



**ACT ABA1000  
Battery  
Management  
Station**

**User Manual**

**Revision A**

## ACT ABA1000 Battery Management Station User Manual

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### Revision History

Revision	Date	Reason for Change
A	05/02/2016	Initial Release

## Table of Contents

Chapter 1. Overview .....	4
1.1 Main Station .....	4
1.2 Purpose .....	4
Chapter 2. Function .....	6
2.1 Battery Charging .....	6
2.2 Battery Discharge .....	6
2.3 Battery Activation .....	7
Chapter 3. Features .....	8
Chapter 4. Operating Principle .....	9
Chapter 5. Specifications .....	10
Chapter 6. Operation Panel Description .....	11
6.1 Connection .....	11
6.2 Operation Procedure .....	12
Chapter 7. Daily Maintenance .....	22
Chapter 8. Trouble Shooting .....	23
Chapter 9. Things to Pay Attention .....	24

## Chapter 1. Overview

ABA1000 Battery Management Station (BMS) is a battery management system used to maintain, reactivate and test battery cells up to 12V. This system includes a battery charger, a battery discharger, a battery activator and system monitor.

This station can increase the capacity of old batteries by activating the disabled active material of a battery's electrode plate, thereby amending battery malfunctions caused by chemical failures.

The charging, discharging, activation functionalities can be used either individually or collectively. When the functions are used collectively, lag-out batteries will undergo low-volt constant current charging and discharging of single or multi-cell batteries (up to 100A).

An LCD display will display the activation curve as well as parameters such as voltage and resistance as activation finishes.

### 1.1 Main Station

The station has two large jumper cable (red, black). The cable terminals (red, black) are fixed to the rear of the panel to facilitate control of the switch.



### 1.2 Purpose

This battery activation station (hereinafter referred to as activation station), is a multi-function device for battery maintenance and testing, and is an indispensable helper in daily maintenance. The station is compact, making it convenient to move and operate. It has found widespread use in electric power, finance, telecommunication, military, automobile, subway, manufacturing, and other industries.

Batteries performance naturally degrades and deteriorates every year, resulting in large quantities of batteries being scrapped and bringing about economic losses environmental pollution. Therefore rehabilitation and activation of battery cells and battery recycling has always been a hot topic, especially in recent years due to governmental concerns.

Modern power supply systems with high safety standards are all equipped with a backup power supply, UPS, etc., but energy storage is still the core part of the system. These batteries are usually arranged in groups, and any single battery aging will affect the performance of the whole group batteries and cause damage to other battery cells resulting in a shortening of the group's lifespan. Car batteries are often considered broken and scrapped when they are unable to properly start a car, but many of these defective batteries can still be treated and activated, rendering them useful again and prolonging their service lives. In this way, regular battery maintenance is a very pragmatic choice.

The activation station has a programmable battery charging/discharging cycle activation function as well as independent battery charging and discharging functions. All charge and discharge functions are programmable. The device automatically charges according to the three-step process. These functions fully meet the demand for battery daily maintenance.

This equipment can be used online or offline, and is compatible with 2 V, 6 V, and 12 V batteries.

## Chapter 2. Function

### 2.1 Battery Charging

This section covers programming for single-battery charging. Programmable settings include: battery number, battery type, charging current, charging time, and battery voltage limit.

Charging methods: Defaults to three-stage battery charging according to programming parameters: constant current, constant voltage, and floating charge.

When charging time has been met or charging is complete the unit will stop charging, and the display will indicate that the battery is fully charged.

Constant current charging: the charging current is  $I_{10}$ , when the voltage exceeds the limit voltage the system switches to constant voltage mode, when the current is less than  $0.1 I_{10}$  the system switches to floating charge mode, as shown in the figure below:

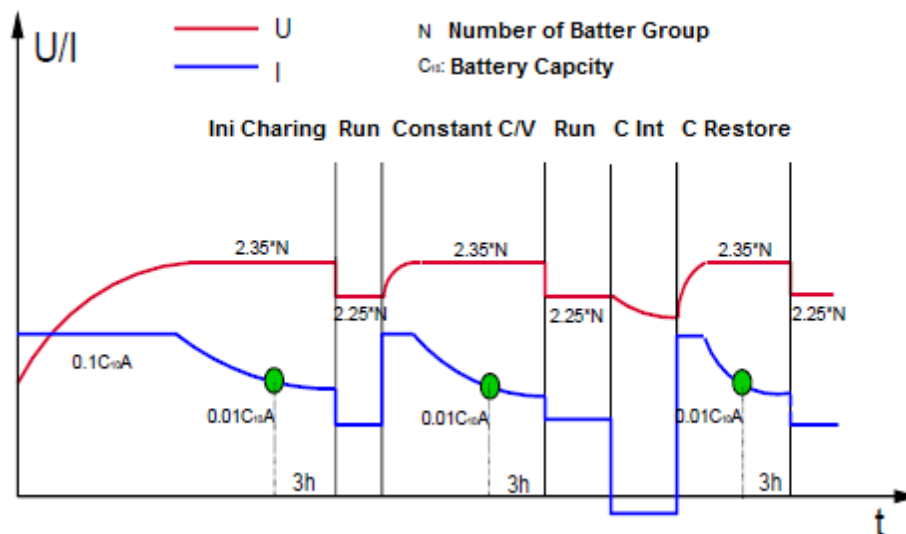


Figure 1 - Three-stage charging process

Dynamic charging process information is displayed in real-time.

Temperature monitoring: if the temperature is higher than the set limits the cooling fan will start automatically.

### 2.2 Battery Discharge

This section covers programming for single-battery discharging. Programmable settings include: battery number, battery type, discharging current, discharging time, and battery voltage limit.

Discharge method: constant current discharge. When the system is below the voltage limit or over the discharge time the system will stop discharging, and show that discharge has been completed

Dynamic discharging information is displayed in real-time.

Temperature monitoring: if the temperature is higher than the set limits the cooling fan will start automatically.

## 2.3 Battery Activation

This section covers programming for single-battery activation. Programmable settings include: battery number, battery type, charging voltage (upper limit), discharge voltage (lower limit), charging and discharging cycles, charging current per cycle, charge time, discharge time, and battery voltage limit.

Activation mode: cycles one by one according to programmed values. Discharge ends when the voltage is lower than the set limit or the set time limit has been reached. Charging ends when the set time limit has been reached or the battery is fully charged

Dynamic activation information is displayed in real-time.

Temperature monitoring: if the temperature is higher than the set limits the cooling fan will start automatically.

## Chapter 3. Features

- 1) Battery has complete maintenance function
- 2) Compact size, highly portable
- 3) Temperature monitoring: if the temperature is higher than the set limits the cooling fan will start automatically.
- 4) Three-stage charging to prevent overcharging.
- 5) Optional pulse recovery charging mode: to improve batteries damaged by inverse vulcanization
- 6) Voltage/current limiting to protect from overcharging or overdischarging
- 7) Intelligent polarity reverse connection protection
- 8) Modular design, convenient maintenance
- 9) User-friendly interface, large screen LCD, simplified Chinese menu operation



## Chapter 4. Operating Principle

Working principle: failure and capacity attenuation of common lead-acid batteries and maintenance-free batteries are directly related to increases in internal resistance and voltage, which will significantly decrease battery performance. Battery quality is primarily impacted by vulcanization, with two important factors caused by sulfide: one is polarization voltage, the other is the memory effect. Polarization voltage is the process of charging and charge accumulation resulting from reversed battery electrodes, which increases the internal resistance of battery. An effective method to eliminate polarization voltage is to use a negative polarity pulse to release the counter polarity charge on the electrode at both ends of the battery. The memory effect can be eliminated through repeated charging and discharging. Backward battery activation uses fuzzy mathematical control theory and a multi-stage charging and discharging algorithm to fully simulate the derived battery charge and discharge characteristics. Charge and discharge characteristics simulation results can be completely reproduced for each battery. To activate a battery and enhance its capacity, backwards sulfate crystallization ionization is used, and an active material is continuously dissolved in the electrolytes reducing the inner resistance of the battery, and increasing the charging voltage stability. A battery's actual capacity can be restored and improved through activation.

## Chapter 5. Specifications

Battery activation station technical indicators are shown in table 1: :

Electrical Characteristics	Intelligent Battery Activation station	Resolving Power	Steady Current / Voltage Accuracy
Charging Current	1 A to 50 A (12 V mode)	0.01 A	≥1.0%
Discharge Current	1 A to 50 A (12 V mode)	0.01 A	≥1.0%
Charge and Discharge Voltage	9.0 V to 16 V (12 V mode)	0.01 V (6, 12 V mode)	≤0.5%
Temperature Measuring Range	-10 °C to 55 °C	0.001 °C	0.1 °C
Pulse Period	15 seconds		
Power Supply	AC 220 V ± 10 %		
Dimensions	300 mm × 425 mm × 200 mm		
Weight	15 kg		
Operation Temperature	0 °C to 50 °C		
Operation Humidity	5 % to 90 % indoors		
Display Mode	480 × 800 pixels LCD		
Communication Interface	Can be customized according to customer requirements (RS232 communications and USB communications)		
Carrying Mode	Portable		
Heat Dissipation Method	Strong wind cooling		

Table 1 Technical indexes of battery activation station

## Chapter 6. Operation Panel Description

All operations on the host are can be performed in the front panel as shown in figure 2:



Figure 2 - Front panel of host

### 6.1 Connection

Make sure the current loop on the device (red, black and fixture) and batteries are correctly connected. First, connect the cathode (black fixture), followed by the positive (red clamp voltage loop (red, black and small fixture), and check to make sure the positive and negative poles are connected correctly. The connection diagram is shown in Figure 3:

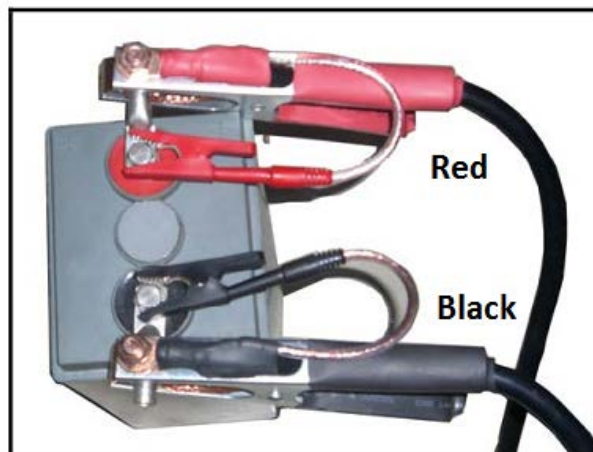


Figure 3 - Fixture and battery connection diagram (diagram may look different from actual product)

## 6.2 Operation Procedure

### 6.2.1 Main Menu

Open the air switch on the panel, the system will automatically enter the operation main interface of the battery activation station. The main menu interface is shown in Figure 4:



Figure 4 – Activator main interface

### 6.2.2 Battery Charge

Clicking on the **Battery charge** icon in the main menu to enter the battery charging settings interface as shown in figure 5:

Figure 5 - Battery charging settings interface

1) Select the battery number, the default starts from 0000, the number can be sequentially increased in accordance with the order of operation. Users cannot set their own battery number. The maximum is 29.

2) Based on the type of battery, users select the input voltage of the battery and battery capacity in the battery type bar. After choosing the battery voltage, the system will provide the user with a default value for the cutoff voltage, or the user can also manually set the value. When the battery capacity has been input, the system will give a default value for the charge current, or the user can manually set the value.

1. The system preset charging (discharge) electric current is usually set to  $I_{10}$ , where  $I_{10}$  represents a discharge rate of 10 hours of discharge current. For a 200 Ah battery,  $I_{10}$  is 20 A; for a 150 Ah battery,  $I_{10}$  is 15 A.



## Note

2. Single charge and discharge time shall not exceed 18 hours (applicable to charge / discharge settings).
3. Set the cutoff voltage in the parameter settings to protect the battery
4. For small capacity batteries user should also pay attention to the working current settings recommended for the rate of  $I_{10}$  charging and discharging.

3) After setup is complete, click start charging.

① If the parameter settings returns an error, the system will pop up a prompt box, seen in figure 6:

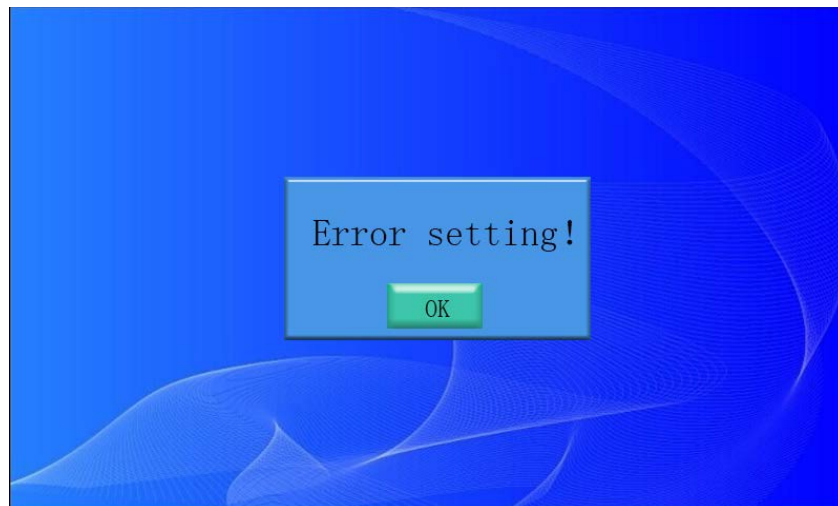


Figure 6 - Parameter setting error interface

Click **OK** to return to the parameter settings interface from the newly set charging parameters.

② If there are no errors with the input parameters, the system will display real-time data and a curve graphics interface when charging as shown in figure 7:

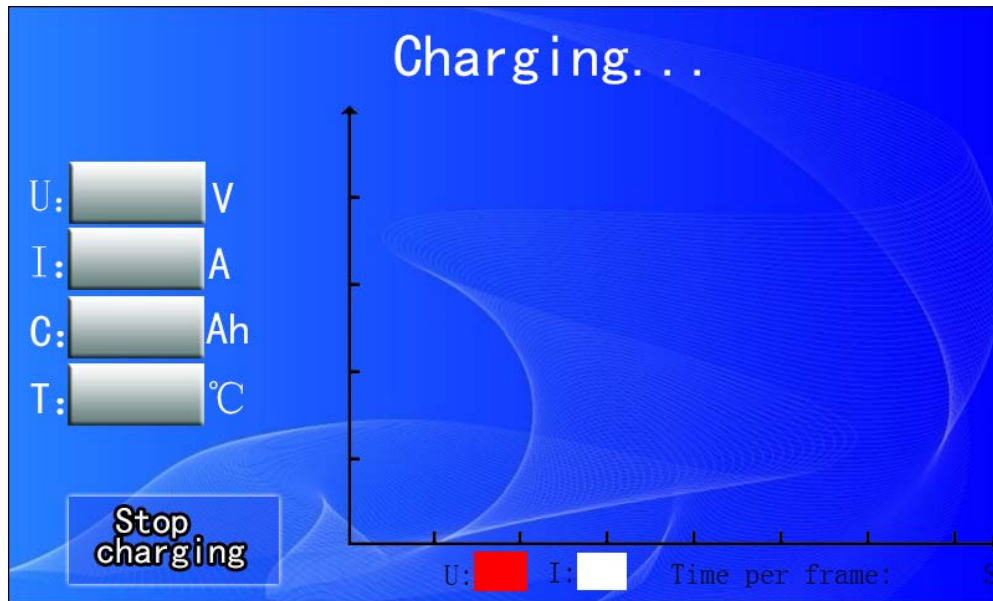


Figure 7 – Real-time data display interface

The interface displays real-time voltage, current, and temperature data, and there are two voltage and current real-time graphs. Users can click the **Stop charging** button to interrupt the charging. When the **Stop charging** button is clicked, a prompt will pop up asking the user to confirm that they want to stop charging. If **yes** is selected, the unit will stop charging and return to the charging settings interface. If **no** is selected, the system will return to the real-time data display interface.

### 6.2.3 Battery Discharge

The battery discharge interface is similar to the battery charge interface, and the operations are the same with opposite effects. In the main menu, click the **Battery discharge** icon to enter the battery discharge interface as shown in figure 8:



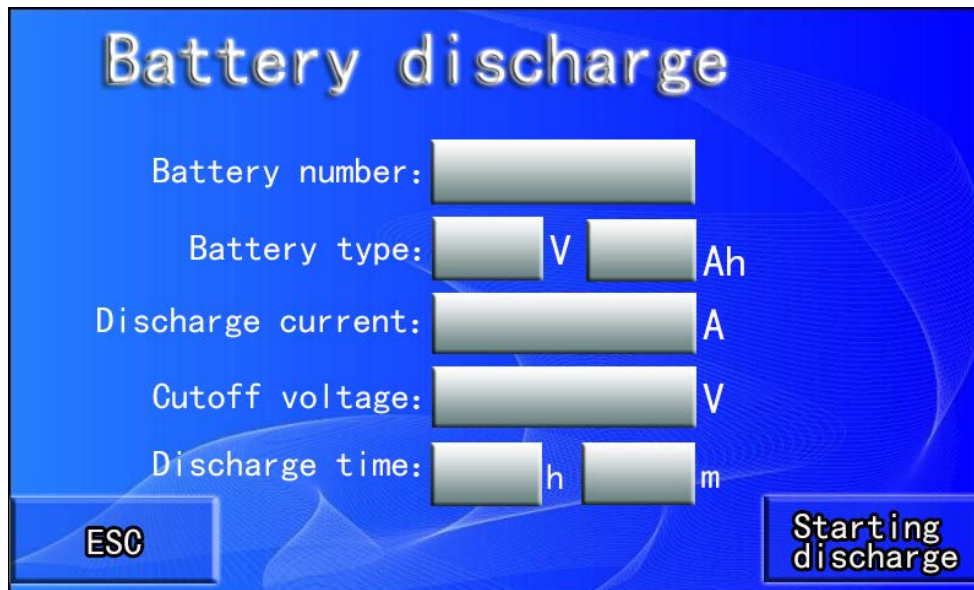


Figure 8 - Battery discharge interface

Battery discharge parameters are similar to battery charging.

#### 6.2.4 Battery Activation

Click on the **Battery activation** icon in the main menu to enter the battery activation interface as shown in figure 9:

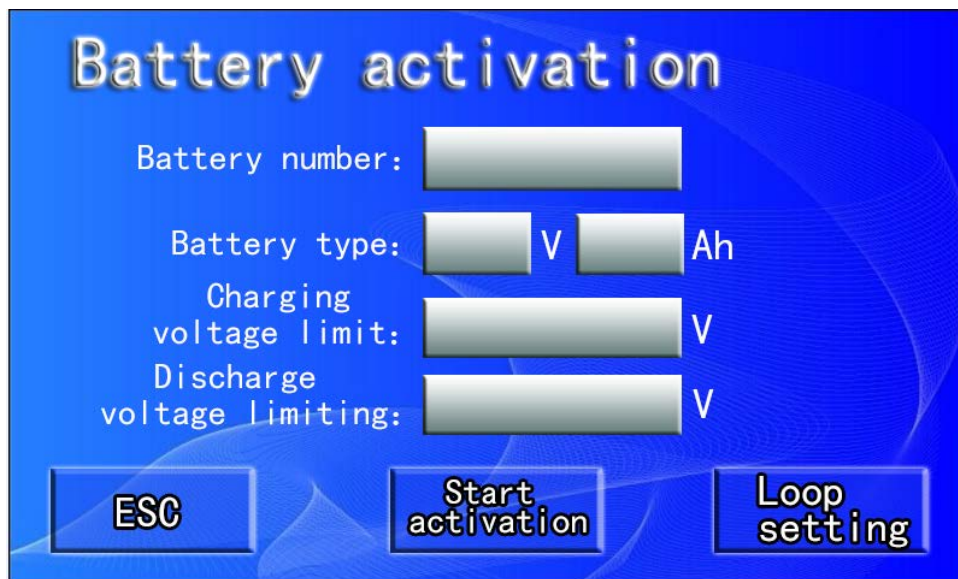
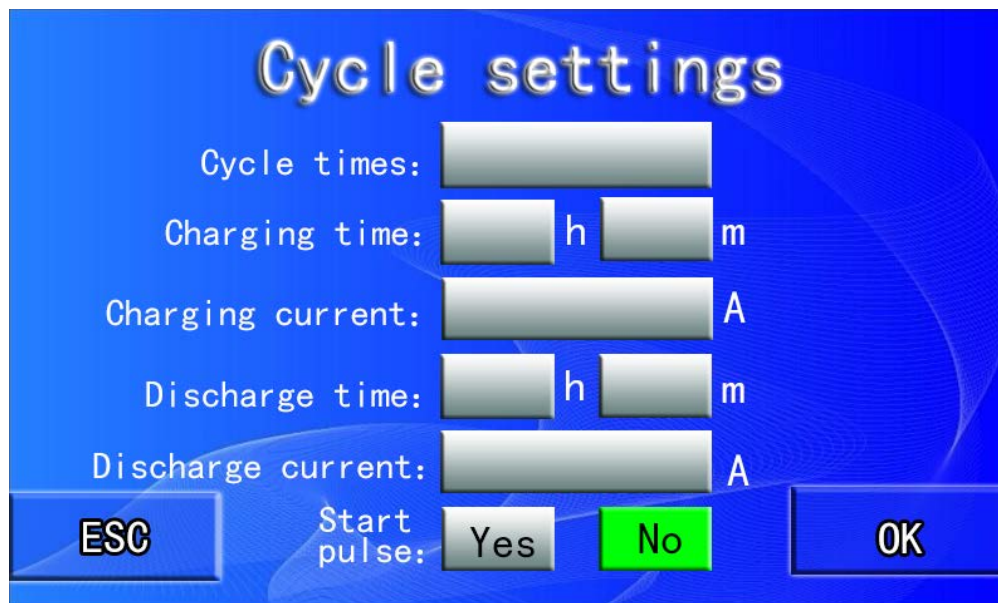


Figure 9 - Battery activation interface

Click on **Loop settings** to enter the cycle settings interface as shown in figure 10:

On the cycle settings page users can set the number of cycles, charge and discharge current, charge and discharge time, and whether to start the pulse (default is not activated).



**Cycle settings**

Cycle times:

Charging time:  h  m

Charging current:  A

Discharge time:  h  m

Discharge current:  A

ESC Start pulse: Yes No OK

Figure 10 - Battery activation cycle settings interface

After setting the parameters click **OK**, then click **Start Activation** to enter the activated real-time data display interface as shown in figure 11:

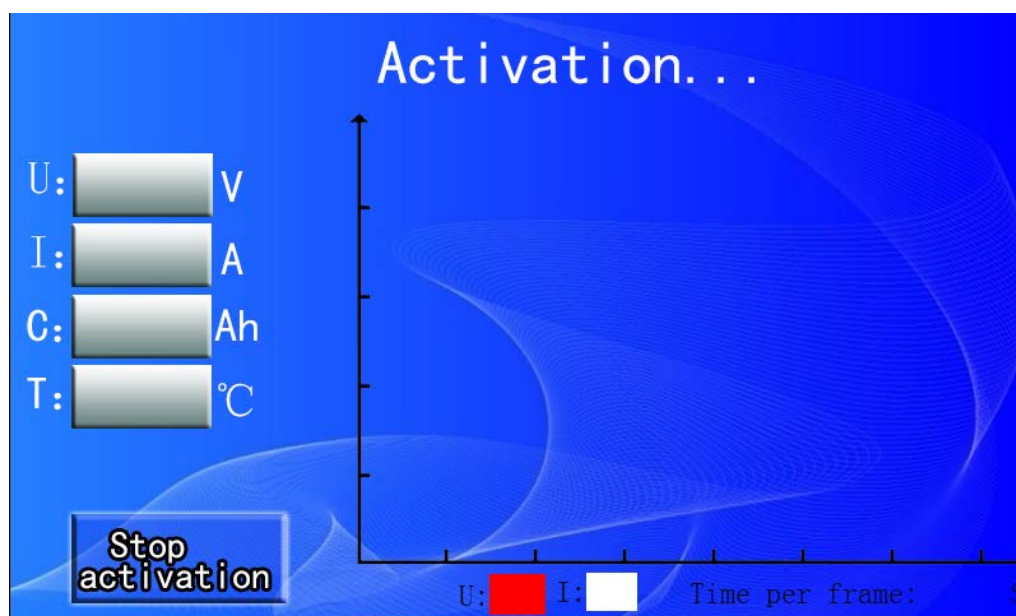


Figure 11 - Battery activation real-time data display interface

**Pulse charging Description:** this pulse charging/activation uses positive pulse charging method, that is, in the constant voltage charging phase, injection of high pulse signal periodically can reactivate sulfide lagging battery.

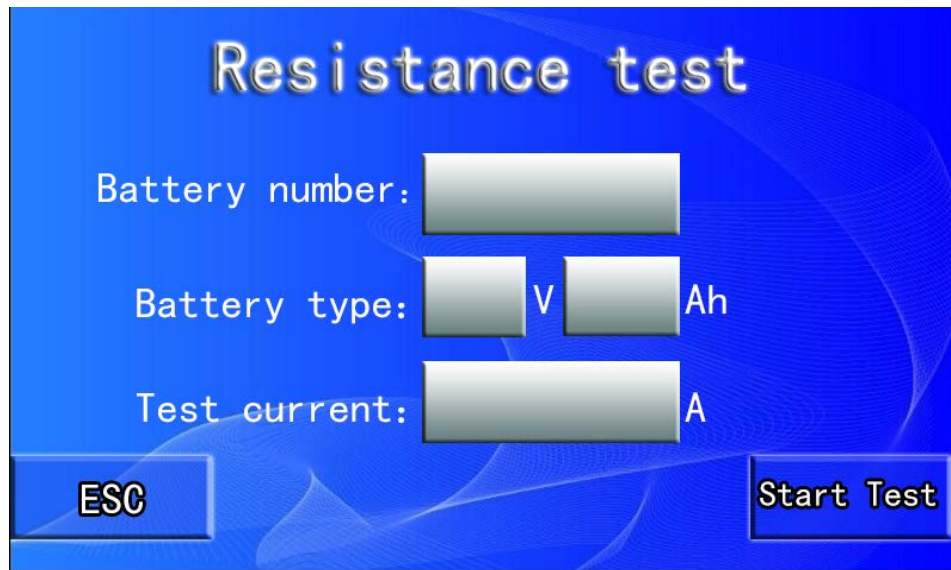
**Pulse charging instructions:** battery activation / cycle set to start pulse, battery charging in the



first stage, the BMS station will charge the battery using constant current, when the voltage reaches the set value, the instrument will automatically turn to the pulse charging, until the charging current is less than  $0.1 I_{10}$  or the charging time to stop charging.

### 6.2.5 Resistance Test

Click on the **Resistance test** icon on the main menu to enter the resistance test setting interface shown in Figure 12:



The image shows a software interface titled "Resistance test" on a blue background. It contains three input fields for configuration: "Battery number:" followed by a text box, "Battery type:" followed by a dropdown menu currently showing "V" and a text box for "Ah", and "Test current:" followed by a text box and a unit "A". At the bottom left is an "ESC" button, and at the bottom right is a "Start Test" button.

Figure 12 - Battery internal resistance test parameters interface

Test current setting recommendations:  $(1.5 \text{ to } 2) I_{10}$ .

### 6.2.6 Data Management

Click on the **Data management** icon in the main menu to enter the data management interface shown in Figure 13:



Figure 13 - Data management interface



## Note

- 1) The data management interface can query previously saved test data such as charging / discharging query, activation query, and internal resistance query.
- 2) The data delete function can be used to delete all stored data. This operation cannot be reversed, so be careful when using it.
- 3) The RS232 interface to the host computer can be used to send data to the computer. This machine can save 30 sets of charge limits, 30 sets of discharge limits, 30 sets of activation test limits, and 30 sets of internal resistance test limits. If there are 30 sets already saved on the machine, the data from the first set will be overwritten.

### 6.2.7 Charging Query

Click on the **Charging inquiries** icon on the data management menu to enter the charging query as shown in Figure 14:

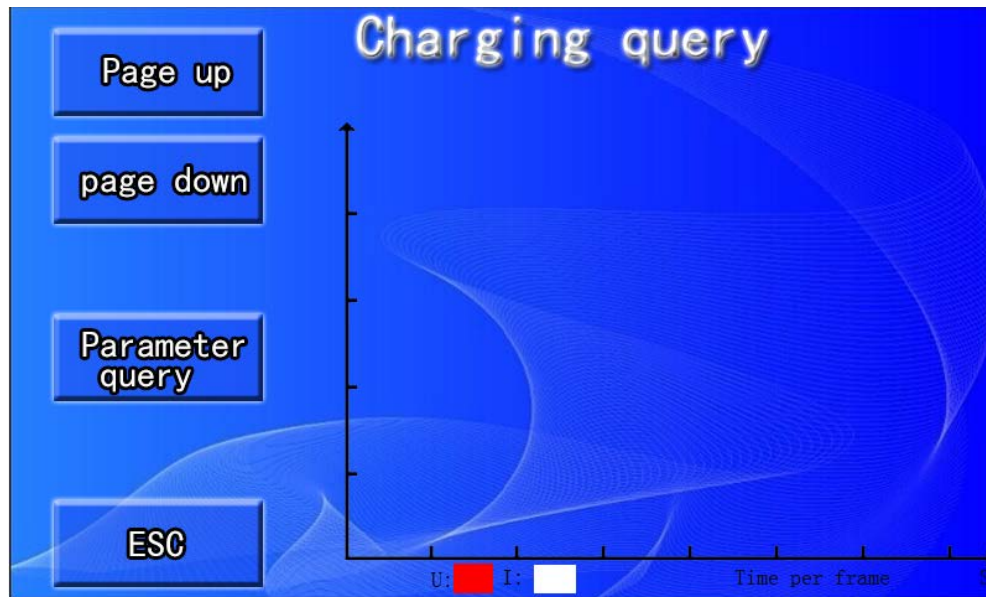


Figure 14 - Charging query interface

The screen displays the last saved data when you enter the interface. Click on a page to query historical data on a group. Click on the query parameters to query test parameters for this group's data as shown in Figure 15:

The screenshot shows a software interface titled "Charging parameters" on a blue background. It contains several input fields for configuring a query. The fields are labeled as follows: "Battery number:" followed by a text box; "Battery type:" followed by a dropdown menu currently showing "V" and a unit label "Ah"; "charging current:" followed by a text box and a unit label "A"; "cutoff voltage:" followed by a text box and a unit label "V"; and "Charging time:" followed by a text box and a unit label "S". At the bottom left, there is an "ESC" button.

Figure 15 - Charging parameters query interface

### 6.2.8 Discharging Query

Discharge query is similar to charging query.

## 6.2.9 Activation Query

Click on the **Activation query** icon in the data management menu to enter the activation query interface as shown in Figure 16:

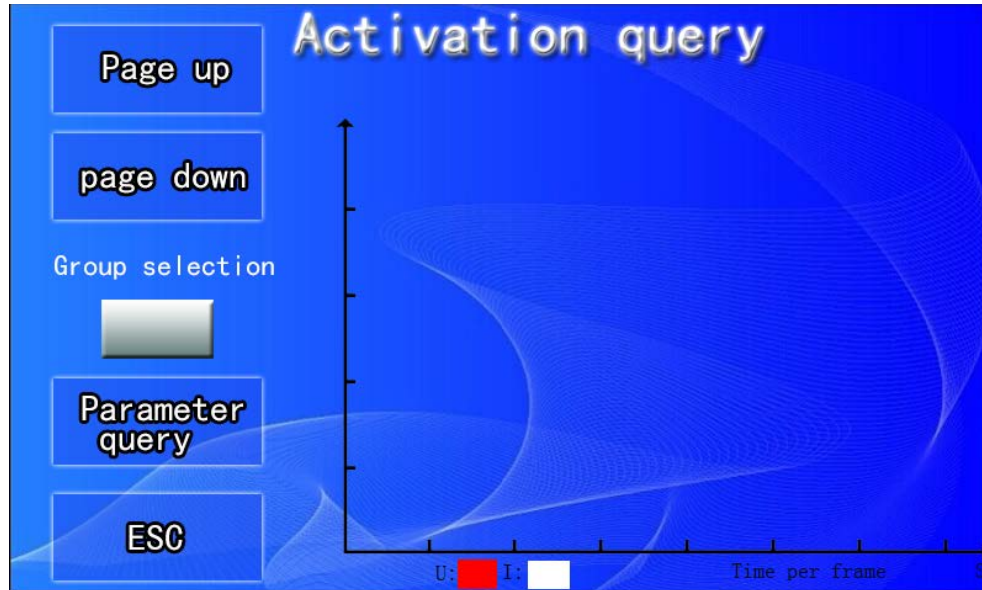


Figure 16 - Activation query interface



### Note

- 1) A set of activation data contains at least one set of discharge data and charging data.
- 2) When you first enter the user interface, the interface displays the first discharge data from the last saved activation group data. If you click on page up, it will display battery charging data in second last activation group process. If click page down on the interface the next page will display the charging data of the first cycle during the last activation, click again on the next page, if the group set only one cycle, it will display the discharge data again for this cycle. If the group set up a multiple cycle, it will display the discharge data of second cycles, and so on.
- 3) Select the number of groups in the box below the input group number, you can jump to the query data.
- 4) Click the query parameters to check the parameters of a group's activation settings.

## 6.2.10 System Settings

Click on the **System settings** icon on the main menu to enter the system settings interface as shown in figure 17:



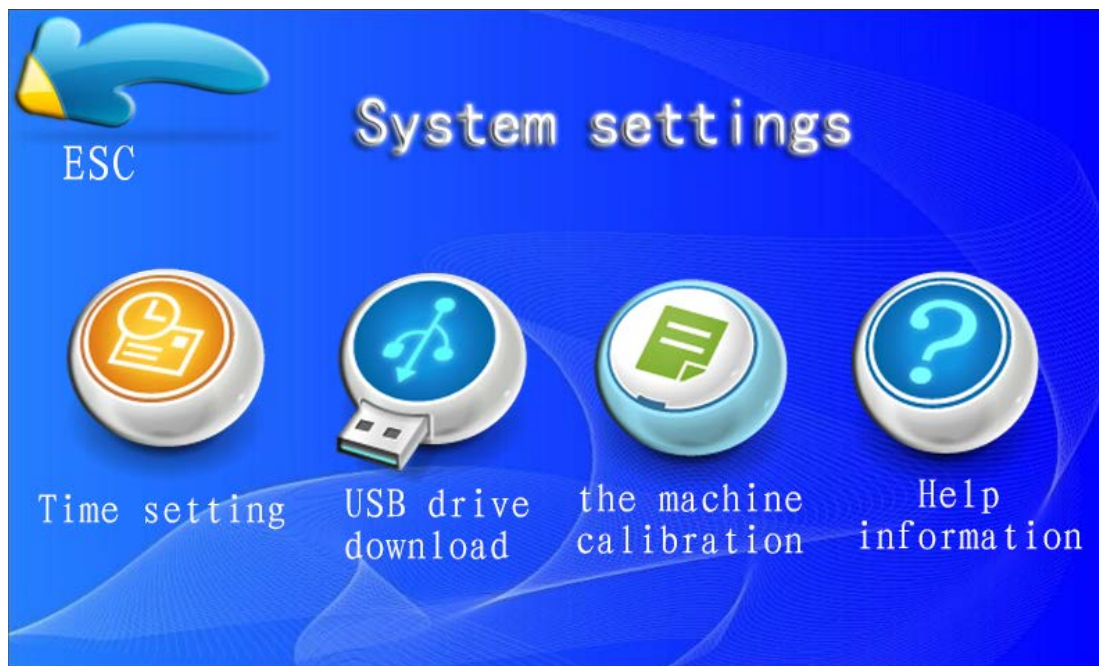


Figure 17 - System settings interface

Operation instructions:

1. Time setting: if the station is not used for a long time, need to check the time is correct, if not correct, need to reset the time.
2. USB drive download: after click, insert the USB drive, through screen instruction, you can save the data to the USB drive.
3. The machine calibration: this menu need password to enter, and only for trained engineers. This operation as calibration equipment voltage value, voltage unit is volts (V).
4. Help information: display some simple operating information.

To enable users to better use the device, the proposed settings are as follows:

1. Charging and discharging for single lead acid battery, it is recommended that the charging and discharging time be set to 10 hours, and the charging and discharging current is set to  $I_{10}$
  2. To activate lead-acid battery set, the proposed charging and discharging time is set to 8 hours, charging and discharging current is set to  $2 I_{10}$
  3. Voltage limit setting: Upper limit voltage set to  $2.35 \times N$  (in a single 2V battery unit)  
Lower limit voltage set to  $1.80 \times N$  (in a single 2V battery unit)
- Example: 12 V single cell, the upper limit voltage set  $2.35 \times 6 = 14.1$  V, the lower limit voltage set  $1.80 \times 6 = 10.8$  V. Due to differences between individual batteries, the actual setting should be based on actual application.

## Chapter 7. Daily Maintenance

### 1) Cleaning and maintenance of the main station

Use soft damp cloth and mild cleaning liquid to clean activation station. Please do not use soluble cleaning agent or alcohol, so as not to damage the unit display panel.

### 2) Jumper fixture cleaning and maintenance

Use soft damp cloth and mild cleaning liquid to clean fixture, after cleaning wipe dry. Please don't hurt the metal part of the probe, to avoid the bad contact connection.

### 3) Equipment use

The equipment must be handled with care, in a dry environment. After usage, the battery activation station and all fixtures and wiring should be stored in its own toolbox.

## Chapter 8. Trouble Shooting

### 1) No Display when turning on the power switch

The power supply cable is not connected, please check the power plug is plugged in.

### 2) LED display operation is normal, no signal from external battery

Station, the battery and jumper cable are not fully in contact, please check the contact is secure and reliable.

### 3) Battery type error

Check whether the voltage loop is properly connected and whether the battery type is the same as the selected type.

### 4) The battery current display is incorrect

Verify that the current sampling wire is fully in contact with the round connector.

### 5) Voltage fluctuations

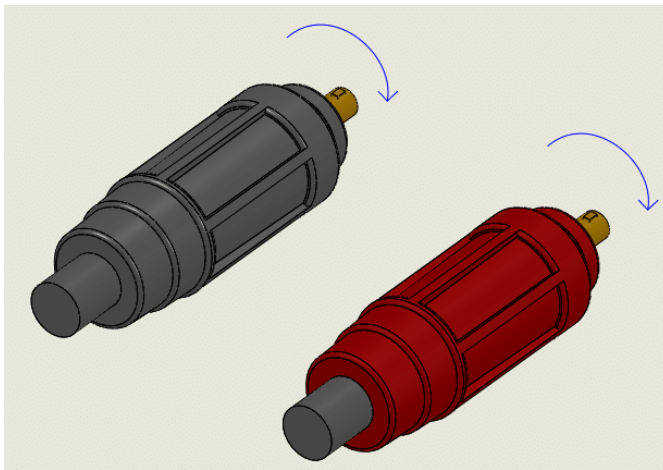
Verify that the voltage sampling line is fully in contact with the battery terminal.

### 6) Error message that the charge or discharge is complete while it is not

Verify that the current sampling line is in full contact with the round connector

## Chapter 9. Things to Pay Attention

- 1) Before starting, correctly connect the battery positive and negative pole and battery type.
- 2) Select correct battery type before activating or charging and discharging.
- 3) Before starting the station, ensure that the jumper cable clip and battery terminal in full contact.
- 4) Avoid battery short circuit.
- 5) Single charge, discharge time can not exceed 18 hours.
- 6) When changing the battery, the activation station power must be turned off at first.
- 7) For the correct connection of the jumper cable clip and the station: inserted into the back panel socket, screw clockwise. As shown below:







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