XINJE

XD/XL/XG series programmable controllers
User Manual [Software Section] (V3.8.0)

Wuxi Xinje Electric Co., Ltd.

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catalogue

Basic Description

- Thank you for purchasing the xinje XD/XL/XG series programmable controllers.
- This manual primarily Explains how to use the XDPPro host software for XD/XL/XG series programmable controllers.
- Before using the product, read this manual carefully and program only after fully understanding its contents.
- Please deliver this manual to the end user.

User Guidelines

- Only operators with adequate electrical knowledge may perform wiring and other related operations on the product. If you encounter any unfamiliar aspects, please consult the instructions.
  Consult our technical staff.
- The examples listed in manuals and other technical documents are for user reference only and do not guarantee specific outcomes.
- When using this product with other products, confirm that it meets the relevant specifications and requirements.
- When using this product, verify that it meets all requirements and is safe.
- Set up backup and safety features to prevent machine malfunctions or losses caused by this product's issues.

Responsibility Statement

- Although the content in the manual has been carefully reviewed, errors may still occur; we cannot guarantee complete consistency.
- We regularly review the content in this manual and will make improvements in future versions. We welcome your valuable feedback.
- Any changes to the information in this manual will not be notified separately; please understand.

Association Manual

For details on instructions and hardware specifications for XD/XL/XG series PLCs, please refer to the following manual.

- XD/XL Series Programmable Controller User Manual [Basic Instructions Section]
- XD/XL Series Programmable Controller User Manual [Position Control Section]
- XD/XL Series Programmable Controller User Manual [Hardware Section]
- User Manual for XDH/XLH Series Programmable Controllers [Advanced Motion Control Section]
- Ethernet Communication User Manual
- "XG Series Programmable Controller User Manual [Basic Instructions Section]"
- "XG Series Programmable Controller User Manual [Position Control Section]"
- "XG Series Programmable Controller User Manual [Hardware Section]"

Contact Way

If you have any questions about using this product, please contact the authorized distributor or office where you purchased it, or directly reach out to xinje Company.

- Fax: 0510-85111290
- Website: www.xinje.com
- Address: No.816, Jianzhu West Road, Binhu District, Wuxi City, Jiangsu Province

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1. Instructions for Use

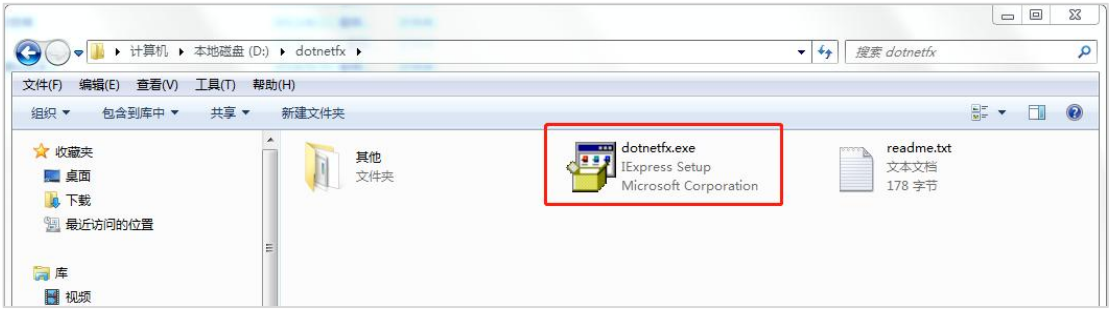
1-1. System Requirements

Processor	Intel Core i3 and above	Display Scaling Settings	100% (Recommended)
Internal Storage	At least 4G	Display Resolution	1920*1080 (Recommended)
Hard Drive	Over 300 GB	operating system	Windows 7 or later (recommended)

1-2. Installation Steps

Using XDPPro V3.8.0 as an example, this section Explains the software installation and uninstallation steps.

1. If the Framework 3.5 library is not installed on your operating system, first download ".NET Framework 3.5" from the Download Center on xinje's official website (www.xinje.com), then run the installer "dotnetfx.exe" located in the "dotnetfx" subfolder within the installation folder.

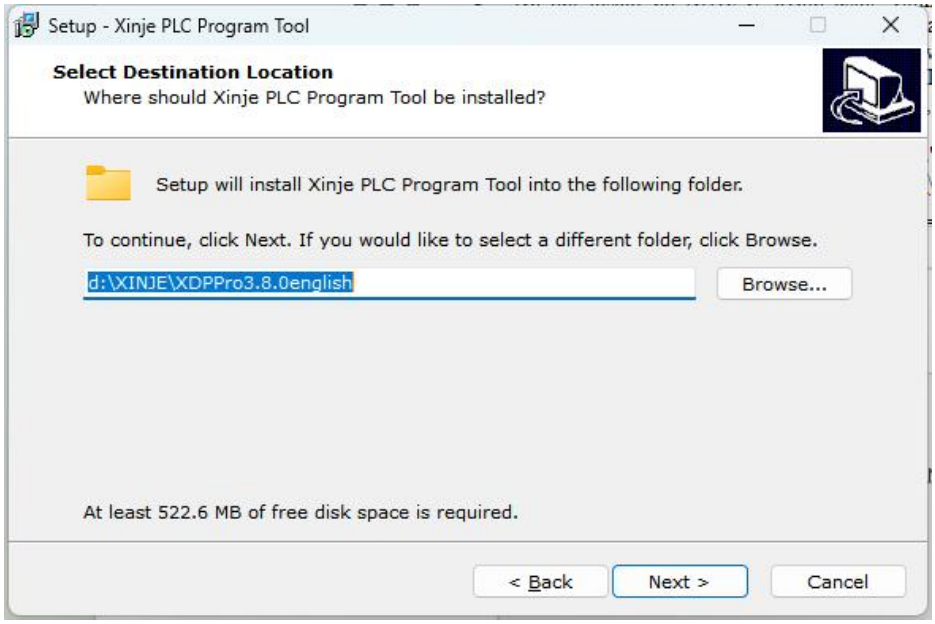


- Before installation, close antivirus software such as 360 and disable the firewall if necessary.
- Computers running Windows 7-64, Windows 8 or later must first install Framework 4.0. Download and install it directly from the Microsoft website.

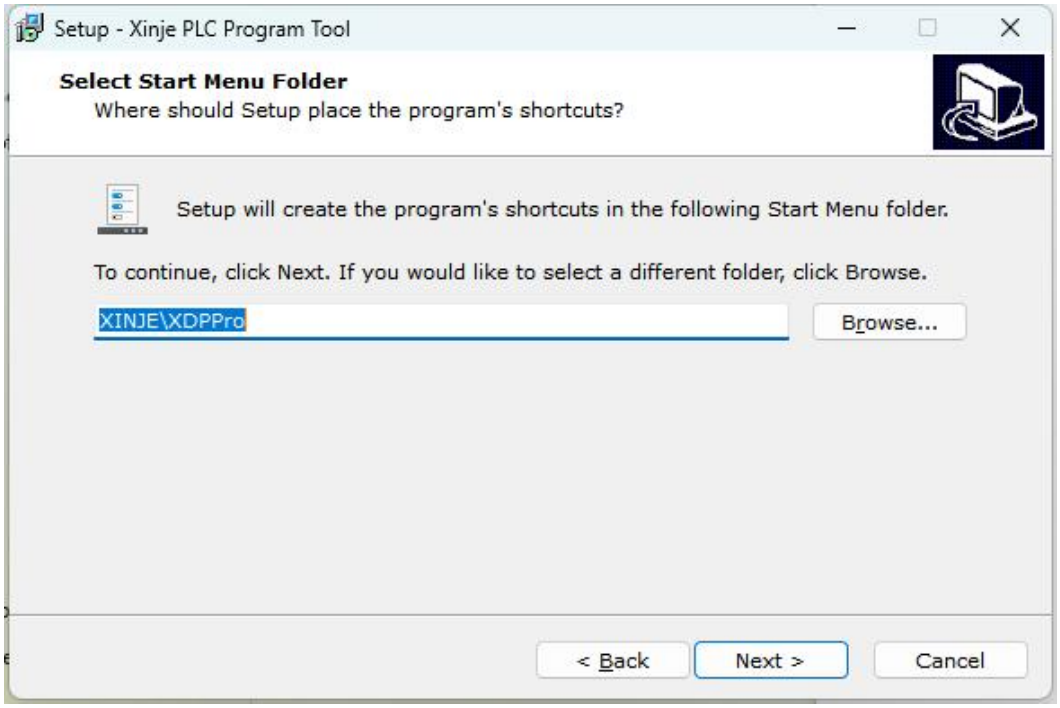
2. Decompress the installation package: In the XD/XL/XG programming software installation folder, double-click "XDPPro_3.8.0_20250303_zh.exe" and follow the installation wizard to complete the installation.

(1) During software installation, "XNetSetup_2024_10_30_v2.3.3.0_Ch.exe" will be installed by default. If already installed, skip this step; if not installed or using an older version of xnet, uninstall it first as prompted, select the installation directory, and click "Next".

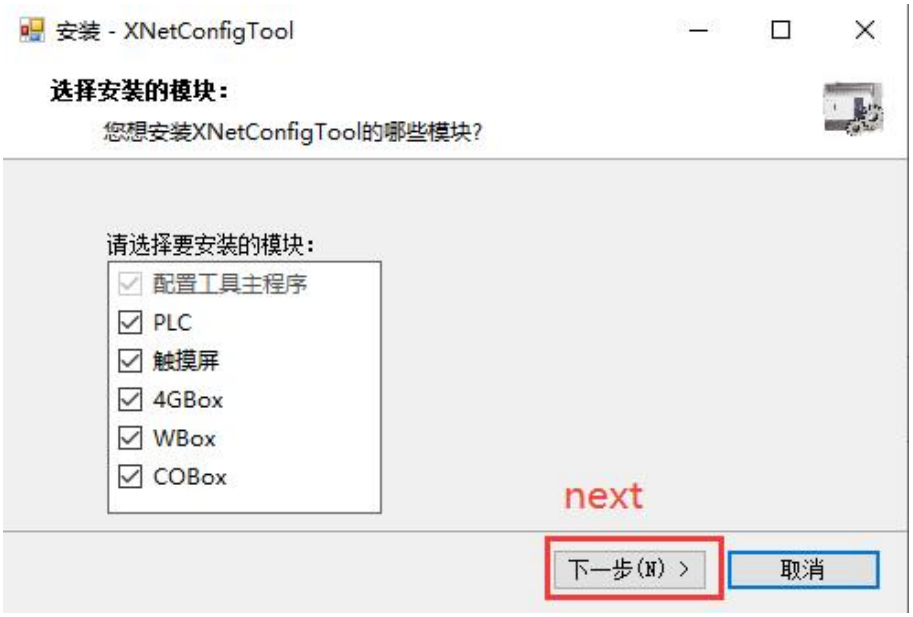
- Do not install on Drive C, avoid using Chinese characters in the installation path, and do not reuse previous installation paths to prevent residual files from previous installations from preventing the new software from running.
- If your computer has only one disk partition (Disk C), locate the mapped virtual folder (enable the hidden folder view option), delete all files within it, and then install the software on Disk C. For example: if the admin software is installed at "C:\Program Files (x86)\XINJE\XDPPro\\", delete all files in the directory "C:\Users\admin\AppData\Local\VirtualStore\ProgramFiles (x86)\XINJE\XDPPro\\".



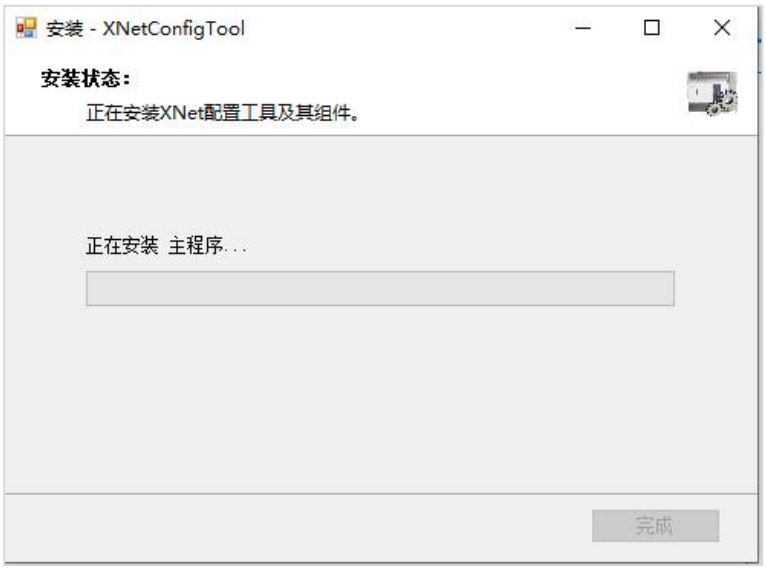
(2) Select whether to create a shortcut and click Next;



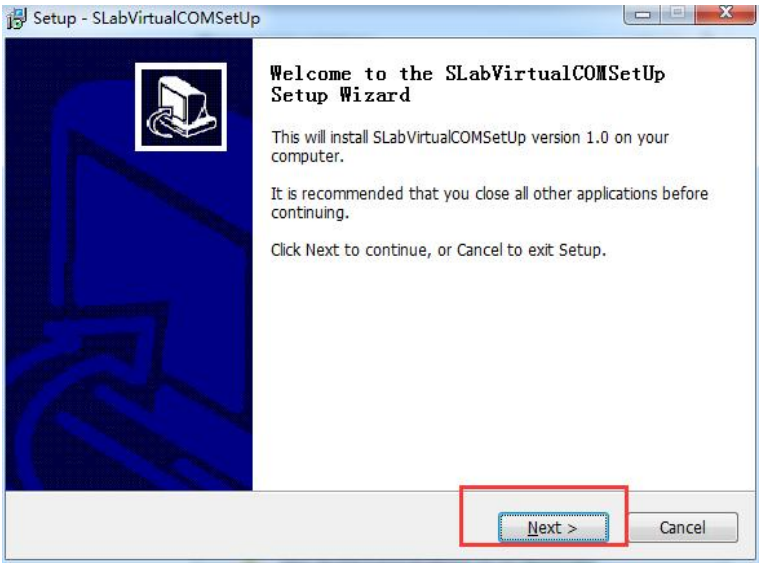
(3) Select the modules to install (all are selected by default), then click Next;

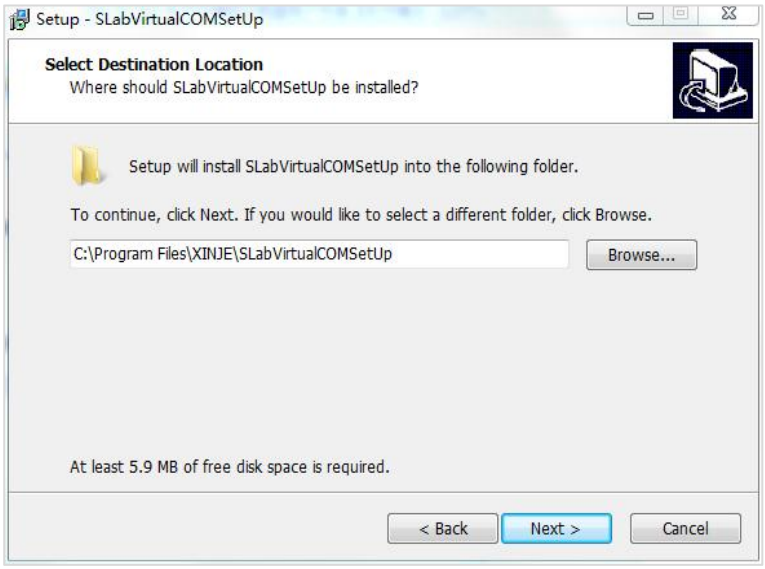


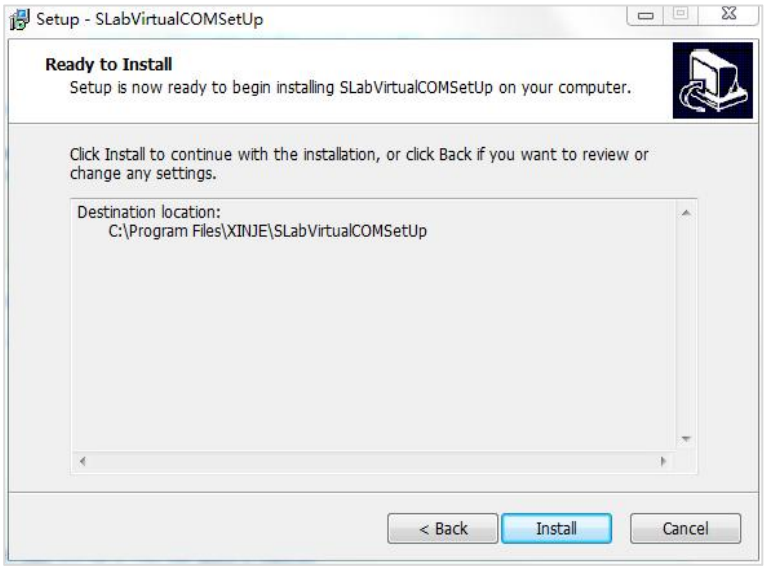
(4) Wait for completion;

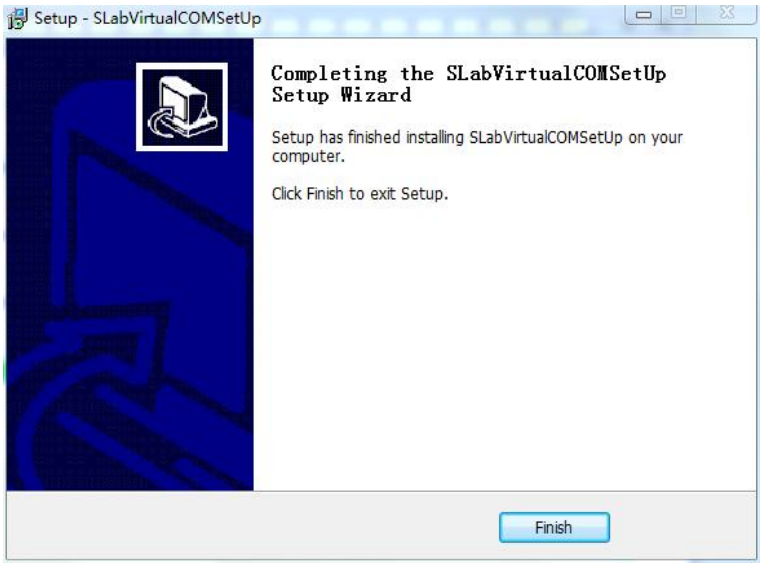


(5) Since this program includes a built-in USB driver, the USB driver installer will appear during installation—just follow the prompts.

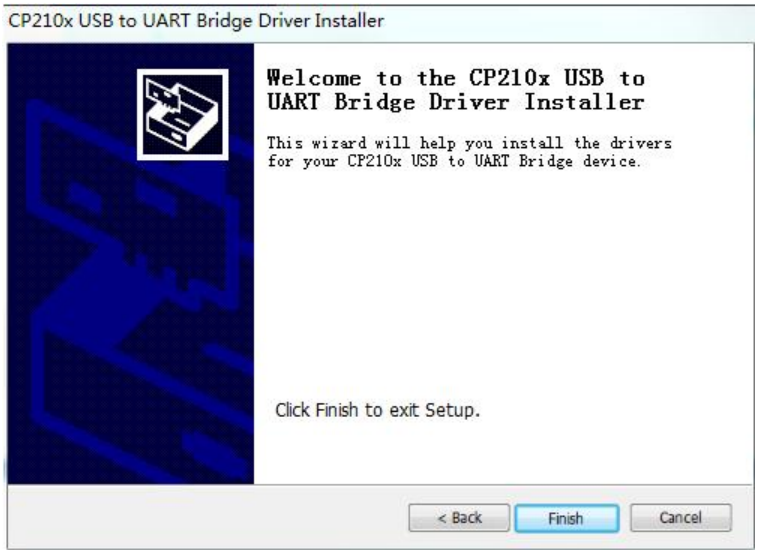

Setup - SLabVirtualCOMSetUp
Welcome to the SLabVirtualCOMSetUp Setup Wizard
This will install SLabVirtualCOMSetUp version 1.0 on your computer.
It is recommended that you close all other applications before continuing.
Click Next to continue, or Cancel to exit Setup.
Next >
Cancel


Setup - SLabVirtualCOMSetUp
Select Destination Location
Where should SLabVirtualCOMSetUp be installed?
Setup will install SLabVirtualCOMSetUp into the following folder.
To continue, click Next. If you would like to select a different folder, click Browse.
C:\Program Files\XINJE\SLabVirtualCOMSetUp
Browse...
At least 5.9 MB of free disk space is required.
< Back
Next >
Cancel


Setup - SLabVirtualCOMSetUp
Ready to Install
Setup is now ready to begin installing SLabVirtualCOMSetUp on your computer.
Click Install to continue with the installation, or click Back if you want to review or change any settings.
Destination location:
C:\Program Files\XINJE\SLabVirtualCOMSetUp
< Back
Install
Cancel



(6) Click "Next" to continue installing the USB driver;

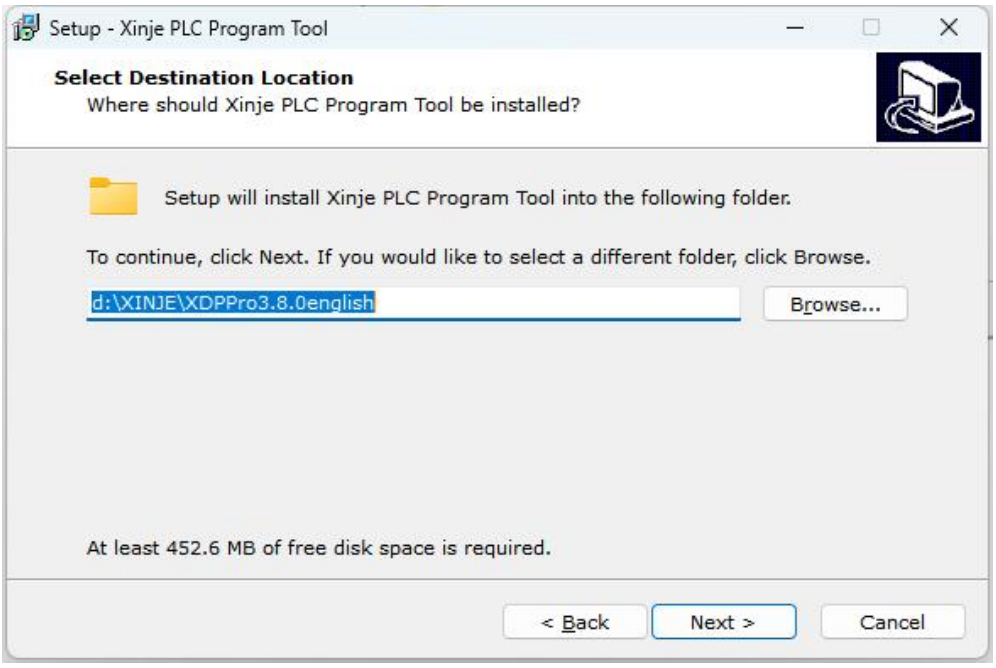


(7) Select "I accept this agreement" and click "Next";

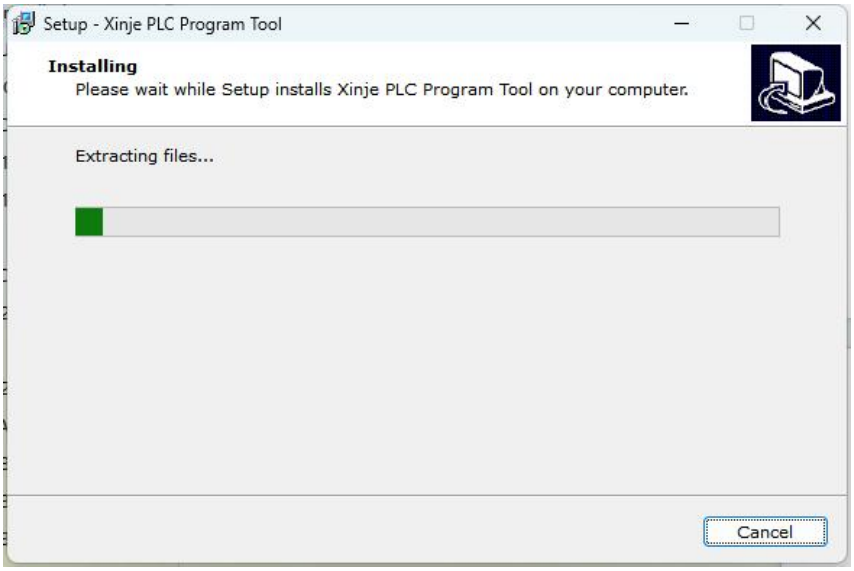
(8) The following window appears, displaying "The driver is ready to use," indicating that the driver has been installed.

(9) After completing the driver installation, the software version 3.8.0 will be automatically installed by following the installation wizard.

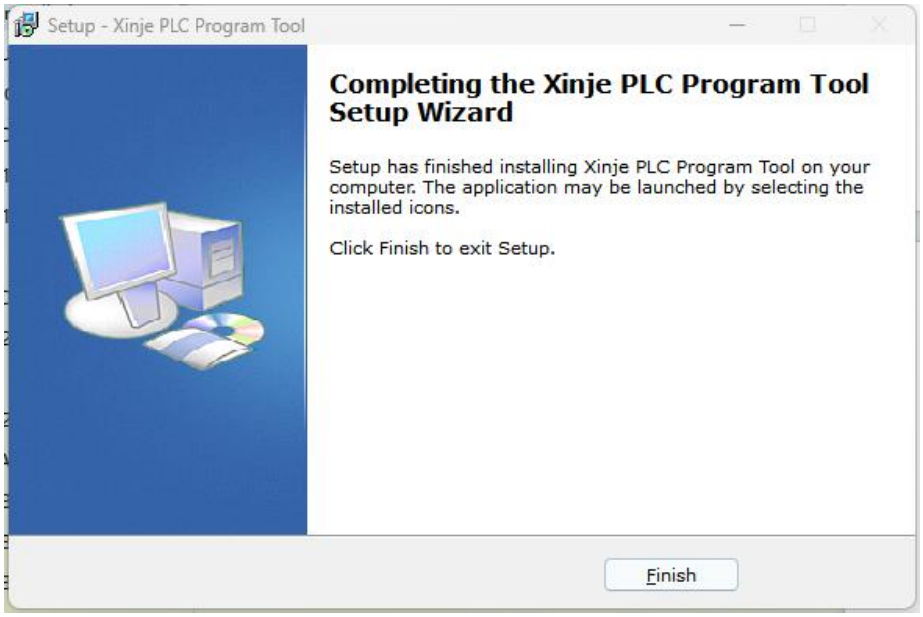
(10) Select the software installation path and click "Next" repeatedly until the "Install" button appears;



(11) It shows "Installing XDPPro". Please wait.



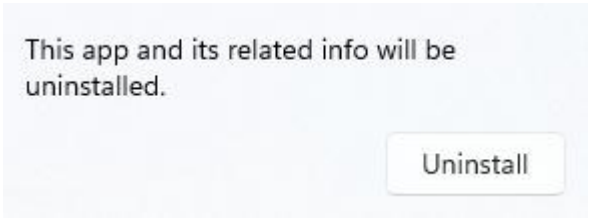
(12) When "Installation Complete" appears, click "Complete" to finish installing the programming tool software.


Setup - Xinje PLC Program Tool
Completing the Xinje PLC Program Tool Setup Wizard
Setup has finished installing Xinje PLC Program Tool on your computer. The application may be launched by selecting the installed icons.
Click Finish to exit Setup.
Finish

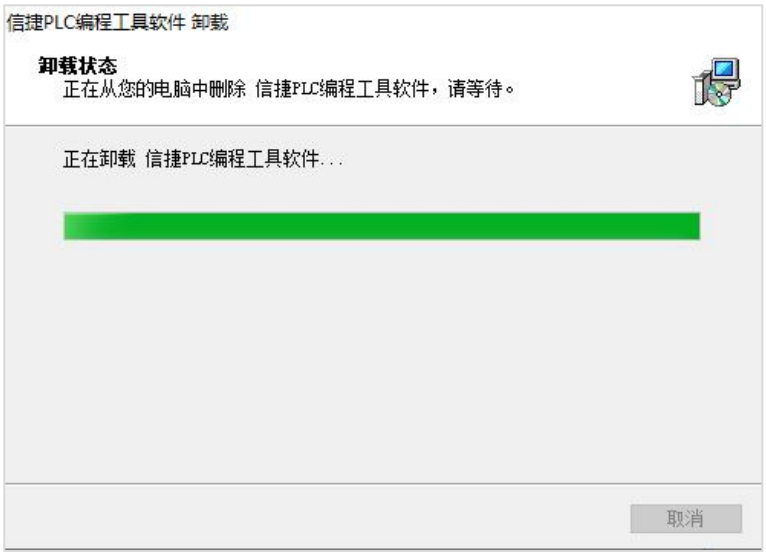
1-3. Unloading Steps

1. Open [Settings] - [Apps and Features];
2. Search for "xinje" in the search box;
3. Select "xinje PLC Programming Tool Software 3.8.0_20250303" and click Uninstall;

4. In the uninstallation pop-up window for this application and related information, click [Uninstall];

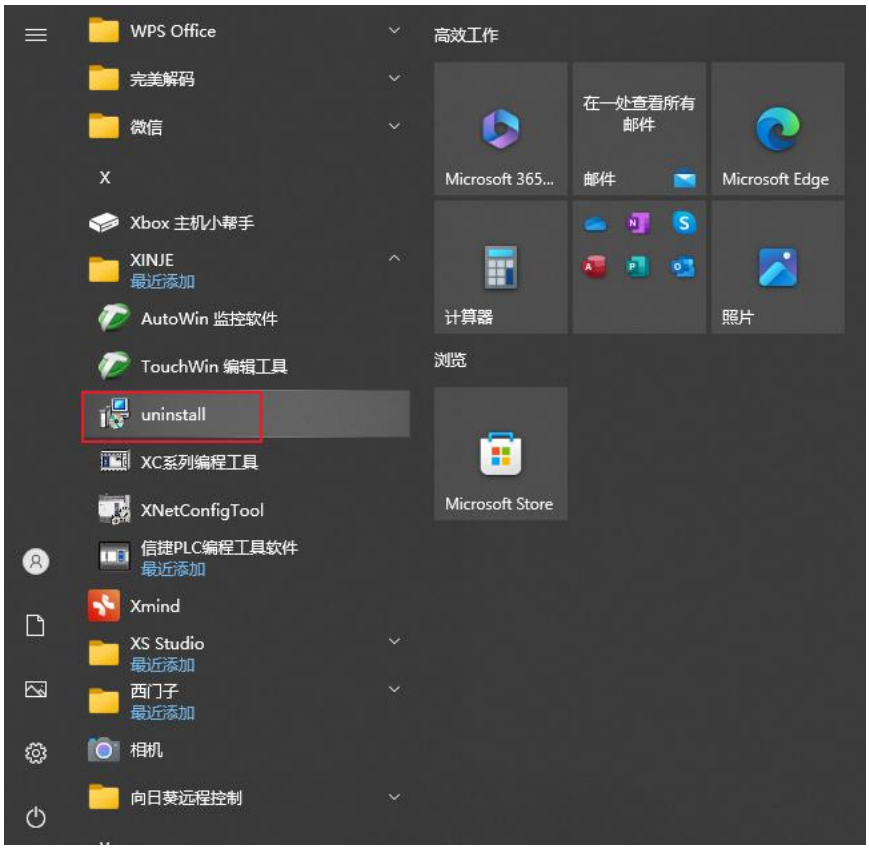


5. Deleting;



6. Uninstallation successful.

You can also open Start> All Programs in the computer panel to locate the installed folder (usually named "XINJE"), then click Uninstall to remove the program as shown below.



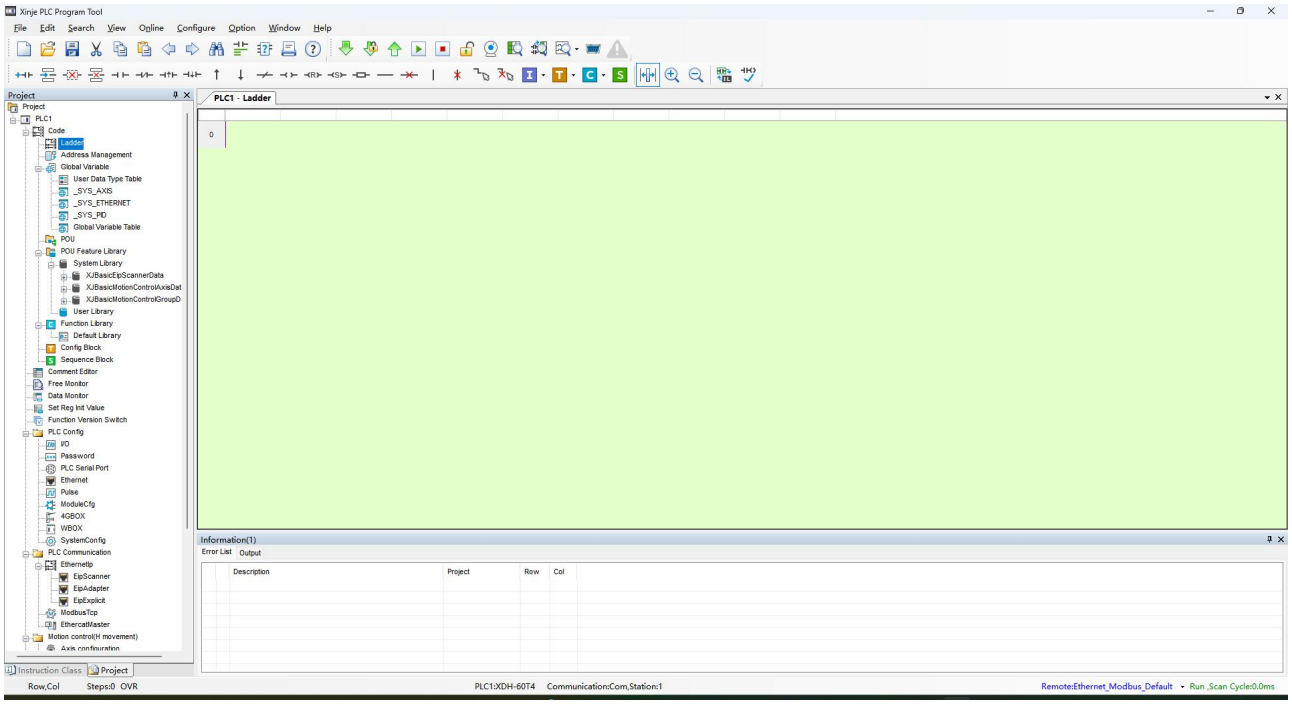
2. Basic Operations

2-1. Opening and closing XDPPro

2-1-1. Opening the Programming Software

1. Double-click the shortcut Icon on the desktop;

2. The screen displayed when XDPPro starts up is shown below:



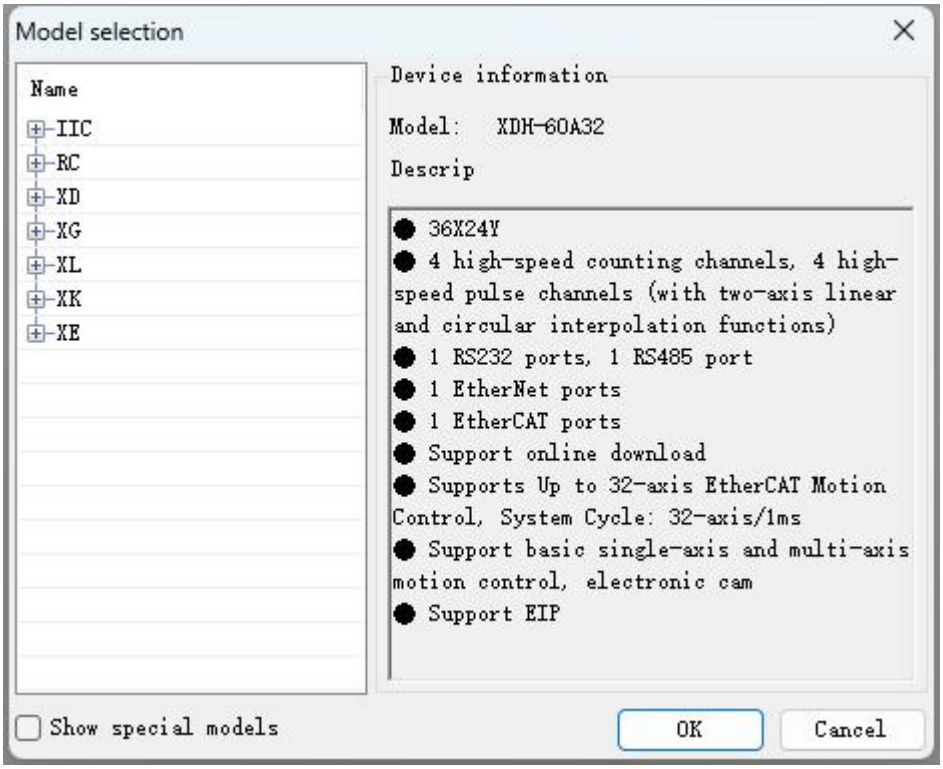
2-1-2. Closing the Programming Software

Select the menu [File] → [Exit], or click the button directly ✕ to close XDPPro.

2-2. Create or Open a Project

2-2-1. Create a new project

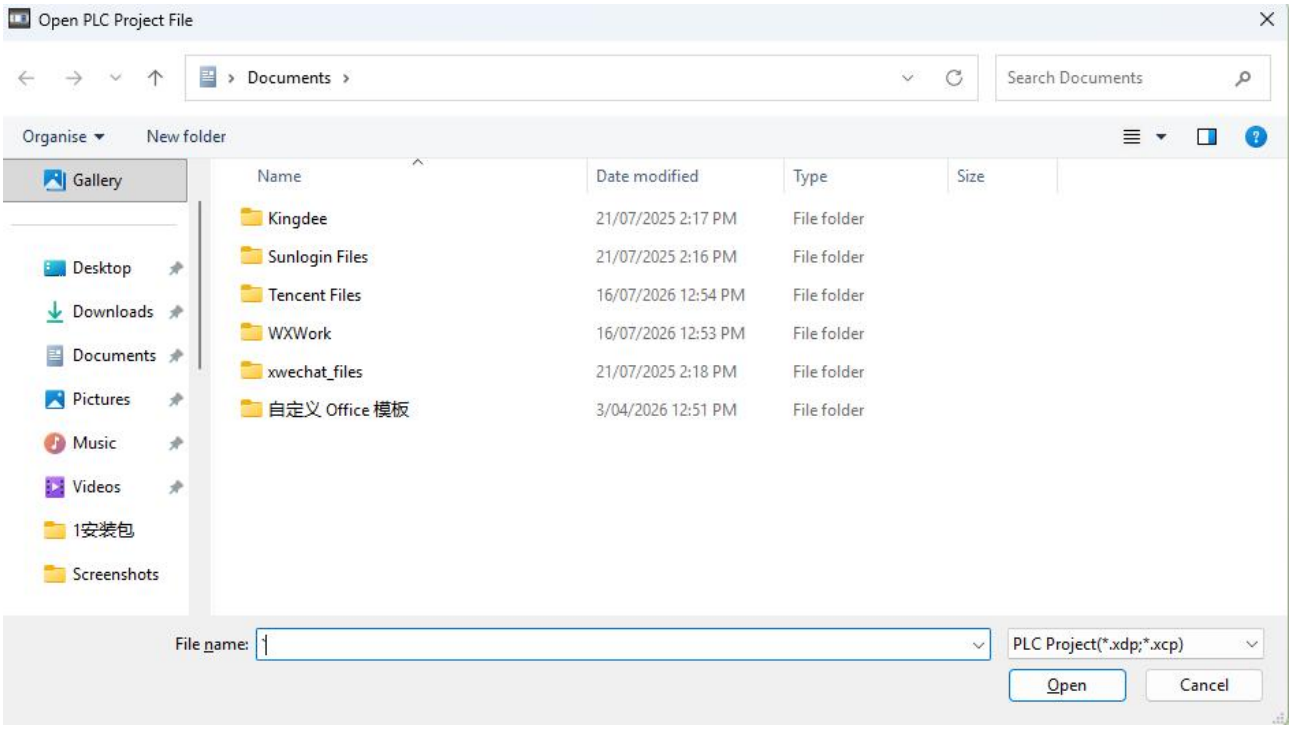
1. Select [File] → [Create New Project], or click the  Icon "", to open the Model Selection window as shown below:



2. In the "Model Selection" window, choose the engineering model corresponding to your actual device type, then click [OK] to create a new project.

2-2-2. Open the Project

Select [File] → [Open Project], or click the Icon  "", then choose an *.xdp file in the Open PLC Project File dialog box and click [Open] to complete.



- When opening an XDPPro project, if the software detects it as an older version file, it will first back up the original file and rename it uniformly as *.bak. To use the previous version, simply change the extension to ".xdp" and open it with XDPPro. *.bak files can be located by right-clicking the program, selecting Open File, and choosing the backup folder.
- The software automatically saves backups every 3 minutes. In case of an error, you can restore the project from the "bak" file in the backup folder. If the software closes normally, the backup files will be deleted.

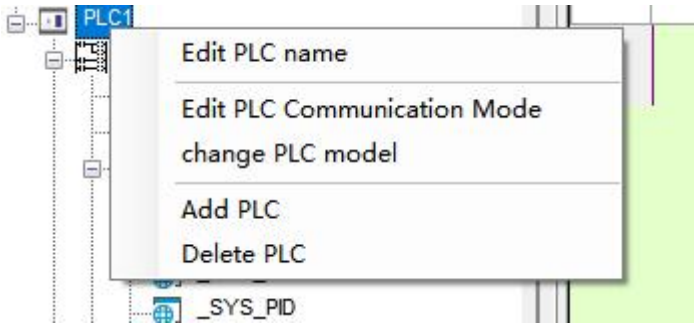
2-3. Adding and Removing PLC Types

When a new project is created, it defaults to PLC1. If users need to edit multiple PLCs, they can add several PLC editing objects within the same interface.

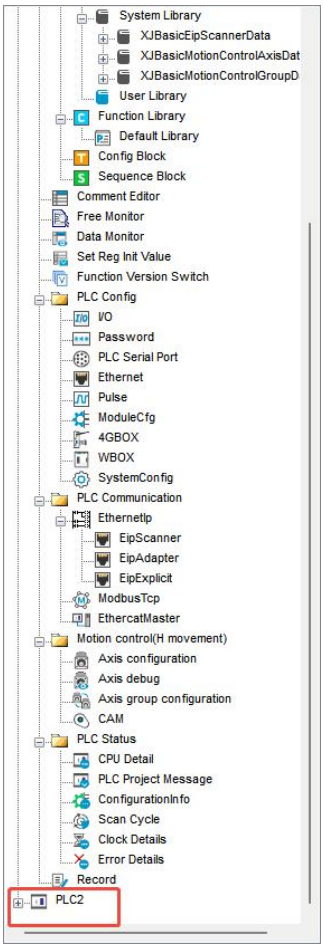
2-3-1. Add PLC

Method 1: Click [File] - [Add PLC].

Method 2: Go to the left Engineering tab, right-click [PLC1] – Add PLC. As shown below:



After successfully adding the PLC, it will be named "PLC2" by default, as shown below:

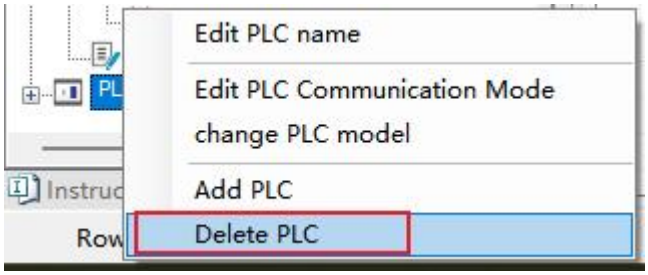


When editing different PLCs, simply click each one. Users can also modify names, edit communication modes, change model types, or delete entries directly.
This feature allows programs for multiple PLCs within the same industrial control system to be stored in a single project file.

The PLC name in the project must not contain; otherwise, the program cannot be downloaded properly.

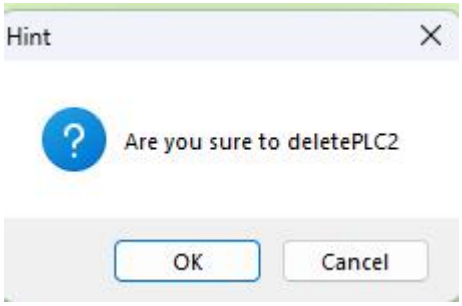
2-3-2. Delete Model

Method 1: Right-click the PLC you want to delete and select "Delete PLC".



Method 2: First select the PLC you want to delete, then click [File] → [Delete PLC].

After performing the operation, the system will prompt you to confirm deletion. Confirm by clicking "OK," or click "Cancel." As shown below:

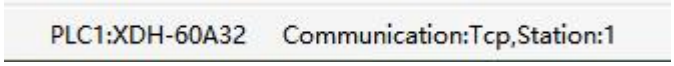


- Code from multiple PLC editing objects can be copied between each other, and operations such as copy-paste can also be performed across different projects.
- Copy ladder diagrams between different projects; do not cross software versions. If you cannot copy a ladder diagram across versions, convert it to a command sequence, paste it into the new project, and then convert it back to a ladder diagram.

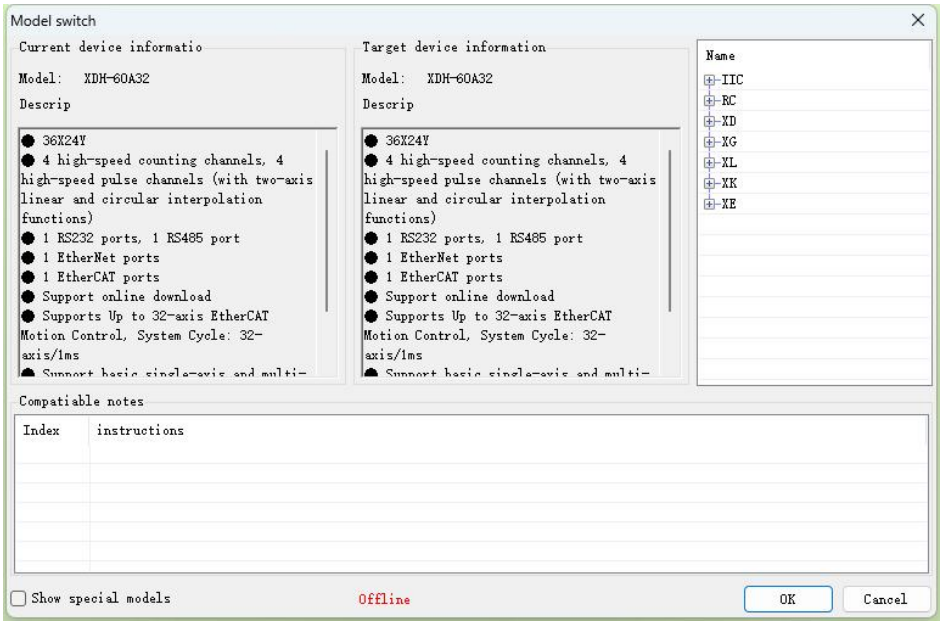
2-3-3. Change Device Model

Method 1: Click [File] → [Change PLC Model].

Method 2: Double-click the PLC model in the status bar.

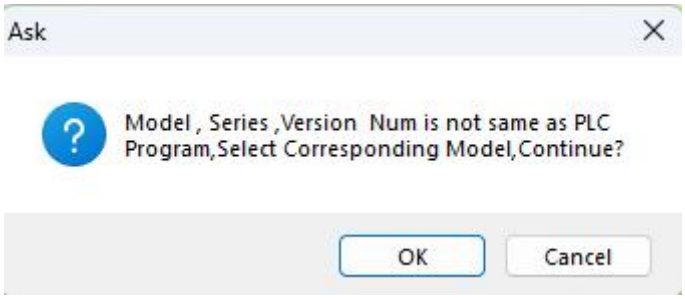


After clicking, the model switching interface will appear:



Users can switch devices based on their needs.

When successfully connecting to a PLC using the programming software, if the connected PLC model differs from the default model set when the software launches, a message will appear: "Model and serial number do not match the PLC." The software will automatically select the appropriate model. Continue? Click OK to replace the software's model with the actual one recognized during connection.



3. Basic Introduction to the Editing Environment

3-1. Basic Composition of the Interface

Title: Below the "xinje PLC Programming Tool Software" section, display the file name and path of the currently open ladder diagram program.

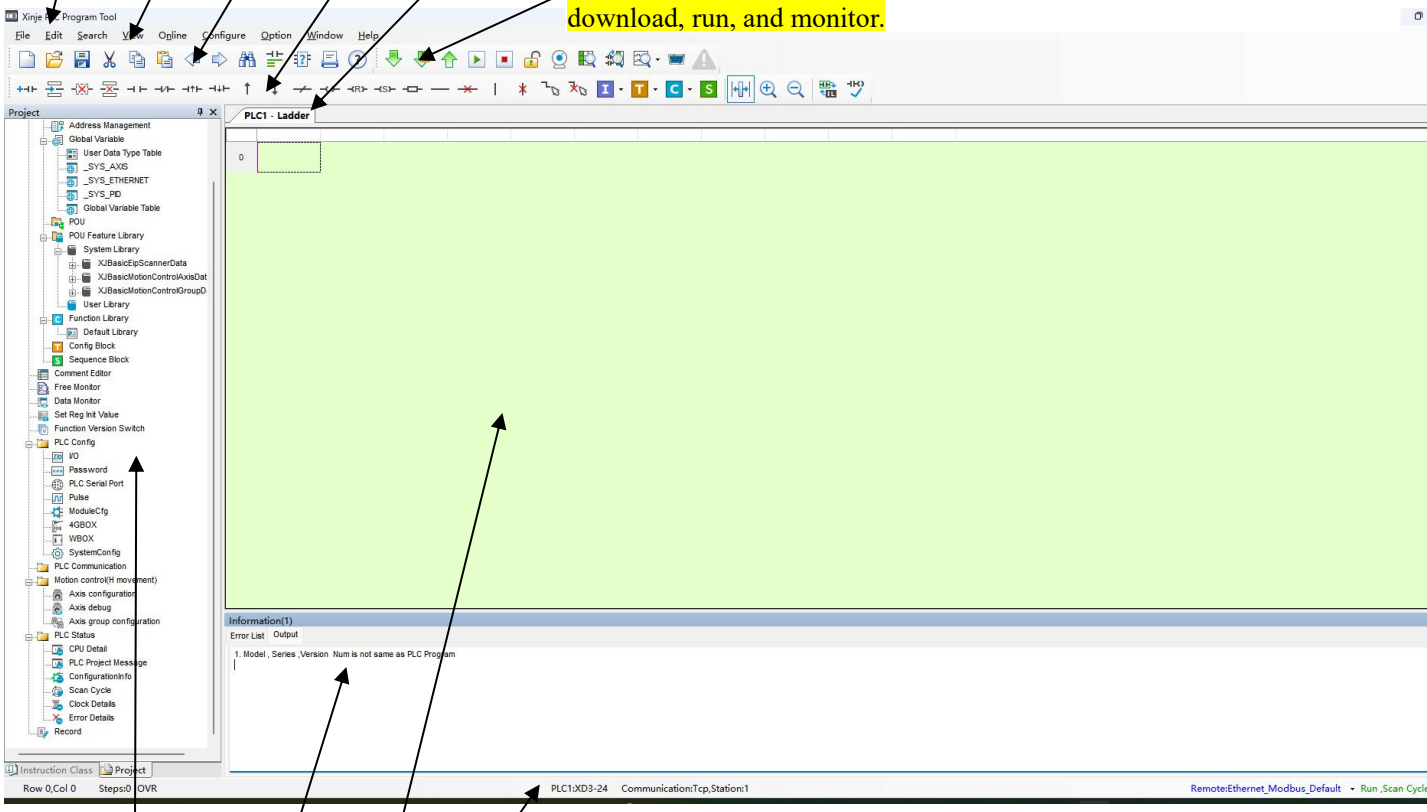
Menu Bar: Select the action from the drop-down menu.

Standard Toolbar: Icons for basic functions such as Copy and Find.

Trapezoid diagram input field: Select the appropriate symbol Icon to enter the instruction symbol.

Window switching bar: Switches between windows such as the histogram, soft component annotations, and used soft components.

PLC Operation Panel: Includes common operations such as upload, download, run, and monitor.



Status bar: Displays information such as the PLC model, communication method, and operational status.

Edit Area: Area for entering trapezoidal diagrams and writing programs.

Information Bar: Displays error lists and outputs.

Engineering Bar/Command Bar: Displays the project directory and command list. The options in the Engineering Bar are primarily designed to facilitate user operations; these functions are also included. In the menu bar.

Each form can be freely adjusted in position and size.

3-2. Regular Toolbar

Icon	Function	Explain
	Create New Project	Create a Project
	Open Project	Open existing trapezoidal diagram programs, annotations, and other files
	Save Project	The operation to save edited files such as ladder diagram programs and annotations
	Shear	Perform the cut operation within the specified range
	Duplicate	Copy within the specified range
	Paste	Paste the cut and copied content to the specified location
	Move Backward	Return to the previous cursor area
	Forward Positioning	Jump to the area where the cursor is located (relative to the previous step)
	Seek	Find components within a specified range
	Trapezoidal Diagram Showing Node Annotations	Trapezoidal diagram showing node annotations
	Block Display	Axis instructions and other commands are displayed in blocks.
	Put A Seal On	Print the program in ladder diagram or instruction set format
	Help	View Help Documentation

3-3. PLC Operation Panel

Icon	Function	Explain
	Download the user program from your computer to the PLC.	Download the program or data from the programming software into the PLC.
	Download the user program securely from the computer to the PLC.	Download the program or data from the programming software to the PLC in a secure manner. Once downloaded, the program cannot be uploaded; attempting to upload will display the message "Program does not exist."
	Upload the user program from the PLC to the computer	Read the program or data from the PLC into the programming software.
	Move PLC	Run the program in the PLC
	Stop PLC	Stop the program running in the PLC
	Password activation	Lock the program

Icon	Function	Explain
	Close Password	Unlock the program
	Supervisory Control	Monitor the execution process of the ladder diagram program
	Data Monitoring	Monitor and configure the status or values of all software components in the PLC.
	Free Monitoring	Monitor and configure the status and values of specified PLC soft components and variables.
	Oscilloscope Monitoring	Monitor the status and numerical changes of specified PLC software components.
	Communication Parameter Configuration	Configure communication settings to connect to the PLC
	Monitoring Warning	Ensuring the consistency between the addresses of monitoring system variables and the addresses of device variables

To lock the PLC for the first time, enter a password in "PLC Settings" → "Password," then re-download the program—the PLC will automatically lock it. After locking, unlock the system before uploading the program (the "Upload" button will display an unlocking interface; alternatively, manually click to unlock and enter the correct password to proceed). Once unlocked, the program can be uploaded without a password. Clicking "Lock" again will restore the password requirement.

3-4. Trapezoid Diagram Input Field

Icon	Function	Icon	Function
	Insert A Node		Lineae Transversae
	Insert A Row		Delete The Line
	Delete A Node		Vertical Line
	Delete A Row		Delete Vertical Line
	Always Open Node		Draw A Line With The Mouse
	Always Closed Node		Delete With Mouse
	Rising Edge		Command Configuration
	Trailing Edge		Configuration Block
	Multi-Condition Rising Edge		C Function Block Library
	MultIconditional Descent Trajectory		Sequential Function Block

Icon	Function	Icon	Function
	Take Negation		Auto-Adjust Column Width
	Output Winding		Amplify
	Reduction Coil		Reduce
	Set Coil		Trapezoidal Chart Conversion
	Other		Grammar

3-5. Menu Bar Introduction

3-5-1. "File"

Icon	Operate	Explain
	Create New Project (Ctrl+N)	Create a new project
	Open Project	Open a created project
-	Close the Project	Close the current project
	Save Project (Ctrl+S)	Save the current project
-	Save as Project	Save the current project with a new file name
-	Advanced Save	You can choose whether to save comments, and C language is not displayed by default; FS cannot be configured.
-	add PLC	Add a new PLC programming object
-	Search the 485 network to add a PLC	Search for PLCs in the 485 network (this function is not supported)
-	delete PLC	Delete the selected PLC programming object
-	Change PLC Model	Change the selected PLC model
-	Import PLC Model	Import the dedicated machine configuration file
-	Import Downloaded File	Import/Export as a downloadable file (no source file), for production under program confidentiality requirements
-	Export and Download File	
-	Print Settings (Ctrl+P)	Set Printing Options
	put a seal on	Start Printing Program
-	Open the project recently	Open the recently edited project
-	withdraw from	withdraw from

3-5-2. "Edit"

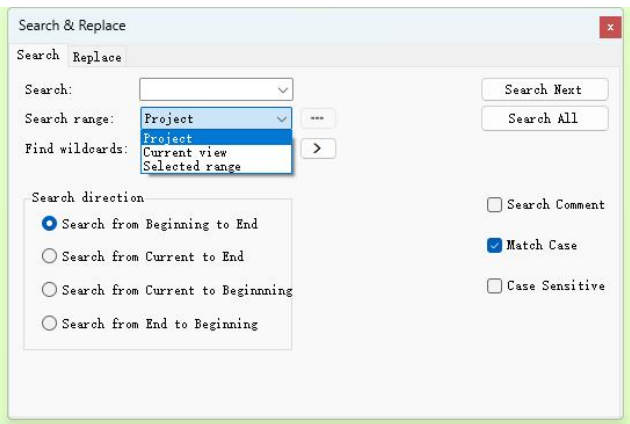
Icon	Operate	Explain
-	Cancel (Ctrl+Z)	Cancel the previous operation (repeat 10 times)
-	Redo (Ctrl+Y)	Restore the previous canceled operation (repeat 10 times)
	Cut (Ctrl+X)	Cut the statement or ladder diagram

Icon	Operate	Explain
	Copy (Ctrl+C)	Copy a statement or ladder diagram
	Paste (Ctrl+V)	Paste the copied or pasted statement or ladder diagram at the specified location
-	Select All (Ctrl+A)	Select the entire current trap diagram or statement
-	Delete	Delete the selected trapezoidal diagram or statement
	Insert a row (Shift+Insert)	Insert a row at the specified location
	Delete a row (Shift+Delete)	Delete the current row
	Delete vertical line	Delete the current vertical line
	Insert a Node (Insert)	Insert a node at the specified location
	Delete a node	Delete the current node
-	Edit Node Annotation	Annotate nodes
-	Trapezoidal Chart Label	Trapezoid diagram illustration. See the "Trapezoid Diagram Input Field" for usage.
-	Special Function Instruction Configuration	Configure PID, pulse, high-speed counting, configuration blocks, and sequential blocks.

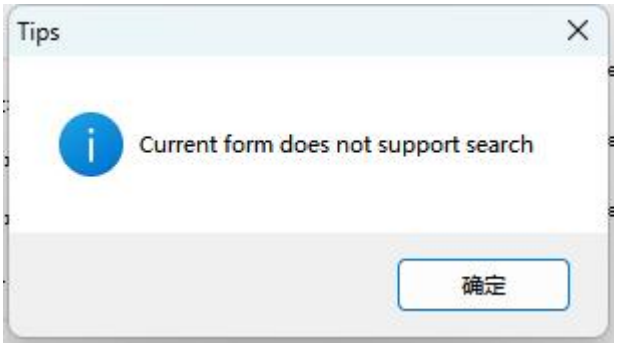
3-5-3. "Find/Replace"

Icon	Operate	Explain
	Search (Ctrl+F)	Find the specified soft component or variable
-	Step Number Search (Ctrl+T)	Find a specific step number
-	Row Number Search	Find specified row number
-	Replace (Ctrl+R)	Replace the specified content
	Move backward (Alt+Left)	Return to the previous cursor area
	Move Up (Alt+Right)	Jump to the next cursor area (relative to the previous operation)

■ The search range offers three options: Engineering, Current View, and Selected Range.



- Engineering search refers to locating target content across all program components, including the main program, POUs, function blocks, and global variable tables.
- Current view search refers to the window where the mouse focus is located. If the focused window does not support search (e.g., soft component annotations or usage status), clicking "Search Next" will display: This window does not support search.

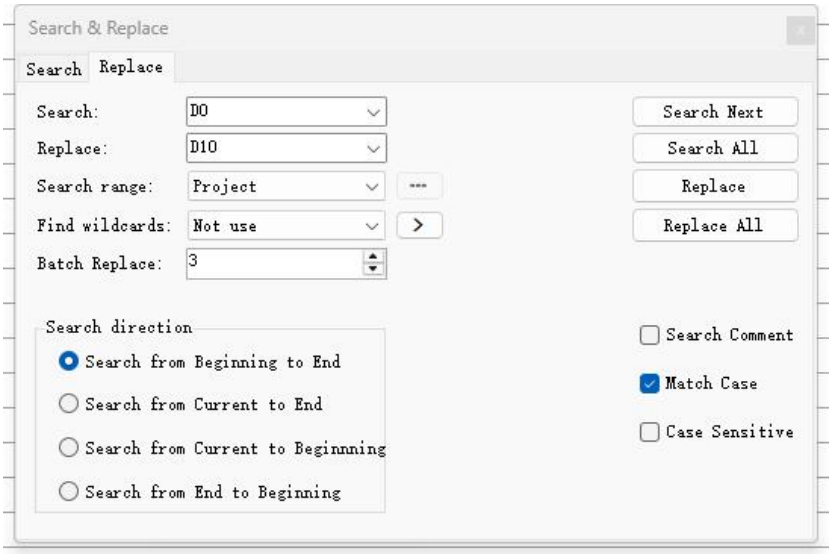


- Selection Range: Select "Selection Range". The "..." button on the right is available. Click it to open the "Select Find/Replace Range" dialog box, where you can select files to search and replace using the tree diagram. For other options, the "..." button on the right turns gray; clicking it is invalid.

When searching for soft components, the search criteria must be adjusted due to differences in representation between C language and the main program; for example, in C, HD150 is written as HD[150].

■ Register batch replacement refers to the number of soft components that are sequentially replaced starting from the current one.

For example: In the engineering project, there are three consecutive registers D0, D1, and D2. Set the search content to D0, replace it with D10, and perform batch replacement on 3 entries. Consequently, D10, D11, and D12 will replace D0, D1, and D2 in the current project.



3-5-4. "Display"

Icon	Operate	Explain
-	Data Monitoring	Display Data Monitoring Window
-	Free Monitoring	Display the Free Monitoring Window
-	Engineering Section	Display Engineering Bar
-	Command Prompt Box	Display Command Prompt Box
-	Information Box	Display Information Box
-	Tool bar	show toolbar
-	Status bar	Show Status Bar
	Auto-adjust column width	Content can also be fully displayed when the window is compressed
	Amplify	Zoom in on the ladder diagram
	Reduce	Zoom out the ladder diagram
	Command Language/Ladder Diagram Conversion	Display the program in command language/ladder diagram format
	Trapezoidal diagram showing node annotations	Display node annotations in the flowchart
-	Node Annotation List	Show Node Commentary List
	Block Display	Axis instructions and other commands are displayed in blocks.

3-5-5. "PLC Operation"

Icon	Operate	Explain

Icon	Operate		Explain
	Download the User Program		Download the user program to the PLC
	Securely Download the User Program		Download the program or data from the programming software to the PLC in a secure manner. Once downloaded, the program cannot be uploaded; attempting to upload will display the message "Program does not exist."
	Upload user program		Upload the program from the plc to the programming software.
-	Computational algorithm space consumption		Calculate the space occupied by the program in the plc
-	Calculate the space occupied by the secure download program		Space occupied by plc program during secure calculation download
-	Compare trapezoidal diagram programs		Comparing the programming methods for trapezoidal diagrams in engineering and equipment design
-	User configuration reading		Read the plc configuration into the programming software
-	User configuration writing		Write the plc configuration settings defined in the programming software into the plc.
	Move plc		Run the plc
	Stop plc		Stop the plc
-	Power supply stops the plc operation.		Use this function when a program error occurs and power the device again.
-	Software-based plc reset		The software performs an approximate power-on process, replacing the traditional power-on procedure for configuration writes.
	Supervisory control		Monitor the execution process of the ladder diagram program
	Data monitoring		Monitor and configure the status or values of all software components in the plc.
	Free monitoring		Monitor and configure the status and values of specified plc soft components and variables.
-	All outputs are prohibited		Disable all plc outputs and maintain this state until you click again or power the device on again.
-	Clear the saved area after power outage		Clear the saved area data during power loss; available when the plc stops.
	Plc lock		Lock the plc
	Plc deblocking		Unlock plc
	Grammar		Perform syntax checking on the program
-	Double-coil examination		Check for any issues with dual-coil output in the procedure.
-	Plc initialise		Restore all parameters in the plc to their factory settings
-	Plc information	Entity information	Display information about the currently online plcs
		Bd information	Show information about the bd board for online plc expansion
		Module information	Display module information for online plc expansion
		Scan period	Display the current scan cycle
		Error message	Show relevant error information for the plc

Icon	Operate		Explain
		Log information	Show relevant plc log information

- For detailed PLC information, refer to Section 4-4.
- To lock the PLC for the first time, enter the password in [PLC Settings] → [Password Setting], then re-download the program—the PLC will automatically lock it. After locking, unlock the system before uploading the program (the unlock interface will appear when you click Upload, or manually click Unlock and enter the correct password to proceed). Once unlocked, the program can be uploaded without a password; clicking Lock again will restore the password requirement.
- The program downloaded to the PLC after advanced saving and PLC encryption does not support comparing ladder diagram programs.

3-5-6. "PLC Settings"

Icon	Operate	Explain
-	PLC Serial Port Settings	When communicating via PLC, set the serial port parameters
-	Password Settings	PLC Encryption Password Settings
-	Extension Module Settings	Basic Settings for Extension Modules
-	PLC Initial Value Settings	Set initial values for PLC registers
-	Floating Point Setting	Set the number of comparison bits for the contact floating-point comparison instruction

3-5-7. "Options"

Icon	Operate	Explain
-	Communication Settings	Set the communication method for the PLC
-	TCP/IP Device Configuration	Configure TCP/IP Device
-	Download Settings	Select whether to remove comments or apply C-language encryption (the code remains executable after encryption, but its content cannot be viewed).
	Software Serial Port Settings	Set PLC Communication Parameters
-	Default decryption password settings	After setting a default decryption password, the system automatically decrypts files during uploads without requiring manual entry—using passwords from the list. A correct password unlocks the PLC, enabling file upload. To lock the PLC, press the Lock button in the menu or re-download the password-protected program; otherwise, no password is needed for program uploads.
-	Other Engineering Settings	Set the number of digits for floating-point display
-	Trapezoid Diagram Editor Settings	Set the color of the histogram, instruction prompts, bubble prompts, histogram bolding, and number of line breaks
-	C Editor Settings	Set relevant content in C language editing
	ST Editor Settings	Set relevant content in ST language editing

3-5-8. "Window"

Icon	Operate	Explain
-	Dock MDI	Windows can be freely docked at interface boundaries
-	the previous	Activate the previous window
-	next	Activate the next window

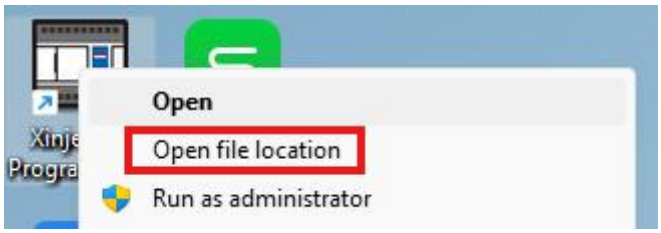
-	1 PLC1 – Schematic Diagram	Name of the currently active window

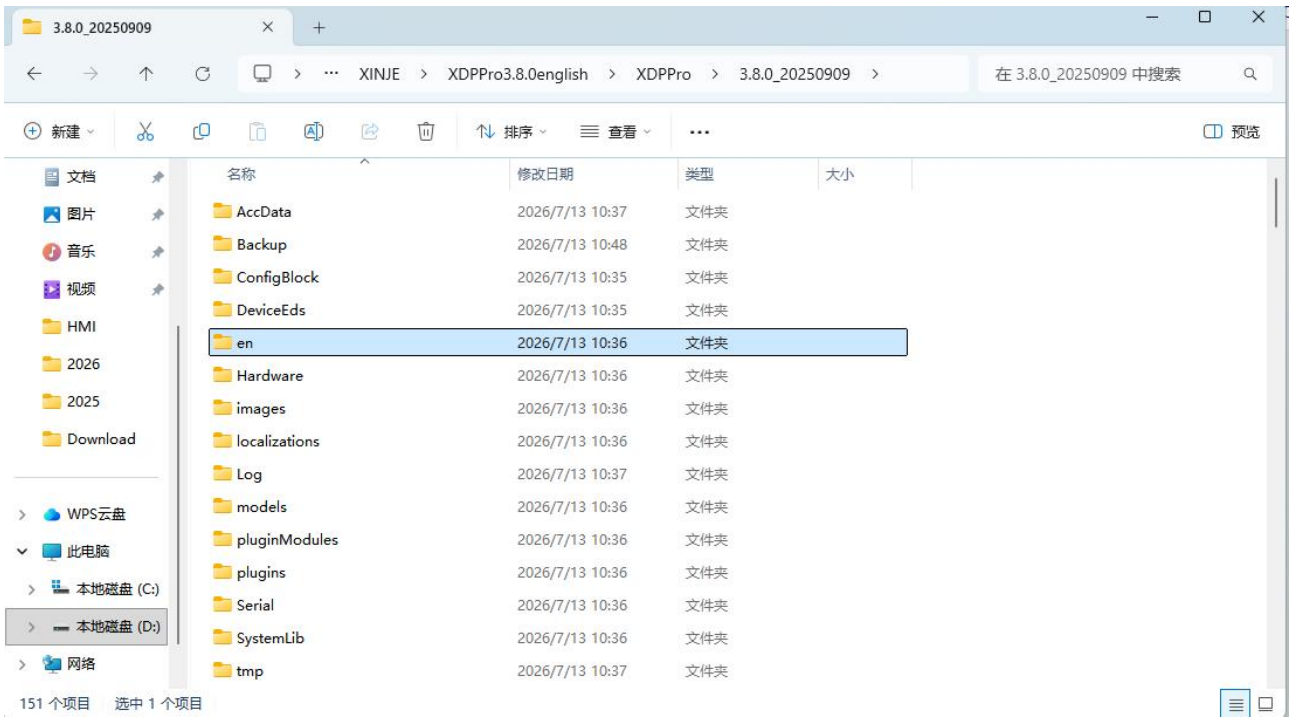
3-5-9. "Help"

Icon	Operate	Explain
	Help (F1)	For software usage manuals, you can manually add help documents.
-	software upgrading	Provide programming software upgrades (not supported yet)
-	firmware upgrade	Directly call the PLC system's self-update tool
-	about	Show basic information about the software

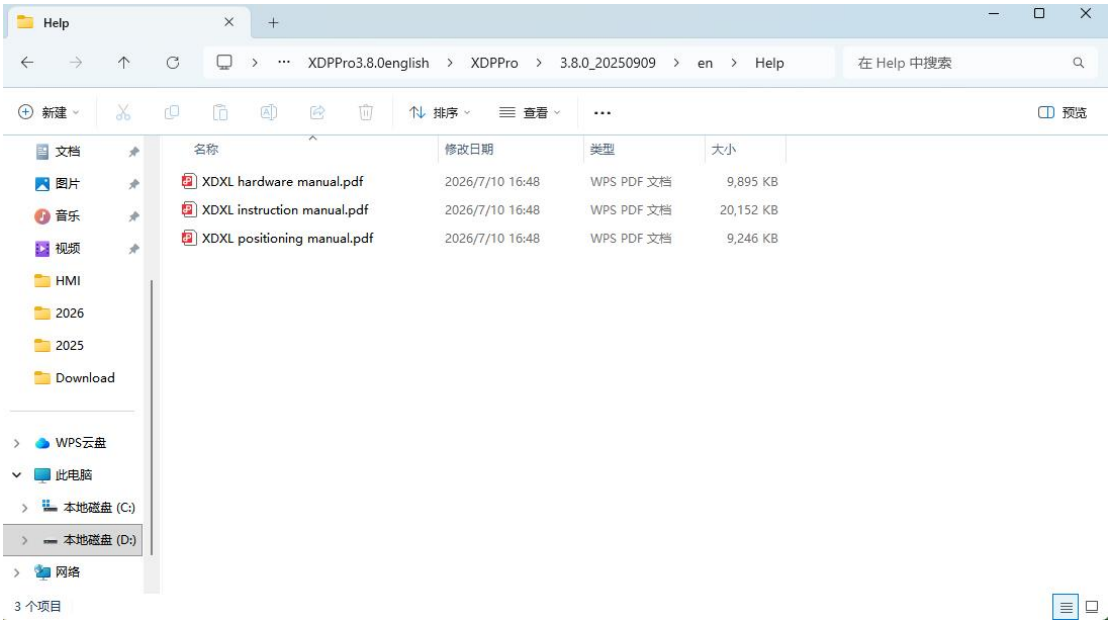
Manual steps to add help documentation:

1. Right-click the programming software shortcut on the desktop, then select "Open File Location" to open the folder where the software is installed.

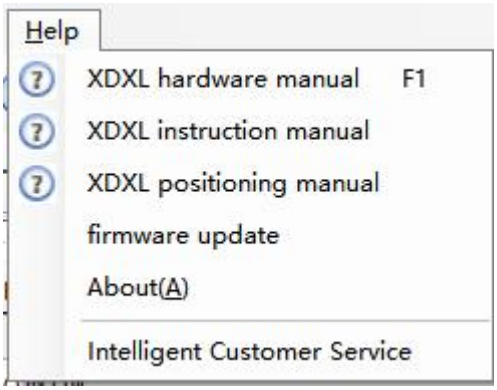




2. Locate the "en" folder, create a new "HELP" folder within it, and then paste the downloaded PLC instruction documents into the "HELP" folder.



3. Open the programming software; the [Help] menu will display the two added documents, indicating successful addition. You can then view the documents directly in the [Help] menu.



3-6. Project Bar

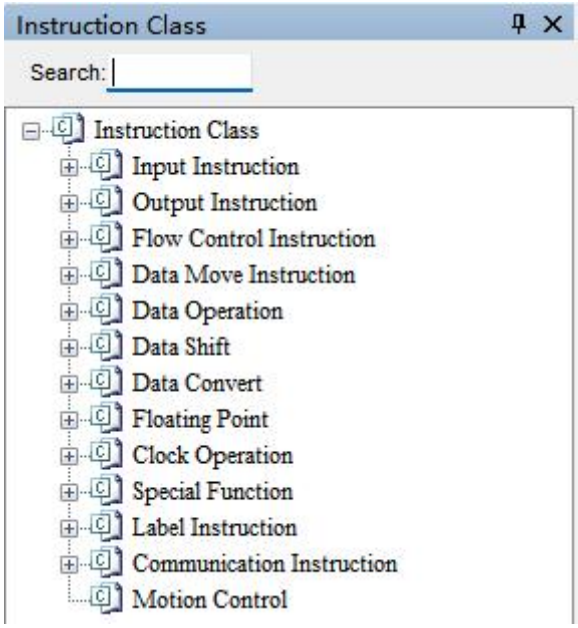
The left pane includes the "Engineering" section and the "Instructions Classification" section.

3-6-1. Project Bar

The Engineering section provides commonly used functions for PLC programming; detailed usage is covered in subsequent chapters.

3-6-2. Instruction Classification Column

Classify commands by function for easy user search. Press F8 to activate this interface, enter the command in the search box, and double-click to display the command name in the corresponding ladder diagram as shown below:



3-7. Introduction to Shortcuts

Keyboard shortcuts	Function	Keyboard shortcuts	Function
Ctrl+N	new construction	Shift+F6	trailing edge
Ctrl+S	Save Project	F7	output
Ctrl+P	print setup	Shift+F8	reset
Ctrl+Z	cancel	Shift+F7	set
Ctrl+Y	Redo	F8	other
Ctrl+C	duplicate	F11	lineae transversae
Ctrl+V	paste	Shift+F11	Delete the line
Ctrl+X	shear	F12	vertical line
Ctrl+A	check all	Shift+F12	Delete vertical line
Delete	Delete Node	Ctrl+F	seek
Shift+Insert	Insert a row	Ins	Insert a node
Shift+Delete	Delete a row	Ctrl+R	replace
F5	Always Open Coil	Alt+Left	Move backward
F6	Always-closed coil	Alt+Right	Forward Positioning
Shift+F5	rising edge	Ctrl+G	grammar
Ctrl+F5	Multi-condition rising edge	F1	help
Ctrl+F6	MultIconditional descent trajectory	Alt+F6	Take Negation

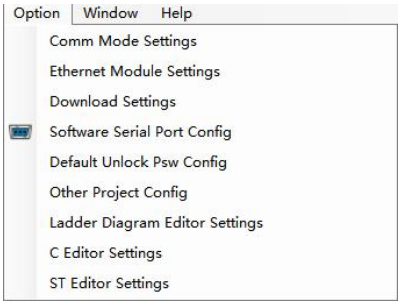
4. Implementation of Simple Functions

4-1. Online

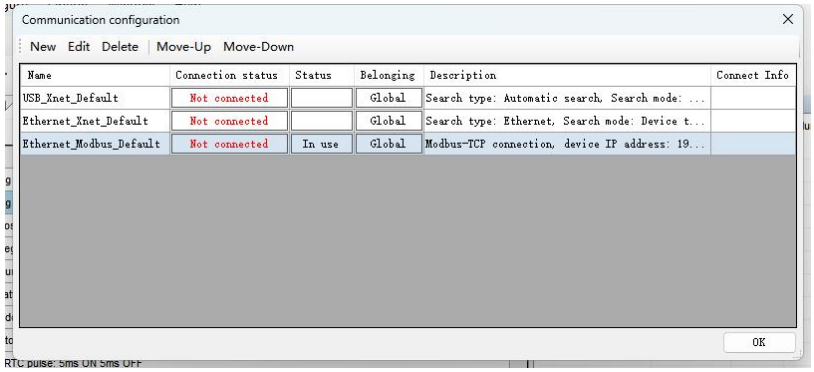
The XD/XL/XG series PLCs can be connected online via RS232, USB, or RJ45 ports: RS232 connections use XVP cables, USB connections use printer cables, and RJ45 connections use Ethernet cables.

4-1-1. Connect via USB port

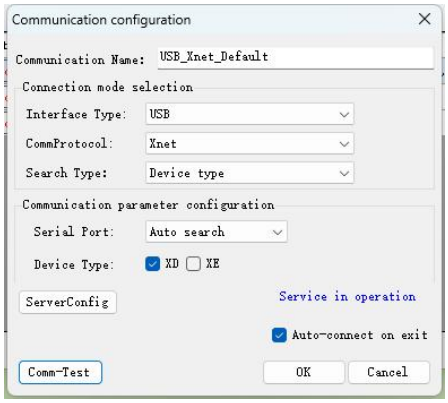
1. Click [Options] → [Software Serial Port Settings] in the menu bar  , or click the Icon".

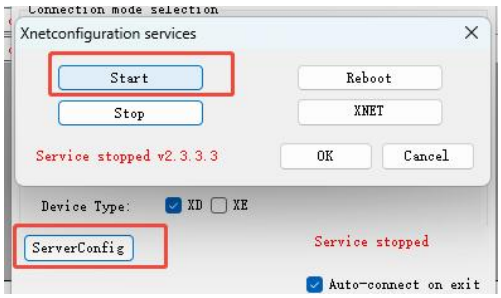


2. The [Software Serial Port Settings] window shown below will appear; click "New" to configure it as follows:

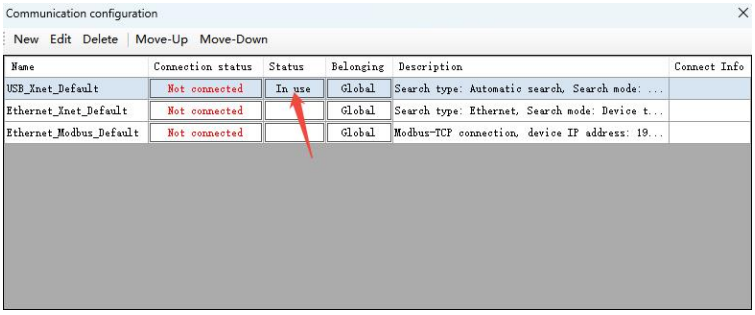


3. Select USB as the square communication interface, use Xnet as the communication protocol, specify device type for identification, restart the service, then click OK.

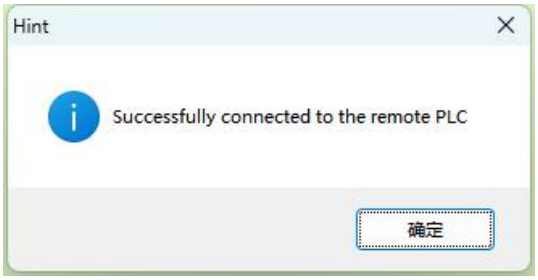




4. After changing the usage status to "In Use", click OK;



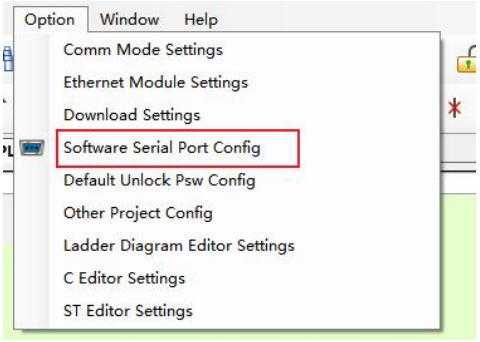
5. The message "Successful connection to the local PLC" indicates a successful connection.



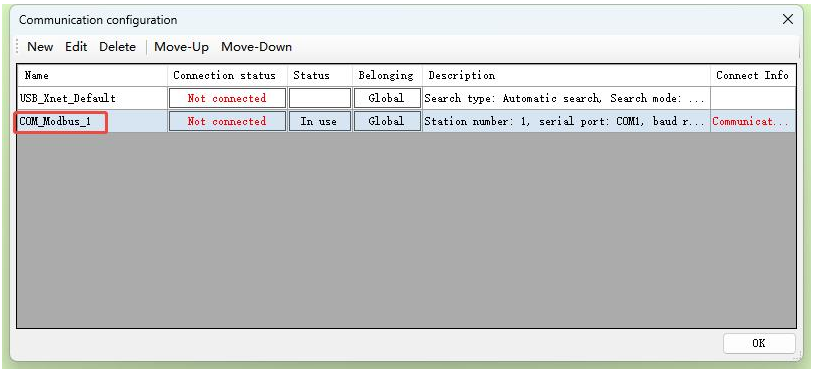
If the "XNet service not installed" prompt appears when opening Programming (as shown in the figure), it indicates that XNetConfigTool is not properly installed, causing abnormal connections via the XNET protocol. Close your antivirus software and firewall, then reinstall this configuration tool.

4-1-2. Connect via serial port

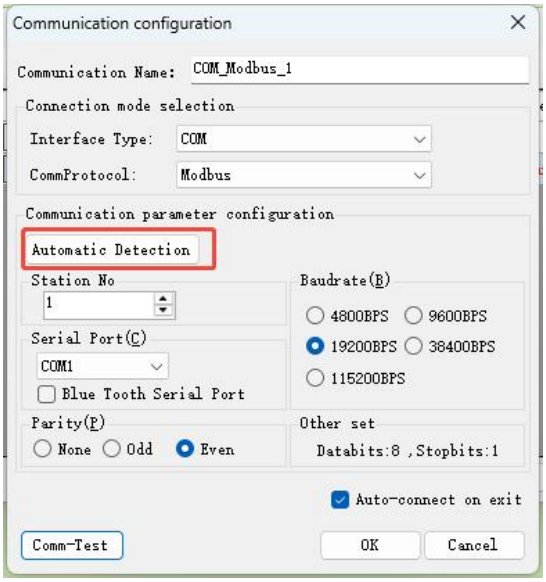
1. Click [Options] → [Software Serial Port Settings] in the menu bar , or click the Icon".



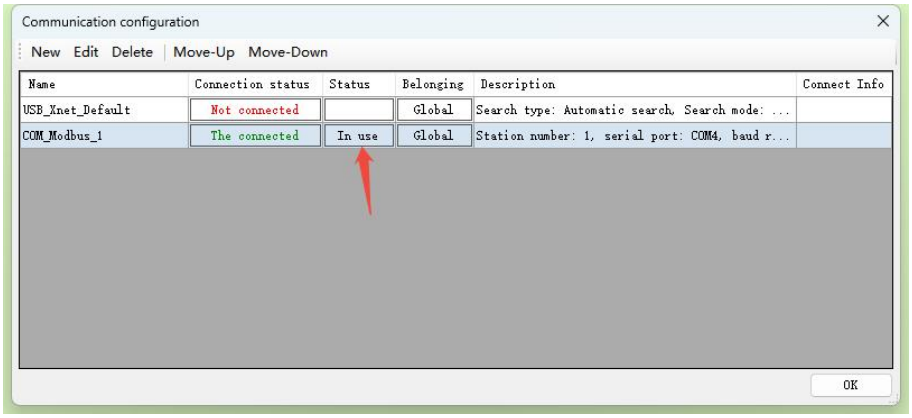
Follow the steps below:



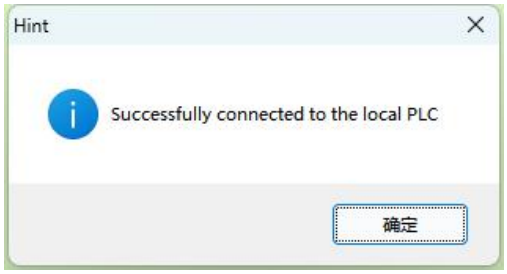
Click Auto Search to confirm successful PLC connection; then click OK.



The connection status for this method will change to Connected. Then, set the usage status from Connected to In Use, and click OK to complete the connection.



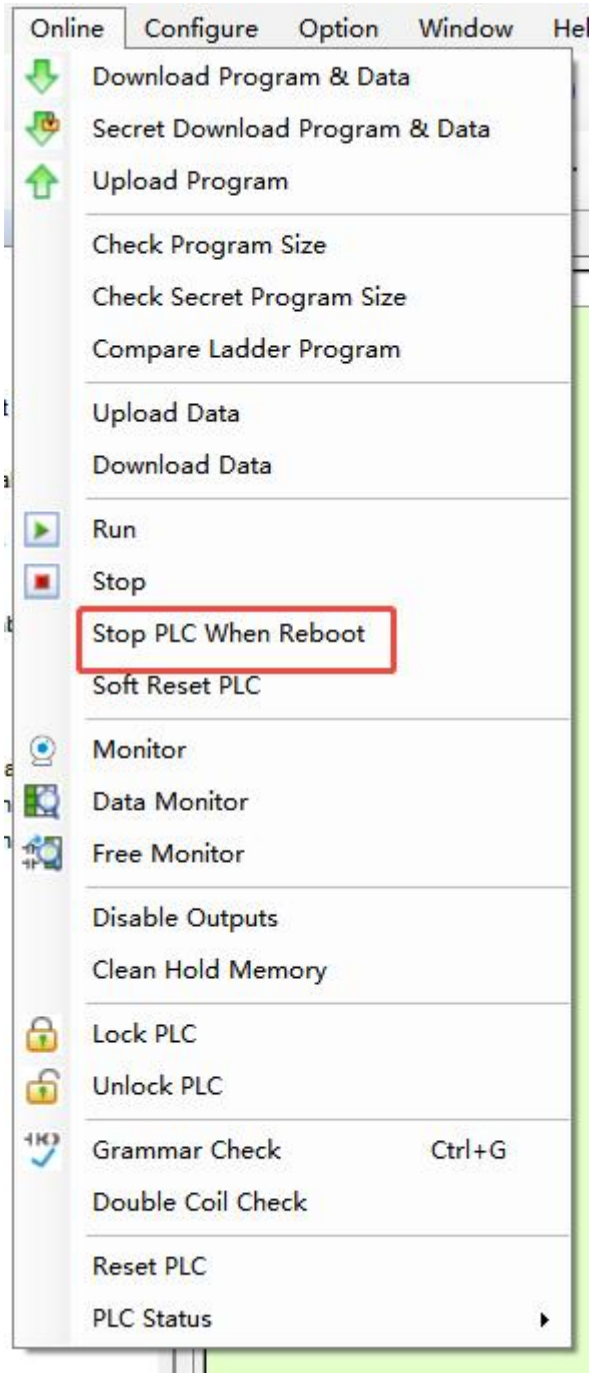
"Connected successfully to the local PLC." Your PLC is now connected to the PC.



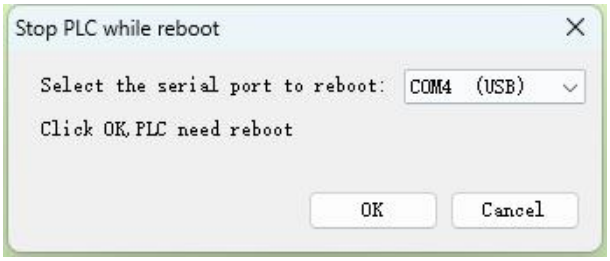
2. If automatic detection fails, you can power down the PLC.

If serial port detection fails and the following error message appears, it may indicate that the serial port parameters have been modified. Power on the device to restart the PLC.

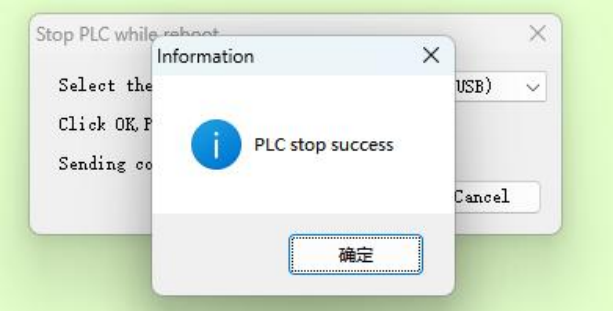
(1) Click "PLC Operation" again → Power on to stop the PLC; the following prompt will appear:



(2) Select the corresponding COM port in Device Manager, confirm it is connected to PORT1 on the PLC, and click OK:



(3) Follow the instructions to power off the PLC. Once the PWR indicator light turns off, wait 5 seconds, then power it on again. If the following message appears, indicating successful power-on completion, click OK.



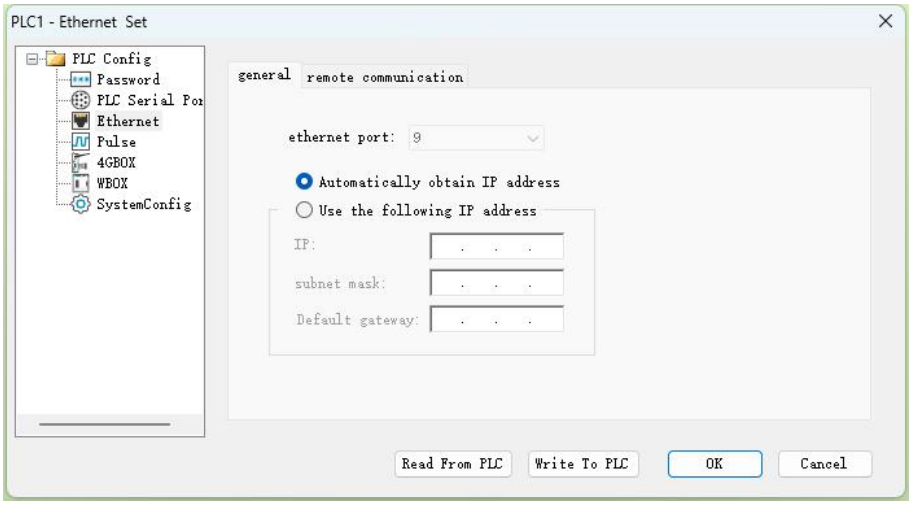
(4) After clicking OK, select Run PLC; the running scan cycle will appear in the bottom-right corner, indicating successful connection.

(5) If power shutdown fails or the connection to the PLC cannot be established after shutdown, please contact our sales for service.

4-1-3. Connect via Ethernet port

1. Set the IP address for the PLC's network port

The default IP address for the network port PLC is 192.168.6.6 and can be modified using programming software. Open XDPPro, then navigate to [PLC Configuration] → [Ethernet Port] in the Engineering section on the left side of the interface, as shown below:

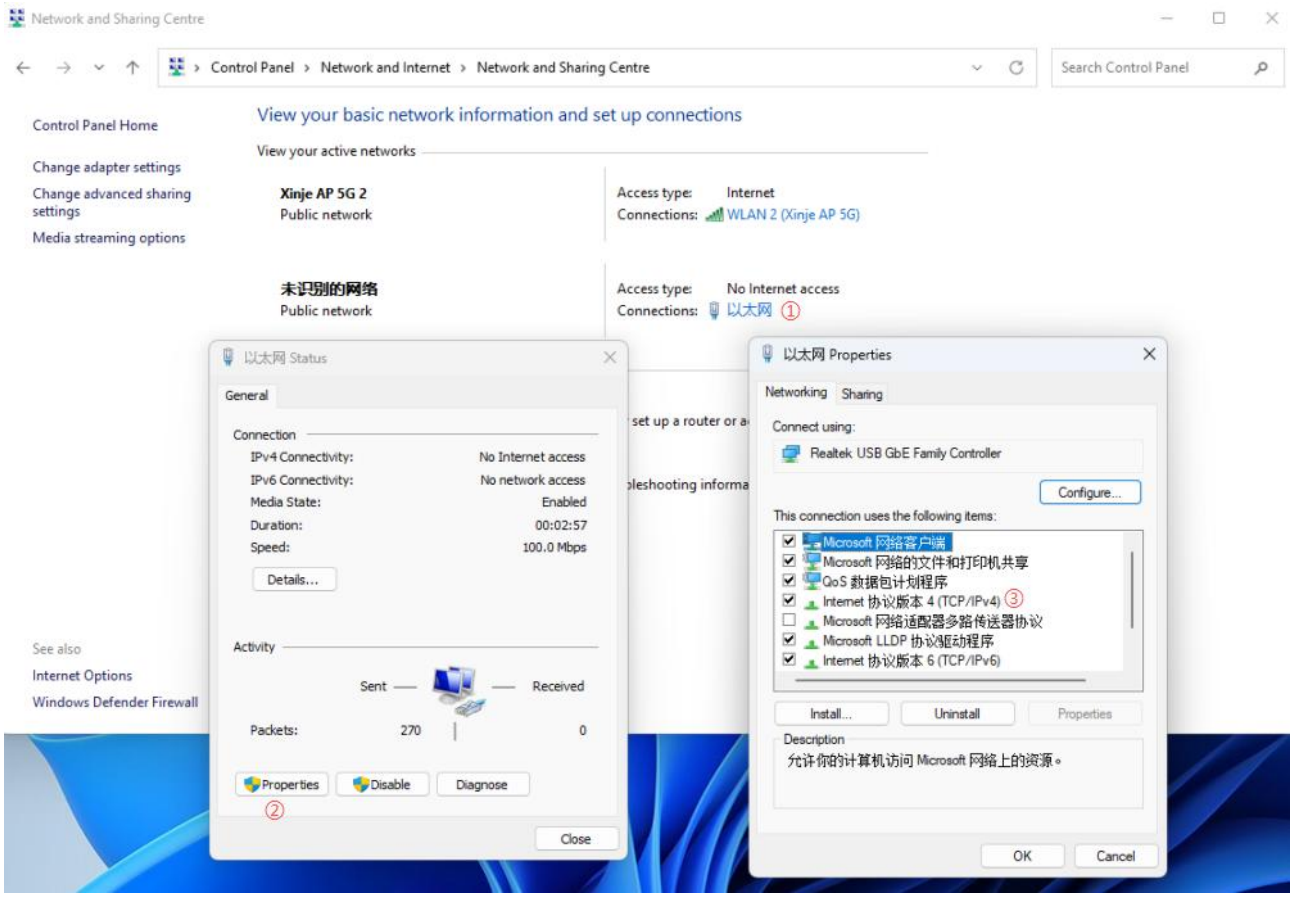


After modifying the IP address, write the configuration to the PLC and restart the PLC after power-off; the new IP address will take effect.

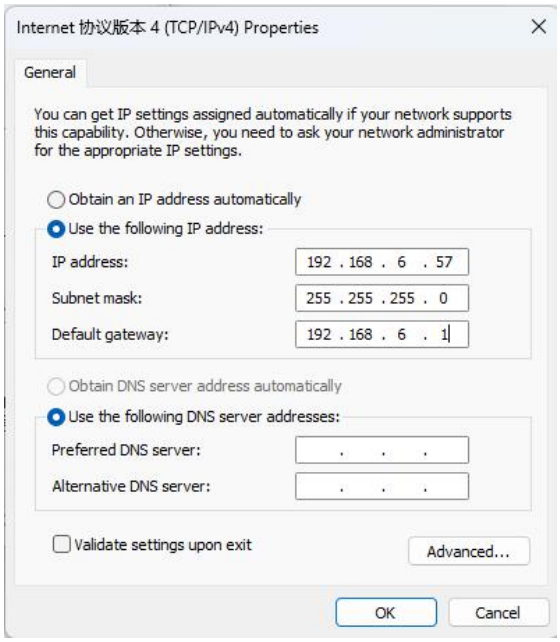
2. Set your computer's IP address

(1) In the bottom-right corner of your computer desktop, locate the network Icon and right-click to select "Open Network Sharing Center". 

(2) On the Network and Sharing Center interface, double-click "Local Connection" to view network card status information, then double-click the "Properties" button. In the menu bar, locate the IPv4 Settings option and double-click to open the IP Address Configuration interface.



(3) Enter the required parameters in the IP address configuration interface as shown below, then click the "OK" button to complete the configuration.



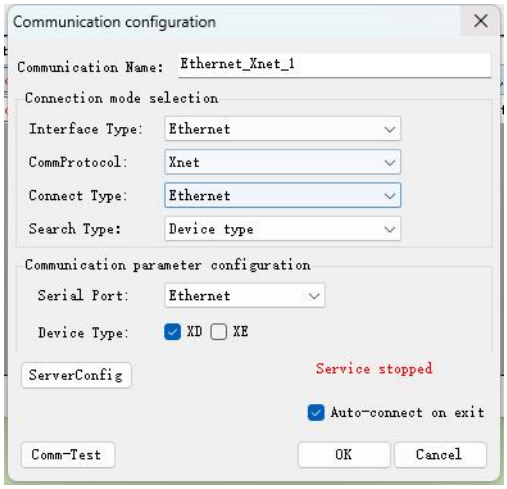
3. XDPPro connects to the PLC via a network port

There are three primary methods for connecting a network port to a PLC: specifying an address, locating the LAN port by ID, or establishing a remote connection.

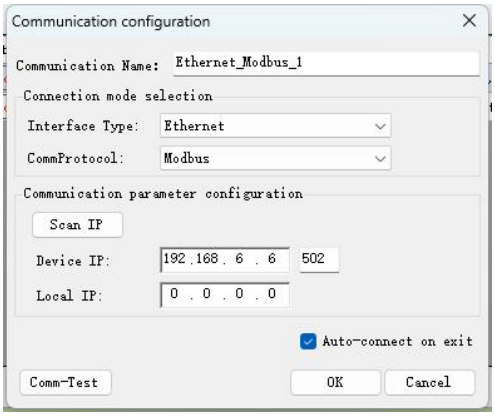
4-1-3-1. Specify IP address for connection

Open the programming software, select [Software Serial Port Settings], and choose any communication port to enter the configuration interface. Select "Ethernet" as the communication interface. The network port supports both Modbus-TCP and XNET protocols; either protocol can be selected.

- Select the XNET protocol and choose the IP address configured for the network port. Then click "Configure Service" → "Restart Service". After completing the parameter settings, click OK to finalize the connection.



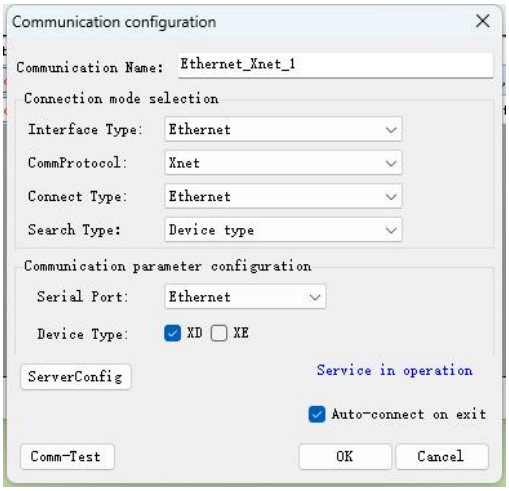
- Select the Modbus-TCP protocol. Enter the PLC's IP address as the device IP and your computer's IP address as the local IP. Alternatively, click "Scan IP" to automatically enter the required parameters, then confirm to complete the connection.



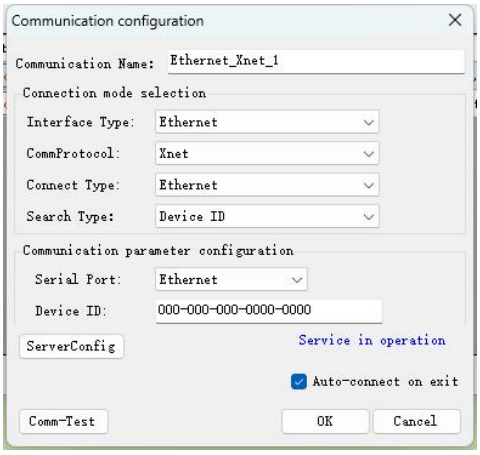
4-1-3-2. Find LAN ports by ID

Open the programming software, select [Software Serial Port Settings], choose any communication port to enter the configuration interface; set the communication interface to Ethernet, select XNET as the communication protocol, choose Local Area Network Port as the connection method, and select Device Type or Device ID as the search option—both methods are valid.

- Select "Device Type" as the search option, check the corresponding type, then click "Configure Service" → "Restart Service", and confirm to complete the connection.



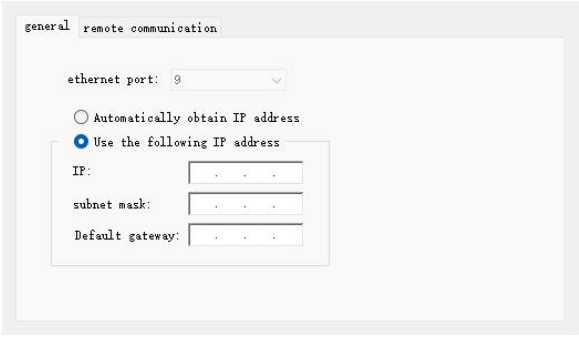
- Select "Device ID" as the search method and enter the PLC's network port ID (the PLC ID can be viewed on the PLC label or in the "PLC Body Information" section of the left menu bar; this requires a successful connection between the PLC and the software).



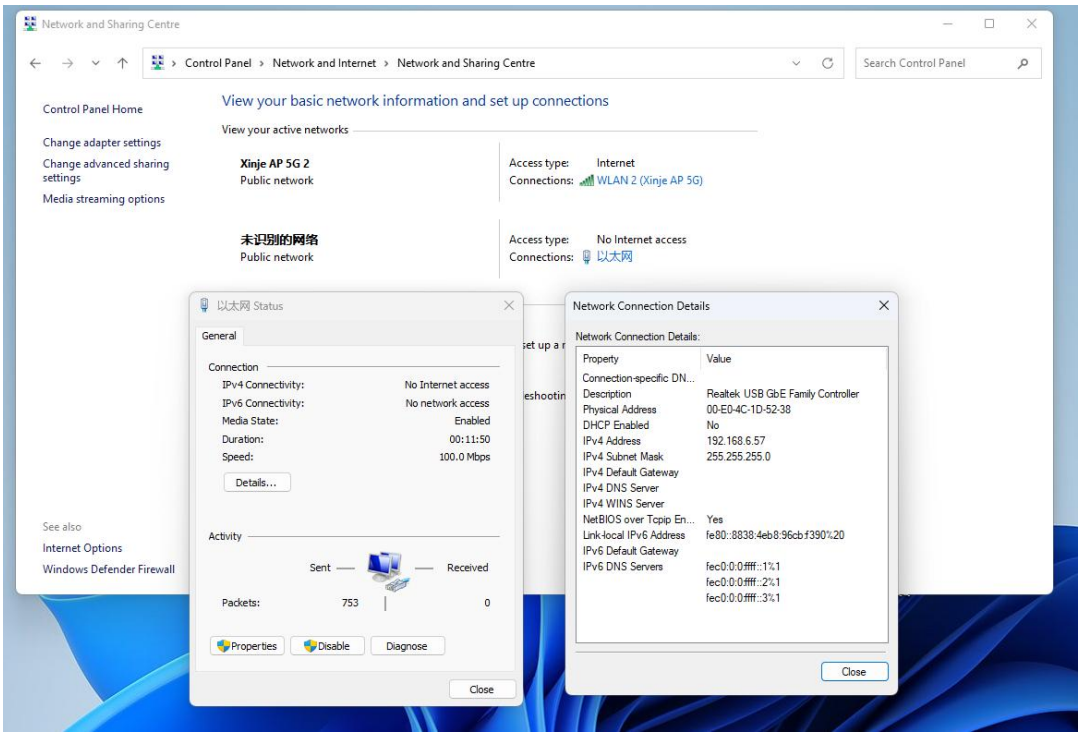
- For ID and LAN connections, the PLC's IP address must reside in the same network segment as the computer's IP address.
- A computer may have multiple network cards. When communicating with a PLC via Ethernet, use only one network card and assign it a single IP address.

If the connection still doesn't establish after normal operation, follow these steps to check:

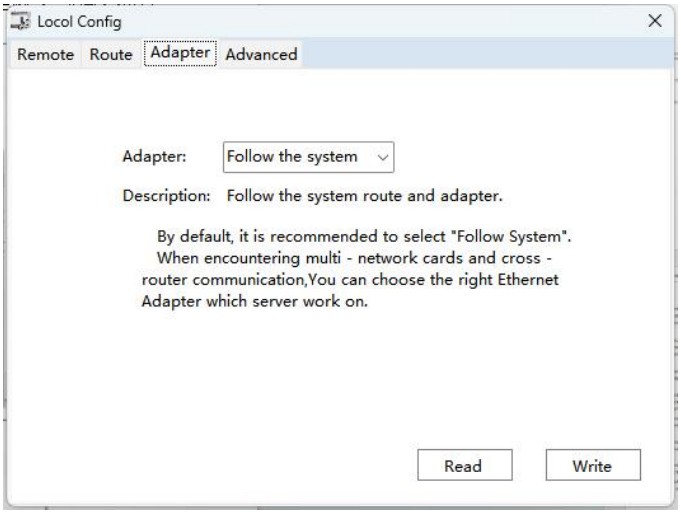
1、If your computer can successfully ping the PLC's IP address (you can follow the ping procedure by searching on Baidu or referring to Section 1-1-3 of the Ethernet Communication User Manual), but cannot establish a connection, check the "Ethernet Port" field in the left engineering panel of the programming software. If the Ethernet configuration is set to "Auto Get IP Address," modify the "Use Below IP" option, specify the desired IP address, and then power on the PLC again.



2、 If Step 1 confirms no issues, check the computer's Local Connection Status under Details to verify the IPv4 address and ensure there is only one IP address. If there are two IPv4 addresses, the computer has two network cards; uninstall the extra card. Follow steps 4-1-3-4 to uninstall the network card.

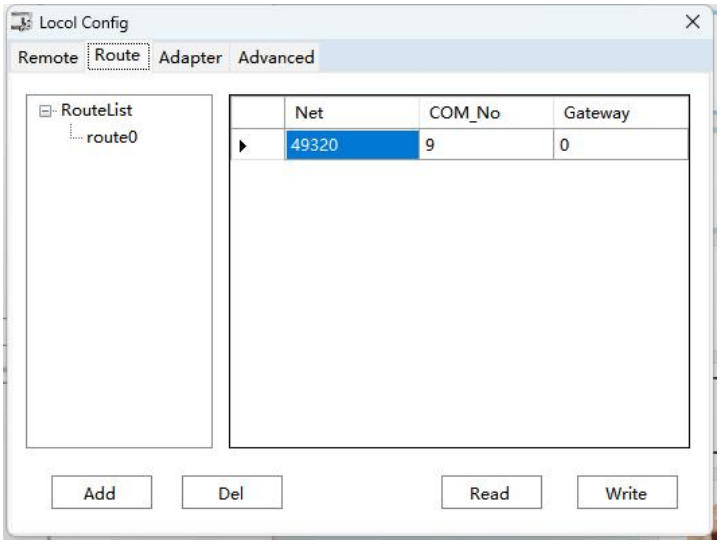


3、 If both steps confirm no issues, use the XNet config tool to check "My Computer," go to "Adapter Settings," and select "Follow System" or the corresponding network card.



My Computer Router Configuration

4、If all the above configurations are correct and ping is successful, use the XNet config tool to check both the "Route Table Settings" in My Computer and those on your PLC. Ensure they match; then click Read to view the route table settings.

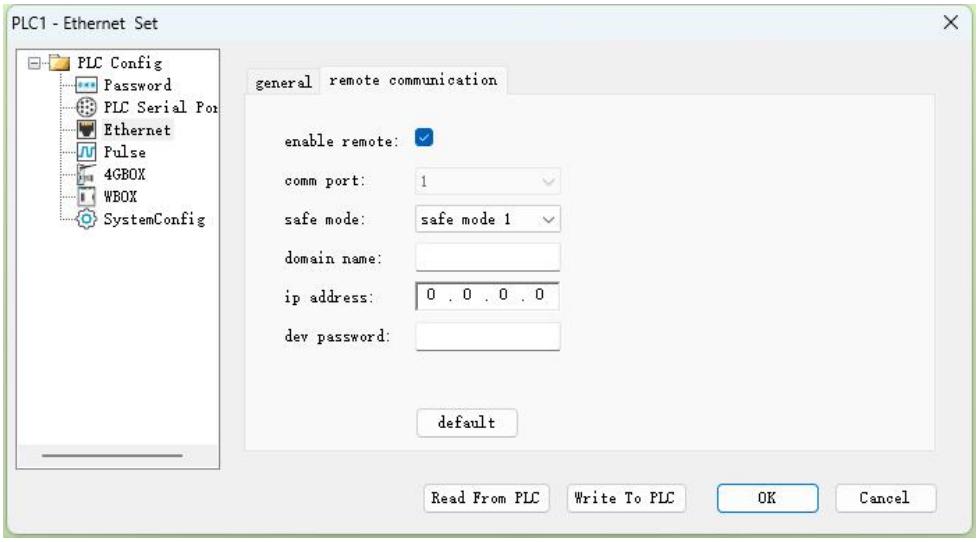


PLC Routing Table Configuration

4-1-3-3. Remote Connection

1) Remote Communication Settings

On the left side of the software, select [PLC Configuration] → [Ethernet Port], then open the window and choose "Remote Communication." For detailed parameters, refer to Section 3-1-2 of the X-NET Communication User Manual. Using the default value writing example, the configuration takes effect after the PLC is power-restarted, as shown in the figure below:



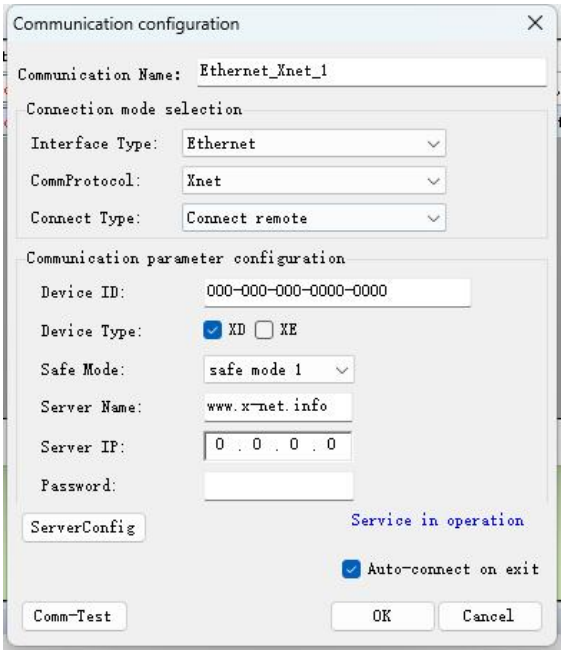
2) Remote Connection

1. Click [Software Serial Port  Settings] to open the "Communication Configuration" window, then select "Ethernet" as the communication interface;

2. Select XNET as the communication protocol;

3. Select "Remote Connection" as the connection method;

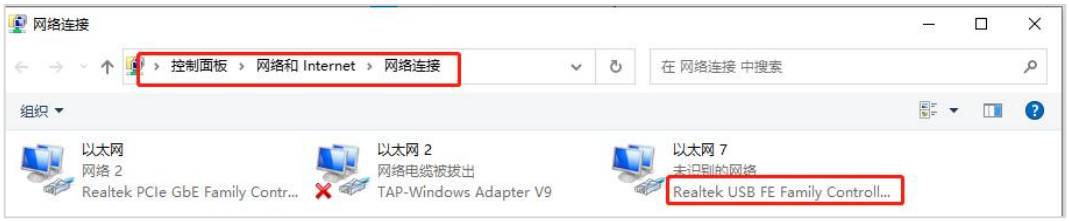
4. Enter the configuration parameters for the network port PLC: Device ID and password, then click OK to complete the remote connection.



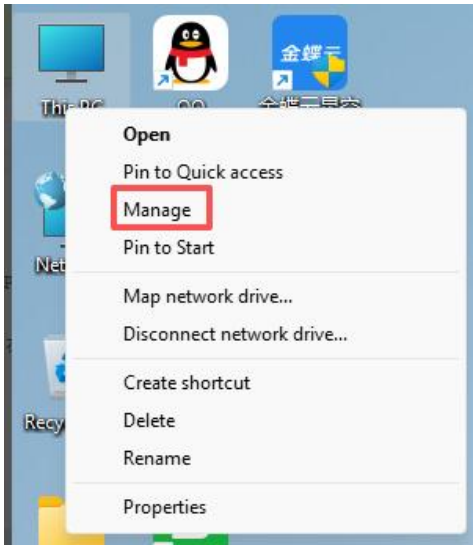
4-1-3-4. Steps to Uninstall Dual Network Cards

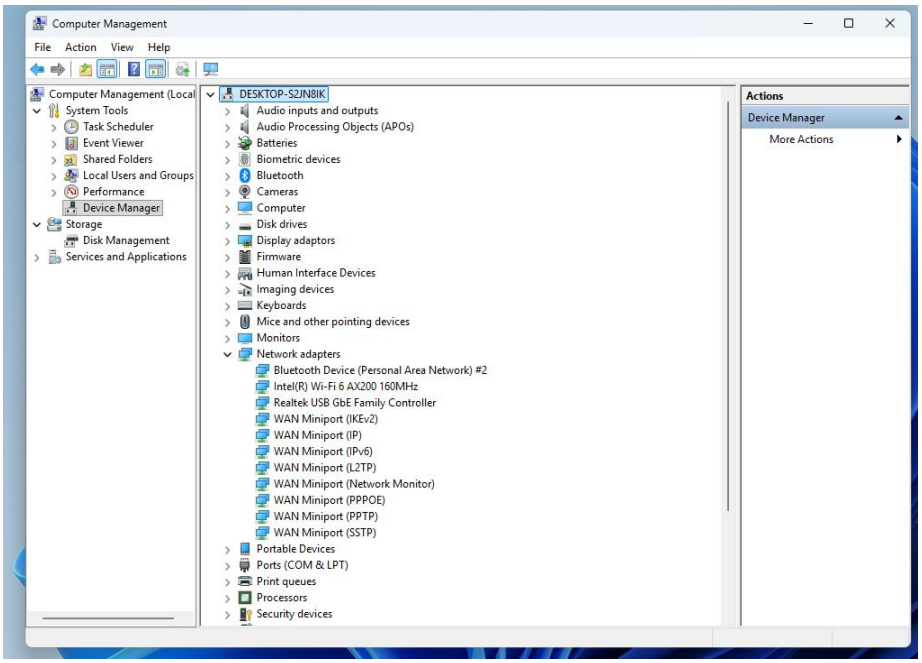
If an IPV4 address has two IP addresses, the computer has two network cards, which may prevent the PLC from connecting via Ethernet. Uninstall the extra network card. Follow these steps:

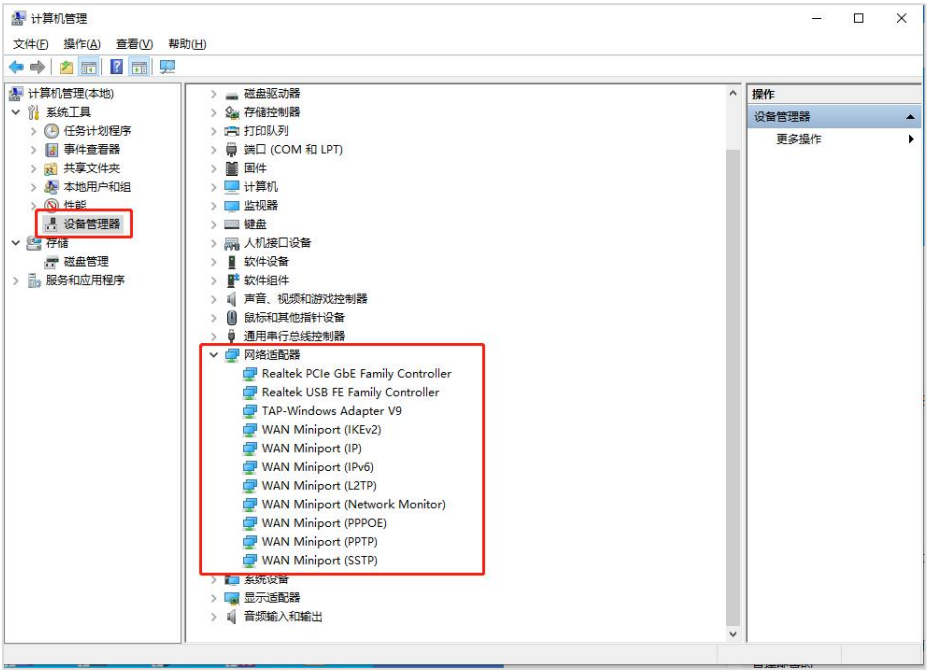
1. In Control Panel> Network and Internet Settings> Network Connections, locate the network name with two IP addresses:



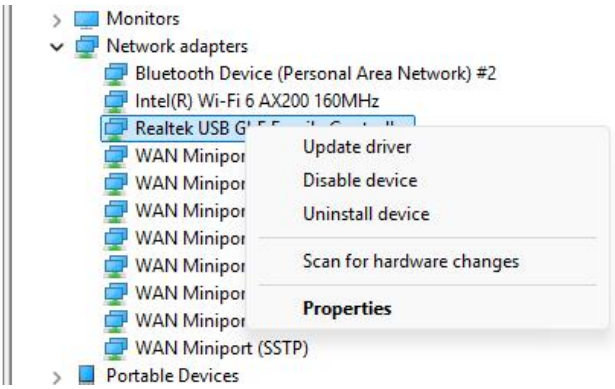
2. Right-click this computer to open "Management", then locate the "Network Adapter" in "Device Manager":



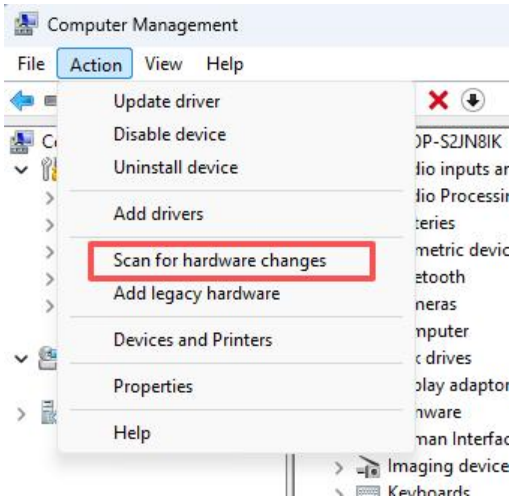




3. Find the corresponding network name in the network adapter, right-click it, and uninstall this device (you generally don't need to check the option to remove its driver).



4. After uninstallation, click the operation to scan for hardware changes, identify the uninstalled network card, and then reassign its IP address.



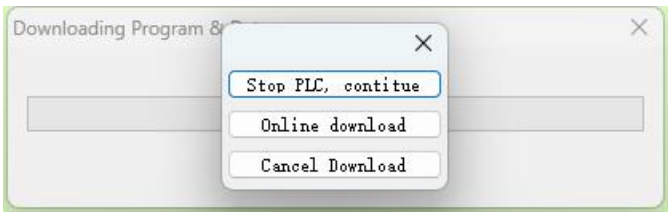
4-2. Program upload/download and PLC status control

4-2-1. Downloading the Program

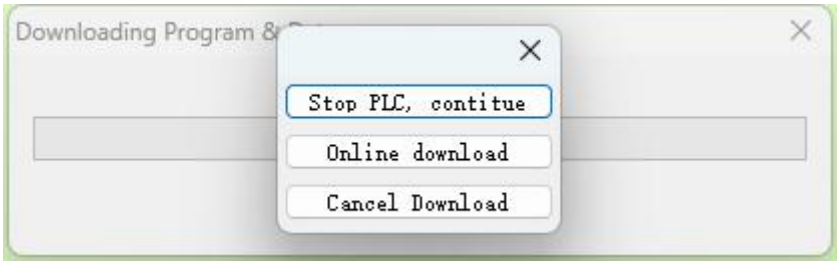
Downloads are divided into [Download User Program] and [Confidential Download User Program]. The key difference is that once the [Confidential User Program Download] is installed in the PLC, the program and data within it cannot be uploaded permanently, ensuring excellent confidentiality to protect users' intellectual property. Please adhere to these precautions during use.

1. After successful connection, click [PLC Operation] → [Download User Program] in the menu bar or tap the toolbar Icon to download the program to the PLC.

If the PLC is a non-online-download model and is running, the following prompt window will appear:



If the PLC is an online-download model and is running, the following prompt window will appear:



① Stop the PLC and continue downloading

Stop the current program running in the PLC and download a new program to the PLC . After downloading, click the button to start the PLC.

② Data retained; continue downloading

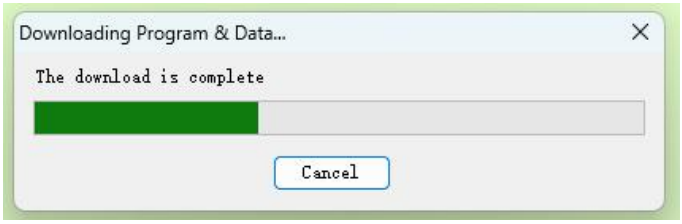
During the download process, the PLC remains in operational mode but does not execute the program; register values and coil states stay unchanged. Upon completion of the download, the new program is executed immediately. When you click "Data Maintain, Continue Download," a prompt window appears regardless of whether any motion control commands have been written to the program:

③ Download Online

Do not halt the program execution in the PLC while downloading the new program. The PLC remains operational throughout both the download process and afterward. For detailed instructions, refer to Chapter 4-2-2.

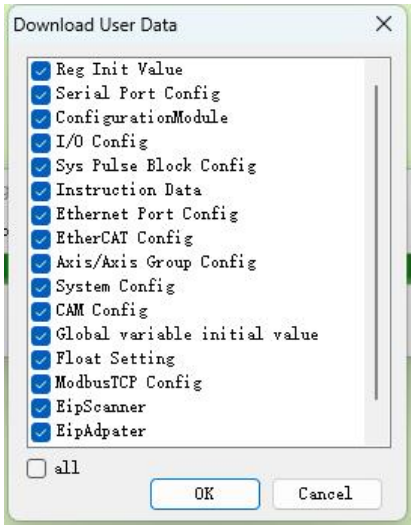
If a password is set for the program or the download is confidential, six red dots will appear in the upper-right corner of the progress bar.

2. During program download, the system will automatically calculate the current program's usage percentage.

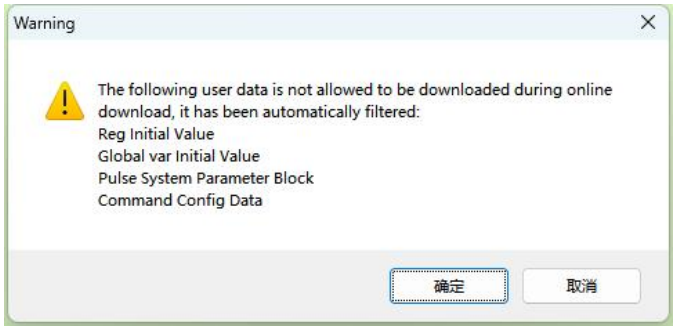


You can also use this function via [PLC Operation] – [Calculate Program Space Usage]/[Calculate Space Usage for Confidential Download Programs], as shown below.

3. Upon completion of the program download, a "Download User Configuration" window will appear. Users can select the data types to download as needed; by default, all options are selected, as shown below:

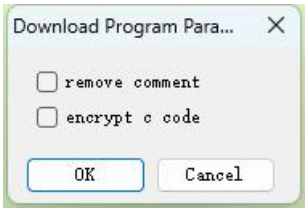


If you select "Keep Data and Continue Download" or "Download Online" as the download method and click OK, the following prompt window will appear:



4. Before downloading the program, you can also configure whether to remove software component comments and enable C language encryption to enhance confidentiality.

Click [Options] → [Download Settings], as shown below:



4-2-2. Download Online

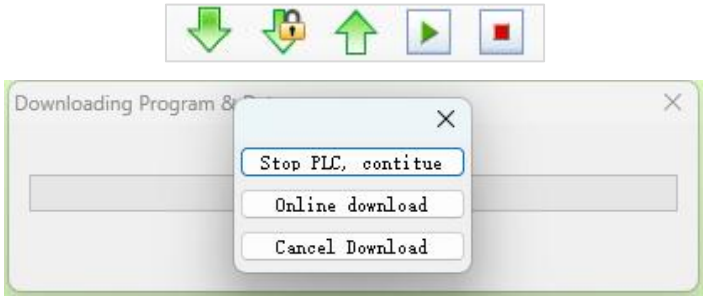
This section Explains how to write programs or data during PLC operation. When performing the online download function, follow the rules carefully.

4-2-2-1. Functional Overview

In RUN mode, you can directly modify the running program within XDPPro. The modified program must undergo an "online download"; once downloaded, the PLC requires a certain amount of time to compile it. Upon completion, the new program will immediately take effect on system control operations. Therefore, special attention should be paid before downloading, with careful consideration given to potential consequences. This function does not interfere with the PLC's normal operation during modification or download, and after the new program is downloaded, existing relays, I/O states,

and register data remain unchanged.

To proceed, click the "Online Download" option under "Download" or "Confidential Download", as shown in the figure below.



4-2-2-2. Conditions for performing online download operations

- Customers should select models that support online download functionality, such as the XD5E-60T4-E.
- Meets the online download requirements; see Chapter 4-2-2-3.
- The software version matches the firmware version, with backward compatibility.

Programming software that does not support online downloading cannot perform downloads on PLCs with this feature; a pop-up will prompt you to use the corresponding host machine version.

Models and software versions supported for online download:

1) Download the device model online

Product line	Product model	Applied version
XDH/XLH Series	Full Series	Firmware version V3.7.1 (20210309) or later
XL5H Series	Full Series	
XG series	XG2-26T4	
IPC	XA310	
XD5E Series	XD5E-24R-E	Hardware version H4.x.x and above
	XD5E-24T-E	
	XD5E-30R-E/C	
	XD5E-30T-E/C	
	XD5E-30T4-E/C	
	XD5E-48R-E	Hardware version H2.x.x and above
	XD5E-48PR-C	
	XD5E-48T-E	
	XD5E-60R-E/C	
	XD5E-60T-E/C	
	XD5E-60PT-C	
	XD5E-60T4-E/C	Supports online download
	XD5E-60T6-E/C	Hardware Version H4.x.x and above
	XD5E-60T10-E/C	Hardware version H3.x.x and above
	XD5E-60NPR-E	Supports online download
XDME series	XDME-30T4-E/C	Hardware version H4.x.x and above
	XDME-60T4-E	Hardware version H2.x.x and above
	XDME-60T10-E	Hardware version H4.x.x and above
XL5E Series	XL5E-16T	Hardware Version H4.x.x.x and above
	XL5E-32T	Hardware Version H5.x.x.x and

	XL5E-32T4	above
	XL5E-64T6	Hardware version H6.x.x.x or higher
	XL5E-64T10	
XL5N Series	XL5N-32T	Supports online download
XLME series	XLME-16T4	Supports online download
	XLME-32T4	Hardware Version H5.x.x.x and above
	XLME-64T10	Hardware version H6.x.x.x or higher

2) Online download software version: XDPPro V3.7.4a or later.

4-2-2-3. Download Rules

The online download function includes regular commands and special commands. Regular commands continue to run and take effect according to the new program; special commands remain active unless modified; if a special command changes, it is processed according to the online download rules, and all other functions and configurations are handled accordingly.

Instruction classification	Mnemonic	Rule description
Bit-edge operation for character elements	LDP D0.0	For models supporting online download functionality, the following instructions have been removed: LDP D0.0, LDP D[0].0, PLS D0.0, and PLF D[0].0.
	LDP D[0].0	
	PLS D0.0	
	PLF D[0].0	
Sequential Function Block	SBLOCK	(1) The BLOCK function block cannot be downloaded online currently. If you attempt to download it after modification, a prompt will appear: "The sequence of function blocks has changed. Do you want to stop downloading?" (2) If the BLOCK function block remains unchanged, the "Online Download" process will continue running according to the original instructions and configuration. Note: BLOCK blocks refer to functional blocks present in the program. Changes to BLOCK blocks in the left engineering bar do not affect the download process.
	SBLOCKE	
	SBSTOP	
	SBGOON	
	WAIT	
	FROM	
	TO	
Pulse Instruction	PLSR	(1) Pulse commands are not supported for online download. If you attempt to download after modification, a prompt will appear: "The special command has changed. Do you want to stop downloading?" (2) If the pulse command remains unchanged, the "Online Download" process will continue running according to the original commands and configurations. (3) After the PLSF conduction condition is disabled, pulse output cannot be immediately turned off; this depends on the scan cycle.
	PLSF	
	DRVI	
	DRVA	
	ZRN	
	STOP	
	GOON	
	DMOV	
Special Function Instruction	PWM	(1) Special function commands are not supported for online download. If you attempt to download after modification, a prompt will appear: "The special command has changed. Do you want to stop downloading?" (2) If the special function commands remain unchanged, the "Online Download" process will continue to Operate according to the original commands and configurations.
	FRQM	
	STR	
	STOP	
	RST	
	DMOV	
	MSC	
PID control function	PID	(1) PID commands cannot be downloaded online currently. If you attempt to download after modification, a prompt will appear: "The special command has changed. Do you want to stop downloading?" (2) If the PID parameters remain unchanged, the "Online Download" process will continue operating according to the

Instruction classification	Mnemonic	Rule description
		original settings. (3) The PID instruction does not support dual-coil output. (4) Online downloaded models do not support having the third operand of multiple PID commands be identical.
High-Speed Counting	CNT CNT_AB RST	(1) The high-speed counting instruction does not support online download currently. If you attempt to download it after modification, a prompt will appear: "The special instruction has changed. Do you want to stop downloading?" (2) If the high-speed counting instruction remains unchanged, the "online download" process will continue to Operate according to the original instructions and configuration. (3) The CNT instruction does not support dual-coil output.
Clock Instruction	TADD TSUB HTOS STOH TCMP DACMP	(1) Clock instructions are not supported for online download. If you modify and download them later, a prompt will appear: "Special instructions have changed. Do you want to stop downloading?" (2) If the clock instruction remains unchanged, the "Online Download" process will continue running according to the original instructions and configuration.
C Function Block	C functional block	(1) The C instruction does not support online download currently. If you attempt to download after modification, a prompt will appear: "The special instruction has changed. Do you want to stop downloading?" (2) If the C instruction remains unchanged, the "Online Download" process will continue running according to the original instructions and configuration. Note: These changes refer to alterations in the C instruction content or the installation path of the host computer.
suspend	external interrupt timer interruption High-speed Count Interrupt Pulse interruption	Online downloads are allowed only if the content or position of the label changes. Online downloads are not supported if the interrupt number itself or its value changes.
EtherCAT	Single-axis Command Array Group Instructions Electronic Cam	Online download is not supported.

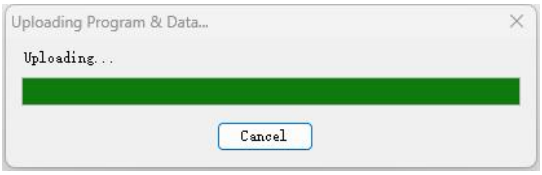
- For instructions not covered above, the PLC will Operate normally according to the new program once the updated instructions are downloaded online.
- If the project requires a password, unlock it before downloading online.
- The term "change" in the table refers to: Basic instruction format: [operator {operand1}{operand2}{...}]. A "change" means: I. The operator changes; II. The operands change; III. The instruction itself remains unchanged but the number of instructions changes.

4-2-3. Uploading the Procedure

Uploading is divided into [Upload User Program] and [Upload User Program and Configuration], differing only in whether data from the PLC is uploaded to the programming software.

After successful connection, click [PLC Operation] → [Upload User Program] in the menu bar or

the toolbar Icon to upload the PLC program. Click [File] → [Save Project] or the Icon to save the program.



- If the PLC has password protection enabled, a password prompt will appear during upload; only after entering the correct password can you proceed. Six red dots will also appear in the upper-right corner of the upload progress bar.
- If the upload prompt shows "Program does not exist," the program was downloaded confidentially to the PLC and cannot be uploaded.

4-2-4. PLC Status Control

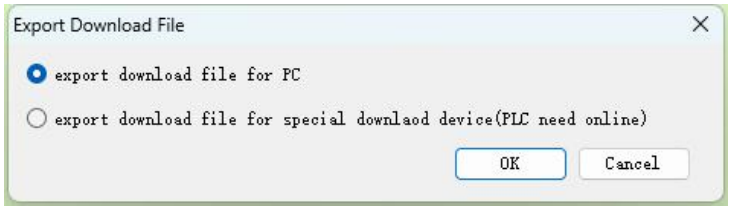
After connecting online , click the button to start the PLC; click the button to stop the PLC.

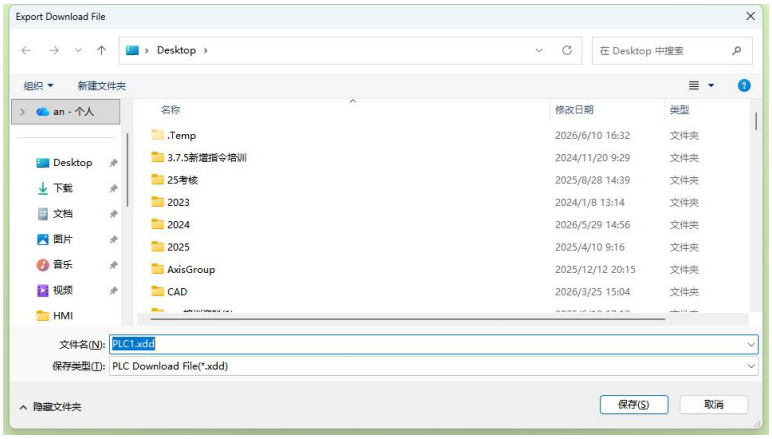
4-2-5. Import, Export, and Download Files

4-2-5-1. Export and Download File

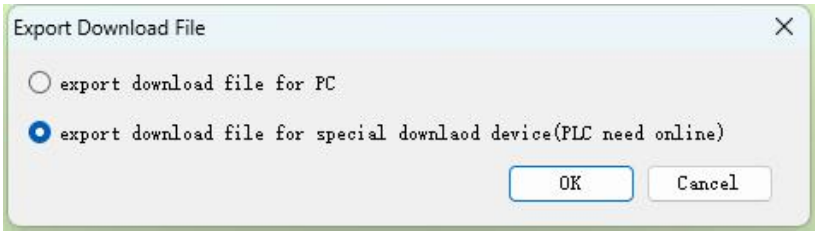
The programming software supports generating downloadable files for the entire project. The programs within the project are confidential and non-source files; they cannot be viewed or modified, but all programs can be downloaded normally.

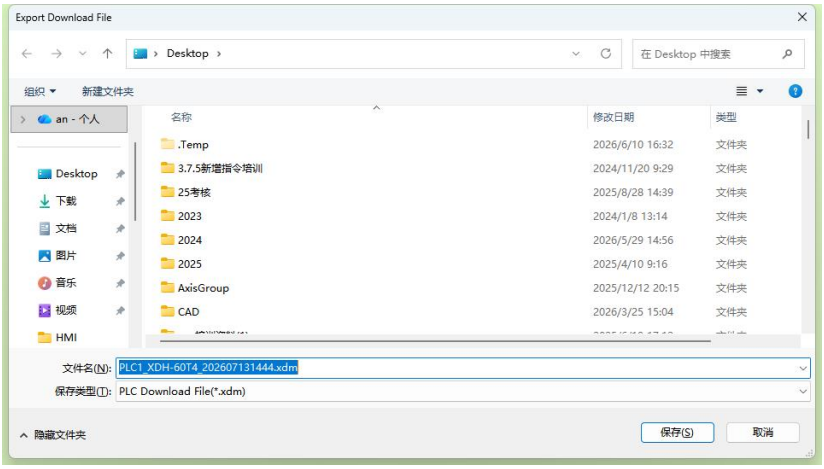
1. Click File in the menu bar → Export and Download File;
2. To export and download files, you can choose [Export for Computer Download] or [Export for Dedicated Downloader Only].
3. Select [Export and Download File] → Click OK to save the file locally. The downloaded file will have the ".xdx" extension.





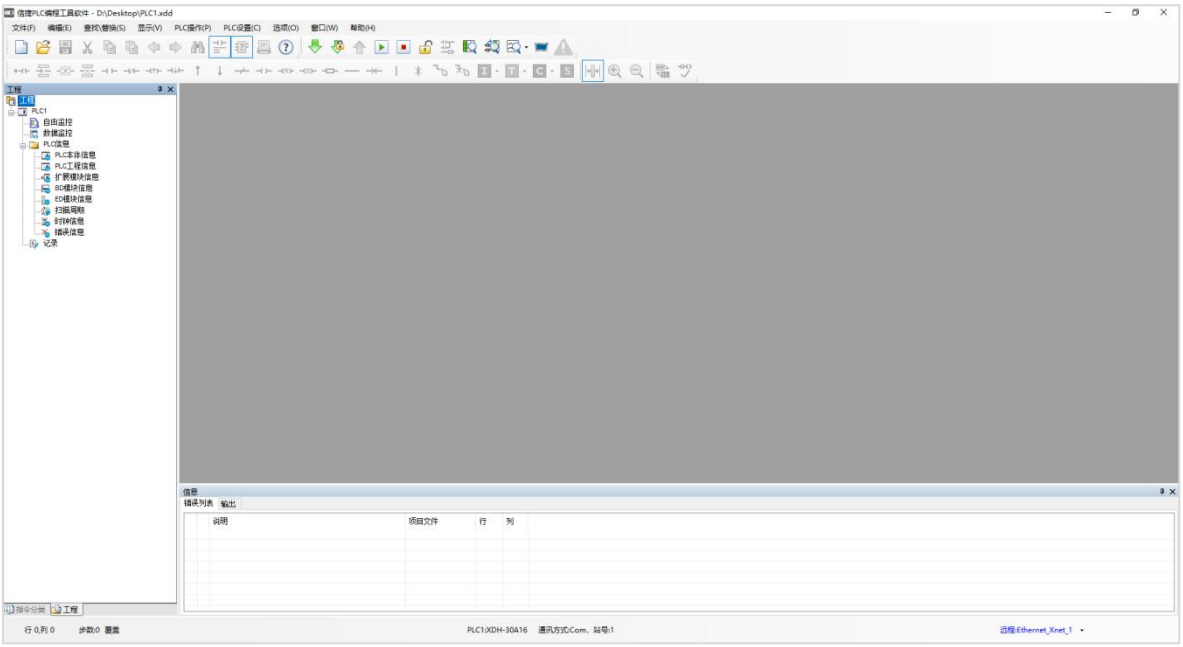
4. Select [Export for Download] and click OK to save the file locally. The downloaded file will have the.xdm extension.





4-2-5-2. Import Downloaded Files

The programming software supports downloading the generated file to another PLC.
Click File in the menu bar → Import Downloaded Files, select the desired file to import. After successful import, the page will display in gray.
After connecting the PLC, click Download to save the file to the PLC.



[Import Download File (for Downloader Use Only):] First, connect the PLC to the software and ensure successful connection between the downloader and the PLC. Click Import Download File, then click Download to transfer the file to the downloader.

4-3. Initial Value Setting of PLC and Data Reading/Writing

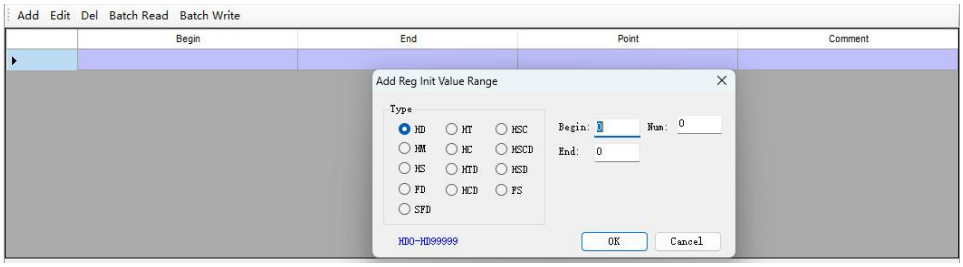
4-3-1. Initial Value Setting for Soft Components

The programming software supports setting initial values for power outage retention registers or coils (e.g., HD, FD, HT) and downloading them to the PLC.

Click the [Engineering Bar] → [Set Initial Values for Soft Elements] on the left to open the configuration window.

Click Add, select the soft component type, and define the range by setting the start and end soft components.

Click "Modify" to change the soft component type and range;

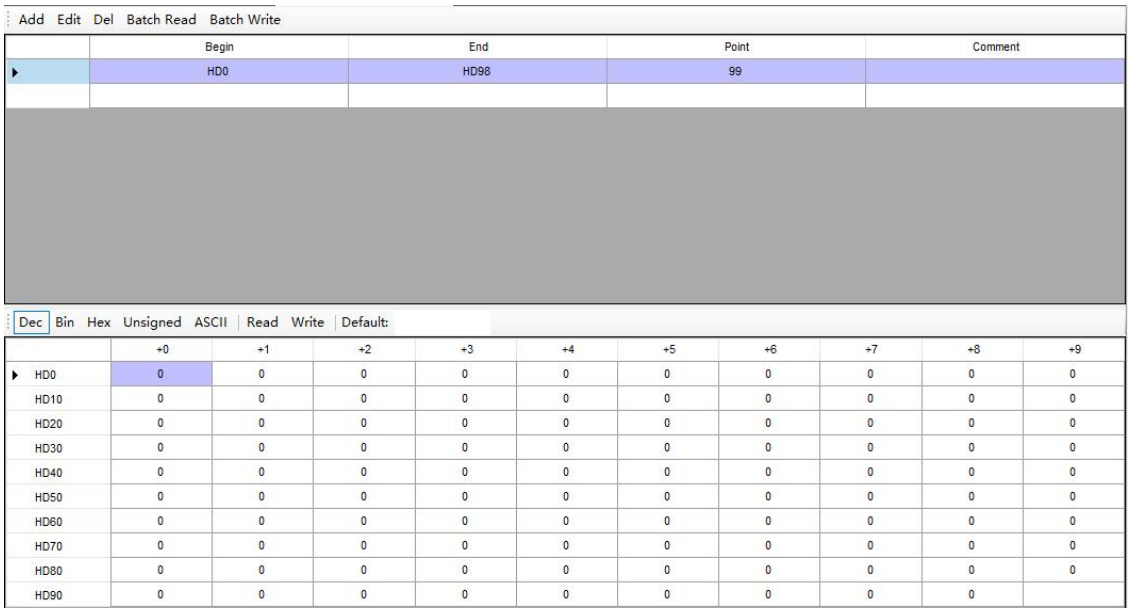


For registers, you can set the initial value to "decimal", "binary", "hexadecimal", etc.

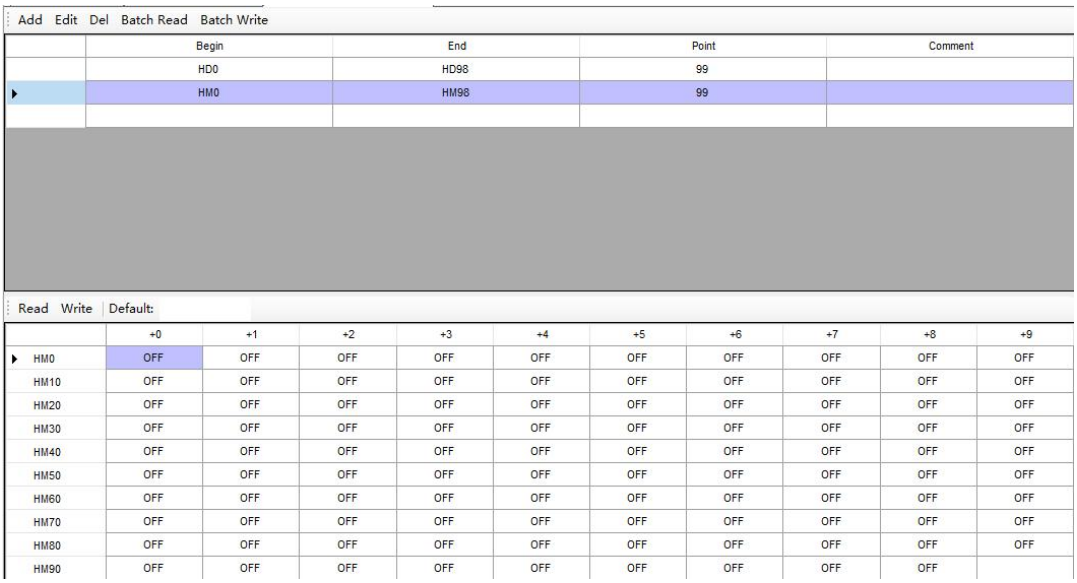
The "Read" and "Write" functions are used to upload values from specified registers or download initial values into the PLC.

The "Batch Read" and "Batch Write" functions are used to upload values from all registers in the list and download initial values to the PLC.

The Default Value allows you to set the initial values for specified registers in bulk.



For the coil, you can set its initial state to ON or OFF.



4-3-2. Data Reading and Writing

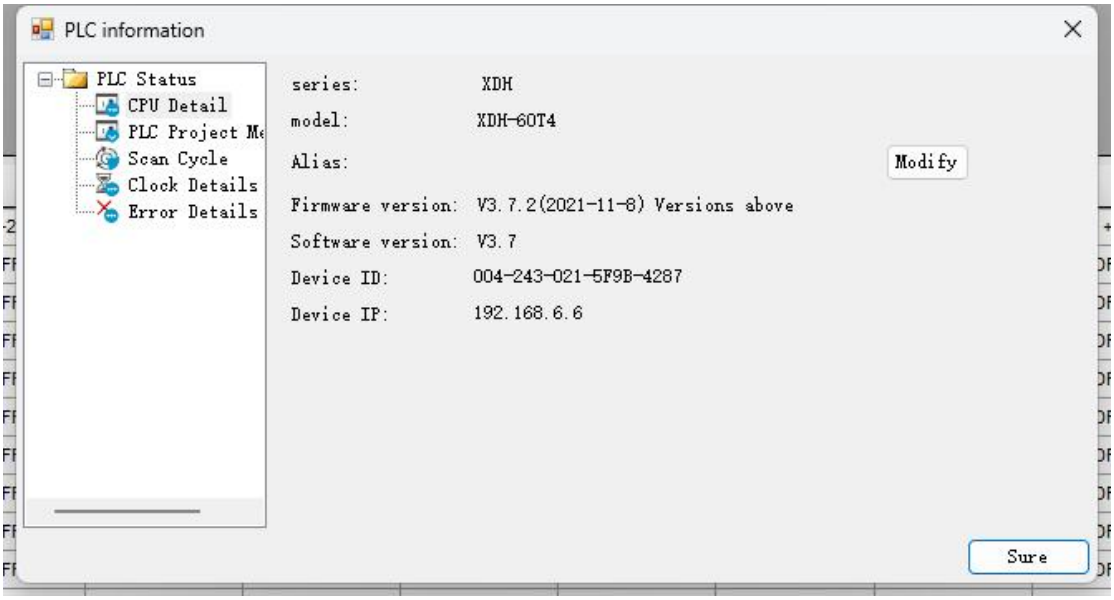
If the operation target is a partial address, first set the initial values of the soft components using the [Soft Component Initial Value Setting] function, then click the "Read" or "Write" buttons.

4-4. Inquiry of PLC and Module Information

Click the relevant item in the [Engineering Bar] - [PLC Information] on the left to view it.

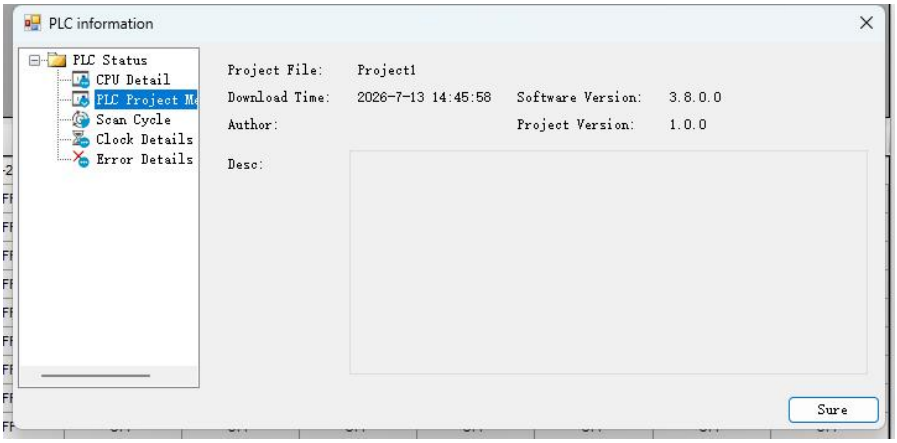
4-4-1. PLC Body Information

Displays the PLC series, model, lower-level machine version, and the appropriate upper-level machine version.



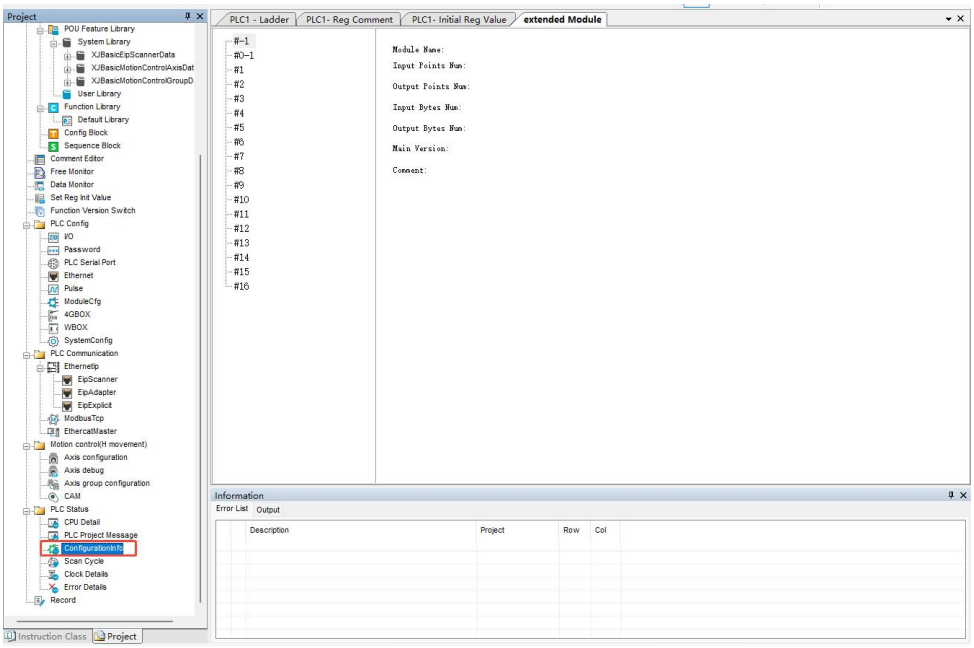
4-4-2. PLC Engineering Information

Display engineering-related information in the current PLC.



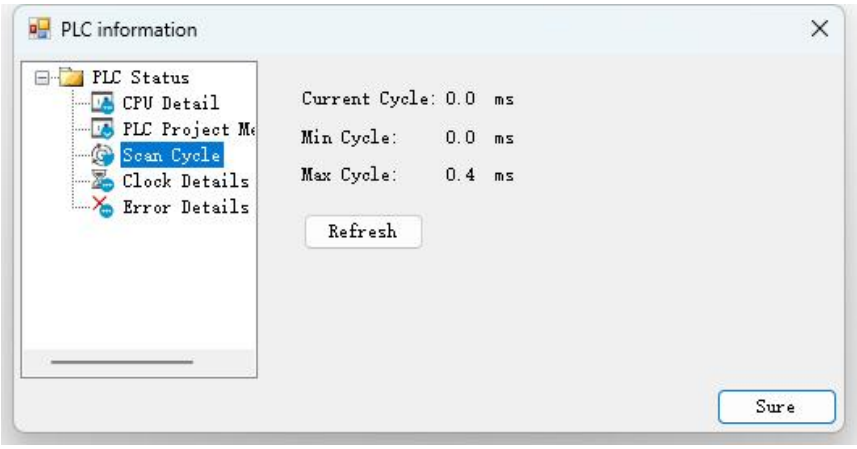
4-4-3. Module Configuration Information

This function displays the model numbers and configuration details of all left expansion ED modules, upper expansion BD modules, and right expansion modules connected to the PLC.



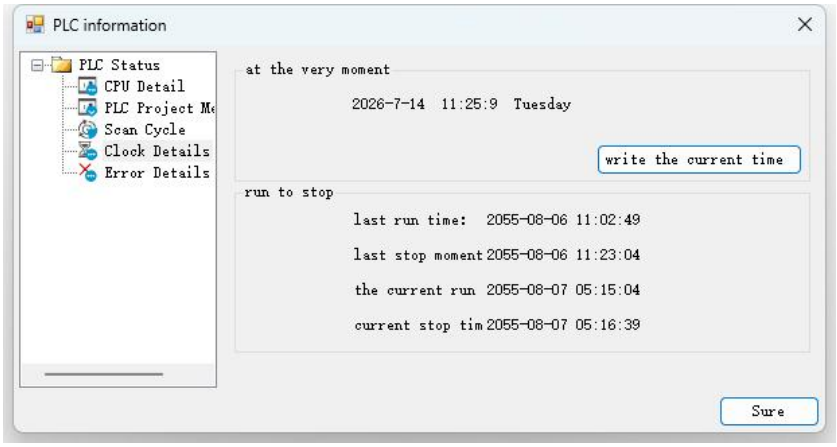
4-4-4. Scanning Cycle

This function displays the PLC's current scan cycle, shortest scan cycle, and longest scan cycle.



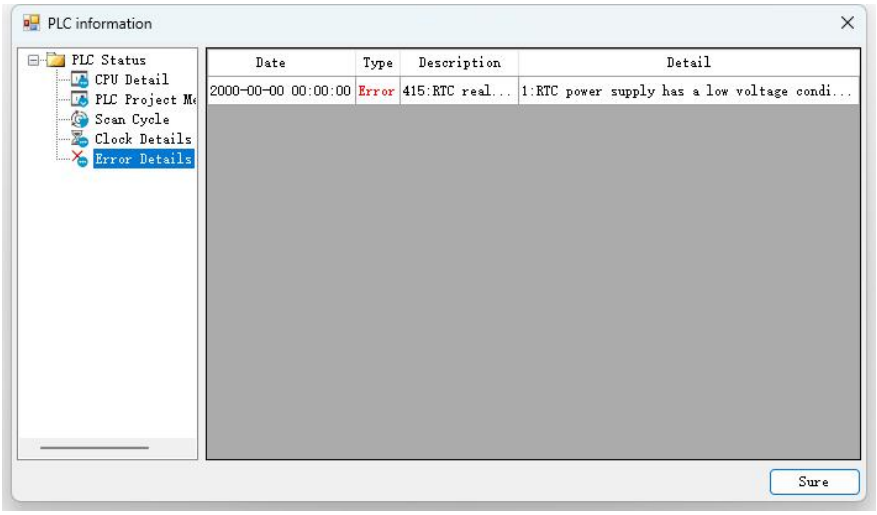
4-4-5. Clock Information

The PLC unit typically comes with a built-in clock that allows you to view the current date and time. If the clock is inaccurate, you can also [write the current time].



4-4-6. Error Message

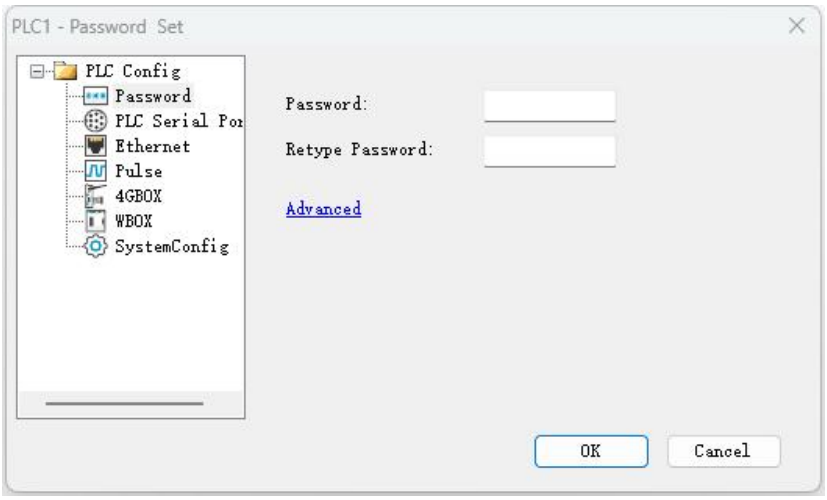
This feature displays historical error messages that occurred during the current PLC operation.



4-5. Locking/unlocking the Procedure

4-5-1. Password Setup

Once the password is set, it is downloaded to the PLC along with the program, thereby encrypting the PLC. Correct password entry is required during program upload to complete the process.
Click the Engineering Bar → [PLC Settings] → [Password Settings] to configure and modify the password in the settings panel. The password consists of six letters or digits (case-sensitive). By default, the system has no password set.



Click "Advanced". If you check "The program must be decrypted before downloading", this means you'll need to enter the correct password when re-downloading the encrypted PLC program. This feature prevents accidental program downloads that could erase the original PLC firmware and provides protection for your PLC. However, use this function with caution— forgetting the password will lock the PLC.

- If you do not check the "Decrypt before downloading the program" option, you can still stop the PLC and re-download the user program to overwrite the original one even if the PLC program has a password. The password primarily protects the user program. When using online download, you must unlock the PLC.
- After a PLC is locked, you can still use it by updating its firmware, but the existing program will be lost.
- After setting a password, users must remember it. The ●●●●●● password will be displayed but cannot be viewed.

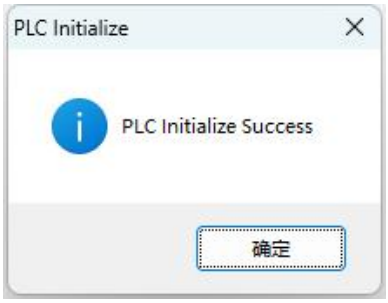
4-5-2. Lock/Unlock

To lock the PLC for the first time, enter a password in "PLC Settings" → "Password Setup," then re-download the program—the PLC will automatically lock it. After locking, unlock the system before uploading the program (the upload button will display an unlocking interface; alternatively, manually click to unlock and enter the correct password to proceed). Once unlocked, the program can be uploaded without a password. Clicking "Lock" again will restore the password requirement.

After setting a password for the PLC, the program cannot be read when locked, thereby protecting the programmed content. During the upload process, if five consecutive incorrect password attempts occur, the PLC will automatically lock the password; in this case, the PLC must be powered on again to unlock and resume the upload operation.

4-5-3. Initialization of the PLC

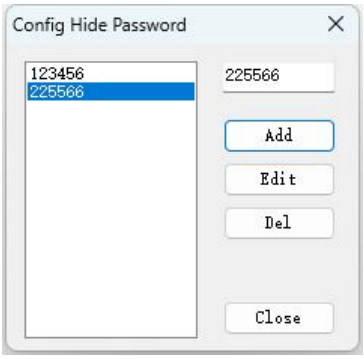
Click the menu bar [PLC Operation] → [PLC Initialization]. All PLC registers and configuration settings will be restored to factory defaults. The changes take effect after powering off and restarting the PLC.



4-5-4. Default decryption password settings

When users frequently upload programs to encrypted PLCs or need to enter different passwords for various models, they can set a default decryption password. As shown in the figure below, multiple decryption passwords can be configured; during uploads, users avoid repeated password entries as the system automatically uses a pre-set password from the list. A correct password unlocks the PLC and allows program upload. After unlocking, users must press the lock button on the menu or re-download the password-protected program file to lock it again—otherwise, no password is required for subsequent program uploads.

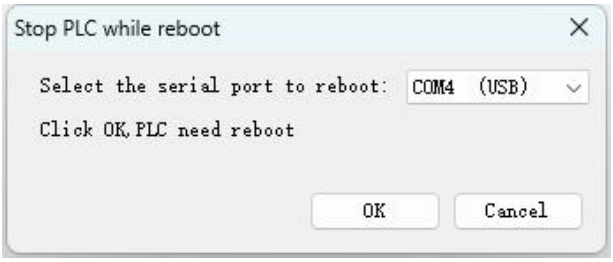
Click Options in the menu bar, then select Default Encryption Password Settings to set your encryption password.



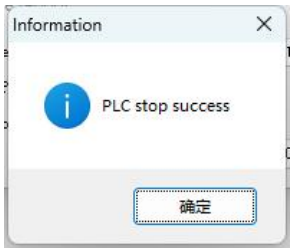
4-6. Other Simple Functions

4-6-1. Power Supply Stop PLC

When an error occurs in the user program within the PLC, causing communication failure during operation, use the [Power-On Stop PLC] function to halt the PLC immediately upon power-up, allowing you to download the correct user program. After applying this function and powering off the PLC before restarting it, the software will confirm successful power-on stop.
Connect to PLC port COM1 using a serial cable, then select [PLC Operation] → [Power On and Stop PLC]. The following prompt window will appear:



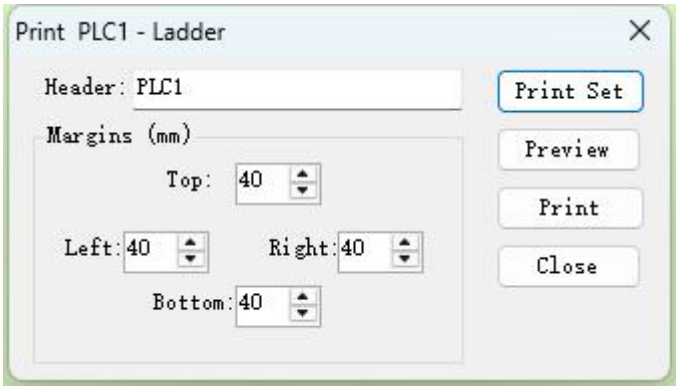
Follow the instructions: Turn off the PLC power and wait at least 5 seconds until the PWR indicator turns off. Then power on the PLC again. If the following message appears, power-on has succeeded. Click OK.



The power-off function must be Operated via COM1 port; it cannot be used with other serial or USB ports.

4-6-2. Print

Click [File] → [Print] to open the print settings window, where you can print the program as a trapezoidal diagram or in command format.



Print object

- Trapezoidal diagrams, command statements, and comments are all acceptable.
- You can print everything or select a portion (bounded by the cursor).

Print setup

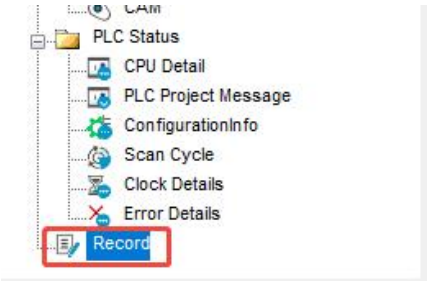
- Printer Selection
- Print Range (per row)
- Number of copies to print

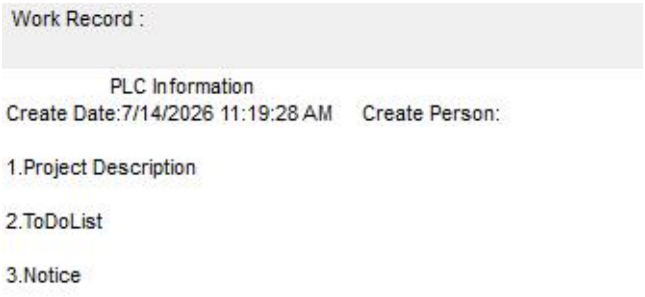
4-6-3. Record

Daily Work Records

Click the [Record] button in the left engineering bar to activate the recording function.

This feature can be used to record relevant information about PLC programs, such as creator, project description, and notes.





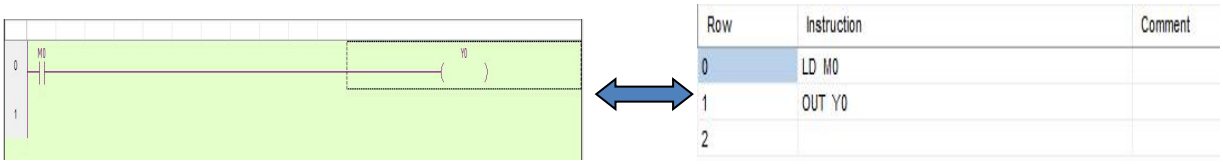
5. Programming Operations

5-1. Programming Method

XDPPro supports two programming methods: ladder diagram programming and instruction set programming.

- Trapezoidal diagram programming: Intuitive and user-friendly, it is the preferred method for most PLC programmers and maintenance personnel.
- Command Language Programming: Suitable for experienced programmers familiar with PLCs and logical programming.

The two programming methods can be converted between each other. Click the [Trapezoidal Diagram Conversion] Icon to automatically convert the trapezoidal diagram into the corresponding command statement.



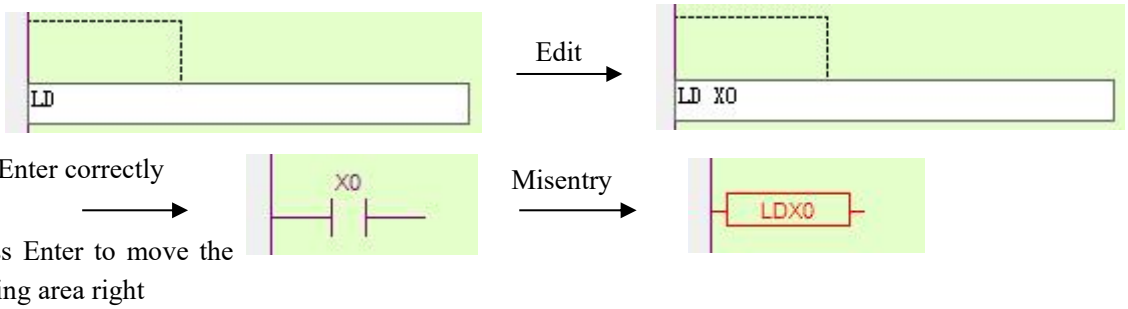
5-2. Editing a Trapezoid Diagram

5-2-1. Input Contact

Icon	Function	Keyboard shortcuts
⊣ ⊢	Always Open Node	F5
⊣/⊢	Always Closed Node	F6
⊣↑⊢	Rising Edge	Shift+F5
⊣↓⊢	Trailing Edge	Shift+F6
↑	Multi-Condition Rising Edge	Ctrl+F5
↓	Multiconditional Descent Trajectory	Ctrl+F6
—/—	Take Negation	Alt+F6

The following illustrates the instruction input:

Left-click to select a node on the trapezoidal diagram; the dashed box will indicate the selected node. First, click the Icon ("") or press F5 to open a dialog box (LD X0), where you can edit commands and coils. After completing the edits, press Enter. If an error occurs, the node will turn red. Double-click the node to re-enter the operation.



5-2-2. Input Coil

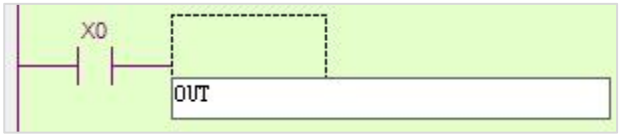
Icon	Function	Keyboard Shortcuts
	Output Coil, Timing, and Counting	F7
	Set Coil	Shift+F7
	Reduction Coil	Shift+F8
	Other	F8

The following illustrates the instruction input.

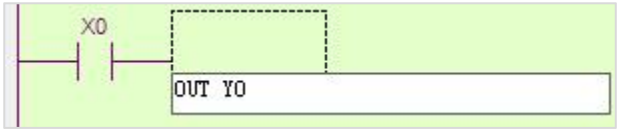
Example 1: Coil Output

① After entering X0 at the first connection point of the trapezoidal diagram, move the dashed box one grid to the right;

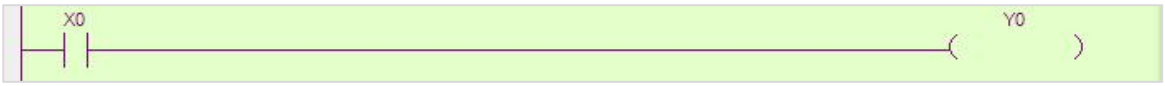
② Click the Icon ("") (or press F7) to open the command dialog box (OUT);



③ Enter Y0 at the cursor;



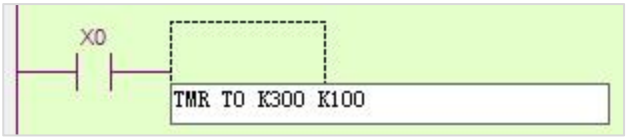
④ Press Enter to input. If correct, the dashed box moves to the next line; if incorrect, the contact point turns red—double-click it to modify.



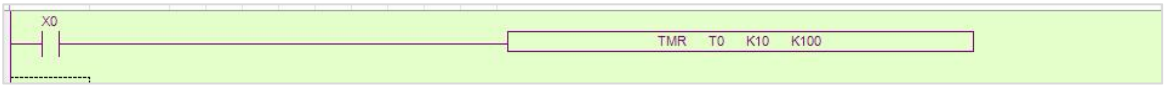
Example 2: Inputs for Timers and Counters

① Timer input method: TMR + space + timer number + space + timer duration + space + time base (non-additive).

TMR_A + Space + Timer Number + Space + Timer Time + Space + Time Base (Cumulative)



After entering the correct value, press Enter to automatically line break the dashed box.



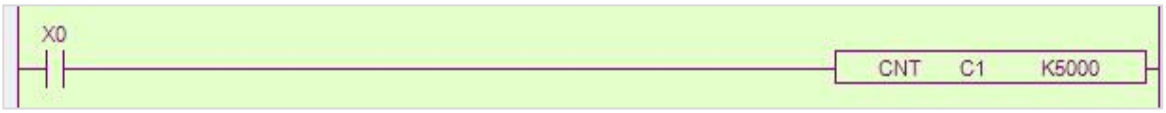
② Counter input method: CNT + space + counter number + space + value (16-bit non-power-off persistent increment counter)

CNT_D + space + counter number + space + count value (16-bit non-power-loss persistent decrement counter)

DCNT + space + counter number + space + count value (32-bit non-power-off persistent increment counter)

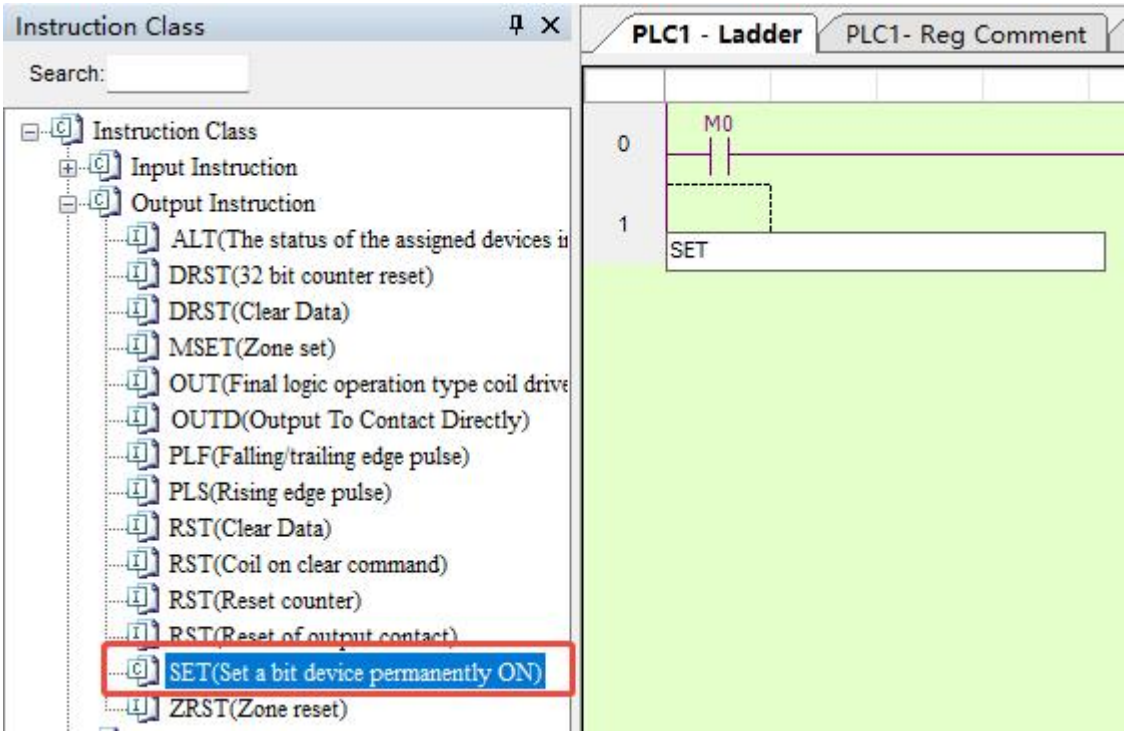
DCNT_D + space + counter number + space + count value (32-bit power-off retained decrement counter)

After entering the correct value, press Enter to automatically line break the dashed box.



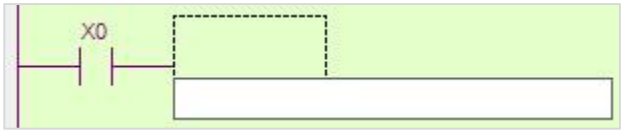
Example 3: Input of Other Instructions

① Click the key (or press F8) to display the command list in the left pane; double-click the command you want to enter, it will activate in the specified area—just input the parameters.

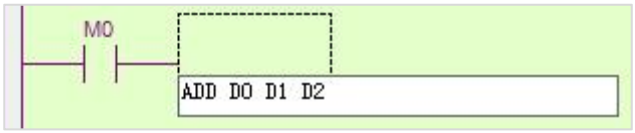


② Users familiar with commands can also double-click the input area to manually enter commands and parameters;

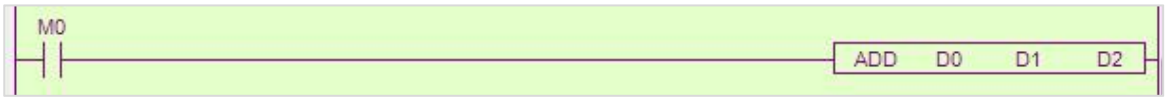
Double-click the activated area:



Enter the instruction and operands in the dialog box:



③ After entering the correct content, press Enter to automatically line break the input area.



- The instruction input format is: instruction + space + operand.
- If the contact is red, it indicates an error.
- Ensure the connection is complete; no gaps are allowed.

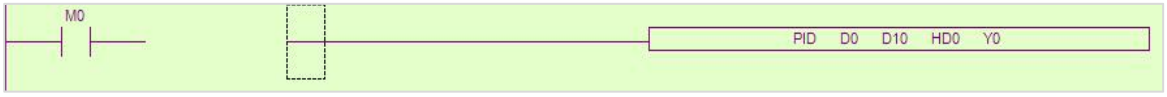
5-2-3. Operations on Horizontal and Vertical Lines

Icon	Function	Keyboard Shortcuts
—	Insert Horizontal Line	F11
|	Insert a vertical line	F12

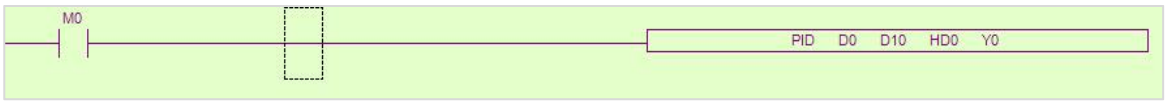
Icon	Function	Keyboard Shortcuts
	Delete the line	Shift+F11
	Delete vertical line	Shift+F12
	Draw a line with the mouse	-
	Delete with Mouse	-

1) Insert horizontal and vertical lines

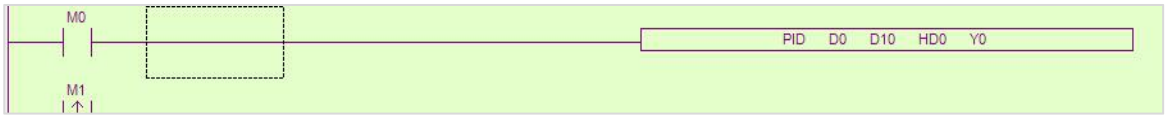
① Move the dashed box to the desired location:



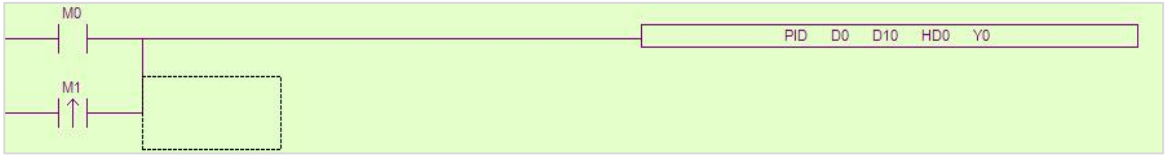
Click  the key (or press F11).



② Move the dashed box to the upper right corner of the desired input area:



Click  the key (or press F12).



2) Delete horizontal and vertical lines

① Remove the line: Move the dashed box to the location where you want to eliminate it, then press the key (or Shift+F11).

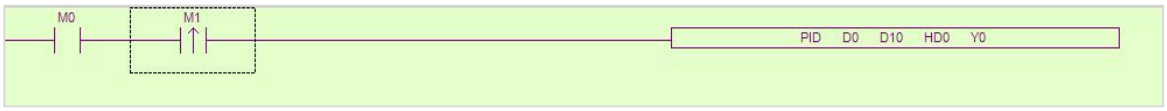
② Delete the vertical line: Move the dashed box to the upper-right  corner where you want to remove it, then click (or press Shift+F12).

5-2-4. Operations on Nodes and Rows

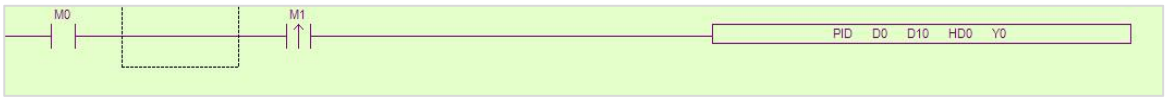
Icon	Function	Keyboard shortcuts
	Insert Node	Ins
	Insert Row	Shift+Ins
	Delete Node	Del
	Delete Rows	Shift+Del

1) Insert Node

Move the dashed box to where you want to enter it;

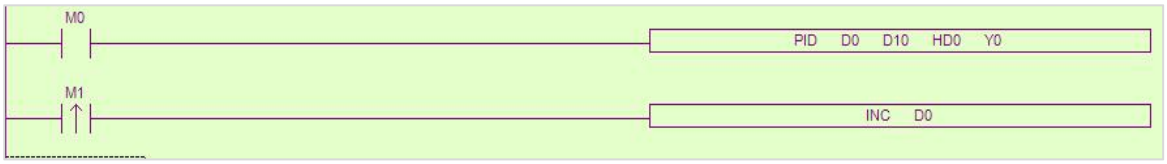


Press  the key (or Ins) to extend the node to the right; a blank column appears within the dashed box.

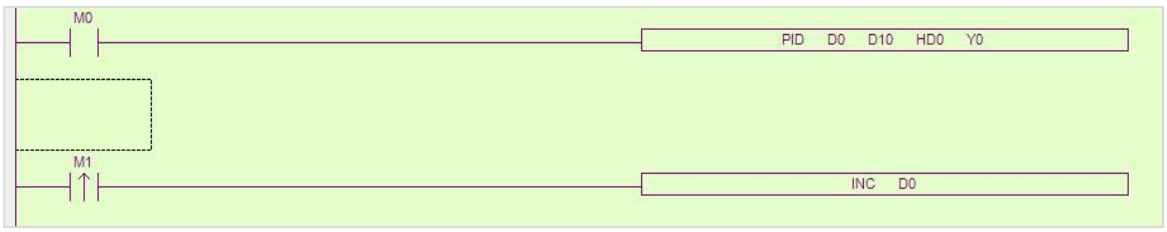


2) Insert Row

Move the dashed box to where you want to enter it;

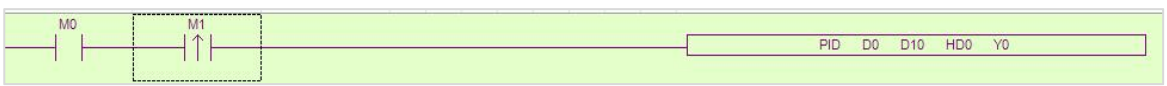


Press  the key (or SIns) to move the trapezoidal chart down one row, and a blank row will appear within the dashed box.

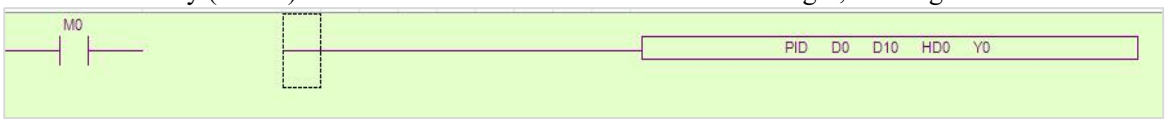


3) Delete Node

Move the dashed box to where you want to enter it;

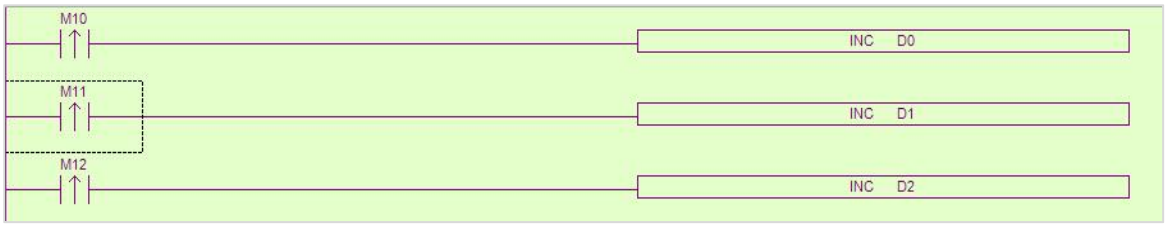


Press the key (or Del) to move the dashed box one column to the right, creating a blank column.

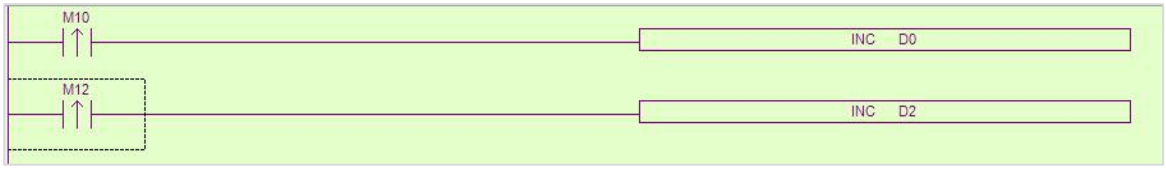


4) Delete Row

Move the dashed box to where you want to enter it;



Press the key (or Shift+Del) to delete the row containing the dashed box, and the next row will automatically move up one position.

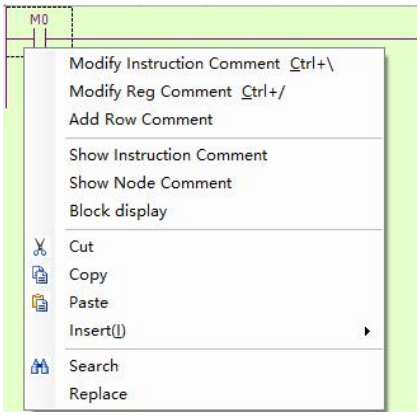


5-2-5. Editing Comments

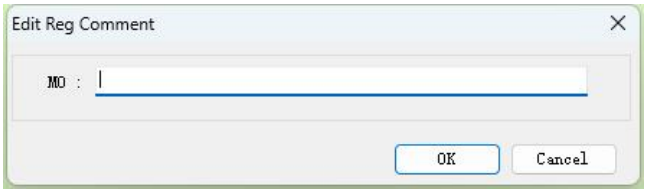
Click the menu bar [Show] → [Trapezoidal Chart Display Node Annotations] to enable or disable trapezoidal chart annotations.

1) Add comments to soft components

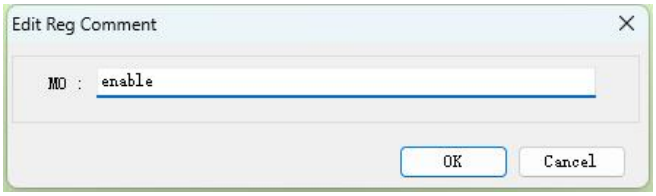
① Move the dashed box to the soft component you want to annotate, right-click to open the menu;



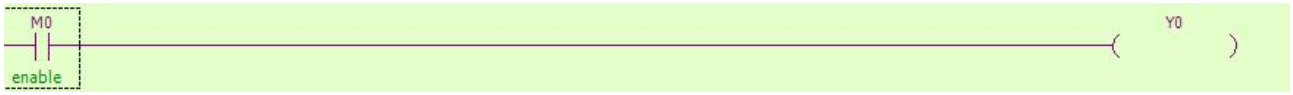
② Click the "Modify Soft Component Annotation" Icon to open the annotation dialog box for that component;



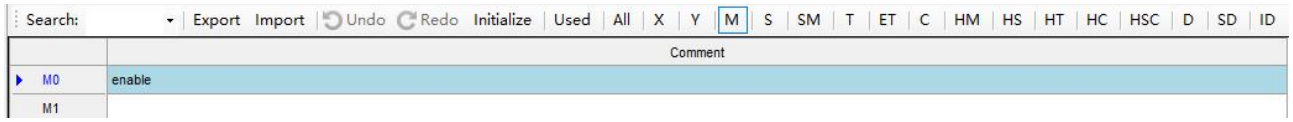
③ Add and modify text in the dialog box;



④ Click OK to complete the annotation. When the trapezoidal diagram annotation is displayed, the annotation information for all components will appear below each component.



Click [Soft Component Annotations/Usage] in the left engineering bar or select Display → Node Annotation Table on the menu bar to open the PLC1 Soft Component Annotation Table. In this table, you can view, modify, or add annotations for all PLC soft components. The display mode allows categorized or full display.

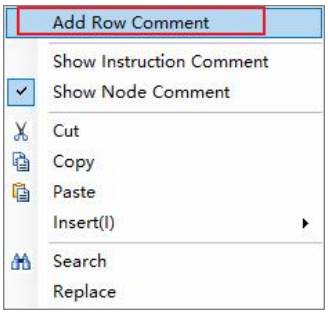


If you check "Enter the comment box after editing the instruction", a pop-up window titled "Edit Soft Component Comment" will automatically appear after completing the instruction editing (see 5-11-6-4). Enter the comment box after editing the instruction.

2) Add comments to the program segment

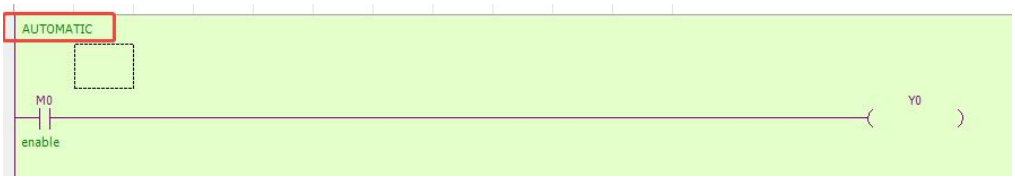
When writing programs, developers may need to add specific functional comments to certain code segments to facilitate future understanding of their purpose and make modifications easier.

To add comments to a program segment, right-click the desired location. The following dialog box will appear:



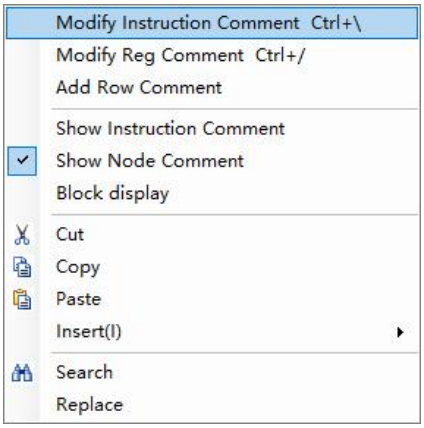
Click Add Row Comment to open the input box shown below:

Enter the comment content directly. After completion, click the blank area to finalize the entry; it will display in green font as shown below:

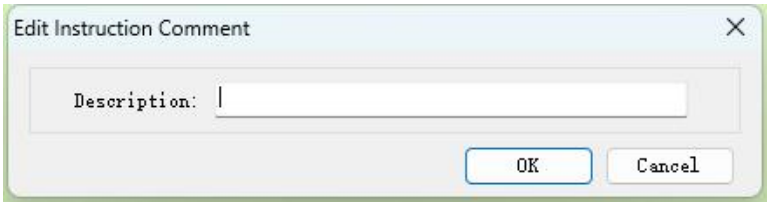


3) Add comments to instructions

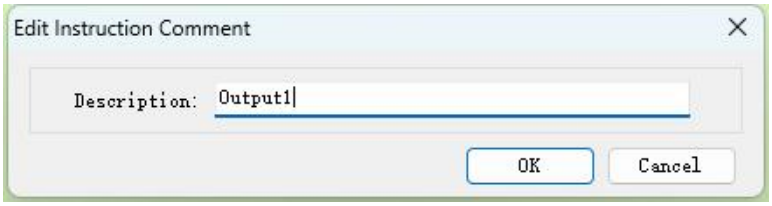
① Move the dashed box to the instruction you want to annotate, right-click to open the menu;



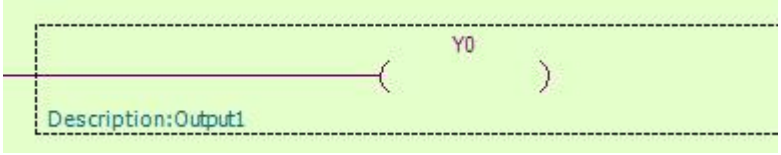
② Click the "Modify Instruction Comment" Icon to open the comment dialog for that instruction;



③ Add and modify text in the dialog box;



④ Click "OK" to complete the annotation. When the trapezoidal diagram annotation is displayed, all annotations matching this instruction will appear below it.

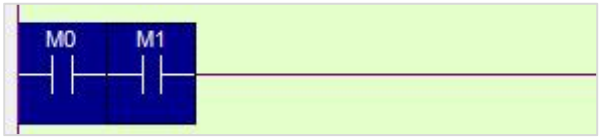


5-2-6. Copying and Cutting Trapezoidal Diagrams

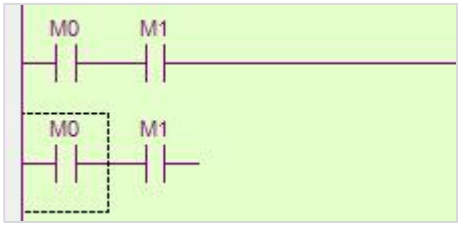
1) Copy

Move the dashed box to the desired location, hold down the left mouse button and drag; the selected

area will display in contrasting color. Click (or press Ctrl+C).

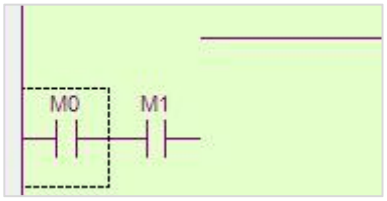


Then move the dashed box to the desired location and click (or press Ctrl+V);



2) Shear

Drag the mouse to select the area you want to cut, press (or Ctrl+X), then move the dashed box to the desired paste location, and click (or Ctrl+V).

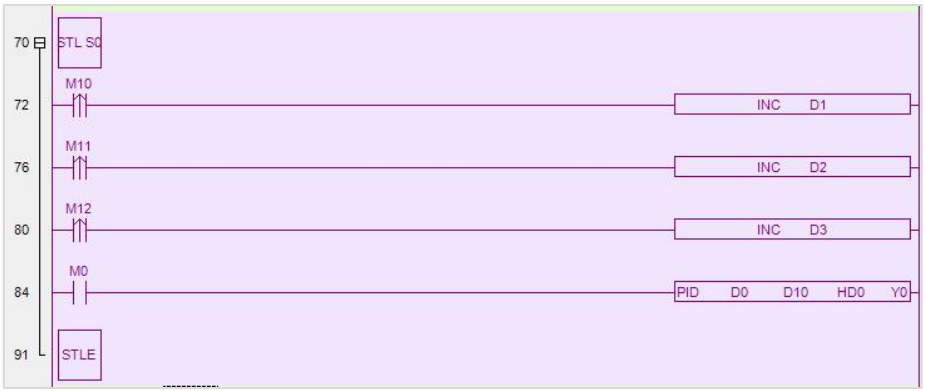


Hold the Ctrl key to select multiple nodes for cutting or pasting.

5-2-7. Management of Trapezoidal Diagram Instructions

1) Folding and unfolding statements

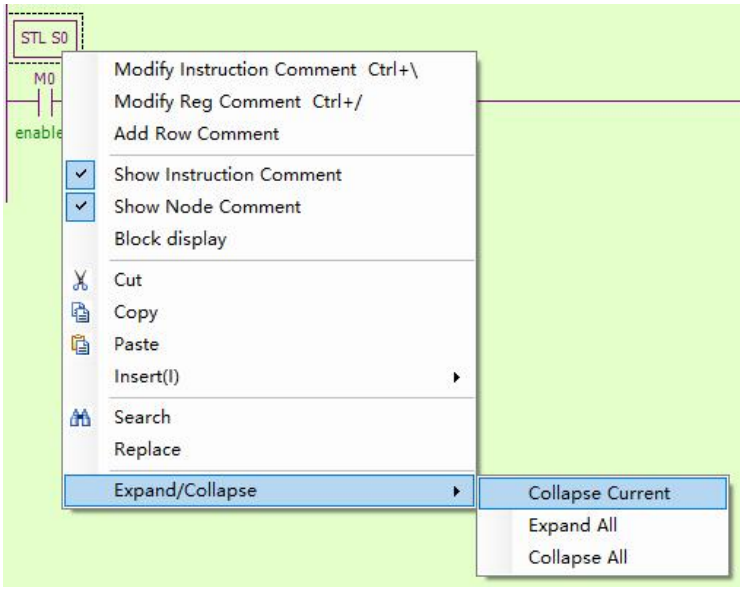
When user programs are excessively lengthy, effective instruction management helps users clarify their thinking and successfully complete program development.



The diagram above shows a sequence of flow statements. The gray-white area on the left indicates the line numbers corresponding to each statement. From the start to the end of the flow, there is a pair of opening and closing parentheses (""). Clicking "" changes the parentheses to "", folding the corresponding statement section as shown below:

Folding statement blocks generally applies only to statements such as if statements and loops. The folded code becomes more concise, helping users better understand the program's overall structure.

You can also fold and unfold using the right-click menu, as shown below:

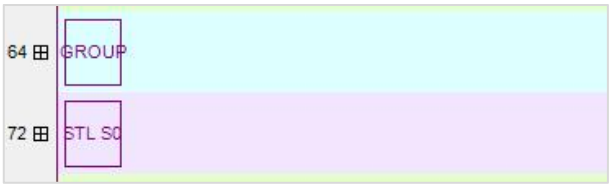


2) GROUP/GROUPE

The fold and unfold functions do not apply to regular statements, but they become applicable when statements are grouped using the GROUP/GROUPE command.

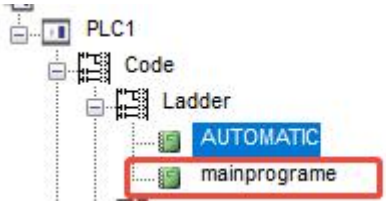
The GROUP and GROUPE instructions have no practical meaning; they serve only as formal constructs within the program. Typically, a GROUP instruction begins with GROUP and ends with GROUPE, with the middle section containing the actual user program code. Grouping may be based on differences in segment functionality or other criteria. Below is an example of grouping that can be entered directly as instructions.

If you fold the entire statement, the following effect will occur. To view ⊞ a specific section of the program, click "":



For easier management, users can also view them in the Engineering section on the left as shown below. All foldable items are listed under [Trapezoidal Programming] and can be expanded by double-clicking.

If there is a line comment on the row before the folding instruction, it will be displayed in the engineering bar.

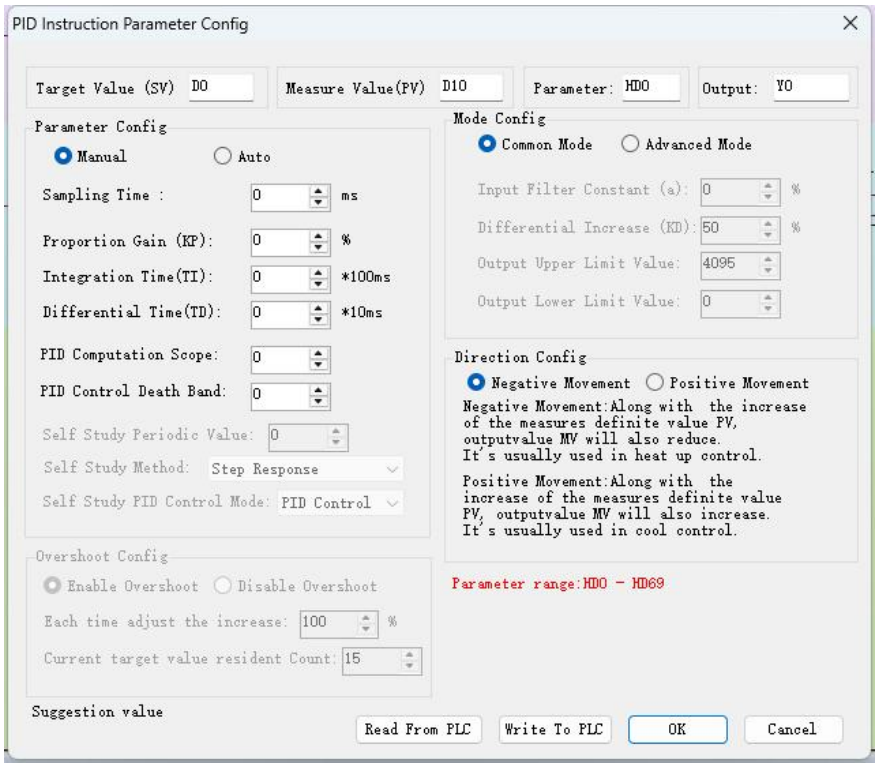


5-3. Writing Special Instructions

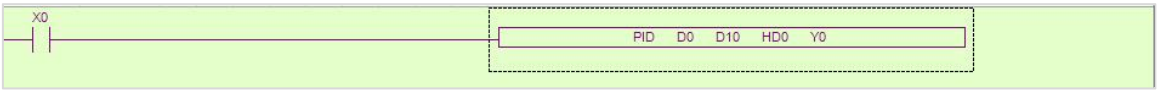
Complex commands with multiple parameters, such as PID and pulse control commands, must be configured via the configuration panel for clear and intuitive operation.

5-3-1. PID Instruction

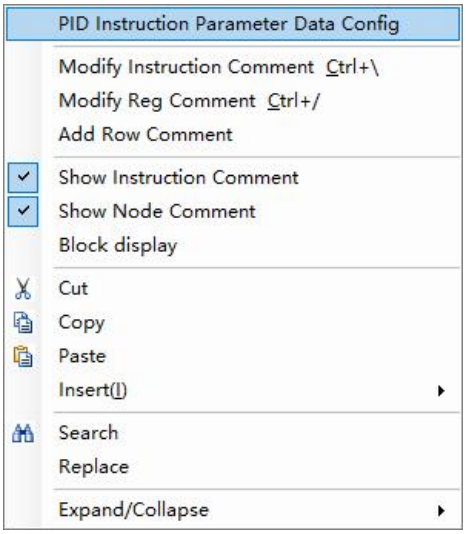
Position the cursor at the command input point, then click the Icon "" - [PID Configuration] in the command bar to open the parameter setup dialog. Set parameters including address, common PID parameters, mode settings, overshoot, direction, and other basic configurations as shown below:



After setting the parameters, click OK. The instructions will appear in the trapezoidal diagram window as shown below:



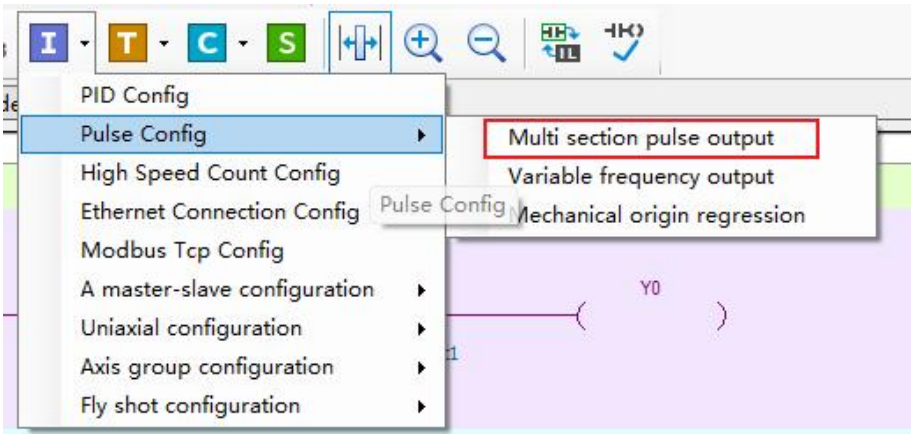
To modify parameters, right-click the instruction to change its address; other parameters can be modified manually via free monitoring.



The values for pulse settings, PID parameters, and high-speed counting configurations are downloaded into the PLC during user data transfer.

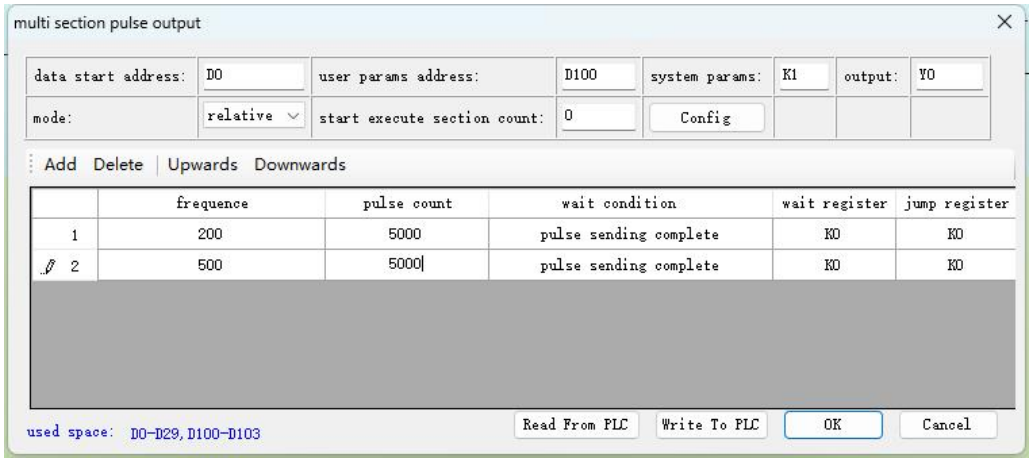
5-3-2. Pulse Instruction

Position the cursor at the command input point, then click the Icon "" - [Pulse Configuration] in the command bar, as shown below:

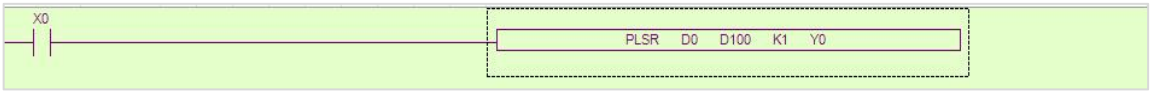


The DRVA and DRVI instructions must be entered directly in the ladder diagram as specified by the instructions.

For multi-stage pulse output, the parameter configuration dialog box appears. Settings include basic parameters such as instruction type selection, bit count, number of stages, frequency, acceleration/deceleration time, configuration, and address, as shown below:



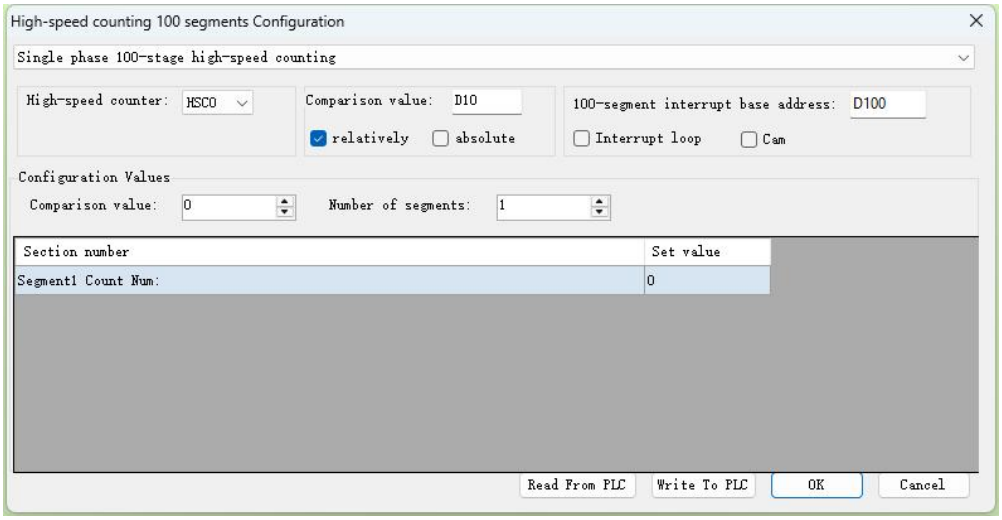
After setting the parameters, write them to the PLC and click OK. The instruction will appear in the designated area of the ladder diagram as shown below:



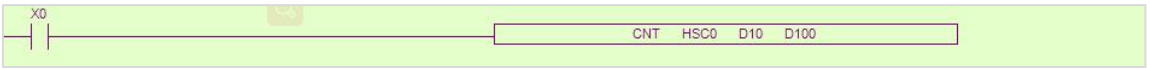
To modify parameters, right-click the instruction. Other parameters can be changed manually via free monitoring.

5-3-3. High-speed Count Instruction

Position the cursor at the instruction input point, then click the Icon "" - [High-Speed Count Configuration] in the command bar to open the parameter setup dialog. Set parameters including basic configurations such as the high-speed counter, comparison value, relative/absolute mode, and 100-interval interrupt base address value, as shown below:



After setting the parameters, click OK. The instructions will appear in the designated area of the ladder diagram, as shown below:

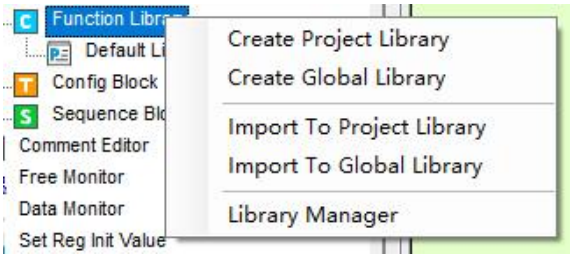


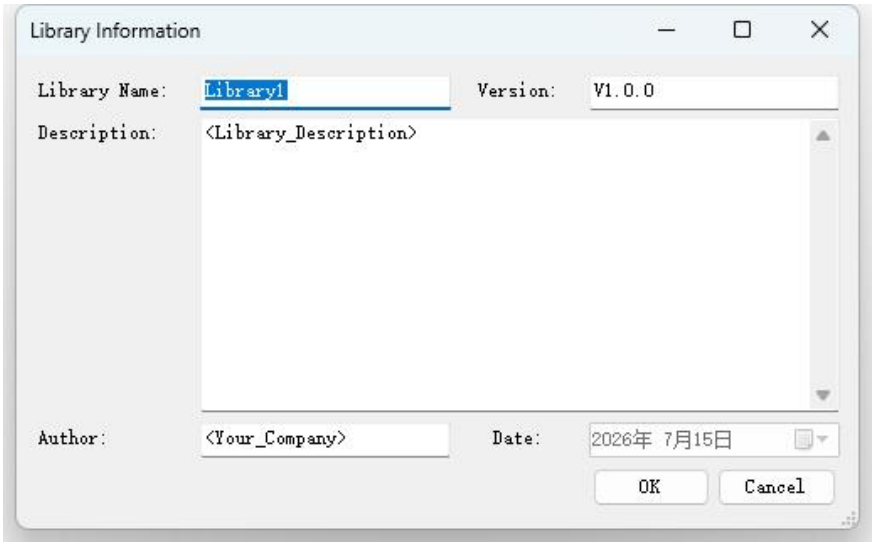
To modify parameters, right-click the instruction. Other parameters can be changed manually via free monitoring.

5-4. Function Library

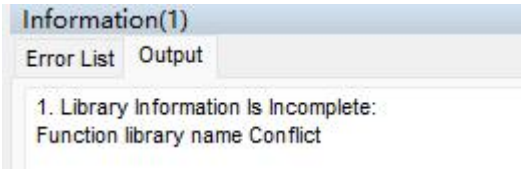
5-4-1. Project Library

In the Engineering toolbar on the left, select Function Library and right-click to choose New Project Library. The pop-up window allows you to edit the library's name, version, description, author, and other details, as shown below: Right-clicking Function Block creates a new project library or global library, imports/exportes existing libraries, or manages libraries.

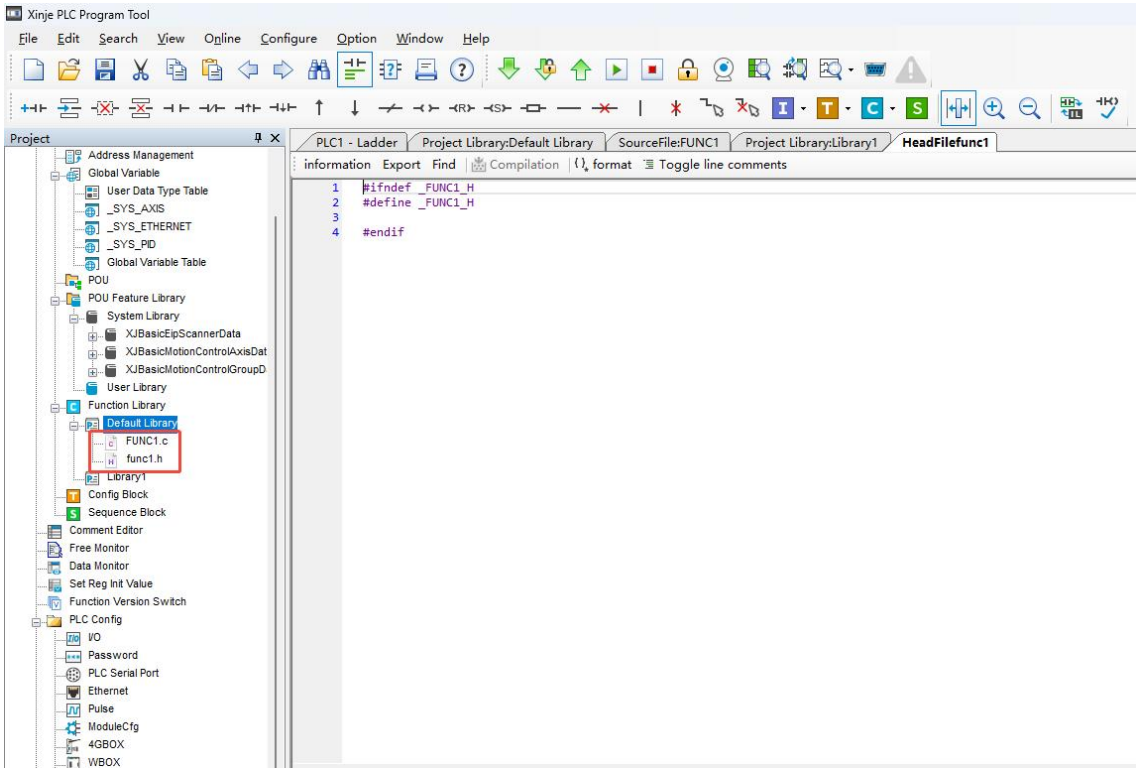




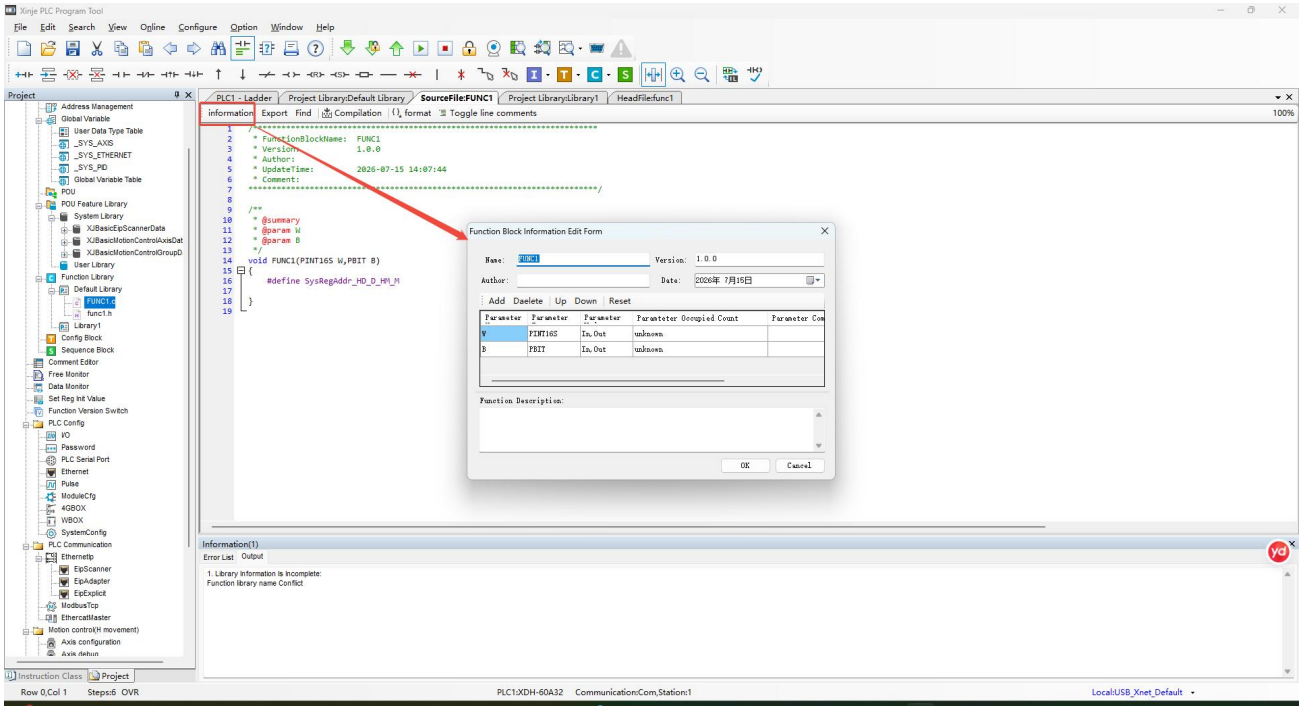
If the library name matches any library name in the current function library, a pop-up window will appear as shown below.



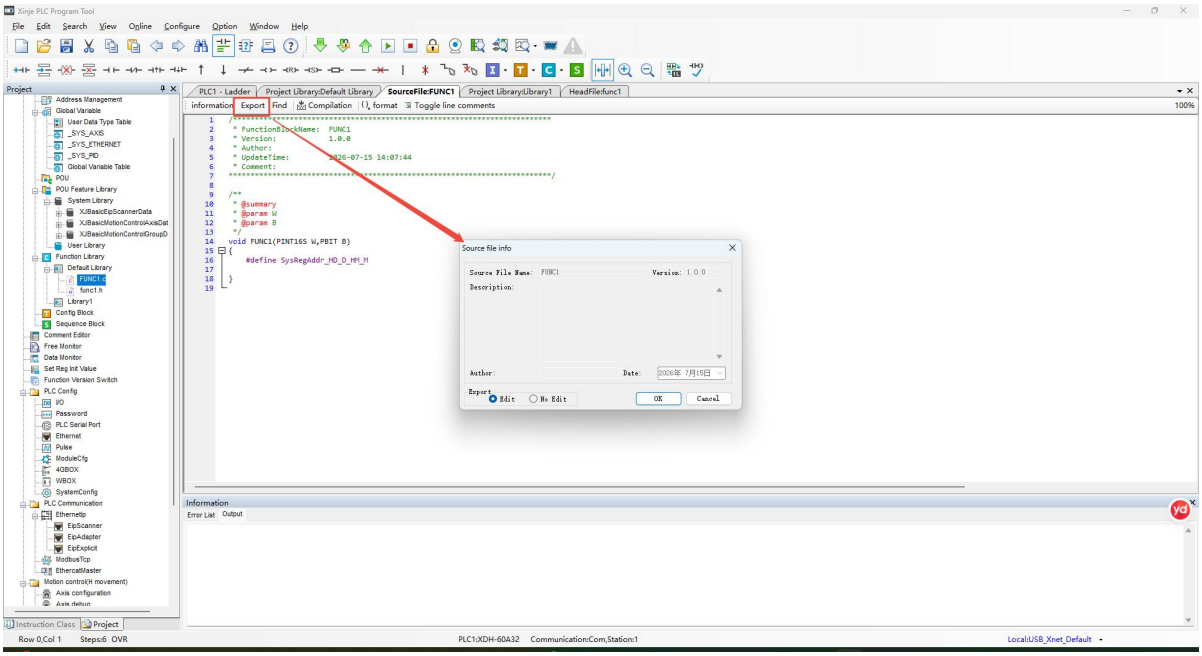
The added source file and header file are displayed under separate categories. Clicking the file name allows you to write C functions in the editing window.



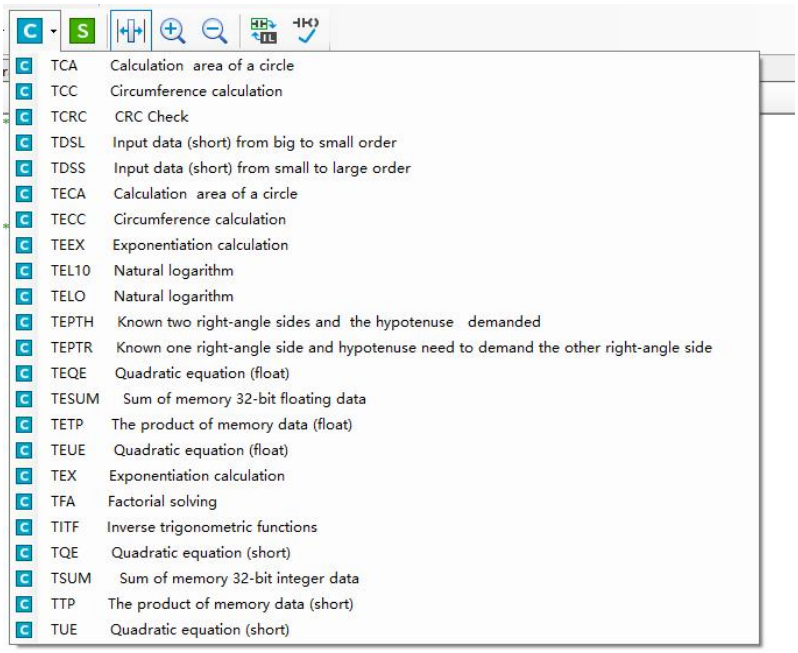
Click "Information" to edit the function block name, description, and other details.



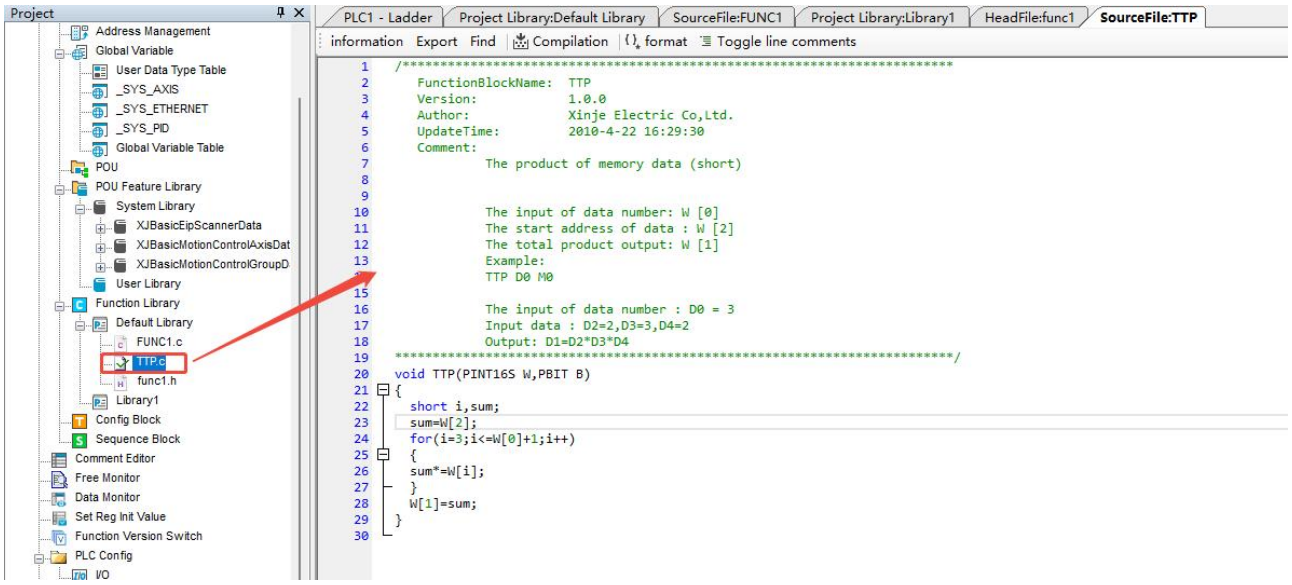
If you need to use the function after exiting the project, export it as a separate function file in either editable or non-editable format. The exported file will have the ".FCB" extension.



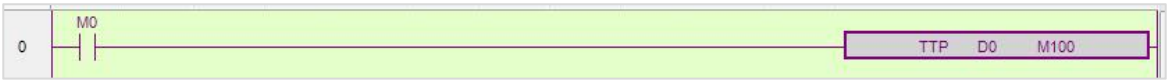
Click the [Trapezoidal Graph Input  Field] to access the following C functions that the software provides for direct invocation:



When you click the product of multiple TTP data points [integers], this function appears under the source file in the left engineering pane. Click TTP to edit the function:

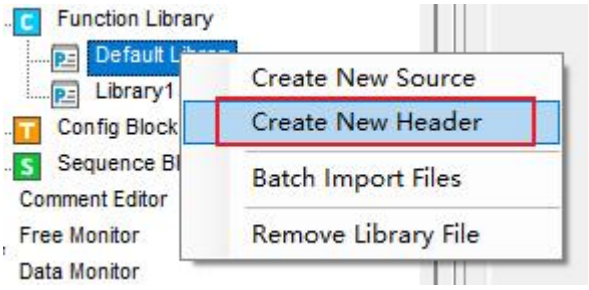


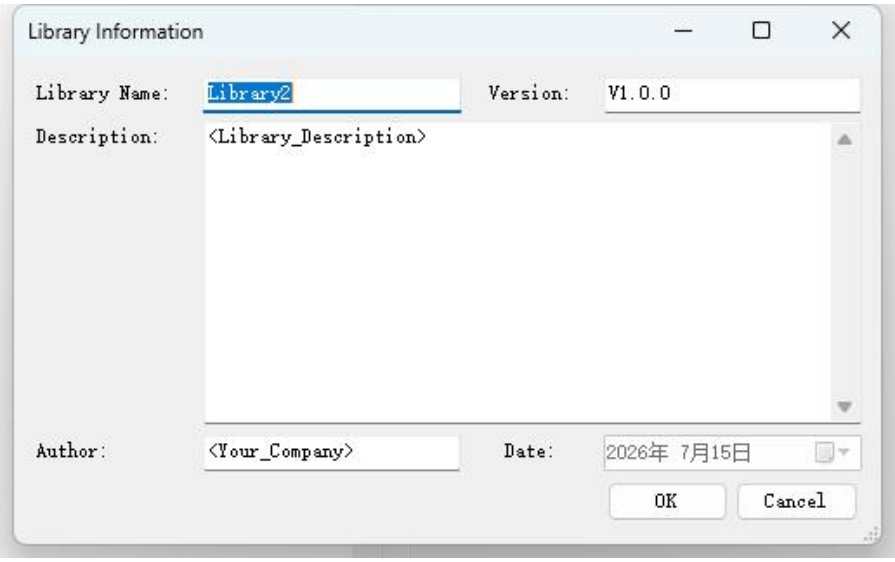
After function editing and compilation are completed, you can call it in the program as shown below:



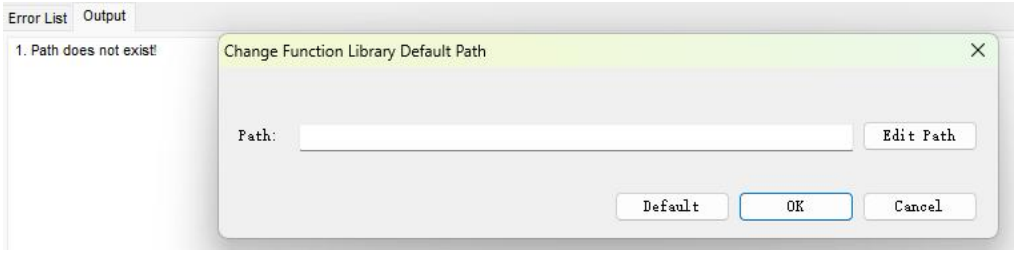
5-4-2. Global Database

In the Engineering toolbar on the left, select Function Library, then right-click and choose Create Global Library. The pop-up window allows you to edit the library's name, version, description, author, and other details, as shown below:

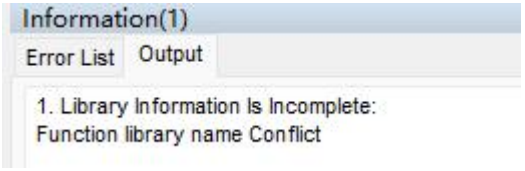




If no global library directory is set, the prompt shown below will appear, displaying the global library directory setup interface.



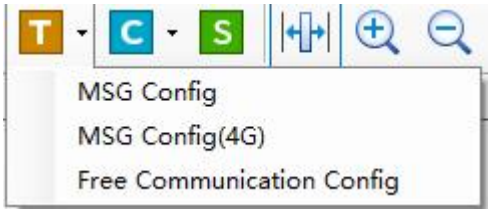
After setting the path, a window for creating a new library file will appear. Enter library information (name, version, description, author). If the library name matches any existing library name in the current function library, a pop-up window will appear as shown below:



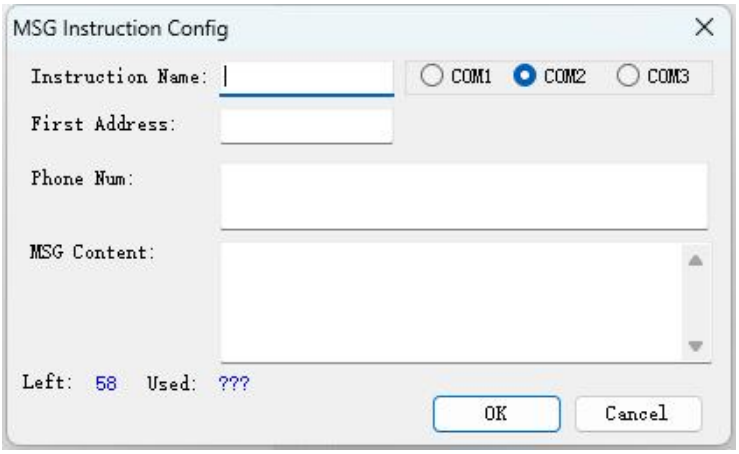
5-5. Configure Function Blocks

5-5-1. SMS Configuration

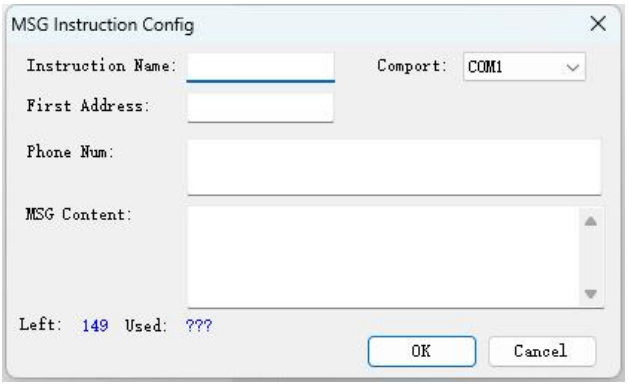
The SMS configuration for G-BOX and 4GBOX is implemented  via the PLC command input field, as shown in the figure below:



[SMS Configuration] For "GBOX SMS Command Configuration";



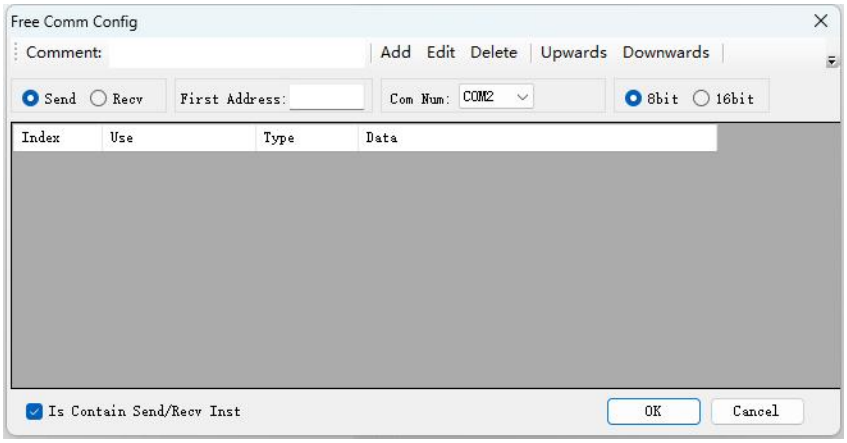
[SMS Configuration (4G)] for "GBOX (4G) SMS Command Configuration";



For specific applications, please refer to the User Manual for the Wireless Data Transmission Module G-BOX and the User Manual for the 4GBOX Wireless Data Communication Module.

5-5-2. Free-format Communication

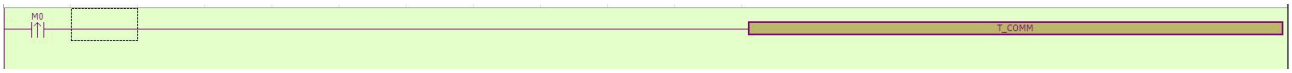
Free-format communication commands RCV and SEND can be entered directly in the ladder diagram according to their format or defined via the configuration panel. Click the PLC command input field, select [Free-format Communication Configuration], and the command configuration panel will appear as shown below:



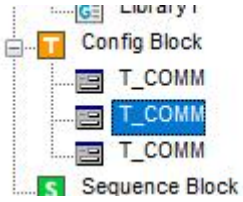
Enter the specifications, send/receive settings, primary address number, port number, and buffer size, then click "Add" to open the command configuration interface where you can configure data addresses and verification methods.

You can configure multiple send commands in the panel. After configuration, click OK. The commands

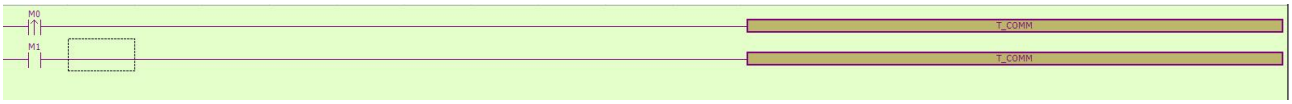
will display as follows in the ladder diagram:



To modify, double-click the command in the trapezoid diagram or the command name in the left engineering bar:



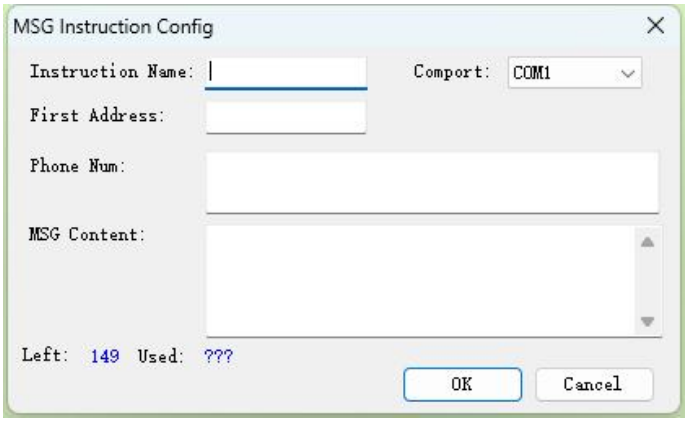
- Before configuring free-format communication commands, set the corresponding serial port to "Free-Format Communication" and configure the communication parameters.
- A single command can only contain either send or receive instructions. In other words, if both send and receive commands are required, at least two free-format communication commands must be configured, as shown in the figure below.



5-5-3. SMS Configuration (4G)

The SMS configuration for 4GBOX is implemented via the PLC command input field, as shown in the figure below:

[SMS Configuration (4G)] for "GBOX (4G) SMS Command Configuration";

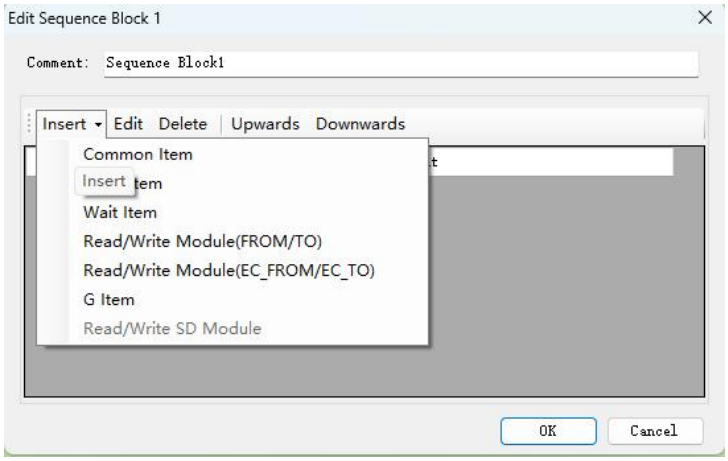


For specific applications, please refer to the User Manual for the Wireless Data Transmission Module G-BOX and the User Manual for the 4GBOX Wireless Data Communication Module.

5-6. Sequential Function Blocks

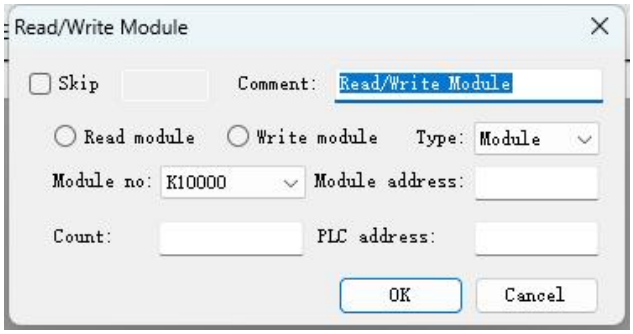
BLOCK is designed for sequential program execution, suitable for applications requiring multiple pulse outputs or read/write modules. All programs within BLOCK execute sequentially based on the order of condition fulfillment. Instructions in BLOCK are configured via a panel interface.

Click the Icon "" in the command  bar to enter the BLOCK configuration interface, as shown below:

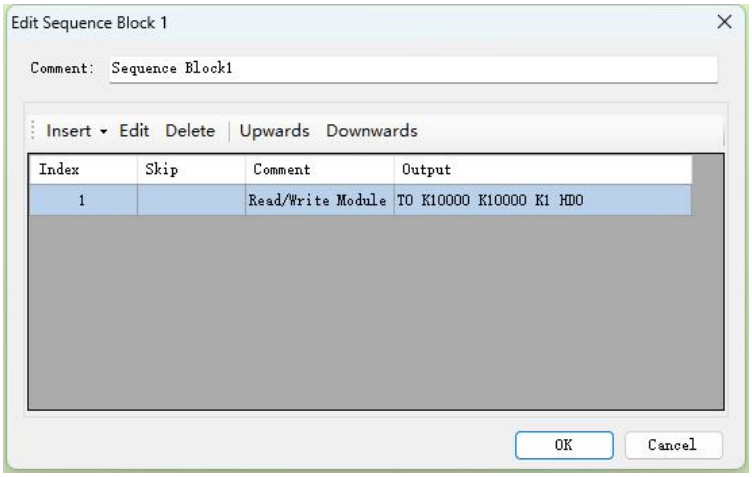


In the configuration window shown above, you can add command statements, pulse configurations, Wait instructions, read/write modules (FROM/TO), G instructions, and SD card read/write modules.

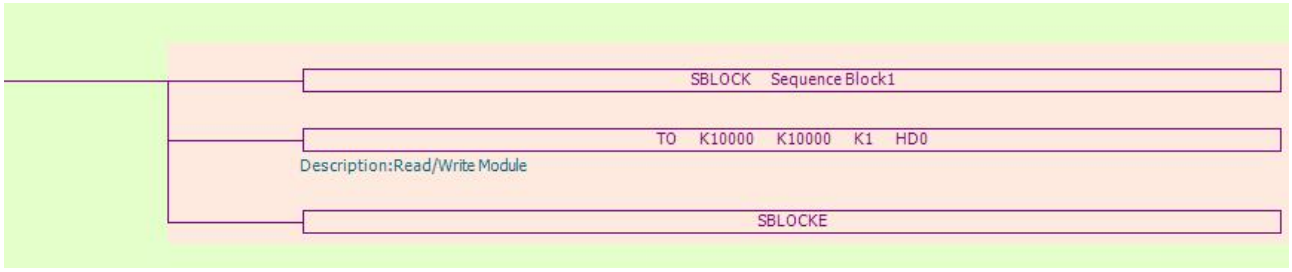
Taking the read/write module as an example, insert "Read/Write Module (FROM/TO)" and enter the relevant parameters in the configuration panel, as shown below:



Click OK to generate one instruction. You can add multiple instructions to a sequential function block using the same method:



Click OK to generate sequential function block instructions in the trapezoidal diagram, as shown below:



Double-click "SBLOCK Sequence Block 1" to open the "Edit Sequence Block 1" configuration panel. Double-click "TO K10000 K1 K5 HD0" to open the configuration panel for this command.

For further information on BLOCK usage, refer to the relevant BLOCK chapters in the User Manual for XD/XL Series Programmable Controllers [Basic Instructions Section].

5-7. PLC Configuration

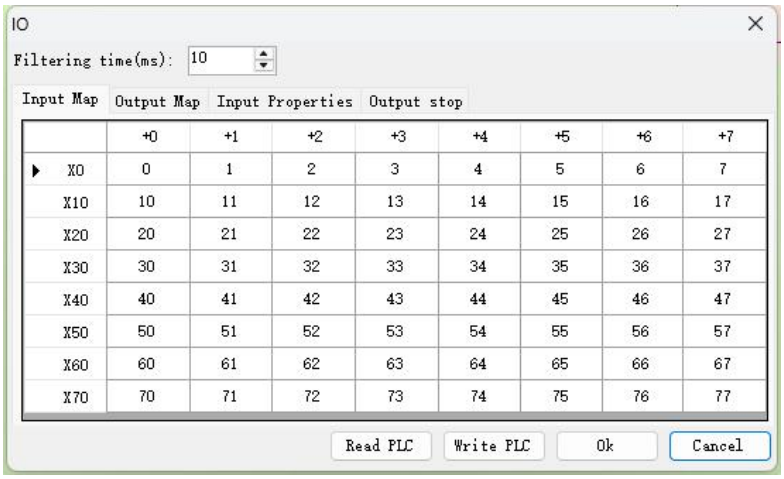
5-7-1. IO

Click [PLC Configuration] → [I/O] in the left engineering panel to open the I/O settings window. Here you can configure input filtering time (default 10 ms), input/output point mapping relationships, input +/-logic, and output status during STOP.

5-7-1-1. Filtering Time

Filter Time: A signal is considered valid if present at the input terminal and its duration exceeds the filter time.

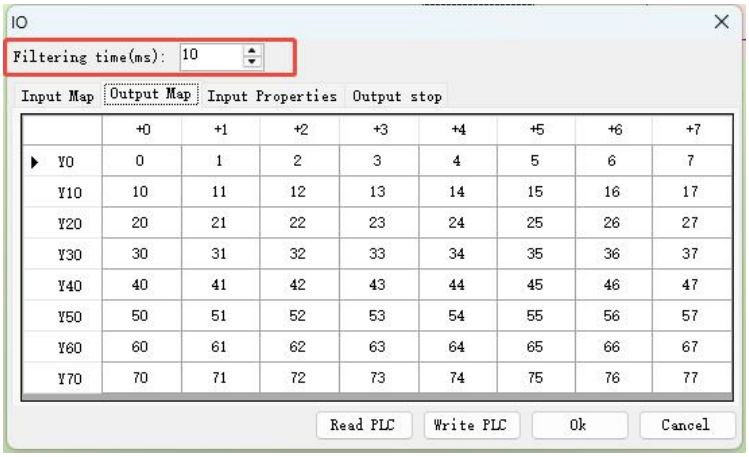
1) For offline download models and bus-based models, only a unified filtering time can be set. The configuration interface is shown below; you can configure the input terminal filtering time by clicking [PLC Configuration] → [I/O] → [Filtering Time] in the left engineering panel.



	+0	+1	+2	+3	+4	+5	+6	+7
X0	0	1	2	3	4	5	6	7
X10	10	11	12	13	14	15	16	17
X20	20	21	22	23	24	25	26	27
X30	30	31	32	33	34	35	36	37
X40	40	41	42	43	44	45	46	47
X50	50	51	52	53	54	55	56	57
X60	60	61	62	63	64	65	66	67
X70	70	71	72	73	74	75	76	77

2) For Ethernet-based online download models, each channel corresponds to a separate filtering parameter, with the default value set at 10 ms. The configuration interface is shown below; you can

adjust the input terminal filtering time by clicking [PLC Configuration] → [I/O] → [Filter Time] in the left engineering panel.



Only devices with firmware versions V3.7.4 or higher (XD5E/XL5E/XL5N/XDME/XLME/XL5H) that can be downloaded online support customizing filter timing for individual input terminals.

5-7-1-2. Input/Output Point Mapping

Input/Output Point Mapping: Definitions of actual input and output ports corresponding to internal soft component numbers; Example:

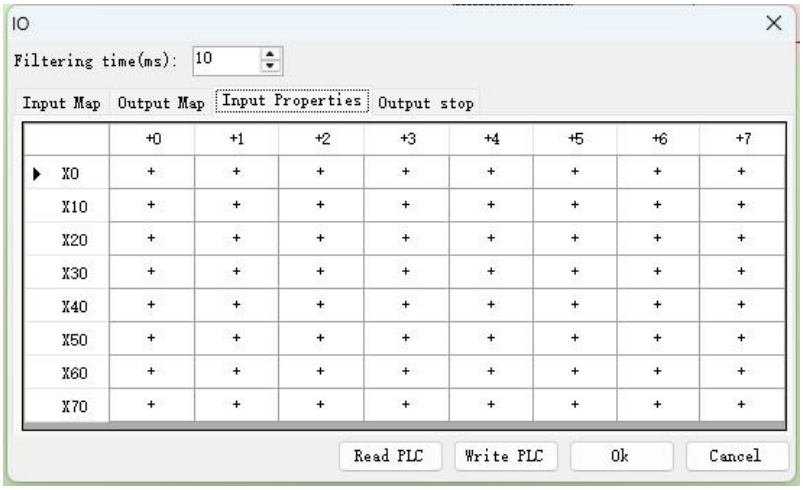
Parameter Configuration	Explain
Enter the default configuration: X0 corresponds to value 0, X1 corresponds to value 1	When the input terminal X0 is set to ON, the soft component X0 is also set to ON.
	When the input terminal X1 is set to ON, the soft component X1 is also set to ON.
Enter the modification configuration as: X0 corresponds to value 1, X1 corresponds to value 0	When input terminal X0 is set to ON, the soft component X1 is also set to ON.
	When input terminal X1 is set to ON, the soft component X0 is also set to ON.
Output default configuration: Y0 corresponds to value 0, Y1 corresponds to value 1	When the soft component Y0 is set to ON, the output terminal Y0 outputs a signal.
	When the soft component Y1 is set to ON, the output terminal Y1 outputs a signal.
Change the configuration to: Y0 corresponds to value 0, Y1 corresponds to value 0	When the soft component Y0 is set to ON, both output terminals Y0 and Y1 provide an output signal.

Multiple input terminals cannot be mapped to the same internal soft component; otherwise, it may cause operational abnormalities.

5-7-1-3. Input Attributes

Input property: When set to "+", input and output states follow positive logic; when set to "-", they follow negative logic.

Positive logic: The terminal is ON when a signal is present, and OFF when no signal is present; negative logic follows the opposite rule.



5-7-1-4. Output status of STOP

1）Devices

Devices	Firmware Requirements	Software Requirements
XDH/XLH/XG2	V3.7.3 and above	V3.7.16 and later
XD5E/XL5E/XL5N/XDME/XLME/XL5H	V3.7.4 and above	V3.7.18 and later
XD3E (Bipolar model)	V3.7.4a and above	V3.7.18 and later

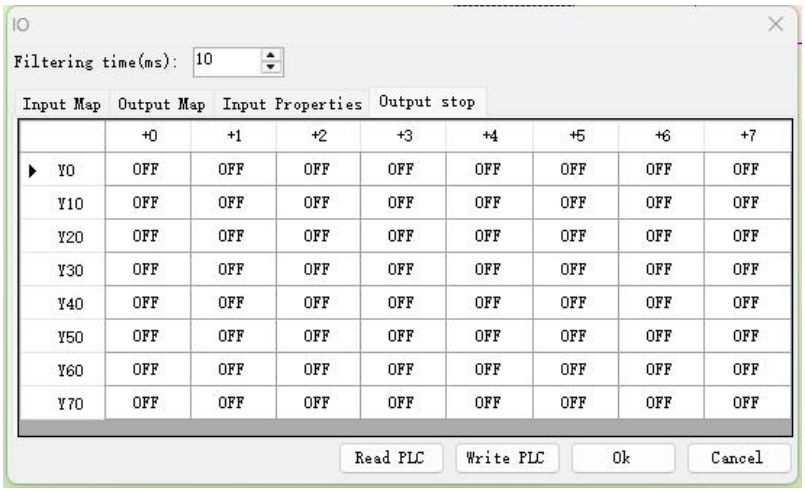
Only the above models support this feature.

2）STOP output status

After the PLC stops or reports an error, maintain the output state selected in the table.

3）Parameter setting

Click [PLC Configuration] → [I/O] in the left engineering panel to access the [STOP Output Status] section. Each channel corresponds to a distinct output status. Double-click the cell to configure it using the drop-down menu, where you can set options as "OFF", "Hold", or "ON"; the default is "OFF".



4）Parameter Meaning

"OFF": When the PLC is in STOP mode, the output terminals are reset.
The "Maintain" function preserves the corresponding status of the output terminals when the PLC transitions from RUN to STOP mode while operating in STOP mode.
"ON": When the PLC is in STOP mode, the output terminals are set.

The above parameters take effect after the PLC restarts.

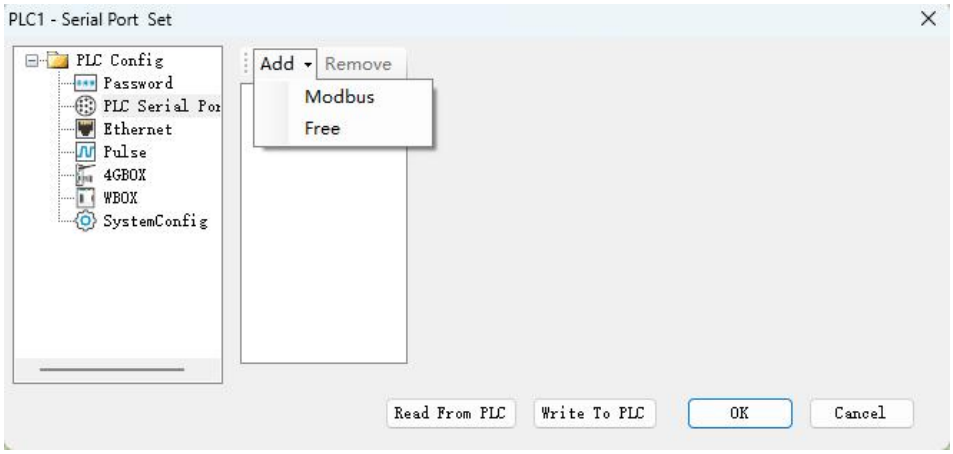
5-7-2. Password

For details, see 4-5-1. Password Setup.

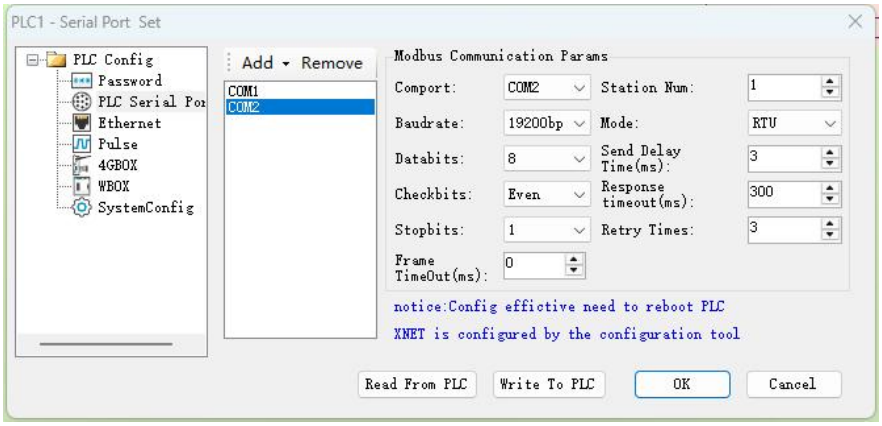
5-7-3. PLC Serial Port Settings

Modbus communication parameters and free-format communication parameters are primarily configured via the left-side Engineering Bar under [PLC Configuration] → [PLC Serial Port]. X-NET communication parameters should be configured using the XINJEConfig configuration tool.

1、 Click the Engineering menu → [PLC Configuration] → [PLC Serial Port Settings] to open the serial port settings window.



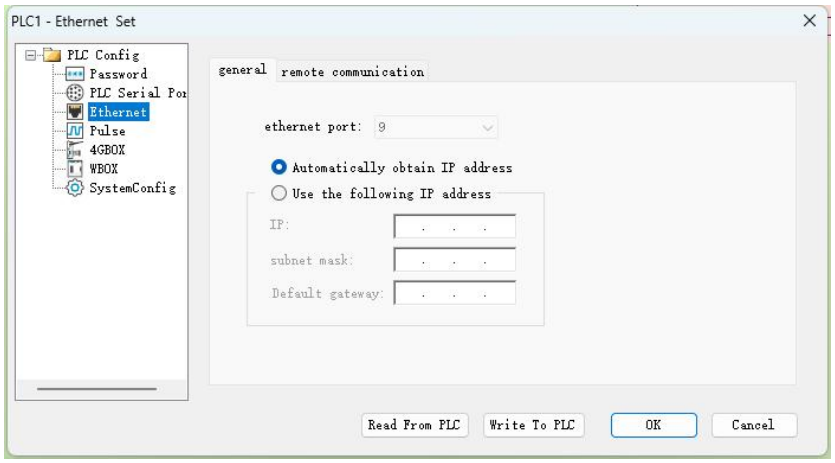
2. Click "Add" to select between Modbus communication or free-format communication;



3. Select the "Port Number" sequentially to configure different serial ports; two Modbus communication modes are available: "Modbus-RTU" and "Modbus-ASCII".
4. Click "Read PLC" to retrieve the PLC's default communication parameters;
5. Click "Write to PLC" to save the current parameters into the PLC, then power on the PLC again.

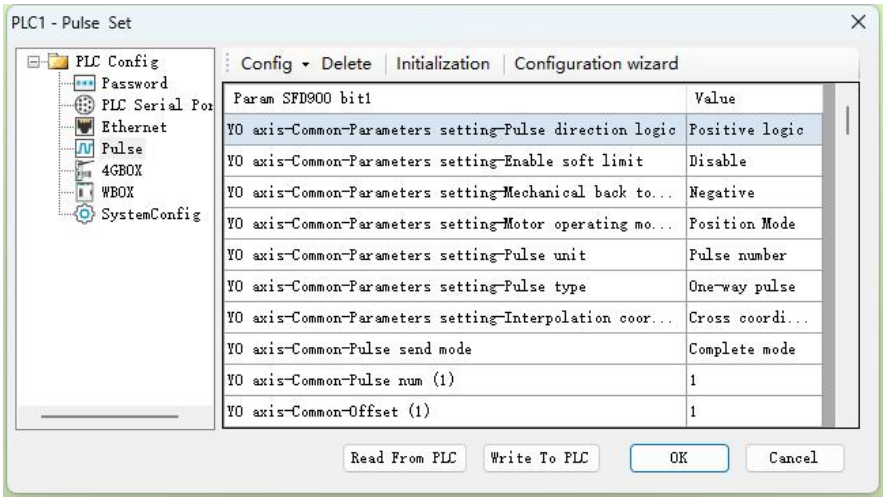
5-7-4. Ethernet Port Configuration

Click [PLC Configuration] → [Ethernet Port] in the left engineering panel to access two configuration windows: Basic and Remote Communication. This function is primarily used for basic Ethernet communication settings; refer to the Ethernet Communication User Manual for details.



5-7-5. Pulse Parameters

To use pulse commands, you must configure the pulse parameters. Click [Parameters] in the diagram above or select [Engineering Bar] → [PLC Configuration] → [Pulse Parameters] on the left side to open the parameter setup interface, which allows modifying common pulse parameters for Y0–Y11 and system parameters for Sets 0–4.

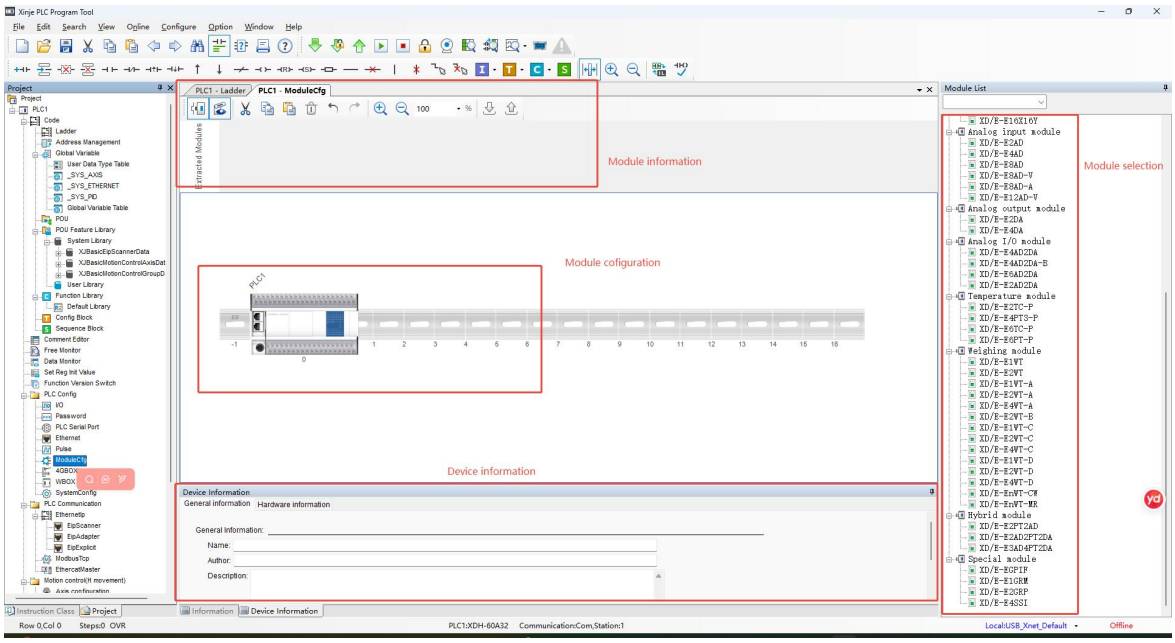


[Initialize] Restores the current axis parameters to factory settings;
[Configuration Wizard] guides users on how to configure parameters;

For detailed instructions on using pulse-related parameters, refer to the User Manual for XD/XL Series Programmable Controllers [Positioning Control Section].

5-7-6. Module Configuration

5-7-6-1. Interface Introduction



1) Configuration Display Toolbar

Icon	Operate	Explain
	Extracted module	Show or hide the Uninserted Module Area
	Display Module Label	Show or hide the model label information above the module in the module configuration area
	Shear	Cut the selected module, including its configuration parameters
	Duplicate	Copy the selected module, including its configuration parameters
	Paste	Paste the selected module. If a module with the same name exists in the paste area, its name will automatically be prefixed with _1 or _2.
	Delete	Delete the selected module
	Cancel	To undo all actions on this page, there are 20 steps in the undo history. Clear undone actions: Save, Close, Create New Project, Download Configuration
	Recover	To restore all operations on this page, the operation will only become highlighted after cancellation is triggered.
	Zoom In/Out	Zoom in on the Module Configuration Area View to increase the display scale by 10%, and the scaling window will refresh accordingly
	Display Ratio Window	Control the view scale of the "Module Configuration Area" to 100% by default, with a range of 50%–200%, and modify

Icon	Operate	Explain
		it using the dropdown menu.
	Write In Plc	Write the module configuration information to the PLC.
	Fetch Plc	Read the module configuration information from the PLC to the interface.

2) Module storage area not inserted

Used to store removed modules. Addition method:

- After selecting this area or area module, double-click the module in the list to add it.
- Select a module (CPU rack module, module placement area module, or module list module), then drag and drop to add.
- Copy the module (CPU rack module, module placement area module, or module list module) and paste it to add.

- The above operations are supported only when the module storage area is not opened.
- You can add up to 20 modules; additional additions are restricted.
- Supports single or multiple selection of modules in the placement area or CPU rack; the module list supports only single selection.
- When storing a module with assigned parameters into the Un inserted Module Storage Area, the parameters are retained.

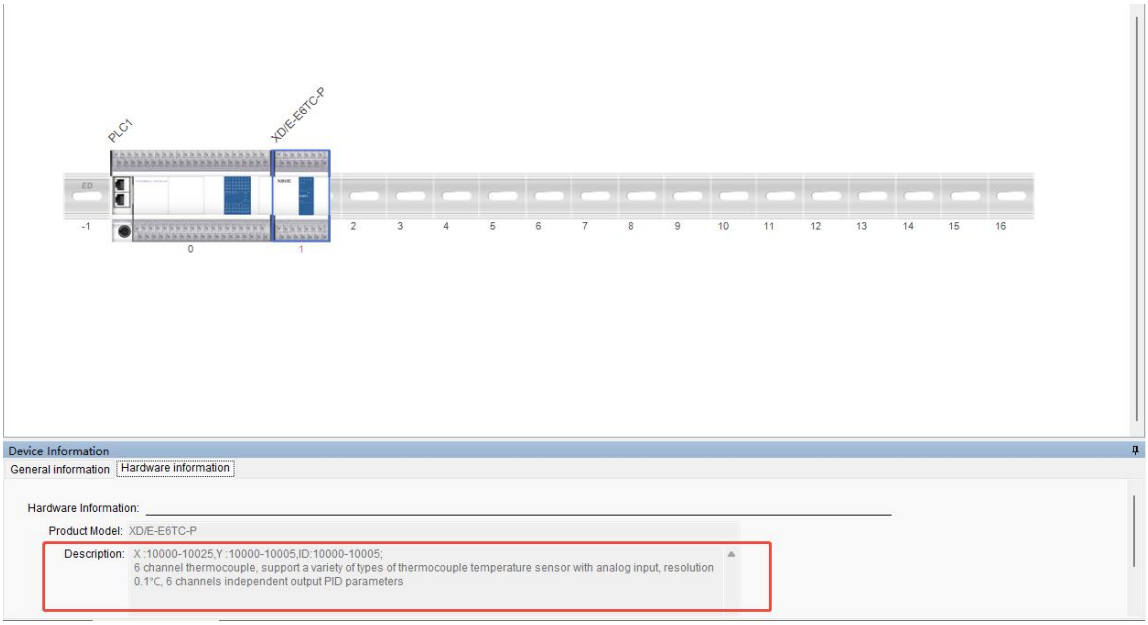
3) Module Configuration Area

The module is added in the same way as when it was not inserted into the module storage area.

- If the number of configured right expansion modules is ≥5, or if the system detects ≥5 device mounting modules when opening the project, an exclamation mark will appear in the PLC interface: "Number of external right expansion modules ≥5; requires use of the XD-ETR terminal resistor module." Double-click the exclamation mark to cancel.
- When dragging a module to a slot of a configured module or when the slot type does not match the module type being added, the mouse displays a restriction indicating insertion is prohibited.
- Use the arrow keys to move left and right to select.

4) Product Information Section

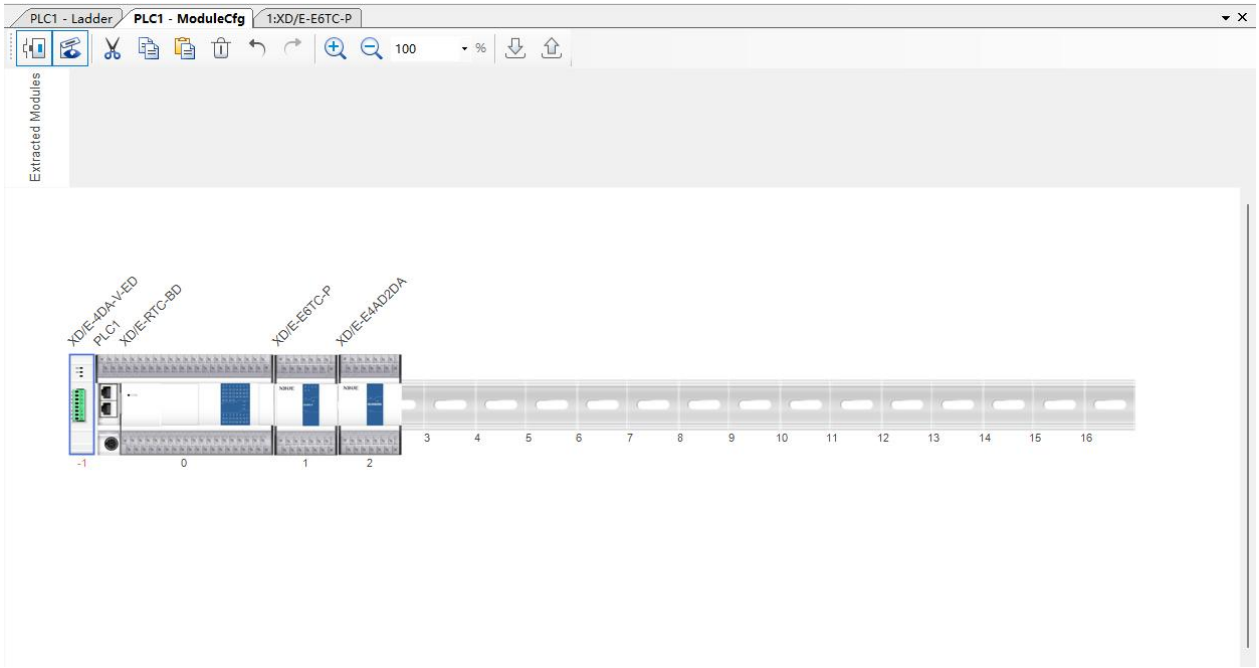
Click the configuration module in the rack to display corresponding device information. This interface integrates with the module configuration interface (displayed and closed simultaneously). When selecting multiple modules, it shows the information of the last selected module.



5-7-6-2. Module Configuration

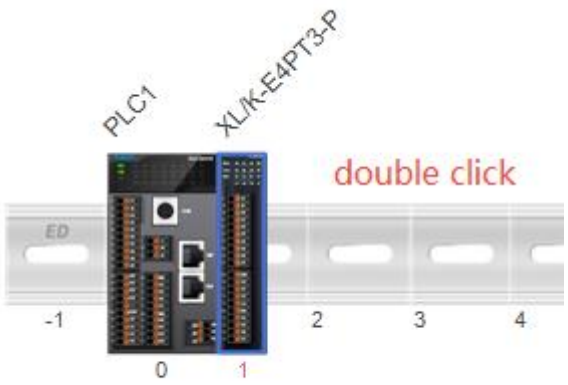
This function is used to configure the expansion modules, including the left ED module and the upper BD module.

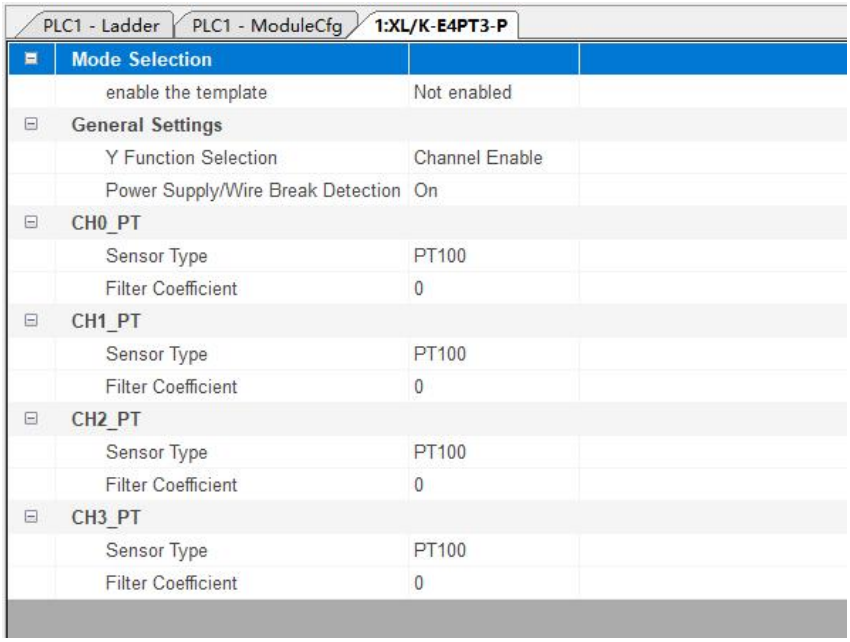
1. Click [PLC Configuration] → [Module Configuration] in the left engineering panel to open the expansion module settings window.



2. Click the corresponding item in the right list in order, select the module from the right module list, and double-click it.

3. Double-click the corresponding module Icon to enter the module configuration interface and set module parameters.

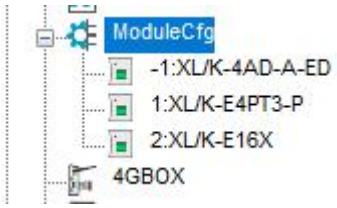




4. Click "" to  view the default configuration parameters for the extension module.

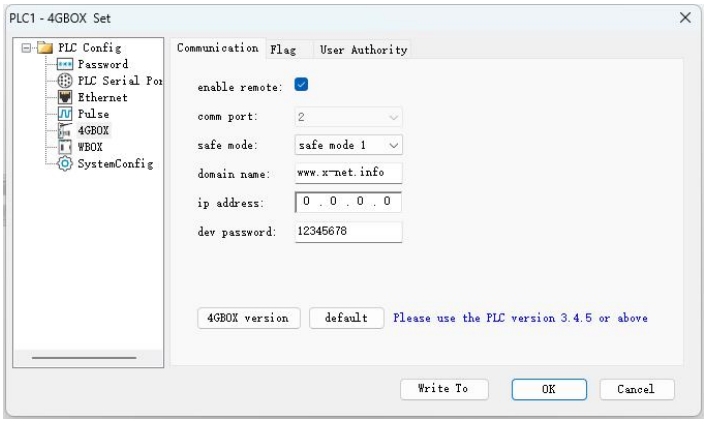
5. After completing the parameter settings for  the expansion module, click "" to save the values in the PLC. The changes will take effect only after power shutdown and subsequent power-on. Under

the Module Configuration node, mount the configured modules and double-click to access module parameter configuration.



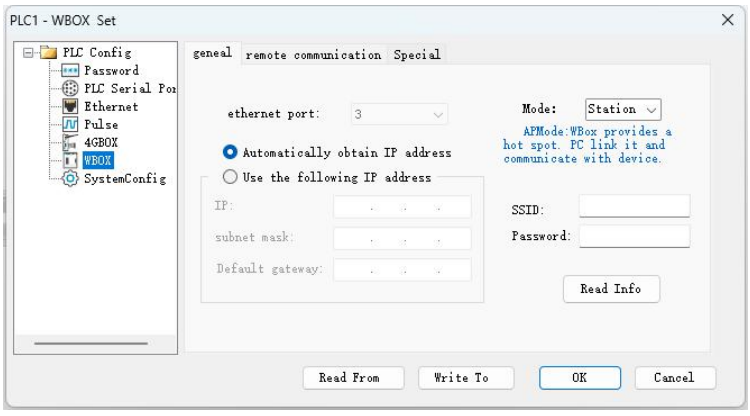
5-7-7. Configuration of 4GBOX

Click [PLC Configuration] → [4GBOX] in the left engineering panel to open the configuration window, which consists of three sections: Communication Parameters, Flag Registers, and User Permissions. This feature allows you to configure 4GBOX-related communication parameters; refer to the 4GBOX Wireless Data Communication Module User Manual for detailed settings.



5-7-8. WBOX Settings

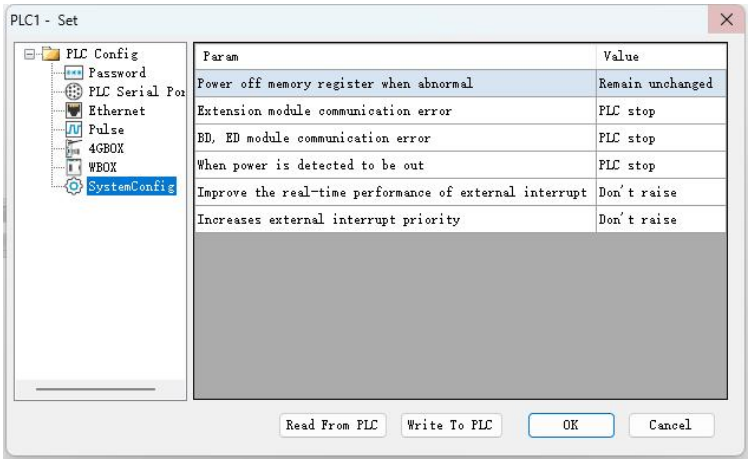
Click [PLC Configuration] → [WBOX] in the left engineering panel to open the configuration window. This feature is primarily used for setting parameters during WBOX communication; refer to the User Manual for the WBOX Wireless Data Communication Module for detailed configurations.



5-7-9. System Settings

This section modifies settings related to the PLC system. Unless otherwise required, it is recommended

not to make any changes.



5-8. PLC Communication

5-8-1. Modbus TCP graphical configuration

5-8-1-1. Overview

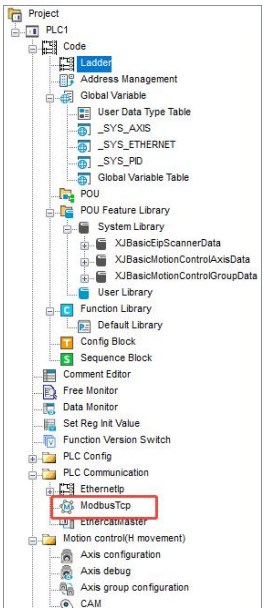
To facilitate seamless data communication with Modbus-TCP devices, the models listed in the table below support graphical configuration via Modbus-TCP.

Type	XDH/XLH/XG2	XD3E	XD5E/XL5E/XL5N/XDME/XLME	XL5H
Firmware Requirements	V3.7.3 and above	V3.7.4a and above (bipolar models)	V3.7.4 and above (Download online)	V3.7.4 and above (Download online)
Number of Station Connections	32	8	8	4
Shared Connections Count	3000 items	500 items	500 items	500 items

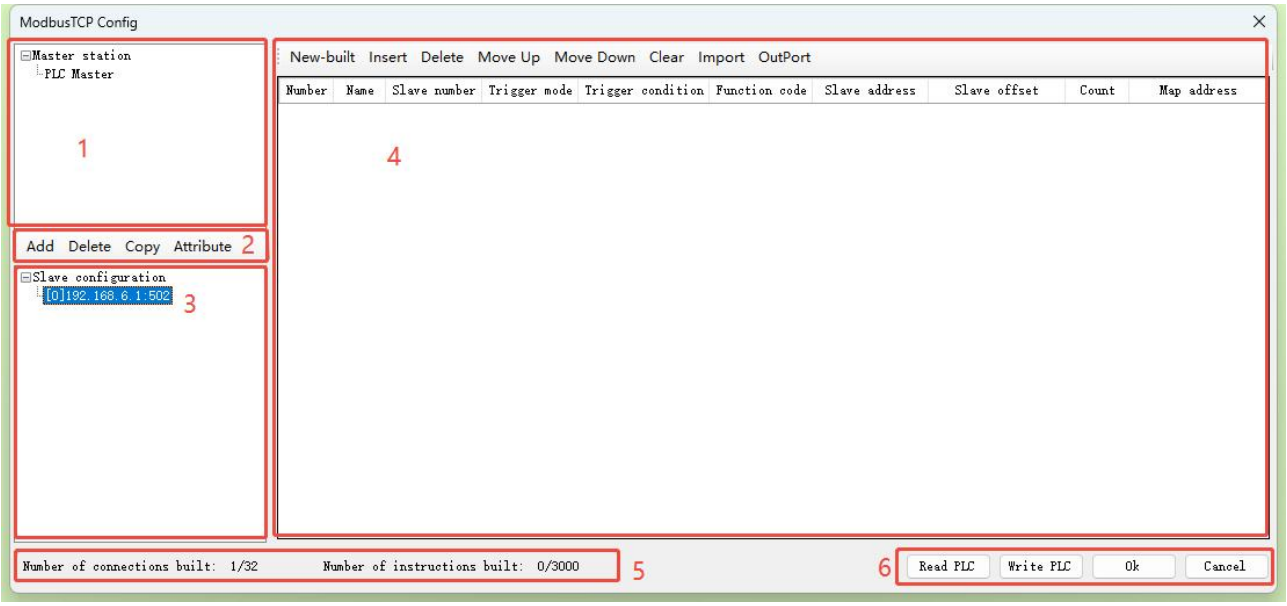
Graphical configuration ensures that connection establishment does not conflict with socket creation; if necessary, data communication can be achieved via socket creation. For detailed instructions on establishing connections using sockets, refer to the Ethernet Communication User Manual.

5-8-1-2. Modbus TCP Master Station Configuration

The connection configuration process is as follows:
In the left task navigation bar, navigate to "Engineering" files → "PLC Communication" → "Modbus TCP", then double-click to enter the configuration interface and add a Modbus TCP connection.



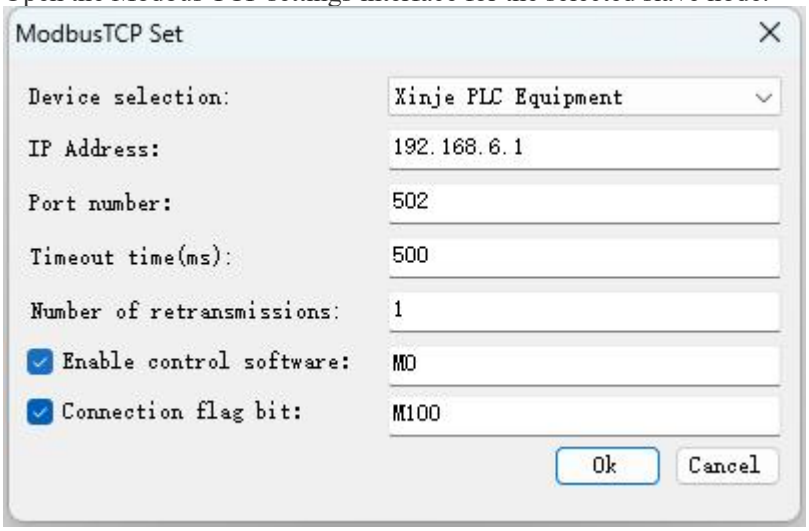
1) Modbus TCP graphical configuration table



[Region 1]: Displays the main station configuration information;

【region 2】:

- Supports adding, deleting, copying, and modifying attributes for branch node nodes;

Add	Add a default slave node at the bottom and move the cursor to this added slave node.
Delete	Delete the selected secondary node. This function is ineffective if the current tree node is empty.
Duplicate	When the user clicks the Copy button, it copies the selected slave node information (attributes + command configuration details) and automatically pastes it at the bottom of the tree node, changing the IP address to the default value. The cursor then moves to this pasted slave node.
Attribute	Open the Modbus TCP settings interface for the selected slave node. 

- In the Modbus TCP configuration interface, you can set the following parameters:

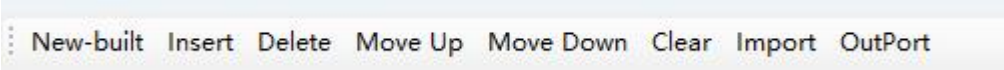
Equipment selection	xinje PLC devices and other Modbus devices; the default is xinje PLC devices.
Ip address	The IP address of the target PLC; defaults to 192.168.6.1, starting from 1, with the next address being the previous one plus 1.
Port number	Default value: 502.
Timeout time	Default value: 500 ms; range: 10–65535.
Enable control soft components	Not disabled by default; enabling it allows you to configure the local coil control. When disabled: The PLC automatically establishes a TCP connection to the target

	IP upon startup. Enabling: Supports only bit registers. A TCP connection to the target IP is established only when the specified coil is set to ON. If the condition is not met, the TCP connection is closed.
Connection flag	Store the result of whether this device was connected successfully in the corresponding connection flag register.
Repost count	If the communication times out, it will be resent. The default number is 1, with a range of 1 to 15 allowed.

[Region 3]: Displays slave station configuration information.

【region 4】:

- Supports users in selecting and configuring relevant commands for secondary nodes, including create, insert, delete, move up, move down, clear, import, and export.



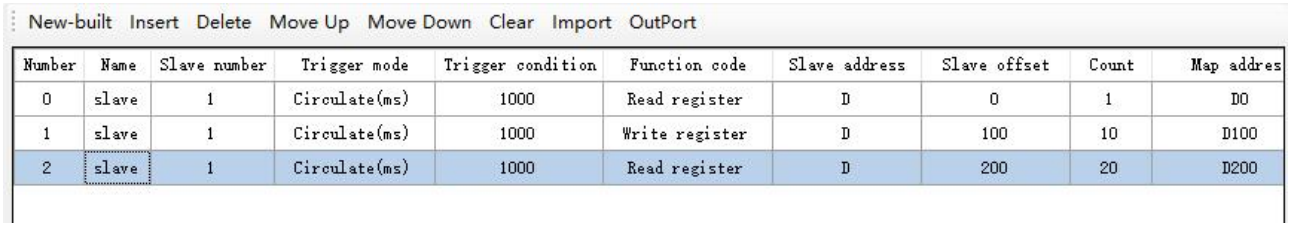
- Show the instruction information selected by the user from the secondary node.

Number	Name	Slave number	Trigger mode	Trigger condition	Function code	Slave address	Slave offset	Count	Map address
0	slave	1	Circulate(ms)	1000	Read register	D	0	1	D0
1	slave	1	Circulate(ms)	1000	Read register	D	0	1	D0
2	slave	1	Circulate(ms)	1000	Read register	D	0	1	D0
3	slave	1	Circulate(ms)	1000	Read register	D	0	1	D0

[Region 5]: Monitor the number of active connections and connection establishment requests.

[Region 6]: Supports reading from PLC, writing to PLC, and saving data (Confirm/Cancel).

2) Add Number of Instructions



Number	Name	Slave number	Trigger mode	Trigger condition	Function code	Slave address	Slave offset	Count	Map addres
0	slave	1	Circulate(ms)	1000	Read register	D	0	1	D0
1	slave	1	Circulate(ms)	1000	Write register	D	100	10	D100
2	slave	1	Circulate(ms)	1000	Read register	D	200	20	D200

- Name: The name of the mapping instruction, which users can modify.
- From station number: Default 1, range 0–247.
- Trigger method: Loop (ms) and Condition Trigger
  - Cycle (ms): When triggered in loop mode, the value in the trigger condition represents the cycle period, measured in ms; Range: 0–2^32–1
  - Condition-triggered: The trigger method uses condition-based activation, where the trigger conditions are bits of SM/M/HM coils or words. By default, edge triggering is used and implemented by the lower-level device.
- Trigger condition: Depends on the trigger method. Check this field's validity when confirming.
- FC
  - When the user selects a XJ PLC device:

Read Coil	Supports up to 2000 reading coils
Write Coil	Supports up to 1960 coils
Read Register	The maximum number of read registers is 125
Write register	The maximum number of write registers is 122

- When the user selects another Modbus device:

Reading Coil (01H)	Read 0X type addresses, up to 2000
Read input coil (02H)	Read 1X-type addresses, up to 2000
Read Register (03H)	Read 4X-type addresses, up to 125
Read input register (04H)	Read 3X-type addresses, up to 125
Write a single coil (05H)	Write a single 0X-type address
Write to a single register (06H)	Write a single 4X-type address
Write multiple coils (0FH)	Write 0X type addresses, maximum 1960
Write to multiple registers (10H)	Write 4X-type addresses, maximum 122

- From Station Address Space

For a slave station using a xinje PLC, this field specifies the register type corresponding to the function code. Refer to the following configuration:

Read/write coil; pull-down options: M, X, Y, HM, S, SM, T, C, ET, SEM, HS, HT, HC, HSC;

Read/Write register; Pull-down options: D, HD, ID, QD, SD, TD, CD, ETD, HSD, HTD, HCD, HSCD, FD, SFD, FS.

- Number: The length of data that can be read or written. The default value is 1, and the maximum supported length depends on the function code mentioned above.
- Mapping address: Coil status, cache address in the master station. Default is D0.

5-8-2. Ethernet IP Configuration

Applicable Devices	Firmware Requirements	Software Requirements
XDH/XLH/XG2	V3.7.4 and above	V3.7.17a and later
XD5E/XL5E/XL5N/XDME/XLME	V3.7.4 and above (Download online)	V3.7.18 and later

Other models do not support this feature currently, except for the aforementioned ones.

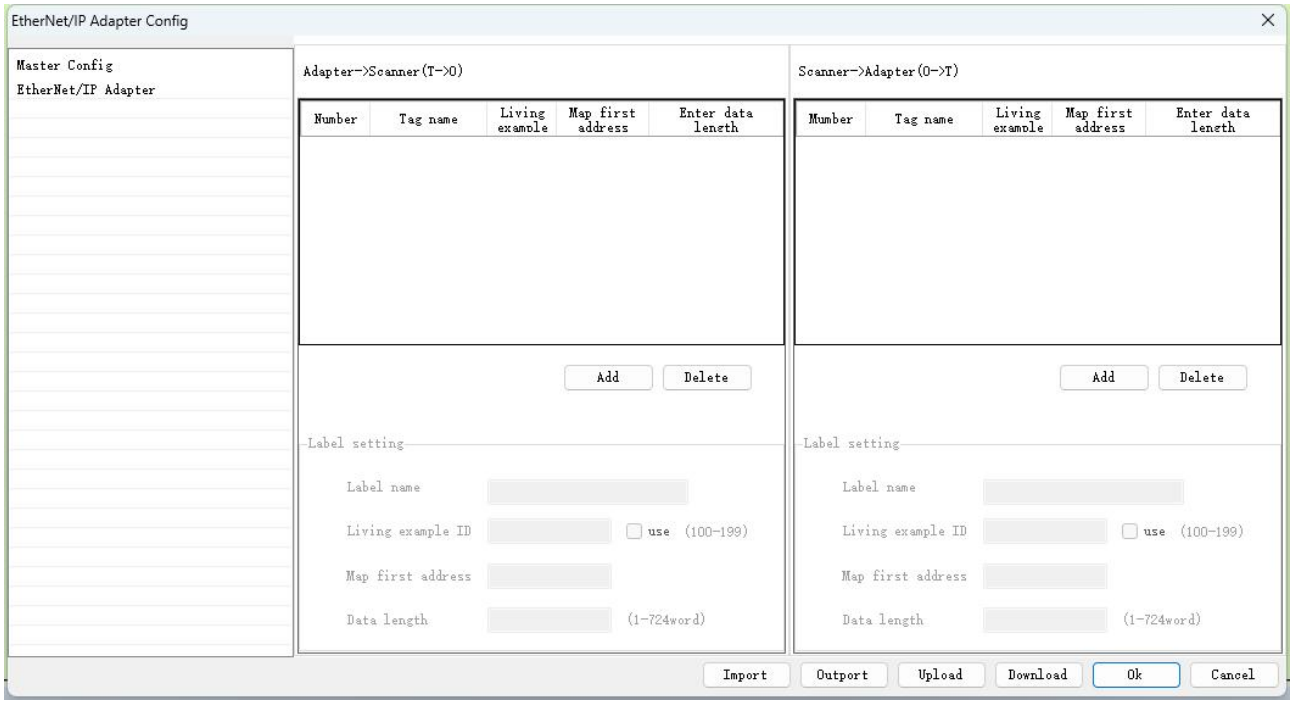
Click [PLC Communication] → [Ethernet IP] in the left engineering panel to select one of three configuration options: [EipScanner], [EipAdapter], or [EipExplicit].

5-8-2-1. EIP Implicit Communication Adapter Settings

Click the left-side menu bar: [PLC Communication] → [Ethernet IP] → [EipScanner] to open the configuration window. For detailed settings, refer to the Ethernet Communication User Manual.

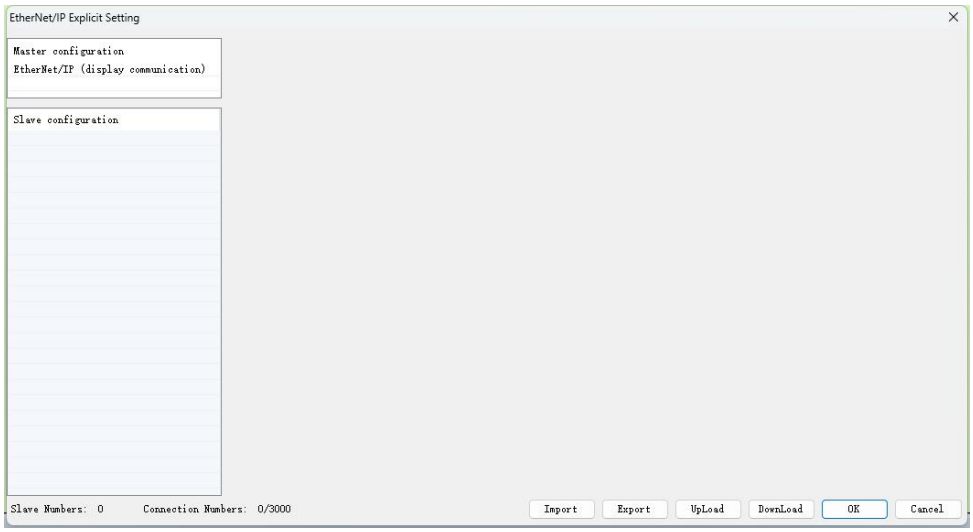
5-8-2-2. EIP Implicit Communication Scanner Settings

Click the left engineering menu: [PLC Communication] → [Ethernet IP] → [EIP Adapter] to open the configuration window. For detailed settings, refer to the Ethernet Communication User Manual.



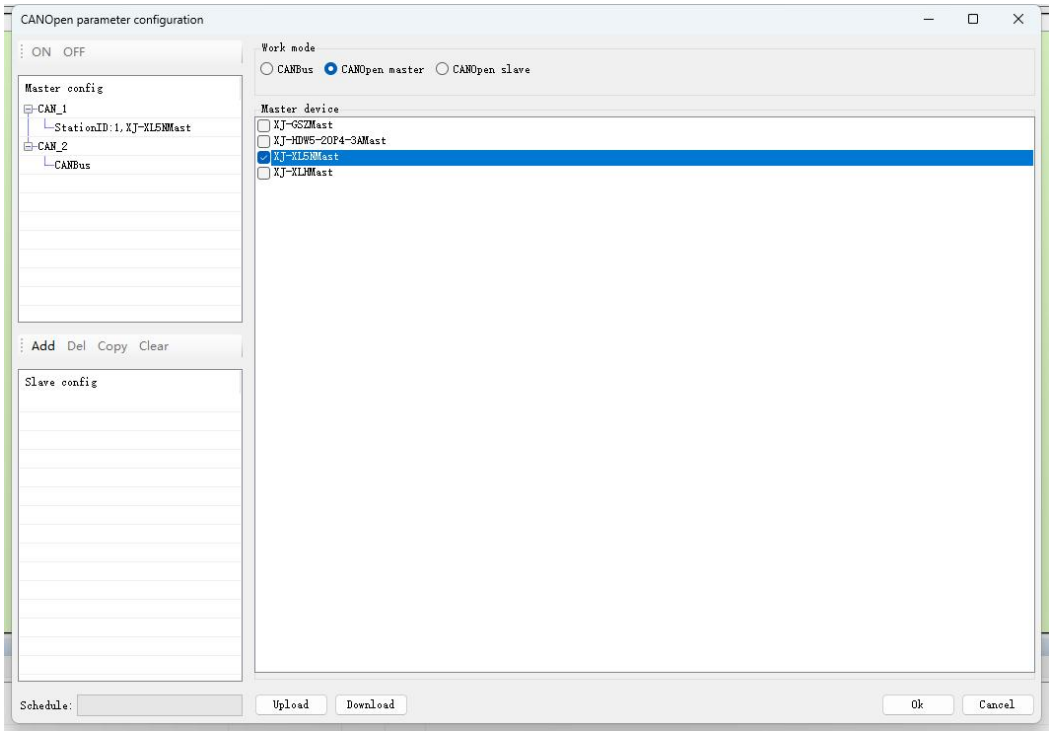
5-8-2-3. EIP Display Communication Settings

Click the left engineering menu: [PLC Communication] → [Ethernet IP] → [EipExplicit] to open the configuration window. For detailed settings, refer to the Ethernet Communication User Manual.



5-8-3. CANopen Communication Settings

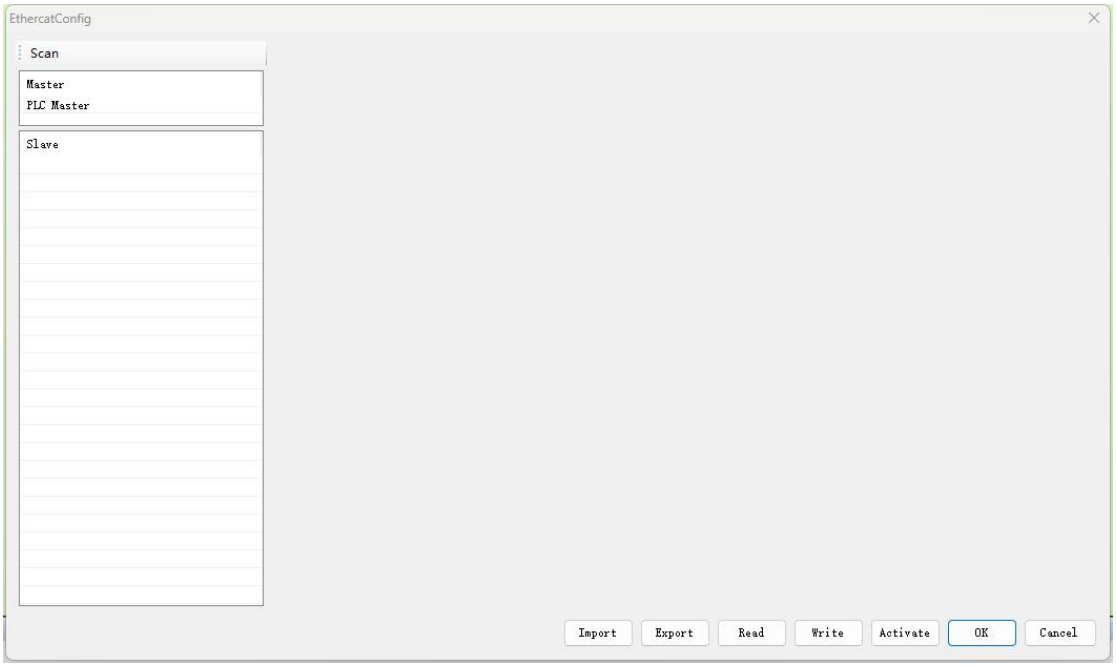
Click [PLC Communication] → [CANopen] in the left engineering panel to open the configuration window. For detailed settings, refer to the CAN Communication User Manual.



5-8-4. EtherCAT Configuration

Click [PLC Communication] → [EtherCAT Master] in the left engineering panel to open the

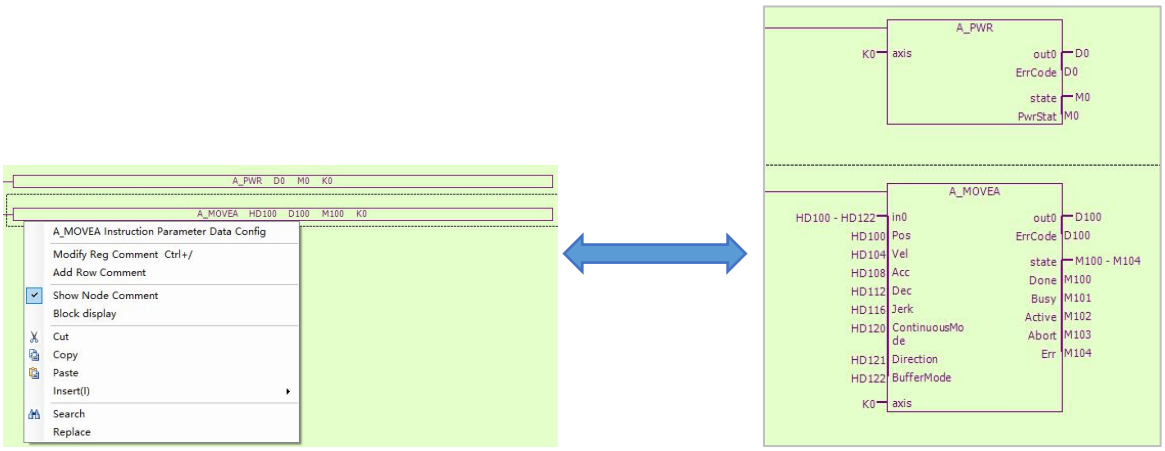
configuration window. For detailed settings, refer to the User Manual for XDH/XLH/XG2 Series Programmable Controllers – Advanced Motion Control Section.



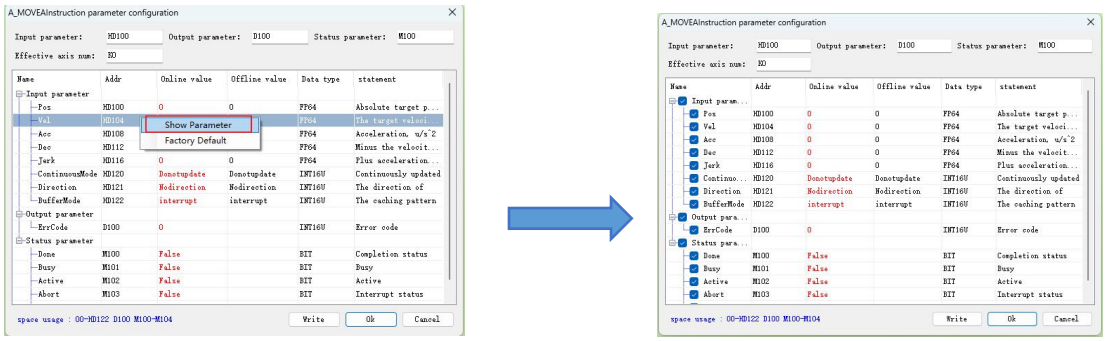
5-9. Motion Control

5-9-1. Display Method for Operation Control Instructions

The operation control command is displayed by default as a strip of output nodes. You can change this to block display by right-clicking an output node or the Icon in the menu bar. To modify the display format, right-click as shown below:



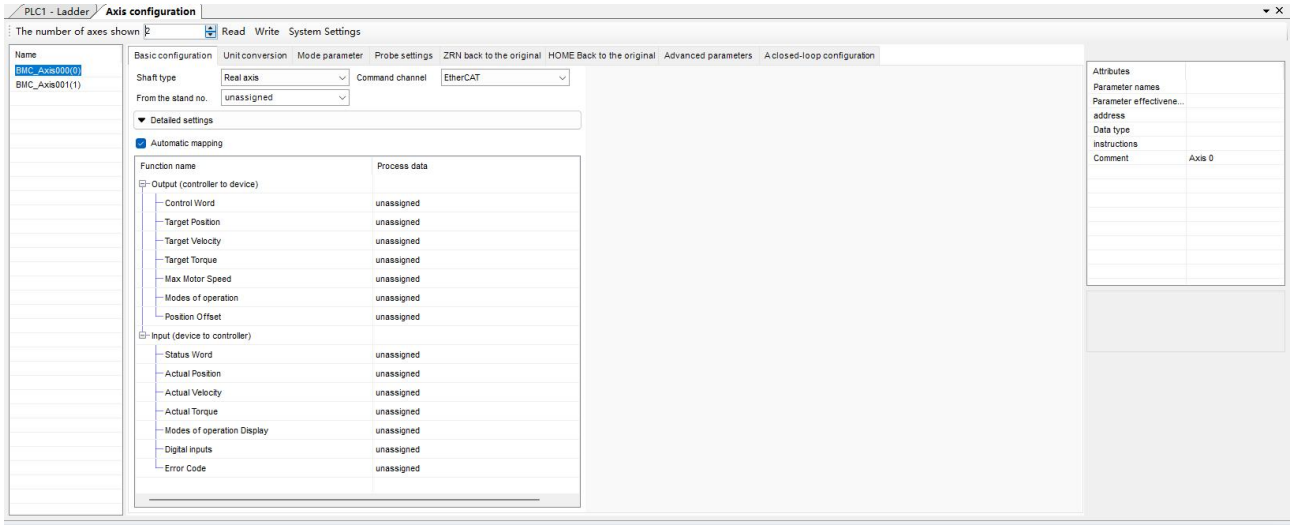
By default, all input and output parameters are displayed in block view. Right-click the corresponding command to open the "Command Parameter Configuration" interface, then right-click there and select "Display Parameters" to enter the configuration settings and specify the display content for input/output parameters.



Restoring to factory settings restores all input and output parameters to their default display state.

5-9-2. Axis Configuration

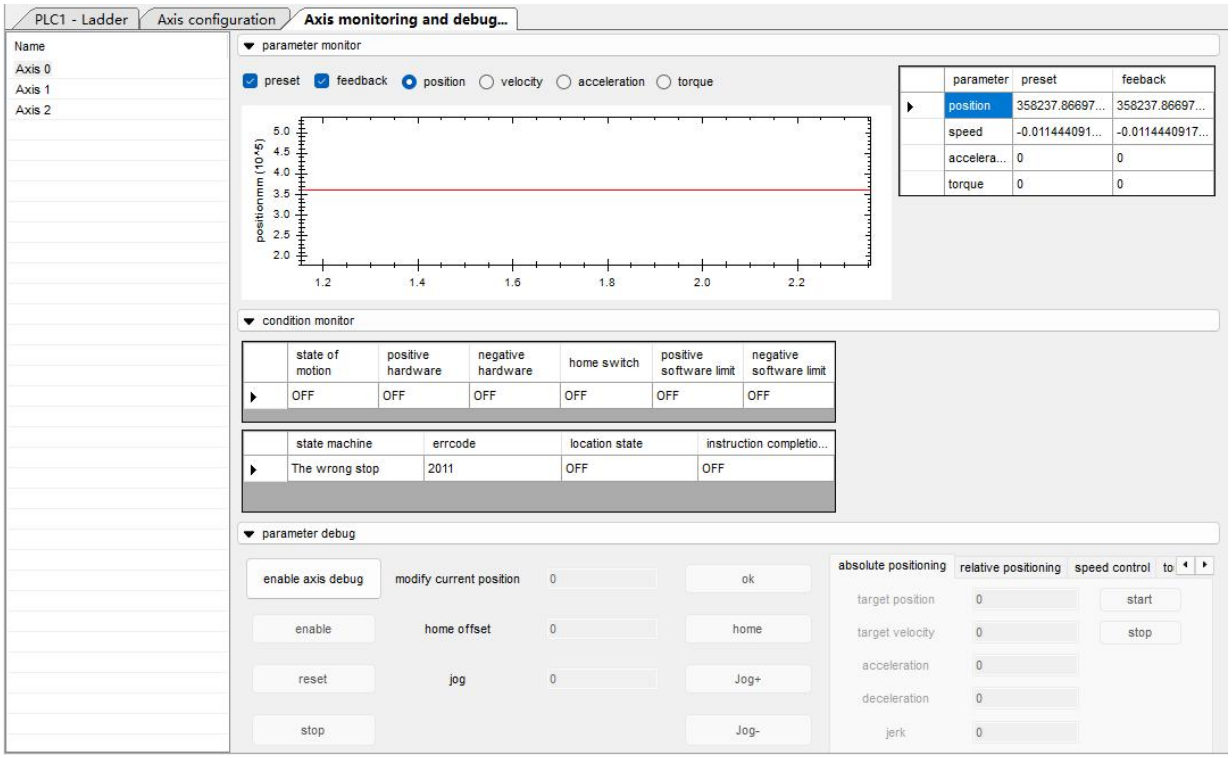
Click [Motion Control] → [Axis Configuration] in the left engineering panel to open the configuration window. For detailed settings, refer to the User Manual for XDH/XLH Series Programmable Controllers – Advanced Motion Control Section.



- For EtherCAT bus models using firmware versions V3.7.3 or higher, automatic mapping must be selected when employing operation control commands.
- If an error occurs during downloading the "Axis/Axis Group Configuration" from user settings with the message "Axis configuration (PDO parameters) download failed" (as shown below), check whether your PLC firmware version is V3.7.3 or earlier. PLCs within this version range do not support automatic mapping of PDO parameters, but this does not affect functionality.

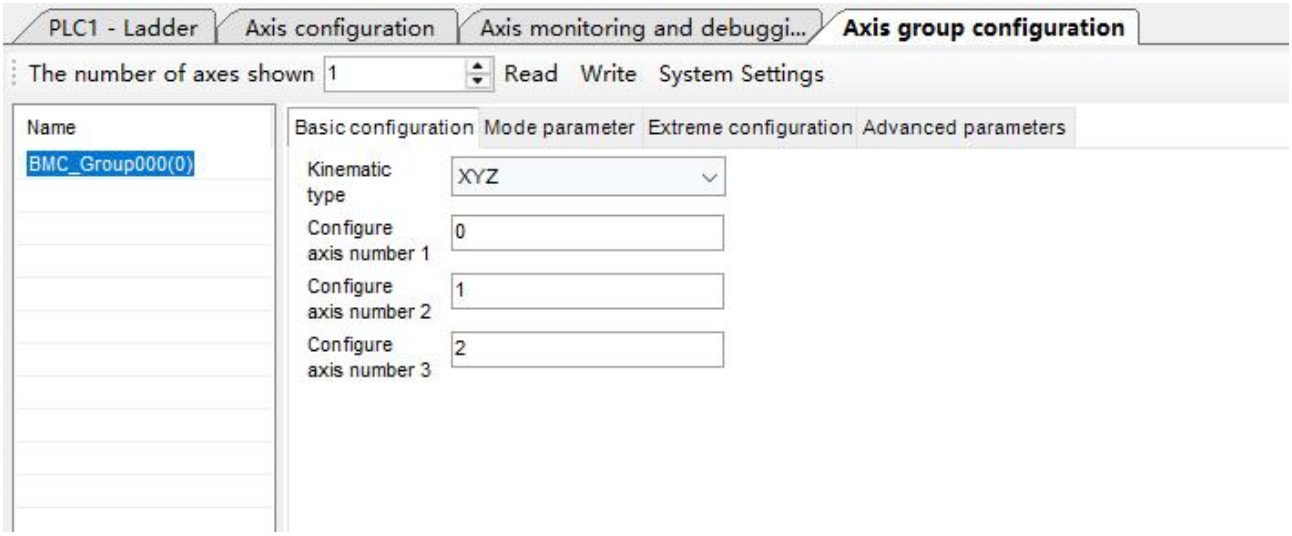
5-9-3. Axis Debugging

Click [Motion Control] → [Axis Calibration] in the left engineering panel to open the configuration window. For detailed instructions, refer to the User Manual for XDH/XLH/XG2 Series Programmable Controllers – Advanced Motion Control Section.



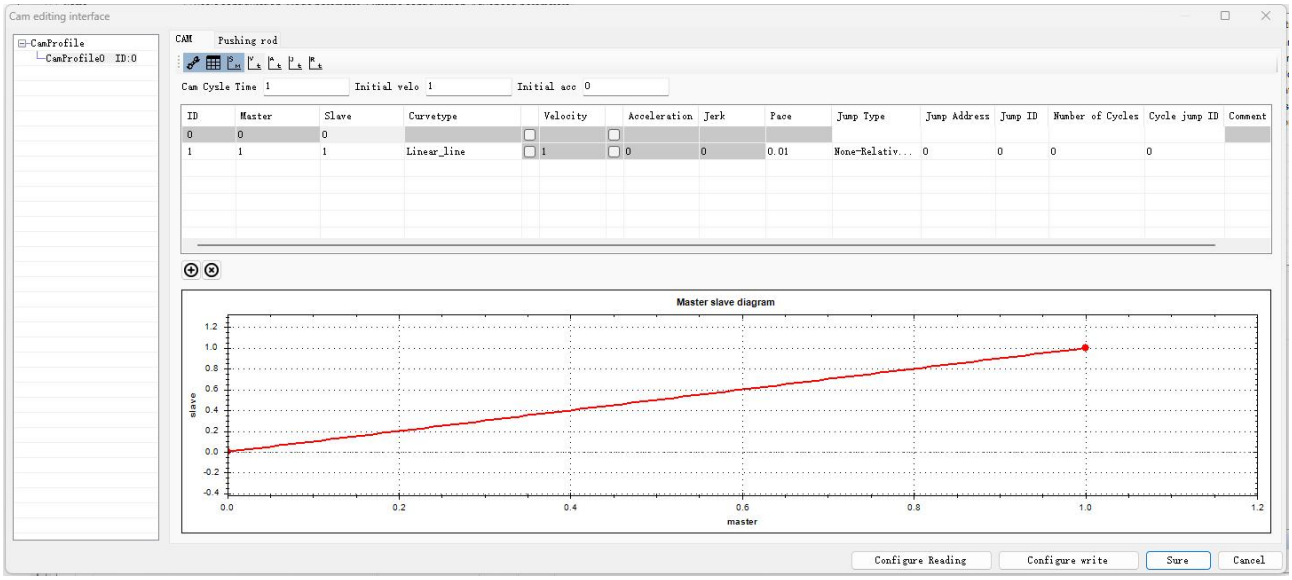
5-9-4. Axis Group Configuration

Click [Motion Control] → [Axis Group Configuration] in the left engineering panel to open the configuration window. For detailed settings, refer to the User Manual for XDH/XLH/XG2 Series Programmable Controllers – Advanced Motion Control Section.



5-9-5. CAM

Click [Motion Control] → [CAM] in the left engineering panel to open the configuration window. For detailed settings, refer to the User Manual for XDH/XLH/XG2 Series Programmable Controllers – Advanced Motion Control Section.

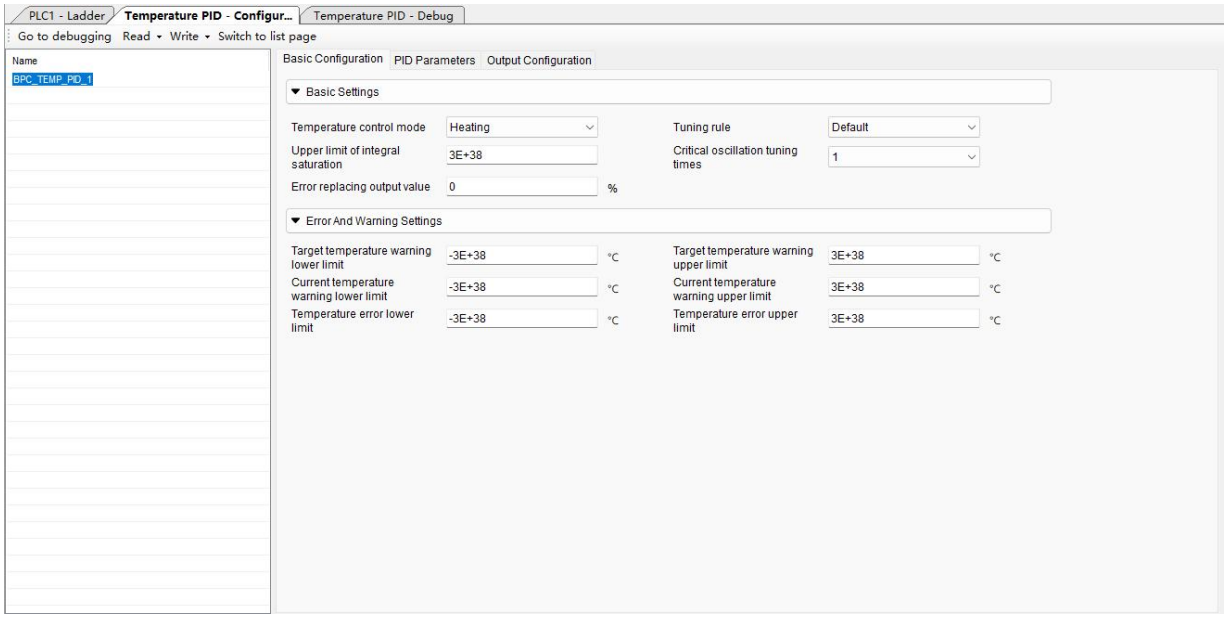


5-10. Process Control

The XD5E/XL5E series PLC firmware versions 3.7.3 and above support the BPC(Temp_PID) function block. Before use, enable the [XJBasicProcessControl] library in the [System Library] and create a corresponding instance in SysPID.

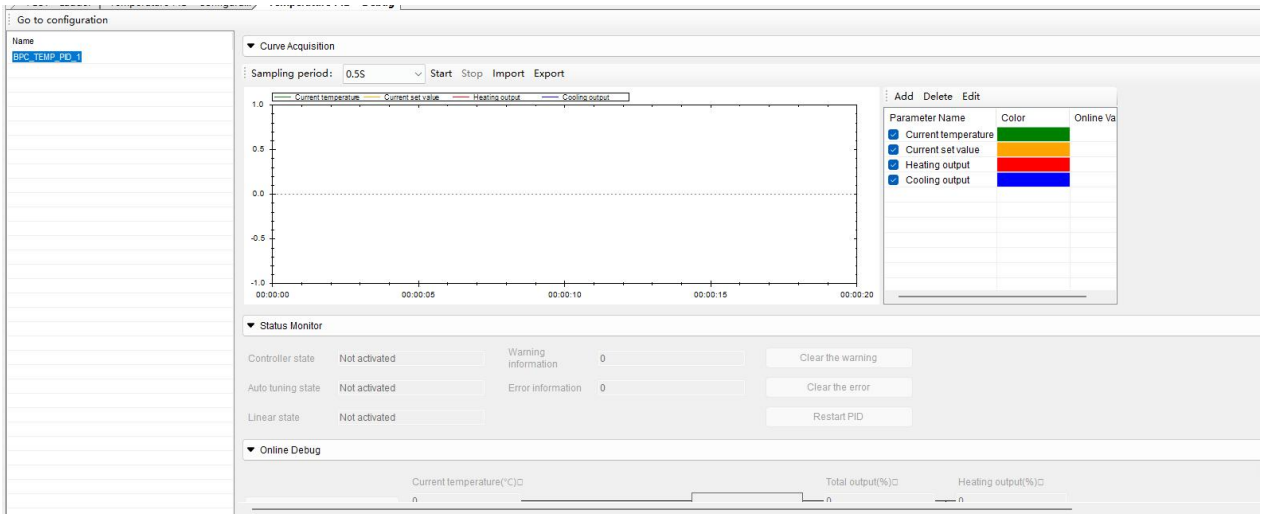
5-10-1. Temperature PID Configuration

Click [Process Control] → [Temperature PID Configuration] in the left engineering panel to open the configuration window. For detailed settings, refer to the User Manual for XD/XL Series Programmable Controllers – Basic Instructions Section.



5-10-2. Temperature PID Tuning

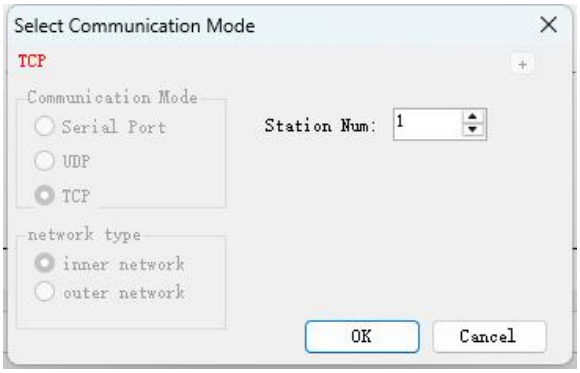
Click [Process Control] → [Temperature PID Tuning] in the left engineering panel to open the configuration window. For detailed settings, refer to the User Manual for XD/XL Series Programmable Controllers – Basic Instructions Section.



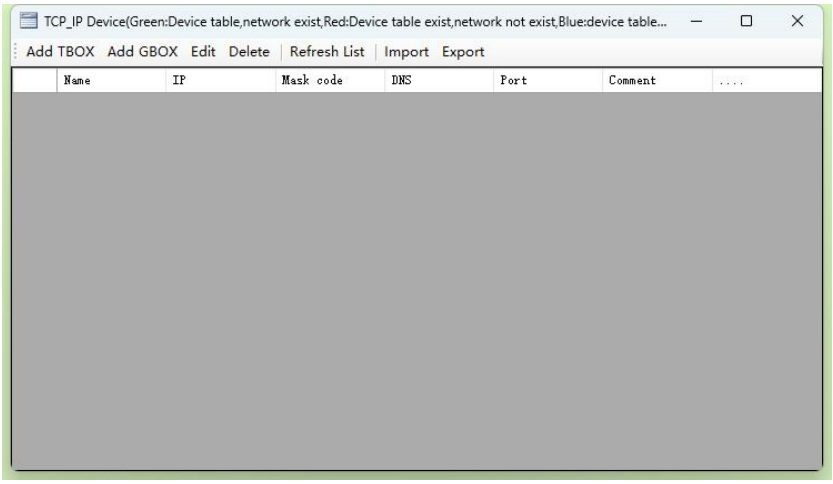
5-11. Other Settings

5-11-1. Communication Method Settings

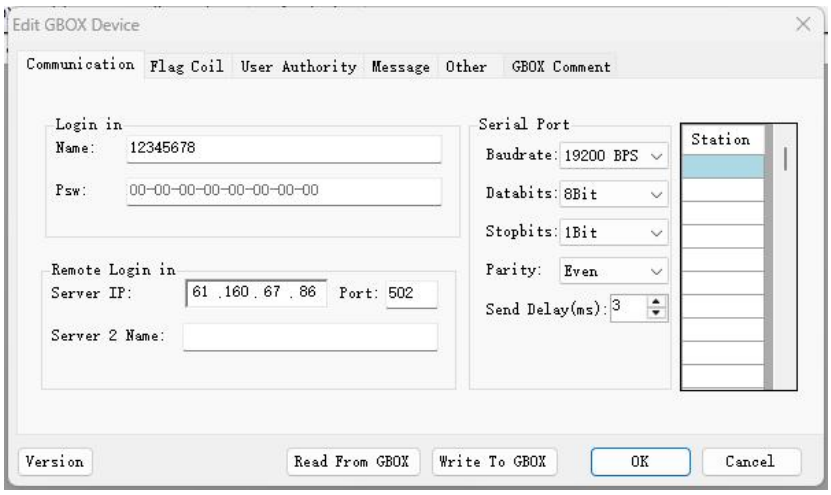
Click [Options] → [Communication Method Settings] in the menu bar to open the configuration window. This feature is used to configure the communication method between the computer and connected devices (including the PLC unit and network modules).



The default communication method is the serial port. Clicking "+" opens the TCP/IP Device (i.e., TCP/IP Configuration) window, as shown below:

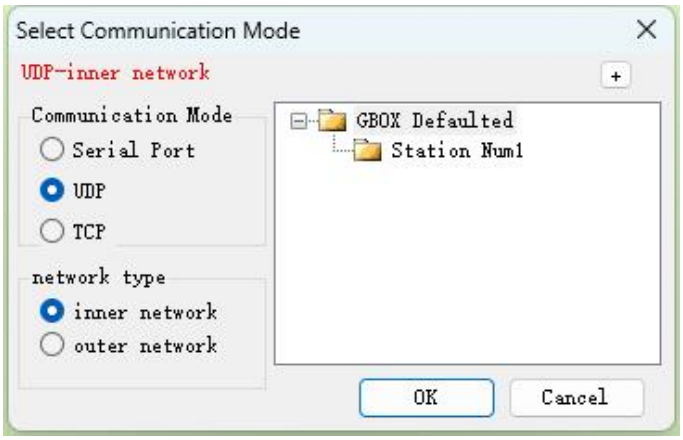


Click the "Add GBOX" button to add communication devices. The following window will appear:



Set the corresponding parameters in the window. For detailed settings, refer to the Wireless Data Transmission Module G-BOX Operation Manual; further details are not provided here.

After successful addition, the communication settings interface will update: the UDP option and network type will be activated. The G-BOX typically uses the external network type, while the T-BOX uses the internal network type, as shown below:



You can also configure the communication settings by selecting the corresponding PLC name in the engineering panel, right-clicking it, and choosing "Edit PLC Communication Mode" from the pop-up menu, as shown below:

5-11-2. TCP/IP Device Configuration

Set the window to "TCP/IP Device"; the UDP communication mode can only be activated after the TCP/IP device is configured.

5-11-3. Download Settings

Click [Options] → [Download Settings] in the menu bar to choose whether to remove comments and C-language encryption (the code remains executable after encryption, but its content cannot be viewed).

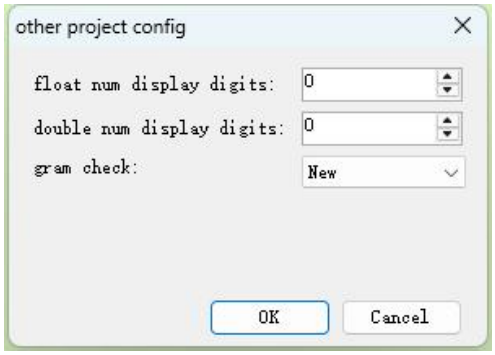
5-11-4. Default decryption password settings

When users frequently upload programs to encrypted PLCs or need to enter different passwords for various models, they can set a default decryption password. As shown in the figure below, multiple decryption passwords can be configured; during uploads, users avoid repeated password entries as the system automatically uses a pre-set password from the list. A correct password unlocks the PLC and allows program upload. After unlocking, users must press the lock button on the menu or re-download the password-protected program file to lock it again—otherwise, no password is required for subsequent

program uploads.

Click Options in the menu bar, then select Default Encryption Password Settings to set your encryption password.

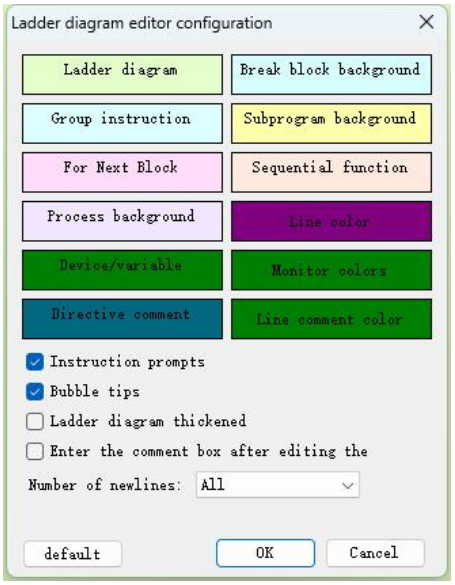
5-11-5. Other Engineering Settings



- The maximum number of floating-point display bits is set to 7.
- The maximum number of display bits for double precision is 15.
- New additions to the Grammar Check version:
  - ① The P tag for a CALL call must be present;
  - ② The P tag for CJ redirection must exist;
  - ③ The CJ instruction cannot execute jumps across main programs or subprograms;
  - ④ STL statement operands cannot be repeated.

5-11-6. Trapezoidal Diagram Editor Configuration

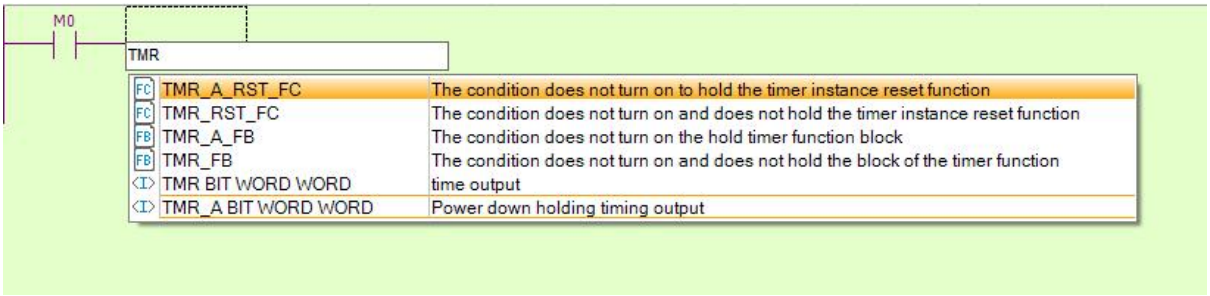
To achieve optimal visual results, users can adjust the colors of various elements in the trapezoid chart window. Click [Options]> [Trapezoid Chart Editor Configuration] to open the settings window:

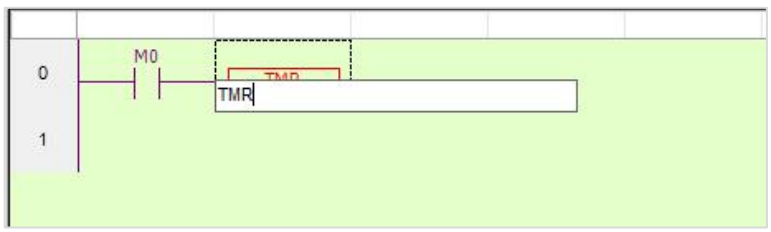


In the configuration window, users can set background colors for elements such as ladder diagrams, interrupt blocks, Group instruction blocks, function blocks, For Next blocks, sequential function blocks, and flow processes. They can also configure line colors, soft component/variable annotation colors, monitoring status colors, and other display settings—including instruction prompts during input, activation of bubble prompts, entry into annotation boxes after editing instructions, and line spacing parameters.

5-11-6-1. Instruction Prompt

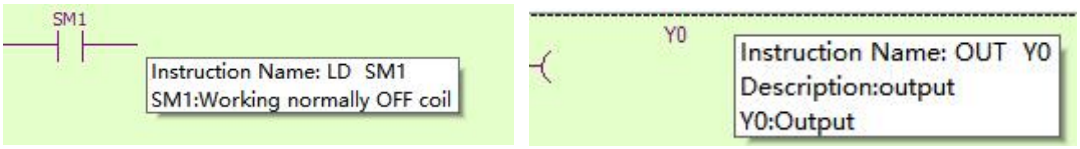
In the [Trapezoid Editor Configuration] interface, if you check [Command Prompt], a prompt window will appear with the corresponding command when entering commands (default is checked). If unchecked, no prompt window appears during command entry.



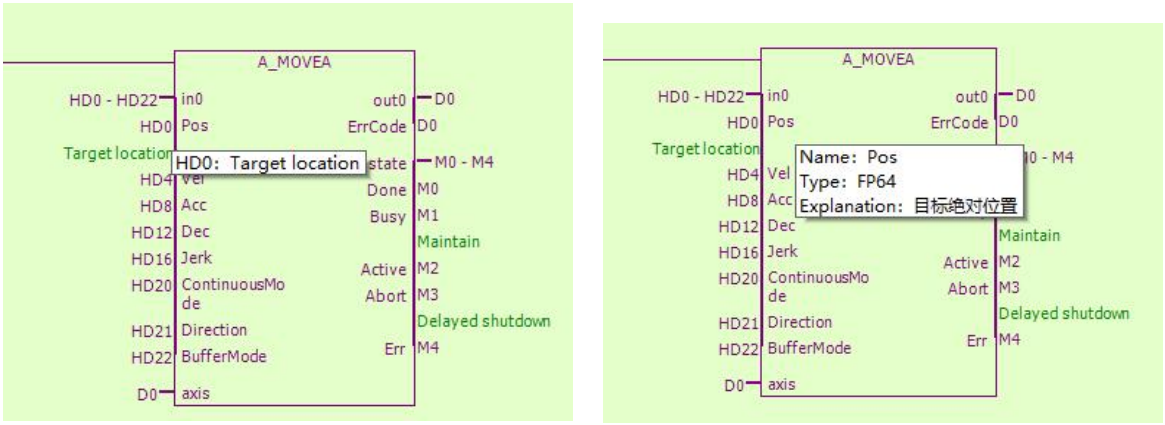


5-11-6-2. Bubble Prompt

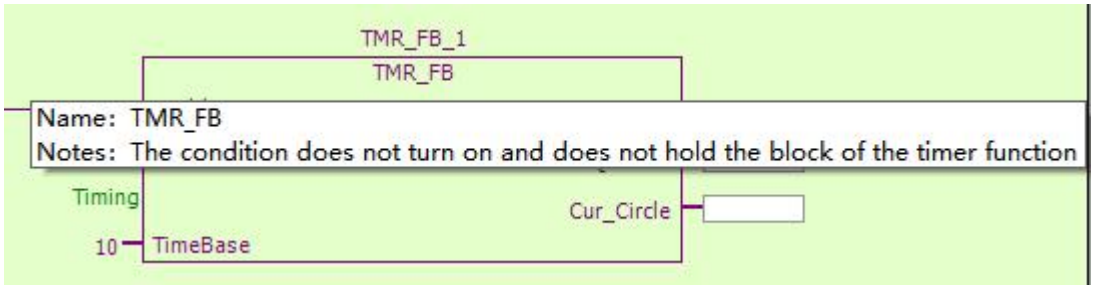
In the [Trapezoid Editor Configuration] interface, if you check [Bubble Prompt] (default enabled), placing the mouse over the corresponding soft component displays additional programs within a designated area and allows you to view component annotations and instruction notes.
When [Bubble Prompt] is selected, placing the mouse over input nodes or bar output nodes displays annotations and instruction notes for the corresponding soft components or variables, as shown below:

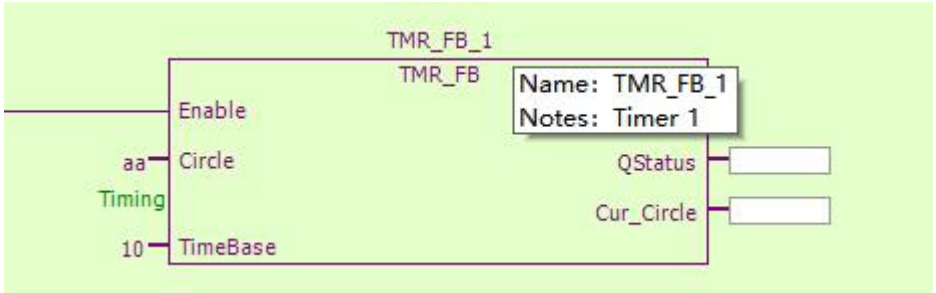


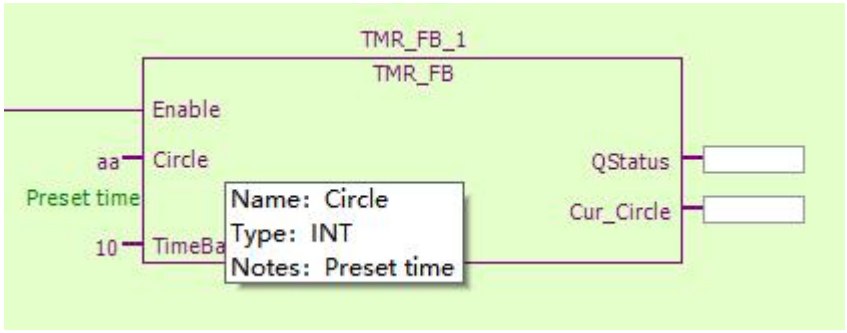
When the [Bubble Prompt] option is selected and used with block operation control commands, you can view soft component names and their annotations, variable names, types, and description notes. Register ranges along with corresponding in0, out0, state values are not displayed in bubbles, as shown below:

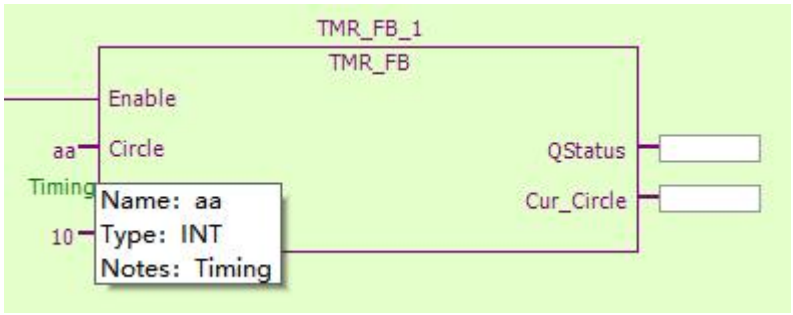


When the [Bubble Prompt] option is selected and used with a POU instruction, you can view the POU name and comments, POU instance names and comments, argument names, types, and comments, as well as argument types, names, and comments, as shown in the figure below:



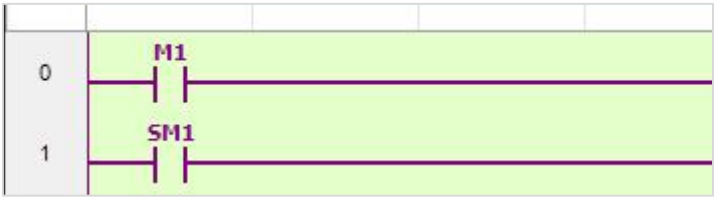






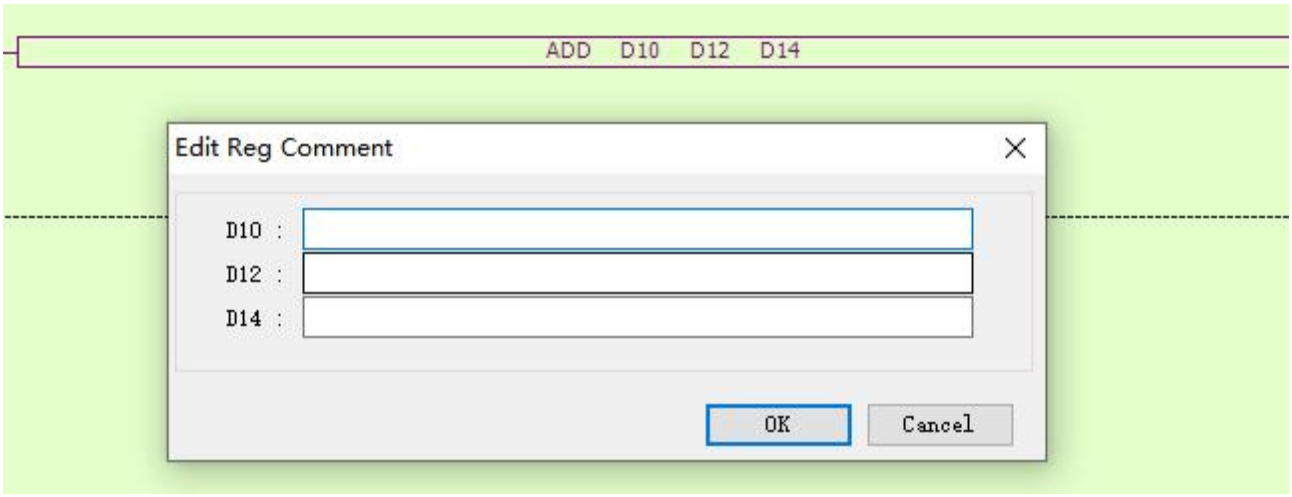
5-11-6-3. Trapezoid diagram in bold

In the [Trapezoid Editor Configuration] interface, if you check [Trapezoid Bold] (default is unchecked), the trapezoid font, graphics, and bubble prompts will be bolded by one pixel.



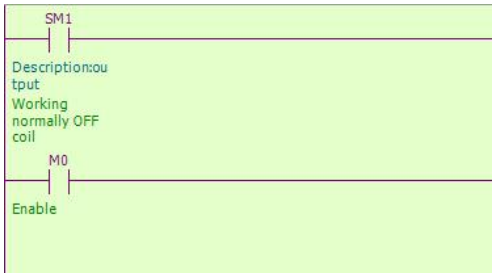
5-11-6-4. After entering the editing command, go to the comment box

In the [Trapezoid Editor Configuration] interface, if you check [Enter comment box after editing commands] (default is unchecked), a "Edit Soft Component Comments" pop-up window will automatically appear after successfully completing the editing.



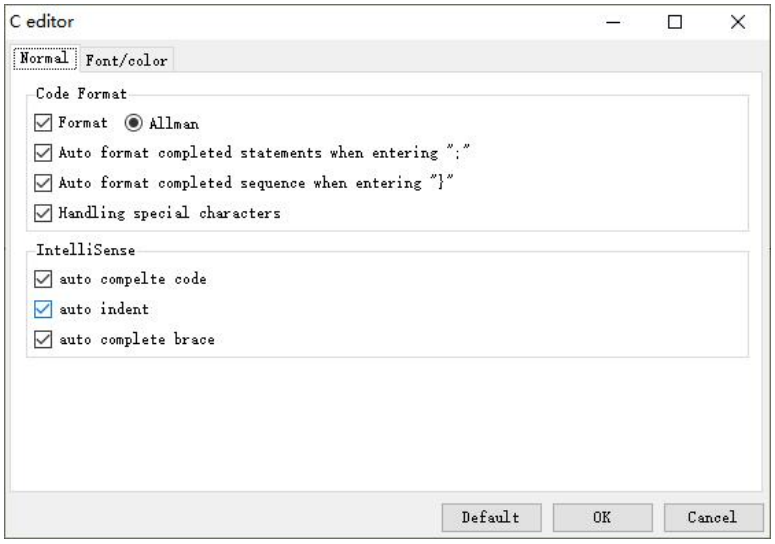
5-11-6-5. Change row number

In the [Trapezoid Diagram Editor Configuration] interface, you can set the [Number of Line Breaks] (default: all). For variable names, soft component annotations, and instruction annotations that are not fully displayed due to column width limitations, you can configure the number of line breaks to automatically wrap them. Setting [Number of Line Breaks] to 2 in the figure below displays two lines for variable names, soft component annotations, and instruction annotations, with any additional text hidden as "...".



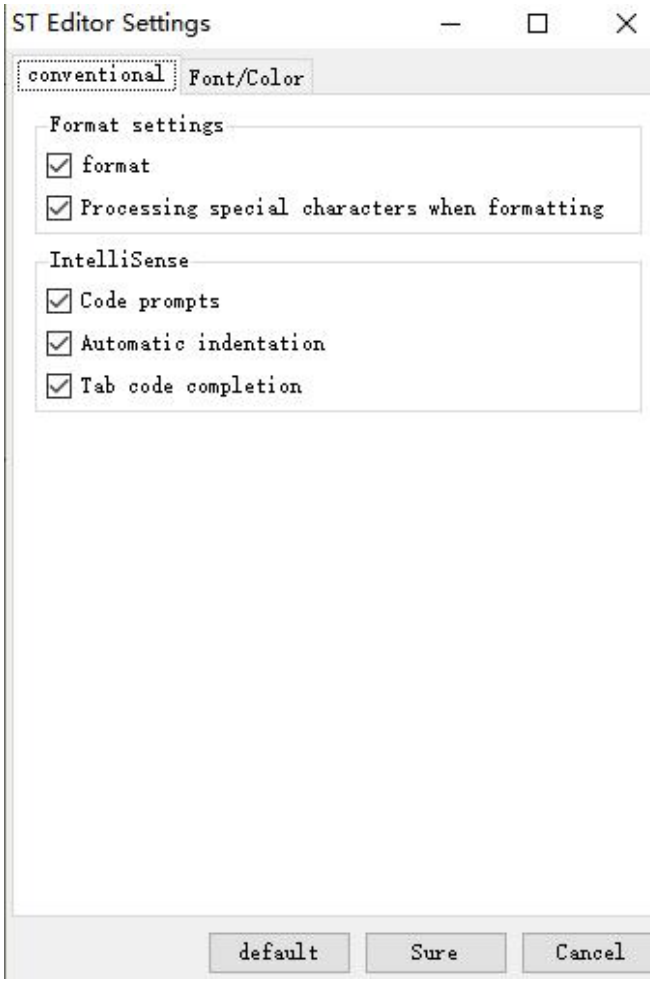
5-11-7. C Editor Settings

Set the relevant content in C language editing.

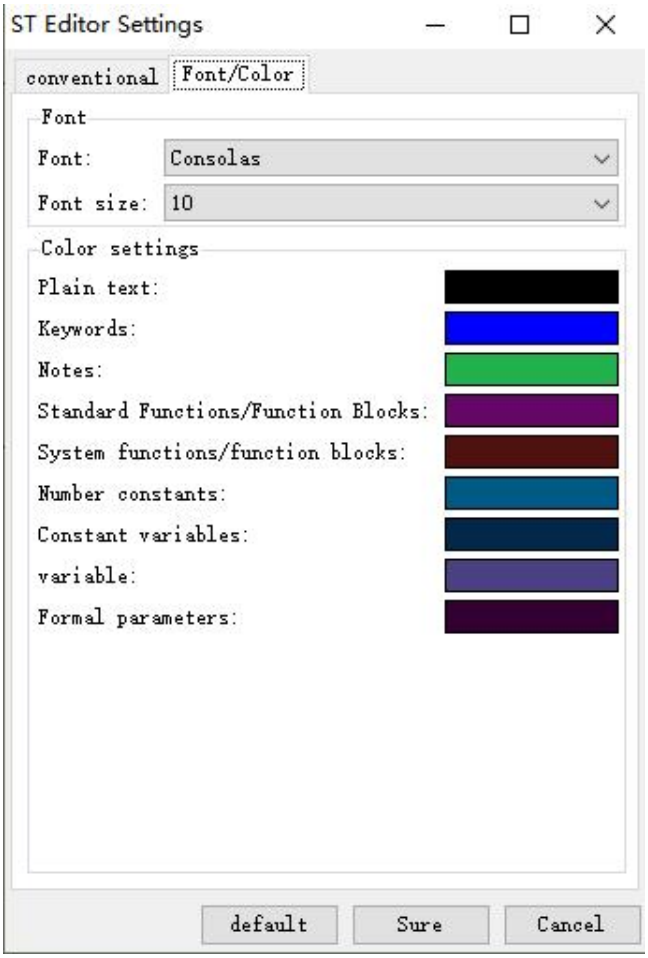


5-11-8. ST Editor Settings

Set the relevant content in ST language editing.



Allow modifying fonts, sizes, and colors in the editor.

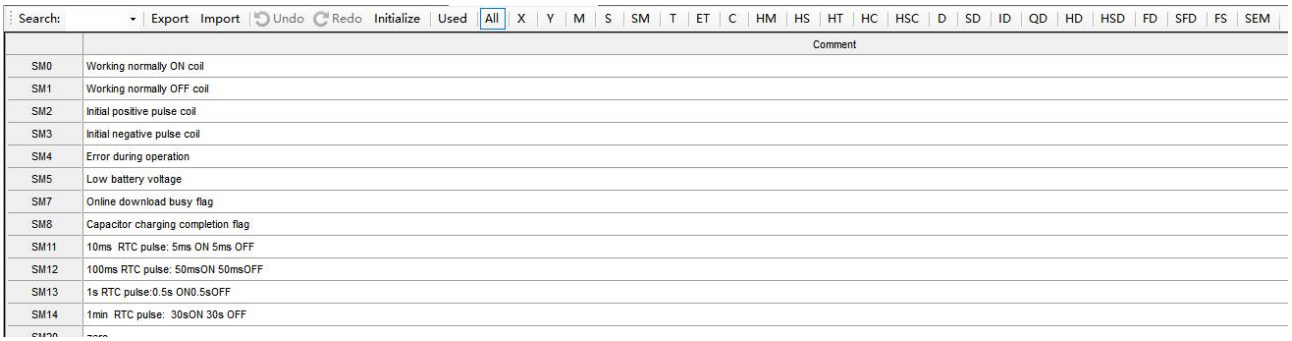


5-12. Monitoring

5-12-1. Notes/Usage of Soft Components

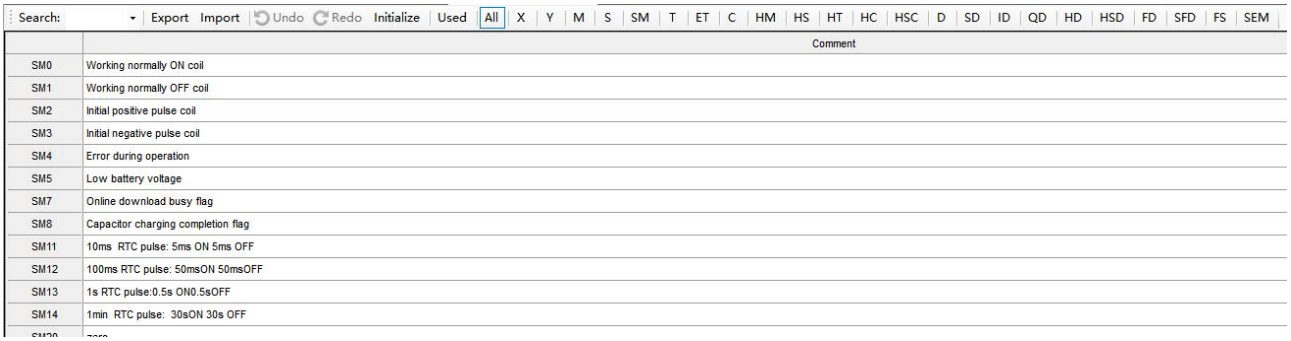
This feature displays all software component annotations in the PLC, including those used internally by the system and those added by user programs. Double-click the annotation bar to edit it.

- Click Export to export the customer's annotated soft components and annotations as a CSV table.
- Click "Import" to add component annotations from a CSV file to the software.
- Click "Initialize" to set annotation information for system components, such as SM0.
- Click "Used" to display the software components and notes used in the program.
- Click "Used" and "All" to list all used software components and their annotations.
- Click "Used" and single-category labels such as "X", "Y", or "M" to display the used soft components and annotations under that category.

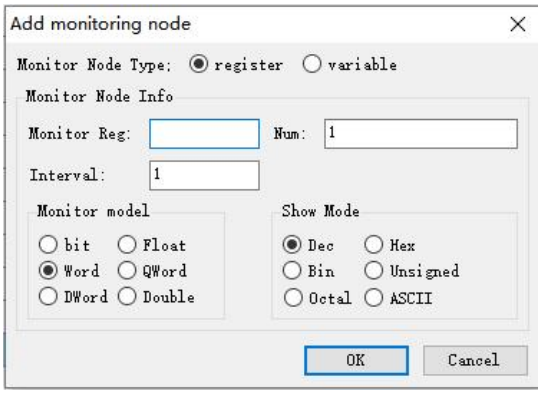


5-12-2. Free Monitoring

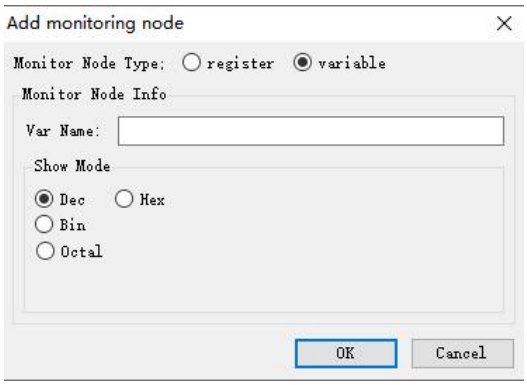
In online mode, click [Free Monitoring] in the PLC operation panel to open the Free Monitoring window. The window displays four free monitoring tables ranging from Monitor 1 to Monitor 4.



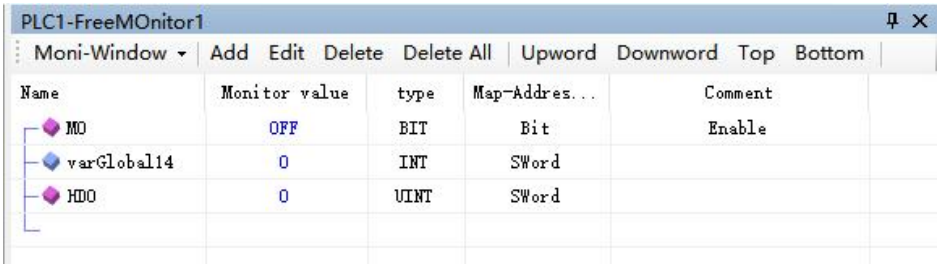
Click "Add" to open the "Add Monitoring Node" window: Enter the primary address of the software component to monitor in the "Monitoring Node" field, set the number of components to monitor consecutively in the "Batch Monitoring Count" field, select the monitoring method for software components in the "Monitoring Mode" field, and choose the display mode for software components in the "Display Mode" field.



Select the variable under "Monitoring Node Type", enter the variable name to monitor in "Variable Name", and choose the display mode for the variable in the "Display Mode" field. Variables are part of the POU functionality; refer to Chapter 6, "POU".

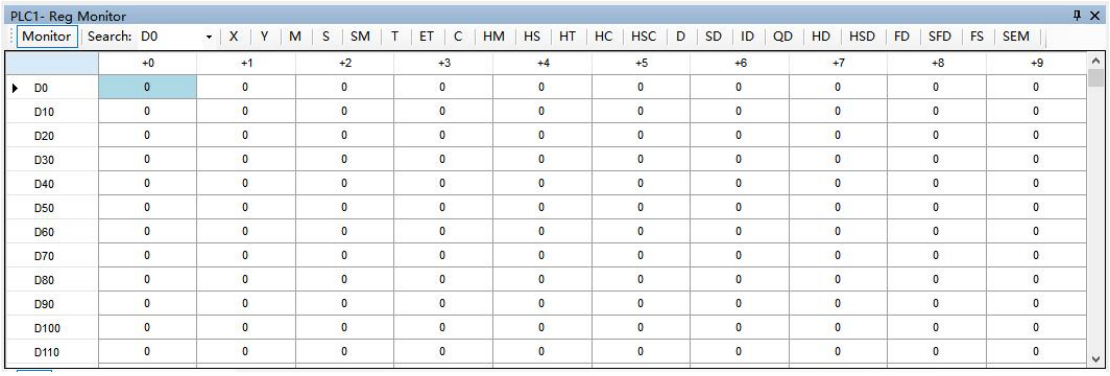


After completion, the monitoring window displays the monitoring values, types, mapping addresses/byte lengths, and comments for the corresponding software components or variables. Double-clicking the respective entries allows you to edit their properties.



5-12-3. Data Monitoring

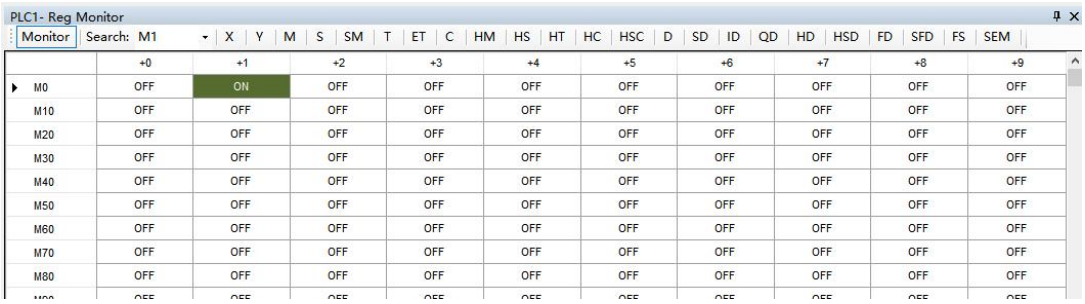
In online mode, click [Data Monitoring] in the PLC operation panel to open the data monitoring window. The window displays coil statuses and data register values in list format, and allows you to directly modify register values or coil statuses.



Double-click the coil to invert its state; double-click the register to activate value modification, then press Enter to confirm.

Enter the corresponding component number in the search bar, press Enter, and the monitoring table will automatically jump to the corresponding position.

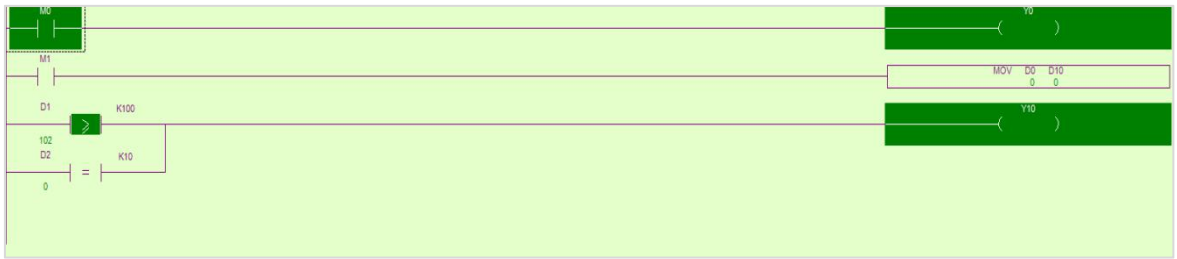
When the coil is OFF, the display shows black text on a white background; when ON, it shows white text on a green background, as shown below:



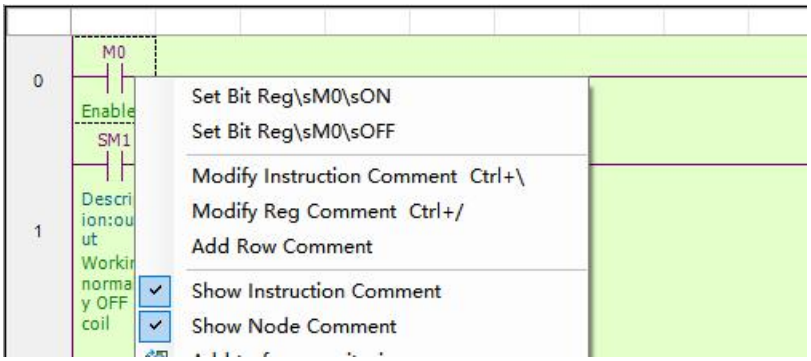
5-12-4. Trapezoidal Diagram Monitoring

Once the PLC is successfully connected and operational, users can monitor the ladder diagram to track program execution status, which proves particularly beneficial for debugging.

Click the Icon "" in the PLC operation  panel to open ladder diagram monitoring. All status indicators of software components are displayed: green-coated coils with white text indicate the ON state, while real-time data from registers, counters, and timers are shown on the ladder diagram as illustrated below.



To facilitate debugging, users can right-click the component to change its current state and view the modified behavior.



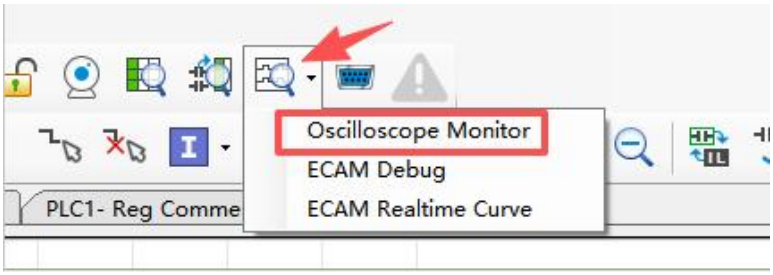
5-12-5. Oscilloscope Monitoring

5-12-5-1. Conditions for Using the Oscilloscope

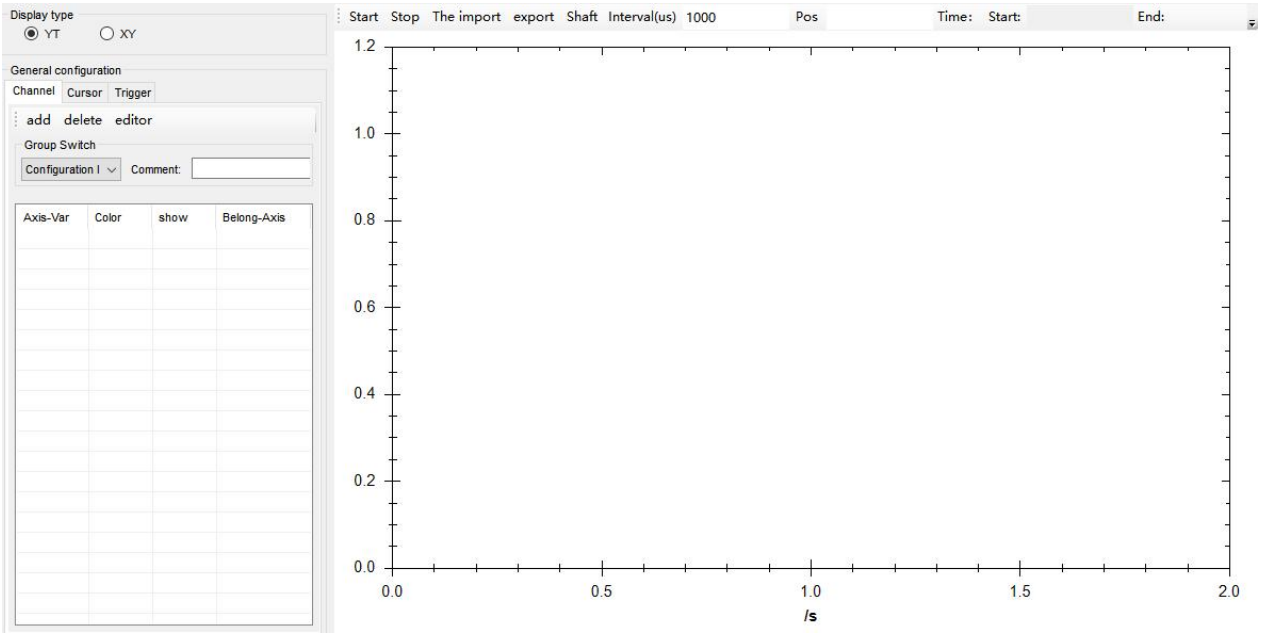
All versions of software starting from 3.7.16 support oscilloscope functionality.

5-12-5-2. Opening the Oscilloscope Interface

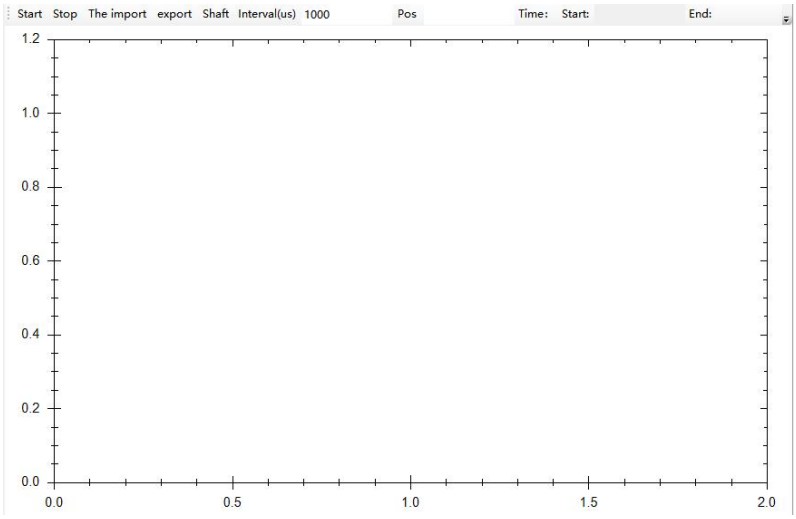
Click the oscilloscope Icon shown in the figure to open the oscilloscope interface.



The interface after opening is as follows:



5-12-5-3. Oscilloscope Main Interface



Parameter Name	Explain
Begin	The oscilloscope has started working.
Stop	The oscilloscope has stopped working.
Leading-in	Open saved oscilloscope data
Leading-out	Save all oscilloscope data in the current scenario (curve configuration, cursor, triggers, image data, operating time, etc.)
Split axle	Display different Y-axis subregions within the same display area Note: This feature is available only when the curve is configured with multiple axes. If there is only one axis, axis separation cannot be achieved. When users configure different axes, multiple Y axes will appear. Axis separation is enabled only when there are multiple Y axes.
Time interval (us)	The time interval displayed between two sampling points, measured in microseconds (default to the synchronization unit period in EtherCAT).
Fixed position	Plot a curve starting at a specific time point (in seconds) or a numerical value
Time	Show the start, end, and oscilloscope operation time

Interface Operation Instructions

Parameter Name	Explain
Amplify	Press and hold the left mouse button to drag and select the area you want to enlarge. The default zoom mode is two-way zoom (horizontal and vertical). Right-click the displayed area to open the menu and change the zoom mode (horizontal zoom, vertical zoom).
Reduce	Right-click the display area and select Restore to Original Scale or Restore to Previous Scale from the menu to zoom out
Drag	There are three dragging methods: ① Hold Ctrl + left mouse button; the cursor changes to a hand shape, then drag the image; ② Press and hold the middle mouse button (wheel) while dragging the image; ③ Right-click when both Pan Left/Right and Pan Up/Down options are unchecked (no zoom function available), then hold the left mouse button and drag the image.

Right-click menu

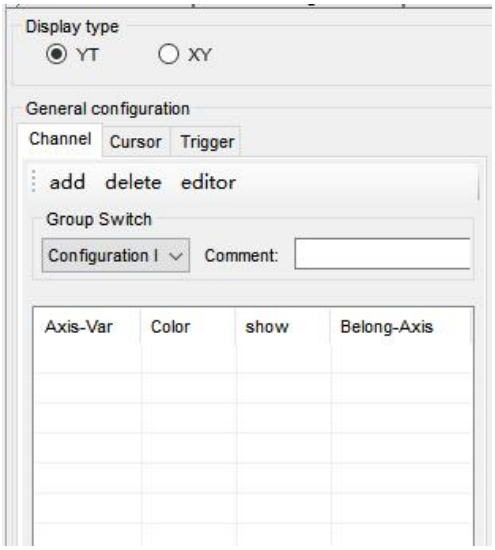
Parameter Name	Explain
Save Chart	Save the image of the current interface in image format
Derive data	Save image data in Excel format
Show Node	When the mouse moves to a node on the curve, display the coordinate values of

Parameter Name	Explain
Value	that node
Show cursor value	When the mouse moves, display the coordinate values of the cursor location in real time
Horizontal Zoom	Zoom only on the X-axis
Vertical Zoom	Zoom only on the Y-axis (zooms a region only when both horizontal and vertical zoom are selected)
Restore to previous zoom ratio	Reduce the image size to the previous display ratio and area
Restore to original scale	Show the entire curve

After one minute of data display, the curve for the previous minute will be cleared, but the data remains. Users can view all data by clicking Export Data in the right-click menu.

5-12-5-4. Oscilloscope Configuration Interface

1) Oscilloscope Display Type Configuration



Parameter Name	Explain
YT	The horizontal axis represents time, and the vertical axis represents individual register variables. When configuring a curve, you only need to set individual register variables.
XY	Both the horizontal and vertical coordinates are register variables. When configuring the curve, you need to set two register variables.

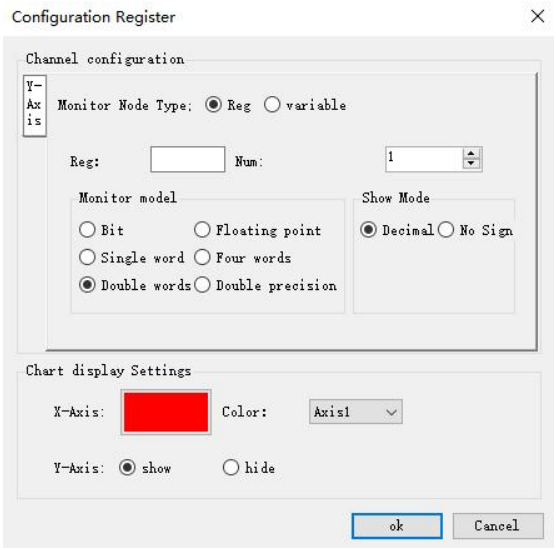
2) Axis Variable Configuration

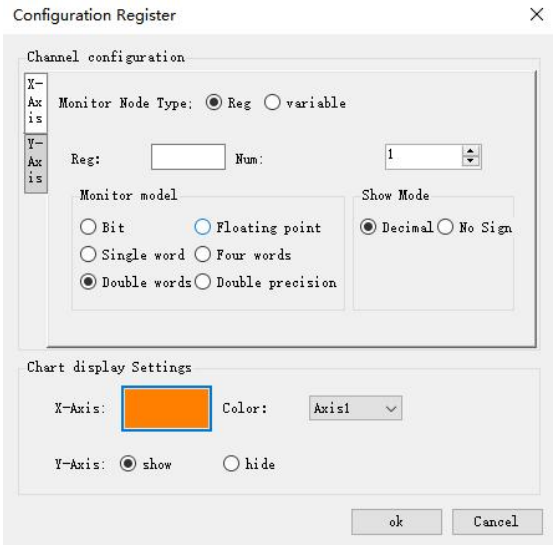
Parameter Name	Explain
Add	Add Curve
Delete	Delete Curve
Edit	Edit curve properties

When the oscilloscope is running, you cannot add or delete curves; you can only edit curve properties.

3) Channel Configuration

Click [Channel] - [Add] to open the configuration register window:



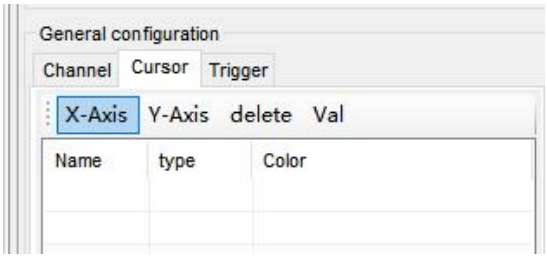


Parameter Name	Explain
X axle	Register type (HD, D, SD) + register offset (number) + register data type
Y axle	Register type (HD, D, SD) + register offset (number) + register data type
Monitoring Node Type	You can choose to monitor a register or a variable.
pigment	Curve color (click the color block to modify the curve color)
show	Whether the curve is displayed on the oscilloscope screen
Belting shaft	Which axis on the oscilloscope display interface does the curve appear on (for implementing the axis division function)?

Parameter Name	Explain
Group Switch	Multiple configuration groups can be set up

- When the oscilloscope type is YT, the [X-axis] cannot be configured; it displays time values on the horizontal axis.
- When the oscilloscope is running, you can only adjust the curve color, display settings, and axis properties; XY axis registers cannot be modified.

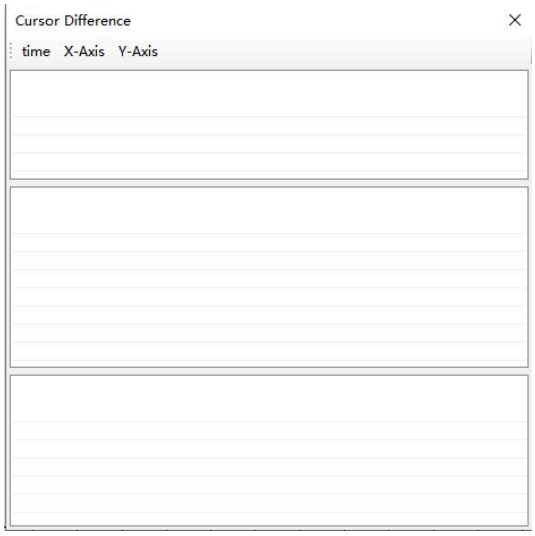
4) Cursor Configuration



Parameter Name	Explain
X axle	Add an X-axis cursor (vertical cursor perpendicular to the X-axis)
Y axle	Add Y-axis cursor (horizontal cursor perpendicular to the Y-axis)
delete	Delete Cursor
numeric value	Show cursor difference data

5) Difference Interface

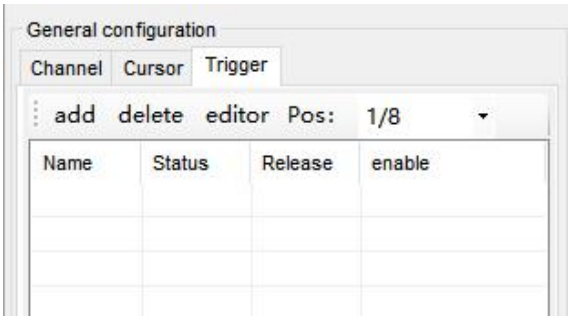
Click [Difference] to view the image below:



Parameter Name	Explain
time	Show/Hide the Status Time area (available only when the oscilloscope type is YT)
X axle	Show/Hide Channel/X-Axis Regions
Y axle	Show/Hide Y-Axis Regions

- StatusTime Region Display Rules:
  - Displays two times: computer time (PC time) and the oscilloscope's display time.
  - Time data source: The value of the X-axis cursor on the X-axis (time axis).
- Channel Area Display Rules:
  - Data source: Y-axis register values corresponding to the X-axis cursor position (data on the Y-axis aligned with the X-axis in the coordinate system). For example, if the X-axis cursor is at position 1s on the X-axis, the Y-axis register value at 1s serves as the display data source.
  - Channel Column: Displays all register variables monitored on the oscilloscope.
- Y-axis Region Display Rules:
  - Data source: Values represented by the Y-axis cursor on the vertical axis.
  - For each additional Y-axis, the table displays one data point.

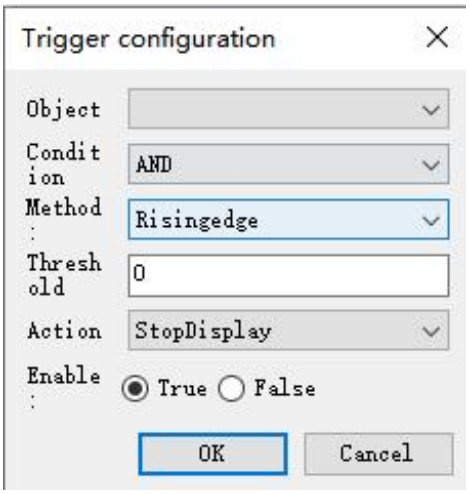
6) Trigger Configuration



Parameter name	Explain
Add	Add trigger
Delete	Delete the selected trigger
Edit	Edit the selected trigger
Position	Position displayed on screen after the trigger is activated

- Trigger location description: For example, if the trigger location is 1/8, the trigger stops but does not immediately cease. The displayed content stops when the triggered data occupies 7/8 of the current interface.
- When the trigger is activated, the status turns red and a dashed line appears at the trigger location on the interface to indicate it.
- When triggered with version XY, the trigger stops immediately upon activation.

After clicking [Add], the following window will appear:

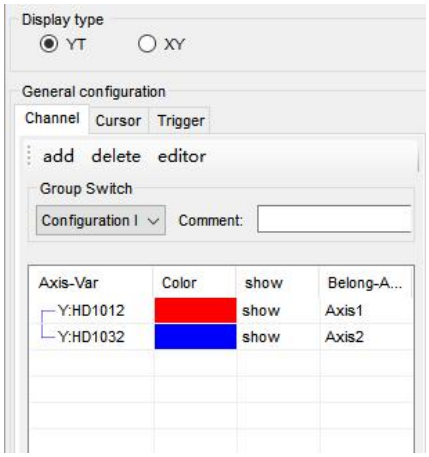


Parameter name	Explain
Target	Configured register variables
Condition	The logical relationship between triggers that share the same register object
Way	Trigger edge (rising edge: Rising edge; falling edge: Falling edge)
Threshold	Trigger threshold
Action	Behavior after the trigger is activated (stopdisplay: Stop displaying; restartdisplay: Restart displaying)
Enable	Is the trigger working?

5-12-5-5. Oscilloscope Usage Examples

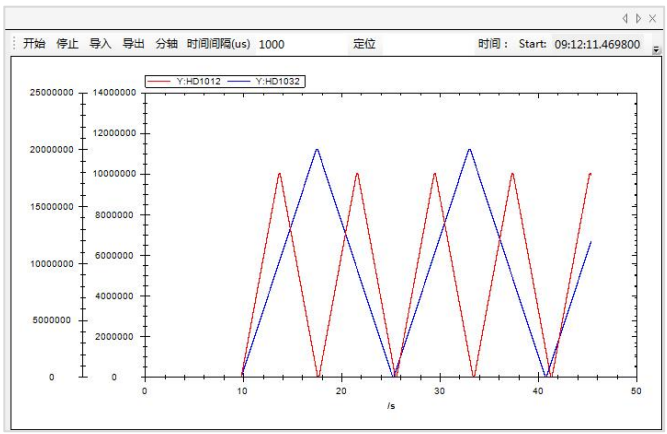
For example, using the xinje XG2 series PLC to control two DS5C servo drives, the motors are Operated in forward and reverse directions in CSP mode respectively, with their actual position waveforms monitored.

The oscilloscope interface configuration 11-5 is as follows:



Specifically, HD1012 corresponds to axis 1–6064h, while HD1032 corresponds to axis 2–6064h.
Click [Start] to launch the oscilloscope; it will display the current positions of both axes. When neither axis is active, the display shows two straight lines (with slight waveform jitter that is particularly noticeable at low vertical scale ratios). Once both axes are operational, the waveform begins to change, and the oscilloscope automatically adjusts the scale proportions during operation. To view the full waveform, click [Stop] and select [Return to Original Scale Ratio] from the right-click menu (the waveform displays only data within 60 seconds, but all data is saved; use [Export Data] to save data up to one hour in Excel format).

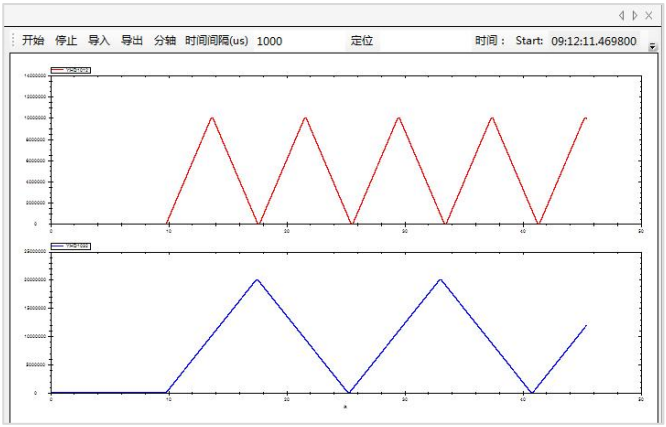
The waveform is shown below:



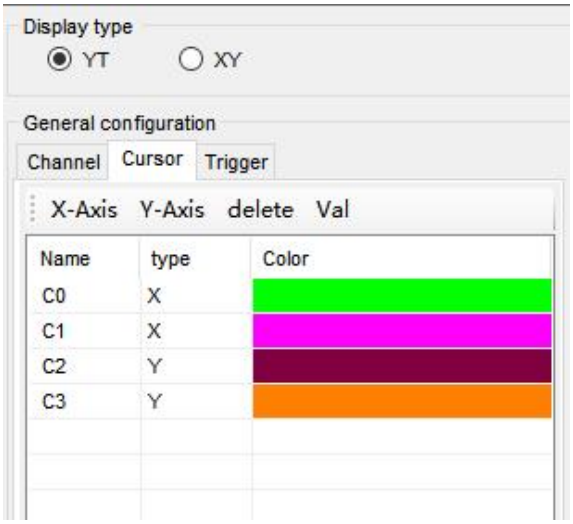
On the left, there are two coordinate axes: the left axis represents the vertical coordinate of axis 2, and the right axis represents the vertical coordinate of axis 1.

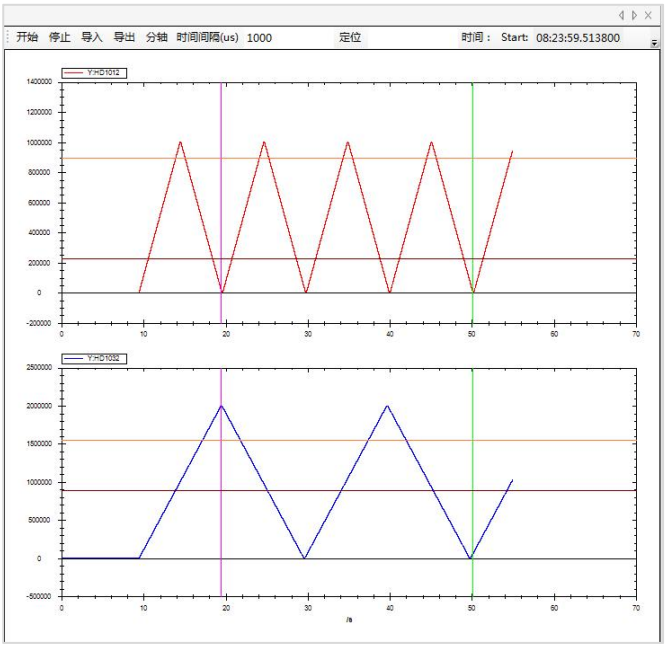
To divide it into two axes, click [Divide Axis] (set the axis variables to two different axes).

The resulting graphic after [Axis Division] is as follows:

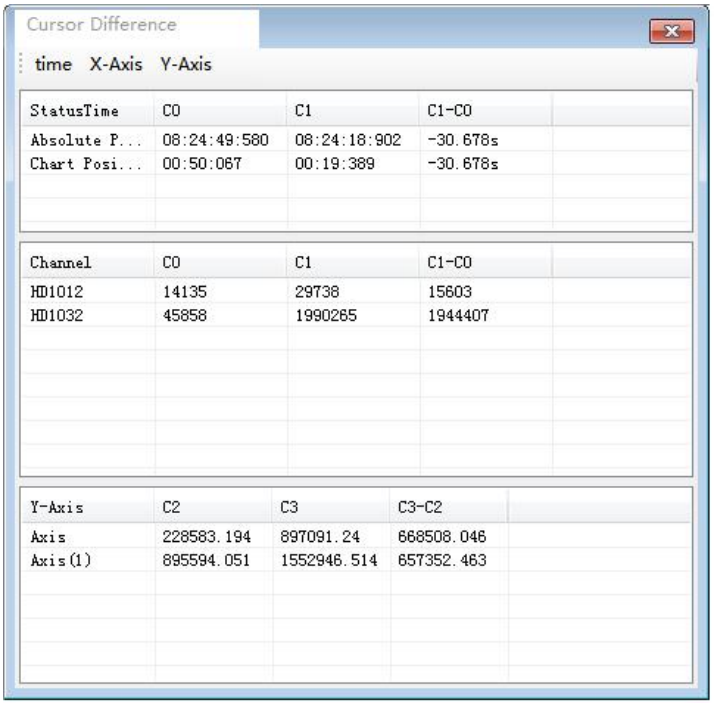


Click the cursor to configure the [X-axis] and [Y-axis] to generate cursors (two cursors are configured on the X-axis and Y-axis in the figure). Drag the cursor position with the mouse.





Click the cursor to configure [Value] and enter the cursor difference interface. This interface, when used with the cursor, allows you to monitor the specific register values.



StatusTime region：

Absolute Position indicates the current actual time (i.e., computer time) shown by the cursor;

The Chart Position indicates the time the oscilloscope has been operating (i.e., the x-coordinate of the cursor position).

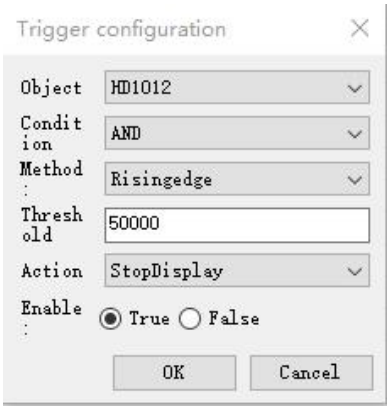
Channel region：

The data within the region represent the values of registers corresponding to cursor positions; combined with the [StatusTime] section, these enable real-time monitoring of register values. As shown in the figure, at 50.067s, the value of register HD1012 is 14135 and that of register HD1032 is 45858; at 19.389s, the value of register HD1012 is 29738 and that of register HD1032 is 1990265. [C1–C0] represents the difference between two cursor positions (Note: When the number of cursors set on a axis is greater than or equal to 2, the cursor difference interface automatically generates the corresponding difference values).

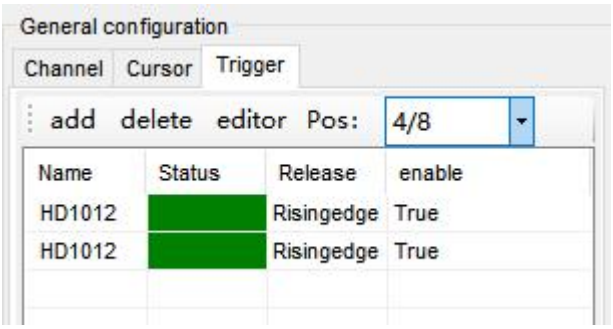
Axis region：

The data in the region represent values corresponding to the cursor on the Y-axis. As shown in the figure, [C2] has a value of 228583.194 on Axis 1 and 895594.051 on Axis 2; [C3] has a value of 897091.24 on Axis 1 and 1552946.514 on Axis 2; [C3–C2] represents the difference between the values at these two cursors.

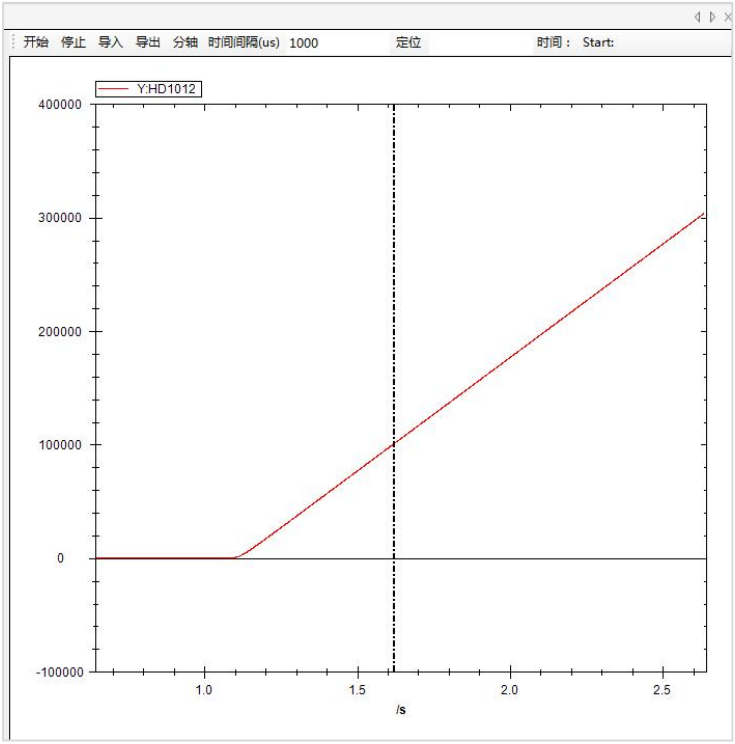
The trigger configuration is shown in the figure:



Configure two triggers, both targeting HD1012, with an AND condition and Rising edge activation. Set one threshold to 50,000 and the other to 100,000. Select StopDisplay as the behavior and enable True for this option.



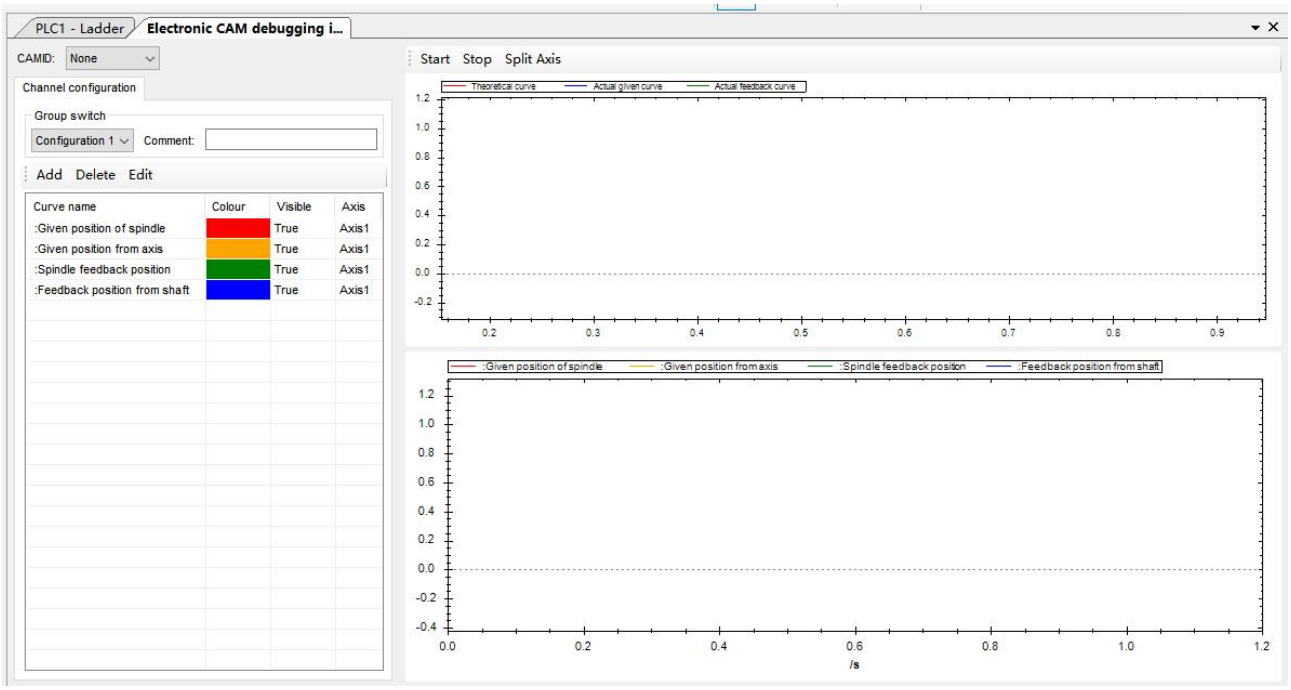
Select trigger position 4/8; the oscilloscope results after operation are as follows:



The dashed line in the diagram indicates the trigger position. When triggered, this position occupies 4/8 of the current waveform; the oscilloscope stops operation (with the dashed line covering half of the waveform). All triggers display red status, indicating they have been activated. If the trigger condition is set to AND, the system stops only when both triggers are triggered. Consequently, the register value at the trigger position is set to 100000. If the trigger condition is OR, the system stops upon activation of either trigger. For a combination where one trigger uses AND and the other uses OR as the trigger condition, the system determines triggering based on the OR logic.

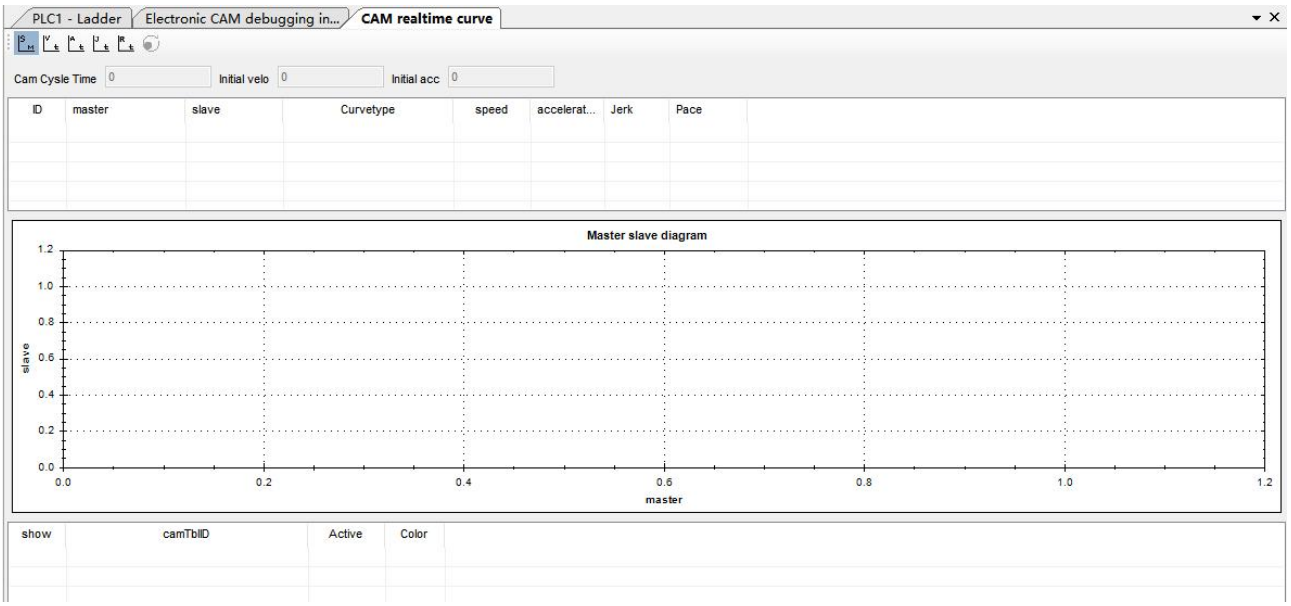
5-12-6. Electronic Cam Adjustment

For detailed implementation of the functions, please refer to the User Manual for XDH/XLH/XG2 Series Programmable Controllers [Advanced Motion Control Section].



5-12-7. Cam Motion Setting Curve

For detailed implementation of the functions, please refer to the User Manual for XDH/XLH/XG2 Series Programmable Controllers [Advanced Motion Control Section].



5-12-8. Information Section

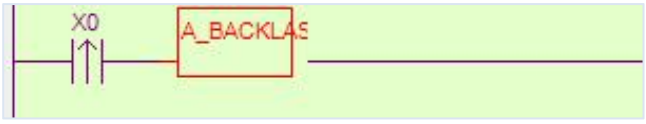
The information pane includes "Error Information" and "Output".

1) Error List

This feature displays syntax and execution errors. Generally, when editing a ladder diagram, if a statement contains an error, pressing Enter will automatically highlight it in red and display the error in the error message field, as shown below:

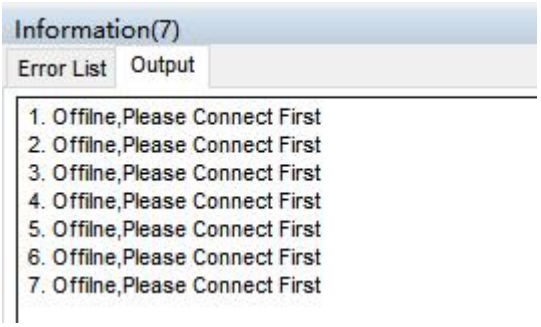
For syntax checking only, click [PLC Operation] → [Syntax Check] in the menu bar.

Double-click the error message to automatically position the cursor at the error location, making it easier for users to locate and fix the issue, as shown below:



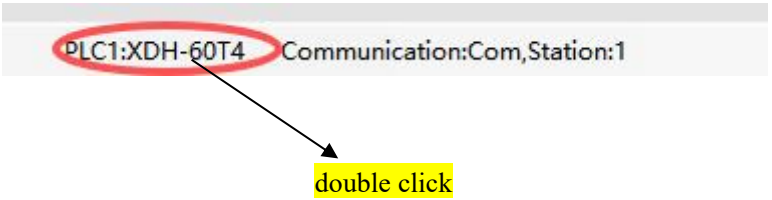
2) Output

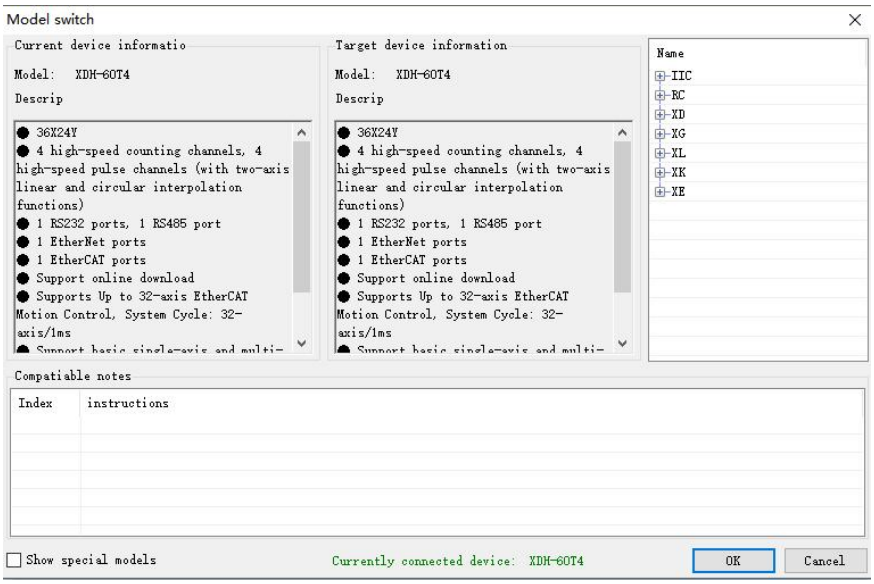
The relevant information is only written to the output field when a PLC operation encounters an error, indicating a user operation mistake, as shown in the figure below:



5-12-9. Status Bar

The status bar displays not only relevant information about the currently active PLC, but also allows users to double-click the status display to quickly open and modify PLC properties, as shown below:





The PLC status indicator in the bottom-right corner: Double-click it to stop all monitoring and release the serial port usage; double-click again to resume monitoring, as shown below:

Run ,Scan Cycle:0.0ms

On the far left, you can see the row and column numbers of the instruction where the cursor is located, as well as the current step count of the ladder diagram, as shown below:

Row 2,Col 3 Steps:10 OVR

Double-click "Overwrite" to switch to "Insert". When editing and pasting a trapezoid diagram, it will be pasted in insert mode.

Row 2,Col 3 Steps:10 OVR

6. POU

6-1. Introduction to POU

POU stands for Program Organizational Unit, the fundamental building block of the xinje PLC programming tool software. Users can develop applications using POU components, which include functions, function blocks, and programs—all of which can be implemented using ladder diagrams, C language, or ST language. Programs can call these functions and blocks to create user-defined applications.

For versions 3.7.16 and 3.7.16a, Ethercat bus models support the POU function; all versions from 3.7.17 onward fully support POU functionality; versions 3.8.0 and above also support ST language programming. For usage details, refer to the User Manual for XD/XL Series Programmable Controllers [Basic Instructions Section].

6-2. Data Types

6-2-1. Basic Types

The supported basic types are as follows:

Data type	Type declaration	Length/Bit
BIT	Position	1
BOOL	Blue	8
SINT	Short Integer	8
USINT	Unsigned Short Integer	8
INT	Integer	16
UINT	Signless Integer	16
DINT	Double Integer	32
UDINT	Unsigned Double Integer	32
LINT	Long Integer	64
ULINT	Unsigned Long Integer	64
REAL	Real	32
LREAL	Real Number	64
BYTE	Bit String	8
WORD	Bit String	16
DWORD	Bit String	32
LWORD	Bit String	64

6-2-2. Complex Types

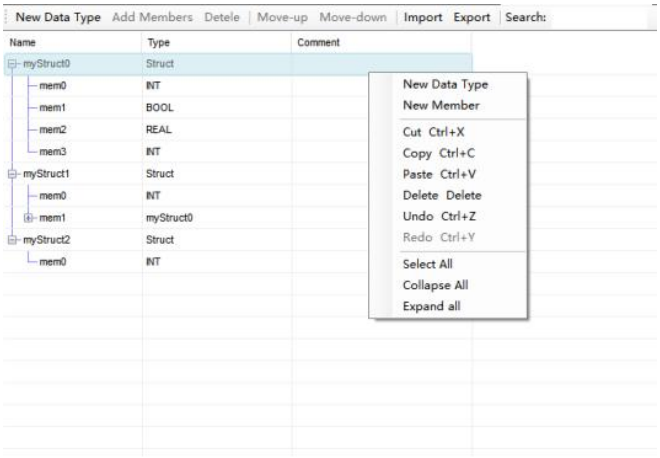
- Supports user-defined structure types;
- Support function block types;
- Supports pointer types;
- Support array types (currently supports one-dimensional arrays only).

6-3. Variable Table

6-3-1. User Data Types Table

1) Instructions for Use

- Click to open the User Data Types Table in the left engineering tree. The table lists all currently defined data types. You can create new data types or add members to the selected data type.
- Supports moving up, moving down, cutting, copying, pasting, deleting, selecting all, folding all, and expanding all operations.
- Supports importing and exporting user data type tables in CSV format;
- Supports copy and paste operations between external tables;
- Row tables support multi-selection drag-and-drop to move rows; you cannot select both a structure and its members for drag or paste operations.



2) Create a new data type

- Structure Name: The name must comply with the naming conventions (refer to Section 6-3-2, Naming Rules for Global Variable Tables).
- Structure type: Struct, fixed and cannot be modified;
- Structure Description: Provides additional details for the defined structure.

3) Members of the structural entity

- Member Name: The name must comply with the naming conventions (refer to Section 6-3-2, Naming Rules for Global Variable Tables).
- Member Type (allowed only):
- ① Basic data type;
  ② Structure type (nesting allowed; mutual nesting not allowed);

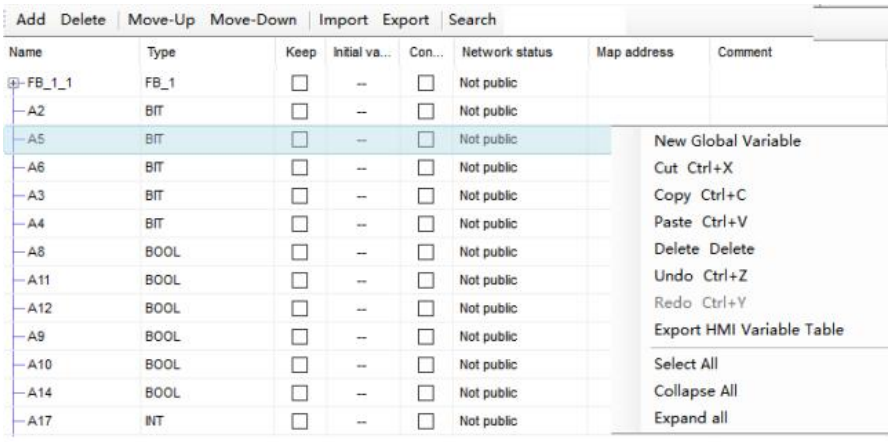
  ③ pointer type；

  ④ arraytype 。
- Member Description: Provides comments for members within a structure.

6-3-2. Global Variable Table

1) Instructions for Use

- Supports moving up, moving down, cutting, copying, pasting, deleting, undoing, redoing, selecting all, folding all, and expanding all. You can find the corresponding actions or shortcuts in the right-click menu, as shown below.
- Supports importing and exporting variable tables in CSV format;
- Supports copy and paste operations between documents and external tables;
- Add and delete operations apply only to global variables; you cannot directly modify variable members.
- Row tables support multi-selection drag-and-drop to move rows. You cannot select both variables or members within a variable for drag-and-drop operations.
- Supports table search and automatically identifies matching global variables.
- Variables defined in global variables can be directly accessed in the ladder diagram or within C code.



2) Name

Global variable names must comply with naming conventions:

- Allow only uppercase or lowercase letters as the start character;
- Only allows uppercase and lowercase letters, numbers, and '.'.
- Do not allow duplicate names;
- No spaces are allowed;
- Do not repeat names with classic PLC instruction names;
- Do not repeat data type names;
- Do not repeat register names;
- The name length cannot exceed 64 characters;
- The name is case-insensitive;
- It is not recommended to use names that conflict with existing software component names in the system; instead, use similar names such as C, T, or D.

3) Type

The data types for global variables are as follows:

- Basic data types along with their corresponding pointer types and array types;
- User-defined data types along with their corresponding pointer and array types;
- Function block types, along with their corresponding pointer types and array types.

4) Mapping Address

By default, addresses are not mapped and are automatically assigned to anonymous addresses by the software. Users can also specify non-anonymous addresses for fixed addresses.

When the "Keep" option is selected, if you want to set a mapping address, it must be a power-loss retained address such as HD or HM. If a non-power-loss retained address is specified, an error message will appear stating "The Keep attribute conflicts with non-keep registers; cannot be set simultaneously," and the "Keep" setting for the variable will automatically be deselected (see Section 6-4 Address Management).

5) Initial Value

- Select "Keep" or set a constant with an initial value.
- To apply the initial values, check the global variable's initial value when downloading the program or user data.
- Arrays and structures set initial values for their internal members using a propagation tree.

6) Notes

Comments for each global variable.

7) Constant

Constants cannot map addresses; they can only serve as input variables.

8) Network Status

The public status is only used when Ethernet IP displays communication information; see the Ethernet Communication User Manual for details.

6-3-3. System Variable Table

The system variable table is used to store variables for the axis structure, EIPscanner status variables, and other related data.

6-3-3-1. _SYS_AXIS

- The SYSDataContext is used to store axis structure variables;
- The variables in SYS Jasyn use an anonymous address space;
- If no anonymous address space is configured, a download error will occur. Users must uncheck the "Reference" option in.SYS AXIS to enable proper downloads.
- Without selecting "Reference" in SYS AXIS, this variable does not function properly.
- For further details, please refer to the User Manual for XDH/XLH/XG2 Series Programmable Controllers [Advanced Motion Control Section].
- When opening a project created with an older version of the software in version 3.7.17b, "_SYS AXIS" appears as "System Variable Table"; for newly created projects, it displays as "_SYS AXIS".

Name	Type	Keep	Initial va...	Con...	Map address	Comment	Ref...
BMC_Axis000	BMC_AXIS_REF	☐	--	☐		Motion control single-axis ...	☑
Status	BMC_AXIS_STATUS	☐	--	☐		axis state machine	☑
Dir	BMC_AXIS_DIRINFO	☐	--	☐		command direction informa...	☑
SrvStatus	BMC_AXIS_SRVS...	☐	--	☐		servo state	☑
Cmd	BMC_AXIS_CMDIN...	☐	--	☐		axis setpoint	☑
Act	BMC_AXIS_ACTINFO	☐	--	☐		axis feedback value	☑
Cfg	BMC_AXIS_CFGINFO	☐	--	☐		Basic axis setting	☑
Scale	BMC_AXIS_SCALE	☐	--	☐		Axis unit conversion	☑
ErrInfo	BMC_AXIS_ERRINFO	☐	--	☐		error message	☑

6-3-3-2. _SYS_ETHERNET

- `_ethernet` is used to store parameters related to Ethernet/IP communication for EIP scanners and does not occupy the anonymous address space.
- For specific usage, refer to the Ethernet Communication User Manual.

Add Delete | Move-Up Move-Down | Import Export | Search

Name	Type	Keep	Initial va...	Con...	Map address	Comment
EIPScanner	sETHIP_SCANNER[256]	☐	--	☐		EIP Scanner Information
EIPScanner[0]	sETHIP_SCANNER	☐	--	☐		EIP Scanner Information
ConnectionID	DINT	☐	--	☐		connection ID
ConnectedStatus	DINT	☐	--	☐		connection status code
ConfigationStatus	DINT	☐	--	☐		Configuration status code
GeneralStatus	DINT	☐	--	☐		universal status code
ExtendedStatus	DINT	☐	--	☐		extended status code
EIPScanner[1]	sETHIP_SCANNER	☐	--	☐		EIP Scanner Information
EIPScanner[2]	sETHIP_SCANNER	☐	--	☐		EIP Scanner Information
EIPScanner[3]	sETHIP_SCANNER	☐	--	☐		EIP Scanner Information
EIPScanner[4]	sETHIP_SCANNER	☐	--	☐		EIP Scanner Information

6-3-3-3. _SYS_PID

- SYS_PID is used to store the actual parameters of a BPC_TEMP_PID function block instance and occupies an anonymous space address.

- For detailed instructions, please refer to the User Manual for XD/XL Series Programmable Controllers [Basic Instructions Section].

Name	Type	Keep	Initial va...	Con...	Map address	Comment
varGlobal0	BPC_TEMP_PID	☑		☐		Process control temperatu...
Enable	BOOL	☑		☐		Input variables (internally e...
SetValue	REAL	☑		☐		Target temperature value, ...
PresentValue	REAL	☑		☐		Current temperature value,...
ManualValue	REAL	☑		☐		Manual output value, unit: %
LineValue	REAL	☑		☐		Linearization slope, unit: ...
PIDMode	UINT	☑		☐		Control mode. 0:(default) i...
ModeActive	BOOL	☑		☐		mode activation
WarningCLR	BOOL	☑		☐		Warning cleared
ErrorCLR	BOOL	☑		☐		error clear
Reset	BOOL	☑		☐		Controller reboot
CurrentSetV...	REAL	☑		☐		Current setpoint, unit: °C
HeatOutput	REAL	☑		☐		Heating output, in %
CoolOutput	REAL	☑		☐		Refrigeration output, in %
HeatOutput_...	DINT	☑		☐		Heating analog output
CoolOutput_...	DINT	☑		☐		Refrigeration analog output
HeatOutput_...	BOOL	☑		☐		Heating PWM output
CoolOutput_...	BOOL	☑		☐		Cooling PWM output
State	UINT	☑		☐		Current control mode. 0:(d...
WarningFlag	BOOL	☑		☐		warning flag bit
WarningCode	UDINT	☑		☐		warning code
ErrorFlag	BOOL	☑		☐		error flags
ErrorCode	UDINT	☑		☐		error code
BasicConfig	BPC_TEMP_PID_B...	☑		☐		basic configuration
HeatParams	BPC_TEMP_PID_CTL	☑		☐		heating parameters

6-4. Member Notes

In addition to encrypted content and system content, software versions V3.7.18 and above support adding or modifying comments for types, variables, and members.

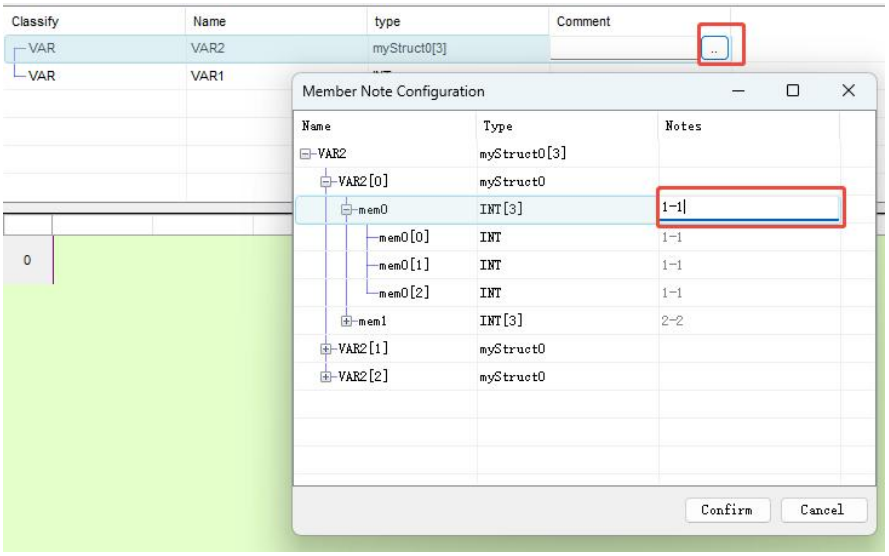
[User Data Types Table] Supports editing structure member descriptions individually, with array member variables automatically inheriting array variable annotations (displayed in light gray). It also allows modifying array member variable descriptions, as shown in the figure below.

Name	Type	Comment
myStruct0	Struct	
mem0	INT[3]	1-1
mem0[0]	INT	1-1
mem0[1]	INT	1-1
mem0[2]	INT	1-1
mem1	INT[3]	2-2
mem1[0]	INT	2-2
mem1[1]	INT	2-2
mem1[2]	INT	2-2

[Global Variable Table] When calling custom structure variables, the structure documentation is automatically inherited as comments. The following example using myStruct0 demonstrates support for modifying both structure variable comments and array member comments.

[Local Variable] Double-click the comment box of a variable with members, then click "..." to open the [Member Comment Settings] interface. The variable appears in the interface and can be fully expanded tree-wise. Variables without members do not display "...".

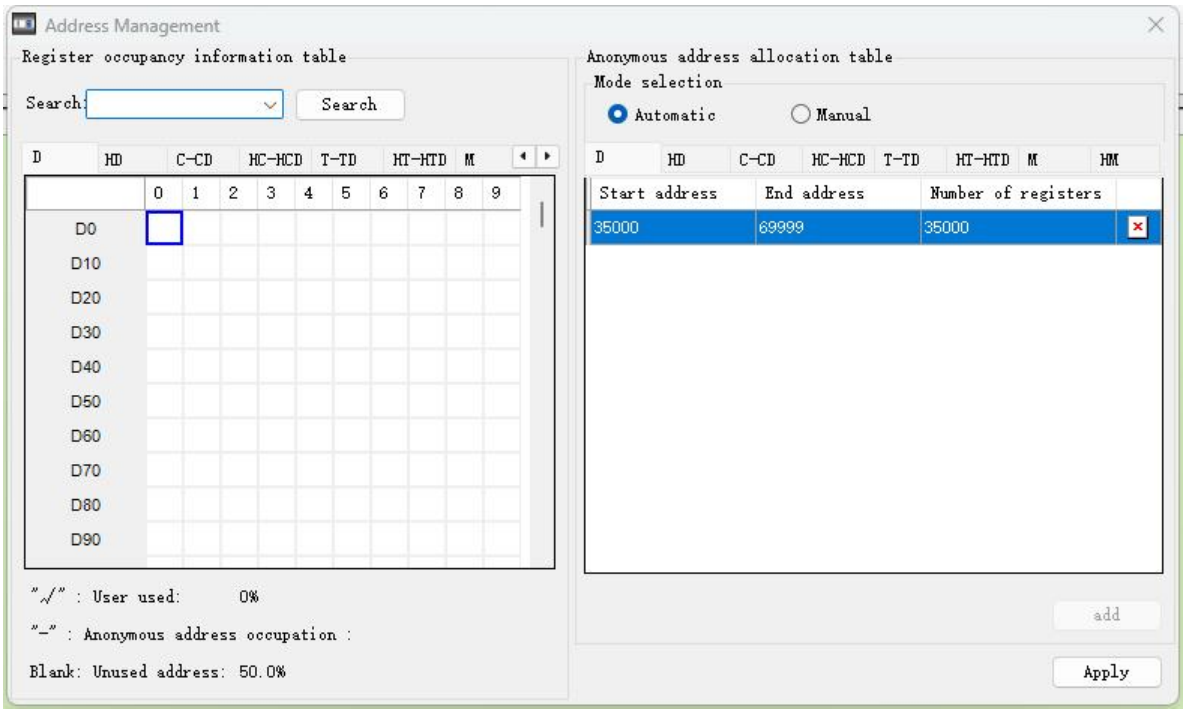
Direct editing modifies the variable itself. Use "..." to enter the [Member Comment Settings] interface, where both variables and their node nodes can be commented.



- inherited comment colors appear light gray; modified comment colors appear black.
- Automatically declared, imported, or pasted variables with comments will not inherit changes if the comments have been modified (excluding deletion).
- The inherited annotation can be modified but cannot be deleted to leave it empty.

6-5. Address Management

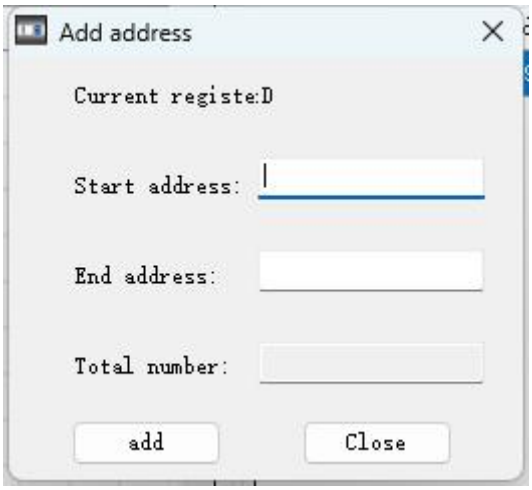
Users can set unused addresses in the program to "Anonymous Address" for storing user-defined variables.



The left table displays the register address allocation table, where "√" denotes the software components used by the user program and '–' indicates an assigned anonymous address space. Enter the target component address in the search dropdown box to automatically locate the corresponding cell. Supported anonymous address spaces include D, HD, T (TD), C (CD), HC (HCD), HT (HTD), M, and HM. For registers T–TD and C–CD, selecting 'T' automatically assigns the corresponding TD register; selecting 'C' assigns the corresponding CD register.

The anonymous address information table adds two modes: automatic and manual.

Voluntarily	The anonymous address table does not support addition, deletion, or modification; users cannot alter the address range allocation. Switching device models causes random changes to the anonymous address table. When launching software or creating a new project, the default automatic mode is applied, with the anonymous address table retrieved from the configuration file. Opening an existing project uses the anonymous addresses saved within that project.
Hand movement	The anonymous address table supports adding, deleting, and modifying entries. Users can adjust the address range based on their needs and switch device models. The anonymous address table retains current settings. The "Add" button opens the Address Addition dialog box; fill in the required information and click Add to complete configuration.



Use Constraints

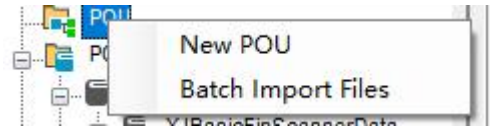
- When manually setting an anonymous address, the start and end addresses must be addresses supported by your device. If an address does not exist, a message will appear: "This address does not exist. Try again." If the end address exceeds the register's maximum value, the software will automatically set it to the maximum value with the message: "Address exceeded. Set to maximum value."
- If the byte count is less than 100 or the start address exceeds the end address, a message appears stating "The anonymous address space is too small; enter again" (this restriction does not apply to XD1/XD2/XD3 and XL1/XL3 series due to fewer HC/HCD and HT/HTD units than required).
- The configured anonymous address range includes addresses already used by users. A message appears: "The configured anonymous address space contains used registers. Confirm whether to re-enter them."

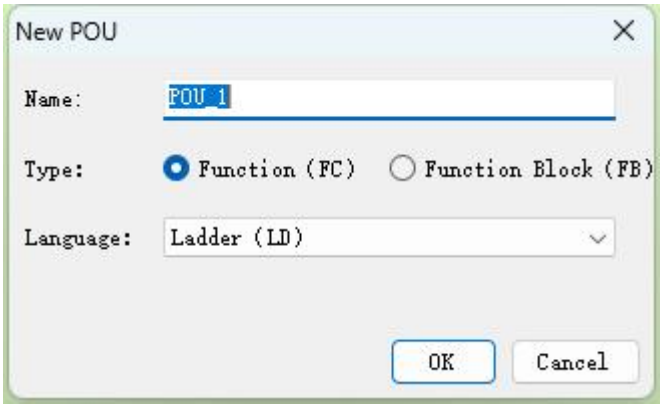
- Only network port models and Ethercat bus models support automatic allocation of anonymous addresses; other series do not have this feature enabled by default, requiring users to configure it manually when using the POU function.
- When registers or coils such as D, HD, T (TD), C (CD), HC (HCD), HT (HTD), M, HM, etc., are assigned anonymous addresses, these addresses become occupied by user-defined or system-defined variables and cannot be used directly. For example: If HD1000–1099 are set as anonymous addresses and a program executes the instruction MOV D0 HD1000, an error will occur with the message "The instruction does not support using registers in the anonymous address space." The error details are as follows:

6-6. Function/Function Block Operations

6-6-1. New Function/Function Block

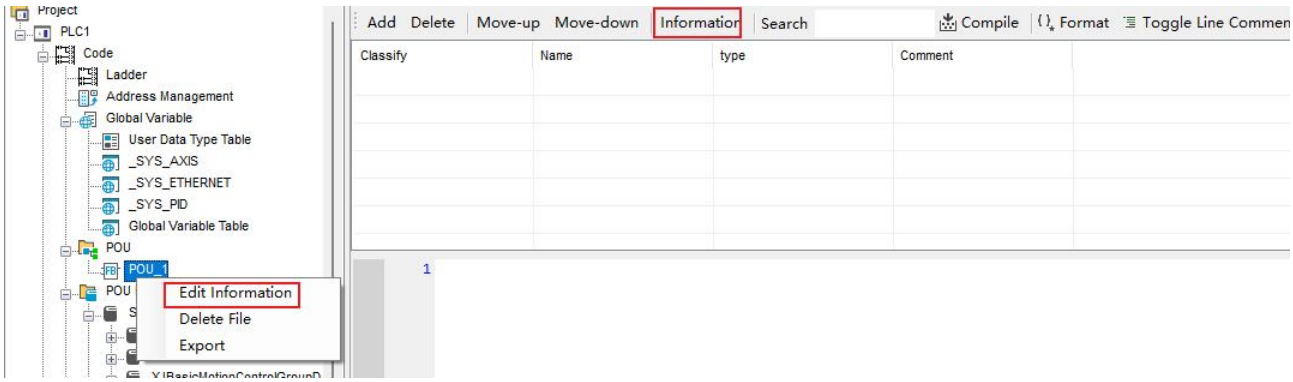
Move the mouse to the POU, right-click, and select "New POU" to create a function (FC) or function block (FB), then choose the appropriate programming language. The steps are shown in the figure below.

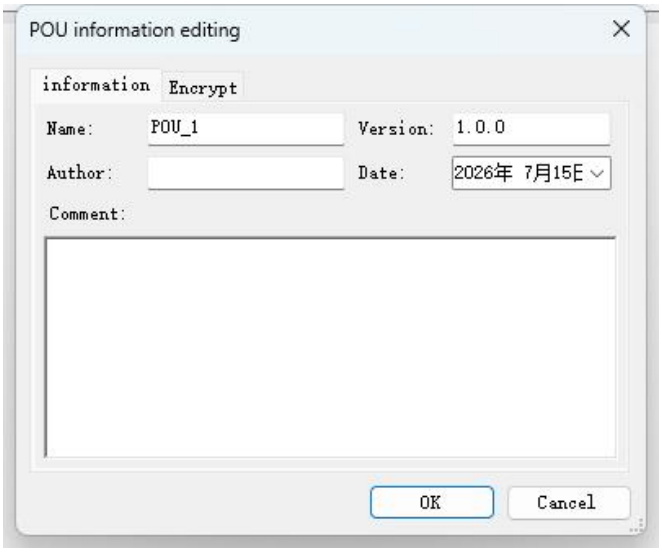


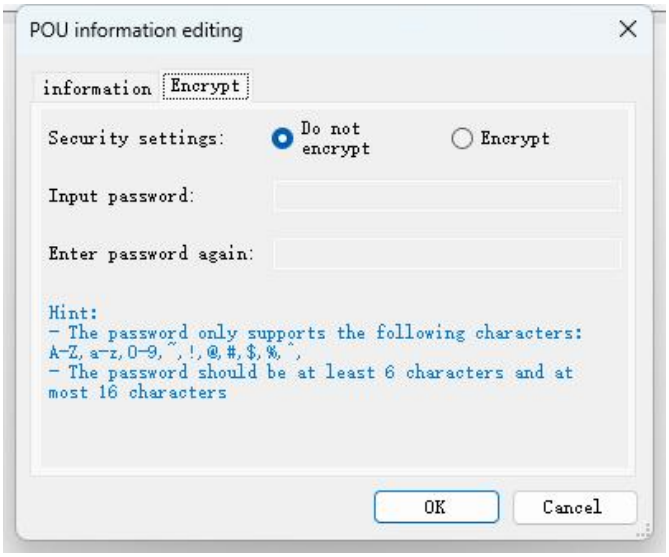


6-6-2. Modify Function/Function Block

Move the mouse to the POU project file, right-click, and select "Edit Information" or choose "Information" from the project file menu. The "Function Information Editing" window will appear: in "POU Information Editing – Information," you can modify function and function block details; in "POU Information Editing – Security," you can choose whether to encrypt the current POU, as shown in the figure below.

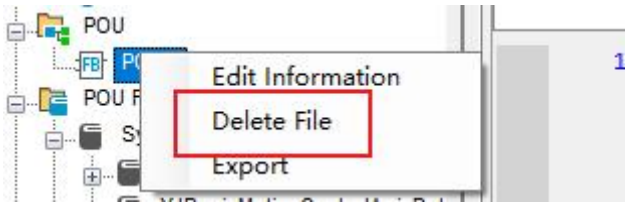



POU information editing
information
Encrypt
Name:
POU_1
Version:
1.0.0
Author:
Date:
2026年 7月15日
Comment:
OK
Cancel


POU information editing
information
Encrypt
Security settings:
Do not encrypt
Encrypt
Input password:
Enter password again:
Hint:
- The password only supports the following characters:
A-Z, a-z, 0-9, ~, !, @, #, $, %, ^,
- The password should be at least 6 characters and at most 16 characters
OK
Cancel

6-6-3. Delete Function/Function Block

Move the mouse to the POU project file, right-click, and select Delete File to remove functions and function blocks as shown in the figure below.

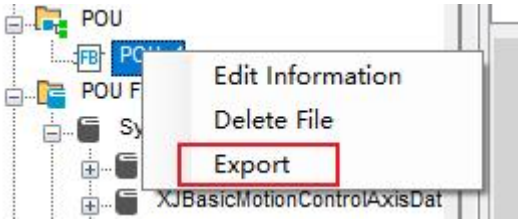


6-6-4. Export and Import Functions/Function Blocks

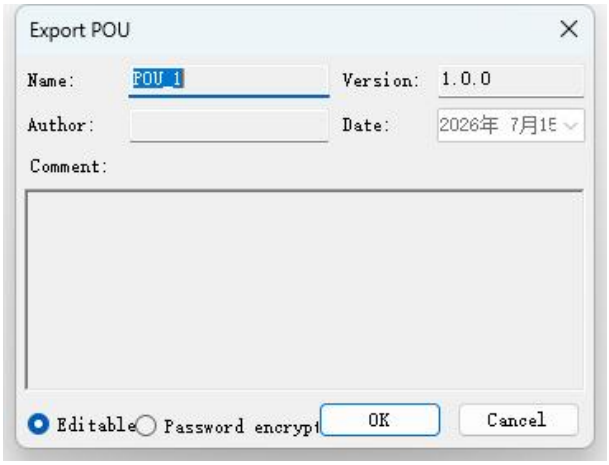
Functions/function blocks can be exported as files for use by other projects.

1) Export

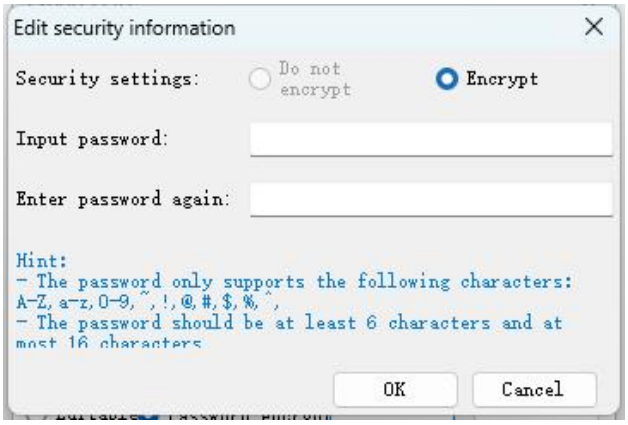
1. Right-click the POU you want to export and select Export:



2. In the open "Export POU" window, select Edit to make the source code visible and editable.



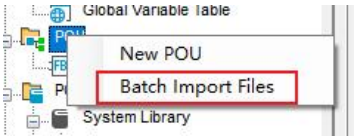
To enable password encryption, you need to set a password. After importing the program, the correct password is required to view and edit the source code; otherwise, it cannot be viewed and can only be accessed.



3. After clicking OK, select the export path to complete the export and generate an.xpou file.

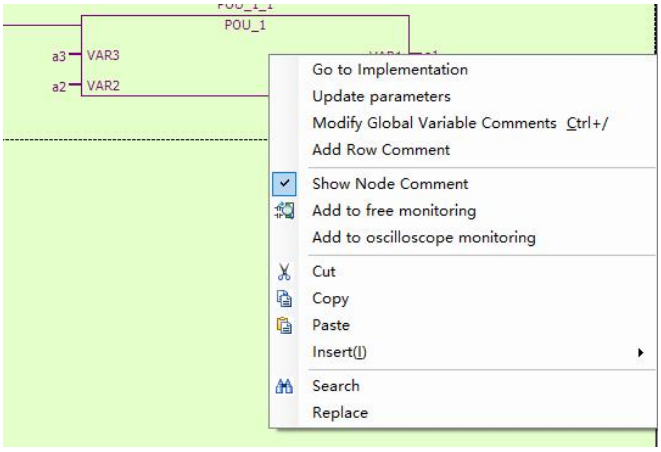
2) Import

1. In the left Engineering tab, right-click "POU" and select "Import Files in Batch".



2. After selecting the path, click the file you want to import, then click Open to complete the import.

6-6-5. Right-click menu description for POU

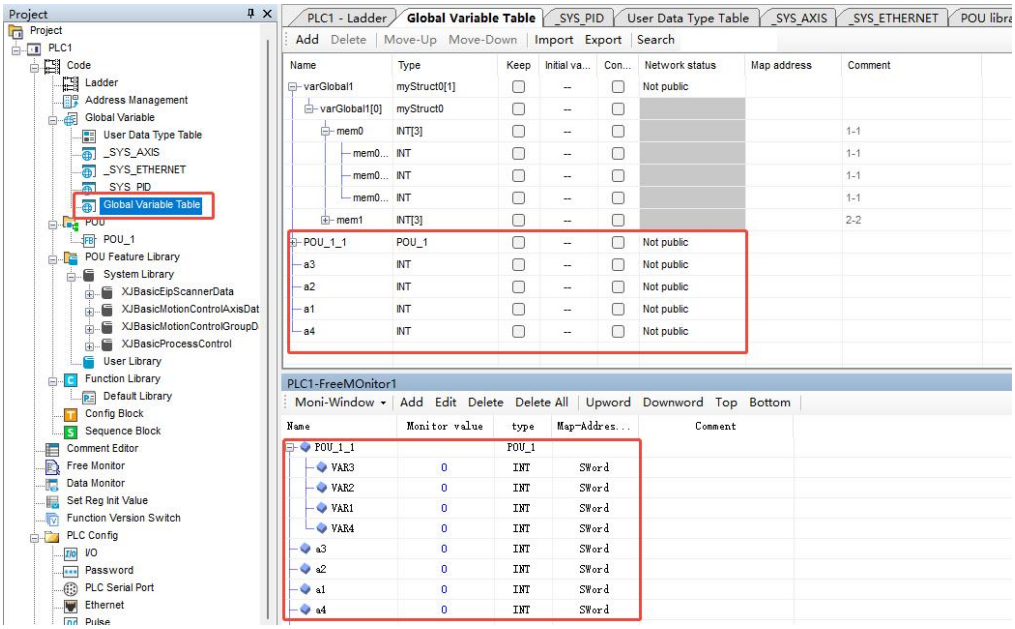


Project	Content
Go to Implementation	Quickly locate the implementation section of the current POU
updated parameter	Update block pin information (Pin information updates in real time; this feature is not required currently)
Change Variable Commentary	Modify the comments for the global variables corresponding to FB/FC
Add Row Commentary	Add a row comment above the POU
Add to Free Monitoring	Add the actual parameters and other information of the current POU to free monitoring
Add to Oscilloscope Monitoring	Add the actual parameters and other information of the current POU to oscilloscope monitoring

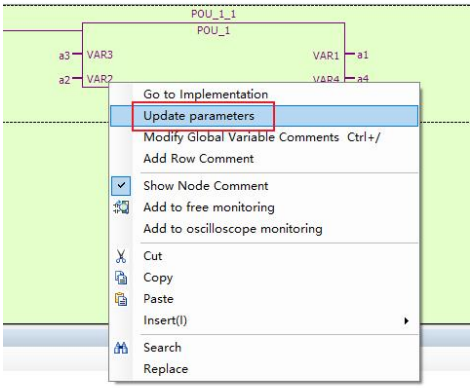
6-6-6. Monitoring/Modifying Variable Values and Comments

1) Methods for monitoring/moving variable values

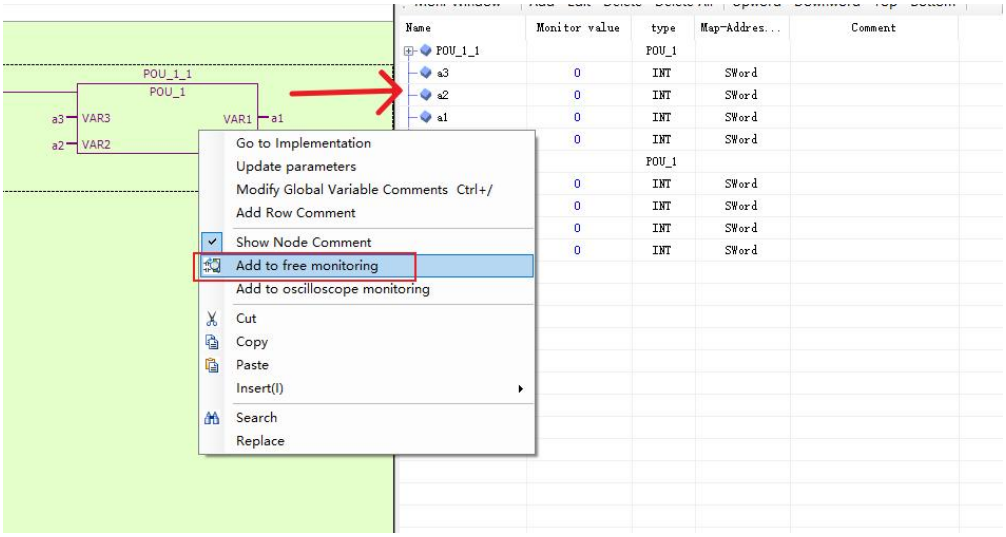
Method 1: After defining the corresponding variables in the global variables section, open the Free Monitoring interface, select the variable to monitor or modify, and click it to drag it into the Free Monitoring box for monitoring or modifying its value.



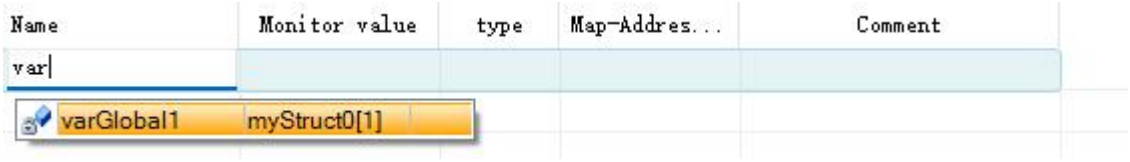
Method 2: Right-click the FC/FB referenced in the trapezoidal diagram, then select "Modify Current Monitoring Value" to adjust the variable's status or value in this interface (this method does not allow modifying the variable's display format).



Method 3: Right-click the FC/FB referenced in the trapezoidal diagram, select "Add to Free Monitor," and add the global variables used in the FC/FB to the Free Monitor. Then monitor or modify the variable states or values within the Free Monitor.



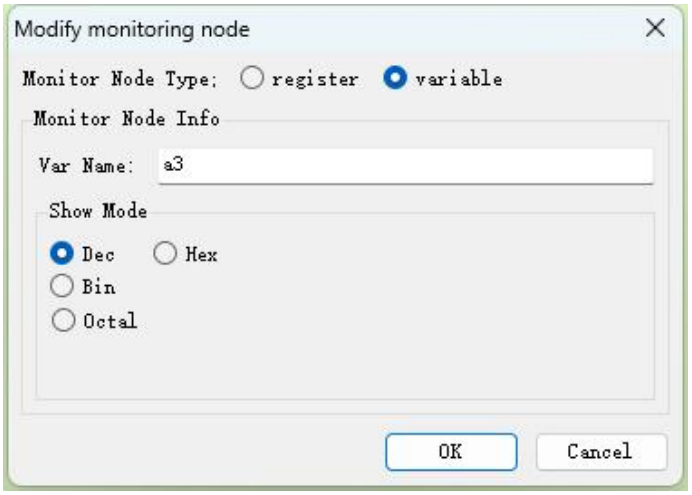
Method 4: Directly enter the variable name defined in the Global Variable Table on the Free Monitoring interface to monitor or modify the variable's status or value.



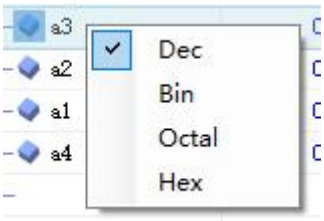
2) Modify the display format of monitoring variables

In the "Free Monitoring" interface, you can modify the display mode of monitoring variables.

Method 1: Double-click the "Type" or "Byte Length" field corresponding to the monitoring/ modification variable to open the "Modify Monitoring Node" interface, where you can change the display mode of the monitoring.



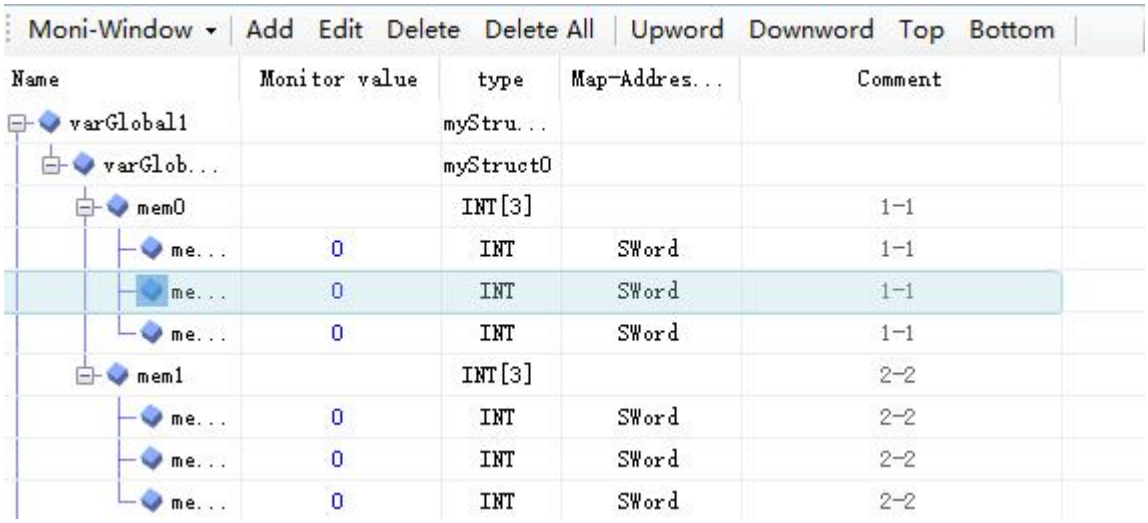
Method 2: Select the variable whose monitoring mode needs to be changed, then right-click it to choose the corresponding display mode.



Change the display mode. This applies only to the current node and not to other variables with the same or different names.

3) Modify the comment for the monitoring variable

In the [Free Monitoring] interface, you can add or modify comments for global variables and their member variables. The comments will be updated in the global variable definition area after modification.



Name	Monitor value	type	Map-Addres...	Comment
varGlobal1		myStru...		
varGlob...		myStruct0		
mem0		INT[3]		1-1
me...	0	INT	SWord	1-1
me...	0	INT	SWord	1-1
me...	0	INT	SWord	1-1
mem1		INT[3]		2-2
me...	0	INT	SWord	2-2
me...	0	INT	SWord	2-2
me...	0	INT	SWord	2-2

6-7. Function Block

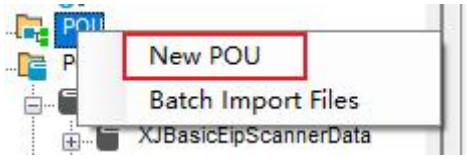
6-7-1. Introduction

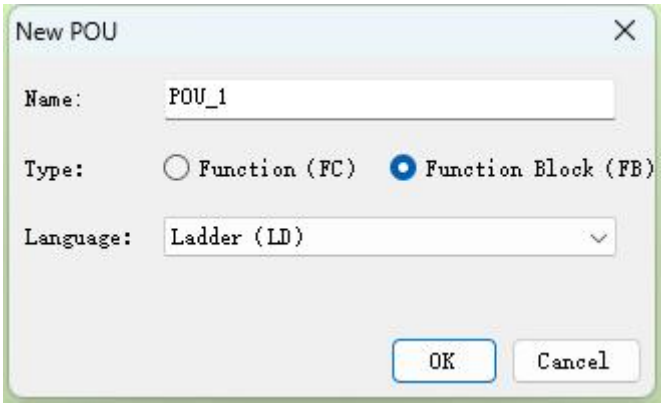
A Function Block (FB) transforms reusable program components into standardized elements that can be repeatedly invoked within a program, thereby enhancing development efficiency, reducing programming errors, and improving overall program quality.

A function block is a program organization unit that generates one or more values during execution. It maintains its own set of unique internal variables, which define its state characteristics. Consequently, for identical input parameter values, different internal states may lead to distinct computational outcomes. In control systems, function blocks can represent specific control algorithms (e.g., PID controllers for closed-loop control), while others may serve as counters, timers, or filters. Function blocks can incorporate other function blocks and functions, and can also be invoked by other function blocks or programs.

6-7-2. New Function Block

Right-click "POU" in the left Engineering tab, select "New POU," and enter a name in the dialog box. Choose Function Block (FB) as the type and select Trapezoidal Diagram (LD) or C Language (C) as the language. Click OK to complete the new function block.





6-7-3. Programming Function Block

The FB editing interface consists of two sections: the Variable Declaration Area and the Program Editing Area.

6-7-3-1. Variable Declaration Section

1） class

Properties of the block variable.

Class	Category Description	Description
VAR_INPUT	Input variable	Its value is the parameter read from the function block
VAR_OUTPUT	Output variable	Its value is written by the parameters in the function block
VAR_IN_OUT	Input/Output Variables	When called, the function block reads its value; after execution, it writes the value back to the parameter.
VAR	local variable	For internal use, stores intermediate result variables of function blocks. The data remains until overwritten.
VAR_TEMP	Temporary variable	Used to store temporary intermediate result variables, retaining only one cycle of local temporary data without consuming CPU storage space In C, this is not required; you can define temporary variables arbitrarily within the code.

2) Name

Variable names must comply with the naming conventions (refer to Section 6-3-2, Global Variable Table).

3) Type

- Basic data types along with their corresponding pointer types and array types;
- User-defined data types along with their corresponding pointer and array types;
- Function block types, along with their corresponding pointer types and array types;
- Version 3.7.17 and later support compatibility with BIT&BOOL and BIT array & BOOL array types.

  FB: ① The BIT variable is assigned a BOOL-type value to FB;
  ② The BIT array variable is assigned to the BOOL array type input of FB;
  ③ The BOOL-type output of FB is assigned to a BIT-type variable;
  ④ The BOOL array type output from FB is assigned to a BIT array variable.

  FC: Not supported yet.

- FB member variables cannot use BIT types or BIT array types; only BIT pointer types are allowed.
- In the FB function block, VAR_INPUT, VAR_OUTPUT, and VAR can be defined as BOOL types; they cannot be defined as BIT types or BIT arrays. If BIT-type variables are required, they must be defined as BIT pointers (i.e., BIT*) and linked to corresponding actual parameters; otherwise, wild pointers may occur, causing the program to fail.

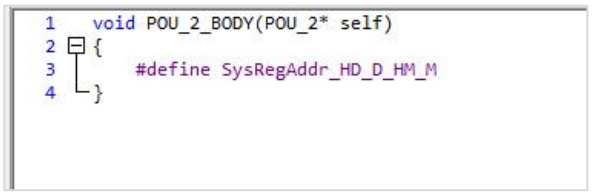
4) Notes

Provide a description for this variable.

6-7-3-2. Program Editing Area

1) FB Trapezoidal Diagram Editing Interface

2) FB C Language Editing Interface



6-7-3-3. Program Example

Example 1: Create a ascending/decreasing function block using trapezoidal diagram notation.

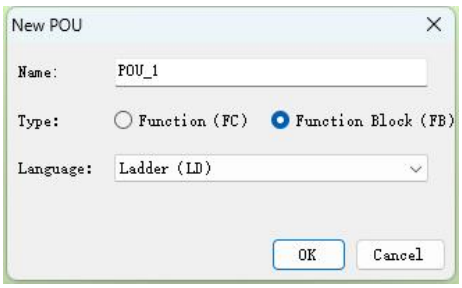
It has three inputs: an increasing signal, a decreasing signal, and a reset signal; the current count value is the output.

When the rising edge of the increasing signal is detected, increment the count by 1.

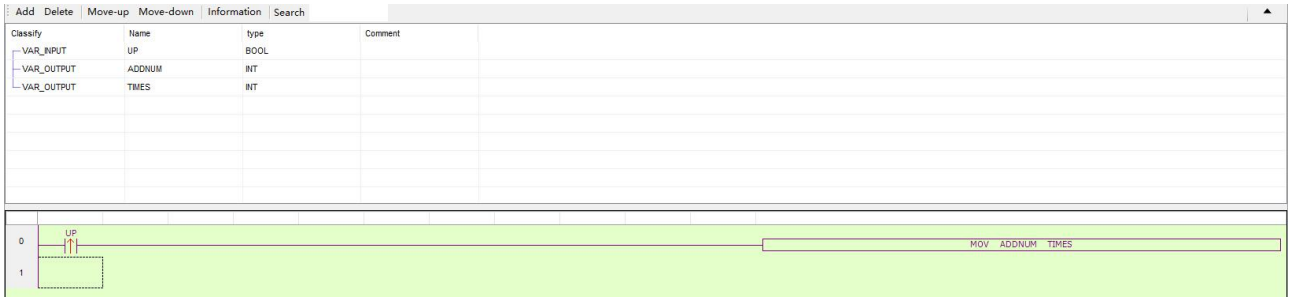
Detect the rising edge of the decaying signal and decrement the count by 1.

On the rising edge of the reset signal, reset the counter.

1. Create a new POU and name it POU_FB_LD.



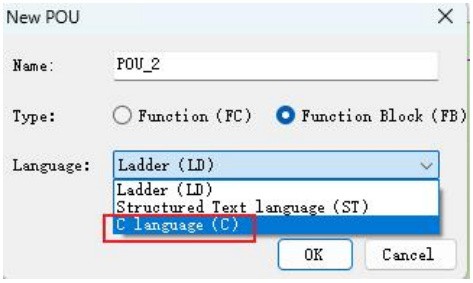
2. Declaration variables and program writing.



Note: Since variables of the BIT type in FB must be defined as BIT pointer types (i.e., BIT*), and pointer-type variables cannot serve as edge signals, this example uses a BOOL-type variable as the edge signal triggered by the instruction.

Example 2: Implement an Example in C.

1. Create a new POU and name it POU_FB_C.



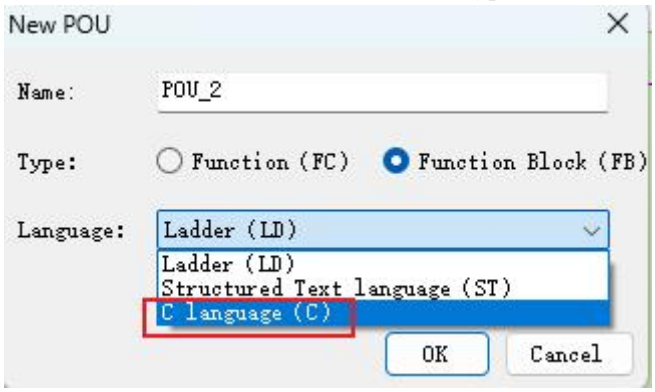
2. Declaration variables and program writing.

VAR_INPUT	Up	BOOL
VAR_INPUT	Down	BOOL
VAR_INPUT	Reset	BOOL
VAR_OUTPUT	Value	DINT
VAR	UP_P	BOOL
VAR	Down_P	BOOL
VAR	Reset_P	BOOL

```
void POU_FB_C_BODY(POU_FB_C* self)
{
#define SysRegAddr_HD_D_HM_M


    if ( self->Up == 1 && self->UP_P == 0)
    {
        self->Value = self->Value + 1;
    }
    self->UP_P = self->Up;

    if ( self->Down == 1 && self->Down_P == 0)
    {
        self->Value = self->Value - 1;
    }
    self->Down_P = self->Down;

    if ( self->Reset == 1 && self->Reset_P == 0)
    {
        self->Value = 0;
    }
    self->Reset_P = self->Reset;
}
```

Example 3: Implementing variable assignment in C.

1. Create a new POU, select FB as the type and C as the language, then declare variables.



VAR	VAR1	BIT*	
VAR_INPUT	VAR2	BIT*	
VAR_OUTPUT	VAR3	BIT*	
VAR_OUTPUT	VAR4	BIT*	
VAR_IN_OUT	VAR5	BIT	
VAR_IN_OUT	VAR6	BIT	
VAR	VAR7	BOOL	
VAR_INPUT	VAR8	BOOL	
VAR_OUTPUT	VAR9	BOOL	
VAR_OUTPUT	VAR10	BOOL	
VAR_IN_OUT	VAR11	BOOL	
VAR_IN_OUT	VAR12	BOOL	
VAR_OUTPUT	VAR13	BOOL	
VAR_OUTPUT	VAR14	BOOL	
VAR	VAR15	INT	
VAR_INPUT	VAR16	INT	
VAR_OUTPUT	VAR17	INT	
VAR_OUTPUT	VAR18	INT	
VAR_IN_OUT	VAR19	INT	
VAR_IN_OUT	VAR20	INT	
VAR_OUTPUT	VAR21	INT	
VAR_OUTPUT	VAR22	INT	

2. Write the program.

```
void FB_1_BODY(FB_1* self)
{
    /*在FB中VAR_IN_OUT类别变量为引用传递*/
#define SysRegAddr_HD_D_HM_M


    varGlobal0.Val = 1;//将BIT类型全局变量varGlobal0置ON
    self->VAR1  = &varGlobal0; //将VAR BIT*类型变量对应到实参varGlobal0的地址上
    //由于VAR类别BIT类型变量只能定义为指针类型,即BIT*,且无法在调用FB时对应到相应的实参
    //在使用此变量时需自行对应到实参地址
    ( *self->VAR2 ).Val = 0; //将VAR_INTPUT BIT*类型变量置OFF
    //此时仅内部VAR_INPUT变量置OFF,外部对应实参状态不受影响
    *self->VAR3 = *self->VAR1;//将VAR BIT*类型变量赋值给VAR_OUTPUT BIT*类型变量
    *self->VAR4 = *self->VAR2;//将VAR_INPUT BIT*类型变量赋值给VAR_OUTPUT BIT*类型变量
    *self->VAR5 = *self->VAR1;//将VAR BIT*类型变量赋值给VAR_IN_OUT BIT类型变量
    *self->VAR6 = *self->VAR2;//将VAR_INPUT BIT*类型变量赋值给VAR_IN_OUT BIT类型变量


    /*在以下对BOOL\INT类型变量进行赋值的程序中:
    VAR\VAR_INPUT赋值给VAR_OUTPUT = 非指针类型变量赋值给非指针类型变量
    VAR_OUTPUT赋值给VAR_IN_OUT = 非指针类型变量赋值给指针类型变量
    VAR_IN_OUT赋值给VAR_OUTPUT = 指针类型变量赋值给非指针类型变量*/

    self->VAR7 = 0;//将VAR BOOL类型变量置OFF
    self->VAR8 = 1;//将VAR_INTPUT BOOL类型变量置ON
    //此时仅内部VAR_INPUT变量置ON,外部对应实参状态不受影响
    self->VAR9 = self->VAR7;//将VAR BOOL类型变量赋值给VAR_OUTPUT BOOL类型变量
    self->VAR10 = self->VAR8;//将VAR_INPUT BOOL类型变量赋值给VAR_OUTPUT BOOL类型变量
    *self->VAR11 = self->VAR7;//将VAR BOOL类型变量赋值给VAR_IN_OUT BOOL类型变量
    *self->VAR12 = self->VAR8;//将VAR_INPUT BOOL类型变量赋值给VAR_IN_OUT BOOL类型变量
    self->VAR13 = *self->VAR11;//将VAR_IN_OUT BOOL类型变量赋值给VAR_OUTPUT BOOL类型变量
    self->VAR14 = *self->VAR12;//将VAR_IN_OUT BOOL类型变量赋值给VAR_OUTPUT BOOL类型变量

    self->VAR15 = 10;//将VAR INT类型变量赋值为10
    self->VAR16 = 20;//将VAR_INTPUT INT类型变量置20
    //此时仅内部VAR_INPUT变量变为20, 外部对应实参状态不受影响
    self->VAR17 = self->VAR15;//将VAR INT类型变量赋值给VAR_OUTPUT INT类型变量
    self->VAR18 = self->VAR16;//将VAR_INPUT INT类型变量赋值给VAR_OUTPUT INT类型变量
    *self->VAR19 = self->VAR15;//将VAR INT类型变量赋值给VAR_IN_OUT INT类型变量
    *self->VAR20 = self->VAR16;//将VAR_INPUT INT类型变量赋值给VAR_IN_OUT INT类型变量
    self->VAR21 = *self->VAR19;//将VAR_IN_OUT INT类型变量赋值给VAR_OUTPUT INT类型变量
    self->VAR22 = *self->VAR20;//将VAR_IN_OUT INT类型变量赋值给VAR_OUTPUT INT类型变量
}
```

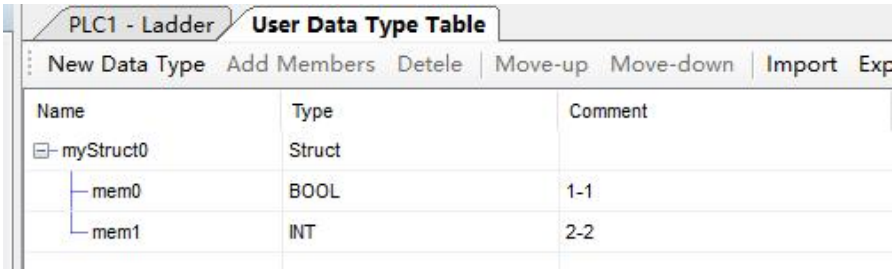
Example 4: Implementing the call of member variables in a structure using C's FB.

Define the structure in the User Data Types Table as shown below:

1. Create a new POU, select FB as the type and C as the language, then declare variables.

   In FB, define the category variables VAR_INPUT, VAR_OUTPUT, and VAR_IN_OUT with type myStruct0, and access their member variables to achieve the following:

- When a member of the BOOL type in VAR_INPUT is set to ON, assign the INT-type variable in VAR_OUTPUT its value as the sum of the INT-type variables in VAR_INPUT and VAR_IN_OUT.
- When the member of VAR_INPUT type BOOL is set to OFF, the VAR_OUTPUT variable of INT type becomes 0, and VAR_IN_OUT equals the INT-type variable of VAR_INPUT.



Name	Type	Comment
myStruct0	Struct	
mem0	BOOL	1-1
mem1	INT	2-2

2. Write the program.

```
1   void POU_4_BODY(POU_4* self)
2   {
3       #define SysRegAddr_HD_D_HM_M
4       if(self->VAR1.mem0==1)
5       {
6           self->VAR2.mem1 = self->VAR1.mem1 + self->VAR3->mem1;
7       }
8       else
9       {
10          self->VAR2.mem1 = 0;
11          self->VAR3->mem1 = self->VAR1.mem1;
12      }
13
14  }
```

Example 5: Implementing the call to array elements using FB in C.

1. Create a new POU, select FB as the type and C as the language, then declare variables.

   In FB, define the category variables VAR_INPUT, VAR_OUTPUT, and VAR_IN_OUT as arrays to achieve the following:

- When the element VAR1[0] in the BOOL[3]-type variable of VAR_INPUT is set to ON, the element VAR2[0] in the INT[3]-type variable of VAR_OUTPUT equals the sum of VAR3[0] from the INT[3]-type variable of VAR_IN_OUT and the constant 10.
- When the element VAR1[0] in the BOOL[3] type variable of VAR_INPUT is set to OFF, assign the value of VAR3[0] in the INT[3] type variable of VAR_IN_OUT to VAR2[1] in the INT[3] type variable of VAR_OUTPUT.

Classify	Name	type	Comment
VAR_INPUT	VAR1	BOOL[3]	
VAR_OUTPUT	VAR2	INT[3]	
VAR_IN_OUT	VAR3	INT[3]	

2. Write the program.

```
void POU_7_BODY(POU_7* self)
{
    #define SysRegAddr_HD_D_HM_M
    if(self->VAR1[0]==1)
    {
        self->VAR2[0] = self->VAR3[0] + 10;
    }
    else
    {
        self->VAR2[1] = self->VAR3[0];
    }
}
```

Example 6: Use of a BIT-type variable in FB.

Define separate BIT-type variables for the INPUT, OUTPUT, and IN_OUT categories to achieve the following functions:

① When VAR1 is ON, set VAR2 to ON and VAR3 to OFF;
② When VAR1 is OFF, set VAR2 to OFF and VAR3 to ON.

1. Create a new POU, select FB as the type and C as the language, then declare variables.

Classify	Name	type
VAR_INPUT	VAR1	BIT*
VAR_OUTPUT	VAR2	BIT*
VAR_IN_OUT	VAR3	BIT

2. Write the program.

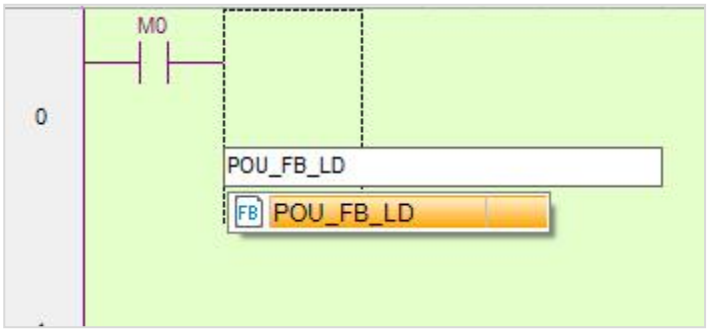
```
void FB_BIT_BODY(FB_BIT* self)
{
    #define SysRegAddr_HD_D_HM_M
    if(self->VAR1->Val==1)
    //if ( ( *self->VAR1 ).Val == 1 )
    {
        self->VAR2->Val = 1;
        self->VAR3->Val = 0;
        //( *self->VAR2 ).Val = 1;
        //( *self->VAR3 ).Val = 0;
    }
    else
    {
        self->VAR2->Val = 0;
        self->VAR3->Val = 1;
    }
}
```

6-7-4. Instance Call Function Block

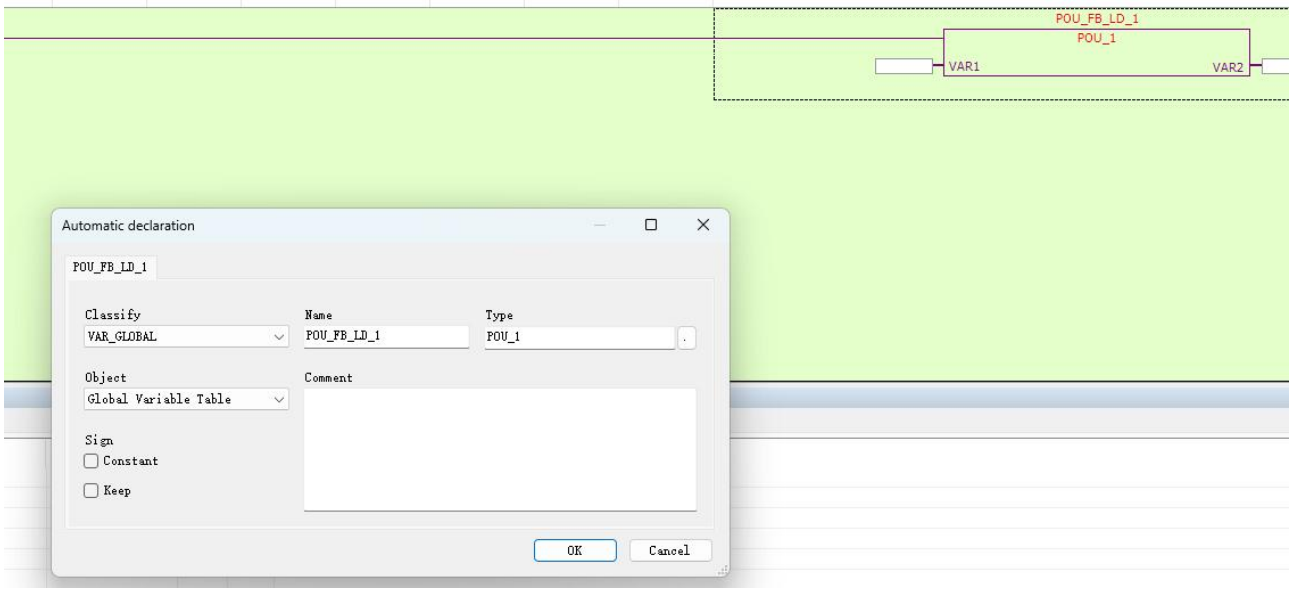
After completing the FB program, to use it within the application, you need to instantiate and call the function blocks.

1) Trapezoidal diagram calls FB

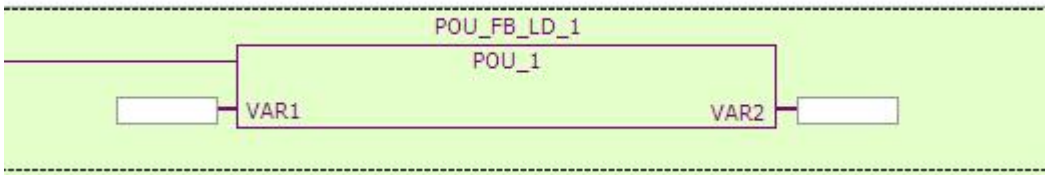
1. In the program, directly enter the FB name, call the POU_FB_LD function block written in 6-7-3-3, and press Enter to confirm.



2. A pop-up window will automatically display the variable declaration.

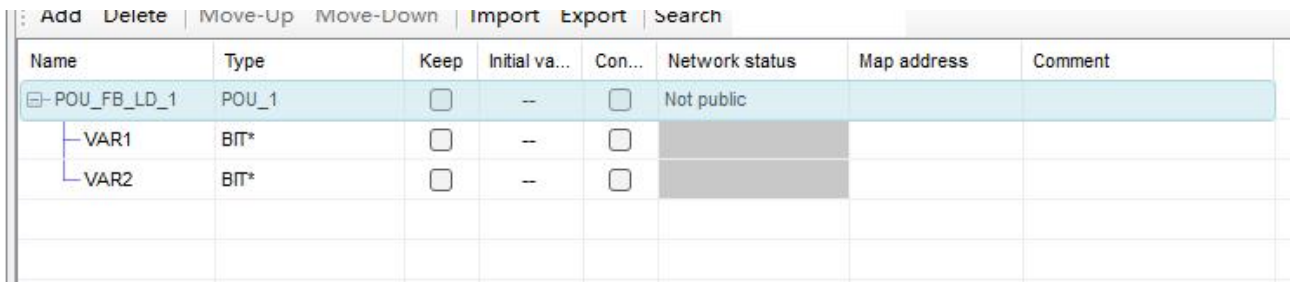


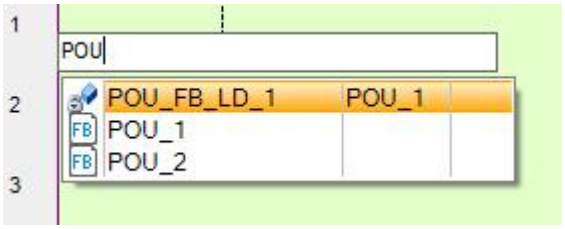
3. After entering the relevant information, click OK to complete the instantiation call.



When a parameter of an FB function is of pointer type, the actual argument cannot be null.

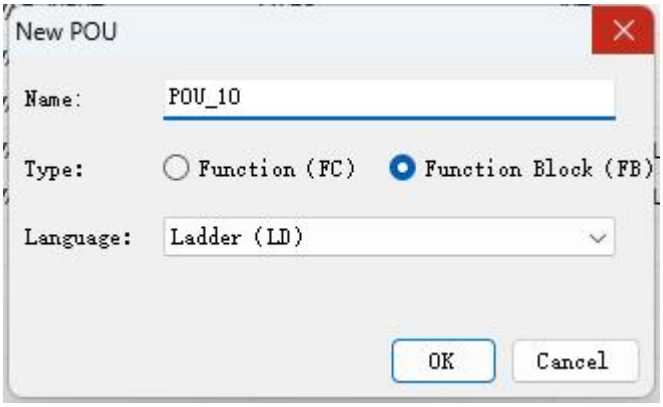
4. Alternatively, declare the instance variables first, then directly enter their names in the ladder diagram to complete the call.





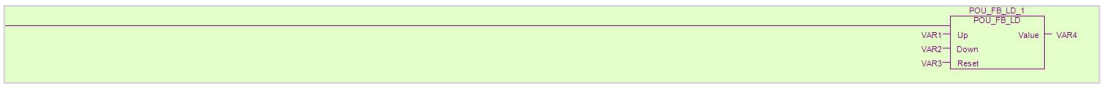
2) Implement FB calls using a trapezoidal diagram

1. Create a new POU with Type Selection Function (FB), Language Selection Trapezoid Diagram (LD), and name POU_10.

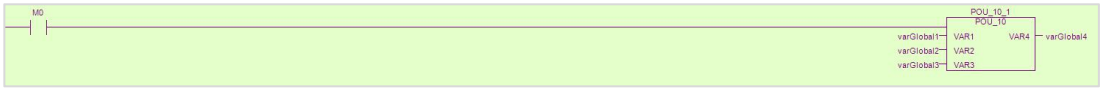


2. Declaration variables: In POU_10 (FB), call the POU_FB_LD function from Example 6-6-3 to map input/output variables to the local variables declared in POU_10.

Classify	Name	type	Comment
VAR_INPUT	VAR3	INT	
VAR_INPUT	VAR2	INT	
VAR_INPUT	VAR1	INT	
VAR_OUTPUT	VAR4	INT	
VAR	POU_FB_LD_1	POU_1	



3. The main trapezoidal diagram calls POU_10 (FB) and adds input/output variables.

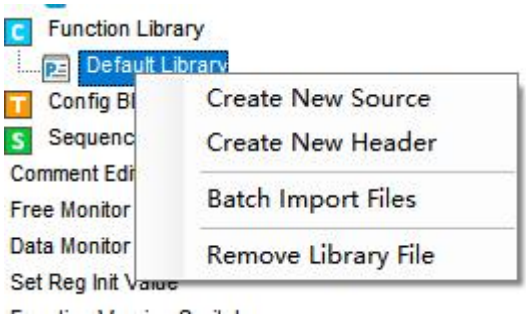


3) Calling FB in C

1. Define the corresponding variables among global variables.

Name	Type	Keep	Initial va...	Con...	Network status
POU11	POU_FB_LD_2	☐	--	☐	Not public
UP	INT	☐	--	☐	
DOWN	INT	☐	--	☐	
RESET	INT	☐	--	☐	
VALUE	INT	☐	--	☐	
varGlobal5	BOOL	☐	--	☐	Not public
varGlobal6	BOOL	☐	--	☐	Not public
varGlobal7	BOOL	☐	--	☐	Not public
varGlobal8	DINT	☐	--	☐	Not public

2. Create a new C source file.

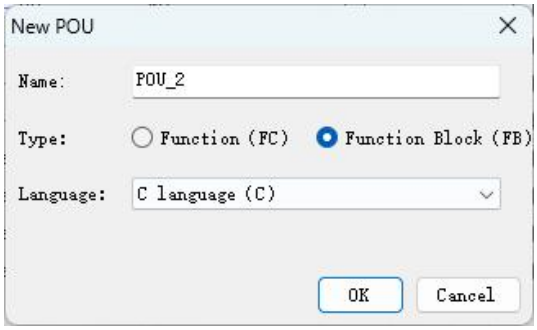


3. Call POU_FB_LD and map the input/output variables to global variables.

```
 9   /**
10    * @summary
11    * @param W
12    * @param B
13    */
14   void FUNC2(PINT16S W,PBIT B)
15   {
16       #define SysRegAddr_HD_D_HM_M
17       POU11.Up = varGlobal5;
18       POU11.Down = varGlobal6;
19       POU11.Reset = varGlobal7;
20
21       POU_FB_LD_BODY ( &POU11 );
22
23       varGlobal8 = POU11.Value;
24   }
```

4) Implementation of FB calls in C language

1. Create a new POU.

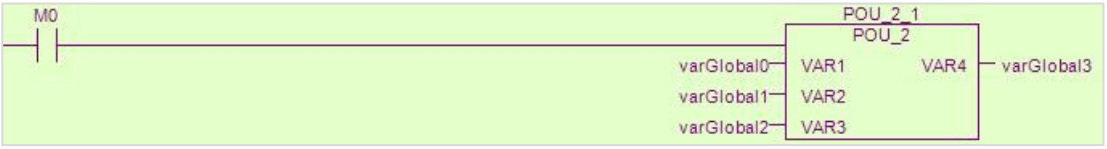


2. Define the variables and write the program to implement the use of local variables in FB by calling the POU_FB_C function block from section 6-6-3 in C language.

Classify	Name	type	Comment
VAR_INPUT	VAR3	BOOL	
VAR_INPUT	VAR2	BOOL	
VAR_INPUT	VAR1	BOOL	
VAR_OUTPUT	POU_FB_LD_2	POU_FB_LD	

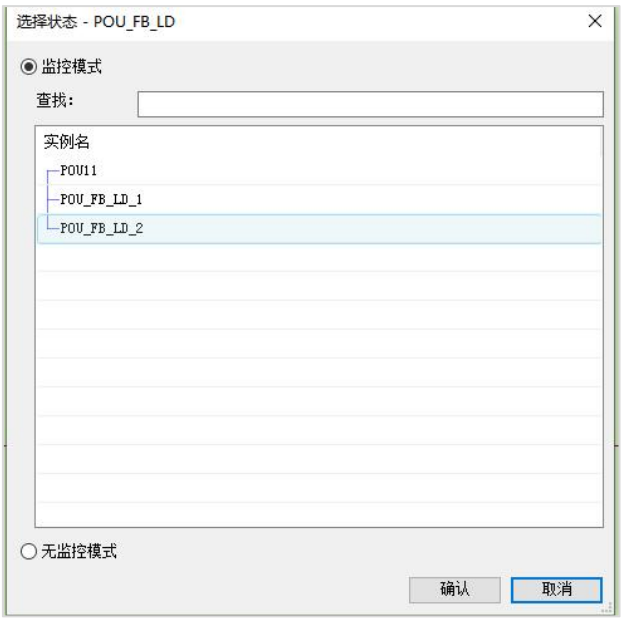
```
void POU_2_BODY(POU_2* self)
{
#define SysRegAddr_HD_D_HM_M
    self->POU_FB_LD_2.Up = self->VAR1;
    self->POU_FB_LD_2.Down = self->VAR2;
    self->POU_FB_LD_2.Reset = self->VAR3;

    POU_FB_LD_2.BODY ( &self->POU_FB_LD_2 );
    self->VAR4 = self->POU_FB_LD_2.Value;
}
```

3. Instantiate and call FB, then add input/output variables.

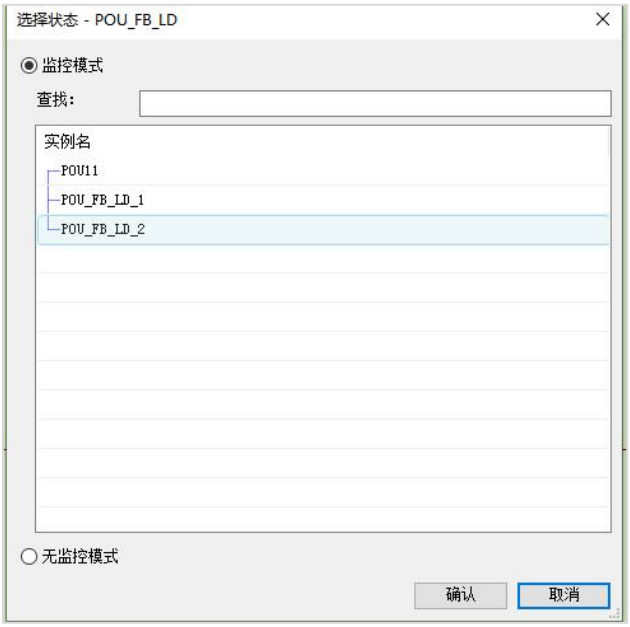


6-7-5. Monitoring Function Block

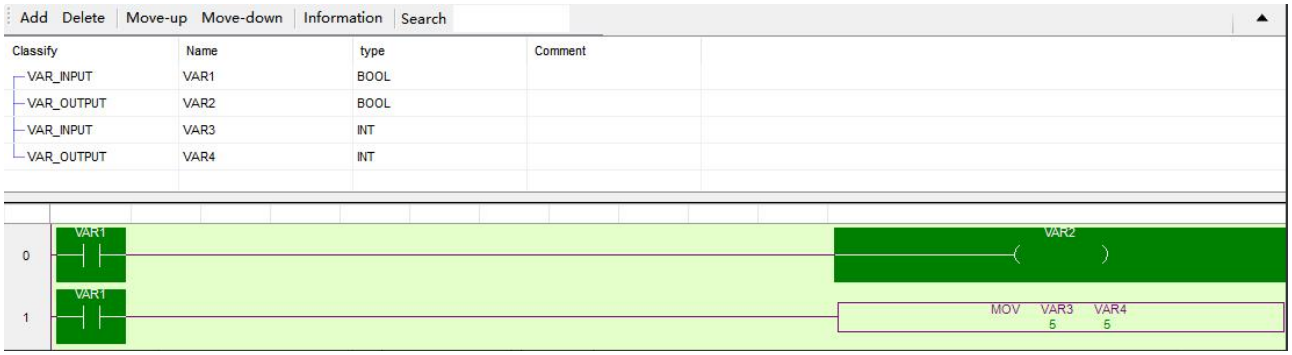
Method 1: When "Trapezoidal Chart Monitoring" is enabled, select the FB to monitor and right-click "Go to Implementation" to display the interface shown below:



Method 2: When "Trapezoidal Chart Monitoring" is enabled, click the FB in the project bar. If an instance of this FB exists, a pop-up window will appear as shown below.



Select the monitoring module, choose the instance name to monitor, and click OK to enter the monitoring interface.



Click the current monitoring instance or follow steps 1–2 above to switch between monitoring instances.

Non-monitored objects: FC, C language variables, VAR_TEMP, complex type pointers, or members pointed to by such pointers.

6-8. Functions

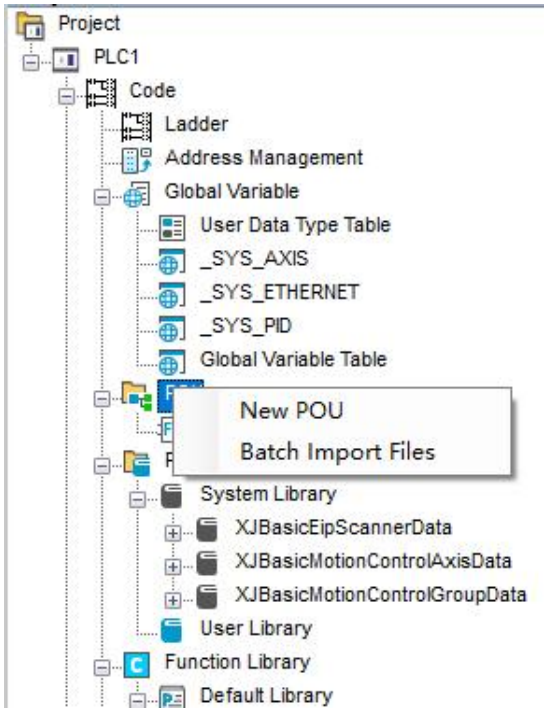
6-8-1. Introduction

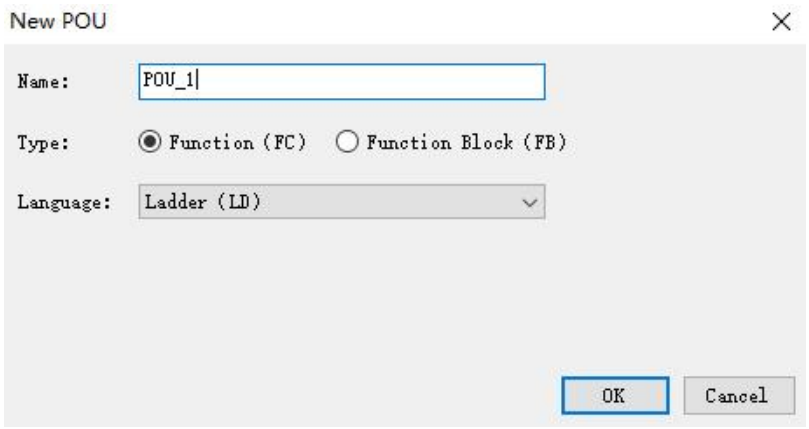
A function (FC) is a program unit that accepts parameters but contains no static variables. That is, when given identical input parameters, calling a function will always yield the same result. A key characteristic of functions is their inability to use internal variables for storing values, which distinguishes them entirely from function blocks.

The various mathematical functions we commonly use, such as sin(x) and sqrt(x), are typical examples of functions. Functions can be used by other functions, function blocks, or programs.

6-8-2. New Function

Right-click "POU" in the left Engineering tab, select "New POU", enter a name in the dialog box, choose Function (FC) as the type, and select Trapezoidal Diagram (LD) or C Language (C) as the language. Click OK to complete the function creation.

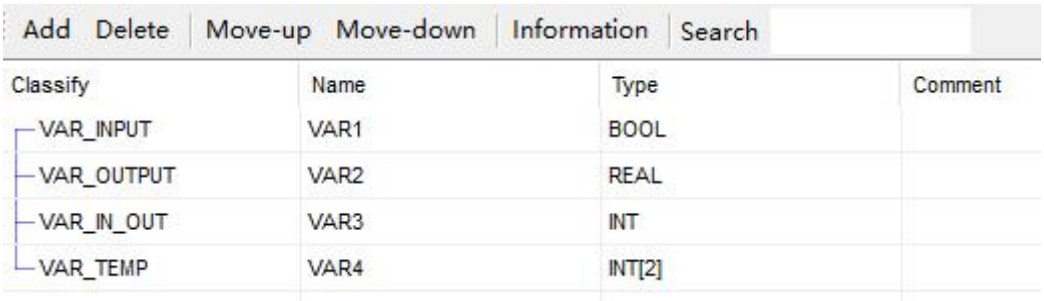




6-8-3. Programming Functions

The FC editing interface consists of two sections: the variable declaration area and the program editing area.

6-8-3-1. Variable Declaration Section



1) class

Properties of function variables.

Class	Category description	Description
VAR_INPUT	input variable	Its value is the parameter read from the function block
VAR_OUTPUT	output variable	Its value is written by the parameters in the function block
VAR_IN_OUT	Input/Output Variables	When called, the function block reads its value; after execution, it writes the value back to the parameter.
VAR_TEMP	temporary variable	Used to store temporary intermediate result variables, retaining only one cycle of local temporary data without consuming CPU memory space. Not required in C language and can be defined as needed within the code.

2) Name

Variable names must comply with the naming conventions (refer to Section 6-3-2: Naming Rules for Global Variables).

3) Type

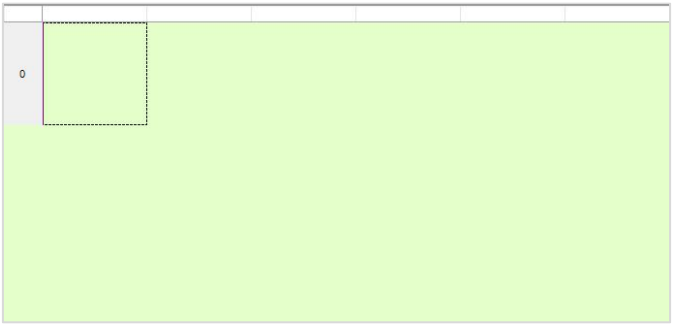
- Basic data types along with their corresponding pointer types and array types;
- User-defined data types along with their corresponding pointer and array types;
- Function block types, along with their corresponding pointer types and array types;
- The VAR/category type cannot use array types;
- The VAR_OUTPUT and VAR_IN_OUT types cannot use pointer types.

4) Notes

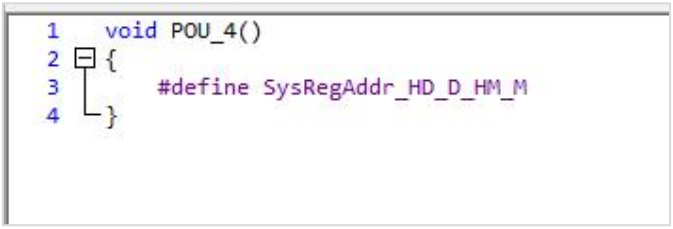
Provide a description for this variable.

6-8-3-2. Program Editing Area

1) FC Trap Diagram Editing Interface



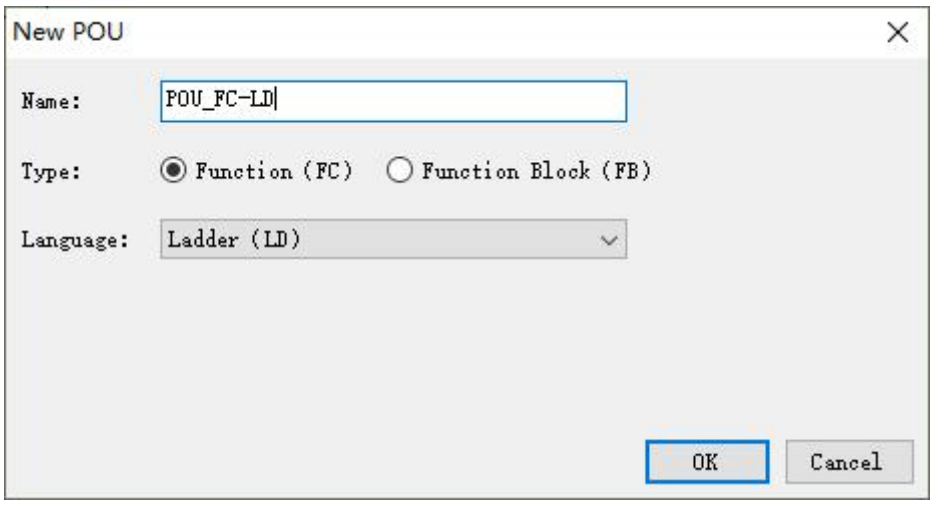
2) FC C Language Editing Interface



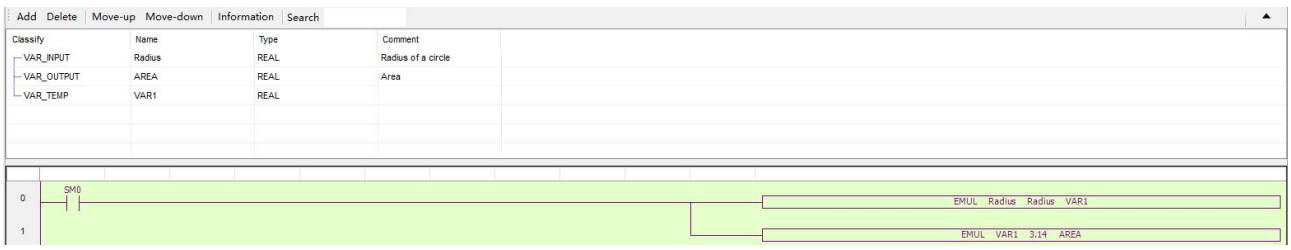
6-8-3-3. Program Example

Example 1: Implementing circle area calculation using trapezoidal diagram language, with radius as input and area as output.

1. Create a new POU, select FC as the type and Trapezoidal Diagram (LD) as the language, then name it POU.FC_LD.

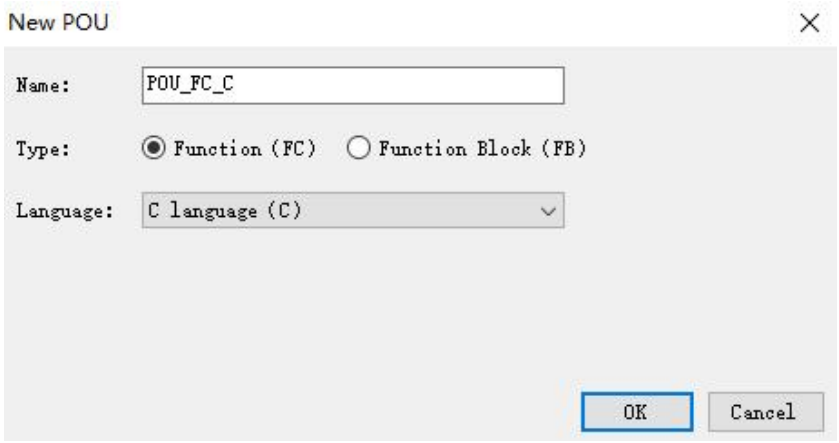


2. Declaration variables and program writing.

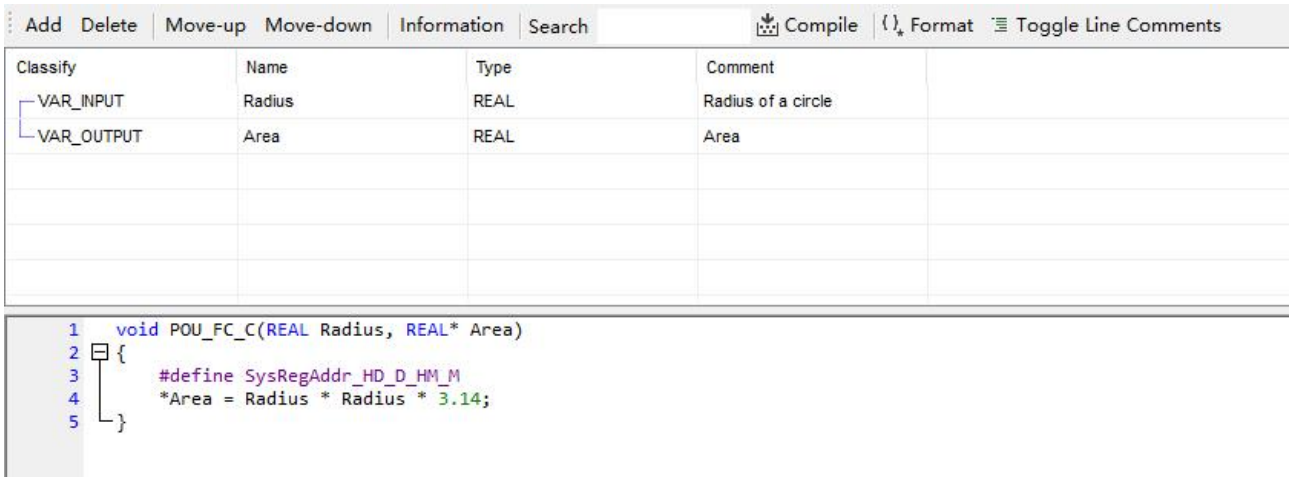


Example 2: Implement the same functionality as Example 1 in C.

1. Create a new POU with type FC and language C, then name it POU.FC_C.

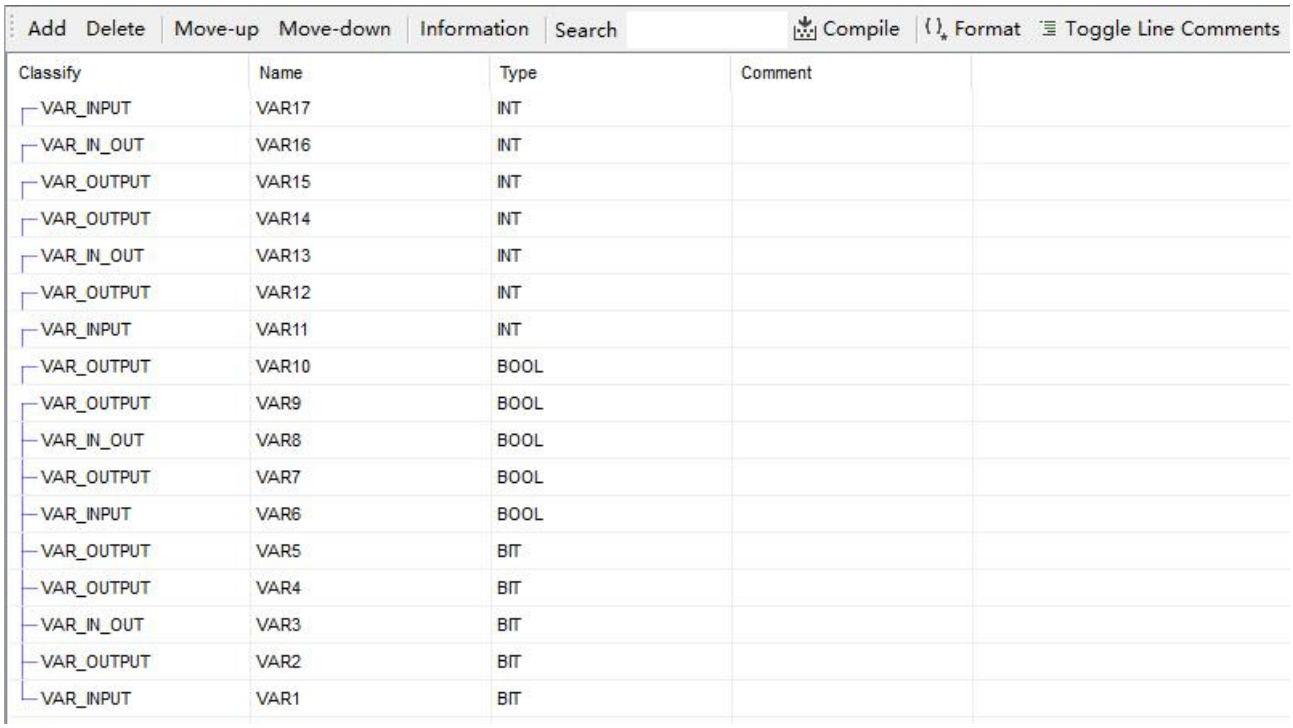


2. Declaration variables and program writing.



Example 3: Implementing variable assignment in C.

1. Create a new POU, select FC as the type and C as the language, then declare variables.

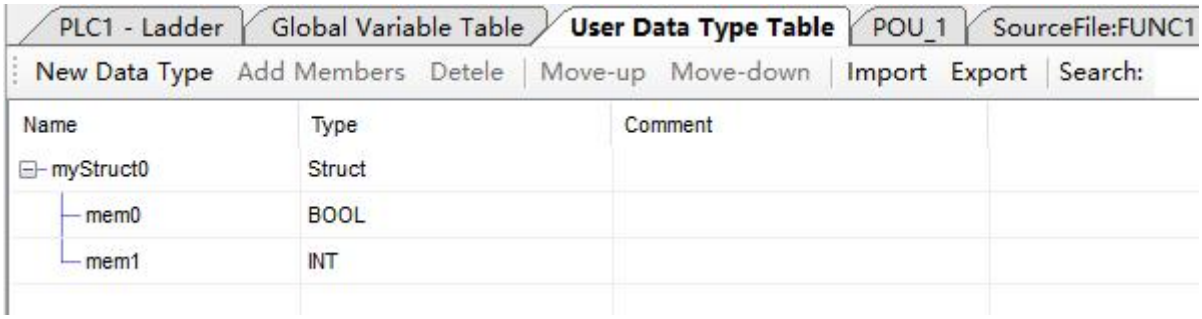


2. Write the program.

```
void POU_FC_C(INT VAR17, INT* VAR16, INT* VAR15, INT* VAR14, INT* VAR13, INT* VAR12, INT VAR11,
              BOOL* VAR10, BOOL* VAR9, BOOL* VAR8, BOOL* VAR7, BOOL VAR6, BIT* VAR5, BIT* VAR4,
              BIT* VAR3, BIT* VAR2, BIT VAR1)
{
    //VAROUTPL, VAR-IN_SUT class variable reference passing
    #define SysRegAddr_HD_D_HM_M
    /*******************BT Type Variables*******************/
    VAR1.Val=0;// Set VAR_INPUT BIT-type variable to OFF
    VAR2->Val=1;// Set VAR_OUTPUT BIT-type variable to ON
    VAR3->Val=1;// Set VAR_IN_OUT BIT-type variable to ON
    *VAR4=VAR1;// Assign value of VAR_INPUT BIT variable to VAR_OUTPUT BIT variable
    *VAR5=*VAR3;// Assign value of VAR_IN_OUT BIT variable to VAR_OUTPUT BIT variable

    /*******************BOOL Type Variables*******************/
    VAR6 =0;// Set VAR_INPUT BOOL-type variable to OFF
    *VAR7=1;// Set VAR_OUTPUT BOOL-type variable to ON
    *VAR8=1;// Set VAR_IN_OUT BOOL-type variable to ON
    *VAR9=VAR6;// Assign value of VAR_INPUT BOOL variable to VAR_OUTPUT BOOL variable
    *VAR10=*VAR8;// Assign value of VAR_IN_OUT BOOL variable to VAR_OUTPUT BOOL variable

    /*******************INT Type Variables*******************/
    VAR11=10;// Assign constant value to VAR_INPUT INT-type variable
    *VAR12=20;// Assign constant value to VAR_OUTPUT INT-type variable
    *VAR13=30;// Assign constant value to VAR_IN_OUT INT-type variable
    *VAR14=VAR11;// Assign value of VAR_INPUT INT variable to VAR_OUTPUT INT variable
    *VAR15=*VAR13;// Assign value of VAR_IN_OUT INT variable to VAR_OUTPUT INT variable
    *VAR16=VAR11;// Assign value of VAR_INPUT INT variable to VAR_IN_OUT INT variable
    *VAR17=40;// Assign constant value to VAR_INPUT INT pointer variable

}
```

Example 4: Implementing the call of member variables in a structure using FC in C.

Define the structure in the User Data Types Table as shown below:



1. Create a new POU, select FC as the type and C as the language, then declare variables.

   In FC, define the category variables VAR_INPUT, VAR_OUTPUT, and VAR_IN_OUT with type myStruct0, then access their member variables to achieve the following:

- When the member of VAR_INPUT with type BOOL is set to ON, the VAR_OUTPUT variable of type INT equals the sum of the VAR_INPUT variable (of type INT) and the VAR_IN_OUT variable (of type INT).
- When a member of the BOOL type in VAR_INPUT is set to OFF, assign the INT-type variable in VAR_OUTPUT to 0, and make VAR_IN_OUT equal to the INT-type variable in VAR_INPUT.

类别	名称	类型
VAR_INPUT	VAR1	myStruct0
VAR_OUTPUT	VAR2	myStruct0
VAR_IN_OUT	VAR3	myStruct0

2. Write the program.

```
void POU_3(myStruct0 VAR1, myStruct0* VAR2, myStruct0* VAR3)
{
    #define SysRegAddr_HD_D_HM_M
    if(VAR1.mem0==1)
    {
        VAR2->mem1 = VAR1.mem1 + VAR3->mem1;
    }
    else
    {
        VAR2->mem1 = 0;
        VAR3->mem1 = VAR1.mem1;
    }
}
```

Example 5: Implementing the call to array elements using FC in C.

1. Create a new POU, select FC as the type and C as the language, then declare variables.

   In FB, define the BIT-type variable for the VAR_INPUT category and the INT-array-type variables for the VAR_OUTPUT and VAR_IN_OUT categories to achieve the following:

- When the BIT-type variable in the VAR_INPUT category is set to ON, the element VAR2[0] in the INT[3]-type variable of the VAR_OUTPUT category equals the sum of VAR3[0] from the INT[3]-type variable of the VAR_IN_OUT category and the constant 10.
- When the BIT-type variable in VAR_INPUT is set to OFF, assign the value of VAR3[0] from the INT[3]-type variable in VAR_IN_OUT to element VAR2[1] in the INT[3]-type variable in VAR_OUTPUT.

类别	名称	类型
VAR_INPUT	VAR1	BIT
VAR_OUTPUT	VAR2	INT[3]
VAR_IN_OUT	VAR3	INT[3]

2. Write the program.

```
void POU_6(BIT VAR1, INT VAR2[3], INT VAR3[3])
{
    #define SysRegAddr_HD_D_HM_M
    if(VAR1.Val==1)
    {
        VAR2[0] = VAR3[0] + 10;
    }
    else
    {
        VAR2[1] = VAR3[0];
    }
}
```

Example 6: Use of a BIT-type variable in FC.

Define separate BIT-type variables for the INPUT, OUTPUT, and IN_OUT categories to achieve the following functions:

① When VAR1 is ON, set VAR2 to ON and VAR3 to OFF;

② When VAR1 is OFF, set VAR2 to OFF and VAR3 to ON.

1. Create a new POU, select FC as the type and C as the language, then declare variables.

类别	名称	类型	注释
VAR_INPUT	VAR1	BIT	
VAR_OUTPUT	VAR2	BIT	
VAR_IN_OUT	VAR3	BIT	

2. Write the program.

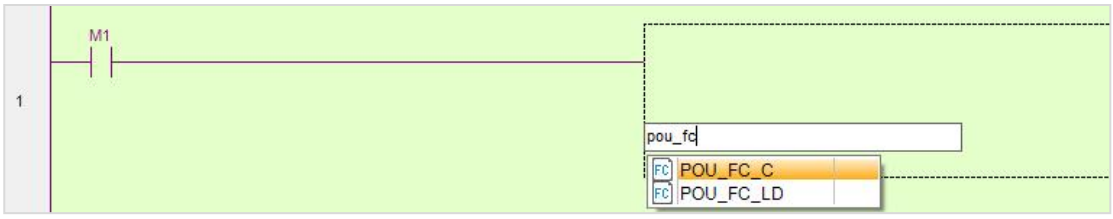
```
1   void FC_BIT(BIT VAR1, BIT* VAR2, BIT* VAR3)
2   {
3       #define SysRegAddr_HD_D_HM_M
4       if ( VAR1.Val == 1)
5       {
6           VAR2->Val = 1;
7           VAR3->Val = 0;
8       }
9       else
10      {
11          VAR2->Val = 0;
12          VAR3->Val = 1;
13      }
14  }
```

6-8-4. Calling Functions

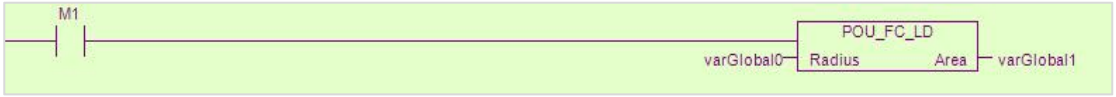
Once the FC program is complete, you can call it directly.

1) Trapezoidal diagram calls FC

1. Directly enter the FC name, call the POU.FC_LD function block from Example 6-7-3, and press Enter to confirm.

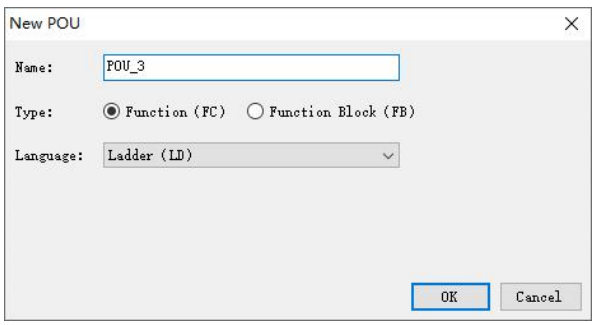


2. Add input and output variables.

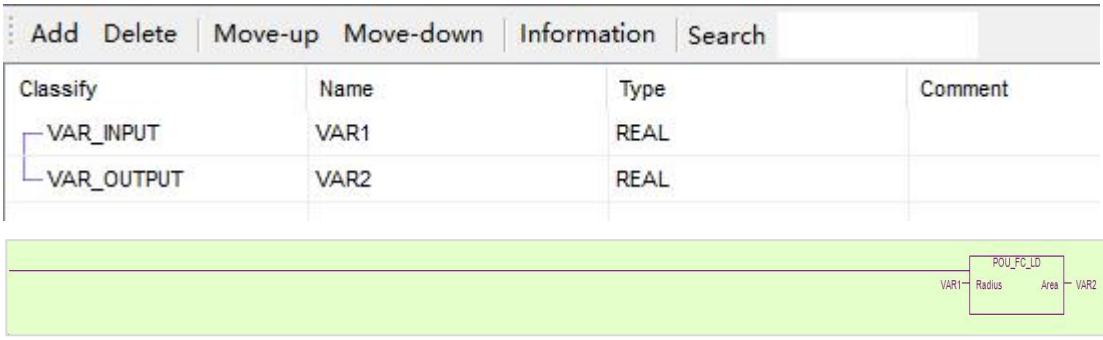


2) The trapezoidal diagram implements FC calling FC

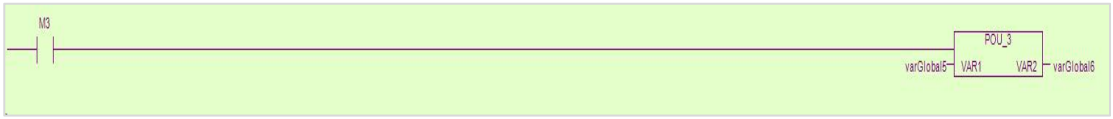
1. Create a new POU with Type Selection Function (FC), Language Selection Trapezoid Diagram (LD), and name POU_3.



2. Declaration variables: In POU_3 (FC), call the POU.FC_LD function from Example 6-7-3 to map input/output variables to the local variables declared in POU_3.

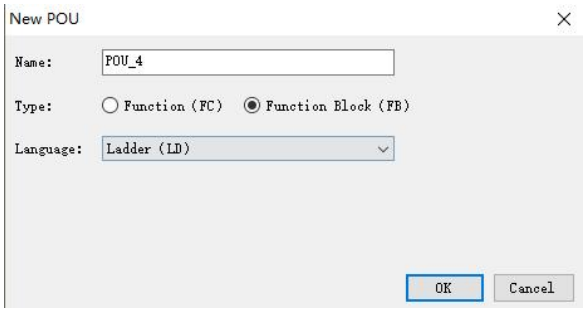


3. The main trapezoidal diagram calls POU_3 (FC) and adds input/output variables.

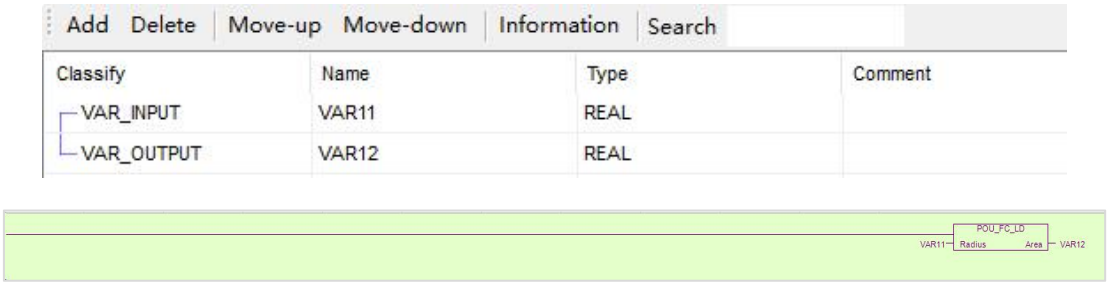


3) Implementing FB calling FC using a trap diagram

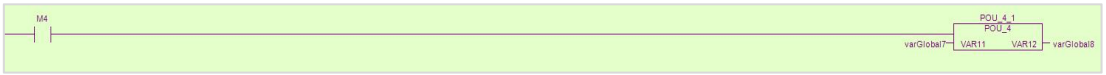
1. Create a new POU with Type selected as Function (FB), Language selected as Trapezoidal Diagram (LD), and name POU_4.



2. Declaration variables: In POU_4 (FB), call the POU.FC_LD function from Example 1 to map input/output variables to the local variables declared in POU_4.



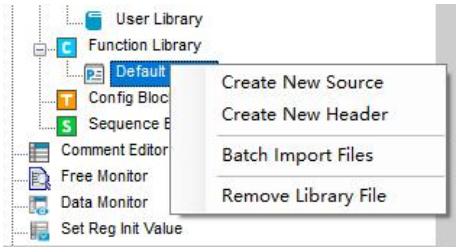
3. The main trapezoidal diagram calls POU_4 (FB) and adds input/output variables.



4) Calling FC in C

1. Define variables in global variables that match the types specified in FC.

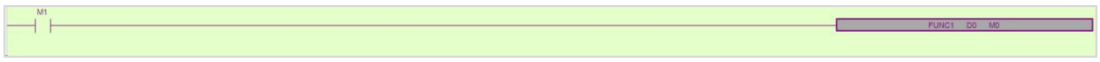
2. New C language source file



3. Call POU.FC_LD and map the input/output variables to global variables.

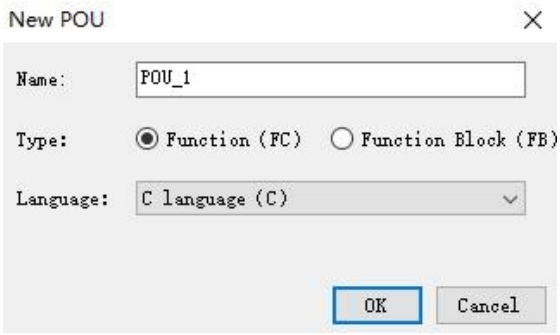
```
10    * @summary
11    * @param W
12    * @param B
13    */
14   void FUNC1 ( PINT16S W, PBIT B )
15   {
16   #define SysRegAddr_HD_D_HM_M
17       POU_FC_LD ( varGlobal3, &varGlobal4 );
18       /* Call POU_FC_LD and map input and output variables to global variables
19
20       Variables of the VAR_OUTPUT category inside the FC are passed by reference.
21       When mapped to global variables, a valid physical memory address must be available.
22       Therefore, when mapping a VAR_OUTPUT variable inside the FC to a non-pointer global variable, the address-of operator & must be added.
23
24       If the target global variable is a pointer type and this pointer is not subsequently mapped to a valid memory address,
25       wild pointers will occur during C code execution, causing PLC faults and abnormal operation. */
26   }
27
```

4. Call this C language source file in the trap diagram.

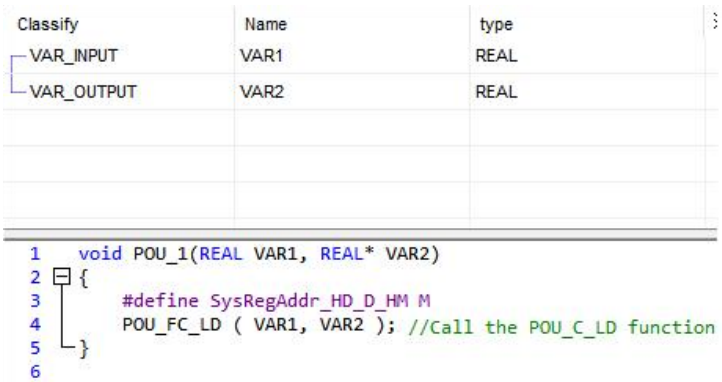


5) Implementing FC calls in C language

1. Create a new POU with the Function Selection (FC) type, using C language (C), and name it POU_1.



2. Declaration variable: Call the POU.FC_LD function from Example 6-6-3 in POU_1 (FC).

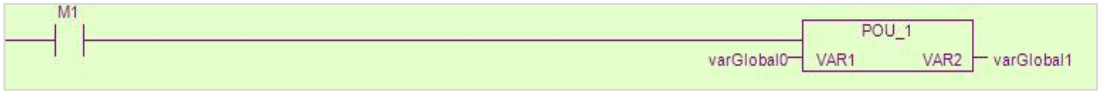


Classify	Name	type
VAR_INPUT	VAR1	REAL
VAR_OUTPUT	VAR2	REAL

```
1   void POU_1(REAL VAR1, REAL* VAR2)
2   {
3       #define SysRegAddr_HD_D_HM M
4       POU_FC_LD ( VAR1, VAR2 ); //Call the POU_C_LD function
5   }
6
```

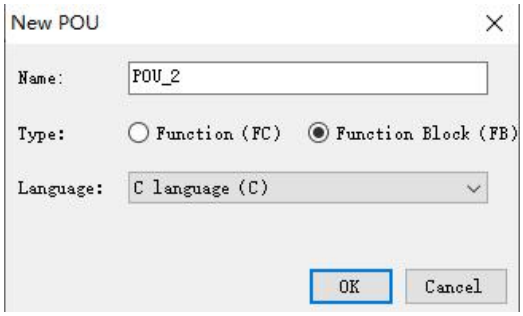
Parameter passing must strictly maintain type consistency.

3. Call POU_1 (FC) and add input/output variables.



6) Implementation of FB calling FC in C language

1. Create a new POU type selection function (FB) using C language, named POU_2.



2. Declaration variable: Call the POU.FC_LD function from Example 6-6-3 in POU_2 (FB).

Classify	Name	type	Comment
VAR_INPUT	VAR1	REAL	
VAR_OUTPUT	VAR2	REAL	
VAR	VAR3	REAL	

```
void POU_2_BODY(POU_2* self)
{
#define SysRegAddr_HD_D_HM_M
    POU_FC_LD (  self->VAR1, &self->VAR2 );
    /*************Description*************/
    /* Local variables inside an FB accessed via C language must be prefixed with self->.
    For example, to access variable VAR1 within the FB, write self->VAR1.

    Variables of the VAR_OUTPUT category in an FC are passed by reference,
    while VAR_OUTPUT variables inside an FB are not passed by reference.
    When mapping a VAR_OUTPUT variable of an FC to a VAR_OUTPUT variable of an FB, the address-of operator & must be added.

    VAR_IN_OUT variables in both FC and FB are passed by reference.
    When mapping a VAR_IN_OUT variable of an FC to a VAR_IN_OUT variable of an FB, the address-of operator & is not required.

    ##### Assume the original FC contains a VAR_IN_OUT variable, and the FB has a VAR_IN_OUT variable A1.
    The calling syntax is as follows:
    POU_FC_LD(self->VAR1, &self->VAR2, self->A1);
}  When calling this FB block, the pointer-type variable A1 shall be mapped to an actual argument.*/
```

Parameter passing must strictly maintain type consistency.

3. Call POU_2 (FB) and add input/output variables.

6-8-5. Execute Function

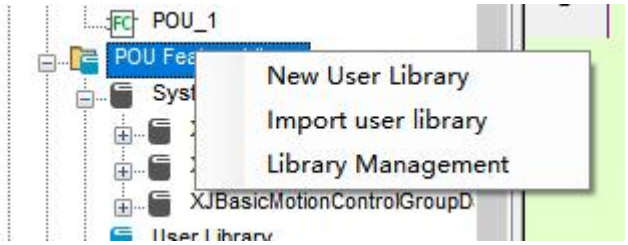
Function execution operations are similar to those of function blocks; refer to the section "6-6-5. Running Function Blocks".

6-9. POU System Library

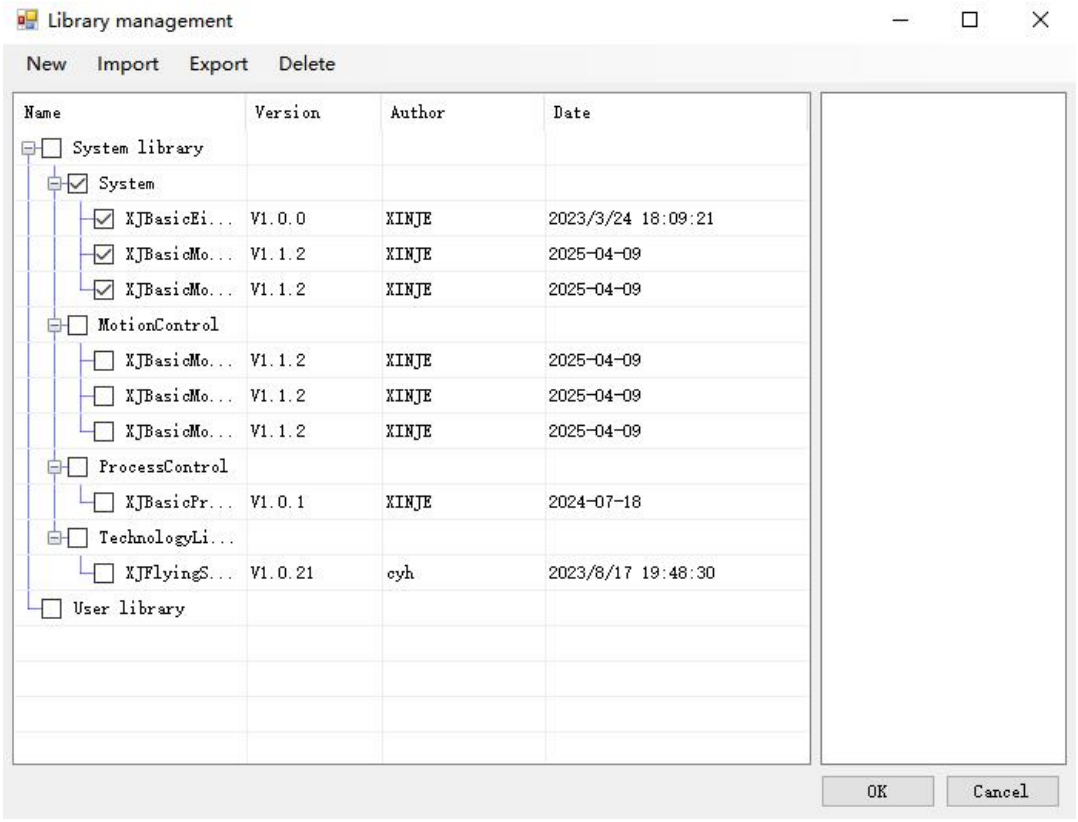
6-9-1. System Library

This repository stores relevant libraries for system operation control commands, temperature PID commands, and other related functions. When using these commands, the following steps are required.

1. Right-click "POU Function Library" -> "Library Management";

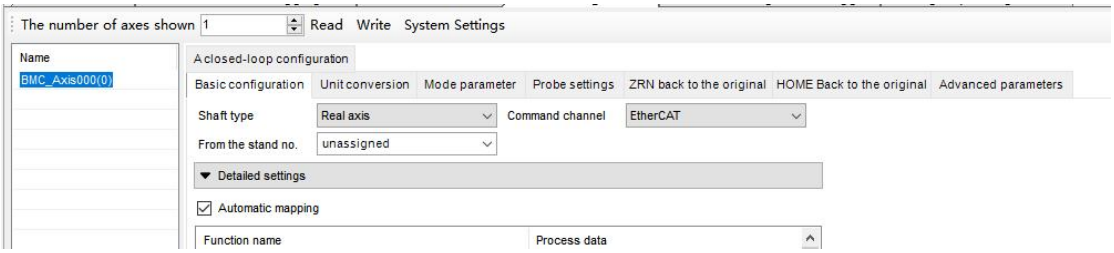


2. Select the required library, click OK to add it.

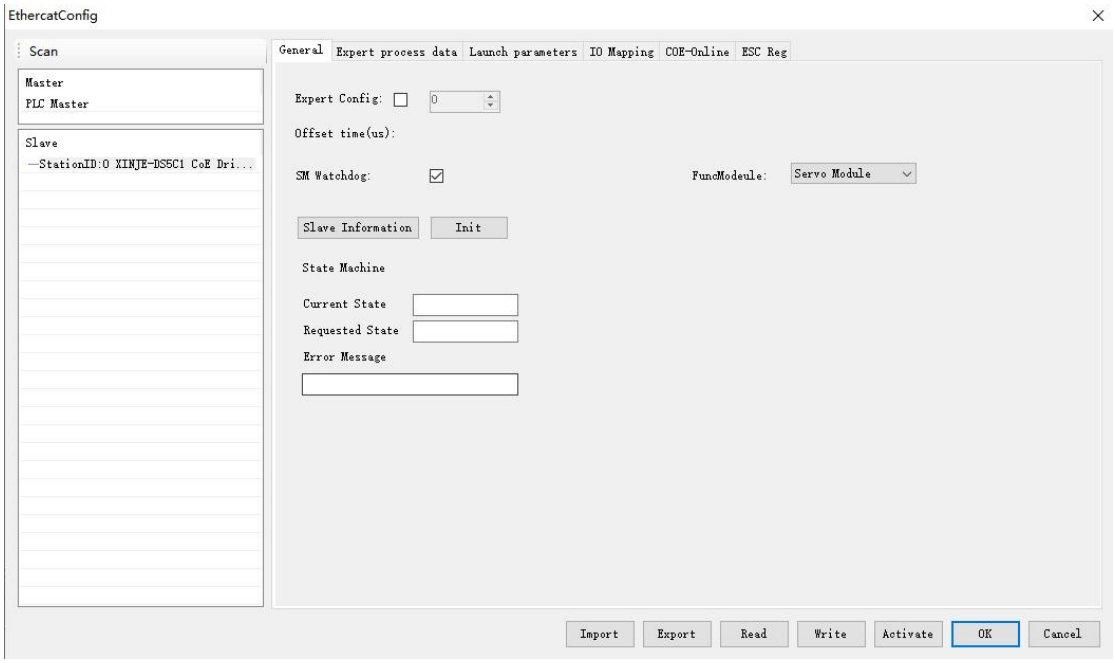


Example: Call the enable instruction.

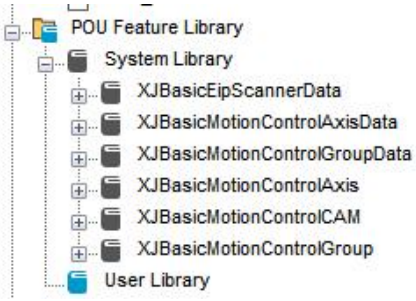
1、 Add an axis to the configuration, set relevant parameters, save the configuration, and power on again.



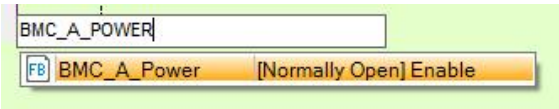
2. In the "Ethercat Parameter Configuration" interface, scan the bus axis, modify the relevant parameters, then select "Configure Write" → "Activate".



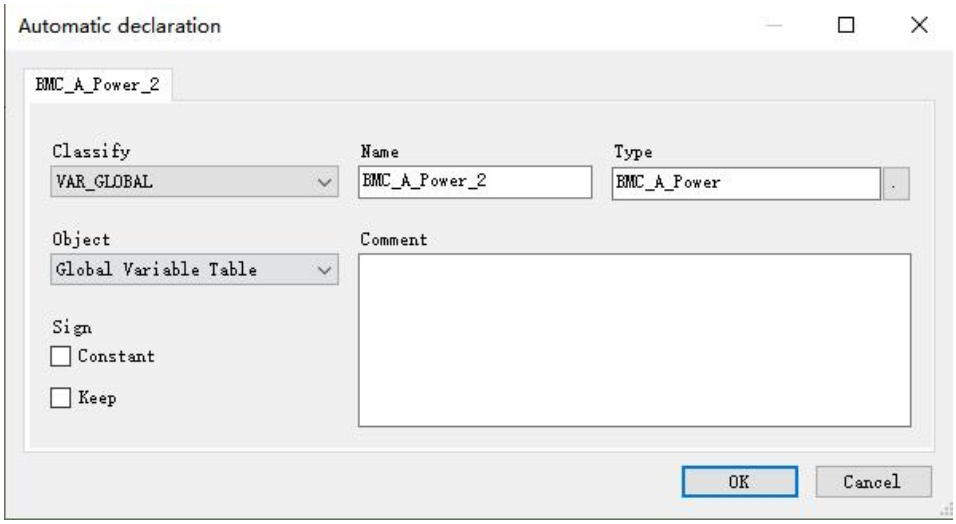
3. Add the system library;



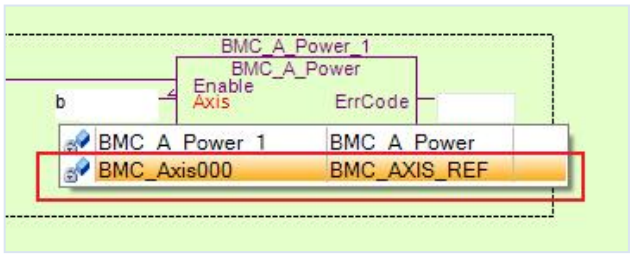
4. Enter the enable command "BMC_A_power" in the main ladder diagram and press Enter to confirm;



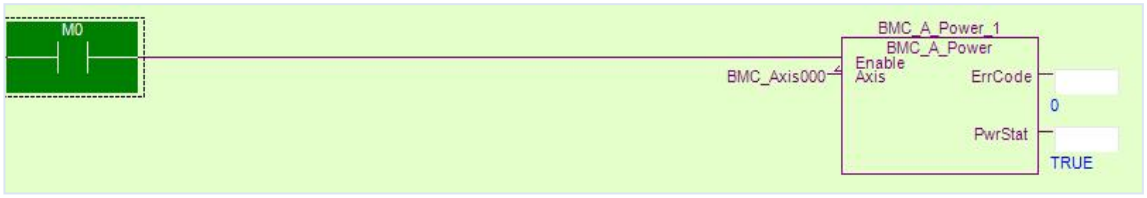
5. A pop-up window for declaring variables will appear automatically; click "OK" based on the actual modifications.



6. Add "BMC_Axis000" to the "Axis" pin;



7. Download the program and configuration, run it, and complete axis enabling.

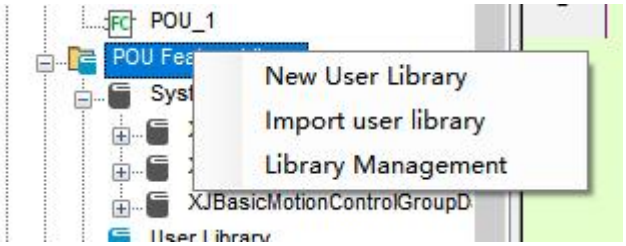


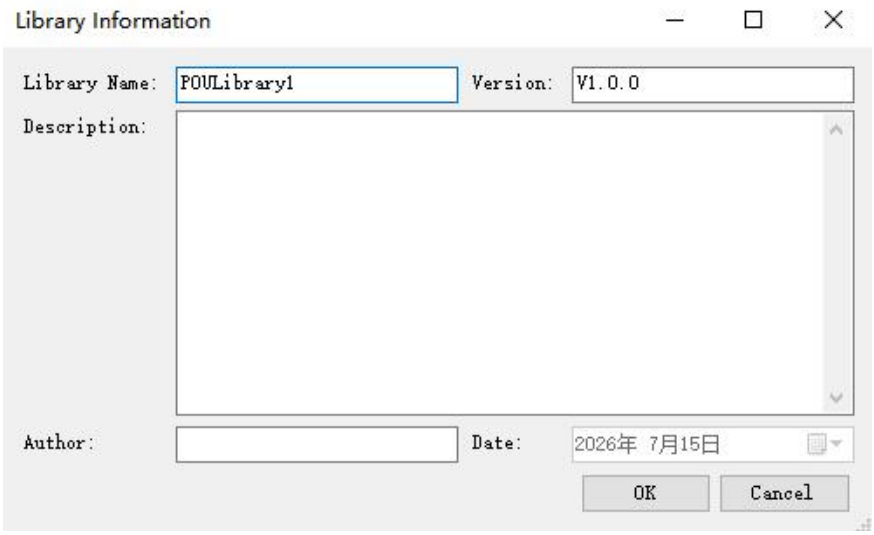
- For POU operation control instructions and related details, please refer to the User Manual for XDH/XLH/XG2 Series Programmable Controllers [Advanced Motion Control Section].
- For POU temperature PID instructions, refer to the User Manual for XD/XL Series Programmable Controllers [Basic Instructions Section].

6-9-2. User Database

6-9-2-1. Create User Database

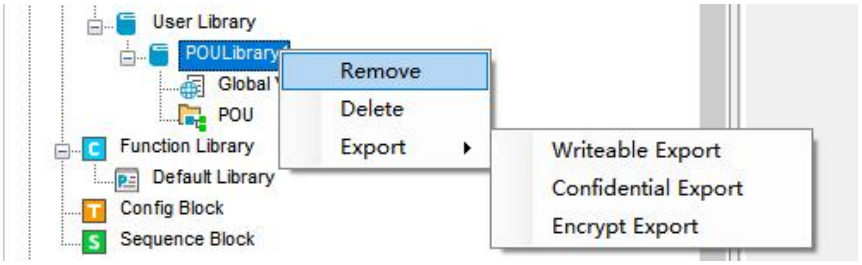
In the Engineering toolbar on the left, select POU Function Library and right-click to choose New User Library. You can edit the user library's name, version, description, author, and other details in the pop-up interface, as shown below:





6-9-2-2. Export User Database

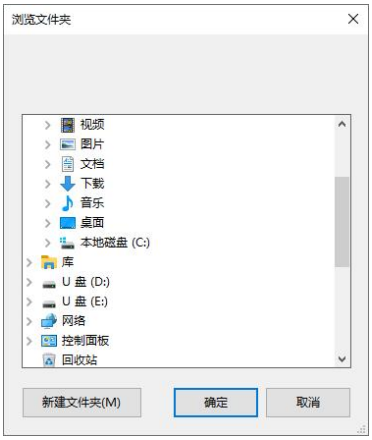
Right-click the library name to select "Remove", "Delete", or "Export" as shown below:



Project	Function
Remove	If you do not use this library, you can reactivate it in Library Management.
Delete	Do not use this library and delete it from library management

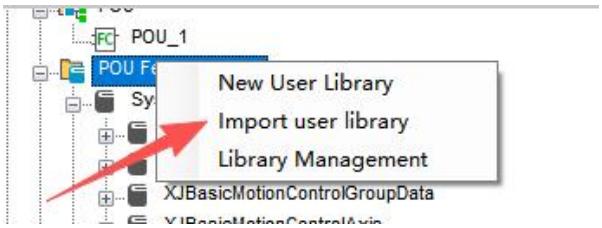
Project	Function
Leading-Out	After selecting a different export mode, choose the export folder to complete the export
Writeable Export	Content is editable
Confidential Export	The exported library is protected and cannot view or edit POU code. You can check data types, global variables, and function/function block input/output parameters through content information.
Encrypt Export	The exported library requires a password. After encryption, you cannot view or edit POU codes. Enter the correct password to decrypt and edit the POU codes.

After selecting the export path, click Confirm to export.

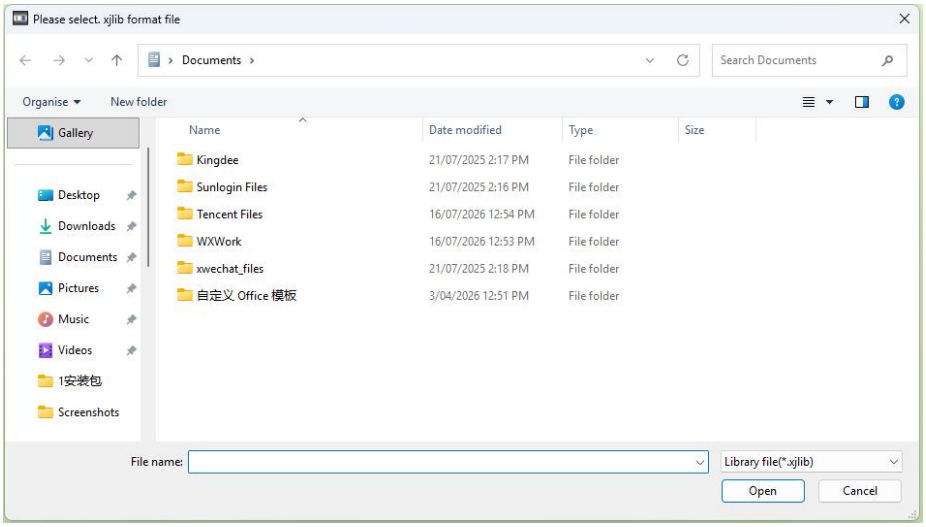


6-9-2-3. Import User Database

Right-click the "POU Function Library" and select "Import User Library".

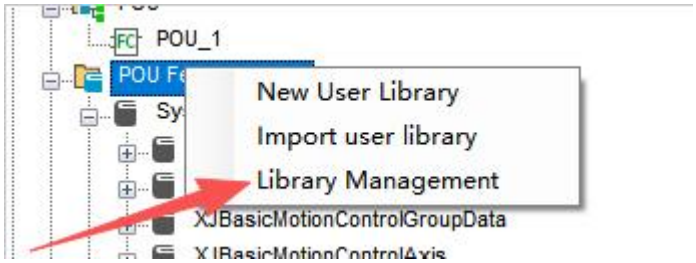


Select a file to import, click Open, and complete the import.

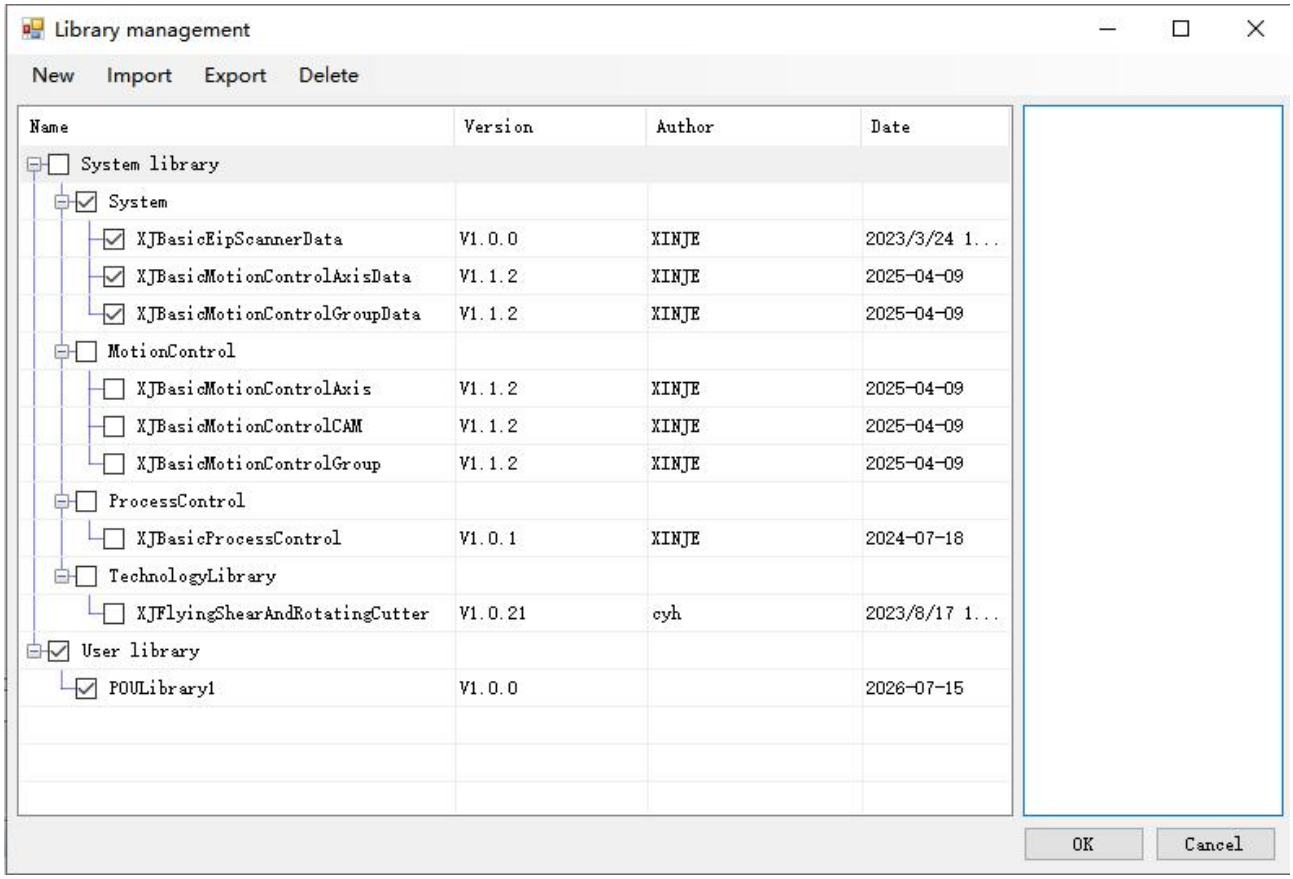


6-9-2-4. Warehouse Management

Right-click the "POU Function Library" and select "Library Management".

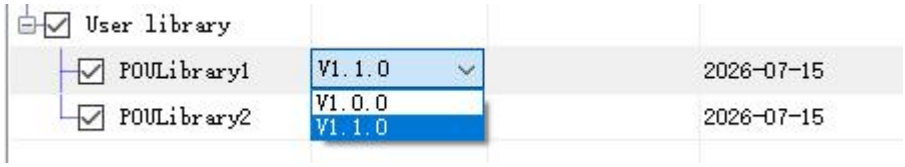


In library management, you can perform operations such as creating, importing, exporting, and deleting libraries. You can also enable or disable a library by selecting it.



Before importing or exporting a library, uncheck the system library option.

Create a library with the same name but different versions. In Library Management, double-click the version to select the desired version.



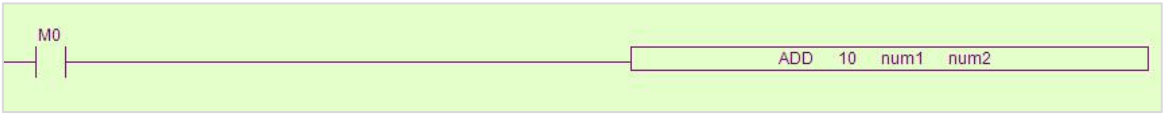
6-10. Common Questions and Precautions for POU

1) Basic instructions that do not support variable usage

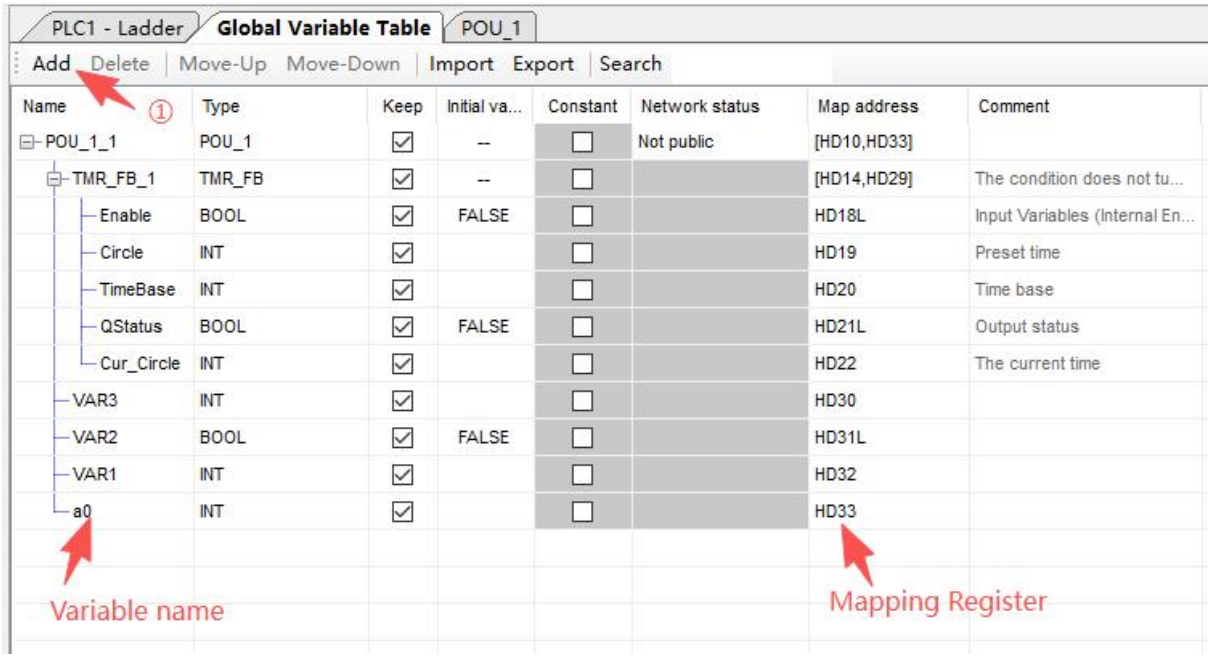
Type of instruction	Command Name
data movement instruction	BMOV、PMOV、FMOV、DFMOV
Encoding/Decoding Instruction	DECO、ENCO、ENCOL
Data Shift Instruction	SFTL、SFTR、WSFL、WSFR
Data Processing Instruction	MEAN、DMEAN
Data Conversion Instruction	ASCI、HEX、BDWTD、BECON
FlashROM Write Instruction	FWRT、DFWRT、QFWRT
Batch Position Reset Instruction	ZRST、MSET
Data Comparison Instruction	CMP、ZCP、DCMP、DZCP、ECMP、EDCMP、EZCP、QCMP
Clock Instruction	TRD、TWR、TADD、TSUB、HTOS、STOH、TCMP、DACMP
Division Instruction	DIV、DDIV、QDIV

2) Mixed use of variables and registers is not supported in the current instructions.

3) When using variables and constants in instructions, constants should only contain numerical values.



4) For POU arguments, only variables can be used; registers cannot be employed. If mapping to fixed registers is required, it should be done using global variables.

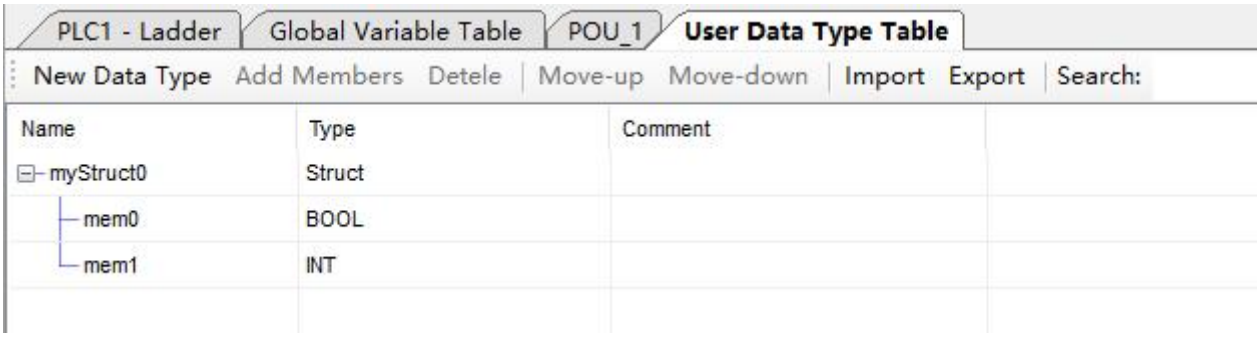


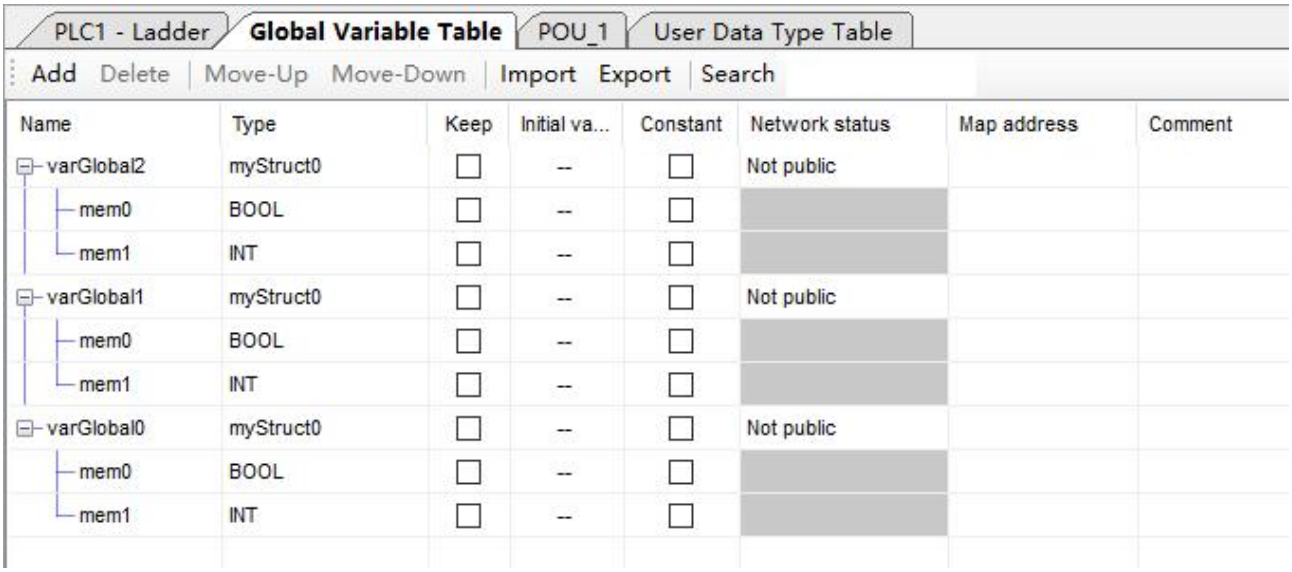
5) The trapezoidal diagram program calls methods of structures and array members

(1) Accessing members within a structure

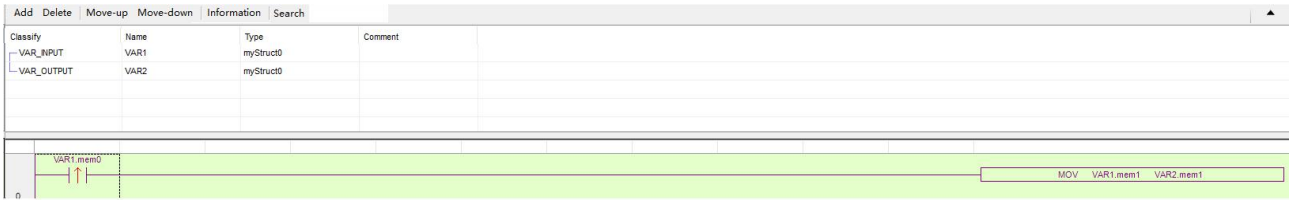
① The trapezoidal diagram calls members within a structure.

First, define the required structure in the User System Type Table and instantiate it as a global variable.





② In FB/FC, the trapezoidal diagram calls members of a structure variable.

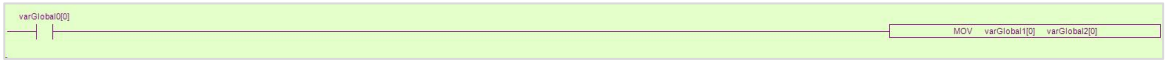


(2) Call elements in an array

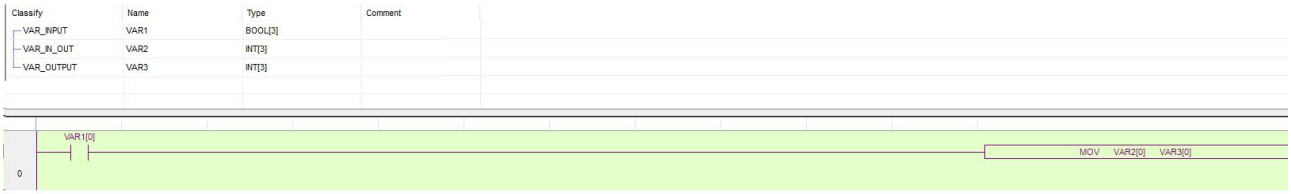
① The trapezoidal function calls elements in the array

Define BIT/INT array variables in the global variable table.

Call the element in the corresponding array in the ladder diagram.



② Call elements in an array within FB/FC



The VAR_INPUT categorical variable in FC cannot use an array type.

6) Usage restrictions for edge signals in POU

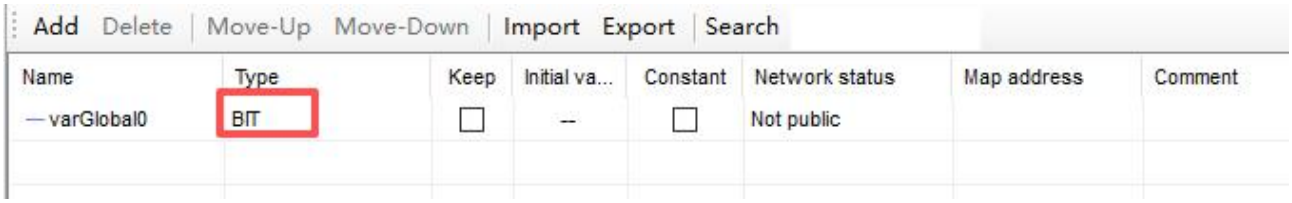
- Edge + BIT Type

Range of application	Supported Variable Categories	Supported Variable Types
Main Trapezoid Diagram	VAR_GLOBAL	BIT Type Variable, Members of the BIT Array
Function-Trapezoidal Graph Language	VAR_GLOBAL	BIT Type Variable, Members of a BIT Array
Function Block – Trapezoidal Diagram Language	VAR_GLOBAL	BIT Type Variable, Members of the BIT Array

- Edge + BOOL Type

Range of application	Supported Variable Categories	Supported Variable Types
Main Trapezoid Diagram	VAR_GLOBAL	BOOL type variables, BOOL pointer type variables, members of a BOOL array
Function-Trapezoidal Graph Language	VAR_GLOBAL	BOOL type variables, BOOL pointer type variables, members of a BOOL array
Function Block – Trapezoidal Diagram Language	VAR_GLOBAL 、 VAR 、 VAR_TEMP 、 VAR_INPUT 、 VAR_OUTPUT、VAR_INOUT	BOOL type variables, BOOL pointer type variables, members of a BOOL array

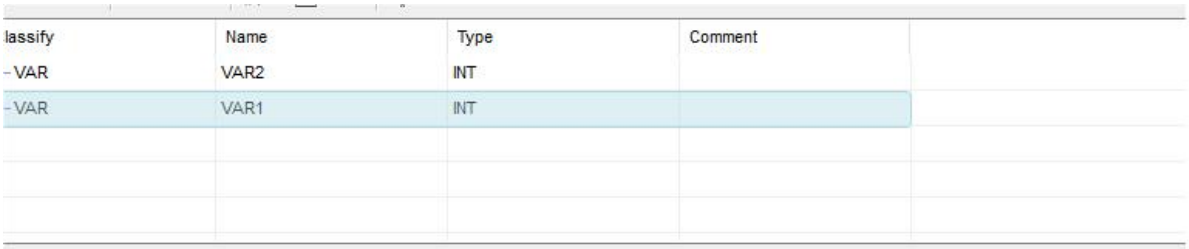
7) When used in a C function, you can directly Operate on BOOL variables; however, global variables of the BIT type cannot be used directly. If needed, you may write it as Val.




```
7   ************************************************************************
8
9   /**
10   * @summary
11   * @param W
12   * @param B
13   */
14  void FUNC1 ( PINT16S W, PBIT B )
15  {
16  #define SysRegAddr_HD_D_HM_M
17      varGlobal0.Val = M[1];
18  }
```

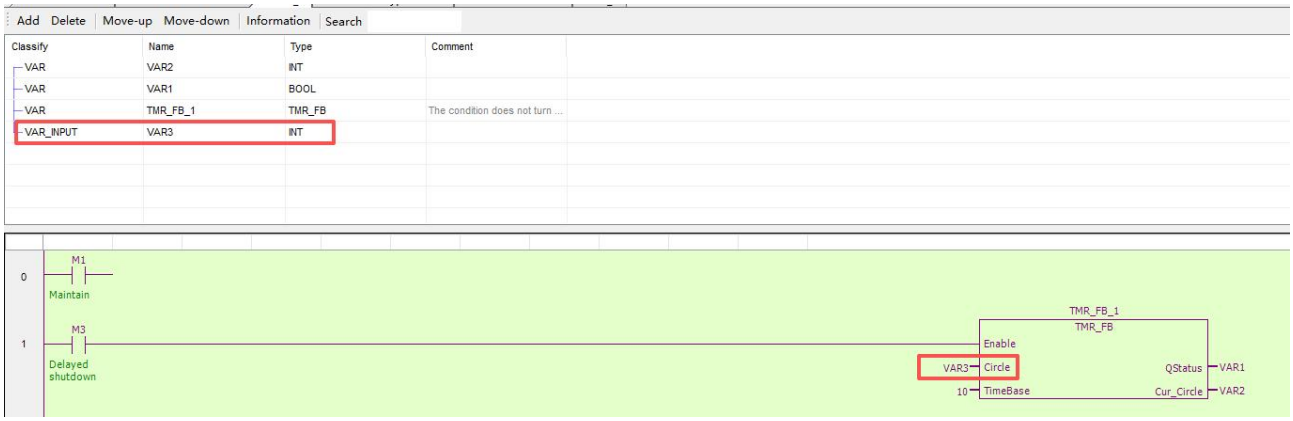
8) Simplify the self-> notation in FB

① First, write `define var1 self->var1` in FB; you can then directly use VAR1 there (this syntax requires no input assistant).




```
1   void POU_2_BODY(POU_2* self)
2   {
3       #define SysRegAddr_HD_D_HM_M
4       #define var1 self->VAR1//If var1 is defined in the macro definition, it can be directly used in the program.
5                               The drawback of this usage is that there is no input assistant
6       var1 = 1;
7
8   }
```

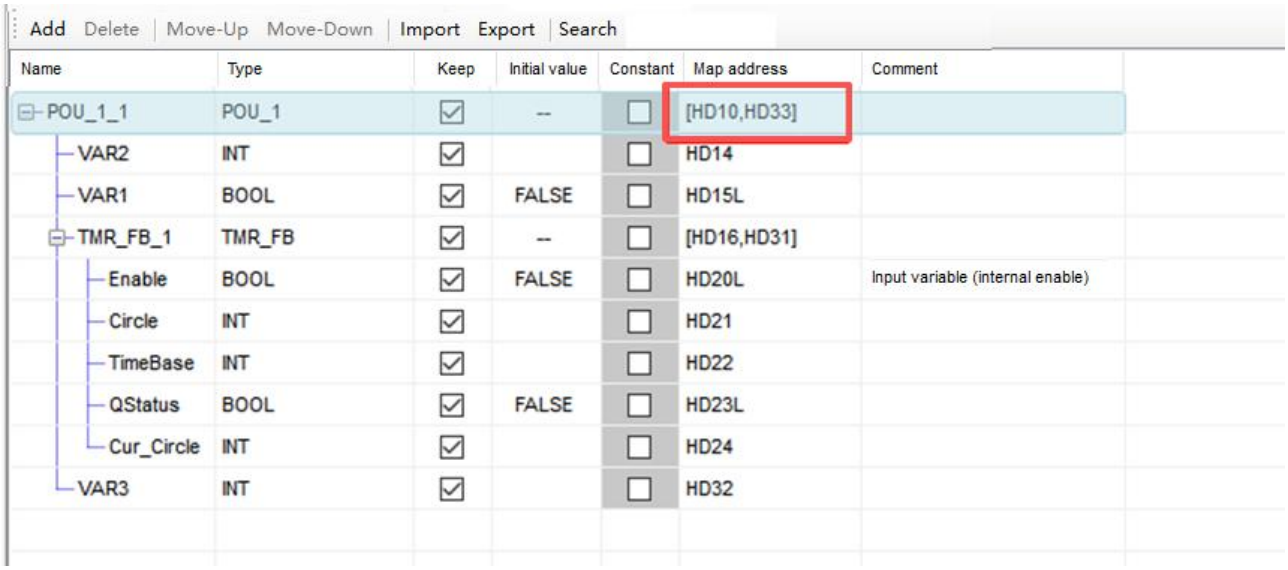
② Use the variables in pou directly



9) Address mapping of the structure in the global variable table

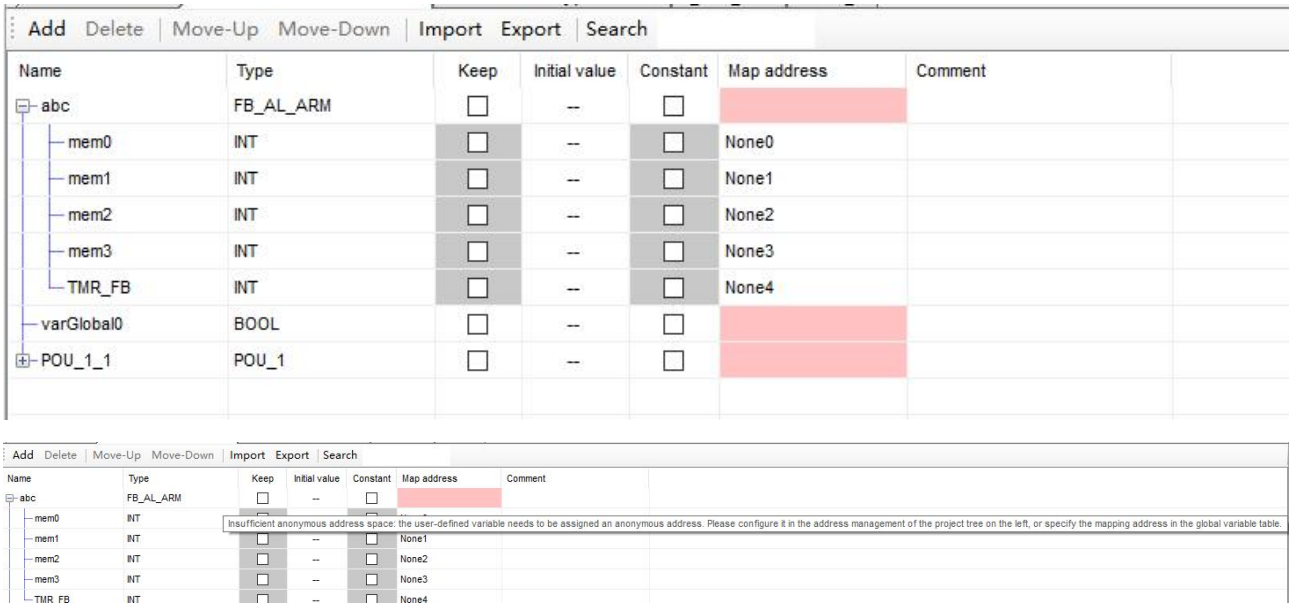
For a single variable, map directly to the specified address. For a structure, map all members in the address following the structure name; you cannot map just one member. Structures are stored

sequentially in memory as data items.



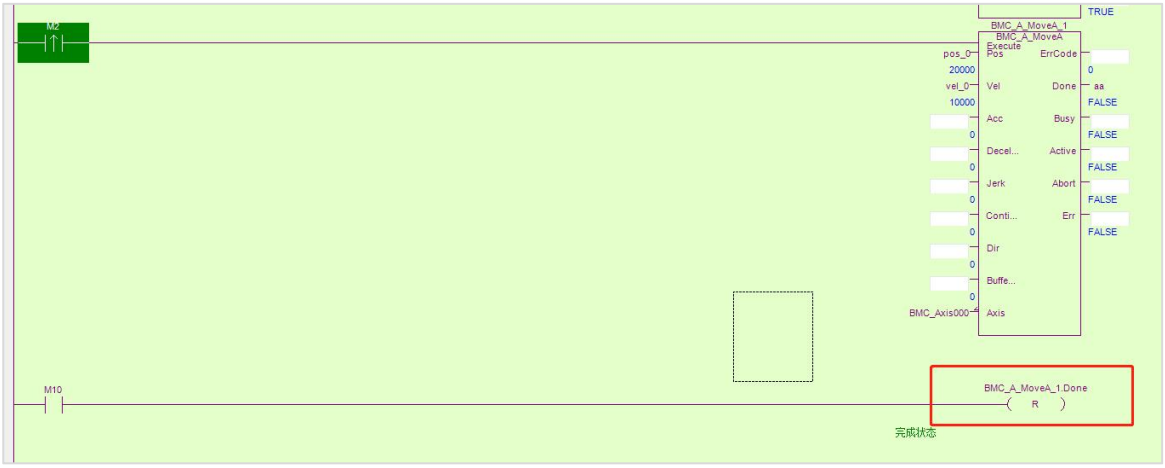
10) What does "the address of None" mean?

Mapped to an invalid address. Re-map within the red box or configure an anonymous address. Downloading will fail if not configured.



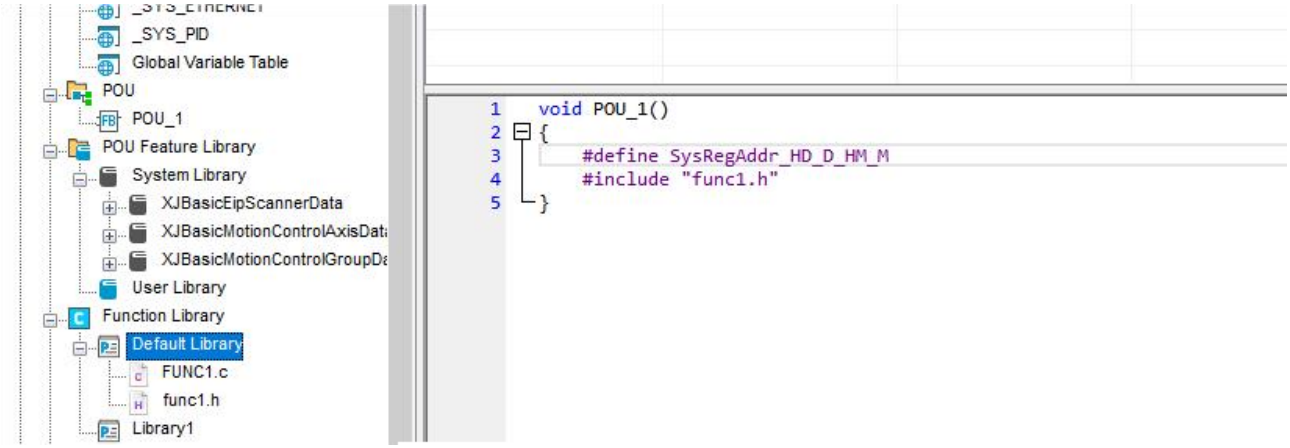
11) To modify the output state of a packaged FB block via commands, you must reset the corresponding variable within the FB block; directly resetting the actual parameter associated with that variable will cause the output state to revert to its original state once the activation condition is removed.

For example: The completion status in the reset instruction must reset to BMC_A_MOVE_1_DONE; you cannot directly reset the mapped variable (i.e., aa), as doing so would cause aa to revert to TRUE after M10 turns OFF.



12) How to call a header file in POU when programming in C?

Similar to the method for calling header files in C, see the figure below for details.



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