

Communication Protocol of Hybrid inverter or Hybrid inverter with controller all-in-one

V 2.2.

One. Overview

This paper describes the internal communication protocol standard of inverter or inverter control all-in-one machine for energy production

The serial port communication between the inverter or the inverter control all-in-one machine and the upper machine is the basis for developing and testing the series of product protocols.

Second. Physical interface

The interface standard is RS485, communication in asynchronous serial communication, with baud rate supporting 9600,10 data per frame (including 1 starting bit, 8 data bit, 1 stop bit without parity), all data are 16 decimal unsigned numbers.

Third. The Communication Statute

The 1) statute states

The communication format is similar to the MODBUS format

The ADDR: controller local address (range: 01H-F E H), the F F H is the broadcast address, and can be connected regardless of the address of the device.

Please follow the individual device protocol document for as many contents.

DATA: Whatever data, the device needs to add the device number to the data.

CRC calibration: Note that the check code format is low byte before and high byte after.

2) message format description

The a) command code is 11H (Ask for the device information. When GPRS connects to the server, it is issued by the server. When APP connects the

device directly through wifi, APP issues this command to obtain the device information)

Upper machine down information: (Upper machine reads 2 manufacturer parameters to M C U, namely equipment number information)

Address	Function code	Start register address	Number of registers	CRC check
FFH.	11H.	1060H.	0002H.	CRC16.
1	1	2	2	2

Controller return information:

Definition	Address	Function code	Returns the number of data bytes	Returns the data		CRC check
				Device no.	Data	
Data	ADD R.	11H.	08H.	DATA.		CRC16.
Number of bytes	1	1	1	4	4	2

Note: the equipment offline machine returns data, the first four bytes in the data content with the device number (device number register address: 0x1060H-0x1061H), the lower machine to obtain and assemble the data for return.

Issue: FF 11 10 60 00 02 6D 08 //20190427

If the inverter device device modbus address is 06, the device number is 103, for example:
Return: 06 11 08 31 00 00 67 31 00 00 67 93 3A

If there is a PWM controller device device mod bus address is 09, the device number is 107 for example:

Return: 09 11 08 22 00 00 6B 22 00 00 6B F2 77

b) command code 12H(read running parameters)

Upper Down down: (Upper reads 36 operating parameters to M C U)

Definition	Address	Function code	Start register address	Number of registers	CRC check
Data	ADDR	12H.	1000H.	0024H.	CRC16.
Number of bytes	1	1	2	2	2

Controller return information:

Definition	Address	Function code	Returns the number of data bytes	Returns the data		CRC check
				Device number	Data	
Data	ADDR.	12H.	4C H.	DATA.		CRC16.
Number of bytes	1	1	1	4	72	2

Note: the equipment offline machine returns data, the first four bytes in the data content with the device number (device number register address: 0x1060H-0x1061H), the lower machine to obtain and assemble the data for return.

Take inverter device No.103 for example:

Issue: 06 12 10 00 00 24 + 2 calibration

Return: 06 12 4C 31 00 00 67 + 72 bytes of data + 2 check codes

The c) command code is 16H (Read the basic parameters)

Upper down down: (Upper reads 39 setting parameters to M C U)

Definition	Address	Function code	Start register address	Number of registers	CRC check
Data	ADDR.	16H.	1024H.	0027H.	CRC16.
Number of bytes	1	1	2	2	2

Controller return information:

Definition	Address	Function code	Returns the number of data bytes	Returns the data		CRC check
				Device number	Data	
Data	ADD R.	16H.	52H.	DATA.		CRC16.
Number of bytes	1	1	1	4	78	2

Note: the equipment offline machine returns data, the first four bytes in the data content with the device number (device number register address: 0x1060H-0x1061H), the lower machine to obtain and assemble the data for return.

Take inverter device No.103 for example:

Issue: 06 16 10 24 00 1A + 2 calibration

Return: 06 16 38 31 00 00 67 + 52 bytes of data + 2 check codes

d) command code is 17H (Read the manufacturer's parameters)

Down information: (upper machine reads 85 manufacturer parameters to M C U)

Definition	Address	Function code	Start register address	Number of registers	CRC check
Data	ADDR	17H.	104B H.	0055H.	CRC16.
Number of bytes	1	1	2	2	2

Controller return information:

Definition	Address	Function code	Returns the number of data bytes	Returns the data		CRC check
				Device number	Data	
Data	ADDR	17H.	AE H.	DATA.		CRC16.
Number of bytes	1	1	1	4	170	2

Note: the equipment offline machine returns data, the first four bytes in the data content with the device number (device number register address: 0x1060H-0x1061H), the lower machine to obtain and assemble the data for return.

Take inverter device No.103 for example:

Issue: 06 17 10 4B 00 49 + 2 calibration

Return: 06 17 5E 31 00 00 67 + 146 bytes of data + 2 check codes

e) command code is 18H (Up machine sets parameters to MCU)

Upper machine down down:

Definition	Address	Function code	Set the parameter address	Parameter value	CRC check
Data	ADDR	18H.	10XXH.	XXXXH.	CRC16.
Number of bytes	1	1	2	2	2

Controller return information:

If the parameter returns the same, the setting is successful, if the error is returned, automatically until correct.

Definition	Address	Function code	Returns the number of data bytes	Returns the data			CRC check
				Device number	Set the parameter address	Parameter value	
Data	ADD R.	18H.	08H.	DATA.			CRC16.
Number of bytes	1	1	1	4	2	2	2

Note: the equipment offline machine returns data, the first four bytes in the data content with the device number (device number register address: 0x1060H-0x1061H), the lower machine to obtain and assemble the data for return.

Take inverter device No.103 for example:

Issued by: 06 18 10 2A 09 3C 03 36

Return: 06 18 08 31 00 00 67 10 2A 09 3C 2A 86

f) command code: 1FH (Restore the factory settings range of 0x1024-0x109F)

Upper machine down down:

Definition	Address	Function code	Start register address	Number of registers	CRC check
Data	ADDR .	1FH.	1024H.	007B H.	CRC16.
Number of bytes	1	1	2	2	2

Controller return information:

If the parameter returns the same, the setting is successful, if the error is returned, automatically until correct.

Definition	Address	Function code	Returns the number of data bytes	Returns the data			CRC check
				Device number	Start register address	Number of registers	
Data	ADDR.	1F H.	08H.	DATA			CRC16.
Number of bytes	1	1	1	4	2	2	2

Note: the equipment offline machine returns data, the first four bytes in the data content with the device number (device number register address: 0x1060H-0x1061H), the lower machine to obtain and assemble the data for return.

Take inverter device No.103 for example:

Issue: 06 1F 10 24 00 7B 91 57

Return: 06 1F 08 31 00 00 67 10 24 00 7B BD F1

g) For all error messages, the controller returns the following command

Definition	Address	Function code	Returns the number of data bytes	Returns the data			CRC check
				Device number	Bytes 8,9	Bytes, 10,11	
Data	ADDR .	FF H.	08H.	DATA.	1000H.	00FFH.	CRC16.
Number of bytes	1	1	1	4	2	2	2

Note: the equipment offline machine returns data, the first four bytes in the data content with the device number (device number register address: 0x1060H-0x1061H), the lower machine to obtain and assemble the data for return.

Take inverter device No.103 for example:

Return: 06 FF 08 31 00 00 67 10 00 00 FF F8 C3

Appendix I: The device returns the data register address mapping table

Property	Word-type address	Content	app classification	Byte length	Coefficient (Unit)
Running data	0x1000	Inverse voltage	Inverter parameter 1	2	0.1 (V)
	0x1001	Municipal electric voltage	Inverter parameter 1	2	0.1 (V)
	0x1002	Load voltage	Inverter parameter 1	2	0.1 (V)
	0x1003	Inverse frequency	Inverter parameter 1	2	0.01 (HZ)
	0x1004	Inverter working mode	Inverter parameter 1	2	0: Smart mode 1: Battery priority mode 2: Municipal power priority mode 3:Energy-saving mode
	0x1005	Inverse current current	Inverter parameter 1	2	0.01 (A)
	0x1006	Battery voltage	Inverter parameter 1	2	0.1 (V)
	0x1007	Radiator temperature	Inverse parameter 1 + 2	2	0.1 (°C)
	0x1008	Municipal electric charging state	Inverse parameter 1 + 2	2	0: Standby 1: Constant charge 2: Raise the charging 3: Full of it
	0x1009	Municipal electric charging current	Inverse parameter 1 + 2	2	0.01 (A)

Running data	0x100 A.	Municipal electric frequency	Inverse parameter 1 + 2	2	0.01 (HZ)
	0x100 B.	PV fan start and stop	Inverse parameter 1 + 2	2	0: The PV controller does not start the fan 1: PV controller start fan
	0x100 C.	Inverter running state	Inverse parameter 1 + 2	2	0: Standby 1: Municipal electric charging soft start 2: The inverter has a soft start 3: Inverse runs normally 4: Municipal power bypass 5: Charging of municipal power bypass 6: Failure mode 7: Commissioning mode
	0x100 D.	Inverter internal state	Inverse parameter 1 + 2	2	See Attachment 1: Inverter internal status definition
	0x100 E.	Total discharge hours of high word	Inverse parameter 1 + 2	2	0.1K W H.
	0x100F . .	Total discharge hours of low word	Inverse parameter 1 + 2	2	0.1K W H.

0x10 10.	Active power	Inverse parameter 1 + 2	2	1 (W)
0x10 11.	Number of battery pack strings	Inverse parameter 1 + 2	2	String
0x10 12.	Battery type	Inverse parameter 1 + 2	2	0: Lead-acid storage battery 1: Colloidal battery 2: ternary lithium battery 3: Lithium iron phosphate 4: Customized
0x10 13.	Battery temperature compensation voltage point	Inverse parameter 1 + 2	2	1 mV.
0x10 14.	Battery temperature	Inverse parameter 1 + 2		1 (°C)
0x10 15.	Inverse frequency set value	Device parameters	2	0: 50Hz. 1: 60Hz.
0x10 16.	Inverter switch machine status	Device parameters	2	<u>0 Shutdown</u> <u>1 Start-on</u>
0x10 17.	Rated on the power	Device parameters	2	1 (VA)
0x10 18.	Inverse voltage setting value	Device parameters	2	0.1 (V)
0x10 19.	Voltage level	Device parameters	2	0.1 (V)
0x10 1A.	Current level	Device parameters	2	0.01 (A)
0x10 1B.	Version number	Device parameters	2	Version number
0x10 1C.	Failure code 1		2	See Attachment 2: fault code 1 definition

D.	0x101 Failure code 2		2	See Attachment 3: fault code 2 definition
E.	0x101 PV controller fault code			Attachment 3A: PV charging controller fault code
F.	0x101 PV controller switch machine status			<u>0 Shutdown</u> <u>1 Start-on</u>
O.	0x102 PV panel voltage			0.1V.
1.	0x102 Total PV charging current			0.1A.
2.	0x102 Charging status	Charging status		00 Not being charged 01 MPPT charging 02 Boost charging 03 Floating charging 04 Balanced charging
0x1023.	Photovoltaic charging power			0.1W.

Customer setting data	0x10 24.	Over voltage voltage	Battery parameters- Advanced	2	0.1 (V)
	0x10 25.	Charging limit voltage	Battery parameters- Advanced	2	0.1 (V)
	0x10 26.	Over voltage recovery voltage	Battery parameters- Advanced	2	0.1 (V)
	0x10 27.	Boost charging voltage	Battery parameters- Advanced	2	0.1 (V)
	0x10 28.	Boost charging return voltage	Battery parameters- Advanced	2	0.1 (V)
	0x10 29.	Floating charge and charging voltage	Battery parameters- Advanced	2	0.1 (V)
	0x10	Over discharge	Battery parameters- Advanced	2	0.1 (V)

2A.	voltage			
0x10 2B.	Under voltage recovery voltage	Battery parameters-Advanced	2	0.1 (V)
0x10 2C.	Battery is under voltage	Battery parameters-Advanced	2	0.1 (V)
0x10 2D.	Boost charging time	Battery parameters-Advanced	2	1~3H.
0x10 2E.	Temperature compensation factor	Battery parameters-Advanced	2	0~6 mV/ °C / 2V.
0x10 2F.	Number of battery strings	Battery Parameters-Quick	2	String
0x103 0.	Battery type	Battery Parameters-Quick	2	0: Lead-acid storage battery 1: Colloidal battery 2: ternary lithium battery 3: Lithium iron phosphate 4: Customized
0x10 31.	Device Modbus address	System parameters	2	1~255
0x10 32.	Customized parameters	System parameters	2	See Annex 4: Customized parameter bit definition
0x10 33.	Bypass voltage under voltage protection point	System parameters	2	0.1 (V)
0x10 34.	Bypass voltage under voltage recovery point	System parameters	2	0.1 (V)
0x10 35.	Bypass voltage over voltage protection point	System parameters	2	0.1 (V)
0x10	Bypass voltage over voltage recovery point	System parameters	2	0.1 (V)

36.				
0x10	Inverse open voltage point	System parameters	2	0.1 (V)
37.				
0x10	Inverse off voltage point	System parameters	2	0.1 (V)
38.				
0x10	Inverter on / off	System parameters	2	0 Shutdown 1 Start-on
39.				
0x10	AC source input selection	System parameters	2	0 Power grid input 1 Diesel engine input
3A.				
0x103	Working mode	System parameters		0: Smart mode 1: Battery priority mode 2: Municipal power priority mode 3: Energy-saving mode
B.				
0x103	Energy-saving mode opening point	System parameters	2	1 (VA)
C.				
0x1	Energy-saving mode shutdown point	System parameters	2	1 (VA)
03D.				
0x1	PV charging on / off	System parameters	2	0 Shutdown 1 Start-on
03E.				
0x1	Municipal electric charge rated current		2	0.01A.
03F.				
0x1	Full of the restart charging voltage		2	0.1V.
040.				
0x1	Set the parameter 10		2	
041.				
0x1	Set the parameter 9		2	
042.				
0x1	Set the parameter 8		2	
043.				
0x1	Set the parameter 7		2	

044.				
0x1 045.	Set the parameter 6		2	
0x1 046.	Set the parameter 5		2	
0x1 047.	Set the parameter 4		2	
0x1 048.	Set the parameter 3		2	
0x1 049.	Set the parameter 2		2	
0x1 04A.	Set parameter 1 (PV controller fan operating state)		2	0: The PV controller does not start the fan 1: PV controller start fan

Note: 1. Convert the corresponding values in the table to hexadecimal when sending actual transmission.

2. Manufacturer parameters, not for customer development, need to enter the password when entering.

Attachment 1: Inverter internal state definition:

Bit (bits)	Name	Bit definition
15	Reserved	
14	Reserved	
13	AC input slow start relay status	0: Open 1: Close

12	Fan running status	0: Stop 1: Run
11	EPO status	0: Invalid 1: Effective
10	Inverter phase-locked state	0: Unlocked in phase 1: Phase-locking
9	Bypass static switch	0: Open 1: Close
8	DC input delay relay status	0: Open 1: Close
7	DC Input relay status	0: Open 1: Close
6	Inverter relay status	0: Open 1: Close
5	Bypass relay status	0: Open 1: Close
4	AC Input power supply status	0: Stop 1: Run
3	Energy-saving mode allows	0: Not allowed 1: Allow
2	AC mains charging is allowed	0: Not allowed 1: Allow
1	AC mains charging switch status	0: AC mains charging 1: AC mains is not charged
0	Start and stop command status of the diesel engine	0: Stop 1: Run

Attachment 2:
Fault Code 1 definition:

Fault Code (b i t s)	Failure information
0	Battery over voltage
1	Battery is overheating
2	Charge the over-current
3	Charging soft start failed
4	Inverse change is soft and over current
5	The inverter overheated
6	Short circuit to reverse

7	Output overload
8	Memory read and write error
9	Inverse soft start failed
10	Battery over-voltage
11	Inverter over-voltage
12	Serial port communication failure
13	Inverter turns hard over-current
14	Inverter radiator temperature sensor fails
15	Transformer is overheated

Attachment 3:
Fault code 2 definition:

Fault Code (bit s)	Failure information
0	AC input over-voltage
1	AC input over-voltage
2	Battery is slightly under voltage
3	Inverter relay is faulty
4	Bypass relay failure
5	Battery temperature sensor fails
6	CAN communication failure
7	Bus bar over voltage
8	Bus bar under bus
9	Inverter current zero point is abnormal
10	Inverter voltage zero point is abnormal
11	Load voltage zero point is abnormal

12	The power grid zero point is Abnormal
13	Reserved for 2
14	Reserved for 3
15	Manual failure

Annex 3A:

Fault Code (bits)	Failure information
0	Battery over voltage
1	Battery is not connected
2	PV array over voltage
3	Short-circuit to the controller
4	Charge the over-current
5	Controller is overheated
6	Battery is overheating
7	Output overload
8	Memory error
9	
10	
11	Battery over-voltage alarm
12	Controller temperature sensor fails
13	Battery temperature sensor fails
14	PV array under voltage
15	

PV charging controller fault code definition:

Attachment 4:

Customer setting bit definition:

bit (bits)	Name	Bit definition
15	Manual failure	0: Not valid 1: Effective
14	Reserved	
13	Reserved	
12	Overload turn bypass enabling	0: Ability 1: Not capable
11	Failure clearing	0: Not cleared 1: Clear it
10	Alarm is turned off	0: Not closed 1: Close it
9	Single-machine or parallel machine	0: Single-alone 1: Combined machine
8	Power on automatically	0: Not capable 1: Ability
7	EPO functionality	0: Not capable 1: Ability
6	AC mains frequency self-detection	0: Not capable 1: Ability
5	Automatic battery detection	0: Not capable 1: Ability
4	The AC bypass enables it	0: Not capable 1: Ability
3	Energy-saving mode allows	0: Not allowed 1: Allow
2	AC mains charging is allowed	0: Not allowed 1: Allow
1	AC mains charging switch	0: AC mains charging 1: AC mains is not charged
0	Diesel engine start and stop command	0: Stop 1: Run

Attachment 5:

Device type code definition:

Device Type Code (bits)	Type information
11	MPPT controller and inverter all-in-one machine
21	MPPT controller
22	PWM controller

23	Municipal electric complementary controller
31	Inverter
32	AC mains hybrid inverter
41	Wind solar hybrid controller