on this screen.
3. If you wish for the device, when it is connected, to operate, ensure that the mode is set to *Online.*

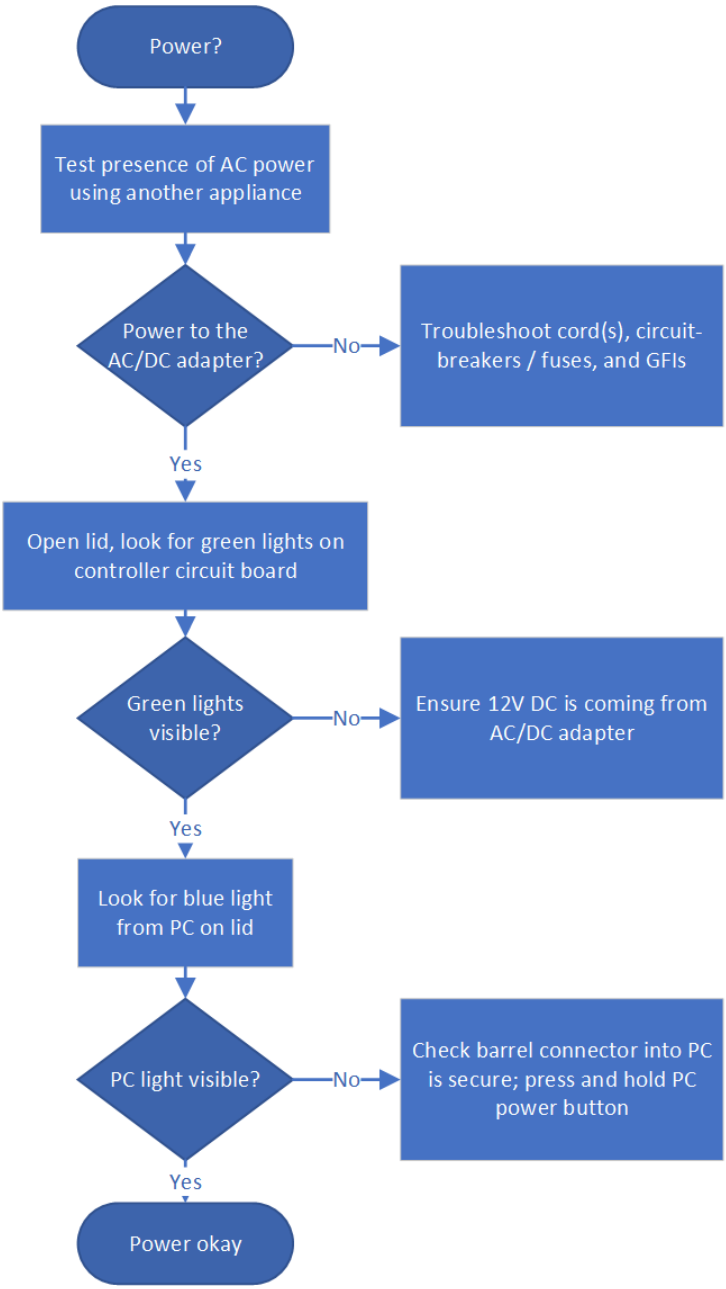
Is the device operating?

If the portal status shows “Healthy” with a timestamp in the last several minutes, the device is operating properly. Don’t expect information to begin to show in the Analyze tab of the device page in the portal, or in the graph in the app until the device has been operational for a full hour. If the device does not show as “Healthy” within a few minutes, however, see the Troubleshooting section of this guide.



Troubleshooting

Power



Physical Ethernet (wired) Internet