Voltronic Power

Inverter and BMS 485 communication Protocol

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1. BMS Pin Definition
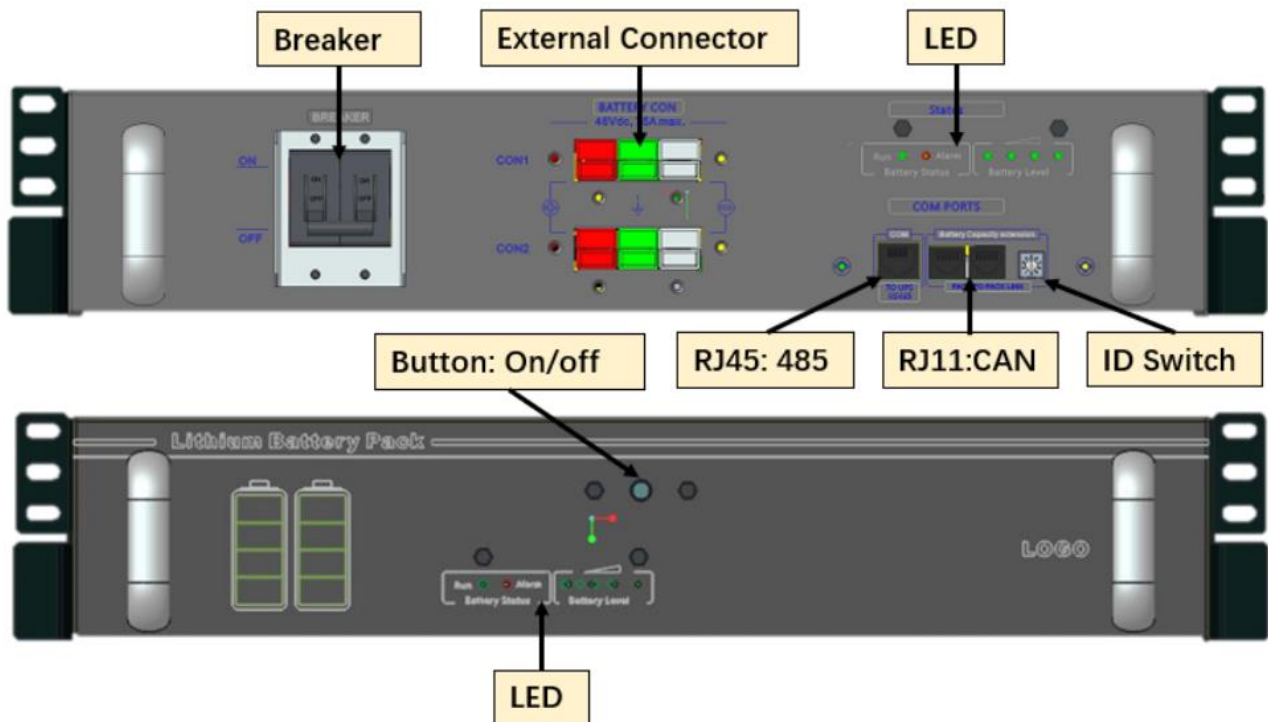
1.1 BMS Port

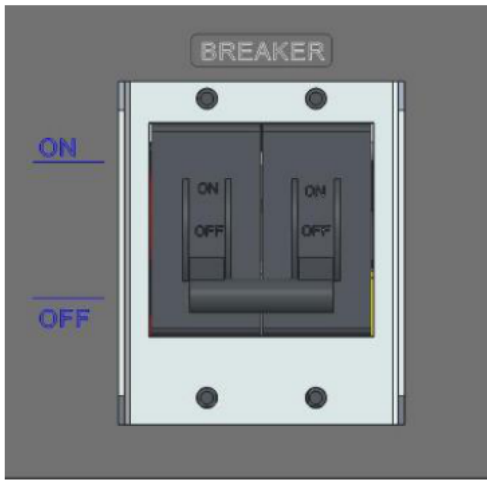Figure 1 Battery Product Interface

Reference Picture	PIN	Definition
	TOP	The breaker is on.
	BOTTOM	The breaker is off.

Figure 2 Breaker
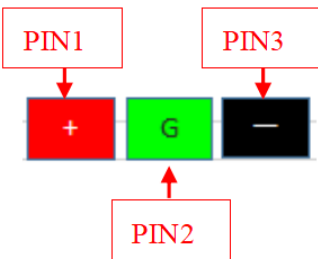
Reference Picture	PIN	Definition
	1(+)	Positive for charge and discharge
	2(G)	Connect to GND
	3(-)	Negative for charge and discharge

Figure 3 External connector
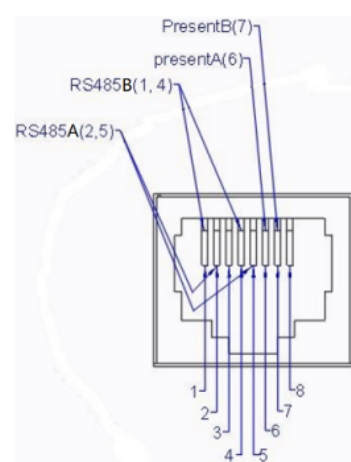
Reference Picture	PIN	Definition
	1	RS485B
	2	RS485A
	3	NC2
	4	RS485B
	5	RS485A
	6	PresentA
	7	PresentB
	8	NC1

Figure 4 RJ45 Communication port
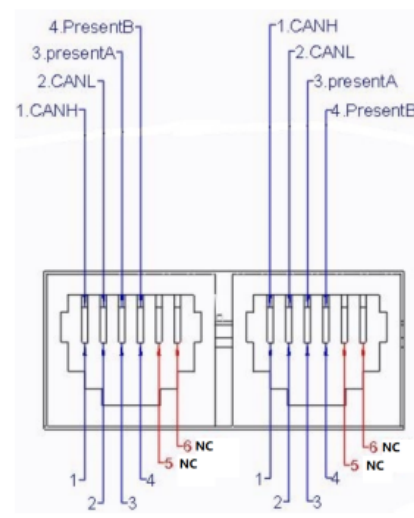
Reference Picture	PIN	Definition
	1	CANH
	2	CAHL
	3	PresentA
	4	PresentB
	5	NC
	6	NC

Figure 5 RJ11 Communication port

Reference Picture	Num	Refer to modbus ID
	0	0x0F
	1	0x0E
	2	0x0D
	3	0x0C
	4	0x0B
	5	0x0A
	6	0x09
	7	0x08
	8	0x07
	9	0x06

Figure 6 ID Switch

*Note1:

1. When numbers of BMS are used for parallel control，each BMS ID switch must different. Each BMS is individual, there is no need to distinguish which BMS is master.

2. If only one BMS is inserted in system, you can adjust the arrows of ID switch to 0~9，If two BMS are inserted in system, you can adjust the arrows of ID switch of one BMS to 0~9 and adjust the arrows of ID switch of the other BMS to the rest.

1.2 Start to use battery and power on

Step 1, wake up from shutdown mode (shipment mode)

The battery is shipped in shutdown mode, all the LEDs is off. There are two ways to wake up the battery pack from shipment mode. 1ST, to charge the battery pack by UPS. 2nd, press the button for more than 5 seconds. The LEDs will turn on after wake up.

Step 2, connect the power connector to UPS DC

Connect to UPS DC Connector
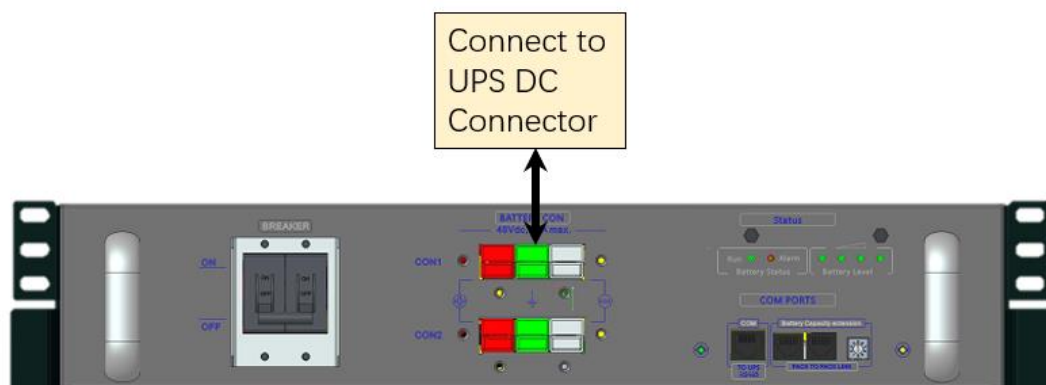
Step 3, turn on the Breaker

Step 4, connect battery RJ45 485 communication cable to UPS 485 interface to active battery.

Step 5, if there is no 485 communication with UPS, need to insert one "Pres" cable into RJ11 instead, to active the battery.

Connect to UPS 485 Interface

"Pres" cable
(No use, if "Pres" signal is short by UPS via 485 interface; otherwise, "Pres" cable is necessary)
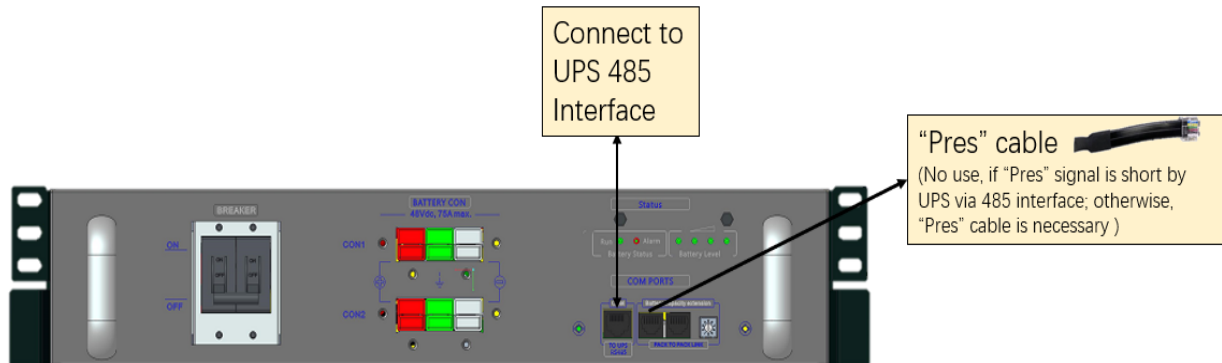
1.3 Connection of Battery Pack in parallel

Battery could be connected with parallel, the max parallel number is 10pcs. Battery packs communicate with CANBUS, and then one of the battery pack communication with system with RS485. And each BMS ID switch must different.

Connecting Diagram as below.

Connect to UPS DC Connector

Connect to UPS 485 Interface

"Pres" cable
(No use, if "Pres" signal is short by UPS via 485 interface; otherwise, "Pres" cable is necessary)

ID	Pack Qty	Capacity
0	1	50AH
0,1	2	100AH
0~2	3	150AH
0~3	4	200AH
0~4	5	250AH
0~5	6	300AH
0~6	7	350AH
0~7	8	400AH
0~8	9	450AH
0~9	10	500AH

ID SWITCH
(Should be set different for each batteries in parallel)
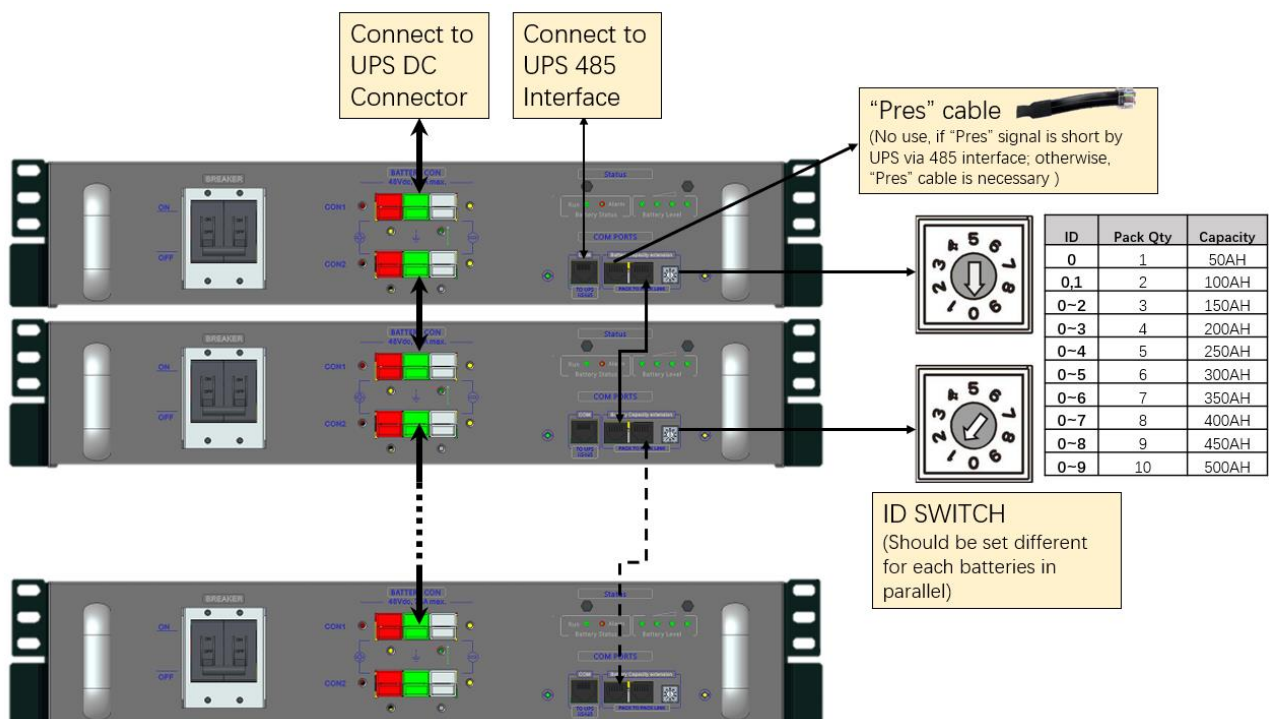
2. Communication parameter configuration

Baud rate	Start bit	Data bit	Parity bit	Stop bit
9600	1	8	N	1

3. Communication frame format

Device query command format

Index	1	2	3		4		5	
Function	Slave ID	Command type	Start Address of data		Data Length		*CRC	
Bytes	1	1	2		2		2	
	BMS address	Function code	MSB	LSB	MSB	LSB	LSB	MSB

*The CRC check range is all of the bytes before the CRC field,

Command type table

Index	Command type	Description
1	0x03	Read Data
2	0x10	Write Data

BMS normal response format

Index	1	2	3		4		5	
Function	Slave ID	Command type	Data Length		Data information		CRC	
Bytes	1	1	2		Data length * 2		2	
	BMS address	Function code	MSB	LSB	MSB	LSB	LSB	MSB

BMS abnormal response format

Index	1	2	3	4
Function	Slave ID	Command type + 128	Error code	CRC
Bytes	1	1	1	2

Error code

Index	Error code	Note
1	0x01	Slave ID should be within 1~16. Slave ID error if out of range
2	0x02	Command type error if command didn't exist,
3	0x03	CRC error

4. Command lists

The common node ID of BMS for RS485 communication is is 0x01, every BMS can respond ID 0x01.

Beside, each BMS has unique ID for RS485 communication. For example, if arrow of ID switch is point to 0, then this BMS unique ID is 0x0F. ID switch show in Figure 6. Using common ID(0x01) or unique ID(like 0x0F) to visit BMS, the data of return from BMS are the same.

4.1 Version information

Data Address	Byte Size	Parameter	Parameter Unit	Remarks
0x0001	2	Protocol type		Default 0
0x0002	2	Protocol version		Default 0
0x0003	4	BMS firmware version		ACE define
0x0005	4	BMS hardware version		

4.2 BMS general status parameters inquiry

Data Address	Byte Size	Parameter	Parameter Unit	Remarks
0x0010	2	Number of cell: M	pcs	Current single pack data serial cell number, default 15
0x0011	2	Cell1 voltage	0.1V	Current single pack data cell voltage 1 ~ 15
0x0012	2	Cell2 voltage		
0x0013	2	Cell3 voltage		
0x0014	2	Cell4 voltage		
0x0015	2	Cell5 voltage		
0x0016	2	Cell6 voltage		
0x0017	2	Cell7 voltage		
0x0018	2	Cell8 voltage		
0x0019	2	Cell9 voltage		
0x001A	2	Cell10 voltage		
0x001B	2	Cell11 voltage		

0x001C	2	Cell12 voltage		
0x001D	2	Cell13 voltage		
0x001E	2	Cell14 voltage		
0x001F	2	Cell15 voltage		
0x0020	2	Cell16 voltage		Default 0
0x0021	2	Cell17 voltage		Default 0
0x0022	2	Cell18 voltage		Default 0
0x0023	2	Cell19 voltage		Default 0
0x0024	2	*Cell20 voltage		Default 0
0x0025	2	Number of temperature sensor: N	pcs	Current single pack data NTC number 6
0x0026	2	Temperature Sensor 1	0.1K (Kelvin temperature)	Current single pack data NTC1 temperature
0x0027	2	Temperature Sensor 2		Current single pack data NTC2 temperature
0x0028	2	Temperature Sensor 3		Current single pack data NTC3 temperature
0x0029	2	Temperature Sensor 4		Current single pack data NTC4 temperature
0x002A	2	Temperature Sensor 5		Current single pack data NTC5 temperature
0x002B	2	Temperature Sensor 6		Current single pack data MOSFET temperature
0x002C	2	Temperature Sensor 7		Default 0
0x002D	2	Temperature Sensor 8		Default 0
0x002E	2	Temperature Sensor 9		Default 0
0x002F	2	Temperature Sensor 10		Default 0
0x0030	2	Module charge current	0.1A	Summary data of all packs Sum of charge current, is 0 when discharging
0x0031	2	Module discharge current	0.1A	Summary data of all packs Sum of discharge current of all packs, is 0 when charging
0x0032	2	Module voltage	0.1V	Summary data of all packs Average voltage of all packs
0x0033	2	SOC	%	Summary data of all packs Average SOC of all packs
0x0034	4	Module total capacity	mAH	Summary data of all packs Sum of fully charged capacity of all packs

*If the parameter doesn't exist, return 0x0000

4.3 BMS manufacturer usage inquiry

Data Address	Byte Size	Parameter	Parameter Unit	
0x0036	2	Pack parallel number	/	==Summary data of all packs== Number of online packs
0x0037	2	Charge Alarm	/	==Summary data of all packs== Charge alarm bits of all online packs (The result of logic "OR" of charge alarm bits of all single pack)
0x0038	2	Discharge Alarm	/	==Summary data of all packs== Discharge alarm bits of all online packs (The result of logic "OR" of discharge alarm bits of all single pack)
0x0039	2	Charge Protect	/	==Summary data of all packs== Charge protect bits of all online packs (The result of logic "OR" of charge protect bits of all single pack)
0x003A	2	Charge Protect 2	/	
0x003B	2	Discharge Protect	/	==Summary data of all packs== Discharge protect bits of all online packs (The result of logic "OR" of discharge protect bits of all single pack)
0x003C	2	Discharge Protect 2	/	
0x003D	2	BMS State	/	Reserved, default 0
0x003E	4	Design capacity	mAh	==Current single pack data== Design capacity of single pack (not consider parallel 50Ah and 100Ah packs)

Charge Alarm

Bit	Content	Note	Remarks
15	Reserved		
14	Reserved		
13	Reserved		
12	Reserved		
11	Reserved		

Bit	Content	Note	Remarks
10	Reserved		
9	Reserved		
8	Reserved		
7	Reserved		
6	Reserved		
5	Reserved		
4	Reserved		
3	OCC	Charge over current alarm	
2	CLT	Charge low temperature alarm	
1	COV	Cell over voltage alarm	
0	CHT	Charge over temperature alarm	

Discharge alarm

Bit	Content	Note	Remarks
15	Reserved		
14	Reserved		
13	Reserved		
12	Reserved		
11	Reserved		
10	Reserved		
9	Reserved		
8	Reserved		
7	Reserved		
6	Reserved		
5	Reserved		
4	Reserved		
3	CUV	Cell voltage low alarm	
2	FETHT	Mosfet over temperature alarm	
1	DLT	Discharge low temperature alarm	
0	DHT	Discharge over temperature alarm	

Charge Protect

Bit	Content	Note	Remarks
15	OCC2	2nd level charge over current	
14	Reserved		
13	CANID	CAN ID distribution not complete	

12	2NDOVP	2nd level cell over voltage	
11	OCC	Charge over current	
10	OCV	Cell over voltage	
9	CLT	Charge low temperature	
8	CHT	Charge over temperature	
7	SUV	Safety under voltage	
6	FETHT	Mosfet over temperature	
5	AFESCD	AFE detect discharge short circuit	
4	AFEOCD	AFE detect discharge over current	
3	AFEOCC	AFE detect charge over current	
2	AFEComm	AFE communication fail	
1	BoostNRDY	Mosfet driver status	
0	PRES	"In System" signal	

Charge Protect 2

Bit	Content	Note	Remarks
15	Reserved		
14	Reserved		
13	Reserved		
12	Reserved		
11	Reserved		
10	Reserved		
9	Reserved		
8	Reserved		
7	Reserved		
6	Reserved		
5	Reserved		
4	Reserved		
3	IDError	CAN ID error	
2	OCCHw	Detect charge short circuit	
1	Shutdown	Low voltage shutdown	
0	ShutdownByCmd	Receive shutdown command	

Discharge protect

Bit	Content	Note	Remarks
15	Shutdown	Low voltage shutdown	
14	DHT	Discharge over termperature	
13	DLT	Discharge low temperature	
12	OCD	Discharge over current	
11	CUV	Cell under voltage	

10	FETHT	Mosfet over temperature	
9	Reserved		
8	Reserved		
7	Reserved		
6	IDError	CAN ID error	
5	Reserved		
4	AFESCD	AFE detect discharge short circuit	
3	AFEOCD	AFE detect discharge over current	
2	AFEOCC	AFE detect charge over current	
1	BoostNRDY	Mosfet driver status	
0	PRES	"In System" signal	

Discharge protect 2

Bit	Content	Note	Remarks
15	Reserved		
14	Reserved		
13	CANID	CAN ID distribution not complete	
12	Reserved		
11	Reserved		
10	Reserved		
9	Reserved		
8	Reserved		
7	Reserved		
6	ShutdownByCmd	Receive shutdown command	
5	DHT2	2nd level discharge over temperature	
4	2NDOVP	2nd level cell over voltage	
3	Reserved		
2	OCD2	2nd level discharge over current	
1	Short	Detect discharge short circuit	
0	AFEComm	AFE communication fail	

4.4 BMS warning information inquiry

Data Address	Byte Size	Parameter	Note	Remarks

0x0040	2	Number of cell: M		==Current single pack data== Single pack serial cell number, default 15
0x0041	2	Cell 1/2 voltage state	00H: normal 01H: below lower limit 02H: above higher limit F0H: other error	==Current single pack data== Status of current single pack, F0H is not implemented. 00H: normal 01H: under voltage protect 02H: over voltage protect
0x0042	2	Cell 3/4 voltage state		
0x0043	2	Cell 5/6 voltage state		
0x0044	2	Cell 7/8 voltage state		
0x0045	2	Cell 9/10 voltage state		
0x0046	2	Cell 11/12 voltage state		
0x0047	2	Cell 13/14 voltage state		
0x0048	2	Cell 15/16 voltage state		
0x0049	2	Cell 17/18 voltage state		
0x004A	2	Cell 19/20 voltage state		
0x0050	2	Number of temperature sensor: N		Single pack NTC number 6
0x0051	2	BMS Temperature1/2 state	00H: normal 01H: below lower limit 02H: above higher limit F0H: other error	==Current single pack data== Status of current single pack, F0H is not implemented. 00H: normal 01H: under temp protect 02H: over temp protect
0x0052	2	BMS Temperature3/4 state		
0x0053	2	BMS Temperature5/6 state		
0x0054	2	BMS Temperature7/8 state		
0x0055	2	BMS Temperature9/10 state		
0x0060	2	Module charge voltage state	00H: normal 01H: below lower limit 02H: above higher limit F0H: other error	==Current single pack data== The corresponding status of current single pack
0x0061	2	Module discharge voltage state		
0x0062	2	Cell charge voltage state		
0x0063	2	Cell discharge voltage state		
0x0064	2	Module charge current state		
0x0065	2	Module discharge current state		
0x0066	2	Module charge temperature state		

0x0067	2	Module discharge temperature state		
0x0068	2	Cell charge temperature state		
0x0069	2	Cell discharge temperature state		

*If the parameter didn't exist, return 0x0000

4.5 BMS charger and discharge information inquiry

Data Address	Byte Size	Parameter	Parameter Unit	Remarks
0x0070	2	Charge voltage limit	0.1V	Current single pack data Charge alarm voltage 3750mv*15 = 56250mv
0x0071	2	Discharge voltage limit	0.1V	Current single pack data Discharge alarm voltage 2600mv *15 = 39000mv (not used by UPS yet)
0x0072	2	Charge current limit	0.1A	Summary data of all packs Total charge current protect threshold of all online packs (not used by UPS yet)
0x0073	2	Discharge current limit	0.1A	Summary data of all packs Total discharge current protect threshold of all online packs (not used by UPS yet)
0x0074	2	Charge, discharge status		
0x0075	2	Run Time To Empty	min	Summary data of all packs Total available capacity of all packs / discharge current
0x0076	4	Module remain capacity	mAh	Summary data of all packs Total available capacity of all packs

Charge, discharge status:

Bit	Content	Note	Remarks
7	Charge enable	1: yes 0: request stop charge	Summary data of all packs Any pack disables charge,

			set 0
6	Discharge enable	1: yes 0: request stop discharge	==Summary data of all packs== All packs disable discharge, set 0
5	Charge immediately	1: request: 0: no request	SOC <=9% set 1, otherwise 0
4	Charge immediately2	1: request: 0: no request	9 <SOC <=14% set 1, otherwise 0
3	Full charge request	1: request: 0: no request	Always 0
2	Small current charge request	1: request: 0: no request	Always 0
1			
0			

*Bit 5: Set when SoC is very low, like 5~9%, device need charge immediately until this flag disappear.

*Bit 4: Set when SoC is low, like 10~14%, it will be better that device charge immediately until this flag disappear.

*Bit 3: Set when BMS need device fully charged.