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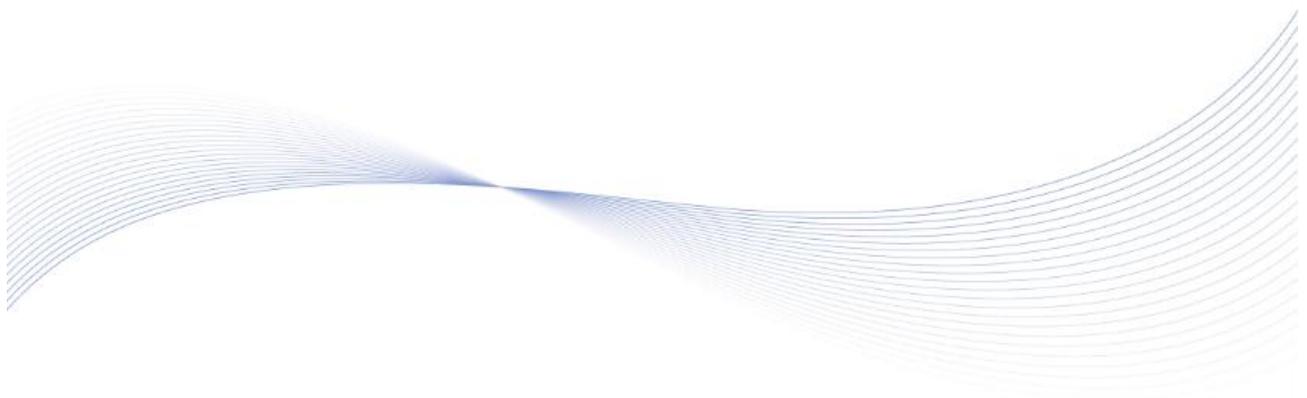
# SmartGen

MAKING CONTROL SMARTER

## **HBCU300**

### **BMS MASTER CONTROL MODULE**

# **COMMUNICATION PROTOCOL**



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**Table 1 Software Version**

Date	Version	Content
2024-08-20	V1.0	Original release.

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## 1. DESCRIPTION

This protocol describes read and write command format of RS485 half-duplex serial port communication and definition of internal information data for the third-party to develop and use.

HBCU300 controller has 2 RS485 interfaces, 1 ETHERNET interface.

The controller is used as the slave, using Modbus-RTU protocol, and does not support other protocols such as Modbus-ASCII.

Communication address: 1~254 (default: 1)

Baud rate: 2400/4800/9600/19200/115200bps (default: RS485-1 115200bps)

Start bit: 1-bit

Data bit: 8-bit

Parity bit: No/Odd/Even Parity (default: no parity)

Stop bit: 1 or 2 bits (default: 1-bit)

Supported function code: 03H, 05H. Function code 03H is used for reading controller alarm, status information and various power data; while function code 05H is used for sending remote command.

Data check mode: CRC16.

Internal registers of controller are in the unit of "word (double bytes)".

Communication timeout period: over 200ms.

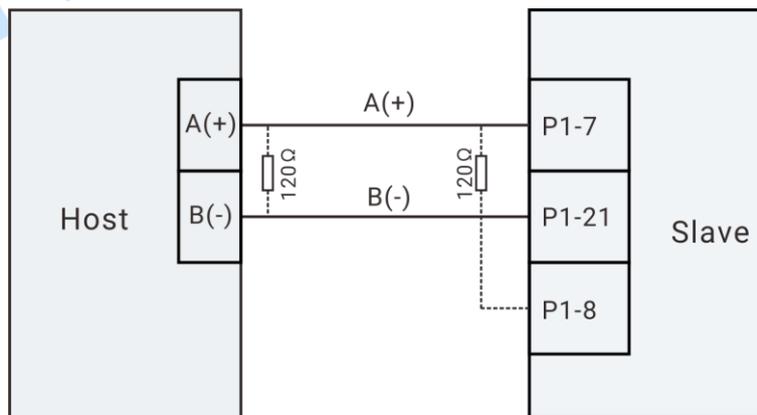
Communication distance: 9600 baud rate, the longest distance can reach 1,000m when using 120Ω shielding twisted pair.

Once maximum 120 data of word register can be read.

Up to 32 controllers can be connected together for network communication.

When RS485 is connected, 120Ω twisted pair with shielding layer shall be used, and the shielding layer shall be grounded at one end.

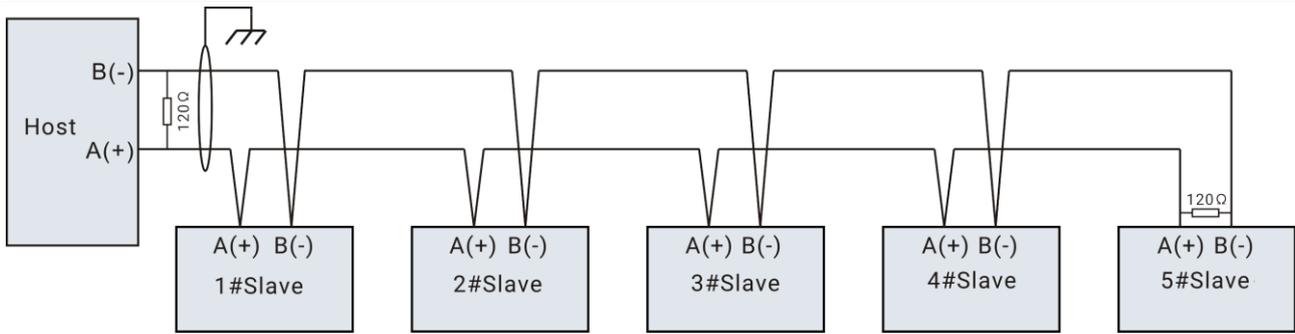
## 2. WIRING DIAGRAM



**Fig.1 Single Unit Communication Wiring Diagram**

**NOTE1:** 2 120Ω impedance resistors can be connected automatically according to site situation, details refer to the following description.

**NOTE2:** The above diagram is about RS485-1 wiring RS485-2's is the same.



**Fig.2 Multi-unit Communication Wiring Diagram**

**NOTE1:** Please set each controller’s communication module address before networking. Same module address is inhibited in the same network.

**NOTE2:** The shielding layer of communication line is single-end grounded on the host side.

**3. CONTROLLER INTERNAL REGISTER ADDRESS AND DATA**

**3.1 ALARM, STATUS COIL DATA FIELD CORRESPONDING TO FUNCTION CODE 03H**

**Table 2 Alarm, Status Coil Data Field**

Modbus Address	PLC Address	Name	Description
100.0	40101.0	Battery System Alarm	
100.1	40101.1	Serious Alarm	
100.2	40101.2	Moderate Alarm	
100.3	40101.3	Light Alarm	
100.4	40101.4	Reserved	
100.5	40101.5	Reserved	
100.6	40101.6	Reserved	
100.7	40101.7	Reserved	
100.8	40101.8	Reserved	
100.9	40101.9	Reserved	
100.10	40101.10	Reserved	
100.11	40101.11	Reserved	
100.12	40101.12	Reserved	
100.13	40101.13	Reserved	
100.14	40101.14	Reserved	
100.15	40101.15	Reserved	
101.0	40102.0	Total Volt High (Serious Alarm)	
101.1	40102.1	Total Volt Low	
101.2	40102.2	Single Volt High	
101.3	40102.3	Single Volt Low	
101.4	40102.4	Large Single Volt Difference	
101.5	40102.5	Charge Temp. High	
101.6	40102.6	Charge Temp. Low	
101.7	40102.7	Large Temp. Difference	

Modbus Address	PLC Address	Name	Description
101.8	40102.8	Fast Temp. Rise	
101.9	40102.9	SOC Low	
101.10	40102.10	Charge Overcurrent	
101.11	40102.11	Discharge Overcurrent	
101.12	40102.12	Insulation Resistance Low	
101.13	40102.13	Single Volt Sampling Error	
101.14	40102.14	Single Temp. Sampling Error	
101.15	40102.15	Current Sampling Error	
102.0	40103.0	B+ Sampling Error	
102.1	40103.1	Main Positive Relay Bond	
102.2	40103.2	Main Negative Relay Bond	
102.3	40103.3	BMU Comm. Alarm	
102.4	40103.4		
102.5	40103.5		
102.6	40103.6		
102.7	40103.7		
102.8	40103.8	Max. Charge Current Out of Limit	
102.9	40103.9	Max. Discharge Current Out of Limit	
102.10	40103.10	HVDB Temp. High	
102.11	40103.11	Pre-charge Failure	
102.12	40103.12	Connector Temp. High	
102.13	40103.13	Connector Temp. Sampling Error	
102.14	40103.14	Discharge Temp. High	
102.15	40103.15	Discharge Temp. Low	
103.0	40104.0	HVDB Temp. Sampling Error	
103.1	40104.1	Emergency Stop	
103.2	40104.2	SOH Low	
103.3	40104.3		
103.4	40104.4		
103.5	40104.5		
103.6	40104.6		
103.7	40104.7		
103.8	40104.8		
103.9	40104.9		
103.10	40104.10		
103.11	40104.11		
103.12	40104.12		
103.13	40104.13		
103.14	40104.14		
103.15	40104.15		
104.0	40105.0		
104.1	40105.1		
104.2	40105.2		

Modbus Address	PLC Address	Name	Description
104.3	40105.3		
104.4	40105.4		
104.5	40105.5		
104.6	40105.6		
104.7	40105.7		
104.8	40105.8		
104.9	40105.9		
104.10	40105.10		
104.11	40105.11		
104.12	40105.12		
104.13	40105.13		
104.14	40105.14		
104.15	40105.15		
105.0	40106.0	Total Volt High (Moderate Alarm)	
105.1	40106.1	Total Volt Low	
105.2	40106.2	Single Volt High	
105.3	40106.3	Single Volt Low	
105.4	40106.4	Large Single Volt Difference	
105.5	40106.5	Charge Temp. High	
105.6	40106.6	Charge Temp. Low	
105.7	40106.7	Large Temp. Difference	
105.8	40106.8	Fast Temp. Rise	
105.9	40106.9	SOC Low	
105.10	40106.10	Charge Overcurrent	
105.11	40106.11	Discharge Overcurrent	
105.12	40106.12	Insulation Resistance Low	
105.13	40106.13	Single Volt Sampling Error	
105.14	40106.14	Single Temp. Sampling Error	
105.15	40106.15	Current Sampling Error	
106.0	40107.0	B+ Sampling Error	
106.1	40107.1	Main Positive Relay Bond	
106.2	40107.2	Main Negative Relay Bond	
106.3	40107.3	BMU Comm. Alarm	
106.4	40107.4		
106.5	40107.5		
106.6	40107.6		
106.7	40107.7		
106.8	40107.8	Max. Charge Current Out of Limit	
106.9	40107.9	Max. Discharge Current Out of Limit	
106.10	40107.10	HVDB Temp. High	
106.11	40107.11		
106.12	40107.12	High Volt Connector Temp. High	
106.13	40107.13	Connector Temp. Sampling Error	

Modbus Address	PLC Address	Name	Description
106.14	40107.14	Discharge Temp. High	
106.15	40107.15	Discharge Temp. Low	
107.0	40108.0	HVDB Temp. Sampling Error	
107.1	40108.1		
107.2	40108.2	SOH Low	
107.3	40108.3		
107.4	40108.4		
107.5	40108.5		
107.6	40108.6		
107.7	40108.7		
107.8	40108.8		
107.9	40108.9		
107.10	40108.10		
107.11	40108.11		
107.12	40108.12		
107.13	40108.13		
107.14	40108.14		
107.15	40108.15		
108.0	40109.0		
108.1	40109.1		
108.2	40109.2		
108.3	40109.3		
108.4	40109.4		
108.5	40109.5		
108.6	40109.6		
108.7	40109.7		
108.8	40109.8		
108.9	40109.9		
108.10	40109.10		
108.11	40109.11		
108.12	40109.12		
108.13	40109.13		
108.14	40109.14		
108.15	40109.15		
109.0	40110.0	Total Volt High (Light Alarm)	
109.1	40110.1	Total Volt Low	
109.2	40110.2	Single Volt High	
109.3	40110.3	Single Volt Low	
109.4	40110.4	Large Single Volt Difference	
109.5	40110.5	Charge Temp. High	
109.6	40110.6	Charge Temp. Low	
109.7	40110.7	Large Temp. Difference	
109.8	40110.8	Fast Temp. Rise	

Modbus Address	PLC Address	Name	Description
109.9	40110.9	SOC Low	
109.10	40110.10	Charge Overcurrent	
109.11	40110.11	Discharge Overcurrent	
109.12	40110.12	Insulation Resistance Low	
109.13	40110.13	Single Volt Sampling Error	
109.14	40110.14	Single Temp. Sampling Error	
109.15	40110.15	Current Sampling Error	
110.0	40111.0	B+ Sampling Error	
110.1	40111.1	Main Positive Relay Bond	
110.2	40111.2	Main Negative Relay Bond	
110.3	40111.3	BMU Comm. Alarm	
110.4	40111.4		
110.5	40111.5		
110.6	40111.6		
110.7	40111.7		
110.8	40111.8	Max. Charge Current Out of Limit	
110.9	40111.9	Max. Discharge Current Out of Limit	
110.10	40111.10	HVDB Temp. High	
110.11	40111.11		
110.12	40111.12	High Volt Connector Temp. High	
110.13	40111.13	Connector Temp. Sampling Error	
110.14	40111.14	Discharge Temp. High	
110.15	40111.15	Discharge Temp. Low	
111.0	40112.0	HVDB Temp. Sampling Error	
111.1	40112.1		
111.2	40112.2	SOH Low	
111.3	40112.3		
111.4	40112.4		
111.5	40112.5		
111.6	40112.6		
111.7	40112.7		
111.8	40112.8		
111.9	40112.9		
111.10	40112.10		
111.11	40112.11		
111.12	40112.12		
111.13	40112.13		
111.14	40112.14		
111.15	40112.15		
112.0	40113.0		
112.1	40113.1		
112.2	40113.2		
112.3	40113.3		

Modbus Address	PLC Address	Name	Description
112.4	40113.4		
112.5	40113.5		
112.6	40113.6		
112.7	40113.7		
112.8	40113.8		
112.9	40113.9		
112.10	40113.10		
112.11	40113.11		
112.12	40113.12		
112.13	40113.13		
112.14	40113.14		
112.15	40113.15		
113.0	40114.0	Aux. Input1 Status	
113.1	40114.1	Aux. Input2 Status	
113.2	40114.2	Aux. Input3 Status	
113.3	40114.3	Aux. Input4 Status	
113.4	40114.4	Aux. Input5 Status	
113.5	40114.5	Aux. Input6 Status	
113.6	40114.6	Aux. Input7 Status	
113.7	40114.7		
113.8	40114.8	Output1 Feedback	
113.9	40114.9	Output2 Feedback	
113.10	40114.10	Output3 Feedback	
113.11	40114.11	Output4 Feedback	
113.12	40114.12	Output5 Feedback	
113.13	40114.13	Output6 Feedback	
113.14	40114.14		
113.15	40114.15		
114.0	40115.0	Aux. Output1 Status	
114.1	40115.1	Aux. Output2 Status	
114.2	40115.2	Aux. Output3 Status	
114.3	40115.3	Aux. Output4 Status	
114.4	40115.4	Aux. Output5 Status	
114.5	40115.5	Aux. Output6 Status	
114.6	40115.6	Aux. Output7 Status	
114.7	40115.7	Aux. Output8 Status	
114.8	40115.8		
114.9	40115.9		
114.10	40115.10		
114.11	40115.11		
114.12	40115.12		
114.13	40115.13		
114.14	40115.14		

Modbus Address	PLC Address	Name	Description
114.15	40115.15		
0115.0 -0146.15	40116.0 -40147.15	BMU1 Single 1 Balanced Status ... BMUm Single n Balanced Status	Max display balanced status of 512 BMUs 32 registers
147.0 -147.15	40148.0 -40148.15		
148.0 -148.15	40149.0 -40149.15		
149.0 -149.15	40150.0 -40150.15		
150.0 -150.15	40151.0 -40151.15		
151.0 -151.15	40152 -40152.15		
152.0 -152.15	40153.0 -40153.15		
153.0 -153.15	40154.0 -40154.15		
154.0 -154.15	40155.0 -40155.15		
155.0 -155.15	40156.0 -40156.15	BMU1 Comm. Status ... BMU16 Comm. Status	
156.0 -156.15	40157.0 -40157.15	BMU17 Comm. Status ... BMU32 Comm. Status	
157.0	40158		
157.1	40158.1		
157.2	40158.2		
157.3	40158.3		
157.4	40158.4		
157.5	40158.5		
157.6	40158.6		

**Example:**

If need to read "Serious Alarm" and "Single Volt Low (Serious Alarm)", firstly get their corresponding address is 100.1 and 101.3 by checking the table, it is known that you need to read 2 address's data.

Assume the slave (controller) address is 01, the master (can be computer) request command is as following:

**Table 3 Master (Computer) Request Command**

Slave Address	Function Code	Starting Address (100)		Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	03	00	64	00	02	85	D4

Slave response command is as following:

**Table 4 Slave (Controller) Response Command**

Slave Address	Function Code	Data Qty. (Bytes)	Data				CRC 16 Calibration	
			Data MSB of Address 100	Data LSB of Address 100	Data MSB of Address 101	Data LSB of Address 101	LSB	MSB
01	03	04	00	02	00	08	5A	35

**Table 5 Data Analysis**

Address	Received Data (Hex)	Convert to Binary	Data Signification
100	0002H	0000 0000 0000 0010 (correspond to 100.15, 100.14..... 100.1, 100.0)	Data of bit 1 is 1 indicates that there is serious alarm.
101	0008H	0000 0000 0000 1000 (correspond to 101.15, 101.14..... 101.1, 101.0)	Data of bit 101.3 is 1 indicates that the "Single Volt Low (Serious Alarm)" is active.

**3.2 VALUE DATA FIELD CORRESPONDING TO FUNCTION CODE 03H**

**Table 6 Value Data Field**

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Note
160	40161	Total Volt of Battery Cluster	(0~1500.0)	0.1	V	16-bit Unsigned	
161	40162	Current	(-3000.0~+3000.0)	0.1	A	16-bit Signed	
162	40163	SOC	(0~100.0)	0.1	%	16-bit Unsigned	
163	40164	SOH	(0~100.0)	0.1	%	16-bit Unsigned	
164	40165	Reserved				16-bit Unsigned	
165	40166	Reserved				16-bit Unsigned	
166	40167	Reserved				16-bit Unsigned	
167	40168	Battery Total Energy	(0.0-6553.5)	0.1	kWh	16-bit Unsigned	
168	40169	Battery Left Energy	(0.0-6553.5)	0.1	kWh	16-bit Unsigned	
169	40170	Cycle Times of Battery Cluster	(0~32767)	1	Times	16-bit Unsigned	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Note
170	40171	CHG/DSG Status	(0-2)	1		16-bit Unsigned 0: Still 1: Discharge 2: Charge	
171	40172	Online Battery	(0~65535)	1		16-bit Unsigned	
172	40173	Online Temp. Sensor	(0~65535)	1		16-bit Unsigned	
173	40174	Pos. Insulation Resistance	(0~20000)	1	KΩ	16-bit Unsigned	
174	40175	Neg. Insulation Resistance	(0~20000)	1	KΩ	16-bit Unsigned	
175	40176	P+ Volt	(-3276.8~+3276.7)	0.1	V	16-bit Signed	
176	40177	P- Volt	(-3276.8~+3276.7)	0.1	V	16-bit Signed	
177	40178	CHG Volt Upper Limit	(0~6553.5)	0.1	V	16-bit Unsigned	
178	40179	DSG Volt Lower Limit	(0~6553.5)	0.1	V	16-bit Unsigned	
179	40180	Max CHG Current	(0~6553.5)	0.1	A	16-bit Unsigned	
180	40181	Max DSG Current	(0~6553.5)	0.1	A	16-bit Unsigned	
181	40182	Max Single Volt	(0~5000)	1	mV	16-bit Unsigned	
182	40183	Min Single Volt	(0~5000)	1	mV	16-bit Unsigned	
183	40184	Battery Average Volt	(0~5000)	1	mV	16-bit Unsigned	
184	40185	Volt Difference of Battery Pack	(0~5000)	1	mV	16-bit Unsigned	
185	40186	Battery No. of Max Single Volt	(0~65535)	1		Low 8-bit: Battery No. High 8-bit: Slave No.	
186	40187	Battery No. of Min Single Volt	(0~65535)	1		Low 8-bit: Battery No. High 8-bit: Slave No.	
187	40188	Max Single Temp.	(-40~+125)	1	°C	16-bit Signed	
188	40189	Min Single Temp.	(-40~+125)	1	°C	16-bit Signed	
189	40190	Average Temp.	(-40~+125)	1	°C	16-bit Signed	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Note
190	40191	Temp. Difference of Battery Pack	(0~65535)	1	°C	16-bit Unsigned	
191	40192	Max Single Temp. Sensor No.	(0~65535)	1		Low 8-bit: Battery No. High 8-bit: Slave No.	
192	40193	Min Single Temp. Sensor No.	(0~65535)	1		Low 8-bit: Battery No. High 8-bit: Slave No.	
193	40194	Power Volt	(0~6553.5)	0.1	V	16-bit Unsigned	
194	40195	Reserved					
195	40196						
196	40197	Reserved					
197	40198						
198	40199	Reserved					
199	40200						
200	40201	Reserved					
201	40202						
202	40203	Temp.1	(-40~+125)	1	°C	16-bit Signed	
203	40204	Temp.2	(-40~+125)	1	°C	16-bit Signed	
204	40205	Temp.3	(-40~+125)	1	°C	16-bit Signed	
205	40206	Temp.4	(-40~+125)	1	°C	16-bit Signed	
206	40207	Max Temp. of High Volt Connector	(-40~+125)	1	°C	16-bit Signed	
207	40208	Reserved					
208	40209	Max Temp. No. of High Volt Connector				16-bit Unsigned	
209	40210	Reserved					
210	40211	Current CHG Capacity	(0~6553.5)	0.1	Ah	16-bit Unsigned	
211	40212	Current DSG Capacity	(0~6553.5)	0.1	Ah	16-bit Unsigned	
212	40213	Reserved	(0~6553.5)	0.1	Ah	16-bit Unsigned	
213	40214	Reserved	(0~6553.5)	0.1	Ah	16-bit Unsigned	
214	40215	Total CHG Capacity	(0~429496729.6 )	0.1	Ah	32-bit Unsigned	
215	40216						
216	40217	Total DSG Capacity	(0~429496729.6 )	0.1	Ah	32-bit Unsigned	
217	40218						

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Note
218	40219	Current Energy CHG	(0~6553.5)	0.1	kWh	16-bit Unsigned	
219	40220	Current Energy DSG	(0~6553.5)	0.1	kWh	16-bit Unsigned	
220	40221	Reserved	(0~429496729.6)	0.1	kWh	32-bit Unsigned	
221	40222						
222	40223	Reserved	(0~429496729.6)	0.1	kWh	32-bit Unsigned	
223	40224						
224	40225	Total Energy CHG	(0~429496729.6)	0.1	kWh	32-bit Unsigned	
225	40226						
226	40227	Total Energy DSG	(0~429496729.6)	0.1	kWh	32-bit Unsigned	
227	40228						
228	40229	BMS Status		1		16-bit Signed	<a href="#">BMS Status</a>
229	40230	BMS Delay		1	s	16-bit Signed	
230	40231	Reserved					
231	40232	Reserved					
232	40233	Reserved					
233	40234	Reserved					
234	40235	Reserved					
235	40236	Reserved					
236	40237	Controller Model				16-bit Unsigned	
237	40238	SW Version				16-bit Unsigned	
238	40239	HW Version				16-bit Unsigned	
239	40240	Release Year	(0-99)	1		Only save last 2-digit of Year	
240	40241	Release Month	(1-12)	1		16-bit Unsigned	
241	40242	Release Day	(1-31)	1		16-bit Unsigned	
242	40243	RTC-Year	(0-99)			Only save last 2-digit of Year	
243	40244	RTC-Month	(1-12)	1		16-bit Unsigned	
244	40245	RTC-Day	(1-31)	1		16-bit Unsigned	
245	40246	RTC-Week	(0-6)	1		16-bit Unsigned	
246	40247	RTC-Hour	(0-23)	1	h	16-bit Unsigned	
247	40248	RTC-Minute	(0-59)	1	min	16-bit Unsigned	
248	40249	RTC-Second	(0-59)	1	s	16-bit Unsigned	
249	40250	Reserved					
250	40251	Reserved					
251	40252	Battery Cluster Power	(-3276.8~+3276.7)	0.1	kW	16-bit Signed	
252	40253	Max Power CHG	(0-6553.5)	0.1	kW	16-bit Unsigned	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Note
253	40254	Max Power DSG	(0-6553.5)	0.1	kW	16-bit Unsigned	
254	40255	Reserved					
255	40256	Reserved					
256	40257	Reserved					
257	40258	Reserved					
258	40259	Reserved					
259	40260	SD Card Status	(0-2)	1		16-bit Unsigned 0: SD Card OK 1: SD Card Pull-out 2: SD Card Error	
260	40261	Left Capacity	(0-4294967296)	1	MB	32-bit Unsigned	
261	40262						
262	40263	Total Capacity	(0-4294967296)	1	MB	32-bit Unsigned	
263	40264						
264	40265	Total BMU	(0-32)	1		16-bit Unsigned	
265	40266	Reserved	(0-65535)	1		16-bit Unsigned	
266	40267	Reserved					
267	40268	Reserved					
268	40269	Reserved					
269	40270	Reserved					
270	40271	Reserved					
271	40272	BMU1 Single Volt& Temp. Qty.	(0-65535)	1		16-bit Unsigned Total 32 registers Low 8-bit: Temp. Sensor Qty. High 8-bit: Cell Qty.	
...	...	...					
302	40303	BMUn Single Volt& Temp. Qty.					
303	40304	Reserved					
304	40305	Reserved					
305	40306	Reserved					
306	40307	Reserved					

**Table 7 BMU Single Voltage & Temperature**

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Note
500-999	40501-41000	BMU 1 Single Volt1 ... BMU m Single Volt	(0~5000)	1	mV	16-bit Unsigned Total 500 registers	

Modbus Address	PLC Address	Name	Range (Decimal)	Ratio	Unit	Description	Note
		n					
1000 -1499	41001 -41500	BMU 1 Single Temp.1 ... BMU m Single Temp. n	(-40~+125)	1	°C	16-bit Signed Total 50 registers	
1500 -1599	14501 -41600	BMU 1 HV Connector Temp. 1 ... BMU m HV Connector Temp. n	(-40~+125)	1	°C	16-bit Signed Total 100 registers	

**NOTE1:** Actual value=Received Data\*Ratio. Take current as the example, received data is 1000 (03E8H), ratio is 0.1A, so the actual frequency value is 100.0A(1000\*0.1A);

**NOTE2:** For 4-byte data, the actual value=Received Data MSB\*65536 + Received Data LSB;

**NOTE3:** When received data is 32767, it indicates that there is no normal data, “+++” can be displayed;

**NOTE4:** Definition of signed number. Take received data 8000H as the example, transfer it to binary 1000 0000 0000 0000b, the MSB is 1, which is a negative number. One’s complement is obtained by subtracting 1 from it, which is inverted to obtain the absolute value of the negative number. Then transfer it to -32768 in decimal.

**Example:**

Read “Total Charge Energy (current is 12345.6kWh)”, firstly get their corresponding addresses are 224 and 225 by checking the table, then it is known that you need to read 2 bytes’ data.

Assume the slave address is 01, the master request command is as following:

**Table 8 Master Request Command**

Slave Address	Function Code	Starting Address (224)		Data Qty. (2)		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	03	00	E0	00	02	C5	FD

Slave response command is as following:

**Table 9 Slave Response Command**

Slave Address	Function Code	Data Qty. (Bytes)	Data				CRC 16 Calibration	
			Data MSB of Address 224	Data LSB of Address 224	Data MSB of Address 225	Data LSB of Address 225	LSB	MSB
01	03	04	E2	40	00	01	0C	5F

Fill the received data into the corresponding address, as shown in the table below:

**Table 10 Data Analysis**

Address	Received Data (Hex)	Combination (Hex)	Total Charge Energy
224	E240H	0001E240H	123456*0.1kWh
225	0001H		

3.3 REMOTE COIL FIELD CORRESPONDING TO FUNCTION CODE 05H

Table 11 Remote Coil Field

Modbus Address	PLC Address	Name	Description
0	1		
1	2		
2	3		
3	4		
4	5		
5	6		
6	7	Remote Output 1 Active	Only send FF00H active
7	8	Remote Output 2 Active	Only send FF00H active
8	9	Remote Output 3 Active	Only send FF00H active
9	10	Remote Output 4 Active	Only send FF00H active
10	11	Remote Output 5 Active	Only send FF00H active
11	12	Remote Output 6 Active	Only send FF00H active
12	13	Remote Output 7 Active	Only send FF00H active
13	14	Remote Output 8 Active	Only send FF00H active
14	15		
15	16		
16	17		
17	18		

**NOTE:** Remote command in the above table can be sent once only.

**Example:**

Remote output 1 outputs (only active for Remote Control Output in the output setting), firstly get its remote address is 6 by checking the table.

Assume that slave address is 01, the master request command is as following:

Table 12 Master Request Command

Slave Address	Function Code	Remote Address (6)		Remote Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	05	00	06	FF	00	6C	3B

Slave response command is as following:

Table 13 Slave Response Command

Slave Address	Function Code	Remote Address (6)		Remote Data		CRC 16 Calibration	
		MSB	LSB	MSB	LSB	LSB	MSB
01	05	00	06	FF	00	6C	3B

The remote control command is executed successfully or not can be verified by reading "Aux. Input1 Status" of address 113.0 via function code 03H.

3.4 BMS STATUS

Table 14 BMS Status

Value (No.)	Content	Description
0	BMS Power-on Waiting	Delay (Unit: s)
1	BMS ID Assigning	Delay (Unit: s)
2	BMS Standby	No Delay
3	BMS Start & Self-check	Delay (Unit: s)
4	BMS Main Negative Closed	Delay (Unit: s)
5	BMS Pre-charge Closed	Delay (Unit: s)
6	BMS Main Positive Closed	Delay (Unit: s)
7	BMS Running	No Delay
8	BMS HV Power-off Waiting	Delay (Unit: s)
9	BMS Main Positive Open	Delay (Unit: s)
10	BMS Stop	No Delay

4. COMMUNICATION PARAMETER VIEW & CONFIGURATION

4.1 CURRENT COMMUNICATION PARAMETER VIEW

View current communication parameters via PC software.

4.2 COMMUNICATION PARAMETER CONFIGURATION

Set communication parameters via PC software.

**NOTE:** The configuration will be active immediately after parameter setting is completed.

5. FAQ

5.1 COMMUNICATION LINE SHIELDING LAYER GROUNDED

In order to prevent coupled interference signal on communication line, its single end needs to be grounded.

5.2 TERMINAL RESISTOR

At both ends of the linear network (on the two communication ports furthest apart), it is necessary to connect 120Ω terminal resistor in parallel on a pair of communication lines. According to the transmission line theory, the terminal resistor can absorb reflected waves on the network, effectively enhancing the signal strength. The value of two terminal resistors in parallel should be approximately equal to the characteristic impedance of the transmission line at the communication frequency.

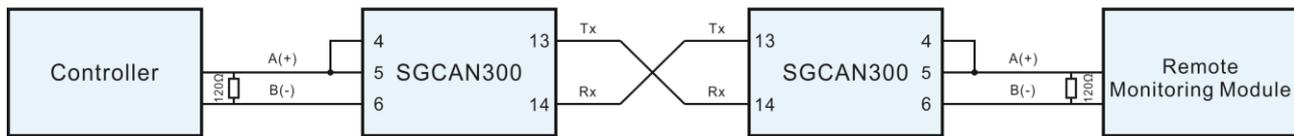
A regular RS485 network usually uses terminal resistor. It can also be not used in the case of network connection line is very short, temporary or laboratory test.

5.3 RS485 TO USB COMMUNICATION ADAPTOR

PC can communicate with SG72A module produced by our company.

## 5.4 EXTENDED COMMUNICATION DISTANCE

Long distance (up to 10km) communication can be realized by a pair of SGCAN300 CANBUS relay modules.



**Fig.3 SGCAN300 Application Diagram**

## 5.5 COMMON SOLUTIONS OF COMMUNICATION FAILURE

- 1) Check whether the positive and negative of RS485 or network cable is correctly connected; check whether the RS485 converter (if configured) is normal;
- 2) Check whether the terminal resistor is correctly connected;
- 3) Check whether the communication parameter in parameter setting is correct, for example, baud rate, data bit, parity bit and stop bit must meet the controller requirements;
- 4) Check whether the COM port corresponds to USB port where the RS485 converter is connected to the computer;
- 5) Check whether the controller communication address is correct, which is defaulted as 01;
- 6) When using 03 function code, note that the maximum length of data read each time is 120 addresses, and the last address read cannot exceed the maximum Modbus communication address; note that the write function of 06 function code mapping value data field can only write data to one address at a time;
- 7) If there is offset address in Modbus communication address, the original base address plus the offset address is required to be the correct Modbus communication address for the item;
- 8) Modbus communication for 05 function code: although 1 for active and 0 for inactive, FF00H must be sent to make the corresponding bit be 1 and 0000H to make the corresponding bit be 0.  
PLC communication: Send 1 to position 1, send 0 to position 0;
- 9) Check whether CRC-16 low-order byte is in front, and high-order byte is in the back;
- 10) Do not read controller data too quickly for multiple times. It is recommended that the interval be more than 500ms;
- 11) When using the ETHERNET port to read data, please note that if the IP address and subnet mask of the controller is correct (new parameter can be active after the controller is powered off and powered on again if network setting parameters are changed, such as IP address, subnet mask, etc.). Do not change MAC address unless you need;
- 12) Please set each controller's communication module address before networking. Same module address is inhibited in the same network;
- 13) Because Modbus serial port does not support multiple masters, multiple software cannot communicate with controller at the same time;
- 14) Disconnect the connection line of controller's RS485, measure the voltage difference of RS485's A and B terminal. If the difference is between  $\pm 200\text{mV}$ , it means communication port has abnormal situation;
- 15) If signal is weak caused by too long communication distance, you can replace the cable with a better quality or add a relay in the middle of communication cable;
- 16) It is recommended to download third-party communication software under serial communication such as modscan32, modbus poll to check whether communication is normal;

- 17) It is recommended to download third-party communication software under network communication such as NetAssist, PortHelper to check whether communication is normal.
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