SmartGen

MAKING CONTROL SMARTER

BACM2440

BATTERY CHARGER

COMMUNICATION PROTOCOL

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Table 1 Software Version

Date	Version	Content
2025-11-7	V1.0	Original release.

CONTENTS

1 DESCRIPTION

This protocol describes the command format for reading and writing via the charger's RS485 half-duplex serial ports, as well as the definition of internal messages and data to facilitate third-party development and use.

The charger works as a slave module. It supports the Modbus-RTU protocol but does not support other protocols, such as Modbus-ASCII.

Frame format:
Communication address: 1~254 (Default: 10)
Baud rate: 9600/19200/38400bps (Default: 9600bps)
Start bit: 1-bit
Data bit: 8-bit
Parity bit: none parity, odd parity and even parity (Default: none parity)
Stop bit: 1-bit

Function code supported: 03H and 06H. Function code 03H is used for reading value register inside the charger (value register saves various set value of analog data and parameters); Function code 06H is used for saving a single value data into the memory inside the charger.

Data checking method: CRC16.

The register data inside the controller are packed as two bytes per register.

Communication timeout period: over 200ms.

Transmission distance: At a baud rate of 9600bps, the maximum transmission distance can reach up to 1,000 meters with 120-ohm shielded twisted pair cable.

A maximum of 120 registers can be read per request.

It can support the communication of 32 networked controllers.

RS485 cabling must use 120-ohm shielded twisted pair cable, and one end of the shield should be grounded.

2 ADDRESS AND DATA OF CHARGER INTERNAL REGISTERS

2.1 FUNCTION CODE 03H MAPPING PARAMETERS OF DATA FIELD

Table 2 Parameters of Data Field

Modbus Address	PLC Address	Item	Ratio	Unit	Description	Remarks
1000	41001	Battery Voltage	0.01	V	Unsigned	2Bytes
1001	41002	Charging Current	0.01	A	Unsigned	2Bytes
1002	41003	Output Voltage	0.01	V	Unsigned	2Bytes
1003	41004	Battery Temp.	1	°C	Signed	2Bytes
1004	41005	Battery Temp. Sensor Resistance Value	0.1	Ω	Unsigned	2Bytes
1005	41006	COM Voltage	0.01	V	Unsigned	2Bytes
1006	41007	Charging Status			Unsigned	2Bytes
1007	41008	BOOST Status			Unsigned	2Bytes
1008	41009	Aux. Inputs Status			Unsigned	2Bytes
1009	41010	Mains Failure			Unsigned	0: Inactive 1: Active
1010	41011	Charging Failure			Unsigned	
1011	41012	Shutdown			Unsigned	
1012	41013	Battery Detection Enable			Unsigned	
1013	41014	Battery High Temp. Warning			Unsigned	
1014	41015	Battery Undervoltage Warning			Unsigned	
1015	41016	Battery Type			Unsigned	0: 12V 1: 24V
1016	41017	Battery Overvoltage Warning			Unsigned	0: Inactive 1: Active
1017	41018	Charger High Temp. Protection			Unsigned	

NOTE 1: Actual value = data received * ratio. Take the Current as the example: if the data received is 2000 (7D0H), ratio is 0.01, then the actual current value is 20.00A (2000*0.01A).

NOTE 2: If the data received is 32766, it means there is no normal data, and "###" will be shown.

NOTE 3: Definition of signed number: Take the data received "8000H" as the example, convert it to binary number "1000 0000 0000 0000b". The MSB is 1, which means it is negative. The number minus 1 will get its 1's complement, then inverting it will get the absolute value of the negative number. Finally convert the absolute value to decimal number -32768.

EXAMPLE:

If "Battery Voltage" and "Charging Current" need to be read, check the table above and find its address is 1000 and 1001, so it needs to read two data addresses.

Assuming the slave (controller) address is 0A, the master/host (could be PC) request command is as following:

Table 3 Master (PC) Request Frame

Slave Address	Function Code	Start Address (0024)		Request Data Length (2)		CRC 16	
		MSB	LSB	MSB	LSB	LSB	MSB
0A	**03**	**03**	**E8**	**00**	**02**	**45**	**00**

The slave response is as following:

Table 4 Slave (Controller) Response Frame

Slave Address	Function Code	Data Length (Bytes)	Data				CRC 16	
			Data of Address 1000 MSB	Data of Address 1000 LSB	Data of Address 1001 MSB	Data of Address 1001 LSB	LSB	MSB
0A	**03**	**04**	**0A**	**BC**	**07**	**D0**	**81**	**63**

Table 5 Data Analysis

Address	Data Received (Hex)	Convert to Decimal	Meaning
1000	0ABCH	2700	The ratio is 0.01, so the battery voltage is 27V.
1001	07D0H	2000	The ratio is 0.01, so the charging current is 20A.

2.2 FUNCTION CODE 03H & 06H MAPPING DATA FIELD OF PARAMETERS

Table 6 Parameters Config Field

Modbus Address	PLC Address	Item	Function Code	Range	Default	Remarks
2000	42001	Rated Current Output	03H	(0-100.0)	40.0A	
2001	42002	Charging Current	03H/06H	(0-100)	100%	
2002	42003	Battery Select	03H/06H	(0-2)	1	
2003	42004	Charge Stages	03H/06H	(2-3)	3	
2004	42005	Absorption Voltage	03H/06H	(10.00-15.00)	14.10V	
2005	42006	Float Voltage	03H/06H	(10.00-15.00)	13.50V	
2006	42007	Absorption Time Enable	03H/06H	(0-1)	1	0: Disabled 1: Enabled
2007	42008	Absorption Time	03H/06H	(0.1-100.0)	1.0h	
2008	42009	Current Enable after Absorption	03H/06H	(0-1)	1	0: Disabled 1: Enabled
2009	42010	Current after Absorption	03H/06H	(0.20-3.00)	0.5A	
2010	42011	Auto BOOST Voltage	03H/06H	(10.00-15.00)	12.8V	
2011	42012	Auto BOOST Voltage Delay	03H/06H	(0-3600)	20s	
2012	42013	Low-voltage Trickle Charging Enable	03H/06H	(0-1)	1	
2013	42014	Low-voltage Trickle Charging Voltage	03H/06H	(10.00-15.00)	11.00V	
2014	42015	Low-voltage Trickle Charging Current	03H/06H	(0-100)	50%	
2015	42016	Undervoltage Protection Voltage	03H/06H	(8.00-15.00)	8.00V	
2016	42017	Battery Detection Enable	03H/06H	(0-1)	0	0: Disabled 1: Enabled
2017	42018	Battery Undervoltage Alarm Enable	03H/06H	(0-1)	1	0: Disabled 1: Enabled
2018	42019	Battery Undervoltage Alarm Threshold	03H/06H	(8.00-15.00)	11.50V	
2019	42020	Battery Undervoltage Alarm Delay	03H/06H	(0-3600)	120s	
2020	42021	Battery Undervoltage Alarm Return Threshold	03H/06H	(8.00-15.00)	12.00V	
2021	42022	Battery Undervoltage Alarm Return Delay	03H/06H	(0-3600)	10s	
2022	42023	Temp. Sensor Enable	03H/06H	(0-1)	1	0: Disabled

Modbus Address	PLC Address	Item	Function Code	Range	Default	Remarks
						1: Enabled
2023	42024	Temp. Compensation Enable	03H/06H	(0-1)	1	0: Disabled 1: Enabled
2024	42025	Temp. Compensation Value	03H/06H	(0.020-0.060)	0.018 V/°C	
2025	42026	High Temp. Alarm Enable	03H/06H	(0-1)	1	0: Disabled 1: Enabled
2026	42027	High Temp. Alarm Threshold	03H/06H	(0-80)	55°C	
2027	42028	High Temp. Alarm Delay	03H/06H	(0.0-60.0)	0.5s	
2028	42029	High Temp. Return Threshold	03H/06H	(0-80)	50°C	
2029	42030	High Temp. Return Delay	03H/06H	(0.0-60.0)	10s	
2030	42031	Aux. Inputs Setting	03H/06H	(0-4)	3	0: Not Used 1: Shutdown 2: Enable Battery Detection 3: Manual BOOST 4: 12V System
2031	42032	Aux. Input Delay	03H/06H	(1.0-60.0)	2.0s	
2032	42033	Comm. Address	03H/06H	(1-254)	10	
2033	42034	Comm. Baud Rate	03H/06H	(0-2)	0	0: 9600 1: 19200 2: 38400
2034-2053	42035-42054	Charger Description	03H/06H			
2054	42055	Battery Overvoltage Alarm Enable	03H/06H	(0-1)	1	0: Disabled 1: Enabled
2055	42056	Battery Overvoltage Alarm Threshold	03H/06H	(8.00-15.00)	15.00V	
2056	42057	Battery Overvoltage Alarm Delay	03H/06H	(0-3600)	120s	
2057	42058	Battery Overvoltage Alarm Return Threshold	03H/06H	(8.00-15.00)	13.80V	
2058	42059	Battery Overvoltage Alarm Return Delay	03H/06H	(0-3600)	10s	
2059	42060	Overvoltage Output Control Enable	03H/06H	(0-1)	0	0: Disabled 1: Enabled
2060	42061	Slave ID	03H/06H	(1-99)	1	
2061	42062	Aux. Outputs Setting	03H/06H	(0-7)	7	0: Not Used 1: Undervoltage

Modbus Address	PLC Address	Item	Function Code	Range	Default	Remarks
						2: Overvoltage 3: Undervoltage + Overvoltage 4: Charging Failure 5: Charging Failure +Undervoltage 6: Charging Failure +Overvoltage 7: Undervoltage+ Overvoltage+ Charging Failure (Output if any one above is met)
2062	42063	Battery Type	03H/06H	(0-5)	0	0: Custom 1: Lead-Acid Battery 2: Li-ion Battery 3: Ca-Ca Battery 4: Power Supply 5: Ni-Cd Battery

Table 7 Master Request Command

Slave Address	Function Code	Address (2001)		Data		CRC 16	
		MSB	LSB	MSB	LSB	LSB	MSB
0A	**06**	**07**	**D1**	**00**	**3C**	**D9**	**ED**

The slave response command is as following:

Table 8 Slave Response Command

Slave Address	Function Code	Address (2001)		Data		CRC 16	
		MSB	LSB	MSB	LSB	LSB	MSB
0A	**06**	**07**	**D1**	**00**	**3C**	**D9**	**ED**

The data address 2001 can be written with the corresponding data via Function Code 06H.

3 FAQ

3.1 GROUNDING OF THE CABLE SHIELD

To prevent the coupling of interference on the cable, one end of the cable shield should be grounded.

3.2 TERMINATION RESISTOR

At both ends of the linear network (between the two communication ports furthest apart), two 120-ohm termination resistors need to be installed in parallel. According to the signal transmission theory, the termination resistor can avoid the signal reflections and improve the signal integrity effectively. The value of two termination resistor in parallel is basically equal to the characteristic impedance of the transmission cable.

A standard RS-485 network will usually use the termination resistor. The resistor can be avoided while the cable is too short, or it is a temporary or lab test.

3.3 RS485 TO USB CONVERTER

It can communicate with PC via the SmartGen SG72A converter.

3.4 SOLUTIONS FOR COMMUNICATION FAILURE

1) Check whether the positive and negative of RS485 is connected correctly;
2) Check whether the communication parameters setting is correct;
3) Check the RS485 converter (if any) is normal;
4) Check whether the termination resistors are connected correctly;
5) Disconnect the RS485 cables to the controller, test the voltage difference of RS485 Terminal A and B on the controller, if the result is between -200mV and +200mV, it means the communication port is abnormal;
6) It is recommended to download third-party communication test software to verify whether the communication is normal, such as modbus poll.