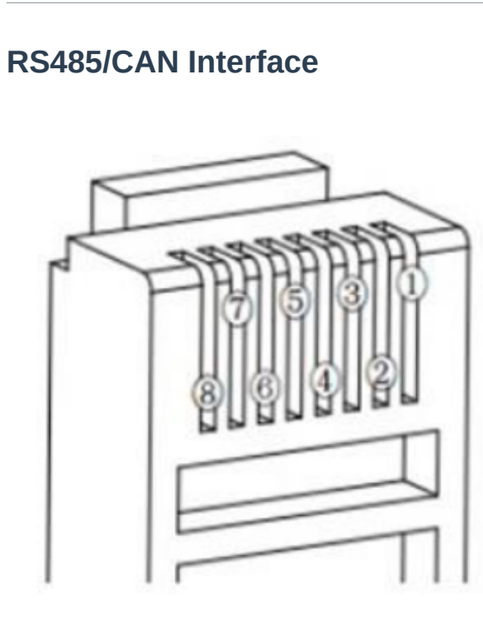
Solar Charger Controller Modbus Protocol V1.0

1.Revision History

Version	Update Date	Update Content
V1.0	2025.06.05	Initial Release (Common for PWM and MPPT)

2.Pin Definitions

RS485/CAN Interface

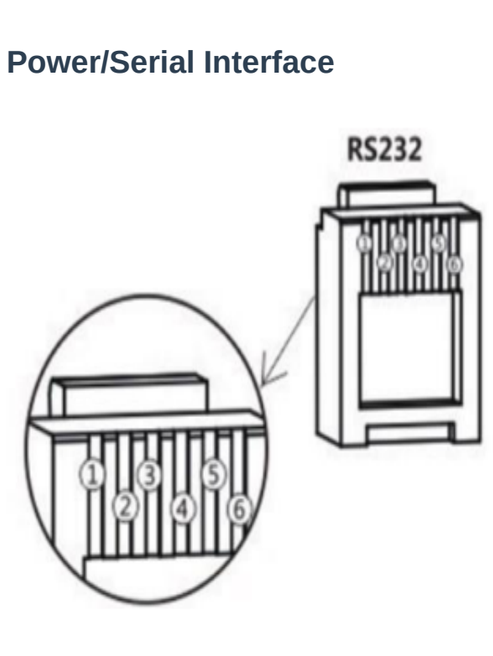


- ① +5V (Power positive, load capacity not less than 200mA)
- ② A (RS485 bus signal)
- ③ B (RS485 bus signal)
- ④ GND (Power ground/communication ground)
- ⑤ NC (Not connected, not allowed for other functions)
- ⑥ CAN_H (CAN bus signal)
- ⑦ NC (Not connected, not allowed for other functions)
- ⑧ CAN_L (CAN bus signal)

Notes:

- RS485 initial baud rate: 9600bps
- CAN initial baud rate: 500Kbps
- RS485 and CAN can be combined into a single physical interface or separated into two physical interfaces
- Products without CAN interface requirements may ignore CAN pin definitions

Power/Serial Interface



- ① TX
- ② RX
- ③ Power ground/signal ground
- ④ Power ground/signal ground
- ⑤ Power positive +12V
- ⑥ Power positive +12V

3.Protocol Definition

3.1 Format

Field	Size	Description
Start Delimiter	-	>10ms
Address Code	1 BYTE	Device address
Function Code	1 BYTE	Operation type
Starting Address	2 BYTE	Register address
Data Length	2 BYTE	Read/write data length
CRC Check	2 BYTE	CRC16 checksum
End Delimiter	-	>10ms

3.2 Specifications

1. Start Delimiter: >10ms
2. Address Code: 1 byte, range: 01H～F7H (decimal 1～247), 00H is broadcast address (all slaves respond but don't return commands). FFH is universal address code (all slaves respond and return acknowledgment). The universal address code FFH functions the same as the device's current Device ID.
3. Function Code: 1 byte

Command Name	Data Type	Function Code	Error Code
Read single or multiple registers	WORD	03H	83H
Write single register	WORD	06H	86H
Write continuous N registers	WORD	10H	90H
Restore factory defaults	No byte access	78H	F8H
Clear history records	No byte access	79H	F9H
Read controller calibration parameters	WORD	7BH	FBH
Set calibration values to controller	WORD	7AH	FAH

4. Starting Address: 2 bytes
5. Data Length: 2 bytes
6. CRC Check: 2 bytes, CRC checksum of address code, function code, and data bytes
7. End Delimiter: >10ms

> **Notes:**
>
> 1. Data addresses and data are 2 bytes, with high byte sent first, then low byte; whereas CRC is sent with low byte first, then high byte.
> 2. Error code for server frame data errors, client returns error exception response function code: Error code = Function code | 80H
> 3. Exception code description:
>   - a. 01H -- Unsupported function code
>   - b. 02H -- Incorrect PDU starting address or PDU starting address + data length exceeds legal range
>   - c. 03H -- Data for reading registers or writing registers is too long
>   - d. 04H -- Client failed to read or write registers
>   - e. 05H -- Incorrect checksum in server data

3.3 Examples

1) Reading Registers

Request:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Function code	BYTE	03H
Starting address	WORD	0000H～FFFFH
Number of words to read	WORD	0001H～007DH
Checksum	WORD	CRC checksum of all above bytes

Normal Response:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Function code	BYTE	03H
Data length	BYTE	01H～FAH
Data content	WORD	Read data (high byte first, then low byte)
...	WORD	Read data (high byte first, then low byte)
Checksum	WORD	CRC checksum of all above bytes

Exception Response:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Error code	BYTE	83H
Exception code	BYTE	N (N=1, 2, 3, 4)
Checksum	WORD	CRC checksum of all above bytes

2) Writing Single Register

Request:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Function code	BYTE	06H
Starting address	WORD	0000H～FFFFH
Write data	WORD	0000H～FFFFH
Checksum	WORD	CRC checksum of all above bytes

Normal Response:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Function code	BYTE	06H
Starting address	WORD	0000H～FFFFH
Write data	WORD	0000H～FFFFH
Checksum	WORD	CRC checksum of all above bytes

Exception Response:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Error code	BYTE	86H
Exception code	BYTE	N (N=1, 2, 3, 4)
Checksum	WORD	CRC checksum of all above bytes

3) Writing Continuous N Registers

Request:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Function code	BYTE	10H
Starting address	WORD	0000H～FFFFH
Number of bytes to write	WORD	0001H～007DH
Quantity of words	BYTE	2 x number of bytes
Data content	WORD	Write data (high byte first, then low byte)
...	WORD	Write data (high byte first, then low byte)
Checksum	WORD	CRC checksum of all above bytes

Normal Response:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Function code	BYTE	10H
Starting address	WORD	0000H～FFFFH
Number of bytes to write	WORD	0001H～007DH
Checksum	WORD	CRC checksum of all above bytes

Exception Response:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Error code	BYTE	90H
Exception code	BYTE	N (N=1, 2, 3, 4)
Checksum	WORD	CRC checksum of all above bytes

4) Restore factory defaults

Request:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Function code	BYTE	78H
Complete the data	WORD	0000H
Complete the data	WORD	0001H
Checksum	WORD	CRC checksum of all above bytes

Normal Response:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Function code	BYTE	78H
Complete the data	WORD	0000H
Complete the data	WORD	0001H
Checksum	WORD	CRC checksum of all above bytes

Exception Response:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Error code	BYTE	F8H
Exception code	BYTE	N (N=1, 2, 3, 4)
Checksum	WORD	CRC checksum of all above bytes

5) Clear the history records

Request:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Function code	BYTE	79H
Complete the data	WORD	0000H
Complete the data	WORD	0001H
Checksum	WORD	CRC checksum of all above bytes

Normal Response:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Function code	BYTE	79H
Complete the data	WORD	0000H
Complete the data	WORD	0001H
Checksum	WORD	CRC checksum of all above bytes

Exception Response:

Description	Bytes	Command
Device address	BYTE	01H～F7H
Error code	BYTE	F9H
Exception code	BYTE	N (N=1, 2, 3, 4)
Checksum	WORD	CRC checksum of all above bytes

4. PDU Address Allocation Table

Numbers followed by H indicate hexadecimal, numbers without H are decimal

Product System Information

PDU Address	Bytes	R/W	Description	Data (Range)	Meaning	Unit	Remarks
001AH	2	R/W	Controller/device address	1～247	-	-	Low 8 bits

RAM Information

Battery and Light Information

PDU Address	Bytes	R/W	Description	Data (Range)	Meaning	Unit	Remarks
0100H	2	R	Battery SOC	0～100	Current battery capacity	%	-
0101H	2	R	Battery voltage	-	Battery voltage*0.1	V	-
0102H	2	R	Charging current (into battery)	-	Charging current*0.01	A	-
0104H	2	R	Light (load) voltage	-	Light voltage*0.1	V	-
0105H	2	R	Light (load) current	-	Light current*0.01	A	-
0106H	2	R	Light (load) power	-	Actual value	W	-

Solar Panel Information

PDU Address	Bytes	R/W	Description	Data (Range)	Meaning	Unit	Remarks
0107H	2	R	Solar panel voltage	-	Solar panel voltage*0.1	V	-
0108H	2	R	Solar panel current (into controller)	-	Solar panel current*0.01	A	-
0109H	2	R	Charging power	-	Actual value	W	-

LOAD Function

PDU Address	Bytes	R/W	Description	Data (Range)	Meaning	Unit	Remarks
010AH	2	W	Light ON/OFF command	0 or 1	1 = Light ON, 0 = Light OFF	-	-

Historical Data Information

PDU Address	Bytes	R/W	Description	Data (Range)	Meaning	Unit	Remarks
010BH	2	R	Minimum battery voltage of the day	-	Min battery voltage*0.1	V	-
010CH	2	R	Maximum battery voltage of the day	-	Max battery voltage*0.1	V	-
010DH	2	R	Maximum charging current of the day	-	Max charging current*0.01	A	-
010EH	2	R	Maximum discharging current of the day	-	Max discharging current*0.01	A	-
010FH	2	R	Maximum charging power of the day	-	Actual value	W	-
0110H	2	R	Maximum discharging power of the day	-	Actual value	W	-
0111H	2	R	Charging amp-hours of the day	-	Actual value	AH	-
0112H	2	R	Discharging amp-hours of the day	-	Actual value	AH	-
0113H	2	R	Power generation of the day	-	Actual value	kWh/1000	-
0114H	2	R	Power consumption of the day	-	Actual value	kWh/1000	-
0115H	2	R	Total operation days	-	days	-	-
0116H	2	R	Total battery over-discharge times	-	-	-	-
0117H	2	R	Total battery fully charged times	-	-	-	-
0118H-0119H	4	R	Total charging amp-hours	-	Actual value	AH	-
011AH-011BH	4	R	Total discharging amp-hours	-	Actual value	AH	-
011CH-011DH	4	R	Cumulative power generation	-	Actual value	kWh/1000	-
011EH-011FH	4	R	Cumulative power consumption	-	Actual value	kWh/1000	-
0120H	2	R	Light status	0 or 1	High 8 bits b7: 0 = Light OFF, 1 = Light ON	-	-
			Charging status	-	Low 8 bits 00H: Charging not started 01H: Charging startup mode 02H: MPPT charging mode 03H: Equalization charging mode 04H: Boost charging mode 05H: Float charging mode 06H: Current limiting (over power)	-	-

Controller Fault Information

PDU Address	Bytes	R/W	Description	Data (Range)	Meaning	Unit	Remarks
0121H-0122H	4	R	Controller fault and alarm information	-	High 16 bits B15-B2: Reserved B1: Battery short circuit protection B0: Battery low temperature protection Low 16 bits B15: Fan alarm B14: Circuit, charge MOS short circuit B13: Battery reverse connection protection B12: Solar panel reverse connection B11: Solar panel working point overvoltage B10: Solar panel reverse current B9: PV input terminal overvoltage B8: PV input terminal short circuit B7: PV input power too large B6: External environment temperature too high B5: Controller temperature too high B4: Load power too large or load overcurrent B3: Load short circuit B2: Battery undervoltage warning B1: Battery overvoltage B0: Battery over-discharge	-	Example: A value of 1 in the corresponding bit indicates a fault in the corresponding item, a value of 0 indicates no fault. When there are no faults, returns 00000000H

EEPROM Information

Battery Parameter Settings

PDU Address	Bytes	R/W	Description	Data (Range)	Meaning	Unit	Remarks
E003H	2	R/W	High 8 bits: System voltage setting Low 8 bits: Detected voltage	-	12: 12V 24: 24V 36: 36V 48: 48V FF: Auto detect Others: Auto detect	-	-
E004H	2	R/W	Battery type	-	Open, sealed, gel, lithium battery, custom	-	Note 1
E005H	2	R/W	Overvoltage threshold	70～170	Voltage*0.1	V	Note 2
E006H	2	R/W	Charging limit voltage	70～170	Voltage*0.1	V	Note 2
E007H	2	R/W	Equalization charging voltage	70～170	Voltage*0.1	V	Note 2
E008H	2	R/W	Boost charging voltage/Over-charging voltage (lithium battery)	70～170	Voltage*0.1	V	Note 2
E009H	2	R/W	Float charging voltage/Over-charging return voltage (lithium battery)	70～170	Voltage*0.1	V	Note 2
E00AH	2	R/W	Boost charging return voltage	70～170	Voltage*0.1	V	Note 2
E00BH	2	R/W	Over-discharge return voltage	70～170	Voltage*0.1	V	Note 2
E00CH	2	R/W	Undervoltage warning voltage	70～170	Voltage*0.1	V	Note 2
E00DH	2	R/W	Over-discharge voltage	70～170	Voltage*0.1	V	Note 2
E00EH	2	R/W	Discharge limit voltage	70～170	Voltage*0.1	V	Note 2
E00FH	2	R/W	High 8 bits: Charging cutoff SOC Low 8 bits: Discharging cutoff SOC	-	-	-	-
E010H	2	R/W	Over-discharge delay time	0~120	-	S	-
E011H	2	R/W	Equalization charging time	0～300	Step size +10	Min	-
E012H	2	R/W	Boost charging time	10～300	Step size +10	Min	-
E013H	2	R/W	Equalization charging interval	0～255	0: Disabled, step size +5	day	-
E014H	2	R/W	Temperature compensation coefficient	0～5	0: No compensation, step size +1	mV/℃/2V	-

Mode Settings

PDU Address	Bytes	R/W	Description	Data (Range)	Meaning	Unit	Remarks
E01DH	2	R/W	Load working mode	00H	Pure light control, light control ON/OFF load	-	-
				01H	Light control ON load, turn OFF after 1 hour delay	-	-
				02H	Light control ON load, turn OFF after 2 hour delay	-	-
				03H	Light control ON load, turn OFF after 3 hour delay	-	-
				04H	Light control ON load, turn OFF after 4 hour delay	-	-
				05H	Light control ON load, turn OFF after 5 hour delay	-	-
				06H	Light control ON load, turn OFF after 6 hour delay	-	-
				07H	Light control ON load, turn OFF after 7 hour delay	-	-
				08H	Light control ON load, turn OFF after 8 hour delay	-	-
				09H	Light control ON load, turn OFF after 9 hour delay	-	-
				0AH (decimal 10)	Light control ON load, turn OFF after 10 hour delay	-	-
				0BH (decimal 11)	Light control ON load, turn OFF after 11 hour delay	-	-
				0CH (decimal 12)	Light control ON load, turn OFF after 12 hour delay	-	-
				0DH (decimal 13)	Light control ON load, turn OFF after 13 hour delay	-	-
				0EH (decimal 14)	Light control ON load, turn OFF after 14 hour delay	-	-
				0FH (decimal 15)	Manual mode	-	-
				10H (decimal 16)	Debug mode	-	-
				11H (decimal 17)	Always ON mode	-	-

Light Control Settings

PDU Address	Bytes	R/W	Description	Data (Range)	Meaning	Unit	Remarks
E01EH	2	R/W	Light control delay time	0～60	-	Min	-
E01FH	2	R/W	Light control voltage	1～40	-	V	-

Historical Data Records

PDU Address	Bytes	R/W	Description	Data (Range)	Meaning	Unit	Remarks
0xF000	2	R	Current day historical data	-	Returns data block for the requested day, block size is 20 bytes	-	-
0xF001	2	R	Data from 1 day ago	-	-	-	-

Note 1:

PDU	Bytes	R/W	Description	Data Range	Rover and PWM	Rover Elite	Rover Plus	Rover Boost	REGO (12/24/36/48)V
E004H	2	R/W	Battery type	00	User	-	User	User (default LI-48V(16S))	User
-	-	-	-	01	FLD	FLD	FLD	FLD	FLD
-	-	-	-	02	SLD	SLD	SLD	AGM	SLD
-	-	-	-	03	GEL	GEL	GEL	GEL	GEL
-	-	-	-	04	LI	LI	LI	-	LI
-	-	-	-	05	-	-	AGM	LI-36V(12S)	-
-	-	-	-	06	-	-	-	LI-48V(15S)	LI-48V(15S)

Note 2:

PDU	Bytes	R/W	Description	Data Range	Values	Unit
E005H	2	R/W	Overvoltage	70~170	Voltage * 0.1	V
E006H	2	R/W	Limited charge voltage	70~170	Voltage * 0.1	V
E007H	2	R/W	Equalization charge voltage	70~170	Voltage * 0.1	V
E008H	2	R/W	Boost charging voltage / overcharge voltage (lithium battery)	70~170	Voltage * 0.1	V
E009H	2	R/W	Float charging voltage / overcharge return voltage (lithium battery)	70~170	Voltage * 0.1	V
E00AH	2	R/W	Boost charge return voltage	70~170	Voltage * 0.1	V
E00BH	2	R/W	Over discharge return voltage	70~170	Voltage * 0.1	V
E00CH	2	R/W	Undervoltage warning voltage	70~170	Voltage * 0.1	V
E00DH	2	R/W	Over discharge voltage	70~170	Voltage * 0.1	V
E00EH	2	R/W	Discharge limit voltage	70~170	Voltage * 0.1	V

1. Rover, PWM, Rover Elite, and Rover Plus meet the value range definition (70~170);
2. Rover Boost in non-lithium battery type meets the value range definition (70~170);
3. Rover Boost in lithium battery mode uses actual values as shown in the diagram;
4. For time-related settings, please refer to the specification documents of each controller;
5. Read/Write applies to user and lithium battery modes. In lead-acid battery types, the PDU is read-only. Related application software development work needs to pay attention to this!

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