

MT99BT

MODBUS Communication Protocol

V1.00

Content

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Chapter 1. Description

This document describes the input and output command, information and data of the MT99BT under MODBUS communication mode. So it is convenient for the 3rd part using and developing

1.1. Purpose of communication protocol

The purpose of the MT99BT MODBUS communications protocol is to allow setup information and measured data to be efficiently transferred between a MODBUS Master Station and a MT99BT. It includes:

- 1) Allowing setting and reading all MT99BT set-up parameters from a MODBUS Master Station.
- 2) Allowing reading all data measured by a MT99BT and SOE (Event log).

1.2. Version of MODBUS communication protocol

This document is proper for all versions of MT99BT meters. If any change happens later, it will be declared.

Chapter 2. Detailed description of MT99BT-MODBUS protocol

2.1. Basic rules of MT99BT-MODBUS protocol

The following rules determine the communication rules for devices in RS485 (or RS232C) loop controllers and other RS485 serial communication loops:

- 1) All communications on the RS-485 loop conforms to a MASTER/SLAVE scheme. In this scheme, information and data is transferred between a MODBUS MASTER device and up to 32 SLAVE monitoring devices.
- 2) The MASTER will initiate and control all information transfer on the RS-485 communications loop.
- 3) Under no circumstances will a SLAVE device initiate a communications sequence.
- 4) All communications activity on the RS-485 loop occurs in the form of "PACKETS", a packet being simply a serial string of 8-bit bytes. The maximum number of bytes contained within one packet is 255. The bytes that comprise a packet consist of standard asynchronous serial data, which are generated using equipment similar to that used for RS-232C.
- 5) The packages from MASTER are named request. The packages from SLAVE are named response.
- 6) Under any circumstance, Slave can just respond one request.

2.2. Transfer mode

MODBUS protocol supports ASCII and RTU modes of transmissions. The MT99BT supports only the RTU mode of transmission with 8 data bits, no parity, and one stop bit.

2.3. Description of MODBUS package structure

Every MODBUS packet consists of four fields:

- 1) Address field
- 2) Function field
- 3) Data field
- 4) Check field

2.3.1. Address field

The address field is 1-byte long and identifies which slave device the packet is for. Valid addresses range between 1 and 247. The slave device whose address matches the value in this field will perform the command specified in the packet.

2.3.2. Function field

The function field is 1-byte long and tells the addressed slave which function to perform. Slave response packet should include same function field byte as request. The Modbus functions supported by MT99BT are listed as below:

Function code	Definition	Function
0x01	Read register status	Obtain one or more relay status of current MT99BT internal(0/1)
0x03	Read register	Obtain one or more current register value of current MT99BT internal
0x05	Operating general register	Write 0xFF00 to close (ON) the relay Write 0x0000 to open (OFF) the relay
0x10	Setting register	Write specific value into one or more register of MT99BT internal

2.3.3. Data field

The length of Data Field is varies in length depending on its function. In general, MODBUS supports "BIG INDIAN" mode, it means high-word byte before, low-word byte after.

Example 2.1

One 16 byte register value is 0x12AB; register is transmitted in below sequence:

High-word byte = 0x12

Low-word byte = 0x0AB

2.3.4. Check field

In Modbus RTU mode, the 16-bit Cyclic Redundancy Check (CRC-16) is used. The sending device calculates a 16-bit value, based on the information stored in the address, function and data fields using the CRC-16 algorithm and appends it to the end of the packet. The receiving device performs the same calculation upon the reception of a packet. If the result does not match the checksum stored in the packet, transmission errors have occurred and the packet will be ignored by the receiving device.

For detail of CRC16 parity arithmetic, please refer to the appendix.

2.4. Abnormal responses

If a Modbus master device sends a non-effective command to a MT99BT or attempts to read a non-effective holding register, an exception response will be generated. The exception response consists of the slave address, function code, error code, and error check field. The high order bit of the function code is set to 1 to indicate that the packet is an exception response.

Below list describes the meanings of exception codes:

Function code	Description
01illegal function code	MT99BT-Modbus support the function code include: 01H, 02H, 03H, 05H,10H and 0FH.This code means the slave device receive an illegal function code, or the MT99BT receive the error command.
02illegal data address	MT99BT receive the address referenced in the data field is an invalid address.
03illegal data address	The requested register number is too long.

2.5. Broadcast command

The MT99BT support broadcast commands when communicating in MODBUS mode. Do write command 0x10 for timing.

Chapter 3. Communication package

The standard MODBUS protocol supports only 16-bit registers, which limit the maximum value of any measurement to 65535.

3.1. Read remote value (Function code 02H)

Use 02 command to read remote value, address start from 0.

The DI data in response packet is packed as one bit for one DI. 1 = ON, 0 = OFF.

The LSB (Least Significant Bit) of the first data byte contains the request addressing output. Other DI is same as this, until to the high bit of this byte, and rank from low bit to high bit in the followed byte.

If the return output Num. is not a multiple of 8, it will use zero to fill in the remainder bit of last data byte (until to the high bit of the byte). The byte count field specifies all byte num. of the data.

Read DI status packet (Master→MT99BT)		Response Packet (Master→MT99BT→Master)	
Slave address	1 byte	Slave address	1 byte
Function code 02H	1 byte	Function code 02H	1 byte
Start address	2 bytes	Byte Num. (N)	1 byte
DI Num.	2 bytes	DI status	N byte
CRC check code	2 bytes	CRC check code	2 byte

$N = \text{output num.} \div 8$, if remainder $\neq 0$, then $N = N + 1$.

3.2. Read register (Function code 03H)

This command packet requests that the MT99BT responds all valid registers. The value of reserved registers is 0.

Read register packet (Master→MT99BT)		Response Packet (MT99BT→Master)	
Slave address	1byte	Slave address	1byte
Function code 03H	1byte	Function code 03H	1byte
Start address	2bytes	Byte Num. (2*register Num.)	1byte
Register Num.	2bytes	First register data	2bytes
CRC check code	2bytes	Second register data	2bytes
			
		CRC check code	2bytes

3.3. (Single write)Control general command (Function code 05H)

Use 05 command can control internal resistance measurement and cell sensor LED control light, different address represent different commands.

Write register packet (Master→MT99BT)		Response packet (MT99BT→Master)	
Slave address	1byte	Slave address	1byte
Function code 05H	1byte	Function code 05H	1byte
Start address (battery identification)	2bytes	Start address	2bytes
Data field	FF	Data field	FF
Data field	00	Data field	00
CRC check code	2bytes	CRC check code	2bytes

Where the start address represents the battery ID, if you want to control the monitored cell of the battery

ID 5, set the start address to 5 directly.

Note: Address 1000 is a special register used to manually test the internal resistance

3.4. Write register (Function code 10H)

This command packet allows the Master to program the MT99BT setup parameters. The following are the data format:

Write register packet (Master→MT99BT)			Response packet (MT99BT→Master)	
Slave address	1byte		Slave address	1byte
Function code10H	1byte		Function code10H	1byte
Start address	2bytes		Start address	2bytes
Register Num.	2bytes		Register Num.	2bytes
Byte Num. (2*Register Num.)	1byte		CRC check code	2bytes
First register data				
Second register data				
.....				
CRC check code	2bytes			

Note: MT99BT presume all registers are continuous from the first one.

3.5. (Multiple write)Control general command (Function code 0FH)

Use 15 command can achieve command operate include cell sensor LED control light and control more continuous, different address represent different command.

Write register packet (Master→MT99BT)			Response packet (MT99BT→Master)	
Slave address	1byte		Slave address	1byte
Function code0FH	1byte		Function code0FH	1byte
Start address (battery identification)	2bytes		Start address	2bytes
Control target Num. (control battery Num.)	2bytes		Control target Num. (control battery Num.)	2bytes
Write byte Num. N (N=Target Num.÷8,if remainder ≠0, then N=N+1)	1byte		CRC check code	2bytes
Data field	N byte			
CRC check code	2bytes			

Chapter 4. Calculate CRC-16

This section describes the procedure for obtaining the CRC-16 error check field. A packet can be considered as a continuous, serial stream of binary data (0, 1). The 16-bit checksum is obtained by multiplying the serial data stream by 216 (1000000000000000) and then dividing it by the generator polynomial $x^{16}+x^{15}+x^2+1$, which can be expressed as a binary data 11000000000000101. The quotient is ignored and the 16-bit remainder is the checksum and is appended to end of the packet. When calculating the CRC-16 value, all arithmetic operations use the modulo two or exclusive OR (XOR) algorithm.

The checksum of CRC-16 can be generated by following steps:

- 1) Form a new polynomial by dropping the MSB (Most Significant Bit) of the generator polynomial and reversing the bit sequence. This yields the binary number 1010 0000 0000 0001 or A0 01 Hex.
- 2) Load a 16-bit register with initial value FFFF Hex.
- 3) Exclusive OR the first data byte with the low-word byte of the 16-bit register, storing the result in the 16-bit register.
- 4) Shift the 16-bit register one bit to the right. If the bit shifted out to the right is one, then turn to step 5, otherwise turn to step 6.
- 5) Exclusive OR the 16-bit register with the new generator polynomial, with result stored in the 16-bit register.
- 6) Repeat steps 4, until 8 shifts have been performed.
- 7) Exclusive OR the next data byte with the 16-bit register, and the result stored in the 16-bit register.
- 8) Repeat steps 4 through 7 until all bytes of the packet have been Exclusive ORed with the 16-bit register and shifted 8 times.
- 9) The content of the 16-bit register is the checksum and is appended to the end of the packet.

Following is the procedure for calculating the 6403 Bytes of 16 Hex:

Step	Byte	Action	Register	Bit#	Shift
2		Initial Value	1111 1111 1111 1111		
	1	Load the first byte	0000 0000 0110 0100		
3		XOR	1111 1111 1001 1011		
4		SHIFT 1 bit to the right	0111 1111 1100 1101	1	1
5a		XOR polynomial	1101 1111 1100 1100		
4		SHIFT 1 bit to the right	0110 1111 1110 0110	2	0
4		SHIFT 1 bit to the right	0011 0111 1111 0011	3	0
4		SHIFT 1 bit to the right	0001 1011 1111 1001	4	1
5a		XOR polynomial	1011 1011 1111 1000		
4		SHIFT 1 bit to the right	0101 1101 1111 1100	5	0
4		SHIFT 1 bit to the right	0010 1110 1111 1110	6	0
4		SHIFT 1 bit to the right	0001 0111 0111 1111	7	0
4		SHIFT 1 bit to the right	0000 1011 1011 1111	8	1
5a		XOR polynomial	1010 1011 1011 1110		
	2	Load the second byte	0000 0000 0000 0011		
7		XOR	1010 1011 1011 1101		
4		SHIFT 1 bit to the right	0101 0101 1101 1110	1	1

5a		XOR polynomial	1111 0101 1101 1111		
4		SHIFT 1 bit to the right	0111 1010 1110 1111	2	1
5a		XOR polynomial	1101 1010 1110 1110		
4		SHIFT 1 bit to the right	0110 1101 0111 0111	3	0
4		SHIFT 1 bit to the right	0011 0110 1011 1011	4	1
5a		XOR polynomial	1001 0110 1011 1010		
4		SHIFT 1 bit to the right	0100 1011 0101 1101	5	0
4		SHIFT 1 bit to the right	0010 0101 1010 1110	6	1
5a		XOR polynomial	1000 0101 1010 1111		
4		SHIFT 1 bit to the right	0100 0010 1101 0111	7	1
5a		XOR polynomial	1110 0010 1101 0110		
4		SHIFT 1 bit to the right	0111 0001 0110 1011	8	0
		CRC-16	0111 0001 0110 1011		

Chapter 5. Register description of MT99BT

All MT99BT registers having basic addresses **4xxxx** when communicating in MODBUS protocol. According to the MODBUS Protocol, in response to a request for register **4xxxx** of a particular slave device (MT99BT), the MODBUS master reads register **xxxx-1** from the slave (MT99BT). For example register 40011 corresponds to register 10.

5.1. String real-time data

Register No.	Attributes	Description	Data type	Note
Battery string 1 - Real-time data				
4x0001	RO	String voltage	U32	×0.01, Unit:V, Low-word before,high-word after
4x0002		(Cell voltage summation)		
4x0003	RO	String charge/discharge current	S32	×0.01, Unit:A Low-word before,high-word after
4x0004				
4x0005	RO	String SOC	U16	×1, Unit:%
4x0006	RO	Reserve	U16	
4x0007	RO	Balancing	U16	×0.01, Unit:%
4x0008	RO	Battery string status	U16	0 - Floating charge 1 - Equal charge 2 - Discharge 3 - Rest 4 - Abnormal
4x0009	RO	Hall connect status	U16	Bit0: 0 - Disconnect 1 - Connect
4x0010	RO	String sensor alarm information	U16	Different bit represent different alarm type, When bit is 1 represent alarm type generate, When bit is 0 represent no alarm type generate. Bit0:String voltage upper-limit alarm Bit1:String voltage lower-limit alarm Bit2:String current upper-limit alarm Bit3:String current lower-limit alarm Bit4:String SOC lower-limit alarm Bit5:Reserve Bit6:Hall disconnect alarm Bit7:Device temperature upper-limit alarm Bit8~Bit15:Reserve
4x0011	RO	Battery number	U16	Battery number
4x0012	RO	Alarm status	U16	Bit: 0 – Normal 1 – Alarm Bit0: String alarm status of string 1 Bit1: Cell sensor alarm status of string 1 Bit2: There is a cell sensor communication off in string 1

				Bit3: There is a cell sensor voltage upper-limit alarm in string 1 Bit4: There is a cell sensor voltage lower-limit alarm in string 1 Bit5: There is a cell sensor internal resistance upper-limit alarm in string 1 Bit6: There is a cell sensor SOC upper-limit alarm in string 1 Bit7: There is a cell sensor SOH upper-limit alarm in string 1 Bit8: There is a cell sensor temperature upper-limit alarm in string 1 Bit9~Bit15:Reserve
4x0013	RO	Internal resistance measuring status	U16	Bit0: 0 – Idle 1 – Measuring
4x0014	RO	Battery internal resistance average low-bit	U32	×0.001, Unit:mΩ, Low-word before,high-word after
4x0015	RO	Battery internal resistance average high-bit		
4x0016	RO	Battery internal resistance maximum low-bit	U32	×0.001, Unit:mΩ, Low-word before,high-word after
4x0017	RO	Battery internal resistance maximum high-bit		
4x0018	RO	Battery internal resistance minimum low-bit	U32	×0.001, Unit:mΩ, Low-word before,high-word after
4x0019	RO	Battery internal resistance minimum high-bit		
4x0020	RO	Battery internal resistance maximum Corresponding battery ID	U16	Battery identification
4x0021	RO	Battery internal resistance minimum Corresponding battery ID	U16	Battery identification
4x0022	RO	Battery voltage average	U16	×0.001, Unit:V
4x0023	RO	Battery voltage	U16	×0.001, Unit:V

		maximum		
4x0024	RO	Battery voltage minimum	U16	×0.001, Unit:V
4x0025	RO	Battery voltage maximum Corresponding battery ID	U16	Battery identification
4x0026	RO	Battery voltage minimum Corresponding battery ID	U16	Battery identification
4x0027	RO	Battery temperature average	S16	×0.1, Unit:°C
4x0028	RO	Battery temperature maximum	S16	×0.1, Unit:°C
4x0029	RO	Battery temperature minimum	S16	×0.1, Unit:°C
4x0030	RO	Battery temperature maximum Corresponding battery ID	U16	Battery identification
4x0031	RO	Battery temperature maximum Corresponding battery ID	U16	Battery identification
4x0032	RO	Reserve	U16	
4x0033	RO	Reserve	U16	
4x0034	RO	Reserve	U16	
...	...	...	...	
4x0040	RO	Reserve	U16	
Battery string 2 - Real-time data				
4x0101	RO	String voltage	U32	×0.01, Unit:V, Low-word before,high-word after
4x0102		(Cell sensor voltage summation)		
4x0103	RO	String	S32	×0.01, Unit:A Low-word before,high-word after
4x0104		charge/discharge current		
4x0105	RO	String SOC	U16	×1, Unit: %
4x0106	RO	Reserve	U16	
4x0107	RO	Balancing	U16	×0.01, Unit: %
4x0108	RO	Battery string status	U16	0 - Floating charge 1 - Equal charge

				2 - Discharge 3 - Rest 4 - Abnormal
4x0109	RO	Hall connect status	U16	Bit0: 0 - Disconnect 1 - Connect
4x0110	RO	String sensor alarm information	U16	Different bit represent different alarm type, When bit is 1 represent alarm type generate, When bit is 0 represent no alarm type generate. Bit0: String voltage upper-limit alarm Bit1:String voltage lower-limit alarm Bit2:String current upper-limit alarm Bit3:String current lower-limit alarm Bit4:String SOC lower-limit alarm Bit5:Reserve Bit6:Hall disconnect alarm Bit7:Device temperature upper-limit alarm Bit8~Bit15:Reserve
4x0111	RO	Battery number	U16	Battery number
4x0112	RO	Alarm status	U16	Bit: 0 – Normal 1 – Alarm Bit0: String 2 string alarm status Bit1: String 2 cell sensor alarm status Bit2: There is a cell sensor communication off in string 2 Bit3: There is a cell sensor voltage upper-limit alarm in string 2 Bit4: There is a cell sensor voltage lower-limit alarm in string 2 Bit5: There is a cell sensor internal resistance upper-limit alarm in string 2 Bit6: There is a cell sensor SOC upper-limit alarm in string 2 Bit7: There is a cell sensor SOH upper-limit alarm in string 2 Bit8: There is a cell sensor temperature upper-limit alarm in string 2 Bit9~Bit15:Reserve
4x0113	RO	Internal resistance measurement status	U16	Bit0: 0 – Idle 1 – Measuring
4x0114	RO	Battery internal resistance average low-bit	U32	×0.001, Unit:mΩ, Low-word before,high-word after
4x0115	RO	Battery internal resistance average high-bit		
4x0116	RO	Battery internal	U32	×0.001, Unit:mΩ.

		resistance maximum low-bit		Low-word before,high-word after
4x0117	RO	Battery internal resistance maximum high-bit		
4x0118	RO	Battery internal resistance minimum low-bit	U32	×0.001, Unit:mΩ. Low-word before,high-word after
4x0119	RO	Battery internal resistance minimum high-bit		
4x0120	RO	Battery internal resistance maximum Corresponding battery ID	U16	Battery identification
4x0121	RO	Battery internal resistance minimum Corresponding battery ID	U16	Battery identification
4x0122	RO	Battery voltage average	U16	×0.001, Unit:V
4x0123	RO	Battery voltage maximum	U16	×0.001, Unit:V
4x0124	RO	Battery voltage minimum	U16	×0.001, Unit:V
4x0125	RO	Battery voltage maximum Corresponding battery ID	U16	Battery identification
4x0126	RO	Battery voltage minimum Corresponding battery ID	U16	Battery identification
4x0127	RO	Battery temperature average	S16	×0.1, Unit:°C
4x0128	RO	Battery temperature maximum	S16	×0.1, Unit:°C
4x0129	RO	Battery temperature minimum	S16	×0.1, Unit:°C
4x0130	RO	Battery temperature maximum Corresponding battery ID	U16	Battery identification
4x0131	RO	Battery temperature	U16	Battery identification

		minimum Corresponding battery ID		
4x0132	RO	Reserve	U16	
4x0133	RO	Reserve	U16	
4x0134	RO	Reserve	U16	
...	...	...	...	
4x0140	RO	Reserve	U16	
Device status information				
4x0201	RO	Fault status	U16	Bit: 0 – Normal 1 – Abnormal Bit0:Memory chip failure Bit1:Storage coefficient CRC failed Bit2:Net-port failure Bit3~Bit15:Reserve
4x0202	RO	Device temperature	S16	×0.1, Unit:°C
4x0203	RO	Reserve	U16	
4x0204	RO	Reserve	U16	
4x0205	RO	Reserve	U16	

5.2. Cell sensor real-time data

Cell sensor real-time data provide two types of classifications, one is battery classification and the other one is measurement classification. (Battery ID, communication status, voltage, internal resistance, temperature, SOC, SOH, alarm information)

Measurement type classification:

Battery string 1 - Cell sensor real-time data:

Register No.	Attributes	Description	Data type	Note
Battery identification				
4x1001	RO	Identification of battery 1#	U16	
4x1002	RO	Identification of battery 2#	U16	
4x1003	RO	Identification of battery 3#	U16	
...	...	...	...	...
4x1139	RO	Identification of battery 139#	U16	
4x1140	RO	Identification of battery 140#	U16	
Communication status				
4x1201	RO	Communication status of battery 1#	U16	Bit0:Communication status;1-Normal,0-Interruption
4x1202	RO	Communication status of battery 2#	U16	Bit0:Communication status;1-Normal,0-Interruption
4x1203	RO	Communication status of battery 3#	U16	Bit0:Communication status;1-Normal,0-Interruption
...	...	...	...	...
4x1339	RO	Communication status of battery	U16	Bit0:Communication

		139#		status;1-Normal,0-Interruption
4x1340	RO	Communication status of battery 140#	U16	Bit0:Communication status;1-Normal,0-Interruption
Voltage				
4x1401	RO	Voltage of battery 1#	U16	×0.001, Unit:V
4x1402	RO	Voltage of battery 2#	U16	Same as above
4x1403	RO	Voltage of battery 3#	U16	Same as above
...	...	...	...	...
4x1539	RO	Voltage of battery 139#	U16	
4x1540	RO	Voltage of battery 140#	U16	
Temperature				
4x1601	RO	Temperature of battery 1#	S16	×0.1, Unit:°C
4x1602	RO	Temperature of battery 2#	S16	×0.1, Unit:°C
4x1603	RO	Temperature of battery 3#	S16	×0.1, Unit:°C
...	...	...	...	...
4x1739	RO	Temperature of battery 139#	S16	×0.1, Unit:°C
4x1740	RO	Temperature of battery 140#	S16	×0.1, Unit:°C
Internal resistance				
4x1801	RO	Internal resistance of battery 1#	U32	×0.001, Unit:mΩ Low-word before,high-word after Initially unmeasured = 0
4x1802				
4x1803	RO	Internal resistance of battery 2#	U32	Same as above
4x1804				
4x1805	RO	Internal resistance of battery 3#	U32	Same as above
4x1806				
...	...	...	...	...
4x2077	RO	Internal resistance of battery 139#	U32	
4x2078				
4x2079	RO	Internal resistance of battery 140#	U32	
4x2080				
SOC				
4x2201	RO	SOC of battery 1#	U16	×1, Unit:%
4x2202	RO	SOC of battery 2#	U16	×1, Unit:%
4x2203	RO	SOC of battery 3#	U16	×1, Unit:%
...	...	...	...	...
4x2339	RO	SOC of battery 139#	U16	×1, Unit:%
4x2340	RO	SOC of battery 140#	U16	×1, Unit:%
SOH				

4x2401	RO	SOH of battery 1#	U16	×1, Unit:%
4x2402	RO	SOH of battery 2#	U16	×1, Unit:%
4x2403	RO	SOH of battery 3#	U16	×1, Unit:%
...	...	...	...	...
4x2539	RO	SOH of battery 139#	U16	×1, Unit:%
4x2540	RO	SOH of battery 140#	U16	×1, Unit:%
Alarm information				
4x2601	RO	Alarm information of battery 1#	U16	Different bit represent different alarm type, When bit is 1 represent alarm type generate, When bit is 0 represent no alarm type generate. Bit0:Cell sensor voltage upper-limit alarm Bit1:Cell sensor voltage lower-limit alarm Bit2:Cell sensor internal resistance upper-limit alarm Bit3:SOC lower-limit alarm Bit4:SOH lower-limit alarm Bit5:Temperature upper-limit alarm Bit6~Bit15:Reserve
4x2602	RO	Alarm information of battery 2#	U16	
4x2603	RO	Alarm information of battery 3#	U16	
...	...	...	...	
4x2739	RO	Alarm information of battery 139#	U16	
4x2740	RO	Alarm information of battery 140#	U16	
Alarm light status				
4x2801	RO	Alarm light status of battery 1#	U16	Bit0:Alarm light status; 1-Light on,0-Light off
4x2802	RO	Alarm light status of battery 2#	U16	Bit0:Alarm light status;
4x2803	RO	Alarm light status of battery 3#	U16	1-Light on,0-Light off
...	...	...	...	...
4x2939	RO	Alarm light status of battery 139#	U16	Bit0:Alarm light status;
4x2940	RO	Alarm light status of battery 140#	U16	1-Light on,0-Light off

Battery string 2 - Cell sensor real-time data:

Register No.	Attributes	Description	Data type	Note
Battery identification				
4x4001	RO	Identification of battery 1#	U16	
4x4002	RO	Identification of battery 2#	U16	
4x4003	RO	Identification of battery 3#	U16	

...	...	...	...	...
4x4139	RO	Identification of battery 139#	U16	
4x4140	RO	Identification of battery 140#	U16	
Communication status				
4x4201	RO	Communication status of battery 1#	U16	Bit0:Communication status;1-Normal,0-Interruption
4x4202	RO	Communication status of battery 2#	U16	Bit0:Communication status;1-Normal,0-Interruption
4x4203	RO	Communication status of battery 3#	U16	Bit0:Communication status;1-Normal,0-Interruption
...	...	...	...	...
4x4339	RO	Communication status of battery 139#	U16	Bit0:Communication status;1-Normal,0-Interruption
4x4340	RO	Communication status of battery 140#	U16	Bit0:Communication status;1-Normal,0-Interruption
Voltage				
4x4401	RO	Voltage of battery 1#	U16	×0.001, Unit:V
4x4402	RO	Voltage of battery 2#	U16	Same as above
4x4403	RO	Voltage of battery 3#	U16	Same as above
...	...	...	...	...
4x4539	RO	Voltage of battery 139#	U16	
4x4540	RO	Voltage of battery 140#	U16	
Temperature				
4x4601	RO	Temperature of battery 1#	S16	×0.1, Unit:°C
4x4602	RO	Temperature of battery 2#	S16	×0.1, Unit:°C
4x4603	RO	Temperature of battery 3#	S16	×0.1, Unit:°C
...	...	...	...	...
4x4739	RO	Temperature of battery 139#	S16	×0.1, Unit:°C
4x4740	RO	Temperature of battery 140#	S16	×0.1, Unit:°C
Internal resistance				
4x4801	RO	Internal resistance of battery 1#	U32	×0.001,
4x4802				Unit:mΩ Low-word before,high-word after

				Initially unmeasured = 0
4x4803	RO	Internal resistance of battery 2#	U32	Same as above
4x4804				
4x4805	RO	Internal resistance of battery 3#	U32	Same as above
4x4806				
...	...	...	...	...
4x5077	RO	Internal resistance of battery 139#	U32	
4x5078				
4x5079	RO	Internal resistance of battery 140#	U32	
4x5080				
SOC				
4x5201	RO	SOC of battery 1#	U16	×1, Unit: %
4x5202	RO	SOC of battery 2#	U16	×1, Unit: %
4x5203	RO	SOC of battery 3#	U16	×1, Unit: %
...	...	...	...	...
4x5339	RO	SOC of battery 139#	U16	×1, Unit: %
4x5340	RO	SOC of battery 140#	U16	×1, Unit: %
SOH				
4x5401	RO	SOH of battery 1#	U16	×1, Unit: %
4x5402	RO	SOH of battery 2#	U16	×1, Unit: %
4x5403	RO	SOH of battery 3#	U16	×1, Unit: %
...	...	...	...	...
4x5539	RO	SOH of battery 139#	U16	×1, Unit: %
4x5540	RO	SOH of battery 140#	U16	×1, Unit: %
Alarm information				
4x5601	RO	Alarm information of battery 1#	U16	Different bit represent different alarm type, When bit is 1 represent alarm type generate, When bit is 0 represent no alarm type generate Bit0:Cell sensor voltage upper-limit alarm Bit1:Cell sensor voltage lower-limit alarm Bit2:Internal upper-limit alarm Bit3:SOC lower-limit alarm Bit4:SOH lower-limit alarm Bit5:Temperature upper-limit alarm Bit6~Bit15:Reserve
4x5602	RO	Alarm information of battery 2#	U16	
4x5603	RO	Alarm information of battery 3#	U16	
...	...	...	...	
4x5739	RO	Alarm information of battery 139#	U16	
4x5740	RO	Alarm information of battery 140#	U16	
Alarm light status				
4x5801	RO	Alarm light status of battery 1#	U16	Bit0:Alarm light status; 1-Light on,0-Light off
4x5802	RO	Alarm light status of battery 2#	U16	Bit0:Alarm light status;
4x5803	RO	Alarm light status of	U16	1-Light on,0-Light off

		battery 3#		
...	...	...	...	...
4x5939	RO	Alarm light status of battery 139#	U16	Bit0:Alarm light status;
4x5940	RO	Alarm light status of battery 140#	U16	1-Light on,0-Light off

Battery classification:**Battery string 1 - Cell sensor real-time data:**

Register No.	Attributes	Description	Data type	Note
4x10001	RO	Identification of battery 1#	U16	Battery identification
4x10002	RO	Voltage of battery 1#	U16	×0.001, Unit:V
4x10003	RO	Temperature of battery 1#	S16	×0.1, Unit:℃
4x10004	RO	Internal resistance of battery 1#	U32	×0.001, Unit:mΩ Low-word before,high-word after Initially unmeasured = 0
4x10005				
4x10006	RO	SOC of battery 1#	U16	×1, Unit:%
4x10007	RO	SOH of battery 1#	U16	×1, Unit:%
4x10008	RO	Alarm light status of battery 1#	U16	Bit0 - Alarm light status 0 - off 1 - on
4x10009	RO	Alarm status of battery 1#	U16	Different bit represent different alarm type, When bit is 1 represent alarm type generate, When bit is 0 represent no alarm type generate. Bit0:Cell sensor voltage upper-limit alarm Bit1:Cell sensor voltage lower-limit alarm Bit2:Internal resistance upper-limit alarm Bit3:SOC lower-limit alarm Bit4:SOH lower-limit alarm Bit5:Temperature upper-limit alarm Bit6~Bit15:Reserve
4x10010	RO	Device status of battery 1#	U16	Bit0:Communication status 1-Normal,0-Interruption
4x10011	RO	Reserve		
4x10012	RO	Reserve		
4x10013	RO	Reserve		

4x10014	RO	Identification of battery 2#	U16	Battery identification
4x10015	RO	Voltage of battery 2#	U16	×0.001,Unit:V
4x10016	RO	Temperature of battery 2#	S16	×0.1, Unit:°C
4x10017	RO	Internal resistance of battery 2#	U32	×0.001, Unit:mΩ Low-word before,high-word after Initially unmeasured = 0
4x10018				
4x10019	RO	SOC of battery 2#	U16	×1, Unit: %
4x10020	RO	SOH of battery 2#	U16	×1, Unit: %
4x10021	RO	Alarm light status of battery 2#	U16	Bit0 - Alarm light status 0 - off 1 - on
4x10022	RO	Alarm status of battery 2#	U16	Different bit represent different alarm type, When bit is 1 represent alarm type generate, When bit is 0 represent no alarm type generate. Bit0:Cell sensor voltage upper-limit alarm Bit1:Cell sensor voltage lower-limit alarm Bit2:Internal resistance upper-limit alarm Bit3:SOC lower-limit alarm Bit4:SOH lower-limit alarm Bit5:Temperature upper-limit alarm Bit6~Bit15:Reserve
4x10023	RO	Device status of battery 2#	U16	Bit0:Communication status 1-Normal, 0-Interruption
4x10024	RO	Reserve		
4x10025	RO	Reserve		
4x10026	RO	Reserve		
4x10027 — 4x10039	RO	Related information of battery 3#		
4x10040 — 4x10052	RO	Related information of battery 4#		
4x10053 — 4x10065	RO	Related information of battery 5#		

...	...	...	...	...
4x11808	RO	Battery identification of battery 140#	U16	Battery identification
4x11809	RO	Voltage of battery 140#	U16	×0.001, Unit:V
4x11810	RO	Temperature of battery 140#	S16	×0.1, Unit:°C
4x11811	RO	Internal resistance of battery 140#	U32	×0.001, Unit:mΩ Low-word before,high-word after Initially unmeasured = 0
4x11812				
4x11813	RO	SOC of battery 140#	U16	×1, Unit: %
4x11814	RO	SOH of battery 140#	U16	×1, Unit: %
4x11815	RO	Alarm light status of battery 140#	U16	Bit0:Communication status 1-Normal, 0-Interruption
4x11816	RO	Alarm status of battery 140#	U16	Different bit represent different alarm type, When bit is 1 represent alarm type generate, When bit is 0 represent no alarm type generate. Bit0:Cell sensor voltage upper-limit alarm Bit1:Cell sensor voltage lower-limit alarm Bit2:Internal resistance upper-limit alarm Bit3:SOC lower-limit alarm Bit4:SOH lower-limit alarm Bit5:Temperature upper-limit alarm Bit6~Bit15:Reserve
4x11817	RO	Device status of battery 140#	U16	Bit0:Communication status 1-Normal, 0-Interruption
4x11818	RO	Reserve		
4x11819	RO	Reserve		
4x11820	RO	Reserve		

Battery string 2 - Cell sensor real-time data:

Register No.	Attributes	Description	Data type	Note
4x13001	RO	Identification of battery 1#	U16	Battery identification
4x13002	RO	Voltage of battery 1#	U16	×0.001, Unit:V
4x13003	RO	Temperature of		×0.1,

		battery 1#	S16	Unit:°C
4x13004	RO	Internal resistance of battery 1#	U32	×0.001, Unit:mΩ Low-word before,high-word after Initially unmeasured = 0
4x13005				
4x13006	RO	SOC of battery 1#	U16	×1, Unit: %
4x13007	RO	SOH of battery 1#	U16	×1, Unit: %
4x13008	RO	Alarm light status of battery 1#	U16	Bit0 - Alarm light status 0 - off 1 - on
4x13009	RO	Alarm status of battery 1#	U16	Different bit represent different alarm type, When bit is 1 represent alarm type generate, When bit is 0 represent no alarm type generate. Bit0:Cell sensor voltage upper-limit alarm Bit1:Cell sensor voltage lower-limit alarm Bit2:Internal resistance upper-limit alarm Bit3:SOC lower-limit alarm Bit4:SOH lower-limit alarm Bit5:Temperature upper-limit alarm Bit6~Bit15:Reserve
4x13010	RO	Device status of battery 1#	U16	Bit0:Communication status 1-Normal, 0-Interruption
4x13011	RO	Reserve		
4x13012	RO	Reserve		
4x13013	RO	Reserve		
4x13014	RO	Identification of battery 2#	U16	Battery identification
4x13015	RO	Voltage of battery 2#	U16	×0.001, Unit:V
4x13016	RO	Temperature of battery 2#	S16	×0.1, Unit:°C
4x13017	RO	Internal resistance of battery 2#	U32	×0.001, Unit:mΩ Low-word before,high-word after Initially unmeasured = 0
4x13018				
4x13019	RO	SOC of battery 2#	U16	×1, Unit: %
4x13020	RO	SOH of battery 2#	U16	×1, Unit: %
4x13021	RO	Alarm light status of battery 2#	U16	Bit0 - Alarm light status 0 - off 1 - on

4x13022	RO	Alarm status of battery 2#	U16	Different bit represent different alarm type, When bit is 1 represent alarm type generate, When bit is 0 represent no alarm type generate. Bit0:Cell sensor voltage upper-limit alarm Bit1:Cell sensor voltage lower-limit alarm Bit2:Internal resistance upper-limit alarm Bit3:SOC lower-limit alarm Bit4:SOH lower-limit alarm Bit5:Temperature upper-limit alarm Bit6~Bit15:Reserve
4x13023	RO	Device status of battery 2#	U16	Bit0:Communication status 1-Normal, 0-Interruption
4x13024	RO	Reserve		
4x13025	RO	Reserve		
4x13026	RO	Reserve		
4x13027 — 4x13039	RO	Related information of battery 3#		
4x13040 — 4x13052	RO	Related information of battery 4#		
4x13053 — 4x13065	RO	Related information of battery 5#		
...	...	...	...	...
4x14808	RO	Battery identification of battery 140#	U16	Battery identification
4x14809	RO	Voltage of battery 140#	U16	×0.001, Unit:V
4x14810	RO	Temperature of battery 140#	S16	×0.1, Unit:°C
4x14811 4x14812	RO	Internal resistance of battery 140#	U32	×0.001, Unit:mΩ Low-word before,high-word after Initially unmeasured = 0
4x14813	RO	SOC of battery 140#	U16	×1, Unit:%
4x14814	RO	SOH of battery 140#	U16	×1, Unit:%

4x14815	RO	Alarm light status of battery 140#	U16	Bit0 - Alarm light status 0 - off 1 - on
4x14816	RO	Alarm status of battery 140#	U16	Different bit represent different alarm type, When bit is 1 represent alarm type generate, When bit is 0 represent no alarm type generate. Bit0:Cell sensor voltage upper-limit alarm Bit1:Cell sensor voltage lower-limit alarm Bit2:Internal resistance upper-limit alarm Bit3:SOC lower-limit alarm Bit4:SOH lower-limit alarm Bit5:Temperature upper-limit alarm Bit6~Bit15:Reserve
4x14817	RO	Device status of battery 140#	U16	Bit0:Communication status 1-Normal, 0-Interruption
4x14818	RO	Reserve		
4x14819	RO	Reserve		
4x14820	RO	Reserve		

5.3. Device parameter data register

Register No.	Attributes	Description	Data type	Note
4x0501	RW	Modbus communication address	U16	Range: 1-247
4x0502	RW	Communication baud rate	U16	Range: 0-2 0: 9600 1: 19200 2: 38400
4x0503	RW	IP address(IPv4)	U32	Example: 127.1.2.3 Bit0 – Bit7: 3 Bit8 – Bit15: 2 Bit16 – Bit23: 1 Bit24 – Bit31: 127
4x0504				
4x0505	RW	Sub-net mask	U32	Example: 127.1.2.3 Bit0 – Bit7: 3 Bit8 – Bit15: 2 Bit16 – Bit23: 1 Bit24 – Bit31: 127
4x0506				
4x0507	RW	Default gateway	U32	Example: 127.1.2.3 Bit0 – Bit7: 3 Bit8 – Bit15: 2 Bit16 – Bit23: 1 Bit24 – Bit31: 127
4x0508				

4x0509	RW	Cell sensor type	U16	0: 1-1 1: 1-2
4x0510	RW	Cell sensor protocol	U16	0: Standard 1: Extend
4x0511	RW	Cell number of string 1	U16	Range: 0 – 70
4x0512	RW	Cell number of string 2	U16	Range: 0 – 70
4x0513	RW	Function configuration	U16	Bit represent function enable or not, When bit is 1 represent the function enable, When bit is 0 represent the function not enable. Bit0 Balancing: 1: Balancing enable; 0: Close balancing enable; Bit1 Cell sensor alarm control light: 1: Cell sensor alarm control light enable; 0: Close enable; Bit2 Active test internal resistance: 1:Active test enable; 0: Close active test enable;
4x0514	RW	Hall sensor specifications	U16	Range: 0 - 5 0: 50A (Over-load 100A) 1: 100A (Over-load 200A) 2: 200A (Over-load 400A) 3: 300A (Over-load 600A) 4: 400A (Over-load 800A) 5:500A (Over-load 1000A)
4x0515	RW	Battery capacity	U16	Unit:Ah
4x0516	RW	Battery voltage type	U16	Range:0 -2 0:2V 1:12V 2:6V
4x0517	RW	Battery internal resistance reference value	U16	Range: 10 - 10000 ×0.01 Unit: mΩ
4x0518	RW	Battery cutoff voltage	U16	×0.01 Unit: V
4x0519	RW	Battery recovery voltage	U16	×0.01 Unit: V
4x0520	RW	Battery floating charge voltage	U16	×0.01 Unit: V
4x0521	RW	Battery floating charge current	U16	×0.01 Unit: A
4x0522	RW	Reserve	U16	

4x0523	RW	Reserve	U16	
4x0524	RW	Reserve	U16	
4x0525	RW	Reserve	U16	
4x0526	RW	Active measuring internal resistance time interval	U16	Unit:h Range: 1 - 120 、 168、 720、 1440、 2160 Note: 1-120:Effective measurement time interval 168: 1 measurement per week 720: 1 measurement per month 1440: 1 measurement per two months 2160: 1 measurement per three months Default is 24
4x0527	RW	Internal resistance correction value	U16	Range: 0 ~ 10000 ×0.01 Unit: mΩ
4x0528	RW	Target balancing	U16	Unit:0.1% Range: 0% - 99.5% Real-time balancing < Target balancing,perform balancing
4x0529	RW	Balancing interval time	U16	Range 120 - 1200 Default is 120 Unit:s (second)
4x0530	RW	Reserve	U16	
4x0531	RW	Reserve	U16	
4x0532	RW	(Charge)String current upper-limit alarm threshold	U16	×0.1 Unit: A 0 means close the alarm
4x0533	RW	String current upper-limit alarm hysteresis value (dt)	U16	×0.1 Unit: A Don't need hysteresis,set to 0
4x0534	RW	(Discharge)String current lower-limit alarm threshold	S16	×0.1 Unit: A Range: ≤ 0 0 means close the alarm
4x0535	RW	String current lower-limit alarm hysteresis value (dt)	U16	×0.1 Unit: A Don't need hysteresis,set to 0
4x0536	RW	String voltage upper-limit alarm threshold	U16	×0.1 Unit: V 0 means close the alarm
4x0537	RW	String voltage upper-limit alarm hysteresis value (dt)	U16	×0.1 Unit: V Don't need hysteresis,set to 0
4x0538	RW	String voltage lower-limit alarm threshold	U16	×0.1 Unit: V 0 means close the alarm
4x0539	RW	String voltage lower-limit alarm hysteresis value (dt)	U16	×0.1 Unit: V Don't need hysteresis,set to 0
4x0540	RW	String SOC lower-limit alarm threshold	U16	×1, Unit: 1% Range : 0 - 100

				0 means close the alarm
4x0541	RW	String SOC lower-limit alarm hysteresis value (dt)	U16	×1, Unit: 1% Range : 0 - 100 Don't need hysteresis,set to 0
4x0542	RW	Reserve	U16	Reserve
4x0543	RW	Reserve	U16	Reserve
4x0544	RW	Hall alarm enable	U16	Range: 0 - 1 0:No enable 1:Enable;
4x0545	RW	Device temperature upper-limit alarm threshold	U16	×0.1, Unit:℃ Range: 0.0°- 100.0° 0 means close the alarm
4x0546	RW	Device temperature upper-limit alarm hysteresis value (dt)	U16	×0.1, Unit:℃ Range: 0.0°- 100.0° Don't need hysteresis,set to 0
4x0547	RW	Reserve	U16	Reserve
4x0548	RW	Reserve	U16	Reserve
4x0549	RW	Reserve	U16	Reserve
4x0550	RW	Reserve	U16	Reserve
4x0551	RW	Cell sensor voltage upper-limit alarm threshold	U16	×0.001 Unit: V 0 means close the alarm
4x0552	RW	Cell sensor voltage upper-limit alarm hysteresis value (dt)	U16	×0.001 Unit: V Don't need hysteresis,set to 0
4x0553	RW	Cell sensor voltage lower-limit alarm threshold	U16	×0.001 Unit: V 0 means close the alarm
4x0554	RW	Cell sensor voltage lower-limit alarm hysteresis value (dt)	U16	×0.001 Unit: V Don't need hysteresis,set to 0
4x0555	RW	Cell sensor internal resistance upper-limit alarm threshold	U16	×0.01 Unit: mΩ 0 means close the alarm
4x0556	RW	Cell sensor internal resistance upper-limit alarm hysteresis value (dt)	U16	×0.01 Unit: mΩ Don't need hysteresis,set to 0
4x0557	RW	Cell sensor SOC lower-limit alarm threshold	U16	×1, Unit: 1% Range : 0 - 100 0 means close the alarm
4x0558	RW	Cell sensor SOC lower-limit alarm hysteresis value (dt)	U16	×1, Unit: 1% Range : 0 - 100 Don't need hysteresis,set to 0
4x0559	RW	Cell sensor SOH lower-limit alarm threshold	U16	×1, Unit: 1% Range : 0 - 100 0 means close the alarm
4x0560	RW	Cell sensor SOH	U16	×1, Unit: 1%

		lower-limit alarm hysteresis value (dt)		Range : 0 - 100 Don't need hysteresis,set to 0
4x0561	RW	Cell sensor temperature upper-limit alarm threshold	U16	×0.1, Unit:℃ Range: 0.0°- 100.0° 0 means close the alarm
4x0562	RW	Cell sensor temperature upper-limit alarm hysteresis value (dt)	U16	×0.1, Unit:℃ Range: 0.0°- 100.0° Don't need hysteresis,set to 0
4x0563	RW	Reserve	U16	Reserve
4x0564	RW	Reserve	U16	Reserve
4x0565	RW	Reserve	U16	Reserve
4x0566	RW	Reserve	U16	Reserve
4x0567	RW	Reserve	U16	Reserve
4x0568	RW	Reserve	U16	Reserve
4x0569	RW	Reserve	U16	Reserve
4x0570	RW	Reserve	U16	Reserve

5.4. Cell sensor information configuration sheet

Main address information of cell sensor configuration

Battery string 1 - Address information configuration:

Register No.	Attributes	Description	Data type	Note
4x7001	RW	Cell sensor address of 1#	U32	If the cell sensor protocol is extend,the address information configuration should be SN code, If the protocol is standard,the address information should be Modbus address. Low-word before,high-word after.
4x7002				
4x7003	RW	Identification of 1# cell sensor connect battery A	U16	
4x7004	RW	Identification of 1# cell sensor connect battery B	U16	Only MT99BT-SXX need to set this register
4x7005	RW	Cell sensor address of 2#	U32	If the cell sensor protocol is extend,the address information configuration should be SN code, If the protocol is standard,the address information should be Modbus address. Low-word before,high-word after.
4x7006				
4x7007	RW	Identification of 2# cell sensor connect battery A	U16	
4x7008	RW	Identification of 2# cell	U16	Only MT99BT-SXX need to set this register

		sensor connect battery B		
4x7009	RW	Cell sensor address of 3#	U32	
4x7010				
4x7011	RW	Identification of 3# cell sensor connect battery A	U16	
4x7012	RW	Identification of 3# cell sensor connect battery B	U16	Only MT99BT-SXX need to set this register
...	...	...	...	...
4x7273	RW	Cell sensor address of 69#	U32	
4x7274				
4x7275	RW	Identification of 69# cell sensor connect battery A	U16	
4x7276	RW	Identification of 69# cell sensor connect battery B	U16	Only MT99BT-SXX need to set this register
4x7277	RW	Cell sensor address of 70#	U32	
4x7278				
4x7279	RW	Identification of 70# cell sensor connect battery A	U16	
4x7280	RW	Identification of 70# cell sensor connect battery B	U16	Only MT99BT-SXX need to set this register

Battery string 2-Address information configuration:

Register No.	Attributes	Description	Data type	Note
4x7501	RW	Address of cell sensor 1#	U32	If the cell sensor protocol is extend,the address information configuration should be SN code, If the protocol is standard,the address information should be Modbus address. Low-word before,high-word after.
4x7502				
4x7503	RW	Identification of 1# cell sensor connect battery A	U16	
4x7504	RW	Identification of 1# cell sensor connect battery B	U16	Only MT99BT-SXX need to set this register
4x7505	RW	Address of cell sensor 2#	U32	If the cell sensor protocol is extend,the address information configuration should be SN code, If the protocol is standard,the address information should be Modbus address. Low-word before,high-word after
4x7506				
4x7507	RW	Identification of 2# cell sensor connect battery A	U16	
4x7508	RW	Identification of 2# cell sensor connect battery B	U16	Only MT99BT-SXX need to set this register
4x7509	RW	Address of cell sensor 3#	U32	
4x7510				
4x7511	RW	Identification of 3# cell sensor connect battery A	U16	
4x7512	RW	Identification of 3# cell sensor connect battery B	U16	Only MT99BT-SXX need to set this register
...	...	...	...	...
4x7773	RW	Address of cell sensor 69#	U32	
4x7774				
4x7775	RW	Identification of 69# cell sensor connect battery A	U16	
4x7776	RW	Identification of 69# cell sensor connect battery B	U16	Only MT99BT-SXX need to set this register
4x7777	RW	Address of cell sensor 70#	U32	
4x7778				
4x7779	RW	Identification of 70# cell sensor connect battery A	U16	
4x7780	RW	Identification of 70# cell sensor connect battery B	U16	Only MT99BT-SXX need to set this register

5.5. One-click setting address reference register

Register No.	Attributes	Description		Note
4x8001	WO	Command	U16	Write 0x55AA, means start address searching Write 0xAA55, write the searched address into storage
4x8002	RO	Searching address status	U16	Bit0:String 1 searching status Bit1:String 2 searching status 0: Idle or searching 1: Finish searching
4x8003	RW	Communication protocol	U16	0: Standard 1: Extend
4x8004	RW	Cell sensor type	U16	0: 1-1 1: 1-2
4x8005	RW	Reserve		
4x8006	RW	String 1 cell sensor number	U16	Range: 0 – 70
4x8007	RW	String 2 cell sensor number	U16	Range: 0 – 70
4x8008	RW	Reserve		
4x8009	RW	Reserve		
4x8010	RW	Reserve		
4x8011	RW	Reserve		
Battery string 1 - cell sensor address information				
4x8101	RW	Address of cell sensor 1#	U32	Address SN code, Low-word before, high-word after
4x8102				
4x8103	RW	Identification of 1# cell sensor monitoring (A)	U16	
4x8104	RW	Identification of 1# cell sensor monitoring (B)		Only MT99BT-SXX need this register
4x8105	RW	Address of cell sensor 2#	U32	Address SN code, Low-word before, high-word after
4x8106				
4x8107	RW	Identification of 2# cell sensor monitoring (A)	U16	
4x8108	RW	Identification of 2# cell sensor monitoring (B)		Only MT99BT-SXX need this register
...	...	...	...	...
4x8377	RW	Address of cell sensor 70#	U32	Address SN code, Low-word before, high-word after
4x8378				
4x8379	RW	Identification of 70# cell sensor monitoring (A)	U16	
4x8380	RW	Identification of 70# cell sensor monitoring (B)		Only MT99BT-SXX need this register
Battery string 2 - cell sensor address information				

4x8501	RW	Address of cell sensor 1#	U32	Address SN code,Low-word before,high-word after
4x8502				
4x8503	RW	Identification of 1# cell sensor monitoring (A)	U16	
4x8504	RW	Identification of 1# cell sensor monitoring (B)		Only MT99BT-SXX need this register
4x8505	RW	Address of cell sensor 2#	U32	Address SN code,Low-word before,high-word after
4x8506				
4x8507	RW	Identification of 2# cell sensor monitoring (A)	U16	
4x8508	RW	Identification of 2# cell sensor monitoring (B)		Only MT99BT-SXX need this register
...	...	...	...	...
4x8777	RW	Address of cell sensor 70#	U32	Address SN code,Low-word before,high-word after
4x8778				
4x8779	RW	Identification of 70# cell sensor monitoring (A)	U16	
4x8780	RW	Identification of 70# cell sensor monitoring (B)		Only MT99BT-SXX need this register

Note: One-click setting address implementation logic: write 0x55AA to 4x8001 first, then query bit status of Bit0 to Bit1 of 4x8002 respectively (Bit0 to Bit1 respectively correspond to COM1 to COM2 port search address completion status, for example, Bit0 changes from 0 to 1 to indicate COM1 completes the address searching, and the other Bits are the same.) When the status of Bit1 is 1, the MT99BT all ports complete the address search. Read the number of cells corresponding to COM separately, and ensure that 0xAA55 is written to 4x8001 after the number of detected monomers is correct. And, one-click setting o address related register is valid only when the one-click setting address function is used. For example, when the normal used it needs to read the information configuration and quantity of the single information, the related information cannot be read from the "one-click setting address" register.

5.6. Control register

Register No.	Attributes	Description	Note
00001 ~ 00140	WO	(String 1)cell sensor control light Battery 1# - 140#	(05HFunction code) Data field: 0xFF00: Control alarm light ,red light 0x0000: Breathing light (0FHFunction code) Data field: Bit:0 – Breathing light, 1 – Red light Note: Only when the bit 1 of 4x0513 close active cell sensor alarm control light,then can control light through command; Else: If one of node A and B control alarm light,then red light on when use MT99BT-SXX ; Breathing light effect requires simultaneous control of nodes A
01001	WO	(String 2)cell sensor control light	(05HFunction code) Data field: 0xFF00: Control alarm light ,red light

~ 01140		Battery 1# - 140#		0x0000: Breathing light (0FHFunction code) Data field: Bit:0 – Breathing light, 1 – Red light Note: Only when the bit 1 of 4x0513 close active cell sensor alarm control light,then can control light through command;
/	/	/	/	/
05001 ~ 05140	WO	(String 1) Measuring internal resistance independently Battery 1# - 140#		(05HFunction code) Data field: 0xFF00: Internal resistance measurement Non 0xFF00 :Invalid (0FHFunction code) Data field: Bit:0 – Invalid , 1 – Internal resistance measurement Else : Control node A is valid,control node B is invalid when use MT99BT-SXX , string 2 same as string 1
06001 ~ 06140	WO	(String 2) Measuring internal resistance independently Battery 1# - 140#		(05HFunction code) Data field: 0xFF00: Internal resistance measurement Non 0xFF00 : Invalid (0FHFunction code) Data field: Bit:0 – Invalid , 1 – Internal resistance measurement
/	/	/	/	/
10000	WO	Internal resistance measurement (all)	U16	0xFF00:Internal measurement start Non 0xFF00: Invalid Note: Only support 05HFunction code
10005	WO	Wake/sleep cell sensor	U16	0xFF00:Wake command 0x0000:Sleep command Note: Only support 05HFunction code

5.7. Time register

Attributes	Description		Note
RW	UNIX time		Low-word before,high-word after
\	Reserve, cannot write or read		
RW	Second	U16	Range: 0 - 59
RW	Minute	U16	Range: 0 - 59
RW	Time	U16	Range: 0 - 23
RW	Day	U16	Range: 1 - 31
RW	Month	U16	Range: 1 - 12
RW	Year	U16	Range: 00-99

Note: Each time the device will be reset to January 1, 2017 0 hours, 0 minutes, 0 seconds when re-powering. If the time of the equipment will be needed, you need to use MT99BT to calibration the time after powering.

4x60201 ~ 4x60202, Unix time need to be read at once

4x60204 ~ 4x60209, The date (year, month, day...) need to be read at once

5.8. Version information register

Register No.	Attributes	Description		Note
4x60501	RO	Soft-ware version No.	U16	Range: 100 ~799 Standard version No.
4x60502	RO	Soft-ware internal measurement No.	U16	Range: 001 ~ 999
4x60503 ~ 4x60534	RO	Customized information	U16	It is expressed in ASCII code, that is, 1 register has 2 ASCII values, and the high and low bytes represent an ASCII value separately; if it is a standard version program, the register values are all 0;
4x60535 ~ 4x60563	RO	Reserve	U16	
4x60564	RO	Hard-ware version No.	U16	

5.9. Remote register

	Register No.	Attributes	Description		Note
Device status information	1x0001	RO	String 1 hall status	Bit 0	1: Connect 0 : Disconnect
	1x0002	RO	String 2 hall status	Bit 1	1 : Connect 0 : Disconnect
	1x0003	RO	Alarm light status	Bit 2	1: On 0 : Off
	1x0004	RO	Device fault status	Bit 3	1: Fault 0 : Normal
	1x0005	RO	Reserve	Bit 4	
	1x0006	RO	Reserve	Bit 5	
	1x0007	RO	Reserve	Bit 6	
	1x0008	RO	Reserve	Bit 7	
	1x0009	RO	Reserve	Bit 0	
	1x0010	RO	Reserve	Bit 1	
	1x0011	RO	Reserve	Bit 2	

	1x0012	RO	Reserve	Bit 3	
	1x0013	RO	Reserve	Bit 4	
	1x0014	RO	Reserve	Bit 5	
	1x0015	RO	Reserve	Bit 6	
	1x0016	RO	Reserve	Bit 7	
String alarm information Battery string 1	1x0017	RO	String voltage upper-limit alarm	Bit 0	1:Alarm 0:Non alarm
	1x0018	RO	String voltage lower-limit alarm	Bit 1	1:Alarm 0:Non alarm
	1x0019	RO	String current upper-limit alarm	Bit 2	1:Alarm 0:Non alarm
	1x0020	RO	String current lower-limit alarm	Bit 3	1:Alarm 0:Non alarm
	1x0021	RO	String SOC lower-limit alarm	Bit 4	1:Alarm 0:Non alarm
	1x0022	RO	Reserve	Bit 5	
	1x0023	RO	Hall disconnect alarm	Bit 6	1:Alarm 0:Non alarm
	1x0024	RO	Device temperature upper-limit alarm	Bit 7	1:Alarm 0:Non alarm
	1x0025	RO	Reserve	Bit 0	
	1x0026	RO	Reserve	Bit 1	
	1x0027	RO	Reserve	Bit 2	
	1x0028	RO	Reserve	Bit 3	
	1x0029	RO	Reserve	Bit 4	
	1x0030	RO	Reserve	Bit 5	
	1x0031	RO	Reserve	Bit 6	
	1x0032	RO	Reserve	Bit 7	
Cell sensor alarm information (total) Battery string 1	1x0033	RO	Total cell sensor voltage upper-limit alarm	Bit 0	1:Alarm 0:Non alarm
	1x0034	RO	Total cell sensor voltage lower-limit alarm	Bit 1	1:Alarm 0:Non alarm
	1x0035	RO	Total cell sensor internal resistance upper-limit alarm	Bit 2	1:Alarm 0:Non alarm
	1x0036	RO	Total cell sensor temperature upper-limit alarm	Bit 3	1:Alarm 0:Non alarm
	1x0037	RO	Total cell sensor SOC lower-limit alarm	Bit 4	1:Alarm 0:Non alarm
	1x0038	RO	Total cell sensor SOH lower-limit alarm	Bit 5	1:Alarm 0:Non alarm
	1x0039	RO	Reserve	Bit 6	
	1x0040	RO	Reserve	Bit 7	

	1x0041	RO	Reserve	Bit 0	
	1x0042	RO	Reserve	Bit 1	
	1x0043	RO	Reserve	Bit 2	
	1x0044	RO	Reserve	Bit 3	
	1x0045	RO	Reserve	Bit 4	
	1x0046	RO	Reserve	Bit 5	
	1x0047	RO	Reserve	Bit 6	
	1x0048	RO	Reserve	Bit 7	
String alarm information	1x0049	RO	String voltage upper-limit alarm	Bit 0	1:Alarm 0:Non alarm
	1x0050	RO	String voltage lower-limit alarm	Bit 1	1:Alarm 0:Non alarm
	1x0051	RO	String current upper-limit alarm	Bit 2	1:Alarm 0:Non alarm
	1x0052	RO	String current lower-limit alarm	Bit 3	1:Alarm 0:Non alarm
	1x0053	RO	String SOC lower-limit alarm	Bit 4	1:Alarm 0:Non alarm
	1x0054	RO	Reserve	Bit 5	
	1x0055	RO	Hall disconnect alarm	Bit 6	1:Alarm 0:Non alarm
	1x0056	RO	Device temperature upper-limit alarm	Bit 7	1:Alarm 0:Non alarm
	1x0057	RO	Reserve	Bit 0	
	1x0058	RO	Reserve	Bit 1	
	1x0059	RO	Reserve	Bit 2	
	1x0060	RO	Reserve	Bit 3	
	1x0061	RO	Reserve	Bit 4	
	1x0062	RO	Reserve	Bit 5	
	1x0063	RO	Reserve	Bit 6	
	1x0064	RO	Reserve	Bit 7	
Cell sensor alarm information (total)	1x0065	RO	Total cell sensor voltage upper-limit alarm	Bit 0	1:Alarm 0:Non alarm
	1x0066	RO	Total cell sensor voltage lower-limit alarm	Bit 1	1:Alarm 0:Non alarm
	1x0067	RO	Total cell sensor internal resistance upper-limit alarm	Bit 2	1:Alarm 0:Non alarm
	1x0068	RO	Total cell sensor temperature upper-limit alarm	Bit 3	1:Alarm 0:Non alarm
	1x0069	RO	Total cell sensor SOC lower-limit alarm	Bit 4	1:Alarm 0:Non alarm
	1x0070	RO	Total cell sensor SOH lower-limit alarm	Bit 5	1:Alarm 0:Non alarm
	1x0071	RO	Reserve	Bit 6	
	1x0072	RO	Reserve	Bit 7	
	1x0073	RO	Reserve	Bit 0	

	1x0074	RO	Reserve	Bit 1	
	1x0075	RO	Reserve	Bit 2	
	1x0076	RO	Reserve	Bit 3	
	1x0077	RO	Reserve	Bit 4	
	1x0078	RO	Reserve	Bit 5	
	1x0079	RO	Reserve	Bit 6	
	1x0080	RO	Reserve	Bit 7	
Battery string 1 The alarm information of first battery	1x0081	RO	Communication status	Bit 0	1:Normal 0 : Disconnect
	1x0082	RO	Alarm light status	Bit 1	1: On 0 : Off
	1x0083	RO	Reserve	Bit 2	
	1x0084	RO	Reserve	Bit 3	
	1x0085	RO	Reserve	Bit 4	
	1x0086	RO	Reserve	Bit 5	
	1x0087	RO	Reserve	Bit 6	
	1x0088	RO	Reserve	Bit 7	
	1x0089	RO	Voltage upper-limit alarm	Bit 0	1:Alarm 0:Non alarm
	1x0090	RO	Voltage lower-limit alarm	Bit 1	1:Alarm 0:Non alarm
	1x0091	RO	Internal resistance upper-limit alarm	Bit 2	1:Alarm 0:Non alarm
	1x0092	RO	Temperature upper-limit alarm	Bit 3	1:Alarm 0:Non alarm
	1x0093	RO	SOC lower-limit alarm	Bit 4	1:Alarm 0:Non alarm
	1x0094	RO	SOH lower-limit alarm	Bit 5	
	1x0095	RO	Reserve	Bit 6	
	1x0096	RO	Reserve	Bit 7	
Battery string 1 The alarm information of second battery	1x0097 - 1x0112	RO	Same as the arrangement of first battery	Bit	
...	...	...	...	...	...
Battery string 1 The alarm information of 140th battery	1x2305 - 1x2320	RO	Same as the arrangement of first battery	Bit	
/	/	/	/	/	
Battery string 2 The alarm information of first battery	1x4001 - 1x4016	RO	Same as the arrangement of first battery of string 1	Bit	
Battery string 2 The alarm information of	1x4017 - 1x4032	RO	Same as the arrangement of first battery of string 1	Bit	

second battery					
...	...	...	...	...	...
Battery string 2 The alarm information of 140th battery	1x6225 - 1x6240	RO	Same as the arrangement of first battery of string 1	Bit	

Notice:

- Matis reserves the right to modify this manual without prior notice in view of continued improvement.
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