M340A/G340A Battery Testing Systems

User Manual V4.2

Landt Instruments

2020.5

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1. Product introduction

"LANHE Battery Testing System" is a new generation battery testing system designed and developed by Landt Instruments Inc.The system has an intuitive interface, simple operation, powerful performance, and provides many practical and innovative functions, which can greatly improve the user's work efficiency while satisfying a good user experience.

- ✓ Supports measurement of various parameters such as voltage, current, capacity, efficiency and internal resistance of various batteries and capacitors
- ✓ Support high-precision testing with an accuracy of one ten thousandth
- ✓ Support high-speed sampling, sampling rate up to 100sps (some models can be customized 1000sps)
- ✓ Support automatic multi current range
- ✓ Support intelligent discovery devices without complex configuration
- ✓ Support single PC to manage a large number of LAN devices, support device grouping, numbering
- ✓ Support rich test steps, simpler and more intuitive step editing
- ✓ Support more powerful data analysis functions, more flexible graphics operations
- ✓ Support more convenient calibration and maintenance

2. Tester introduction and use

2.1 Tester model

Series	Range	Precision	Sampling Rate	Channel
M210A Single range	100uA~1mA	±0.02%RD±0.02%FS	100sps	8Ch
M210A Single range	1mA~100mA	±0.01%RD±0.01%FS	100sps	8Ch
G210A Single range	200mA~10A	±0.01%RD±0.01%FS	100sps	8Ch
M340A Multi-range	100mA	±0.01%RD±0.01%FS	100sps	8Ch
	10mA	±0.01%RD±0.01%FS		
	1mA	±0.01%RD±0.01%FS		
	100uA	±0.01%RD±0.01%FS		

Table 2-1 Tester model

2.2 Network topology

As the most widely used interface, the network port has the advantages of convenient installation and deployment. The Instruments have been designed to connect all devices through the network, just plug the device into the Internet. Through the router, the device can automatically obtain an IP address through DHCP. Scan all available devices on the LAN with the test software on the PC.

The network topology is as follows:

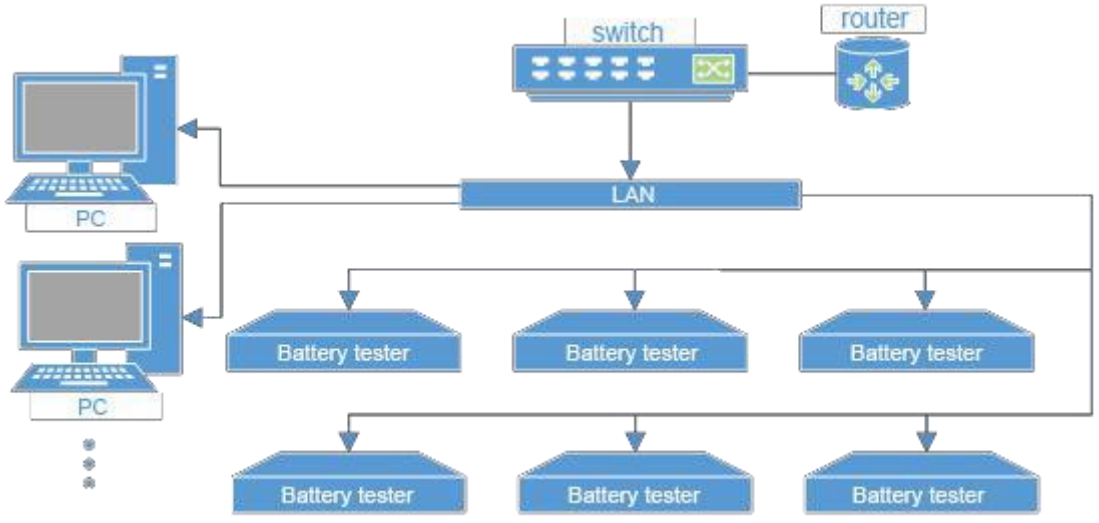


Figure 2-1 Network topology

2.3 Tester front panel

2.3.1 Front panel

The front panel includes the power switch, multi-color status indicator, channel aviation plug and device number LED.

Figure 2-2 M340A front panel

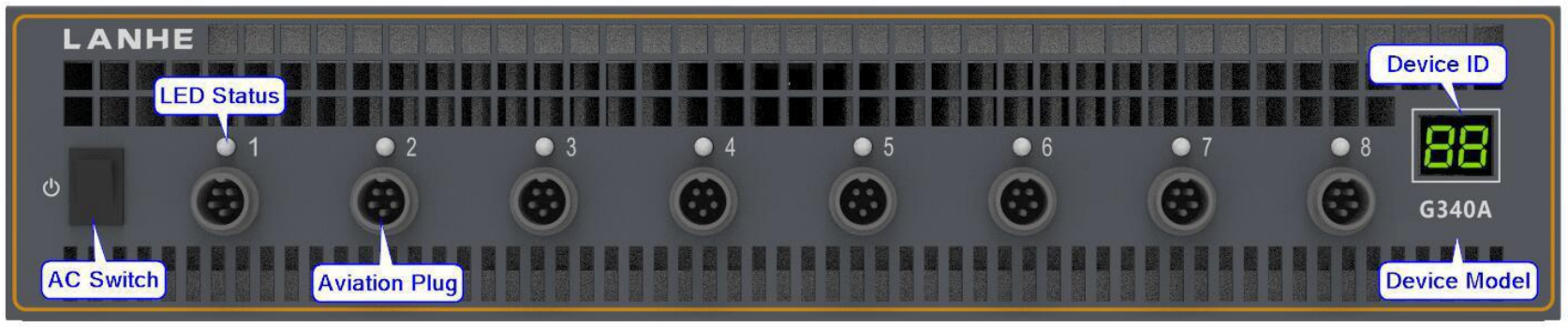


Figure 2-3 G340A front panel

2.3.2 Indicator

The indicator light contains the channel status and device number.

Color	Status	Description
blue	flicker	Discharge
red	flicker	Charge
green	flicker	Rest
yellow	flicker	Pause
88	bright	Device ID number(Same as the number in software)

Table 2-2 Indicator status

2.4 Tester rear panel

The rear panel contains 100M Ethernet port, RS232 serial port and 220V power port.

Figure 2-4 M340A rear panel

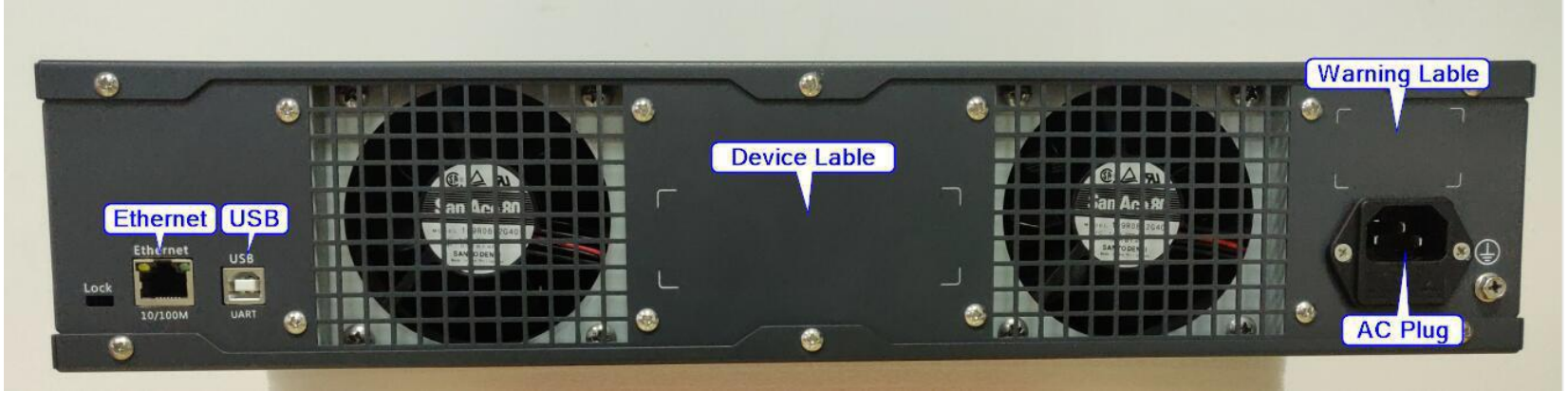


Figure 2-5 G340A rear panel

2.5 Tester connection

1. Connect the 220V AC power cable and network cable to the tester, and connect the other end of the network cable to the switch
2. Insert the battery clamp into the aviation socket and clip the battery according to the positive and negative poles
3. toggle the power switch, the battery tester is turned on

Note:

1. To ensure measurement accuracy, please heat the machine for half an hour in advance
2. Make sure the battery is properly clamped before starting the test

2.6 Aviation plug and cable

The M series products use a five-core aviation plug that provides a four-wire Kelvin connection and also adds a GND pin as a signal shield. The connection is shown below:

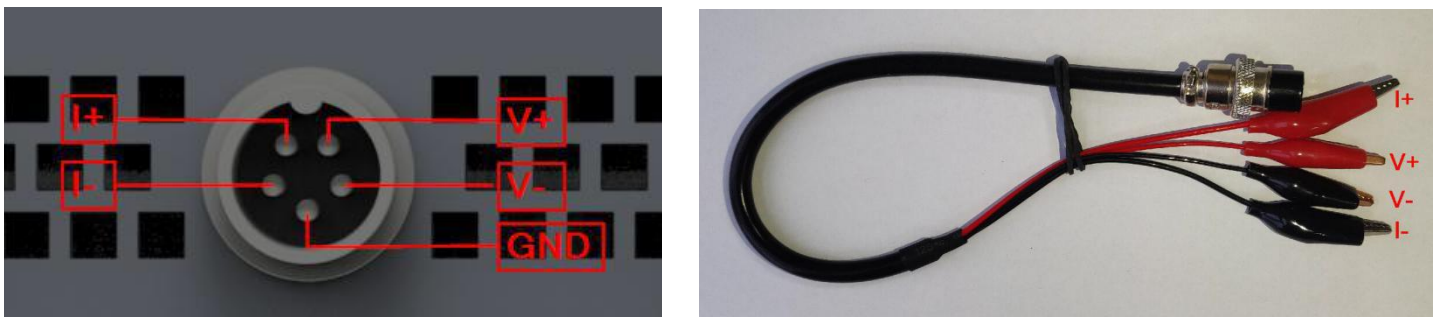


Figure 2-6 Connection method

3. Software installation and uninstall

3.1 PC Configuration requirements

Device	Minimum Configuration	Recommended Configuration	Luxury Configuration
CPU	I3 or more	I5 or more	I7 or more
RAM	4G or more	8G or more	16G or more
Hard disk	120G or more	SSD 120G or more	SSD 250G or more
Operating system	Microsoft Win7, Win10	Microsoft Win7, Win10	Microsoft Win7, Win10
File system format	NTFS	NTFS	NTFS
Interface	Ethernet port, USB interface	Ethernet port, USB interface	Ethernet port, USB interface
Applicable scene	Less than three devices, mainly for low-speed or short-term high-speed testing, the single test data volume is less than 5 million	Within 20 devices, mainstream high-performance testing,the single test data is less than 60 million	50 or more devices, or high test requirements, single test data may be hundreds of millions, etc.

Table 3-1 PC configuration requirements

Note: When opening large data files, a 64-bit operating system and sufficient memory are required.

3.2 Installation

1. Run the installation package file in the product U disk and enter the installation wizard:

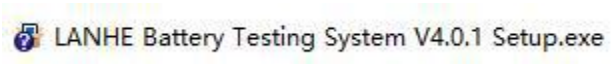


Figure 3-1 Installation package

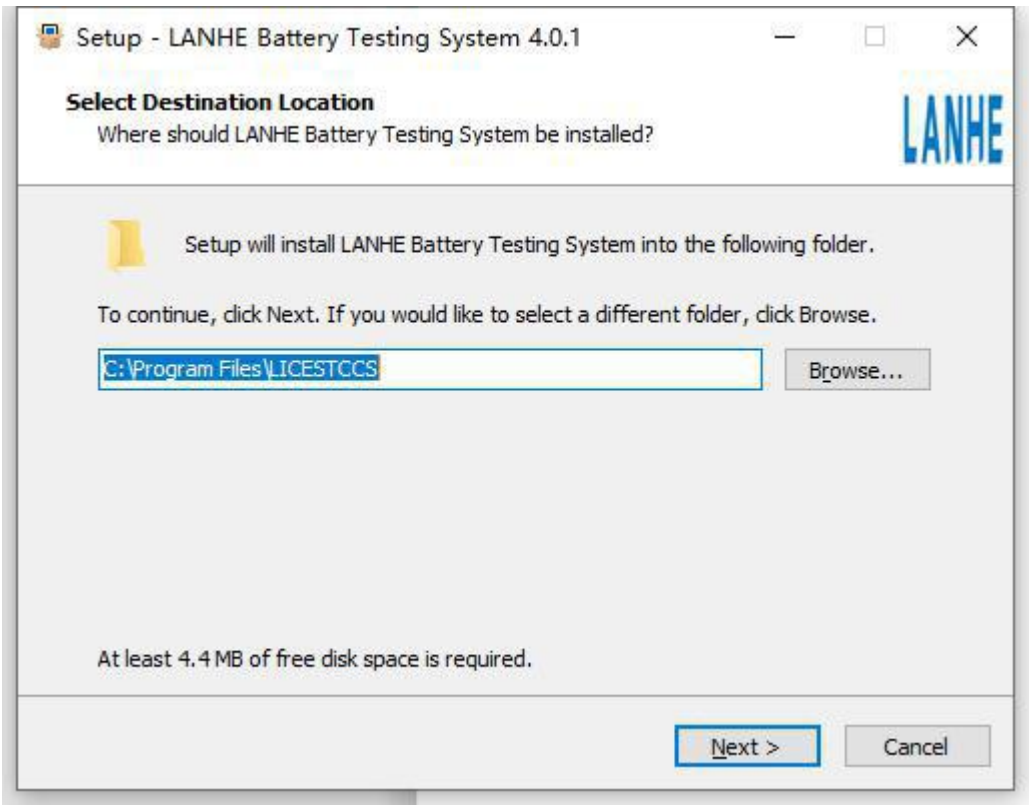


Figure 3-2 Installation wizard

2. Follow the wizard to set the installation location, start menu, desktop icon.

3. Confirm the settings and click Install to start the installation.

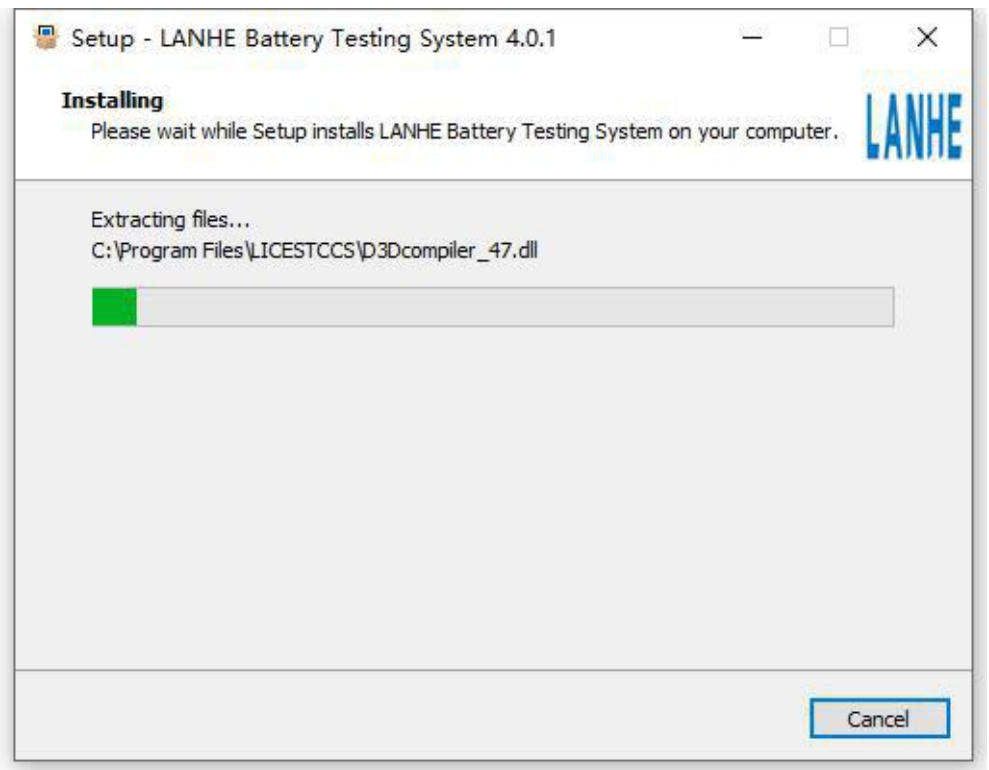


Figure 3-3 Installing

Figure 3-4 Complete

4. After the installation is complete, three desktop icons are generated:

Figure 3-5 Desktop icons

Software name	Description
LANHE Mon	Monitor device status, edit step, run test
LANHE Data	Analysis test data
LANHE Cali	Equipment calibration, maintenance

Table 3-2 Software description

3.3 Uninstall

1. Open Control Panel - Programs - Programs and Features, double-click "LANHE Battery Testing System" in the software list to launch the uninstall wizard.
2. Click "Yes" in the uninstall wizard interface to perform the Uninstall. Note:

The uninstall process may prompt whether to delete user information. If you need to keep the edited test process and group information, please do not delete the user information.

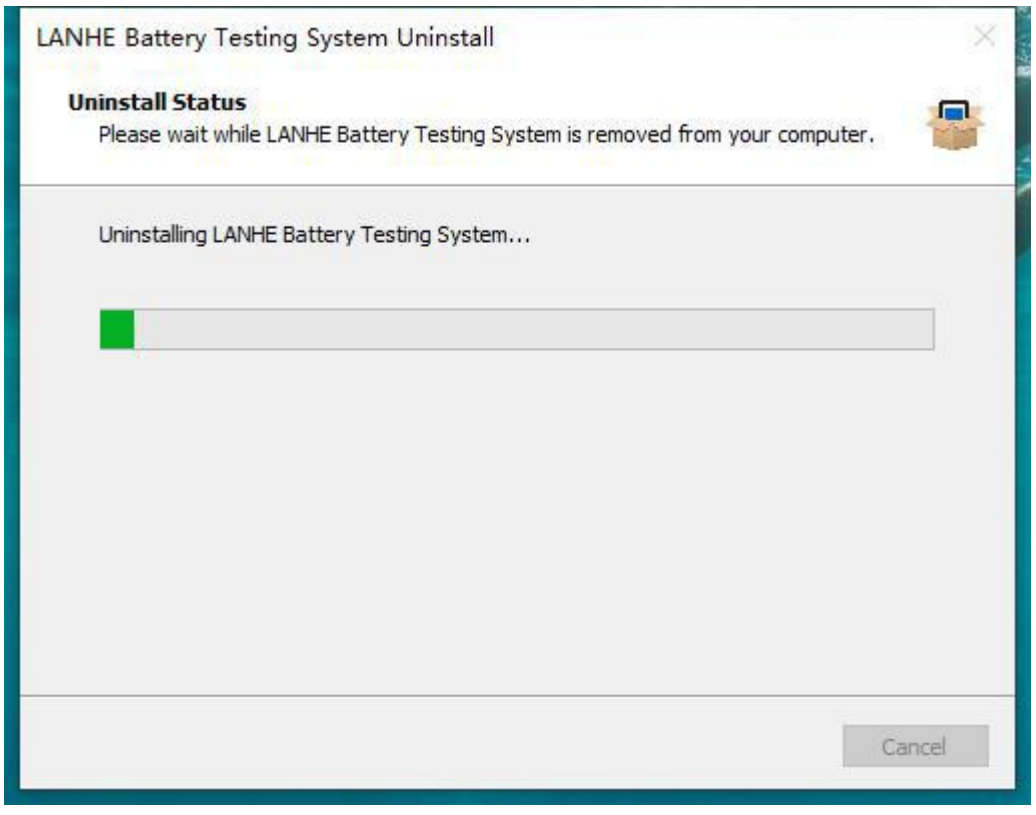


Figure 3-6 Uninstall

4. LANHE Mon

4.1 Software interface

The LANHE Mon software is divided into four pages: Console, Process, Device, About.

By default, it is in the console, you can monitor device status and start testing.

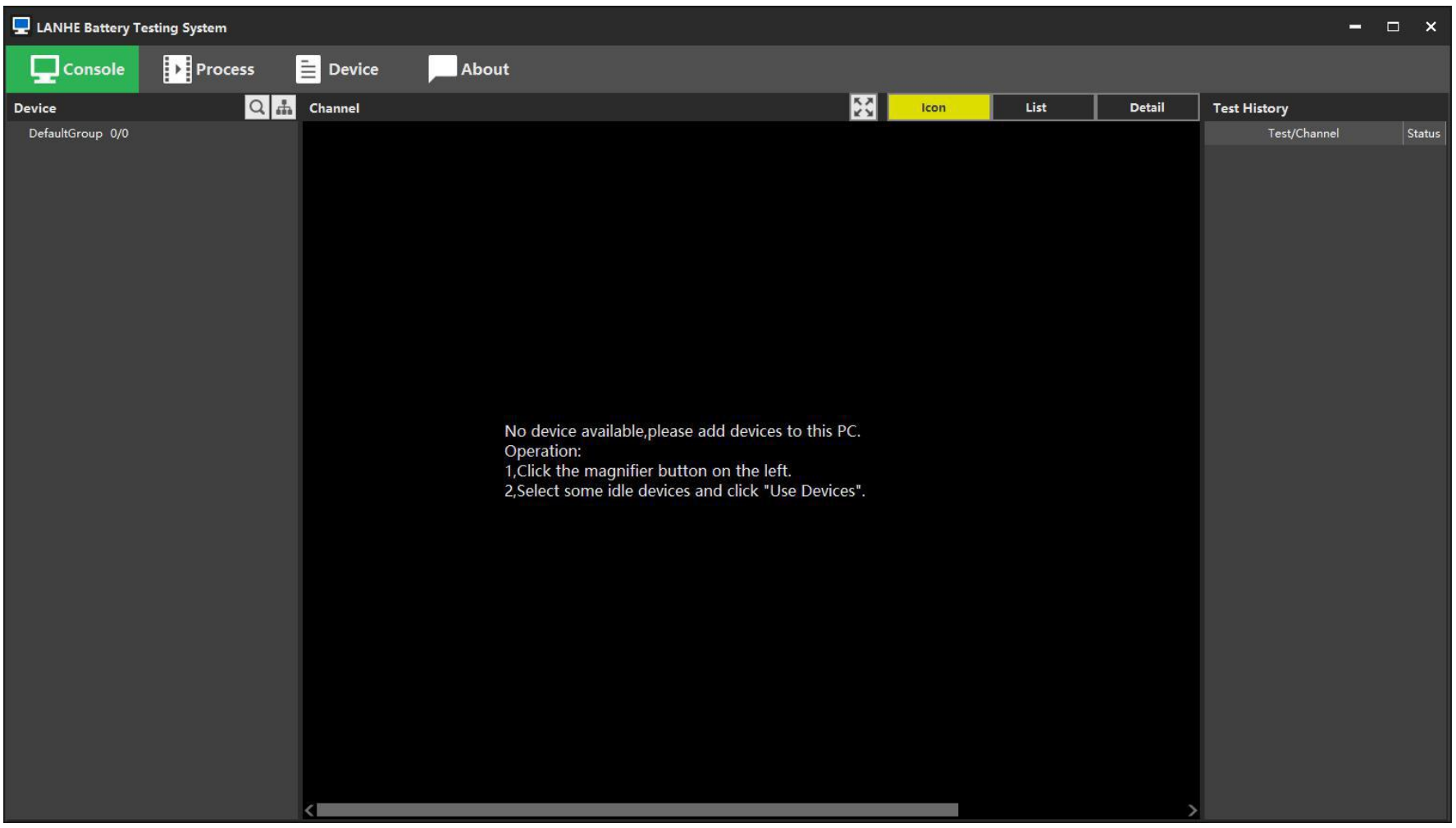


Figure 4-1 LANHE Mon

Page function:

Page	Function
Console	Monitor device status, start test
Process	Edit test process
Device	View device details properties
About	Software related information

Table 4-1 Page function

4.2 Console

The console interface is divided into device①, channel②, and test history③.

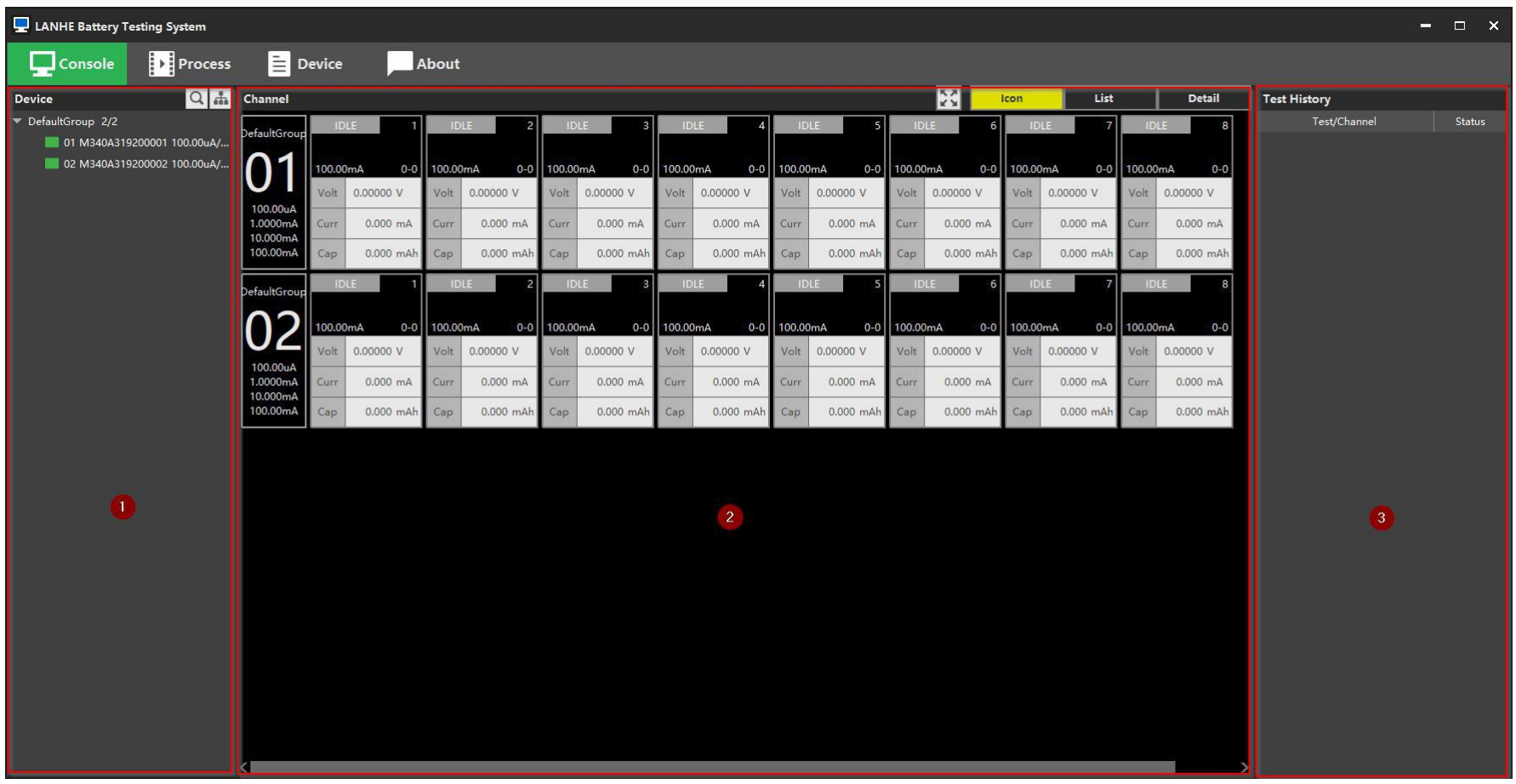


Figure 4-2 Console

Section	Function
①Device	Search for devices; manage device grouping and numbering
②Channel	Start testing, monitor channel status, view test data
③Test History	View historical test records, data

Table 4-2 Console sections

4.2.1 Search device

When first started, the device list is empty.

①Click the button to search for LAN devices.

②In the search window, the currently available devices are displayed in real time.

③Select some devices in the mouse frame and click the “Use Device” button to pull the device to the PC.

Note:

1.Only idle devices can be pulled.

2.The number of newly pulled devices is 0. To distinguish different units, please assign them a number.

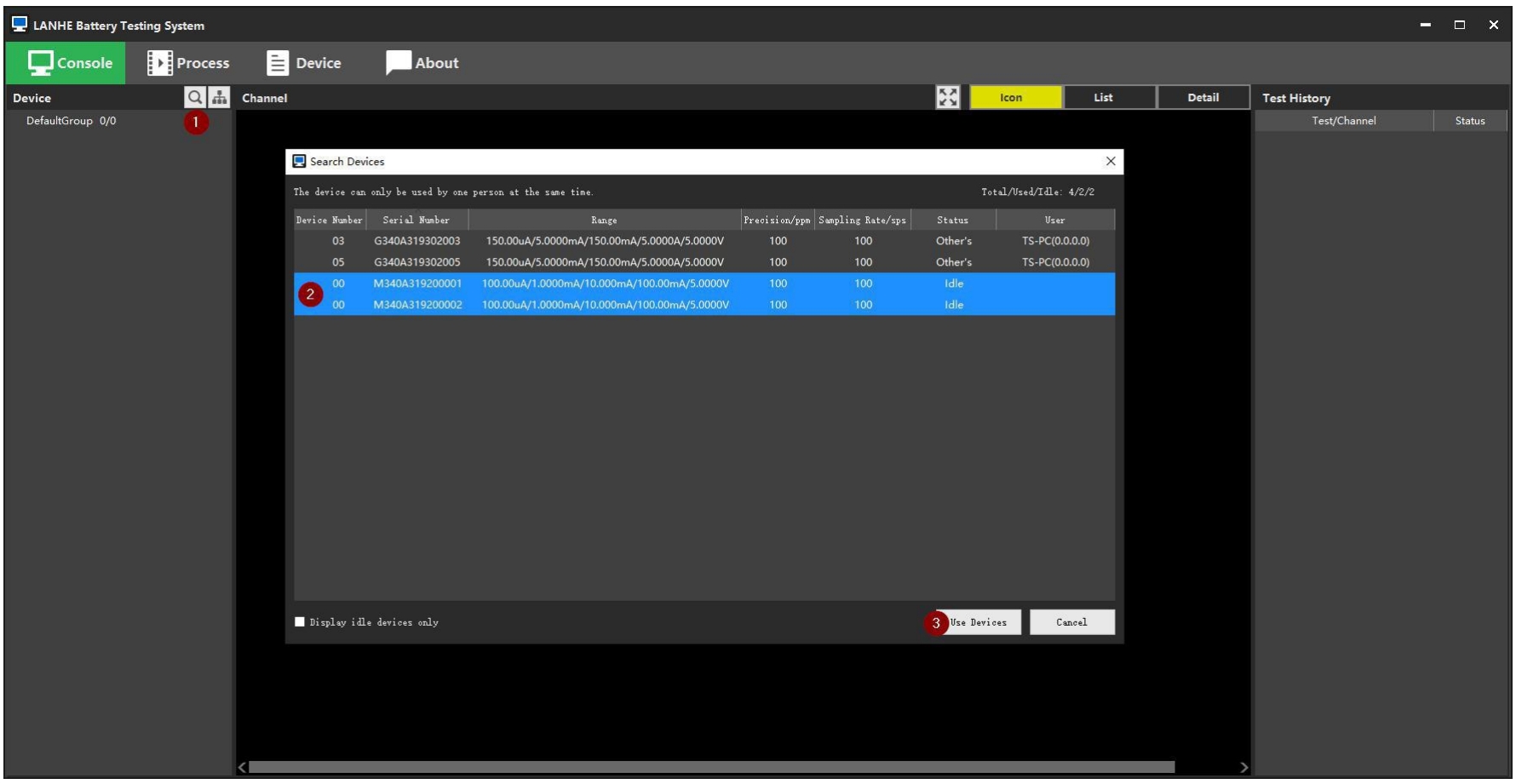


Figure 4-3 Pull device

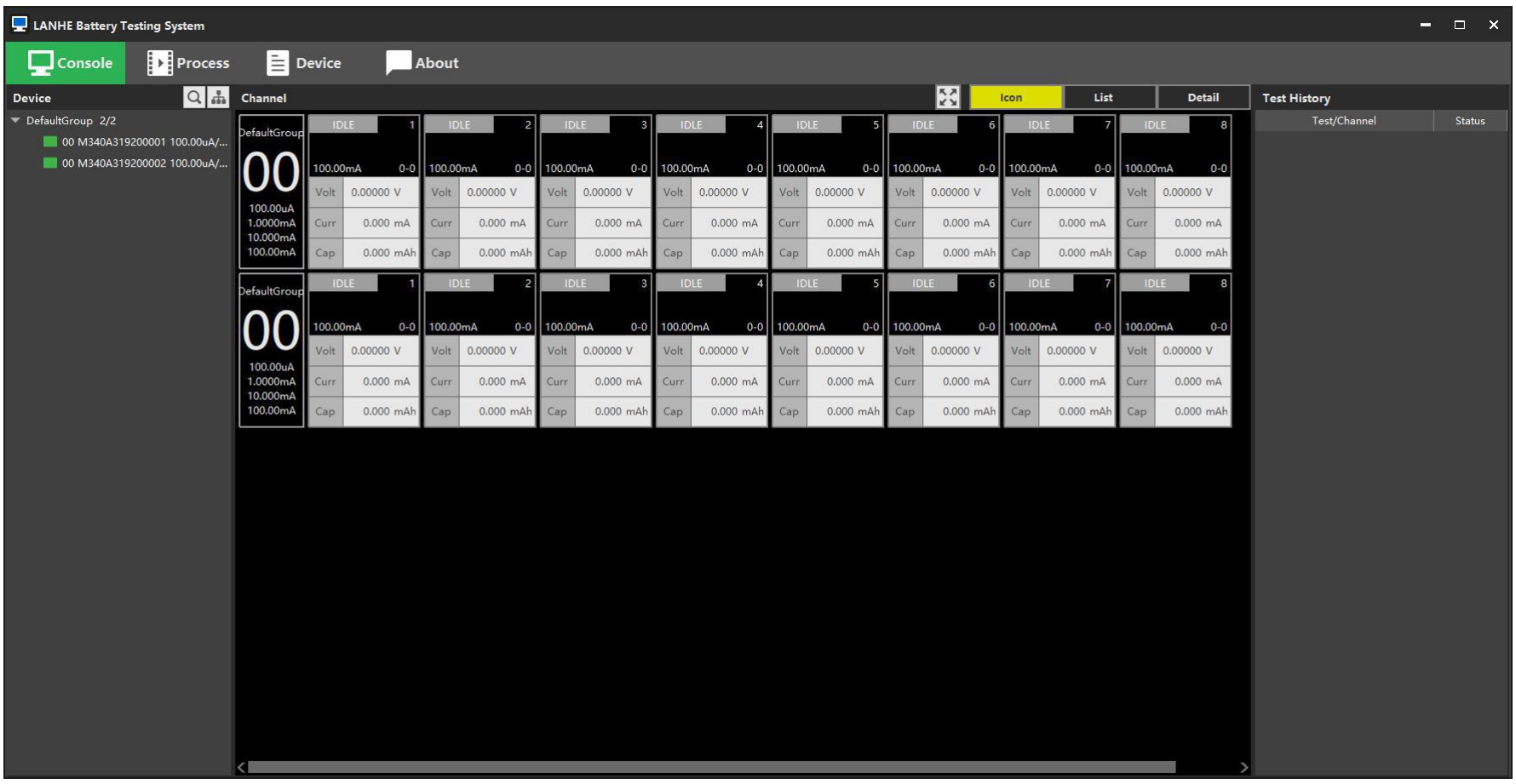


Figure 4-4 Device has been pulled

4.2.2 Release device

The device can only be used by one computer at the same time until the user releases the device.

Release method: Select the device in the device list, right click "Release Device".

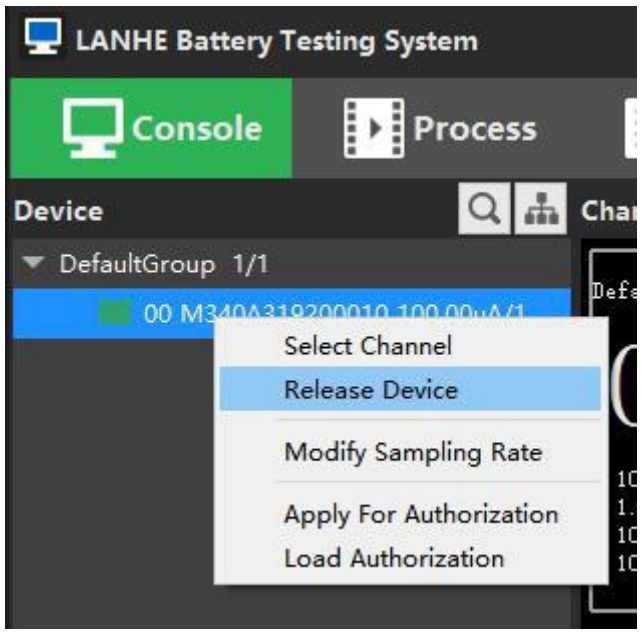


Figure 4-5 Release device

4.2.3 Grouping

1. Default Group

The software has a default group "Default Group" that cannot be deleted and renamed, and all newly pulled devices are automatically placed in this group.

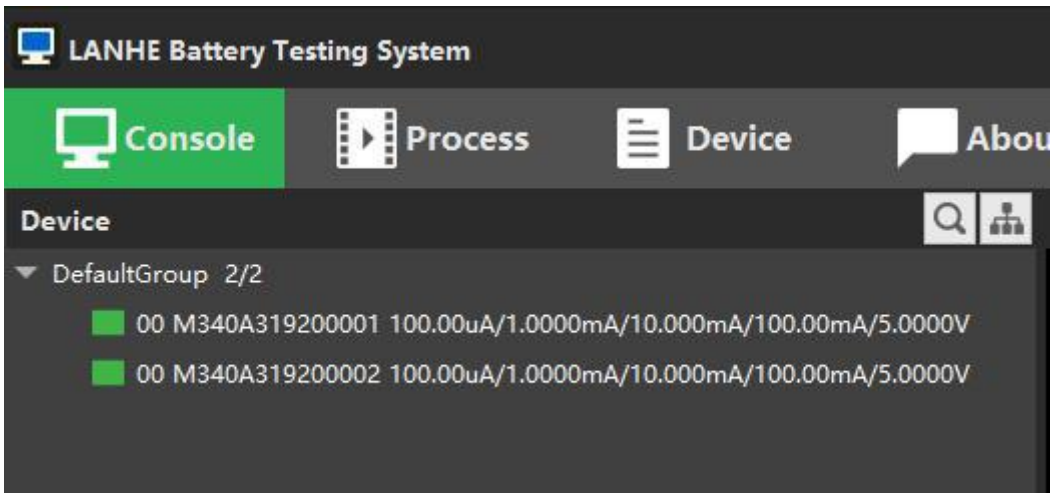


Figure 4-6 Default Group

2. Manage groups

①Click the button to open the Device Manager window.

②In the group list, you can add, delete, and rename groups by right-click menu.

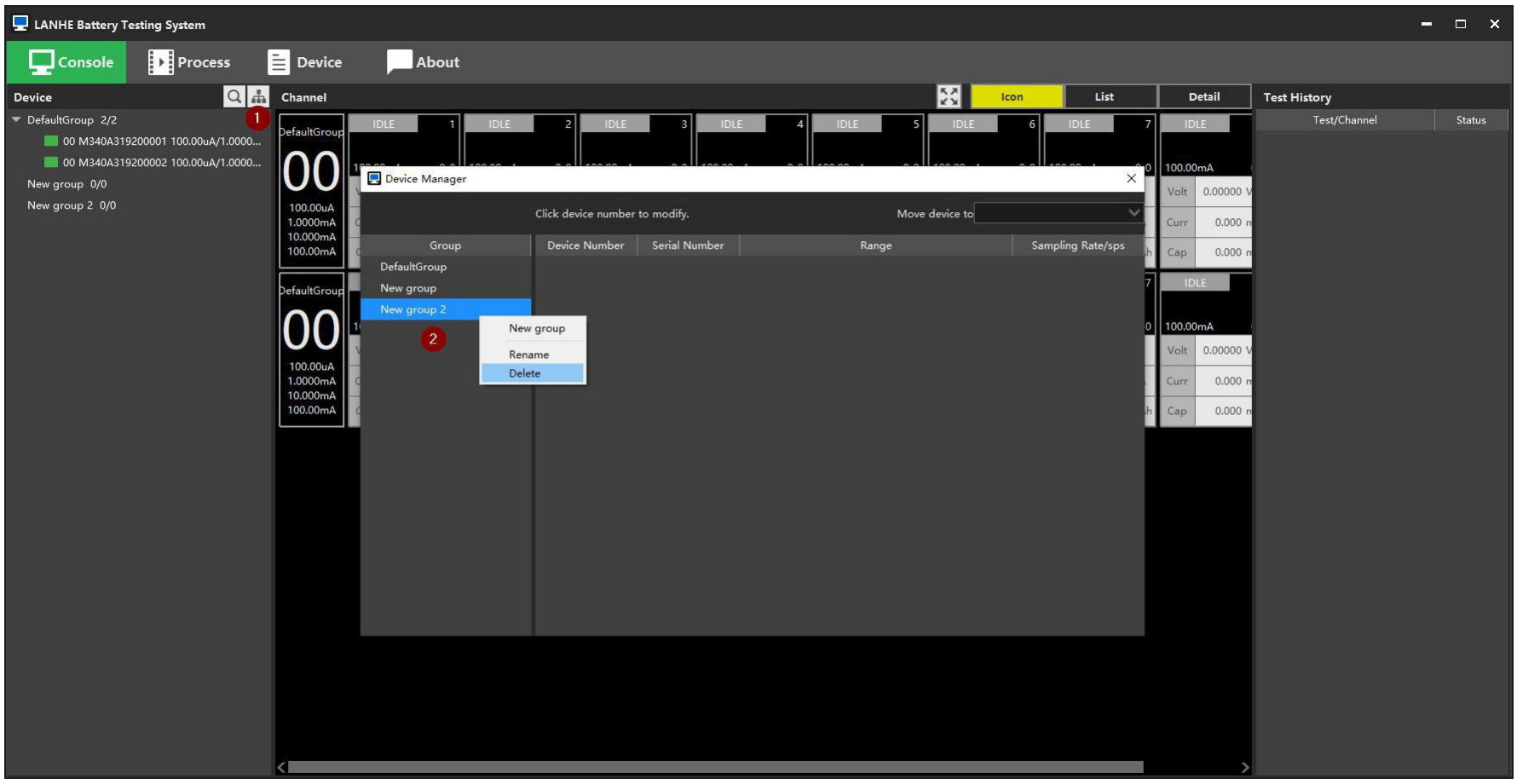


Figure 4-7 Device Manager

3. Move device to group

①Click the group on the left and the devices of this group will be displayed on the right.

②Select some devices and click "Move Device to".

Note: After the device changes the group, the number is cleared to 0. Please reassign a number that is not duplicated in its new group.

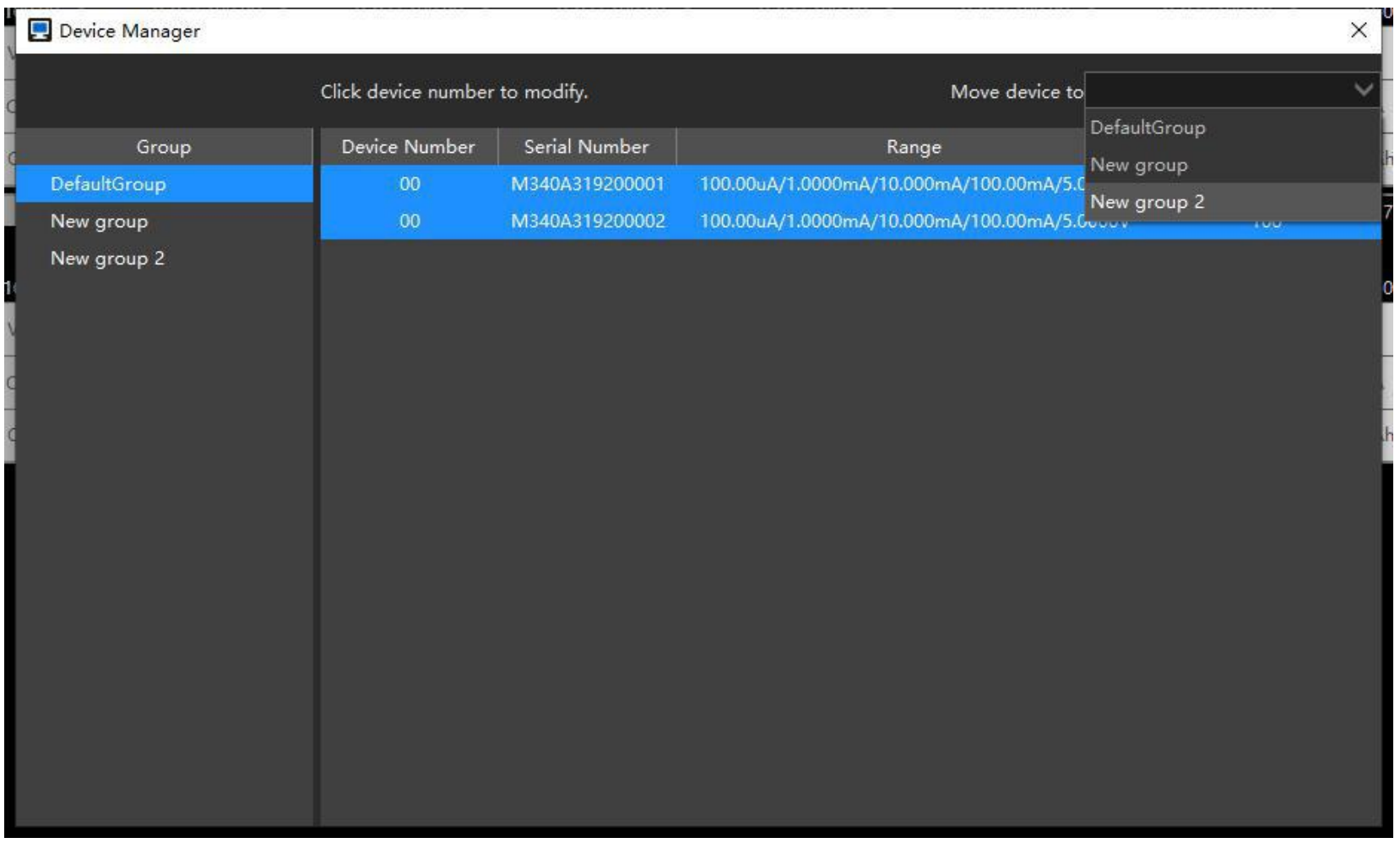


Figure 4-8 Move device to group

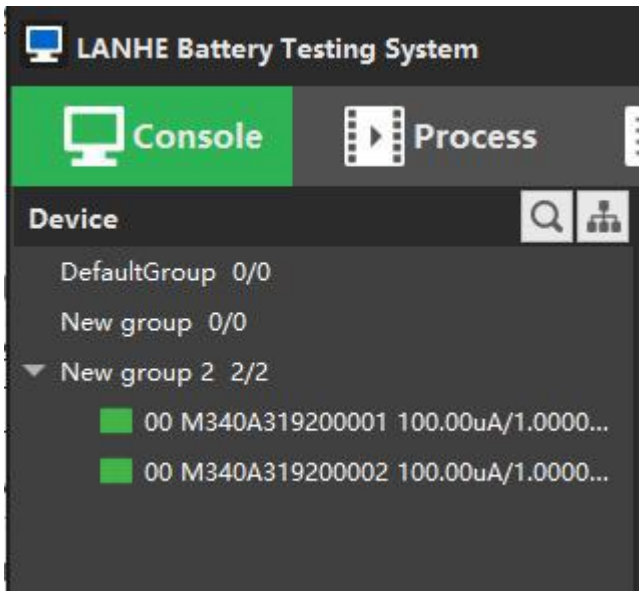


Figure 4-9 After moving

4.2.4 Numbering

The number will be displayed on the LED of the front panel of the numbered device. This feature is used to distinguish different units of the devices.

The default number of the new device is 0. You can set the number within 1-99.

Do not repeat the number in the same group.

Numbering method:

In the "Device Manager" window, click the first column "Device Number" of the device table, the column becomes changeable (such as Figure 4-10), enter the number and press Enter to complete the number.

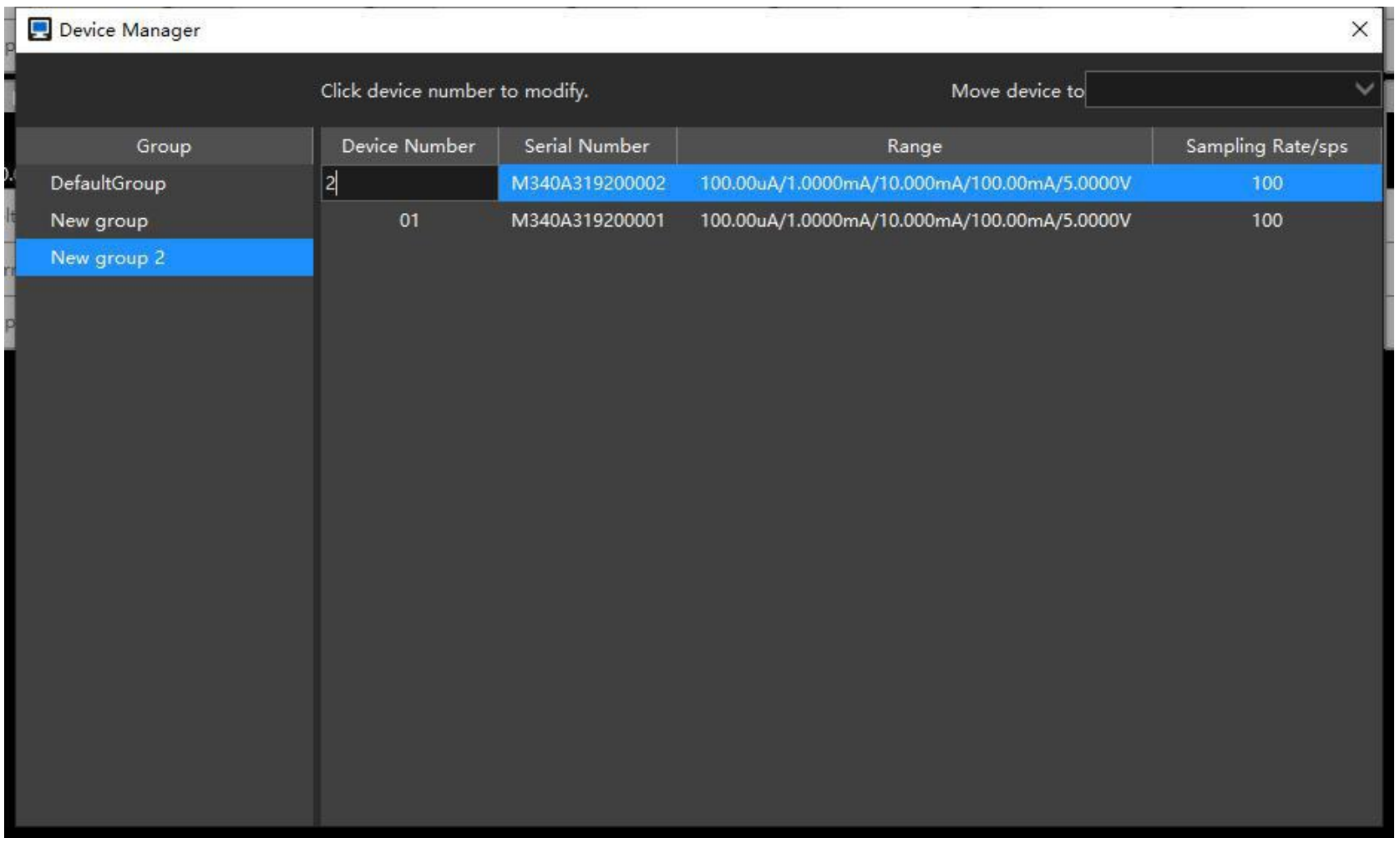


Figure 4-10 Number the device

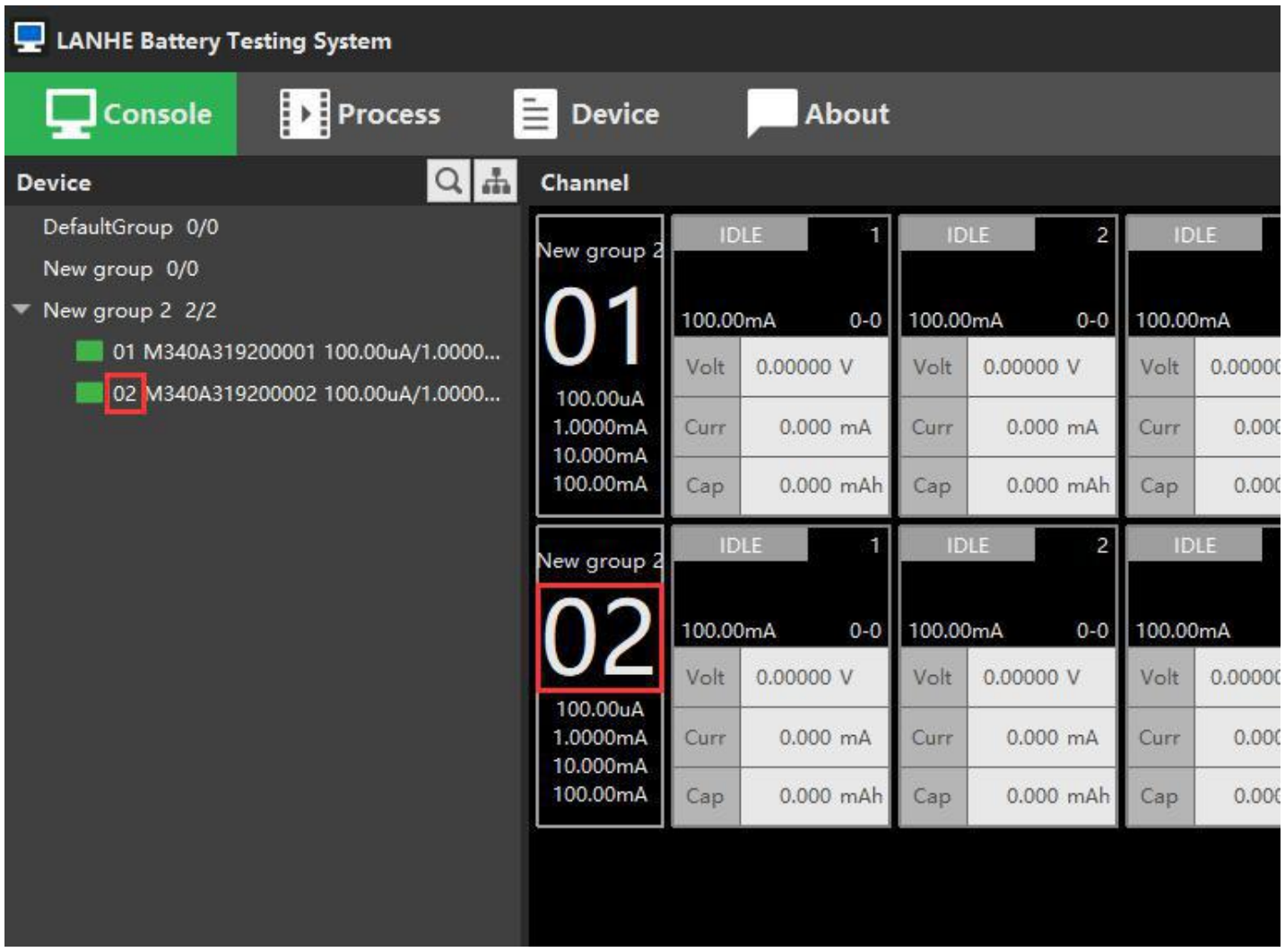


Figure 4-11 After numbering

Figure 4-12 Device front panel

4.2.5 Authorization

There are two types of authorization in the current version, "General" and "Electrochemical".

Appropriate authorization has generally been made when the equipment is shipped.

Apply for authorization:

If you need to update the authorization (for example, upgrade from the general version to the advanced version), right-click the device list and select menu "Apply For Authorization" to send the generated

application file to the technician.

Load authorization:

After the technician sends back the authorization file, select the menu "Load Authorization" to load the authorization file.

You can check the authorization status on the device page later, and the refresh of this status may be slightly

delayed.

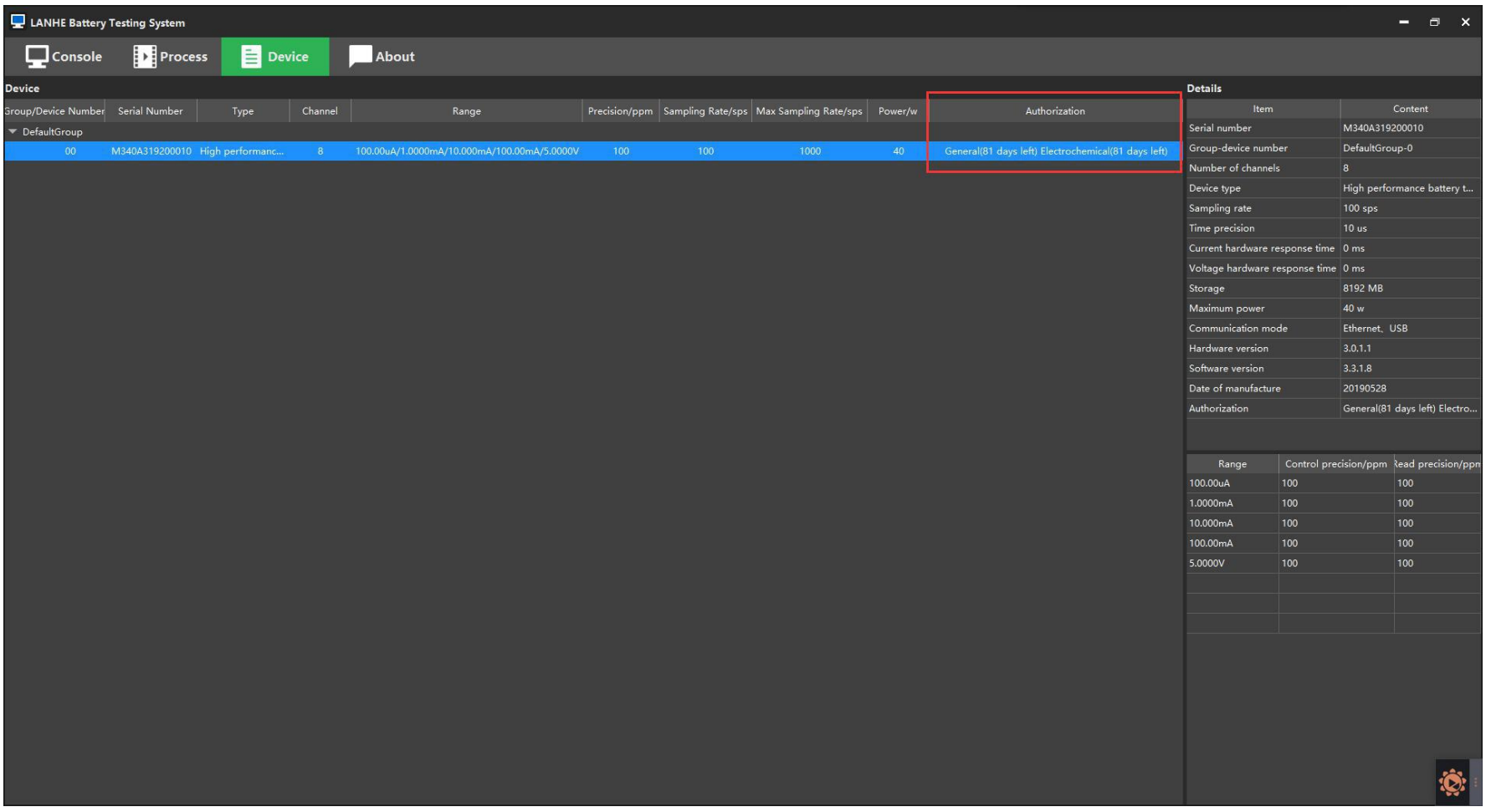


Figure 4-13 View authorization status

4.2.6 Channel area

The channel area can monitor channel status, run tests, and view test data.

Each line represents a device.

①Switch between 3 display modes

②Brief device information

③Channel operating area

Figure 4-14 Channel area

1.Three display modes

Mode	Description	Remark
Icon	The channel is displayed as a large tile	Display main information, easy to operate
List	The channel is displayed in a single line, less than one line	Display main information, compactly arranged
Detail	The channel is displayed in a single line, occupying a line	Display full information

Table 4-3 Three display modes

Figure 4-15 Icon mode

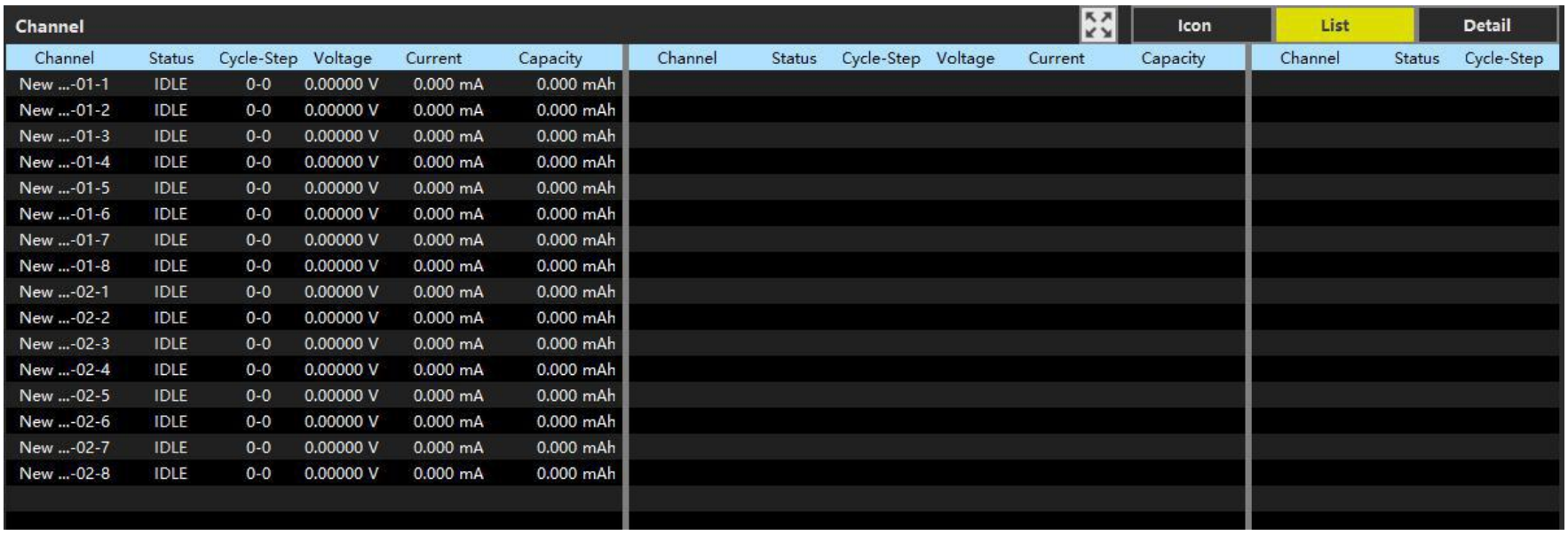


Figure 4-16 List mode

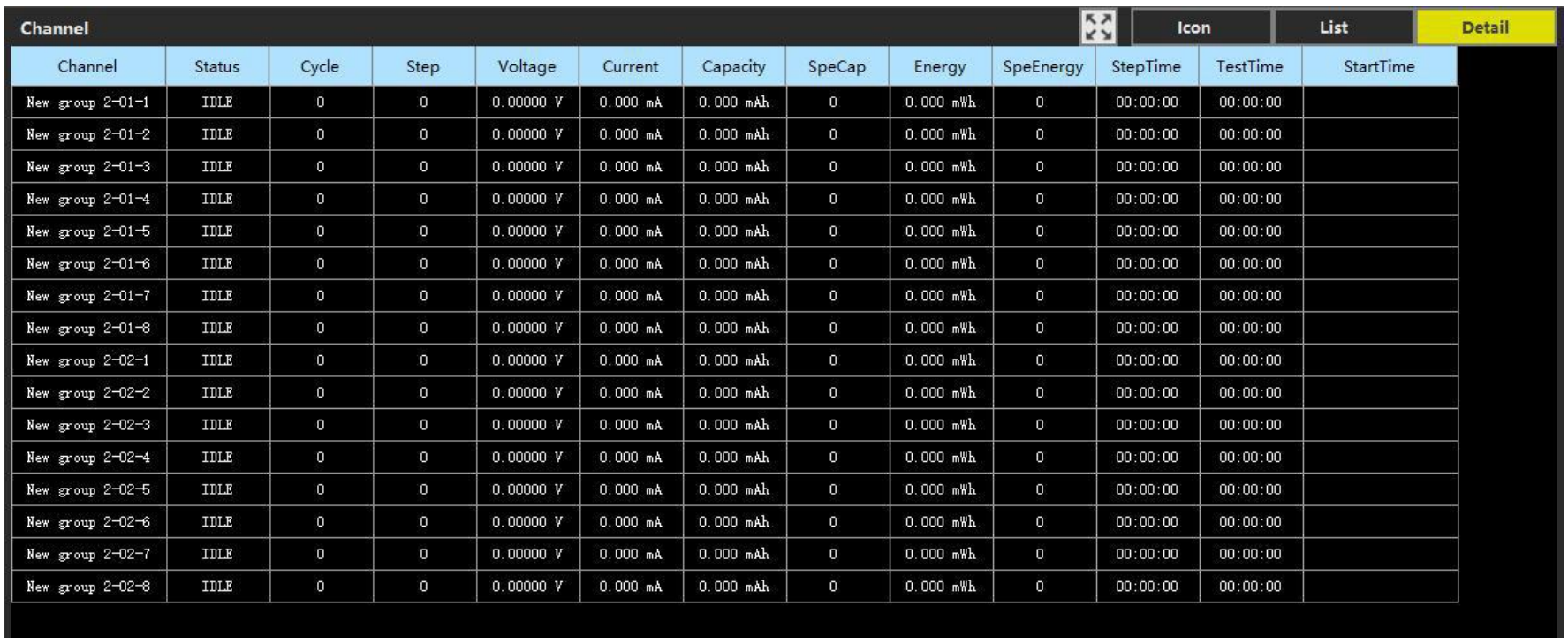


Figure 4-17 Detail mode

2.Device Information

Display brief information about the device, such as group, device number, and ranges.

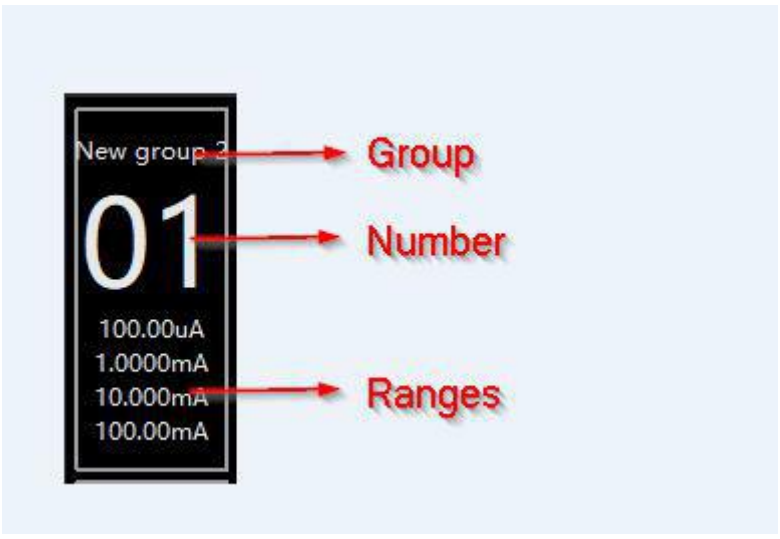


Figure 4-18 Device Information

3.Channel information

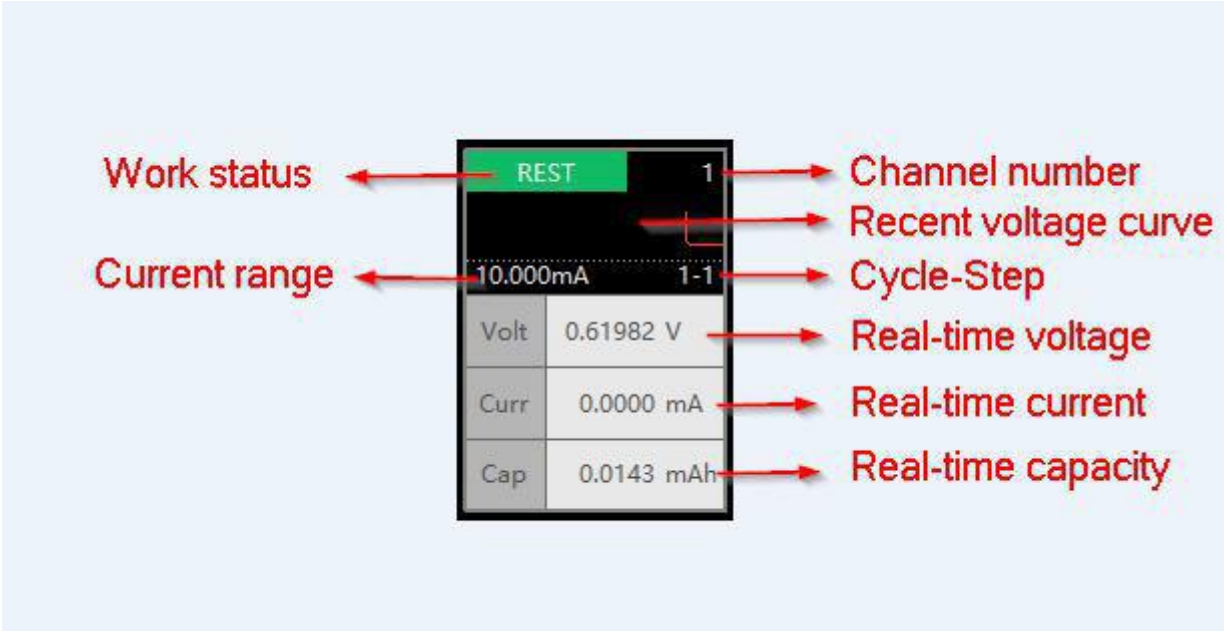


Figure 4-19 Channel information

4.2.7 Select channel

1.Select in the channel area

In the channel area, the channel can be selected by the left mouse button.Ctrl, Shift can be used for complex selection.

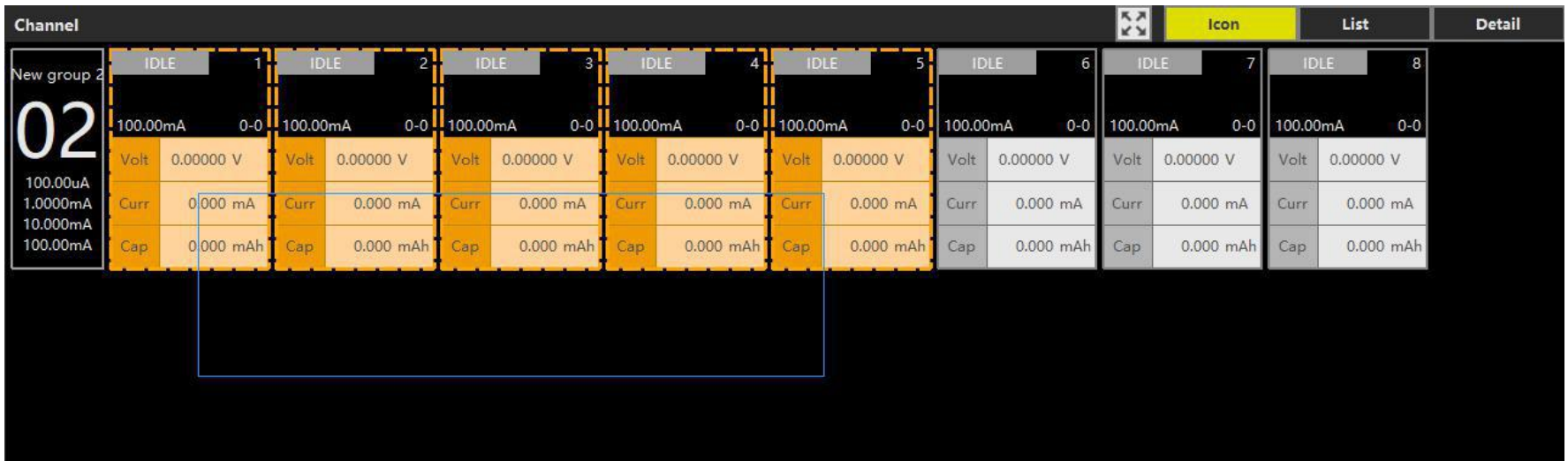


Figure 4-20 Select in the channel area

2.Select in the device list

Select the device on the device list, then right-click "Select Channel" to quickly select all channels of the selected devices.

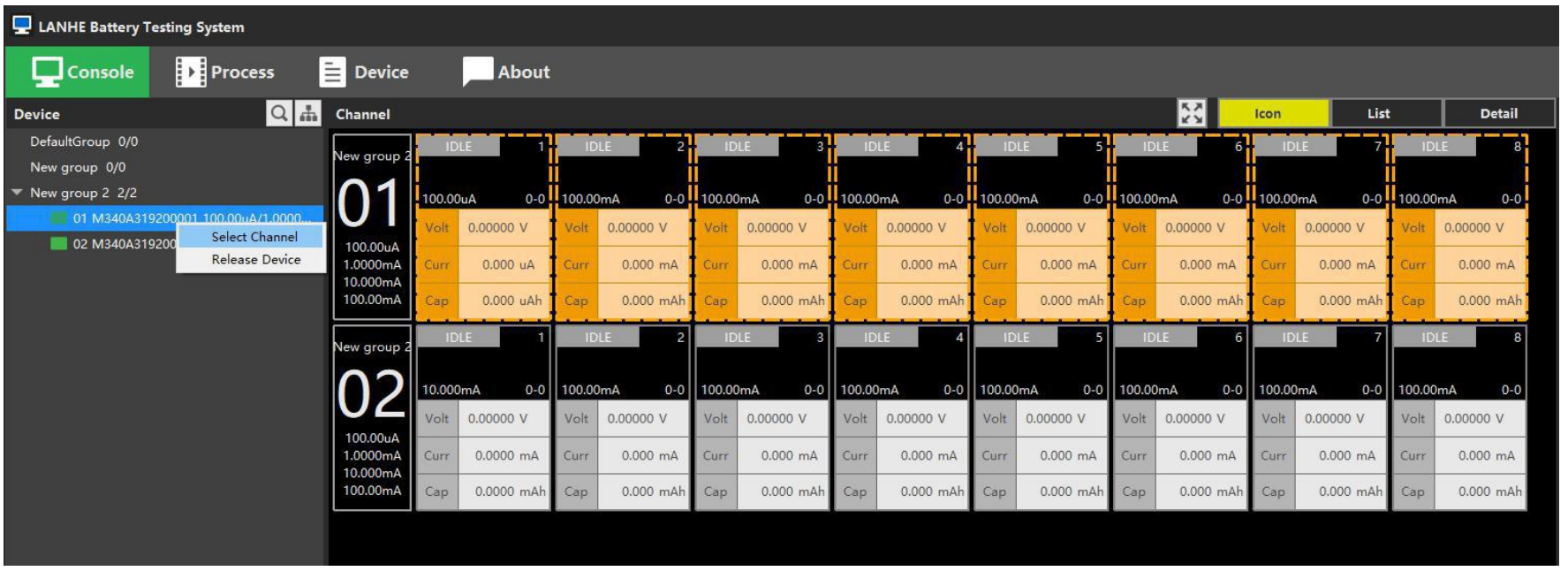


Figure 4-21 Select in the device list

3.Select in test history

If you have run a test, you can select the channel used for the previous test.

In the test history, the primary node is a test, and the secondary node is the channel of the test.

Right-click the primary node,click menu "Select Channel" to select all channels of this test.

Right-click the secondary node,click menu "Select Channel" to select this channel.

Figure 4-22 Select all channels of a test

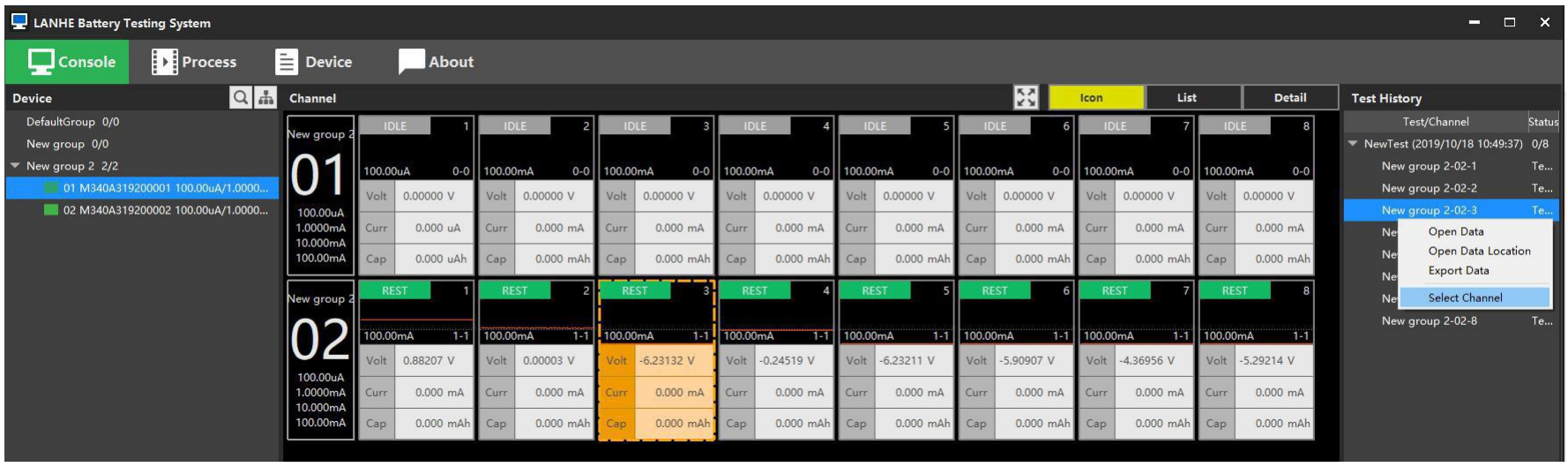


Figure 4-23 Select one channel for a test

4.2.8 Start test

After selecting the channel, right click menu "Start", you can see the "Start" window.

On the window, you can select the process, edit the startup information, and set the data file path.

If the process contains a multiplying rate step, the active material parameters are required.

After the channel is started, the channel light will flash, red charging, blue discharging, green resting, yellow pause.

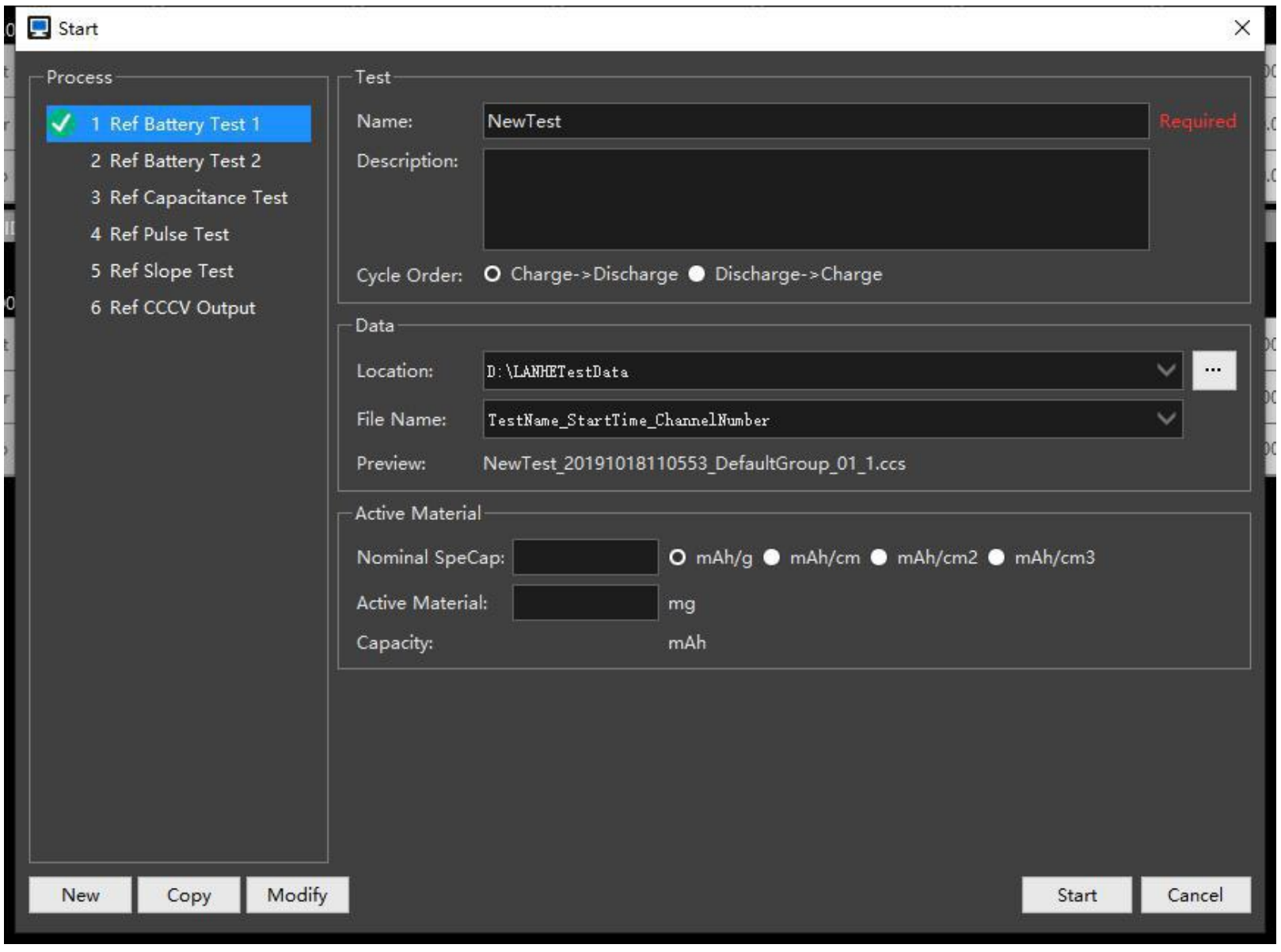


Figure 4-24 Start window

Note:

The software will check the process at startup. The test cannot be started in the following cases:

1. There is an error in the process.

2. There is a multiplication step in the process, but the active material parameter is not set.

3. The parameter in the process exceeds the upper limit of the selected device.

4. There are steps or conditions in the process that are not supported by the device.

4.2.9 Start electrochemical test

If there is a device that supports electrochemical functions, there will be an additional "Start Electrochemical Test" menu under the "Start" menu, which is used to start some electrochemical tests.

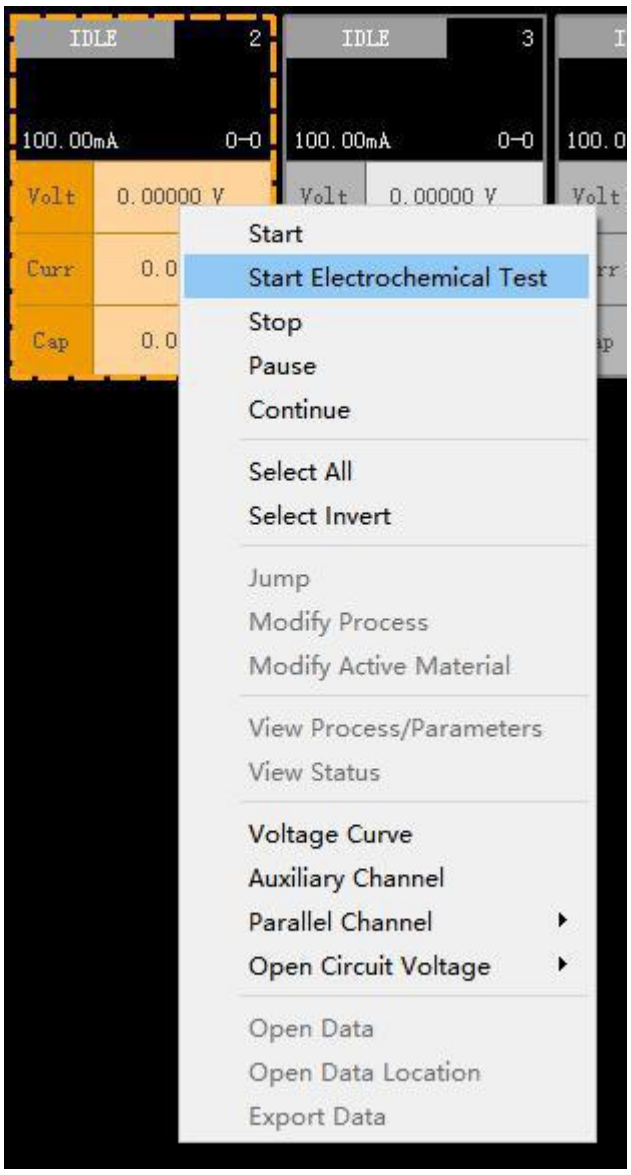


Figure 4-25 Menu-Start Electrochemical Test

The parameters of electrochemical functions are different, such as cyclic voltammetry：

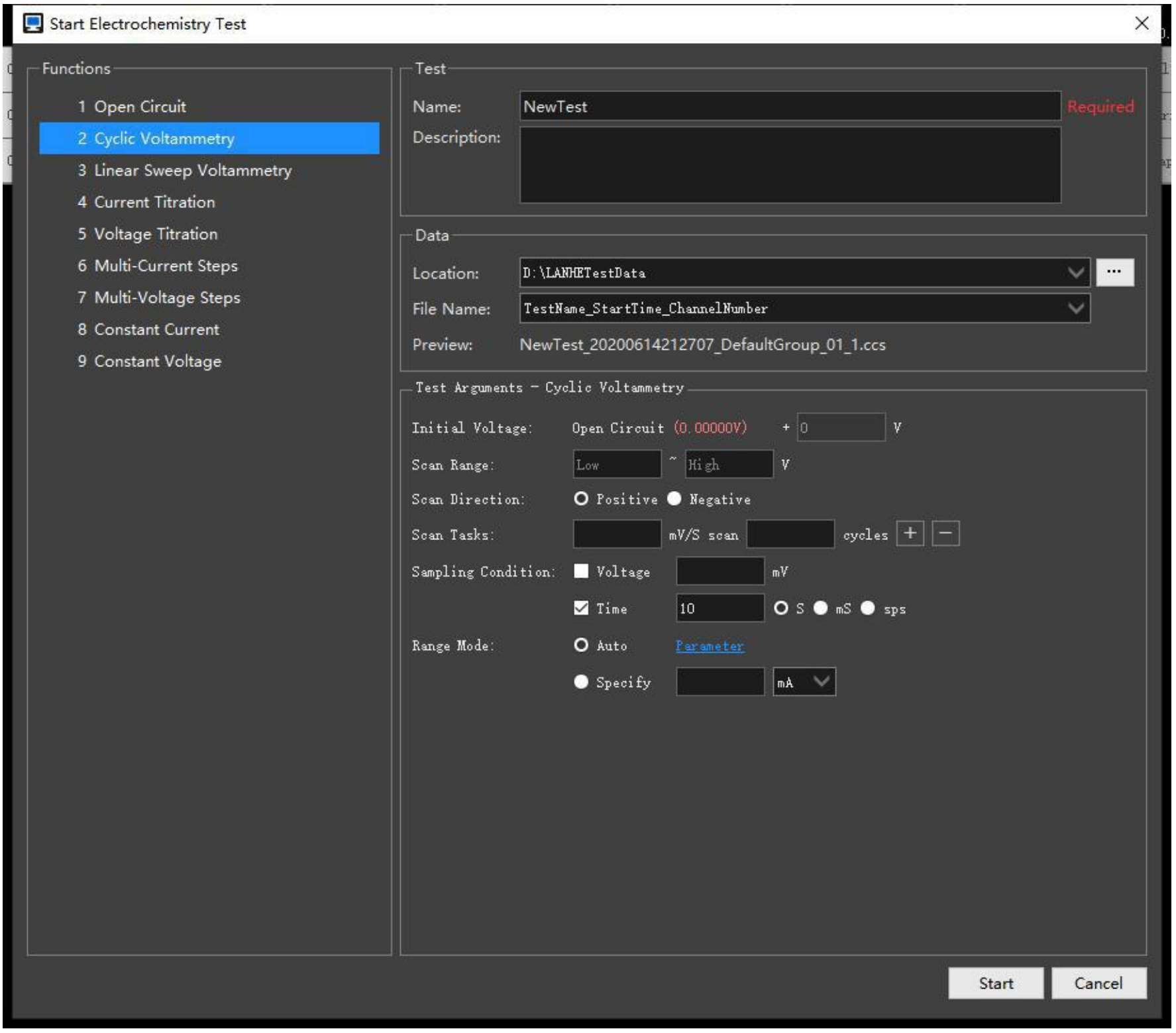


Figure 4-26 Cyclic voltammetry window

Item	Description
Initial Voltage	It can be started with an open circuit voltage, or it can be started by increasing or decreasing some voltage on the basis of the open circuit voltage
Scan Range	Set the scan voltage range
Scan Direction	Set the scan direction
Scan Tasks	The tasks can be increased or decreased by the +- button, you can set the scanning speed and number of cycles for each task
Sampling Condition	Support two sampling conditions: voltage/time
Range Mode	Generally use auto range, also support specified range

Table 4-4 Cyclic voltammetry parameters

4.2.10 Stop test

Right-click on the channel being tested and select the menu "Stop" to stop the test. The channel returns to the "idle" state after stopping.

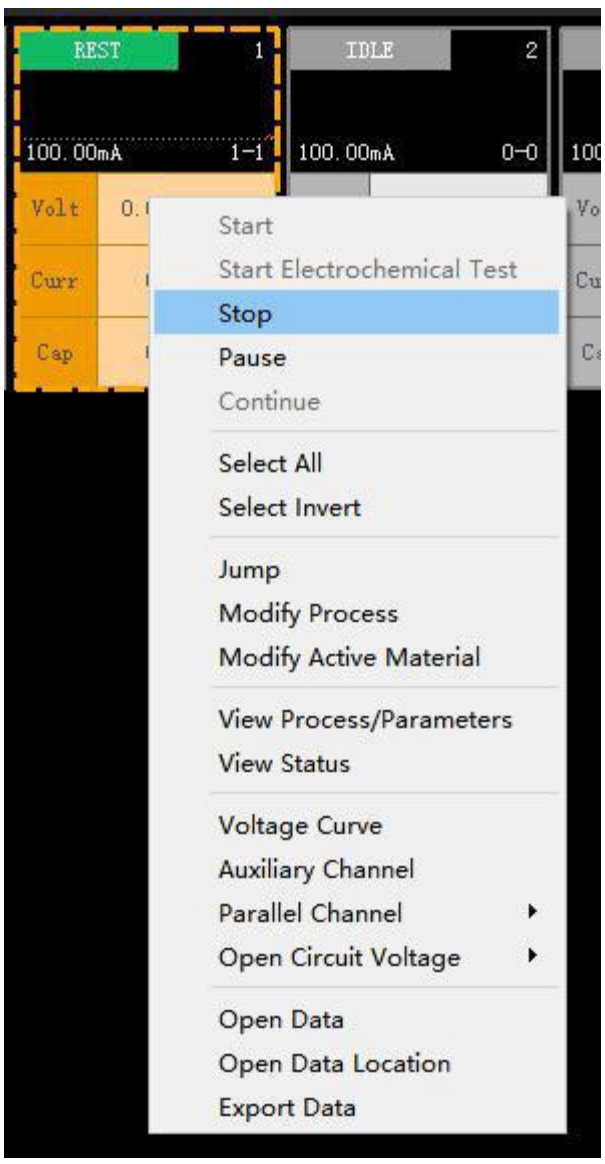


Figure 4-27 Stop test

Note: The test cannot be recovered after stopping, and the channel data reception will be interrupted. Received test data can still be opened normally.

4.2.11 Pause test

The channel right-click menu "Pause" can pause the test. The channel light in the pause state is flashing yellow.

Figure 4-28 Pause state

In addition to the manual pause, during the test, when the software crashes, the device stops abnormally, the network is abnormally disconnected, etc., the intelligent protection mechanism of the device causes the channel to enter the pause state.

After the software or device returns to normal, you can continue to run previously unfinished tests.

4.2.12 Continue test

The channel in the pause state can continue to run through the right-click menu "Continue".

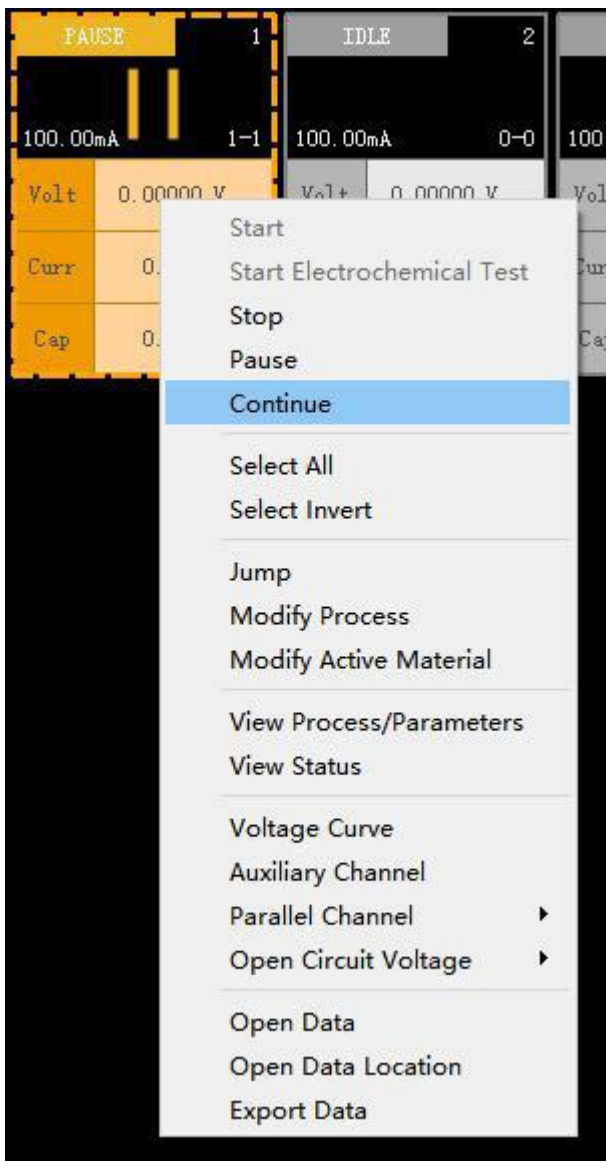


Figure 4-29 Continue test

4.2.13 Jump

The "jump" menu can jump to other steps in the current process, or switch to the steps of other

processes.

Support multi-channel simultaneous jumps if their current process is the same.

You can only jump to an executable step (Charge, Discharge, REST, END), but can not jump to the logical step (LOOP, JUMP, OR).

Jump operation:

1. Select a channel that is being tested or paused, right-click menu "Jump" to display the "Jump" window.

2. The window displays the currently used process and steps. The green icon represents the step that is currently running.

3. Double-click a step, or select a step and click the "jump" button.

4. Click the Cross Process Jump check box to display all available processes in the system, then you can jump to other processes.

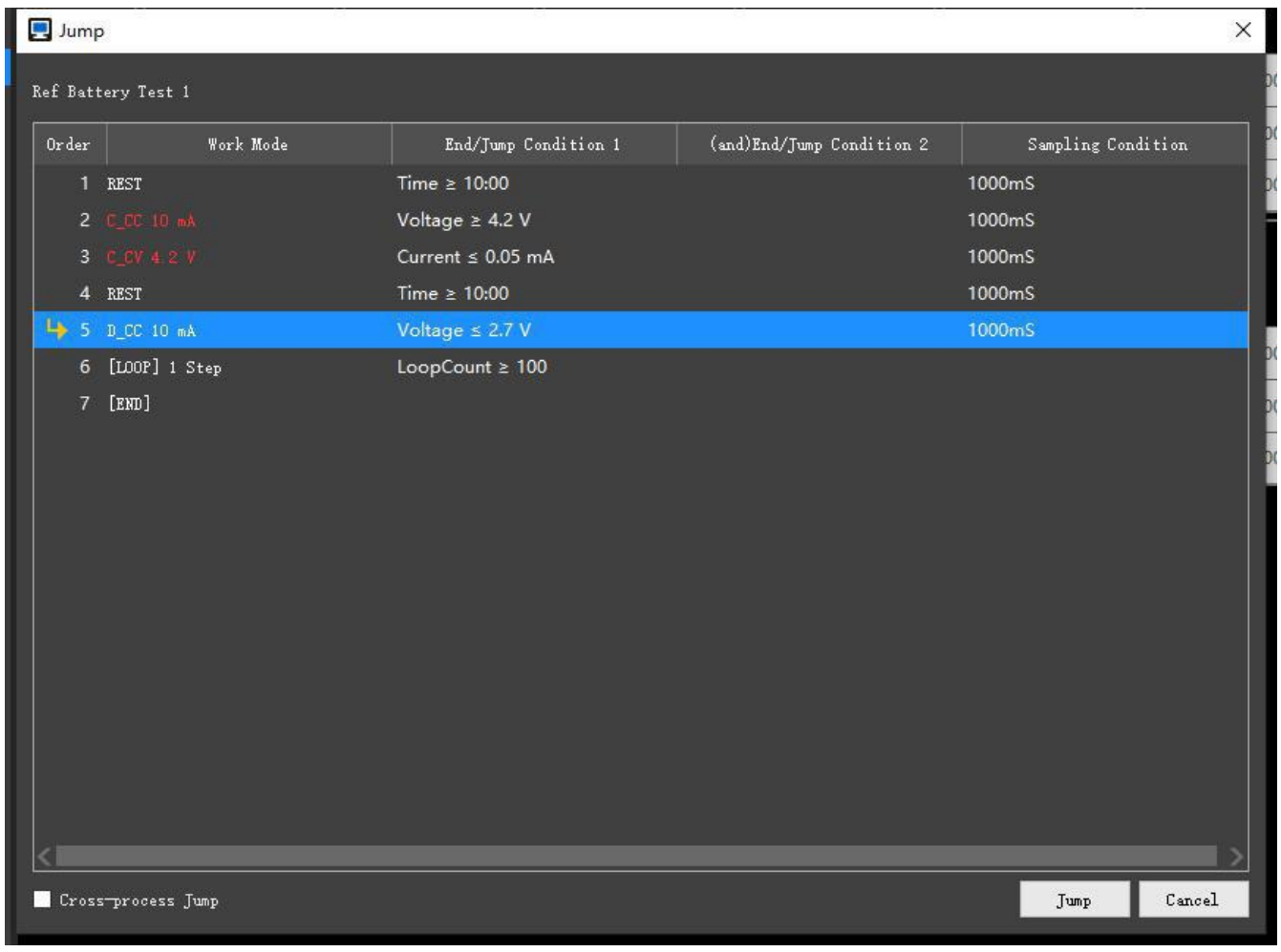


Figure 4-30 Jump to this process

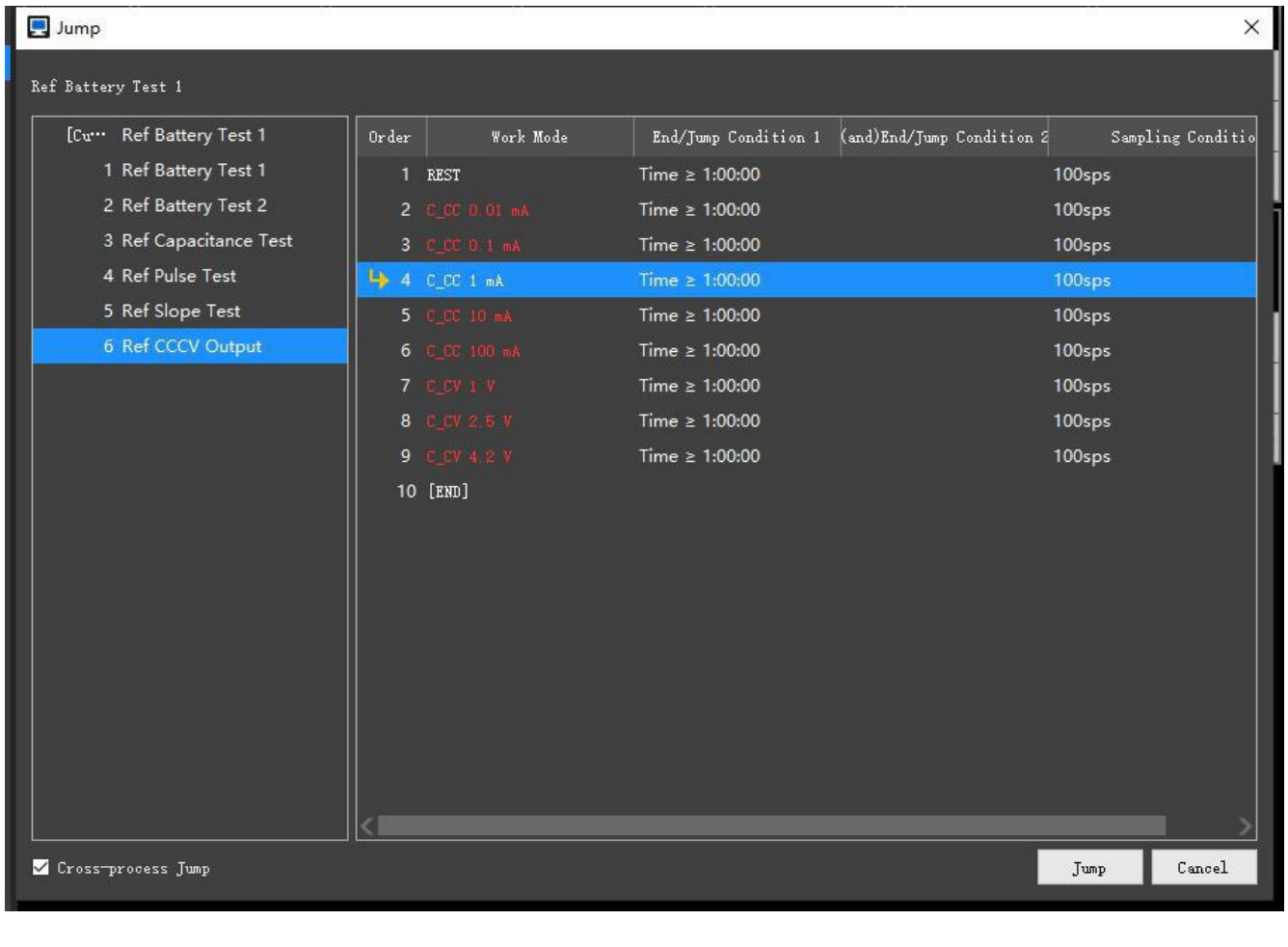


Figure 4-31 Jump to other process

4.2.14 Modify process parameters

Process parameters can be modified during the test using the "Process Parameters" menu.

The current step in the data will be split into two steps due to different parameters.

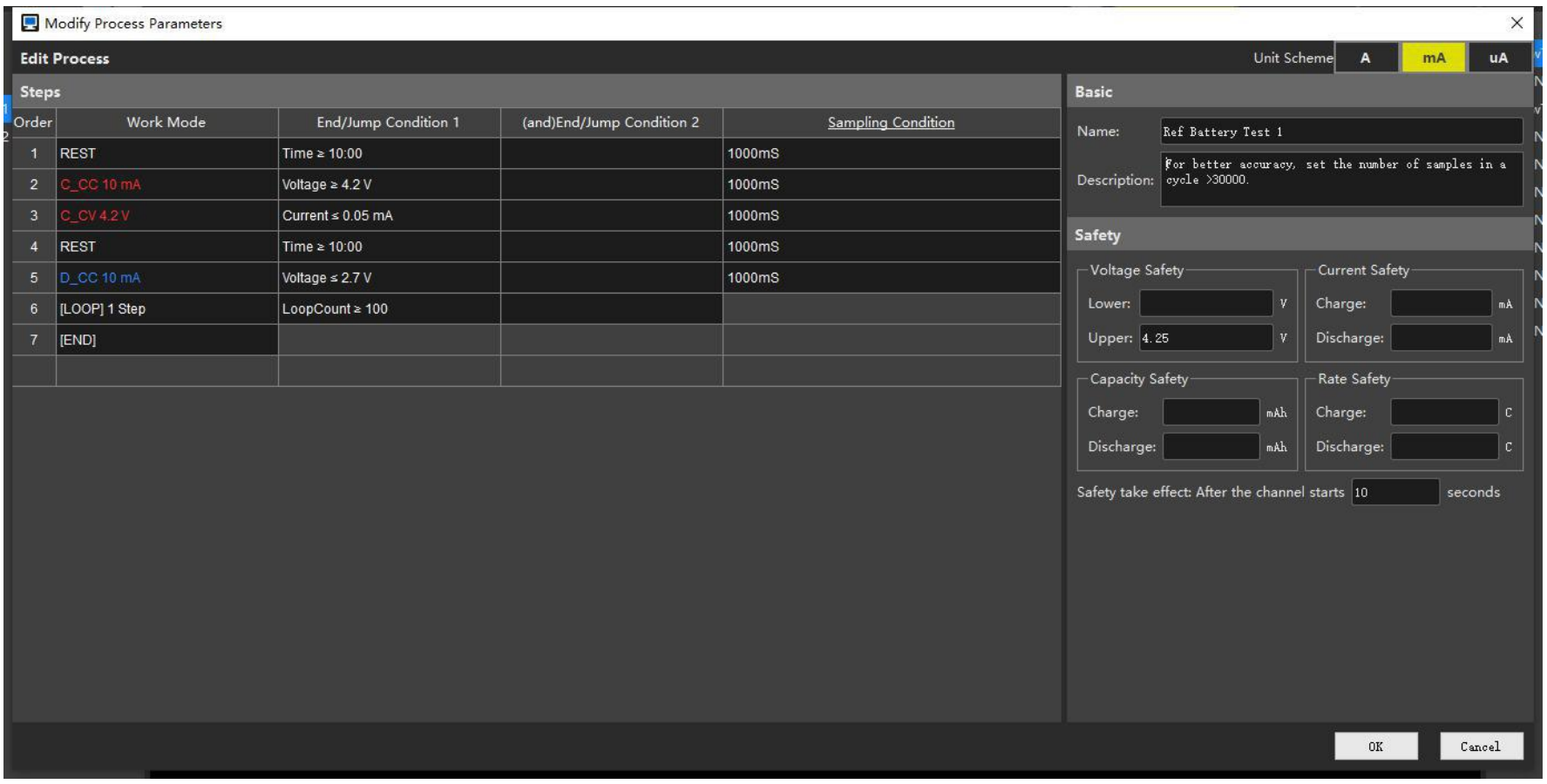


Figure 4-32 Process parameters window

4.2.15 Modify active material parameters

The active material parameters can be modified during the test using the "Active Material" menu.

The current step in the data will also be split into two steps due to different parameters.

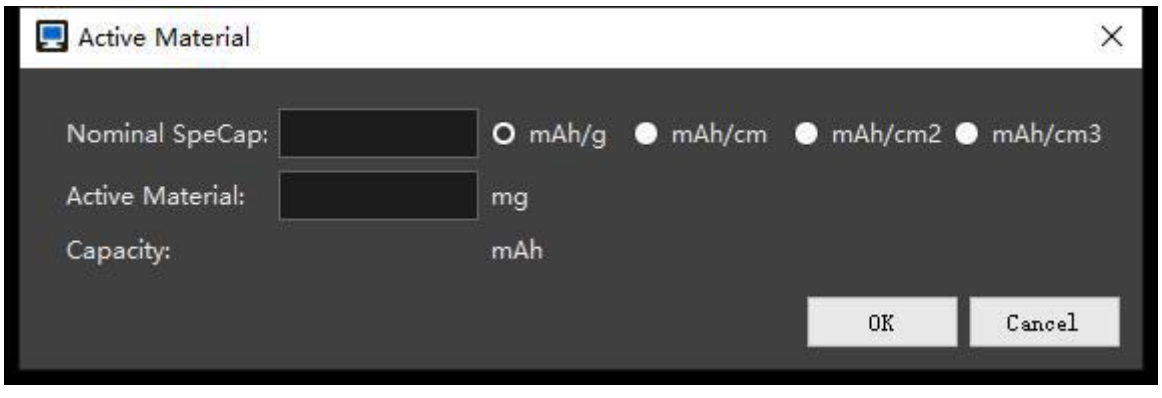


Figure 4-33 Active material window

4.2.16 View process

The current test process can be viewed through the menu "View Process".

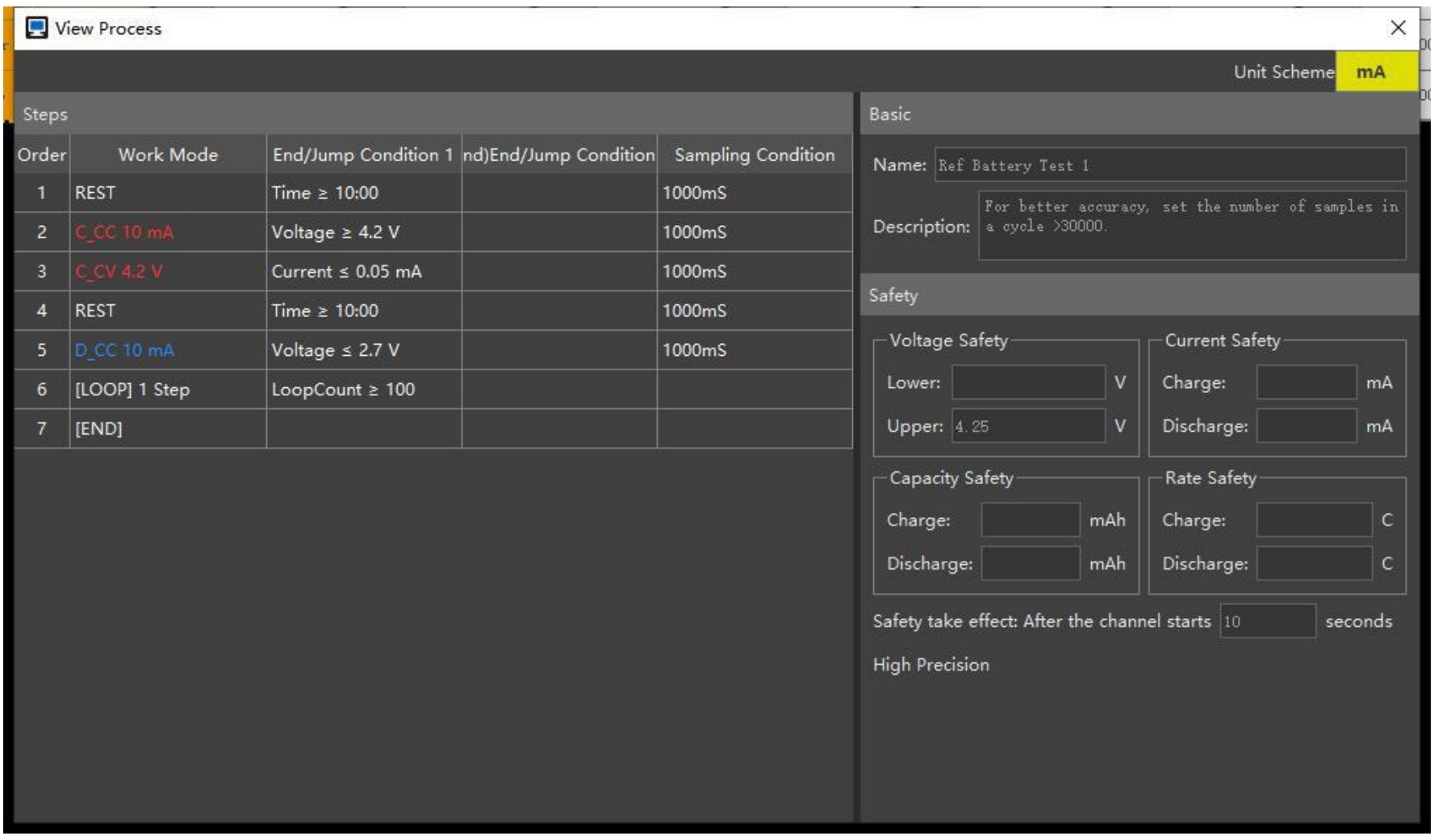


Figure 4-34 View process

4.2.17 View status

You can view various information about the current test through the menu "View Status".

Such as test process, current work steps, data location, startup time, etc.

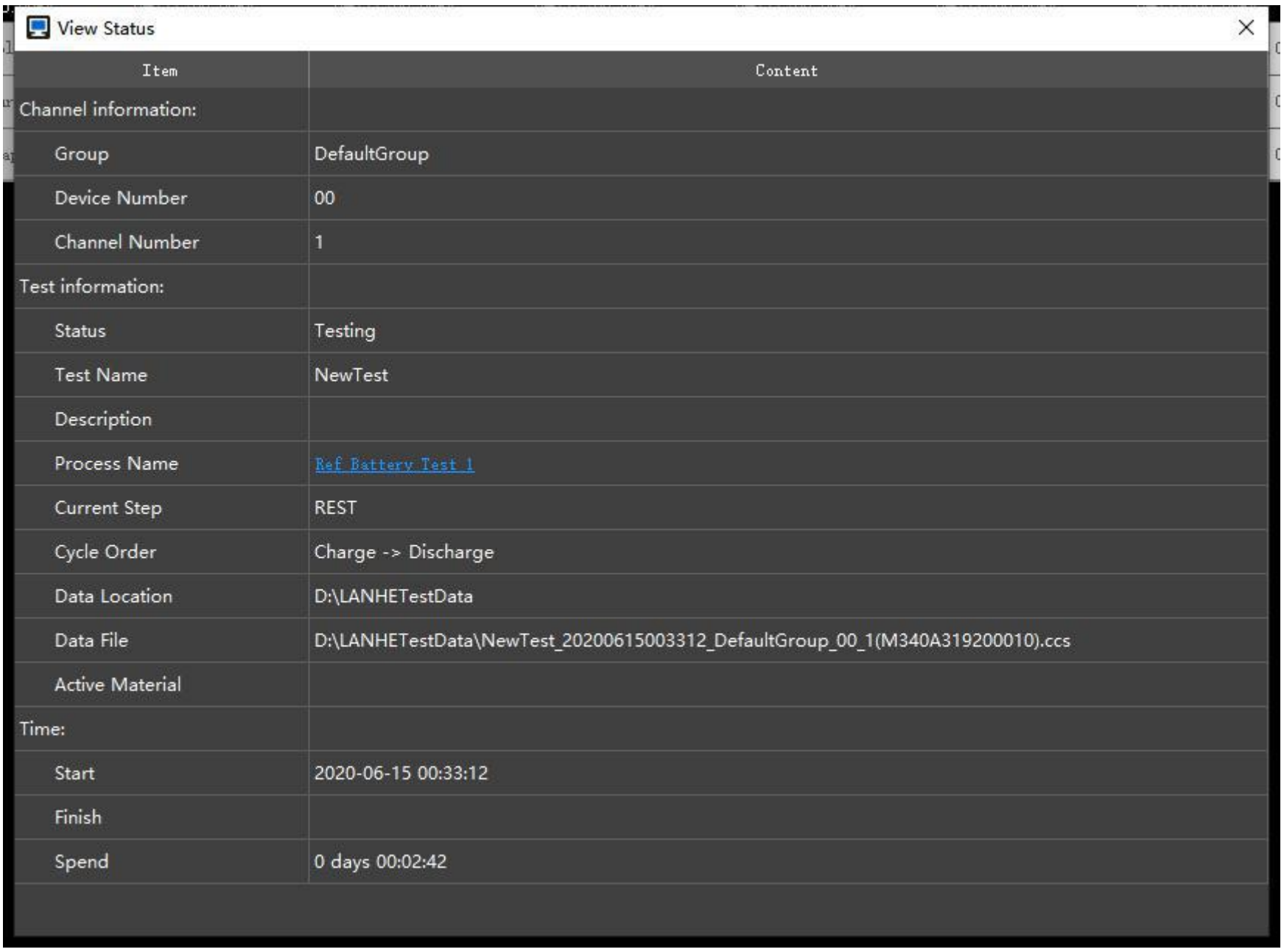


Figure 4-35 View status

4.2.18 Voltage curve setting

The curve duration in the channel icon can be adjusted via the menu "Curve settings".

This curve is an abbreviated version of the voltage curve over a period of time. By default, the voltage within half an hour is displayed.

Figure 4-36 Curve settings

4.2.19 Auxiliary channel

You can set some channels as auxiliary channels of a channel.When you start a main channel, its auxiliary

channels will also start.All auxiliary channel data is generated into the main channel data file.

Steps:

1. Right-click menu "Auxiliary Channel" to open the configuration window.

2. Click on the small edit box above.

3. Select a main channel, and the edit box displays the main channel information.

4. Click on the big edit box below.

5. Select some auxiliary channels,and the edit box displays the auxiliary channel information.

6. Click the button "Bind" .

7. The main channel displays "*", the auxiliary channel displays "Aux", indicating that the configuration is successful.

8. Button "Unbind" can unbind these channels.

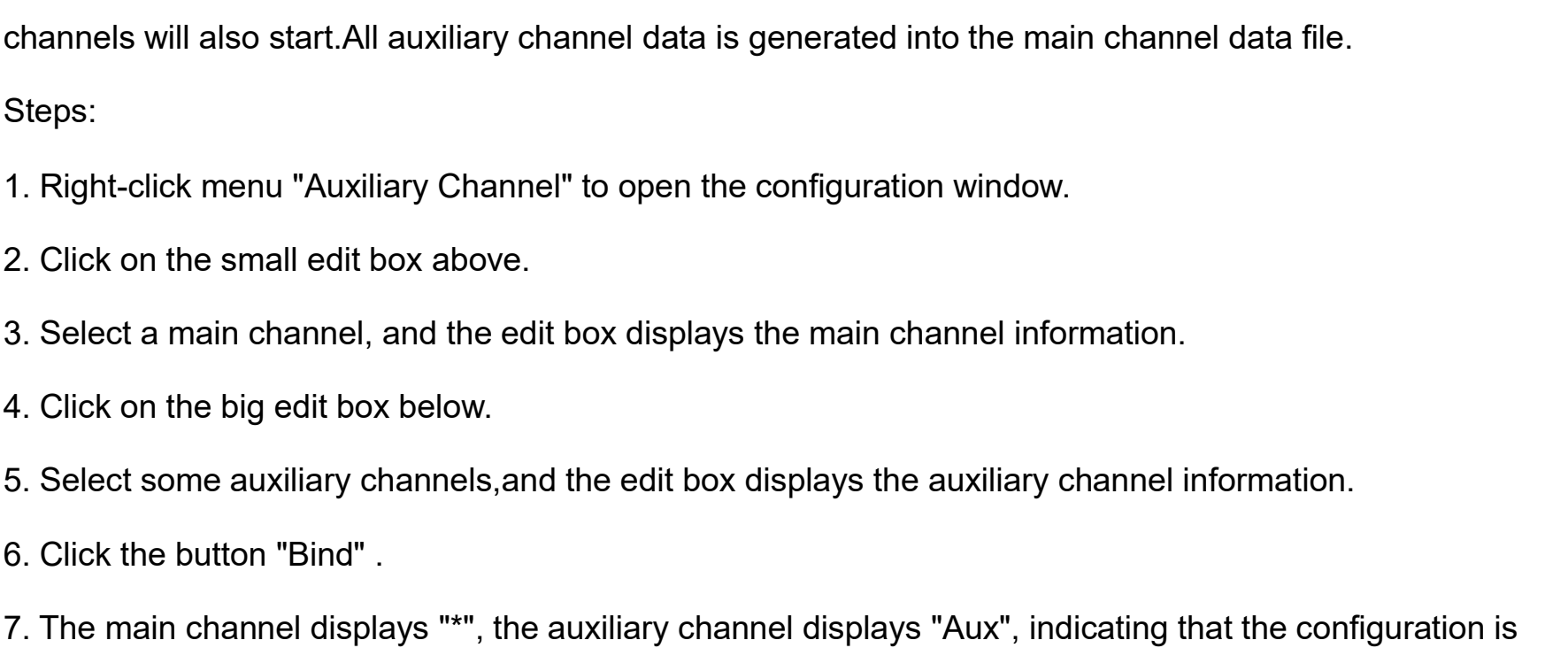


Figure 4-37 Select the main channel

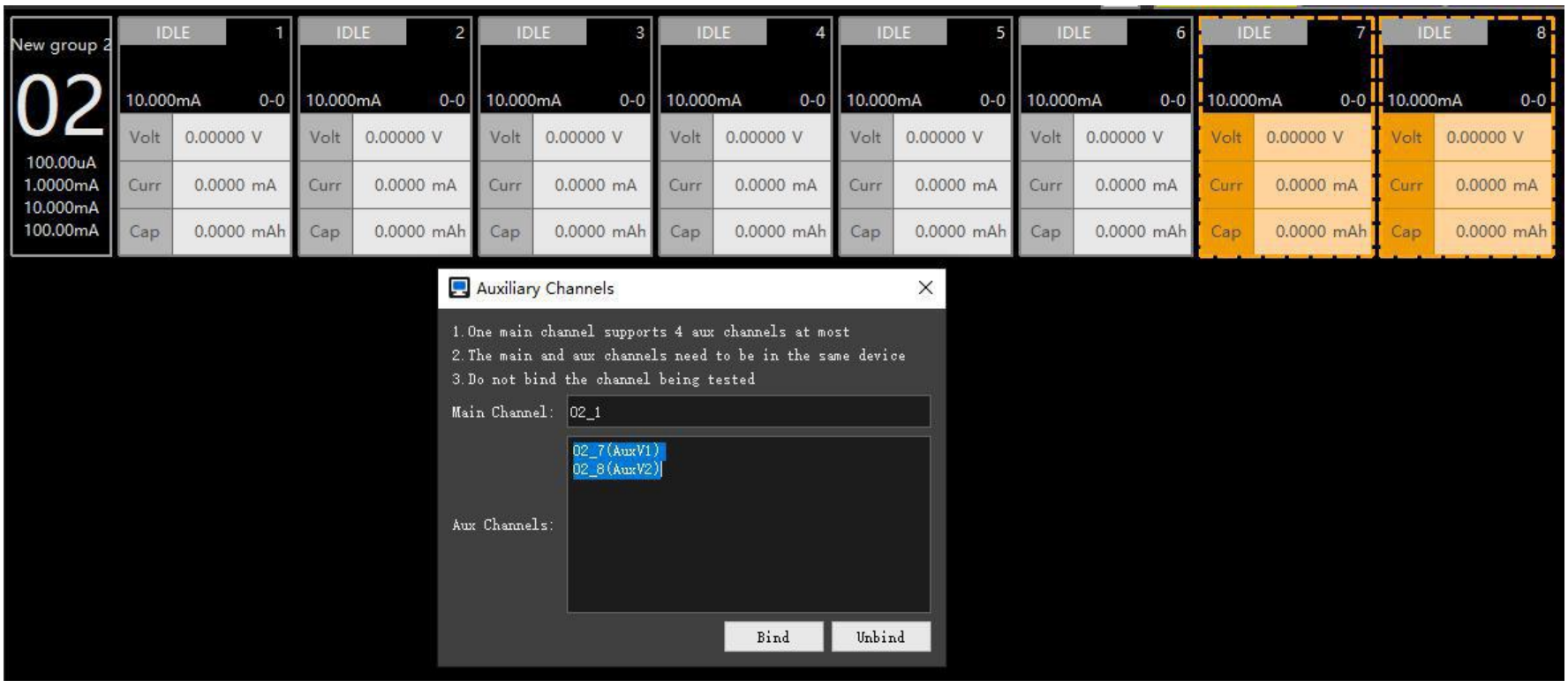
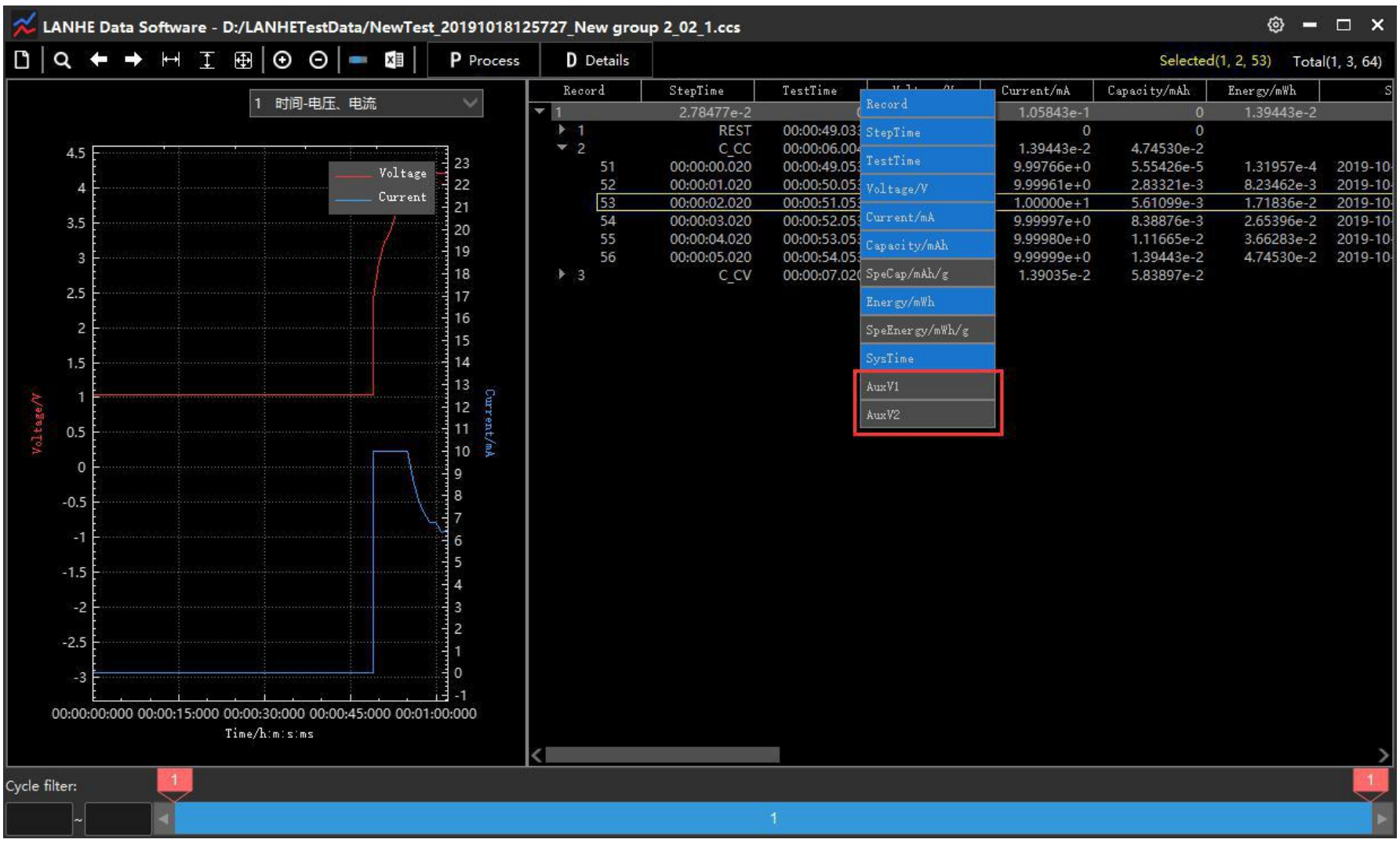


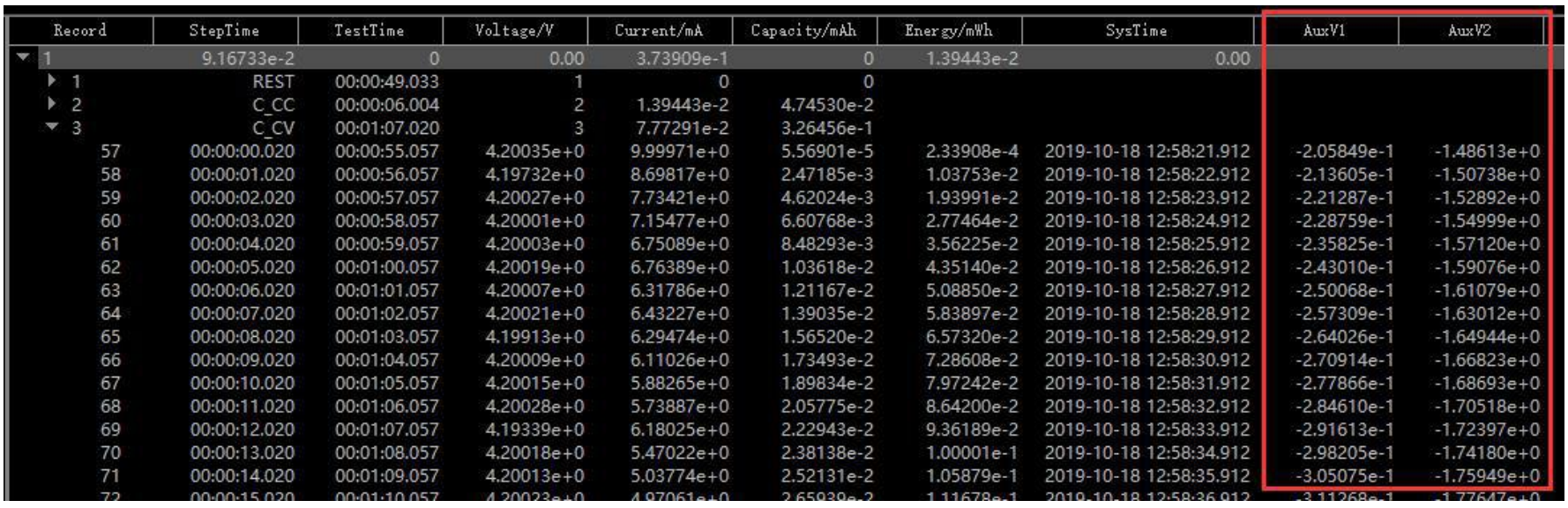
Figure 4-38 Select auxiliary channels

Figure 4-39 Configuration succeeded

Note:

- The auxiliary channel is inoperable, only starts and stops with its main channel, and its test data is summarized into the data of its main channel.
- When viewing the main channel data, you need to select the auxiliary channel in the header menu of the recording layer to display the auxiliary data.





Record	StepTime	TestTime	Voltage/V	Current/mA	Capacity/mAh	Energy/mWh	SysTime	AuxV1	AuxV2
1	9.16733e-2	0	0.00	3.73909e-1	0	1.39443e-2	0.00		
1 REST		00:00:49.033	1	0	0				
2 C_CC		00:00:06.004	2	1.39443e-2	4.74530e-2				
3 C_CV		00:01:07.020	3	7.77291e-2	3.26456e-1				
57	00:00:00.020	00:00:55.057	4.20035e+0	9.99971e+0	5.56901e-5	2.33908e-4	2019-10-18 12:58:21.912	-2.05849e-1	-1.48613e+0
58	00:00:01.020	00:00:56.057	4.19732e+0	8.69817e+0	2.47185e-3	1.03753e-2	2019-10-18 12:58:22.912	-2.13605e-1	-1.50738e+0
59	00:00:02.020	00:00:57.057	4.20027e+0	7.73421e+0	4.62024e-3	1.93991e-2	2019-10-18 12:58:23.912	-2.21287e-1	-1.52892e+0
60	00:00:03.020	00:00:58.057	4.20001e+0	7.15477e+0	6.60768e-3	2.77464e-2	2019-10-18 12:58:24.912	-2.28759e-1	-1.54999e+0
61	00:00:04.020	00:00:59.057	4.20003e+0	6.75089e+0	8.48293e-3	3.56225e-2	2019-10-18 12:58:25.912	-2.35825e-1	-1.57120e+0
62	00:00:05.020	00:01:00.057	4.20019e+0	6.76389e+0	1.03618e-2	4.35140e-2	2019-10-18 12:58:26.912	-2.43010e-1	-1.59076e+0
63	00:00:06.020	00:01:01.057	4.20007e+0	6.31786e+0	1.21167e-2	5.08850e-2	2019-10-18 12:58:27.912	-2.50068e-1	-1.61079e+0
64	00:00:07.020	00:01:02.057	4.20021e+0	6.43227e+0	1.39035e-2	5.83897e-2	2019-10-18 12:58:28.912	-2.57309e-1	-1.63012e+0
65	00:00:08.020	00:01:03.057	4.19913e+0	6.29474e+0	1.56520e-2	6.57320e-2	2019-10-18 12:58:29.912	-2.64026e-1	-1.64944e+0
66	00:00:09.020	00:01:04.057	4.20009e+0	6.11026e+0	1.73493e-2	7.28608e-2	2019-10-18 12:58:30.912	-2.70914e-1	-1.66823e+0
67	00:00:10.020	00:01:05.057	4.20015e+0	5.88265e+0	1.89834e-2	7.97242e-2	2019-10-18 12:58:31.912	-2.77866e-1	-1.68693e+0
68	00:00:11.020	00:01:06.057	4.20028e+0	5.73887e+0	2.05775e-2	8.64200e-2	2019-10-18 12:58:32.912	-2.84610e-1	-1.70518e+0
69	00:00:12.020	00:01:07.057	4.19339e+0	6.18025e+0	2.22943e-2	9.36189e-2	2019-10-18 12:58:33.912	-2.91613e-1	-1.72397e+0
70	00:00:13.020	00:01:08.057	4.20018e+0	5.47022e+0	2.38138e-2	1.00001e-1	2019-10-18 12:58:34.912	-2.98205e-1	-1.74180e+0
71	00:00:14.020	00:01:09.057	4.20013e+0	5.03774e+0	2.52131e-2	1.05879e-1	2019-10-18 12:58:35.912	-3.05075e-1	-1.75949e+0

Figure 4-40 View auxiliary channel data

4.2.20 Parallel channel

Use the menu "Parallel Channel" to configure parallel channels.

The parallel function can support a larger current range and improve the equipment utilization efficiency.

Compared with the conventional range, the parallel method can also obtain higher accuracy.。

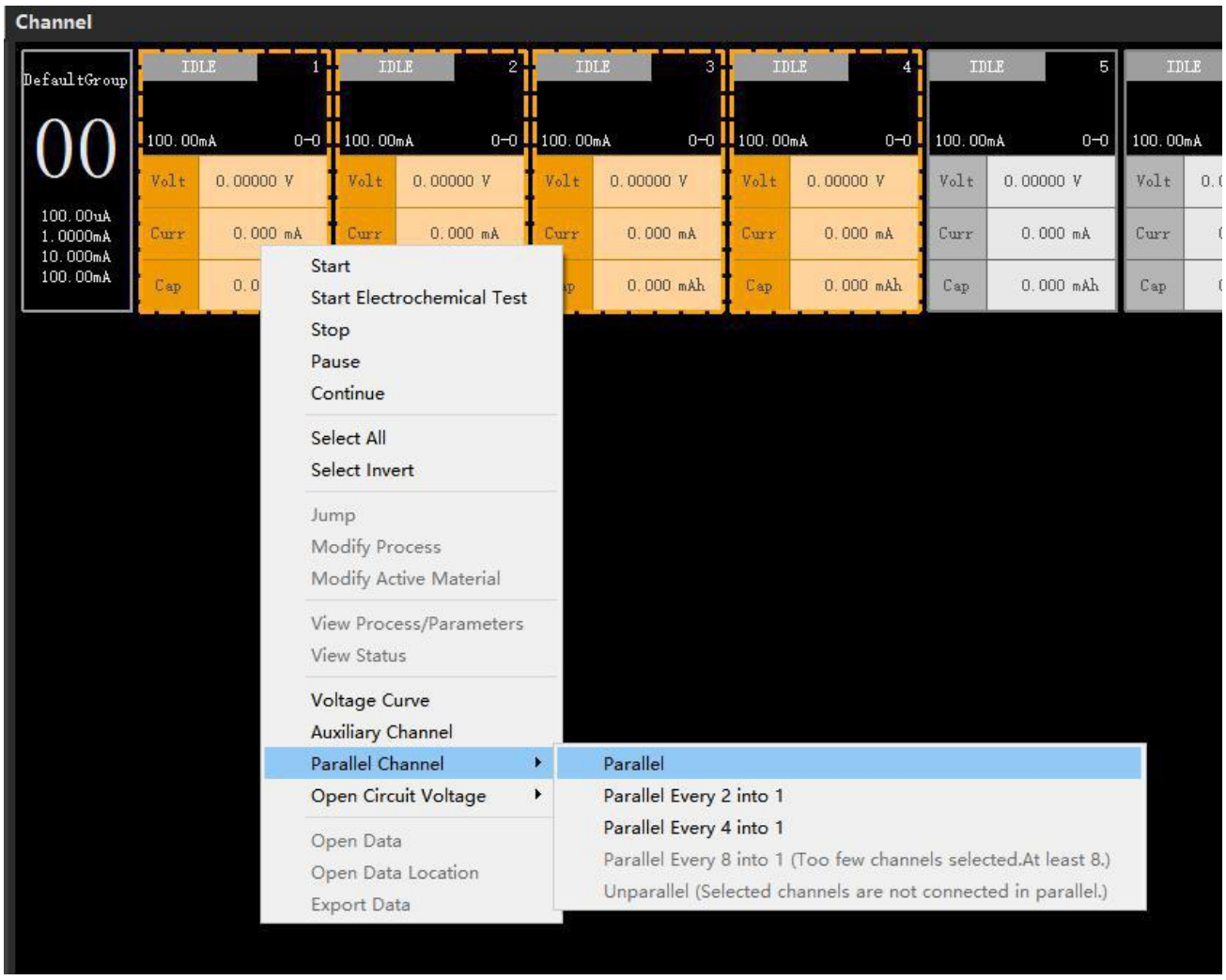


Figure 4-41 Menu-Parallel Channel

Sub-menu introduction：

Menu	Description
Parallel	1. Single device: select a continuous channel in a device, and connect all channels in parallel to the first selected channel. 2. Multi-device: Select all channels of multiple devices and connect all channels in parallel to channel 1 of the first device.
Parallel Every 2 into 1	For the selected channels in each device, every 2 channels are merged into 1
Parallel Every 4 into 1	For the selected channels in each device, every 4 channels are merged into 1
Parallel Every 8 into 1	For the selected channels in each device, every 5 channels are merged into 1
Unparallel	For each selected channel, remove the parallel group it is in

Table 4-5 Sub-menu introduction

After the channels are connected in parallel, multiple channels will be displayed as the effect of one channel. After that, the operations are all directed to the main channel, and the auxiliary channels can no longer be

operated separately.

The current range of the main channel will be expanded, and the new range (max:xxx) will be displayed on the right. The new range will be used to judge when the main channel is started.。

Figure 4-42 Parallel effect

Note that the following conditions must be met when setting parallel：

1. The selected device supports parallel function.

2. The selected channel is not being tested.

3. The selected channels are not connected in parallel yet.

4. Continuous channels need to be selected.

5. When multiple devices are connected in parallel, the devices need to be in the same group and the number is not 0, and all selected devices need to select all channels.

6. The maximum number of parallel devices is 32

7. The maximum number of parallel channels depends on the device version.

If the sub-menu is unavailable, the reason for the unavailability will be shown in parentheses.

4.3.21 Open-circuit voltage

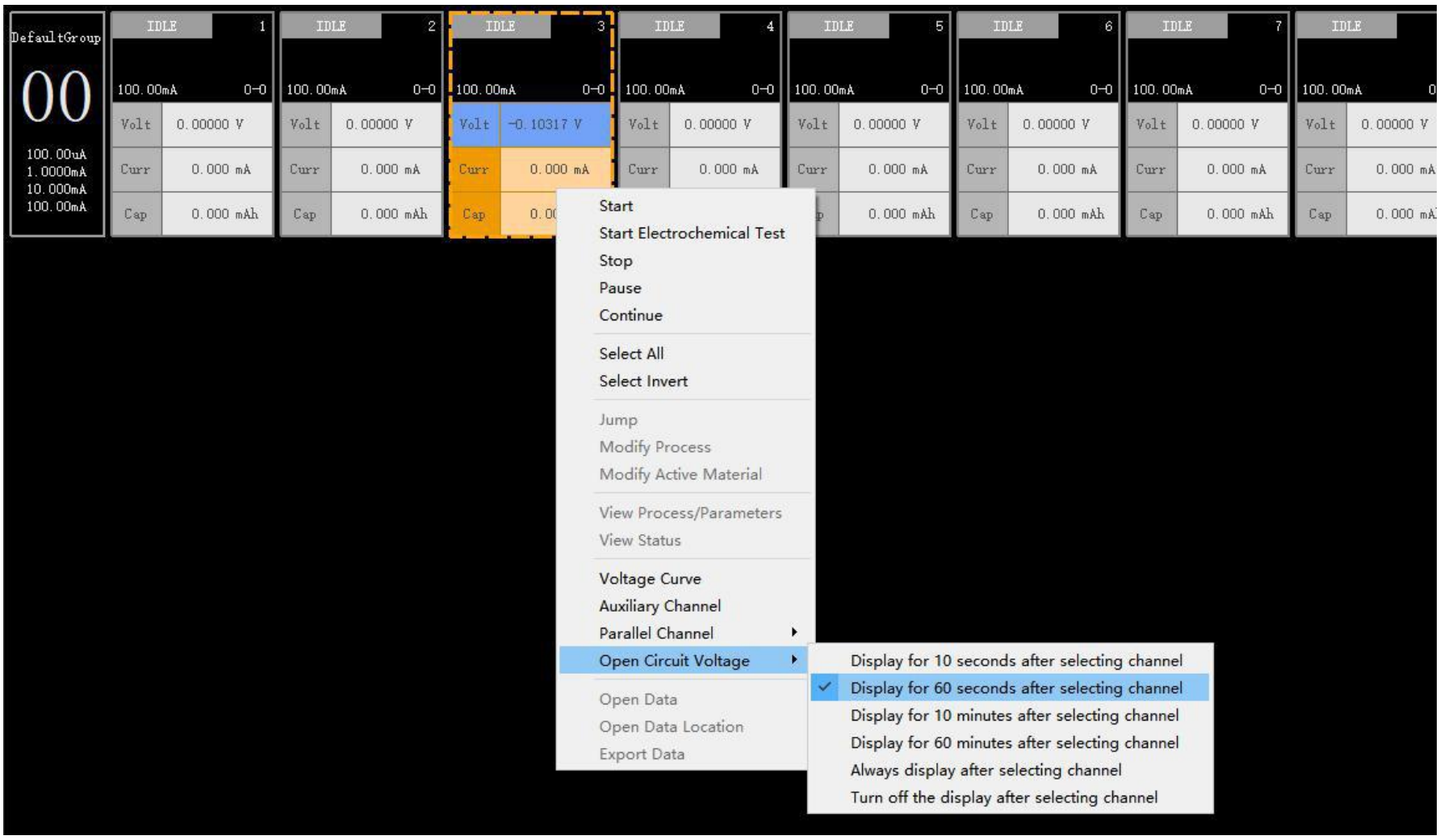


Figure 4-43 Open-circuit voltage settings

Open-circuit voltage can be displayed when channel is selected.This feature is off by default.

For example in Figure, if you switch to item 2, the open-circuit voltage will be displayed automatically after selecting the channel for 1 minute.

Display effect:

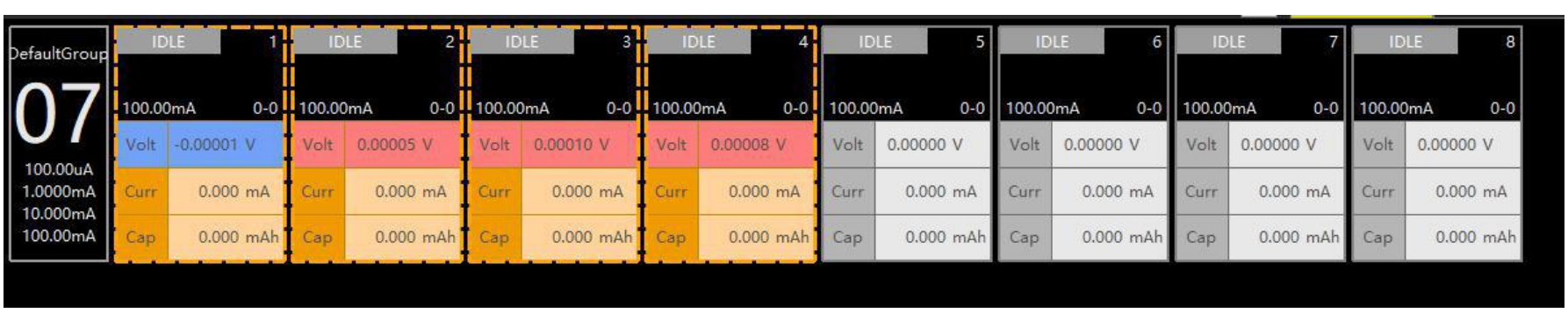


Figure 4-44 Open-circuit voltage display effect

If the channel is displaying an open-circuit voltage, its voltage background color is red (+) or blue (-).

4.2.22 Open data

During the test, you can view the test data of the channel at any time.

Several ways to open data:

1. Channel area

Method 1: Double click on a channel. (The channel is in test or completion status)

Method 2: Right-click on a channel and select the menu "Open Data".

Menu "Open Data Location", can locate the folder of the data.

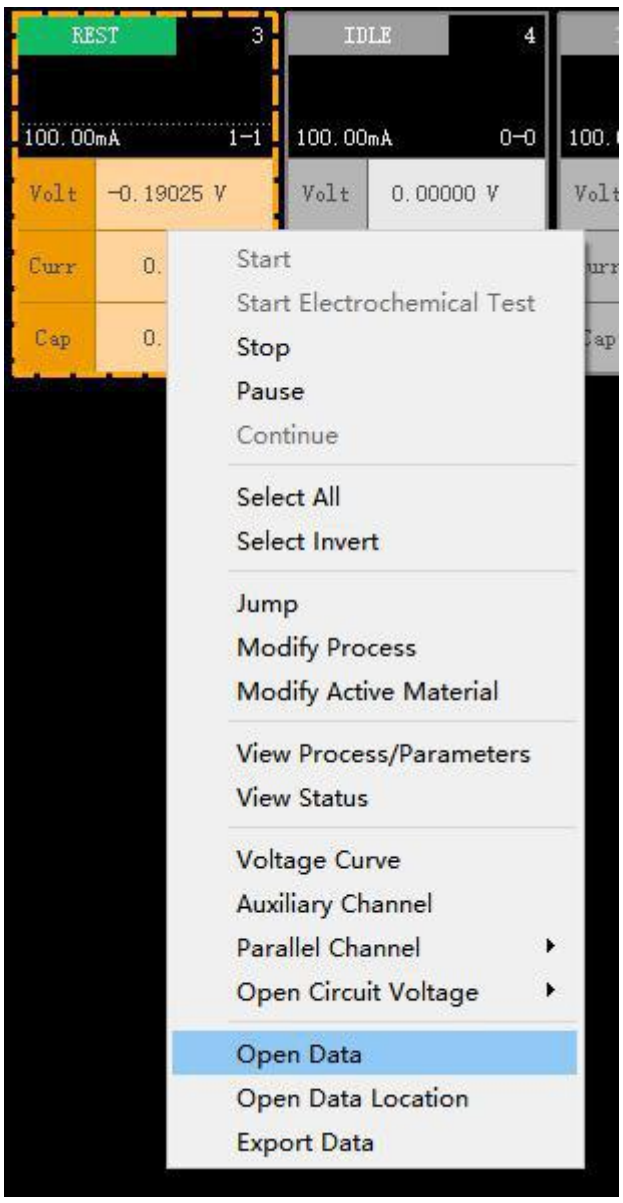


Figure 4-45 Open data

2. Test history area

Right-click on the first-level node and the menu "Open Data" opens all channel data of this test.

Right-click on the secondary node and the menu "Open Data" opens one channel data of this test. You can also double click to open.

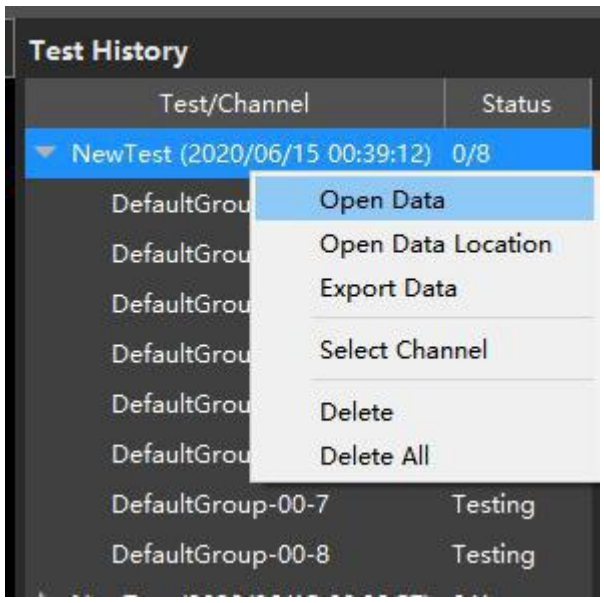


Figure 4-46 Open all data for a test

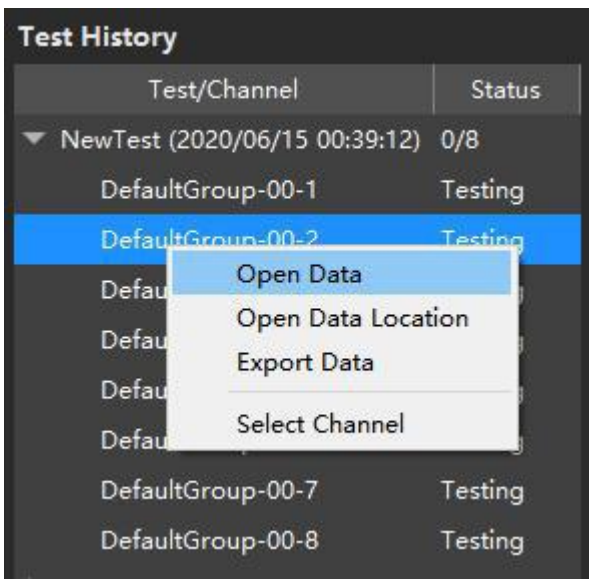


Figure 4-47 Open one data for a test

4.3.23 Export Data

See chapter 5.9 for details.

4.3.24 Reacquire Data

When the test data is not received, you can try to pull the data again through the menu "Reacquire Data".

The menu is hidden by default. You can display the menu by simply pressing the CTRL key while you right-click.

Note: This function will try to re-transmit the complete data, which may take a long time. Only recommended to deal with missing test data. If you still can't find the data, please keep the current state of the device and contact the technician.

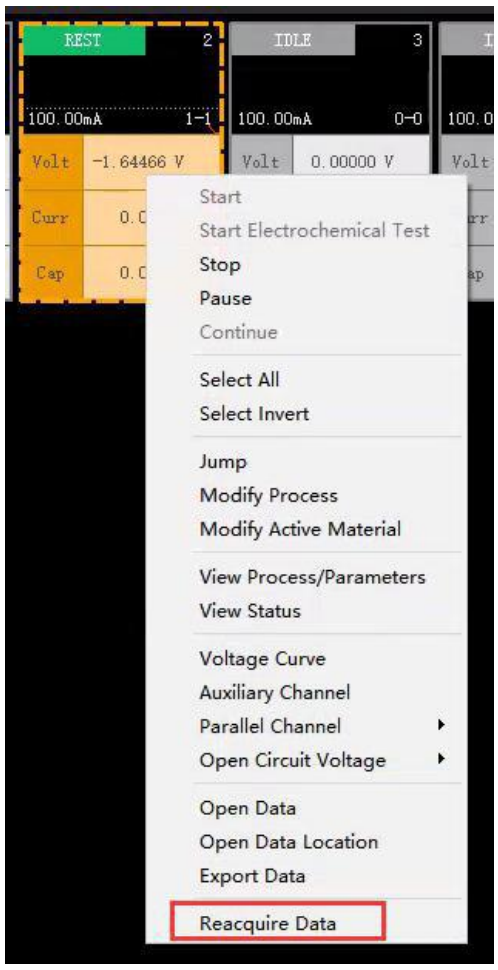


Figure 4-48 Menu-Reacquire Data

4.2.25 Modify sampling rate

This function is used to adjust the sampling speed of the device to obtain different accuracy.

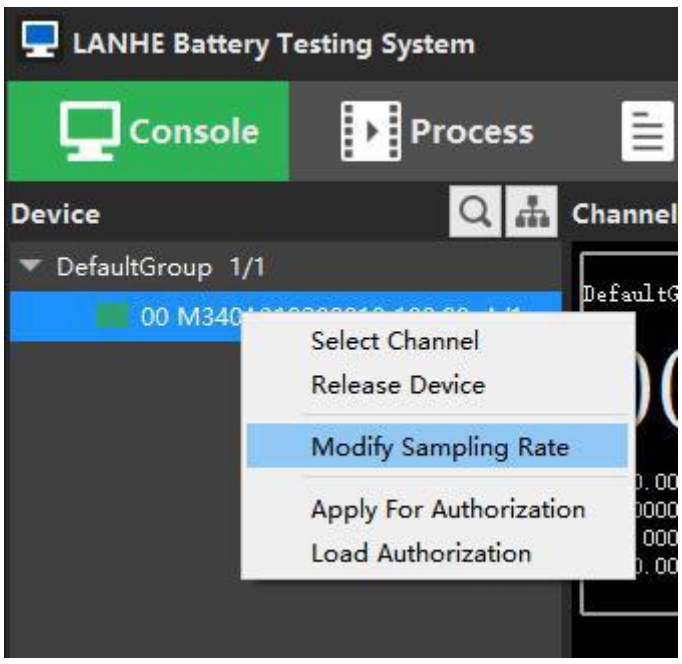


Figure 4-49 Menu-Modify Sampling Rate

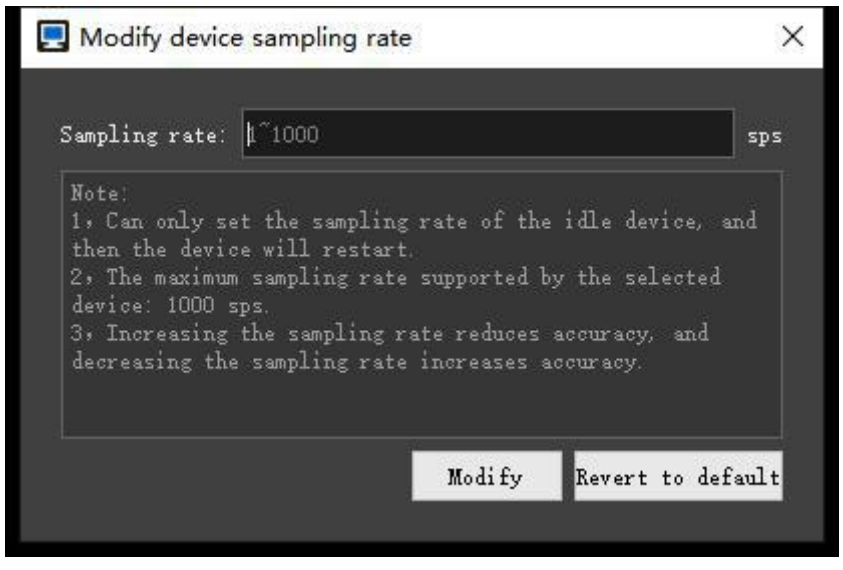


Figure 4-50 Modify sampling rate window

If the factory sampling rate is 100sps and the maximum supported sampling rate is 1000sps, you can:

1. If the actual test uses less than 100sps, you can lower the sampling rate to obtain higher accuracy.

2. If the actual test requires a higher sampling rate, a higher sampling rate can be set, but accuracy will be slightly lost.

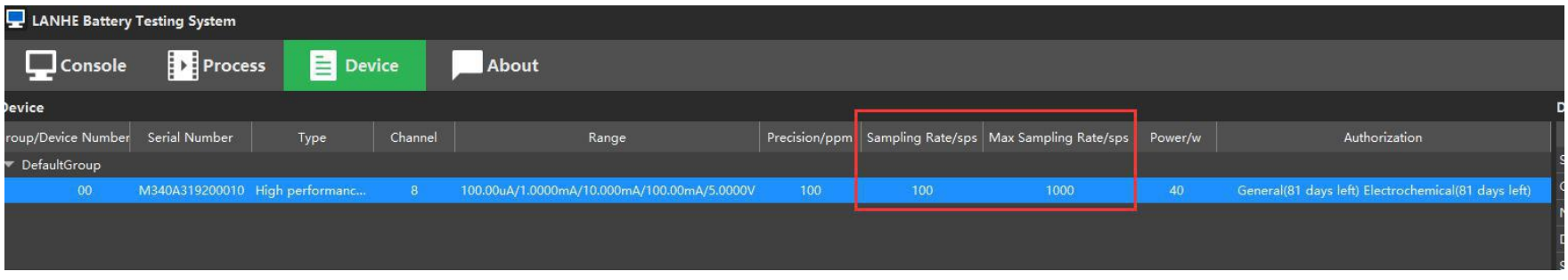


Figure 4-51 View device sampling rate

4.2.26 Test history

The test history preserves the history of all tests.

The first-level node is a test, and the secondary node is the channel of the test.

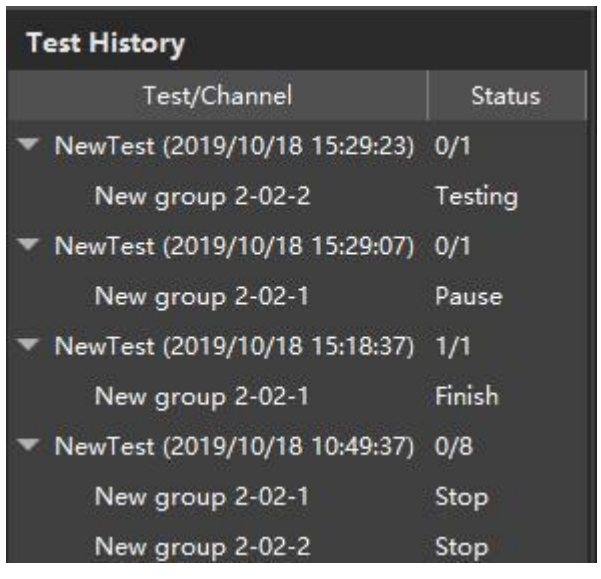


Figure 4-43 Test history

4.3 Process

4.3.1 Process interface

The process interface includes two parts: "Process list" and "Edit process".

Process list: Display all processes, providing functions such as creating, deleting, copying, importing, and exporting.

Edit process: writing step, setting basic information and protection conditions.

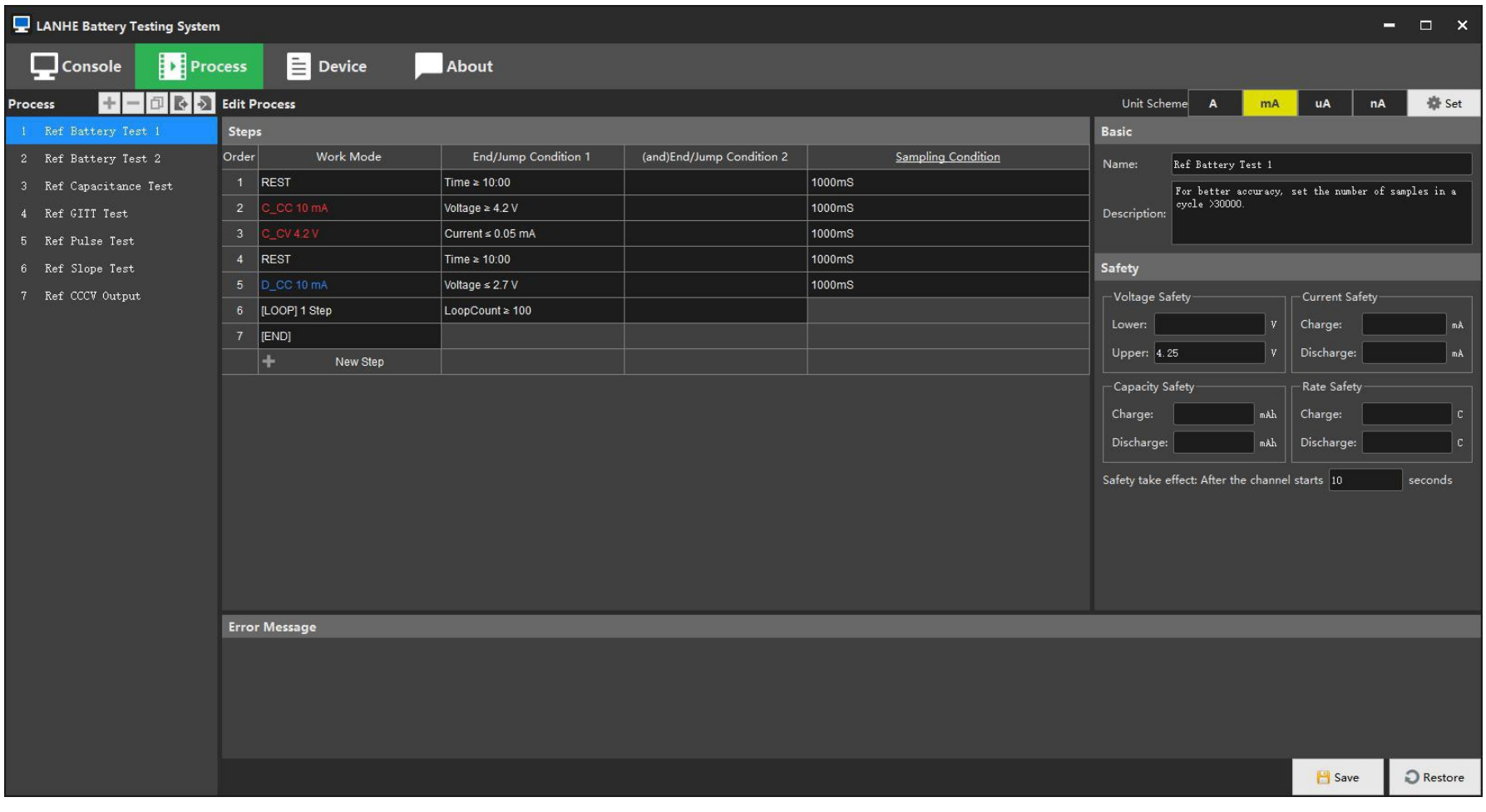


Figure 4-44 Process

4.3.2 Process list

The process list is used to manage the process.

You can add, delete, copy, import, and export the process through the upper button or right click menu.

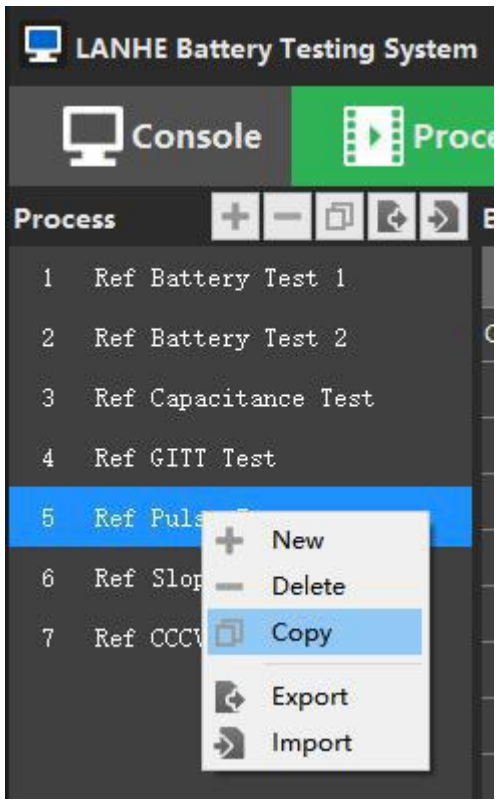
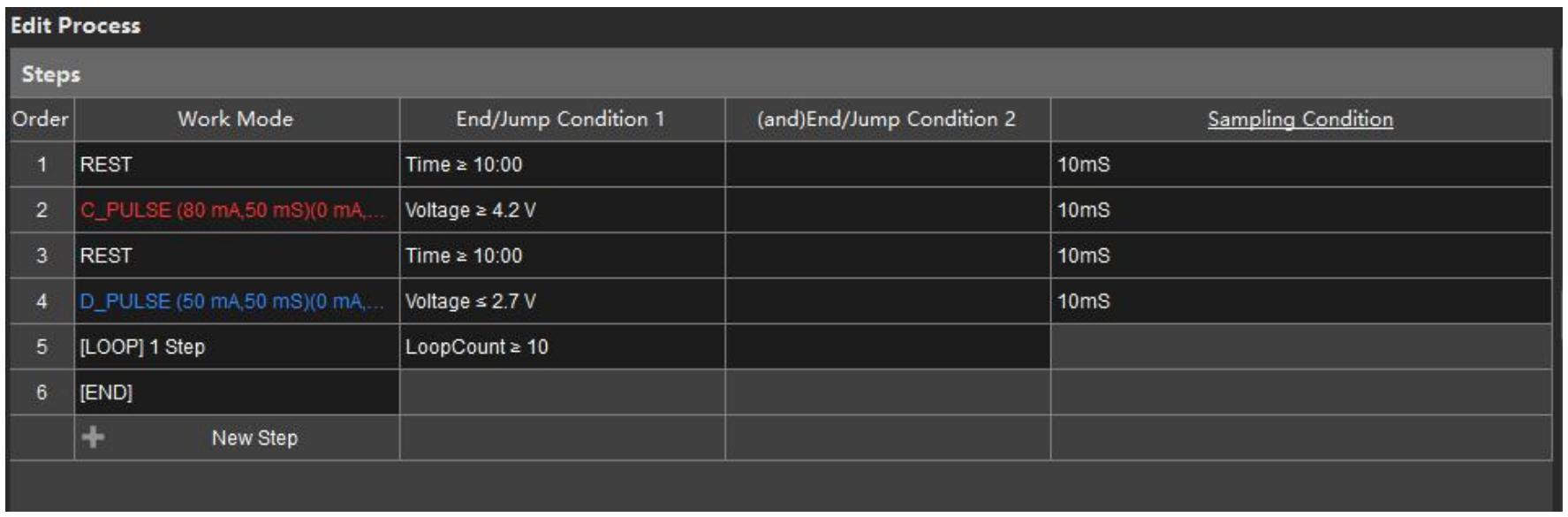


Figure 4-45 Process list

4.3.3 Steps

For the specific step editing method, see **Chapter 7, Edit Step**.

The following figure shows an example of a simple lithium battery cycle:



Edit Process

Steps

Order	Work Mode	End/Jump Condition 1	(and)End/Jump Condition 2	Sampling Condition
1	REST	Time ≥ 10:00		10mS
2	C_PULSE (80 mA,50 mS)(0 mA,...	Voltage ≥ 4.2 V		10mS
3	REST	Time ≥ 10:00		10mS
4	D_PULSE (50 mA,50 mS)(0 mA,...	Voltage ≤ 2.7 V		10mS
5	[LOOP] 1 Step	LoopCount ≥ 10		
6	[END]			
	New Step			

Figure 4-46 Step example

4.3.4 Unit scheme

For different batteries or capacitors, different ranges are required for testing. The units of current, capacity and other parameters are different. We provide 3 unit schemes to adapt.

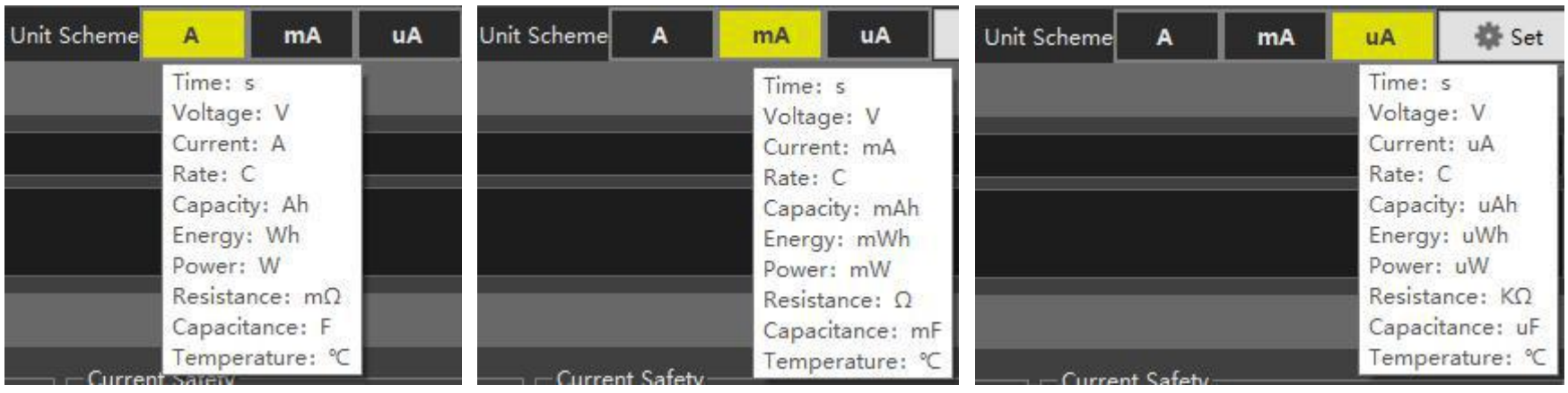


Figure 4-47 Unit schemes

4.3.5 Process settings

Click the button 

in the upper right corner of the process page to open the settings dialog. You can configure work mode,unit scheme and so on.

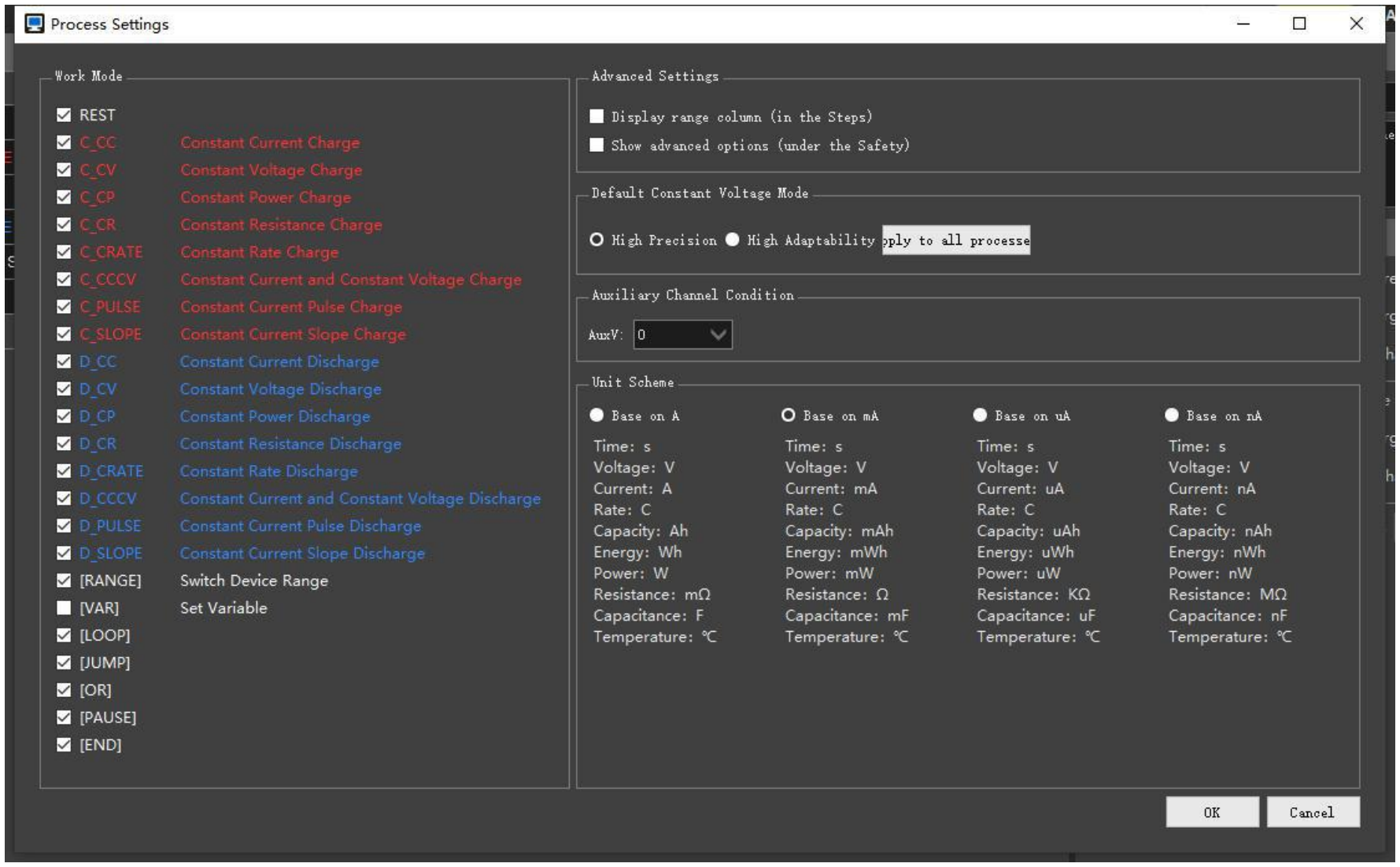


Figure 4-48 Process settings

4.4 Device

This page allows you to view device details.

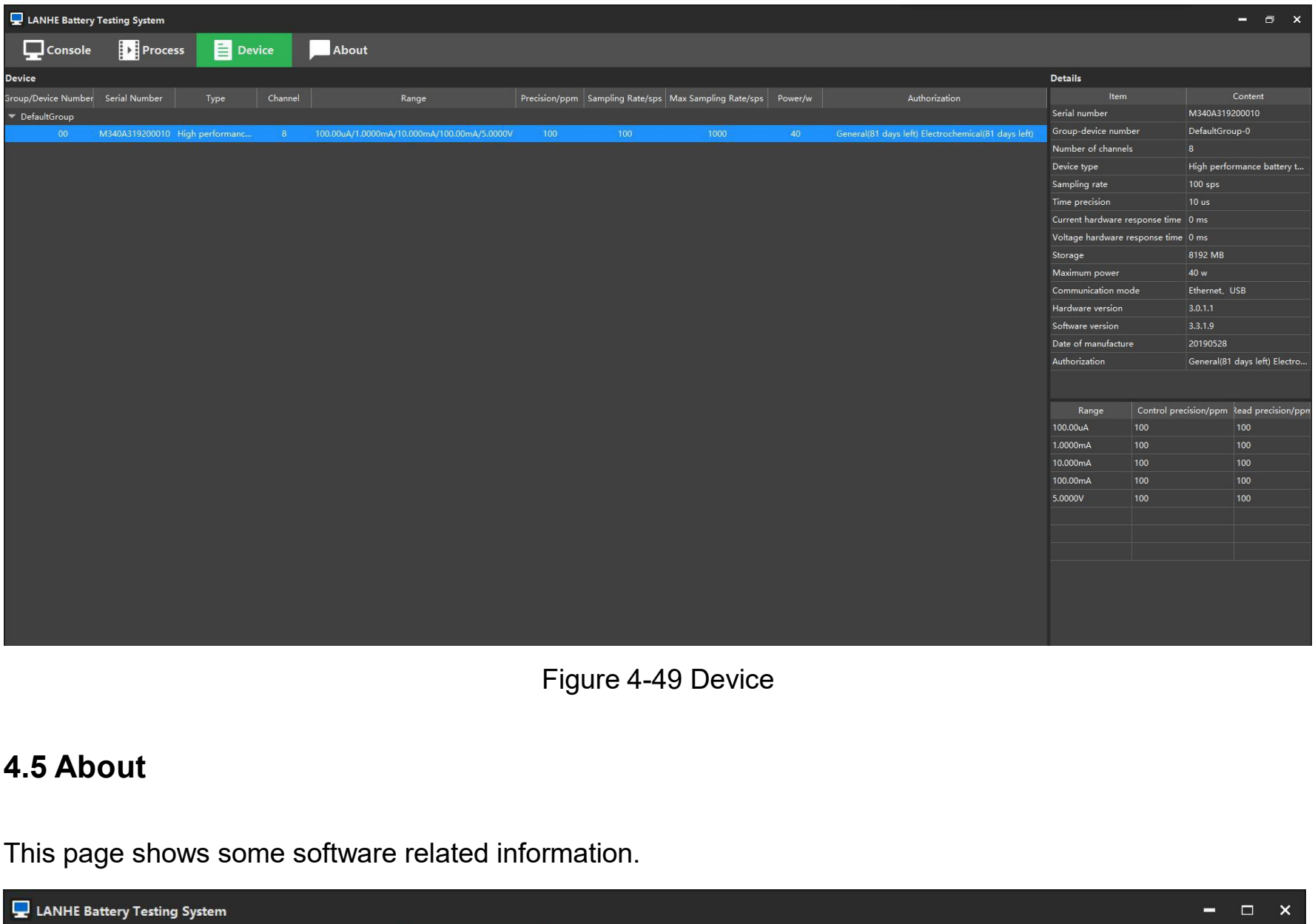


Figure 4-49 Device

4.5 About

This page shows some software related information.

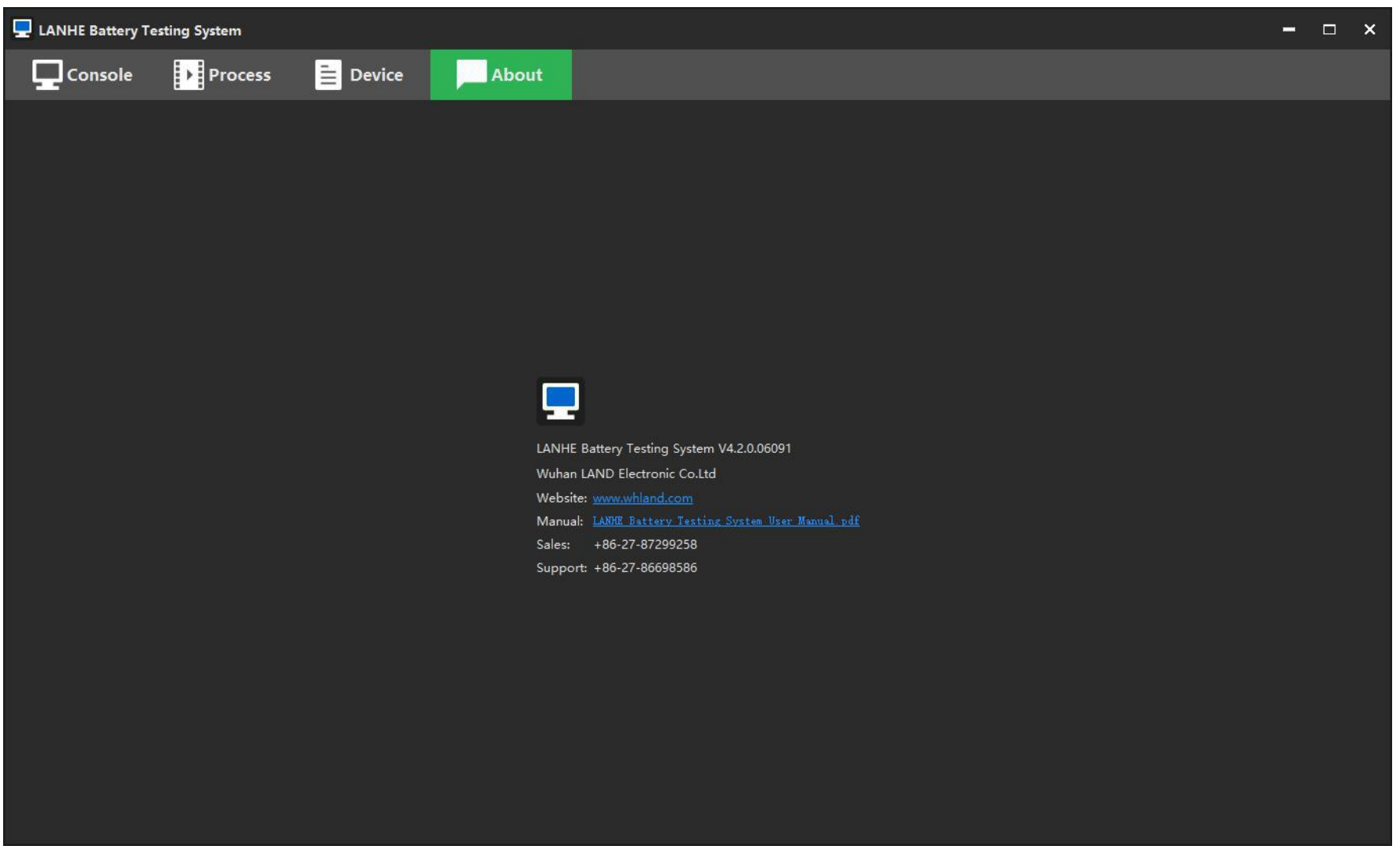


Figure 4-50 About

5. LANHE Data

LANHE Data software can view test data and analyze data through graphs and tables.

5.1 Interface

The software interface is mainly divided into 5 parts: ①Title bar ②Toolbar ③Graphics area ④Data area, ⑤Cycle filter.

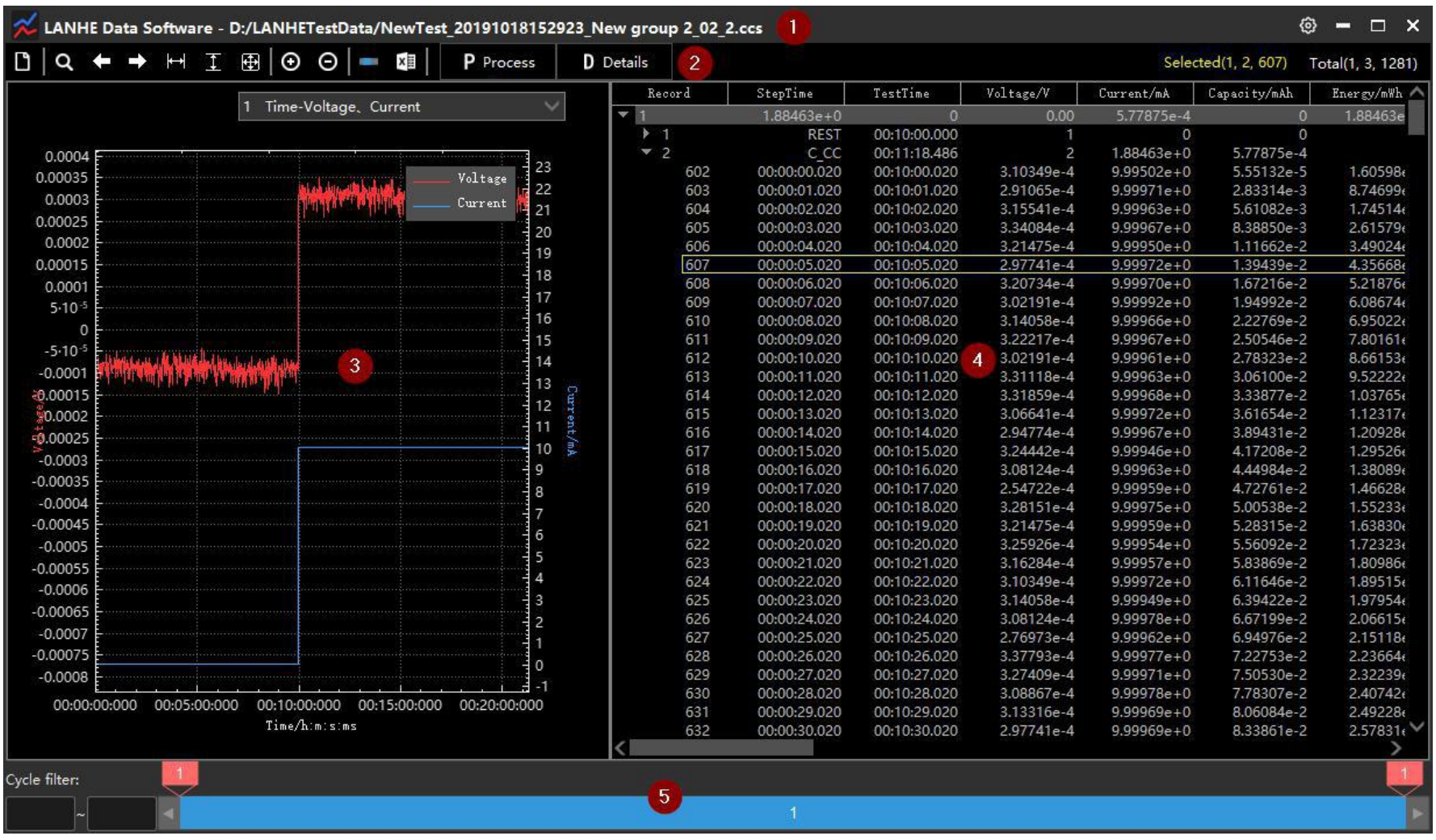


Figure 5-1 Data software interface

Section	Description
1.Title bar	Display software title, currently open file path

2.Toolbar	Open files, common graphics operations, common data expansion, and other accessibility features.
3.Graphics area	Show various data curves
4.Data area	Display all data in a hierarchical manner
5.Cycle filter	Filter data by cycles

Table 5-1 Data software functions

5.2 Toolbar

The toolbar can do some useful operations on the graphics area or data area.

Toolbar functions:

Icon	Name	Description
	Open	Open data file
	Zoom	Graphic--Select an area to enlarge
	Previous	Graphic--Fall back to the previous state
	Next	Graphic--Advance to the next state
	Matching width	Graphic--Revert to initial width
	Matching height	Graphic--Revert to initial height
	Match width and height	Graphic--Revert to initial width and height
	Expand	Data--Expand all cycles, if all are expanded, expand all the steps
	Fold	Data--Fold all the steps, if all are folded, fold all the cycles
	Cycle filter	Controls the displayed cycle range, showing all cycles by default
	Export data	Export data to EXCEL or TEX format document.
	View process	View the process of the data
	View details	View test details

Table 5-2 Toolbar functions

5.3 Open data file

How to open the data file:

Method 1: Double click on a .ccs data file.

Method 2: Drag a .ccs data file to the software window.

Method 3: Click the toolbar icon  to bring up the “Open Data File” dialog box and select a .ccs format file.

Method 4: In the LANHE Mon software, double-click on a channel that is being tested or completed.

Method 5: In the LANHE Mon software, double-click the test history on the right to open the historical test data.

5.4 Cycle filter

Cycle filter tool can adjust the number of visible loops.

At the bottom of the software, you can enter the start and end cycle number or drag the slider to filter the cycles.

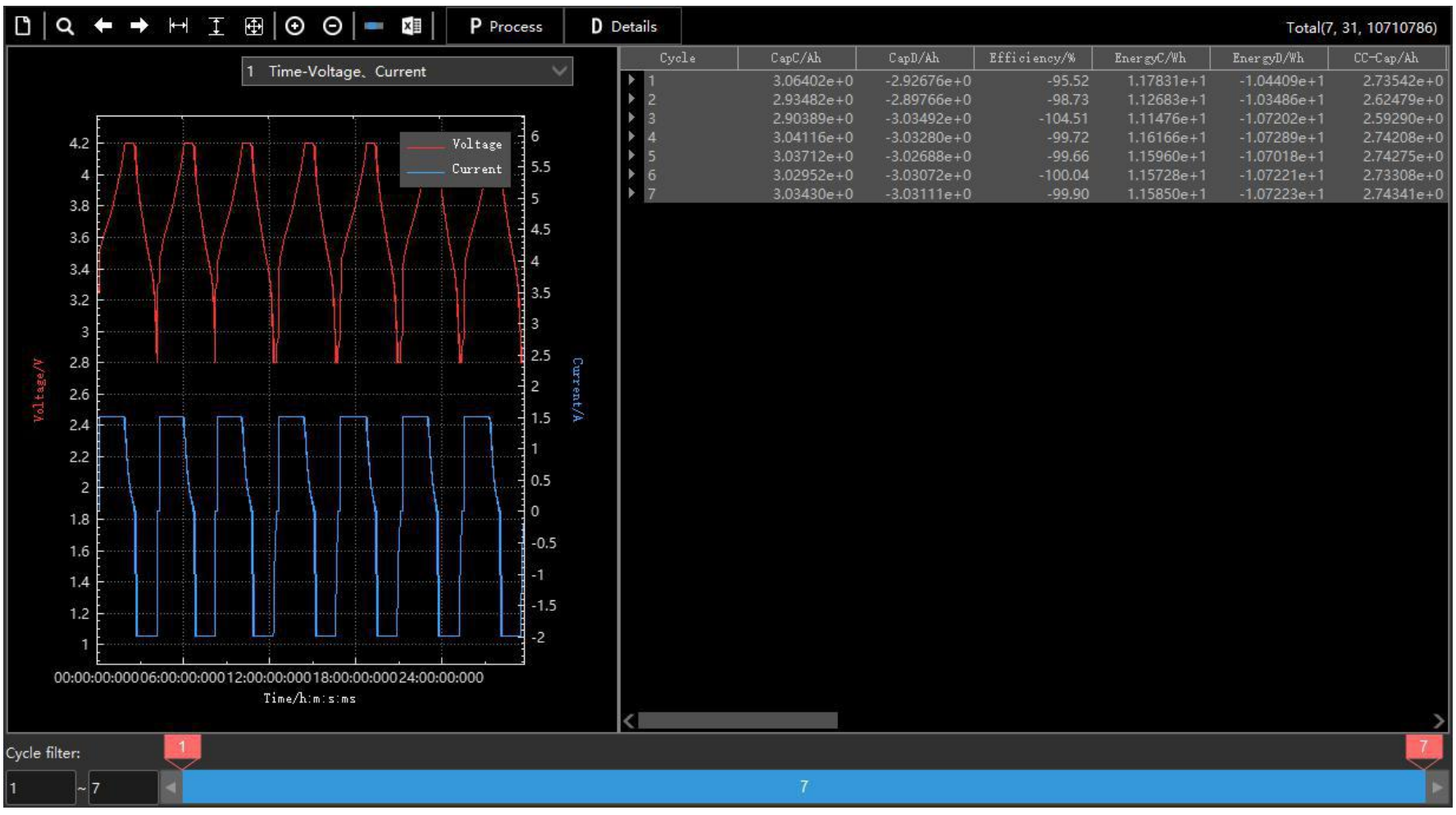


Figure 5-2 All Cycles

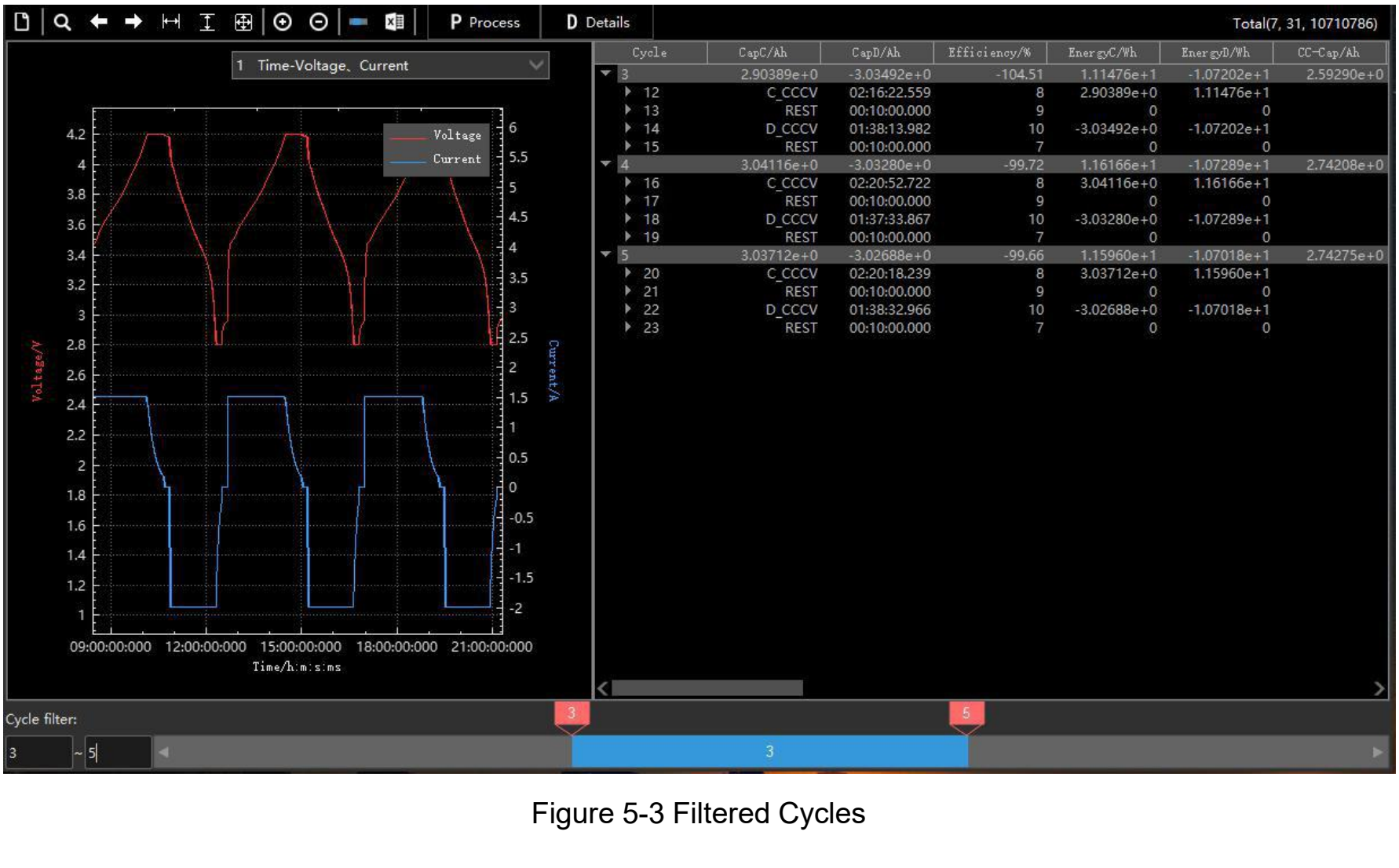


Figure 5-3 Filtered Cycles

5.5 Graphic area

5.5.1 Interface

The graphic area includes:

①graphic types ②Y1 axis ③Y2 axis ④X axis ⑤ curve

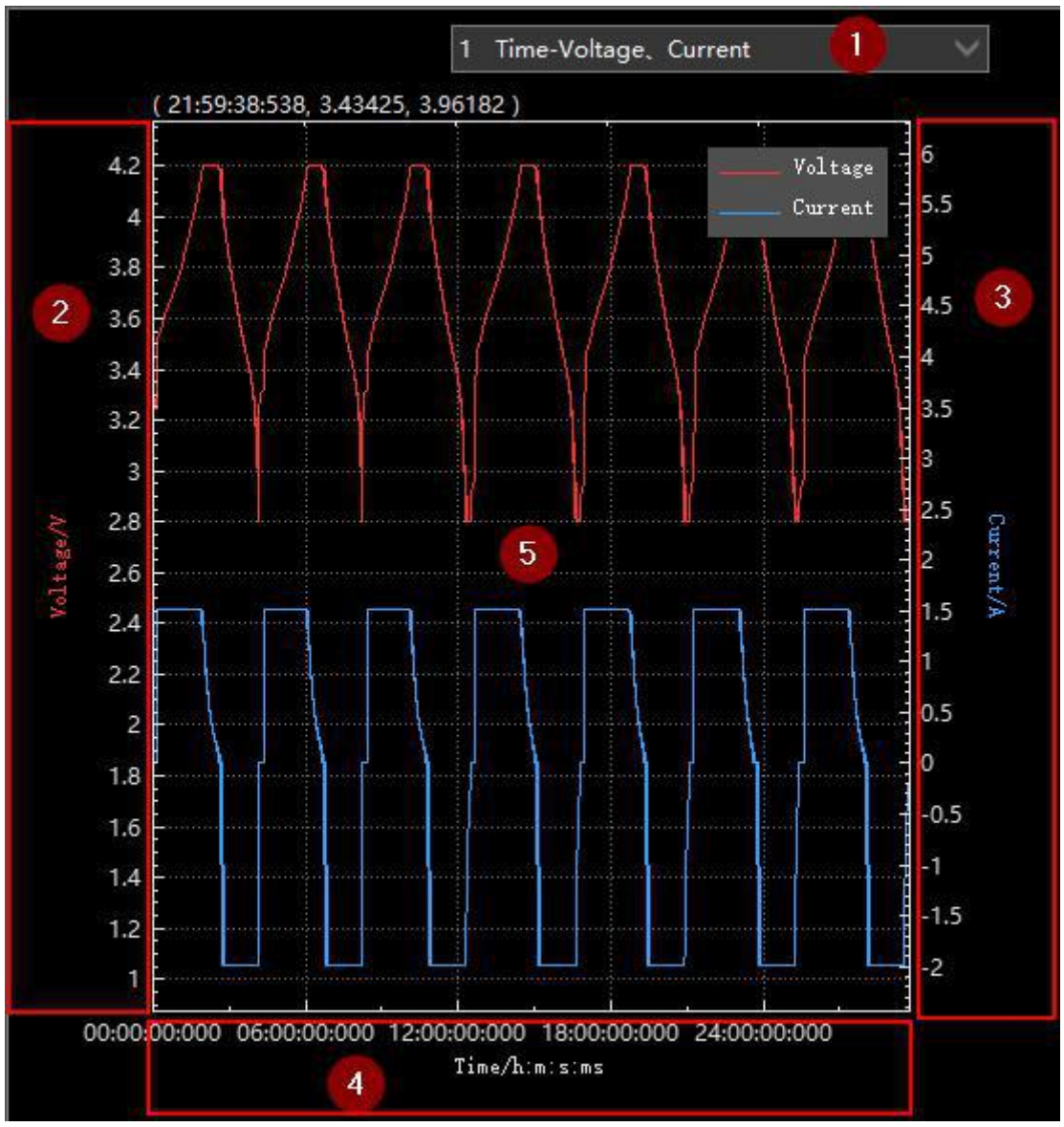


Figure 5-4 Graphic area

Support multiple curve types:

1.Time-Voltage, Current

2.Capacity-Voltage

3.Energy-Voltage

4.Specific capacity-Voltage

5.Specific Energy-Voltage

6.Step-Capacity, Energy

7.Cycle-Efficiency, Capacity

8.Cycle-Efficiency, Specific Capacity

9.Cycle-Efficiency, Energy

10.Cycle-Efficiency, Specific Energy

11.Cycle-Platform ratio, Platform Capacity

12.Cycle-Discharge mid and end Voltage

13.Cycle-DCIR

14.Cycle-Capacitance

15.Remaining capacity ratio-Voltage

16.dQ/dV.

5.5.2 Operation method

Data software provides a free and convenient way to manipulate graphics.

With the mouse wheel and shortcut keys, you can flexibly view the curve at any position.

Operation method:

Function	Operation	Details
Move graphic	Mouse drag	1. Press in the ⑤curve area and drag all the graphics in any direction
		2. Press in the ④X-axis area to drag all graphics horizontally.(Press Shift in 1 to switch to this mode)
		3. Press in the ②Y1 axis area to drag the graphic belonging to the Y1 axis vertically.(Press Ctrl in 1 to switch to this mode)
		4. Press in the ③Y2 axis area to drag the graphic belonging to the Y2 axis vertically.(Press Alt in 1 to switch to this mode)
Zoom graphic	Mouse wheel	1. When the mouse is in the ⑤curve area, the graphics can be scaled horizontally and vertically simultaneously
		2. When the mouse is in the ④X-axis area, all graphics can be scaled horizontally.(Press Shift in 1 to switch to this mode)
		3. When the mouse is in the ②Y1 axis area, the graphics belonging to the Y1 axis can be vertically scaled.(Press Ctrl in 1 to switch to this mode)
		4. When the mouse is in the ③Y2 axis area, the graphics belonging to the Y2 axis can be vertically scaled.(Press Alt in 1 to switch to this mode)
Locate data	Double click	Double click the mouse in the curve area to locate the data
	Click curve	Some curves can be located to its cycle by clicking

Table 5-3 Graphic operation

Example 1: Double click to locate a record

Figure 5-5 Locate a record

Example 2: Click on the curve to locate its cycle

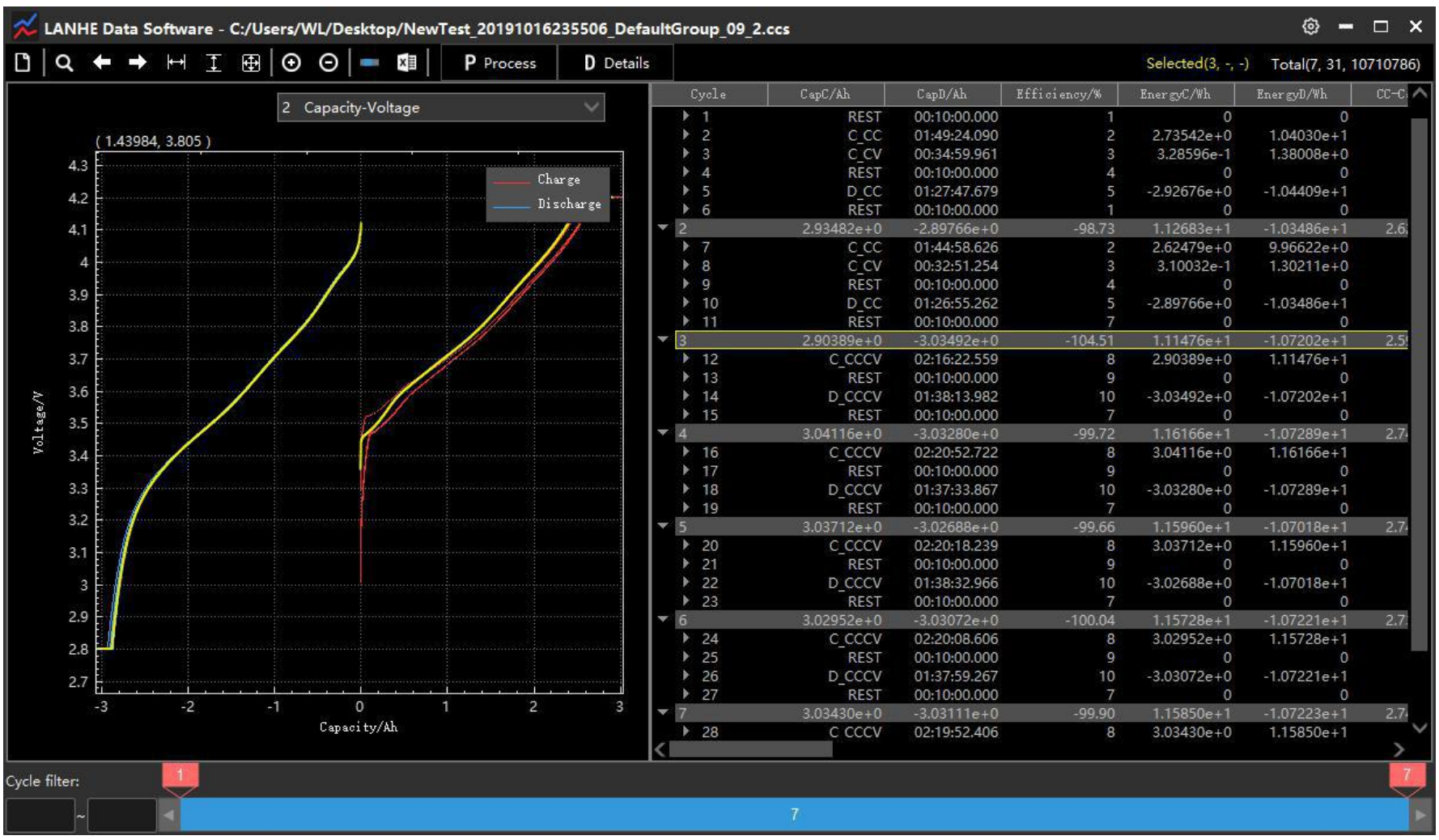


Figure 5-6 Locate a cycle

5.5.3 Right-click menu

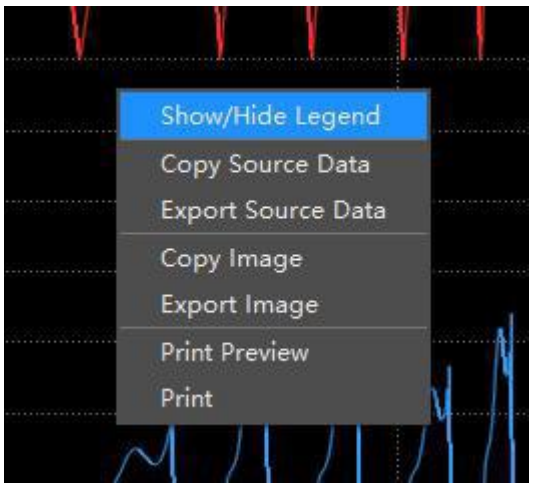


Figure 5-7 Right-click menu

Menu	Description
Show/Hide Legend	Show or hide the legend in the upper right corner
Copy Source Data	Copy the X / Y axis data of the current drawing to the clipboard
Export Source Data	Export the X / Y axis data of the current drawing to a text file
Copy Image	Save graphics to clipboard
Export Image	Save graphics to image file
Print Preview	Pop up print preview dialog
Print	Pop up print dialog

Table 5-4 Menu function

5.6 Data area

5.6.1 Interface

The data is divided into: ①Header ②Cycle ③Step ④Record

Figure 5-7 Data area

5.6.2 Adaptive header

There are 3 levels of data, when you click on different levels, the header automatically adapts to that level.

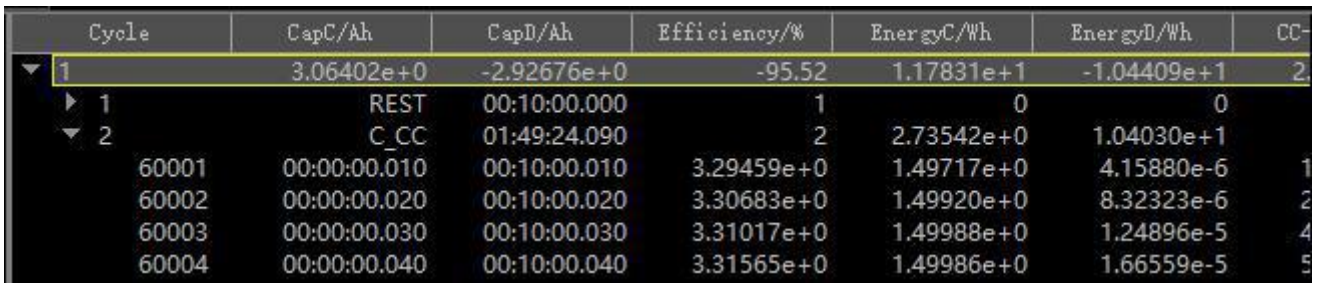


Figure 5-8 Cycle header

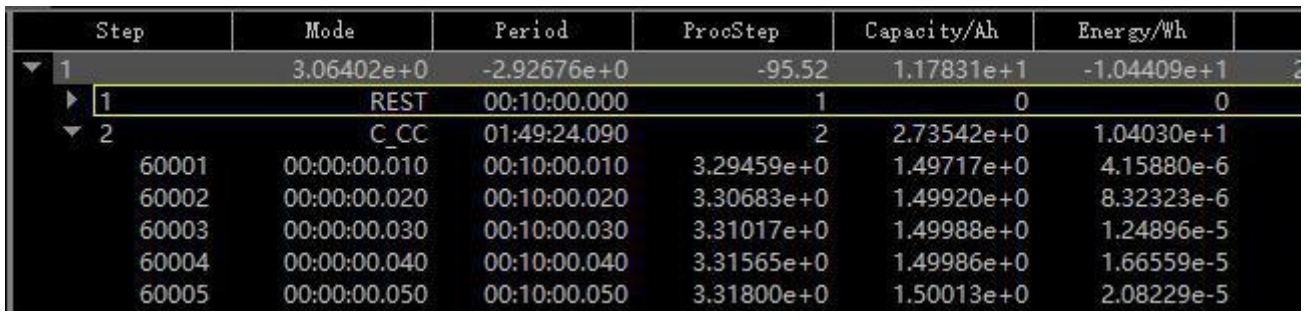


Figure 5-9 Step header

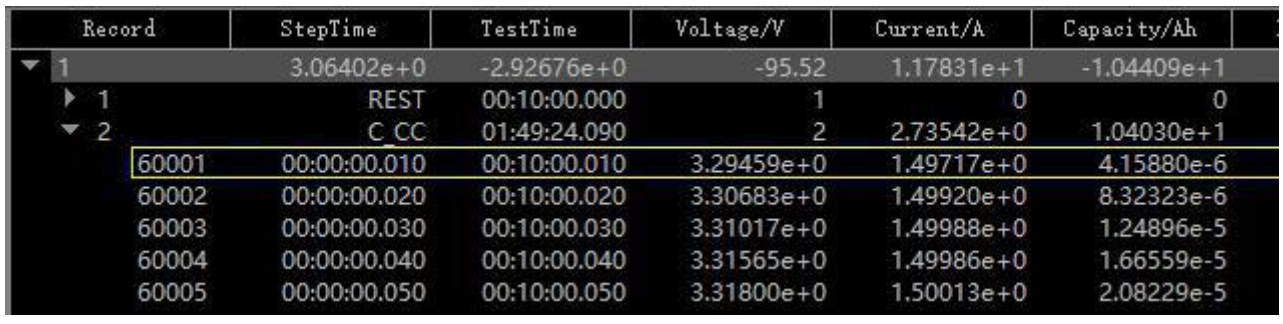


Figure 5-10 Record header

5.6.3 Column visibility

You can configure which columns are visible through the header right-click menu.

The following Figures show the menu of the three headers：

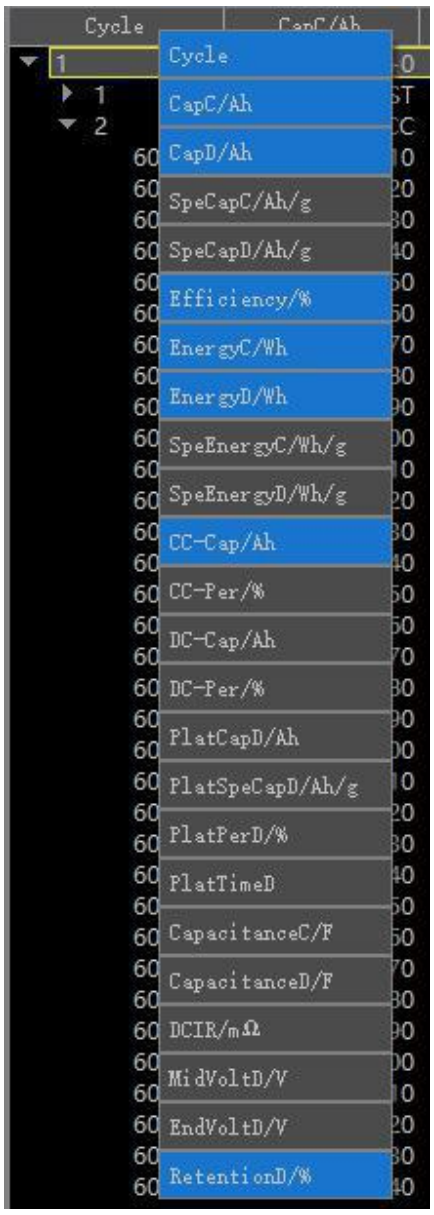


Figure 5-11 Cycle menu

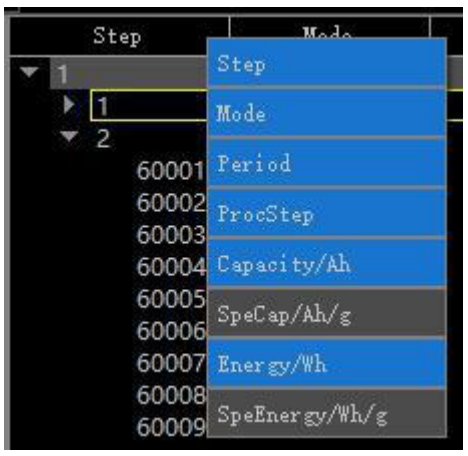


Figure 5-12 Step menu

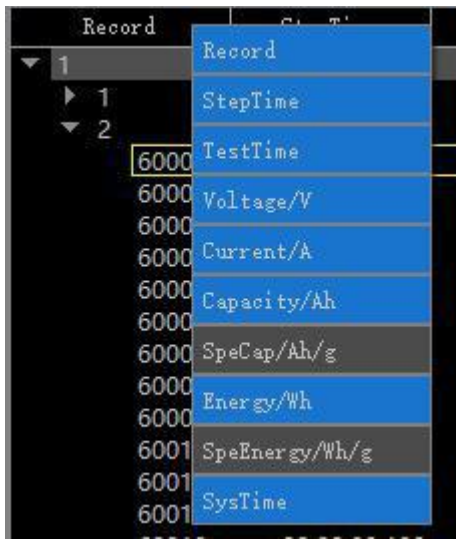
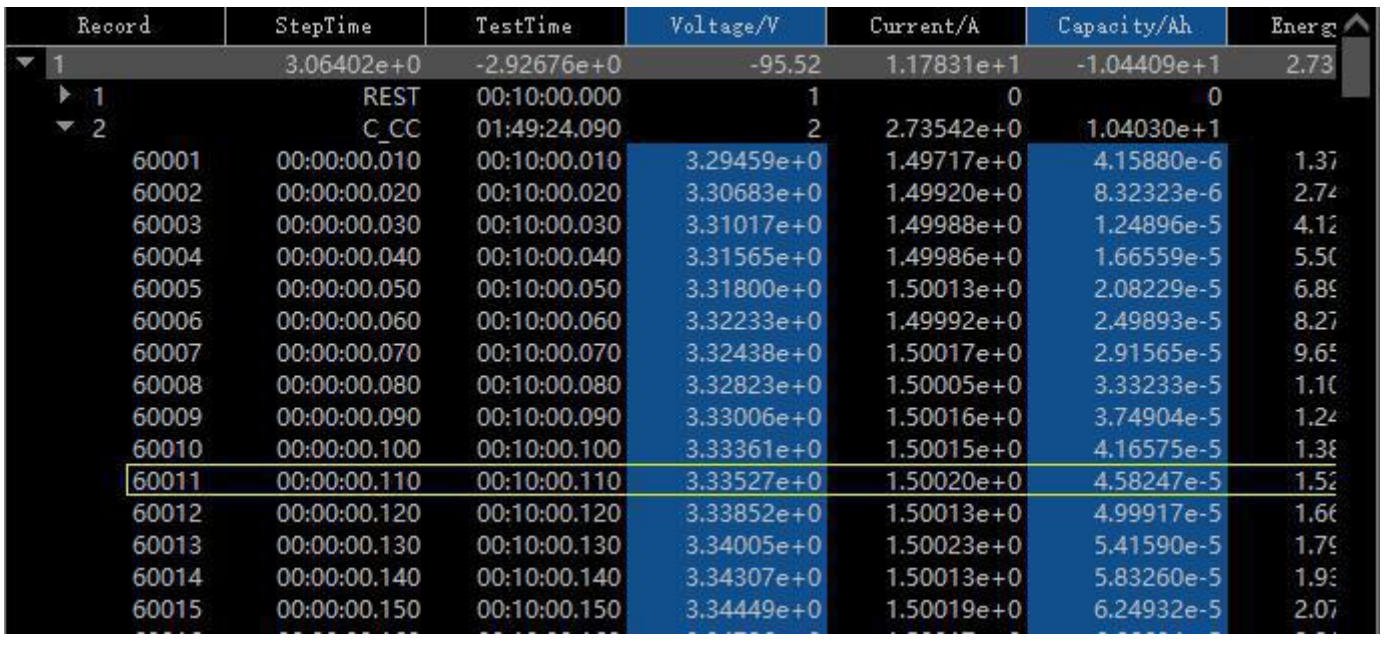


Figure 5-13 Record menu

5.6.4 Highlight and copy data

You can click on the column header to highlight the column data, click again to cancel highlighting.



Record	StepTime	TestTime	Voltage/V	Current/A	Capacity/Ah	Energ
1	3.06402e+0	-2.92676e+0	-95.52	1.17831e+1	-1.04409e+1	2.73
1	REST	00:10:00.000	1	0	0	
2	C_CC	01:49:24.090	2	2.73542e+0	1.04030e+1	
60001	00:00:00.010	00:10:00.010	3.29459e+0	1.49717e+0	4.15880e-6	1.37
60002	00:00:00.020	00:10:00.020	3.30683e+0	1.49920e+0	8.32323e-6	2.74
60003	00:00:00.030	00:10:00.030	3.31017e+0	1.49988e+0	1.24896e-5	4.12
60004	00:00:00.040	00:10:00.040	3.31565e+0	1.49986e+0	1.66559e-5	5.50
60005	00:00:00.050	00:10:00.050	3.31800e+0	1.50013e+0	2.08229e-5	6.89
60006	00:00:00.060	00:10:00.060	3.32233e+0	1.49992e+0	2.49893e-5	8.27
60007	00:00:00.070	00:10:00.070	3.32438e+0	1.50017e+0	2.91565e-5	9.65
60008	00:00:00.080	00:10:00.080	3.32823e+0	1.50005e+0	3.33233e-5	1.10
60009	00:00:00.090	00:10:00.090	3.33006e+0	1.50016e+0	3.74904e-5	1.24
60010	00:00:00.100	00:10:00.100	3.33361e+0	1.50015e+0	4.16575e-5	1.38
60011	00:00:00.110	00:10:00.110	3.33527e+0	1.50020e+0	4.58247e-5	1.52
60012	00:00:00.120	00:10:00.120	3.33852e+0	1.50013e+0	4.99917e-5	1.66
60013	00:00:00.130	00:10:00.130	3.34005e+0	1.50023e+0	5.41590e-5	1.79
60014	00:00:00.140	00:10:00.140	3.34307e+0	1.50013e+0	5.83260e-5	1.93
60015	00:00:00.150	00:10:00.150	3.34449e+0	1.50019e+0	6.24932e-5	2.07

Figure 5-14 Highlight column

When switching levels, the highlight state will be invalid.

Highlighted data can be copied to the clipboard via the context menu "Copy highlighted data".

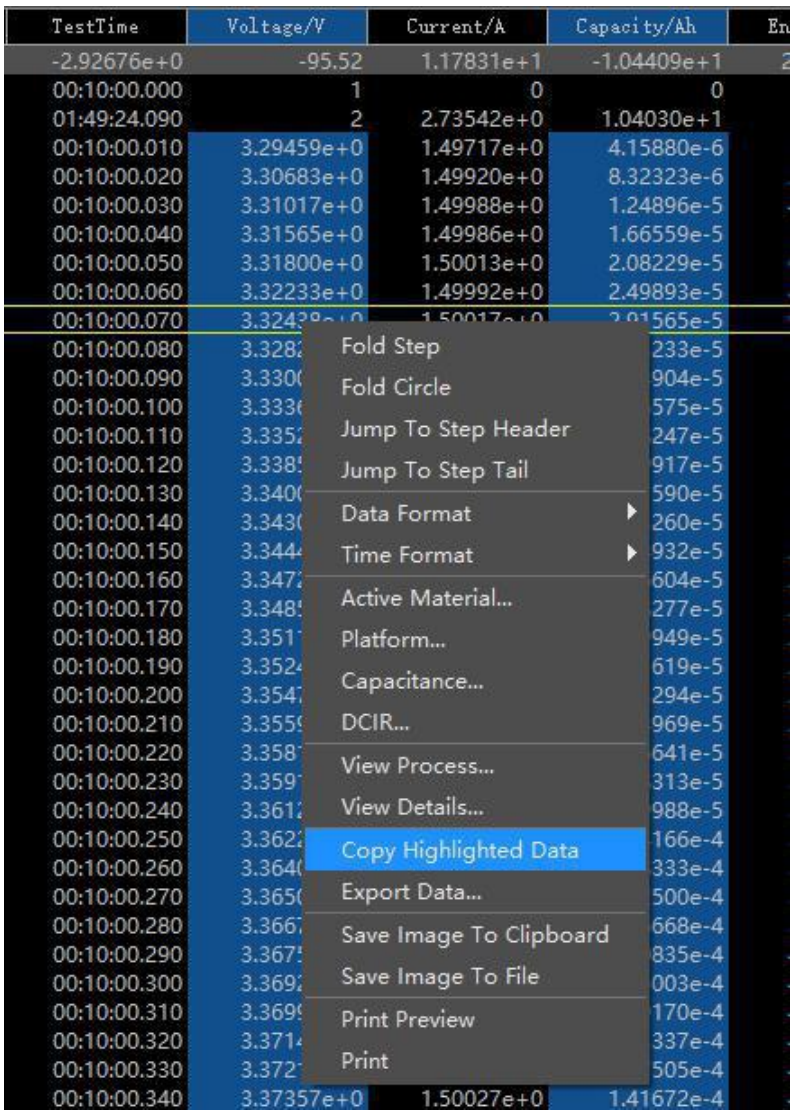


Figure 5-15 Copy highlighted data

	A	B
1	Voltage/V	Capacity/Ah
2	3.29E+00	4.00E-06
3	3.31E+00	8.00E-06
4	3.31E+00	1.20E-05
5	3.32E+00	1.70E-05
6	3.32E+00	2.10E-05
7	3.32E+00	2.50E-05
8	3.32E+00	2.90E-05
9	3.33E+00	3.30E-05
10	3.33E+00	3.70E-05
11	3.33E+00	4.20E-05
12	3.34E+00	4.60E-05
13	3.34E+00	5.00E-05
14	3.34E+00	5.40E-05
15	3.34E+00	5.80E-05
16	3.34E+00	6.20E-05
17	3.35E+00	6.70E-05
18	3.35E+00	7.10E-05
19	3.35E+00	7.50E-05
20	3.35E+00	7.90E-05

Figure 5-16 Paste data into excel

5.6.5 Right-click menu

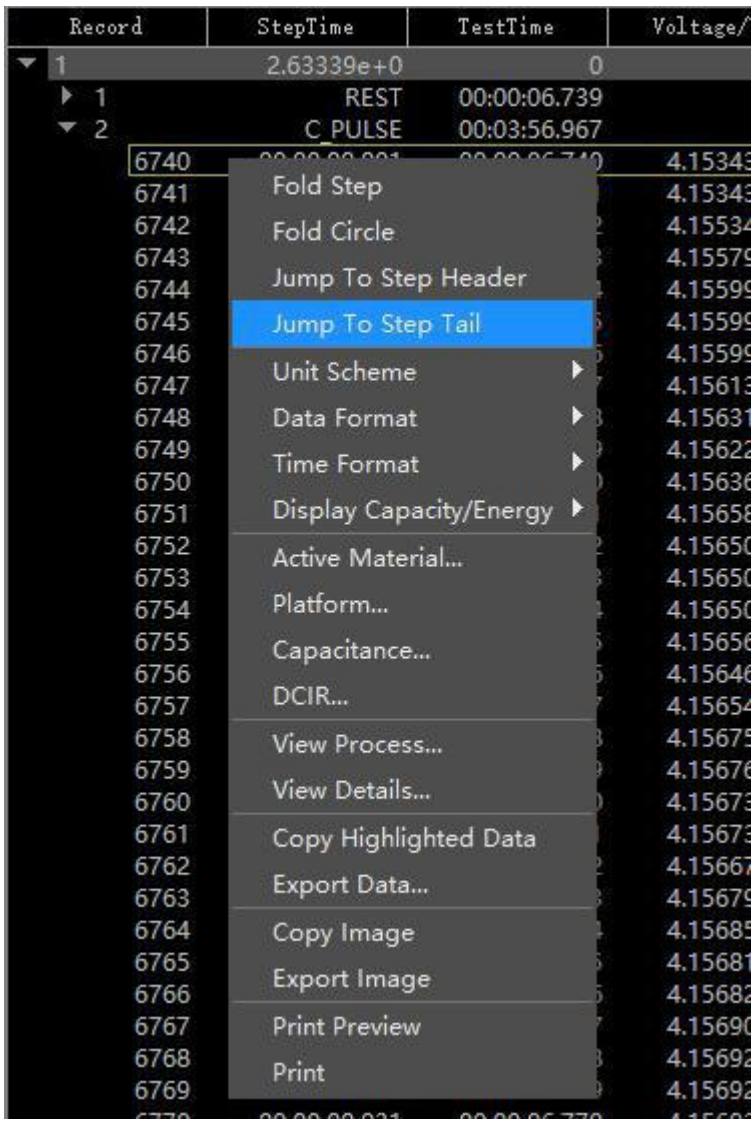


Figure 5-17 Menu

Menu	Description
Fold/Expand Cycle	Fold/Expand Cycle
Fold/Expand Step	Fold/Expand Step
Jump To Step Header/Tail	Select the first/last record of the current step
Unit Scheme	Set the unit scheme for data display.Currently there are 4 units: A/mA/uA/nA.View details in the LANHE Mon software process settings dialog.
Data Format	Set the display format of the data, decimal point or scientific notation
Time Format	Set the display format of time data
Display Capacity/Energy	Set the display mode of capacity/energy data. Accumulate: Cumulative charge and discharge in one cycle. Single Step: Individual statistics for each step.
Active Material	Set active material parameters, in order to calculate specific capacity, specific energy, etc.

Platform	Set the voltage when calculating the discharge platform
Capacitance	Set the high and low voltage when calculating the capacitance
View Process	View the test process
View Details	View test details
Copy Highlighted Data	Copy highlighted data to the clipboard
Export Data	Open the data export window and export the data
Save Image To Clipboard	Save data area image to clipboard
Save Image To File	Save data area image to a image file
Print preview	Bring up the print preview dialog
Print	Bring up the print dialog

Table 5-5 Menu function

5.7 View process

Click the toolbar button P Process ,You can view the process used in this test.

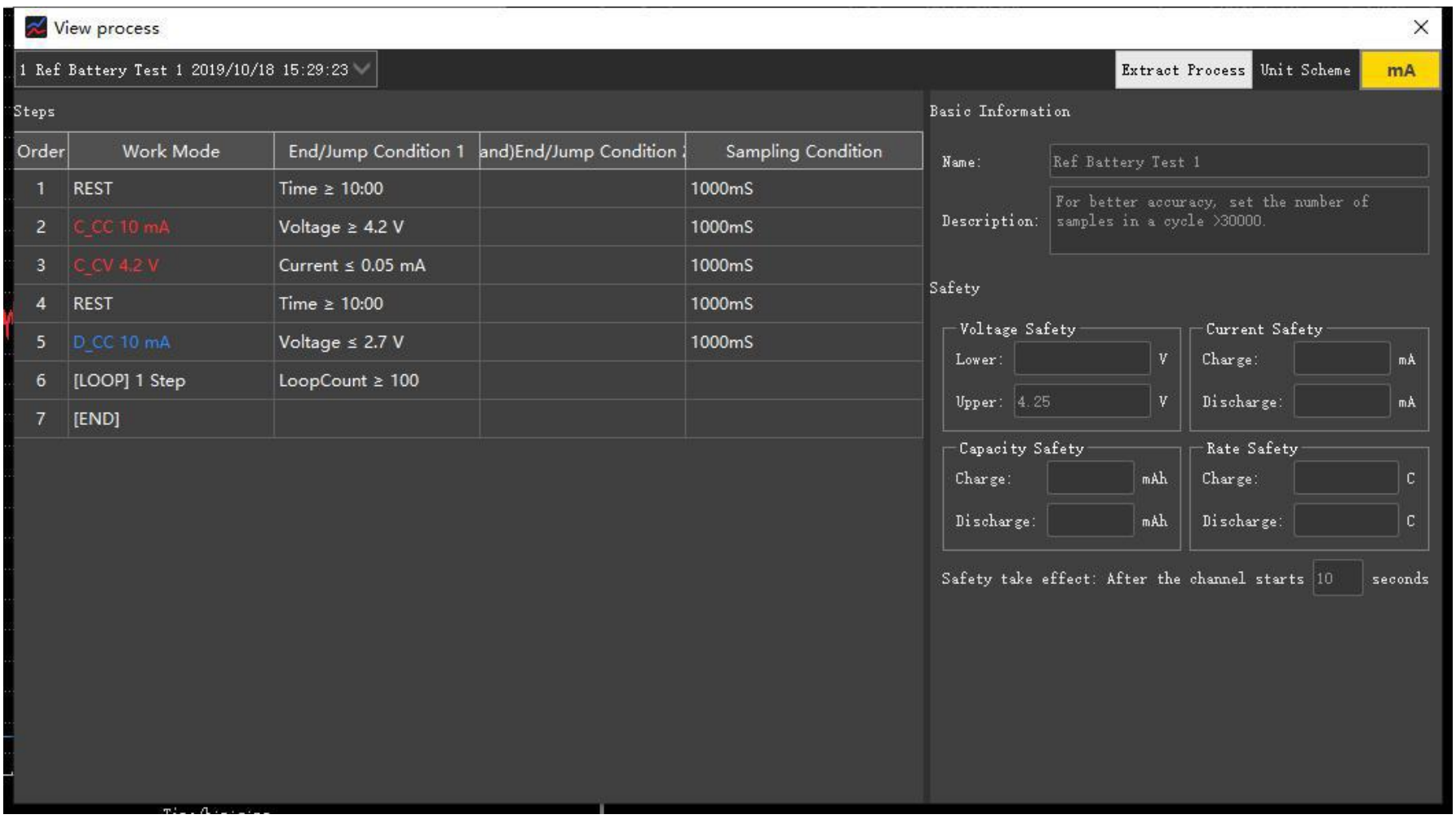


Figure 5-18 View process

5.8 View Details

Click the toolbar button D Details to bring up the "Details" window. This window can view some useful information related to this test, such as test basic situation, log, device information.

5.8.1 Details-Test

This page shows the PC, channel, startup, time information, and statistics.

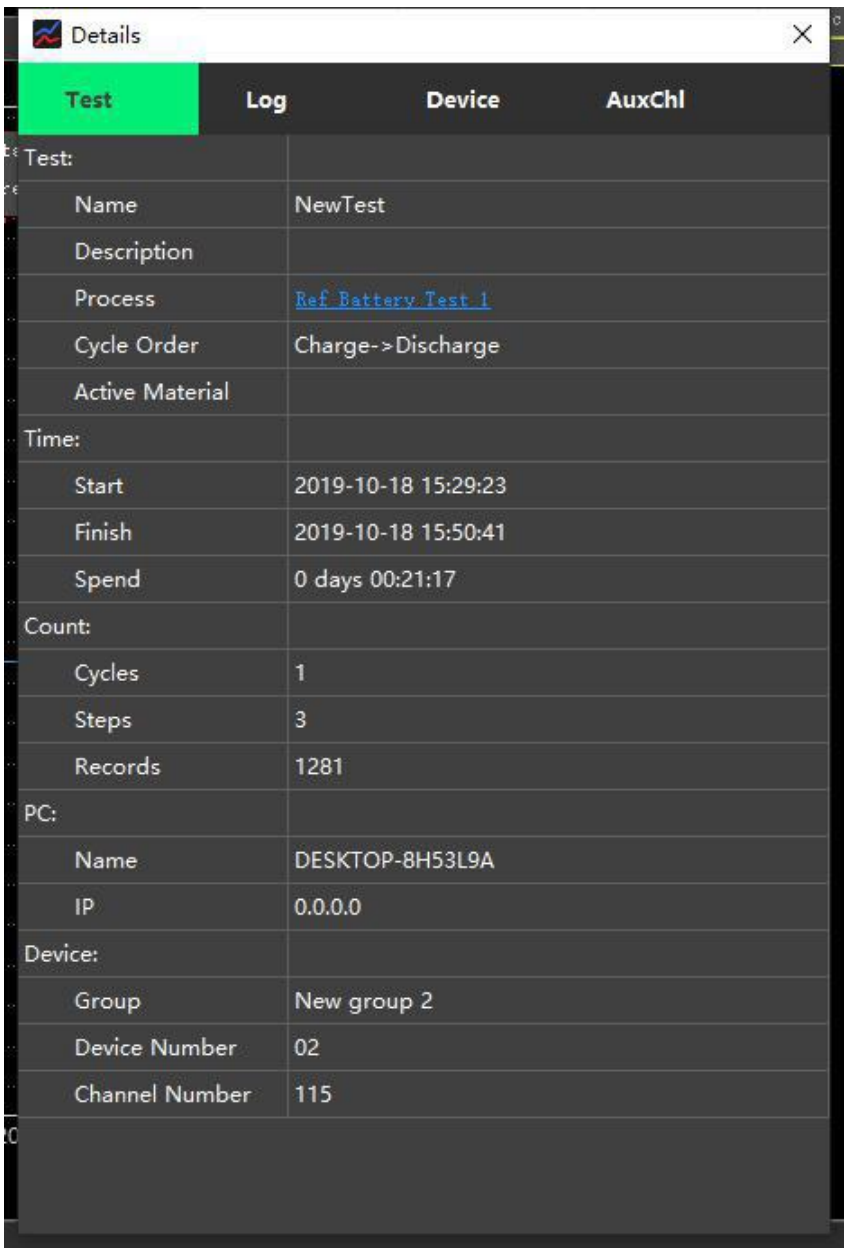


Figure 5-19 Details-Test

5.8.2 Details-Log

The test log records flagged events during the test, such as start, pause, stop, completion, exceptions, and more. It is easy to trace the abnormal situation of the test.

Double-click on a log, you can locate the specific location of the log event in the graphics area and data area.

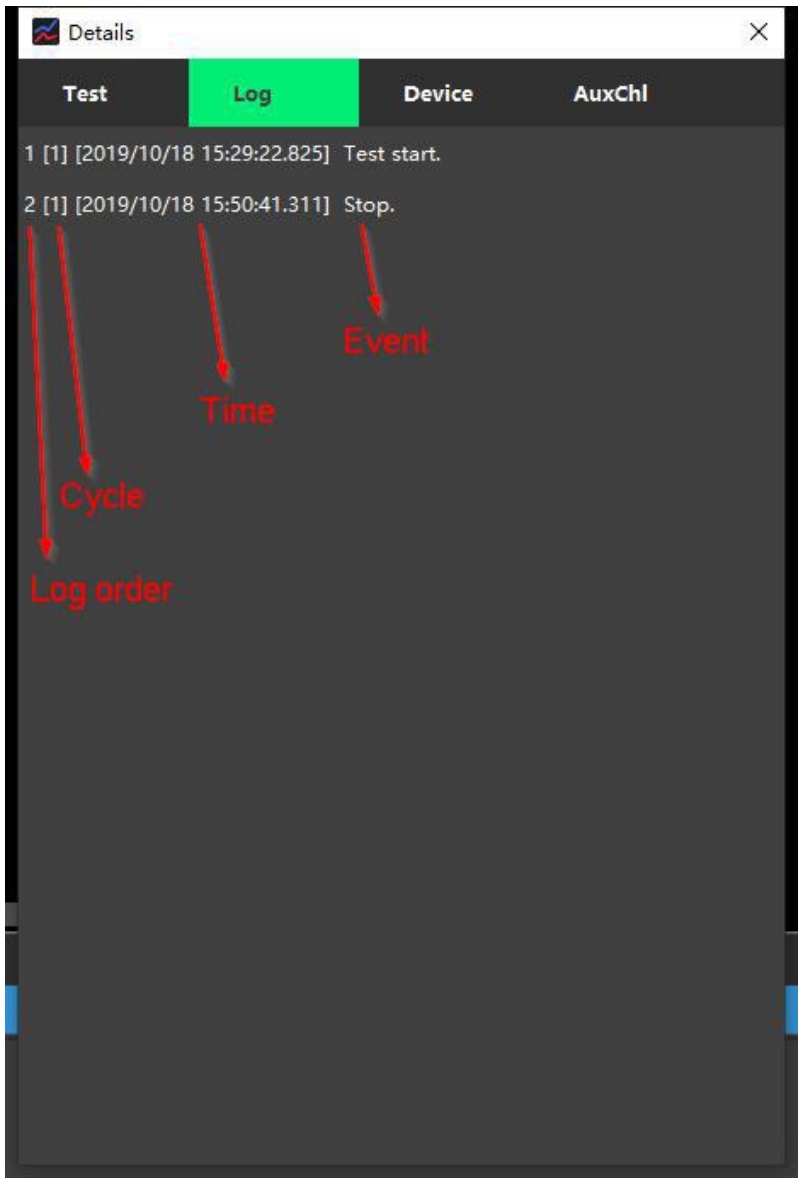


Figure 5-20 Details-Log

5.8.3 Details-Device

This page shows the properties of the device used in this test.

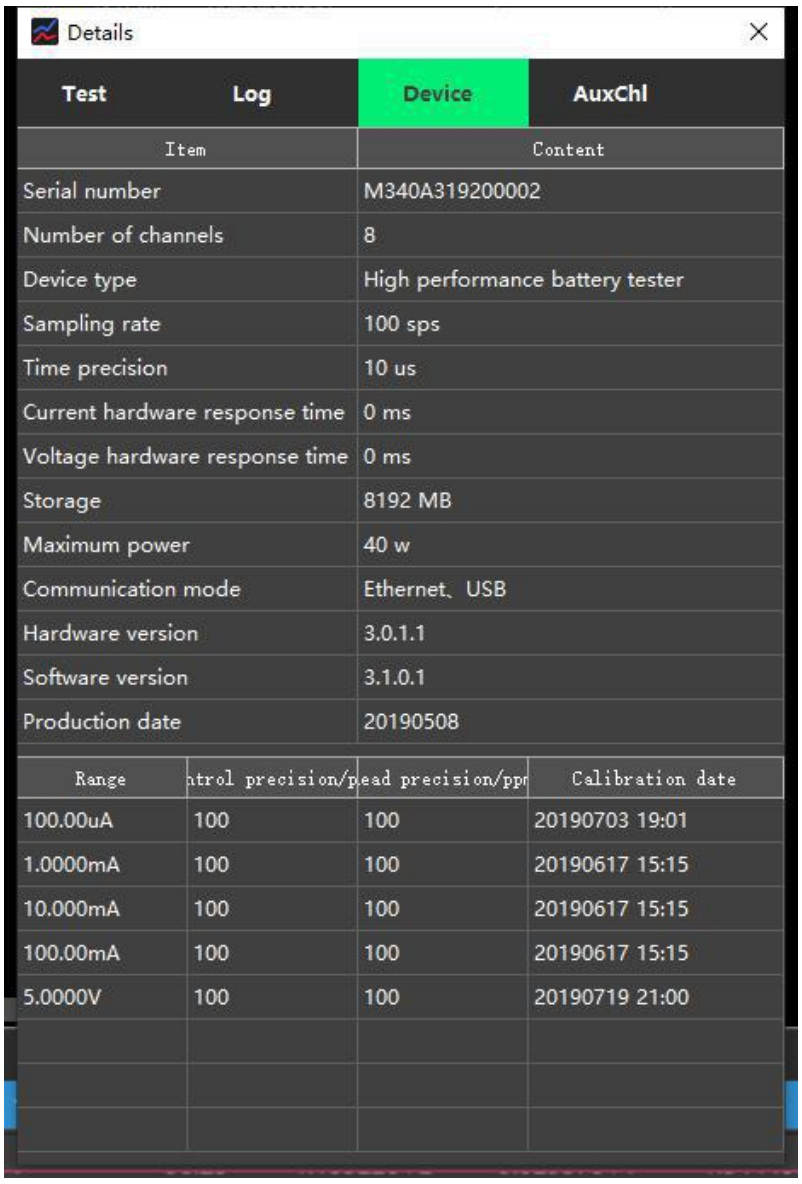


Figure 5-21 Details-Device

5.8.4 Details-AuxChl

This page shows the properties of the Auxiliary Channel device used in this test.

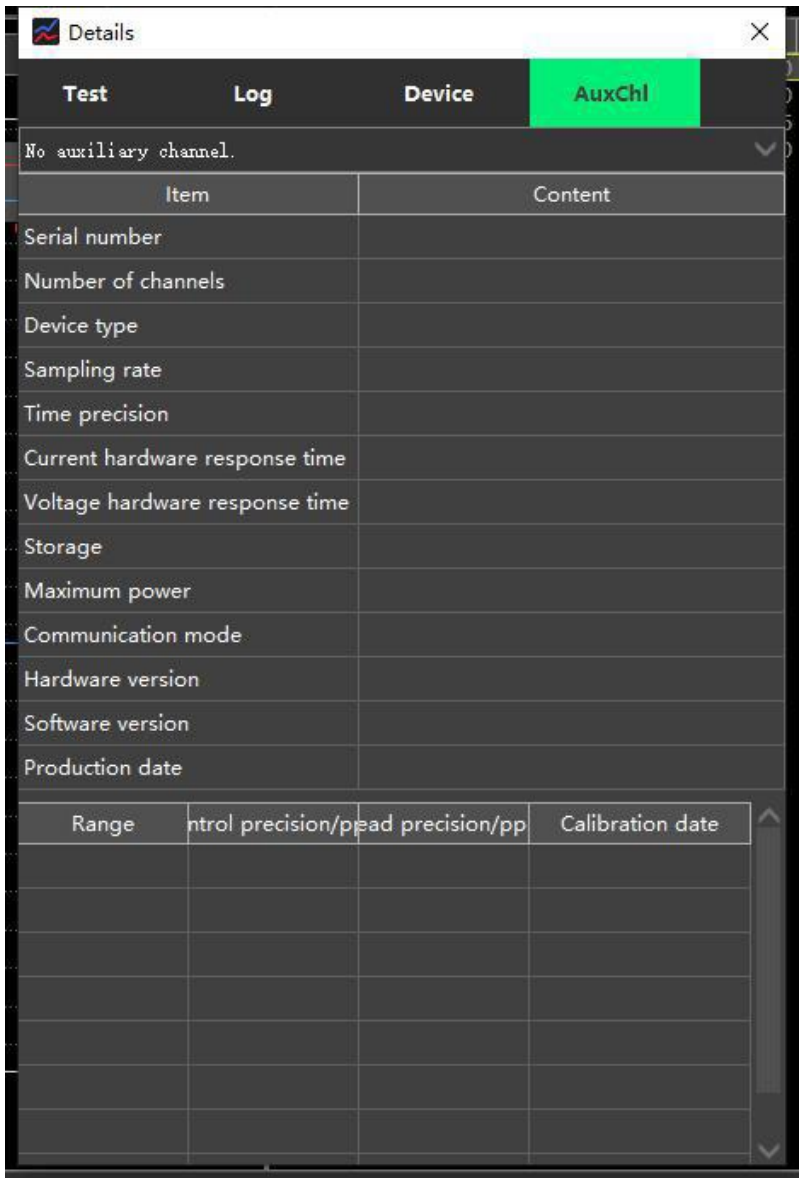


Figure 5-22 Details-AuxChl

5.9 Export data

With the menu "Export Data" or button , you can export the data as a custom-format EXCEL or TXT document for further analysis.

The export dialog is divided into two pages: "Files" and "Settings". Files:

Select the data file to be exported and set the output path. Settings:

Select export entries, cycle range, export density, excel format.

General export steps:

1. Check the data levels to be exported: cycle, step, record

2. Check the elements in each level

3. Adjust the order of elements

4. You can set which cycles are exported only

5. You can set how many records to export per cycle

6. Choose an export format

7. Click the export button

The parameters of active material, platform and capacitance can be modified so that the relevant data will be recalculated during exporting. The related data is marked with the same color.

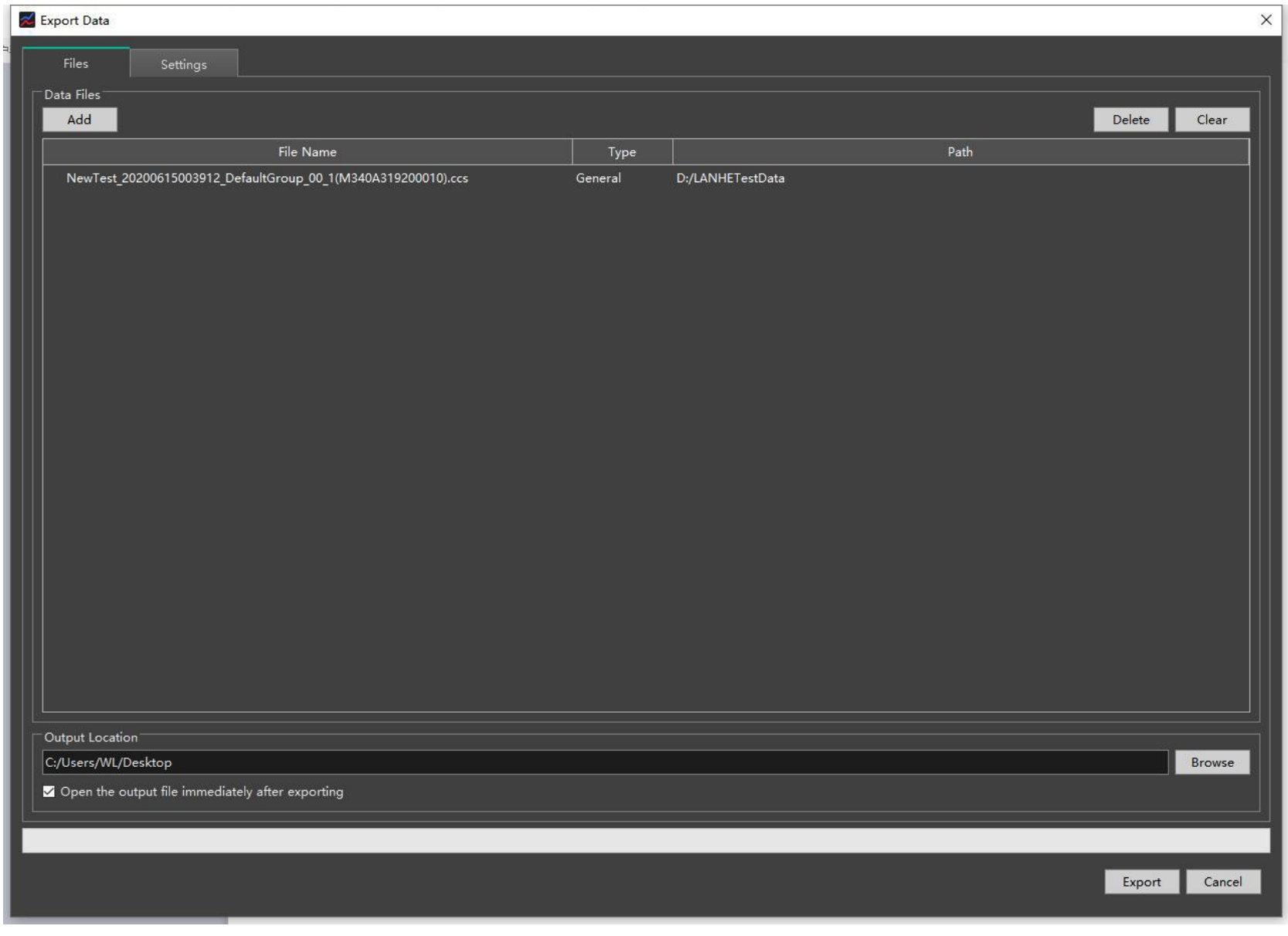


Figure 5-23 Files

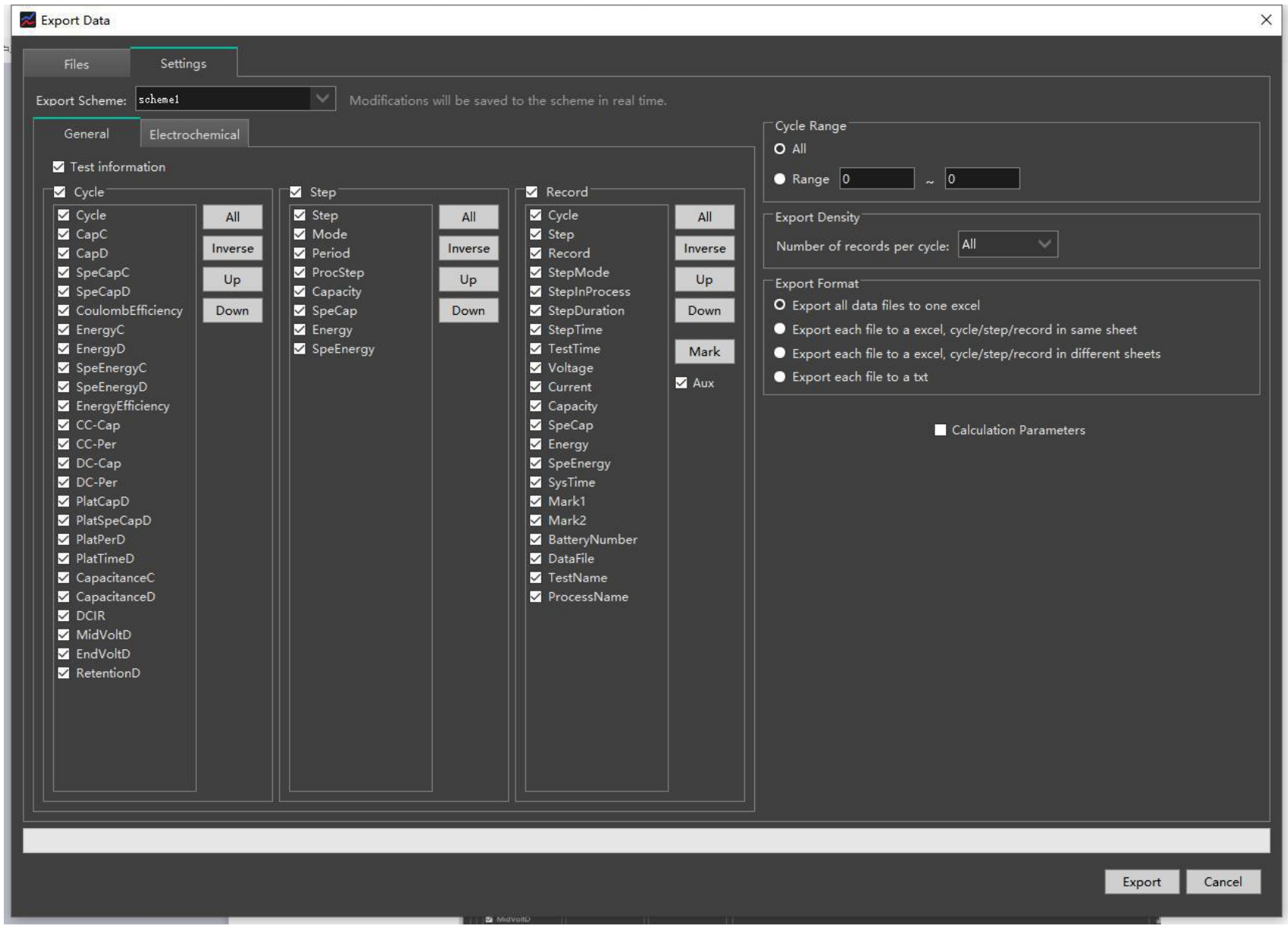


Figure 5-24 Settings - General

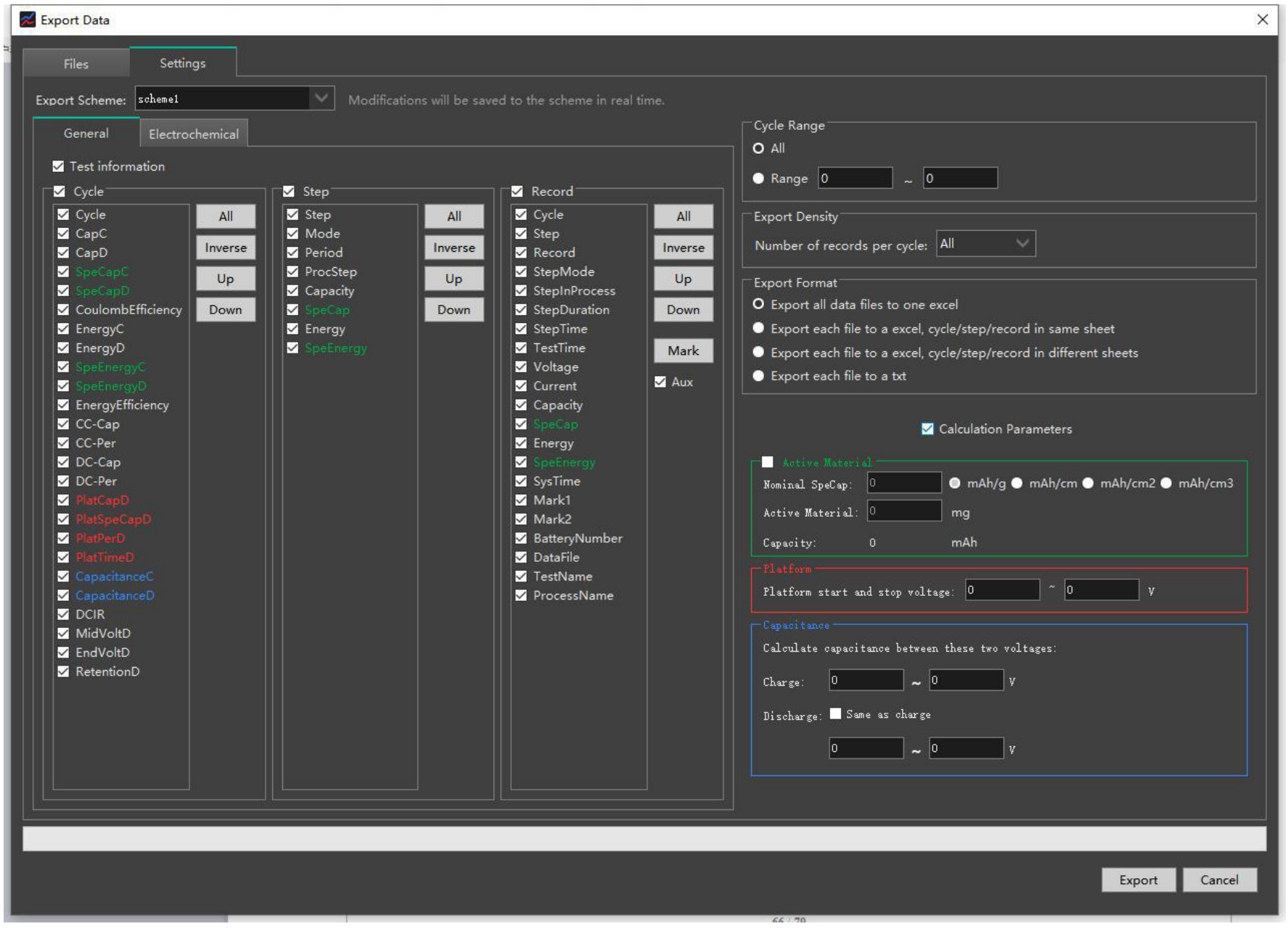


Figure 5-25 Settings - General

The setting interface of the electrochemical test is different from the general one:

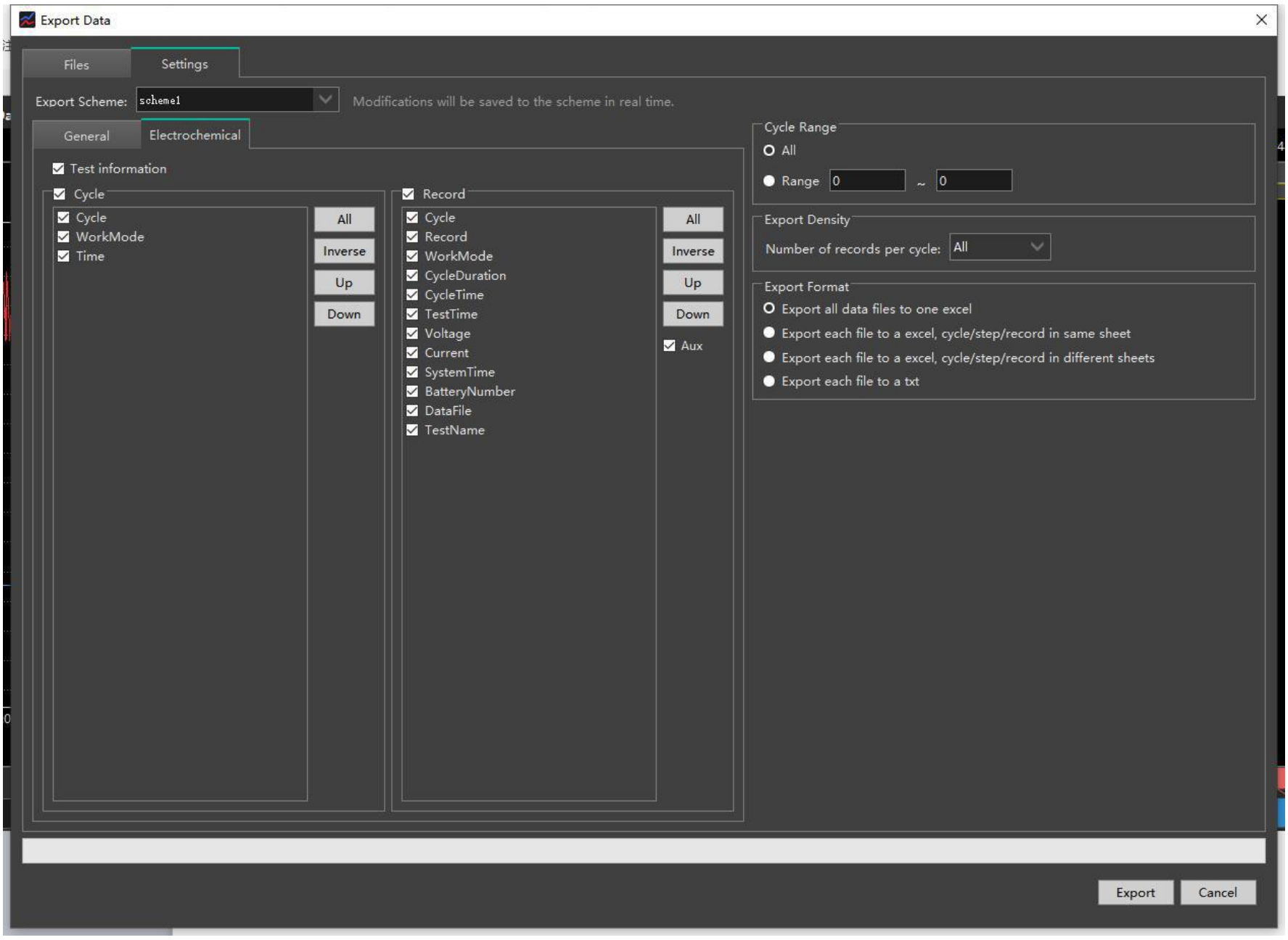


Figure 5-26 Settings - Electrochemical

6. LANHE Cali

6.1 Interface

The LANHE Cali software is divided into 3 parts: selecting equipment, calibration settings, and calibration records.

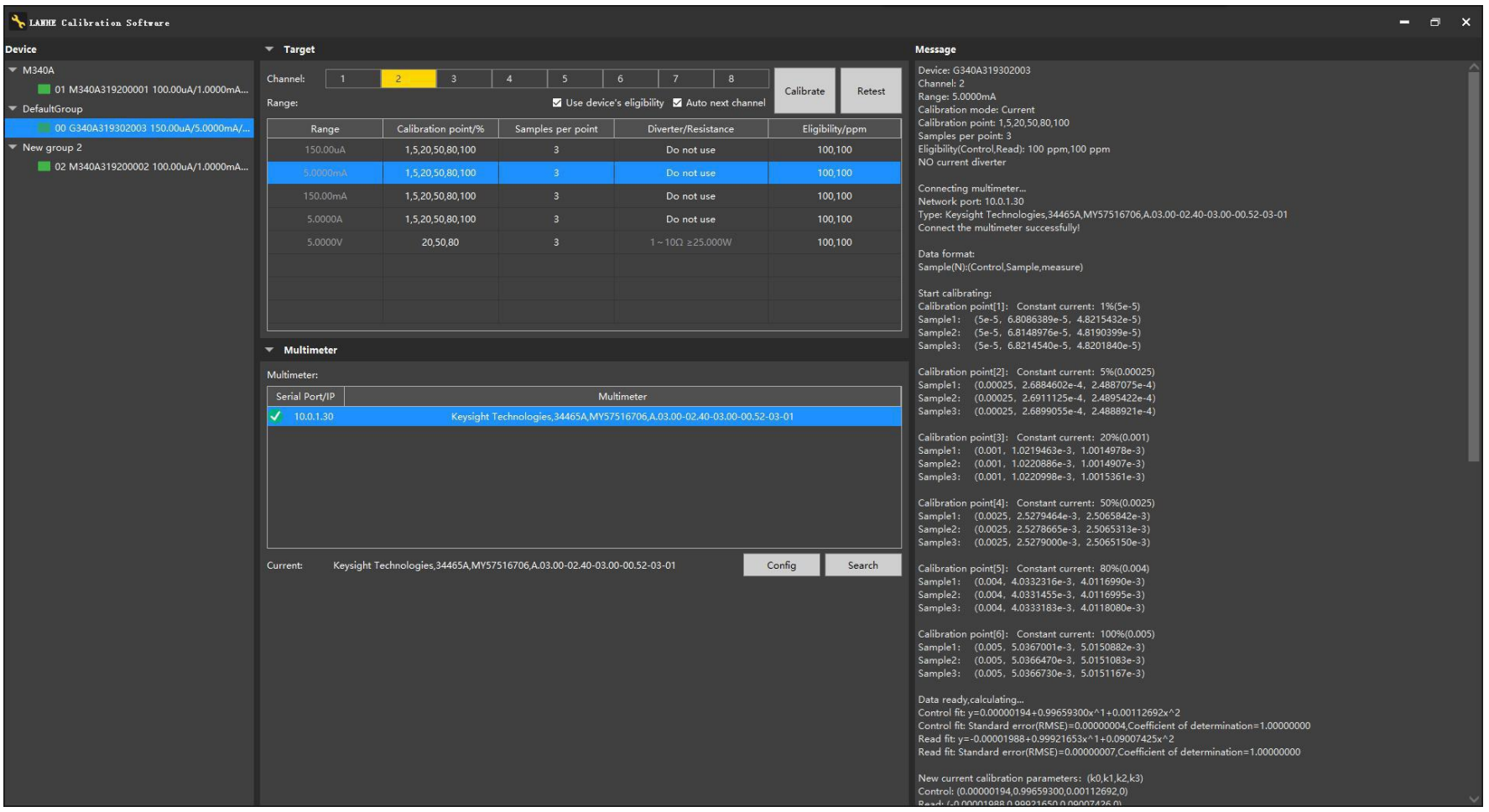


Figure 6-1 Interface

6.2 General calibration procedure

1. Select a device on the left, then the ranges of the device will be displayed in the middle table.

2. Select the channel and range to be calibrated.

3. Edit the calibration parameters of the range.

Calibration point, number of samples per calibration point, eligibility criteria.

If you use current diverter, you also need to set the current diverter.

4. Scan the multimeter.

Click the “Config” button, enter the scanning parameters, and click “Search” to scan the multimeter.

5. Select a scanned multimeter.

6. Click the "Calibrate" button.

The software automatically calibrates the range of the channel and outputs a calibration record in real time on the right.

Note: If you do not select a multimeter, you can also calibrate. When the software needs to read the multimeter, a prompt will pop up. At this time, you need to manually input the reading.

6.3 Multimeter configuration

Support network port and serial port to connect multimeter.

The format of network port is: IP, port number.

The format of serial port is: baud rate, data bit, parity, stop bit, flow control

Examples are as follows:

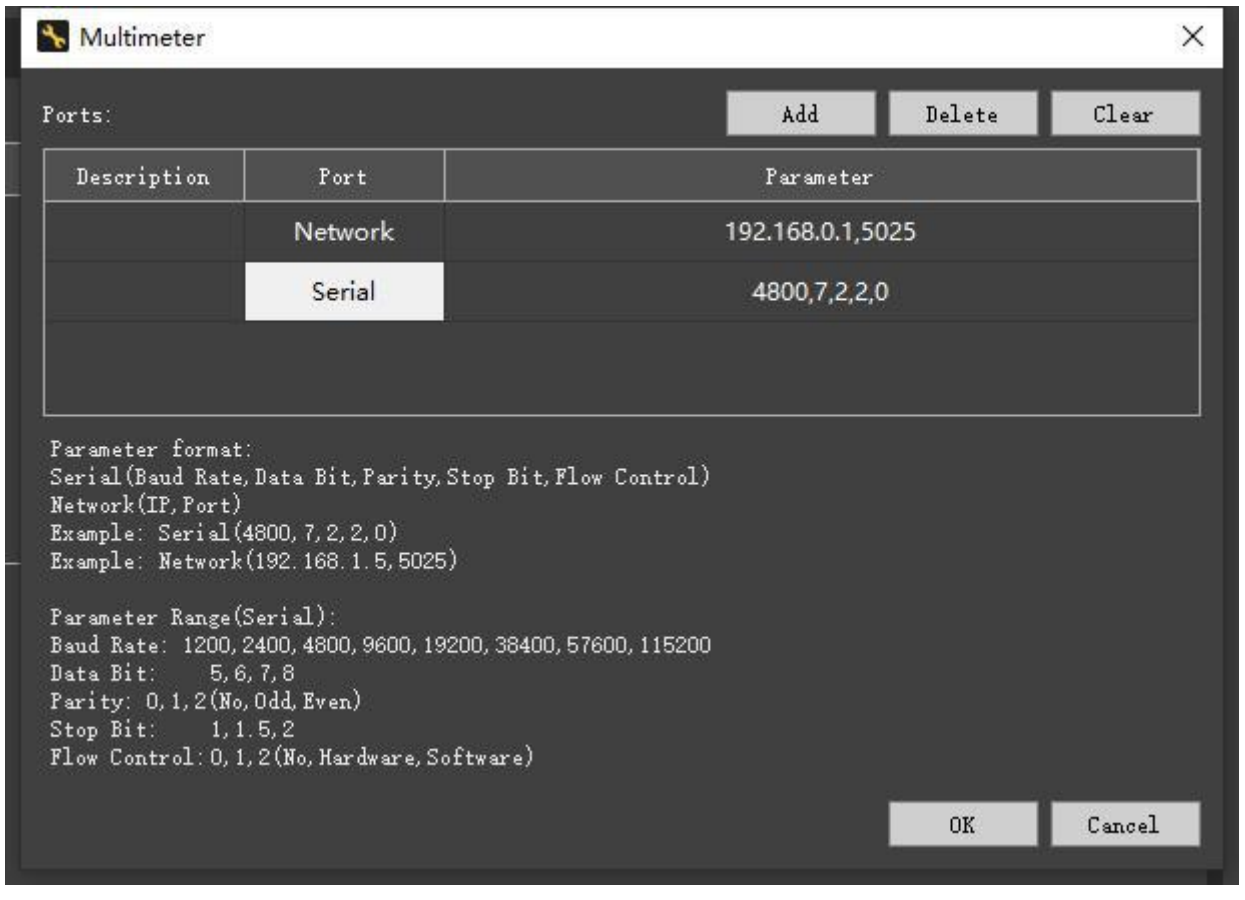


Figure 6-2 Multimeter configuration

6.4 Calibration parameter

Parameter	Description
Calibration point	Percentage of range
Samples per point	Number of samples per calibration point
Diverter	The parameters of current diverter
Resistance	The system automatically recommends the appropriate resistor based on the range
Eligibility	After the calibration, the device will be retested. If the error

	exceeds this standard, it will be judged as unqualified.(ppm:millionth)

Table 6-1 Calibration parameter

6.5 Calibration record

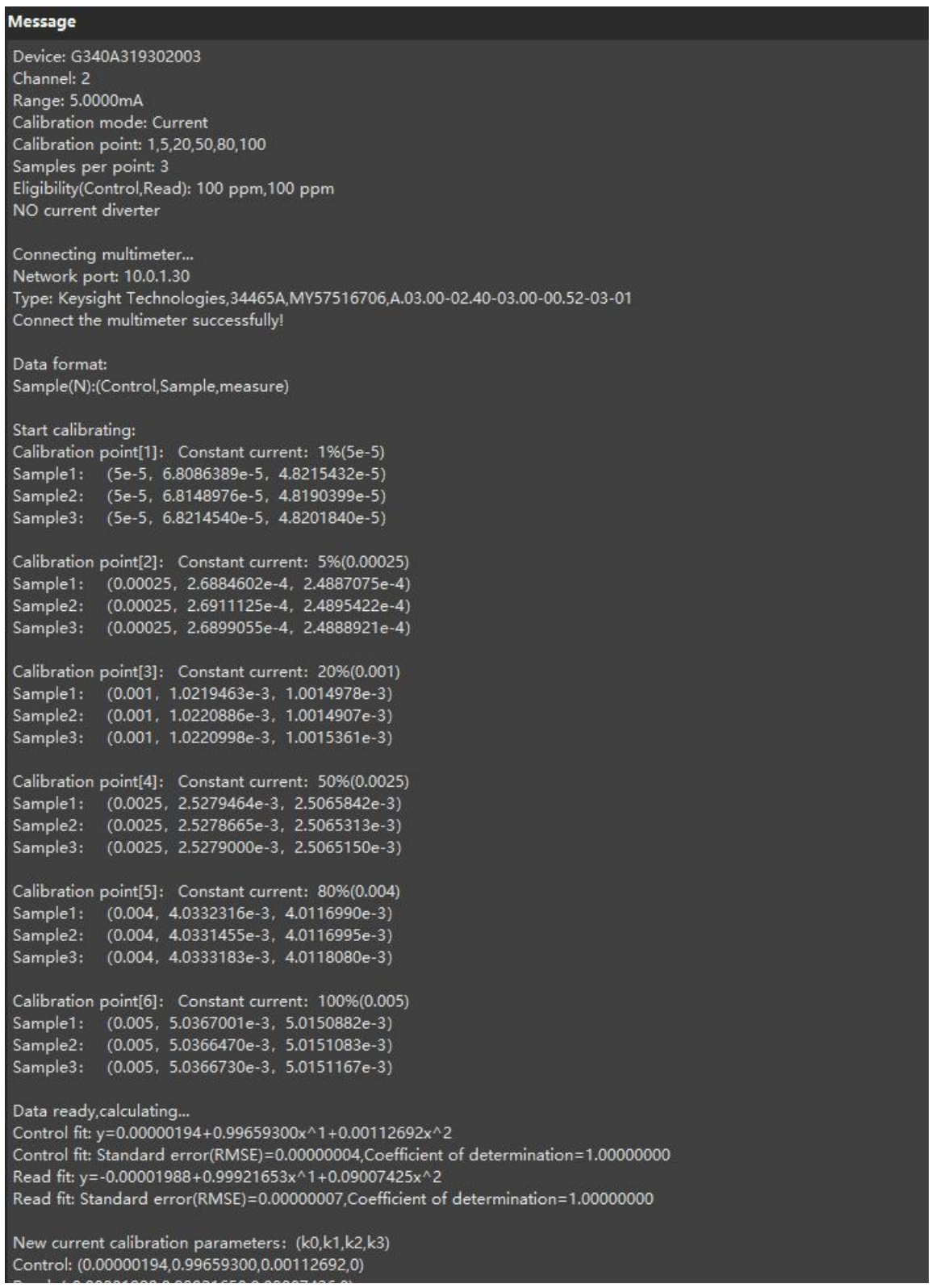


Figure 6-3 Calibration record

6.6 Release device forcibly

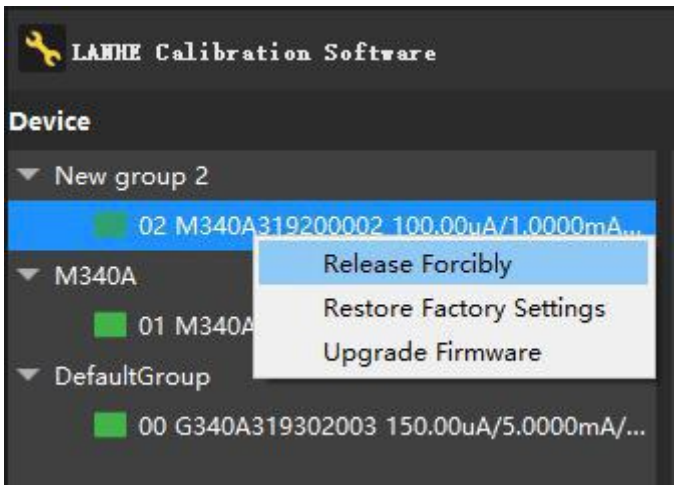


Figure 6-4 Release forcibly

When the PC of the device is abnormal, the device can be released to idle state through the menu "Release forcibly", after which others can use the device.

Note: Releasing device forcibly will erase the current test information of the device, please ensure that the device has no useful tests in progress.

6.7 Restore factory settings

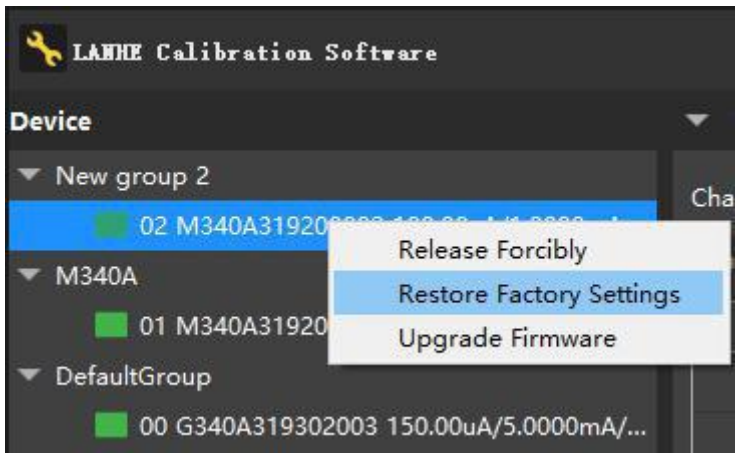


Figure 6-5 Restore factory settings

When the device crashes and the restart does not help, you can try to use this function to restore the device state to the factory state. This method can solve the general device abnormality problem.

6.8 Upgrade firmware

This menu can upgrade device firmware.

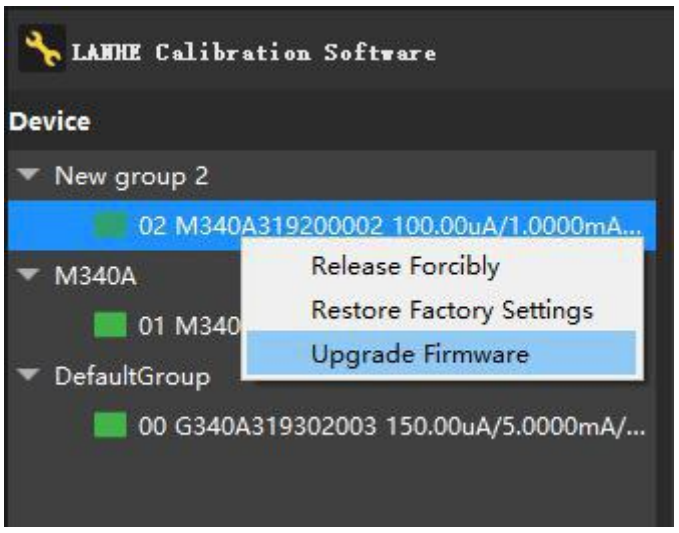


Figure 6-6 Upgrade firmware

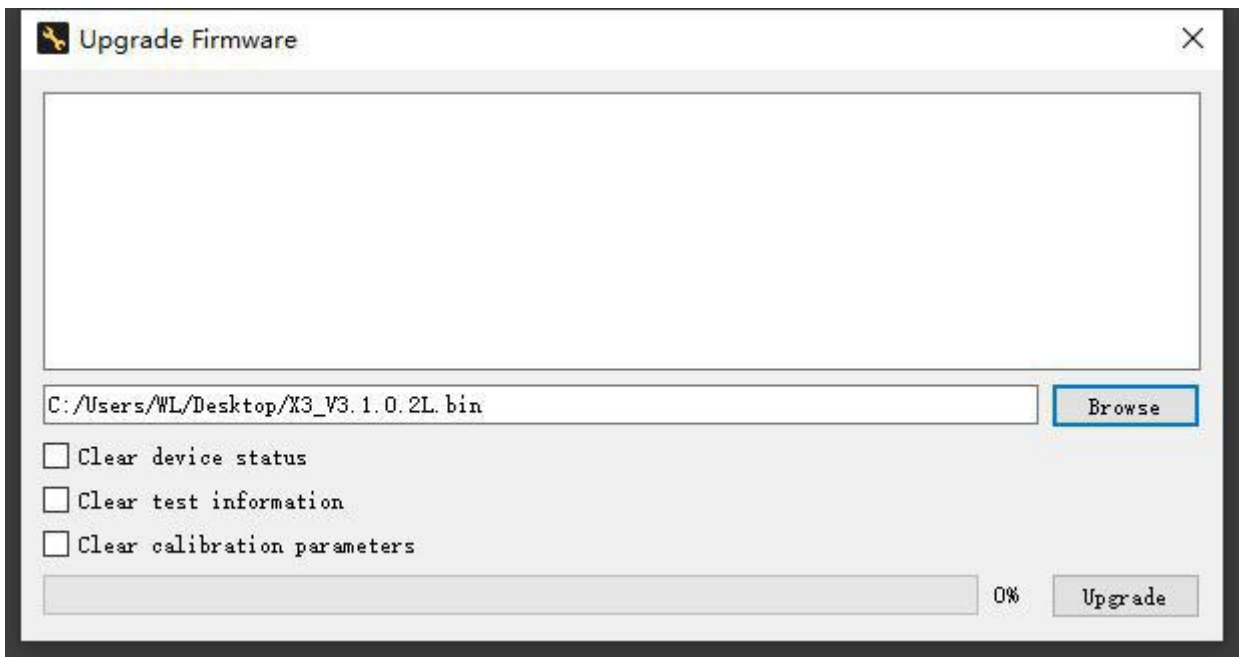


Figure 6-7 Upgrade window

Select a firmware file in the ".BIN" format and check the 3 options (normally the default).

Click the "Upgrade" button to start the upgrade.

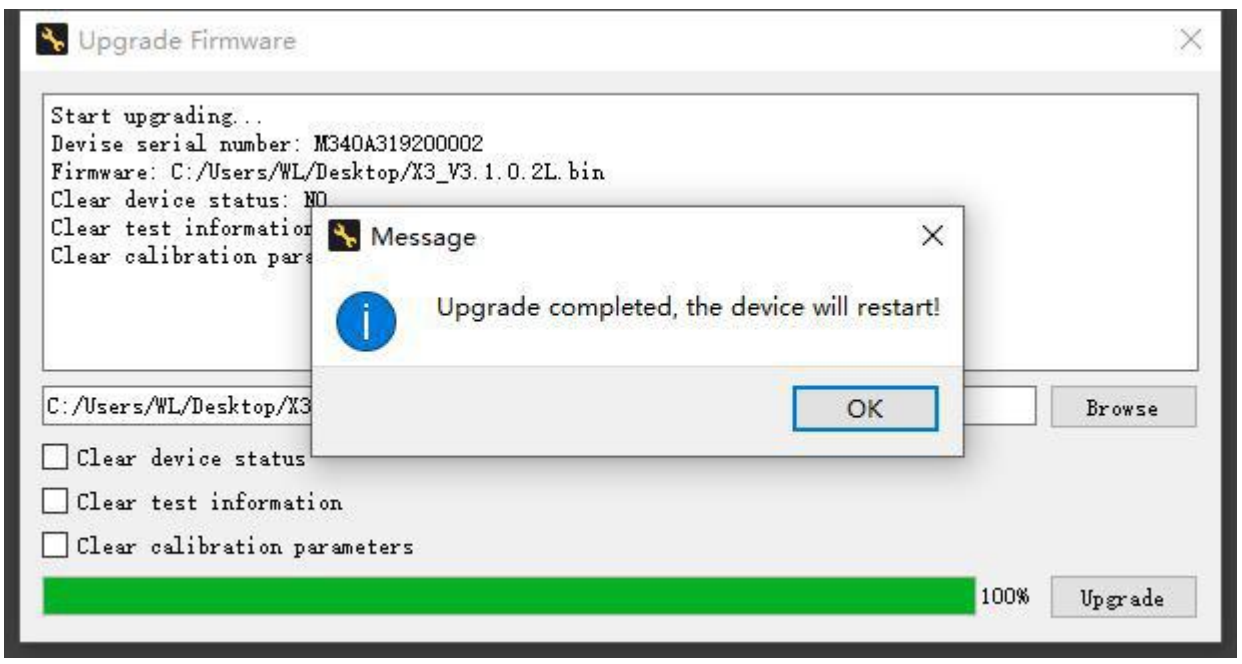


Figure 6-8 Upgrade

7. Edit Step

7.1 Add and delete step

Add a step:

Method 1: Right-click menu "Insert Row" to add a new step in this position.

Method 2: Click on the "Add" cell in the last row to add a step after the last row.

Delete a step:

Right-click the menu "Delete Lines" to delete the step.

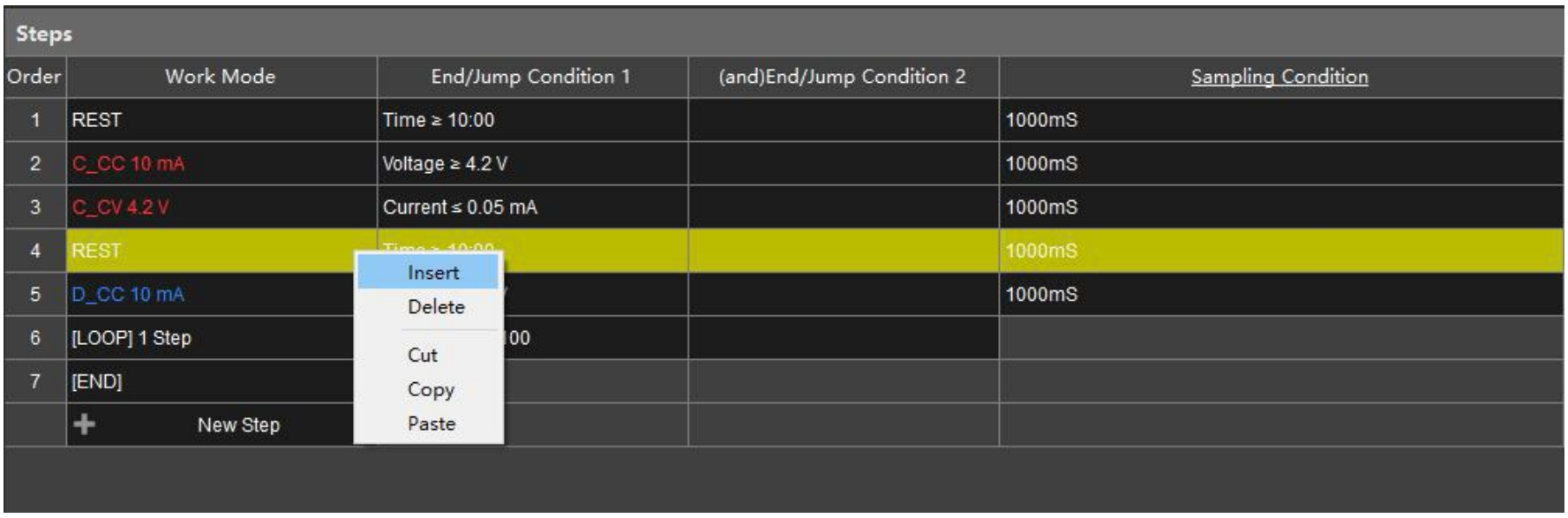


Figure 7-1 Add and delete step

7.2 Cut,copy,paste step

Similar to 7.1, the cut, copy and paste functions can be completed through the right-click menu.

7.3 Modify step

One step is divided into: Order, Work Mode, End/Jump Condition 1, End/Jump Condition 2, Sampling Condition.

Section	Description
Order	The order of the steps in the process
Work Mode	The work mode of the device.
End/Jump Condition 1	Once this condition is met, go to the next step. For the step [CycleTo]: this condition is the end condition of the cycle. For the step [JumpTo]: this condition is a jump condition.
End/Jump Condition 2	The relationship with "End/Jump Condition 1" is "and".
Sampling Condition	Set sampling conditions, there are multiple settings.

Table 7-1 Step sections

7.3.1 Work Mode

There are two work modes: executive step and logical step.

Execution steps: including REST, charging and discharging steps.

Logical step: including [RANGE], [LOOP], [JUMP], [OR], [END].

- [LOOP] example:

As shown below, cycle 100 times from steps 1 to 6.

Steps				
Order	Work Mode	End/Jump Condition 1	(and)End/Jump Condition 2	Sampling Condition
1	REST	Time ≥ 10:00		1000mS
2	C_CC 10 mA	Voltage ≥ 4.2 V		1000mS
3	C_CV 4.2 V	Current ≤ 0.05 mA		1000mS
4	REST	Time ≥ 10:00		1000mS
5	D_CC 10 mA	Voltage ≤ 2.7 V		1000mS
6	[LOOP] 1 Step	LoopCount ≥ 100		
7	[END]			
	+ New Step			

Figure 7-2 [LOOP] example

- [JUMP] example:

As shown below, every time after completing step 3, if the capacity reaches 30mAh, the step will jump directly to the end.

Order	Work Mode	End/Jump Condition 1	(and)End/Jump Condition 2	Sampling Condition
1	REST	Time ≥ 10:00		1000mS
2	C_CC 10 mA	Voltage ≥ 4.2 V		1000mS
3	C_CV 4.2 V	Current ≤ 0.05 mA		1000mS
4	[JUMP] 8 Step	Capacity ≥ 30 mAh		
5	REST	Time ≥ 10:00		1000mS
6	D_CC 10 mA	Voltage ≤ 2.7 V		1000mS
7	[LOOP] 1 Step	LoopCount ≥ 100		
8	[END]			
	+ New Step			

Figure 7-3 [JUMP] example

- [OR] example:

As shown below, 4.2V constant voltage charging, when the current is less than 0.5mA or the time is more than 30 minutes, complete this step.

3	C_CV 4.2 V	Current ≤ 0.5 mA
4	[OR]	Time ≥ 30:00
5	D_CC 10 mA	Voltage ≤ 2.75 V

Figure 7-4 [OR] example

- "And" example：

10mA constant current discharge, If the voltage is less than 2.75V and the capacity reaches 20mAh, complete this step.

Steps				
Order	Work Mode	End/Jump Condition 1	(and)End/Jump Condition 2	Sampling Condition
1	D_CC 10 mA	Voltage ≤ 2.75 V	Capacity ≥ 20 mAh	1000mS
2	[END]			

Figure 7-5 "And" example

7.3.2 Sampling Condition

Sampling conditions can set the speed at which the device collects data.

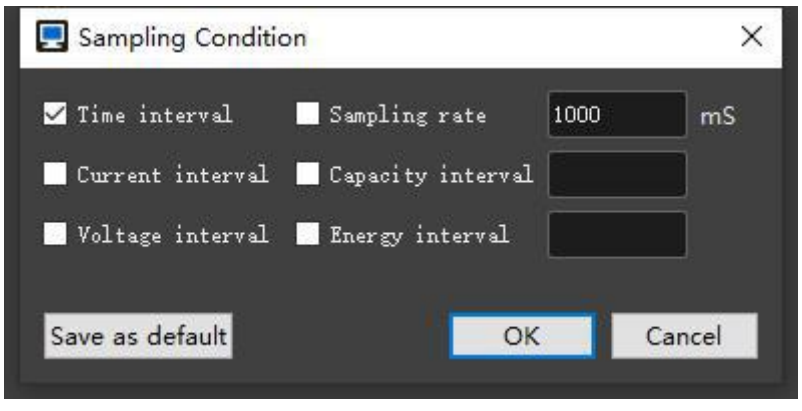


Figure 7-6 Sampling conditions

Time interval：Time between two sampling points

Sampling rate：Number of samples per second

It can also take samples according to the change of these: current, capacity, voltage, energy.

7.3.4 Time format

The following input formats are supported when the condition is "time":

1 (1S)

1.5 (1.5S, 1500 mS)

1:30 (1min 30 S)

1:30.500 (1min 30s 500ms)

1:30:00 (1h 30min)

1:30:30.500 (1h 30min 30s 500ms)

Regardless of the format you enter, the final display will automatically be converted to the "h:m:s.ms" format. If "h" and "ms" are 0, they will be omitted.

The table below shows the common time input and display effects:

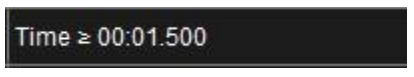
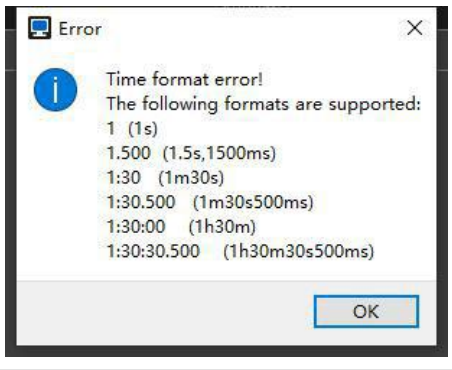
Input type	Input	display
Integer		
		
Decimal		
"h:m:s.ms"		
		
		
Wrong input		
		
		

Table 7-2 Time format

7.4 Save, Restore

There are two buttons in the lower right corner of the process editing area, "Save", "Restore". 

Save: Save the current changes, check for errors, and output error messages.

Restore: Undo the current changes and revert to the content before the process was modified.

Double-click on a line in the error window, the step area will highlight the step where the error is located.

The following figure shows the results of the process check:

Steps

Order	Work Mode	End/Jump Condition 1	(and)End/Jump Condition 2	Sampling Condition
1	REST	Time ≥ 10:00		1000mS
2	C_CC 10 mA	Voltage ≥ 4.2 V		1000mS
3	C_CV 4.2 V	Current ≤ 0.05 mA		1000mS
4	REST	Time ≥ 10:00		1000mS
5	D_CC 10 mA	Voltage ≤ 2.7 V		1000mS
6	[LOOP] 1 Step	LoopCount ≥ 100		
7	[END]			
	+ New Step			

Error Message

Start checking process: Ref Battery Test 1(1)

Check completed, found 0 errors

Figure 7-6 Error-free process

Steps

Order	Work Mode	End/Jump Condition 1	(and)End/Jump Condition 2	Sampling Condition
1	REST	Time ≥ 10:00		1000mS
2	C_CC 10 mA	Voltage ≥ 4.2 V		1000mS
3	C_CV 4.2 V	Current ≤ 0.05 mA		1000mS
4	REST			1000mS
5	D_CC 10 mA	Voltage ≤ 2.7 V		1000mS
6	[LOOP] 500 Step	LoopCount ≥ 100		
7	[END]			
	+ New Step			

Error Message

Start checking process: Ref Battery Test 1(1)

4 ERROR: Missing end/jump condition

6 ERROR: The step does not exist

Check completed, found 2 errors

Figure 7-7 Process with errors

8. Exception

8.1 Software exception

Installation failed:

1.Confirm that the operating system is Win7 or Win10. This version does not support XP systems

2.Restart the computer and install again

The software cannot find the device:

1.Try to turn off the firewall

2.Confirm that the computer and device are properly connected to the router's LAN output

3.Close the agent software

The device is occupied:

1.Use the calibration software to release the device

Note: Make sure the device is not being tested

Unable to open data file:

1.Try to use this software on 64-bit systems

2.Send the data to us for help

Cannot export data:

1.Make sure that the Office software is installed on the computer, and EXCEL can be used normally

2.Contact us for help

8.2 Hardware first aid and recovery

When a device exception occurs, you can use the firmware upgrade tool (serial version) to fix it.

step:

1. Connect the device to the computer through the console port.

2, Start CCSISP.exe in the installation directory, the software will automatically scan all serial devices.

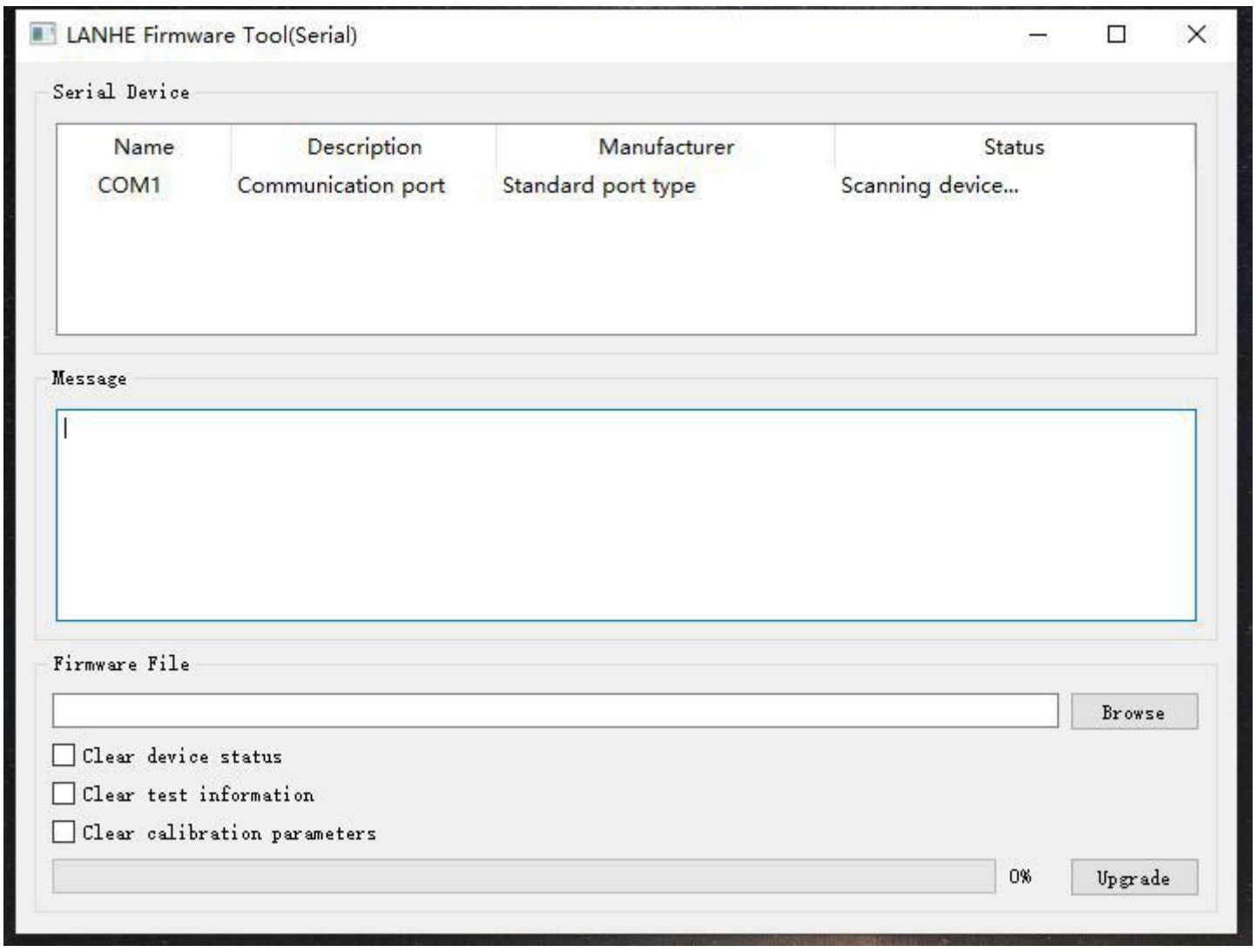


Figure 8-1 LANHE Fireware Tool(Serial)

3，Restart the device and the software scans the device.

4，Select the firmware file (.BIN) and click the "Upgrade" button.

5，When the output interface shows "Upgrade Complete", the upgrade is complete and the device will restart.

*6，If you still can't connect, you can check the three options of “Clear Device Status”, “Clear Test Information”, “Clear Calibration Parameters”, then upgrade again.

Note:

"Clear device status" will result in the loss of group information and need to be regrouped.

"Clear test information" will cause the channel test status to be lost and the previous test cannot be continued.

The device needs to be re-calibrated after “clearing calibration parameters”, otherwise the accuracy is not accurate.

FAQ

Q1: How much data can the data software open?

A: It is recommended to use the software on a 64-bit system. After testing, it can open more than 20 million records. The size of the open file is limited by the physical memory size of the computer.

Q2: Will Uninstall or re-installing software cause data loss?

A: No.

The Uninstall of the software will only affect the files in the software installation directory, and will not affect the data files of the data directory.

Q3: Can I retain my personal configuration when upgrading or re-installing software? Such as test process, test history, etc.

A: Upgrading or re-installing software does not clear user information by default.

If you do not need to keep this information, you can check "Delete User Information" in the uninstall window.

Matters needing attention

- If you need to replace your computer or hard disk, please backup the data in advance.

Technical Support

- If you have any trouble using the product, please contact us for help.
- Support：+1(888)505-1296