CW 100-485 communication protocol

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1. CW 100, Communication data can be divided into functional code data and non-functional code data, the latter includes running command, running status, operation parameters, alarm information, etc.

I .1 CW 100 functional code data

Function code data is the important setting parameters of the frequency converter, as follows:

CW 100 FC data	Group P (readable)	P 0、P 1、P 2、P 3、P 4、P 5、P 6、P 7、P 8、P 9、PA 、PB
	Group A (readable and written)	A 0、A 1、A 2、A 5、A 6、A 7、A 8、A 9、AA 、AB 、AC

The function code data mailing address is defined as follows:

1. When reading the functional code data for the communication

For the functional code data of P 0 ~ PF and A 0~AF groups, the higher communication address directly indicates the functional group number, and the lower 16 functional code directly indicates the serial number in the functional group. The examples are as follows:

1) P 0-16 functional parameters, whose communication address is F 010H, where F 0H represents the functional parameters of P 0 group and 10H represents the hexadecheal data format of the function number 16 in the functional group

2) AC-08 function parameters, whose mailing address is AC 08, where ACH represents the function parameter of AC group and 08H represents the hexadecimal data format of function number 8 in the function group

2, when writing for communication, into the functional code data

For the function code data of P 0 ~ PF group, its communication address is 16 points high, and according to whether EEPROM is written, it is divided into 00~0F or F 0~FF. 16 points low is directly the serial number of the function code in the function group. The examples are as follows:

1) Write the function parameters P 0-16

Without writing to the EEPROM, its mailing address is 0010H

When EEPROM needs to write, its mailing address is F 010H

For the function code data of A 0 to AF group, its communication address is 16 years high, which is divided into 40 to 4 F or A 0 to AF according to whether EEPROM is required. 16 years low is directly the serial number of the function code in the function group. The examples are as follows:

2) Write the functional parameters AC-08

When writing to a EEPROM is not required, its mailing address is 4C 08H

When EEPROM needs to write, its mailing address is AC 08H

I .2 CW 100 non-functional code data

CW 100 NOT"function Code data	Status Data (read-only)	Monitoring parameters of U group, fault description of converter and operating status of converter
	Control parameters (write-only)	Control command, communication set point, digital output terminal control, analog output AO1 control, analog output AO 2 control, high-speed pulse (FMP) output control, and parameter initialization

1. Status data

Status data is divided into U group monitoring parameters, converter fault description and converter operating status

1) U group parameter monitoring parameters

For the description of the monitoring data of group U, see the relevant descriptions in Chapter 5 and Chapter 6. The address of group U is defined as follows: U 0 ~ UF is 70~7F, and the lower mailing address of group group 16 is the serial number of the monitoring parameters in the group. The example is as follows: U011, whose mailing address is 700 BH

2) Failure description of the frequency converter

When reading the fault description of the converter, the communication address is fixed to 8000H. By reading the address data, the upper computer can obtain the fault code of the current converter. The description of the fault code is defined in Chapter 5 F 9-14 function code

3) Operation status of the frequency converter

When the communication reads the operating state of the inverter, the communication address is fixed to 3000H. By reading the address data, the upper computer can obtain the operating state information of the current operation of the inverter, which is defined as follows:

Frequter operating status address	Read the state word definition
3000H	1: Is running
	2: Reverse operation
	3: Downtime

2. Control the parameters

The control parameters are divided into control command, digital output terminal control, analog output AO1 control, analog output AO2 control, and high-speed pulse (FMP) output control

1) Control the command

When F0-02 (command source) is selected as 2: communication control, the upper computer can realize the relevant command control of the start and stop of the inverter through the communication address. The control command is defined as follows:

Control the command mailing address	Command function
2000H	1: Is running
	2: Reverse operation
	3: Positive, turn the point to move
	4: Reverse point movement
	5: Free shutdown
	6: reduce, speed stop
	7: Therefore, the obstacle is

	reset

2) Communication setting point

Communication set value In CW 100, frequency source, torque ceiling source, VF separation voltage source, PID given source and PID feedback source select the given data of communication set timing. The corresponding address is 1000H, and when the host corresponding address value is set, the data range is-10000~10000, corresponding to the given value-100.00%~100.00%

3) Digital output terminal control

When the digital output terminal function is selected as 20: communication control, the upper computer can change through the communication address

Control of the digital output terminal of the frequency device, defined as follows:

The digital output terminal controls the mailing address	Command content
2001H	BIT 0: DO 1 output control BIT 1: DO 2 output control BIT 2: RELAY 1 output control BIT 3: RELAY 2 output control BIT 4: FMR output control BIT 5: VDO 1 BIT 6: VDO 2 BIT 7: VDO 3 BIT 8: VDO 4 BIT 9: VDO 5

4) Analog output AO 1, AO 2, high-speed pulse output FMP control

When the analog output is AO 1 and AO 2, and the high speed pulse output FMP output function is selected as 12: communication setting, the upper computer computer can control the inverter analog output and high speed pulse output through the communication address, which is defined as follows:

Output control mailing address		Command content
AO 1	2002H	0 ~ 7 FFF indicates between 0% and 100%
AO 2	2003H	
F MP	2004H	

5) Parameter initialization

This function is required when the parameter initialization of the inverter is required through the upper computer.

If FP-00 (, user password) is not 0, the password needs to be verified through communication first. After the verification, the upper computer will initialize the parameter within 30 seconds.

The communication address for user password verification is 1F 00H. If the correct user password is written to the address, the password verification can be completed

The address is 1F 01H and its data content is defined as follows:

The parameter initializes the mailing address	Command function

1F 01H	1: Restore the factory parameters
	2: Clear and record the information
	4: Restore the user backup parameters
	501: Backup user current parameters

2. CW 100 Modbus Communication protocol

The CW 100 series inverter provides RS 485 communication interface and supports Modbus-RTU slave station communication protocol. Users can realize centralized control through the computer or PLC, set the frequency converter operation command through the communication protocol, modify or read the function code parameters, and read the working state and fault information of the frequency converter.

.12 Agreement content

The serial communication protocol defines the information content and usage format transmitted in the serial communication. This includes: host polling (or broadcast) format; host coding method, including: required action function code, transmission data and error check. The response of the slave also adopts the same structure, including: action confirmation, return data and error verification, etc. If the slave has an error while receiving the information, or cannot complete the action required by the host, it will organize a failure information and feedback to the host in response.

.12.1 Application mode

The frequency converter is connected to the "single-master and multi-slave" PC / PLC control network with RS 485 bus, serving as the communication slave.

.1.22 Bus structure

1. Hardware interface

Insert RS 485 into the inverter and expand the card MD 38TX 1 hardware.

2, extension, pu structure single host multiple slave system. Each communication device in the network has a unique slave station address, with a device serving as a pass

The host (often flat PC host, PLC, HMI, etc.), actively initiate communication, read or write the slave parameters, other devices are in the communication slave, in response to the host's inquiry or communication operation. Only one device can send the data at the same time, while the other devices are in the receiving state. The setting range of the slave address is 1~247,0 is the broadcast communication address. The slave address in the network must be unique.3, the communication transmission mode of asynchronous serial, half-duplex transmission mode. In the process of serial asynchronous communication, data sends one frame of data at a time in the form of packets. It is agreed in the MODBUS-RTU protocol that when the idle time of no data on the communication data line is greater than that 3.5 Transmission time of Byte, indicating the start of a new communication frame.

The built-in communication protocol of CW 100 series inverter is Modbus-RTU slave communication protocol, which can respond to the "query / command" of the host, or make corresponding actions according to the "query / command" of the host, and communicate the data response. Host can refer to personal

computer (PC), industrial control equipment or programmable logic controller (PLC),

The host can communicate with a single plane and publish broadcast information to all lower planes. For the separate access query / command of the host, the visited slave returns a reply frame; for the broadcast information, the host needs no feedback response to the host.

2.2 Communication data structure

The Modbus protocol communication data format of CW 100 series frequency converter is as follows. frequency converter only supports reading or writing of Word parameters, the corresponding communication read command is 0x 03; write command is 0x06, and byte or bit reading is not supported:

In theory, the upper computer can read several consecutive function codes at a time (that is, n can be up to 12), but it should be noted that it can not cross the last function code of this function code group, otherwise the reply will be wrong.

If the communication frame error is detected by the machine or causes unsuccessful reading and writing for other reasons, the error frame will be answered.

1. Description of the data frame field:

Frame-head START	More than 3.5 characters of the transfer time is idle
Deliver address ADR	Address address range: 1 ~ 247; 0 = Broadcast address
command code CMD	03: Read the slave parameters; 06: Write the slave parameters
Function code address H	The parameter address inside the inverter is indicated in 16 system; it is divided into functional codes and non-functional codes (such as running status parameters, running commands, etc.), see the address definition for details. When transmitting, high bytes are in front and low bytes are back.
Function code address L	
The number of functional codes, H	If the number of functional codes read in this frame is 1 indicates that one functional code is read. When transmitting, high bytes are in front and low bytes are back. This agreement can only rewrite one function code at a time, without this field.
The number of functional codes, L	
data H	Answer data, or data to be written, is transmitted with high bytes before and low bytes behind.
data L	
CRC CHK Low level	Detection value: CRC 16 check value. When transmitting, low byte in front, high word After the festival. The calculation method is described in this section of CRC calibration for details.
CRC CHK High level	
END	At the time of 3.5 characters

2. CRC calibration mode:

The CRC (Cyclical Redundancy Check) uses the RTU frame format, and the message includes an error detection domain based on the CRC method. The CRC domain detects the content of the entire message. The CRC domain is two bytes containing a 16-bit binary value, which is added to the message after calculated by the transmission device. The receiving device recalculates the CRC of the received message and compares the value with the received CRC domain, and if two CRC values are not equal, there is a transmission error. CRC is done by first saving 0xFFFF and then calling a process to process the continuous 8-bit bytes in the message with the value in the current register. Only 8 Bit data in each character is valid for CRC, and both start and stop bits and parity bits are invalid. During CRC generation, each 8-bit character is different from the register content (XOR), and the result is different to the lowest effective bit, and

not if the LSB is 0. The entire procedure was repeated 8 times. After the last digit (8th digit) is completed, the next 8-bit byte is separately different from the current value of the register. The value in the final register is the CRC value after all bytes in the message.
When CRC is added to the message, low bytes join first, then high bytes.

Address definition of the communication parameter

Read and write function code parameters (some function codes cannot be changed and are only for manufacturers or monitoring):

2.3 Function code parameter address marking rules

Represent the rule with the function code group number and the reference code as the parameter address:

High bytes: F 0~FF (Group P), A 0~AF (Group A), 70~7F (Group U)

Low Bytes: 00 to FF

For example, for the range function code F 3-12, the access address of the function code is expressed as

0xF 30C; Note:

1) PF group: neither read parameters nor change parameters;

2) U group: can only be read, can not change the parameters.

Some parameters cannot be changed when the frequency converter is in operation; some parameters cannot be changed; change the function code parameters, note the parameter range, units, and relevant instructions.

Function code group number	Communication visit, ask for the address	Communication fies the function code address in RAM
From the P 0 to the PE group	0xF 000 ~ 0xFEFF	0x 0000 ~ 0x 0EFF
From A 0 to AC group	0xA 000 ~ 0xACFF	0x 4000 ~ 0x 4CFF
U 0 group	0x 7000 ~ 0x 70FF	

Note that because EEPROM is frequently stored, it will reduce the service life of EEPROM, so some function codes are not stored in communication mode, just change the value in RAM.

1) If it is a P group parameter, to achieve the function, as long as the high F of the function code address into 0.

2) If it is A group A parameter, to realize the function, just change the high A of the address of the function code into 4

can realize. The corresponding function code address is indicated as follows:

High bytes: 00~0F (Group P), 40~4F (Group A)

Low Bytes: 00 to FF

in compliance with:

Function code P 3-12, not stored in EEPROM, the address is 030C;

Function code A 0-05, not stored in EEPROM, the address is 4005;

This address means that can only write RAM, can not read the action, read, invalid address.

For all the parameters, this function can also be implemented using the command code 07H.

The data is given by the host computer through the communication address 0x 1000. The data format is the data with 2 decimal places, and the data range is-F 0-10~ + F 0-10.

1. Stop / operation parameters:

Parameter address	parametric description	Parameter address	parametric description
1000H	* Communication Setpoint (decimal) 10000 ~ 10000	1010H	PID set up
1001H	running frequency	1011H	PID feedback
1002H	busbar voltage	1012H	PLC step
1003H	output voltage	1013H	PULSE Input pulse frequency in 0.01kHz

1004H	output	1014H	Feedback speed in 0.1Hz
1005H	output power	1015H	The remaining running time
1006H	output torque	1016H	AI 1 pre before voltage
1007H	running speed	1017H	AI 2 pre front voltage
1008H	The DI input flag	1018H	AI 3 pre front voltage
1009H	The DO output flag	1019H	linear velocity

100AH	AI 1 voltage	101AH	Current power-on time
100BH	AI 2 voltage	101BH	Current running time
100CH	AI 3 voltage	101CH	PULSE Input pulse frequency in 1Hz
100DH	Count the numerical input	101DH	Communication set value
100EH	Length value input	101EH	Actual feedback speed
100FH	loading speed	101FH	Main frequency X is shown
-	-	1020H	Auxiliary frequency Y is shown

pay attention to:

1) The communication set value is the percentage of the relative value, and 10000 corresponds to 100.00%, and-10000 corresponds to-100.00%.

2) For the data of frequency dimension, the percentage is the percentage of the relative maximum frequency (F 0-10); for the data of torque dimension, the percentage is F 2-10 and A 2-48 (the torque upper limit number is set, corresponding to the first and second motors respectively).

2. Enter the control command to the frequency converter: (write only)

Command word address	Command function
2000H	0001: Forward turn operation
	0002: reverse operation
	0003: Positive turning point movement
	0004: reverse point movement
	0005: Free shutdown
	0006: deceleration stop
	0007: Fault is reset

3. Read the frequency converter status: (read-only)

status word address	State word function
3000H	0001: Forward turn operation
	0002: reverse operation
	0003: shut down

4, parameter lock password check: (if the return is 8888H, that is, the password check passed)

Password address	Enter the contents of the password

1F 00H	*****

5. Digital output terminal control: (write only)

command address	Command content
	BIT 0: DO 1 output control BIT 1: DO 2 output control

2001H	BIT 2: RELAY 1 output control BIT 3: RELAY 2 output control BIT 4: FMR output control BIT 5: VDO 1 BIT 6: VDO 2 BIT 7: VDO 3 BIT 8: VDO 4 BIT 9: VDO 5

6. Analog output AO 1 control: (write only)

command address	Command content
2002H	0 ~ 7 FFF indicates between 0% and 100%

7. Simulated output AO 2 control: (write only)

command address	Command content
2003H	0 ~ 7 FFF indicates between 0% and 100%

8. Pulse (PULSE) Output control: (write only)

command address	Command content
2004H	0 ~ 7 FFF indicates between 0% and 100%

9. Failure description of the frequency converter:

Fault address of the frequency converter	Inverter fault information	Inverter fault information
8000H	0000: No fault 0001: Hold on 0002: accelerated overcurrent 0003: deceleration overcurrent 0004: Constant-speed over-current 0005: accelerated overvoltage 0006: decelerated overvoltage 0007: Constant speed overvoltage 0008: Buffered resistance overload fault 0009: undervoltage fault 000A: frequency converter overload 000B: Motor overload	0015: abnormal parameter read and write 0016: Frequency converter hardware failure 0017: Motor short circuit to ground fault 0018: Hold on 0019: Hold on 001A: Run time arrives 001B: User-defined fault 1 001C: User-defined fault 2 001D: Power-on time arrives 001E: drop load 001F: PID feedback is lost during runtime 0028: Fast current limit timeout fault 0029: Switching motor fault during operation

	000C: Enter the missing phase 000D: output output phase 000E: the module is overheating 000F: External failure 0010: Communication is abnormal 0011: Conactor abnormal 0012: Current detection fault 0013: Motor tuning fault 0014: Encoder / PG card fault	002A: Speed deviation is too large 002B: Motor overspeed 002D: Motor over temperature 005A: Number of encoder lines set correctly 005B: Encoder is missed 005C: Initial position is wrong 005E: Speed feedback error

2.4 Description of the FD group communication parameters

Fd -00	Baud rate	Factory value	6005
	Set the scope	Individual bit: MODBUS baud rate	
		0: 300BPS 1: 600BPS 2: 1200BPS 3: 2400BPS 4: 4800BPS	5: 9600BPS 6: 19200BPS 7: 38400BPS 8: 57600BPS 9: 115200BPS

This parameter is used to set the data transmission rate between the upper computer computer and the frequency converter. Note that the baud rate set by the upper computer and the inverter must be consistent, otherwise, the communication cannot be carried out. The larger the port rate, the faster the communication speed.

Fd -01	data format	Factory value	0
	Set the scope	0: No check: data format <8, N, 2> 1: even test: Data format <8, E, 1> 2: odd check: data format <8, 0, 1> 3: No check: Data format <8-N-1>	

The data format set by the upper computer and the inverter must be consistent, otherwise, the communication cannot be carried out.

Fd -02	This machine address	Factory value	1
	Set the scope	1~247,0-bit radio address	

When the local address is set to 0, it is the broadcast address, realizing the broadcasting function of the upper computer. The local address is unique (except the broadcast address), which is the basis of realizing the point-to-point communication between the upper computer and the frequency converter.

Fd -03	Response delay	Factory value	2ms
	Set the scope	0~20ms	

Response delay: refers to the intermediate interval between the end of the inverter data acceptance and the data sent by the upward computer. If the response delay is less than the processing time of the system, the response delay shall be subject to the system processing time. If the response delay is longer than the system processing time, the system shall process the data and delay until the response delay time to send the data to the upper machine.

Fd -04	Communication super, time	Factory value	0.0 s
	Set the scope	0.0s (invalid); 0.1~60.0s	

The communication timeout time parameter is invalid when the function code is set to 0.0s.

When the function code is set to a valid value, if the interval between one communication and the next communication exceeds the communication timeout time, the system will report the communication fault error (Err 16). Usually, it is set to be invalid. If in a continuous communication system, you set the secondary parameters, you can monitor the communication status.

Fd -05	Communication association, discuss the selection	Factory value	0
	Set the scope	0: Non-standard Modbus protocol; 1: standard Modbus protocol	

Fd-05=1: the Modbus protocol for the selection criteria. Fd-05=0: When reading the command, the number of returned bytes is one byte more than the standard Modbus protocol, please see the "5 Communication Data Structure" section of this protocol.

Fd -06	Communication to read the current resolution	Factory value	0
	Set the scope	0: 0.01A ; 1: 0.1A	

Used to determine the output unit of the current value when the communication reads the output current.

3. Actual use of the reference

Use 485 communication to stop the frequency, start and stop.

3.1. Set P002 to 2 and select the communication command channel

Send control code: 01 06 F 0 02 00 02 9A CB

3.2 Set P003 to 9, and select the main frequency source for the given communication transmission control code:
01 06 F 0 03 00 09 8A CC

3.3 Start-up

Send control code: 01 06 20 00 00 01 43 CA

3.4 Set the operating frequency to 32 HZ with two decimal points, and the set value must be placed in the high level to send the control code: 01 06 10 00 20 00 94 CA

3.5 Stop

Send control code: 01 06 20 00 00 06 02 08