



Aqua-C1 Nutrient & Irrigation Controller Instruction Manual

1. Overview of Aqua-C1 Nutrient & Irrigation Controller	2
2. Specifications of Aqua-C1 Nutrient & Irrigation Controller.....	3

1. Aqua-C1: Overview of Aqua-C1 Controller System

THEPROTECTOR now launches a stand-alone water and fertilizer controller! It can be equipped with a variety of modules: water level pressure sensor, main controller, LDA-1 light adjustment adapter, AC Station control module, and peristaltic pump extended module.

Aqua-C1 is a simple dosing system for small planting environments (suitable for growing containers, houses, small greenhouses, etc.). It can realize the functions related to the fertilizer buckets such as fertilizer dispensing, automatic water refill, and irrigation.

Aqua-C1 can monitor the EC, pH, water level, and water level height of the backwater bucket in real time, and records the corresponding historical records.

Aqua-C1 uses a peristaltic pump to accurately adjust the volume of each fertilization.

The peristaltic pump is equipped with a 4-way dosing system by default on the host, and supports a 4-way extended peristaltic pump. It can support up to 8 different kinds of nutrients at the same time for proportional formula fertilization.

There are two methods for dosing, namely target value dosing and quantitative dosing:

Target value dosing: after setting the corresponding target value on the host, the actual measured EC value is used as the reference for dosing until it reaches the target value.

Quantitative dosing: set the volume (X gallons) of water to be fertilized, and add the appropriate proportion of fertilizer for dosing according to the official ratio of nutrient fertilizer.

Aqua-C1 uses AC Station controller and I/O controller to control related devices to execute the corresponding output logic.

Aqua-C1 supports lighting extension with the modes such as timer, cycle, normally on, normally off, and automatic adjustment (sensor support required).

Aqua-C1 supports multiple irrigation (I/O extended module required) with the modes of aeroponics, trickle, tidal, timer, cycle, normally on, normally off, etc. Daytime and nighttime irrigation parameters can be set separately for more professional irrigation.

Aqua-C1 supports the fertilizer bucket for automatic refill, with water level pressure sensor (extended module) for automatic water refill.

With the function of data monitor and alarm, Aqua-C1 will regularly record the action information of the device, including high-low water level alarm, high-low EC alarm, high-low pH alarm, high-low water temperature alarm, excessive-working-hours alarm of peristaltic pump, etc., and provide the corresponding recording, saved in the built-in TF card, which can be read through the screen interface and remote network connection method, and save the data for a period of time. It can be read through the on-screen interface and remote network connection and save data for a period of time.

Aqua-C1 supports stand-alone data reading and network data reading, and provides network and RS485 networking methods.

Aqua-C1 can be equipped with optional WiFi for local area network communication.

Aqua-C1 provides intelligent and flexible system control, and is a complete solution for indoor automatic dosing.

Note:

1. Please install in accordance with local and national electrical codes.
2. Aqua-C1 is designed for indoor use. Please use Aqua-C1 related accessories for best performance.

Specifications of Aqua-C1

Device





Name	Aqua-C1
Power	120VAC±15VAC、60Hz、1A 220VAC±15VAC、50/60Hz、1A
DC24	6 sets outlets: AC24V/0.3A, 6 sets Dry contact
Other outlet (RJ12)	RJ12 x 3, 3 sets RS485 Outlet: DC24V、1.0A
Water level sensor	1 set RS485 Outlet: DC24V、1.0A
Outlet	RJ45
Size	290*225*95mm(L*W*H)
Cable length	≈2m/6.5ft
Net Weight	3.0 kg
Accessories	EC Sensor (0-10) 1 set pH Sensor (0-14) 1 set



Pressure sensor parameters

	Data
Input	DC24V
Output	0~10V (DC)
Signal	RJ12sets
Signal light	Green LED
Max	10pcs
Max output	1 set
Controller Sig	RS485 (Modbus-RTU)



Peristaltic pump parameters

	Data
Input	DC12V
Output	10~470ml/min
Max	8pcs
Max	1 Output
Controller Sig	RS485 (Modbus-RTU)



EC Sensor

	Data
Range	0.0-9.9
Tolerance	0.1EC
Calibration	0EC/1.413EC two-point
Temperature Compensation	YES
Temperature Measurement	0~45 C 32~113°F



pH Sensor

	Data
Range	0.0-14.0
Tolerance	0.1pH
Calibration	pH4.00/pH7.00 two-point
Temperature Compensation	YES



AC Station parameters:

(Optional accessories)

	Data
Input	USA outlet AC110V 60Hz
Output	USA outlet AC110V/60Hz/MAX10
Max power	<1100W
Signal	RJ12 sets
Signal light	Green LED
Operation	Touch KEY
Max output	10pcs
Controller Sig	RS485 (Modbus-RTU)



Light sensor parameters

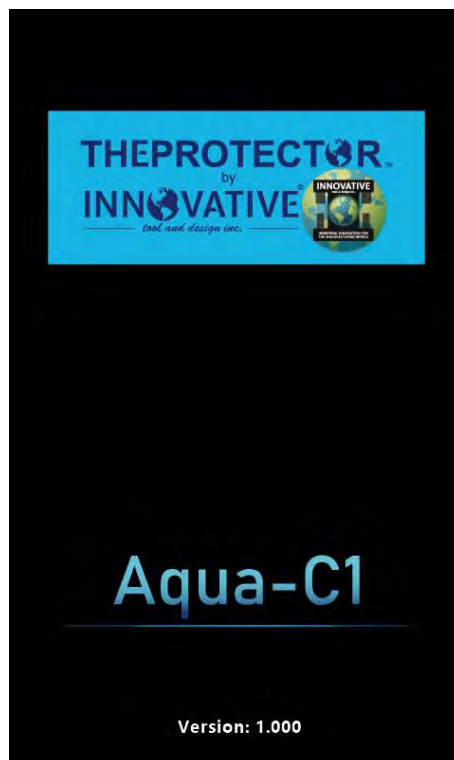
(Optional accessories)

	Data
Input	DC24V
Output	0~10V (DC)
Signal	RJ12 sets
Signal light	Green LED
Max	10 pcs
Max output	1set
Controller Sig	RS485 (Modbus-RTU)

Special Remarks

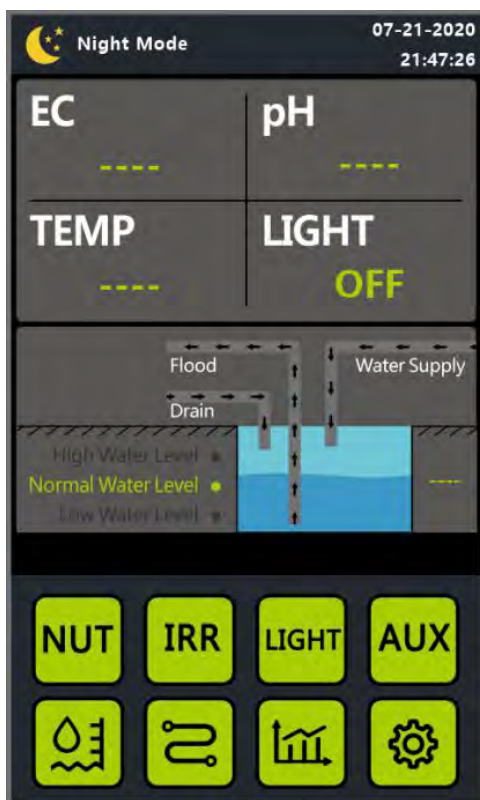
- ❖ Note 1: Each device can manage one dispensing pool/bucket. It cannot install 2 dispensing pools/buckets at the same time, but set different dosing formulas at different times.
- ❖ Note 2: The device needs to be connected to the network in order to send data to the cloud for preservation normally. If the network is abnormal, only relevant data will be saved locally and local relevant information for 6 months will be recorded. The cloud will be able to read the relevant information that has not been uploaded again after the connection is restored.
- ❖ Note 3: The device displays 4 peristaltic pumps by default, and can support up to 8 peristaltic pumps. The parameters (operating mode/rate) of each peristaltic pump is consistent, and all peristaltic pumps are set synchronously with each setting.

Setup Interface



After the device starts, it will start loading the interface. After loading to 100%, it will enter the homepage.

Homepage/Main Interface



A: The prompt bar displays day or night, date, time, and other related data.

B: The real-time data of the current device (EC, pH, temperature, other status, etc.) is displayed on the interface.

C: In the middle of the pool area, it displays the on-off status of current executed port, the water level of the pool, and the real-time water level data.

D: After power on, the system enters the 30-second device cache state, and the status bar displays the corresponding countdown.

E: Below are the relevant keys to enter the specific setting interface: dosing data configuration interface, irrigation data configuration interface, lighting data configuration interface, port data type setting interface, backwater data configuration interface, equipment data management interface, and system data setting interface.

Dosing Operation Mode Setting Interface / Switch Mode Prompt Interface



The upper part of this interface is for dosing operation modes: monitoring mode, independent working mode, periodic table mode. (*Note 1)

- Monitoring mode: in this mode, the equipment will only monitor the relevant data of the dosing pool and will not perform dosing.
- Independent working mode: in this mode, a dosing formula is selected and related dynamic dosing is carried out.
- Periodic table working mode: in this mode, a set of periodic tables needs to be prepared. within a certain period, the corresponding dynamic dosing is executed according to the contents of dosing formulas of different time periods.
- Each formula has 2 working versions, corresponding to automatic and manual dosing. In the manual mode, the amount of fertilizer to be added can be automatically calculated and displayed according to the current peristaltic pump flow rate, with the input of bucket size and the concentration per unit X (Gal/min).
- When switching to the dosing operation mode, the interface will prompt whether to switch. After confirming to close the current mode, it then enters a new mode.

Periodic Table Setting Interface



In the periodic table mode, click "Setting" to enter its interface.

- In this interface, it shows the start time of the cycle and the end time after adding one or more cycles.
- The start time of the entire cycle can be adjusted by clicking Start.
- The parameters of a single cycle (recipe/duration of execution) can be added and set by clicking the button "+".
- Up to 6 recipes and running cycles can be added simultaneously.
- After updating the data, the button "SAVE" will flash, which will stop to save data after pressing the button.
- After adding the list data, the end date of current periodic table will be calculated automatically.



In the periodic table mode, clicking the button "-" on the periodic column can delete the data in the single data column.

- After deleting this data, it disappears from the interface.
- If there is a relevant recipe in the next column, that data will move up by one.
- After updating, the end time is also updated simultaneously.
- After updating, a new dosing program will be restarted.
-

Dosing Formula Setting Interface

Under the setting interface of dosing operation mode, it switches to independent working mode.

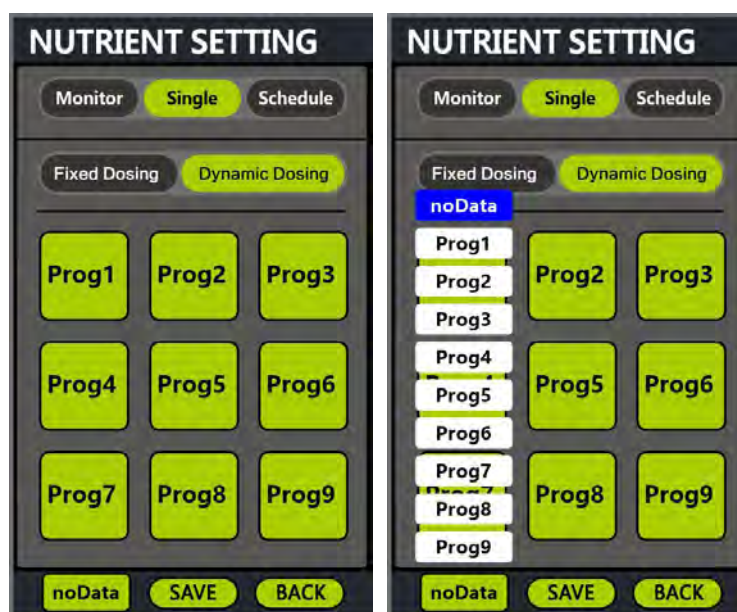
On the left of "Setting", it displays currently running dosing program as follows:

Mode	Content	Description
Monitor Monitor	Monitor Mode	Under monitoring mode
Single Single	PROG 01 RUNNING	Dosing formula 1 is running
Schedule Schedule	Schedule 1 Running	Cycle list 1 is running
	Schedule is Ready	Cycle list is ready
	Schedule Complete	Cycle list is complete

Click on the button of single formula to enter the setting interface of dosing formula.

It is divided into Fixed Dosing and Dynamic Dosing.

Select the dosing program (Prog1-9) that you want to work automatically by the lower left position. If you do not set the data, you can set it as "noData".



Description of Fixed Dosing:

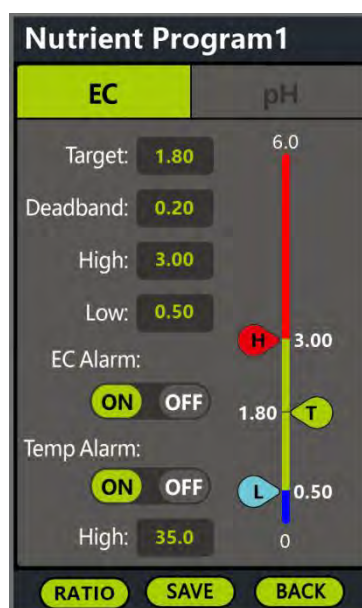


It can set the quantity (Volume) of fertilizer to be added, data unit (L/Gal), receive working test, separate pump effective operation, input data per unit for each pump, expected working time, etc.

Switch the dosing type to enter Dynamic Dosing.

Description of Dynamic Dosing:

◆ Setting Interface of EC



Under the setting interface of dosing formula, the current formula name (Nutrient Program1~9) is displayed at the top.

Below the name, there are labels for switching parameters, which are "EC" and "pH" respectively. A button "Ratio" is at the left bottom for switching the parameter content to be set.

Below the label EC, it is as follows: (the upper limit of EC is 6.00)

- EC target value: the EC target value to be achieved for the dosing formula.
- EC tolerance value: the EC tolerance value set for the dosing formula.
- High EC alarm value: the high EC alarm value set for the dosing formula. If the high alarm value is exceeded,

the operation of the formula will be stopped voluntarily. The device will record the alarm information locally and send it to the cloud (*Note 2).

- **Low EC alarm value:** the low EC alarm value set for the dosing formula. When it is lower than the low alarm value, the device records the alarm information locally and sends it to the cloud with relevant alarm information (*Note 2).
- **EC alarm enable switch:** a button to turn on and off the high-low EC alarm function. After it is turned off, if there is high or low alarm information during dosing, the corresponding alarm action will not be triggered, but the relevant information will still be recorded in the device and the cloud.
- **Temperature (water temperature) alarm enable switch:** a button to turn on and off the high temperature (water level) alarm function. After it is turned off, if a high alarm message appears in during dosing, the corresponding alarm action will not be triggered, but the relevant information will still be recorded in the device and the cloud.
- **High temperature (water temperature) alarm value:** the high temperature (water temperature) alarm value set for the dosing formula. After exceeding this alarm value, the device records the information locally and sends it to the cloud (*Note 2)
- **Current parameter line display:** a (blue|green|red) status bar is displayed on the right side of the page, on which there are 3 labels corresponding to the target value (T), minimum value (L) and maximum value (H). At the same time, the corresponding parameter data can also be modified by sliding the label. After sliding, the data in the setting box will be modified simultaneously.

◆ pH Setup Interface



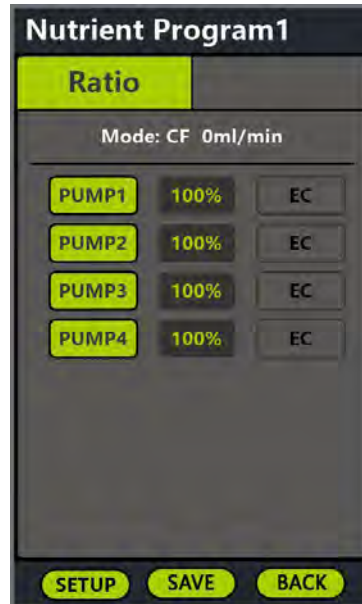
Under the tag of pH, the following information is displayed on the interface: (the maximum set value of pH ranges from 0 to 14.00)

- **pH target value setup box:** the pH target value that needs to be reached set for the formula of dosing.
- **pH interval value setup box:** the pH tolerance value set for the formula of dosing.
- **pH high alarm value setup box:** the pH high alarm value set for the formula of dosing. if the high alarm value is exceeded, the combination process of the fertilizer for the formula will be actively stopped, and the device will record the alarm information locally, sending the relevant alarm information to the Cloud (*Note 2).
- **pH low alarm value setup box:** the pH low alarm value set for the formula of dosing. if it's below the low alarm value, the device will record the alarm information locally, and send the relevant alarm information to the Cloud (*Note 2).
- **pH alarm enabling switch:** the button to turn on and off the pH high and low alarm function. after turning off, if the high and low alarm information appears in the fertilizer combining, the corresponding alarm action will

not be triggered, but the relevant information will still be recorded in the device and the Cloud.

- Linear display of current parameters: A (blue|green|red) status bar is displayed on the right side of the page, on which there are 3 tags corresponding to the target value (T), lowest value (L), and highest value (H). meanwhile, you can also slide the tag to modify the corresponding parameter data. when the slide is over, the data in the setup box will be modified synchronously.

◆ Working Mode Setup of Peristaltic Pump



On the interface below the tag of Ratio, if a peristaltic pump expansion device is connected, the corresponding peristaltic pump information will be displayed. By default, only 4 pieces of peristaltic pump information will be displayed on the interface. (up to 8)

The following information will be displayed on the interface:

- Status information of the peristaltic pump: the working mode and rate parameters set by the peristaltic pump in the formula of dosing.
- Parameter setup button of the peristaltic pump: enter the interface for setting parameters of the peristaltic pump (* Note 3).
- Online enabling of peristaltic pump work: click of the button on the far left with the name of the the peristaltic pump (PUMP 1-8), and there are 2 states for the indicator with on and off. if the indicator is on, the peristaltic pump is enabled. if the indicator is off, the peristaltic pump is disabled.
- Working ratio set setup of the peristaltic pump: the input box in the middle can be used to enter the input ratio of the peristaltic pump (10%-100%), which is valid after the peristaltic pump is enabled.
- Working type set setup of the peristaltic pump: the select box on the far right can display the current working type of the peristaltic pump (Type EC, Type pH+, Type pH-).

Pump Setting

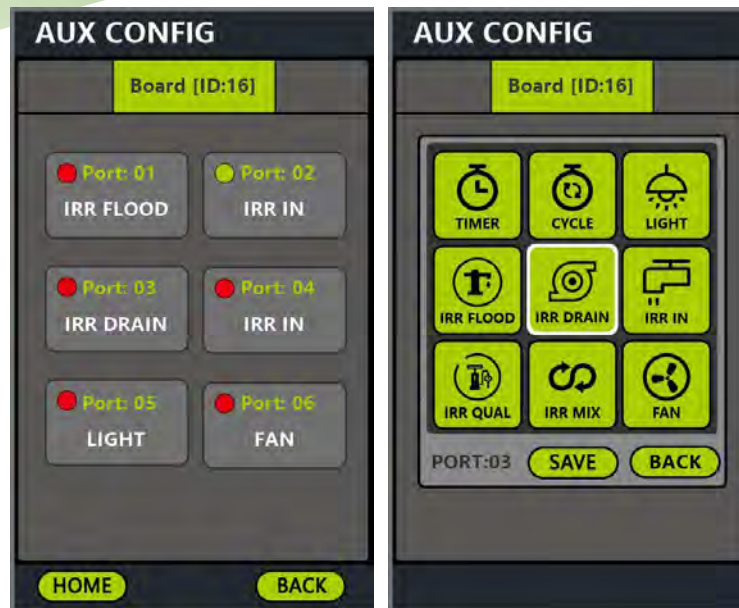
The screenshot shows a 'Pump Setting' interface with the following fields and controls:

- Dosing: 10 s
- Interval: 30 s
- Flow Rate: 300 mL/min
- Mode: CF (selected) and VF (unselected)
- Cycles: Reset button
- Last Date: 2000-01-02 00:44:38
- Navigation buttons: HOME, SAVE, BACK

Below the tag of Ratio, click the “Setting” button to enter the parameter setting interface of the peristaltic pump.

- Run-time (Dosing) of the peristaltic pump: the run-time per single operation of the peristaltic pump (in the case of 100% ratio).
- Cache time (Interval) of the peristaltic pump: the cache time per single operation of the peristaltic pump (in the case of 100% ratio).
- Operating speed (Flow Rate) of the peristaltic pump: the default parameters of the peristaltic pump (10 - 430) ml/min.
- Operation mode of the peristaltic pump: modes for operating the peristaltic pump, CF fixed frequency (same speed of single operation) / VF variable frequency (same time of single operation).
- Reset the operating cycles of the peristaltic pump: the operating cycles of the peristaltic pump can be reset by through this button. When a certain extent is reached, it will indicate that the peristaltic pump has been working for a long time and the internal hose needs to be replaced.
- Prompt of the last reset date: the last date information of resetting the peristaltic pump will be displayed in the bottom information bar.

VII Interface of Selecting Irrigation Types

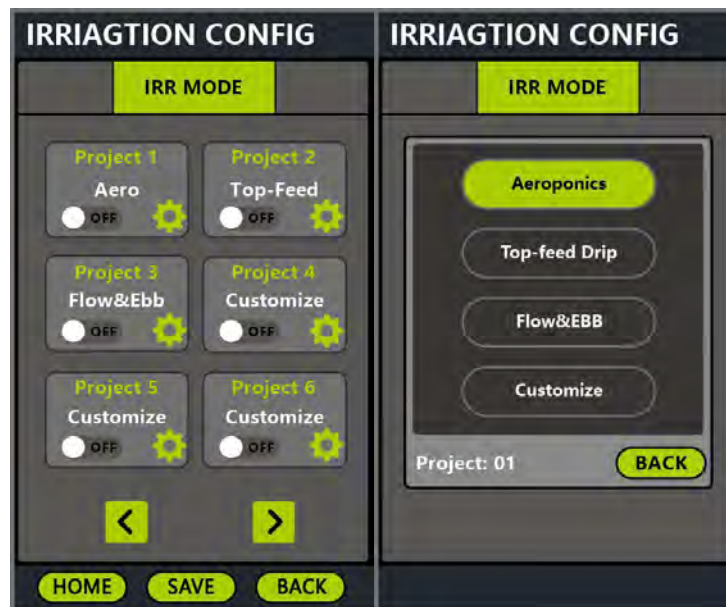


Confirm the device port that requires setting in the port interface at first, and set it as irrigation drain (IRR DRAIN), irrigation backwater, irrigation inflow (IRR IN), light, fan and other data according to actual needs.

After setting the data, you can select the irrigation function button on the main interface, and the relevant information of the irrigation program that has been set currently will be displayed on the interface.

Config Interface of Device Irrigation Mode

Each irrigation program device has a different irrigation project, and different irrigation data interfaces are displayed respectively.



Select the existing device button on the interface to enter the corresponding select interface for irrigation mode. Below the irrigation interface, the irrigation mode can be selected will be displayed:

- Aeroponics: irrigation setup (cycle mode) and backwater setup.
- Top-feed Drip: irrigation setup (timer mode).
- Flow & Ebb: irrigation setup (cycle mode) and backwater setup.
- Customize: irrigation setup (manual mode, cycle mode and timer mode) and backwater setup (manual mode, automatic mode and timer mode).

Only one irrigation mode can be set for each device. The selected mode will light up, and it can be unselected for all, then the button will all be gray.

Setup Interface of Irrigation Time for Aeroponics

The left screenshot shows the 'Aeroponics' interface with the 'Spray' tag selected. It features two rows of time settings: 'DAY' with 'ON' (20 sec) and 'OFF' (120 sec) buttons, and 'NIGHT' with 'ON' (60 sec) and 'OFF' (300 sec) buttons. At the bottom are 'HOME', 'SAVE', and 'BACK' buttons.

The right screenshot shows the 'Aeroponics' interface with the 'Device Set' tag selected. It features a list of seven items, each with a checkbox and text: 'Board Port: 01 Flood', 'Board Port: 03 Drain', and five 'NO DATA' entries. At the bottom are a dropdown arrow and a 'BACK' button.

Select the spray mode "Spray" and the port parameter setup "Device Set" on the tags at the top of the interface to switch the setup interface.

On the parameter setup interface of Spray, you can distinguish between day and night and set it under different conditions.

- ON: spray time.
- OFF: stop time.

On the parameter setup interface of port, set whether to execute port data.

Setup Interface of Irrigation Time for Top-feed Drip

The left screenshot shows the 'Top-feed Drip' interface with the 'Drip' tag selected. It features a 'Timer:' section with a list of 5 groups. Each group has a start time, an end time, and an 'OFF' button. At the bottom are 'HOME', 'SAVE', and 'BACK' buttons.

The right screenshot shows the 'Top-feed Drip' interface with the 'Device Set' tag selected. It features a list of seven items, each with a checkbox and text: 'Board Port: 01 Flood', 'Board Port: 03 Drain', and five 'NO DATA' entries. At the bottom are a dropdown arrow and a 'BACK' button.

The tag at the top of the interface shows the Top-feed Drip mode "Drip".

On the parameter setup interface of Top-feed Drip, 5 groups of timing work data can be set at the same time.

- Timing period: set the start time and end time of the timing period.
- Switch status: ON or OFF. If the switch is off, the time segment does not take effect.

Setup Interface of Irrigation Time for Flow & Ebb

The image displays two side-by-side screenshots of a mobile application interface titled "Flow and Ebb".

Left Screenshot (Flood Mode):

- At the top, there are two tabs: "Flood" (selected) and "Device Set".
- Below the tabs, there are two columns of settings: "Flood" and "Waiting".
- Under "Flood", there are two rows: "DAY:" and "NIGHT:". Each row has a numeric input field followed by "min".
- Under "Waiting", there are two rows: "DAY:" and "NIGHT:". Each row has a numeric input field followed by "min".
- At the bottom, there are three buttons: "HOME", "SAVE", and "BACK".

Right Screenshot (Device Set Mode):

- At the top, there are two tabs: "Device Set" (selected) and "Flood".
- Below the tabs, there is a list of settings, each with a checkbox and a label.
- The first two items are "Board Port: 01 Flood" and "Board Port: 03 Drain".
- The next six items are "NO DATA".
- At the bottom, there are two buttons: a downward arrow icon and "BACK".

Select the flow mode “Flood” and the ebb mode “Drain” on the tags at the top of the interface to switch the setup interface.

On the parameter setup interface of Flow, you can distinguish between day and night and set it under different conditions.

- Flood: parameter time of flow.
- Waiting: parameter time of ebb.

The pool uses relevant backwater data of the backwater program data 2.

Manual Operation Interface of Customize



Select the irrigation mode “Flood” on the tag at the top of the interface to set the interface.

Under the tag of Flood, there are three different working mode settings: manual mode, cycle mode and timer mode.

- Manual mode: set the operating status of irrigation to always on (ON) or always off (OFF).
- Cycle mode: parameter time setup of cycle operation (min).
- Timer mode: parameter time setup of timing operation (10 groups).

Under the parameter setup of manual mode, the following relevant settings will be displayed on the interface.

- Operation switch: on this interface, the irrigation of device can be set always on (ON) or always off (OFF).

Under the parameter setup of cycle mode, the following relevant settings will be displayed on the interface.

- Switch-on time (min): on this interface, the switch-on time of day and night can be set.
- Switch-off time (min): on this interface, the switch-off time of day and night can be set.

Under the parameter setup of timer mode, the following relevant settings will be displayed on the interface, and 5 groups of timing work data can be set at the same time.

- Timing period: set the start time and end time of timing.
- Switch status: ON or OFF. If the switch is off, the time segment does not take effect.

After modifying the data, the “SAVE” button will start flashing, and the relevant irrigation data can be saved only after pressing it.



Confirm the device port that requires setting in the port interface at first, and set it as light and other data according to actual needs.

After setting the data, you can select the light function button on the main interface, and the relevant information of the light program that has been set currently will be displayed on the interface.

Setup Interface of Light Working Typ

Each device corresponds to the working type of a light.



Under the parameter setup of light, there are three different working mode settings: manual mode, cycle mode and timer mode.

- Manual mode: set the operating status of light to always on (ON) or always off (OFF).
- Cycle mode: parameter time setup of cycle operation (min).
- Timer mode: parameter time setup of timing operation (10 groups).

Under the parameter setup of manual mode, the following relevant settings will be displayed on the interface.

- Operation switch: on this interface, the irrigation of device can be set always on (ON) or always off (OFF).

Under the parameter setup of cycle mode, the following relevant settings will be displayed on the interface.

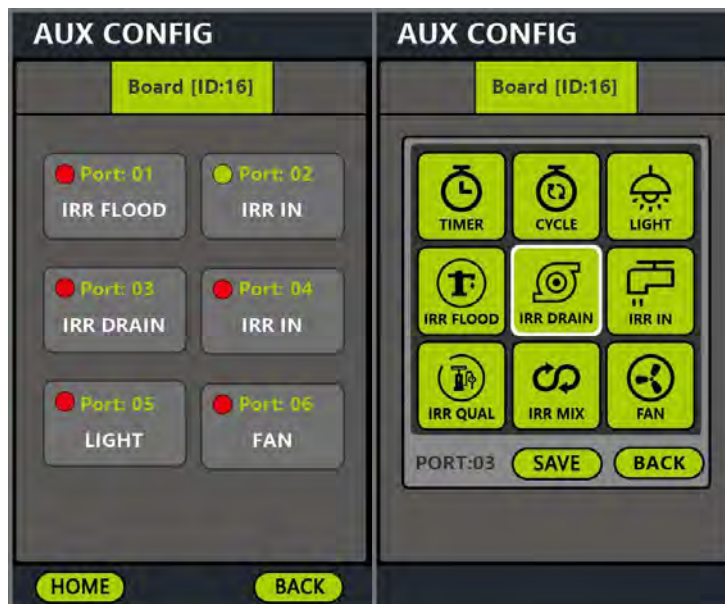
- Switch-on time (min): on this interface, the switch-on time of day and night can be set.
- Switch-off time (min): on this interface, the switch-off time of day and night can be set.

Under the parameter setup of timer mode, the following relevant settings will be displayed on the interface, and 10 groups of timing work data can be set at the same time.

- Timing period: set the start time and end time of timing.
- Switch status: ON or OFF. If the switch is off, the time segment does not take effect.

After modifying the data, the “SAVE” button will start flashing, and the relevant light data can be saved only after pressing it.

Setup Interface of Automatic Water Refill



Confirm the device port that requires setting in the port interface at first, and set it as light and other data according to actual needs.

After setting the data, you can select the light function button on the main interface, and the relevant information of the light program that has been set currently will be displayed on the main interface. If you select the backwater function button, the information of automatic backwater device that has been set currently will be displayed on the interface.



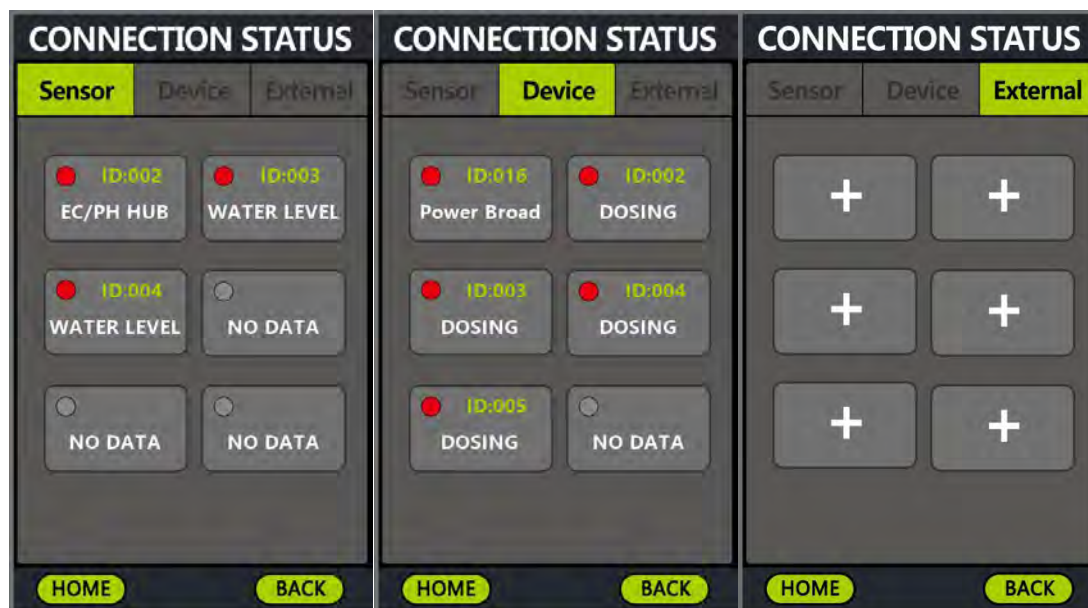
On the automatic backwater interface, the functions are respectively as follows:

- Water level of dosing bucket: the real-time water level of current dosing bucket.
- High water level setup of dosing bucket: set the high water level data when automatic water refill stops.

- Low water level setup of dosing bucket: set the low water level data when automatic water refill starts.
- Status of automatic water refill: working status of current automatic water refill.
- Dosing method setup: automatic water refill/manual water refill.
- Manual operation: Manually start or close water refill in manual water refill mode.
- Maximum duration setup: set the maximum duration for automatic water refill.

After modifying the data, the “SAVE” button will start flashing, and the relevant light data can be saved only after pressing it.

Setup Interface of Device Status



Tags on the interface display relevant information about sensors (Sensor), actuators (Device), and external devices (External) respectively.

System Setting Interface



Settings of EC data unit, temperature unit, calibration interface, time setup of automatic lock screen as well as settings of date, time, day and night are available on the interface.