# **PBAT-Gate 3.3**

# MODBUS PROTOCOL AND REGISTER LIST

V1.05

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# **Chapter 1 Introduction**

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

### 1.1 Purpose of the Communication Protocol

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

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

### 1.2 Version of Communication Protocol

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

## Chapter 2 Detailed Description of the PABT-GATE Modbus

### **Protocol**

The following rules define the protocol rules for information transfer between a MODBUS Master device and the PBAT-GATE in a RS-485 serial communications loop:

- 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, according to 8-bit data bits, 1 stop bit, no parity bit way to transfer, 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 Modes of Transmission

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

### 2.3 Description of the Modbus Packet Structure

Every MODBUS packet consists of four fields:

- 1) The Address Field
- 2) The Function Field
- 3) The Data Field
- 4) The Error 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. The packet matching the slave device is its own address in this filed.

#### 2.3.2 Function Field

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

Function Code	Meaning	Action					
0x01	Read Relay Status	Obtains ON/ OFF information of one or more relay in PBAT-GATE (0/1)					
0x03	Read Holding Registers	Obtains the current value in one or more holding registers of the PBAT-GATE					
0x05	Relay control	Write 0xFF00 to close (ON) the relay Write 0x0000 to open (OFF) the relay					
0x10	Preset Multiple Registers	Places specific binary values into a series of consecutive holding registers of the PBAT-GATE					

#### 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-order byte first, low-order byte second. For example,

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

High-order byte = 0x12

Low-order byte = 0x0AB

#### 2.3.4 Error 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 response

If a Modbus master device sends a non effective command to a PBAT-GATE 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	Meaning
01 illegal function code	PBAT-GATE-Modbus support the function code include: 01H, 02H, 03H, 05H, and 10H.  This code means the slave device receive an illegal function code, or the PBAT-GATE receive the error command.
02 illegal function code	PBAT-GATE receive the address referenced in the data field is an invalid address or the request register is not in the valid register range.
03 illegal function code	The requested register number is too long.

# **Chapter 3 Packet Communication**

Two MODBUS functions are supported by the PBAT-GATE. The standard MODBUS protocol supports only 16-bit registers, which limit the maximum value of any measurement to 65535. **Section 3.1** will describe the format of Read/ Response Packet of holding register.

# 3.1 Read Holding Registers (Function Code 03H)

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

Request Packet (Master→PBAT-GATE)		Response Packet(PBAT-GA	TE→Master)
Unit ID/ Slave address	1 byte	Unit ID/ Slave address	1 byte
03 H (Function Code)	1 byte	03 H (Function Code)	1 byte
Start register address	2 byte	Byte num.(2 * register num.)	1 byte
Registers num.	2 byte	First register data	2 byte
CRC check code	2 byte	Second register data	2 byte
		CRC check code	2 byte

## Modbus-TCP 协议:

97 76 00 00 00 06 04 04 00 7D 00 7D					
	Example	Length	Explain	Remark	
Мар	0x97	1	Identifier Hi	Client request:	
	0x96	1	Identifier Lo		
	0x0000	2	Protocol identifiers	Header handle	
	0x0006	2	Length		
	0x04	1	Element ID	Slave address	
Function code	0x04	1		Function code	
Data	0x007D	1	Start register	Register	
				address	
	0x007D	2	The number of registers		
Verify					

# **Chapter 4 Description of PBAT-GATE Registers**

All PBAT-GATE measured and setup parameters are treated as HOLDING REGISTERS having 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, the MODBUS master reads register **xxxx-1** from the slave . For example register 40011 corresponds to register 10.

4.1 Real-time Date of Battery

Register	Access	Definition	Data Type	Remark
Address	Access	Deminion	Data Type	i telliai k
44809				× 0.01,
<del>11</del> 003	RW	Voltage of string 1#	Float 32 ABCD	Unit: V,
44810	100	voltage of ourling 1"	11001 02 71505	Higher word is first, lower
44010				is second
44811				<b>x</b> 1,
	RW	Voltage of string 2#	Float 32 ABCD	Unit: V,
44812	100			Higher word is first, lower
				is second
44813				<b>x</b> 1,
	RW	Voltage of string 3#	Float 32 ABCD	Unit: V,
44814				Higher word is first, lower
				is second
44815	15		<b>x</b> 1,	
	RW	Voltage of string 4#	Float 32 ABCD	Unit: V,
44816				Higher word is first, lower
				is second
44817		Current of string 1# Float		<b>x</b> 1,
	RW		Float 32 ABCD	Unit: A,
44818				Higher word is first, lower
				is second
44819				<b>x</b> 1,
	RW	Current of string 2#	Float 32 ABCD	Unit: A,
44820	1777			Higher word is first, lower
				is second
44821				<b>x</b> 1,
	RW	Current of string 3#	Float 32 ABCD	Unit: A,
44822				Higher word is first, lower
				is second
44823				<b>x</b> 1,
	Current of string 4#	Float 32 ABCD	Unit: A,	
		Sanon of ouring 411		Higher word is first, lower
1.16.5				is second
44825	_,			<b>x</b> 1,
44826	RW	SOC of string 1#	Float 32 ABCD	Unit: %,
				Higher word is first, lower

				is second □
44827				x1,
44828	RW	SOC of string 2#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44829				×1,
44830	RW	SOC of string 3#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44831				<b>x</b> 1,
44832	RW	SOC of string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44833				×0.1,
44834	RW	Equilibrium of string 1#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44835				×0.1,
44836	RW	Equilibrium of string 2#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44837				×0.1,
44838	RW	Equilibrium of string 3#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44839				×0.1,
44840	RW	Equilibrium of string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44841				x1, Higher word is first, lower is second
44842	RW	Battery status of string 1#	Float 32 ABCD	<ul><li>0 - floating charge</li><li>1 - equalizing charge</li><li>2 - discharge</li><li>3 - standing</li><li>4 - abnormal</li></ul>
44843				x1, Higher word is first, lower is second
44844	RW	Battery status of string 2#	Float 32 ABCD	<ul><li>0 - floating charge</li><li>1 - equalizing charge</li><li>2 - discharge</li><li>3 - standing</li></ul>

				4 - abnormal
				x1,
44845				Higher word is first, lower
				is second
	RW	Battery status of string 3#	Float 32 ABCD	0 - floating charge 1 - equalizing charge
				2 - discharge
44846				3 - standing
				4 - abnormal
				x1,
44847				Higher word is first, lower
44047				is second
	DW	Dettem status of strices All	FI+ 00 ADOD	0 - floating charge
	RW	Battery status of string 4#	Float 32 ABCD	1 - equalizing charge
44848				2 - discharge
				3 - standing
				4 - abnormal
45817	RW	String1_Resistance		x1, Unit:%,
45818		Balance (%)	Float 32 ABCD	High word first, low word
				second
45819	RW	String2_Resistance	Float 32 ABCD	x1, Unit:%, High word
45820		Balance (%)		first, low word second
45821	RW	String3_Resistance	Float 32 ABCD	x1, Unit:%, High word
45822		Balance (%)		first, low word second
45823	RW	String4_Resistance	Float 32 ABCD	x1, Unit:%, High word
45824		Balance (%)		first, low word second
45825 45826	RW	String1_ Remaining time	Float 32 ABCD	x1, Unit:h, High word first, low word second
45827				x1, Unit:h, High word first,
45828	RW	String2_ Remaining time	Float 32 ABCD	low word second
45829				x1, Unit:h, High word first,
45830	RW	String3_ Remaining time	Float 32 ABCD	low word second
10000				x1, Unit:h, High word first,
45831	RW	String4_ Remaining time	Float 32 ABCD	low word second
	<u> </u>	1	1	

# 4.2 Real-time Data of cells

Register Address	Access	Description	Туре	Remark			
	Number of cells in battery						
40001				<b>x</b> 1,			
40002	RW	Number of cell 1#(channel 1)	Float 32 ABCD	Higher word is first, lower is second			

40003				x1,
40004	RW	Number of cell 2#(channel 2)	Float 32 ABCD	Higher word is first,
40004				lower is second
40005				x1,
40006	RW	Number of cell 3#(channel 3)	Float 32 ABCD	Higher word is first,
40000				lower is second
40007				x1,
40008	RW	Number of cell 4#(channel 4)	Float 32 ABCD	Higher word is first,
40000				lower is second

# 4.3 Real-time Data of PBAT6X-X2

Register Address	Access	Description	Туре	Remark	
		Voltage of	string 1#		
40009	RW	Voltage of cell 1# in string 1#	Float 32 ABCD	x1, Unit: V, Higher word is first, lower is second	
40011				×1,	
40012	RW	Voltage of cell 2# in string 1#	Float 32 ABCD	Unit: V, Higher word is first, lower is second	
40013				x1,	
40014	RW	Voltage of cell 3# in string 1#	Float 32 ABCD	Unit: V, Higher word is first, lower is second	
40015				×1,	
40016	RW	Voltage of cell 4# in string 1#	Float 32 ABCD	Unit: V, Higher word is first, lower is second	
			***	***	
		•••	•••		
40245	RW	Voltage of cell 119# in	Float 32 ABCD	x1, Unit: V,	
40246		string 1#	11000 027000	Higher word is first, lower is second	
40247	RW	Voltage of cell 120# in	Float 32 ABCD	×1, Unit: V,	
40248		string 1#		Higher word is first, lower is second	
Temperature of string 1#					
40249 40240	RW	Temperature of cell 1# in string 1#	Float 32 ABCD	x1, Unit: ;C	

				History and in first laws in
				Higher word is first, lower is
40054				second
40251		Tomporature of call 2# in		x1, Unit: ;C
40050	RW	Temperature of cell 2# in	Float 32 ABCD	·
40252		string 1#		Higher word is first, lower is
				second
40253		Towns and the of sell 2# in		x1, Unit: ;C
	RW	Temperature of cell 3# in	Float 32 ABCD	
40254		string 1#		Higher word is first, lower is second
40255				×1,
40255		Tomporature of call 4# in		Unit: ;C
40056	RW	Temperature of cell 4# in string 1#	Float 32 ABCD	Higher word is first, lower is
40256		String 1#		second
•••	•••		•••	•••
40485	•••	•••	•••	x1,
+0+05		Temperature of cell		Unit: ;C
40486	RW	119# in string 1#	Float 32 ABCD	Higher word is first, lower is
10 100		113# 111 301119 1#		second
40487				x1,
10 101		Temperature of cell		Unit: ;C
40488	RW	120# in string 1#	Float 32 ABCD	Higher word is first, lower is
10.00		120# III 3ttilig 1#		second
	I	Internal resistan	ce of string 1#	
40489				x1,
	D)4/	Internal resistance of	Float 32 ABCD	Unit: mΩ,
40490	RW	cell 1# in string 1#		Higher word is first, lower is
				second
40491				<b>x</b> 1,
	D) 47	Internal resistance of	EL 100 ADOD	Unit: mΩ,
40492	RW	cell 2# in string 1#	Float 32 ABCD	Higher word is first, lower is
		3		second
40493				<b>x</b> 1,
	ראים	Internal resistance of	Float 32 ABCD	Unit: mΩ,
40494	RW	cell 3# in string 1#	Float 32 ABCD	Higher word is first, lower is
				second
40495				×1,
	RW	Internal resistance of	Float 32 ABCD	Unit: mΩ,
40496	1744	cell 4# in string 1#	I loat 32 ABCD	Higher word is first, lower is
				second
			•••	
			•••	•••
40725	RW	Internal resistance of	Float 32 ABCD	<b>x</b> 1,

		cell 119# in string 1#		Unit: mΩ,
40726				Higher word is first, lower is second
40727				×1,
40728	RW	Internal resistance of cell 120# in string 1#	Float 32 ABCD	Unit: $m\Omega$ , Higher word is first, lower is second
		SOC of st	ring 1#	
40729				x1,
40730	RW	SOC of cell 1# in string 1#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
40731				x1,
40732	RW	SOC of cell 2# in string 1#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
40733				x1,
40734	RW	SOC of cell 3# in string 1#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
40735				x1,
40736	RW	SOC of cell 4# in string 1#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
40965				<b>x</b> 1,
40966	RW	SOC of cell 119# in string 1#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
40966 40967	RW		Float 32 ABCD	Higher word is first, lower is
	RW		Float 32 ABCD Float 32 ABCD	Higher word is first, lower is second
40967		string 1#  SOC of cell 120# in	Float 32 ABCD	Higher word is first, lower is second  x1,  Unit: %,  Higher word is first, lower is
40967	RW	string 1#  SOC of cell 120# in  string 1#	Float 32 ABCD	Higher word is first, lower is second  x1,  Unit: %,  Higher word is first, lower is second  x1,
40967 40968		string 1#  SOC of cell 120# in string 1#  SOH of st	Float 32 ABCD	Higher word is first, lower is second x1, Unit: %, Higher word is first, lower is second
40967 40968 40969	RW	string 1#  SOC of cell 120# in string 1#  SOH of st	Float 32 ABCD	Higher word is first, lower is second  x1,  Unit: %,  Higher word is first, lower is second  x1,  Unit: %,  Higher word is first, lower is
40967 40968 40969 40970	RW	string 1#  SOC of cell 120# in string 1#  SOH of st	Float 32 ABCD	Higher word is first, lower is second x1, Unit: %, Higher word is first, lower is second x1, Unit: %, Higher word is first, lower is second

		string 1#		Unit: %,
40974				Higher word is first, lower is
				second
40975				<b>x</b> 1,
	RW	SOH of cell 4# in	Float 32 ABCD	Unit: %,
40976	IXVV	string 1#	1 loat 32 ABCD	Higher word is first, lower is
				second
			•••	
41205				<b>x</b> 1,
	RW	SOH of cell 119# in	Float 32 ABCD	Unit: %,
41206	IXVV	string 1#	Float 32 ABCD	Higher word is first, lower is
				second
41207				<b>x</b> 1,
	RW	SOH of cell 120# in	Float 22 ABCD	Unit: %,
41208	IZVV	string 1#	Float 32 ABCD	Higher word is first, lower is
				second

Register Address	Access	Description	Туре	Remark			
radiooo	Voltage of string 2#						
41209				x1,			
41210	RW	Voltage of cell 1# in string 2#	Float 32 ABCD	Unit: V, Higher word is first, lower is second			
41211				x1,			
41212	RW	Voltage of cell 2# in string 2#	Float 32 ABCD	Unit: V, Higher word is first, lower is second			
41213				x1,			
41214	RW	Voltage of cell 3# in string 2#	Float 32 ABCD	Unit: V, Higher word is first, lower is second			
41215				×1,			
41216	RW	Voltage of cell 4# in string 2#	Float 32 ABCD	Unit: V, Higher word is first, lower is second			
			•••				
41445 41446	RW	Voltage of cell 119# in string 2#	Float 32 ABCD	x1, Unit: V, Higher word is first, lower is second			

41447				<b>x</b> 1,
11117		Voltage of cell 120# in	Float 32 ABCD	Unit: V,
41448	RW	string 2#		Higher word is first, lower is
		Jg		second
		Temperature	of string 2#	
41449				x1,
	5,4,	Temperature of cell 1#		Unit: ;C
41450	RW	in string 2#	Float 32 ABCD	Higher word is first, lower is
				second
41451				x1,
	DW	Temperature of cell 2#		Unit: ;C
41452	RW	in string 2#	Float 32 ABCD	Higher word is first, lower is
				second
41453				×1,
	RW	Temperature of cell 3#	Float 32 ABCD	Unit: ;C
41454	IXVV	in string 2#	1 loat 32 ABOB	Higher word is first, lower is
				second
41455				×1,
	RW	Temperature of cell 4# in string 2#	Float 32 ABCD	Unit: ;C
41456	1200			Higher word is first, lower is
				second
			•••	
			•••	
41685				×1,
	RW	Temperature of cell	Float 32 ABCD	Unit: C
41686		119# in string 2#		Higher word is first, lower is
				second
41687				x1,
44000	RW	Temperature of cell 120# in string 2#	Float 32 ABCD	Unit: C
41688				Higher word is first, lower is
		letamal	an of states - O!	second
44000		Internal resistan	ce of String 2#	4
41689				<b>x</b> 1,
44000	RW	Internal registeres of	Float 32 ABCD	Linit: m∩
41690	RW	Internal resistance of	Float 32 ABCD	Unit: mΩ,
41690	RW	Internal resistance of cell 1# in string 2#	Float 32 ABCD	Higher word is first, lower is
	RW		Float 32 ABCD	Higher word is first, lower is second
41691	RW	cell 1# in string 2#	Float 32 ABCD	Higher word is first, lower is second x1,
41691	RW RW	cell 1# in string 2#  Internal resistance of	Float 32 ABCD	Higher word is first, lower is second \$\$x1\$, Unit: $m\Omega$ ,
		cell 1# in string 2#		Higher word is first, lower is second  ×1,  Unit: mΩ,  Higher word is first, lower is
41691 41692		cell 1# in string 2#  Internal resistance of		Higher word is first, lower is second \$\$x1\$, Unit: $m\Omega$ , Higher word is first, lower is second
41691	RW	cell 1# in string 2#  Internal resistance of cell 2# in string 2#	Float 32 ABCD	Higher word is first, lower is second  x1,  Unit: mΩ,  Higher word is first, lower is second  x1,
41691 41692 41693		cell 1# in string 2#  Internal resistance of cell 2# in string 2#  Internal resistance of		Higher word is first, lower is second $ \begin{array}{c} \times 1 , \\ \text{Unit: } m\Omega , \\ \text{Higher word is first, lower is second} \\ \times 1 , \\ \text{Unit: } m\Omega , \end{array} $
41691 41692	RW	cell 1# in string 2#  Internal resistance of cell 2# in string 2#	Float 32 ABCD	Higher word is first, lower is second  x1,  Unit: mΩ,  Higher word is first, lower is second  x1,

41695				<b>x</b> 1,
41093		Internal resistance of		Unit: mΩ,
41696	RW	RW I	Float 32 ABCD	·
		cell 4# in string 2#		Higher word is first, lower is second
				Second
		•••	•••	***
			•••	4
41925		lateman mediateman of		x1,
44000	RW	Internal resistance of	Float 32 ABCD	Unit: $m\Omega_{\tau}$
41926		cell 119# in string 2#		Higher word is first, lower is
44007				second
41927		Later and the Pater and of		x1,
44000	RW	Internal resistance of	Float 32 ABCD	Unit: mΩ,
41928		cell 120# in string 2#		Higher word is first, lower is
		200 ( )		second
11000	<u> </u>	SOC of st	tring 2#	
41929		000 16 11 4 11 1		x1,
44000	RW	SOC of cell 1# in	Float 32 ABCD	Unit: %,
41930		string 2#		Higher word is first, lower is
11001				second
41931		SOC of cell 2# in string 2#	Float 32 ABCD	x1,
	41932 RW			Unit: %,
41932				Higher word is first, lower is
44000				second
41933		000 ( ) ( ) ( ) ( )		x1,
11001	RW	SOC of cell 3# in	Float 32 ABCD	Unit: %,
41934		string 2#		Higher word is first, lower is
11005				second
41935		200 ( 11 4"		x1,
44000	RW	SOC of cell 4# in	Float 32 ABCD	Unit: %,
41936		string 2#		Higher word is first, lower is
				second
•••		•••	•••	•••
		•••	•••	
42165		000.4		x1,
45.55	RW	SOC of cell 119# in	Float 32 ABCD	Unit: %,
42166		string 2#		Higher word is first, lower is
45.5-				second
42167				x1,
45.55	RW	SOC of cell 120# in	Float 32 ABCD	Unit: %,
42168	-	string 2#		Higher word is first, lower is
				second
40.455	I	SOH of st	ring 2#	
42169	RW	SOH of cell 1# in	Float 32 ABCD	x1,
42170		string 2#		Unit: %,

			Higher word is first, lower is
			second
			x1,
DW	SOH of cell 2# in	Float 32 ABCD	Unit: %,
1 \ \ \ \	string 2#	1 10dt 02 71B0B	Higher word is first, lower is
			second
			x1,
DΜ	SOH of cell 3# in	Floor 22 APCD	Unit: %,
RW	string 2#	Float 32 ABCD	Higher word is first, lower is
			second
			x1,
RW	RW SOH of cell 4# in string 2#	Float 32 ABCD	Unit: %,
			Higher word is first, lower is
			second
	•••	•••	•••
		•••	•••
			<b>x</b> 1,
DW	SOH of cell 119# in		Unit: %,
RVV	string 2#	Float 32 ABCD	Higher word is first, lower is
	-		second
			<b>x</b> 1,
DW	SOH of cell 120# in		Unit: %,
KVV	string 2#	Float 32 ABCD	Higher word is first, lower is
	_		second
	RW RW RW	RW SOH of cell 3# in string 2#  RW SOH of cell 4# in string 2#  RW SOH of cell 119# in string 2#  SOH of cell 120# in	RW SOH of cell 3# in string 2# Float 32 ABCD  RW SOH of cell 4# in string 2# Float 32 ABCD  Float 32 ABCD  RW SOH of cell 1# in Float 32 ABCD  RW SOH of cell 119# in string 2# Float 32 ABCD  RW SOH of cell 120# in Float 32 ABCD

Register Address	Access	Description	Туре	Remark
		Voltage of	string 3#	
42409				x1,
42410	RW	Voltage of cell 1# in string 3#	Float 32 ABCD	Unit: V, Higher word is first, lower is second
42411				x1,
42412	RW	Voltage of cell 2# in string 3#	Float 32 ABCD	Unit: V, Higher word is first, lower is second
42413				x1,
42414	RW	Voltage of cell 3# in string 3#	Float 32 ABCD	Unit: V, Higher word is first, lower is second
42415		Voltage of cell 4# in		x1,
42416	RW	Voltage of cell 4# in string 3#	Float 32 ABCD	Unit: V, Higher word is first, lower is

				second
42645				x1,
42646	RW	Voltage of cell 119# in string 3#	Float 32 ABCD	Unit: V, Higher word is first, lower is second
42647				x1,
42648	RW	Voltage of cell 120# in string 3#	Float 32 ABCD	Unit: V, Higher word is first, lower is second
		Temperature	of String 3#	
42649				x1,
42650	RW	Temperature of cell 1# in string 3#	Float 32 ABCD	Unit: C Higher word is first, lower is second
42651				x1,
42652	RW	Temperature of cell 2# in string 3#	Float 32 ABCD	Unit: C Higher word is first, lower is second
42653				x1,
42654	RW	Temperature of cell 3# in string 3#	Float 32 ABCD	Unit: C Higher word is first, lower is second
42655				x1,
42656	RW	Temperature of cell 4# in string 3#	Float 32 ABCD	Unit: C Higher word is first, lower is second
42885				x1,
42886	RW	Temperature of cell 119# in string 3#	Float 32 ABCD	Unit: C Higher word is first, lower is second
42887				×1,
42888	RW	Temperature of cell 120# in string 3#	Float 32 ABCD	Unit: ,C Higher word is first, lower is second
		Internal resistan	ce of string 3#	
42889				<b>x</b> 1,
42890	RW	Internal resistance of cell 1# in string 3#	Float 32 ABCD	Unit: $m\Omega$ , Higher word is first, lower is second
42891	RW	Internal resistance of	Float 32 ABCD	×1,

		cell 2# in string 3#		Unit: mΩ,
42892				Higher word is first, lower is
				second
42893				×1,
		Internal resistance of		Unit: mΩ,
42894	RW	cell 3# in string 3#	Float 32 ABCD	Higher word is first, lower is
				second
42895				x1,
	5,,,	Internal resistance of		Unit: mΩ,
42896	RW	cell 4# in string 3#	Float 32 ABCD	Higher word is first, lower is
		_		second
			•••	•••
			•••	•••
43125				<b>x</b> 1,
	RW	Internal resistance of	Float 32 ABCD	Unit: mΩ,
43126	IXVV	cell 119# in string 3#	1 loat 32 ADOD	Higher word is first, lower is
				second
43127				×1,
	RW	Internal resistance of	Float 32 ABCD	Unit: mΩ,
43128	IXVV	cell 120# in string 3#	1 loat 32 ADOD	Higher word is first, lower is
				second
		SOC of st	ring 3#	
43129				×1,
	RW	SOC of cell 1# in	Float 32 ABCD	Unit: %,
43130		string 3#	1 1001 02 7 13 03	Higher word is first, lower is
				second
43131				x1,
	RW	SOC of cell 2# in	Float 32 ABCD	Unit: %,
43132		string 3#		Higher word is first, lower is
				second
43133				<b>x</b> 1,
	RW	SOC of cell 3# in	Float 32 ABCD	Unit: %,
43134		string 3#		Higher word is first, lower is
				second
43135				x1,
	RW	SOC of cell 4# in	Float 32 ABCD	Unit: %,
43136		string 3#		Higher word is first, lower is
				second
		•••	•••	
40005		•••	•••	4
43365	-	000 of11440#1		x1,
40000	RW	SOC of cell 119# in	Float 32 ABCD	Unit: %,
43366		string 3#		Higher word is first, lower is
	]			second

43367				<b>x</b> 1,
	RW	SOC of cell 120# in	Float 32 ABCD	Unit: %,
43368	KVV	string 3#	Float 32 ABCD	Higher word is first, lower is
				second
		SOH of st	ring 3#	
43369				<b>x</b> 1,
	RW	SOH of cell 1# in	Float 32 ABCD	Unit: %,
43370	IXVV	string 3#	1 loat 32 ABCD	Higher word is first, lower is
				second
43371				<b>x</b> 1,
	RW	SOH of cell 2# in	Float 32 ABCD	Unit: %,
43372	IXVV	string 3#	1 loat 32 ABOB	Higher word is first, lower is
				second
43373				x1,
	RW	SOH of cell 3# in string 3#	Float 32 ABCD	Unit: %,
43374				Higher word is first, lower is
				second
43375				<b>x</b> 1,
	RW	SOH of cell 4# in	Float 32 ABCD	Unit: %,
43376		string 3#	1 10at 02 7 1505	Higher word is first, lower is
				second
			•••	
		•••	•••	
43605				<b>x</b> 1,
	RW	SOH of cell 119# in	Float 32 ABCD	Unit: %,
43606	1200	string 3#	1 1001 02 71505	Higher word is first, lower is
				second
42607				×1,
43607	RW	SOH of cell 120# in	Float 32 ABCD	Unit: %,
40000	IXVV	string 3#		Higher word is first, lower is
43608				second

Register Address	Access	Description	Туре	Remark	
		Voltage of	string 4#		
43609				×1,	
	RW	Voltage of cell 1# in	Voltage of cell 1# in	Float 32 ABCD	Unit: V,
43610		string 4#	FIOAL 32 ABCD	Higher word is first, lower is	
				second	
43611				x1,	
	PW Voltage of cell 2# in string 4#	Voltage of cell 2# in	Float 32 ABCD	Unit: V,	
43612		string 4#		Higher word is first, lower is	
				second	
43613	RW	Voltage of cell 3# in	Float 32 ABCD	x1,	

		string 4#		Unit: V,
43614		String 4#		Higher word is first, lower is
43014				second
43615				x1,
43013		Voltage of cell 4# in		Unit: V,
43616	RW	string 4#	Float 32 ABCD	Higher word is first, lower is
43010		String 4#		second
•••			•••	
12015			•••	x1,
43845		Voltage of cell 110# in		,
40040	RW	Voltage of cell 119# in	Float 32 ABCD	Unit: V,
43846		string 4#		Higher word is first, lower is
400.47				second
43847		Value		x1,
400.40	RW	Voltage of cell 120# in	Float 32 ABCD	Unit: V,
43848		string 4#		Higher word is first, lower is
		_		second
		Temperature	of string 4#	
43849				<b>x</b> 1,
	RW	Temperature of cell 1#	Float 32 ABCD	Unit: C
43850		in string 4#		Higher word is first, lower is
				second
43851				x1,
	RW	Temperature of cell 2# in string 4#	Float 32 ABCD	Unit: ;C
43852	IXVV			Higher word is first, lower is
				second
43853				x1,
	DW	Temperature of cell 3#		Unit: ເ℃
43854	RW	in string 4#	Float 32 ABCD	Higher word is first, lower is
				second
43855				<b>x</b> 1,
	D14.	Temperature of cell 4#	FI	Unit: ;C
43856	RW	in string 4#	Float 32 ABCD	Higher word is first, lower is
		Ĭ		second
	•••		•••	
44085				<b>x</b> 1,
		Temperature of cell		Unit: ;C
44086	RW	119# in string 4#	Float 32 ABCD	Higher word is first, lower is
				second
44087				x1,
		Temperature of cell		Unit: C
44088	RW	120# in string 4#	Float 32 ABCD	Higher word is first, lower is
77000		120π 111 301119 4π		second
				SECULIA

Internal resistance of string 4#					
44089				<b>x</b> 1,	
44090	RW	Internal resistance of cell 1# in string 4#	Float 32 ABCD	Unit: $m\Omega$ , Higher word is first, lower is second	
44091				x1,	
44092	RW	Internal resistance of cell 2# in string 4#	Float 32 ABCD	Unit: $m\Omega$ , Higher word is first, lower is second	
44093				x1,	
44094	RW	Internal resistance of cell 3# in string 4#	Float 32 ABCD	Unit: $m\Omega$ , Higher word is first, lower is second	
44095				x1,	
44096	RW	Internal resistance of cell 4# in string 4#	f Float 32 ABCD	Unit: $m\Omega$ , Higher word is first, lower is second	
			•••		
44325				x1,	
44326	RW	l RW l	Internal resistance of cell 119# in string 4#	Float 32 ABCD	Unit: $m\Omega$ , Higher word is first, lower is second
44327				x1,	
44328	RW	Internal resistance of cell 120# in string 4#	Float 32 ABCD	Unit: $m\Omega$ , Higher word is first, lower is second	
		SOC of s	tring 4#		
44329				x1,	
44330	RW	SOC of cell 1# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second	
44331				<b>x</b> 1,	
44332	RW	SOC of cell 2# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second	
44333				x1,	
44334	RW	SOC of cell 3# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second	
44335				x1,	
44336	RW	SOC of cell 4# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second	

44565				x1,
44566	RW	SOC of cell 119# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44567				x1,
44568	RW	SOC of cell 120# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
		SOH of st	tring 4#	
44569			_	<b>x</b> 1,
44570	RW	SOH of cell 1# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44571				×1,
44572	RW	SOH of cell 2# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44573				x1,
44574	RW	SOH of cell 3# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44575				x1,
44576	RW	SOH of cell 4# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44805				<b>x</b> 1,
44806	RW	SOH of cell 119# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second
44807				<b>x</b> 1,
44808	RW	SOH of cell 120# in string 4#	Float 32 ABCD	Unit: %, Higher word is first, lower is second

4.4 Alarm Register

	Alarm of	battery	×1,
			,
RW	Alarm of string 1#	Float 32 ABCD	x1, Higher word is first, lower is second Different bits indicate different alarm types, Bit 1 indicates that the alarm type is generated, Bit 0 indicates that the alarm type is not generated, Bit0:alarm for upper limit of string voltage. Bit1:alarm for lower limit of string voltage. Bit2:alarm for upper limit of string current. Bit3: Hall sensor disconnection alarm Bit4: alarm for lower limit of SOC. Bit5: alarm for lower limit of string current.
DW		Float 32 ABCD	
KW	Alarm of string 2#		
RW	Alarm of string 3#	Float 32 ABCD	
RW	Alarm of string 4#	Float 32 ABCD	
RW	String1_Charge Current over	Float 32 ABCD	normal: 0 alarm: 1
RW	String2_Charge Current over	Float 32 ABCD	normal: 0 alarm: 1
RW	String3_Charge Current over	Float 32 ABCD	normal: 0 alarm: 1
RW	String4_Charge Current over	Float 32 ABCD	normal: 0 alarm: 1
RW	String1_Discharge Current over	Float 32 ABCD	normal: 0 alarm: 1
RW	String2_Discharge Current over	Float 32 ABCD	normal: 0 alarm: 1
RW	String3_Discharge Current	Float 32 ABCD	normal: 0 alarm: 1
	RW RW RW RW RW RW	RW Alarm of string 2# RW Alarm of string 3# RW Alarm of string 4# RW String1_Charge Current over RW String2_Charge Current over RW String3_Charge Current over RW String4_Charge Current over RW String4_Charge Current over RW String1_Discharge Current over RW String2_Discharge Current over String3_Discharge Current	RW Alarm of string 2# Float 32 ABCD  RW Alarm of string 3# Float 32 ABCD  RW Alarm of string 4# Float 32 ABCD  RW String1_Charge Current over Float 32 ABCD  RW String2_Charge Current over Float 32 ABCD  RW String3_Charge Current over Float 32 ABCD  RW String4_Charge Current over Float 32 ABCD  RW String1_Discharge Current over Float 32 ABCD  RW String2_Discharge Current over Float 32 ABCD  RW String3_Discharge Current Float 32 ABCD  RW String3_Discharge Current Float 32 ABCD  RW String3_Discharge Current Float 32 ABCD

45847	RW	String4_Discharge Current	Float 32 ABCD	normal: 0	
45848		over		alarm: 1	
45849	DW	String1_Voltage imbalance	Float 32 ABCD	normal: 0	
45850	RW			alarm: 1	
45851	RW	Otrice of Maltage inchalance	Float 32 ABCD	normal: 0	
45852	KVV	String2_Voltage imbalance	Float 32 ABCD	alarm: 1	
45853	DW	RW String3_Voltage imbalance Float 32 ABC	Floor 22 ADOD	normal: 0	
45854	KVV		Float 32 ABCD	alarm: 1	
45855	RW	String / Voltage imbalance	Float 22 APCD	normal: 0	
45856		String4_Voltage imbalance	Float 32 ABCD	alarm: 1	
45857	RW	DW	Strings Dag imbalance	bolones Float 22 ABCD	normal: 0
45858		RW String1_Res imbalance	Float 32 ABCD	alarm: 1	
45859	RW	A String? Desimbolance	Float 32 ABCD	normal: 0	
45860		String2_Res imbalance		alarm: 1	
45861	RW	DW String? Dog imbolones	Floot 22 ABCD	normal: 0	
45862		String3_Res imbalance	Float 32 ABCD	alarm: 1	
15862	45863 RW	V String4_Res imbalance	Float 32 ABCD	normal: 0	
40000				alarm: 1	

	Alarm of cell				
44857		Alarm o	of cell	×1, Higher word is first, lower is second Different bits indicate	
44858	RW	Alarm of cell 1# in string 1#	Float 32 ABCD	different alarm types , Bit 1 indicates that the alarm type is generated , Bit 0 indicates that the alarm type is not generated , Bit0: alarm for upper limit of cell voltage. Bit1: alarm for lower limit of cell voltage. Bit2: alarm for upper limit of temperature. Bit3: alarm for lower limit of temperature Bit4: alarm for upper limit of average voltage. Bit5: alarm for lower limit of average voltage. Bit6: reserved	

				Bit7: alarm for upper limit of
				internal resistance.
				Bit8: alarm for lower limit of
				SOC
				Bit9: alarm for lower limit of
				SOH.
				bit10: alarm for connection
				status
44859	D\//	W Alarm of cell 2# in string 1#	Float 32 ABCD	
44860	KVV			•••
44861	DW	Alarm of cell 3# in string 1#	Float 32 ABCD	
44862	RW			•••
44863	RW	Alarm of cell 4# in string 1#	Float 32 ABCD	
44864	INVV			
			•••	
•••			•••	
45813	RW	Alarm of cell 119# in string 4#	Float 32 ABCD	
45814				
45815	RW	Alarm of cell 120# in string 4#	Float 32 ABCD	
45816				

Battery Connect Status					
45879				Bit0:Connect status,	
45880	RW	Sring1_Cell1_Connect status	Float 32 ABCD	normal: 1	
43000				suspend: 0	
45881				Bit0:Connect status,	
45882	RW	Sring1_Cell2_Connect status	Float 32 ABCD	normal: 1	
43002				suspend: 0	
45883				Bit0:Connect status,	
45884	15001 RW	Sring1_Cell3_Connect status	Float 32 ABCD	normal: 1	
43004				suspend: 0	
45885				Bit0:Connect status,	
45886	RW	Sring1_Cell4_Connect status	Float 32 ABCD	normal: 1	
43000				suspend: 0	
			•••		
			•••		
46835	RW	Sring4_Cell119_Connect	Float 32 ABCD		
46836		status			
46837	RW	Sring4_Cell120_Connect	Float 32 ABCD		
46838		status	FIUAL 32 ADCD		