

MODBUS Protocol between Inverter and BMS

1. Data format

1.1 Data byte format

Start bit(1)	Data bits (8bits,LSB->MSB)	Stop bit(1)
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1.2 Baud rate

Baud rate: 9600~19200. (Default baud rate: 9600)

Reading time interval: **100mS**

1.3 Packet format

Master : UPS/SMPS

Master BMS : 0x10 (Battery module ID-0), Slave BMS: battery module0x01~0x0f

Address: the ID of the BMS, from 0x01 to 0x10; the default slave address is 0x10(master BMS), battery module ID is 0, as the below table No. 16 in yellow.

No.	Module Address	Battery Module ID	ID Arrangement			
1	0x01	1	ON	ON	ON	OFF
2	0x02	2	ON	ON	OFF	ON
3	0x03	3	ON	ON	OFF	OFF
4	0x04	4	ON	OFF	ON	ON
5	0x05	5	ON	OFF	ON	OFF
6	0x06	6	ON	OFF	OFF	ON
7	0x07	7	ON	OFF	OFF	OFF
8	0x08	8	OFF	ON	ON	ON
9	0x09	9	OFF	ON	ON	OFF
10	0x0a	10	OFF	ON	OFF	ON
11	0x0b	11	OFF	ON	OFF	OFF
12	0x0c	12	OFF	OFF	ON	ON
13	0x0d	13	OFF	OFF	ON	OFF
14	0x0e	14	OFF	OFF	OFF	ON
15	0x0f	15	OFF	OFF	OFF	OFF
16	0x10	16	ON	ON	ON	ON

1.3.1 Packet send from master

Slave Address	Function code	Starting address(Hi)	Starting address(Lo)	Numbers of data(Hi)	Numbers of data(Lo)	CRC (Lo)	CRC (Hi)
8bit	8bit	8bit	8bit	8bit	8bit	8bit	8bit

1.3.2 Packet response by slave

Slave Address	Function code	Byte count	Data 1 (Hi)	Data1 (Lo)	Data n (Hi)	Data n: (Lo)	CRC (Lo)	CRC (Hi)
8bit	8bit	8bit	8bit	8bit	8bit	8bit	8bit	8bit

2.Function Code

2.1 Read registers

Send by the master SMPS

Slave Address	Function Code	Address (Hi)	Address (Lo)	Num of register(Hi)	Num of register(Lo)	CRC (Lo)	CRC (Hi)
0x01-0x10	0x03	0x00	0x00-0xff	0x00	0x00-0xff	-	-

Response by salve (BMS)

Slave address	Function Code	Byte Count	Data1 (Hi)	Data1 (Lo)	...	Data N (Hi)	Data (Lo)	CRC (Lo)	CRC (Hi)
0x01-0x10	0x03	2*(Num of register)	...--	-

2.2 Write registers

Send by the master SMPS

Slave Address	Function Code	Address (Hi)	Address (Lo)	Num of register(Hi)	Num of Register(Lo)	Byte Count	
0x01-0x10	0x10	0x00	0x00-0xff	0x00	0x00-0xff	2*(Num of register)	
Data1 (Hi)	Data1 (Lo)		DataN (Hi)	DataN (Lo)	CRC (Lo)	CRC (Hi)

...	-	-
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Response by salve (Write success)

Slave Address	Function Code	Address (Hi)	Address (Lo)	Num of register(Hi)	Num of register(Lo)	CRC (Lo)	CRC (Hi)
0x01-0x10	0x10	0x00	0x00-0xff	0x00	0x00-0xff	-	-

Response by salve (Write Error)

Slave address	Function Code	Error num	CRC (Lo)	CRC (Hi)
0x01-0x10	0x090	...	-	-

3.Register

ULONG: Unsigned long,4 bytes

LONG: Signed long, 4 bytes

USHORT: Unsigned int, 2 bytes

SHORT: signed int, 2bytes

Address	Content	Length	RW/Data type	Unit	Comment
0000	Voltage	2byte	R/USHORT	10mV	0~9000*10mV
0001	Current	2byte	R/SHORT	10mA	0~32767: Charge -32768~0: Discharge
0002-0017	Cell Voltage	32byte	R/USHORT	mV	Voltage of 16 Cells, 2 byte for each cell
0018	Temp of PCB	2byte	R/SHORT	℃	Temperature
0019	Temp Avg	2byte	R/SHORT	℃	Temperature
0020	Temp Max	2byte	R/SHORT	℃	Temperature
0021	Cap Remaining	2Byte	R/USHORT		Remaining capacity

0022	Max charging Current	2Byte	R/USHORT		
0023	SOH	2byte	R/USHORT		0-100%
0024	SOC	2byte	R/USHORT		0-100%
0025	Status	2byte	R/USHORT		<p>0x0000:Heating off/Stand by</p> <p>0x0001:Heating off/Charging</p> <p>0x0002:Heating off/Discharging</p> <p>0x0004:Heating off/Protect</p> <p>0x0008:Heating off/Charging Lmt</p> <p>0x8000:Heating on/Stand by</p> <p>0x8001:Heating on/Charging</p> <p>0x8002:Heating on/Discharging</p> <p>0x8004:Heating on/Protect</p> <p>0x8008:Heating on/Charging Lmt</p> <p>The high byte is 0x00:heating status -- off</p> <p>The high byte is 0x80:heating status -- off</p>
0026	Warning	2byte	R/USHORT		<p>0x0001: Pack OV</p> <p>0x0002: Cell OV</p> <p>0x0004: Pack UV</p> <p>0x0008: Cell UV</p> <p>0x0010: Charge OC</p> <p>0x0020: Discharge OC</p> <p>0x0040: Ambient temperature warning</p> <p>0x0080: Mos over temperature warning</p> <p>0x0100: Charge OT</p> <p>0x0200: Discharge OT</p> <p>0x0400: Charge UT</p> <p>0x0800: Discharge UT</p> <p>0x1000: Low capacity</p>

0027	Protection	2byte	R/USHORT		0x0001: Pack OV 0x0002: Cell OV 0x0004: Pack UV 0x0008: Cell UV 0x0010: Charge OC 0x0020: Discharge OC 0x0040: Ambient temperature protection 0x0080: Mos over temperature 0x0100: Charge OT 0x0200: Discharge OT 0x0400: Charge UT 0x0800: Discharge UT 0x1000: Low capacity 0x2000: Discharge SC
0028	Error Code	2byte	R/USHORT		0x0001: Voltage error 0x0002: Temperature error 0x0004: Current detection Error 0x0010: Cell unbalance
0029	Cycle counts	4byte	RW/ULONG		1 ~ 65535
0030					
0031 0032	Full Capacity	4byte	RW/ULONG	mAS	=mAh/3600
0033 0034 0035	Temp	6Byte			Temperature for 6 sensor , 1byte/1Sensor
0036	Cell Num	2byte	RW/USHORT		Number of cell strings
0037	Designed Capacity	2Byte		0.1AH	Battery nominal capacity
0038	Cell Balance Status	2Byte			0001: Cell 1 balance on 0002: Cell 2 balance on 0004 0008 8000: Cell 16 balance on
00039-0054	Cell Voltage	32byte	R/USHORT	mV	Voltage of 17-32 Cells, 2 byte for each cell

0105-0116	Model	24Byte	R		Product model
0117-0119	FW Version	6Byte	R		Software version (e. g.: 6-byte string V03R04)
0120-0127	Serial No.	16Byte	RW		Product serial number. A 16-byte string