

espGROW OWNERS MANUAL

Plant Module with Pump Kit

- Plant module with capacitive soil sensor, 6' micro USB cable and power supply
- Pump kit with pump, extension cable, water stake, 5' x $\frac{3}{8}$ " tubing, loom, and 50 oz mini starter water supply pail with lid

Thank you for purchasing espGROW.

As a not-so-good grower, I've murdered many plants. In the coroner's report, cause of death has always been over or under watering. Having plants around was great but they never stayed healthy very long. If I would be gone for a period of time, like on vacation, few would survive...I never wanted to make someone else responsible for taking care of them. That is the same reason I don't have pets.

A few years ago, I met a licensed Michigan grower for legal cannabis. He could never really enjoy a vacation or time away because his crop was too valuable to put at risk. He was tied to his plants. With more alone time during the pandemic, I wondered if maybe there could be a better solution for growers. All I found was drip watering systems or a few DIY projects for techies. Nothing comprehensive. And so, espGROW was created to fill the gap. No one wants to be a plant murderer.

Visit <https://www.espGROW.com> for downloads, updated features, and more information as it becomes available.



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STEP 1 Configure Basic Settings

1. Plug in USB power supply and connect to Plant module. ***Make sure pump power pigtail is disconnected.*** After a minute or so, all four LEDs will begin strobing.
2. Sign in to **espGROW** Wi-Fi (*no password*) to display Settings page with smartphone.

espGROW Settings

Wi-Fi (Identify module)

SSID:

Password:

Update Server:

BROKER

Broker:

Username:

Password:

Port:

Backup Broker:

Backup Username:

Backup Password:

Backup Port:

TOPICS (base/location/room/topic)

Base:

Location:

Room:

OTHER

Tag:

Standalone:

3. Wi-Fi

- **SSID, Password** for your Wi-Fi Internet router
- Use espgrow.com for **Update Server**

4. Broker (MQTT protocol)

- Accept default or enter broker details
- Leave backup broker blank

5. Topics (case-sensitive)

- **Base, Location and Room** together defines your group. ***Must be the same*** for each module to communicate

6. Other

- **Tag** is custom text for logging
- Standalone = 1 (using **ONLY** Plant modules)
- Standalone = 0 (using Plant with Water and other modules)

7. **SAVE** stores settings and restarts

NOTE: You must use an MQTT broker and your Wi-Fi to view or change settings. Subscriptions are only a few dollars for reliable service.

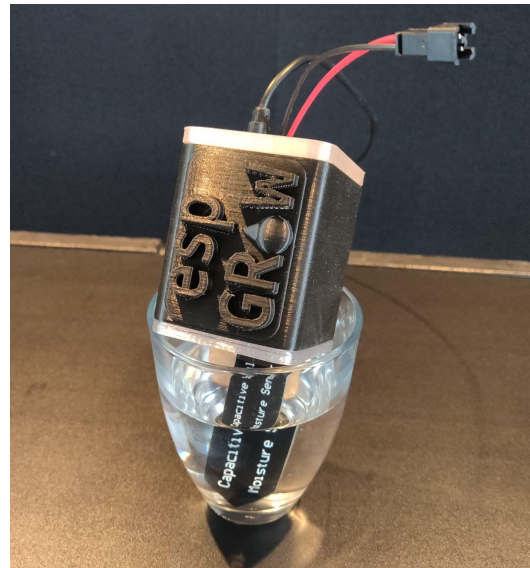
FREE MQTT BROKERS (testing)

- Port 1833 no user or password
 - test.mosquitto.org
 - mqtt.eclipse.org

STEP 2 Calibrate Soil Sensor

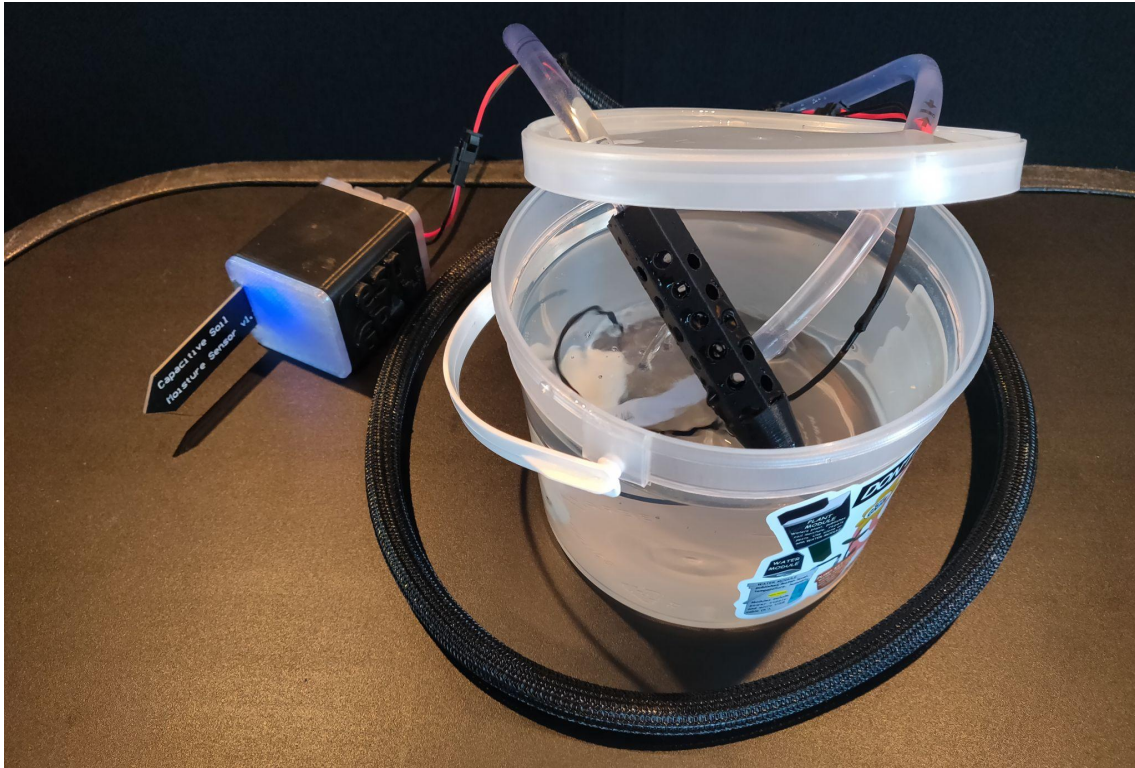
Make sure pump power pigtail on Plant module is **NOT** connected (for now) to avoid a mess. Only the micro USB cable should be connected as shown below.

- You will need a paper towel (or soft rag) to quickly dry soil sensor
 - After STEP 1, module will beep and all four LEDs will flash once every few seconds, indicating the need for calibration; 10 sensor readings in water and then 10 sensor readings in air, beeping once after each reading
1. Fill a small, clear glass with 2" water.
 2. Place Plant module (sensor only) in water. Beep will now be slightly higher in tone indicating calibration in water has begun.
 3. It will take a minute or so for the 10 readings. When finished, the beep tone will be slightly higher indicating the sensor has been calibrated for maximum wetness.
 - a. **Remove Plant module from glass and dry sensor IMMEDIATELY.** Beep tone will be slightly higher in tone.
 4. After a minute or so the Plant module will have finished the maximum dryness calibration, restart automatically, then begin to **"call for water"** (moisture level below set point).
- Because the soil sensor is in air, the Plant module should be **calling for water**. The yellow-blue LEDs will strobe and then a series of tones will be heard. After a minute or so delay, the blue LED will stay on for a short time with a solid tone. This indicates pump power is on. *In this case, nothing happens because the pump power pigtail is disconnected.* **Calling for water** and **pump ON** sequences are repeated over and over because in air the soil moisture is below the set point.



STEP 3 Test Plant Module in Air

If test is successful, Plant module will “call for water” and pump will run

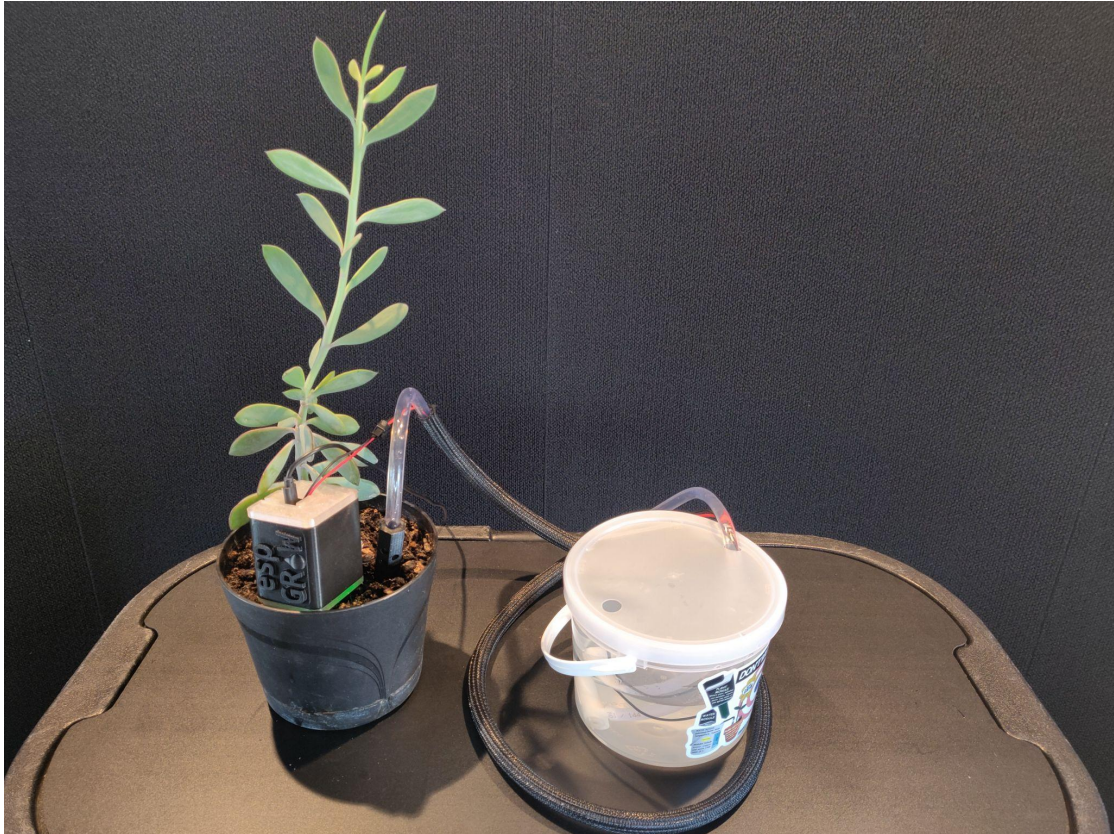


Plant module with pump kit shown configured for testing

1. For now, disconnect micro USB cable from power supply
2. Fill 50 oz mini water supply pail up to 1” from top for testing
3. Push male end of pump power cable through ½” hole in lid from bottom of lid
4. Push tubing through the same ½” hole in lid from the top and connect to pump
5. Set pump at bottom of pail
6. Push other end of tubing through remaining ½” hole in lid from the top and then into Water stake under the lid until stop is felt. *You will be able to see the pump running and water being returned to the pail when testing.*
7. Connect pump power cable from loom to pigtail on Plant module
8. Reconnect micro USB cable to power supply and plug into outlet

STEP 4 Test Plant Module in Soil

Move Water Stake and Plant module to potted plant



Plant module with Water Stake in potted plant shows soil moisture good (green)

1. Disconnect micro USB cable from power supply
2. Make sure potted soil is level and evenly packed
3. Remove Water Stake from tubing and slide tubing back out of hole in lid
4. Reinsert tubing back into Water Stake until the stop is felt
5. Insert Water stake into potted soil near center of pot leaving 1-1/2" exposed
6. Insert Plant module (or soil moisture sensor if removed from case) into potted soil about 2" from Water Stake (adjust as needed)
7. *Carefully* adjust tubing and/or power cable in loom for optimal fit
8. Snap on case cover (protects micro USB and pump power cable opening)
9. Reconnect micro USB cable to power supply to restart Plant module.
It will **either** a) call for water or b) the green LED will light if soil moisture is above the set point

STEP 5 Test Soil Moisture Level

Move pump to permanent water supply and do a final test

How to Test Plant Module and Pump Anytime

- Remove Plant module from soil and wipe dry with a paper towel
- Reinsert Plant module when water begins to flow from the Water Stake



Water Stake and Plant module in potted plant with green LED (soil OK)

Soil moisture level OK (green LED)

- Green LED means soil moisture level is OK
- Pump will not run until moisture level drops below set point

STEP 5 Prepare Permanent Water Supply

The 50 oz starter pail will get you started but a larger container is needed for your water supply.

Prepare Water Supply Lid

You will need a drill with $\frac{1}{2}$ " and $\frac{5}{8}$ " bits and a container with lid for your water supply. A standard 5 gallon bucket with lid works well.



1. Prepare the lid to accommodate pump tubing and cables by drilling one $\frac{1}{2}$ " hole for each Plant module around the lid perimeter
2. If you are using a Water module, drill two $\frac{5}{8}$ " holes (1" on center) as shown above to mount the Water module, face down, one hole for each ultrasonic port
3. Remove pump from 50 oz pail and reinstall in larger water supply pail
4. As before, Insert pump power cable (pump end) through hole from below and connect to clip on loom
5. Insert tubing through same hole from above and connect to pump. Both will fit in the $\frac{1}{2}$ " hole

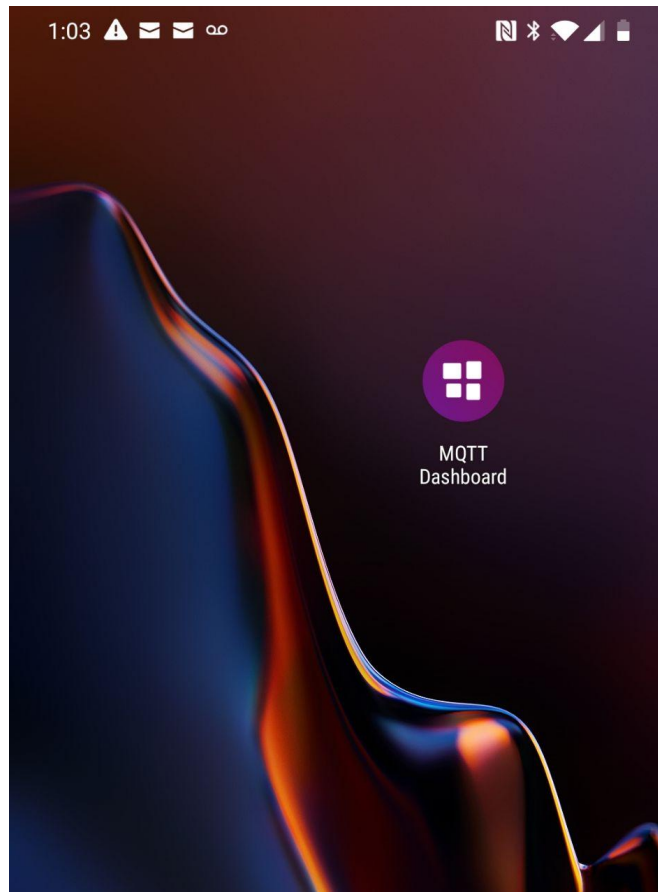
IMPORTANT: Water supply container *must be lower than pot to avoid flooding from siphoning effect (after pump has run), or you will need to use a check valve (not included)*

STEP 6 Install MQTT App on Smartphone

Install an MQTT client app to change settings and manage your grow with your Apple or Android smartphone

Visit the Google or Apple play store and search for “MQTT client” to see a list of MQTT client apps you can install on your smartphone. There are many good free and low cost apps to choose from. **MQTT Dashboard** is recommended and used in the examples. The free version works well. The professional version requires a small donation (less than \$7).

To use MQTT Dashboard, locate the MQTT icon and start the app.



MQTT Dashboard

STEP 7 **Configure MQTT App**

Once configured, publish *either* the topic for container depth with a value, or publish the topic to automatically calculate the depth of any water supply container

All smartphone MQTT client apps work basically the same. Start by configuring the broker URL, username and password (if any), and port (default is 1833). Some apps, such as the Professional version of MQTT Dashboard, support multiple brokers, each with their own group of clients.

Make an espGROW Dashboard

Smartphone apps let you create dashboards for topics you wish to subscribe to (view-only), items you wish to publish a value for (set), and items you want to both subscribe to and publish.

MQTT Dashboard and other apps allow you publish either a set value or choose from a dropdown list of values. Publishing a set value is handy for doing a module reset or other topic that simply requires a “1” for the value. Other apps allow you to create drop-down lists of all values you wish to be able to easily publish. This is great for setting topics with many different possible values like the soil moisture % or pump runtime seconds.

STEP 8a Configure Water Supply

If you are using Plant modules *standalone without a Water module*, skip to STEP 9. Follow STEP 8a to use the Controller, STEP 8b to use a smartphone, or STEP 8c for containers other than 3.5 or 5 gallon buckets.

Configure with Controller

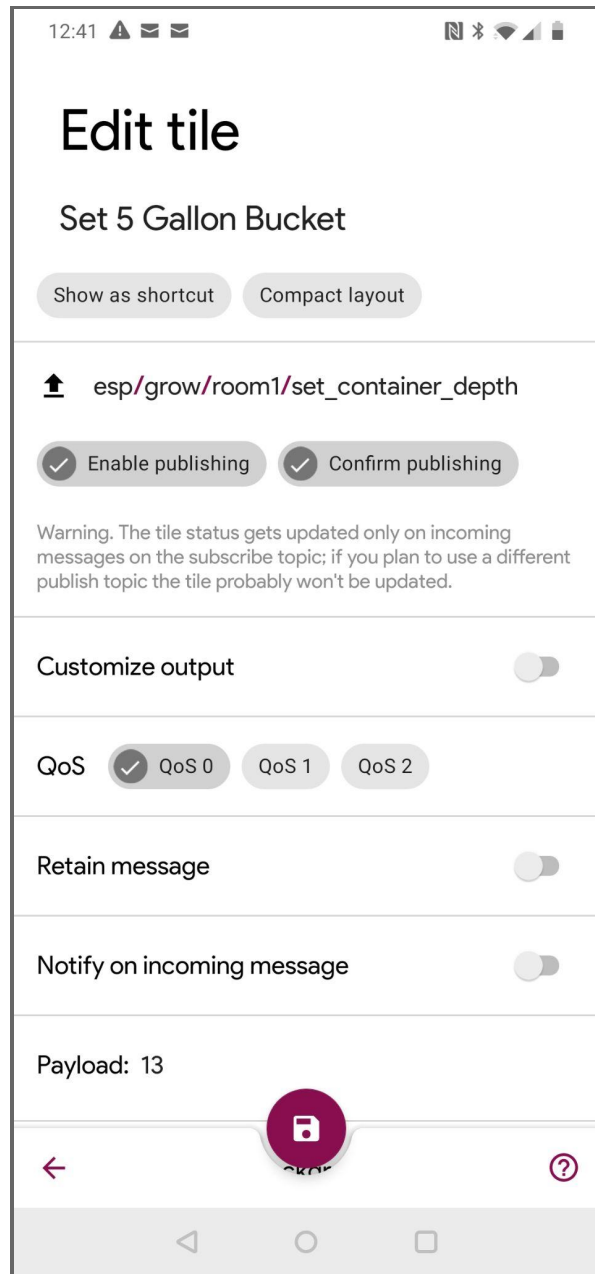


- Push the button for menus and turn the knob to scroll down to **Setup**
 - a. If you are using a standard 3.5 or 5 gallon bucket (pail), select the bucket you are using from the **Setup** menu and push the button to publish the topic
 - b. If you are using a different container, skip to **STEP 8c**

STEP 8b Configure Water Supply

Configure with Smartphone

- Create tile and publish **set_container_depth** topic with depth in inches (subtract 1" to allow space at top of container)

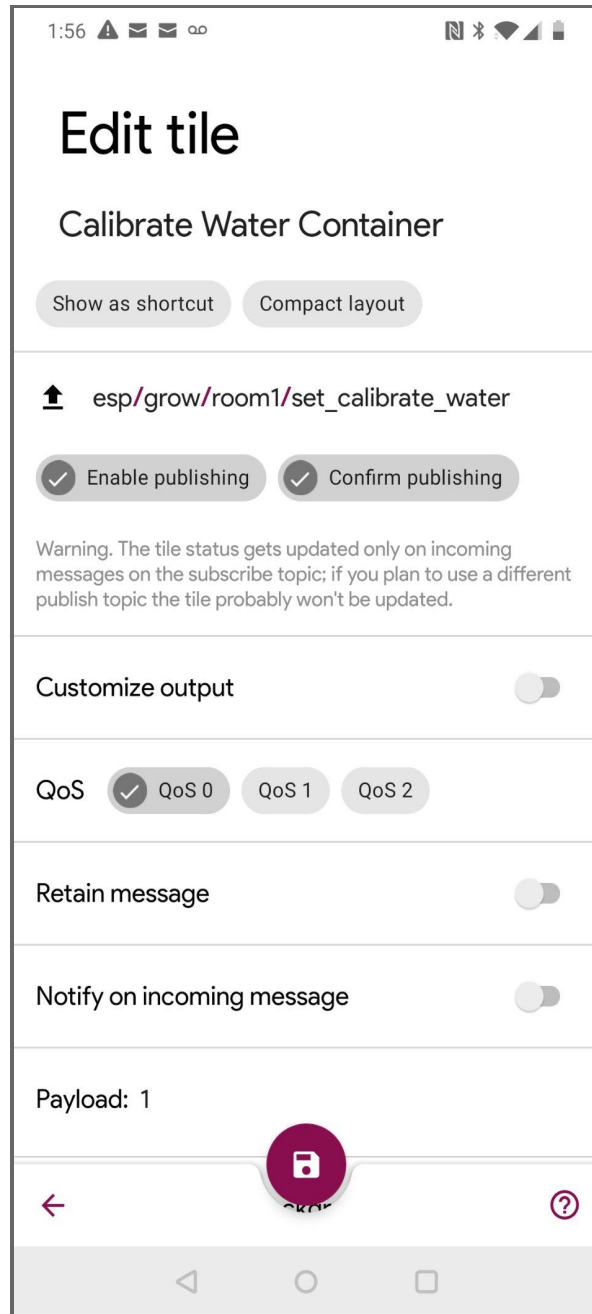


- Measure and publish the container depth in inches minus 1 inch to leave enough air space to keep the Water module's ultrasonic ports from getting wet
- 5 gallon bucket is:
 $14'' - 1'' = 13''$
- 3.5 gallon bucket is:
 $11'' - 1'' = 10''$
- 50 oz starter pail is:
 $4.5'' - 1'' = 3.5''$

STEP 8c Calibrate Water Supply

If you are using a Controller, scroll to Settings then Calibrate Water. You can also use your smartphone as shown below.

- Create tile and publish **set_calibrate_water** topic with the value 1.



Calibrating the container for your water supply is another way to configure your Water module.

Make sure the container is empty during the calibration process.

The sensor is calibrated by averaging 10 depth measurements and takes only a minute or so. If you have a Controller, watch the display for messages; “Calibrating 1/10, Calibrating 2/10, and so on. The Water module will automatically restart after calibration. Once calibrated, add water to the container to about an inch below the lid. The green LED should light up. The yellow LED will be lit if supply is low.

STEP 9 Configure Other Modules

Repeat STEP 1 to configure basic settings for all other modules

Grow Groups

For espGROW modules to work together as a system, Broker and Topic (base/location/room) must be exactly the same. Modules with the same Broker and Topic structure are considered to be in the same *grow group*.

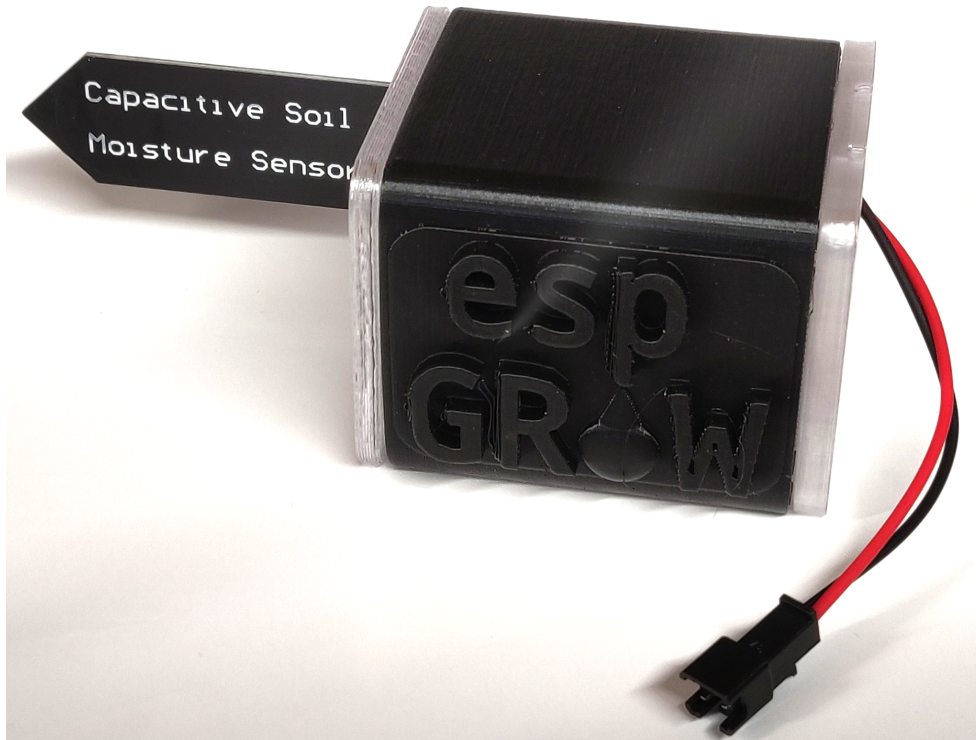
The most basic grow group is one Water module with one or more Plant modules sharing a water supply and using a smartphone to manage espGROW. Although not required, the Controller is the easiest way to manage espGROW.

Using Different Grow Groups

Modules may use the same Broker but with a different Topic structure used to define a different grow group. Multiple groups are used for espGROW installations located in different locations. You can set Base, Location and Room to anything you like. For example, *mi/detroit/bloom1* and *detroit/smith/room1* could be used to define different grow projects in michigan.

Plant Module

Publishes soil moisture level and controls the water pump connected to the pump power pigtail when the Plant module calls for water



Plant module

Each plant normally has its own Plant module with soil sensor inserted in the soil for automatic watering. However, it is possible to use other configurations:

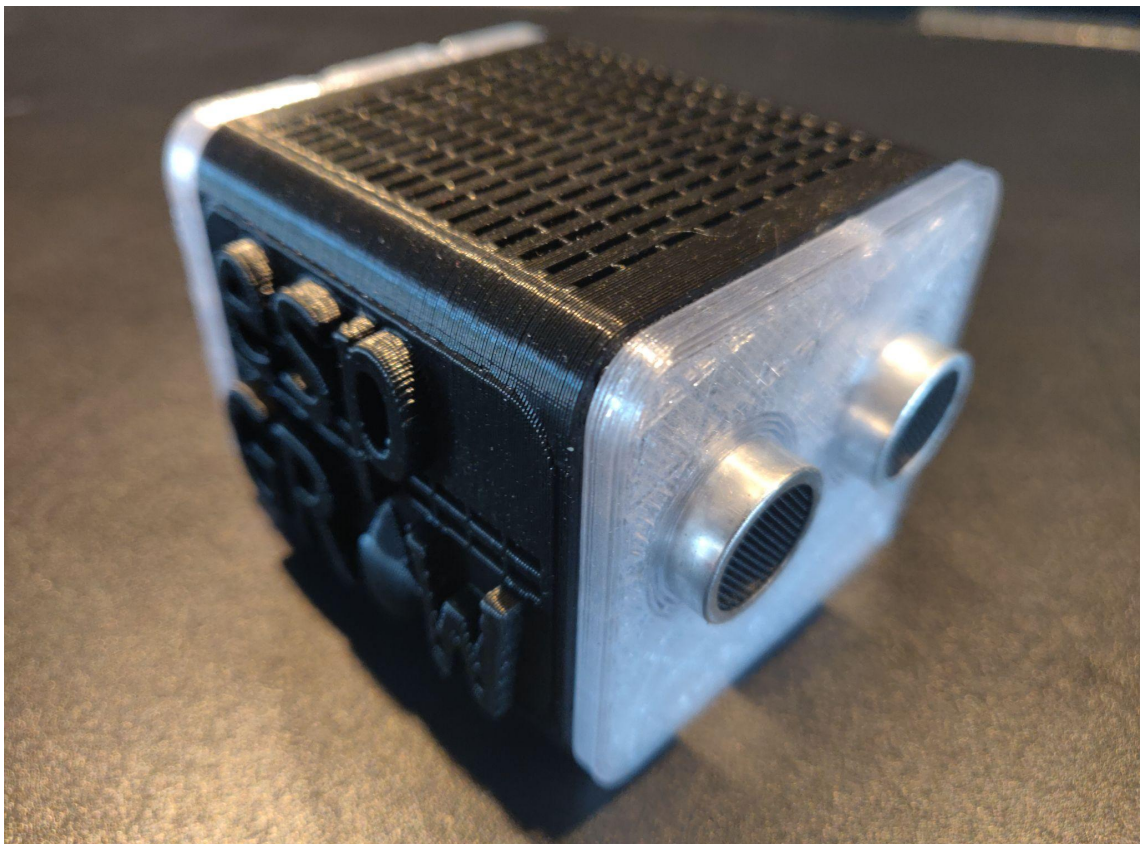
- Plant module in a large “pot” such as a plastic tote with more than one plant
- Plant module in one plant but with the pump power pigtail connected to an external relay and power supply to support a large pump capable of servicing multiple plants

You can also use the soil sensor outside the Plant module case to fit in small pots or other applications by removing the retaining pin.

Water Module

Publishes water supply level, temperature, humidity and pH (optional)

*Having a Water module to monitor the water supply means you never have to worry about pumps being run dry. Water modules signal Plant modules to stop pumps *before* the water supply gets too low, preventing damage. By using ultrasonic sound waves, the Water module continually computes how much water is left in your supply container. With the optional pH and probe option, it also publishes the pH of your water supply.*



Water Module

Controller Module

Displays grow data from all modules in real time and publishes setting changes

- Displays sensor readings, alerts, messages on its 4x20 LCD display
- Uses simple menus with knob/button to publish setting changes
- Best place for Controller is in your grow room

Controller modules simplify and add the cool factor to your espGROW system. Besides displaying a real time status of your grow, using the Controller is just a lot easier than your smartphone. However, the ideal system uses both. With an MQTT app on your smartphone you can manage your grow from anywhere.



Controller with Water, Plant and Light modules

The Controller above shows the water container is 76% full with a 15% minimum before pumps are prevented from running. The air is 83 degrees Fahrenheit with 31% humidity. The two letters/numbers preceding the colon (:) identify each module. Plant module (cd) shows soil at 68% moist with a watering set point of 40%. Light module (d0) shows visible light intensity of 1967. Controller module (A3) has been running for 605,483 cycles.

Viewer Module

Displays grow data from all modules in real time

- Viewer module is like a Controller but lower cost with smaller 2x16 character LCD display and no knob/button



Viewer module prompting: “Connect smartphone to Wi-Fi” for Settings web page

Having a Viewer module in a different room(s) is the easiest and most cost effective way to monitor your grow, read-only. The 16 character x 2 line display, LEDs and speaker tones will keep you informed as simply as possible with messages, speaker tones and LEDs. For example, if the connection to your broker is lost, the Viewer will let you know.

Logger Module

Saves time stamped grow data from all modules to micro SD card



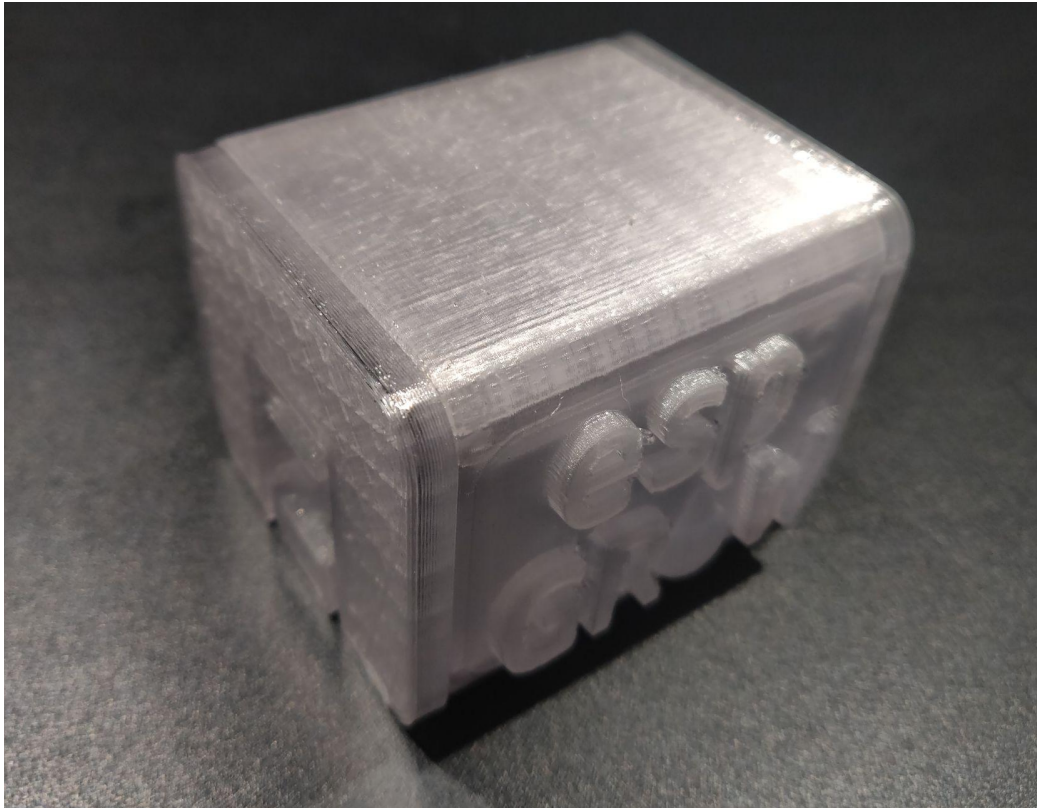
Logger Module

The Logger saves published data from all connected modules in real time to micro SD card as a timestamped, comma delimited (CSV) text file. The CSV file from the Logger module is compatible with Excel®, or any spreadsheet, formatted to make it very easy to generate graphs and reports to chart your grow.

The Logger provides you with a complete history of grow data so you can see what works best, and what doesn't, over the life of your plants. Being able to correlate logged data with plants' physical condition makes it easier to troubleshoot problems and/or optimize your grow recipe; temperature, humidity, pH, light, soil moisture, and watering times.

Light Module

Publishes IR, visible and full light intensities in LUX



Light Module

Plants won't grow without light. The Light module measures your lights' intensity and publishes values for key parts of the light spectrum. Values for Infra-Red and visible light intensities are published in LUX and displayed on your smartphone, Controller and/or Viewer module. Values are also saved to micro SD card by Logger modules.

Using espGROW

There are two main ways to automate watering; using Plant modules by themselves (Standalone) or with Water and other modules.

Standalone Mode

Standalone mode is configured on the espGROW Settings page; 1 = on, 0 = off. Standalone “on” is the best option if you have no Internet service, no broker or no Water module. ***The disadvantage to Standalone mode is that when plants call for water pumps will run even when the water supply is empty.*** You must ensure the water supply doesn’t run low or pumps may be damaged.

Plant modules water plants as needed when Standalone = 1. This enables Plant modules to water plants offline. *Once configured, no Internet or broker is needed and automatic watering still works.* If a broker is defined, modules will restore broken connections automatically. However, without a connected broker you won’t be able to receive sensor readings or messages.

When Plant module(s) are used with a Water module, it publishes the water supply level to Plant modules, automatically disabling pumps when the water level falls below the set point. With a Water module, the supply level is continually displayed on Controller, Viewer, and smartphones.

Protecting Pumps

Even though espGROW pumps are very simple and inexpensive, pump damage can be minimized by using a large water supply container. ***The 50 oz starter pail is for testing only. It is too small for a water supply.***

Calling for Water

Yellow and blue LEDs strobe followed by a series of audible tones

- Pump will start after a short delay (delay set point)
- Pump will run then stop after a short time (run time set point)
- Calling for water cycle repeats until soil is moist (soil moisture set point)
Water will stop flowing and the green LED will light when the soil moisture level set point is reached. If not, see Troubleshooting.

How Automatic Watering Works

- If soil is drier than the soil moisture set point, the Plant module will begin “calling for water”. After a short delay (pump delay set point) water will start flowing to the plant and coming out the Water Stake. After another short delay (pump run-time set point), water will stop flowing. After yet another short delay (pump delay set point) the water will have soaked into the soil and the soil moisture level will be checked. If the soil is still too dry, the plant will *call for water* and the sequence will be repeated. This process will continue, over and over, until the desired moisture level (soil moisture level set point) has been reached.
- If the soil is wetter than the soil moisture set point, the green LED on the Plant module will light and you are “good to grow!”.
- Most espGROW modules do not have displays. Status LED’s and speaker tones give both visual and audio cues as to” what is going on”. Green LEDs are good. Red LEDs are fails. Yellow LEDs are warnings. Blue LEDs show activity. For details, refer to the LED Codes section.

How Modules Communicate

All modules (clients) have Wi-Fi and rely on the Internet and a broker (server) to communicate with one another. For example, the Water module publishes the water supply level. When connected, Controller and Viewer modules display the % remaining and Plant modules won’t run pumps if the supply is too low. After the initial configuration, only Plant modules can be used without an Internet connection and broker (standalone mode).

Swapping Water Containers

Many growers use both water and different nutrient mixes at different stages in the grow process. With holes through the lid (not through the side of the pail) it is easy to swap water supply containers. Simply lift the lid in the air until pumps are hanging freely and swap in a new container with fresh water or nutrients mix.

Identifying Modules

Modules are identified by a 16 character MAC address which is unique to every device that communicates. To simplify this for displays, espGROW uses only the last 2 characters (short MAC ID). It is a good idea to write the short MAC ID on white tape. Put the tape ID on the module case, and also on the container lid for Plant modules, to simplify troubleshooting.

Factory Reset

Factory reset erases all settings in memory *except* soil sensor calibration data.

To perform factory reset:

- Remove lower case cover.
- Locate reset button to left of micro USB connector on microcontroller PCB
- Power up module
- Press Reset button twice when restarting
 - Module will restart when reset and all four LEDs will flash (configuration web page active)

Soil Sensor Reset

Once calibrated, soil sensor calibration settings can only be changed by publishing the calibration_reset topic to a module by short MAC ID. To perform a soil sensor reset for a specific Plant module:

- Publish **esp/grow/room1/plant/reset_calibrate** using the 2 character short MAC ID as the payload value for the Plant module you wish to reset

Firmware Updates

If you have a Controller, scroll down and select *Update Firmware*. If not, publish the value “1” to topic: **esp/grow/room1/update_firmware**. This will automatically update and restart all modules in the esp/grow/room1 or your custom group.

MQTT Clients

Clients are espGROW modules; Plant, Water, Controller, Viewer, Logger, Light, and smartphones. Clients publish data such as sensor readings and/or new settings like pump runtime seconds. Clients subscribe to topics like temperature and humidity to receive data. Like brokers, clients can also be located anywhere in the world.

MQTT Broker

The MQTT broker defined on the Settings webpage must be accessible for espGROW modules and your smartphone to communicate. The broker relays messages and other data between your clients in real time via Wi-Fi and/or the Internet. The broker (server) can be anywhere on the Internet for worldwide communications, or just within Wi-Fi range for limited or standalone installations without Internet service.

Small, less critical espGROW systems may use a free MQTT broker. Larger, more critical systems may use commercial brokers with technical support and high reliability. The cost for commercial brokers is based on the number of clients. Broker subscriptions for several clients start at only a few dollars a month to use.

Advanced users can repurpose an old PC, or build their own MQTT broker for less than \$100 using a Raspberry Pi computer available from Amazon and other sellers. Open source broker software such as Eclipse Mosquitto™ is free. You can download it from <https://mosquitto.org>.

MQTT Topics

Subscribe to topics to view data. Publish topics to send data. View sensor values like soil moisture % with an MQTT client app by subscribing to that topic(s). Whenever the value for the topic changes, the app receives the new value. To change a setting, publish a new value for the topic. All subscribers receive the changed value.

- If you are using a smartphone:
 - Download and install an MQTT client app (many are free)
 - Download a list of topics from espgrow.com
 - Configure app to match broker and enter espGROW topics

Topic text is case sensitive. You can use whatever Base, Location and Room you want to create the default path.

The factory default path is:

esp/grow/room1

BASE = esp

LOCATION = grow

ROOM = room1

Text is appended to the default path to define specific topics. For more information about using MQTT, Google "MQTT".

Wildcard Topic Examples

Wild cards are especially handy for viewing topics. You can use a wildcard to view everything that is published at any level in the topic path. For example, to view EVERYTHING published you can subscribe to you use the multi-level wildcard #:

esp/grow/room1/#

The “#” wildcard as used above matches everything to the right. This may be more information than you can view as data is published constantly. To match only all Plant module topics use:

esp/grow/room1/plant/#

I’m sure you get the idea but what if you want to see all plant topics and you have more than one grow room and multiple espGROW systems? Using the “%” wildcard lets you match everything within a specific portion of the path. Let’s say you have two grow rooms, room1 and room2. To see everything published by Plant modules (like the soil moisture level%) in both rooms you would use both the single-level wildcard + and the multi-level wildcard:

esp/grow/+/plant/#

Plant Topic Examples

The Plant module uses factory default recipe settings until you've published new set points with a Wi-Fi connection and Controller or smartphone. Assuming you are using the default path, to view the soil moisture level for your plant(s) on your smartphone, you would subscribe to:

esp/grow/room1/plant/moist_percent_topic

To change the soil moisture set point to 40% on your smartphone you would publish the topic along with the new set point value. The percent sign (%) is assumed and not used. This set point would tell all plant modules to ***call for water*** when the soil moisture level is 40% (default setting) or lower .

esp/grow/room1/plant/set_min_moist 40

To allow the water to soak into the soil, and also give you a chance to take action before watering begins, there is a set point topic for pump delay in seconds. The default is 60 seconds. To set the pump delay set point to 60 seconds you would publish:

esp/grow/room1/plant/set_pump_delay 60

Many growers prefer to water their plants until the water begins to seep out of the bottom of the pot. This ensures water to the roots for maximum growth and can take 60 seconds or more. The default is 30 seconds. To set the pump runtime set point to 60 seconds publish:

esp/grow/room1/plant/set_pump_runtime 60

A great feature of Plant modules is their ability to repel pests with ultrasonic blasts. You won't be able to hear the blasts unless you set the frequency to be within your audible hearing range. Different pests respond to different frequencies. You can set it to whatever frequency you wish. The default is 38000 Hz for mites.

esp/grow/room1/plant/set_hz 38000

If you change soil moisture sensors you will need to recalibrate your Plant module. The reset button on the microcontroller PCB will only reset the Wi-Fi. The sensor calibration can only be reset using the topic below.

To reset the calibration for a specific Plant module, supply the short MAC address when publishing the topic. In the example below, replace "ab" with the short MAC address of the module you wish to reset the soil moisture sensor calibration.

esp/grow/room1/plant/reset_calibrate ab

Supplying an asterisk (*) will reset the calibration for ALL Plant modules.

esp/grow/room1/plant/reset_calibrate *

Water Topic Examples

The Water module prevents pumps from running dry by automatically disabling them when the water supply is low. The default is 15%. To set the minimum water level to 10% publish:

esp/grow/room1/water/set_min_water 10

For the Water module to work properly, it must be calibrated to match the depth of your water supply container in inches. With the Controller this is very easy. Simply choose a preset for a 3.5 or 5 gallon pail using the Controller. You can also do this with your smartphone. A standard 5 gallon pail is 13.5 inches. Measure the depth of the container you wish to use and publish the depth in inches:

esp/grow/room1/water/set_container_depth 13.5

Alternatively, you can also use espGROW to compute the depth. To do this the container must be dry. Similar to calibrating the soil moisture sensor, the Water module will compute the container depth in 10 steps and take only a minute or so. Supply a value of 1 to start the calibration process.

esp/grow/room1/water/set_calibrate_water 1

Besides managing your Water supply, the Water module also senses temperature, humidity, and pH with the optional pH controller and probe inserted through the lid of your water supply. To view the temperature in degrees Fahrenheit, subscribe to:

esp/grow/room1/water/temp_f

To view the humidity, subscribe to:

esp/grow/room1/water/humidity

To view the heat index in Fahrenheit, subscribe to:

esp/grow/room1/water/heat_index_f

If you prefer to use Centigrade instead, simply substitute “c”:

esp/grow/room1/water/temp_c

esp/grow/room1/water/heat_index_c

If you are using the Water module to measure pH, to view the pH of your water supply, subscribe to:

esp/grow/room1/ph/ph_value

Logger Topic Examples

Imagine having a tool to identify why your plant is, or isn't doing well. The Logger is great for this purpose. With the Logger, you can identify problems such as heat or light deficiencies. For precious plants, you can chart the growth of your plants through their entire lifetime. A 16 GB or larger micro SD card is recommended.

As you might imagine, the log file can get quite large and unmanageable. So that isn't the case, espGROW automatically starts a new log file whenever the Logger module is restarted, and also just before the file becomes too large to load into most spreadsheets.

View the logging interval in seconds by subscribing to:

esp/grow/room1/logger/interval

Set the logging interval to 5 minutes by publishing:

esp/grow/room1/logger/set_interval 300

Light Topic Examples

For photosynthesis to occur, your plant needs exposure to light of various wavelengths. The distance from your light source is directly proportional to intensity. The espGROW Light module measures light intensity in LUX and also supplies values for infrared, uv, and visible light. The percent topic below is LUX%. To view these various light intensity values subscribe to:

esp/grow/room1/light/full

esp/grow/room1/light/ir

esp/grow/room1/light/lux

esp/grow/room1/light/percent

esp/grow/room1/light/uv

esp/grow/room1/light/visible

Advanced

MQTT Broker Redundancy

Redundancy requires two brokers and is recommended only for advanced users.

Users seeking 100% uptime can define a backup broker. Should the connection to the primary broker fail, modules will automatically fail-over to the backup broker as defined on the Settings webpage. Running your own broker locally with the primary broker on the Internet is one way to improve uptime should your Internet connection fail. When modules fail over to the backup broker, the primary broker becomes the backup broker and vice-versa. This change is saved in the module's memory.

Occasionally a connection failure to the primary broker, when using redundant brokers, it is possible for some modules to wind up on the primary broker and some on the backup. Should you suspect this has happened, you can easily correct the situation with the Controller or with your smartphone by failing over to the backup broker. This puts clients back on the same broker. To do this publish the topic below with a value of 1:

esp/grow/room1/fail_over_broker 1

You can also change the backup broker by publishing the topic:

esp/grow/room1/set_backup_broker mybroker.com

LED Codes

Various LED sequences are used to illustrate module status at a glance without a display. LEDs alert the user when intervention is needed. In an espGROW system with Plant, Water and other modules, when green LEDs are lit on all modules, everything is working, water supply is OK, soil is OK, etc. and there are no outstanding problems (“good to grow”).

Module	LED Code	Description
All	RED	Wi-Fi or sensor failure
All	RED flashing	Connecting to Wi-Fi network
All	RED-YELLOW flashing	E-stop ON
All	RED-GREEN-BLUE-YELLOW strobing	Wi-Fi active portal and web server is active
All	GREEN	Sensor working and/or readings are within set points
All	YELLOW	Warning
Plant	RED-BLUE	Connection to Water module failed (except standalone mode)
Plant	RED-BLUE flashing	Calibrating soil sensor in water
Plant	RED-GREEN flashing	Calibrating soil sensor in air
Plant	RED-GREEN-BLUE-YELLOW flash with tone	Place soil sensor in water to calibrate
Plant	RED-GREEN-YELLOW flash	Place soil sensor in air to calibrate
Plant	BLUE	Pump ON
Plant	YELLOW	Water supply level below set point
Plant	YELLOW-BLUE strobing	Pump delay ON (run pending)
Water	RED-BLUE flashing	Calibrating water supply
Water	RED-BLUE-GREEN	DHT and ultrasonic sensors both fail
Water	RED-GREEN	DHT sensor failure
Water	RED-BLUE	Ultrasonic water sensor failure
Water	RED-YELLOW	Ultrasonic water sensor not calibrated
Water	YELLOW	Water supply level below set point

Troubleshooting

- Plant module never calls for water.
 - Soil is already moist (at or above set point)
 - Moisture level set point too high
 - Soil sensor disconnected
 - Soil sensor not properly calibrated
 - Soils sensor is defective
- Plant module calls for water but pump still does not run
 - If blue LED goes on
 - Cable is disconnected
 - Faulty connection -- ensure that connector pins are fully inserted into housings and do not slide out when connected
 - Pump is faulty -- try a new pump
 - If blue LED does NOT come on
 - Relay jumper wire broken
 - Relay jumper wire loose -- make sure relay set screws are tight
- Module will not connect to Wi-Fi
 - Incorrect credentials
 - Weak or no Wi-Fi signal present