

STM32F407-ENET Communication Function

1	FUNCTION DESCRIPTION	2
2	DESCRIPTION OF REGISTERS AND RELAYS:	3
2.1	THE SPECIAL RELAYS USED IN ENET:	3
2.2	THE SPECIAL REGISTERS USED IN ENET:	4
3	REFERENCE SCHEMATIC	5
4	ETHERNET PARAMETER SETTING	5
5	GX WORKS2 PROGRAMMING SOFTWARE CONNECTED VIA ETHERNET	8
6	CHANGE IP PARAMETER ADDRESS FUNCTION.....	9
7	APPLICATION OF MODBUS TCP / MODBUS UDP CLIENT	10
7.1	USE TCP PROTOCOL TO WRITE 0 TO D8438.....	10
7.2	USE UDP PROTOCOL TO WRITE PORT NUMBER OF TARGET SERVER TO D8438	10
7.3	MODBUS TCP / MODBUS UDP SERVER COMPONENT ADDRESS	11
8	SUPPORTED INSTRUCTIONS	11
9	ERROR CODE	12
10	TEST PROGRAM FUNCTION DESCRIPTION	14
11	APPENDIX	14

1 Function description

W5500 internally integrates full hardware TCP / IP protocol stack + MAC + PHY. The application has obvious advantages such as simple and fast, high reliability, good security, etc. The internal integration of 802.3 Ethernet MAC and 10BaseT / 100Base-T Ethernet PHY technology makes the hardware design of single-chip access to Ethernet solution more simple and efficient, but Does not support automatic polarity switching; supports SPI high-speed serial peripheral interface (up to 80Mhz)

8 independent hardware sockets, each communication does not affect each other;

- 1) By default, the five channels are all connected by MELSOFT, the fifth channel is the MODBUS TCP server function, the sixth channel supports SNTP (if SNTP is enabled on the programming software parameters), and the seventh channel supports the MELSOFT connection (fixed);
- 2) The parameter download software supports the automatic generation of MAC address parameters (generated by the algorithm, the probability of generating the same MAC address is lower) or fill in the MAC address by yourself (cannot be the same in the same local area network);
- 3) Use the SPI1 interface of STM32F407, the maximum speed is 41MHZ, please select the appropriate SPI rate according to the use occasion;
- 4) Support GX Works2 programming software to search the FXCPU function on the network, and automatically search out the FX3U and the corresponding IP on the network;
- 5) The new version of the program only supports the use of dedicated Ethernet parameter software to download parameters, and no longer supports GX Works2 programming software to download Ethernet parameters;
- 6) The currently supported connections are: 1. MELSOFT connection; 2. MODBUS S connection (MODBUS TCP (UDP) server); 3. SNTP connection; 4. MODBUS C connection (MODBUS TCP (UDP) client-UDP only supports one way (Supports up to 247 slave stations), TCP supports 7 channels (supports up to 7 slave stations));

Note:

- 1) After downloading the Ethernet parameters using the Ethernet parameter software, the new parameters will take effect only after the power is turned off and on;
- 2) GX Works2 programming software-diagnosis-Ethernet diagnostic function cannot be used, Ethernet parameters do not support GX Works2 setting;
- 3) The MAC address setting cannot be repeated in the local area network, you can choose to automatically generate on the parameter software, or you can choose the default MAC Address, just modify the last IP segment;

2 Description of registers and relays:

2.1 The special relays used in ENET:

Channel 1	Item	Remarks	R/W
M8404	ENET is ready	Normally detected W5500 reset successfully to ON.	R
M8406	Executing time setting	The Ethernet adapter is turned on when the time setting is performed.	R
M8411	Execution time setting	After ON, the Ethernet adapter performs time setting.	R/W
M8492	IP address storage area writing requirements	After turning it on, write the IP address settings saved in D8492 to D8497 to the IP address storage area in the basic unit.	R/W
M8493	End of writing to the IP address storage area	After writing, turn it on. It is also turned on when writing fails. IP address storage area write request M8492 is turned OFF after it turns from ON to OFF.	R
M8494	IP address storage area write error	After writing failed, it is turned ON. Address storage area write request M8492 turns OFF after it turns from ON to OFF.	R
M8495	Requirements for clearing the IP address storage area	When turned ON, the contents of the IP address storage area will be cleared.	R/W
M8496	IP address save area cleared	After clearing, turn ON. It is also turned on when clearing fails. Address storage area clear request M8495 will be turned OFF after it turns from ON to OFF.	R
M8497	IP address save area clear error	After the clearing fails, turn ON. The address storage area clear request M8495 will turn OFF after it turns from ON to OFF.	R
M8498	Change the running flag of IP address function.	Turns ON when the IP address saved in the IP address storage area is valid.	R

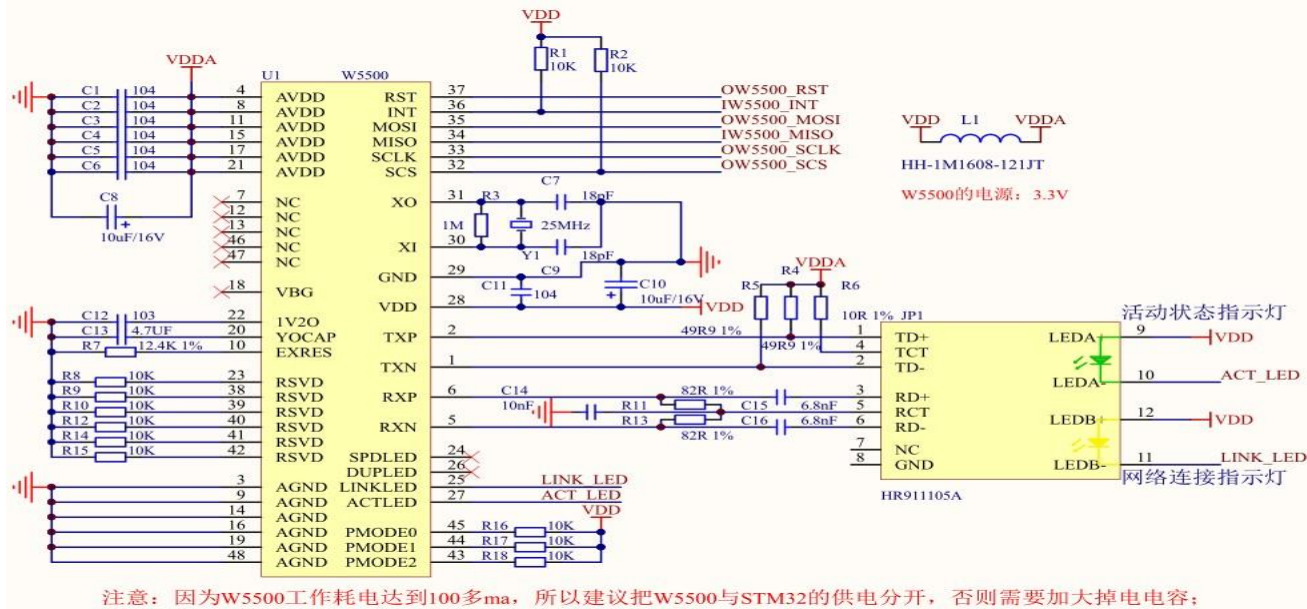
2.2 The special registers used in ENET:

Channel 1	Item	Remarks	R/W
D8405	Ethernet port connection status	Save the connection status of the Ethernet port of the Ethernet adapter. b10: connection status 0: The hub or target device is not connected or disconnected 1: Connecting with hub or target device b14: Data transmission speed 0: running in 10BASE-T 1: Running at 100BASE-TX	R
D8406	Save Ethernet adapter status	Save the Ethernet adapter state. b0: INIT 1: Initialization process ends normally, 0: — b2: 100M / 10M 1: 100Mbps, 0: 10Mbps / unlinked b3: ERR. 1: Set abnormal display, 0: Set normal display b4: COM.ERR 1: Communication abnormal display, 0: Communication normal display b5: 1: Initialization processing ends abnormally, 0:- b7: 1: Link signal is ON, 0: Link signal is OFF b8 ~ b15: Port number 0 ~ 7 0: initialization failed, 1: initialization successful	R
D8411	Time setting function action result	Save the operation result of the time setting function. 0: Not implemented 1: success -1: failed	R
D8413	W5500 program version	not support	R
D8415	MAC address of this site	Save the MAC address (all 3 words).	R
D8416			
D8417	Error code of the Ethernet adapter	Error code detected in the Ethernet adapter	R
D8418			
D8435			
D8436	MODBUS UDP destination IP address (low)	Set the lower bits of the UDP protocol communication destination IP address	R/W
D8437	MODBUS UDP destination IP address (high)	Set the high bits of the UDP protocol communication destination IP address	R/W
D8438	MODBUS UDP destination port address / TCP, UDP protocol selection	Set UDP protocol communication destination port address / TCP, UDP protocol selection (select TCP protocol when 0, non-0 is UDP protocol port address)	R/W
D8380	IP address (low)	The lower part of the IP address.	R
D8381	IP address (high)	The high part of the IP address.	R
D8382	Subnet mask (low)	The lower part of the subnet mask.	R
D8383	subnet mask (high)	The high part of the subnet mask.	R
D8384	Default router IP address (low)	The lower part of the default router IP address.	R
D8385	Default router IP address (high)	The high part of the default router IP address.	R
D8492	IP address setting (low)	The lower part of the IP address setting value.	R/W
D8493	IP address setting (high)	The high part of the IP address setting value.	R/W
D8494	Subnet mask setting (low)	The lower part of the subnet mask setting value.	R/W
D8495	subnet mask setting (high)	The high part of the subnet mask setting value.	R/W
D8496	Default router IP address setting (low)	The lower part of the default router IP address setting value.	R/W
D8497	Default router IP address (high)	The high part of the default router IP address setting value.	R/W
D8498	IP address saving area error code	When ENET fails to rewrite the parameters, save the error code.	R

Note:

1. For the writing and clearing of IP addresses, see the chapter 6 below;
2. The IP address, etc. was changed from D8470-D8475 to D8380-D8385;

3 Reference Schematic



4 Ethernet parameter setting

1. Upload, download, and diagnostic monitoring operations require a login password to perform the operation. The default password is 0, and you can perform the operation without entering it. If you change the password, please remember the password. If you lose it, you cannot perform the operation
2. The software supports selection of RS232 or Ethernet download parameters, and supports automatic search of PLC and IP functions of Ethernet;

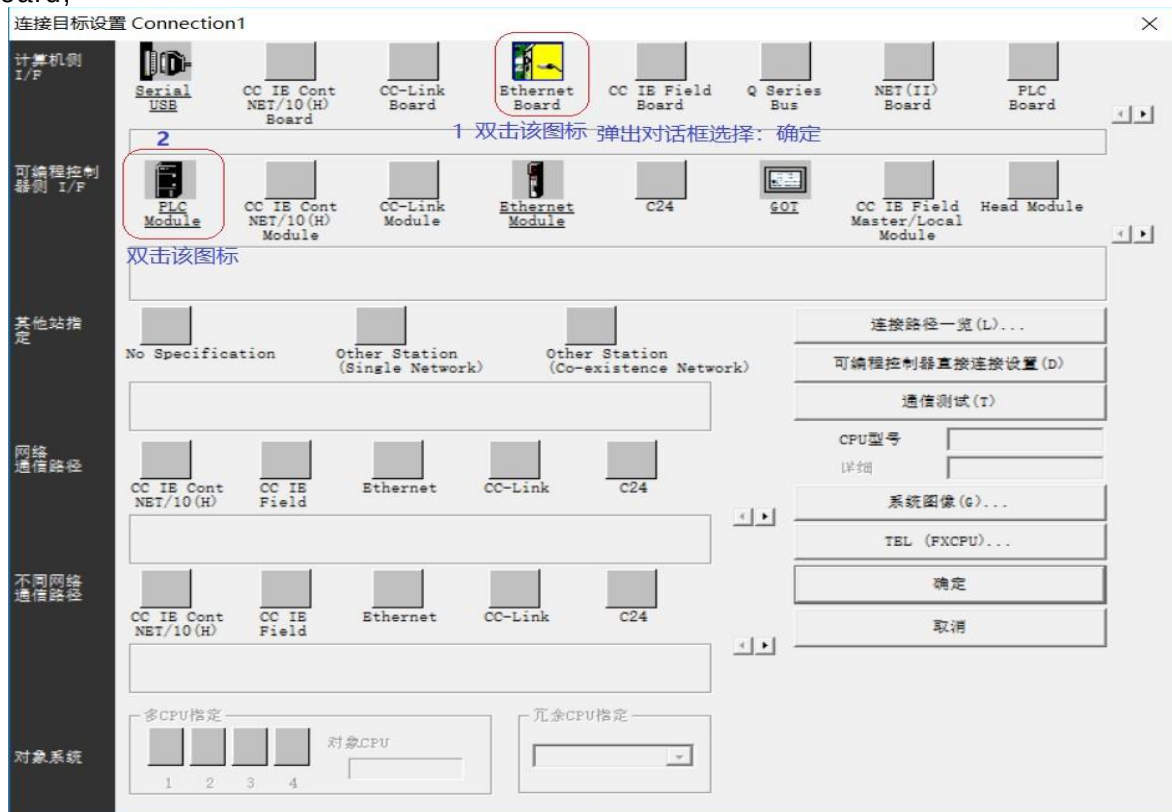






5 GX Works2 programming software connected via Ethernet

1. Open the GX Works2 software, select FX3U, select the connection target, and double-click Ethernet Board;



2. The detailed settings of the CPU module pop up: choose to connect through a hub, enter the IP address of your board, and click OK;

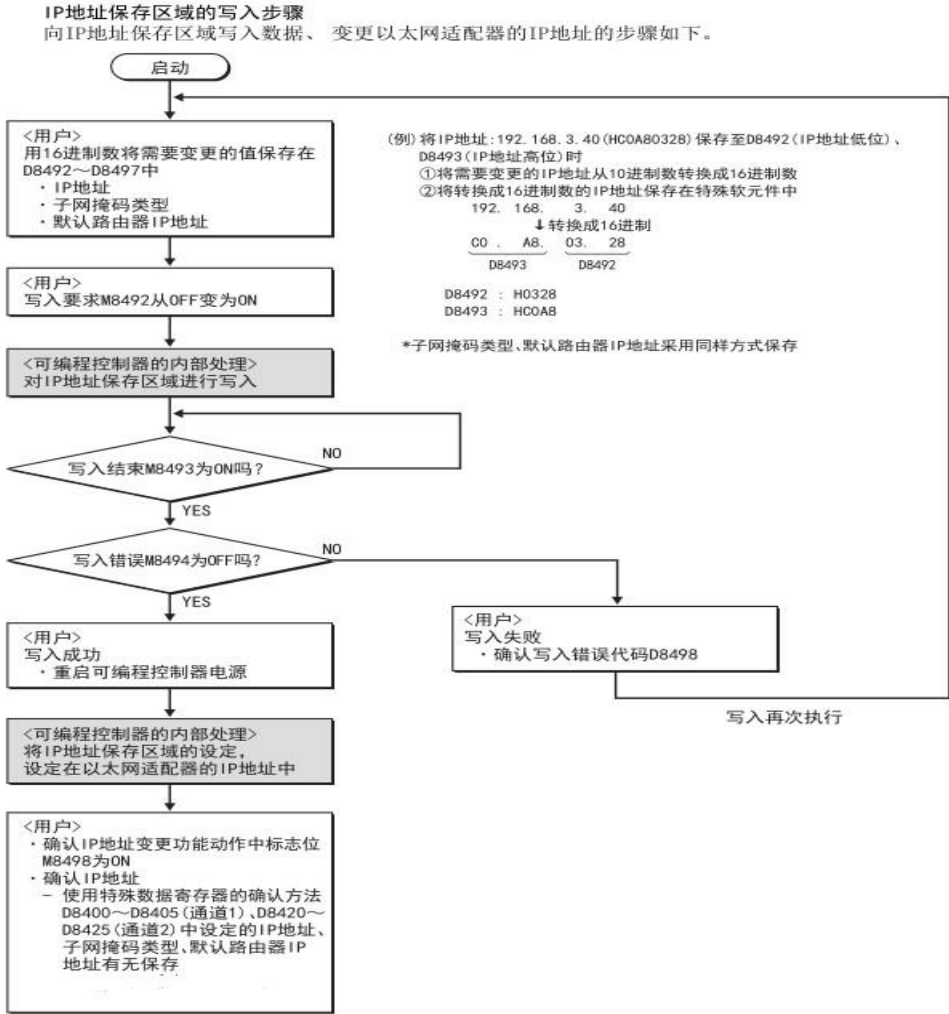


You can also choose to search the FXCPU function on the network to automatically search for the FX3U and the corresponding IP on the network

3. At this point, you can use the programming software to operate the PLC like the serial port;

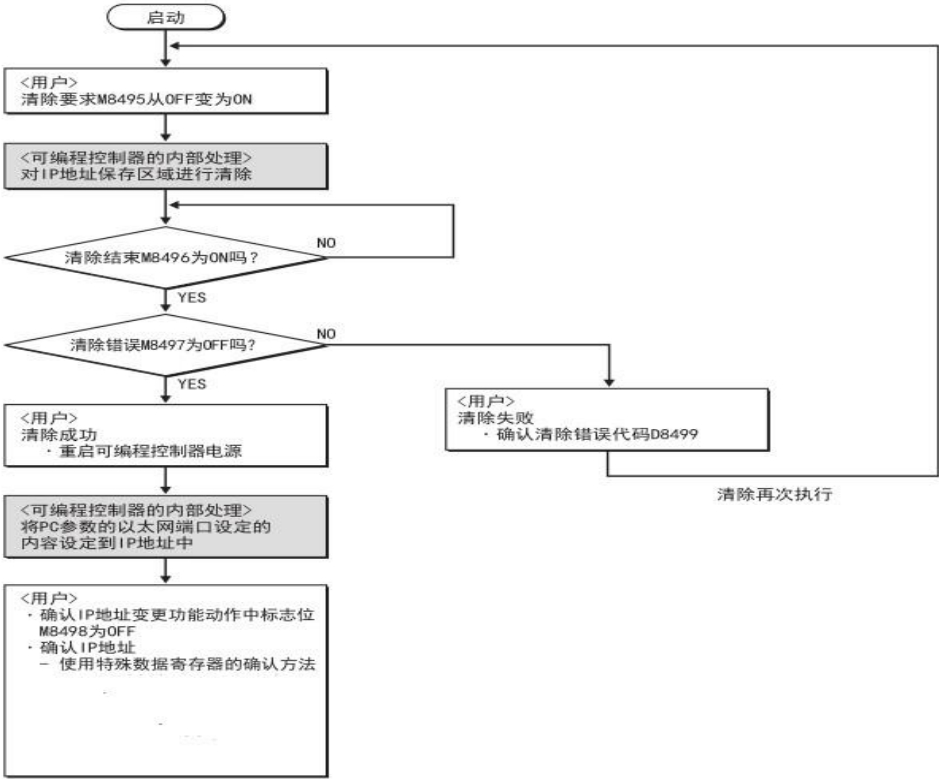
6 Change IP parameter address function

1. Write IP address parameters



2. Clear IP address parameters

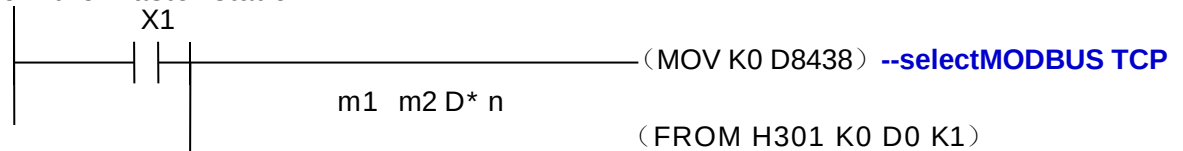
IP地址保存区域的清除步骤
清除IP地址保存区域内容 (设定IP地址变更功能为无效) 的步骤如下所述。除了清除要求M8495的操作之外, 利用PC存储器清除功能也可以清除IP地址保存区域。



7 Application of MODBUS TCP / MODBUS UDP client

7.1 Use TCP protocol to write 0 to D8438.

Reading data from the master station:



**** Transfer the data of register address 0 of station 1 to D0**

m1--The lower 8 bits represent the slave address, and the upper 8 bits represent the command sent; for example: H301-command 3 (read register instruction), slave address 1 (1 ~ 7);

m2--slave component address; The address data is shown in the table above;

D *-Save slave data register;

n-length of read data (1 ~ 255);

Master writes slave data:



**** Write D0 data to slave No. 1 with register address 0**

m1--The lower 8 bits represent the slave address, and the upper 8 bits represent the command sent; for example: H601-command 6 (read register instruction), slave address 1 (1 ~ 7);

m2--slave component address, address data see table below;

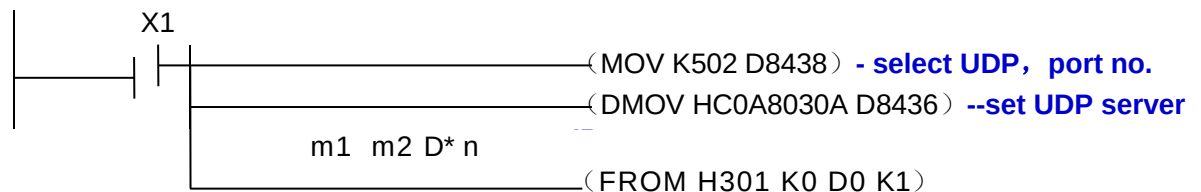
D *-write to slave data register;

n-length of data to be written; when using commands 5 (write bit) and 6 (write register), the length will operate as 1 no matter what number is set, use H10

(K16) When writing multi-bit registers, the data length (1 ~ 255);

7.2 Use UDP protocol to write port number of target server to D8438

Master read slave data:



**** Transfer the data of register address 0 of station 1 to D0**

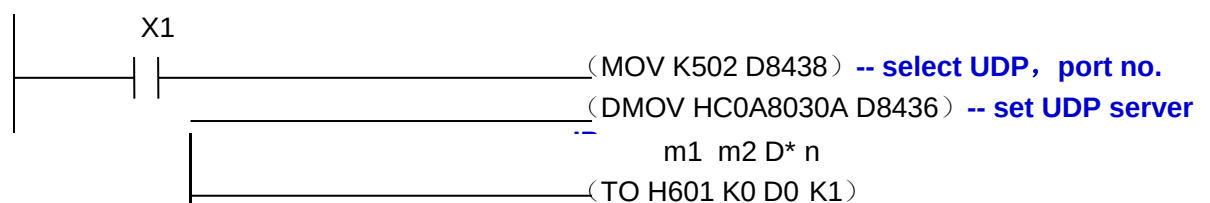
m1--The lower 8 bits indicate the slave address, and the upper 8 bits indicate the command sent; for example: H301-command 3 (read register instruction), slave address 1 (1 ~ 247);

m2--slave component address; address data see table below;

D *-Save slave data register;

n-length of read data (1 ~ 255);

Master write slave data:



**** Write D0 data to slave No. 1 with register address 0**

m1--The lower 8 bits represent the slave address, and the upper 8 bits represent the command sent; for example: H601-command 6 (read register instruction), slave address 1 (1 ~ 247);

m2--slave component address, address data see table below; D *-write to slave data register;

n-length of data to be written; when using commands 5 (write bit) and 6 (write register), the length will operate as 1 no matter what number is set, use H10

(K16) When writing multi-bit registers, the data length (1 ~ 255);

Special Note:

- 1. FROM and TO can be used multiple times in the program. When multiple instructions are executed at the same time, the system will communicate sequentially; if the communication is overtime, record the fault code and execute the next communication instruction
- 2. MODBUS UDP can only use one channel: support slave station 1 ~ 247, MODBUS TCP can use up to seven channels: support slave station 1 ~ 7;
- 3. The maximum data length of FROM / TO instruction: bit (1 ~ 255), register (1 ~ 255);
- 4. To use the FROM / TO instruction, please turn on the Ethernet function and download the Ethernet parameters to turn on the MODBUS TCP client function parameters;
- 5. When using the 05 command to set the slave station components, such as: TO H501 K4000 D0 K1—Set the M0 state of the No. 1 slave station, if D0 is equal to 0, the slave station M0 is OFF; when D0 is not 0, the slave station M0 is ON;

7.3 MODBUS TCP / MODBUS UDP server component address

- FX3U/FX3UC可编程控制器
位软元件:

MODBUS软元件		FX3U/FX3UC软元件
输入（读出专用）	线圈（读出/写入）	
0x0000~0x1DFF	0x0000~0x1DFF	M0~M7679
0x1E00~0x1FFF	0x1E00~0x1FFF	M8000~M8511
0x2000~0x2FFF	0x2000~0x2FFF	S0~S4095
0x3000~0x31FF	0x3000~0x31FF	TS0~TS511
0x3200~0x32FF	0x3200~0x32FF	CS0~CS255
0x3300~0x33FF	0x3300~0x33FF	Y0~Y377
0x3400~0x34FF	-	X0~X377

字软元件:

MODBUS软元件		FX3U/FX3UC软元件
输入寄存器（读出专用）	保持寄存器（读出/写入）	
0x0000~0x1F3F	0x0000~0x1F3F	D0~D7999
0x1F40~0x213F	0x1F40~0x213F	D8000~D8511
0x2140~0xA13F	0x2140~0xA13F	R0~R32767
0xA140~0xA33F	0xA140~0xA33F	TN0~TN511
0xA340~0xA407	0xA340~0xA407	CN0~CN199
0xA408~0xA477	0xA408~0xA477	CN200~CN255*1
0xA478~0xA657	0xA478~0xA657	M0~M7679
0xA658~0xA677	0xA658~0xA677	M8000~M8511
0xA678~0xA777	0xA678~0xA777	S0~S4095
0xA778~0xA797	0xA778~0xA797	TS0~TS511
0xA798~0xA7A7	0xA798~0xA7A7	CS0~CS255
0xA7A8~0xA7B7	0xA7A8~0xA7B7	Y0~Y377
0xA7B8~0xA7C7	-	X0~X377

*1. CN200~255是32位计数器。

8 Supported instructions

Function	Command	Supported element	
		Bit element	Word element
Bit read	1(H1)、2(H2)	X、Y、M、S、T、C、Special M	
Bit write	5(H5)	Y、M、S、T、C、special M	
Register read	3(H3)、4(H4)	X、Y、M、S、T、C、special M	D、T、C、特D
Register write	6(H6)	Y、M、S、T、C、special M	D、T、C、特D
Register batch read	16（H10）	Y、M、S、T、C、special M	D、T、C、特D

** Using register read bit, a register will read 16 bit component status;

** Using register write bit, one register will affect the state of 16-bit device

9 Error code

Category	Error code	Remarks	
Serial port 1, 2 / CAN / ENET error M8063 (D8063) Operation continues	6390	Ethernet parameter check error	ENET
	6391	Port initialization failed (see D8406.b8-b15)	
	6392	Communication timeout with Ethernet W5500	
	6393	IP address conflicts	
	6394	W5500 is interfered with error	
	6395		
	6396		
	6397		
	6368	Not enabled MODBUS TCP server / client function or Ethernet function is not enabled	
	6399	ENET is faulty (see D8418 for details)	

**** Error code during Ethernet communication (D8418)**

Error code	Error content	Solution
753	The Ethernet adapter IP address is set incorrectly	Modify the IP address. Level is set to A / B / C
761	When specifying the default router IP address, the setting value of the subnet mask field is outside the allowable range (allowable range: 192.0.0.0 to 255.255.255.252)	Modify subnet mask
763	When specifying the default router IP address, the default router IP address is set incorrectly	Modify the IP address. The level is set to A / B / C.
764	When specifying the default router IP address, the IP address of the Ethernet adapter and the default router IP address do not belong to the same network address	Modify the IP address. The level is set to A / B / C.
850	Failure to receive response from SNTP server	Confirm that the SNTP server is connected to the network. Modify the IP address.
911	Receive error occurred during TCP / IP communication	Check the operation of the other device. Packets may sometimes be crowded on the line, and then sent after any time. Check if the link cable is loose.
1000	MODBUS client FROM / TO command length range error	Confirm that the read and write length of the instruction is within the range
1001	MODBUS client FROM / TO uses unsupported commands	Use supported commands
1002	The protocol selected by the FROM / TO of the MODBUS client is inconsistent with the protocol of the parameters	The protocol for modifying the FROM / TO instruction or Ethernet parameters is consistent (D8438-0 = TCP protocol, not 0 is UDP protocol)
1003	MODBUS client motherboard and server are not connected	Confirm that the Ethernet IP, port and other parameters are consistent and correct
1004	MODBUS client reception timeout	Confirm that the parameters and connection are normal
1005	MODBUS client FROM / TO instruction slave address range error	Please select the correct range of slave address, TCP protocol address 1 ~ 7, UDP protocol 1-247.
1006	The data command or address received by the MODBUS client FROM / TO instruction is inconsistent	May interfered or crowded
1007	MODBUS client FROM / TO command received and sent transmission flags are inconsistent	May interfered or crowded

**** Error writing to the IP address storage area (D8498)**

Error code	Error content	Solution
100	The value of D8492 ~ D8497 is outside the setting range	Please modify the content of the set value.
400	Write request and clear request changed from OFF to ON at the same time	Please confirm whether the write request and the clear request change from OFF to ON

10 Test program function description

Preparation:

- 1) Requires 3 boards, a main station, a station 1 and a station 2;
- 2) If the communication fails, please use the programming software-diagnosis-to see the fault code;
- 3) There are three programs in the test program folder, a master station, a station 1 and a station 2;
- 4) The communication line is connected. After downloading all programs, all three PLCs are RUN;
- 5) Need to use the Ethernet parameter setting software to configure the parameters of each station: the master station needs to configure the No. 1/2 station corresponding to the MODBUS TCPC channel

IP, port number and other parameters; station 1/2 need to configure MODBUS TCPS channel parameters; working principle:

When the PLCs are running and the communication is normal, Y10 of the three boards flash at the same time, and the X0-X7 of all boards are mapped to the Y0-Y7 of all boards

(Example: If X0 of the master station is ON, X1 of station 1 is ON, and X2 of station 2 is ON, then Y0, Y1, Y2 of all boards are all ON).

Note:

If you choose UDP protocol, then both master and slave stations need to choose UDP protocol; if you choose TCP protocol, then both master and slave stations need to choose TCP protocol.

11 Appendix

1. IP address setting

Set the own station IP address according to the input format (decimal / hexadecimal). Setting range: 0.0.0.1 ~ 223.255.255.254 (decimal)

00.00.00.01 ~ DF.FF.FF.FE (Hexadecimal)

Set the local Ethernet adapter and the communication partner device to the same level and subnet address.

For the IP address, please consult the network administrator (person who manages the network plan or IP address, etc.) and set it.

2. Set the subnet mask type

Set the subnet mask of this station according to the input format (decimal / hexadecimal). Setting range: 192.0.0.0 ~ 255.255.255.252 (decimal)

C0.00.00.00 ~ FF.FF.FF.FC (Hexadecimal)

For the subnet mask, please consult the network administrator (person who manages the network plan or IP address, etc.) and set it.