TBB POWER

Version: A1.1

Battery Monitor Kit

User Manual





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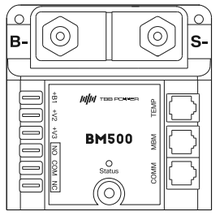
1. Introduction

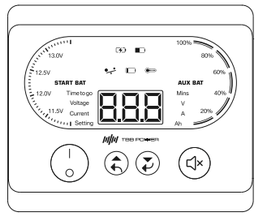
TBB's Battery Monitor Kit is composed by two devices:

- A battery shunt BM500
- A monitor MBM

TBB's battery monitor kit is highlighted as below features:

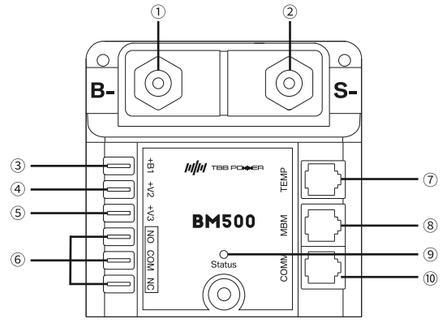
- Measured current is up to 500A
- Could be used for battery (or battery bank) 12V, 24V or 48V
- Compatible with AGM, GEL or LFP battery
- Built-in Bluetooth on MBM to allow user to monitor battery by mobile APP
- Programmable dry contact allow user to connect with a warning facility
- Contact ratings 2A@30Vdc or 0.5A@125Vac
- Measurement accuracy
  - Current: +/- 0.4%
  - Voltage: +/-0.3%
- Support CAN and RS485





2. BM500

2.1 Connectors and terminals



NO.	Print	Description
1	B-	Connect to auxiliary battery negative
2	S-	Connect to DC load(s)' (and starter battery) negative
3	+B1	Connect to auxiliary battery positive
4	+V2	Connect to starter battery positive
5	+V3	Connect to the second starter battery positive
6	NO COM NC	Programmable dry contacts (See details in Chapter 2.2)
7	TEMP	Connect with temperature sensor cable
8	MBM	Connect to MBM
9	Status	LED indicator (See Chapter 2.3)
10	COMM	485 and CAN communication port (See Chapter 2.4)

Table 1 Connector and terminal of BM500

2.2 Dry Contact

BM500 provides two types dry contacts for customers' option:

- NC + COM. NC stands for Normal Close, which means the dry contact stays at close(engage) before triggered, so it will turn to open (disengage) when it's triggered
- NO + COM. NO stands for Normal Open, which means the dry contact stays at open (disengage) before triggered, so it will turn to close (engage) when it's triggered

It is important to note that the contact ratings 2A@30Vdc or 0.5A@125Vac.

The user is allowed to select one or more than one (up to four) condition / logic from below table to trigger the dry contact and alarm (The setting is available in mobile APP only).

Alarm or protection condition/logic		Alarm or protection value		Resume value		Setting step
		Default	Range	Default	Range	
0	No condition	--	--	--	--	--
1	Auxiliary battery voltage low	10.5V	7.0V~95.0V	11.0V	7.0V~95.0V	0.01V
2	Auxiliary battery voltage high	16.0V	7.0V~95.0V	15.5V	7.0V~95.0V	0.01V
3	Auxiliary battery SoC low	20.0%	0~99.0%	30.0%	0~99.0%	0.1%
4	Time to go low	1800 sec.	60~86400 sec.	3600 sec.	60~86400 sec.	1 sec.
5	Over-current (charge)	10A	1A~600A	9A	1A~600A	0.01A
6	Over-current (discharge)	-10A	-1A~600A	-9A	-1A~600A	0.01A
7	Auxiliary battery temperature low	0℃	-20~+50℃	1℃	-20~+50℃	0.1℃
8	Auxiliary battery temperature high	40℃	-20~+50℃	39℃	-20~+50℃	0.1℃
9	Deviation rate of auxiliary battery's middle point voltage	2%	0~50%	0.5%	0~50%	0.1%
10	Starter battery voltage low	10.5V	7.0V~95.0V	11.0V	7.0V~95.0V	0.01V
11	Starter battery voltage high	16.0V	7.0V~95.0V	15.5V	7.0V~95.0V	0.01V
12	2nd Starter battery voltage low	10.5V	7.0V~95.0V	11.0V	7.0V~95.0V	0.01V
13	2nd Starter battery voltage high	16.0V	7.0V~95.0V	15.5V	7.0V~95.0V	0.01V

Table 2 Condition/logic for alarm and dry contact

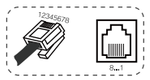
2.3 LED Indicator

Status	Status flash interval	Description
Power on initialization state	The red alternated with the green one	Power on initialization state. When the BM500 is just energized, the battery must be in the static status
Operation	Green flashing	Normal
	Red flashing	Alarm (See Table 2)
	Red on	The charge or discharge current of the auxiliary battery exceeds 500A

Table 3 LED indicators

2.4 COMM Port

TBB's battery monitor kit is compatible with RS485 and CAN. It allows the user to connect with an external device by either RS485 or CAN protocol. The COMM port is defined as below:



COMM

PIN port	Status color	Description
Pin1	Orange / white	Reserved
Pin2	Orange	Reserved
Pin3	Green / white	485A
Pin4	Blue	CANH
Pin5	Blue / white	CANL
Pin6	Green	485B
Pin7	Brown / white	Reserved
Pin8	Brown	Reserved

Table 4 Pin definition of COMM port

3. Monitor MBM



Display Icon	Item	Description
	Charge	The battery is being charged
	Discharge	The battery is being discharged
	Overcurrent	High charge or discharge current alarm for auxiliary battery
	SoC.Low alarm	Low state of charge for auxiliary battery
	Temperature anomaly	Low temperature or high temperature alarm for auxiliary battery
START BAT	Starter battery voltage	To indicates the voltage of starter battery
	ON/OFF switch	It's used to ON / OFF control to TBB's lithium battery (For other battery, it's not functional)
	Scroll up or Return button	To scroll up to last item. Or, as function of exit configuration with long press of 2secs
888	Value information area	MBM displaying value
	Scroll down or Confirm button	To scroll down to next item. Or, as function of confirmation of your selection and configuration, with long press for 2secs
	Mute button	To mute or unmute the alarm
AUX BAT	AUX.BAT SoC	To indicate the auxiliary battery state of charge (SoC) (%)

Table 5 Display and button of MBM

4. Operation

The monitor MBM can show a wide range of important battery parameters.The monitor will automatically show information of Time to go, Voltage, Current for the auxiliary battery; Or users can switch the information by short pressing the Scroll up (Confirm button) or Scroll down button (Return button).

When no operation on monitor, monitor backlit will be turned OFF automatically after 150 seconds. And the backlit will be turned ON again if any button is pressed.

Note: Here is essential to have battery monitor kit work properly

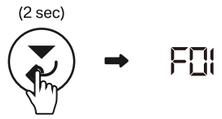
- Set the battery type and capacity correctly (The setting procedure could be referred to Chapter 5.1 and 5.2)
- In the first running of this kit, please charge the auxiliary battery fullyand have the SoC displayed 100% on monitor as a calibration procedure

Display at value information area		Description
Time to go	Mins	Shows how much time is left under the present load, before the auxiliary battery is empty. Or shows how much time is left under the charge current, before the auxiliary battery is full charged **Noted: It will just show 999 if value is greater than 999**
Voltage	V	Shows the voltage of the auxiliary battery which connected to the +B1 input
Current	A	Shows the current flowing in or out of the auxiliary battery

Table 6 Display at value information area

5. Setting by MBM

By pressing the Scroll down button (Confirm button) for 2 seconds, it will enter into setting page. This menu can be accessed by the following sequence:



There are four items in setting page to be selected:
(1) F01 (2) F02 (3) C01 (4) C02

The user can press Scroll up (Return button) or Scroll down (Confirm button) button to switch in above four selections. By pressing the Scroll up button (Return button) for 2 seconds, it will quit from setting page and return to normal operation page.

5.1 F01 - Battery type setting

The user can choose the chemistry type of your battery by setting this menu. This menu can be accessed by the following sequence:



Number	Battery type
0	AGM
1	GEL
2	Semi traction
3	Traction
4	Lead Carbon
5	LFP

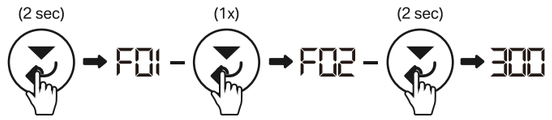
Table 7 Battery type in F01

Press Scroll down button (Confirm button) for 2 seconds to confirm the selection if either battery type is being selected.

Note: AGM is default setting

5.2 F02 - Battery capacity setting

The user can choose your auxiliary battery's capacity by setting this menu. This menu can be accessed by the following sequence:

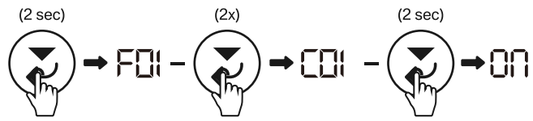


Press Scroll down button (Confirm button) to move the cursor in hundreds, tens and single digits; press Scroll up button (Return button) to change the number in 0-9; Press Scroll down button (Confirm button) for 2 seconds to confirm the selection if either battery capacity is being selected.

Note: 300Ah is default setting

5.3 C01 - Reset battery

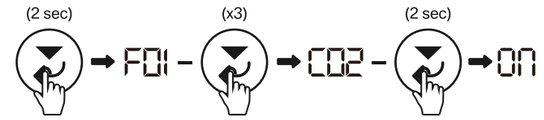
This can be applied after you have installed a fresh battery of the same specifications as the previous one. This menu can be accessed by the following sequence:



The user can select ON. Press Scroll down button (Confirm button) for 2 seconds to confirm the selection.

5.4 C02 - Buzzer alarm setting

The user can turn on or turn off the buzzer alarm by setting this menu. This menu can be accessed by the following sequence:



The user can select ON or OFF in this setting:
- ON: The audible alarm will be enable
- OFF: the audible alarm will be disable

Press Scroll down button (Confirm button) for 2 seconds to confirm the selection if either the buzzer alarm setting is being selected.

Note: ON is default setting

6. Warning Code

Upon any warning happened, MBM will display corresponding warning code in the value information area. Please find following chart the definition for each code:

Item	Warning code	Warning type	Description
BM500 warning code	E01	V.LOW(+B1)	Low battery voltage for auxiliary battery
	E02	V.HIGH (+B1)	High battery voltage for auxiliary battery
	E03	SoC.LOW (+B1)	Low state of charge for auxiliary battery
	E04	TIME.LOW (+B1)	Low time remaining for auxiliary battery
	E05	I.CHARGE (+B1)	High charge current for auxiliary battery
	E06	I.DISCH (+B1)	High discharge current for auxiliary battery
	E07	T.LOW (+B1)	Low battery temperature for auxiliary battery
	E08	T.HIGH (+B1)	High battery temperature for auxiliary battery
	E09	MIDPNT (+B1)	Midpoint voltage deviation
	E10	V.LOW (+V2)	Low battery voltage for starter battery
	E11	V.HIGH (+V2)	High battery voltage for starter battery
	E12	V.LOW (+V3)	Low battery voltage for 2nd starter battery
	E13	V.HIGH (+V3)	High battery voltage for 2nd starter battery

Table 8 Warning code list

7. Troubleshooting Guideline

Problem	Remedy or suggestion
The BM500 doesn't operate (the Led of status doesn't flash)	- Check the 'B-' and battery side connections - Check battery voltage. Battery might be flat. The B1+ voltage must be >7VDC - Try to restart the monitor by removing and reconnecting the supply wire to the 'B+'
The monitor doesn't operate (no display)	- Check the Ethernet cable to MBM
Current readout gives wrong polarity (current should positive when charging and negative when discharging the battery)	- Shunt installed in reverse. Make sure that the 'B-' is connected to the battery negative terminal and the 'S-' bolt to the battery loads
Display returns '---' in Time to go readout and the state of charge (SoC) bar is flashing.	- Make sure that the battery is not charging and discharging when you restart the BM500 device
State of charge and / or Time to go readout not accurate	- Check if all current is flowing through the 'B-' of the shunt (the negative terminal of the battery may only contain the wire going to the 'B-' side of the shunt!) - Shunt installed in reverse. Make sure that the 'B-' bolt is connected to the battery negative terminal and the 'S-' bolt to the battery loads - Check if all battery properties (F01 and F02) are correctly set - Check if the battery monitor is synced with your battery. Perform full charge cycle
The monitor resets all the time	- Check the wiring for corrosion and / or loose contacts - Battery might be flat or defective
The monitor does not automatically synchronize	- The battery is not reaching its fully charged state. Please check if the charge algorithm matches the requirements of your battery. Do not interrupt the charge process before it is finished

Table 9 Troubleshooting guideline

8. Specification

Model	BM500
Communication	RS485, CAN
Nominal battery voltage	7~95V
Nominal current	±500A
Auxiliary battery voltage (+B1)	7~95V
Starter battery voltage (+V2,+V3)	1~95V, max support 2 batteries
Battery capacity	10~10000Ah
Battery type	AGM / GEL / Semi traction / Traction / Lead Carbon / LFP
Temperature sensor	1
Working temperature	-20~50℃
Storage temperature	-30~70℃
Voltage accuracy	±0.3%
Current accuracy	±0.4%
Continuous current	500A
Dimension	BM500: 105mm*105mm*63mm MBM: 110x78 mm (front) / 99x67mm (bottom) / 32mm (total depth) / 23.5mm (installation depth)
IP	IP20
Standards	CE certified (Safety: EN60335-1:2012, EN62233:2008 EMC:EN61000-6-3:2012, EN50498 Automotive EMC)

Table 10 Specification of BM500

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