Modbus TCP Instructions

V1.0

eye record

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Chapter 1 Vision Sensor Parameter Configuration

1.1 Add Modbus TCP tool

On the communication configuration interface, click [Communication Configuration]□[Add]□[ModbusServer], the modbus tool in this product is ModbusTCP, and Modbus is used as a substitute for the following description.

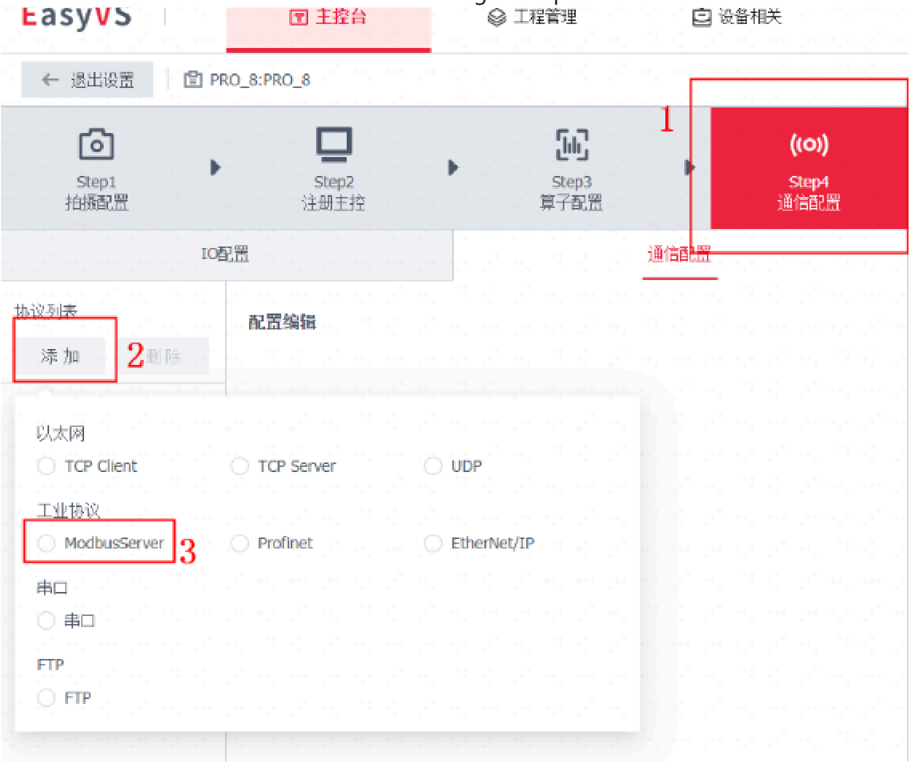
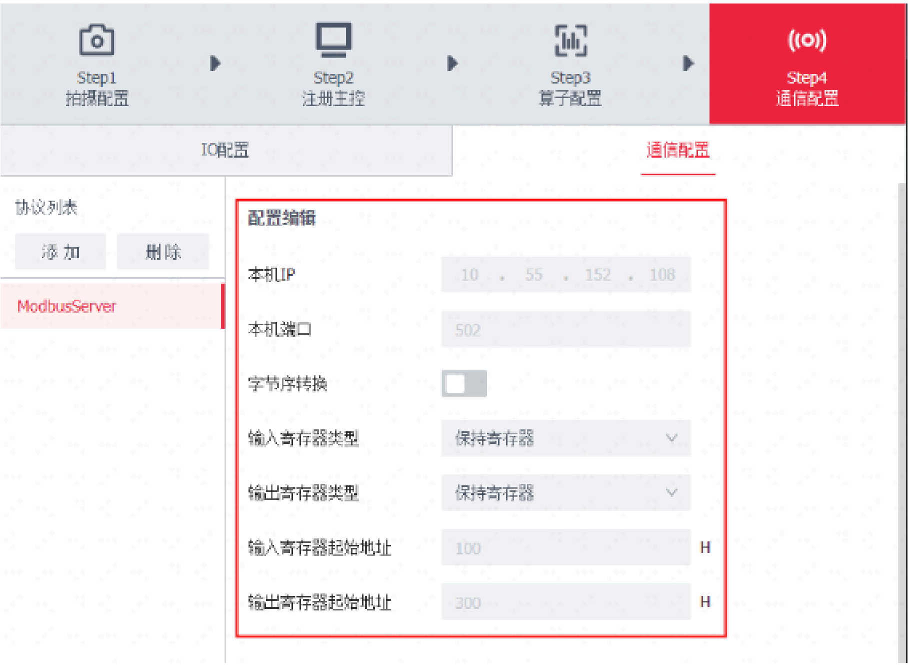


Figure 1-1 Adding the Modbus Communication Tool



Step1 拍摄配置

Step2 注册主控

Step3 算子配置

Step4 通信配置

IO配置

通信配置

协议列表

添 加

删 除

ModbusServer

配置编辑

本机IP 10 . 55 . 152 . 108

本机端口 502

字节序转换

输入寄存器类型 保持寄存器

输出寄存器类型 保持寄存器

输入寄存器起始地址 100 H

输出寄存器起始地址 300 H

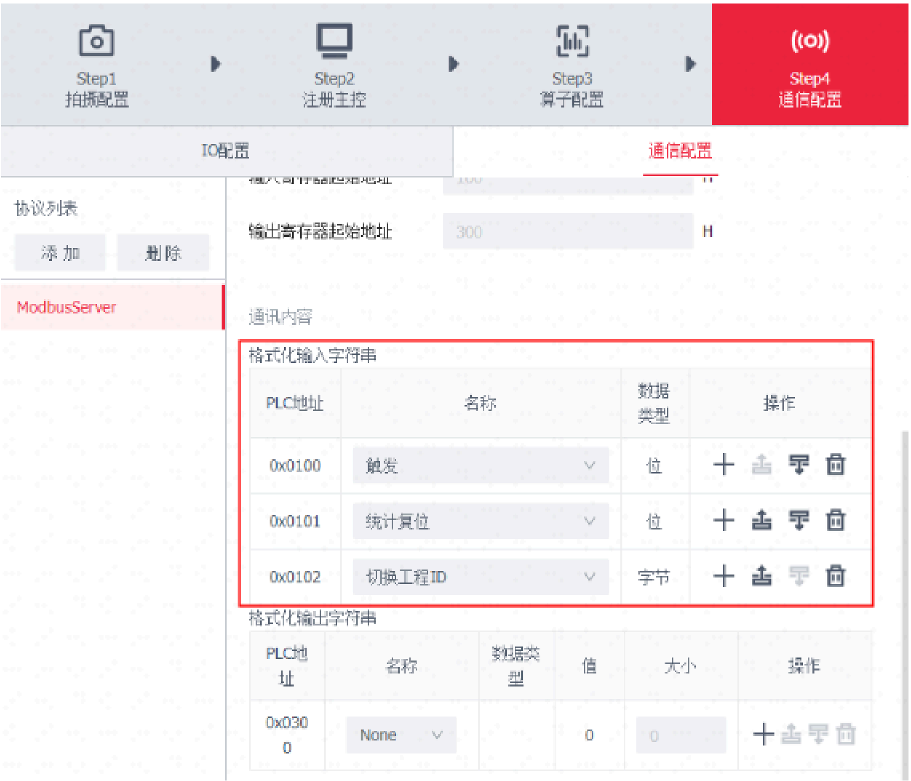
Figure 1-2 Modbus basic configuration

1.2 Configuration parameters

Add communication content as required, and add the communication content as shown in the following table as an example.

Table 1-1 Modbus communication configuration

	PLC address	name	data type
Format the input string	0x100	trigger	bit
	0x101	Statistical reset	bit
	0x102	Switch project IDs	byte
Format the output string	0x300	Project status	Plastic surgery
	0x302	1 Whether there is a straight line. state	Plastic surgery
	0x304	1 Whether there is a straight line. Start Coordinate X	floating-point type
	0x306	2 Grayscale area. state	Plastic surgery
	0x308	2 Grayscale area. Number of spots	Plastic surgery



输入寄存器起始地址 100 H

输出寄存器起始地址 300 H

协议列表

通讯内容

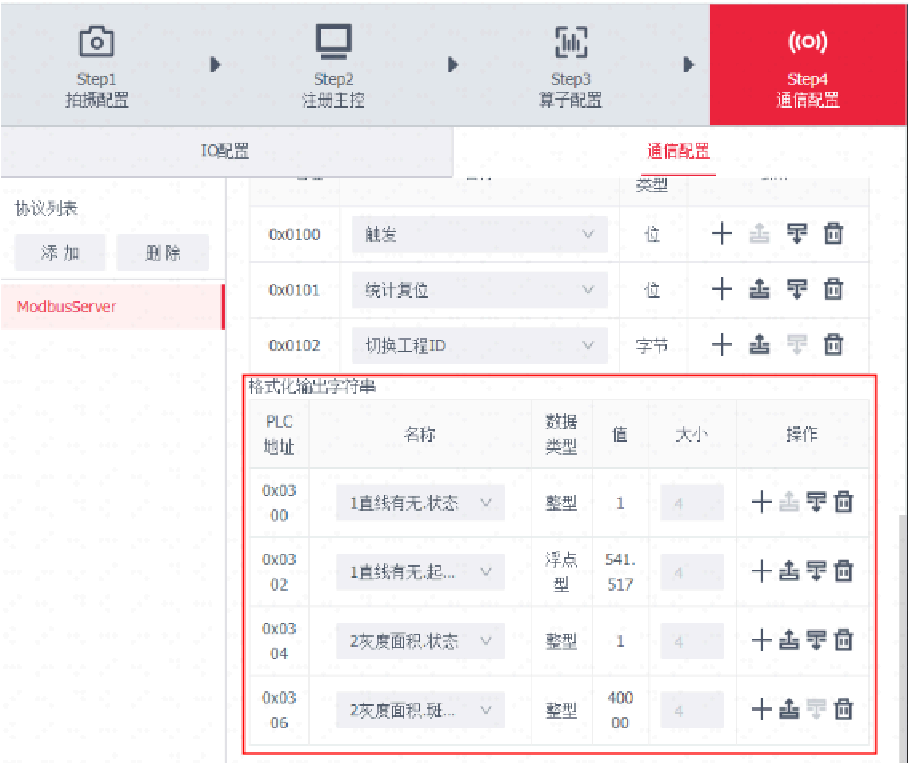
格式化输入字符串

PLC地址	名称	数据类型	操作
0x0100	触发	位	+
0x0101	统计复位	位	+
0x0102	切换工程ID	字节	+

格式化输出字符串

PLC地址	名称	数据类型	值	大小	操作
0x0300	None		0	0	+

Figure 1-3 Adding a Formatted Input String

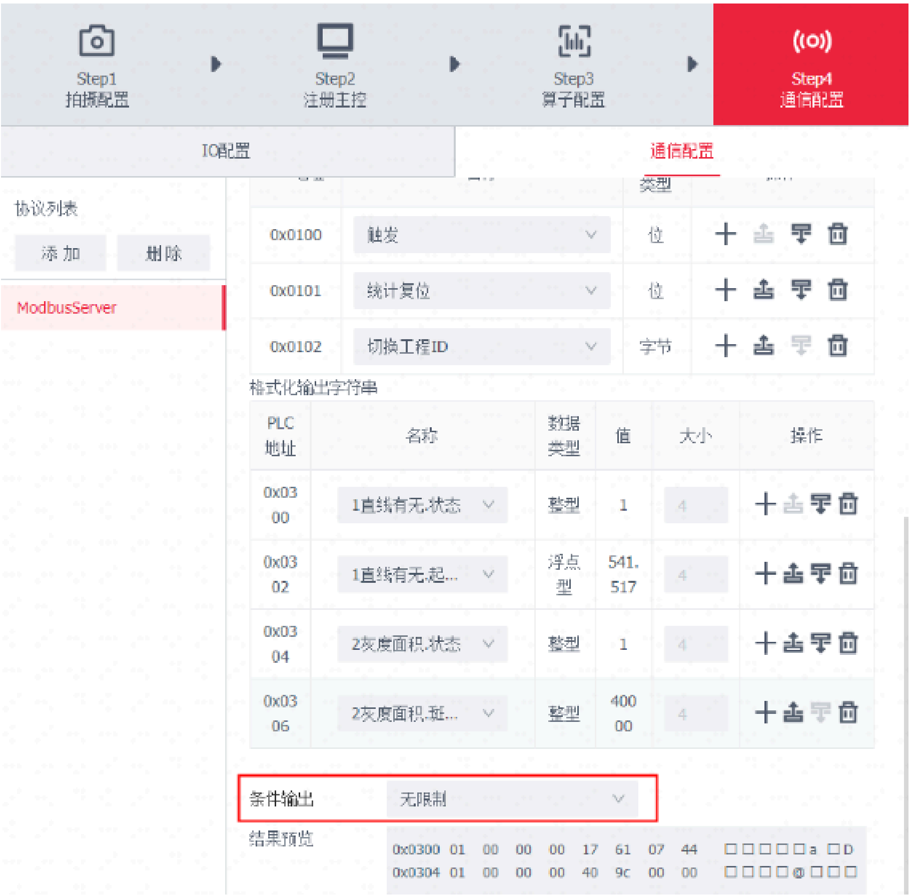


		类型	
0x0100	触发	位	
0x0101	统计复位	位	
0x0102	切换工程ID	字节	

格式化输出字符串

PLC地址	名称	数据类型	值	大小	操作
0x0300	1直线有无.状态	整型	1	4	
0x0302	1直线有无.起...	浮点型	541.517	4	
0x0304	2灰度面积.状态	整型	1	4	
0x0306	2灰度面积.斑...	整型	40000	4	

Figure 1-4 Adding a Formatted Output String



		类型	
0x0100	触发	位	
0x0101	统计复位	位	
0x0102	切换工程ID	字节	

格式化输出字符串

PLC地址	名称	数据类型	值	大小	操作
0x0300	1直线有无.状态	整型	1	4	
0x0302	1直线有无.起...	浮点型	541.517	4	
0x0304	2灰度面积.状态	整型	1	4	
0x0306	2灰度面积.斑...	整型	40000	4	

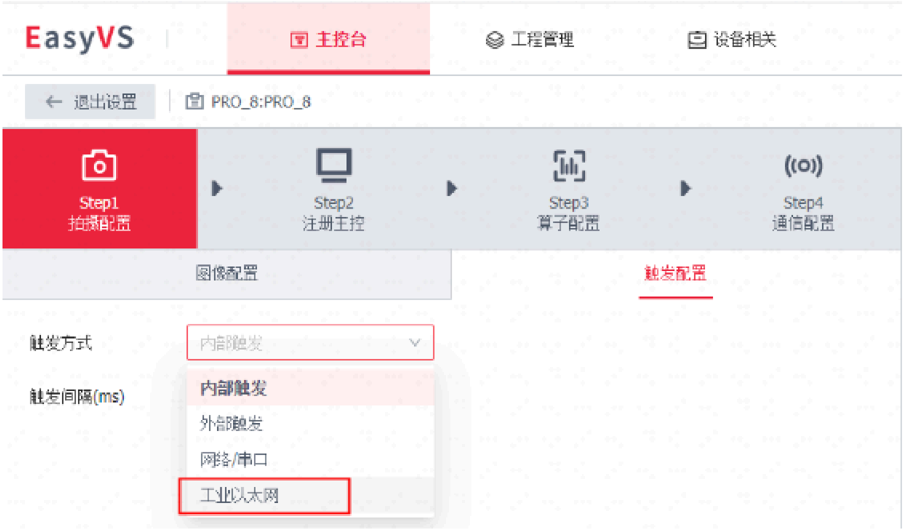
条件输出 无限制

结果预览

```
0x0300 01 00 00 00 17 61 07 44   □□□□□a □D
0x0304 01 00 00 00 40 9c 00 00   □□□□@□□□
```

Figure 1-5 Conditional output is unlimited

In [Shooting Configuration]□[Trigger Configuration], select [Industrial Ethernet].



触发方式 内部触发

触发间隔(ms)

Figure 1-6 Setting up Industrial Ethernet triggering

When all configurations are completed, click [Save Project] to end the configuration of the vision sensor.

说明

※ Click to add formatted entries; click and The order of format entries can be adjusted; Formatted entries can be deleted.

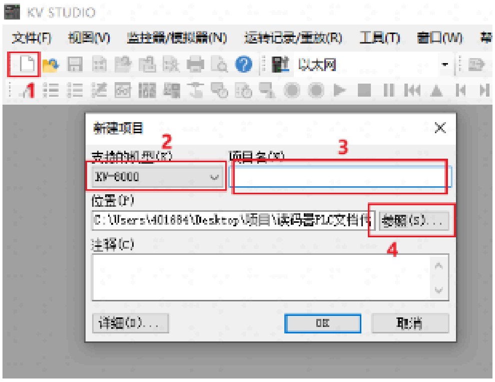
*The condition output can be adjusted to the NG/OK status of a certain operator or the NG/OK status of the project, and can be adjusted according to the actual work.

Chapter 2 Keyence KV8000 Configuration and Testing

2.1 PLC configuration

2.1.1 New construction projects

Open KV STUDIO, click New Project, select KV-8000 for supported models, modify the project name and project save location, and click OK after setting it.



新建项目

支持的机型(K)：KV-8000

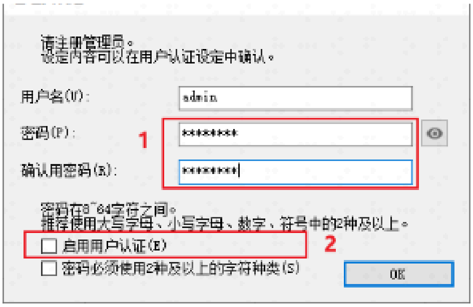
项目名(N)：

位置(P)：C:\Users\401684\Desktop\项目\读码器PLC文档传 参照(S)...

注释(C)：

Figure 2-1 New project

Set the user name and password with more than 8 digits in the pop-up administrator interface, select [Start User Authentication] according to the project confidentiality requirements, and uncheck the test project to prevent forgetting the password and preventing the project from being opened.



请注册管理员。
设定内容可以在用户认证设定中确认。

用户名(U)： admin

密码(P)： ********

确认用密码(R)： ********

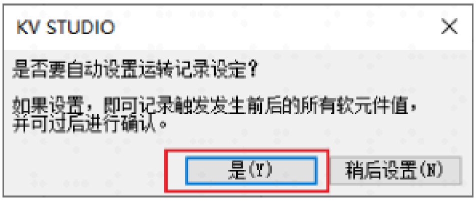
密码在8~64字符之间。
推荐使用大写字母、小写字母、数字、符号中的2种及以上。

□ 启用用户认证(E)

□ 密码必须使用2种及以上的字符种类(S)

Figure 2-2 Administrator settings interface

Click [Yes] on the [Do you want to set automatic operation record settings] screen that pops up.



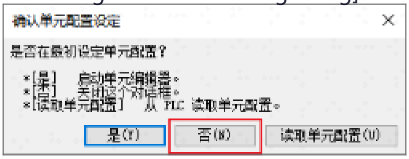
KV STUDIO

是否要自动设置运转记录设定？

如果设置，即可记录触发发生前后的所有软元件值，
并可过后进行确认。

Figure 2-3 Automatic operation record settings

[Whether to set the unit configuration at the beginning] is selected No.



确认单元配置设定

是否在最初设定单元配置？

*[是]　启动单元编辑器。
*[否]　关闭这个对话框。
*[读取单元配置]　从 PLC 读取单元配置。

Figure 2-4 Determines the unit configuration settings

Click [Monitor/Simulator] in the upper menu bar [Communication Settings] [Communication Settings].

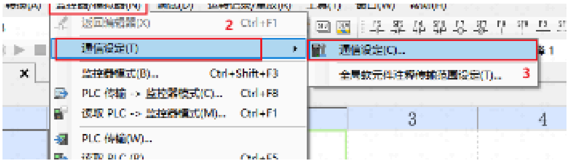
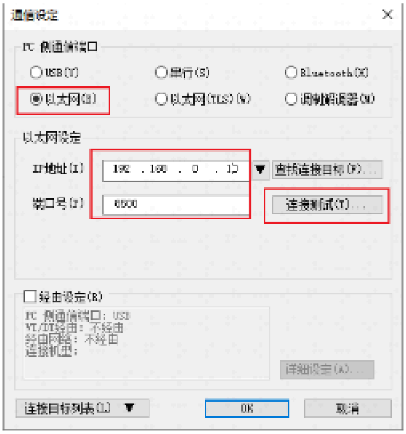


Figure 2-5 Opening Communication Settings

In this case, select Ethernet, enter the IP address and port number in the Ethernet settings, and click "Connection Test".



通信设定

PC 侧通信端口

○ USB(Y)　○ 串行(S)　○ Bluetooth(X)
● 以太网(E)　○ 以太网(TLS)(N)　○ 调制解调器(M)

以太网设定

IP地址(I)　192 . 168 . 0 . 10

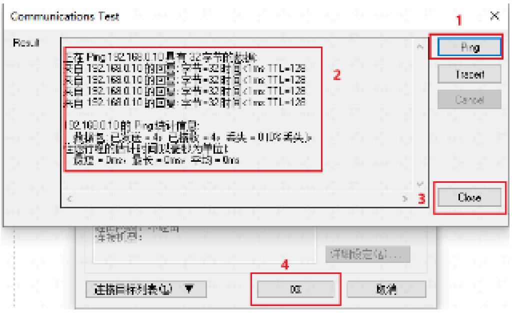
端口号(P)　8500

□ 经由设定(R)

PC 侧通信端口：USB
VT/DT经由：不经由
经由网络：不经由
连接机型：

Figure 2-6 Communication settings

Click [Ping] to confirm the current network status, and when it is confirmed, click [Close] [OK].

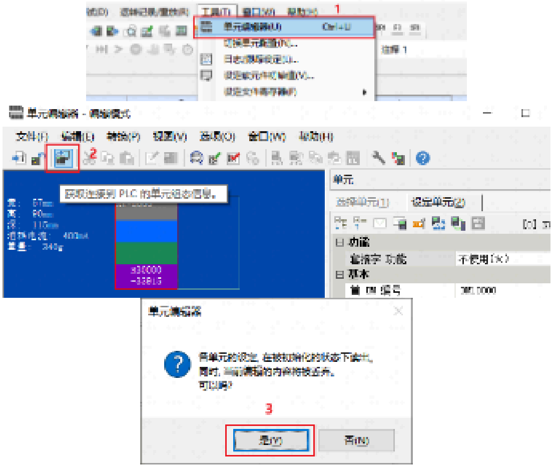


```
正在 Ping 192.168.0.10 具有 32 字节的数据:
来自 192.168.0.10 的回复: 字节=32 时间<1ms TTL=128
来自 192.168.0.10 的回复: 字节=32 时间<1ms TTL=128
来自 192.168.0.10 的回复: 字节=32 时间<1ms TTL=128
来自 192.168.0.10 的回复: 字节=32 时间<1ms TTL=128

192.168.0.10 的 Ping 统计信息:
    数据包: 已发送 = 4，已接收 = 4，丢失 = 0 (0% 丢失)，
往返行程的估计时间(以毫秒为单位):
    最短 = 0ms，最长 = 0ms，平均 = 0ms
```

Figure 2-7 Determines the network state

Click [Tools]□[Unit Editor], click [Get Unit Configuration Information Connected to PLC] in the Unit Editor interface, and select "Yes" in the pop-up interface.

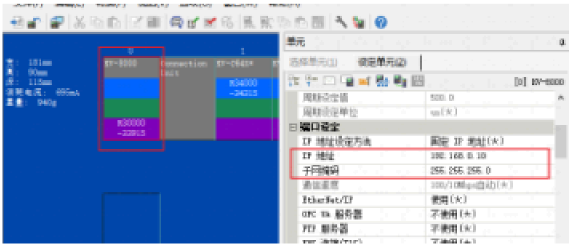


单元编辑器

将单元的设定，在被初始化的状态下读出。
同时，当前编辑的内容将被丢弃。
可以吗?

Figure 2-8 Unit Editor Confirmation

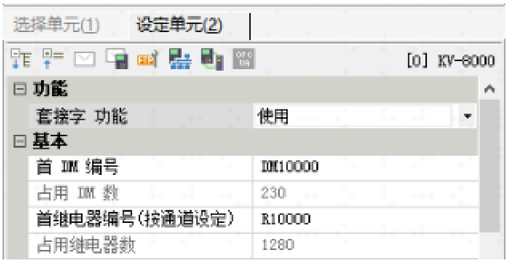
Select the KV-8000CPU module and click [Set Unit] to confirm the IP address, subnet mask, and other network parameters.



端口设定
IP 地址设定方法: 固定 IP 地址(*)
IP 地址: 192.168.0.10
子网掩码: 255.255.255.0
通信速度: 100/10Mbps自动(*)
EtherNet/IP: 使用(*)
OPC UA 服务器: 不使用(*)
FTP 服务器: 不使用(*)

Figure 2-9 Setting Unit

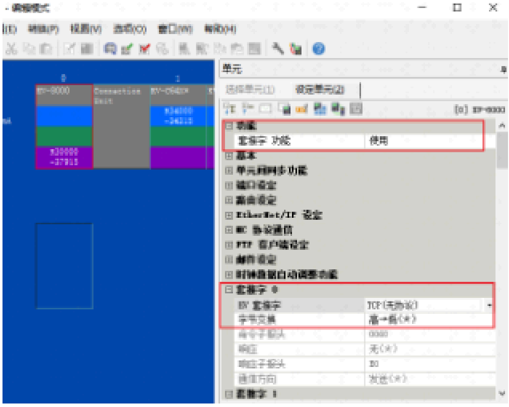
The socket function is selected [Use], and [First Relay Number] is set to R10000.



⊟ 功能
套接字 功能: 使用
⊟ 基本
首 DM 编号: DM10000
占用 DM 数: 230
首继电器编号(按通道设定): R10000
占用继电器数: 1280

Figure 2-10 Socket function selection

For the socket number that can be used (in this case, socket 0/1 is used), select TCP (No Protocol), Byte High Low Switching (High□ Low).



⊟ 功能
套接字 功能: 使用
⊟ 套接字 0
KV 套接字: TCP(无协议)
字节交换: 高→低(*)
命令子报头: 0000
响应: 无(*)
响应子报头: 00
通信方向: 发送(*)

Figure 2-11 Socket number

2.2.2 Write PLC programs

Since the Keyence KV-8000 only supports SocketTCP function and does not have the ModbusTCP instruction library, you need to download the ModbusTCP function block through the official website of Keyence, open the official sample program after the download is successful, the left project bar □ Scan Execution Module □ Main Program, right-click the menu bar and select Copy.

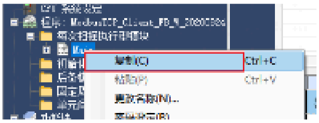
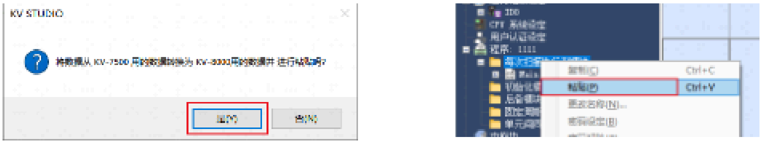


Figure 2-12 reproduced

In the current program, select "Execute Module for Each Scan" in the left project bar, right-click on the menu bar to select "Paste", and select "Yes" on the pop-up interface.



将数据从 KV-7500 用的数据转换为 KV-8000用的数据并 进行粘贴吗?

Figure 2-13 Scan Execution Module

If the program name is the same and the program name needs to be modified, fill in the MB_TCP_Client1 in this case and click OK to complete the setting.

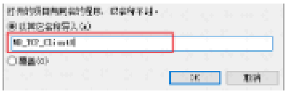

● [illegible]
MB_TCP_Client1
○ [illegible]
OK 取消

Figure 2-14 Modifying the Pin Configuration of the Program Name Table 2-1 Function Block

	Independent	type	data type	Size description		The sample program uses an address
1	UnitNo	Unit UINT		1 word	Unit Number (Ethernet Unit)	#0
2	SocketNo	IN	UINT	1 word	0-15	#0
3	arrComCfg	INOUT	UINT	10 words	Communication settings	DM0~DM9
4	wFuncCD	IN	UINT	1 word	Feature code	DM20
5	wXferSize	IN	UINT	1 word	Data volume	DM22
6	wDataBlkAddr	IN	UINT	1 word	The block address	DM23
7	pComData	IN	UDINT	2 words	Pointer address	DM24~DM25
8	arrxReq	IN	UINT	1 word	Request Relay (4 positions)	MR100~MR103 (MR104~115 Reserved)
9	arrxAck	OUT	UINT	1 word	Response Relay (10 positions)	MR200-MR209 (MR210~215 Reserved)
10	wErrCD	OUT	UINT	1 word	Error code	DM26
11	wStatus	OUT	UINT	1 word	Connection status	DM27
12	dwComTime	OUT	DINT	1 word	Communication time monitoring	DM28-DM29

***Modbus data storage address EM0~EM123**

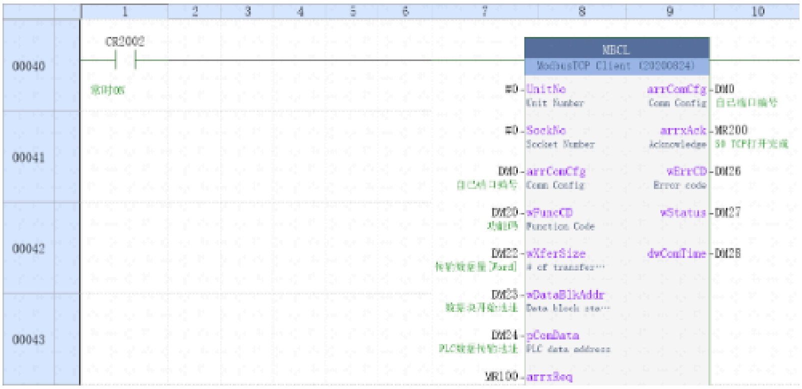
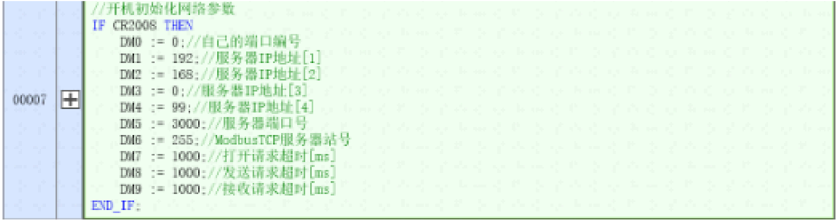

1 2 3 4 5 6 7 8 9 10
00040
00041
00042
00043
CR2002
常时ON
MBCL
ModbusTCP Client (20200824)
#0 UnitNo Unit Number
#0 SockNo Socket Number
DM0 arrComCfg Comm Config 自己端口编号
DM20 wFuncCD Function Code 功能码
DM22 wXferSize # of transfer… 传输数据量[Word]
DM23 wDataBlkAddr Data block sta… 数据块开始地址
DM24 pComData PLC data address PLC数据传输地址
MR100 arrxReq
arrComCfg Comm Config DM0 自己端口编号
arrxAck Acknowledge MR200 S0 TCP打开完成
wErrCD Error code DM26
wStatus DM27
dwComTime DM28

Figure 2-15 Modbus data storage addresses EM0~EM123

Table 2-2 Parameter settings of ModbusTCP communication network

Serial number name		Soft component	Parameter	remark
0	PLC own port number	DM0	0	0 indicates automatic assignment of port numbers
1	Server IP Address[1]	DM1192		
2	Server IP address[2]	DM2168		
3 Server IP address[3]DM314 server IP address[4]DM41085 server port number DM55026 server station number DM62557TCP Open request timeout [ms]DM71000				
				Range 0~65535
8	Send request timeout [ms]	DM8	1000	
9	Receive Request Timeout [ms]	DM9	1000	

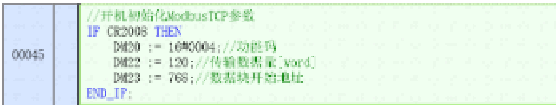
*The official original case program is written as a ladder chart program, which is too long and inconvenient to read, so some programs in this case are modified to write in ST language. *TCP open request timeout and send request timeout. The timeout for receiving requests is set to 10,000ms in the official case, and the time is too long to affect the efficiency of program execution, so it is modified to 1,000ms in this case



```
00007
//开机初始化网络参数
IF CR2008 THEN
    DM0 := 0;//自己的端口编号
    DM1 := 192;//服务器IP地址[1]
    DM2 := 168;//服务器IP地址[2]
    DM3 := 0;//服务器IP地址[3]
    DM4 := 99;//服务器IP地址[4]
    DM5 := 3000;//服务器端口号
    DM6 := 255;//ModbusTCP服务器站号
    DM7 := 1000;//打开请求超时[ms]
    DM8 := 1000;//发送请求超时[ms]
    DM9 := 1000;//接收请求超时[ms]
END_IF;
```

Figure 2-16 Case procedure

Modbus communication data:



```
00045
//开机初始化ModbusTCP参数
IF CR2008 THEN
    DM20 := 16#0004;//功能码
    DM22 := 120;//传输数据量[word]
    DM23 := 768;//数据块开始地址
END_IF;
```

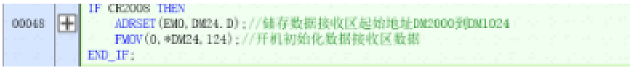
Figure 2-17 Communication data

Table 2-3 Function block pin description

Function block	name	Soft component	Example	Effective range
wFuncCD	Function code	DM20	$0004	$01/02/03/04/05/06/0F/10
wXferSize	Amount of data	DM22	120	1-123
wDataBlkAddr	The slave's soft	DM23	768	0-65535 Refer to the other party's specifications

The function implemented by the above Modbus parameters is to read the result data of 120 words starting from 0x300 in the Modbus slave station input register

In line 48 of the program, the read/written data is stored in EM0~EM123 through the data pointer DM24, and the data in the data storage area is emptied at each power on to avoid data interference.



```
00048
IF CR2008 THEN
    ADRSET(EM0,DM24.D);//储存数据接收区起始地址DM2000到DM1024
    FMOV(0,*DM24,124);//开机初始化数据接收区数据
END_IF;
```

Figure 2-18 Data storage and purge code

Procedure line 59 begins: Triggers MR000 to turn on MR100 (socket TCP open request) to establish a network connection request with the camera.

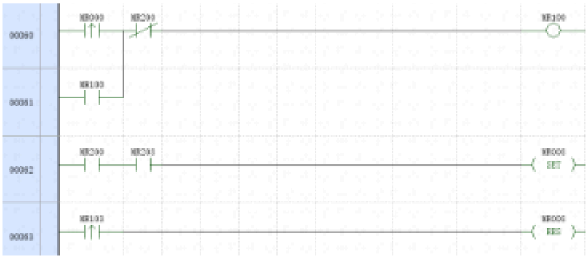


Figure 2-19 Connecting ladder charts

Program line 64 begins: Triggers MR001 to turn on MR102 (socket TCP shutdown request) to close the network connection with the camera.

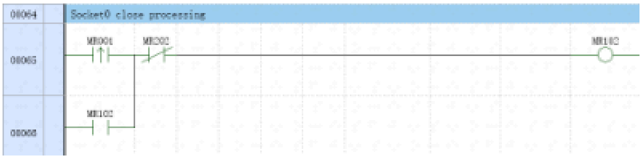


Figure 2-20 Disconnect trapezoidal diagram

Table 2-4 Function block pin description

Function block	name	Soft component address description
arrxReq	Request relay	MR100: TCP Open Request, MR101: Modbus Communication Request MR102: TCP Close Request, MR103: Clear Error MR104~115 Reserve for the system.
arrxAck	Response relay	MR200: TCP is open, MR201: Modbus communication is complete, MR202: TCP is closed, MR203: Modbus communication is ready, MR204-MR207: Reserved MR208: TCP is opened incorrectly, MR209: Modbus communication error MR210~215 is reserved for the system;

Starting from line 67 of the program: Trigger MR002 to turn on MR101 (Modbus communication request), read or write data from the slave according to the set communication content: function code + data.

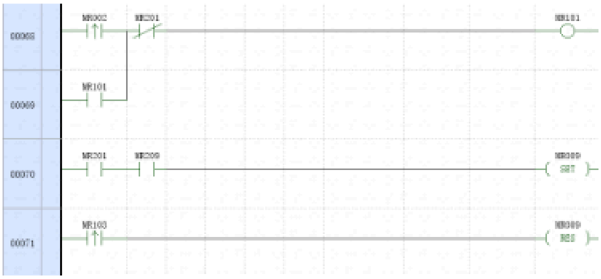


Figure 2-21 Ladder chart of read and write data

Function description: When executing a Modbus/TCP communication request through MBCL's FB, first confirm the connection status of both TCP parties, and send data directly if the connection has been established. If the TCP connection is not established, the TCP open process is performed first, and the Modbus/TCP data is sent after the connection is established.

If the connection has already been established, there is no need to trigger the TCP open request on line 59 again, only the Modbus/TCP communication request on line 67 needs to be triggered each time it is sent.

Table 2-5 Description of the other pins of the function block

Function block	name	Program	illustrate
wErrCD	Error code	DM26	Range 0~65535
wStatus	Connection status	DM27	0: Closed; 4: The two sides have established a connection.
dwComTime	Communication monitoring time	DM28~DM29	Modbus/TCP communication requests ON~the time elapsed when the communication is completed

Table 2-6 List of Function Block Error Codes

Error code	error message	Cause/Countermeasure
0	inerrancy	
30	The other party's IP address or port number is set incorrectly	Please check the IP address and port number of the other party set in arrComCfg.
31	The port number of the local party is	Please check the settings of the local port number in arrComCfg.
38	A TCP shutdown request was made without a TCP connection	Check when the TCP shutdown request is triggered.
39	Before the Modbus/TCP communication is completed, it is	Check when the TCP shutdown request is triggered.

	TCP shutdown request	
40	Modbus/TCP communication timeout	Check the timeout setpoint in arrComCfg; The communication status set by the other party.
41	Modbus/TCP communication request failed	Check the communication status set by the other party and whether a TCP connection is established.
42	TCP open request failed	Please check the communication status set by the other party. Confirm the communication path (e.g. network cable); Whether the PLC socket
43	TCP abnormally disconnected	Please check the communication status set by the other party. Confirm the communication path (e.g. network cable).
200	The IP address of the party is incorrect	Check the IP address settings of the unit editor.
60001~60016	Returned an incorrect response from the Modbus/TCP server	Please check the specifications of the Modbus/TCP server (whether the function code and address range are correct); Please refer to the error code in the other party's device manual 01~16.
65532	Incorrect data address (wrong pointer	Verify that the ADRSET directive is correct
65533	The amount of data transferred is	Please confirm the value of wXferSize, the correct range is 1~123.
65534	Feature code error	Please check the value of wFuncCD, the supported function codes are 01H, 02H, 03H, 04H, 05H, 06H, 0FH, 10H.
65535	TCP open timeout	Please check the communication status set by the other party. Confirm the communication path (e.g. network cable); arrComCfg.

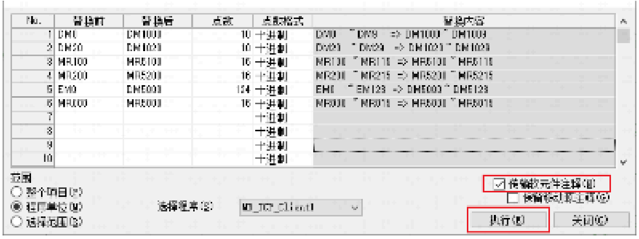
Table 2-7 TCP connection status codes at a glance

Code status		illustrate
0	CLOSED	Closed state.
1	LISTEN	Have a connected state.
2	SYN SENT	Run active open, state after sending SYN.
3	SON RCVD	The server receives the SYN and sends the state after the response.
4	ESTABLISHED	The state after the connection is established.
5	CLOSE WAIT	Received FIN, waiting for the end state.
6	FIN WAIT1	When it ends, the status of the FIN is sent.
7	FIN WAIT2	The FIN server and client receive the state of the FIN at the same time.
8	CLOSING	The server and client receive the status of FIN at the same time.
9	LAST ACK	The FIN is received from the communication destination, and after it is over, the state of the

Modbus/TCP communication can only be carried out when the TCP connection status code = 4, that is, the connection is established.

Since the Modbus/TCP communication between this case and the vision sensor needs to read the result data and send trigger commands, it is necessary to use the official Keyence function block twice, so the software component address of the official sample program will conflict with this case, and it needs to be replaced with an unused software component address.

How to operate: First, import the first official sample program into this program, click the top menu bar □ Edit□ Batch Replace, in the pop-up window, fill in the number of points before, after replacement, check [Transfer Software Component Notes] in the lower right corner, and click [Execute].



No.	置换前	置换后	点数	点数格式	置换内容
1	DM0	DM1000	10	十进制	DM0 ~ DM9 => DM1000 ~ DM1009
2	DM20	DM1020	10	十进制	DM20 ~ DM29 => DM1020 ~ DM1029
3	MR100	MR5100	16	十进制	MR100 ~ MR115 => MR5100 ~ MR5115
4	MR200	MR5200	16	十进制	MR200 ~ MR215 => MR5200 ~ MR5215
5	EM0	DM5000	124	十进制	EM0 ~ EM123 => DM5000 ~ DM5123
6	MR000	MR5000	16	十进制	MR000 ~ MR015 => MR5000 ~ MR5015
7				十进制	
8				十进制	
9				十进制	
10				十进制	

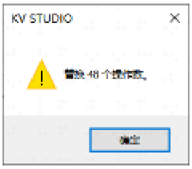
范围
○ 整个项目(P)
● 程序单位(M)
○ 选择范围(S)

选择程序(G) MB_TCP_Client

☑ 传输软元件注释(D)
□ 传输标签注释(C)

Figure 2-22 Bulk replacement of soft components

After the replacement is successful, the following window is displayed, click [OK].



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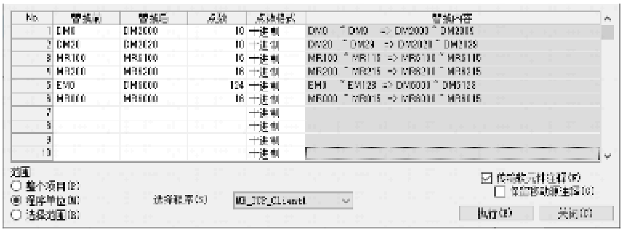
替换 48 个操作数。

Figure 2-23 Replacement successful

Import the official program again, replace the software component address, import the official program twice, and modify the actual network parameters and communication content according to the Modbus/TCP address of the vision sensor.



No.	替换前	替换后	点数	点数格式	替换内容
1	DM0	DM2000	10	十进制	DM0 ～DM9 => DM2000～DM2009
2	DM20	DM2020	10	十进制	DM20 ～DM29 => DM2020～DM2029
3	MR100	MR5100	16	十进制	MR100 ～MR115 => MR5100～MR5115
4	MR200	MR8200	16	十进制	MR200 ～MR215 => MR8200～MR8215
5	EM0	DM6000	124	十进制	EM0 ～EM123 => DM6000～DM6123
6	MR000	MR8000	16	十进制	MR000 ～MR015 => MR8000～MR8015
7				十进制	
8				十进制	
9				十进制	
10				十进制	

范围
○ 整个项目(E)
● 程序单位(M)
○ 选择范围(R)

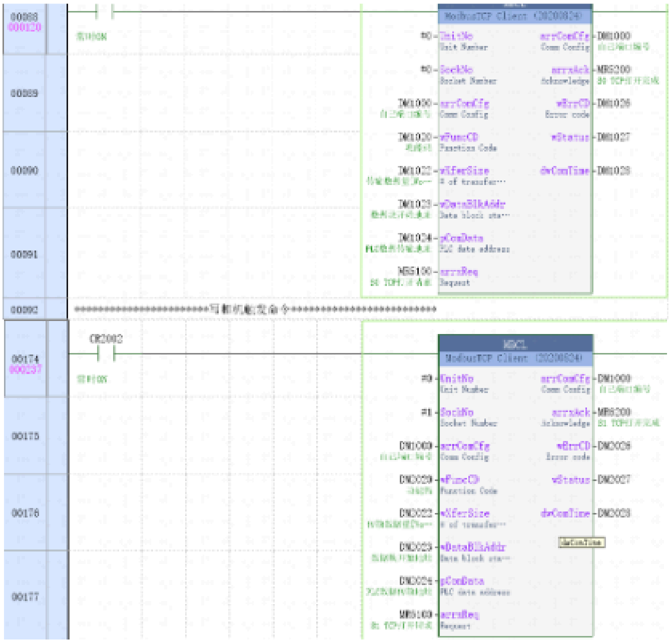
选择程序(S) MB_TCP_Client

☑ 传输软元件注释(F)
☐ 保留移动源注释(O)

Figure 2-24 Modifying the actual network parameters and communication content

Note that the SockNo pin of the function block is modified, each function block needs to be filled in a different socket number, and the 0/1 socket number that has been checked in the above step is filled in the pin.

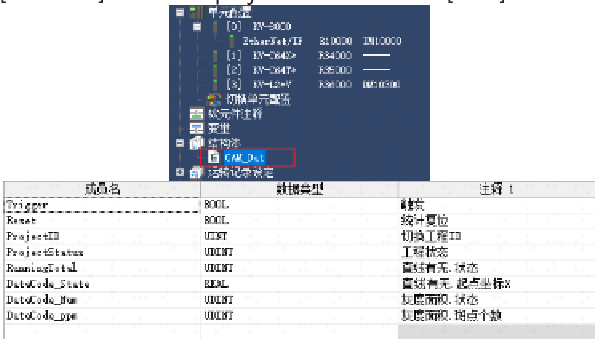
The port number pin of the function block, if the same device is connected, the same software component address or different software component addresses with the same parameter value can be filled.



00088
000120
00089
00090
00091
00092
常时ON
ModbusTCP Client (20200824)
#0 - UnitNo Unit Number
#0 - SockNo Socket Number
DM1000 - arrComCfg Comm Config
DM1020 - wFuncCD Function Code
DM1022 - wXferSize # of transfer…
DM1023 - wDataBlkAddr Data block sta…
DM1024 - pComData PLC data address
MR5100 - arrxReq Request
arrComCfg Comm Config - DM1000
arrxAck Acknowledge - MR5200
wErrCD Error code - DM1026
wStatus - DM1027
dwComTime - DM1028
*************************写相机触发命令*************************
00174
000237
CR2002
常时ON
MBCL
ModbusTCP Client (20200824)
#0 - UnitNo Unit Number
#1 - SockNo Socket Number
DM1000 - arrComCfg Comm Config
DM2020 - wFuncCD Function Code
DM2022 - wXferSize # of transfer…
DM2023 - wDataBlkAddr Data block sta…
DM2024 - pComData PLC data address
MR5100 - arrxReq Request
arrComCfg Comm Config - DM1000
arrxAck Acknowledge - MR6200
wErrCD Error code - DM2026
wStatus - DM2027
dwComTime - DM2028
dwComTime
00175
00176
00177

Figure 2-25 Populate the parameters

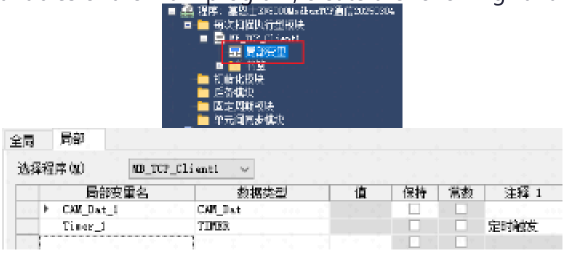
Right-click [Structure] in the left project tree and select [New] to create the following data type.



成员名	数据类型	注释 1
Trigger	BOOL	触发
Reset	BOOL	统计复位
ProjectID	UINT	切换工程ID
ProjectStatus	UDINT	工程状态
RunningTotal	UDINT	直线有无.状态
DataCode_State	REAL	直线有无.起点坐标X
DataCode_Num	UDINT	灰度面积.状态
DataCode_ppm	UDINT	灰度面积.凹点个数

Figure 2-26 Creating a Data Type

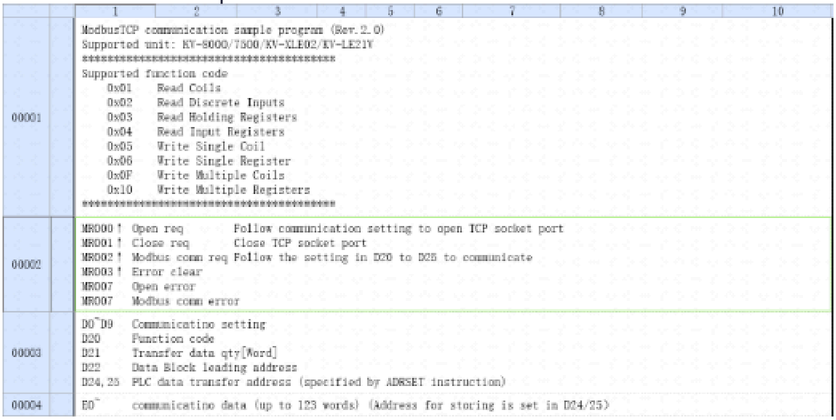
In the local variables of the main program, create the following variables.



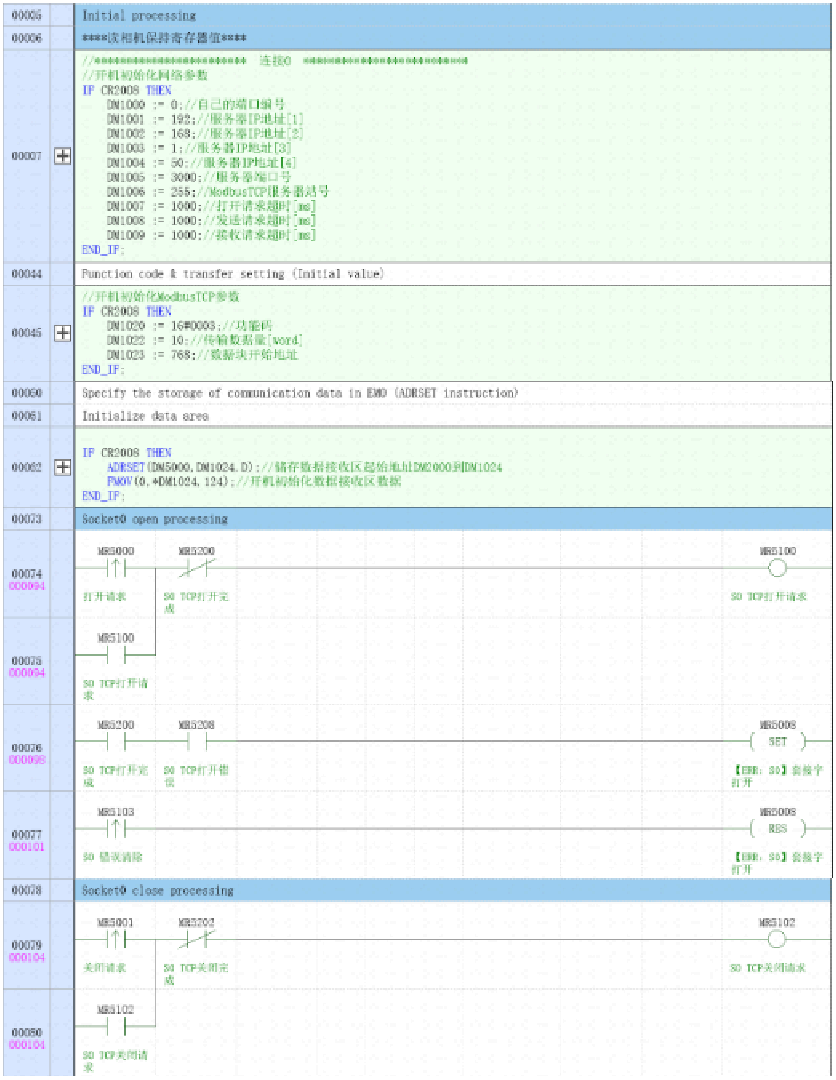
局部变量名	数据类型	值	保持	常数	注释 1
CAM_Dat_1	CAM_Dat		□	□	
Timer_1	TIMER		□	□	定时触发
			□	□	

Figure 2-27 New Variables

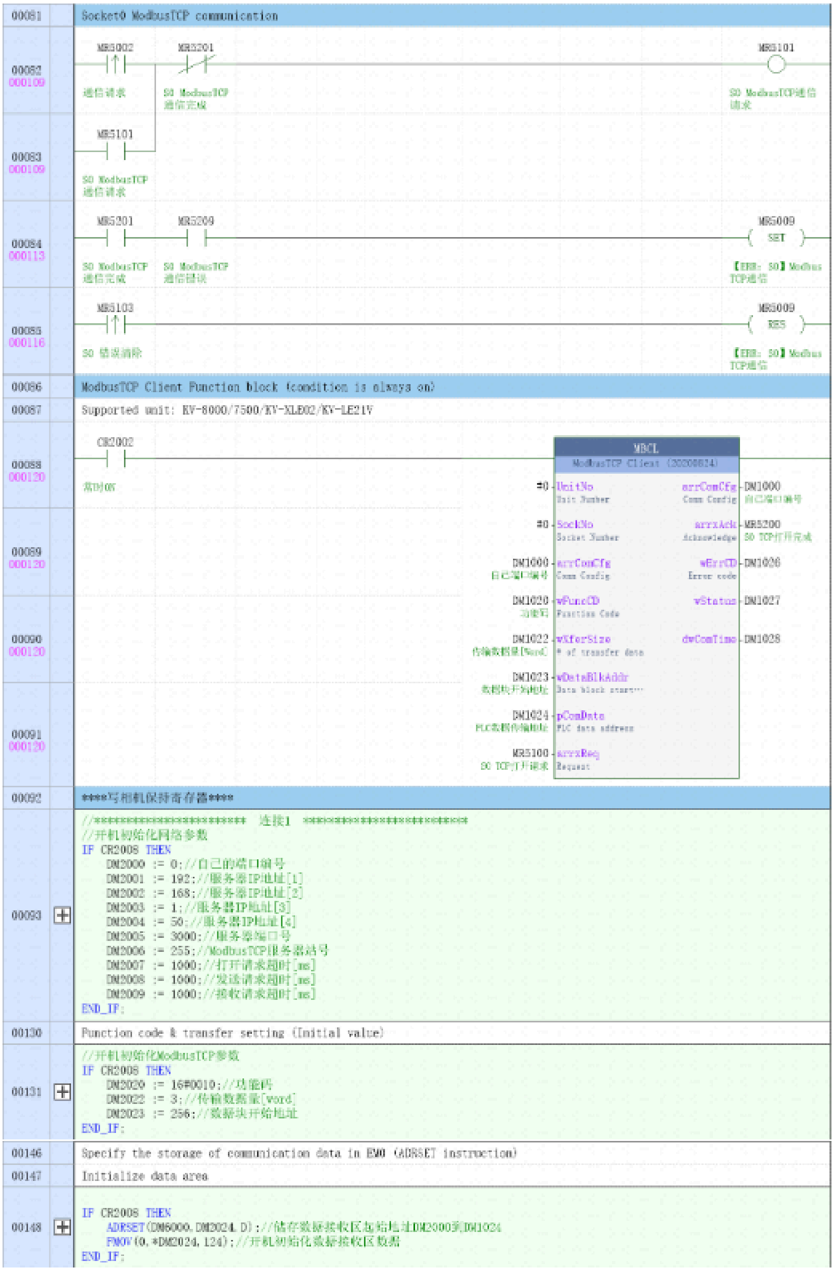
The modified official procedure is as follows:



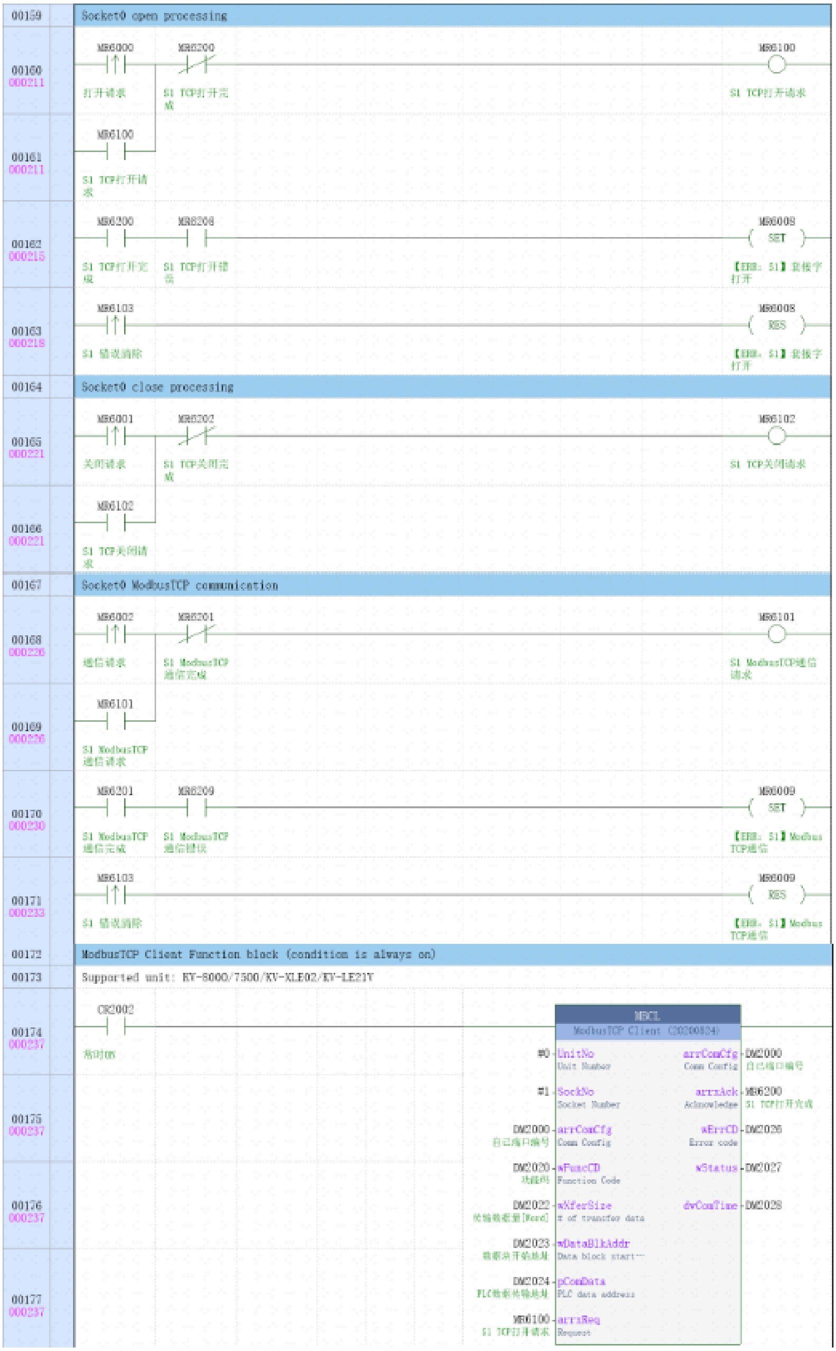
```
00001  ModbusTCP communication sample program (Rev.2.0)
       Supported unit: KV-8000/7500/KV-XLE02/KV-LE21V
       ******************************************
       Supported function code
           0x01    Read Coils
           0x02    Read Discrete Inputs
           0x03    Read Holding Registers
           0x04    Read Input Registers
           0x05    Write Single Coil
           0x06    Write Single Register
           0x0F    Write Multiple Coils
           0x10    Write Multiple Registers
       ******************************************
00002  MR000↑ Open req        Follow communication setting to open TCP socket port
       MR001↑ Close req       Close TCP socket port
       MR002↑ Modbus comm req Follow the setting in D20 to D25 to communicate
       MR003↑ Error clear
       MR007  Open error
       MR007  Modbus comm error
00003  D0~D9  Communicatino setting
       D20    Function code
       D21    Transfer data qty[Word]
       D22    Data Block leading address
       D24,25 PLC data transfer address (specified by ADRSET instruction)
00004  E0~    communicatino data (up to 123 words) (Address for storing is set in D24/25)
```



```
00005      Initial processing
00006      ****读相机保持寄存器值****
00007  ⊞   //************************  连接0  ************************
           //开机初始化网络参数
           IF CR2008 THEN
               DM1000 := 0;//自己的端口编号
               DM1001 := 192;//服务器IP地址[1]
               DM1002 := 168;//服务器IP地址[2]
               DM1003 := 1;//服务器IP地址[3]
               DM1004 := 50;//服务器IP地址[4]
               DM1005 := 3000;//服务器端口号
               DM1006 := 255;//ModbusTCP服务器站号
               DM1007 := 1000;//打开请求超时[ms]
               DM1008 := 1000;//发送请求超时[ms]
               DM1009 := 1000;//接收请求超时[ms]
           END_IF;
00044      Function code & transfer setting (Initial value)
00045  ⊞   //开机初始化ModbusTCP参数
           IF CR2008 THEN
               DM1020 := 16#0003;//功能码
               DM1022 := 10;//传输数据量[word]
               DM1023 := 768;//数据块开始地址
           END_IF;
00060      Specify the storage of communication data in EMD (ADRSET instruction)
00061      Initialize data area
00062  ⊞   IF CR2008 THEN
               ADRSET(DM5000,DM1024.D);//储存数据接收区起始地址DM2000到DM1024
               FMOV(0,*DM1024,124);//开机初始化数据接收区数据
           END_IF;
00073      Socket0 open processing
00074      MR5000 打开请求 / MR5200 S0 TCP打开完成                       MR5100 S0 TCP打开请求
000094
00075      MR5100 S0 TCP打开请求
000094
00076      MR5200 S0 TCP打开完成 / MR5208 S0 TCP打开错误                 MR5008 SET 【ERR: S0】套接字打开
000098
00077      MR5103 S0 错误清除                                            MR5008 RES 【ERR: S0】套接字打开
000101
00078      Socket0 close processing
00079      MR5001 关闭请求 / MR5202 S0 TCP关闭完成                       MR5102 S0 TCP关闭请求
000104
00080      MR5102 S0 TCP关闭请求
000104
```



```
00081  Socket0 ModbusTCP communication
00086  ModbusTCP Client Function block (condition is always on)
00087  Supported unit: KV-8000/7500/KV-XLE02/KV-LE21V
00092  ****写相机保持寄存器****
00093  //************************  连接1  **************************
       //开机初始化网络参数
       IF CR2008 THEN
           DM2000 := 0;//自己的端口编号
           DM2001 := 192;//服务器IP地址[1]
           DM2002 := 168;//服务器IP地址[2]
           DM2003 := 1;//服务器IP地址[3]
           DM2004 := 50;//服务器IP地址[4]
           DM2005 := 3000;//服务器端口号
           DM2006 := 255;//ModbusTCP服务器站号
           DM2007 := 1000;//打开请求超时[ms]
           DM2008 := 1000;//发送请求超时[ms]
           DM2009 := 1000;//接收请求超时[ms]
       END_IF;
00130  Function code & transfer setting (Initial value)
00131  //开机初始化ModbusTCP参数
       IF CR2008 THEN
           DM2020 := 16#0010;//功能码
           DM2022 := 3;//传输数据量[word]
           DM2023 := 256;//数据块开始地址
       END_IF;
00146  Specify the storage of communication data in EM0 (ADRSET instruction)
00147  Initialize data area
00148
       IF CR2008 THEN
           ADRSET(DM6000,DM2024.D);//储存数据接收区起始地址DM2000到DM1024
           FMOV(0,*DM2024,124);//开机初始化数据接收区数据
       END_IF;
```



```
00159        Socket0 open processing
00160 000211 MR6000 打开请求 | MR6200 S1 TCP打开完成 | MR6100 S1 TCP打开请求
00161 000211 MR6100 S1 TCP打开请求
00162 000215 MR6200 S1 TCP打开完成 | MR6208 S1 TCP打开错误 | MR6008 SET 【ERR: S1】套接字打开
00163 000218 MR6103 S1 错误消除 | MR6008 RES 【ERR: S1】套接字打开
00164        Socket0 close processing
00165 000221 MR6001 关闭请求 | MR6202 S1 TCP关闭完成 | MR6102 S1 TCP关闭请求
00166 000221 MR6102 S1 TCP关闭请求
00167        Socket0 ModbusTCP communication
00168 000226 MR6002 通信请求 | MR6201 S1 ModbusTCP通信完成 | MR6101 S1 ModbusTCP通信请求
00169 000226 MR6101 S1 ModbusTCP通信请求
00170 000230 MR6201 S1 ModbusTCP通信完成 | MR6209 S1 ModbusTCP通信错误 | MR6009 SET 【ERR: S1】ModbusTCP通信
00171 000233 MR6103 S1 错误消除 | MR6009 RES 【ERR: S1】ModbusTCP通信
00172        ModbusTCP Client Function block (condition is always on)
00173        Supported unit: KV-8000/7500/KV-XLE02/KV-LE21V
00174 000237 CR2002 常时ON
00175 000237
00176 000237
00177 000237
             MBCL
             ModbusTCP Client (20200824)
             #0 -UnitNo Unit Number                          arrComCfg Comm Config -DM2000 自己端口编号
             #1 -SockNo Socket Number                        arrxAck Acknowledge -MR6200 S1 TCP打开完成
             DM2000 自己端口编号 -arrComCfg Comm Config       wErrCD Error code -DM2026
             DM2020 功能码 -wFuncCD Function Code             wStatus -DM2027
             DM2022 传输数据量[Word] -wXferSize # of transfer data   dwComTime -DM2028
             DM2023 数据块开始地址 -wDataBlkAddr Data block start…
             DM2024 PLC数据传输地址 -pComData PLC data address
             MR6100 S1 TCP打开请求 -arrxReq Request
```

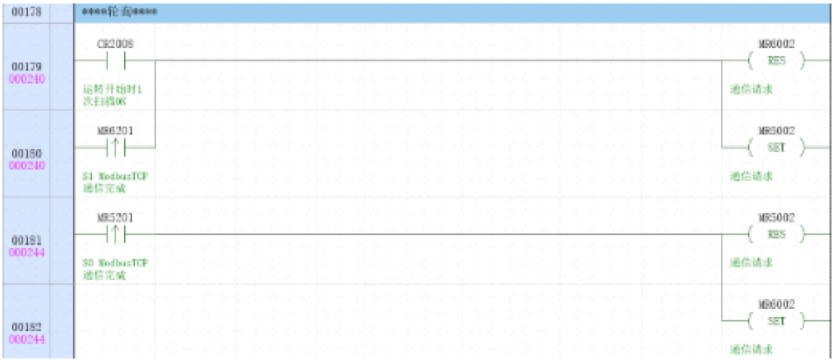
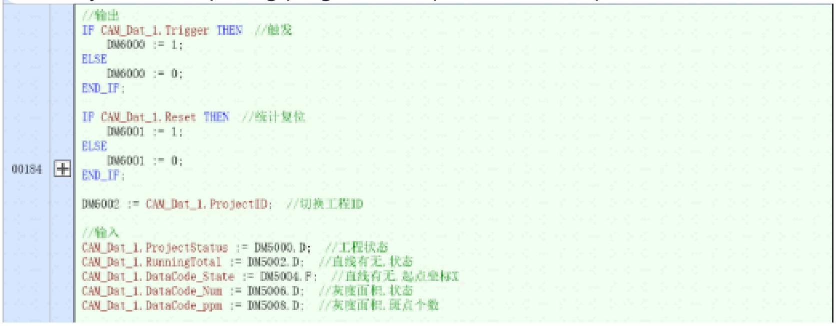


Figure 2-28 Program Example 1

Lines 178-182 of the program: Since the official case is only the communication of a single function of a single device, the use of multiple function blocks is required to realize the reading of vision sensor data and the sending of commands, and they cannot conflict with each other, so it is necessary to write a polling program to implement the loop read and write function.



```
00184
//输出
IF CAM_Dat_1.Trigger THEN  //触发
    DM6000 := 1;
ELSE
    DM6000 := 0;
END_IF;

IF CAM_Dat_1.Reset THEN  //统计复位
    DM6001 := 1;
ELSE
    DM6001 := 0;
END_IF;

DM6002 := CAM_Dat_1.ProjectID;  //切换工程ID

//输入
CAM_Dat_1.ProjectStatus := DM5000.D;  //工程状态
CAM_Dat_1.RunningTotal := DM5002.D;  //直线有无.状态
CAM_Dat_1.DataCode_State := DM5004.F;  //直线有无.起点坐标X
CAM_Dat_1.DataCode_Num := DM5006.D;  //灰度面积.状态
CAM_Dat_1.DataCode_ppm := DM5008.D;  //灰度面积.斑点个数
```

Figure 2-29 Program Example 2

Program Line 184: Vision Sensor Formatting The [Trigger] and [Statistical Reset] configured in the input string Although the data type is Bit, it still takes up space in ModbusTCP communication, so it is necessary to convert Bit and Word in the program, and then map the received and sent storage to the newly created local variable.

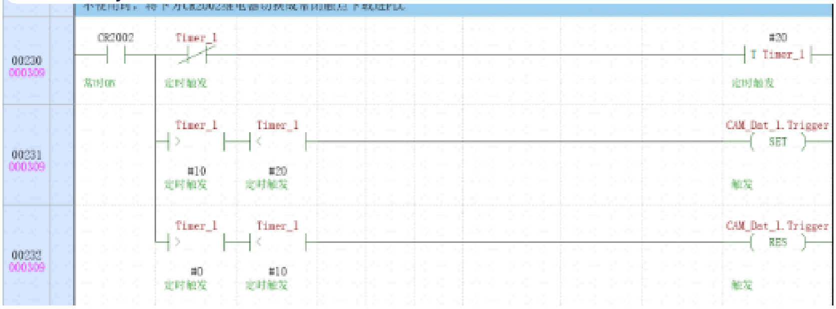


Figure 2-30 Program Example 3

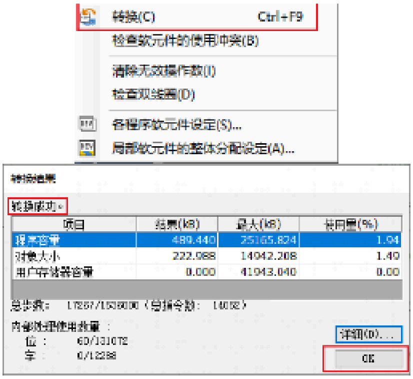
Lines 230-232 of the program: In order to facilitate the testing of the test department, the trigger command is sent to the vision sensor through the timer command (the vision sensor is configured with single frame or level mode), when the timing time needs to be modified, the timer instruction timing time can be modified according to the needs, in this case, the sensor will be triggered to take a picture once at a timer of 2s, if this function is not needed, the CR2002 relay in line 230 of the program can be used as usual

The open contact is switched to normally closed contact, and this function is blocked, and the PLC program needs to be re-downloaded after modification to take effect.

2.2 Communication Testing

2.2.1 Download the program

Click [Convert] → [Convert] in the upper menu bar to compile the written program, and click [OK] after the conversion is successful.



转换结果

转换成功。

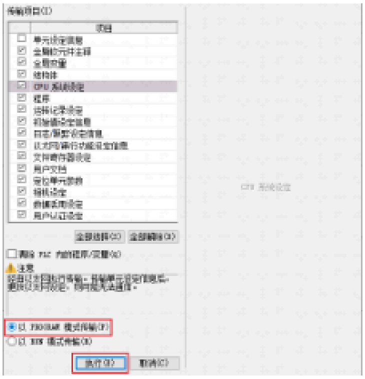
项目	结果(kB)	最大(kB)	使用量(%)
程序容量	489.440	25165.824	1.94
对象大小	222.088	14942.208	1.49
用户存储器容量	0.000	41943.040	0.00

总步数： 17257/1536000（总指令数： 14052）

内部处理使用数量 ：
位 ： 60/131072
字 ： 0/12288

Figure 2-31 Compilation program

Menu bar click PLC transfer, check [Transfer in PROGRAM mode] in the dialog box that pops up, and click [Execute].



传输项目(I)

	项目
□	单元设定信息
☑	全局软元件注释
☑	全局变量
☑	结构体
☑	CPU 系统设定
☑	程序
☑	追踪记录设定
☑	初始值设定信息
☑	日志/跟踪设定信息
☑	以太网/串行功能设定信息
☑	文件寄存器设定
☑	用户文档
☑	定位单元参数
☑	轴机设定
☑	数据采用设定
☑	用户认证设定

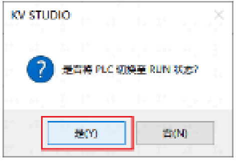
□ 清除 PLC 内的程序/变量(X)

⚠ 注意
[illegible]

● 以 PROGRAM 模式传输(P)
○ 以 RUN 模式传输(R)

Figure 2-32 Transmission procedure

[Do you switch the PLC to RUN state?] Select Yes.



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是否将 PLC 切换至 RUN 状态?

Figure 2-33 Switching confirmation

2.2.2 Communication Testing

Select [Monitor/Emulator][Monitor Mode] in the upper menu bar to put the program online.

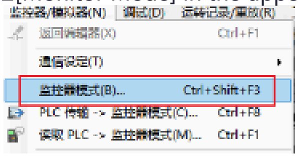

监控器/模拟器(N)
调试(D)
运转记录/重放(R)
返回编辑器(X) Ctrl+F1
通信设定(T)
监控器模式(B)... Ctrl+Shift+F3
PLC 传输 -> 监控器模式(C)... Ctrl+F8
读取 PLC -> 监控器模式(M)... Ctrl+F1

Figure 2-34 Monitor mode

Select [Monitor/Emulator] [Login to the Monitor Window] in the upper menu bar and add the following variables in the Monitor window.

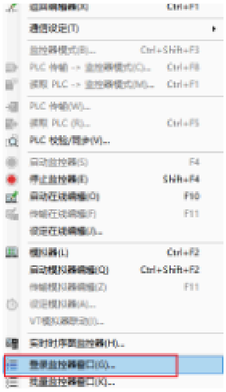
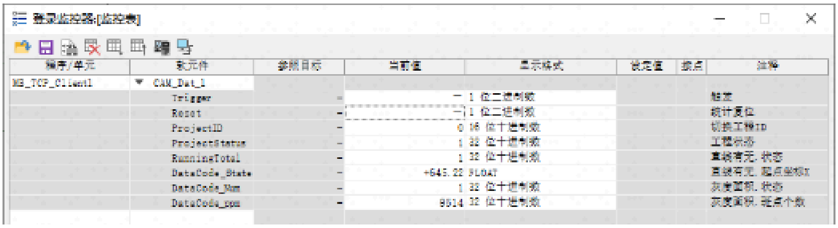


Figure 2-35 Login to the monitor window



程序/单元	软元件	参照目标	当前值	显示格式	设定值	断点	注释
MB_TCP_Client1	CAM_Dat_1						
	Trigger	-	—	1 位二进制数			触发
	Reset	-	—	1 位二进制数			统计复位
	ProjectID	-	0	16 位十进制数			切换工程ID
	ProjectStatus	-	1	32 位十进制数			工程状态
	RunningTotal	-	1	32 位十进制数			直线有无.状态
	DataCode_State	-	+645.22	FLOAT			直线有无.起点坐标X
	DataCode_Num	-	1	32 位十进制数			灰度面积.状态
	DataCode_ppm	-	9514	32 位十进制数			灰度面积.斑点个数

Figure 2-36 Adding Variables

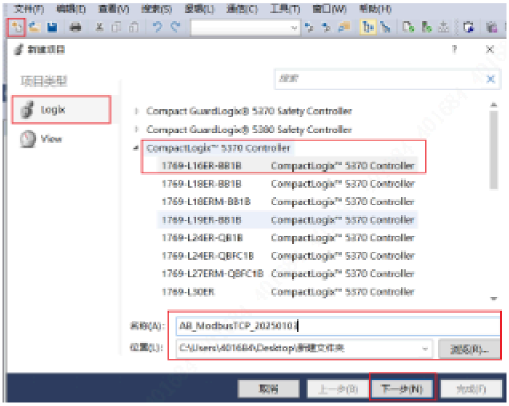
When the vision sensor is manually triggered to take a photo, change the value of the [CAM_Dat_1.Tigger] variable to [TRUE], the PLC will send a trigger command to the vision sensor, the vision sensor will start taking pictures, and continuously output the result data to the PLC, when the vision sensor needs to stop in level mode, change the value of the [CAM_Dat_1.Tigger] variable to [FALSE], and when the vision sensor stops taking pictures and needs to reset the total number of runs, it will be [CAM_Dat_ 1.Reset] variable value is changed to [TRUE], when switching the project ID, the communication of the project ID to be switched needs to be configured to the same communication protocol in advance, otherwise the PLC and the vision sensor will be disconnected after the switch, and the vision sensor interface needs to be manually refreshed after the switch is successfully refreshed before the switched project ID will be displayed.

Chapter 3 Rockwell PLC Configuration and Testing

3.1 PLC configuration

3.1.1 New construction projects

Open the Studio 5000 software, click Project New, select [Logix][CompactLogix 5370 Controller] [1769-L16ER-BB1B], modify the project name and file location, and click Next.



- Compact GuardLogix® 5370 Safety Controller
- Compact GuardLogix® 5380 Safety Controller
- CompactLogix™ 5370 Controller

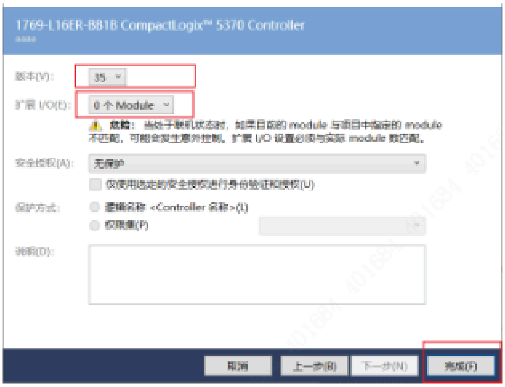
1769-L16ER-BB1B	CompactLogix™ 5370 Controller
1769-L18ER-BB1B	CompactLogix™ 5370 Controller
1769-L18ERM-BB1B	CompactLogix™ 5370 Controller
1769-L19ER-BB1B	CompactLogix™ 5370 Controller
1769-L24ER-QB1B	CompactLogix™ 5370 Controller
1769-L24ER-QBFC1B	CompactLogix™ 5370 Controller
1769-L27ERM-QBFC1B	CompactLogix™ 5370 Controller
1769-L30ER	CompactLogix™ 5370 Controller

名称(A): AB_ModbusTCP_20250103

位置(L): C:\Users\401684\Desktop\新建文件夹

Figure 3-1 New project

Select the version number and the number of expansion IO modules based on the PLC used in the project, and click Done.



1769-L16ER-BB1B CompactLogix™ 5370 Controller

版本(V): 35

扩展 I/O(E): 0 个 Module

⚠ 警告：当处于联机状态时，如果目前的 module 与项目中指定的 module 不匹配，可能会发生意外控制。扩展 I/O 设置必须与实际 module 数匹配。

安全授权(A): 无保护

□ 仅使用选定的安全授权进行身份验证和授权(U)

保护方式: ○ 逻辑名称 <Controller 名称>(L)
○ 权限集(P)

说明(D):

Figure 3-2 Selecting Relevant Parameters

3.1.2 PLC Configuration

Select [Task]□[MainTask]□[MainProgram]□[MainRoutine] in the project tree, and double-click to enter the ladder chart programming interface.

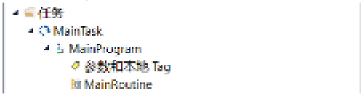


Figure 3-3 Entering the ladder chart programming interface

Right-click the ladder chart and select [Import Rung].

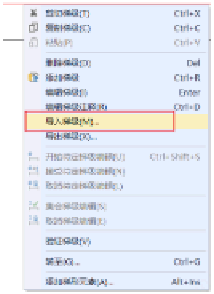


Figure 3-4 Importing rungs

Locate the ModbusTCPClient library file provided by Rockwell Corporation in the file, select and open it.

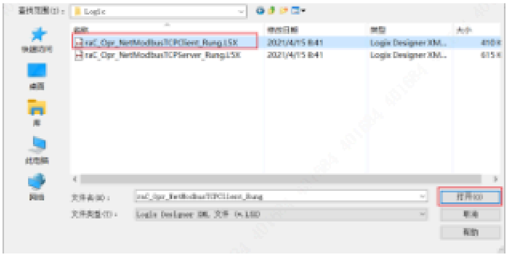

Logic
raC_Opr_NetModbusTCPClient_Rung.L5X
raC_Opr_NetModbusTCPServer_Rung.L5X
2021/4/15 8:41
Logix Designer XM...
raC_Opr_NetModbusTCPClient_Rung

Figure 3-5 Importing the ModbusTCPClient library file

Click OK.

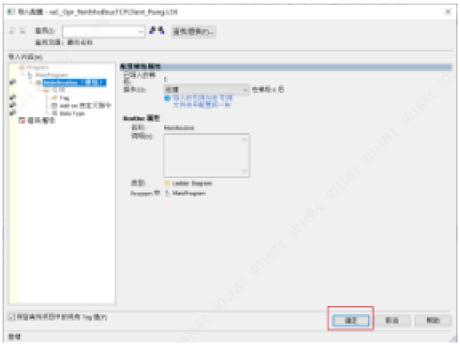


Figure 3-6 Import configuration determination

After successful import, the following function blocks are displayed in the ladder chart.

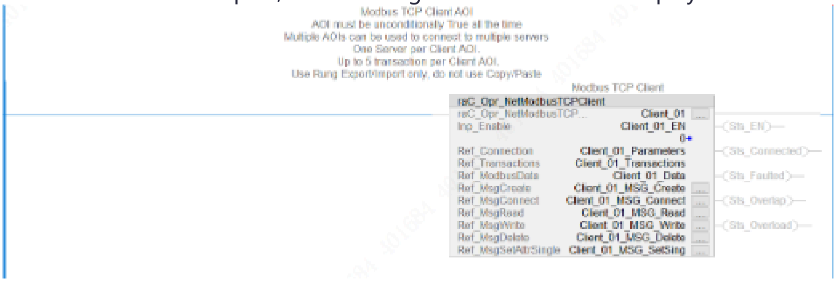

Modbus TCP Client AOI
AOI must be unconditionally True all the time
Multiple AOIs can be used to connect to multiple servers
One Server per Client AOI.
Up to 5 transaction per Client AOI.
Use Rung Export/Import only, do not use Copy/Paste
Modbus TCP Client
raC_Opr_NetModbusTCPClient
raC_Opr_NetModbusTCP... Client_01
Inp_Enable Client_01_EN
0
Ref_Connection Client_01_Parameters
Ref_Transactions Client_01_Transactions
Ref_ModbusData Client_01_Data
Ref_MsgCreate Client_01_MSG_Create
Ref_MsgConnect Client_01_MSG_Connect
Ref_MsgRead Client_01_MSG_Read
Ref_MsgWrite Client_01_MSG_Write
Ref_MsgDelete Client_01_MSG_Delete
Ref_MsgSetAttrSingle Client_01_MSG_SetSing
Sts_EN
Sts_Connected
Sts_Faulted
Sts_Overlap
Sts_Overload

Figure 3-7 Display of the imported ladder chart

In the project tree, select [Asset]□[Data Type]□[User-Defined] to create the following data types.

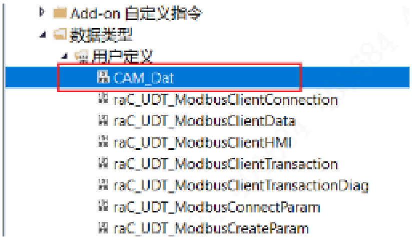
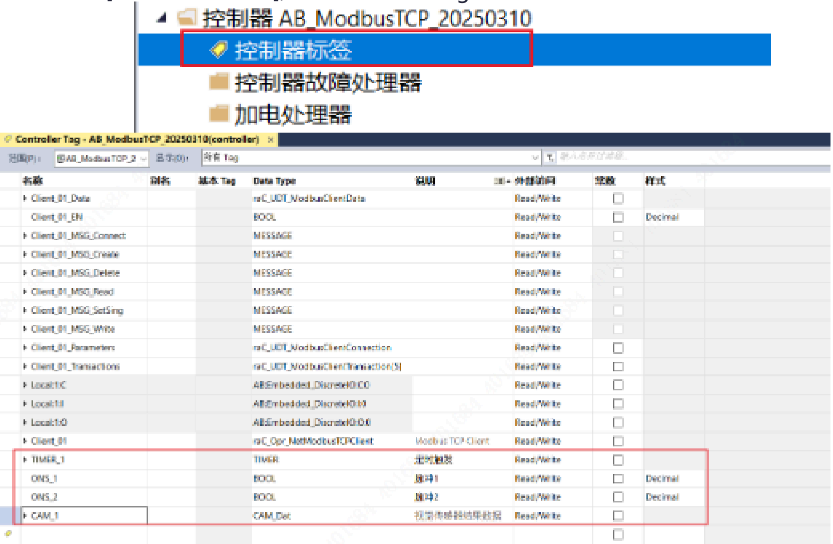

Add-on 自定义指令
数据类型
用户定义
CAM_Dat
raC_UDT_ModbusClientConnection
raC_UDT_ModbusClientData
raC_UDT_ModbusClientHMI
raC_UDT_ModbusClientTransaction
raC_UDT_ModbusClientTransactionDiag
raC_UDT_ModbusConnectParam
raC_UDT_ModbusCreateParam

Figure 3-8 New Data Type

In the [Controller Label], add the following variables:



名称	别名	基本 Tag	Data Type	说明	外部访问	常量	样式
Client_01_Data			raC_UDT_ModbusClientData		Read/Write	□	
Client_01_EN			BOOL		Read/Write	□	Decimal
Client_01_MSG_Connect			MESSAGE		Read/Write	□	
Client_01_MSG_Create			MESSAGE		Read/Write	□	
Client_01_MSG_Delete			MESSAGE		Read/Write	□	
Client_01_MSG_Read			MESSAGE		Read/Write	□	
Client_01_MSG_SetSing			MESSAGE		Read/Write	□	
Client_01_MSG_Write			MESSAGE		Read/Write	□	
Client_01_Parameters			raC_UDT_ModbusClientConnection		Read/Write	□	
Client_01_Transactions			raC_UDT_ModbusClientTransaction[5]		Read/Write	□	
Local:1:C			AB:Embedded_DiscreteIO:C:0		Read/Write	□	
Local:1:I			AB:Embedded_DiscreteIO:I:0		Read/Write	□	
Local:1:O			AB:Embedded_DiscreteIO:O:0		Read/Write	□	
Client_01			raC_Opr_NetModbusTCPClient	Modbus TCP Client	Read/Write	□	
TIMER_1			TIMER	定时触发	Read/Write	□	
ONS_1			BOOL	脉冲1	Read/Write	□	Decimal
ONS_2			BOOL	脉冲2	Read/Write	□	Decimal
CAM_1			CAM_Dat	视觉传感器结果数据	Read/Write	□	
						□	

Figure 3-9 Adding Variables

The main program is supplemented with the following procedures:

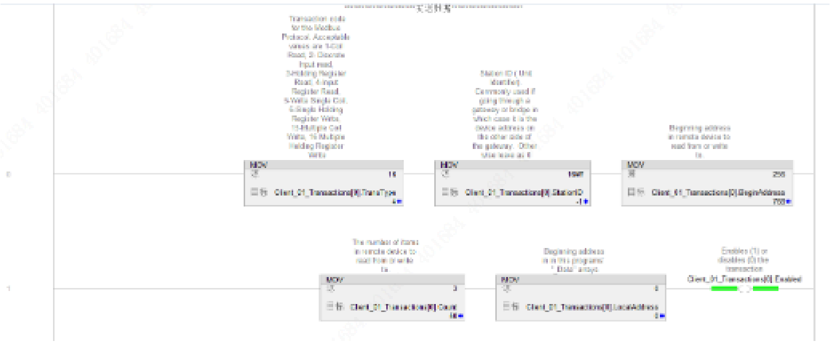

MOV
16
Client_01_Transactions[0].TransType
MOV
16#FF
Client_01_Transactions[0].StationID
MOV
256
Client_01_Transactions[0].BeginAddress
MOV
3
Client_01_Transactions[0].Count
MOV
0
Client_01_Transactions[0].LocalAddress
Client_01_Transactions[0].Enabled

Figure 3-10 Supplemental procedure

Line 0-1: Set the ModbusTCP function code to send control data to the vision sensor to be 16, the slave ID is 16#FF, the starting address of the sending vision sensor hold register is 0x100, the decimal representation is 256, the write length is 3 words, and the data to be sent is stored in the address starting from the 0th integer variable of the PLC controller label [Client_01_Data.HoldRegisters_4xxx] array, which will be enabled 1。

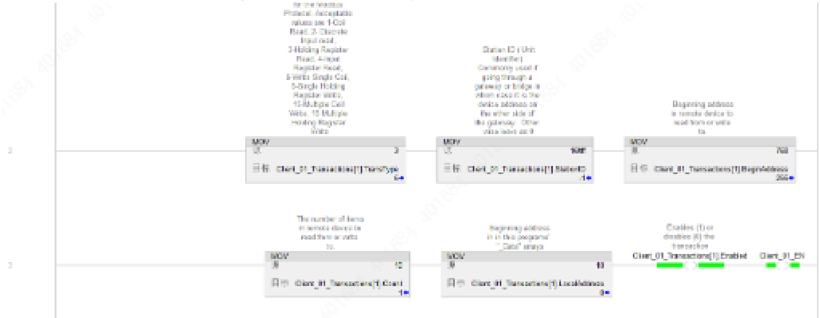

MOV
3
Client_01_Transactions[1].TransType
MOV
16#FF
Client_01_Transactions[1].StationID
MOV
768
Client_01_Transactions[1].BeginAddress
MOV
10
Client_01_Transactions[1].Count
MOV
10
Client_01_Transactions[1].LocalAddress
Client_01_Transactions[1].Enabled
Client_01_EN

Figure 3-11 Supplemental Program Example 1

Line 2-3 of the program: Set the ModbusTCP function code to receive data from the vision sensor to be 3, the slave ID is 16#FF, the starting address of the received data is 0x300, the decimal representation is 768, the length of the receiver is 10, and the received data is stored in the PLC controller label [Client_01_Data.HoldRegisters_4xxx] array of the 10th integer variable, which will enable the setting of 1.

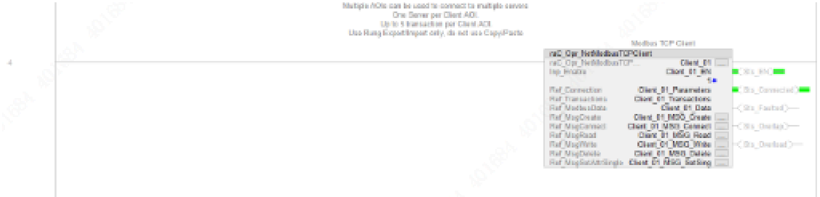


Figure 3-12 Supplemental Program Example 2

Line 4 of the program: Import the official ModbusTCP function block.

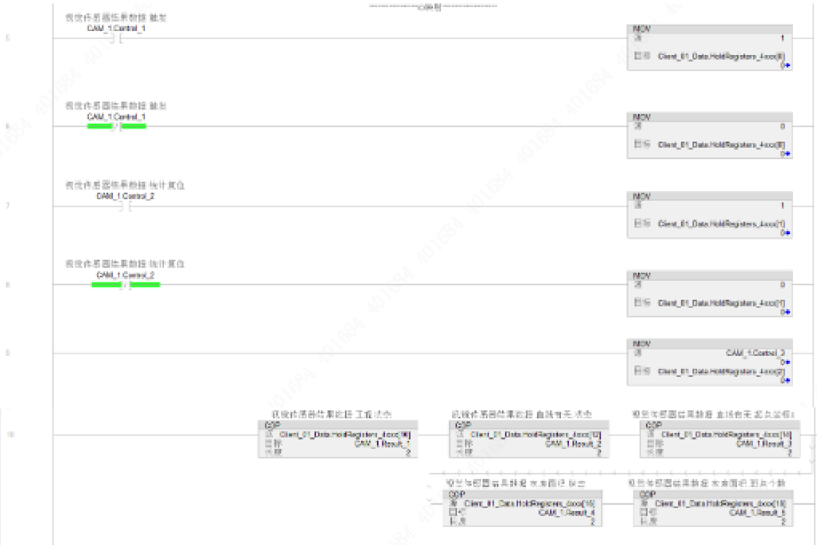


Figure 3-13 Supplemental Program Example 3

Lines 5-10: Map the data read and sent by the vision sensor to the new global variable in the previous step.

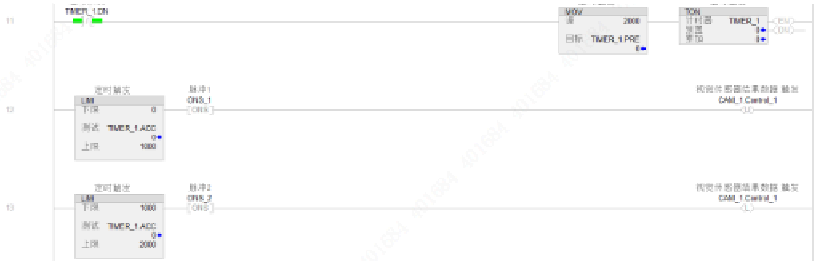


Figure 3-14 Supplemental Program Example 4

Lines 11-13 of the program: In order to facilitate the testing of the test department, the trigger command is sent regularly through the timer command, and the timing time needs to be modified, the value of the [TIMER_1.PRE] variable in line 11 of the program can be modified as needed, and in this case, the sensor will be triggered to take a picture once at a timer of 2s, if this function is not needed, the normally closed contact in line 11 [TIMER_1.DN] will be changed to a normally open contact, and the PLC program needs to be re-downloaded after modification

In the ModbusTCP communication function block, right-click [Client_01_Parameters] and select [Monitor Client_01_Parameters] to enter the monitoring interface of the controller tab.

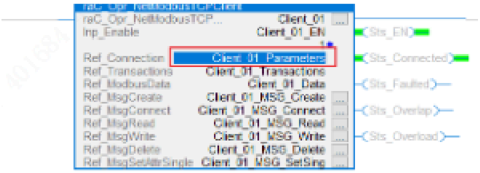

raC_Opr_NetModbusTCPClient
raC_Opr_NetModbusTCP... Client_01
Inp_Enable Client_01_EN
Ref_Connection Client_01_Parameters
Ref_Transactions Client_01_Transactions
Ref_ModbusData Client_01_Data
Ref_MsgCreate Client_01_MSG_Create
Ref_MsgConnect Client_01_MSG_Connect
Ref_MsgRead Client_01_MSG_Read
Ref_MsgWrite Client_01_MSG_Write
Ref_MsgDelete Client_01_MSG_Delete
Ref_MsgSetAttrSingle Client_01_MSG_SetSing
Sts_EN
Sts_Connected
Sts_Faulted
Sts_Overlap
Sts_Overload

Figure 3-15(1) Entering the monitoring interface of the controller label

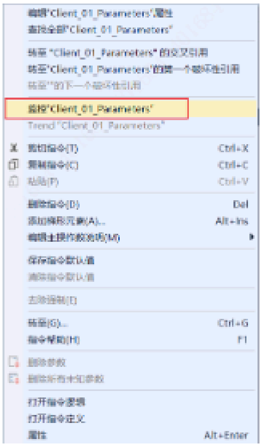
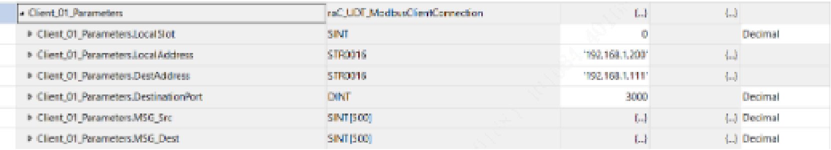


Figure 3-15(2) Entering the monitoring interface of the controller label

[Client_01_Parameters.LocalAddress] is set to the IP address of the PLC, [Client_01_Parameters.DestAddress] is set to the IP address of the vision sensor, and [Client_01_Parameters.DestinationPort] is set to the port number of the vision sensor.



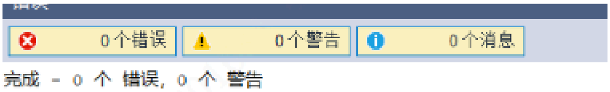
▴ Client_01_Parameters	raC_UDT_ModbusClientConnection	{...}	{...}	
▸ Client_01_Parameters.LocalSlot	SINT	0		Decimal
▸ Client_01_Parameters.LocalAddress	STR0016	'192.168.1.200'	{...}	
▸ Client_01_Parameters.DestAddress	STR0016	'192.168.1.111'	{...}	
▸ Client_01_Parameters.DestinationPort	DINT	3000		Decimal
▸ Client_01_Parameters.MSG_Src	SINT[300]	{...}	{...}	Decimal
▸ Client_01_Parameters.MSG_Dest	SINT[300]	{...}	{...}	Decimal

Figure 3-16 is set to the vision sensor port number

3.2 Communication Test

3.2.1 Download the program

click 💾 Save button, the program will be automatically compiled, and when it is displayed without errors, you can download it.



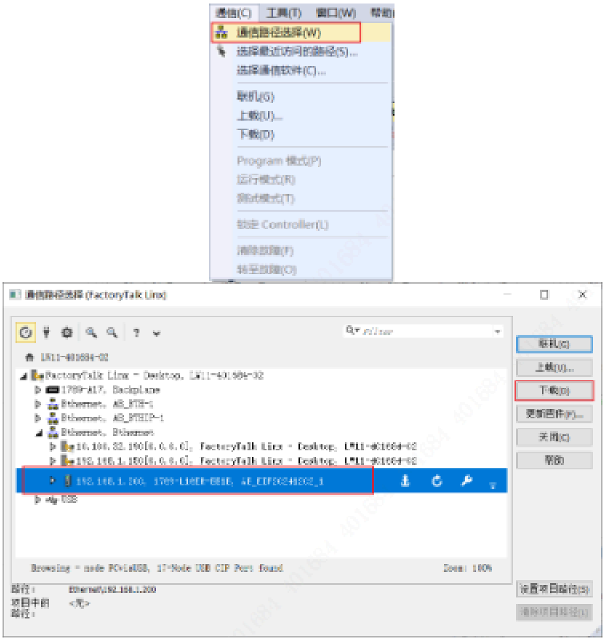
错误

☒ 0个错误	⚠ 0个警告	ⓘ 0个消息

```
完成 - 0 个 错误, 0 个 警告
```

Figure 3-17 Saving and Auto-Compiling Programs

Select [Communication]□[Communication Path Selection], find the PLC device in the network, and click Download.



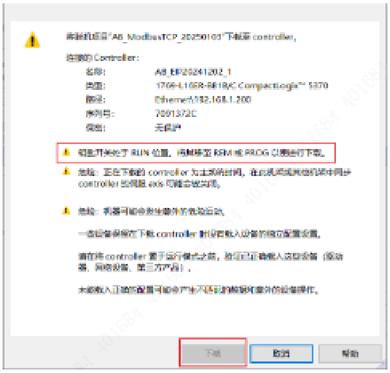
Browsing - node PCviaUSB, 17-Node USB CIP Port found   Zoom: 100%

路径： Ethernet\192.168.1.200

项目中的路径： <无>

Figure 3-18 Communication path selection

Note: If the key switch of the PLC body is in the RUN position, the download button cannot be clicked and the following information will be displayed, and the key switch on the PLC body needs to be moved to the REM position before the download button can be clicked normally.



将脱机项目"AB_ModbusTCP_20250103"下载至 controller。

连接的 Controller:

名称:	AB_EIP20241202_1
类型:	1769-L16ER-BB1B/C CompactLogix™ 5370
路径:	Ethernet\192.168.1.200
序列号:	7091372C
保护:	无保护

钥匙开关处于 RUN 位置。将其转至 REM 或 PROG 以便进行下载。

危险：正在下载的 controller 为主动的时间，在此机架或其他机架中同步 controller 控制器 axis 可能会被关闭。

危险：意外可能会发生意外的设备运动。

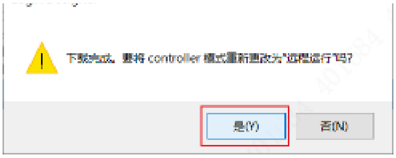
一些设备保留在下载 controller 时仅被载入设备的独立配置设置。

请在将 controller 置于运行模式之前，验证已正确载入这些设备（驱动器、网络设备、第三方产品）。

未能载入正确的配置可能会产生不可预测的结果和意外的设备操作。

Figure 3-19 Download Warning

When the download is complete, prompt for the following information, click [Yes], and move the key switch of the PLC body back to the RUN position.



下载完成。要将 controller 模式重新更改为"远程运行"吗?

Figure 3-20 Download complete

3.2.2 Communication Test

After the download is completed, the software will automatically enter the online mode, and if the [Sts_Connected] pin of the ModbusTCP communication function block is positioned, it indicates that the PLC and the vision sensor have communicated successfully.

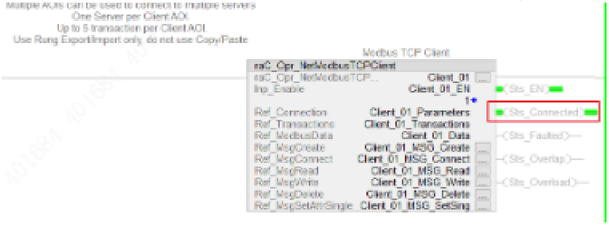
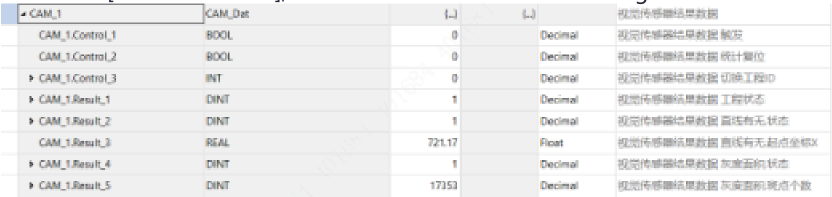


Figure 3-21 Communication Success

In the [Controller Label], monitor the values of the following variables:



CAM_1	CAM_Dat	{...}	{...}		视觉传感器结果数据
CAM_1.Control_1	BOOL	0		Decimal	视觉传感器结果数据 触发
CAM_1.Control_2	BOOL	0		Decimal	视觉传感器结果数据 统计复位
CAM_1.Control_3	INT	0		Decimal	视觉传感器结果数据 切换工程ID
CAM_1.Result_1	DINT	1		Decimal	视觉传感器结果数据 工程状态
CAM_1.Result_2	DINT	1		Decimal	视觉传感器结果数据 直线有无 状态
CAM_1.Result_3	REAL	721.17		Float	视觉传感器结果数据 直线有无 起点坐标X
CAM_1.Result_4	DINT	1		Decimal	视觉传感器结果数据 灰度面积 状态
CAM_1.Result_5	DINT	17353		Decimal	视觉传感器结果数据 灰度面积 斑点个数

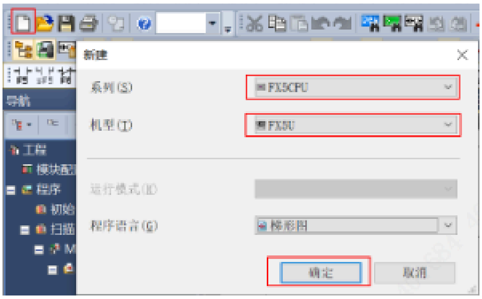
Figure 3-22 Monitoring variables

When the vision sensor is manually triggered to take a photo, the value of the [CAM_1.Control_1] variable is changed to 1, the PLC will send a trigger command to the vision sensor, the vision sensor will start taking pictures, and continuously output the result data to the PLC, when the vision sensor needs to stop in level mode, change the value of the [CAM_1.Control_1] variable to 0, the visual sensor will stop taking pictures, and when the total number of runs needs to be reset, set [CAM_1.Control_2] The variable value is changed to 1, and when switching the project ID, the communication of the project ID to be switched needs to be configured to the same communication protocol in advance, otherwise the PLC and the vision sensor will be disconnected after the switch, and the vision sensor interface needs to be manually refreshed after the switch is successfully refreshed before the switched project ID will be displayed.

4.1 PLC Configuration

4.1.1 New projects

Open the Mitsubishi Works3 software, click New Project, select FX5CPU Series, select FX5U, and click OK.



新建

系列(S) FX5CPU

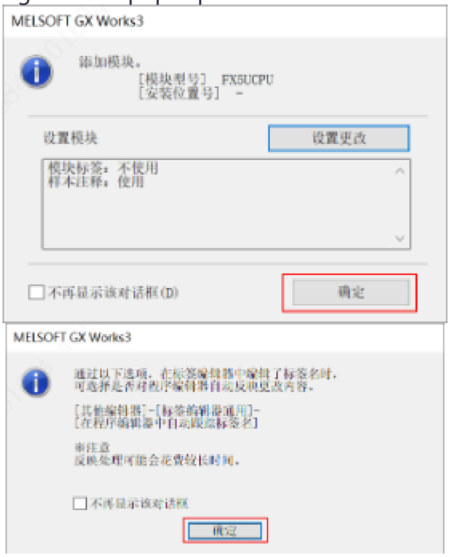
机型(T) FX5U

运行模式(R)

程序语言(G) 梯形图

Figure 4-1 New Project

Click OK in the dialog box that pops up.



MELSOFT GX Works3

添加模块。
[模块型号] FX5UCPU
[安装位置号] -

设置模块

模块标签：不使用
样本注释：使用

□不再显示该对话框(D)

MELSOFT GX Works3

通过以下选项，在标签编辑器中编辑了标签名时，
可选择是否对程序编辑器自动反映更改内容。

[其他编辑器]-[标签编辑器通用]-
[在程序编辑器中自动跟踪标签名]

※注意
反映处理可能会花费较长时间。

□不再显示该对话框

Figure 4-2 Confirmation Interface

Double-click [Module Configuration Diagram] in the left navigation bar.

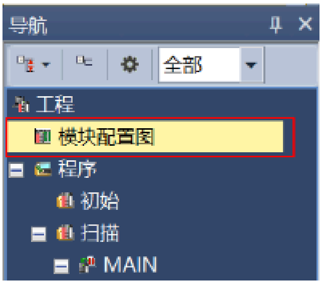


Figure 4-3 Module configuration diagram

Right-click the CPU module and click [Change CPU Model].

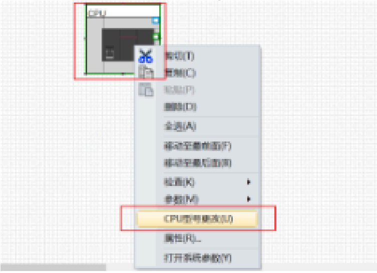
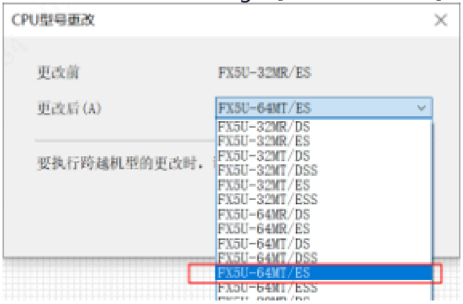


Figure 4-4 CPU model change

Depending on the actual PLC model change, [FX5U-64MT/ES] is selected in this case.


CPU型号更改

更改前 FX5U-32MR/ES

更改后(A) FX5U-64MT/ES

要执行跨越机型的更改时，

Figure 4-5 PLC model change

4.1.2 Configuring the PLC Program

In the left navigation pane, select [Parameters][FX5UCPU][Module Parameters][Ethernet Port].

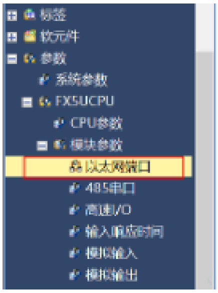
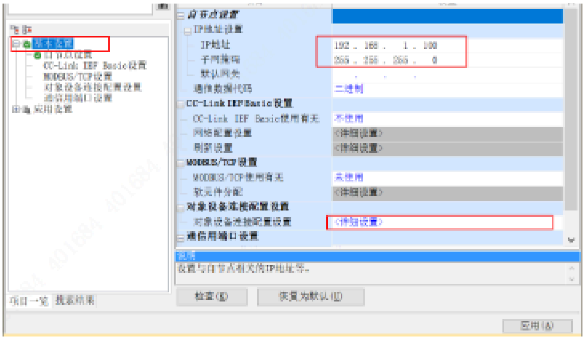


Figure 4-6 Ethernet port

Configure the IP address, subnet mask, and other information of the PLC in the basic information, and double-click the connection configuration settings of the object device after setting it.



自节点设置

IP地址设置

IP地址 192 . 168 . 1 . 100

子网掩码 255 . 255 . 255 . 0

默认网关

通信数据代码 二进制

CC-Link IEF Basic设置

CC-Link IEF Basic使用有无 不使用

网络配置设置 <详细设置>

刷新设置 <详细设置>

MODBUS/TCP设置

MODBUS/TCP使用有无 未使用

软元件分配 <详细设置>

对象设备连接配置设置

对象设备连接配置设置 <详细设置>

通信用端口设置

说明

设置与自节点相关的IP地址等。

Figure 4-7 Basic configuration

In the Ethernet device (general) in the navigation pane on the right, select Active connected device, and left-click and drag to the left interface.

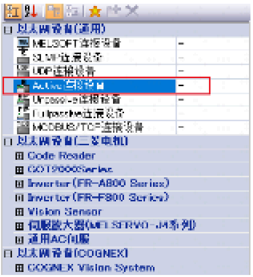


Figure 4-8 Active Connected Devices

[Communication means] Select the communication protocol, [Programmable controller] port number is set to 2000 (setting range: 1~5548, 5570~65534, 5549~5569 have been used by the system, please do not specify), [sensor. Device] Enter the IP address and port number of the vision sensor.

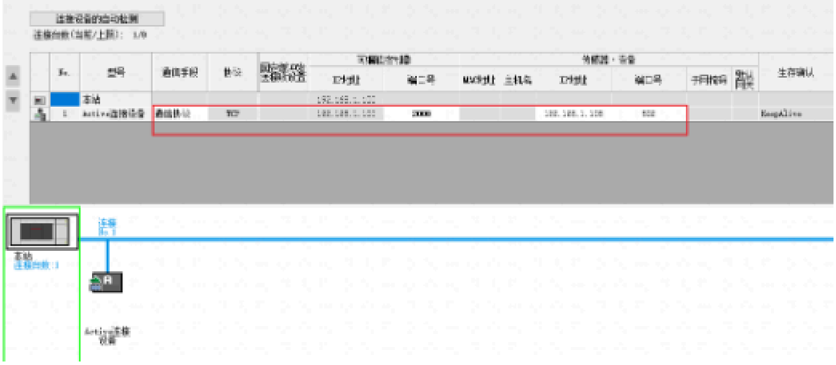


Figure 4-9 Input sensor related configuration

When the settings are complete, tap [Reflect settings and turn off] in the menu bar above.

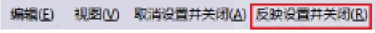


Figure 4-10 reflects the settings and closes

Return to the Ethernet port settings screen, click [Apply] to save the settings and turn it off

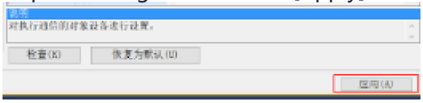


Figure 4-11 Save and Close

In the menu bar, click [Tools]□[Communication Protocol Support Functions], select [CPU (Ethernet)] in the dialog box that pops up, and click OK.

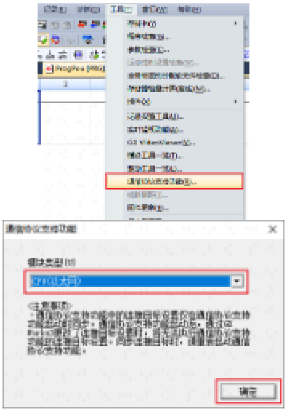
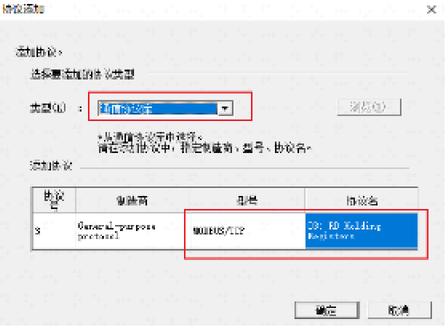


Figure 4-12 Selecting CPU (Ethernet)

Click New , click [Add], select [Communication Protocol Library] for the protocol type, select [Modbus/TCP] for the model, and the protocol name is based on the protocol name.

The visual sensor register data specifies that you need to set the 03/16 function code, first set the 03 function code to read the vision sensor hold register, then repeat the above steps, and then add the 16 function code to write data to the vision sensor hold register.

Figure 4-13 Adding the Protocol Number



协议添加

添加协议

选择要添加的协议类型

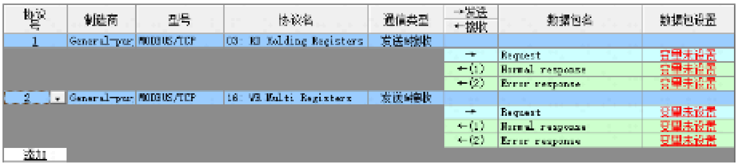
类型(L)：通信协议库

*从通信协议库中选择。
请在添加协议中，指定制造商、型号、协议名。

添加协议

协议号	制造商	型号	协议名
3	General-purpose protocol	MODBUS/TCP	03: RD Holding Registers

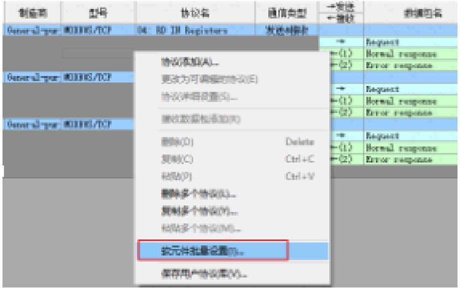
Figure 4-14 Adding Protocols



协议号	制造商	型号	协议名	通信类型	→发送 ←接收	数据包名	数据包设置
1	General-pur	MODBUS/TCP	03: RD Holding Registers	发送&接收			
					→	Request	变量未设置
					←(1)	Normal response	变量未设置
					←(2)	Error response	变量未设置
2	General-pur	MODBUS/TCP	16: WR Multi Registers	发送&接收			
					→	Request	变量未设置
					←(1)	Normal response	变量未设置
					←(2)	Error response	变量未设置

Figure 4-15 Adding Protocol Effects

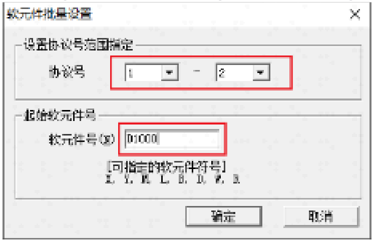
Right-click on the blank space and select [Bulk Settings of Soft Components].



制造商	型号	协议名	通信类型	→发送 ←接收	数据包名
General-pur	MODBUS/TCP	04: RD IN Registers	发送&接收		
				→	Request
				←(1)	Normal response
				←(2)	Error response
General-pur	MODBUS/TCP				
				→	Request
				←(1)	Normal response
				←(2)	Error response
General-pur	MODBUS/TCP				
				→	Request
				←(1)	Normal response
				←(2)	Error response

Figure 4-16 Batch setup of soft components

In the software bulk settings, specify the setup protocol number range to 1-2 and the starting software number to D1000 (using the free storage in the program).



软元件批量设置

设置协议号范围指定

协议号 1 ～ 2

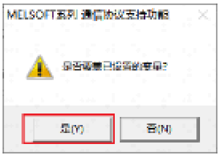
起始软元件号

软元件号(S) D1000

[可指定的软元件符号]
X, Y, M, L, B, D, W, R

Figure 4-17 Setting the parameters related to the soft component

[Does it override the set variable?] Select Yes.

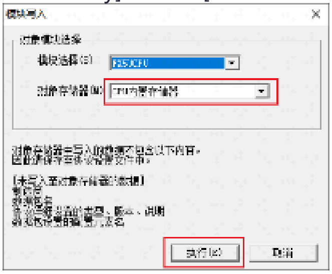


MELSOFT系列 通信协议支持功能

是否覆盖已设置的变量?

Figure 4-18 Confirm the coverage variable

Click [Module Write]], [Object Memory] selects [CPU Internal Memory], clicks [Execute],



模块写入

对象模块选择

模块选择(S) R05CPU

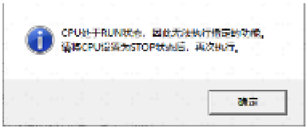
对象存储器(M) CPU内置存储器

对象存储器中写入的数据不包含以下内容。
因此请将其保存在协议设置文件中。

[未写入至对象存储器的数据]
制造商
数据包名
协议详细设置的机型、版本、说明
数据包设置的元素名

Figure 4-19 Module continuation

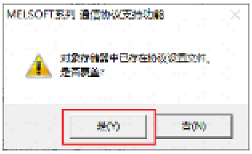
If the CPU is in the RUN state and cannot perform the specified function. Set the CPU to STOP and then do it again.], you need to put the CPU in STOP mode and perform the module write operation again.



CPU处于RUN状态，因此无法执行指定的功能。
请将CPU设置为STOP状态后，再次执行。

Figure 4-20 Communication protocol support function tips

Click Yes.



MELSOFT系列 通信协议支持功能

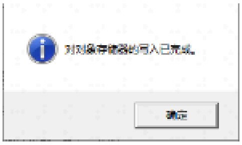
对象存储器中已存在协议设置文件，
是否覆盖?

Figure 4-21 Communication protocol support function coverage confirmation

Shows that the write to the object memory is complete.] and then click OK, and it is]Save the configuration to your computer for easy downloading

recommended to click Save

Use or modify it every time, and close the interface after saving.



对对象存储器的写入已完成。

Figure 4-22 Write Completion Confirmation

Write PLC programs

Select [Tag]□[Struct] in the project tree, right-click [New Data], and create the following structure variables.

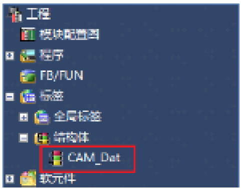
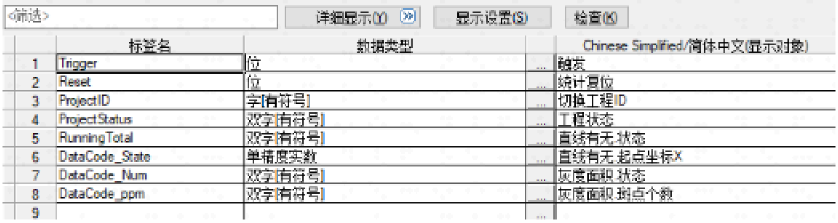


Figure 4-23 New Data



	标签名	数据类型		Chinese Simplified/简体中文(显示对象)
1	Trigger	位	...	触发
2	Reset	位	...	统计复位
3	ProjectID	字[有符号]	...	切换工程ID
4	ProjectStatus	双字[有符号]	...	工程状态
5	RunningTotal	双字[有符号]	...	直线有无 状态
6	DataCode_State	单精度实数	...	直线有无 起点坐标X
7	DataCode_Num	双字[有符号]	...	灰度面积 状态
8	DataCode_ppm	双字[有符号]	...	灰度面积 斑点个数
9			...	

Figure 4-24 Establishing Structure Variables

Select [Program]□[Scan]□[MAIN]□[ProgPou] in the project tree, and add the following variables to [Local Label].

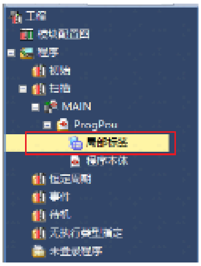
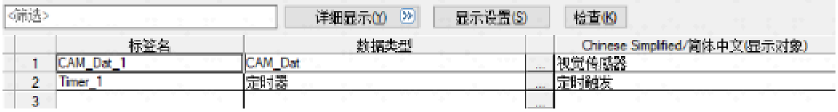


Figure 4-25 Local labels



	标签名	数据类型		Chinese Simplified/简体中文(显示对象)
1	CAM_Dat_1	CAM_Dat	...	视觉传感器
2	Timer_1	定时器	...	定时触发
3			...	

Figure 4-26 Adding Variables

Add the following program to the ladder diagram interface.

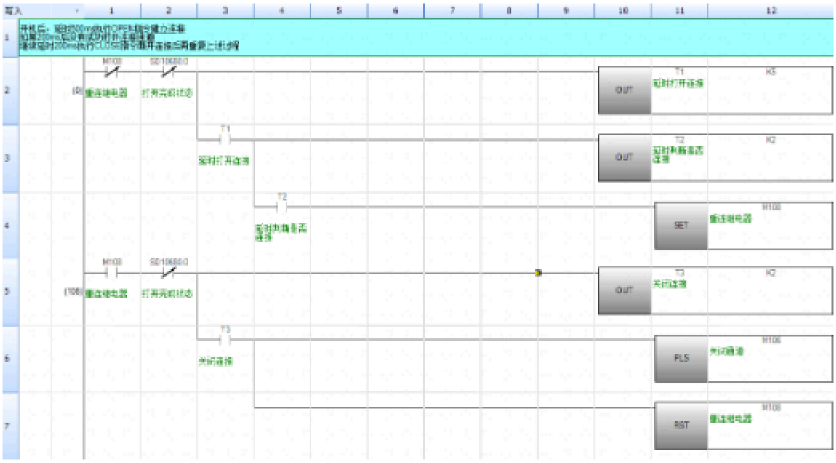


Figure 4-27 Example 1

Line 2-4: Open the timer T1 with the normally closed contact at the auxiliary relay M108 and the 0th position of the system's special register SD10680, execute the OPEN command to establish the connection and open the timer T2 after a delay of 500ms, and set the connection channel if it is not opened after 200ms.

Line 5-7: When M108 is positioned and SD10680.0 is still not connected, turn on the timing T3, delay 200ms and then place the M106 after a scan cycle to disconnect and reset the M108.

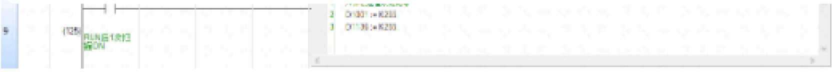


Figure 4-28 Program Example 2

Program line 9: Use the special relay SM402 to assign 255 to registers D1001/D1136 on the first scan cycle of CPU operation, which are used to store the vision sensor slave station number.

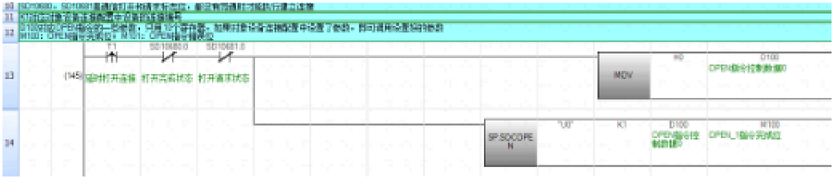


Figure 4-29 Program Example 3

Line 13-14 of the program: If TCP communication is not currently opened and there is no open request, the rising edge of the timer T1 will trigger the OPEN command to establish a connection with the vision sensor, K1 corresponds to the connection number of the device in the object device connection configuration, D100 corresponds to some parameters of the OPEN command, occupying the 10 word addresses after D100, if the communication parameters are set in the object device connection configuration, assign a value of 0 to D100 to indicate the call of the set parameters, and M100 is OPEN The completion bit of the instruction, M101 is the error bit of the OPEN instruction, which will only trigger one scan cycle, when M100 and M101 are triggered at the same time, it means that the instruction execution error is

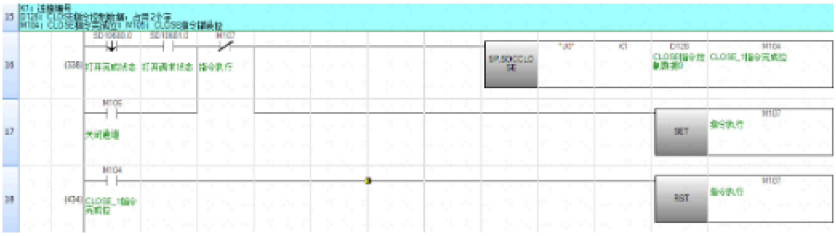
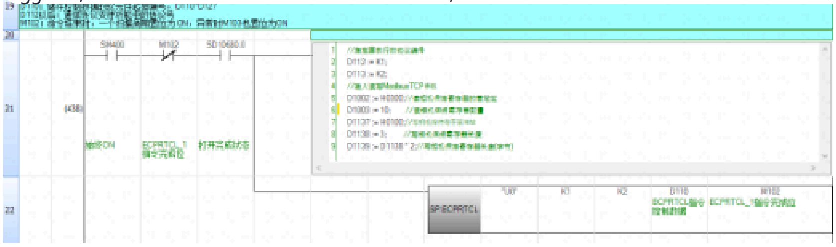


Figure 4-30 Program Example 4

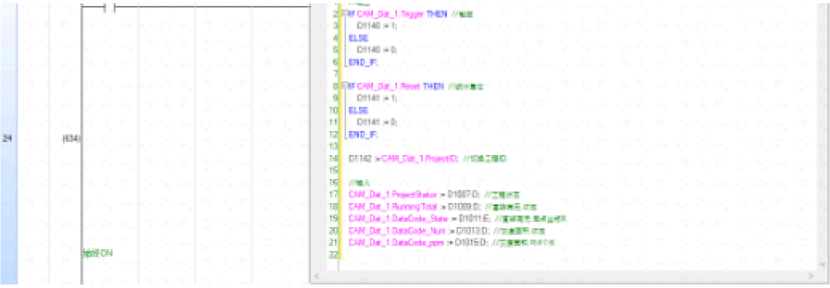
Line 16-18: When the connection is suddenly interrupted due to the unreliable network cable connection or other reasons, SD10680.0 will change from TRUE to FALSE, and its falling edge will trigger the CLOSE command to close the connection, and the normally closed contact of M107 will prevent the repeated execution of the CLOSE command. D128 is the starting number of the CLOSE command control data software component, occupying 2 words, M104 is the completion bit of the CLOSE command, M105 is the error bit of the CLOSE command, only one scan cycle will be triggered, and when the CLOSE command is executed, M104 will reset M107.



```
//[illegible]
D112 := K1;
D113 := K2;
//[illegible]ModbusTCP[illegible]
D1002 := H0300;//[illegible]
D1003 := 10;      //[illegible]
D1137 := H0100;//[illegible]
D1138 := 3;       //[illegible]
D1139 := D1138 * 2;//[illegible]
```

Figure 4-31 Program Example 5

Lines 20-22 of the program: When the communication is on, assign the protocol number that needs to be executed in the communication protocol support function to the address starting D112, D1002 store the first address of the read vision sensor hold register 0x300, D1003 store the number of read vision sensor hold registers 10 words, D1137 store the first address of the writing vision sensor hold register 0x100, D1138 store and write the number of vision sensor hold registers 3 words, D1139 stores the byte length of the memory kept by the vision sensor, executes the ECPRTCL instruction and transmits and receives data from the vision sensor, K2 is the number of protocols that execute the communication protocol support function, D110 is the starting number of the software component that stores the control data of the ECPRTCL instruction, the range is D110~D127, M102 is the completion bit of the ECPRTCL instruction, M103 is the error bit of the ECPRTCL instruction, and only one scan cycle will be triggered when ECPRTCL When the instruction execution is complete, the M102 is placed and its normally closed contacts will break the ECPRTCL instruction for one scan cycle, and the ECPRTCL instruction will continue to be



```
IF CAM_Dat_1.Trigger THEN //[illegible]
    D1140 := 1;
ELSE
    D1140 := 0;
END_IF;

IF CAM_Dat_1.Reset THEN //[illegible]
    D1141 := 1;
ELSE
    D1141 := 0;
END_IF;

D1142 := CAM_Dat_1.ProjectID; //[illegible]ID

//[illegible]
CAM_Dat_1.ProjectStatus := D1007:D; //[illegible]
CAM_Dat_1.RunningTotal := D1009:D; //[illegible]
CAM_Dat_1.DataCode_State := D1011:E; //[illegible]
CAM_Dat_1.DataCode_Num := D1012:D; //[illegible]
CAM_Dat_1.DataCode_ppm := D1015:D; //[illegible]
```

Figure 4-32 Program Example 6

Program Line 24: Vision Sensor Formatting The [Trigger] and [Statistical Reset] configured in the input string Although the data type is Bit, it still takes up space in ModbusTCP communication, so it is necessary to convert Bit and Word in the program, and then map the receive and send registers to the newly created local variables

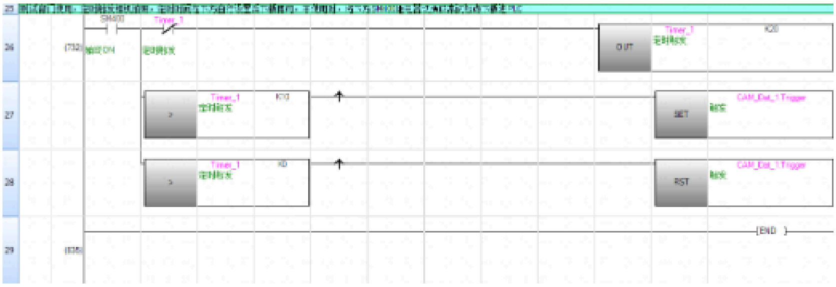


Figure 4-33 Program Example 7

Lines 26-28 of the program: In order to facilitate the testing of the test department, the trigger command is sent to the vision sensor through the timer command (the visual sensor is configured with single frame or level mode), the timer is a 100ms timer, when the timing time needs to be modified, the timer command timer time of the program 15 lines can be modified according to the needs, in this case, the sensor takes a picture once at a time, if this function is not required, the normally open contact of the SM400 relay in line 26 of the program can be switched to a normally closed contact, this function can be stopped, After the modification, you need to download the PLC program again to take effect.

4.2 Communication Test

4.2.1 Download the program

Click [Online]□[Current Connection Destination] in the upper menu bar, select [Direct Connection Settings]□[Ethernet], select the Ethernet adapter on the computer side, click [Communication Test], and when [Successfully connected to FX5UCPU] pops up, click OK.

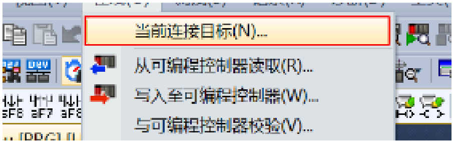
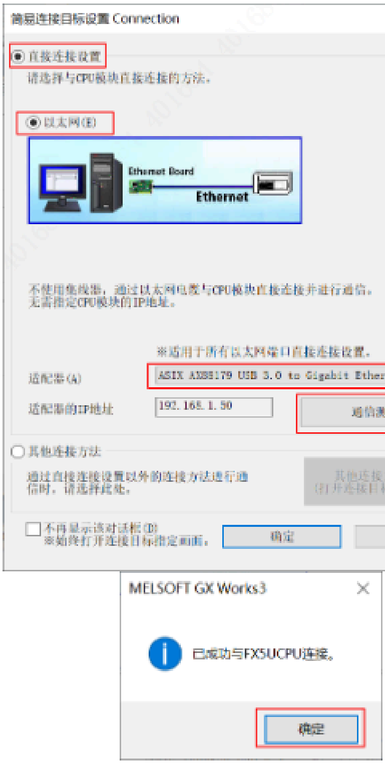


Figure 4-34(1) Communication test



简易连接目标设置 Connection

● 直接连接设置

请选择与CPU模块直接连接的方法。

● 以太网(E)

不使用集线器，通过以太网电缆与CPU模块直接连接并进行通信。
无需指定CPU模块的IP地址。

※适用于所有以太网端口直接连接设置。

适配器(A)　ASIX AX88179 USB 3.0 to Gigabit Ethernet Adapter

适配器的IP地址　192. 168. 1. 50

通信测试(T)

○ 其他连接方法

通过直接连接设置以外的连接方法进行通信时，请选择此处。

其他连接方法(O)
(打开连接目标指定画面)

□ 不再显示该对话框(D)
※始终打开连接目标指定画面。

确定　取消

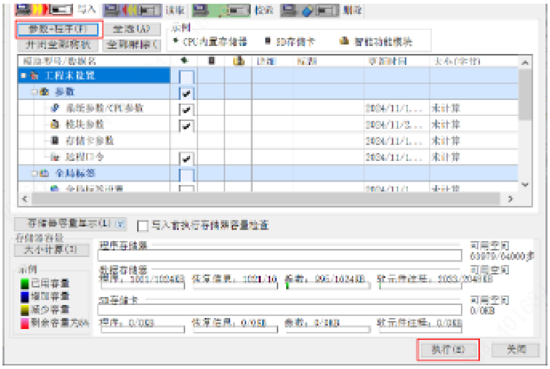
MELSOFT GX Works3

已成功与FX5UCPU连接。

确定

Figure 4-34(2) Communication test

Click above button, download the program into the PLC, select [Parameter + Program], and click [Execute].



模块型号/数据名				详细	标题	更新时间	大小(字节)
工程未设置	□						
参数	☑						
系统参数/CPU参数	☑					2024/11/1...	未计算
模块参数	☑					2024/11/2...	未计算
存储卡参数						2024/11/1...	未计算
远程口令	☑					2024/11/1...	未计算
全局标签	□						
全局标签设置	□					2024/11/1	未计算

存储器容量显示(L)　□ 写入前执行存储器容量检查

存储器容量
大小计算(Z)

示例
🟩 已用容量
🟦 增加容量
🟨 减少容量
🟥 剩余容量大于0%

程序存储器　可用空间 63979/64000步

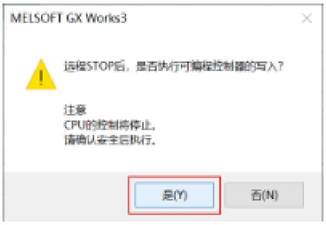
数据存储器　可用空间
程序：1001/1024KB　保存信息：1021/10　参数：995/1024KB　软元件注释：2033/2048KB

SD存储卡　可用空间 0/0KB
程序：0/0KB　保存信息：0/0KB　参数：0/0KB　软元件注释：0/0KB

执行(E)　关闭

Figure 4-35 Selection [Parameter + Program]

[After a remote STOP, is a write to the programmable controller performed?] Select Yes.



MELSOFT GX Works3

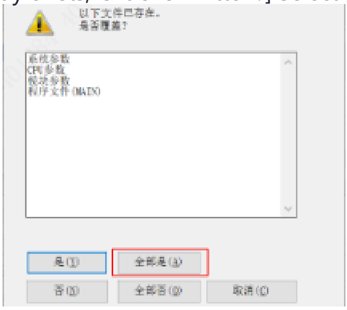
远程STOP后，是否执行可编程控制器的写入?

注意
CPU的控制将停止。
请确认安全后执行。

是(Y) 否(N)

Figure 4-36 Confirm the write

[The following file already exists, is it overwritten?] Select [All Yes].



以下文件已存在。
是否覆盖?

系统参数
CPU参数
模块参数
程序文件(MAIN)

是(Y) 全部是(A)
否(N) 全部否(O) 取消(C)

Figure 4-37 confirms coverage

After the download is successful, the PLC needs to be powered off and restarted.

4.2.2 Communication Testing

Click in the toolbar above Monitor Mode button, enter Monitor Mode, and click [Online]□[Monitor]□ [Log in to the Monitor mouth]□[Monitor Window 1], enter the Monitor window.

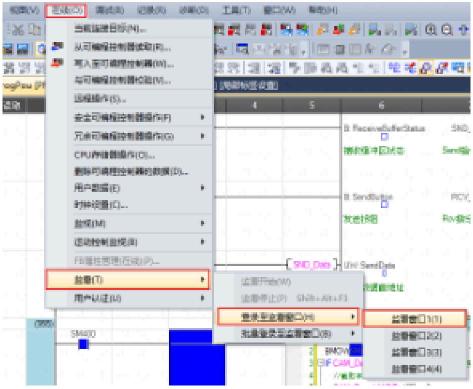
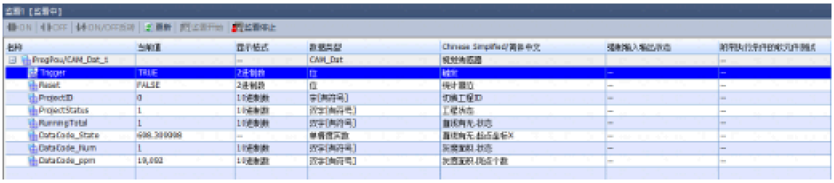


Figure 4-38 Entering the Monitoring Window

Add the following variables in the watch window and click it Monitoring begins.



监看1 [监看中]

名称	当前值	显示格式	数据类型	Chinese Simplified/简体中文	强制输入输出状态	附带执行条件的软元件测试
ProgPou/CAM_Dat_1		--	CAM_Dat	视觉传感器		--
Trigger	TRUE	2进制数	位	触发	--	--
Reset	FALSE	2进制数	位	统计复位	--	--
ProjectID	0	10进制数	字[有符号]	切换工程ID	--	--
ProjectStatus	1	10进制数	双字[有符号]	工程状态	--	--
RunningTotal	1	10进制数	双字[有符号]	直线有无.状态	--	--
DataCode_State	698.380000	--	单精度实数	直线有无.起点坐标X	--	--
DataCode_Num	1	10进制数	双字[有符号]	灰度面积.状态	--	--
DataCode_ppm	18,082	10进制数	双字[有符号]	灰度面积.亮点个数	--	--

Figure 4-39 Monitoring window

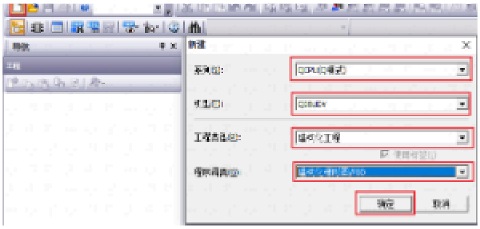
When the vision sensor is manually triggered to take a photo, change the value of the [CAM_Dat_1.Tigger] variable to [TRUE], the PLC will send a trigger command to the vision sensor, the vision sensor will start taking pictures, and continuously output the result data to the PLC, when the vision sensor needs to stop in level mode, change the value of the [CAM_Dat_1.Tigger] variable to [FALSE], and when the vision sensor stops taking pictures and needs to reset the total number of runs, it will be [CAM_Dat_ 1.Reset] variable value is changed to [TRUE], when switching the project ID, the communication of the project ID to be switched needs to be configured to the same communication protocol in advance, otherwise the PLC and the vision sensor will be disconnected after the switch, and the vision sensor interface needs to be manually refreshed after the switch is successfully refreshed before the switched project ID will be displayed.

Chapter 5 Mitsubishi Q06UDV configuration and testing

5.1 PLC Configuration

5.1.1 New projects

Open the Mitsubishi Works2 software, click New Project, select QCPU series, select Q06UDV, select Structured Engineering, and select Structured Ladder Chart/FBD for Program Language, and click OK.



新建

系列(S): QCPU(Q模式)

机型(T): Q06UDV

工程类型(P): 结构化工程

☑ 使用标签(L)

程序语言(G): 结构化梯形图/FBD

Figure 5-1 New Construction Project

Select [Parameters][PLC Parameters][Built-in Ethernet Port Settings] in the left item tree, modify the IP address, subnet mask and other parameters of the PLC, click [Open Settings], and set protocol 1 to [TCP][Communication Protocol][Active][4000] (the port number setting range of this site is 1025~4999 and 5010~65534, other port numbers have been occupied by the system, please do not use them), and set the communication object according to the actual vision sensor used Set the IP address and port number to D2000 (store the operating status of the communication protocol for 19 characters from the starting software and do not use the address area again elsewhere in the program), click [End of Setting].

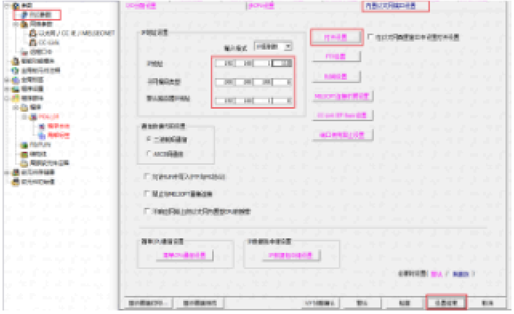
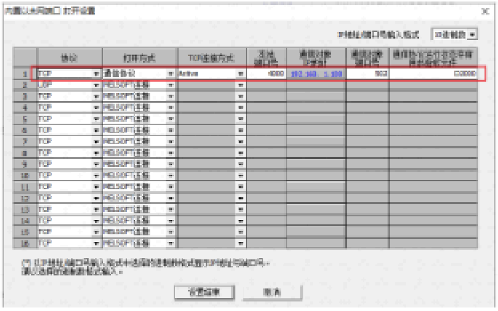


Figure 5-2(1) Parameter settings



内置以太网端口 打开设置

IP地址/端口号输入格式 10进制数

	协议	打开方式	TCP连接方式	本站端口号	通信对象IP地址	通信对象端口号	通信协议执行状态存储用软元件
1	TCP	通信协议	Active	4000	192.168.1.100	502	D2000
2	UDP	MELSOFT连接					
3	TCP	MELSOFT连接					
4	TCP	MELSOFT连接					
5	TCP	MELSOFT连接					
6	TCP	MELSOFT连接					
7	TCP	MELSOFT连接					
8	TCP	MELSOFT连接					
9	TCP	MELSOFT连接					
10	TCP	MELSOFT连接					
11	TCP	MELSOFT连接					
12	TCP	MELSOFT连接					
13	TCP	MELSOFT连接					
14	TCP	MELSOFT连接					
15	TCP	MELSOFT连接					
16	TCP	MELSOFT连接					

Figure 5-2(2) Parameter settings

In the upper menu bar, select [Tools]□[Communication Protocol Support Functions]□[Built-in Ethernet], and enter the parameter setting interface.

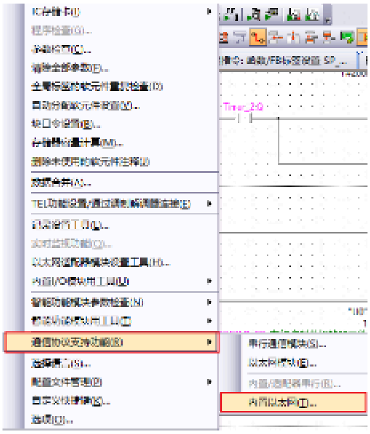
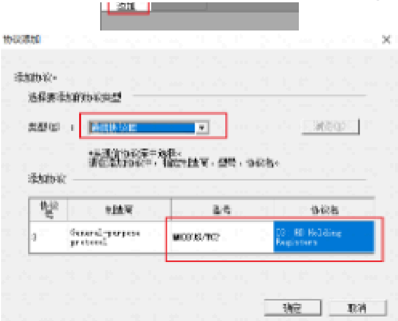


Figure 5-3 Entering the built-in Ethernet

Click New, click [Add], select [Communication Protocol Library] for the protocol type, select [Modbus/TCP] for the model, and the protocol name is based on the protocol name.

The visual sensor register data specifies that you need to set the 03/16 function code, first set the 03 function code to read the vision sensor hold register, then repeat the above steps, and then add the 16 function code to write data to the vision sensor hold register.



协议添加

添加协议

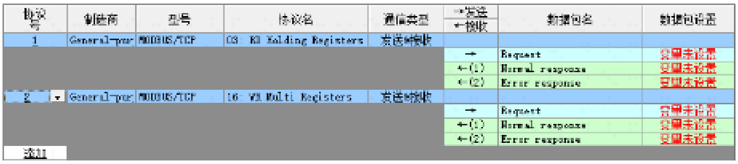
选择要添加的协议类型

类型(T)：通信协议库

添加协议

协议号	制造商	型号	协议名
1	General-purpose protocol	MODBUS/TCP	03: RD Holding Registers

Figure 5-4(1) Adding a Communication Protocol



协议号	制造商	型号	协议名	通信类型	→发送 ←接收	数据包名	数据包设置
1	General-pur	MODBUS/TCP	03: RD Holding Registers	发送&接收			
					→	Request	变量未设置
					←(1)	Normal response	变量未设置
					←(2)	Error response	变量未设置
2	General-pur	MODBUS/TCP	16: WR Multi Registers	发送&接收			
					→	Request	变量未设置
					←(1)	Normal response	变量未设置
					←(2)	Error response	变量未设置

Figure 5-4(2) Adding a Communication Protocol

Right-click on the blank space and select [Bulk Settings of Soft Components].

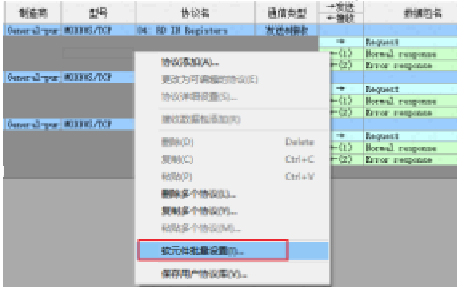
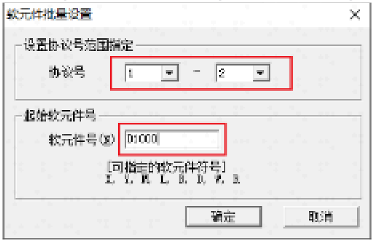


Figure 5-5 Entering the soft component batch setup

In the software bulk settings, specify the setup protocol number range to 1-2 and the starting software number to D1000 (using the free storage in the program).



软元件批量设置

设置协议号范围指定

协议号 1 - 2

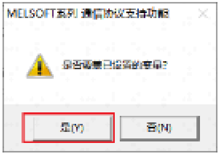
起始软元件号

软元件号(W) D1000

[可指定的软元件符号]
X, Y, M, L, B, D, W, R

Figure 5-6 Batch setup of soft components

[Does it override the set variable?] Select Yes.

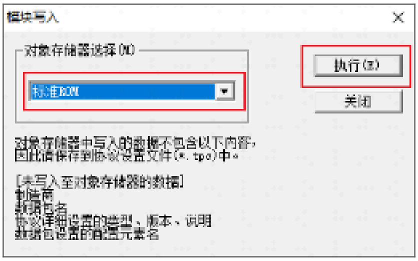


MELSOFT系列 通信协议支持功能

是否覆盖已设置的变量?

Figure 5-7 confirms whether it is overrided

Click [Module Write], [Object Memory] selects [Standard ROM], clicks [Execute],

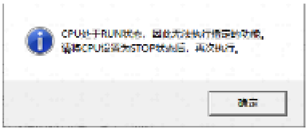


对象存储器中写入的数据不包含以下内容，
因此请保存到协议设置文件(*.tpo)中。

[未写入至对象存储器的数据]
制造商
数据包名
协议详细设置的类型、版本、说明
数据包设置的配置元素名

Figure 5-8 Module Writing

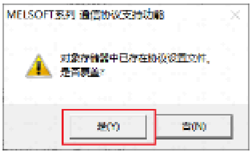
If the CPU is in the RUN state and cannot perform the specified function. Set the CPU to STOP and then do it again.], you need to put the CPU in STOP mode and perform the module write operation again.



CPU处于RUN状态，因此无法执行指定的功能。
请将CPU设置为STOP状态后，再次执行。

Figure 5-9 RUN status prompt

Click Yes.



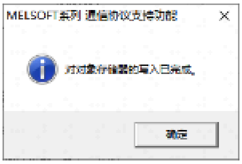
对象存储器中已存在协议设置文件，
是否覆盖？

Figure 5-10 Override tip

Shows [Write to object memory completed.]] and then click OK, and it is recommended Save configurations to your computer for convenience

o click Save

Next time you use or modify, close the interface after saving.



对对象存储器的写入已完成。

Figure 5-11 Write completion prompt

5.1.2 Write PLC programs

Select [Program Parts]→[Struct] in the project tree, right-click [New Data], and create the following structure variables.

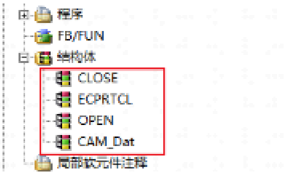
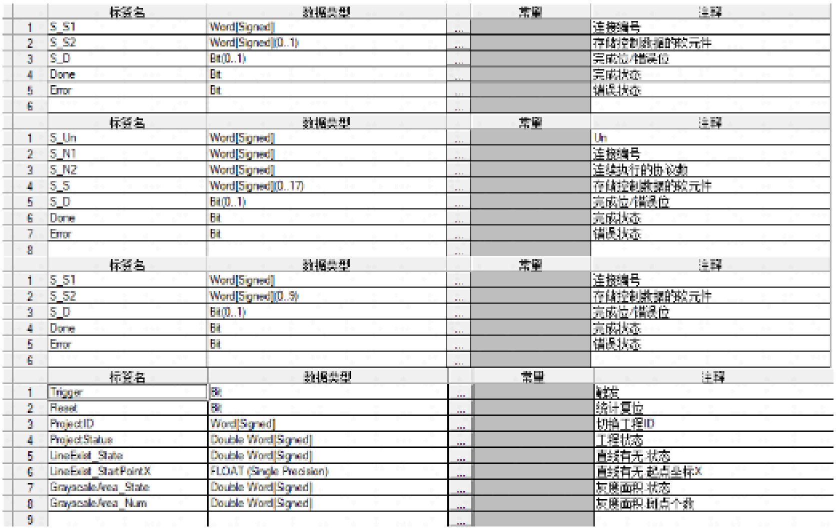


Figure 5-12(1) Establish structure variables



	标签名	数据类型		常量	注释
1	S_S1	Word[Signed]	...		连接编号
2	S_S2	Word[Signed](0..1)	...		存储控制数据的软元件
3	S_D	Bit(0..1)	...		完成位/错误位
4	Done	Bit	...		完成状态
5	Error	Bit	...		错误状态
6			...		

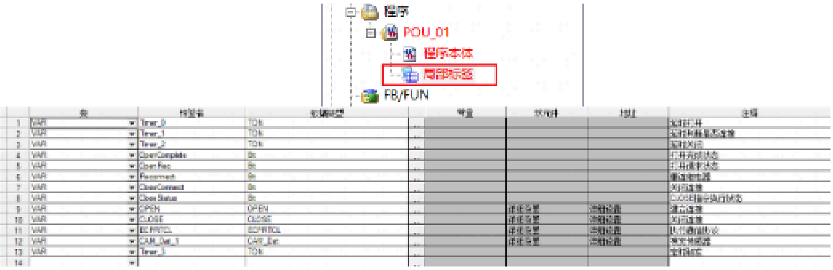
	标签名	数据类型		常量	注释
1	S_Un	Word[Signed]	...		Un
2	S_N1	Word[Signed]	...		连接编号
3	S_N2	Word[Signed]	...		连续执行的协议数
4	S_S	Word[Signed](0..17)	...		存储控制数据的软元件
5	S_D	Bit(0..1)	...		完成位/错误位
6	Done	Bit	...		完成状态
7	Error	Bit	...		错误状态
8			...		

	标签名	数据类型		常量	注释
1	S_S1	Word[Signed]	...		连接编号
2	S_S2	Word[Signed](0..9)	...		存储控制数据的软元件
3	S_D	Bit(0..1)	...		完成位/错误位
4	Done	Bit	...		完成状态
5	Error	Bit	...		错误状态
6			...		

	标签名	数据类型		常量	注释
1	Trigger	Bit	...		触发
2	Reset	Bit	...		统计复位
3	ProjectID	Word[Signed]	...		切换工程ID
4	ProjectStatus	Double Word[Signed]	...		工程状态
5	LineExist_State	Double Word[Signed]	...		直线有无.状态
6	LineExist_StartPointX	FLOAT (Single Precision)	...		直线有无.起点坐标X
7	GrayscaleArea_State	Double Word[Signed]	...		灰度面积.状态
8	GrayscaleArea_Num	Double Word[Signed]	...		灰度面积.斑点个数
9			...		

Figure 5-12(2) establishes the structure variables

Select [Program Parts][Program][Local Label] in the project tree, and add the following variables to the local labels.



	类	标签名	数据类型		常量	[illegible]	地址	注释
1	VAR	Timer_0	TON	...				延时打开
2	VAR	Timer_1	TON	...				[illegible]
3	VAR	Timer_2	TON	...				延时关闭
4	VAR	OpenComplete	Bit	...				打开完成状态
5	VAR	OpenReq	Bit	...				打开请求状态
6	VAR	Reconnect	Bit	...				重连接继电器
7	VAR	CloseConnect	Bit	...				关闭连接
8	VAR	CloseStatus	Bit	...				CLOSE指令执行状态
9	VAR	OPEN	OPEN	...		详细设置	详细设置	建立连接
10	VAR	CLOSE	CLOSE	...		详细设置	详细设置	关闭连接
11	VAR	ECPRTCL	ECPRTCL	...		详细设置	详细设置	执行通信协议
12	VAR	CAN_Dat_1	CAN_Dat	...		详细设置	详细设置	[illegible]
13	VAR	Timer_3	TON	...				[illegible]
14				...				

Figure 5-13 Adding variables to local labels

Double-click [Program Body] to add the following programs.

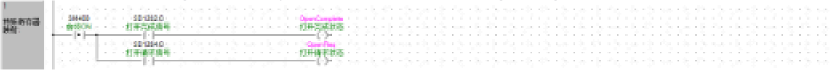


Figure 5-14 Adding a program

Program line 1: Map the system special register status to the new local label in the previous step to facilitate reference in the program.

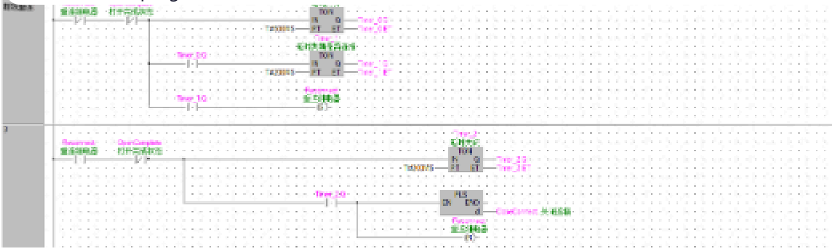


Figure 5-15 Sample Program 1

Line 2 of the program: Open the timer Timer_0 using the normally closed contact of the reconnect and open the completed state OpenComplete, execute the OPEN command to establish the connection and open the timer Timer_1 after a delay of 500ms, and if the connection channel is not opened after 200ms, then set the reconnect reconnect reconnect.

Procedure line 3: When the reconnect reconnect is placed and communication is still not established, turn on the timer Timer_2, delay 200ms to turn off the connection relay CloseConnect for a scan cycle, execute the CLOSE command to disconnect, and reset the reconnect reconnect reconnect.

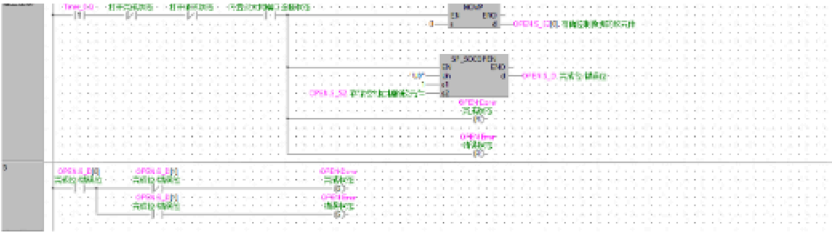


Figure 5-16 Sample Procedure 2

Lines 4-5 of the program: If the TCP communication is not currently open and there is no open request, and the network cable is well connected, the rising edge of the timer Timer_0 will trigger the OPEN command to establish a connection with the camera, the s1 pin in the OPEN instruction corresponds to the protocol number in the built-in Ethernet port opening settings, the s2 pin corresponds to some parameters of the OPEN directive, occupying 10 word addresses, if the communication parameters are set in the built-in Ethernet port opening settings, assign a value of 0 to the first address in s2 Indicates that the set parameters are called, OPEN. S_D[0] is the completion bit of the OPEN command, OPEN. S_D[1] is the wrong bit of the OPEN command, which will only trigger a scan cycle, when the OPEN. S_D[0] and OPEN. S_D[1] also triggers an error in the execution of the instruction on behalf of the instruction.

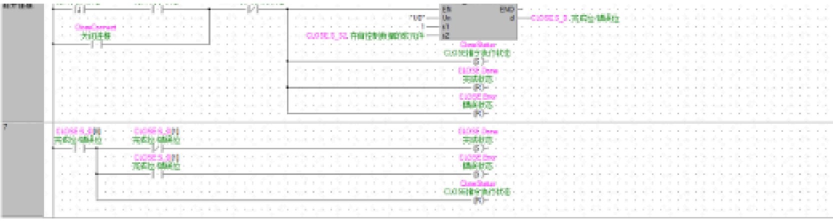


Figure 5-17 Sample Program 3

Line 6-7: When the connection is suddenly interrupted due to unreliable network cable connection or other reasons, the open completion state OpenComplete will change from TRUE to FALSE, and its descending edge will trigger the CLOSE command to perform the connection closing operation, and set the CLOSE command to execute the state CloseStatus, and the normally closed contact of CloseStatus will prevent the repeated execution of the CLOSE command. The s1 pin in the CLOSE command corresponds to the protocol number in the built-in Ethernet port opening settings, and the s2 pin corresponds to the CLOSE command to control data, occupying a 2-word address, CLOSE. S_D[0] is the completion bit of the CLOSE command, CLOSE. S_D[1] is the wrong bit of the CLOSE command, which will only trigger a scan cycle, when the CLOSE. S_D[0] and CLOSE. S_D[1] also triggers an error to execute the instruction on behalf of the instruction, and when the execution of the CLOSE instruction is completed, the CLOSE. S_D[0] triggers the reset CLOSE command to execute the state CloseStatus.

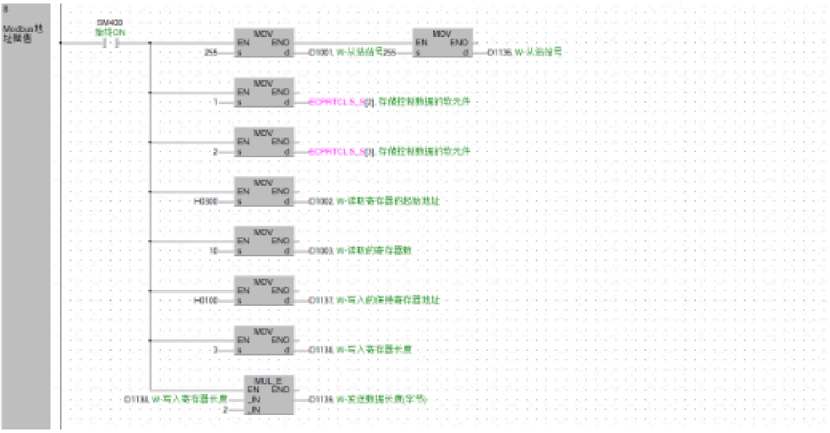


Figure 5-18 Example Program 4

Program line 8: Assign 255 to registers D1001/D1136, which are used to store the Modbus slave station number, and assign the protocol number to be executed in the communication protocol support function to ECPRTCL. S_S[2]、ECPRTCL. In S_S [3], D1002 stores the first address of the read vision sensor hold register 0x300, D1003 stores the number of read vision sensor hold registers 10 words, D1137 stores the address of the write vision sensor hold register 0x100, D1138 stores the number of write vision sensor hold registers 3 words, and D1139 stores the byte length of the write vision sensor hold register 6 bytes.

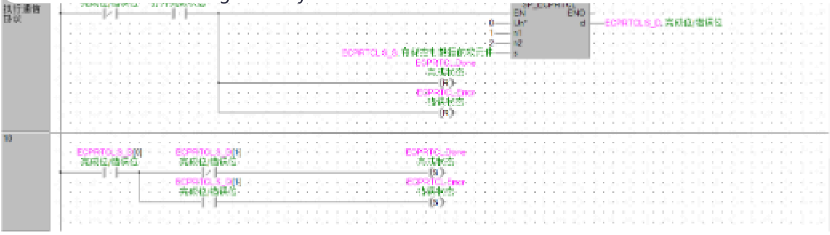


Figure 5-19 Sample Procedure 5

Lines 9-10 of the program: When the communication is on, the ECPRTCL instruction is executed to send and receive data from the vision sensor, the n1 pin in the ECPRTCL instruction corresponds to the protocol number in the built-in Ethernet port opening setting, the n2 pin represents the number of protocols that perform the supported functions of the communication protocol, and the s pin represents the soft component that stores the ECPRTCL instruction control data, ECPRTCL. S_D[0] is the completion bit of the OPEN instruction, ECPRTCL. S_D[1] is the error bit of the OPEN instruction, which will trigger only one scan cycle, when ECPRTCL. S_D[0] and ECPRTCL. S_D[1] also triggers an error in the execution of the instruction on behalf of the instruction.

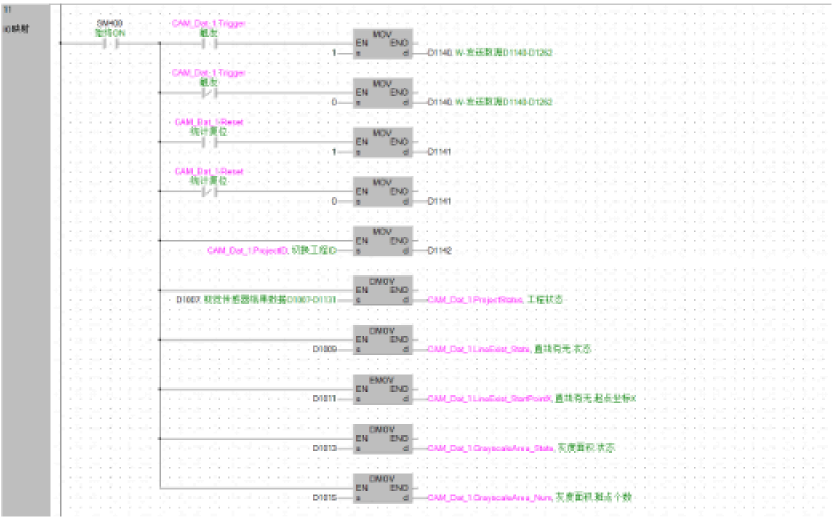

11
IO映射
SM400
始终ON
CAM_Dat_1.Trigger
触发
MOV
EN ENO
s d
1
0
D1140 W-发送数据D1140-D1262
CAM_Dat_1.Reset
统计复位
D1141
CAM_Dat_1.ProjectID, 切换工程ID
D1142
DMOV
D1007 R-接收数据D1007-D1131
CAM_Dat_1.ProjectState, 工程状态
D1009
CAM_Dat_1.LineExist_State, 直线有无 状态
EMOV
D1011
CAM_Dat_1.LineExist_StartPointX, 直线有无 起点坐标X
D1013
CAM_Dat_1.GrayscaleArea_State, 灰度面积 状态
D1015
CAM_Dat_1.GrayscaleArea_Num, 灰度面积 黑点个数

Figure 5-20 Sample Procedure 6

Program Line 11: Vision Sensor Formatting The [Trigger] and [Statistical Reset] configured in the input string Although the data type is Bit, it still takes up space in ModbusTCP communication, so it is necessary to convert Bit and Word in the program, and then map the received and sent stores to the newly created local variables.

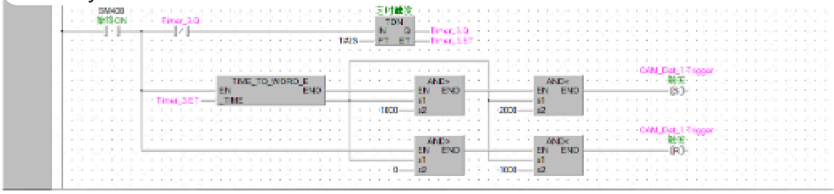


Figure 5-21 Sample Procedure 7

Line 12 of the program: In order to facilitate the testing of the test department, the trigger command is sent to the vision sensor through the timer command (the vision sensor is configured in single frame or level mode), when the timing time needs to be modified, the timer instruction timing time can be modified according to the needs, in this case, the sensor takes a picture once at a timer 2s, if this function is not needed, the normally open contact of the SM400 relay in line 12 of the program can be switched to a normally closed contact, this function can be stopped,

When the program is edited, right-click on the edited program, select [Program Login]□[Scan], and add the program to the scanner.

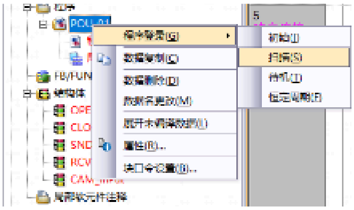
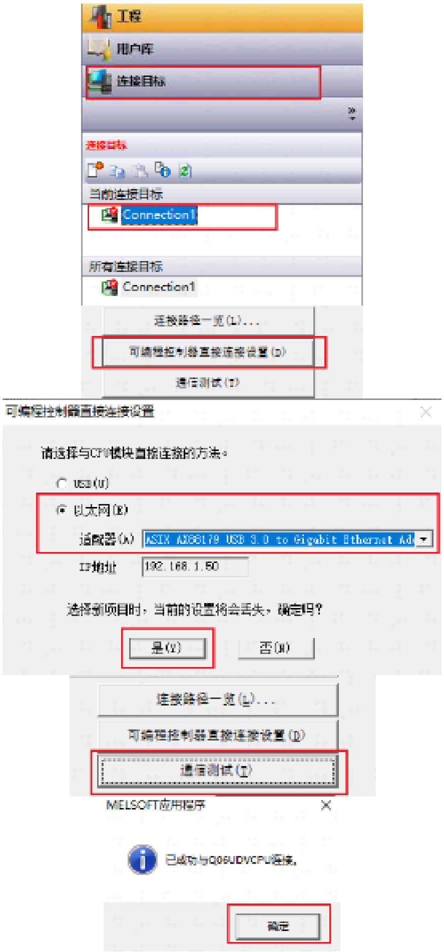


Figure 5-22 Scanner

5.2 Communication Testing

5.2.1 Download the program

Click [Connection Target] on the left project tree, double-click Connection1 in the current connection target to enter the connection target settings, click [Programmable Controller Direct Connection Settings] on the right, select which connection method and adapter to check according to the actual connection method with the PLC, click [Yes], and then click [Communication Test], when the communication is successful, it will display [Successfully connected to Q06UDVCPU], click OK to exit the interface.



请选择与CPU模块直接连接的方法。

○ USB(U)

● 以太网(E)

适配器(A) ASIX AX88179 USB 3.0 to Gigabit Ethernet Ad

IP地址 192.168.1.50

选择新项目时，当前的设置将会丢失，确定吗？

已成功与Q06UDVCPU连接。

Figure 5-23(1) Programmable controller directly connects to the setup

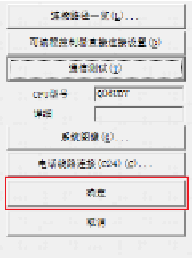


Figure 5-23(2) Programmable controller directly connects to the setup

Click above Save button, save the program, and select [Convert/Compile] [Convert + Compile All].

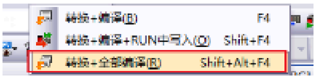
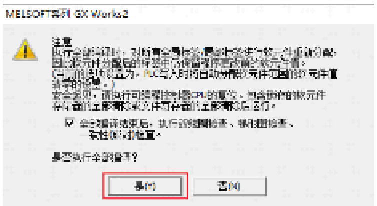

转换+编译(B) F4
转换+编译+RUN中写入(O) Shift+F4
转换+全部编译(R) Shift+Alt+F4

Figure 5-24 Conversion/Compilation

Select Yes.



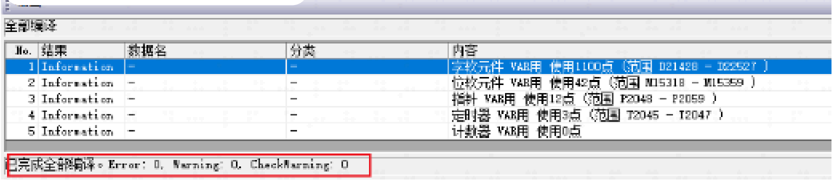
注意
执行全部编译时，对所有全局标签/局部标签进行软元件[illegible]，因此软元件分配后的[illegible]。
([illegible]PLC写入时将自动分配软元件范围的软元件值[illegible]。)
安全起见，请执行可编程控制器CPU的复位、包含锁存的软元件存储器的全部清除或文件寄存器的全部清除后运行。

☑ 全部编译结束后，执行[illegible]检查、[illegible]检查、[illegible]。

是否执行全部编译？

Figure 5-25 Compilation confirmation

After confirming that the output is error-free, click on it PLC write, select [Parameter + Program], and click [Execute].



全部编译

No.	结果	数据名	分类	内容
1	Information	-	-	字软元件 VAR用 使用1100点 (范围 D21428 - D22527)
2	Information	-	-	位软元件 VAR用 使用42点 (范围 M15318 - M15359)
3	Information	-	-	指针 VAR用 使用12点 (范围 P2048 - P2059)
4	Information	-	-	定时器 VAR用 使用3点 (范围 T2045 - T2047)
5	Information	-	-	计数器 VAR用 使用0点

已完成全部编译。Error: 0, Warning: 0, CheckWarning: 0

Figure 5-26(1) PLC Write

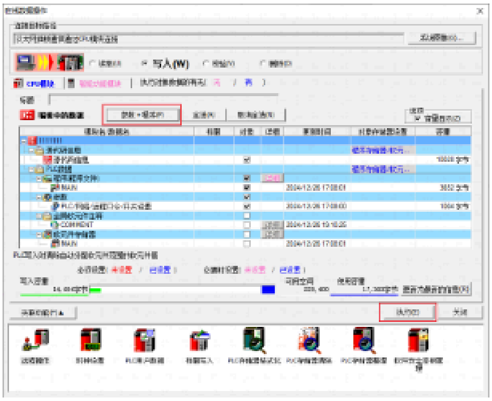
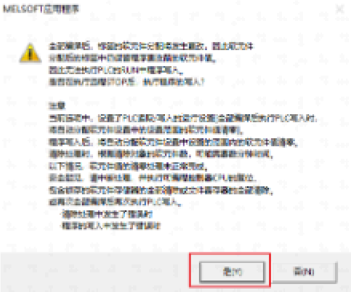


Figure 5-26(2) PLC write

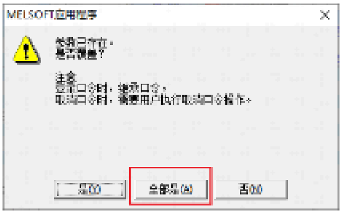
Select Yes.


MELSOFT应用程序

[illegible]

Figure 5-27 Write Acknowledgment

All.

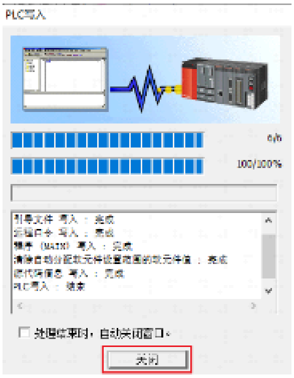

MELSOFT应用程序

数据已存在。
是否覆盖？

注意
显示口令时，继承口令。
取消口令时，需要用户执行取消口令操作。

Figure 5-28 Coverage confirmation

When finished, click [Close].



PLC写入

0/0

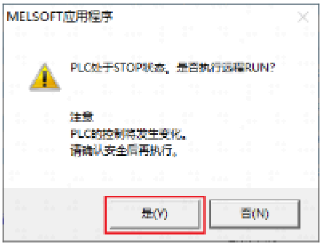
100/100%

```
引导文件 写入 : 完成
远程口令 写入 : 完成
程序 (MAIN) 写入 : 完成
清除自动分配软元件设置范围的软元件值 : 完成
源代码信息 写入 : 完成
PLC写入 : 结束
```

□ 处理结束时，自动关闭窗口。

Figure 5-29 Write complete

Select Yes.



MELSOFT应用程序

PLC处于STOP状态。是否执行远程RUN?

注意
PLC的控制将发生变化。
请确认安全后再执行。

Figure 5-30 Execution

When you're done, power the PLC back on.

5.2.2 Communication Test

Click in the toolbar above Monitor starts, enter monitoring mode, select [View][Collapse Window][Watch 1],

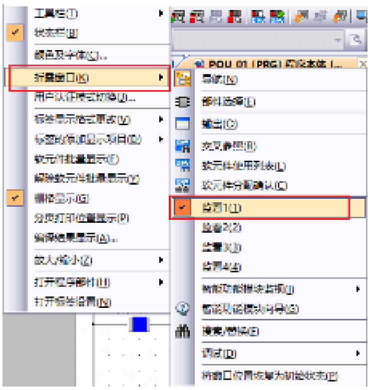
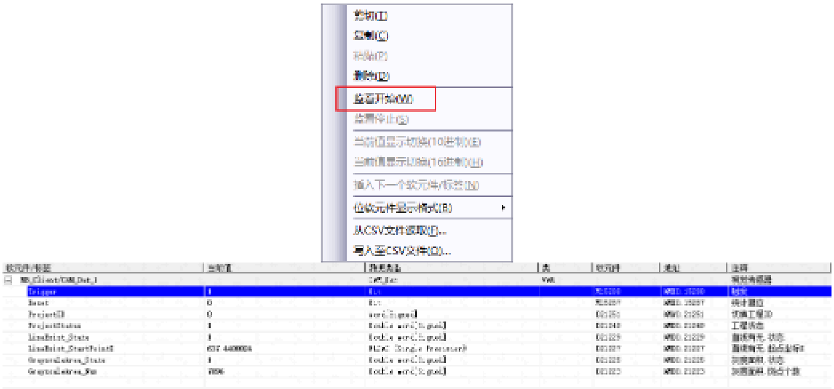


Figure 5-31 Entering Monitoring

Add the following variables to the monitor window, and right-click [Start Monitor] in the blank space.



软元件/标签	当前值	数据类型	类	软元件	地址	注释
MB_Client/CAM_Dat_1		CAM_Dat	VAR			视觉传感器
Trigger	1	Bit		[illegible]	[illegible]	触发
Reset	0	Bit		[illegible]	[illegible]	统计复位
ProjectID	0	Word[Signed]		[illegible]	[illegible]	切换工程ID
ProjectStatus	1	Double Word[Signed]		[illegible]	[illegible]	工程状态
LinePoint_State	1	Double Word[Signed]		[illegible]	[illegible]	直线有无_状态
LinePoint_StartPointX	637.4400024	FLOAT [Single Precision]		[illegible]	[illegible]	直线有无_起点坐标X
GrayscaleArea_State	1	Double Word[Signed]		[illegible]	[illegible]	灰度面积_状态
GrayscaleArea_Num	7896	Double Word[Signed]		[illegible]	[illegible]	灰度面积_像点个数

Figure 5-32 Monitoring begins

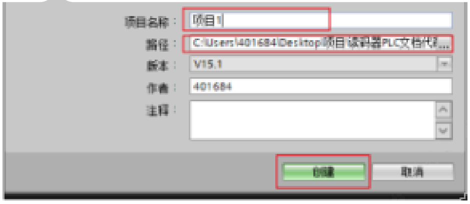
When the vision sensor is manually triggered to take a photo, change the value of the [CAM_Dat_1.Tigger] variable to [TRUE], the PLC will send a trigger command to the vision sensor, the vision sensor will start taking pictures, and continuously output the result data to the PLC, when the vision sensor needs to stop in level mode, change the value of the [CAM_Dat_1.Tigger] variable to [FALSE], and when the vision sensor stops taking pictures and needs to reset the total number of runs, it will be [CAM_Dat_ 1.Reset] variable value is changed to [TRUE], when switching the project ID, the communication of the project ID to be switched needs to be configured to the same communication protocol in advance, otherwise the PLC and the vision sensor will be disconnected after the switch, and the vision sensor interface needs to be manually refreshed after the switch is successfully refreshed before the switched project ID will be displayed.

Chapter 6 Siemens 1200 Configuration and Testing

6.1 PLC Configuration

6.1.1 New projects

Open Botu V15.1 and click New button, change the project name and save the path, and click [Create].



项目名称： 项目1

路径： C:\Users\401684\Desktop\项目 读码器PLC文档代码...

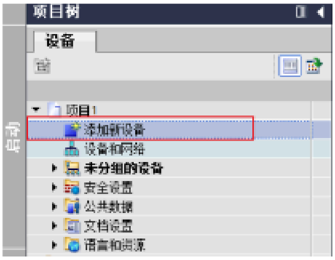
版本： V15.1

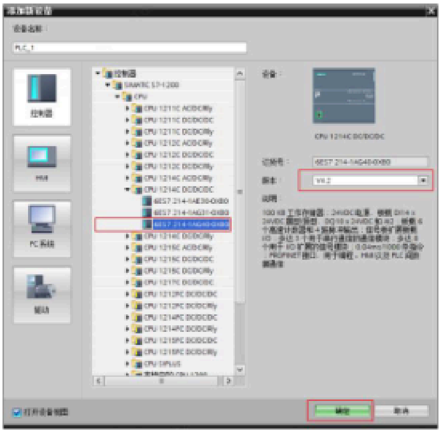
作者： 401684

注释：

Figure 6-1 New Projects

In the project tree on the left, double-click [Add New Device], select the required PLC model and version according to actual needs, select 1214C DC/DC/DC, version V4.2, and click [OK].





添加新设备

设备名称：PLC_1

- 控制器
  - SIMATIC S7-1200
    - CPU
      - CPU 1211C AC/DC/Rly
      - CPU 1211C DC/DC/DC
      - CPU 1211C DC/DC/Rly
      - CPU 1212C AC/DC/Rly
      - CPU 1212C DC/DC/DC
      - CPU 1212C DC/DC/Rly
      - CPU 1214C AC/DC/Rly
      - CPU 1214C DC/DC/DC
        - 6ES7 214-1AE30-0XB0
        - 6ES7 214-1AG31-0XB0
        - 6ES7 214-1AG40-0XB0
      - CPU 1214C DC/DC/Rly
      - CPU 1215C AC/DC/Rly
      - CPU 1215C DC/DC/DC
      - CPU 1215C DC/DC/Rly
      - CPU 1217C DC/DC/DC
      - CPU 1212FC DC/DC/DC
      - CPU 1212FC DC/DC/Rly
      - CPU 1214FC DC/DC/DC
      - CPU 1214FC DC/DC/Rly
      - CPU 1215FC DC/DC/DC
      - CPU 1215FC DC/DC/Rly
      - CPU SIPLUS
      - 非特定的 CPU 1200

设备： CPU 1214C DC/DC/DC

订货号： 6ES7 214-1AG40-0XB0

版本： V4.2

说明：

100 KB 工作存储器；24VDC 电源，板载 DI14 x 24VDC 漏型/源型，DQ10 x 24VDC 和 AI2；板载 6 个高速计数器和 4 路脉冲输出；信号板扩展板载 I/O；多达 3 个用于串行通信的通信模块；多达 8 个用于 I/O 扩展的信号模块；0.04ms/1000 条指令；PROFINET 接口，用于编程、HMI 以及 PLC 间数据通信

☑ 打开设备视图

Figure 6-2 Select PLC model and version

Double-click the CPU module in the device view to enter the CPU property settings interface.

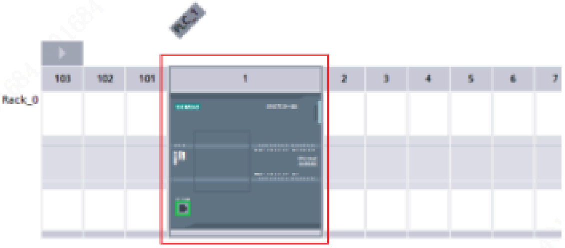
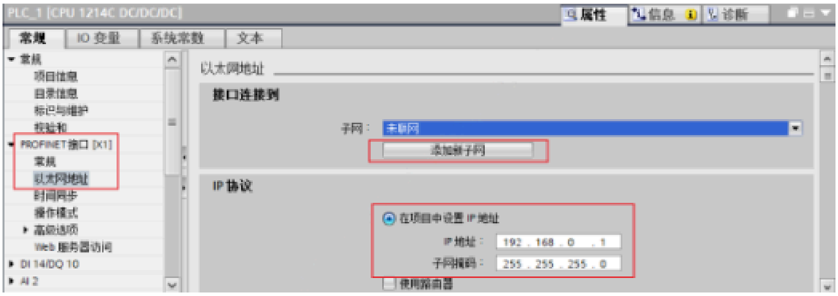


Figure 6-3 CPU setup interface

In [General], select [PROFINET Interface] [Ethernet Address], click [Add New Subnet], check [Set IP Address in Project], and fill in the IP address and subnet mask correctly.



子网： 未联网

● 在项目中设置 IP 地址

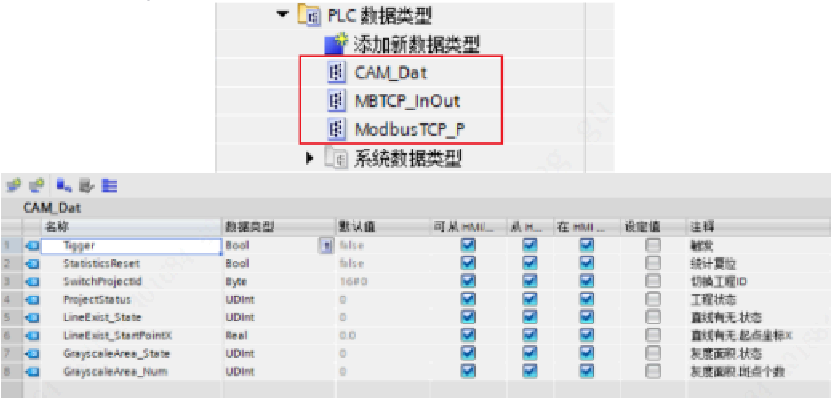
IP 地址： 192 . 168 . 0 . 1

子网掩码： 255 . 255 . 255 . 0

Figure 6-4 IP filling

6.1.2 Write PLC programs

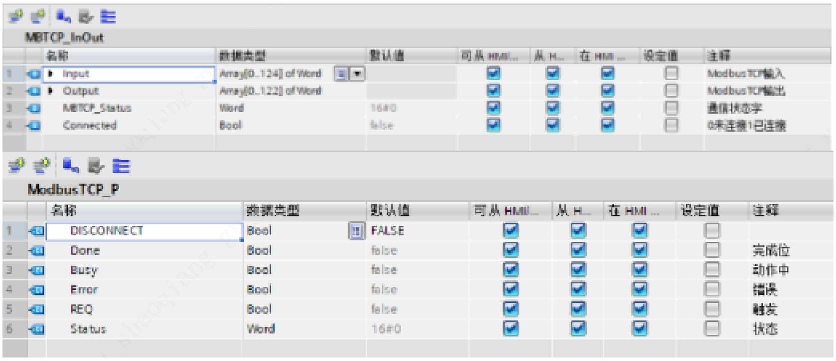
In the [PLC Data Type] of the project tree, add the structure data type in the figure below, and write the ModbusTCP communication program for IO mapping corresponding to the formatted input/output string in the vision sensor.



CAM_Dat

	名称	数据类型	默认值	可从 HMI...	从 H...	在 HMI ...	设定值	注释
1	Tigger	Bool	false	☑	☑	☑	☐	触发
2	StatisticsReset	Bool	false	☑	☑	☑	☐	统计复位
3	SwitchProjectid	Byte	16#0	☑	☑	☑	☐	切换工程ID
4	ProjectStatus	UDInt	0	☑	☑	☑	☐	工程状态
5	LineExist_State	UDInt	0	☑	☑	☑	☐	直线有无_状态
6	LineExist_StartPointX	Real	0.0	☑	☑	☑	☐	直线有无_起点坐标X
7	GrayscaleArea_State	UDInt	0	☑	☑	☑	☐	灰度面积_状态
8	GrayscaleArea_Num	UDInt	0	☑	☑	☑	☐	灰度面积_斑点个数

Figure 6-5(1) Add Data Types



MBTCP_InOut

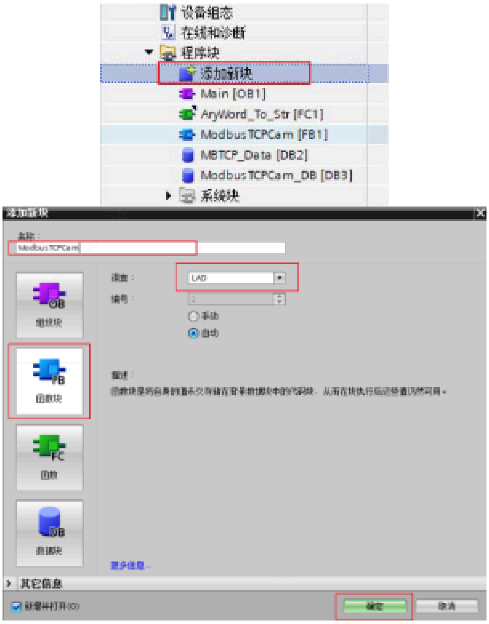
	名称	数据类型	默认值	可从 HMI...	从 H...	在 HMI ...	设定值	注释
1	▸ Input	Array[0..124] of Word		☑	☑	☑	□	ModbusTCP输入
2	▸ Output	Array[0..122] of Word		☑	☑	☑	□	ModbusTCP输出
3	MBTCP_Status	Word	16#0	☑	☑	☑	□	通信状态字
4	Connected	Bool	false	☑	☑	☑	□	0未连接1已连接

ModbusTCP_P

	名称	数据类型	默认值	可从 HMI...	从 H...	在 HMI ...	设定值	注释
1	DISCONNECT	Bool	FALSE	☑	☑	☑	□	
2	Done	Bool	false	☑	☑	☑	□	完成位
3	Busy	Bool	false	☑	☑	☑	□	动作中
4	Error	Bool	false	☑	☑	☑	□	错误
5	REQ	Bool	false	☑	☑	☑	□	触发
6	Status	Word	16#0	☑	☑	☑	□	状态

Figure 6-5(2) Add Data Types

Double-click [Add New Block] in the item tree, select [Function Block], select [LAD], change the name, and confirm.



- 设备组态
- 在线和诊断
- 程序块
  - 添加新块
  - Main [OB1]
  - AryWord_To_Str [FC1]
  - ModbusTCPCam [FB1]
  - MBTCP_Data [DB2]
  - ModbusTCPCam_DB [DB3]
  - 系统块

添加新块

名称：ModbusTCPCam

语言：LAD

编号：2

○ 手动

● 自动

描述：

函数块是将自身的值永久存储在背景数据块中的代码块，从而在块执行后这些值仍然可用。

Figure 6-6 Adding a function block

Open the newly created function block, click [Block Interface] at the top, and add the following internal variables to the interface.

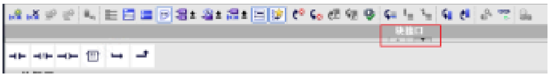
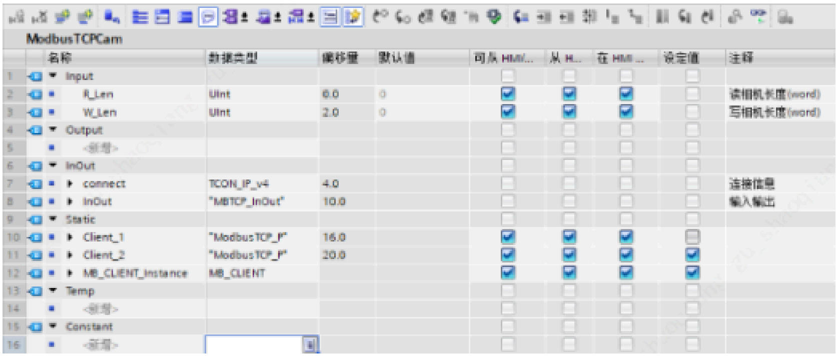


Figure 6-7(1) Adding variables



ModbusTCPCam

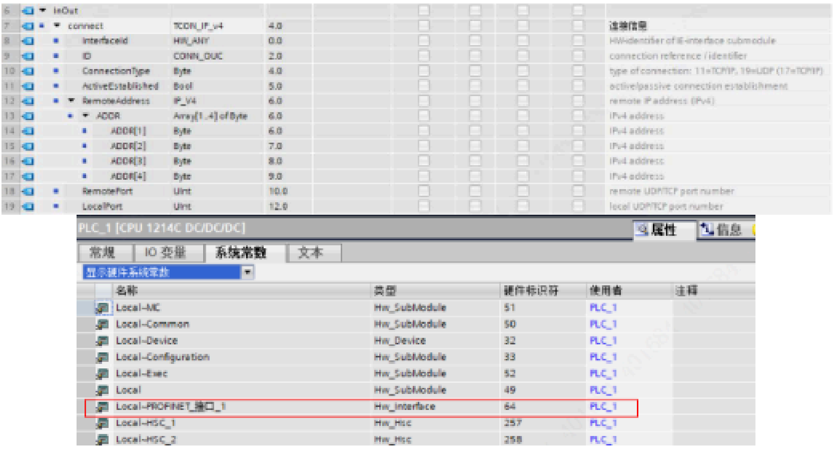
	名称	数据类型	偏移量	默认值	可从 HMI/...	从 H...	在 HMI ...	设定值	注释
1	▼ Input				□	□	□	□	
2	R_Len	UInt	0.0	0	☑	☑	☑	□	读相机长度(word)
3	W_Len	UInt	2.0	0	☑	☑	☑	□	写相机长度(word)
4	▼ Output				□	□	□	□	
5	<新增>				□	□	□	□	
6	▼ InOut				□	□	□	□	
7	▶ connect	TCON_IP_v4	4.0		□	□	□	□	连接信息
8	▶ InOut	"MBTCP_InOut"	10.0		□	□	□	□	输入输出
9	▼ Static				□	□	□	□	
10	▶ Client_1	"ModbusTCP_P"	16.0		☑	☑	☑	□	
11	▶ Client_2	"ModbusTCP_P"	20.0		☑	☑	☑	☑	
12	▶ MB_CLIENT_Instance	MB_CLIENT			☑	☑	☑	☑	
13	▼ Temp				□	□	□	□	
14	<新增>				□	□	□	□	
15	▼ Constant				□	□	□	□	
16	<新增>				□	□	□	□	

Figure 6-7(2) Adding variables

In the [connect] variable of the InOut variable, the relevant parameters of ModbusTCP communication are stored, and the specific meanings are as follows: InterfaceId: The hardware identifier of the network port of the client PLC, and the corresponding hardware identifier is viewed in [Device Configuration][CPU Attribute][System Constant].

ID: Connection ID, with a value range of 0~4095, this parameter will uniquely determine the connection in the CPU, and each connection must use a unique ID;

ConnectionType: The default value of 11 does not need to be modified, if modified, it will cause a communication error; ActiveEstablished:1 means active connection, 0 means passive connection; RemoteAddress: The IP address of the connection partner; RemotePort: The port number of the connection partner; LocalPort: Local port, 1~49151, 0 is any port.



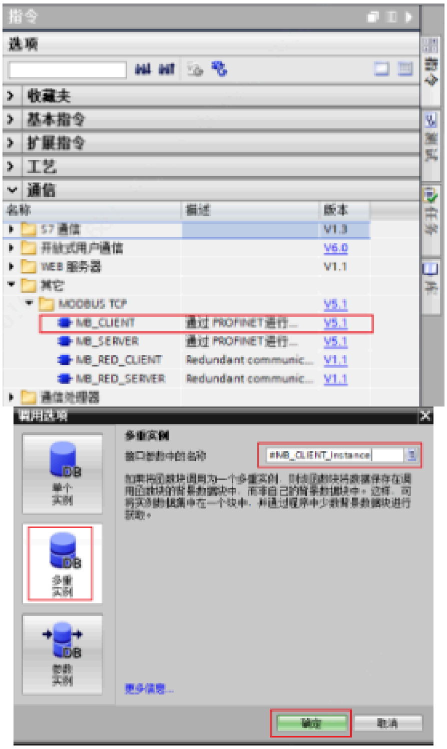
6	▼ InOut			□	□	□	□	
7	▼ connect	TCON_IP_v4	4.0	□	□	□	□	连接信息
8	InterfaceId	HW_ANY	0.0	□	□	□	□	HW-identifier of IE-interface submodule
9	ID	CONN_OUC	2.0	□	□	□	□	connection reference / identifier
10	ConnectionType	Byte	4.0	□	□	□	□	type of connection: 11=TCP/IP, 19=UDP (17=TCP/IP)
11	ActiveEstablished	Bool	5.0	□	□	□	□	active/passive connection establishment
12	▼ RemoteAddress	IP_V4	6.0	□	□	□	□	remote IP address (IPv4)
13	▼ ADDR	Array[1..4] of Byte	6.0	□	□	□	□	IPv4 address
14	ADDR[1]	Byte	6.0	□	□	□	□	IPv4 address
15	ADDR[2]	Byte	7.0	□	□	□	□	IPv4 address
16	ADDR[3]	Byte	8.0	□	□	□	□	IPv4 address
17	ADDR[4]	Byte	9.0	□	□	□	□	IPv4 address
18	RemotePort	UInt	10.0	□	□	□	□	remote UDP/TCP port number
19	LocalPort	UInt	12.0	□	□	□	□	local UDP/TCP port number

PLC_1 [CPU 1214C DC/DC/DC]

名称	类型	硬件标识符	使用者	注释
Local~MC	Hw_SubModule	51	PLC_1	
Local~Common	Hw_SubModule	50	PLC_1	
Local~Device	Hw_Device	32	PLC_1	
Local~Configuration	Hw_SubModule	33	PLC_1	
Local~Exec	Hw_SubModule	52	PLC_1	
Local	Hw_SubModule	49	PLC_1	
Local~PROFINET_接口_1	Hw_Interface	64	PLC_1	
Local~HSC_1	Hw_Hsc	257	PLC_1	
Local~HSC_2	Hw_Hsc	258	PLC_1	

Figure 6-8 Modifying the variable defaults

After the variable is created, return to the ladder diagram interface, select [Instruction] [Communication] [Other] [ModbusTCP] [MB_CLIENT] on the right side of the programming interface, hold down the left mouse button and drag it into the program, in the pop-up interface, select [Multiple Instances], [Name in the interface parameters] Select the static variable that has been established in the previous step, click Confirm.



名称	描述	版本
S7 通信		V1.3
开放式用户通信		V6.0
WEB 服务器		V1.1
其它		
MODBUS TCP		V5.1
MB_CLIENT	通过 PROFINET 进行...	V5.1
MB_SERVER	通过 PROFINET 进行...	V5.1
MB_RED_CLIENT	Redundant communic...	V1.1
MB_RED_SERVER	Redundant communic...	V1.1
通信处理器		

调用选项

多重实例

接口参数中的名称 #MB_CLIENT_Instance

如果将功能块调用为一个多重实例，则该功能块将数据保存在调用功能块的背景数据块中，而非自己的背景数据块中。这样，可将实例数据集中在一个块中，并通过程序中少数背景数据块进行获取。

Figure 6-9 Creating an Instance

Repeat the above operation, add a MB_CLIENT instruction again, realize the functions of data reception and transmission respectively, and assign the corresponding pins of the instructions according to the following figure.

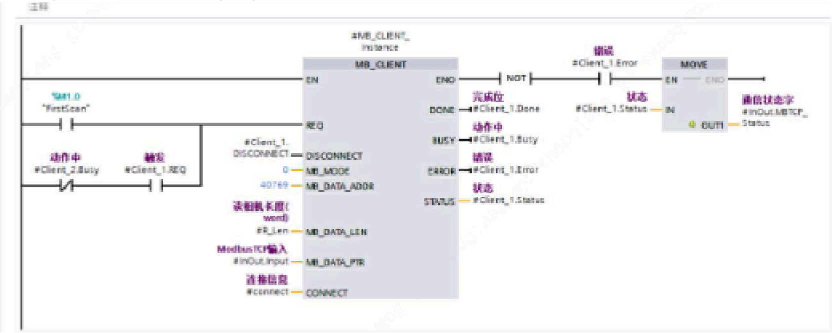
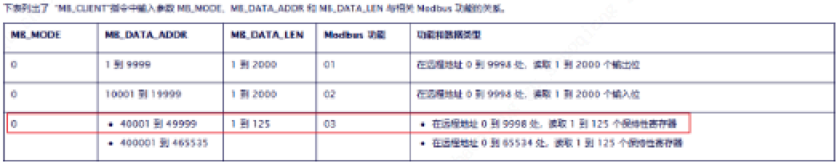


Figure 6-10 Sent

Program segment 1: When the first scan cycle of PLC power-on or [Client_1.REQ] is set, the [REQ] pin is placed, the command sends a communication request, the [DISCONNECT] pin in the command can control the connection with the Modbus server to establish/terminate, the default 0 establishes the connection, and the combination of [MB_MODE], [MB_DATA_ADDR], and [MB_DATA_LEN] defines the ModbusTCP used in the current instruction In this case, the result data of the vision sensor is stored in the address with a length of 20 words starting from the register, 03 function code, and 0X300, so the combination of the corresponding [MB_MODE], [MB_DATA_ADDR], and [MB_DATA_LEN] parameters is 0,40769,20, where [MB_DATA_LEN] connects the input

Variables [R_Len], controlled by external pins, easy to modify and debug.



下表列出了 "MB_CLIENT"指令中输入参数 MB_MODE、MB_DATA_ADDR 和 MB_DATA_LEN 与相关 Modbus 功能的关系。

MB_MODE	MB_DATA_ADDR	MB_DATA_LEN	Modbus 功能	功能和数据类型
0	1 到 9999	1 到 2000	01	在远程地址 0 到 9998 处，读取 1 到 2000 个输出位
0	10001 到 19999	1 到 2000	02	在远程地址 0 到 9998 处，读取 1 到 2000 个输入位
0	• 40001 到 49999 • 400001 到 465535	1 到 125	03	• 在远程地址 0 到 9998 处，读取 1 到 125 个保持性寄存器 • 在远程地址 0 到 65534 处，读取 1 到 125 个保持性寄存器

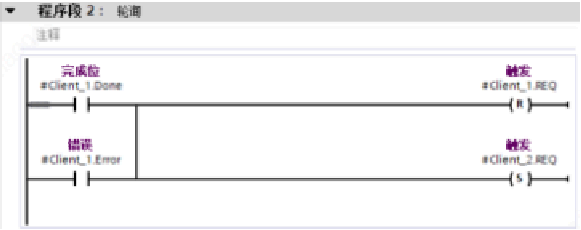


Figure 6-11 Polling

Program Segment 2: When the MB_CLIENT instruction in Program Segment 1 completes the bit or the wrong position 1, resets [Client_1.REQ], stops sending communication requests, and sets [Client_2.REQ] at the same time.

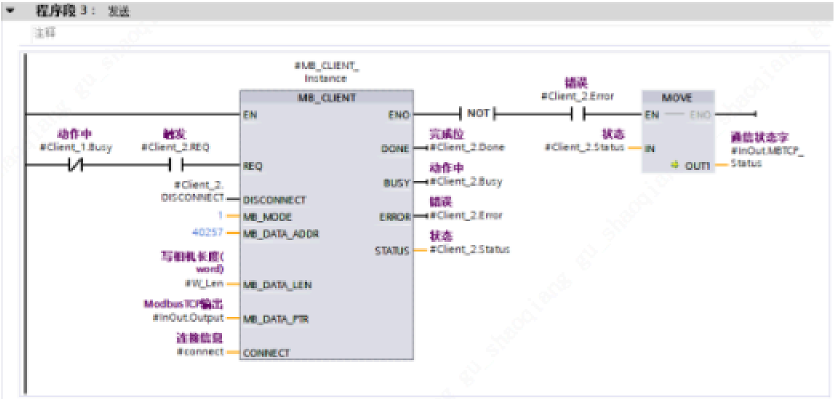


Figure 6-12 sent

Program Segment 3: When [Client_2.REQ] is placed and [Client_2.Busy] is not placed, the [REQ] pin is placed, the instruction sends a communication request, and the vision sensor input command is saved in the address that maintains the register, 16 function code, and the length of 3 words starting with 0X100, so the corresponding combination of MB_MODE, MB_DATA_ADDR, MB_DATA_LEN parameters is 1,40257,3, where [MB_ DATA_LEN] Connect the input variable [W_Len], which is controlled by an external pin for easy modification and debugging.

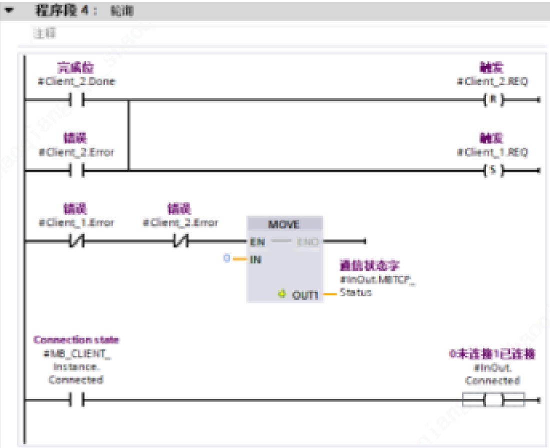


Figure 6-13 Polling

Segment 4: When the MB_CLIENT instruction in segment 3 completes the bit or the wrong position 1, resets [Client_2.REQ], stops sending communication requests, and sets [Client_1.REQ] at the same time, and jointly implements the polling operation with segment 2, and the static variable [Connected] in the MB_CLIENT instruction instance can obtain the current connection state, and map the connection state to the external InOut variable. It is convenient for debuggers to check the connection status.

Double-click the [Main] main program in the project tree to enter the main program interface, left-click to drag the newly created FB function block into the main program, change the name of the instance DB block as needed, and click OK.

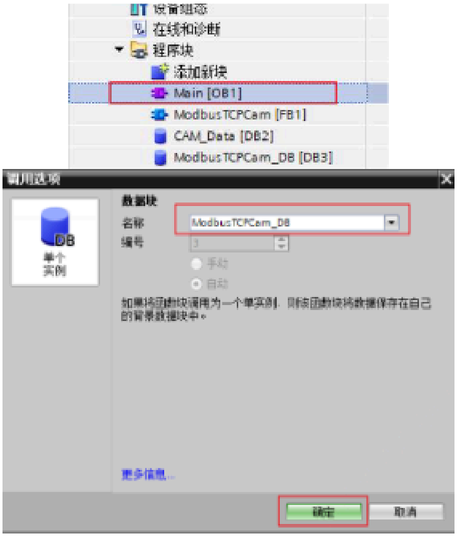


Figure 6-14(1) Adding FB blocks

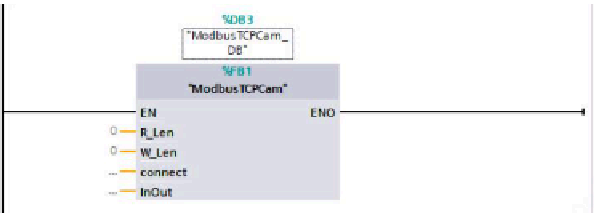
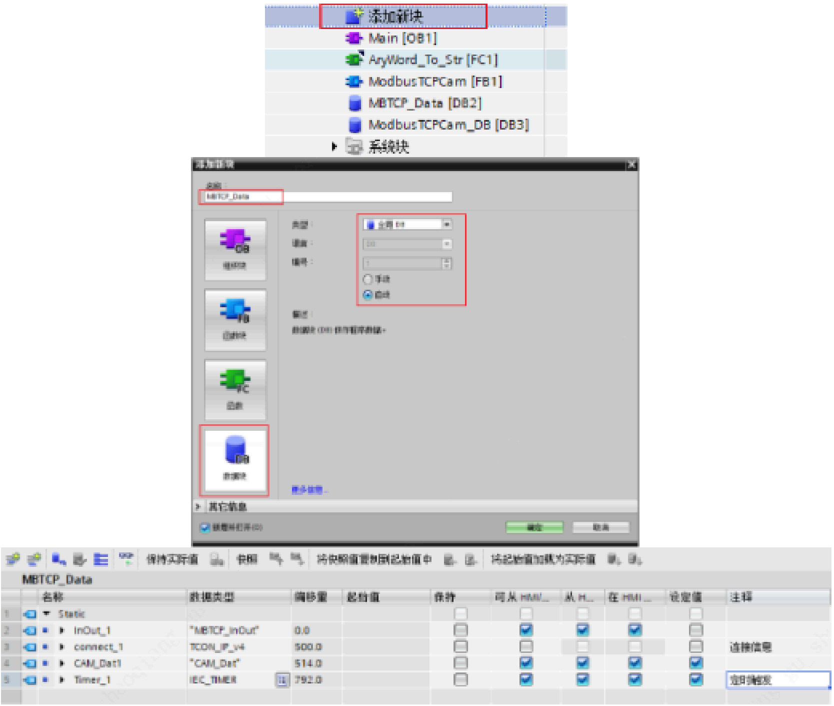


Figure 6-14(2) Adding FB blocks

Click [Add New Block], select [Data Block], change the name, and confirm to add the following variables to the data block.

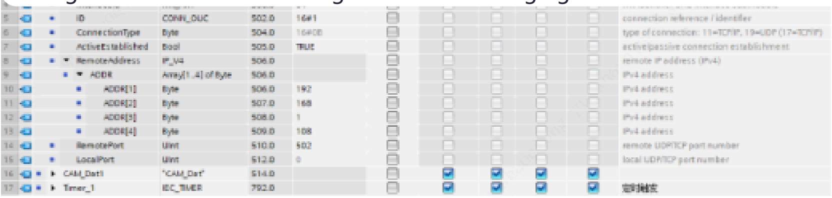


MBTCP_Data

	名称	数据类型	偏移量	起始值	保持	可从 HMI/...	从 H...	在 HMI ...	设定值	注释
1	▼ Static				□	□	□	□	□	
2	▸ InOut_1	"MBTCP_InOut"	0.0		□	☑	☑	☑	□	
3	▸ connect_1	TCON_IP_v4	500.0		□	□	□	□	□	连接信息
4	▸ CAM_Dat1	"CAM_Dat"	514.0		□	☑	☑	☑	☑	
5	▸ Timer_1	IEC_TIMER	792.0		□	☑	☑	☑	☑	定时触发

Figure 6-15 Adding a New Block

[connect_1] contains information related to ModbusTCP communication, and the starting value is modified according to the communication settings of the actual connected vision sensor, and the starting value in this case is changed to the following figure.



5	ID	CONN_OUC	502.0	16#1	□	□	□	□	□	connection reference / identifier
6	ConnectionType	Byte	504.0	16#0B	□	□	□	□	□	type of connection: 11=TCP/IP, 19=UDP (17=TCP/IP)
7	ActiveEstablished	Bool	505.0	TRUE	□	□	□	□	□	active/passive connection establishment
8	▼ RemoteAddress	IP_V4	506.0		□	□	□	□	□	remote IP address (IPv4)
9	▼ ADDR	Array[1..4] of Byte	506.0		□	□	□	□	□	IPv4 address
10	ADDR[1]	Byte	506.0	192	□	□	□	□	□	IPv4 address
11	ADDR[2]	Byte	507.0	168	□	□	□	□	□	IPv4 address
12	ADDR[3]	Byte	508.0	1	□	□	□	□	□	IPv4 address
13	ADDR[4]	Byte	509.0	108	□	□	□	□	□	IPv4 address
14	RemotePort	UInt	510.0	502	□	□	□	□	□	remote UDP/TCP port number
15	LocalPort	UInt	512.0	0	□	□	□	□	□	local UDP/TCP port number
16	▸ CAM_Dat1	"CAM_Dat"	514.0		□	☑	☑	☑	☑	
17	▸ Timer_1	IEC_TIMER	792.0		□	☑	☑	☑	☑	定时触发

Figure 6-16 Modifying the Communication Start Value

Add the variables in the data block to the pins of the FB function block dragged to the main program in the previous step, where the [R_Len] pin is the number of registers to read the vision sensor result data, here is 10, [W_Len] is the length of the registers to write the vision sensor command, and 3 is filled here. (Note: The [Trigger] and [Statistical Reset] configured in the vision sensor formatting input string still take up 1Word space in ModbusTCP communication despite the data type Bit, and similarly, [Switch Project ID] still takes up 1Word space despite the data type Byte)

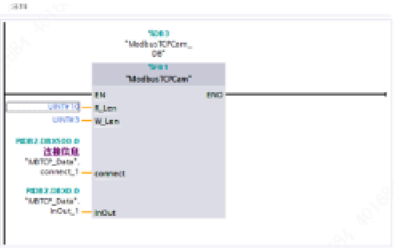
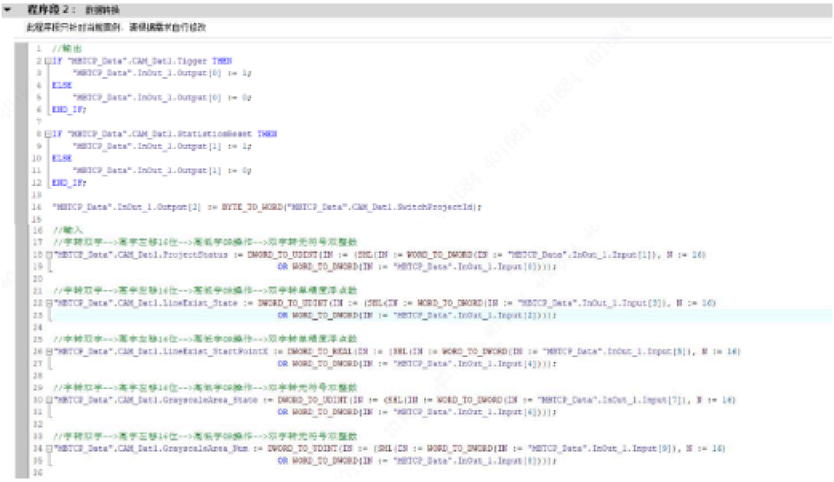


Figure 6-17 Example of Segment (1).



程序段 2： 数据转换

此程序段只针对当前案例，请根据需求自行修改

```
1  //输出
2  IF "MBTCP_Data".CAM_Dat1.Tigger THEN
3      "MBTCP_Data".InOut_1.Output[0] := 1;
4  ELSE
5      "MBTCP_Data".InOut_1.Output[0] := 0;
6  END_IF;
7
8  IF "MBTCP_Data".CAM_Dat1.StatisticsReset THEN
9      "MBTCP_Data".InOut_1.Output[1] := 1;
10 ELSE
11     "MBTCP_Data".InOut_1.Output[1] := 0;
12 END_IF;
13
14 "MBTCP_Data".InOut_1.Output[2] := BYTE_TO_WORD("MBTCP_Data".CAM_Dat1.SwitchProjectId);
15
16 //输入
17 //字转双字-->高字左移16位-->高低字OR操作-->双字转无符号双整数
18 "MBTCP_Data".CAM_Dat1.ProjectStatus := DWORD_TO_UDINT(IN := (SHL(IN := WORD_TO_DWORD(IN := "MBTCP_Data".InOut_1.Input[1]), N := 16)
19                                          OR WORD_TO_DWORD(IN := "MBTCP_Data".InOut_1.Input[0])));
20
21 //字转双字-->高字左移16位-->高低字OR操作-->双字转单精度浮点数
22 "MBTCP_Data".CAM_Dat1.LineExist_State := DWORD_TO_UDINT(IN := (SHL(IN := WORD_TO_DWORD(IN := "MBTCP_Data".InOut_1.Input[3]), N := 16)
23                                          OR WORD_TO_DWORD(IN := "MBTCP_Data".InOut_1.Input[2])));
24
25 //字转双字-->高字左移16位-->高低字OR操作-->双字转单精度浮点数
26 "MBTCP_Data".CAM_Dat1.LineExist_StartPointX := DWORD_TO_REAL(IN := (SHL(IN := WORD_TO_DWORD(IN := "MBTCP_Data".InOut_1.Input[5]), N := 16)
27                                          OR WORD_TO_DWORD(IN := "MBTCP_Data".InOut_1.Input[4])));
28
29 //字转双字-->高字左移16位-->高低字OR操作-->双字转无符号双整数
30 "MBTCP_Data".CAM_Dat1.GrayscaleArea_State := DWORD_TO_UDINT(IN := (SHL(IN := WORD_TO_DWORD(IN := "MBTCP_Data".InOut_1.Input[7]), N := 16)
31                                          OR WORD_TO_DWORD(IN := "MBTCP_Data".InOut_1.Input[6])));
32
33 //字转双字-->高字左移16位-->高低字OR操作-->双字转无符号双整数
34 "MBTCP_Data".CAM_Dat1.GrayscaleArea_Num := DWORD_TO_UDINT(IN := (SHL(IN := WORD_TO_DWORD(IN := "MBTCP_Data".InOut_1.Input[9]), N := 16)
35                                          OR WORD_TO_DWORD(IN := "MBTCP_Data".InOut_1.Input[8])));
36
```

Figure 6-18 Example of Segment (2).

In the program segment 2 of the main program, insert the SCL program segment to convert the word array sent and received by the ModbusTCP communication into the data type corresponding to the formatted input and output of the vision sensor communication configuration.

Procedure lines 1-6: When the placement ["MBTCP_Data". CAM_Dat1.Tigger], the PLC sends 1 to the vision sensor holding register 0x100 via ModbusTCP, the vision sensor takes a picture, otherwise 0.

Procedure lines 8-12: When the position ["MBTCP_Data". CAM_Dat1.StatisticsReset], the PLC sends 1 to the vision sensor hold register 0x101 via ModbusTCP, the [Total number of runs] in the vision sensor is reset, otherwise 0 is sent.

Line 14 of the procedure: Modify ["MBTCP_Data". CAM_Dat1.SwitchProjectId], the PLC sends the corresponding value to the vision sensor maintenance register 0x102 through ModbusTCP, the [Project ID] in the vision sensor will change, if the new project switched is not configured with ModbusTCP communication, the communication will be interrupted, please be careful when switching.

Lines 18-19 of the program: Since the results of the vision sensor received by the PLC are stored in the word array, but the [engineering state] in the vision sensor is of the UDInt (32-bit unsigned double integer) type, it is necessary to convert the two characters to the data type, so the merger and conversion is carried out through the steps of "Word□DWord□ high word left 16 bits□ high and low word OR operation□DWord to

Procedure lines 22-23: [Straight line presence or absence. state] is the same as above. Procedure lines 26-27: [Straight line presence or absence. The conversion method for starting point coordinate X is similar to the previous step, with the only difference being that the DWord is finally converted to a Real type.

Procedure lines 30-31: Conversion method with [Project Status]. Procedure lines 34-35: Conversion method with [Project Status].

In order to facilitate the testing of the test department, the following program is added to the program section 3 of the main program to achieve timing triggering, the timing time can be modified to modify the timer pin and judgment conditions, and if not in use, [AlwaysTRUE] can be changed to normally closed contact to block this function.

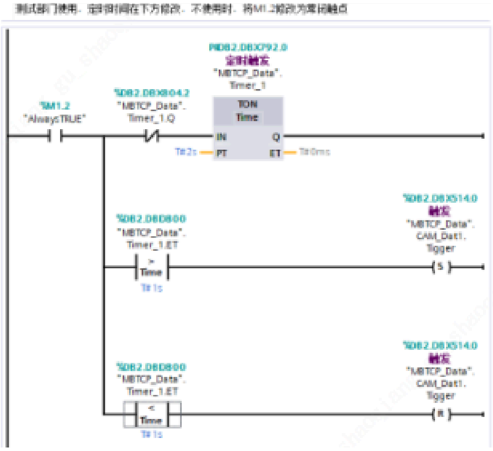


Figure 6-19 Timed trigger program

6.2 Communication Test

6.2.1 Downloading the program

Select the PLC device in the project tree and click Compile button, compile all programs, and show that the compilation is complete and error-free

Error, prove that the compilation is passed, click Download button, select Reinitialize, and click [Load].

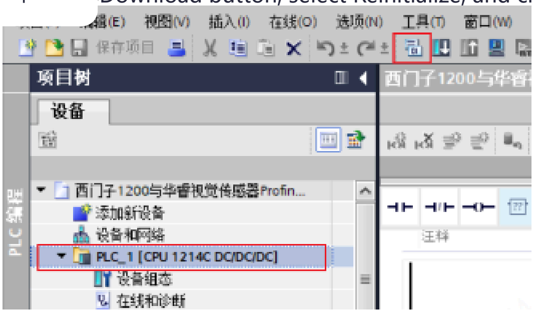
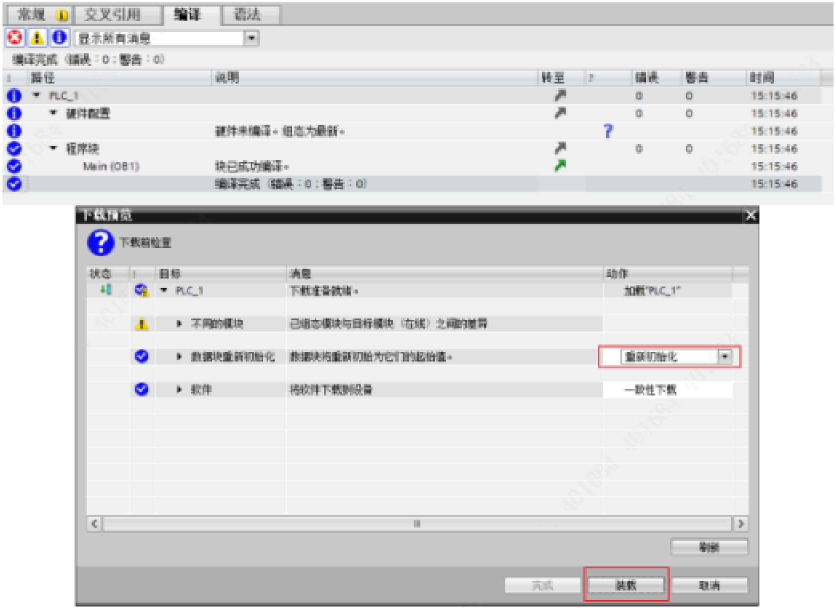


Figure 6-20(1) Download the program



编译完成（错误：0；警告：0）

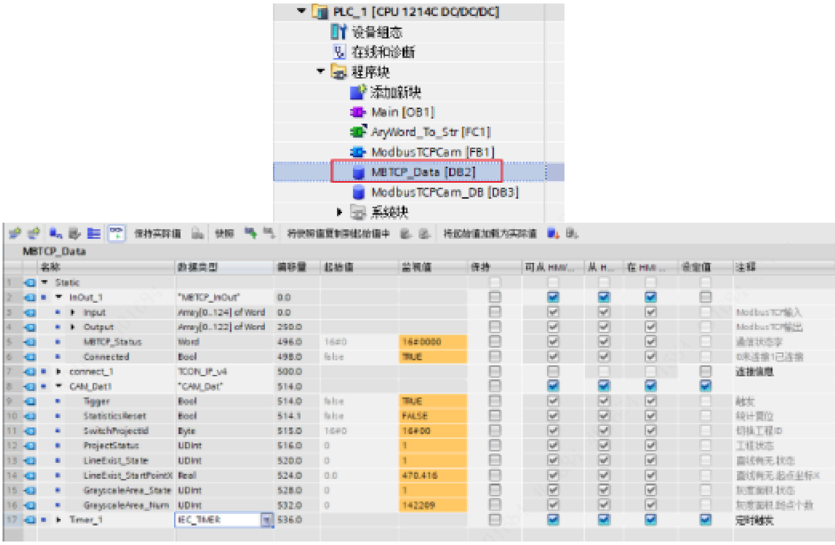
路径	说明	转至	?	错误	警告	时间
PLC_1				0	0	15:15:46
硬件配置				0	0	15:15:46
	硬件未编译。组态为最新。		?			15:15:46
程序块				0	0	15:15:46
Main (OB1)	块已成功编译。					15:15:46
	编译完成（错误：0；警告：0）					15:15:46

状态	!	目标	消息	动作
		PLC_1	下载准备就绪。	加载"PLC_1"
		不同的模块	已组态模块与目标模块（在线）之间的差异	
		数据块重新初始化	数据块将重新初始为它们的起始值。	重新初始化
		软件	将软件下载到设备	一致性下载

Figure 6-20(2) Download the program

6.2.2 Communication test

Double-click the [MBTCP_Data] data block in the project tree, open the data block, and click it [Monitor All] button to monitor the data block variable value.


- PLC_1 [CPU 1214C DC/DC/DC]
  - 设备组态
  - 在线和诊断
  - 程序块
    - 添加新块
    - Main [OB1]
    - AnyWord_To_Str [FC1]
    - ModbusTCPCam [FB1]
    - MBTCP_Data [DB2]
    - ModbusTCPCam_DB [DB3]
  - 系统块

MBTCP_Data

	名称	数据类型	偏移量	起始值	监视值	保持	可从 HMI...	从 H...	在 HMI ...	设定值	注释
1	Static					□	□	□	□	□	
2	InOut_1	"MBTCP_InOut"	0.0			□	☑	☑	☑	□	
3	Input	Array[0..124] of Word	0.0			□	☑	☑	☑	□	ModbusTCP输入
4	Output	Array[0..122] of Word	250.0			□	☑	☑	☑	□	ModbusTCP输出
5	MBTCP_Status	Word	496.0	16#0	16#0000	□	☑	☑	☑	□	通信状态字
6	Connected	Bool	498.0	false	TRUE	□	☑	☑	☑	□	0未连接1已连接
7	connect_1	TCON_IP_v4	500.0			□	□	□	□	□	连接信息
8	CAM_Dat1	"CAM_Dat"	514.0			□	☑	☑	☑	☑	
9	Tigger	Bool	514.0	false	TRUE	□	☑	☑	☑	□	触发
10	StatisticsReset	Bool	514.1	false	FALSE	□	☑	☑	☑	□	统计复位
11	SwitchProjectId	Byte	515.0	16#0	16#00	□	☑	☑	☑	□	切换工程ID
12	ProjectStatus	UDInt	516.0	0	1	□	☑	☑	☑	□	工程状态
13	LineExist_State	UDInt	520.0	0	1	□	☑	☑	☑	□	直线有无状态
14	LineExist_StartPointX	Real	524.0	0.0	470.416	□	☑	☑	☑	□	直线有无起点坐标X
15	GreyscaleArea_State	UDInt	528.0	0	1	□	☑	☑	☑	□	灰度面积状态
16	GreyscaleArea_Num	UDInt	532.0	0	142269	□	☑	☑	☑	□	灰度面积像点个数
17	Timer_1	IEC_TIMER	536.0			□	☑	☑	☑	☑	定时触发

Figure 6-21 Monitoring interface

[InOut_1.Connected] shows [TRUE] means that the PLC is connected to the vision sensor successfully, [FALSE] means the connection failed, at this time, you need to check whether the connection settings of the PLC are configured correctly according to the above instructions, and if so, check whether the communication settings of the vision sensor are correct.

If you need to send a command to the vision sensor, double-click to modify the monitoring value of the sent instruction. Note: When the vision sensor is connected to the PLC, after the PLC is powered off or put into STOP mode, the PLC can be restarted, the vision sensor and the PLC can be connected normally, but the data transmission/reception will be invalid, and the communication configuration of the vision sensor needs to be reconfigured or the vision sensor can be restarted.