Inverter
Inverter & Charger
Solar Charge Inverter

Modbus Protocol V1.8

一、Update history
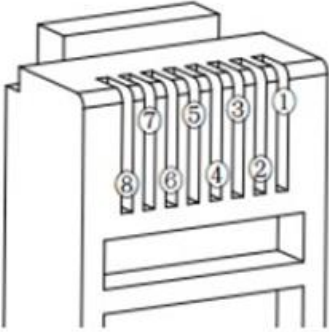
version	Updated date	Updated content	author	Audit
V1.0	2019.05.10	Initial release (HF and power frequency share this protocol, there is no corresponding definition of 0xFFFF fill)	Gao Yi	Huang Feng
V1.1	2019.01.21	New: 4009 address is defined as input frequency	Gao Yi	Huang Feng
V1.2	2020.03.11	New: 4110~4111 addresses are defined as unique identification codes; Fixed: 4112~4199 address bytes; New: 4327~4615 energy storage inverter part agreement; New: 4568 address is defined as charging power setting; (Simultaneous for PV and AC charging) Note: 4000~4326 is the protocol for ordinary inverters; 4000~4615 为储能逆变器用协议；	Anson	Huang Feng
V1.3	2020.03.16	For 4303~4310, 4311~4318, 4319~4326 addresses, add descriptions, in which	Huang Feng	Huang Feng

		4319~4326 is made into hardware, software, and protocol version numbers		
V1.4	2020.05.21	Modified: Charging state definition in 4332 address; Modified: the number of bytes in the address from 4334 to 4393; Modified: fault definition in 4398~4401 address; Modified: 4402 address definition 'year' added remarks description; Modified: 4419 address is defined as reserved; Modified: Changed the definition of '01' in 4420 address to '0xAA'; Modified: The unit in the 4422 address is changed to 0.1A, and the definition is changed to the total charging current can be set; Modified: battery type definition in address 4424; Modified: 4438 address is defined as reserved;	Anson	Huang Feng

		Modified: 0.01Hz in 4442 address; Modified: 4451 address is defined as reserved; Modified: 4547-4549 addresses are defined as reserved; Modified: 4562-4563 addresses are defined as reserved; Modified: 4568 address is defined as reserved, and the original definition is the same as 4422; Modified: 4600 address is read-only R; Illustrate: 1)4000~4326 for unidirectional and power frequency inverters 2) 4000~4006, 4009, 4108~4301, 4303~4615 are suitable for bidirectional energy storage inverters		
V1.5	2020.10.9	New: FFH is a universal address code, and all slaves respond and return an answer command. The generic address code FFH and the current Device ID of the inverter	Huang Chengcheng	Huang Feng

		have the same function.		
V1.6	2021.1.11	Added: 4452 Overvoltage Protection Voltage 4453 Overvoltage Protection Recovery 4454 Undervoltage alarm recovery voltage	Gao Yi	Huang Chengcheng
V1.7	2021.1.27	Modified: 4424 Added N13N14 battery type Remove NCA and 24V lithium battery types	Gao Yi	Huang Chengcheng
V1.8	2021.10.26	Added: 4112~4120: SN	Gao Yi	Huang Chengcheng

2. Pin Definition:

RJ45 通讯接口	①	+5V (positive power supply, load capacity not less than 200mA)
	②	A (RS485 bus signal)
	③	B (RS485 bus signal)
	④	GND (Power Ground/Communication Ground)
	⑤	NC (idle, no other functions allowed)
	⑥	CAN_H (CAN bus signal)
	⑦	NC (idle, no other functions allowed)
	⑧	CAN_L (CAN bus signal)
	Illustrate: ->RS485 初始波特率 9600bps ->CAN initial baud rate 500Kbps -> RS485 and CAN can be combined into one physical interface, or separated into two physical interfaces -> products that do not require a CAN interface, the CAN pin definition can be ignored	

3. Definition of Agreement:

1. Format

Start character	Address code (1BYTE)	Feature codes (1BYTE)	Start address (2BYTE)	The length of the data (2BYTE)	CRC check (2BYTE)	Closing character

2. Description

1)起始符:>10ms

2) Address code: 1 byte, range: 01H~F7H (decimal 1~247), 00H is the broadcast address, all slaves respond, but do not return commands; FFH is the general address code, all slaves respond, return to answer commands. The generic address code FFH and the current Device ID of the inverter have the same function.

3) Function code: 1 byte

The name of the command	Access data type	Feature codes	Error codes
Read single or multiple word registers	WORD	03H	83H
Write a single word register	WORD	06H	86H
Write consecutive N word registers	WORD	10H	90H

4) Start address: 2 bytes

5) Data length: 2 bytes

6) CRC check: 2 bytes, which is the CRC checksum of each byte of the address code, function code and data

7）结束符：>10ms

Note:

1) The data address and data are 2 bytes, and the **high bytes are sent first, followed by the low bytes, while the CRC sends the low bits first, and then the high bits.**

2) The error code is that there is an error in the frame data delivered by the server, and the error returned by the client responds to the function code: error code = function code| 80H

3) Description of the exception code

　　a、01H -- Unsupported feature codes

　　b. 02H -- The PDU start address is incorrect or the PDU start address + data length is beyond the legal range

　　c. 03H -- The data of the read register or the data of the write register is too long

　　d, 04H -- The client failed to execute the read or write registers

　　e、05H -- The data check code issued by the server is incorrect

3. Examples

1) Read hold registers

Request:

description	Number of bytes	command

Device address	BYTE	01H~F7H
Feature codes	BYTE	03H
Start address	WORD	4000~4059; 4100~4199; 4300~4615;
Number of words read	WORD	Ensure that the data read is within the range of legitimate addresses
Checksum	WORD	All of the above byte CRC checksums

Normal Response:

description	Number of bytes	command
Device address	BYTE	01H~F7H
Feature codes	BYTE	03H
The length of the data	BYTE	01H~FAH
Data content	WORD	Readout data (high first, low last)
...	WORD	Readout data (high first, low last)
Checksum	WORD	All of the above byte CRC checksums

Abnormal Response:

description	Number of bytes	command
Device address	BYTE	01H~F7H
Error codes	BYTE	83H
Outlier codes	BYTE	N(N=1,2,3,4,5)
Checksum	WORD	All of the above byte CRC checksums

2) Write a single register
Request:

description	Number of bytes	command
Device address	BYTE	01H~F7H
Feature codes	BYTE	06H
Start address	WORD	4100~4199; 4300~4615;
Write data	WORD	0000H~FFFFH
Checksum	WORD	All of the above byte CRC checksums

Normal response

description	Number of bytes	command
Device address	BYTE	01H~F7H
Feature codes	BYTE	06H
Start address	WORD	4100~4199; 4300~4615;
Write data	WORD	0000H~FFFFH

Checksum	WORD	All of the above byte CRC checksums

Abnormal Response:

description	Number of bytes	command
Device address	BYTE	01H~F7H
Error codes	BYTE	86H
Outlier codes	BYTE	N(N=1,2,3,4,5)
Checksum	WORD	All of the above byte CRC checksums

3) Write consecutive n registers

Request:

description	Number of bytes	command
Device address	BYTE	01H~F7H
Feature codes	BYTE	10H
Start address	WORD	4100~4199; 4300~4615;
Number of write addresses	WORD	
Bytes written	BYTE	Twice the number of write addresses
Data content		Data Written (High Bit First, Low Bit Last)
…		Data Written (High Bit First, Low Bit Last)
Checksum	WORD	All of the above byte CRC checksums

Normal Response:

description	Number of bytes	command
Device address	BYTE	01H~F7H
Feature codes	BYTE	10H
Start address	WORD	4100~4199; 4300~4615;
Number of write addresses	WORD	0001H~007DH
Checksum	WORD	All of the above byte CRC checksums

Abnormal Response:

description	Number of bytes	command
Device address	BYTE	01H~F7H

Error codes	BYTE	90H
Outlier codes	BYTE	N(N=1,2,3,4,5)
Checksum	WORD	All of the above byte CRC checksums

4. PDU address allocation table

PDU address (Decimal)	byte	read/ write	unit	description		data	analysis	return data	Parse instance
4000	2	R	0.1V	Inputvoltage					AC input voltage
4001	2	R	0.01A	Input current					AC input current
4002	2	R	0.1V	Output voltage					Inverter output voltage
4003	2	R	0.01A	Output current					Inverter output current
4004	2	R	0.01Hz	Output frequency					Inverter output frequency
4005	2	R	0.1V	Battery voltage					Battery voltage
4006	2	R	0.1℃	Temperature					Internal temperature
4007~ 4008	4	R	/	Device Status	High Word	Bit31	1: Input UVP		High-frequency inverter failure BIT31: Input undervoltage BIT30: Input overvoltage BIT29: Output overload BIT28:DC/DC 过载 BIT27:DC/DC 硬件过流 BIT26: Bus overvoltage BIT25: Ground fault BIT24: Other faults BIT23: Output short circuit BIT22: Output undervoltage BIT21: Output overvoltage Bit20: Low power hibernation
						Bit30	1: Input OVP		
						Bit29	1: Output OPP		
						Bit28	1:DC/DC overload		
						Bit27	1: DC/DC OCP(HW)		
						Bit26	1: BUSOVP		
						Bit25	1: PEN		
						Bit24	1: OTP		
						Bit23	1: Output short circuit		
						Bit22	1: Output UVP		
						Bit21	1: Output OVP		
						Bit20	1: Sleep		
						Bit19	reserve		
						Bit18	reserve		
						Bit17	reserve		
						Bit16	reserve		
					Low Word	Bit15	1: Utility Fail	UPS failure	The power frequency machine is faulty
						Bit14	1: Battery Low		
						Bit13	1: APR		
						Bit12	1: UPS File		
						Bit11	1: UPS Type isLine-Interactive 0: UPS Type is On line		

Addr		R/W	Unit	Name				Description
					d	Bit10	1: Test in progress			
						Bit9	1: Shutdown Active		
						Bit8	1: Beeper On		
						Bit7	1:Fan locked(Inv)		
						Bit6	1: Over Load(Inv)		
						Bit5	1: Short Cut(Inv)		
						Bit4	1:Bat bad(Inv) (AC start Vbat<9V)	Inverter 故障	
						Bit3	reserve		
						Bit2	reserve		
						Bit1	reserve		
						Bit0	reserve		
4009	2	R	0.01Hz	I/P Frequency					AC input frequency
4010~4059		R	/	Reserve					Reserve a bit
4100	2	R/W	/	Battery or utility	00H	DisableTestfor10seconds		01H	If the battery voltage is low, the UPS will immediately switch the mains power supply
					01H	EnableTestfor10seconds			
4101	2	R/W	/	TurnOn/Off beep	00H	Turn on beep		01H	When the AC output is abnormal, turn on the buzzer
					01H	Turn off beep			
4102	2	R/W	/	Inverter mode	00H				01H: Normal mode 02H: Hibernation mode 03H: Shut down 04H: reserved bit
					01H	Normal mode			
					02H	Sleep mode			
					03H	Shutdown			
					04H	Restore			
4103	2	R/W	0.1min	Shutdown UPS output Delay time	Range from 0.2~10min				
4104	2	R/W	1min	After UPS output off, delay time to turn on UPS output again	Range from 0000~9999				
4105	2	R/W	/	Cancel shutdown command	00H	Cancel Shutdown command (UPS in shutdown mode)			
					01H	Turn on UPS output (UPS in restore wait mode)			
4106	2	R/W	0.1V	Rating Voltage					Rated voltage
4107	2	R/W	0.01A	Rating Current					Current rating
4108	2	R/W	/	Inverter Password					

4109	2	R/W	/	Device ID	01H~F7H				Default: 01H
4110~4111	4	R/W	/	Unique identification code					Unique identifiers 默认:0xFFFFFFFF
4112~4120	18	R	/	SN	Data format: ASCII				For details, see the SN definition file
4121~4199	158	R/W	/	Reserve					Reserve a bit
4300	2	R		Inverter fault state	00H	Normal			Whether it is in a protected state
					01H	Fault			
4301	2	R		Inverter Charger action query	00H	Inverter is not charging			Whether it is in a charging state
					01H	Inverter is charging			
4302	2	R		Charger knob test	00H	Charger knob is at 100~500A level			Current knob adjustment
					01H	Chargerknob is at 600~1000A level			
4303~4310	16	R	ASICII	Company Name					Default: RENOGY
4311~4318	16	R	ASICII	Inverter Model					Default: Product SKU The version number in the product approval letter
4319~4326	16	R	ASICII	Version	Format: xx.xx.14				Hardware|firmware|protocol version number The version number in the product approval letter
PV information									
4327	2	R	/	BatSoc %					Percentage of battery remaining
4328	2	R	0.1A	ChargeCurr					Charging current, the current flowing into the battery, e.g. 500, means 50.0A
4329	2	R	0.1V	Pv volt					PV voltage
4330	2	R	0.1A	Pv Curr					The buck controller outputs inductor current
4331	2	R	1W	Pv charger Power					PV charging power
4332	2	R	/	ChargeState	Low Word	00H: Charging is not turned on 01H: Constant current charging 02H: Constant voltage			Low 8 bits: (state of charge)

					charging 04H: Float charge 06H: Battery activation phase 07H: Battery disconnection processing stage		
4333	2	R	1W	ChargePower			Charging power
4334~4393	120	R/W	/	Reserve			obligate
Inverter settings							
4394~4397	8	R	/	CurrErrReg	Fault bits, each representing a fault, a total of 64 bits. This register is used by internal debugging tools.		The current fault bit
4398~4401	8	R	/	CurrFcode	01: The battery is under-voltaged 02: Software protection for battery discharge average current overcurrent 03: The battery did not receive the alarm 04: Battery undervoltage stop discharge alarm 05: Battery overcurrent protection 06: Charging overvoltage protection 07: Bus overvoltage hardware protection 08: Bus overvoltage software protection 09: PV overvoltage protection 10: Bulk overcurrent software protection 11: Bulk overcurrent software protection 12: The mains power is power-off 13: Bypass overload protection 14: Inverter overload		The current fault code has a total of 4 addresses, and each address stores a fault code corresponding to the current fault, and can display 4 fault codes at the same time. 0 indicates no fault. For example, there are currently two faults: battery undervoltage and inverter overload. It will be displayed as follows: 4398: 01 4399: 13 4400: 00 4401: 00

						protection			
						15: Inverter overcurrent hardware protection			
						16: Inverter overcurrent software protection			
						17: Inverter short-circuit protection			
						18: Mains charging overcurrent hardware protection			
						19: Bulk radiator over-temperature protection			
						20: Inverter radiator over-temperature protection			
						21: The fan is faulty			
						22: Memory failure			
						23: The model settings are incorrect			
						24:CmdOff			
						25: Bus short circuit			
						26: Relay short circuit			
						27: The mains charging plate is overheated			
						28: The AC input and output are reversed			
						29: Bus undervoltage software protection			
						30: The battery capacity is less than 10% (only when connected to the BMS host)			
						31: The battery capacity is less than 5% (only connected to the BMS host)			
						32: Battery low power shutdown (only connected to BMS host)			
4402	2	R/W	/	SysDateTime					8th place high: year (20 for 2020) Bottom 8 bits: Month
4403	2	R/	/	SysDateTime					High 8 bits: Day

		W						Low 8 bits: hours
4404	2	R/W	/	SysDateTime				High 8 digits: points 8 bits lower: seconds
4405	2	R	/	MachineState		00: power-on delay 01: Waiting state 02: Initialization 03: Soft start 04: Mains operation 05: Inverter operation 06: Inverter to mains 07: Mains power to inverter 08: Reserved 09: Reserved 10: Shut down 11: Breakdown		The current state of the machine
4406	2	R	/	PriorityFlag		0: The user did not enter a password 1: The user password has been entered 4: The manufacturer's password has been entered		Password protection status flags
4407	2	R	0.1V	BusVolt				Bus voltage
4408	2	R	0.1A	Load Curr				Load current
4409	2	R	1W	Load Active Power				Load active power
4410	2	R	1W	Load Reactive Power				Load apparent power
4411	2	R	1mV	Inv Dc Volt				Inverter DC component
4412	2	R	0.1A	Line Chg Curr				When the mains is charged, the current on the battery side.
4413	2	R	%	Load Ratio				Percentage of load
4414	2	R	0.1℃	Temper it				DC-DC heatsink temperature
4415	2	R	0.1℃	Temper-b				DC-AC heatsink temperature
4416	2	/	/	/				obligate
Switch control								
4417	2	In	/	Cmd Machine Reset		1: Reset Other: No action		Reset control
4418	2	In	/	Cmd Restore Factory Setting		0xAA: Recovery, Other: No action Restore the factory value to clear all accumulated		Restore factory values

address	byte	Read and write	unit	English name		maximum	minimum	Default value	remark
								information, restore the parameters to the default state, and the restart takes effect	
4419	2			Reserve					
4420	2	In	/	Cmd Clear His Record		0xAA: Clear Other: No action			Clear history
4421	2	In	/	Batt Equal Chg Immediate		0: Prohibited 1: Enable			Immediately equalize the charging command
Battery-related settings									
4422	2	R/W	0.1A	Pv Chg Curr Set					The total charging current is settable
4423	2	R/W	1AH	Bat Rate Cap					Battery rated capacity
4424	2	R/W	/	BatTypeSet		00: UserDef 01: SLD 02: FLD 03: GEL 04:LFP14(48v) 05:LFP15(48v) 06:LFP16(48v) 0C: N13 0D: N14			Battery type
address	byte	Read and write	unit	English name		maximum	minimum	Default value	remark
4425	2	R/W	0.1V	Bat Const Chg Volt		9.0V	15.5V	14.4V	Equalize the charge voltage
4426	2	R/W	0.1V	Bat Improv Chg Volt		9.0V	15.5V	14.4V	Increase the charge voltage/overcharge voltage
4427	2	R/W	0.1V	Bat Float Chg Volt		9.0V	15.5V	14.0V	Float charge voltage/overcharge return voltage
4428	2	R/W	0.1V	Bat Improv Chg Back Volt		9.0V	15.5V	13.2V	Boost the charge return voltage
4429	2	R/W	0.1V	Bat Over Dischg Back Volt		9.0V	15.5V	12.6V	Over-discharge return voltage
4430	2	R/W	0.1V	Bat Under Volt		9.0V	15.5V	11.0V	Undervoltage warning voltage
4431	2	R/W	0.1V	Bat OverDischg Volt		9.0V	15.5V	12.2V	Over-discharge voltage

4432	2	R/W	0.1V	Bat Dischg Limit Volt		9.0V	15.5V	11.2V	Discharge limiting voltage
4433	2	R/W	1s	Bat OverDischg Delay Time		0S	120S	60S	Over-discharge delay time
4434	2	R/W	1min	Bat Const Chg Time		0min	600min	120min	Equalize the charging time
4435	2	R/W	1min	Bat Improv Chg Time		10min	600min	120min	Improves charging time
4436	2	R/W	1day	Bat Const Chg Gap Time		0Day	255Day	30Day	Equalize the charging interval
4437	2	R/W	0.1V	Bat Switch DC Volt		36.0V	62V	46V	Mains switching voltage
4438	2			Reserve					
4439	2	R/W	0.1V	Batt Volt Sw To Inv		36V	62V	64.0V	Inverter switching voltage
4440	2	R/W	1min	Batt Equal Chg Time out		5min	900min	240min	Equalize the charge timeout
Inverter settings									
4441	2	R/W	/	Output Priority		0:solar 1:line 2:sbu			Output priority
4442	2	R/W	0.01Hz	Output Freq Set					Output frequency
4443	2	R/W	/	Ac Volt Range		0: wide range 1: Narrow range			AC input range
4444	2	R/W	/	Power Saving Mode		0: Prohibited 1: Enable			Energy saving mode
4445	2	R/W	/	Auto Restart Ov Load		0: Prohibited 1: Enable			Automatic restart of overload
4446	2	R/W	/	Auto Restart Ov Temper		0: Prohibited 1: Enable			Over-temperature auto-restart
4447	2	R/W	/	Chg Source Priority		0: PV priority, only when PV is invalid, start mains charging 1: Mains power priority, only start photovoltaic charging when the mains is invalid 2: Mixed mode, mains and PV charging at the same time, priority PV. 3: Photovoltaics only, mains power is not charged.			Charging priority
4448	2	R/	/	Alarm Enable		0: Prohibited			Alarm control

		W				1: Enable		
4449	2	R/W	/	Alarm En When Source Loss		0: Prohibited 1: Enable		Alarm is enabled when the input source is interrupted
4450	2	R/W	/	Byp Enable When Ov Load		0: Prohibited 1: Enable		Overload bypass enabled
4451	2	R	/	Reserve				Pending Position
4452	2	R	/					Overvoltage protection voltage
4453	2	R	/					Overvoltage protection recovery voltage
4454	2	R	/					The undervoltage alarm recovers the voltage
4455~4500	92	R/W	/	Reserve				obligate
Electricity statistics								
4501~4507	14	R	1AH	PV Energy Last 7day		00: Yesterday's electricity generation 01: The day before yesterday's electricity generation		Historical data of PV power generation for the last 7 days
4508~14	14	R	1AH	Bat Chg Energy Last 7day				Historical data of battery charge in the last 7 days
4515~4521	14	R	1AH	Bat DisChg Energy Last 7day				Historical data of battery discharge level in the last 7 days
4522~4528	14	R	1AH	Line Chg Energy Last 7day				Historical data of the last 7 days of mains battery charging
4529~4535	14	R	0.1KWH	Load Consum Last 7day				Historical data of the last 7 days of load consumption
4536~4542	14	R	0.1KWH	Load Consum From Line Last 7day				Historical data of the last 7 days of load consumption from mains
4543	2	R	1AH	Break the bat				Ampere-hours of battery charging on the same day
4544	2	R	1AH	Bat Dischg AH Today				The number of ampere-hours the battery is discharged on the same day

4545	2	R	0.1KWH	Generat Energy Today				PV power generation on the day
4546	2	R	0.1KWH	Used Energy Today				Electricity consumption on the day of load
4547~4549	6			Reserve				
4550~4551	4	R	1AH	Bet Chag Ah Total				The cumulative charging ampere-hours of the battery
4552~4553	4	R	1AH	Bat Dischg AH Total				The cumulative number of ampere-hours of discharge of the battery
4554~4555	4	R	0.1KWH	Generat Energy Total				Cumulative PV power generation
4556~4557	4	R	0.1KWH	Used Energy Total				Accumulated power consumption of the load
4558	2	R	1AH	Line Chg Energy Tday				The amount of electricity charged on the same day as the mains power
4559	2	R	0.1KWH	Load Consum Line Tday				The load consumes electricity from the mains on the same day
4560	2	R	1min	Inv Work Time Today				Working hours on the day of the inverter
4561	2	R	1min	Line Work Time Todya				Bypass working hours on the day
4562~4563	4	R		Reserve				
4564~4565	4	R	0.1KWH	Load Consum Line Total				The load cumulatively consumes electricity from the mains
4566	2	R	1h	Inv Work Time Total				Cumulative working hours of the inverter
4567	2	R	1h	Line Work Time Total				Cumulative working hours for bypasses
4568~4599	64	R/W	/	Reserve				obligate
Fault logging								
4600~4615	32	R	/	FaultHistoryRecord				Each fault record occupies 16 addresses, and a total of 16 fault records are stored.

									Fault Record Internal Data Format Definition: (Defined by Internal Offset Address) 0x00: Fault code, the specific definition of fault code is shown in the instruction manual. If the value of the fault code is 0, the fault record is invalid. 0x01~0x03: The time when the fault code occurs 0x04~0x0F: A total of 12 data packets captured at the time of the failure.