MODBUS Protocol between UPS(SMPS) and BMS

Version	Modify	Date	
V01.01	Init	04-21-2015	
V01.02		08-13-2015	
V01.03	ID arrangement	09-16-2015	
V01.04	Register definition	10-19-2015	
V01.05	Register re-definition	11-30-2015	
V01.06	Add Register for Temp	06-21-2017	
V01.10	Add new Register	04-15-2021	
V01.11	Add new Register for Bluetooth	08-13-2022	

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Master: APP/BLE MASTER

Slave BMS: Battery module 0x01

No.	Module Address	Battery Module ID	ID Arrangement			
1	0x01	1	ON	ON	ON	OFF

1.3.1 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 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)	.....		Data N (Hi)	Data N (Lo)	CRC (Lo)	CRC (Hi)
...	....			...	...	-	-

Response by slave (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 slave (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, 2 bytes

Address	Content	Length	RW/Data type	Unit	Comment
0000	Voltage	2 bytes	R/USHORT	10mV	0 ~ 9000 * 10mV
0001	Current	2 bytes	R/SHORT	100mA	0 ~ 32767 (charging) -32768 ~ 0 (discharging)
0002-0017	Single Cell Voltage	32 bytes	R/USHORT	mV	Voltage of 16 cells, 2 bytes for each cell

0018	PCB Temperature	2 bytes	R/SHORT	℃	Temperature
0019	Temperature Avg.	2 bytes	R/SHORT	℃	Temperature
0020	Temperature Max.	2 bytes	R/SHORT	℃	Temperature
0021	Capacity Remaining	2 bytes	R/USHORT		
0022	Max. Charging Current	2 bytes	R/USHORT	0.1A	Max. Charging Current
0023	SoH	2 bytes	R/USHORT		0-100%
0024	SoC	2 bytes	R/USHORT		0-100%
0025	Status	2 bytes	R/USHORT		0x0000: Heating off/Standby 0x0001: Heating off/Charging 0x0002: Heating off/Discharging 0x0004: Heating off/Protection 0x0008: Heating off/Charging current limit 0x8000: Heating on/Standby 0x8001: Heating on/Charging 0x8002: Heating on/Discharging 0x8004: Heating on/Protection 0x8008: Heating on/Charging current limit The high byte is 0x00: Heating status -- off The high byte is 0x80: Heating status -- on
0026	Alerts	2 bytes	R/USHORT		0x0001: Overvoltage for the whole group 0x0002: Overvoltage for a single cell 0x0004: Undervoltage for the whole group 0x0008: Undervoltage for a single cell 0x0010: Overcurrent during charging 0x0020: Overcurrent during discharge 0x0040: Abnormal ambient temperature 0x0080: High MOS temperature 0x0100: Over-temperature during charging 0x0200: Over-temperature during discharge 0x0400: Low temperature during charging 0x0800: Low temperature during discharge 0x1000: Low capacity 0x2000: 0x4000:

0027	Protection	2 bytes	R/USHORT		0027 Protection 2-bytes R/USHORT 0x0001: Overvoltage for the whole group 0x0002: Overvoltage for a single cell 0x0004: Undervoltage for the whole group 0x0008: Undervoltage for a single cell 0x0010: Overcurrent during charging 0x0020: Overcurrent during discharge 0x0040: Abnormal ambient temperature 0x0080: High MOS temperature 0x0100: Over-temperature during charging 0x0200: Over-temperature during discharge 0x0400: Low temperature during charging 0x0800: Low temperature during discharge 0x1000: Float stopped 0x2000: Discharge short circuit
0028	Error Code	2 bytes	R/USHORT		0x0001: Voltage error 0x0002: Temperature error 0x0004: Current detection error 0x0010: Single cell imbalance
0029 0030	Cycle counts	4byte	RW/ULONG		1 ~ 65535
0031 0032	Full capacity	4byte	RW/ULONG	mAS	=mAh/3600
0033 0034 0035	Temperature	6Byte			Temperature for 6 sensors, 1 byte/1 sensor
0036	Number of battery cells	2 bytes	R/USHORT		Number of battery cells
0037	Designed capacity	2 bytes		0.1AH	Battery standard capacity
0038	Single cell balancing status	2 bytes			0x0001: Single cell 1 balancing on 0x0002: Single cell 2 balancing on 0x0004: 0x0008: 0x8000: Single cell 16 balancing on
0039	Number of temperature sensors	2 bytes	R/USHORT		Number of temperature sensors
0040	Switch for HW	2 bytes			0001: Charging MOS On 0002: Discharging MOS On 0004: Sleep On 0008: Sound On
0041	Switch for Alerts	2 bytes			0x0001: Whole group overvoltage enable 0x0002: Single cell overvoltage

					0x0004: Whole group undervoltage 0x0008: Single cell undervoltage 0x0010: Charging overcurrent 0x0020: Discharging overcurrent 0x0040: Ambient temperature anomaly 0x0080: MOS temperature high 0x0100: Charging overtemperature 0x0200: Discharging overtemperature 0x0400: Charging low temperature 0x0800: Discharging low temperature 0x1000: PCB overtemperature 0x2000: Low capacity
0042	Switch for Protection	2 bytes			0x0001: Overvoltage of whole pack 0x0002: Overvoltage of single cell 0x0004: Undervoltage of whole pack 0x0008: Undervoltage of single cell 0x0010: Overcharge current 0x0020: Over-discharge current 0x0040: Abnormal ambient temperature 0x0080: High MOS temperature 0x0100: Overcharge temperature 0x0200: Over-discharge temperature 0x0400: Low charging temperature 0x0800: Low discharging temperature 0x1000: PCB over temperature 0x2000: Low capacity
0043	Log Duration Idle	2 bytes		Minutes	Interval for Recording During Idle Time
0044	Log Duration Active	2 bytes		Minutes	Charge and discharge recording interval
0045 0046	Date and Time	4 bytes			Date and time (Defined in Note 1)
0047	Charging over-current mode	2 bytes			Charge current limiting mode 0: No current limiting protection 1: Always limit charge current 2: Pre-charge protection 4: Current limiting after charging overcurrent 8: Pre-charge + current limiting after charging overcurrent
0048	Charging restricted flow voltage			mV	Start voltage for charging with restricted flow
0049	SoC stop Float	2 bytes		%	Pause floating SoC

0050	SoC Recovery Float	2 bytes		%	Recover floating SoC
0051	Duration Float	2 bytes		S	Float charge duration
0052	Duration Idle	2 bytes		S	Pause floating duration
0053	Float charging voltage	2 bytes		0.1V	Floating pause voltage
0054	Restore float charging voltage	2 bytes		0.1V	Recover floating voltage after pause
0055	Float Charge mode	2 bytes			0000: Continuous float 0001：Voltage detection 0002：Timed float 0003：SoC detection
0056	Balancing voltage	2 bytes			Balance start voltage difference
0057	Balanced ΔV	2 bytes			Balance start voltage difference
0058	Alerts Low capacity	2 bytes			Low-capacity alerts
0059	Delete data records	2 bytes			0001：Delete data records
0061	Single Cell UV Alarm	2 bytes	RW/USHORT	mV	Single cell under-voltage alarm
0062	Single Cell UV Protect	2 bytes	RW/USHOR	mV	Single cell under-voltage protection
0063	Single Cell UV Recover	2 bytes	RW/USHORT	mV	Single cell under-voltage recovery
0064	Pack UV Alarm	2 bytes	RW/USHORT	10mV	Pack under-voltage alarm
0065	Pack UV Protect	2 bytes	RW/USHORT	10mV	Pack under-voltage protection
0066	Pack UV Recover	2 bytes	RW/USHORT	10mV	Pack under-voltage recovery
0067	Single Cell OV Alarm	2 bytes	RW/USHORT	mV	Single cell over-voltage alarm
0068	Single Cell OV Protect	2 bytes	RW/USHORT	mV	Single cell over-voltage protection

0069	Single Cell OV Recover	2 bytes	RW/USHORT	mV	Single cell over-voltage recovery
0070	Pack OV Alarm	2 bytes	RW/USHORT	10mV	Pack over-voltage alarm
0071	Pack OV Protect	2 bytes	RW/USHORT	10mV	Pack over-voltage protection
0072	Pack OV Recover	2 bytes	RW/USHORT	10mV	Pack over-voltage recovery
0073	Fully Charged Voltage	2 bytes	RW/USHORT	0.1V	
0074	Fully Charged Current	2 bytes	RW/USHORT	0.1A	
0076	Charge Overcurrent Times	2 bytes	RW/USHORT	Times	Times of charge overcurrent
0077	Discharge Overcurrent Times	2 bytes	RW/USHORT	Times	Times of discharge overcurrent
0078	Recover Charge Overcurrent	2 bytes	RW/USHORT	S	Recovery delay time for charge overcurrent
0079	Recover Discharge Overcurrent	2 bytes	RW/USHORT	S	Recovery delay time for discharge overcurrent
0080	Over-current limit 1 during charging	2 bytes	RW/USHORT	10mA	Over-current limit 1 during charging
0081	Over-current limit 1 during discharging	2 bytes	RW/USHORT	10mA	Over-current limit 1 during discharging
0082	Load short current	2 bytes	R/USHORT	10mA	Load short current
0083	Over-current limit 2 during charging	2 bytes	RW/USHORT	10mA	Over-current limit 2 during charging
0084	Over-current limit 2 during discharging	2 bytes	RW/USHORT	10mA	Over-current limit 2 during discharging
0085	Delay of over-current limit 1 during charging	2 bytes	RW/USHORT	S	Delay of over-current limit 1 during charging
0086	Delay of over-current limit 2 during charging	2 bytes	RW/USHORT	S	Delay of over-current limit 2 during charging
0087	Delay of over-current limit 1 during discharging	2 bytes	RW/USHORT	S	Delay of over-current limit 1 during discharging
0088	Delay of over-current limit 2 during discharging	2 bytes	RW/USHORT	S	Delay of over-current limit 2 during discharging
0089		2 bytes	RW/USHORT		

0090	Charging low temperature warning	2 bytes	RW/SHORT	Offset +50℃	Charging low temperature warning (-30~+30)
0091	Charging low temperature protection	2 bytes	RW/SHORT	Offset +50℃	Charging low temperature protection (-30~+30)
0092	Charging low temperature recovery	2 bytes	RW/SHORT	Offset +50℃	Charging low temperature recovery (-30~+35)
0093	Charging high temperature warning	2 bytes	RW/SHORT	Offset +50℃	Charging high temperature warning (10~80)
0094	Charging high temperature protection	2 bytes	RW/SHORT	Offset +50℃	Charging high temperature protection (10~80)
0095	Charging high temperature recovery	2 bytes	RW/SHORT	Offset +50℃	Charging high temperature recovery (10~80)
0096	Discharging low temperature warning	2 bytes	RW/SHORT	Offset +50℃	Discharging low temperature warning (-30~+30)
0097	Discharging low temperature protection	2 bytes	RW/SHORT	Offset +50℃	Discharging low temperature protection (-30~+30)
0098	Discharging low temperature recovery	2 bytes	RW/SHORT	Offset +50℃	Discharging low temperature recovery (-30~+35)
0099	Discharging high temperature warning	2 bytes	RW/SHORT	Offset +50℃	Discharging high temperature warning (10~80)
00100	Discharging high temperature protection	2 bytes	RW/SHORT	Offset +50℃	Discharging high temperature protection (10~80)
00101	Discharge over-temperature restore	2 bytes	RW/SHORT	Offset +50℃	Restore range: 10~80℃
00102	PCB over-temperature alarm	2 bytes	RW/SHORT	Offset +50℃	Alarm range: 60-100℃
00103	PCB over-temperature protection	2 bytes	RW/SHORT	Offset +50℃	Protection range: 60-100℃
00104	PCB over-temperature restore	2 bytes	RW/SHORT	Offset +50℃	Restore range: 60-100℃
0105-0116	Model	24 bytes	R		Product model
0117-0119	FW Version	6 bytes	R		BMS software version (e.g., 6-byte string "V03R04")
0120-0127	Serial No.	16 bytes	RW		Product serial number (16-byte string)
0128	Heating turn-on temperature	2 bytes	RW/SHORT	Offset +50℃	Range: -10~25℃
0129	Heating turn-off temperature	2 bytes	RW/SHORT	Offset +50℃	Range: -10~25℃
0130	Low ambient temperature alarm	2 bytes	RW/SHORT	Offset +50℃	Discharge low temperature alarm range: -30 ~+30 (default -20)
0131	Low ambient temperature protection	2 bytes	RW/SHORT	Offset +50℃	Discharge low temperature protection range: -30 ~+30 (default -25)

0132	Low ambient temperature restore	2 bytes	RW/SHORT	Offset +50℃	Discharge low temperature restore range: -30~+35 (default -20)
0133	High ambient temperature alarm	2 bytes	RW/SHORT	Offset +50℃	Discharge high temperature alarm range: 20 ~+75 (default 60)
0134	High ambient temperature protection	2 bytes	RW/SHORT	Offset +50℃	Discharge high temperature protection range: 20 ~+75 (default 70)
0135	High ambient temperature restore	2 bytes	RW/SHORT	Offset +50℃	Discharge high temperature restore range: 20~+75 (default 60)

Note 1: For the temperature settings of 90-104 and 128-135, in order to avoid negative values, 50 is added to the actual value when reading and writing. For example, if 30 is written, the actual value is -20.