



User Manual

BTS9 Battery Test System

Notice, Attention, and Warning



Notice: Key information that will help you correctly use the device.



Attention: How to avoid data loss or hardware damage.



Warning: Risky practice that will possibly result a property loss, injury or death.

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Instruction:

Please read this manual carefully before using the BTS9.1 for better experience and maintain the performance of the battery test system. The document is subject to change due to the system's continual upgrading.

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Version History

Version/Status	Author	Complete/Release data	Imprint
V1.0/Draft	Qian Cao	2015-12-03	Create user manual file for BTS9 battery test system.
V1.1/Draft	Qian Cao	2015-12-14	Uploaded device model list, hardware installation description, modified operation of channels, modified automatic calibration section, and added FAQ.
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V3.2	Guizu Chen	2021-11-05	Refine the operation process and proofreading.
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Chapter 1 BTS9 Instruction

1.1. Purpose of the Document

This document is designed for users and pre/after-sales technicians to understand the operation method of BTS9. By introducing the characteristics of the system, overall performance, and application scope of Battery Testing System 9 (BTS9).

1.2. Scope of Application

NEWARE BTS9 series high-precision battery testing systems are widely used in the military, 3C products, power battery, battery materials research. It can perform comprehensive performance tests on lithium polymer, lithium ion, nickel metal hydride, nickel cadmium, and lead acid batteries, laptop battery tests as well as batch of battery production and capacity sorting tests, and so on.

1.3. Terminology

Form 1 Terminology Clarification

Terminology	Clarification
Upper-Machine	The BTS software installed on a PC which is composed of a server, client, data analysis software, and step editor to control, monitor, and analyze the data. Which is also called Host-computer .
Mid-Machine	The control node of the battery test system, centralized controller of multiple test equipment, assigned for step operation, data recording, and data uploading.
Equipment Number	The exclusive coding of each machine in the entire system for equipment identification.
SMBUS	System Management Bus:for communication and interaction with the intelligent battery.
Equipment IP	The independent IP address for each mid-machine. The IP address of the mid-machine in the same network segment must be exclusive from that of other computers or devices.
Server IP	IP address of the PC on which the server software is installed.
Lower-Machine	Control by the mid-machine, perform charge/discharge operations, collect the real-time current and voltage of the battery, and upload the sampling data to the mid-machine. BTS9000 and BTS5008 have their own channel control modules.
Aux Machine	Receive the control of the mid-machine, perform charge/discharge operations, collect the current and voltage of the battery in real time, and upload the sampling results to the mid-machine. BTS9000 and BTS5008 have their own channel control modules.
Unit number	The unit code of the lower-machine or the auxiliary machine, used for locating the communication address, which is exclusive to the same mid-machine, ranges from 1 to 32.
Channel	A module that consists of several circuits. Each independent module provides the charge and discharge test functions for a single battery.
Calibration	By using calibration software, you can eliminate device inherent errors as well as system deviations in control and sampling values.
Calibration Tools	A device that connects server, mid-machine, and a multi-meter to calibrate channels.
Database	A data management system for storing and retrieving equipment information, test information, and data records.
Backup	Run continuously in the background according to the preset rules, the backup system will continually loading test data.
Download	It runs continuously in the background, accepts external calls, obtains the corresponding test data from the database, and returns the test data to the requester.
Report	Run continuously in the background according to the pre-configured format, exporting test reports for users to view.

Step Editor	View and edit the test process, setting or modifying the operation parameters of each step.
Mapping	Virtualizes the channels of the realistic device into the specified channel code and picture.
Bound	Several auxiliary machine and a main channel are combined to realize the charge and discharge test of the battery.
Loop Stack	Each step in the test process supports loop nesting, and the loop stack is used to store the number of times that have been executed at each loop nesting level.
Conditional Breakpoints	During the test process, the user can specify to suspend the test process after completing the corresponding cycle times at the set step.

1.4. BTS9 Instruction

BTS 9 system is a new generation of battery test system developed by NEWARE through continuous innovation over the years to meet market demand. The system supports measurement of battery cell voltage and temperature, measurement of DCIR, pulse mode, constant power charging, I2C/SMBUS protocol, interaction with intelligent battery, intelligent charging and so on.

The BTS9 battery test system is based on the existing office network and computer of enterprises, units, laboratories, and so on. The operation is simple. Users can remotely log in to the system through the Internet to perform various operations.

C/S network system structure and database management test data, centralized control of multiple connected devices, and centralized management analysis and statistics of all the data. Figure 1-1 shows the diagram of the BTS9 battery detection system.

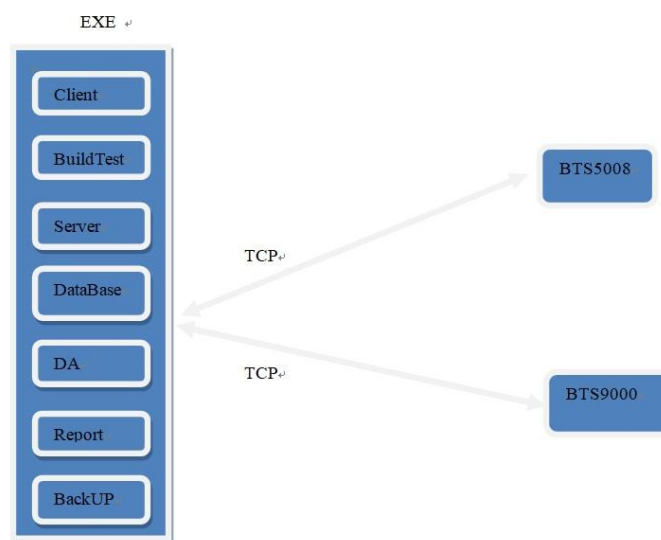


Figure 1-1 BTS9 Battery Test System Block Diagram

BTS9 battery test system is constructed by the upper-machine, mid-machine, and channel control module (as shown in the figure above). The mid-machine is compatible with BTS5008 and BTS9000 models. The mid-machine has its own test channel, which can test the battery.

1.5. System Features

BTS9 battery test system adopts an advanced three-level control architecture (upper-machine, mid-machine, and lower-machine). The mid-machine centrally manages the test process and data transmission of all the lower-machines, realizing the real-time response of power failure protection, abnormal test protection, test mode switch and recording of all test events. Each channel has independent

over-current, over-voltage, under-voltage, overload, monomer voltage, auxiliary temperature, and other protection conditions to ensure the high reliability and safety of test data.

The system has a rigorously constructed software testing platform to ensure that all circuit units, software modules, and structural designs have 100% complete coverage of principle verification and function and performance testing. All equipment is subjected to a vibration test before leaving the factory to ensure that it will not be damaged during transportation.

Hardware Features

1. Advanced hardware circuit architecture, modular design, and channel independent control.
2. Sophisticated calibration system.
3. The clamps acquired numbers of patterns, and the clamps is customizable with a wide selection.
4. Independent ventilation and heat dissipation design to effectively improve the stability of system.
5. With four pins input socket, the test range is wide and the test accuracy is high
6. Capable of comprehensive battery testing.
7. Supports channel mapping and AUX channel binding.
8. The independent grounding terminals, cables, and PCB boards that made of flame retardant materials.
9. The system is equipped with an anti-reverse connection module to prevent the electrode of the battery from being connected reversely to ensure the safety of testing and production.
10. The independent double loop control mode of the hardware, CC to CV smooth transition, can prevent the current sharp edge and high current impact on the battery, protecting the battery and the safety of the tester.

Software Features

1. C/S system architecture design, based on TCP/IP network communication protocol.
2. Muti-users management.
3. Software user-friendly interface - advanced UI design.
4. Supports test process control function.
5. Flexible programming test scheme.
6. Supports battery formation and grading, curve comparison functions.
7. The test data is comprehensive and the test process can be reappear.
8. The system is expandable and up-gradable.
9. Comes with report export function, convenient to view the test status.
10. Support automated connection ports to achieve automated testing.
11. Supports automatic backup to ensure high reliability of the protection of data.
12. Support automatic monitoring. If any abnormal situation occurs, the system automatically sends a report and an email notification to test technicians.

1.6. Models

BTS9 battery test system can power-up the equipment below:

1. BTS9000:
 - BTS9002 High accuracy 2-channel tester
 - BTS9004-GSM High accuracy 4-channel tester, support pulse mode
 - BTS9008 High accuracy 8-channel tester
2. BTS5008:
 - BTS5008 comes with: 5V6A(3-range), 5V12A(3-range), 10V20A, 20V10A, 20V20A ,20V30A, 24V15A and so on, can satisfy the needs of laptop battery test.
3. SMBUS module:

Supports the SMBUS, I2C communication protocol, and can be loaded on BTS9000 or BTS5008 equipment.
4. AUX5:

Temperature/voltage auxiliary machine, that using thermocouple and thermal resistance to sampling the temperature.
5. CALI5:

Auto-calibration machine for connecting server, mid-machine and multi-meters:

- 5V/6A, 8 channels
 - 30V/50A, 8 channels
6. Resistance meter:
The BVIR handheld internal resistance meter can measure internal resistance up to 20mΩ and voltage up to 20V.

Chapter 2 High Accuracy Tester

This chapter is introduced the standard BTS9 battery test equipment.

2.1. BTS9000

The channel of the BTS9000 mid-machine comes with the test channels, which can be used simultaneously to implement the mid/lower-machine functions, which are mainly used for high-precision battery testing. The sampling frequency can reach 1000Hz. The minimum test range is in μA level. The equipment can support 40 channels and offline operation. support cycle life test, over-charge/over-discharge test of GSM pulse test, DC internal resistance DCIR test, HPPC test, etc. Battery sorting, and consistency evaluation are supported.

BTS9000 series models as Form2 below:

Form 2 BTS9000 model features

Model	Features
BTS9002	2 channel high accuracy tester
BTS9004-GSM	4 channel high accuracy tester, supports pulse mode
BTS9008	8 channel high accuracy tester
BTS9040-GSM	40 channel high accuracy tester, supports pulse mode

The following content use the BTS9004 as an example to describe the basic information about the device. The following figure(Figure 2-1) shows the front panel:



Figure 2-1 BTS9004 front panel

1 Channel status indicator	The green light means charge, the red light means discharge, and the yellow light means rest (you can customize the color according to the your needs).
2 Channel connection indicator light	If the channel is connected, the indicator will flash once.
3 Network indicator light	If the red light blinks, the network is normal connected, if the red light is off, the network is disconnected.

Figure 2-2 shows the rear panel of the BTS9004

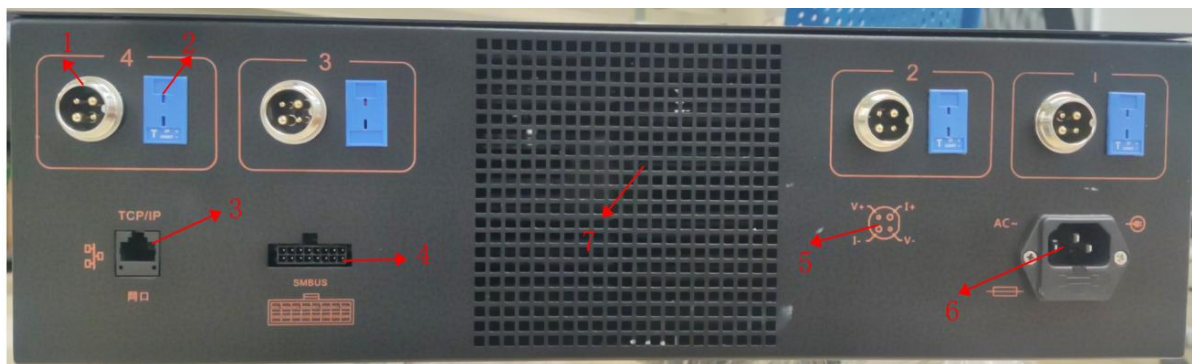


Figure 2-2 BTS9004 back appearance

1 204N Aviation socket	Able to connect different battery clamps
2 Thermal couple socket	Connect the thermocouple for measuring temperature, T type thermocouple, K type thermocouple, and so on according to your needs.
3 Net port TCP/IP	Connect to PC through network cable
4 SMBUS port	Socket for battery communication.
5 Label of aviation socket	Description of the channels' sequential connection
6 Power supply port	It can be connected to 220V power supply and 110V power supply.
7 Air outlet of radiator fan	For internal cooling.

Technical specifications of BTS9000 series equipment are shown in Form 3:

Form 3: Technical specifications for BTS9000 Series equipment (for example, CT-9004-5V5A)

Power source Input range	AC 220V +10% / -20%, 50Hz
Output power/channel	25W
Voltage range/channel	0.7 V~5V
Current range	Range 1: 0.1uA---150uA, Range 2: 140uA---5mA, Range 3: 4.5mA---150mA, Range 4: 140mA---5A
Current resolution	16bits (Range5A: 0.08mA, Range150uA: 3nA)
Voltage resolution	16bits (0.08mV)
Time resolution	1μS
Data record frequency	1000Hz(constant charge/discharge mode)/individual pulse recording(GSM pulse mode)
Current test/output accuracy	±0.2‰ FS
Voltage test/output accuracy	±0.2‰ FS
Current stability	±0.25mA; (Range: 5A)
Voltage stability	±0.25mV
Step types	Charge: CC, CV, CCCV, CP Discharge:CC, CP, CR, GSM Pulse Rest, Pause, Cycle
Step counts	1~255
Single step time	65535s
Loop nesting	4 layers
Pulse time control accuracy	±1μS
Minimum pulse width	400μS

Single step protection condition	Supported
Types of protection condition	Upper limitation: voltage/current/capacity Lower limitation: voltage/current Fluctuation protection: Voltage/current Charge and discharge slope
Hardware response time	$\leq 100\mu\text{S}$ (10% to 90% or 90% to 10%)
Calibration frequency	3 month
Operation environment	25 \pm 5°C(Accuracy guarantee), 25 \pm 20°C(Ultimate-use temperature)
Storage environment	0~60°C
Local data record capacity	1GB per channel
Communication method	10/100M Ethernet
Automatic continue after power failure	Supported
Hardware upgrade	Supported
AUX channels	Supported
Channel parallel	Can be implemented by the latest software upgrades, but the paralleled channel is not capable of pulse discharge.
Channel migration	Supported
Driving simulation	Can be implemented by the latest software upgrades

2.2. BTS5000

BTS5000 series is developed for laptops, tablets, mobile phones, and power tools. The BTS5000 series adopts the latest generation of energy-saving inverter technology. The battery discharged energy can be internally converted to other channels for charging. If there is still discharged energy surplus, it will be returned to the power grid, which will save your room space and electric power consumption.

Typical BTS5000 series equipment models are displayed as below:

Form 4 BTS5000 series models and features

Model	Features
CT-5008-5V6A	3 range(1A, 3A, 6A), 0.02%FS accuracy
CT-5008-5V12A	3 range(1A, 4A, 12A), 0.02%FS accuracy
CE-5008-20V10A	Single range, power feedback model, 0.02%FS accuracy
CE-5008-24V15A	Single range, power feedback model, 0.02%FS accuracy
CE-5008-20V30A	Single range, power feedback model, 0.02%FS accuracy

CE-5008-20V30A is been used as an example to describe the basic device information. The following figure (Figure 2-3) shows the front panel:



Figure 2-3 CT-5008-20V30A Front view

1 Power switch	Equipment starter/closer
2 Device Number display screen	Displays the device channel number
3 Radiator fan	Heat dissipation for equipment
4 Channel indicator	The green light indicate charging, the red light indicate discharging, and the yellow light indicate rest (you can even customize the color according to your needs).

CT-5008-20V30A back figure:



Figure 2-4 CT-5008-20V30A back appearance figure

1 High current socket	Current line terminal I+ I-
2 Voltage terminal	VH Socket, V+ V-
3 SMBUS port	Battery communication port connection
4 Tray light port	Port of the tray channel light connection
5 Power supply	220V or 110V power supply
6 Net port TCP/IP	Connect with PC through network cable

CT-5008-20V30A specification (Form 5):

Specification		
Items		Parameters
Input power source		AC:220V +10% / -20% / 50Hz
Input power		6400W(3 inverter)
Resolution		AD: 16bit DA: 16bit
Input resistance		≥1MΩ
Voltage	Output range/channel	Charge: 2.5V~20V Discharge:2.5V~20V
	Accuracy	± 0.02% of range(full range)
	Stability	0.025%

Current	Output range/channel	Charge: 30mA~30A Discharge: 30mA~30A
	Accuracy	$\pm 0.02\%$ of range(full range)
	Stability	0.025%
Power	Output power/channel	600W
	Stability	0.05%
Time	Current response	The hardware response time from current to 30A is 30ms
	Step time range	1~65535 minutes/step Time format 00:00:00(h, min, s)
Data record	Condition	Time Δ t: (0.01s~60000s)
		Voltage Δ U: (12mV~20V)
		Current Δ I: (7.5mA~30A)
	Frequency	100Hz
Charge	Charge mode	CC, CV, CCCV
	Stop condition	Voltage, Current, Relevant time, Capacity
Discharge	Discharge mode	CC,CP
	Stop condition	Voltage, Current, Relevant time, Capacity
Cycle	Cycle test range	1~65535 times
	Stpes per cycle	255
	Loop nesting	With nested loop function, supports a maximum of 4 layers of nesting
Protection	Security protection and exception protection	Data protection for power outage
		Safety protection conditions: Voltage upper/lower limitation, current upper/lower limitation, delay time. Exception protection conditions: Maximum CC charge/discharge current fluctuation, Current falling range for CV charging, Amplitude of voltage rise during CC charge, Amplitude of voltage drop during CC discharge.
	Hardware	Anti-reverse connection protection, reverse connection warning
Channel feature		Constant current source and constant voltage source adopt independent double closed loop structure
Channel control mode		Independent control
Voltage and current sampling		4 wire connection
Noise		<80dB
Host computer communication		TCP/IP
Data output		EXCEL、TXT、Chart
Communication port		Ethernet 10/100M
Channels number/unit		8
Requirement of operation environment		
Items		Parameters
Operation temperature range		10°C~40°C
Storage temperature range		10°C~45°C

Working environment humidity	30% ~ 80% RH(No condensation)
Storage environment humidity	30% ~ 90% RH(No condensation)

2.3. SMBUS

The tester has a built-in communication module that supports SMBUS, I2C, and HDQ protocols. Which is capable of real-time data sampling with the battery pack with frequency of 100KBPS. Its data transportation speed is 8-times faster than that of traditional products, and it can obtain the real-time status of each cell and make step parameter adjustments more quickly and accurately.

SMBUS series versions and models are shown in Form 6:

Form 6 SMBUS version model, and features

1	SMB-MOULE-1.1	The pull-up resistor and the pull-up port voltage are stable
2	SMB-MOULE-1.3	The pull-up resistor and the pull-up port voltage have four gears each, which can be configured on the client.

The following figure shows the front view of different versions of SMBUS boards

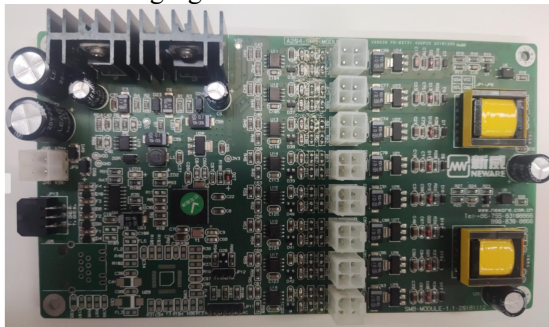


Figure 2-5 SMB-MOULE-1.1 module

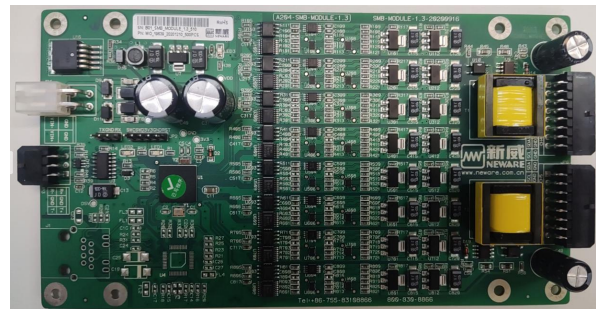


Figure 2-6 SMB-MOULE-1.3 module

2.4. AUX5

AUX5 series of auxiliary machine are connected with the mid-machine, accept the control of the mid-machine. With the lower-machine, they also perform real-time sampling of battery voltage and temperature.



Figure 2-7AUX5 Front view

1	Voltage socket	For connection of voltage test cable
2	Temperature socket	For connection of temperature test cable

2.5. CALI5

The automatic calibration tool CALI5 is connected to the server, the mid-machine, and the multi-meter to operate the calibration of the channel to eliminate the inherent error of the device, i.e., eliminate the system deviation of the control value and the sampling value of the system deviation. Before the battery test equipment is manufactured or after a calibration cycle, it is necessary to use the calibration tool CALI5 for channel calibration.



Figure 2-8 CALI5 Front panel

Auto-calibration machine CALI5 back panel Figure 2-9:

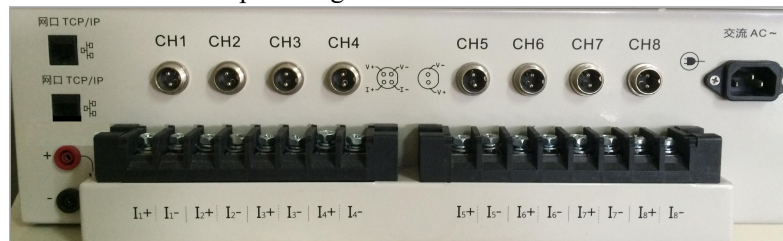


Figure 2-9 CALI5 back panel

2.6. Connection of Test Equipment

This section describes how to connect the tester. The following uses the BTS9008 as an example:

1. Power connection

This device uses a three-core power cord to connect to the power socket of the mid-machine and then to the grid.



Attention: Please note that the input voltage. Grounding terminal is effectively grounded!

2. Mid-machine connection

The mid-machine is connected to the BTS9.1 upper-machine through TCP/IP port.



Attention: Pay attention to fire prevention and keep away from flammable objects.

3. Aux connection

The aux is connected internally with the mid-machine to realize communication without external connection.

4. Battery connection

When connecting the battery, the current/voltage cable and communication cable of the battery have a strict corresponding relationship with the cable sequence on the channel interface. Please check the cable sequence of the channel interface carefully when connecting the device as shown in the figure below).

V+:Cathode Voltage V-:Anode Voltage I+:Cathode Current I-:Anode Current C: SCL clock line D: SDA data cable



Figure 2-10 Channel wire connection



Warning: When connecting the battery to the clamps, ensure that the cathode and anode of the battery are correctly connected to the positive and negative terminals of the clamps to prevent accidents during the test.

Chapter 3 Installation and Maintenance

This chapter introduces the installation and maintenance of the system from three aspects: software installation, hardware maintenance, and software uninstall.

3.1. Installation

PC software installation is assigned to new installation and upgrade installations. The new installation is for the user's first-time installation. Upgrade Installation: This feature enables users to upgrade existing software.

New Installation

When you install the host software for the first time, you can choose default installation or a personalized installation.

Default installation: Do not select the corresponding software module. Follow the default options on the installation page and install the software as prompted.

Personalized installation: Users can install clients, servers, backup servers, and reporting servers based on different requirements. You can manually set an installation path and select the language.



Notice: The software only supports NTFS file systems. Before installation, disable the Windows firewall or enable ports TCP8002, 8003 (device ports), and 8004.

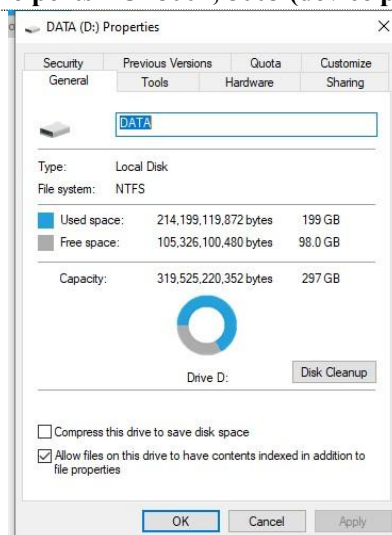


Figure 3-1 Hard disk file system display window

1. The operating environment of the client and server is as follows: Form 2: Server Operating Environment

Form 2 Operation requirement of server

Components	Parameters
CPU	>Core Dual-core or Q9550(4 core)
Frequency	>2.4GHz
RAM	>4GB
Hard-drive	SATA socket, >500GB(with 3 units of hard-drive RAID5(recommended))
File form	NTFS
Operation system	Microsoft Windows 7/ 8/10/11 64 bit

Port	Ethernet communication port, RS232/485
Switch	Switch will be needed for multi machines.
Power source	UPS recommended

2. Operation software installation

Decompress the BTS.9.1.4 file, open the decompressed BTS91_SETUP file, and run Setup.exe as the administrator to go to the installation wizard page, as shown in Figure 3-2. User can select the Chinese or English version as required.

Click **Next** button to enter BTS9.1.4 installation interface, as figure 3 - 3 shown:

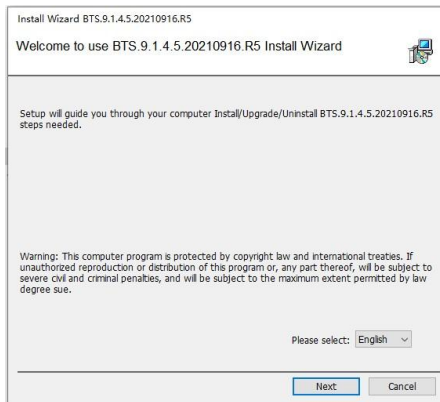


Figure 3-2 Installation guide

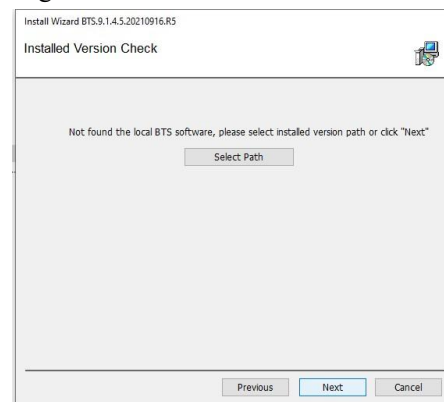


Figure 3-3 Software version check

If you select "Manually specify the installed version directory," you can select a previous software installation directory to overwrite the installation.

If you click **Next**, the Select Installation Content page is displayed. The installation wizard directly locates the directory that was installed before, but this directory must be empty before the next installation can be performed. You can click the "Select installation path" button to select a new installation directory.

The default installation are includes client installation and server installation. You can also select the installation contents as required. Click the **Next** button to start the software installation after confirming precautions such as disabling the firewall, as shown in Figure 3-4.

During the installation, if OpenService Failed is displayed during the process of forcibly clearing historical services, it is because the user installs the software for the first time and the system does not have historical services to be cleared. This will not affect the installation and operation of the software and will not be displayed when the software is installed again, as shown in Figure 3-5:

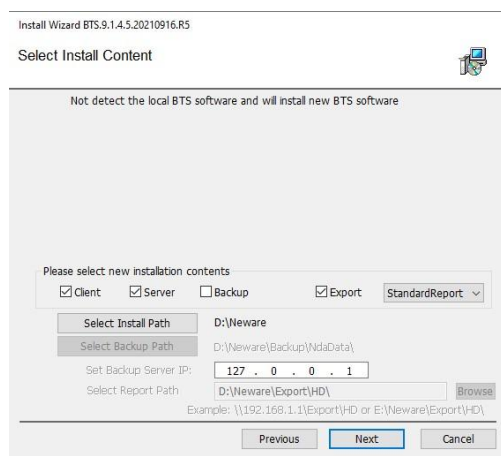


Figure 3-4 Select Content

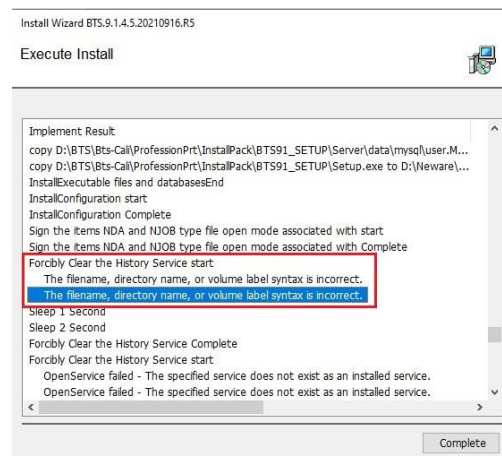


Figure 3-5 Installation

If the installation is complete, click the **Complete** button to exit the installation guide, as figure 3-6 shown:

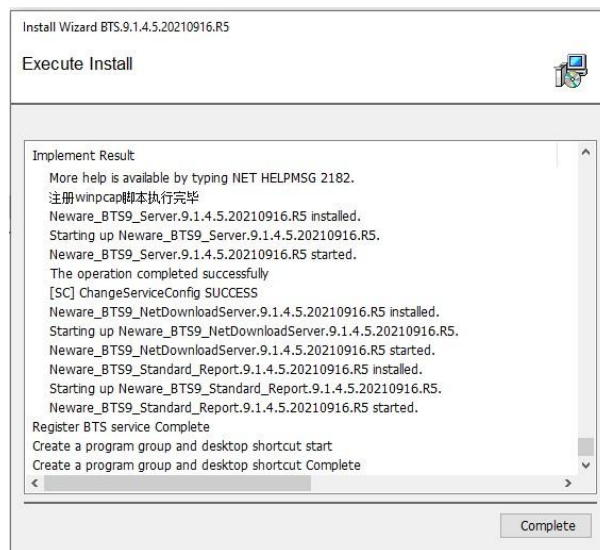


Figure 3-6 Installation complete

3. Complete the software installation

If you select "Install Server" and "Install Backup Service" during personalized installation, check whether the options are correctly installed after the installation:

- ① Open "Control panel" → "Managing tools" interface.
- ② As shown in Figure 3-7, select service to view Neware_BTS9_MySQL, Neware_BTS9_Server, and Neware_BTS9_Backup. The four services are listed on the right and have already begun.

Neware_BTS9_MySQL.9.1.4.5.20210916.R5	Neware_BTS9_MySQL.9.1.4.5.20...	Running	Automatic	Local System...
Neware_BTS9_NetDownloadServer.9.1.4.5.20210916.R5	NEWARE Battery Test System N...	Running	Automatic	Local System...
Neware_BTS9_Server.9.1.4.5.20210916.R5	NEWARE Battery Test System S...	Running	Automatic	Local System...
Neware_BTS9_Standard_Report.9.1.4.5.20210916.R5	NEWARE Battery Test System R...	Running	Automatic	Local System...

Figure 3-7 Server display window

If all functions are installed, ensure that the five services are started. If any service is not started, right-click the service and choose Start from the shortcut menu.

- ③ If any of the five services is missing from the list, uninstall the latest installed services and reinstall them. Then check whether the server is correctly installed (repeat the above steps).
- ④ If any of the five services is manual, practice the following steps to change the startup type to automatic. The Neware_BTS9_Standard_Report service, whose startup type is manual, is used as an example.

Methods:

- Right-click "Neware_BTS9_Standard_Report" → Right-click Properties, and the Properties dialog box is displayed.
- Select **Automatic** from the drop-down list box. As shown in the figure below:

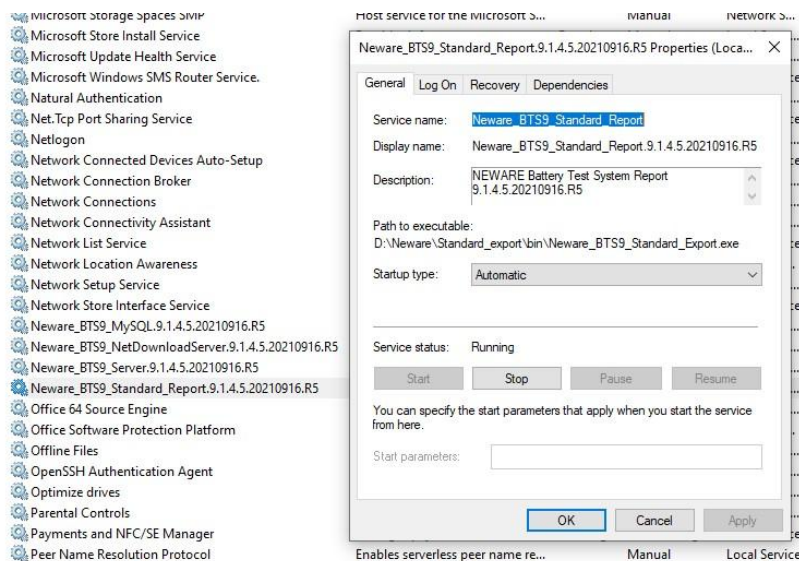


Figure 3-8 Neware_BTS9_Standard_ReportService Properties dialog box



Notice: In the computer management window, right-click and choose "Stop" from the shortcut menu to stop the running service. This operation is required to shut down the running service when the server needs to be manually upgraded.

Upgrade

If the user has installed the elder version of BTS9 operation software, this software can be upgraded directly when compatible with the new version without uninstalling the current software. If they are incompatible, uninstall them first and then install the new version.

The upgrade process as follow:

1. See Step 1 in the software installation process.
2. Select an installation language and click **Next**. The Installed Version Check interface will displayed. Information about the installed software version and installation directory is displayed on the interface. See Figure 3-9:
3. Click **Next**. On the **Select Upgrade Content** page, you can select the upgrade mode and upgrade content as required. Upgrade mode By default, the client and server are upgraded in the original directory, as shown in Figure 3-10. Click **Next** to confirm the warning content and enter the software upgrade interface.

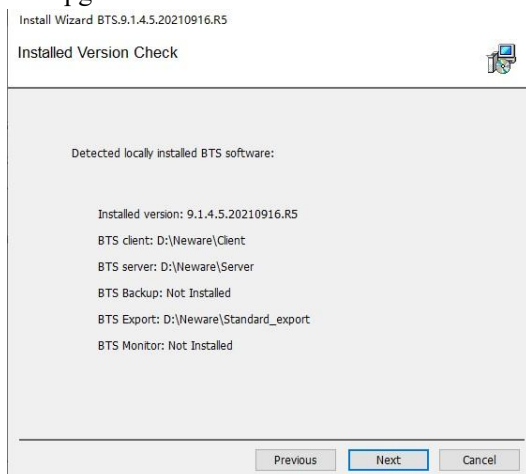


Figure 3-9 Version check

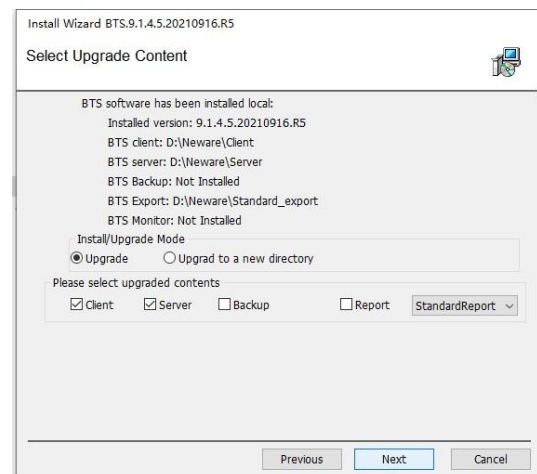


Figure 3-10 Selection of upgrade content

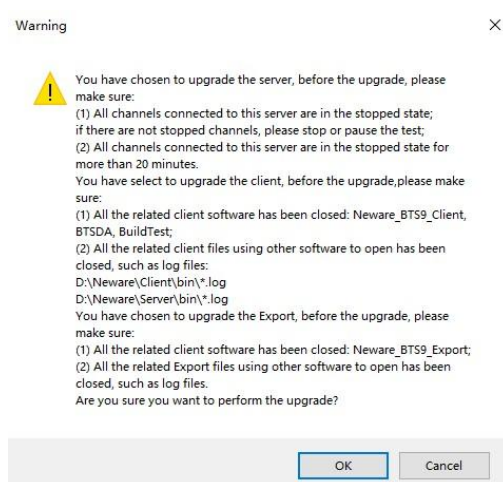


Figure 3-11 Notice of Upgrade

Confirm information:

Before you upgrade the server, please confirm:

- All channels connected to this server have been stopped. If there are any channel are operating, stop or pause the test first.
- Equipment has been stopped for more than 20 minutes.

Before you upgrade the server, please confirm:

- All client-related software has been closed: BTSDA, BuildTest, and Neware_BTS9_Client.
- Client files, such as log files, that are opened by other software have been closed.

Before you upgrade the server, please confirm:

- All back-up software has been closed: Neware_BTS9_Backup.
- Backup files, such as log files, that are opened by other software have been closed.

4. Click **OK** to exit the installation guide, and the software will be successfully upgraded.

3.2. Hardware Maintenance

If you need to add other hardware devices or have a device connection problem, you can use the hardware maintenance method described in this section to find and resolve this problem.


First, after the hardware is connected, use the client search function to search for the device and ensure that the IP address is correct. Ensure that the first three segments of the IP address are the same and that the last segment is different. Then, connect the TCP/UDP debugging tool to the corresponding device to perform debugging. The specific operation process is as follows:

1. Hardware connection

Method of connecting the device as described in **Section 2.6**. After the device is connected, check the circuit, turn the power on and start the device, and ensure the device indicator is on.

2. Equipment searching

① Searching for devices from BTS software

- Click device search button  on BTS device list display area, the search dialog box will be displayed.
- You can select Mid-machine, Calibrate Tooling, and Multi-meter as required. Click the **Search** button to display all online devices and related device information in the list.
- Double-click the device list. The Set Device Information dialog box is displayed. You can change the MAC address as required. Select the Automatically Obtain IP Address (DHCP) option box to automatically obtain an IP address. As shown in the picture below, click the **OK** button to complete the modification.
- The device IP address in the device information is the IP address of the mid-machine. The server's IP address must be the same as the IP address of the PC.

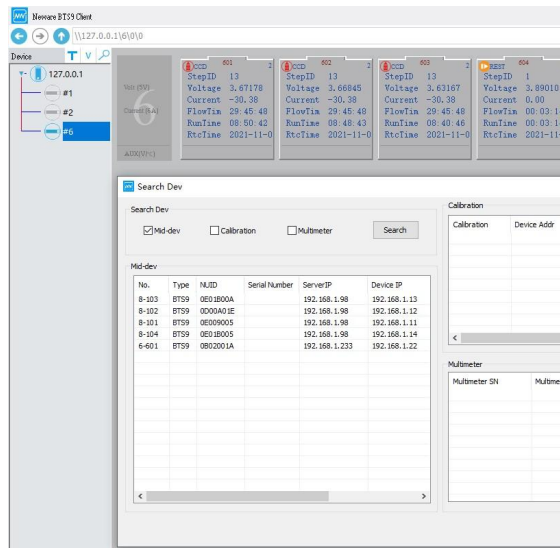


Figure 3-12 Equipment searching interface

Inside the BTS9000 high precision tester, every 8-channel are corresponding to a mid-machine. When searching for the mid-machine through the client, the mid-machine with the same channels number and the same code will be found, as shown in the figure below, multiple BTS9 devices on the mid-machine have been searched.

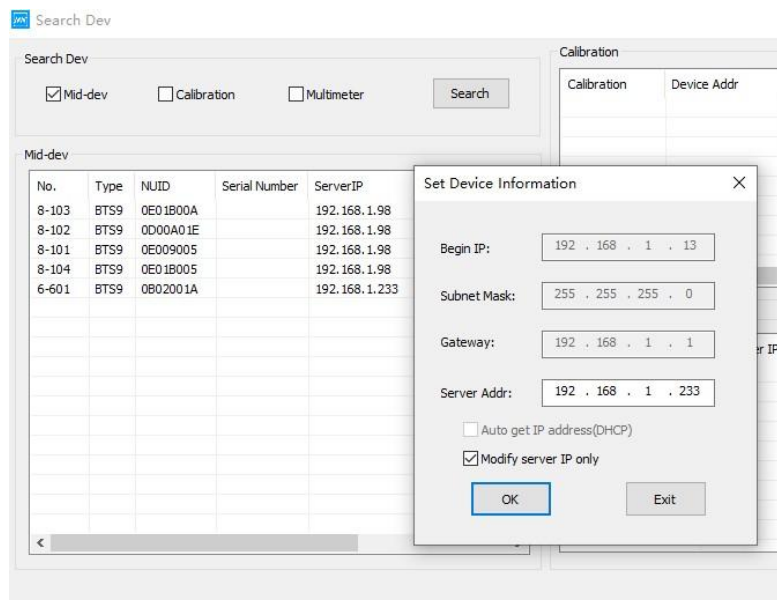


Figure 3-13 Equipment searching interface

When using these devices, you need to change the server IP addresses of these channels to the IP addresses of the current PC. After the modification, the four channels of the device will be activated. The client will map all these device channels to the same mid-machine in the form of multiple channels of the mid-machine, as shown in the following figure:

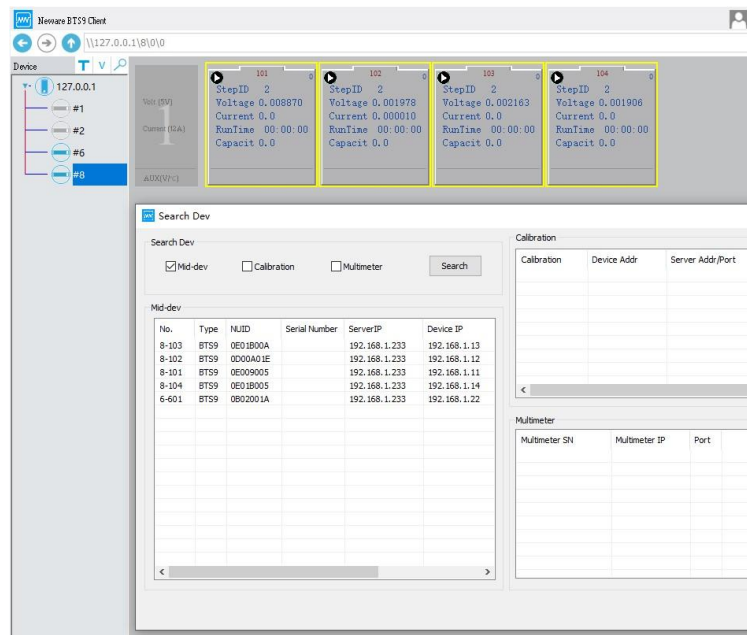


Figure 3-14 BTS9004-GSM Successfully connected with computer

Notice: The device search function searches only devices in the current network segment, not across routers.

② The TCP/UDP tool searches for devices

You can use the TCP/UDP tool to remove or add a device to a server. Start the TCP/UDP tool, enter the device IP address to be searched in the destination IP address box, set the corresponding device port number, select TCP Mode, connect to clients, and click Connect. The connection is successful, as shown below:



Figure 3-15 Connect the Mid-machine

Use the command "search" to enter the unit search stage, and the information of the lower-machine unit and channel connected by the device will be displayed in the display box of the receiving content, as shown below:

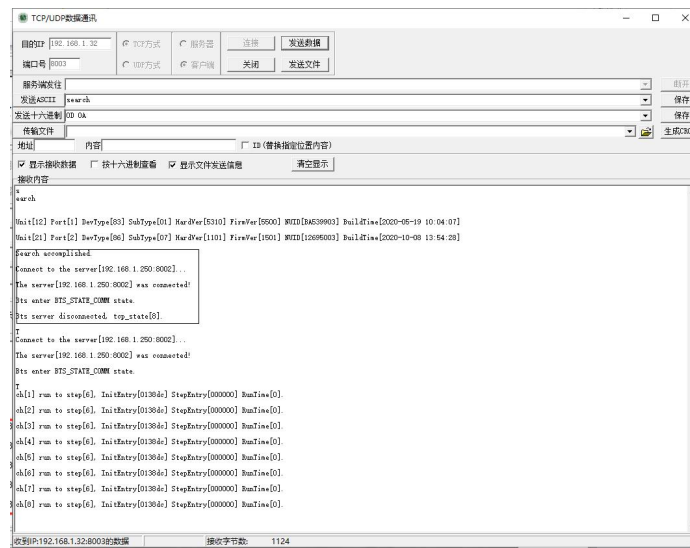


Figure 3-16 The TCP/UDP tool searches for devices.

3. Hardware adjustment

To start a channel test on the software, if the connection of the system is correct the test will be functioning. If the channel cannot be operated, try to find out if there's a issue of cable, send the UART instruction through the TCP/UDP tool to check the number of failures of the lower-machine, connect the cable and test again until the debugging is successful. Here are the simple steps:

Connect the TCP 8003 port on the IP address of the target device → send the ASCII instruction code → send the hexadecimal terminator 0D 0A to execute the corresponding instruction. Common debugging commands are as follows:

Form 7 List of common debugging instructions for the mid-machine

Indicate	Meaning
help	Printing HELP information
ver	Check information of the version
local	Change IP address <local_ip>
server	Change IP address <server_ip>
search	Connection detection
status	Mid-machine status check
uart	Status of serial port check
disp	Print channel status <Channel number>
step	Step parameter <Channel number> <Step sequence number>
query	Event record
update	System upgrade <CRC-32>
0D 0A	Hexadecimal character

3.3. Uninstall

Through the control panel or software directory "Uninstall.exe" program, you can un-install the software.

Uninstall the software through the control panel. The steps are as follows: Click the "Start" menu "All Programs" "Neware" "Uninstall" Click to open As shown below, click **Next** to uninstall:

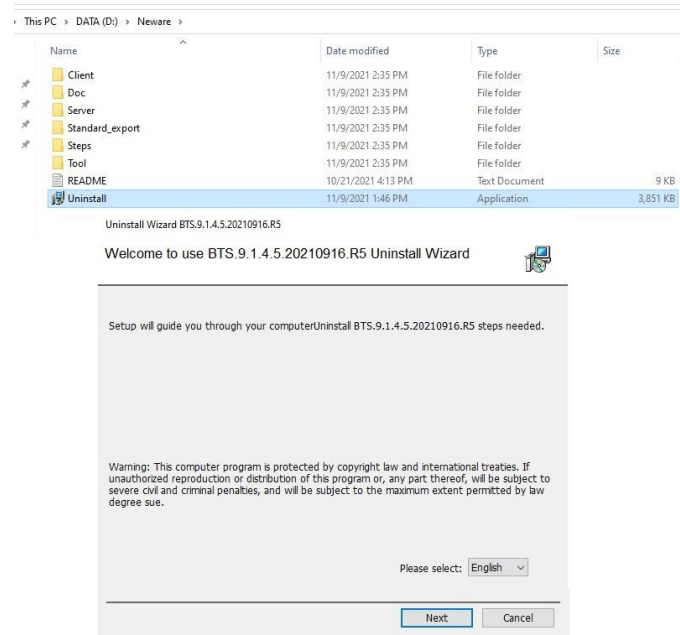


Figure 3-17 Software delete interface

After the software is uninstalled, manually clear the software folder to delete the software and test information.



Notice: Back up test data before delete. During delete, data may be damaged or compatibility problems may occur due to edition differences.

Chapter 4 Software Features

4.1. Start the Software

A BTS client is a human-computer interaction interface that can set and send commands to control devices. Real-time display of channel test data and status. you can query current and historical test data. To operate the device, you must open the client software in the following three ways:

1. Click“Start”→“All program”→“Neware”→“Neware_BTS9_Client”.
2. Double-click“Neware_BTS9_Client”Shortcut icon to open software.
3. In the software installation directory, double-click“Neware_BTS9_Client”file.

Open the software, and the software interface is as follows:



Figure 4-1 Software interface

4.2. Main Interface Display

After all devices are connected, the device and its channels are automatically displayed on the client. As shown in the figure below (Figure 4-2), if no device is displayed, check whether the device is connected.

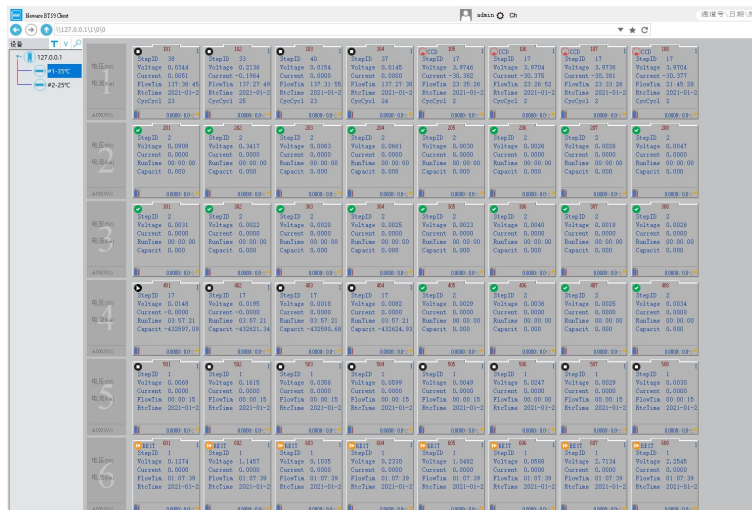



Figure 4-2 Main interface of the software

1. Title bar: There is a title bar at the top of the main interface. From left to right, the title bar includes the LOGO, software name, Permission Management Settings, user name, Configuration button, Search edit box, Search criteria drop-down button, Search button, HOME button, About Button, Minimize, Maximize/Zoom, and Close.

- Search the edit box: Enter the search criteria, such as device number and battery bar code, and hit enter.
- Drop-down menu for search criteria: Click to display the drop-down list of search criteria and enter relevant search information, as shown in Figure 4-3:
- Fuzzy search: Click the search button , fuzzy search is used to display channel data information for all online devices under the current mid-machine. You can perform operations on the search results as required, as shown in Figure 4-4:

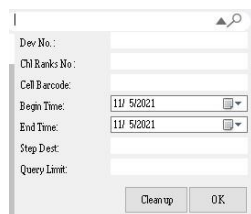


Figure 4-3 Search criteria setting

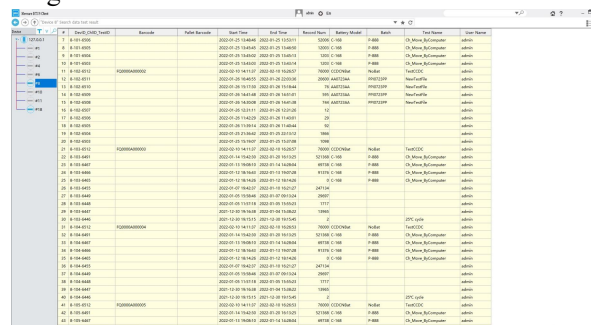



Figure 4-4 Search result setting



Notice: Delete Historical Data will delete the corresponding data index in the database and the corresponding NDA data. Data cannot be restored after being deleted. Therefore, use this function with caution.

- HOME Click : The main interface of the client is shown in the following figure (Figure 4-5):

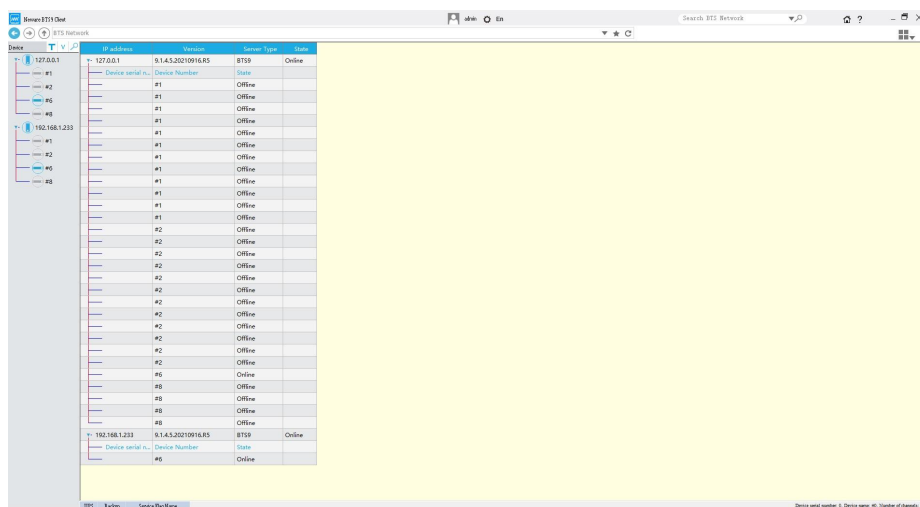


Figure 4-5 HOME interface

- About buttons[?]: You can view basic information about the current client software, as shown in the following figure: (Figure 4-6)

About BTS 9.1.4.5.20210916.R5



Figure 4-6 About

1. Toolbar: Located below the title bar, from left to right are the back button, forward button, up button, address edit box, history drop-down button, favorites button, refresh button, display mode switch button, display mode switch down button, sidebar button.
 - Up button: Return to the upper directory, For example, the current directory is a secondary directory. Device No. Interface (Device 2), If you return to the previous level, the level 1 directory is displayed, that is, the server IP address page (127.0.0.1).
 - Address editor: Display the device address you are currently viewing. You can also add the address of the current view to your favorites for future usage.
 - History draw down button: It mainly displays the corresponding addresses of different operation interfaces during operation. You can select an address as required to switch between the operation interface and devices. As shown in the figure below: (Figure 4-7)
 - ① Search history zone
 - ② History draw down button
 - ③ Collection
 - ④ Refresh



Figure 4-7 Historical address display

2. Device list display area: It is located on the left of the lower part of the toolbar. After the server is successfully connected, the searched devices are automatically displayed in this area to display all devices under the current server and their status (online and offline). The first level is the server's IP address (127.0.0.1 and 192.168.1.233), and the second level is the device number (8). Right-click the device number to calibrate, upgrade, export reports, query logs, and other operations, as shown in the following figure: (Figure 4-8)

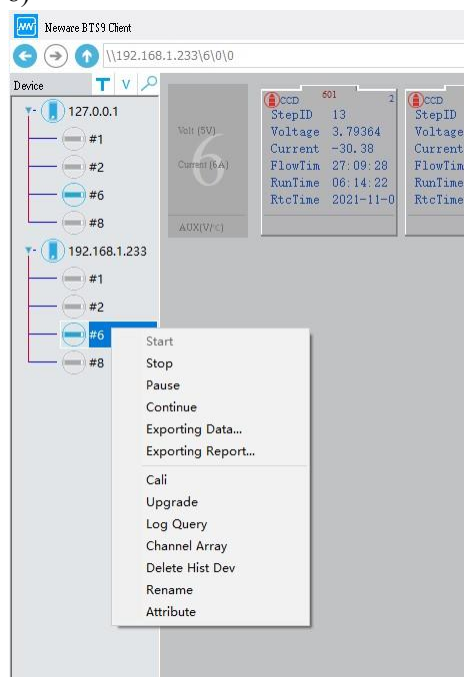


Figure 4-8 Device list display



Notice: The deletion operation does not delete the test data of the device, but the offline device ID is no longer displayed in the device list.

3. The data display area, located below the toolbar and to the right of the device list, displays device information, channel information, and test data for the current device. Test data is displayed differently in different display modes.

4.3. Channel Display mode

There are three client channel display modes: large icon, small icon, and list. You can switch between display modes by clicking the icon or clicking the drop-down menu next to the icon.

Large Icon

The large icon interface is composed of a simulated big battery icon shape and corresponding channel data, as shown below:

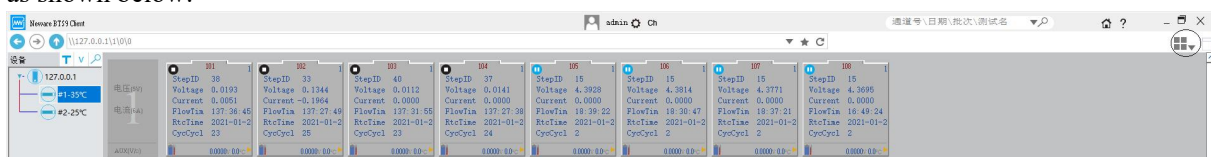


Figure 4-9 Large icon display

- Equipment information display: the leftmost part of the channel data display area is the equipment information display area, and the voltage and current displayed are the range of the equipment; Other parameter names correspond to the parameter values of the channel on the right. The following figure shows that the current device is 5V6A. (Figure 4-10)
- Channel legend analysis:
 - The device is not connected to the server, and no channel status is displayed. When the device is connected to the server, the status (Stop, Protect, Suspend, Pause, Complete) of the channel is displayed.
 - When the channel is operating, the blue dynamic downward arrow indicates the charging process, the red dynamic upward arrow indicates the discharge process, indicating the suspension state of the test, indicating Stop, indicating REST, indicating the channel protection state, indicating complete, indicating the channel disabled state. indicating the pulse.
 - Channel information display button. You can click this button to view the channel information.
 - Click the button to display the auxiliary channel relationship. Click the button to view the corresponding auxiliary channel bound to the main channel. (Figure 4-11)
 - Click the AUX channel display button, open the aux channel display window and you will see the voltage and temperature information. The AUX display button will be displayed on the channel icon only after the AUX is bound to the battery test channel and the aux field is set in the step.



Figure 4-10 Equipment information display

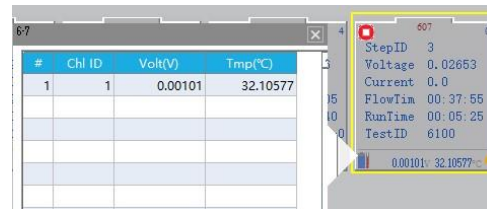


Figure 4-11 AUX channel information

Small Icon

The small icon display is composed of a simulated small battery icon shape and corresponding channel data, as shown in the figure below: (Figure 4-12)



Figure 4-12 Small icon visualize display

- Device information display: The parameter name displayed in the device information display area corresponds to the parameter value on the right channel. As shown in the following figure (Figure 4-13), the number 1 indicates the unit number:



Figure 4-13 Device information display

- As shown in the figure above, the channel icon are displayed: channel number, step number, execution status (charge, discharge, rest, and so on), real-time voltage, and real-time current.

List Display

The real-time data information of each channel is displayed in a list. You can customize the displayed data items and arrange the data items in ascending or reverse order. The list display interface is as shown in the figure below (Figure 4-14). Select the $+$ / $-$ button below the channel number to view/hide the information related to the Aux under the channel.

Channel	Cell Barcode	p Numl	Step Type	Work Status	Volt(V)	Current(mA)	Time(H:M:S.mS)	Cap (mAh)	Cycle	Aux Volt(V)	ux Temp(°C)	Start Time	Model	Batch	Test Name	User Name	NDA exported Path
601	FQ0000A000001	13	CCDChg	Testing	3.78833	-30.38	06:21:38 -193.234809		2			2021-11-04 10:03:25			25°C cycle	admin	D:\Neware\NDA\Model\Batch\25°C cycle-6-6...
602	FQ0000A000002	13	CCDChg	Testing	3.79111	-30.38	06:19:39 -192.213628		2			2021-11-04 10:03:25			25°C cycle	admin	D:\Neware\NDA\Model\Batch\25°C cycle-6-6...
603	FQ0000A000003	13	CCDChg	Testing	3.76961	-30.38	06:11:42 -188.206649		2			2021-11-04 10:03:25			25°C cycle	admin	D:\Neware\NDA\Model\Batch\25°C cycle-6-6...
604	017200H0PVN416+	22	CCChg	Testing	3.84303	50.00	01:15:31 62.941493		4			2021-11-04 15:59:16			25°C cycle	admin	D:\Neware\NDA\Model\Batch\25°C cycle-6-6...
605	0183007UPVN414+	22	CCChg	Testing	3.94323	50.00	02:20:59 117.489358		4			2021-11-04 15:59:16			25°C cycle	admin	D:\Neware\NDA\Model\Batch\25°C cycle-6-6...
606	017200VUPVN41A+	22	CCChg	Testing	3.78160	49.99	00:46:23 38.652795		4			2021-11-04 15:59:16			25°C cycle	admin	D:\Neware\NDA\Model\Batch\25°C cycle-6-6...
607	FQ0000A000001	2	Rest	Testing	0.00630	0.0	00:01:15 0.000000		0	0.00337	32.20688	2021-11-05 13:42:34				admin	D:\Neware\NDA\Model\Batch\TestName-6-6...
608	FQ0000A000002	2	Rest	Testing	0.04472	0.0	00:01:15 0.000000		0	-12.59948	29.56727	2021-11-05 13:42:34				admin	D:\Neware\NDA\Model\Batch\TestName-6-6...

Figure 4-14 List visualize interface

1. Main list customization: Users can customize the display of test data fields as required. Right-click the table header and select the data field that you want to display from the drop-down list, as shown in the following figure: (Figure 4-15)

Figure 4-15 List customization

2. Field sorting: Click on a data field, and the data can be sorted in ascending or descending order according to the field, as shown in the figure below: (Figure 4-16)

Channel	Cell Barcode	p Numl	Step Type	Work Status	Volt(V)	Current(mA)	Time(H:M:S.mS)	Cap (mAh)	Cycle
608	FQ0000A000002	2	Rest	Testing	0.03853	0.0	00:01:36	0.000000	0
607	FQ0000A000001	2	Rest	Testing	0.00655	0.0	00:01:36	0.000000	0
606	017200VUPVN41A+	22	CCChg	Testing	3.78266	50.00	00:46:43	38.932088	4
605	0183007UPVN414+	22	CCChg	Testing	3.94396	50.00	02:21:19	117.768655	4
604	017200H0PVN416+	22	CCChg	Testing	3.84344	50.00	01:15:52	63.220786	4
603	FQ0000A000003	13	CCDChg	Testing	3.76920	-30.38	06:12:02	-188.376372	2
602	FQ0000A000002	13	CCDChg	Testing	3.79079	-30.37	06:20:12	-192.493767	2
601	FQ0000A000001	13	CCDChg	Testing	3.78793	-30.38	06:22:11	-193.514983	2

Figure 4-16 List customization

3. List operation: Right-click list data to operate directly on the channel. You can also view channel information and test data, as shown in the following figure: (Figure 4-17)

Figure 4-17 List operation

Double-click the list data to view the channel information for the current channel, as shown below:

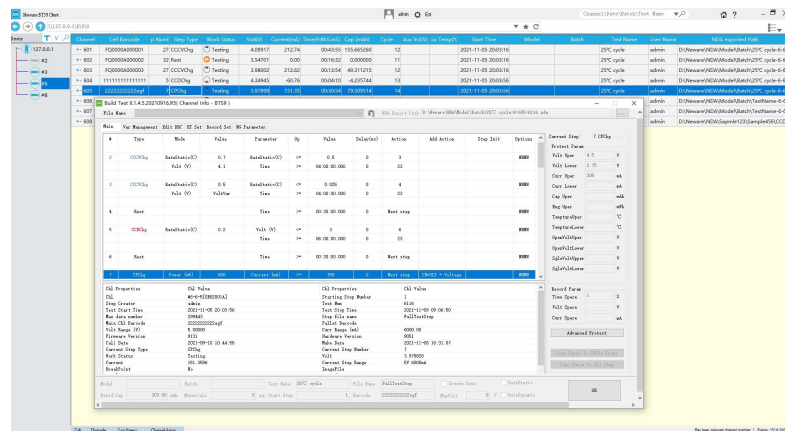


Figure 4-18 Channel information

4.4. Operation of Channel Control

Selecting the Channels

To selecting the channels:

1. Click the channel to select the battery. If the yellow border is displayed, the channel is selected, as shown in Figure 4-19.
2. To select multiple discontinuous channels, hold down the Ctrl key and click the channel to be selected.
3. If multiple channels are selected, hold down the left mouse button and select the target channel.
4. Pressing Ctrl + A selects all channels.

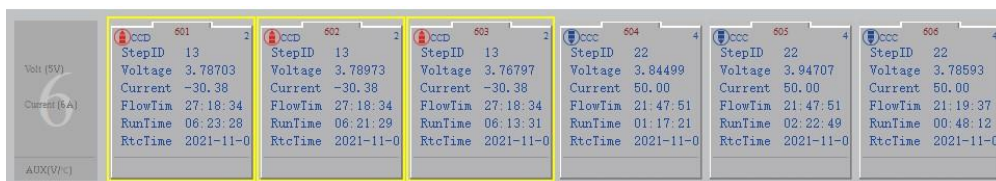


Figure 4-19 Select the channels

Start

Practice the following steps to start a channel:

1. Select channel → Right click → "Start".
2. On the right-click menu (as shown in Figure 4-20), you can set step parameters, record conditions, protection conditions, and professional protection parameters. When the condition is reached, the channel will performs the corresponding operation.

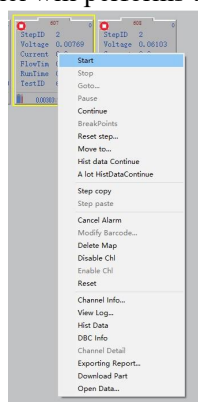


Figure 4-20 Start interface

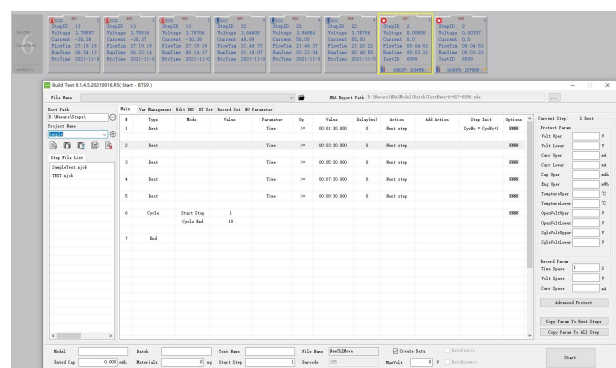


Figure 4-21 Step editor

Notice: Please refer to lithium battery test step setting.


Stop

To stop the tests of one or more channels, perform the stop operation as follows:

Select one or several channels, → right-click → "Stop". At this point, the corresponding channel stops performing the step and enters the stop state .

Pause

When you need to suspend one or more channel tests, you can perform the "pause" operation as follows:

Select one or more channels → right-click → "Pause". At this point, the corresponding channel stops executing the step and enters the suspended state .

Conditional Breakpoint

If a pause or stop channel operation is performed while the step is being operating, the voltage value may suddenly change significantly. Stopping the channel test with a "conditional breakpoint" is a good way to solve this problem and get the required data to the user.

In the test process, when the user sets a conditional breakpoint, the channel suspends the test process after the corresponding cycle time of the set step is completed to ensure smooth and continuous data. Right-click the channel and select "Conditional breakpoint" to set it, as shown below:

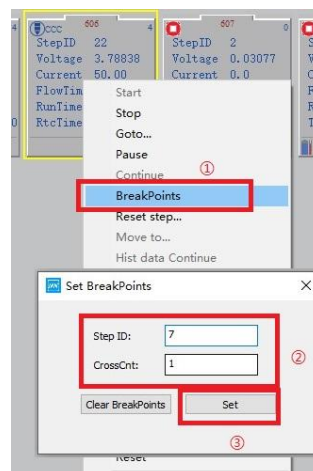


Figure 4-22 Breakpoints

The set BreakPoints interface is as shown in the figure. In the figure 4-22, it indicates that the channel test stops after the discharging operation at the seventh step in the process. Click the Setup button to complete the setting. Users can also clear the current settings of BreakPoints.

Continue

For the channel under manual "stop" state, "pause" state, and "protection" state, in case of power failure of the upper-machine, the user can connect to the original unfinished test step to continue the test, effectively preventing the loss of measurement data.

Operation: Select the channel to perform the "connection" operation. Right-click "Connection". You can restore the corresponding channel to the step state.



Notice: 'Stop' and 'Continue' working together to suspend and resume channel test work. Channels that have completed the test will not be able to "continue." program forcibly exits or powers off. Restart the program and you can continue the system.

Historical Data Continue

Select the channel. You can continue the historical data, continue the step test, and maintain the consistency of test data. On the historical data connection selection screen, select the source test information or NDA file for historical data connection. The current test cannot connect to historical data. You need to start a new step to connect historical data. If no image file is displayed, use the image tool to load the NDA file and connect the historical data again after the image is generated.

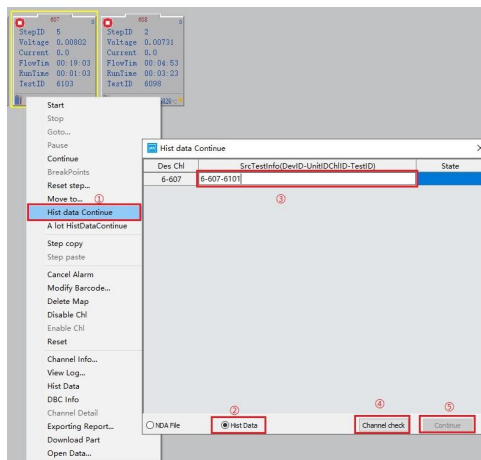


Figure 4-23 Source test information historical connection

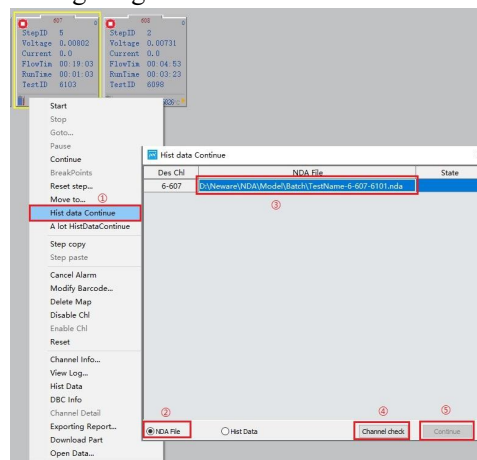


Figure 4-24 Continuation with NDA file data history data

The "migration" function is to change the unfinished steps and test data of the original channel to the target channel to continue the test, so as to ensure the normal operation of the battery test, and automatically connect the test data of the damaged channel. (The current test cannot be migrated, so you need to start a new step before the migration. If no image file is displayed, you need to use the image tool to load the NDA file and perform channel migration again after the image is generated.)

Users can migrate the test flow and breakpoint information from the current step to the target channel as follows:

1. Right-click the channel to be executed and click Migrate. The Channel Migration setting interface is displayed, as shown in 4-25:

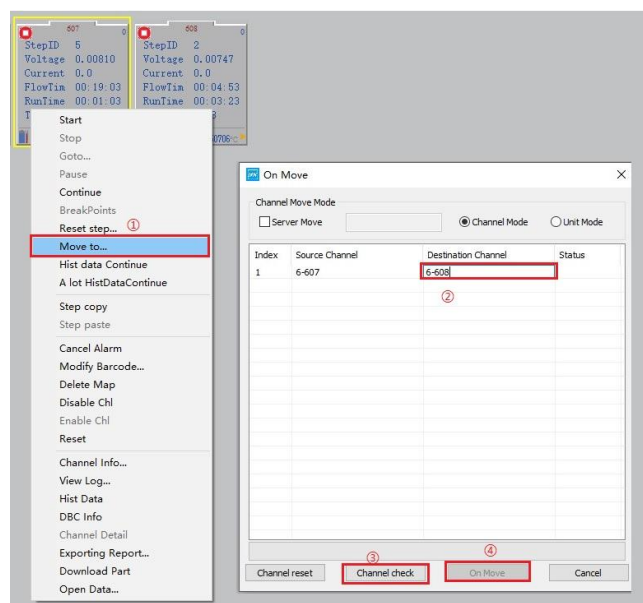


Figure 4-25 Channel migration setting

- You can select between channel migration, unit migration, and inter-service migration.
- In the destination channel option, fill in the destination channel (device number, unit number, and channel number).
- Click **Channel check** to check the channel matching degree. If the destination channel matches the migration channel, click the **Channel migration** button to perform channel migration.
- When the migration status reaches 100%, the migration operation is complete. During the migration, you can cancel the migration.
- In the channel migration interface, you can also reset the channel, select the channel/unit to be migrated, the destination channel/unit, etc.

Channel Information

You can query channel information to learn the details of the selected channel. For example, you can view the test range, channel number, current and voltage of the selected channel, cycle stack, detailed information of the step file, and the step being executed, as shown in 4-26.

The detailed procedure is as follows:

- Select the channel you want to view (the selected flag indicates the channel has a yellow box)
- Right-click on channel information and choose "Channel Information" from the shortcut menu. Alternatively, double-click the channel to view the channel information.

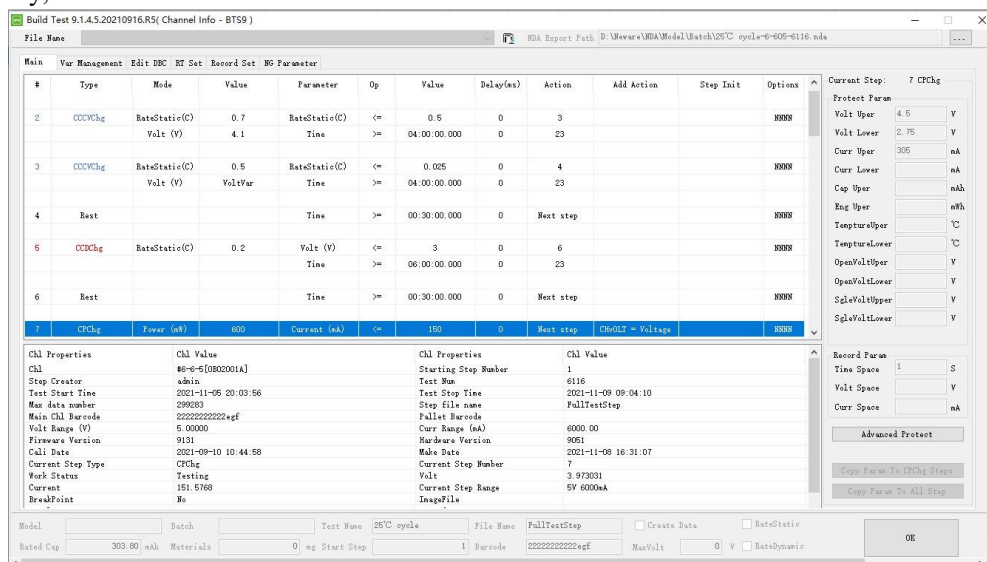


Figure 4-26 Channel Information

Disable/Enable Channel

In the case of channel damage, the "Disable channel" function can be used to identify the channel to avoid the wrong test data caused by the use of the channel, as shown in the following figure: (Figure 4-27)

After selecting **Disable Chl**, the icon on the channel is

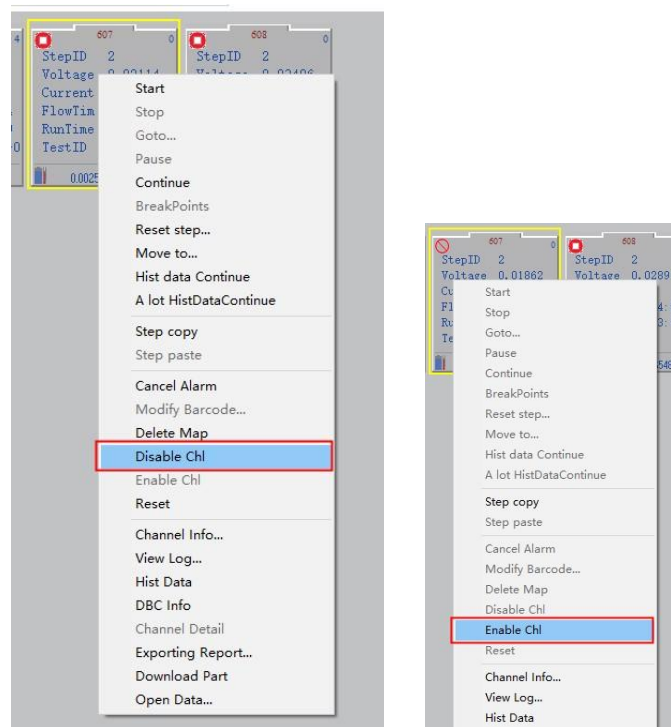


Figure 4-27 Disable/Enable channel

If a channel has been identified as disabled, you can use the **Enable Chl** to restore the channel, as shown in the preceding figure.



Notice: A Disabled Channel is defined as a channel that is in the stopped or completed state.

View Log

You can view the current channel during work events (such as: users start, stop, continue, jump, step reset, communication error, data export channel, etc.), the events in the process of testing the system time, the event corresponding data sequence number, the events of the type, as well as the events such as the voltage and current, a precise search.

Methods for the following:

1. Select the channel to be viewed and right click → select the "View Log" option. The log search and preview window are displayed, as shown in the following figure. (Figure 4-28)
2. You can query logs based on the device ID, unit ID, channel ID, and time range.
3. You can view different types of logs, including all logs, client logs, server logs, and hardware logs.
4. You can query logs based on log description.

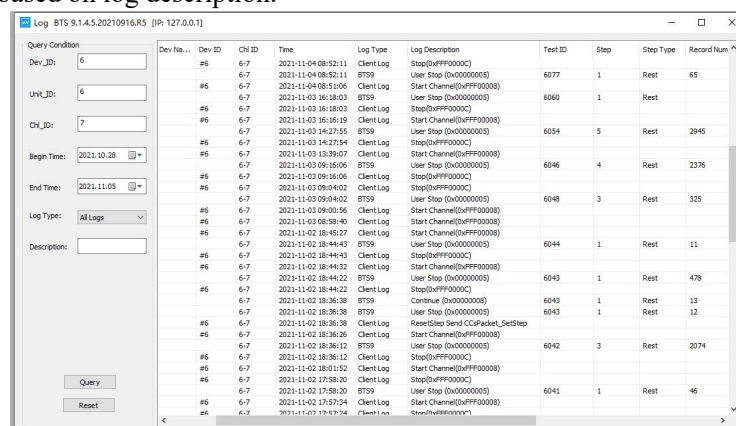


Figure 4-28 View Log

**Notice: You can set log permissions in Log Configuration as required.**

Step Operation

Users can copy, paste, and reset the steps of the current channel as required.

1. Copy step

Copy the existing step flow information in the channel to the target channel, so that the target channel and the copied channel have the same step flow.

Operation: After selecting the channel that to be executed, right click the mouse button → Step Copy → Select the target channel as shown in Figure 4-29:

**Notice: A channel step in the protected state cannot be copied.**

2. Step paste

Paste the step flow information that has been copied in the channel onto the target channel.

Operation: Select target channel → right-click → "Step paste", then the editing window of the step file pops up, and the step on the interface is the current step file pasted. Users can also set and modify steps on this interface, as shown in the picture below. In the figure 4-30, it means copying the step files of other channels to channel 608.

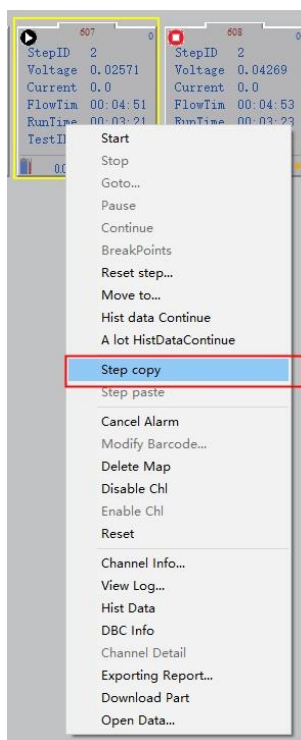


Figure 4-29 Step copy

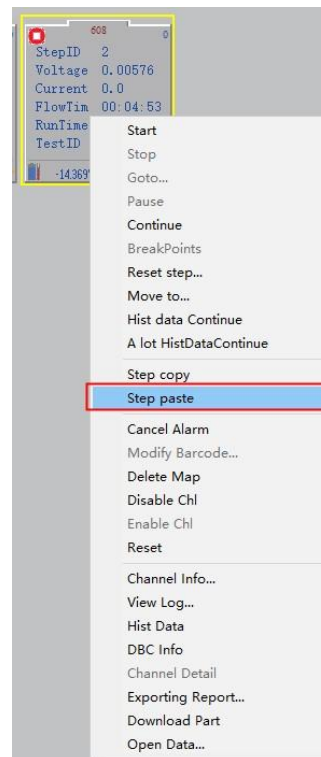


Figure 4-30 Step paste

3. Step reset

Step reset: Namely dynamic modification step. This function can be used when the user needs to modify the step of the current channel during the test. The test data continues normally.

Operation: If the channel is in the stopped state, select the channel → click the right mouse button → select "Step Reset." You can modify the set step operation.

4. Jump

Perform the **Jump** operation to jump from the current step to the target step. This operation can maintain the normal connection of test data. The jump method is as follows:

1. Right-click the specified channel and choose Jump to display the step setting interface.
2. In the step setting interface, select the step to jump to; In this case, between the current step and the jumpstep, it indicates the jump from the current step to the target step, as shown in 4-31. This indicates that the switch from step 22 to step 15 continues the test. Step is skipped. You can skip to any step in the current step file.

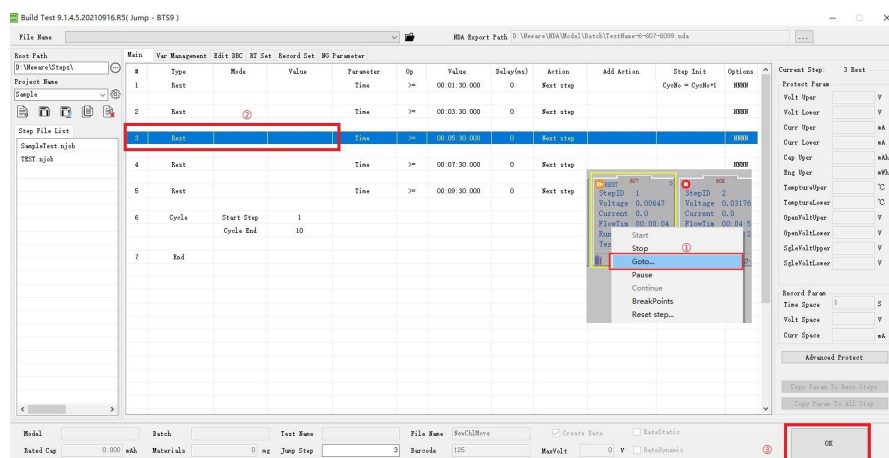


Figure 4-31 Jump

4.5. Build Test

The step editor is used to view and edit the test process and set or modify the operation parameters of each step. can create, save, delete, and open the original step file, and can check the current step file. This section mainly introduces the use of the step editor from the aspects of step mode, step type (step parameters, cut-off conditions), step recording and protection conditions, and so on.

Double-click "Buildtest.exe" to open the step editor, as shown below: (Figure 4-32)

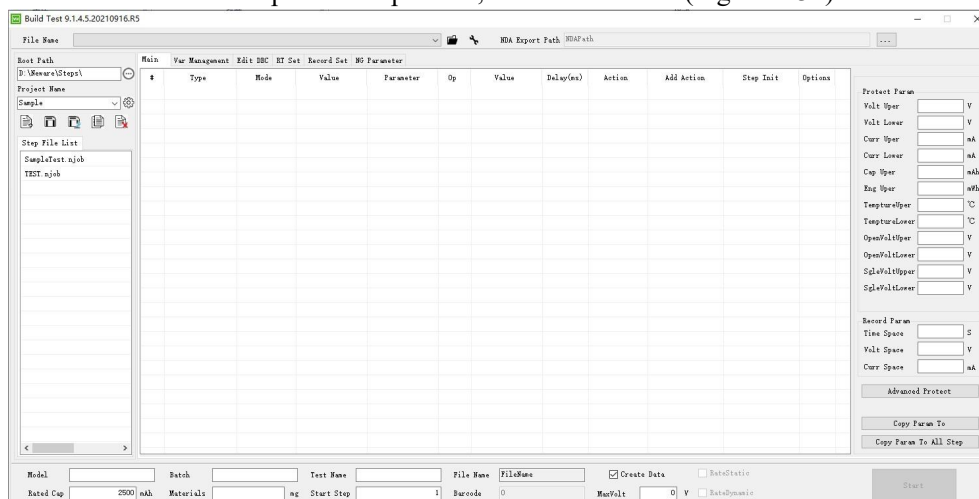


Figure 4-32 Step editing

1. Click the setting button , to set the Device Type, Range Set and language Set.

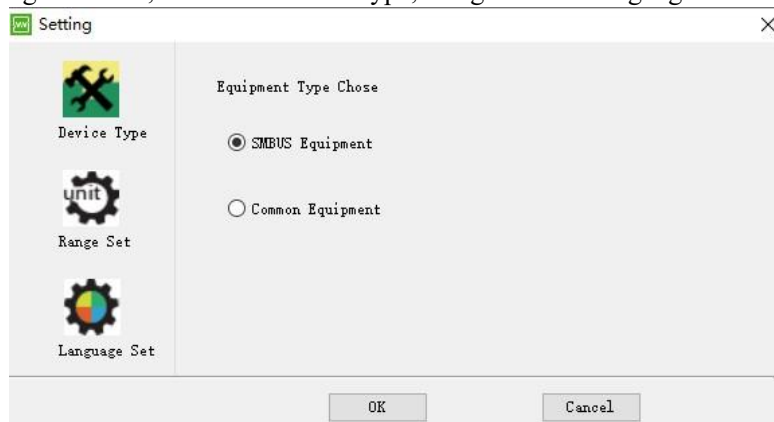


Figure 4-33 Equipment Type Chose

Types of equipment: The step protection conditions on different devices are different. The following content describes the step editor on SMBUS devices.

Range setting: Users can set it according to the actual range of the device.

Language setting: English and Chinese are available

2. Users can set the battery batch number and file description as required to facilitate data search and management.

Types of step

The BTS9 software supports the following step settings: Users can set cut-off conditions. When the cut-off condition is met, the step performs the jump operation. Multiple cut-off conditions can be set. The relationship between each cut-off condition is "or". That is, in the test project, as long as any cut-off condition is triggered, the step can realize 'jump': next step, suspend, stop, protect, complete. The system supports the upper and lower limits of battery voltage and temperature as the cut-off conditions for auxiliary channels.

1. CC charge
Charge the battery at a constant current set by the user. Voltage, time, capacity, energy, power, and -V values can be set as charging cut-off conditions.
2. CC discharge
Discharge the battery at a constant current set by the user. You can set voltage, time, capacity, energy, and power as discharge cut-off conditions.
3. CV charge
Charge the battery at a constant voltage set by the user. Current, time, capacity, energy, and power can be set as charging cut-off conditions.
4. CCCV charge
Charge the battery at a constant current set by the user. When the set voltage is reached, the battery is charged at a constant voltage. Current, time, capacity, energy and power can be set as charging cut-off conditions.
5. CCCV discharge
Discharge the battery at a constant current set by the user. When the set voltage is reached, the battery is discharged at a constant voltage. You can set current, time, capacity, energy, and power as discharge cut-off conditions.
6. CP charge
Charge the battery at a constant power set by the user. Voltage, current, time, capacity, and energy can be set as charging cut-off conditions.
7. CP discharge
Charge the battery at a constant power set by the user. Voltage, current, time, capacity, and energy can be set as charging cut-off conditions.
8. CR charge
Charge the battery with a constant internal resistance set by the user. Voltage, current, time, capacity, energy, and power can be set as charging cut-off conditions.
9. CR discharge
Discharge the battery at a constant internal resistance set by the user. Voltage, current, time, capacity, energy, and power can be set as charging cut-off conditions.
10. Rest
During the rest time, the channel is in a stopped state; when the rest is over, the step performs the jump operation. During the test process, using this function can make the performance of the battery stable, which is conducive to improving the accuracy of the battery test.
11. Pause
When the pause operation is performed, the channel is in the pause state, which is convenient for users to measure the thickness of the battery and other operations. A manual connection test is required.
12. Cycle
It supports four sets of loop nesting. The cycle step can make the step run repeatedly between the set two steps. The user can customize the start step and cycle test to meet their specific requirements.
13. Pulse mode:
Pulse mode(BTS-9000 as an example): The high-speed series supports pulse mode, which can be used for battery simulation. The minimum pulse width of a single pulse is 400 s, and a maximum of 16 pulse segments can be set. Support the current pulse mode, editing steps as follows:

- ① Select Pulse step in the step editor.
- ② Users can set the pulse step parameters according to their needs by clicking on "Step parameter" or "Value" to pop up the interface of "Pulse Step Setting" as shown in the following figure. (Figure 4-34)

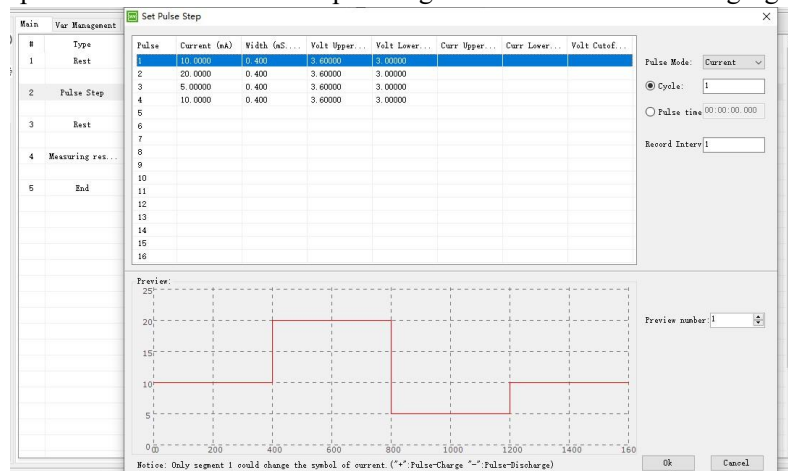


Figure 4-34 Set pulse step window

Number of periods: Number of current pulses, charges and discharges.

Pulse time: Indicates the time when the pulse step is executed.

Periodic recording interval: Data is recorded once every interval, as shown in the figure 4-34. In 100 periods, 100 pieces of data can be recorded.

Preview number: You can set the number of pulse segments to preview.

14. Internal resistance test

Users can set DCR to "Measure Internal Resistance" as required and directly measure the corresponding internal resistance value, as shown in the figure below. (Figure 4-35) The user can set the pulse time and current value according to their needs. The time value of a pulse should not be less than 10 ms, and the current value of pulse 2 should be greater than that of pulse 1. Generally, pulse 1 can be set to 10 S and current 0.1 C, while pulse 2 can be set to time 1 S and current 1 C.

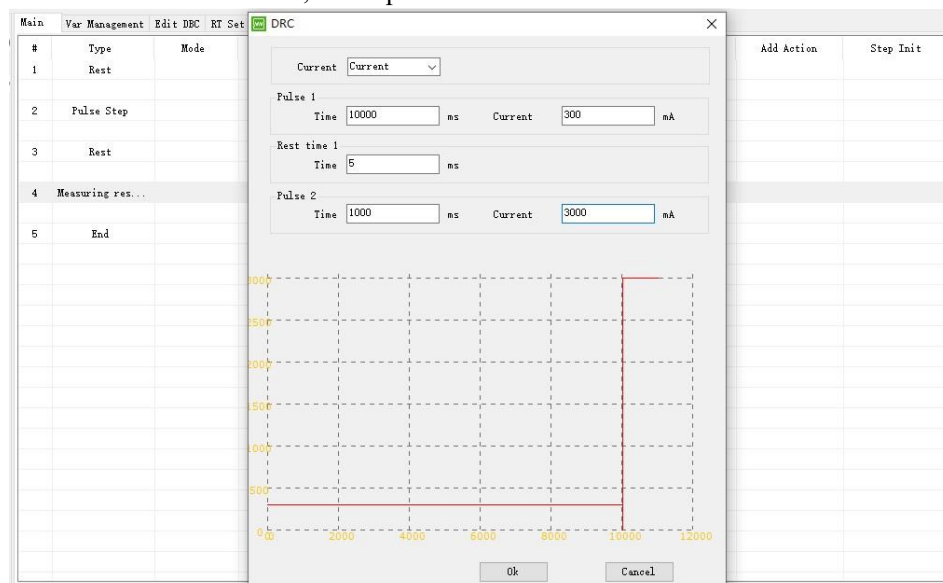


Figure 4-35 Internal resistance test setting



Notice: Constant resistance Minimum value = minimum discharge voltage / range current, maximum value = range voltage / (range current x 0.2%). In the process of step setting, "shelving" should be carried out between discharge and charging steps to facilitate stability. The maximum number of cycles does not exceed 65,535.

Step Condition

Users can set step recording conditions, protection conditions, formation voltage change rate, professional protection conditions, etc.

1. Record condition

Recording conditions of the BTS9 battery test system. The relationship between recording conditions and conditions is logical. As long as any condition is met during the test, the data will be recorded for once. Appropriate selection of recording conditions, such as long time intervals, can keep data files as small as possible but ensure that required data is not missed. Only digits can be recorded. Both voltage and current intervals support decimal points.

Channel recording conditions: time interval, voltage interval, and current interval, as shown in Figure 4-36:

- **Time interval:** The system records a set of data at an interval. The BTS9000 interval is an integer multiple of 1ms and does not support negative values.
- **Voltage interval:** The system records a set of data when the voltage difference between the recorded data and the recorded data reaches a preset value.
- **Current interval:** When the difference between the recorded current and the recorded current reaches the set value, the system records a set of data.

2. Protection condition

Hardware protection is provided for the channels with abnormal battery current and voltage sampling during the test.

① Channel protection condition: including voltage/current upper and lower limits, capacity protection, check back deviation, as shown in the following figure: (Figure 4-37)

Step	Type	Step Name	Step Set	Record Set	Step Parameter	Value	Unit	Value	Unit	Action	Add Action	Step Limit	Options
1	Test				Time	00:00:10.000	s	0		Test step			0000
2	CCCVChg	Constant (V)	3.598		Time	00:00:00.000	s	0		Test step			0000
3	Test				Time	00:01:30.000	s	0		Test step			0000
4	CCCVChg	Current (mA)	120		Time	00:00:00.000	s	0		Test step			0000
5	Test				Time	00:10:00.000	s	0		Test step			0000
6	Cycle	Start Step	1										0000
7	End	Cycle End	10										0000

Figure 4-36 Channel recording condition

Current Step: 2 CCCVChg	
Protect Param	
Volt Upper	4.5 V
Volt Lower	3 V
Curr Upper	120 mA
Curr Lower	10 mA
Cap Upper	10 mAh
Eng Upper	10 mWh
TempUpper	45 °C
TempLower	0 °C
OpenVUpper	4.5 V
OpenVLower	3 V
OpenVUpper	4.5 V
OpenVLower	3 V
OpenVUpper	4.5 V
OpenVLower	3 V
OpenVUpper	4.5 V
OpenVLower	3 V

Figure 4-37 Channel protection condition

- **Voltage upper/lower limit:** When the battery voltage exceeds the preset range, the channel enters the security protection state.
- **Current upper/lower limit:** When the battery current exceeds the set range, the channel enters the safety protection state.
- **Capacity protection:** When the battery charging capacity reaches the set value, the channel enters the safe protection state.
- **Back-check deviation:** When the absolute value error of the voltage difference between the main channel and the auxiliary channel exceeds the absolute value of the set backcheck deviation, an alarm prompt dialog box pops up and the channel enters the protected state.

Attention

1. Users can set the recording conditions and protection conditions on the interface separately for each step as required. If no recording condition is set for the current step, the default value is adopted for the recording condition of the current step, that is, 1S to record data once.
2. The user can put the parameters of the current step into the same type of step or all steps according to the need for easy operation.
3. Each process can be set up with 254 steps. When the system completes the last step according to the

set steps, it will stop by itself. In the step setting interface, you can "insert step", "delete line", "clear step", "step check", "copy", "paste", "cut" and other operations by right-clicking the step number and choosing the corresponding operation.



Notice: By default, the last step is "End." Therefore, the maximum number of steps that can be edited is 254.

4.6. Historical Data Query

You can search, save, and delete historical data through historical data query. The query can be classified as fuzzy or precise.

Fuzzy Query

Users do not need to set any query conditions. They just need to select the mid-machine/device number and click the query button to perform a fuzzy query, as shown in the picture below. If you select the mid-machine, you can query the historical test data of all devices connected to the mid-machine in different time periods. If you select a device ID, you can query all the test data of that device in different test periods.

#	DevID_CHID_TestID	Barcode	Pallet Barcode	Start Time	End Time	Record Num	Battery Model	Batch	Test Name	User Name
88	6-102-477	222		2021-08-24 09:54:40	2021-08-24 10:54:58	3626	TestMove	PttMove	Move0802	admin
89	6-102-476	222		2021-08-23 18:28:05	2021-08-24 09:17:24	2084	TestMove	PttMove	Move0802	admin
90	6-102-475	222		2021-08-23 16:01:11	2021-08-24 09:17:04	3626	TestMove	PttMove	Move0802	admin
91	6-102-474	222		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
92	6-102-473	222		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
93	6-102-472	FQ0000A000001		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
94	6-103-477	333		2021-08-24 09:54:40	2021-08-24 10:54:58	3626	TestMove	PttMove	Move0802	admin
95	6-103-476	333		2021-08-23 18:28:05	2021-08-24 09:17:24	2084	TestMove	PttMove	Move0802	admin
96	6-103-475	333		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
97	6-103-474	333		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
98	6-103-473	333		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
99	6-103-472	FQ0000A000002		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
100	6-104-477	444		2021-08-24 09:54:40	2021-08-24 10:54:58	3626	TestMove	PttMove	Move0802	admin
101	6-104-476	444		2021-08-23 18:28:05	2021-08-24 09:17:24	2084	TestMove	PttMove	Move0802	admin
102	6-104-475	444		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
103	6-104-474	444		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
104	6-104-473	444		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
105	6-104-472	FQ0000A000003		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
106	6-105-477	555		2021-08-24 09:54:40	2021-08-24 10:54:59	3626	TestMove	PttMove	Move0802	admin
107	6-105-476	555		2021-08-23 18:28:05	2021-08-24 09:17:24	2084	TestMove	PttMove	Move0802	admin
108	6-105-475	555		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
109	6-105-474	555		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
110	6-105-473	555		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
111	6-105-472	FQ0000A000004		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
112	6-106-477	666		2021-08-24 09:54:40	2021-08-24 10:54:59	3626	TestMove	PttMove	Move0802	admin
113	6-106-476	666		2021-08-23 18:28:05	2021-08-24 09:17:24	2079	TestMove	PttMove	Move0802	admin
114	6-106-475	666		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
115	6-106-474	666		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
116	6-106-473	666		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
117	6-106-472	FQ0000A000005		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
118	6-107-477	777		2021-08-24 09:54:40	2021-08-24 10:54:54	3626	TestMove	PttMove	Move0802	admin
119	6-107-476	777		2021-08-23 18:28:05	2021-08-24 09:17:24	2079	TestMove	PttMove	Move0802	admin
120	6-107-475	777		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
121	6-107-474	777		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
122	6-107-473	777		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin

Figure 4-38 Fuzzy query condition

Precise Query

The BTS9 software supports precise queries of test data. Search criteria include device ID, channel row and column ID, bar code of the battery, start time, end time, step description, and a limit on the number of items to be queried. These conditions can be set in any combination for precise queries, as shown in the figure below: (Figure 4-39)

#	DevID_CHID_TestID	Barcode	Pallet Barcode	Start Time	End Time	Record Num	Battery Model	Batch	Test Name	User Name
88	6-102-477	222		2021-08-24 09:54:40	2021-08-24 10:54:58	3626	TestMove	PttMove	Move0802	admin
89	6-102-476	222		2021-08-23 18:28:05	2021-08-24 09:17:24	2084	TestMove	PttMove	Move0802	admin
90	6-102-475	222		2021-08-23 16:01:11	2021-08-24 09:17:04	3626	TestMove	PttMove	Move0802	admin
91	6-102-474	222		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
92	6-102-473	222		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
93	6-102-472	FQ0000A000001		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
94	6-103-477	333		2021-08-24 09:54:40	2021-08-24 10:54:58	3626	TestMove	PttMove	Move0802	admin
95	6-103-476	333		2021-08-23 18:28:05	2021-08-24 09:17:24	2084	TestMove	PttMove	Move0802	admin
96	6-103-475	333		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
97	6-103-474	333		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
98	6-103-473	333		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
99	6-103-472	FQ0000A000002		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
100	6-104-477	444		2021-08-24 09:54:40	2021-08-24 10:54:58	3626	TestMove	PttMove	Move0802	admin
101	6-104-476	444		2021-08-23 18:28:05	2021-08-24 09:17:24	2084	TestMove	PttMove	Move0802	admin
102	6-104-475	444		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
103	6-104-474	444		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
104	6-104-473	444		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
105	6-104-472	FQ0000A000003		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
106	6-105-477	555		2021-08-24 09:54:40	2021-08-24 10:54:59	3626	TestMove	PttMove	Move0802	admin
107	6-105-476	555		2021-08-23 18:28:05	2021-08-24 09:17:24	2084	TestMove	PttMove	Move0802	admin
108	6-105-475	555		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
109	6-105-474	555		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
110	6-105-473	555		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
111	6-105-472	FQ0000A000004		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
112	6-106-477	666		2021-08-24 09:54:40	2021-08-24 10:54:59	3626	TestMove	PttMove	Move0802	admin

Figure 4-39 Exact query condition

Data Operation

Users can right-click to open the channel information, query data, open data, save data, open folders, delete historical data, and so on. As shown below:

Channel information: Open the Channel information corresponding to the relevant historical data.

Open data: Open the relevant NDA test data corresponding to historical data.

Data save as: Save the current historical data to the specified path.

Open file: Open the folder where test data is stored in NDA file format so that users can view and manage other test data.

Delete historical data: Delete the historical data of the current channel.

#	DevID_ChID_TestID	Barcode	Pallet Barcode	Start Time	End Time	Record Num	Battery Model	Batch	Test Name	User Name
94	6-103-477	333		2021-08-24 09:54:40	2021-08-24 10:54:58	3626	TestMove	PttMove	Move0802	admin
95	6-103-476	333		2021-08-23 18:28:05	2021-08-24 09:17:24	2084	TestMove	PttMove	Move0802	admin
96	6-103-475	333		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
97	6-103-474	333		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
98	6-103-473	333		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
99	6-103-472	F		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
100	6-104-477	4		2021-08-24 09:54:40	2021-08-24 10:54:58	3626	TestMove	PttMove	Move0802	admin
101	6-104-476	4		2021-08-23 18:28:05	2021-08-24 09:17:24	2084	TestMove	PttMove	Move0802	admin
102	6-104-475	4		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
103	6-104-474	4		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
104	6-104-473	4		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
105	6-104-472	F		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
106	6-105-477	5		2021-08-24 09:54:40	2021-08-24 10:54:59	3626	TestMove	PttMove	Move0802	admin
107	6-105-476	555		2021-08-23 18:28:05	2021-08-24 09:17:24	2084	TestMove	PttMove	Move0802	admin
108	6-105-475	555		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
109	6-105-474	555		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
110	6-105-473	555		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
111	6-105-472	FQ0000A0000004		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
112	6-106-477	666		2021-08-24 09:54:40	2021-08-24 10:54:59	3626	TestMove	PttMove	Move0802	admin
113	6-106-476	666		2021-08-23 18:28:05	2021-08-24 09:17:24	2079	TestMove	PttMove	Move0802	admin
114	6-106-475	666		2021-08-23 16:01:11	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
115	6-106-474	666		2021-08-23 13:42:26	2021-08-24 09:17:03	3626	TestMove	PttMove	Move0802	admin
116	6-106-473	666		2021-08-23 11:28:56	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
117	6-106-472	FQ0000A0000005		2021-08-23 10:28:14	2021-08-24 09:17:02	3626	TestMove	PttMove	Move0802	admin
118	6-107-477	777		2021-08-24 09:54:40	2021-08-24 10:54:54	3626	TestMove	PttMove	Move0802	admin

Figure 4-40 Data operation



Attention: After deleting historical data, the data cannot be recovered!

4.7. Manual Report Export

Configure report options based on your preferences and requirements to export reports manually. You can export the report manually in the following three ways:

- ① Select channel, right-click the report export, the selected channel of the current test data for the report export.
- ② Select a device in the device bar and right-click to export the report. Filter the channel, barcode number, test number, battery model, battery batch number, and user name of the device and export the report.
- ③ On the historical data page, select a historical data set and export the report.

Figure 4-41 Manual report export

Report Export Configuration

The report export has two default configuration items. One is the RAW Report, which contains test information, step information, and record layer information. The other is the CYC report, which includes test information, step information, and cycle information. You can also select configuration items to save or delete them. The default configuration cannot be deleted.

Report an export item Settings can optionally select test information, step information, record layer information, circular information, and auxiliary channel data. After selecting cycle information, step information, and record information, configure specific data items on the export interface of the cycle layer, step layer, and record layer.

On the export configuration page of the cycle layer, select data items (such as cycle number, charge capacity, discharge capacity, charge specific capacity, and discharge specific capacity) and set the unit, value format, background color, font color, bold or not, and alignment style of data items. Set up cyclic filtering. The first cyclic filtering mode is all export. The second cyclic filtering mode is the export interval, such as input 1-3 or 1,2,5,8. The third type of cyclic filtering is cyclic interval. For example, the interval from 1 to 100 is 2, and the output is 1,3,5... 99. Set the cycle statistics mode according to the step sequence: first charge and then release, or first discharge and then charge. (Figure 4-42)

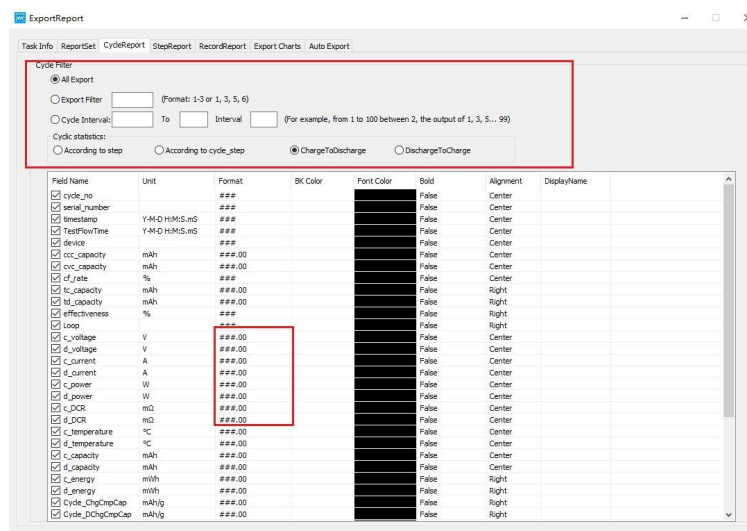


Figure 4-42 cycle layer export configuration

Select step report data items (such as step ID, step type, capacity, and specific capacity) on the step layer export configuration interface, and set the unit, value format, background color, font color, bold or not, and alignment style of data items. Set up step filter, export all step types, or filter discharge electrician step/charge step. (Figure 4-43)

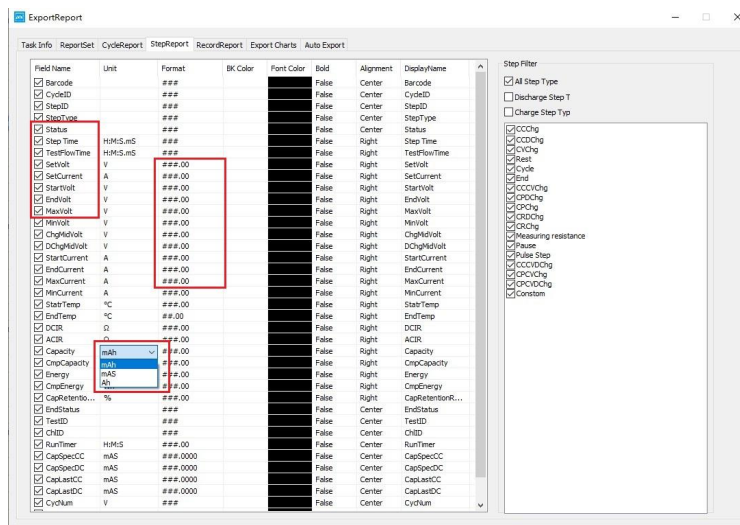


Figure 4-43 Step layer export configuration

Select data items (such as data serial number, step number, step type, step time, current, voltage, etc.) in the record layer export configuration interface, and set the unit, value format, background color, font color, bold or not, and alignment style of data items. Add abnormal point conditions, such as current upper and lower limits. Data exceeding the upper and lower limits will be marked and recorded separately. Delete abnormal point conditions can be done by right-clicking to delete them. Set the recording layer data filter, select the condition current/voltage/capacity/energy/temperature to determine the add and/or. (Figure 4-44)

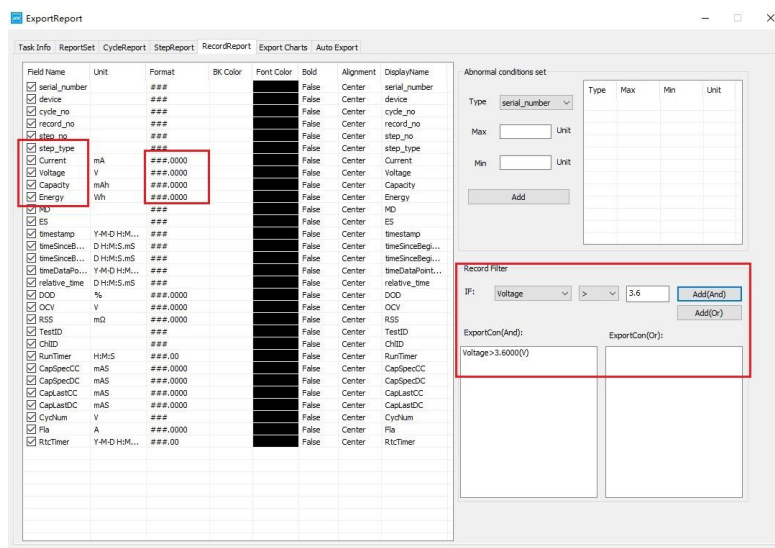


Figure 4-44 Record layer export configuration interface

There are two ways to set the report export path. The first way is to modify the default report export path on the client:D:\Neware\Reports\ Figure 4-45. The second method is to modify the path on the report export screen, as shown in Figure 4-46. Name of the report export file You can insert the user name, battery batch number, battery model, test process, device ID, unit ID, channel ID, and test ID as required. The default report name is %Model%-%Batch%-%DevId%-%UnitId%-%Chl%-%TestId%.xls (Battery model-Battery Lot Number-Device ID-Unit ID-Channel ID-Test ID.xls). Figure 4-47 is the report export directory and name Settings box.

The report can be displayed in two ways: normal display and coordinate inversion, that is, the form data title bar is above or to the left of the form.

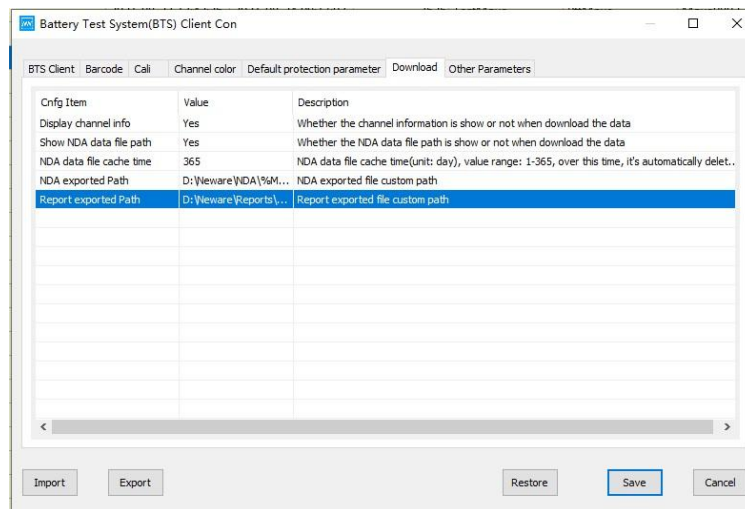


Figure 4-45 Default path for exporting reports

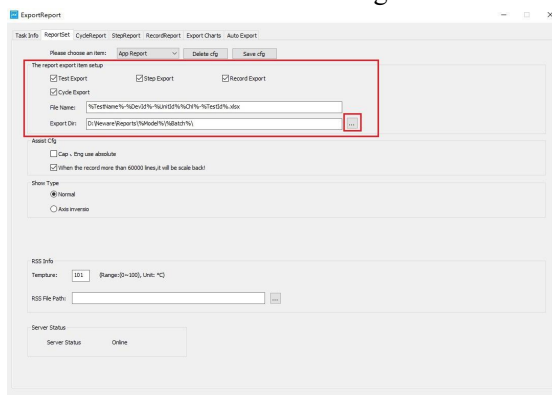


Figure 4-46 Report export directory name settings

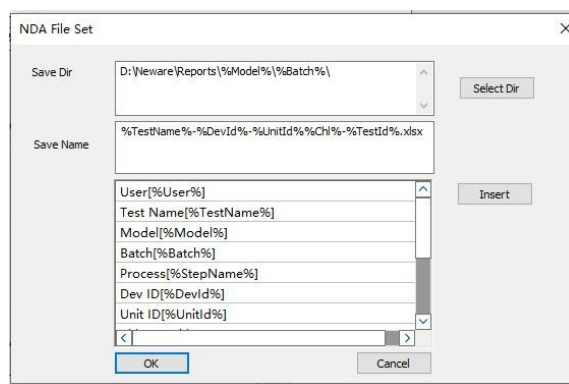


Figure 4-47 Report export directory and

Set the filter criteria to filter reports based on the filter type (channel, barcode number, test name, battery model, battery batch number, and user name), name, and time. Click Start to filter. Reports that meet the filter criteria are displayed in the report filter result bar on the left. Select the report to be exported and click "Start" to export the report. The exported report will appear in the report guide bar on the right. After exporting the report successfully, the status will be displayed as "complete." If you want to combine the selected reports into one report file, select Merge the selected tasks into one file. Otherwise, the selected filtering results are exported to a report.

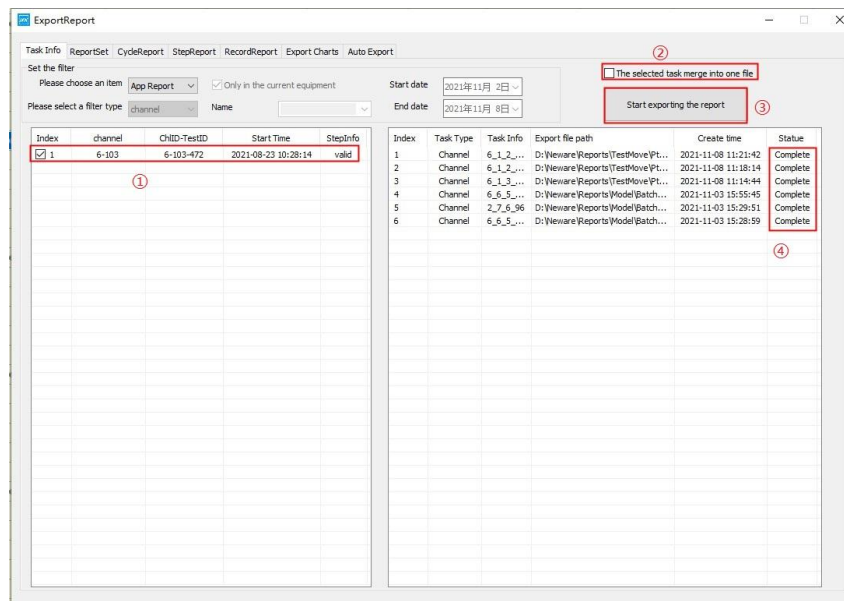


Figure 4-48 Report filtering setting

4.8. Battery's Barcode Management

The BTS battery test system provides the battery barcode management software, which can insert the barcode into the main channel and the barcode of the tray and save the data to the database. After starting the test, the abnormal battery channel and tray number can be traced according to the barcode number. You can also query historical data and assist with battery test data analysis.

Battery Barcode loading

In the barcode entry configuration configured on the client, set the value of "barcode entry" to "Yes." Start the channel. In the dialog box that appears, enter the barcode for batteries or trays. You can import the barcode from a file or copy and paste the barcode, as shown in Figure 4-49:

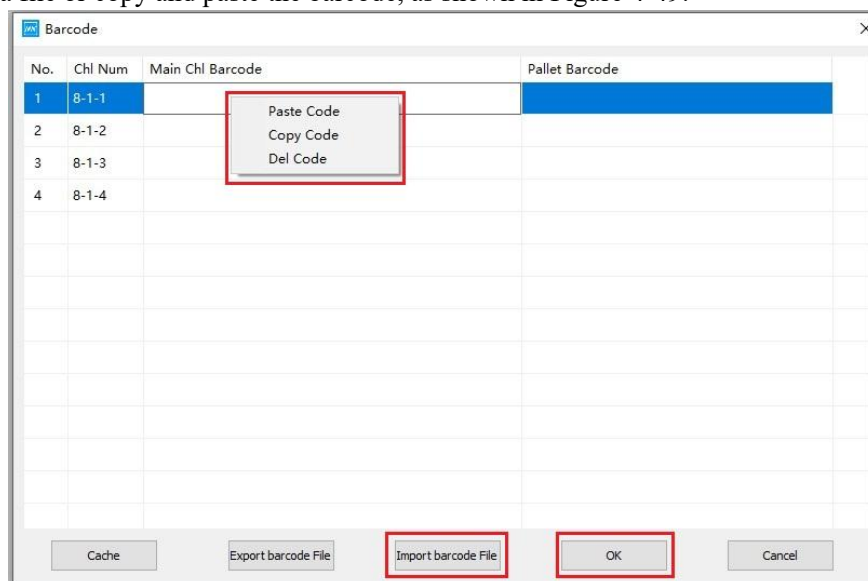


Figure 4-49 Barcode entry window



Notice: Battery bar code input can be divided into keyboard input, USB input, and SMBUS communication automatic code reading. Before USB insert, connect the wired scanner to the PC through a serial port or USB port. Automatic code reading for SMBUS communication depends on the battery bar code configured in the test.

Barcode Editing

In barcode entry configuration, set Value in Modify Barcode to Yes. Right-click channel → Modify bar code to modify bar code, as shown in Figure 4-50:

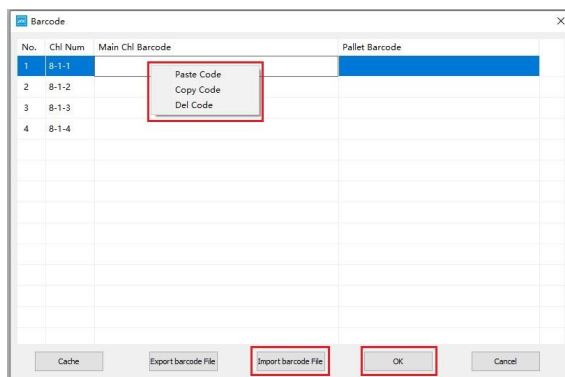


Figure 4-49 Barcode loading

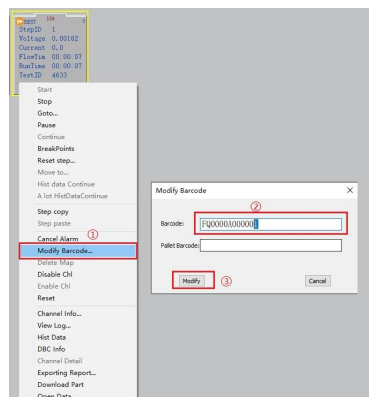



Figure 4-50 Barcode editing



Notice: In barcode entry configuration, you can set the barcode length, special symbols allowed to be entered, and the line height of the barcode entry list. For details, see barcode Entry Configuration.


4.9. User Management

User Login

Users must log in to the client software to perform related operations. The operations are as follows: Click "Authority management" button  on the menu bar, Enter the "user name" and "password" (the default user name is "admin" and the password is "xinwei"). You can click **Modify User** to change the current password, as shown in Figure 4-51. You can set a record password and automatic login to facilitate your next login.

Modify Password

You can change the current device password for better storage of your account and password.

The operation is as follows: In a login state, click the user rights management button  → click "Modify User" → Select user group → Select user name → Enter a new password → click "Submit," as shown below:

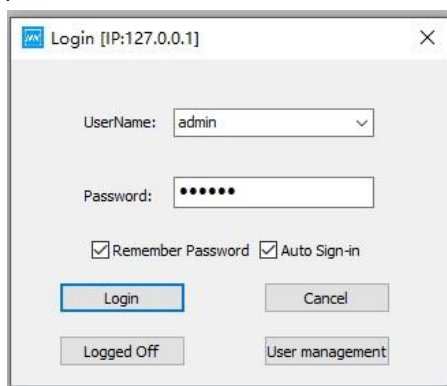


Figure 4-51 User login

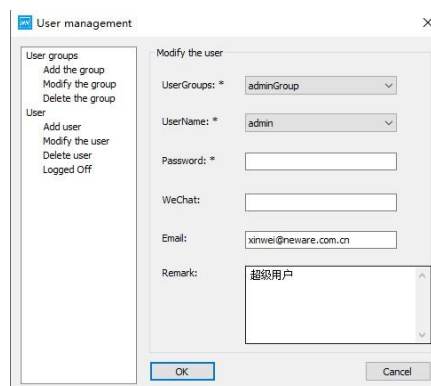


Figure 4-52 User management



Notice: You must be a valid user to change the password of this account.

Add User

To add users with different permissions, practice the following operations:

1. Add a user group: Select Add Group, enter the name of the user group, and select Permissions.
2. Add a new user: Select "Add User", select an existing user group name from the "User Group" drop-down list, fill in the user name, email address, and password, and click "Submit" to create a new user, as shown in the following figure: (Figure 4-51)

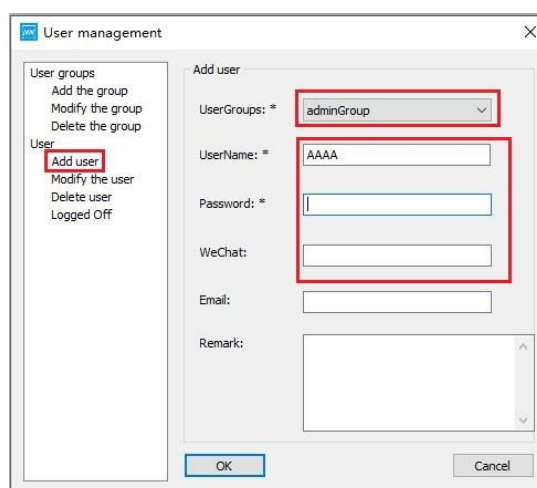


Figure 4-53 Add User



Notice: On the Users management interface, you can define different user groups and their operation rights as required. Only accounts with management rights can manage users. Otherwise, the color will be gray.

User Log out

When a user does not use the client software or needs to switch users, the user logout function can be used. Once logged out, you need to log in again to continue operating the system.

The operations are as follows: On the 4-51 screen, click "User Logout." In the prompt dialog box, click "User Logout."

4.10. Reset Mapping

You can set the channel number of a device to a specified channel name as required, facilitating management and operation. Channel display is divided into real-device and virtual-device channel display interfaces. The mapping mode is divided into primary channel mapping and Aux binding.

Switch of Interface

The channel display is divided into two different display interfaces for the real device and the virtual device. Users can switch between the real (R) and virtual (V) interfaces as required.

When the user is in the interface of the real device, click the "V" button to enter the main interface of the virtual device and operate the virtual channel, as shown below:

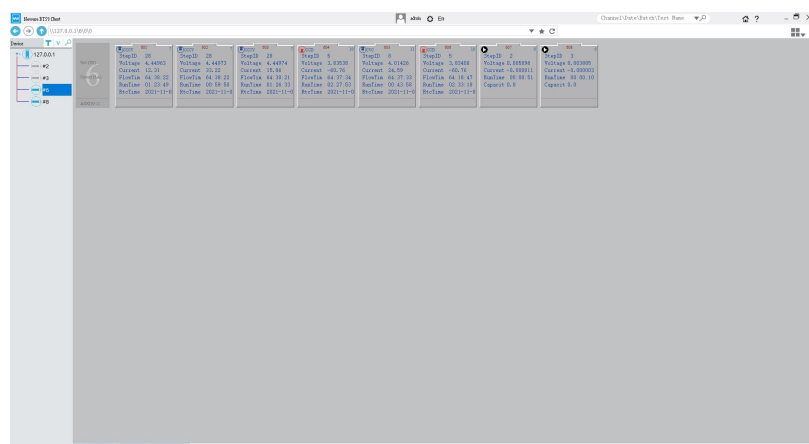


Figure 4-54 Realistic equipment display interface

When the user is in the virtual device interface, click the "R" button to enter the main interface of the real

device and operate the real channel, as shown in the following figure: (Figure 4-55)

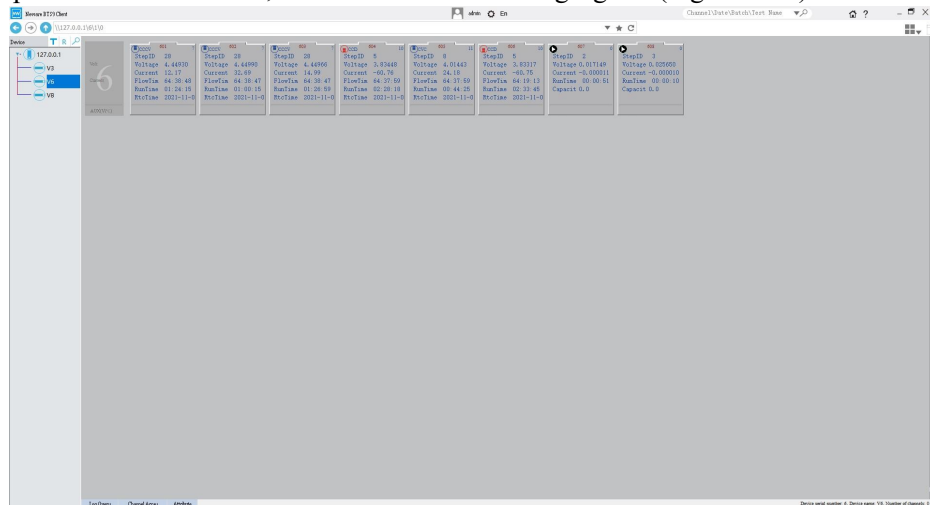


Figure 4-55 Virtual device display

Channel Display

The BTS9 software supports the display of the main channel and Aux. You can also bind, delete, and locate Aux on the client interface as required.

1. Display of main channels

By default, the main channel is displayed based on the physical channel number (device number + unit number + channel number), as shown in the following figure. In the figure 4-56, the device number is 6, the unit number is 1/2/3/4/5/6, and the channel number is 1-8.

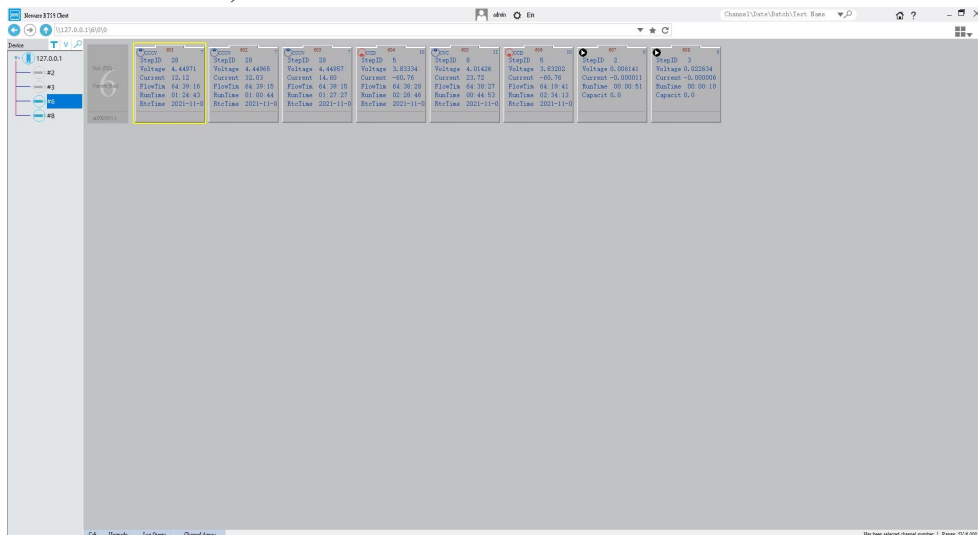


Figure 4-56 Main channels display

2. Auxiliary channel display

The auxiliary channel show/hide button is located in the right-most "sidebar" (①) in the toolbar, as shown in Figure 4-57. ② Main channel area, ③ auxiliary channel areas.

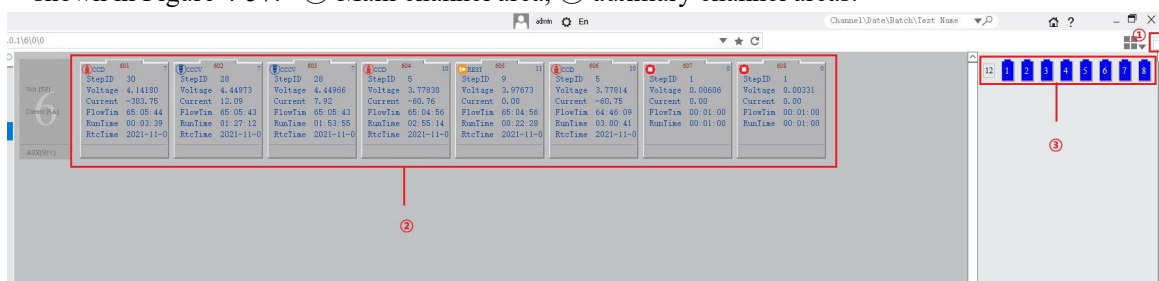


Figure 4-57 Main channels display

① Auxiliary channel mapping

In the AUX display area, select one/more unbound AUX (blue battery icon) and drag them to the main channel. If the icon is displayed on the main channel, the AUX is mapped successfully, as shown in Figure 4-58:

② Position Mapping

Click the icon on the primary channel to view the mapping between the main channel and Aux. Alternatively, right-click a mapped Aux and choose Locate main Channel. As shown in Figure 4-59, the map Aux 12-1 to main channel 1-1.

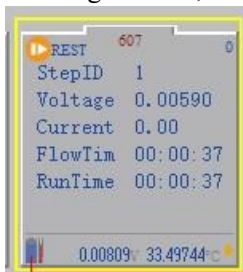


Figure 4-58 Mapped

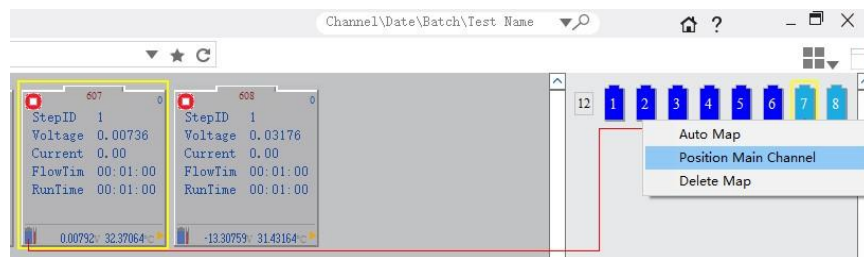


Figure 4-59 Position Main Channel

③ Delete map

Right-click the main channel and Aux → choose “Delete Mapping” from the shortcut menu to delete the binding relationship between the Aux and the main channel, as shown in Figure 4-60. You can delete a mapping and bind Aux again to modify the mapping relationship.

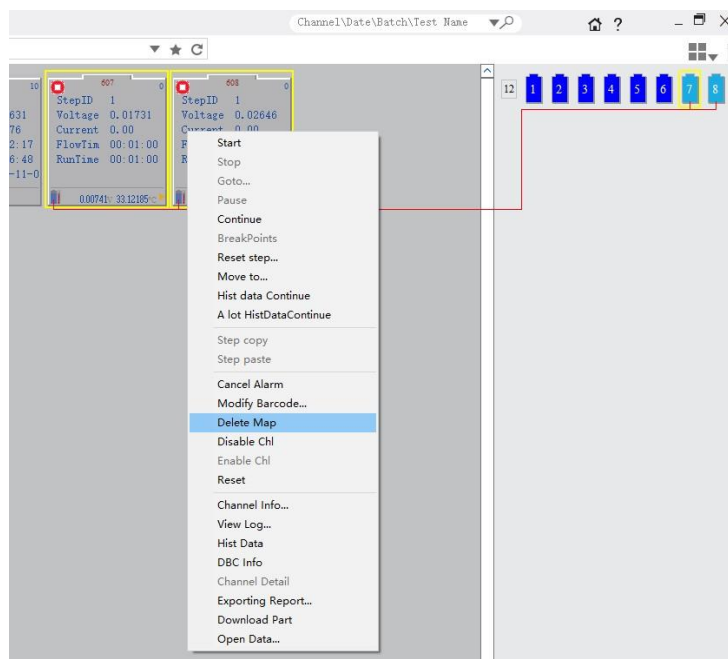


Figure 4-60 Delete map



Notice: The main channel cannot be in operating when the mapping is deleted.

4.11. Upgrade

Users can upgrade the device software on the client interface. Select the mid-machine upgrade file and upgrade the matched mid-machine. After the upgrade, the mid-machine will automatically restarts.

Perform the following operation: Right-click the number of the device to be upgraded (mid-machine) → Select Upgrade → In the Upgrade dialog box that is displayed, load the upgrade file whose suffix is .Enc → Perform the upgrade, as shown in 4-61. If the device cannot be upgraded, load the upgrade file again.

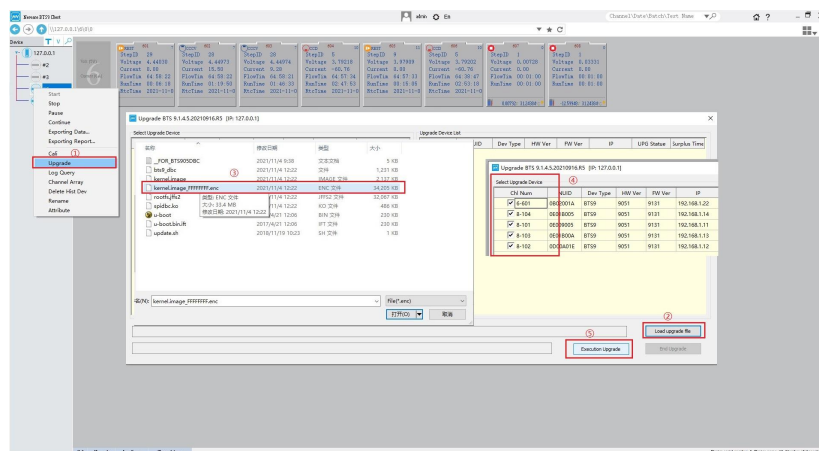


Figure 4-61 Upgrade setting window

	Notice: The *.enc file of the upgrade package is provided by NEWARE. The upgrade file automatically matches the up-gradable device, allowing you to upgrade the specified NUID device. You can select the upgraded device as your needs.
	Warning: Before upgrading the mid-machine, ensure that all tester's channels under the mid-machine are not working; otherwise, the connection operation cannot be performed after upgrading the mid-machine.

4.12. Properties

Right-click the device number → select **Properties** → in the pop-up "Device Properties" window, you can view the relevant information of the mid-machine and unit: firmware version, hardware version, NUID, device range, online status, calibration time, etc., as shown below:

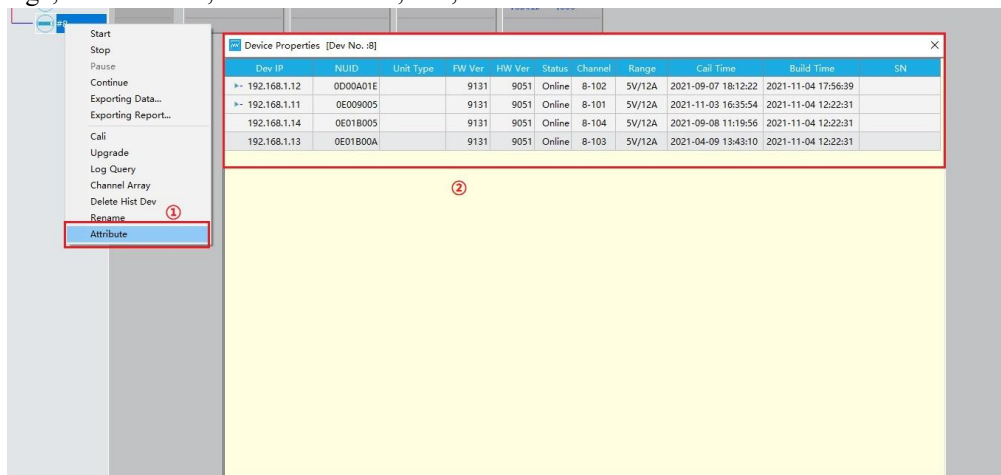


Figure 4-62 Properties display window

4.13. Backup

According to the maximum number of devices connected to the current server and BTS system, data backup can be completed in real time. Right-click IP address → select "Backup" → set information related to "backup", as shown in 4-63:

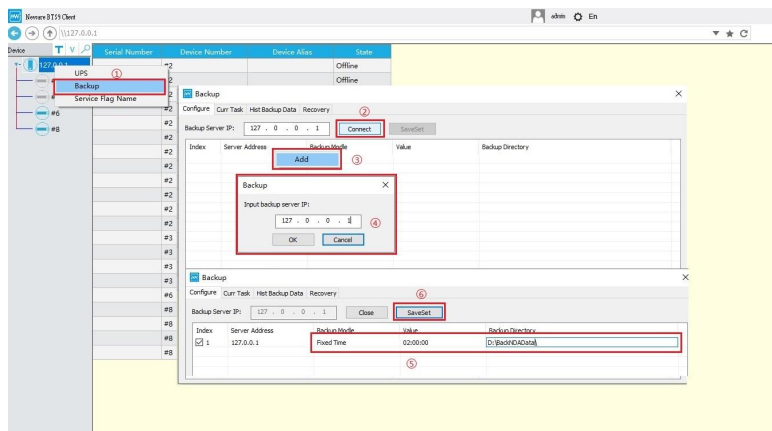


Figure 4-63 Backup window

1. Backup files are in NDA format by default. When the backup is complete, you can use BTSDA to view the data.
2. During data backup, if the storage space is insufficient, the system automatically deletes the earliest backup file by default to ensure normal data backup.
3. The backup system runs as a server. If the backup service is abnormal, it automatically restarts within two minutes.
4. The backup system can follow the server to install the backup system to the server directory. During uninstallation, the backup system can follow the server to uninstall the backup system. The backup system can also be installed independently. If the backup system is installed independently, specify the data source.
5. A BTS9 system server can back up only one backup system at a time.

Configuration

Users can set the backup mode and backup directory as required. Backup modes include Interval, Fixed Time, and Automatic.

1. **Interval:** Set the backup interval. The system backs up data based on the specified interval.
2. **Fixed time:** Set a fixed point in time for backup. When the system time reaches the specified point in time, the system will automatically backs up the data.
3. **Automatic:** Backup is automatically performed when the server is idle.

Current Backup Tasks

Query the current backup status of channel test data. The backup system can manually back up channel test data based on user requirements, as shown in the following figure. (Figure 4-64)

Select the device that you want to back up and click Query to view the backup status of all channel test data on the device. You can also view the current channel backup status by clicking "Show Backup Status." Double-click the device/cell number to back up the specified channel.

Backup data backed up by the system is stored in a lower-level folder in the installation directory. If some test data files become invalid after backup, you can manually back up data again.

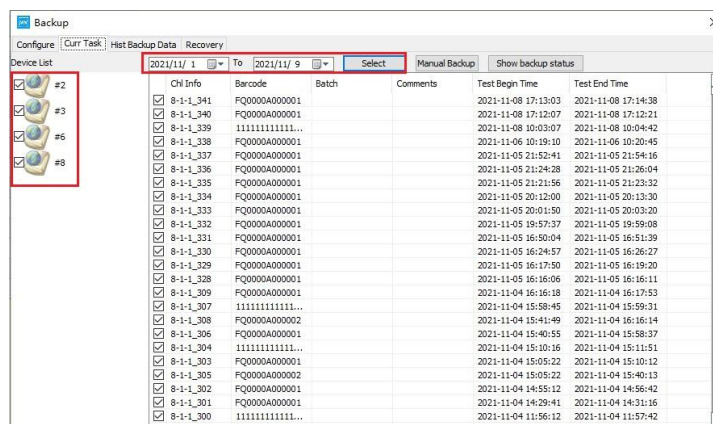


Figure 4-64 Current backup task

Historical Backup Task

You can check historical backup data, including channel information, total data, and channel status, as shown in the following figure: (Figure 4-65)

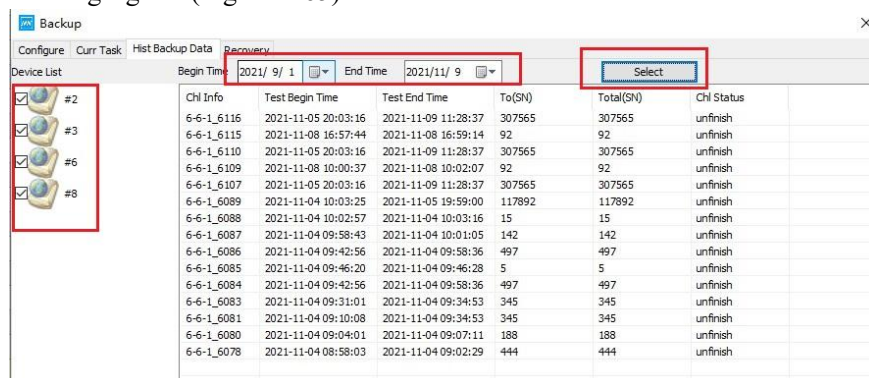


Figure 4-65 Historical backup data

Data Recovery

Data restoration is supported. Based on NDA files, records saved at the end of channels are obtained for data restoration. As shown in Figure 4-66.

1. During data restoration, you can load unfinished tests in the backup directory (only one unfinished test is allowed for a channel) and select the channel to restore data. You can select the last test data backup or all test data backups.
2. The data can be restored only when the test is stopped, the data upload ends, and the backup service is stopped.
3. After data restoration, historical data is still stored in the backup data and is not imported into the database. Restored test data is stored in the database.

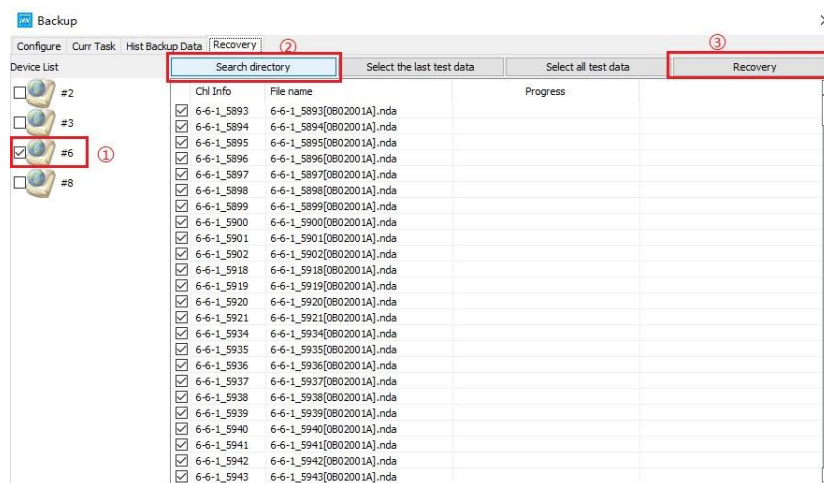



Figure 4-66 Data recovery

Chapter 5 BTS Software Configuration

Click the setting button  on the title bar, in the pop-up dialog box, users can operate "BTS Client", "barcode input", "Calibration", "Log", "Default step protection parameters", "Download Data", "Press bed parameters", "Server channel Calibration", "Server Log", "Small Icon Display configuration", and "Unit" as required by "Setting" and other related parameters.

5.1. BTS Client

You can switch between Chinese and English and add server IP addresses, as shown in Figure 5-1. By adding a server IP address, you can view and operate the device under the same IP address in the software.

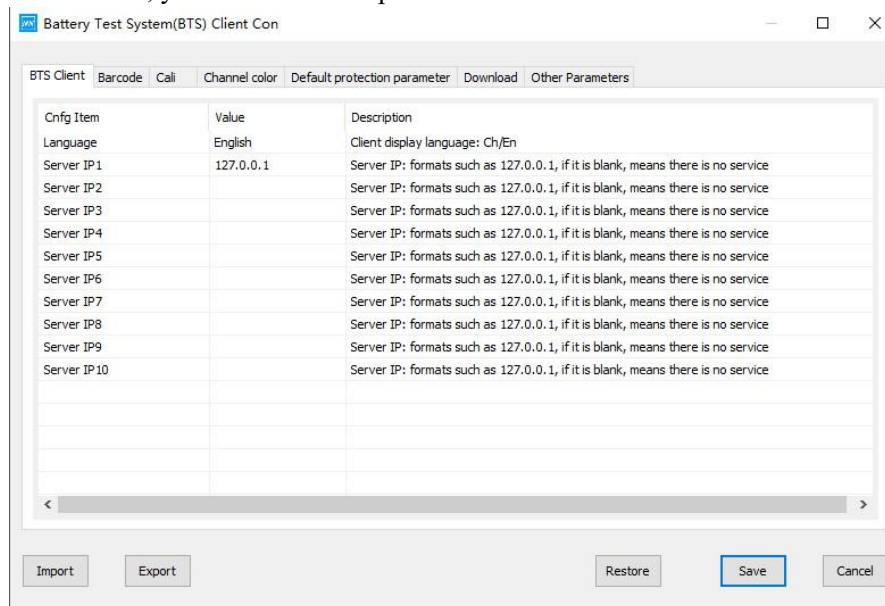


Figure 5-1 BTS client configuration

5.2. Barcode Entering

Click the "Barcode Entry" option. In the setting interface, users can set such permissions as line height, barcode length range, definition of special symbols, whether to enter barcode and modify barcode according to your needs, as shown in Figure 5-2:

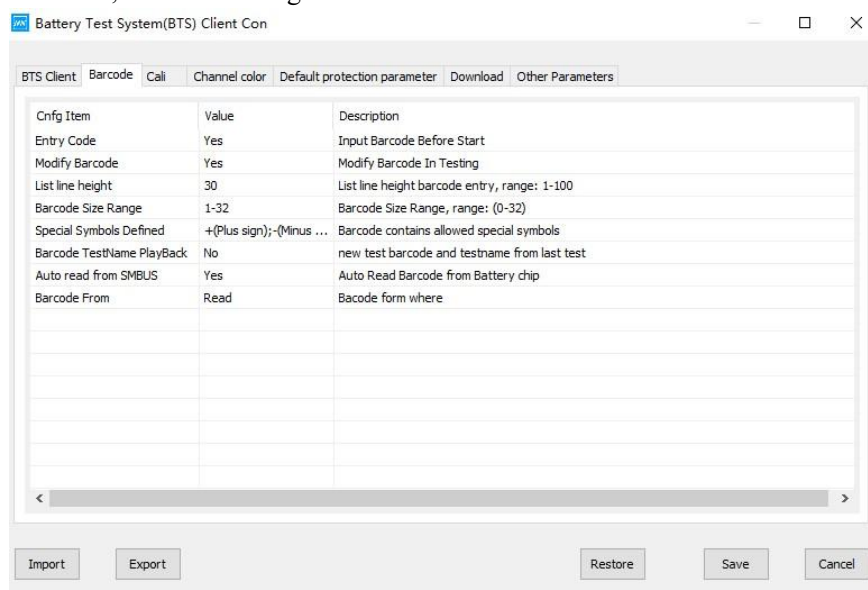


Figure 5-2 Barcode entering configuration

5.3. Calibration

Click the setting button in the title bar, and in the "Battery Test System (BTS) Client Configuration" dialog box that pops up, you can set the corresponding parameters of calibration, such as the maximum and

minimum values of calibration point percentage (value range: 5-95) and the file format (PDF/EXCEL/TXT/ATL) of the calibration report. Set the validity period (max. 365 days) of the calibration/test report. To modify the configuration, click the value column corresponding to the configuration item to modify it, as shown below: (Figure 5-3)

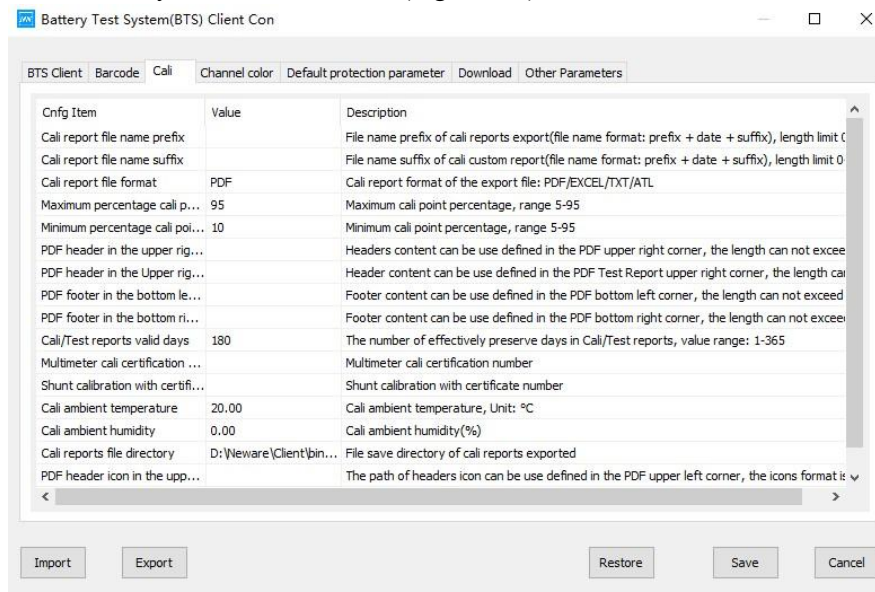


Figure 5-3 Calibration configuration

5.4. Channel Color

Click the **Channel Color** option to set the color of the corresponding state of the client channel. For example, the color of channel when it charge, discharge, and rest. The color of channel when testing is finished, etc. As shown below, after setting, the channel will display the color according to the corresponding configuration: (Figure 5-4)

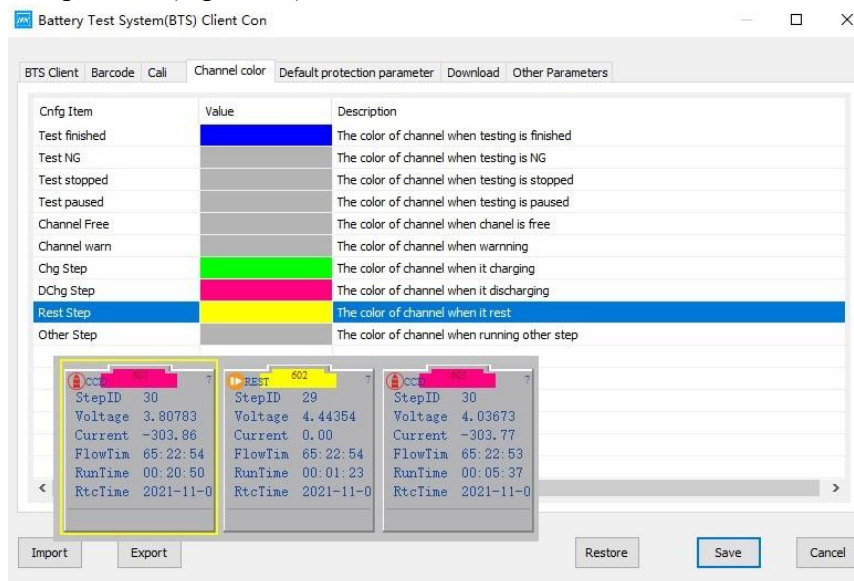


Figure 5-4 Color of channels

5.5. Default Step Parameters

Click "Default step protection parameters" to set step protection parameters, default voltage upper limit is 4.5V, lower limit is 2.5V. (Figure 5-5)

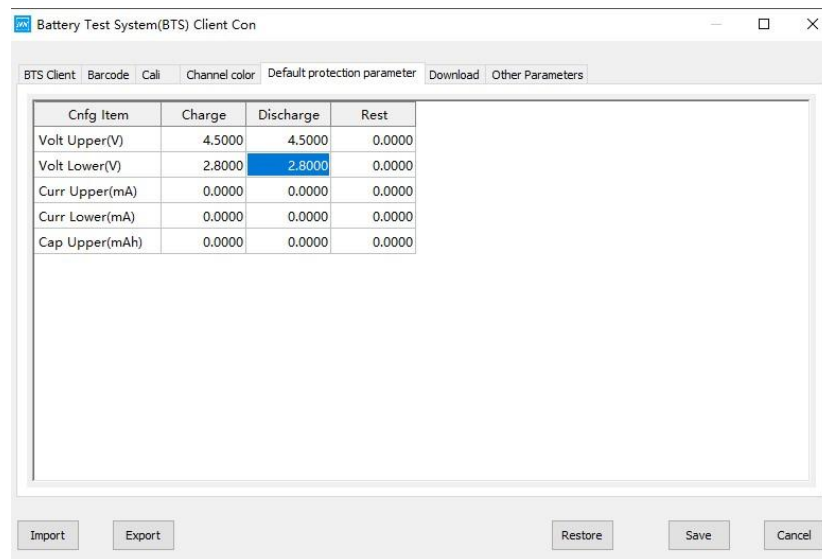


Figure 5-5 Configuration of default step protection parameters

5.6. Data Download

By clicking the "Data Download" option, the user can set the NDA export file directory, cache time, and other settings. You can customize the NDA export path as required, including the save directory and save name, as shown in Figure 5-6. The user-defined content includes the combination of user, batch number, process, channel, test ID, battery bar code, tray bar code, date, NUID of the mid-machine, and NUID of the unit.

1. Save contents

Select "Save directory" text box → select keyword → click **Insert**, you can use this keyword as the file name of "Save directory". For example, insert User [%User%]. Only the placeholder %User% of the keyword is displayed in the directory. During the generation of the NDA file, this placeholder is replaced with the actual "user" information as the name of the n-level directory, as shown in the following figure 5-6. Upper-level directories and lower-level directories are distinguished by slashes (\), and users need to enter them manually.

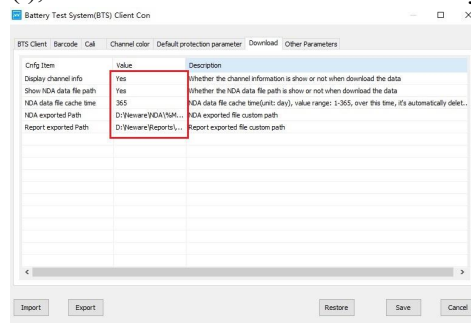


Figure 5-6 Download data

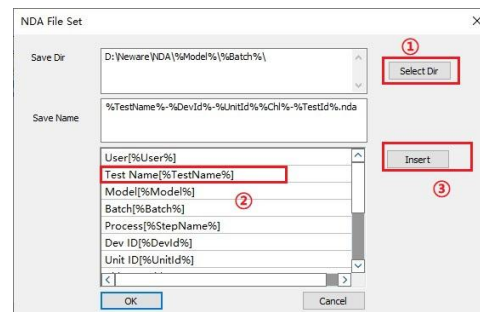


Figure 5-7 NDA file configuration

2. Save name

You can customize the name of the NDA file as required. You can manually enter the corresponding name (suffix. Nda) or select the corresponding keyword as the name of the saved file: Select the "Save Name" text box → Select the keyword → click **Insert** to use the keyword as the name of the saved file in NDA. If you do not specify a save name, the system uses the last prefix in the save directory as the save name by default, as shown in Figure 5-7. In this figure, the save name is named after the last placeholder "%User%" in the save directory.

During the creation of NDA files, the system replaces placeholders with actual user information, batch number information, and flow information, and creates folders with corresponding names as n-level directories for data storage.

5.7. Other Parameters

Users can set limitation to the maximum serial number of the test record data as required, and pause the test when the warning limit is reached, which is mainly used to prevent data coverage and loss caused by large data during offline operation: (Figure 5-8)

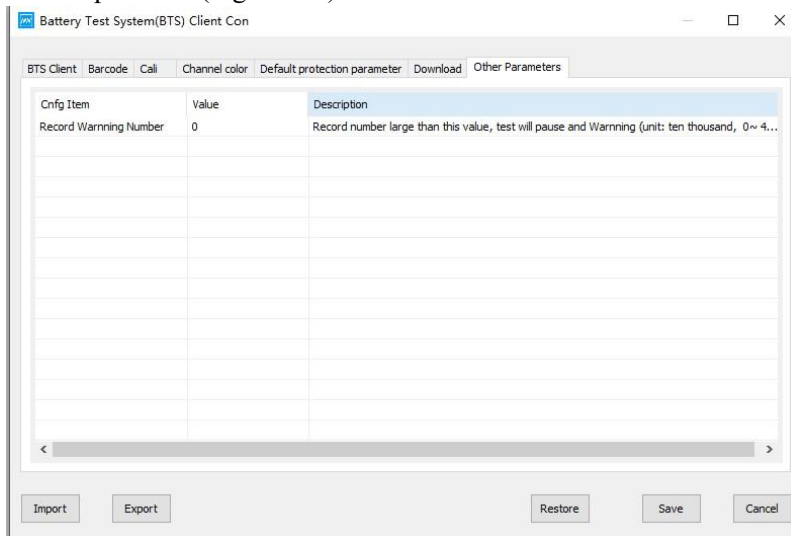


Figure 5-8 Other parameter configuration

5.8. Import/Export Configuration

1. Import configuration: On the configuration management page, click Import Configuration. The dialog box for selecting a configuration file will be displayed. You can import the saved CONFIGURATION file in XML format to the current configuration page.
2. Export configuration: On the configuration management page, click Export Configuration. The dialog box for selecting the path to export the configuration file will be displayed. The current configuration is saved to the selected directory in XML format.
3. Restore default: On the configuration management page, tap Restore Defaults to restore all current configuration items to their default values. After restoring the default values, click Save for the settings to take effect.

Chapter 6 BTSDA Data Analyzing Software

BTSDA---Battery Testing System Data Analyzer is the battery detection system's data analysis software, with a variety of data analysis and processing functions, through the curve-data-operation record associated way will curve and data display in one interface, intuitive and simple.

1. Description of functions

Data analysis software, designed for data view, analyze, and generate reports, etc. The following table describes the functions of the software:

Form 8 BTSDA functions

Curve-data-log association and location	There is a bound relationship between the data area and the recorded data in the curve area, that is, double-clicking any point in the curve area/data area will find its associated positioning data or curve record in the data area/curve area.
Data review and analysis	The data display area of the main interface of the software includes cyclic layer folding and expanding, step layer folding and expanding, and record layer folding and expanding. The test data can be analyzed by displaying the battery performance parameter settings.
Custom curvilinear coordinates	In the curve setting function, X, Y1, Y2, Y3, and Y4 axes represent the performance parameters of the battery. Users can customize the parameters of the coordinate axes according to their needs, so that the parameter curves in different combinations can provide users with a variety of data analysis schemes.
Data segment view	In a large amount of data with multiple cycles, the segmented data viewing tool can be used to realize the segmented data viewing with specific cycles.

Report	According to the different needs of users, the test data can be exported to various forms of reports. such as WYSIWYG reports, hierarchical reports, formation reports, regular reports, custom reports, etc.
DCIR	The DC internal resistance and the power value of any step (including pulse step) can be calculated automatically, and the graphs and data reports of internal resistance can be derived.
Log and channel information	In the data display area, you can view the channel information corresponding to the current test data and the execution process of the step. Logs can also be used to view unexpected events and error information during channel testing.
Output function	Data and curves support file backup and printing. The exported files can be in Excel or TXT. Or save it in NDA format.
Language upgrade	The software supports Chinese and English. As the function of battery test system and analysis software is gradually improved, the software can support upgrade function, good compatibility, simple operation.

2. Overall logic

BTSDA consists of menu-bar, toolbar, graphics area and data area.

6.1. Open the Software

You can start the BTSDA. exe software in the following four ways:

1. Open it on the installation path: In the client installation path, → double-click btsda. exe to start the BTSDA software, click "File" → select "Open" → select the corresponding "*.nda" file."

名称	修改日期	类型	大小
TestName-2-204-101	2021/11/8 10:51	NDA 文件	30,167 KB
25°C cycle-6-606-6112	2021/11/8 10:47	NDA 文件	64,405 KB
25°C cycle-6-606-6111	2021/11/8 10:31	NDA 文件	119 KB
25°C cycle-6-603-6107	2021/11/8 9:59	NDA 文件	62,920 KB
25°C cycle-6-602-6107	2021/11/8 9:57	NDA 文件	62,925 KB
25°C cycle-6-601-6107	2021/11/8 9:53	NDA 文件	62,928 KB
25°C cycle-6-605-6107	2021/11/8 9:53	NDA 文件	63,966 KB
25°C cycle-6-604-6107	2021/11/8 9:52	NDA 文件	63,996 KB
25°C cycle-6-606-6107	2021/11/8 9:40	NDA 文件	63,843 KB
25°C cycle-3-102-167	2021/11/8 9:14	NDA 文件	35,108 KB
25°C cycle-3-101-199	2021/11/8 9:12	NDA 文件	35,108 KB
25°C cycle-3-104-91	2021/11/8 9:12	NDA 文件	35,193 KB
25°C cycle-3-103-123	2021/11/8 9:11	NDA 文件	35,194 KB
25°C cycle-6-604-6098	2021/11/5 20:03	NDA 文件	3,743 KB
TestName-6-607-6101	2021/11/5 16:56	NDA 文件	101 KB
25°C cycle-6-604-6097	2021/11/5 15:04	NDA 文件	24,455 KB
25°C cycle-6-605-6097	2021/11/5 15:08	NDA 文件	22,869 KB
25°C cycle-6-606-6100	2021/11/5 15:07	NDA 文件	23,780 KB
25°C cycle-6-606-6097	2021/11/5 9:29	NDA 文件	18,296 KB
25°C cycle-6-603-6089	2021/11/5 9:26	NDA 文件	23,629 KB
25°C cycle-6-602-6089	2021/11/5 9:25	NDA 文件	23,624 KB
25°C cycle-6-601-6089	2021/11/5 9:25	NDA 文件	23,613 KB
TestName-8-104-4594	2021/11/4 16:14	NDA 文件	110 KB
TestName-8-103-1075	2021/11/4 16:14	NDA 文件	146 KB
TestName-8-102-4928	2021/11/4 16:13	NDA 文件	109 KB
TestName-8-101-308	2021/11/4 16:12	NDA 文件	112 KB
TestName-8-102-4925	2021/11/4 15:40	NDA 文件	63 KB
TestName-8-104-4591	2021/11/4 15:39	NDA 文件	78 KB
TestName-8-103-1072	2021/11/4 15:38	NDA 文件	52 KB
TestName-8-101-305	2021/11/4 15:38	NDA 文件	47 KB

Figure 6-1 Open-file

2. View data: The client automatically invokes the data analysis software to view and analyze the current channel data. Select the data channel to be viewed → right-click → "View Data" to open the test data of the channel and view, compare, and analyze the test data as shown below: (Figure 6-2)

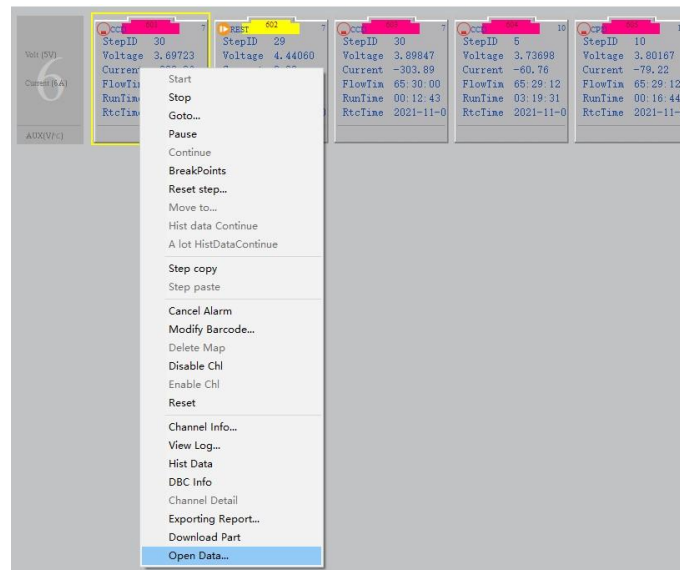


Figure 6-2 Open data display interface

3. Double-click“*.nda”file, start BTSDA.exe software to check and analysis the data.

6.2. Features

BTSDA Interface

BTSDA interface includes menu bar, toolbar, graphics area and segmented preview, as shown below:

- ① Menu
- ② Tools
- ③ Graphics area
- ④ Data segmented preview area
- ⑤ Data area

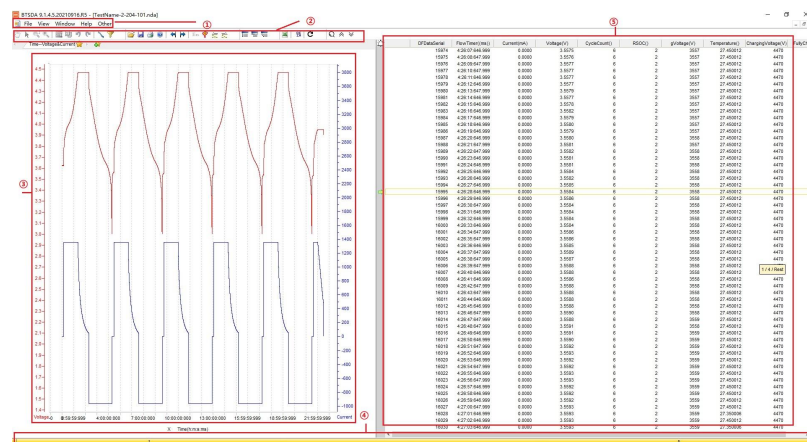


Figure 6-3 BTSDA Interface

Association Mapping

BTSDA adopts curve-data correlation display mode, and there is a one-to-one correspondence between data and curves. The operation method is as follows:

Double-click a point in the "graph area" or "data area", and an triangle icon ▼ will appear at the corresponding point on the curve (if the clicking position is beyond the range of X value, the endpoint value of the X axis shall prevail), and a yellow arrow ➡ will appear in the "data area", pointing to the data record corresponding to the position of the curve, as shown below. This operation is invalid when you double-click the data area loop layer data.

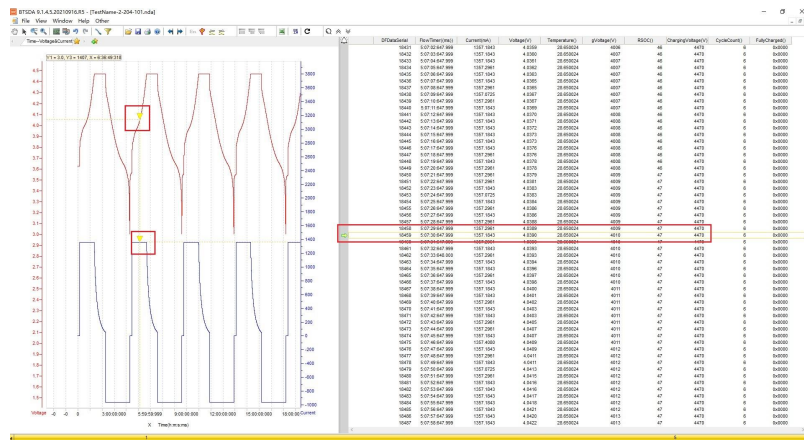


Figure 6-4 Diagram of curve-data association

Data segment preview

In a large amount of data with multiple cycles, the segmented data viewing tool can be used to realize the segmented data viewing with specific cycles. The operation method is as following:

Double-click the yellow scroll bar at the bottom, labeled "Data segment Viewing tool," and in the pop-up **Cycle Range Setting** box, set the display range of the cycle layer to be viewed, as shown in the figure. (Figure 6-5)

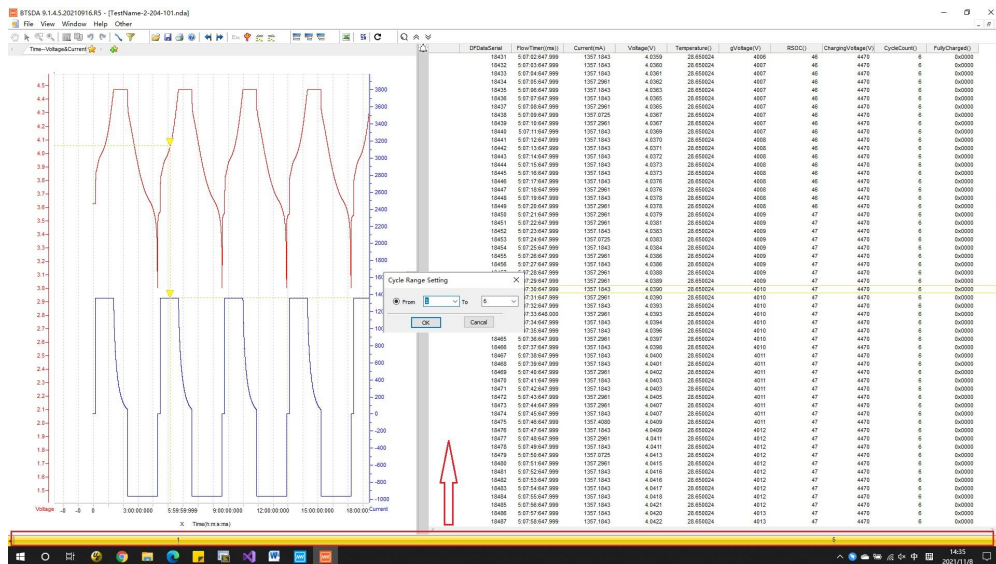


Figure 6-5 Data sectional view setting









Menu













The menu bar is located below the title bar and provides users with global fields control over view and analysis, including file operation, view switching, window adjustment, language selection, and Help.

Tools

In BTSDA software, many tools are integrated into the toolbar to facilitate the operation. The toolbar shortcuts are as follows:

Form 9 Tools

	Drag the graph using the Hand Shape Tool		File opening icon
	Use the arrow tool to select data items		File saving icon
	Local curve magnifying tool		File printing icon
	Scaling tool for curves		Calling help

	Restores the graph to its initial state		Split left/right tool
	Copy graphics to the clipboard		Chinese/English switcher
	Curve contrast control tool		Data area-cyclic layer folding/unfolding
	Previous channel, next channel select tool		Data area-step layer folding/unfolding
	DCIR setting tool		Data area step layer expansion/collapse
	Data filtering tool		Report export tool

1. Data filtering

Implement a data filtering function. Based on the original BTSDA9.0 version, the Mode 2 filtering mode has been added, as shown in Figure 6-6. You can select either of the two filtering modes.

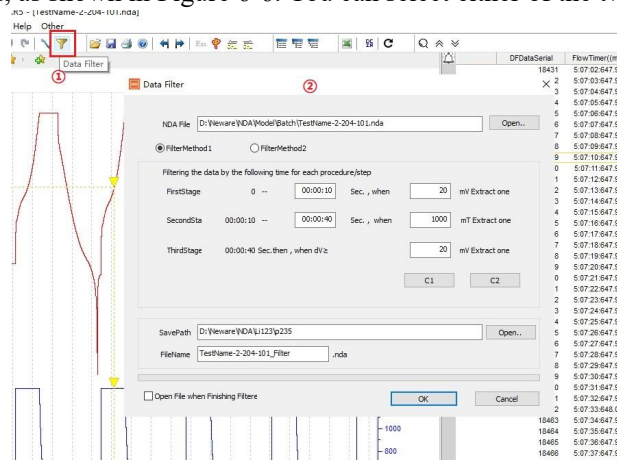


Figure 6-6 Data filtering window

2. Export

Data can be exported in different ways. For example, Visible Report, Layer Report, Formation Report, General Report, Customize Report, etc., as shown in the following figure. (Figure 6-7) It supports export in TXT, EXECL, and PDF formats and supports customize export paths and file names. Right-click → select **Export** to achieve this function.

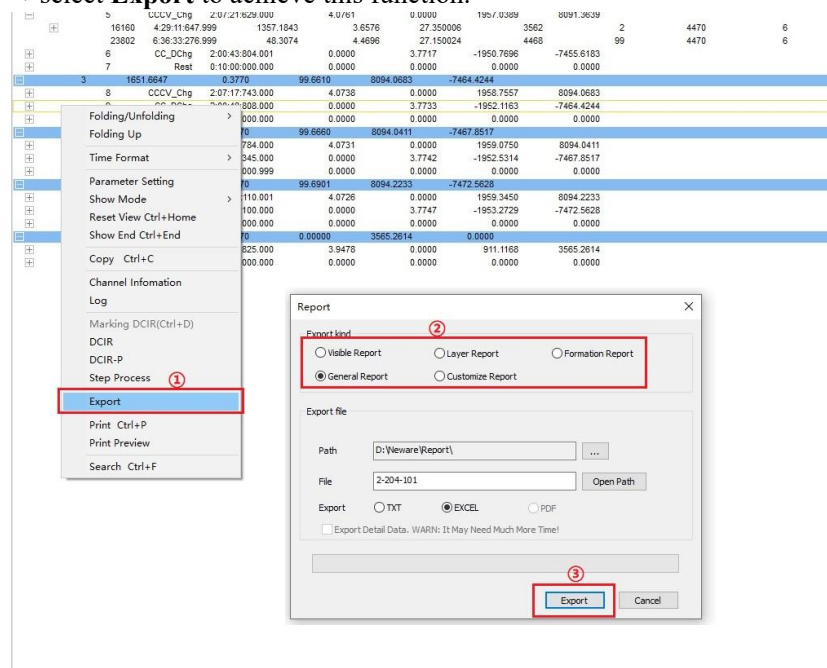


Figure 6-7 Report function setting

3. DCIR setting

The DC internal resistance and the power value of any step (including pulse step) can be calculated automatically, and the graphs and data reports of internal resistance can be derived. In contrast to the measuring internal resistance step in the step editor, the measuring internal resistance step is edited in the step, which is executed according to the conditions set by the step in the test process, and the internal resistance is finally measured, while the DCIR parameter is set in THE BTSDA, and the internal resistance value is obtained through the subsequent calculation of the data that has been tested. This function can be achieved by clicking the set button **DCIR** or right clicking → select "DCIR"/"DCIR-P".

① Step DCIR Setting 6-8:

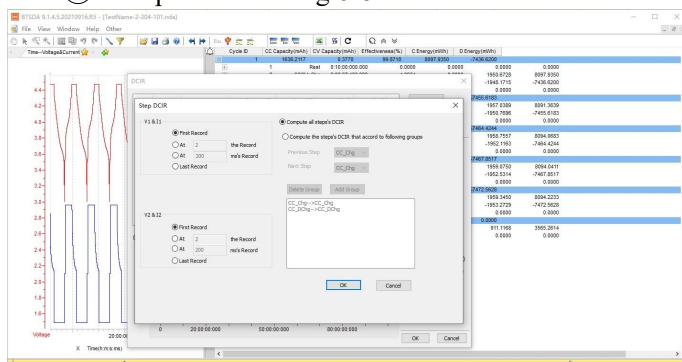


Figure 6-8 Step DCIR setting

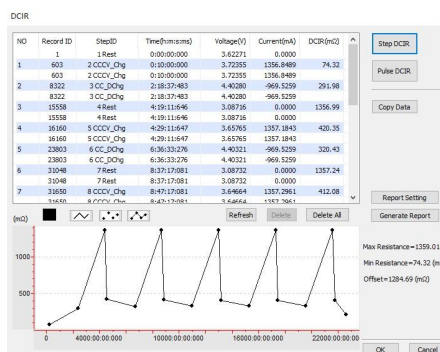


Figure 6-9 Step DCIR calculation

After the DCIR parameters are set, click **OK**. The DCIR battery internal resistance calculated according to the configuration conditions will be displayed in Figure 6-9 and the corresponding image will be drawn.

② DCIR-P: Through the pulse discharge step, to calculate the internal resistance. Currently, only part of the BTS9 equipment has this function. Select the **Pulse DCIR** button to enter the pulse DCIR setting interface, as shown in Figure 6-10:

After setting DCIR-P, click **OK** button to display the DCIR value and P value calculated by the software in the INTERFACE of DCIR-P, and draw the corresponding image. As shown in figures 6-11.

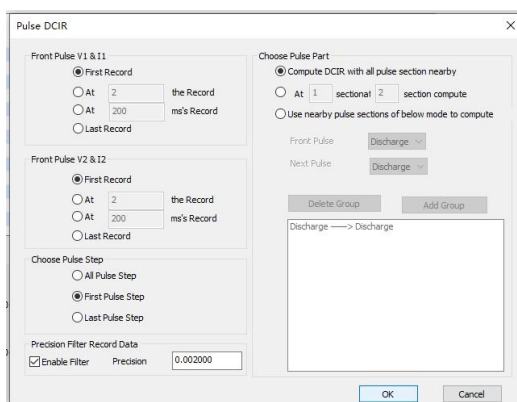


Figure 6-10 Pulse DCIR setting

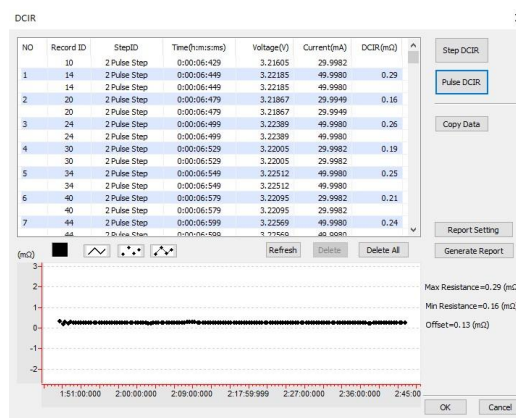




Figure 6-11 Result display

Figure Zone

The curve displayed in the BTSDA data analysis software represents the accumulated movement track of the recorded data of each step during the execution of a complete test process at a certain time interval. X axis and Y axis respectively represent battery performance parameters. In a specific step process, the corresponding relationship between the data recorded by X axis and Y axis can be used to analyze and test battery performance.

1. Tab bar

In the curve setting function, users can customize the parameters of the coordinate axes according to their needs, so as to achieve the parameter curves under different combinations and provide users with a variety of data analysis schemes. The operation method is as follows:

Click  (or right click "Graphics setting"), on the Curve Settings screen, select the parameters represented by the X axis and the Y1, Y2, Y3, and Y4 axes, respectively. The default settings are as follows: X indicates time, Y1 indicates empty, Y2 indicates empty, Y3 indicates empty, and Y4 indicates empty. Click color , You can set the color of the curve displayed in the "Graph area" as shown below:

If you want to delete the label, right-click the label and choose **Delete**. In the curve setting interface, right-click the label list to delete it, or choose not to display this label.

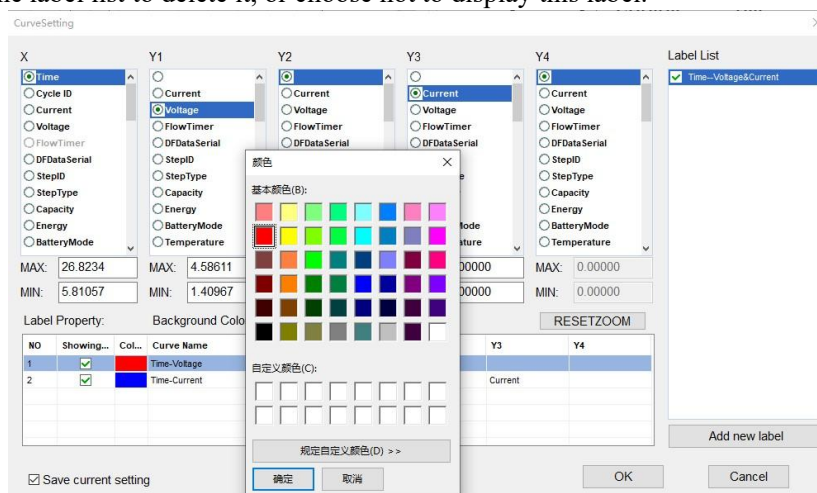


Figure 6-12 Curve setting

2. Curve

The point information on the curve is loaded layer by layer. After the point information for the first layer is obtained, the point information is loaded layer by layer in the background thread. At the same time, the customer can view the data of the current loaded layer and perform other operations.

There is a one-to-one correspondence between the recorded data in the curve area and the data area. Double-click the curve/data to realize the corresponding display of data/curve. See association positioning.

① The mouse tracking

When the mouse is placed inside the graph area, a yellow strip box will appear above the graph to display the value of the X and Y coordinate axes at the position of the mouse. Coordinate values change as the mouse moves. As shown below:

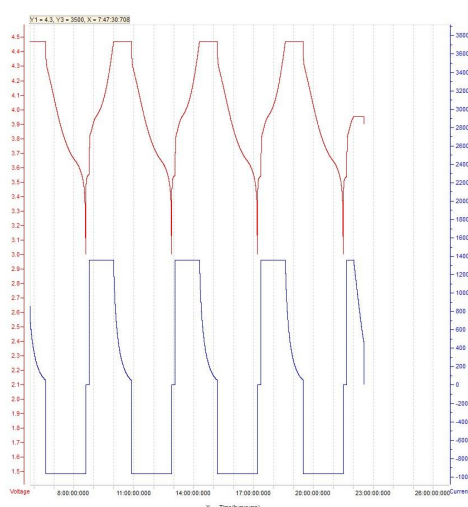


Figure 6-13 XYZ display

② Curvilinear translation

- Use "Hand tool"

Click the hand-shaped icon in the toolbar , The marker changes into the shape of a hand. Hold down the left mouse button in the graphics area and drag the mouse to move the curve

up, down, left and right.

- Move the scale on the axes

Place the mouse over the scale on the X/Y axis and change it into the shape of your hand. Hold down the left mouse button and drag up and down or left and right to move the curve along the scale of the coordinate axis, as shown in the figure below (Figure 6-14). The light gray area is the X-axis left and right movement area. When the mouse is placed on this area, it will change into the shape of a "hand shape + left and right arrow".

In Figure 6-15, the light red and mauve areas on both sides of the Y axis are the up and down control areas of the Y axis. When you move the mouse over this area, it changes to the "hand shape + up and down arrow" shape. Hold down the left mouse button to drag the Y axis up and down.

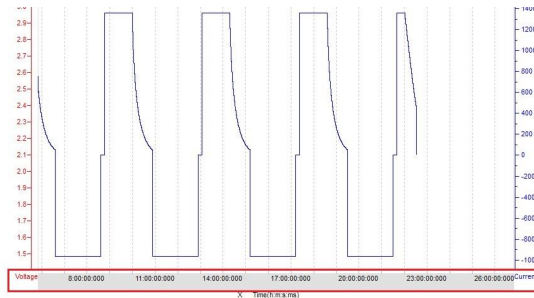


Figure 6-14 X-axis left/right movement zone

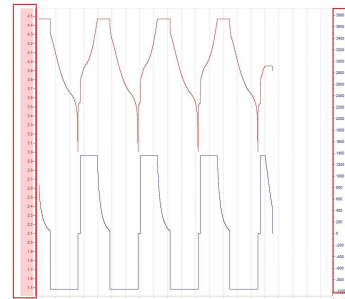




Figure 6-15 Y-axis up/down movement zone

- Hold down Shift and scroll wheel to move the curve left and right.


③ Curve scaling and recovery

Users can scale the curve in the following ways as required. Click the restore icon  or right click **Restore** to restore the graph to the initial state.

- Use "Zoom tool"

Click the zoom icon  on the toolbar, hold down the left mouse button in the graphics area and drag the mouse upward to enlarge the graphics. Drag the mouse down to make the graph smaller.

- Use "Topo-zoom tool"

Click the local zoom icon  on the toolbar. Press and hold the left mouse button in the graphics area and drag. When you release the mouse, the area inside the dotted box will be enlarged and fill the entire graphics area, and the scale of the coordinate axes will change accordingly.

- Scroll the mouse wheel

Zoom defaults to X-axis zoom; press Ctrl+wheel to zoom in on the Y axis. In mouse wheel zoom mode, the zoom curves with the mouse position as the center.

- The mouse zooms in and out of the coordinate area

Move the mouse to both sides of the Y coordinate axis, and colored blank areas will appear: light red on the left and lavender on the right, as shown in the figure below (Figure 6-16). Turn the mouse into the shape of "hand + left and right springs", and roll the mouse wheel to scale the X-axis with the Y-axis as the fixed point.



Figure 6-16 Y-scale

Data Area

The data area is used to display the detailed values of the test data, including the table header, test data, and log lights, as shown in the figure below (Figure 6-17). Users can view all test data and test information through the data area, and can also set personalized parameters through the right menu of the data area.

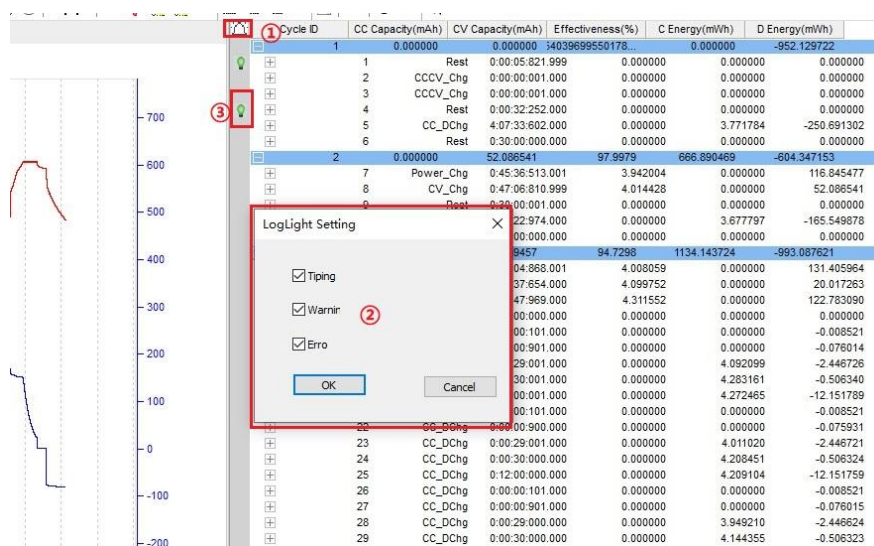
- ① Log indicator
- ② Header
- ③ Test data

DFDataSerial	FlowTime(ms)	Current(mA)	Voltage(V)	VoltVar()	gVoltage(V)	CycCount()
1	0.000000	0.000000	3.403969550178...	0.000000	-952.129722	
1	Rest	0:00:05:521.999	0.000000	0.000000	0.000000	0.000000
2	CCCV_Chg	0:00:00:001.000	0.000000	0.000000	0.000000	0.000000
3	CCCV_Chg	0:00:00:001.000	0.000000	0.000000	0.000000	0.000000
10	0:00:05:522.999	0.000008	4.288935	4.430000	4315	249
11	0:00:05:523.999	0.000008	4.288935	4.430000	4315	249
4	Rest	0:00:32:252.000	0.000000	0.000000	0.000000	0.000000
5	CC_DChg	4:07:33:602.000	0.000000	3.771784	-250.681302	-952.129722
6	Rest	0:30:00:000.000	0.000000	0.000000	0.000000	0.000000
2	0.000000	52.096541	97.9979	666.890469	-804.347153	
7	Power_Chg	0:45:36:513.001	3.942004	0.000000	116.845477	457.802188
8	CV_Chg	0:47:06:810.999	4.014428	0.000000	52.096541	209.088281
9	Rest	0:30:00:001.000	0.000000	0.000000	0.000000	0.000000
10	Power_DChg	2:00:22:974.000	0.000000	3.677797	-165.549878	-604.347153
11	Rest	0:30:00:000.000	0.000000	0.000000	0.000000	0.000000
3	221.509253	20.059457	94.7298	1134.143724	-993.087821	
12	CC_Chg	0:37:04:868.001	4.008059	0.000000	131.405964	524.023229
13	CV_Chg	0:06:37:654.000	4.099752	0.000000	20.017263	82.066363
14	CCCV_Chg	1:04:47:969.000	4.311552	0.000000	122.783090	528.054132
15	Rest	0:30:00:000.000	0.000000	0.000000	0.000000	0.000000
16	CC_DChg	0:00:00:101.000	0.000000	0.000000	-0.008521	-0.035784
17	CC_DChg	0:00:00:901.000	0.000000	0.000000	-0.076014	-0.315649
18	CC_DChg	0:00:29:001.000	0.000000	4.092099	-2.446726	-10.018817
19	CC_DChg	0:00:30:001.000	0.000000	4.283161	-0.506340	-2.167418
20	CC_DChg	0:12:00:001.000	0.000000	4.272465	-12.151789	-51.915768
21	CC_DChg	0:00:00:101.000	0.000000	0.000000	-0.008521	-0.035002
22	CC_DChg	0:00:00:900.000	0.000000	0.000000	-0.075931	-0.308682
23	CC_DChg	0:00:29:001.000	0.000000	4.011020	-2.446721	-9.824245
24	CC_DChg	0:00:30:000.000	0.000000	4.208451	-0.506324	-2.129583
25	CC_DChg	0:12:00:000.000	0.000000	4.209104	-12.151759	
26	CC_DChg	0:00:00:101.000	0.000000	0.000000	-0.008521	
27	CC_DChg	0:00:00:901.000	0.000000	0.000000	-0.076015	
28	CC_DChg	0:00:29:000.000	0.000000	3.949210	-2.446624	
29	CC_DChg	0:00:30:000.000	0.000000	4.144355	-0.506323	
30	CC_DChg	0:12:00:001.000	0.000000	4.145743	-12.151778	-50.365434
31	CC_DChg	0:00:00:100.000	0.000000	0.000000	-0.008436	-0.033598
32	CC_DChg	0:00:00:901.000	0.000000	0.000000	-0.076014	-0.299730
33	CC_DChg	0:00:29:000.000	0.000000	3.888381	-2.446620	-9.518719

Figure 6-17 Data area hierarchical division

1. Log indicator setting

Click the "lamp" image on the left of the watch head, and the loglight can be set in the popup dialog, as shown below: (Figure 6-18)



Loglight Setting Figure 6-18

2. Header

Test data, step layer test data, and record layer test data, as shown in the figure below (Figure 6-19). Click the cycle layer (1), step layer (2), record layer (3) on the toolbar, or right-click the test data and choose "Collapse/Expand" to achieve the related data collapse/expand. By viewing different battery performance parameters, you can analyze battery data.

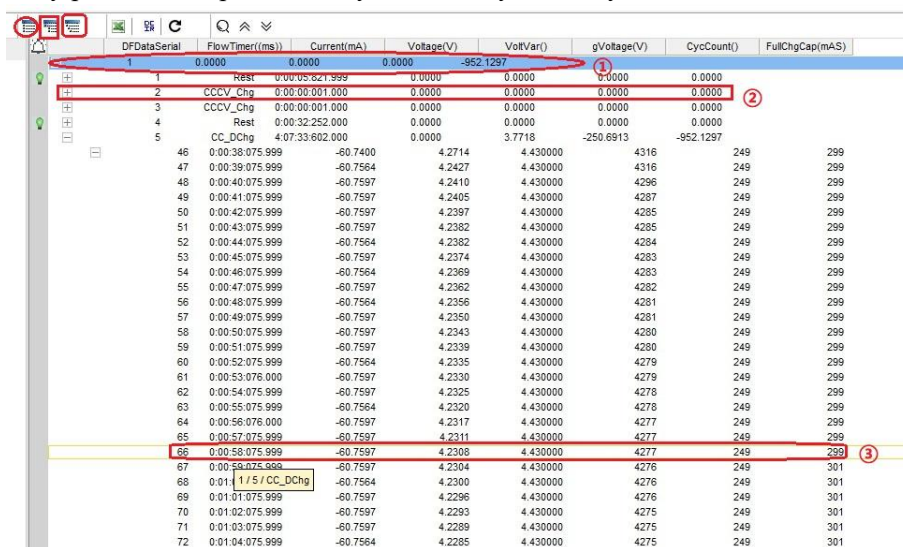


Figure 6-19 Data display

① Cycle layer header setting

Select the loop layer data, click the table header, right click, and select the loop layer data field that you want to display, as shown below: (Figure 6-20)

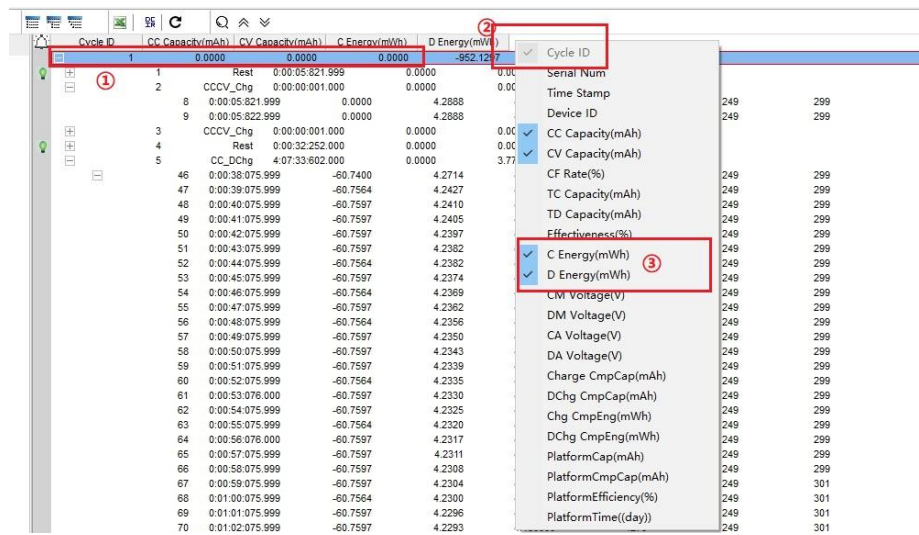


Figure 6-20 Cycle layer data setting

② Step layer header setting

Select the step layer data, click the table header, right click, and select the step layer data field to be displayed, as shown in the figure below: (Figure 6-21)

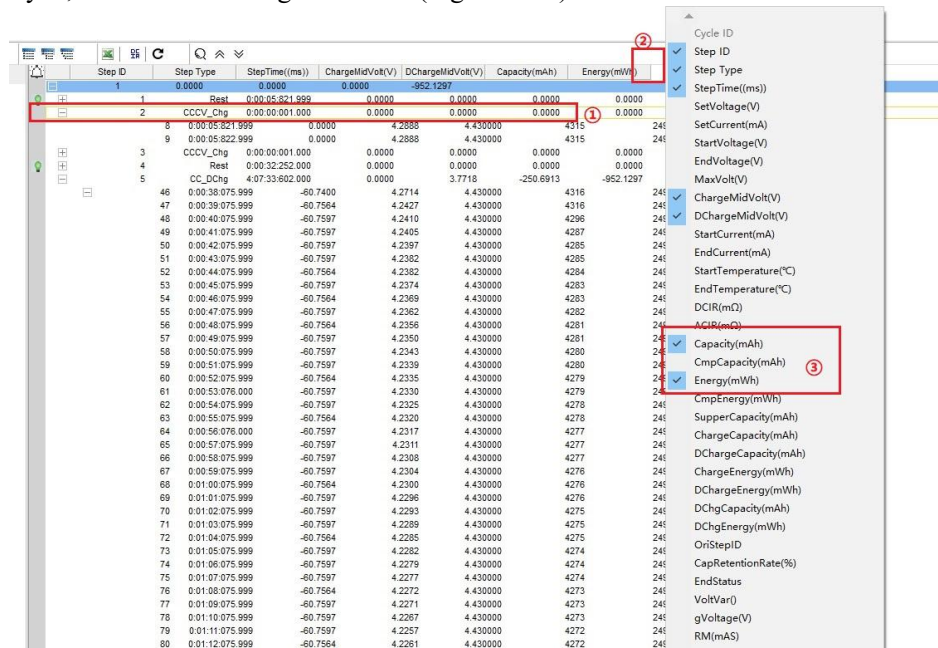


Figure 6-21 Step layer data setting interface

③ Record layer header setting

As shown below, select step layer data, click the table header, right click, and select the step layer data field to be displayed, as shown below: (Figure 6-22)

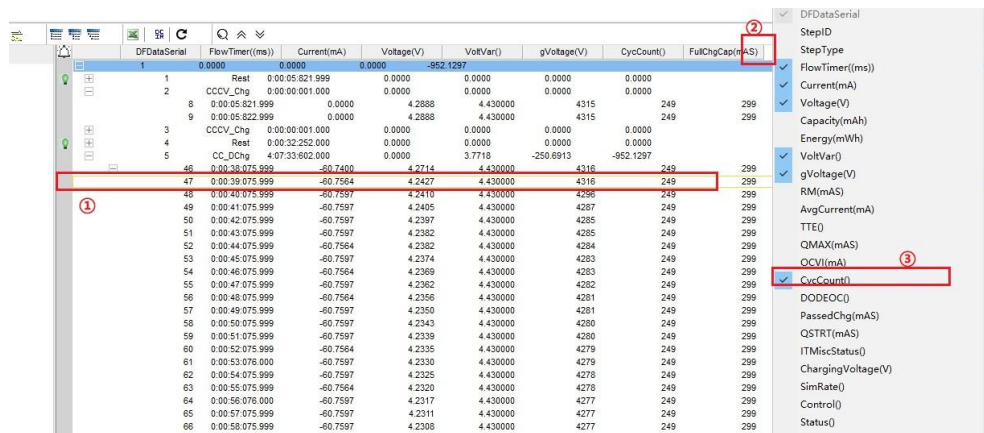


Figure 6-22 Record layer data setting

3. Test data

Users can view the corresponding test data as required for data analysis.

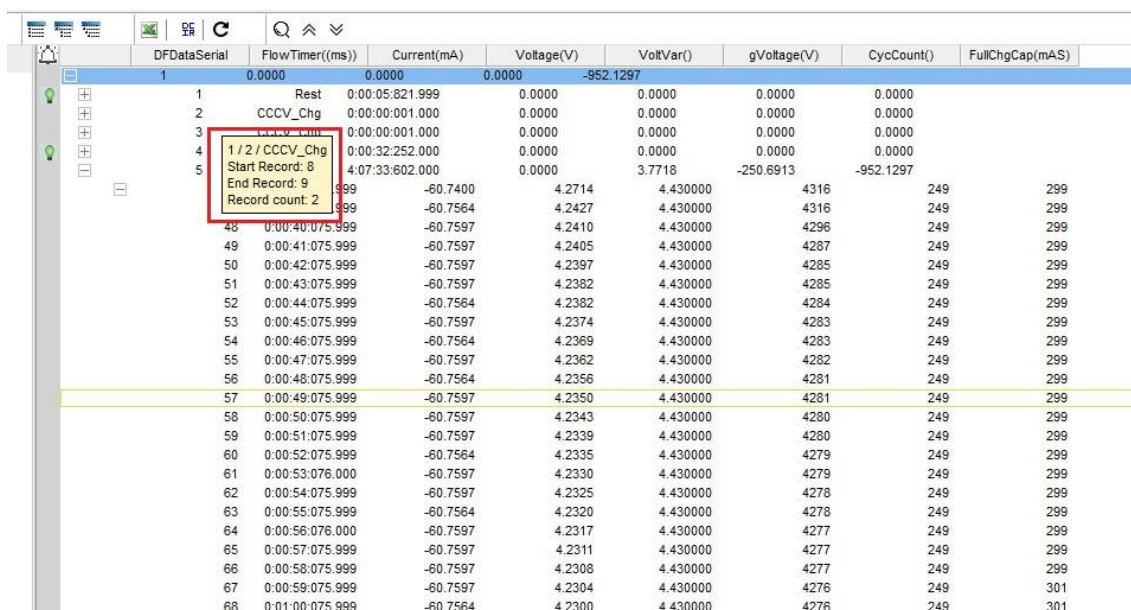
① Prompt message

When the mouse moves to a different place, the interface prompts users to view and analyze data, such as circular layer prompt message, step layer prompt message, record layer prompt message, etc.

When the mouse is placed on the data line of the cycle layer, "Cycle Number", "start step", "end step", "total step" and other prompt information will appear, as shown below: (Figure 6-23)

Figure 6-23 Cycle layer information

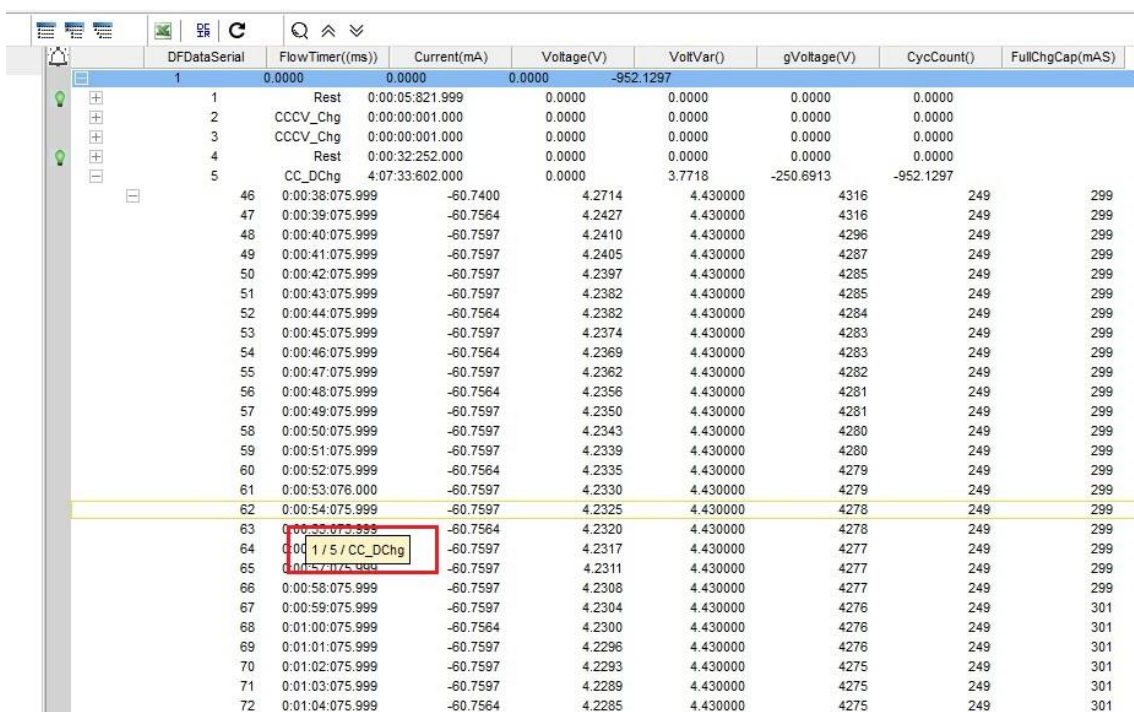
When the mouse is placed on the data row of the step layer, it will display information such as "cycle number/Step Serial number/Step type", "Start record data bar", "End record data bar", "Total record number" and other prompts will appear, as shown below: (Figure 6-24)



	DFDataSerial	FlowTimer((ms))	Current(mA)	Voltage(V)	VoltVar()	gVoltage(V)	CycCount()	FullChgCap(mAS)
1	0.0000	0.0000	0.0000	-952.1297				
1	Rest	0:00:05:821.999	0.0000	0.0000	0.0000	0.0000	0.0000	
2	CCCV_Chg	0:00:00:001.000	0.0000	0.0000	0.0000	0.0000	0.0000	
3	CCCV_Chg	0:00:00:001.000	0.0000	0.0000	0.0000	0.0000	0.0000	
4	Rest	0:00:32:252.000	0.0000	0.0000	0.0000	0.0000	0.0000	
5	CC_DChg	4:07:33:602.000	0.0000	3.7718	-250.6913	-952.1297		
46		0:00:40:075.999	-60.7400	4.2714	4.430000	4316	249	299
47		0:00:39:075.999	-60.7564	4.2427	4.430000	4316	249	299
48		0:00:40:075.999	-60.7597	4.2410	4.430000	4296	249	299
49		0:00:41:075.999	-60.7597	4.2405	4.430000	4287	249	299
50		0:00:42:075.999	-60.7597	4.2397	4.430000	4285	249	299
51		0:00:43:075.999	-60.7597	4.2382	4.430000	4285	249	299
52		0:00:44:075.999	-60.7564	4.2382	4.430000	4284	249	299
53		0:00:45:075.999	-60.7597	4.2374	4.430000	4283	249	299
54		0:00:46:075.999	-60.7564	4.2369	4.430000	4283	249	299
55		0:00:47:075.999	-60.7597	4.2362	4.430000	4282	249	299
56		0:00:48:075.999	-60.7564	4.2356	4.430000	4281	249	299
57		0:00:49:075.999	-60.7597	4.2350	4.430000	4281	249	299
58		0:00:50:075.999	-60.7597	4.2343	4.430000	4280	249	299
59		0:00:51:075.999	-60.7597	4.2339	4.430000	4280	249	299
60		0:00:52:075.999	-60.7564	4.2335	4.430000	4279	249	299
61		0:00:53:076.000	-60.7597	4.2330	4.430000	4279	249	299
62		0:00:54:075.999	-60.7597	4.2325	4.430000	4278	249	299
63		0:00:55:075.999	-60.7564	4.2320	4.430000	4278	249	299
64		0:00:56:076.000	-60.7597	4.2317	4.430000	4277	249	299
65		0:00:57:075.999	-60.7597	4.2311	4.430000	4277	249	299
66		0:00:58:075.999	-60.7597	4.2308	4.430000	4277	249	299
67		0:00:59:075.999	-60.7597	4.2304	4.430000	4276	249	301
68		0:01:00:075.999	-60.7564	4.2300	4.430000	4276	249	301

Figure 6-24 Step layer information

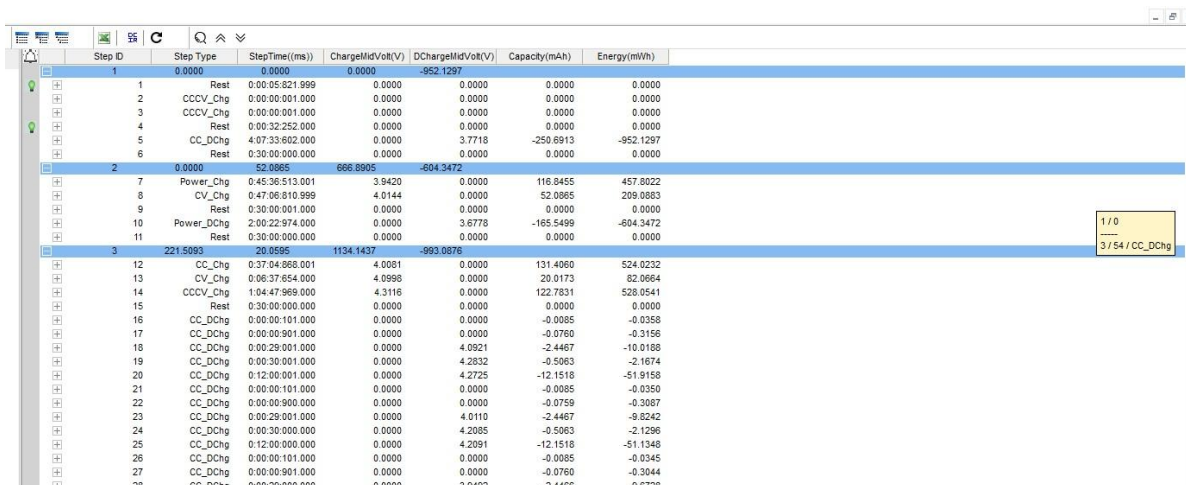
Prompt information of recording layer: When the mouse is placed on the data line of recording layer, prompt information such as "cycle number/step number/step type" will appear, as shown below: (Figure 6-25)



	DFDataSerial	FlowTimer((ms))	Current(mA)	Voltage(V)	VoltVar()	gVoltage(V)	CycCount()	FullChgCap(mAS)
1	0.0000	0.0000	0.0000	-952.1297				
1	Rest	0:00:05:821.999	0.0000	0.0000	0.0000	0.0000	0.0000	
2	CCCV_Chg	0:00:00:001.000	0.0000	0.0000	0.0000	0.0000	0.0000	
3	CCCV_Chg	0:00:00:001.000	0.0000	0.0000	0.0000	0.0000	0.0000	
4	Rest	0:00:32:252.000	0.0000	0.0000	0.0000	0.0000	0.0000	
5	CC_DChg	4:07:33:602.000	0.0000	3.7718	-250.6913	-952.1297		
46		0:00:38:075.999	-60.7400	4.2714	4.430000	4316	249	299
47		0:00:39:075.999	-60.7564	4.2427	4.430000	4316	249	299
48		0:00:40:075.999	-60.7597	4.2410	4.430000	4296	249	299
49		0:00:41:075.999	-60.7597	4.2405	4.430000	4287	249	299
50		0:00:42:075.999	-60.7597	4.2397	4.430000	4285	249	299
51		0:00:43:075.999	-60.7597	4.2382	4.430000	4285	249	299
52		0:00:44:075.999	-60.7564	4.2382	4.430000	4284	249	299
53		0:00:45:075.999	-60.7597	4.2374	4.430000	4283	249	299
54		0:00:46:075.999	-60.7564	4.2369	4.430000	4283	249	299
55		0:00:47:075.999	-60.7597	4.2362	4.430000	4282	249	299
56		0:00:48:075.999	-60.7564	4.2356	4.430000	4281	249	299
57		0:00:49:075.999	-60.7597	4.2350	4.430000	4281	249	299
58		0:00:50:075.999	-60.7597	4.2343	4.430000	4280	249	299
59		0:00:51:075.999	-60.7597	4.2339	4.430000	4280	249	299
60		0:00:52:075.999	-60.7564	4.2335	4.430000	4279	249	299
61		0:00:53:076.000	-60.7597	4.2330	4.430000	4279	249	299
62		0:00:54:075.999	-60.7597	4.2325	4.430000	4278	249	299
63		0:00:55:075.999	-60.7564	4.2320	4.430000	4278	249	299
64		0:00:56:075.999	-60.7597	4.2317	4.430000	4277	249	299
65		0:00:57:075.999	-60.7597	4.2311	4.430000	4277	249	299
66		0:00:58:075.999	-60.7597	4.2308	4.430000	4277	249	299
67		0:00:59:075.999	-60.7597	4.2304	4.430000	4276	249	301
68		0:01:00:075.999	-60.7564	4.2300	4.430000	4276	249	301
69		0:01:01:075.999	-60.7597	4.2296	4.430000	4276	249	301
70		0:01:02:075.999	-60.7597	4.2293	4.430000	4275	249	301
71		0:01:03:075.999	-60.7597	4.2289	4.430000	4275	249	301
72		0:01:04:075.999	-60.7564	4.2285	4.430000	4275	249	301

Figure 6-25 Record layer information

When using the vertical scroll bar in the data area to view data, the data will be a prompt message from "cycle No/Step No/Step Type" at the beginning of the data in the current interface to "cycle No/Step No/Step Type" at the bottom of the current interface, as shown below: (Figure 6-26)



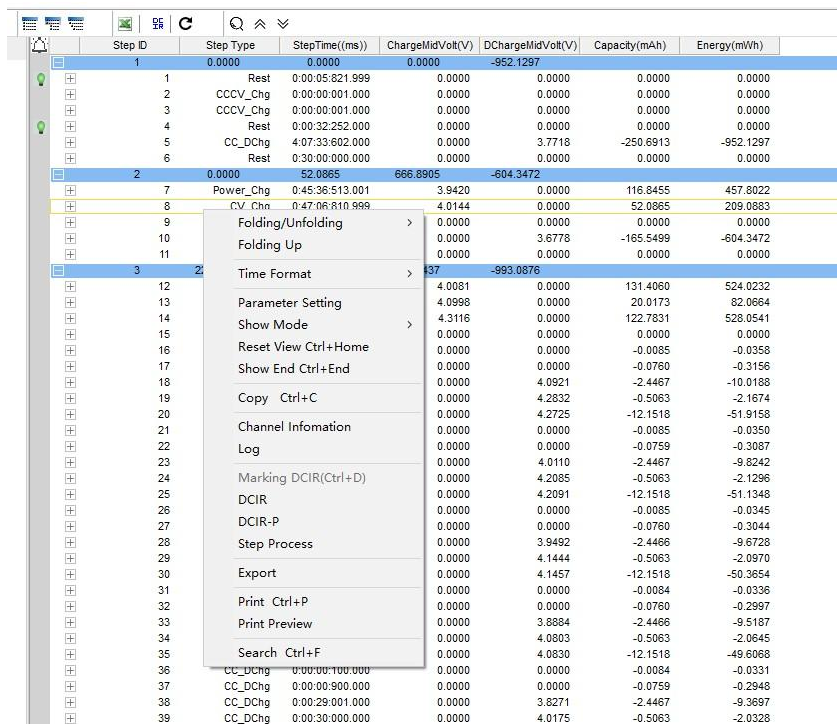
Step ID	Step Type	StepTime(ms)	ChargeMidVolt(V)	DChargeMidVolt(V)	Capacity(mAh)	Energy(mWh)
1	0.0000	0.0000	0.0000	-952.1297		
1	Rest	0:00:05.821.999	0.0000	0.0000	0.0000	0.0000
2	CCCV_Chg	0:00:00:001.000	0.0000	0.0000	0.0000	0.0000
3	CCCV_Chg	0:00:00:001.000	0.0000	0.0000	0.0000	0.0000
4	Rest	0:00:32:252.000	0.0000	0.0000	0.0000	0.0000
5	CC_Chg	4:07:33:602.000	0.0000	3.7718	-250.8913	-952.1297
6	Rest	0:30:00:000.000	0.0000	0.0000	0.0000	0.0000
2	0.0000	52.0865	666.8905	-604.3472		
7	Power_Chg	0:45:36:513.001	3.9420	0.0000	116.8455	457.8022
8	CV_Chg	0:47:06:810.999	4.0144	0.0000	52.0865	209.0883
9	Rest	0:30:00:001.000	0.0000	0.0000	0.0000	0.0000
10	Power_DChg	2:00:22:974.000	0.0000	3.6778	-165.5499	-604.3472
11	Rest	0:30:00:000.000	0.0000	0.0000	0.0000	0.0000
3	221.5095	20.9695	1134.1437	-993.0876		
12	CC_Chg	0:37:04:968.001	4.0081	0.0000	131.4060	524.0232
13	CV_Chg	0:06:37:854.000	4.0998	0.0000	20.0173	82.0664
14	CCCV_Chg	1:04:47:968.000	4.3116	0.0000	122.7831	528.0541
15	Rest	0:30:00:000.000	0.0000	0.0000	0.0000	0.0000
16	CC_DChg	0:00:00:101.000	0.0000	0.0000	-0.0085	-0.0358
17	CC_DChg	0:00:00:901.000	0.0000	0.0000	-0.0760	-0.3156
18	CC_DChg	0:00:29:001.000	0.0000	4.0921	-2.4467	-10.0188
19	CC_DChg	0:00:30:001.000	0.0000	4.2832	-0.5063	-2.1674
20	CC_DChg	0:12:00:001.000	0.0000	4.2725	-12.1518	-51.9158
21	CC_DChg	0:00:00:101.000	0.0000	0.0000	-0.0085	-0.0350
22	CC_DChg	0:00:00:900.000	0.0000	0.0000	-0.0759	-0.3087
23	CC_DChg	0:00:29:001.000	0.0000	4.0110	-2.4467	-9.8242
24	CC_DChg	0:00:30:000.000	0.0000	4.2085	-0.5063	-2.1296
25	CC_DChg	0:12:00:000.000	0.0000	4.2091	-12.1518	-51.1348
26	CC_DChg	0:00:00:101.000	0.0000	0.0000	-0.0085	-0.0345
27	CC_DChg	0:00:00:901.000	0.0000	0.0000	-0.0760	-0.3044
28	CC_DChg	0:00:29:000.000	0.0000	3.9492	-2.4466	-9.6728

Figure 6-26 Scroll bar information

② Right-click function menu

Right-click test data, fold/expand cycle layer/step layer/record layer data, set the relevant parameters, view channel information, log, etc.

Folding/Unfolding: Users can fold/Unfold test data of the cyclic layer/step layer/recording layer according to different requirements, so as to facilitate data viewing and analysis.



Step ID	Step Type	StepTime(ms)	ChargeMidVolt(V)	DChargeMidVolt(V)	Capacity(mAh)	Energy(mWh)
1	0.0000	0.0000	0.0000	-952.1297		
1	Rest	0:00:05.821.999	0.0000	0.0000	0.0000	0.0000
2	CCCV_Chg	0:00:00:001.000	0.0000	0.0000	0.0000	0.0000
3	CCCV_Chg	0:00:00:001.000	0.0000	0.0000	0.0000	0.0000
4	Rest	0:00:32:252.000	0.0000	0.0000	0.0000	0.0000
5	CC_Chg	4:07:33:602.000	0.0000	3.7718	-250.8913	-952.1297
6	Rest	0:30:00:000.000	0.0000	0.0000	0.0000	0.0000
2	0.0000	52.0865	666.8905	-604.3472		
7	Power_Chg	0:45:36:513.001	3.9420	0.0000	116.8455	457.8022
8	CV_Chg	0:47:06:810.999	4.0144	0.0000	52.0865	209.0883
9	Rest	0:30:00:001.000	0.0000	0.0000	0.0000	0.0000
10	Power_DChg	2:00:22:974.000	0.0000	3.6778	-165.5499	-604.3472
11	Rest	0:30:00:000.000	0.0000	0.0000	0.0000	0.0000
3	221.5095	20.9695	1134.1437	-993.0876		
12	CC_Chg	0:37:04:968.001	4.0081	0.0000	131.4060	524.0232
13	CV_Chg	0:06:37:854.000	4.0998	0.0000	20.0173	82.0664
14	CCCV_Chg	1:04:47:968.000	4.3116	0.0000	122.7831	528.0541
15	Rest	0:30:00:000.000	0.0000	0.0000	0.0000	0.0000
16	CC_DChg	0:00:00:101.000	0.0000	0.0000	-0.0085	-0.0358
17	CC_DChg	0:00:00:901.000	0.0000	0.0000	-0.0760	-0.3156
18	CC_DChg	0:00:29:001.000	0.0000	4.0921	-2.4467	-10.0188
19	CC_DChg	0:00:30:001.000	0.0000	4.2832	-0.5063	-2.1674
20	CC_DChg	0:12:00:001.000	0.0000	4.2725	-12.1518	-51.9158
21	CC_DChg	0:00:00:101.000	0.0000	0.0000	-0.0085	-0.0350
22	CC_DChg	0:00:00:900.000	0.0000	0.0000	-0.0759	-0.3087
23	CC_DChg	0:00:29:001.000	0.0000	4.0110	-2.4467	-9.8242
24	CC_DChg	0:00:30:000.000	0.0000	4.2085	-0.5063	-2.1296
25	CC_DChg	0:12:00:000.000	0.0000	4.2091	-12.1518	-51.1348
26	CC_DChg	0:00:00:101.000	0.0000	0.0000	-0.0085	-0.0345
27	CC_DChg	0:00:00:901.000	0.0000	0.0000	-0.0760	-0.3044
28	CC_DChg	0:00:29:000.000	0.0000	3.9492	-2.4466	-9.6728
29			4.1444	-0.5063	-2.0970	
30			4.1457	-12.1518	-50.3654	
31			0.0000	-0.0084	-0.0336	
32			0.0000	-0.0760	-0.2997	
33			3.8884	-2.4466	-9.5187	
34			4.0803	-0.5063	-2.0645	
35			4.0830	-12.1518	-49.6068	
36	CC_DChg	0:00:00:100.000	0.0000	0.0000	-0.0084	-0.0331
37	CC_DChg	0:00:00:900.000	0.0000	0.0000	-0.0759	-0.2948
38	CC_DChg	0:00:29:001.000	0.0000	3.8271	-2.4467	-9.3697
39	CC_DChg	0:00:30:000.000	0.0000	4.0175	-0.5063	-2.0328

Figure 6-27 Folding/Unfolding

Time scheme: You can set the time display mode as required: Automatic, days, hours, minutes, s, Ms, μ s. As Figure 6-28 displayed:

Step ID	Step Type	StepTime(ms)	ChargeMidVol(V)	DChargeMidVol(V)	Capacity(mAh)	Energy(mWh)
1	Rest	0.0000	0.0000	-952.1297	0.0000	0.0000
2	CCCV_Chg	0:00:00.001.000	0.0000	0.0000	0.0000	0.0000
3	CCCV_Chg	0:00:00.001.000	0.0000	0.0000	0.0000	0.0000
4	Rest	0:00:32.252.000	0.0000	0.0000	0.0000	0.0000
5	CC_DChg	4:07:33.602.000	0.0000	3.7718	-250.6913	-952.1297
6	Rest	0:30:00.000.000	0.0000	0.0000	0.0000	0.0000
7	Power_Chg	0:45:36.513.001	3.9420	0.0000	116.8455	457.8022
8	CV_Chg	0:47:06.810.999	4.0144	0.0000	52.0865	209.0883
9	Rest	0:30:00.001.000	0.0000	0.0000	0.0000	0.0000
10	Power_DChg	2:00:22.574.000	0.0000	3.6778	-165.5499	-604.3472
11	Rest	0:30:00.000.000	0.0000	0.0000	0.0000	0.0000
12	CC_Chg	0:37:04.668.001	4.0081	0.0000	131.4060	524.0232
13	CV_Chg	0:06:37.654.000	4.0999	0.0000	20.0173	82.0664
14	CCCV_Chg	1:04:47.969.000	4.3116	0.0000	528.0541	0.0000
15	Rest	0:30:00.000.000	0.0000	0.0000	0.0000	-0.0358
16	CC_DChg	0:00:00.101.000	0.0000	0.0000	0.0000	0.0000
17	CC_DChg	0:00:00.901.000	0.0000	0.0000	0.0000	0.0000
18	CC_DChg	0:00:29.001.000	0.0000	0.0000	0.0000	0.0000
19	CC_DChg	0:00:30.001.000	0.0000	0.0000	0.0000	0.0000
20	CC_DChg	0:12:00.001.000	0.0000	0.0000	0.0000	0.0000
21	CC_DChg	0:00:00.101.000	0.0000	0.0000	0.0000	0.0000
22	CC_DChg	0:00:00.900.000	0.0000	0.0000	0.0000	0.0000
23	CC_DChg	0:00:29.001.000	0.0000	0.0000	0.0000	0.0000
24	CC_DChg	0:00:30.000.000	0.0000	0.0000	0.0000	0.0000
25	CC_DChg	0:12:00.000.000	0.0000	0.0000	0.0000	0.0000
26	CC_DChg	0:00:00.101.000	0.0000	0.0000	0.0000	0.0000
27	CC_DChg	0:00:00.901.000	0.0000	0.0000	0.0000	0.0000
28	CC_DChg	0:00:29.000.000	0.0000	0.0000	0.0000	0.0000
29	CC_DChg	0:00:30.000.000	0.0000	0.0000	0.0000	0.0000
30	CC_DChg	0:12:00.001.000	0.0000	0.0000	0.0000	0.0000
31	CC_DChg	0:00:00.100.000	0.0000	0.0000	0.0000	0.0000
32	CC_DChg	0:00:00.901.000	0.0000	0.0000	0.0000	0.0000
33	CC_DChg	0:00:29.000.000	0.0000	0.0000	0.0000	0.0000
34	CC_DChg	0:00:30.000.000	0.0000	0.0000	0.0000	0.0000
35	CC_DChg	0:12:00.001.000	0.0000	0.0000	0.0000	0.0000
36	CC_DChg	0:00:00.100.000	0.0000	0.0000	0.0000	0.0000
37	CC_DChg	0:00:00.900.000	0.0000	0.0000	0.0000	0.0000
38	CC_DChg	0:00:29.001.000	0.0000	0.0000	0.0000	0.0000
39	CC_DChg	0:00:30.000.000	0.0000	0.0000	0.0000	0.0000
40	CC_DChg	0:12:00.001.000	0.0000	0.0000	0.0000	0.0000
41	CC_DChg	0:00:00.100.000	0.0000	0.0000	0.0000	0.0000
42	CC_DChg	0:00:00.900.000	0.0000	0.0000	0.0000	0.0000

Figure 6-28 Time format

Parameter setting: In the "Parameter Setting" option under the right-click function, users can set "unit setting," "cycle layer," "step layer," "record layer" and other parameters as required.

- Unit setting: Users can set the specific unit of data display as well as the quality of active substance and battery capacity as required, as shown in the figure below: (Figure 6-29)

- ① Parameter setting
- ② Select display variables
- ③ Unit switch
- ④ Data display format

Cycle	Step	Record
Name	Data Type	Unit
<input checked="" type="checkbox"/> DFDataSerial	DWORD	
<input type="checkbox"/> StepID	DWORD	
<input type="checkbox"/> StepType	DWORD	
<input checked="" type="checkbox"/> FlowTime	UINT64	(ms)
<input checked="" type="checkbox"/> Current	double	mA
<input checked="" type="checkbox"/> Voltage	double	V
<input type="checkbox"/> Capacity	double	mAh
<input type="checkbox"/> Energy	double	mWh
<input type="checkbox"/> VoltVar	float	0
<input checked="" type="checkbox"/> gVoltage	DWORD	V
<input type="checkbox"/> RM	DWORD	mAS
<input type="checkbox"/> AvgCurrent	int	mA
<input type="checkbox"/> TTE	DWORD	min
<input type="checkbox"/> QMAX	DWORD	mAS
<input type="checkbox"/> OCVI	int	mA
<input checked="" type="checkbox"/> CycCount	DWORD	Counts

Figure 6-29 Unit setting

- Cycle layer parameter setting: On the left side of the cycle layer parameter setting interface is the cycle layer parameter selection bar, which contains all parameters that can be displayed in the cycle layer header. Users can select the parameters according to their needs.
- On the right side of the cycle layer parameter setting screen, you can set the functions of the cycle layer, including cycle layer statistics mode, ultra-capacitor voltage range, platform voltage, and cycle time display, as shown in Figure 6-30:

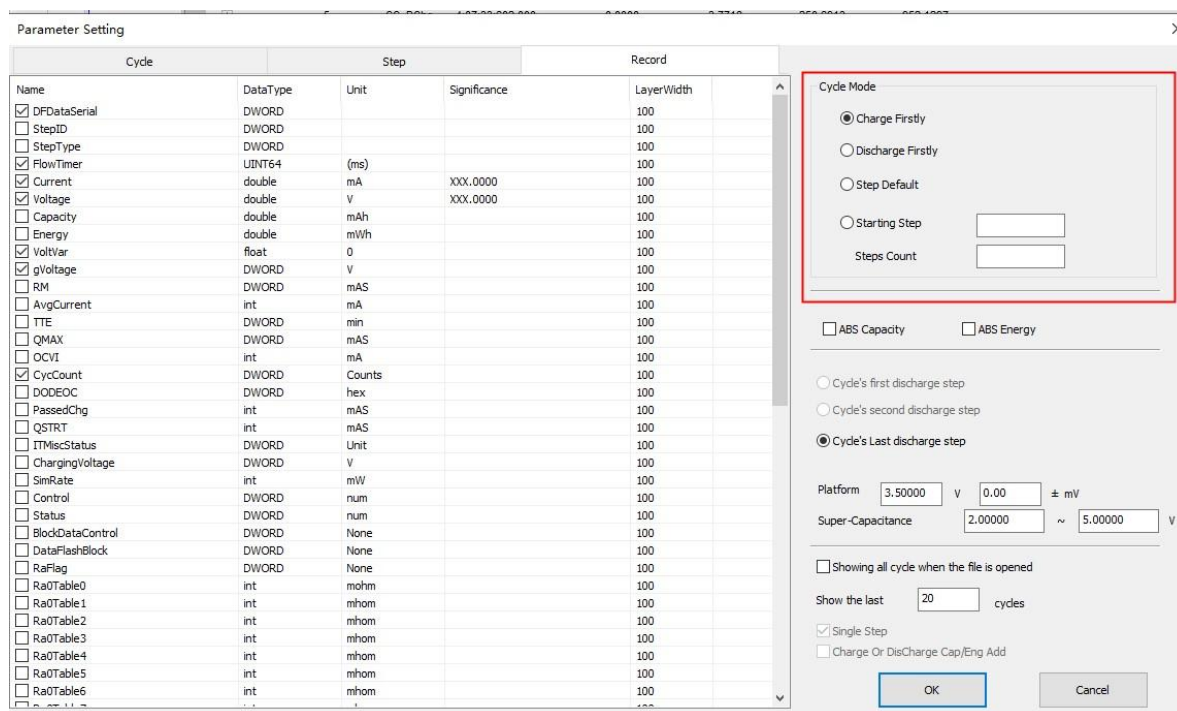


Figure 6-30 Cycle layer parameter setting

Cycle layer statistical method: Including charge first after discharge/discharge first after charge/step default mode/user customized mode, users can test statistical cycle according to personal habits, that is, determine the content structure of each cycle layer.

Voltage plateau: This can be specified by the user and whether to record the voltage platform in specified step within a cycle.

Display of cycle: The user can specify that all loops or the last part of the loop are displayed when the file is opened, and this setting is retained in the system. In the future, open the BTSDA software, the interface will be displayed according to the previous cyclic layer display Settings.

- Step layer: As shown in Figure 6-31, you can set the test data to be displayed on the step layer.
- Record layer: Recording layer Parameter Settings: You can set the test data to be displayed on the recording layer, as shown in Figure 6-32.

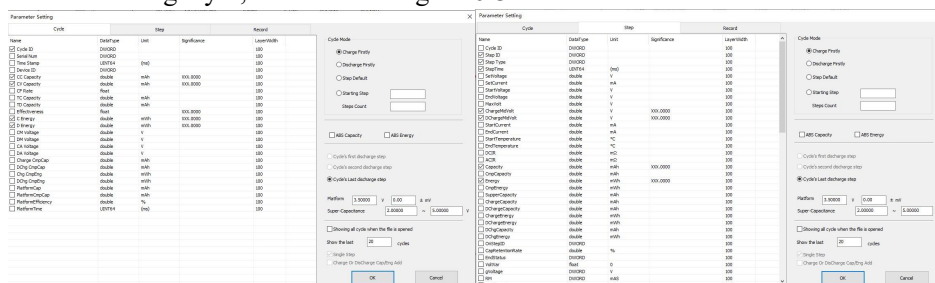


Figure 6-31 Step layer parameter setting

Figure 6-32 Record layer parameter

setting

Channel information: Right-click test data → choose "Channel Information" to view the channel information corresponding to the current test data and the execution process of the step. The system adopted with the **Step editor** software to directly display the channel information, as shown in the following figure: (Figure 6-33)

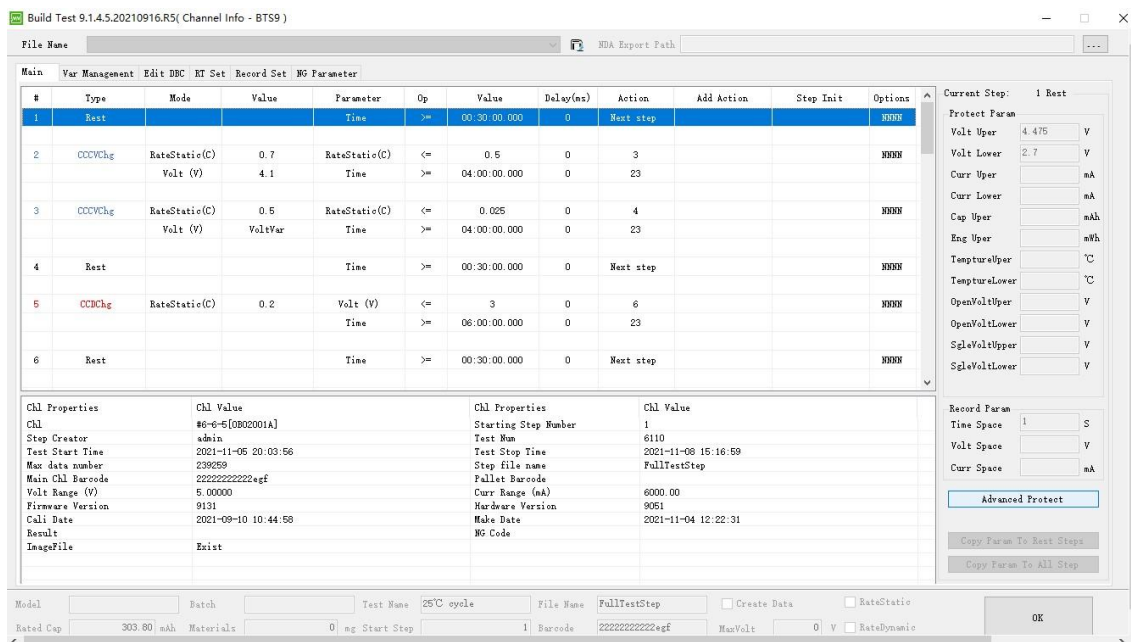


Figure 6-33 Channel information interface

Log: In the data display area, right-click and choose Log to view accidental events and error information during the channel test. You can view different types of logs as required, as shown in the following figure: (Figure 6-34)

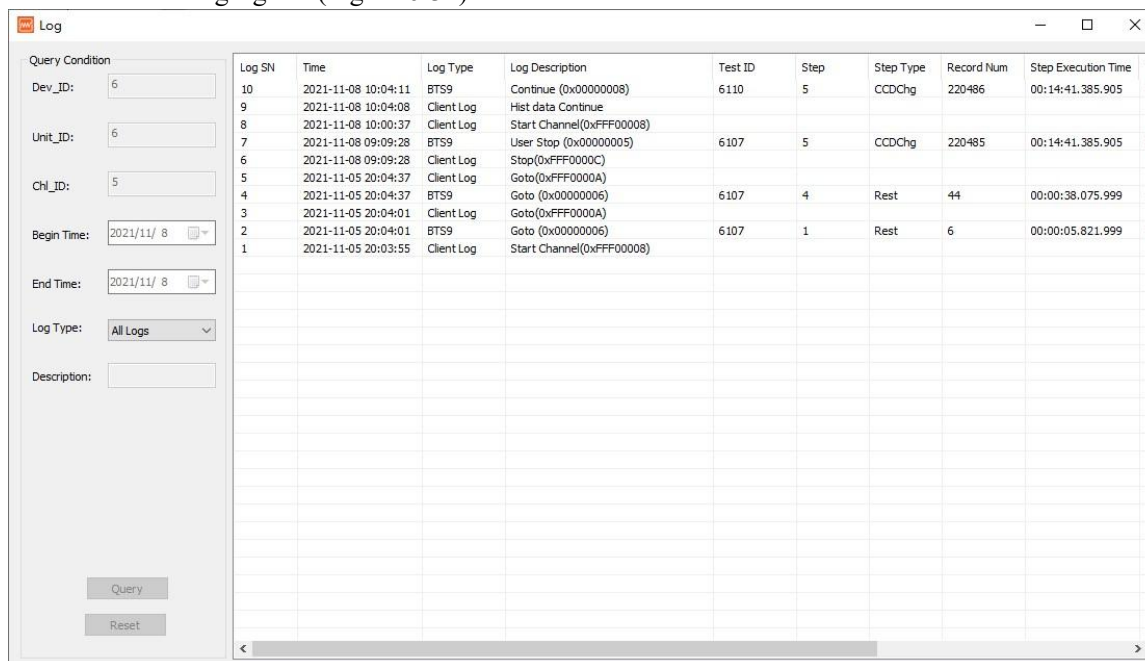
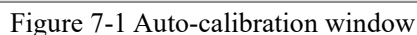


Figure 6-34 View log

Step process: Right-click the data display area and choose **Step Process** from the drop-down list. In the pop-up dialog box, the step information for the current channel is displayed, as shown in Figure 6-35. The information in the figure indicates that the current step is the fourth: CC and CV charge steps.



In the device list, right-click the device number → choose **Calibration** to set the relevant calibration parameters, such as selecting the calibrated device, searching for the calibration tool, and manually adding the multi-meter, as shown in the following figure: (Figure 7-1) The calibration system supports main channel calibration and auxiliary channel calibration. Among them, the auxiliary channel currently only supports Aux5's auxiliary channel, and the method of calibrating the auxiliary channel is the same as that of the main channel. Users can set calibration options, control the calibration process through the interface, and check the calibration results.



Before calibration, select the equipment that needs to be calibrated, calibration tooling, and a multi-meter, and set the parameters.

1. Select Device that Needs to be Calibrate

Use the software searches for a device, the device will be displayed in the device list. You can select the device to be calibrated as required and tick in front of the device.

2. Select Calibrator and Multi-meter

Calibrator: A device that connects a server, a mid-machine, and a multi-meter to calibrate channels. Currently, a maximum of eight channels can be calibrated.

Search device: Click the **Search Dev** button to search for the corresponding multi-meter and calibration equipment, and select the equipment as required. See Figure 7-2.

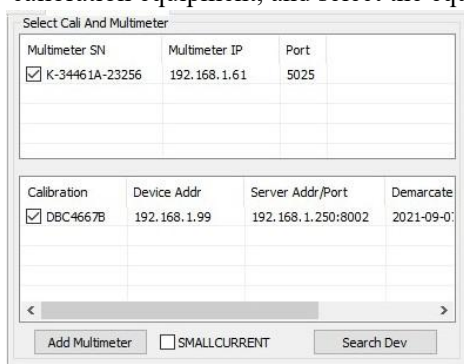


Figure 7-2 Select calibrator and multi-meter

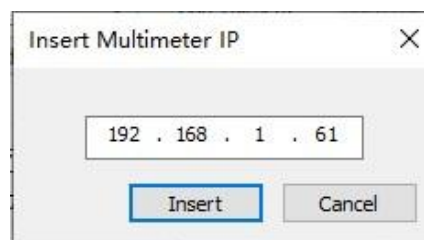


Figure 7-3 Manual insert multi-meter

Manual insert the multi-meter: Click "Add Multi-meter Manually". For example, in the dialog box, enter the IP address of the multi-meter, for example, 192.168.1.102, and click **Insert** as shown in Figure 7-3:

3. Calibrator channels

Channels are divided into left and right sets. Each set comes with 4 channels. You can calibrate 8 channels at the same time, and each channel is calibrated sequentially:

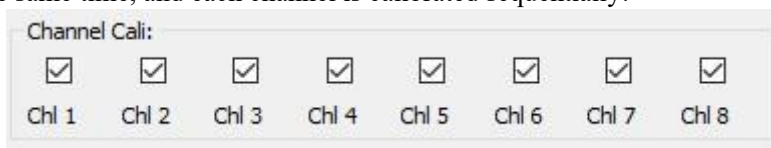


Figure 7-4 Calibrator channels display



Notice: The calibration fixture selected must correspond to the channel in the device list bar one by one.

4. Resistance of the shunt of calibrator

The resistance value is the default value and cannot be modified. If the calibration fails, the administrator can modify the calibration. When you select the calibration tool, the modification permission is enabled, as shown in Figure 7-5.

Calibration separator: In order to ensure the correct result of automatic calibration and the accuracy can reach the expected goal, the shunt of the automatic calibration tool should be calibrated regularly before using it.

① Users can prepare an additional calibrated multi-meter, with the red and black multi-meter pen connected current cathode and anode.

② The on-board channel of the calibration fixture is used to execute CC, and the multi-meter paired with the calibration fixture is used to measure the voltage at both ends of the shunt.

③ From the measured current value and voltage to calculate the actual resistance value.

5. Temperature and humidity

You can set the temperature and humidity based on actual conditions, as shown in Figure 7-6:

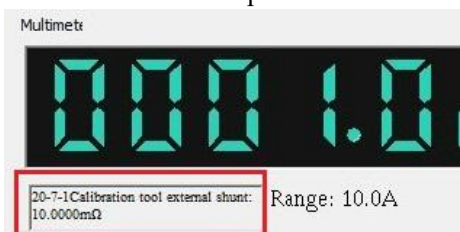


Figure 7-5 Shunt value display

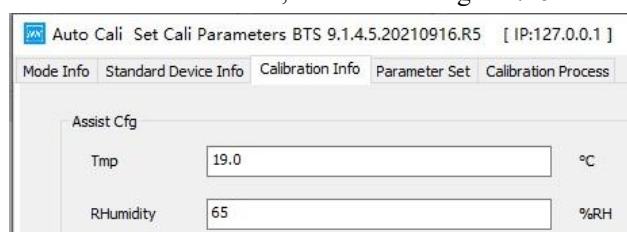


Figure 7-6 Temperature and humidity

Calibration Mode

Users can select the corresponding calibration mode and current/voltage calibration section number as required.

1. Calibration mode:

Calibration, Accuracy test, Cali and accuracy, accuracy cali and accuracy again, as figure below: (Figure 7-7)

Figure 7-7 Calibration mode and segments

Calibration: After the user selects the channel to be calibrated and sets the calibration parameters, each calibration point is automatically sampled and calculated, and the calculated KB value is written to the lower-machine. During calibration, only the selected channel will be calibrated.

Accuracy test: After the user sets the channel to be calibrated and the parameters, each calibration point of each channel is automatically sampled and calculated, and the control precision or measurement precision is comparing with the required precision to determine whether the channel meets the accuracy requirements. During calibration, only high-precision test of channels is operating.

Calibration first, then test accuracy: After the user selects the channel and sets the parameters, the system will start the calibration automatically. After the calibration is completed, the automatic accuracy test will continue.

Test accuracy first, then calibration: After the user sets the channel to be operated and also the parameters, the system will automatically starts to test the accuracy of all channels, then calibrates and rechecks each channels.

2. Segments of calibration

Calibration point: Calibrate the equipment in segments according to the range percentage, and each upper and lower range percentage in each section is a calibration point.

Segments: The equipment range is segmented by percentage, and there is a segment between each adjacent calibration point. If the number of calibration points is N and the number of calibration segments is M, then $M = n - 1$. The details are described below:

- ① In "calibration" mode, the current calibration points and voltage calibration points are "3-stage calibration" and cannot be modified.
- ② In the "Precision test" calibration mode, the current calibration points and voltage calibration points are both set to "3-section calibration" by default, and the calibration points can also be modified to "9-section calibration" at most.
- ③ "In the calibration mode of "Calibrate first and then test accuracy", the current calibration points and voltage calibration points are "4-section calibration" by default, and the calibration points can also be modified to "9-section calibration" at most.
- ④ The lowest value is 10%, and the highest value is 95% (the highest value of the three-section calibration is 90%), and the high value of each section must be greater than the low value. Starting from the second row, the low value of each row is equal to the high value of the previous row. Users can set the low value and high value as required.
- ⑤ The default precision is 1‰ and changeable. The smaller the accuracy, the more accurate the calibration or test.

3. Start calibration

Click **Start calibration**. The software starts to calibrating. The "Precision Test" mode displays as "Start test," while the "Calibrate before Precision Test" mode displays "Start calibration and test."

7.2. Check Real-time Data

Click the "View real-time data" button, and the real-time data display interface pops up, as shown below:

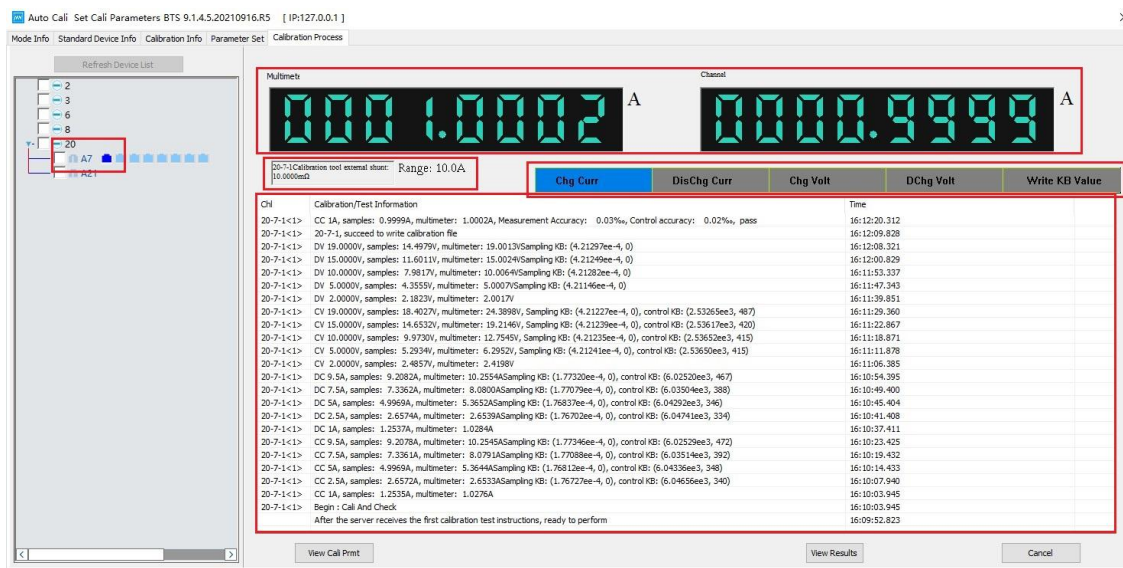


Figure 7-8 Real-time data display

The data display interface is mainly divided into the following areas: equipment list area, multi-meter and channel value display area, range display area, progress display area, and calibration/test status information display area.

1. Equipment list area

Display equipment status during calibration. If the calibration passes, mark "√". If the calibration does not pass, hit "×". The calibration criteria are a "green triangle," as shown in the figure above. (Figure 7-8)

2. Multi-meter and channel value display area

The current and voltage values collected by the multi-meter and channel are displayed in A/V, as shown in Figure 7-9:

3. Range display area

The range display area displays the total range of voltage and current, calibration status, and the percentage of calibration range end value, as shown in Figure 7-10:

Range: When calibrating or testing the current of the equipment, display the total current range, in unit A. When calibrating or testing the voltage of the equipment, the total voltage range is displayed in V.



Figure 7-9 Multi-meter and channel values display

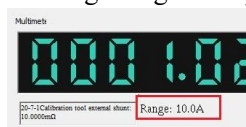


Figure 7-10 Range display area

4. Process display area

As shown in Figure 7-11, the calibration and testing progress of the channel is displayed, and the current step will be highlighted.



Figure 7-11 Step process display area

5. Calibration/test status and information display area

Display channel calibration status and calibration/test information. As shown in Figure 7-12.

ChI	Calibration/Test Information	Time
20-7-1<1>	CC 1A, samples: 0.9999A, multimeter: 1.0002A, Measurement Accuracy: 0.03%, Control accuracy: 0.02%, pass	16:12:20.312
20-7-1<1>	20-7-1, succeed to write calibration file	16:12:09.828
20-7-1<1>	DV 19.0000V, samples: 14.4979V, multimeter: 19.0013V Sampling KB: (4.21297ee-4, 0)	16:12:08.321
20-7-1<1>	DV 15.0000V, samples: 11.6011V, multimeter: 15.0024V Sampling KB: (4.21249ee-4, 0)	16:12:00.829
20-7-1<1>	DV 10.0000V, samples: 7.9817V, multimeter: 10.0064V Sampling KB: (4.21282ee-4, 0)	16:11:53.337
20-7-1<1>	DV 5.0000V, samples: 4.3555V, multimeter: 5.0007V Sampling KB: (4.21146ee-4, 0)	16:11:47.343
20-7-1<1>	DV 2.0000V, samples: 2.1823V, multimeter: 2.0017V	16:11:39.851
20-7-1<1>	CV 19.0000V, samples: 18.4027V, multimeter: 24.3898V, Sampling KB: (4.21227ee-4, 0), control KB: (2.53265ee3, 487)	16:11:29.360
20-7-1<1>	CV 15.0000V, samples: 14.6532V, multimeter: 19.2146V, Sampling KB: (4.21239ee-4, 0), control KB: (2.53617ee3, 420)	16:11:22.867
20-7-1<1>	CV 10.0000V, samples: 9.9730V, multimeter: 12.7545V, Sampling KB: (4.21235ee-4, 0), control KB: (2.53652ee3, 415)	16:11:18.871
20-7-1<1>	CV 5.0000V, samples: 5.2934V, multimeter: 6.2952V, Sampling KB: (4.21241ee-4, 0), control KB: (2.53650ee3, 415)	16:11:11.878
20-7-1<1>	CV 2.0000V, samples: 2.4857V, multimeter: 2.4198V	16:11:06.385
20-7-1<1>	DC 9.5A, samples: 9.2082A, multimeter: 10.2554ASampling KB: (1.77320ee-4, 0), control KB: (6.02520ee3, 467)	16:10:54.395
20-7-1<1>	DC 7.5A, samples: 7.3362A, multimeter: 8.0800ASampling KB: (1.77079ee-4, 0), control KB: (6.03504ee3, 388)	16:10:49.400
20-7-1<1>	DC 5A, samples: 4.9969A, multimeter: 5.3652ASampling KB: (1.76837ee-4, 0), control KB: (6.04292ee3, 346)	16:10:45.404
20-7-1<1>	DC 2.5A, samples: 2.6574A, multimeter: 2.6539ASampling KB: (1.76702ee-4, 0), control KB: (6.04741ee3, 334)	16:10:41.408
20-7-1<1>	DC 1A, samples: 1.2537A, multimeter: 1.0284A	16:10:37.411
20-7-1<1>	CC 9.5A, samples: 9.2078A, multimeter: 10.2545ASampling KB: (1.77346ee-4, 0), control KB: (6.02529ee3, 472)	16:10:23.425
20-7-1<1>	CC 7.5A, samples: 7.3361A, multimeter: 8.0791ASampling KB: (1.77088ee-4, 0), control KB: (6.03514ee3, 392)	16:10:19.432
20-7-1<1>	CC 5A, samples: 4.9969A, multimeter: 5.3644ASampling KB: (1.76812ee-4, 0), control KB: (6.04336ee3, 348)	16:10:14.433
20-7-1<1>	CC 2.5A, samples: 2.6572A, multimeter: 2.6533ASampling KB: (1.76727ee-4, 0), control KB: (6.04656ee3, 340)	16:10:07.940
20-7-1<1>	CC 1A, samples: 1.2535A, multimeter: 1.0276A	16:10:03.945
20-7-1<1>	Begin : Cali And Check	16:10:03.945
	After the server receives the first calibration test instructions, ready to perform	16:09:52.823

Figure 7-12 Calibration/Test status information

Status: It is divided into charging current, discharging current, charging voltage, discharging voltage and write KB value. When status is detected by calibration/test, the status is displayed in blue color. As shown in figure, it indicates that the current is the discharge current of calibration/test.

Information zone: Charging current corresponding to the calibration test information symbol is displayed as CC.

The calibration test information symbol of discharge current is displayed as DC.

Charging voltage corresponding calibration test information symbol is displayed as CV.

The calibration test information symbol of discharge voltage is displayed as DV.

Calibration/Test: Approved, then automatically start the next step. If not, you can re-collect data for a maximum of two times. The result is based on the last sampling value.

7.3. View Result

After the channel calibration and test is complete, click **View Result**. On the displayed page, you can view the time, calibration channel number, calibration result, and description, as shown in Figure 7-13.

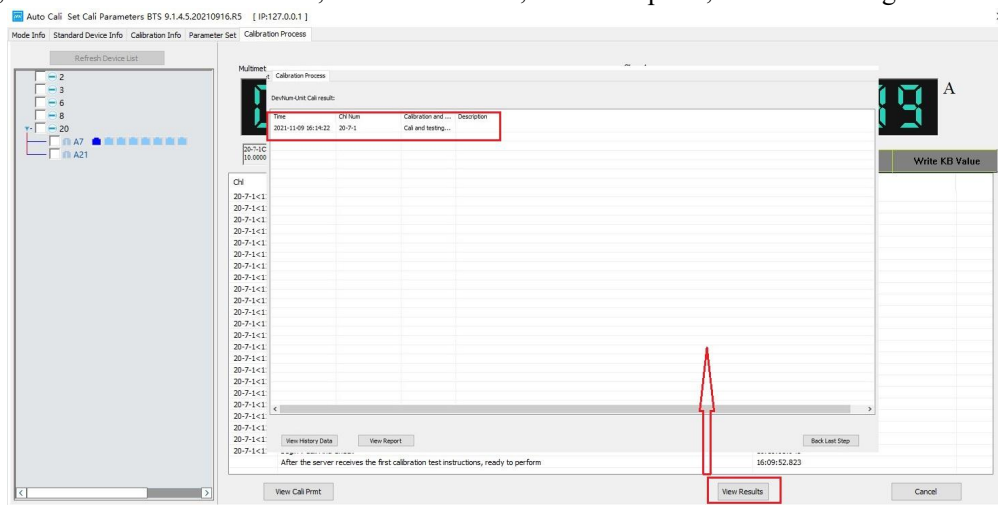


Figure 7-13 Calibration result

1. Check historical data

You can click **View Historical Data** to view the historical calibration of the device based on the device ID, unit ID, or channel ID, as shown in Figure 7-14:

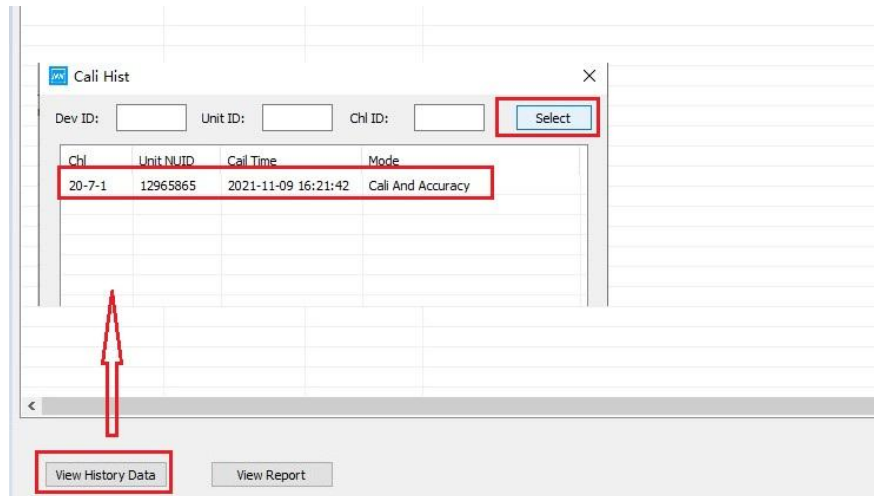


Figure 7-14 Calibration history

2. Viewing reports

Click the **View Report** button to automatically jump to the CaliReport folder under the installation directory, as shown in Figure 7-15:

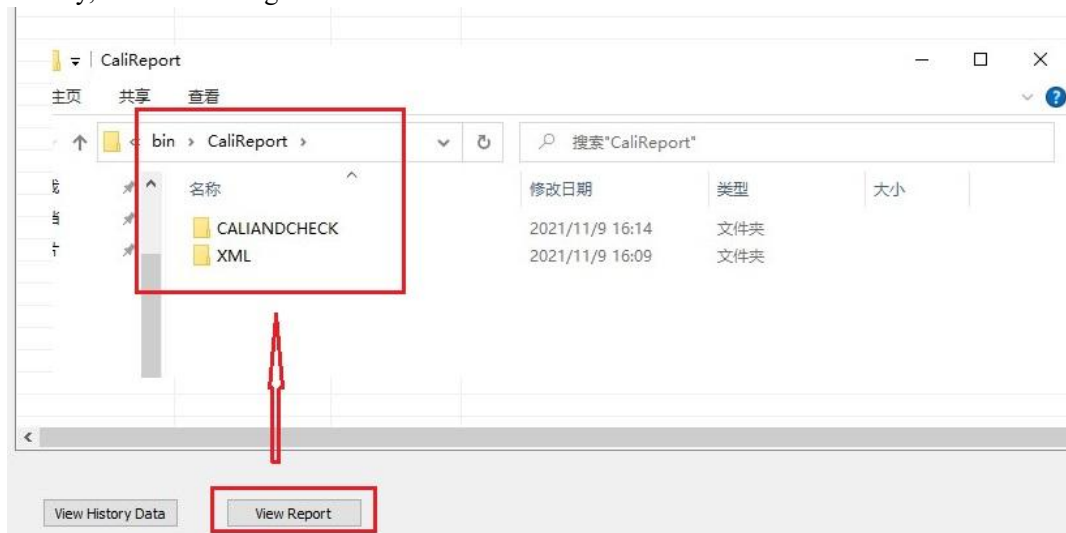


Figure 7-15 View report

CALI file: To store calibration report data. Double-click the calibration report to view the corresponding calibration data: Channel number, calibration item, range percentage, control value, sampling value, true value, control KB, sampling KB, as shown in the figure below: (Figure 7-16)



Calibration And Accuracy Report

1-2-1[12345678] Channel Calibration Report

Channel Number:	1-2-1[12345678]	Calibration Result:	Pass
Calibration Name:	CAL15[BC522216]	Serial Number:	
Calibration Time:	2021-09-07 15:12	Multimeter:	HP3458A

Calibration Data(Current Unit: A, Voltage Unit: V)

Calibration Item	Range	Range Percentage	Control Value	Sampling Value	True Value	Control Kb	Measure Kb
CC	1.00000	10.00	0.100000	0.125490	0.0986362		
	1.00000	25.00	0.250000	0.266025	0.254050	k=6.325032e+04 b=314	k=1.687451e-05 b=0
	1.00000	50.00	0.500000	0.500373	0.513076	k=6.325241e+04 b=314	k=1.686585e-05 b=0
	1.00000	75.00	0.750000	0.734706	0.772156	k=6.323914e+04 b=323	k=1.687049e-05 b=0
	1.00000	95.00	0.950000	0.922133	0.979409	k=6.324150e+04 b=319	k=1.687317e-05 b=0
	4.00000	10.00	0.400000	0.501960	0.391093		
	4.00000	25.00	1.00000	1.06434	1.00725	k=1.595373e+04 b=314	k=6.687182e-05 b=0
	4.00000	50.00	2.00000	2.00149	2.03442	k=1.595051e+04 b=317	k=6.689905e-05 b=0
	4.00000	75.00	3.00000	2.93876	3.06196	k=1.594499e+04 b=328	k=6.691409e-05 b=0
	4.00000	95.00	3.80000	3.68853	3.88426	k=1.593943e+04 b=345	k=6.694075e-05 b=0
	12.0000	10.00	1.20000	1.50606	1.18042		
	12.0000	25.00	3.00000	3.19249	3.03979	k=5.286736e+03 b=312	k=2.018602e-04 b=0
	12.0000	50.00	6.00000	6.00521	6.13765	k=5.288804e+03 b=306	k=2.016708e-04 b=0
	12.0000	75.00	9.00000	8.81666	9.23398	k=5.291430e+03 b=290	k=2.016625e-04 b=0
	12.0000	95.00	11.4000	11.0663	11.7093	k=5.294947e+03 b=258	k=2.014796e-04 b=0
DC	1.00000	10.00	0.100000	0.125474	0.0986351		
	1.00000	25.00	0.250000	0.266056	0.254047	k=6.325102e+04 b=314	k=1.686883e-05 b=0
	1.00000	50.00	0.500000	0.500358	0.513094	k=6.324733e+04 b=315	k=1.687050e-05 b=0
	1.00000	75.00	0.750000	0.734676	0.772160	k=6.323725e+04 b=315	k=1.687101e-05 b=0
	1.00000	95.00	0.950000	0.922148	0.979421	k=6.324052e+04 b=319	k=1.686931e-05 b=0



Supervisor:

Time: 2021-10-26 16:29

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2

Version: 9.1.4.5.20210916.R5

Figure 7-16 Data from the calibration report

CHECK profile: It mainly stores equipment-precision testing data. Double-click the accuracy detection report to view the corresponding calibration data: channel number, calibration item, range, range percentage, control value, sampling value, true value, control deviation, measurement deviation, required precision, control precision, measurement precision, as shown below: (Figure 7-17)

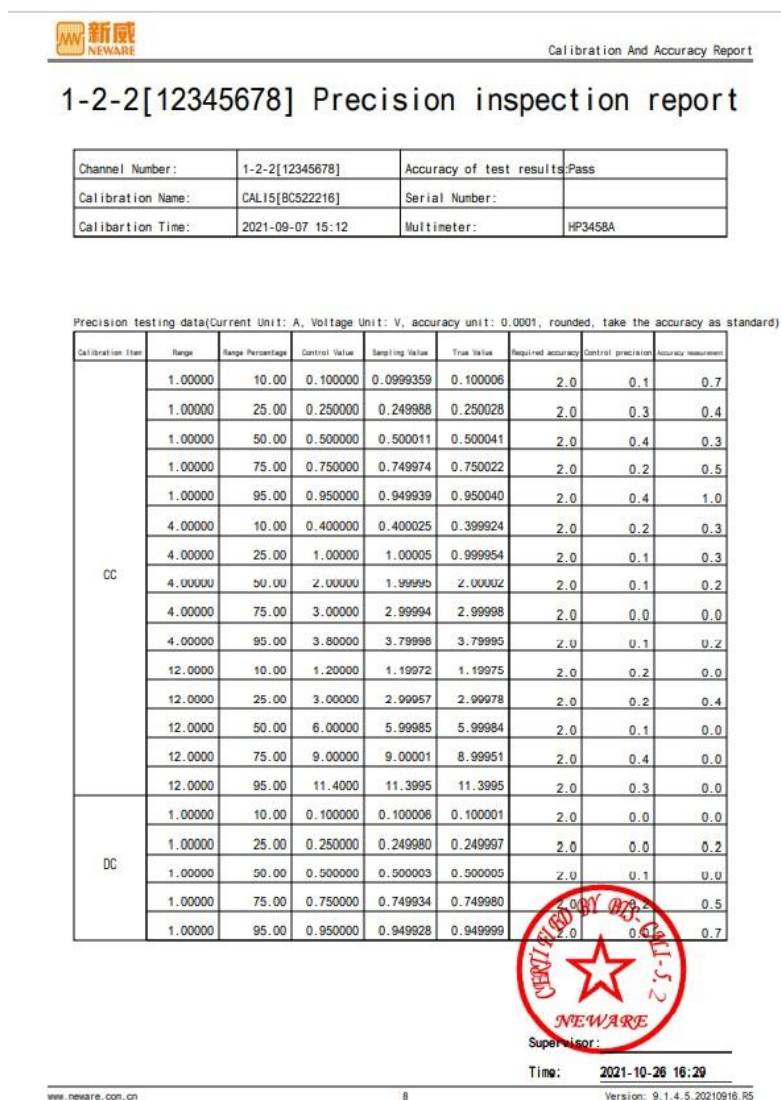


Figure 7-17 Accuracy test data



Notice: You can set server channel calibration parameters in client configuration. For example, set the maximum and minimum values (ranging from 5~95) of the calibration point percentage, set the file format (PDF/EXCEL/TXT/ATL) of the calibration report, and set the validity days of the calibration/detection report. See server channel calibration.

Chapter 8 Build Test Tutorial

Introduction of step editor interface

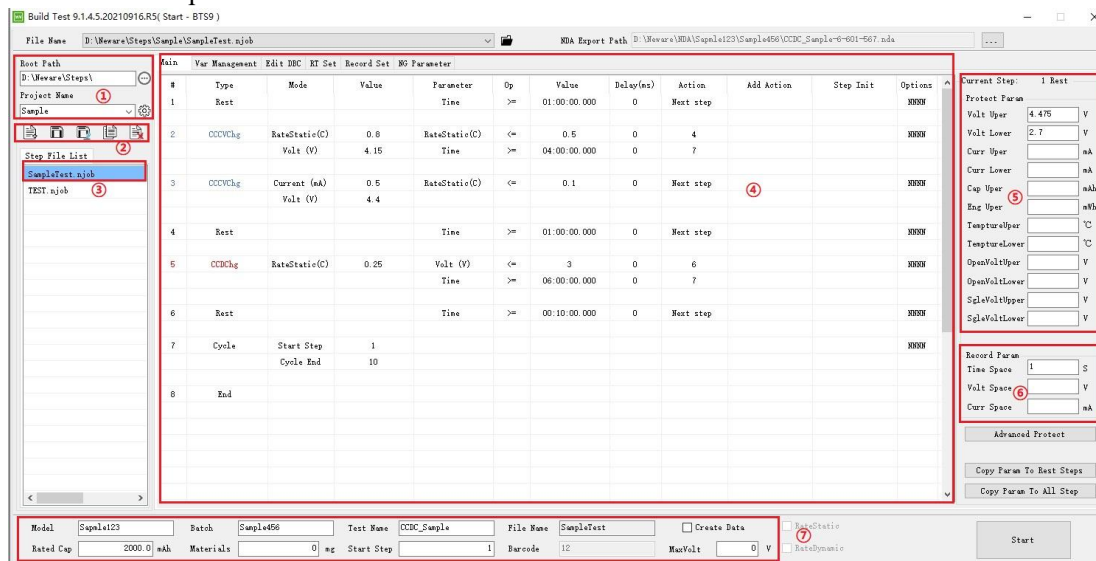


Figure 8-1 Step file storage path

- ① Test file storage (set the root directory and the project folder)
- ② File operation (Add, save, save as, delete)
- ③ List of step files under the current project (selected as currently displayed step files)
- ④ Main step zone (This includes test flow, variable management, editing DBC, display settings, record settings, and NG Settings)
- ⑤ Protection condition (each step is a separate protection parameter)
- ⑥ Record condition (each step is a separate recording parameter)
- ⑦ Test information (relevant description of the tests)

The following describes the saving path of step files and the relationship between function interfaces and step files.

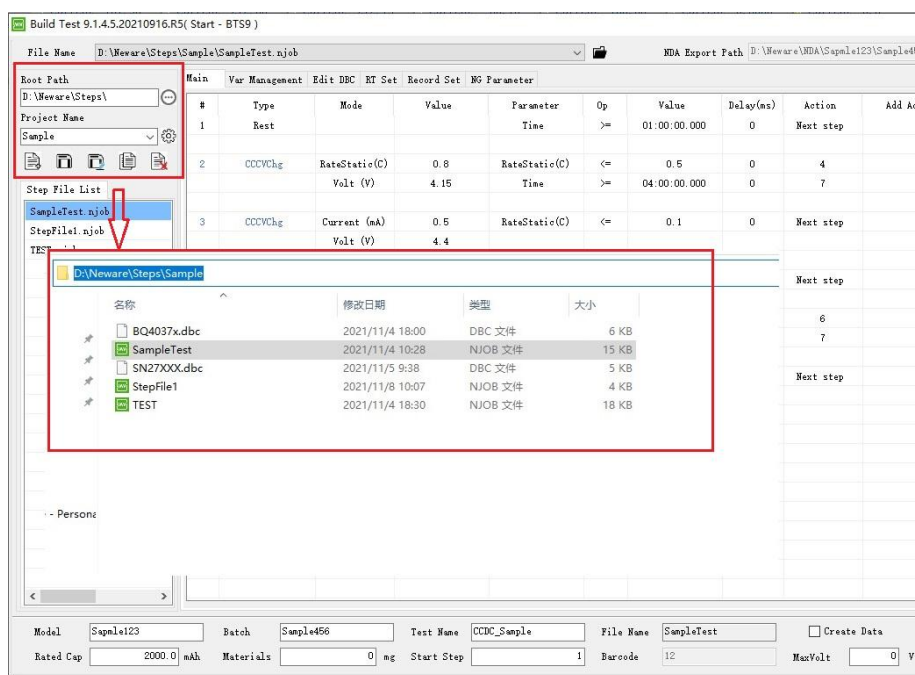


Figure 8-2 Step File storage path

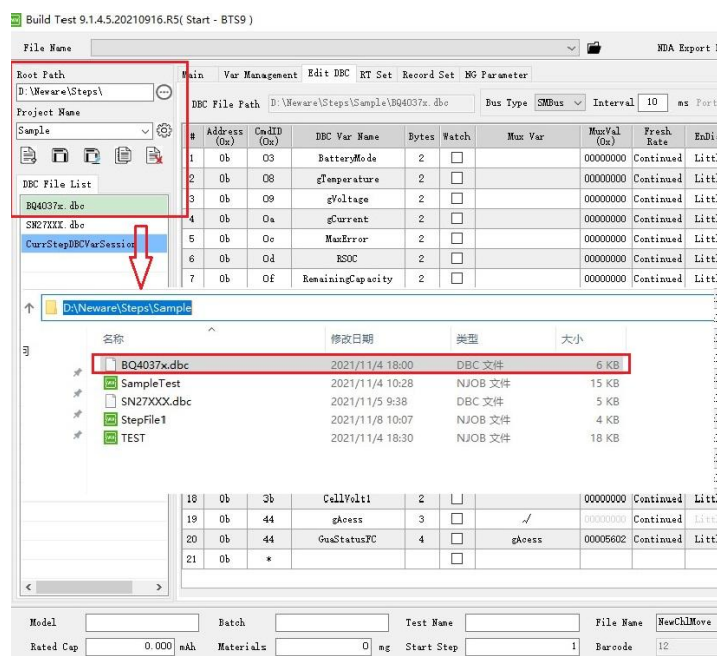


Figure8-3 DBC file storage path

The step editor can create two types of files: Figure 8-2, ending with an .njob file, and Figure 8-3, ending with a DBC communication (coulometer) configuration file. These two types of files are stored in the root directory and the storage path, which consists of the project name. The .njob file is generated on the main step interface, and the DBC file is generated on the Edit DBC interface.

The step file can contain communication or not with a communication test. The step file without communication can be started or stored after the master finishes editing the process on foot. The step file with communication will be these 2 following ways:

- If an existing .dbc file is adapted, load the existing .dbc file on the Edit DBC page and edit the main step to test or save the njob step file.
- If no adapted .dbc file, then edit .dbc file in DBC interface, after complete the editing of DBC, you can save it as .dbc file (follow-up testing can be directly imported) or don't save it. DBC step template editing, held directly at start or storage (in this way, the follow-up tests still need to edit the DBC. we recommend to storage template after editing).

8.1. Main Step Row

The main step row is an interface used to describe the testing process, which is mainly composed of step type, step parameter, cut-off condition expression, additional action, initial action, etc.

#	Type	Mode	Value	Parameter	Op	Value	Delay(ms)	Action	Add Action	Step Init	Options
1	Rest			Time	>=	00:00:10.000	0	Next step		CycleNo = CycleNo+1	RRRR
2	CCCVChg	Current (mA)	100	Current (mA)	<=	30	0	Next step			RRRR
	CCCVChg	Volt (V)	3.988	Volt (V)	>=	01:00:00.000	0	Next step			
	CCCVChg	RateStatic(C)		RateStatic(C)	>=	00:07:30.000	0	Next step			RRRR
	CCCVChg	RateDynamic(C)		RateDynamic(C)	>=	00:07:30.000	0	Next step			RRRR
3	CPCVChg	Current (mA)	120	Current (mA)	<=	3	0	Next step			RRRR
	CPCVChg	Eng (mA)		Eng (mA)	>=	01:00:00.000	0	Next step			RRRR
	CPCVChg	CellVolt(V)		CellVolt(V)	>=	01:00:00.000	0	Next step			RRRR
	CPCVChg	RSOC(W)		RSOC(W)	>=	00:10:00.000	0	Next step			RRRR
4	Pulse Step	Cap (mAh)		Cap (mAh)	>=	00:10:00.000	0	Next step			RRRR
	Pulse Step	ASOC(W)		ASOC(W)	>=	00:10:00.000	0	Next step			RRRR
5	Measuring resist	Temp (C)		Temp (C)	>=	00:10:00.000	0	Next step			RRRR
	Measuring resist	Power (mW)		Power (mW)	>=	00:10:00.000	0	Next step			RRRR
6	Constan	VoltC(V)		VoltC(V)	>=	00:10:00.000	0	Next step			RRRR
	Constan	Cap decay (W)		Cap decay (W)	>=	00:10:00.000	0	Next step			RRRR
7	Pause	IR (aA)		IR (aA)	>=	00:10:00.000	0	Next step			RRRR
	Cycle	Other Var		Other Var	>=	00:10:00.000	0	Next step			RRRR

Figure 8-4 Main Step row

① Step name: The type of step in the drop-down box includes CCCV, CPCV, self-defined volunteer step by 2 step parameters, and others are all 1 step parameter.

②Parameter: If the cut-off condition expression (parameter, operator, value) = 1 is true, it will perform actions and additional actions, each cut-off condition is an or-relationship.

Specific constant values, variables in variable management or values read in the coulometer can be used to realize advanced steps such as intelligent charging and discharging or changing current and voltage, as shown in Figure 8-5 below.

Charge voltage is variable at different cycle intervals. Figure 8-6: CC charging parameters are DBC variables (read from the coulometer) that is, the charging current is updated in real time according to the data in the coulometer. Figure 8-7: Cut-off conditions are DBC variables, that is, the voltage of the coulometer (gVoltage) > the set charging voltage (ChgVolt). Go to the next step.

Special instructions for RateStatic and RateDynamic:

The RateStatic is based on the nominal capacity set at startup; The RateDynamic is the capacity obtained based on the action of "Get Cap" at the end of the discharge step;

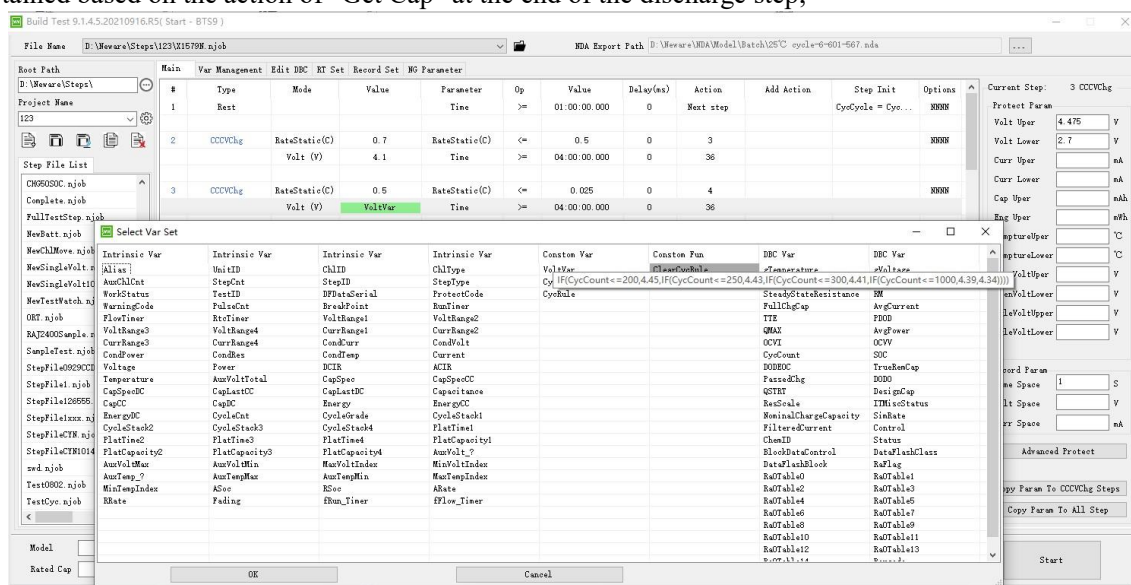


Figure 8-5 Custom variable parameters

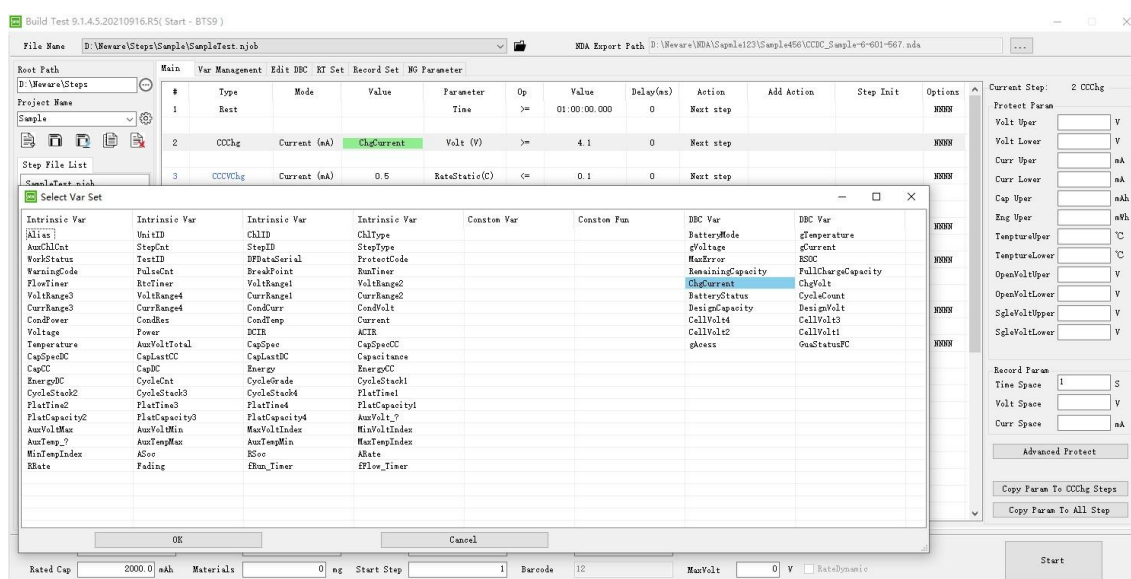


Figure 8-6 DBC variable parameter

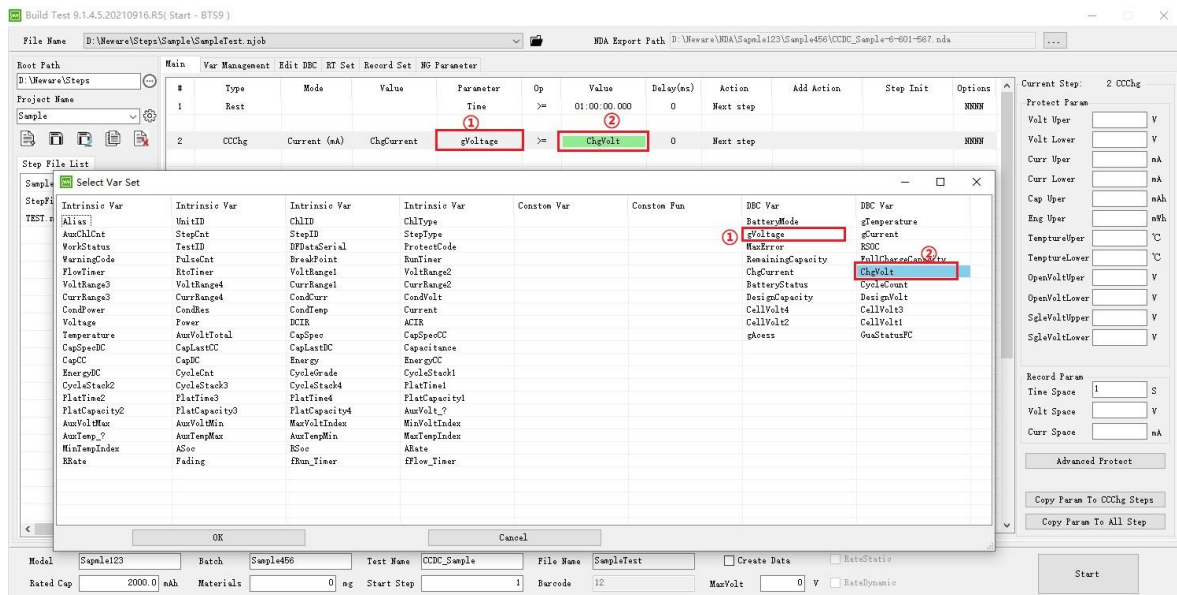


Figure 8-7 DBC variable stop parameter

8.2. Tag Management

The variable management interface is mainly used to edit custom expressions or custom functions.

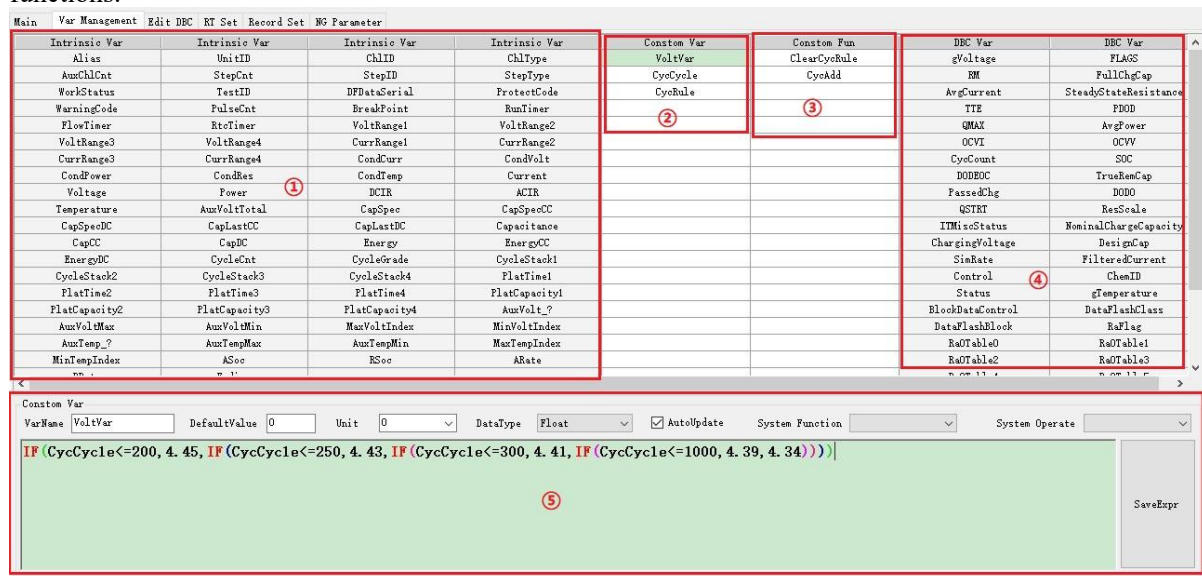


Figure 8-8 The Variable Management

- ① The built-in variable area is the system's default setting and cannot be modified.
- ② Self-defining variable area, self-defining variables, independent storage space, and it can be modified.
- ③ Self-defining function area, self-defining function, no storage space, can be called to execute the corresponding function body.
- ④ DBC variable area, user-loaded DBC variables.
- ⑤ In the variable editing area, Figure 8-8 is the expression of self-defining variable VoltVar. Check automatic solution (active real-time update calculation), if not check, it will calculate by passive invocation. Figure 8-9 is a self-defining function, whose function body is an assignment expression.

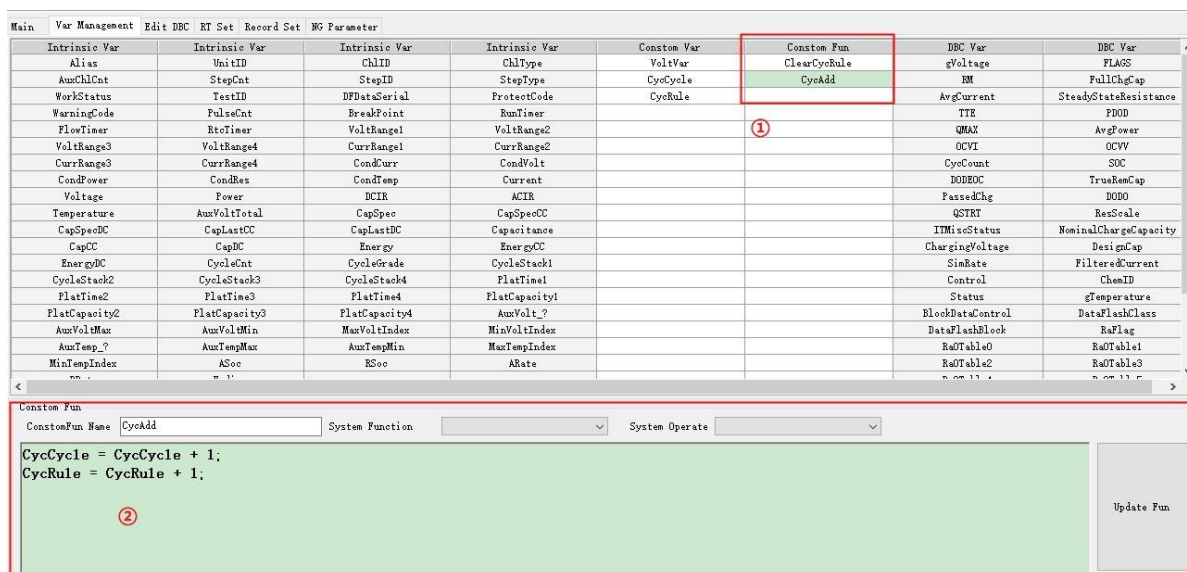


Figure 8-9 Self-defining function

8.3. Edit DBC

Edit DBC interface is used to edit DBC variables, storage, loading, and other related operations. If the battery does not have the communication function, you do not need to edit this interface and set the communication mode to null. Otherwise, a communication error will be reported. As Figure 8-10, loading the .dbc template and storing it as a .dbc template or loading it into a step file to start the test.

- ① .dbc file name, you can click to load it.
- ② Communication mode, delay, etc.
- ③ The port voltage and pull-up resistance must be configured based on the chip.
- ④ Click here to add DBC variables.
- ⑤ Refer to the chip manual, DBC variable are customizable and easy to recognize, and not able to have the same names as a built-in or custom variable.
- ⑥ Attention area: For adding the required attention into communication queue, after the editing is complete.
- ⑦ DBC cache loading: Loading the DBC variable into step file, including the information of voltameter.
- ⑧ Storage the .dbc file template, stored as a template to facilitate future usage. No need to edit again.

The size, type, start bit, effective bit, and unit are all defined in the chip manual and can be filled in.

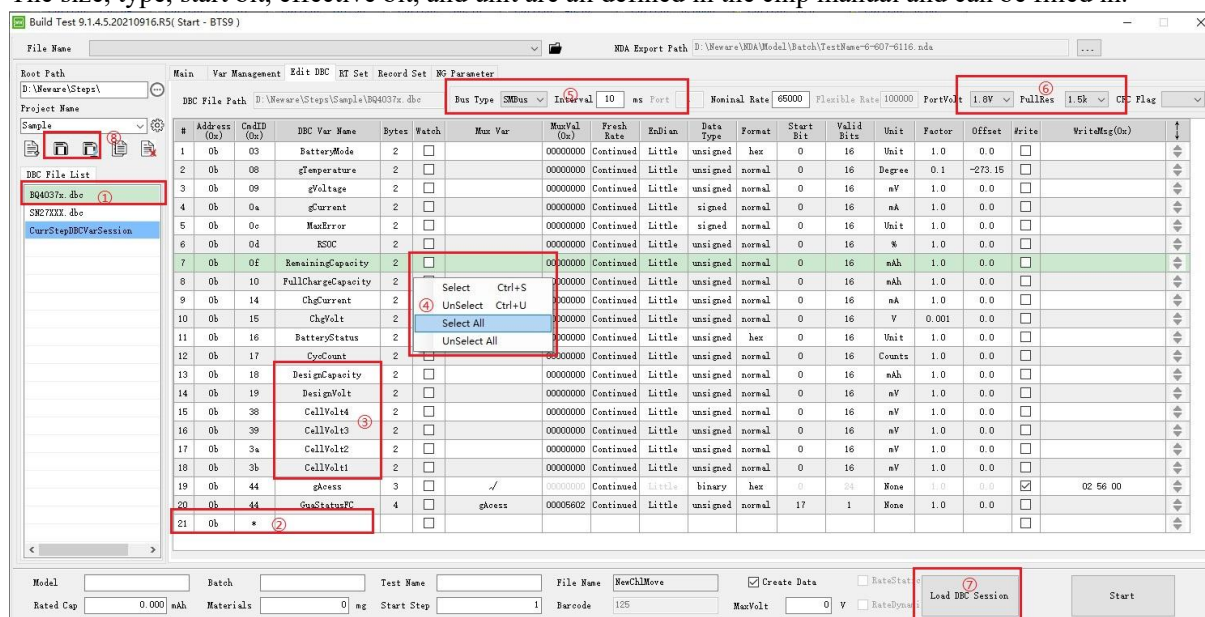


Figure 8-10 editing DBC

Notes on gain and bias:

Original value(value read from coulometer) * gain + bias value = terminal value

In Figure 8-11, the specified temperature unit of the coulometer is 0.1K Kelvin, but in reality situation, the coulometer requires a gain value of 0.1 and a bias value of -273.15.

12.1.4 0x06/07 Temperature()

This read-word function returns the temperature in units 0.1°K.

SBS Cmd	Name	Access			Protocol	Type	Min	Max	Unit
		SE	US	FA					
0x06/07	Temperature()		R		Word	U2	0	65535	0.1°K

#	Address (0x)	CmID (0x)	DBC Var Name	Bytes	Watch	Mux Var	MuxVal (0x)	Fresh Rate	Endian	Data Type	Format	Start Bit	Valid Bits	Unit	Factor	Offset	Write
1	0b	08	gTemperature	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	Degree	0.1	-273.15	<input type="checkbox"/>
2	0b	09	gVoltage	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	V	0.001	0.0	<input type="checkbox"/>

Figure 8-11 Gain and bias

8.4. Display Settings

Display Settings is for setting the content to be displayed on the software interface

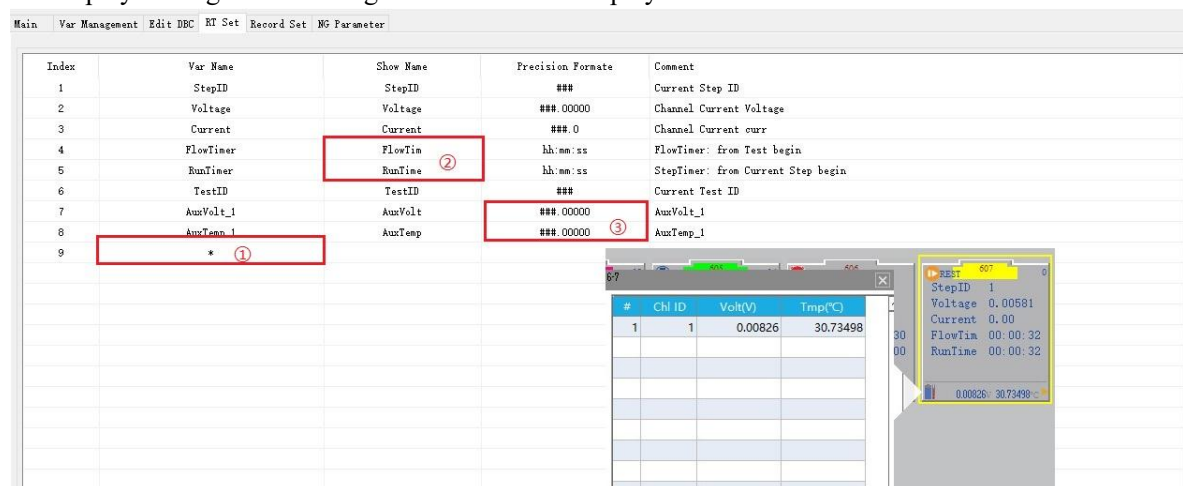


Figure 8-12 Display Setting

- ① Double-click to add display variables, double-click or select in the Select variables interface and confirm.
- ② The name displayed on the software channel icon
- ③ The precision format is the data format to be displayed on the client interface. That is, the number of decimal points.

The Aux data must be bound to the Aux machine first, meanwhile, the Aux data must be added to the display setting page. The Aux data can be seen above the channel. If multiple Aux machines are bound, the Aux data can be displayed, as shown in Figure 8-12.

8.5. Record Setting

Record Settings are the **Log** data which is required in test-flow, including built-in variables, customize variables, DBC variables (mandatory included all loaded DBC variables).

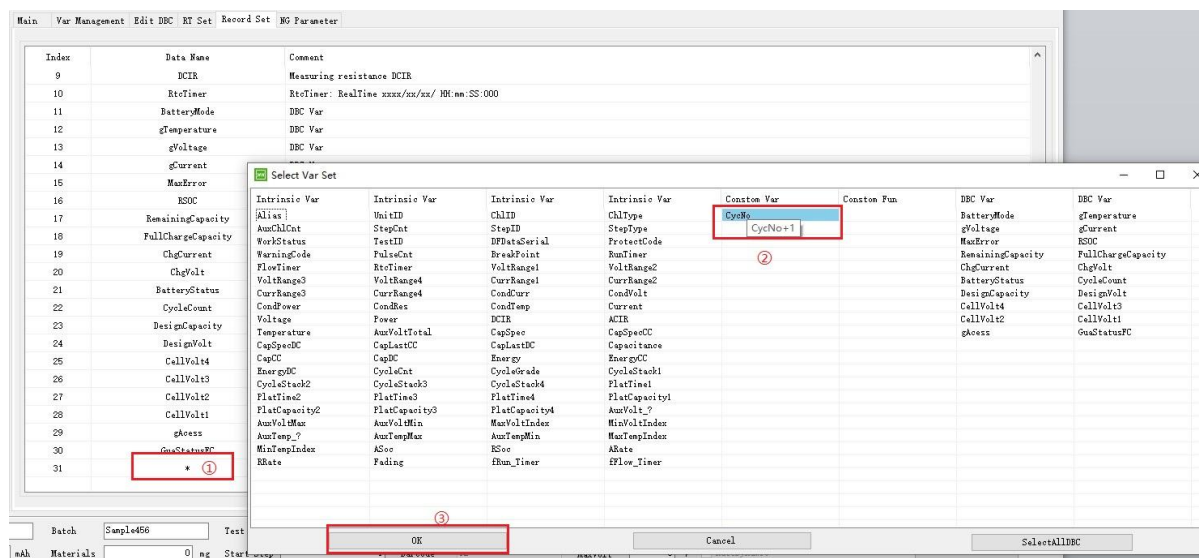


Figure 8-13 Record setting

Figure 8-13 displayed:

- ① Double click, add the variable that needs to be record.
- ② The Select Variables interface will lists all variables that can be selected.
- ③ Double click or click OK.

As shown in Figure 8-14, self-defining functions have no storage space and cannot be Log. Therefore, it will displayed the gray color.

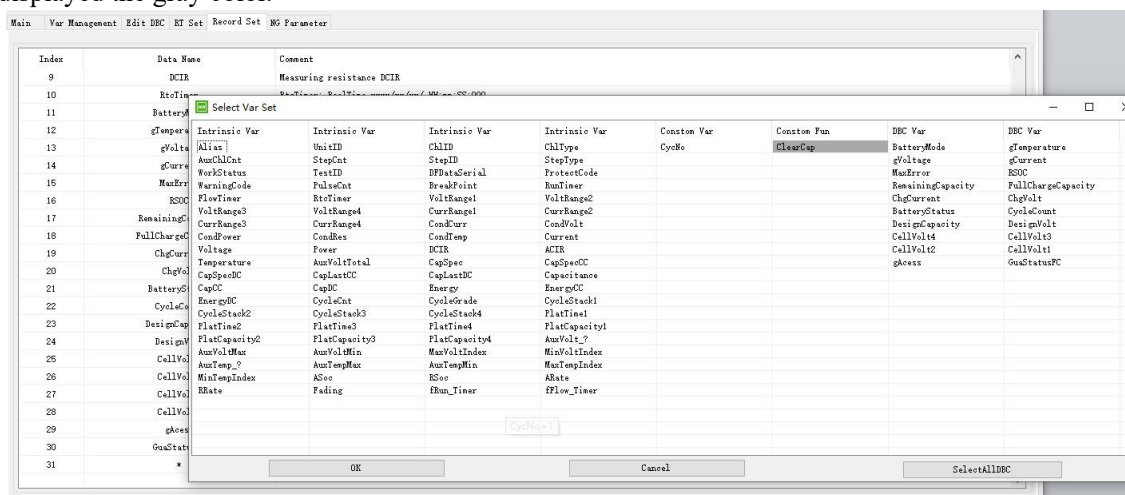


Figure 8-14 Selection of Record Setting

8.6. Detailed Description of Edit DBC(Voltameter infomation)

Introduction of how to use the step editor to setting DBC(coulometer) information.

1. DBC editing interface and parameters.

Main Var Management Edit DBC RT Set Record Set NG Parameter																			
DBC File Path: D:\Neware\Steps\Sample\BQ4037x.dbc				Bus Type: SMBus		Interval: 10		ms		Port: 1	Nominal Rate: 65000		Flexible Rate: 100000		Port Volt: 1.8V		Pull Res: 1.5k		CRC Flag
#	Address (0x)	CmdID (0x)	DBC Var Name	Bytes	Watch	Max Var	MaxVal (0x)	Fresh Rate	Endian	Data Type	Format	Start Bit	Valid Bits	Unit	Factor	Offset	Write	WriteMsg(0x)	
1	0b	03	BatteryMode	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	hex	0	16	Unit	1.0	0.0	<input type="checkbox"/>		
2	0b	08	gTemperature	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	0.1K	1.0	0.0	<input type="checkbox"/>		
3	0b	09	gVoltage	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mV	1.0	0.0	<input type="checkbox"/>		
4	0b	0a	gCurrent	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	signed	normal	0	16	mA	1.0	0.0	<input type="checkbox"/>		
5	0b	0c	MaxError	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	signed	normal	0	16	Unit	1.0	0.0	<input type="checkbox"/>		
6	0b	0d	RSOC	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	%	1.0	0.0	<input type="checkbox"/>		
7	0b	0f	RemainingCapacity	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mAh	1.0	0.0	<input type="checkbox"/>		
8	0b	10	FullChargeCapacity	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mAh	1.0	0.0	<input type="checkbox"/>		
9	0b	14	ChgCurrent	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mA	1.0	0.0	<input type="checkbox"/>		
10	0b	15	ChgVolt	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	V	0.001	0.0	<input type="checkbox"/>		
11	0b	16	BatteryStatus	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	hex	0	16	Unit	1.0	0.0	<input type="checkbox"/>		
12	0b	17	CycleCount	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	Counts	1.0	0.0	<input type="checkbox"/>		
13	0b	18	DesignCapacity	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mAh	1.0	0.0	<input type="checkbox"/>		
14	0b	19	DesignVolt	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mV	1.0	0.0	<input type="checkbox"/>		
15	0b	38	CellVolt4	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mV	1.0	0.0	<input type="checkbox"/>		
16	0b	39	CellVolt3	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mV	1.0	0.0	<input type="checkbox"/>		
17	0b	3a	CellVolt2	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mV	1.0	0.0	<input type="checkbox"/>		
18	0b	3b	CellVolt1	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mV	1.0	0.0	<input type="checkbox"/>		
19	0b	44	gAccess	3	<input checked="" type="checkbox"/>	~	00000000	Continued	Little	binary	hex	0	24	None	1.0	0.0	<input checked="" type="checkbox"/>	02 56 00	
20	0b	44	GuaStatusFC	4	<input checked="" type="checkbox"/>	gAccess	00005602	Continued	Little	unsigned	normal	17	1	None	1.0	0.0	<input type="checkbox"/>		
21	0b	*			<input type="checkbox"/>												<input type="checkbox"/>		

Figure 8-15 Editing DBC

- 1.) #: Serial number
- 2.) Address (0x): This address is the battery cell communication address. See the data manual (common addresses are 0B and 55).
- 3.) CmdID (0x): the first address of the data information (the first address is for 2-byte data and the first address is for 1-byte data). For details, see the Command Code in the data manual.
- 4.) DBC: DBC variable name, commonly referred to as abbreviation, can be changed to any name. See the Data manual Standard Data Commands.
- 5.) Bytes: Data size. See the Standard Data Commands.
- 6.) Attention: Check to pay attention to this message and load it into the test information. Right click to select all.
- 7.) Multiple switch: It will be used when different data bits are read to represent different information. It is mainly used to read DataFlash that need to be written before being read.
- 8.) Multiplexing value: When the read data area is a multiplexing area, it must be used together with the multiple switch.
- 10.) Refresh rate: When reading the coulometer information, for example, bar code, serial number, capacity, you can choose a single time. When the read content is a block, you can choose to decode only (a block contains multiple bytes, according to the actual bit and then explains a number of DBC variables, you do not need to read each variable block once). This can improve the reading rate of data.
- 11.) Big-endian/Little-endian: Indicates that data transmission starts from Big-endian/Little-endian. For details, check the data manual, Data must be sent/read in Little Endian.
- 12.) Data type: To read the type of data. For details, see the data manual.
- 13.) Start bit: Indicates the starting position of the data. For details, see the data manual.
- 14.) Significant bit: Indicates the significant bits of the data information. For details, see the data manual.
- 15.) Unit: The unit of data, which can be changed to any value.
- 16.) Gain value: Display and record the read data in multiplicative relationship, for example, if you set the gain value to 1, it is 1-times data (multiplicative relationship).
- 17.) Offset value: The data offset is determined by the actual user requirements (additive relationship).

18.) Write: Select this option when you need to perform a write operation on the cell.

2. Special data DBC (coulometer) editing scheme

Here is the introduction of some special data editing method.

1.) Example of the use of multiway switches.

When you need to input a fixed value to read the data, you can use the multiplexing switch function to operate the following operation process.

3.6.4 DataFlashBlock(): 0x3F

UNSEALED Access: This command sets the data flash block to be accessed. When 0x00 is written to BlockDataControl(), DataFlashBlock() holds the block number of the data flash to be read or written. Example: writing a 0x00 to DataFlashBlock() specifies access to the first 32-byte block and a 0x01 specifies access to the second 32-byte block, and so on.

3.6.4 DataFlashBlock(): 0x3F

UNSEALED Access: This command sets the data flash block to be accessed. When 0x00 is written to BlockDataControl(), DataFlashBlock() holds the block number of the data flash to be read or written. Example: writing a 0x00 to DataFlashBlock() specifies access to the first 32-byte block and a 0x01 specifies access to the second 32-byte block, and so on.

Main Var Management Edit DBC RT Set Record Set NG Parameter														
DBC File Path: D:\Neware\Steps\Sample\SM2\XXX.dbo				Bus Type	I2C	Interval	10	ns	Port	1	Nominal Rate	10000	Flexible Rate	10000
				Port Volt	1.8V	FullRes	1.5k	CRC Flag						
#	Address (0x)	CntrlID (0x)	DBC Var Name	Bytes	Watch	Min Var	MaxVal (0x)	Fresh Rate	Endian	Data Type	Format	Start Bit	Valid Bits	Unit
1	55	06	gTemperature	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	0.1K
2	55	08	gVoltage	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mV
3	55	0a	FLAGs	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	Unit
4	55	0c	ChargingVoltage	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mV
5	55	10	IM	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mAh
6	55	12	FullChgCap	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mAh
7	55	14	AvgCurrent	2	<input type="checkbox"/>		00000000	Continued	Little	signed	normal	0	16	mA
8	55	24	AvgPower	2	<input type="checkbox"/>		00000000	Continued	Little	signed	normal	0	16	nW
9	55	2a	CycCount	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	Counts
10	55	2c	SOC	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	%
11	55	32	TrueRenCap	2	<input type="checkbox"/>		00000000	Continued	Little	signed	normal	0	16	mAh
12	55	34	PassedChg	2	<input type="checkbox"/>		00000000	Continued	Little	signed	normal	0	16	mAh
13	55	3c	DesignCap	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	mAh
14	55	3f	DataFlashBlock	2	<input checked="" type="checkbox"/>		00000000	Continued	Little	unsigned	normal	0	16	num
15	55	40	Barcode	21	<input type="checkbox"/>		00000002	Continued	Little	string	hex	0	168	None
16	55	*			<input type="checkbox"/>									

Figure 8-16 Edit the DBC-multiway switch

As shown in the figure above (Figure 8-16), **Barcode** refers to the barcode of the battery. The data address of the barcode is at position 40. To obtain the barcode, it needs to be at position 3F.

To obtain the bar code, write a 2 in the position.

The host-computer setup is shown in the figure.

The address must be filled in strictly according to the data manual. The DBC variable name can be filled in according to the data manual, and it is customizable.

The input address (3F address location) multiplex switch value (DataFlashBlock1) must be the same as the barcode multiplex switch value (DataFlashBlock1).

As shown in Figure 8-17, click the check box and a drop-down menu will appear. Click DataFlashBlock1 directly, and a "✓" will appear, indicating that the multiplex switch is enabled.

13	55	3c	DesignCap	2	<input type="checkbox"/>		00000000	Continued	Little	unsigned
14	55	3f	DataFlashBlock	2	<input checked="" type="checkbox"/>	✓	00000000	Continued	Little	unsigned
15	55	40	Barcode	21	<input type="checkbox"/>	✓	00000002	Continued	Little	string
16	55	*			<input type="checkbox"/>					

Figure 8-17 Edit DBC-Select the multiplex switch

The multichannel factor which is the input value, can be filled in according to the data manual. **Note that there is also a write function after the input address that must be checked and filled in with the value to be**

written.

2.) When different positions in a string of data represent different information, you can practice the following operations.

13.4 0x03 BatteryMode()

This read/write word function sets various battery operating mode options.

SBS Cmd	Name	Access			Protocol	Type	Min	Max	Unit
		SE	US	FA					
0x03	BatteryMode()	R/W			Word	H2	0x0000	0xFFFF	—

15	14	13	12	11	10	9	8
CAPM	CHGM	AM	RSVD	RSVD	RSVD	PB	CC

7	6	5	4	3	2	1	0
CF	RSVD	RSVD	RSVD	RSVD	RSVD	PBS	ICC

Figure 8-18 Manual of chip-BatteryMode

As shown in the figure above (Figure 8-18), BatteryMode is a 16-bit, 2-byte data type. Each bit of BatteryMode represents a specific piece of information. In this case, each bit needs to be read out separately:

DBC File Path				D:\Neware\Steps\Sample\BQ4037n.dbc				Bus Type		SMBus		Interval		10		ms		Port		1		Nominal Rate		65000		Flexible Rate		100000		PortVolt		1.8V		FullRes		1.5k		CRC Flag																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
#	Address (0x)	CmdID (0x)	DBC Var Name	Bytes	Watch	Mux Var	MaxVal (0x)	Fresh Rate	Endian	Data Type	Format	Start Bit	Valid Bits	Unit	Factor	Offset	Write	WriteMsg(0x)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			

Figure 8-19 Edit DBC- Split interpret DBC variables

The address is 03, but the DBC variable name is different. Since BatteryMode is a 16-bit, 2-byte data format, put a 2 in the byte column. There is no use for the multiway switch function, so do not fill it in. As shown in the figure above (Figure 8-19), ICC is in position 0, so the starting bit should be 0. Only 1 bit is used, so the effective bit should be 1. And so on, PBS starts at 1, the effective bit is 1, until the last bit.

8.7. Operation Process

Here is the introduction of how to set the step parameters to start the test when you get a new battery and test process.

It covers preparation for the test, usage of main step and step-flow setting, DBC (coulometer) import/edit, modify/import DBC information, and successfully startup.

1.Pretest preparation

1.) Check if the equipment is normally functioning. Inspect the power supply. Whether the device can be connected to the upper-machine (After the device is successfully connected to the upper-machine, the corresponding device number will be displayed on the interface of software).

If the device is displayed in gray color, it means the device is disconnected. In this case, you can check whether the IP address of the server on the device corresponds to the IP address of the computer.

- 2.) Check if the batteries is functional (charge/discharge function, communication function).
- 3.) Prepare the cell (coulometer) data sheet (for viewing **Data Command** to edit DBC).
- 4.) Prepare for the test process.

2. How to setting the operation process of main steps.

- 1.) Here is a sample test flow (Figure 8-20 shows the test process)

Charge Procedure				
Step	Description	set point	end condition	
1	Charge	1.3C	Cycler Voltage = 4.05V	
2	Charge	4.05V	Cycler Current = 1C	
3	Charge	1C	Cycler Voltage = 4.10	
4	Charge	4.1V	Cycler Current = 0.7C	
5	Charge	0.7C	Cycler Voltage = 4.20V	
6	Charge	4.2V	Cycler Current = 0.4C	
7	Charge	0.4C	Cycler Voltage = 4.35V	See Note 1
8	Charge	4.35V	Cycler Current = 0.025C	See Note 1
9	Rest	10min		
10	CC discharge	0.1C	Cycler Voltage = 3.2V	

Note1:

1. VAC CHARGING

CHARGE VOLTAGE SHOULD BE LOWERED AT HIGH CYCLES ACCORDING TO VAC SETTINGS AS FOLLOWS:

CYCLES	CHARGE VOLTAGE
0-2	4.35V
3-5	4.33V
6-1000	4.31V

Figure 8-20 Test Requirement Process

- 2.) According to the test process above, create a new step file (named TEST1) in the main step row.

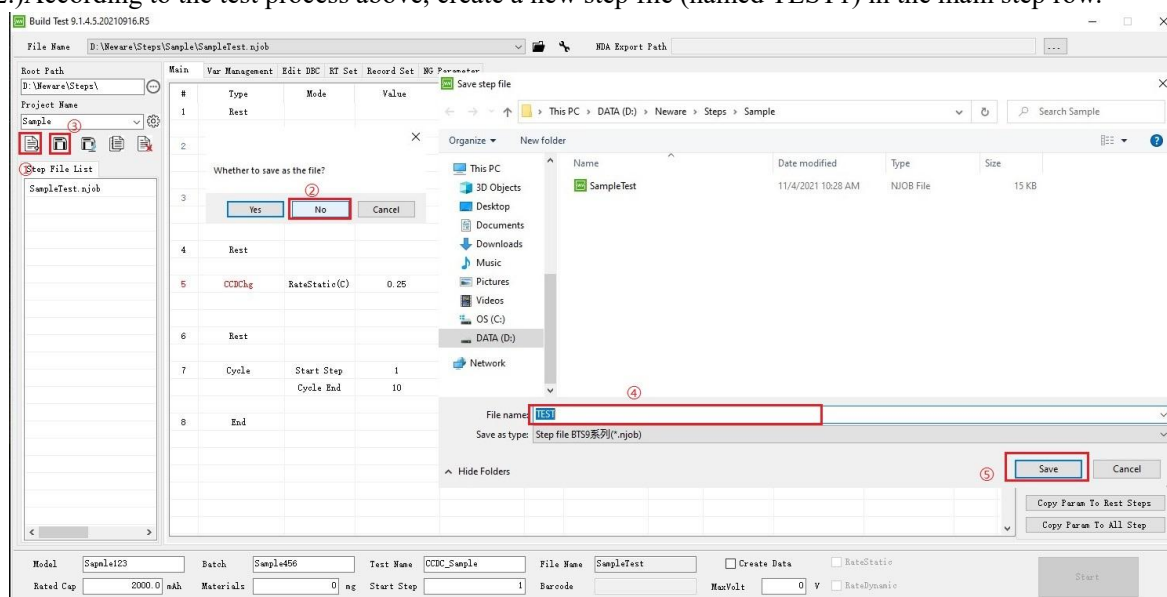


Figure 8-21 Creating a Test file.njob

- 3.) To start editing the step, save the step file and name it TEST1 (save button is in upper left corner).
4.) Import the DBC variable template.

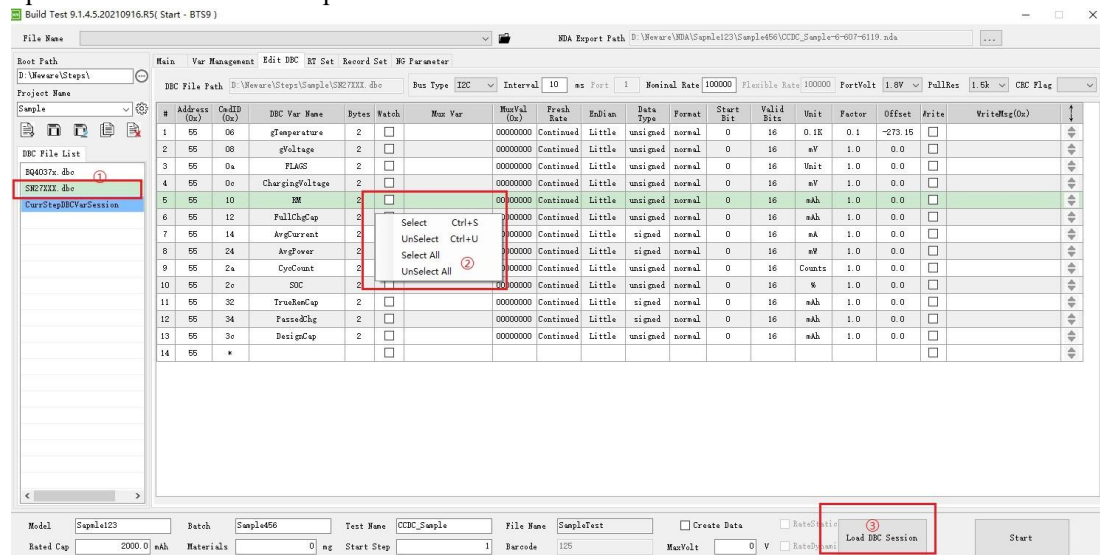


Figure 8-22 Import DBC file

- 4.) Regarding there are variables that need to be customized in the step flow, we need to create them in variable management.

Description of variables/functions in practical case:

Variable name	Expression	Description
VoltVar	IF(CycCount<3,4.35,IF(CycCount<6,4.33,4.31))	CycCount is DBC variable, which means VoltVar change based on CycCount

- 5.) How to create a variable/function?

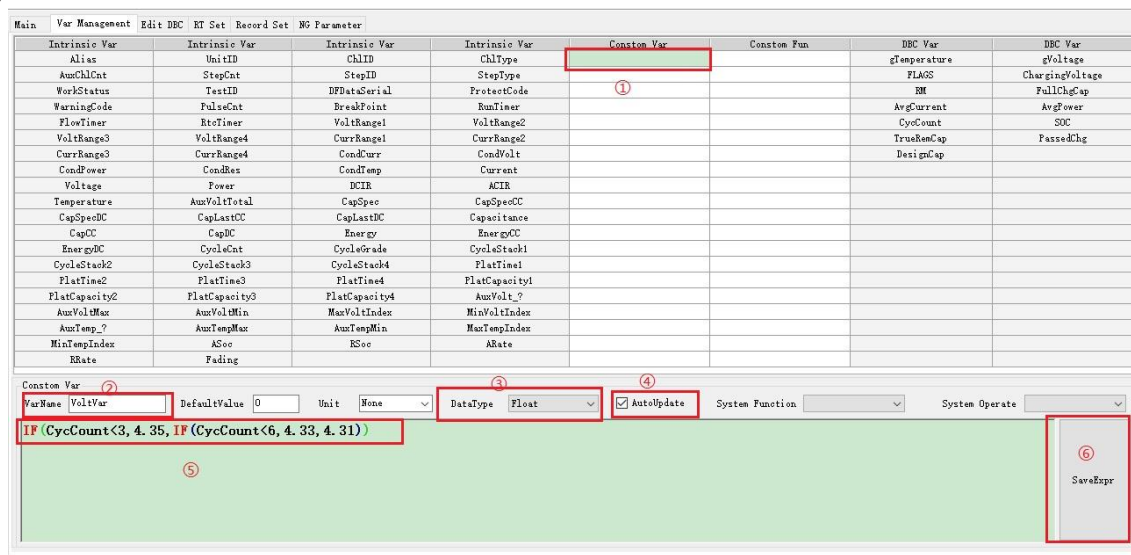


Figure 8-23 Edit custom variables

- ① Select the custom variable blank.
- ② Enter a variable name (the variable name can not be repeated).
- ③ Select **U32** for positive integer, **int** for negative integer, and **float** for decimal.
- ④ Since real-time changes are based on CycCount changes, the automatic solution needs to be checked. That is, the automatic solution needs to be checked if real-time calculation is required.
- ⑤ In the expression editing area, input the corresponding expression:
"IF(CycCount<3,4.35,IF(CycCount<6,4.33,4.31))"
- ⑥ After editing, you need to click "Save Custom Variable." After editing, you also need to click

the save/update button.

6.)Set up a complete step flow

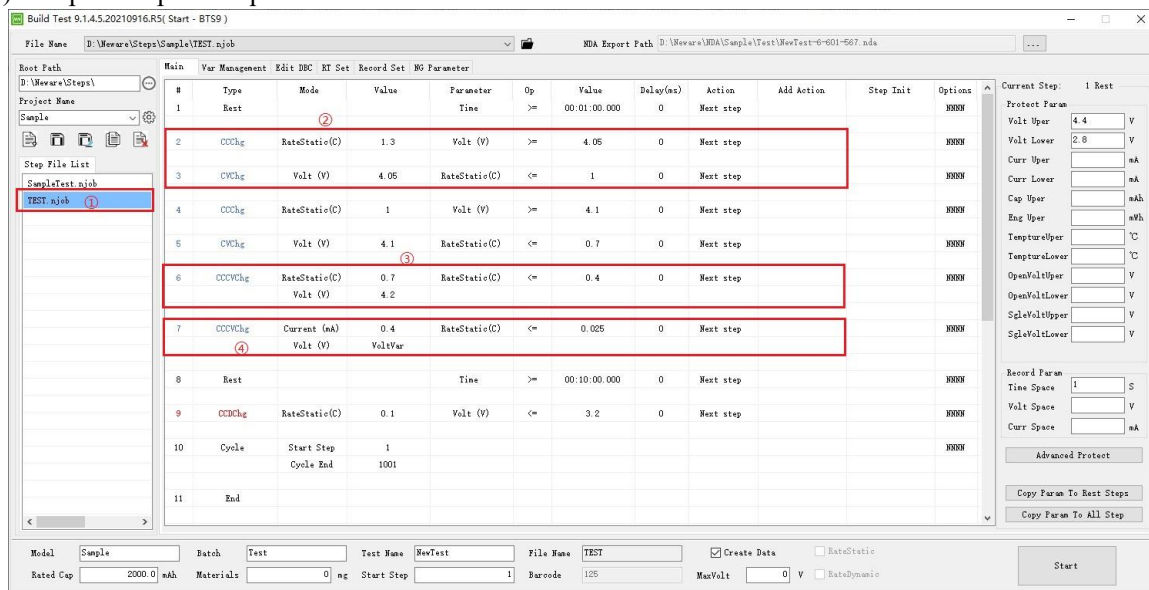


Figure 8-24 Step Flow

Here we need to pay attention to step ②, including CC charging, CV charging, and step ③, CC and CV charging. The meaning of the two words is consistent, that is, CC and CV. The first CC is to reach the CV value and then CV. In step ④, a user-defined variable, VoltVar, is used as the voltage parameter, which is easy to understand and simple to operate.

Step ⑦: Nominal capacity is used to calculate the C-rate current value.

7.) Display Settings: This feature is described in section 8.4.

8.) Record Settings: This feature is described in detail in section 8.5.

9.) Save the steps.

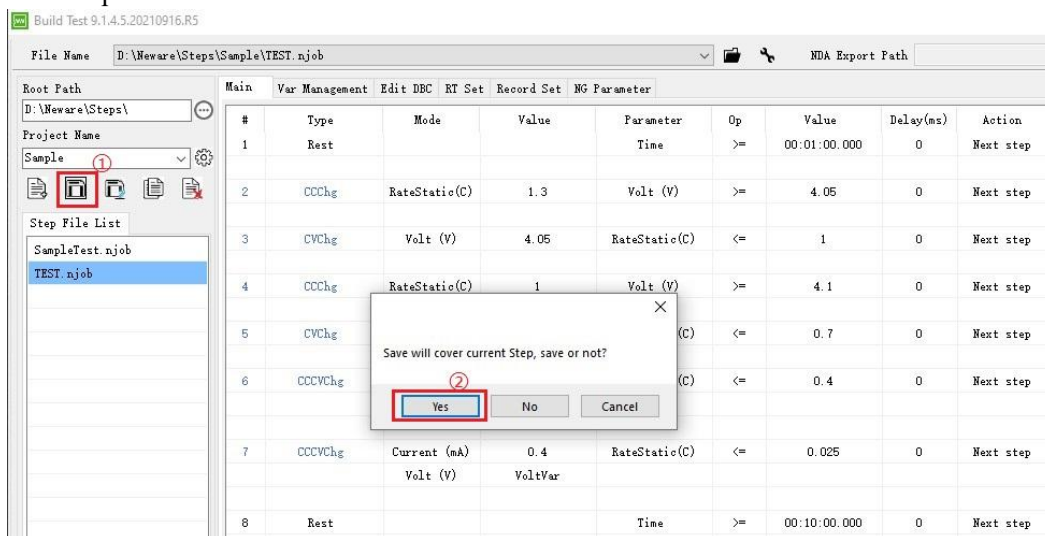


Figure 8-25 Save steps

8.8. Successfully Start

Set up the steps flow, save and start operating the steps on the specific channel.

1.)Right-click on the channel and click **Start**. In the step editor, select TEST.njob, and click **Start**, see Figure 8-26.

2.)After the startup, right-click on the channel and you will see the DBC information column. Click

DBC info to view the real-time DBC information, Figure 8-27.

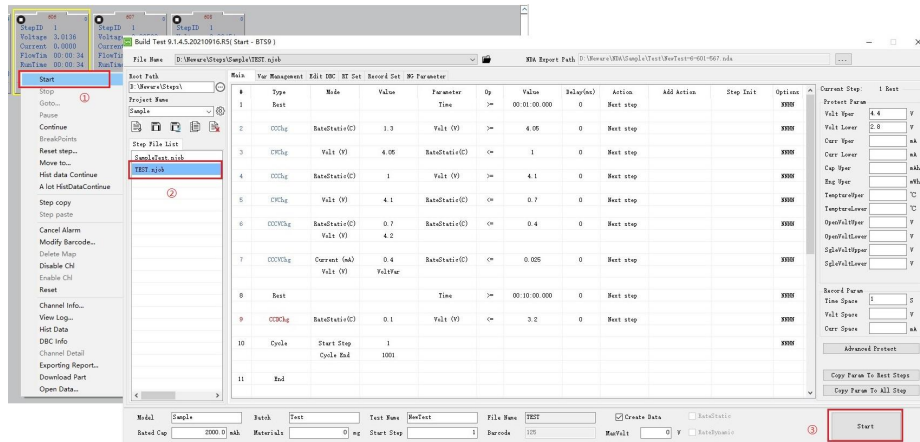


Figure 8-26 Start

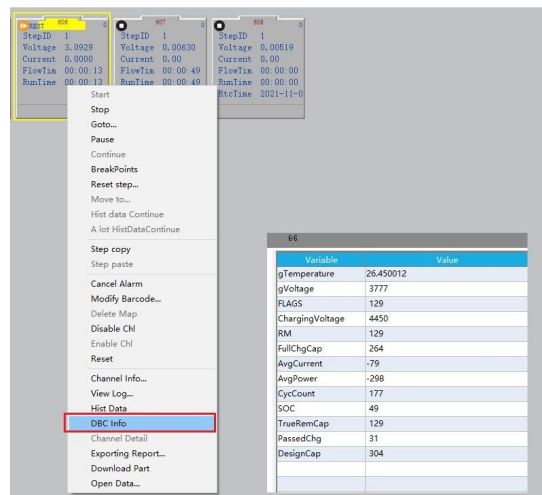


Figure 8-27 DBC Information

FAQ

Q: Why the power-on indicator off after the device is connected?

A: Check if the lower-machine is well connected with power source, and check if the lower-machine is functional.

Q: What we should notice before changing the mid-machine?

A: Pay attention to formatting data and deleting historical devices. Search for the mid-machine again and connect.

Q: Why channels has no current and unable to launch during the test?

A: Check whether the clamp connection is correct (connection method, cathode and anode), then check whether the battery connection is correct. If these are all correct, then the device might have a channel failure.

Q: After the device is connected, the device channel on the client is unavailable, why?

A: Inspect the network connection. If the network connection is functioning, use the TCP/UDP tool to search for the device again.

Q: Why the host computer can not read the mid-machine?

A:

1. Mid-machine and upper-machine are not connected.
2. Host computer and mid-machine are not connected in a same network.

Q: How do you determine whether the server data is full or about to be full, and how do you clear unused test data?

A: You can check the available space on the disk where the server resides. According to the size of the disk where the server is located, the test time and accuracy, the size of the sampling data To wipe the data, right-click on the software history interface and choose "Delete File".



Notice: If historical data is deleted from the software interface, the file cannot be restored.

Q: When I view the barcode of the channel information, the original battery barcode is missing. Why?

A: When the barcode is connected to the channel, do not move it; otherwise, the barcode information of the battery will be lost.

Q: Why the barcode can not be scanned into the channels?

A: During bar code scanning, you cannot practice any operations in the channel. Which means the channel status is has to be "Stop." Otherwise, the bar code cannot be detected in the channel information.

Q: During the calibration process, after setting the parameters, click "Start calibration." The calibration information is not displayed, and it shows the connection timeout or network error. Why?

A: a) Click "Cancel" and redo the calibration.

b) Check whether all the cables are connected properly, restart the mid-machine, lower-machine, calibrator, and the multi-meter.

Q: When the device is power-on, why does the voltage displayed on the client interface change when the test is interrupted on the channel that has already been started?

A: When the device is connected to the battery, the actual battery voltage is displayed on the interface. If the device is not connected to a battery, it is in an open circuit state and the input impedance is high. Therefore, the device sampling line can easily collect the crosstalk voltage from the external environment. Therefore, the display voltage changes randomly.

Appendix

Caution

Please notice the following matters before using Neware's products:

- ✧ Select the power cable based on the parameters of the equipment. Before connecting the device to the power socket, check the voltage rating and ensure that the required voltage and frequency match the actual power supply.
- ✧ Do not test batteries with different parameters at the same time.
- ✧ If multiple devices are operating, do not place the devices too close to each other. This may cause air back-flow or air preheating and is inconvenient for maintenance.
- ✧ To avoid communication errors or damage to the equipment do not remove or install the circuit board without authorization.
- ✧ Before using the equipment, please check whether the equipment is functional and whether the battery fixture probe is damaged. If there is damage, it cannot be used. Paste labels with annotations.
- ✧ When clamping the battery, make sure that the cathode and anode of the battery are correctly connected to the positive and negative of the clamps.
- ✧ When you place the batteries in the clamps, it is suggested to adjust the spacing between the upper and lower baffles of the clamps, and the lower clamps should be at least half pressed down to ensure good contact. If the fixture spacing is too small, it is easy to scratch the battery. Too much will make the battery loose and affect the accuracy of test data.
- ✧ Set the steps correctly during the test; otherwise, the battery may be damaged or even cause safety accidents.
- ✧ When the device's internal temperature exceeds 50 °C, check to see if the fan is functioning properly.
- ✧ If the voltage and current data of a channel experience abnormalities, stop using the channel immediately, label down, and contact the after-sales services for maintenance.

Repair and Maintenance

The equipment you are using is gathered with excellent design and craftsmanship, it should be used with care. The following suggestions will help you properly use the warranty:

- ✧ To ensure the best performance accuracy of the equipment, it is recommended to calibrate the equipment every six months.
- ✧ Before upgrading or reinstalling the software, please uninstall the previous version.
- ✧ Please strictly follow the instructions in this manual to use the equipment.
- ✧ Keep the device dry. Rain, moisture, and all kinds of liquid content will corrode electrical circuits.
- ✧ Keep the equipment clean and do not use or store it in dusty or dirty places that could damage its detachable parts and electronics.
- ✧ Do not store devices in a over-heated place. High temperatures can shorten the life of electronic devices.
- ✧ Do not store the device in a cold place. Otherwise, when the device temperature rises to room temperature, moisture will form inside the device, which will damage the circuit board.
- ✧ Do not knock the device. Violent practice can damage internal circuit boards and delicate structures.
- ✧ Do not clean the equipment with chemicals components.
- ✧ When replacing parts, use only matching or approved parts. Uncertified parts, modifications, can affect the performance of the equipment, or even damage it.
- ✧ Backup the data (such as test data or data partitioning).
- ✧ Correct operation and maintenance of the equipment will help you better experience the performance of the product. Our long-term customer investigation and after-sales service statistics show that equipment failure in many cases is caused by improper operation or incorrect maintenance methods. If the equipment does not work properly, you are advised to read the user manual of this product carefully or contact the customer service of Neware for consultation.

After-sales Service

- ✧ **Free technical training:** Neware provides free technical training before and after sales. We will provide a technician for training and services and sincerely welcome your visit.

- ✧ **Service number:** If you experience any difficulties, you can contact Neware's service number for assistance.
- ✧ **Troubleshooting support:** After receiving the customer's notice about the fault or abnormal operation of Neware's products, if it cannot be corrected by our telephone support, Neware will provide on-site service during service hours, to restoring normal operation by correcting, repairing, adjusting, or replacing the parts of the products.
- ✧ **Response time:** Neware will dispatch a qualified technician to the customer's site within the assigned time. From the time when the technician of Neware concluded that it was necessary to provide on-site troubleshooting service, unless otherwise specified, the onsite service only covers normal service hours, i.e., from 9:00 a.m. to 6:00 p.m. Monday to Saturday (except public holidays and Neware's holidays). Neware provides one year of free maintenance services. Neware also provide free software upgrades to ensure that the equipment is in the best working condition.
- ✧ Neware has opened an 800 free service number: 800-830-8866. If on-site maintenance is required, our technician will be sent to the customer's site immediately to resolve the technical issues.

Contact NEWARE

Thank you for using NEWARE products. We wish NEWARE products could become your great helpers. We provide you with various self-service methods to help you quickly solve most problems during device operation. In order to solve the problem quickly and effectively, we suggest you contact us in time through the following methods when you encounter problems.

Customer service: 800-830-8866

Website: www.neware.com.cn

After-sales service: 0755-83108866, 83108867, 83108868