GUARDIAN GROW MANAGER ONLINE HELP

AESSENSEGROWS.COM

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GUARDIAN GROW MANAGER

User Manual

GUARDIAN GROW MANAGER USER MANUAL V.4.1.2.8

REVISION 4.1.2.8
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Required Steps Before Starting a Grow

Prep 0: **System configuration** – make sure system level settings
Step 1: **Device Configuration** - make sure device is configured properly
Step 2: **Device Diagnosis** - make sure device is running properly
Step 3: **Sensor Calibration** - make sure sensor readings are accurate
Step 4: **Create Grow Plan** – Required for auto control
Step 5: **Add an Account** – make sure secured system access
Step 6: **Alert Settings** – make sure system gets monitored
Step 7: **Assign a Grow Plan to a Device** **– way to start auto control**

Application Description

Software version info:

Online Help » 4.1.2.8-20190301082131 » 4.1.2.8-20190301085006

Icons used in application:

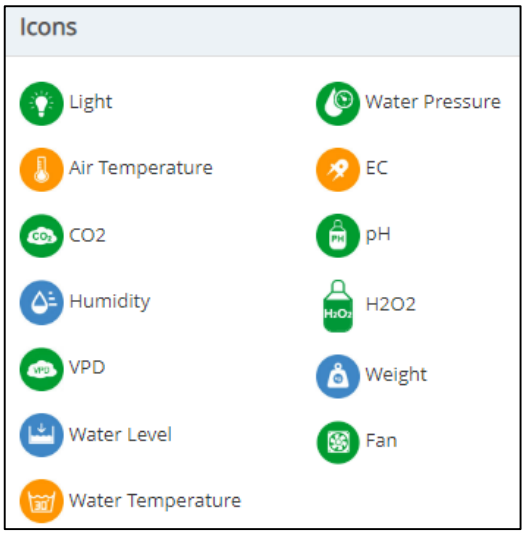


Figure 1: Application icons

Status indication in application:

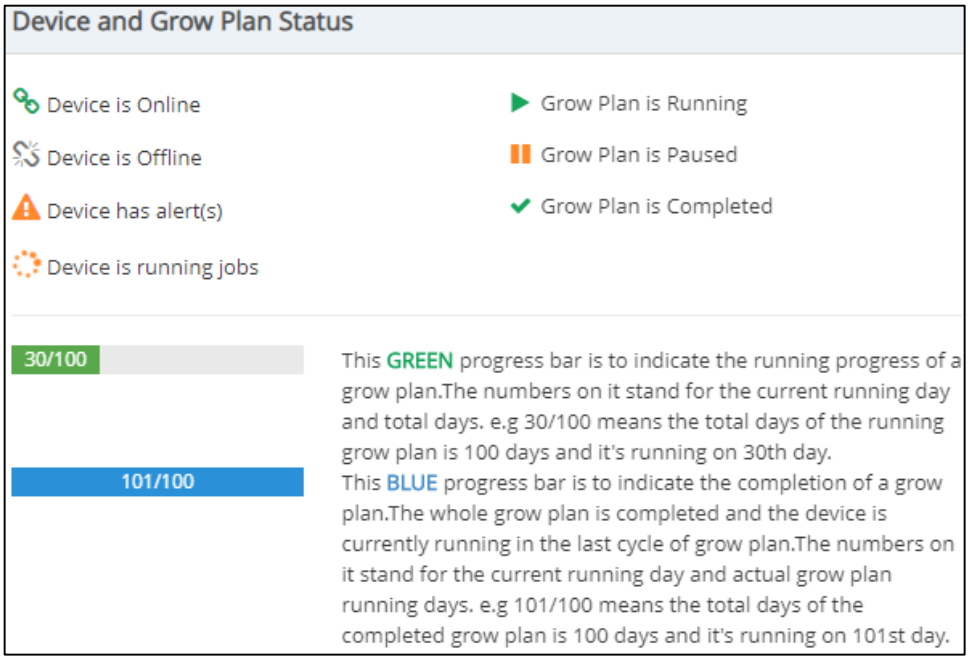


Figure 2: Status indication icons

System Configuration (Administrators Only)

After device is installed, User accounts with administrative privileges can make changes to general and system level configurations. System refers to those configurations that will affect all devices of that type. Click on **Configurations** in the left-hand menu to access Configuration settings.

General Configurations (Administrators only)

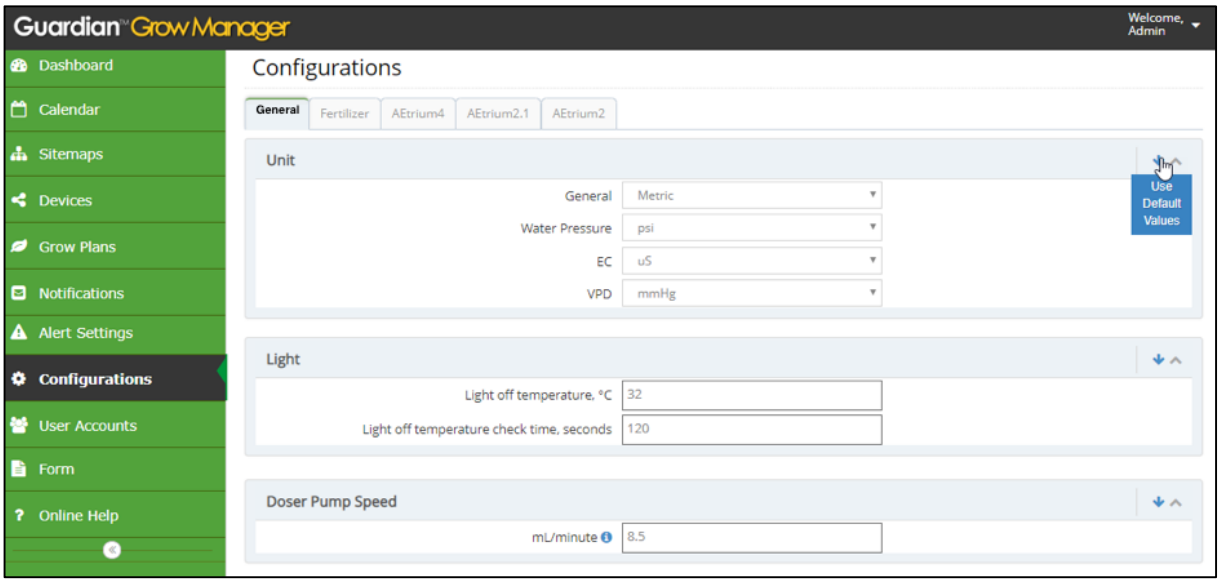


Figure 3: General system configurations

In the **General** configurations tab, general configuration settings can be made such as units of measurement, Alert settings, etc. Clicking on the '↓' button at the top right of each column will revert the parameters to default values (fig. 3). Clicking on the '💾' button will save the parameters. Those parameters will apply to all devices.

Fertilizer (Administrators only)

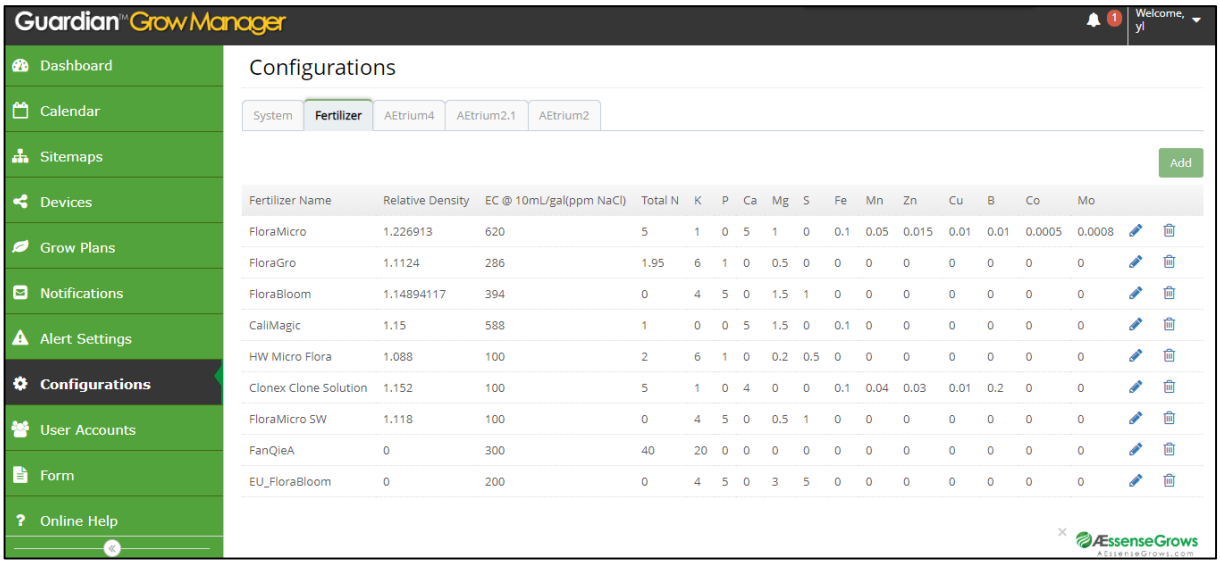


Figure 4: Fertilizer system configurations

Configurations set in the **Fertilizer** tab (fig. 4) will be used in fertilizer calculations in Grow Plans. User can add, edit and delete new fertilizer. Add the name of the Fertilizer (fig. 5), Relative Density (found on product MSDS), reference EC (see instructions below), and guaranteed analysis (from manufacturer's label). Then click on the "**Confirm**" button to save the action

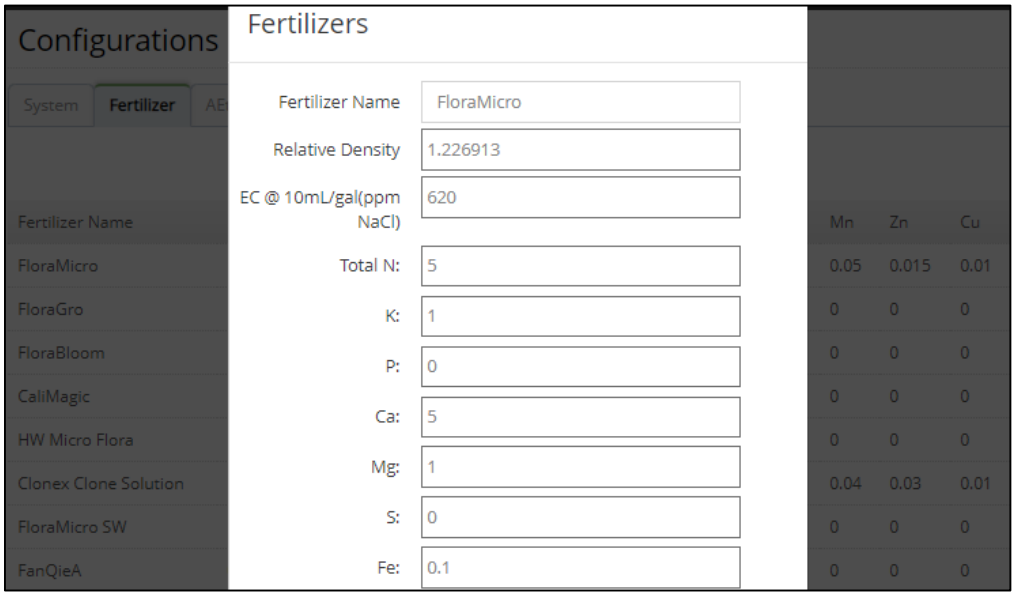


*Figure 5: Add, edit, or delete Fertilizer information*AEtrium-4 (Administrators only)

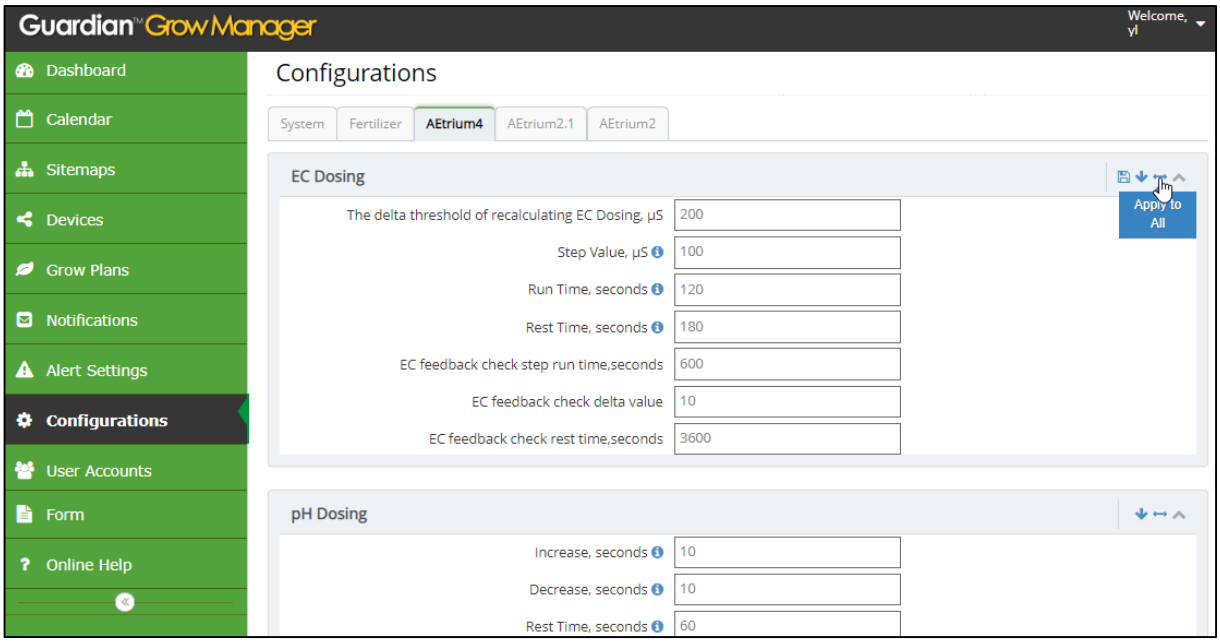


Figure 6: AEtrium 4 system configurations

Configurations set in the **AEtrium-4** tab (fig. 6) will apply to all AEtrium-4 devices. User can click on '⟷' button at the top right of each section to apply the module parameters to all AEtrium-4 devices. System level configurations have lower priority than Device level configurations which will supersede those made system wide (see Device Configuration, pg. 10).

AEtrium-2.1 (Administrators only)

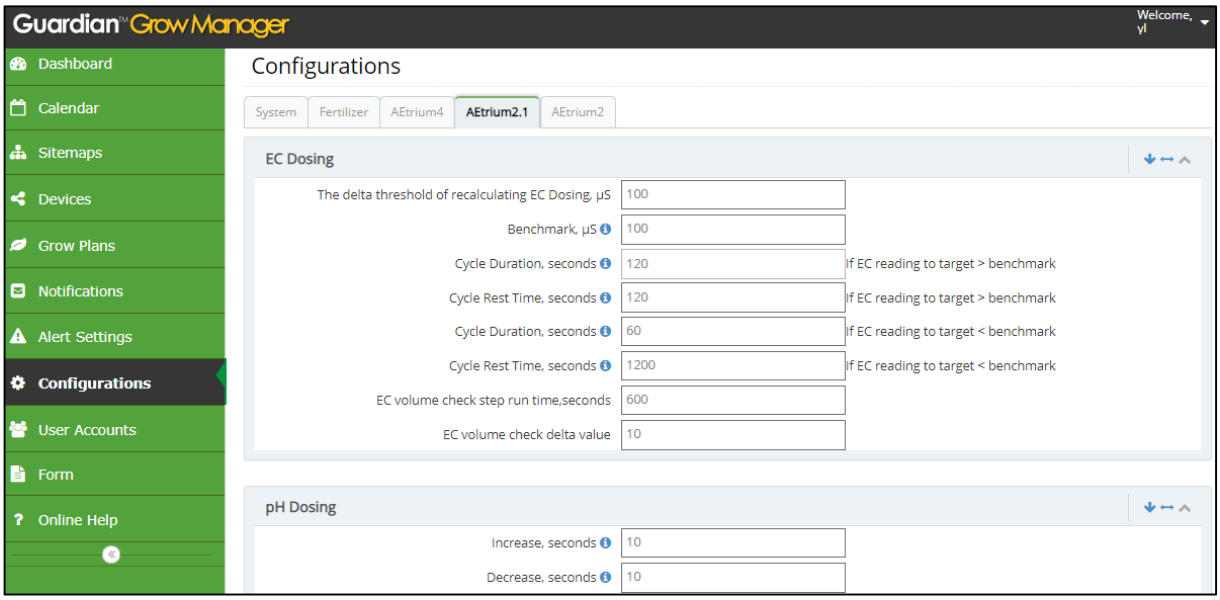


Figure 7: AEtrium 2.1 system configurations

Configurations set in the **AEtrium-2.1** tab (fig. 7) will apply to all AEtrium-2.1 devices.

AEtrium-2 (Administrators only)

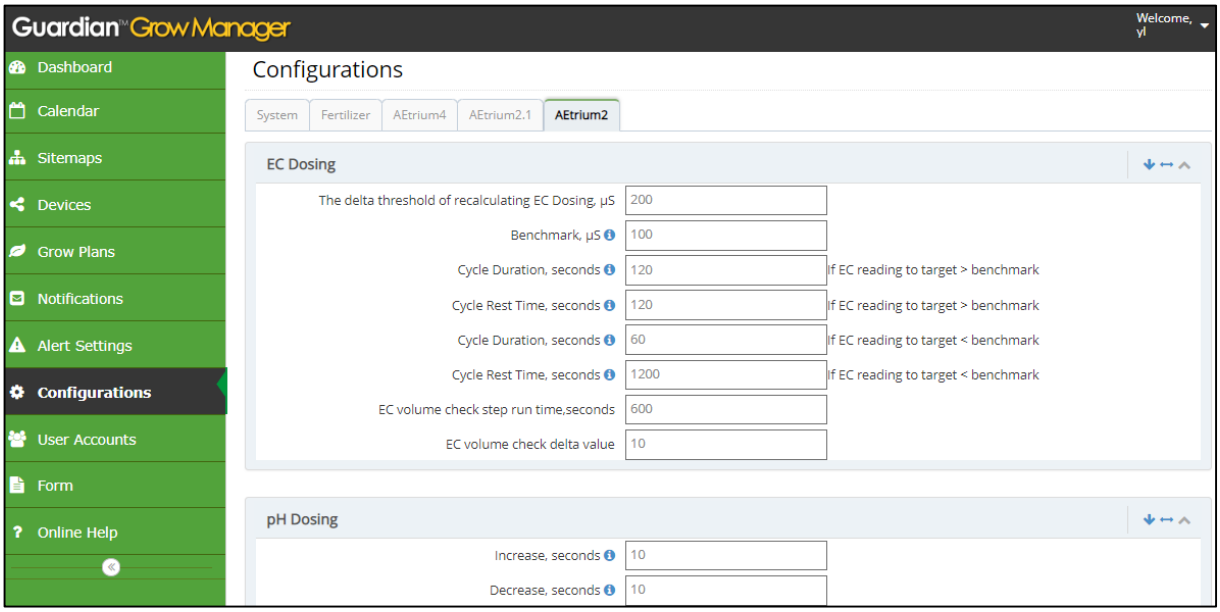


Figure 8: AEtrium 2 system configurations

Configurations set in the **AEtrium-2** tab (fig. 8)will apply to all AEtrium-2 devices.

Device Configuration

After the device is installed and System level configurations are done, the first thing that needs to be done is to make sure the individual Device is configured properly. And Device configuration priority is higher than System configuration, so any configuration set to an individual Device will override System level configurations.

The Admin account holder needs to do following these steps:

1. Click on '**Devices**' in the left-hand Menu.

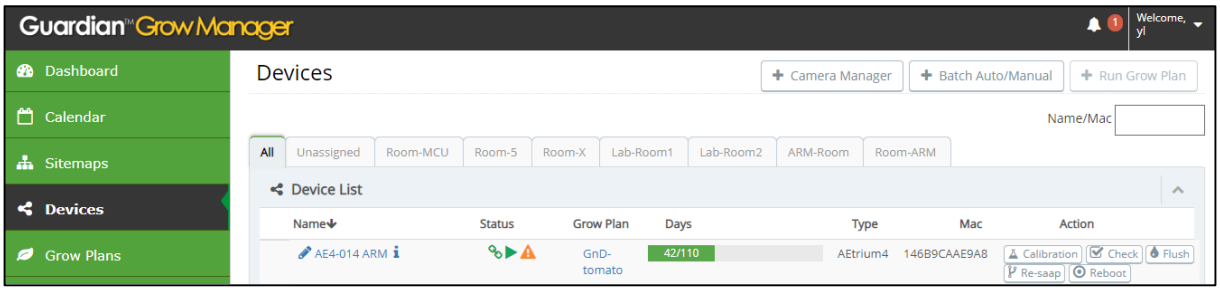


Figure 9: Device menu page

2. From the Name column, choose the device in which you would like to make changes to (fig. 9).

3. Select **Configurations** tab
   The Admin account holder can modify the parameters of the device in Device Configurations and apply it only for the individual device without affecting other devices.

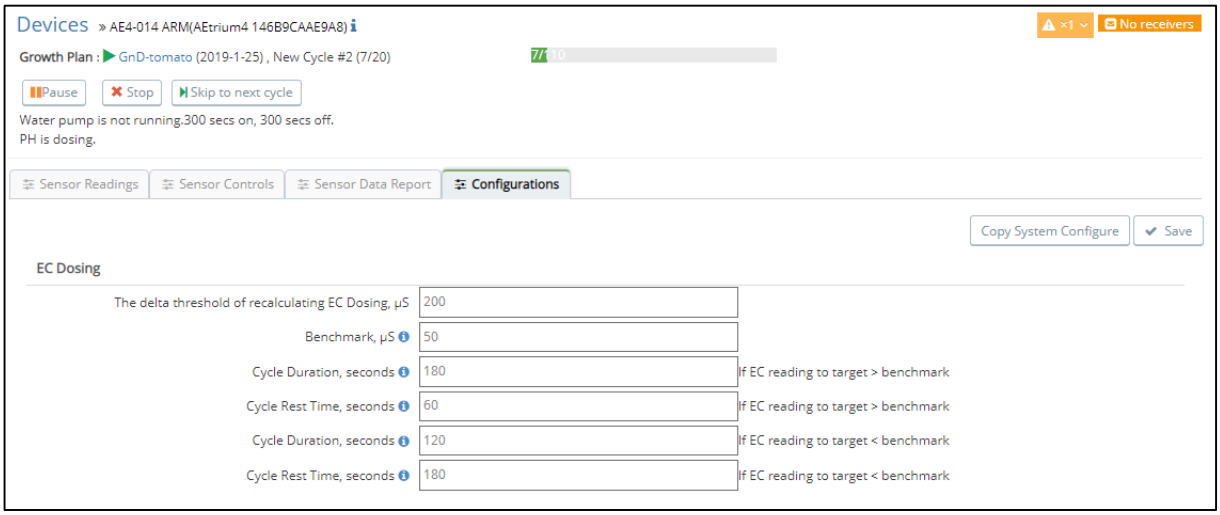


Figure 10: Individual device configuration page

Rename Device

After Configurations is done, to differentiate the device, the Admin account holder can rename the device in Devices page.

1. Go to "**Devices**" page, Choose the device in which you would like to make changes to, click on "" button in the "**Name**" column (fig. 11).

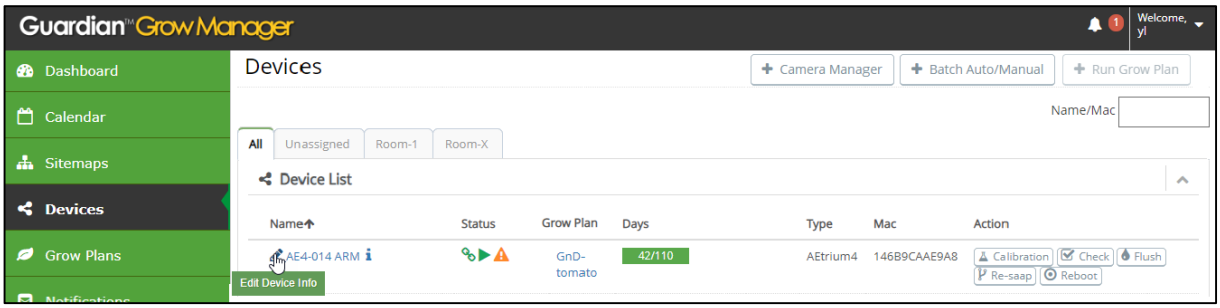


Figure 11: Edit device info option

2. Then input the device name in the popup (fig. 12) and click "**Save**" button.

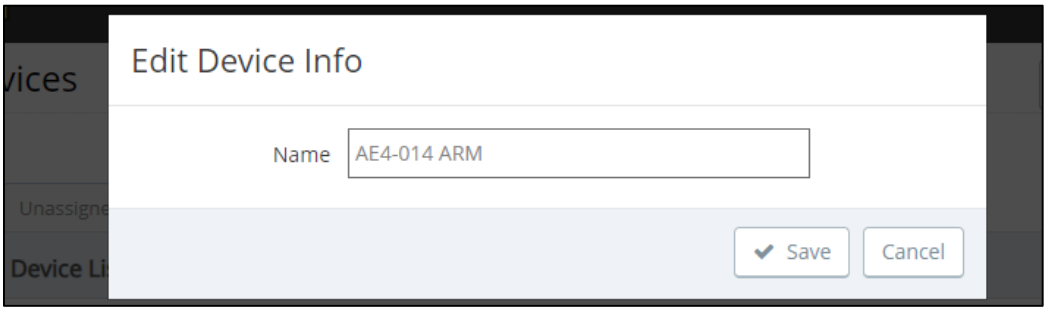


Figure 12: Edit device name window

Device Diagnosis

After making any changes to Configurations is done. It is important to make sure the device is running properly by following these steps:

1. Go to "**Devices**" page, find the device by device name (given in the step above) or Mac address (check the label in front of the PDU), then click on "**Check**" button in the "**Action**" column (fig. 13).

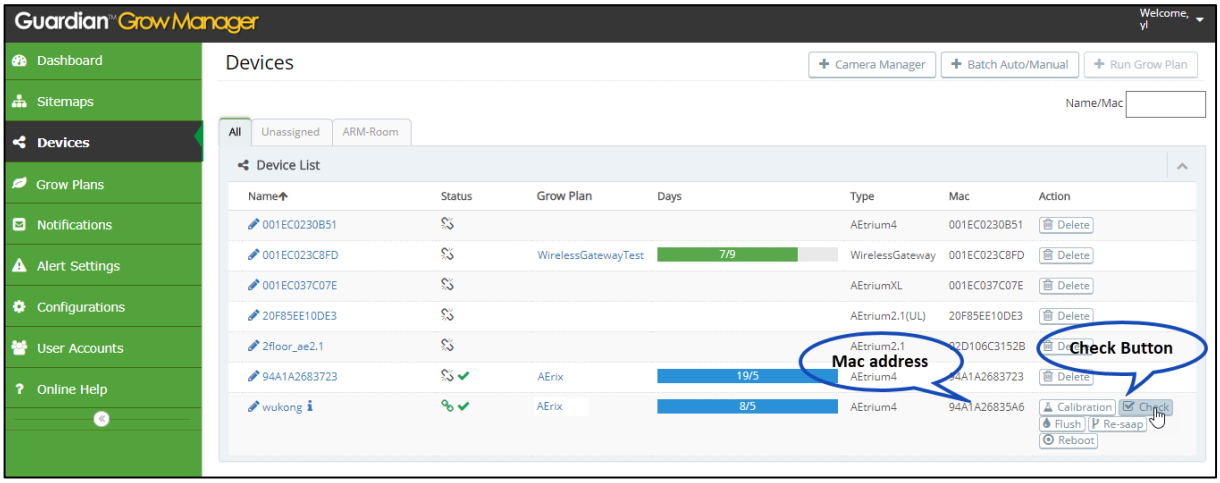


Figure 13: Click 'Check' to start First time diagnosis

2. After clicking the "**Check**" button, the following window will be displayed:

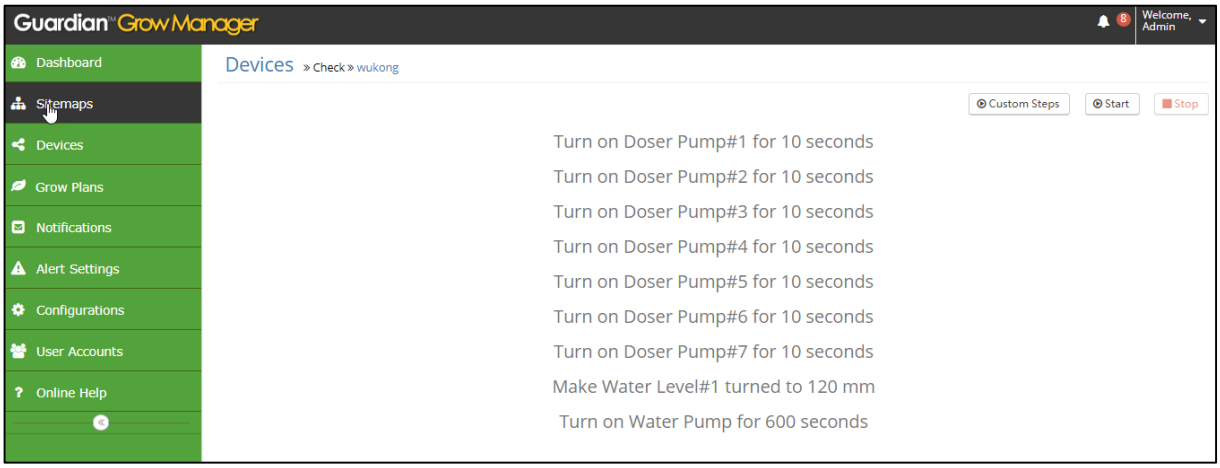


Figure 14: First time diagnosis page

3. You can run the default diagnostic steps (fig. 14) or you can customize the diagnosis steps by clicking the "**Custom Steps**" button (fig. 15). The following window will be displayed:

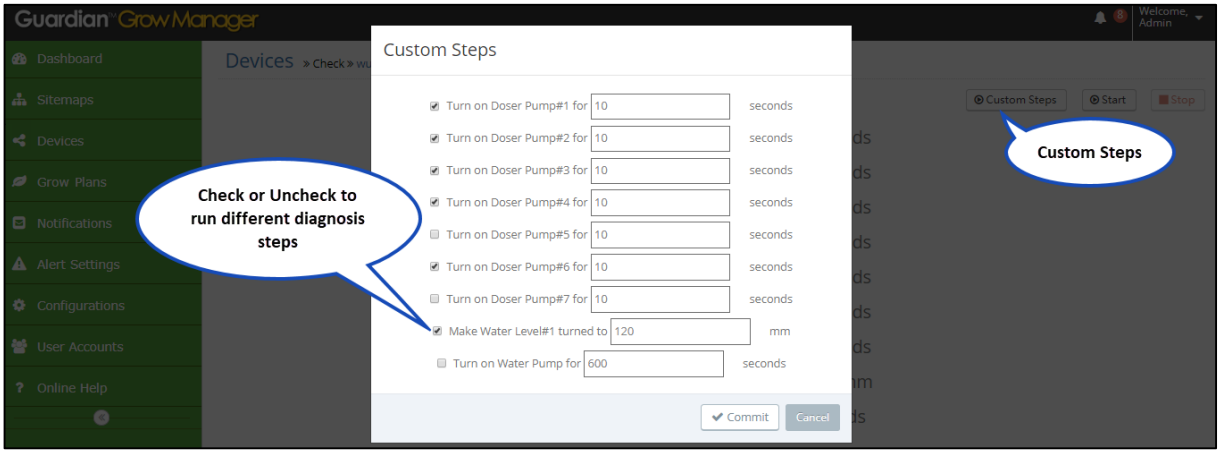


Figure 15: Customize the steps which will be diagnosed

4. Click the "**Start**" button to run the selected testing steps or the "**Stop**" button to step diagnosis at any time (fig. 16).

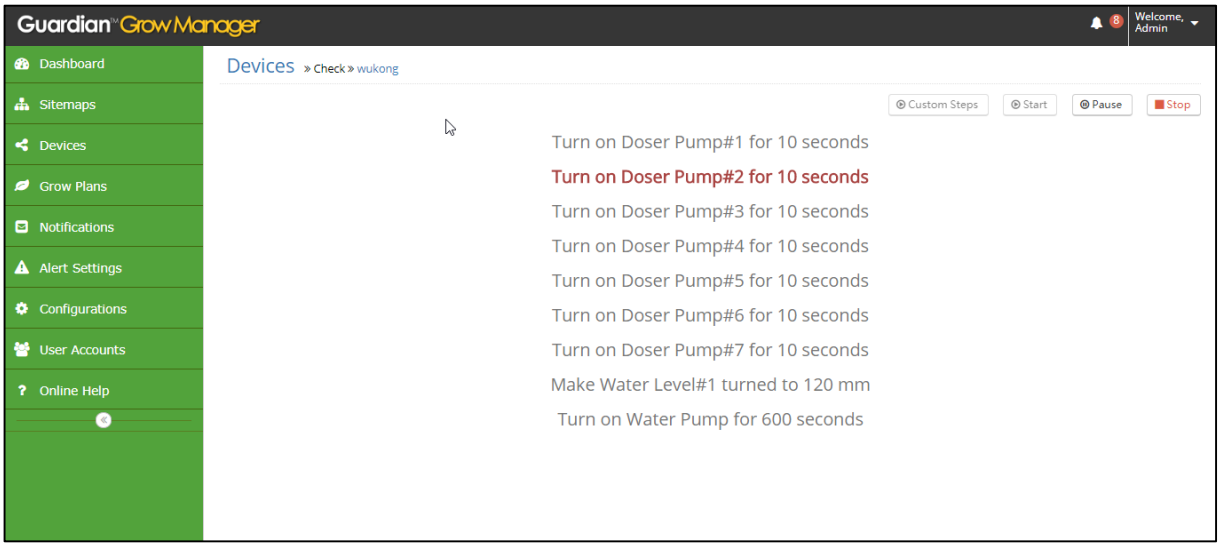


Figure 16: Start diagnosis. Highlight the step currently running

Important: while performing the self-diagnosis, the user needs to be next to the device to verify that all steps can operate properly, if anything abnormal happened, user needs to "**Pause**" or "**Stop**" the test, fix the problem and then "**Resume**" or "**Start**" from remaining steps.

Sensor Calibration

After installation, but before running the system; water temperature, EC, pH and bottle scales need to be calibrated. Additionally, CO_2, relative humidity (RH), and air temperature sensors can be calibrated as well. We highly recommend repeating the same calibration steps before starting a new grow as well as periodic calibration (weekly) of pH sensor. To calibrate the sensors:

1. Go to "**Devices**" page, find the Mac address of your device, click on "**Calibration**" button in the "**Action**" column (fig. 17).

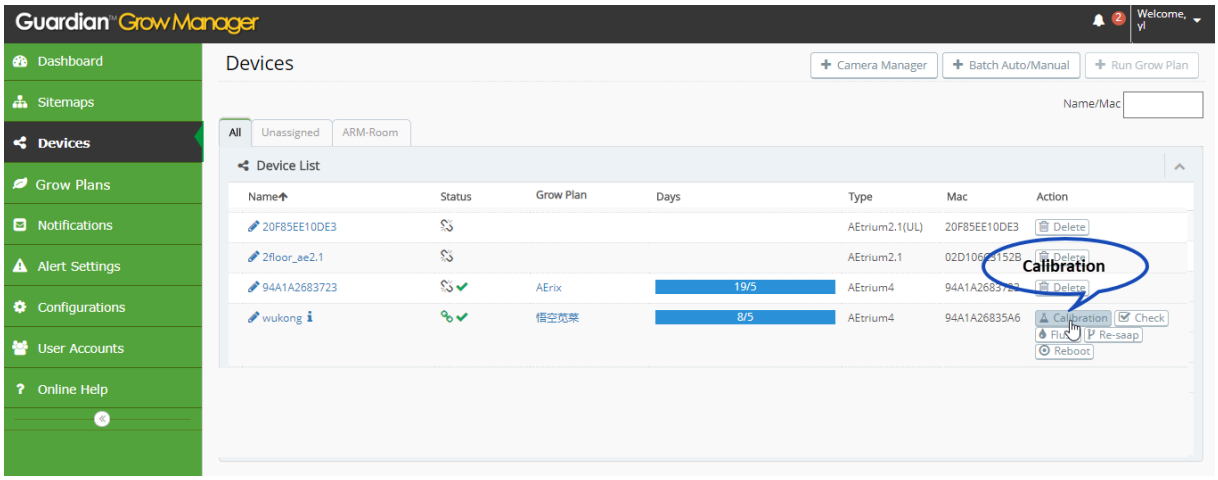


Figure 17: Link to calibration page for individual devices

2. In the calibration page, calibrate "**Water Temperature**" first (fig. 18).

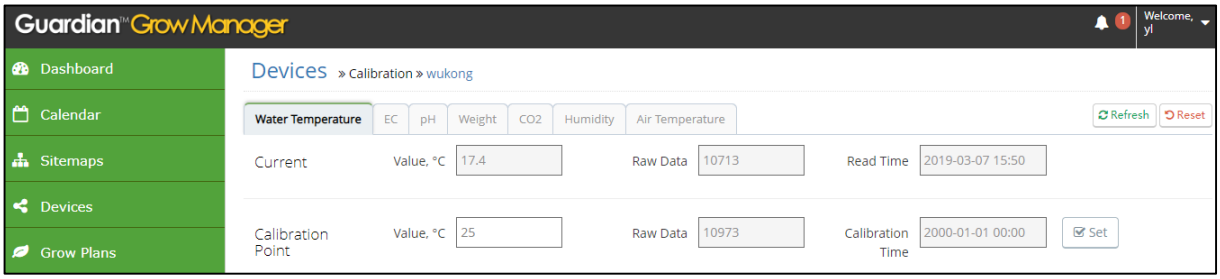


Figure 18: Link to calibration page for individual devices

a. Put water temperature sensor and Mercury or alcohol thermometer inside a small bottle with water.
b. Keep monitoring the "**Raw Data**" reading in the "**Current**" section. Once the Raw Data is stable, input the temperature from the external thermometer into the "**Value**" textbox in "**Calibration Point**" section (fig. 19). Then click "**Set**" button to finish calibrating the water temperature.

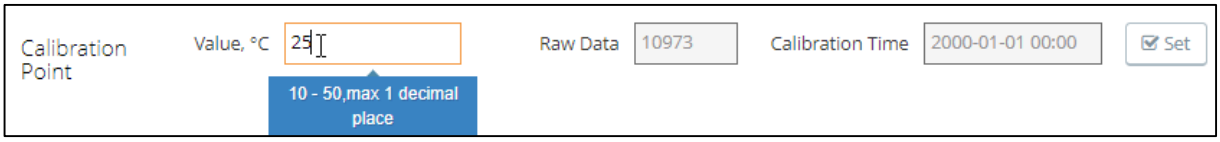


Figure 19: Water temperature calibration point

3. In Calibration page, calibrate "**EC**" as follows:

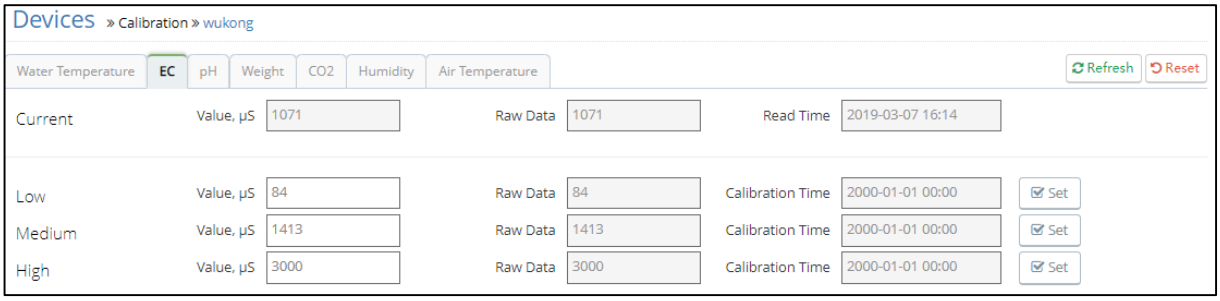


Figure 20: EC sensor calibration page

a. Pour a standard low EC calibration solution (84 µS/cm) into a small bottle, put both water temperature sensor and EC sensor inside the bottle, stir well and keep monitoring the "**Raw Data**" reading in the "**Current**" section (fig. 20).
b. When the "**Raw Data**" value is stable then input the EC value of the standard low EC calibration solution into the "**Value**" textbox in the "**Low**" section. Click "**Set**" Button to finish calibrating the Low EC value.
c. Using a standard medium EC calibration solution (1413 µS/cm) and standard high EC calibration solution (5000 µS/cm) use the same steps to calibrate EC Medium value and EC High value.

4. In Calibration page, calibrate "**pH**" as follows:

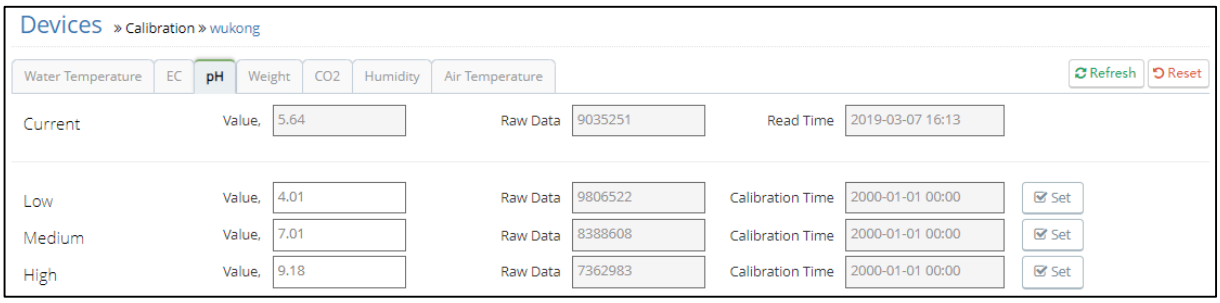


Figure 21: pH sensor calibration page

a. Get standard low pH (4.01) calibration solution and dump some into a small bottle, put both water temperature sensor and PH sensor inside the bottle, stir well and keep monitoring the "**Raw Data**" reading in the "**Current**" section (fig. 21).
b. When the "**Raw Data**" value is stable then input the pH value of the standard low pH calibration solution into the "**Value**" textbox in the "**Low**" section. Click "**Set**" Button to finish calibrating the Low PH value.
c. Get standard medium pH (7.01) calibration solution and standard high pH calibration solution use the same steps as calibration pH low to calibrate pH Medium value and pH High value. If intended operational pH range is above 7.0, use the previous steps to do.

5. In Calibration page (fig. 22), calibrate the individual bottle "**Weight**" as follows:

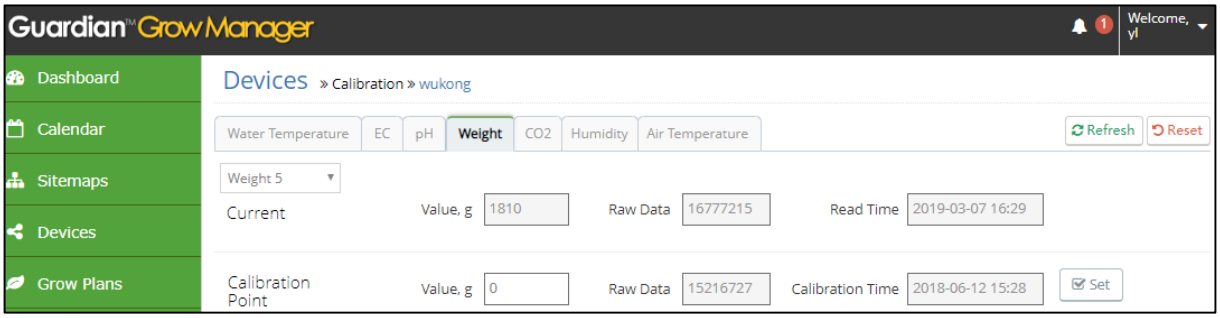


Figure 22: Bottle scale calibration page

a. There are seven weight sensors that need to be calibrated for the AEtrium2.1, and three weight sensors (Bottles 5, 6, and 7) for the AEtrium 4. Select "**Weight 1**" first for the AEtrium 2.1 or "**Weight 5**" first for the AEtrium 4 (fig. 23).

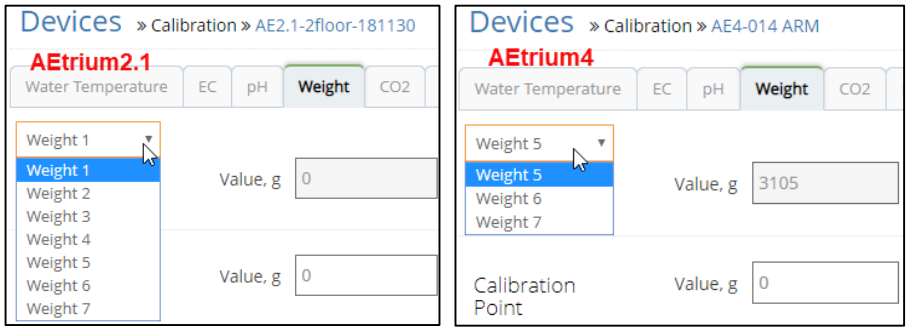


Figure 23: AE2.1 scale calibration page (l) and AE4 scale calibration page (r)

b. Remove empty "**Bottle #1**" from the "**Weight 1**" sensor, keep monitoring the "**Raw Data**" reading in the "**Current**" section.
c. When the "**Raw Data**" value is stable then input the "0" into the "**Value**" textbox in the "**Calibration Point**" section. Click "**Set**" Button to finish calibrating "**Weight 1**" sensor.
d. To set the tare weight of an empty bottle, place an empty bottle in the "**Bottle #1**" position and follow Step C.
e. Use the same steps as calibrate "**Weight 1**" sensor to calibrate "**Weight 2**" to "**Weight 7**" for the AEtrium 2.1 and "**Weight 6 and 7**" for AEtirum 4.

6. In every calibration page
   If *a "***Get calibration failed**" (fig. 24) error notice appears, please click "**Refresh**" button on the top-right corner. The system will auto refresh every three seconds to retrieve Raw Data in the "**Current**" section.

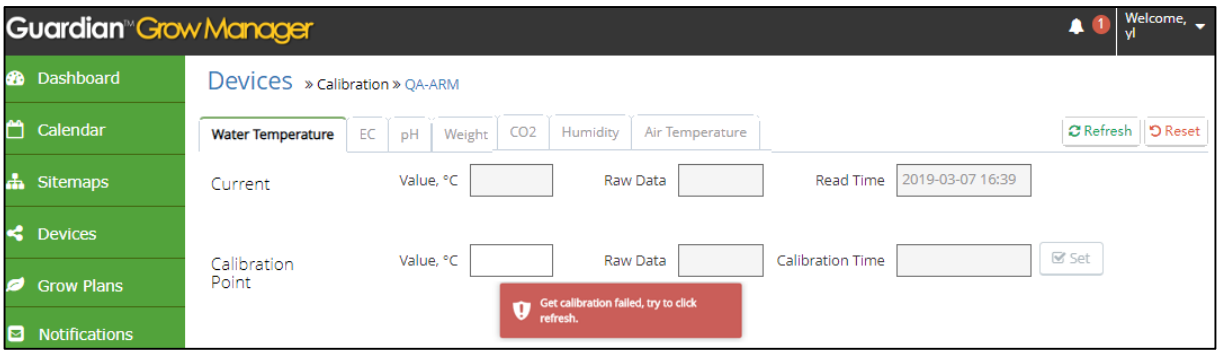


Figure 24: Calibration error alert

Manage Device Location

In order to have an intuitive view of the device's location and status, and to centrally manage the device, devices can be arranged inside a room and then further located into a site. How to group your devices' location through these two layers is decided by the system administrator.

Manage Sites/Rooms/Zones (Administrators only)

When logged in as an Administrator, user can add/remove sites, rooms, and devices.

In the **Sitemaps** page (fig. 25), user can click "**Add Sitemap**" button or "**Delete**" button to add/remove to the site. "**Left**" and "**Right**" button can help change the order.

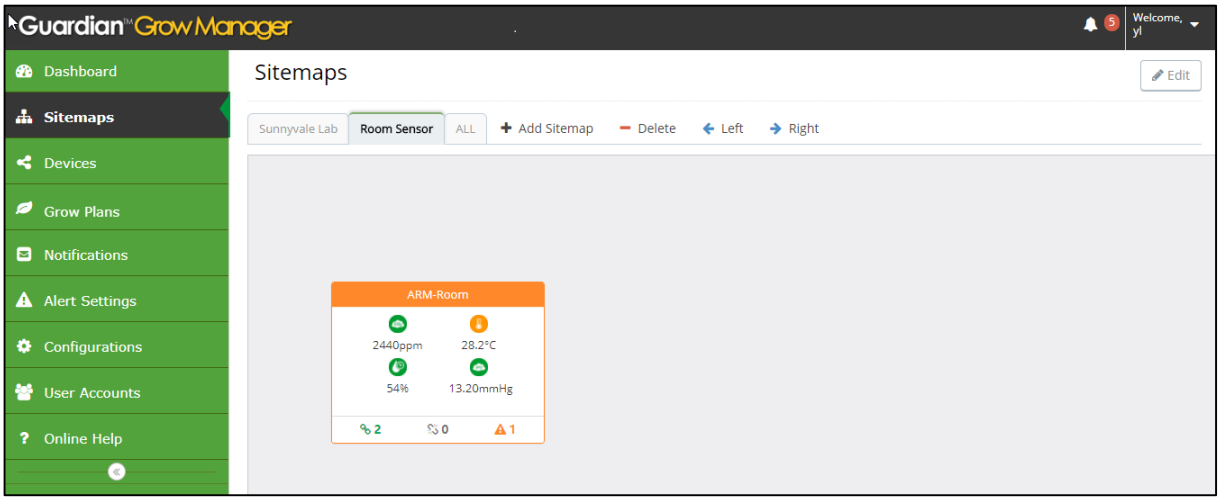


Figure 25: Room added to sitemap

1. Add Sitemap

   Click "**Add Sitemap**" Button, input the sitemap name in the popup (fig. 26). Sitemap name must be 30 characters or less. Then click "**Save**" button.

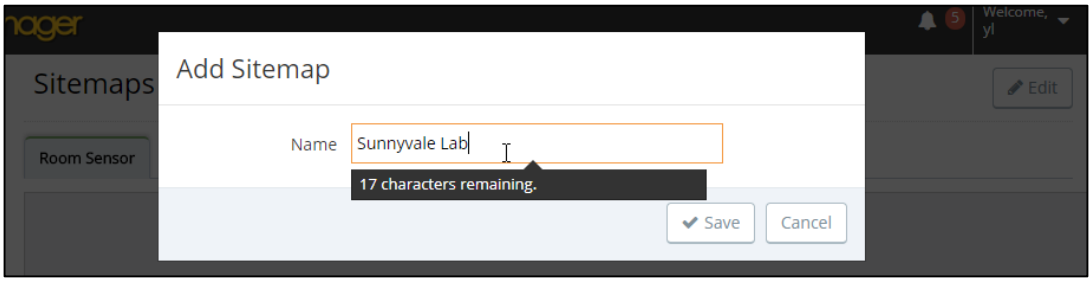


Figure 26: Change room name window

2. Edit Sitemap and add floor map
   a. Select appropriate tab
   b. Click on top-right corner "**Edit**" button
   c. To upload a floor map, click the "**Choose File**" button (fig. 27) and select a file from your computer. Floor map is an .img or .png file generated by a thirty-party drawing tool.



Figure 27: Upload floor plan to sitemap

   d. After the floor map has been set, right click in the floor map section to add a Room. Set the room name in the popup (fig. 28).

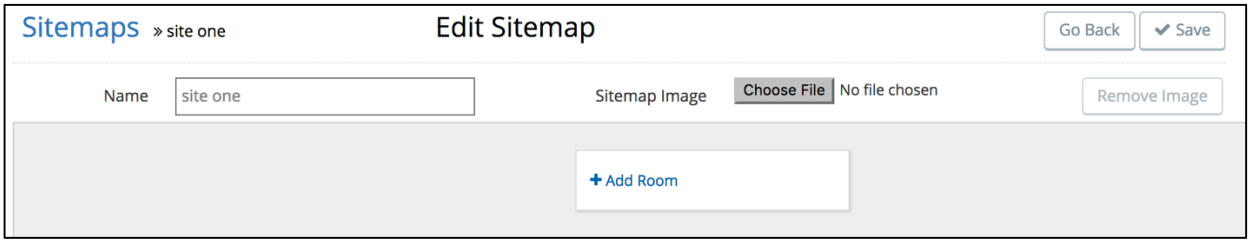


Figure 28: Add room to floor map

The user can change the Room Name and drag and drop the room to the right place based on floor plan (fig. 29).

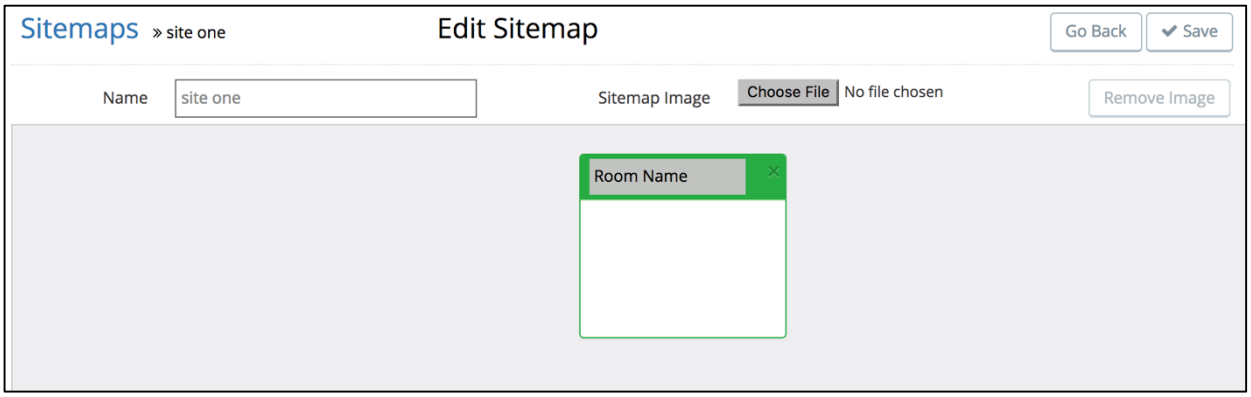


Figure 29: Edit room name

Room size is adjustable directly by putting the cursor over the corner or edge of the room and dragging to desired size.

e. Click "**Save**" button to save changes.
f. Administrator can modify the site name and the room name at any time in Edit Sitemap page.

View Sites and Rooms (Non-administrators)

Non-Admin users can only view current site and room arrangement and see sensor readings of rooms (fig. 30).

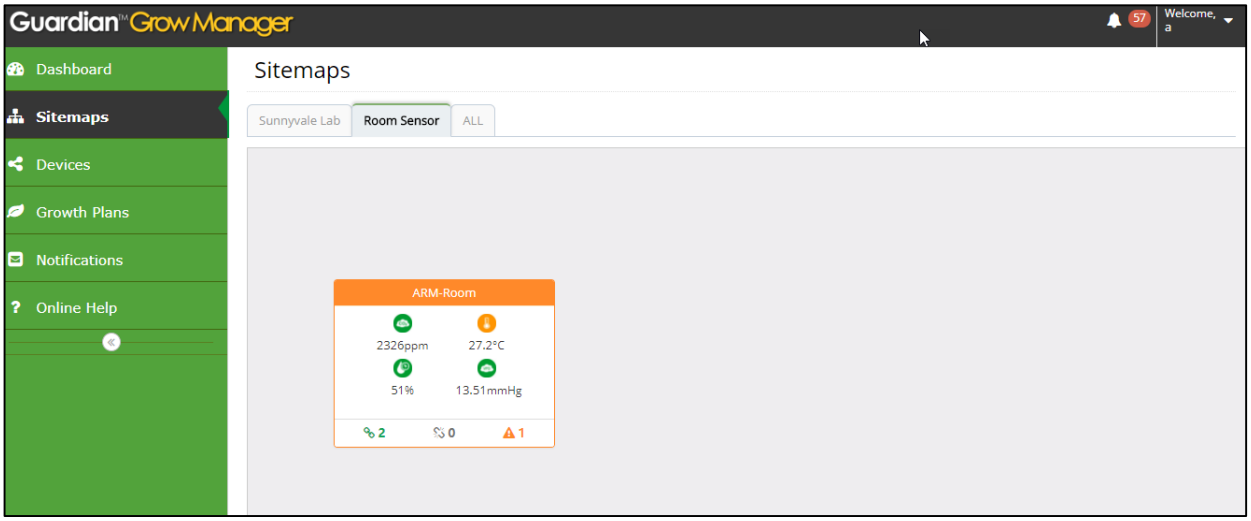


Figure 30: Login as Non-Admin can only view sites and rooms

Manage Devices (Administrator only)

All of the AEtriums (**Devices**) can be added into each room according to room size and the device size and number. Devices can be arranged inside a room horizontally or vertically.

Additionally, Admin's can add, remove, modify or rearrange these devices. Sensor information associated with the given device will be displayed. Combinations of icon, color and number mean different status of the associated device (figs. 1 and 2).

Important: Administrator can add device managers to the Room. After configuration, only Administrative account managers can manage the devices in the room, including alarm acceptance and task assignment.

Detailed environmental and fertilizer solution conditions will be displayed when the cursor is moved over the device in question.

Add device into a room

1. Select one site (e.g. Gnd) and click the room title (e.g. Room-X) on the sitemap page to view the room details as below (fig. 31):

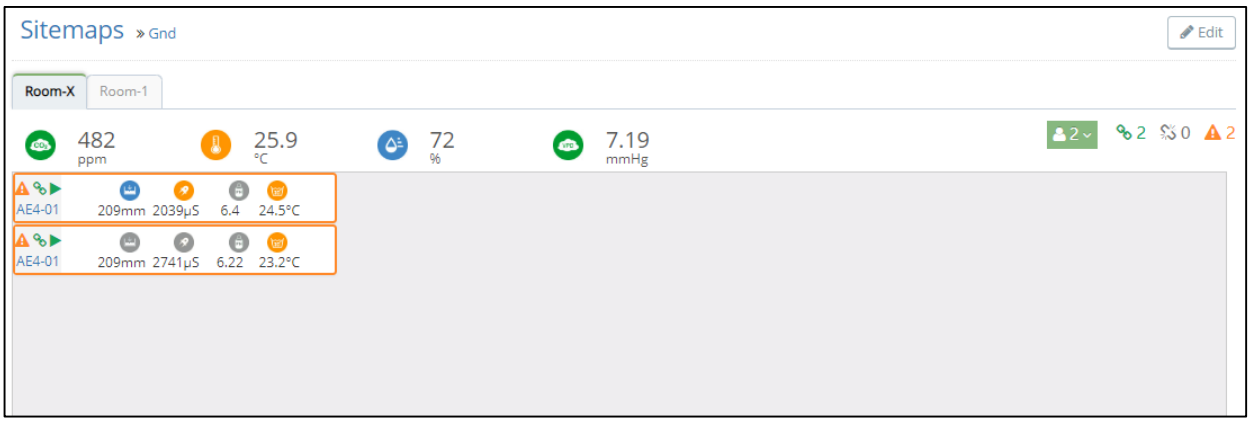


Figure 31: Room tab of Sitemap

2. Click the "**Edit**" button in the top-right of room page, to edit room.

3. Click "**Choose File**" button to import a set the floor map of this room.
4. After importing a floor map, right click on the floor map section at the desired location to put a device (fig. 32).

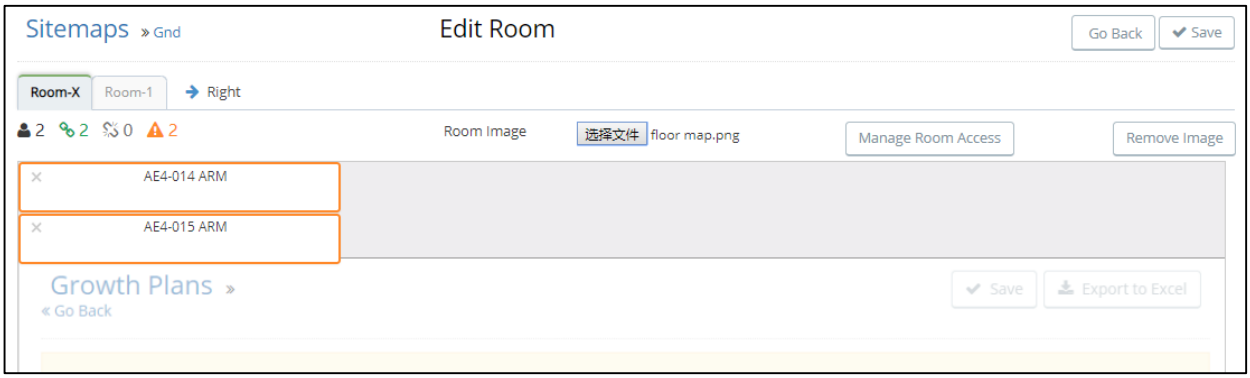


Figure 32: Edit room in Sitemap

5. Select the device and the orientation (horizontal or vertical) in the popup window. Click "**Add**" button to finish adding a device (fig. 33).

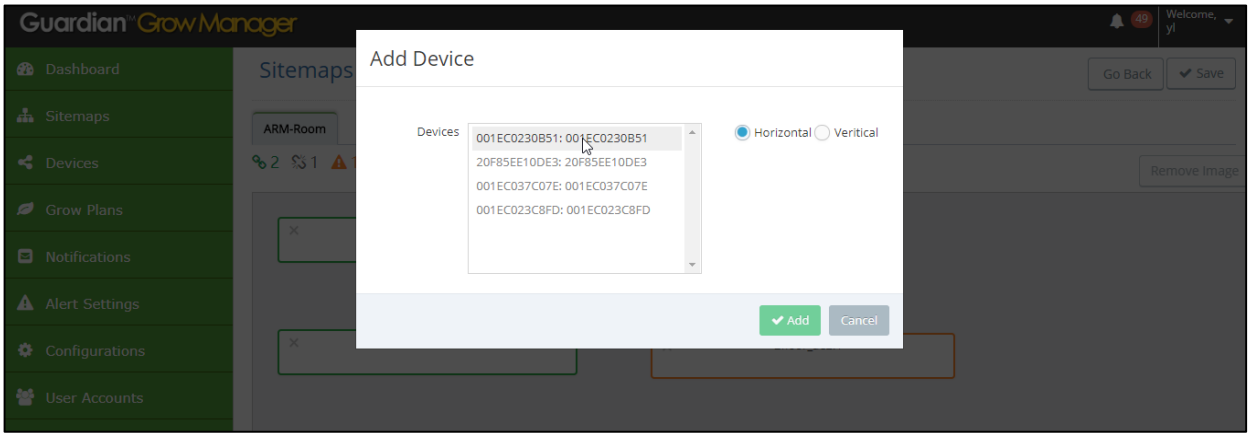


Figure 33: Add device popup window, select device and orientation

6. For users to receive alerts and notifications and access specific devises, individual accounts need to be given access to specific rooms. To provide access to one or multiple individuals, click the "**Manage Room Access**" button, select user(s) in the popup, select the right facing single arrow (⇨), then click the "√ **Confirm**" button to save it (fig. 34). To grant access to all users, select the right facing double arrow (⇨⇨)in the "**Unselected**" box and click on "√**Confirm**". All current users with room access will be shown in the "**Selected**"

box on the right. To remove access, select user(s) from the "**Selected**" box on the right and click on the left facing single arrow (⇦), or select the left facing double arrows (⇦⇦) to remove room access to all previously selected.

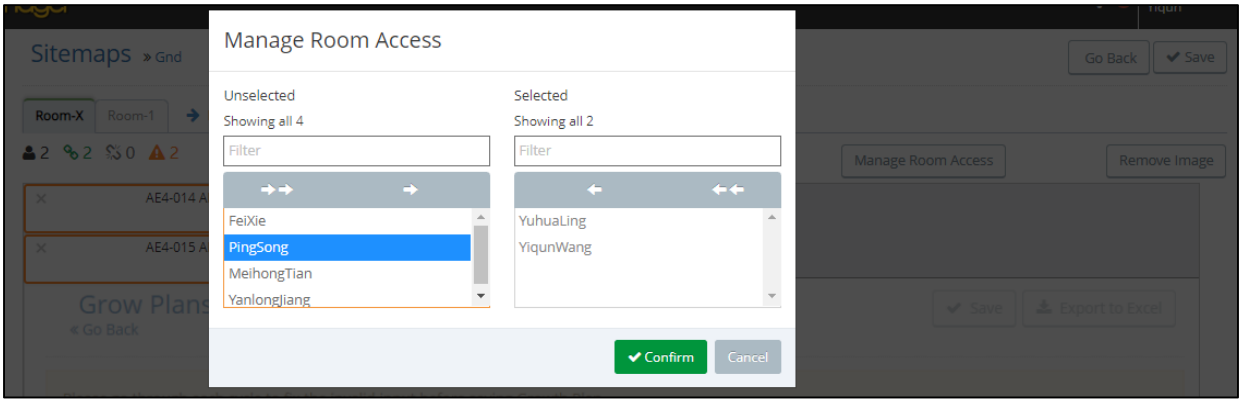


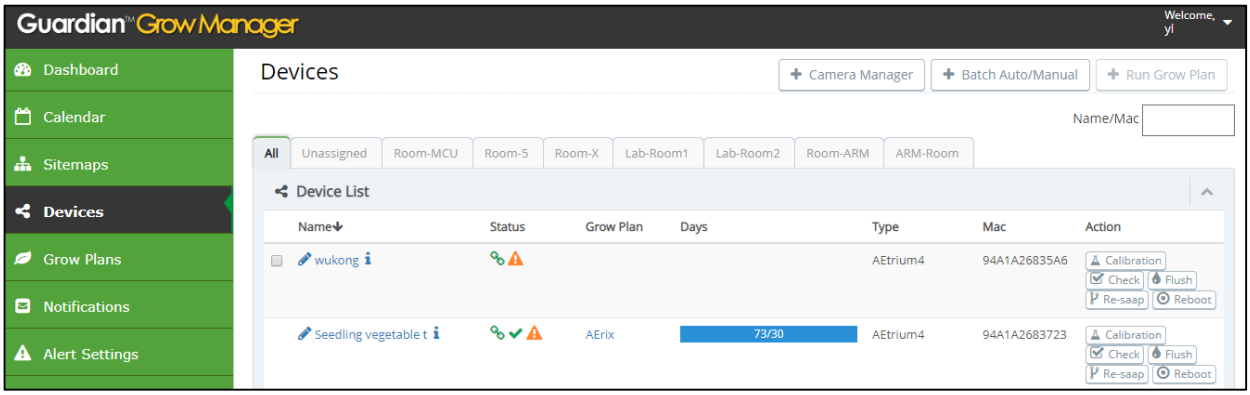
Figure 34: Granting access to selected users in Manage Room Access window

Important: The example above means that these two users can manage the devices in the room, including alarm acceptance.

7. Click the "**Save**" button to save the change, then click "**Go Back**" button back to view page.

Room Control

Master control of room will allow user to apply the control to the devices in that room. User can click the "**Batch Auto/Manual**" button (fig. 35) for its to turn off all lights or air handers or humidifier, water pump in a room.



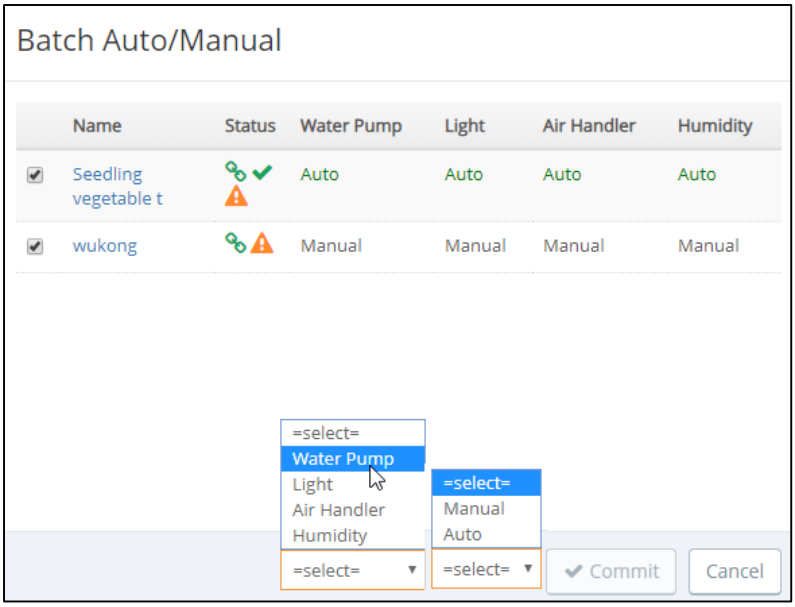


Figure 35: Batch Auto/Manual button on device page (top) and pop up window (below)

View Devices (Non-administrator only)

Non-administrator accounts can only view the devices inside a room and are unable to make changes.

1. Select one site (e.g. Sunnyvale Lab) and click the room title (e.g. ARM-Room) on the sitemap page to view the room details as below (fig. 36):

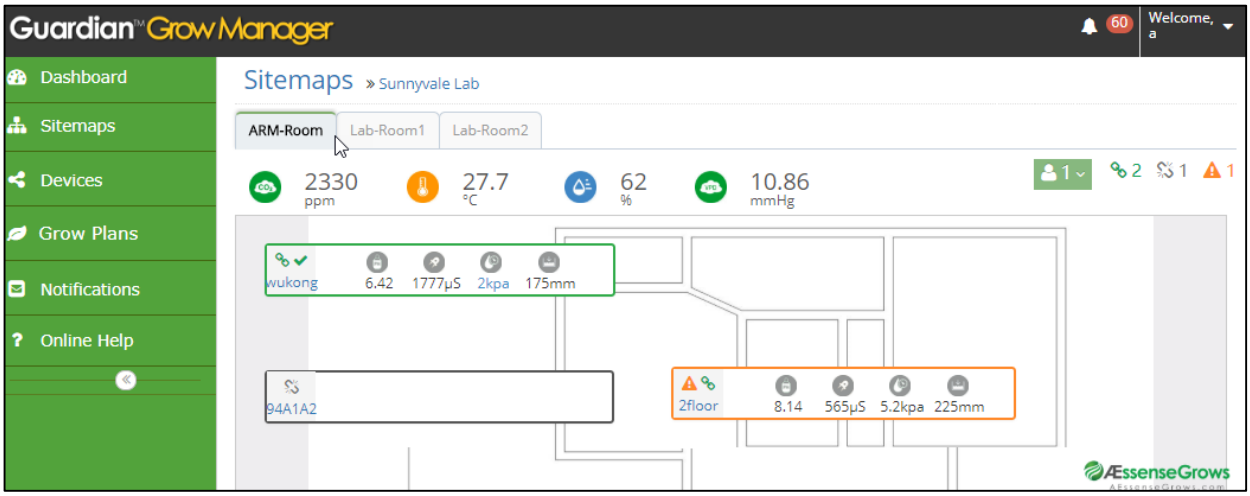


Figure 36: Sitemap room view

2. Move the cursor over one device to see sensor readings and the status of the Grow Plan that is running (fig. 37).

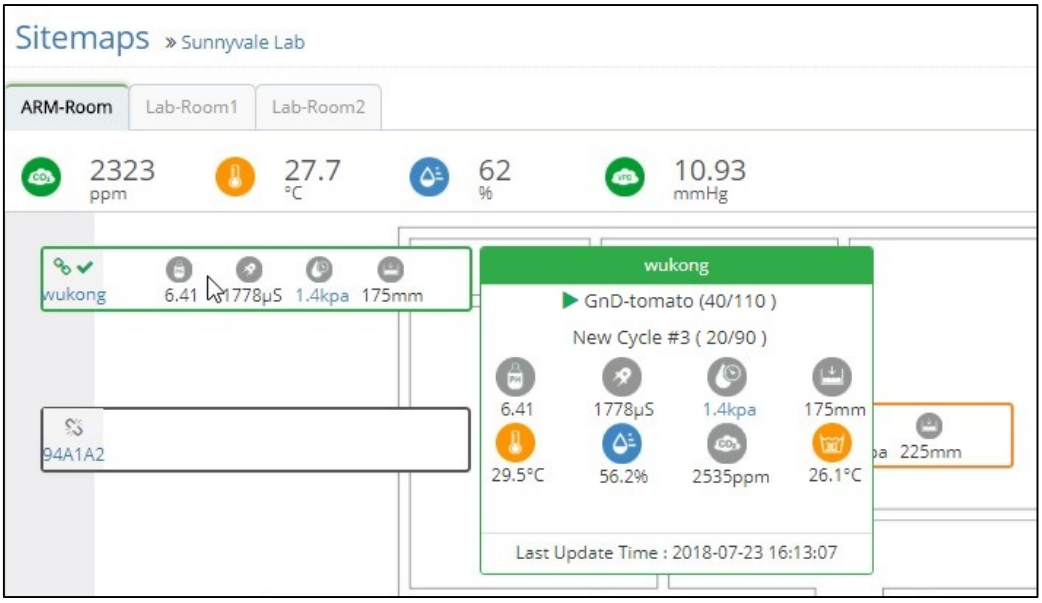


Figure 37: Room and device sensor readings as viewed from sitemap

Manage Grow Plan

View and Edit Grow Plan

AEssenseGrows introduced Grow Plan **Template** and **Grow Plans (any running or completed Grow Plan)** concept into grow control system.

User can setup different parameters for fertilizer, temperature, light, CO2, water, etc. to control grow environment automatically.

System also offer functionality to **Save** an Instance as a Template for future grow which makes a successful grow experience repeatable.

Additionally, Grow Plans can be imported or exported to store and share grow knowledge.

Edit, Clone, Delete a Grow Plan

1. On the "**Grow Plans**" page, the user can view all Grow Plans in "**Templates**", browse the running Grow Plans in "**Active**" tab (fig. 38).

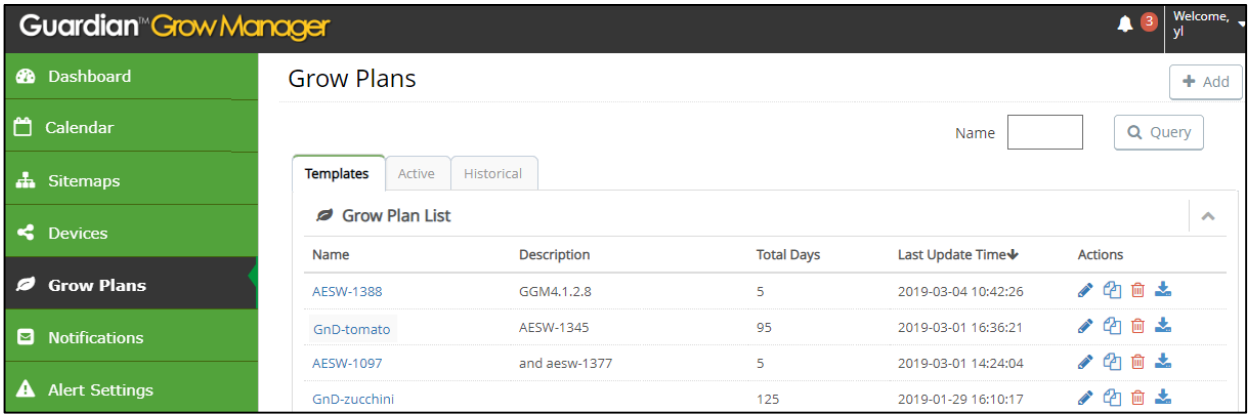


Figure 38: Grow Plan library

2. In the "**Actions**" column, Admin account holders can edit, clone (copy), delete, and export the Grow Plan by selecting one of the action icons (fig. 39).

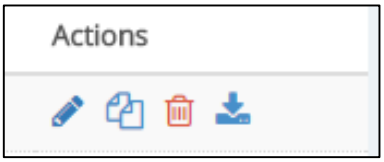


Figure 39: Grow Plan action items: Edit, Clone, Delete, Export (l-r)

a. Click the "**Edit**" button to edit the Grow Plan name, and description, and adjust auto controlling parameters/settings for fertilizer solution, temperature, light, CO2, water, etc. (fig. 40). Then click the "**Save**" button.

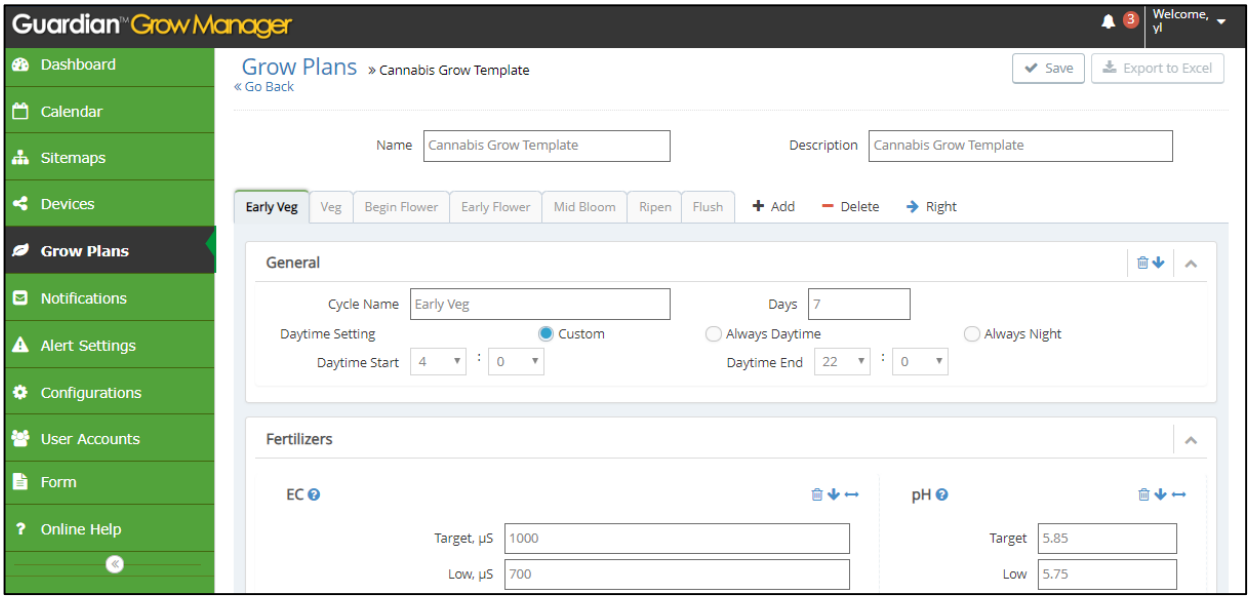


Figure 40: Grow Plan window where auto-control parameters can be edited

b. Click the "**Clone**" button to create a new Grow Plan template identical to the selected template. In the popup window, set the new name for the new template, then Click "√**Clone**" button (fig. 41).

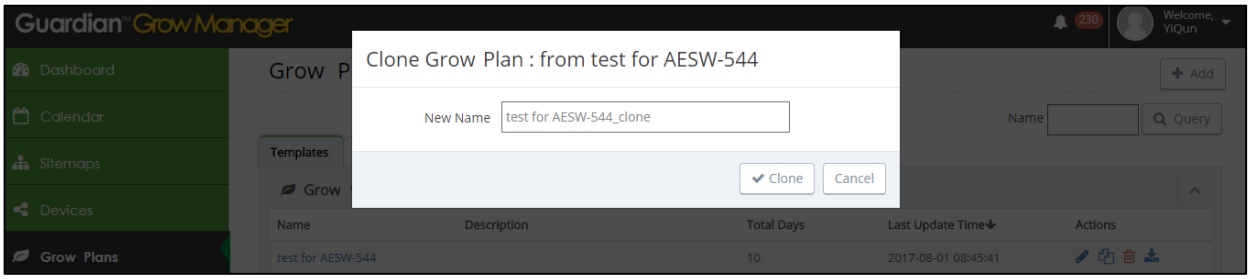


Figure 41: Creating new name for cloned Grow Plan

c. Click "**Delete**" button to delete the selected Grow Plan.

Export a Grow Plan

Grow Plans can be exported to store externally or to share. The system supports two options to export files.

1. Click the "**Export**" button next to the desired Grow Plan on the Grow Plan menu page (fig. 42) to export the Grow Plan.



Figure 42: Export Grow Plan (1)

2. The second option is in the Grow Plan interface; the user can click the "**Export to Excel**" button after the Grow Plan has been saved to export it (fig. 43).

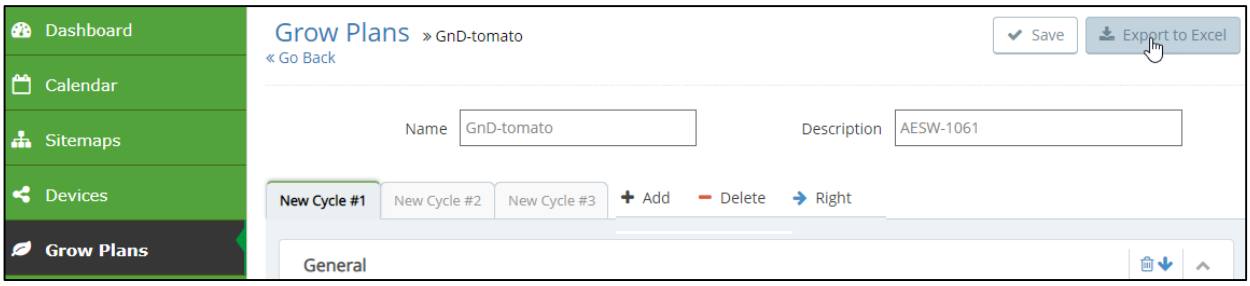


Figure 43: Export Grow Plan (2)

Grow Plans will be exported as XXX.aesjson or XXX.xls file and will automatically be directed to downloads folder.

Import a Grow Plan

1. To import a Grow Plan, click the "**+ Add**" button in the upper right of the Grow Plan page (fig. 44).

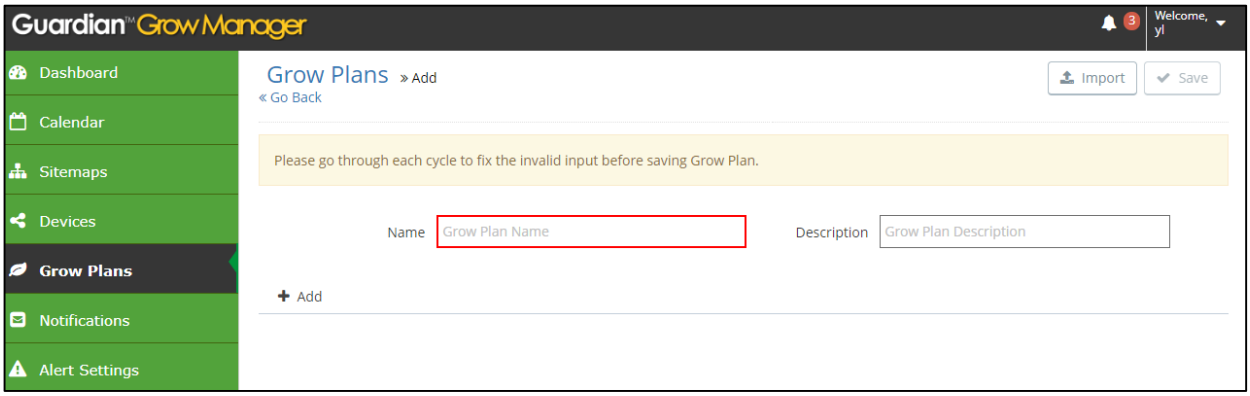


Figure 44: Add and import Grow Plan page

2. Click on "**Import**" button to select one XXX.aesjson file to import a Grow Plan (fig. 45).

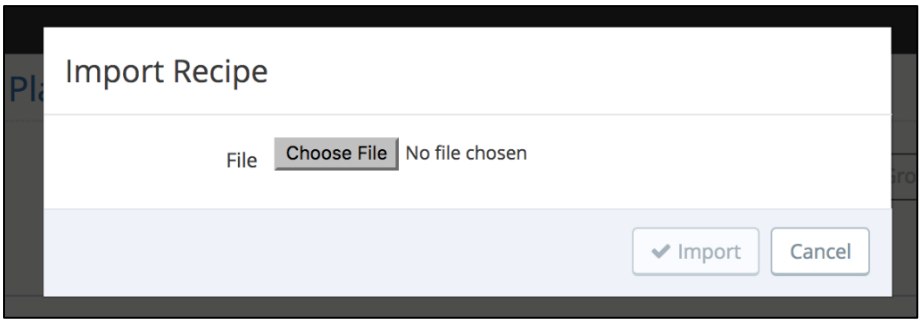


Figure 45: Import Grow Plan

Save an Instance as a Template

1. Once an assigned Grow Plan (by selecting clone: see Assign a Grow Plan to a Device) has stopped, the selected Grow Plan will be shown in the "**Historical**" tab (fig. 46):

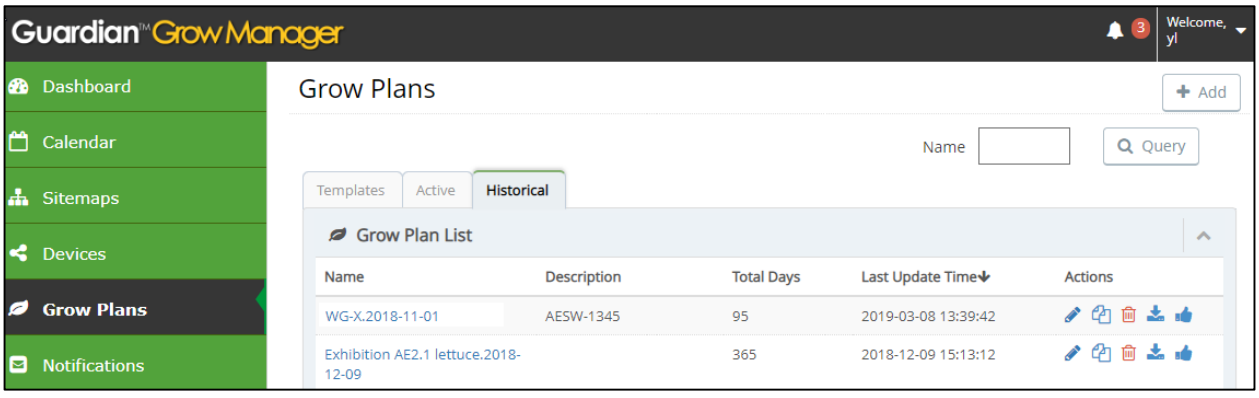


Figure 46: Historical Grow Plan library

2. Click "**Save as a template**" button (fig. 47) to save the Grow Plan as a template for later use.

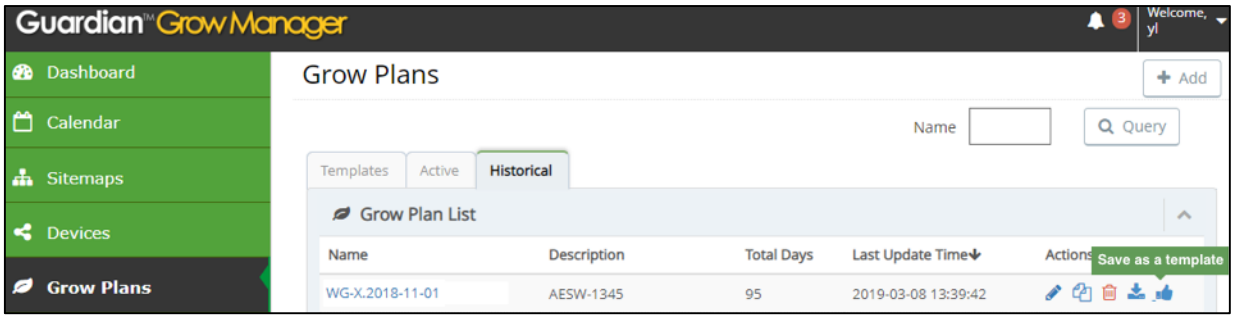


Figure 47: Save a Grow Plan

3. Set the new name of the saved Grow Plan (fig. 48).



Figure 48: Rename the Grow Plan

4. Click "√ **Yes**" button, it will promote to the "Templates" tab from the "Historical" tab.

Create Grow Plan

1. In order to create a new Grow Plan, click the "**+ Add**" button on the view Grow Plans page (fig. 49).

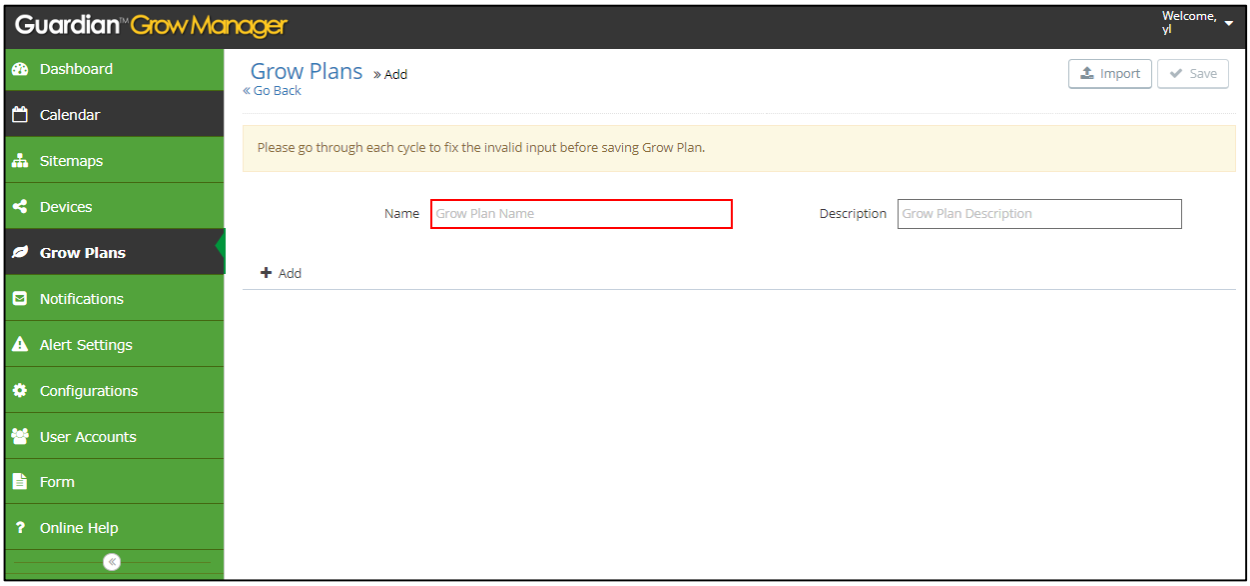


Figure 49: Add new Grow Plan

a. Input the name and description and then click "**+ Add**" button to add a new cycle (fig. 50). One Grow Plan can have several cycles.

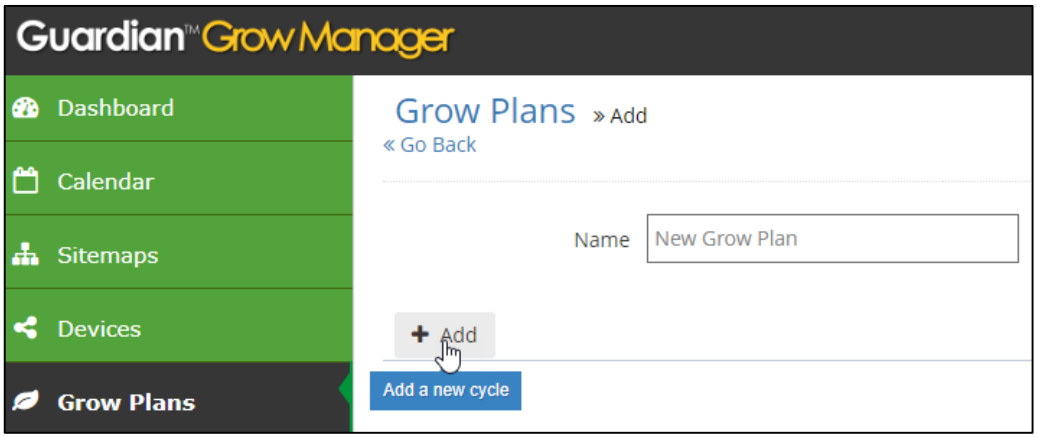


Figure 50: Enter name of the new Grow Plan

b. In the cycle page, set the cycle name and auto controlling parameters/settings (fig. 51) for day length, fertilizers, temperature, light intensity and source, CO2, water, etc. (Further details in below sections below for "**Light Intensity Control**" and "**Fertilizer Solution**").

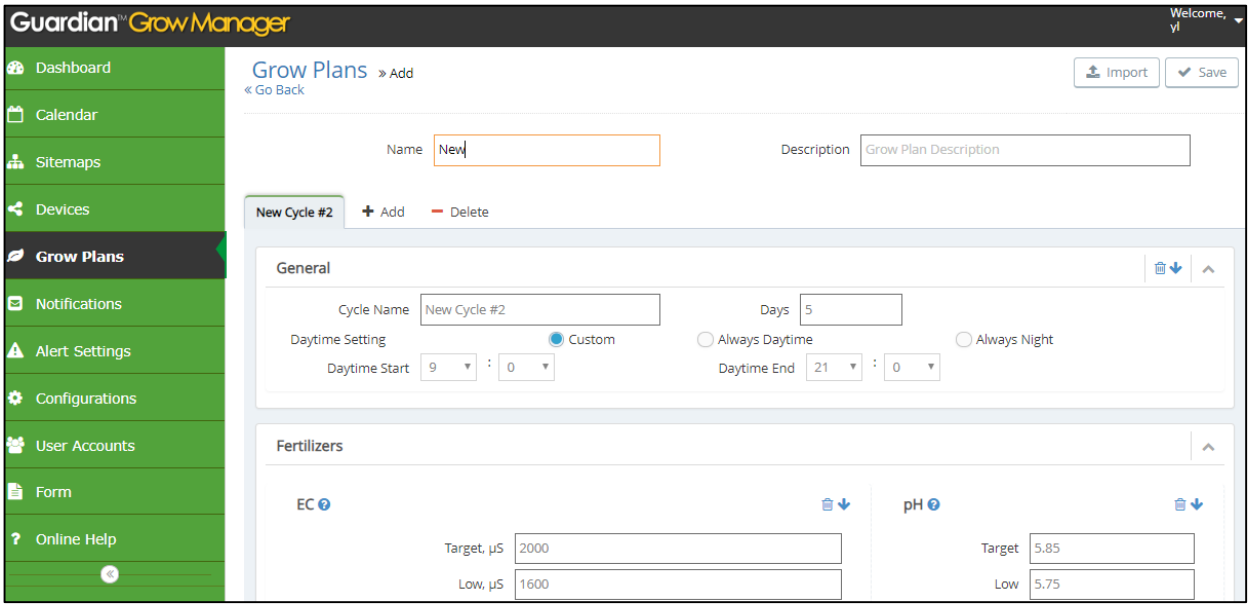


Figure 51: Enter name of the new Grow Plan

c. On the right side of every parameters group box, there are two small buttons "**Clean Input Values**" and "**Use Default Values**" (fig. 52). The "**Clean Input Values**" button will clear all parameters from the boxes, whereas the "**Use Default Values**" button will apply default values to those parameters. And if user add several cycles, there will be three buttons, ⟷ button means "**Apply to All Cycle**" so user can apply the configurations automatically of the selected cycle to all of the other cycles.



Figure 52: Clean Input Values, Use Default Values, Apply to All Cycles icons (l-r)

d. On the cycles tab, user can add a new cycle or delete the selected cycle by clicking on the "**+ Add**" or "**- Delete**" buttons. Adding a cycle will create a copied cycle proceeding (to the right of) the cycle currently selected.
e. After edits have been made to the new Grow Plan, click the "**Save**" button.

Light Intensity Control

During different grow cycles, light(s) can be set varying intensities (fig. 53).

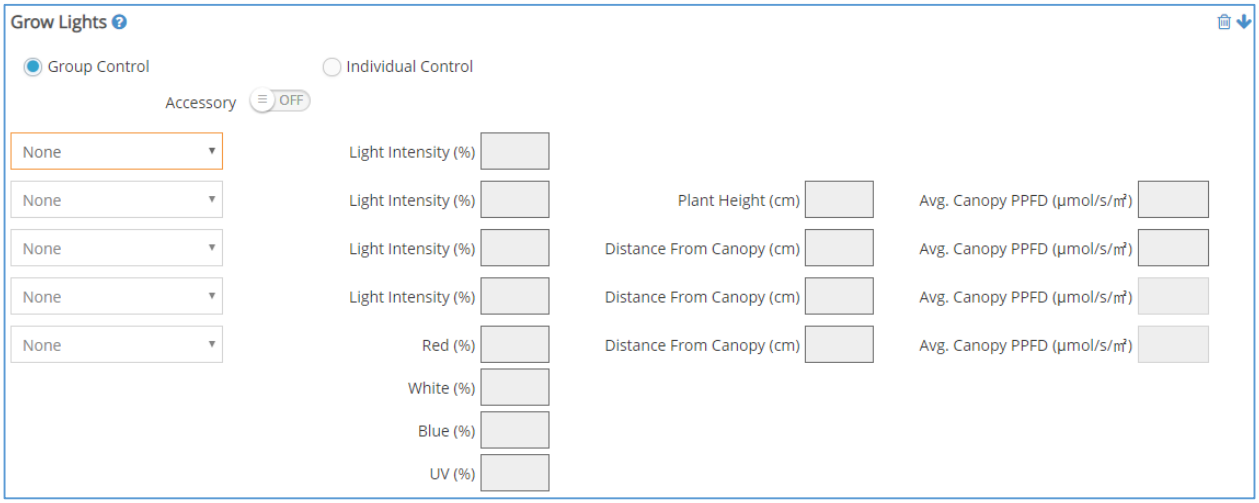


Figure 53: Light intensity control in Guardian Grow Manager

1. The first line (fig. 54) is only used to control the light intensity of AEssenseGrows' Wireless Gateway to control the variable intensity of 3rd party lights. User can select or not select other lines, but they will have no effect on light intensity of Wireless Gateway. If the user does not set the light intensity of Wireless Gateway, the Grow Plan will remind the user that the item is not filled and cannot be saved.

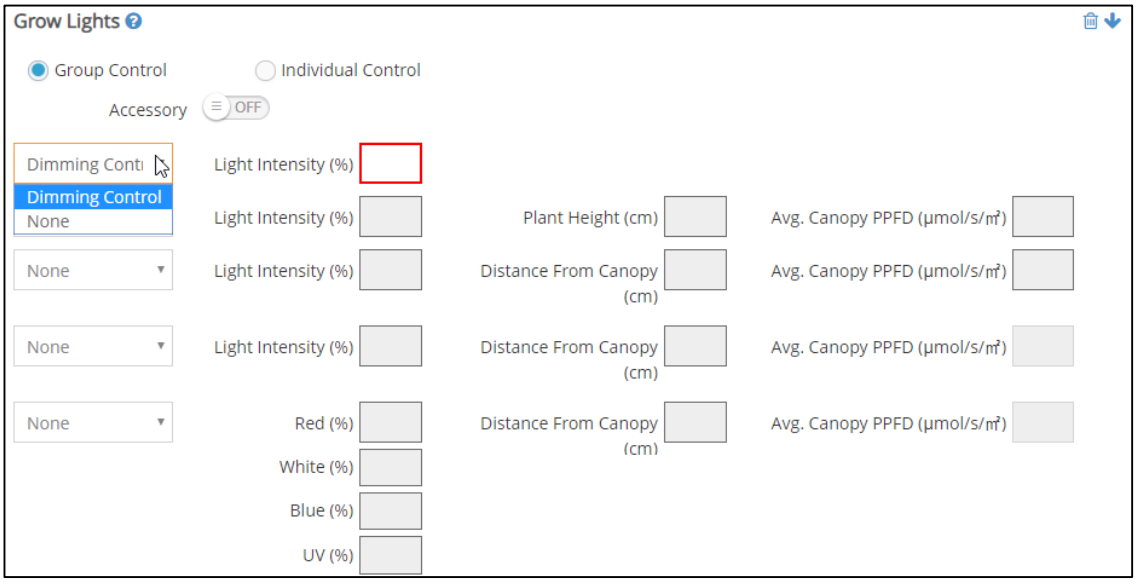


Figure 54: Light source selection for Wireless Gateway

2. The second line (fig. 55) is only used to control the light intensity of AEtrium-2.1. User can select or not select other lines, but they will have no effect on light intensity of AEtrium-2.1. If the user does not set the light intensity of AEtrium-2.1, the Grow Plan will remind the user that the item is not filled and cannot be saved.

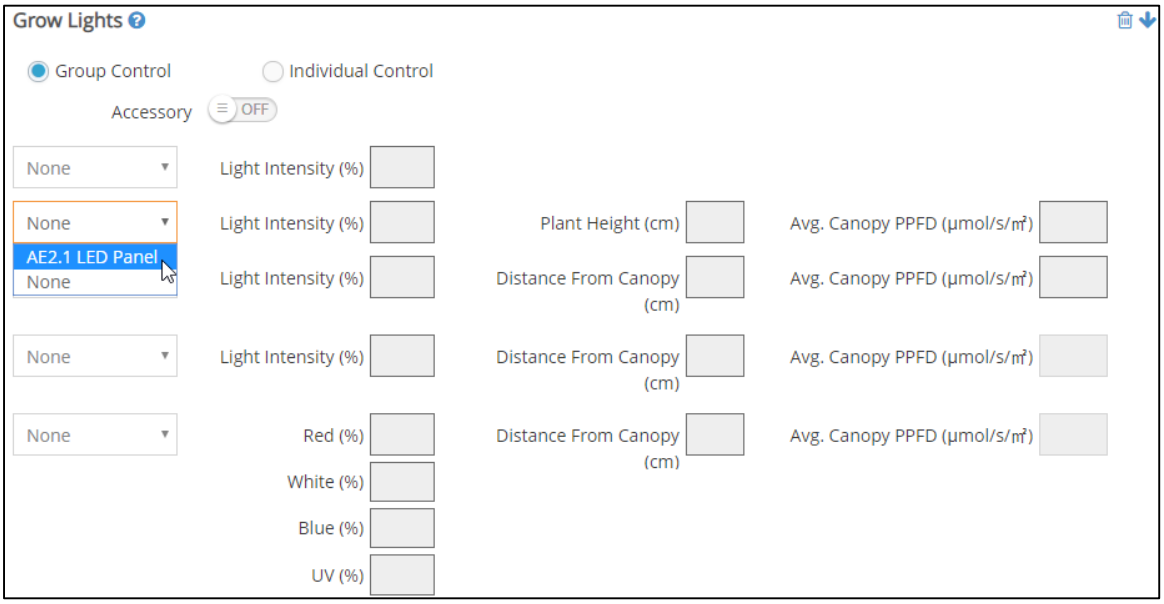


Figure 55: Light source selection for AEtrium 2.1

3. After the light source is selected from the drop-down menus in the first column (Wireless Gateway first row, AEtrium 2.1 second row, AEtrium 4 HID third row, AEtrium 4 LED fourth row), the user must specify the intensity at which to operate that light. The light intensity must be set as a whole number percent, and the range will be dependent upon light source selected (fig. 56).

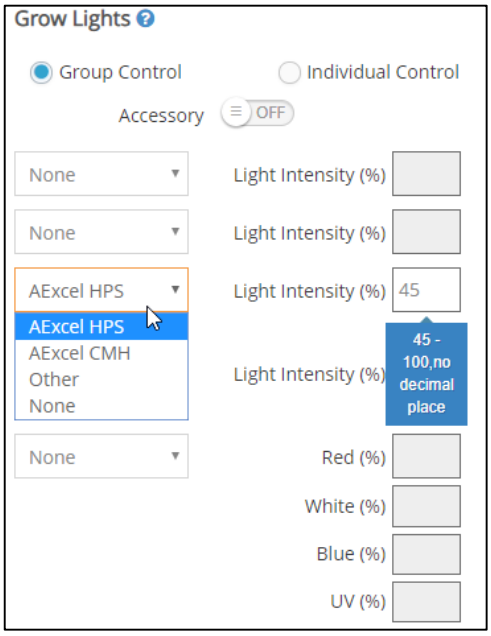


Figure 56: Light intensity setting for AEtrium 4

4. Enter the height of the crop (AEtrium 2.1 only) or the distance from the light to the plant canopy (for AEtrium 4), and an average light intensity (PPFD expressed as µmol/s/m^2) will be calculated in the last box (only for AESsense-Grows lights).

Individual Light Control

The Grow Plan includes two types of light control: Group Control and Individual Control, where group control is the GGM default control mode. User can control the lights on different tubs of the same device through Individual Light Control (fig. 57), which is limited to AEtrium-4. For each tub (#1 being matriarch) select the light source from column 1, set the light intensity in column 2, and distance from crop canopy in

column 3.

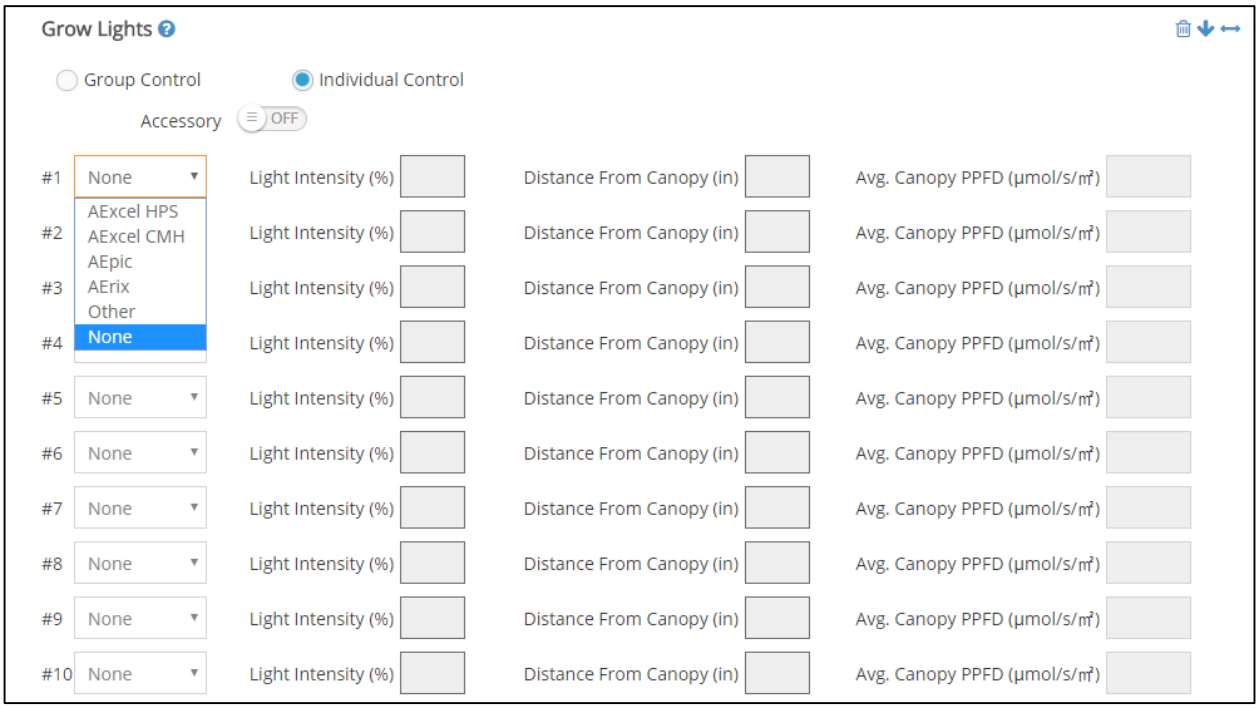


Figure 57: Individual light control mode for AEtrium 4

Fertilizer Control

Fertilizer control is one of the core features of the AEssense Guardian Grow Manager software. As an integrated intelligently controlled grow environment, EC dosing control offers:

1. Smart fertilizer dosing and monitoring thorough EC readings.
2. Flexible and configurable fertilizer dosing options (fig. 58).
3. Bottles 1 to 4 are used for Fertilizers. Bottle 5 and Bottle 6 are used for amending pH, pH up and pH down respectively.

Important: Bottle 7 can be used for H2O2, or for an additional (5^{th}) fertilizer option. So, if user inputs a value in "**Bottle 7**" of the "**Fertilizer**" section, "**H2O2**" configuration cannot be set.



Figure 58: Fertilizers parameters in GGM

The Admin account holder can establish targets for the nutrient solution based on a rate of fertilizer or by specific targeted ratio based on nutrient concentrations. GGM will always dose fertilizer based on EC and not volumetrically but can calculate the target EC rates from each fertilizer based on specific fertilizer properties and user's targets.

1. By EC Ratio

The Admin account holder can decide the EC ratio from every fertilizer to reach the target EC when the EC reading is below the target. For example, the target EC is 1000ppm, the current EC reading is 900pm, and the ratio is 30:40:20:10; then the 100ppm increase will be 30% from bottle 1, 40% from bottle 2, 20% from bottle 3 and 10% from bottle 4 (fig. 59).

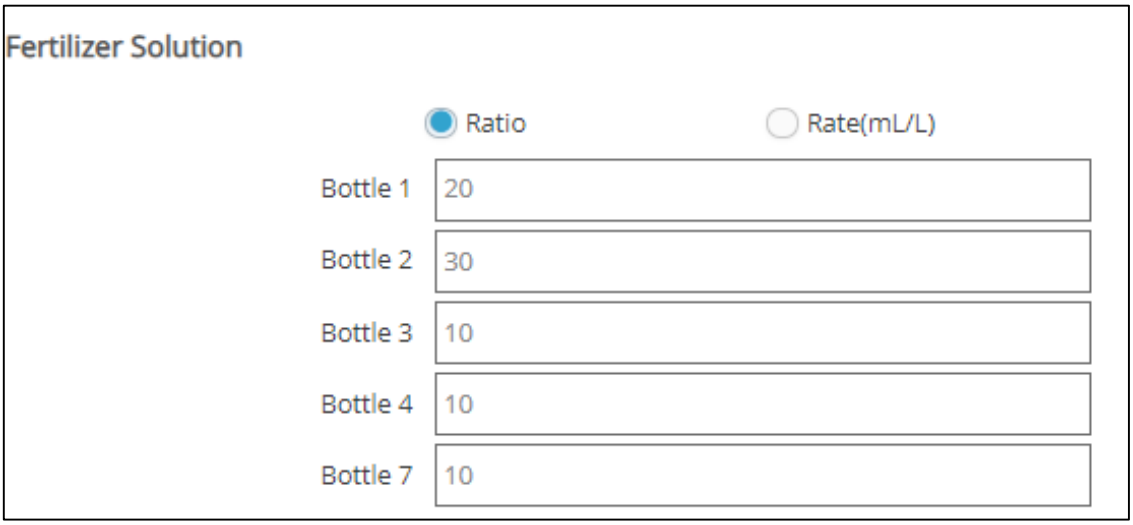


Figure 59: Fertilizer solution modules

2. By Fertilizer Rate

Though GGM will dose based on EC, if the user has entered specific properties of their desired fertilizer, the target EC for each fertilizer can be calculated from specific application rates (fig. 60). Select the fertilizer that corresponds to the appropriate bottle number on the matriarch. Enter the desired application rate (mL/gal) or (mL/L) in the second column. When complete, select "Save" button in Grow Plan.

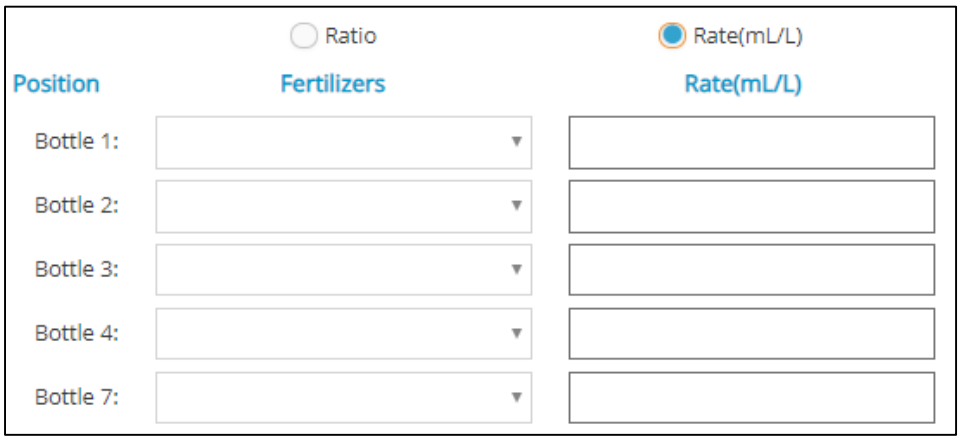


Figure 60: Rate conversion window

3. Fertilizers

Administrator can add/edit/delete Fertilizers in the System Configurations (page 6).

Control Device by Grow Plan

In the “Devices” page, user accounts can view all devices or those grouped by room in the room tab (fig. 61).

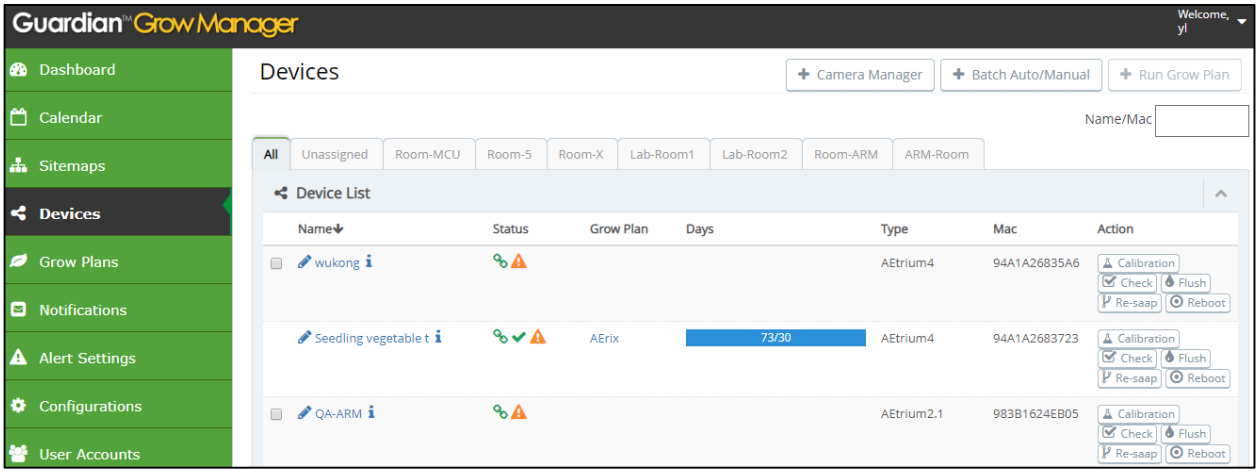


Figure 61: GGM settings based on nutrient calculation

Assign a Grow Plan to a Device

All actuators can be controlled automatically or manually through the Guardian Grow Manager software. A Grow Plan must be assigned to a device in order to enable auto control. User can run a Grow Plan in the Devices list (fig. 62) or the individual Device detail page.

In Devices list, user can apply a Grow Plan to multiple devices.

1. Go to “**Devices**” (selected from menu on left) page to see all devices.
2. Select one or several devices which do not have any Grow Plans running (check box shown on the left side of the row)

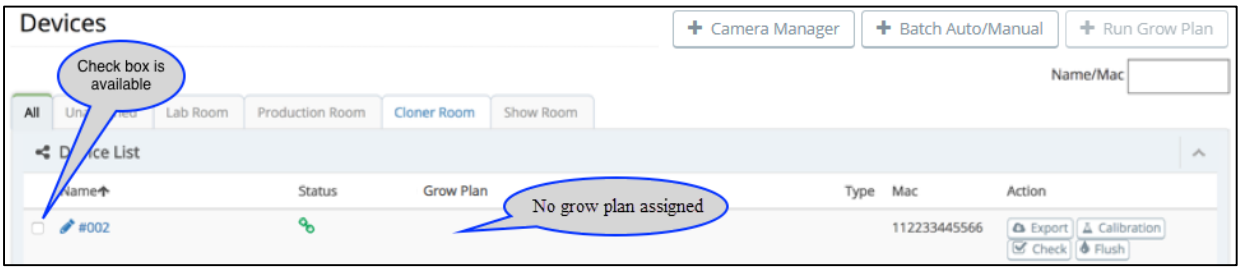


Figure 62: Devices page, check box on the left to select device

3. Click on top-right "**+ Run Grow Plan**" button, and then select a Grow Plan from the drop-down menu and designate start date (e.g. you may want to backdate the start date as a result of stopping the Grow Plan and restarting it during a production period) (fig. 63):

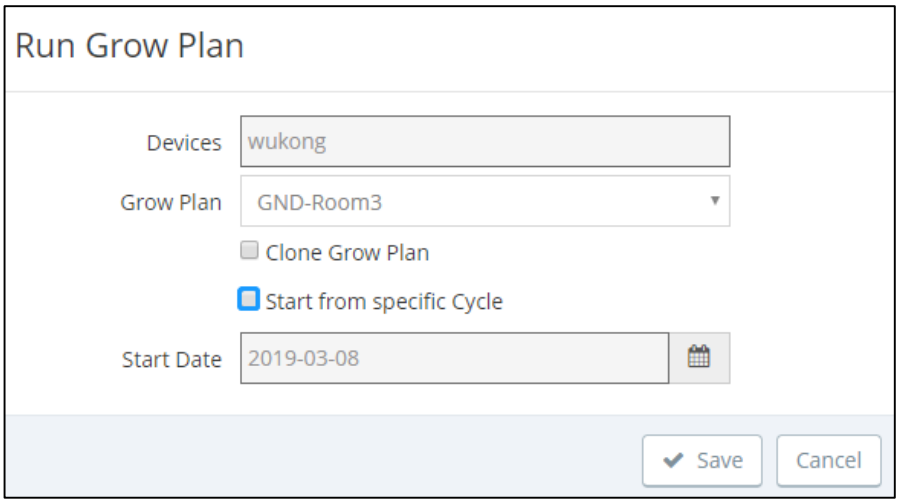


Figure 63: Run Grow Plan page, designate starting cycle and date

4. Click "**Save**" to start Grow Plan and auto control for the selected device.

In device control page, click on top-right "**+Run Grow Plan**" to assign a Grow Plan to the designated device (fig. 64).

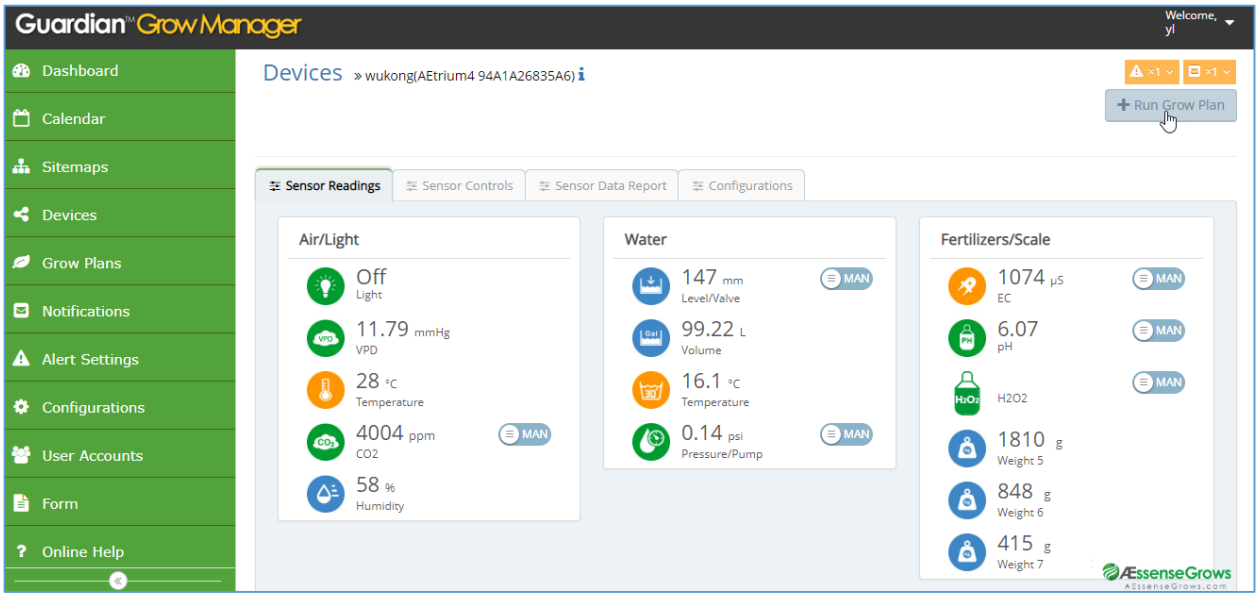


Figure 64: Run Grow Plan from Device page

Start Grow Plan from a Given Cycle

By default, Grow Plans will run from the beginning of the first cycle. In order to start or resume a Grow Plan from any cycle other than the first or from a specific day of the Grow Plan, in the "**Run Grow Plan**" popup window (fig. 65), the user can do the following:

1. Select a Grow Plan from the drop-down menu.
2. Check "**Start from specific cycle**"
3. Select start date to start Grow Plan auto control
4. Select grow cycle and enter the day of the cycle to start or resume the Grow Plan

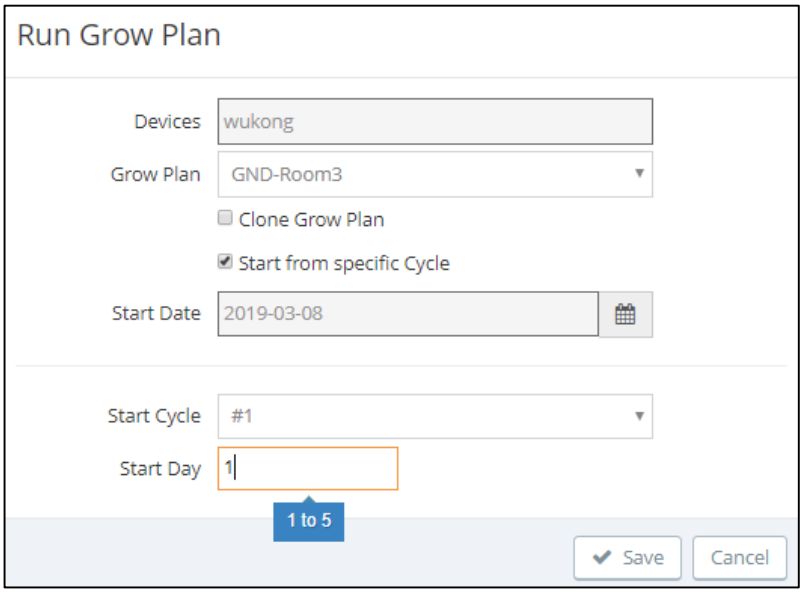


Figure 65: Starting Grow Plan from varying cycles and start date

Clone Grow Plan Before Start

Once a Grow Plan is running, any changes made will be applied to the original Grow Plan. If user does not want to change the original Grow Plan during this specific grow, but want to adjust control parameters freely, then check "**Clone Grow Plan**" after selecting a Grow Plan (fig. 66):

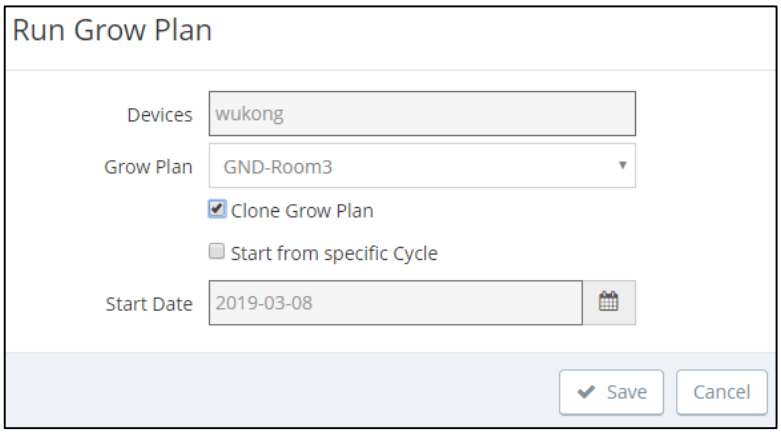


Figure 66: Clone Grow Plan

Cloning the Grow Plan means the device will run a copy of the Grow Plan Template. When the clone stopped, it will become a Grow Plan in

the "**Historical**" tab. The particular Grow Plan can be saved to a template (see page 29 above).

Important: Users can set whether to lock Template in the System Configurations according to their needs. If the user selects "Enable"(fig 67), GGM will automatically clone the Grow Plan when device running Grow Plan.

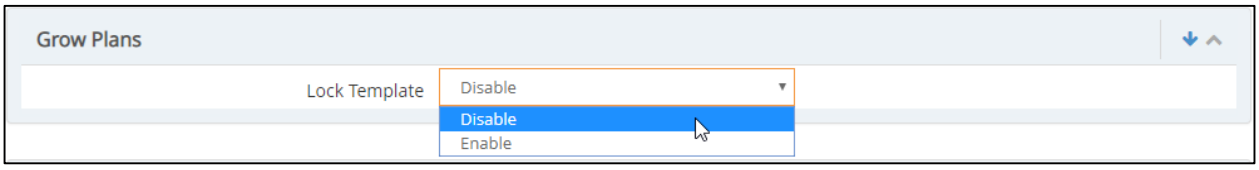


Figure 67: Lock Grow Plan Template

Managing Device

By clicking on the device, user can view the details of the device. Each individual device is a collection of about 30 sensors and 20 actuators. In the "**Sensor Readings**" tab (fig. 68), users can view all the current readings and switch the controls between "**Auto**" or "**Manu**".

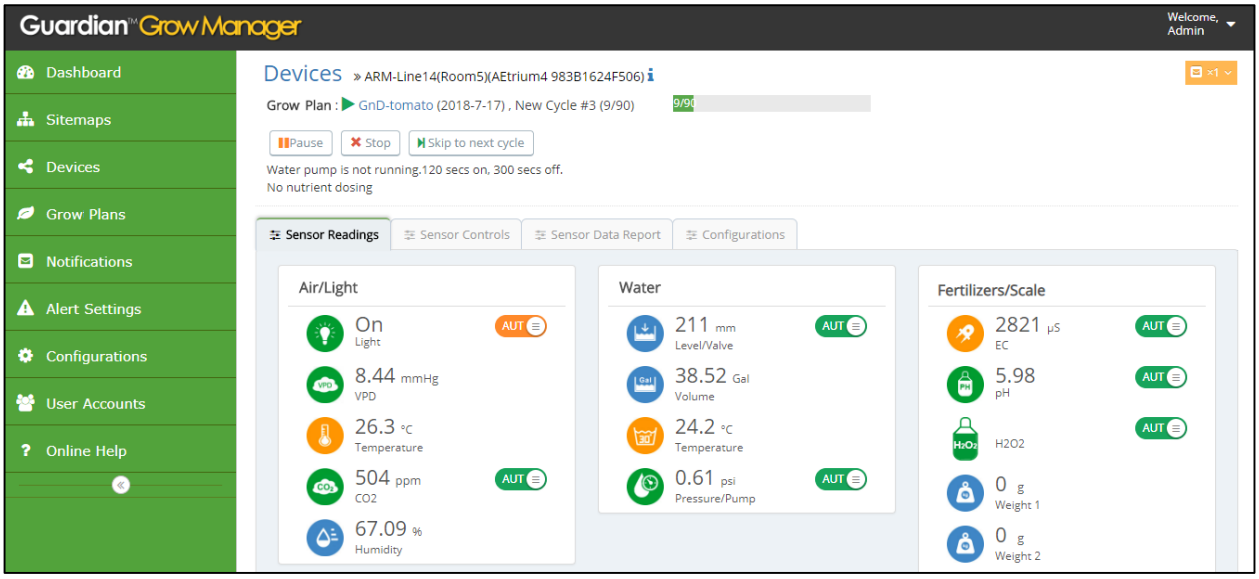


Figure 68: Sensor Readings tab on Device page

Toggle Settings:

- AUT: function is running according to Grow Plan settings

- Green: Function is running according to Grow Plan, but is currently not on or actuated
- Orange: Function is running according to Grow Plan and is currently on or is actuated

- Man: function is not running according to Grow Plan settings and is in the manual option
  - Gray: function is not currently on
  - Orange: function is currently on or actuated

In the "**Sensor Controls**" tab (fig. 69), users can control actuators if the toggle is in the manual position on the "**Sensor Readings**" tab. See Manual Device Control section below for details.

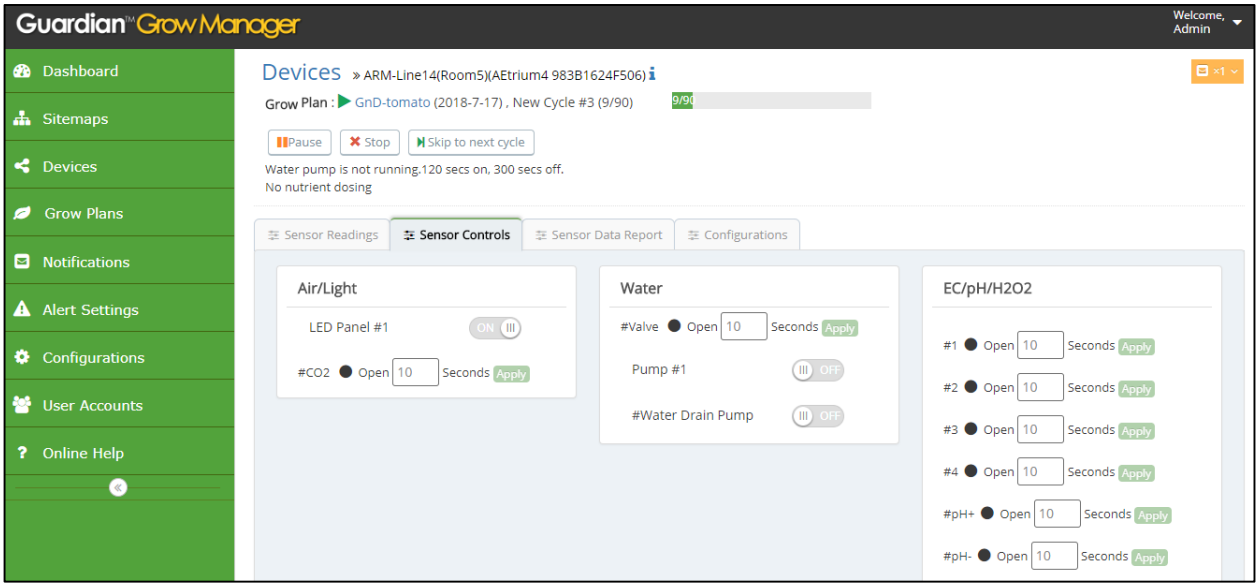


Figure 69: Sensor Controls tab on Device page

In the "**Sensor Data Report**" tab, all of the sensors and actuators can be viewed in a customizable graphical report.
Data for specific sensors can be viewed by selecting the appropriate sensor from the dropdown menu (fig. 70). The desired timeframe of data can be viewed by selecting Realtime, Day, Week, or Query.



Figure 70: Sensor Data Report tab

Further historical data can be viewed by clicking on "**« Previous**" below the graphical display. By clicking on and dragging the bookends of the bar below the graphical display (fig. 71), the user can zoom in on a specific time.

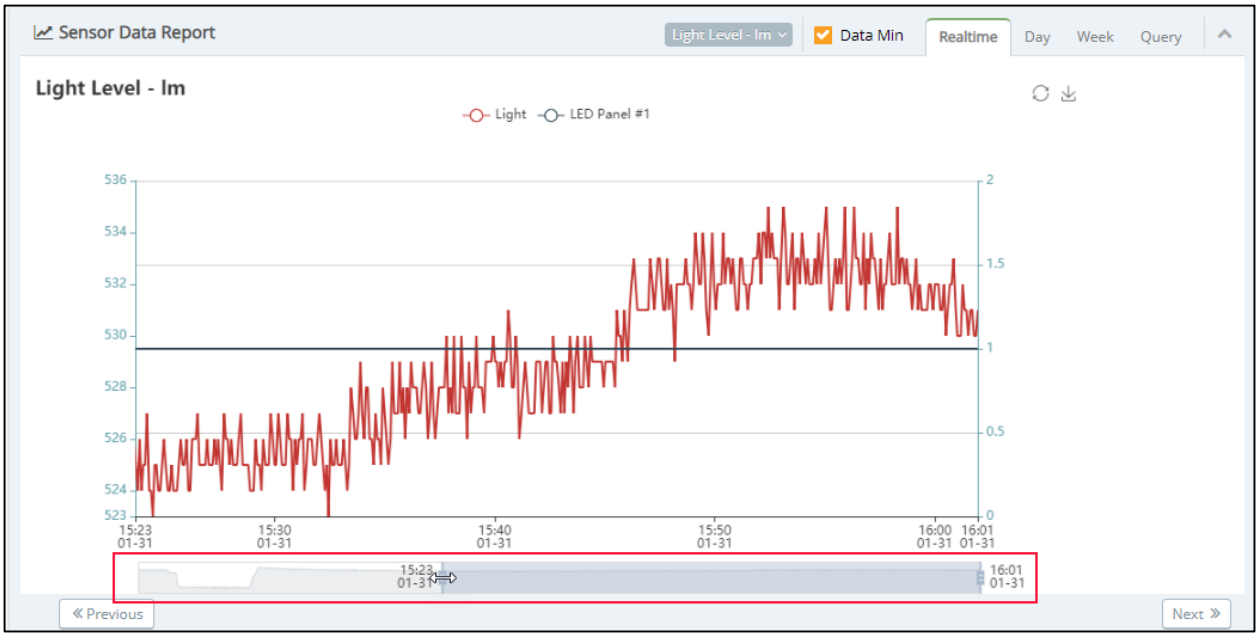


Figure 71: Custom temporal view of sensor controls

In the "**Configurations**" tab (fig. 72), users can set device-specific, configurations or get system configuration by clicking "**Copy System Config**" button. See Device Configurations section above (pg. 6).

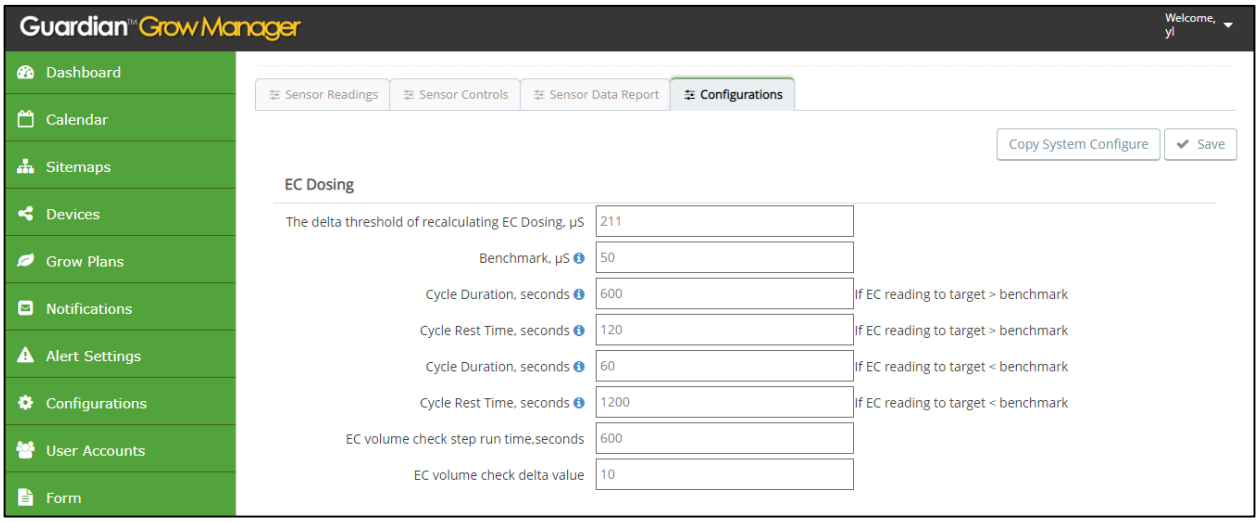


Figure 72: Device configurations tab

If the selected device is an AEtrium2.1, the "**Layer Control**" tab (fig. 73) will be shown and user can conduct layer control. Layers can be managed independently by applying a Grow Plan to the device and setting varying cycles to each layer. Further details below in AEtrium2.1 layer control

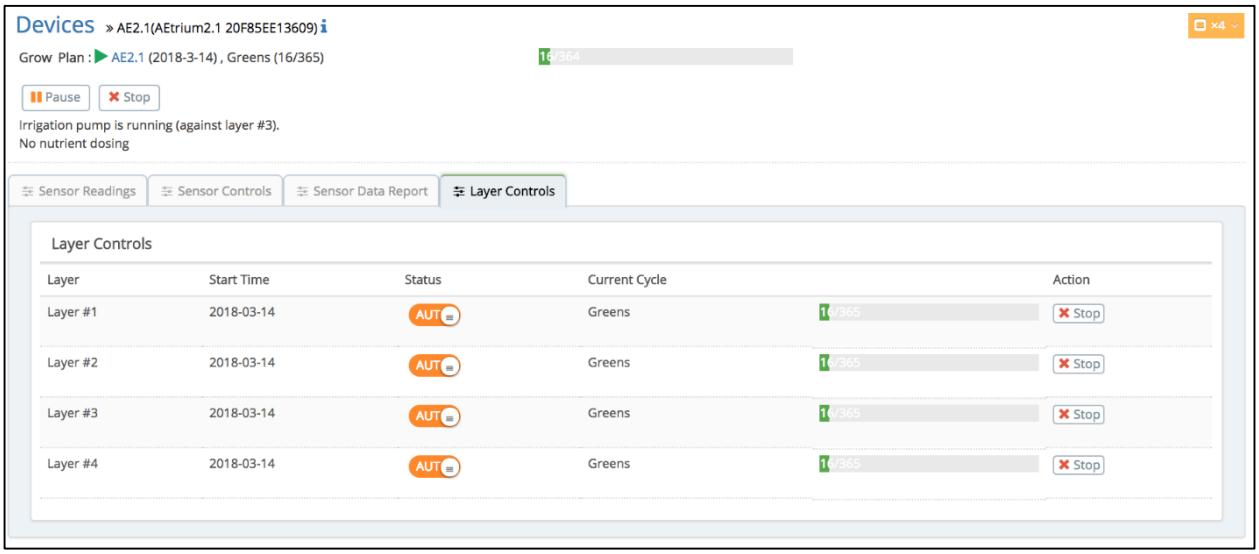


Figure 73: AEtrium 2.1 Layer Controls tab

Important: Before a device can be controlled automatically, a Grow Plan has to be assigned. User can do manual operations by pausing/stopping the Grow Plan or switch "**AUT**" to "MAN" for any controllable actuators.

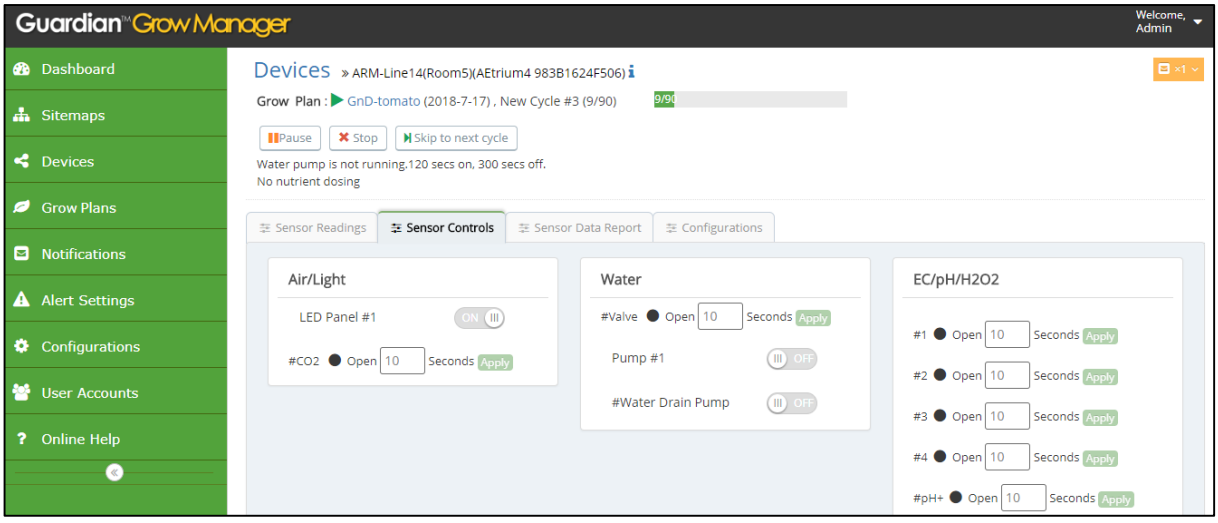
Manual Device Control

Inside the individual device page, in order to control certain actuator manually (e.g. Water level), do the following steps:

1. In "**Sensor readings**", switch from AUT 

to MAU 

to make water level manually controllable
2. In "**Sensor Controls**" tab (fig. 74), user can turn on/off CO2, add water, and dose fertilizers for a certain period of time by entering desired time in the text box and clicking on "**Apply**":



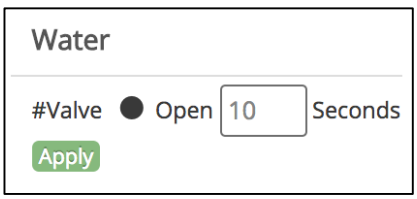


Figure 74: Sensor controls tab (top) and water valve actuation (bottom)

3. Actuators for lights and pumps can be manually run by clicking on the toggle next to the actuator to switch from OFF to ON. The toggle will turn Orange when actuated.

Pausing Grow Plan

When the Grow Plan is running, the user can pause the Grow Plan. This action is recommended for maintenance activities such as filter cleaning and sensor calibration. This function stops all irrigation, water level adjustment, and dosing operations for the duration specified. Lights can be kept on or turned off during this period as well. After the specified pause time has expired, the system will resume automatic control of the Grow Plan.

In the pause popup window (fig. 75), input pause time and choose '**Leave Grow Light ON**' to pause that all actuators be off except for Light.

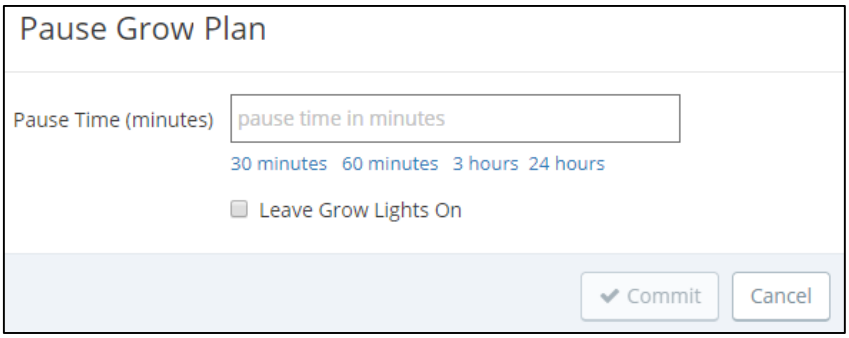


Figure 75: Pause Grow Plan window

User can resume running the Grow Plan (after light cool down period has completed, which can be configured in the settings) manually or wait the pause time. Additional time can be added to the pause cycle by clicking on the Extend Pause Time tab (fig. 76).



Figure 76: Extend pause time or resume Grow Plan

Advance Cycle

If the Grow Plan has several cycles, user can click "**Skip to Next Cycle**" to skip to the next.

AEtrium-2.1 Layer control

The layers of the AEtrium2.1 (fig. 77) have independent control of start time, fans, and lighting. Since all layers share a single reservoir, all will share the same nutrient solution.

1. Actuators be controlled according to the start time of each layer and the time when Grow Plan triggers irrigation and manages lights.
2. Each layer is irrigated according to the Water Pressure/Pump time set in the Grow Plan. The rest time may be greater than or equal to the run time multiplied by 1 minus the number of layers running (e.g. if the Grow Plan is running on three layers and the irrigation on time is 100 sec, then the rest time must be at least 200 sec).

The system default mode is "**MAN"** when the Grow Plan initially starts running, and LED/FAN/irrigation valve are off.

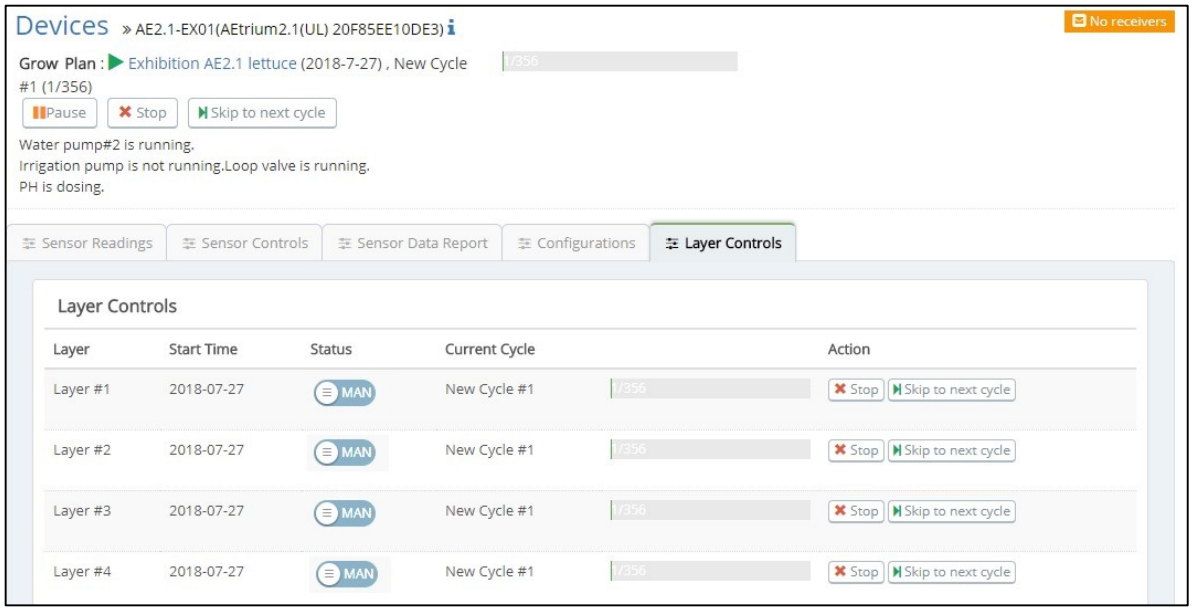


Figure 77: AEtrium 2.1 layer control tab after starting new Grow Plan, note all layers are in Manual

User can switch "**MAN**" to "**AUT**" to enable automatic control at each layer according to the Grow Plan (fig. 78).

Users can advance the cycles of each layer by clicking on the "**Skip to next cycle**" button or can stop the Grow Plan for the layer, by clicking on the "**Stop**" button in the "**Layer controls**" tab.

Clicking on the "**Stop**" button on the "**Sensor Readings**" tab will stop the Grow Plan from running on all layers, whereas clicking on the "**Stop"** button on the "**Layer Control"** tab will only affect the individual layer.

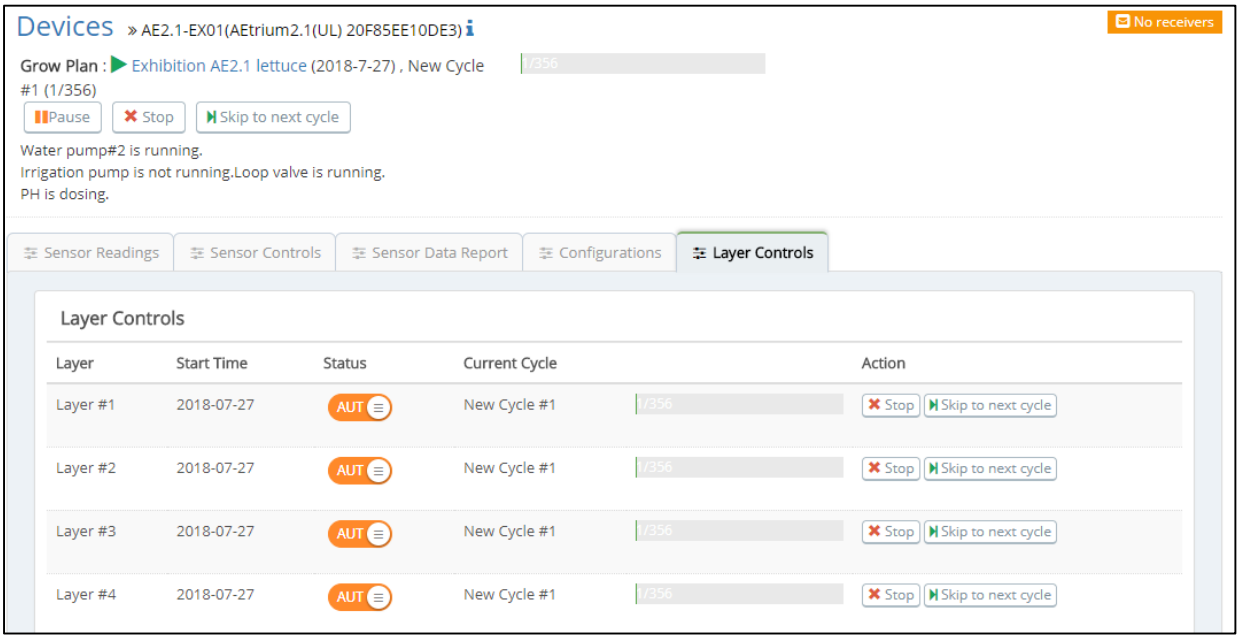


Figure 78: AEtrium 2.1 layer control tab after starting new Grow Plan, note all layers are in AUT and running off of the Grow Plan

Auto Device Cleaning

After installation, auto device cleaning functionality will help user:

1. Clean up watering system automatically based on manual or auto configurations
2. Launch cleaning task manually or automatically

In order to activate, go to "**Devices**" page, and click on the "**Flush**" button in "**Action**" column to start auto cleaning (fig. 79):

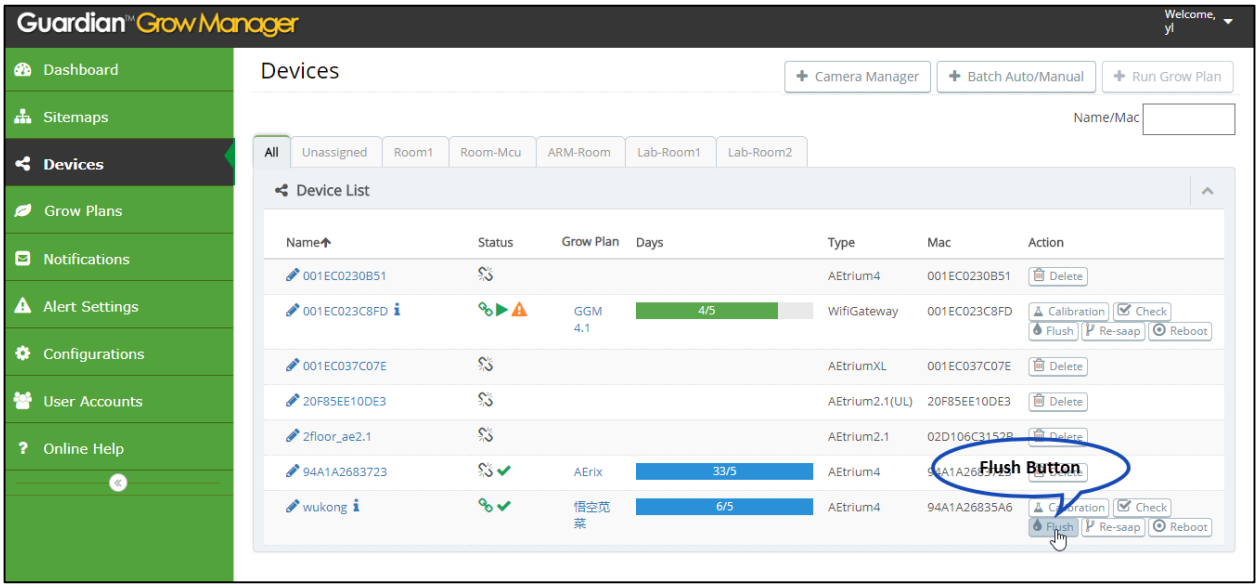


Figure 79: Flush button to activate cleaning or flush cycle

Status of auto cleaning will be showing through popups (fig. 80).

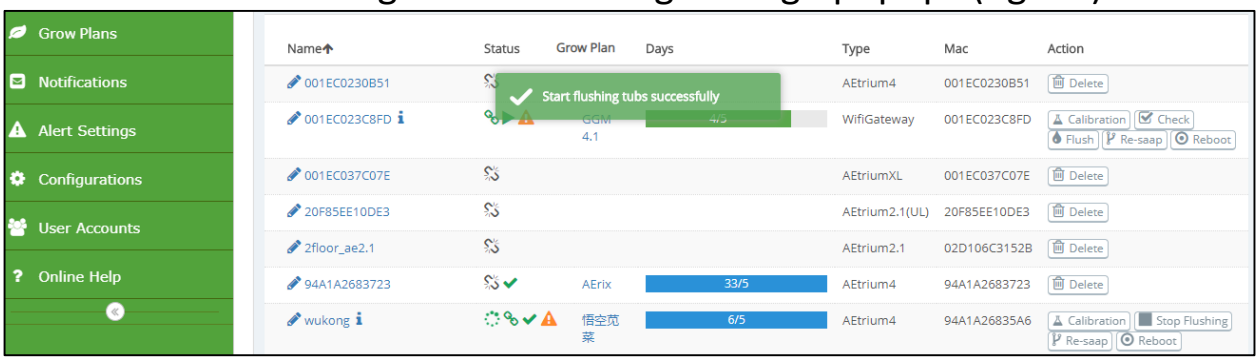


Figure 80: Flush cycle activation message

The flushing process is as follows,

1. **Drain water**. Server will first turn off all actuators, then turn on the drain pump to drain the water until the water level drops to 30mm.
2. **Add water**. The device will open the water valve to add clear water until the water level reaches a target value (default is set at 50% the volume of the reservoir).
3. **Rinse tub**. The device will open water pump for 60s to rinse the tubs.

4. **Check EC**. If the EC reading less than the setting value, then exit flush tub. Another condition of exit flush tub is the flushing times reached 3 times.

The cleaning process can be stopped or paused at any time by clicking on "**Stop Flushing**" button in the "**Action**" column or the Device page, or clicking on "**Pause Flushing**" button in the Device page (fig. 81):

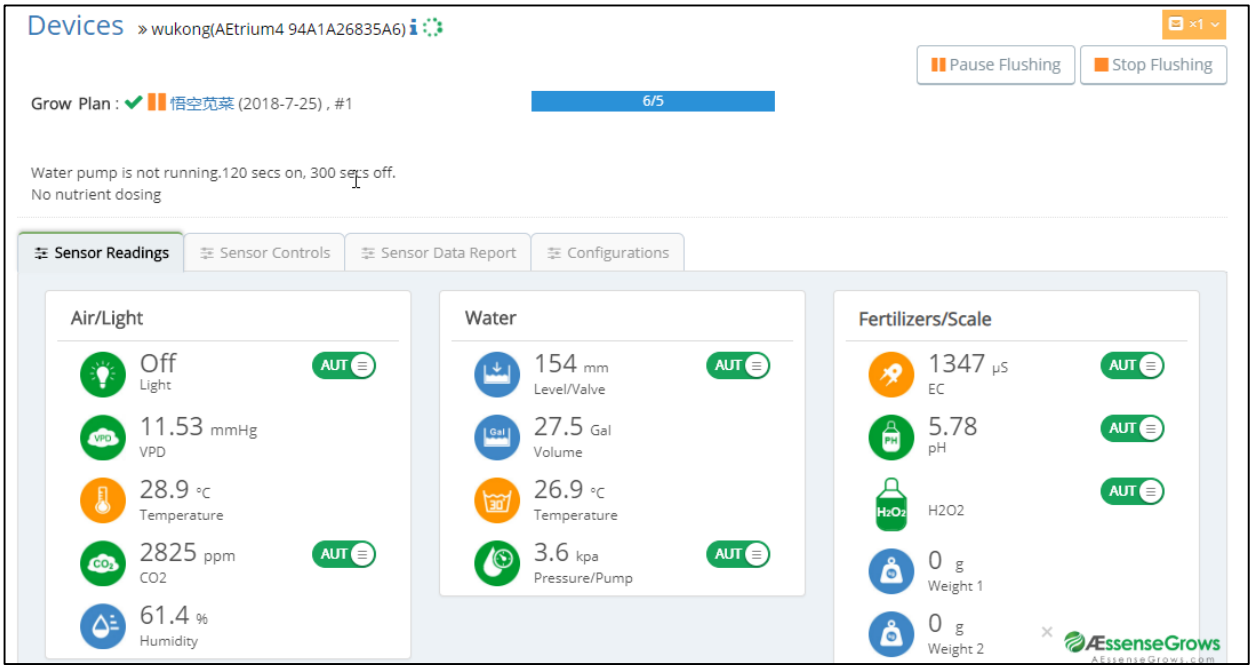


Figure 81: Status of flush cycle

Notifications

Notifications or alerts can be sent to account holders to notify the user when the system is not operating properly, or conditions have deviated from target values. Additionally, the user can view and search all of the system-defined notifications on the "**Notifications**" page by giving search criteria such as device name, notification type and start/end date. Currently, there are five types of notifications (fig. 82):

1) **Critical Device Event:** such as "Device is offline" as a result of a power outage and "Water pressure is very high".

2) **Sensor Data out of Range**: Based on the Grow Plan settings, a notification will be generated if the sensor reading exceeds the alarm thresholds, for example the pH reading is lower than low alarm set in Grow Plan. Now, GGM makes this more specific, divided into CO2, Water Pressure and Water Valve, etc.
3) **Control Board Issue**: such as Water Pressure Sensor not connected.
4) **System Event**: such as "Server startup" as the GGM Linux server restarted after a power outage.
5) **Task Reminder**: Notifies users with an assigned task, such as a reminder to calibrate sensors.

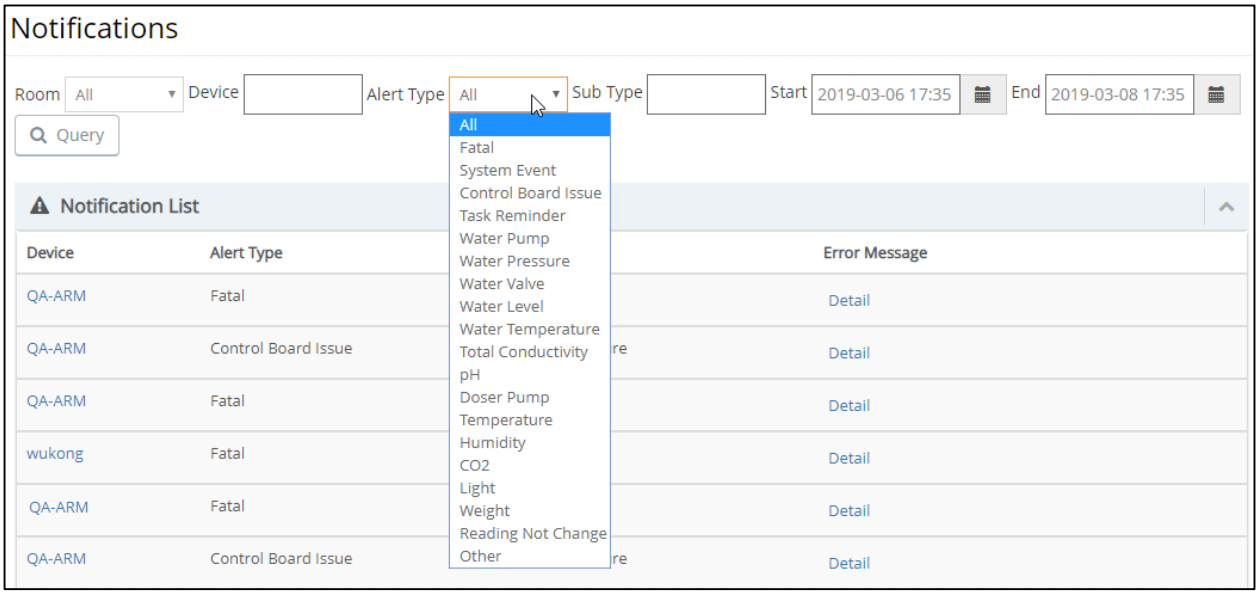


Figure 82: Notifications page

Alert Settings

For the notifications above to be sent (via email or SMS) to GGM users, specifications must be set in the Alert Settings page to designate each account user (fig. 83). This feature is only available for Administrators. The GGM Administrator can decide who will receive what types of alerts happened on which devices in the Room through Email or SMS or

both. The User must first have been applied permissions to the devices and room desired (see Manage Room Access section pg. 23).

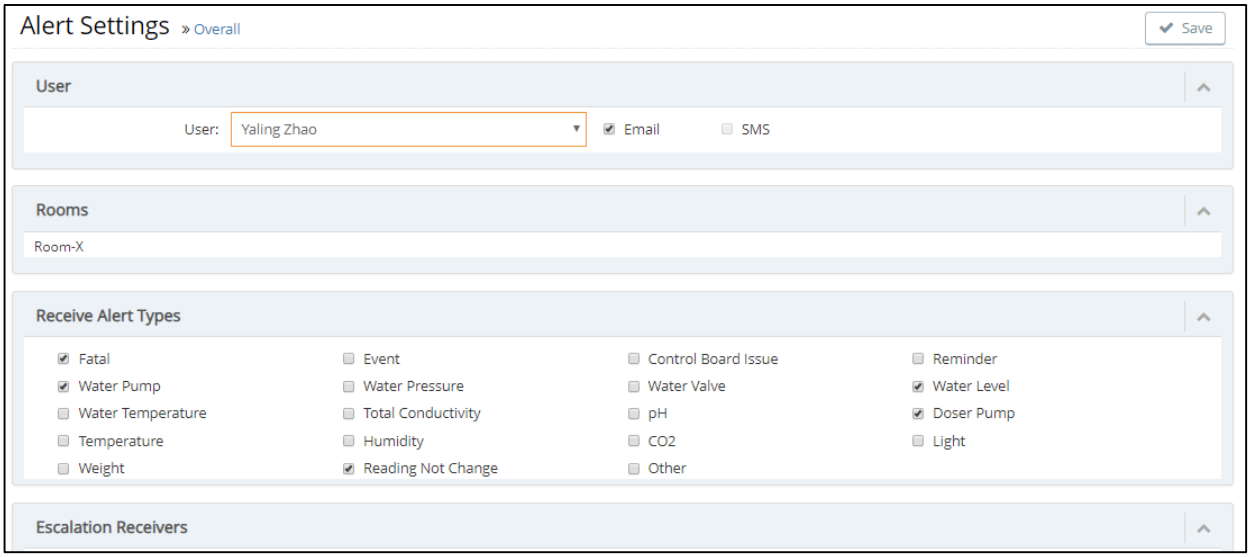


Figure 83: Designating alerts to user account

In addition to designating the user receiving the primary notification, all notifications can be set to have an escalated alert (fig. 84). If the critical alerts are not handled by the user timely, escalation will be sent out to the assigned receivers:

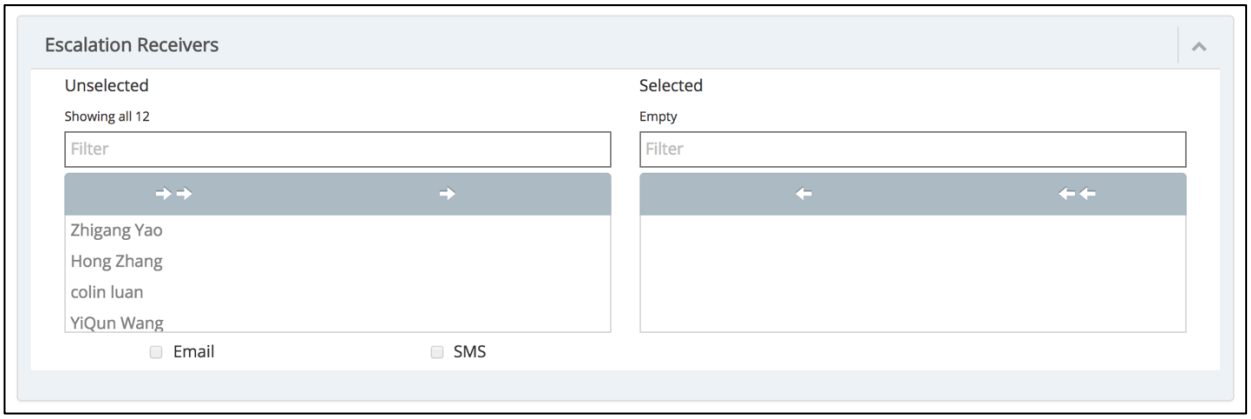


Figure 84: Designating escalation receivers

And user can view all alert settings by clicking "**Overall**" button (fig. 85).

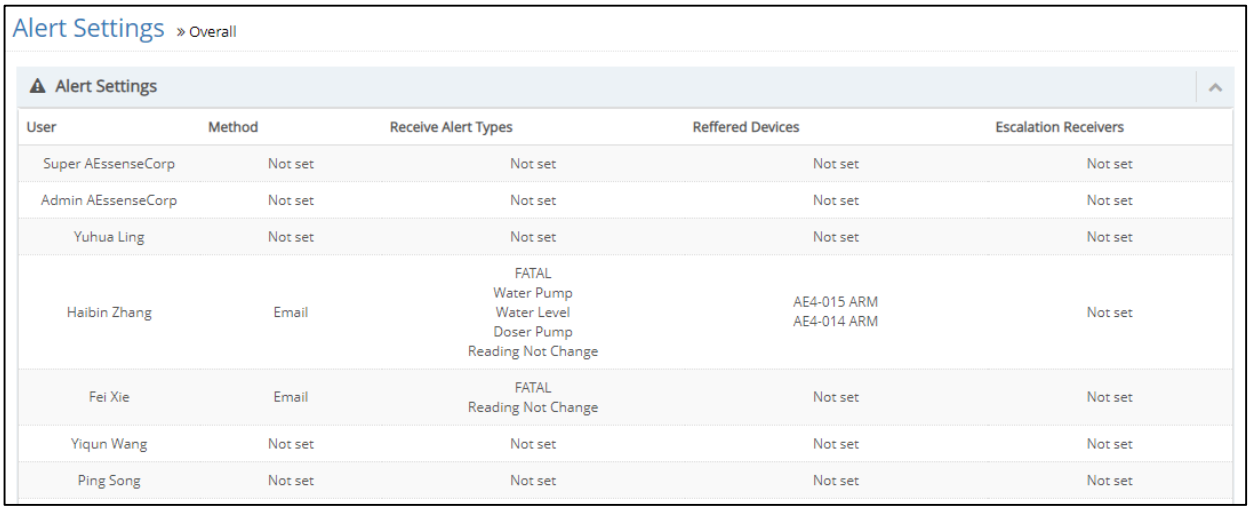


Figure 85: Alert setting overview

Dashboard

The Dashboard is the landing page for the Guardian Grow Manager software and provides various overviews of facility, devices, and assigned tasks.

Device Summary: Shows the summary of rooms and summarized information for all devices within a room (fig. 86). For each room, it shows the number of devices which are online, offline or having alerts. All devices which do not associate with any site will be put under '**Unassigned'**.

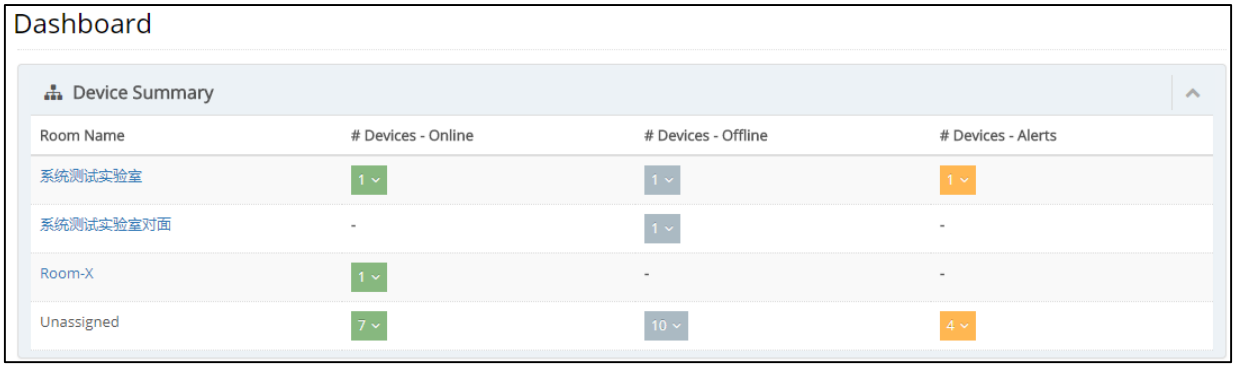


Figure 86: Device summary display in the Dashboard

Grow Plan Summary: indicates the status of the Grow Plans that are running. For each running Grow Plan, the Grow Plan Summary will indicate the Start Time, the Cycle Status (running days/total days based on Grow Plan), and the number of devices running that Grow Plan which are online or offline (fig. 87). All Grow Plans which are not running on any device will not be shown here. If one Grow Plan running on two batches of devices with different start time, two records will be shown in this section.

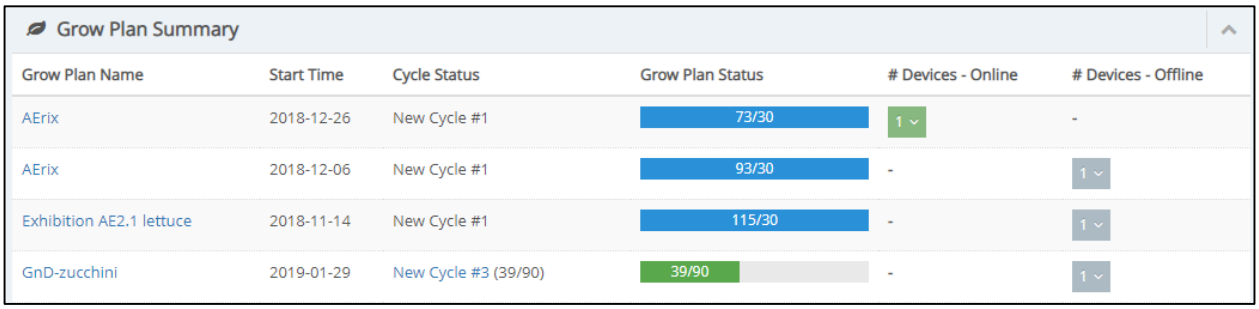


Figure 87: Grow Plan Summary display in the Dashboard

Camera Management (Optional)

A camera can be added to each device in GGM to monitor plant status. Administrators can add, edit and delete camera servers (Digital Video Recorder) and cameras. The user can check plant grow status through camera management easily and quickly.

Add a camera server

1. Click on "**Camera Manager**" button in devices list page (fig. 88):

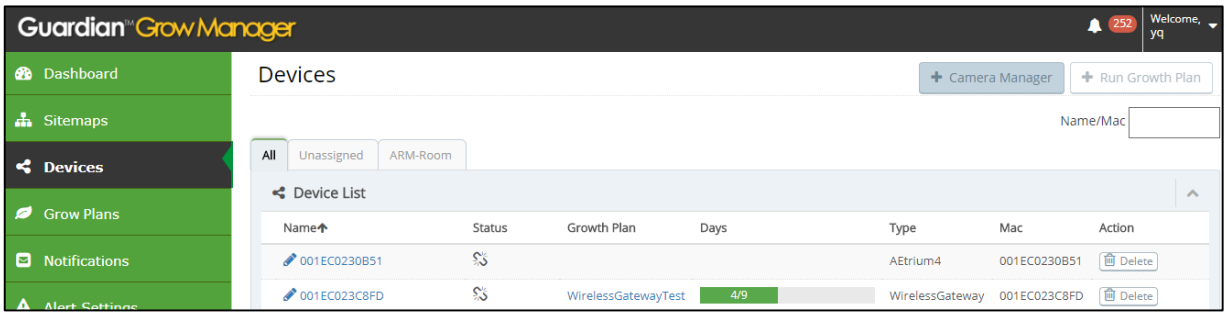


Figure 88: Add camera option in Devices page

2. Click on "**Add Server**" button in camera page (fig. 89):

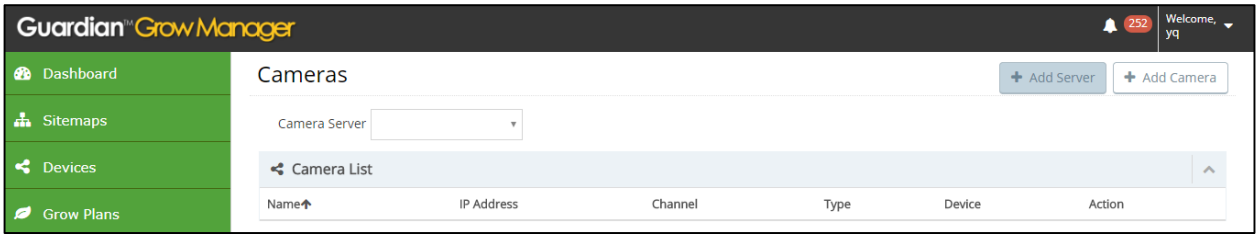


Figure 89: Add Server option

3. Input camera server information and click "**Save**" button (fig. 90):

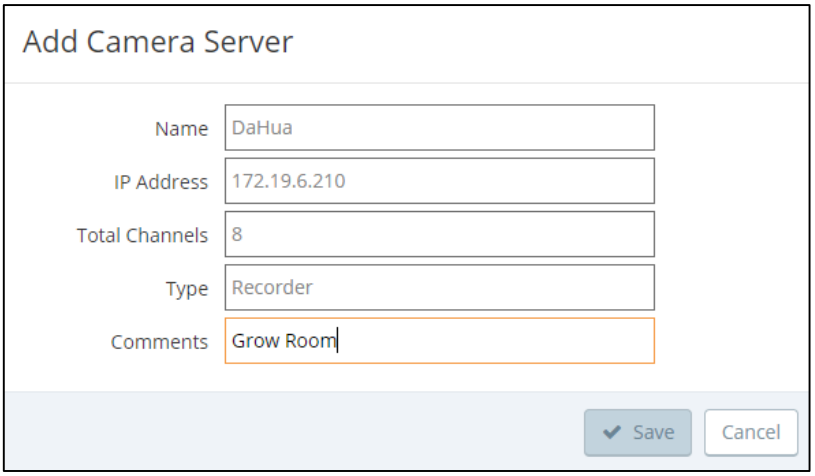


Figure 90: Edit Camera Server details

Add a camera

1. Click on "**Add Camera**" button in camera page (fig. 91):

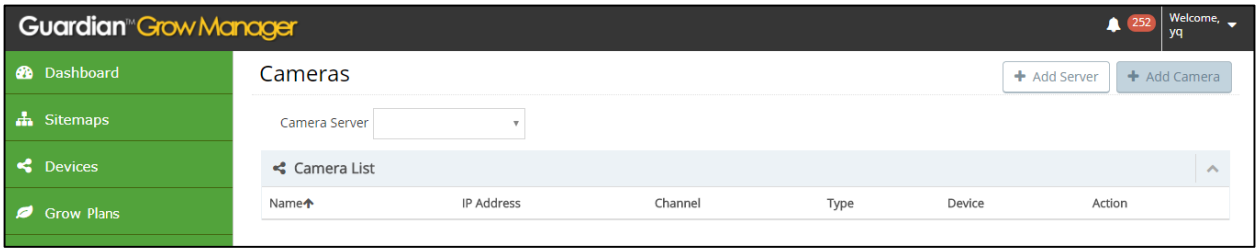


Figure 91: Add camera option

2. In order to input Camera information, select camera server and device which associated (fig. 92). Then Click "**Save**" button.

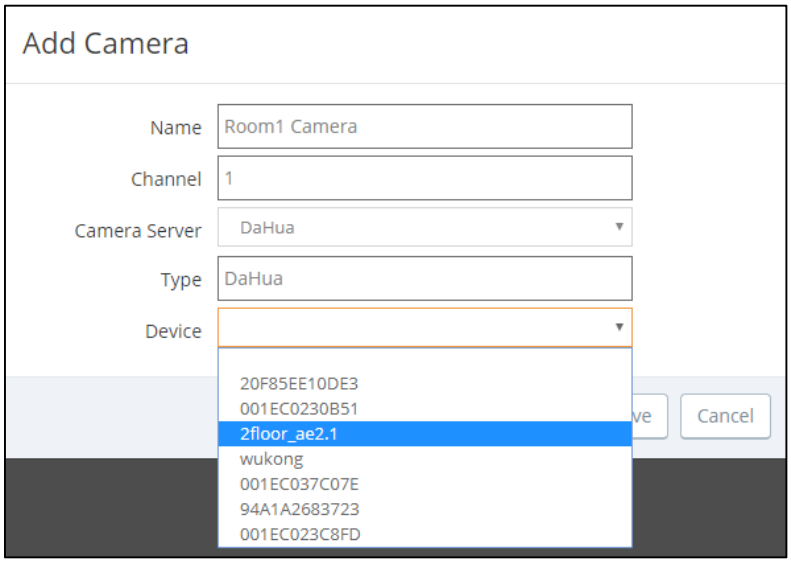


Figure 92: Edit camera details

3. After the camera and camera server have been added and configurations set, images from the camera will appear in the associated device page (fig. 93):

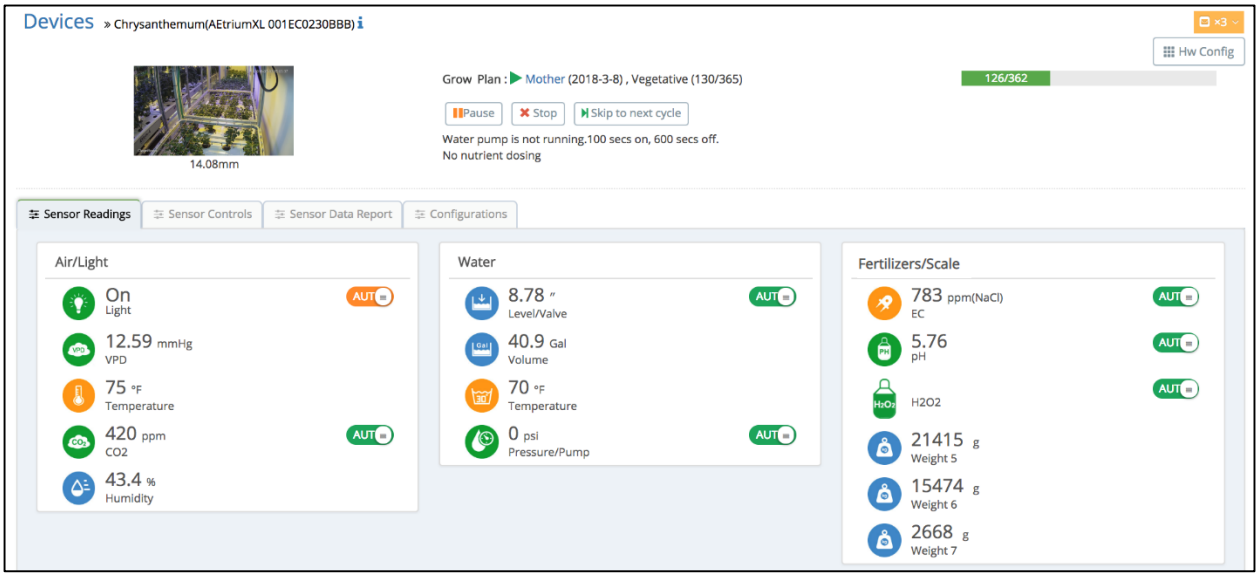


Figure 93: Camera image in Device page

Edit Camera Server and Camera

After adding a camera and server, details of both can be edited at any time.

1. Select Camera Server in camera page (fig. 94):

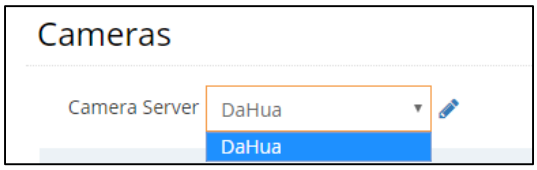


Figure 94: Camera select

2. All Cameras which connect to the selected server will show in below (fig. 95):

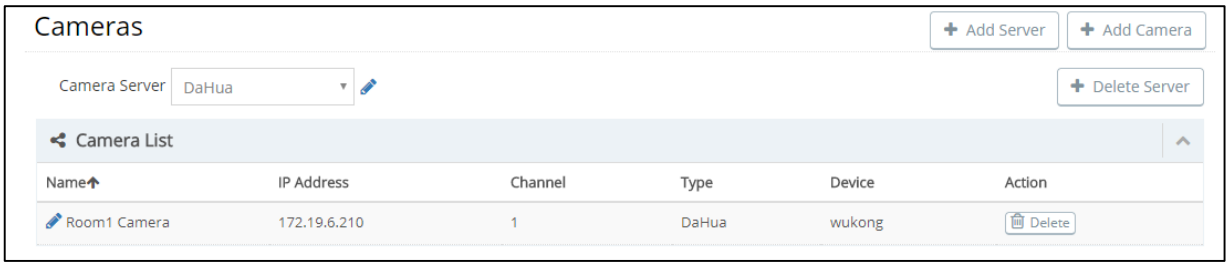


Figure 95: Camera list

3. Click button behind camera server and edit camera server (fig. 96):

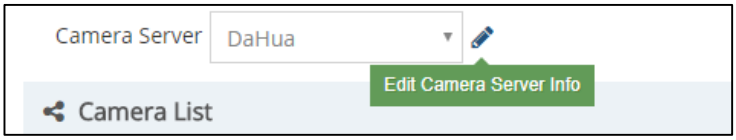


Figure 96: Edit camera server icon

4. Click button for each camera can edit camera information (fig. 97):

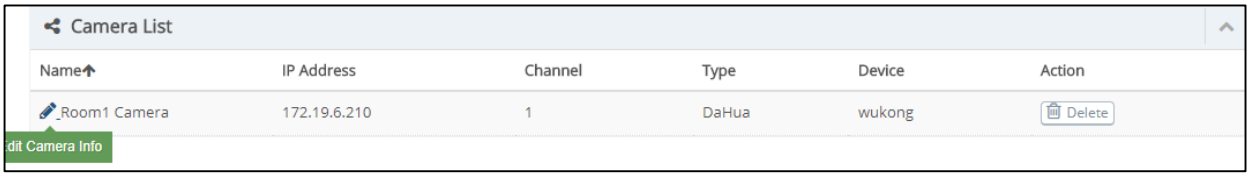


Figure 97: Edit icon in Camera List

Delete Camera Server and Camera

1. Click "**Delete**" button for each camera can delete this camera (fig. 98):



Figure 98: Delete icon in Camera List

2. Click "**Delete Server**" button can delete the selected Server and all cameras which associated (fig. 99):



Figure 99: Delete camera server button

User Accounts

Administrators can add, edit and delete accounts. Users can change password. There are 3 roles defined in the system: Admin (full access), User (View and some operations) and Viewer (View only).

Add an account

1. Click on the "**+ Add**" button in the User Accounts page (fig. 100):



Figure 100: Add account in User Accounts page

2. Enter all required information for the new account in "**Add User**" popup window. Email and phone number are required to receive alert notifications (fig. 101).

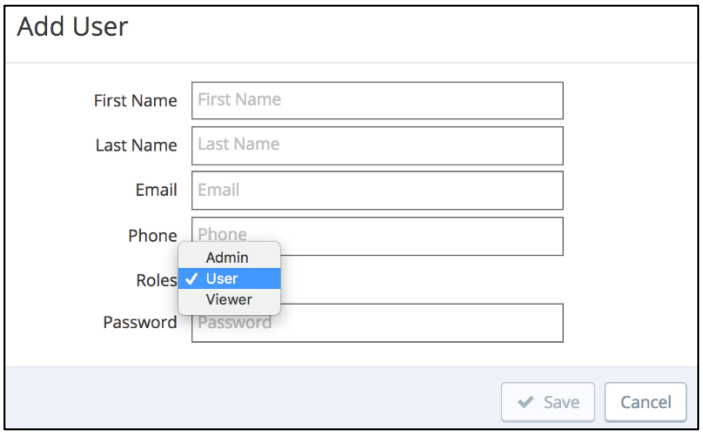
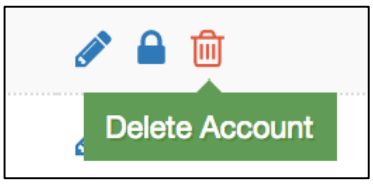


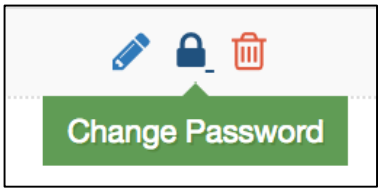
Figure 101: Add user details window

Delete an account



Change an account

Change password



Edit an Account

Change any other user related information:

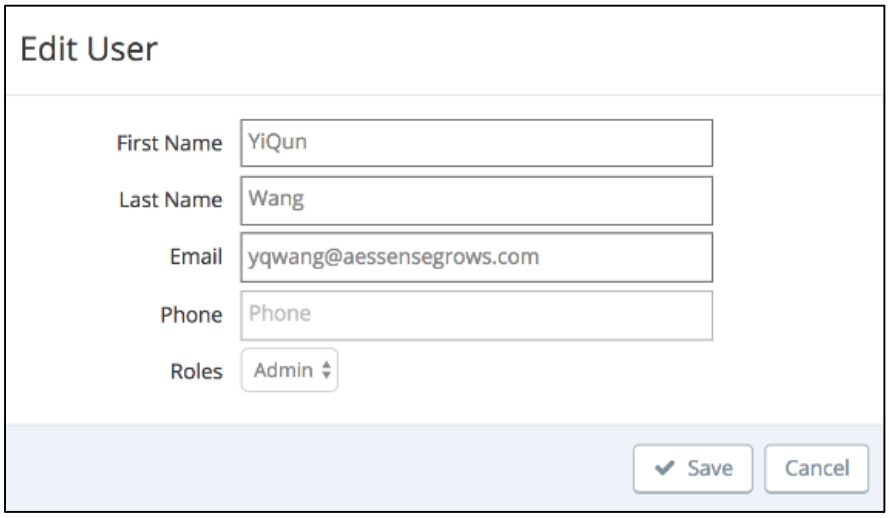


Figure 102: Edit account user information

In the User List page in the User Accounts section, the User Accounts can be sorted by column (fig. 103).

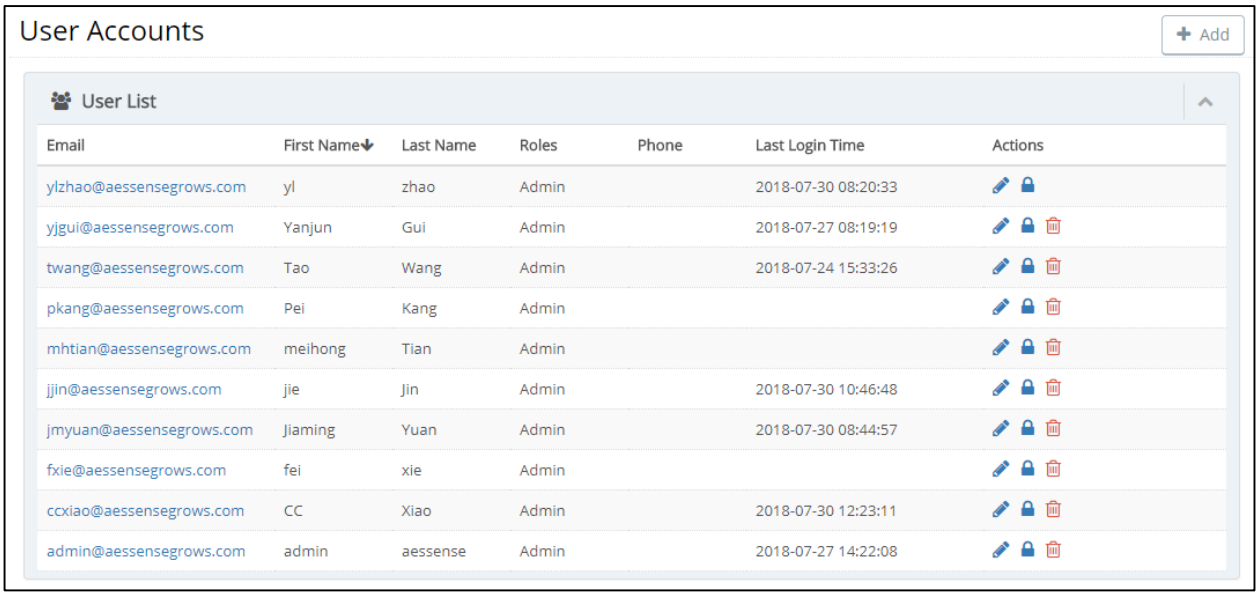


Figure 103: User List

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