aiLights

SOFTWARE MANUAL

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1. What is AILights and What is its Pourpose?

AILights is a product by BUL-AI that allows you to control and adjust the functions of specific panels designed for growing plants. This artificial intelligence represents an automated greenhouse management system that helps create optimal conditions for different crops. It is compatible with both large industrial and small domestic greenhouses.

AILights is suitable for a variety of customers: large corporations, food manufacturers, amateur gardeners, and farmers. The software can be controlled from your mobile device with an Android or iOS operating system. You can also take advantage of its features through your televisor if the model allows it.

Through AILights, you can monitor and control the panels and automate the processes responsible for temperature, humidity in the greenhouse, carbon dioxide, pH, soil moisture, operating mode, ventilation, aspiration, irrigation system, artificial light, and electricity.

2. How to Use AILights?

In order to use AILights, you need to follow these steps:

- Connect the power supply at the bottom of the box, then connect the sockets in the control panel (Chapter 2.2) GBOX to the Internet via the WAN/LAN port, and place the sensors in their required locations in the "Sensor Panel" part (Chapter 2.1);
- Scan the QR code located on the front of the GBOX, and if this does not work, go to the address http://10.10.10.1;
- Download and install the AI Lights app from the website by scanning the QR code on the GBOX packaging or via https://aigarden.bg/app.apk;
- Make a registration;
- Open the app and enter your username and password if you already have an account. If you don't have one, click "Register" and follow the on-screen instructions.

Figure 1.

- Below the "AILights" caption on the displayed screen, you will see a drop-down menu and, next to it, a circle (Figure 1). If it glows in green, then the controller is enabled. Tap the dot to enter the login form. If your dot glows in gray, tap it and a message will pop up telling you what the problem is.
- To activate the controller, you need your unique key or QR code, which you will receive after your registration or through the GBOX (the control box) card in your package. It is important to know that each ID is valid for one customer only and cannot be distributed or used by others.
- Connect the sensors to the controller via the software connection between them (Chapters 3,4,5,6).
- Check that the connection is successful and that the sensors are working properly.
- Set the panel functions using the AI Lights app (Chapter 6).

Figure 2.

On the main screen, you will see all the sensors you have connected to the app. To change the settings of a panel, click on its icon. You will see detailed information about it, such as its current status, the function it performs, and other parameters.

You can select any of the preset functions or create your own. You also have the option to set a schedule for each of the specified panels to match your needs and preferences.

2.1 Sensor positioning

To properly connect the sensor panel (Figure 3), connect the sensors to the appropriate ports using cables:

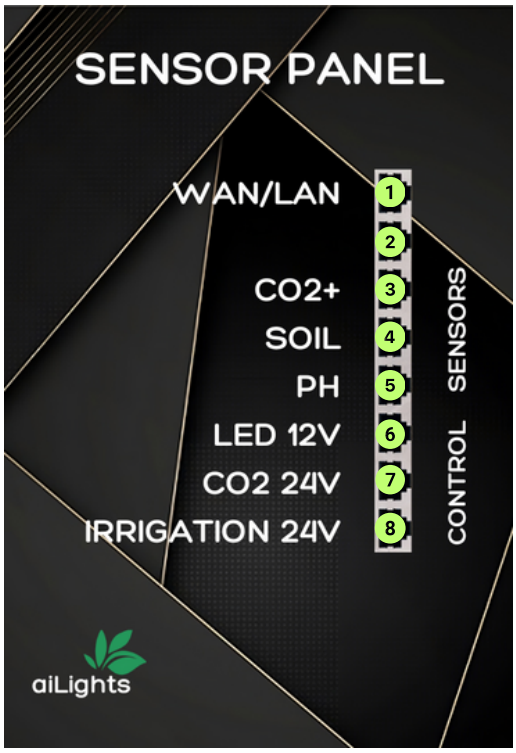


Figure 3.

1. WAN/LAN port for connection to the device.
2. Second WAN/LAN port for connection to the device.
3. Port for a CO_2 sensor with a voltage of 24V.
4. Port for a soil moisture measuring sensor with a voltage of 5V.
5. Port for a soil PH measuring sensor with a voltage of 5V..
6. Port for a connection with the LED controller with a voltage of 12V.
7. Port for a connection with the CO_2 controller with a voltage of 24V.
8. Port for a connection with the irrigation system with a voltage of 24V.

Pay attention to the various ports that are connected to the sensors and control panel. Connecting them differently will lead to incorrect use of the software and to receiving incorrect or no information about the status of your greenhouse and the plants you have decided to grow in it.

2.2 Control panel positioning

On the other side of your control box, you will find a control panel (Figure 4) used to control the aspiration, LED lights, and a smart socket.

Figure 4.

1. Socket for aspiration with a voltage of 220V and MAX 16A.
2. Socket for LED lights with a voltage of 220V and MAX 16A.
3. SMART SOCKET with a voltage of MAX 16A.

3. Working With the Interface

The system interface consists of a main menu and various screens that display information and settings for each function. The main menu is located in the upper left corner of the screen and takes the form of three horizontal dashes. When you tap them, a drop-down menu will open with the following options (Figure 5):

(1)Home - It redirects you to the home screen, where you can see a summary of the system and the status of your plants.
(2)Profile - This option allows you to modify your profile, such as your username, password, email, and other personal data.

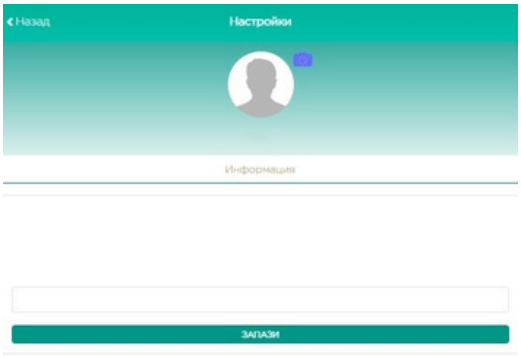


Figure 5.1. This is how your profile looks like

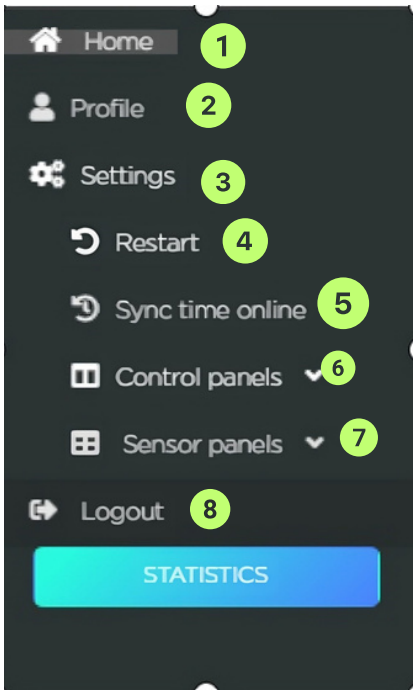


Figure 5.

(3)Settings - It gives access to general system settings such as plant selection, software lock (password), panel regulation, and more.
(4)Restart - This option allows you to reboot the system if you have a problem or want to update the software.
(5)Sync time online - With this option, you can synchronise the system clock with an online source to ensure the accuracy of time intervals and schedules.
(6)Control panels - This option opens a submenu with different panels for controlling the system functions. Each function has its own panel that displays the current values and allows you to change them according to your needs and preferences. The submenu has the following options:

- **Ventilation -** this option opens the ventilation control panel for you. It allows you to adjust the speed and direction of the fans.
- **ASPIRATION –** controls aspiration and ensures optimum temperature, humidity and air.
- **CO_2 -** opens the CO_2 control panel. Here you can view and adjust the CO_2 level in the room.
- **IRRIGATION -** irrigation control panel. Here you can view and adjust the amount and frequency of watering your plants.
- **Smart socket -** this option opens the control panel of the smart contacts. Through it you can view and adjust the power supply of various devices connected to the system, such as lights, pumps, sensors and more.
- **HYDROPONIC –** through this panel you control your hydroponic system.

(7)Sensor Panels - This option allows you to set and monitor various lighting and installation system parameters.
(8)Logout - This option logs you out of the system and redirects you to the login screen.

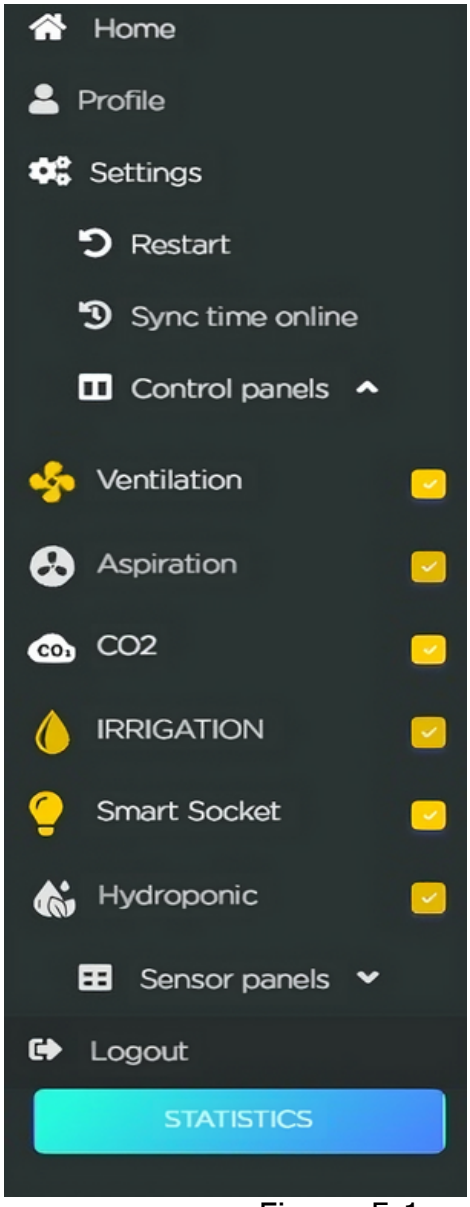


Figure 5.1

3.0.5 Sensor Panels

Sensor panels are essential for the quality control of your plants. Through its functionality, you can set and monitor the various parameters of the whole system.

The shown data helps you optimise growing conditions and prevent potential problems such as drying, overheating, burning and bleaching. The sensor panel can be set to send notifications to your device if a parameter exceeds a set value.

Selecting this menu option shows you the following data field:

- **Temp:** Displays the temperature near the installation in degrees Celsius or Fahrenheit.
- **CO2:** Shows the concentration of carbon dioxide in the air (ppm).
- **Humidity:** Tracks humidity in percent.
- **Soil Humidity:** Displays the soil moisture percentage.
- **Ph Soil:** From here you can see the acidity of the soil in pH units.
- **EC:** Controls the electrical conductivity of soil.
- **Water Temp:** Shows the temperature of the water that waters your plants in degrees Celsius or Fahrenheit.

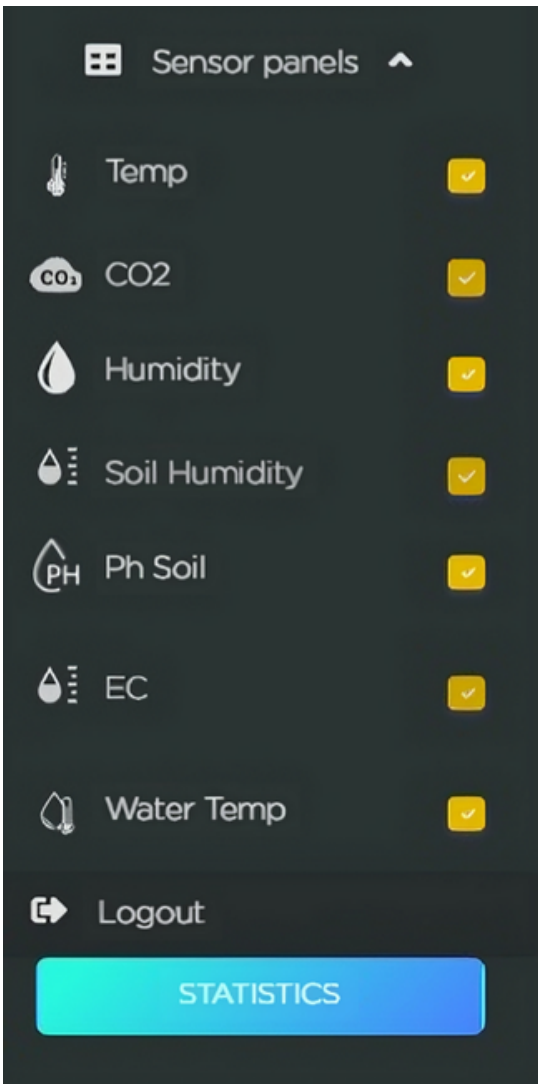


Figure 5.2

3.1. PIN/password insertion

Our software allows you to put a password in the form of a PIN on the application that can be changed at any time. To lock the app with a PIN, follow these steps:

- Open the app and sign in to your account.
- Click the Settings button and select Security.
- Activate the Lock app with the PIN option.
- Enter the four-digit PIN you want to use and confirm it.
- Log out of the app. Now, when you open the app again, you'll need to enter your PIN to log in.

To change your PIN, follow these steps:

- Open the app and sign in with your current PIN.
- Click Settings and select Security.
- Select Reset PIN.
- Enter the old PIN, then the new PIN you want to use, and confirm.
- Exit the application. Now, when you open the app again, you'll need to enter the new PIN to log in.

3.2. Software configuration

To set a function, click on the icon in the corresponding panel. This will reveal detailed information about the functions that can be performed through it, the energy used, and more (Figures 6, 6.1, and 6.2):

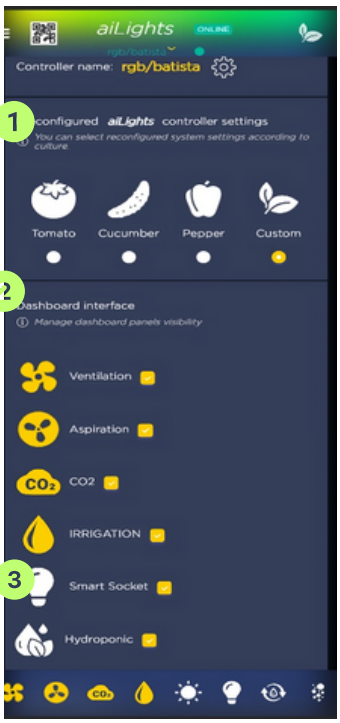


Figure 6.

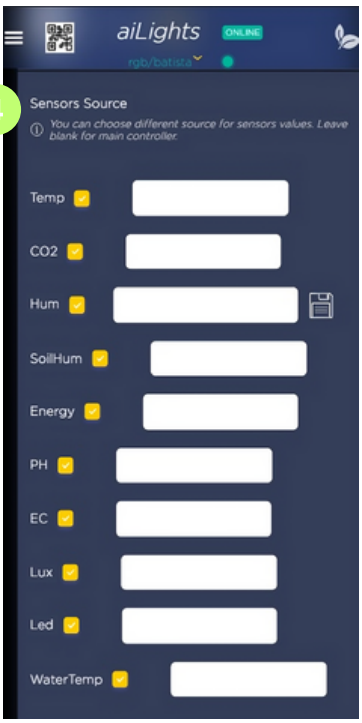


Figure 6.1.

Figure 6.2.

(1)This section allows you to select presets for growing vegetables, which include tomatoes, cucumbers, peppers, and lettuce, as well as to choose your own settings.
(2)**Dashboard interface** is an option that allows you to have visibility of the dashboard panels. They show you different information and controls of the system. To select a panel, you must check the box next to the name of the source you want to use.
(3)"**SMART**" is a feature that automatically adjusts the panels according to the conditions in the greenhouse and the needs of the plants. To set it up, you need to select the fruit or vegetable you are growing and then set the desired temperature, humidity, and lighting in the greenhouse. Here is an example of setting up the "SMART" function:
(

3.3. System for health analysis of your plants

- (3.1)If you want to change any of these parameters, you can do so using the sliders or buttons.
- (3.2)Once you set the parameters for the "SMART" function, the application will save and send them to the panels. They will work according to the set criteria and adapt to changes in the greenhouse conditions. For example, if the temperature in the greenhouse drops below 18°C, the sensors will switch on and raise it to the desired temperature
- (3.3)To change the function of a panel, press one of the following buttons: SMART, TIMER or MANUAL from the drop-down menu. You can then use the sliders or buttons to set the detailed settings for the function.

With AILights you can constantly monitor the health of your plants. Do it like this (Figure 7):

(4)**Sensor Source** allows you to select which sensors to display on the home screen along with information about them from their sources.
(5)With **Sensors Connection** you can adjust temperature, humidity and soil as well as PH, EC and water temperature.

3.3. System for health analysis of your plants

With AILights you can constantly monitor the health of your plants. Do it like this (Figure 7):

3.2. Калибриране на CO_2 сензор

(1) Schedule or restart every selected second;

(2) Simulate sunrise/sunset;

(3) Lock the software with a password for better protection;

(4) Set time for automatic lock;

(5) Interface with lock settings (New password);

(6) Enable graphics;

(7) Turn on plant light intensity analysis;

(8) Turn on the plant condition analyzer.

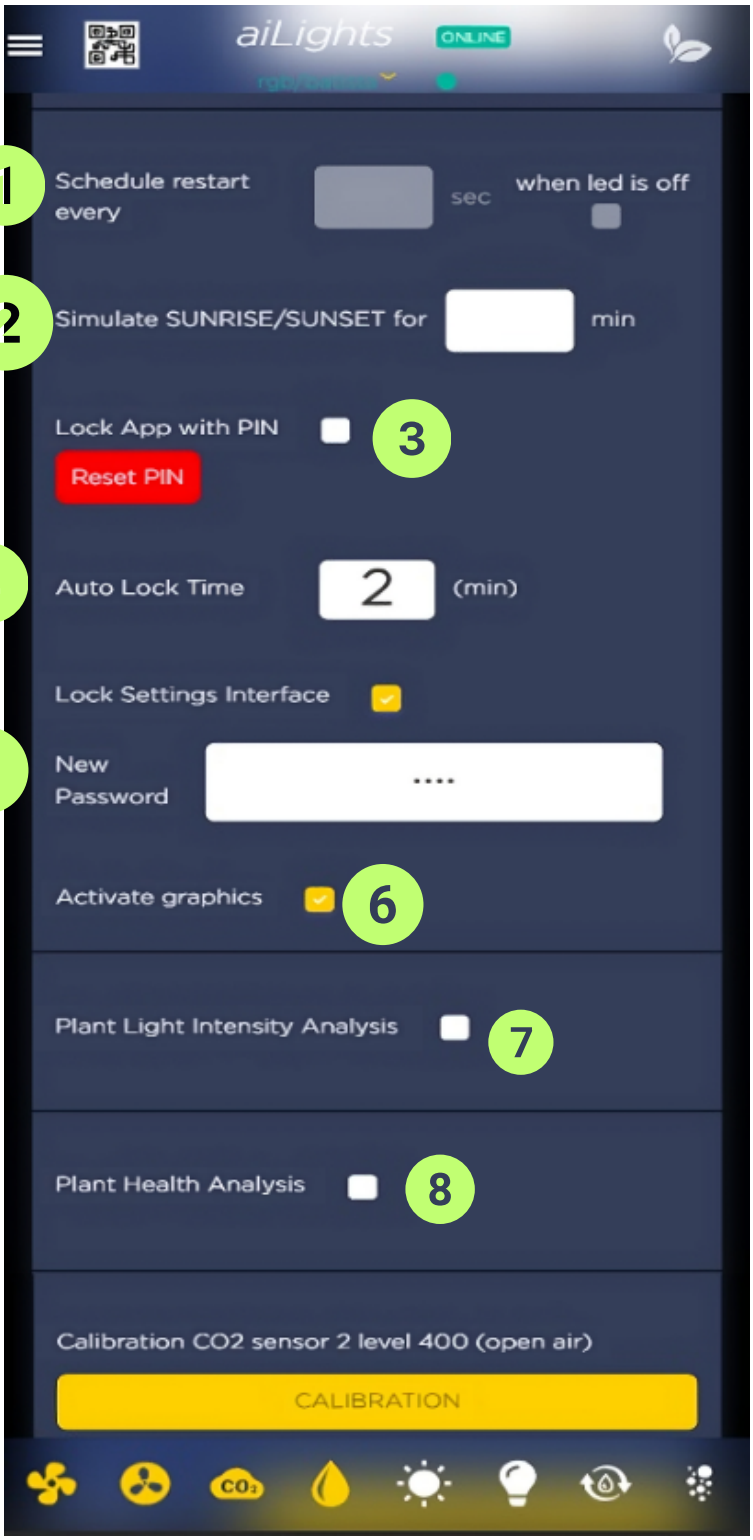


Figure 7.

Further work should allow you to select your settings in more detail. Selecting the "Open" option opens the statistics menu. From there you can select the amount of calibration at different stages:

-Stage 1;
-Stage 2;
-Stage 3;
-Stage 4;
-Stage 5.

Including you have the **Master Reset** option to return to the base settings.

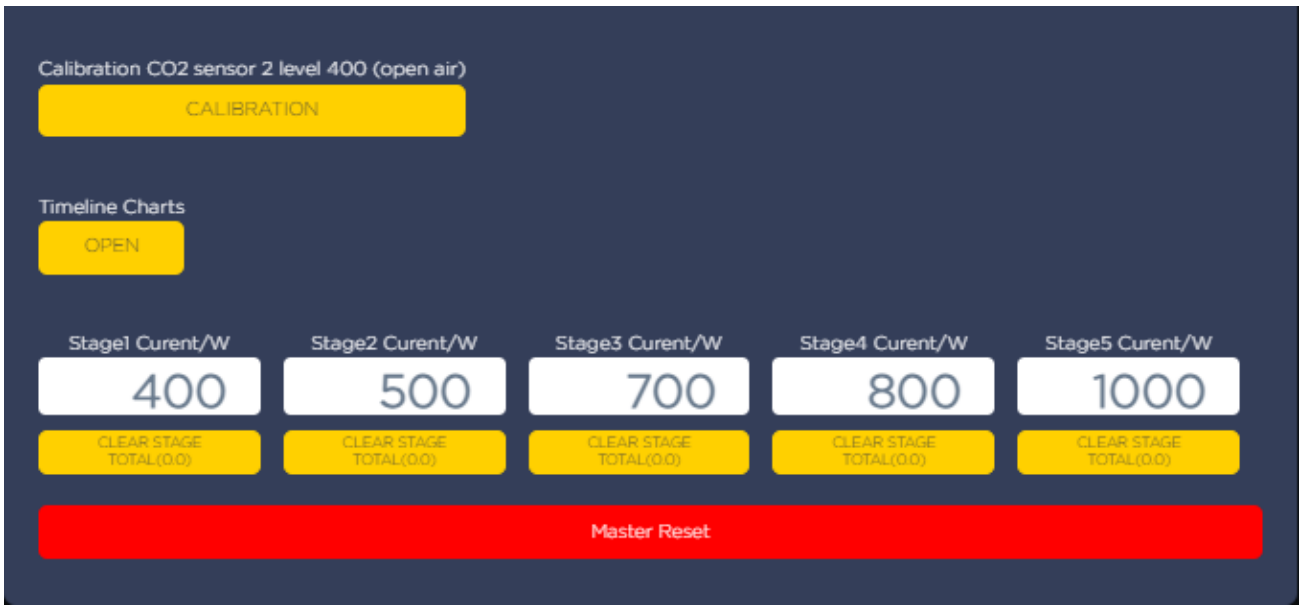


Figure 7.1

By selecting the Callibration button, the system asks you if you want to calibrate your selected sensor.

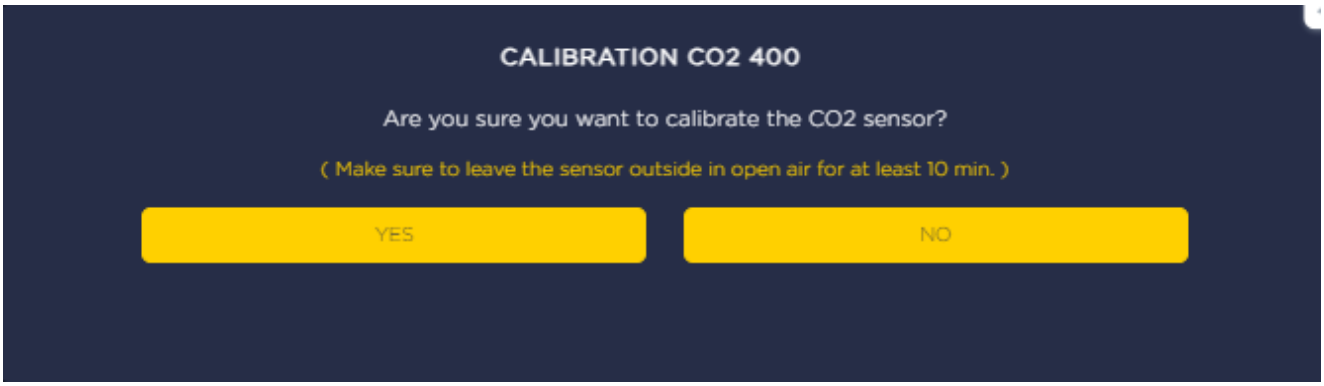


Figure 7.2

4. Tracking information about the growth conditions of your plants

figure 8.

These panels in the control menu allow you to monitor the levels of (figure 8):

1. The temperature in your greenhouse. 2.The CO_2 in your greenhouse. 3.The humidity in your greenhouse. 4.The soil humidity in your greenhouse 5. The soil pH in your greenhouse. 6.The energy used in your greenhouse.

4.1. LED control panel

LED lighting provides optimum light for the growth and flowering of fruit and vegetables. The system can change the colour, intensity, and duration of the lighting according to the development phase. It is controlled automatically (depending on the set schedule) or manually via the software by setting (figure 9):

figure 9.

1. Stages.
2. Start time.
3. Duration.
4. Current status.
5. Power button.

4.1.1. Adjusting the light cycle of plants

The light cycle of plants is an important factor in their growth and development. Different species have special light requirements, which are measured in hours per day and intensity. To optimise the light cycle of your plants, you can use a light system with a choice of options:

1. Determine what kind of plants you have and what kind of light they need.
2. Choose the system that suits the needs of your plants.

With AILights, you have a choice between different light systems that give different light variations: (figure 9):

We have divided the light intensity division into five stages. The parameters are set based on our years of experience and research in the field, and we have trained our artificial intelligence based on the most optimal settings to achieve the best results. We have defined 5 growth stages: **SEED, EVEG, LVEG, FLOW, LFLO.**

Through the manual settings, you can change the intensity and spectrum of the light according to your needs.

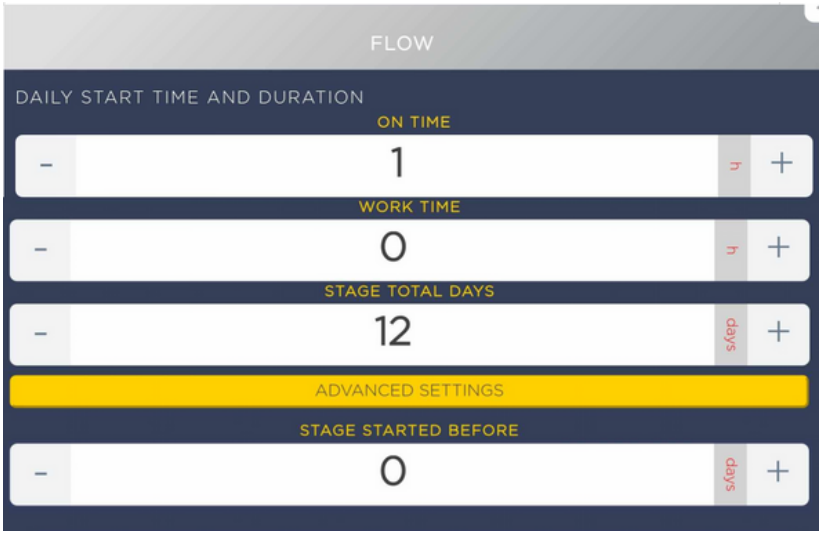


figure 9.1

When the yellow Advanced Setting box is clicked, additional settings are displayed (Figure10.2).

4.1.2. Adjustment by sliders

Manual configuration allows you to control the following options (figure 10):

figure 10.

1. The time the lights start.
2. The minute of starting the lights.
3. The hours of work.
4. The duration of each stage.
5. Days since the start of the stage.
6. VEG LED lighting.
7. BLOOM LED lighting.
8. UV LED lighting.

4.1.3. Connection to the artificial light lamp

In the AILights package, a powerful and adjustable LED lamp (figure 11) is included to provide the light your plants need for photosynthesis. It is extremely easy to connect and is designed for use by anyone. Also included are a power cord (figure 12) and an RJ11 cable to connect the lamp to the sensor panel (figure 13).

figure 11.

figure 12.

figure 13.

To successfully turn on the lamp, you will need to connect the bottom of the power cord (point 1 in figure 14) to the power port located at one end of the artificial light lamp (figure 15).

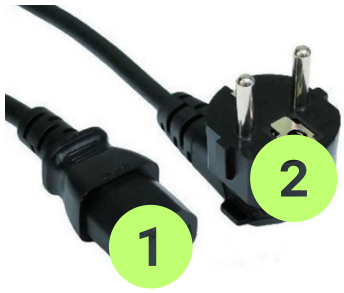


figure 14.

figure 15.

Then connect the other end of the cable to the LED light socket located on the right side of your GBOX labelled LED 220V MAX16A (figure 16).

figure 16.

To complete the connection, connect one end of the other RJ11 type cable (Figure 14) to the free port located at the Control Ports on the other side of the lamp (figure 17) and the other end to the sensor panel located on the left side of your GBOX and labelled LED 12V (figure 18). (Connect the other sensors to their respective locations in the same manner).

figure 17.

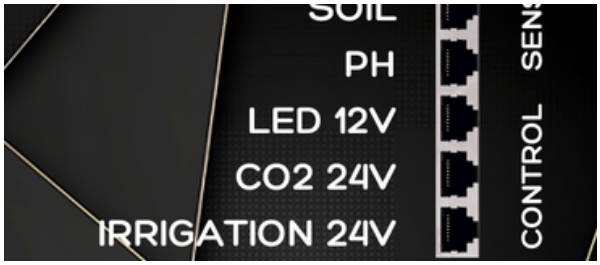


figure 18.

Once you have connected your artificial lighting, you have several options for manual setup and adjustment via the control panel. You are able to configure 3 types of lights (Chart 20):
(1)VEG LED lighting;
(2)BLOOM LED lighting;
(3)UV LED lighting.

To make the manual setup possible, you need to move the switch button (point 4 of graph 20) to the "Manual" option (point 5 of graph 20).
Important note: Moving the switch to the "Manual" option will disable the ability to adjust the different types of lighting from the control panel sliders.

To regain control of the lighting on the sliders from the control panel, please move the switch from the "Manual" option to the "Controller" option again (point 6 of figure 19).

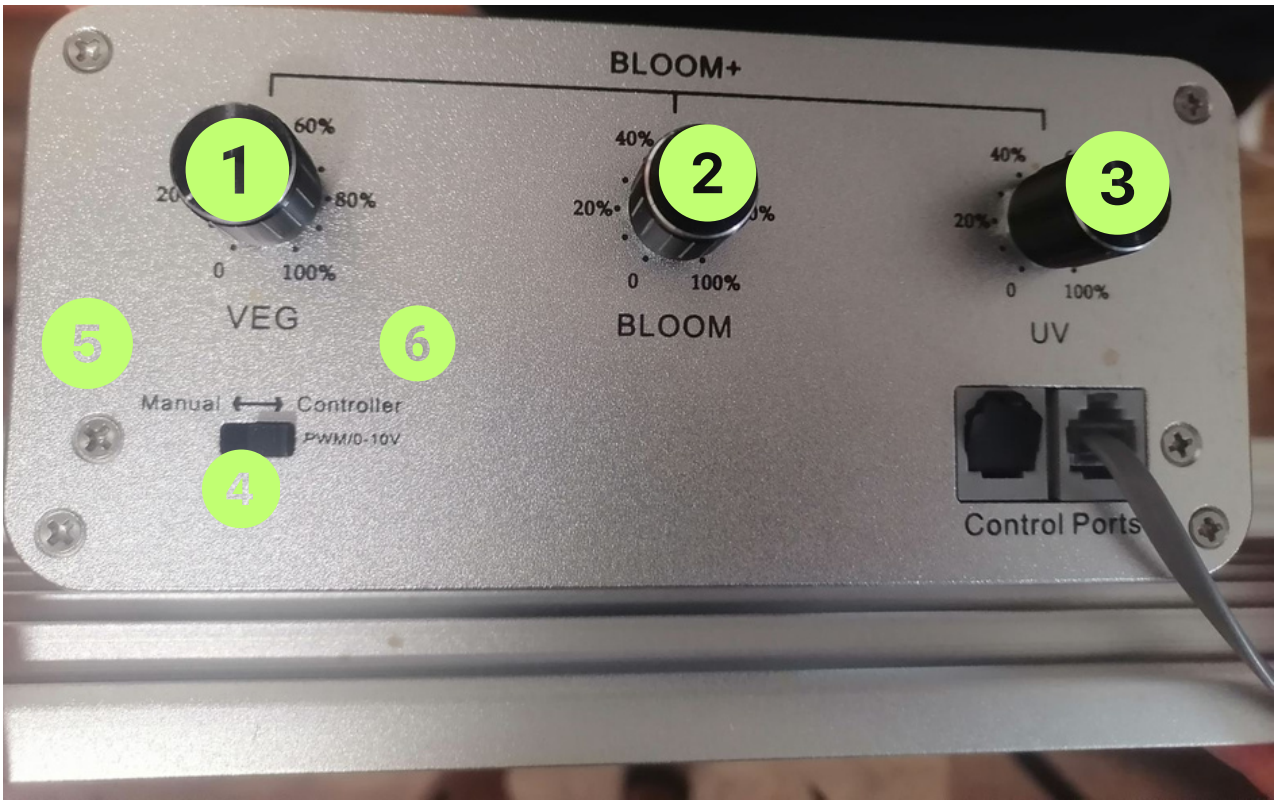


figure 19.

5. Setting the Functions

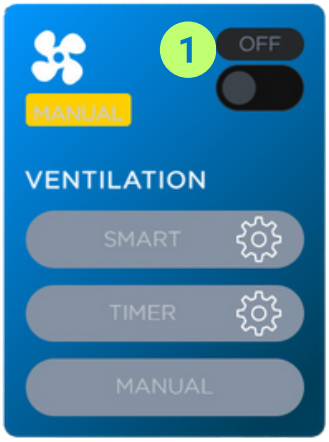
In order to set up the AILights features that are connected to the control panels via a wireless connection, you will need to register and connect to them. Once logged into the app, you will see the main screen. All the panels that are connected to the app are shown there. To adjust the function of any of them, you will need to click on their icon.

You will see detailed information about the panel, such as its current status, the function it uses, the power and intensity used, and other parameters. To change a function, select "SMART", "TIMER" or "MANUAL". You can then use the sliders or buttons to set your preferred settings. The app will save the configuration and send it to the panel.

6. Identifying the Panels

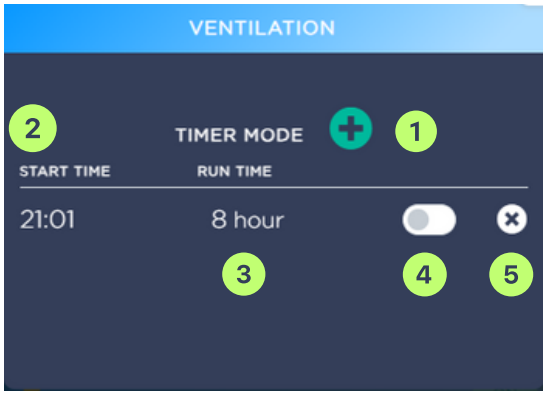
6.1. Ventilation Panel

Ventilation ensures adequate air movement in the greenhouse and prevents overheating or overcooling. The fans are switched on or off automatically, depending on the set temperature, or manually via the software. The controls are:



1. Button to turn the panel on or off.
2. While the "SMART" function is ON, the panel will open and close the window automatically according to the conditions.
3. While the "TIMER" function is ON, the panel will open and close the window according to the set time.
4. With the "MANUAL" function ON, the control of the window is done manually.

From the settings button, you can set parameters of your choice.



TIMER MODE can be adjusted through the "SMART" and "TIMER" functions.

1. Using the "TIMER" mode, you create a schedule for work.
2. Time to start.
3. Time to work.
4. Button to switch on or off.
5. Timer reset button.

6.2. Aspiration Panel

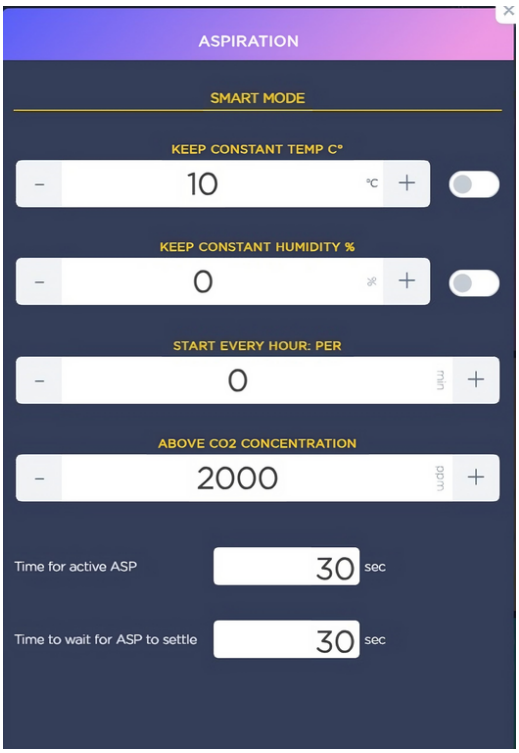
Aspiration removes excess moisture and CO_2 from the greenhouse and improves air quality. Aspirators are switched on or off automatically, depending on the humidity setting (or manually via the software).

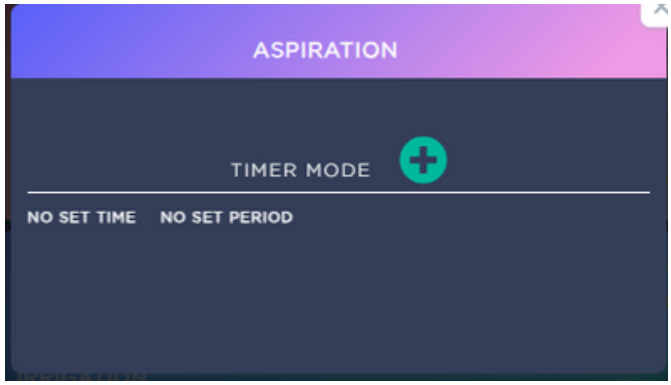
1. Button to turn the panel on or off.
2. While the "SMART" function is ON, the panel will open and close the window automatically according to the conditions.
3. While the "TIMER" function is ON, the panel will open and close the window according to the set time.
4. With the "MANUAL" function ON, the control of the window is done manually.

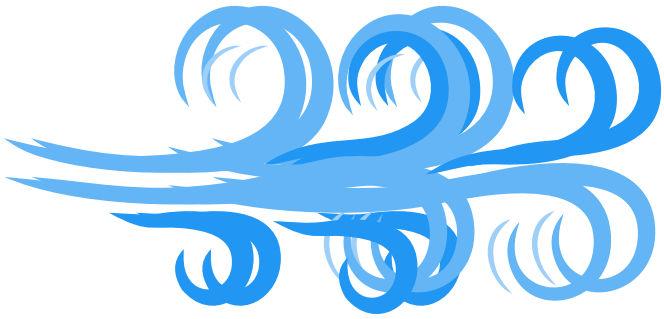
By selecting the "SMART" function, you will be able to set SMART MODE.
There are the following options:

- **KEEP CONSTANT TEMP °C** - тази опция ще запази постоянна температурата в помещението Ви;
- **KEEP CONSTANT HUMIDITY %** - This option will keep the humidity in your room constant.
- **START EVERY HOUR:PER** - This option will activate the device at any specified time period you can set.
- **ABOVE CO_2 CONCENTRATION** - тази опция ще пусне устройството Ви, когато концентрацията на CO_2 надхвърли зададената от Вас стойност;
- **Time for active ASP** - This is the amount of time your device will be active after being turned on.
- **Time to wait for ASP to settle** - This is the time your device will wait before it starts working.

When you select the "Timer" function, you will be able to set the time for which your device will be active.







6.3. CO_2 Panel

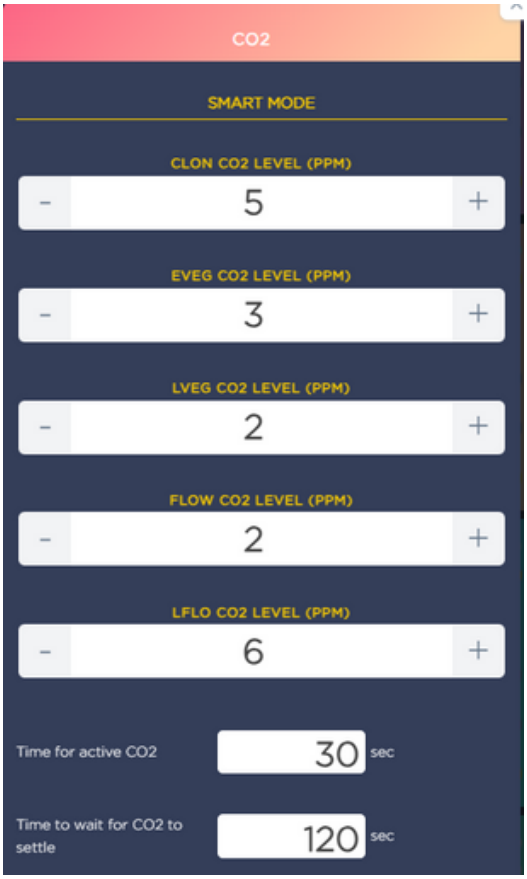
CO_2 (carbon dioxide) is necessary for plant photosynthesis and increased plant productivity. The system can add the required element to the greenhouse via gas cylinders or generators. The amount of CO_2 is adjusted automatically depending on the set level or manually via the software.

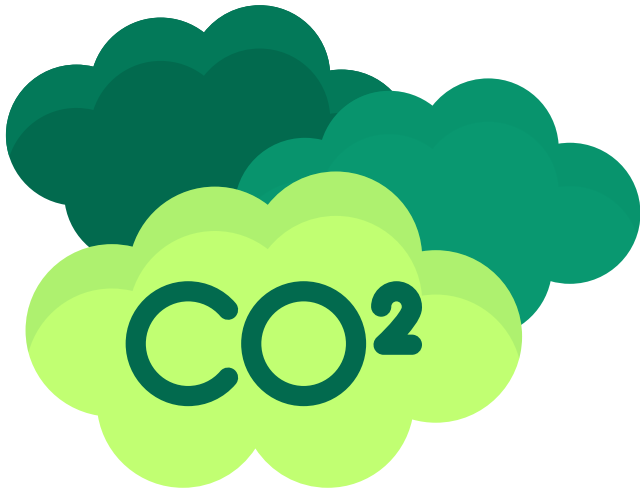
1. Button to turn the panel on or off.
2. While the "SMART" function is ON, the panel will open and close the window automatically according to the conditions.
3. While the "TIMER" function is ON, the panel will open and close the window according to the set time.
4. With the "MANUAL" function ON, the control of the window is done manually.

Когато изберете функцията „SMART“, ще можете да настроите SMART MODE. Тази модификация има следните опции:

- **CLON CO_2 LEVEL (PPM)** - This option will start your device when the CO_2 concentration exceeds your set value.

- **EVEG CO_2 LEVEL (PPM)** - This option allows you to keep the CO_2 concentration in your room constant.
- **LVEG CO_2 LEVEL (PPM)** - This option also allows you to keep the CO_2 concentration in your room constant.
- **FLOW CO_2 LEVEL (PPM)** - With this option, your device is activated when the CO_2 concentration exceeds your set value.
- **LFLO CO_2 LEVEL (PPM)** - This option will keep the CO_2 concentration in your room constant.
- **Time for active CO_2** - This option allows you to set the amount of time your device will be active after it is activated.
- **Time to wait for CO_2 to settle** - This option allows you to set the amount of time your device will be in standby mode before it starts working.
- When you select the "Timer" function, you will be able to set the time for which your device will be active.

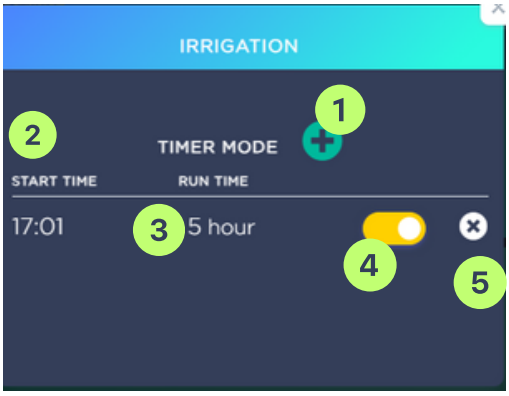




6.4. Irrigation panel

Irrigation is the process by which water is delivered to plants. The system can use pumps, pipes, drip irrigation, as well as sprinklers to create ideal moisture conditions for the plant. The amount of water is automatically adjusted according to Figure or manually via the software.

1. Button to turn the panel on or off;
2. With the "SMART" function, the panel will open and close the window automatically according to conditions;
3. With the "TIMER" function, the panel will open and close the window according to the set time;
4. With the "MANUAL" function, the window control is done manually.

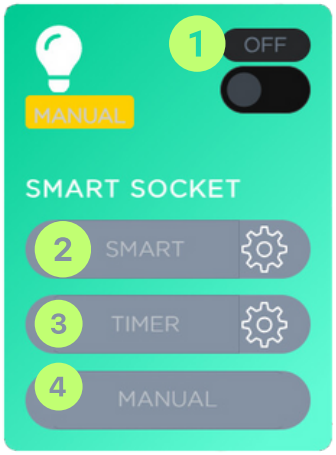


TIMER MODE can be adjusted through the "SMART" and "TIMER" functions.

1. Using the "TIMER" mode, you create a schedule for work.
2. Time to start.
3. Time to work.
4. Button to switch on or off.
5. Timer reset button.

6.5. SMART SOCKET Panel

With the Smart Socket panel, you manage all values on the main board.

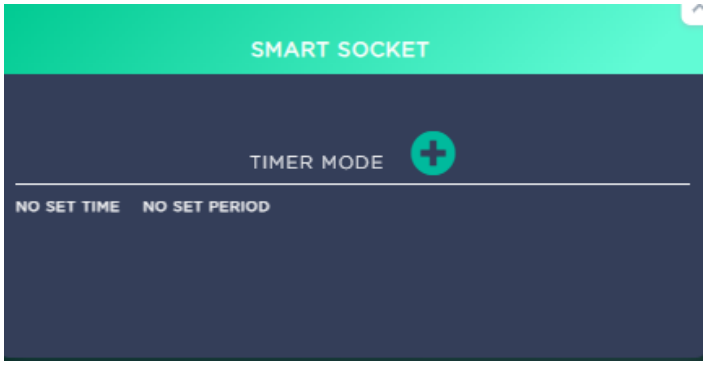


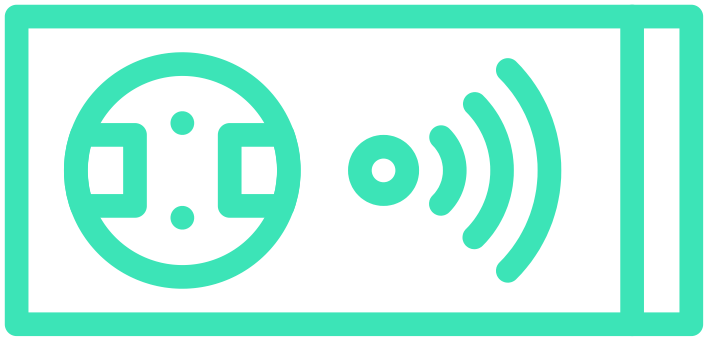
1. Button to turn the panel on or off.
2. While the "SMART" function is ON, the panel will open and close the window automatically according to the conditions.
3. While the "TIMER" function is ON, the panel will open and close the window according to the set time.
4. With the "MANUAL" function ON, the control of the window is done manually.

When you select the "SMART" function, you will be able to set the SMART MODE. The modification has the following options:

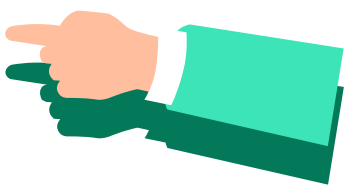
- **TEMP C -** Configure and keep a constant temperature in your room.
- **CO_2 PPM** - Activate your device when the CO_2 concentration exceeds your set value.
- **HUM %** - Set and maintain a constant humidity level in the room.
- **SOIL%** - Set and maintain constant soil moisture levels in your greenhouse.
- **PH** - This option will keep the soil pH levels in the greenhouse constant.
- **START EVERY HOUR: PER** - This option activates your device hourly during a time period you can set.

When you select the "Timer" function, you will be able to set the time for which your device will be active.



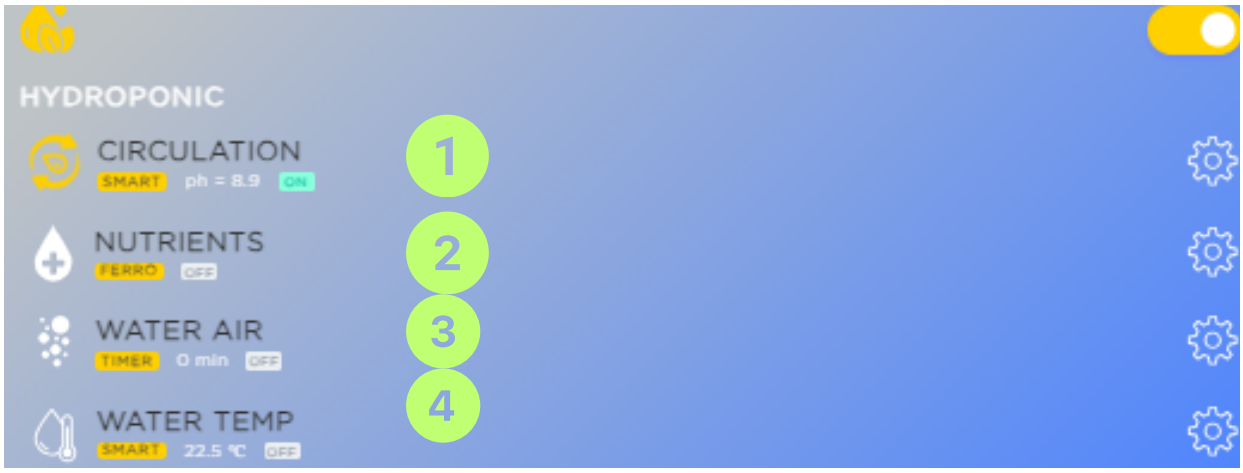


If you'd like to find videos that go into more detail about how the software works, then scan the QR code below. It will take you to our YouTube channel:



6.6. Hydroponic

HYDROPONIC is a feature in the Ailights app that allows you to control and adjust various aspects of your hydroponic system.



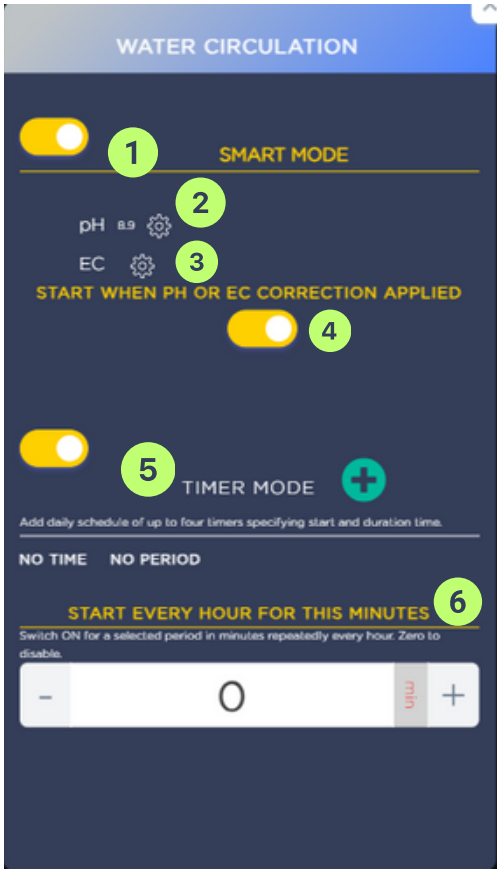
1. **CIRCULATION:** This setting controls how often water circulates in your hydroponic system.
2. **NUTRIENTS:** This setting controls the amount of nutrients that are added to the water.
3. **WATER AIR:** This feature allows you to adjust the amount of air mixed with the water. The correct proportion of air is key to maintaining healthy plant roots.
4. **WATER TEMP:** From here you can control the water temperature in your system. The correct water temperature is important for optimal plant growth.

All of these settings can be adjusted from the gear-like symbol located to the right of each setting. This allows you to customize your hydroponic system to suit the needs of your plants.

6.7. Water Circulation

When you select the WATER CIRCULATION setting in the Ailights app, you have several options for controlling the water circulation in your hydroponic system:

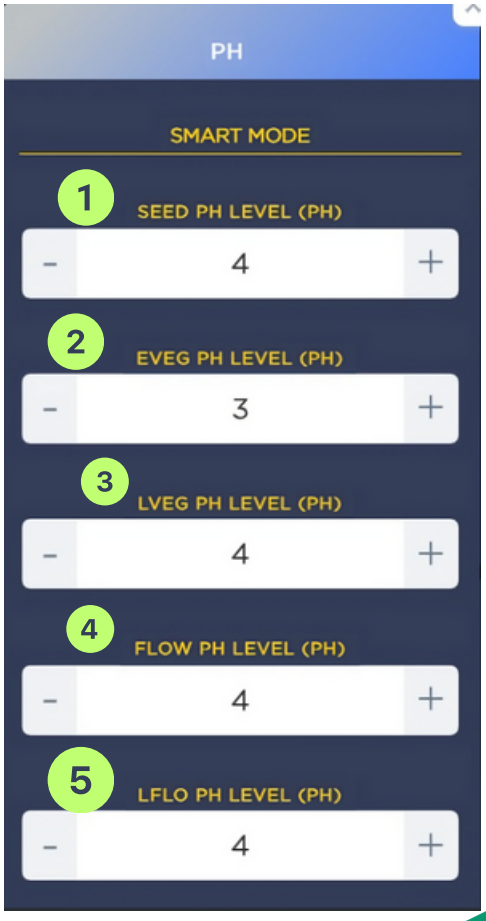
1. **SMART MODE:** Automatically controls water circulation based on various factors.
2. **pH:** controls the pH level in the water.
3. **EC (electrical conductivity)** is a measure of the amount of dissolved salts in the water. It determines the concentration of nutrients.
4. **START WHEN PH OR EC CORRECTION APPLIED:** In this mode, water circulation starts automatically when a pH or EC adjustment is applied.
5. **TIMER MODE:** adds a daily schedule with up to four timers that determine the start and duration of water circulation.
6. **START EVERY HOUR FOR THIS MINUTES:** the option includes water circulation for a selected period (in minutes) that repeats every hour. You can set zero to disable this feature.



6.8. pH

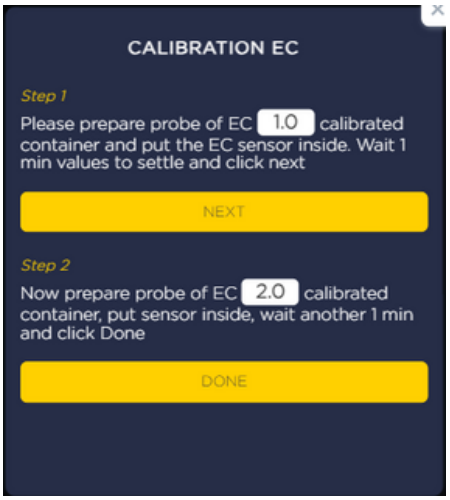
The system allows you to control PH levels for different stages of plant growth. Here's how you can do it:

1. **SEED PH LEVEL (PH)**: From here you can set the PH level that is required during seeding.
2. **EVEG PH LEVEL (PH)**: Using this option, you can set the PH level that is needed during the early vegetation phase.
3. **LVEG PH LEVEL (PH**): Helps you set the PH level needed during the late vegetation phase.
4. **FLOW PH LEVEL (PH)**: You can set the PH level required during the flowering phase.
5. **LFLO PH LEVEL (PH)**: The PH level required during the late flowering phase can be set using this option.



6.9.4. EC

The system allows you to control PH levels for different stages of plant growth. To calibrate the sensor, follow these steps:



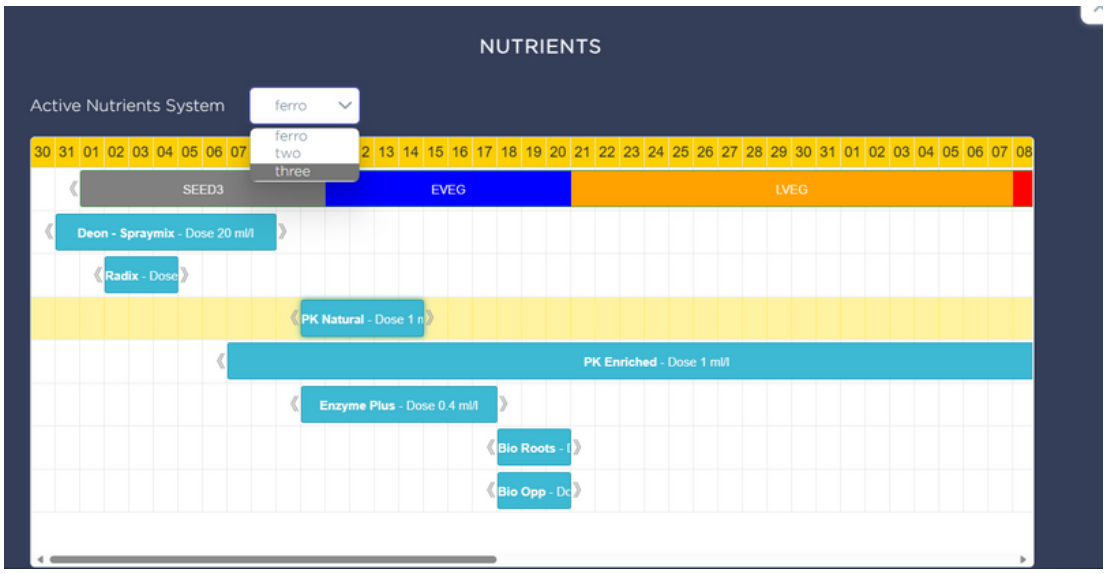
Стъпка 1: Place the probe on the EC 1.0 calibrated container and place the EC sensor inside. Allow the values to settle for 1 minute and click "Next".

Стъпка 2: Now prepare the probe of the EC 2.0 calibrated container, place the sensor inside, wait another 1 min and click “Done”.

1. **SEED EC LEVEL (EC) :** From here you can set the EC level that is needed during the seed phase of the plants.
2. **EVEG EC LEVEL (EC):** With this option, you can set the EC level that is needed during the early vegetation phase.
3. **LVEG EC LEVEL (EC):** This option helps you set the EC level you need during th**e late vegetation phase.**
4. **FLOW EC LEVEL (EC):** With this option, you can set the EC level that is needed during the flowering phase.
5. **LFLO EC LEVEL (EC):** The EC level required during the late flowering phase can be set using this option.

6.9. Nutrients

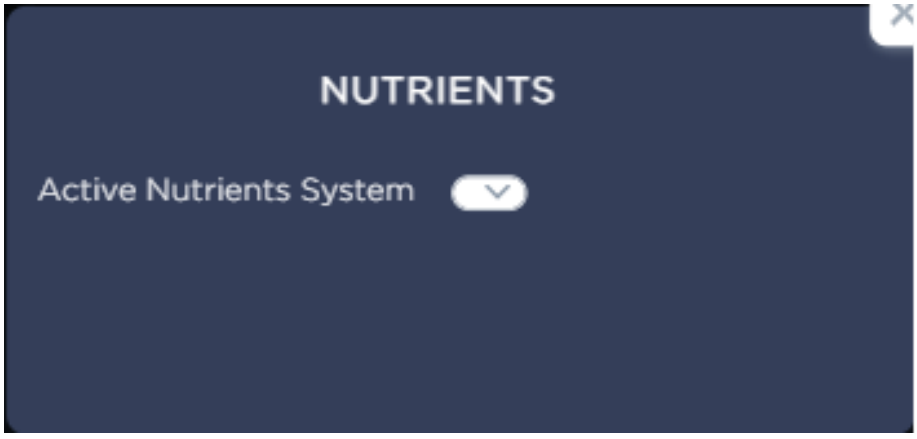
The "NUTRIENTS" section is part of the automatic plant nutrition system based on AILights GBOX. AILights GBOX is the device that is the core of the system and manages all processes. It receives information from the sensors and determines what nutrition to provide to the plants based on this information.



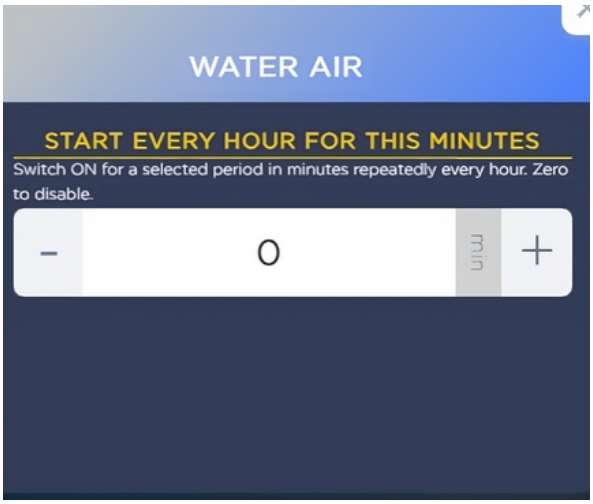
In the menu you can select different types of nutrient charts that are related to different stages of plant development - from seed to early vegetation, late vegetation, flowering and maturation.

1. **Open this select chart**: This option allows you to open a chart that you have selected from the drop-down menu.
2. **Ferro**: Allows you to view a chart that shows the iron content of different foods.
3. **Two**: From here you can select the second chart from the list.
4. **Three**: If you want a third chart, you can select it from the options.

Note that each chart may provide different information depending on the parameters selected. Choose the chart that best suits your needs. Please note that the exact values for both PH and EC may vary depending on the specific type of plant you are growing.



6.9.1. Water Air

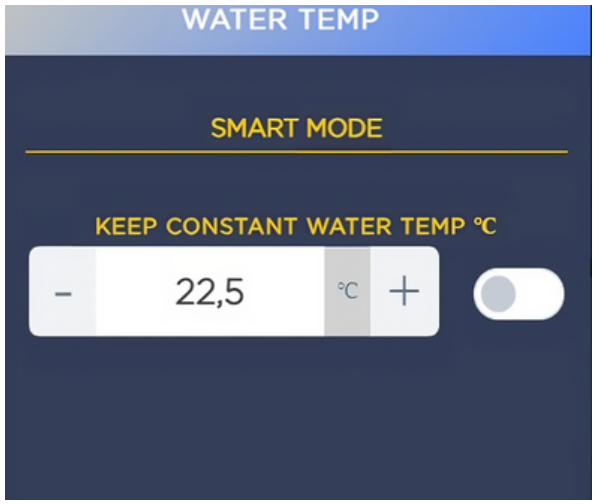


The WATER AIR setting in the AILights app allows you to control the amount of air in the water of your hydroponic system.

START EVERY HOUR FOR THIS MINUTES: In this mode, the air-in-water system turns on for a selected period in minutes that repeats every hour.

6.9.2. Water Temp

The WATER TEMP setting in the Ailights app allows you to control the water temperature in your hydroponic system.



1. **SMART MODE**: In this mode, the app automatically controls the water temperature, taking into account various factors such as the outside temperature, time of day and more.
2. **KEEP CONSTANT WATER TEMP ℃ :** Using this mode, you can set a specific temperature (in degrees Celsius) that the app will try to maintain constantly.

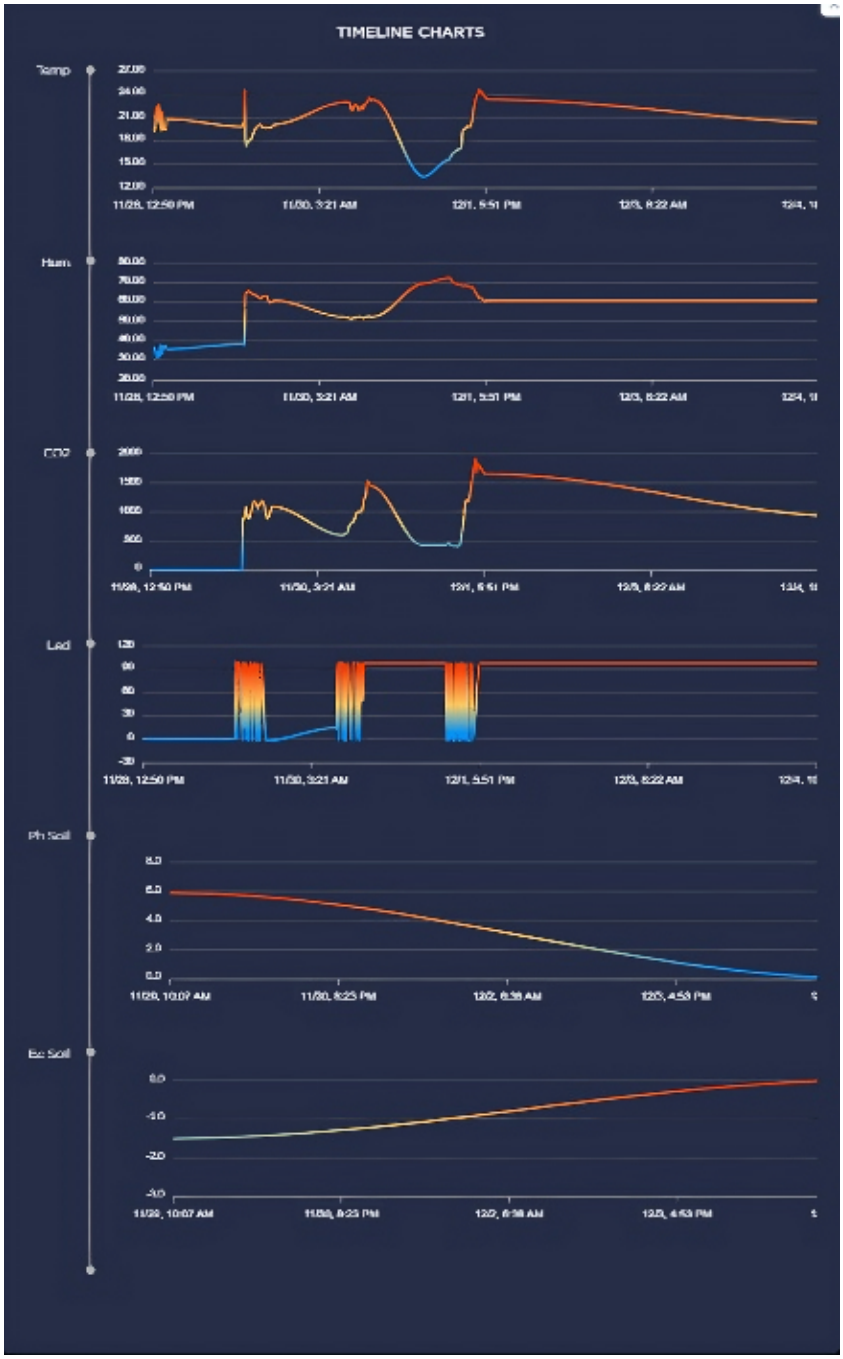
6.9.3. QR code

The QR code is a unique graphic code, different for each user. It can be scanned from your mobile device and is designed to facilitate the process of adding a controller to your system. Here's how it works:

1. Open the Ailights app from your device and find the option to add a new controller in the app menu.
2. Select the option to scan a QR code.
3. Point your device's camera at the QR code that is displayed on your screen.

6.9.4. Statistics

Time diagrams show the change of values or parameters over time. They are useful for analysis and visualization of data from different fields. For example, TIMELINE CHARTS can show you how temperature, humidity, CO2, LED, Ph and Ec of soil and water affect agriculture and the food industry.



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