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1. Overview

The ECB240 is a battery pack charging, discharging, and equalization all-in-one machine developed by SmartSafe. It is primarily used for balancing the voltage between cells in new energy vehicle battery packs with significant voltage differences, improving battery performance and extending the battery pack's lifespan. This product primarily achieves independent balancing control for each connected cell. It uses low voltage and high current to precisely adjust each connected cell to the same voltage level, according to the user's set voltage target. It is also possible to quickly charge and discharge the battery pack using high voltage and high current at the group terminal, allowing the battery level to rapidly reach the target setting.

2. Product Features

- Integrates charging, discharging, and equalization modes into one unit, offering versatile functionality and significantly enhancing the maintenance efficiency and flexibility of battery packs.
- Equipped with various built-in cell equalization and charging/discharging control modes, compatible with mainstream battery types like ternary lithium, lithium iron phosphate, and lithium titanate, to meet the maintenance needs of different battery packs.
- Supports a maximum charging current of 40A and a discharging current of 20A, catering to high-power maintenance scenarios and significantly boosting work efficiency.
- 24-channel cell synchronous equalization, precisely controlling cell voltage differences, effectively improving battery pack consistency.
- Supports multiple control methods such as constant voltage charging and constant current discharging. Combined with customizable target voltage/current parameter settings, it can simulate various real-world usage scenarios to comprehensively test battery pack performance.
- Provided with multiple protection mechanisms, including overvoltage, undervoltage, overcurrent, short circuit, reverse connection, and over-temperature protection, ensuring the safety of the battery and device during testing.
- Supports communication with the device via WIFI, Bluetooth, USB, and more, allowing real-time collection and recording of key parameters such as cell voltage, current, and voltage difference. Automatically generates charts and test reports for easy data analysis and tracking.

- The testing process supports setting protection thresholds and automatic shutdown conditions to ensure that tests are promptly terminated in abnormal situations, protecting the battery from damage.
- Equipped with a 10.1-inch high-definition touchscreen, the user interface is simple and intuitive, making battery pack testing and maintenance easier, more efficient, and reliable.

3. Precautions for Safe Use

3.1 Method for safe use in general conditions

Follow the user manual to operate this device.

3.2 Error-prone method of use or misoperation

1) The tools used are not properly insulated.

2) Failure to operate the device according to the user manual.

3.3 Harms that may result from improper use

1) The tools used being not properly insulated, and the positive and negative terminals of the battery pack being too close can easily cause a short circuit accident.

2) Failure to follow the correct operating procedures will result in the device not functioning properly.

3.4 Emergency response measures in case of abnormal situations

Disconnect the power supply and test cables.

3.5 Precautions for special situations

If the operator fails to implement proper insulation measures or mishandles operations causing a short circuit, the cable should be promptly disconnected.

3.6 Other safety warnings

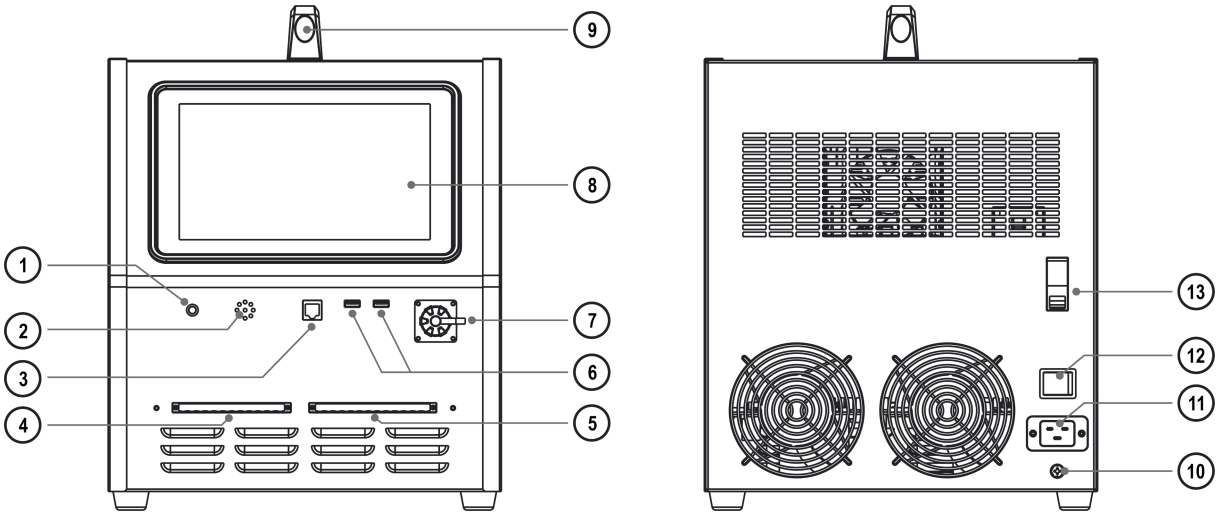
Strictly adhere to safety operating procedures and the correct method of use of the device.

4. Technical Specifications

Parameter name	Description
Model	ECB240
Operating power supply	AC 100~240V, 50/60Hz
Operating voltage	Discharging voltage: DC 0~5V, Charging voltage: DC 0~110V
Voltage detection accuracy	±0.1%FS + 5mV (maximum range 5V)
Operating current	Discharging current: 0.1~20A, Charging current: 0.5~40A
Current detection accuracy	±0.5%FS±0.05A (maximum range 20A)
Operating power	Maximum discharging power: 2.4 kW, maximum charging power: 3.2 kW
Number of equalization channels	2×12
Battery interface	The charging end includes positive and negative electrode interfaces, and the discharging end includes a 24 channels of voltage acquisition interface
Display	10.1 inches, resolution 1280*800
PC data communication	TCP/IP, USB Device
Wireless communication	Wi-Fi
Data transfer	USB drive
Operating modes	Constant current charging + Constant voltage charging
	Constant current discharging + constant voltage discharging
Protection mechanism	Input overcurrent protection, overvoltage protection; output overcurrent protection, over-temperature protection; supports reverse connection and cross-connection protection.
Cooling	Forced air cooling
Operating temperature	-5℃~45℃
Storage temperature	-20℃~70℃
Operating humidity	5%~93%
Storage humidity	5%~93%
Dimensions	446 X 349 X 435 mm

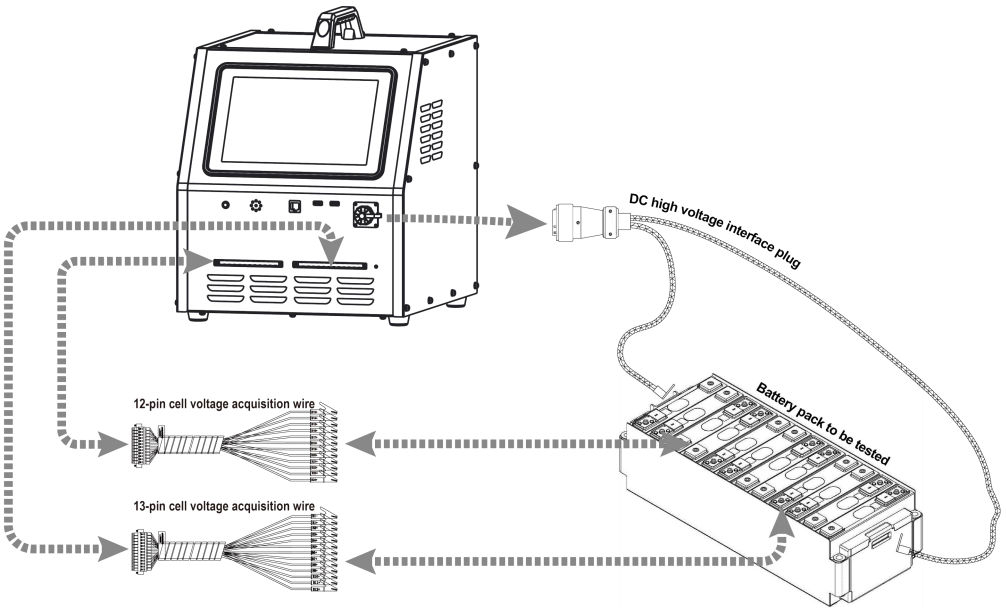
5. Operation and Use

5.1 Device interfaces and buttons



No.	Name	Description
1	Indicator light	A steady green light indicates the device is in standby mode. A green flashing light indicates it's working. A steady yellow light indicates a non-stop warning. A flashing red light indicates a device malfunction or shutdown warning.
2	Buzzer hole	Buzzer sound hole.
3	Communication interface	Used for communication and other expandable functions.
4	Channel 2	Used for connecting a 12-pin cell voltage acquisition wire.
5	Channel 1	Used for connecting a 13-pin cell voltage acquisition wire.
6	USB interface	Used for exporting data, upgrading via USB, and connecting a USB wireless adapter.
7	DC output port	Used for inserting the DC high voltage interface plug and connecting the positive and negative terminals of the battery module.
8	Screen	10.1-inch touch screen.
9	Handle	Easy to carry the device.
10	Grounding terminal	For device grounding.
11	Power input port	Used for connecting to the AC power supply.
12	Power switch	Used for turning on/off communication input.
13	DC switch	Used for turning on/off DC output. When turned on: The device can output according to the set parameters. When turned off: The output port is closed and cannot output.

5.2 Device connection



Output DC cable connection

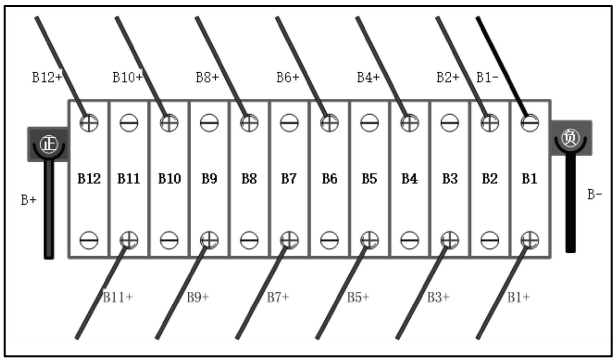
Insert the DC high-voltage plug into the device's "**DC output port**", and connect the other end to the positive and negative terminals of the battery module.

Cell voltage acquisition wire connection

1) If the number of battery cells to be tested does not exceed 12: Use a 13-pin cell voltage acquisition wire to connect to the channel 1 interface of the device.

   If the number of battery cells to be tested exceeds 12: Connect additional cells by using a 12-pin cell voltage acquisition wire to connect to channel 2 of the device (supports up to 24 cells).

2) According to the markings on the cell voltage acquisition wire, B1- connects to the negative terminal of the first cell (B1), B1+ connects to the positive terminal of the first cell (B1), B2+ connects to the positive terminal of the second cell (B2), and so on.



Power supply connection:

Use the AC power cord provided with the device to connect the device's power input port to a power outlet to supply power to the device. Set the maximum target current according to

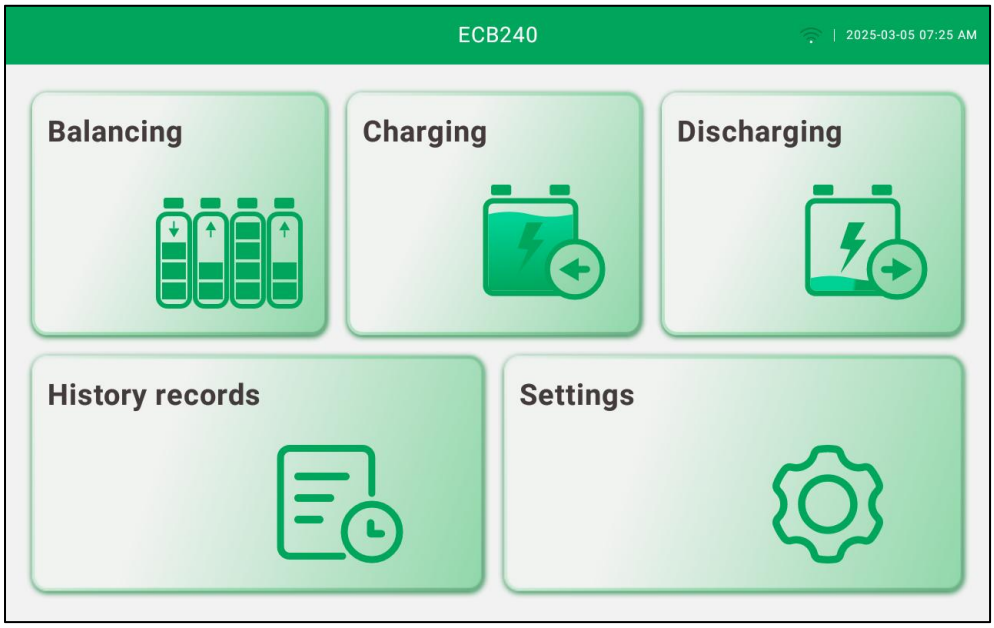
the size of the AC input load to prevent overcurrent.

5.3 Device operation

After connecting the device, turn on the power switch to activate it. Then set the equalization parameters, charging parameters, discharging parameters, and protection conditions. Close the DC switch before starting the test.

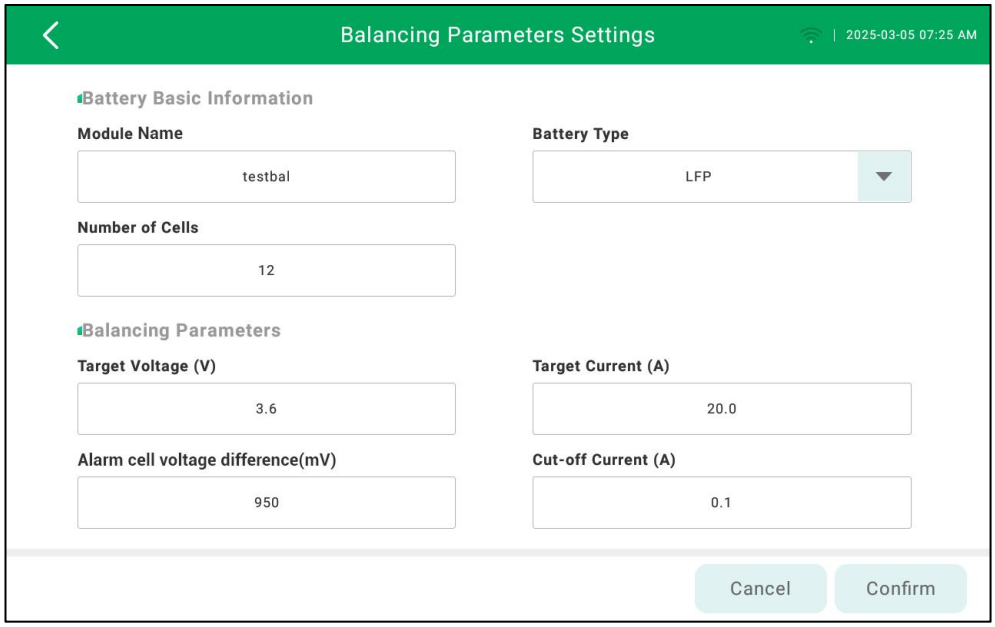
5.3.1 Main function menu

After powering on the device, it defaults to the charge and discharge test screen. The functional modules include **Balancing, Charging, Discharging, History records, and Settings**. Select the desired function and click to enter.



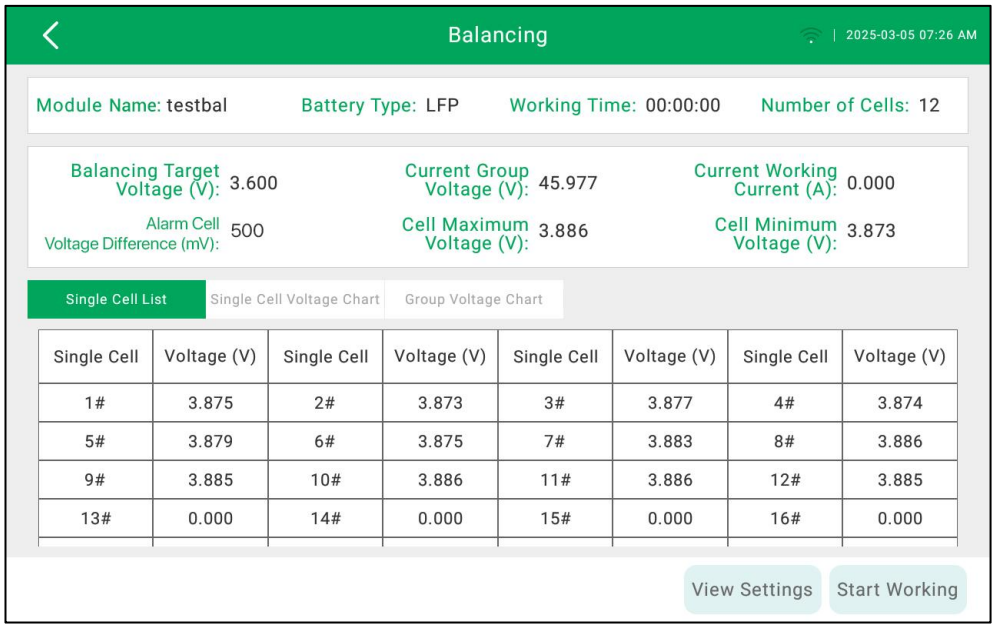
5.3.2 Balancing

1) On the main screen, click "**Balancing**" to enter the Balancing parameters settings screen.

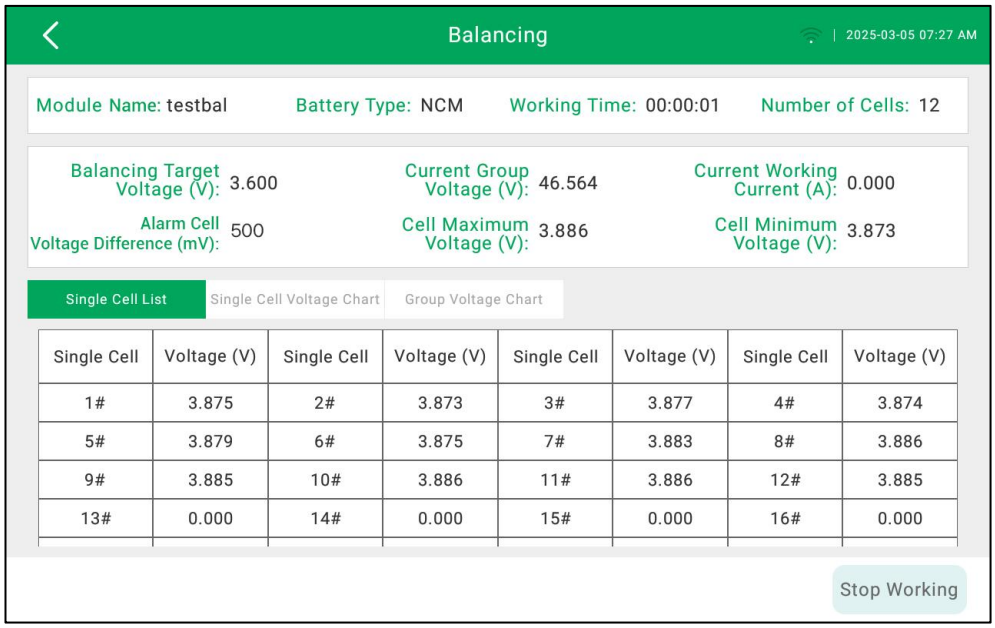


Parameters Description	
Module name	Battery pack module naming.
Battery type	Select the type of battery module to test (different battery parameters vary).
Number of cells	Number of battery cells.
Target voltage	Target voltage value for battery module equalization.
Target current	Set the maximum current allowed during equalization.
Alarm cell voltage difference	The threshold for triggering an alarm due to cell voltage difference.
Cut-off current	The current threshold for terminating charge and discharge tests.

2) After setting the parameters, click "C**onfirm**" to save the current settings and enter the equalization screen. Click "**Start Working**" on the equalization screen to start equalizing.

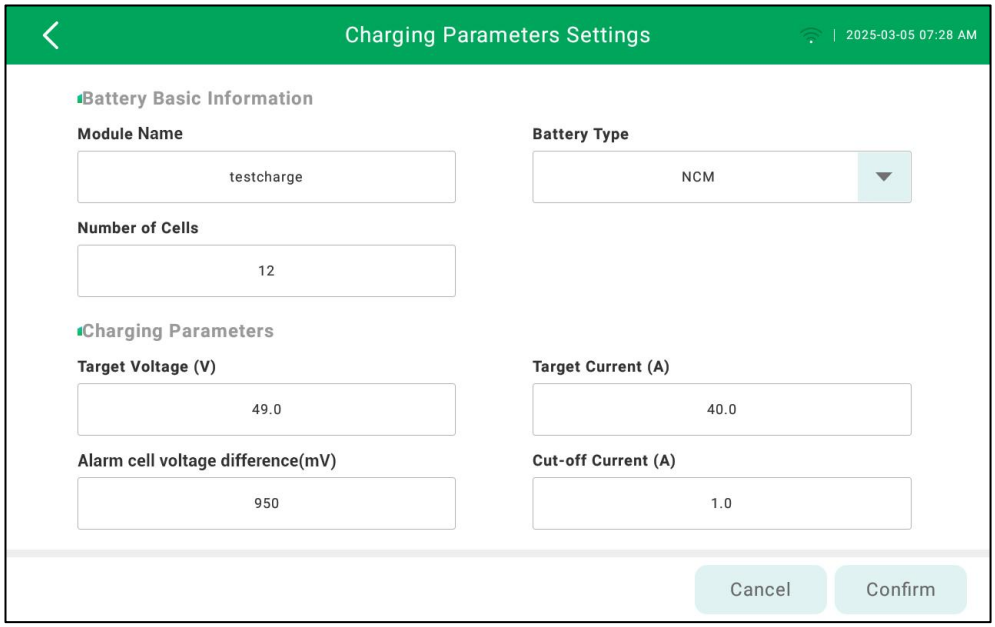


3) During the equalization, you can monitor the equalization progress, including single cell list, single cell voltage chart, and group voltage graphs. Click "**Stop Working**" to end the current equalization process. After stopping, you can view the test data in "**History records**".



5.3.3 Charging

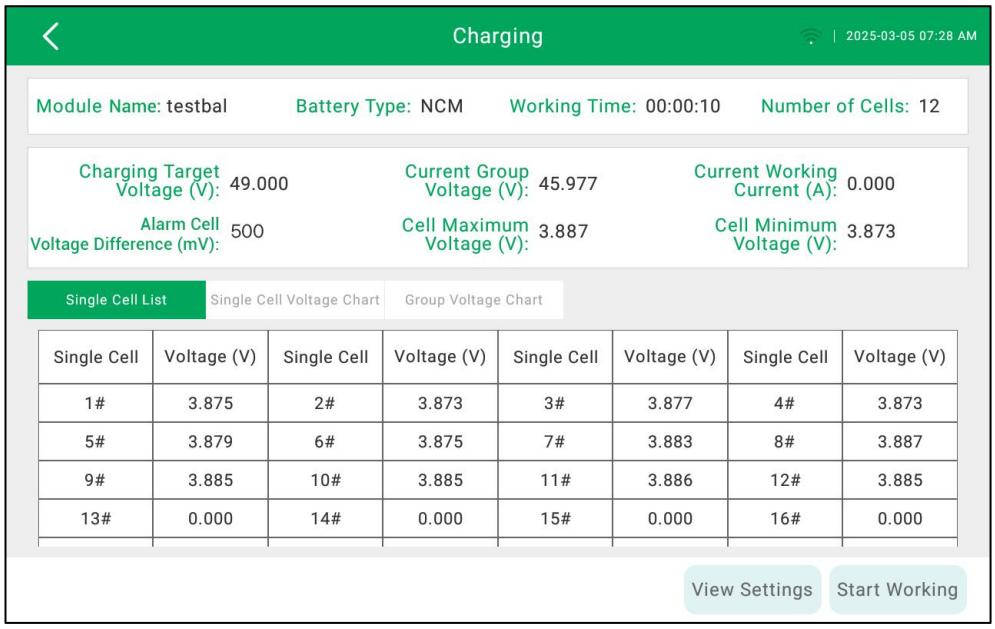
1) On the main screen, click **"Charging"** to enter the charging parameter settings screen.



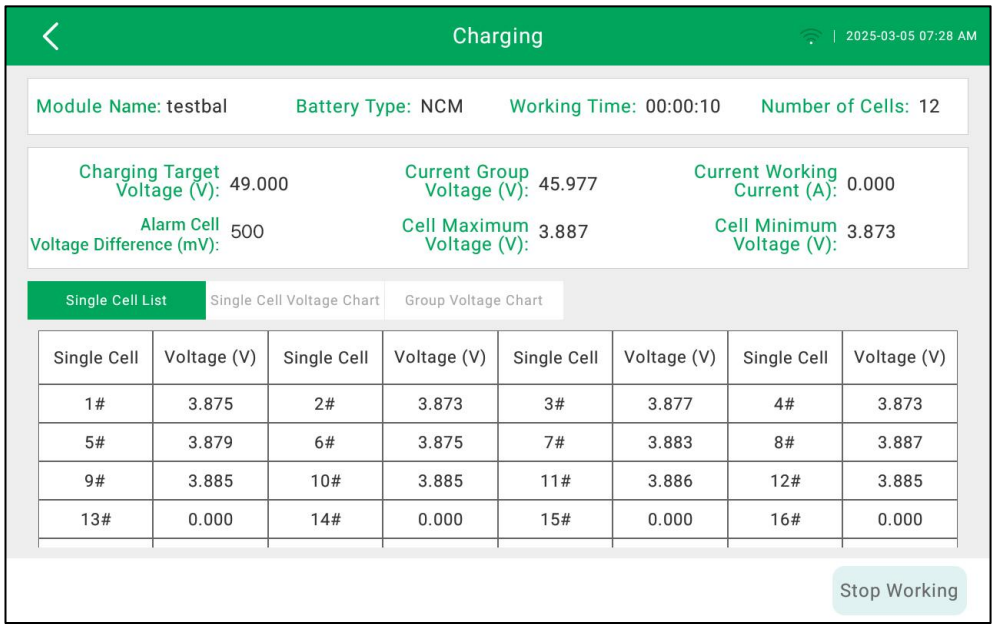
Parameters Description	
Module name	Battery pack module naming.
Battery type	Select the type of battery module to test (different battery parameters vary).
Number of cells	Number of battery cells.

Target voltage	Target voltage value for battery module charging.
Target current	Set the maximum current allowed during charging.
Alarm cell voltage difference	The threshold for triggering an alarm due to cell voltage difference.
Cut-off current	The current threshold for terminating charge and discharge tests.

2) After setting the parameters, click "**Confirm**" to save the current settings and enter the charging screen. Click "**Start Working**" on the charging screen to start charging.

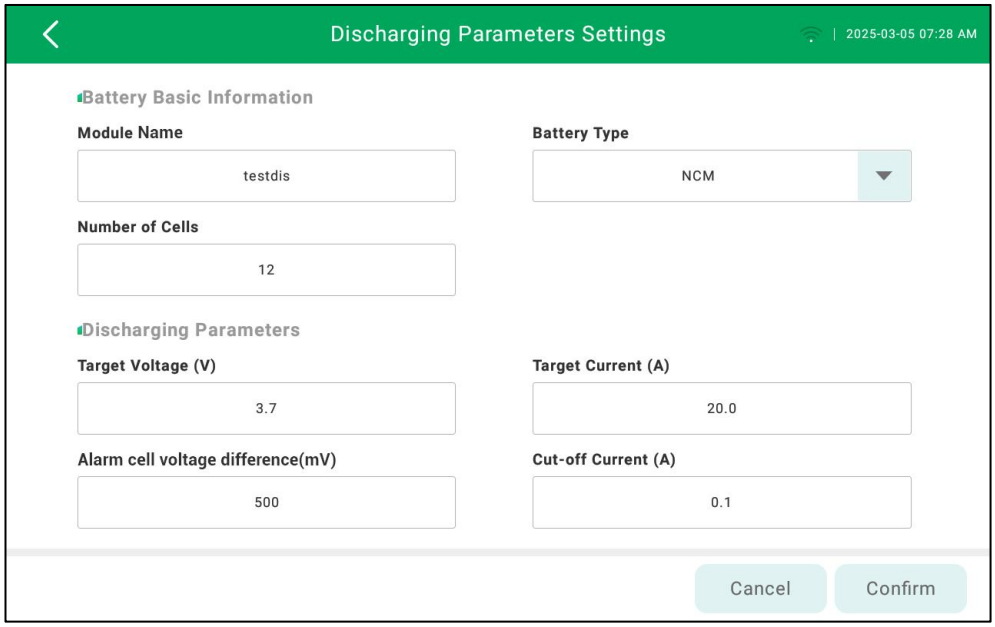


3) During the charging, you can monitor the charging progress, including individual cell voltage, individual cell voltage graphs, and group terminal voltage graphs. Click "**Stop Working**" to end the current charging process. After stopping, you can view the test data in "**History records**".



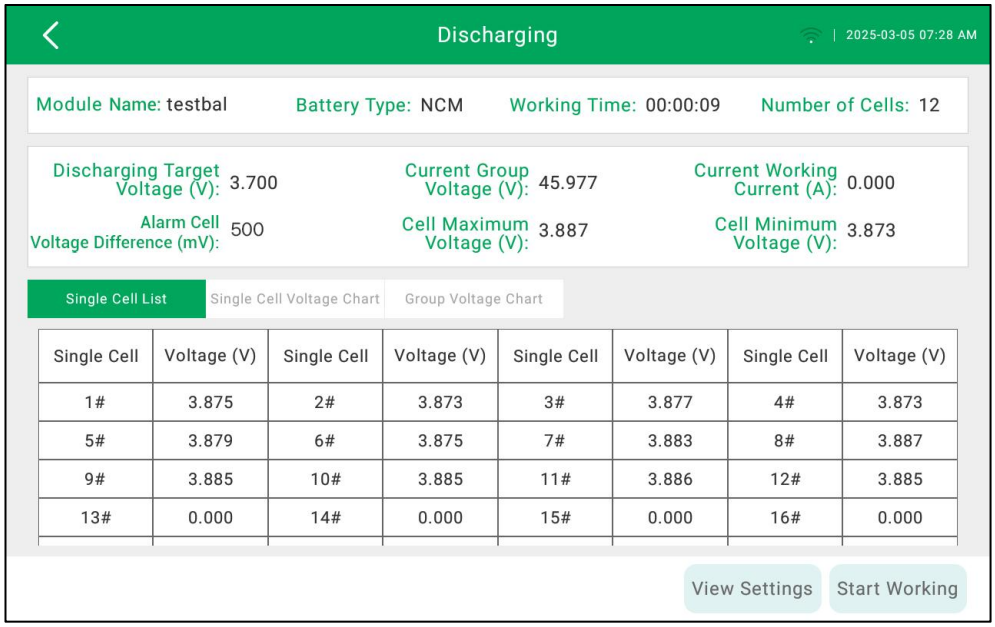
5.3.4 Discharging

1) On the main screen, click "Discharging" to enter the discharging settings screen.

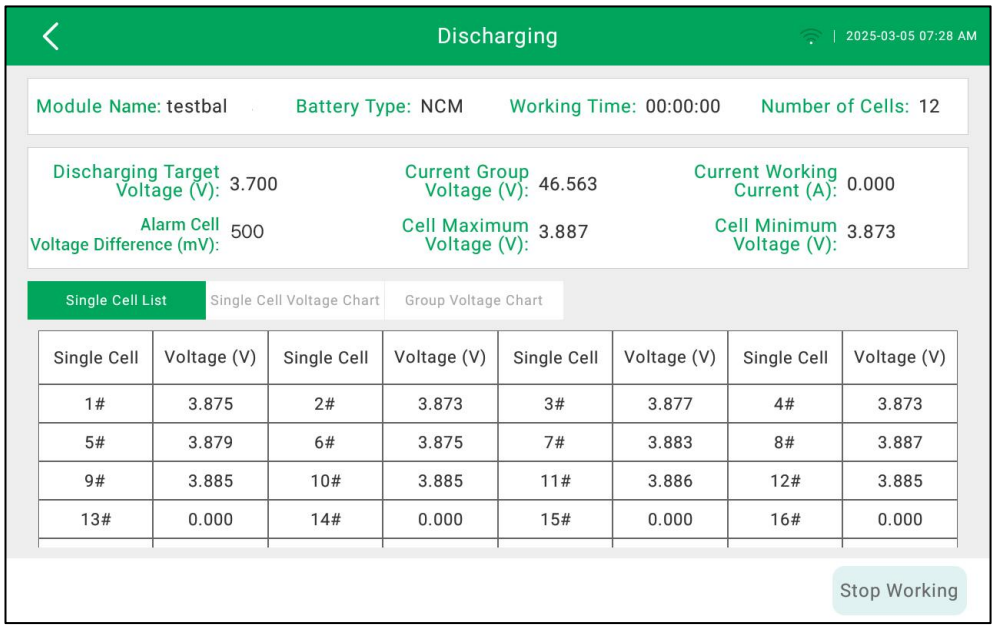


Parameters Description	
Module name	Battery pack module naming.
Battery type	Select the type of battery module to test (different battery parameters vary).
Number of cells	Number of battery cells.
Target voltage	Target voltage value for battery module discharging.
Target current	Set the maximum current allowed during discharging.
Alarm cell voltage difference	The threshold for triggering an alarm due to cell voltage difference.
Cut-off current	The current threshold for terminating charge and discharge tests.

2) After setting the parameters, click "**Confirm**" to save the current settings and enter the discharging screen. Click "**Start Working**" on discharging screen to start discharging.

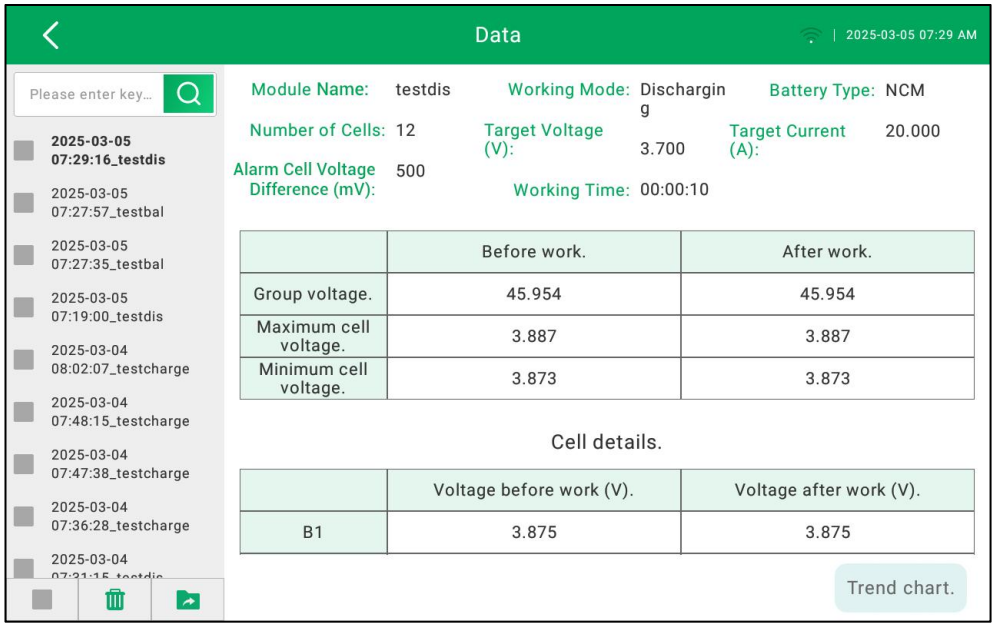


3) During the discharging, you can monitor the discharging progress, including individual cell voltage, individual cell voltage graphs, and group terminal voltage graphs. Click "**Start Working**" to end the current discharging process. After stopping, you can view the test data in "**History records**".



5.3.5 History records

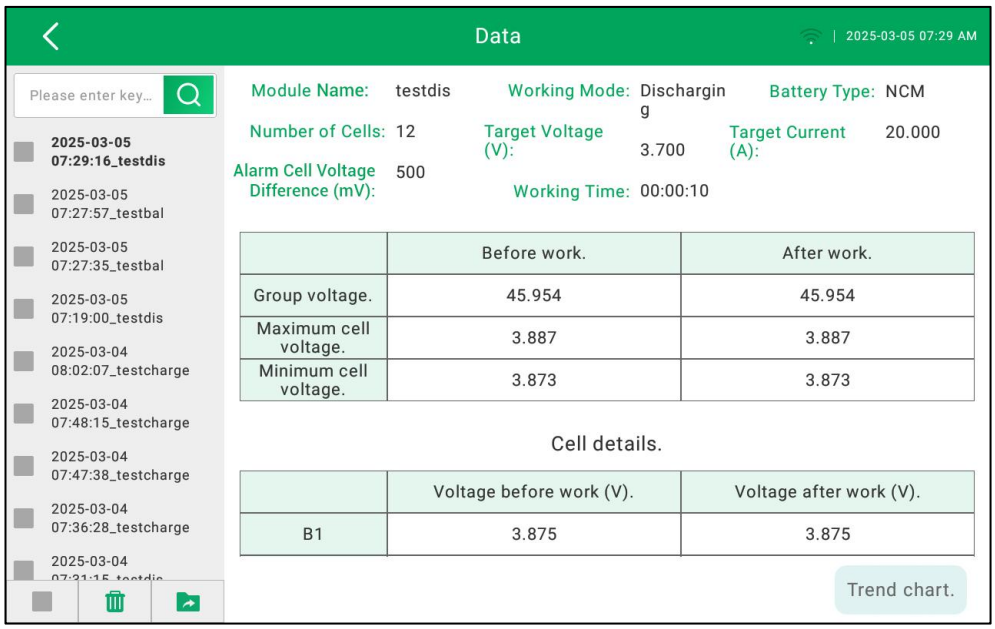
1) Click "**History records**" on the main screen to access the history record page.



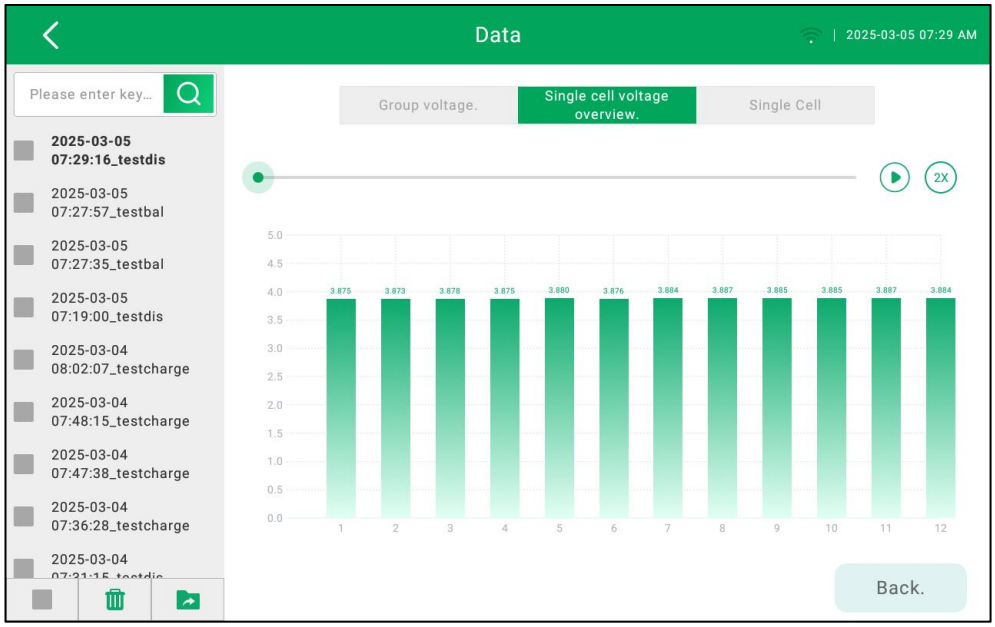
2) Select one or multiple history records by checking the box(es), then click "🗑" to delete the selected records.

3) Select one or more history records by checking the box(es), then click "↗" to export the selected records via USB drive, email, or QR code sharing.

4) Click a record to view its details.

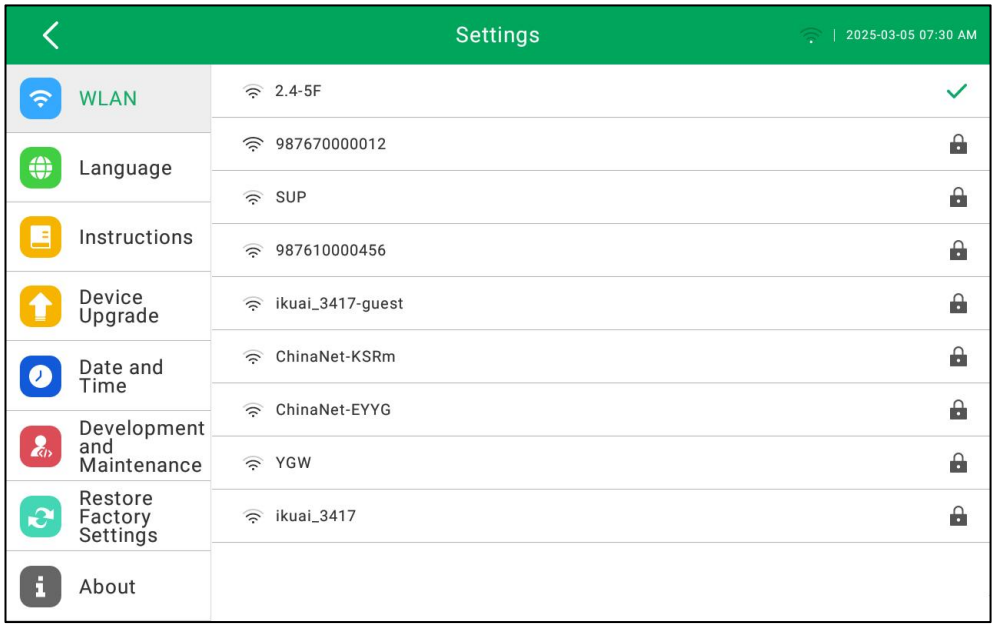


Click "**Trend Chart**" to view the equalization, charging, and discharging trend charts for group terminal voltage or individual cells.



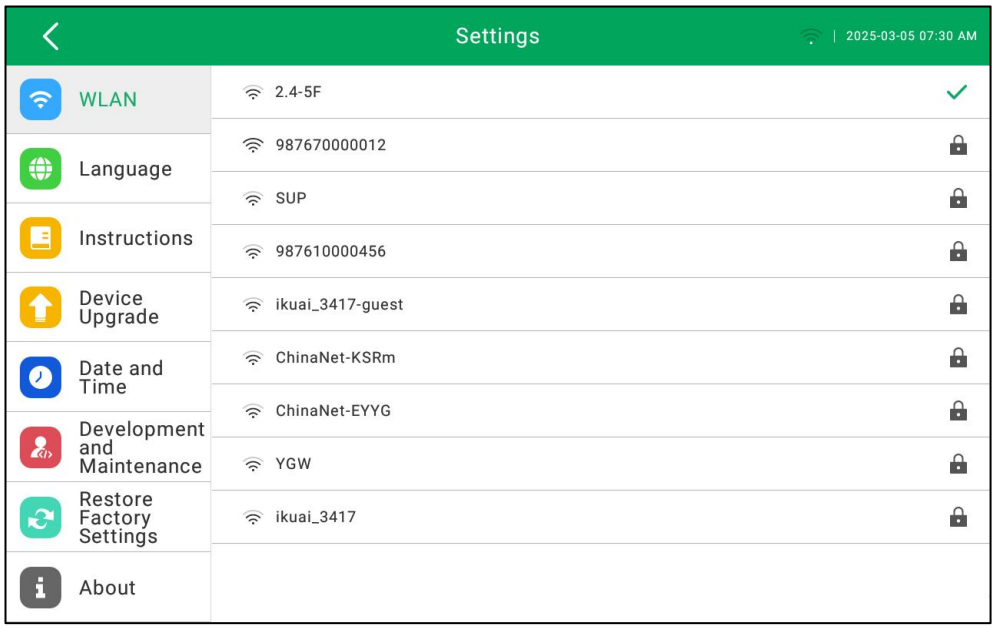
5.3.6 Settings

On the main screen, click "**Settings**" to enter the settings menu. Users can switch between different settings options by clicking on the options on the left side of the screen. Settings options include **WLAN, Language, Instructions, Device Upgrade, Date and Time, Development and Maintenance, Restore Factory Settings, and About.**

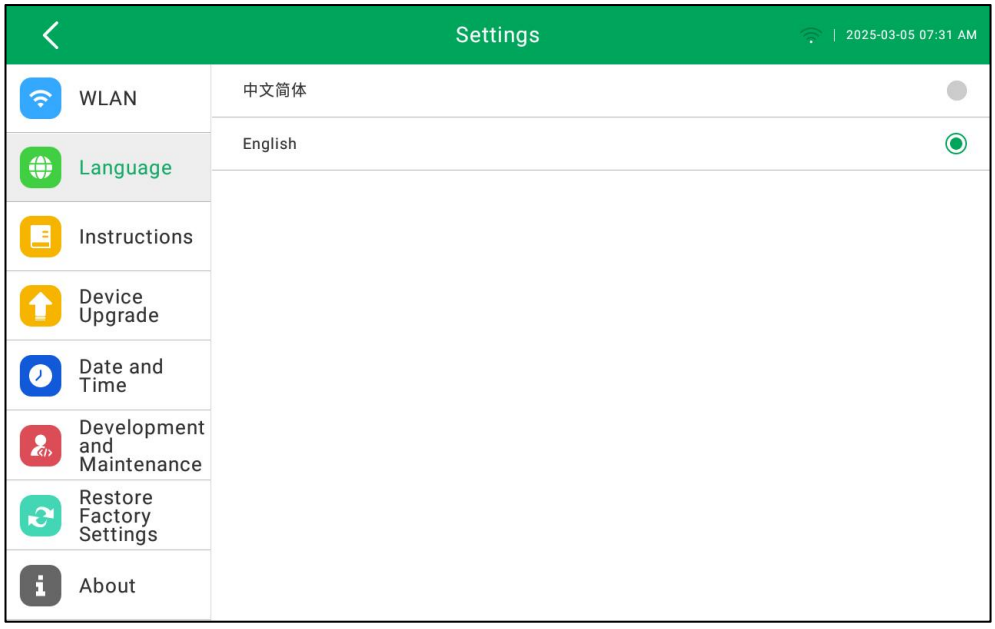


WLAN: Used for setting up the device's wireless network connection.

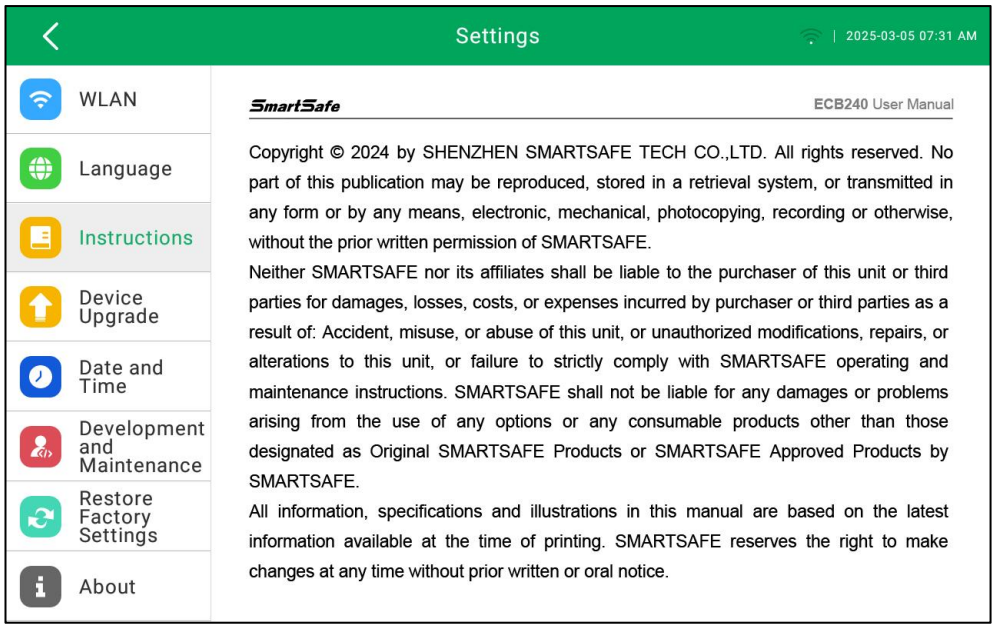
Note: Before setting up the device's wireless network connection, please insert the USB wireless adapter into the device's USB port.



Language: Used for setting the system language.

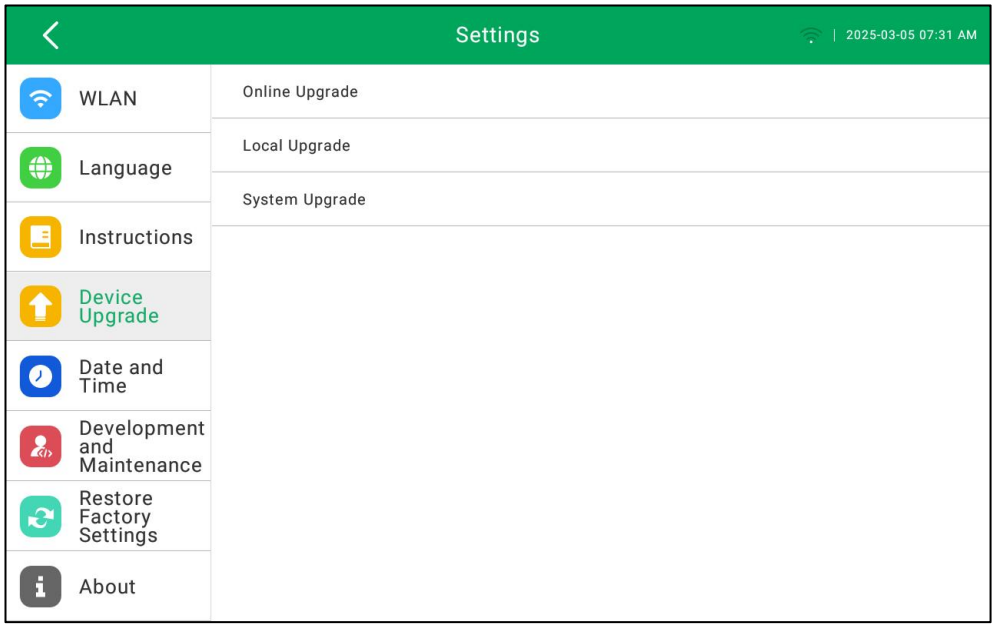


Instructions: Used for viewing the digital version of the manual.

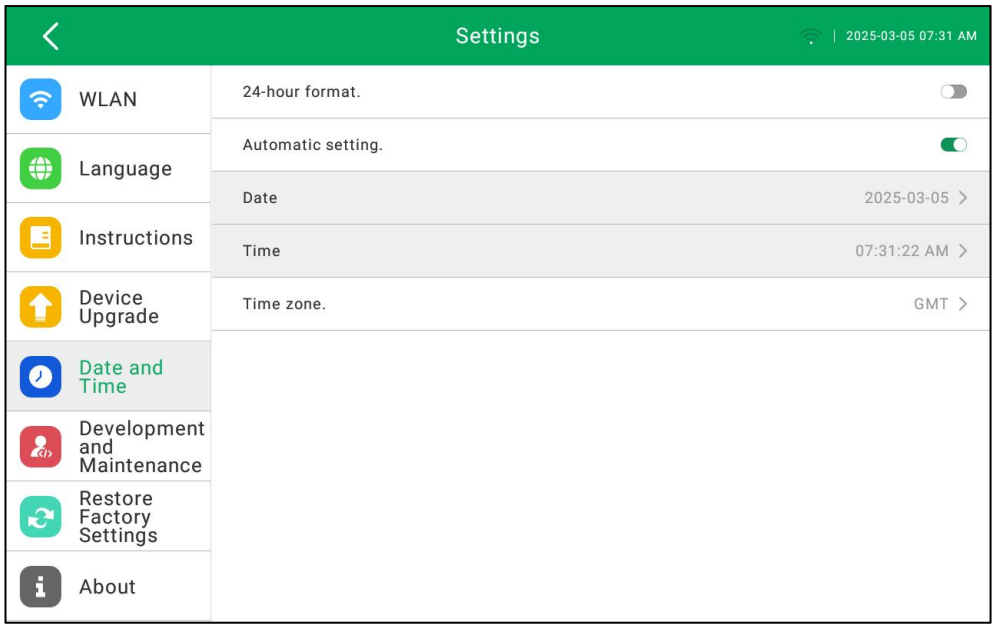


Device Upgrade: Used for upgrading App and system. You can click "**Online Upgrade**" to update the device App to the new version via Wi-Fi, or click "**Local Upgrade**" to update the device App to the new version using a USB with the new App version.

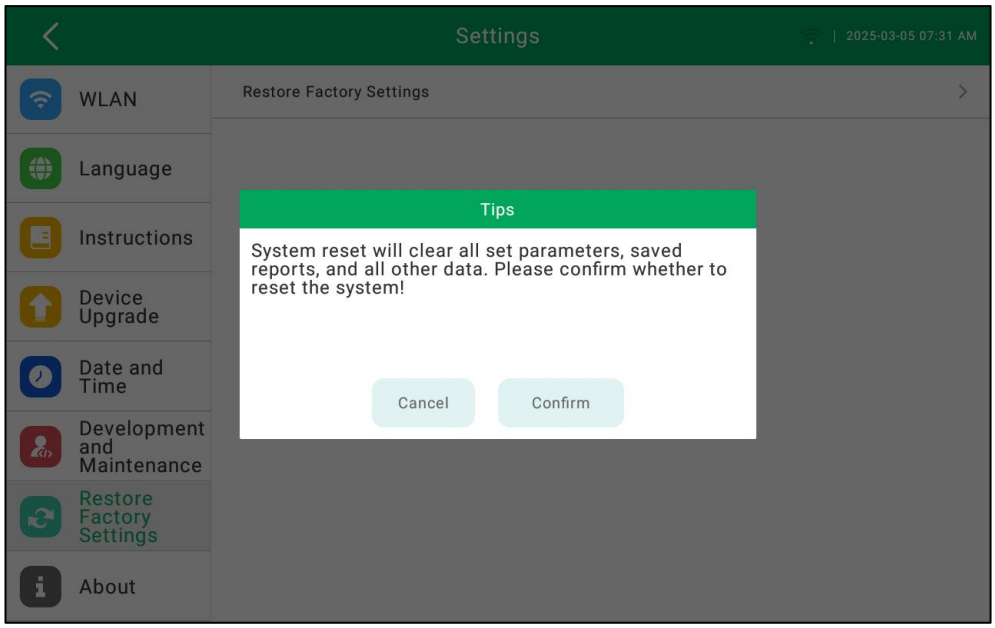
Note: To perform the online upgrade, please connect to a Wi-Fi network first. To ensure the upgrade goes smoothly, please maintain a stable network connection during the process.



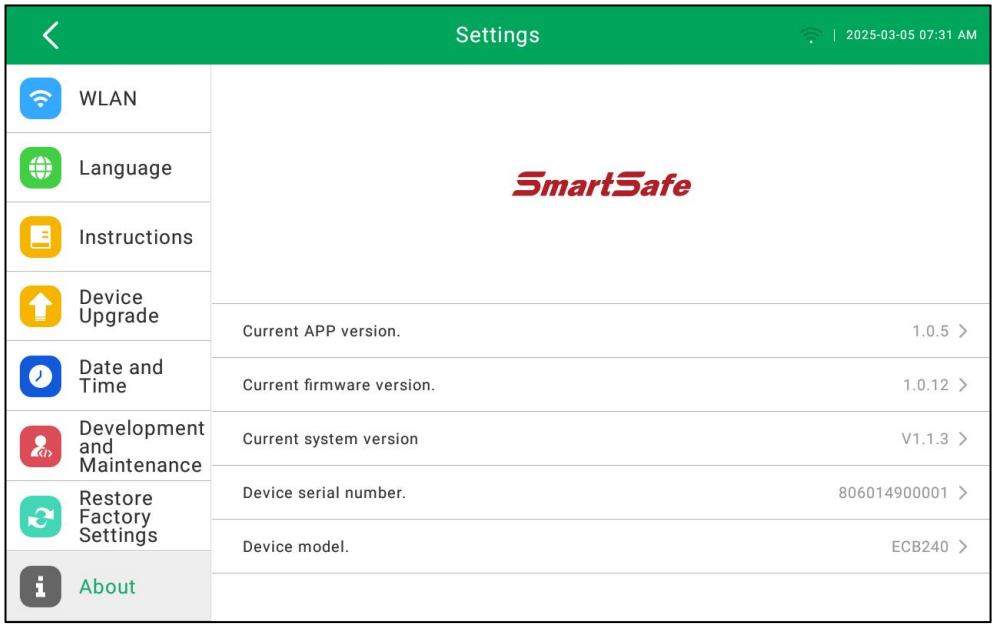
Date and Time: Used for setting the date, time, and time zone, etc.



Restore Factory Settings: This feature is used to reset the system. After clicking “**Restore Factory Settings**", a pop-up message will appear: "System reset will clear all set parameters, saved reports, and other data. Please confirm whether to reset the system!”. Click **"Confirm"** to start the system reset.



About: Used for viewing information such as device model, App version, firmware version, system version, and device serial number.



Warranty

THIS WARRANTY IS EXPRESSLY LIMITED TO PERSONS WHO PURCHASE SMARTSAFE PRODUCTS FOR PURPOSES OF RESALE OR USE IN THE ORDINARY COURSE OF THE BUYER'S BUSINESS.

SMARTSAFE electronic product is warranted against defects in materials and workmanship for one year from date of delivery to the user.

This warranty does not cover any part that has been abused, altered, used for a purpose other than for which it was intended, or used in a manner inconsistent with instructions regarding use. The exclusive remedy for any automotive meter found to be defective is repair or replacement, and SMARTSAFE shall not be liable for any consequential or incidental damages.

Final determination of defects shall be made by SMARTSAFE in accordance with procedures established by SMARTSAFE. No agent, employee, or representative of SMARTSAFE has any authority to bind SMARTSAFE to any affirmation, representation, or warranty concerning SMARTSAFE automotive meters, except as stated herein.

Disclaimer

The above warranty is in lieu of any other warranty, expressed or implied, including any warranty of merchantability or fitness for a particular purpose.

Purchase Order

Replaceable and optional parts can be ordered directly from your SMARTSAFE authorized dealer. Your order should include the following information:

- Order quantity
- Part number
- Part name

Statement:

SMARTSAFE reserves the rights to make any change to product designs and specifications without notice. The actual object may differ a little from the descriptions in the manual in physical appearance, color and configuration. We have tried our best to make the descriptions and illustrations in the manual as accurate as possible, and defects are inevitable, if you have any question, please contact local dealer or after-sale service center of SMARTSAFE, SMARTSAFE does not bear any responsibility arising from misunderstandings.