HIKROBOT

Smart Code Reader Industrial Protocol

Operation Manual

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Symbol Conventions

The symbols that may be found in this document are defined as follows.

Symbol	Description
Danger	Indicates a hazardous situation which, if not avoided, will or could result in death or serious injury.
Caution	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance degradation, or unexpected results.
Note	Provides additional information to emphasize or supplement important points of the main text.

Available Model

This manual is applicable to the ID2000 Series, ID3000 Series, ID5000 Series, and IDH5000 Series Smart Code Reader.

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Chapter 1 Ethernet/IP

1.1 Introduction

Ethernet/IP is a network suitable for industrial environment and time-critical applications. Ethernet/IP uses standard EtherNet, TCP/IP technology and CIP's open application layer protocol, and it can share the network with normal EtherNet communication.

Note

This chapter takes Omron NX series PLC as an example to explain how to communicate with the smart code reader via the Ethernet/IP communication protocol. For other devices, refer to the user manual provided by the manufacturer and make related settings by reading contents of this chapter.

1.2 Hardware Wiring

The wiring of Omron NX series PLC and the smart code reader is shown below.

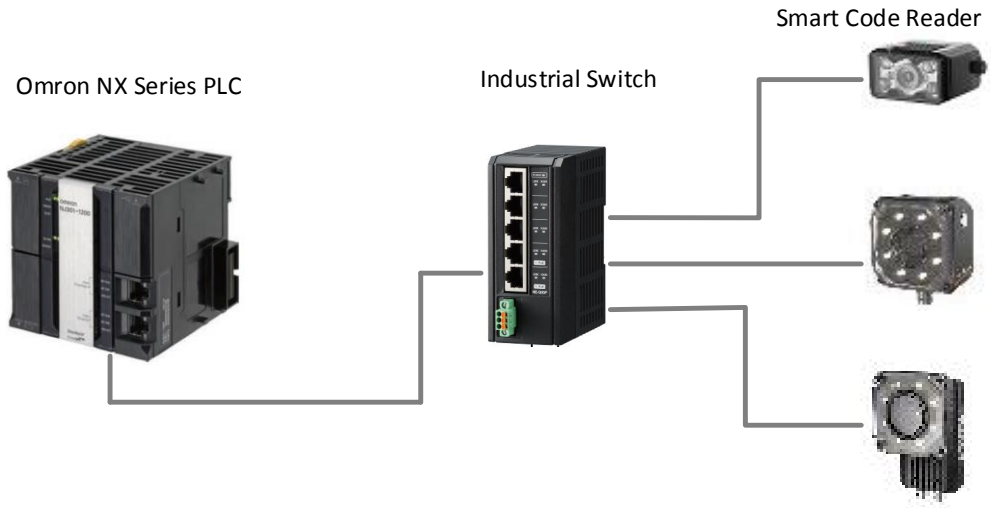


Figure 1-1 Hardware Wiring

1.3 Smart Code Reader Settings

Before using the smart code reader's Ethernet/IP function to communicate with PLC devices,

you need to set the smart code reader first via the IDMVS client software.

Before you start:

- Make sure that the PC has installed the IDMVS client software with version of V2.3.1 and above.
- Check the device's firmware version.

Steps

1. Double click the device in the device list to connect it to the client software.
2. Set the device mode as **Normal** in the live view window.

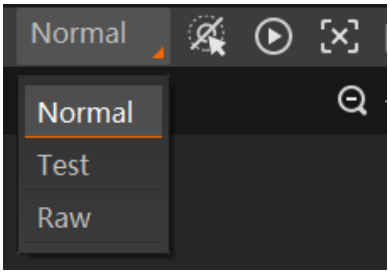


Figure 1-2 Set Device Mode

3. Go to **Communication Settings** in the left navigation panel.
4. Select **Ethernet/IP** as communication protocol, and enable **Ethernet/IP Enable**.
5. Set **Ethernet/IP Input Assembly Size** and **Ethernet/IP Output Assembly Size** according to actual demands.

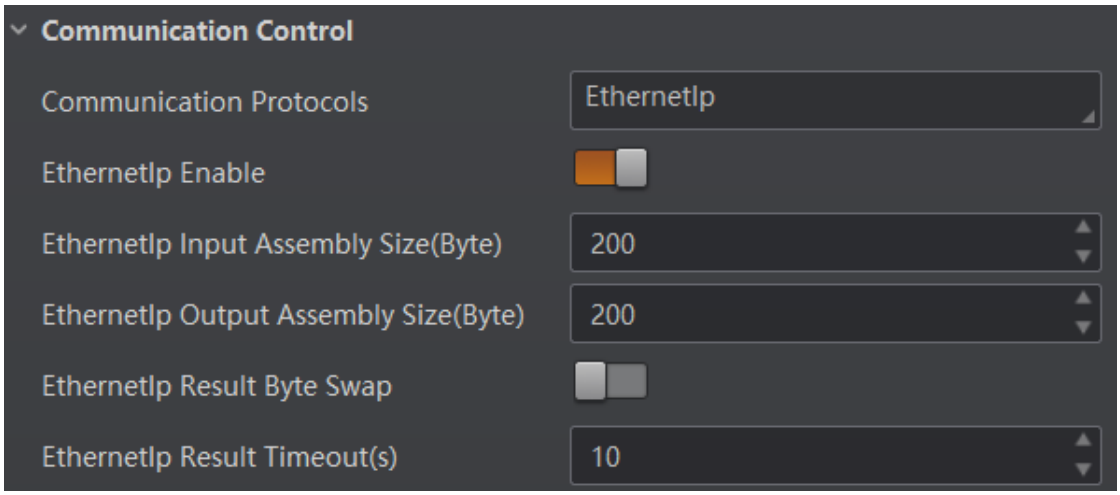


Figure 1-3 Set Parameters

Note

The default value of **Ethernet/IP Input Assembly Size** and **Ethernet/IP Output Assembly Size** is 200.

6. Go to **Data Processing** in the left navigation panel, and set format and contents contained in the outputted information.

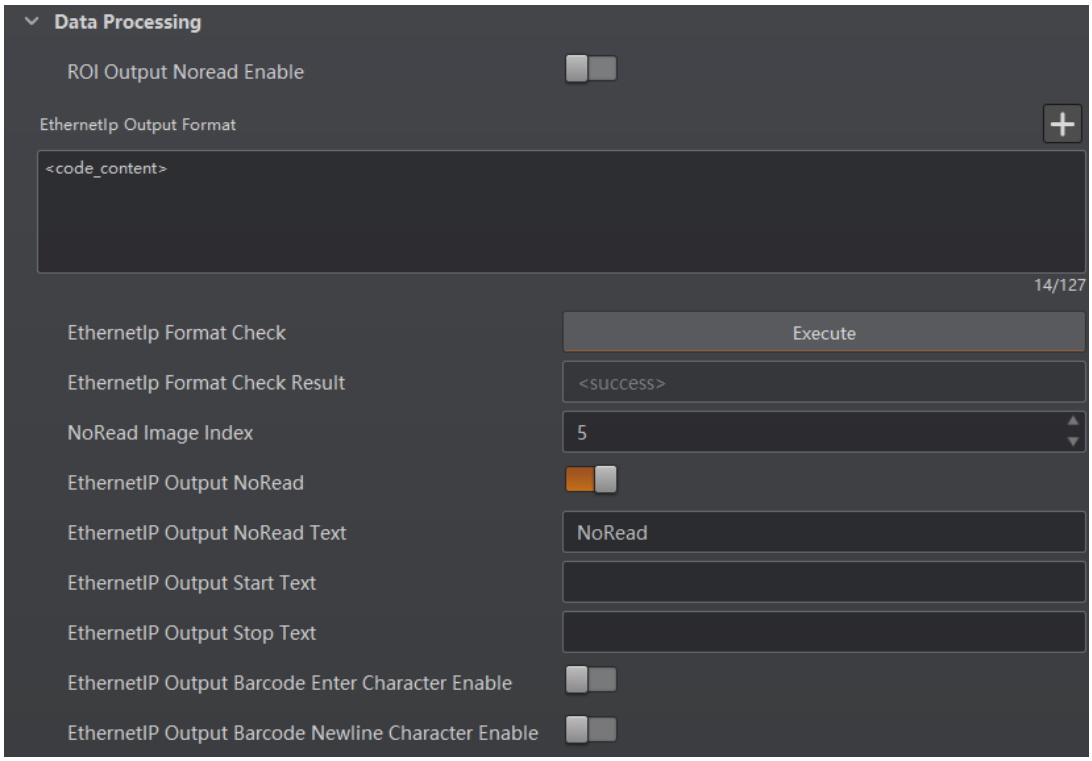


Figure 1-4 Set Data Processing

Note

- Refer to the user manual of the smart code reader for detailed data processing settings.
- The specific parameters may differ by device models.

1.4 PLC Settings

This section takes Omron NX series PLC as an example to explain how to set PLC.

1.4.1 Create Sysmac Studio Project

You need to create Sysmac Studio project first when using Omron NX series PLC.

Steps

1. Run Sysmac Studio, click **New Project**, enter parameters, and click **Create**.

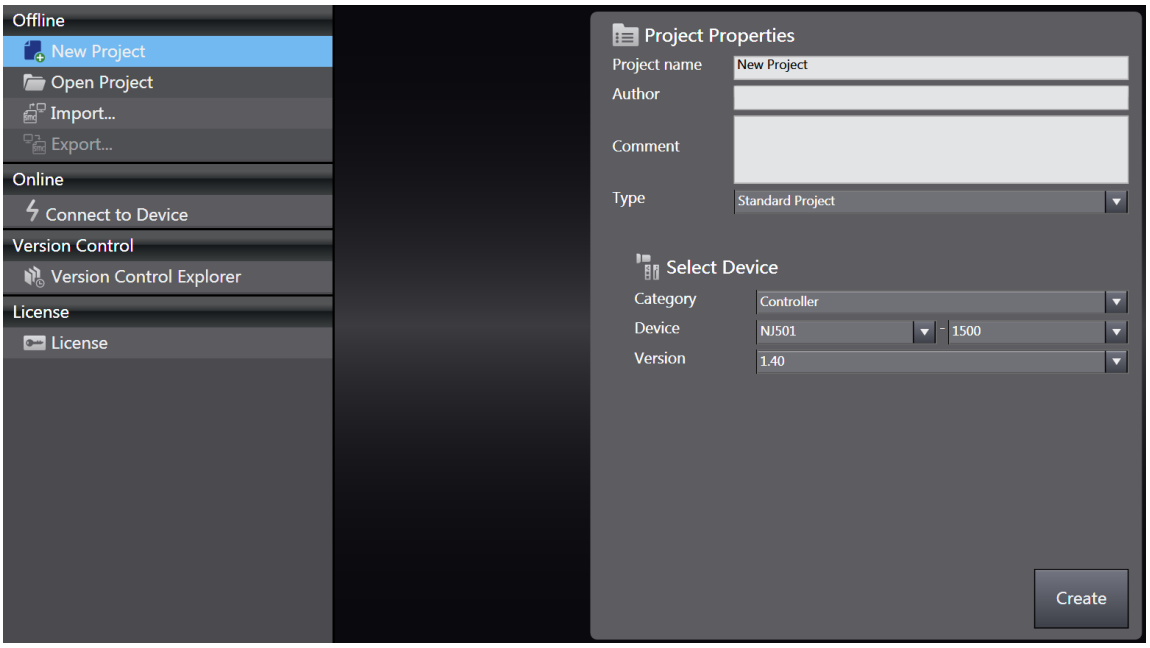


Figure 1-5 Create New Project

2. Create a new **Global Variables** whose size should be the same with that of the smart code reader configured in the IDMVS.

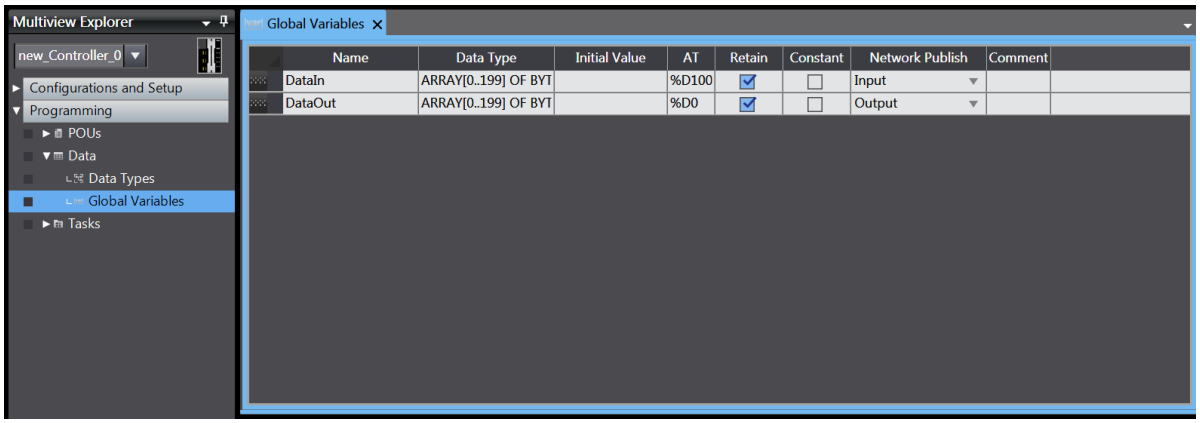


Figure 1-6 Create Global Variables

Note

When connecting multiple smart code readers, you should create several global variables with different names.

3. Go to **Controller Setup** → **Memory Settings**, check **Enable** of DM, and allocate the global variables created in step 2 to DM memory.

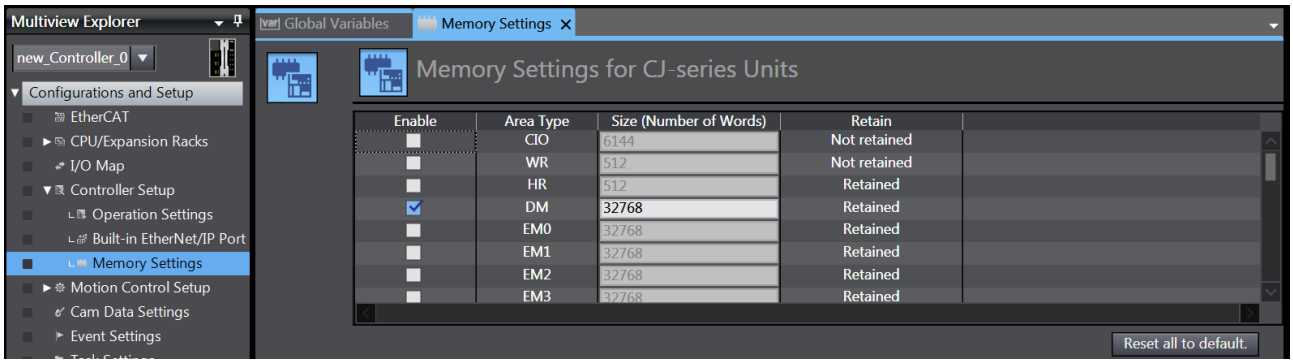


Figure 1-7 Enable DM Area Type

4. Go to **Controller Setup** → **Built-in Ethernet/IP Port Settings**, and set the IP address of PLC port 1.

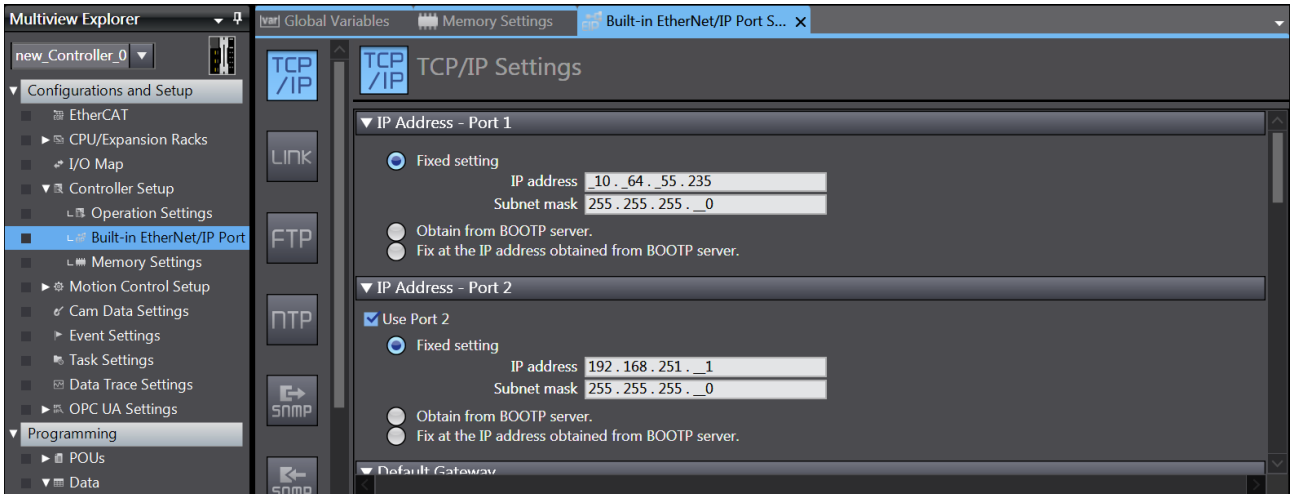


Figure 1-8 Set IP Address

Note

Make sure that the PLC and the smart code reader's IP address are in the same network segment.

5. Click **Tools** in the menu, and select **Ethernet/IP Connection Settings**.

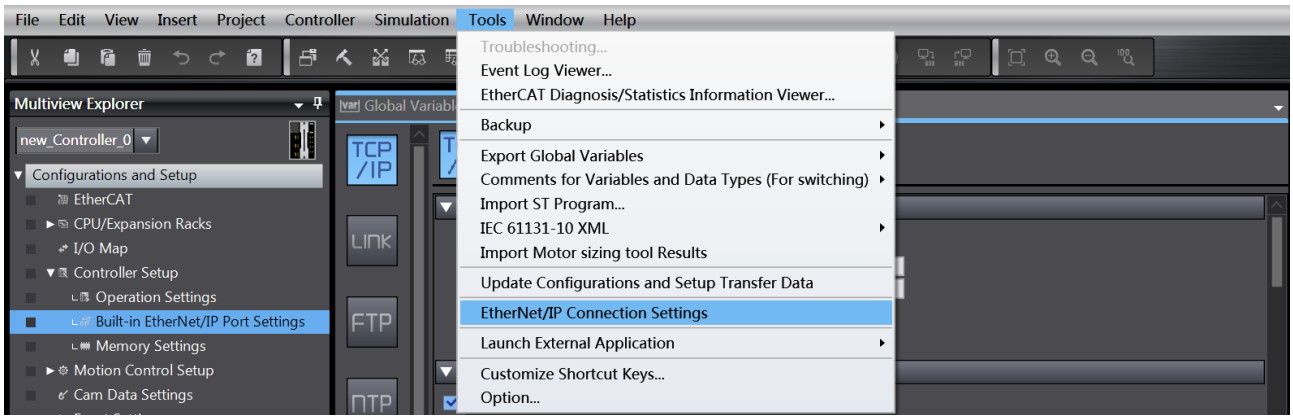


Figure 1-9 Open Ethernet/IP Connection Settings

6. Double click port 1 in **Ethernet/IP Device List**, and click **Registration All** in tag sets to register global variables.

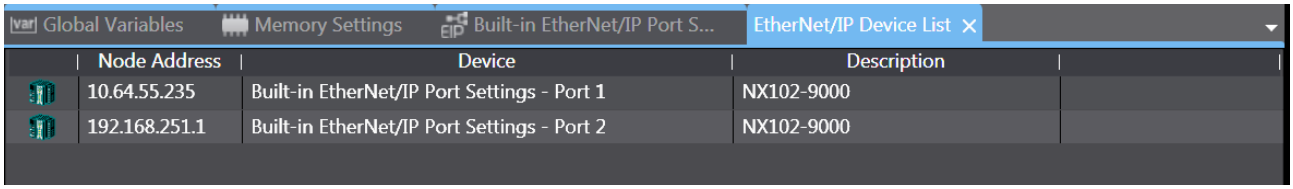


Figure 1-10 Ethernet/IP Device List

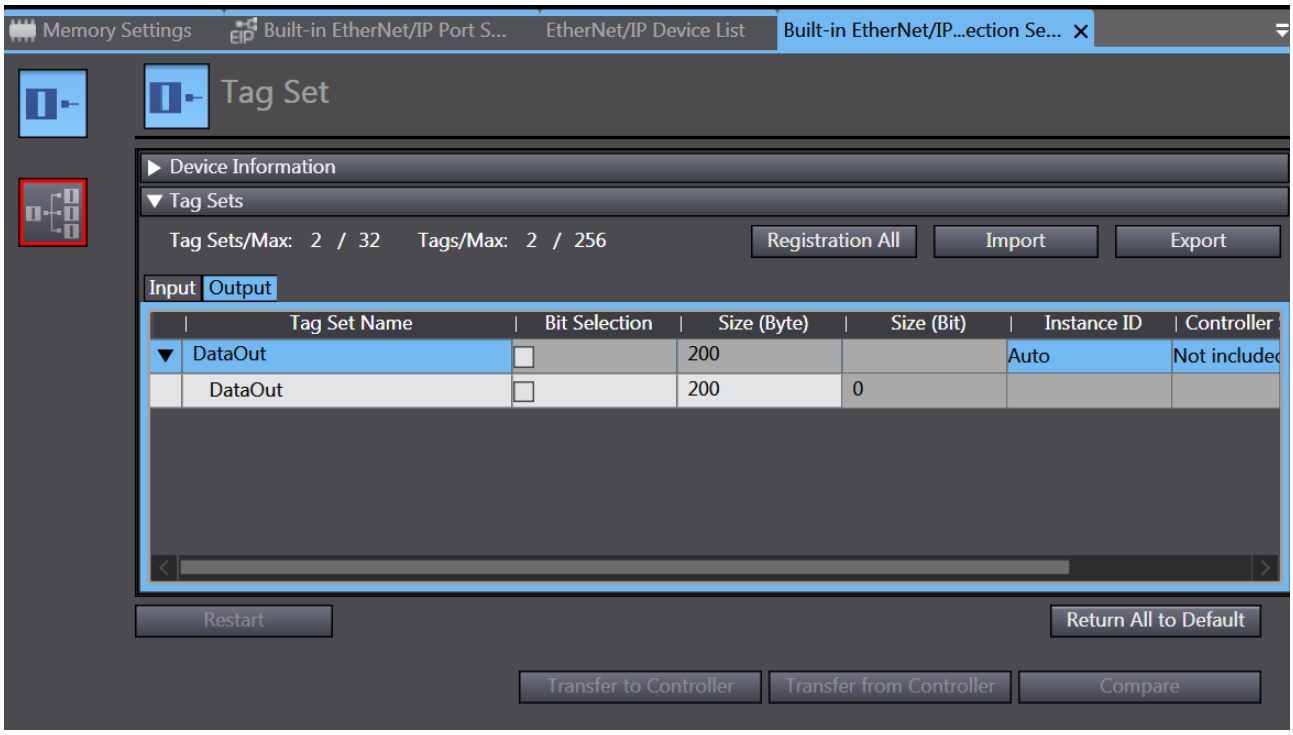


Figure 1-11 Register Global Variables

7. Right click in the **Target Device** area, click **Display EDS Library**, select the corresponding EDS file in the EDS library, and click **Install**.

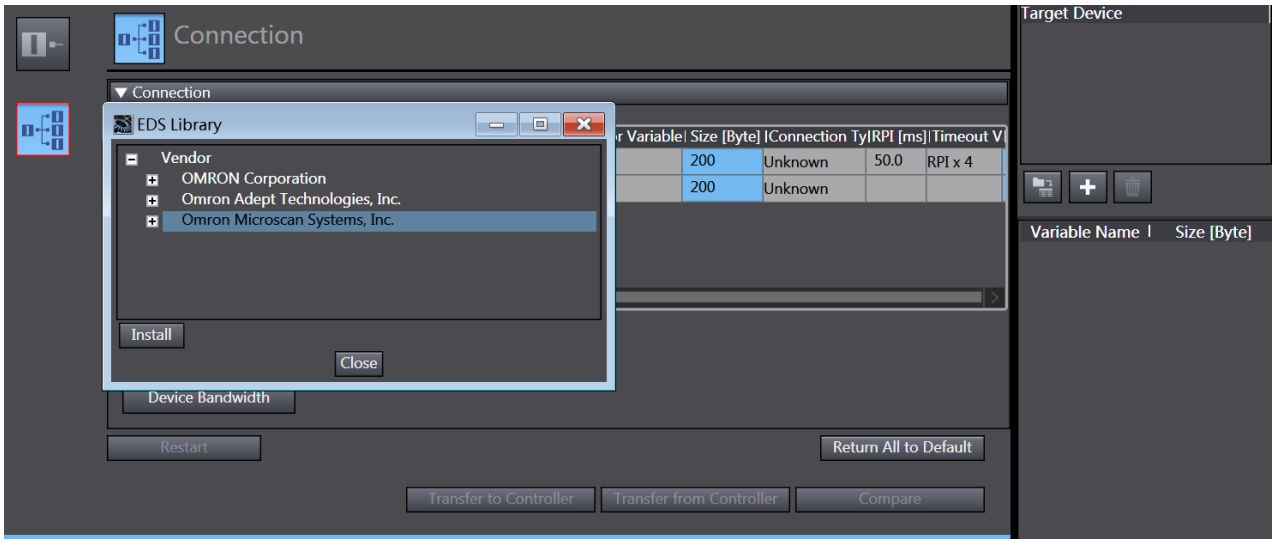


Figure 1-12 Install EDS File

8. Click ＋ in the **Target Device** area to add devices, enter **Node address**, **Model name**, and **Revision** according to actual demands, and click **Add**.
9. Click in **Built-in Ethernet/IP Port Settings**, add created target devices, select **Consume Data From/Produce Data To** as **Connection I/O Type**, and set size and originator variable that are global variable created before.

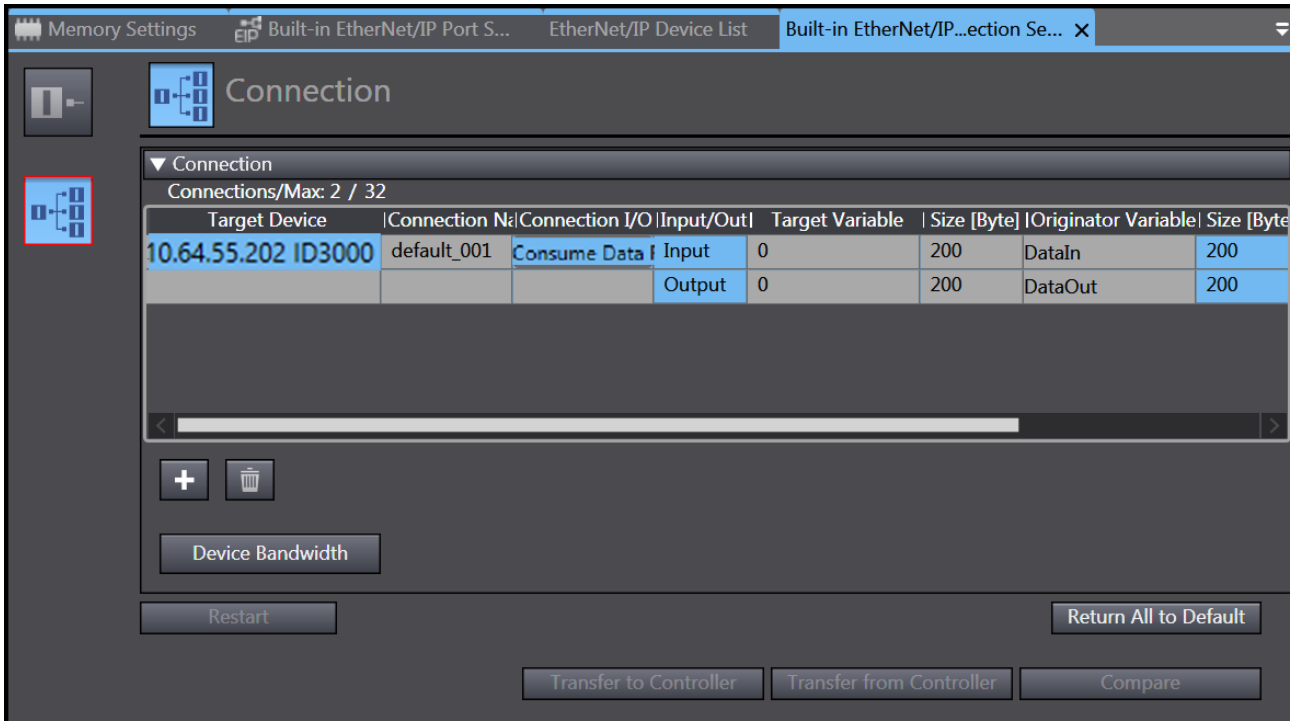


Figure 1-13 Create Target Device

10. Go to **Tools** → **Export Global Variables** → **Network Configurator…**, and export the global variables.

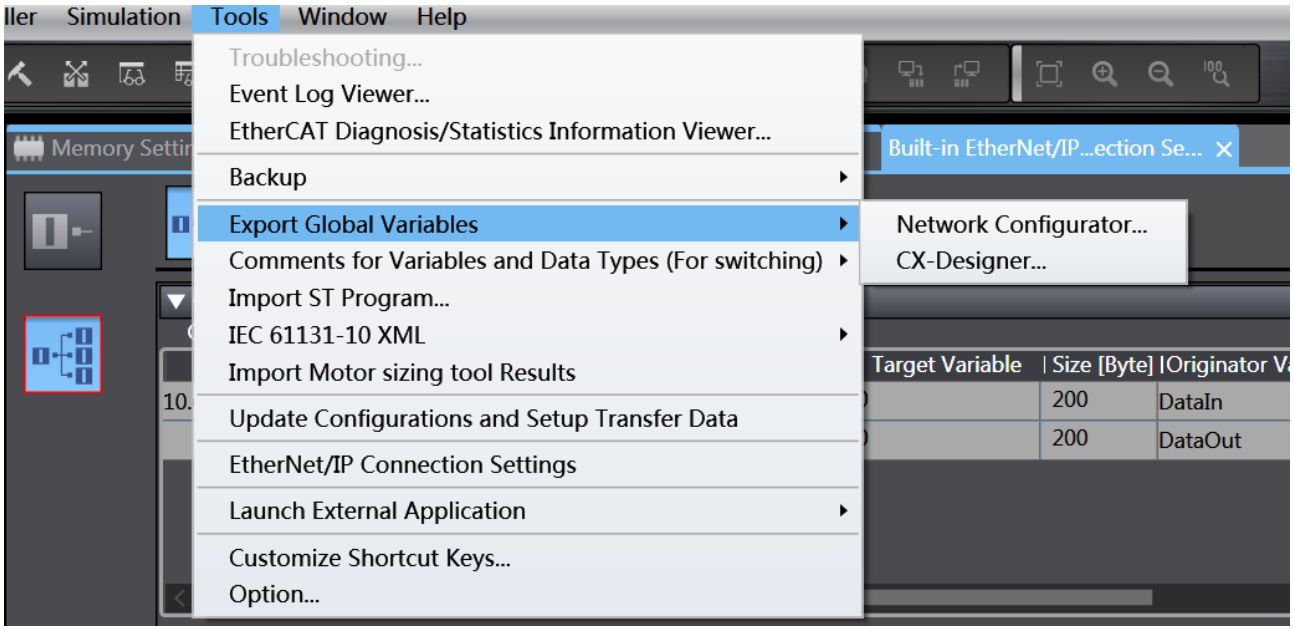


Figure 1-14 Export Global Variable File

11. Save and compile the project, and synchronize it to the PLC controller.

1.4.2 Network Configurator Settings

After the project is created, you need to set it via the network configurator.

Steps

1. Run Network Configurator, click **EDS File** and select **Install...**to import the device's EDS file.

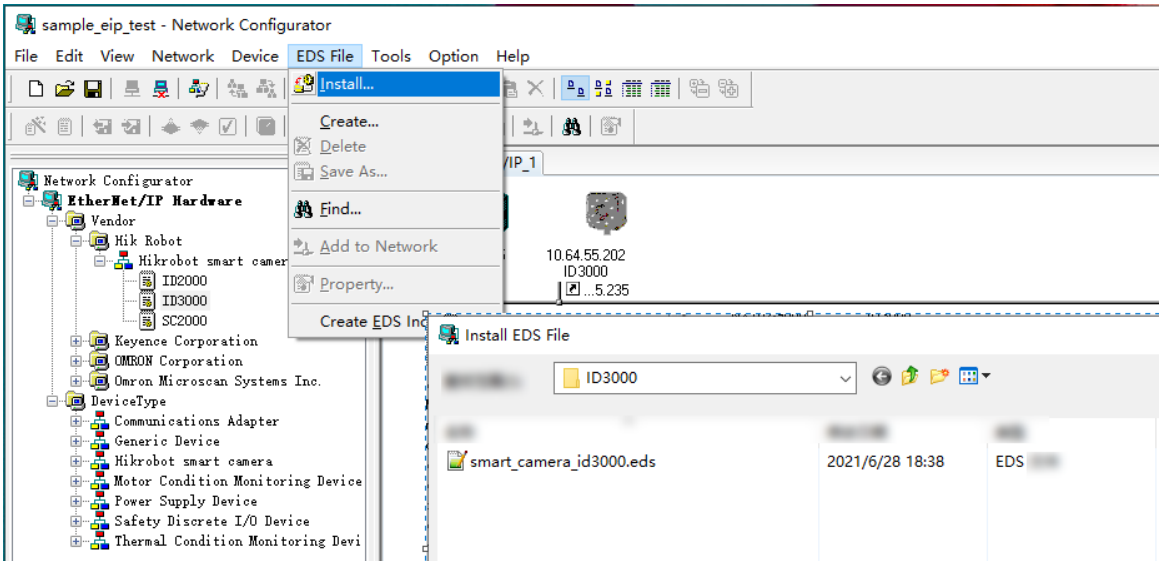


Figure 1-15 Import EDS File

2. Drag in the corresponding PLC controller and the smart code reader.

3. Right click the smart code reader to modify its IP address.

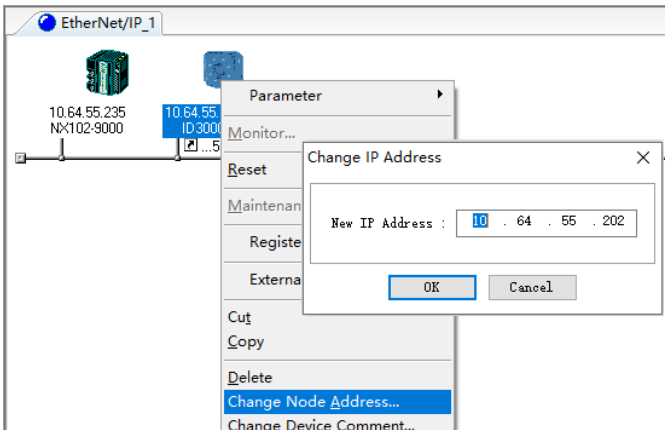


Figure 1-16 Modify IP Address

4. Double click the PLC, go to **Tag Sets** → **To/From File** → **Import from File**, and import the global variables created in the Sysmac Studio.

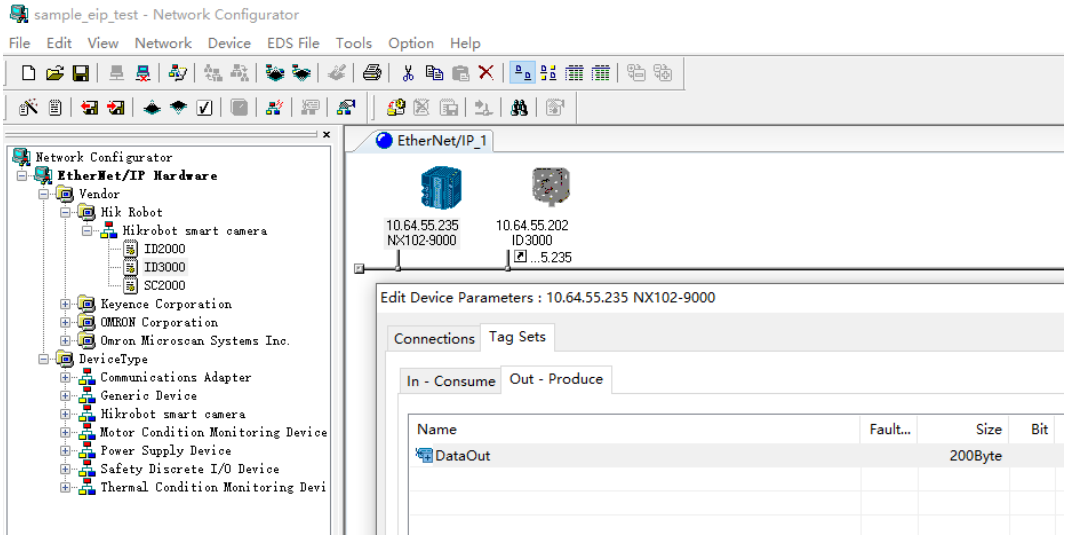


Figure 1-17 Import Global Variables

5. Establish the connection between the smart code reader's input/output and the global variables of PLC controller. **Data In** connects to **Input_13**, and **Data Out** connects to **Output_22**, and set **Packet Interval** as 50 **ms**.

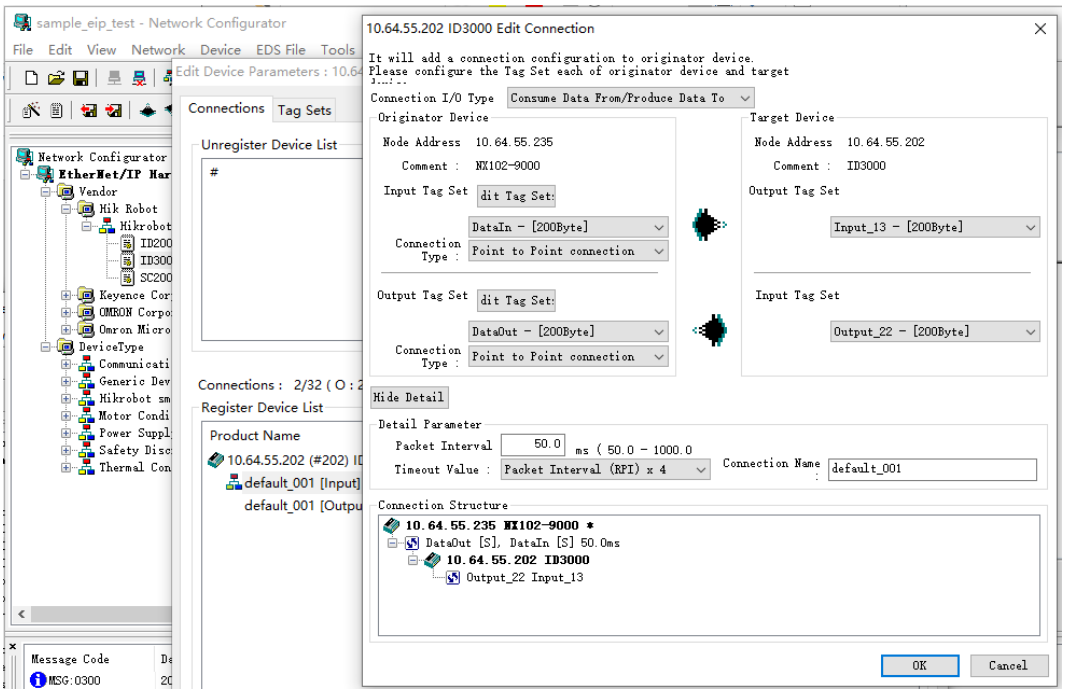


Figure 1-18 Establish Connection

6. Select interface for PLC controller and download configuration to the PLC.

Note

After the connection between the PLC and the smart code reader is finished, the PLC's red NET ERR indicator will unlit.

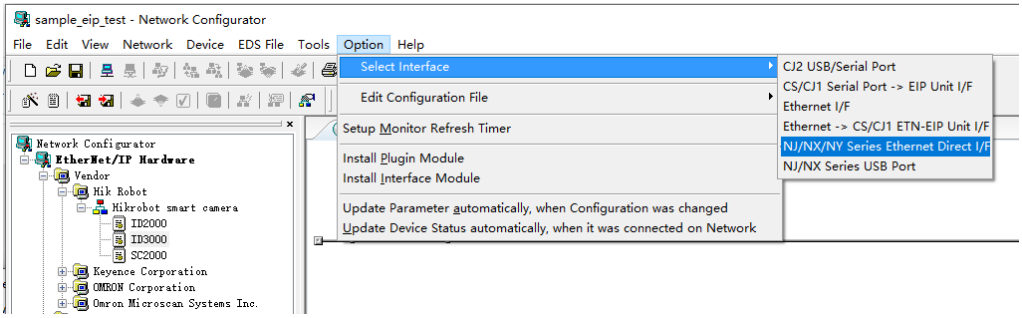


Figure 1-19 Select PLC's Communication Interface Type

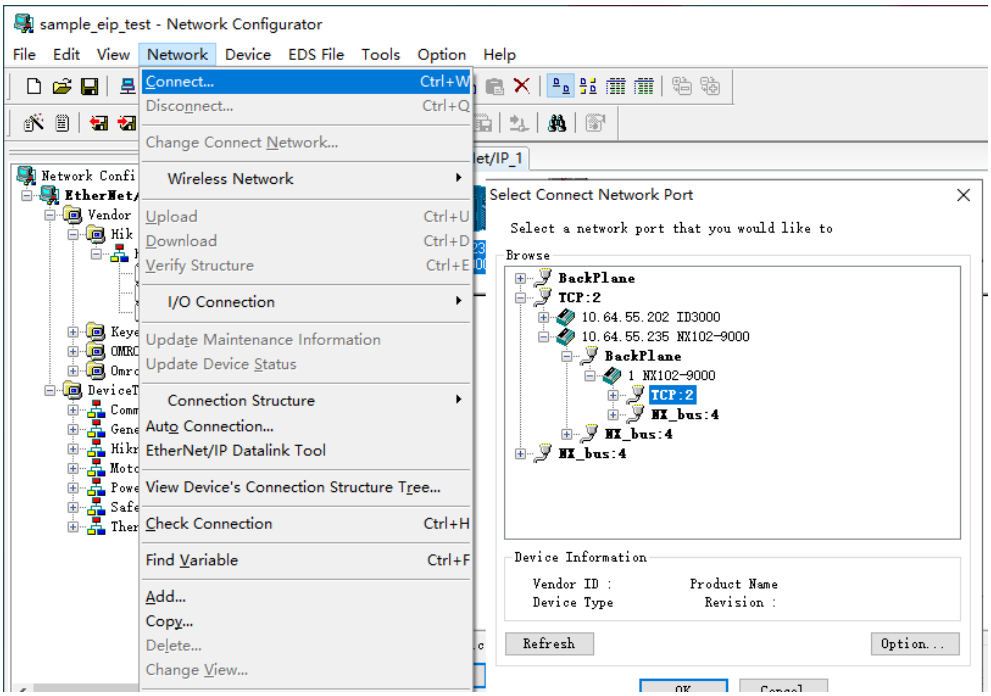


Figure 1-20 Connect

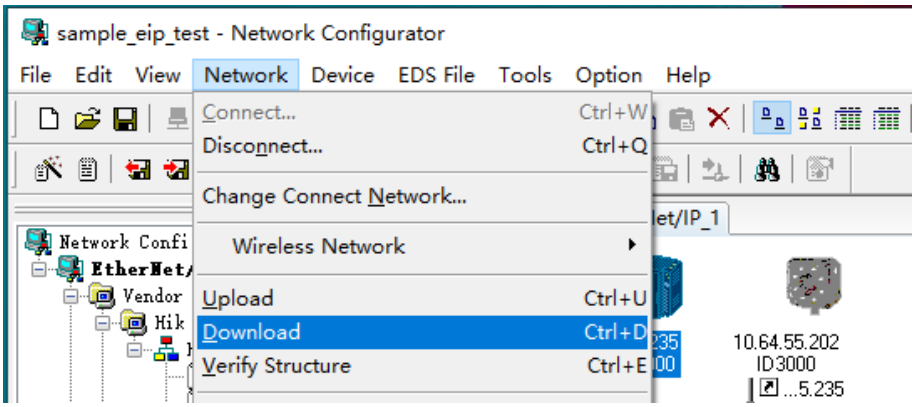


Figure 1-21 Download

1.5 Input and Output Mapping

1.5.1 Input Mapping

The definition of input mapping (smart code reader > PLC controller) is shown below.

Table 1-1 Input Mapping Table

Byte	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
0-1	useful data length							
2					Decoding	Acquiring	Trigger Ack	Trigger Ready
3	General Fault						Results NG	Results OK
4-17	Reserved							
18-19	Result Length							
20	Result Data 0							
…	…							
199	Result Data 179							
…	Result Data …							

Table 1-2 Input Mapping Table Description

Name	Description
Trigger Ready	The device is ready to receive new trigger signal. When the Trigger Enable is set and the device is ready to receive next trigger signal, the Trigger Ready is set.
Trigger Ack	The device has already received the trigger signal.
Acquiring	The device is acquiring images.
Decoding	The device is recognizing decodes on images.
Reserved	Reserved.
Results OK	The device outpus new results successfully.

	When the PLC is set Results Ack, it will be cleared.
Results NG	The device does not read codes or get outputted results. When the PLC is set Results Ack, it will be cleared. **Note** You should disable NoRead function when using NG signal.
General Fault	The device's internal fault, and you can clear this signal via Clear Error.
Result Length	The invalid data length in the result area.
Result Data	The reading result of the device, and the reading result is in ASCII format. ● When the result data length is less than the configured result module, the remaining data is filled with 0. ● When the result data length is greater than the configured result module, the extra data is cut off.

1.5.2 Output Mapping

The definition of output mapping (PLC controller > smart code reader) is shown below.

Table 1-3 Output Mapping Table

Byte	BIT7	BIT6	BIT5	BIT4	BIT3	BIT2	BIT1	BIT0
0						Results Ack	Trigger	Trigger Enable
1	Clear Error							Execute Command
2-17	Reserved							
18-19	User Data Length							
20	User Data 0							
…	…							
199	User Data 179							
…	User Data …							

Table 1-4 Output Mapping Table Description

Name	Description
Trigger Enable	The PLC controls the device's trigger enable function via this bit.
Trigger	When following conditions are met, the PLC sets this bit to trigger the device to acquire an image and run the algorithm once. ● Trigger Enable is set. ● The device is not currently acquiring images and running algorithms. ● Trigger Ready is set.
Results Ack	After the PLC gets the latest results, Result Ack is set. At the same time, Results OK and Results NG will be cleared.
Reserved	Reserved.
Clear Error	Clear error status.

1.6 Trigger Test

Communication Sequence Diagram

The communication sequence diagram of PLC and the device is shown below.

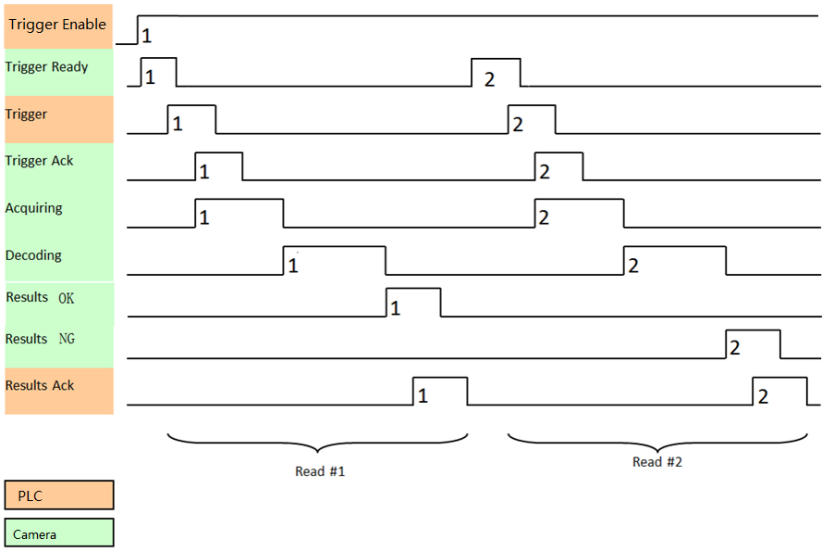


Figure 1-22 Communication Sequence Diagram

The logic of the above sequence diagram is shown below:

1. PLC sets Trigger Enable signal DataOut[0].0. After the device is ready, set Trigger Ready signal DataIn[2].0.
2. After detecting the device's Trigger Ready signal, the PLC sends Trigger signal DataOut[0].1 and controls the device to operate once.
3. The device starts to acquire images and runs the algorithm after receiving Trigger signal.

- If codes are read successfully, set the Results OK signal DataIn[3].0 and put code contents into the address starting from DataIn [20].
- If codes are not read successfully, set the Results NG signal DataIn[3].1 and clear data starting from address of DataIn [20].

Note

- If codes are not read successfully when NoRead is enabled, Results OK + "NoRead" character are feedback.
- If codes are not read successfully when NoRead is disabled, Results NG signal is feedback.

4. After detecting Results OK/NG signal, the PLC starts to read results from DataIn [20].
5. After reading results is finished, set Results Ack signal DataOut[0].2, and notify the device.
6. After the trigger flow is finished, PLC sends Trigger signal again and next round of trigger flow begins.

Note

If the smart code reader cannot output results after receiving the Trigger signal due to an internal error (for example, acquiring images are not enabled after the smart code reader is connected to the IDMVS), the General Fault signal DataIn[3].7 will be set at this time. After the PLC confirms the cause of the error, set the Clear Error signal DataOut[1].7, and the trigger operation can be continued after the error is cleared.

Create Variables

Create variables in accordance with the device's input/output mapping area.

TriggerEnable	BOOL		%D0.0	☑	☐
Trigger	BOOL		%D0.1	☑	☐
ResultsAck	BOOL		%D0.2	☑	☐
ClearError	BOOL		%D0.15	☑	☐
TriggerReady	BOOL		%D101.0	☑	☐
TriggerAck	BOOL		%D101.1	☑	☐
Acquiring	BOOL		%D101.2	☑	☐
Decoding	BOOL		%D101.3	☑	☐
ResultsOK	BOOL		%D101.8	☑	☐
ResultsNG	BOOL		%D101.9	☑	☐
GeneralFault	BOOL		%D101.15	☑	☐
ResultLength	UINT		%D109	☑	☐
ResultData	ARRAY[0..179] OF BYTE		%D110	☑	☐
ResultDataUser	ARRAY[0..179] OF BYTE		%D500	☑	☐

Figure 1-23 Create Variables

Ladder Diagram

The PLC triggers the device to read codes, and related ladder diagrams are shown below.

- Enable Trigger

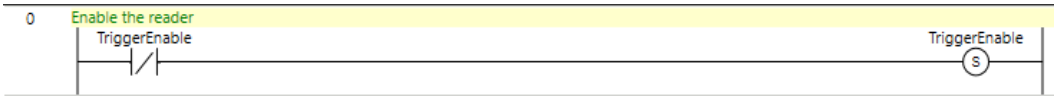


Figure 1-24 Enable Trigger

- Send Trigger Signal

The trigger signal can be generated by adding an edge signal before Trigger Ready according to actual demands. For example, when the PLC detects the photoelectric input signal, it sends a trigger signal once.

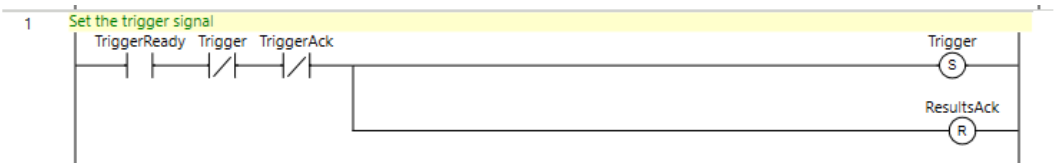


Figure 1-25 Send Trigger Signal

- Clear Trigger Signal

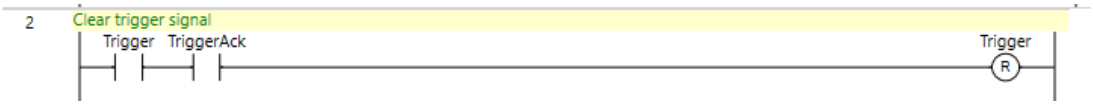


Figure 1-26 Clear Trigger Signal

- Get Device Results

When the device feedbacks the Results OK or Results NG signal, it means that result data has been updated, and the PLC can read result data to the user's storage area. After the reading is complete, set the Results Ack signal to acknowledge that the device has completed reading result data.

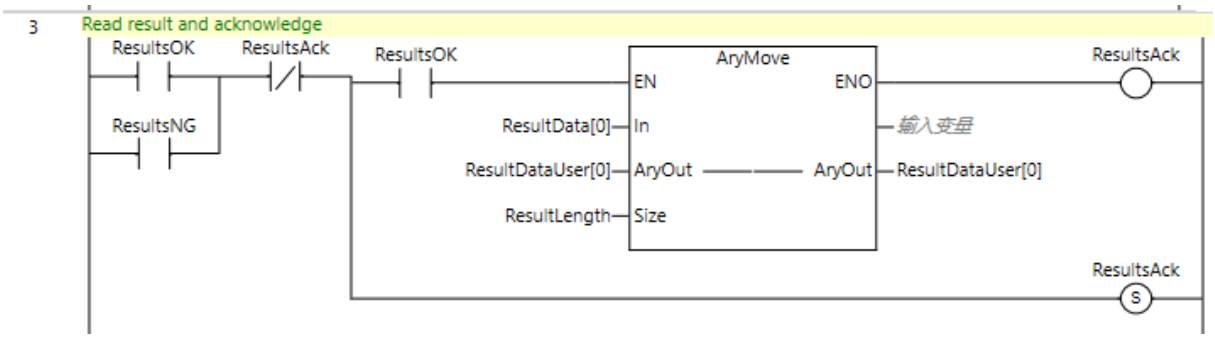


Figure 1-27 Get Device Results

Note

If the endianness of codes read is different from actual one, you can enable result byte swap function via the IDMVS.

- Clear Error

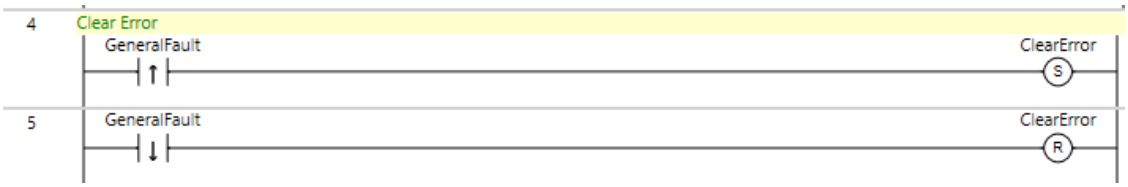


Figure 1-28 Clear Error

View Results

Open the variable monitoring window of the Sysmac Studio, and add the created DataIn input variable and DataOut output variable. The online value of the variable is the internal

input/output value of the device.

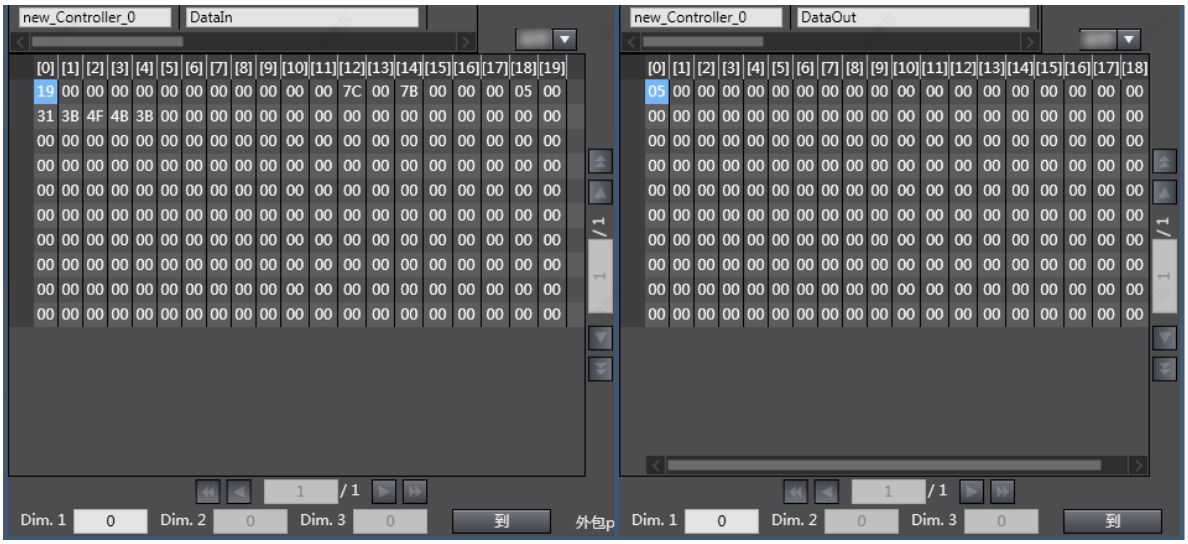


Figure 1-29 View Results

Chapter 2 Profinet

2.1 Introduction

Profinet is an open industrial EtherNet standard launched by PI for automation. Profinet uses TCP/IP and IT standards. It is a real-time EtherNet that not only supports standard TCP/IP, but also provides time precision that standard EtherNet cannot achieve.

Note

This chapter takes Siemens S7 series PLC as an example to explain how to communicate with smart code readers via Profinet communication protocol. For other devices, refer to the user manual provided by the manufacturer and make related settings by reading contents of this chapter.

2.2 Hardware Wiring

The wiring of Siemens S7 series PLC and the smart code reader is shown below.

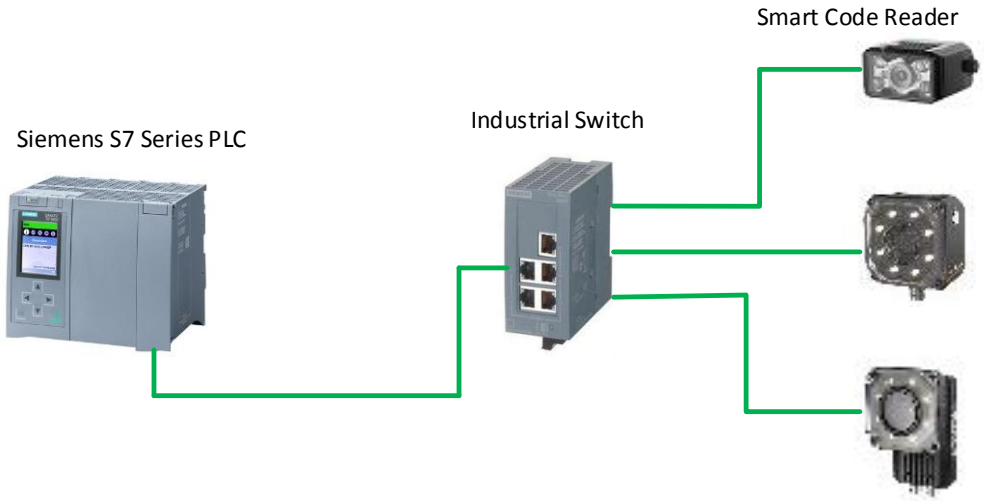


Figure 2-1 Hardware Wiring

2.3 Smart Code Reader Settings

Before using the smart code reader's Profinet function to communicate with other devices, you need to set the smart code reader first via the IDMVS client software.

Before you start:

- Make sure that the PC has installed the IDMVS client software with version of V2.3.1 and above.
- Check the device's firmware version.

Steps

1. Double click the device in the device list to connect it to the client software.
2. Set the device mode as **Normal** in the live view window.

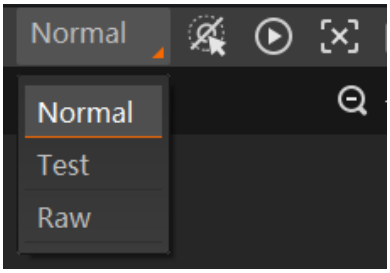


Figure 2-2 Set Device Mode

3. Go to **Communication Settings** in the left navigation panel.
4. Select **Profinet** as communication protocol, and enable **Profinet Enable**.
5. Enter **Profinet Device Name** according to actual demands.

Note

Make sure that the device name is unique.

6. Set **Profinet Result Module Size** and **Profinet Result Timeout** according to actual demands.

Note

The default value of **Profinet Result Module Size** is 64 bytes.

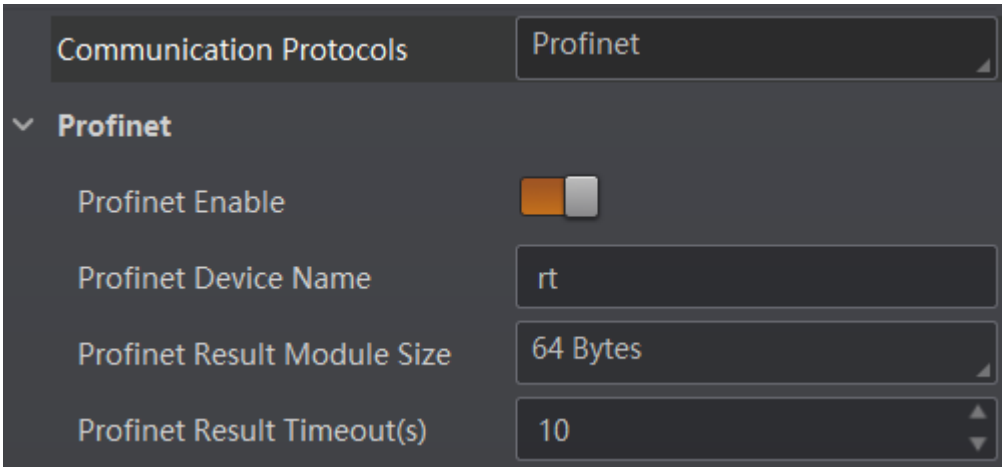


Figure 2-3 Set Communication Parameters

7. Go to **Data Processing** in the left navigation panel, and set format and contents contained in the outputted information.

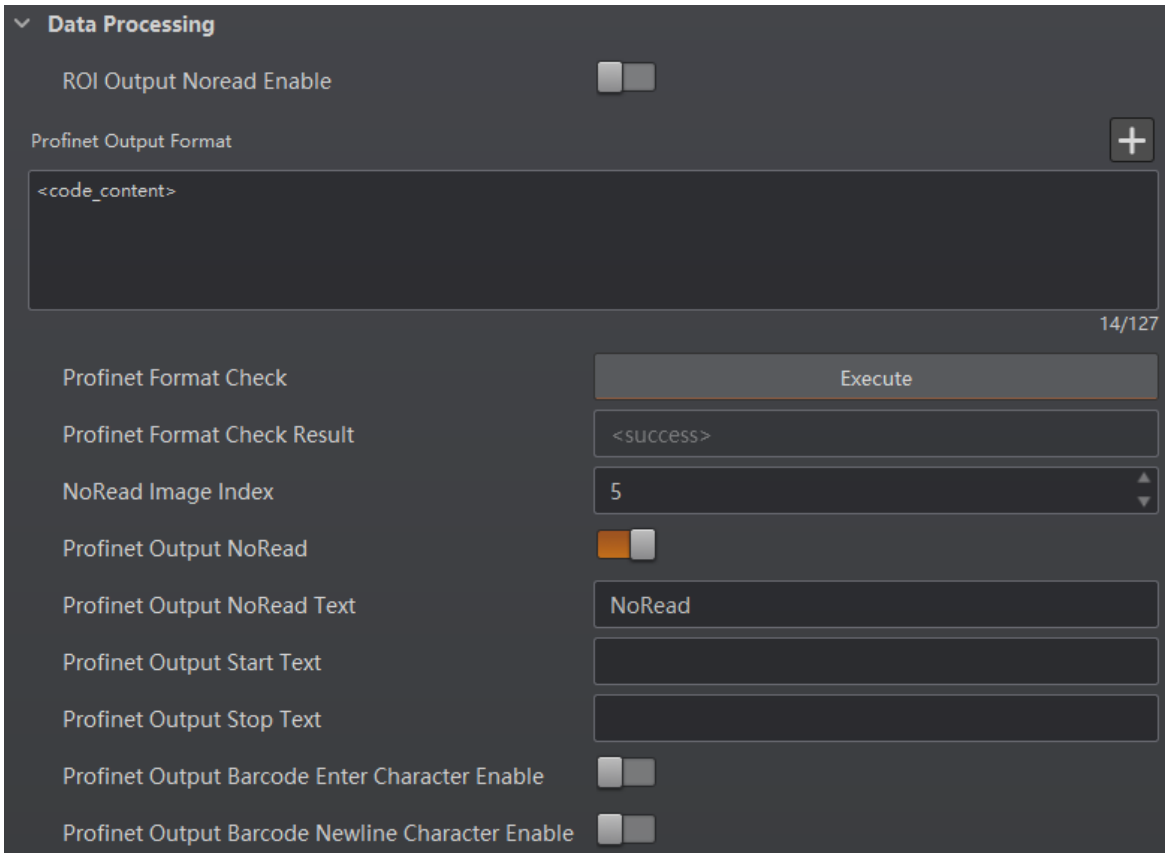


Figure 2-4 Set Data Processing

Note

- Refer to the user manual of the smart code reader for detailed data processing settings.
- The specific parameters may differ by device models.

2.4 PLC Settings

This section takes Siemens S7 series PLC as an example to explain how to set PLC.

Steps

1. Run TIA Portal, click **Create new project**, enter parameters, and click **Create**.

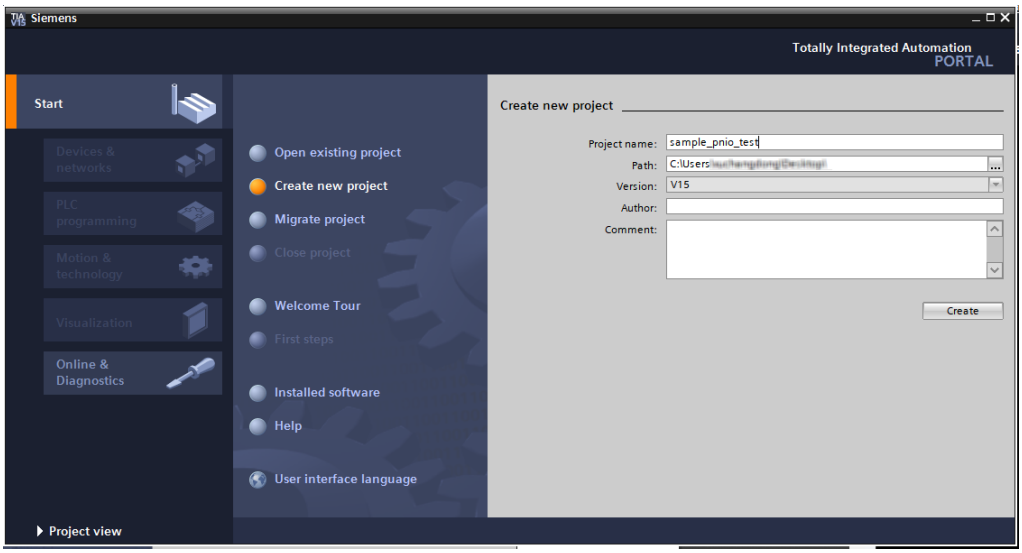


Figure 2-5 Create New Project

2. Go to **Options** → **Manage general station description files (GSD)**, import the GSDML files to TIA Portal, and click **Install**.

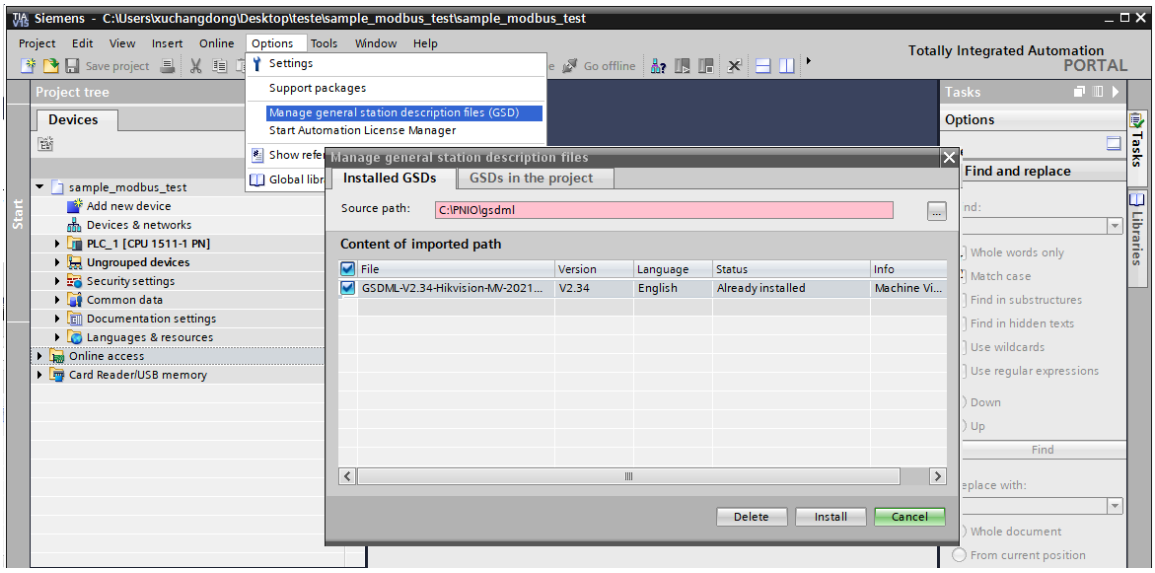


Figure 2-6 Install GSDs

3. Go to **Devices & networks** → **Hardware category** → **Other field devices** → **PROFINET IO** → **Sensors** → **Hikvision** → **Machine Vision Systems**, find the corresponding device, drag or double-click the device to move it onto the network view.
4. Distribute the device to the PLC controller.
5. Double click the device to set its name.

Note

The name configured here should be the same with that in the IDMVS. Otherwise, communication error may occur.

6. Set the subnet that the interface is networked with, and the IP address.

Note

The device's IP address should be different with that in the IDMVS. Otherwise, communication error may occur.

7. Set the device's IO cycle and other parameters.

Note

Increase the value of **Accepted update cycles without IO data** in Watchdog time if the device goes offline.

8. Recompile and load the PLC program. When the PLC is connected to the device, the indicator of the PLC and device will be solid green.

2.5 Device Module Definition

The device has six configurable modules as shown below:
- Acquisition Status Module
- Acquisition Control Module
- Reads Result 64 Bytes Module
- User Data 64 Bytes Module
- Reads Result 128 Bytes Module
- Reads Result 250 Bytes Module

Acquisition Status Module

The acquisition status module sends the information about the current status of the device from the device to the PLC.
- Module Slot No.: 1
- Module Size: 1 byte

Table 2-1 Acquisition Status Module Description

Bit	Name	Description
0	Trigger Ready	The device is ready to receive new trigger signal. When the Trigger Enable is set and the device is ready to receive next trigger signal, the Trigger Ready is set.
1	Trigger Ack	The device has already received the trigger signal.
2	Acquiring	The device is acquiring images.
3	Decoding	The device is recognizing decodes on images.
4	Results OK	The device outpus new results successfully. When the PLC is set Results Ack, it will be cleared.
5	Results NG	The device does not read codes or get outputted results. When the PLC is set Results Ack, it will be cleared. **Note** You should disable NoRead function when using NG signal.
6	Reserved	Reserved.
7	General Fault	An internal error is generated.

Acquisition Control Module

The acquisition control module sends images from the PLC to the device.

- Module Slot No.: 2
- Module Size: 1 byte

Table 2-2 Acquisition Control Module Description

Bit	Name	Description
0	Trigger Enable	The PLC controls the device's trigger enable function via this bit.
1	Trigger	When following conditions are met, the PLC sets this bit to trigger the device to acquire an image and run the algorithm once. ● Trigger Enable is set. ● The device is not currently acquiring images and running algorithms. ● Trigger Ready is set.
2	Results Ack	After the PLC gets the latest results, Result Ack is set. At the same time, Results OK and Results NG will be cleared.
3	Execute Command	Execute the command specified in the User Data area.
4-6	Reserved	Reserved.
7	Clear Error	Clear error status.

Reads Result 64 Bytes Module

The reads result 64 bytes module reads and sends the device's processing result from the device to the PLC.

- Module Slot No.: 3, configurable
- Module Size: 65 bytes

Table 2-3 Reads Result 64 Bytes Module Description

Bit	Name	Description
0	Result Length	Result Data contains the actual length of data.
1…64	Result Data	The result output by the device, and its length is 64 bytes. ● When the actual result is smaller than 64 bytes, the spare bytes will be filled with 0. ● When the actual result is greater than 64 bytes, the extra bytes will be cut off.

User Data 64 Bytes Module

The user data 64 bytes module sends user data from the PLC to the device.

- Module Slot No.: 4, configurable
- Module Size: 65 bytes

Table 2-4 User Data 64 Bytes Module Description

Bit	Name	Description
0	User Data Length	User Data contains the actual length of data.
1…64	User Data	The data or commands sent to the device.

Reads Result 128 Bytes Module

The reads result 128 bytes module is the result data and is sent to the PLC by the device.
- Module Slot No.: 3, configurable
- Module Size: 129 bytes

Table 2-5 Reads Result 128 Bytes Module

Bit	Name	Description
0	Result Length	Result Data contains the actual length of data.
1…128	Result Data	The result output by the device, and its length is 128 bytes. ● When the actual result is smaller than 128 bytes, the spare bytes will be filled with 0. ● When the actual result is greater than 128 bytes, the extra bytes will be cut off.

Reads Result 250 Bytes Module

The reads result 250 bytes module is the result data and is sent to the PLC by the device.
- Module Slot No.: 3, 5, 6, 7, configurable
- Module Size: 251 bytes

Table 2-6 Reads Result 250 Bytes Module

Bit	Name	Description
0	Result Length	Result Data contains the actual length of data.
1…250	Result Data	The result output by the device, and its length is 250 bytes. ● When the actual result is smaller than 250 bytes, the spare bytes will be filled with 0. ● When the actual result is greater than 250 bytes, the extra bytes will be cut off.

2.6 Trigger Test

Communication Sequence Diagram

The communication sequence diagram of PLC and the device is shown below.

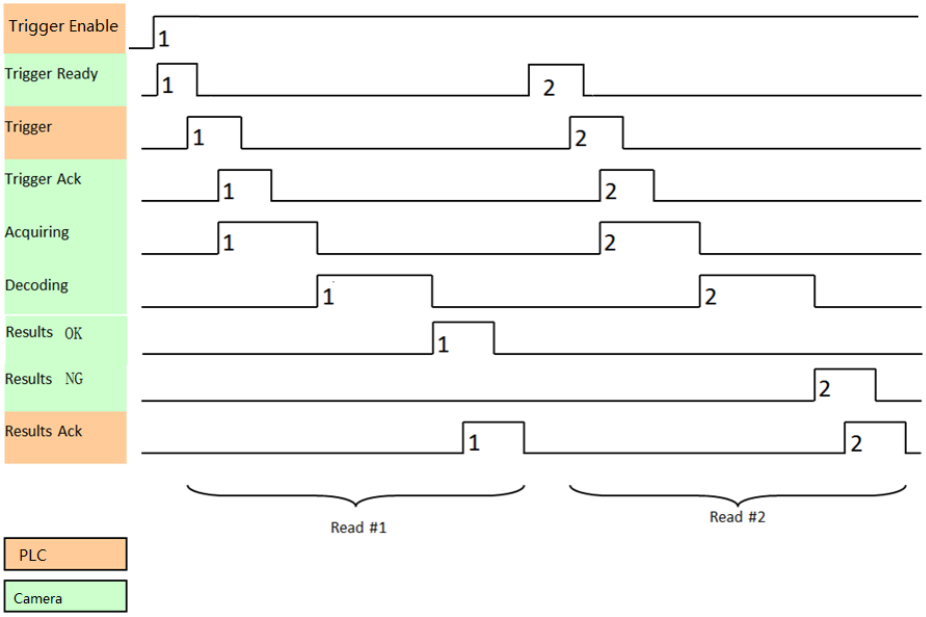


Figure 2-7 Communication Sequence Diagram

The logic of the above sequence diagram is shown below:

1. PLC sets Trigger Enable signal Q0.0. After the device is ready, set Trigger Ready signal I0.0.
2. After detecting the device's Trigger Ready signal, the PLC sends Trigger signal Q0.1 and controls the device to operate once.
3. The device starts to acquire images and runs the algorithm after receiving Trigger signal.

- If codes are read successfully, set the Results OK signal I0.4 and put code contents into the address starting from QB2.
- If codes are not read successfully, set the Results NG signal I0.5 and clear the start

address of QB2.

Note

- If codes are not read successfully when NoRead is enabled, Results OK + “NoRead” character are feedback.
- If codes are not read successfully when NoRead is disabled, Results NG signal is feedback.

4. After detecting Results OK/NG, the PLC starts to read results from QB2.
5. After reading results is finished, set Results Ack signal Q0.2, and notify the device.
6. After the trigger flow is finished, PLC sends Trigger signal again and next round of trigger flow begins.

Note

If the smart code reader cannot output results after receiving the Trigger signal due to an internal error (for example, acquiring images are not enabled after the smart code reader is connected to the IDMVS), the General Fault signal I0.7 will be set at this time. After the PLC confirms the cause of the error, set the Clear Error signal Q0.7, and the trigger operation can be continued after the error is cleared.

Create Variables

Create a new PLC variable according to the address assigned to the device according to the device configuration, and you can view the current value of each module of the device online.

1		Trigger Ready	Bool	%I0.0		✓	✓	✓	FALSE
2		Trigger Ack	Bool	%I0.1		✓	✓	✓	TRUE
3		Acquiring	Bool	%I0.2		✓	✓	✓	TRUE
4		Decoding	Bool	%I0.3		✓	✓	✓	TRUE
5		Results OK	Bool	%I0.4		✓	✓	✓	FALSE
6		Results NG	Bool	%I0.5		✓	✓	✓	FALSE
7		General Fault	Bool	%I0.7		✓	✓	✓	FALSE
8		Trigger Enable	Bool	%Q0.0		✓	✓	✓	TRUE
9		Trigger	Bool	%Q0.1		✓	✓	✓	FALSE
10		Results Ack	Bool	%Q0.2		✓	✓	✓	FALSE
11		Excute Command	Bool	%Q0.3		✓	✓	✓	TRUE
12		Clear Error	Bool	%Q0.7		✓	✓	✓	FALSE
13		Result Length	Byte	%IB1		✓	✓	✓	16#00
14		Result Data0	Char	%IB2		✓	✓	✓	'$00'
15		Result Data1	Char	%IB3		✓	✓	✓	'$00'
16		Result Data2	Char	%IB4		✓	✓	✓	'$00'
17		Result Data3	Char	%IB5		✓	✓	✓	'$00'
18		Result Data4	Char	%IB6		✓	✓	✓	'$00'
19		Result Data5	Char	%IB7		✓	✓	✓	'$00'
20		Result Data6	Char	%IB8		✓	✓	✓	'$00'

Figure 2-8 Create PLC Variable

Overview of addresses

Filter: ☑ Inputs ☑ Outputs ☐ Address gaps ☑ Slot

Type	Addr. fr...	Addr. to	Size	Module	Rack	Slot	Device name
I	0	0	1 Bytes	Acquisition Status _1	0	1	id3000 [MV-ID3XXX]
O	0	0	1 Bytes	Acquisition Control _1	0	2	id3000 [MV-ID3XXX]
I	1	65	65 By...	Reads Result 64 bytes _1	0	3	id3000 [MV-ID3XXX]

Figure 2-9 Overview of Address

Ladder Diagram

The PLC triggers the device to read codes, and related ladder diagrams are shown below.

● Enable Trigger

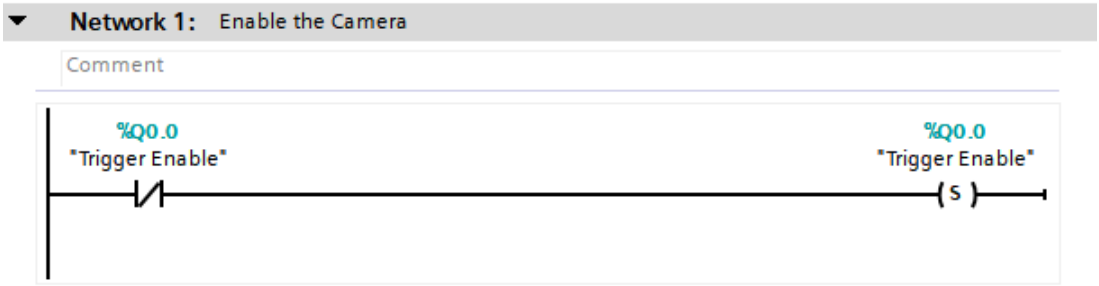


Figure 2-10 Enable Camera

● Send Trigger Signal

The trigger signal can be generated by adding an edge signal before Trigger Ready according to actual demands. For example, when the PLC detects the photoelectric input signal, it sends a trigger signal once. The figure below describes that a trigger signal is outputted every second via the internal system clock.

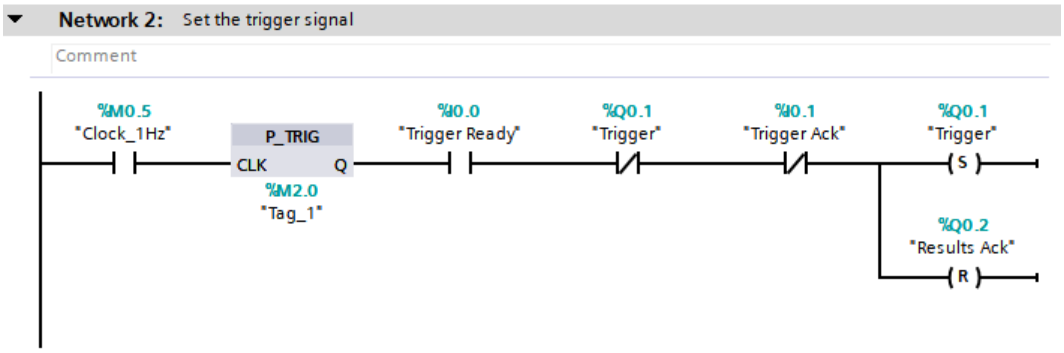


Figure 2-11 Send Trigger Signal

● Clear Trigger Signal

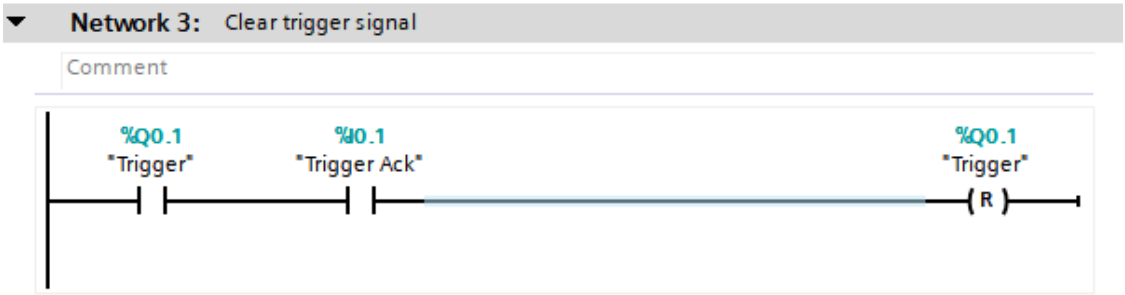


Figure 2-12 Clear Trigger Signal

- Get Device Results

Create a DB data block to store the reading result, add the result variable as shown below. The first byte is the result length, and the result data is stored starting from the second byte.

1	Static								
2	Result Length	Byte	0.0	16#0		☑	☑	☑	
3	Result Data0	Char	1.0	''		☑	☑	☑	
4	Result Data1	Char	2.0	''		☑	☑	☑	
5	Result Data2	Char	3.0	''		☑	☑	☑	
6	Result Data3	Char	4.0	''		☑	☑	☑	
7	Result Data4	Char	5.0	''		☑	☑	☑	
8	Result Data5	Char	6.0	''		☑	☑	☑	
9	Result Data6	Char	7.0	''		☑	☑	☑	
10	Result Data7	Char	8.0	''		☑	☑	☑	
11	Result Data8	Char	9.0	''		☑	☑	☑	
12	Result Data9	Char	10.0	''		☑	☑	☑	
13	Result Data10	Char	11.0	''		☑	☑	☑	
14	Result Data11	Char	12.0	''		☑	☑	☑	
15	Result Data12	Char	13.0	''		☑	☑	☑	
16	Result Data13	Char	14.0	''		☑	☑	☑	
17	Result Data14	Char	15.0	''		☑	☑	☑	
18	Result Data15	Char	16.0	''		☑	☑	☑	
19	Result Data16	Char	17.0	''		☑	☑	☑	
20	Result Data17	Char	18.0	''		☑	☑	☑	

Figure 2-13 Add Result Data Block

When the device feedbacks the Results OK or NG signal, it means that the result data has been updated, and the PLC reads the result data to the DB data block.

After the reading is finished, set the Results Ack signal to acknowledge that the device has

finished reading the result data.

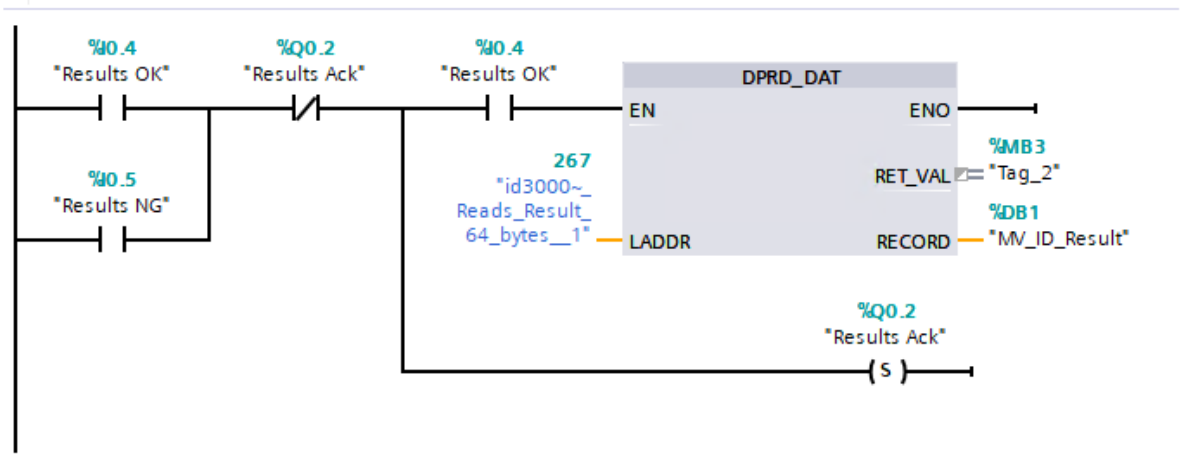


Figure 2-14 Get Results

- Clear Error

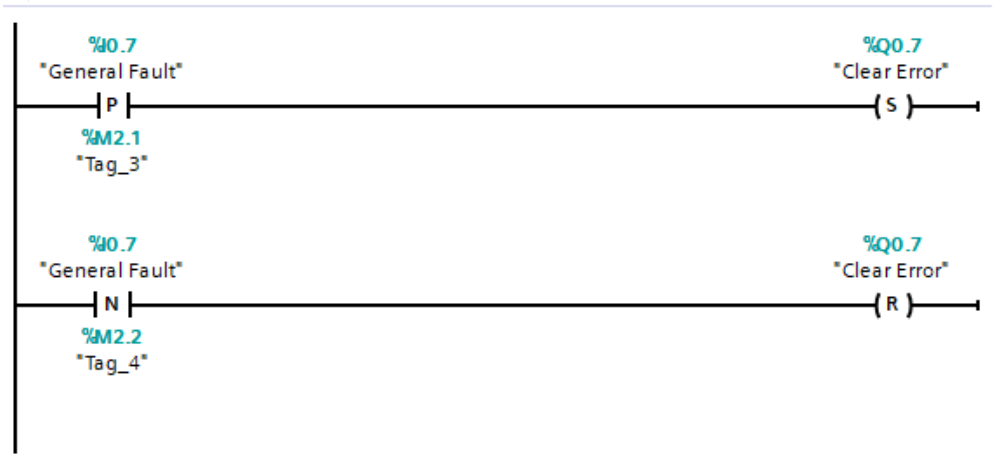


Figure 2-15 Clear Error

View Results

Through the monitoring and option tab, you can monitor the status of the variables of each module of the device and view the result output. You can also add trace records of the

variables via the Trace tab to view the control sequence.

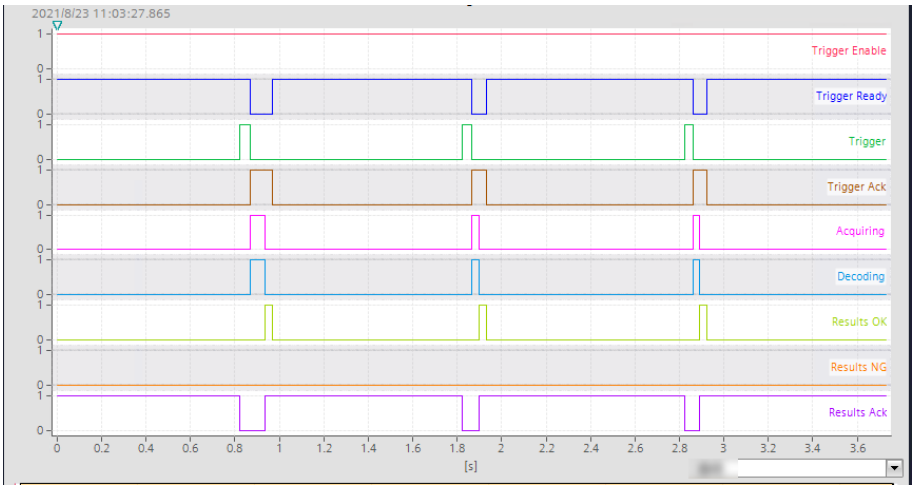


Figure 2-16 View Control Sequence

Chapter 3 ModBus

3.1 Introduction

Modbus is a request/response protocol whose services are specified by function codes. Port 502 is reserved for ModBus communication. It uses standard EtherNet hardware and software to exchange I/O data and diagnostic information.

Note

This chapter takes Siemens S7 series PLC as an example to explain how to communicate with smart code readers via ModBus communication protocol. For other devices, refer to the user manual provided by the manufacturer and make related settings by reading contents of this chapter.

3.2 Hardware Wiring

The wiring of PLC controller, ModBus TCP test tool, and the smart code reader is shown below.

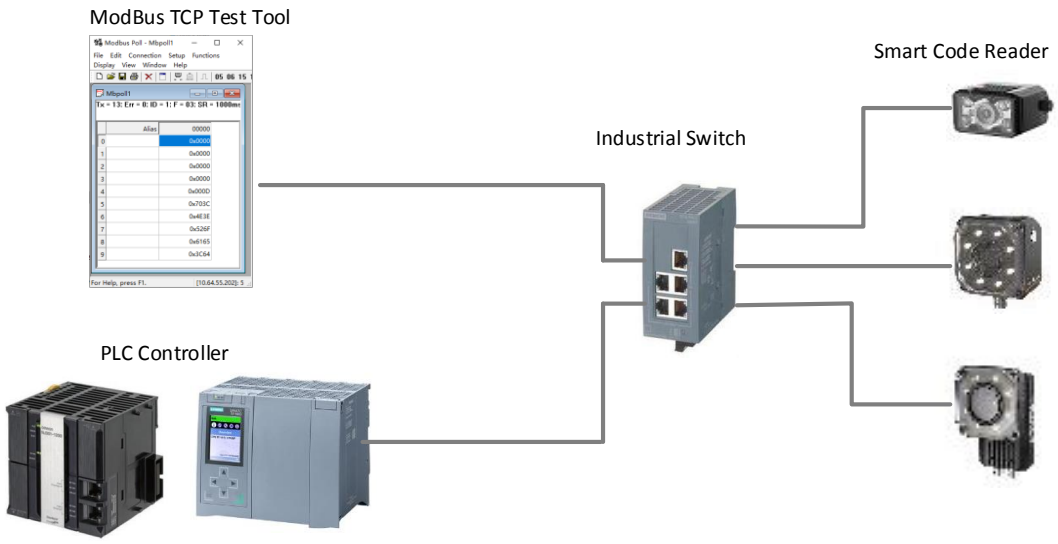


Figure 3-1 Hardware Wiring

3.3 Smart Code Reader Settings

Before using the smart code reader's ModBus function to communicate with other devices,

you need to set the smart code reader first via the IDMVS client software.

Before you start:

- Make sure that the PC has installed the IDMVS client software with version of V2.3.1 and above.
- Check the device's firmware version.

Steps

1. Double click the device in the device list to connect it to the client software.
2. Set the device mode as **Normal** in the live view window.

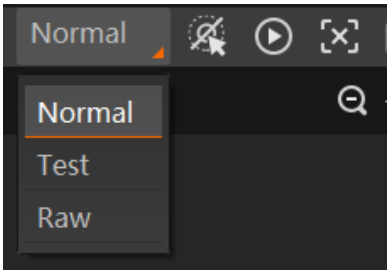


Figure 3-2 Set Device Mode

3. Go to **Communication Settings** in the left navigation panel.
4. Select **ModBus** as communication protocol, and enable **ModBus Enable**.
5. Set **ModBus Mode** as **Server** or **Client**.

- Control, status and result are in holding register when the ModBus mode is server, and offset address is fixed, and only result module size can be configured.

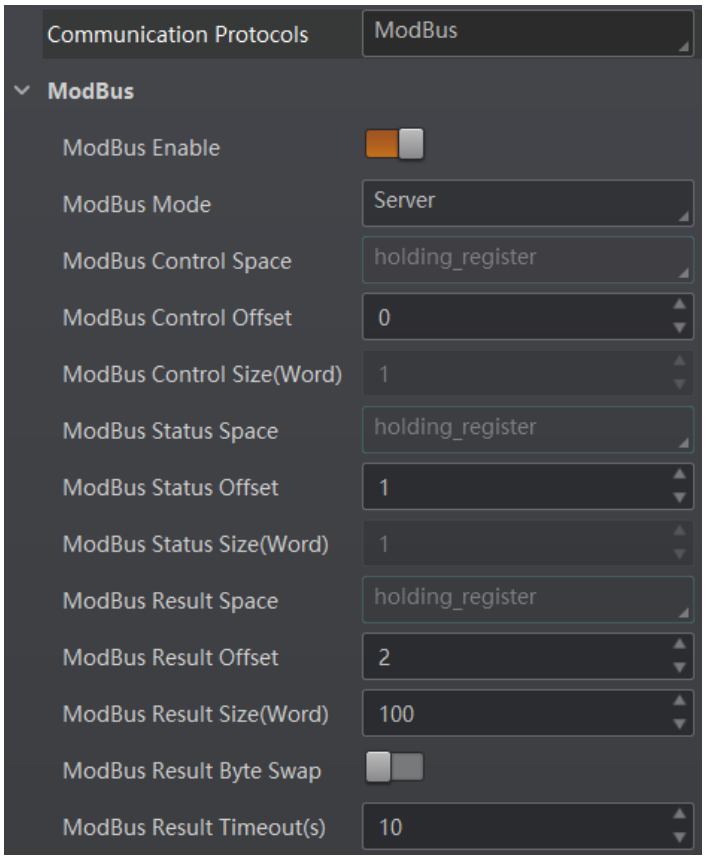


Figure 3-3 Server Mode

- You should set the server's (that is PLC or ModBus test tool) IP address and port number, and control poll interval when the ModBus mode is client. Control, status and result are in holding register, and offset address and result module size can be configured.

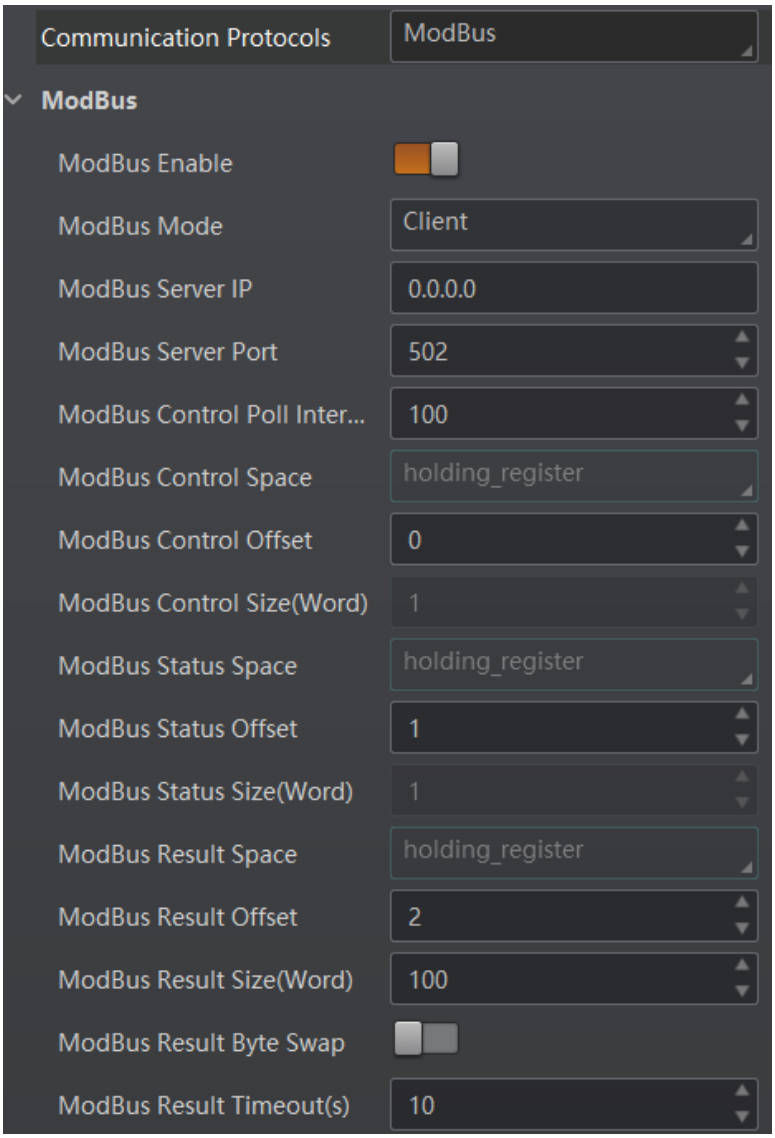


Figure 3-4 Client Mode

6. Go to **Data Processing** in the left navigation panel, and set format and contents contained in the outputted information.

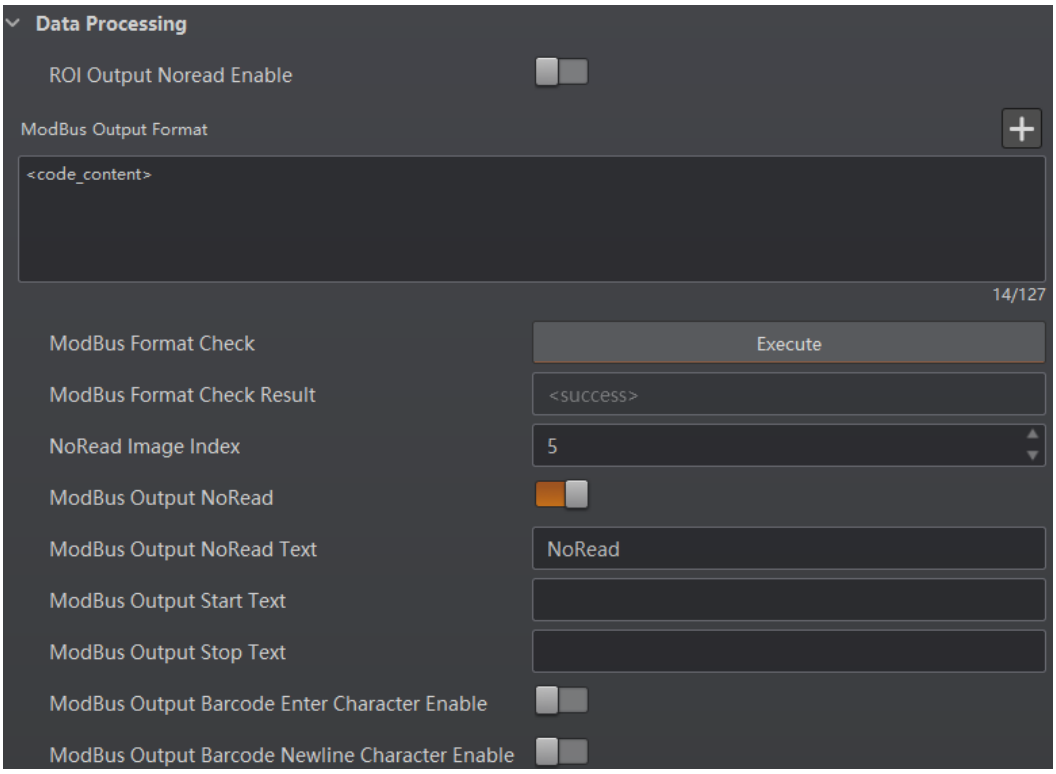


Figure 3-5 Set Data Processing

Note

- Refer to the user manual of the smart code reader for detailed data processing settings.
- The specific parameters may differ by device models.

3.4 ModBus TCP Test Tool

The ModBus TCP test tool can be used to test whether the ModBus communication between devices is normal.

- When the device is working in server mode, ModBus Poll software can be used.
- When the device is working in client mode, ModBus Slave software can be used.

3.4.1 ModBus Poll

When the device is working in server mode, and ModBus Poll software works in client mode and will actively connect to the device.

Steps

1. Enter connection setup parameters according to actual demands.

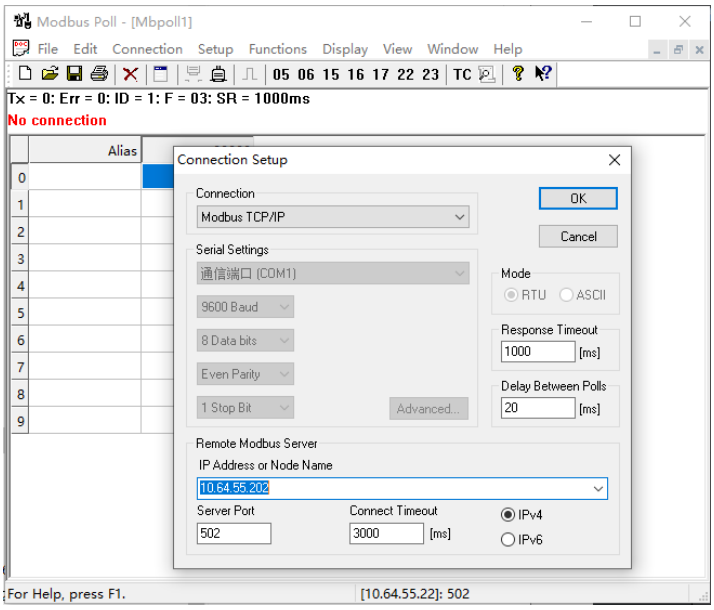


Figure 3-6 Set IP Address and Port

Note

The server port is set as 502.

2. Read the holding registers of the device via the 03 command, start reading from address offset 0, and set an appropriate number of read registers and polling read interval time.

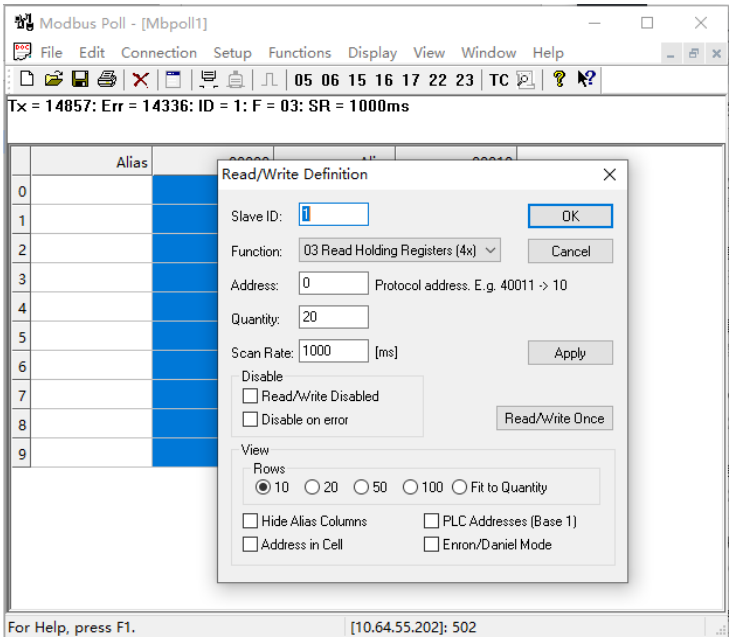


Figure 3-7 Set Polling and Reading Holding Register

3. Alternately write 3 and 5 to the register of offset address 0 in the control area to trigger the device to acquire image once, and return the code reading result in the result area.

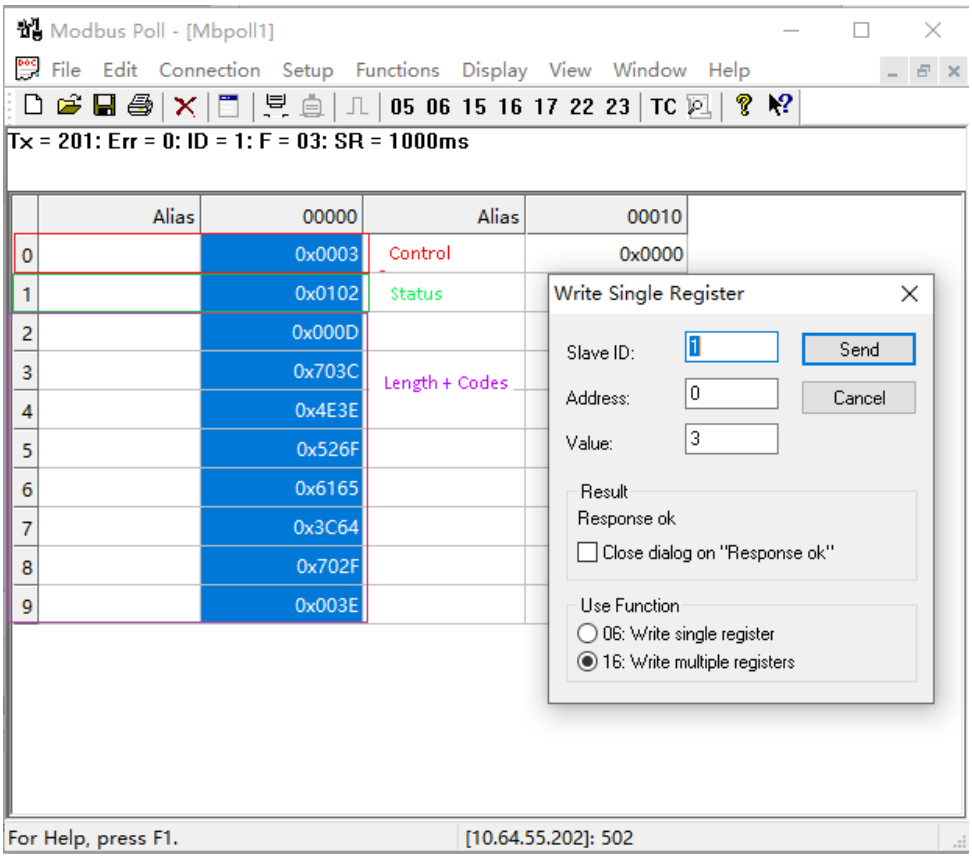


Figure 3-8 Results

3.4.2 ModBus Slave

When the device is working in client mode, ModBus Slave software can be used.

Steps

1. Run ModBus Slave that waits for device connection.
2. Set the device's Server IP and Server Port

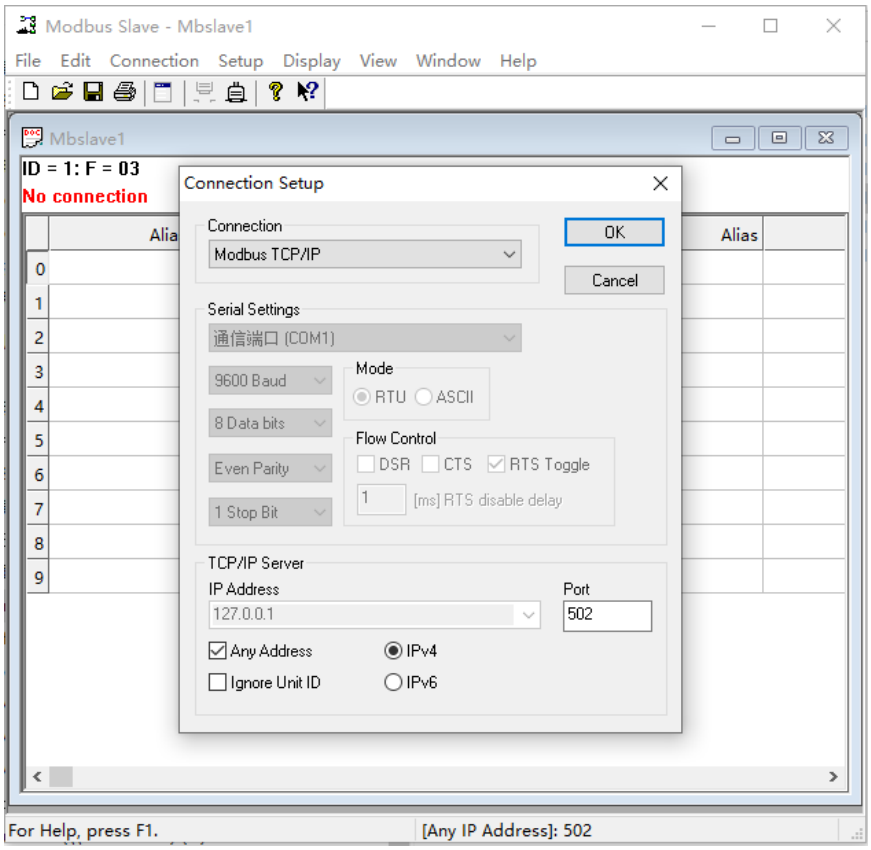


Figure 3-9 Set Server IP and Port

3. Set Slave ID as 255, and monitor the holding register area.
4. Use 03 command to read the holding register area in sequence according to configured interval time.

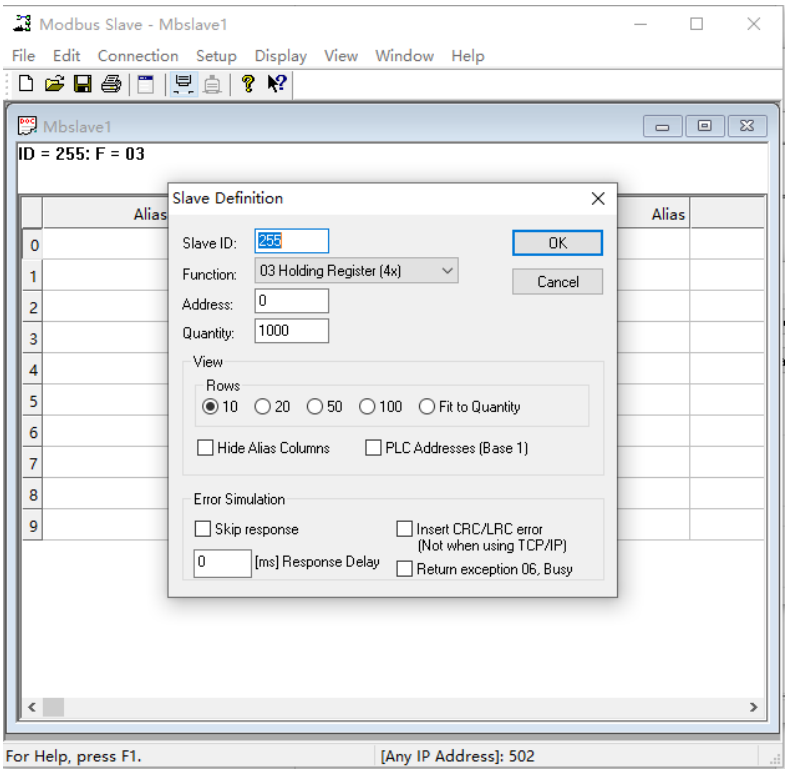


Figure 3-10 Set Slave Definition Parameters

5. Alternately write 3 and 5 to the register in the control area to trigger the device to acquire image once, and return the code reading result in the result area.

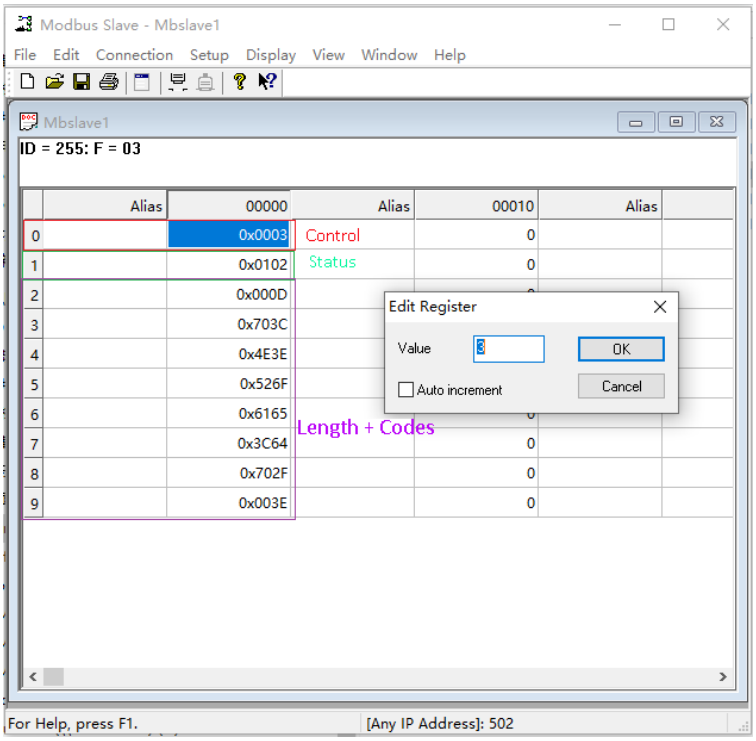


Figure 3-11 Results

3.5 PLC Settings

This section takes the ModBus TCP settings of Siemens S7 series PLC as an example to explain how to set PLC's ModBus communication.

Steps

1. Run TIA Portal, click **Create new project**, enter parameters, and click **Create**.

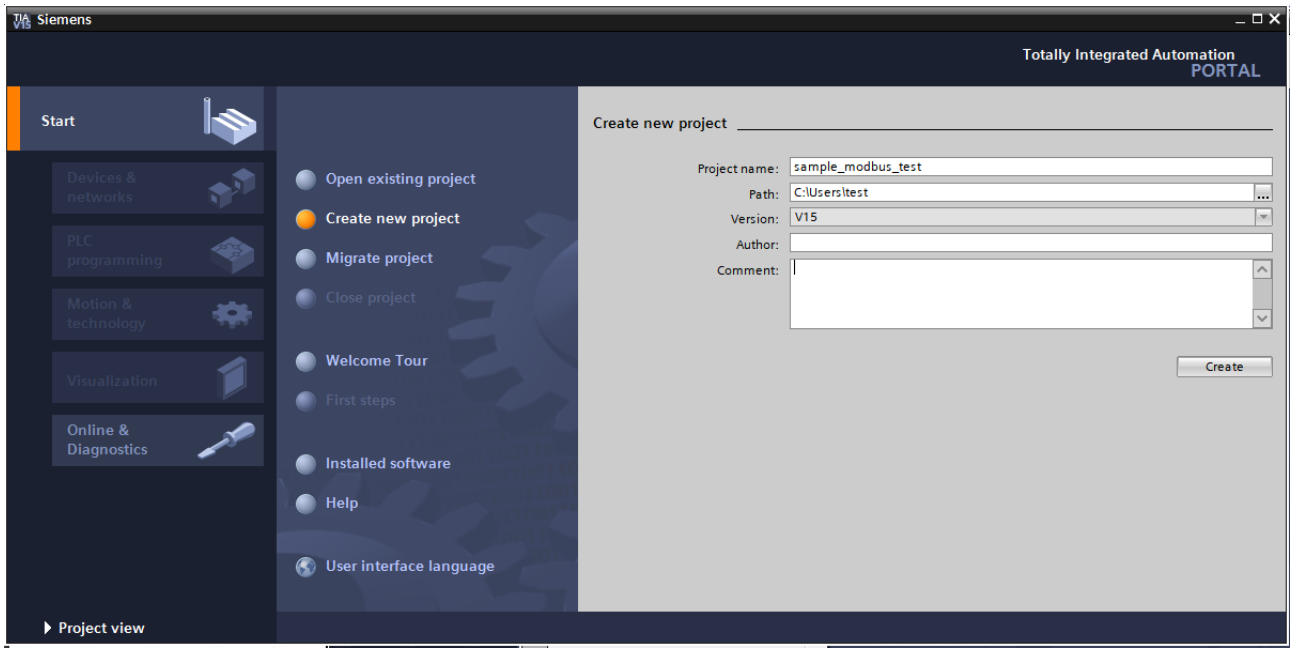


Figure 3-12 Create New Project

2. Add the corresponding PLC controller.

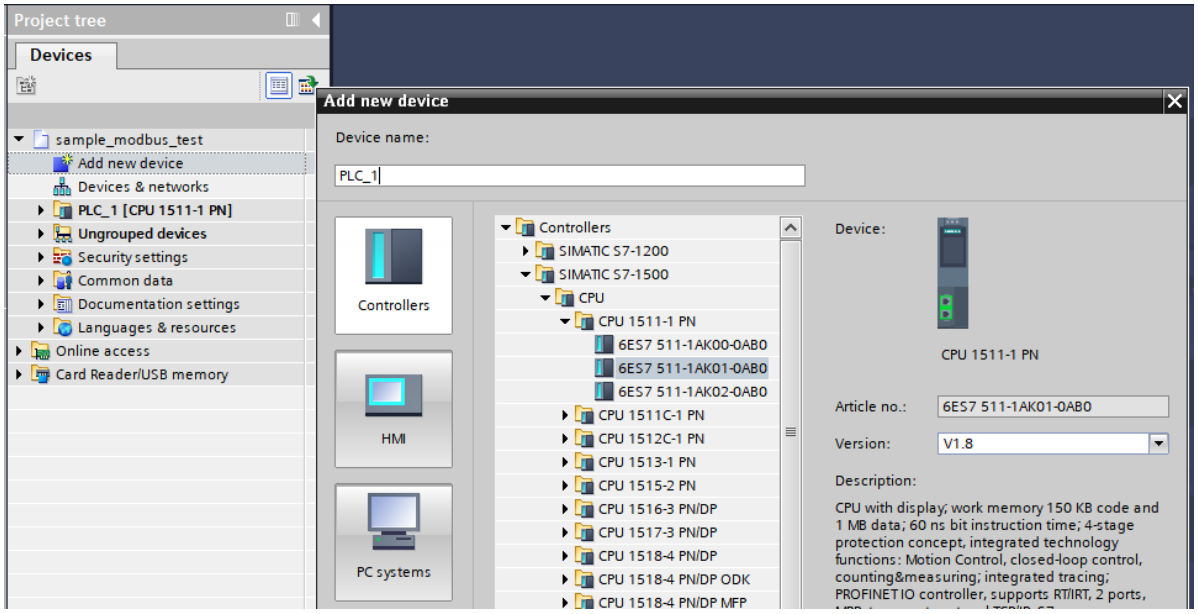


Figure 3-13 Add PLC

3. Set the IP address of the PLC controller.

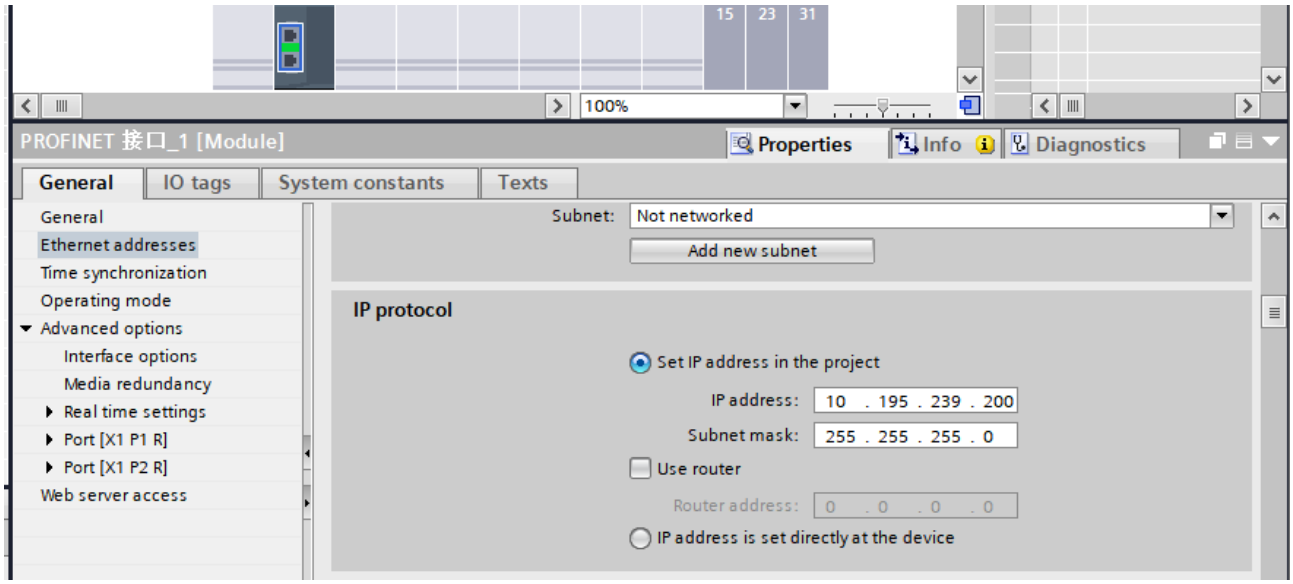
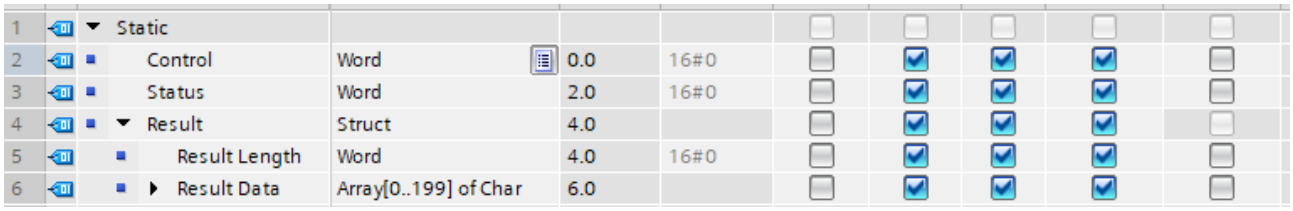


Figure 3-14 Set IP Address

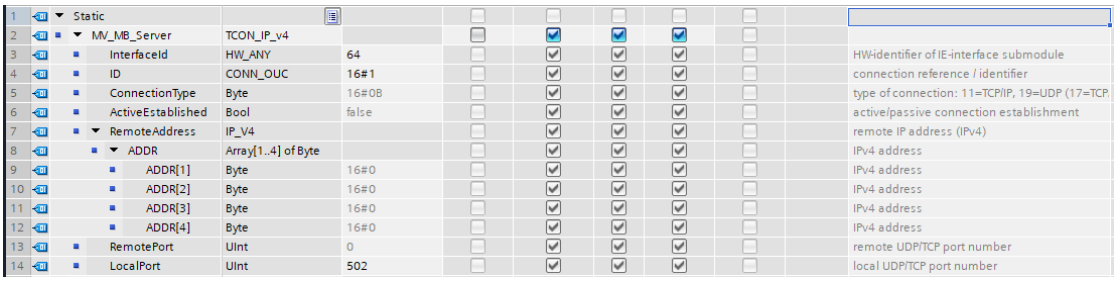
4. Go to **Communication** → **Others** → **MODBUS TCP**, and add MB_SERVER command.
5. Create a new MV_ID_REG data block in MB_HOLD_REG pin to store the communication data of the holding register, and add variables to the data block.



1	Static								
2	Control	Word	0.0	16#0		✓	✓	✓	
3	Status	Word	2.0	16#0		✓	✓	✓	
4	Result	Struct	4.0			✓	✓	✓	
5	Result Length	Word	4.0	16#0		✓	✓	✓	
6	Result Data	Array[0..199] of Char	6.0			✓	✓	✓	

Figure 3-15 MV_ID_REG Data Block

6. Create a new MV_MB_TCON data block at the CONNECT pin, create a MV_MB_Server variable, appoint its data type as TCON_IP_v4, and expand variables to assign values to it.



1	Static								
2	MV_MB_Server	TCON_IP_v4			✓	✓	✓		
3	InterfaceId	HW_ANY	64		✓	✓	✓		HW-identifier of IE-interface submodule
4	ID	CONN_OUC	16#1		✓	✓	✓		connection reference / identifier
5	ConnectionType	Byte	16#0B		✓	✓	✓		type of connection: 11=TCP/IP, 19=UDP (17=TCP
6	ActiveEstablished	Bool	false		✓	✓	✓		active/passive connection establishment
7	RemoteAddress	IP_V4			✓	✓	✓		remote IP address (IPv4)
8	ADDR	Array[1..4] of Byte			✓	✓	✓		IPv4 address
9	ADDR[1]	Byte	16#0		✓	✓	✓		IPv4 address
10	ADDR[2]	Byte	16#0		✓	✓	✓		IPv4 address
11	ADDR[3]	Byte	16#0		✓	✓	✓		IPv4 address
12	ADDR[4]	Byte	16#0		✓	✓	✓		IPv4 address
13	RemotePort	UInt	0		✓	✓	✓		remote UDP/TCP port number
14	LocalPort	UInt	502		✓	✓	✓		local UDP/TCP port number

Figure 3-16 MV_MB_TCON Data Block

7. Store other pins to the address starting from M10.0.
8. Compile project and download it to the PLC controller.

3.6 Device Register Definition

The device only uses holding registers and is divided into three areas: control, status, and result.

Control

The control area controls the device to get images from PLC to the device.
- Control area location: holding register, configurable offset (0 by default).
- Control area size: 1 register (2 bytes).

Table 3-1 Control Area Definition

REG/bit	Name	Description
REG0.0	Trigger Enable	The PLC controls the device's trigger enable function via this bit.
REG0.1	Trigger	When following conditions are met, the PLC sets this bit to trigger the device to acquire an image and run the algorithm once. ● Trigger Enable is set. ● The device is not currently acquiring images and running algorithms. ● Trigger Ready is set.
REG0.2	Results Ack	After the PLC gets the latest results, Result Ack is set. At the same time, Results OK and Results NG will be cleared.
REG0.3-14	Reserved	Reserved.
REG0.15	Clear Error	Clear error status.

Status

The status area feedbacks the device's current status from the device to PLC.
- Status area location: holding register, configurable offset (1 by default).
- Status area size: 1 register (2 bytes).

Table 3-2 Status Area Definition

REG1/bit	Name	Description
REG1.0	Trigger Ready	The device is ready to receive new trigger signal. When the Trigger Enable is set and the device is ready to receive next trigger signal, the Trigger Ready is set.
REG 1.1	Trigger Ack	The device has already received the trigger signal.
REG 1.2	Acquiring	The device is acquiring images.
REG 1.3	Decoding	The device is recognizing decodes on images.
REG 1.4-7	Reserved	Reserved.
REG 1.8	Results OK	The device outpus new results successfully. When the PLC is set Results Ack, it will be cleared.
REG 1.9	Results NG	The device does not read codes or get outputted results. When the PLC is set Results Ack, it will be cleared. **Note** You should disable NoRead function when using NG signal.
REG 1.10-14	Reserved	Reserved.
REG 1.15	General Fault	The device's internal fault, and you can clear this signal via Clear Error.

Result

The result area stores result data from the device to PLC.

- Result area location: holding register, configurable offset (2 by default).
- Result size: 4 to 500 registers (100 by default).

Table 3-3 Result Area Definition

REG/word	Name	Description
REG2	Result Length	The result area includes invalid data length.
REG3…	Result Data	The result output by the device. ● When result data length is smaller than configured result module, the spare bytes will be filled with 0. ● When result data length is greater than configured result module, the extra bytes will be cut off.

3.7 Trigger Test

Communication Sequence Diagram

The communication sequence diagram of PLC and the device is shown below.

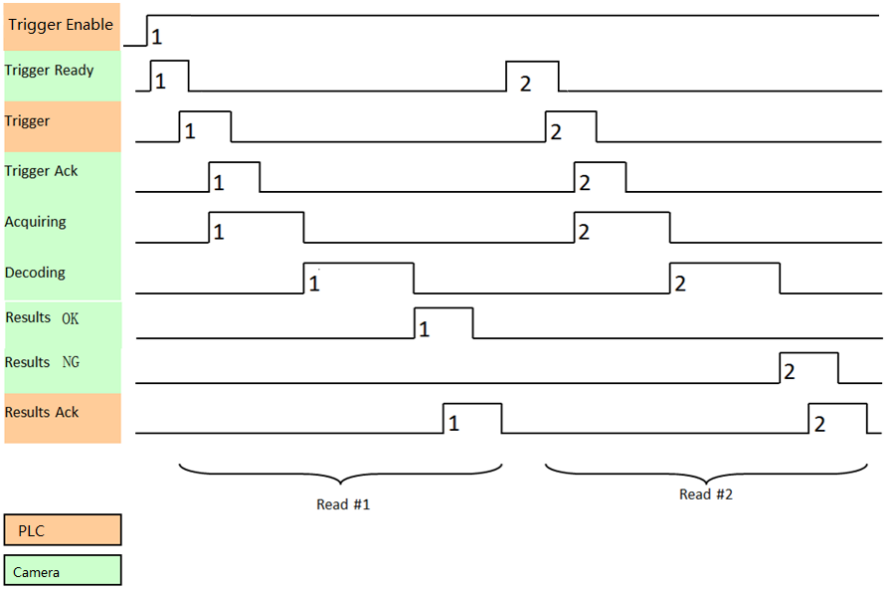


Figure 3-17 Communication Sequence Diagram

The logic of the above sequence diagram is shown below:

1. PLC sets Trigger Enable signal REG0.0. After the device is ready, set Trigger Ready signal REG1.0.
2. After detecting the device's Trigger Ready signal, the PLC sends Trigger signal REG0.1 and controls the device to read codes.
3. The device starts to acquire images and decode images after receiving Trigger signal.

● If codes are read successfully, set the Results OK signal REG1.8 and put code length and contents into the address starting from REG2.

- If codes are not read successfully, set the Results NG signal REG1.9 and clear the start address of REG2.

Note

- If codes are not read successfully when NoRead is enabled, Results OK + “NoRead” character are feedback.
- If codes are not read successfully when NoRead is disabled, Results NG signal is feedback.

4. After detecting Results OK/NG, the PLC starts to read code length and data from REG2.
5. After reading results is finished, set Results Ack signal REG0.2, and notify the device.
6. After the trigger flow is finished, PLC sends Trigger signal again and next round of trigger flow begins.

Note

If the smart code reader cannot output results after receiving the Trigger signal due to an internal error (for example, acquiring images are not enabled after the smart code reader is connected to the IDMVS), the General Fault signal REG1.15 will be set at this time. After the PLC confirms the cause of the error, set the Clear Error signal REG0.15, and the trigger operation can be continued after the error is cleared.

Create Variables

Create variables in accordance with the device’s register.

1		Trigger Enable	Bool	%M100.0	☐	☑	☑	☑
2		Trigger	Bool	%M100.1	☐	☑	☑	☑
3		Results Ack	Bool	%M100.2	☐	☑	☑	☑
4		Clear Error	Bool	%M101.7	☐	☑	☑	☑
5		Trigger Ready	Bool	%M102.0	☐	☑	☑	☑
6		Trigger Ack	Bool	%M102.1	☐	☑	☑	☑
7		Acquiring	Bool	%M102.2	☐	☑	☑	☑
8		Decoding	Bool	%M102.3	☐	☑	☑	☑
9		Results OK	Bool	%M103.0	☐	☑	☑	☑
10		Results NG	Bool	%M103.1	☐	☑	☑	☑
11		General Fault	Bool	%M103.7	☐	☑	☑	☑

Figure 3-18 Create Variables

Ladder Diagram

The PLC triggers the device to read codes, and related ladder diagrams are shown below.

- Send Control and Reading Status

Write MW100 to the control area of the device, read the status area of the device to MW102,

and create variables for each bit of control and status.

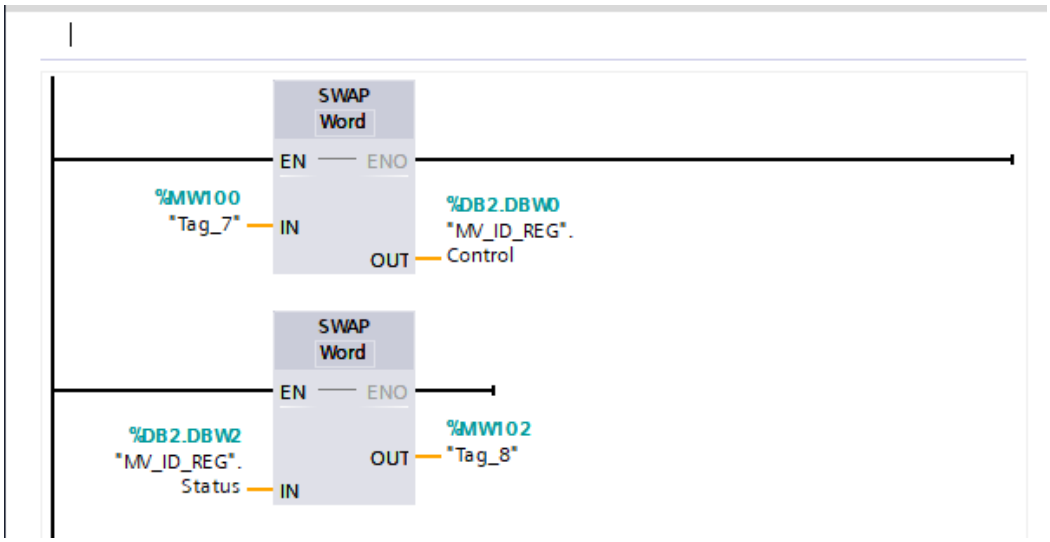


Figure 3-19 Send Control and Reading Status

- Enable Trigger

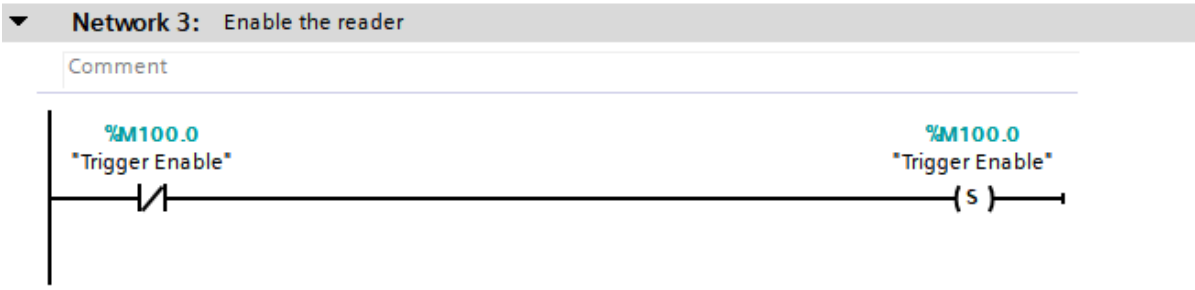


Figure 3-20 Enable Trigger

- Trigger Device to Read Codes

The trigger signal can be generated by adding an edge signal before Trigger Ready according to actual demands. For example, when the PLC detects the photoelectric input signal, it sends a trigger signal once. The figure below describes that a trigger signal is

outputted every second via the internal system clock.

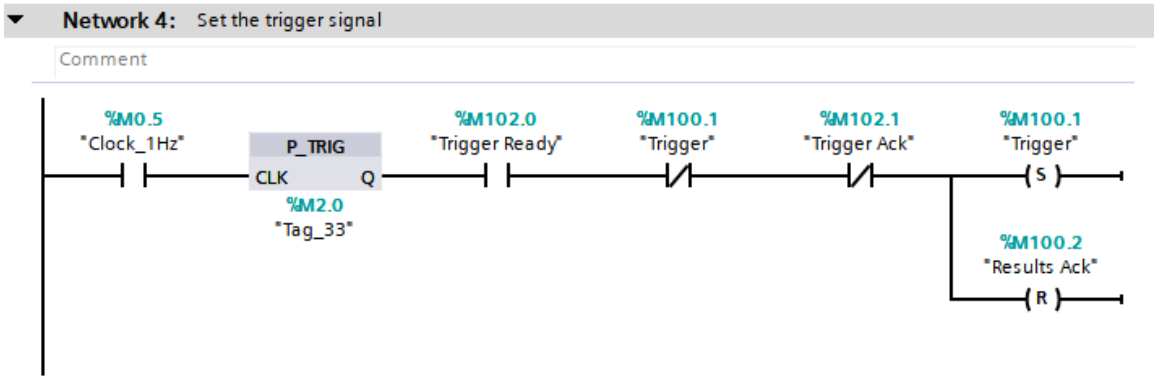


Figure 3-21 Send Trigger Signal

- Clear Trigger Signal

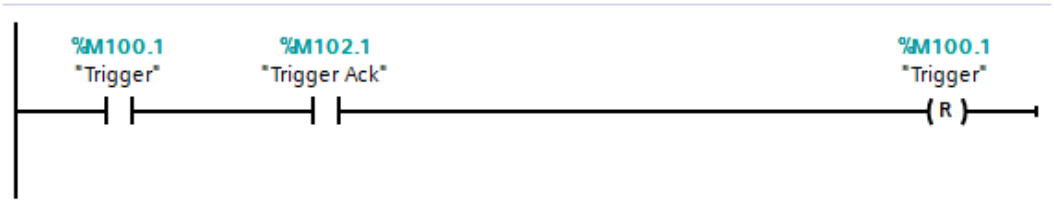
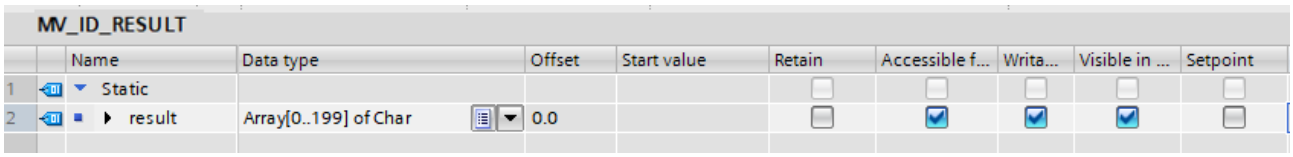


Figure 3-22 Clear Trigger Signal

- Get Device Results

Create a DB data block to store the reading result, add the result array variable as shown below.



MV_ID_RESULT

	Name	Data type	Offset	Start value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint
1	Static				☐	☐	☐	☐	☐
2	result	Array[0..199] of Char	0.0		☐	☑	☑	☑	☐

Figure 3-23 Add Result Array Variable

When the device feedbacks the Results OK or NG signal, it means that the result data has been updated, and the PLC reads the result data to the DB data block.

After the reading is finished, set the Results Ack signal to acknowledge that the device has finished reading the result data.

Note

If the endianness of codes read is different from actual one, you can enable result byte swap function via the IDMVS.

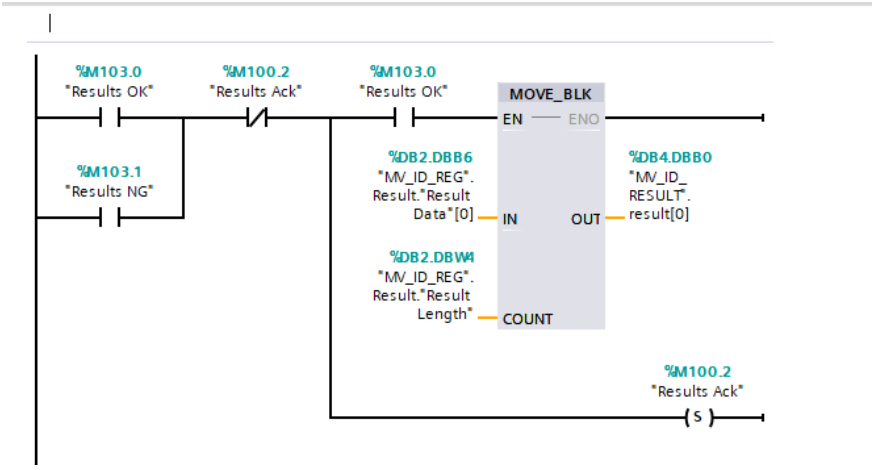


Figure 3-24 Get Device Results

- Clear Error

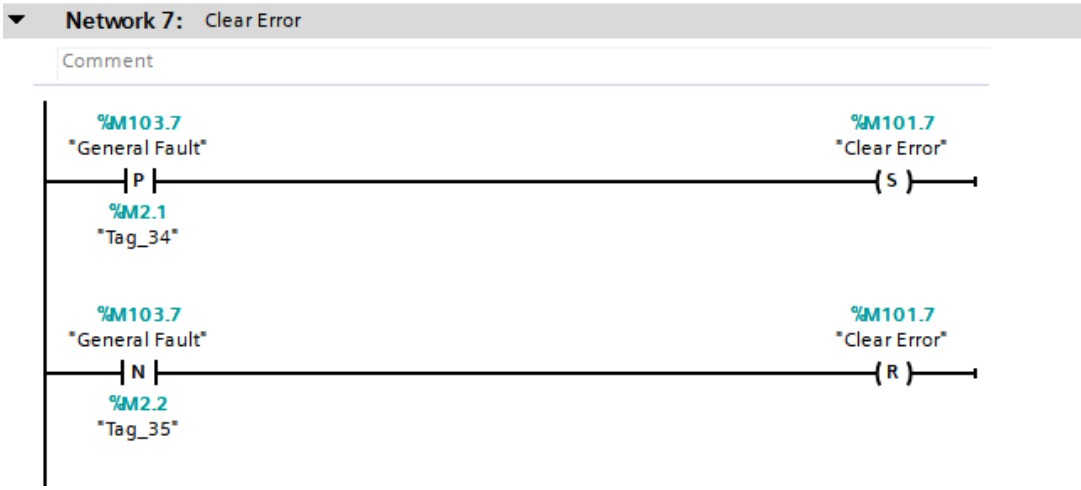


Figure 3-25 Clear Error

View Results

Through the monitoring and option tab, you can monitor the status of the variables of each module of the device and view the result output. You can also add trace records of the

variables via the Trace tab to view the control sequence.

1		Static									
2		Control	Word	0.0	16#0	16#0001		✓	✓	✓	
3		Status	Word	2.0	16#0	16#0001		✓	✓	✓	
4		Result	Struct	4.0				✓	✓	✓	
5		Result Length	Word	4.0	16#0	16#000D		✓	✓	✓	
6		Result Data	Array[0..199] of Char	6.0				✓	✓	✓	
7		Result Data...	Char	6.0	' '	'<'		✓	✓	✓	
8		Result Data...	Char	7.0	' '	'p'		✓	✓	✓	
9		Result Data...	Char	8.0	' '	'>'		✓	✓	✓	
10		Result Data...	Char	9.0	' '	'N'		✓	✓	✓	
11		Result Data...	Char	10.0	' '	'o'		✓	✓	✓	
12		Result Data...	Char	11.0	' '	'r'		✓	✓	✓	
13		Result Data...	Char	12.0	' '	'e'		✓	✓	✓	
14		Result Data...	Char	13.0	' '	'a'		✓	✓	✓	
15		Result Data...	Char	14.0	' '	'd'		✓	✓	✓	
16		Result Data...	Char	15.0	' '	'<'		✓	✓	✓	
17		Result Data...	Char	16.0	' '	'/'		✓	✓	✓	
18		Result Data...	Char	17.0	' '	'p'		✓	✓	✓	
19		Result Data...	Char	18.0	' '	'>'		✓	✓	✓	

Figure 3-26 View Results

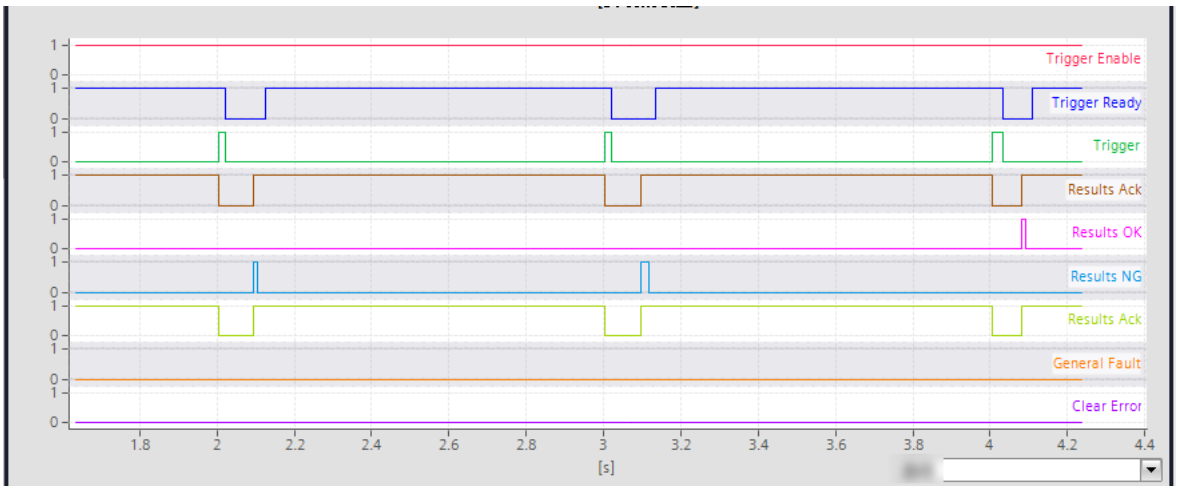


Figure 3-27 View Control Sequence

Chapter 4 MELSEC/SLMP

4.1 Introduction

MELSEC/SLMP is the abbreviation of communication protocol such as reading or writing of the device data of the Q/L series programmable controller CPU by external devices via the C24 or E71 module.

Note

This chapter takes Mitsubishi Q series and FX3U series PLCs as an example to explain how to communicate with smart code readers via MELSEC/SLMP communication protocol. For other devices, refer to the user manual provided by the manufacturer and make related settings by reading contents of this chapter.

4.2 Hardware Wiring

The wiring of Mitsubishi PLC and the smart code reader is shown below.

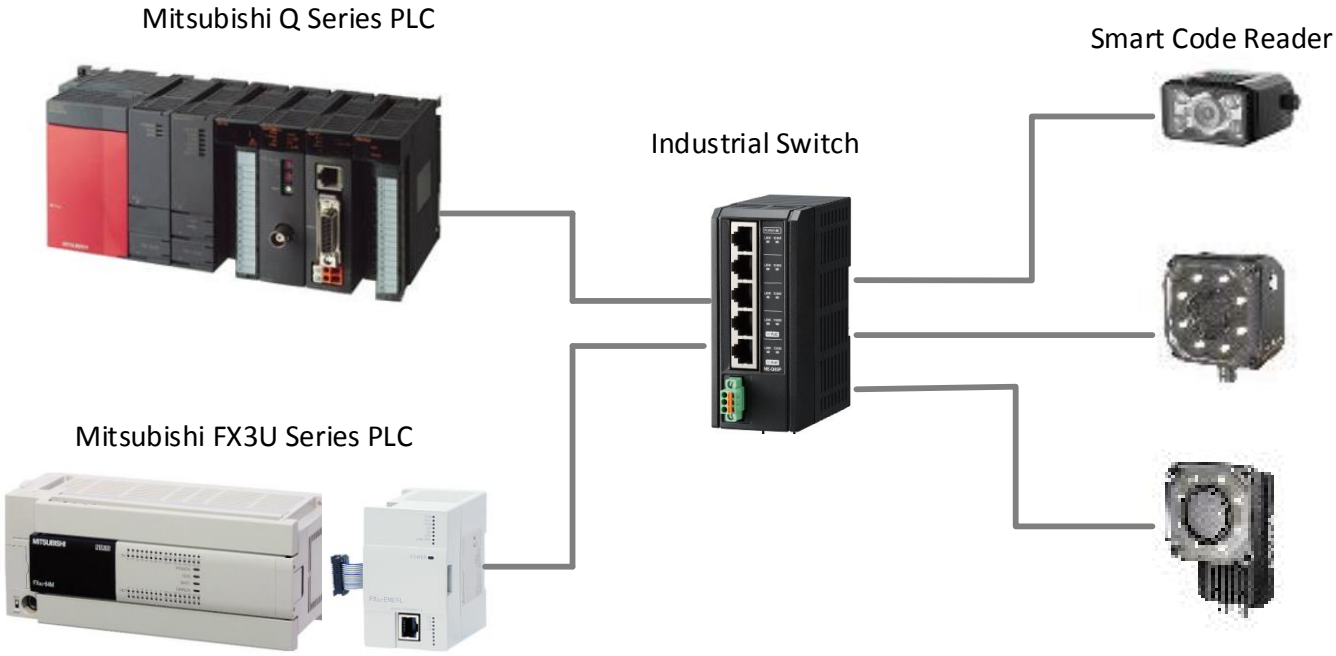


Figure 4-1 Hardware Wiring

4.3 Smart Code Reader Settings

Before using the smart code reader's MELSEC/SLMP function to communicate with other devices, you need to set the smart code reader first via the IDMVS client software.

Before you start:

- Make sure that the PC has installed the IDMVS client software with version of V2.3.1 and above.
- Check the device's firmware version.

Steps

1. Double click the device in the device list to connect it to the client software.
2. Set the device mode as **Normal** in the live view window.

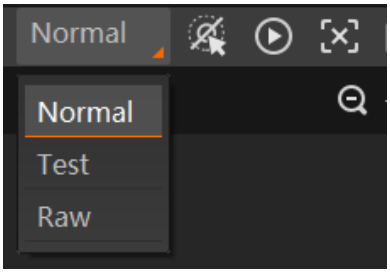


Figure 4-2 Set Device Mode

3. Go to **Communication Settings** in the left navigation panel.
4. Select **MELSEC/SLMP** as communication protocol, and enable **MELSEC/SLMP Enable**.
5. Enter **MELSEC Server IP** and **MELSEC Server Port** according to actual demands.
6. Set **MELSEC Frame Type**.
   - Regarding Mitsubishi Q series PLC, you should set **MELSEC Frame Type** as 1E, 3E, or 4E.
   - Regarding Mitsubishi FX3U series PLC, you should set **MELSEC Frame Type** as 1E.
7. Set **MELSEC Control Poll Interval** according to actual demands.

Note

- The smaller configured interval, the more frequent the reading and the greater the network loads.
- The control, status, and result modules are located in the D area of the device. The offset address and result module size can be configured.

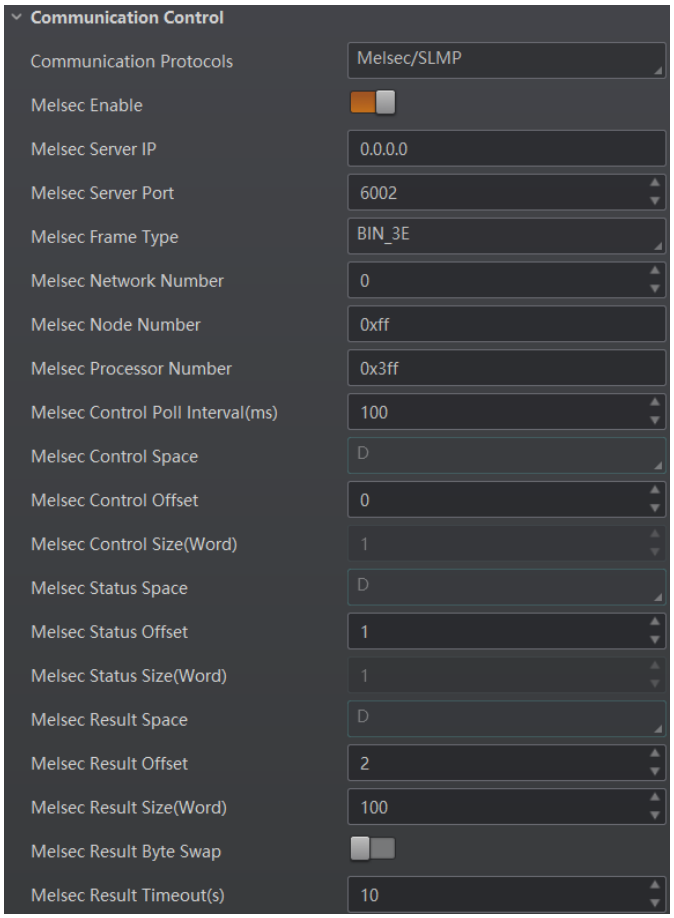


Figure 4-3 Set Parameters

8. Go to **Data Processing** in the left navigation panel, and set format and contents contained in the outputted information.

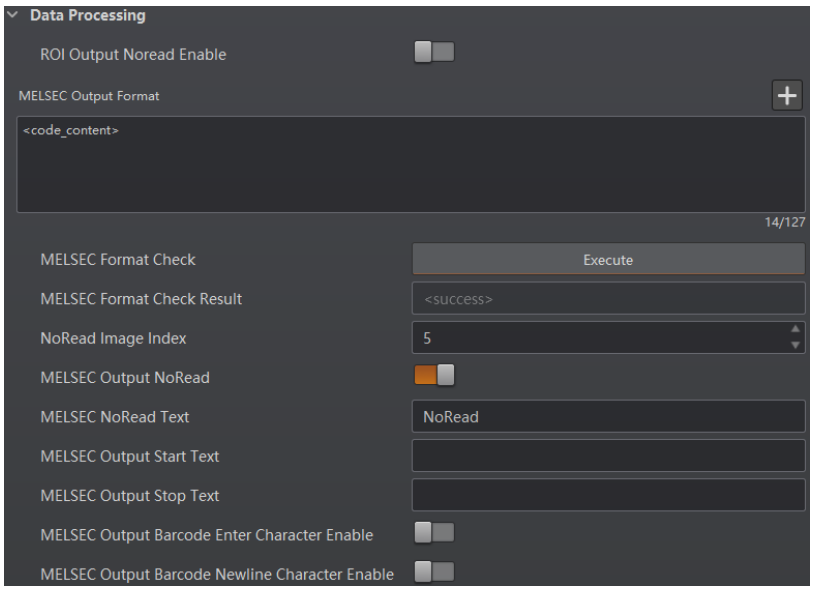


Figure 4-4 Set Data Processing

Note

- Refer to the user manual of the smart code reader for detailed data processing settings.
- The specific parameters may differ by device models.

4.4 PLC Settings

This section takes Mitsubishi FX3U series and Q series PLCs as an example to explain how to set PLC.

4.4.1 Mitsubishi FX3U Series PLC

Mitsubishi FX3U series PLC uses an external Ethernet module to realize MELSEC/SLMP communication function, and the hardware configuration should be done before use. Use FX3U-ENET-L configuration tool to set IP address of Ethernet module and enable MC communication function.

Ethernet Module Configuration

Steps

1. Run FX3U-ENET-L configurator and select module 0.

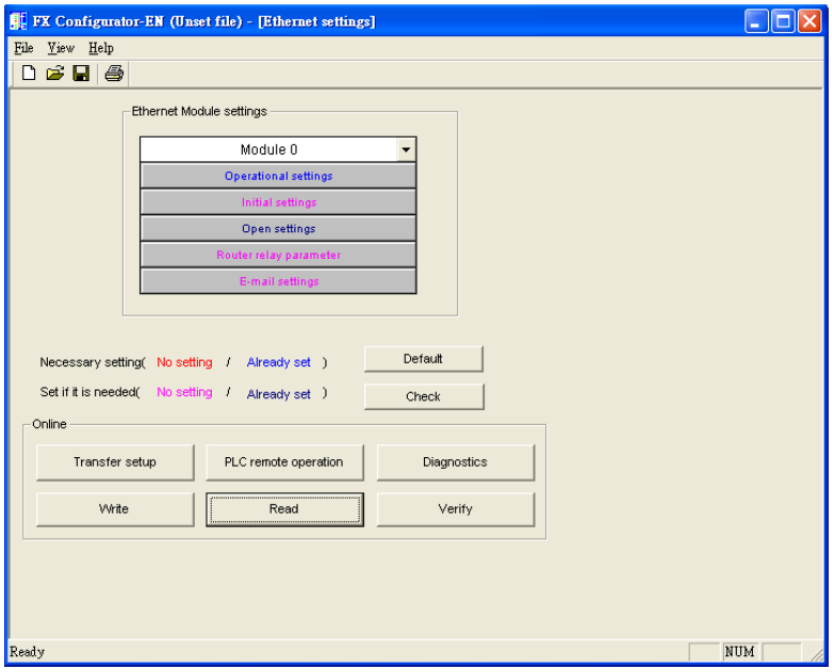


Figure 4-5 Ethernet Module Settings

2. Configure operational settings.

- Communication data code: The device should be set as BIN_1 frame if **Binary code** is

selected, and the device should be set as ASCII_1E frame if **ASCII code** is selected.

- Initial timing: Select **Always wait for OPEN**.
- IP address: It should be the same with the device's Server IP address.

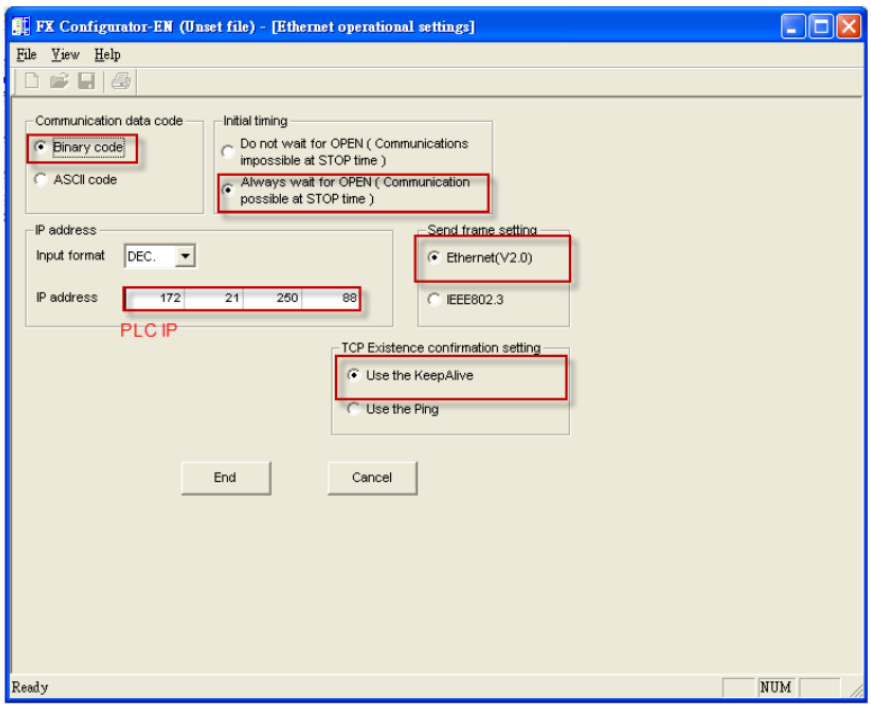


Figure 4-6 Ethernet Operational Settings

3. Open Ethernet open settings, set **TCP** as **Protocol**, **Passive (MC)** as **Open system**, and **5000** as **host station Port No. (DEC.)**.
4. Write to PLC after configuration.

Create GX-Works2 Project

When using Mitsubishi FX3U series PLC, you should also create GX-Works2 project.

Steps

1. Create a new GX-Works2 project, set **Series** and **Type** in according with FX3U series PLC.
2. Go to **Navigation** → **Connection Destination** → **PC Side I/F Serial Setting** → **Serial USB**, and set COM Port and Transmission Speed.

Note

Make sure that PLC can be visited via the cable of USB to serial port.

4.4.2 Mitsubishi Q Series PLC

Regarding the Mitsubishi Q series PLC, you can configure it via GX-Works2.

Steps

1. Create a new GX-Works2 project, set **Series** and **Type** in according with Q series PLC.
2. Go to **Navigation → Connection Destination → PC Side I/F**, select **Q Series Bus**, and select Ethernet to test communication connection.

Note

Make sure that the PLC can be visited via the network.

3. Go to **Navigation → Project → Parameters → PLC Parameters → Built-in Ethernet Port**, set the IP address of the PLC that should be the same with the device's Server IP address.
4. Set communication data code: The device should be set as 3E frame if **Binary code** is selected, and the device should be set as ASCII_1E frame if **ASCII code** is selected.
5. Check **Enable online change (FTP, MC protocol)**.
6. Click **Open settings**, enable MC protocol, set TCP protocol and port that should be the same with the device's Server port address.

4.5 Device Module Definition

The device has three modules, including control, status, and result.

Control

The control module controls the device to get images from PLC to the device.

- Control module location: software component D area, configurable offset (0 by default).
- Control module size: 2 bytes.

Table 4-1 Control Module Definition

D0/bit	Name	Description
D0.0	Trigger Enable	The PLC controls the device's trigger enable function via this bit.
D0.1	Trigger	When following conditions are met, the PLC sets this bit to trigger the device to acquire an image and run the algorithm once. ● Trigger Enable is set. ● The device is not currently acquiring images and running algorithms. ● Trigger Ready is set.
D0.2	Results Ack	After the PLC gets the latest results, Result Ack is set. At the same time, Results OK and Results NG will be cleared.
D0.3-14	Reserved	Reserved.
D0.15	Clear Error	Clear error status.

Status

The status module feedbacks the device's current status from the device to PLC.

- Status module location: software component D area, configurable offset (1 by default).
- Status module size: 2 bytes.

Table 4-2 Status Module Definition

D1/bit	Name	Description
D1.0	Trigger Ready	The device is ready to receive new trigger signal. When the Trigger Enable is set and the device is ready to receive next trigger signal, the Trigger Ready is set.
D1.1	Trigger Ack	The device has already received the trigger signal.
D1.2	Acquiring	The device is acquiring images.
D1.3	Decoding	The device is recognizing decodes on images.
D1.4-7	Reserved	Reserved.
D1.8	Results OK	The device outpus new results successfully. When the PLC is set Results Ack, it will be cleared.
D1.9	Results NG	The device does not read codes or get outputted results. When the PLC is set Results Ack, it will be cleared. **Note** You should disable NoRead function when using NG signal.
D1.10-14	Reserved	Reserved.
D1.15	General Fault	The device's internal fault, and you can clear this signal via Clear Error.

Result

The result module stores result data from the device to PLC.

- Result module location: software component D area, configurable offset (2 by default).
- Result size: 2 to 500 words (100 by default).

Table 4-3 Result Module Definition

Word	Name	Description
D2	Result Length	The result area includes invalid data length.
D3...	Result Data	The result output by the device. ● When result data length is smaller than configured result module, the spare bytes will be filled with 0. ● When result data length is greater than configured result module, the extra bytes will be cut off.

4.6 Trigger Test

Communication Sequence Diagram

The communication sequence diagram of PLC and the device is shown below.

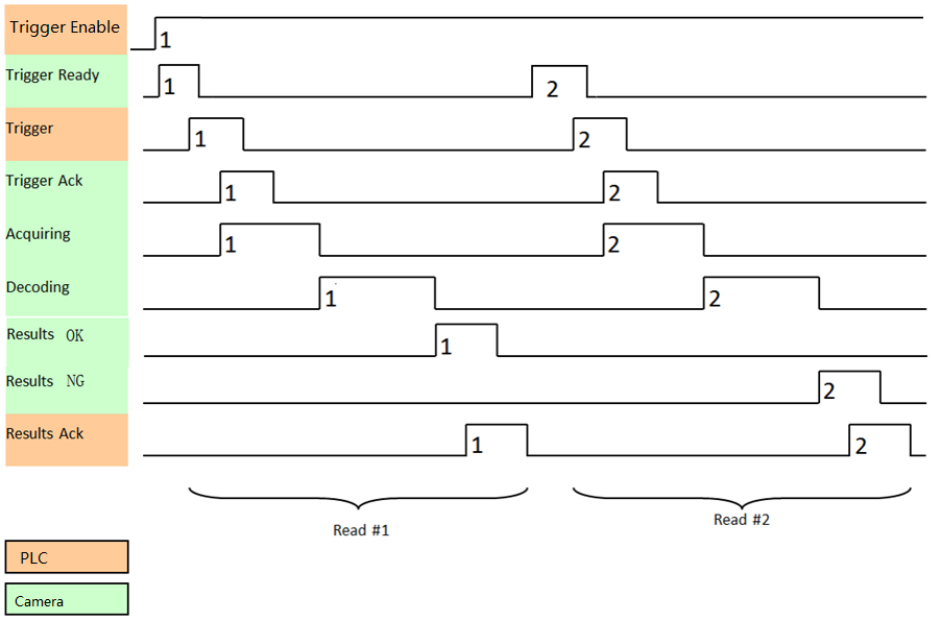


Figure 4-7 Communication Sequence Diagram

The logic of the above sequence diagram is shown below:

1. PLC sets Trigger Enable signal D0.0. After the device is ready, set Trigger Ready signal D1.0.
2. After detecting the device's Trigger Ready signal, the PLC sends Trigger signal D0.1 and controls the device to read codes.
3. The device starts to acquire images and decode images after receiving Trigger signal.

● If codes are read successfully, set the Results OK signal D1.8 and put code length and contents into the address starting from D2.

- If codes are not read successfully, set the Results NG signal D1.9 and clear the start address of D2.

Note

- If codes are not read successfully when NoRead is enabled, Results OK + “NoRead” character are feedback.
- If codes are not read successfully when NoRead is disabled, Results NG signal is feedback.

4. After detecting Results OK/NG, the PLC starts to read code length and data from D2.
5. After reading results is finished, set Results Ack signal D0.2, and notify the device.
6. After the trigger flow is finished, PLC sends Trigger signal again and next round of trigger flow begins.

Note

If the smart code reader cannot output results after receiving the Trigger signal due to an internal error (for example, acquiring images are not enabled after the smart code reader is connected to the IDMVS), the General Fault signal D1.15 will be set at this time. After the PLC confirms the cause of the error, set the Clear Error signal D0.15, and the trigger operation can be continued after the error is cleared.

Ladder Diagram

The PLC triggers the device to read codes, and related ladder diagrams are shown below.

- Enable Trigger

Figure 4-8 Enable Trigger

- Trigger Device to Read Codes

The trigger signal can be generated by adding an edge signal before Trigger Ready according to actual demands. For example, when the PLC detects the photoelectric input signal, it sends a trigger signal once.

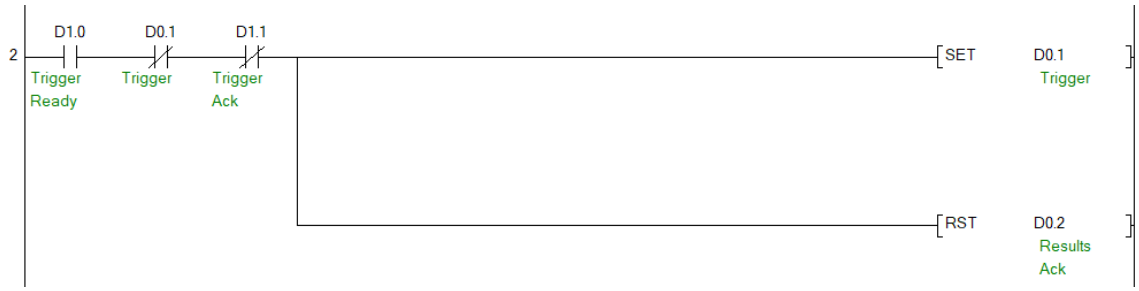


Figure 4-9 Send Trigger Signal

- Clear Trigger Signal

Figure 4-10 Clear Trigger Signal

● Get Device Results

When the device feedbacks the Results OK or NG signal, it means that the result data has been updated, and the PLC reads the result data to the DB data block.

After the reading is finished, set the Results Ack signal to acknowledge that the device has finished reading the result data.

Figure 4-11 Get Device Results

● Clear Error

When there is a trigger error and no result outputted, General Fault signal is set. After locating the cause of the error, the Clear Error signal can be set to clear the error and the device continues to acquire images.

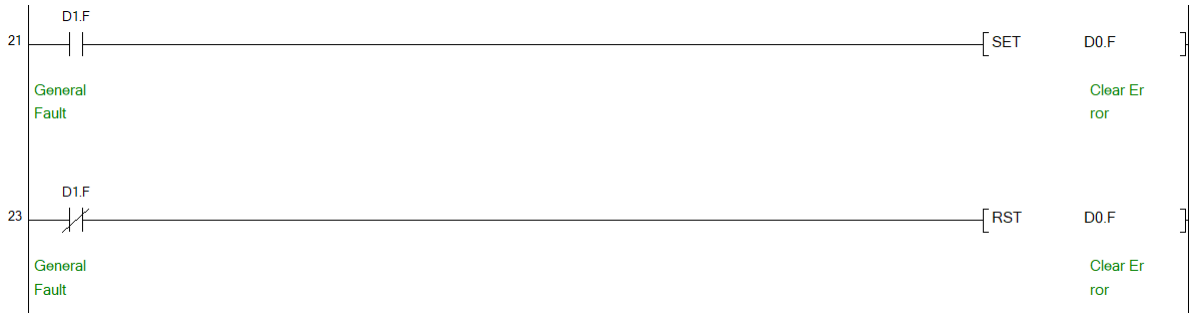


Figure 4-12 Clear Error

View Results

You can monitor the status of each module variable of the device and view outputted results via the software component/buffered memory. You can also observe the changing sequence of module signals of the device via sample tracking.

Chapter 5 FINS

5.1 Introduction

FINS (Factory Interface Network Service) communication protocol is a command/response system for industrial automation control networks developed by Omron, and it helps achieve seamless communication between various networks.

Note

This chapter takes Omron NX series PLC as an example to explain how to communicate with the smart code reader via the FINS communication protocol. For other devices, refer to the user manual provided by the manufacturer and make related settings by reading contents of this chapter.

5.2 Hardware Wiring

The wiring of Omron NX series PLC and the smart code reader is shown below.

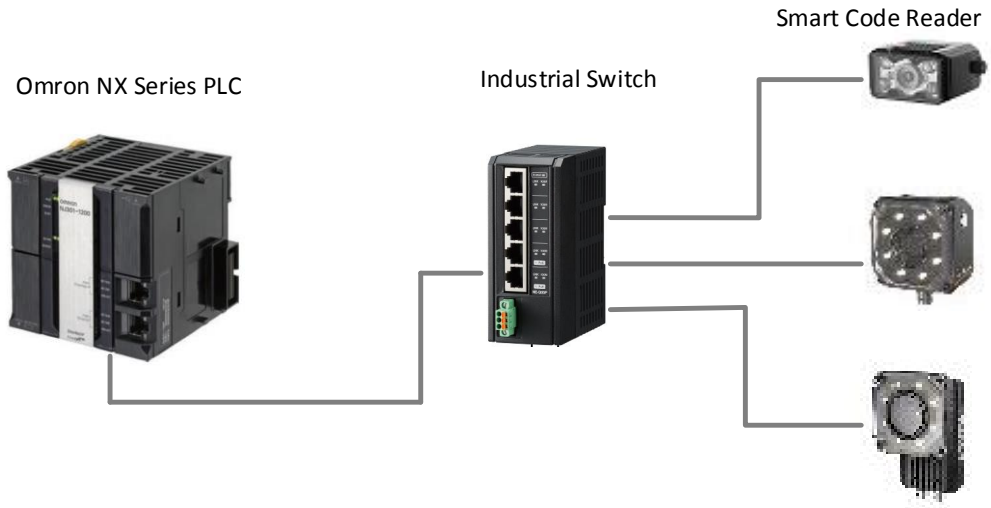


Figure 5-1 Hardware Wiring

5.3 Smart Code Reader Settings

Before using the smart code reader's FINS function to communicate with PLC devices, you

need to set the smart code reader first via the IDMVS client software.

Before you start:

- Make sure that the PC has installed the IDMVS client software with version of V2.3.1 and above.
- Check the device's firmware version.

Steps

1. Double click the device in the device list to connect it to the client software.
2. Set the device mode as **Normal** in the live view window.

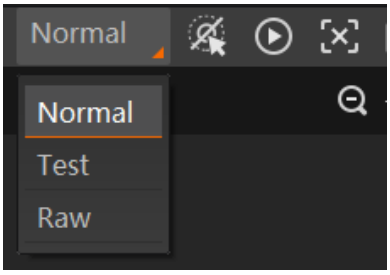


Figure 5-2 Set Device Mode

3. Go to **Communication Settings** in the left navigation panel.
4. Select **FINS** as communication protocol, and enable **FINS Enable**.
5. Enter **FINS Server IP** and **FINS Server Port** according to actual demands.
6. Set **FINS Control Poll Interval** according to actual demands.

Note

The control, status, and result modules are located in the DM area of the device. The offset address and result module size can be configured.

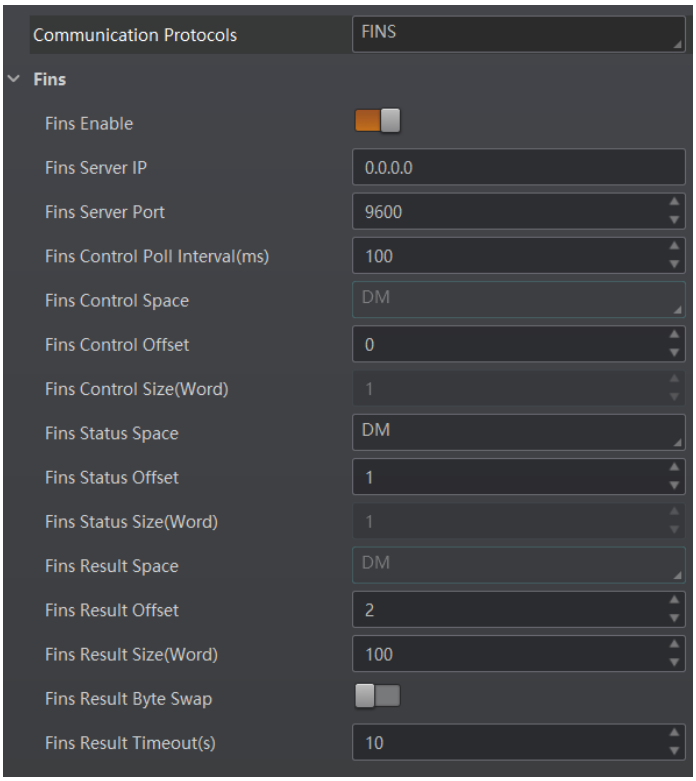


Figure 5-3 Set Parameters

7. Go to **Data Processing** in the left navigation panel, and set format and contents contained in the outputted information.

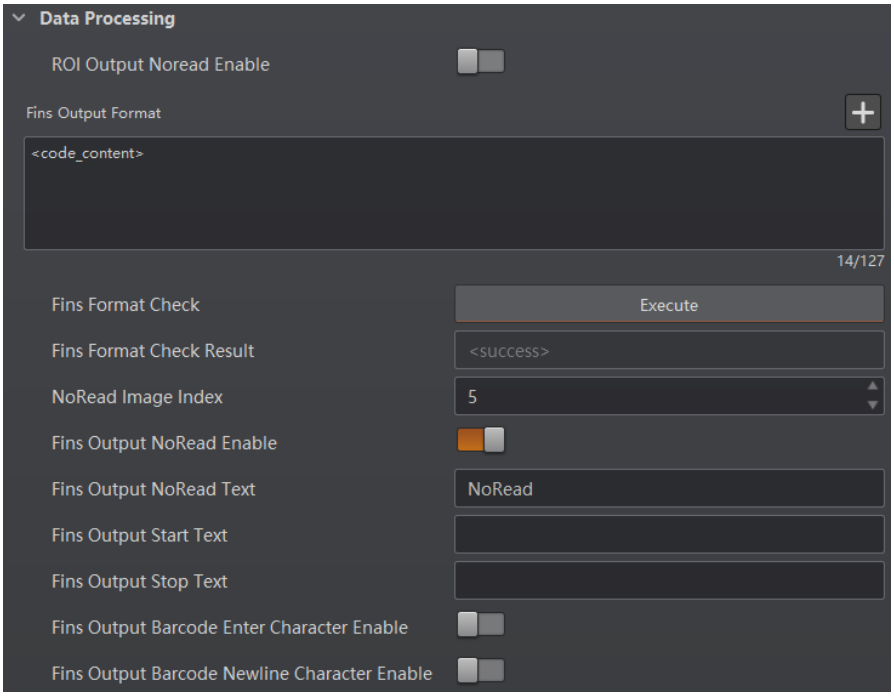


Figure 5-4 Set Data Processing

Note

- Refer to the user manual of the smart code reader for detailed data processing settings.
- The specific parameters may differ by device models.

5.4 PLC Settings

This section takes Omron NJ102-9000 PLC as an example to explain how to set PLC.

Note

Only port 2 of Omron NJ102-9000 PLC supports FINS communication, and make sure that the port 2 is in the same network segment with the device. At the same time, Sysmac Studio configures the PLC via port 1, and make sure that the port 1 is in the same network segment with the PC.

Steps

1. Run Sysmac Studio, click **New Project**, enter parameters, and click **Create**.

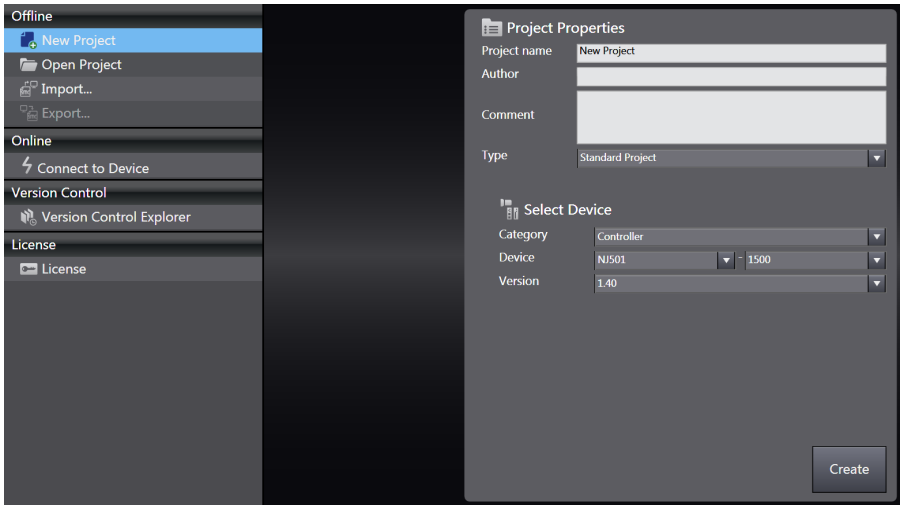


Figure 5-5 Create New Project

2. Go to **Configurations and Setup** → **Controller Setup** → **Built-in Ethernet/IP Port Settings**, and set the IP address of PLC port 1 and port 2 via TCP/IP Settings.

Note

- The configured IP address of PLC's port 1 should be in the same network segment with the PC.
- The configured IP address of PLC's port 2 should be in the same network segment with the device's IP address.

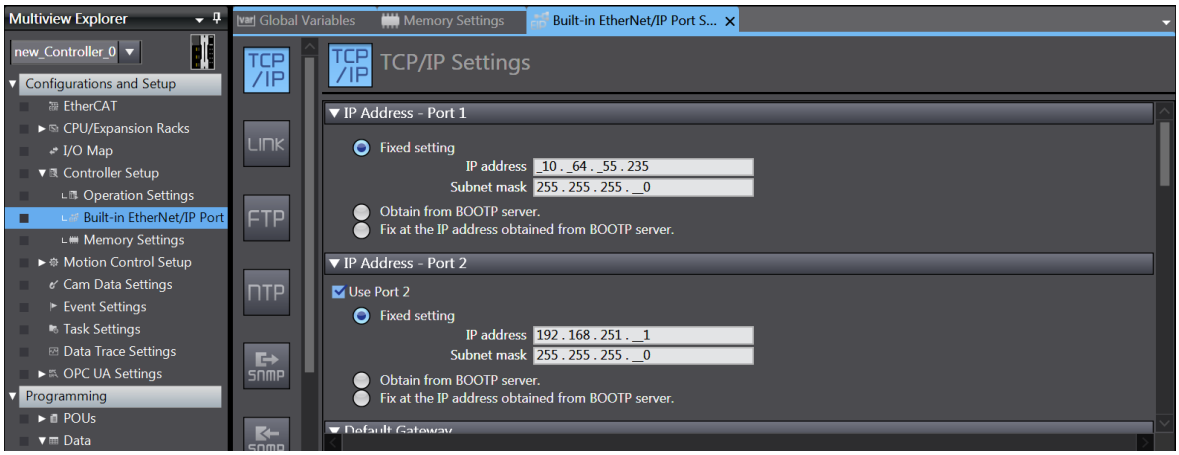


Figure 5-6 Set IP Address

3. Enter FINS/TCP port and configure FINS/TCP connection settings.

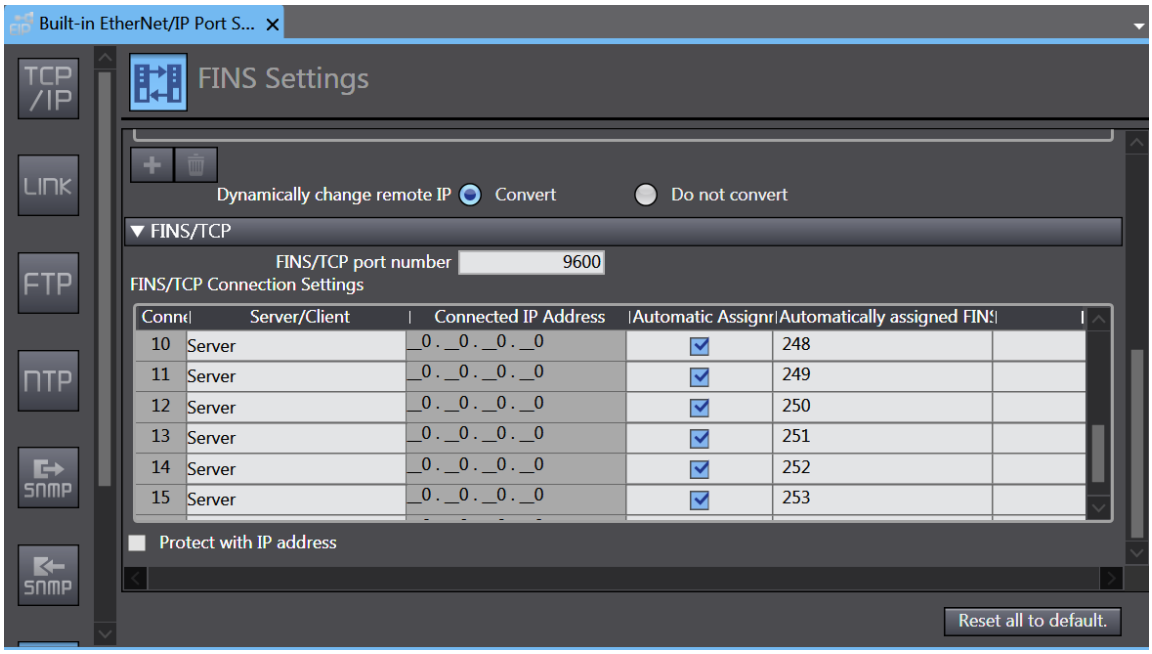


Figure 5-7 Configure Port and Connection Settings

4. Create global variables for the FINS communication.

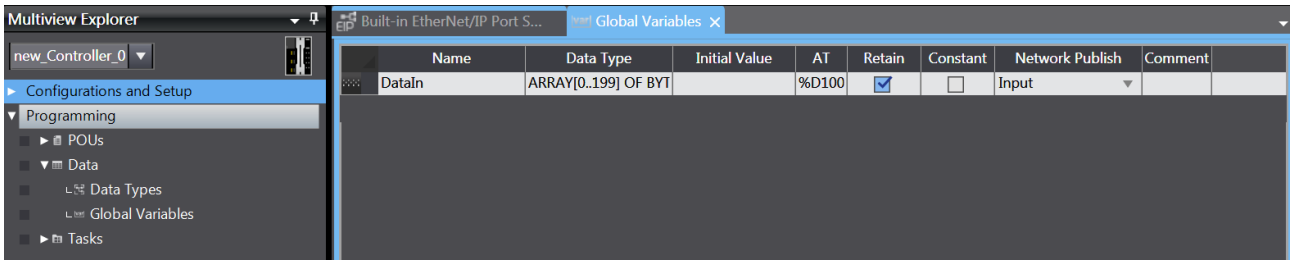


Figure 5-8 Create Global Variables

5. Enable DM area by checking it, as shown below, and allocate created global variables to the DM memory.

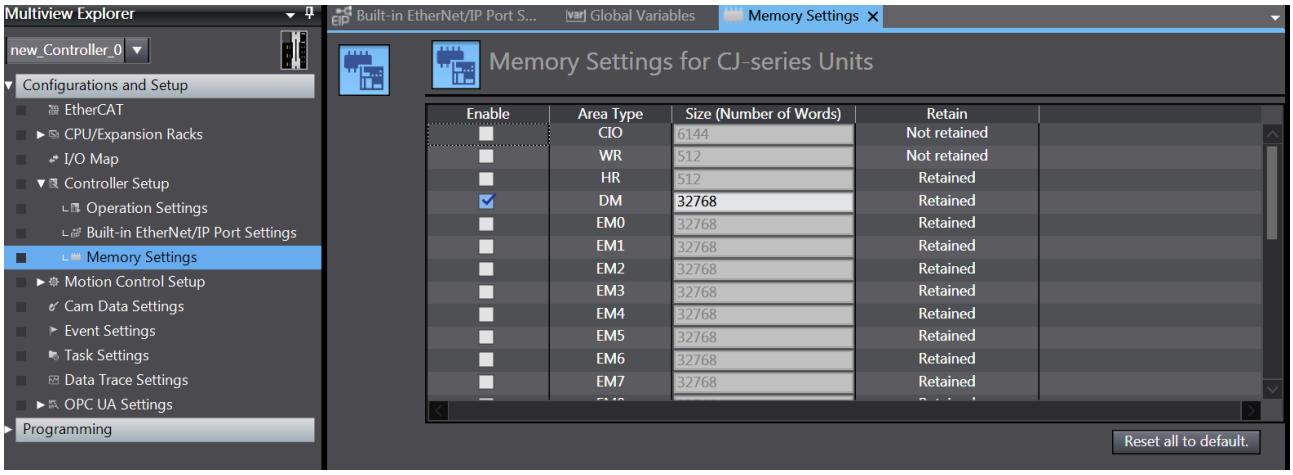


Figure 5-9 Enable DM Area

6. Save settings, go to **Controller** → **Online**, and connect to the PLC.
7. Go to **Controller** → **Transfer...** → **Transfer to Control...**, and write configuration to PLC.

5.5 Device Storage Area Definition

The FINS communication uses DM storage area only that consists of three areas, including control, status, and result.

Control

The control area controls the device to get images from PLC to the device.

- Control area location: DM storage area, configurable offset (0 by default).
- Control area size: 2 bytes.

Table 5-1 Control Area Definition

D0/bit	Name	Description
D0.0	Trigger Enable	The PLC controls the device's trigger enable function via this bit.
D0.1	Trigger	When following conditions are met, the PLC sets this bit to trigger the device to acquire an image and run the algorithm once. ● Trigger Enable is set. ● The device is not currently acquiring images and running algorithms. ● Trigger Ready is set.
D0.2	Results Ack	After the PLC gets the latest results, Result Ack is set. At the same time, Results OK and Results NG will be cleared.
D0.3-14	Reserved	Reserved.
D0.15	Clear Error	Clear error status.

Status

The status area feedbacks the device's current status from the device to PLC.

- Status area location: DM storage area, configurable offset (1 by default).
- Status area size: 2 bytes.

Table 5-2 Status Area Definition

D1/bit	Name	Description
D1.0	Trigger Ready	The device is ready to receive new trigger signal. When the Trigger Enable is set and the device is ready to receive next trigger signal, the Trigger Ready is set.
D1.1	Trigger Ack	The device has already received the trigger signal.
D1.2	Acquiring	The device is acquiring images.
D1.3	Decoding	The device is recognizing decodes on images.
D1.4-7	Reserved	Reserved.
D1.8	Results OK	The device outpus new results successfully. When the PLC is set Results Ack, it will be cleared.
D1.9	Results NG	The device does not read codes or get outputted results. When the PLC is set Results Ack, it will be cleared. **Note** You should disable NoRead function when using NG signal.
D1.10-14	Reserved	Reserved.
D1.15	General Fault	The device's internal fault, and you can clear this signal via Clear Error.

Result

The result area stores result data from the device to PLC.

- Result area location: DM storage area, configurable offset (2 by default).
- Result area size: 4 to 500 registers (100 by default).

Table 5-3 Result Area Definition

DM/Word	Name	Description
D2	Result Length	The result area includes invalid data length.
D3...	Result Data	The result output by the device. ● When result data length is smaller than configured result module, the spare bytes will be filled with 0. ● When result data length is greater than configured result module, the extra bytes will be cut off.

5.6 Trigger Test

Communication Sequence Diagram

The communication sequence diagram of PLC and the device is shown below.

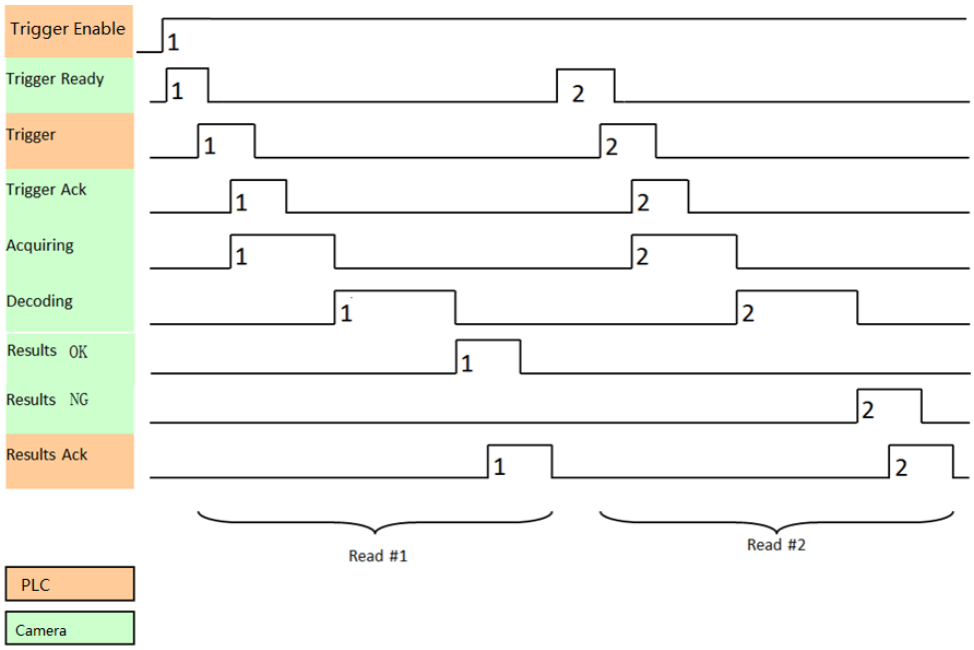


Figure 5-10 Communication Sequence Diagram

The logic of the above sequence diagram is shown below:

1. PLC sets Trigger Enable signal D0.0. After the device is ready, set Trigger Ready signal D1.0.
2. After detecting the device's Trigger Ready signal, the PLC sends Trigger signal D0.1 and controls the device to read codes.
3. The device starts to acquire images and decode images after receiving Trigger signal.

● If codes are read successfully, set the Results OK signal D1.8 and put code length and

contents into the address starting from D2.

- If codes are not read successfully, set the Results NG signal D1.9 and clear the start address of D2.

Note

- If codes are not read successfully when NoRead is enabled, Results OK + “NoRead” character are feedback.
- If codes are not read successfully when NoRead is disabled, Results NG signal is feedback.

4. After detecting Results OK/NG, the PLC starts to read code length and data from D2.
5. After reading results is finished, set Results Ack signal D0.2, and notify the device.
6. After the trigger flow is finished, PLC sends Trigger signal again and next round of trigger flow begins.

Note

If the smart code reader cannot output results after receiving the Trigger signal due to an internal error (for example, acquiring images are not enabled after the smart code reader is connected to the IDMVS), the General Fault signal D1.15 will be set at this time. After the PLC confirms the cause of the error, set the Clear Error signal D0.15, and the trigger operation can be continued after the error is cleared.

Create Variables

Create the variable as shown below according to the device’s storage area definition.

	TriggerEnable	BOOL		%D0.0	☑	☐
	Trigger	BOOL		%D0.1	☑	☐
	ResultsAck	BOOL		%D0.2	☑	☐
	ClearError	BOOL		%D0.15	☑	☐
	TriggerReady	BOOL		%D1.0	☑	☐
	TriggerAck	BOOL		%D1.1	☑	☐
	Acquiring	BOOL		%D1.2	☑	☐
	Decoding	BOOL		%D1.3	☑	☐
	ResultsOK	BOOL		%D1.8	☑	☐
	ResultsNG	BOOL		%D1.9	☑	☐
	GeneralFault	BOOL		%D1.15	☑	☐
	ResultLength	UINT		%D2	☑	☐
	ResultData	ARRAY[0..199] OF BYTE		%D3	☑	☐
	ResultDataUser	ARRAY[0..199] OF BYTE		%D500	☑	☐

Figure 5-11 Create Variables

Ladder Diagram

The PLC triggers the device to read codes, and related ladder diagrams are shown below.

- Enable Trigger

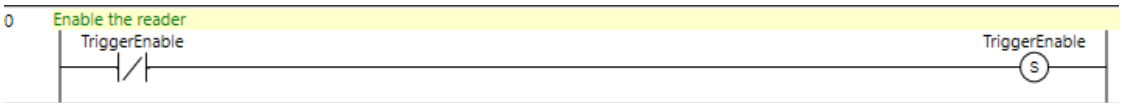


Figure 5-12 Enable Trigger

● Trigger Device to Read Codes

The trigger signal can be generated by adding an edge signal before Trigger Ready according to actual demands. For example, when the PLC detects the photoelectric input signal, it sends a trigger signal once.

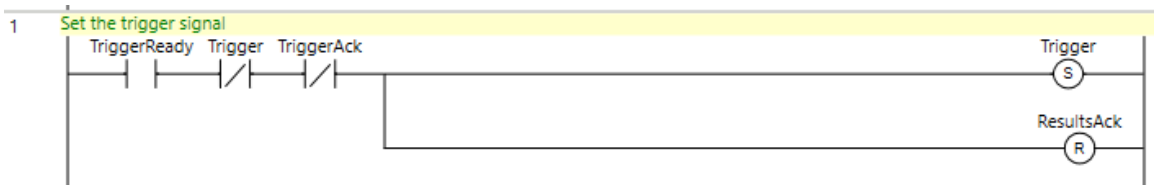


Figure 5-13 Send Trigger Signal

● Clear Trigger Signal

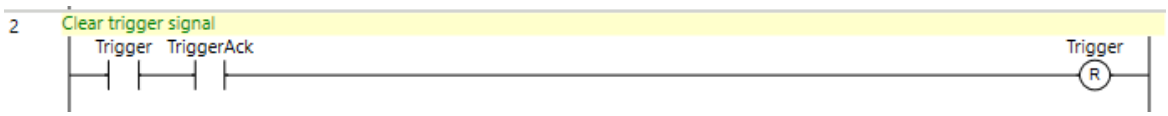


Figure 5-14 Clear Trigger Signal

● Get Device Results

When the device feedbacks the Results OK or NG signal, it means that the result data has been updated, and the PLC reads the result data to the DB data block.

After the reading is finished, set the Results Ack signal to acknowledge that the device has finished reading the result data.

Note

If the endianness of codes read is different from actual one, you can enable result byte swap function via the IDMVS.

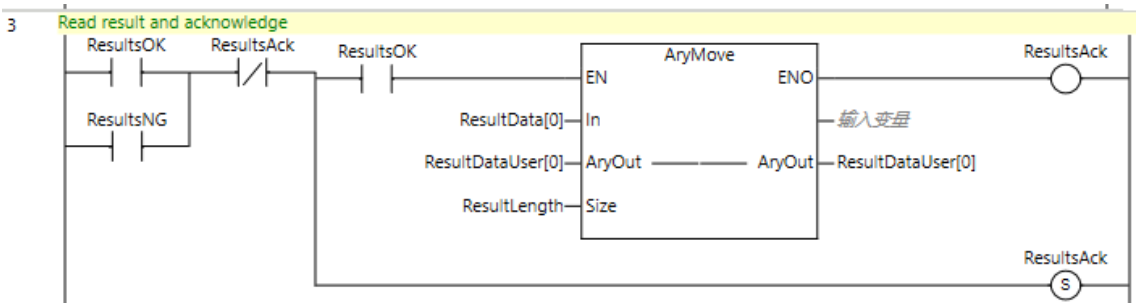


Figure 5-15 Get Device Results

● Clear Error

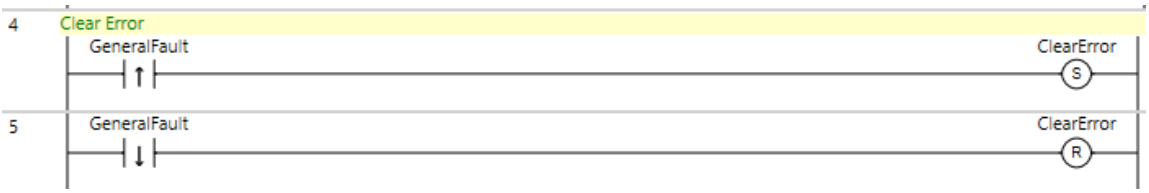


Figure 5-16 Clear Error

View Results

You can monitor the status of each module variable of the device and view outputted results via the monitor window.

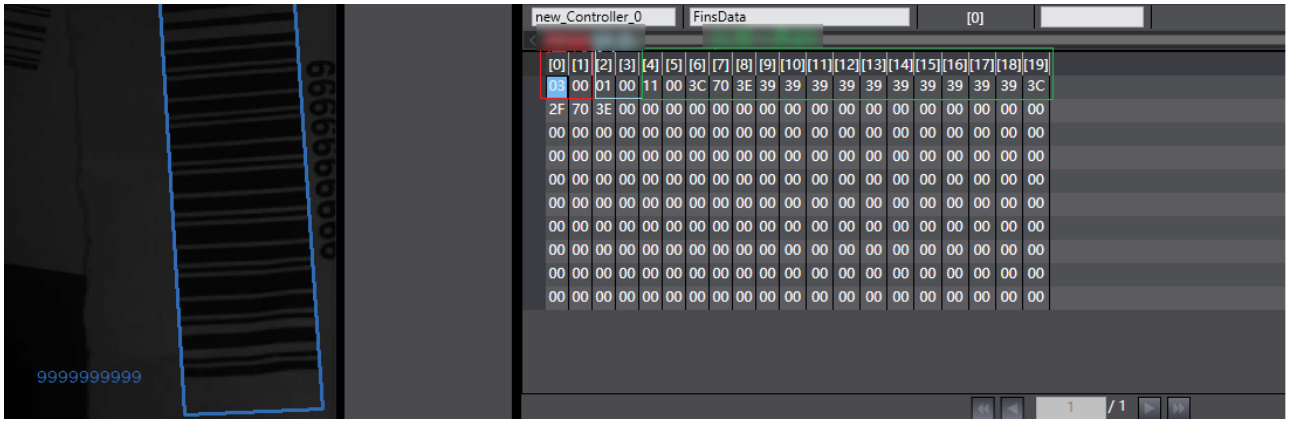


Figure 5-17 View Results

See Far, Go Further

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