

Multi-channel Battery Simulation Software

ITECH BSS2000M 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

WARNING

A WARNING sign denotes a hazard. It calls attention to an operating procedure or practice that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING sign until the indicated conditions are fully understood and met.



NOTE

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

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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.

BSS2000M battery simulation software are specially designed to control battery simulation device, and comes with maximum 20 channel 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 of single channel are as follows (take the IT6000 for an example):



1.2 Preparation before Operation

- Connect to Device

This software need equipped with IT6000C/IT6000B/IT-M3600/IT-M3400. It can be connected with multiple instruments of different models or series to realize multi-channel test and multi-channel synchronous test. In the case of multi-channel independent testing, all functions are not limited. In the case of multi-channel synchronous testing, the user needs to pay attention to whether the specifications of the connected hardware devices meet the present setting when setting the curve. For example, when IT-M3600 and IT6000 series instruments are mixed connected, the voltage, current and power values are all supported by the minimum model, otherwise there will be an error.

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.

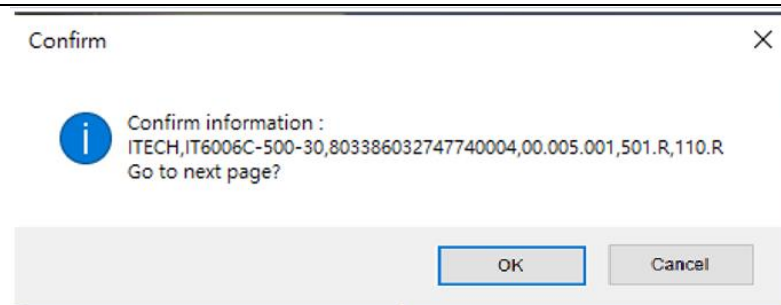
1.3 BSS2000M Initial Interface

Double-click the BSS2000M icon 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:

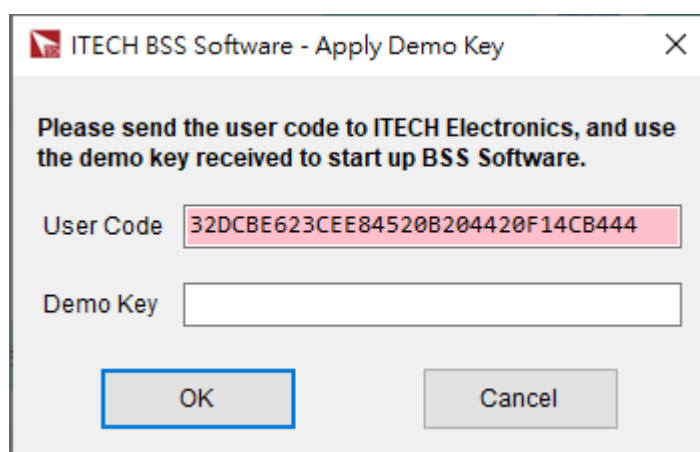
- Communication
Select the communication interface between the software and the device.
- About
Check BSS2000M information, such as name and version number.
- Scan
Scan communication interfaces for the device.
- Enter
When you first enter the main operation interface of the software, click [Enter], the 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

BSS2000M 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

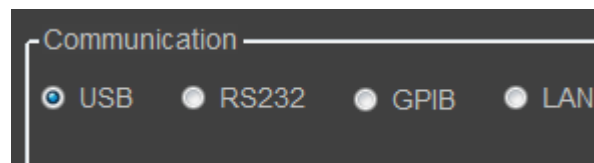
default, RS232 scans at Baud rate of 9,600). The user needs to connect the device to the computer. During hardware setting, select a hardware interface that is compatible with the one connected to the device, and set interface parameters based on different interface types.

Precondition

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

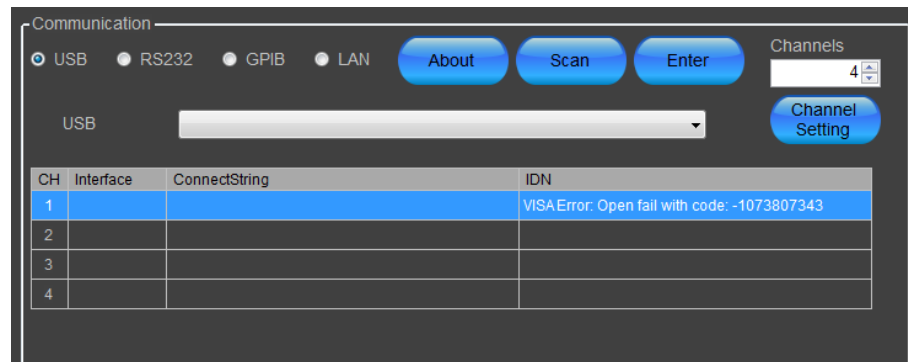
Operation steps

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

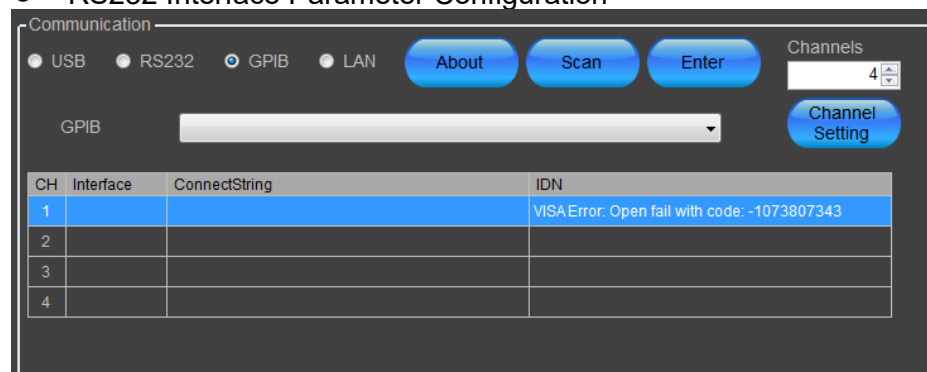


- After selecting the device interface, configure interface parameters at bottom. Click **[Scan]**.

● 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

Communication

☐ USB
 ☐ RS232
 ☐ GPIB
 ☒ LAN
 About
Scan
Enter

IP Address
 Port
 Channels
Channel Setting

CH	Interface	ConnectString	IDN
1			VISAError: Open fail with code: -1073807343
2			
3			
4			

GPIB Address: Set GPIB address of device.

● LAN Interface Parameter Configuration

Communication

☐ RS232
 ☐ USB
 ☐ GPIB
 ☒ LAN
 About
Scan
Enter

IP Address
 Port
 Channels
Channel Setting

CH	Interface	ConnectString	IDN
1			
2			
3			
4			

IP Address: Set LAN IP address of device.

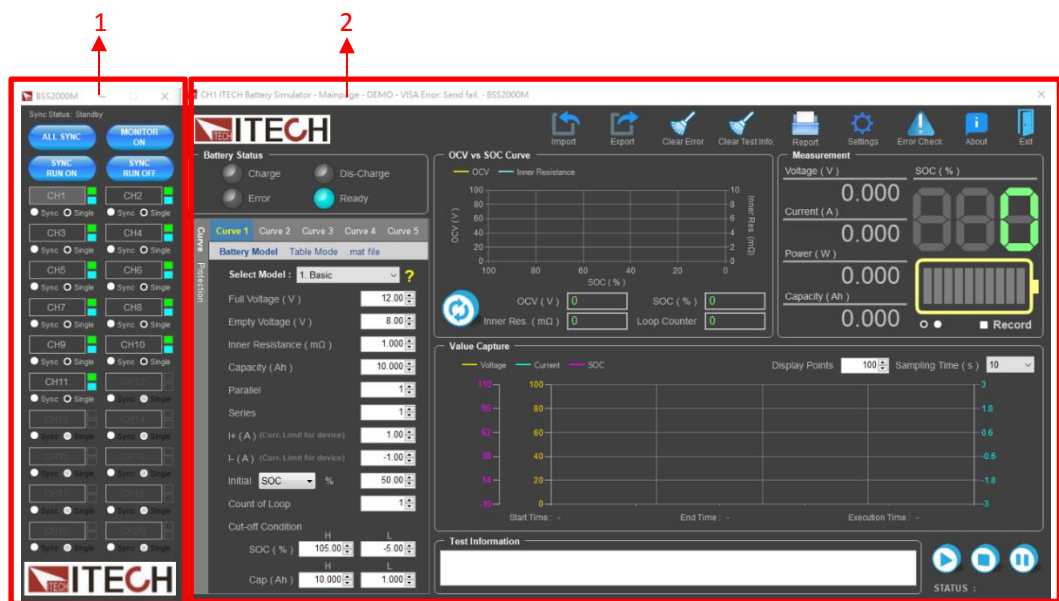
Port: Set Socket port of device, the default value is 30000.

Chapter2 Channel Control

2.1 Introduction of Main Interface

BSS2000M battery simulation software of multi-channel solar battery can support the test of 20 channels at maximum. In the channel control menu, you can control multiple channels for synchronous test; and can also conduct an independent test for single channel.

After successful connection of instrument communication, click Enter and enter the main interface, as shown below.



1: Channel control area. In this area, the user can realize the following functions:

- Switch Channels
- Set whether to synchronize the channels
- Set to turn on or turn off outputs of all channels
- Check the simulation execution information of all channels

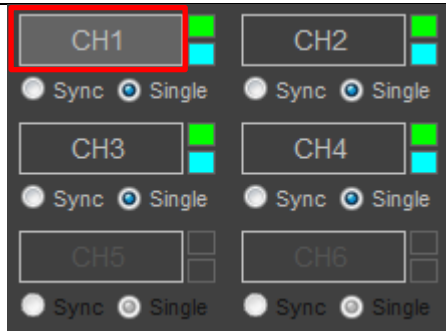
2: Main interface of channel test: execute the battery simulation test

2.2 Channel Control

This software can be connected to 20 channels at maximum. The connection state of each channel is displayed in the channel control menu. If the channel is connected normally, the green box at the right top of the channel displays green. The user can set the channel in active state. The user cannot set the channel in non-active state, which displays gray.

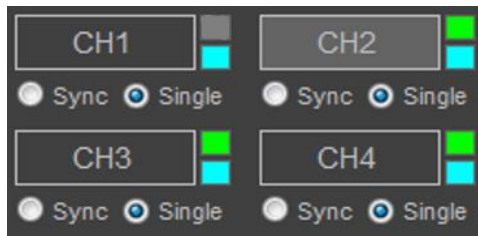
Switch Channels

The user can click the normally-connected channel number to switch the present channel test interface. As shown below. At present, CH1, CH2, CH3 and CH4 channels are connected, and the real-time test main interface is switched to CH1.



Close the Channels

The user can close the main interface of present channel test and off line the channel, and the cahnnel director light will be change to GRAY when the channel is off line. Click the channel control button repeatedly to connect the channel again, and the channel director light returns to GREEN. The CH1 is closed is shown as below.



Set Channel Synchronization

There are Sync and Single option boxes under each channel. The user can select Sync to set the channel for synchronous operation. Select Single, and set that the channel is not to involve in the synchronous operation.



The user can uniformly switch all channels to the Sync mode, and the button turns to ALL SINGLE. Click the button again, and all channels are switched to the Single mode.



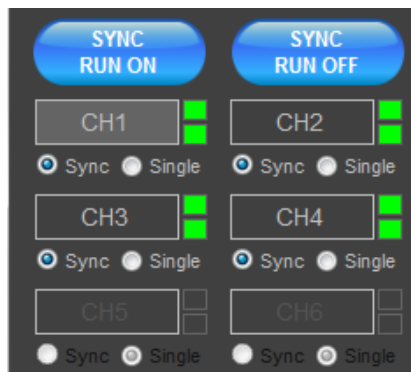
Turn On/Off Channel Output

The user can directly control the output of all channels in the channel control menu, as shown below. When the SYNC RUN ON button is pressed, the outputs of all channels are turned on simultaneously, and the right bottom box displays green. Or, click SYNC RUN OFF to turn off the outputs of all channels simultaneously.

Turn On/Off Channel Output

The user can directly control the output of all channels in the channel control menu, as shown below. When the SYCN RUN ON button is pressed, the outputs of all channels are turned on simultaneously, when the Battery Status is charge,

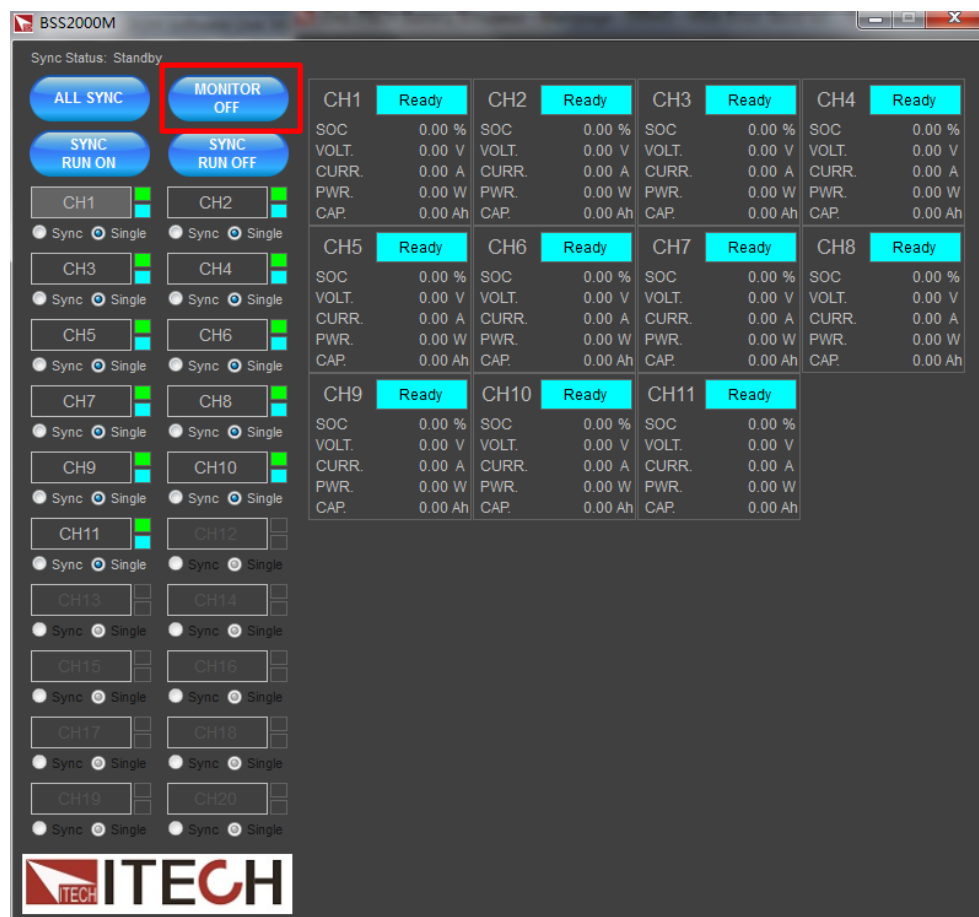
the right bottom box displays green. Or, click SYNC RUN OFF to turn off the outputs of all channels simultaneously.



Check Test Information




Press **MONITOR ON** in the channel control menu. The user can check the output state and test running information of all channels.



Check Channel Synchronization State

The synchronization state of the present channel is displayed at the right top of the channel control menu. When several channels run tests synchronously, the user needs to check whether the real-time operation is completed synchronously, and whether Sync Status is Standby. If the synchronization is executing (for

example

Sync Status: Executing 

synchronization is completed.

is displayed), please wait until the real-time



Note

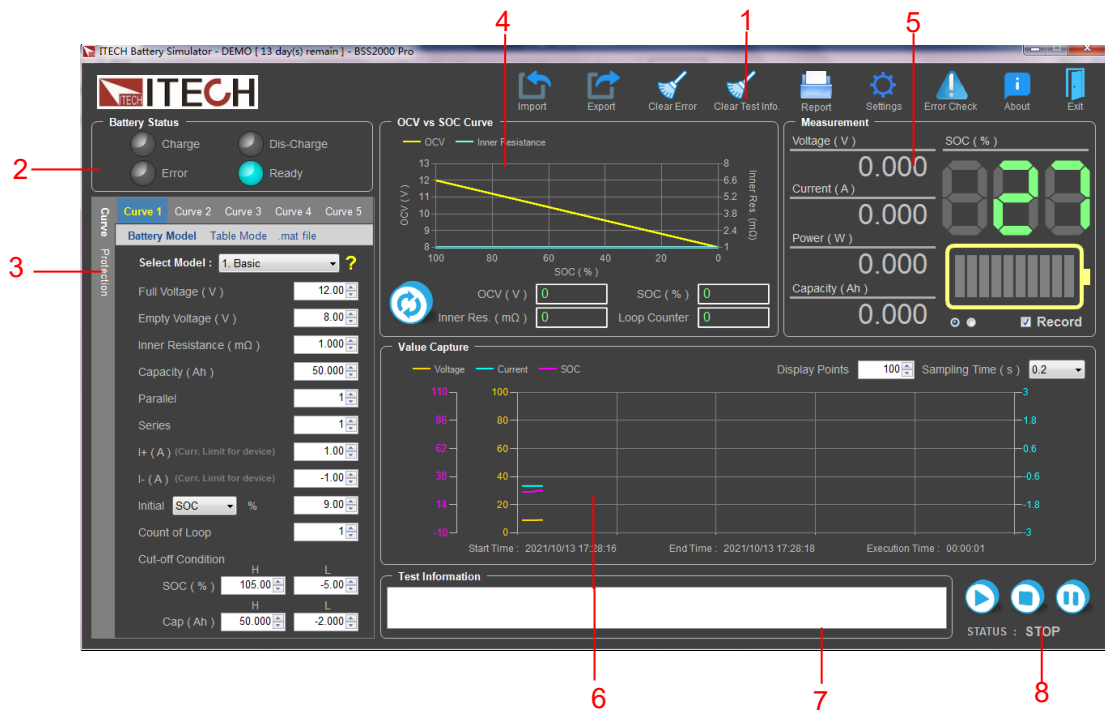
If you continue to operate when the system is executing, the software may crash.

Chapter3 Battery Simulation Test

BSS2000M 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 BSS2000M software as an example, BSS2000M software interface is the same as BSS2000M software except that BSS2000M software interface does not support importing .mat file and there are few optional battery types.

3.1 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

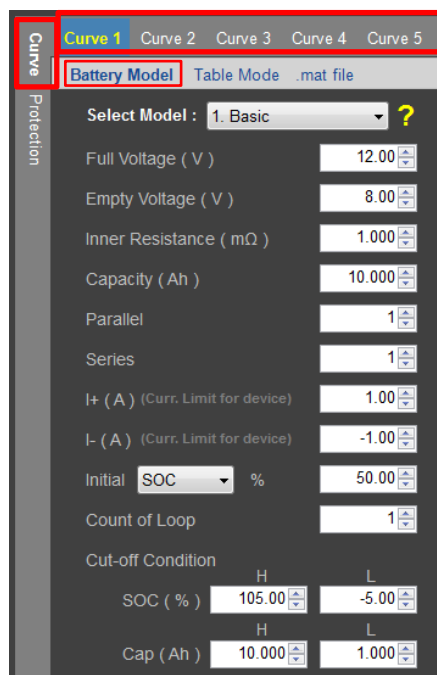
3. Test curve setting area for battery simulation test and protection setting area
4. Preview curve for battery simulation test
5. Measurement data display area
6. Voltage/current measurement curve
7. Information display area during test process
8. Test key

3.2 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". BSS2000M 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
3. Setting the battery parameters and state according to the battery specifications.

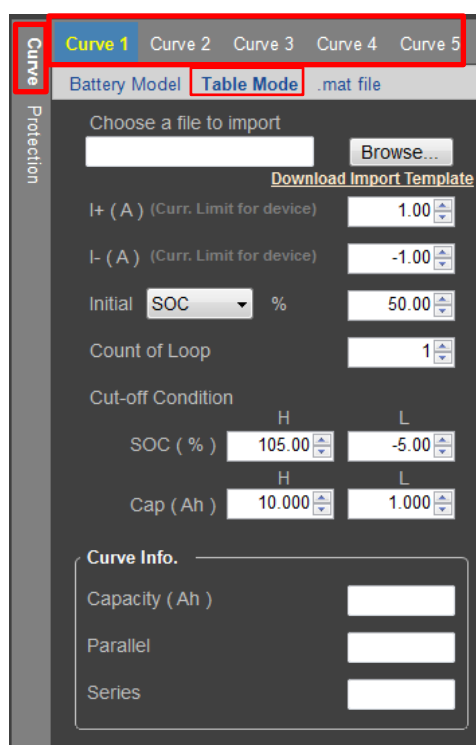


- Full Voltage: Simulate the voltage value when a single battery is in full-voltage status.
- Empty Voltage: Simulate the voltage value when a single battery is in empty-charge status.

- 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.
- 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.

Importing Curve from Table

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



The screenshot shows the 'Battery Model' configuration window. The 'Curve' tab is selected, and 'Table Mode' is chosen under the 'Battery Model' section. The 'Table Mode' section contains fields for I+ (A), I- (A), Initial SOC (%), Count of Loop, and Cut-off Condition (SOC (%) and Cap (Ah)). The 'Curve Info.' section contains fields for Capacity (Ah), Parallel, and Series.

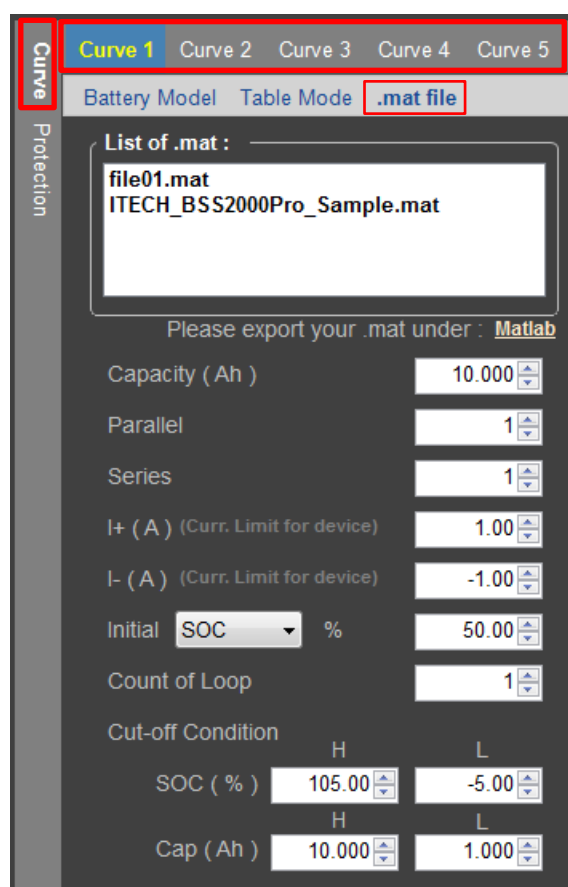
- Choose a file to import: Select the battery characteristic curve file to be imported. Click "Browse..." and select the .CSV curve file. If you need create a new curve file, you can click "Download Import Template" to download a .CSV file for template.
- I+: Positive current limit, which simulates the 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.

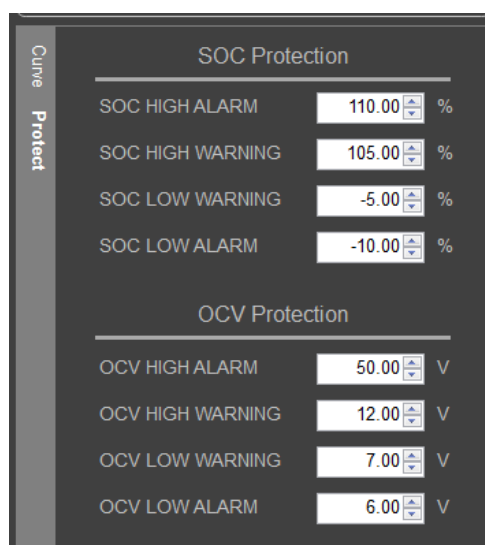
3. Select the .mat file in **List of .mat** box.
4. Setting the battery parameters.
 - Capacity: Simulate the capacity of a single battery.
 - Parallel: Simulate the settings for the number of batteries in parallel connection.
 - Series: Simulate the settings for the number of batteries in serial connection.
 - 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.

3.3 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.



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	12.00 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:

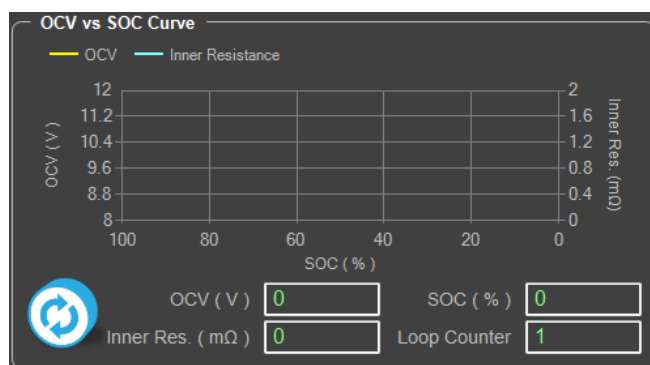
OCV HIGH ALARM/OCV LOW ALARM: Set high or low alarm protection for open-circuit voltage (OCV). When battery OCV reaches the protection value during test, this protection will be triggered and the test will be stopped.

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.

3.4 Previewing Curve

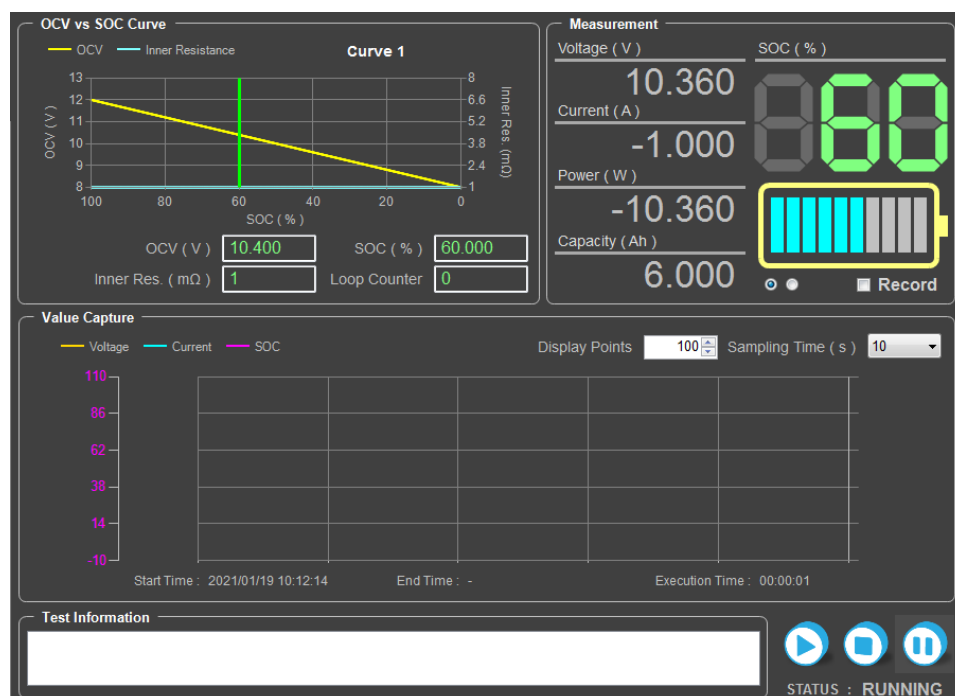
After setting related characteristics of the battery, the user can preview battery characteristic curve on the interface. In the box shown below, click  to

display the set battery curve.



3.5 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

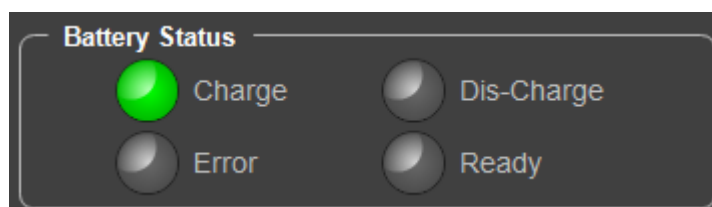



: Pause test

- 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.


3.6 Observing Test Status

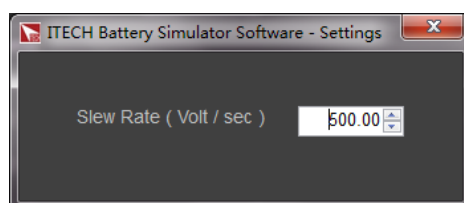
During test, the software main interface displays four test statuses: charge, discharge, error and ready.




- 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.

3.7 Setting Voltage Slope

Click  in the menu to set the voltage change slope.



3.8 Checking Software Version Information

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

Contact US

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1. Please refer to the CD-ROM of related user's manual in package.
2. Visit ITECH website www.itechate.com.
3. Select the most convenient contact for further consultation.