

**NEWARE**  
**BATTERY TESTING SYSTEM (V-BTS8-MA)**  
**Operation Manual**



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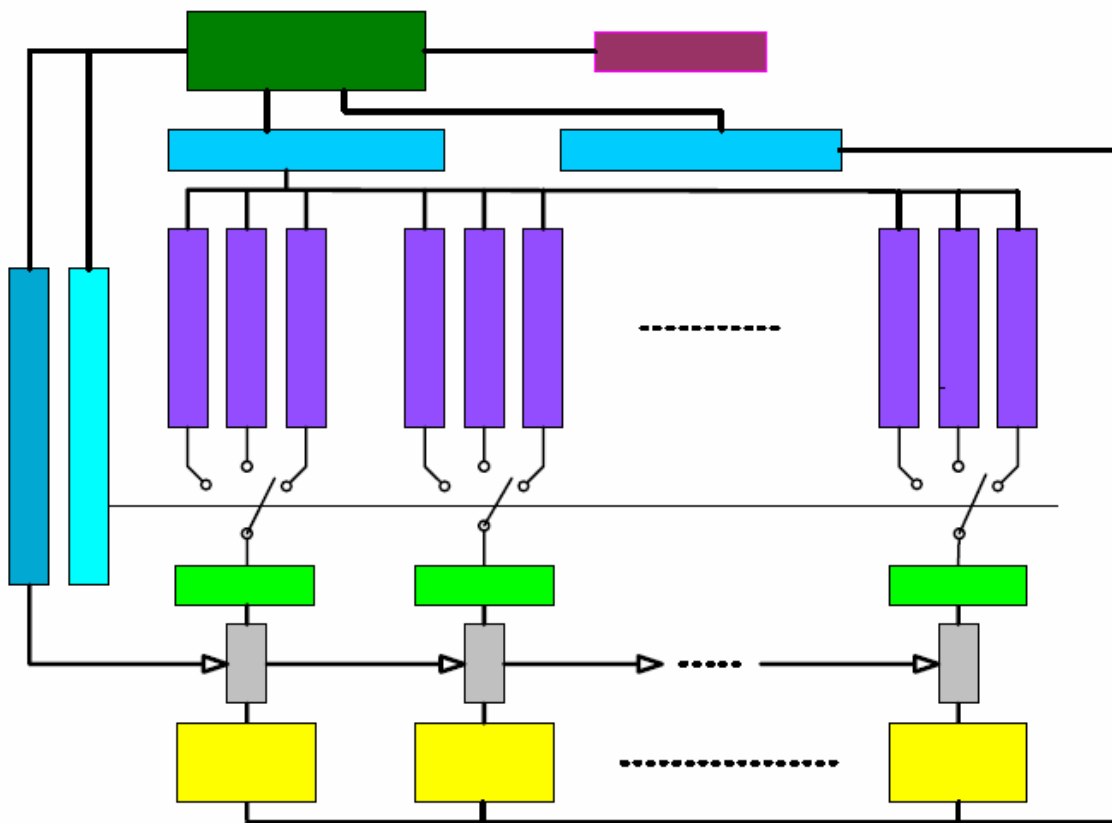
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Thank you for purchasing BATTERY TESTING SYSTEM. To avoid any misuse and damage, please read the operation instruction carefully before operation

## 1. Introduction

NEWARE Battery Testing System series is a general purpose, multi-channel battery testing system for Li-polymer, Li-ion, Ni-MH, Ni-Cd, etc, batteries. This system provides most applications in battery testing fields such as materials research, battery performance test, small-scale battery formation, capability grading, and battery pack testing, etc. According to the international standard design, each channel of the system has an independent constant-current source and a hardware constant-voltage source. Constant-current source and constant-voltage source can be programmed and controlled as desired. In addition, an independent pulse source is added to each battery channel to meet with the requirements of dynamic internal resistance measurement. NEWARE Battery Testing System series adopts module construction. With plug-and-play design, the user can freely remove and load the module units under a nonstop status without interrupting other module units' normal running. This function is convenient for the system's maintenance.



*Principle of Internal Modular Construction*

## 2. Performance

- **Advanced and easy-to-use battery grading function**

According to the battery's capacity, internal resistance and charge/discharge platform, the NEWARE Battery Testing System series can grade the batteries. After the user set the standards of separation, the system will analyze the test result data automatically, confirm the consistency indicators for the batteries under test and provide a test result report. At the same time, the LED on the channel will indicate the physical location of the batteries with the same grade.
- **Each module provides 8 independent programmable channels**

With built-in power supply, and complete controllable circuit, each module can work independently. Each channel can set different working modes. Channels are completely independent.
- **Fine programming characteristic**

The system software can set working steps and working parameters, working modes of each step flexibly. Working modes includes constant current discharge, constant current charge, constant voltage charge, rest, GOTO, (internal resistance measurement). Each working modes can set voltage, current, time, capability, negative voltage slope, and other limit conditions, the relation of which is "logic or". When the present limit conditions are met, the system will continue next working mode automatically. The set program can be saved and opened in the form of Schedule.
- **Complete controllability**

The system software has GOTO, restart and resume functions which allow the user to change the working parameters at any time.
- **Windows-based software interface, Stable performance, and easy operation**

The operation mode of the system' software is close to that of its excellent foreign counterparts and is easy to operate. With real-time monitoring windows and integrated graph/data windows, the testing process can be observed more directly and efficiently. During the test, the software will give timely instructions and warnings, provide intelligent help.
- **Powerful data and graph processing function**

The software of The NEWARE Battery Testing System adopts standard SQL data-base management, and is compatible with Access, Excel. It features large data processing capacity. The user can define the curve coordinate himself such as voltage-time curve, current-time curve, capacity-voltage curve, loop times-charge/discharge capacity curve, loop times-charge/ discharge efficiency curve, etc.
- **Dynamic battery internal resistance test (optional)**

Each channel of The NEWARE Battery Testing System has a built-in pulse source which can calculate battery's internal resistance by means of applying HF pulse to the battery and measuring the battery's sub-voltage. Internal resistance test can be conducted automatically during the process of charge and discharge.

- **Complete test process record (log function)**

The NEWARE Battery Testing System series can make a complete record of all the events happened in the test. During the process of test, some accidental events such as power failure, system shut down, erroneous communication, erroneous operation and forced operation and so on will lead to sudden changes of the test data (sudden changes of the voltage or current). By checking the record, user can more easily find these external interferential causes.

- **Intelligent power failure protection**

In the event of power failure in the process of test, the testing system will automatically shutdown preset running channels. And when the power failure has recovered, the system will automatically resume those stopped channels and ensure that the test is normally conducted and the date will never lose at any cases.

- **Specially made battery flips**

The NEWARE Battery Testing System series provides many types of battery flips. The relative separation of the flips and the machine as well as the software and hardware self-protection of the system (over voltage, over current, etc) increase the safety of the system greatly and ensure the user's carefree test.

**General-purpose (4 leads) flips:** This type is designed under the proposal of the experts and to meet the requirement of mass production. It is applicable to fix various types of cylinder and square batteries. This type is reliable, durable and easy to maintain.

**Flips for R&D use:** This type can lead out all the charge/discharge electrodes and measuring electrodes by using alligator flips and facilitate the fixing of any type of abnormal-shaped batteries or battery groups.

**Li-polymer battery flips,** with a constant temperature cabinet.

**Mobile phone battery flips**

- **4-electrode measuring**

All the battery fixtures have 4 electrodes, including 2 current ends and 2 voltage measuring ends. Multi-electrode measurement improves measuring accuracy.

- **Channel can be inputted impedance up to 10MΩ**

Any battery channel of the NEWARE Battery Testing System has more than 10MΩ input impedance and its current leakage is less than 0.5μA. This feature ensures the reliability of the test result and provides good guarantee for the micro- current measurement.

- **High reliability**

Standard production follows the procedures of ISO9001;

Aging test on randomly selected samples prior to delivery of products;

Independent protection circuit in every channel to prevent over current and over voltage;

Upper and lower dual software protection.

The parts of the equipments are all imported through formal channels

- **Measuring voltage up to 45V** Normally, the system provides -5V-+5V voltage measuring range. We also produce equipments with 10V, 20V, 45V voltage.

- **Control current up to 40A, and up to 200A after parallel connection** Normally, the system provides  $-1.8A$ - $+1.8A$  current output range. we also provide equipments with current up to 3A, 6A, 10A, 20A, 30A,40A. For the customers engaged in material research, we can provide the battery test system of 5mA, 10mA test range, and the minimum current can be up to 0.01mA.
- **Timely before sale service and after sale service** Our purpose is to manufacture the most satisfied products and provide the most considerate service for every customer. We will be glad to provide technical training for free if you are interested in our products. At any time, our engineers are ready for answering any of your questions about our products. If you are planning to buy our products, we may send some sample machines to your company first for your trial use free of charge. We sincerely welcome you to our company for a further understanding of our products. We provide free maintenance during one year after the sales, and only charge for the cost after the guarantee period. We will constantly follow the status of our products by contacting our customers. Please also note that we will timely provide the latest upgraded software of our products to our customers all the time.

### Specification

**Input Power: Optional for 110V AC or 220-240V (Select input power via "Input Power" menu)**

**Power Output Range: +/- 10mA**

**Input Impedance:  $= > 10$  m-ohm**

**Voltage measurement range: +5V**

**Power: 120W**

**Current measurement accuracy: +/- (0.2% of reading + 0.1% of range)**

**Voltage measurement accuracy: +/- (0.1% of reading + 0.05% of range)**

**Time measurement resolution: Second**

**Cycle measurement range: 1-9999 times**

**Data register conditions: 5-900S Time interval, 5-5000mA Range of Voltage, 0.1-10mA Range of Current**

**Port: Network**

**Size: 245mmW \* 197mmD \* 60mmH**

**Weight: 11.5Kg**

## 3. Hardware Structure

### 1. The Front Panel

- ① Power On/Off
- ② Power and mode LED
- ③ Channel working LED

### 2. Picture of Rear Panel

- ① Communication port socket
- ② Power socket



### 3. Description on Battery Fixture

#### 1. General-purpose battery fixture

As shown by **Picture of the Front Panel**, the lower clip is used to fix and the upper clip is used to move upward and downward to meet the different sizes of batteries.

#### 2. Alligator clip

Every set of fixture is composed of two alligator clips, one is red and the other is black. Including:



The large red alligator is power output positive electrode and the small one is voltage test positive electrode. They should be connected with the positive electrodes of the batteries.

The large black alligator is power output negative electrode and the small one is voltage test negative electrode. They should be connected with the negative electrodes of the batteries.

#### 3. Combined battery fixture

Equipped in line with the type of user's combined battery.

#### 4. Connection with Computer

Generally, the computer provides at least one RS232 serial communication port. Plug one end of the communication cable (provided with the test system) the communication port socket at the back of the rack and the other end into the RS232 serial communication port of the computer.

## 4. Instructions on Software

### 4.1 Software Operational Environment

- PII/300 or higher PC computer
- 64MB or higher internal memory
- 1GB or higher free hard disk space
- Microsoft™ Windows 2000 operation system
- One effective RS232 communication port

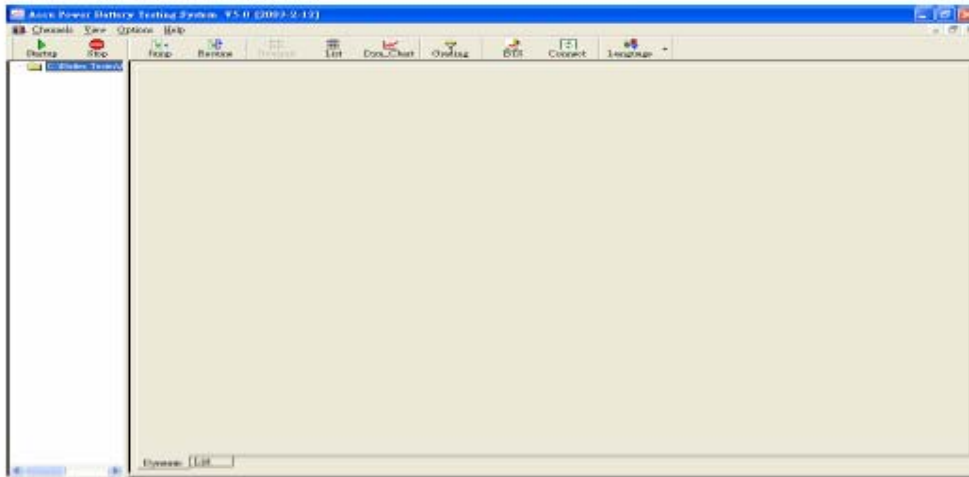
### 4.2 Installation

- a) Create C:\neware in disc C;
- b) Copy files on CD-ROM to C:\neware.
- c) Create TestCtrl.exe shortcut on the desktop;

d) Double click TestCtrl shortcut with the mouse to start up the test program automatically.

### 4.3 Software Startup

Double click the TestCtrl shortcut icon with the right key of the mouse to start TestCtrl. The main interface is as below:



#### [Function of the right key of the mouse]

TestCtrl frequently uses the right key of the mouse. Click the right key of the mouse at different positions of the interface to pop out different floating to complete the required operation.

#### [Notes]

**Switch on the battery test system prior to the startup of the software.**

TestCtrl will automatically check and make sure whether all the modules of the battery test system are effectively connected (the quantity of the rack connection is shown at the lower left corner of the interface). In case some modules are found unconnected, check should be conducted as whether the computer serial port is effective or the communication line connection is reliable.

TestCtrl can intelligently identify the serial port code and serial port transmission rate.

### 4.4 Profile of Software Function

TestCtrl software is a constituent of the NEWARE battery testing system series. To use all the functions of this software, there has to be corresponding hardware support of battery test system

This software has the 7 main functions as for the battery test.

#### a) Startup channel:

Software support conducts independent programming on the working mode and working procedures of every battery channel. After startup, the channel begins to work in line with the programmed working mode and working procedures. The working mode includes constant-current charge/discharge, constant-voltage charge, static setting, GOTO, internal resistance and internal resistance test. Every working mode constitutes one step of the working procedures.



**b) Stop channel:**

After completing all the preset work, the working channel will stop automatically. Meanwhile, the user can stop it compulsorily by using the software.

**c) Jump:**

While the current procedure of a channel is being executed, the user can force it to stop and have it go to the designated working step. Meanwhile, the battery status and test data of the corresponding channel will go on as usual.

**d) Restart:**

Restart means online correction of data. If, after working on a channel for some time, the user decides to change the working parameters under dynamic status as required by actual situation, the restart function can be used for this purpose. Like “Jump”, “Restart” can guarantee the battery status and test data of the channel go on as usual.

**e) Real-time inspection:**

The software support conducts real-time observation on the working channel status (voltage, current, capacity, times of cycles, etc.). Under this real-time observation status, the software simultaneously provides convenient and quick channel control and operation interface.

**f) Inquiry Status:**

Conduct real-time inquiry on the working status of the working channel.

In addition, this software has the following functions intended for data processing and data output:

**a) Text data display:**

Displays such data: time, current, voltage, battery internal resistance and process capacity.

**b) Curve display:**

Displays user-defined coordinate curve, such as voltage-time curve, current-time curve, capacity-time curve, capacity-voltage curve, ratio capacity-voltage curve, cycle-charge/discharge capacity curve and cycle-charge/ discharge efficiency curve. The above data and curves both support printer and print preview and print is adaptive to paper range.


**c) Other functions:**

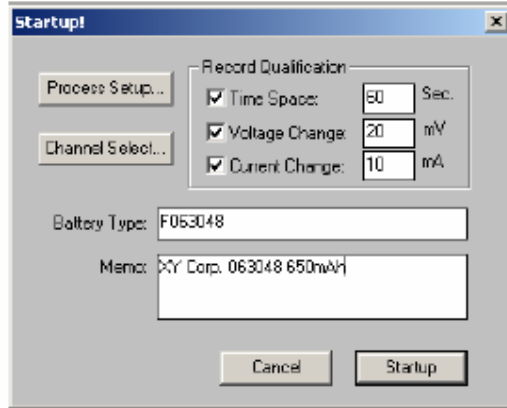
For example: Cursor tracking in graph area, graph-data context, inquire working information, inquire test process, inquire operating record, generate text data file, etc.

## **4.5 Application of Software Function**

### **4.5.1 Control Operation**

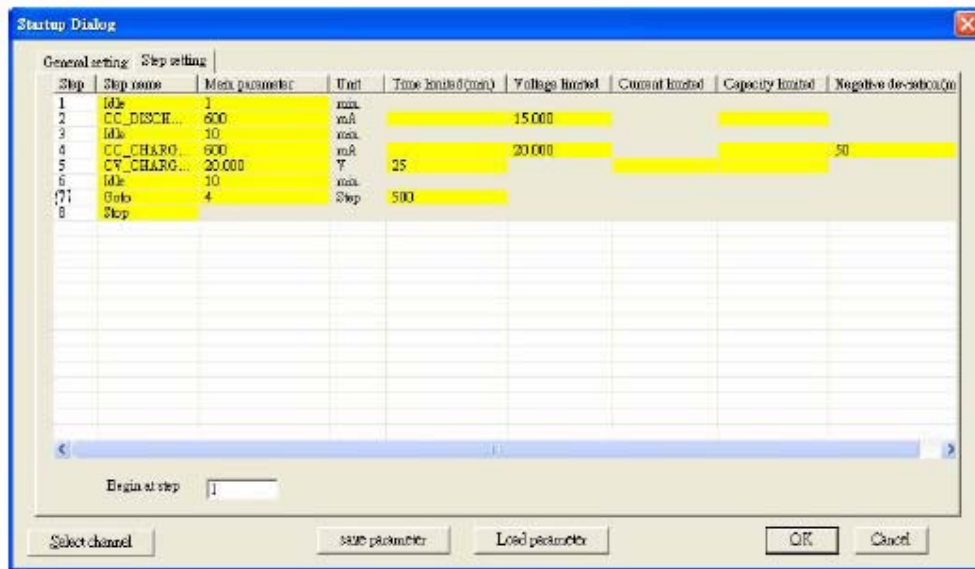
#### **4.5.1.1 Start channel**

Select menu "Channel" → "Start..." (or directly click shortcut icon ) to enter "Channel start" dialog box.



Record Qualification includes three options such as Time space, Voltage change and Current change and multiple options can be effective simultaneously. If multiple options are selected simultaneously, "**Logic or**" relations exist between the respective options. If any one option is satisfied, one datum is recorded. Simultaneous selection of multiple options can have the user record fewer but more important data. Memo column is used to write in memorandum information and store data file automatically for inquiry and printing.

After setting Record qualification and keying Memo information, click Process setting button to enter "Job & Process Setup" dialog box.



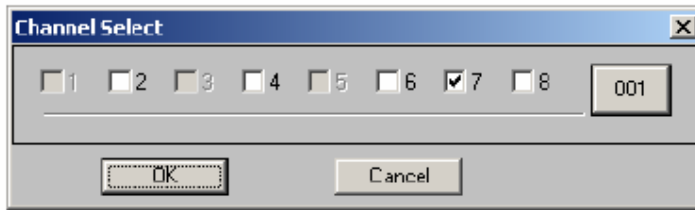
In the "Startup" dialog box, the user can set up or edit every working process and set up "Execute from Step X". Of this, every working process includes three sections: Working mode, Main parameter and Limiting condition. Working mode can be constant-current charge, constant-current discharge, constant-voltage charge, static setting, GOTO, internal resistance test, stop, etc. As for constant-current charge and discharge, the main parameter is the charge or discharge current value. As for constant-voltage charge, the main parameter is the charge voltage value. As for the static setting mode, the main

parameter is the static setting time. As for GOTO mode, the main parameter is the code of the GOTO working process. As for the internal resistance mode, the main parameter is the estimated capacity value of the battery to be tested (it is allowed without setting), which can influence the pulse current value used when testing internal resistance. The stop process has no main parameter. The limiting condition can be different depending on different working conditions. As for various types of limiting conditions, if no data is entered, it means that limiting condition is not used. If multiple limiting conditions are used for a certain working process, “**Logic or**” relations exist between the various limiting conditions. “**Execute from Step X**” is mainly used for “**Restart**”.

All the working procedures can be as many as 10 steps at maximum. If the stop working mode is not included, the system will stop automatically after it completes the last step.

[Notes] “**Schedule**” means: **Schedule** saves in the form of file all the working procedures currently set up by the user. It is not necessary to set up again if the user decides to use the same working process parameters next time. What the user has to do is to export the “**Schedule**” file saved previously. This is very convenient for users who frequently use the same working process parameters.

After setting the working procedures, press **Confirm** button to confirm and complete the setting of the working procedures. Press “**Cancel**” button to cancel the setting, then return to the status before the setting or editing and finally return to “**Start channel**” dialog box.




In the “Channel startup” dialog box, click “Channel selection” to enter “Channel selection” dialog box. Select the channel to be started and press “Confirm” button to return to the “Start channel” dialog box.

[Notes]: In case certain channels become gray in the “Channel selection” dialog box, they cannot be selected and it means that these channels are working. The “**Start channel**” command is effective only for those inactivated channels.

Finally, click **Startup** button in “**Channel startup**” dialog box to complete the “**Start channel**” operation.

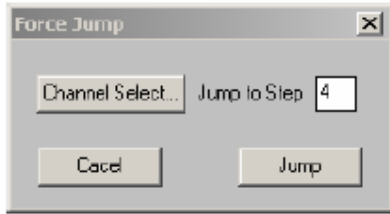
#### 4.5.1.2 Stop channel:

Select menu “Channel” → “Stop...” (or directly click shortcut icon ) to enter the dialog box of “Channel selection” to be stopped.

[Notes]: Opposite to the “Channel selection” dialog box in Channel start, if the channels in the “Channel selection” dialog box turn gray, it indicates they are not working. The “**Stop channel**” command is only applicable to the working channels.

#### 4.5.1.3 Jump:

Select menu “Channel” → “Jump...” to enter the channel “Jump” dialog box.



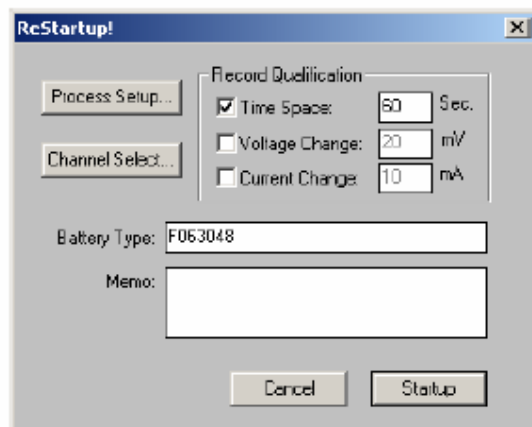
In this dialog box, the operation of “Channel selection” is similar to the operation of “Channel Selection” in Start channel.

After the channel executes Jump, the battery status and test data of the corresponding channel go on working as usual.

[Notes]: “Channel Jump” is not allowed to jump to “Stop” or “GOTO” working procedures (because it is meaningless) or allowed to jump to any undefined working procedures. Otherwise the operation will be deemed invalid.

#### 4.5.1.4 Restart:

Select menu “Channel” → “Restart...” to enter the “Channel restart” dialog box.




Basically, the dialog box interface and operation of this dialog box is similar to “Start channel” operation except that the “Channel selection” operation is only applicable to working channels.

[Notes]: If only the process parameters or limiting conditions are to be modified and respective working modes remain unchanged, it will be necessary to set “Execute from Step X” (“Step X” refers to the step being executed prior to restart) to ensure that the channel works in the previous working process after restart.

After the channel executes restart, the battery status and test data of the corresponding channel go on working as usual.

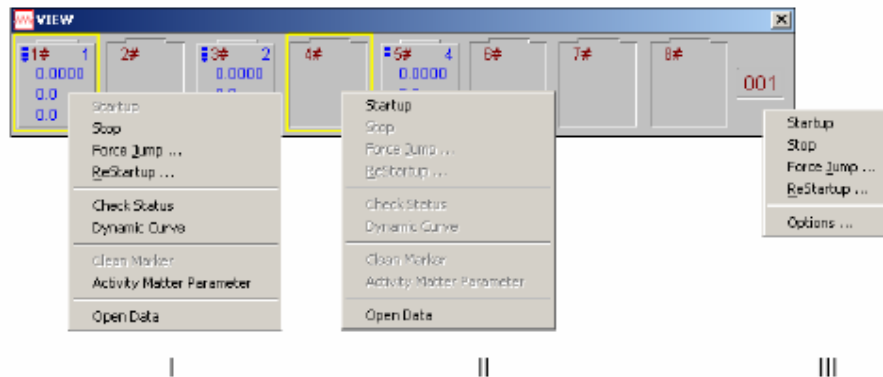
#### 4.5.2 View: Real-time observation:

Select menu "View" → "Brief View..." (or directly click shortcut  icon ) to display view window. Repeat the same operation to hide the view window.



Now, for the channel that is not working, it will display the channel code only, i.e., \_001\_5 indicates Channel 5 in Case 001. Meanwhile the battery profile will notch down. For working channels, the four items such as times of cycles (upper right corner), voltage (V), current (mA), capacity (mAh) will be displayed from upper to lower. If the channel is in the charge mode, a downward blue arrow at the upper left corner will conduct dynamic display. In case of discharge, an upward red arrow at the upper left corner will conduct dynamic display. In case of static setting (noncharge and nondischarge), no arrow will display. In addition, internal resistance is a special process and so there is no arrow indication and the battery profile will notch down to distinguish static setting.

**[Notes]: It is easier and more convenient to operate the channel with the right key of the mouse in the view window.**



As shown in the diagram, right-click the view window to pop out two floating menus ("I" and "II" are fundamentally the same). In the menu mode, only the items in the menu that pops out are effective (not in gray). This is related to the quantity of the selected channels, the channel working mode and the positions of the mouse when right-clicked.

**How to select channel:** Right-click the channel battery profile and a yellow square box will pop out. This means that the channel is selected. Press CTRL button and right-click the mouse simultaneously to select multiple discontinuous channels one by one. To select multiple continuous channels, first right-click the mouse to select one and then press SHIFT button and right-click the last one simultaneously to achieve the selection of multiple continuous channels.

**How to foresee the status of the pop-out menu:** In case of right-clicking the mouse in the selected channel battery profile to pop out menu "I" and "II", and if all the selected channels are in the working mode, such operations as "Stop", "Jump" and "Restart" can be conducted. If all the selected channels are in the non-working mode,

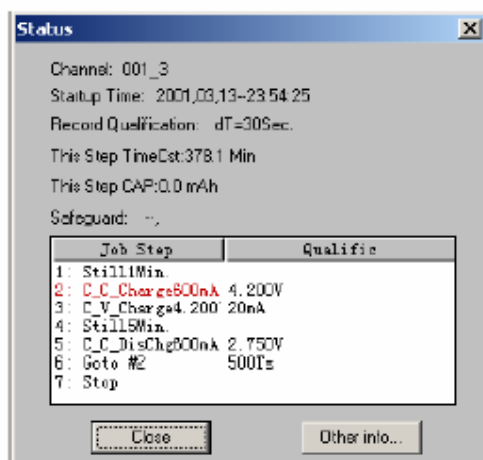
“Start” can be conducted. Besides, if only one channel is selected and the channel is in the working mode, such operations as “Inquiry mode”, “Active material parameter” and “Open data” can be conducted. And when the channel is in the non-working mode, “Open data” can be conducted.

If right-clicking between the channel battery profiles, menu “III” will pop out.

Here, “Start”, “Stop”, “Jump” and “Restart” are completely the same as described above except that the channel is already selected. Other operations will be expounded below.

#### 4.5.3 Channel Information (Inquiry mode):

After the floating menu pops out in the view window, left-click the mouse for “Inquiry mode” (Notes: The selection of the menu in the floating menu is also achieved by left-clicking the mouse) to display the “Inquiry mode” dialog box. Here, the red item in the working process refers to the step being executed.



#### 4.5.4 View Result Data:

After the floating menu pops out in the view window, left-click the mouse for “View Result data” to automatically open the test data file in the corresponding channel. See instructions below for the operation of relevant data.

#### 4.5.5 Result Data Processing and Data Output Operation:

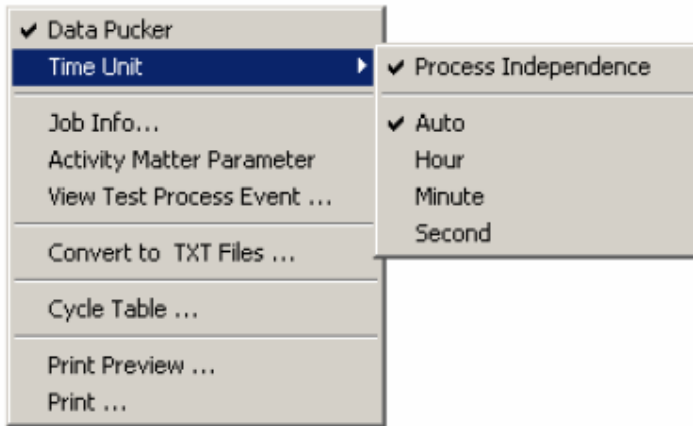
##### 4.5.5.1 Text display:

Select menu “File” → “Open file” (or directly click the shortcut icon ) to enter “Open file”

window. Select and open data file (the data file expanded name is .bts) and the interface will appear. In the interface, the left is the curve and the right is the text data. In the text data, the data is arranged in line with every process.

**[Notes] Right-click the mouse in the text to operate data display and data print.**

As shown in the graph, right-click the mouse in the data text to pop out a floating menu. Below is a description on how to select the options of the floating menu.



**A. Data fold:**

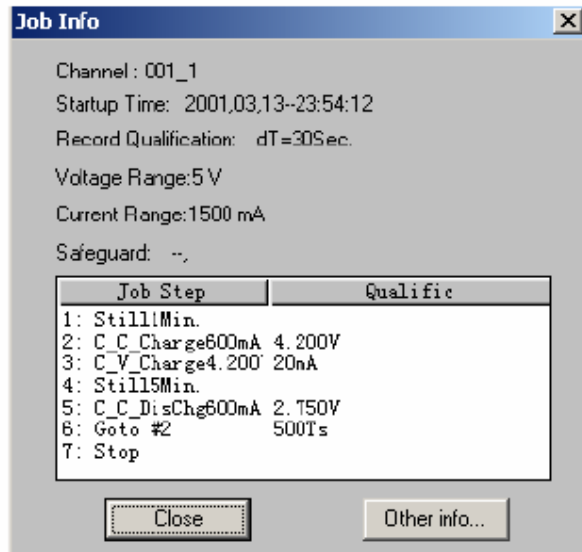
Select Data fold function to display the first and the last data for all the data included in the process, which facilitates an overall view of the whole process. If the Data fold function is not selected (data extension instead), all the content included in the process will be displayed, which facilitates the view of details.

**B. Time unit:**

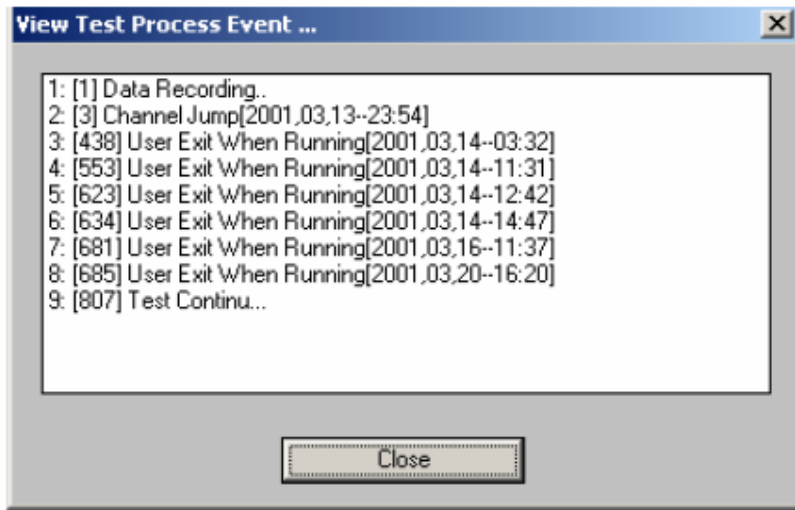
Select Process independence and the timing starts from zero for every single process in the data displayed. Otherwise, the timing is accumulated and continuous between various processes.

**C. Working information:**

Working information is used to view the information such as the working processes of starting time and process.



**D. View test procedure:**



The Test process record records the type of events, system time and data number when the event took place.

#### E. Generative text file:



To save disk space and ensure the completeness of the data, the data file (\*.res) is in binary format. However, the software provides the function to convert the binary data into text data format (\*.txt). In the default mode, the data file format in the generative text file is the same as the display format of the text data.

**[Notes]:** Cancel the optional setting to generate a “clean” text file used as input file of table or graph software like Microsoft Excel.

#### F. Print and print preview:

The software supports the printing of the designated page.

#### 4.5.5.2 Curve display:

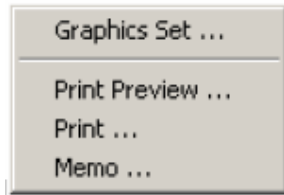
After opening the data file, the software automatically displays curves and text data. Below is a description about the operation.

##### A. Change the display size of the graph:



Move the mouse to the right edge, lower edge or lower right corner of the square box and the cursor will become a dual arrow. Now left-click and pull the mouse simultaneously to change the size of the square box and the graph changes in size accordingly.

**[Notes]: Right-click the mouse in the square box to conduct such operations as graph display and print.**



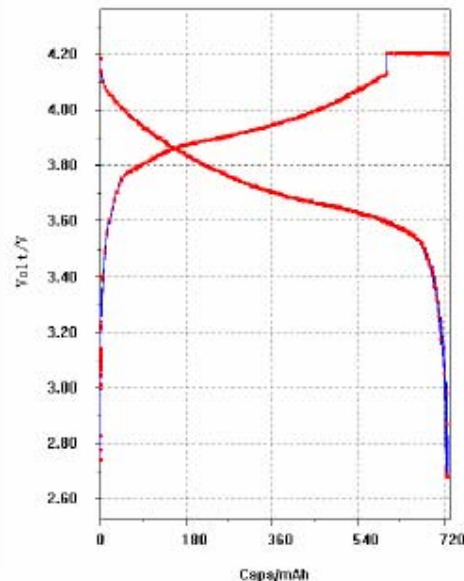
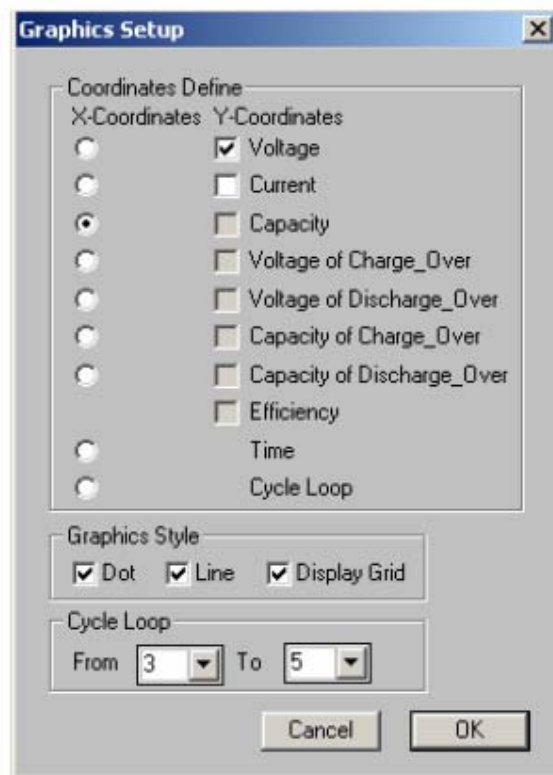
Right-click the mouse in the square box to pop out a floating menu. Below is a description for the options of various menus.

### B. Graph setting:

Left-click Graph setting in the floating menu to display “Graph setting” dialog box.

Here it is possible to define Graph coordinate and select Graph style and it is also possible to select Graph display range (text data changes accordingly).

For example, press Confirm as shown in the left diagram to display the following curve (voltage-capacity curve).

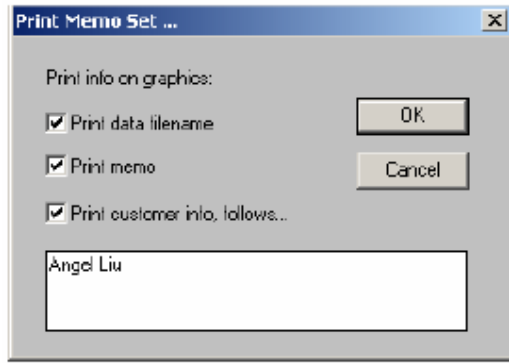


### C. Print and print preview:

Print is automatically adaptive to paper range. In addition, print can also define and memo literal information. See below for details.

#### D. Memo information:

Left-click Memo information in the floating menu with the mouse to display “Memo information” dialog box and memo information will be printed below the graph.



#### 4.5.5.3 Other operations:

##### a) Graph-data context:

Double-click the left key of the mouse in the left graph zone and the corresponding point in the right graph zone will be highlighted too. In this way, the user can view the accurate data value corresponding to the graph point.

Similarly, double-click the left key of the mouse in the text data on the right and the corresponding point in the left graph zone will be highlighted too. If the data is beyond the range of display, the data will scroll into display.

##### b) View operation record:

Select menu “Option” → “Operation record...” and the “Operation record” window will pop out. The software automatically records the time and time duration of the last 20 operations. In addition, it is also possible that there be such display as “<Continued from last operation>” or “<Power breakdown>”. “<Continued from last operation>” indicates that certain channels were still working when last exit occurred. It stopped temporarily due to software exit or power break down. It automatically restores its status and data when software resumes working. “<Power breakdown>” indicates that it stopped during operation due to power break down or non-normal exit (forced exit through **CTRL+ALT+DEL**).

##### c) Capacity separation:

Select menu “Capacity” → “Capacity separation” to pop out “Capacity separation” window.

##### d) Use ratio capacity:

Select menu “Capacity” → “Use ratio capacity” to determine to use ratio capacity or not.

If the user chooses to use ratio capacity, all the data and the capacity data in the graph will be replaced by ratio capacity. If active material quality in the data is not defined, the software will automatically reminds the user to enter the quality parameter of the active material when opening data operation.

##### e) Save as:

If the opened data file exists already, select “File” → “Save as” to copy the currently opened data file to the designated filename in the designated catalog. **It is strongly recommended that the user use “Save as” function to permanently save the data.**