FA100 Series Inverter Communication and Case Studies

This inverter adopts the international standard Modbus communication protocol and supports master-slave communication in RTU format.

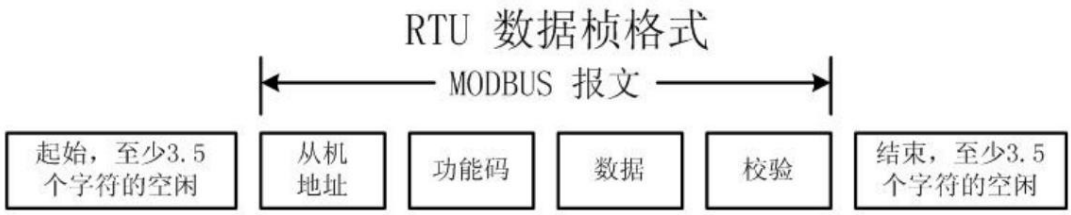
This inverter only supports reading/writing one data at a time. Users can use the PC/PLC, screen and other host computers

Realize centralized control (set inverter control commands, operating frequency, and modify related function code parameters,

The inverter working status and fault information monitoring, etc.) to meet specific application requirements.

1. Communication frame structure

The Modbus protocol communication data format of the inverter is RTU (Remote Terminal Unit) mode



The standard structure of RTU frame:

Frame header	START Idle slave address ADR greater than 3.5 character transmission time
Communication address range:	1 ~ 247; Command code CMD 03: read slave
parameters;	06: write slave parameters
Function code address H	The parameter address inside the inverter is expressed in hexadecimal. It is divided into function code type and non-function code type (such as operation status parameters, operation commands, etc.) parameters, etc. For details, see the address definition. When transmitting, the high byte is in front and the low byte is in the back.
Function code address L	
Function code number H	The number of function codes read in this frame. If it is 1, it means that 1 function code is read. When transmitting, the high byte is in front and the low byte is in the back. This protocol can only read and write 1 function code at a time, and there is no such field.
Function code number L	
Data H Data	The response data, or the data to be written, is transmitted with the high byte first and the low byte last.
L	
CRC CHK low	Test value: CRC16 check value. When transmitting, the low byte is in front and the high byte is in the back. For the calculation method, please refer to the description of CRC check in this section.
CRC CHK High	
END	3.5 characters

The specific format is described in the following example:

A. Set the frequency of inverter No. 1 to 50.0Hz. The format is as follows:

Host command:

Frame header 3.5 Byte Idle	
Address	0x01
function	0x06
code register address 0x03EB	
Register content 0x01F4	
Checksum	0xF9AD
END	3.5 Bytes Free

Inverter response:

Frame header 3.5 Byte Idle	
Address	0x01
function code	0x06
Register Address 0x03EB	
Register content 0x01F4	
Checksum	0XF9AD
END	3.5 Bytes Free

0x03EB (hexadecimal) = 1003 (decimal)

0x01F4 (hexadecimal) = 500 (decimal)

B. Read the operating frequency of inverter No. 1. The format is as follows:

Host command: Frame

header 3.5 Byte Idle	
Address	0x01
function	0x03
code register address 0x00DD	
Register number 0x0001	
Checksum	0x1430
END	3.5 Bytes Free

Inverter response:

Frame header 3.5 Byte Idle	
Address	0x01
function	0x03
code reads byte number 0x02	
Register content 0x01F4	
Checksum	0xB853
END	3.5 Bytes Free

When reading, the "Number of Registers" of this inverter only supports 1 0x00DD (hexadecimal) = 221 (decimal) 0x01F4 (hexadecimal) = 500 (decimal)

C. Response error frame format, error types are as follows:

01H: Data address exceeds the range

02H: 1. The number of data exceeds the range

2. The written data content exceeds the upper and lower limits

03H: During operation, writing of this data is not allowed

2. Communication related parameters description:

A. The following are parameters related to communication

parameter	name	Factory value	parameter description
P0-01	Frequency setting mode	0	0: Frequency digital setting (P0-03) 1: Panel potentiometer 2: External AI1 3: External AI2 4: PID adjustment setting 5: Digital setting, UP/DOWN rate is increased or decreased according to P5-20 6: Digital setting, UP/DOWN rate is increased or decreased according to P5-20, shutdown (non After power failure, the frequency returns to zero 7: Communication settings

If you need to set the frequency by communication, you can set P0-01=7, the corresponding address is 1003 (decimal). If you use other methods to set the frequency, Please set according to your needs.			
P0-02	Run command source selection	0	0: Keyboard control operation 1: Terminal operation, STOP key is invalid 2: Terminal operation, STOP key is valid 3: Communication command control
Control the start and stop of the inverter through communication, the corresponding address is 200 (decimal)			
P0-15	Local address	1	1 to 125
local address is unique, which is the basis for achieving point-to-point communication between the host computer and the inverter.			
P5-25	Communication baud rate	5	2: 1200BPS 3: 2400BPS 4: 4800BPS 5: 9600BPS 6: 19200BPS 7:38400BPS
This parameter is used to set the data transmission rate between the host computer and the inverter. The baud rates must be consistent, otherwise, communication cannot be carried out.			
P5-26	MODBUS data format	0	0: No check (8-N-1) 1: No check (8-N-2) 2: Even parity (8-E-1) 3: Odd parity (8-O-1)
The data format set by the host computer and the inverter must be consistent, otherwise, communication cannot be carried out.			
P5-27	MODBUS response delay Refers to the interval	20	0 to 200ms
between the inverter data reception and the sending of data to the upper computer. If the response delay is less than the system If the response delay is longer than the system processing time, the system processing time will be used as the basis. After completing the data, you need to wait until the response delay time is up before sending data to the host computer.			
P5-28	Serial communication timeout	0.0	0.0: Invalid (no detection) 0.1 to 60.0s
P5-29	Communication abnormal action selection select	0	0: Continue running 1: Alarm shutdown
When the function code is set to P5-28: 0.0 s, the communication timeout parameter is invalid. When the P5-28 function code is set to a valid value, if the interval between one communication and the next communication exceeds the communication timeout When P5-29:1, the system will report a communication fault error (CE) and shut down. Invalid. If this parameter is set in a continuous communication system, the communication status can be monitored.			

B. The corresponding RAM (not stored when power is off) communication addresses of all parameters from P0-00 to PA-26 in the parameter table are:

1000 to1191 (decimal). If you need to store data in EEPROM (power-off storage), subtract 1000.

The RAM address of power code P0-04 is 1004, while in EEPROM, the address is 0004.

The specific addresses of the parameters in the parameter table are detailed in the instruction manual. There is no such distinction for the related addresses in other non-parameter tables.

C. Other special addresses are as follows:

a) Monitoring parameter address (read only):

MODBUS communication address Address (decimal)	Data meaning	MODBUS communication address Address (decimal)	Data meaning
220	Set frequency	232	Accumulated inverter running time
221	Output frequency	233	Display input terminal
222	Output current	234	Display output terminal
223	Bus voltage	235	Display the rated power of the inverter

224	Motor speed	236	Display compensation frequency
225	current percentage	237	Display compensation voltage
226	IGBT temperature	238	Display Phase Angle
227	output voltage	239	Display load factor
228	output power	242	Analog AI1 given value
229	current count value	243	Analog AI2 given value
230	PID given value	244	Keyboard potentiometer given value
231	PID feedback value		

b) Communication control start and stop command address (readable and writable, valid when P0-02=3)

MODBUS communication address (decimal)	Data meaning
200	1: Forward operation 2: Forward jog 5: Reverse operation 6: Reverse jog 8: Stop 16: Free stop 32: Fault reset

c) Communication control running frequency address (readable and writable, valid when P0-01=7)

MODBUS communication address (decimal)	Data meaning
1003	The given value is the given frequency of the inverter.

d) Inverter status address (read only)

MODBUS communication address (decimal)	Data meaning
240	0: Inverter stopped 1: Forward running 2: Reverse running 3: Fault

e) Inverter fault address (read only)

MODBUS communication address (decimal)	Data meaning
241	1: Memory failure 3: Undervoltage 5: 4: Overvoltage Overload 6: Overcurrent 8: Output phase 7: Input phase loss loss 9: Output short circuit 10: System failure 11: External fault 12: PI fault 13: Overheating 14: Overcurrent 15: Motor overload 16: Contactor not engaged 20: Current detection signal failure 21: Communication failure

3. Application examples

A.Communicate with touch screen

Use the touch screen to control the start and stop of the inverter

The screen sets the inverter frequency

Real-time display of the inverter frequency and bus voltage.

a) Inverter parameter setting

P0-01=7 Communication given frequency

P0-02=3 Communication control inverter start and stop

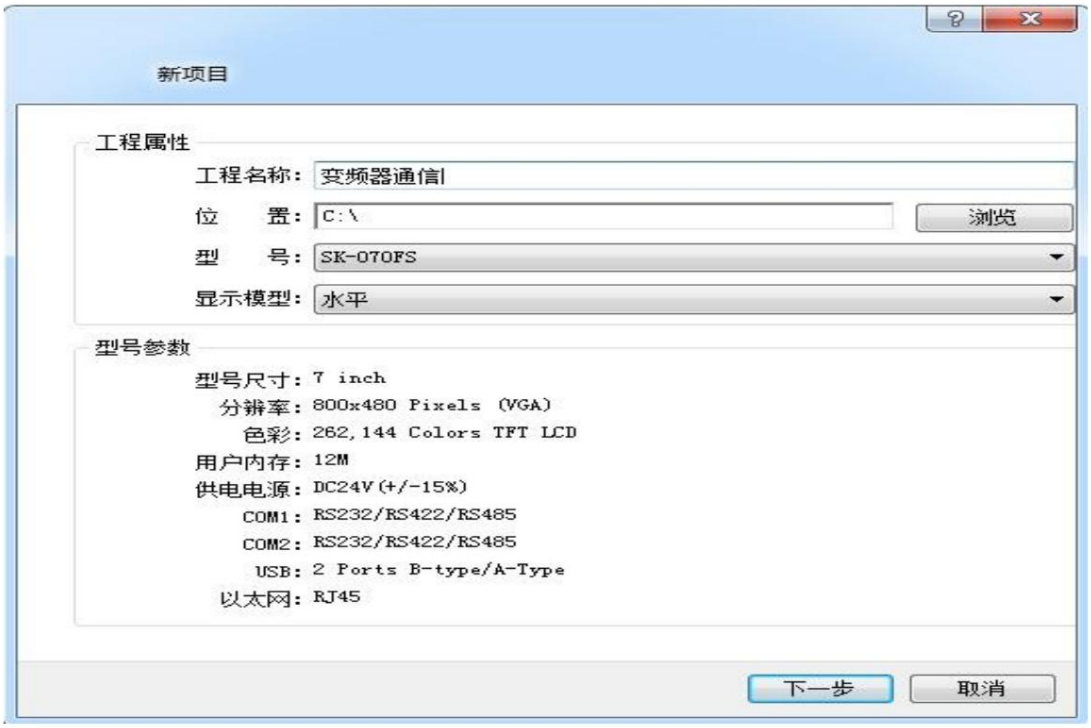
P0-15=1 Communication address is 1, corresponding to the host computer

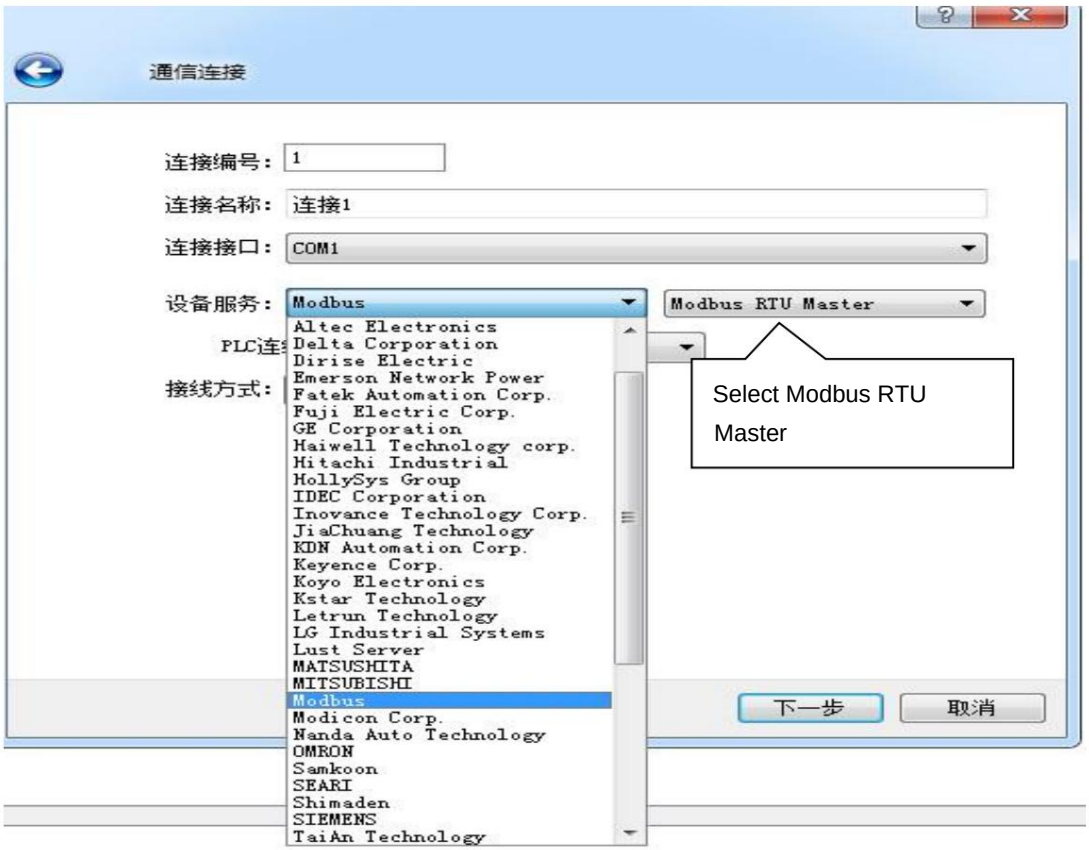
P5-25=5 The baud rate is 9600, corresponding to the host computer

P5-26=0 Data format is no check (8-N-1), corresponding to the host computer

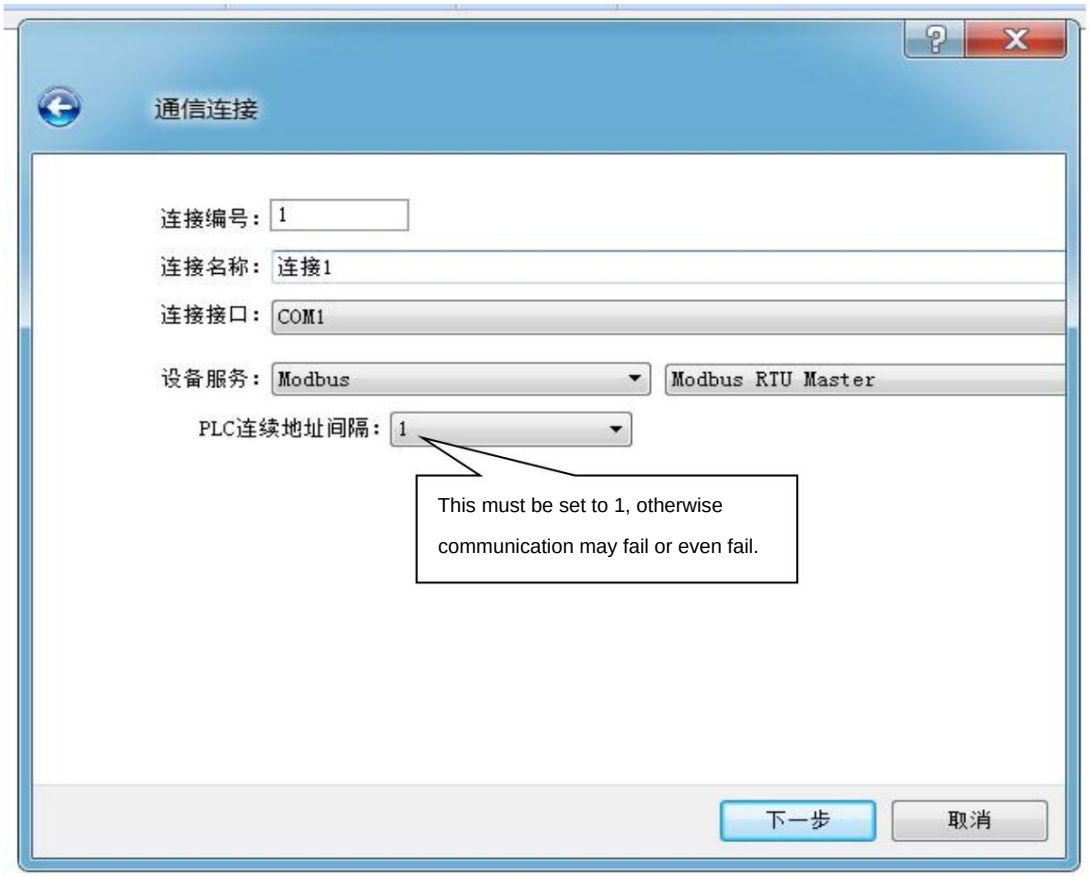
b) Touch screen settings

create a new file



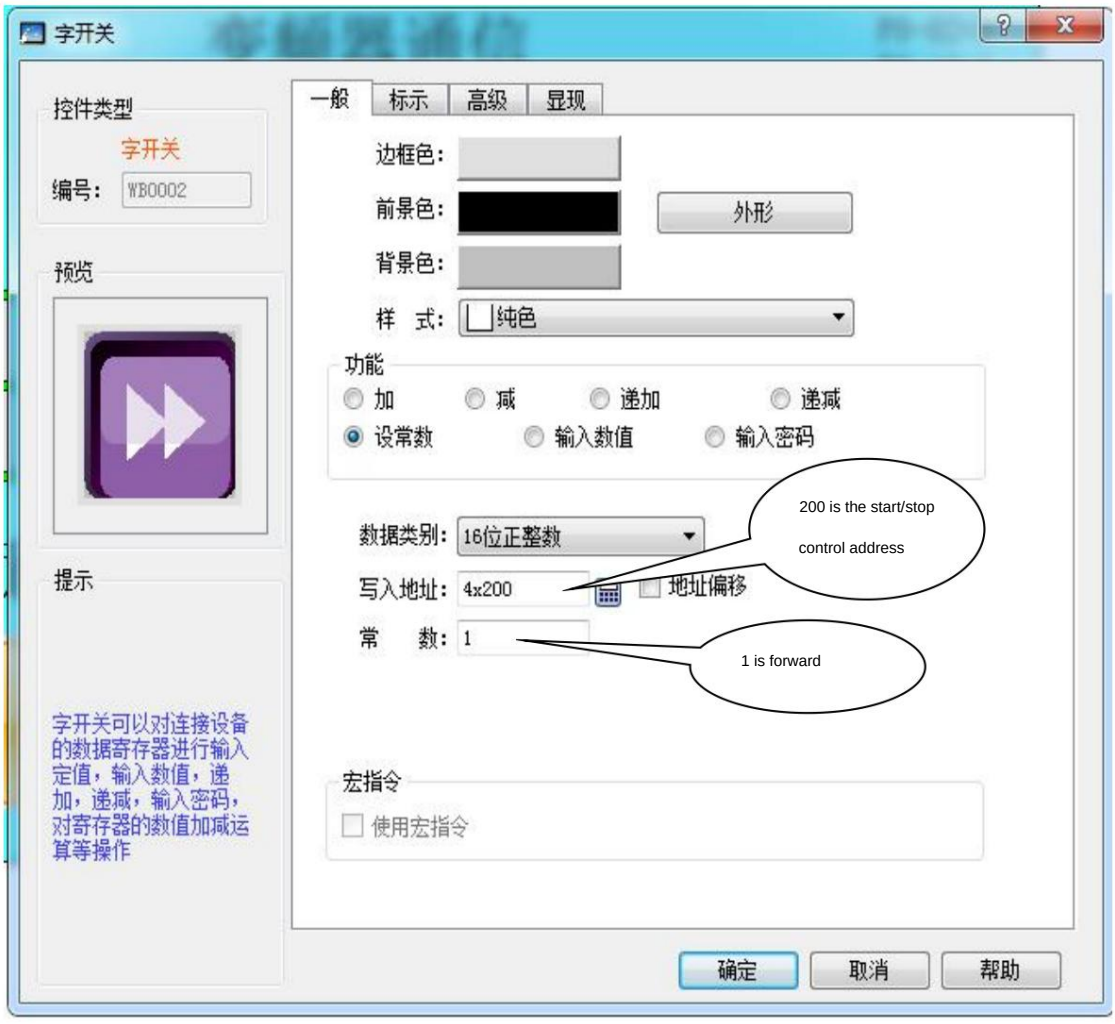


Communication connection and communication port property settings

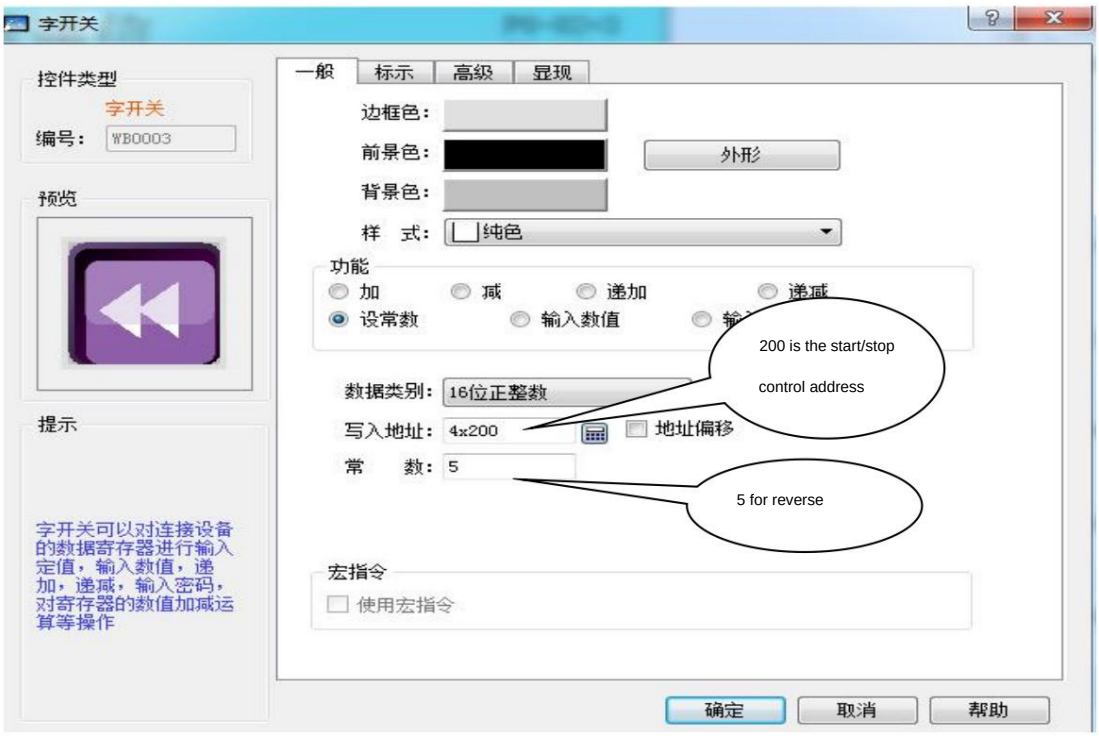


Program screen to be generated

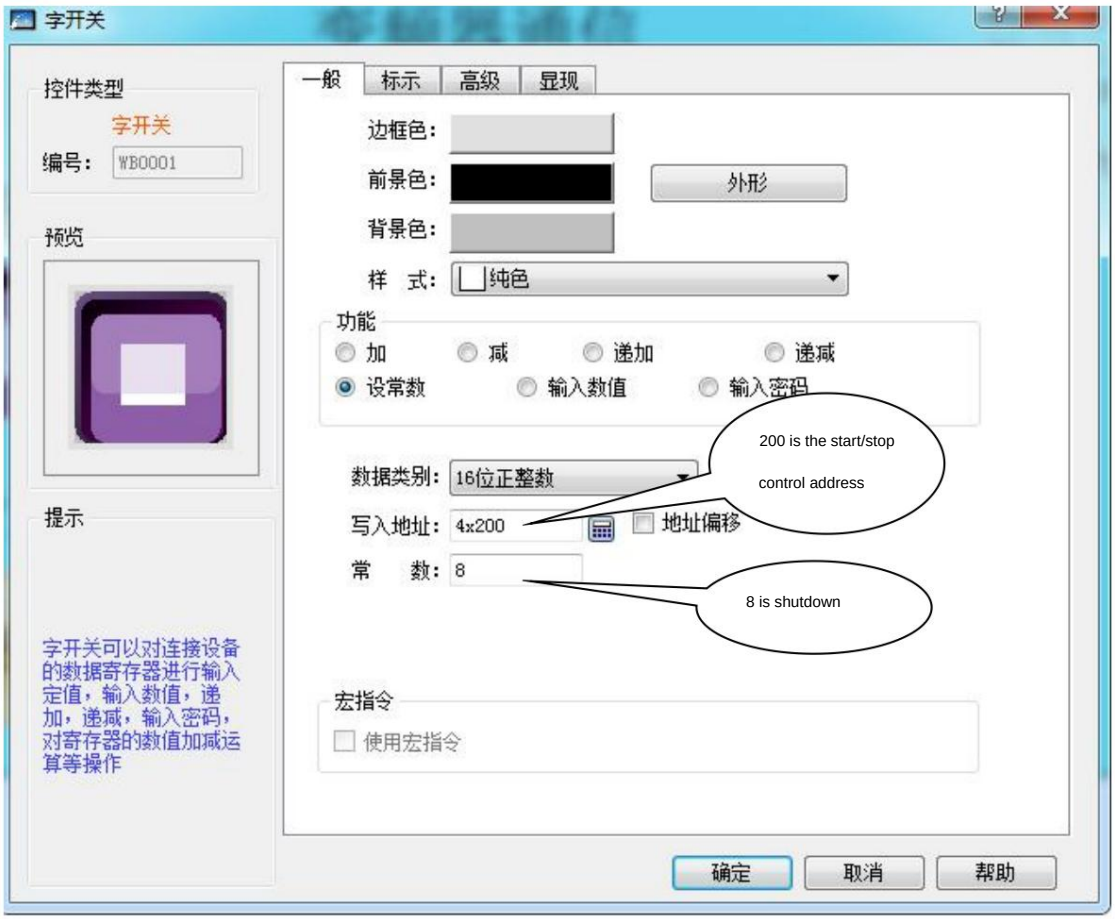
Setting of the forward switch button



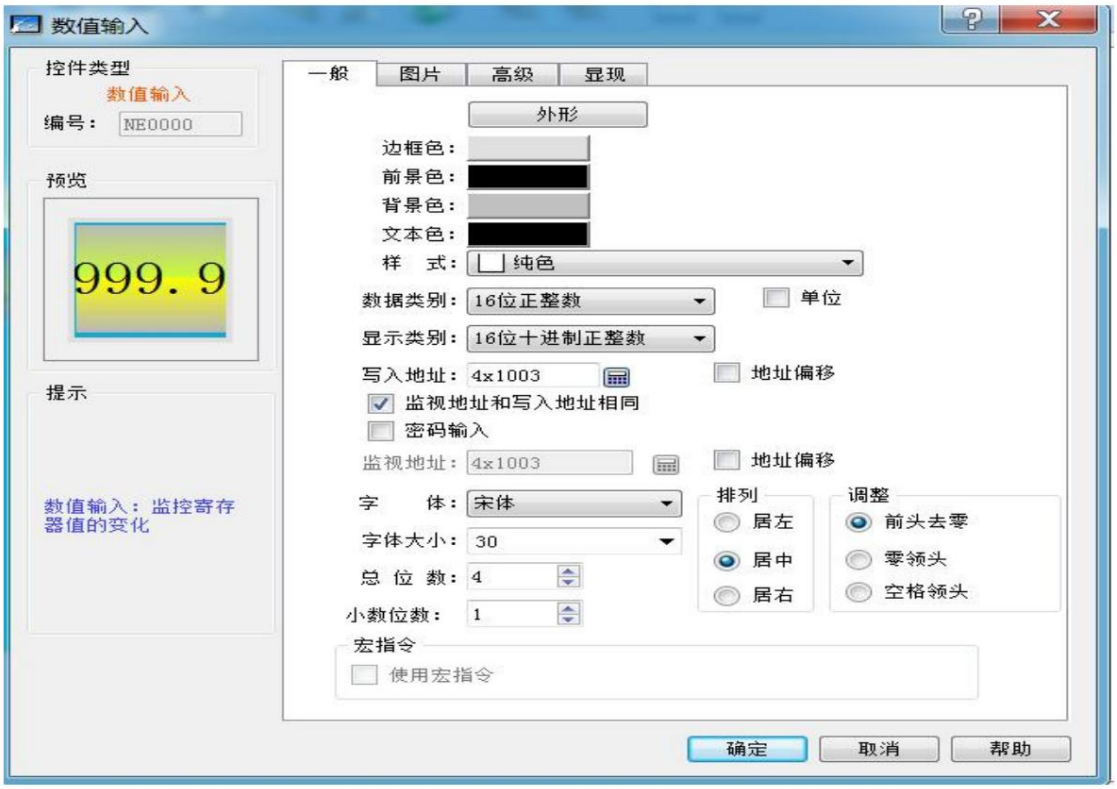
Reverse word switch button setting



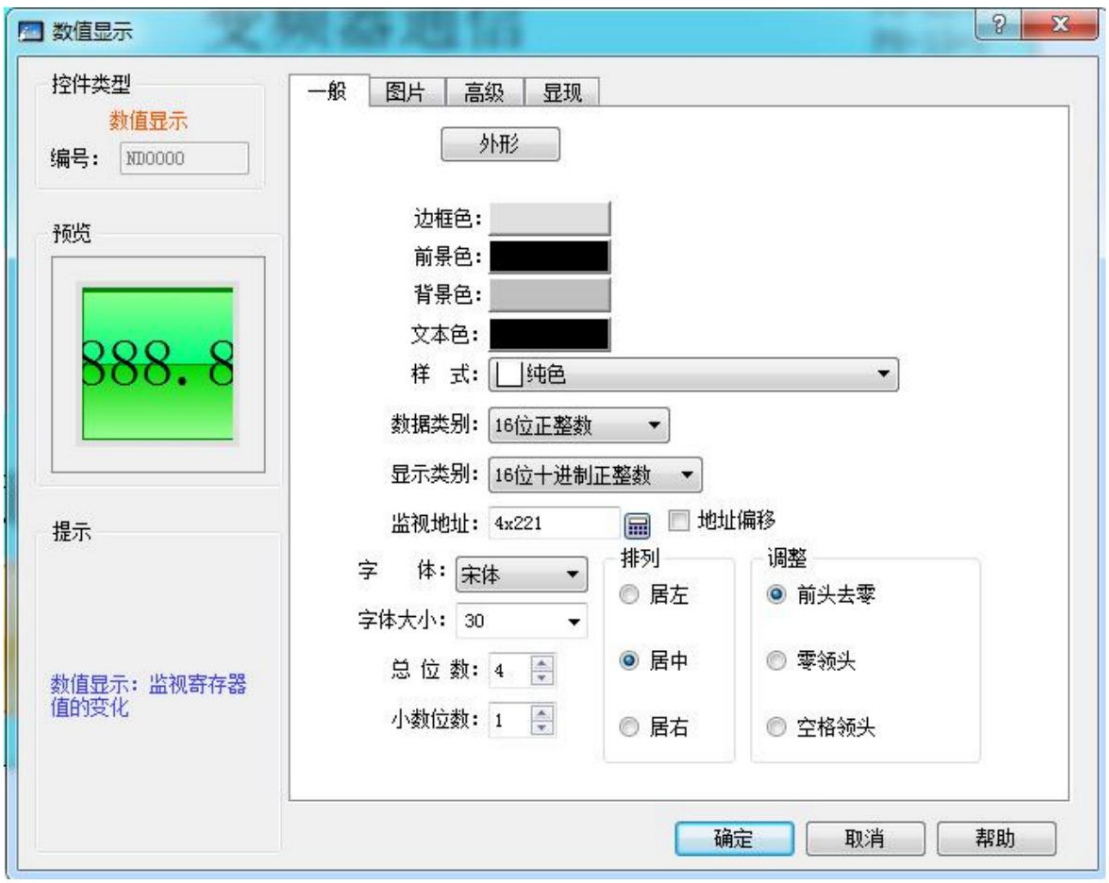
Setting of the stop switch button



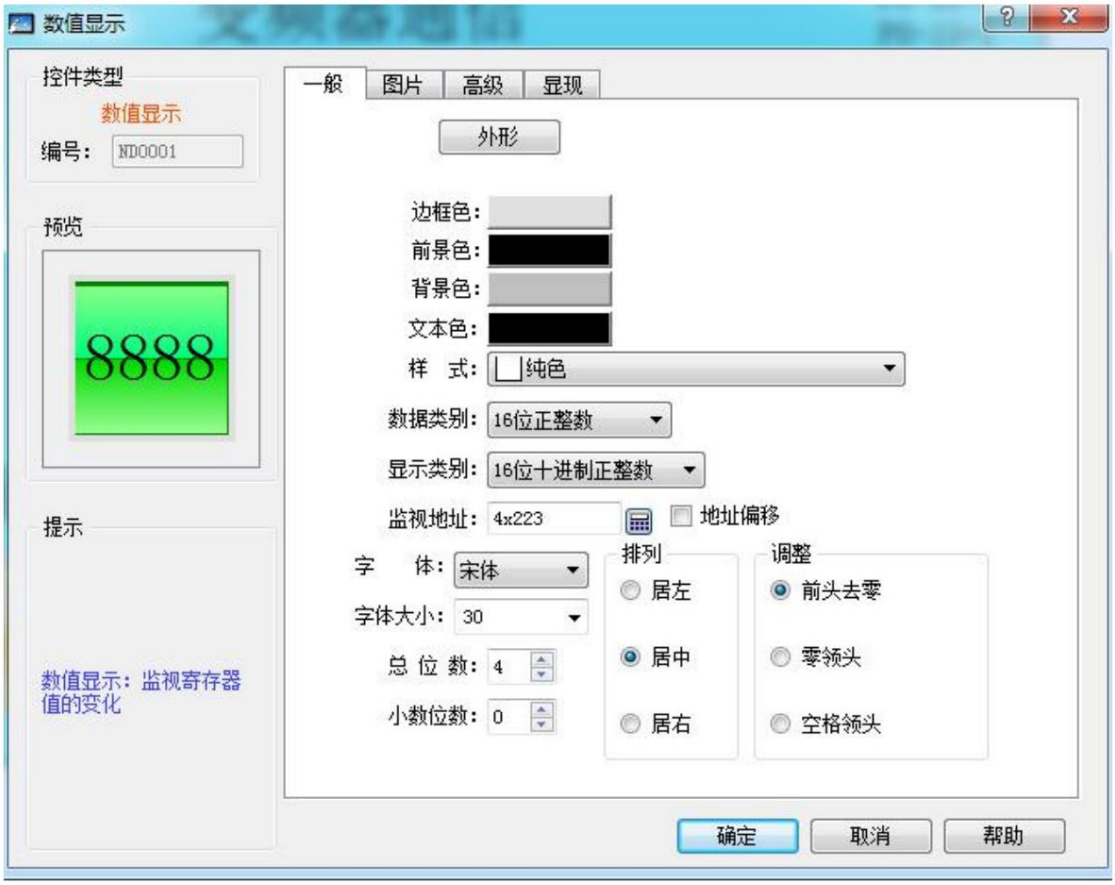
Frequency setting control



Frequency display control settings



Bus voltage display control settings



After the download is complete, the touch screen displays as follows:

Related register address description:

Register address (decimal) Function description Remarks Frequency setting		
1003	Write only Start-stop control Write	
200	only Running frequency Read only	
221	Bus voltage Read only	
223		

B. Communication between PLC and inverter

Control the start and stop of the inverter through communication

The frequency is set by the PLC, rising from 20Hz to 50Hz and then back to 20Hz

The real-time operating frequency is read into the PLC data memory

a) Inverter parameter setting

P0-01=7 Communication given frequency

P0-02=3 Communication control inverter start and stop

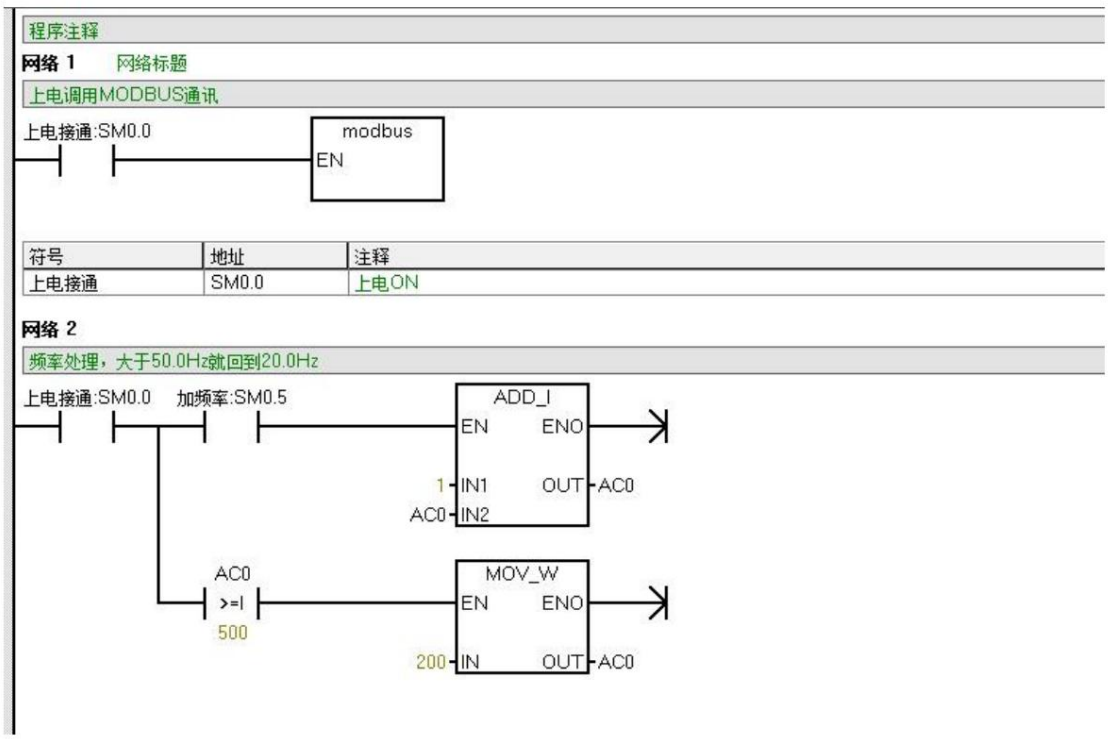
P0-15=1 Communication address is 1, corresponding to the host computer

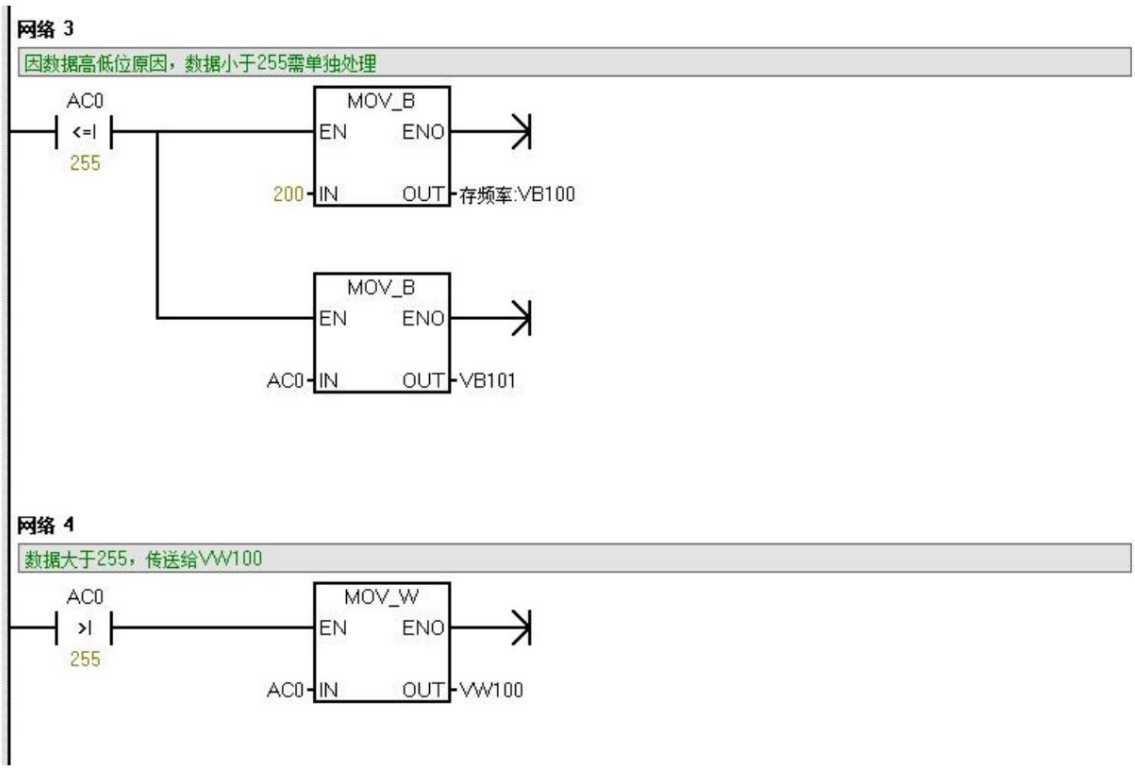
P5-25=5 The baud rate is 9600, corresponding to the host computer

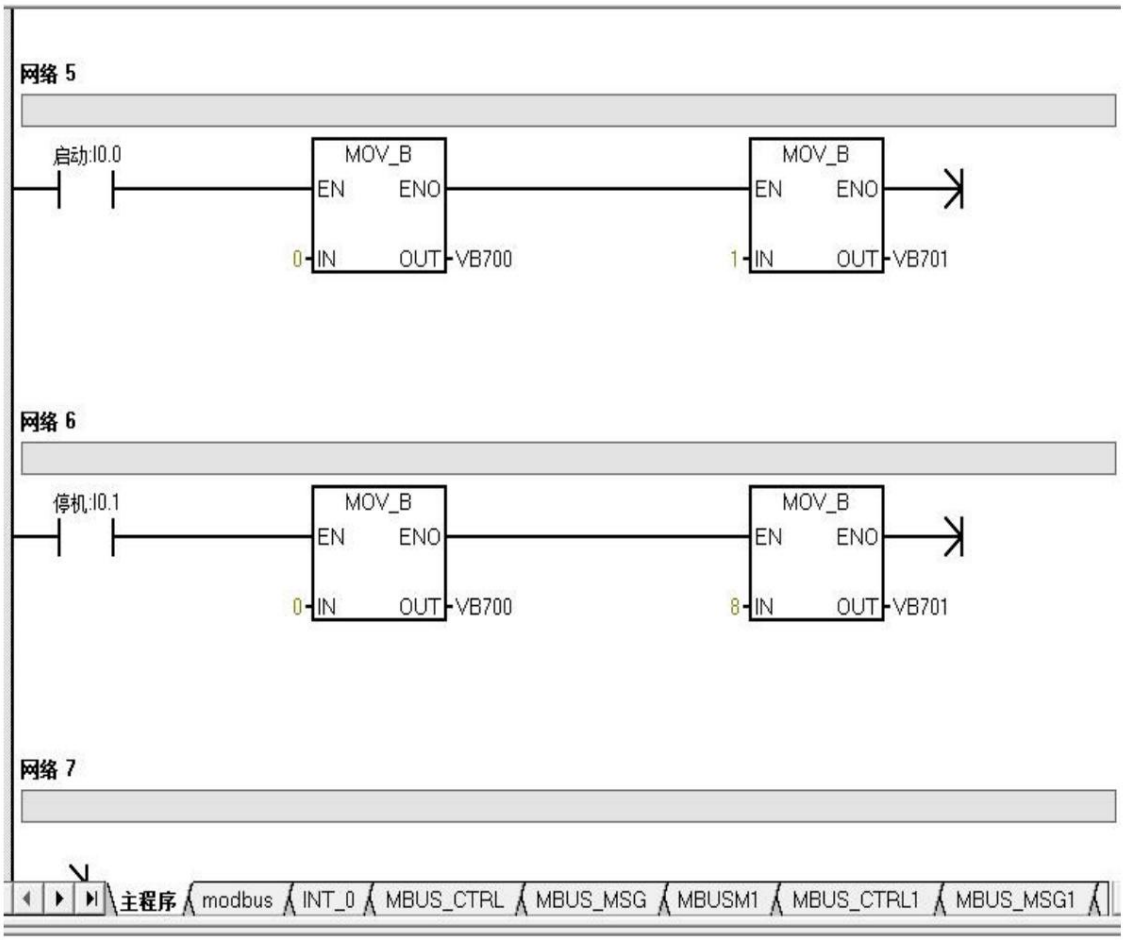
P5-26=0 Data format is no check (8-N-1), corresponding to the host computer

b) PLC setting and program writing

i. Communication between Siemens S200 and inverter





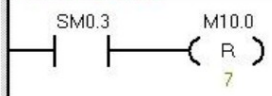


The above is the main program, the MODBUS program is as follows:

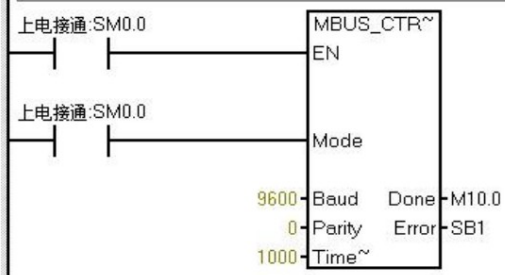
子程序注释

网络 1 网络标题

初始化，上电复位

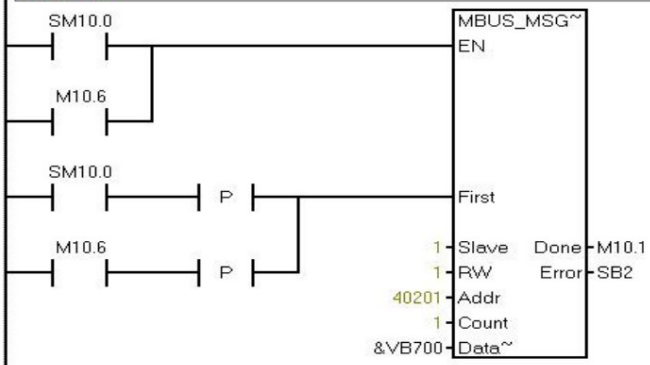


网络 2

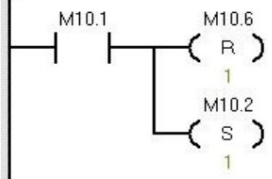


网络 3

写启停控制

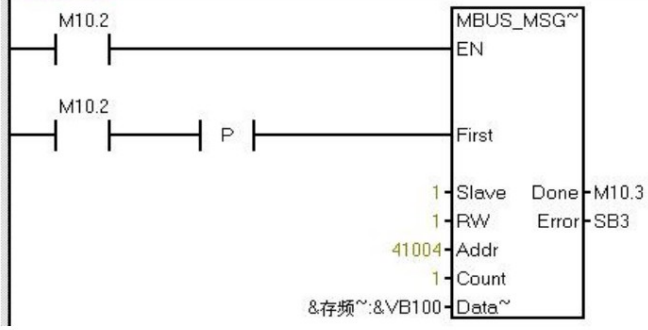


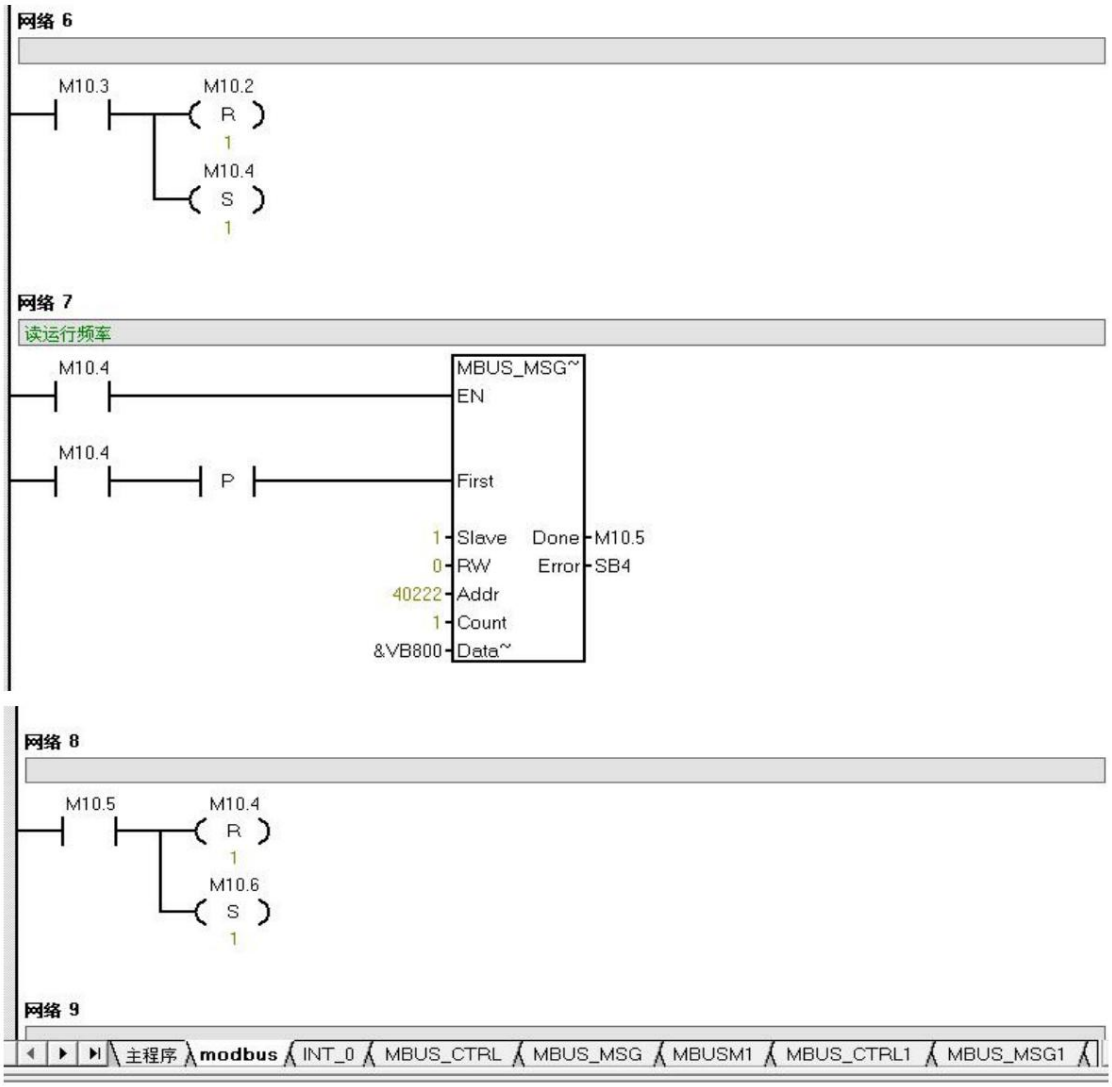
网络 4



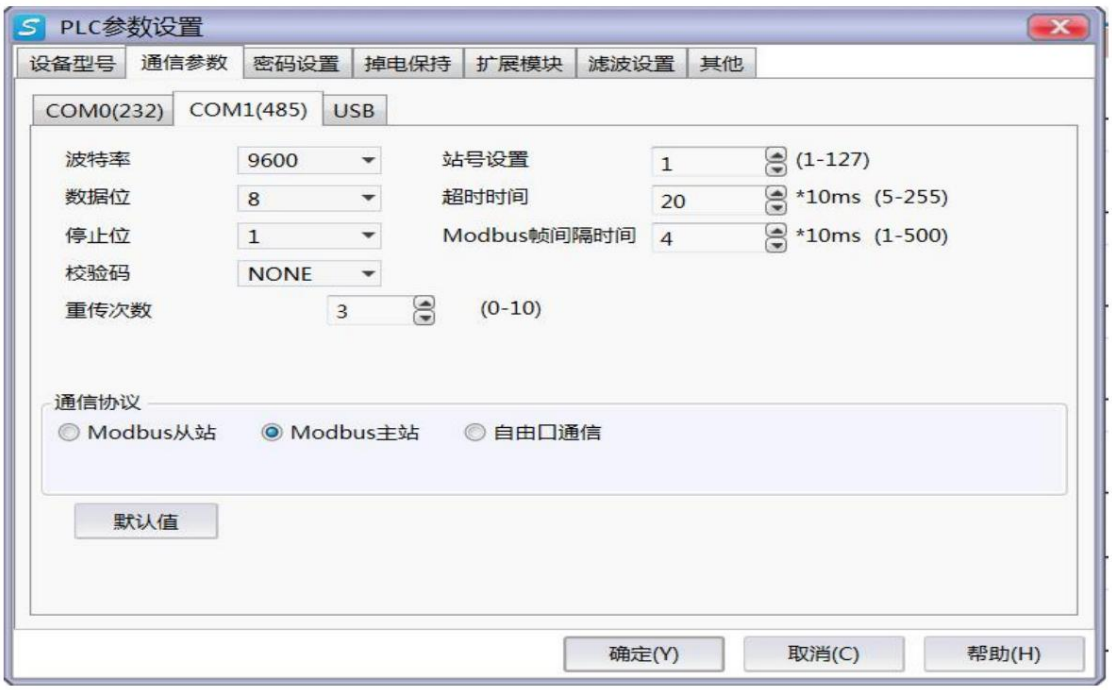
网络 5

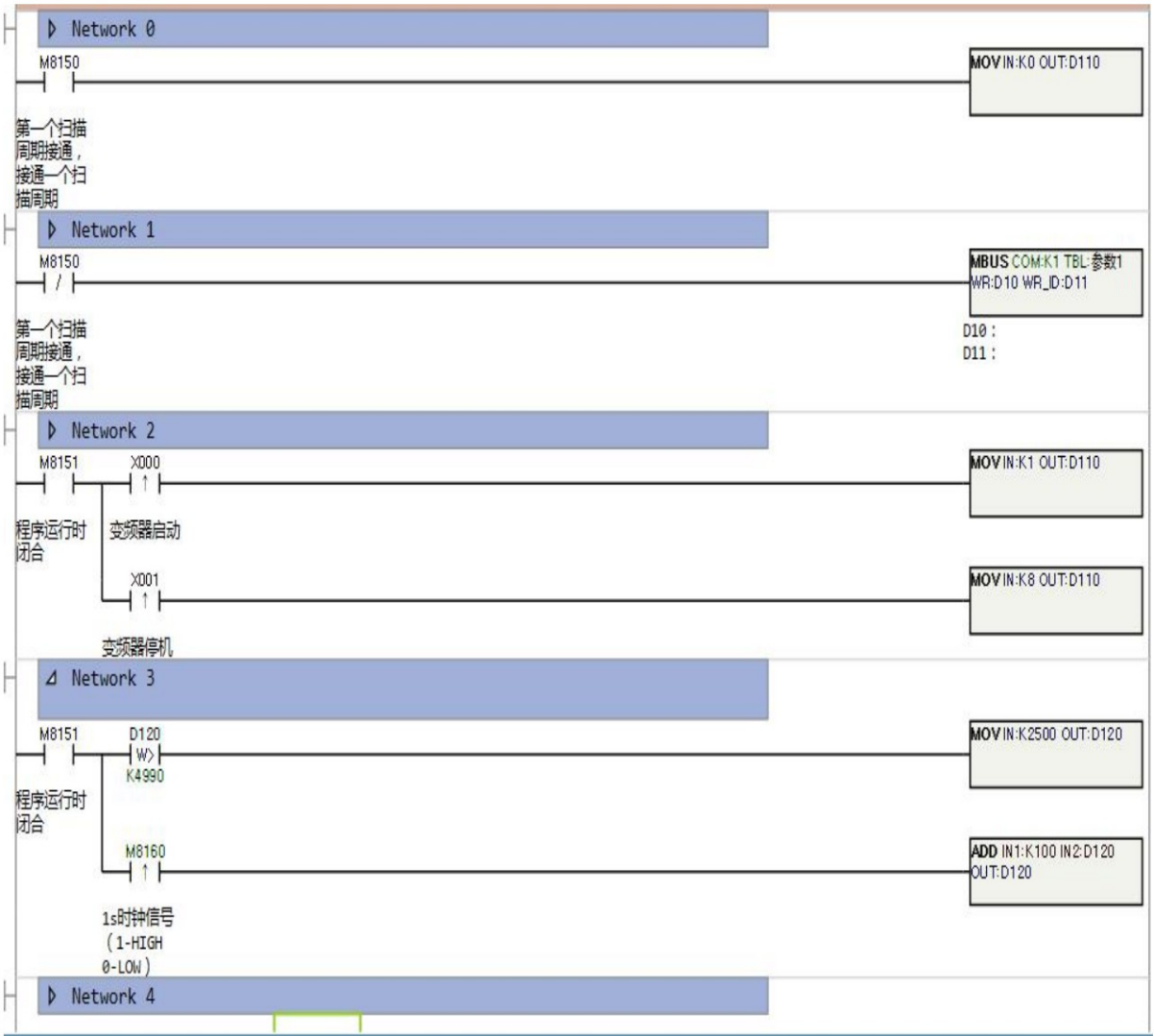
写给定频率





ii. Communication between display and control PLC and inverter





命令编号	从站号	功能码	从站寄存器	从站长度	主站寄存器
0	1	0x06(写字)(写单个寄存器)	200	1	D110
1	1	0x06(写字)(写单个寄存器)	1003	1	D120
2	**1**	**0x03(读字)(读保持寄存器)**	**221**	**1**	**D130**