Intelligent lithium battery RS485 Modbus monitoring communication protocol

Modify records

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1. Protocol overview

Following the MODBUS-RTU protocol, the MODBUS protocol adopts a master/slave communication method, the master sends a request, and the slave responds to the master request after receiving the correct data belonging to the slave. In the agreement, the intelligent lithium battery product is the slave. (The communication format adopts N,8,1 mode, the default baud rate is fixed at 9600,)

The data field of a frame message can be up to 64 bytes, that is, up to 32 registers .

2. Protocol format

2.1 Protocol Frame Format Framework:

serial number	1	2	3	4
number of bytes	1	1	n	2
Format	Slave Address	Function Code	Data (Register begin Address;Register Number;Data Number;Data x.)	CRC

device slave address

The settable range is 1~247, among which the slave address range of lithium battery is 214 ~ 221, 224 ~ 231 . The default address is 214

broadcast address 0.

Modbus communication protocol function code :

03H - read single or consecutive multiple registers (read holding registers)

06H - write single register

10H----- Write multiple registers

The register address is represented by 2 bytes.

2.2 Exception code definition table

serial number	Exception code value (HEX)	express meaning	Remark
1	00H	normal	
2	01H	Invalid function code	The slave node received a function code that the slave node cannot support
3	02H	Invalid data register address	The register address is invalid or out of resolvable range
4	03H	invalid data value	CRC error or invalid data
5	04H	Failed to execute from node	Failed to respond from node

2.3 CRC check algorithm

CRC check adopts 16-bit check, and the check data range includes all the bytes of a frame of data except the last 2 bytes. The reference check code is as follows:

```
unsigned short count_CRC(unsigned char *addr, int num)
{
unsigned short CRC = 0xFFFF;
int i;
while (num--)
{
    CRC ^= *addr++;
    for (i = 0; i < 8; i++)
    {
        if (CRC & 1)
        {
            CRC >>= 1;
            CRC^= 0xA001;
        }
        else
        {
            CRC >>= 1;
        }
    }
}
return CRC;
}
```

3. RTU command format and example:

3.1 03H - read single or consecutive multiple registers

Send frame:

name	byte sequence number	Example
Device address	1	01H
function code	2	03H
Register start address high byte (High Byte)	3	01H
Register start address low byte (Low Byte)	4	0 2H

Number of registers High Byte (N) (High Byte)	5	00H
Number of Registers Low Byte (N) (Low Byte)	6	02H
CRC check (Low Byte)	7	CRC(L)
CRC check (High Byte)	8	CRC(H)

Number of registers: 1~125

Note: Read the contents of 2 consecutive words with the starting address of 0102H from the module with the address of 01H.

Return frame:

name	byte sequence number	Example
Device address	1	01H
function code	2	03H
Returns the number of data bytes (2N)	3	04H
Data 1 (High)	4	0 0 H
Data 1 (Low)	5	01H
Data 2 (High)	6	00H
Data 2 (Low)	7	01H
...		
CRC check (Low Byte)	8	CRC(L)
CRC check (High Byte)	9	CRC(H)

Note: Return the contents of 2 consecutive words with the starting address 0102H from the module with the address 01H (yin

shadow part).

Function code returns:

correct: 0x03;

Error: 0x83

3.2 06H - Write a single register

Send frame:

name	byte sequence number	Example
Device address	1	01H
function code	2	06H
Register address high byte (High Byte)	3	01H
Register address low byte (Low Byte)	4	0 2 H
Register data high byte (High Byte)	5	00H
Register data low byte (Low Byte)	6	01H
CRC check (Low Byte)	7	CRC(L)

CRC check (High Byte)	8	CRC(H)

Note: Write 1 word of data to the register whose address is 01H and whose starting address is 0102H (shaded part).

Return frame:

name	byte sequence number	Example
Device address	1	01H
function code	2	06H
Register address (High Byte)	3	01H
Register address (Low Byte)	4	0 2 H
Register data (High Byte)	5	00H
Register data (Low Byte)	6	01H
CRC check (Low Byte)	7	CRC(L)
CRC check (High Byte)	8	CRC(H)

Function code returns:
correct: 0x06;
Error: 0x86

3.3 10H - write multiple registers in succession

Send frame:

name	byte sequence number	Example
Device address	1	01H
function number	2	10H
Register start address (High Byte)	3	01H
Register start address (Low Byte)	4	0 2 H
Number of registers (N) (High Byte)	5	00H
Number of registers (N) (Low Byte)	6	02H
data byte length	7	04H
Data 1 (High Byte)	8	00H
Data 1 (Low Byte)	9	01H
Data 2 (High Byte)	10	00H
Data 2 (Low Byte)	11	01H
CRC check (Low Byte)	12	CRC(L)
CRC check (High Byte)	13	CRC(H)

Number of registers: 0~123

Note: Write 2 consecutive registers with the starting address of 0102H in the module with address 01H Word data content (shaded area).

Return frame:

name	byte sequence number	Example

Device address	1	01H
function code	2	10H
Register start address (High Byte)	3	01H
Register start address (Low Byte)	4	02H
Number of registers (High Byte)	5	0 0H
Number of registers (Low Byte)	6	02H
CRC check (Low Byte)	7	CRC(L)
CRC check (High Byte)	8	CRC(H)

Function code returns:
correct: 0x10;
Error: 0x90

4. Parameter register assignment

4.1 Read and write parameter register table:

Register Address(0x)	Name	Unit	Data Type	Remarks	W riteable
0000	Vbus	V	Unsigned int 16	multiples of 100	
0001	Vbat	V	Unsigned int 16	multiples of 100	
0005	Tcell_max	° C	Signed int 16	multiple of 1	
0006	Tcell_min	° C	Signed int 16	multiple of 1	
0012	Tcell1	° C	Signed int 16	multiple of 1	
0013	Tcell2	° C	Signed int 16	multiple of 1	
0014	Tcell3	° C	Signed int 16	multiple of 1	
0015	Tcell4	° C	Signed int 16	multiple of 1	
0016	Tcell5	° C	Signed int 16	multiple of 1	
0017	Tcell6	° C	Signed int 16	multiple of 1	
0018	Tcell7	° C	Signed int 16	multiple of 1	
0019	Tcell8	° C	Signed int 16	multiple of 1	
001A	Tcell9	° C	Signed int 16	multiple of 1	
001B	Tcell10	° C	Signed int 16	multiple of 1	
001C	Tcell11	° C	Signed int 16	multiple of 1	
001D	Tcell12	° C	Signed int 16	multiple of 1	
001E	Tcell13	° C	Signed int 16	multiple of 1	
001F	Tcell14	° C	Signed int 16	multiple of 1	
0020	Tcell15	° C	Signed int 16	multiple of 1	
0021	Tcell16	° C	Signed int 16	multiple of 1	
0022	Vcell1	V	Unsigned int	Multiples of 100 0	

			16		
0023	Vcell2	V	Unsigned int 16	Multiples of 100 0	
0024	Vcell3	V	Unsigned int 16	Multiples of 100 0	
0025	Vcell4	V	Unsigned int 16	Multiples of 100 0	
0026	Vcell5	V	Unsigned int 16	Multiples of 100 0	
0027	Vcell6	V	Unsigned int 16	Multiples of 100 0	
0028	Vcell7	V	Unsigned int 16	Multiples of 100 0	
0029	Vcell8	V	Unsigned int 16	Multiple 100 0	
002A	Vcell9	V	Unsigned int 16	Multiple 100 0	
002B	Vcell10	V	Unsigned int 16	Multiple 100 0	
002C	Vcell11	V	Unsigned int 16	Multiple 100 0	
002D	Vcell12	V	Unsigned int 16	Multiple 100 0	
002E	Vcell13	V	Unsigned int 16	Multiples of 100 0	
002F	Vcell14	V	Unsigned int 16	Multiples of 100 0	
0030	Vcell15	V	Unsigned int 16	Multiples of 100 0	
0031	Vcell16	V	Unsigned int 16	Multiples of 100 0	
0101	Software version	/	Unsigned int 16	0xXY=VX.Y version	
0102	hardware version	/	Unsigned int 16	ASCII , 0x3031=V0.1 version 0x304B=V0.K version	
010F	Number of battery cells	individual	Unsigned int 16	multiple of 1	
0209~020A	operation hours	hours	Unsigned int 32	statistics data(4bytes)	
1000	year		Unsigned int 16	range:2000~2199	Yes
1001	month		Unsigned int 16	range: 1~12	Yes

1002	day		Unsigned int 16	range: 1-31	Yes
1003	hour		Unsigned int 16	range: 0~23	Yes
1004	minute		Unsigned int 16	range: 0~59	Yes
1005	second		Unsigned int 16	range: 0~59	Yes
1010	Discharge BUS voltage set value [Vbus_set]	V	Unsigned int 16	Unit: V , multiples of 100	Yes
1011	Discharge BUS current setting (% of BUS current target value) [Ibus_set]	%	Unsigned int 16	Unit: % , multiple of 100 00 If the actual 90 %, pass 9000	Yes
1012	Discharge BUS Power Set (% of BUS Power Target) [Pbus_set]	%	Unsigned int 16	Unit: % , multiple of 100 00 If the actual 90 %, pass 9000	Yes
1013	Average charge current setting (percentage of battery charge current target value) [Ibat_set]	%	Unsigned int 16	Unit: % , multiple of 100 00 If the actual 90 %, pass 9000	Yes
1014	Discharge BUS voltage step setting value [Vbus_set_dod]	V	Unsigned int 16	Unit: V , multiples of 100	Yes
1015	Depth of discharge DOD	%	Unsigned int 16	Unit: % , multiple of 100 00 If the actual 90 %, pass 9000	Yes
1016	Mode control	/	Unsigned int 16	0x010 1-Power management constant voltage discharge ; 0x0 2 0 2 - reserved 0x0303 - battery	Yes

				characteristic discharge mode ; 0x0505 – maintenance; 0x0606 – production test 0x0707 –Self–managed constant voltage discharge (self–following)	
1017	RS 485 modbus address offset	/	Unsigned int 16	Default : 214	Yes
1018	Set the number of cell temperature probes	individual	Unsigned int 16	Range 4~8	Yes
1019	Cell number setting	individual	Unsigned int 16	Range 15~16	Yes
101A	reserved				
101B	reserved				
101C	reserved				
101D	reserved				
101E	reserved				
1030	Ibus	A	Signed int 16	Multiples of 1 00 Charge is positive, discharge is negative	
1031	ibat	I	Signed int 16	Multiples of 1 00 Charge is positive, discharge is negative	
1032	full battery capacity	AH	Unsigned int 16	Multiples of 1 00	
1033	Cycles	Second–rate	Unsigned int 16	multiple of 1	
1034	SO C	%	Unsigned int 16	unit: 0.01 %	
1035	SOH	%	Unsigned int 16	unit: 0.01 %	
1036	Number of battery temperature probes	individual	Unsigned int 16	multiple of 1	
1037	BMS alarm status 1		Unsigned int 16	Hbyte : (**DATA0** :) BIT0: (reserved)	

				BIT1: (reserved) BIT2: (reserved) BIT3: Cell voltage is too low fault BIT4: Voltage sampling disconnection BIT5: The charging MOS is damaged BIT6: Discharge MOS damage BIT7: The voltage sampling element is damaged Lbyte: **(DATA1:)** BIT0: NTC disconnection BIT1: ADC damaged BIT2: Reverse battery connection BIT3: Fan on failure BIT4: Battery Lock BIT5: (reserved) BIT6: (reserved) BIT7: (reserved)	
1038	BMS alarm status 2		Unsigned int 16	Hbyte : **(DATA2 :)** BIT0: Discharge over-temperature protection BIT1: Discharge under-temperature protection BIT2: Overall Overvoltage Protection BIT3: Startup failed BIT4: Charge MOS on state (0 on, 1 off) BIT5: Discharge MOS conduction state (0 on, 1 off) BIT6: (reserved) BIT7 : reserved Lbyte: **(DATA3:)**	

				BIT0: charging status BIT1: Discharge status BIT2: Short circuit protection BIT3: (reserved) BIT4: Overvoltage protection (not resolved) BIT5: undervoltage protection (not resolved) BIT6: Charging over temperature protection BIT7: Charging under temperature protection	
1039	BMS alarm status 3		Unsigned int 16	Hbyte : **(DATA4 :)** BIT0: Environmental low temperature protection BIT1: Environmental high temperature protection BIT2: (reserved) BIT3: (reserved) BIT4: (reserved) BIT5: (reserved) BIT6: (reserved) BIT7: Fan on Lbyte: **(DATA 5:)** BIT 0: Force charging MOS on BIT 1: Force charging MOS off BIT 2: Forced discharge MOS on BIT 3: Forced discharge MOS off BIT 4: Heating pad on BIT 5: MOSFET over temperature protection BIT 6: MOSFET low temperature protection BIT 7: The charging temperature is too low	

103A	BMS alarm status 4		Unsigned int 16	Hbyte : (**DATA6:**) reserved Lbyte: **(DATA7)** BIT0: reserved BIT1: Vibration alarm BIT2: Dry Contact 1 BIT3: Dry Contact 2 BIT4: (reserved) BIT5: (reserved) BIT6: (reserved) BIT7: BMS module SN repetition (BMS module parallel)	
103B	BMS alarm status 5		Unsigned int 16	Hbyte : **DATA8:** BIT0: Ambient over temperature alarm BIT1: Environment under temperature alarm BIT2: MOS over temperature alarm BIT3: SOC too low alarm BIT4: Overpressure alarm BIT5: Battery over-temperature warning BIT6: Battery discharge under temperature alarm BIT7: (reserved) Lbyte: **DATA9:** BIT0: Cell overvoltage alarm BIT1: Cell undervoltage alarm BIT2: Overall overvoltage warning BIT3: Overall undervoltage warning BIT4: Overcharge alarm BIT5: Ignore the overcurrent warning	

				BIT6: Battery charging over temperature alarm BIT7: Battery charging under temperature alarm	
103C	BMS protection status		Unsigned int 16	**HByte: (DATA 0 :)** BIT0: (reserved) BIT1: (reserved) BIT2: (reserved) BIT3: (reserved) BIT4: (reserved) BIT5: Full charge protection BIT6: (reserved) BIT7: (reserved) **LByte(DATA 1 :)** BIT0: Cell overvoltage protection BIT1: Overall overvoltage protection BIT2: Cell undervoltage protection BIT3: Overall undervoltage protection BIT4: charging overcurrent 1 protection BIT5: Charging overcurrent 2 protection BIT6: Discharge overcurrent 1 protection BIT7: Discharge overcurrent 2 protection	
103D	Operating status		Unsigned int 16	b15~8: Discharge mode status 1- Power management constant voltage discharge ; 2-Battery characteristic discharge mode; 3- Self-managed constant voltage discharge (self-following) b7~0: total running status 1-Precharge 2-Through charging 3-	

				Through discharging 4-BUCK charging 5-BOOST charging 6-BUCK discharge 7-BOOST discharge 8-standby (normal, no current) 9-alarm 10-protection shutdown 11- fault shutdown 12-maintenance mode 13-test mode 14-sleep	
103E	reserved				
103F	Number of parallel machines online	indi vual	Unsigned int 16	multiple of 1	
1040~ 1041	total charge capacity	AH	Unsigned int 32	multiple of 1 , unsigned	
1042~ 1043	total capacity	AH	Unsigned int 32	multiple of 1 , unsigned	
104 4~ 1045	total charging time	seco nd	Unsigned int 32	multiple of 1 , unsigned	
1046~ 1047	total time	seco nd	Unsigned int 32	multiple of 1 , unsigned	
1048~ 1049	Total charge W h	WH	Unsigned int 32	multiple of 1 , unsigned	
104A~ 104B	Total put W h	WH	Unsigned int 32	multiple of 1 , unsigned	
104C	MOS temperature	° C	Signed int 16	multiple of 1	
104D~ 1056	PCB barcode	/	Unsigned int 16X10	ASCII	
1065~ 106E	System barcode	/	Unsigned int 16X10	ASCII	
107D	Charging loop control	/	Unsigned int 16	1- The charging circuit is closed 0x55 - The charging circuit is disconnected Note: The external control command, and the logic	Yes

				relationship within the board are closed-and; open-or	
107E	Discharge loop control	/	Unsigned int 16	1- Discharge circuit closed 0x55 - Discharge circuit disconnected Note: The external control command, and the logic relationship within the board are closed-and; open-or	Yes