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## Chapter one About BMSTools

Is used to monitor the battery data, modify the parameters of the protection board and other functions. The software user interface user-friendly, easy to carry out the operation, the editing interface as shown below (Figure 1):

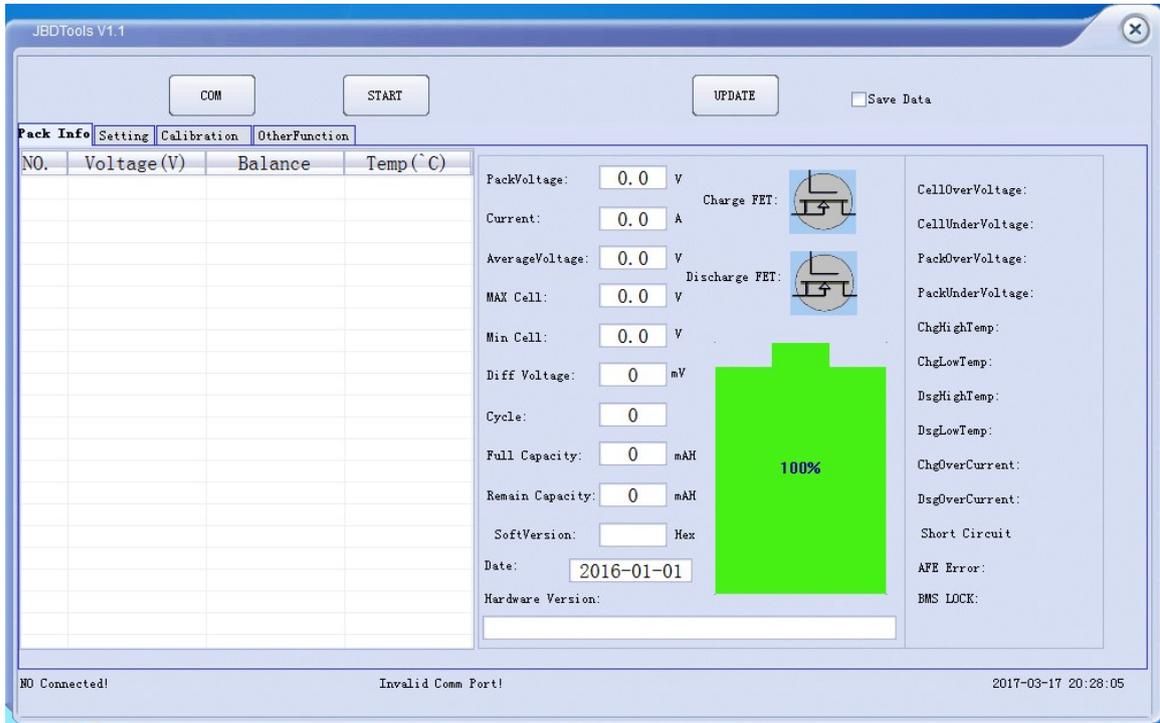


Figure 1

The software window is mainly divided into battery information, parameter setting, calibration and other functions; interface description in detail, the font size is reasonable and the spacing between the columns of reasonable size, complete display of all the content, the user are more convenient to use.

## Chapter two the Use of BMSTools Software

### 2.1 Use of the environment

BMSTools can be installed on windowsXP , Windows7 and above system. It through the serial port to connect with intelligent protection board for data communication, serial port for USB to RS232. It suitable for most computer use.

### 2.2 Set the communication port

BMSTools provide COM port setting, click on the button shown in Figure 2, It will pop up Figure 3 shows the COM setting option, the host will automatically identify the available serial port.

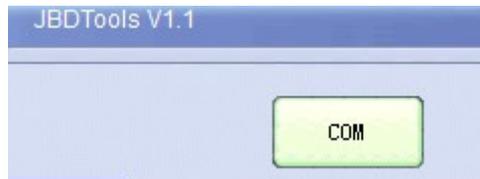


Figure 2



Figure 3

If you open the PC software ,but it does not scan to the serial number, you can click the refresh button, you can refresh the COM port which is not occupied, and then click the OK button to exit. , The host computer software will automatically record the last COM port settings, if the next time to open the PC software, will automatically select the last open serial port, if your serial port tool has not changed, It does not need to change.

### 2.3 Establish communication

After setting the COM port, click the start button to start communication with the intelligent protection board, you can read the basic information of the battery pack, including: single voltage, capacity, number of cycles, protection status, charge and discharge current, MOSFET status and some basic factory information. Specific data shown in Figure 4.

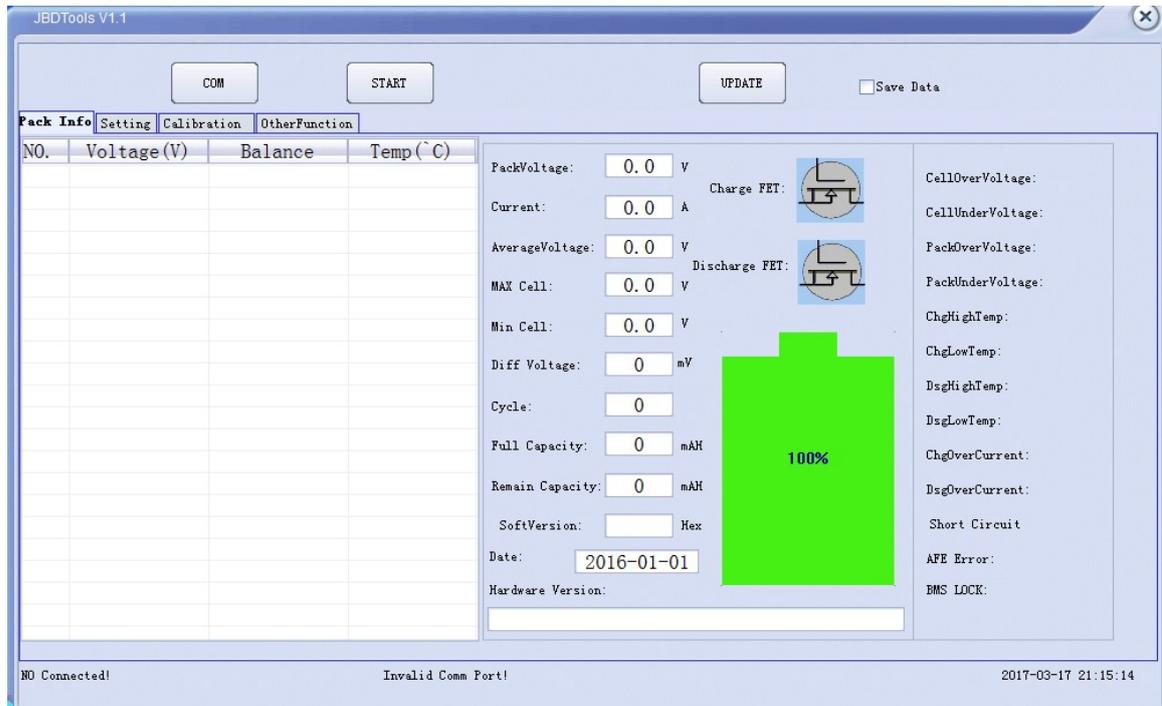


Figure 4

### 2.4 Parameter settings

Parameter settings page is mainly intelligent protection board of some of the protection parameters set, the specific content shown in Figure 5:

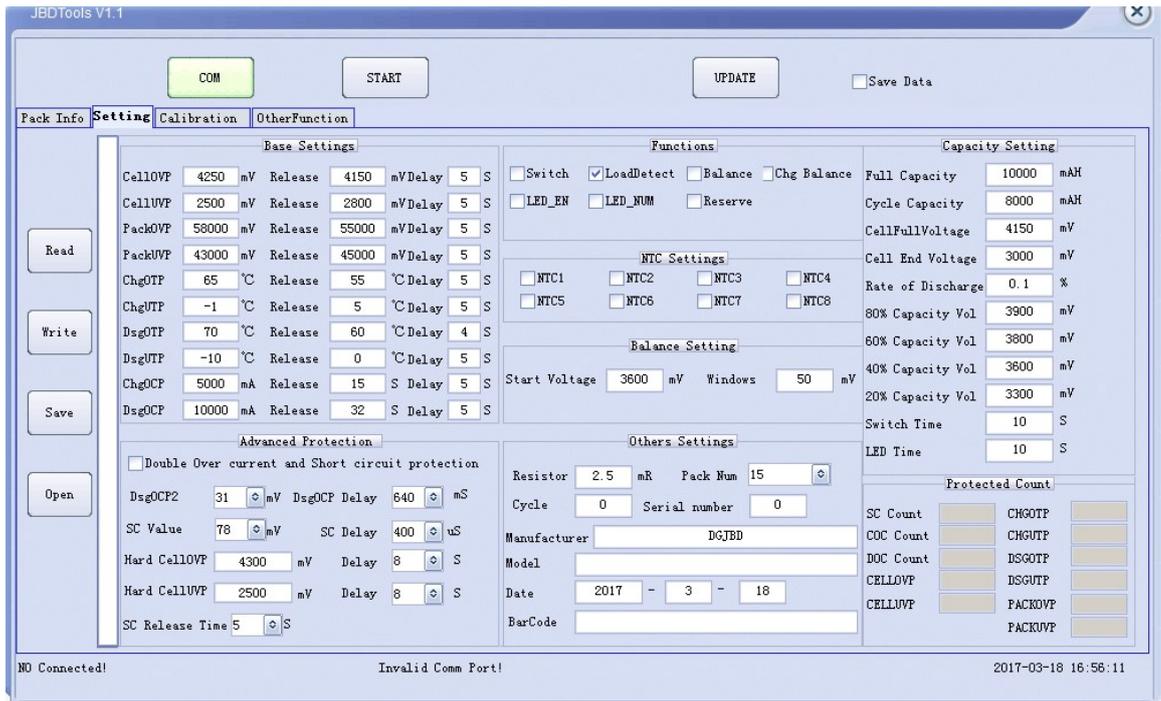


Figure 5

The main contents are as follows:

1. **Basic protection parameters configuration content:** single overvoltage, monomer undervoltage, the whole group overvoltage, the whole group undervoltage, charging high and low temperature, discharge high and low temperature, charge overcurrent and discharge overcurrent protection value, Protection delay. Customers can set parameters according to their own need.

2. **Advanced protection:** including secondary overcurrent, short circuit protection, hardware overvoltage, hardware undervoltage protection settings. secondary overcurrent protection value and short circuit protection value is set in voltage form, converted into current mode  $I = V / R$ , where V represents the set protection value and R is the current sense value.

3. **Function configuration:** Mainly on whether some functions of protection board are open, including electronic switch function, the load detection function after short circuit, equalization function, balanced mode, LED function, LED number and so on. Where the equilibrium mode is valid after checking the balance function.

4. **NTC configuration:** different series of protection, NTC number is not consistent, It has been set up before shipment, It do not need to change.

5. **Equalization configuration:** mainly to set the equilibrium open voltage and equalization accuracy; in the balance function is enabled and the work mode is correct, When the battery voltage is greater than the equilibrium opening point, and the maximum difference is greater than the equilibrium accuracy, the balance function will be turned on. After the equalization function is turned on, if the maximum pressure difference is below the equilibrium accuracy, or the battery voltage is lower than the equilibrium open voltage, the balance function will stop working.

6. **Other information:** mainly contains the number of strings of the battery, the sense resistor resistance, leave the factory time and some other information. Which in addition to the number of battery strings and galvanometer resistance will affect the protection board working conditions, other settings on the working status of the protection board has no effect.

7. **Capacity setting:** the main set some information of battery capacity, because the intelligent protection board with automatic learning capacity function, but the range is set, the maximum learning bias of 25%, each intelligent correction of 10%. So need according to the actual situation of the battery pack to set,

Nominal Capacity: The actual capacity of the battery pack;

Cyclic capacity: the cumulative discharge capacity of the battery that has been applied to a cycle.

Full of voltage: the average battery voltage of the battery pack reaches this value when the battery pack is full;

Discharge cut-off voltage: When the average battery voltage is less than this value, the battery is considered empty.

Self-discharge rate: the number of self-discharge capacity for the battery pack, the general value will be relatively small.

80% capacity voltage ~ 20% capacity voltage: the initial power on our protection board will be based on the average voltage control of these data to calculate the battery capacity, no other purposes.

Parameter settings main operation, in the page of parameter settings have 4 buttons on the left:

1. **Read parameters:** read the parameters from the protection board t, and then displayed in the PC software, In the process of reading, progress bar will show the progress of real-time read such as Figure 6.



Figure 6

2. **Write parameters:** its main function is to set the value of PC software settings to the protection board, the protection board will work in accordance with its set parameters, the write parameters must be approved to release the parameters set correctly, if the parameter is set wrong, then the protection board will can not work, there are two general operating procedures:

- a. First read the parameters, adjust and confirmation ,then click to write;
- b. First import the previously saved parameter file, confirm and then click to write.

In the process of writing, there will be a progress bar, as shown in Figure 7, the final show OK after the success of writing, if the progress bar is not shown OK it means write failure, please try again.

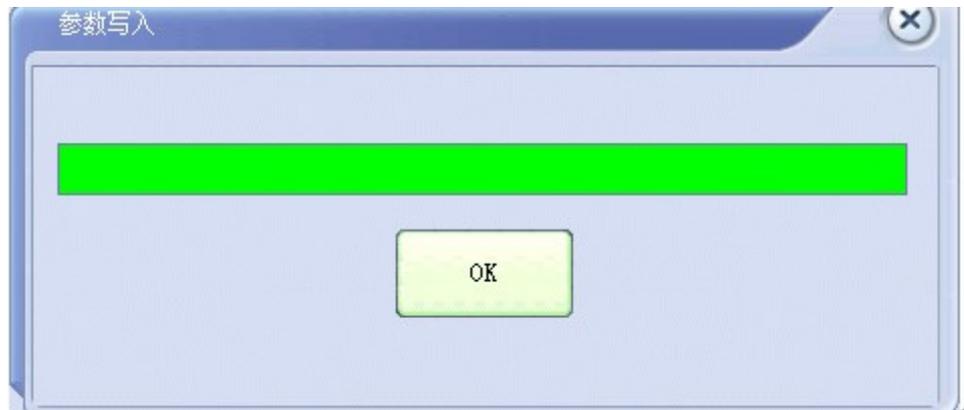


Figure 7

**3. Save the parameters:** This function is to save the PC software parameters in the form of files (\*.fig), its name can be set by the user, like Figure 8.

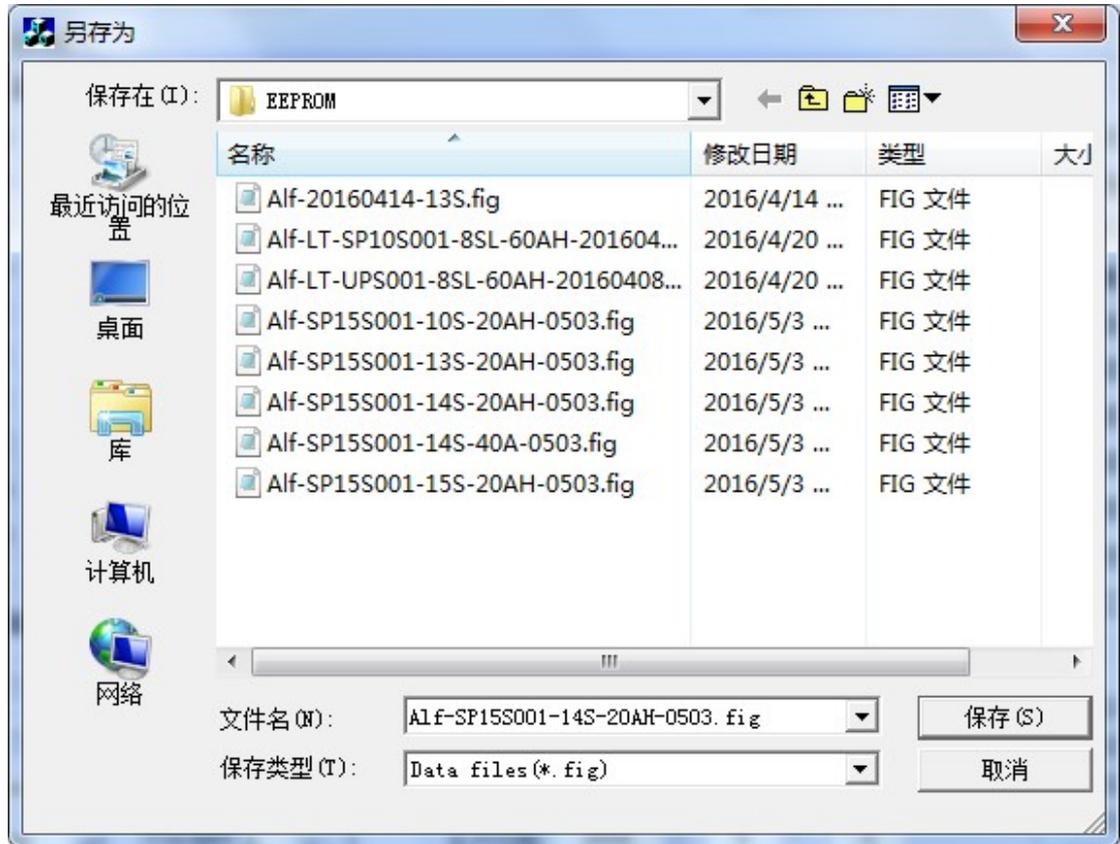


Figure 8

**4. Open the file:** its function to open the previously saved parameters to the PC software, It can be used to view or modify, and then write or save. See Figure 9 for details.

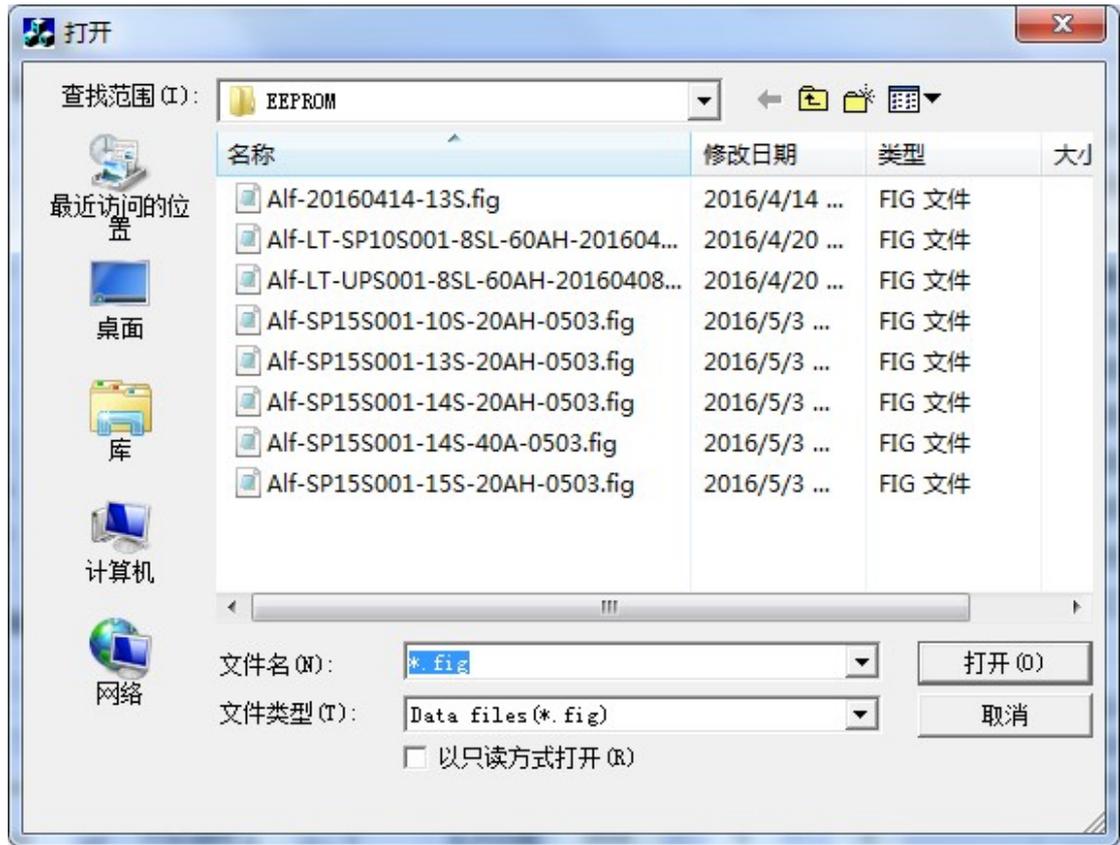


Figure 9

## 2.5 calibration function

Calibration function: used to calibrate the battery voltage, current, temperature.

Monolithic voltage calibration and temperature calibration: This function supports one or more calibrations, but you need to fill in the corresponding place .the click

on  It will start calibration, calibration will be successful after the pop-up a successful check box, see Figure 10.



Figure 10

Current calibration: static calibration, charge current calibration, discharge current calibration.

Static calibration: the current state as 0 current, and the charge current calibration factor and discharge current calibration system will restore to the default data.

Charge calibration: only calibrate the charge state, fill in the edit box like Figure 11 which you actually measure value of the charge current, without sign, such as , 1A fill 1000 and then click the charge current calibration button.



Figure 11

Discharge calibration: only calibrate the discharge state, fill in the edit box like Figure 12 which you actually measure value of the discharge current, without sign, such as , 1A fill 1000 and then click the charge current calibration button.



Figure 12

## 2.6 upgrade function



This function menu mainly through the host computer to upgrade the smart protection board program, click on the pop-up will be shown in Figure 13 prompt box, select the file (\* .hex) path, and then click to download, and then wait until the progress of 100% , See Figure 14 for details.

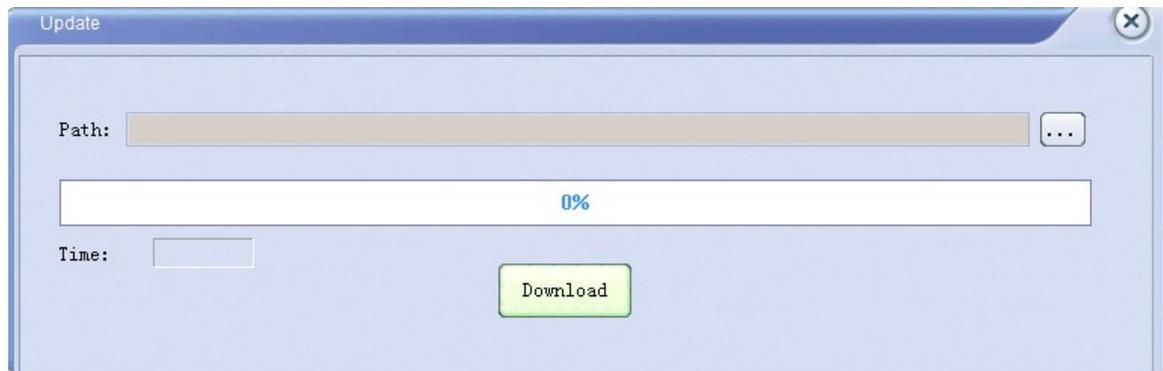


Figure 13



Figure 14

## 2.7 Save the data function



Operation button:

Click the button will pop up like Figure 15, save the file type of excel , the user can name, and then submit to save. Then you will save the saved file under the path you selected. After establishing the communication, it will save a record every 1 second , including the basic information of the battery pack.

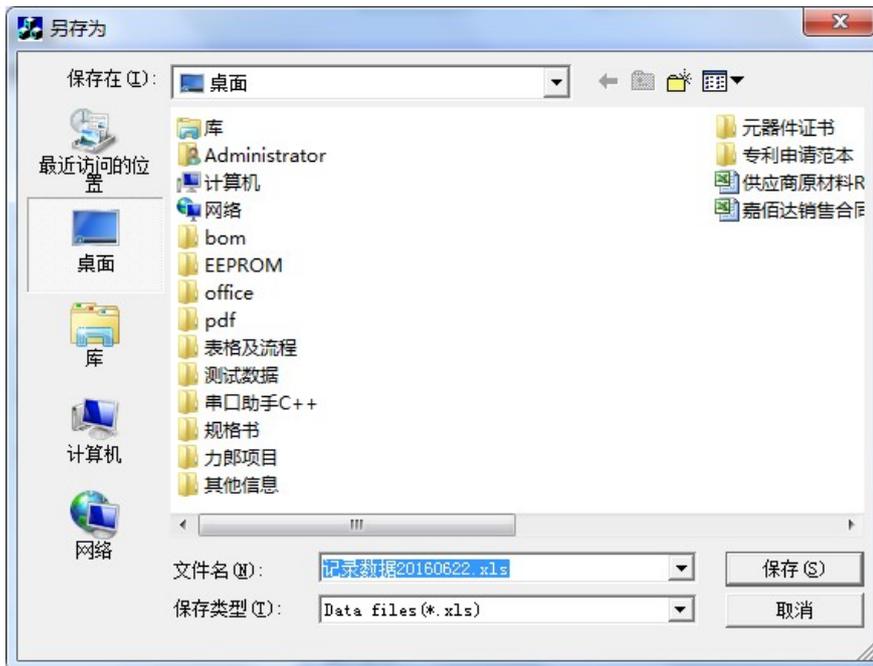


Figure 15

## 2.8 other functions



Mainly contains some test functions: edit the remaining capacity, control MOS tube, balanced test function, and MODBUS protocol debugging tools.

Edit the remaining capacity: You can change the remaining capacity of the battery pack at any time, mainly for testing.

Control the MOS tube: the main control charge and discharge MOSFET, open or close the charge and discharge circuit. It also can be used for intelligent lock car function: Our smart protection board can be connected to Bluetooth communication, if the phone inside the APP increase this command, you can lock the battery through the Bluetooth, the battery does not charge and discharge, unlock also through the Bluetooth APP to unlock.

Equalization control: forces the corresponding equalization to open, to test whether the equalization circuit is valid.