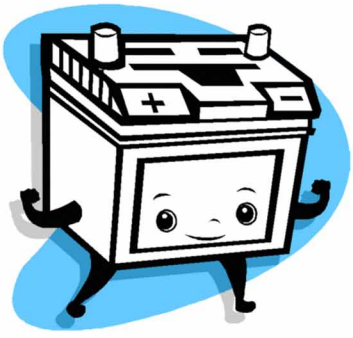
福光电子
Fuguang Electronics

FBM SERIES

Battery Groups Total Online Energy-Saving Tester

FBM-3048CT



The importance of backup battery groups in DC power system

Usually, for the industrial electric devices or facilities which need uninterrupted DC power source, the backup battery groups play a key role in the DC power system. Because they are the last guards for the electric survivability when the power outages cut off the external power supply.

The difficulties in the maintenance & test of the online backup battery groups

According to the survey, over 50% of power interval incidents are caused by the deterioration of the battery groups capacity. Because of the complexity and invisibility of battery structure and capacity, the maintenance & test of online backup battery groups has become a necessary but vexing task. As the maintainer who is responsible for the operations of DC power supply system, are these questions bothering you?

- How to ensure that the battery groups will perform to design standards in an emergency?
- How to maximize the life cycle of the battery groups without threatening serviceability?
- How do climatic and installation variations affect battery life expectancy?

www.batterytest-china.com

The necessity of the regular discharge test for online backup battery groups

Although the latest battery conductance and resistance testing technology provide efficient and convenient methods to evaluate the capacity and find out the lag cells in the battery groups, until now the discharge test is still the most accurate, reliable and comprehensive method to test the online battery groups.

The aims of the regular discharge:

a. It can help the maintainer to know all accurate data of the battery groups, it is available for the installation, life-cycle management and disposal of the battery groups

b. In the condition of good external power supply, the backup battery groups which maintain the floating charging status in most of time, need deep cycle discharge to activate the capability of discharge. It will be helpful to prolong the working life and reliability in an emergency.

The defects of the traditional discharging method for the backup battery groups

Method 1: Offline Discharge Test

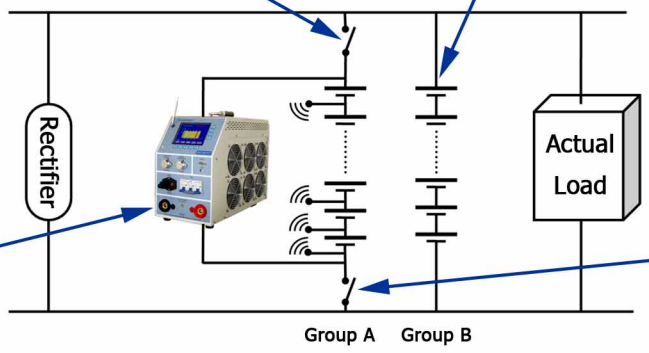
Offline discharge test is the most direct but energy-wasting way to discharge the battery groups:

- Disconnect the battery group with the whole DC power system
- Use a discharge load unit to do the deep cycle (usually over 80% capacity) discharge test
- Connect the battery group back to the DC power system

Offline discharge test need one battery group disconnected with the DC power system. It reduce the total service time of the backup battery system. The battery load unit is the device which let the chemical energy convert to heat, the working of the load unit has to be observed at certain times

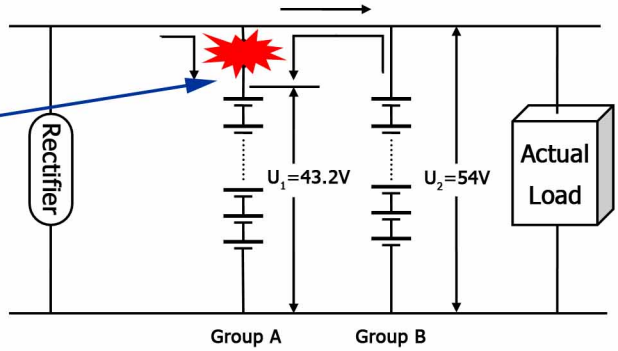
The capacity of the Group B is unpredictable, so the staff have to supervise the whole discharging process. If the power outages happen in the Groups A discharging, the disable of Group B will be the fatal hit to the whole DC power supply.

Offline discharge test will cause the wasting of the energy. The power of the battery group is converted to heat and dissipated by the load unit. Meanwhile usually the discharging test is indoor, the dissipated energy have to be cooled by the air-conditioner. It causes the double energy-wasting in a single test.



The staff must take risks (like short circuit caused by incorrect operation) at the process of disconnecting

Because the voltage of the tested battery groups is too low(for example 43.2V for 48V telecom battery group), in the end of discharge, it is impossible to connect them back to DC power system directly(for example 54V for telecom power system).
Without the extra charger, the connecting will cause the electric spark which is harmful to the staff and the DC devices. Meanwhile because of the voltage gap, both the rectifier and battery Group B will charge the Group A by an intolerable current. It is fatal for the working time of Group A.

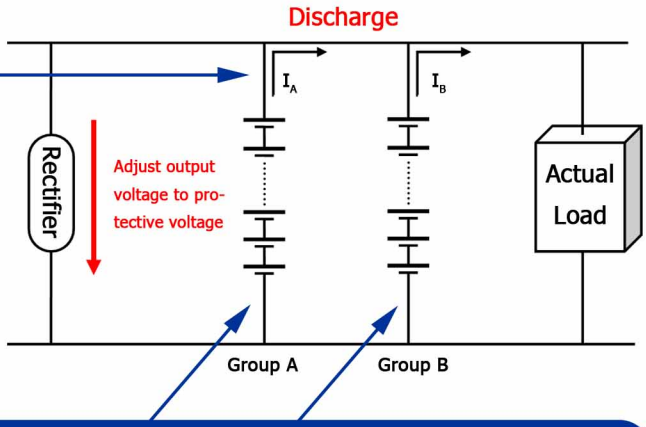


Method 2 : online tentative discharge test

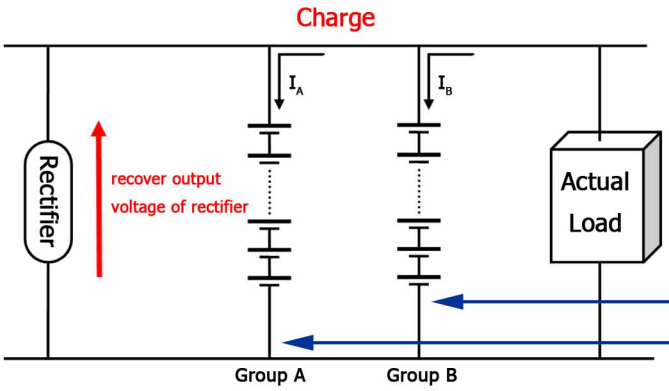
Online tentative discharge test is an energy-saving but incomplete way to discharge the battery groups:

- Adjust the output voltage of rectifier to protective voltage(for example 46V for 48V power system) and let all battery groups discharge to actual load
- In the process of all battery groups discharging, use the battery monitor to locate the lag cells which voltage is much lower than average level
- Recover the output voltage of rectifier to charge all battery groups

Online tentative discharge test will put all backup battery groups into discharging status, it reduces the service time of every battery groups in an emergency. If the power outages happen in the process of the discharging and all battery groups have been discharged over 50%, it will be disastrous for the DC power system. It is usual to control the discharge time and capacity no over 50%. These tentative ,not complete tests can't provide enough data to analyze the actual service time of the battery groups



All the battery groups in parallel are discharged simultaneously. The total discharge current is not stable because the actual load is hard to be constant usually. Meanwhile the discharge currents between each group can't be balance because the resistances of each group are different.



When the voltage of rectifier is recovered, because of the big voltage gap, the rectifier will charge the Group A by an intolerable current. It is harmful for the capability and working life for all the battery groups.

The definition of "Total Online Discharging test" and its applicability

Total online discharge is

A Connecting the Total online discharging tester with the online backup battery groups in series

B Raising the voltage of the tested battery groups automatically, discharging the battery groups to the actual load by constant current and stable power, without any heat dissipation

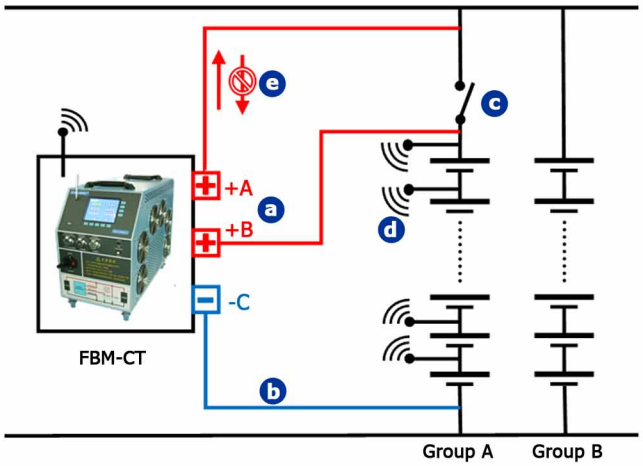
C When the discharge finishes, automatically start to charge the tested battery groups by the setting current from rectifier.

Total online discharge is the brand-new conception which is created and developed by Fuguang Electronics. It depends on our experience in battery maintenance & test over 10 years. Our aim is to provide an energy-saving, efficient and safe method for the online battery groups testing.

Total online discharge test is designed for various DC power systems which have several battery groups and big enough actual load. This testing method is available for sorts of industry business like telecommunication, power utility, new energy facility, railway company and so on.

The testing procedures of total online discharging test

1.Connecting



a. using power cables to connect the port +A, +B of FBM with the positive electrode of rectifier and battery group A.

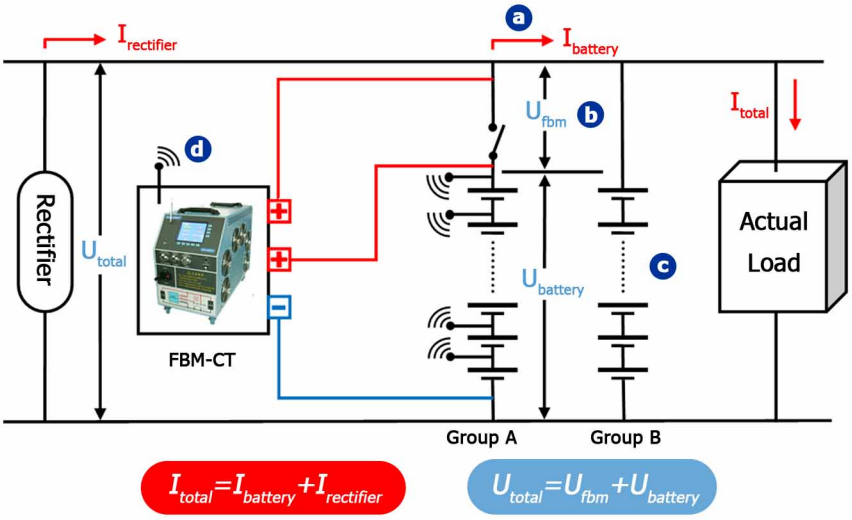
b. using power cables to connect the port –C of FBM with the negative electrode of battery group A

c. disconnect the switch between rectifier and battery group A.

d. connect all wireless modules with each cells in the battery group A.

e. when all connection is finished, the port +A, +B is one-direction channel . That means the battery group A can be discharged but can't be charged by the rectifier now.

2.Discharging



$I_{total}=I_{battery}+I_{rectifier}$ $U_{total}=U_{fbm}+U_{battery}$

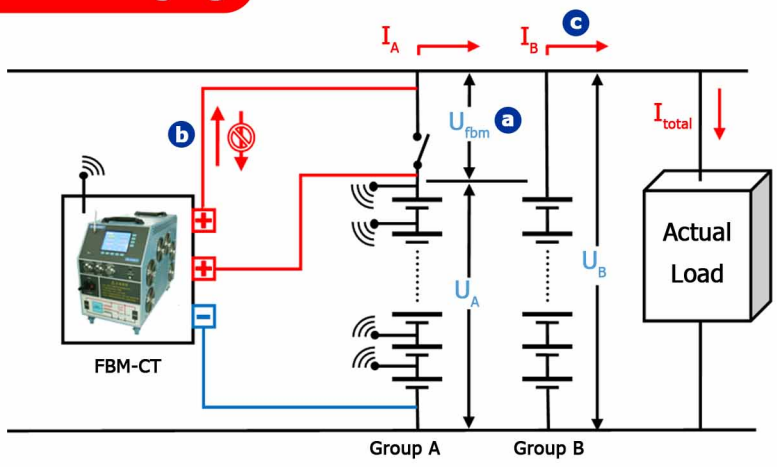
a. start the discharging, the battery group A will be discharged according to the setting current($I_{battery}$), in the process of the discharging, the power from the rectifier will reduce. And the power consumption of actual load comes from the rectifier and the battery group A both. ($I_{total}=I_{battery}+I_{rectifier}$)

b. obviously, the voltage of the battery group A($U_{battery}$) will go down gradually in the discharging. For keeping the constant discharge current, FBM have to add an extra voltage between port +A and +B to fill up the voltage gap ($U_{total}=U_{fbm}+U_{battery}$)

c. the battery groups B will keep the floating charge situation in this discharging.

d. the wireless modules will record the voltages of each cells and save all data in the internal storage. When any threshold is reached in the discharging, FBM will stop the test and start the charge manually or automatically(depending on the setting before the test)

3.If the power outages happen in the discharging



$I_{total}=I_A+I_B$ $U_B=U_{fbm}+U_A$

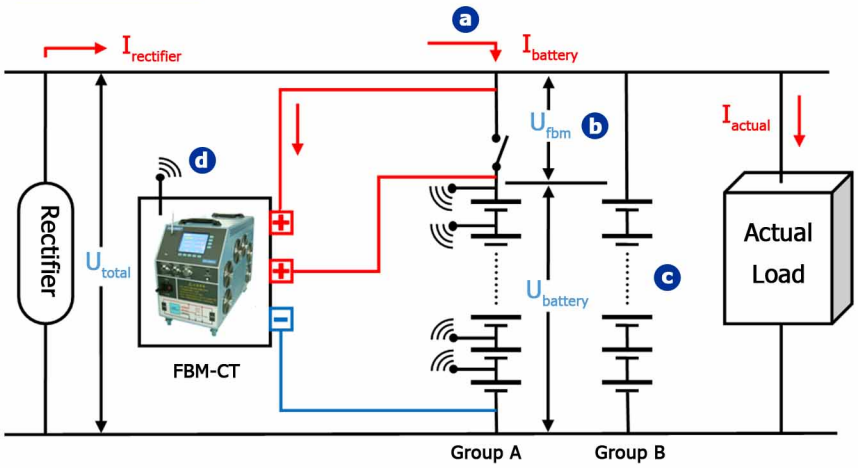
a. if the power outages happen, FBM will warn "the online voltage is abnormal" but not stop the discharge because the battery groups are the power sources for the actual load. FBM still increase the voltage of battery groups A to keep the setting current until it goes down and is equal to the voltage of battery group B. ($U_B=U_A+U_{fbm}$)

b. FBM will stop battery group B to charge the group A because port +A +B still is one-direction channel.

c. in this process, battery group B will work normally as a part of power source of the DC system.($I_{total}=I_A+I_B$)

The testing procedures of total online discharging test

4.Charging



$I_{rectifier}=I_{battery}+I_{actual}$

$U_{total}=U_{fbm}+U_{battery}$

a. when the discharging is finished, FBM will open the channel from port +A to port +B. and the rectifier can start to charge the battery group A under the control of FBM. For protecting the batteries, FBM will restrict the maximum charge current according to the capacity of the battery group A. In the process of charging, the rectifier will provide the power for actual load consumption and battery group A charging. ($I_{rectifier}=I_{battery}+I_{actual}$)

b. at the beginning, for restricting the charging current from the rectifier, FBM have to add an extra voltage between port +A and +B to fill up the voltage gap. Obviously, the voltage of the battery group A(Ubattery) will go up gradually in the charging, so the Ufbm will decrease to zero when the charging current goes down.($U_{total}=U_{fbm}+U_{battery}$)

c. the battery groups B will keep the floating charge situation in this charging.

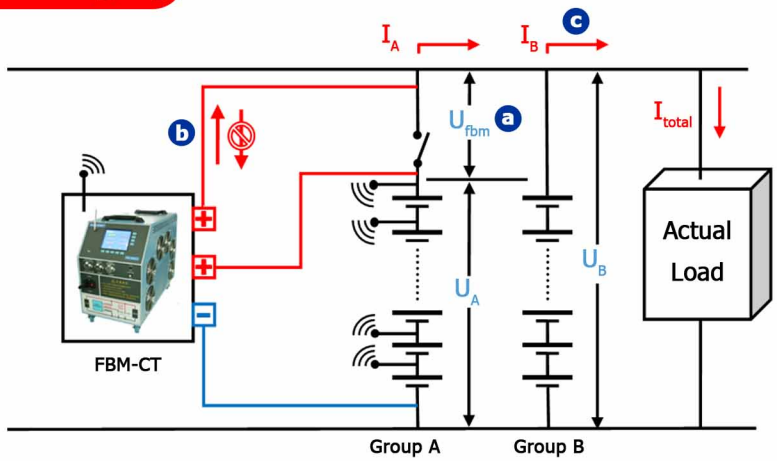
d. the wireless modules will record the voltages of each cells and save all data in the internal storage. When the charge current is low enough, FBM will prompt the user to disconnect the tester.

5.If the power outages happen in the charging

a. If the power outages happen, FBM will warn "the online voltage is abnormal". The charge for battery group A will stop and be the power sources for the actual load. FBM still increase the voltage of battery groups A to keep the setting current until it goes down and is equal to the voltage of battery group B. ($U_B=U_A+U_{fbm}$)

b. FBM will stop battery group B to charge the group A because port +A +B becomes one-direction channel when the power outages happen.

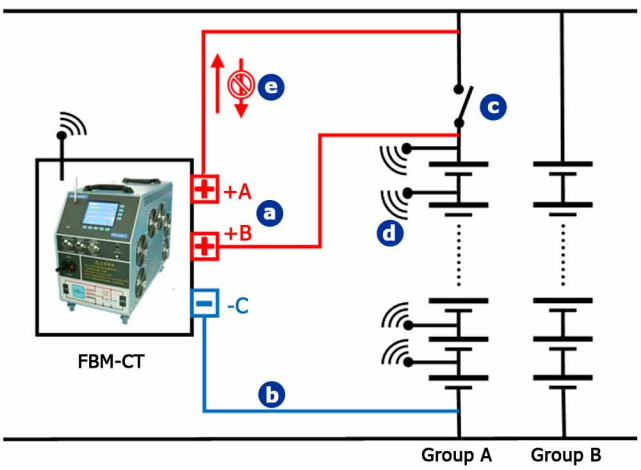
c. in this process, battery group B will work normally as a part of power source of the DC system.($I_{total}=I_A+I_B$)



$I_{total}=I_A+I_B$

$U_B=U_{fbm}+U_A$

6.Disconnecting



a. disconnect the power cable between FBM port –C and the negative electrode of battery group A.

b. connect the rectifier and the positive electrode of battery group A.

c. disconnect the power cables between FBM port +A and the rectifier, between port +B and the positive electrode of battery group A.

d. disconnect the wireless modules with the cells in the battery group A. Use the USB-disk download the discharging & charging data from the FBM.

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The advantages of total online discharging test (compare with traditional methods)

compare item \ testing method	Total Online Discharge Test	Offline Discharge Test	Online Tentative Discharge Test
Testing aims — deep cycle discharge (activate batteries)	accomplished	accomplished	unaccomplished
Testing aims — check the status of batteries capacity	accomplished	accomplished	unaccomplished (without deep cycle, hard to find lag cells)
Accuracy of the test	high accuracy	high accuracy	low accuracy (no deep cycle discharge)
Security factors — service time of backup battery systems	maximized (all battery groups online)	no maximized (one battery group offline)	no maximized (all battery group online but all discharged)
Security factors — electric spark in the connecting after discharge	no spark (automatically charge after discharge)	spark (without a charger, hard to avoid spark in connecting)	no spark (not disconnecting)
Security factors — short-circuit risks in the connecting & disconnecting	low-risk (no need to disconnect negative electrode)	high-risk (need to disconnect positive & negative electrode)	low-risk (no disconnecting)
Security factors — connecting way	always online	offline	always online
Security factors — cells monitoring	wireless monitoring	wiring monitoring (or recording manually)	wiring monitoring (or recording manually)
Discharge current	stable	stable	not stable (actual load is not stable)
Testing efficiency	high efficiency (automatically finish discharge & charge, without heat dissipation)	low efficiency (with heat dissipation, need user supervise & manually control)	low efficiency (need user supervise & manually control)
Energy consumption	energy-saving	energy-wasting	energy-saving
Environmental impact	no impact (without heat dissipation)	hot impact (with heat dissipation)	no impact (without heat dissipation)

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Battery Groups Total Online Energy-Saving Tester

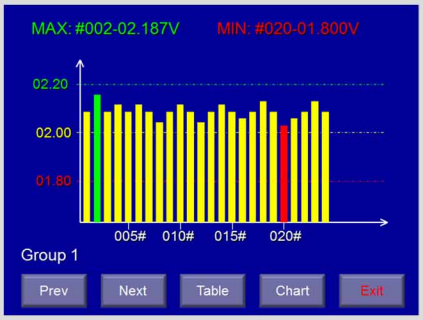
Function features:

- **Total online constant current discharge** FBM connect with one battery groups in the backup battery systems. Under the circumstances which no need to adjust the output voltage of rectifier, FBM can control the tested battery group to constant current discharge and utilize the energy in the actual load. This revolutionary method recycles the energy of the battery group, and keeps other battery groups in floating charge status to maximize the service time of battery system.
- **Total online intelligent charge** When discharging is over, FBM will start charge the battery groups automatically according to the setting current. In the process of charging, another battery group will keep the floating charge status, FBM balance the voltage gap to avoid the electric spark in the connecting after discharge.
- **Cells voltage monitoring & recording** In the discharge & charge of the tested battery groups, FBM wireless modules can monitor all data of each cell and send them back to main machine. After the test, the data can be downloaded to PC, help user to find the lag cells. And wireless modules support 2-12V cell, the cells number is unlimited.
- **Extension load for the lower power of actual load(optional)** If the power of actual load is too low for the discharge test, FBM supports to co-work with a dummy load to fulfill the testing demand.
- **The rest capacity analysis** After the first 5 minutes of the discharging, FBM start to analyze the rest of capacity according to the voltage of cells. And the result can adjusted automatically in the process of discharging.
- **Support to set multiple stop thresholds** FBM offer multiple thresholds such as the total voltage of battery groups, the voltage of each cell, discharge time, discharge capacity to stop the discharge automatically. For preventing over discharge of the tested battery groups, the discharge can be terminated by any one of the threshold values. And LCD screen can show the reason of the stop to avoid users' misjudge.
- **Support to set the number of lag cells for discharging** Usually the discharging must be terminated when one lag cell voltage drops to the threshold value. But in the replacement test of battery groups, for checking the capacity of more than one lag cells, FBM provide the setting and terminate the discharging when more than the setting number of the lag cells are found.
- **Various security designs** FBM have reverse polarity protection, short circuit prevention, over voltage and over heat precautions and so on.
- **5.7 inch colorful LCD screen** The big LCD can display all parameters setting in one screen. In the process of discharging all information about battery groups and cells status(include max & min voltage, the histogram, data form of all cells) can be illustrated. In data management interface, FBM can list all testing data including detailed information clearly.
- **Touching screen and button operation** FBM provide two ways to input: press on the touching LCD or use the button to operate. If one way malfunctioned, user also has another option.
- **Intelligent data storage** The internal memory of FBM can maintain the test data even when the outage happens in the process of testing or user power off FBM manually. Without deleting operation in data management interface, the test data will never be erased. And user can use USB port to download the data to PC.

Intelligent menu design, easy to operate

Multiple stop threshold vaules

Presetting function speed up the setting



Real-time detection of battery voltage

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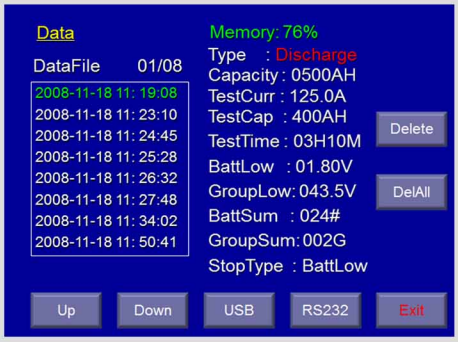
- **Support DC or AC power supply (for FBM-3048CT)** FBM can work with 220V AC external power source. And if the test spot can't offer a external power supply, FBM also can adopt DC power source from the tested battery groups directly.
- **Intelligent judge program** FBM can identify the situations that the battery voltages reach the threshold value or the signal missing by manual mistake. Avoiding manual interruption in the discharging, this revolutionary program makes the test stable and smooth.
- **Automatic discharge current calculation** In the discharge interface, FBM have a calculator to offer the discharge current according to the capacity (usually C10) and hourrate inputted by user. and in all test data, the capacity of battery groups will be shown by C10 automatically.
- **The presetting function for discharge parameters** FBM provide 8 locations for setting up all test parameters in advance, this design can skip the setting procedures for the same discharging, simplify the operation and speed up the test.
- **Self calibration function** FBM allow user to calibrate the battery group voltage, cells voltage and current by the internal program.
- **Smart data analysis software** The software can show the voltage and current curve of battery groups, the voltage curve and chart of each cell, the form of all data, and the capacity of each cell and so on. And the software supports to create complete EXCEL report automatically.



Clear data management interface

Specifications:

Type	FBM-3048CT	FBM-10480CT
Application	48V battery system	UPS battery system
Input voltage range	DC 40~60V	DC 300~600V
Discharge current range	0~300A	0~100A
Charge current range	0~300A	0~100A
Group voltage accuracy & resolution	Accuracy: 0.1V Resolution: 10mV	Accuracy: 0.1V Resolution: 10mV
Single cell voltage accuracy & resolution	Accuracy: 5mV Resolution: 1mV	Accuracy: 5mV Resolution: 1mV
Discharge current accuracy & resolution	Accuracy: 1A Resolution: 0.1A	Accuracy: 1A Resolution: 0.1A
Charge current accuracy & resolution	Accuracy: 1A Resolution: 0.1A	Accuracy: 1A Resolution: 0.1A
Power supply	AC: 220V single-phase 45~65Hz DC: 40~60V	AC: 220V single-phase 45~65Hz
Display screen	5.7 inch colorful touching LCD	
Wireless modules	Support 2V/6V/12V cells, 1 modules can monitoring 4 cells	
Communication port	USB 2.0	
Dimension(mm)	600×400×280	600×400×280
Weight(kg)	25	25

Fuguang Electronics

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