RePower 瑞能

Professional Battery Testing Systems

RepowerACDS Charging and Discharging Equipment Software

Operating Instructions

RCDS-60V/100V/HRCDS-5V Series

VER:2024

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1. Software Introduction

RepowerACDS is the supporting software for RCDS60V/100V/HRCDS-5V equipment. **If HRCDS equipment needs to be connected in parallel across machines, please use the RepowerACDS_DPU (parallel) version** . The main operation interface of the system is shown in Figure 1-1:

Figure 1- 1 System home interface

Note: The operating environment of this manual is Windows 7. Except for the difference in interface style in other environments, the interface composition and operation methods are consistent with this manual. In addition, in this software, if it is displayed in gray, it means that the function is currently unavailable; if it is displayed in black, it means that the function is currently available.

As shown in Figure 1-1, the RepowerACDS home page consists of five main parts, which will be introduced one by one when the user logs in.

1.1 Title Bar/Menu Bar

"(ACDS)" in the title column indicates that the upper computer is the RepowerACDS version; "(ACDS)++" indicates that the upper computer is the RepowerACDS_DPU (parallel) version.

The menu bar includes eight menus including "files", "management", "channels", "view", "option", "statistics", "language", and "help".

1.1.1 File Menu

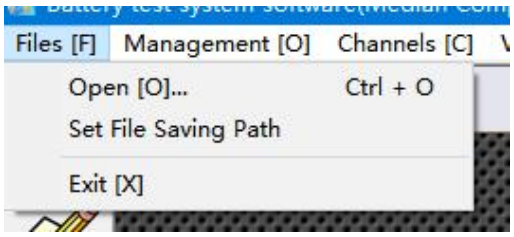


Figure 1- 2 File menu

As shown in Figure 1-2, the file menu includes three functions: "Open", "Set File Saving Path", and "Exit":

1. Open: used to open the data file, as shown in Figure 1-3.

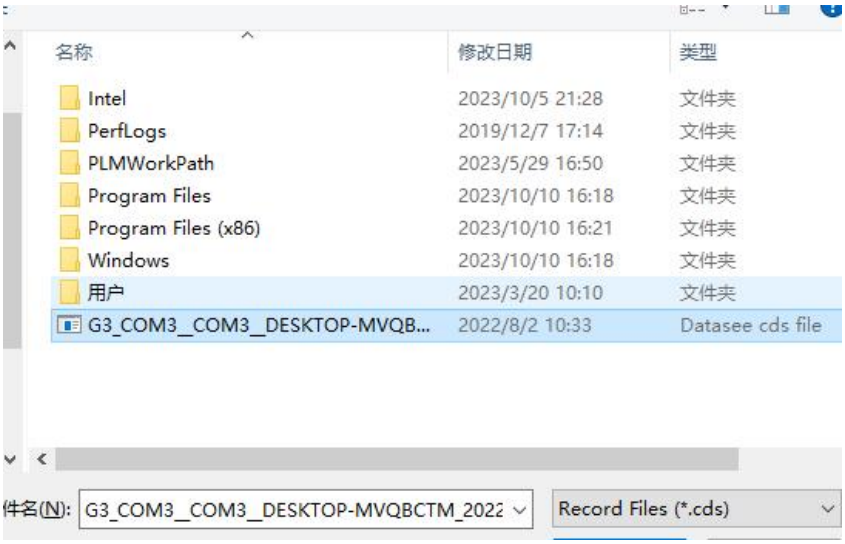


Figure 1- 3 "Open" window

Note: The shortcut for this function is "Ctrl+O".

2. Set File Saving Path: used to manage the save path of data files, as shown in Figure 1-4.

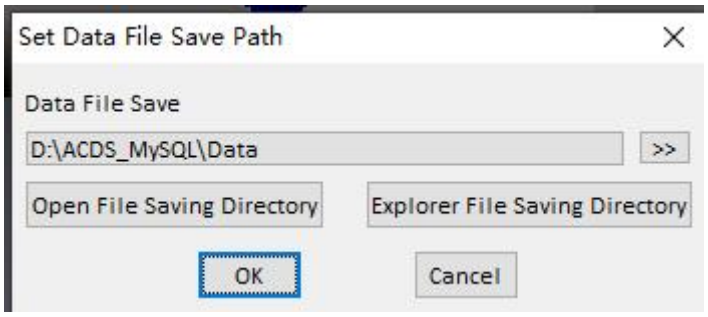


Figure 1- 4 "Set data file save path" window

Note: This feature is only available when the user is logged in.

3. Exit: Used to exit the entire software, and the RepowerACDS software will close after clicking.

1.1.2 Management Menu

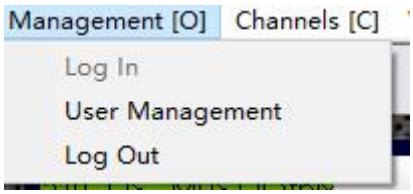


Figure 1- 5 Management menu

As shown in Figure 1-5, the management menu is mainly used to manage user Log in、User management and Log out. User log in and password modification operations will be introduced later.

1.1.3 Channel Menu

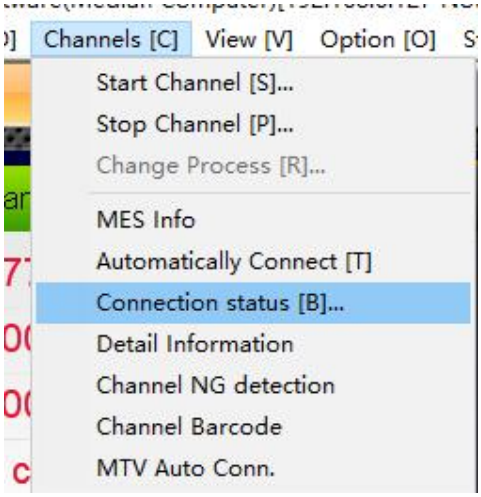


Figure 1- 6 Channel menu

As shown in Figure 1-6, the channel menu is mainly used for channel management, including the following functions:

1. Start Channel: It is used to set the channel startup template. Clicking it will pop up the interface of setting startup template, as shown in Figure 1-7.

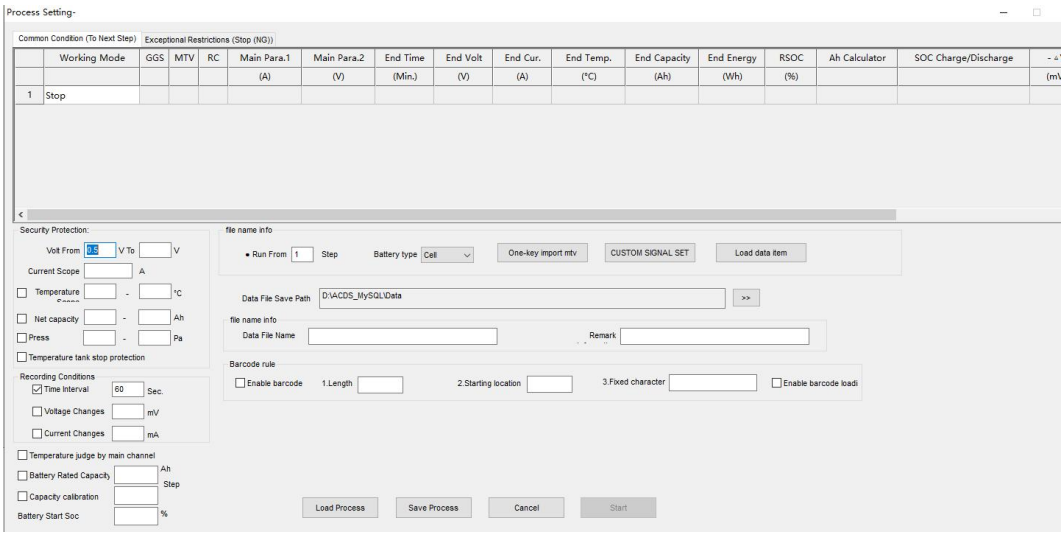


Figure 1- 7 "Working process settings" window

Note that if the user is not logged in, this function is unavailable; if the channel in the stop state is not selected, the "Start" button in Figure 1-7 will be unavailable. The specific operation method will be introduced later.

2. Stop Channel: used to manually stop the started channel. Note that this function is available only if the channel that has been started is selected, and the selected channel will stop after the operation is confirmed.
3. Change Process: It is used to modify the template information of the activated channel, and the modification window is consistent with the startup window. Note that this feature is only available if the user is logged in and has an enabled channel selected.
4. MES information: used to view software MES information, as shown in Figure 1-8.

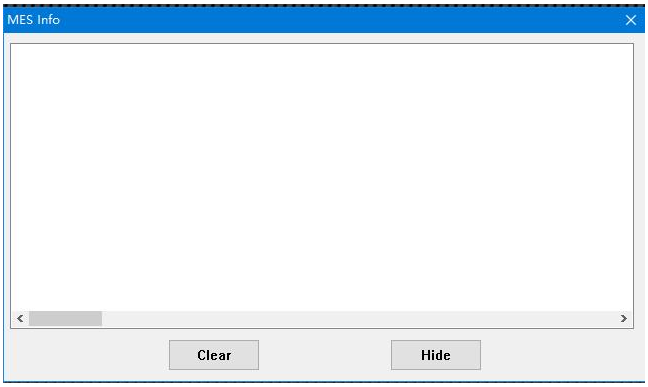


Figure 1- 8 MES information

5. Automaticlly Connect: used for online operation of all channels. The specific operation method will be introduced later.
6. Online status: used to view channel online information, as shown in Figure 1-9 and 1-10.

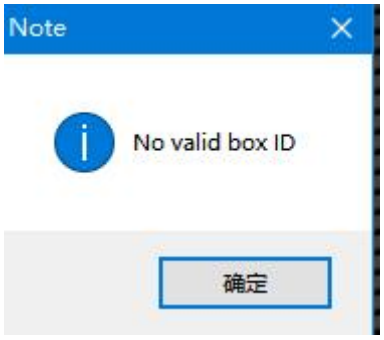


Figure 1- 9 Online status - no valid box number detected

Figure 1- 10 Online status - valid box number detected

Figure 1-9 shows that no valid box number is detected in the set IP address. Figure 1-10 shows that among the set IP addresses, the IP addresses ending in 10 and 25 have detected device information.

Note: This function is not available when the user is not logged in.

7. Detail information: used to view channel box number information, as shown

in Figure 1-11.

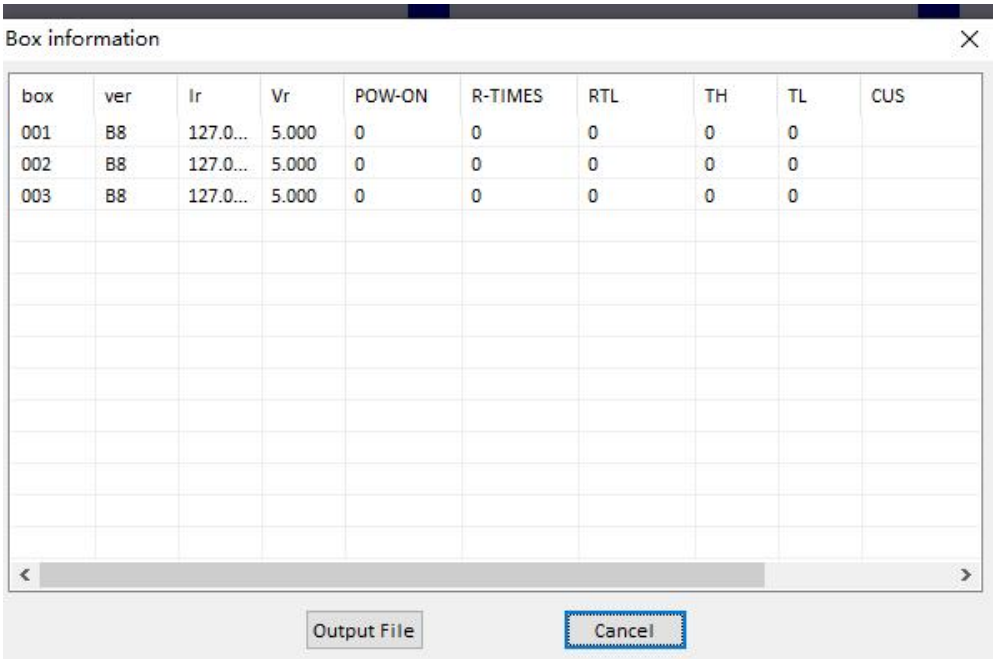


Figure 1- 11 Box number information

8. Channel NG detection: Automatically detects the qualified status of the channel. If the edited step is selected, the status is qualified. If the unedited step is selected, the status is not Used

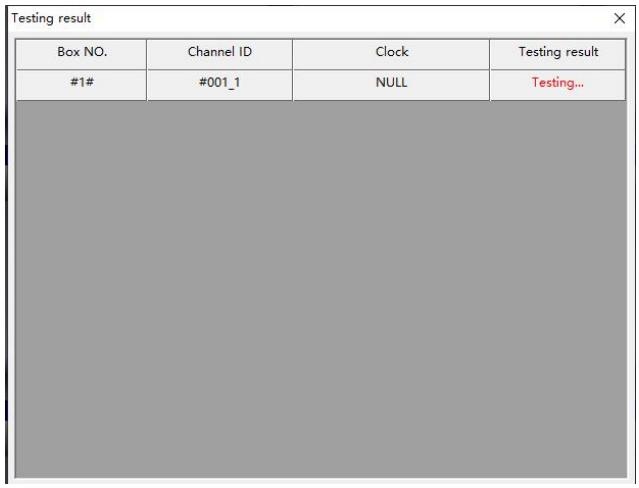


Figure 1- 12 Channel NG detection

9. Channel number: You can customize the device channel name

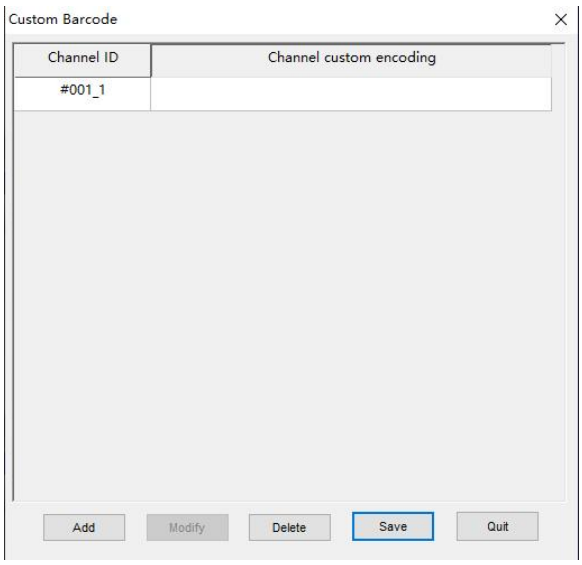


Figure 1- 13 Channel barcord

10. MTV automatic online: can automatically connect to MTV

Note: This function is not available when the user is not logged in.

1.1.4 View Menu

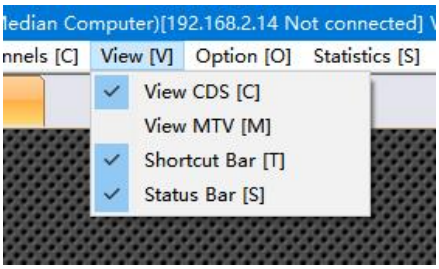


Figure 1- 14 View menu

It is used to set the display content of the software home page. As shown in Figure 1-14, there is a " √ " in front of the menu item, indicating that the item is displayed on the home page, otherwise the item will be hidden on the home page. Among them, "View CDS" and "View MTV" cannot be selected at the same time, only one of them can be displayed.

1.1.5 Options Menu

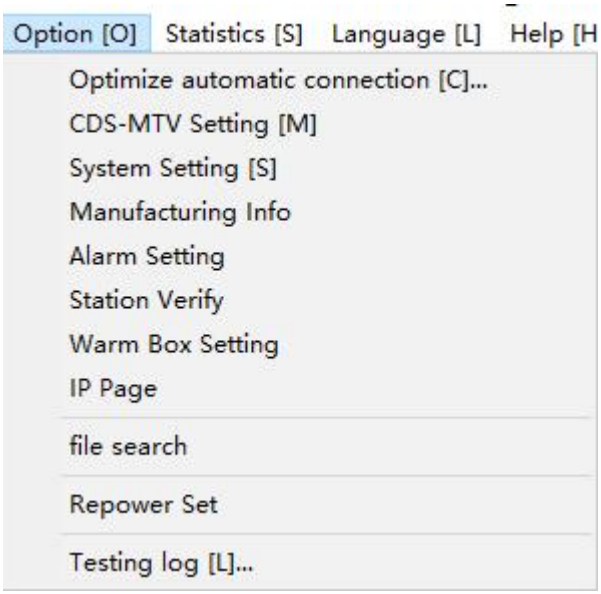


Figure 1- 15 Option menu

As shown in Figure 1-15, the option menu mainly includes the following functions:

1. Optimize automatic connection: It is used to set the MTV IP address to be bound to the CDS channel, as shown in Figure 1-16. The specific operation will be introduced later (the parallel version does not support this function for now).

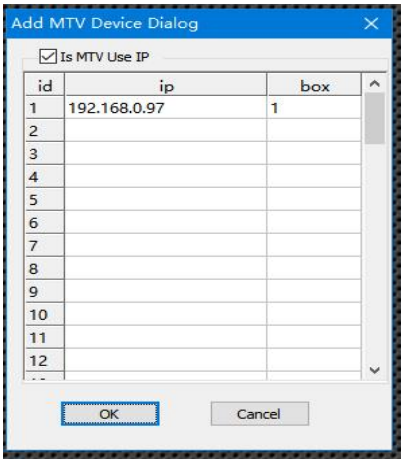


Figure 1- 16 set automatic online

2. CDS-MTV setting: It is used to bind CDS and MTV after adding MTV IP address, as shown in Figure 1-17 (parallel version does not support this

function for now).

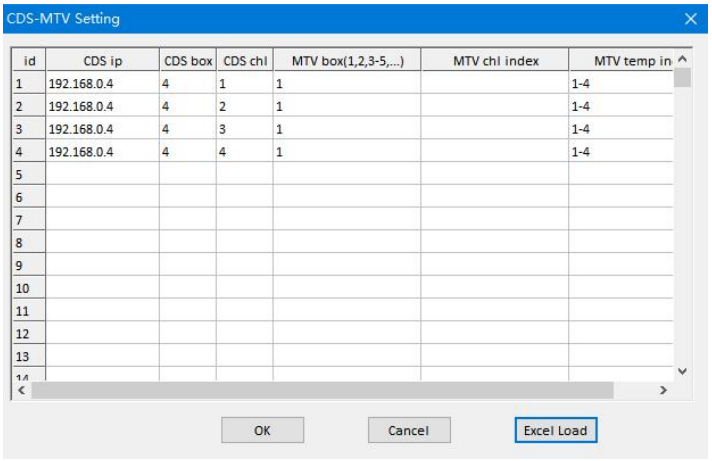


Figure 1- 17 CDS-MTV Settings

The binding operation between CDS and MTV will be introduced later.

3. System settings: used for system settings, as shown in Figure 1-18.

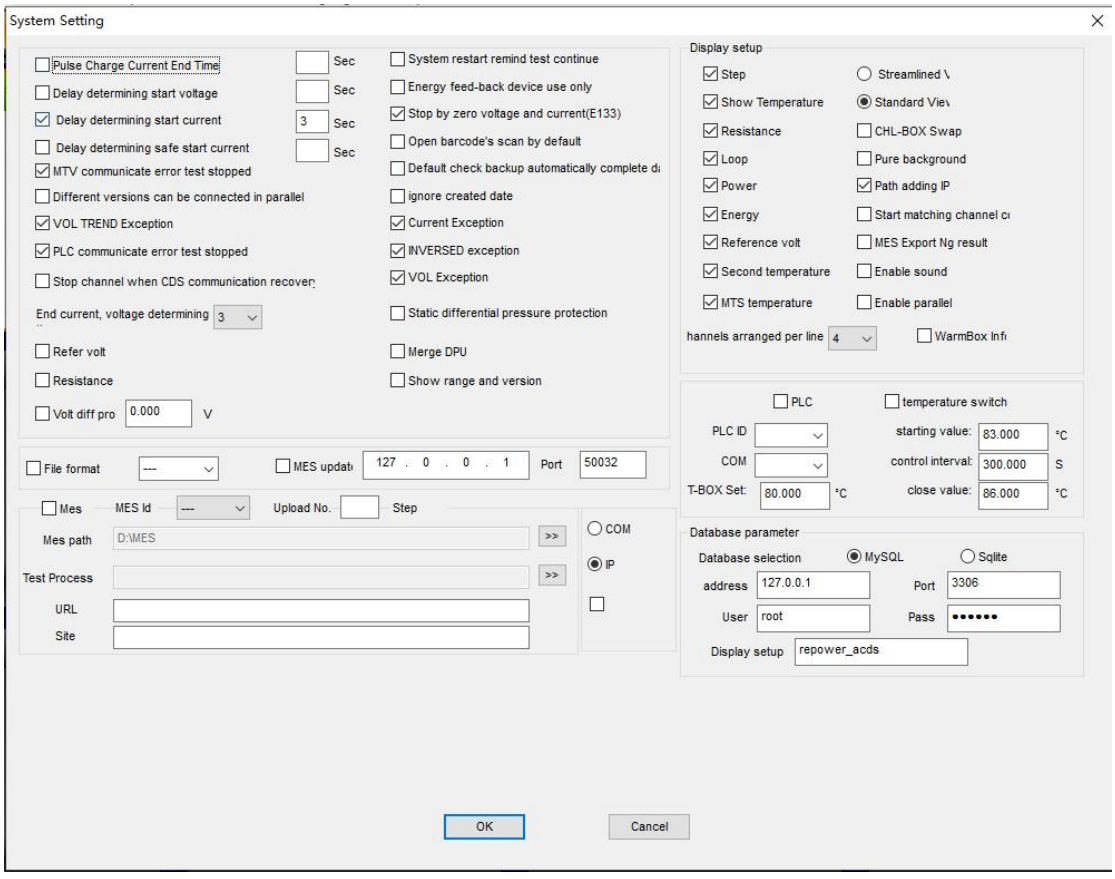


Figure 1- 18 System Settings

The following is the introduction of each content in the "System Settings" window:

1) Pulse charging current termination time: There is "pulse charging" in the working step. After checking and setting this function, the current will terminate after the set time is reached;
2) the voltage protection will not make a judgment within the set time range ;
3) Step Start Current Delay Judgment Time: After checking and setting the time, the current protection will not make a judgment within the set time range;
4) Step start Safety voltage delay judgment time: After checking and setting the time, the safety voltage protection will not make a judgment within the set time range;
5) MTV communication error stop test: After this function is checked, when MTV has a communication error, the channel will stop testing;
6) Different versions can be connected in parallel: if the version number of the lower computer is inconsistent, the channels can be connected in parallel;
7) Abnormal stop of voltage trend: After checking this function, when the charging voltage drops or the discharging voltage rises, the channel will stop testing;
8) PLC communication error stop test: After checking this function, when the PLC has a communication error, the channel will report an error and stop the test;
9) Restart the system and prompt to test the connection: After checking this function, when the software has a channel running, a pop-up window will prompt whether to test the connection after restarting the software;
10) Special for feedback: dedicated for internal debugging;
11) Stop when zero voltage and zero current is detected (E133): This function is checked by default, and the test will stop when the channel has >=3 times of zero voltage and zero current;
12) BARCODE scanning is enabled by default: After this function is checked, the barcode input window will pop up every time the channel is started;
13) Check the backup auto-complete data by default: After this function is

checked, when setting the channel template, check "Backup auto-complete data" by default;

14) Ignore creation date: After checking this function, the date folder will not be created for the channel data when the channel starts;
15) Abnormal current detection stop: When detecting abnormal current conditions such as positive discharge current and negative charge current, the channel will stop testing;
16) Abnormal battery reverse connection stop: After checking this function, when the battery reverse voltage is negative, the channel will stop testing;
17) Abnormal voltage stop: abnormal voltage fluctuation, the channel will stop testing;
18) Cross-DPU parallel: After this function is checked, cross-DPU parallel can be supported
19) Display range and version: After this function is checked, the channel interface can display the device range and version code
20) backup file

a) Check the backup file: after checking, the data will be backed up according to the set interval time;

b) Interval time: how often to back up all data;

c) File path: You can set the backup path by yourself.

21) Synchronized files: the setting information is consistent with the "backup file" information
22) MES upload settings

a) Check the MES upload function

b) Upload MES ID: For example, Tianjin Yinlong chooses TJYL_WL;

c) Upload the capacity of the first part: After setting the first step, the capacity of the first step will be uploaded;

d) The following do not need to set the default.

23) PLC settings

a) Tick PLC

b) set PLC

c) Check the temperature control switch setting

d) Set PLC information

4. Alarm setting: used for system alarm setting, as shown in Figure 1-19.

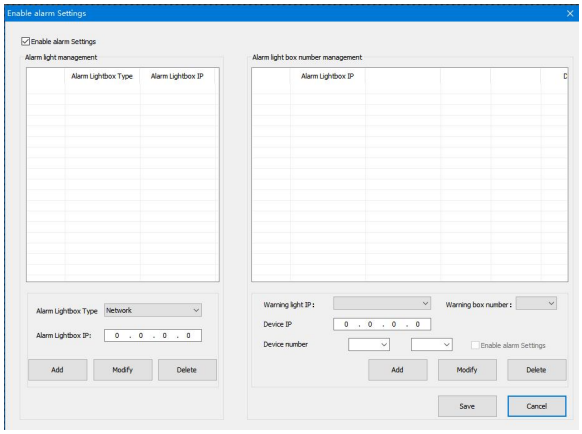


Figure 1- 19 Alarm Settings

Note: In the alarm information, the "alarm light serial port" is unique, and the software only recognizes the alarm light serial port information in the interface. In addition, after the alarm information is set, the information can only be saved by clicking the "Save" button.

5. Station ver: used for system station calibration settings, as shown in Figure 1-20.

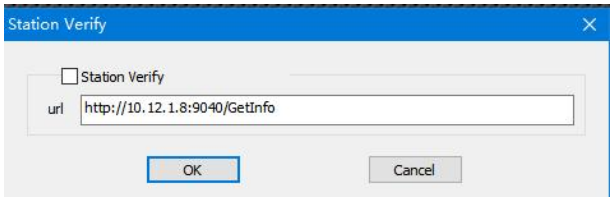


Figure 1- 20 station verify

6. Warm box setting: It is used to set the temperature tank connection, as shown in Figure 1-21

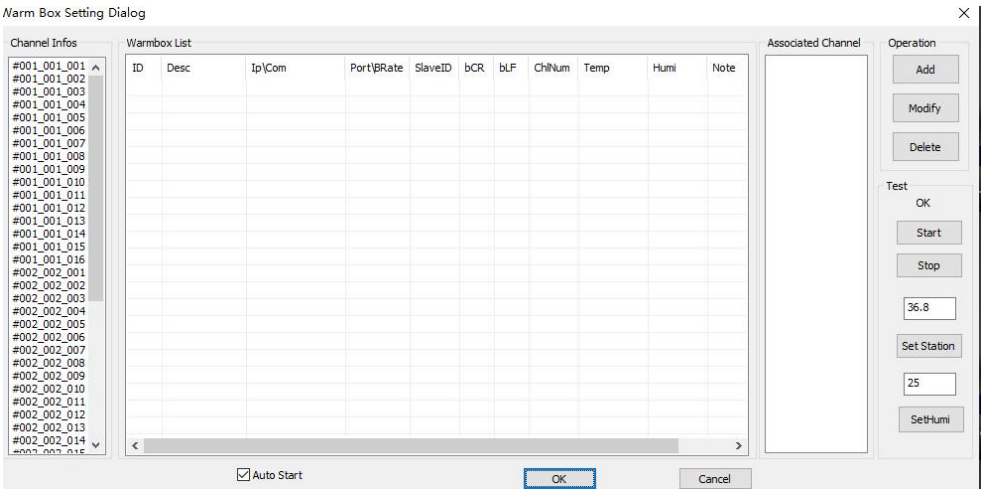


Figure 1- 21 station verify

7. IP page: can be grouped and displayed in pages

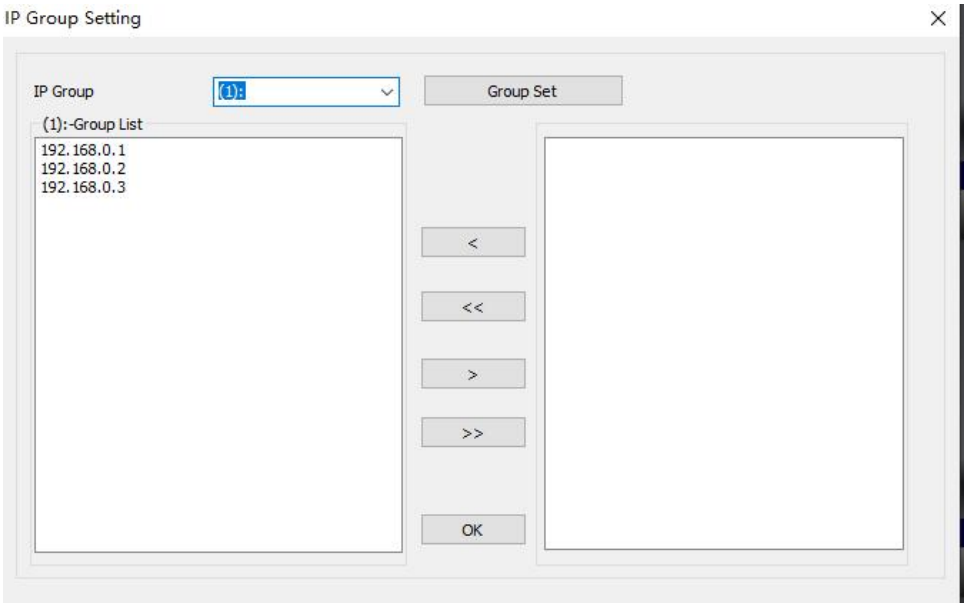


Figure 1- 22 IP page

8. File search: used for system file query settings, as shown in Figure 1-23.

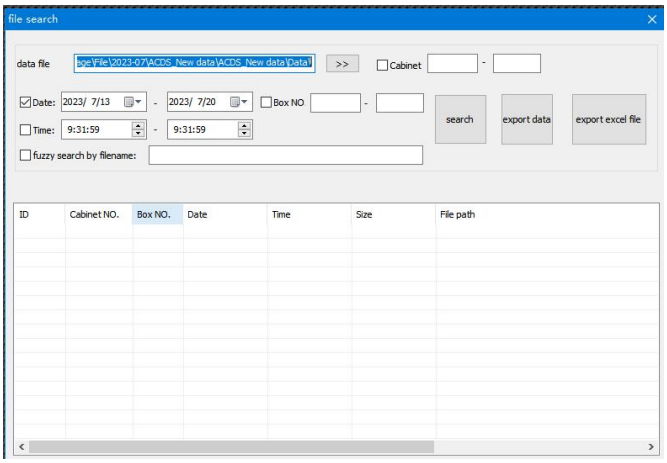


Figure 1- 23 file query

As shown in Figure 1-23, after setting different search conditions, users can filter the search results and export the found data and their Excel files.

9. Setting: It is used for the implementer or system administrator to set the system, and the setting can only be done after completing the password verification. The setting interface is shown in Figure 1-24.

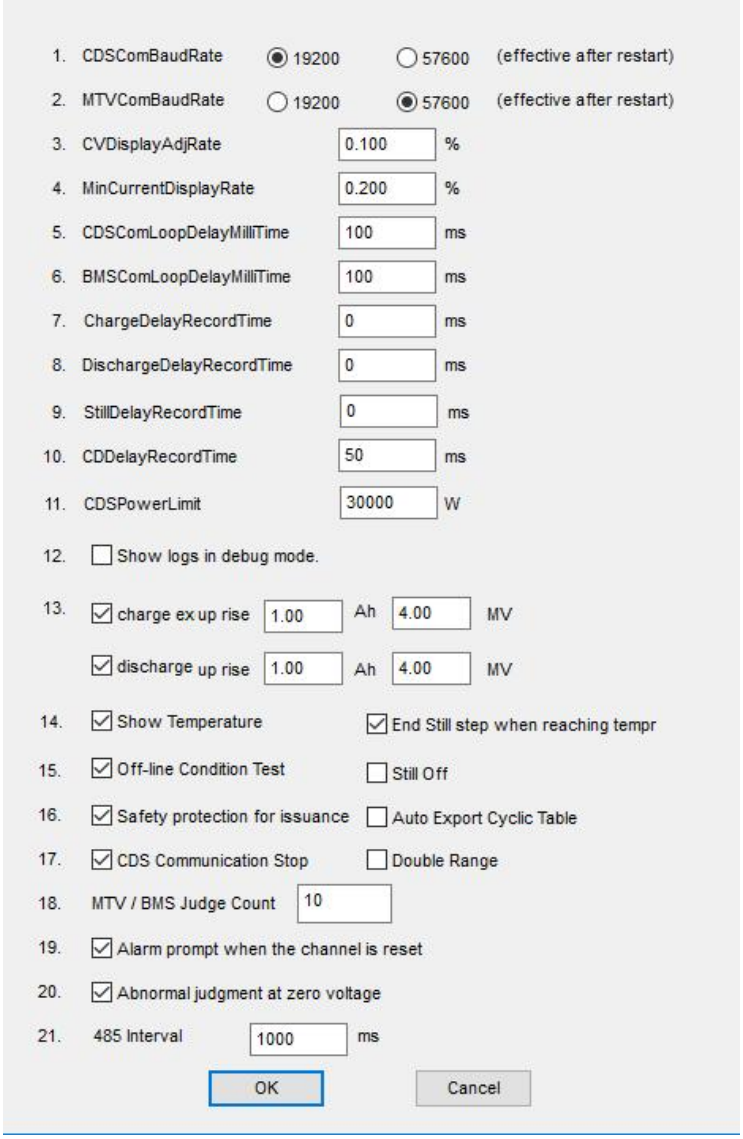


Figure 1- 24 settings

The following is an introduction to the contents of the window shown in Figure 1-24:

1) CDS serial port baud rate: Indicates the baud rate of the communication between the host computer and the CDS device, the default is 19200;
2) MTV Combaud Rate: indicates the baud rate of the communication between the host computer and the MTV device, the default is 19200;
3) Current and voltage amplitude: voltage and current correction range;
4) Minimum current display rate: old version function, currently suspended;
5) CDS sampling interval: CDS sampling rate, default 200ms;

6) MTV sampling interval: MTV sampling rate, default 200ms;
7) Charging delay recording time: charging step data delay recording time, the default is 0;
8) Discharge delay recording time: the delay recording time of discharge step data, the default is 0;
9) Static delay recording data: the delay recording time of static working step data, the default is 0;
10) CD delay record time: charge and discharge switching data delay record time, the default is 0;
11) Delay zero current voltage stop time: zero voltage zero current protection delay time, the default is empty;
12) Maximum power: Used to set the maximum power
13) Temperature correction value: used to set the temperature correction value, the default is 84° C;
14) Capacity correction range: used to set the capacity correction value, after setting, the issued capacity will be the set value multiplied by the correction range value;
15) Log debug mode: used to view the test log in debug mode, used for internal debugging;
16) Dynamic Curve: After this function is selected, the "Dynamic Curve" in the right-click menu of the channel will be available;
17) Current delivery strategy:
18) Current zero cut-off does not take effect：
19) PC working condition protection:
20) High-speed working conditions: suitable for high-speed working conditions of HRCDS equipment.
21) Abnormal charging: Indicates that when charging, when the capacity increases to the set value, the voltage should also increase by the corresponding set value, otherwise it will stop due to abnormal charging;

22) Discharge abnormality: Indicates that when discharging, when the capacity drops to the set value, the voltage will also drop by the corresponding set value, otherwise it will stop due to abnormal discharge;

23) Display temperature: used to set whether to display the device temperature on the channel;

24) Security protection: When the lower computer has not been upgraded to the security protection version, the upper computer blocks the delivery of security protection parameters. This function can be used to solve the prompt restrictions shown in Figure 1-25.

Figure 1- 25 Security protection prompt

25) Jump working step within the static temperature range: After checking, the static working step termination temperature mode 1 will be protected within the temperature setting range, otherwise it will be protected when it exceeds the setting range;

Note: If the end temperature needs to use mode 2 as the judgment condition, please uncheck the jump step within the static temperature range.

26) DPU MTV pass-through: suitable for Thornton project MTV.

27) Automatic export cycle summary table: after checked, automatic export cycle summary table;

28) Pressure difference, current difference record:

29) Display decimal digits: check the last few digits of the voltage, current and capacity display Settings on the rear channel interface;

30) Charging and releasing delay recording: After checking, the charging and

releasing step automatically starts to record data according to more than 50% of the current;

31) Negative voltage range: applied to ±10V200A equipment after checking.

32) Adapter charge and discharge delay judgment:

10. Testing log: used to view all running records of the software from installation to now, as shown in Figure 1-26.

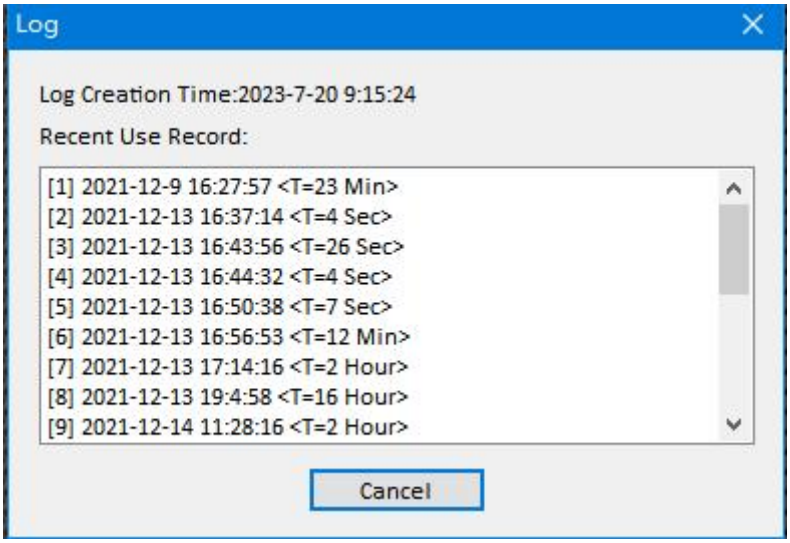


Figure 1- 26 running record

1.1.6 Statistics Menu

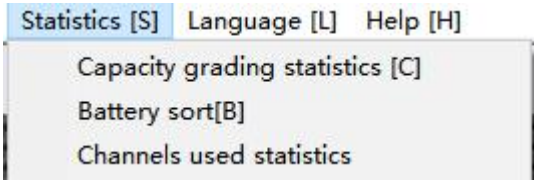


Figure 1- 27 Statistics menu

As shown in Figure 1-27, the statistics menu includes two statistical tools and channel usage statistics functions: For the use of the capacity statistics tool and battery sorting tool, please refer to the operation manual of the corresponding tool; the channel usage statistics interface is shown in Figure 1- 28.

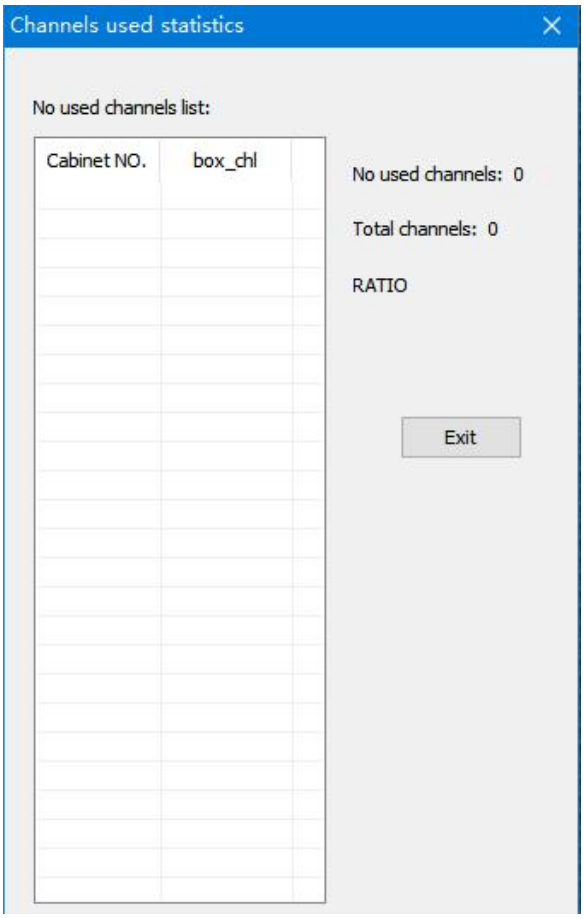


Figure 1- 28 channel usage statistics

1.1.7 Language Menu

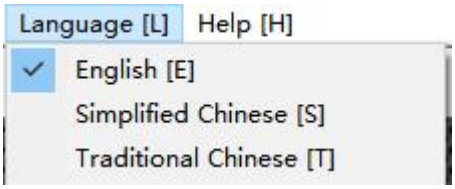


Figure 1- 29 Language menu

As shown in Figure 1-29, the language menu is mainly used for the management of the system display language, and the menu item with a " √ " symbol in front of it indicates the current system language. If you need to switch languages, click Reselect.

1.1.8 Help Menu

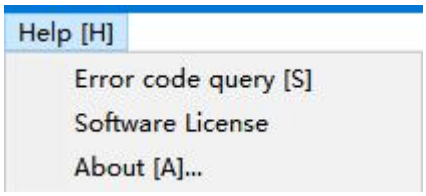


Figure 1- 30 Help menu

As shown in Figure 1-30, the help menu includes two functions: "Error Code Query" "Software License" "About":

1. Error code query: After clicking, the system opens the error code query file , as shown in Figure 1-31.

Figure 1- 31 error code

2. Software License: used to encrypt and decrypt device permissions. As shown in Figure 1-32

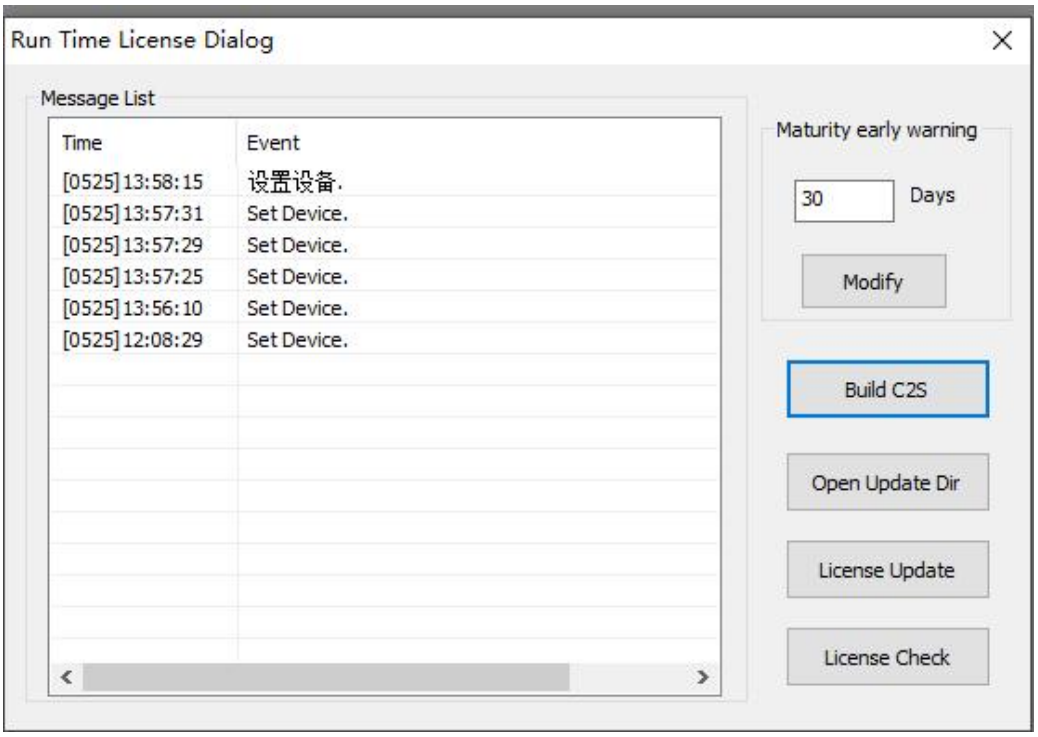


Figure 1- 32 Software License

3. About: After clicking, the system displays software developer, copyright and other information, as shown in Figure 1-33.

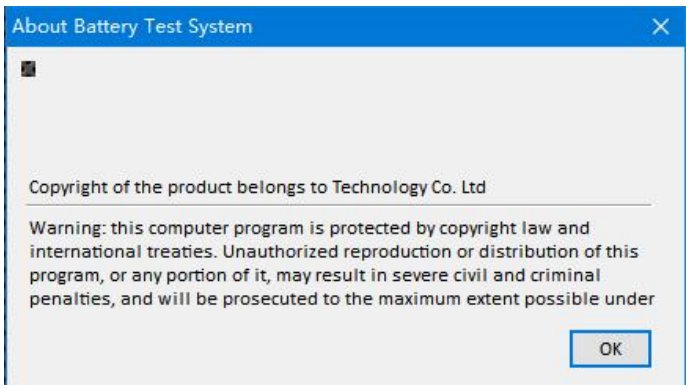


Figure 1- 33 about

1.2 Shortcut Bar

It is used to place some common functions for easy operation by users. The icon functions in the shortcut bar are introduced from top to bottom as follows:

1) Open data file: the shortcut icon of the "Open" function in the file menu (as shown in Figure 1-34).

Figure 1-34 Open data file icon

2) Set the startup template: the shortcut icon of the "Startup" function in the channel menu (as shown in Figure 1-35).

Figure 1-35 Set the startup template icon

3) Stop and start channel: the shortcut icon of the "stop" function in the channel menu (as shown in Figure 1-36).

Figure 1-36 Stop and start channel icon

4) Display CDS/MTV: Shortcut icons for the "Display CDS" and "Display MTV" functions in the view menu (as shown in Figure 1-37). After MTV is connected, click to switch between CDS view and MTV view.

Figure 1-37 shows the CDS/MTV icon

Note: Only when the MTV information is set correctly and the device is connected successfully, click the "Show CDS/MTV" icon button, and the interface will switch to the MTV view.

5) Flashing light: This function can be used to mark the channel with problems. Click this icon, and the alarm light of the device channel will flash. Since the LED light is not connected to the hardware, it does not work in this version. The icon is shown in Figure 1-38:

Figure 1-38 Flashing light icon

6) Light off: It is used to turn off the alarm light of the device channel. Since the LED light is not connected to the hardware, this function is invalid in this version. The icon is shown in Figure 1-39:

Figure 1-39Light off icon

7) Online status: the shortcut icon of the "Online Status" function in the channel menu (as shown in Figure 1-40).

Figure 1-40 Online status icon

8) Set data file save path: the shortcut icon of the "Set save file path" function in the file menu (as shown in Figure 1-41).

Figure 1-41 Set data file save path icon

9) Detection voltage: It is used to test the detection voltage before starting, which is convenient for users to judge whether the channel is connected to the battery or not. The function icon is shown in Figure 1-42.

Figure 1-42 Detection voltage icon

10) One-key start: It is used to batch set and start all channels that are successfully connected (the parallel version does not support this function at the moment), and the function icon is shown in Figure 1-43.

Figure 1-43 One-key start icon

11) One-key stop: It is used to batch stop all channels that are successfully online (the parallel version does not support this function at the moment), and the function icon is shown in Figure 1-44.

Figure 1- 44 One-key stop icon

1.3 Channels

It is used to display the channel status of the software connection and operate the channel. The right-click menu shown in Figure 1-1 can only be displayed by right-clicking this area, and this menu is used for channel operations.

1.4 Communication

The IP address of the device used to connect to the management software. The specific operation will be introduced later.

1.5 Status Bar

It is used to display status information such as device online, login user, system time, etc.

2. Software Settings

2.1 Open the Software

Before opening the software for online connection, please do the following confirmation work:

1. Confirm that the test equipment is correctly connected to the computer;
2. Confirm that the battery pack to be tested is connected;
3. Confirm that the device is powered on.

After confirming, double-click the corresponding upper computer software application program according to whether cross-machine parallel connection (repowerACDS.exe for non-cross-machine parallel connection, cross-machine parallel connection is RepowerACDS_DPU (parallel connection).exe), and open the battery test system control software. The main interface of the software is as follows: As shown in Figure 2-1:

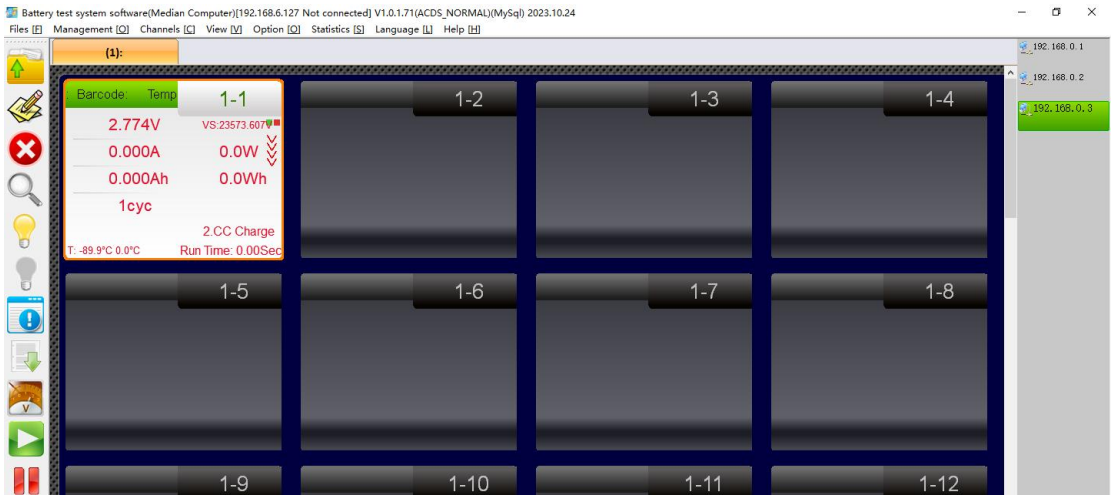


Figure 2- 1 software startup interface

As shown in Figure 2-1, there is no channel after the software is started for the first time, and the user needs to log in and set an IP address for online operation before it can be used normally.

2.2 Login

User login, the login method is shown in Figure 2-2 and 2-3.

Select the menu bar "Management" → "Log in" with the mouse, enter the

password in the pop-up "Log in" window and click the "OK" button.

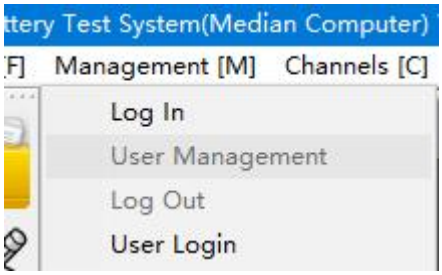


Figure 2- 2 Management login

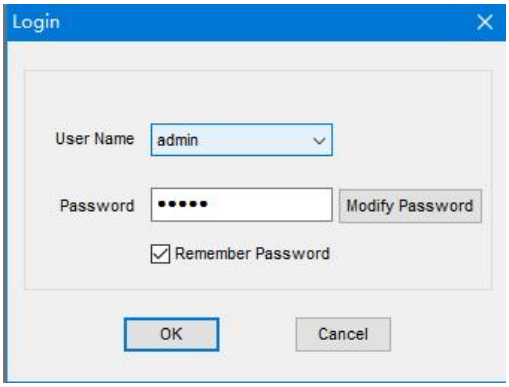
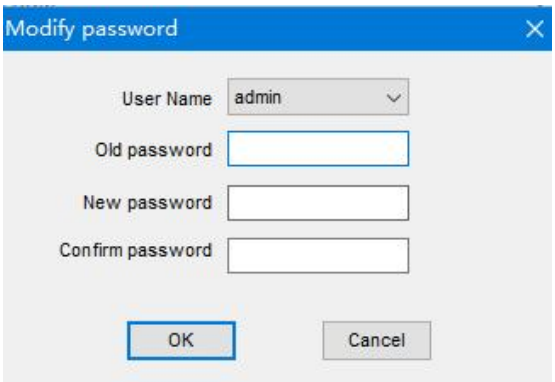


Figure 2- 3 Login

Note: The initial password of the system built-in account is the same as the user name, for example, the password of the user admin is admin .

There are two built-in accounts of admin and user in the software: admin has administrator rights and can perform all operations of the software; user is an ordinary user and cannot design or edit the work process.

If you need to change the password, click the "Change Password" button in Figure 2-3 to modify the password (as shown in Figure 2-4.



2- 4 Change password

2.3 IP Settings

After the user logs in, set the online IP address (device DPU IP address) according to the connection between the hardware and the computer.

Right-click the fourth area in Figure 1-1, and the right-click menu as shown in Figure 2-5 will pop up: "Add TCPIP Address" is used to add a single IP address (as shown in Figure 2-6); "Add TCPIP Address Range" It is used to add multiple consecutive IP addresses (as shown in Figure 2-7).

Figure 2- 5 IP right-click menu

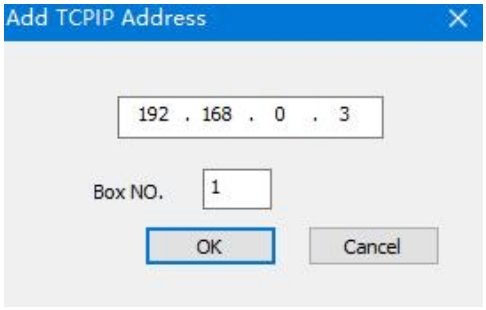


Figure 2- 6 Add ip address

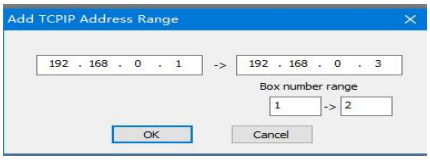


Figure 2- 7 Add ip segment address

In Figure 2-6 and 2-7, the IP address is the IP address on the DPU of the device. If the address is wrong, the connection cannot be established.

After the IP address is successfully added, right-click the added IP address, and the right-click menu is shown in Figure 2-8.

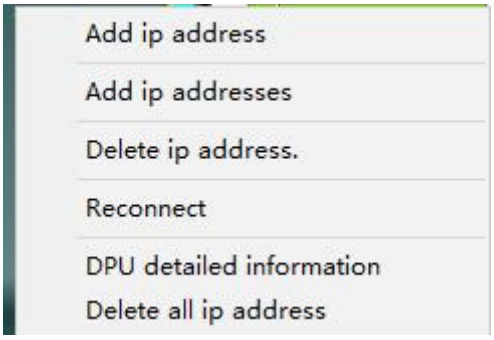


Figure 2- 8 IP right-click menu 2

As shown in Figure 2-8, "delete IP address" means to delete the selected IP address, which is a single deletion; "reconnect" means to connect the selected IP address device with the software, which is a single operation, if you need to perform batch connection, You need to click "Automatic Connection" in the "Channel" menu; "Delete all IP addresses" means to delete all the currently added IP addresses, which is a batch deletion.

2.4 Automatic Connection

Click "Channel [C]" → "Automaticlly connect [T]" in the menu bar (as shown in Figure 2-9), you can perform online operations on all the added IP addresses, and the online results will be displayed in the bottom status bar (such as Figure 2-10), and the interface will display the successfully connected channel (Figure 1-1).

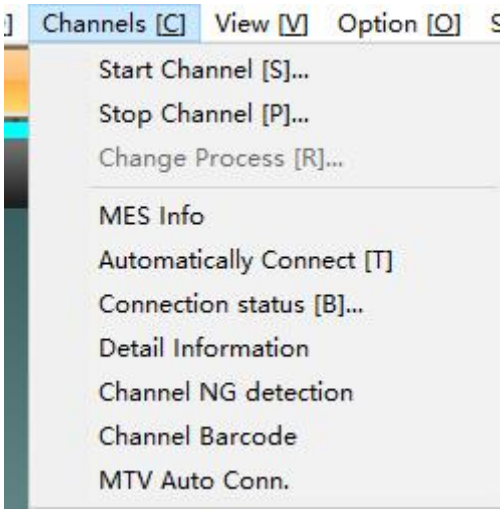


Figure 2 - 9 automatic connection

Figure 2- 10 Automatic online results

2.5 MTV Configuration

Note: The MTV configuration in this article is for the online version of MTV, and the parallel version does not support this function.

When the device has an MTV auxiliary system, it is necessary to add the MTV IP address and perform CDS and MTV binding configuration. Click the "Options" menu - "Optimize automatic connection [C] ... " menu item (as shown in Figure 2-11), and add the MTV address (as shown in Figure 2-12).

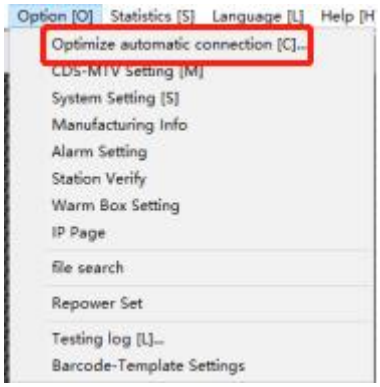


Figure 2- 11 Optimizing automatic connection

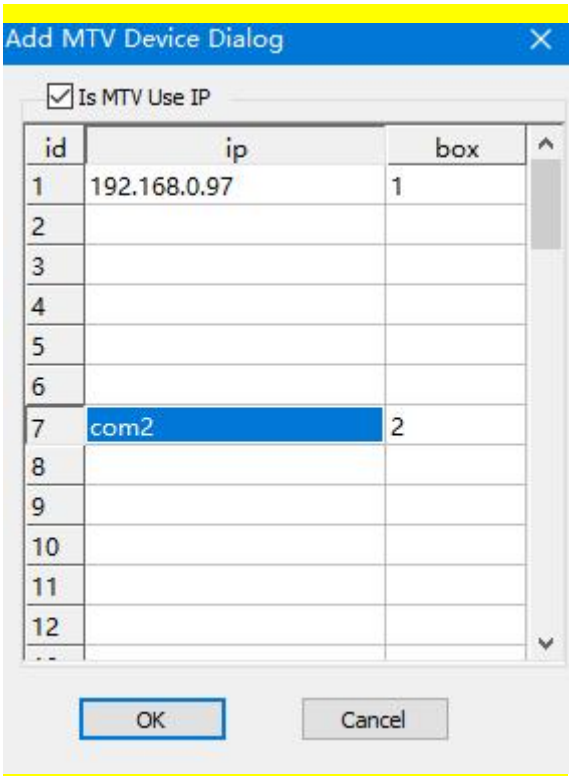


Figure 2- 12 set automatic online

In Figure 2-12, "IP" is the value of "Local IP" on the MTV device, and "Box" is the box number of the MTV device. After the addition is completed, automatic online detection can be performed to check whether the communication is successful.

After the MTV connection is successful, the MTV connection result will be displayed in the status bar (as shown in Figure 2-13), and the CDS channel binding can be performed as follows:

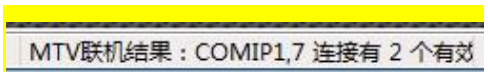


Figure 2- 13 MTV online results

1. Add MTV IP Click "Options" menu - "CDS-MTV Settings" menu item, as shown in Figure 2-14;

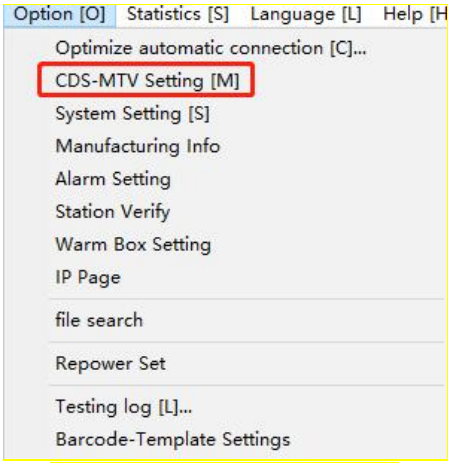


Figure 2- 14 CDS-MTV Settings

2. Set the associated information and save it, as shown in Figure 2-15;

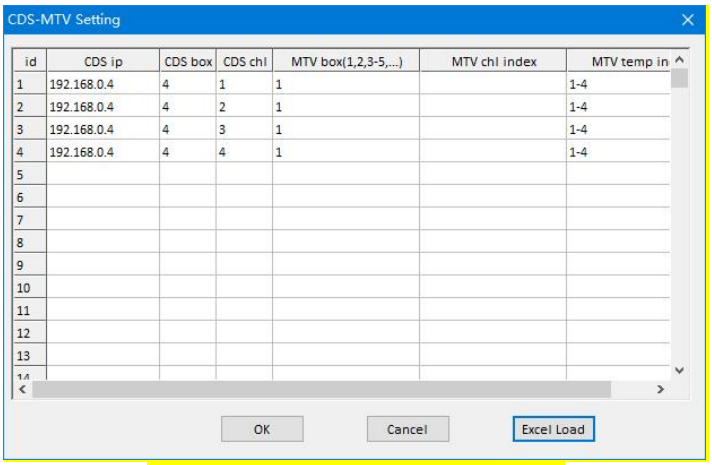


Figure 2- 15 CDS-MTV Settings

As shown in Figure 2-15, "CDS ip" is the IP address of the CDS device; "CDS Box" is the box number of the CDS device; "CDS chl" is the channel number of the CDS device; "MTV Box" is the number of the MTV box; "MTV chl index" is the MTV voltage that CDS equipment needs to be associated with; "MTV Temp index" is the MTV temperature that CDS equipment needs to be associated with.

"CDS Box" and "CDS chl" correspond to the data in the upper right corner of the channel in the CDS view, as shown in the red box in Figure 2-16.

Figure 2- 16 Box No. - Channel No.

3. Switch the "MTV view" to view the MTV data corresponding to the CDS. Figure 2-17 shows the view after setting the comparison information. The comparison setting will be introduced later in the template setting.

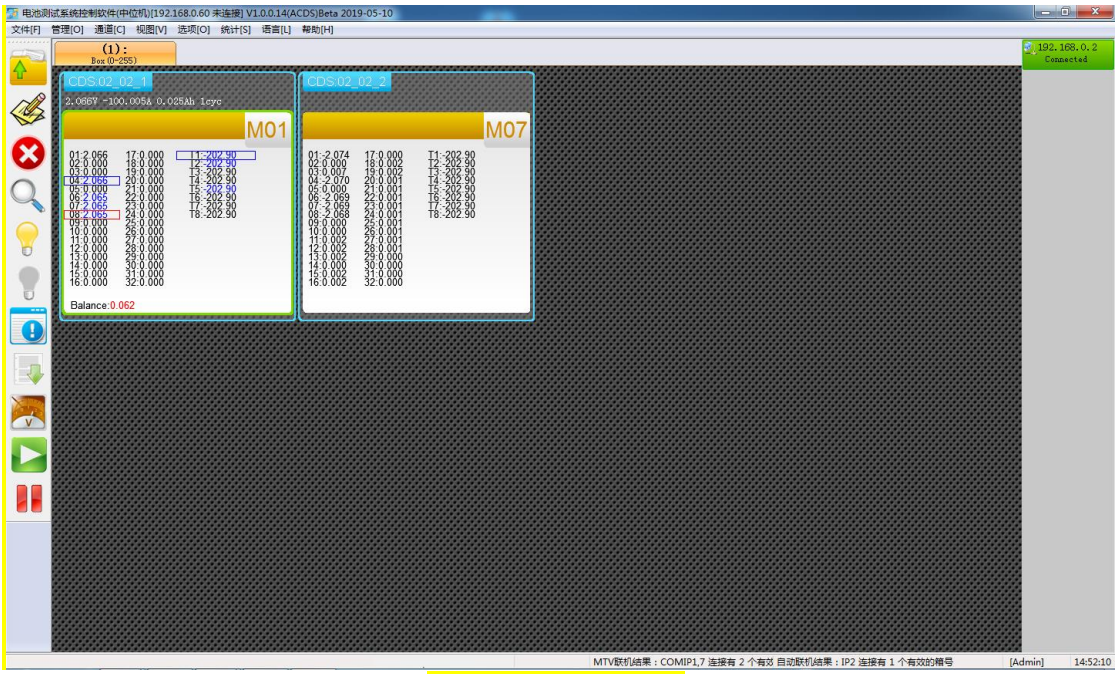


Figure 2- 17 MTV view

In the MTV view, a box represents an MTV device. Regarding the meaning of the data displayed on the channel, the following will introduce the channel selected by the red box in Figure 2-17 as an example:

1. "CDS:02_02_2" indicates a CDS device whose IP mantissa is 2, the box number is 2, and the channel number is 1;
2. "2.066V -100.005A 0.025Ah 1cyc" indicates the current voltage, current,

capacity and cycle number of the CDS channel;

3. "M01" indicates the MTV equipment with box number 1;
4. "01:2.066V" indicates that the current voltage of the first voltage of MTV is 2.066V;
5. "T1:-202.90" indicates that the current temperature acquisition line of the first channel of MTV is not connected;
6. "Balance:0.062" indicates that the difference between the maximum voltage and the minimum voltage of the comparison is 0.062V.

It can be seen from the information in the figure that the MTV device can collect 32 channels of voltage and 8 channels of temperature: the data in blue font indicates the current comparison (comparison settings will be introduced later), such as the number "04" and The voltage from "06" to "08" and the temperature numbered "T1", "T2" and "T6"; the data in red font indicates the data larger than the comparison range, such as "Balance". In addition, the data selected in the red small box is the maximum value in the comparison range, and the data selected in the blue small box is the minimum value in the comparison range.

3. Introduction to Test Templates

After the connection is successful, the corresponding CDS channel will appear on the interface, as shown in Figure 3-1 .

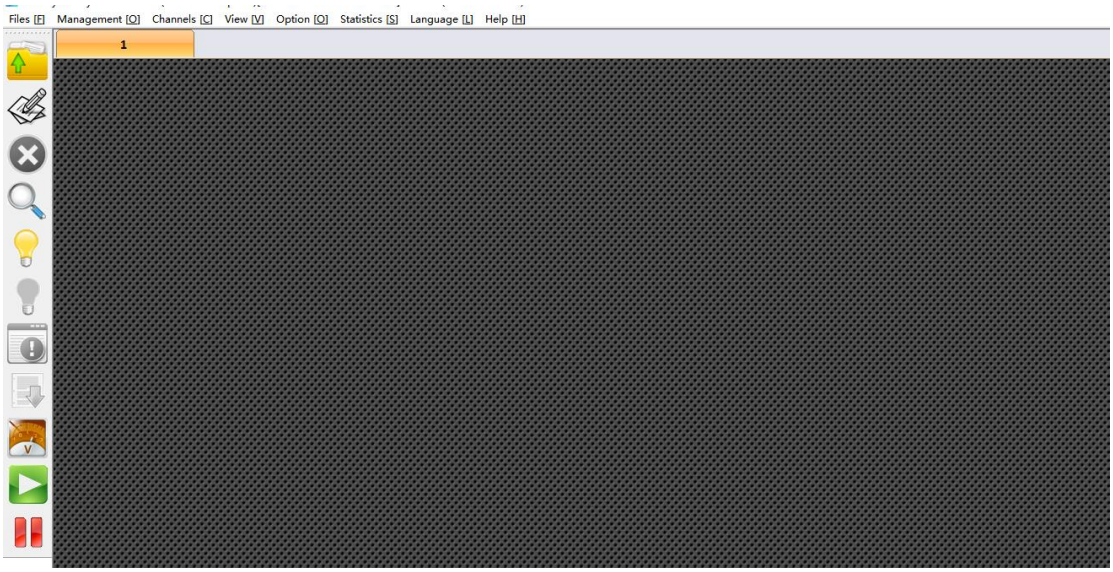


Figure 3- 1 Online success interface

Select "View[V]" - "Display MTV[M]" in the menu bar, or click the icon button "Display CDS/MTV" in the shortcut bar to switch to the MTV interface (as shown in Figure 3-2).

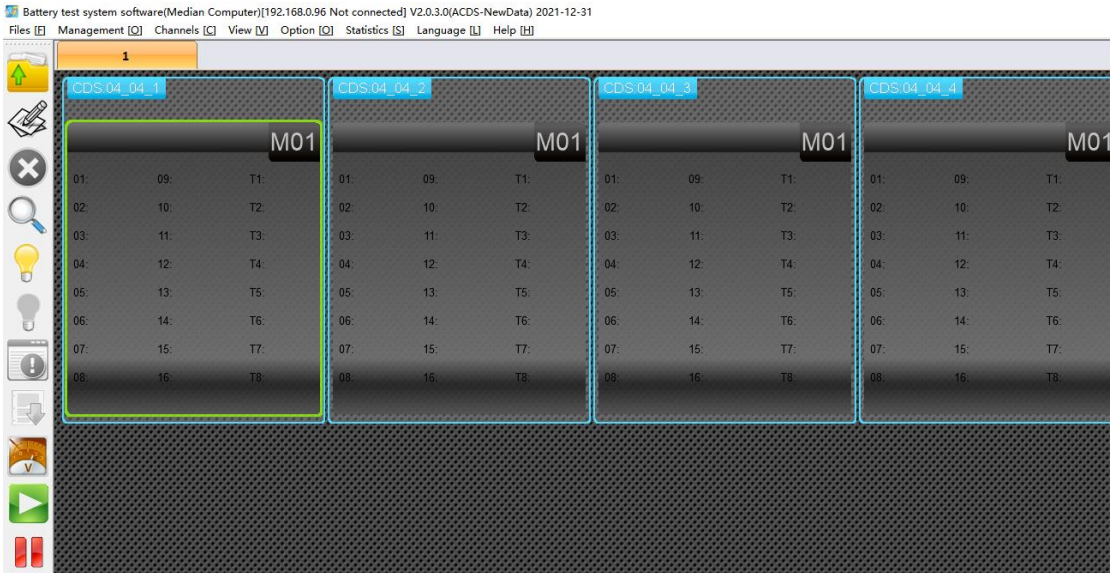


Figure 3- 2 MTV view

3.1 Startup Template

After the device is successfully connected, click the mouse to select the channel to work (multiple selections are allowed), and the software provides three ways to set the startup template:

1. Click the "Set Startup Template" icon button in the shortcut bar (as shown in Figure 1-30);
2. Click "Channel [C]" - "Start [S]..." in the menu bar;
3. Right-click the channel, and click "Start" in the right-click menu (as shown in Figure 3-3).

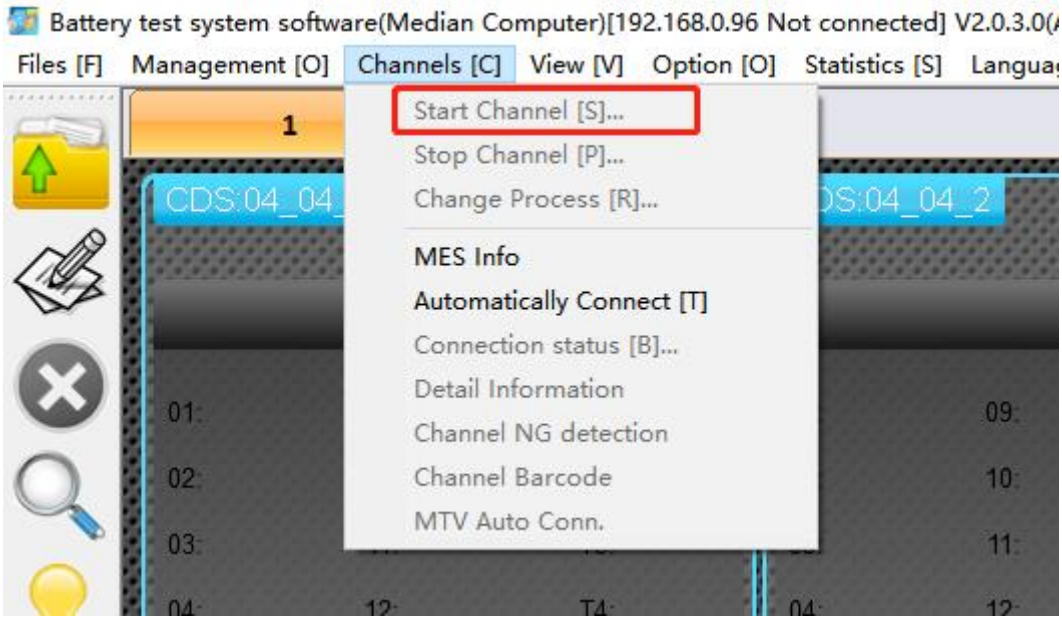


Figure 3- 3 Channel right-click menu

The above three methods can open the "Working process settings" window (as shown in Figure 3-4).

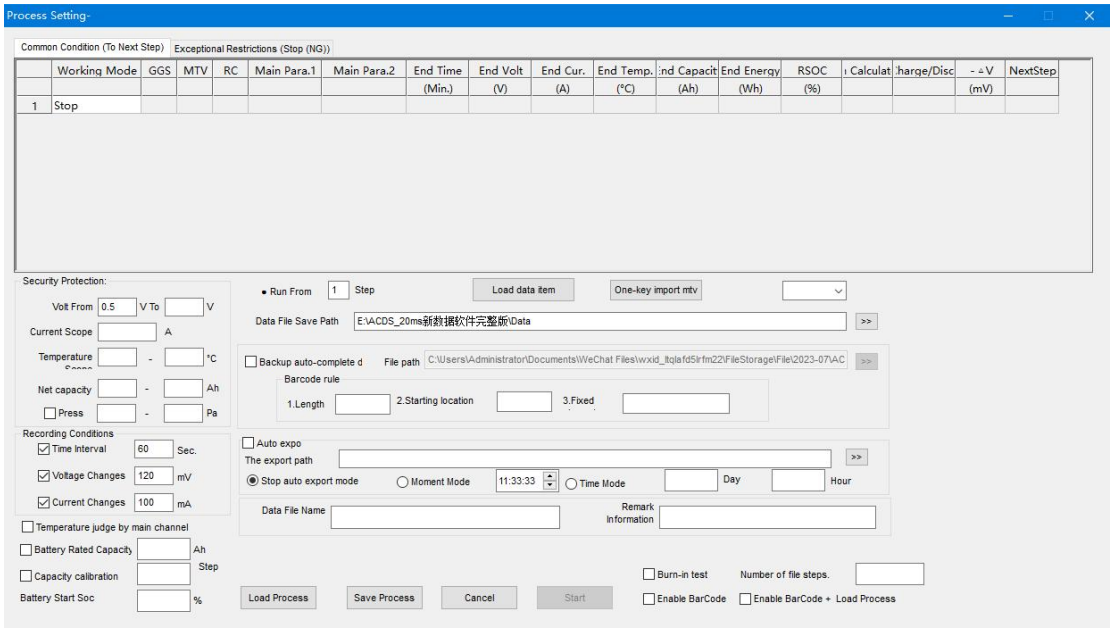


Figure 3- 4 has the channel "Work Process Settings "

Note: If no channel is selected, the "Start" button at the bottom of the "Working Process Setting" window opened by method 1 and method 2 is unavailable (as shown in Figure 3-5), and method 3 is unavailable.

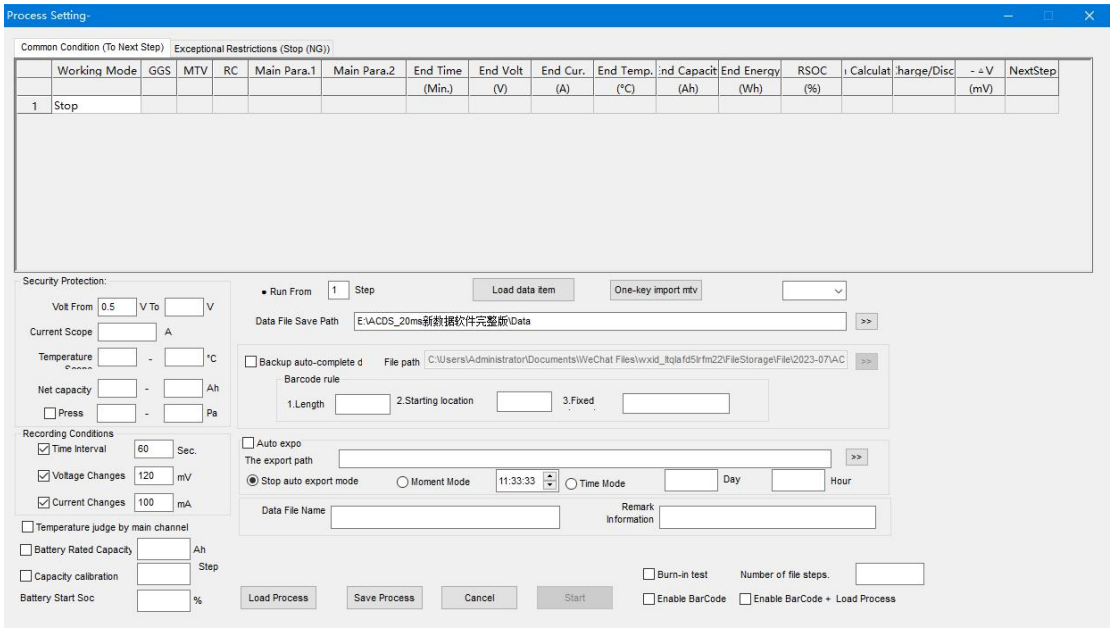


Figure 3- 5 "Working process settings" window without channel

Users can set the workflow according to the characteristics of the battery. Take the following test requirements as an example:

22 series battery pack, single cell working voltage 2.995V-4.205V.

1) Test the voltage before charging, charge to 100% , 30A constant voltage 5V .

2) empty.

3) Power up to 3 V , about SOC 60%.

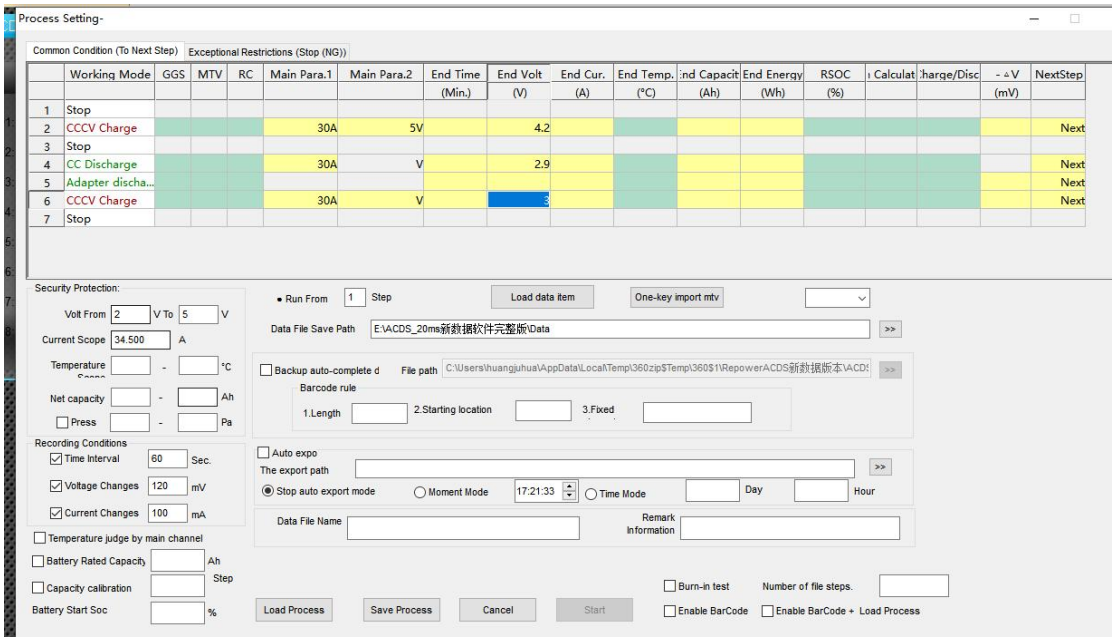


Figure 3- 6 Example

3.2 Introduction to Test Template Settings

3.2.1 Working Mode

Click to display the drop-down menu, and select the working mode to be set according to the steps.

Working modes include: charging: constant current charging (CC), constant voltage charging (CV), constant current and constant voltage charging (CCCV), floating charging, constant power charging; discharging: constant current discharging (CD), constant voltage discharging, Constant power discharge (CP), CR discharge; static, DICR test, pulse test, working condition test, pause, stop.

Note: The conversion in the process of constant current and constant voltage charging needs to achieve no impact voltage current; when discharging, the set voltage must be lower than the current detection voltage.

1. **Constant current charging (CC)** : Charging with a constant current, the termination condition is generally "termination voltage", that is, when the set

current value is charged to the set termination voltage, the channel will run to the next step.

2. **Constant voltage charging (CV)** : When charging with a constant current to the set voltage, the current gradually decreases. The termination condition is generally the termination current. When the current decreases to the set termination current, the channel will run to the next step.
3. **Constant current and constant voltage charging (CCCV)** : the combination of constant current charging and constant voltage charging.
4. **Float charge** : also known as trickle charge, that is to charge with a small current, and the current gradually decreases after reaching the constant voltage point , which is similar to the constant voltage charging mode .
5. **Constant power charging** : charging with constant power, the main parameter 1 is current, and the main parameter 2 is power. When the actual current corresponding to the set power is greater than the set current, the working current will use the set current as the upper limit; otherwise, the set power will be used as the charging standard.
6. **Constant current discharge (CD)** : Discharge with a constant current, and the termination condition is generally the termination voltage, that is, when the set current value is discharged to the set termination voltage, the channel will run to the next step.
7. **Constant voltage discharge** : Discharge with a certain current, and when the constant voltage point is reached, the current gradually decreases.
8. **Constant power discharge (CP)** : Discharge with constant power, the main parameter 1 is current, and the main parameter 2 is power. When the actual current corresponding to the set power is greater than the set current, the working current will use the set current as the upper limit; otherwise, the set power will be used as the discharge standard.
9. **CR discharge** : that is, constant resistance discharge, the main parameter 1 is current, and the main parameter 2 is resistance. When the actual current

corresponding to the set resistance is greater than the set current, the working current will take the set current as the upper limit; otherwise, the set resistance will be used as the discharge standard.

10. **Stand still** : that is, no charging and discharging operations are performed.
11. **DICR test** : DC internal resistance test, divided into conventional version and national standard version (as shown in Figure 3-7).

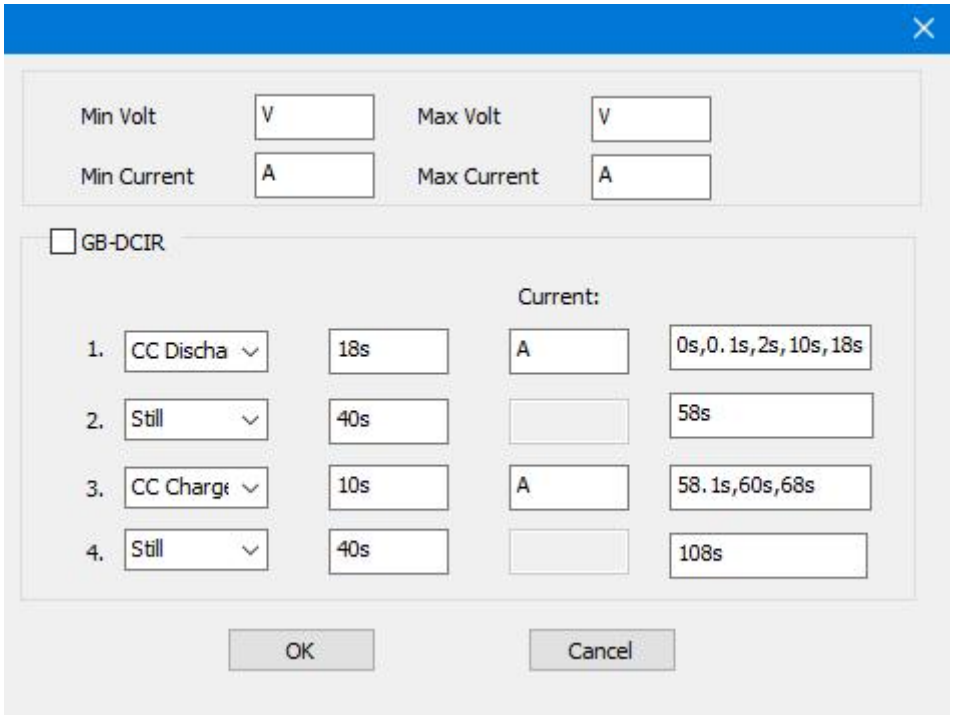


Figure 3- 7 DCIR setting window

As shown in Figure 3-7, after selecting "GB-DCIR", the system will automatically load the national standard version of the working step template, and the user only needs to automatically set the highest voltage, current and charge and discharge current.

12. **Pulse test** : It can realize charge and discharge in the form of pulse (the lower computer of HRCDS does not support this function for the time being) .

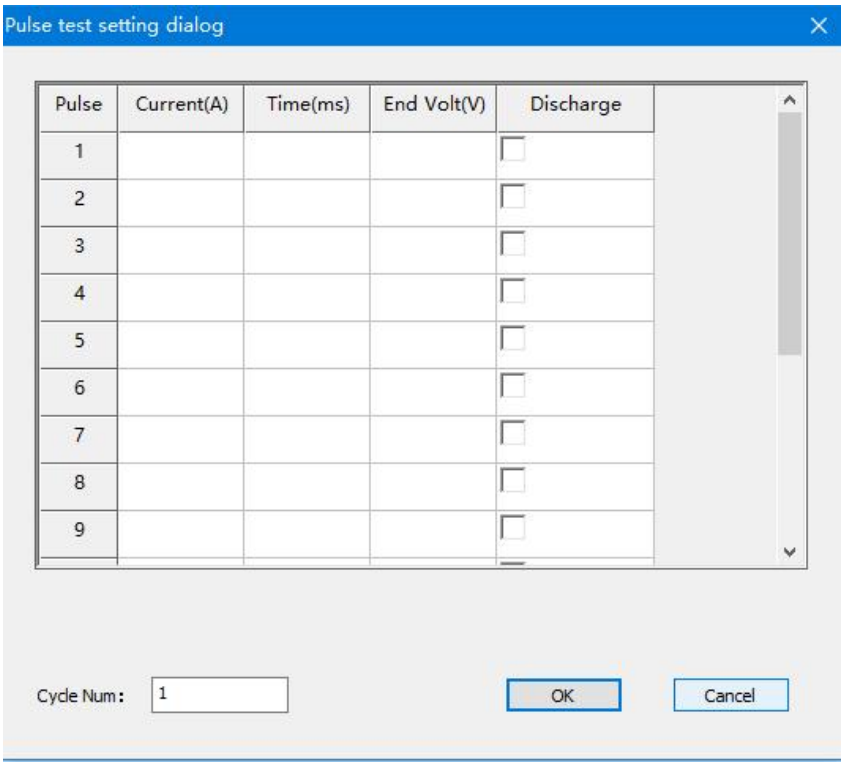


Figure 3- 8 Pulse test step setting

As shown in Figure 3-8, "current (A)" indicates the set charge and discharge current value; "pulse width (ms)" indicates the execution time of this working step; "cut-off voltage (V)" indicates the current value of this working step Termination voltage; "Discharge (charge unchecked)" is used to set the charge and discharge type of this step, the default is charge, and it is discharge after being checked; "periods" indicates the number of cycles required for the set pulse step.

13. **Working condition test** : It can realize the charge and discharge of custom voltage and current value, which is relatively close to the actual use scene.

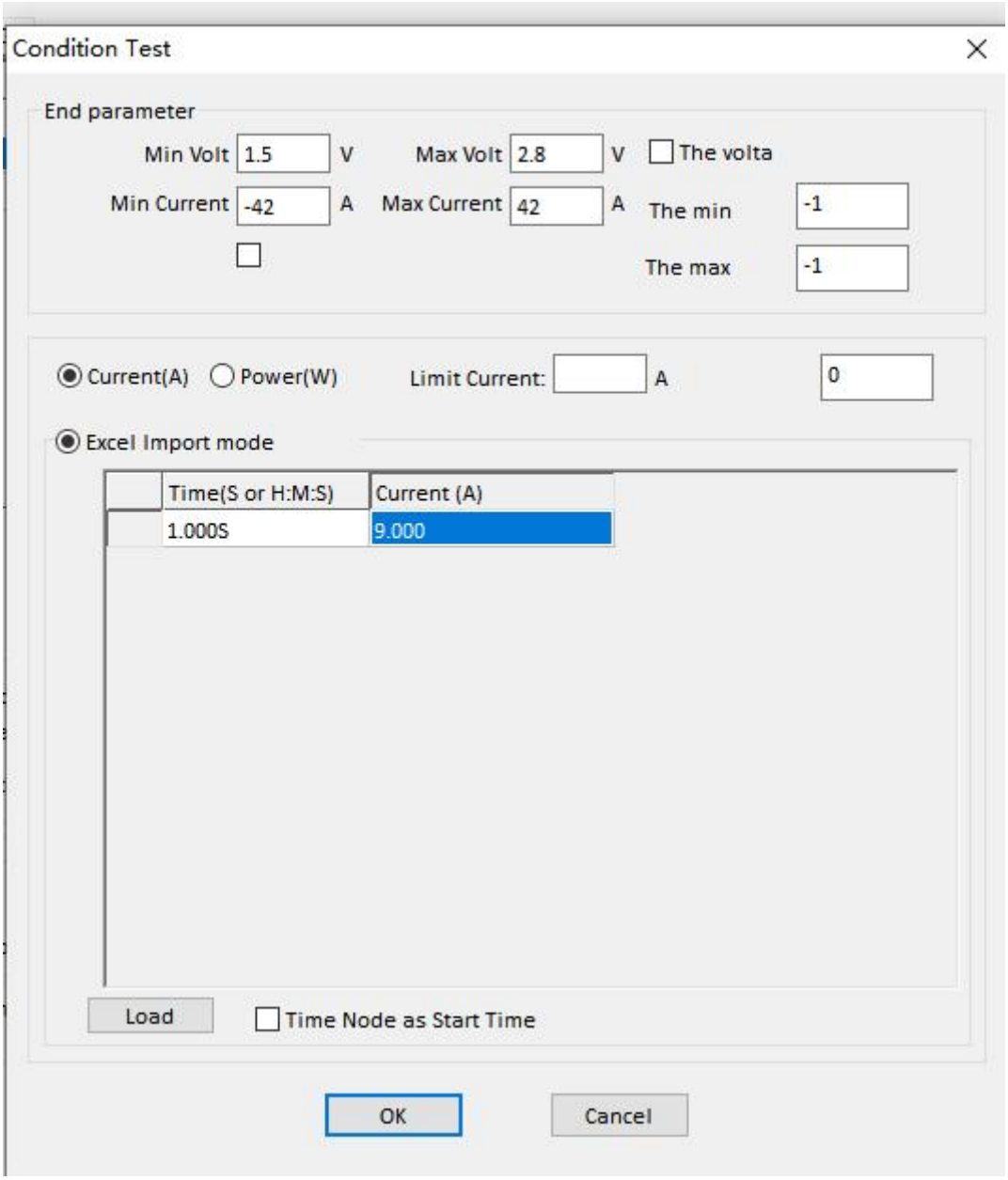


Figure 3- 9 working condition test setting window

As shown in Figure 3-9, the cut-off parameter is used to set the upper and lower limits of the voltage and current of the working step. When the voltage or current of the working step reaches the limit value, the working step will end.

Two modes of current and power (in power mode, the maximum current value of "Max Current" must be set) can be selected for the working condition test, and the working step information is mainly set by importing Excel. "Time node as the starting point" is checked, which means that when the time reaches the set value, the current starts to flow until it reaches the set value, such as the time period from 1s to 2s, the

current starts from 0A until it reaches 9A; "Time node as the starting point" When unchecked, it means that when the time reaches the set value, the current also reaches the set value, such as the time period from 0s to 1s, the current reaches 9A from 0A.

14. **Pause** : When the channel runs to this step, the step will be paused. Paused steps can be resumed through the "Resume Suspended Continuation" function in the right-click menu of the channel.
15. **Stop** : When the channel runs to this step, it will stop automatically.

3.2.2 MTV

This function is available when the voltage or temperature of the MTV module is bound .

Click to pop up the window shown in Figure 3-10, which is used to set the MTV channel and comparison range data to be compared.

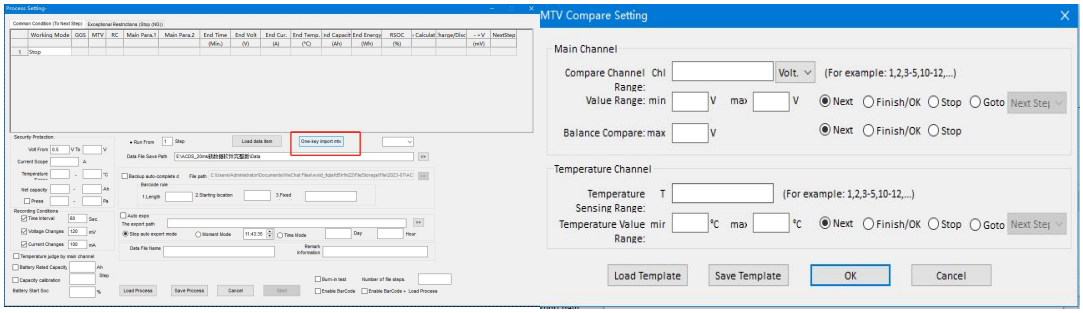


Figure 3- 10 MTV comparison setting window

As shown in Figure 3-10, the MTV comparison setting information mainly includes the following two aspects:

1. Main channel parameter setting

1) Compare the channel range: compare the battery voltage channel range, which has a mapping relationship with the information in the "CDS-MTV Settings" window. Only judge the 5th voltage, then the comparison channel range in the window shown in Figure 3-10 is "2".

enter commas in English input method for discontinuous channels .

2) Voltage value range: min and max represent the minimum and maximum values of the comparison items (voltage, flow, pressure) respectively. As

long as the value of a certain channel is less than or greater than the set value three times consecutively, the channel will execute the set action.

3) Balance comparison: max refers to the maximum range allowed by all comparison channels.

In the MTV view, the highest value in the red frame and the lowest value in the blue frame are used in real time, and the real-time Balance value is displayed at the bottom of the interface. When this value exceeds the maximum range allowed by all comparison channels set, it will be used. Displayed in red font.

2. Temperature channel parameter setting

1) Temperature Sensing Range: Compare the battery temperature channel range, the setting is similar to the voltage comparison.

2) Range of temperature values: min and max represent the minimum and maximum values of the comparison item (temperature), respectively.

In the voltage and temperature comparison setting information, Next, Finish/OK, Stop, and Goto are the actions to be executed by the channel when the protection point is reached, and the meanings are as follows:

1) N ext: Indicates that when the voltage temperature of the MTV monomer in the current working step reaches <min or >max, it will jump to the next step;

2) Finish/OK: Indicates that there is no abnormality in the current work step, and when the work step ends normally and stops running, it will display Finish/OK;

3) Stop: Indicates that there is an exception in the middle of the operation of the current step, and when the operation stops without reaching the end condition normally, it will display Stop/NG;

4) Goto : 1, 2, ... indicates that when the MTV monomer voltage temperature and the main channel reach the end condition, jump to the specified working step.

After setting the comparison parameters, click the "OK" button to complete the MTV comparison setting.

3.2.3 RC

It is used to set the working step data recording conditions. After setting, the working step data recording will not be controlled by the global data recording conditions. The setting interface is shown in Figure 3-11:

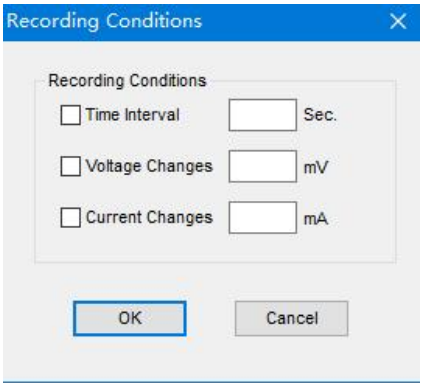


Figure 3- 11 Data recording conditions

3.2.4 Main Parameter 1 and Main Parameter 2 (main channel)

In static mode, main parameter 1 and main parameter 2 are to set the voltage protection range, if the connected battery voltage exceeds this range, the device will alarm and stop working.

In the constant current charging and discharging mode, the main parameter 1 is used to set the constant current value, and the main parameter 2 cannot be set.

In constant voltage charging and discharging mode, constant current and constant voltage charging mode, and float charging mode, the main parameter 1 is used to set the maximum current value before reaching the constant voltage point, and the main parameter 2 is used to set the constant voltage value.

In the constant power charging and discharging mode, the main parameter 1 is used to set the maximum current value, and the main parameter 2 is used to set the constant power value.

In CR discharge mode, the main parameter 1 is used to set the maximum current value, and the main parameter 2 is used to set the constant resistance value.

In the DCIR test, pulse test, and working condition test modes, the main

parameter 1 is used to set the working step information, and the main parameter 2 is not available.

In the jump (GOTO) mode, the main parameter 1 is used to set the step to which to jump, and the main parameter 2 is not available. Note that **the jump can only jump up, not down** : if the current jump step is step 4, the main parameter 1 of the jump step can only be a value less than or equal to 4, and Cannot be greater than 4.

3.3 Normal Judgment Conditions

Including end time, end voltage, end current, end temperature, end capacity, end energy, RSOC, - Δ V, NextStep, as long as one of them meets the set requirements, the device will end the current working step and skip to the next step to continue working.

3.3.1 Termination Time

Except working condition test, pause and stop mode, the end time can be set in other modes, as long as the work reaches the set time, the device will terminate the current step and jump to the next step.

Note that in the jump (GOTO) mode, the end time is used to set the number of jumps. When the number of cycles reaches the set value, the work step will execute the work step after the skip work step

3.3.2 Termination Voltage

This parameter can be set in charging and discharging mode, as long as the detected voltage reaches the set voltage value, it will jump to the next step to continue working (generally used to set the discharge termination voltage).

3.3.3 Termination Current

It is used to set the termination current of the working step. When the current is less than the set value, the current step will be terminated and skip to the next step.

3.3.4 Termination Temperature

When the device temperature reaches the set temperature protection range, the set action will be executed.

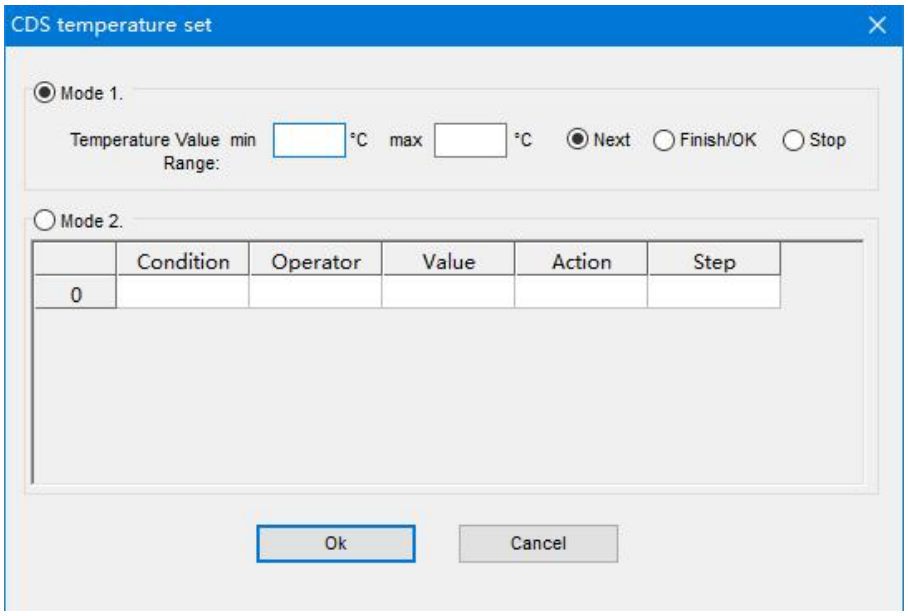


Figure 3- 12 CDS termination temperature

As shown in Figure 3-12, CDS temperature setting includes two modes:

1. mode 1

By default, the static working steps are protected within the temperature range, and the charging and discharging working steps are protected outside the temperature range. If the static process step needs to be consistent with other process steps, please uncheck the "Skip process step within the static temperature range" option in the "Repower Settings" window.

2. mode 2

Operators and actions can be selected by themselves, and "and" and "or" conditions can be selected between judgments.

Note: If it is a parallel channel, all channels must meet the protection conditions by default before the temperature protection will work. If only the main channel is judged, please check the "Temperature judgment is based on the main channel" in the lower left corner of the "Working process settings" window (as shown in Figure 3-13).

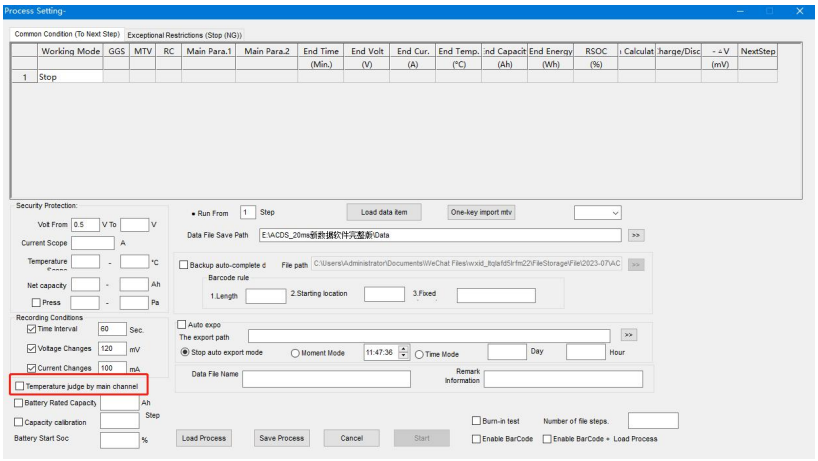


Figure 3- 13 Main channel temperature judgment

3.3.5 Termination Capacity

This parameter can be set in charge and discharge mode, when the charge or discharge reaches the capacity we set, the current step will be terminated and the next step will be executed.

3.3.6 End Energy

This parameter can be set in charge and discharge mode, when the charge or discharge reaches the energy we set, the current step will be terminated and the next step will be executed.

3.3.7 RSOC

The percentage of recharge capacity is used to set the percentage of recharge capacity that has been executed after charging and discharging.

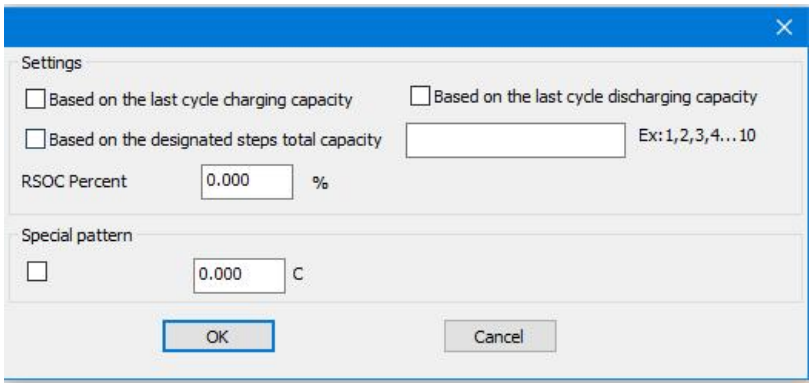


Figure 3- 14 RSOC settings

As shown in Figure 3-14, there are three benchmarks:

1. **the charging** step in the middle of the first discharge step from the current step forward to the first discharge step ;
2. of the capacity of the discharge step in the middle of the first charging step from the current step forward to the first charging step **;**
3. Based on the total capacity of the specified working step: the basis of this condition is the sum of the set working step capacity.

Note: If you need to use this condition as a judgment condition, you need to stand still for at least 30s between charging and discharging steps.

3.3.8 - ΔV

The setting of this parameter is only used for Ni-MH batteries, and limits the -△V generated by the battery before charging is terminated. As shown in Figure 3-15.

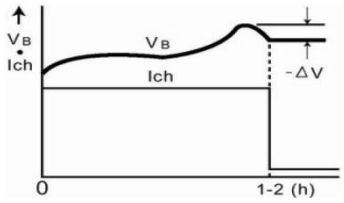


Figure 3- 15 -△V

3.3.9 Next Step

NextStep indicates which step will be executed next when the step reaches the end condition. The default next step is "Next".

Note: If you need to set a specified step, please do not set the end time of the step.

Figure 3-16 is an example of NextStep settings:

the channel execution completes step 2, jump to step 4.

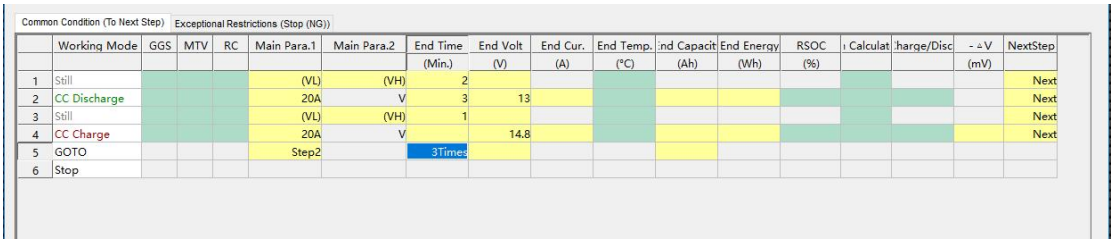


Figure 3- 16 NextStep setting example

3.4 Exceptions and Restrictions

Including ECD/EVD, VOL/TIME, Time Cap, Minimum Volume, Maximum Volume, ΔDCR , NG/STOP. If the user sets these parameters, when the battery test data does not meet the parameters we set, the device will stop working and give an alarm, indicating that the current working battery is abnormal.

3.4.1 ECD/EVD

ECD/EVD is also called current step, and the setting of this parameter is used to capture the abnormal charging end current. The charging of our equipment is composed of two processes of constant current and constant voltage. The final constant voltage process is a trickle charging process. Generally, we set a smaller end current, such as 200mA, to judge that the charging process has been completed. The current step is to prevent the charging current from suddenly changing to 0 when the charging current is relatively large, and the device mistakenly thinks that the charging is over. For example, we use 2200mA for charging and set the termination current to 200mA, and the current step to 250mA. Then when the charging ends at 200mA, it is a normal state; when the current suddenly changes to zero at 200-250mA, we also consider it to be a normal situation; when the current suddenly changes to 0 when it is greater than 250mA, it is an abnormal state, and the device will stop the entire charging process And prompt the relevant error message. The schematic diagram of current steps is shown in Figure 3-17. This function is temporarily unavailable in this version.

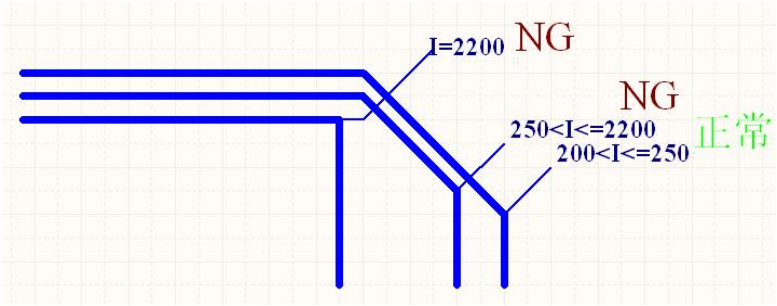


Figure 3- 17 current steps

The main reasons for the above abnormal situation are as follows:

1. The connector has come off.
2. Damage in the middle of the battery test: including disconnection of the current loop PCB, poor contact of components, etc.
3. The battery has over-temperature and over-voltage protection: the battery cell voltage is unbalanced, IC data setting error, etc.
4. The CTS device is broken.

3.4.2 VOL/TIME

After the charging step starts for a corresponding time, the voltage must be greater than the set value.

3.4.3 Time Cap

The maximum time limit when a step is running, when the step reaches the set time limit, the step will jump to the next step.

3.4.4 Minimum Capacity

When charging and discharging, the minimum capacity charged or discharged. When discharging the battery, we require that the minimum discharge capacity of the battery discharge can reach the set value, we can consider the battery to meet the design requirements, otherwise it is a substandard product whose actual capacity cannot reach the design capacity. The set value of the minimum capacity is generally 90% to 95% of the nominal capacity of the battery. For example, for a battery with a nominal capacity of 4600, we can set this parameter to 4200, that is, the battery must be able to hold at least 4200mAh before we consider it qualified, otherwise the software will stop working and display LC (low capacity).

3.4.5 Maximum Capacity

When charging and discharging, the maximum capacity charged or discharged. When charging the battery, the maximum allowable capacity of the battery pack when charging. If the capacity of the charged battery reaches the limit condition, the software will stop working, and it will be judged as a high-capacity unqualified

battery. At the same time, the channel dialog box will display an OC prompt, and the channel LED will flash to give an alarm.

3.4.6 ΔDCR _

DC impedance detection, during the charging and discharging process, the device monitors the DC impedance in real time. If it detects that the DCR exceeds the value we set, the software will stop working and give an alarm. Generally, it is caused by poor contact of the terminal or oxidation of the terminal for too long.

3.4.7 NG/STOP

When the exception condition reaches the limit, the step will decide the operation of the channel according to the set NG/STOP value: NG means to mark the exception condition reached by the step and continue the subsequent step; STOP means to stop the channel.

3.5 Security Protection

It is used to set voltage protection range, current protection range and temperature protection range, as shown in Figure 3-18. During the working process, if the detected voltage, current and temperature are not within the safety protection range we set, the device will stop working and give an alarm.

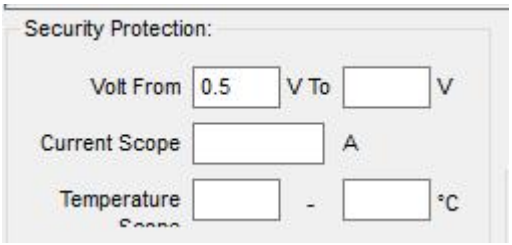


Figure 3- 18 Security protection

Note: The current protection range can be filled in according to the charge and discharge current we set. When the device temperature is "0", no temperature protection judgment is performed.

3.6 Recording Conditions

It is used to set the recording conditions of channel data, as shown in Figure 3-19.

In Figure 3-19, the data is recorded every 10S interval or the voltage change exceeds 120mV. In addition, you can also choose to record data of current changes, and record data when any one of several parameters meets the requirements.

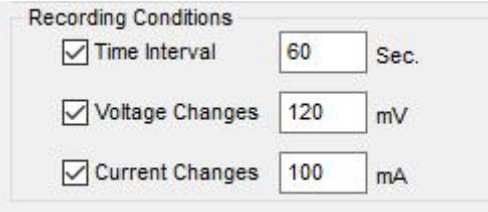


Figure 3- 19 Data recording conditions

3.7 Data Storage Path

As shown in Figure 3-20, the user can select other storage spaces other than the default path as required, that is, save data in a custom path.

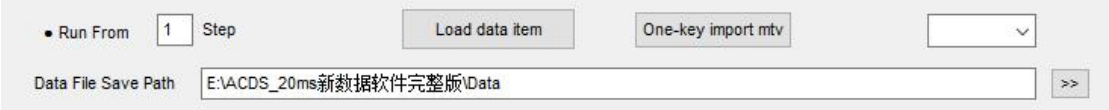


Figure 3- 20 Data storage path

3. 8 Backup Autocomplete Data

Figure 3- 21 Backup autocomplete data

After checking, when the channel execution is completed, the running data will be automatically backed up to the set path.

3. 9 Barcode Rules

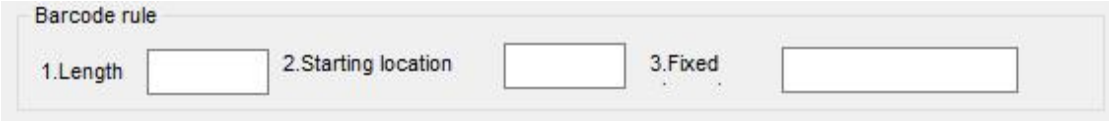


Figure 3- 22 Barcode rules

It is used to set the barcode rules, only when the conditions of the rules are met can the channel be successfully started. As shown in Figure 3-22, "Length" indicates the length of the barcode; "Fixed character start position" indicates the number of fixed characters; "Fixed character" is used to set the special characters in the barcode.

Barcode rules are used in conjunction with "Enable Barcode" and "Enable

Barcode + Load Processes". The barcode setting window is shown in Figure 3-24.

Figure 3- 23 Barcode related

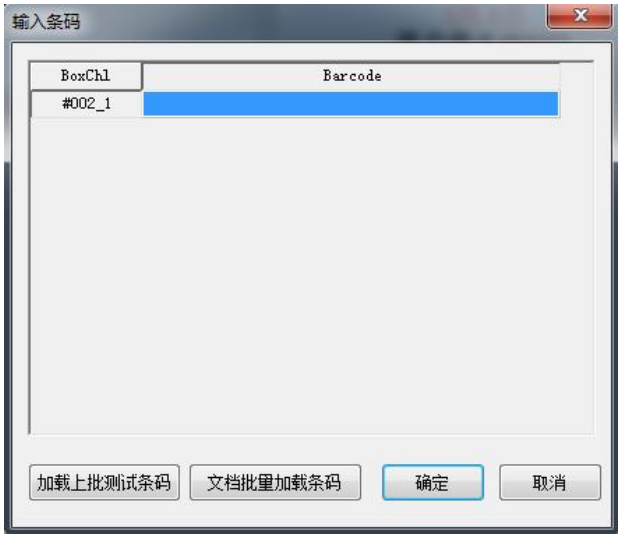


Figure 3- 24 Enter barcode

3.10 Save Template

After setting the template, the user can click "Save Process" as shown in Figure 3-25 to save the template set this time. If you need to use the saved workflow, directly click the button of "Call into Process " to load the saved work template. Our default save path is the "tplx" folder in the root directory of the software, which can be modified by users.

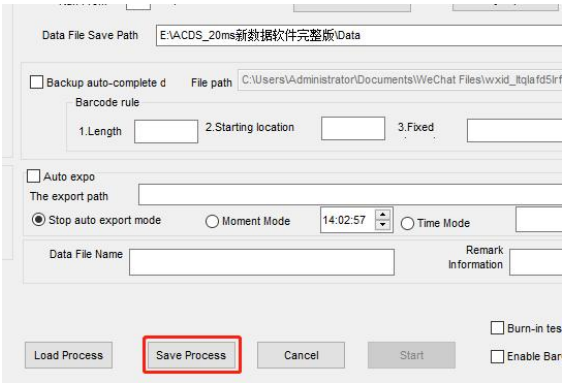


Figure 3- 25 save the template

4. Channel Start Function Description

4.1 Interface Description Before Startup

Select a channel and right-click to pop up a vertical shortcut menu bar, as shown in Figure 4-1 .

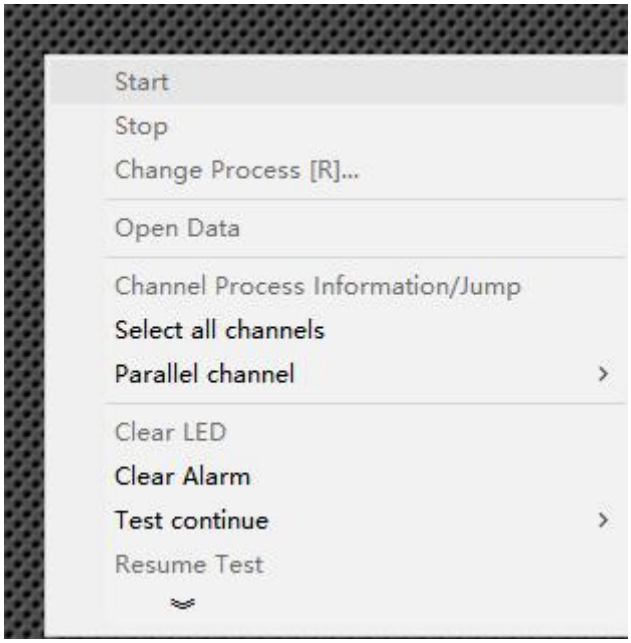


Figure 4- 1 Channel right-click menu

1. Startup: It is the same function as "Startup" in the channel menu and "Set Startup Template" in the shortcut bar. The difference is that "Startup" here is available only when the unstarted channel is selected.
2. Stop: It is consistent with the function of "Stop" in the channel menu and "Stop and start channel" in the shortcut bar.
3. Modify process: It is consistent with the "Modify process" function in the channel menu.
4. Open data: used to view the data of the channel being tested or already tested.
5. Convert data:
6. Channel status query/jump: used to query and modify the test template of the channel under test.

7. Select All Channels: Used to select all channels.
8. Parallel channel: It is used to connect multiple channels in parallel for devices that support channel parallel connection to increase the current range of the device. Figure 4-2 is an example of parallel channel information. After parallel connection, the current range becomes the sum of the ranges of the two channels:

4 - 2 parallel channel information

9. Light off: It is consistent with the "light off" function in the shortcut bar.
10. Clear alarm: used to clear the device alarm.
11. Test continuation: It is used for test continuation of a test stopped abnormally or manually. The user can choose to continue from the current step, from step 1 or from the file test.
12. Resume Suspended Connection: It is used to test and resume the suspended channel.
13. Expand: It is used to expand the right-click menu to display all functions of the channel right-click menu (as shown in Figure 4-3).

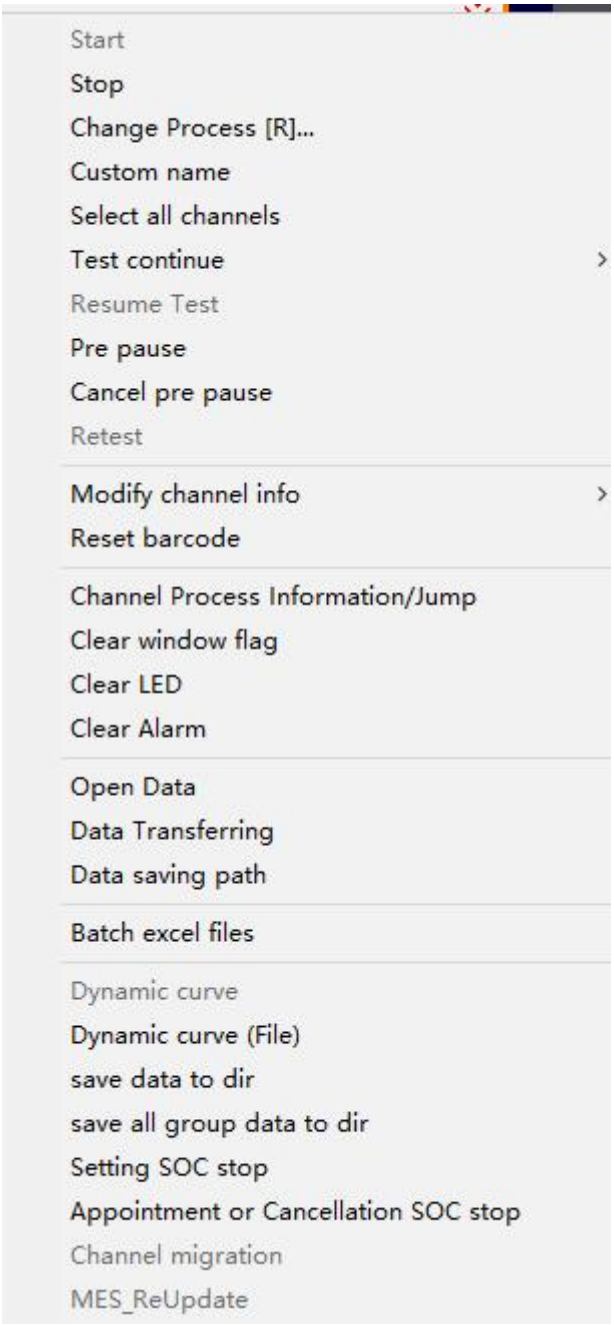


Figure 4- 3 The complete right-click menu of the system home page

After the menu is expanded, the following functions will be added:

1. Retest: It is used to retest the channel after the test is completed.
2. Modify channel information : used to modify the channel file name or channel Barcode.
3. Reset Barcode: Used to modify channel Barcode in batches.
4. Clear window ID: used to clear the ID information on the window channel.

5. Data storage path: used to open the data file storage path.
6. Batch export EXCEL data files: used to batch export selected channel data.
7. Dynamic Curve: It is used to open the channel dynamic curve.
8. Dynamic curve (file): Open channel dynamic curve with file.
9. Save data to statistical folder: Save the selected channel data to the statistical folder " StatisticData ".
10. Save all group data to folder: Save all group data to folder " BackupFile ".
11. Lock/unlock: Lock unused channels and do not use other channels
12. Channel migration:
13. Booking SOC Pause:

4. 2 Interface Description After Startup

Figure 4- 4 channel start display

As shown in Figure 4-4 , the channel information consists of the following parts from top to bottom and from left to right:

1. Template information: including template name, file name and Barcode information , scrolling and displaying in the window , the template in Figure 4-4 is not saved, that is, there is no template name; the file name is "test" ;
2. Box number-channel number: used to identify the box number and channel number information of the equipment , as shown in "2-1" in the figure;
3. Voltage: used to identify the current voltage of the channel, such as "2.1835V" in the figure;

4. Current: used to identify the current current of the channel, such as "0.000A" in the figure;
5. Power: used to identify the current power of the channel, such as "0.0W" in the figure;
6. Capacity: used to identify the current working step capacity of the channel, such as "0.000Ah" in the figure;
7. Energy flow: used to identify the energy flow of the current working step of the channel, such as "0.0Wh" in the figure;
8. Cycle information: used to identify the cycle information of the working step of the channel, "1cyc" means the largest cycle, "1," means the cycle information of goto in the working step , and the corresponding cycle information from left to right is from outside to inside.
9. Working step state: used to identify the current working step of the channel, "RST" in the figure means constant current working step;
10. Temperature: used to identify the current temperature of the channel, as shown in the figure "T=29.2° C";
11. Second voltage: used to identify the current second voltage of the channel, such as "2.195V" in the figure;
12. Running time: used to identify the running time of the current step of the channel, as shown in the figure "Run Time=6.10Sec".

In addition to the above information, the interface information also uses colors and buoys to identify the charging and discharging status, among which red is charging and green is discharging.

Figure 4- 5 charging status

As in 4-5 , the downward arrow indicates that the current is released from the device to charge the battery.

Figure 4- 6 Discharge state

As in 4-6 , the upward arrow means recovering current from the battery to discharge the battery.

4.2.1 Status Query/Jump

After the device is started, right-click to pop up a drop-down menu, as shown in Figure 4-7.

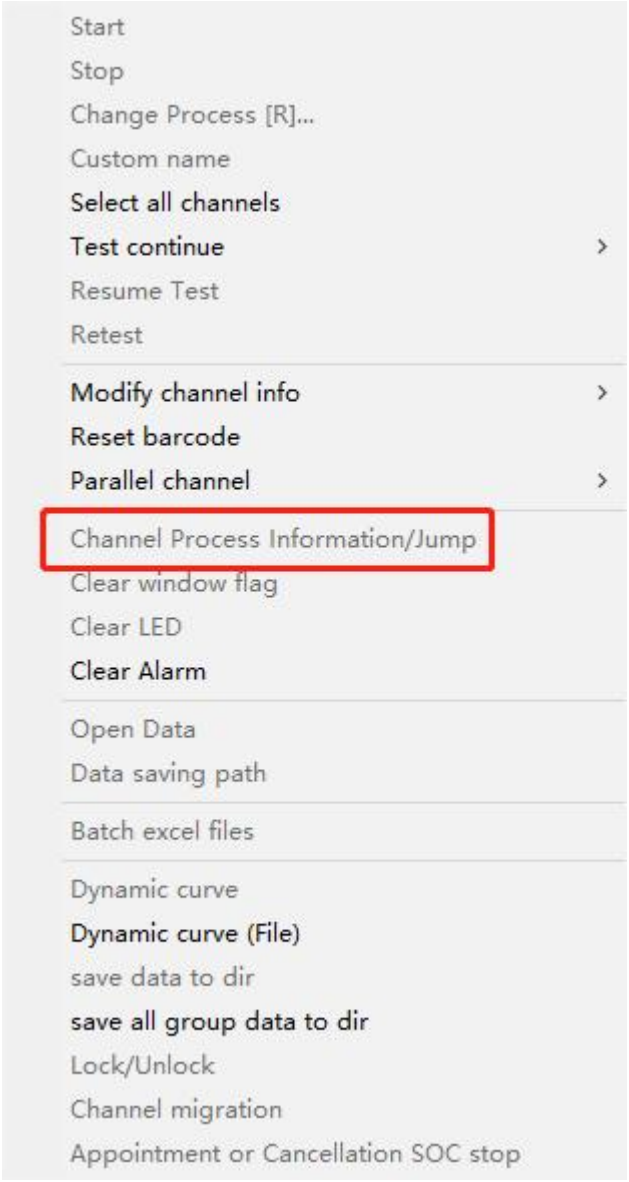


Figure 4- 7 Status query/jump

If the customer wants to jump directly to the next working mode, select "Channel Status Query/Skip" and the interface shown in Figure 4-8 will pop up: we want to jump to step 2, click the second step with the mouse, and select the working mode The working mode of the first step will turn into a blue background, and then click the "Jump" button, and the device will jump to step 2 to perform the charging work.

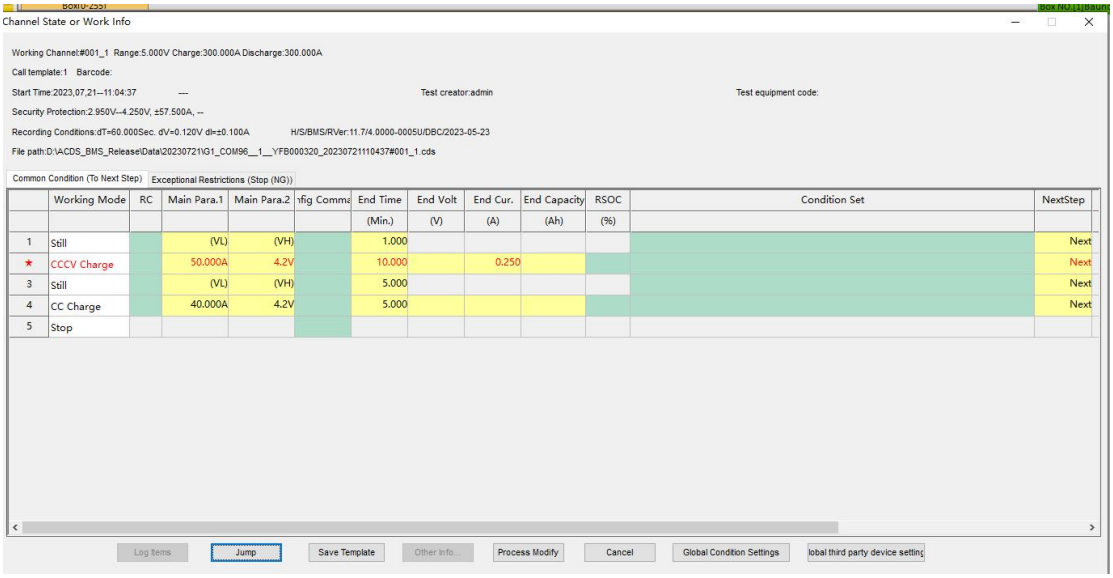


Figure 4- 8 jump example

4.2.2 Process Modification

If the equipment is working, we want to modify its working steps or parameters, and hope that the data can continue to be recorded, then we can click the "Process Modification" button in Figure 4-8, or click the button in Figure 4-7 "Modification process", the system will pop up the interface shown in Figure 4-9.

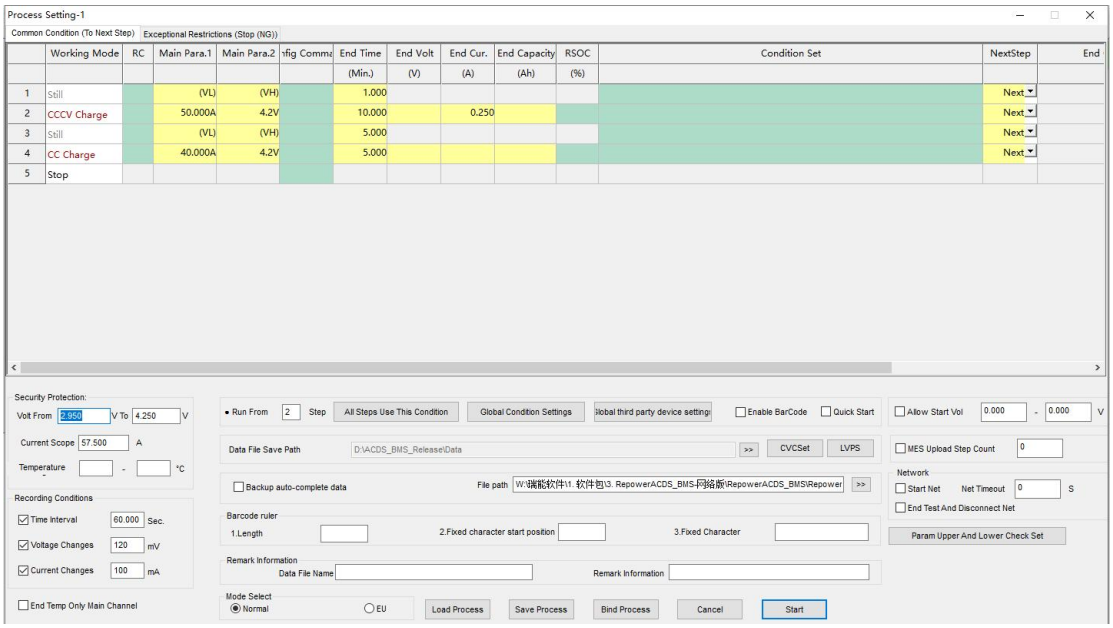


Figure 4- 9 Example of modification process

Select the step to be changed in the working mode column with the mouse, and a drop-down menu will pop up when you right-click, you can insert or delete the

process, re-customize the work process you want, and then select the step to start from, click "Start", the device will follow The steps we set are executed, and the data files can be completely saved.

4.2.3 Open Data

The device starts working for a period of time, and we want to view the running data and images, we can select the "Open Data" function in Figure 4-7, and the interface shown in Figure 4-10 will pop up.

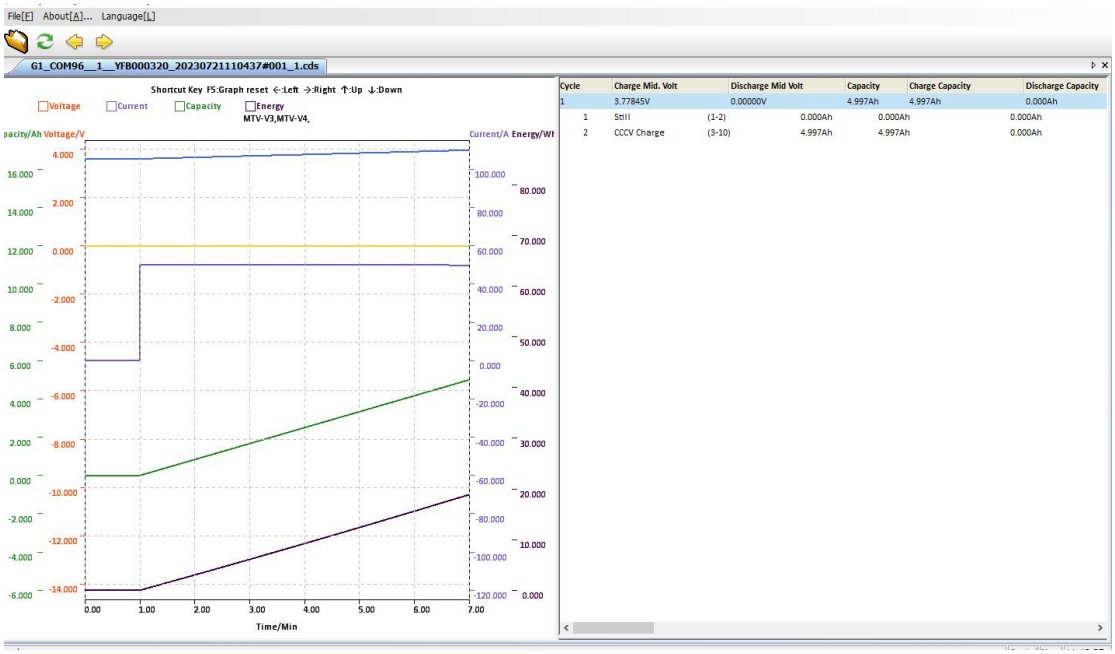


Figure 4- 10 Data view

4.2.3.1 Curves

We can see the graph curve on the left. If we have done a lot of loops and the curves are relatively dense, if you want to see a certain section of the curve, you can put the mouse on the curve, click the right button, and a drop-down menu will pop up, as shown in Figure 4-11.

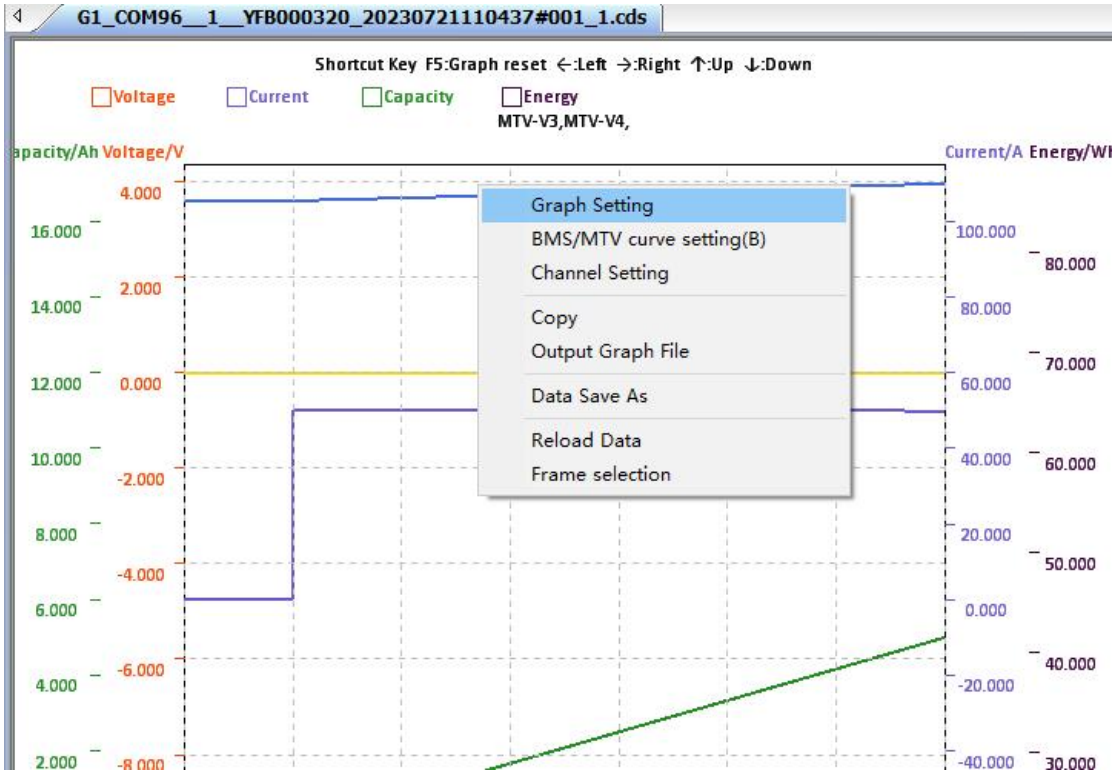


Figure 4- 11 Graphics right-click menu

1. graphics settings

Select “Graphics Settings” and an interface will pop up, as shown in Figure 4-12. You can choose the definition of coordinates and the scope of the cycle, which is convenient for customers to view the details of the curve, and also supports the output of the curve.

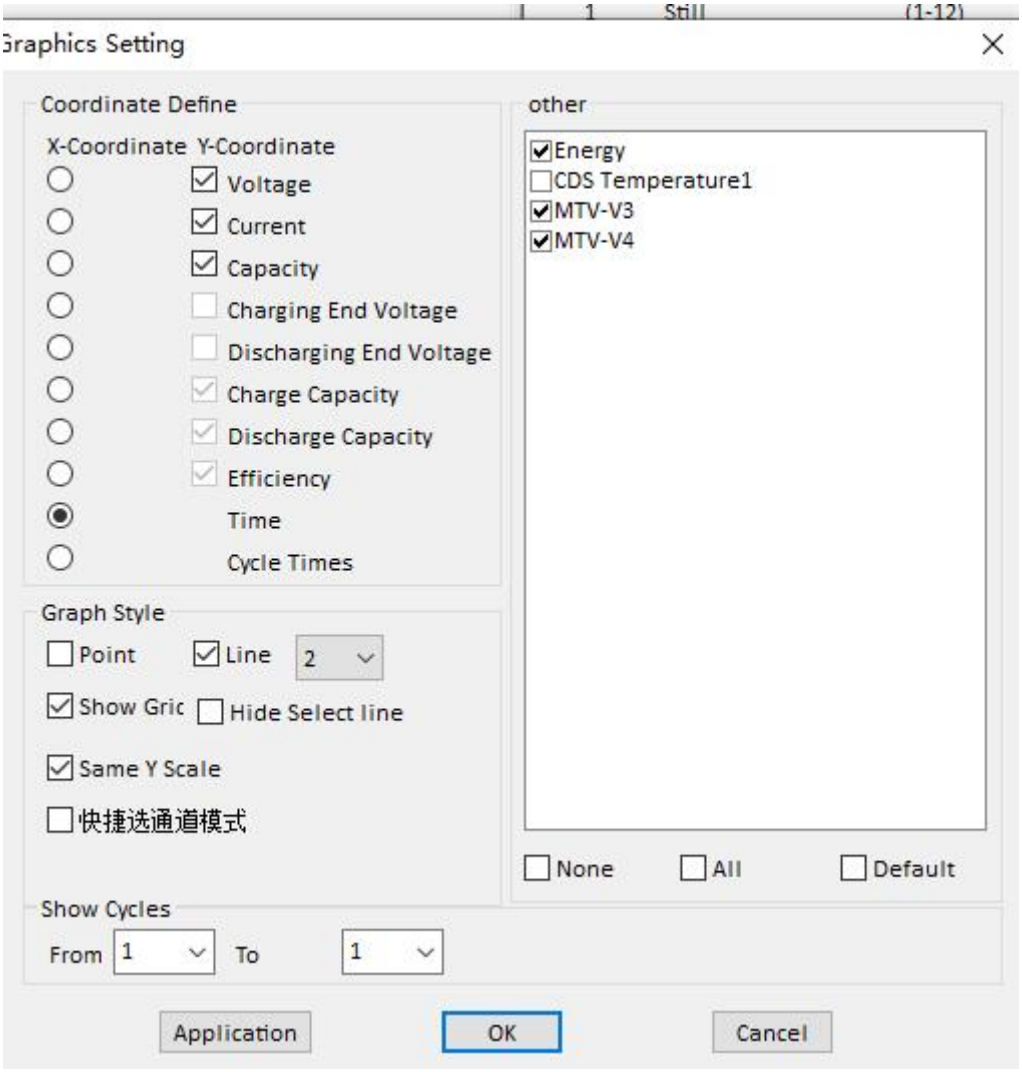


Figure 4- 12 Graphics settings

Curve operation:

1) Place the mouse in the graphics area, press and hold the left mouse button to move left and right, and the curve will slide accordingly.
2) Place the mouse in the graphics area, press and hold " Ctrl " + scroll the mouse wheel, and the curve will be zoomed in horizontally.
3) Place the mouse in the graphics area, select the relevant curve on the top of the image, and press and hold the curve with the left mouse button to drag the curve to move up, down, left, and right.

Place the mouse in the graph area, select the relevant curve on the top of the image, select and hold down " Shift " + scroll the mouse wheel, and the curve will be

enlarged vertically.

2. Copy: It is used to copy the curve graph and then paste it in other software.
3. Output graphics file: used to input graphics files as pictures.
4. Save data as: used to output channel data.

4.3.2.2 Data

The data display is divided into cycle layer, step layer, and record layer data. Right-click any data area, and the right-click menu will pop up for data operation (as shown in Figure 4-13).

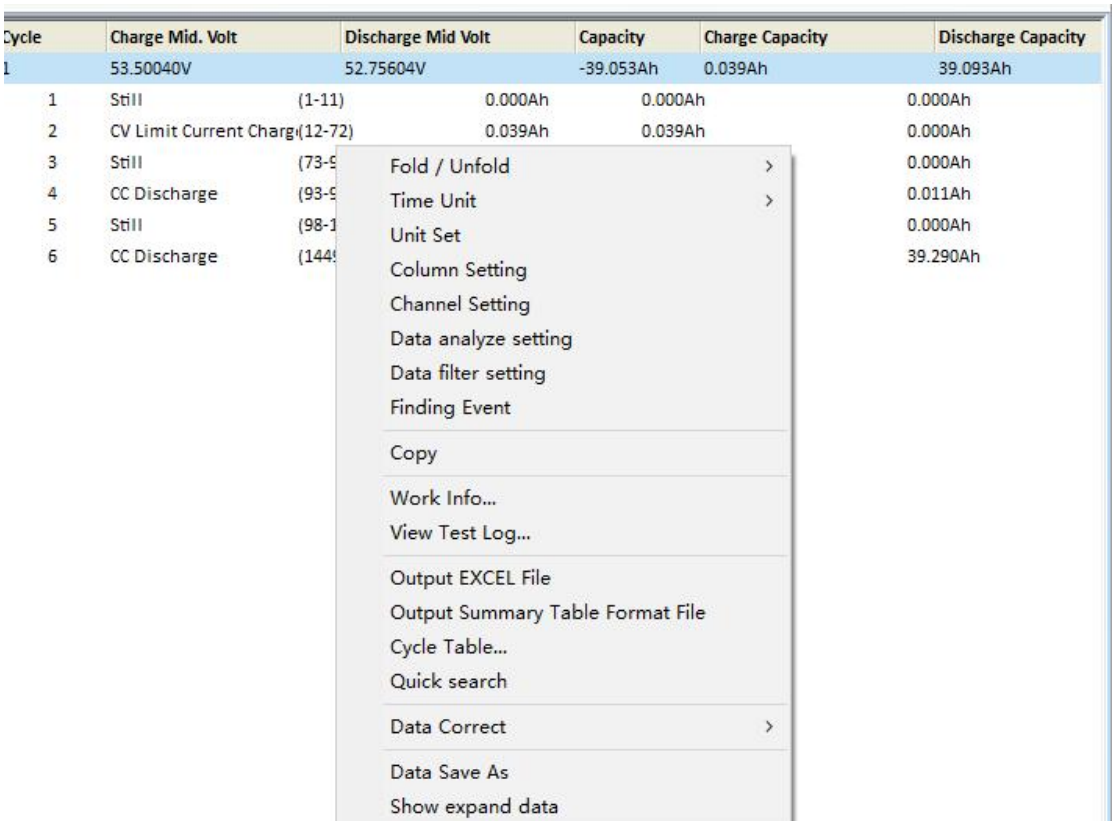


Figure 4- 13 Data right-click menu

1. Data folding/expanding: The data display is folded by default, so that customers can see all the work steps conveniently. If customers want to see detailed data, they can choose "folding/expanding", and the folded data will be opened. Or click directly on the step layer, and the data will be unfolded and folded in a single layer.
2. Time unit: The first item of data is recorded in the unit of real-time time.

Users can change the time unit according to actual needs, and can choose five time units: H:M:S, day, hour, minute, and second. Checking "Process independent" means that the relative time of each step starts from "0", and the steps are relatively independent, otherwise the step time is displayed cumulatively.

Figure 4- 14 Time Unit

3. Unit setting: user-defined data unit, as shown in Figure 4-15.

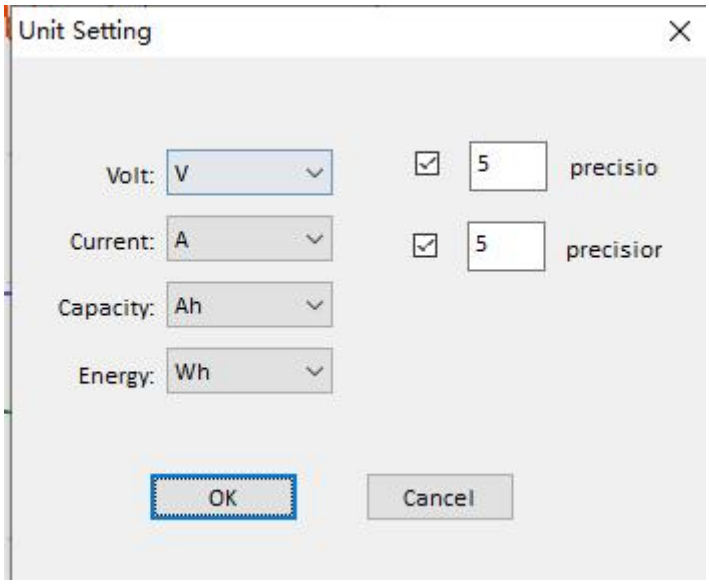


Figure 4- 15 Unit Settings

4. Graphics settings: It is consistent with the function of "graphics settings" in the right-click menu of the curve.
5. Column setting: used to select the test column to be displayed.

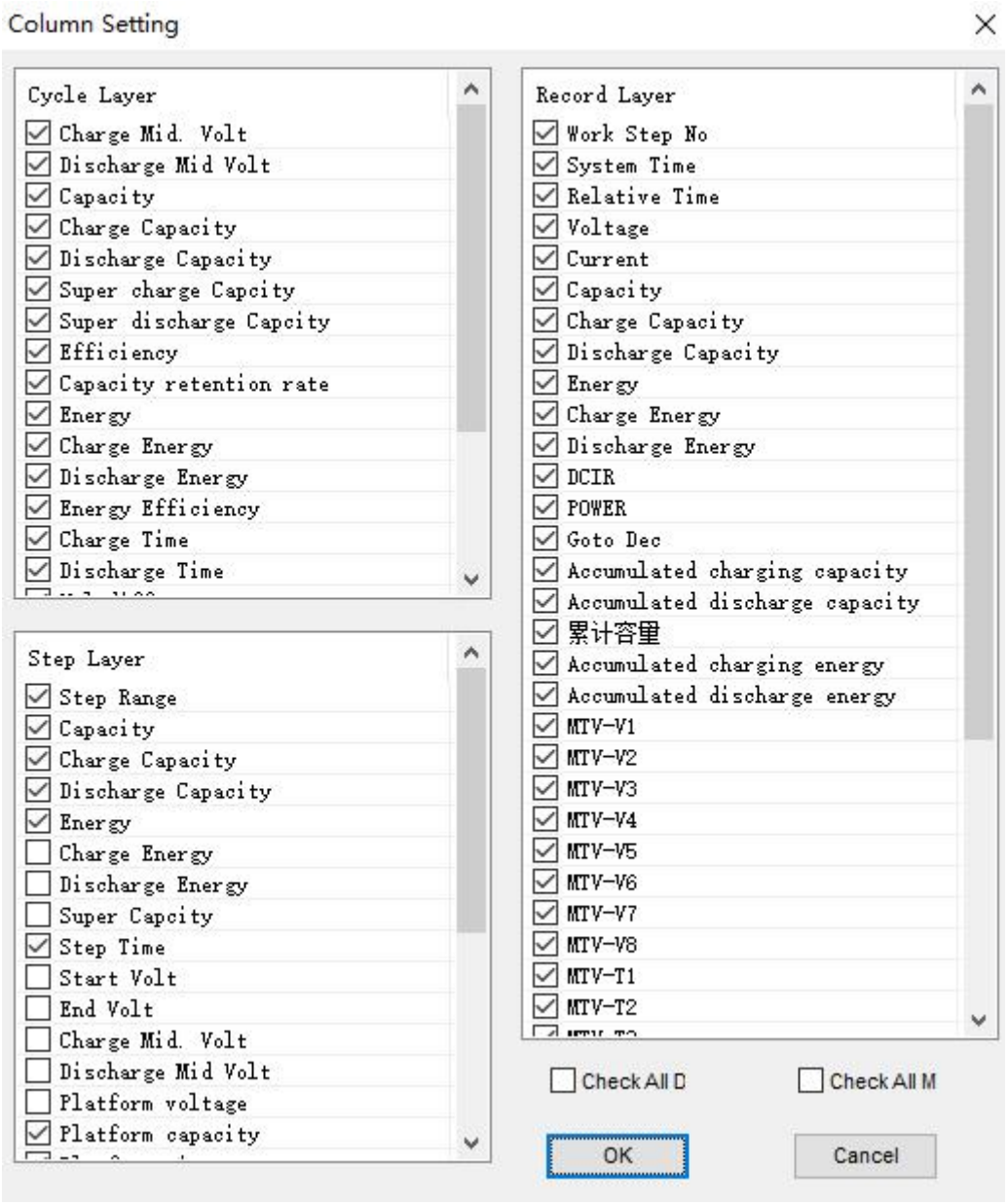


Figure 4- 16 column settings

In Figure 4-16, "Platform Voltage", "Platform Capacity", and "Platform Time" will have values only after the "Discharge Platform Voltage" is set ("Discharge Platform Voltage" can be set in the "General Table" window or "Generate Excel Format file" window setting); "gram capacity" will calculate the corresponding value according to the "mass" set in the "data analysis settings" window.

Right-click to select all columns and unselect all columns, as shown in Figure 4-17

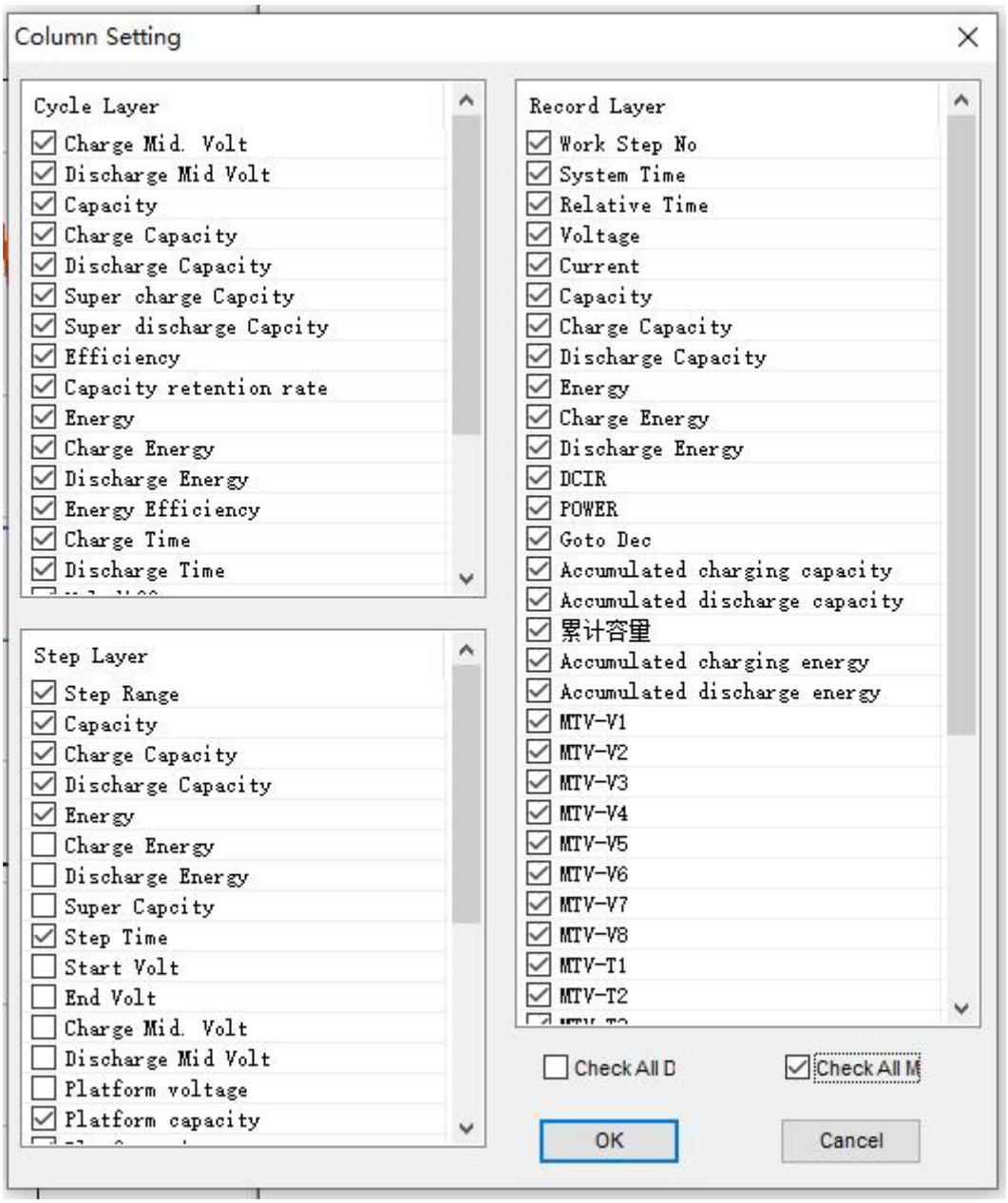


Figure 4- 17 Cancellation example

6. Data analysis setting: It is used to set the reference cycle and quality of the discharge capacity decay rate. After setting the corresponding value, the corresponding discharge capacity decay rate and gram capacity will be calculated from the data

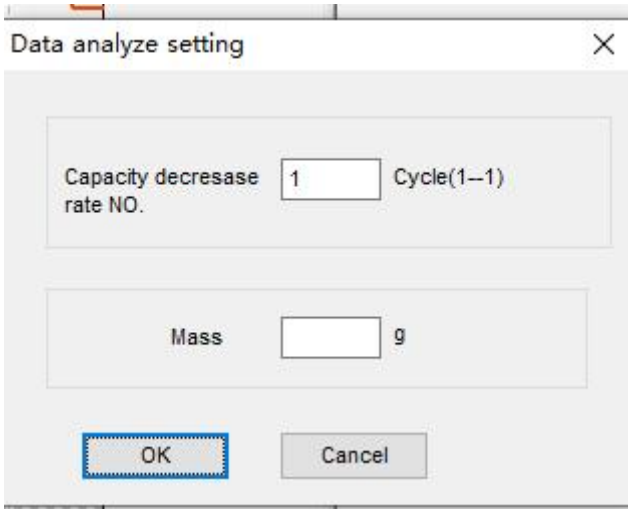


Figure 4- 18 Data Analysis Settings

Current cycle capacity decay rate = 1 - current cycle total discharge capacity / reference cycle total discharge capacity

Gram capacity = working step capacity / mass

7. Data Filter Settings

It is used to set the data filtering conditions, and can filter the data of the data circulation layer, process layer, and recording layer respectively (as shown in Figure 4-19).

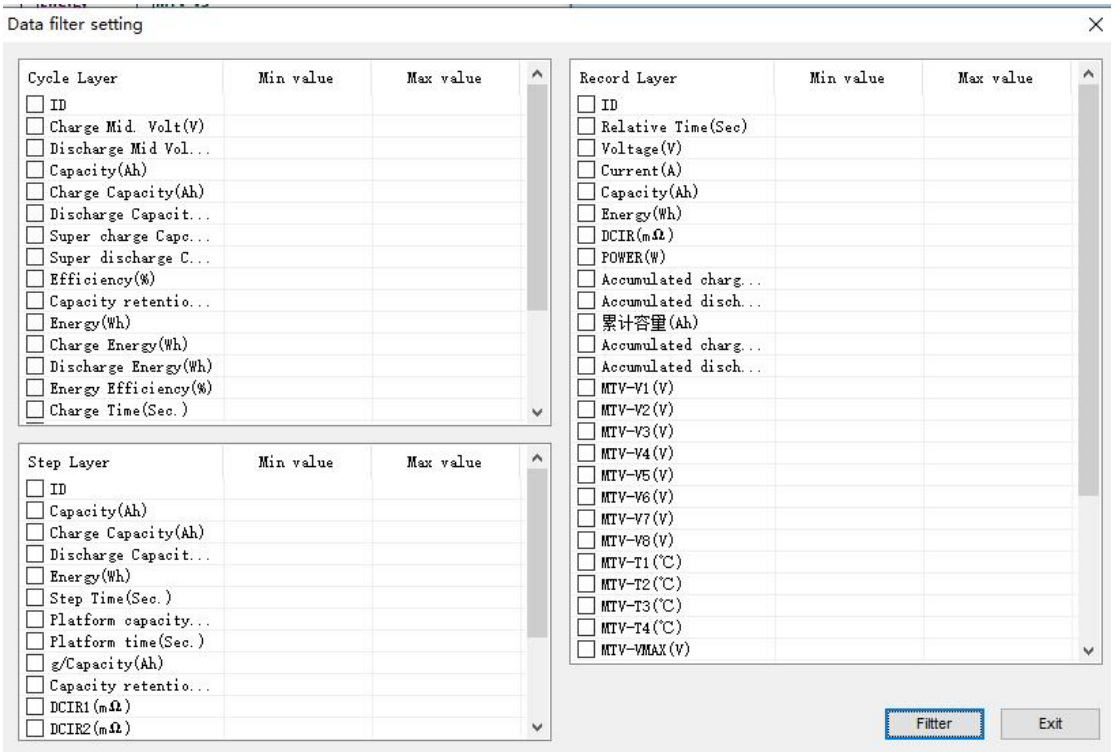


Figure 4- 19 Data Filter Settings

Note : The columns that can be used for filtering match the "Column Settings", and the unchecked columns in the "Column Settings" window will not be used for filtering, and the filtered data can be exported through the export Excel function.

Right-click the column area in the figure , and you can choose whether to select all columns in the pop-up right-click menu , as shown in Figure 4-20.

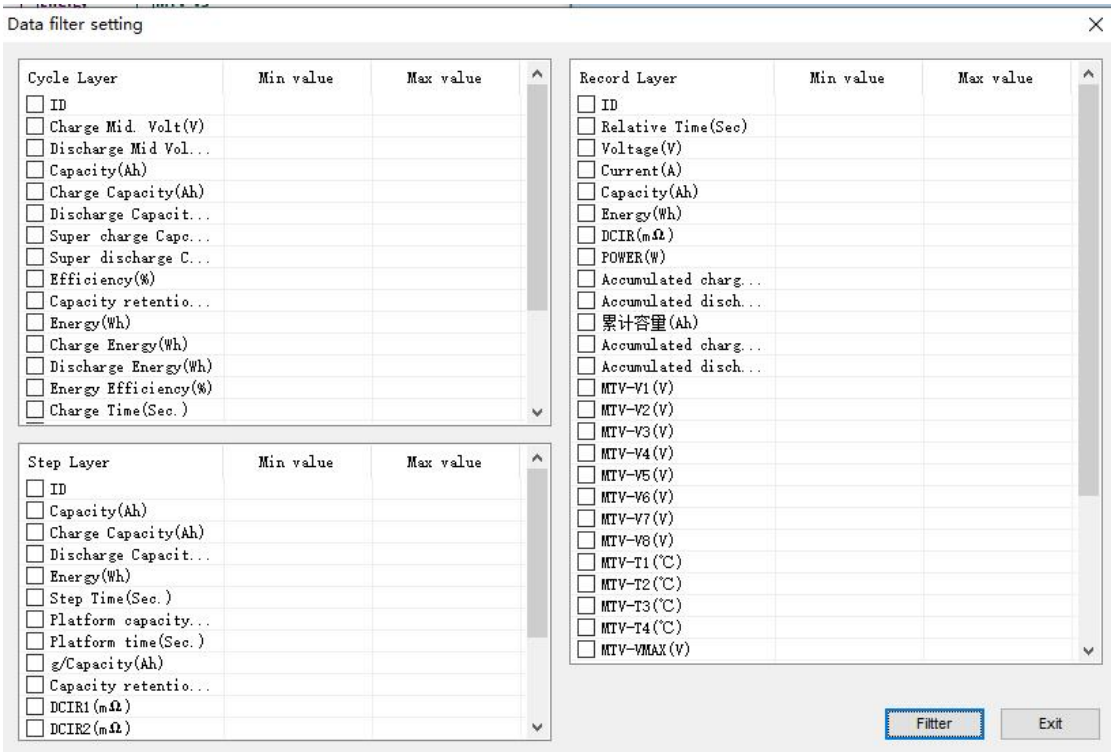


Figure 4- 20 Select All Example

In Figure 4-20 , "Cancel" means no selection.

8. Copy: After selecting the data column, click "Copy" to paste the copied data in other software.

Note : Pasted data has no units.

9. Work information: This function is used to view all the work steps and information set.
10. Check the test log: Select it to pop up a window, which records some information about the channel work in detail, including running problems and detailed time, user operation records, etc. (as shown in Figure 4-21).

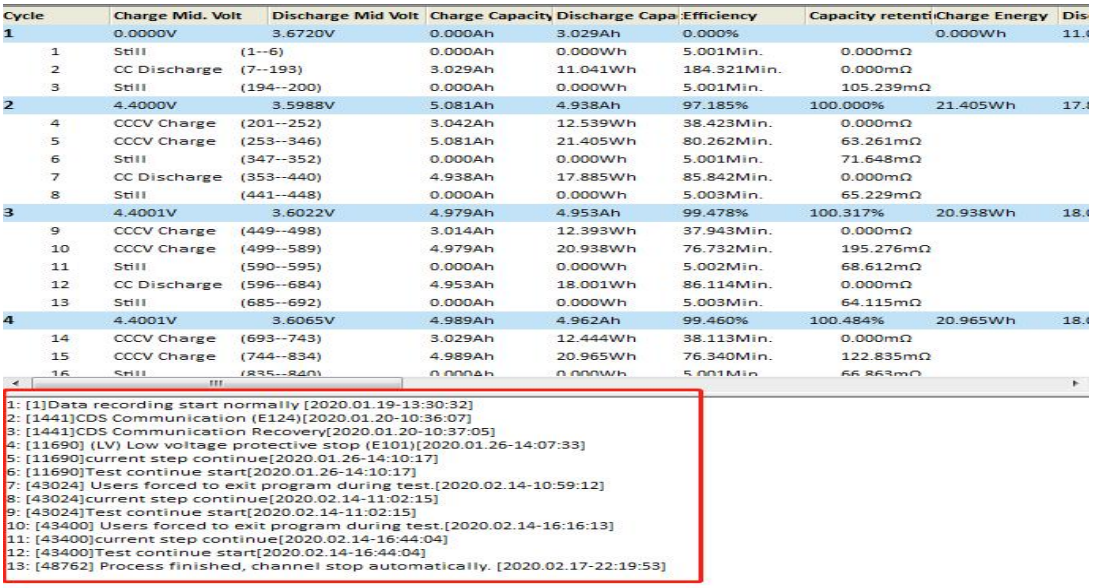


Figure 4- 21 Test log example

11. Generate EXCEL format file: The user can choose to export the current data into an EXCEL format file, which is convenient for viewing on other computers. The window is shown in Figure 4-22.

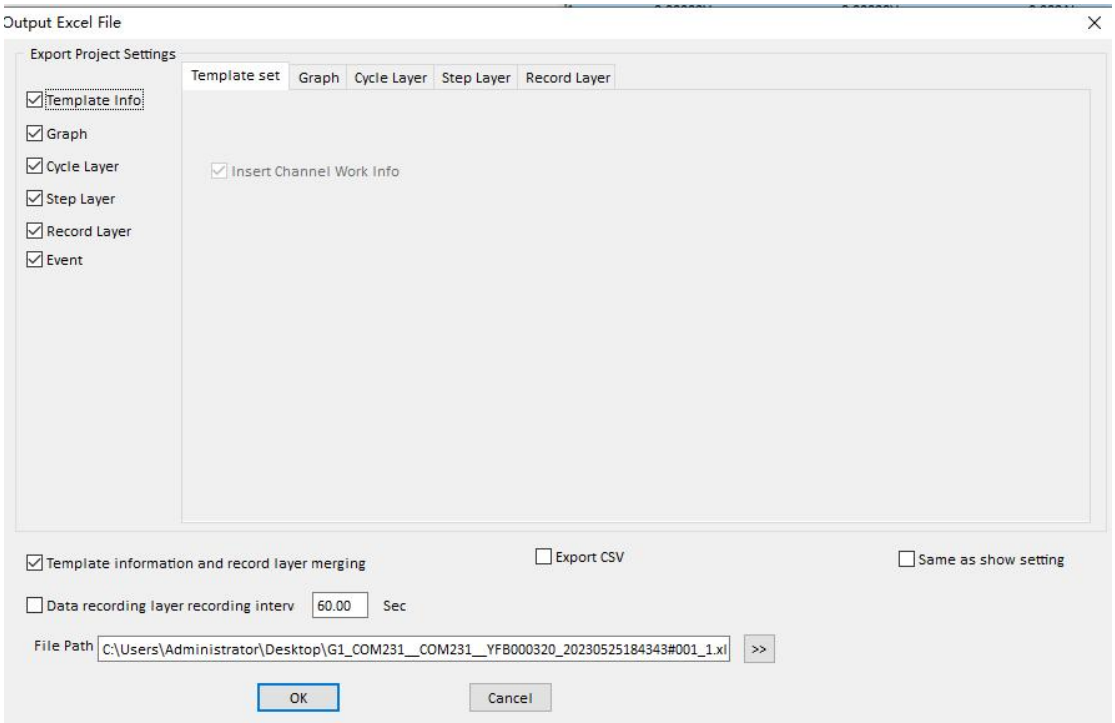


Figure 4- 22 Generate Excel format file

As shown in Figure 4-22, by selecting the item to be exported, the exported Excel file can have different information.

1) Template information: the template information of the channel, and the content cannot be edited.

2) Curve: You can set the curve information to be displayed in the file, as shown in Figure 4-23.

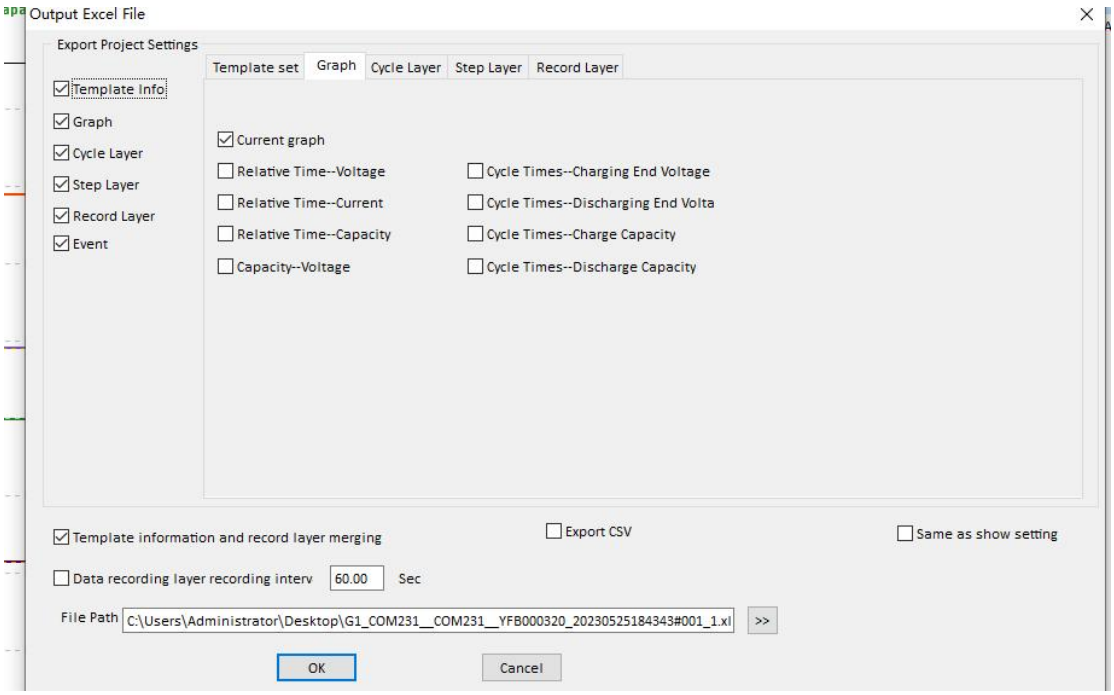


Figure 4- 23 Curve

3) Cycle layer: You can set the cycle layer information in the file, as shown in Figure 4-24.

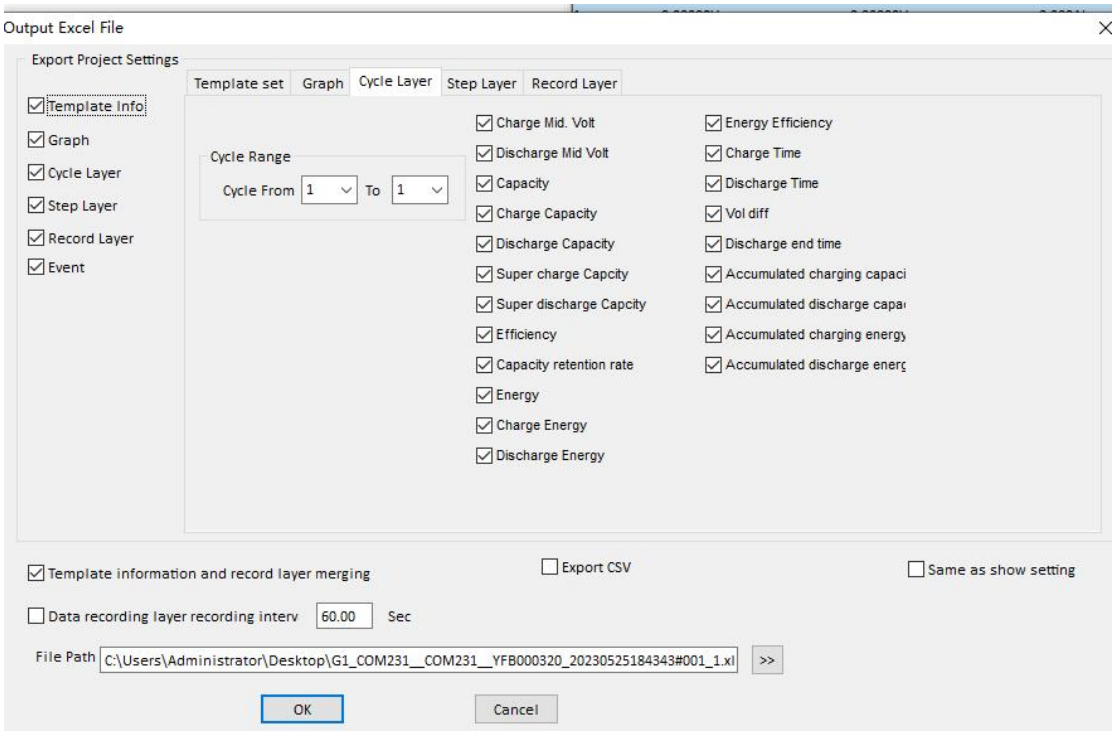


Figure 4- 24 Cycle layer

4) Step layer: You can set the step layer information in the file, as shown in Figure 4-25.

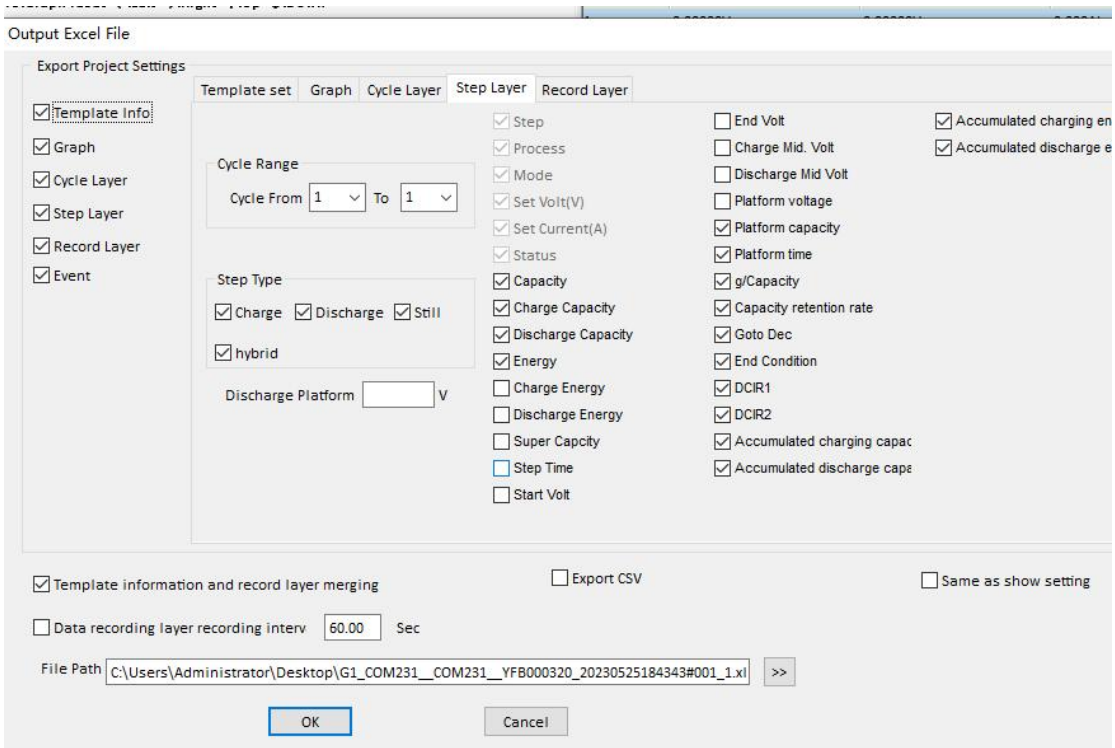


Figure 4- 25 process layer

Note: In the process layer information, only after the "discharge platform

voltage" is set, the "platform voltage", "platform capacity", and "platform time" can be set, otherwise the three items will be displayed by default in the exported Excel file .

5) Record layer: You can set the record layer information in the file, as shown in Figure 4-26.

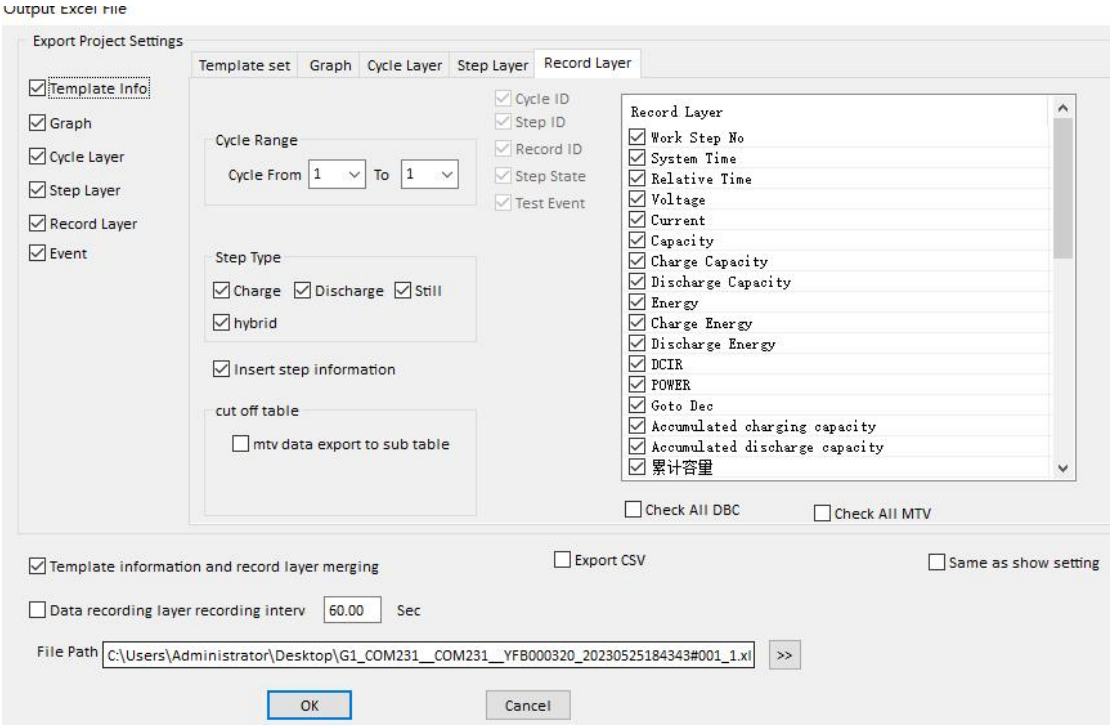


Figure 4- 26 recording layer

Note: Only when "Record Layer" is selected, the "Template Information and Record Layer Merge" and "Record Layer Record Data Interval" in Figure 4-24 can work. "Merge template information and record layer" means that in the exported Excel file, the template information will be merged into the record layer, which is no longer a separate worksheet; "record layer record data interval" means that in the exported Excel file, the record The layer data no longer displays all the data in the source data, and displays the data at the set interval time.

12. Generate summary table format file: Generate a text file with the working mode and total data of each step as recording conditions, as shown in Figure 4-27.

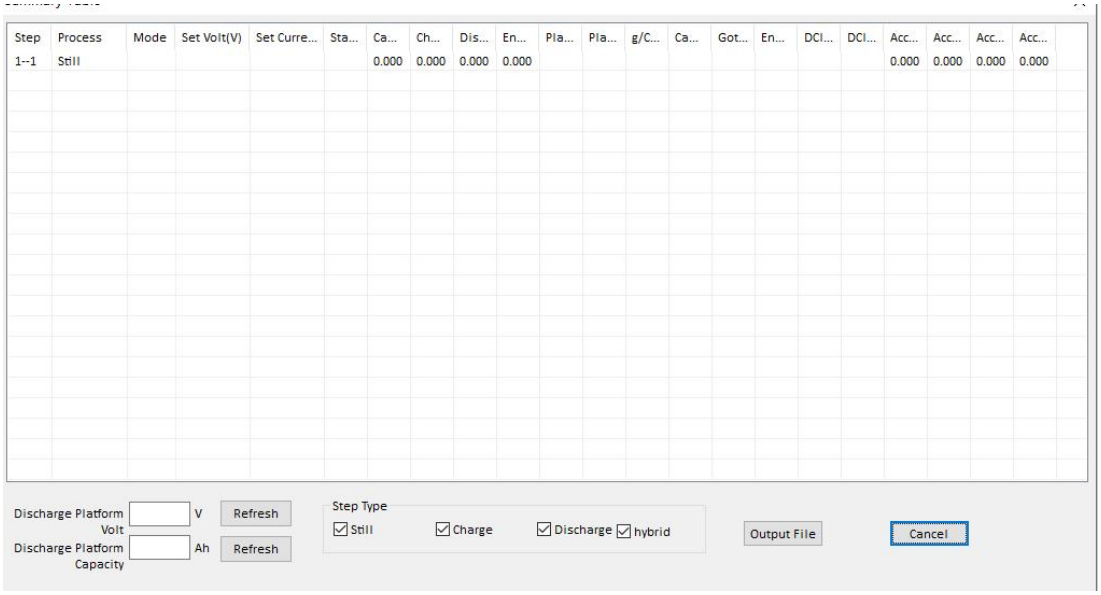


Figure 4- 27 Summary Table

As shown in Figure 4-27, the general table information can also be filtered according to "discharge platform voltage" and "discharge platform capacity", and the export operation can also be performed after selecting the type of work step.

13. Circulation summary table: used to count channel circulation information, as shown in Figure 4-28.

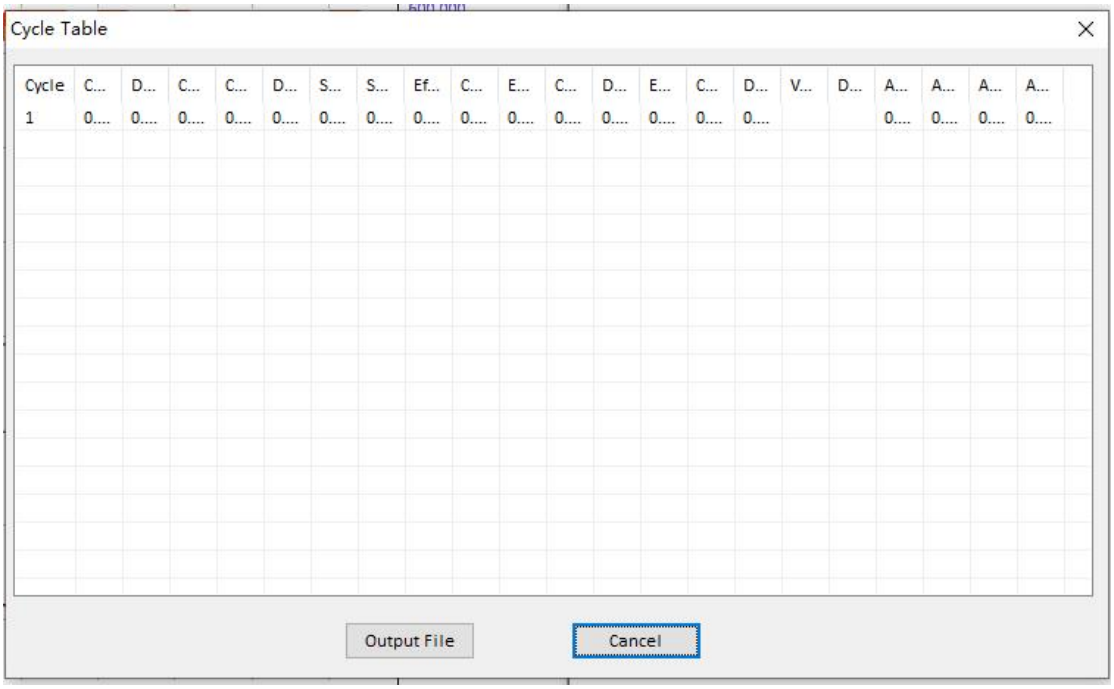


Figure 4- 28 Cycle summary table

14. Quick Search: It is used to find the voltage of the set rest time after charging or discharging in the cycle, as shown in Figure 4-29.

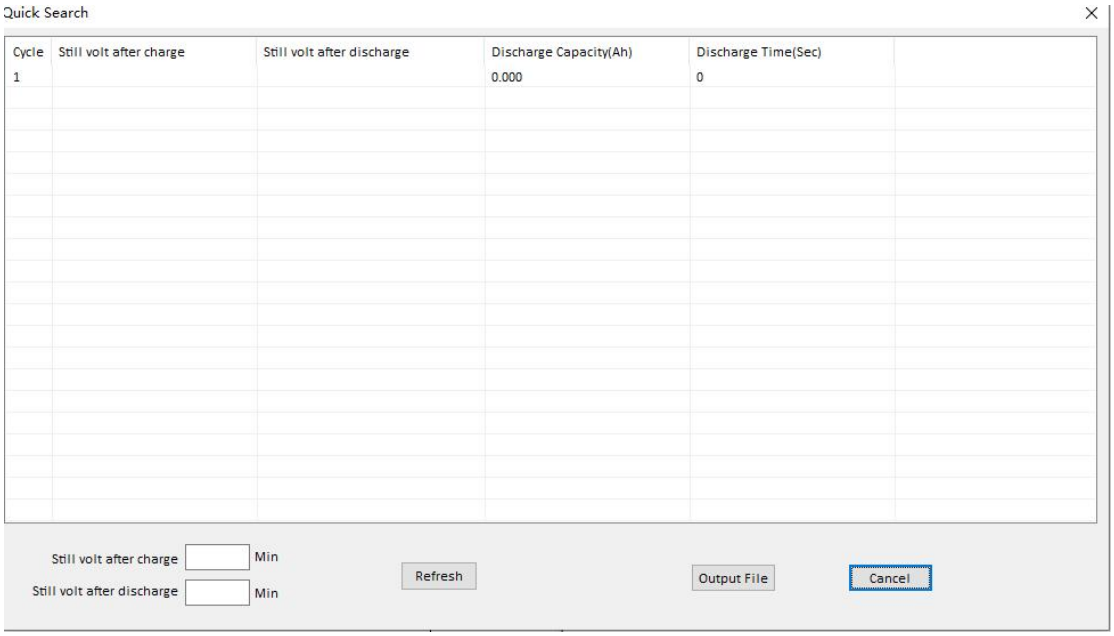


Figure 4- 29 Quick Search

15. Save data as: The user can change the name and save path of the data file.

16. Display extended data: used to view the data within 30 minutes after the channel stops.

17. Display extended data: It is used to display the data value recorded within 20 minutes after the software is closed. This function is not supported in this version.

4.3.2.3 Curve Comparison

Click "Curve Comparison" in the file menu, or click "Add to Curve Comparison" in the right-click menu of the graph to open the "Curve Comparison" option window (as shown in Figure 4-30).

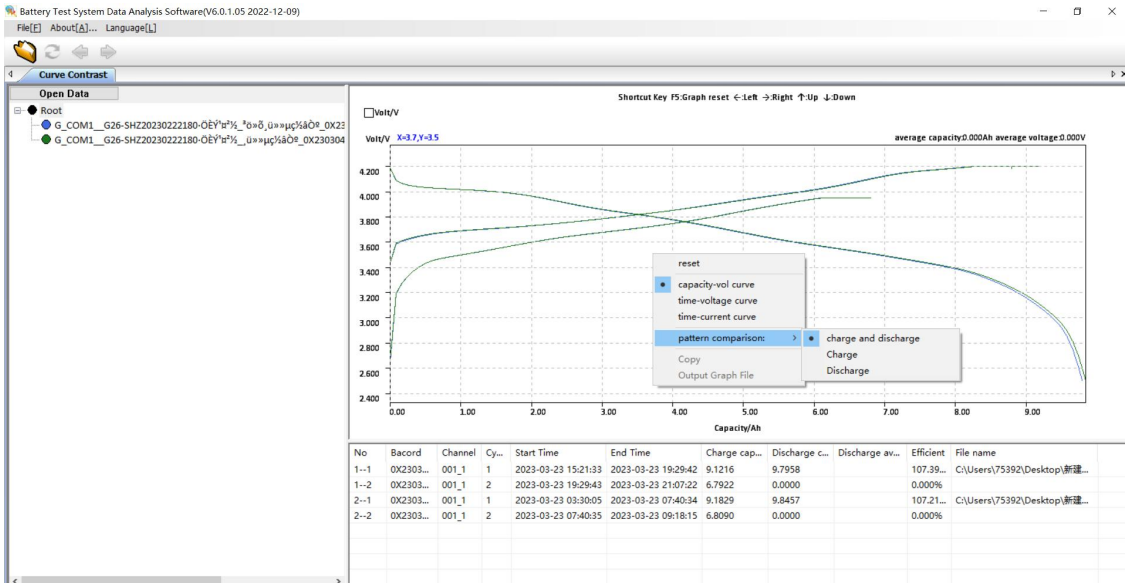


Figure 4- 30 Curve Comparison

As shown in Figure 4-30, the curve comparison window is divided into left and right parts. The tree diagram on the left is used to manage data files, and the right side is used to display the graphics and cycle information of the data selected on the left.

1. file management

Click the "Open Data" button on the left side of Figure 4-30 to select the data file to be compared, and right-click the information in the tree diagram to pop up the management menu, as shown in Figure 4-31. If you click data files, the management menu will be as shown in 4-32.

Figure 4- 31 All management menu

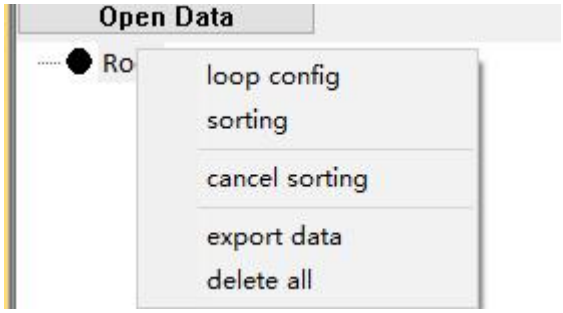


Figure 4- 32 Data management menu

1) Cycle configuration: used to set the comparison cycle information (as shown in Figure 4-33).

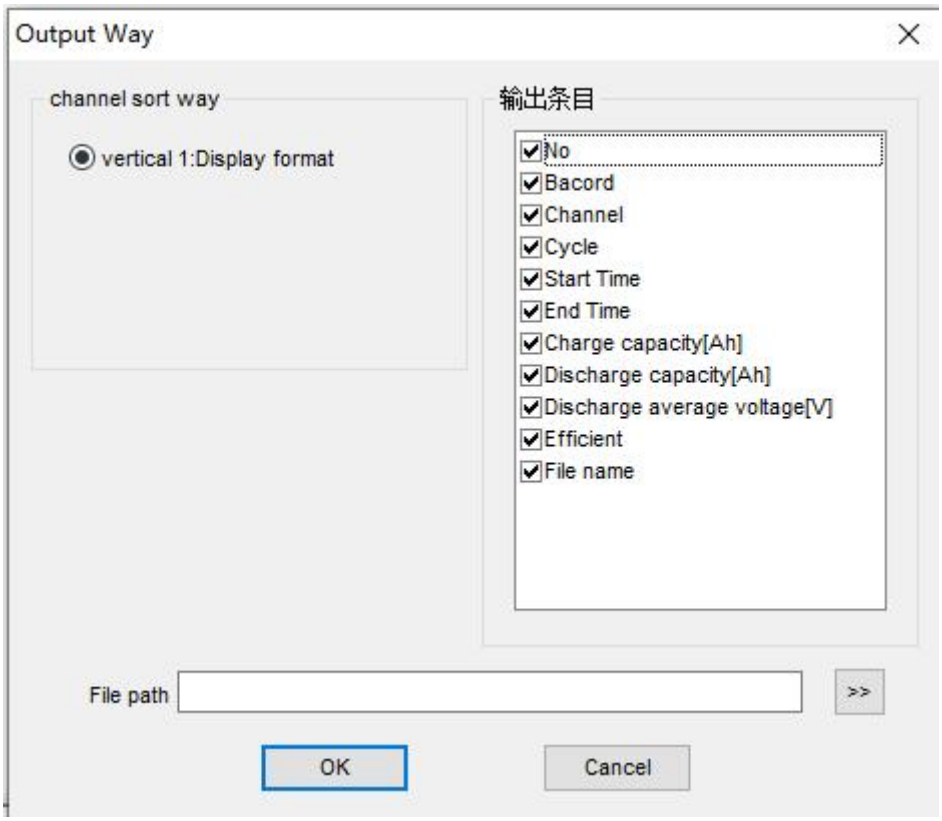


Figure 4- 33 Loop configuration

As shown in Figure 4-33, the cycle configuration includes two modes: range selection and free selection:

A. Range selection: default mode, set and confirm the minimum cycle number, maximum cycle number and cycle interval number, and the comparison data will be displayed according to the setting information.

B. Free selection: After selecting the "Free selection" mode, the "Free

selection" area in the window will be available, click the "Select >>" button, the selected cycle will be displayed in the comparison data, click the "Delete<<" button , the selected cycle will no longer be displayed.

2) Sorting: used to set sorting information (as shown in Figure 4-34). Note: Before sorting, you need to select a benchmark data at the bottom right of the window.

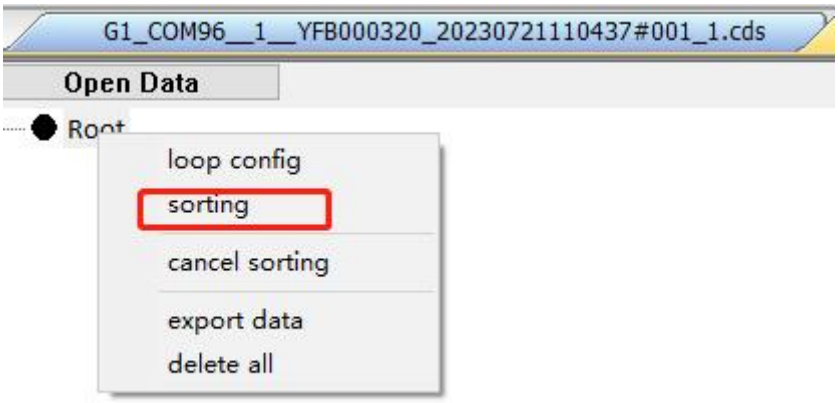


Figure 4- 34 battery sorting

As shown in Figure 4-34, three sorting criteria can be set, each of which is relatively independent, and the relationship between the capacity and the average voltage in the standard is "and", that is, only when the two conditions are met at the same time, the corresponding standard should be met .

Note: The set standard needs to be satisfied at the same time for charging and discharging to meet the set standard. The sorting results are shown in Figure 4-35.

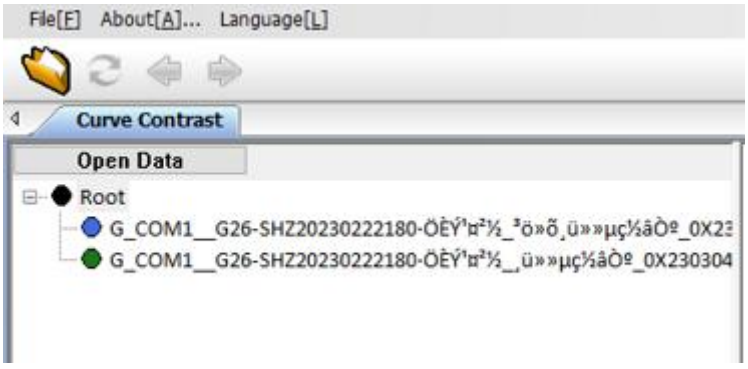


Figure 4- 35 sorting example

3) Cancel Sorting: Used to cancel the set sorting.

4) Data export: used to export data in Excel format after setting the output information.

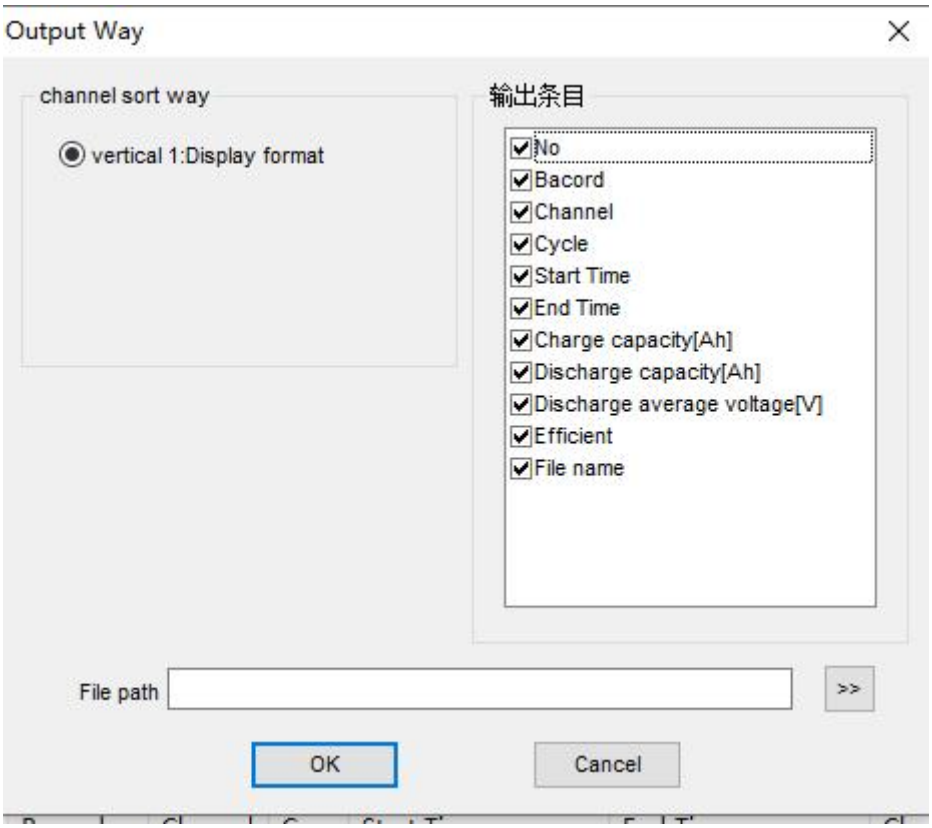


Figure 4- 36 Output Settings

5) Delete All: Used to delete all data files opened in the tree view.

6) Color configuration: used to configure the color displayed in the graph for the selected data, as shown in Figure 4-37.

Figure 4- 37 Color Settings

7) Delete: used to delete the selected data in the tree view.

2. compare data

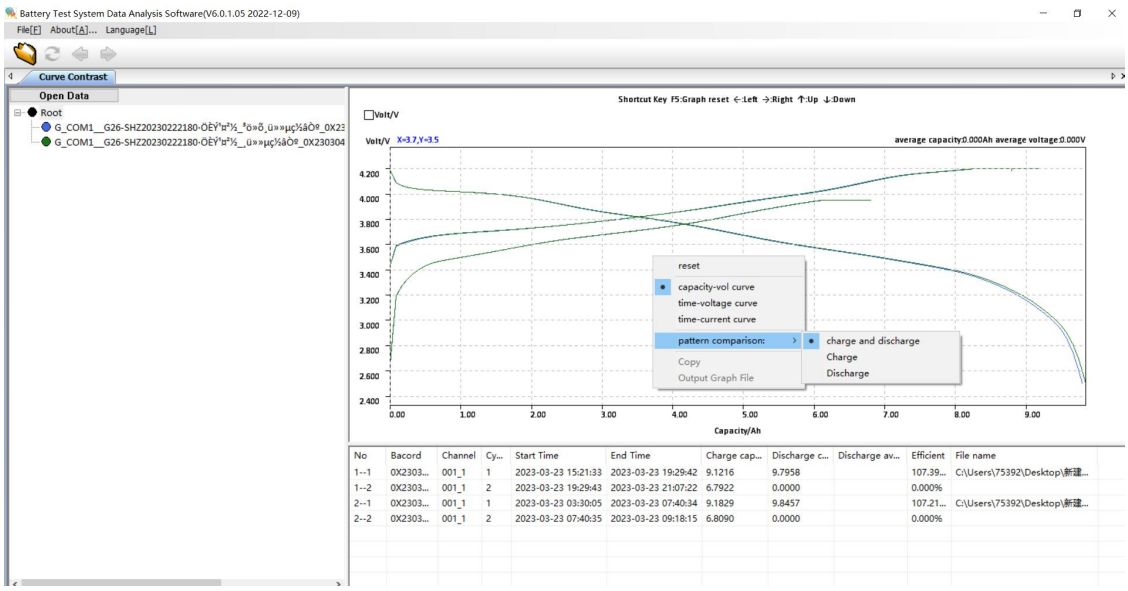


Figure 4- 38 Comparison data

As shown in Figure 4-38, the comparison data includes upper and lower parts, the upper part is used to display graphic information, and the lower part is used to display data cycle information. Click on a cycle in the lower half, and the selected cycle data will be highlighted in the graph .

A. Reset: It is used to restore the graphics to the initial state.

B. Capacity-voltage curve: default curve, capacity-voltage graph, that is, the X-axis in the graph is the capacity, and the Y-axis is the voltage.

C. Time-voltage curve: Time-voltage graph, that is, the X-axis in the graph is time, and the Y-axis is voltage.

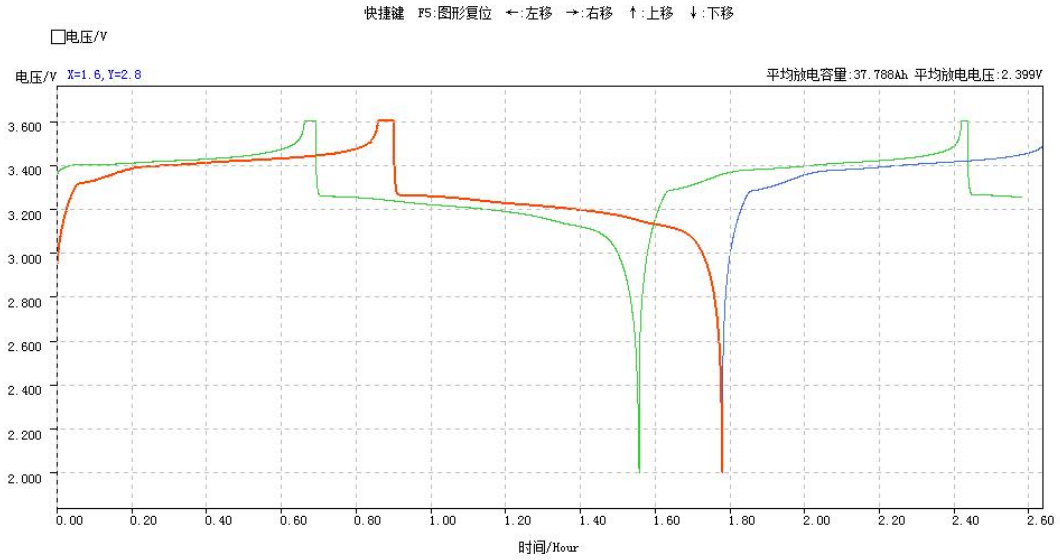


Figure 4- 39 Time-Voltage Diagram

D. Time-current curve: Time-current graph, that is, the X-axis in the graph is time, and the Y-axis is current.

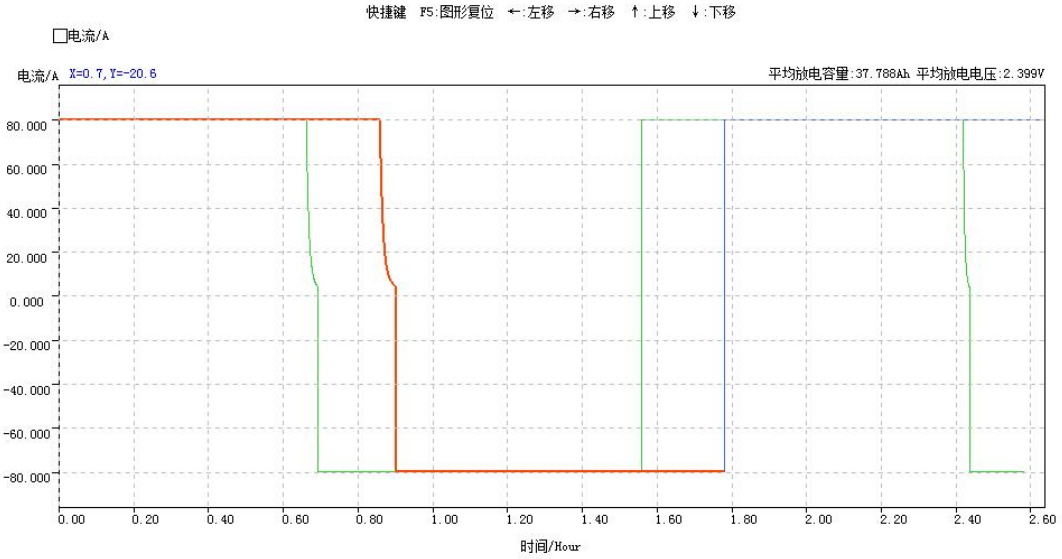


Figure 4- 40 Time-Current Diagram

E. Comparison mode: Including charge and discharge, charge and discharge three modes.

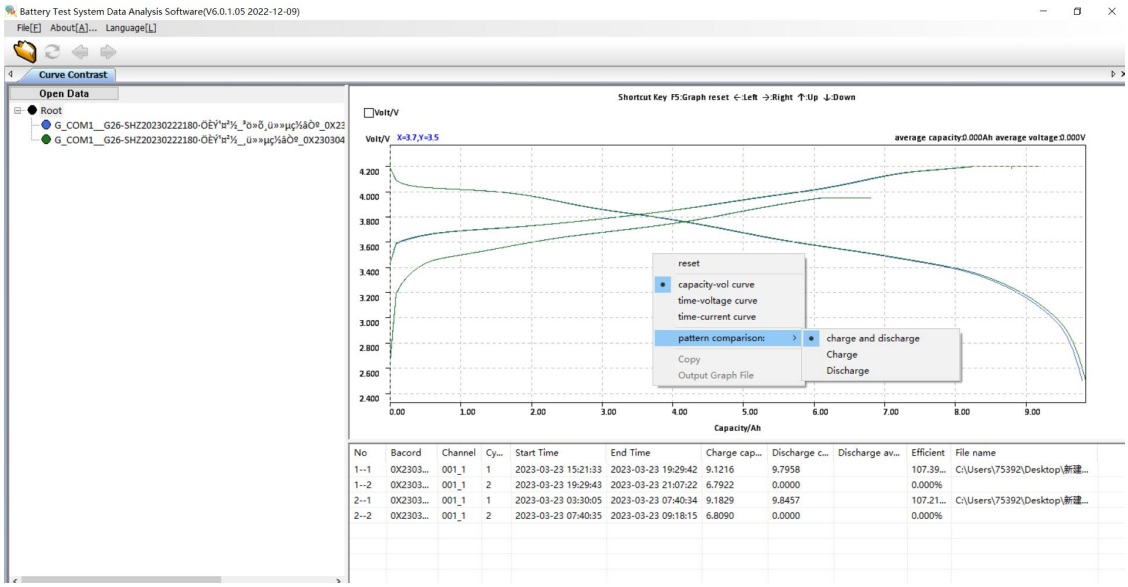


Figure 4- 41 Comparison mode

F. Copy: This feature is temporarily unavailable.

18. Output Graphics File: This function is not available at the moment.

4.2.4 Statistics

In this software, the statistical method of data mainly refers to the statistical analysis of tools.

Click "Statistics" - "Volume Statistics" in the menu bar of the control software home page to open the statistics tool for volume analysis (as shown in Figure 4-42). Users can click the "Settings" button to set the items that need to be counted (As shown in Figure 4-43).

Figure 4- 42 Divide into statistical tools

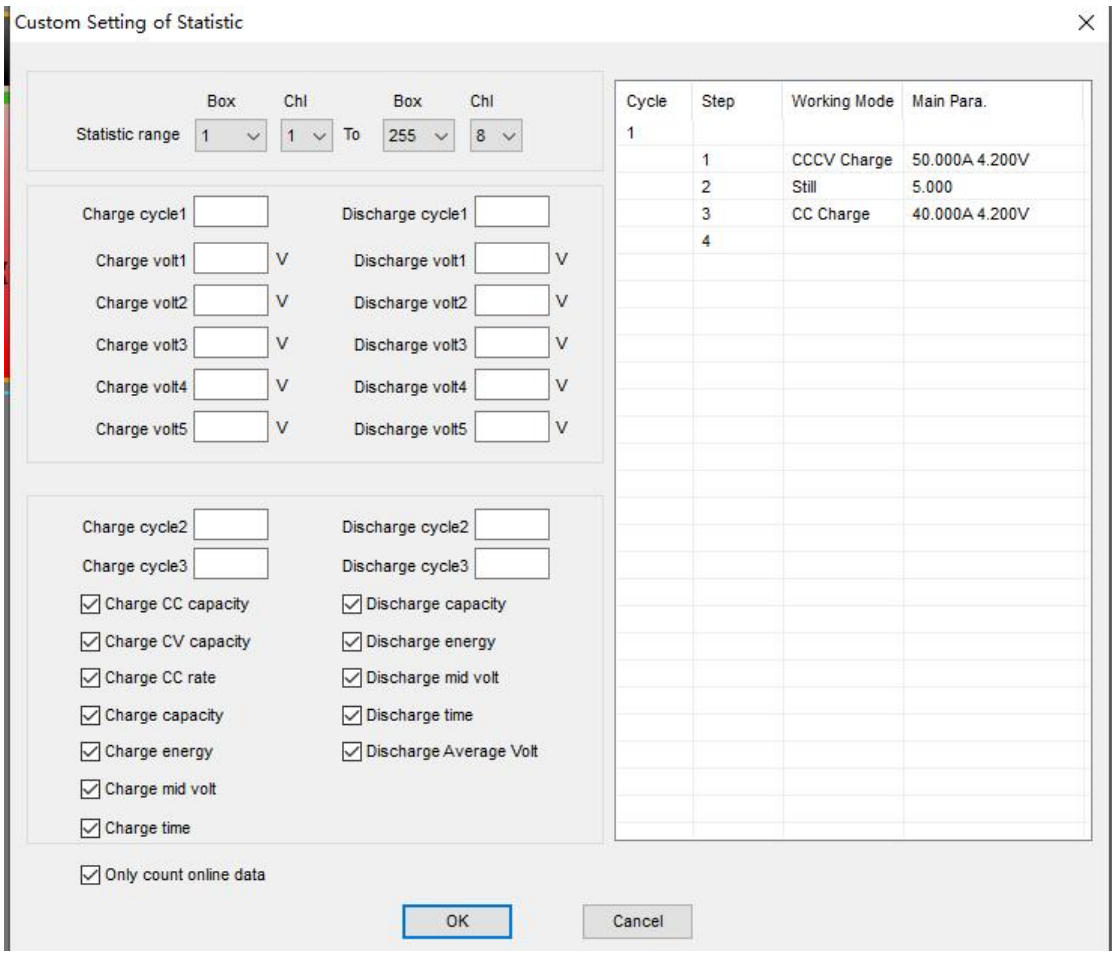
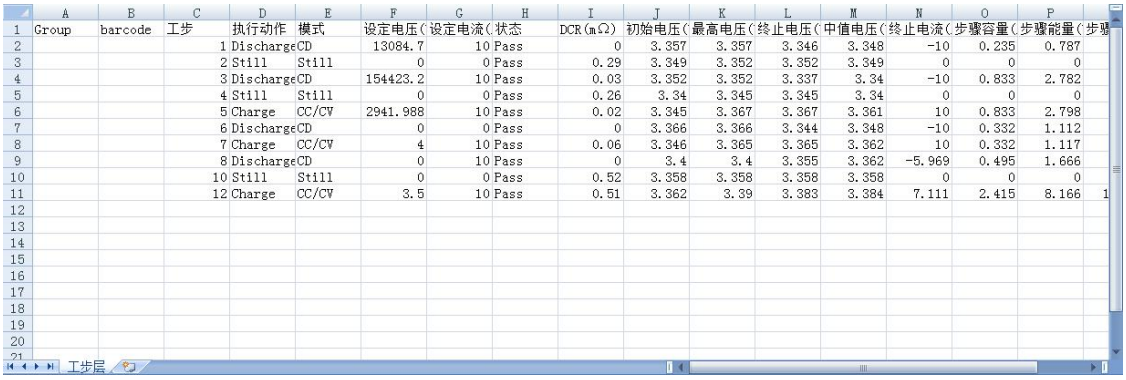


Figure 4- 43 Statistics Settings

The statistical results can be exported as summary table data in Excel format (as

shown in Figure 4-44), or data can be exported by path (as shown in Figure 4-45) .



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Group	barcode	工步	执行动作	模式	设定电压(	设定电流(	状态	DCR(mΩ)	初始电压(	最高电压(	终止电压(	中值电压(	终止电流(	步骤容量(	步骤能量(	步骤
2			1	Discharge	CD	13084.7	10	Pass	0	3.357	3.357	3.346	3.348	-10	0.235	0.787	
3			2	Still	Still	0	0	Pass	0.29	3.349	3.352	3.352	3.349	0	0	0	
4			3	Discharge	CD	154423.2	10	Pass	0.03	3.352	3.352	3.337	3.34	-10	0.833	2.782	
5			4	Still	Still	0	0	Pass	0.26	3.34	3.345	3.345	3.34	0	0	0	
6			5	Charge	CC/CV	2941.988	10	Pass	0.02	3.345	3.367	3.367	3.361	10	0.833	2.798	
7			6	Discharge	CD	0	0	Pass	0	3.366	3.366	3.344	3.348	-10	0.332	1.112	
8			7	Charge	CC/CV	4	10	Pass	0.06	3.346	3.365	3.365	3.362	10	0.332	1.117	
9			8	Discharge	CD	0	10	Pass	0	3.4	3.4	3.355	3.362	-5.969	0.495	1.666	
10			10	Still	Still	0	0	Pass	0.52	3.358	3.358	3.358	3.358	0	0	0	
11			12	Charge	CC/CV	3.5	10	Pass	0.51	3.362	3.39	3.383	3.384	7.111	2.415	8.166	1
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	
21																	

工步层

Figure 4- 44 Example of statistical summary table

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	组号	通道号	电芯编号(	1-静置开始	1-静置结束	1-静置平均	1-静置时间	1-充电开始	1-充电结束	1-充电结束	1-充电平均	1-恒流充电	1-恒压充电	1-充电容量	1-充电恒流	1-充电能量	1-充
2																	
3		006_1		3.641	3.641	3.641	60.3										
4		006_1		3.641	3.641	3.641	2.1										
5		006_1		3.641	3.641	3.641	60.2										
6		006_1		3.641	3.641	3.641	0.3										
7		006_1		3.641	3.641	3.641	60.1										
8		006_1		3.641	3.641	3.641	60.2										
9		006_1		3.641	3.641	3.641	2.1										
10		006_1		3.641	3.641	3.641	90.2	3.641	3.641								
11		006_1						3.643	3.643								
12		006_1						3.643	3.643								
13		006_1		3.644	3.644	3.644	0.3	3.644	3.644								
14		006_1		3.652	3.652	3.652	180.3	3.652	3.652								
15		006_1															
16		006_1															
17		006_1															
18		006_1															
19																	
20																	
21																	

StatisticData 20180517 20180518 20180522

Figure 4- 45 Example of exported resul