

**Battery Simulation Software
ITECH BSS2000/ BSS2000 Pro
Operation Manual**

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CAUTION

A CAUTION sign denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION sign until the indicated conditions are fully understood and met

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NOTE

A NOTE sign denotes important hint. It calls attention to tips or supplementary information that is essential for users to refer to.

Contents

Chapter1	Introduction.....	1
1.1	Software Introduction	1
1.2	Preparation before Operation	1
1.3	BSS2000 Initial Interface.....	2
1.4	Configuring Interface of Device	3
Chapter2	Battery Simulation Test	6
2.1	Overview of Main Interface.....	6
2.2	Editing Curve.....	7
2.3	Setting Protection and Alarm Functions.....	10
2.4	Previewing Curve	11
2.5	Running Test	12
2.6	Observing Test Status	13
2.7	Setting Voltage Slope.....	13
2.8	Checking Error information	13
2.9	Checking Software Version Information	14

Chapter1 Introduction

1.1 Software Introduction

IT6000B/IT6000C/IT-M3600/IT-M3400 series bidirectional programmable DC power supply comes with standard biquadrant function. The hardware output can stimulate the charging and discharging characteristics of various batteries as well as battery output characteristics, which can replace various real batteries in power supply test application.

In battery simulation mode, this series of power supply allows users to select the type, number of cells in serial connection, number of cells in parallel connection and SOC indicators of simulation battery for overall simulation of battery output characteristics, including the change process of internal resistance characteristics during battery discharging process.

BSS2000 and BSS2000 Pro battery simulation software are specially designed to control battery simulation device, and comes with battery simulation function of bidirectional programmable DC power supply to visually realize all settings, tests and analysis functions of battery simulation function. The software interface is simple and easy-to-use where the user can check curve settings and running process data of existing test at the same time.

The wiring and schematic diagram are as follows:



1.2 Preparation before Operation

- Connect to Device

This software need equipped with IT6000C/IT6000B/IT-M3600/IT-M3400. This software supports interfaces like USB, RS232, GPIB and LAN. Before using the software, the user needs to connect the device to computer by communication interface first, and enter the communication interface parameter to software interface. Please refer to 1.4 Configuring Interface of Device for the detailed information.

- Insert the Encryption Lock

Insert the encryption lock provided by ITECH into the computer and the official software will be available to you.

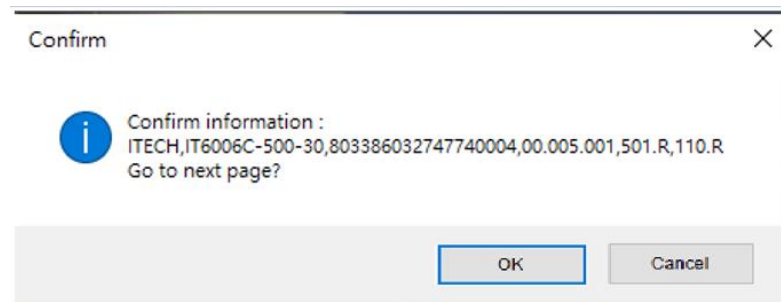
1.3 BSS2000 Initial Interface

Double-click the ITECH_BSS.exe to run BSS2000 software, the software will initialize in about 2 seconds, and then the below interface will appear.



The interface is described as follows:

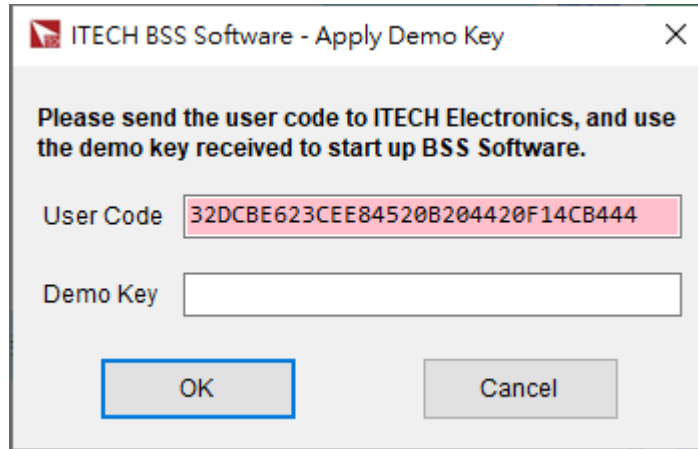
- Communication
Select the communication interface between the software and the device.
- About
Check BSS2000 information, such as name and version number.
- Scan
Scan communication interfaces for the device.
- Enter
When you first enter the main operation interface of the software, click [Enter], the following interface will appear to prompt the information about the connected instrument. This screenshot just for example, please refer to actually information.



- Quick Enter
After the software and the instrument are successfully connected once, the connection information is recorded. When you re-enter the main operation interface of the software, you can directly click **[Quick Enter]**.

Troubleshooting

If the interface below appears during the operation, you need to check the device connection.



The reasons for the above interface:

- Loss of the encryption lock

The interface will also appear without inserting the encryption lock. Please check the encryption lock delivered with box has insert to PC.

If encryption is missed, the user can contact ITECH and convey the user code to us. Then you will receive the demo key offered by ITECH. Input it, click **[OK]** and if the demo key matches, the demo software will be available to you for 14 days.



NOTE

When using the demo software, if you connect the device to PC, the software will enter the TRIAL mode. The software function in TRIAL mode is the same as that of the official software; if you do not connect the device to PC, the software will enter the DEMO mode. In DEMO mode, all functions can be simulated.

1.4 Configuring Interface of Device

BSS2000 software is installed in PC and interacts with matching hardware devices via different communication interfaces. This software supports interfaces like USB, RS232, GPIB and LAN. (At the time of start-up scan, in default, RS232 scans at Baud rate of 9,600). The user needs to connect the device to the computer. During hardware setting, select a hardware interface that is compatible with the one connected to the device, and set interface parameters based on different interface types.

Precondition

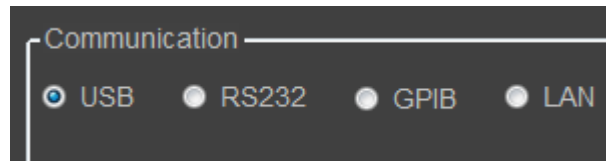
1. Before configuring hardware, you need to check whether the device communication method is consistent with the realistic application or not.

The detailed steps refer to corresponding User Manual of device.

2. Connect the power supply and PC by communication cable.

Operation steps

1. Select the required hardware interface type on the initial interface.

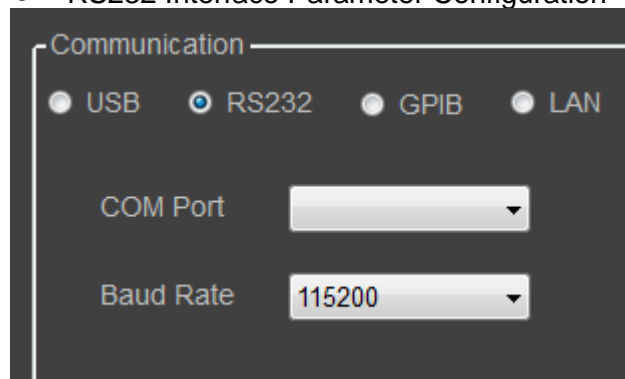


2. After selecting the device interface, configure interface parameters at bottom. Click **[Scan]**.

- USB Interface Parameter Configuration



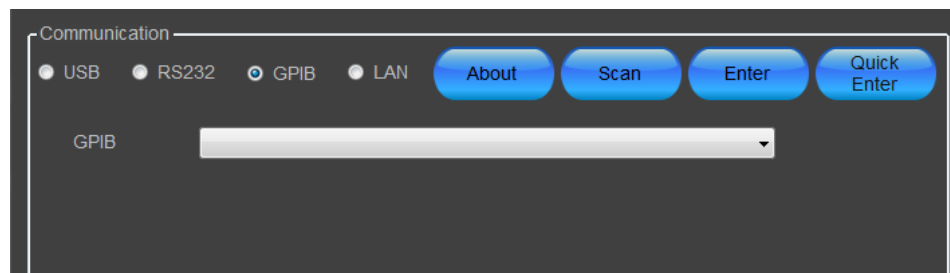
- RS232 Interface Parameter Configuration



COM Port: to select serial interface, i.e., the serial interface number occupied by RS232 communication cable interface.

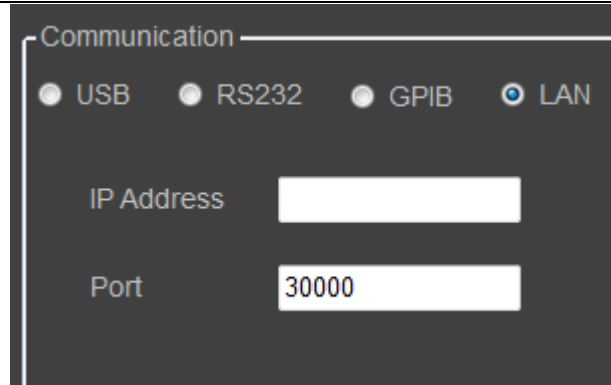
Baud Rate: Baud rate must be configured consistently with those in menu setup.

- GPIB Interface Parameter Configuration



GPIB Address: Set GPIB address of device.

- LAN Interface Parameter Configuration



The screenshot shows a 'Communication' settings window with a dark background. At the top, there are four radio button options: USB, RS232, GPIB, and LAN. The LAN option is selected, indicated by a blue dot. Below the radio buttons, there are two input fields. The first is labeled 'IP Address' and is currently empty. The second is labeled 'Port' and contains the value '30000'.

IP Address: Set LAN IP address of device.

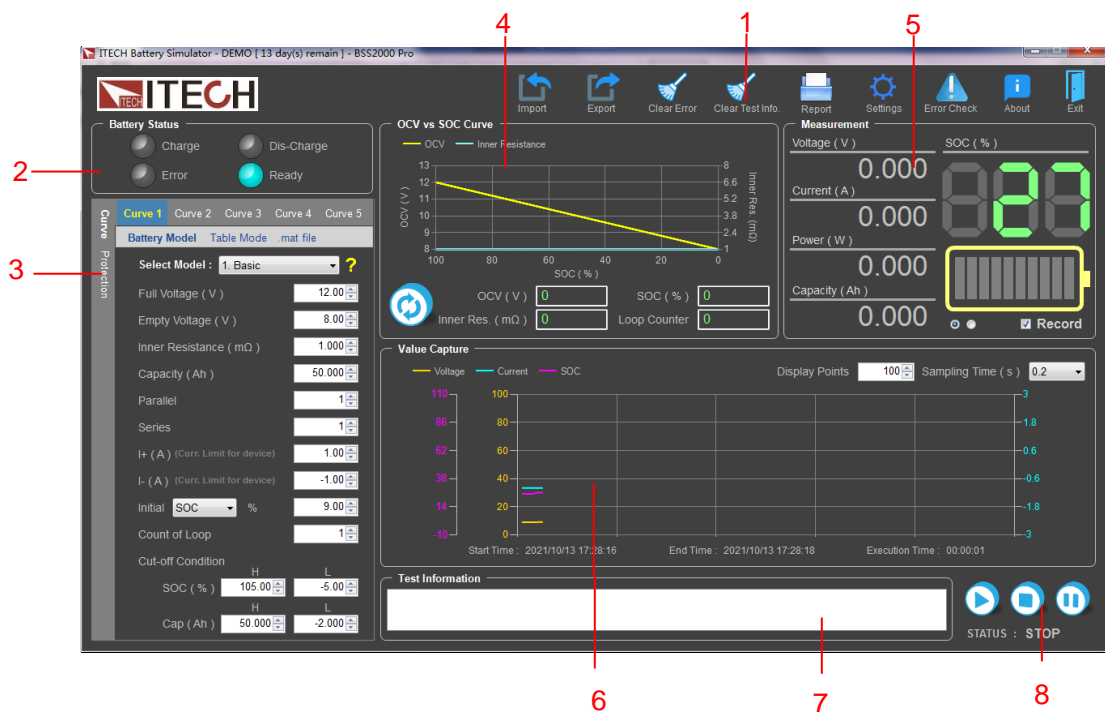
Port: Set Socket port of device, the default value is 30000.

Chapter2 Battery Simulation Test

BSS software control interface is simple where all operations can be completed in a single interface, including setting, running and observation of test data. This chapter introduces the specific test operation method and process of BSS software. Taking BSS2000 Pro software as an example, BSS2000 software interface is the same as BSS2000 Pro software except that BSS2000 software interface does not support importing .mat file and there are few optional battery types.

2.1 Overview of Main Interface

The main interface of BSS software is introduced as follows:



1. Menu bar

- Import: Import curve data.
- Export: Export setting data of existing curve.
- Clear Error: Clear error status.
- Clear Test Info.: Set configuration functions.
- Model: Select battery model.
- Report: Open the test data file folder.
- Settings: Set voltage slope.
- Error Check: Check the error information.
- About: Inquire software-related information.
- Exit: Exit the software interface.

2. Display bar for battery simulation test status.

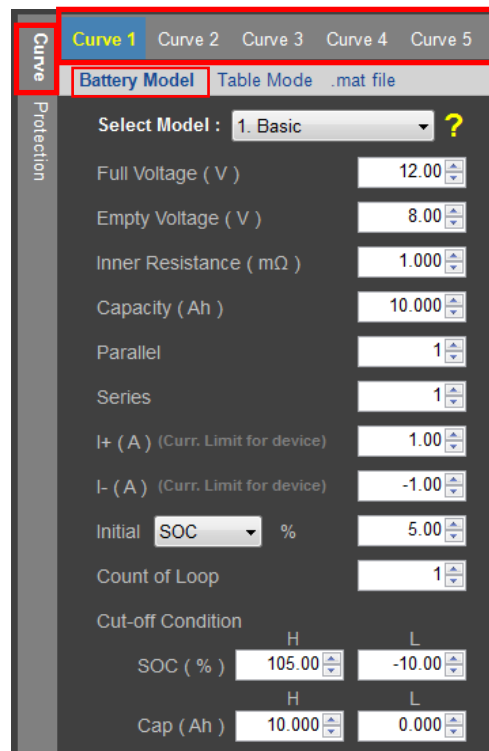
3. Test curve setting area for battery simulation test and protection setting area
4. Preview curve for battery simulation test
5. Measurement data display area
6. Voltage/current measurement curve
7. Information display area during test process
8. Test key

2.2 Editing Curve

BSS software has two editing methods for battery simulation curve. The user can select Battery Model and configure manually, also select Table Mode and import the curve data.

Battery Model:

1. Select curve in the Curve Edit area. Such as click “Curve1”.

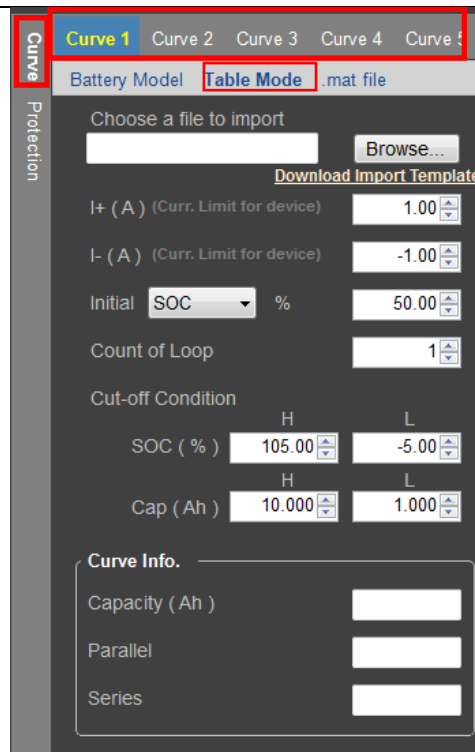


2. Click “Battery Model”.
3. Click list box of “Select Model”. Select the battery models.
 - BSS2000 supports three battery models:
 - 1.Basic: Basic Battery
 - 2.LeadAcid: Lead-acid Battery
 - 3.Lion: Universal Lithium-ion Battery
 - BSS2000 Pro supports nine battery models:
 - 1.Basic: Basic Battery
 - 2.LeadAcid: Lead-acid Battery
 - 3.Lion: Universal Lithium-ion Battery
 - 4.LMO: LiMn2O4 Battery
 - 5.LNMCO: LiNi1/3Mn1/3Co1/3O2 Battery
 - 6.LNMCO&LMO: LiNi1/3Mn1/3Co1/3O2 & LiMn2O4 Battery

- 7.LFP: LiFePO4 Battery
- 8.LTO: Li4Ti5O12 Battery
- 9.NiMH: Nickel Metal Hydride Battery
- 4. Setting the battery parameters and state according to the battery specifications.
 - Full Voltage: Simulate the voltage value when a single battery is in full-voltage status.
 - Empty Voltage: Simulate the voltage value when a single battery is in empty-charge status.
 - Inner Resistance: Simulate the internal resistance of a single battery.
 - Capacity: Simulate the capacity of a single battery.
 - Parallel: Simulate the settings for the number of batteries in parallel connection.
 - Series: Simulate the settings for the number of batteries in serial connection.
 - I+: Positive current limit, which simulates the maximum discharging current of the battery pack. This limit value is the limit of equipment and will not change with the series-parallel relationship.
 - I-: Negative current limit, which simulates the maximum charging current of the battery pack. This limit value is the limit of equipment and will not change with the series-parallel relationship.
 - Initial: Set the initial state of charge of the battery, include three mode, SOC/Voltage/Capacity and SOC value 0~100% corresponds to the voltage range from empty voltage to full voltage.
 - Count of Loop: Number of execute cycles.
 - Cut-off Condition: Cut-off conditions, including state of charge (SOC) and battery capacity.

Importing Curve from Table

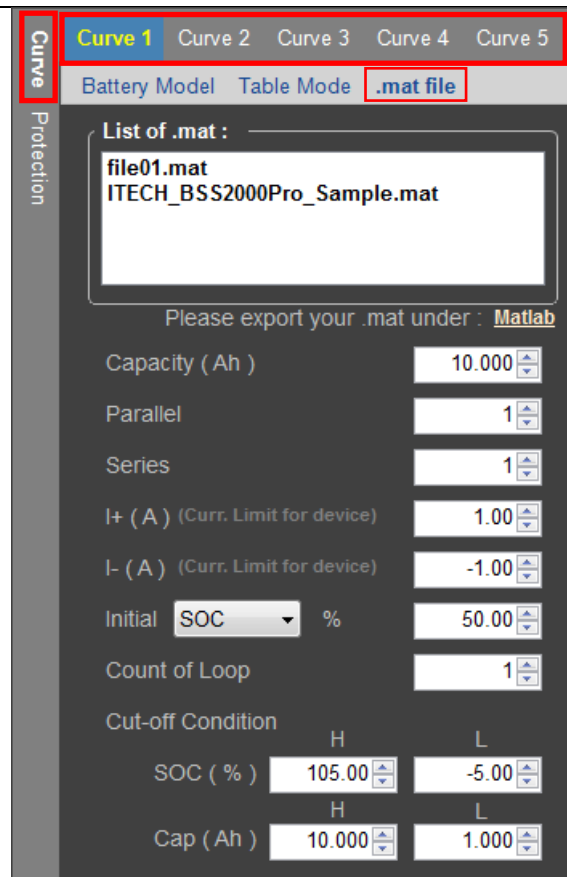
1. Select curve in the Curve Edit area. Such as click "Curve1".
2. Click "Table Mode".



- Choose a file to import: Select the battery characteristic curve file to be imported. Click “Browse...” and select the .CSV curve file. If you need create a new curve file, you can click “Download Import Template” to download a .CSV file for template.
- I+: Positive current limit, which simulates the maximum discharging current of the battery pack.
- I-: Negative current limit, which simulates the maximum charging current of the battery pack.
- Initial: Set the initial state of charge of the battery, include three mode, SOC/Voltage/Capacity and SOC value 0~100% corresponds to the voltage range from empty voltage to full voltage.
- Count of Loop: Number of cycles
- Cut-off Condition: Cut-off conditions, including state of charge (SOC) and battery capacity.
- Curve Info.: imported curve capacity and serial/parallel connection information.

Importing .mat Curve File (Only BSS2000 Pro support)

1. Select curve in the Curve Edit area. Such as click “Curve1”.
2. Click “.mat file”.



Before importing the .mat file, the format .mat file need to be prepared by user and placed in the file path (..\ITECH Electronics\BSS2000 Pro\BSS2000 Pro\Matlab), users can also directly click the folder link in the interface to enter.

3. Select the .mat file in **List of .mat** box.
 4. Setting the battery parameters.
 - Capacity: Simulate the capacity of a single battery.
 - Parallel: Simulate the settings for the number of batteries in parallel connection.
 - Series: Simulate the settings for the number of batteries in serial connection.
 - I+: Positive current limit, which simulates the maximum discharging current of the battery pack.
 - I-: Negative current limit, which simulates the maximum charging current of the battery pack.
 - Initial: Set the initial state of charge of the battery, include three mode, SOC/Voltage/Capacity and SOC value 0~100% corresponds to the voltage range from empty voltage to full voltage.
 - Count of Loop: Number of cycles
- Cut-off Condition: Cut-off conditions, including state of charge (SOC) and battery capacity.

2.3 Setting Protection and Alarm Functions

The user can set protection and alarm functions before testing. When the test reaches protection or alarm conditions, corresponding alarm or protection will be triggered.

Curve Protection

SOC Protection

SOC HIGH ALARM	110.00 %
SOC HIGH WARNING	105.00 %
SOC LOW WARNING	-5.00 %
SOC LOW ALARM	-10.00 %

OCV Protection

OCV HIGH ALARM	50.00 V
OCV HIGH WARNING	40.00 V
OCV LOW WARNING	7.00 V
OCV LOW ALARM	6.00 V

SOC Protection:

SOC HIGH ALARM/SOC LOW ALARM: Set high or low alarm protection for SOC. When battery SOC reaches the protection value during test, this protection will be triggered and the test will be stopped.

SOC HIGH WARNING/SOC LOW WARNING: Set high or low warning for SOC. When battery SOC reaches the protection value during test, this protection will be triggered and warning information will be displayed in Test Information area of the software.


OCV Protection:

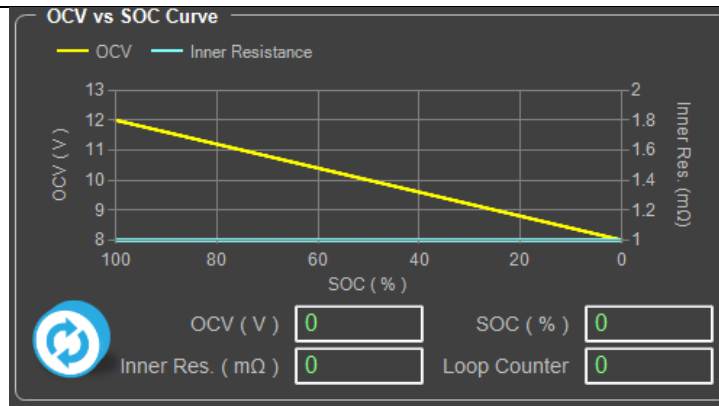
OCV HIGH ALARM/OCV LOW ALARM: Set high or low alarm protection for open-circuit voltage (OCV). When battery OCV reaches the protection value during test, this protection will be triggered and the test will be stopped.

OCV HIGH WARNING/OCV LOW WARNING: Set high or low warning for OCV. When battery OCV reaches the protection value during test, this protection will be triggered and warning information will be displayed in Test Information area of the software.

2.4 Previewing Curve

After setting related characteristics of the battery, the user can preview battery

characteristic curve on the interface. In the box shown below, click  to display the set battery curve.



2.5 Running Test

After the user sets various parameters of the battery simulator, directly click Test key on the main interface to start battery simulation test.



Description:



: preview battery characteristic curve on the interface. The curve cannot be previewed after it starts to run. The button will not be displayed.



: Start test



: Stop test





: Pause test

- Measurement: Real-time display of electrical performance parameters and SOC status of the existing simulated battery. During the test process, click

“Record” to record the existing test data in the CSV file under report file

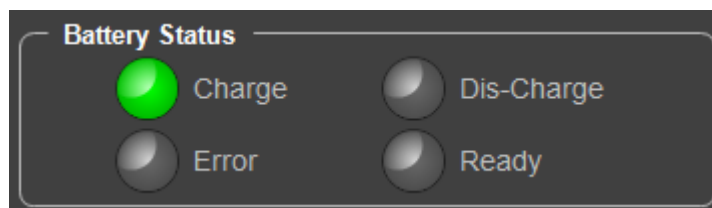



folder. The user can click  in the menu to directly open the report file folder.

- Measure Curve: Real-time display of voltage/current test curve.
The user can set the number of data points displayed and data sampling interval in Measure Curve area.
- Test Information: Display test information. The user can click  in the menu to clear test information.

2.6 Observing Test Status


During test, the software main interface displays four test statuses: charge, discharge, error and ready.

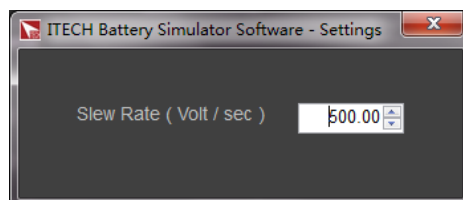


- Charge: The battery is in charging status, ITECH power supply is in Load mode, and sink power status.
- Dis-Charge: The battery is in discharging status, ITECH power supply is in Source mode, and output power.
- Error: There is an error, and the test stops. The test can be run again only when the error status is released. The user can click  in the menu to clear error status.
- Ready: The battery is in ready status for test.

2.7 Setting Voltage Slope




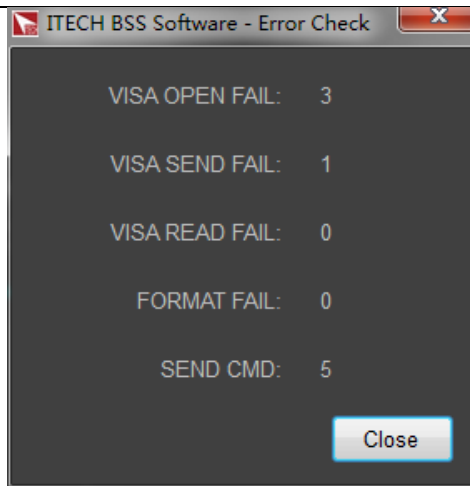
Click  in the menu to set the voltage change slope. When the test is ended, voltage will be recovered to initial voltage status based on set slope.




2.8 Checking Error information



Click  in the menu to check the error information communicating between PC and instrument.



2.9 Checking Software Version Information

Click  in the software menu to check the existing software version information.

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3. Select the most convenient contact for further consultation.