HMITOOL
Configuration Software
Application Manual

SHENZHEN INVT ELECTRIC CO., LTD.

Preface

Overview

VS-Q series HMI is a new generation of economical HMI products, which supports various communication modes, has powerful configuration functions, and can realize multi-level communication through RS485, RS422, RS232 and Ethernet interfaces.

HMITOOL is a kind of configuration software used to quickly construct and produce embedded computer monitoring system. In the collection of many years of experience in the development and application of configuration software, based on the use of advanced computer software technology, window as a unit, the construction of the user to run the system's graphical interface, through the acquisition of on-site data processing, animation display, alarm processing, process control and report output, and other ways to provide users with solutions to solve practical engineering problems, to meet the user for a variety of automation equipment for a variety of needs, has a wide range of applications in the field of automation.

This manual introduces how to operate the VS series screen configuration software HMITOOL. Please read this manual carefully to ensure proper use.

Targeted readers

This manual applies to the following readers:

- Electrical engineers
- Software engineers
- Application engineers

About documentation obtaining

The users using this product for the first time should read this manual carefully first. If you have any doubts about some specific functions and performance, feel free to consult our technical support personnel for assistance, which is beneficial for the correct use of this product.

This manual is not delivered along with the product. To obtain an electronic version of the PDF file, you can:

Log in to the official website of INVT at www.invt.com to download PDF files.

No.	Change description	Version	Release date
1	First release.	V1.0	Jan 2025

Contents

1 Product overview

This chapter summarizes the hardware part of VS-Q Series HMI, introduces the hardware dimension of products, structure, hardware parameters and wiring, including the models of VS-043QE, VS-043QS, VS-070QE, VS-070QS, VS-070QS-G, VS-102QS, VS-102QS-G, VS-156QS, VS070QS VS-1618MDM1. Users can install the operation according to the relevant dimensions of the product. For details on the hardware performance part of the product, refer to the specific reference values.

1.1 Product introduction

INVT VS-Q series HMI is a high-quality human-machine interface product. The entire HMI integrates the CPU unit, input and output unit, display screen, memory and other module units. It can be widely used in control systems in all walks of life. The optimized design of software and hardware makes the product meet the needs of machine control in terms of touch accuracy and accuracy, as well as screen color.

VS-Q series HMI has made great improvements on the previous basis. Compared with before, the startup speed is faster, the page switching speed is faster, the communication speed is also faster, and the HMI sensitivity is higher.

1.1.1 Product features

No.	Feature description
1	Using ARM Cortex_A7 1GHz , dual-core processor, the operation speed is faster, the power consumption is smaller, and the operation is more stable.
2	Using a four-wire resistive touch panel, the touch precision is accurate, durable, and the touch life is long. The display is TFT LCD with 16,770,000 true color display.
3	Adopt anti-interference, anti-high voltage, lightning strike design, enhance the accuracy and reliability of communication, support RS232, 485, 422 communication.
4	The FLASH which is kept after power off is used as ROM, and the access speed is fast.
5	Adopt high-precision switching power supply, low power consumption.

1.1.2 Product models

VS-Q series HMIs are available in the following models:

Model	Size (inch)	Resolution
VS-043QE	4.3	480×272
VS-043QS	4.3	480×272
VS070QS-1618MDM1	7.0	800×480
VS-070QE	7.0	800×480
VS-070QS	7.0	800×480
VS-070QS-G	7.0	1024×600
VS-102QS	10.2	1024×600
VS-102QS-G	10.2	1024×600
VS-156QS	15.6	1920×1080

Take the model VS-070QS-G for example:

VS: Indicates the VS series of HMI

070: Indicates the size (7.0 inches)

Q: Indicates the model number

S: Indicates the type. E: Indicates that the HMI is an economical type (Without Ethernet); if it is S, it means that the HMI is a standard type(With Ethernet).

G: Indicates support for IoT expansion (Note: 15.6 inches comes standard with IoT expansion)

1.2 Mounting dimensions

The following is detailed introduction to mounting dimensions of VS-Q Series HMI. Please install HMI in accordance with fixed mounting dimensions to avoid damaging products.

Model	Dimensions (unit: mm)	Installation hole size (unit: mm)
VS-043QE	139×86×31	132×80
VS-043QS	139×86×31	132×80
VS-070QE	203×145×35	192×138
VS-070QS	203×145×35	192×138
VS-070QS-G	203×145×35	192×138
VS070QS-1618MDM1	203×145×56.45	192×138
VS-102QS	273×211×40	259×201
VS-102QS-G	273×211×39.5	259×201
VS-156QS	395×257×31	383×246

Figure 1-1 Installation dimensions of VS-043QE

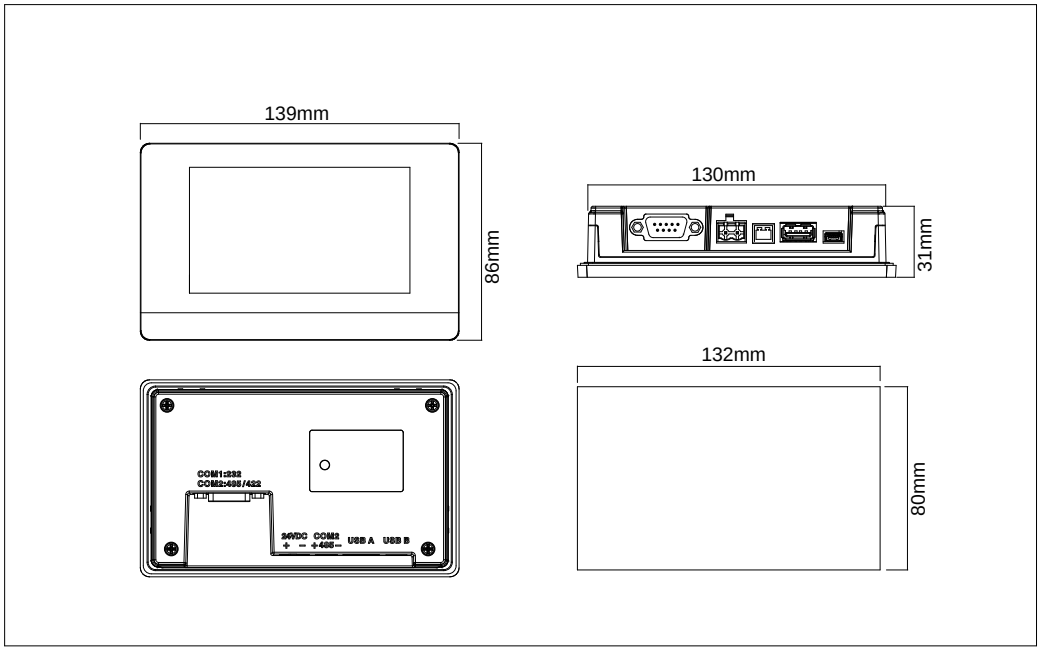


Figure 1-2 Installation dimensions of VS-043QS

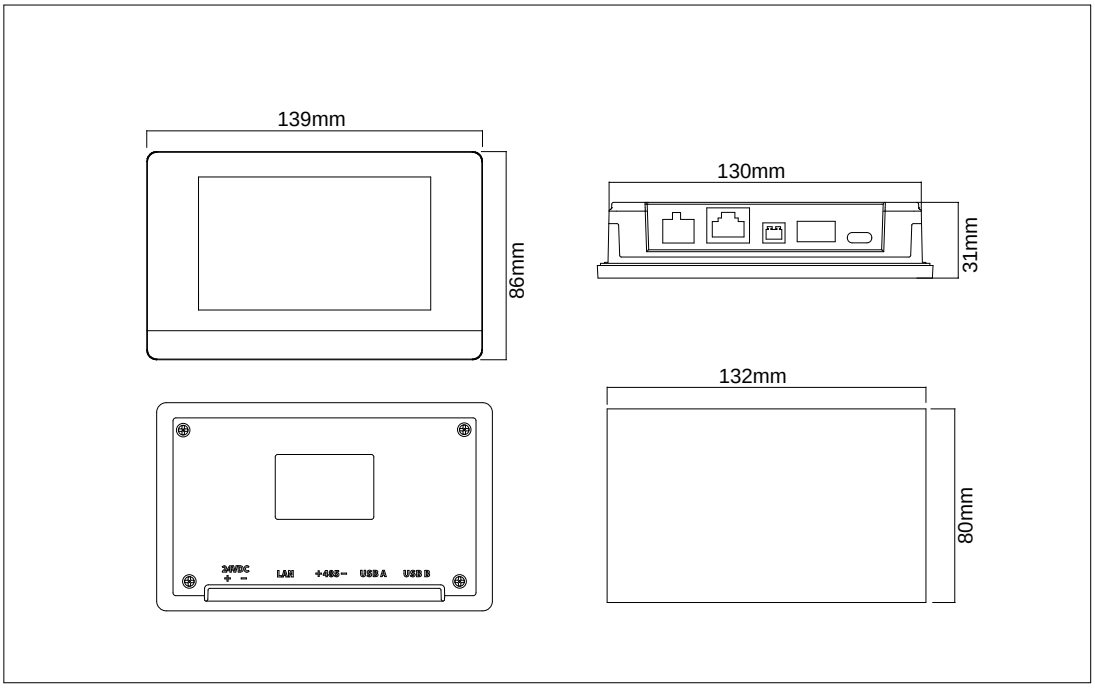


Figure 1-3 Installation dimensions of VS-070QE

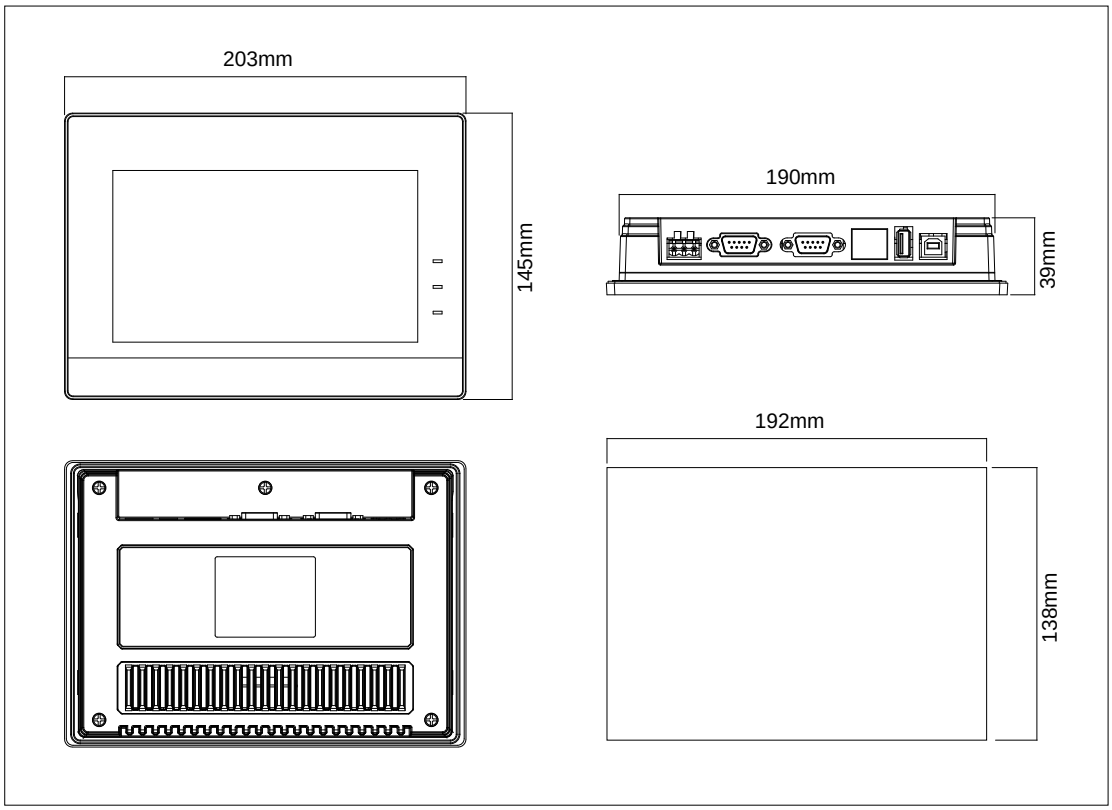


Figure 1-4 Installation dimensions of VS-070QS

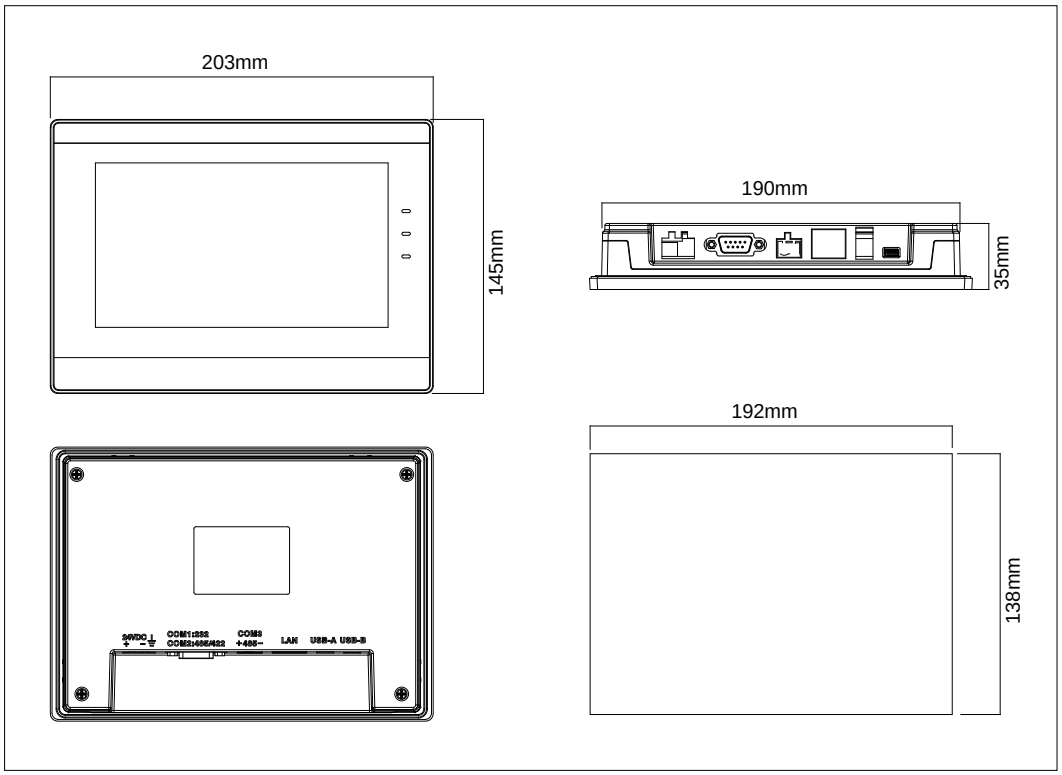


Figure 1-5 Installation dimensions of VS-070QS-G

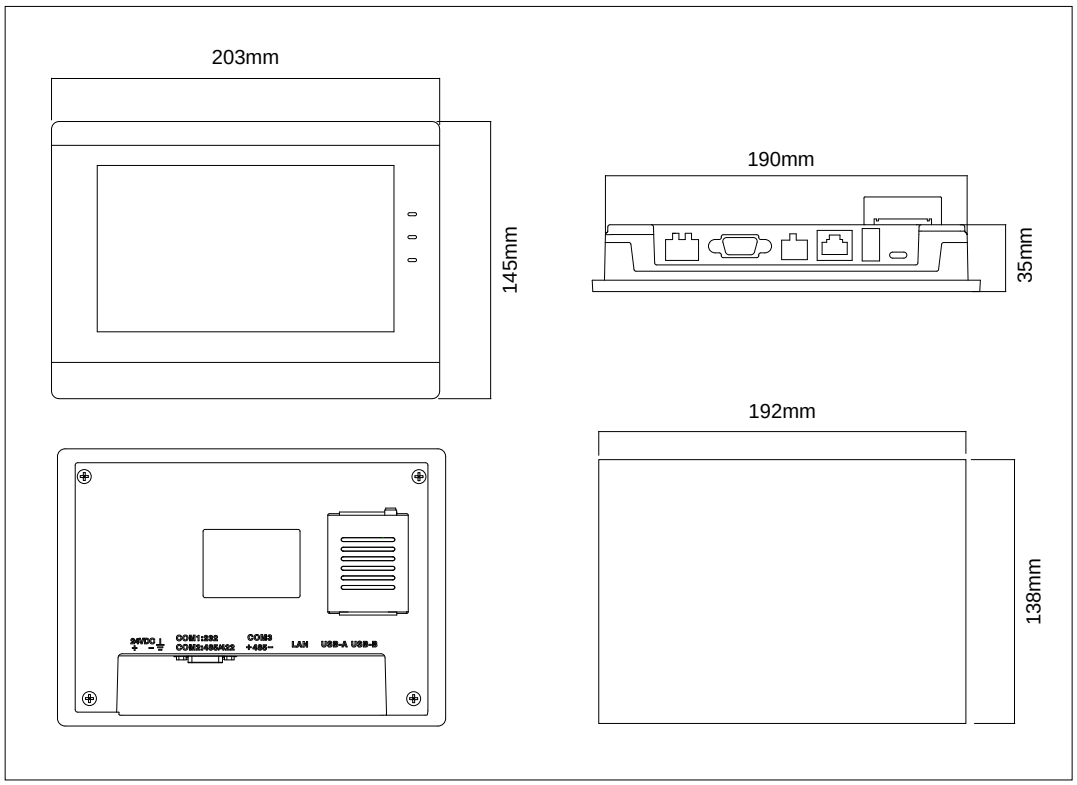


Figure 1-6 Installation dimensions of VS070QS-1618MDM1

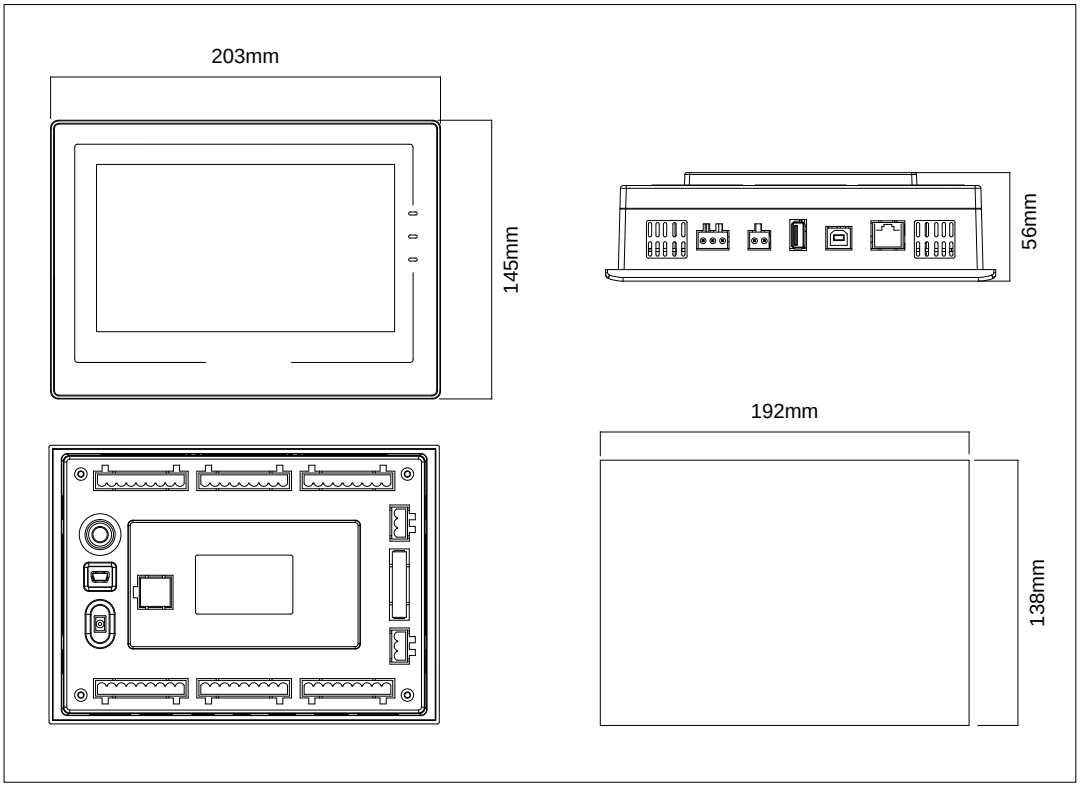


Figure 1-7 Installation dimensions of VS-102QS

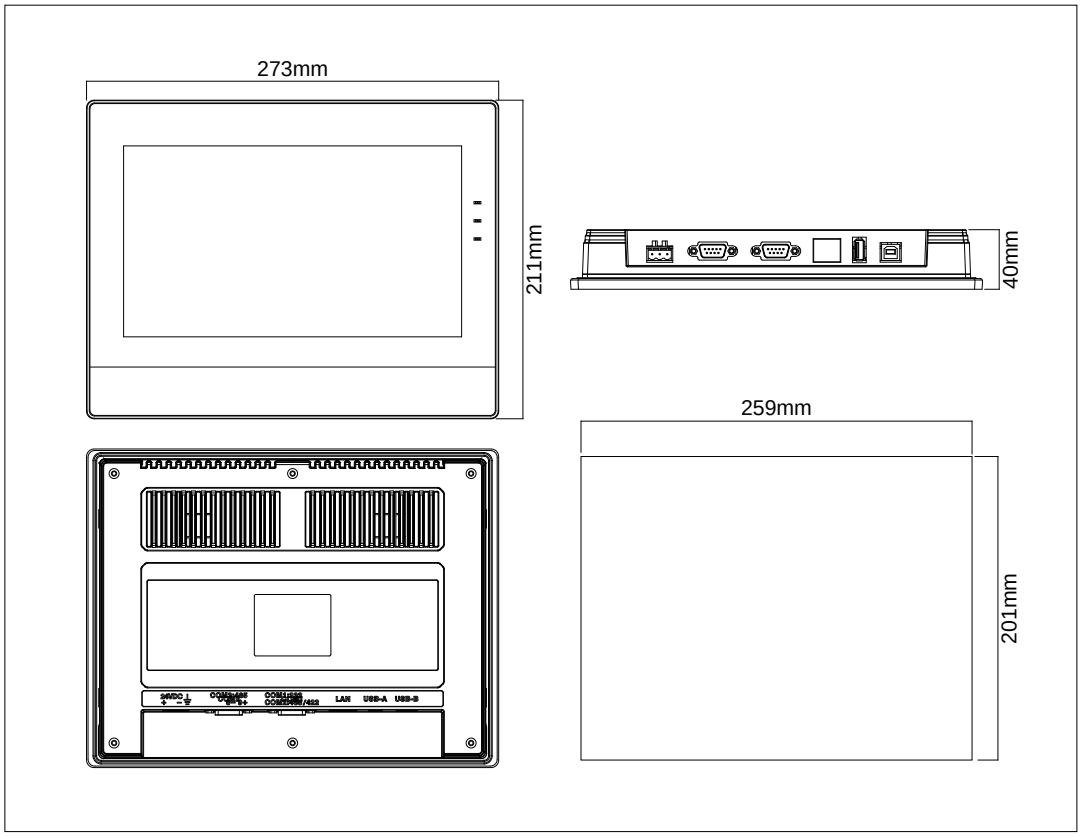


Figure 1-8 Installation dimensions of VS-102QS-G

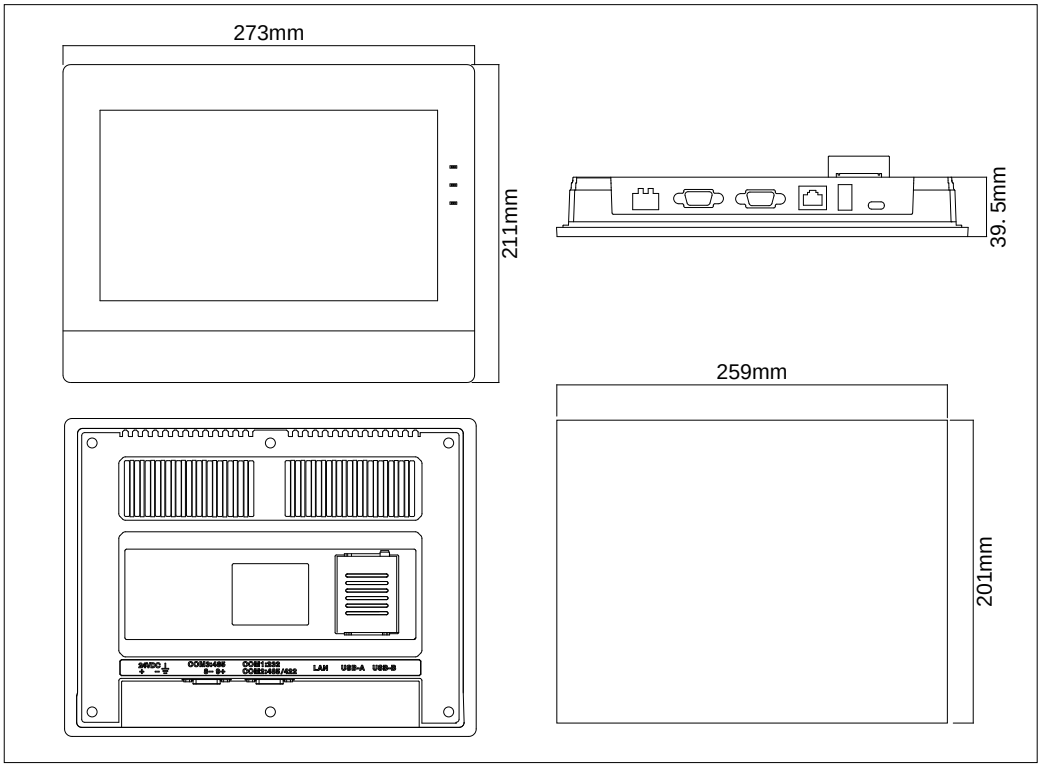
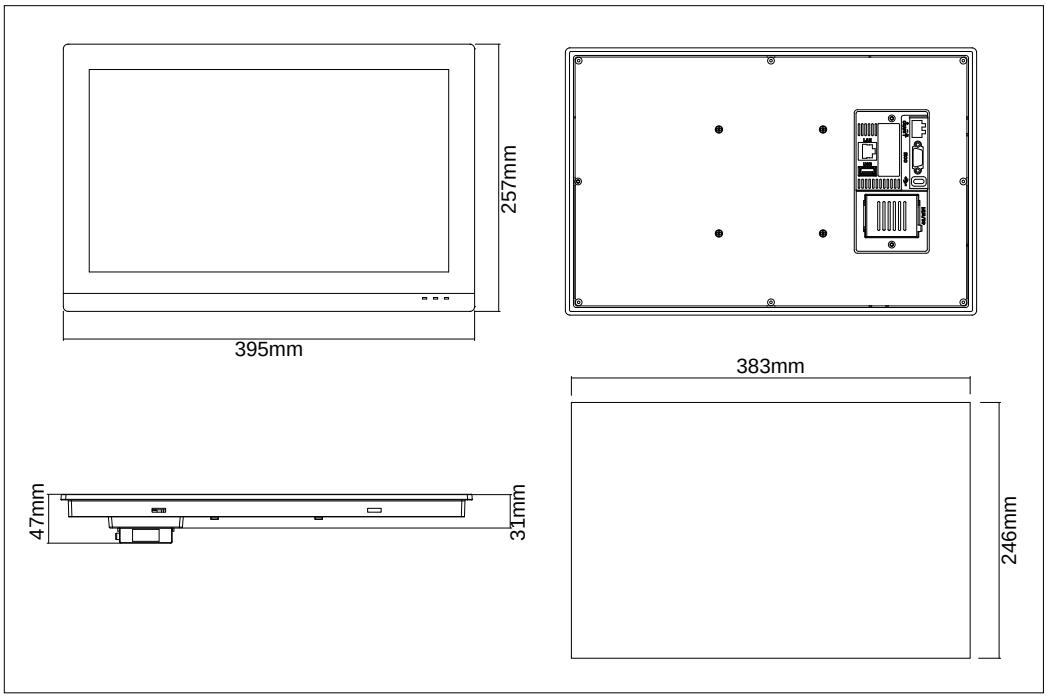


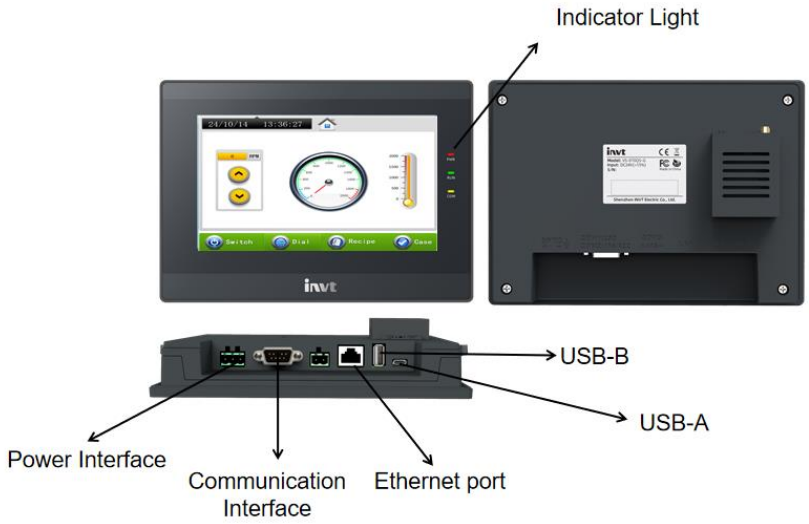
Figure 1-9 Installation dimensions of VS-156QS



1.3 HMI Structure

The entire structure of INVT VS-Q series HMI consists of display area, indicator light, power interface and communication ports. Color of all models accords to the industrial design standard, with the feature of soiling resistance so as to work in harsh factory environment, and indicator lights on the front panel meant to check the equipment status (Except VS-043QE/QS). Power interface and communication ports are located at the bottom of the HMI, which meets the design criteria (Except VS-156QS). The following figure shows the

structure of the HMI (VS-070QS-G for example).



Type	Description
Power Interface	Used to connect 24V DC power supply to power the HMI
Communication Interface	Communicate with PLC
Ethernet port	Used for communication and program uploading and downloading, supporting Modbus TCP/IP
USB-B	Used to insert U disk, upload, download programs or external mouse and other devices
USB-A	Connect with PC; download the configuration file from PC to HMI

1.3.1 Power interface

The power interface of the INVT VS-Q Series HMI locates in the back panel. With DC24V power supply (±15%), it shields effectively against interference, enhancing the anti-disturbance performance of the entire system. The following figure is a view of power interface:

1.3.2 Front panel

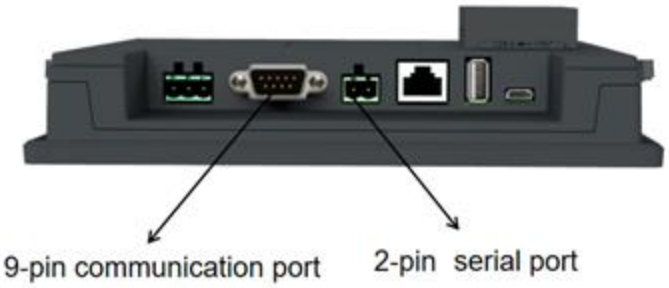
The following figure is a view of front panel, including display screen and indicator lights(Except VS-043QE/QS).

1.3.3 Communication Port

Communication ports of HMI are located in the bottom panel (Except VS-156QS). The communication interface is in the form of a 9-pin communication port and a 2-pin serial port for connection to a PLC or other controller and also for communication.

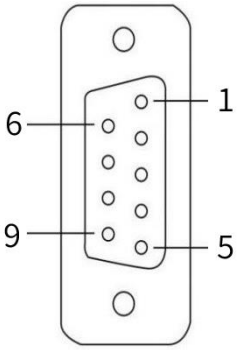
When using a shielded cable, RS232 communication distance shall not go over 15 meters. For connection to the computer, it has a USB communication interface used for downloading configuration (data transmission). The transmission rate can be up to 10Mbps. Definition of communication interface differs if it is connected to different PLC (Please inform us the type of PLC to be connected when ordering for facilitating the distribution of communication cables).

Take VS-070QS-G as an example. Its communication interface is shown as follows.



1.3.4 9-pin communication port

VS-Q series communication interface DB9 male header pinout diagram is as shown in the following figure.



This port is used to connect PLC or other controllers with RS232 / RS422 / RS485 communication port. The number of COM ports varies among different models of DB9 interfaces. For specific details regarding the

number of COM ports and their definitions, please refer to the VS-Q Series HMI selection manual. The pin definitions are as shown in the table below.

Pin	COM1:RS232	COM2:RS422	COM2:RS485	COM3:RS485
1	-	-	-	B-
2	RX	-	-	-
3	TX	-	-	-
4		-	-	A+
5	GND	-	-	-
6	-	RX-	-	-
7	-	RX+	-	-
8	-	TX-	B-	-
9	-	TX+	A+	-

1.3.5 Running indicator lights

Indicator lights of the HMI consist of three LEDs, including Power (PWR), Run (RUN) and communications (COM), just as shown in the following figure:

PWR turns green when it is powered;

RUN turns yellow if CPU works normally while it lights out if CPU fails;

COM turns yellow when the HMI is communicating.

The following table shows the display states of the 3 LED indicator lights on different working state.

Device state	Green LED (PWR)	Yellow LED (RUN)	Yellow LED (COM)
No power supply	○	○	○
Power on	●		
CPU running	●	●	
Communication with connected device	●	●	※
○: LED is OFF ●: LED is ON ※: LED is flashing			

1.4 Technical parameters

1.4.1 VS-043QE and VS-043QS

Model		VS-043QE	VS-043QS
Display			
Display size		4.3"	4.3"
Resolution		480×272	480×272
Screen material		ITO	
Color depth		24bits	
Brightness(cd/m²)		400	
Backlight type		LED	
Backlight life (hr)		20000	
Touch panel type		4-wire high accuracy touch panel	
CPU and memory			
CPU		Cortex-A7 1GHz (dual core)	
Memory		128MB DDR3	
Flash		128MB FLASH	
Communication interface			
USB		USB Host×1,USB Client×1	
Serial interface	COM1	RS232	RS485
	COM2	RS485/422	-
	COM3	-	-
Ethernet		-	Support
WIFI		-	-
Power supply			
Rated voltage		12–24VDC(±15%)	
Rated power		3W	3W
Environment			
Work temperature		-20–55°C	
Work humidity		5–95%RH (No condensation)	
Protection level		IP65 (front panel)	
Certification			
CE		EN55032,EN55035	
FCC compatibility		FCC,Class A	
Dimensions and weight			
Physical dimension W*H*D (mm)		139×86×31	139×86×31
Hole dimension A*B (mm)		132×80	132×80
Weight (g)		200	214
Configuration			
Configuration software		HMITOOL	

Note:
- Indicates not supported
* In the serial interface, DB9 is a male socket

1.4.2 VS-070QE, VS-070QS, and VS-070QS-G

Model		VS-070QE	VS-070QS	VS-070QS-G
Display				
Display size		7"	7"	7"
Resolution		800×480	800×480	1024x600
Screen material		ITO		
Color depth		24bits		
Brightness(cd/m²)		450		
Backlight type		LED		
Backlight life (hr)		20000		
Touch panel type		4-wire high accuracy touch panel		
CPU and memory				
CPU		Cortex-A7 1GHz (dual core)		
Memory		128MB DDR3		
Flash		128MB FLASH		
Communication interface				
USB		USB Host×1,USB Client×1		
Serial interface	COM1	RS232	RS232	RS232
	COM2	RS485/422	RS485/422	RS485/422
	COM3	RS485	RS485	RS485
Ethernet		-	Support	Support
SD card slot		-		
WIFI		-	-	Support
Power supply				
Rated voltage		12–24VDC(±15%)		
Rated power		4W	4W	4W
Environment				
Work temperature		-20–55°C		
Work humidity		5–95%RH (No condensation)		
Protection level		IP65 (front panel)		
Certification				
CE		EN55032,EN55035		
FCC compatibility		FCC,Class A		
Dimensions and weight				
Physical dimension W*H*D (mm)		203×145×35	203×145×35	203×145×35
Hole dimension A*B (mm)		192×138	192×138	192×138
Weight (g)		700	700	700
Configuration				
Configuration software		HMITOOL		
Note: - Indicates not supported * In the serial interface, DB9 is a male socket				

1.4.3 VS-102QS and VS-102QS-G

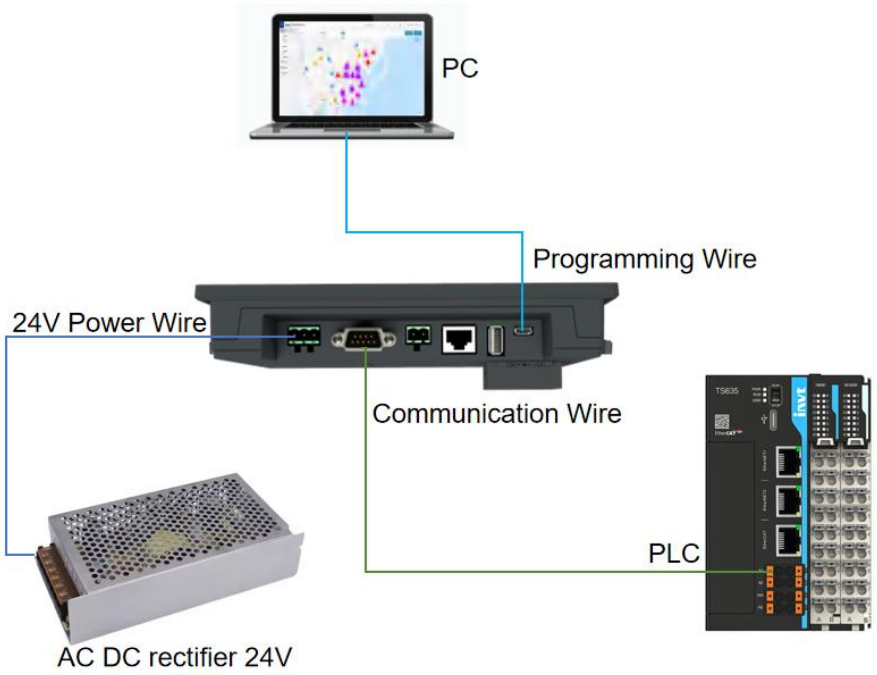
Model		VS-102QS	VS-102QS-G
Display			
Display size		10.2"	10.2"
Resolution		1024x600	1024x600
Screen material		ITO	
Color depth		24bits	
Brightness(cd/m²)		450	
Backlight type		LED	
Backlight life (hr)		20000	
Touch panel type		4-wire high accuracy touch panel	
CPU and memory			
CPU		Cortex-A7 1GHz (dual core)	
Memory		128MB DDR3	
Flash		128MB FLASH	
Communication interface			
USB		USB Host×1,USB Client×1	
Serial interface	COM1	RS232	RS232
	COM2	RS485/422	RS485/422
	COM3	RS485	RS485
Ethernet		Support	Support
SD card slot		-	
WIFI		-	Support
Power supply			
Rated voltage		12-24VDC(±15%)	
Rated power		7W	7W
Environment			
Work temperature		-20–55°C	
Work humidity		5–95%RH (No condensation)	
Protection level		IP65 (front panel)	
Certification			
CE		EN55032,EN55035	
FCC compatibility		FCC,Class A	
Dimensions and weight			
Physical dimension W*H*D (mm)		273×211×40	273×211×40
Hole dimension A*B (mm)		259×201	259×201
Weight (g)		1050	1050
Configuration			
Configuration software		HMITOOL	
Note: - Indicates not supported * In the serial interface, DB9 is a male socket			

1.4.4 VS-156QS

Model		VS-156QS
Display		
Display size		15.6"
Resolution		1920x1080
Screen material		ITO
Color depth		24bits
Brightness(cd/m^2)		300
Backlight type		LED
Backlight life (hr)		15000
Touch panel type		4-wire high accuracy touch panel
CPU and memory		
CPU		Cortex-A7 1.2GHz
Memory		256MB DDR3
Flash		4G(EMMC)
Communication interface		
USB		USB Host×1
Serial interface	COM1	RS485/422/232
	COM2	RS485
	COM3	-
Ethernet		Support
SD card slot		-
WIFI		Support
Power supply		
Rated voltage		12–24VDC(±15%)
Rated power		10W
Environment		
Work temperature		-20–55°C
Work humidity		5–95%RH (No condensation)
Protection level		IP65 (front panel)
Certification		
CE		EN55032,EN55035
FCC compatibility		FCC,Class A
Dimensions and weight		
Physical dimension W*H*D (mm)		395×257×31
Hole dimension A*B (mm)		383×246
Weight (g)		2450
Configuration		
Configuration software		HMITOOL
Note: - Indicates not supported * In the serial interface, DB9 is a male socket		

1.5 Wiring

VS-Q Series HMI requires DC 24V power supply. The following figure shows the connection of the HMI with PLC and PC:



2 Quick start of HMITOOL

This chapter introduces installation of HMITOOL configuration software, as well as basic functions and main characteristics of the software. It also introduces in detail the composition of the software system and the functions of each component, helping users to understand the overall structure framework of HMITOOL configuration software. In addition, it introduces the hardware and software requirements of HMITOOL, and the installation process and working environment of HMITOOL, helping users to learn use of this software and create application projects.

2.1 HMITOOL introduction

Created for the HMI of INVT VS-Q series from Shenzhen INVT Electric Co.,Ltd, HMITOOL configuration software is a development system with an integrated development environment and abundant, advanced functions. Taking advantage of the Windows system, it shows its simplicity and good interface consistency. The menu Layout close to that of Windows operating, it is facile to learn and apply, thus engineers can easily develop their proper projects for the configuration used in the HMITOOL. It features a decrease of time to develop automation projects and to upgrade, maintain the system, as well as a seamless integration with third-party applications and productivity enhanced

Functions and features of HMITOOL are summarized below:

1. Screen

INVT VS-Q series HMI is equipped with 16.77 million display colors, much more bright compared with products of other manufacturers. Using HMITOOL, engineers can find it more convenient and efficient to design configuration projects benefitting from bright colors and rich gallery. When downloaded to HMI, the configuration displays exactly what PC screen shows without image distortion. Meanwhile the operation interface of HMITOOL is clear and concise, consistent with the design of layout menu of Windows. Taking advantages of major display configuration software and HMI configuration software, it is available to configure a high-performance and high-quality engineering document.

2. Complete Functions

HMITOOL provides complete functions, including basic drawing shapes, color rendering, text rendering, library system, animation, bitmaps status, trend display, alarm control, etc.. HMITOOL is even equipped with new multiple sets of recipes and historical data, controls effects of pressing and so on. All what is needed for engineers to achieve an expected success is designing programs and configurations according to their own demand project features.

3. Communication

HMITOOL supports PLC communication drivers of major manufacturers in the world, such as INVT, Siemens, Mitsubishi, Omron, Fujitsu, Panasonic, Schneider, Emerson, etc., covering the very most of them. At the same time we can customize certain PLC communication drivers.

4. Resource

HMITOOL provides abundant resources where Gallery contains three-dimensional indicator lights, three-dimensional buttons, motors, three-dimensional tank, three-dimensional pipes, electronic, bar graphs, etc., and lots of them come with graphic animation, so you can create a live animation. It supports a custom gallery and images inserted from Windows. HMITOOL also provides rich functions of controls, such as trends and alarm controls, etc., to meet the needs of various configurations.

2.2 System requirements

2.2.1 Computer configuration requirements

The basic configuration of the HMITOOL programming environment is shown in the following table:

Item	Minimum Configuration	Recommended Configuration
CPU	Equivalent to Intel's Pentium D805 or above	Equivalent to Intel's Pentium Dual G4620 or above
Memory	4GB	Above 4GB
Graphics card	Functional in 1280 × 640 resolution and 256 color mode	Functional in 1280 × 640 resolution and 65535 color mode
hard disk	Above 500MB	Above 64G
OS	Windows 7 and later	Windows 7 and later
Communication ports	Type C port, RJ-45	
Other devices	Power supply	

2.2.2 How to get HMLTool

HMITOOL is free, and users can download the software installation package in the application software options of "Support" > "Download" on INVT official website (www.invt.com).

Our Company is constantly improving products and materials, so the users should update the software version in time when they need it, and consult the latest released reference materials, which is beneficial to the program design of users.

2.2.3 HMITOOL software installation process

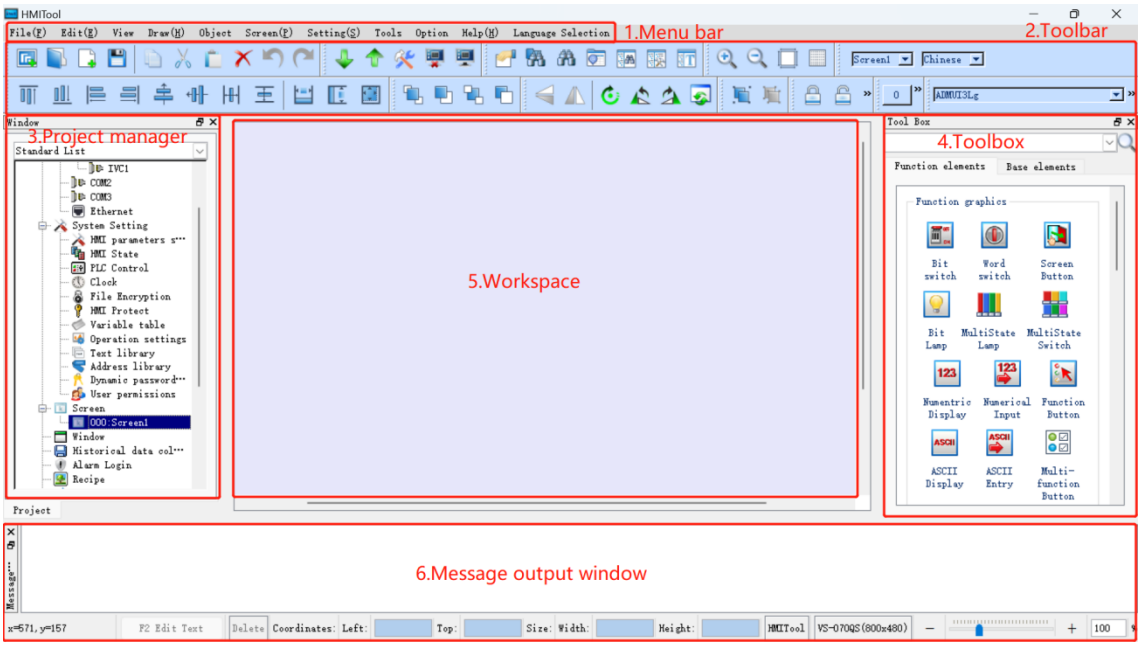
The HMITOOL installation package released by Shenzhen INVT Electric Co., Ltd. is a separate executable program whose installation process can be started by double-clicking.

1. Follow the installation wizard step by step. Users can choose different installation paths as required.
2. After installation, the HMITOOL program group will appear in the Start menu; at the same time, the installer will also install the HMITOOL shortcut icon on the desktop.
3. Double-click the shortcut icon to run the program.
4. Uninstall: The software can be uninstalled through Windows Control Panel.

Note: To upgrade and install the new version of HMITOOL, please uninstall the old version of HMITOOL first.

2.3 HMITOOL running interface

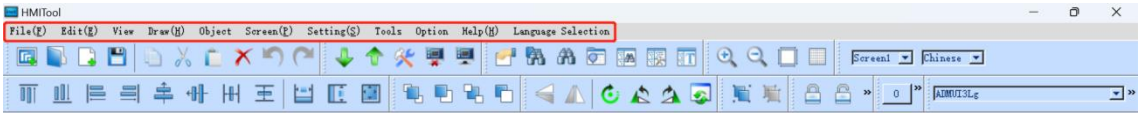
The main interface of this program basically includes 6 parts: menu bar, toolbar, Project manager, toolbox, workspace and "Messages output" window.



No.	Name	Description
①	Menu bar	Programming software operation menu, including editing, parameter setting, language selection and other related settings, file management and screen programming shortcuts.
②	Toolbar	Shortcuts to commands button; Display file; open project; new project; restoration and other function buttons.
③	Project manager	Communication connections, parameter settings, image management, alarm settings, set recipe and tree-form menu set by historical data collector.
④	Toolbox	Basic configuration controls designed for engineers to configure; contain function controls and basic controls.
⑤	Workspace	Window for engineering staff to configure, edit graphic object.
⑥	"Messages output" window	Prompts concerning information input, output, error messages and other tips as engineers conduct configuration editing and compiling.

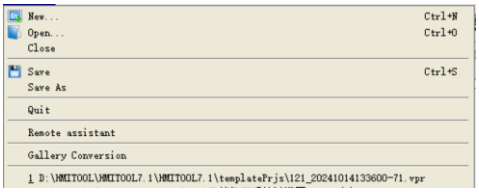
2.3.1 Menu bar

Editing menu bar of HMITOOL configuration software provides users with an extensive menu options, almost covering all the engineering tools and editing commands needed. The menu bar includes File menu, Edit menu, View menu, Draw menu, Object, Screen menu, Setting menu, Tools menu, Help menu, Language selection menu, and also a Right-click menu. The menu bar is shown below:



1. File

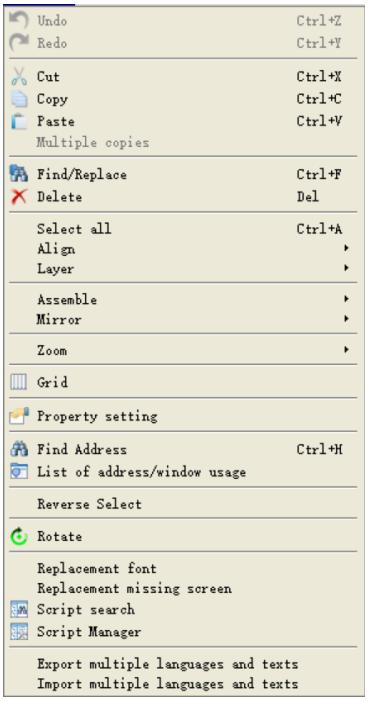
"File" menu supports operations of New project (Ctrl+N), Open Project (Ctrl+O), Close, Save (Ctrl+S), Save As and Quit (Ctrl+Q). If a certain item shows gray, it indicates that the operation is invalid in the current environment. The method of opening the file menu is to click "File (F)" on the top left corner of the software, and then it ejects a pull-down File menu toolbar.



- New Project: shortcut key Ctrl + N; to create a blank project.
- Open Project: shortcut key Ctrl + O; to open a project file created, saved before and suffixed by .vpm.
- Close: to close the current project file without exiting HMITOOL configuration software.
- Save: shortcut key Ctrl + S; to save the current configuration file having been modified, the name and save path of the file are by default as before.
- Save As: to save the current configuration file; available to override the name and save path of the project.
- Exit: to exit HMITOOL configuration software.

2. Edit

"Edit" menu consists of a set of commands used to edit texts, graphics and other content in the screen. There are Undo, Restore, Cut (T), Copy (C), Multiple copy (D), Paste (P), Delete (D), Select All (A), Align, Layer, Group, Mirror, Zoom, Grid, Property setting, Find Address, Address Table, Reverse Select, Macro search, Macro Manager. If a command in the menu bar is gray, it means in current operation, that command is invalid. To executive these commands, you should first select the graphic object to be edited, and then choose the corresponding command in "Edit" menu. But there are in "Edit" menu some commands that are group commands. If so, a little triangle will show on the right of the command and each command, with a drop-down menu, has a corresponding shortcut, as shown in the figure below:

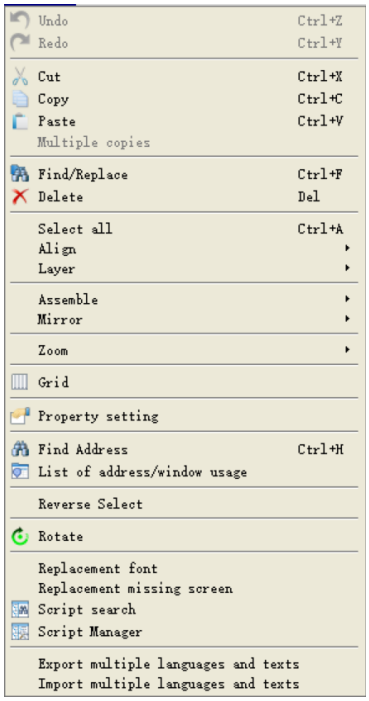


- Undo: shortcut key Ctrl + Z; to cancel the last operation command and your recent action.
- Restore: shortcut key Ctrl + Y, to restore the last operation command and your recent action.
- Cut: shortcut key Ctrl + X, to delete your selected graphical objects and copy them into the clipboard buffer.
- Copy: shortcut key Ctrl + C; to copy the selected graphic object into the paste buffer.
- Multiple copy: to copy a quantity of selected graphical objects in horizontal and vertical directions, and

then the address can be in ascending order of 0-255 units.

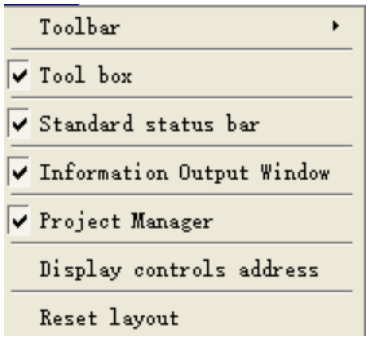
- Paste: shortcut key Ctrl + V, to copy and paste buffer graphics objects into the current screen.
- Delete: Del, to remove selected graphical object from the screen.
- Select all: shortcut key Ctrl + A; to select all objects in the current frame of the project.
- Align: to make selected objects (more than two) aligned according to the selected type alignment, including Top, Bottom, Vertical Center, Left, Right, Horizontal Equal Interval, Vertical Equal Interval, Make same width, Make same height, Make same width and height.
- Layer: to place the selected objects to a different image level. You can choose Bring To Top, Bring Forward, Send to Bottom or Send Backward.
- Group: to combine selected objects (more than two) into one control, or split This command can be selected more than one object (two or more) are combined into a control, an object can also can split a detachable object or split combined objects into the original object. When using Group, please be sure not to assembly objects to touch, otherwise objects cannot be touchable after being downloaded to the HMI. Layer is recommended if it is necessary to overlay touchable objects.
- Mirror: to rotate the selected object in accordance with certain rules, horizontally or vertically.
- Zoom: to zoom the current screen in accordance with a certain proportion scale for a more fine control operation; zoom options are Zoom In, Zoom Fit and Zoom Out.
- Grid: to place or cancel a grid with certain width in the current screen.
- Property settings: to open the Properties window of an object (when one single object is selected) and that of a screen (when nothing is currently selected).
- Find Address: to find the address you are using.
- Address Table: to open or close the list of addresses being used. Address Table is a list of address used by objects, easy to find and replace.
- Invert Selection: to select all objects not being chosen in the current screen and objects that are chosen before are not included.
- Macro Search: to locate calls of the macro in the project; you can optionally specify to search or manually enter the search.
- Macro Manager: Execute this command to see locations of all macros used; you can choose to display macros of all the screens or those of a specific screen.

Note: When using Assemble key, do not assemble objects to be touched, or it cannot be touched after downloading to the HMI. Users may use Layer command to superpose touch objects.



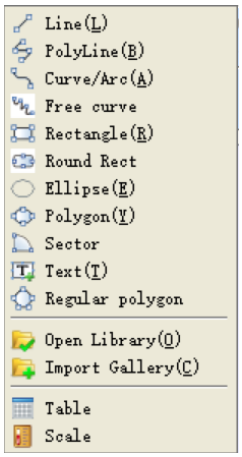
3. View

This menu allows developers to custom their operating interface according to their own habits: decide whether certain operating window is shown in the current operating environment. The icon ✓ on the left of the command means the display of the toolbox on the screen, otherwise it is hidden.



4. Draw

The menu is mainly used to draw graphics on the screen. HMITOOL provides straight line (L), Polyline (B), Curve/Arc (A), Free Lines, Rectangles (R), Round Rectangle, Ellipse (E), Polygon (Y), Arc, Text (T), Open Library (0), Build Library (C), Table, Scale. It's convenient for engineers to change the color, text, size and location of graphic elements created by the Tools menu.



- Line: Execute this command to draw a straight line in any direction within the current screen.
- Polyline: Execute this command to draw a polyline in any direction within the current screen.
- Curve/Arc: Execute this command to draw a line in the current screen, after finishing drawing by right button, the radian of drawings can be adjusted as needed.
- Free line: Execute this command to draw a line in the current screen in any direction, lines are drawn with the movement of the mouse.
- Rectangle: Execute this command to draw a rectangle of any size in the current screen.
- Rounded Rectangle: Execute this command to draw any rectangle with rounded corners in the current screen.
- Ellipse: Execute this command to draw any size of ellipse in the current screen.
- Polygon: Execute this command to draw an arbitrary polygon in the current screen.
- Arc: Execute this command to draw any sector in the current screen.
- Text: Execute this command to create a transparent rectangle where you can enter any text inside.
- Open Library: Execute this command to open the image library of the system.
- Build Library: Execute this command to convert the image control drawn by user into a file of library; it is easy to operate next time.
- Table: Execute this command to create a table with required ranks in the current screen.
- Scale: Execute this command to draw a desired scale.

5. Object

"Object" menu consists of a set of touch keys and function keys, including Bit Switch, Word Switch, Screen Button, Function Button, Multifunction key, Stepping Button, Single Button, Combo Box, Sliders, Numerical Display, Numerical Input Display, ASCII Display, ASCII Entry, Bit Lamp, Multistate Switch, Multistate Lamp, Message display, Time Display, Date Display, Weekday Display, Static Picture, Picture Display, GIF Display, Dynamic Diagram, Dynamic circle, Dynamic Rectangle, Flowing block, Graphics Move, Animation, Bar Graph, Meter, Arc chart, Trend Chart, XY Trend Chart, Historic trend, Data group, Historical data, Alarm Control, Alarm Bar, Historical Alarm, Timer, Message Board, Recipe selector, Recipe data display, Keyboard and Qrcode.

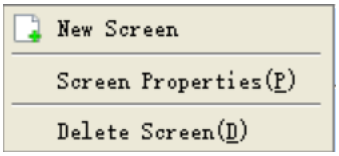
- Bit switch: Execute this command to create touch keys for performing bit manipulations to the connected device, including Set ON, Set OFF, Dot and Invert.
- Word switch: Execute this command to set a touch key for performing word bit operation in the current screen to the connected device, including Add, Subtract, Increasing, Decreasing, Set Constant, Enter Value, Enter Password.
- More: Execute this command to reach the Screen Button, Function Button, Multifunction key, Stepping Button, Single button, Combo Box and Sliders.
- Numerical display: This command is used to draw on the current screen a numerical display frame reflecting numerical value of certain monitored address.
- Numeric input display: Execute this command to draw on the current screen a numerical display frame for data input and digital value display of certain monitored address.
- ASCII display: Execute this command to draw on the current screen a numerical display frame for ASCII code.
- ASCII input display: This command is used to draw on the current screen a frame of display and output for the input of ASCII code.
- Bit lamp: Execute this command to create on the current screen a graph monitoring the bit status of one single connected device.
- Multistate switch: Execute this command to create multi-state button monitoring numerical value changes of single address of the connected device according to the change of status.
- Multistate lamp: You can place a graph in the current screen monitoring the word status of multiple consecutive device addresses.
- Message display: Execute this command to create a display control showing pre-configured message

on the current screen.

- Time Display: Execute this command to insert the time control on the screen to show the time.
- Date Display: Execute this command to insert the date control on the screen to display the date.
- Week Display: Execute this command to insert a week control on the current screen to display the week.
- Static Picture: Execute this command to insert a static image of the local hard disk on the current screen.
- Picture Display: This command is used to draw a graph display frame on the current screen for displaying a plurality of graphs.
- GIF Display: Execute this command to draw a graph display frame on the current screen to display a static or animated image suffixed by .GIF.
- Dynamic Diagram: Execute this command to open the windows of Dynamic Circle, Dynamic Rectangle, Flowing block, Graphics Move and Animation.
- Bar Graph: Execute this command to insert a columnar control on the current screen to observe the changes in the numerical value of monitored address according to the rise and fall or the right-left traverse of the columnar graph.
- Meter: Execute this command to create an instrument on the current screen to monitor the changes of numerical value of single address of connected device.
- Arc chart: Execute this command to insert a sector control on the current screen for reflecting the numerical value of monitored address and the reflection area can be presented by Pie FG Color, Pie BG Color or Bottom Color.
- Chart: Execute this command to open the window of Trend Chart, XY Trend Chart, historical trend and Data group.
- Historical Data: Execute this command to create a display control on the current screen to show messages saved by the historical data collector.
- Alarm: Execute this command to open windows of Alarm Control, Alarm Bar and History Alarm.
- Timer: Execute this command to insert a control on the current screen to trigger a particular function according to time conditions.
- Message Board: Execute this command to insert on the current screen a control where users can write.
- Recipe Selector: Execute this command to insert on the current screen a recipe control that shows all names of recipes if they exist.
- Recipe Data Display: Execute this command to insert a recipe data display control on the current screen, which shows all the data of recipes if they are set up.
- Keyboard: Execute this command to insert a keyboard control on the current screen, which can be any key in the keyboard when custom the keyboard.
- Qrcode: Execute this command to insert a Qrcode control on the screen for user-defined Qrcode; It should be used in concert with an input control, otherwise the address is invalid and the Qrcode won't appear.

6. Screen

"Screen (P)" menu consists of commands applied to screens, including New Screen, Screen Properties (P) and Delete Screen (D).

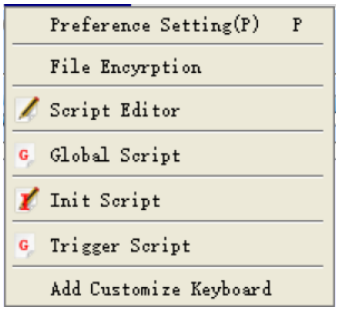


- New Screen: Execute this command to create a new screen in the current project.
- Screen Properties: Execute this command to open the properties of the current screen by which you can set the name and background.
- Delete Screen: Execute this command to delete the current screen.

Note: Please make sure the current screen is the one you want to delete and whether there are needed controls before operating causes it cannot be undone.

7. Setting

"Setting (s)" menu contains the following commands: Preference Settings (P), File Protection (M), Macro Editor, Global Macro, Initialization Macro and Add Customize Keyboard.

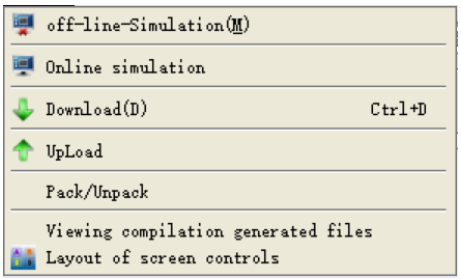


- Preference Setting: Execute this command to open the preference setting window, in which you can modify the HMI model, display mode, splash screen, screen saver time, flicker frequency, alarm sound, touch sound, password and settings of initial lever.
- File Protection: Execute this command to open the password setting window of file protection through which you can set a password to protect the file of the current project is set in the password window.

  Note: Please keep in mind the password since password is necessary to open the project configuration file after the setting. And it is case-sensitive.
- Macro Editor: Execute this command to open the macro editor where you can add, modify, compile or delete a macro.
- Global Macro: Execute this command to open a global macro setting screen, set or modify the global macros.
- Initialization Macro: Execute this command to open the interface of initialization macros setting to set or modify initialization macros.
- Add Customize keyboard: Execute this command to open a user-defined keyboard.

8. Tools

Applied to compile and download the configuration project, "Tools" menu contains seven commands, which are Off-line Simulation (M), Online simulation, Download (D), Upload, Pack/Unpack, Viewing compilation generated files and Layout of Screen Controls.

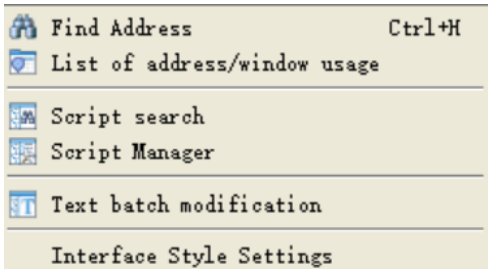


- Off-line Simulation: Execution of this command can invoke the application program of HMITOOL graph configuration and open the simulation interface. Users can simulate the configuration project running currently on PC to observe the effect, in order to modify the screen. Please save it Off-line simulation

before you save the user first.

- Online Simulation: This command can be called HMITOOL screen configuration software application, open the simulation panel, users can simulate engineering currently run on a PC to observe the effect, in order to correct the graph. When online simulation, you can also use the PC's Ethernet or serial communication device connected to data communications and communications test status. Please save it before the online simulation.
- Download: Execution of this command can download engineering configuration compiled by HMITOOL software to HMI through a USB cable. Before downloading, please compile and save the project.
- Upload: Execute this command to upload the historical data, configuration, recipes, and historical alarm from the HMI to a PC through a USB cable.
- Pack/Unpack: Execute this command to compress the project configuration into an XXX.vpr file, or to extract the compressed file to the project configuration file .vpm.
- Viewing compilation generated files:Execute this command to compile the current project configuration into a binary file.
- Layout of Screen Controls: Execute this command to set text attributes, control sizes, etc.

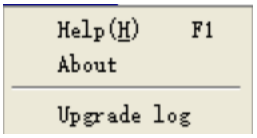
9. Option menu



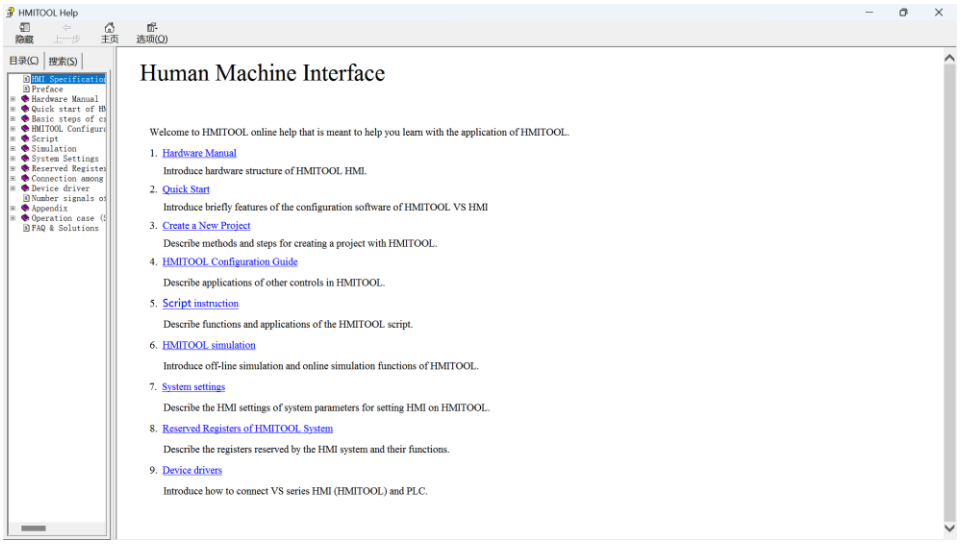
- Find Address: Execute this command to find the address you want and show the using status of the address on Information Output Window.
- List of address/Window usage:Execute this command to find the status of all addresses and screens in all windows or specified windows.
- Script search:Execute this command to check the using of the assign macro instruction, and show it on information ouput window.
- Script Manager:Execute this command to look for all macro instructions' status on all windows or assigned window.
- Text batch modification:Execute this command to modify the specified text in bulk.
- Interface Style Settings:Execute this command to modify the style of the current interface.

10. Help menu

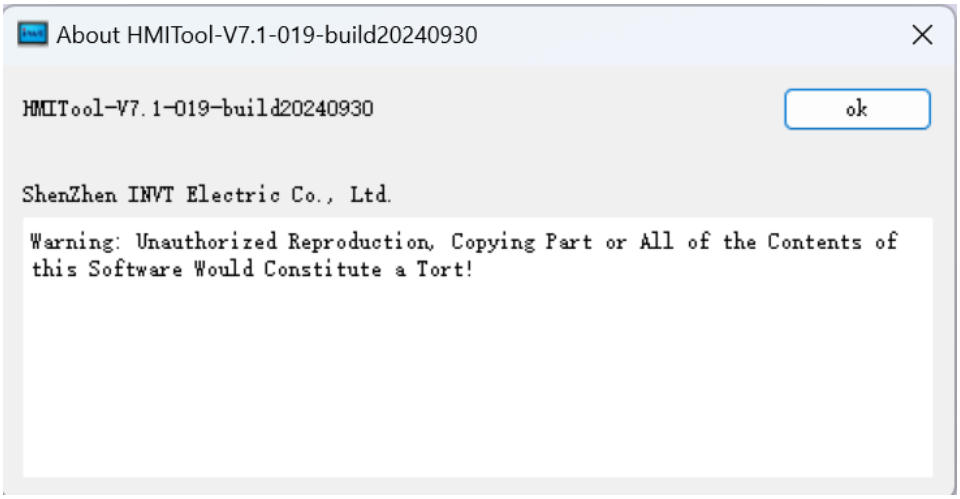
"Help" menu can call up the Help documentation and About HMITOOL: its version number and copyright notice.



The help file is shown below:



Version number and copyright statement of HMITOOL are shown below:



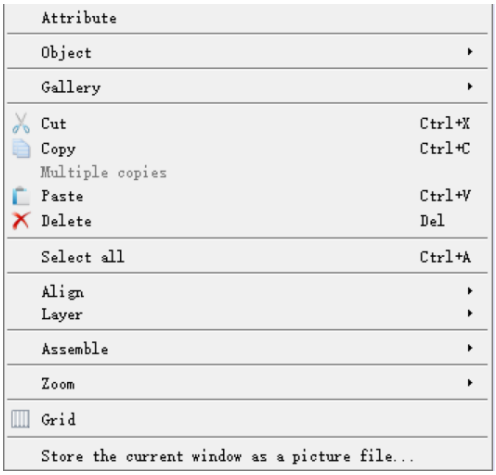
11. Language selection menu

This menu enables switching between Chinese, English, Russian and Turkish languages of the software. It is shown in the figure below:

Select "Chinese" to switch the language of the software to Simplified Chinese; select "English" to switch the language of the software to English, and the same operation mode for other languages.

12. Right Click Menu

Right click menu is set to facilitate user's operations, which is consistent with most Windows user's operating habits and styles. Lots of configuration functions can be found here: Attribute, Objects, Library, Cut, Copy, Multiple copy, Paste, Delete, Select all, Align, Layer, Group, Zoom, Grid, Screen.



- Attribute: Execute this command to open the properties window of a control (one single object selected) and the screen (no object selected).
- Object: Execute this command to open all of the object controls in the Object menu.
- Library: Execute this command to open the gallery or generate graphs.
- Cut: Shortcut Ctrl + X; this command can delete your selected graphical objects, and copy them into the clipboard buffer.
- Copy: Shortcut Ctrl + C; execute this command to copy the graphic object of your choice into the paste buffer.
- Multiple copy: Execute this command to copy a quantity of selected graphical objects in horizontal and vertical directions, and then the address can be in ascending order of 0-255 units.
- Paste: shortcut key Ctrl + V, to copy and paste buffer graphics objects into the current screen.
- Delete: Del, execute this command to remove selected graphical object from the screen.
- Select: shortcut key Ctrl + A; execute this command to select all objects in the current frame of the project.
- Align: Execute this command to make selected objects (more than two) aligned according to the selected type alignment, including Top, Bottom, Vertical Center, Left, Right, Horizontal Equal Interval, Vertical Equal Interval, Make same width, Make same height, Make same width and height.
- Layer: Execute this command to place the selected objects to a different graph level. You can choose Bring To Top, Bring Forward, Send to Bottom or Send Backward.
- Group: to combine selected objects (more than two) into one control, or split This command can be selected more than one object (two or more) are combined into a control, an object can also can split a detachable object or split combined objects into the original object.

Note: When using Group, please be sure not to assembly objects to touch, otherwise objects cannot be touchable after being downloaded to the HMI. Layer is recommended if it is necessary to overlay touchable objects.

- Zoom: Execute this command to zoom the current screen in accordance with a certain proportion scale for a more fine control operation; zoom options are Zoom In, Zoom Fit and Zoom Out.
- Grid: Execute this command to create or cancel a grid with certain width on the current screen.
- Screen: Used to create a new screen, open screen property window and delete a screen.

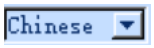
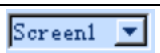
2.3.2 Standard toolbar

HMITOOL offers a series of shortcut tool buttons, some of which are tool command buttons while some belong to editing commands. You can easily get to the needed commands here instead of seeking it in the

menu bar if familiar with these buttons. Each button has tooltips that will appear when the mouse is placed on the button. HMITOOL provides a total of 51 tool buttons, which will turn gray if the If the operation is invalid in the current environment.

Each command in the toolbar corresponds to that in the menu, and their functions are respectively:

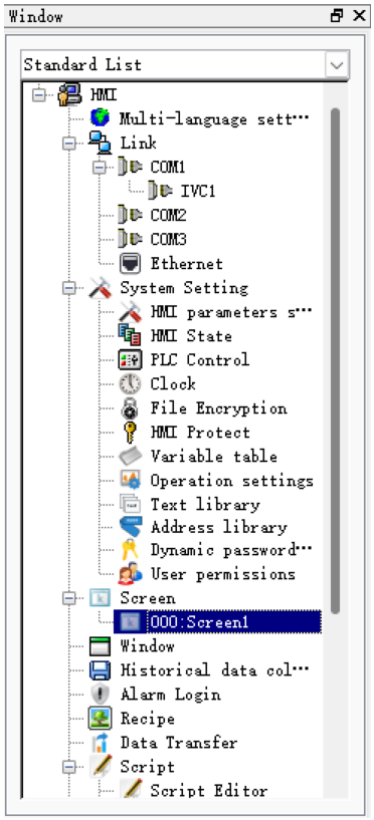
Label	Instruction	Description
	New Project	Shortcut key Ctrl + N; to create a blank project.
	Open Project	Shortcut key Ctrl + O; execute this command to open a project file created, saved before and suffixed by .vpm.
	New Screen	Execute this command to create a new screen
	Save	Shortcut key Ctrl + S, used to save the current screen configuration that has been changed, with the file name and directory being the same as the original.
	Undo	Shortcut key Ctrl + Z; to cancel the last operation command and your recent action.
	Redo	Shortcut key Ctrl + Y, to restore the last operation command and your recent action
	Cut	Shortcut key Ctrl + X, to delete your selected graphical objects and copy them into the clipboard buffer.
	Copy	Shortcut key Ctrl + C; to copy the selected graphic object into the paste buffer.
	Paste	Shortcut key Ctrl + V, to copy and paste buffer graphics objects into the current screen.
	Delete	Del, to remove selected graphical object from the screen.
	Group	Execute this command to combine several graphic objects you select into one object.
	Ungroup	This command can decompose a combination of graphic objects you have selected into the original graphic objects; it's the inverse operation of Group.
	Flip Horizontal	Execute this command to make a single graphic or multiple graphics pivot horizontally.
	Flip Vertical	Execute this command to make a single graphic or multiple graphics pivot vertically.
	Grid	Execute this command to create or cancel a grid with certain width on the current screen.
	Zoom In	Execute this command to magnify the current screen two times; to continue to enlarge, please continue to execute the command.
	Zoom Fit	Execute this command to restore the current screen to the standard size.
	Zoom Out	Execute this command to shrink the current screen half the size; to continue zooming out, proceed to execute the command.

Label	Instruction	Description
	Language	Execute this command to select the language you want.
	Status Drop-down Box	If select a control with status, the drop-down box will show the number of control status; if the number in the box changes, the status of the selected control will switch into corresponding status.
	Screen Frames	Execute this command to jump to the page you want to view.
	Property Settings	Execute this command to get the properties of the selected key.
	Locked	Execute the command to lock the key selected on the screen and it cannot be moved after locking.
	Unlock	Execute this command to remove the locking of screen buttons.
	Find/replace the Button	Click the button, and the user can find all the usage of the specific register and can be replaced by the other.
	Address Find	Execute this command to find out whether an address is occupied and the search results are displayed in the "information output window".
	Address Display	Execute this command to browse the used address of all controls in certain screens or all the screens.
	Find Macro	Execute this command to find whether a macro is used; the search result is displayed in the "information output window".
	Macro Manager	Execute this command to see the macro condition of all controls in certain screens or all the screens.
	Text Batch Modification	Click this button to batch modify the text in the selected control, screen, or window.
	Rotate	Select the control, and use it to rotate freely in the center of the control.
	Off-line simulation	Execute this command to run directly off-line simulation command.
	Online Simulation	Execute this command to run directly online simulation command.
	Download	Execute this command to pop up the download dialog; after connecting the VS-Q Series HMI to PC, you can download the configuration project to the HMI.
	Upload	Execute this command to upload historical data, configuration, recipes and alarm history from a running HMI to a PC via the equipped USB cable.
	Bring To Top (F)	Execute this command to shift the graphic object you selected to the top of the screen.
	Send To Bottom	Execute this command to shift the graphic object you selected to the bottom of the screen.
	Bring Forward	Execute this command to shift the graphic object you selected forward one layer.
	Send Backward (B)	Execute this command to shift the graphic object you selected backward one layer.

Label	Instruction	Description
	Make Same Width	Use this command to make a group of selected patterning the same width as that marked by a black point.
	Make Same Height	Use this command to make a group of selected patterning the same height as that marked by a black point.
	Make Same Width and Height	Use this command to make a group of selected patterning the same width and height as that marked by a black point.
	Top	Shortcut key Ctrl + Up, execute this command to align upper boundaries of selected multiple graphic objects top.
	Bottom	Shortcut key Ctrl + Down, execute this command to align lower boundaries of selected graphic objects bottom.
	Left	Shortcut key Ctrl + Left, execute this command to left justify the left edges of selected graphic objects.
	Right	Shortcut key Ctrl + Right, execute this command to right justify the right edges of selected graphic objects.
	Horizontal Center	Execute this command to align selected graphics horizontal center.
	Vertical Center	Execute this command to align selected graphics vertical center.
	Horizontal Equal Interval	Execute this command to make two or more controls align horizontally equal interval.
	Vertical Equal Interval	Execute this command to make two or more controls align vertically equal interval.

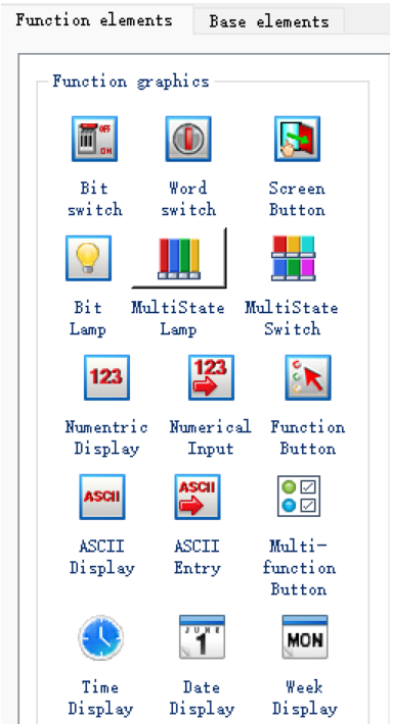
2.3.3 Project manager

HMITOOL Project Manager window is in the left of configuration software window, below the toolbar. You can set the parameters of the HMI, including Multi-language Settings, Connection, Setting, Screen, Window, Historical data collector, Alarm landing, recipe, Data transmission and Macro; Connection consists of Connection 1 and Connection 2 settings which contains HMI parameter settings, HMI state, PLC control, Clock, File encryption, HMI protection and Variable table.



2.3.4 Toolbox

HMITOOL Toolbox provides a wealth of tool buttons, some of which are functional control buttons, and some are basic controls. After being familiar with these buttons, designers can quickly find the commands they need instead of searching in the menu bar. HMITOOL supports totally 55 function controls and 14 basic controls.



Toolbox individual operating controls and menu content corresponding to each other, each button functions are:

Label	Instruction	Description
	Line	Execute this command to draw a straight line in any direction within the current screen.
	Polyline	Execute this command to draw a polyline in any direction within a current graph.
	Curve/Arc	Execute this command to draw a line in the current screen, after finishing drawing by right button, the radian of drawings can be adjusted as needed.
	Free Line	Execute this command to draw a line in the current screen in any direction, lines are drawn with the movement of the mouse.
	Circle/Ellipse	Execute this command to draw any size of circle or ellipse in the current screen.
	Rectangle	Execute this command to draw a rectangle of any size in the current screen.
	Rounded Rectangle	Execute this command to draw any rectangle with rounded corners in the current screen.
	Polygon	Execute this command to draw an arbitrary polygon in the current screen.
	Arc	Execute this command to draw any sector in the current screen.
	Positive Polygon	Execute this command to draw a positive polygon on the screen.
	Text	Execute this command to create a text input on the screen.
	Table	Execute this command to create a table with required ranks in the current screen.
	Scale	Execute this command to draw a desired scale.
	Open Library	Execute this command to open the graph library of the system.
	Import Gallery	Execute this command to import the graphics of the local library into HMITOOL for the engineering designers to use.
	Bit Switch	Execute this command to create touch keys for performing bit manipulations to the connected device, including Set ON, Set OFF, Dot and Invert.
	Word switch	Execute this command to set a touch key for performing word bit operation in the current screen to the connected device, including Add, Subtract, Increasing, Decreasing, Set Constant, Enter Value, Enter Password.
	Screen button	Execute this command to set the switching of screens, including opening screen, open the previous screen, close and Open screen, Closes screen, Open previous screen and Close open screen.

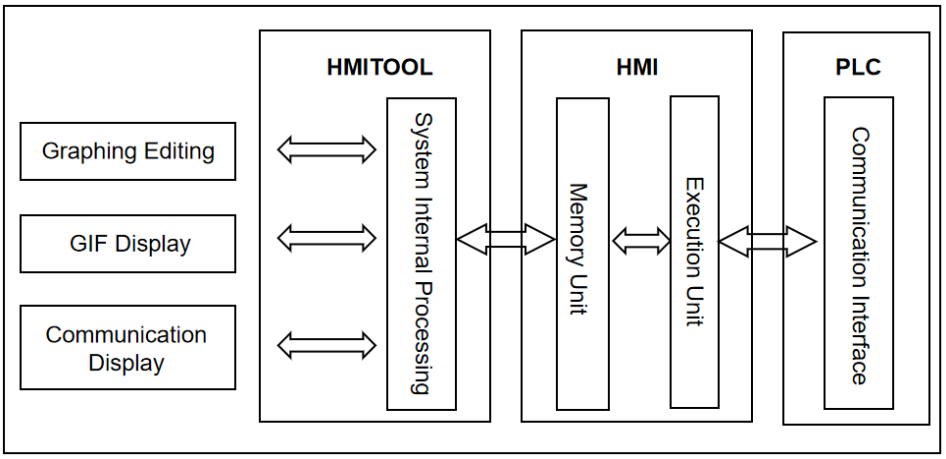
Label	Instruction	Description
	Function button	Execute this command to set a certain function control of the operating system, including Turn off background light, Confirm alarms, Restart HMI, Set screen saver time, Write recipe to PLC, Read recipe from PLC, Set the date and time, Clear alarm, Switch to previous recipe, Switch to later recipe, Save current recipe, Screenshots, System parameters, User login, Cancel the user login, Touch sound ON / OFF, Alarm sound ON / OFF, Clear all historical data, Clear alarm history, Unlock HMI protection, read& save recipe, Spare function, Overload recipe, Switch language, Print screen to printer, Slave devices IP configuration, DIP switches 1 and 3 feature set.
	Stepping button	Execute this command to create a stepping button control in the current screen to realize the cyclic switching of execution states.
	Single button	Execute this command to create a single button control in the current screen; click the designated state area, then the state will switch accordingly.
	Combo box	Execute this command to create a drop-down box button control in the current screen, for viewing and selection. Once user selects an item, the corresponding value will be written into the control address of character buffer.
	Slider	Execute this command to create a slider analog switch control in the current screen; drag the slider to change the value of corresponding character register addresses.
	Numerical Display	This command is used to draw on the current screen a numerical display frame reflecting numerical value of certain monitored address.
	Numeric Input Display	Execute this command to draw on the current screen a numerical display frame for data input and digital value display of certain monitored address.
	ASCII Display	Execute this command to draw on the current screen a numerical display frame for ASCII code.
	ASCII Input Display	This command is used to draw on the current screen a frame of display and output for the input of ASCII code.
	Bit Lamp	Execute this command to create on the current screen a graph monitoring the bit status of one single connected device.
	Multistate Switch	Execute this command to create multi-state button monitoring numerical value changes of single address of the connected device according to the change of status.
	Multistate Lamp	Place a graph in the current screen to monitor the word status of multiple consecutive device addresses.
	Message Display	Execute this command to display corresponding message information according to different monitoring address.
	Recipe Selector	Execute this command to insert on the current screen a recipe control that shows all names of recipes and enter, monitor contents of RWIO.

Label	Instruction	Description
	Recipe Data Display	Execute this command to insert a recipe data display control on the current screen, which shows all the data of recipes if they are set up.
	Multi-function button	Execute this command to create a multi-function button in the current screen to realize multiple functions through one key.
	Keyboard	Execute this command to insert a keyboard control on the current screen, which can be any key in the keyboard when custom the keyboard.
	Time Display	Execute this command to insert the time control on the screen to show the time.
	Date Display	Execute this command to insert the date control on the screen to display the date.
	Week Display	Execute this command to insert a week control on the current screen to display the week.
	Static Picture	Execute this command to insert a static image of the local hard disk on the current screen.
	Picture Display	This command is used to draw a graph display frame on the current screen for displaying a plurality of graphs.
	GIF Display	Execute this command to draw a graph display frame on the current screen to display a static or animated image suffixed by .GIF.
	Dynamic Circle	Execute this command to create a dynamic circle in the current screen whose size and location transform according to the continuous address change of connection device.
	Dynamic Rectangle	Execute this command to create a dynamic rectangle in the current screen whose size and location transform according to the continuous address change of connection device.
	Flow Block	use this command to create a simulation control of flow state in the current screen.
	Graph Move	Execute this command to create a graph display frame in the current screen whose graphic state and location change according to the continuous address change of connection device.
	Animation	Execute this command to create an animation control in the current screen to move the control.
	Meter	Execute this command to create an instrument on the current screen to monitor the changes of numerical value of single address of connected device.
	Arc Chart	Execute this command to insert a sector control on the current screen for reflecting the numerical value of monitored address.
	Pie Chart	Execute this command to insert a sector control on the current screen for reflecting the numerical value of monitored address.

Label	Instruction	Description
	Bar Graph	Execute this command to insert a columnar control on the current screen to observe the changes in the numerical value of monitored address according to the rise and fall or the right-left traverse of the columnar graph.
	Trend Chart	Execute this command to create a trend chart control in the current screen to monitor the change trend of continuous address value of connection device.
	XY Trend Chart	Execute this command to create a XY trend chart control in the current screen to monitor the change of two continuous address value of connection device.
	Data Group Display	Execute this command to create a date group display control in the current screen to display several groups of data in the trend chart.
	Historical Trend Chart	Execute this command to create a historical trend chart control in the current screen to display historical data in the trend chart.
	Historical Record Display	Execute this command to create a historical record display control in the current screen to display historical data collected.
	Historical Alarm Display	Execute this command to create a display control of historical alarm record in the current screen to show historical alarm data.
	Alarm Display	Execute this command to create an alert box control in the current screen to display the date, time and message of each alert.
	Alarm Bar	Execute this command to create an alert bar in the current screen to scroll display alert information.
	Operation Log	Execute this command to create an operation log display frame in the current screen to display the time, user and contents of the operation.
	Timer	Execute this command to create a macro timer in the current screen to control the execution of the macro.
	Message Board	Execute this command to create a message board control in the current screen where users can write.
	QRcode	Execute this command to create a QR code control in the current screen to display character or number with the help of input control.
	Corner Flow Block	Execute this command to create a Corner flow block control in the current screen to display the shape and flow speed.
	Multi-Window	Execute this command to create a multi-window control in current screen to display the assigned window.
	Scroll Bar Control	Scroll bar control to draw different types of scroll bars for table data browsing.
	Pipeline Control	Pipeline control and the control of a scroll bar.

2.3.5 System composition

HMITOOL is a configuration editing software of VS-Q series HMI. HMITOOL allows engineers to edit the configuration on the PC, and then download the final configuration and required communication driver to communication and the required driver to the storage mechanism of the HMI with a USB cable; HMIs can be controlled and monitored after being connected to PLCs or other connection devices through actuators and serial communication ports. The following figure shows HMITOOL system composition.



2.4 Basic operations

This chapter describes briefly the mouse usage, shortcut keys and some of the terminology of HMITOOL software.

2.4.1 Mouse usage and shortcut keys

When use the mouse to create configuration screens on the configuration screen editor, the mouse is as shown in the following figure:

The following is several common operations of mouse and their purposes:

- Left-click

Press the button on the left side, then release—this is referred to in the book [click], used in the selection menu, to select the object, choose Tool buttons, edit configuration graph, confirm settings.

- Double left click

Press the button twice in rapid succession on the left side—this is referred to [Double] in this book, applied to attribute setup for existing parts on the screen: screen and window attributes, HMI connection properties, set properties; to change settings of Historical data collector, recipes, alarms and other control options.

- Right-click

Press the key on the right, then release—this is referred to in the book [right-click]. Right-click on a part can open the right drop-down menu, or right-click in the space display the context menu. You can also quit the editing state, restore the mouse state.

- Drag

Move the mouse while hold the button-- this is called in the book [drag], using the drag operation can select multiple items to move parts, mobile pop-up edit windows.

While edit with HMITOOL configuration software, the shape of the mouse will changes with different operations to distinguish different types of operation. The following table shows available operations under various shapes of the mouse when edit screens:

Mouse shape	Executable operation
	Select objects; click tool buttons
+	Paste
	Draw graphs
	Input text
	Enlarge the objet vertically
	Enlarge the objet horizontally
	Enlarge the objet vertically and horizontally
	Readjust
	Enlarge the objet vertically and horizontally
	Rotate the object

Table below lists common shortcut keys. Designers can use these keys to quicken the configuration.

Shortcut keys	Executable operation
CTRL+C	Copy
CTRL+V	Paste
CTRL+X	Cut
CTRL+F	Address Lookup
CTRL+ drag	Copy the selected objet and move it
CTRL+left click	Select multiple objects
←→↑↓	Move the selected objet left and right, up and down
ESC	Undo the operation
DEL	Delete

2.4.2 Common Terms

Common Terms	Description
Project	Shortened from user's application system. Introducing the concept of project means to make complex computer expertise easier for the general engineers. Files created in HMITOOL configuration is suffixed by .vpm; it can be stored in any specified location.
Object	Operating goals and operating environment, collectively called Object, such as windows, components, data, graphs and objects.
Select the object	Making a window or object operable by a mouse click is referred to select object, the selected object (including windows) is also known as the current object
Configuration	Define, create and edit object in a window environment and set its status feature (attribute) parameter

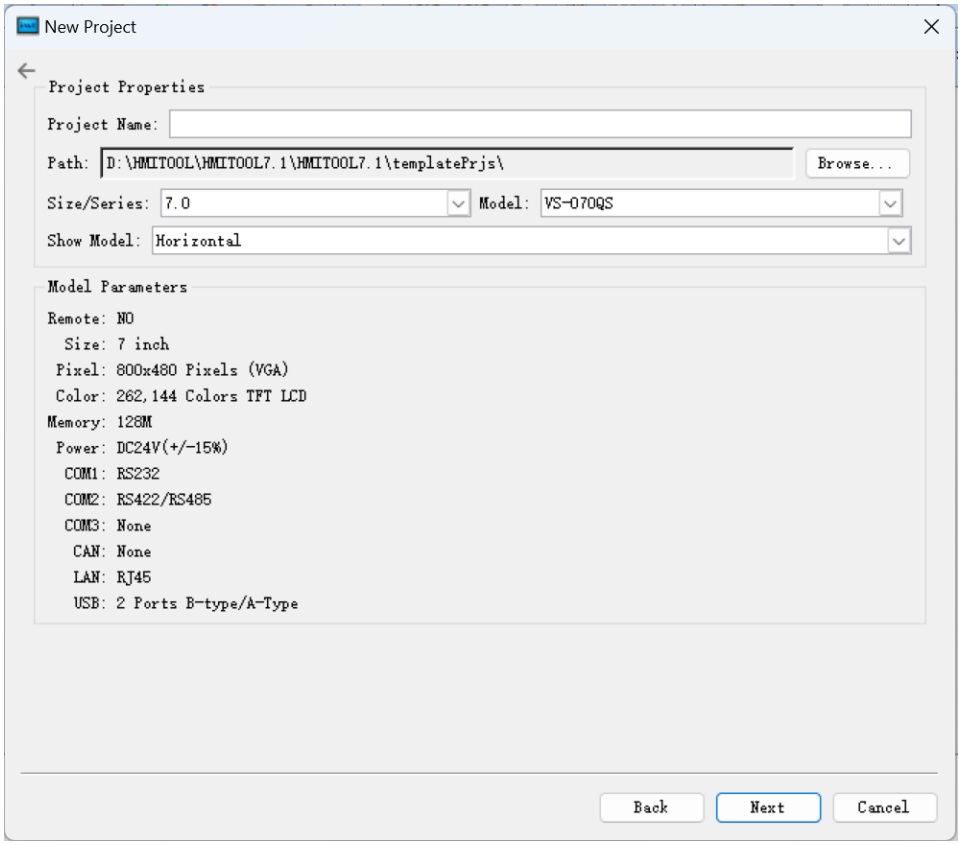
Common Terms	Description
Attribute	Name, genre, sate, property and the usage are called collectively Attribute
Menu	A set of execution commands. For example, the system menu "File" menu is used to dealing with execution commands related to project documents. HMITOOL menus are all pull-down menus that can also be divided into multiple levels, each known as a sub-sub-menu
Command Button	Buttons with certain command operations, part of which in the toolbar while part of in the menu bar
Set ON	Switch the object with bit status display to sate "ON"
Set OFF	Switch the object with bit status display to sate "OFF"
Style	A transition effect of object from the foreground to the background color
Address	Memory variables related to the current object
Connecting Device	Communication devices connected to current project
Control	Set of particular functions

3 Basic steps of creating a new project

This chapter introduces basic steps of creating a new project.

3.1 Create a new project

This operation is necessary when engineers need to create a new project. Select New Project in the File menu or New Project button  in the tool bar, then HMITOOL will pop up the "New Project dialog box" where you can decide the name and storage path of the project. Select the corresponding HMI model; click "OK" to complete creating a new project and enter into the dialog box of Communication port settings; click Cancel to exit the dialog box.



1. New project dialog box

- Project name: Project name of the new project
- Path: Storage path of new project file; the default is C: \
- Size/Series: The model number of the HMI used in the project is selected according to the actual size and model number, and the default model number is VS-070QS
- Show mode: Display direction of the HMI used by the project. Available models include:

Horizontal: Configuration with the HMI being horizontal; Vertical: Configuration with the HMI being vertical. The default mode is Horizontal

The figure above is the New Project dialog box where engineers decide the Name, Path, Model and Display Mode, then click Next to set communication port. Specific model is determined by the HMI model that user has.

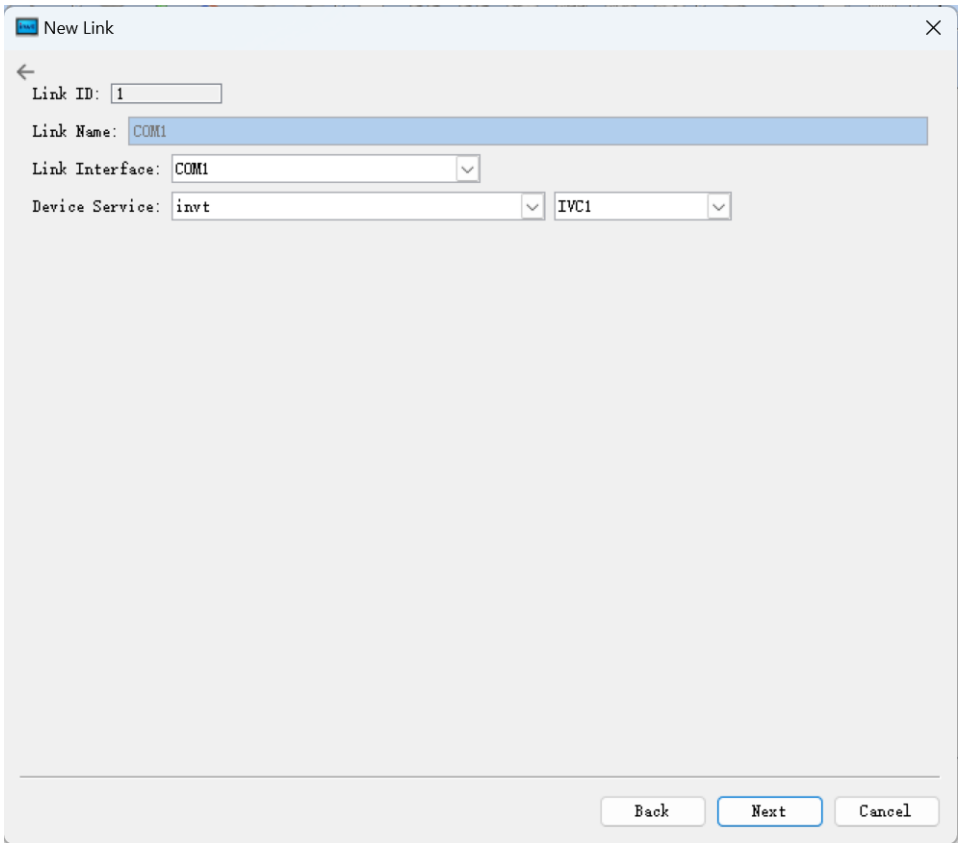
Note

- The name of the new project cannot contain the following characters: \ /: * "<> |?.
- The location of the new project cannot contain the following characters: \ /: * "<> |?.

2. Communication settings dialog box

Communication settings dialog box is used to set communication parameters of the communication port of HMI. Only correct communication parameters can ensure normal communication between PLC and HMIs. The specific communication parameters depend on the model of PLC to be connected.

- Connection ID: Internal parameters cannot be changed!
- Connection Name: The name of the communication port.
- Device Service: Selection of PLC brand and CPU type.
- Connection Interface: Select COM port or Ethernet port.
- PLC Continuous Address Interval: Set PLC consecutive address space; the default value is recommended.



The figure above is the dialog box of communication port settings where engineers choose corresponding device services according to types of connection devices. To use Ethernet connection, choose "Direct Connection(Ethernet)" option in the "Connection Type".

Note

- If the HMI used has multiple COM ports (e.g., VS-102QS), when only one PLC is connected, it is determined by the COM port used.
- If the touch panel used has only one COM port, only the COM1 port is set.

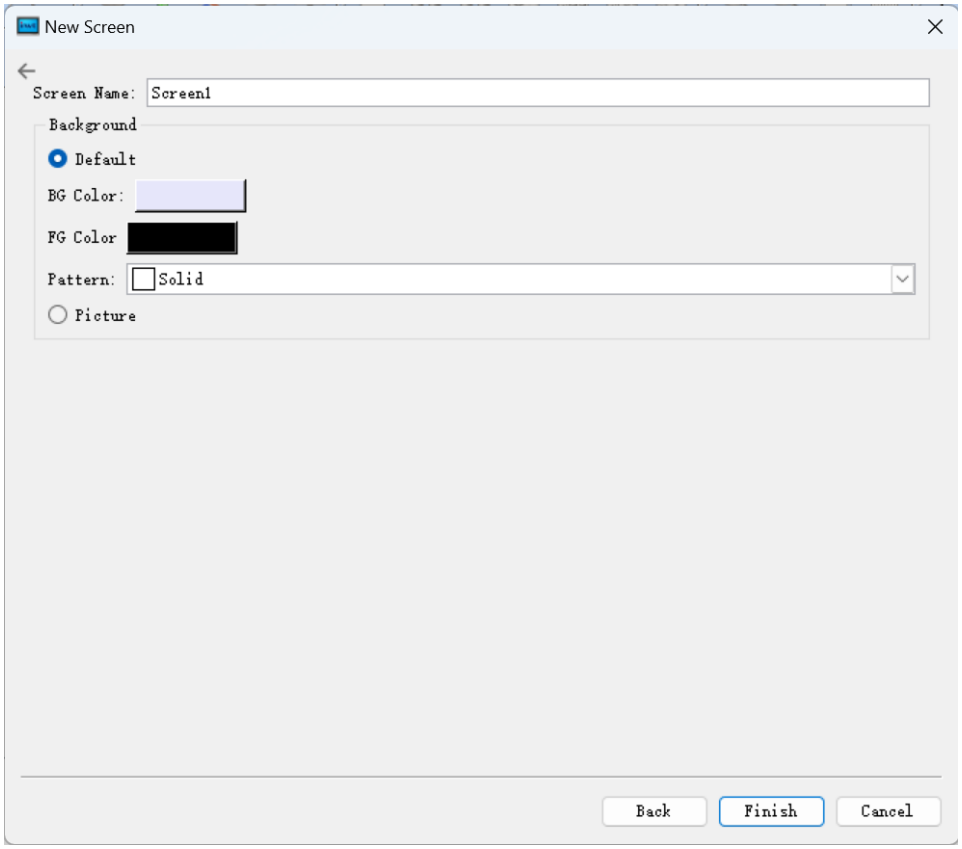
When you configure the communication properties can also be set in the Project Manager connection, the other parameters are set in the communication properties.

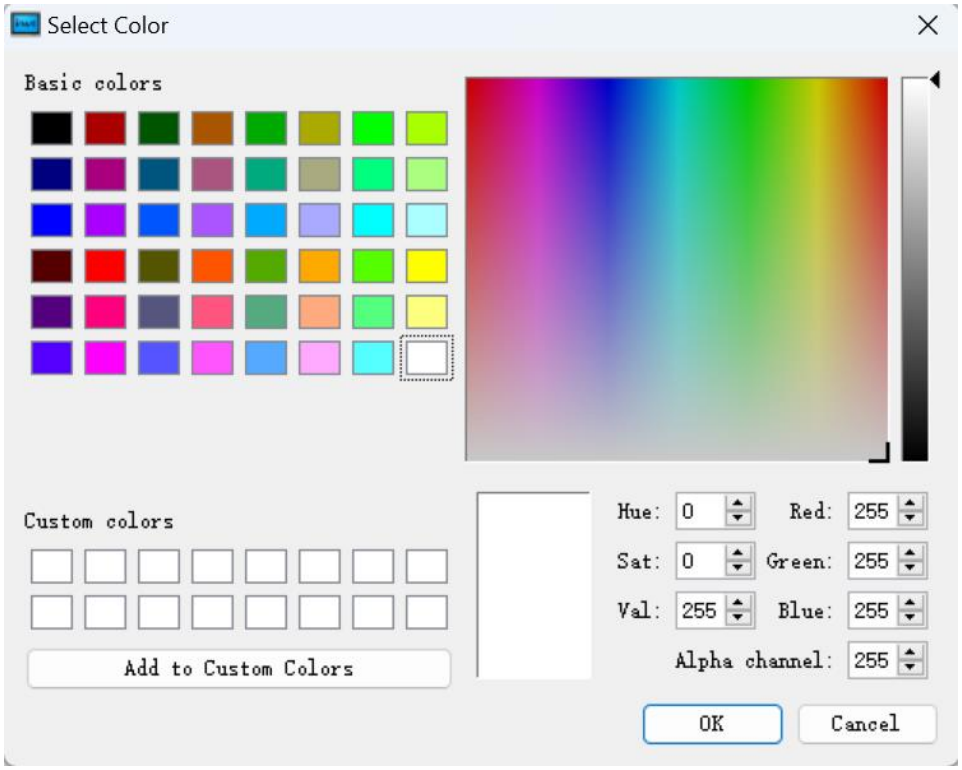
3. Screen Properties settings box

Click "Next" in the Communication settings dialog box to pop up a New Screen dialog box where you can set the name and the background color of screens. The default name is a screen number; the default background color is blue.

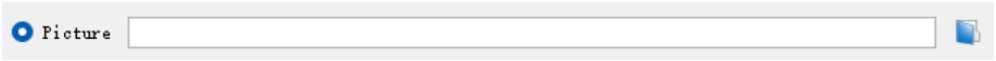
When we create a new screen every time, HMITOOL configuration software will assign a screen number to the new screen to indicate the screen order of the current project. Numbers start from 1, that is, the serial number of the first frame 1. No. 5 is the fifth screen.

To change the background color of the new screen, just click the rectangle behind the Background Color to bring up the color selection frame. With more than two hundred kinds of colors for users to select quickly, HMITOOL software provides the most extensive selection of color. If you are dissatisfied still, you can click on the lower right of the color selection box to customize color. In the Custom Colors dialog box, select the basic color first, then color in the middle of the square area; drag the mouse to adjust the desired color area; you can also type in the right vertical rectangle and drag the mouse to complete the desired color, at last click "OK". You can also enter directly basic color values.





Engineers can also choose own pictures as the screen background. Click the path icon to find the image path.



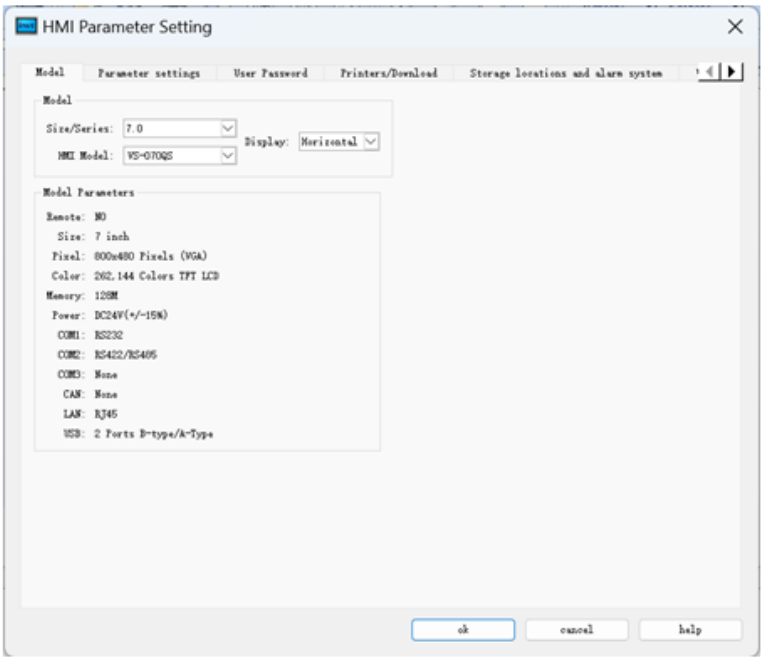
Click "OK" to complete the above steps, the system will immediately open the screen you just created. Preparations for new construction are done. Then it's time to edit own configuration project.

3.2 Set parameters and add graphic objects

3.2.1 Model settings

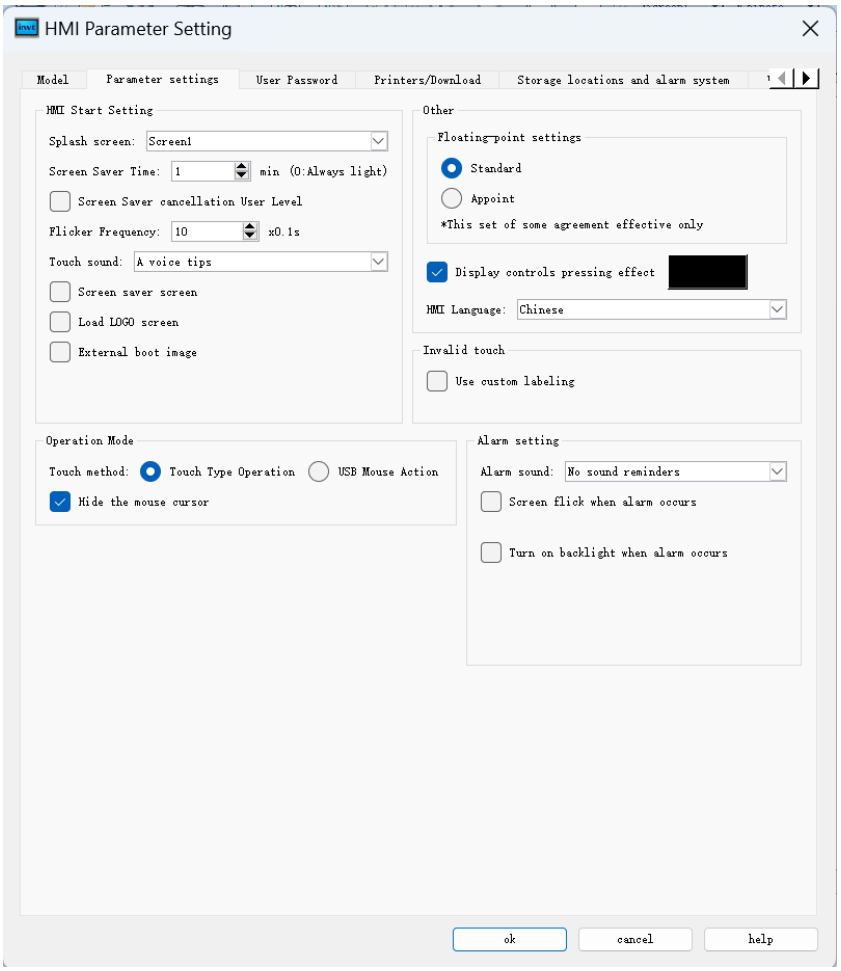
You can modify the parameter settings through Preference Setting in the drop-down menu Settings, or double-click the HMI Parameter Settings in Setting, Project Manager. Then a pop-up dialog box is shown as the figure below:

- HMI Model: Change the HMI model through this option.
- Display Mode: Adjust horizontal or vertical display screen.
- HMI Size: You can select the size of the HMI by changing the content of this option.



3.2.2 Parameter settings

The parameter setting screen is shown below:



1. HMI start setting

- Splash Screen: The start screen of HMI when powered on.
- Screen Saver Time: Set screensaver time
- Flicker Frequency: Set the flicker frequency of objects or controls which can blink; you can change the speed of flicker by inputting directly a value and clicking the spin button.
- Alarm Sound: When the alarm occurs, the HMI can remind users through sound; the right drop-down menu contains two cases, with or without sound reminder.
- Touch Sound: Options in the right drop-down menu can decide Sound reminder or No sound reminder.
- Screen Savers Screen: Select a screen among the existing screens as screensaver screen; just touch the screen to return the former screen.
- Load Logo Screen: If choose this option, the HMI will display the selected loading screen after power-on for a certain while, and then switch to the splash screen; thus users can give some tips or notes.
- External Boot Image: When this item is selected, the touch panel will display the selected external image after powering up, stay for the set time, and then go to the startup image.

2. Operation mode

- Touch Method: Users can choose whether to use touch operation or connect a USB mouse to operate.
- Hide Mouse Cursor: Whether to display the mouse.

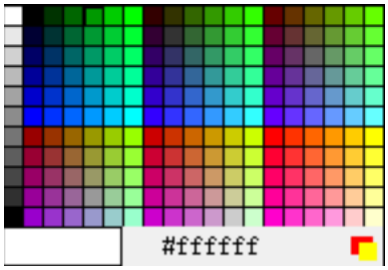
3. Other settings

Floating-point settings:

- [Standard]: High byte floating point ahead while the low one behind;
- [Appoint]: Users determine the order.

4. Display controls pressing effect

HMITOOL is newly added pressing effect display. When the pressing effect is applied, rectangular pressing trace will appear if users touch the control. The pressing trace color depends on user's preference. Currently Bit switch, Word switch, Screen button, Function button, Numeric input and ASCII input controls support this effect. The default is No effect.



5. Invalid touch

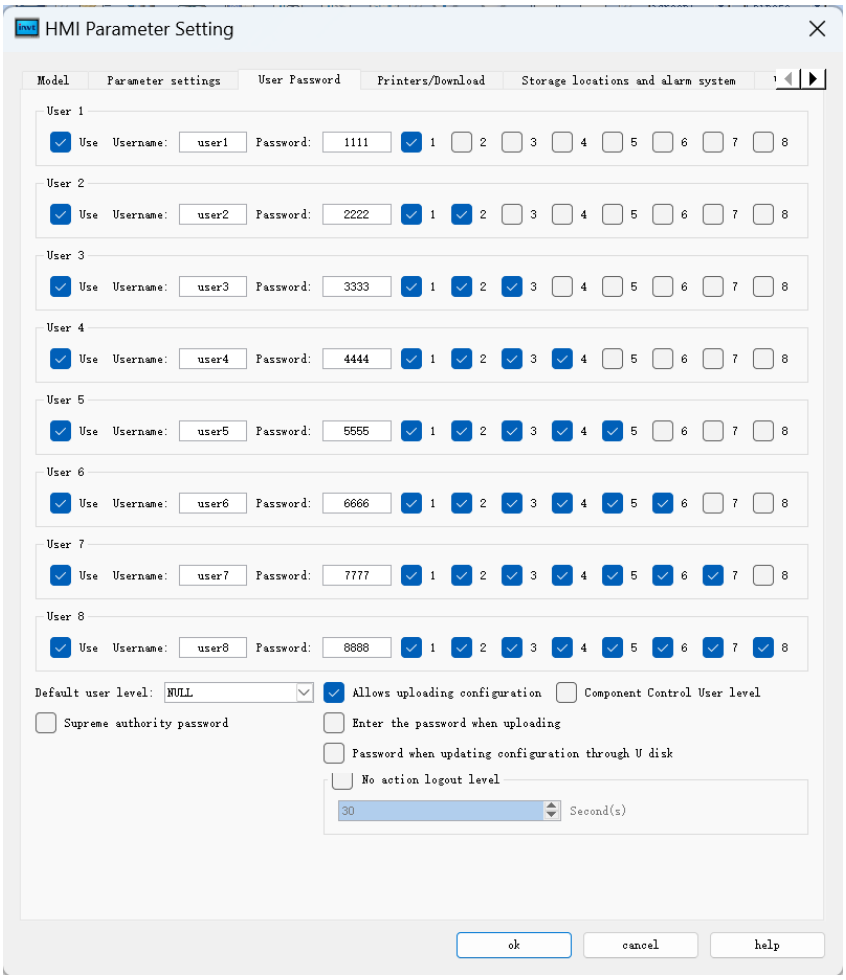
Select the "Use custom labeling", which means touchable controls cannot be touched, then the image marking the control chosen by user is untouchable.

Note: Pressing effect of elliptical controls is still a rectangle.

6. Alarm setting

Alarm Sound: When an alarm is triggered, the touchscreen can provide an audio alert to notify the user. The dropdown menu on the right offers two options: sound alert enabled or disabled.

3.2.3 User password

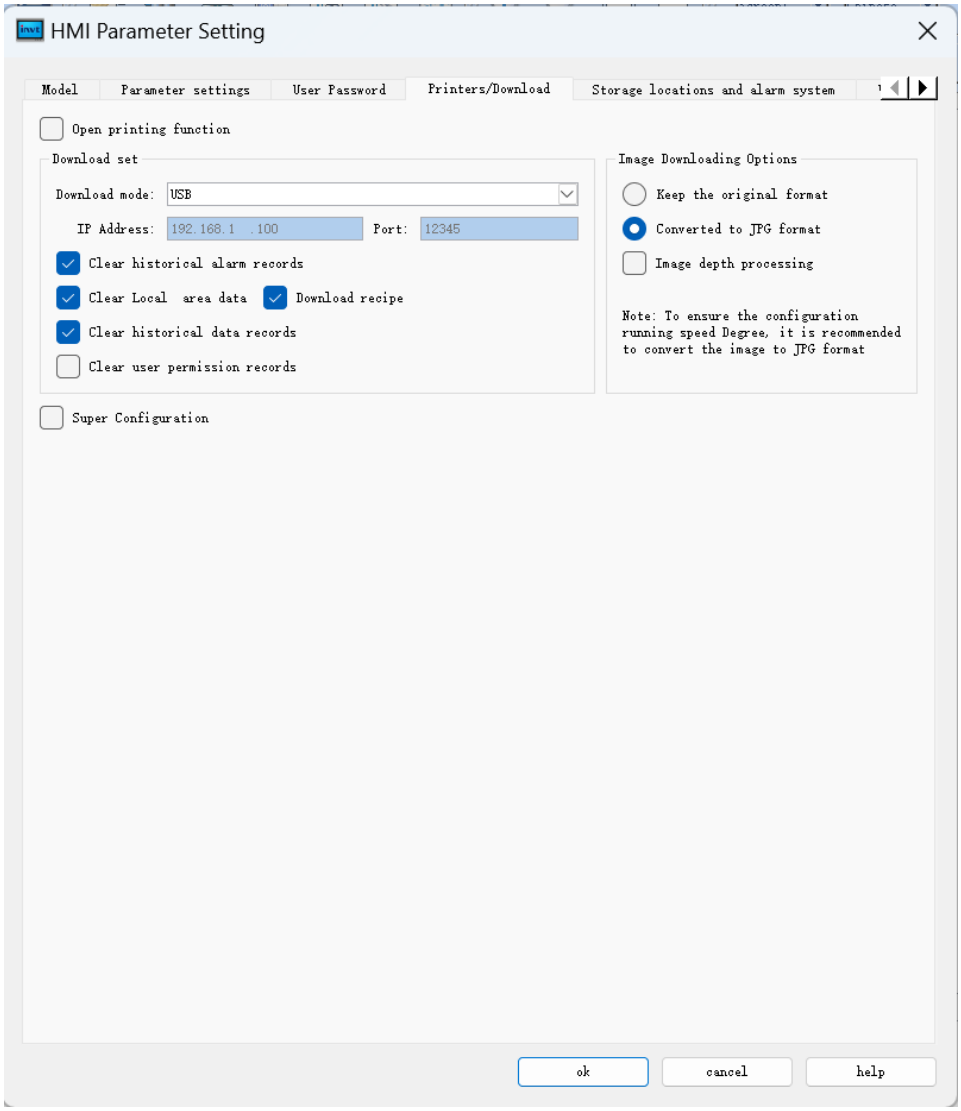


This function has 8 sets of user password, each of which has eight levels of password for users to choose.

- The default user level: The current default user class is NULL.
- Allow uploading configuration: If select this option, you can upload the project from HMI to PC; otherwise it cannot be uploaded.
- Enter the password when uploading: Whether uploading projects requires a password.
- Password when updating configuration through U disk: The password set up, the password is necessary when you update the HMI configuration projects through U disk.
- Supreme authority password: This password can operate all controls limited by grades.
- Upload: Whether this password enables upload configuration projects from HMI to PC.
- Permissions: Whether this password can perform all limiting operations.

3.2.4 Printers and download

Settings of connection to the printer and downloading:



This page contains parameter settings of connection between the printer and the HMI; users can select corresponding parameters according to printer models.

1. Download settings

- Download mode: Users need to select USB or Ethernet connection to download. If choose the Ethernet, it's necessary to set the IP address and port number (IP address and port number are those of the HMI).
- Clear historical alarm records: Whether to clear the history alarm information before downloading.
- Clear Local area data: Whether to clear the data information saved in the power-down holding area when downloading;
- Clear historical data records: Whether to clear the history data information before downloading.
- Download recipe: Whether to download recipes in the current project to the HMI.
- Clear User Permission records: Whether to clear the user permission information stored in the HMI before the download.

2. Image downloading options

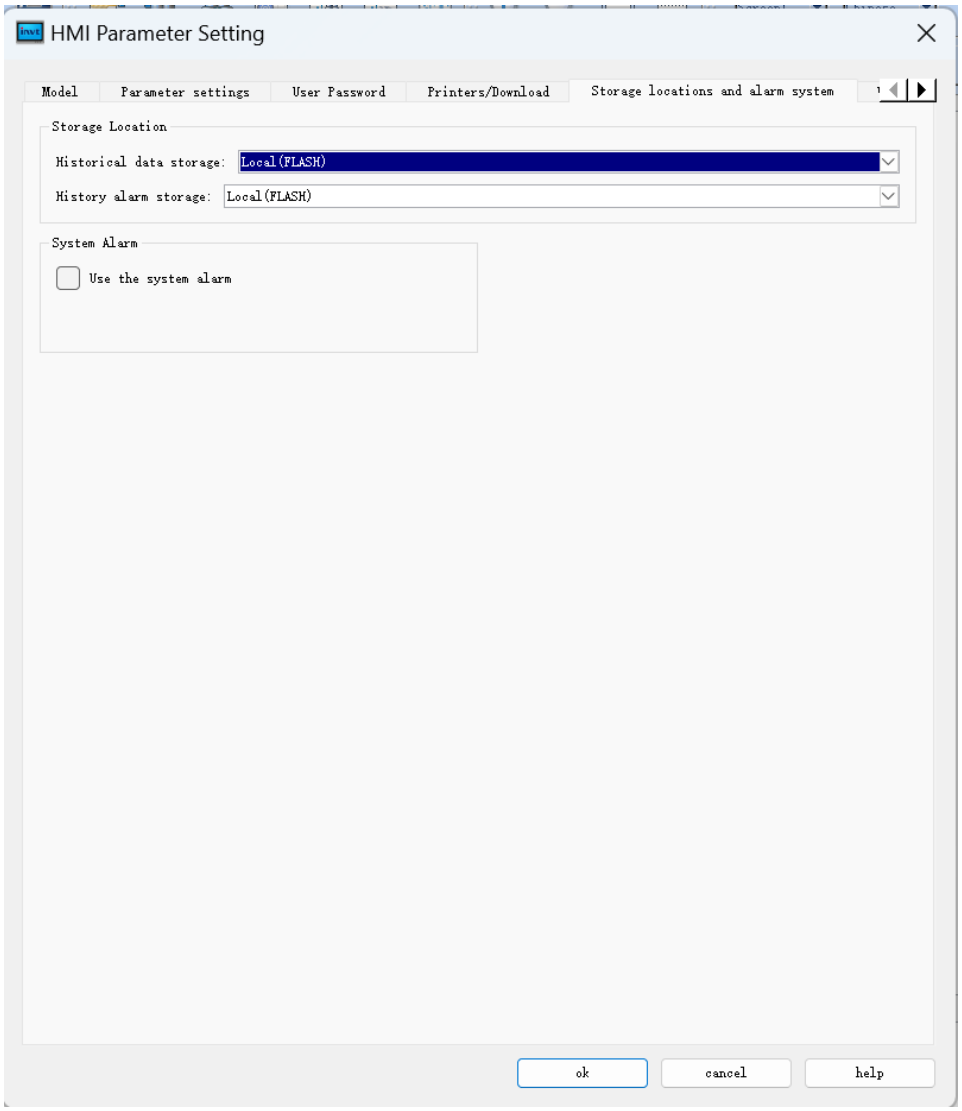
Keep the original format: Selecting this option means retain the image format unchanged when downloading.

Convert to JPG format: Convert all images to JPG format before downloading them into HMI.

Note: Due to the larger space occupied by BMP format images, it's suggested to select this option.

3.2.5 Storage location and alarm system

Storage location and alarm system, as shown below:



1. Storage Location

It is the location for historical data, historical alarm and screen shots. Provide "Local (FLASH)", "U disk" two options for users to choose according to their need. The default is Local (FLASH).

2. Alarm System

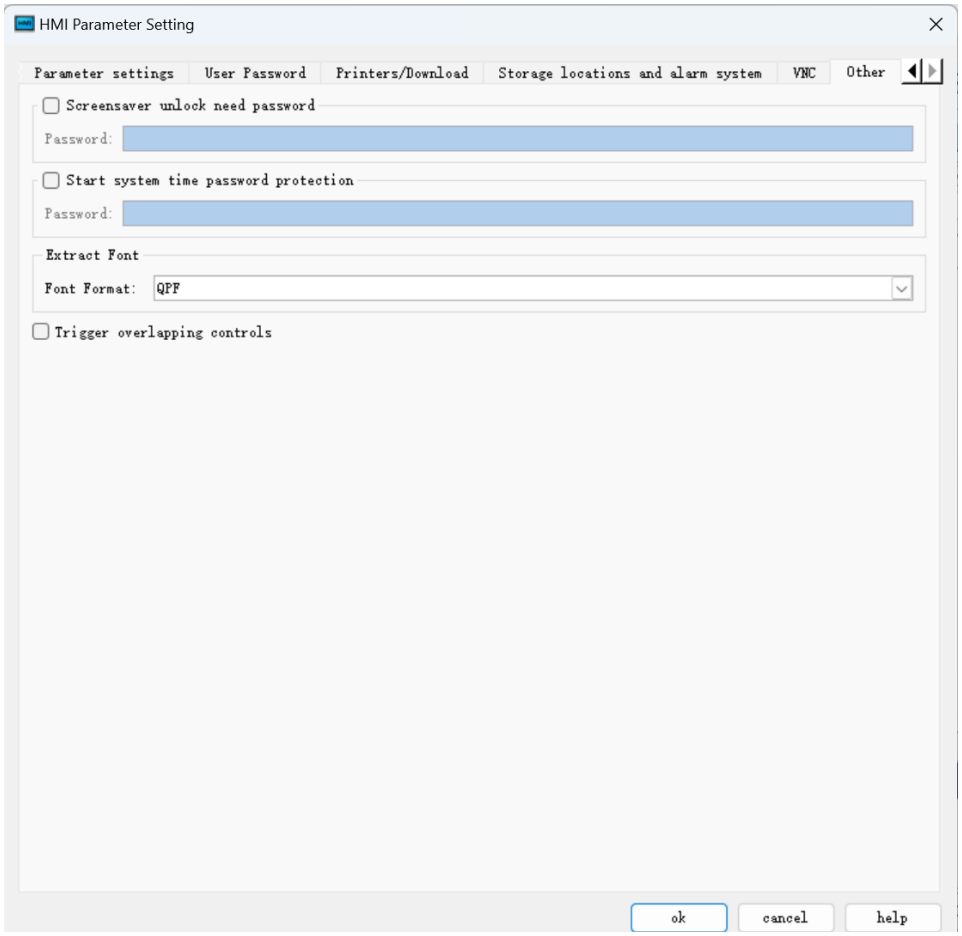
Use the alarm system: Whether to use the system alarm. When an alarm occurs, the alarm system displays the current alarm information at the top or bottom of each screen according to the options set by users.

Alarm background color, Text color, Font and Font size, these are attributes options of the alarm display system. Users can set these options as needed.

- Way of display: "Always display" refers to the alarm displayed all the time; "Cyclic display" means that alarm display or disappear within a certain period to achieve the flicker effect.
- Position of alarm bar: Choose the position where the alarm bar appears.

3. Other setting

Other setting as show below:



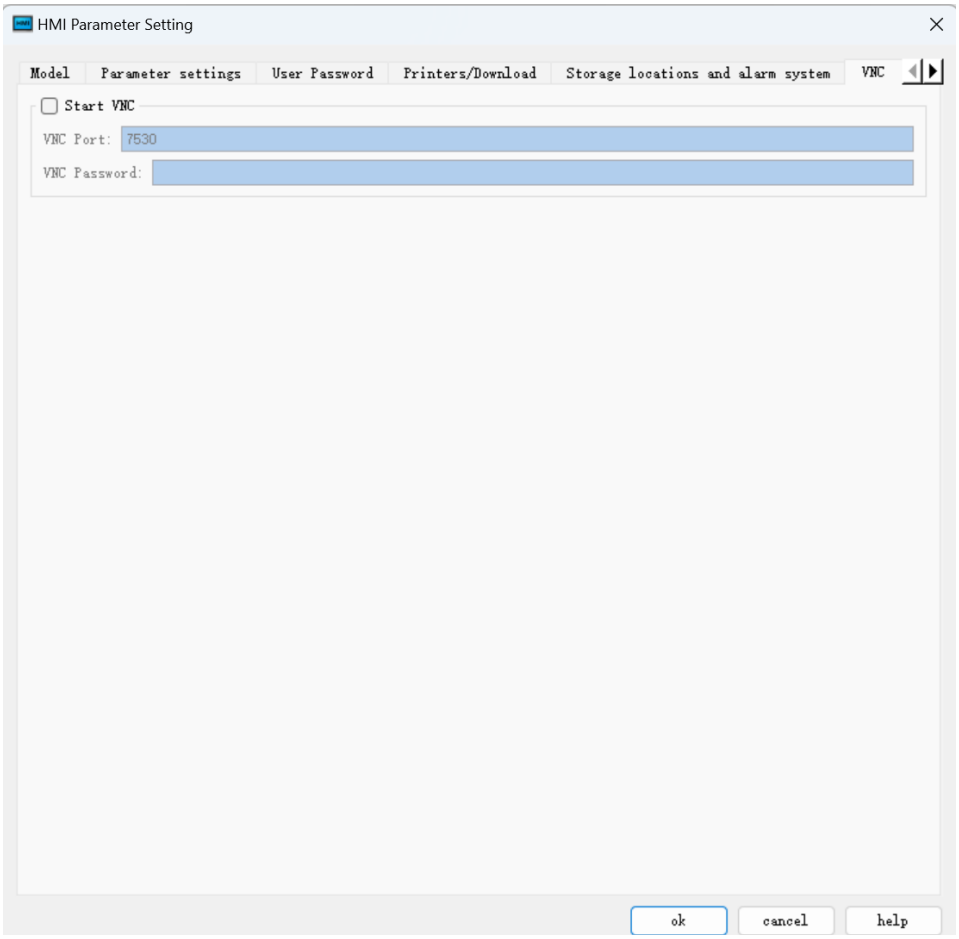
If checking out this section, users need to input this password when unlocking the screensaver.

Start system time password protection: When you enable this option, you need to properly enter the password set here when modifying the HMI system time, allowing the user to modify the HMI system time.

4. VNC settings

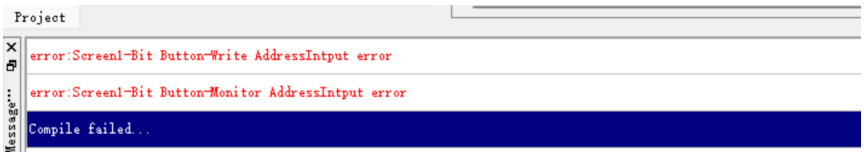
- Start VNC: Enable VNC Settings
- VNC Port: Set the VNC port number
- VNC Password: Set the VNC connection password

The special type HMI supports remote through the VNC connection HMI operation, detailed reference to the "VNC connection".

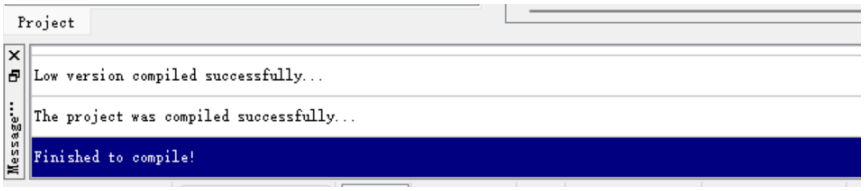


3.3 Download configuration projects

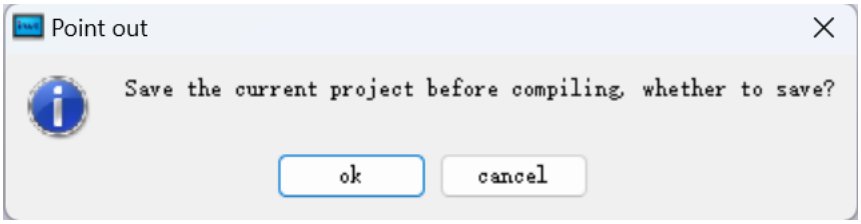
Step 1 When complete the editing of configuration, you need to click the button on the toolbar or employ the shortcut Ctrl + S, and then click button and wait for the system to compile. During the compilation, the information output window will show the situation in real time. It cannot complete the compilation if error exists, as shown in the figure below:



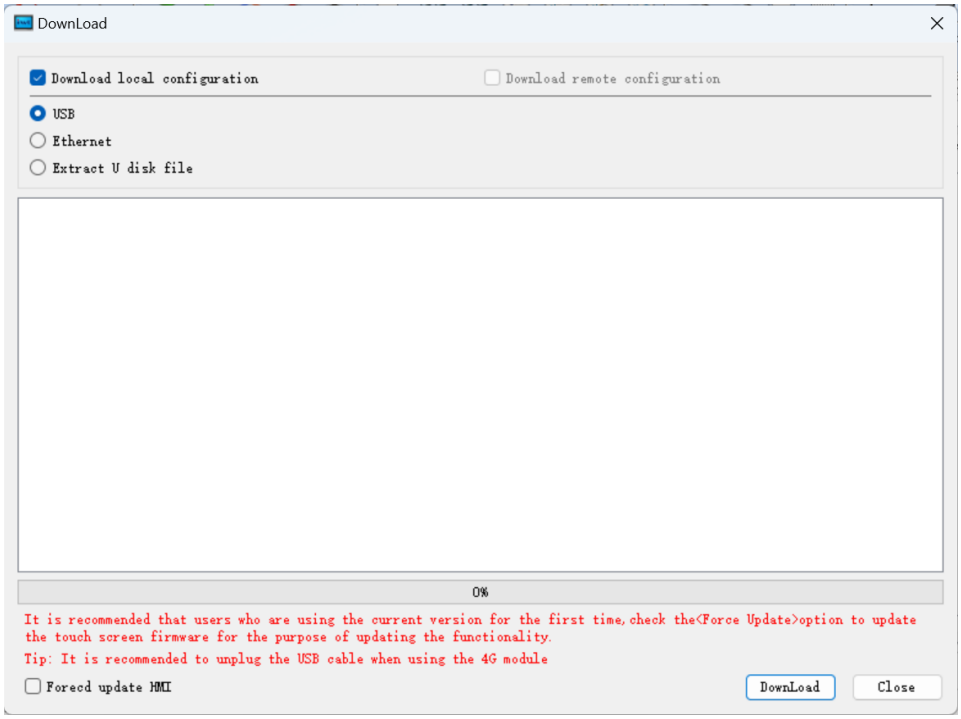
You can modify it according to the error hint in the information output window; or you can also double-click the error, then HMITOOL will automatically find the wrong object as well as select it. So engineers can double-click on the object to view its property settings, find the reason of the error and make appropriate alterations. After click the Save button to compile and execute the command again. If there is no error, the system will pop up a dialog box indicating successful compilation after a while. At last, click "OK" to finish it, as shown in figure below:



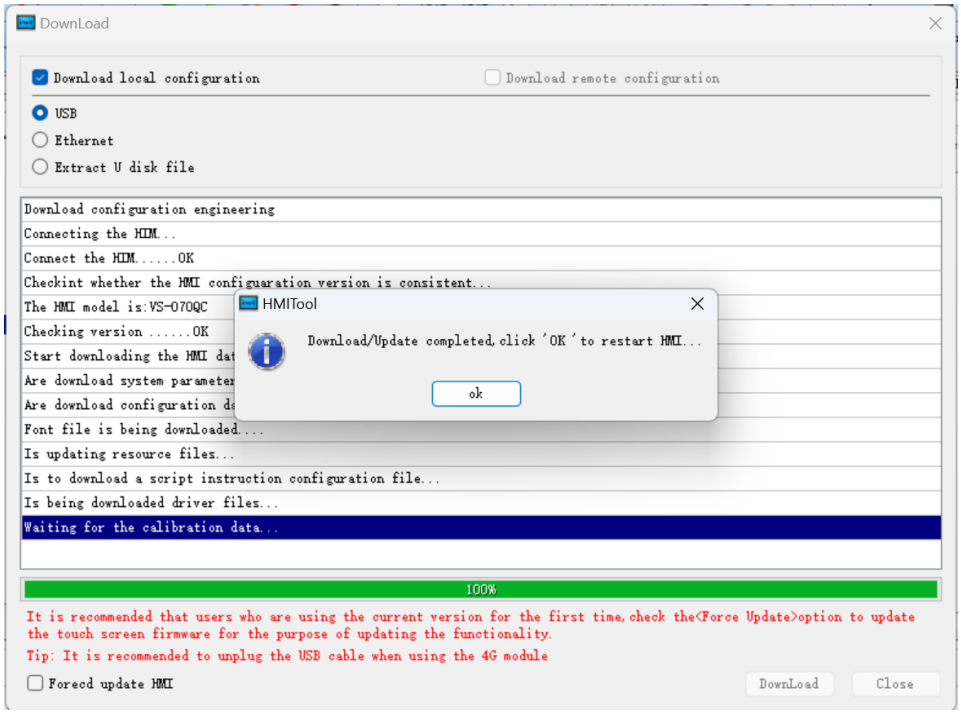
Note: It's necessary to compile before downloading while the step of conservation is required before compiling. Otherwise it will fail to compile, as shown in figure below. After compilation, if you modify again, you need to compile again.



Step 2 Finally, select Download HMI Configuration in the Download menu, and the engineering configuration designer can select any from **USB**, **Ethernet**, or **Extract U disk file**, as shown in the figure below:



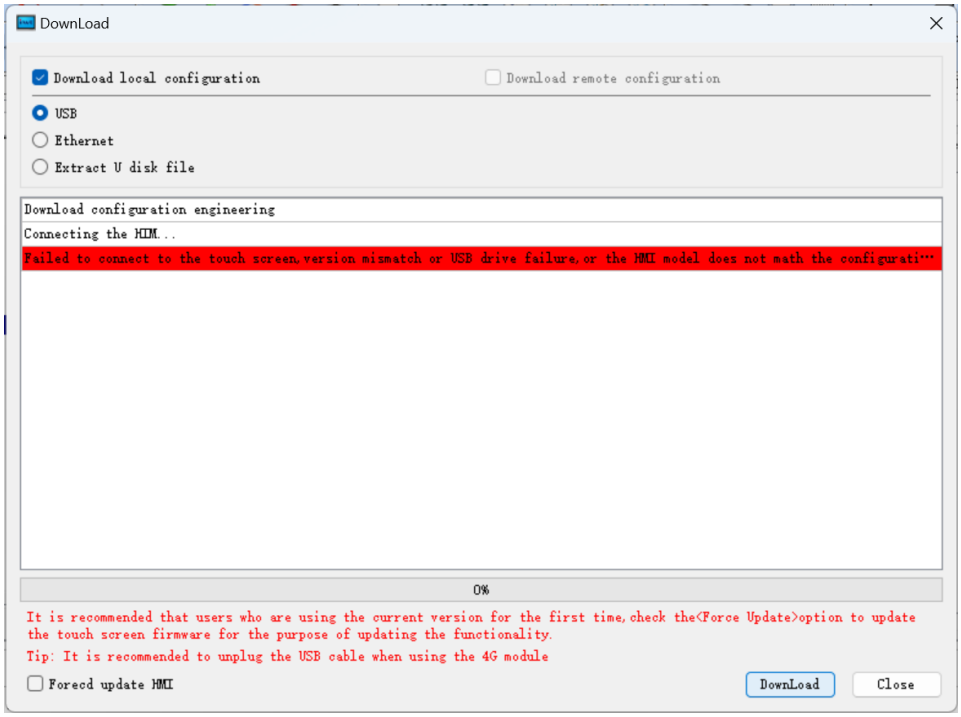
Step 3 Click to download; the middle progress bar shows the downloading progress. After the downloading, a pop-up window shows the completion of USB download. Click "OK" to complete the downloading task, as shown in figure below:



Step 4 The next step is the connection to the PLC to see whether the configuration project runs correctly in HMI. Ways of connection between HMI and PLC or PC are shown in "1.5 Wiring" in Hardware handbook.

Note:

- ✧ Do not cut off the power of HMI, PC or USB cable and avoid other operations during the transmission process; otherwise it will be affected.
- ✧ Please install the USB drivers before downloading; otherwise the PC will not be connected to HMI. Thus you will not be able to complete the downloading task.



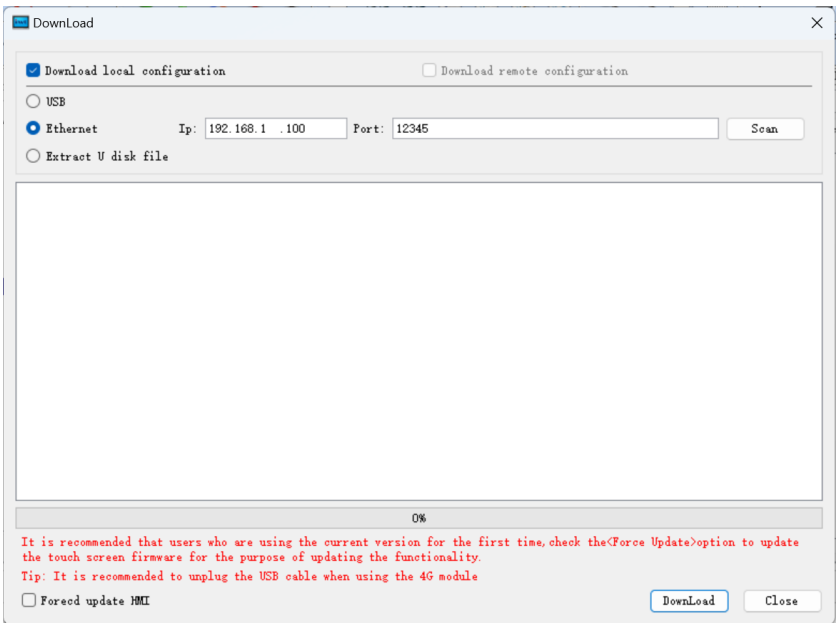
Note: When the dialog box shown above pops up, it means that the version does not match or the PC fails to recognize the HMI, at this time you can check whether the USB driver is installed. Connect the PC and HMI,

power on the HMI, you can in the Windows "My Computer" > "Properties" > "Hardware " > "Device Manager" > "Universal Serial Bus Controller" to find out whether there is a USB driver. You can try to unplug the USB cable to check whether the PC can recognize the HMI.

Downloading configuration through Ethernet

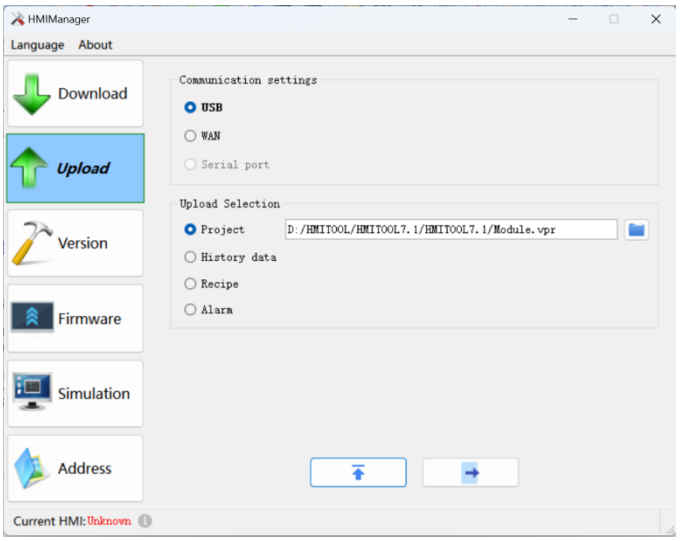
Set HMI network parameter settings: In the download interface, set the IP and port of which the IP can be set according to your own needs, here set to 192.168.1.100, the port is fixed to 12345.

Compile the configuration: If select downloading configuration through Ethernet it is necessary to input IP address and port number in the input box. IP is that of the downloading target HMI. The IP here is 192.168.1.100 as above, and the port is fixed to 12345. Then click to restart and download, as shown in figure below:



3.4 Upload configuration programs

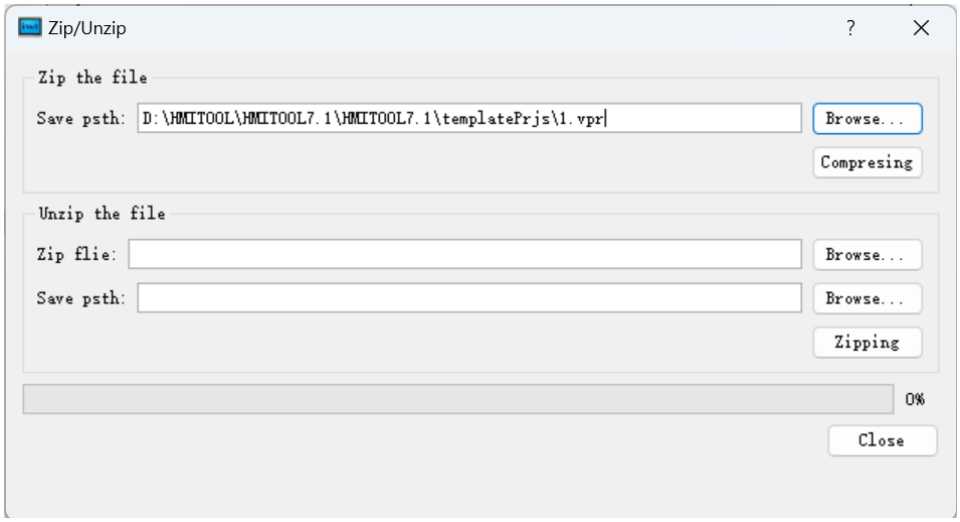
HMITOOL software supports uploading configuration program from the HMI to the hard disk. Connect HMI to PC; select "Upload Processing" in , and then select "Upload Configuration" in the pop-up dialog box, the interface of uploading will be displayed. Select the path where you want to save the file, click "OK", and then click Start Upload to save the configuration program to the selected file path.



Note: HMITOOL configuration software also supports uploading historical data, recipes and historical alarms. Selecting Upload Historical Data allows you to upload historical data from the HMI to the hard disk, and other similar.

3.5 Zip/Unzip

Select "Zip/Unzip" in the Download menu to open the dialog box.



- **Zip the file:** Zip the project file to generate a compressed file suffixed **.vpr**. Used external images will be also packaged into the compressed file. If users send the compressed file to another computer, the images still exist after unzipping. However, if only sending the configuration project file, you will lose external images in other computers because the external images could not find the original image path.

  Save Path: Location to store the compressed file; after selecting the save path, Click "Compression", and then close it when the progress bar reaches 100%.

- **Unzip the file: Decompress** a file-suffixed .vpr into that of .vpm which can be opened directly in HMITOOL.

  Zip file: Choose files to be extracted.

  Save Path: Location to store the decompressed file suffixed .vpm; after selecting the save path, click "Zipping", and then close it when the progress bar reaches 100%.

4 HMITOOL configuration guidelines

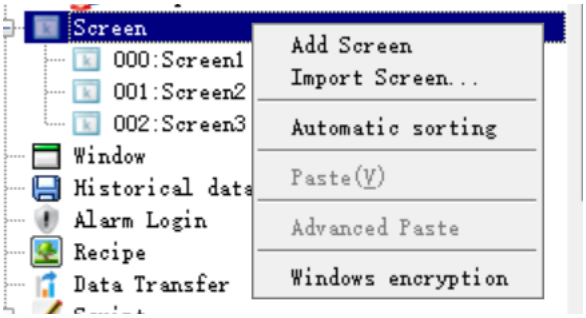
4.1 Screen operations

This chapter details screen operations of HMITOOL configuration.

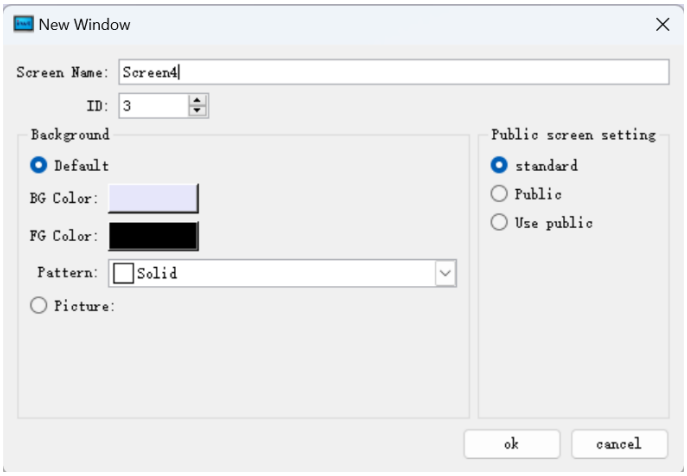
4.1.1 Create a new screen

"New Screen" command is used to create a new screen in the current project. Steps of creating new screens are as follows:

(1) Select the "New Screen" command in the Screen menu or click the button command  or right click the Screen menu in the project manager, and then select "Add Screen", as shown in figure below:



(2) In the pop-up "New Screen" dialog box, set the name and background color of the new screen, then click "OK". The default name of the new screen is a screen number; the default background color is blue, as shown in figure below:

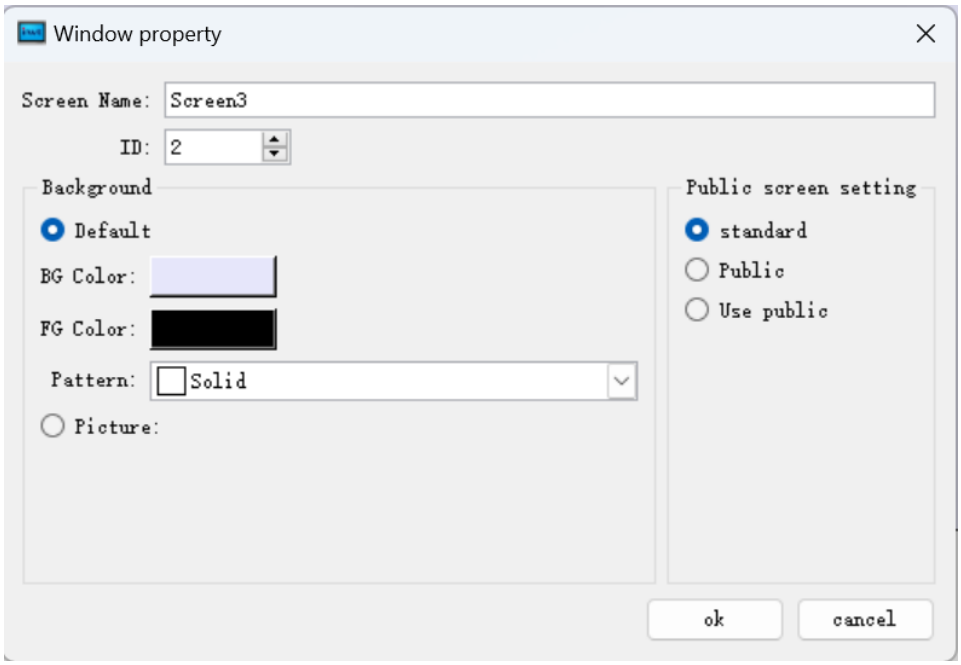


4.1.2 Modify screen properties

To modify the properties of the screen, including the name, background color, you can perform the following operations:

Under the circumstances that no object or control is selected (you can click blank space in the current screen), select the  command on the toolbar or left click to select the screen in the project manager,

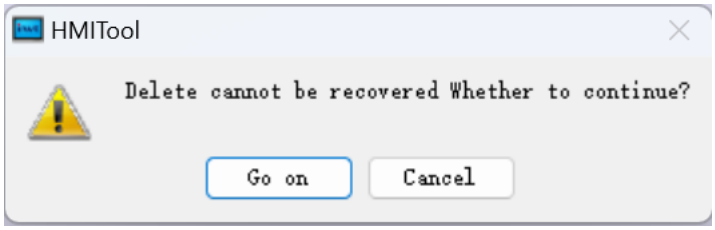
and then right click on it or you can right click in the screen while on object is selected in order to bring up the context menu in which you can find "Property" command.



4.1.3 Delete a screen

This command is used to delete the screen in the current project; methods are as follows:

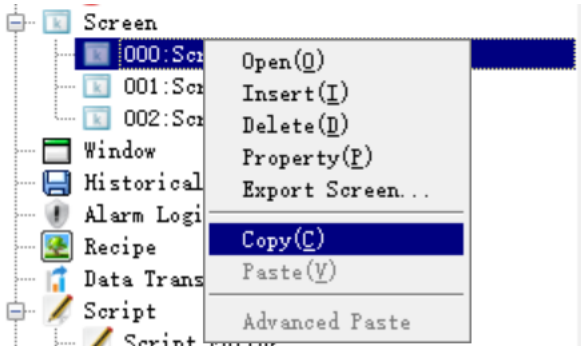
Select " Delete Screen" in the Screen menu; or left-click to choose the screen to be delete in the project manager, then right click to select "Delete" key; or right click in the blank space in the screen while on object is selected in order to bring up the context menu in which you can find "Delete" command. Click "Go on" to complete the operation of deleting.



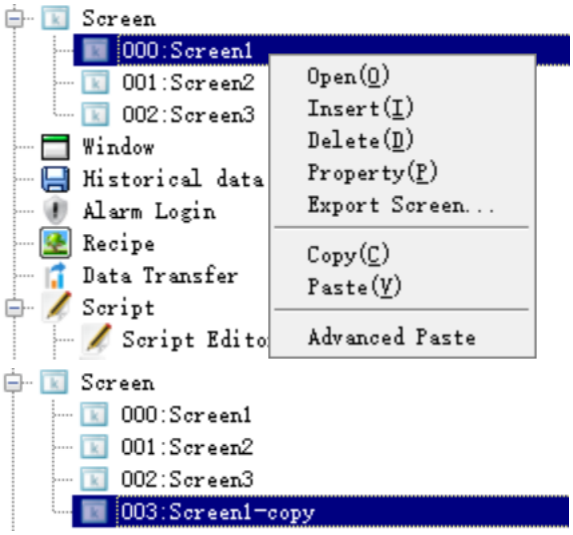
4.1.4 Copy a screen

This command is to copy the screen in current project; methods are as follows:

Left-click on the screen to be copy in the project manager, then right click to bring up the context menu and select "Copy", will be prompted to set the new screen name, enter the name, enter the screen number, and select "OK", the screen that is copied and listed, select "Cancel" to cancel the current operation, as shown below:



Right-click in the screen options, pop-up right-click menu, at this time, "Paste" option becomes bright, click "Paste" to complete the copy process. The generated copy of the screen number is automatically added one, the screen name for the copied screen name + "- copy", as shown below:



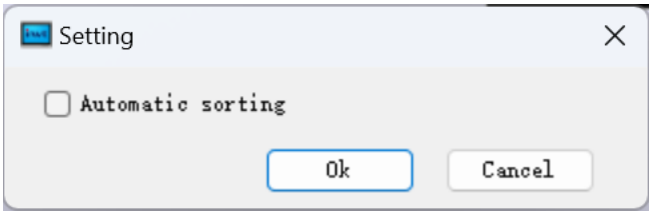
4.1.5 Automatic sorting

The automatic sort command is used to sort the screen number in the current screen. Methods are as follows:

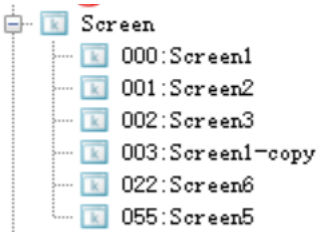
Select the project manager the screen option by clicking the left mouse button, then right-click menu select "automatic sorting and automatic sorting will prompt the settings screen, select the automatic sorting function, click "OK", can carry out sorting operation on the current screen (from small to large order). The specific process is shown in the following:

Click the left mouse button options, and right-click to choose "Automatic sorting".

Check the automatic sorting, and click "OK".



The sorting results are shown below:



4.2 Graphics editing commands

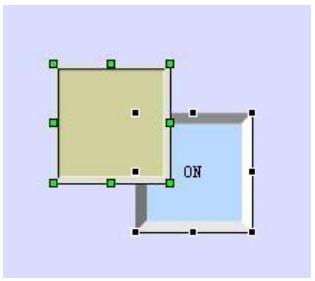
This chapter details HMITOOL graphical editing commands.

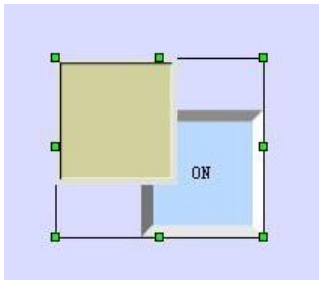
4.2.1 Group and ungroup

The combination command is a group command, which is to combine 2 or more graphics objects and controls in the current screen into a graphic object, a whole, and 2. The contents of the combination can be graphics drawn by engineering designers, or drawn by themselves, or can be system library graphics, or other controls, such as alarm controls, trends, and so on. After the combination control, keep the property of the original control object, which can be modified. The cancellation combination is to decompose the graph which is combined with the combination command into several original combination elements, and cancel the combination command is the reverse operation of the combination command.

Methods of grouping:

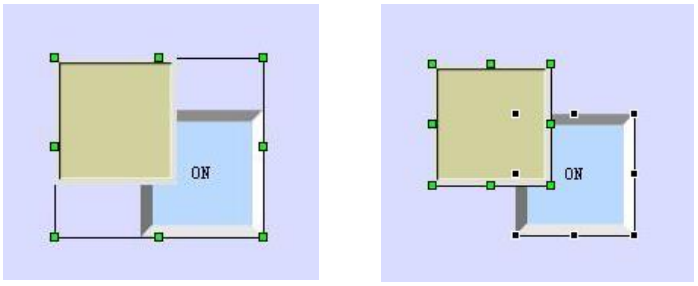
First it needs to select multiple graphic objects, and then select the Group command  in the Edit menu, or that command button in the toolbar menu, or right click to bring up the context menu and select "Group" item, before and after comparison picture is as figure below:





Methods of ungrouping:

Select a combined graphic object from grouping, and then select the Ungroup command in the Edit menu, or in the toolbar menu, or in the context menu; before and after comparison picture is as figure below:



Note: Select multiple objects through Ctrl key.

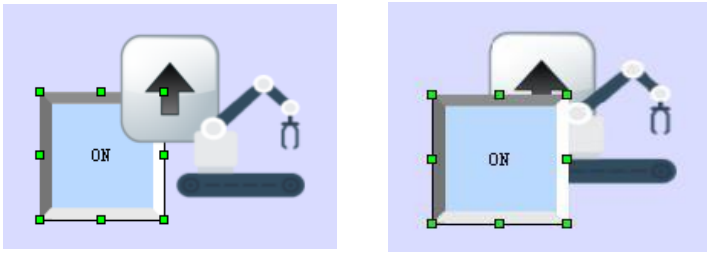
4.2.2 Layer

Layer Command is by group. It is used to adjust the display level of intersecting graphic objects. Each object HMITOOL has a graphic level; the top of the graphic objects are always displayed on top of the lower graphic objects, so you can use this command to adjust the hierarchy level. The default level of new graphic object is higher than that of original. HMITOOL Layer consists a total of four commands: Bring To Top, Bring Forward, Send to Bottom and Send Backward. To execute this command, you need first select one or more graphical objects on the current screen, and then select the corresponding command in the Edit menu or toolbar menu.

Bring to top:

Execute this command to move the selected graphic object to the uppermost layer of all graphic objects, so that the selected graphic object will overwrite the intersecting part.

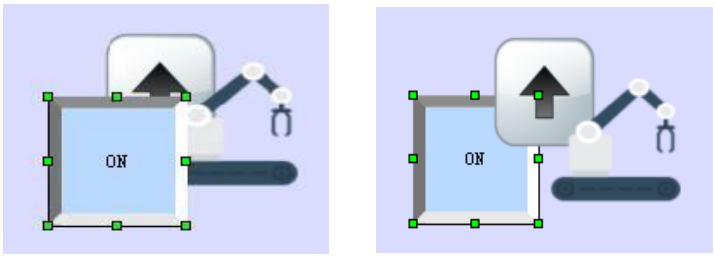
First choose an object in several graphs, and then choose Bring To Top command in Edit menu, or command button  in the toolbar buttons, or call the right click menu and choose Bring To Top command in the Layer option. See figure below for a comparison before and after combination



Send to bottom:

Execute this command to send the selected graphic object to the lowermost layer of all graphic objects, so that the intersecting part of the selected object will be invisible.

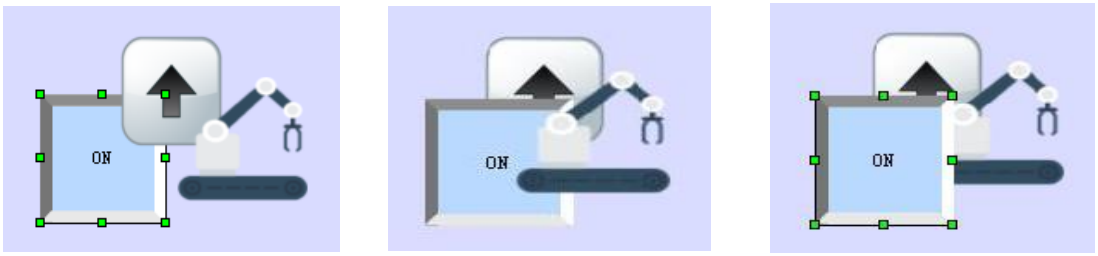
First choose an object in several graphs, and then choose Send To Bottom command in Edit menu, or command button  in the toolbar buttons, or call the right click menu and choose Send To Bottom command in the Layer option. See figure below for a comparison before and after combination.



Bring Forward:

Execute this command to bring the selected graphic object one level forward to the intersecting graphic objects. You first need to select one object in multiple graphic objects, and then select "Bring forward" in the Edit menu or the toolbar button, or right click to bring up the context menu containing "Bring forward" in the series commands of Layer.

First choose an object in several graphs, and then choose Bring Forward command in Edit menu, or command button in the toolbar buttons, or call the right click menu and choose Bring Forward command in the Layer option. See figure below for a comparison before and after combination.



Send Backward:

Execute this command to send the selected graphic object one level backward to the intersecting graphic objects. You first need to select one object in multiple graphic objects, and then select " Send backward" in the Edit menu or the toolbar button, or right click to bring up the context menu containing "Send backward" in the series commands of Layer.

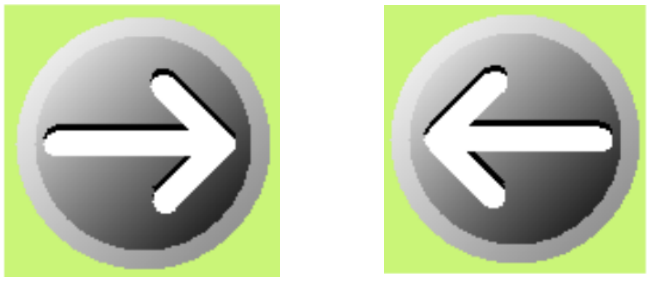
First choose an object in several graphs, and then choose Send Backward command in Edit menu, or command button in the toolbar buttons, or call the right click menu and choose Send Backward command in the Layer option. See figure below for a comparison before and after combination.

4.2.3 Rotary

This command is by group. HMITOOL configuration editor software allows engineers to rotate one or more graphical objects at any angle. Graphic objects that can be rotated to contain straight lines, circles, rectangles, graphics system library, controls, a combination of graphics, and polygons.

Flip horizontal:

"Flip horizontal" allows engineers to rotate the graphic object (may be a plurality of graphic objects) at 180° by the axis of vertical center in the horizontal plane after selecting. First select one or more graphical objects, then click "Flip Horizontal" in the Edit menu "Mirror" or click the Flip Horizontal button in the Tool bar  . When a single graphic object is selected, as shown in figure below:



Contrast before and after Flip Horizontal of single graph object

Flip vertical:

"Flip Vertical" allow engineers to rotate the graphic object (may be a plurality of graphic objects) at 180°by the axis of horizontal center in the vertical plane after selecting. First select one or more graphical objects, then click "Flip Vertical" in the Edit menu "Mirror" or click the Flip Vertical button in the Tool bar  . When a single graphic object is selected, as shown in figure below:

Contrast before and after Flip Vertical of single graph object

Rotating:

Currently, only the following 12 controls are supported to support this function: Time Display, Date Display, Week Display, Static Picture, GIF Display, Picture, Numerical Display, Numerical Input, ASCII Display, ASCII Entry, MultiState Lamp, MultiState Switch After rotation allows engineering design personnel selection controls, to object center as the dot, memory 360°. Select an object, click the "rotate" command in the edit menu, or click the rotate button in the tools button  .

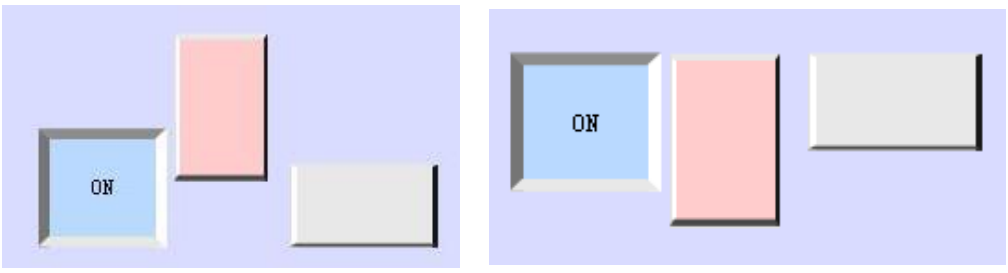
Contrast before and after Rotating

4.2.4 Alignment and size

This command is by group, so is the Size. HMiTOOL configuration software allows engineers to operate alignment and size operation on multiple graphical objects, but only when multiple graphic objects are selected. Users can hold down the key Ctrl to select the graphic objects to be aligned, or hold down the left mouse button and drag to delineate them. Alignment operations include a large number of editing commands: Left, Right, Vertical Center, Horizontal Center, Top, Bottom, Horizontal Equal Interval and Vertical Equal Interval, Make same width, Make same height, Make same height and width, etc.

Top:

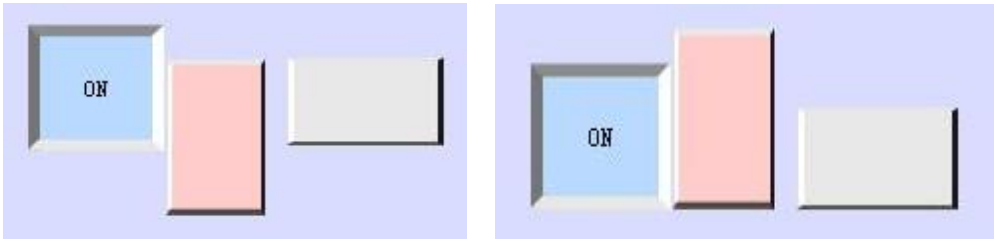
The command of Top Alignment allows engineering designers to top justify multiple graphic objects (no less than two graphical objects) through clicking "Top"  of the Alignment in the Edit menu or through the context menu. These graphic objects will take the highest edge of graphic objects as a reference, and then make them at the same level. Before and after comparison diagram of Top Alignment is shown in figure below:



Before and after comparison diagram of Top Alignment

Bottom:

The command of Bottom Alignment allows engineering designers to bottom justify multiple graphic objects (no less than two graphical objects) through clicking "Bottom"  of the Alignment in the Edit menu or through the context menu. These graphic objects will take the lowest edge of graphic objects as a reference, and then make them at the same level. Before and after comparison diagram of Bottom Alignment is shown in figure below:

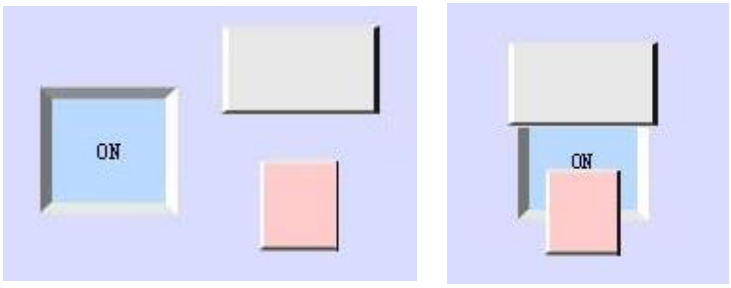


Before and after comparison diagram of Bottom Alignment

Vertical center:

The command of Vertical center allows engineering designers to make centers of graphical objects in the same vertical line (no less than two graphical objects) through clicking "Vertical center"  of the Alignment in the Edit menu or through the context menu. This vertical line is the vertical centerline of the leftmost and rightmost edges. Before and after comparison diagram of Vertical Center Alignment is shown in

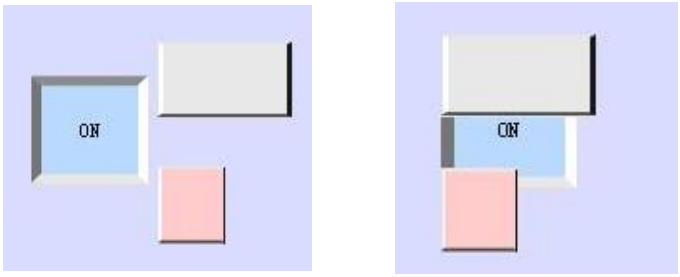
figure below:



Before and after comparison diagram of Vertical Center Alignment

Left:

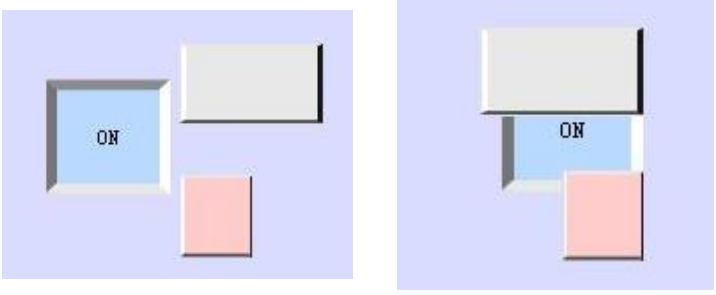
The command of Left Alignment allows engineering designers to left justify multiple graphic objects (no less than two graphical objects) through clicking "left" of the Alignment in the Edit menu or through the context menu. These graphic objects will take the leftmost edge of graphic objects as a reference, and then make the left sides of each graphic object along the same vertical line. Before and after comparison diagram of Left Alignment is shown in figure below:



Before and after comparison diagram of Left Alignment

Right:

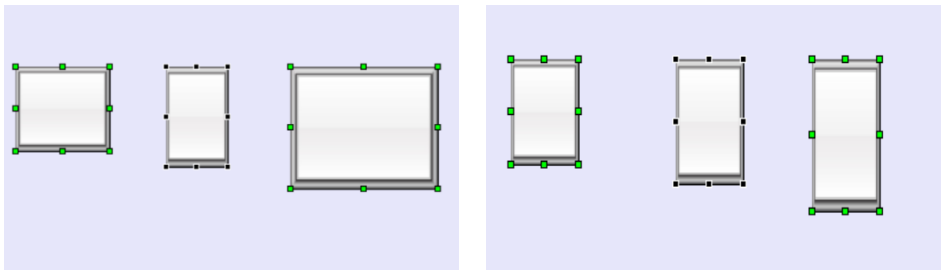
The command of Right Alignment allows engineering designers to right justify multiple graphic objects (no less than two graphical objects) through clicking "Right" of the Alignment in the Edit menu or through the context menu. These graphic objects will take the rightmost edge of graphic objects as a reference, and then make the right sides of each graphic object along the same vertical line. Before and after comparison diagram of Right Alignment is shown in figure below:



Before and after comparison diagram of Right Alignment

Make same width:

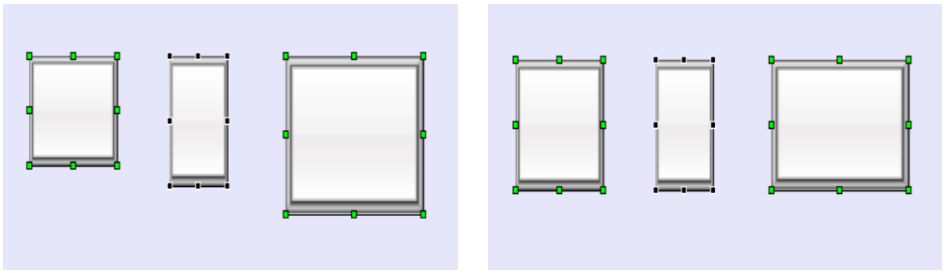
This command allows engineering designers to make multiple graphic objects (no less than two graphical objects) have the same width through clicking "Make same width"  of the Size in the Edit menu or through the context menu. These graphical objects will be reduced or enlarged by the upper left point while the height remains unchanged, so that the width of each graphic object is in accordance with what has been selected before (surrounded by black points while others by green points). Before and after comparison diagram of Make same width is shown in figure below:



Before and after comparison diagram of Make same width

Make same height:

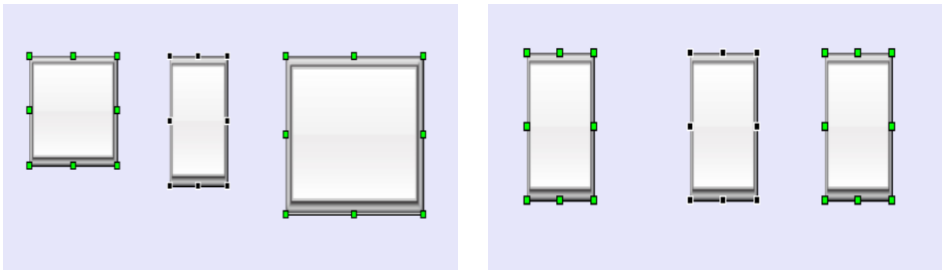
This command allows engineering designers to make multiple graphic objects (no less than two graphical objects) have the same height through clicking "Make same height"  of the Size in the Edit menu or through the context menu. These graphical objects will be reduced or enlarged by the upper left point while the width remains unchanged, so that the height of each graphic object is in accordance with what has been selected before (surrounded by black points while others by green points). Before and after comparison diagram of Make same height is shown in figure below:



Before and after comparison diagram of Make same height

Make same height and width:

This command allows engineering designers to make multiple graphic objects (no less than two graphical objects) have the same height and width through clicking "Make same height and width"  of the Size in the Edit menu or through the context menu. These graphical objects will be reduced or enlarged by the upper left point, so that the height and width of each graphic object is in accordance with what has been selected before (surrounded by black points while others by green points). Before and after comparison diagram of Make same height and width is shown in figure below:



Before and after comparison diagram of Make same height and width

Horizontal equal interval:

This command allows engineering designers to make multiple graphic objects (no less than two graphical objects) have the equal interval horizontally through clicking "Horizontal Equal Interval"  of the Alignment in the Edit menu or through the context menu.

Vertical equal interval:

This command allows engineering designers to make multiple graphic objects (no less than two graphical objects) have the equal interval vertically through clicking "Vertical Equal Interval"  of the Alignment in the Edit menu or through the context menu.

Note: Before executing commands of Make same width, same height, same width and height, please make sure whether the selected objects have been rotated. The height and width of rotated object also rotate with itself.

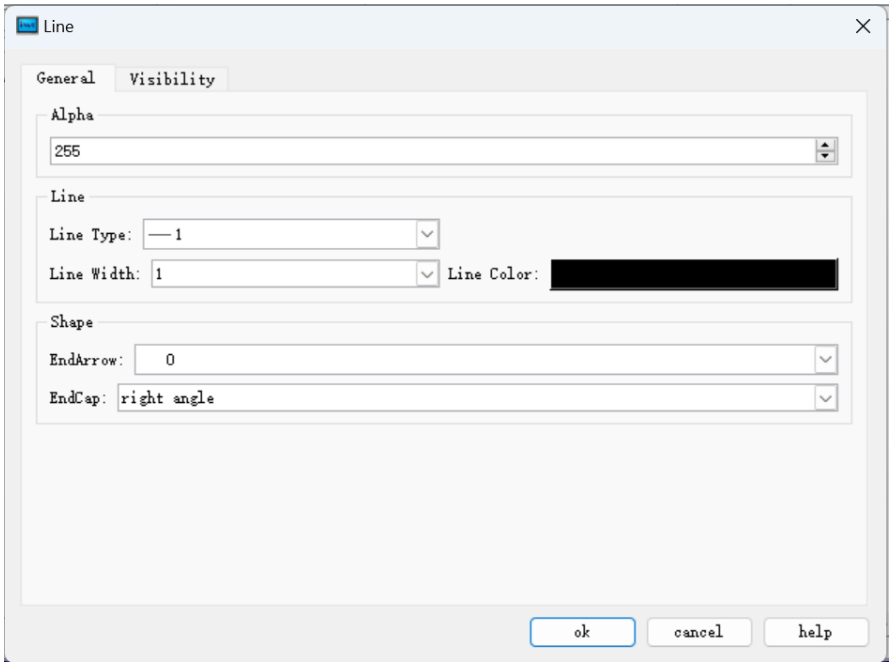
4.3 Draw basic graphics

This chapter details operations of drawing basic graphics with HMITOOL.

4.3.1 Line

Select the "Line" command in Draw menu or left-click the line button  in the toolbar; move the mouse in the screen editing window, and it will become a cross; click on the mouse in the view (i.e. screen), then a line is added.

After the above steps, the transparency of the line, the line type, width, color, the arrow and shape of end will be set by default while engineers can modify these properties in order to meet the needs of projects. Double click over a straight line, or click on the Property button  in the toolbar after selecting it. Line Property dialog box will pop up, as shown in figure below:



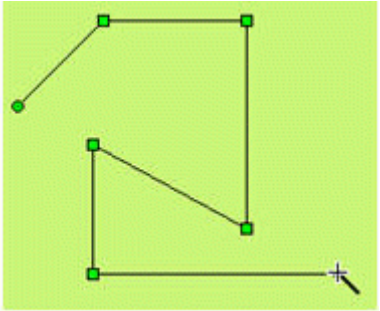
HMITOOL configuration software provides up to 6 straight line types, 30 kinds of line width, and 6 straight-line end arrows, with the ability to adjust the properties using the pull-down and trimming buttons. To change the length, direction, and position of the line, select the line first, then move the mouse to the end of the line; after that hold the left button of the mouse, and drag the mouse to the right position to release the left button.

4.3.2 Polyline

Select the Polyline command in the Draw menu or click the Polyline command button  in the toolbar to move the mouse to the Edit window. The mouse will change to a cross. That's when you can draw a polyline in the Edit window.

Move the mouse to a position where you want to draw the polyline. Click the left mouse button once, and then a small green dot appears in the screen editing window, which is an endpoint of the polyline.

Move the mouse to other positions in the screen, the system will automatically draw a straight line; move the mouse to change the direction; left click once and the place where you click will appear a small green box. Here the line from the first endpoint to the first small green rectangle will not move with the mouse. The mouse can be moved to the next point to change the direction of the polyline, just click the left mouse button. When you need to complete the drawing of the polyline, right click to complete drawing the polyline, as shown in figure below:



After finishing the above steps, the transparency, line type, line width, line color, end arrow and end point shape of the polyline will be set by default. The engineer can modify these attributes to meet the needs of the project. Move the cursor to the polyline; double-click the left button, or first select the line, and then click the toolbar property button  . A dialog box same as that of Line Property will pop up.

You can adjust the properties of the polyline using the pull-down and fine-tune buttons. The HMITOOL configuration software provides up to 6 straight line types, 30 kinds of line width, and 6 types of end arrow for polylines. To change the length, direction and position, select the line first, and then move the mouse to the polyline; hold down the left button of the mouse, after, drag the mouse to the appropriate location to release the left button.

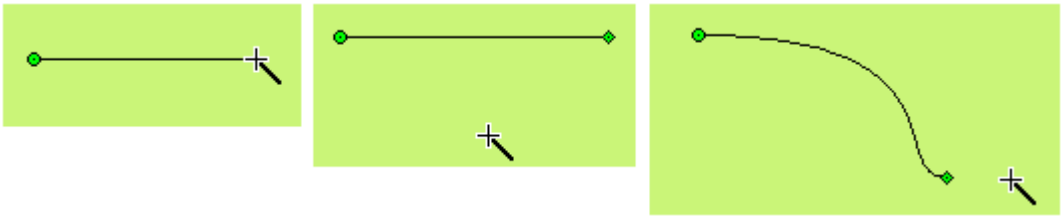
4.3.3 Curve/Arc

Select the Curve/Arc command in the Draw menu or click the Curve/Arc command button  in the toolbar menu; move the mouse to the Edit window, then the mouse cursor will change to a cross, by now you can draw a curve/arc in the Edit Window.

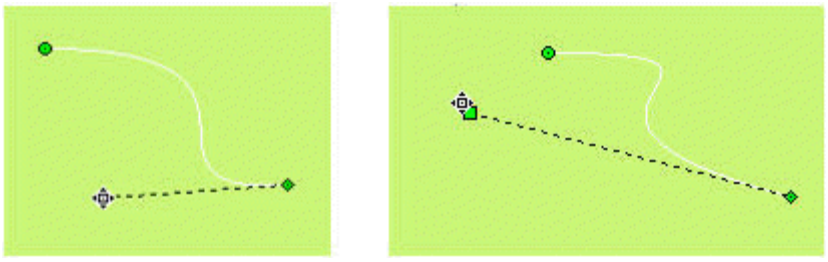
Move the mouse to a position where you want to curve. Left click and a small green dot appears in the window. This position is the start position of the curve/arc.

Move the mouse to other position in the screen, then the system will automatically draw a straight line; after click the left mouse button and release.

At this time, the mouse cursor is still cross-shaped. Move the mouse to other position in the screen, which is the end of the curve / arc. Hold down the left button does and move the mouse in the screen to draw the arc; release the mouse and right click to end the operation. See the figure below:



As shown above, the starting point of the graph is a green dot, and the end point is a diamond dot. Here the initial curve/arc has been drawn. Move the mouse to the point and the cursor becomes the shape of ; hold down the left mouse button, move the mouse to the appropriate location, and then release the mouse to draw the required curve. You can also move the start or end point to the appropriate position. See the figure below:



After completing the above steps, the transparency, line type, line width, line color, end point and endpoint shape of the curve / arc will be set by the system default. The engineer can modify these attributes to meet the requirement of engineering. Move the mouse to the curve/arc; double-click the left button, or select the

curve/arc first, and then click the toolbar property button , a dialog box same as that of Line Property will pop up.

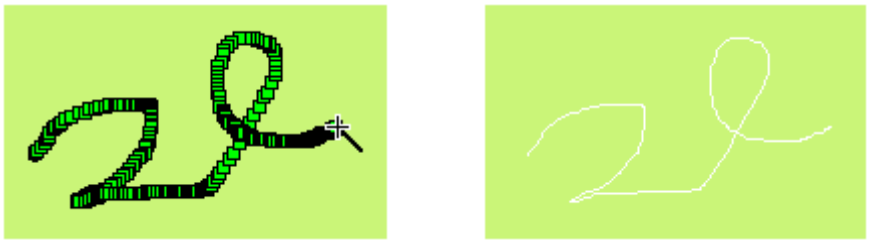
You can adjust the curve / arc properties through the pull-down and trimming buttons. The HMITOOL configuration software provides up to 15 line types, 10 kinds of line widths, and 6 straight-line end arrows for curves/arcs.

4.3.4 Free line

Select the Free Line command in the Draw menu or click the Free Line command button in the toolbar. Move the mouse to the Edit window and the cursor will change to a cross shape so now you can draw a free line in the Edit window.

Move the mouse to a position where you want to free line; click the left mouse button, and a small green dot will appear in the editing window, which is the starting position of the free line.

Move the mouse to other positions in the screen, and then the system will automatically draw a free line following the trajectory of the mouse movement; click the left mouse button or right button to complete drawing the free line. See the figure below:



After the above steps, the transparency, line type, line width, line color, end arrow and end point shape of the free curve will be set by the system default. The engineer can modify these attributes to meet the needs of the project: Move the cursor to the free curve, double-click the left button; or select the free curve first, and then click the toolbar property button , a dialog box same as that of Line Property will pop up.

In this case, you can adjust the properties of the free curve through the pull-down and fine-tune buttons. The HMITOOL configuration software provides up to 6 straight line types, 30 kinds of line width and 6 types of straight-line end arrows for curves/arcs.

4.3.5 Rectangle

Select the Rectangle command in the Draw menu or click the Rectangle command button in the toolbar button. Move the mouse to the Edit window and then the cursor will change to a cross; click on the screen to add a rectangle.

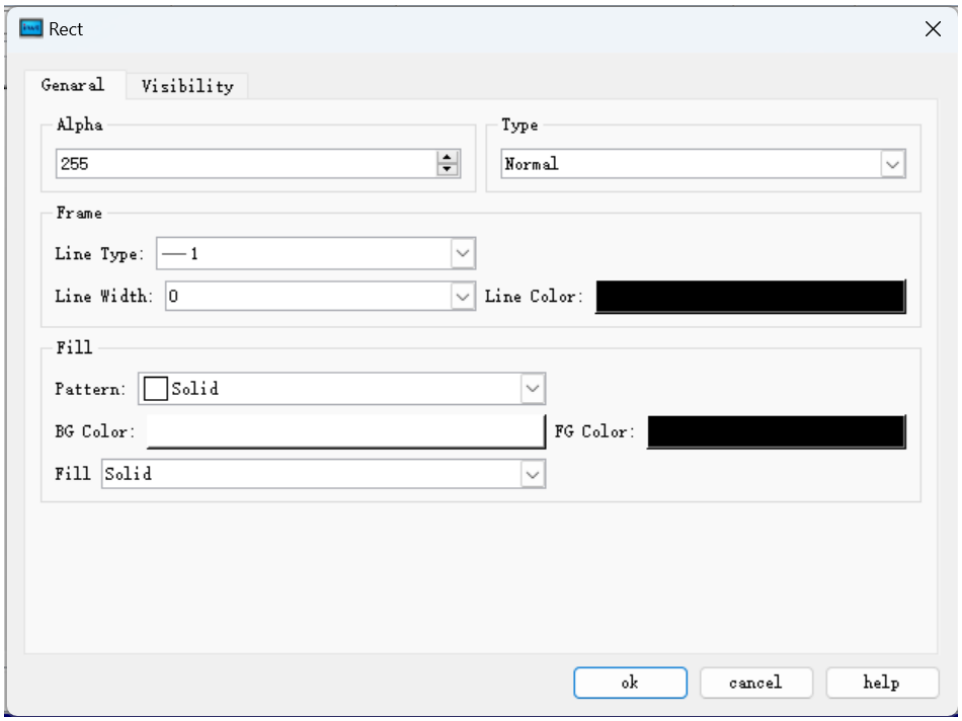
To change the size of the rectangle, select the rectangle first, and then move the mouse to the eight square green dots which appear in the rectangle. When the mouse cursor becomes ↔ or ↕ or ⤡ , click and hold down the left mouse button to drag the rectangle; release the left mouse button when it reaches the appropriate location. By now a required rectangular box is drawn.

↔: Change the width of the rectangle

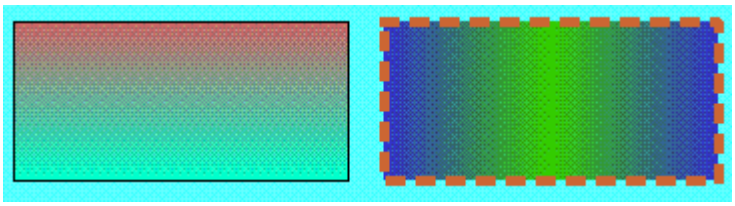
: Change the height of the rectangle

: Change the width and height of the rectangle

After the above steps, the transparency, line type, line width, line color and fill pattern of the rectangle will be set by the system default. The engineer can modify these properties to meet the needs of the project. Move the mouse to the rectangle, double click the left button; or select the rectangle first, and then click the Property button in the toolbar. The properties of the rectangle will pop up, as shown in figure below:



You can adjust the properties of the rectangle through the pull-down and fine-tune buttons. HMITOOL configuration software provides up to 15 types of borderline, 10 kinds of borderline width and 21 kinds of fill patterns. See the figure below:



4.3.6 Rounded rectangle

Choose the icon from Basic Graphs in the control bar, move the cursor to editing area, and the cursor will become a cross.

Click the starting position where the graph will be placed, drag the cursor when pressing the mouse key. At this moment the system will automatically draw an area along the track of the cursor. Then, click left or right mouse key to complete drawing of rectangle.

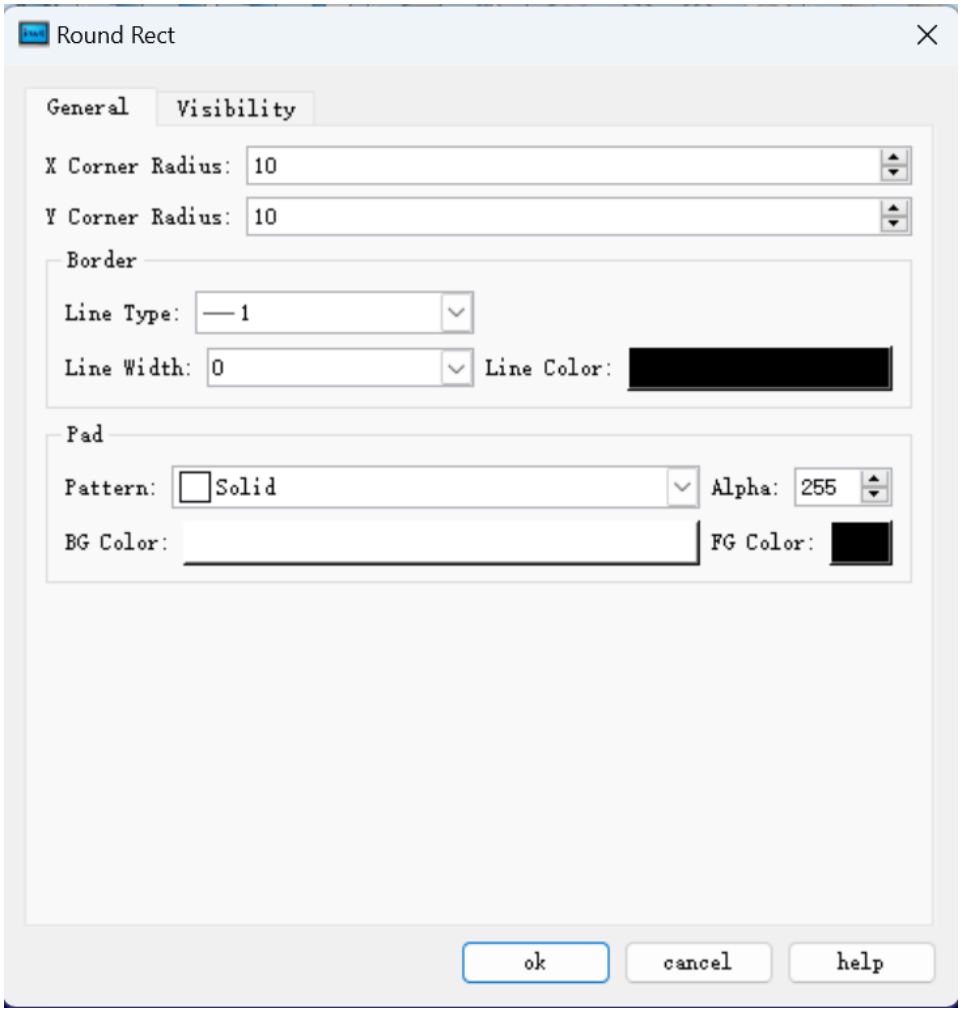
To change the size of the rounded rectangle, select the rectangle first, and then move the mouse to the eight square green dots which appear in the rectangle. When the mouse cursor becomes ↔ or ↔ or ⤡ , click and hold down the left mouse button to drag the rounded rectangle; release the left mouse button when it reaches the appropriate location. By now a required rounded rectangular box is drawn.

↔: Change the width of the rounded rectangle

↕ : Change the height of the rounded rectangle

↘ : Change the width and height of the rounded rectangle

After the above steps, the transparency, line type, line width, line color and fill pattern of the rounded rectangle will be set by the system default. The engineer can modify these properties to meet the needs of the project. Move the mouse on it, double click the left button; or select the rounded rectangle first, and then click the Property button  in the toolbar. The properties of the rectangle will pop up, as shown in figure below:



Radius of X curve: Radian of the four corners in X direction.

Radius of Y curve: Radian of the four corners in Y direction.

4.3.7 Circle/Ellipse

Select the Circle/Ellipse command in the Draw menu or left-click the Circle/Ellipse command button  in the toolbar. Move the mouse to the screen editing window, and the mouse cursor will become a cross; click the left mouse button on the screen to add a circle to the screen.

To change the size of an ellipse / circle, select the Circle/Ellipse first, and then move the mouse to the 8 square green dots that appear in the ellipse / circle. When the mouse cursor becomes ↔ or ↕ or ↘, click and hold down the left mouse button to an appropriate location; release the left button to complete

drawing.

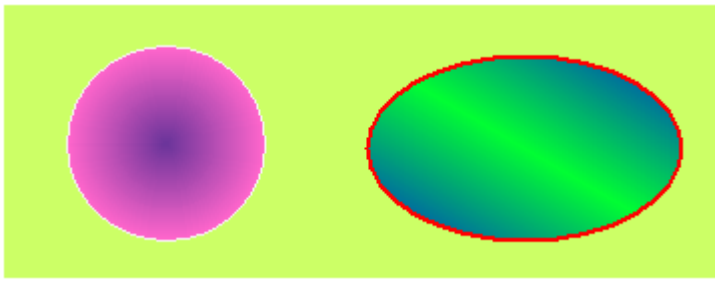
: Change the width of the ellipse / circle

: Change the height of the ellipse / circle

: Change the width and height of the ellipse / circle

After the above steps, the transparency, line type, line width, line color, and fill pattern of the ellipse / circle will be set by default. The engineer can modify these attributes to meet the needs of the project. Move the cursor to the ellipse / circle, double click the left button; or select the Circle/Ellipse first, and then click the Property button in the toolbar, here a dialog box will pop up.

The HMITOOL configuration software provides up to 15 types of border line, 10 kinds of border line width and 21 of fill patterns for ellipse / circle. See the figure below:

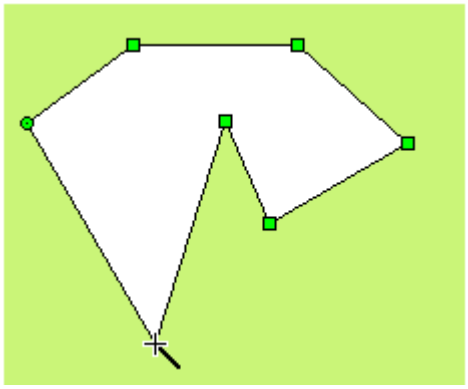


4.3.8 Polygon

Select the Polygon command in the Draw menu or click the Polygon command button in the toolbar. Move the mouse to the editing window. The mouse will change to a cross, by now you can draw a polygon in the screen.

Move the mouse to a position where you want to draw a polygon, left click (or hold down the left button), then a small green dot will appear in the screen editing window, which is the start point of the polygon.

Move the mouse to another position on the screen. At this time, the system will draw a straight line automatically. Move the mouse to other appropriate positions; each time you left click, a new side of polygon is drawn; right click to complete drawing. See the figure below:

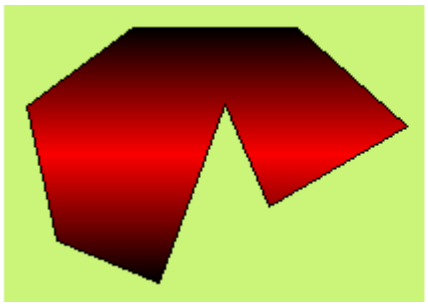


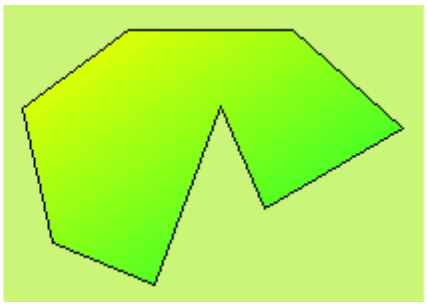
To re-shape a polygon, click it first and it will appear several green dots (depending on the number of sides of the polygon), indicating that the polygon has been selected; and then move the mouse cursor over one of them, then it will become the shape ; left click and drag it to the position you prefer, so that you can change the length and location of two lines connected by this turning point. Release the left button to

complete.

After the above steps, the transparency, line type, line width, line color and fill pattern of the polygon will be set by the system default. The engineer can modify these attributes to meet the needs of the project. Move the mouse over the polygon, double click the left mouse button; or select the polygon first, and then click the Property button  in the toolbar, and a dialog box same as that of the rectangle will pop up.

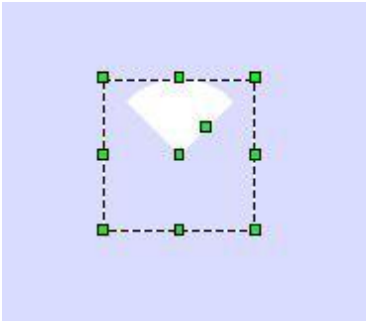
You can adjust the properties of polygon through the pull-down and fine-tuning buttons. HMITOOL configuration software provides up to 15 types of border line, 10 kinds of border line width and 21 kinds of fill patterns for the polygon, as shown in figure below:





4.3.9 Sector

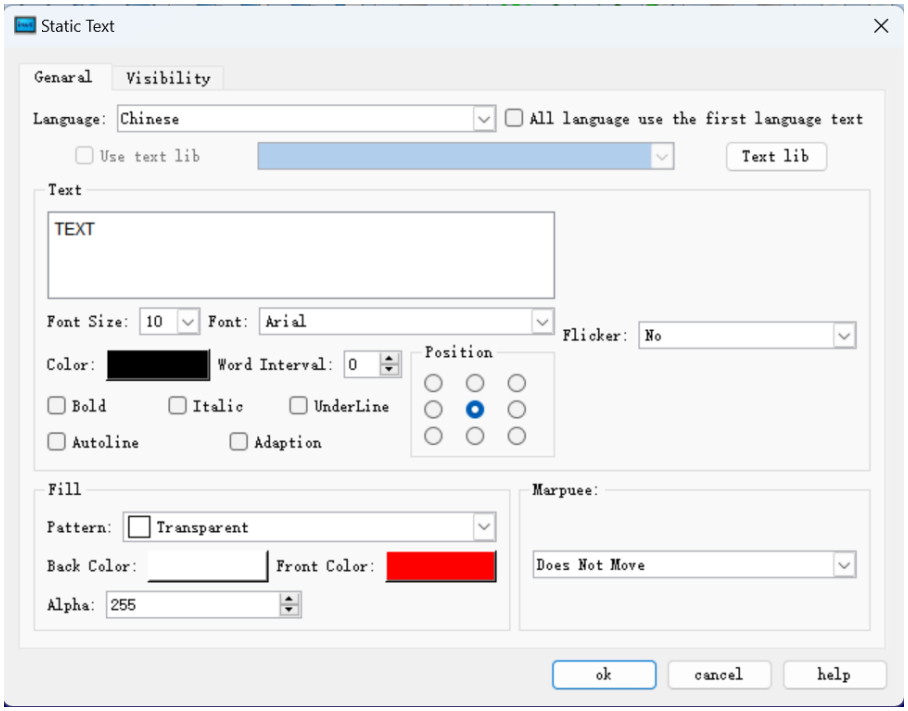
Select the Sector command in the Draw menu or left-click the Sector command button  in the toolbar; move the mouse to the screen editing window, and then it will become a cross, which means you can draw a pie chart in the screen now. See the figure below:



Move the mouse to any point of the green dots in the middle of the rectangle, then the mouse will change to the shape ; change the arc of the sector by moving the mouse.

4.3.10 Text

Select the Text command in the Draw menu or left-click the Text command button  in the toolbar to bring up the Static Text dialog box, as shown in figure below:



Input the text to be displayed in TEXT in the dialog box above.

The size of the font to be displayed can be changed in the drop-down menu of Font Size. HMITOOL configuration software provides the font size of 7-56 pound.

Engineering designers can change the types of fonts to be displayed in the drop-down menu of Font. HMITOOL configuration software provides almost all font styles.

Language: For different languages, you can enter different text contents in the text box, different font and font size are also available.

In the dialog box, click the left button before the Bold and Italic box to change the fond.

The configuration software provides kerning and line spacing that vary from 0-15 through the fine-tuning button next to the kerning and line spacing.

HMITOOL configuration software also provides up to 16 kinds of underline form, and can change the display position of text contents in the text box; you can also change the fill pattern and transparency.

When the font property is modified, click "OK" to close the dialog box. Move the mouse to where you want to place the text in the editing window; left click the left mouse button, and the system will draw a rectangle automatically.

To modify or re-input the text contents, double-click the text unit with the left mouse button, then re-enter the contents through the keyboard. You can use the Enter to change line feed when using the keyboard.

To change the size of the text background box, select the text unit, and then move the mouse to its edge; when the mouse becomes ↕ or ↔ or ⤡, click and hold down the left mouse button to pull the text box to the appropriate location; after that release the left mouse button to complete the operation.

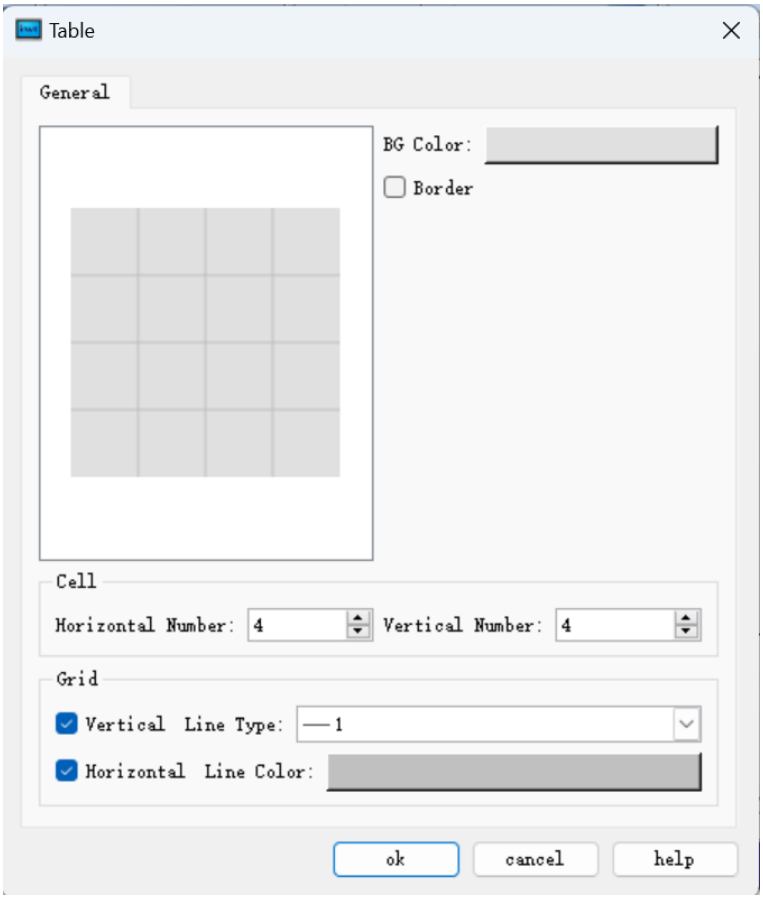
↔: Change the width of the text unit background

↕ : Change the height of the text unit background

⤡ : Change the width and height of the text unit

4.3.11 Table

Select the Table command in the Draw menu or the left click the command button  in the toolbar, then it will appear a pop-up table dialog box, as shown in figure below:

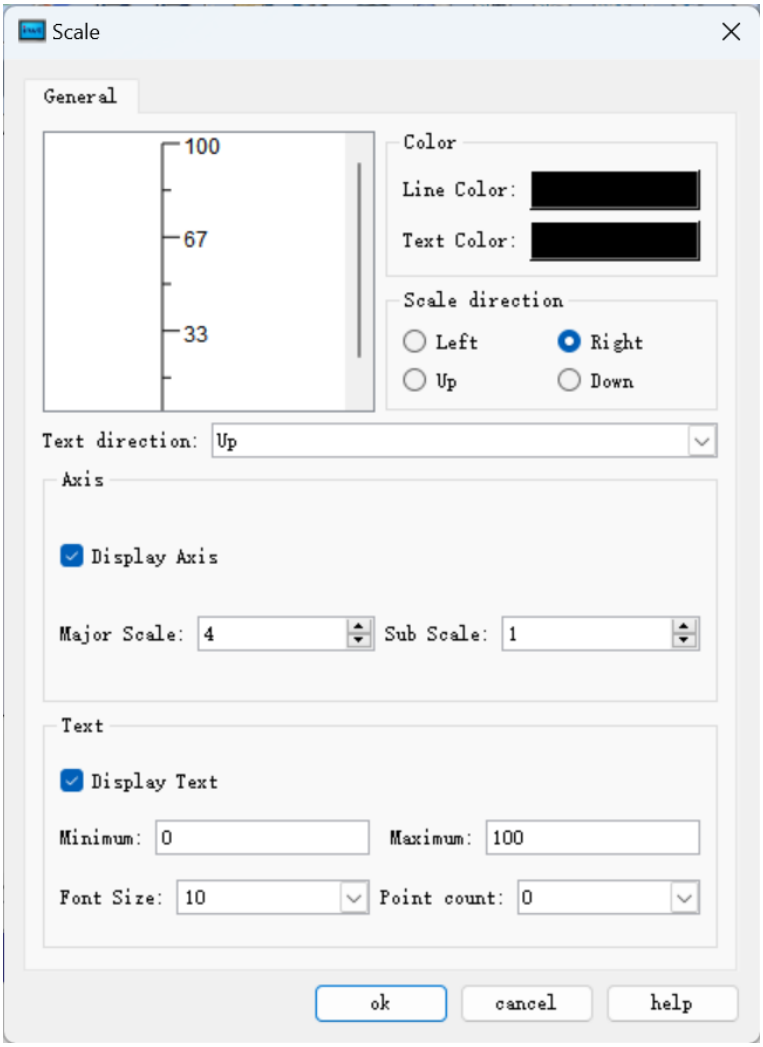


In the above dialog box of the above diagram, HMITOOL configuration software provides choices of the Background Color, Border, Grid and Grid lines. You can decide whether to display vertical or horizontal grid lines in the Grid option, and the type and color of lines are changeable.

The table is just a graphic object, which means you cannot add text, data or other embedded objects to the table. The table can only be displayed as a chassis image. To display text, data, and other objects on a table, you can use Text and numeric display objects to overlay the table and set it to the top layer.

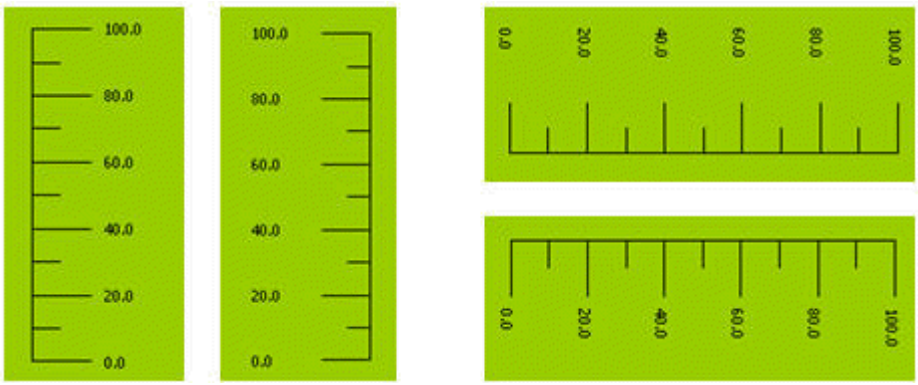
4.3.12 Scale

Select the Table command in the Draw menu or the left click mouse the command button  in the toolbar, then it will appear a pop-up scale dialog box, as shown in figure below:



In the above dialog box, HMITOOL configuration software provides choices of Color, Axis and Text. The color item allows to selecting the line color and text color. You can select whether to display the axes in the Axis item and decide the number of the major scale and sub scale by means of the trimming button or inputting directly. Decide whether to display text in the text item and change the maximum and minimum values of the scale, as well as the size of the text and the decimal digits of the scale value.

When you have modified the scale property and click "OK" to close the dialog box, move the mouse to the position where you want to display the scale. Click the left mouse button, and then the system will automatically draw a scale unit. See the figure below:

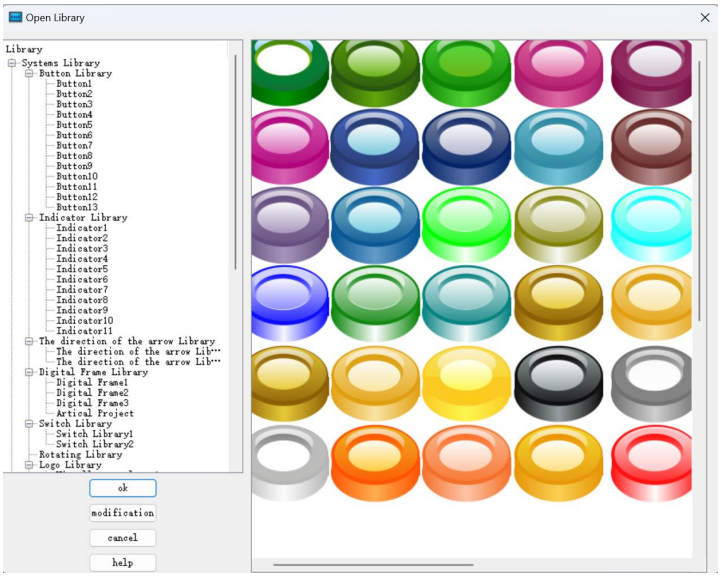


After the above steps, a scale like first from left of the figure above. If you want to change it to the form of the

second left scale in the figure above, first choose the scale, move the mouse to one of the height sides, press down the left key and drag the mouse when the mouse becomes ↔, and have the mouse pass through the other height side. To change the scale to the right forms in the figure above, perform Free Rotation for it.

4.3.13 Open library

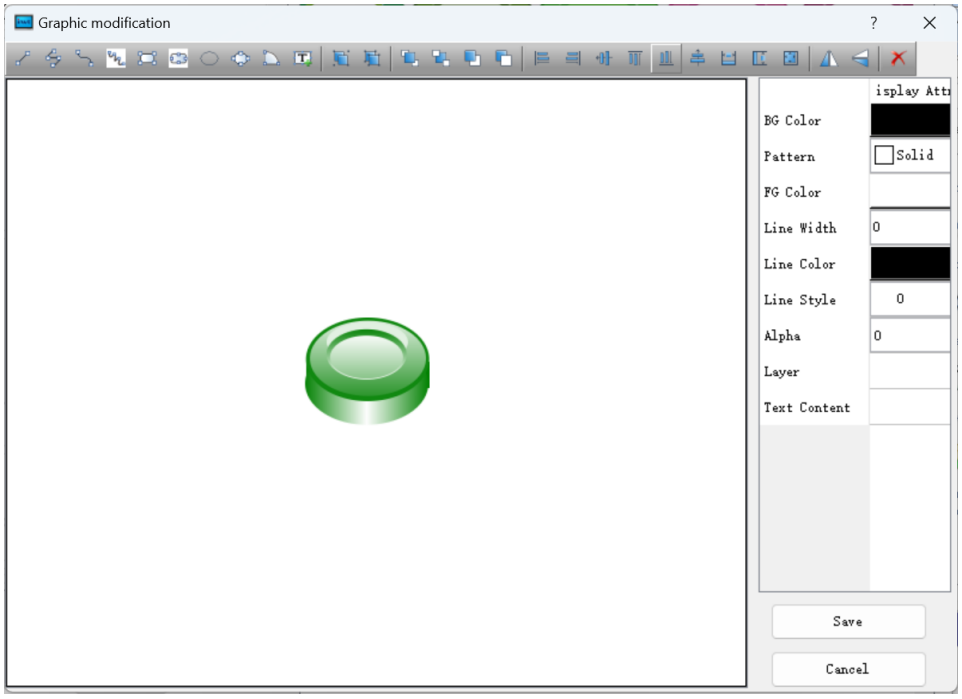
Select the Open Library command in the Draw menu or click the Open Library command button  in the toolbar to bring up the Library List dialog box, as shown in figure below:



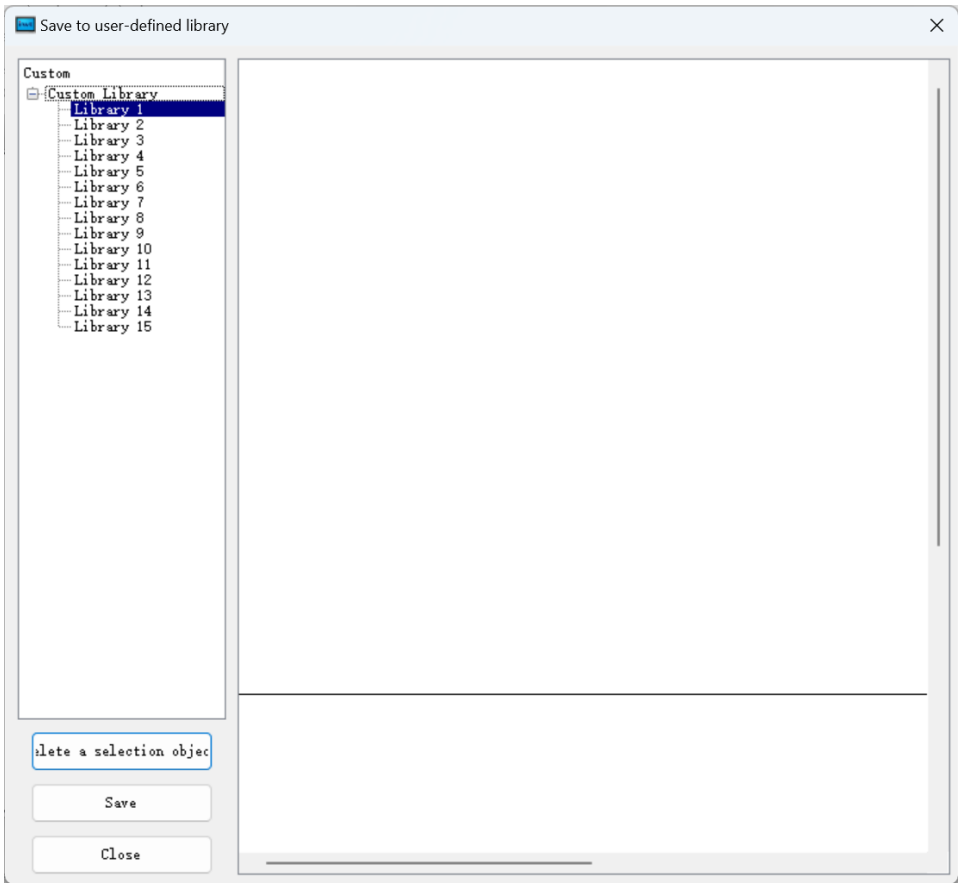
The system library of HMITOOL configuration editing software provides a wealth of graphic objects for engineering designers. HMITOOL version is even added a large number of buttons, indicators and other graphic objects. Engineering designers can find a proper graphic object so as to save configuration design time.

Engineers only need to click on the category of the desired graphic object in the system library on the left. Click the + sign to open the sub-category, and then select the desired graphic. Click to select the image, and then click on the screen to add graphic object when the cursor become a cross.

Modify: After selecting the graphic you want to modify, click the "Modify" button at the bottom left of the dialog box, as shown in figure below:



In the interface shown as figure above, select the graphic, and then execute the "Split" function on the tool bar to split the control. Then you can choose one part to modify: settings of foreground color, background color, pattern and others can be found on the right of the dialog box. After modification, execute the Group command to the entire split graphics, and then click the "Save".

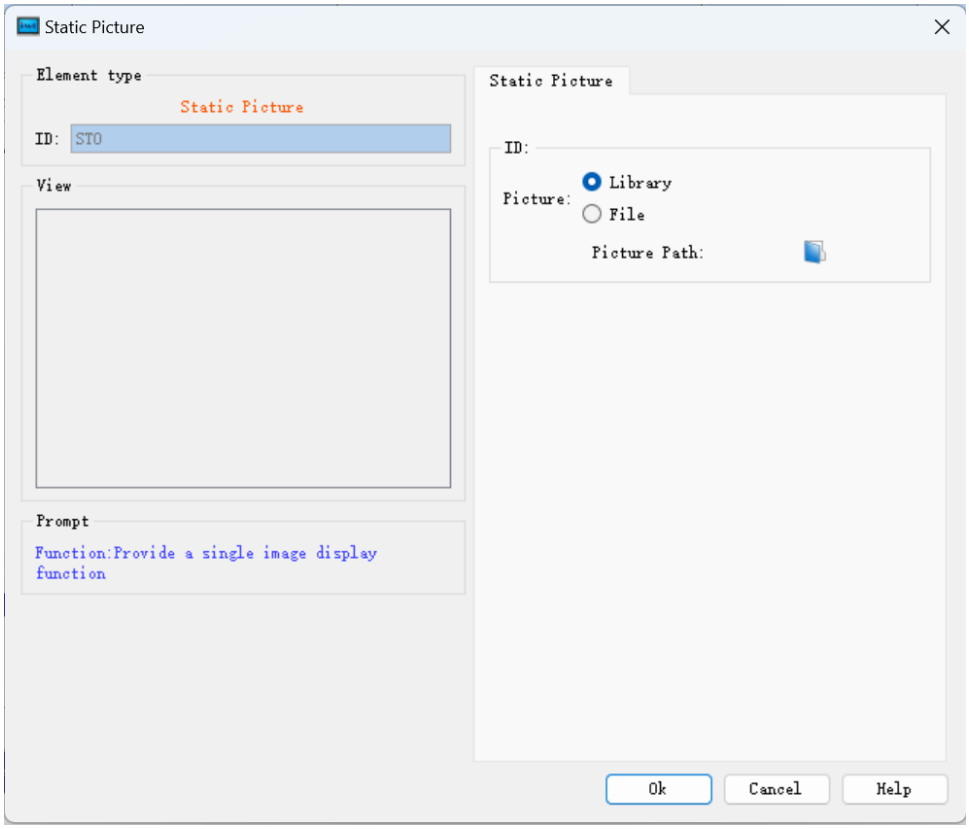


In the "Custom" list on the left of the dialog box, select the location where you want to save the modified graphics (e.g. "Library 2") and click "Save". If you want to view the newly saved graphics, click the Open Lib

command button  in the pop-up dialog box, then select the "Custom Library".

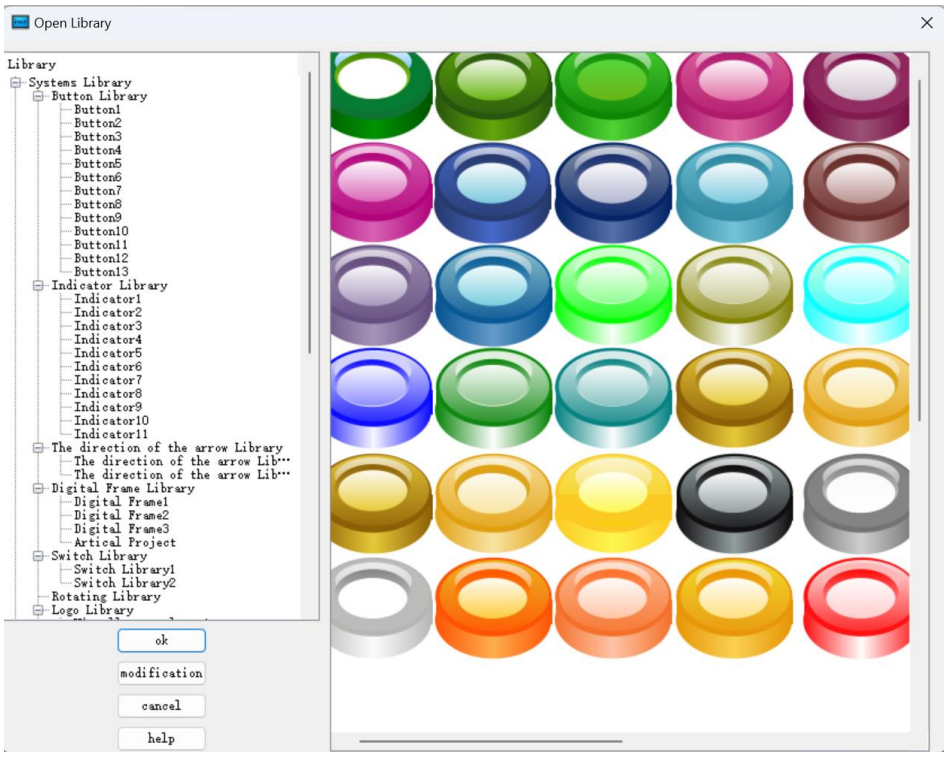
4.3.14 External picture

In HMITOOL, pictures can be inserted into a number of controls; take the "Static Picture" as an example:



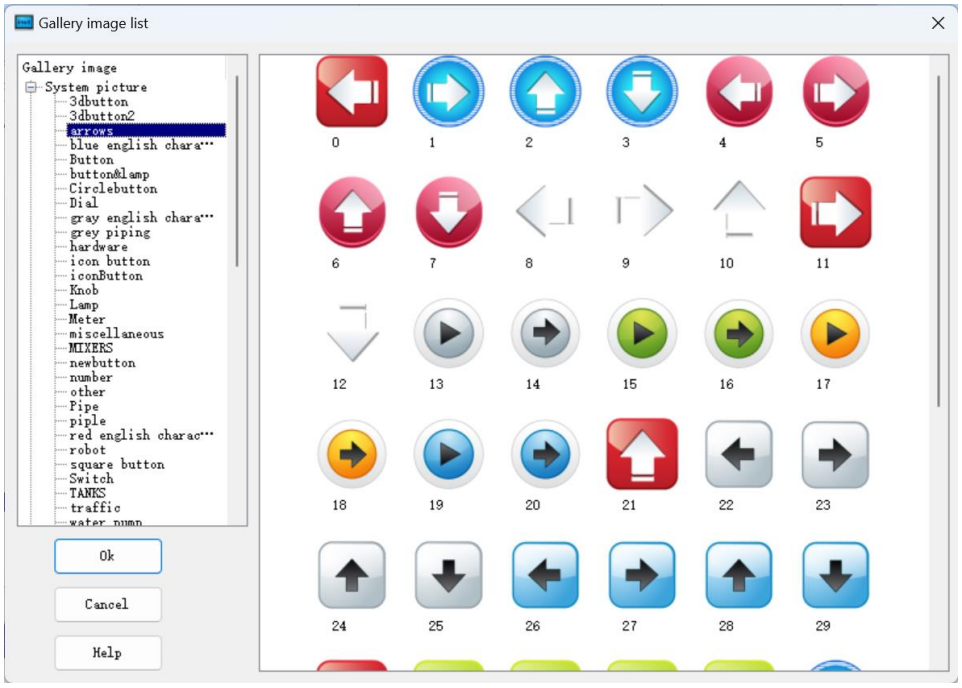
Picture:

Library: Built-in gallery in the system, as shown below:

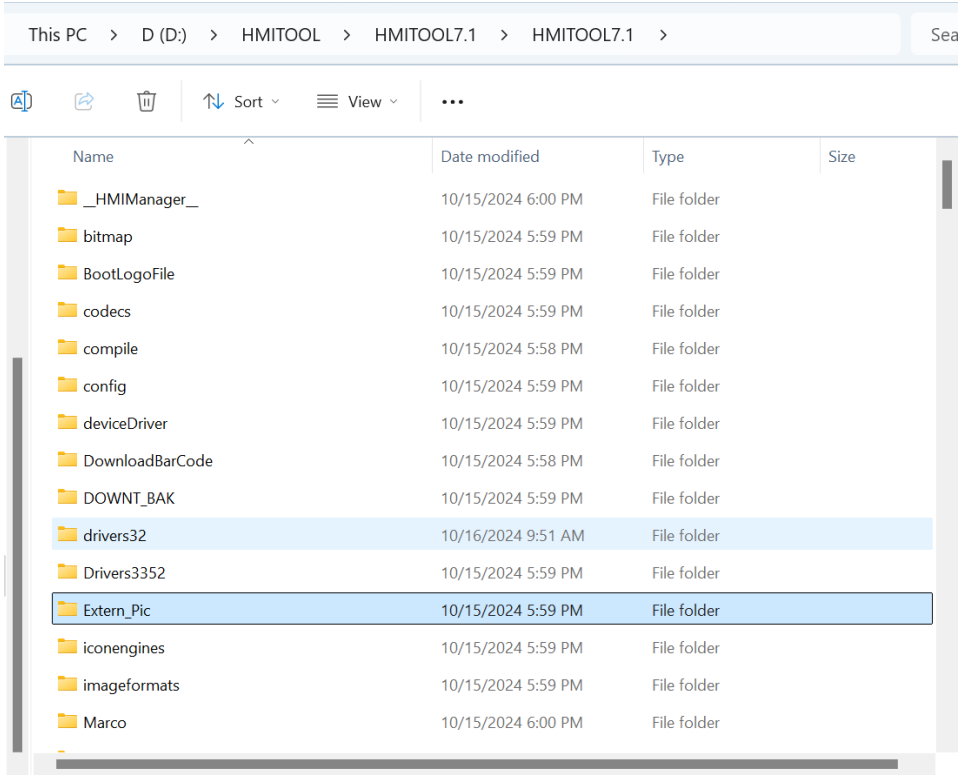


File: Consist of External File and System File. External pictures can be those in computer and system pictures are available for downloading on the official website, which will be saved in the folder of **Extern_Pic** under the installation directory.

When "System" is selected, the following dialog box will pop up:

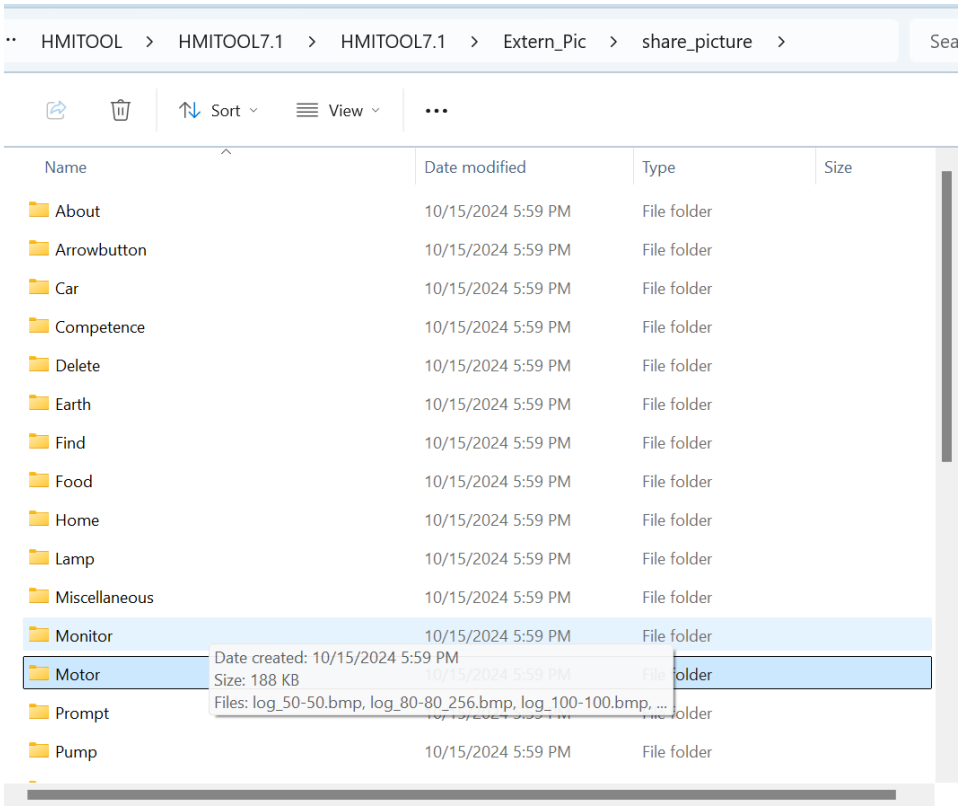


These images are stored in the **Extern_Pic** folder under the installation directory, as shown below:



The **Extern_Pic** folder contains two folders: the **share_picture** folder and **system_picture** folder, corresponding respectively to the shared picture and system picture in the Gallery image list, of which those in the **system_picture** folder are system pictures that cannot be added or modified, while those in the

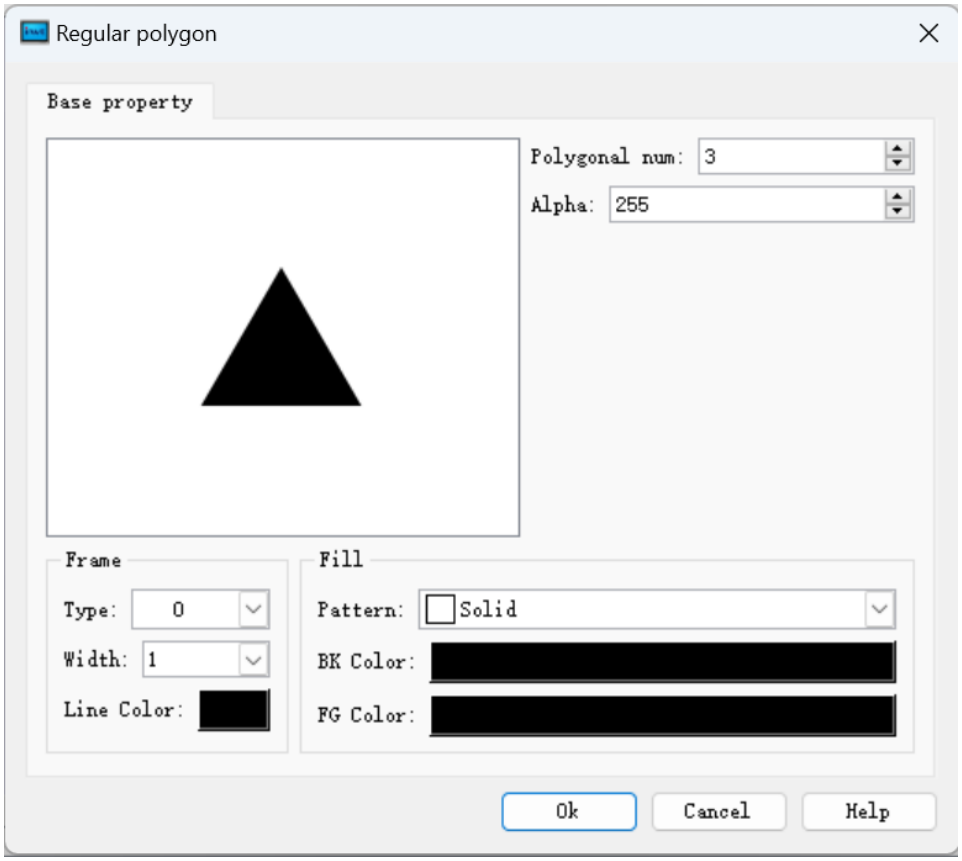
share_picture folder can, as shown in the following figure:

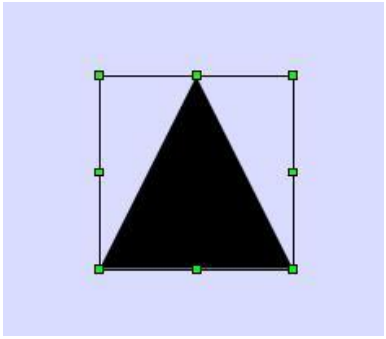


You can add other folders by yourself in the **share_picture** folder or change the name of an existing folder (for example, Motor), meanwhile the name of **share_picture** folder cannot be changed. In addition, it is possible to add or delete pictures of the Motor folder.

4.3.15 Regular polygon

Select the straight line command in the drawing menu or the left mouse button to click the regular polygon command button  in the toolbox button to set the number of corners, transparency, line type, line width, line color of the regular polygon to meet the needs of the project. After setting, click the button to determine the button, the screen appears cross mark, move to the appropriate position of the screen, click the left, you can draw a regular polygon. You can click the right polygon control through the left mouse button, right-click the "property" or click the toolbar button  , set the property, modify the regular polygon.





The size of the control can be freely stretched by controlling the green dots around it.

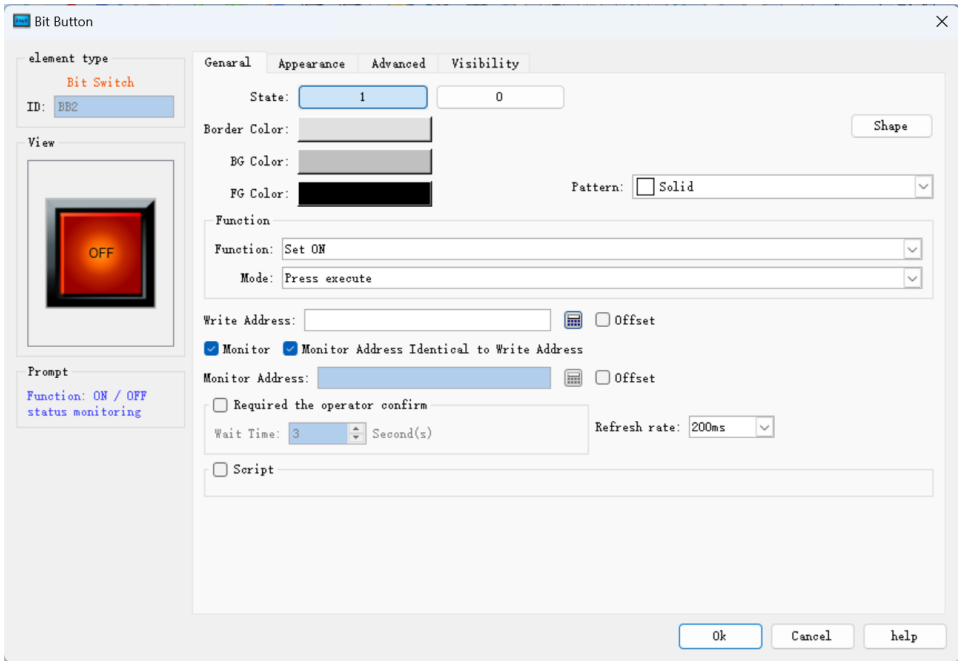
4.4 HMITOOL basic controls

This chapter mainly introduces the use of basic controls of HMITOOL.

4.4.1 Bit button

Bit button is used to operate and display the ON/OFF status or 1/0 status of the bit address of the device connected with the HMI. Bit button is the most fundamental and frequently used control. Steps to set a Bit button:

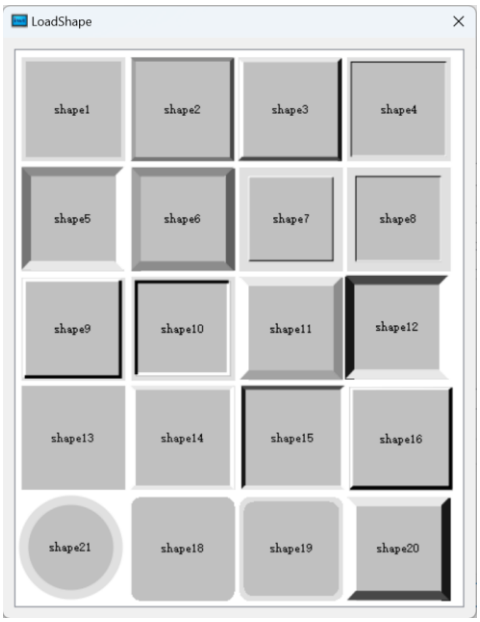
1. Click the Bit Button icon  on the toolbar to bring up a dialog box, which is for setting the properties of Bit Button, as shown in figure below:



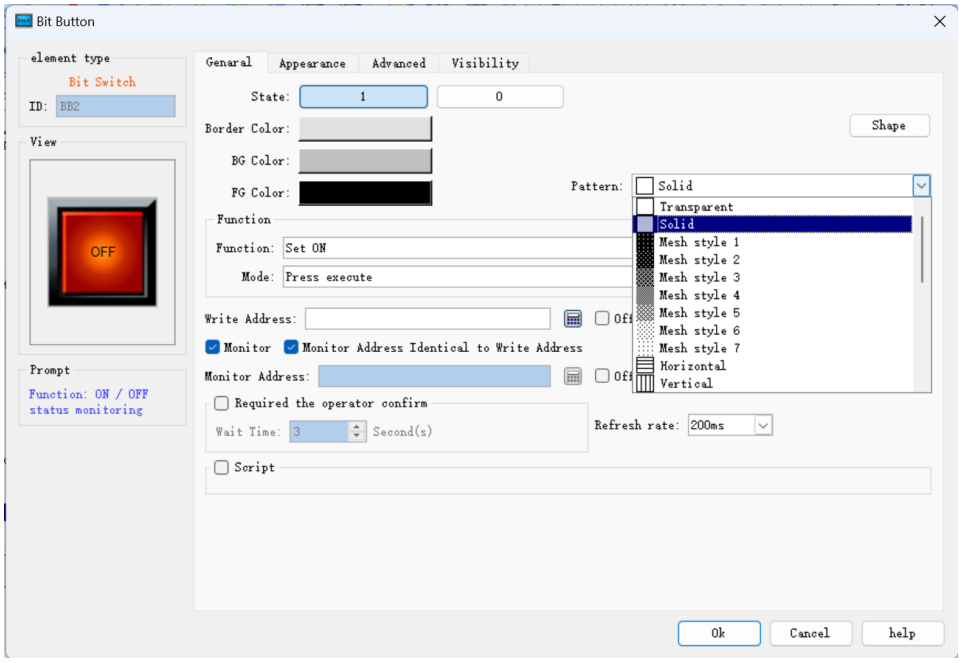
2. The dialog box includes four items, that is, "General", "Mark", "Advanced" and "Visibility".

■ **General**

Shape: Click the Shape button to select a shape for the control graph, as shown in figure below.

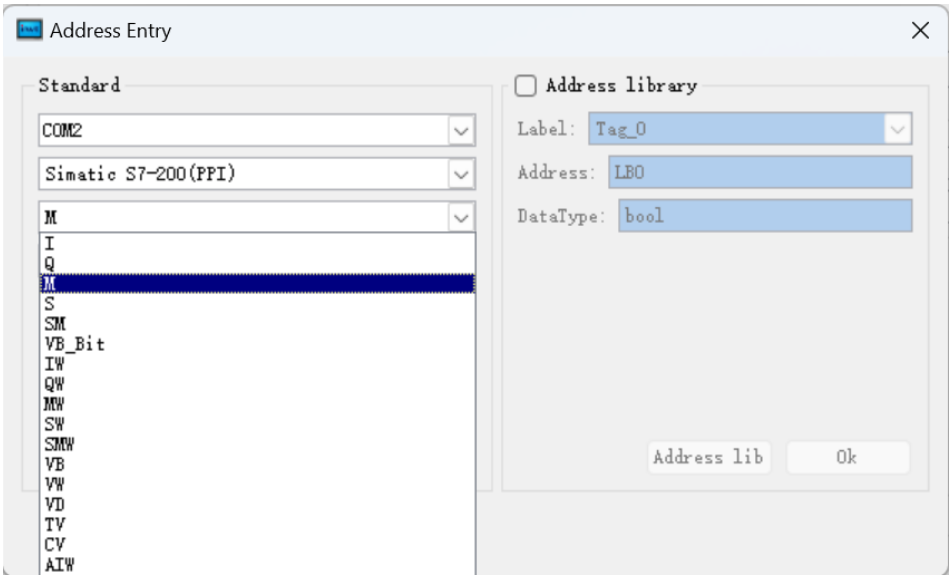


- Border Color: When having chosen a shape with border, click this button to select a different color for the border.
- Foreground Color: When it needs to change the foreground color, click this button to choose a different foreground color on the drop-down color selection box. (Foreground color works only if the transition style is selected).
- Background Color: When it needs to change the background color, click the button to select on the drop-down color selection box.
- Pattern: Click the drop-down box, which contains a total of 21 kinds of patterns as shown in figure below:



- Set: If Set function is chosen, after the downloading to HMI, the value of the write-in address may be set to 1 by clicking the bit button. In other words, the write-in address of the device connected will be set to ON status, and the status of 1/ON will be displayed.
- Reset: If Reset function is chosen, after downloading to HMI, the value of the write-in address may be set to 0 by clicking the bit button. In other words, the write-in address of the device connected will be set to OFF status, and the status of 0/OFF will be displayed.
- Inching: If Inching function is chosen, either "pressing down being 1" or "pressing down being 0" may be chosen. When "pressing down being 1" is chosen, after downloading to HMI, the value of the write-in address of the device connected is set to 1/ON when the bit button is pressed down, and the status of 1/ON will be displayed; meanwhile, the value of the write-in address of the device connected is set to 0/OFF when the bit button is released, and the status of 0/OFF will be displayed. When "pressing down being 0" is chosen, after download to HMI, the value of the write-in address of the device connected is set to 0/OFF when the bit button is pressed down, and the status of 0/OFF will be displayed; Meanwhile, the value of the write-in address of the device connected is set to 1/ON when the bit button is released, and the status of 1/ON will be displayed.
- Alternate: When alternate function is chosen, after the downloading to HMI, if the current status of the bit button is 0/OFF, the value of the write-in address will be set to 1/ON when the bit button is touched, and the status of 1/ON will be displayed; If the current status of the bit button is 1/ON, the value of the write-in address will be set to 0/OFF when the bit button is touched, and the status of 0/OFF will be displayed. The status changes with the times of touching.
- Write Address: Click the Keyboard button icon after "Write Address" to enter the address. HMITOOL software will distribute corresponding address symbols according to different connected devices. For example, in FX-2N series of MITSUBISHI (Mitsubishi) PLC, X represents the address of input coil; Y represents that of the output coil; M that of the intermediate relay; C that of the counter (switch status display); T that of the timer (switch Status display); D that of the data register; C * that of the counter (count value); T * represents that of the timer (count value). Another example is the series of SIEMENS

(Siemens) S7-200: I represents the input address; Q on behalf of the output address; M on behalf of the intermediate relay address; V on behalf of the data register address. See the figure below:



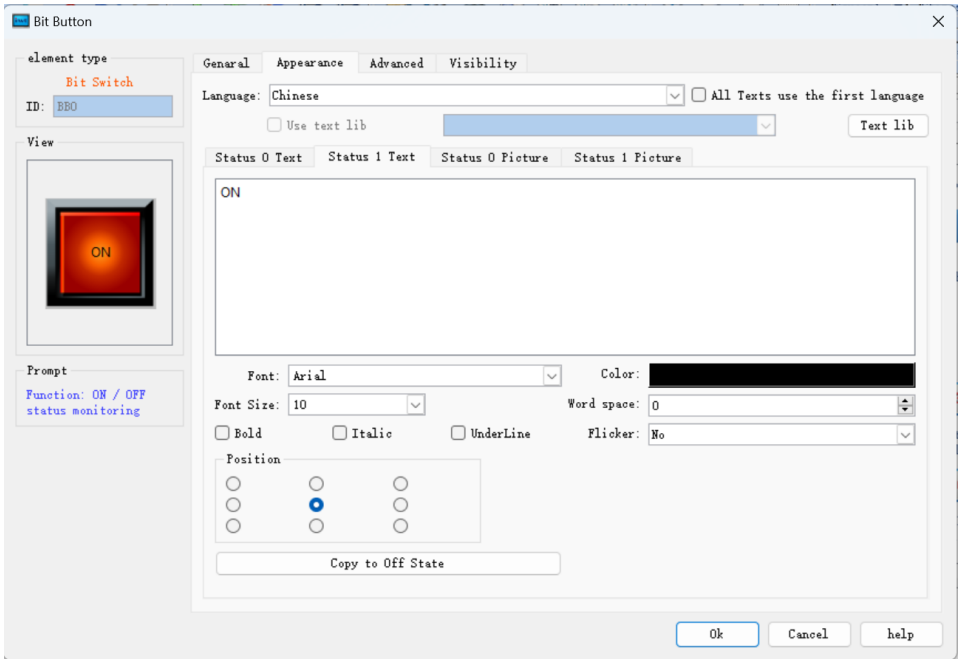
So that engineers can write the current status of this bit button to the address using a different address symbol for PLC or other connected devices. The value of the write address or display address is 0 / OFF when the bit button is in the 0 / OFF state; and the value of the write or display address is 1 / ON when the control is in the state of 1 / ON.

- Monitor: Select "Monitor" to display the "Monitor Address", indicating that the "bit button" can be used to monitor the value change of "Monitor Address". The value of the Monitor address is 0 / OFF when the bit button is in the 0 / OFF state; and the value of the Monitor address is 1 / ON when the control is in the state of 1 / ON. When "Monitor Address" is chosen, the monitor address and write address can be different. For example, when it selects the Set function, touching this control makes set the write address to 1 / ON; but if the monitor address is at 0 / OFF at this time, the bit button will still display 0 /OFF state. Generally, users choose "Monitor address identical to Write address" in order to reflect or display directly the state value you write.
- Macro: Chosen "Use Macro", then it will display a list of macros. User can select a macro to execute when press the bit button. Only compiled macros are displayed in the drop-down list.

Note: When Monitor isn't chosen, the button switch state will not change even if the control is touched.

- **Mark:**

When select the Mark tab, the property of Status 0 Text is displayed, as shown in figure below:



The page also has four items, "Status 0 Text", "Status 1 Text", "Status 0 Picture" and "Status 1 Picture".

Status 0 Text, Status 1 Text: Used to change the font, font size, margin, font color, and position of the state 0 or state 1 text. HMITOOL also provides the copying function, enabling copy one's attributes to another's, which is convenient and timesaving.

- All Texts use the first language: This option is used when it comes to multiple languages ("Language" in the Project Manager). When the total number of languages is greater than 1, you can select this option to make sure that the contents of this control will not switch with the languages.
- Language: This option is used when it comes to multiple languages. Input contents with a different language for multiple languages.(In the Function button, select the 'Switch language' option and which one to switch to; then in the simulation or on the HMI screen, all the controls with text will be presented by the selected language). For different languages, the text content, font and font size can be different, but the color, kerning and position are the same.
- Font: Choose the type of text for the text; different languages can choose different fonts.
- Font Size: Choose the font size for the text content; different languages can choose different font sizes.
- Color, Margin, Position: Set the color, Margin, and alignment of the text selected current. When it has more than one language, these options are the same to that of the language 1, and they are invalid in the language setting of others.
- Status 0 Picture, Status 1 Picture: You can add different formats of picture for different states according to various "Picture source". When a picture is chosen, it will be automatically added to the "General" page. If "Fit to Object Size" is selected, the selected image will be the same size as the control.
- Fit to Object Size: If "Fit to Object Size" is selected, the selected image will be the same size as the control; and the Margin and Position options are hidden.

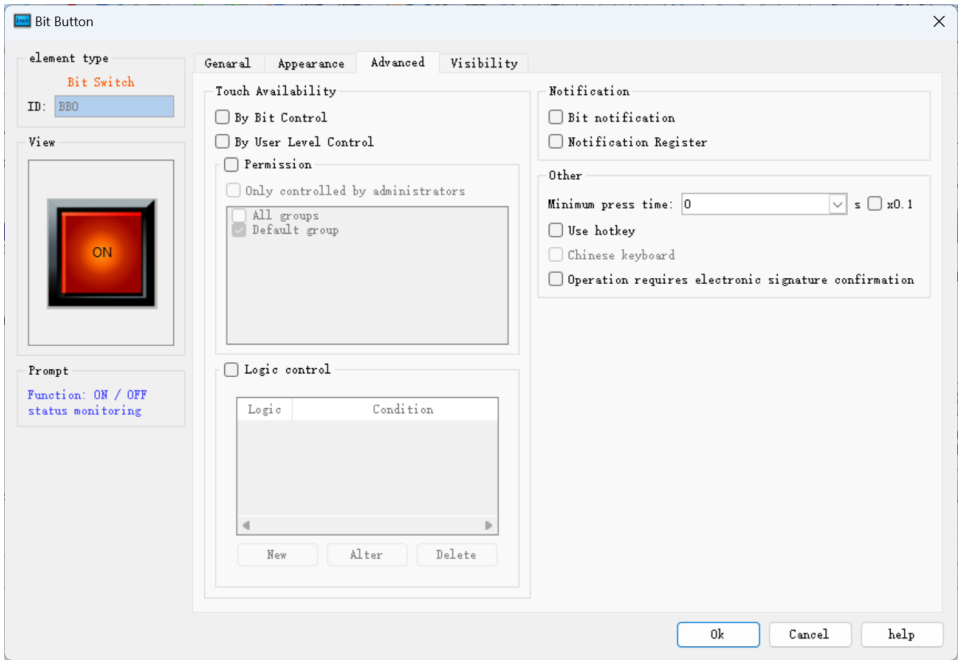
If you import a picture from an external file, the "Transparency" option appears to make a specified color transparent

Note: When "Flicker" is chosen, the flashing screen is on the ON / OFF status. The default flashing

frequency is 1s. If you want to change the frequency, you can double-click the "Project Manager" in the "HMI parameter settings". Select the "Flashing frequency" to change it.

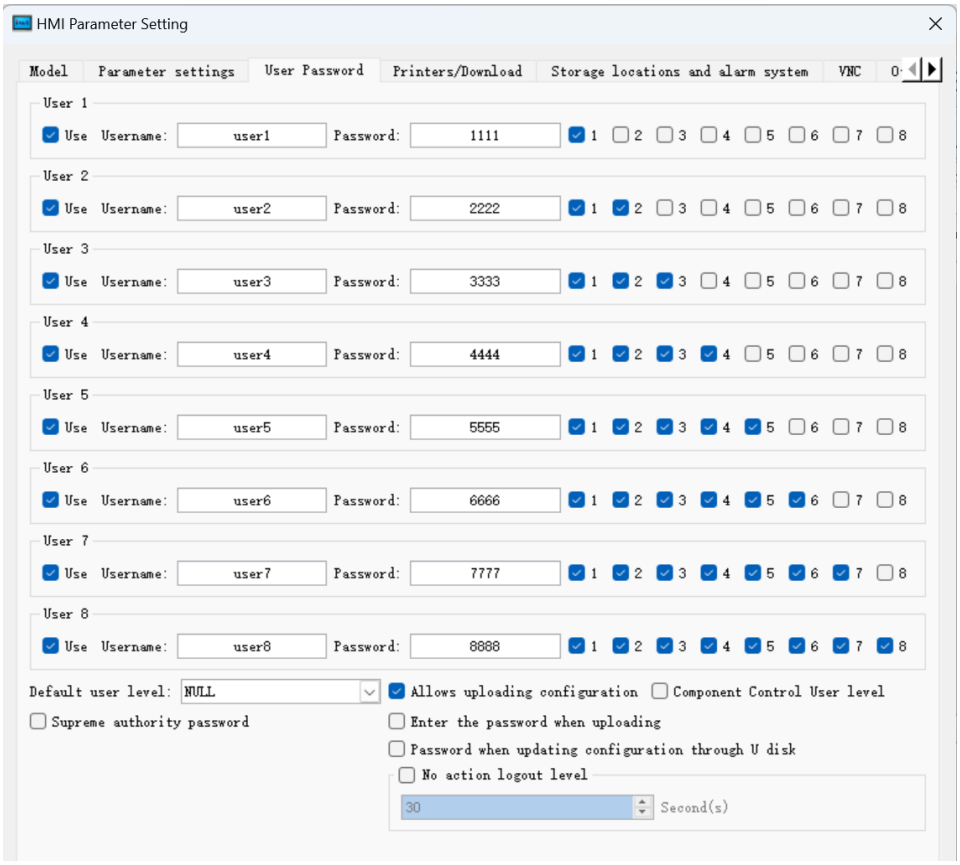
■ **Advanced**

Select the "Advanced" page to display the "Advanced" properties, as shown in figure below:



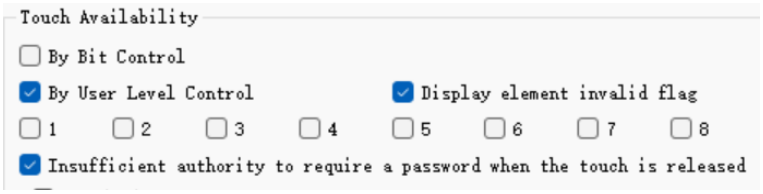
- Controlled by Bit: "Controlled by Bit" having been chosen, when the "Valid Status" selected is 1, the "Bit Button" can be effectively touched if and only if the value of the "Control Bit" is 1. When the selected "Valid Status" is 0, the "Bit Button" can only be effective if and only if the value of the "Control Bit" is set to 0. Otherwise, the "Bit Button" cannot function no matter how.
- Controlled by User Level: User can select multiple options as needed. After setting, in the simulation or on the HMI screen, the current user is checked whether this user lever has the permission.

For example, if option 2 and 3 are chosen in the Effective Level Controlled in the Advanced Page of the control, and the User Password Setting in the HMI Parameter Setting is as shown in figure below:



If Default User Level is NULL, this control is not touchable, and in this case you can use Change User Level in Function buttons to change the default level. For example, if the password entered by the user is 6666, corresponding to User Level 6, but the user chooses only option 1, not matching option 2 or 3, so the system will prompt that the password is incorrect; When the password entered by the user is 2222 or 3333, as both users have option 2, matching option 2 or 3, the password is valid and this control will be changed to a touchable control. If the Default User Level is user 2 to 3, then both user levels have option 2 to match the touching conditions, and then this control is touchable in simulation or initialized screen; If the Default User Level is user 6, then this user level does not have an option to match the touching conditions, and then this control is not touchable in simulation or initialized screen. The default setting is as shown in figure below:

If select "change the user level is insufficient", when the user level is not matched, a login interface will pop up so that user can select a matching level and log in again, as shown below:



In HMITOOL software, only bit button, drop-down box, ASCII input, function button, ASCII keyboard input, multi-function button, multi-state button, recipe selection, screen button, radio button, step button, word

button, slider and numeric input controls have this function, and as for their application, it can refer to that of bit button.

- Minimum press time: How many seconds it needs to react after the press in the simulation or on the HMI screen.
- Notification: In the case of that the control can be touched in the simulation or on the HMI screen, click on the control, and enter a value with the pop-up input keyboard; then the state value will be written to the set "Notification Bit" address (1 or 0).
- Notification Register: In the case of that the control can be touched in the simulation or on HMI screen, click on the control, and input a value through the pop-up input keyboard, then the value will be written to the set "notification register address" (i.e. the value input by user).
- Hotkey: When this function is selected, you can enter a number or character to achieve the same effect as that of pressing, For example, if input 1, click the numeric keypad 1in the simulation or on HMI screen, or through an external keyboard, it functions similarly.

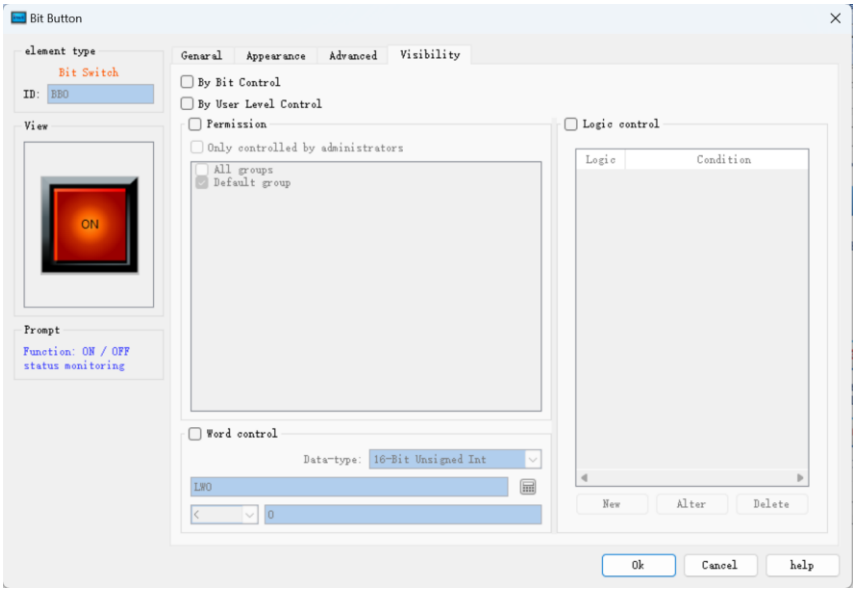
Note: The default user level is NULL, which is the lowest level. Engineering designers can change it by selecting the "Change User Level" function in the function button and entering the corresponding password.

Effective touch means actual effect generates when the control is touched, such as the success of the set, reset, inching, alternation. Another example is the numeric input. When user touches the numeric input button, the keyboard will pop up. Meanwhile the numeric input button will not generate a notification effect, since this operation is not written to the address. If you press ESC to exit the keyboard will not produce notice.

It is valid only when you enter a numeric value between the maximum and minimum values on the keyboard and press the ENTER key, then a notification will arise.

■ Visibility

Select the "Visibility" page to display the "Visibility" property, which is used to set whether the control is displayed or hidden. See the figure below:



- Controlled by bit: When this option is checked, if the Effective State is 1, then the Bit Button can be displayed on the HMI when and only when the value of the Control Bit is 1; If the Effective State is 0, then the Bit Button can be displayed on the HMI when and only when the value of the Control Bit is 0.
- Controlled by User Level: When User Level Controlled is chosen, the conditions will be the same as those in the User Level Controlled option in "Advanced" page, and only when such conditions are met the Bit Button can be displayed on the HMI.
- Word control: Set the judgment condition, and when the register address data satisfies the setting condition, the control displays, otherwise the control is hidden

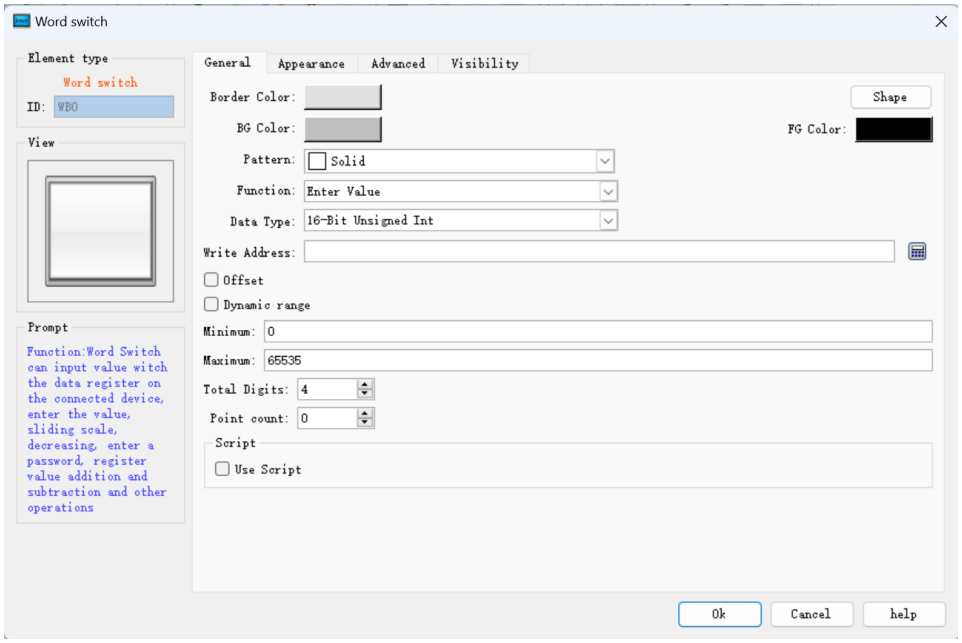
Note: If neither of these two options is checked, the control will be always displayed on the HMI.

4.4.2 Word button

Word Button can support operations of Constant, Enter Value, Increasing, Decreasing, Enter Password, Add and Subtract to the data register address of connected device.

To add a word button:

Select the Word Button icon  on the toolbar, then the following dialog box is displayed, as shown in figure below:

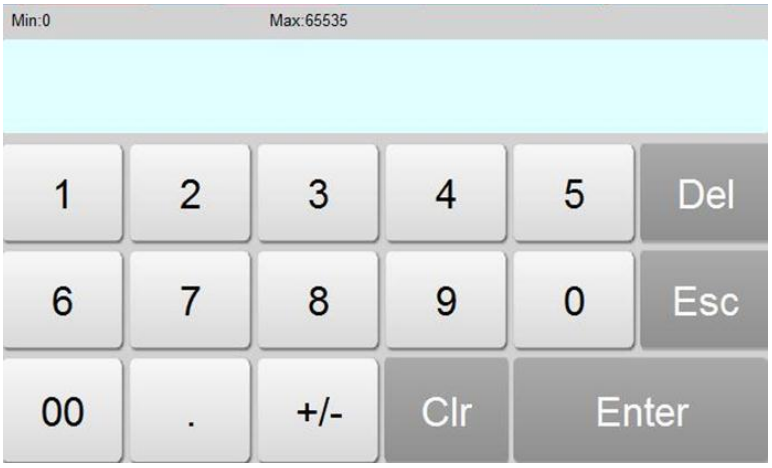


Note: The shape, border color, foreground color, background color and pattern can be set with reference to "Bit Button" control.

Function:

- Set constant: You can choose different data types, HMITOOL software provides a variety of data types: 16/32-bit positive integer, 16/32-bit integer, 16/32-bit BCD positive integer and 32-bit floating point number. Setting a constant is to write the constant value you set to the write address. For example, if the write address is LW1 and the constant is set to 10, the value of LW1 is set to 10 every time the button is touched, regardless of its current value.
- Enter value: You can select a different data type; input a value between the maximum and minimum with

a keyboard popping up after the word button being touched. See the figure below:



- Increasing: When the Delay parameter is 0, its function is the same as that of the Add. If the Delay parameter is not 0, the value of the write address increases by a constant value and is written to the register.
- Decreasing: When "Delay parameter" is 0, this function is the same as that of "Subtract". If "Delay parameter" is not 0, after a certain time, the value written to the address decreases by the constant value and is written to the register.
- Enter Password: Same as the "Enter Value" except that the "Enter Password" function has no option of decimal digits.
- Add: After choosing the data type, writing the address, constant and maximum value, every time you touch the "word button" control, the set value corresponding to the register value will plus the constant value based on the original value. Each time the button is touched, the value written to the address is incremented by a constant; however the value written to the address cannot exceed the maximum value you set. For example, the write address is LW1, the constant is 5, and the maximum value is 65535. Each time you click the Word Button control, the value of LW1 is added to the original value by 5, but the maximum value of LW1 cannot exceed 65535.
- Subtract: After choosing the data type, writing the address, constant and minimum value, every time you touch the "word button" control, the set value corresponding to the register value will minus the constant value based on the original value. Each time the button is touched, the value written to the address is decremented by a constant; however the value written to the address cannot be less than the maximum value you set. For example, the write address is LW1, the constant is 5, and the minimum value is 0. Each time you click the Word Button control, the value of LW1 is subtracted from the original value by 5, but the value of LW1 cannot be less than 0.
- Total number of digits: Number of data including that of decimal points.
- Decimal digits: When the data type is not "32-bit floating point" and there are decimal digits, then the maximum value of the input value should be reduced to 10 nth power. For example: When the selected data type is "32-bit positive integer", and the number of digits is 3, so the user can only enter the value of 0-99999.999.
- Macro: When "Use Macro" is chosen, the macro list is displayed. The user can select a macro to execute

when the word button is pressed. Only compiled macros are displayed in the drop-down list.

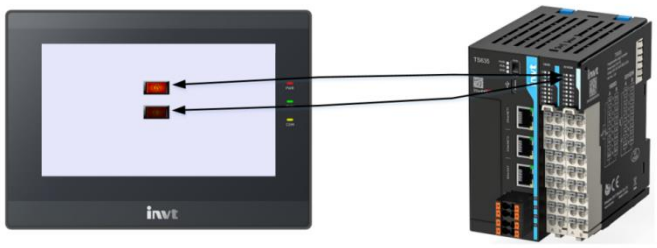
Note: The "Mark" tab of the "Word Button" is similar to that of the "Bit Button" control, except that the Word button has neither Status Text 1 nor Status Picture 1 because the Word Button has only one state.

If select the 32-bit data type for Word button, the address will occupy the length of two words. For example, write V10 to SIEMENS (Siemens) PLC data register, then the occupied data register address includes V10 and V11. If user still employs other control to monitor V11 value, it will fail to work. Pay attention to the application of 32-bit data type in case of error.

The "Advanced" and "Visibility" pages of the Word Button are the same as that of the Bit Button control. You can refer to the Bit Button control and refer to Bit Switch for the use of hotkey.

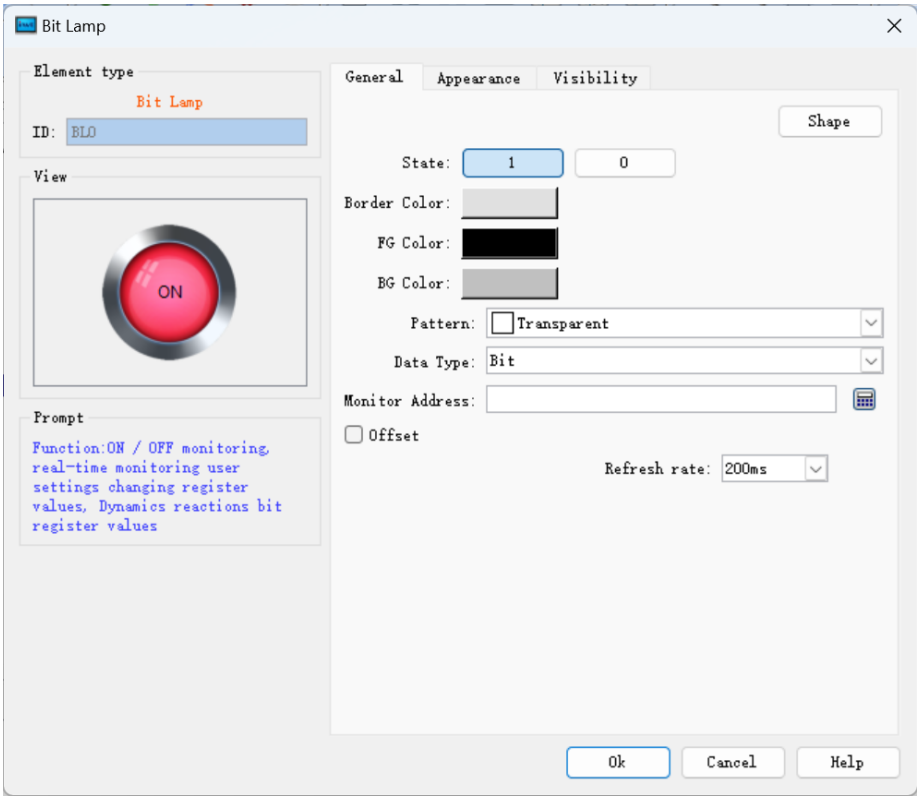
4.4.3 Bit lamp

The Bit Lamp can be used to monitor the ON / OFF status of bit contact of the connected device and to display it on the HMI scree. See the figure below:



Set up a Bit Lamp:

1. Select the Bit Lamp button icon  on the toolbar: The dialog box shown in figure below will pop up:



- Data Type: The drop-down box has three options, namely: Bit, Word Bit and Double-word Bit. If you

select "Bit", the Monitor (read) address is Double-word Bit means a double word address.

- Bit Number: When the chosen data type is "Word Bit" or "Double-word Bit", the value of the monitor address (status of ON/OFF) is determined by the bit number value. It is from 0 to 15 for Word Bit and 0 to 31 for Double-word Bit.

  For example, when "Word Bit" is selected, the monitor address is LW1 with a value of 23, if the bit number is 3, the state of this address value is 0 because the binary number of 23 is 10111 whose 3rd number from right to left is 0.

Note: Refer to Bit Button control for Shape, Border color, Foreground color, Background color and Pattern.

2. In the "General" property dialog box of the bit lamp, choose an address to be monitored by this indicator. Through the settings in "Mark", you can set contents and pictures to be displayed and also choose whether to blink.

Note: The "Mark" page of the "Bit Lamp" is the same as that of the "Bit Button" which you can refer to.

To reset the properties of this indicator, double-click it to reset it in the property dialog box.

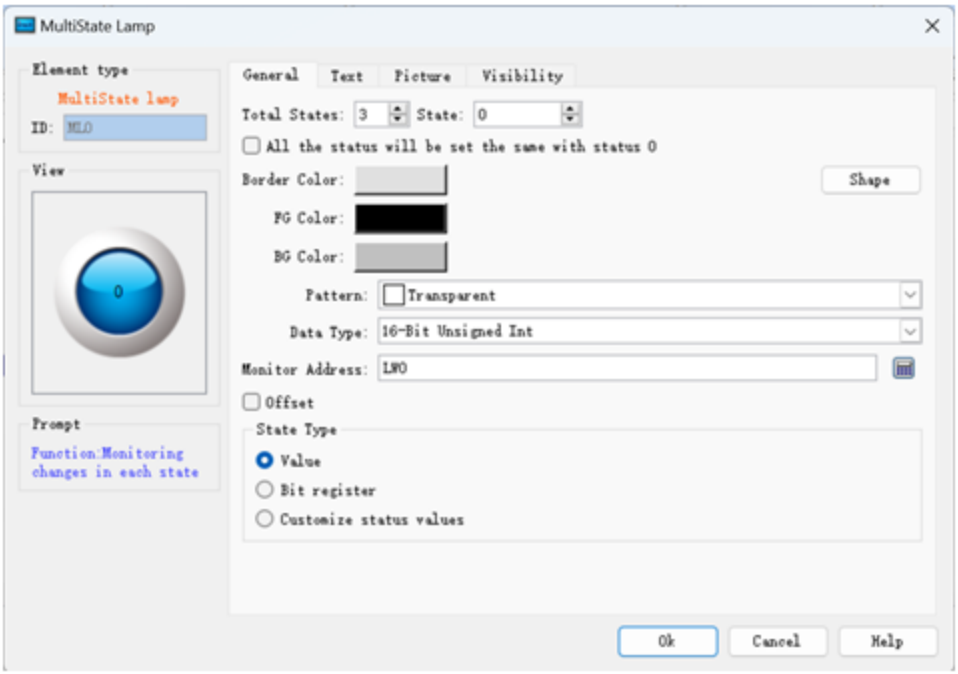
Note: The "Visibility" page of the Bit Lamp is the same as that of the Bit Button control that you can refer to.

3. After the properties set up, click "OK" to add the control in the view area (i.e., the screen)

4.4.4 Multi-state indicator lamp

The Multi-state indicator lamp control is mainly used to display different states according to the value of the monitor address. Up to 512 states can be displayed.

Click the Multi-state indicator button  on the toolbar to bring up the dialog box as shown in figure below:



- **General:**

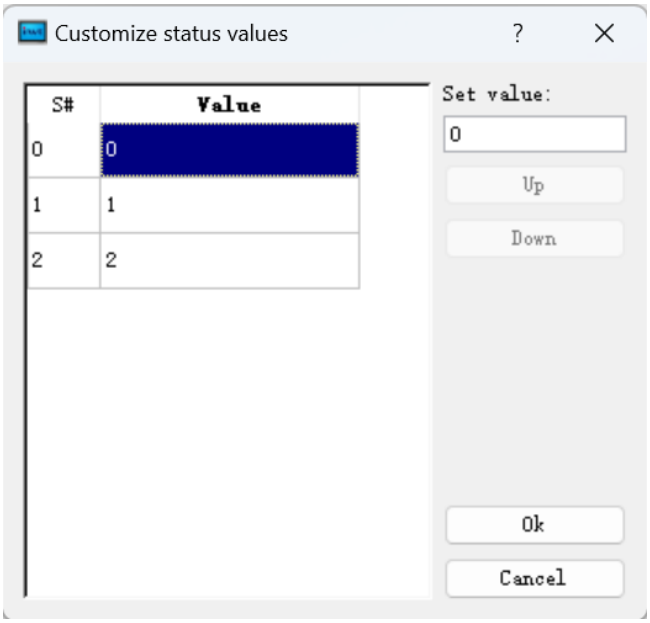
- State: User can change the status value in order to modify the border color, foreground color, background color and pattern of the control in different states
- State Type: (Assuming the user input value is n)
- Value: the written value is from zero to the number of total states minus 1.
- Register Bit: The written value is the n power of 2.

For example:

The monitor (read) address is LW3, and then the total state number is 8. After, click "OK" to add the control to the screen; then add a numerical input control on the screen; set the write address and monitor address to LW3; finally save the project.

In the simulation or on the screen, user clicks on the numeric input control, and input a preferred state value through the input keyboard. If the input value is 2, the value of the monitoring (reading) address is 1, the control shows the text in the state of 1 (the text content in state 1 of the control in the Text page); correspondingly, when the value entered for the LW3 address is 8, the control will display the text content of state 3. If a value of 3 is input to the LW3 address, the multi-state indicator does not switch to any state.

- Customize status value: When user selects this option, a "Defined status value" button appears. Click it to bring up "Customize status value" dialog interface, as shown in figure below:



In this dialog box, the "S #" column is the current status column, that is, the selected value in it indicates the current status value; double- click a Value to enter the value in the current state that you want to write.

For example: The monitor (read) address is LW3, and then the total state number is 8. After, click "OK" to add the control to the screen; then add a numerical input control on the screen; set the write address and monitor address to LW3; finally save the project.

In the simulation or on the screen, user clicks on the numeric input control, and input a preferred state value through the input keyboard. If the input value is 1, the value of the monitoring (reading) address is 1, the control shows the text in the state of 1 (the text content in state 1 of the control in the Text page); correspondingly, when the value entered for the LW3 address is 33, the control will display the text content of state 33. If a value of 513 is input to the LW3 address, the multi-state indicator does not switch to any

state.

- Data Type: The data type of the write address and monitor (read) address.
- Monitor address: The read address, which is a status value to be read, and then reflects the current state selected by user in the control.
- Total states: Users can set the total number of states according to individual need, which can be up to 512 states, that is from state 0 to state 511.

For example, selecting a data type of 16-bit positive integer, a total number of states of 512, when the data value stored in the monitor address is 0, the Multi-state indicator shows the text and the corresponding picture of the state 0; if the data value is 5, the Multi-state indicator will show the text and the corresponding picture of the state 5;. When the value is 516, the Multi-state indicator will not display the message of the State, because the total number of states up to 512 states.

Note:

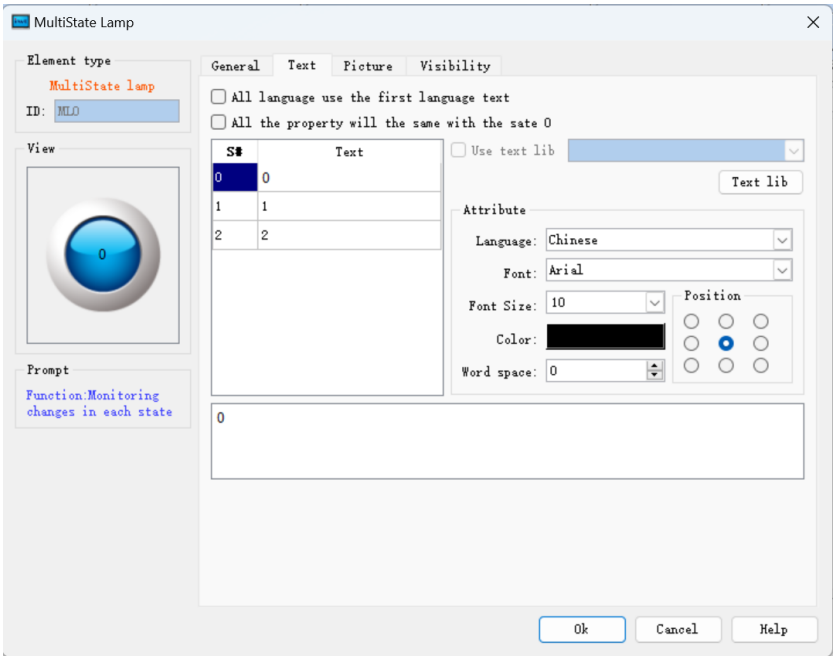
✧ Shape, Border color, Foreground color, Background color and Pattern can be used with reference to that of "Bit Button" control.

✧ When "Multi-state indicator lamp" selects the 32-bit data type, the stored address occupies 2 words. For example, when write data to the SIEMENS PLC's data register, and the address written is V10 , then the occupied data register address includes V10 and V11; if users also use other controls to monitor the value of V11, an error will appear. Users should pay attention to the use of 32-bit data types in case of Note data and address errors.

✧ The data category must be consistent with the data to be indicated.

■ **Text:**

Click the "Text" tab of the Multi-State Indicator Property box to display the text property settings screen as shown in figure below:



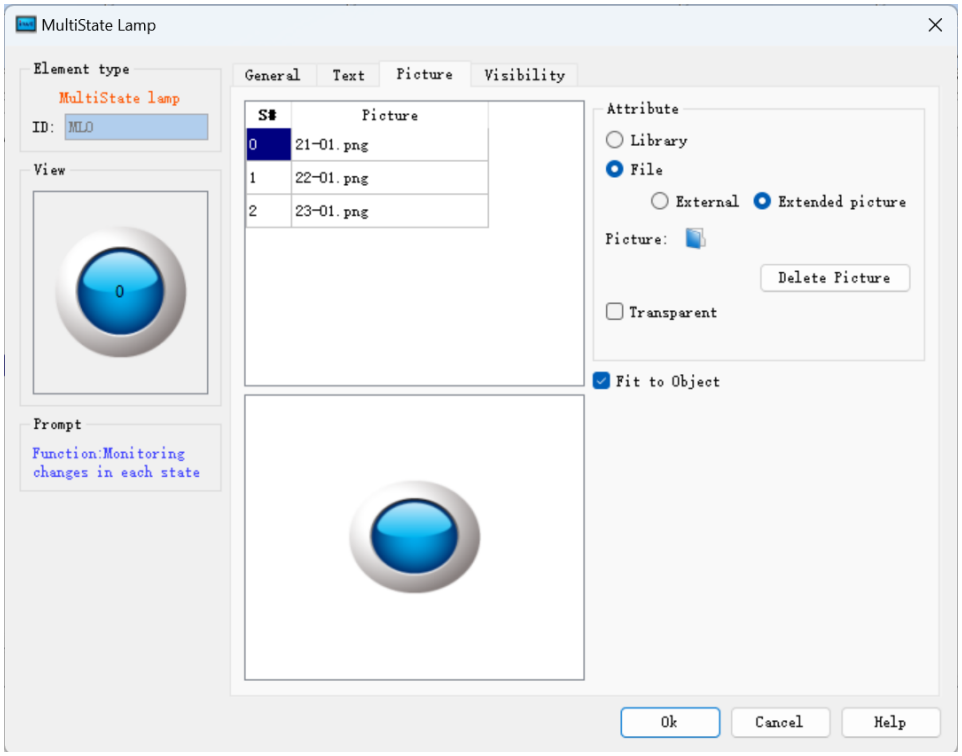
- All languages use the first language text: This option is employed when dealing with multiple languages, that is, in the "Language" in the Project Manager, the total number of languages selected is greater than

1; in this case, the control text does not change with the switch of language.

- Language: This option is used when dealing with multiple languages. Select a different language, you can enter different text contents in different states, in order to achieve the multi-language. (In the function button, select the 'Switch language' option, and the language to switch to; in the simulation or screen, click this button, and then all the screen with text control will switch to that with text content of the specified language). For different languages, text content, font and font size can be different, but the color, kerning and position are the same.
- Font: You can choose the type of text for the input text; different states can choose different fonts, and different languages can choose different fonts.
- Font Size: You can choose the font size for the input text content; different states can choose different font sizes; different languages can also choose different font sizes.
- Color, Kerning, Position: Set the color, kerning, and alignment of the selected text. When you choose a language other than Language 1 in the Text page when the total number of languages selected in the Project Manager is greater than 1, the three functions: color, kerning and position are invalid because they are the same as the language 1.

■ **Picture:**

Click the "Picture" tab of the Multi-State Indicator Property box to display the attribute settings as shown in figure below.



This page is mainly employed to load pictures for different states. Picture of each state is empty by default while it can be changed according to personal need.

Steps are as follows: Select the item in the list box whose picture needs to be changed, then choose the right picture either in system library or through save path on Windows. So when click on different status, corresponding pictures will be loaded below. In addition, user can also decide whether to fit to Object: if not,

the margin and position of the control can also be modified, so as to beautify it.

Fit to Object: When this is selected, the size of the graphic is the same as that of the controls on the General page while the Margin and Position options are hidden, otherwise they appear.

If importing a picture from an external file, the "Transparent" option will display for use. This function is meant to make a specified color transparent.

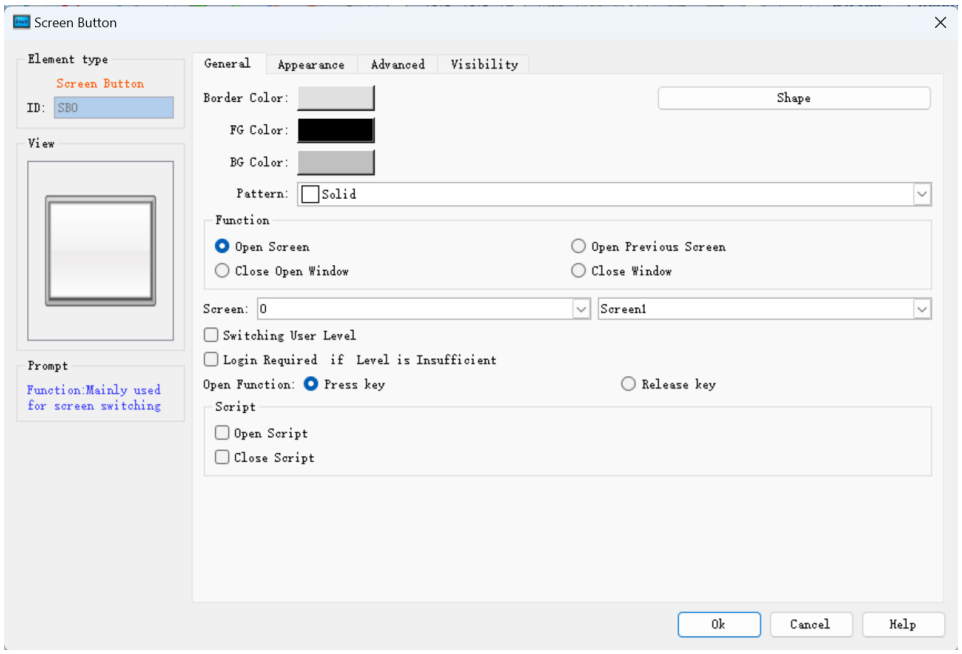
Note: Refer to "Bit button" control for Visibility page.

After setting all the properties, click "OK" and then add the control in the screen area.

4.4.5 Screen button

Screen button is designed for screen switching, changing the user level, pop-up window and other operations. After being set, it can make a screen/ window jump to a certain screen / window while you can also decide whether to change the user level at the same time.

Click the icon button  on the toolbar to bring up the dialog box, as shown in figure below:



Note: Shape, border color, foreground color, background color and pattern settings can be used with reference to "Bit Button".

■ **Function modules:**

Open Screen: It allows users to jump to the selected screen by clicking the button. This function can be employed on a screen or in a window.

Open Previous Screen: It allows users to jump to the previous screen of this page by clicking the button.

This function can only be used in the screen page.

Close Open Screen: This function can only be used in the window page. It allows closing the current window and opening another window or screening.

Close Screen: This function can only be used in the window page. This function allows closing the current window page.

- **Switch user level:**

Logout: Restore the current user level to the default user level

Specified User Level: Change the current user level to the specified user level

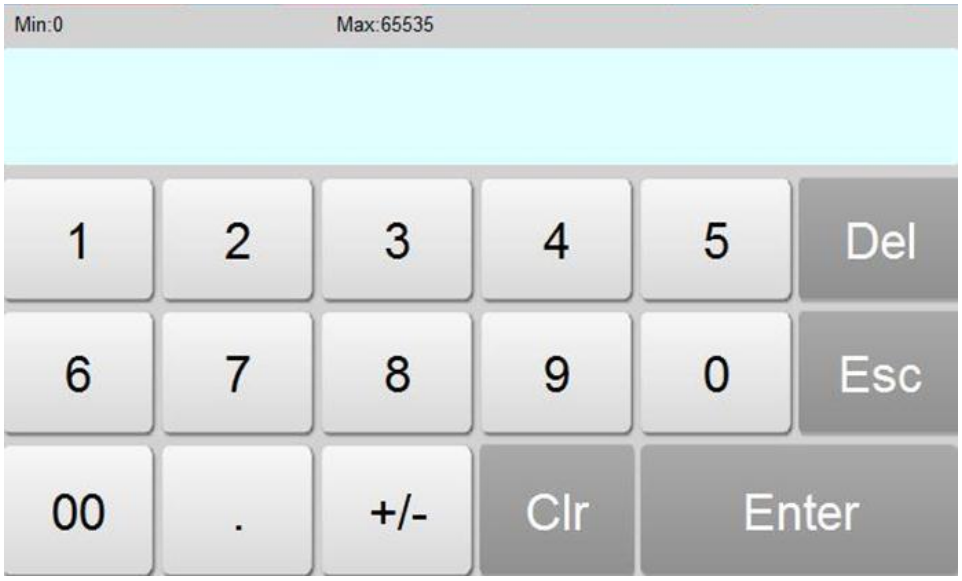
- **Open function:**

Press: When the user presses the mouse, it executes the screen switching function.

Release: When the user releases the mouse, it executes the screen switching function.

- **Login required if level is insufficient:**

If the user has selected the "Controlled by User Level" option on the "Advanced" page of the "Screen Button" dialog box, and has changed the "Effective Lowest Level", then the screen control is only valid if the current user level is higher than or equal to the user- If the current user level is less than the effective minimum level set by the user, the password input box will pop up when the user touches the screen control on the HMI, as shown in figure below:



This screen can only be opened when the password entered by the user is higher than that set by the user, and the current user level is decided by the level password just entered by the user.

- **Macros:**

"Open macros" displays a list of macros. The user can select one to execute when press the button. Only compiled macros can be displayed in the drop-down list.

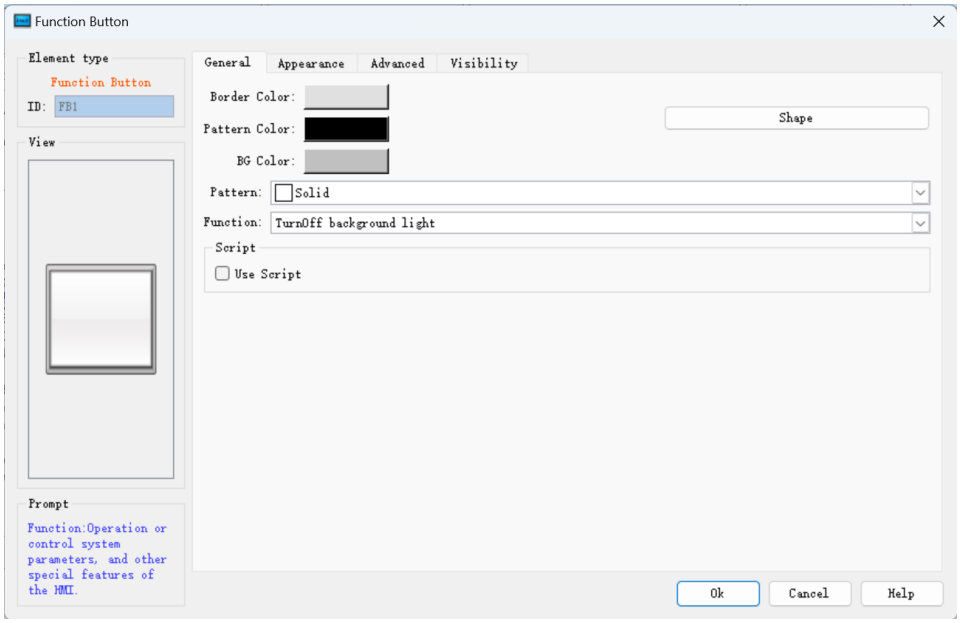
Note: The "Label" page of the Screen Button is similar to that of the "Bit Button" control. Because the Screen Button has only one state, its Label page only has Status 1 Text and Status 1 Picture. Apart from that, the functions are the same.

The "Advanced" and "Visibility" pages of the "Screen Buttons" are the same as those of the "Bit Button" control, which can be used with reference to the Bit Button.

After setting all the properties, click "OK" and the mouse cursor will turn into a cross. Left click in the view area to add the control to the screen.

4.4.6 Function button

Function Button is an essential control in HMI; with the Function button you can achieve a variety of functions easily and quickly. Click  to open the property dialog box of Function Button, as shown in figure below:



Note: Refer to Bit Button control for Shape, Border color, Foreground color, Background color and Pattern.

1. Turn off Background light

Choose the function of turn off the background light. Then click the button on the screen to turn off it while HMI will still works properly. To turn on the backlight, simply touch anywhere on the HMI.

2. Confirm Alarm

Choose the function of Confirm the alarm. Then you can confirm the selected alarm by clicking the button.

3. Restart

If the function button is set to System Restart, then the HMI will be restarted by touching this button.

4. Set screen saver timeout

If the function button is set to Set Screen Saver Timeout, then a window will pop up for setting of screen saver timeout after touching this button.

5. Write recipe to the PLC

Choose this function to transmit recipe to the PLC. Click this button on the HMI to transmit the recipe saved in the current HMI to the PLC or corresponding continuous data register of other connected devices. (The address is the write address set by engineers when set up a recipe with the software.)

6. Read recipe from the PLC

Choose this function to read recipe from the PLC. Click this button on the HMI to read the recipe data from the PLC or corresponding continuous data register of other connected devices. (The address is the write

address set by engineers when set up a recipe with the software.)

7. Set the date and time

Choose this function to set the time and date; click the button on the HMI to set the inner time and date.

8. Clear Alarm

Choose this function to clear the alarm; click the button on the HMI to clear the selected and confirmed alarm.

9. Previous recipe

Choose this function of the Previous Recipe to open the previous recipe of the current one after clicking this button. If the current recipe is the first one or the total number of recipe is 1, this operation does not change recipe parameters.

10. The latter recipe

Choose this function of the Latter Recipe to open the latter recipe of the current one after clicking this button. If the current recipe is the last one or the total number of recipe is 1, this operation does not change recipe parameters.

11. Save the current recipe

Choose this function for saving the current recipe by clicking the button on the HMI to save the recipe data from corresponding continuous data register of the PLC or other connected device, which is set when engineers set up the recipe with the software.

12. Screenshots

Set the function button function as Screenshot; click this button to intercept the current screen as a picture saved in the user-specified location. The address of Picture name can be input using ASCII Input, the Picture name cannot consist of : #￥%&*-+<> etc. And the length of the name must be 20 or shorter than 20.

13. System parameters

Set the system parameter of the function button. Click it on HMI to open the system parameter setting screen where you can modify settings, such as system time, screen saver time, background light contrast and so on.

14. Log on

Choose the function of Log on. When the user clicks this button, a login interface will pop up. After choosing the User Name, a keyboard will pop up with which user inputs a password to achieve access permission.

15. Cancel user login

Choose the function of cancel a user's login; click this button on the HMI to log out and cancel the current user's privilege so that the user's level becomes the lowest.

16. Alarm Sound (ON / OFF)

Choose the function of Alarm Sound ON / OFF to make a sound when it occurs an alarm. You can set the function button to enable or disable this function. If the current state is on, the alarm sound will be shielded after user clicking this button, and vice versa

17. Touch sound (ON / OFF)

Set the function button to Touch Sound Switch, and then the touch sound may be turned on/off by touching this button. If there is touch sound at present, the touch sound will be turned off after touching this button, and vice versa.

18. Clear all historical data

The history data stored in HMI will be cleared.

19. Clear the historical alarm

The history alarm saved in HMI is cleared.

20. HMI protection unlock

Enter the password to deactivate the HMI protection.

21. Recipe Read & Save

Read and save the recipe.

22. Alternate function

Only as back-up function, it does not perform any operation.

23. Reload recipe

Reload the recipe data in flash to the corresponding RWI address.

24. Switch languages

Switch text contents of all the controls to that of another specified language

25. Print Screen via a serial printer

Print the set screen through a serial printer. Connection setting of the printer driver is under the "HMI Parameter settings" -> "Printer and Download settings", in the left frame of the software interface.

26. Slave device IP configuration

This function requires the "Extended Mode" that can be set in the "Communication Port Property". The application of Ethernet communications for multi-machine needs to add a station number and the register address controlling the station number in front of the corresponding control. When the project in HMI is running, click on the function control, and the station number set by user will be shown in the " IP config "dialog box; then set the corresponding IP parameters of station number to achieve multi-machine Ethernet communication.

27. Function set of DIP switch 1 and 3

Functions of DIP switch 1 and 3 on the hardware when they are in ON state, mainly consisting of IP setting, system time setting and backlight parameters. After the setting, click "OK" to restart.

28. HMI delay solution lock

When HMI protects the -> advanced -> delay function, the button is needed to hit the button at the HMI, and the delay function will take effect

29. Touch calibration

Recalibrate current HMI coordinates

Use Macro: Selecting "Use macro" will bring up a list of macros and users can choose one to execute when the function is executed. Only compiled macros are displayed in the drop-down list.

Note:

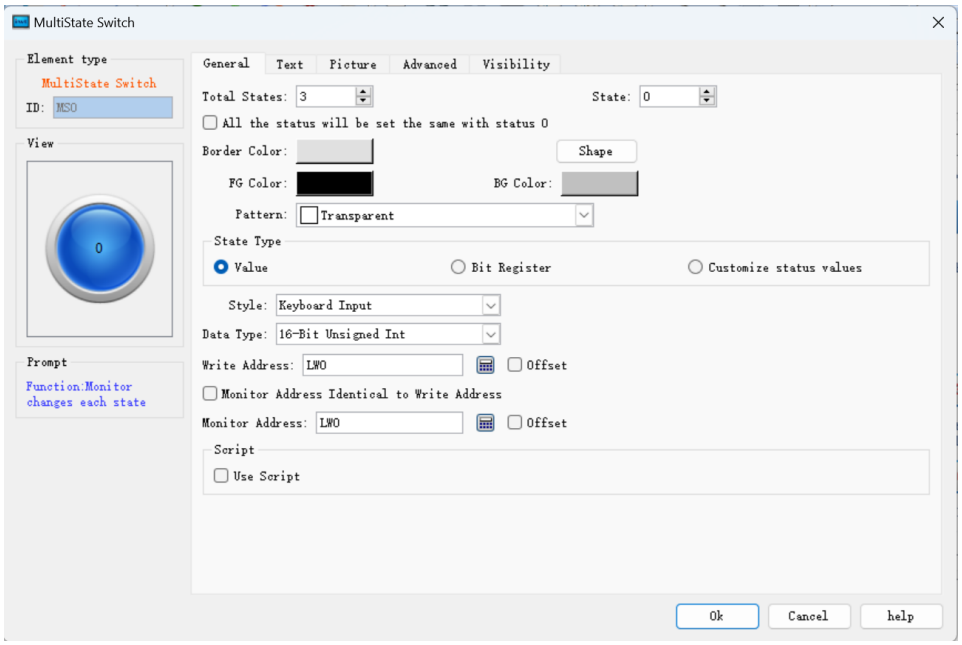
- ✧ After jumping to the system screen, the system will close the current project; when return from the system screen, it will restart the project, and enter the start screen of project settings.
- ✧ The "Mark" page of Function button is similar to that of the "Bit Button" control which you can refer to, except that the Mark page of Function button has neither Status Text 1 nor Status Picture 1 because it has only one state.
- ✧ The Advanced and Visibility pages of the Function Button are the same as that of the Bit Button control. You can refer to the Bit Button control and refer to Bit Switch for the use of hotkey.
- ✧ Operations of Previous recipe, later recipe, save recipe, read & save recipe are only valid to the current recipe group. If you still want to operate, set the LW61141 group then.
- ✧ Clear history data means all historical data groups are cleared.

After setting all the properties, click "OK" to add the control button to the view area (i.e., the screen)

4.4.7 Multi-state button

Functions between Multi-state button and Multi-state indicator lamp are basically the same, while the only difference is that multi-state button supports value input, rather than simple function of indicating. Specific operation is as follows:

Click the button icon  on the toolbar to display the dialog box shown below.



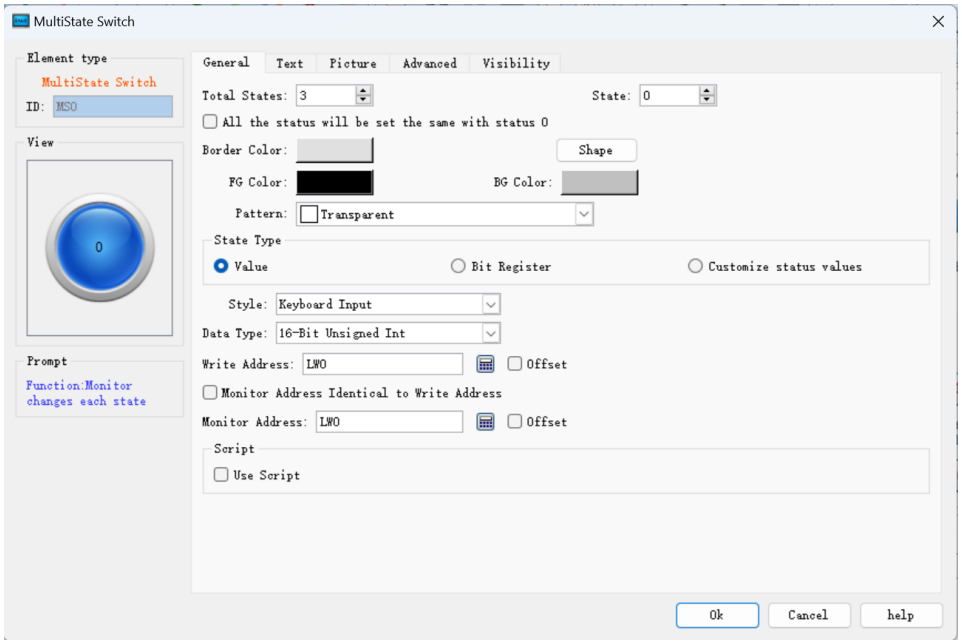
- State: User can change the state value, as well as the border color, foreground color, background color and pattern of the control in different states
- State type: (assuming the input value is n)
  - ✧ Value: The value written is a number from zero to the total number of states.
  - ✧ Register bit: the value written is nth power of 2.

  For example:

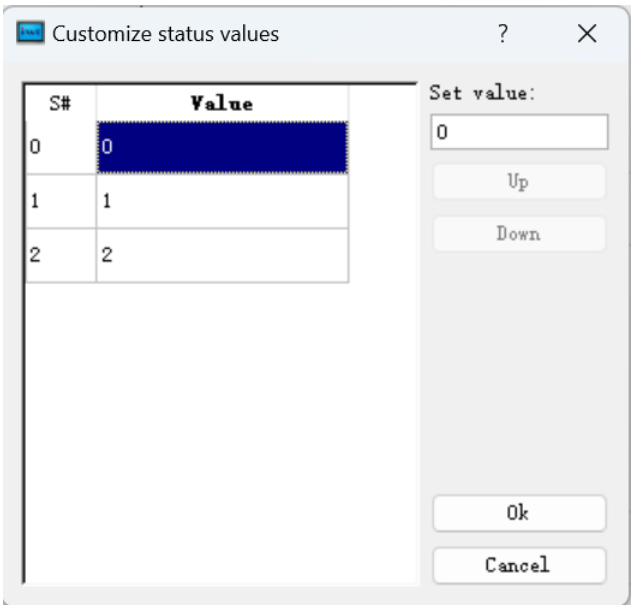
Select "Value" for State Type, "Keyboard Input" for Mode and LW3 for Write Address and select the option of "Monitor Address Identical to Write Address", the total number of states 8. After that, click "OK" to add the control to the screen, then save the project.

In the simulation or screen, click on the control, and then an input keyboard pops up where user can enter a state value. Assuming that the input value is 3, then the value written to the register LW3 is the 3rd power of 2, which shows the text in the state 3 (the text in state 3 of this control in the Text page). Conversely, when the value entered for the LW3 address is 8, the control displays the text content of the state 3. When the value of the LW3 address input is 5, the control does not display any status.

✧ Customize Status Value: When select this option, a "Define Status Value..." button appears, as shown in figure below:



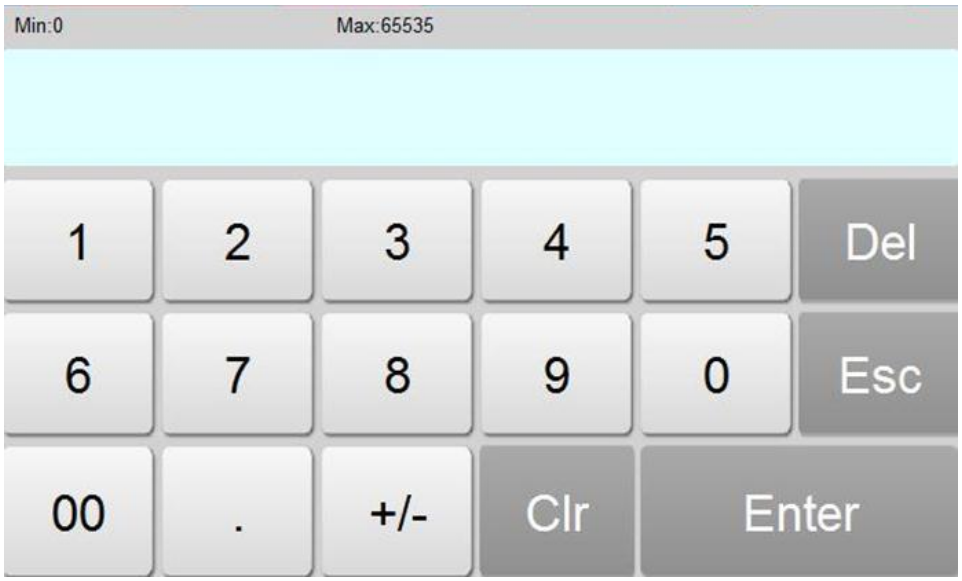
Click "Define status value..." button, it will pop up a "Customize status value" dialog interface, as shown in figure below:



In this dialog box, the "S #" column is the current status column. After selecting a row, the corresponding value to "S#" in that row indicates the current status value; double-click to enter the value in the current state.

For example, select "Customize status value" for State Type, "Keyboard Input" for Mode, and LW3 for Write Address and select the option of "Monitor Address Identical to Write Address", the total number of states is 8. After that, click "OK" to add the control to the screen, then save the project. In the simulation or screen, click on the control, and then an input keyboard pops up where user can enter a state value. Assuming that the input value is 1, then the value written to the register LW3 is 22, which shows the text in the state 1 (the text in state 1 of this control in the Text page). Conversely, when the value entered for the LW3 address is 33, the control displays the text content of the state 2. When the value of the LW3 address input is 2, the control does not display any status.

- Mode: Provide six function options: "Keyboard Input", "Output constant", "Increase", "Decrease", "Loopback increase" and "Loopback decrease".
  - ✧ Keyboard input: Three options in the "State Type" can be selected. In the simulation or screen, when click the control, it will pop up a keyboard for user to enter the value, as shown in figure below:



  - ✧ Output constant: Only the "Value" option can be selected among the three function options in the "State Type". After selecting this option, a "constant" box will show for constant setting. In the simulation or screen, if click on the control, the value written is the set constant value
  - ✧ Increase: Only the "Value" option can be selected among the three function options in the "State Type". In the simulation or screen, when click on the control, each click means the number of state plus 1; it stops increasing in case of beyond the total number of state.
  - ✧ Decrease: Only the "Value" option can be selected among the three function options in the "State Type". In the simulation or screen, when click on the control, each click means the number of state minus 1; it stops decreasing in case of beyond the total number of state.
  - ✧ Loopback increase: Only the "Value" option can be selected among the three function options in the "State Type". In the simulation or screen, when click on the control, each click means the number of state plus 1; it returns to state 0 if beyond the total number of state.
  - ✧ Loopback decrease: Only the "Value" option can be selected among the three function options in

the "State Type". In the simulation or screen, when click the control, each click means the number of state minus 1, it will return to the maximum state in case of beyond the total number of state.

- Data Type: The data type of the write address and monitor (read) address
- Monitor address: Read address whose value is to read the state value and reflect the current state on the control.
- Total number of states: the maximum number of states
- Use Macro: If this option is selected, when click on the control in the simulation or screen, the macro selected by the user is executed in this case.

Note:

✧ Shape, border color, foreground color, background color and pattern can be used with reference to "Bit button" control.

✧ Refer to "Multi-state indicator lamp" control for "Text" and "Picture" pages.

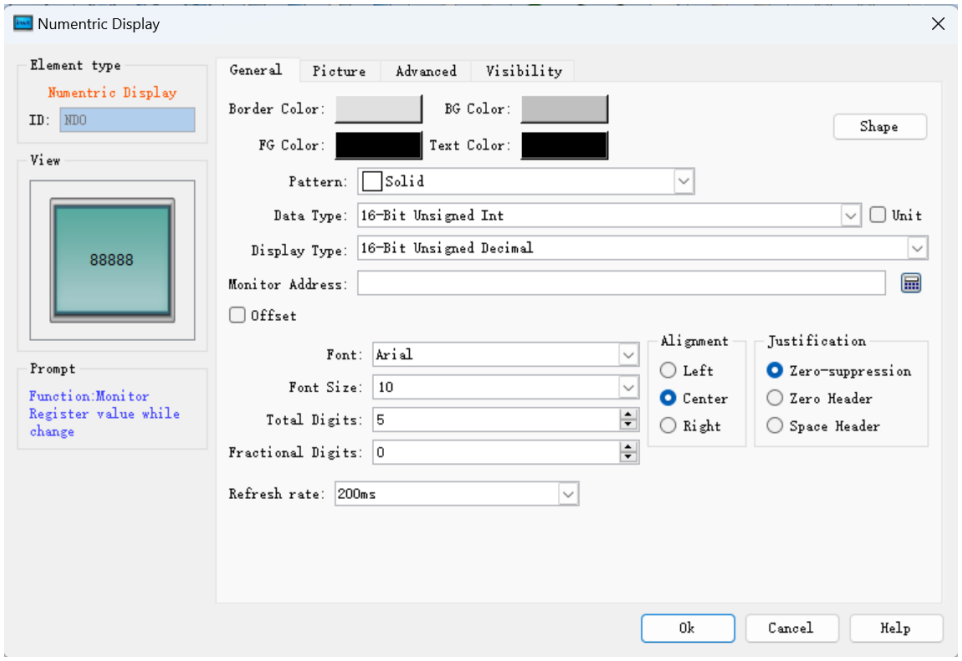
✧ The "Advanced" and "Appearance" pages are referred to the "Bit Button" control. Specific hot keys can be used to refer to the bit switch.

After setting the properties, click "OK" to add the control in the view area (that is, the screen)

4.4.8 Numerical display

Numeric display control is a commonly used control displaying values in data register stored in PLC or other connected devices, such as speed, current, pressure and so on.

Select the display icon  in the toolbar, and then the system will bring up a dialog box. See the figure below:



In this dialog box, you can set the value saved in data register of PLC or other connected devices, such as the display digits, the decimal place, and font size, color, alignment and adjustment of text control.

- Data type: Users can choose different data categories according to the value of the register address to be monitored.
- Display Type: Users can choose different display categories according to project needs.

- Monitor address: Read address. The control is applied to display the data; the monitor address is the data register address carrying data to be displayed in PLC or other connected devices.
- Decimal Place: Display the number of decimal places for the data.
- Font: Choose a general font or digital font.
- Font size: Choose the size of the displayed font as needed.
- Alignment: The default is Center.
  - ✧ Left: The numerical value displayed is in the left part of the display area.
  - ✧ Center: The numerical value displayed is at the center of the display area.
  - ✧ Right: The numerical value displayed is in the right part of the display area.
- Justification: The default is zero-suppression.
  - ✧ Zero-suppression: Zero in front of the significant figure is hidden. If the value of the monitor address is 00123, a 16-bit positive integer, then the value displayed in the display box is 123.
  - ✧ Zero Header: Display the leading zero of the effective number of bits. If the value of the monitor address is 00123, a 16-bit positive integer, then the value displayed in the display box is 00123.
  - ✧ Space Header: Display the space instead of 0 in front of the significant digit. If the value of the monitor address is 00123, a 16-bit positive integer, then the value displayed in the display box is 123.
- Text Color: The font color of the data displayed;

Note:

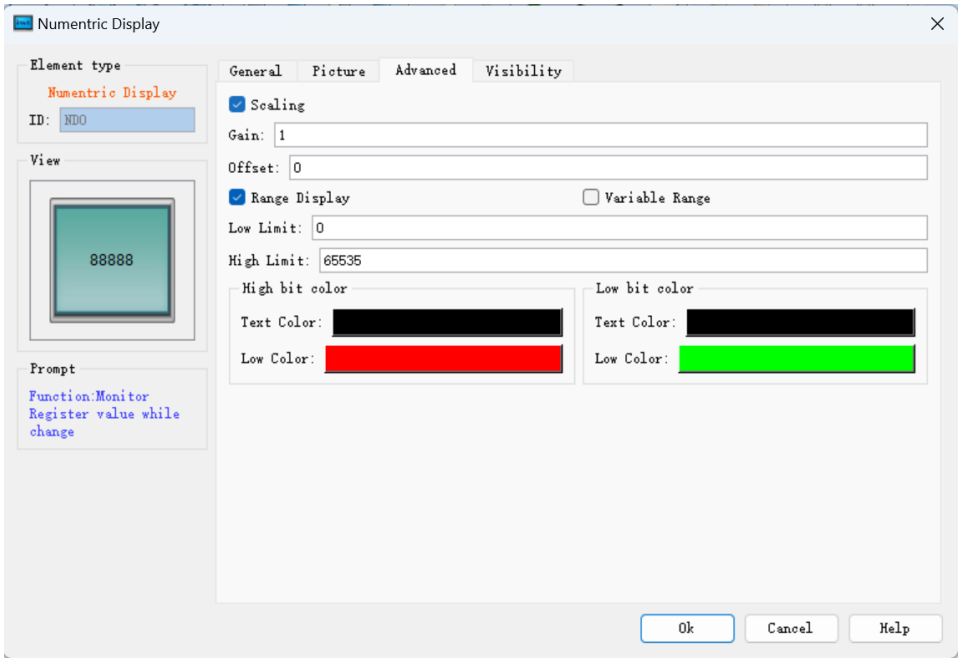
✧ Shape, border color, foreground color, background color and style can be used with reference to "Bit button" control.

✧ Double-click the data display box to reset the contents and properties of the data display. When the control functions in the HMI, an on-screen keyboard will pop up, giving an access to the data input for user.

✧ The number of decimal place affects the data display. When the selected data type is 16/32-bit positive integer, 16/32-bit integer, and then the displayed value is acquired by offsetting the decimal point of return value by the set number of digits. If the value 212 is returned and the number of decimal places is 2, then "2.12" is displayed. If the selected data type is a 32-bit floating-point number, the value has no offset; but only the fractional decimal places are displayed. If the value 2.123 is returned and the scale is set to 2, only "2.12" is displayed.

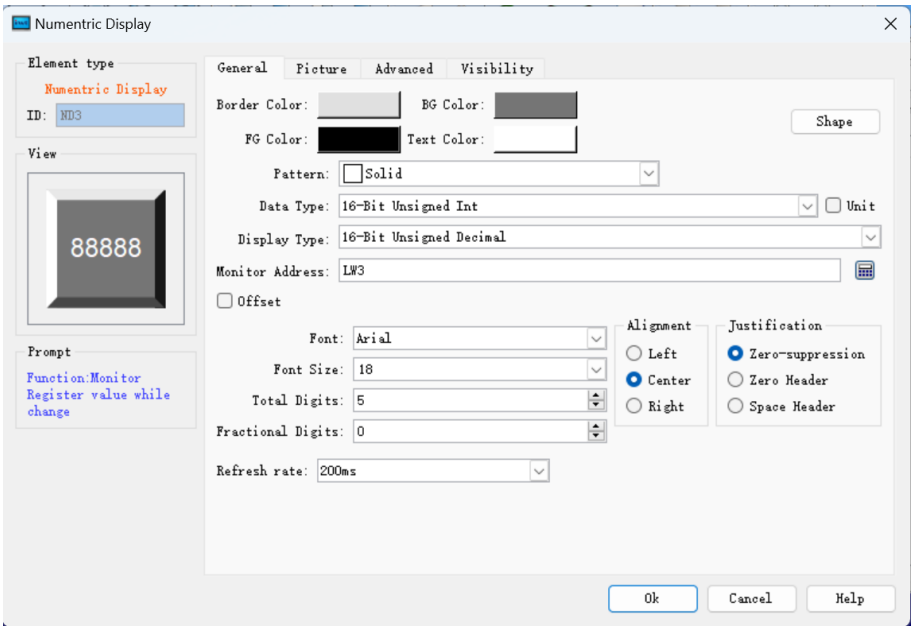
✧ Total number of bits means the sum of the length of the integer part and the fraction part. If the integer length of the displayed value is greater than that of the integer part, the length of the displayed integer will be that of the actual value. For example, for the value 2123, the length of value is 2, and number of decimal place is 1, then it will display 212.3.

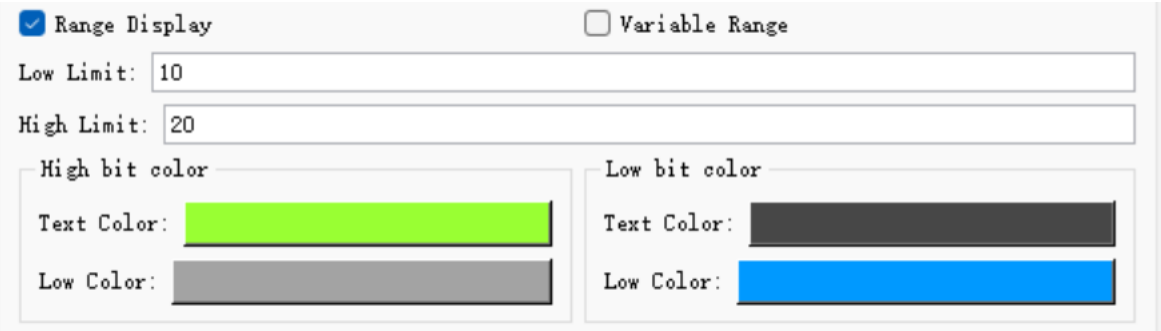
The "Advanced page" of "Numeric Display" contains powerful functions, including "Scaling" and "Range Display", as shown in figure below:



- Scaling: When this option is selected, the data displayed by the numeric display control is: Monitor (Read) Address Value × Gain + Offset
- Display Range: When this option is selected, user can set the lower and higher limit values as well as the low and high-level background color according to the needs. The address value monitored (read) by the control will be represented by different color patterns in the user-set lower and higher limit values.
- Variable range: the values of "Lower Limit" and "Higher Limit" are dynamically changed, depending on the address entered by the user
  - ✧ Lower limit: Set the lower limit of the display. When the number displayed is lower than this limit, the background color will be the color set in Low Level Background Color.
  - ✧ Higher limit: Set the higher limit of the display. When the number displayed is higher than this limit, the background color will be the color set in High Level Background Color.

For example, when you set the background color and text color in the General page and select the Range display color as shown in figure below:





When the value of the monitored address changes, the text and background of the numeric display change accordingly, as shown in figure below:

Note:

✧ Refer to the use of "Bit button" control for the Visibility page.

✧ When the 32-bit data type is selected, the stored address occupies 2 words. For example, when write data to the SIEMENS PLC's data register, and the address written is V10, then the occupied data register address includes V10 and V11; if users also use other controls to monitor the value of V11, an error will appear. Users should pay attention to the use of 32-bit data types in case of Note data and address errors.

After the setting, click "OK" to add the control to the view area (that is, the screen)

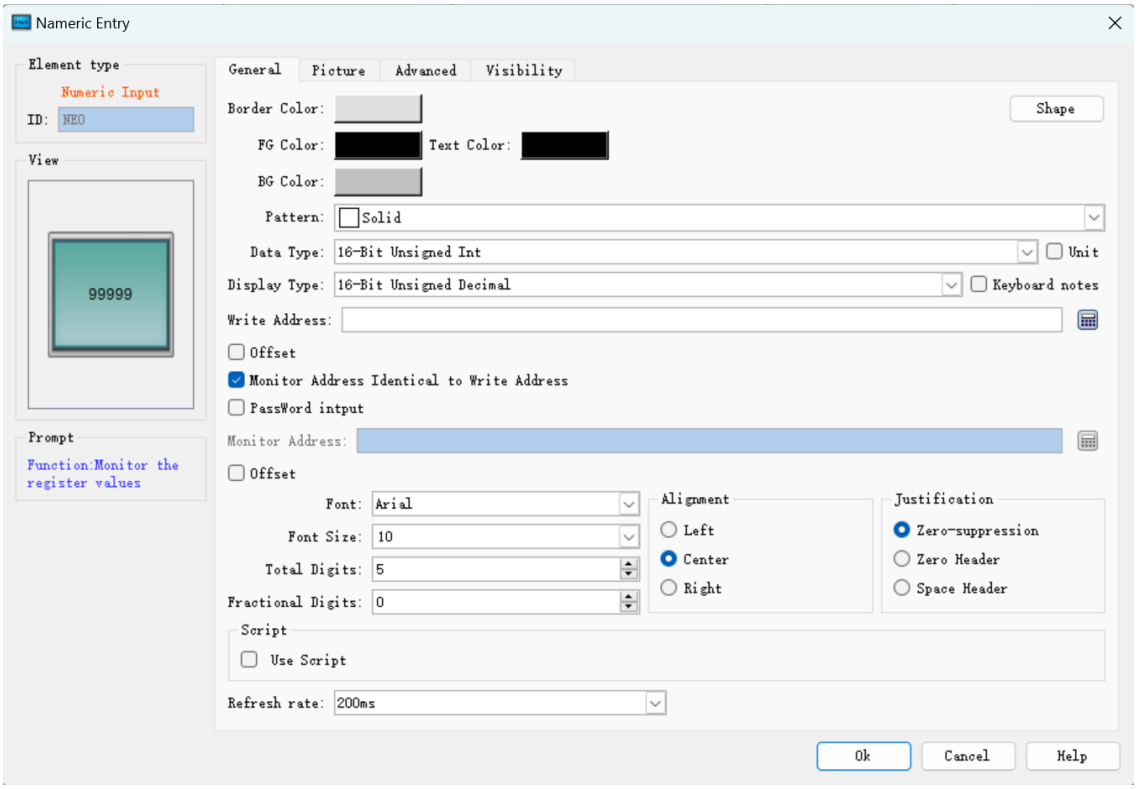
4.4.9 Numerical input

Numeric input is the most commonly used control, almost essential for all of the process control processes. It can input, display and store the value in the data register of the PLC or other connected devices, such as speed, current, pressure and so on.

Functions of Numeric input and numerical display are basically the same, and the only difference is that the numerical input can enter values to the data register of PLC or other connected devices, but not just display the value.

Specific operations to create a numeric input touch key are as follows:

1. Select the Numerical input icon  in the toolbar, and a dialog box appears, as shown in figure below.

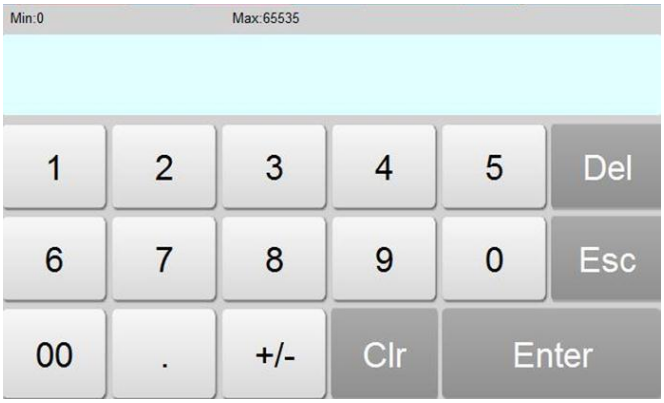


Note:

✧ Shape, border color, foreground color, background color and pattern can be set with reference to "Bit button" control.

✧ Refer to the "Numerical Display" control for "Alignment", "Justification", "Decimal Place" and "Total Digits".

2. Double-click the data display box to reset the contents and properties of the data display. When the control functions in the HMI, an on-screen keyboard will pop up, giving an access to the data input for user, as shown in figure below.



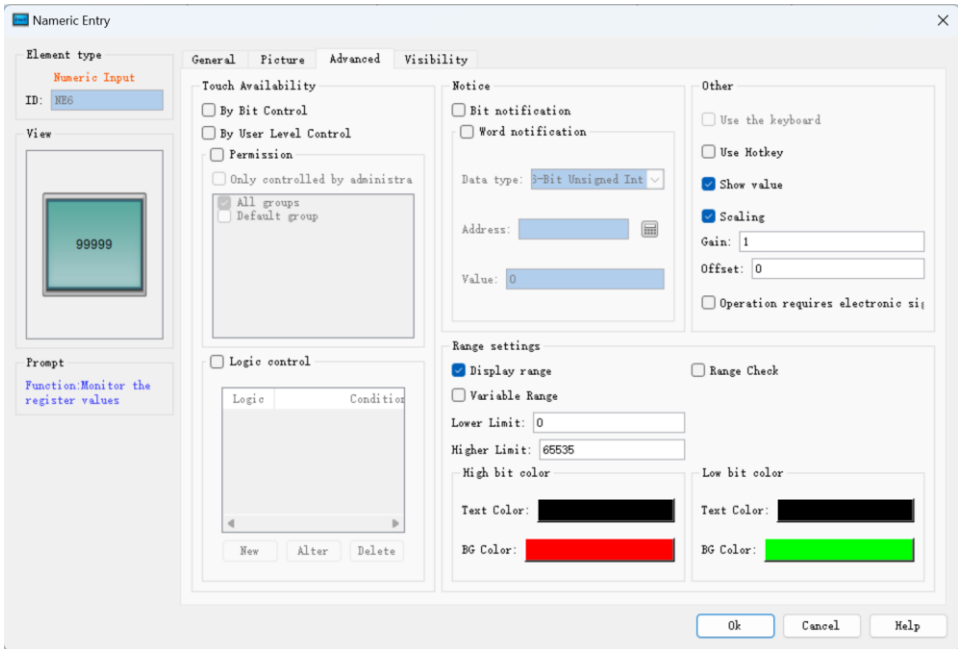
Note: When the 32-bit data type is selected, the stored address occupies 2 words. For example, when write data to the SIEMENS PLC's data register, and the address written is V10, then the occupied data register address includes V10 and V11; if users also use other controls to monitor the value of V11, an error will appear. Users should pay attention to the use of 32-bit data types in case of data and address errors.

- The number of decimal place affects the data display. When the selected data type is 16/32-bit positive integer, 16/32-bit integer, and then the displayed value is acquired by offsetting the decimal point of

return value by the set number of digits. If the value 212 is returned and the number of decimal places is 2, then 2.12 is displayed. If the selected data type is a 32-bit floating-point number, the value has no offset; but only the fractional decimal places are displayed. If the value 2.123 is returned and the scale is set to 2, only 2.12 is displayed.

- Total number of bits means the sum of the length of the integer part and the fraction part. If the integer length of the displayed value is greater than that of the integer part, the length of the displayed integer will be that of the actual value. For example, for the value 2123, the length of value is 2, and number of decimal place is 1, then it will display 212.3.
- Password input: "Password input" means the password input function, and the characters entered by the user are displayed in the form of "*" in the process of inputting and displaying.
- Use Macro: Select the option of "Use Macro" to display the list of macros. User can select a macro to execute when the numeric input button is pressed. Only compiled macros are displayed in the drop-down list.
- Total digit: The total number, the sum of the integer part and the sum of the decimal parts, controls the size of display and input values. The total number of decimal places is 4, and the decimal number is 1. The maximum decimal value is 999.9, which is the maximum value of the input and display of the control. The input exceeds the value, indicating errors; the display exceeds this value, ignores the redundant bits, and displays the number of settings only. Such as: total number of 4, decimal 1, the actual value of 12345, the control display effect of 234.5.
- "Advanced" page: This page is mainly used to set the gain, offset and range check of input data (to check whether the input value is beyond the set range); In addition, the advanced page also has "Touch availability " and "Notification" options, which have the same functionality as that of the "Bit Button" control which users can refer to.

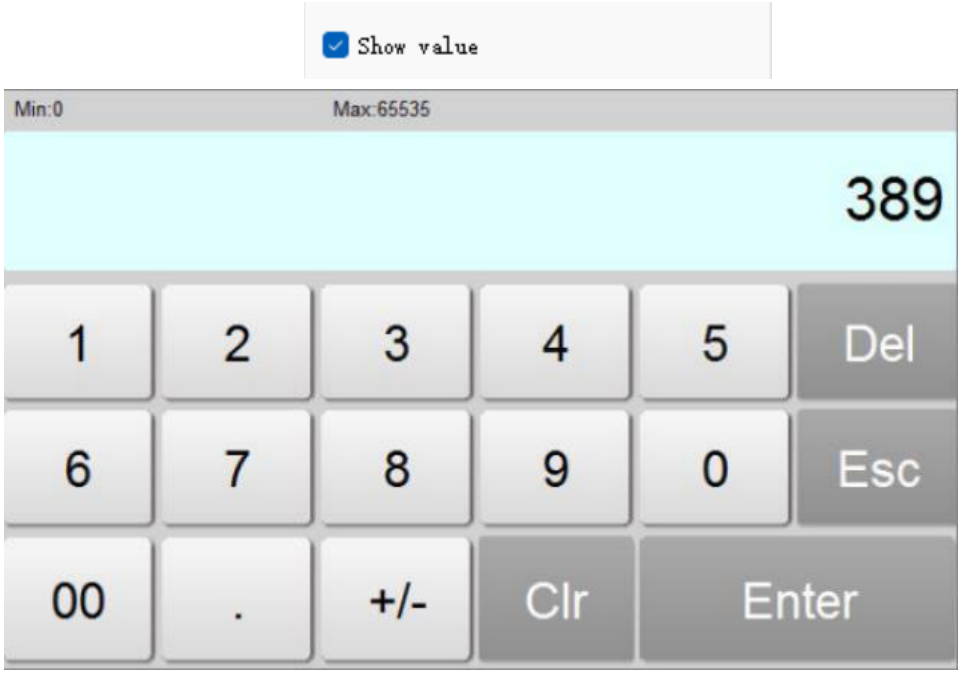
3. Click the "Advanced" tab, as shown in figure below:



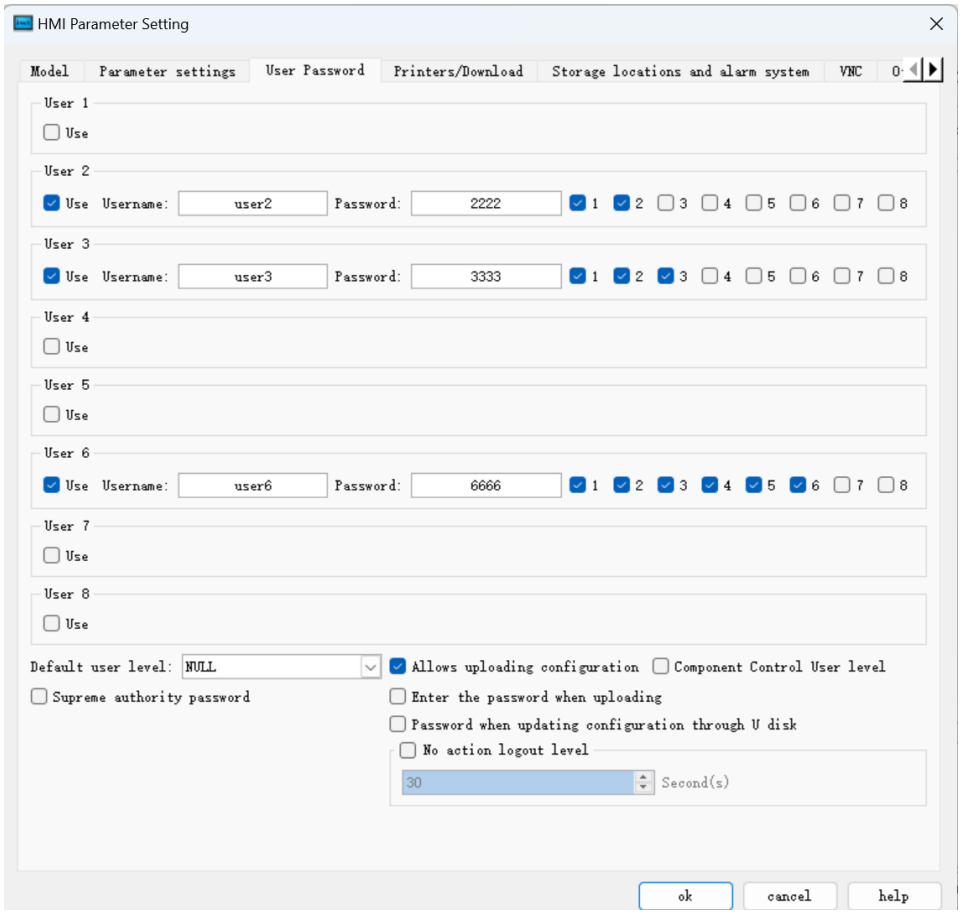
- Controlled by Bit: If select this option, the control is not available until under specific conditions. When the "Valid Status" selected is 1, the "Bit Button" can be effectively touched if and only if the value of the

"Control Bit" is 1. When the selected "Valid Status" is 0, the "Bit Button" can only be effective if and only if the value of the "Control Bit" is set to 0. Otherwise, the "Bit Button" cannot function no matter how.

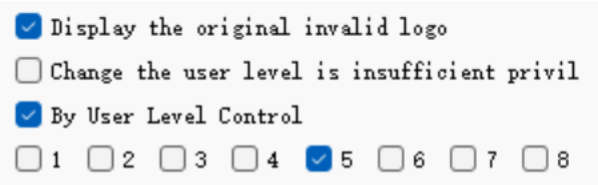
- Controlled by User Level: User can select multiple options as needed. After setting, in the simulation or on the HMI screen, the current user is checked whether this user lever has the Visibility.
- Use Hot Keys: Refer to the Bit button.
- Show value: If select this option, the user data input, it will display the control value in the input keyboard when user inputs values, for example, the display value is 389, click on the Numerical input control, then the input area will show 389, otherwise the input area is empty, as shown below:



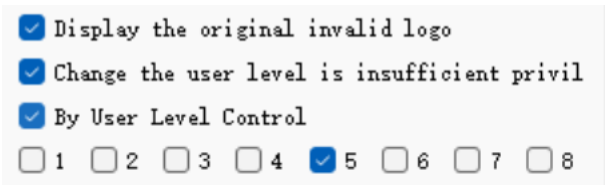
For example, if option 2 and 3 are chosen in the Effective Level Controlled in the Advanced Page of the control, and the User Password Setting in the HMI Parameter Setting is as shown in figure below:



If "Default user level" is "NULL", this control is not touchable, and in this case you can use "Change User Level" in Function buttons to change the default level. For example, if the password entered by the user is 6666, corresponding to User Level 6, but the user chooses only option 1, not matching option 2 or 3, so the system will prompt that the password is incorrect; When the password entered by the user is 2222 or 3333, as both users have option 2, matching option 2 or 3, the password is valid and this control will be changed to a touchable control. If "Default user level" is user 2 to 3, then both user levels have option 2 to match the touching conditions, and then this control is touchable in simulation or initialized screen; If the Default User Level is user 3, then this user level does not have an option to match the touching conditions, and then this control is not touchable in simulation or initialized screen. The default setting is as shown in figure below:



4. If selecting "change the user level is insufficient", when the user level is not matched, a login interface will pop up so that user can select a matching level and log in again, as shown below:



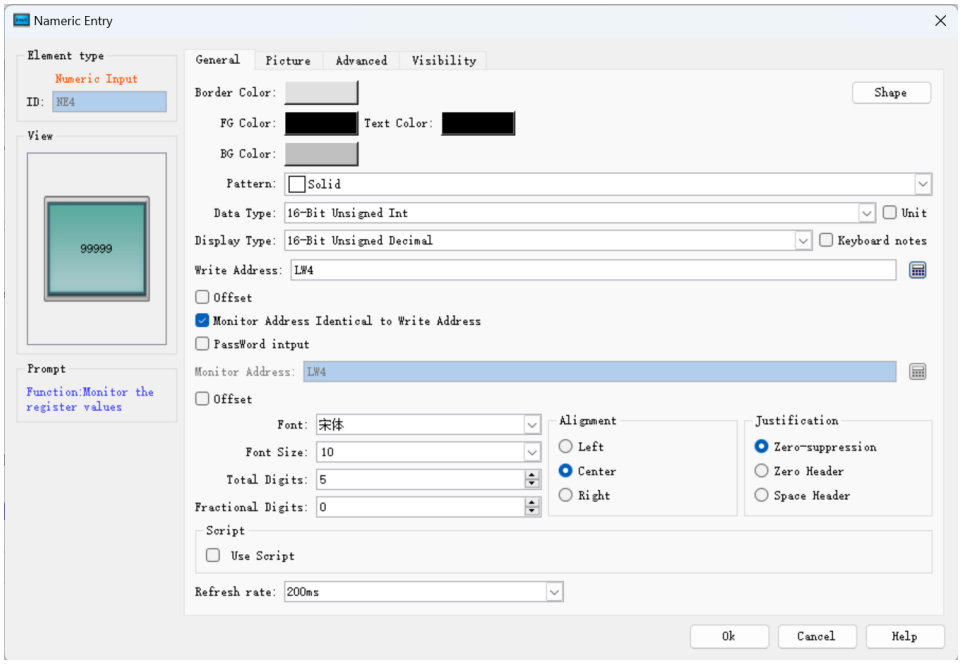
- Notification: In the case that the control can be touched, in the simulation or screen, click on the control

to input a value through a pop-up input keyboard; then it will write the set state value (1 or 0) to the "Notice bit" address.

- Scaling: When this option is selected, the value written to the address = (the value entered by user through the pop-up keyboard - offset) / Gain; the displayed value (ie, the value of the monitor address) = the value of the monitor address × gain + offset
- Display Range: When this option is selected, user can set the lower and higher limit values as well as the low and high-level background color according to the needs. The address value monitored (read) by the control will be represented by different color patterns in the user-set lower and higher limit values.
- Variable range: the values of "Lower Limit" and "Higher Limit" are dynamically changed, depending on the address entered by the user
- Lower limit: Set the lower limit of the display. When the number displayed is lower than this limit, the background color will be the color set in Low Level Background Color.
- Higher limit: Set the higher limit of the display. When the number displayed is higher than this limit, the background color will be the color set in High Level Background Color.
- Range check: Check whether the input value is beyond the set maximum or minimum value.

5. After the settings, click "OK" to add the control to the view area (that is, the screen).

When General page is set as shown below, the number is displayed in binary while we input number in decimal. When Display Type is other type, the input type is the same as the Display Type.



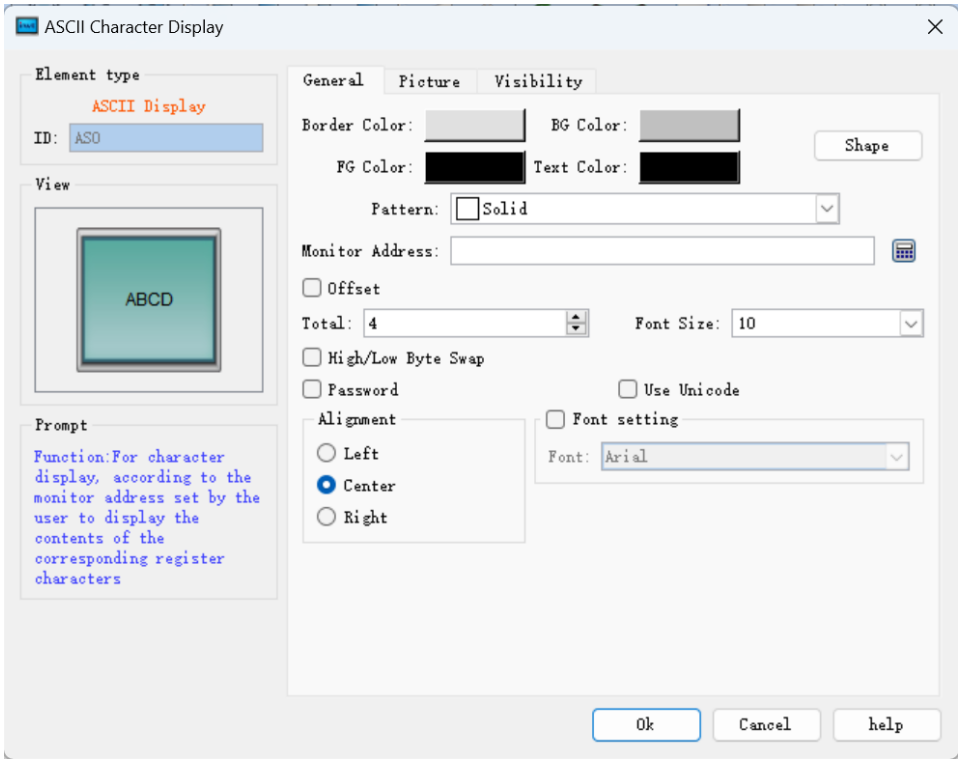
6. After setting of the properties, click "OK" button, and then the mouse shape will become a cross. Now you can draw a rectangle in the screen by clicking the mouse and thus add this control into the screen.

4.4.10 ASCII display

ASCII Display is used to displaying ASCII in device.

Click the ASCII display button icon 

, then a dialog box pops up as shown in figure below:



In this dialog box, you can set the monitor address of the connected device to be displayed, choose the font size of the display text and other properties.

- Monitor Address: The data stored in this address can be displayed on real-time basis, or data can be input to this address.
- Total: The maximum number of characters that can be displayed.
- Font Size: The font size of the character to be displayed
- Exchange high and low bytes of input: The high byte in the value input by user will be exchanged with the low byte, and then the data after such exchange will be stored into the monitored word address.
- Password: When this is selected, the control does not show specific characters but displays an asterisk (*)
- Use UNICODE: The monitor address value is displayed in Unicode encoding
- Alignment:

  Left: The character displayed is in the left part of the display area.

  Center: The character displayed is at the center of the display area.

  Right: The character displayed is in the right part of the display area.

Note:

Refer to Bit Button control for Shape, Border color, Foreground color, Background color and Pattern.

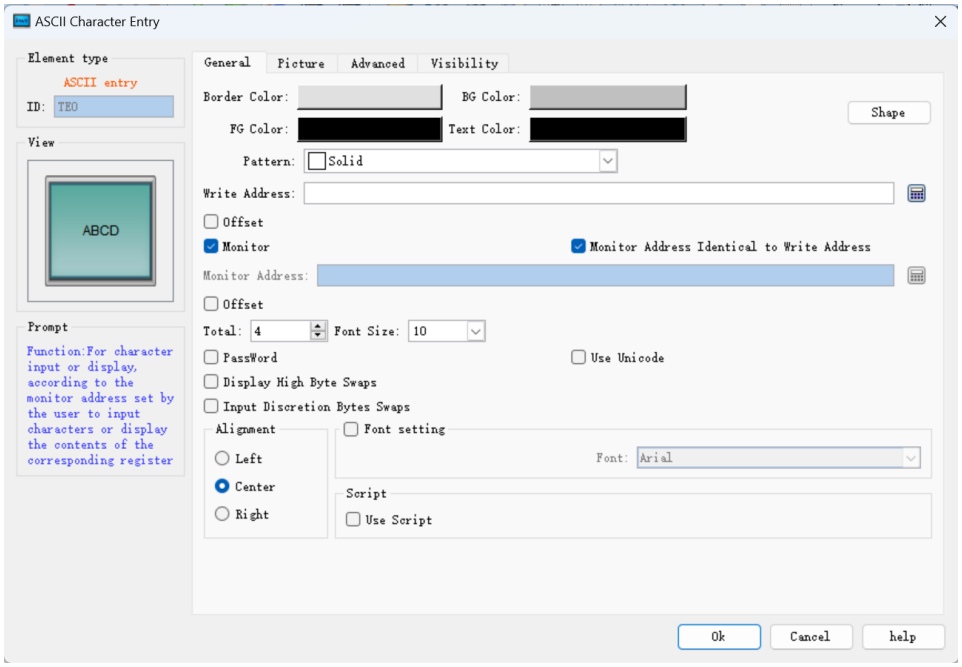
If set the transparence property of this control, the setting of background color is invalid.

Refer to the use of "Bit button" control for the Visibility.

4.4.11 ASCII input

Click the ASCII input button icon 

, then a dialog box pops up as shown in figure below:

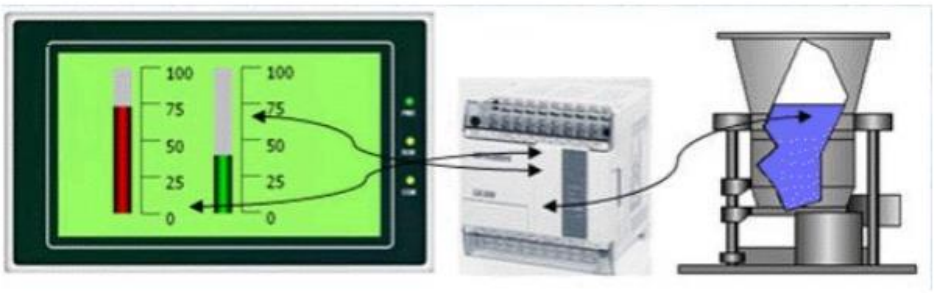


- Write address: Input ASCII text into the address.
- Monitor: The address value to be read and displayed by this control.
- Monitor address identical to write address: The monitor address is the same as the write address.
- Monitor address: The address to be read
- Total: The maximum number of characters that can be displayed.
- Font Size: The font size of the character to be displayed
- Exchange high and low bytes of input: The high byte in the value input by user will be exchanged with the low byte, and then the data after such exchange will be stored into the monitored word address.
- Password: When this is selected, the control does not show specific characters but displays an asterisk (*)
- Use UNICODE: The monitor address value is displayed in Unicode encoding
- Alignment:
  - ✧ Left: The character displayed is in the left part of the display area.
  - ✧ Center: The character displayed is at the center of the display area.
  - ✧ Right: The character displayed is in the right part of the display area.
- Use Macro: Select the option of "Use Macro" to display a list of macros. User can select one to execute when the button is pressed. Only compiled macros are displayed in the drop-down list.

Note: For example, when the 32-bit data type is selected, the stored address occupies 2 words. For example, when writing data to the SIEMENS PLC's data register, and the address written is V10, then the occupied data register address includes V10 and V11; if users also use other controls to monitor the value of V11, an error will appear. Users should pay attention to the use of 32-bit data types in case of Note data and address errors. Other functions in "General" page are the same with those of SCII Display which you can refer to. Refer to Bit Button for the application of "Advanced" and "Visibility" page.

4.4.12 Bar graph

Graph, also called bar graph, is mainly used to present the real-time change in the numerical values in the form of bars, so that user may view such change more visually. Graph may present the change in the numerical values of data registers of PLC or other devices connected, and also the real-time change in all analog quantities in process flows. See the figure below.



Operations of adding a histogram (bar) and modifying the properties are as follows:

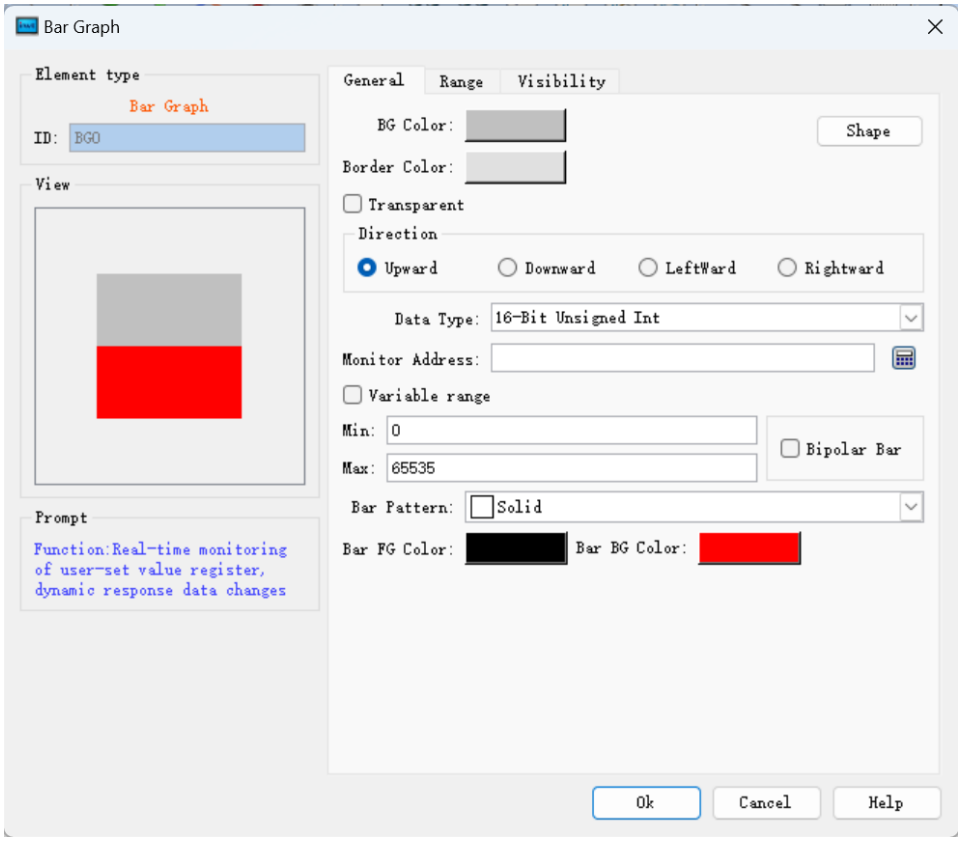
1. Select the Bar Chart icon in the toolbar or the Tools menu. Then it appears a dialog box shown in figure below.

2. Set the properties of the bar graph in the Property dialog box, and then click "OK":

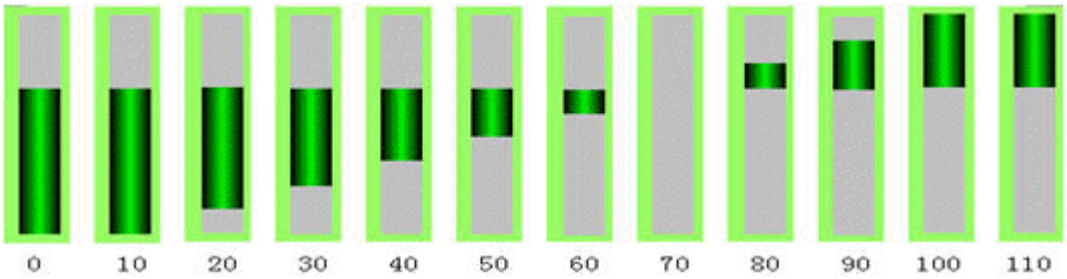
- Background color: The background color of the bar chart.
- Border Color: Set the border color of the bar. In Figure 4-102, the setting of border color is invalid; user can select the "shape" in another bar; the change is visible.
- Transparent: Set the background of the bar to be transparent
- Direction: The direction of the histogram scroll, there are four directions: Upward, Downward, Leftward and Rightward.
  - ✧ Upward: When the value of the monitor address increases, the columnar surface rolls from bottom to top
  - ✧ Downward: When the value of the monitor address increases, the column rolls from top to bottom
  - ✧ Leftward: When the value of the monitoring address increases, the columnar surface rolls from right to left.
  - ✧ Rightward: When the value of the monitor address is increased, the columnar surface rolls from left to right.
- Data type: The data type of the read address value, ie word address or double word address.
- Monitor address: The data register address that can be displayed in the bar, ie, the read address.
- Maximum: The maximum value of the Monitor (read) address. When the value of the monitor (read) address is greater than it, the bar is full and no longer changes with the value of the monitor address.
- Minimum: The minimum value of the Monitor (read) address. When the value of the monitor (read) address is less than this value, the bar is empty and no longer changes with the value of the monitor address.
- Variable range: The maximum and minimum values are dynamically changed, depending on the address

entered by the user; the data type of the address is the same as the set "Data type".

- Bipolar bar: It can be displayed on both sides according to the value of the data register.
- Midpoint: The midpoint of the bipolar bar.



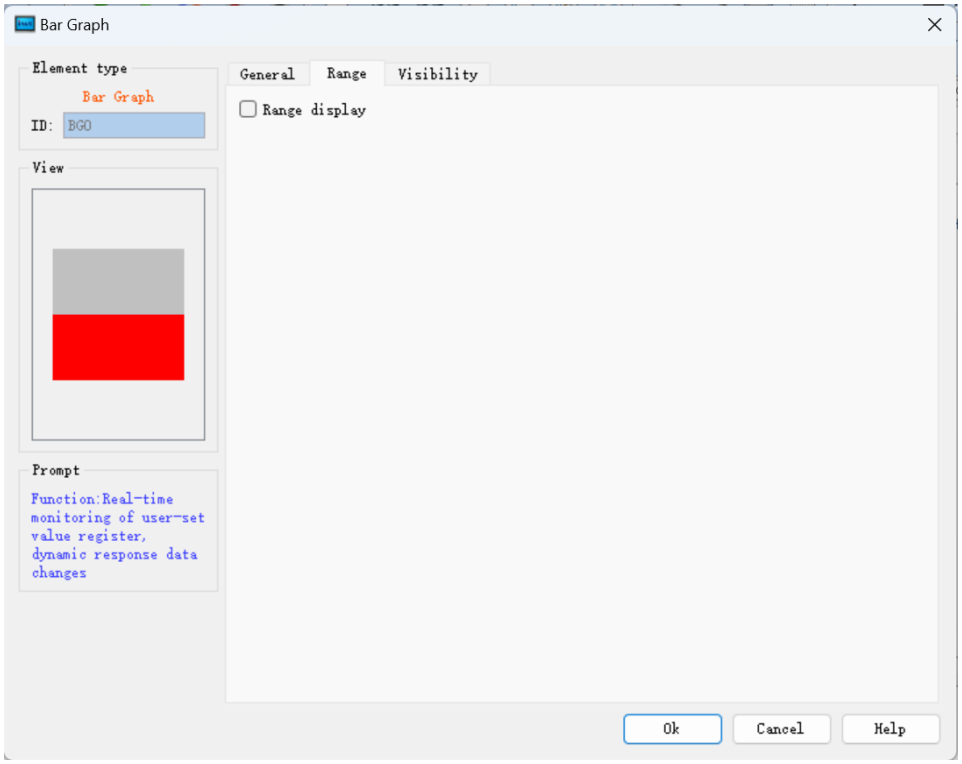
For example, assuming the maximum value is 100, the minimum is 10, and the scroll mode is upward, when the bipolar bar is selected, input 70 to the "Midpoint" value. Then the value incremented of the monitor address from 0 is shown in figure below:



3. Modify the bar chart: Click on the histogram, then it will appear eight small green dots that you can drag with the mouse to modify its size.

"Range" page:

This page is mainly used to display the value of the monitor address in the specified range to show a different foreground color and background color. The properties are shown in figure below:



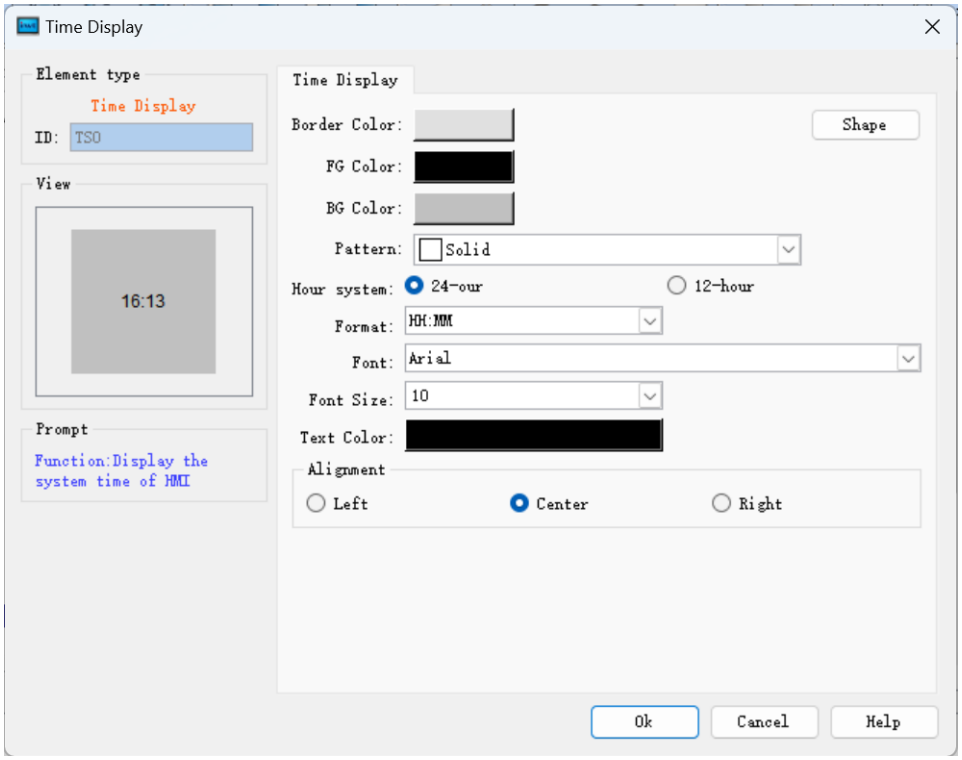
- Display Range: When this option is selected, user can set the lower and higher limit values as well as the low and high-level background color according to the needs. The address value monitored (read) by the control will be represented by different color patterns in the user-set lower and higher limit values.
- Variable range: the values of "Lower Limit" and "Higher Limit" are dynamically changed, depending on the address entered by the user.
  - ✧ Lower limit: Set the lower limit of the display. When the number displayed is lower than this limit, the background color will be the color set in Low Level Background Color.
  - ✧ Higher limit: Set the higher limit of the display. When the number displayed is higher than this limit, the background color will be the color set in High Level Background Color.

After the settings, click "OK" to add the control to the view area (the screen).

Note: If the value of the monitor address is between the maximum and the minimum, the foreground and background color is identical to the settings in "General" page. Refer to "Bit button" for the application of "Visibility".

4.4.13 Time display

The control of Time Display is mainly used to display the system time. Click on the control icon  , then it will appear a dialog box as shown in figure below:



Note:

Refer to Bit Button control for Shape, Border color, Foreground color, Background color and Pattern.

Format: Four modes of time display for users to choose.

HH:MM Hour: Minute

HH:MM:SS Hour: Minute: Second

HH-MM-SS Hour- Minute-Second

HH-MM Hour- Minute

Font: Font type of text

Font Size: Decide the font size of time display

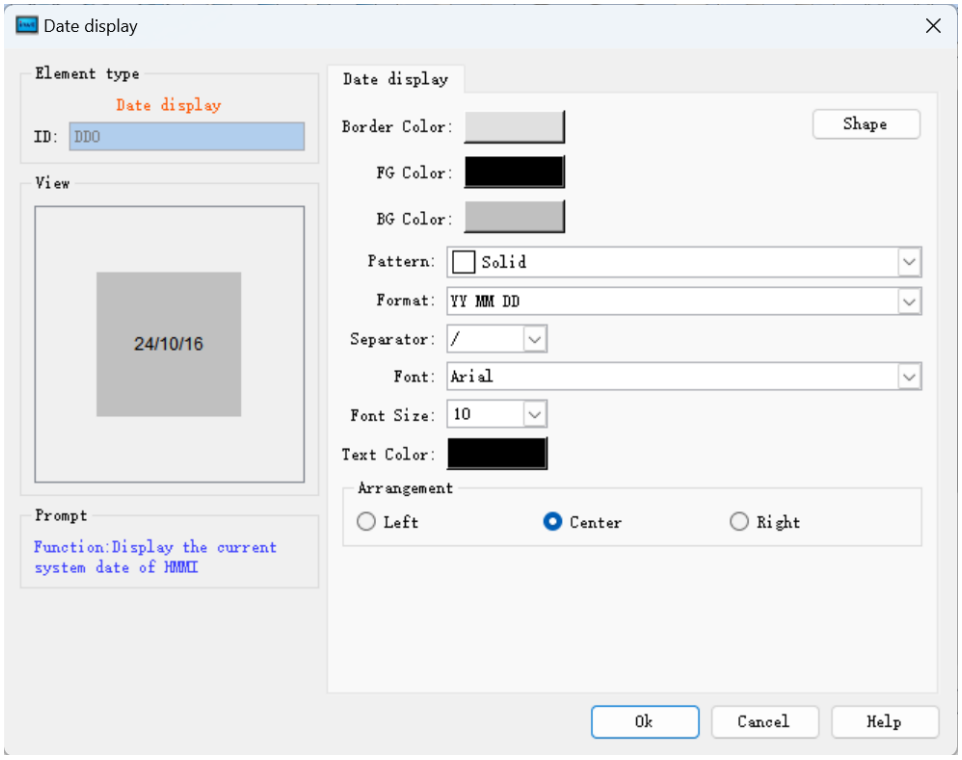
Color: Decide the text color of time display

Alignment: Decide the position of time display, left, center or right.

After the settings, click "OK" to add the control to the view area (the screen)

4.4.14 Date display

The control of Date Display is mainly used to display the system date. Click in the button icon  in the toolbar, and then it will appear a dialog box as shown in figure below:



Format: There are nine modes of date display for user's choice.

YYYY-MM-DD

MM-DD-YYYY

DD-MM-YYYY

YYYY/MM/DD

MM/DD/YYYY

DD/MM/YYYY

YYYY.MM.DD

MM.DD.YYYY

DD.MM.YYYY

Font: Font type of text

Font Size: Decide the font size of time display

Color: Decide the text color of time display

Alignment: Decide the position of time display, left, center or right.

After the settings, click "OK" to add the control to the view area (the screen)

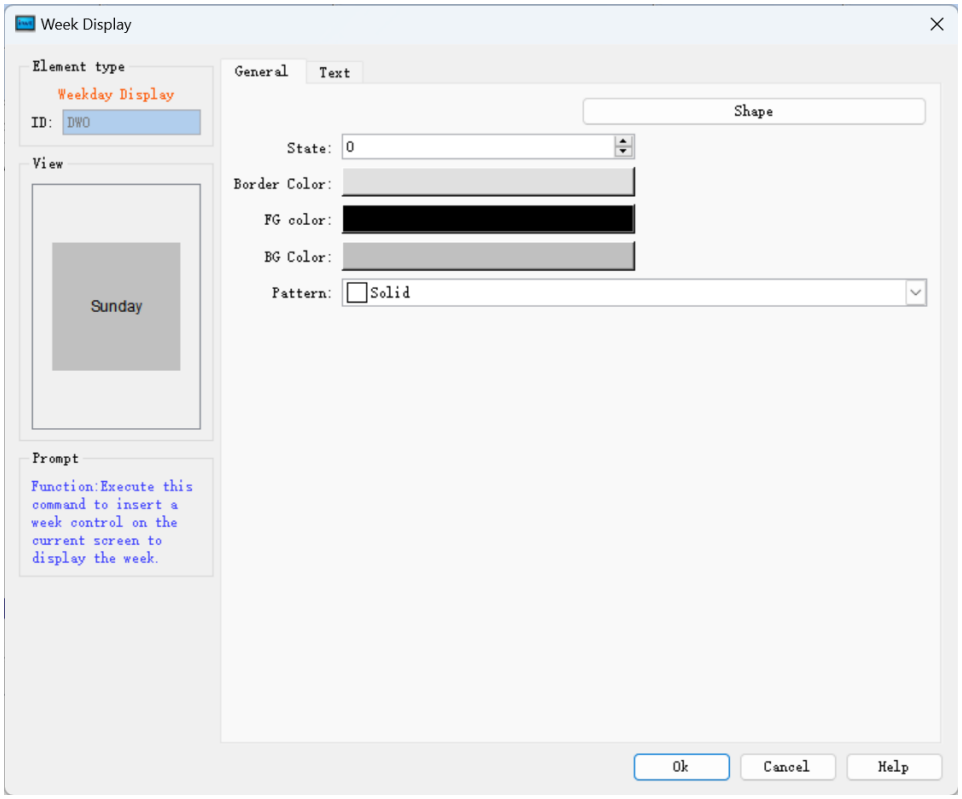
Note:

Refer to Bit Button control for Shape, Border color, Foreground color, Background color and Pattern.

4.4.15 Week display

The control of Week Display is mainly used to display the system week. Click on the button icon 

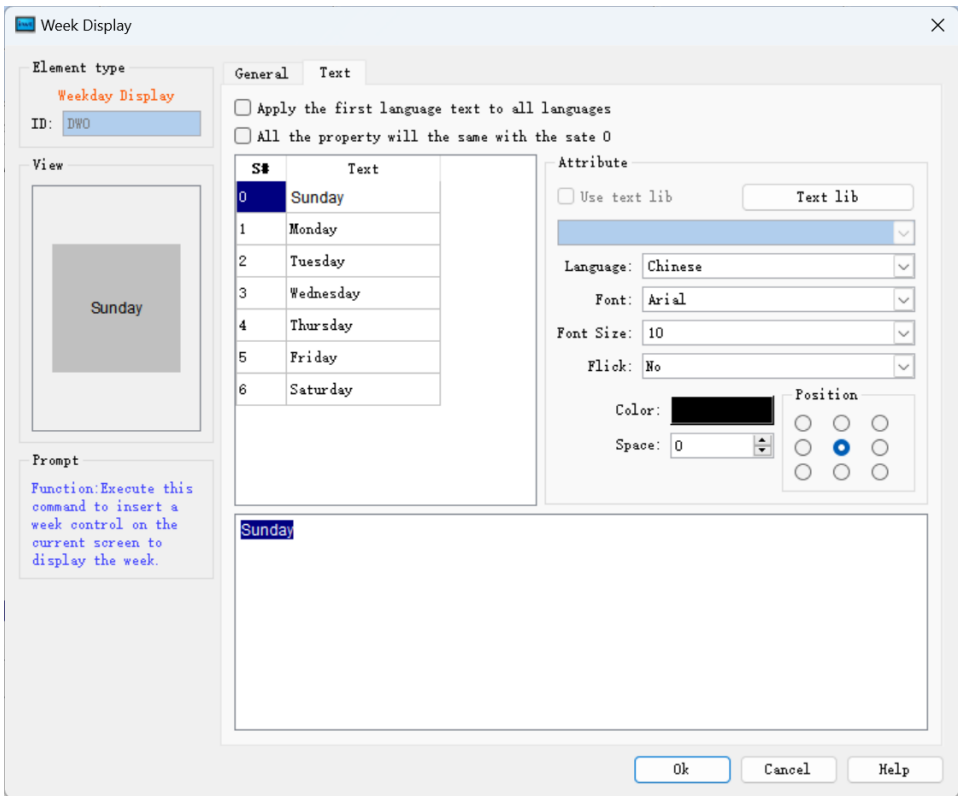
in the toolbar, then a dialog box will appear as shown in figure below:



State: Change a different status value to set the border color, foreground color, background color and pattern of different states.

Note: Refer to Bit Button control for Shape, Border color, Foreground color, Background color and Pattern.

Click on the "Text" tab where you can modify the text display, such as the text content, text size, text color, kerning, line spacing, flicker and position. "Text" page interface is shown in figure below:



- Apply the first language text to all languages: When it comes to multiple languages (in the "Language" in the Project Manager, the total number of languages selected is greater than 1), and if this option is selected, the display contents do not change with the language switch.
- Language: This option is used when dealing with multiple languages. Select a different language, you can enter different text contents in different states, in order to achieve the multi-language. (In the function button, select the 'Switch language' option, and the language to switch to; in the simulation or screen, click this button, and then all the screen with text control will switch to that with text content of the specified language). For different languages, text content, font and font size can be different, but the color, kerning and position are the same.
- Font: Choose the font type for the input text; different states can have different fonts, and different languages can also have too.
- Font Size: Choose the font size for the input text content; different states can choose different font sizes, and different languages can also too.
- Color, Kerning, Position: Set the color, kerning, and alignment of the text in the current selection. When you select a language other than Language 1 and the total number of languages selected in the Project Manager is greater than 1, the applications of color, kerning and position are invalid because the values of the three function options are the same as those of the language 1

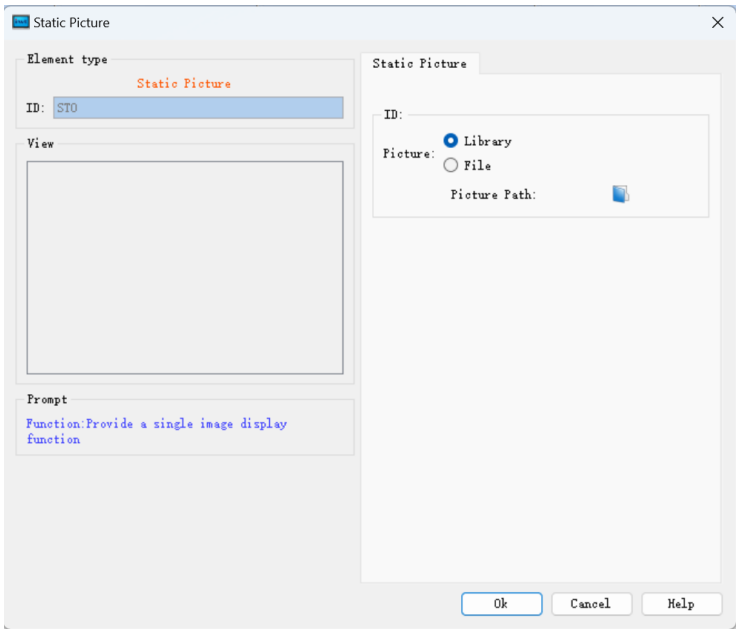
Note: To modify the contents of the text, first select the item to be modified in the list box, and then enter the text below the editing box.

After the settings, click "OK" to add the control to the view area (the screen)

4.4.16 Static picture

The control of Static picture is mainly used to show a picture that can be in various formats from the file or from the library. With the picture loaded, it can be applied as a screen background to beautify the project interface.

1. Click on the static picture icon  on the toolbar to pop up a dialog box as shown in figure below:



2. After selecting a picture, click "OK", and then the mouse cursor will become cross-shaped; left click on anywhere on the screen to add the picture control.

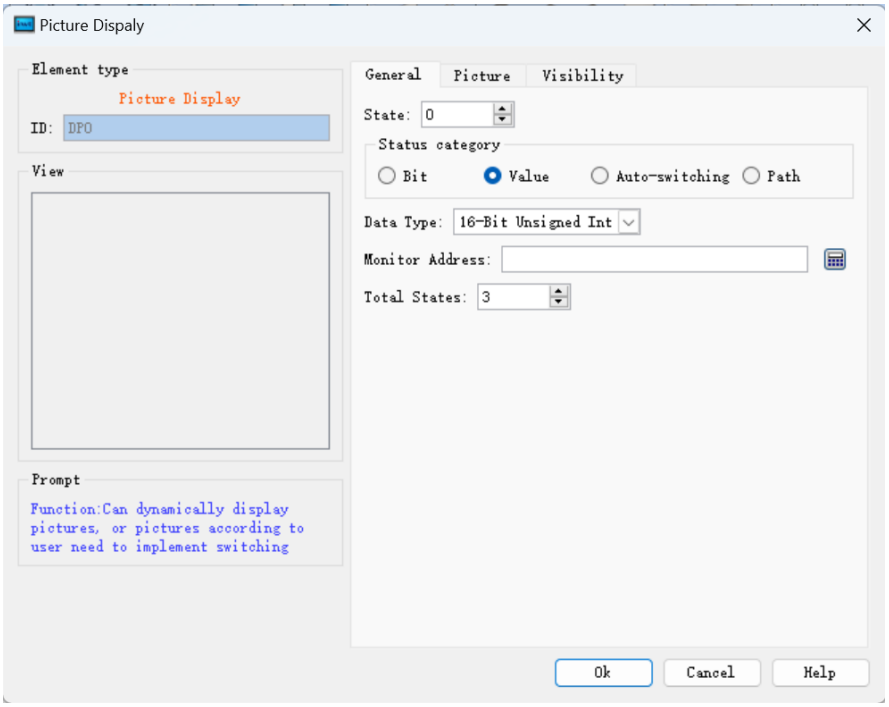
3. The size of the inserted picture can be modified through the mouse. HMITOOL configuration software supports various image formats: JPG, BMP, PNG, WMF, EMF, GIF.

4.4.17 Picture display

Picture Display is an extension of the Static picture control, because the Static picture can only display one picture while Picture display can display up to 32 pictures. Picture display may have different definitions according to different status categories selected by user.

Steps are as follows:

Click the icon of the Picture display  on the toolbar. The dialog box shown in figure below pops up:



- Bit: When Bit is selected, the total number of states is only two, state 0 and 1. Monitor address can only be a bit address. The control displays the corresponding picture based on the state 0 or 1 of the monitor address.
- Value: When the Value option is selected, the total number of states can be up to 2048, and different pictures are displayed according to the value of the monitor address. When the value of the monitor address is 0, the picture under the state 0 is displayed, and so on.
- Auto-switching: When the auto-switching option is selected, the total number of states can be up to 2048, and the control does not need to change pictures according to the value of the monitor address, as long as user sets the total number of states; then set the automatic transformation frequency. If it runs in the HMI, the control will switch pictures automatically within the range.

Note:

The "Picture" page of the Picture Display is similar to that of the "Multi-state Indicator Lamp" control that you can refer to. Refer to the "Bit button" control for the application of "Visibility".

After the settings, click "OK" to add the control to the view area (the screen).

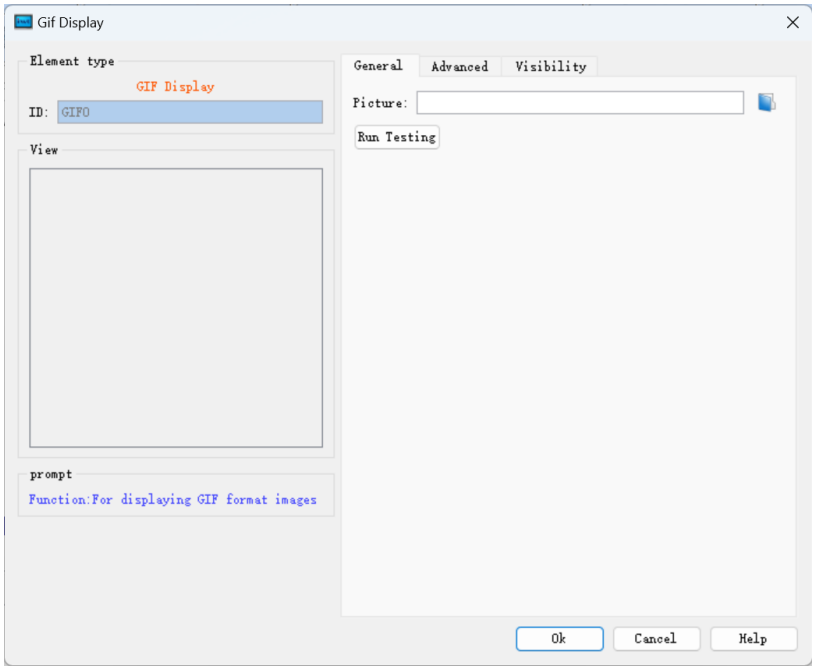
4.5 HMITOOL advanced controls

This chapter introduces the advanced controls.

4.5.1 GIF display

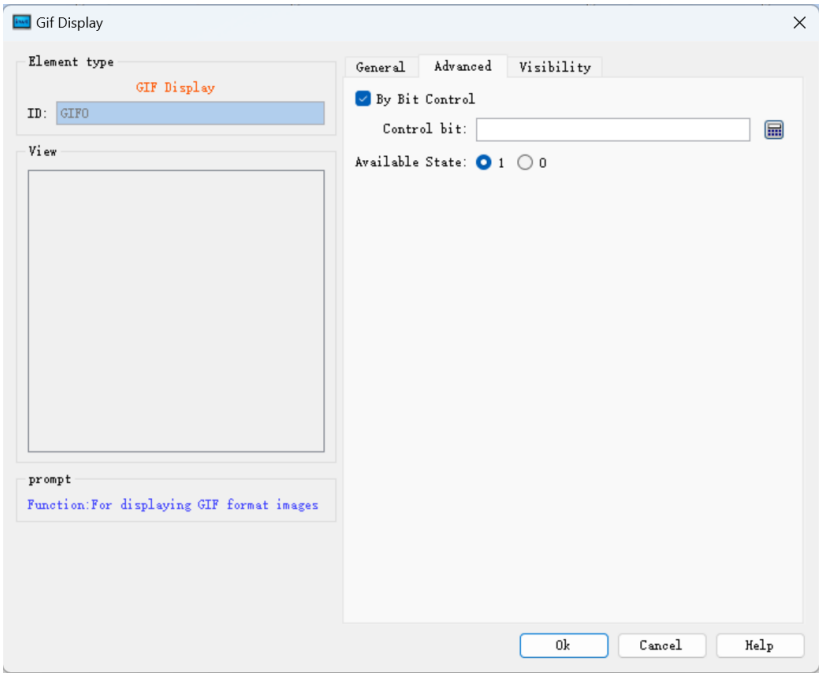
GIF display can be used to display images of GIF format, supporting 32 frames at most. Operation is as follows:

Click the GIF icon  on the toolbar to display the dialog box shown in figure below.



After setting the properties, click "OK", then the mouse cursor will become a cross in the editing area; left click to draw a rectangle and the control is added to the view area (i.e. the screen)

Select the "Advanced" page to display its properties.



Controlled By bit: When "Controlled by Bit" is selected, if the "Active Status" selected is 1, the GIF picture will be animated if and only if the value of "Control bit" is 1, otherwise it is a static display; when the selected "Active Status" is 0, the GIF picture will be animated if and only if the value of "Control Bit" is 0, otherwise it will be displayed statically.

Note: The "Visibility" page can refer to the use of "Bit Button" control.

4.5.2 Trend chart

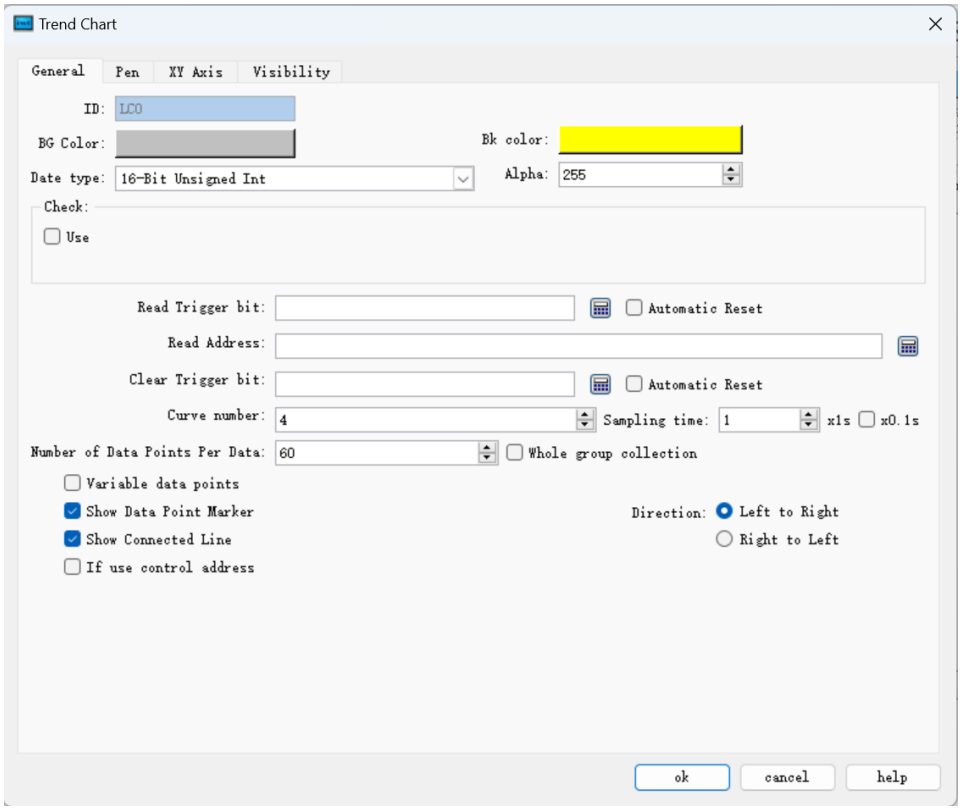
Trend chart summary:

Dynamic, variable and continuous value displayed continuously.

Draw reference curves of multiple data. Take the time as the horizontal axis, the value as the vertical coordinate axis, in order to accurately and intuitively judge the change tendency of a certain value during a period of time. Up to 8 polylines can be displayed (line graph).

Add properties of the trend graph:

1. Select the Trend Chart icon  in the toolbar, and then the properties dialog box appears, as shown in figure below:



- BG color: Change the background color of the trend chart. The effect cannot be visible until you click "OK".
- Data type: 7 kinds of data types are available for users.
- Read trigger bit: Only when the "Read trigger bit address" value is 1, the curve will move around.
- Curve number: Number of lines, up to 8.
- Automatic reset of Read trigger bit: When the read address detected is 1, then the address value is assigned to 0.
- Number of data points per group: Number of data shown on the X-axis.
- Sampling time: The sampling frequency.
- Read Address: The value of the Read Address represents the value of each line on the Y-axis direction. According to different data group numbers and data types, Read address can be read continuously (16-bit data) or read at intervals (32-bit data).
- Variable data points: According to the address value of the dynamic set of "Number of data points per group." When this option is selected, the address value default is the initial value of the Number of Data Points per Group.

Detection

- Enabled: Indicate whether the detection line (reference line) is enabled.
- Color: The color of the detection line (reference line).
- Detection address: Write the value of the current detection line (reference line) to the detection address. Whether to use the control address: Set the dynamic minimum and maximum value of the Y-axis according to the value of control address value. This address occupies five consecutive address shifts;

change the minimum and maximum value of the Y-axis scale referencing the X-axis and also whether to restore the initial state.

Address offset	Control register address control object
0	16 bits less than the minimum value
1	16 bits more than the minimum value
2	16 bits less than the maximum value
3	16 bits more than the maximum value
4	Whether to restore the initial state of the maximum and minimum values. The address value of 1 indicates a dynamic change, otherwise the initial value is restored

Note: The control address can only use the internal address, and the minimum and maximum value account for two consecutive word address respectively.

For example:

When the 16-bit data type is selected and the number of data groups is 8, it is assumed that the user-input address is LW3, and 8 groups of address values are continuously read out

LW3: The value of line1

LW4: The value of line 2

LW5: The value of line 3

LW6: The value of line 4

LW7: The value of line 5

LW8: The value of line 6

LW9: The value of line 7

LW10: The value of line 8

Therefore, when the user selects 16-bit data and sets the number of N groups of data, the user can read out the address values of the N groups in succession according to the address rules of different PLC models.

When the 32-bit data type is selected and the number of data groups is 5, it is assumed that the user-input address is LW3. Then, 5 sets of address values are read out consecutively.

LW3: The value of line 1

LW5: The value of line 2

LW7: The value of pen 3

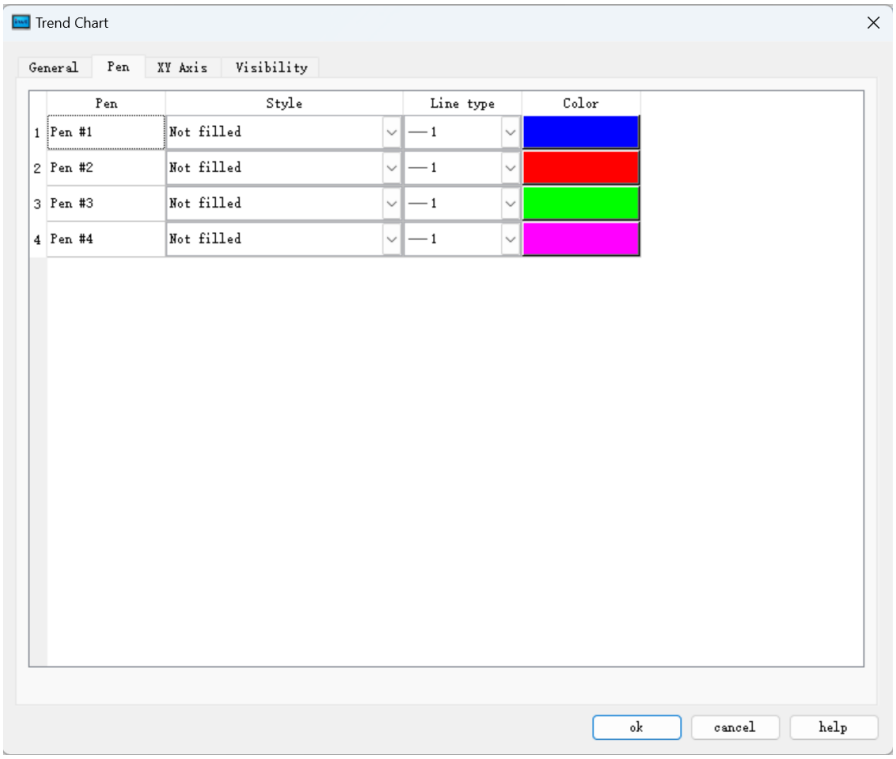
LW9: The value of line 4

LW11: The value of line 5

Therefore, when select 32-bit data and set the N-group data group number, user can read out the N group address value by adding 2 to the address value (at interval) according to the address rules of different PLC models.

- Direction:
  - ✧ Left to right: The line moves from the left.
  - ✧ Right to left: The line moves from the right.
- Background color: The color of the line
- Clear Trigger Bit: Clear the current status of all lines when the address value changes from 0 to 1 (rising edge). The line remains the same when the address value changes from 1 to 0 (falling edge) or has no change.

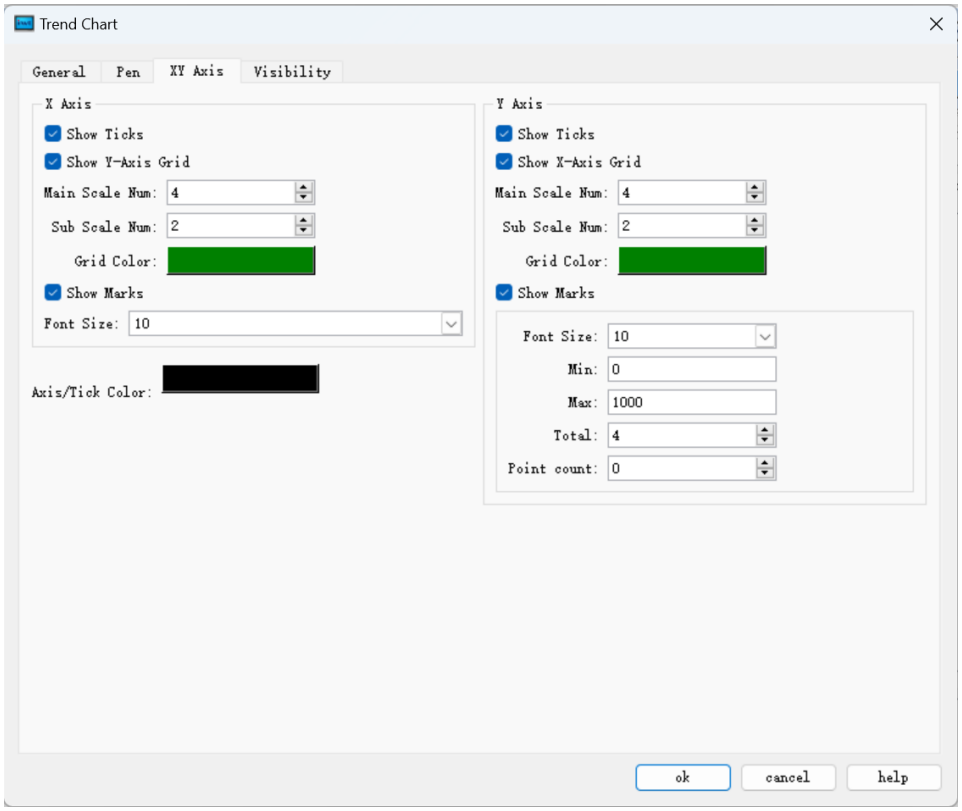
2. The "Line" page of the Trend Chart is shown in figure below: This page allows user to set the maximum value, minimum value, style and color of each pen.



The data type in the General page determines that of the maximum and minimum values here.

For example, if the maximum or minimum value is a floating-point number, user must first select 32-bit floating-point number in the Data Type in the General page. Otherwise, an error will occur when user clicks "OK".

3. The "XY Axis" page of the trend chart is shown in figure below:



X-axis

Display scale: whether to display the X-axis scale.

Show Y-axis grid: Whether to display Y-axis grid.

Axis / Scale Color: Change the color of the X-axis / scale.

Grid Color: Change the X-axis grid color.

Main sub-scale: X-axis main scale.

Sub-scale: X-axis times the number of times.

Display Scale Indicates whether the X-axis scale is displayed.

Y-axis

Display Scale: Whether to display the Y-axis scale.

Show X-axis grid: Whether to display the X-axis grid.

Axis / Scale Color: This option changes the color of the Y-axis / scale.

Grid Color: This option changes the Y-axis grid color.

Major scale division: Numbers of Y-axis major scale.

Sub-scale division: Numbers of Y-axis sub-scale.

Show Marks: Whether to display the Y-axis scale mark.

Font Size: Change the font size of the Y-axis scale.

Minimum: The minimum value of the Y-axis scale.

Max: The maximum value of the Y-axis scale.

Total: Display the maximum digital number of the data.

Decimal Place: The maximum digital number that can be displayed after the decimal point.

Note: The "Visibility" page can refer to that of "Bit Button" control.

4.5.3 XY trend chart

XY trend chart overview:

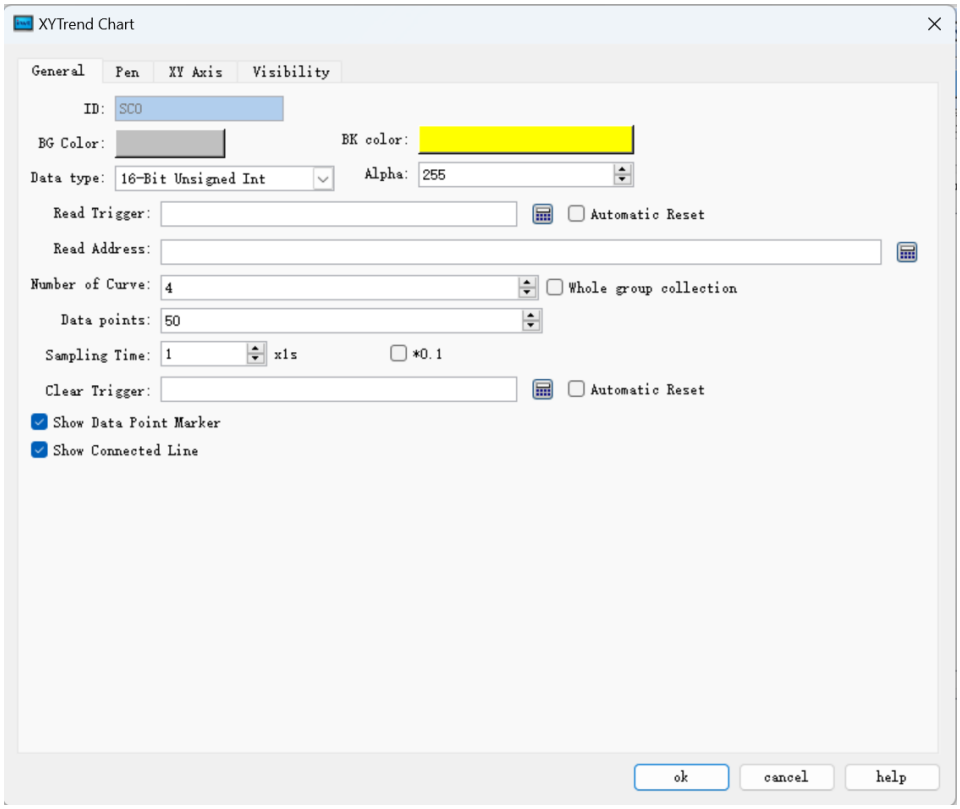
Dynamic, variable and continuous value displayed continuously.

You can draw multiple data reference curve, and take two consecutive register address value as the horizontal axis and vertical axis coordinates respectively, in order to observe the change rules accurately and intuitively.

Up to 8 polylines can be displayed (line graph).

Operations of adding XY Trends and modifying XY Trend Properties are similar to those of Trend Chart. Users can refer to the "Trend Chart" page operation. Open the icon  .

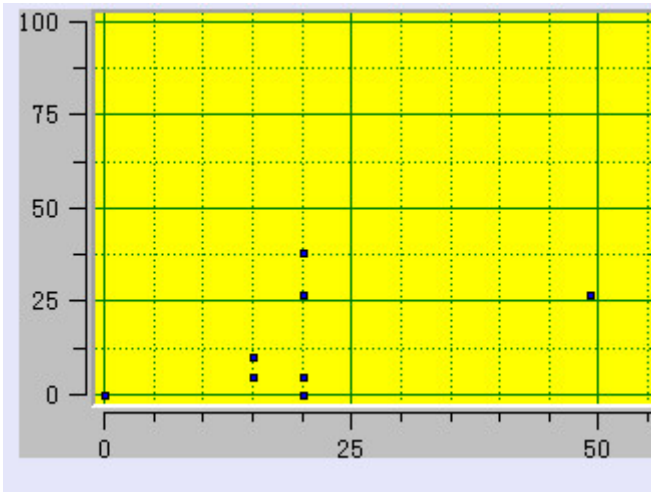
Open the XY Trend Property dialog box; refer to the "Trend Chart" property settings. It should be noted that each line in the Trend Chart represents the value of consecutive addresses starting from the write address, and each in the XY Trend Chart represents the value of two consecutive addresses starting at the write address.



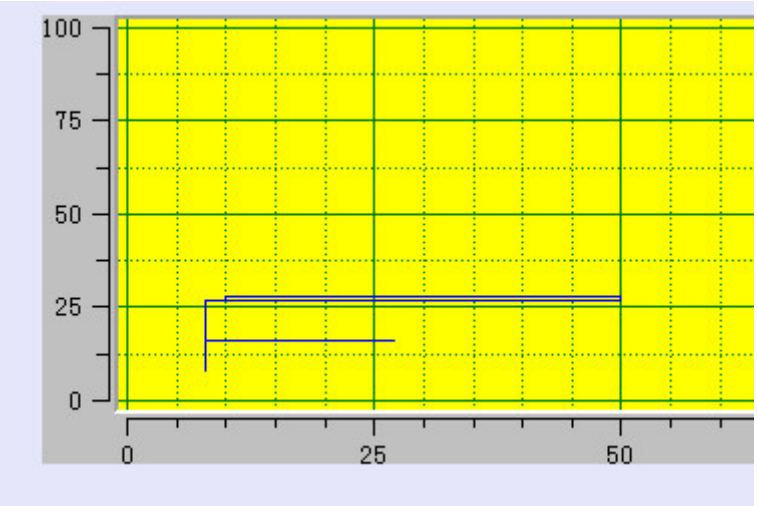
XY trend chart application:

- BG color: Change the background color of the XY trend chart.
- Data Type: Select the data type of the collected data 16-bit data, 32-bit data.
- Read trigger: Only when the "Read trigger bit address" value is 1, start to collect data and draw XY trend graph.

- Read address: The starting address of collected data, take LW0 for example, select 16-bit data, LW0 indicates X-axis, LW1 indicates Y-axis, and so on. Select 32-bit data, the 32-bit data composed of LW0 and LW1 indicates X-axis, the 32-bit data composed of LW2 and LW3 indicates Y-axis, and so on.
- Number of Curve: up to 8, set the maximum number of data to be displayed by the control at the same time.
- Data points: up to 255, the maximum value of each group of collected data, the collected data reaches the set value, if not triggered by the 'clear trigger', stop plotting the trend graph.
- Sampling time: The sampling frequency.
- Show data point marker: Enable this feature and each time data is collected solid markers will be drawn on the displayed points.



- Show connected line: Enable this function, each time the data is collected, a straight line connection will be drawn between the current display point and the last display point.



- Bk color: XY trend graph base color.
- Clear Trigger: The data acquisition reset address clears the plotted graph and restarts the trend graph.

4.5.4 Historical trend chart

Historical trend chart overview: This trend chart is used in conjunction with the "Historical Data Collector" in the Project Manager. That is, it shows the value of the data in the "Historical Data Collector".

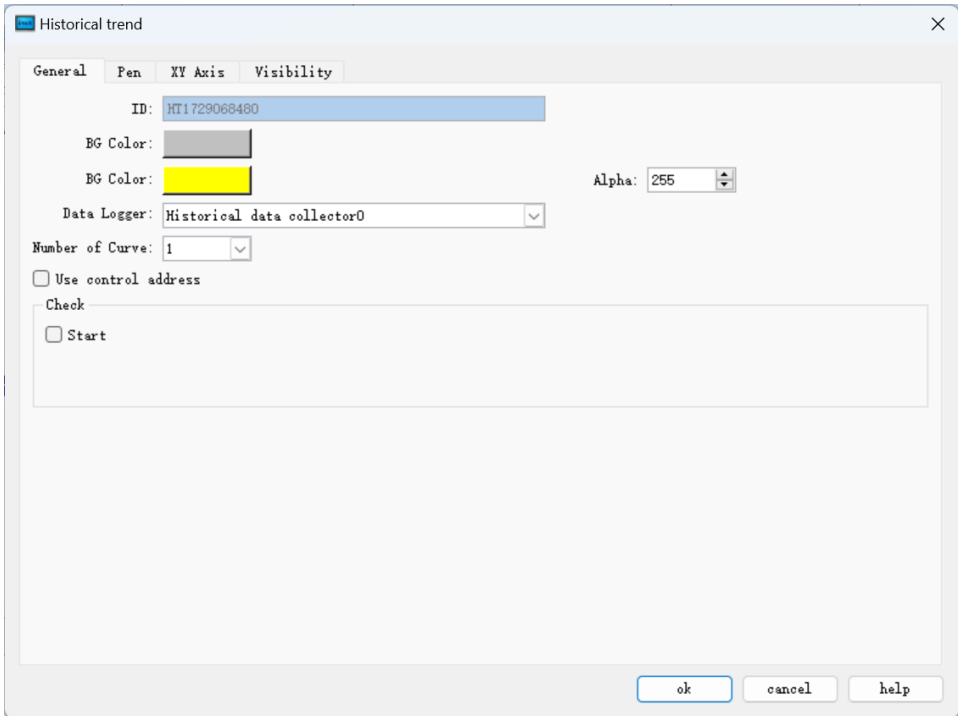
Overview of XY trend chart: Dynamic, continuous display of variable continuous value.

Display multiple data reference curves. Take the time as the X axis, the address value as the Y axis, in order to judge the change tendency of certain address value accurately and intuitively during a period of time.

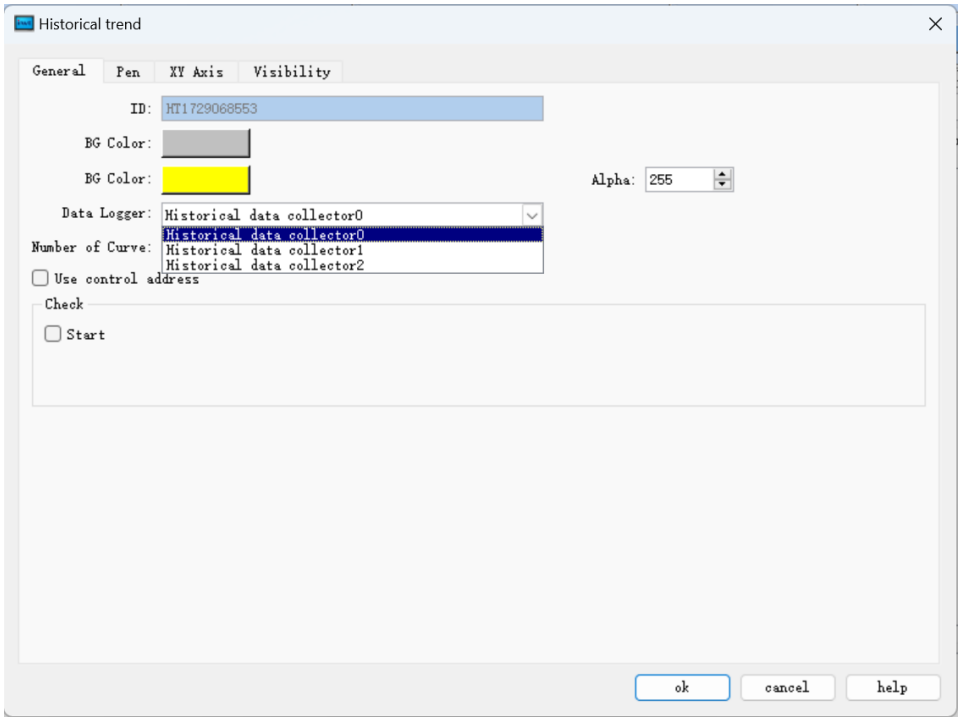
Up to 8 polylines can be displayed (line graph).

Add the trend chart and modify its properties:

1. Select the trend icon  in the toolbar, the "Historical trend" dialog box appears, as shown in figure below:



- Background color: Change the background color of the trend chart. Change the color cannot directly see the color change, click "OK" to apply.
- Transparency: Change the transparency of the background color.
- Data Collection: The default is that from "Historical data collector" in Project Manager. HMITOOL adds multiple sets of historical data, so developers who choose this option can choose which set of historical data to use. As shown below:



- Number of curves: Number of line to be displayed; up to 8.
- Background color: The color of the pen (or line) trace.
- Use control address: Whether to use control address. It is occupied by 28 address offset, used to control the display of each line, maximum value, minimum value, the end time of control, control time period (minutes), the maximum value when only the Y axis is displayed, the minimum value when only the Y axis is displayed whether to display the Y axis and the restoration to the initial state.

Address offset	Control register address control object
0	Set the total number of lines displayed
1	Whether to display 1
2	Whether to display 2
3	Whether to display 3
4	Whether to display 4
5	Whether to display 5
6	Whether to display 6
7	Whether to display 7
8	Whether to display 8
9	Maximum value in Y axis
10	
11	Minimum value in Y axis

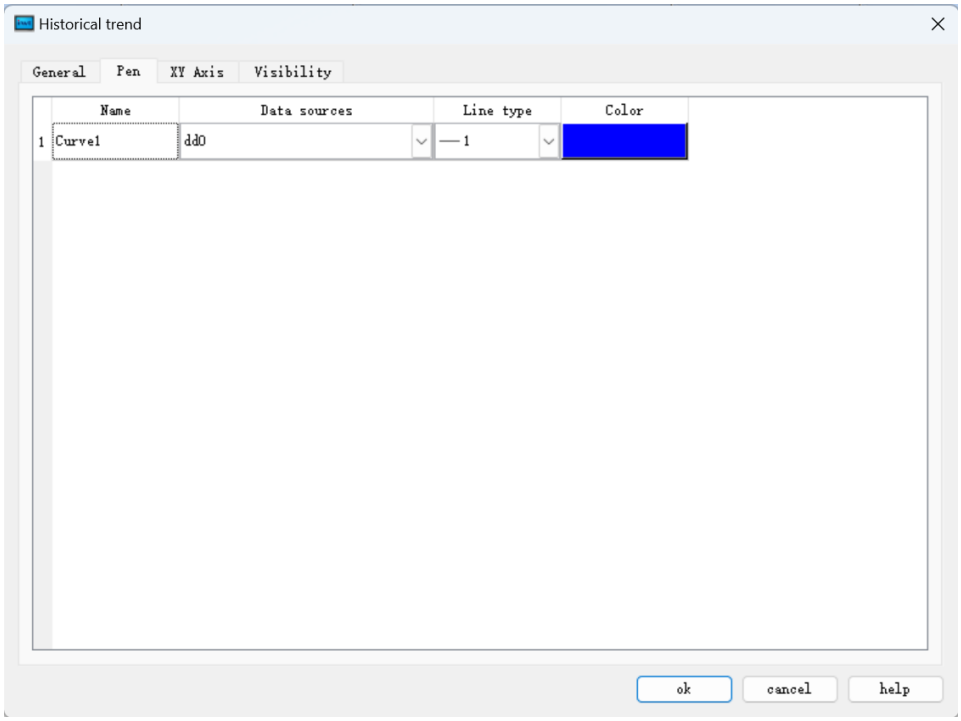
Address offset	Control register address control object
12	
13	When set to 0, use the default maximum and minimum value; when set to 1, set the upper and lower limits
14	Query start time
15	
16	
17	
18	
19	
20	Query end time
21	
22	
23	
24	
25	
26	When set to 1, enter the query, and return to the state 0 automatically
27	When set to 1, recover to new state and return to the state 0 automatically

Whether to display the control address:

Detection

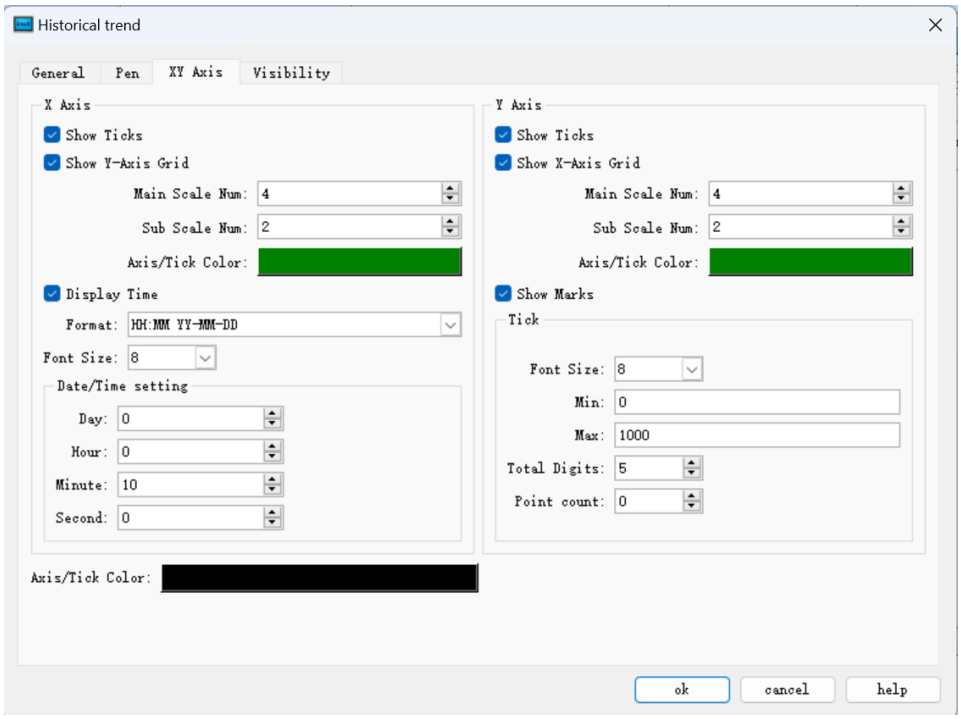
- Enabled: Indicate whether the detection line (reference line) is enabled.
- Color: The color of the detection line (reference line).
- Detection address: Write the corresponding value to of the current detection line (reference line) to the detection address register.

2. The "Line" page of the historical trend graph is shown in figure below.



This page allows setting the maximum, minimum, pattern, and color of each line. The data source is the "Historical Data Collector" in the Project Manager. Each line can correspond to a different data source.

3. The "XY Axis" page of the historical trend chart is shown in figure below.



X-axis

- Display scale: whether to display the X-axis scale.
- Show Y-axis grid: Whether to display Y-axis grid.
- Axis / Scale Color: Change the color of the X-axis / scale.
- Grid Color: Change the X-axis grid color.

- Main sub-scale: X-axis main scale.
- Sub-scale: X-axis times the number of times.
- Display time: Set the time format and font size of time.
- Time Range: Set the time range displayed on the trend graph.

Y-axis

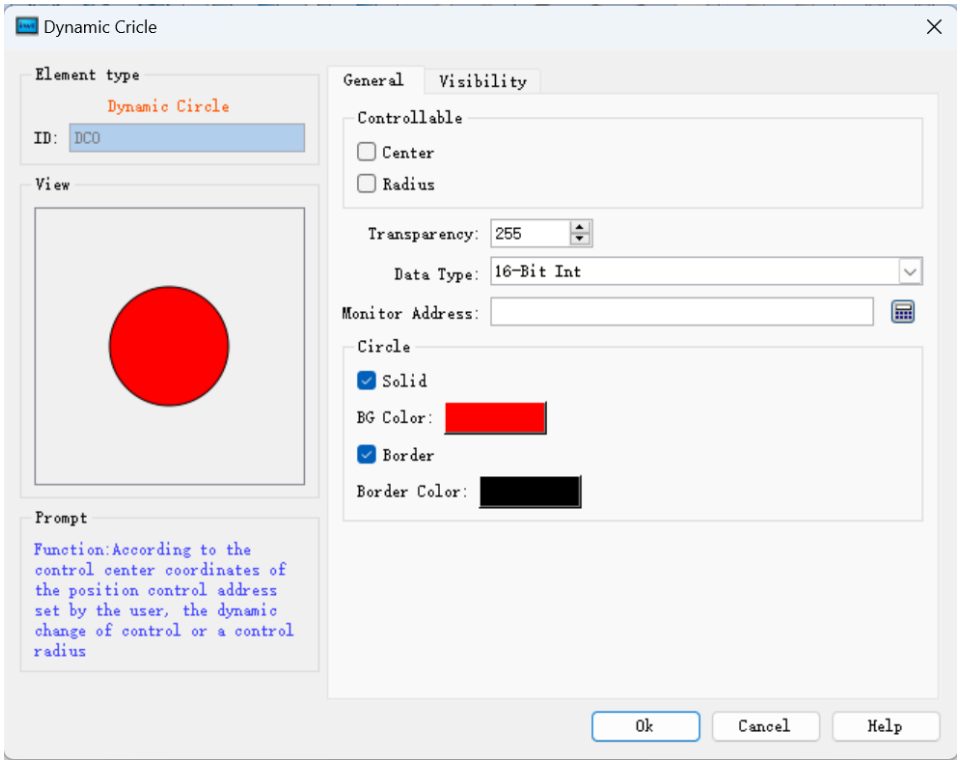
- Display Scale: Whether to display the Y-axis scale.
- Show X-axis grid: Whether to display the X-axis grid.
- Axis / Scale Color: This option changes the color of the Y-axis / scale.
- Grid Color: This option changes the Y-axis grid color.
- Major scale division: Numbers of Y-axis major scale.
- Sub-scale division: Numbers of Y-axis sub-scale.
- Show Marks: Whether to display the Y-axis scale mark.
- Font Size: Change the font size of the Y-axis scale.
- Minimum: The minimum value of the Y-axis scale.
- Max: The maximum value of the Y-axis scale.
- Total: Display the maximum digital number of the data.
- Decimal Place: The maximum digital number that can be displayed after the decimal point.
- Display the multi-axis: whether to display multiple axes.

Note: The "Visibility" page can refer to that of "Bit Button" control.

4.5.5 Dynamic circle

A dynamic circle is designed to move and change size following certain track by placing a graphic on the screen. This movement and size change are determined by the value of the monitor address. Add the dynamic graphic control and modify the dynamic graphic control properties:

Select the dynamic circle icon  in the toolbar, as shown in figure below:



Three sets of address values to be read by Dynamic circle represent the x-coordinate, y coordinates of the circle center and the radius of the circle respectively. The way that these three groups of addresses are read depends on the data type selected by the user.

Control:

- Center: The circle moves according to the position of the center of the circle while the radius does not change.
- Radius: Just the radius size changes and the position do not move.
- Center & Radius: Not only the radius changes with the value of monitor address representing the radius of the circle, but also the center does with the value of monitor address representing the x, y coordinates of the circle center.
- Transparency: Change the transparency of the background color of a dynamic circle.

Solid:

When user does not select Solid, the circle is an empty circle, which means it has no background color. Otherwise the circle is a solid circle; the background color option can change its background color

Border:

When user does not select this option, the circle does not have change lines, and the color of the edge line cannot be changed. Otherwise, the circle is a circle with an edge line; border color options can change the color of the edge line.

Here's an example:

Select the data type "16-bit integer", and read out three sets of data consecutively to represent respectively the x coordinate, y coordinate of the center and circle radius, according to address formats of different PLC models. When the monitor address is LW1, it needs to read the address values of LW1, LW2 and LW3. The

meaning of the address is as follows:

✧ The value of LW1 is the x-coordinate of the circle center.

✧ The value of LW2 is the y-coordinate of the circle center.

✧ The value of LW3 is the radius of the circle.

Note: Regardless of whether selecting Center or Radius in the control option, HMI will still read three groups of address, which represent the same meaning. For example, you select the radius in the control bar, and the monitoring address is LW1, then still only value of LW3 can control the radius of the circle.

When select the data type "32-bit integer" and the monitor address is LW1, then it needs to read the address values of LW1, LW2 and LW3. The meaning of the address is as follows:

✧ The value of LW1 is the x-coordinate of the circle center.

✧ The value of LW3 is the y-coordinate of the circle center.

✧ The value of LW5 is the radius of the circle.

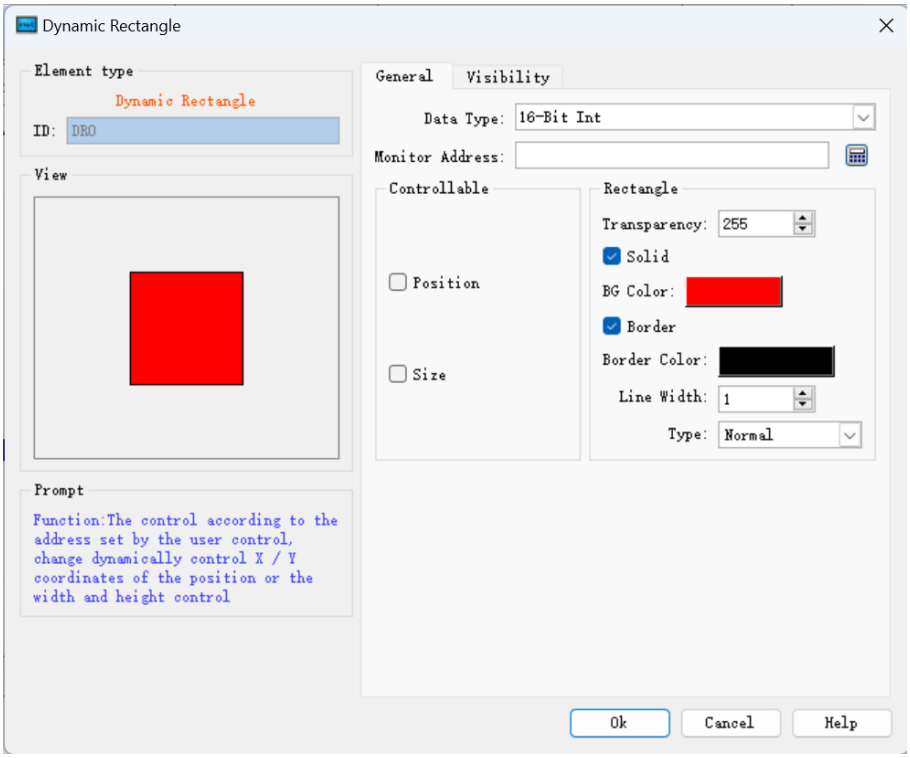
When select the data type "32-bit integer", according to the address format of different PLC models, you can add 2 at interval to the monitor address to acquire three sets of data representing the x coordinate, y coordinate of the circle center and the radius respectively.

Note: The "Visibility" page can refer to that of "Bit Button" control.

4.5.6 Dynamic rectangle

Functions of dynamic rectangle are similar to those of dynamic circle. They all reflect the dynamic state of monitor address in real time by changing the position or size of the graph according to different values of monitor address.

Select the dynamic rectangle icon  in the toolbar to bring up the dialog box shown in figure below:



The dynamic rectangle needs to read four sets of address values to represent the x-coordinate, y-coordinate, the width and height of the rectangle respectively. The way to read these four groups of addresses depends on the data type selected by the user.

- Line Width: Change the width of the line
- Type: Select the right angle, clipped angle or round angle.

Note: Type is effectual only when the line width value is greater than 1.

Here's an example:

When select the data type "16-bit integer" and the monitor address is LW1, then it needs to read the four sets of address values LW1, LW2, LW3, and LW4. Their meanings are as follows:

✧ The value of LW1 is the x coordinate of the rectangular;

✧ The value of LW2 is the y coordinate of the rectangular;

✧ The value of LW3 is the width of the rectangle;

✧ The value of LW4 is the height of the rectangle.

In the case of selecting a data type of "16-bit integer", the user can read four sets of data consecutively according to the address specification format of the PLC model to represent the rectangle x coordinate, rectangle y coordinate, and rectangle width and height, respectively.

When the user selects the data type as "32-bit integer" and the address LW1 is monitored, the address values of LW1, LW3, LW5, and LW7 need to be read out.

✧ The value of LW1 is the rectangular x coordinate;

✧ The value of LW3 is the rectangular y coordinate;

✧ The value of LW5 is the width of the rectangle;

✧ The value of LW7 is the height of the rectangle;

When select the data type "32-bit integer", according to the address format of different PLC models, you can add 2 at interval to the monitor address to acquire four sets of data representing the x coordinate, y coordinate, the width and the height of the rectangle respectively.

Control:

- Position: The height and width of the rectangle does not change with the corresponding monitor address value while the position of the rectangle changes with the monitor address value that represents the x and y coordinates of the rectangle.
- Size: The height and width of the rectangle changes with the following four fixed points, but the position of the rectangle does not change.
- Upper Left: The fixed point of the rectangle is in the upper left corner, and it extends in the direction of the lower right corner.
- Upper right: The fixed point of the rectangle is in the upper right corner, and it extends in the direction of the lower left corner.
- Lower Left: The fixed point of the rectangle is in the lower left corner, and it extends in the direction of the upper right corner.

- Lower right: The fixed point of the rectangle in the lower right corner, and it extends in the direction to the upper left corner.

Solid:

When user does not select Solid, the rectangle is an empty one, which means it has no background color. Otherwise it is a solid rectangle; the background color option can change its background color.

Border:

When user does not select this option, the rectangle does not have change lines, and the color of the edge line cannot be changed. Otherwise, it is a rectangle with an edge line; border color options can change the color of the edge line.

Transparency: Change the transparency of the background color of the dynamic rectangle control.

Note:

The "Visibility" page can refer to that of "Bit Button" control.

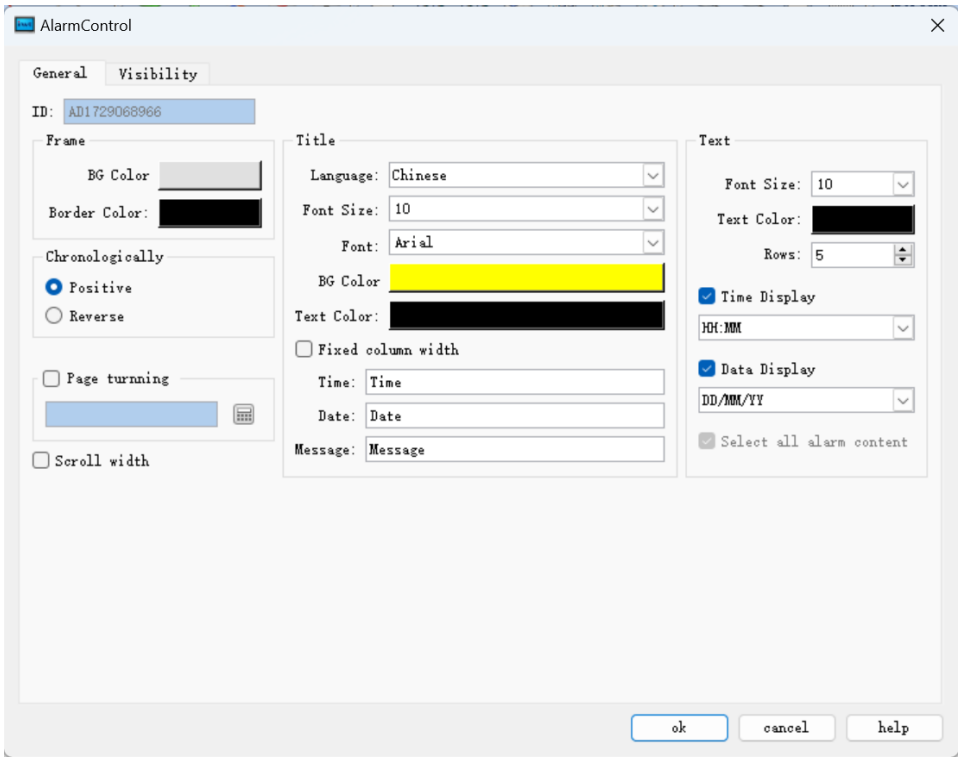
4.5.7 Alarm display

The alarm control can display the alarm information of the current equipment (digital alarm and analog alarm). Before executing this control, it needs to configure the alarm settings. For ways to configure the alarm settings please refer to "Alarm setting".

Alarm control can store real-time alarm information, and the number of alarms is determined when you configure. HMITOOL supports digital alarm messages.

Add the alarm control:

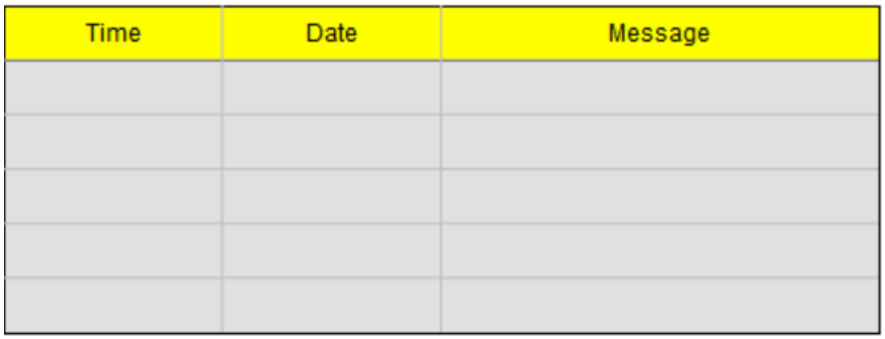
Select the Alarm Control in the Tool menu or select the Alarm Control button  in the Toolbar menu; a dialog box shown in figure below will pop up:



In the alarm display box, you can set the color and size of the display frame, color and type of the grid line, the time, date and color of alarm title. In the text box, you can also set font size, text color and number of rows of alarm message. If the row is set to 5, then the alarm control can display 5 alarm messages, when there is a new alarm occurs, the earlier one will be replaced.

- Language: For different languages, font size, font, time, date and message content can be different while the background color and text color are the same as the first language.
- Select all alarm contents: When this option is selected, the alarm display control will display all the alarm information of "Digital Alarm" and "Analog Alarm" in the Project Manager; otherwise, only the specified alarm information selected by the user is displayed.

Set up and press "OK", then left click to draw the alarm control on the screen, as shown in figure below:



Note:

The size of the alarm control is determined by the rows and the maximum character size of the alarm. The mouse can resize it and the position of the alarm control can be adjusted.

When the number of alarm content branches is bigger than that of rows, the alarm control will automatically add one row, as well as a scroll bar to display the alarm information.

The "Visibility" page can refer to that of "Bit Button" control.

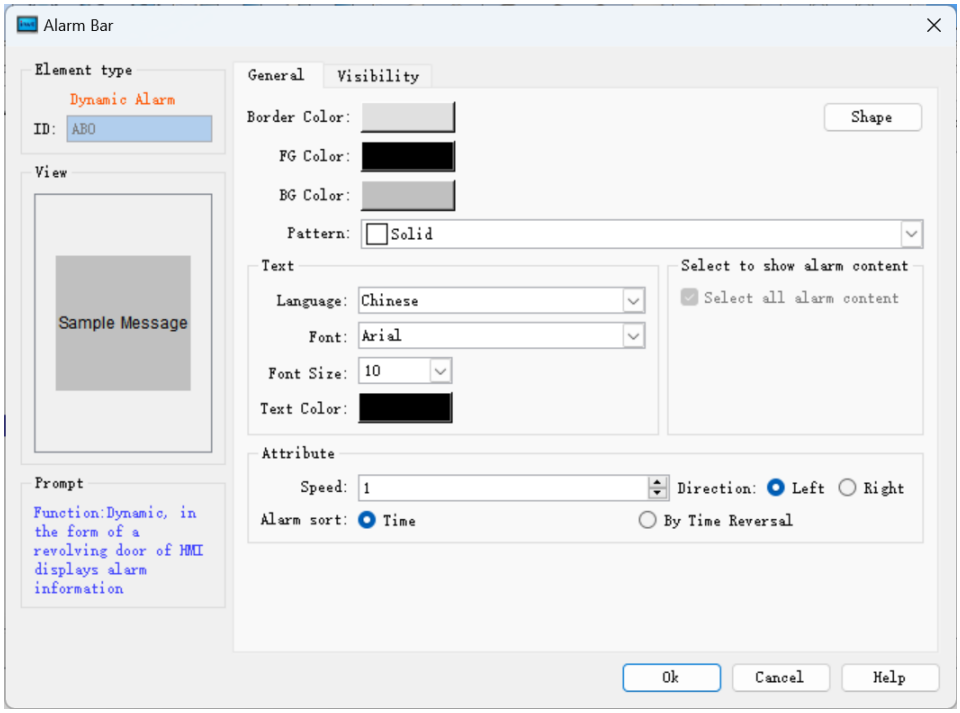
4.5.8 Alarm bar

The Alarm Bar is used to display the current alarm. It differs from the alarm control in that the dynamic alarm bar displays the current alarm contents (digital alarm contents and analog alarm contents) in the form of text scroll.

If there are three alarms, then the dynamic alarm bar will scroll display the first alarm, then the second, and finally the third, and so on. The scroll direction is from right to left, but it is also possible to make it from left to right; the speed, movement interval time and alarm sound are determined by the properties; please refer to "Alarm display setting". Before using the dynamic alarm bar, you need to configure the alarm settings; refer to "Alarm settings" please.

Add the alarm bar:

Select the Alarm Bar or the button  in the Tool menu, as shown in figure below:



- Select all alarm contents: When this option is selected, the alarm display control will display all the alarm information of "Digital Alarm" and "Analog Alarm" in the Project Manager; otherwise, only the specified alarm information selected by the user will be displayed.
- Language: For different languages, font size, font, time, date and message content can be different, and the background color and text color are the same as the first language.
- Font: Change the font format of the alarm contents
- Font Size: Change the font size of the alarm content
- Text color: Change the font color of the alarm contents
- Speed: Movement step of the alarm contents.
- Direction: The moving direction of the alarm content (Left or Right)
- Alarm Sort: The order of the alarm display.

Note:

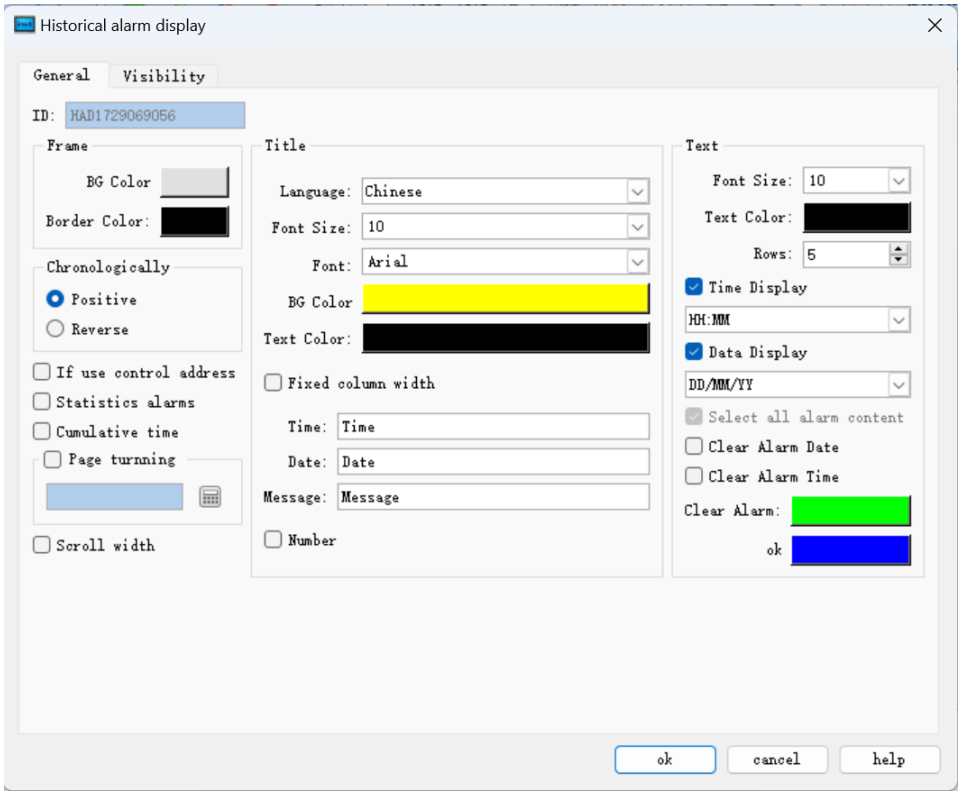
Application of shape, border color, background color, foreground color and pattern can be used with reference to "Bit Button" control.

When calling off-line simulation, the font size should be "16x16"; in other case, you can choose otherwise.

The "Visibility" page can refer to that of "Bit Button" control.

4.5.9 Historical alarm display

The main function of Historical Alarm is to display the previous alarm contents; the operation is the same with that of Alarm display, which means you can refer to the application of the alarm display. Click the Historical Alarm button  on the toolbar to bring up the following dialog box:



Control address: Write 1 to the address register 0 in address offset (16-bit integer, same to 1 to 12); write the start time to address register 1 – 6 in address offset, and write the end time to that of address register 7 – 12. Then the historical alarm display will show the data content during the corresponding time. If you want to display all the historical alarm information, write 0 to the 0 address register. Address Register 13 in Address offset is not useful for now.

This address occupies 12 consecutive address offset; the meaning of each is as follows:

Address offset	Control register address control object
0	1 represents display the data between the start and end time; 0 means all data is displayed.
1	Start time (Year)
2	Start Time (Month)
3	Start time (Day)
4	Start Time (Hour)
5	Start Time (Minute)
6	Start Time (Second)
7	End time (Year)
8	End Time (Month)
9	End Time (Day)

Address offset	Control register address control object
10	End Time (Hour)
11	End time (Minute)
12	End time (Second)

- Clear alarm date: Cancel the alarm date
- Clear alarm time: Clear the alarm time
- Clear alarm: The line used to remove the alarm is marked with this color
- Statistics alarms: Enable alarm count, which is showed after the alarm message.
- Cumulative time: Enable alarm cumulative time, which is showed after the alarm message.
- OK: Indicate the alarm with this color when it is generated

Note:

The basic operation can refer to "Alarm Display" control.

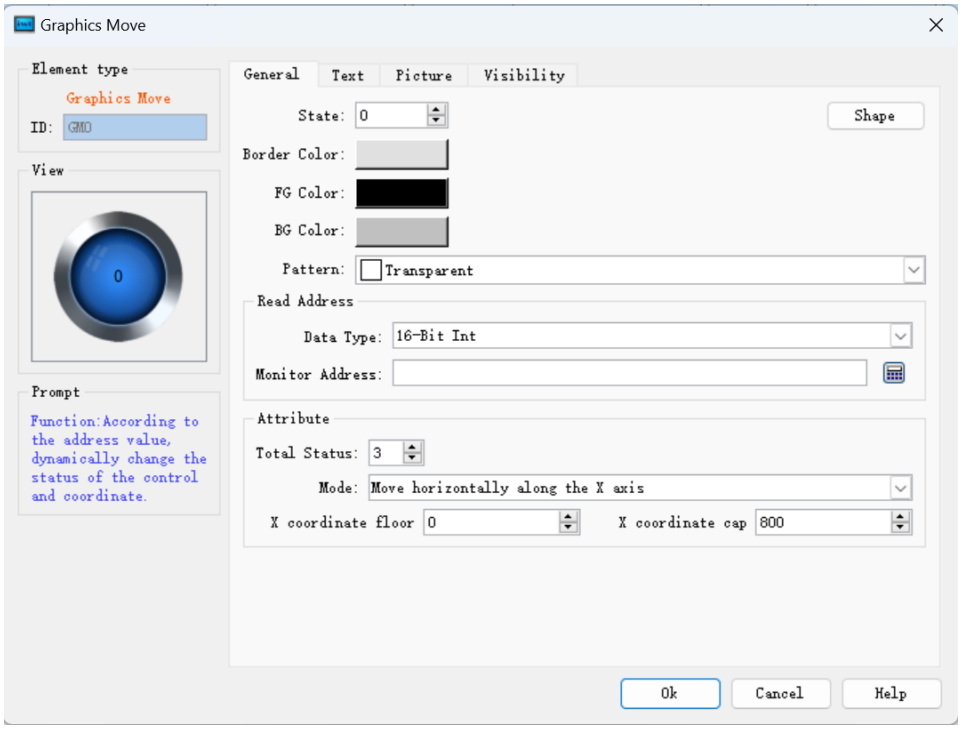
The "Visibility" page can refer to that of "Bit Button" control.

4.5.10 Graphic move

With the Graphics Move control, a gallery graphic or graphic file can move in a specific direction on the screen, and the associated variable value can trigger the movement of the variables. This control can produce an animation effect on the screen.

Add the graphic move control and modify its properties:

Select the Graphic Move command button  in the toolbar; set the properties in the dialog box that pops up; and click "OK", as shown in figure below:



Picture selection:

On the Pictures page, select a picture as a moving graphic that can also be customized.

Monitor address:

The monitor address for the change of graphic movement occupies three addresses, which correspond to the change of the total status, the value of the X axis and the value of the Y axis. For example, assuming the monitor address is LW1 in the internal memory and the data type is 16 Bit. (Then the value change of LW1, LW2, LW3 can directly control the total number of state, X-axis movement and Y-axis movement); if data type is 32 Bit, then the monitor address of Total Status is LW1, that of X coordinate is LW3 and that of Y coordinate is LW5.

Method:

The following examples all take LW1 in internal storage address as the monitoring address, and the data type is 16 Bit. As an example to illustrate each movement:

- Move horizontally along the X axis: The graph moves only horizontally, but not vertically; cannot move below the lower limit of X axis or above the upper limit of X axis. The total number of status is the value of the monitor address LW1 and that of the LW2 represents the X coordinate.
- Move vertically along the Y axis: The graph moves only vertically, but not horizontally; cannot move below the lower limit of Y axis or above the upper limit of Y axis. The total number of status is the value of the monitor address LW1 and that of the LW2 represents the Y coordinate.
- Move horizontally and vertically in the mean time: The graph can move in horizontal and vertical direction at the same time; it cannot move below the lower limit of X-axis or above the upper limit of X-axis horizontally, or move below the lower limit of Y axis or above the upper limit of Y axis vertically. The total number of status is the value of the monitor address LW1, that of the LW2 represents the X coordinate and that of LW3 represents the coordinate.
- Move horizontally and proportionally along the X axis: The graph moves only horizontally, but not vertically; cannot move below the lower limit of X axis or above the upper limit of X axis. The total number of status is the value of the monitor address LW1 and that of the LW2 represents the X coordinate.
- Move vertically and proportionally along the Y axis: The graph moves only vertically, but not horizontally; cannot move below the lower limit of Y axis or above the upper limit of Y axis. The total number of status is the value of the monitor address LW1 and that of the LW2 represents the X coordinate.
- Move anti-horizontally and proportionally along the X axis: The graph moves only horizontally, but not vertically; cannot move below the lower limit of X axis or above the upper limit of X axis. The total number of status is the value of the monitor address LW1 and that of the LW2 represents the X coordinate.
- Move anti-vertically and proportionally along the Y axis: The graph moves only vertically, but not horizontally; cannot move below the lower limit of Y axis or above the upper limit of Y axis. The total number of status is the value of the monitor address LW1 and that of the LW2 represents the X coordinate.

Note:

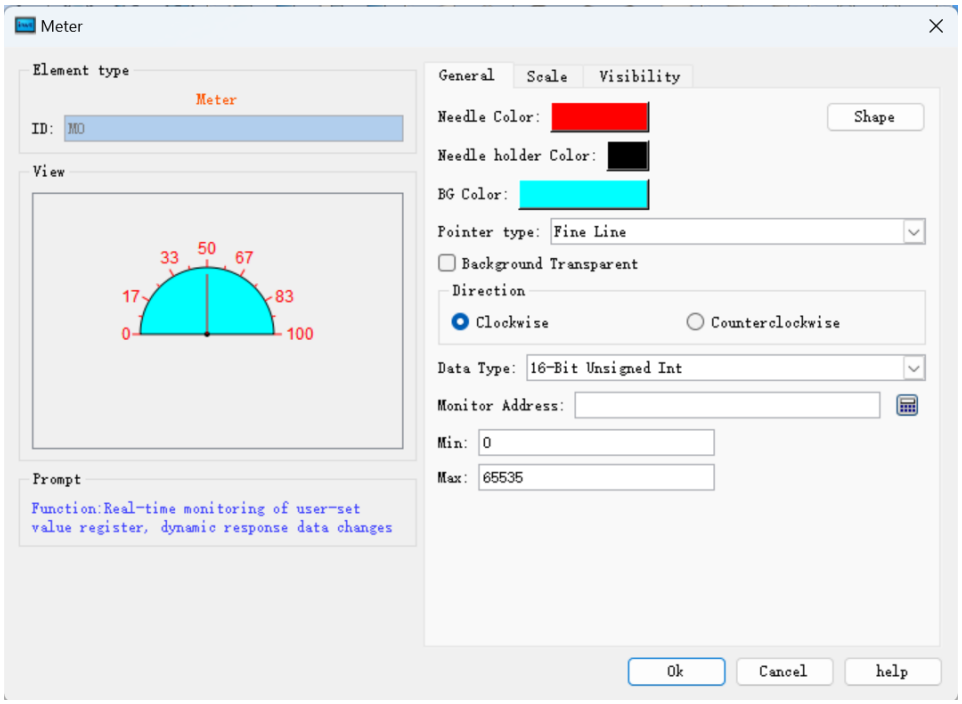
- ✧ As for "Text" and "Picture" pages, refer to those of the "Multi-state Indicator" control.
- ✧ The "Visibility" page can refer to that of "Bit Button" control.
- ✧ Changing the values of the last two monitor address can control the position of the graphic movement.
- ✧ The maximum coordinate of the X / Y-axis is the maximum value of the screen.

4.5.11 Meter

The Meter control can display the current value of associated variables through a pointer; generally the control is a semicircle or circular, which can be a visual representation of the actual situation of the variable.

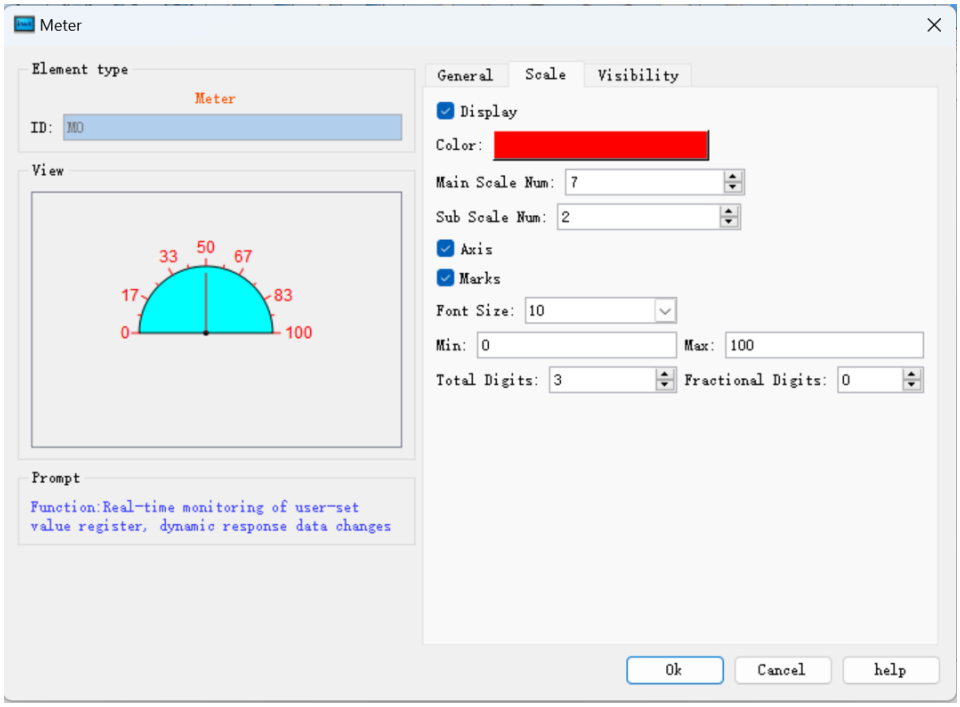
Add the Meter control and modify the properties:

1. Select the Meter control icon  in the toolbar; then the dialog box shown in figure below appears:



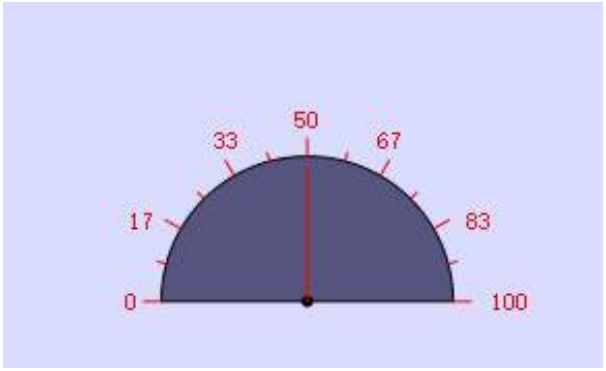
- Needle color: Change the color of the pointer
- Needle holder Color: Change the color of the needle holder
- Background color: Change the background color of the dial
- Pointer type: Fine Line, Thick Line, Diamond and Triangle
- Background transparency: Whether the control is transparent
- Direction: Select the clockwise or counterclockwise direction
- Data type: Choose different data types according to their needs
- Monitor address: Read the address value that is shown by the pointer on the dial plate.
- Maximum: Set the maximum value that cannot be exceeded by the monitor address value
- Minimum: Set the minimum value that the monitor address value cannot be lower than

2. Click the Scale tab to set the scale properties, as shown in figure below:



On this page, you can set the color, number of major scale, number of sub-scale, and whether to display the axis and whether to display the scale marks, etc.

3. In the screen editing area click to draw the control. The effect diagram of the Meter control is as follows:



4. Select the Meter control graph, move the mouse on the 8 small green dots to modify its size; double-click to re-modify the control properties.

Note:

✧ Meter control has a fixed aspect ratio; if modify the size, its length and width enlarge or shrink in the meantime.

✧ The "Visibility" page can refer to that of "Bit Button" control.

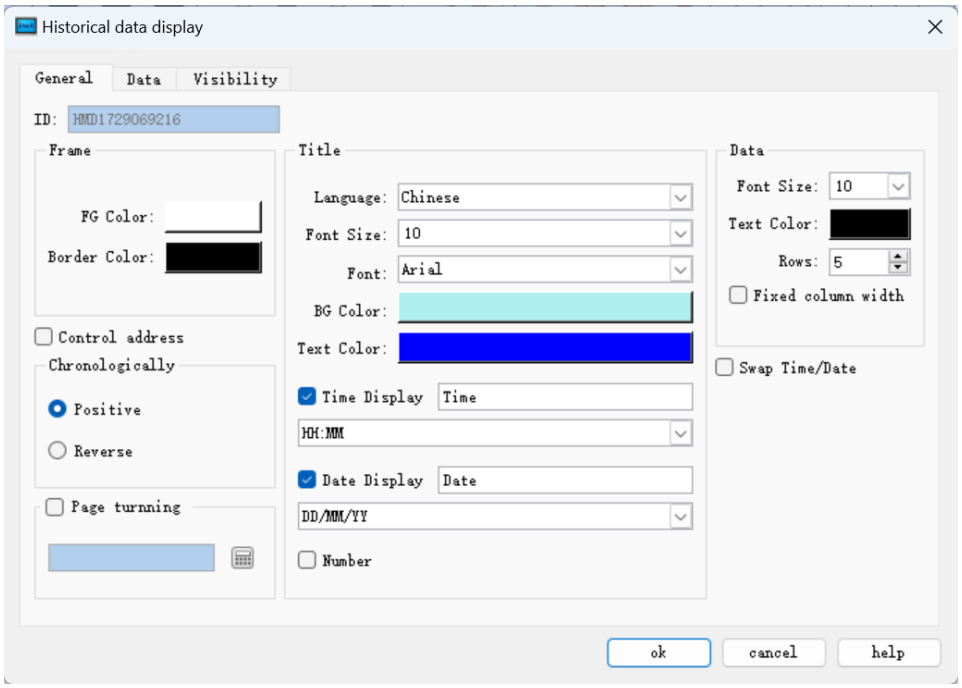
4.5.12 Historical data display

In actual use, data generated from PLC or other connected equipment can update at any time, such as alarm. When it comes to historical data, we can use the historical data collector in HMITOOL to observe the historical data.

HMITOOL provides the function of historical data collector. Enter the Historical data collector dialog box in the project manager. If it is a new project, right-click the "Historical data collector" to add one; then

double-click "Historical Data Collector 0" to enter the setting dialog box. For details, refer to properties of "History Data Collector".

Click on the historical data display button  on the toolbar, and the following dialog box will pop up:



General:

- Foreground Color: Click the color inside the box to change the foreground color of the display.
- Border Color: Click the color inside the box to change the color of the display border.
- Title: Choose the font size, font style, background color, text color and whether to display the date and time. Language settings can be referred to that of "Alarm Display".
- Data: Choose the font size, color, and the maximum line numbers to be displayed.
- Control address:

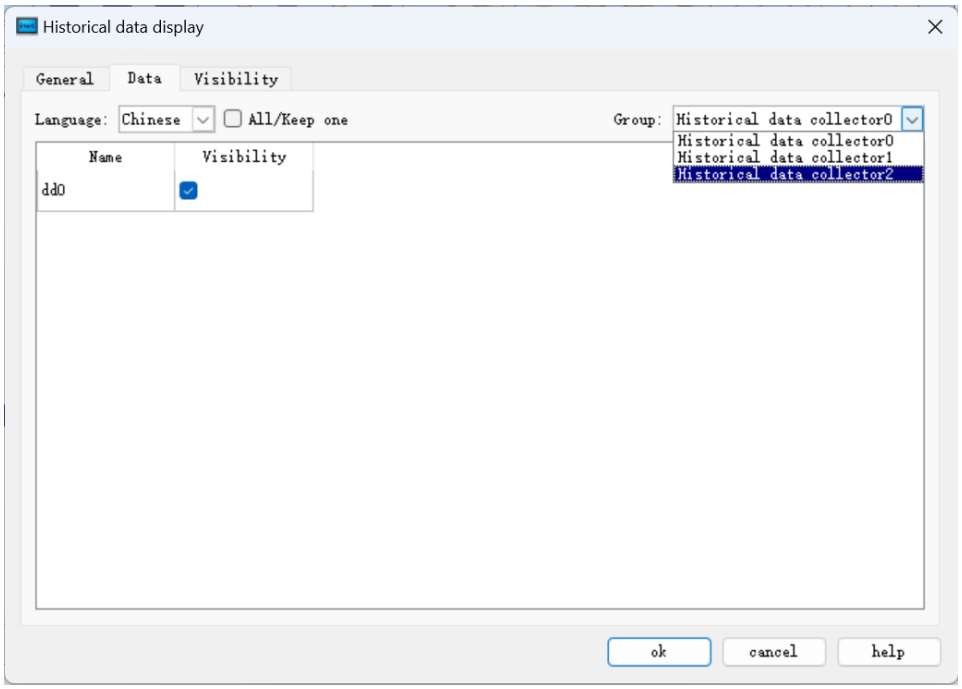
Write 1 to the address register 0 in address offset (16-bit integer, same to 1 to 12); write the start time to address register 1 – 6 in address offset; write the end time to that of address register 7 – 12; at last write 1 to address register 13. Then the historical data display will show the data content during the corresponding time. The address register 13 will automatically reset. If you want to display all the historical alarm information, write 0 to the address register 0.

This address occupies 40 offset addresses consecutively. Meaning of each address is as follows:

Address offset	Control register address control object
0	1 represents display the data between the start and end time; 0 means all data is displayed.
1	Start time (Year); one word
2	Start Time (Month); one word

Address offset	Control register address control object
3	Start time (Day); one word
4	Start Time (Hour); one word
5	Start Time (Min); one word
6	Start Time (Second); one word
7	End time (Year); one word
8	End Time (Month); one word
9	End Time (Day); one word
10	End Time (Hour); one word
11	End time (Minute); one word
12	End time (Second); one word
13	Value is from 0 to 1 and the value of address offset 0 is 1, then display the data during particular period; reset automatically; one word
14	All the historical data information between the start time and end time; double word

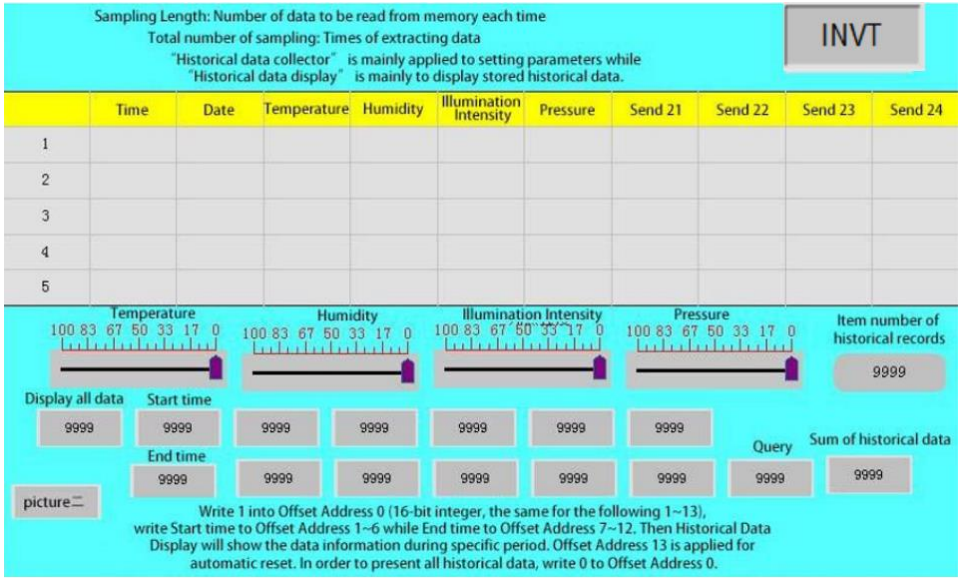
Data:



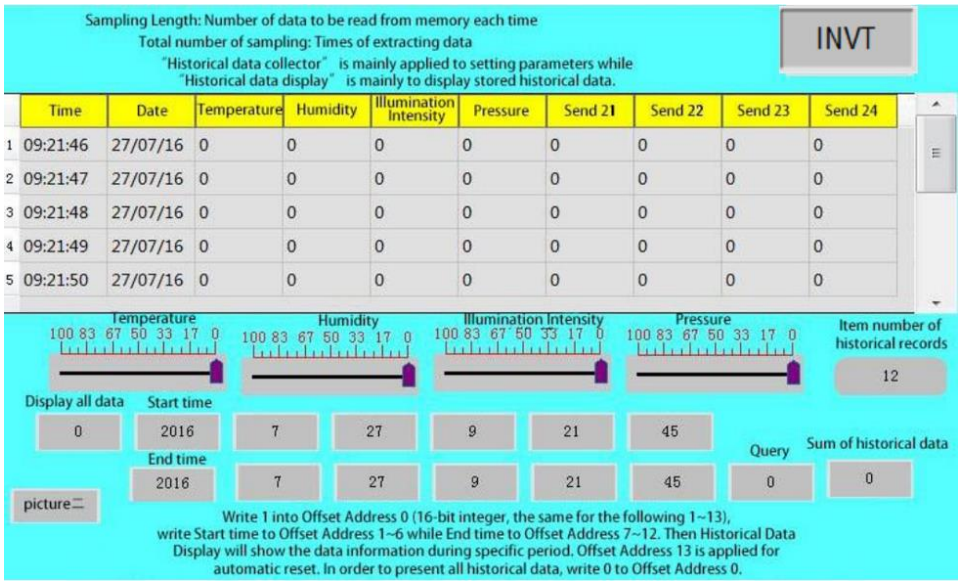
Group number: HMITOOL provides multi-group historical data to choose.

Historical data display operation: When display historical data through control addresses, the configuration

process is as follows :



In this operation, input 1 to "Display all data", 1 to "Inquire", then the data collector will display all the historical data during the start time and the end time period. See the figure below:



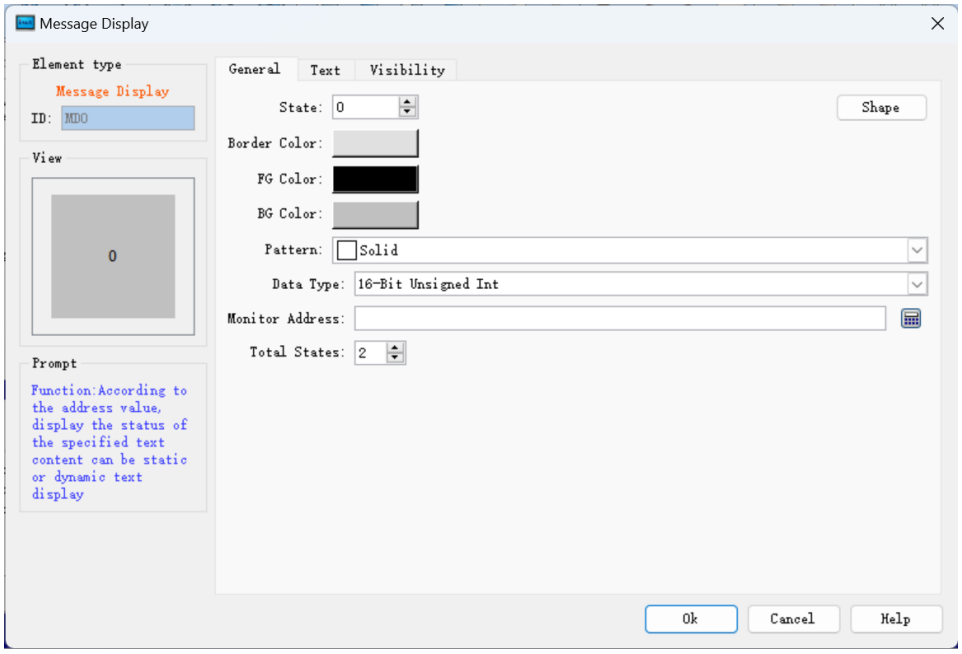
Input 1 to "Display all data", set the start time as 2016-7-11 3: 30: 4 and the end time as 2016-7-11 14: 39: 4; when the input value of "Inquire" is 1, then it only displays the data during this time.

Note:

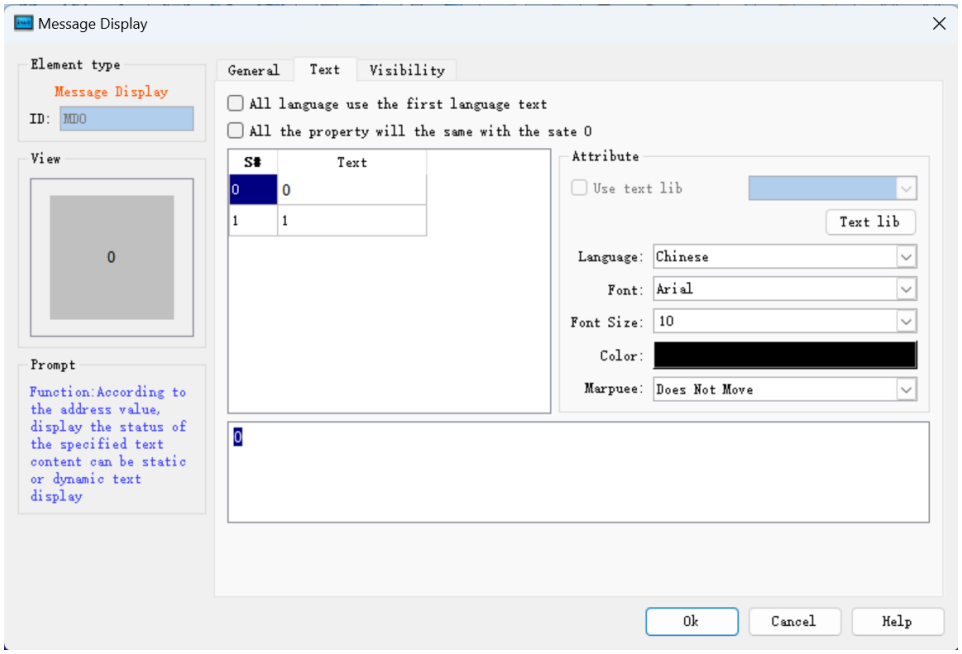
The "Visibility" page can refer to that of "Bit Button" control.

4.5.13 Message display

Message Display functions similarly to the multi-state indicator, except that the total states number of the message display control increases, which is up to 128. This control icon on the toolbar is  , click it to bring up a dialog box as shown in figure below:



The "Text" tab of "Message Display" is shown in figure below:



The language, font, font size and color settings can refer to those of the multi-state indicator control.

Cursors: This item has three options-- Not move, Left and Right.

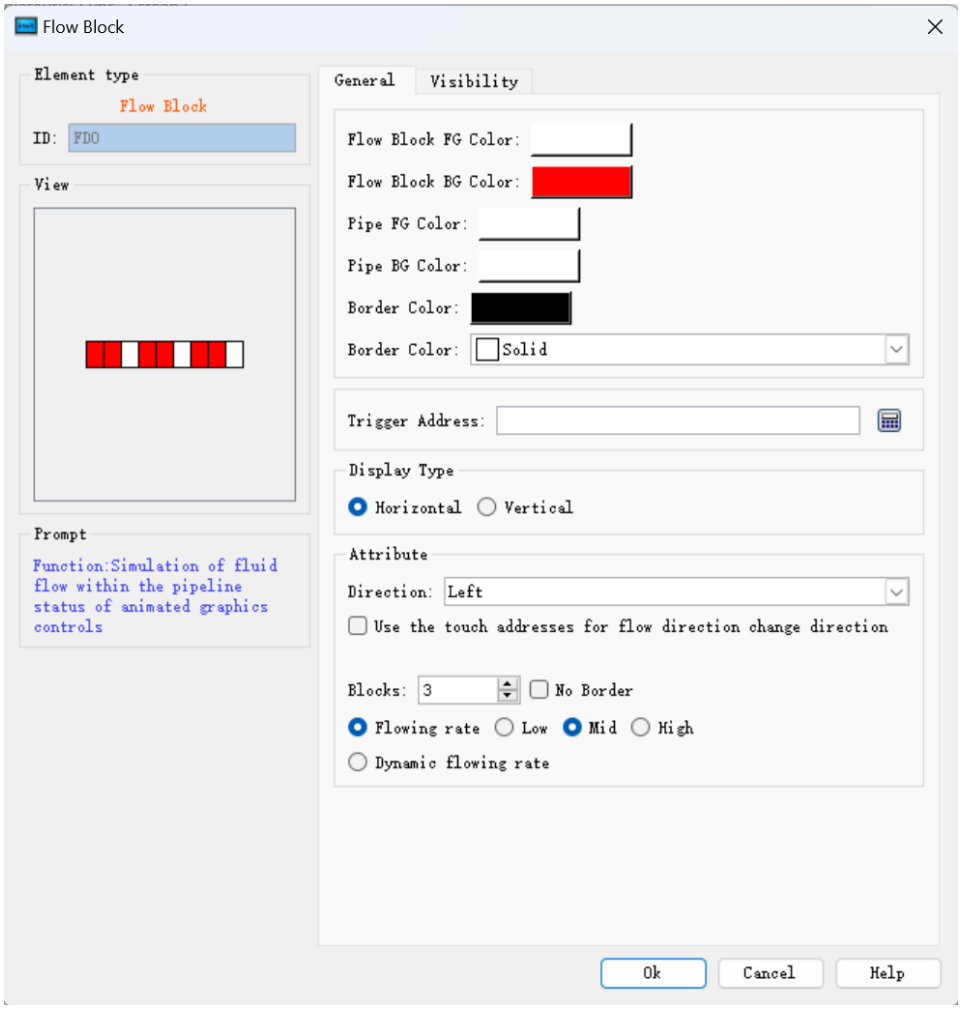
- Not move: The current state of text is static.
- Left: Text in the current state moves to the left at the speed (assumed to be n) set by user by n pixel value.
- Right: Text in the current state moves to the right at the speed (assumed to be n) set by user by n pixel value.

Note:

As for property settings, you can refer to the attributes of "Multi-state indicator" control.

4.5.14 Flow block

A Flow block is an animated graphic that simulates the liquid flow within a pipe. Whether to flow is determined by the state of the trigger address. When the trigger address is 1, the Flow block is in flow state; while when it is 0, the Flow block is in static state. User determines the flow speed. Click the button on the toolbar, and then it appears a pop-up dialog box, as shown below:



- Color: Set the color properties of the Flow block.
- Flow block foreground color: Click on the color button to set the Flow block foreground color;
- Flow block background color: Click on the color button to set the Flow block background color;
- Pipe foreground color: Click on the color button to set its foreground color;
- Pipe background color: Click on the color button to set the pipe background color;
- Border color: Click on the button to set the border color of the Flow block control;
- Pattern: Click to select the pattern of the Flow block control; the default setting is "Solid".
- Trigger Address: Address that controls the stationary or moving of the Flow block; when the value of the address is 1, then the block flows.
- Attribute: Set the properties of the Flow block, such as direction, flow speed.
- Display Mode: Select "Horizontal" to make the Flow block move horizontally; and select "Vertical" to

make it flow vertically.

- Direction: When the display mode is "Horizontal", you can choose "Left" or "Right"; in another case, "Up" or "Down".

Change the flow direction to the opposite direction through the trigger address: when the "Trigger address" value is equal to that of the "Effective status" set by user, the Flow direction is switched to the opposite.

For example, If "Flow direction" is "Left", this option is selected, "Trigger address" is LB2, and "Effective Status" is set to 1, then when the value of LB2 is 1, the direction of the Flow block is switched to "Right", while when the value of LB2 is 0, the direction is changed back to the original "Left".

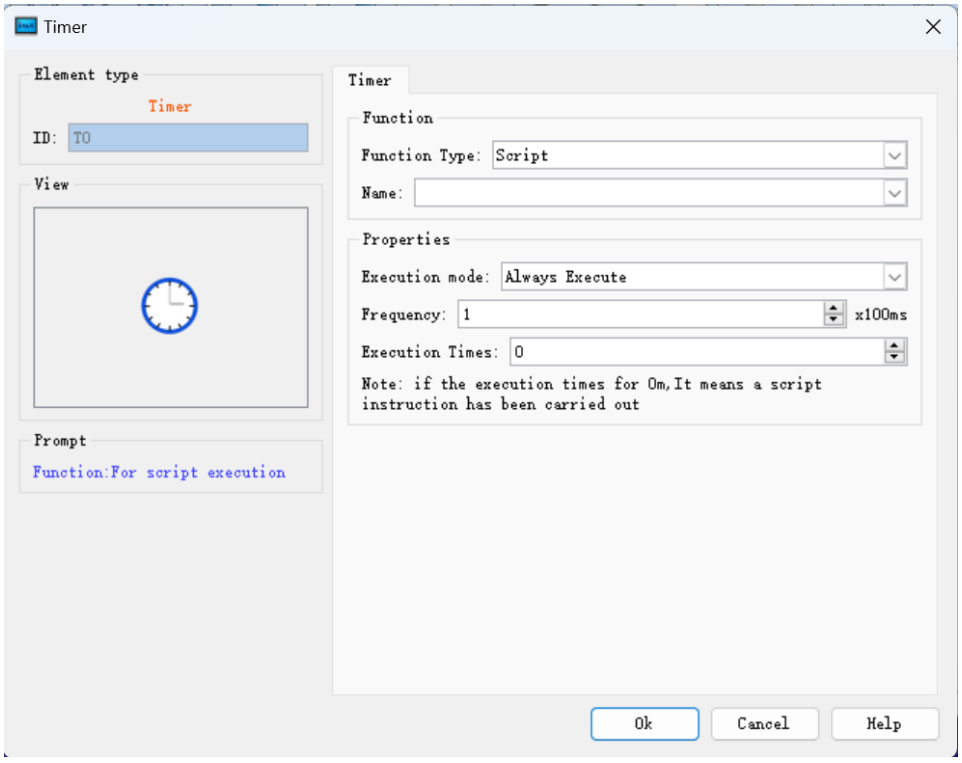
- Blocks: The number of Flow units, ranging from 1 to 30;
- No Border: When this attribute is selected, the edges of the Flow block are hidden.
- Flow rate: Either fixed rate or dynamic rate
- Fixed Flow rate: High, Middle or Low.
- Dynamic Flow rate: The Flow rate is determined by the value of a word address, which should be between 1 and 10. When the value is 0, the Flow block does not flow; When the value is 1, the Flow block flows at the lowest rate; When the value is 10, the Flow block flows at the highest rate.

Note:

The "Visibility" page can refer to that of "Bit Button" control.

4.5.15 Timer

A timer is a control that uses a time condition to trigger a specific function. In the HMITOOL configuration software, the timer is used as a control triggered by macro commands. Click on the toolbar  or double-click on an existing property timer will enter the timer settings page:



- Control mode: Select the execution mode of macro instruction as always execute or address trigger.

1. "Always execute" is always executed according to the set frequency, and if always trigger is selected, the selected macro command will always be executed according to the set frequency when the project is running;

2. "Address trigger" means that when the value of the specified bit is 1, it will execute at the set frequency, and when the value of the specified bit is 0, the macro command will not be executed.

- Address: When the execution mode of "address trigger" is selected, the address input field will appear, and the bit that controls the execution of this macro instruction will be input here. When the value of this bit is 1, the macro instruction is executed.
- Execution frequency: The frequency at which the selected macro is executed. The range is 0.1 – 60S.
- Execution times: The number of times the selected macro instruction is executed. When the number of times is 0, the macro instruction will be executed all the time.
- Function type: Select the type of function to be executed. The function controlled by timer in HMITOOL configuration software is macro instruction.
- Name: The name of the macro to be executed. The timer cannot be set when there is no macro command.

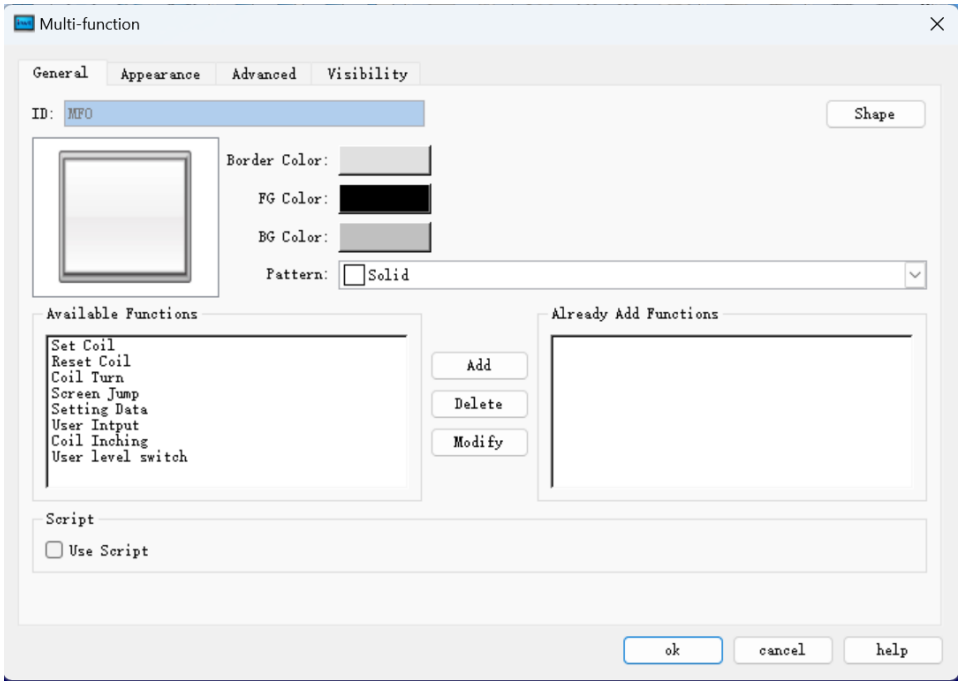
Use the timer variable to enable the timer function. The timer variable combination contains the following six variables:

Note:

The size of the timer control cannot be changed, and the position can be set. When the project is running, the timer control is not displayed on the HMI.

4.5.16 Multi-function button

Multi-function button allows realizing the function of multi-step custom operation through one single control. It can simplify user operation. Click  on the toolbar or double-click the existing multi-function button to enter the property page.



General:

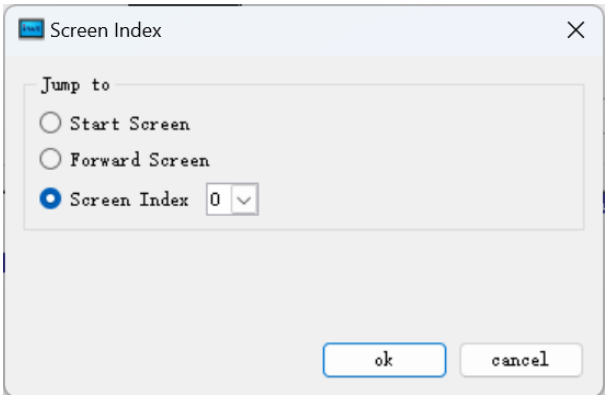
1. Button appearance

Shape, color, style, and other settings.

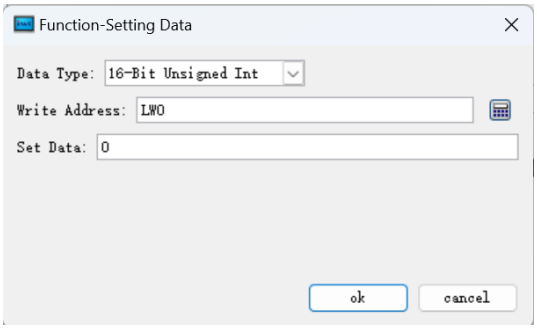
2. Available functions

Several functions are listed for user to select.

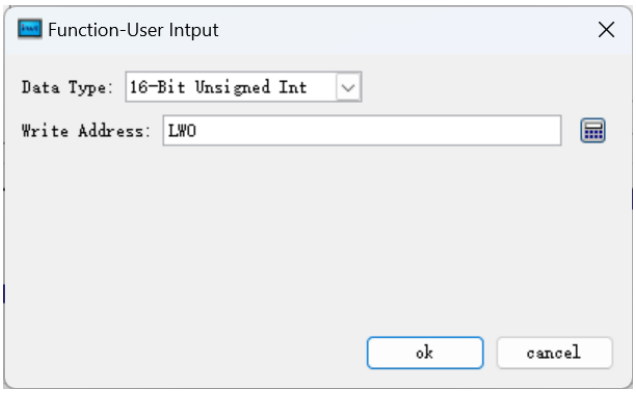
- Set Coil: Set the input address.
- Reset Coil: Reset the input address.
- Coil Alternation: Invert the input address value; if the address value is 0, then it becomes 1; if 1, it becomes 0;
- Coil Jog: When touched, the input address will be set; reset after releasing;
- Screen Jump: Jump to the selected screen. Modify it to choose the screen to jump to.



- Set data: Write the set value to the set address. You can select the type of data to be written, as well as the address and the data.



- User input: Enter a value and write it to the set address. You can select the data type to be written and set the address to be written. When this command is executed, it will appear the data input interface where you can perform the above operation.



Select an available function and click Add to add the function to the list of selected features.

When "User Input" and "Coil Jog" are selected, only the User Input will be executed while the coil jog will not.

3. Added functions

When you select an available function, the function is listed here. Double click it or click "Modify" to set or modify. Click "Delete" to delete this function.

Clicking the multifunction button while the configuration is running means performing all of the selected functions.

4. Macro

Select "Execute Macro" to see the list of macros. Choose a macro, and click the multi-function button to execute it when the project runs.

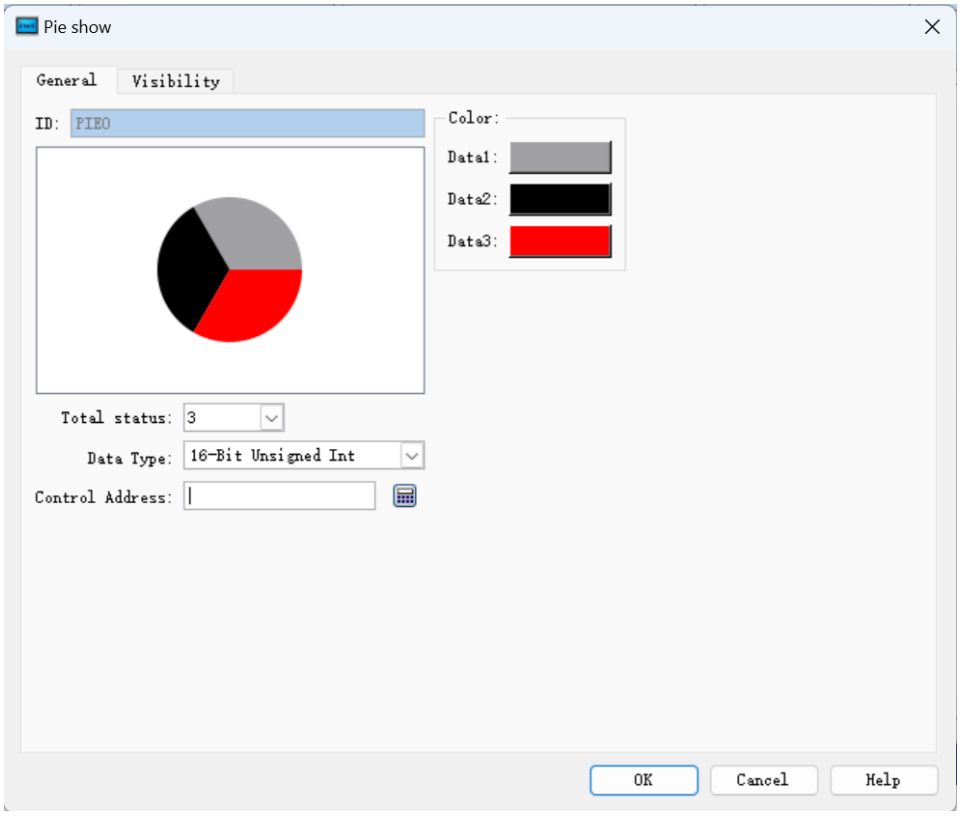
Note:

Label, Advanced and Visibility settings: Refer to those of the Bit Button.

Refer to "Bit Switch" for hot keys of Advanced.

4.5.17 Pie chart

A pie chart is used to show the proportion of a certain part, simply and clearly. Click  on the toolbar or double-click the existing Pie Chart button to enter the Property page.



- Total: Quantity of components. Up to 12 pieces of data can be chosen.
- Data type: what type of data is selected for each type.
- Control Address: The written address is the first needed data address. The following address is the continuous one of the first. For example, the total quantity is 3, the data type is a 16-bit positive integer, and the control address is LW5, then the address of data 1 is LW5, that of data 2 is LW6, and that of data 3 is LW7.

If the data type is 32-bit and the control address is LW5, then the address of data 1 is LW5, that of data 2 is LW7, and that of data 3 is LW9.

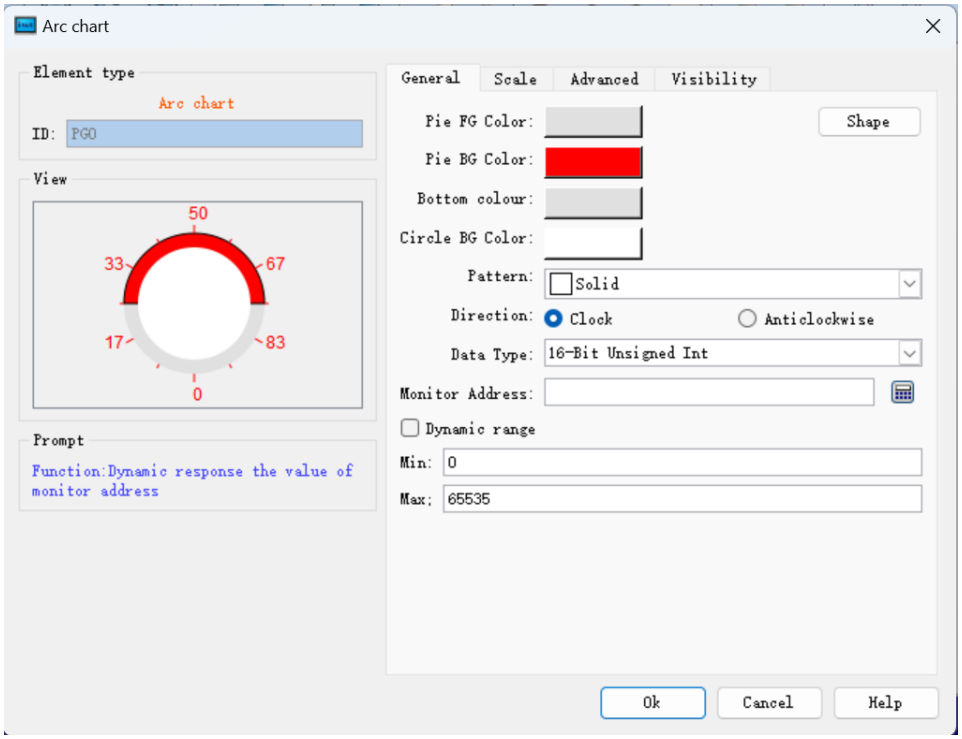
- Color: Set the color of each data.

4.6 HMITOOL new controls

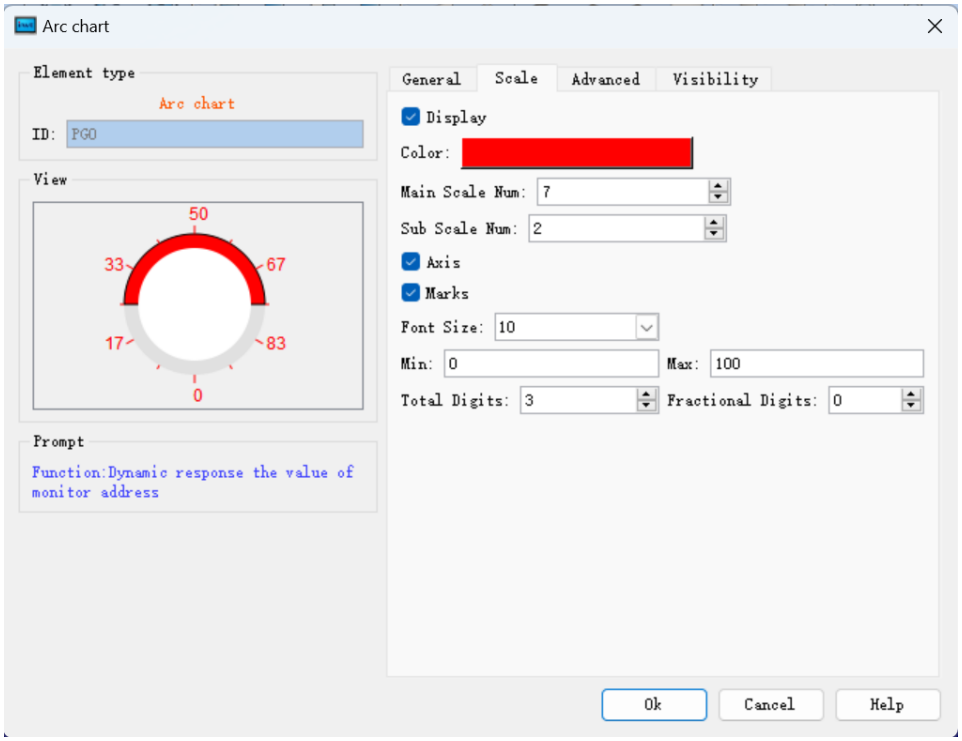
This chapter introduces the new controls.

4.6.1 Arc chart

The control of Arc Chart (also called Pie chart) functions similarly to the Meter, which is applied to read and reflect the value of monitor address. In this control, the reaction area can be shown by the "Pie foreground color", "Pie background color" and "Pattern". The control icon on the toolbar is  ; click on it to pop up a dialog box as shown in figure below:



The Scale page dialog box, as shown in figure below:

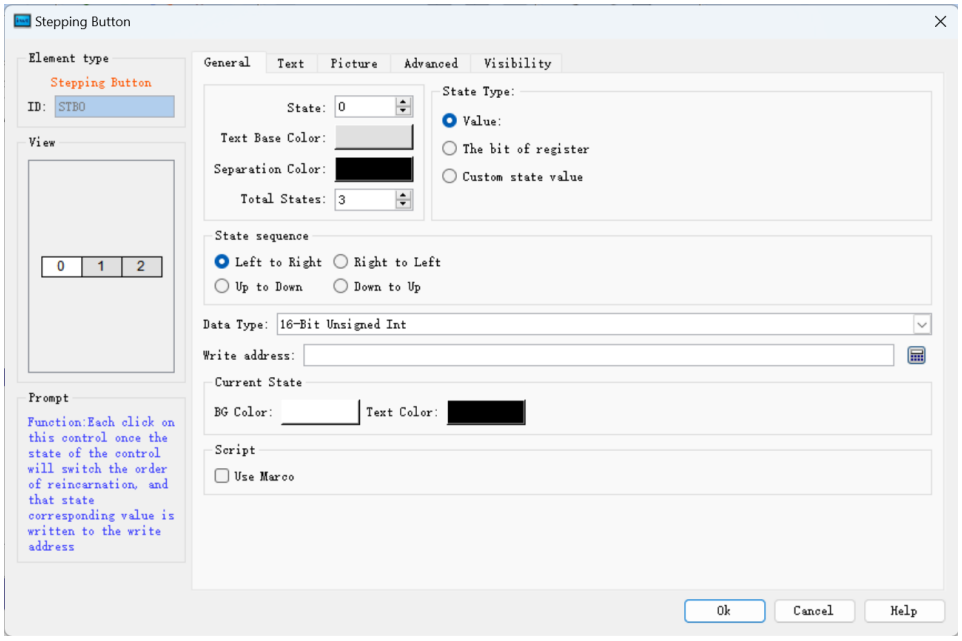


Refer to the scale page of "Meter" for the settings of scale.

Refer to "Numerical display" for the parameter settings of "Advanced".

4.6.2 Stepping button

This command is applied to create a stepping button control in the current screen to realize the cyclic switching of execution states. Click the button icon  to pop up a dialog box as shown in figure below:



State sequence: Direction of the text on the control. For example, if the total number of states is 3, then texts of State 0, State 1 and State 2 are 0, 1, 2 respectively.

- Left to Right: The control is placed horizontally, the text is oriented from left to right: 0, 1, 2
- Right to Left: The control is placed horizontally, the text is oriented in a right-to-left orientation: 2, 1, 0
- Up to Down: The control is placed vertically; the text direction is in accordance with the direction from top to bottom: 0, 1, 2
- Down to Up: The control is placed vertically; the text direction is in accordance with the direction from bottom to top: 2, 1, 0
- State Type: Refer to that of the "Multi-state Indicator Lamp".
- Current state: Set the background color and text color of the text in the current state.

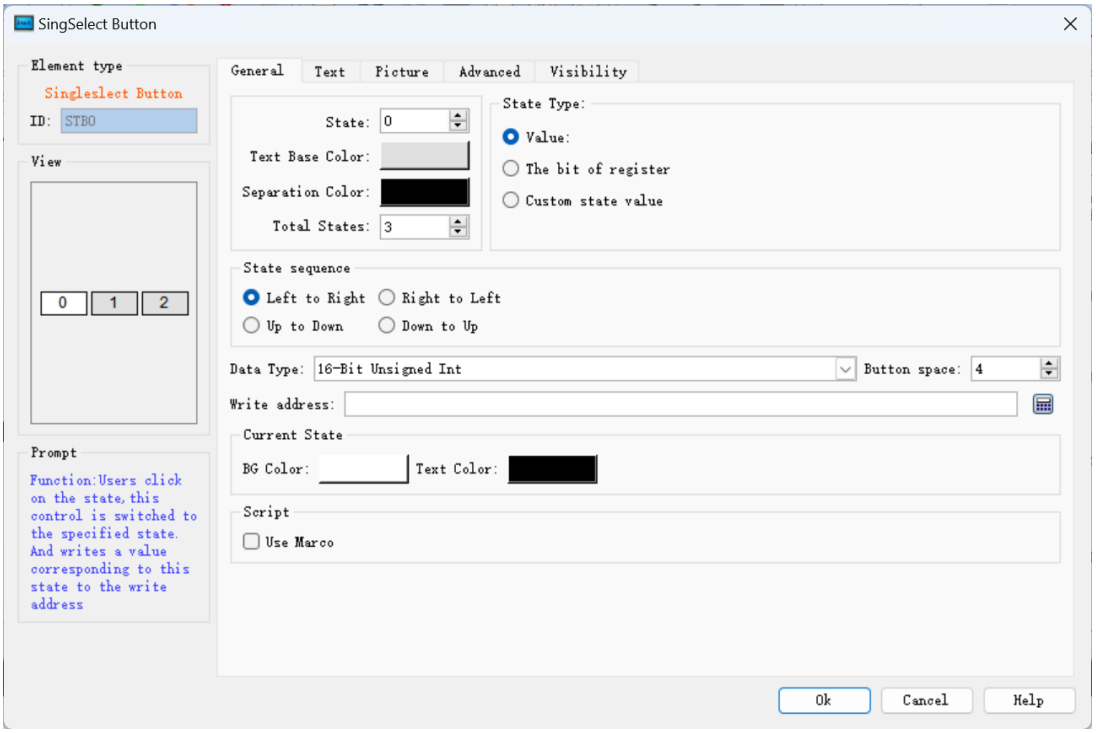
Refer to "Multi-state Indicator Lamp" for the parameter settings of pages of Text, Picture.

Refer to Bit button for the application of "Advanced" page and hotkeys.

E. g, assuming that the state type is "Value", the write address is LW1, the total number of states is 3, and the text of state 0, state 1 and state 2 are 0, 1 and 2 respectively; after downloading the project to HMI, keep on clicking on the control, whose state will be converted constantly between 0-2, and the corresponding value will be written to LW1.

4.6.3 Radio button

This command is applied to create a radio button control in the current screen to switch to a certain state selected by user. Click the button icon to pop up a dialog box as shown in figure below:



State sequence: Direction of the text on the control

For example, if the total number of states is 3, then texts of State 0, State 1 and State 2 are 0, 1, 2 respectively.

- Left to Right: The control is placed horizontally, the text is oriented from left to right: 0, 1, 2
- Right to Left: The control is placed horizontally, the text is oriented in a right-to-left orientation: 2, 1, 0
- Up to Down: The control is placed vertically; the text direction is in accordance with the direction from top to bottom: 0, 1, 2
- Down to Up: The control is placed vertically; the text direction is in accordance with the direction from bottom to top: 2, 1, 0
- State Type: Refer to that of the "Multi-state Indicator Lamp".
- Current state: Set the background color and text color of the text in the current state.

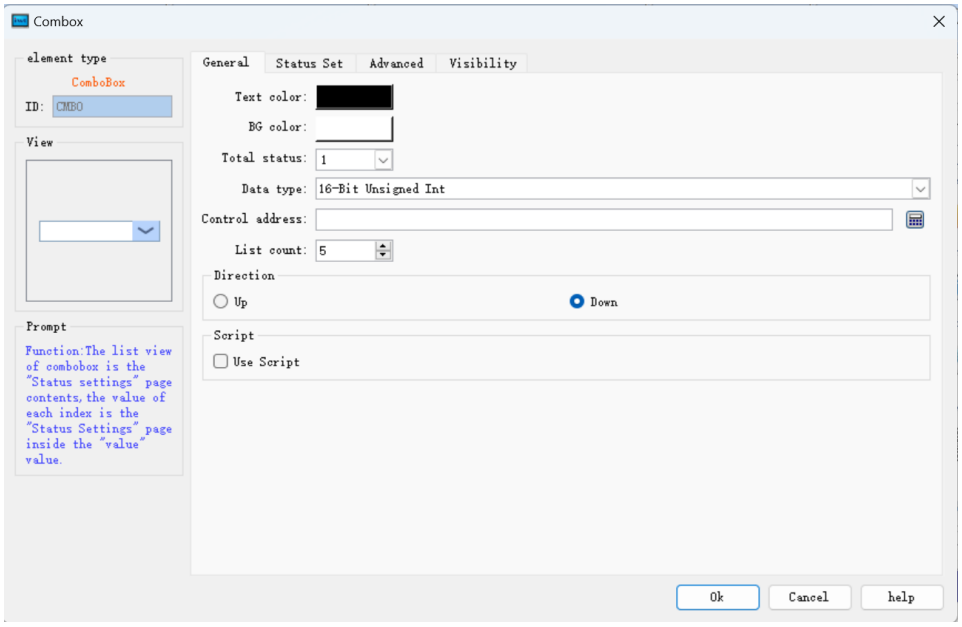
Refer to "Multi-state Indicator Lamp" for the parameter settings of pages of Text, Picture.

Refer to Bit button for the applications of "Advanced" and "Visibility".

4.6.4 Combo box

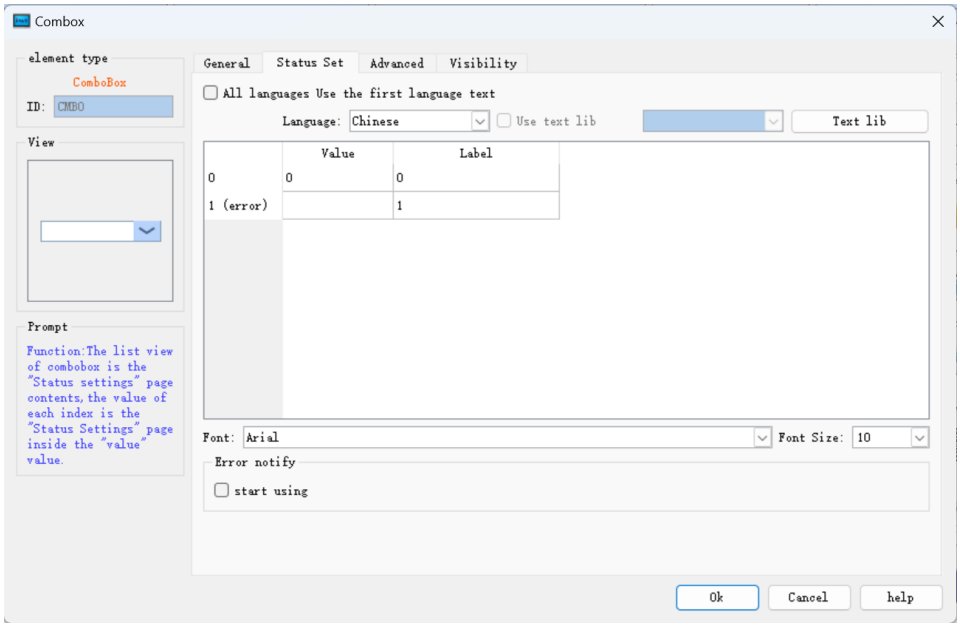
The Combo Box allows you to display a list of items that can be viewed and selected by user. Once an item has been selected, the corresponding value is written to the control address of the character register.

The control icon on the toolbar is  ; click on it to pop up the dialog box as shown in figure below:



- Total Number of States: Set the number of states for this object. Each item represents a status and is displayed on the list. The value of this item can be written to [Control Address].
- Background Color: Select the background color of the selected object
- Text Color: Select the text color of the selected object
- Control Address: Write address
- Use macro: Execute the selected macro if they are touchable.

Status Set: Click "Status Set" page; the following figure is shown:



- Language: Use a consistent "font" and "font size" for all states while different "fonts" and "font sizes" for different languages.
- Value: Set a value for each item, but it needs to be subject to the following two specifications:
  - ✧ [Read]: If the system detects any change in the contents of [Control Address], the object will compare the content with its value and select the first matching item. If no item matches, it will

jump to the error state and triggers the error notification bit (if set).

- ✧ b. [Write]: When an item is selected, the system will write the value to [Control Address].

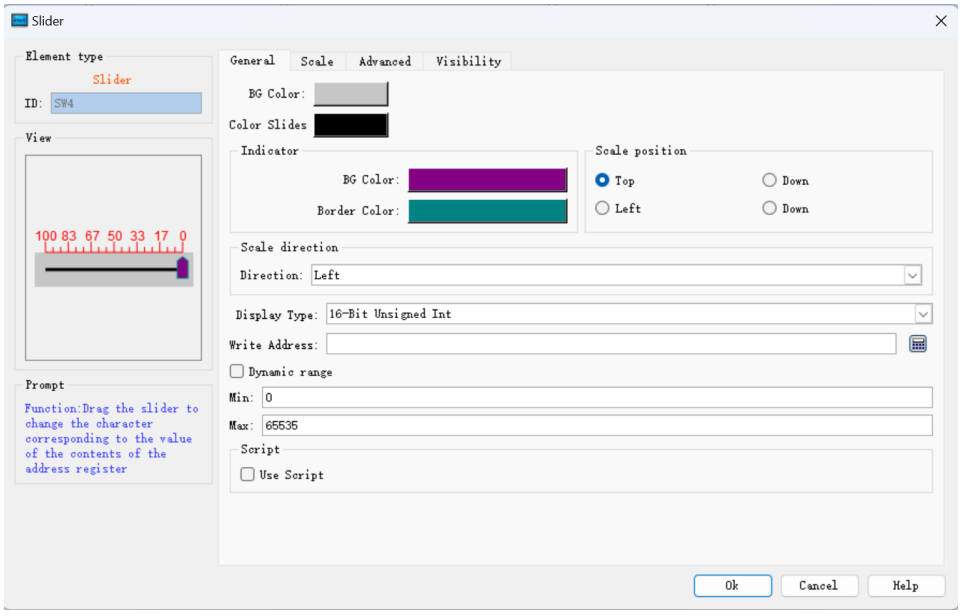
- Label: User can set text content for each item. The item menu will show texts of all the items on the list for user to view and select.
- Error notification
  - ✧ a. For example, when [Number of status] is set to 8, state 8 is the error status. Similarly, if it is 11, the state 11 is the error state.
  - ✧ b. When an error occurs, the combo menu will display the text of the error status.
  - ✧ When an error occurs, the system sets a specific bit to ON / OFF (written to [Error notification address]). Notification of this bit register can be used to trigger an operation to correct the error.

Refer to "Bit Button" for the application of "Advanced" and "Visibility".

4.6.5 Slider

Slide analog switch: drag the sliding block to change the value contents of the corresponding character register address.

Select the icon  in the toolbar and the attribute dialog box of "Slider" will appear, as shown in figure below:



- Scale position: Select the position of scale.
- Scale direction: Select the alignment direction of scale.
- Write address: when the slider is dragged, the set value can be real-time written and displayed.
- Dynamic range: Control the slider with the word address. When the dynamic range check box is not ticked, the maximum / minimum values can be controlled by data type, and the user can also change it freely. At the moment, the movement value of the slider is actually the value here; when the dynamic range check box is ticked, the maximum / minimum values are received in the form of word address, and the maximum / minimum values are controlled through address.

Refer to "Meter" for the settings of the Scale page.

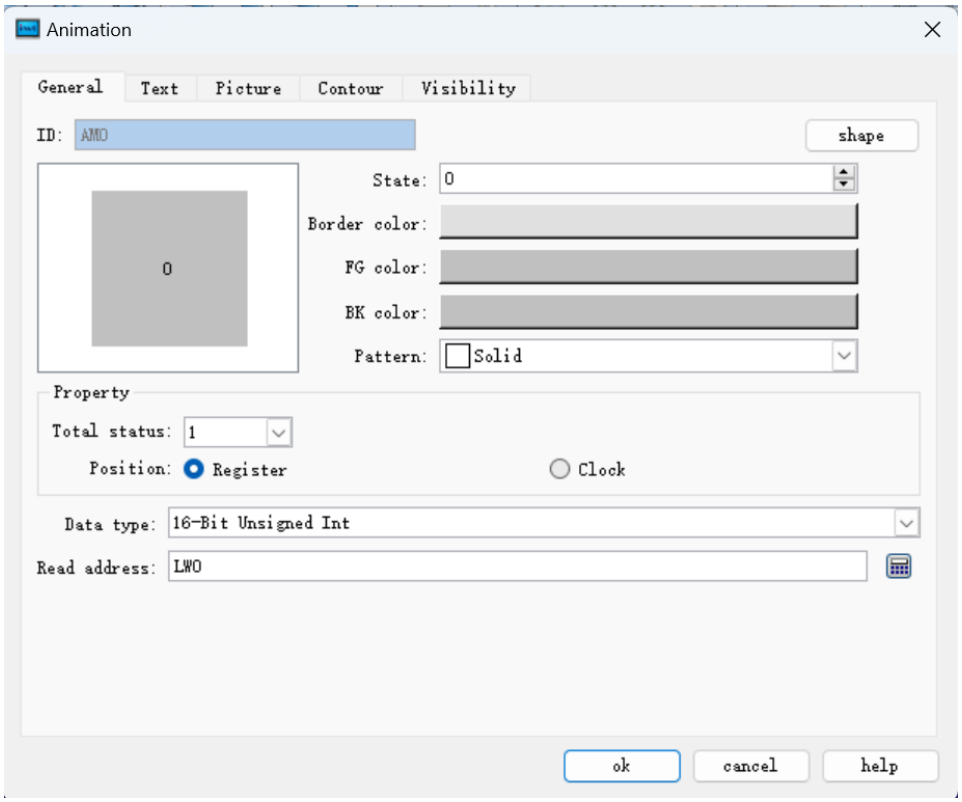
Refer to "Bit button" for the application of "Advanced" and "Visibility".

4.6.6 Animation

Animation: You can define the movement of component in advance, and control its position in the trajectory through data of two registers, one controls the state and the other controls the position.

This control icon on the toolbar is:  , after finishing drawing mobile points (Note: up to 64 points) in the screen area), right-click to complete the draw of moving points.

Double-click the control to bring up the pop-up dialog box shown in figure below:

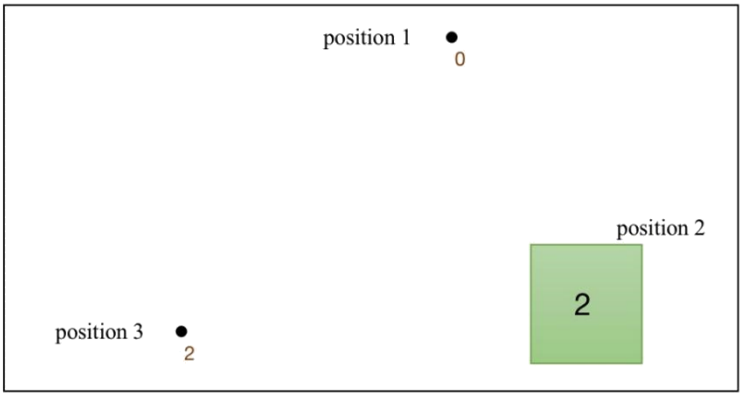


- Total status: Set the number of element states
- Location:
- Register: When "Register" is selected, the status and position of the element is controlled by the register data.
- Read Address: If the status and position are determined by the data in the register, the read address of the element status and position must be set correctly. The format of the read address is shown in the table below.

Data Type	Control address for Status	Control address for Position
16-Bit	Address	Address + 1
32-Bit	Address	Address + 2

For example, if the register is [LW100] and the data format is "16-bit positive integer", [LW100] stores the state of the element, and [LW101] stores the display its position. As shown in figure below, for example,

[LW100] = 2, [LW101] = 1, so the element displays state 2 and appears in position 1.



- Clock: If choose "Clock" option, the component will automatically change the status and display position. The item of "Automatic position control" is used to set the status and change mode of position.
- Speed: The speed of position change; the unit is 0.1 second. For example, 10 means the element is shifted by one position every one second.
- Back: Assume the element has four positions -- position 0, position 1, position 2 and position 3. If this option is not selected, the element will move to the initial position (position 0) when it moves to the last position (position 3), and then repeat the original position change mode.

Position 0-> position 1-> position 2-> position 3-> position 0-> position 1-> position 2...

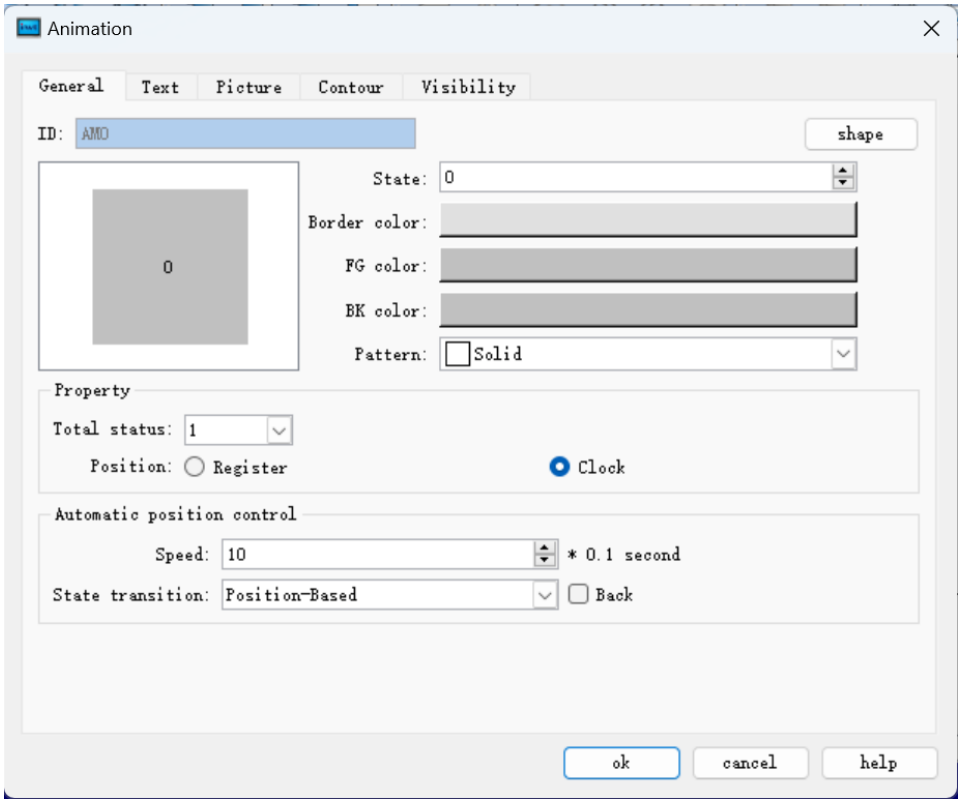
If this option is selected, the element will move to the initial position (position 0) when it is moved to the last position, and the original position change mode will be repeated. The sequence of movement position is as follows:

Position 0-> position 1-> position 2-> position 3-> position 2-> position 1-> position 0...

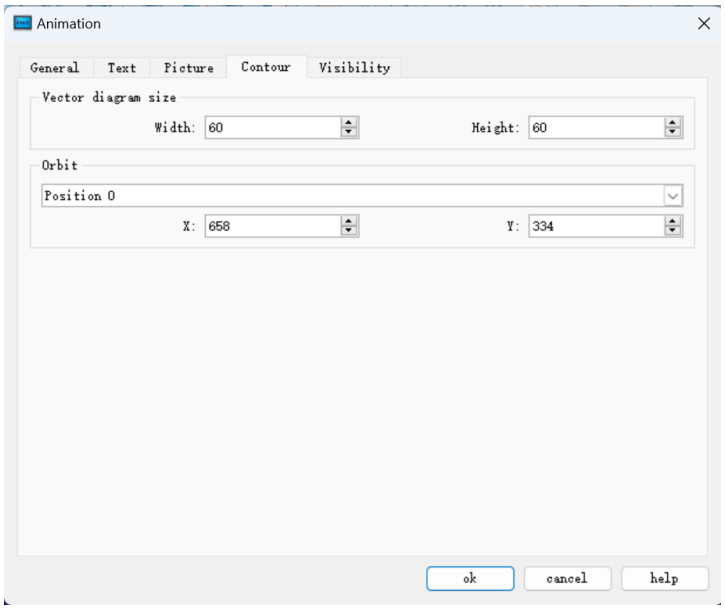
- Status transition: The way of state change

You can choose Position-Based or Time-Based. Selecting "Position-based" indicates that the status changes with the change of position.

If the "Time-Based" is selected, the position and status will be changed according to the points on the screen.



Profile page:



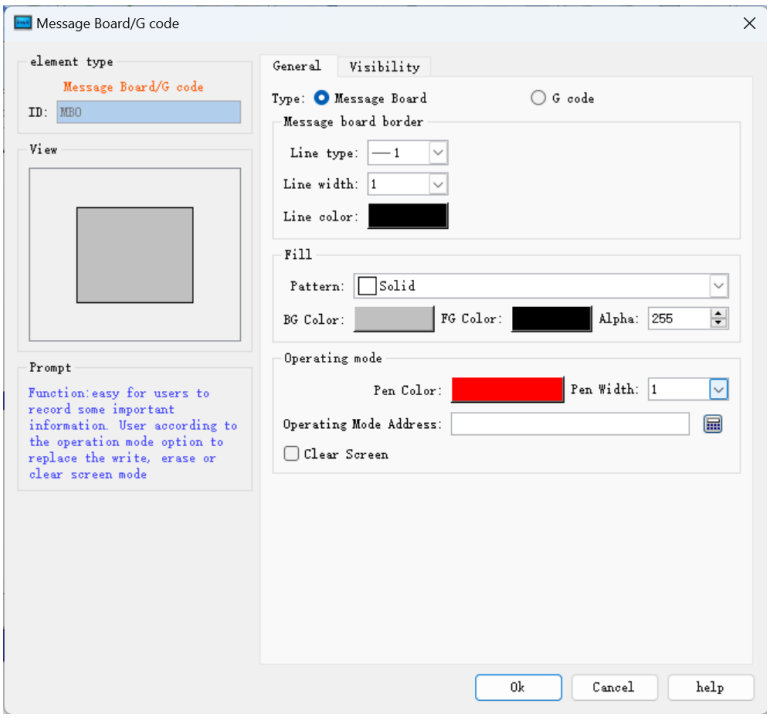
- Vector Diagram Size:
  - ✧ Width: Width of the graphical control in the General page.
  - ✧ Height: Height of the graphical control in the General page.
- Orbit: Adjust the position of different track points by selecting them.

Refer to "Multi-state Indicator Lamp" for settings of "Text" and "Picture" page.

Refer to "Bit button" for the application of "Visibility" page.

4.6.7 Message board

Message board: A control that user can write on. The control icon on the toolbar is  . Click on this button to pop up the dialog box shown in figure below:



- Line color: The color of the text written on the control
- Line width: The width of the line describing the font
- Operating mode:

Operating Mode Address: This address is a word address and is valid only when the address is equal to 0 or 1. An address value equal to 0 indicates a writing operation; an address value equal to 1 indicates an erasing operation.

The address is a word address occupying 3 consecutive addresses: the first address controls the operating mode, 0 for writing operations, 1 for erasing operations; the second address controls the line width; and the third address controls the RGB color of the brush.

- Clear Screen

Clear screen address: when the address value is equal to that set by the clear screen status (0 or 1), it will erase automatically all the contents written on the control

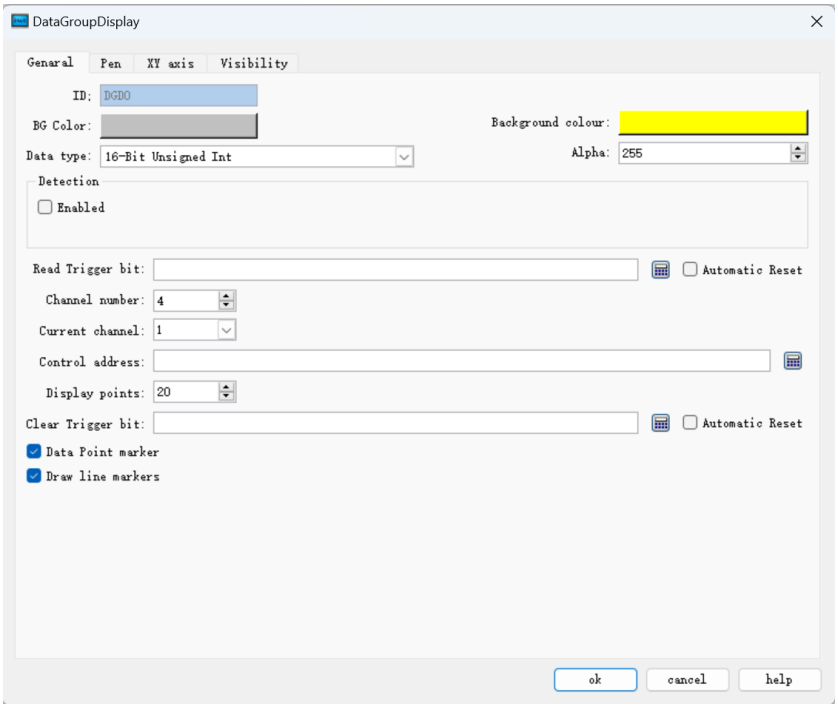
Refer to "Bit button" for the application of "Visibility" page.

4.6.8 Data group display

Data Group Display: A data group (or block) refers to data in a group of consecutive addresses, such as LW12, LW13, LW14, LW15 and so on. The data group display element can simultaneously display the contents of a plurality of data groups. For example, the data groups from LW12 to LW15 and from RWI12 to RWI15 can be simultaneously shown so that user can observe and compare the data in each register. It is also available to draw reference curves for multiple data sets. Take the number of points as the horizontal axis, address value

of each data as the vertical axis so as to judge the change trend of a value accurately and intuitively during a period of time. Up to 8 polylines (line graph) can be displayed.

The control icon on the toolbar is:  ; click on the button, and then a dialog box pops up as shown in figure below:



- Background color: Choose the background color of the trend graph.
- Data type: 7 data types are available for users.
- Read trigger bit: Only when the "Read trigger bit address" value is 1, the curve will move around.
- Automatic Reset: When the value of "Read Trigger Bit Address" is 1, the address will be set to 0 automatically after releasing the mouse button.
- Channel number: The number of data sets, and also the number of lines.
- Current Channel: Select a different channel to set the address for [Control Address] of different channels.
- Control Address: Read Address. There are different control addresses for different channels.

This address can be set with diverse initial address according to different channel number; l the length of the address = Len * Display points (when the data type is 16-digit, len = 1; when the data type is 32, len = 2).

For example, if the initial address of channel 1 is LW1, the data type is 32-bit integer, and the display points is 4, the address occupied by channel 1 is LW1 LW3 LW5 LW7;

Display points: Quantity of control addresses to read for each channel.

Detection

- Enabled: Whether the detection line (reference line) is enabled.
- Color: The color of the detection line (reference line).
- Detection address: Write the current corresponding value of the detection line to the detection address
- register.

For example:

16-Bit, 4 Channel number, 10 Display points, LW1 for Channel 1 [Control Address]; LW100 for Channel 2 [Control Address]; LW200 for Channel 3[Control Address]; RWI1 for Channel 4 [Control Address]. Then:

- Line 1: LW1 to LW10
- Line 2: LW100 to LW109
- Line 3: LW200 to LW209
- Line 4: RWI1 to RWI10

If 32-bit data type, other settings remain unchanged:

- Line 1: LW1 to LW20
- Line 2: LW100 to LW119
- Line 3: LW200 to LW219
- Line 4: RWI1 to RWI20

Therefore, when select 32-bit data type and set N-group data, then the N group address value can be read by plus 2 (interval) according to address rules of the different PLC models.

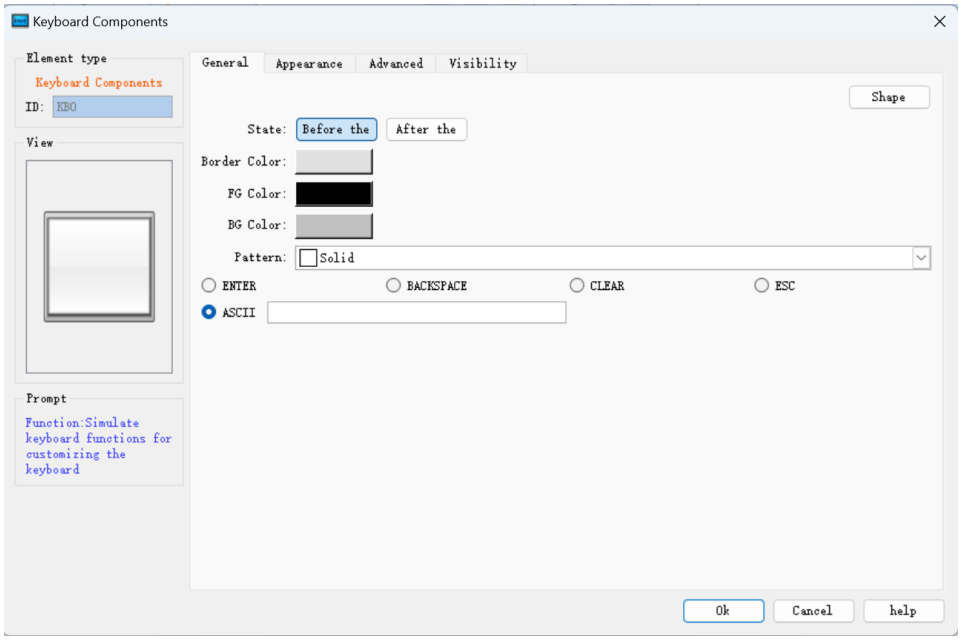
- Background color: The color of the line movement area.
- Clear Trigger Bit: Clears the current status of all lines when the Clear trigger bit address has a value change of 0 to 1 (rising edge); otherwise it remains no change when the value falls from 1 to 0 (falling edge) or has no change.
- Data Point marker: Each line is composed of points
- Draw line markers: Each line is composed of lines.

Note: Refer to "Bit button" for the application of "Visibility" page.

4.6.9 Keyboard

1. Keyboard

This control is employed to customize the keyboard, composed of each button on the keyboard. The icon of the control on the toolbar is:  ; Click on the button, then a dialog box shown in figure below will pop up.

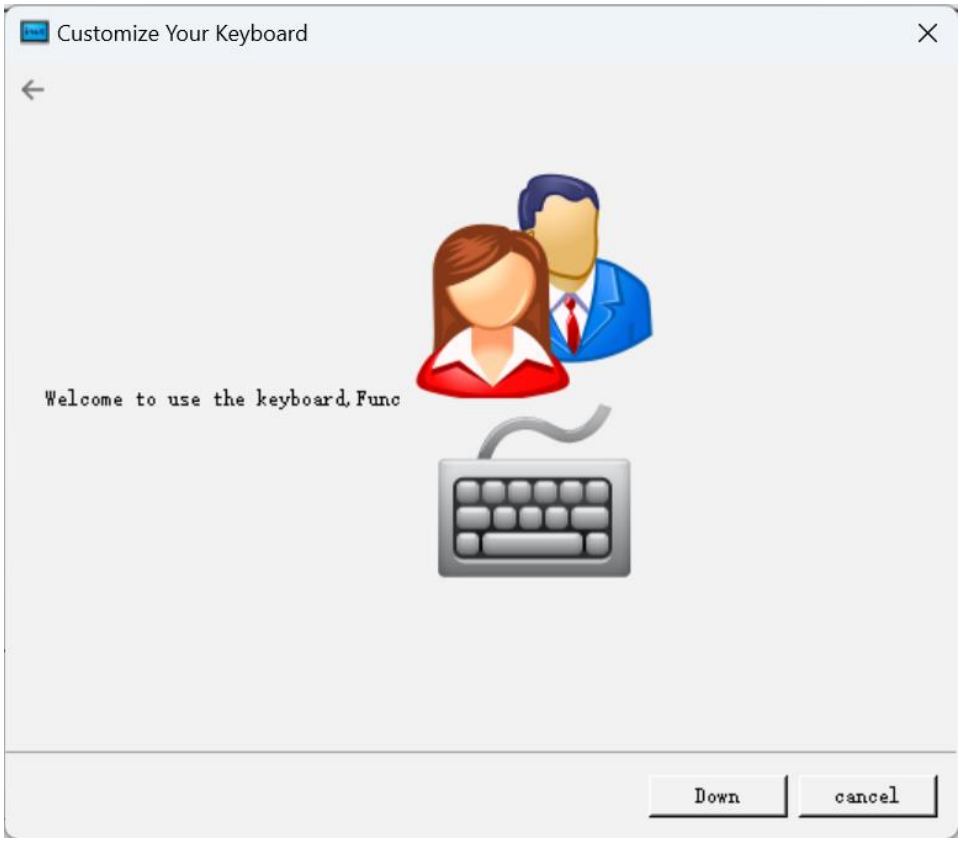


- State: Click "Before" and "After" buttons to set the border color, foreground color, background color and pattern in different states.
- ENTER: Function button, whose role is to realize the input
- BACKSPACE: Function button, which is used for backspace deletion
- CLEAR: Function button applied to clear all the contents that have been input
- ESC: Function button to cancel the currently ejected keyboard, without entering anything
- ASCII: The value entered by the keyboard

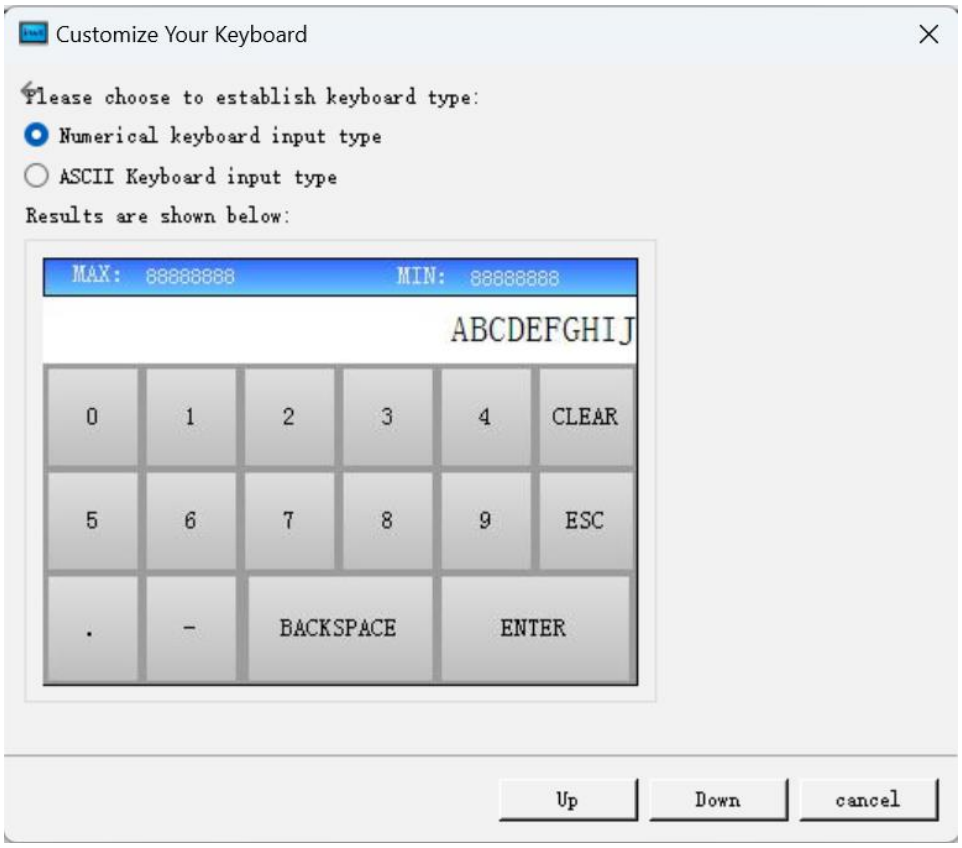
Refer to "Bit button" for the application of "Visibility" page.

2. Way to add a user-defined keyboard

Start up the guide to add keyboard by means of the Add User-defined Keyboard in the Setting menu. Using this guide, user may quickly add a user-defined keyboard that has been built in the program, as shown in the figure below:

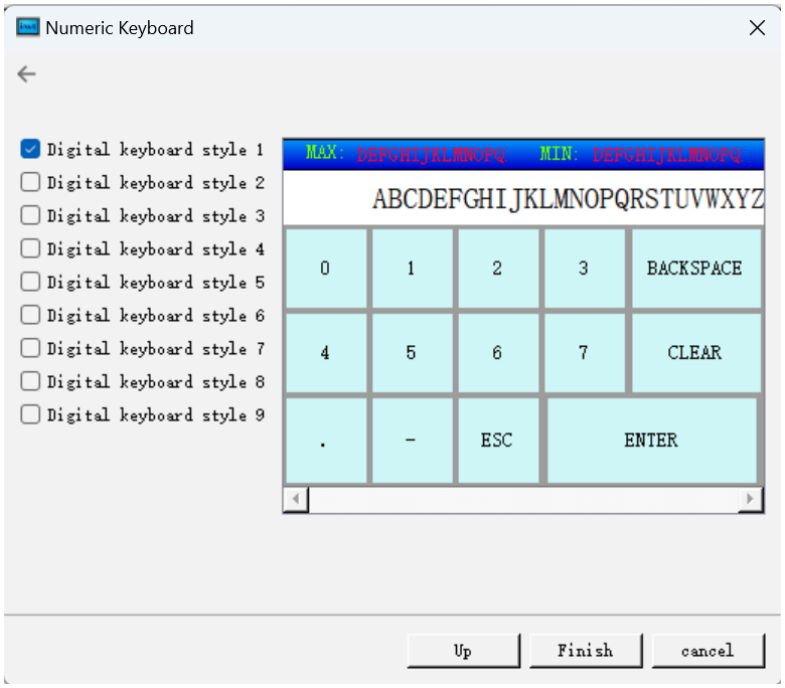


Click Next, and an interface will pop up for keyboard type choosing. You may choose the type of the keyboard to be added in this interface, as shown in the figure below:



After selecting the keyboard type you want to add, click Next to load the pre-defined keyboard. There are nine predefined keyboards available for loading. The user can add the required keyboard as needed. The

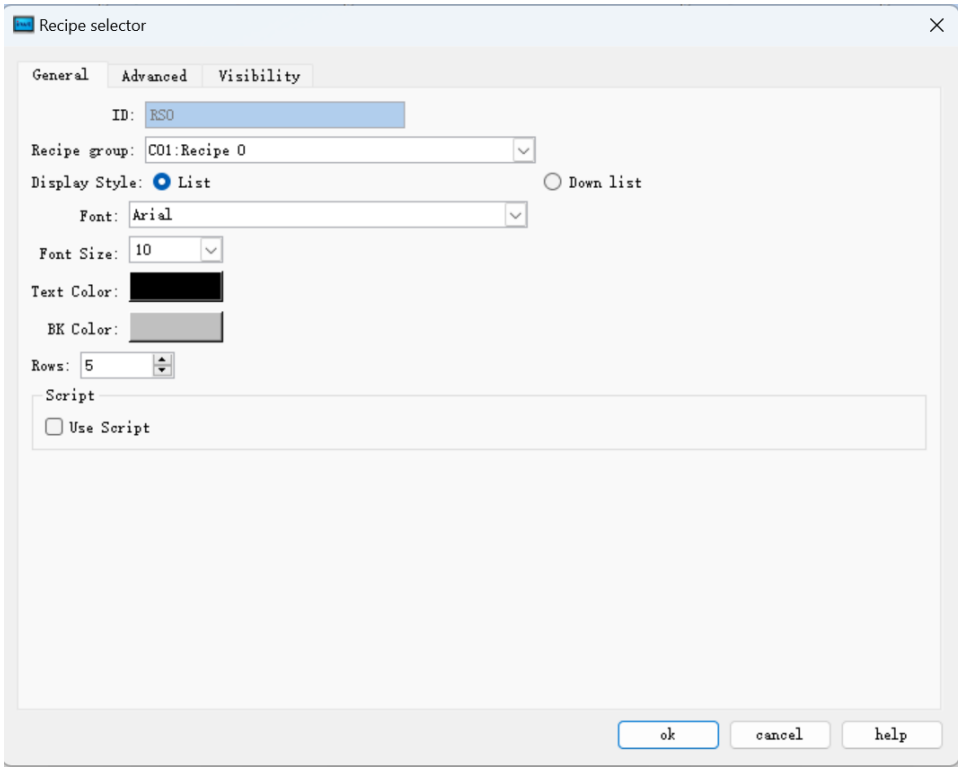
maximum added keyboard number could be 32, as shown in figure below:



Click "OK" to add the selected keyboard to the project.

4.6.10 Recipe selector

The function of the Recipe selector is to list all recipe names in the case of recipe creation. Selecting the specified recipe name in the list causes the recipe number to be written to recipe number register RWI0. Correspondingly, if the value of the recipe number register RWI0 is changed, the recipe selector will also point to the specified recipe name accordingly. The control icon on the toolbar is:  ; click the icon to pop up the dialog box shown below:

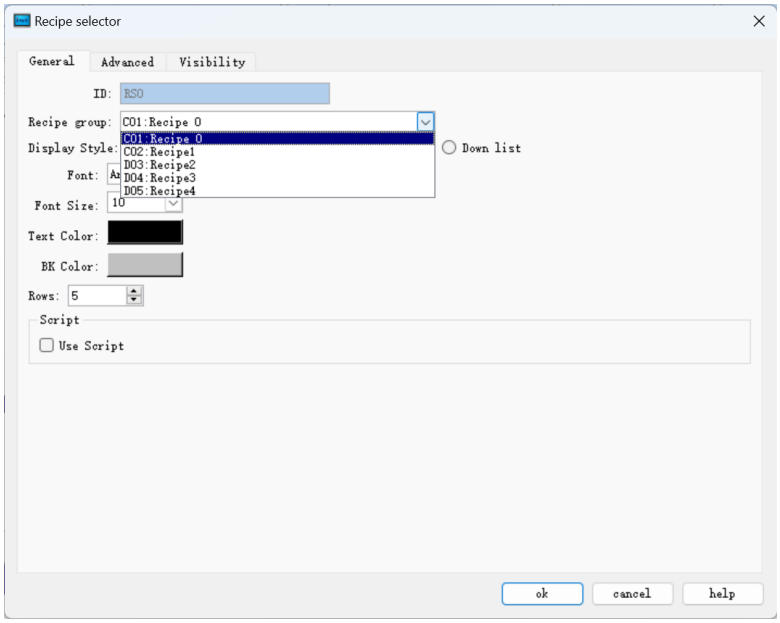


Display style

Set the display style of the recipe selector

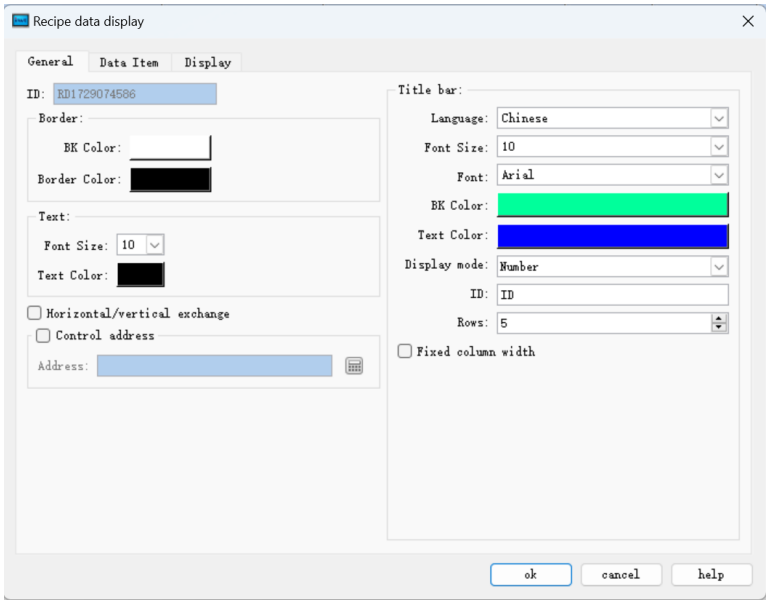
- List: The recipe selector will be displayed in the form of a list.
- Dropdown box: The recipe selector will be displayed in the form of dropdown box.
- Font, Font size, Text color, and Background color are settings for list box properties and text content properties
- Rows: This option is only available when "List" is selected for the display style.

HMITOOL adds a new function of multiple sets of recipe; developers can choose which recipe to display while use this control, as shown below:



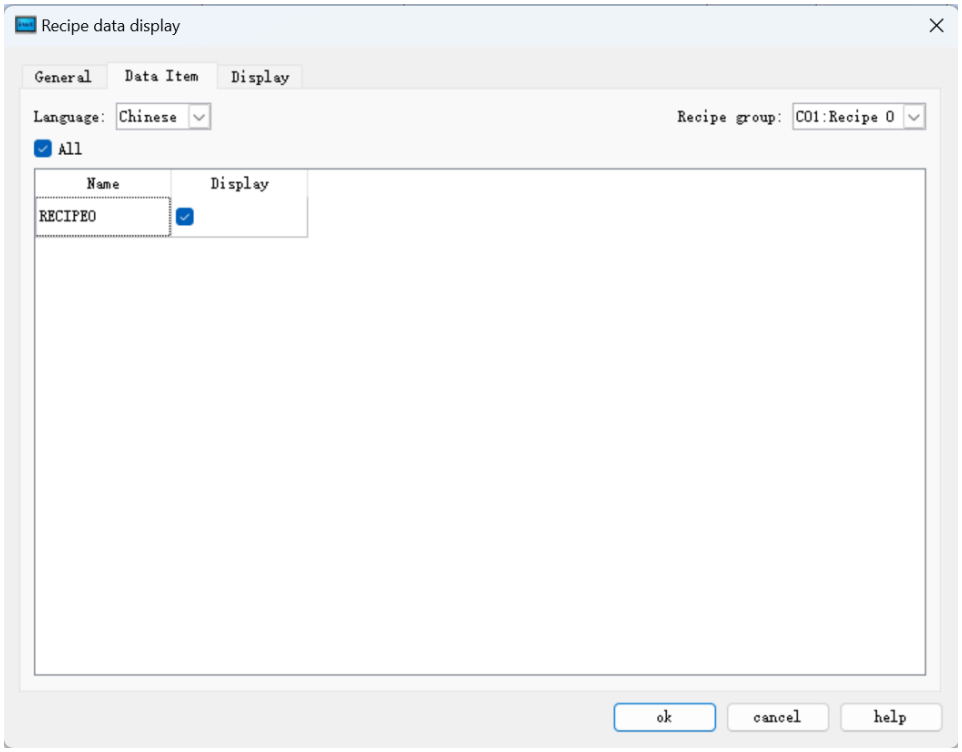
4.6.11 Recipe display

The function of recipe display is to list the data of all recipes if any recipe has been established. The icon of this control in the tool bar is  . Click this icon, and then the following dialog box will pop up:



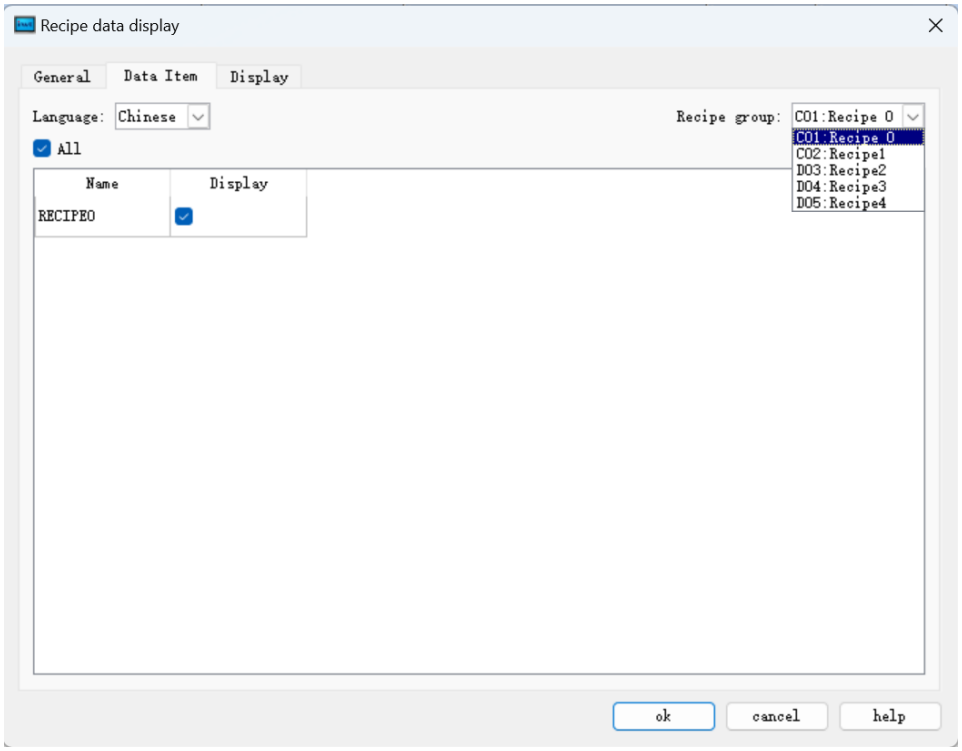
General page consists of settings of text contents and list properties.

Data Item page, as shown below.



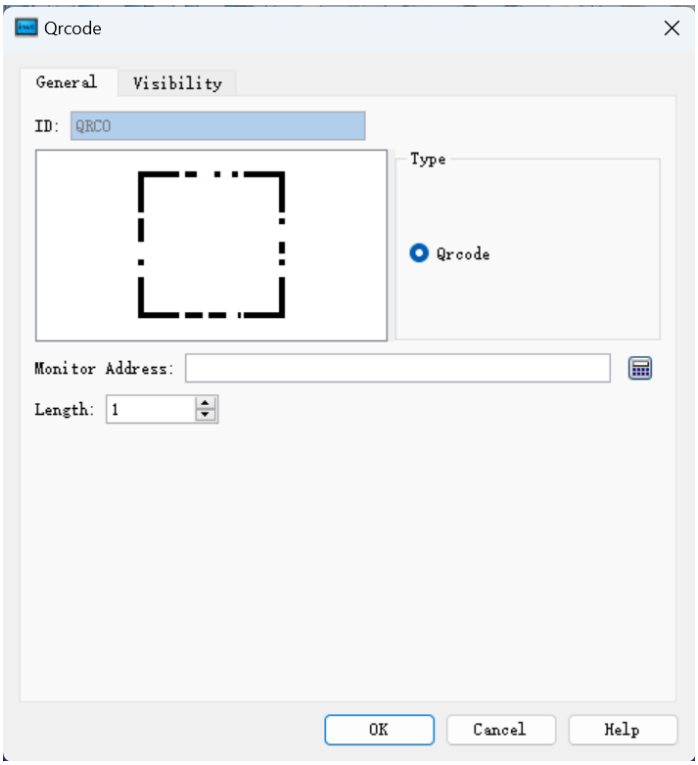
- Language: Choose a different language to list recipe names in different languages.
- Name: List of all recipe names
- Display: Whether to display the recipe according to user's need.
- ALL: Select all sections in Display.

HMITOOL adds the function of multiple groups of recipe; developers can choose which recipe to display while using this control, as shown below:



4.6.12 Qrcode

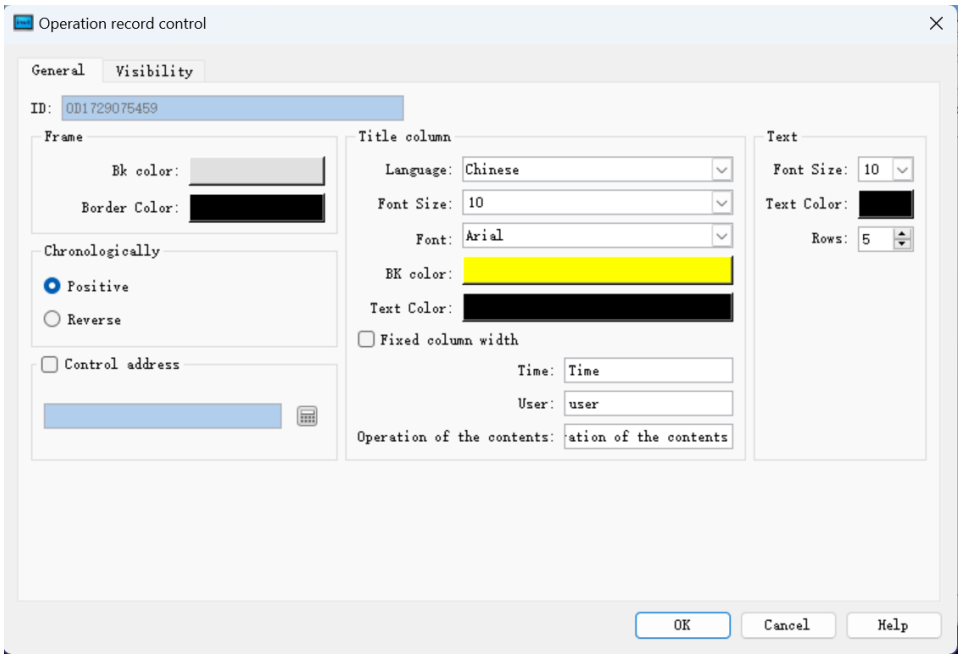
Select the control icon  on the toolbar and set its properties in the dialog box shown below:



- Monitor Address: Address to monitor through Qrcode
- Length: The maximum length of the character that can be displayed

4.6.13 Operation log

Select the control icon  on the toolbar and set its properties in the dialog box shown below:



- Background color: Set the background color of display control
- Border color: Set the border color of display control
- Language: Set the text content on the title bar when select multi-language
- Font size: Font size of title bar
- Background color: Background color of title bar
- Text color: Font color of title bar
- Time: Text to display in the Time column of title bar
- User: Text to display in the User column of title bar
- Operation content: Text to display in the content column of title bar
- Font size: Font size of record text
- Text color: Text color of record text
- Rows: The maximum number of rows the control can display

Note:

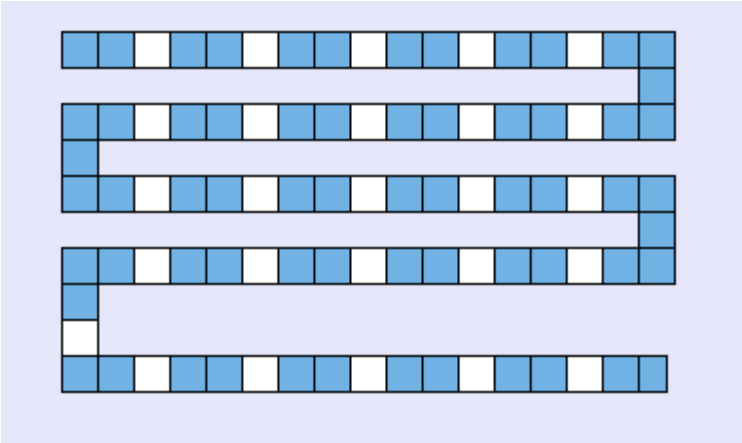
To enable the HMI operation record, it needs to set the value of LW60600 equal to 1 and the variable table is not empty;

The operation log can only record the variable operation in the variable table.

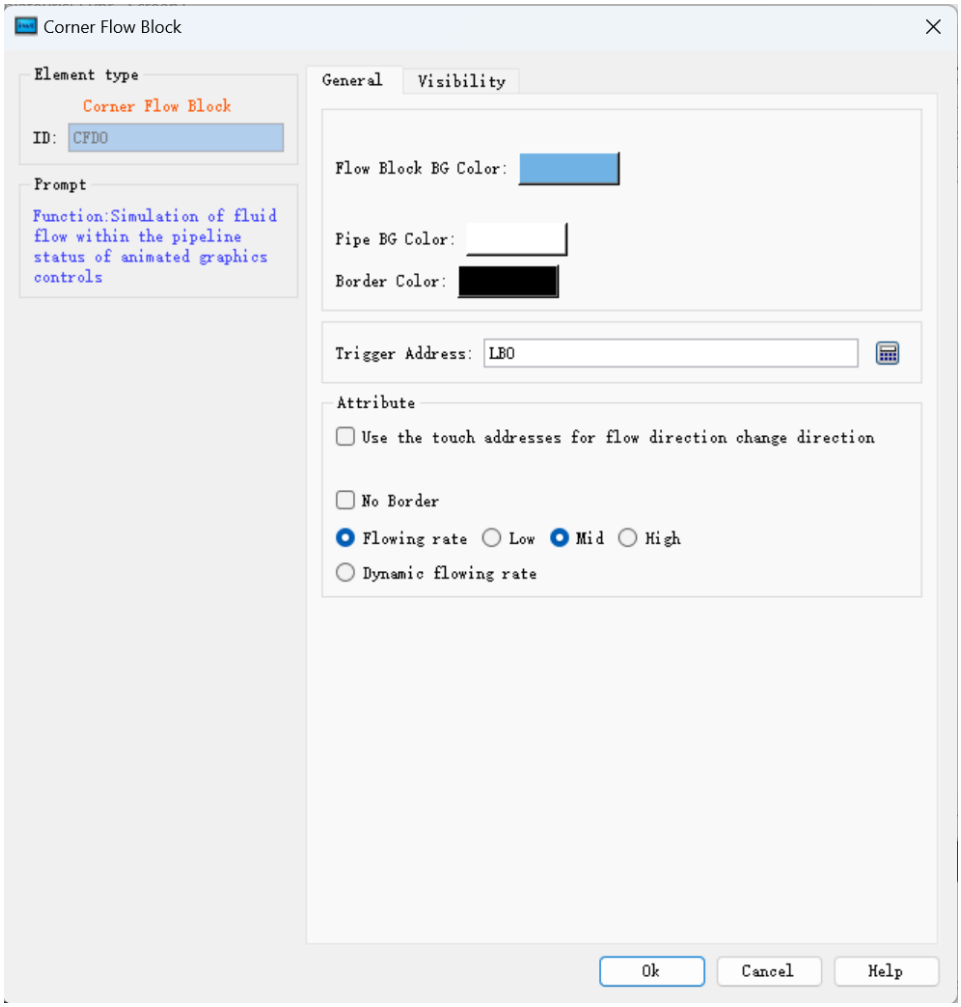
4.6.14 Corner flow block

The function of corner flow block is similar to the flow block. The difference is corner flow block increased corner drawing function, and it is more flexible than flow block.

Click  icon on the Toolbox, move mouse cursor to the Picture area window, it will get a tracking cross. Click the tracking cross on the starting position of corner flow block, and then move the mouse, there is a line between starting position and tracking cross, click the cross on the ending position of corner flow block, you can get first block. The ending position is also the next block's starting position, the rotation angle is 90°. So you can get multi segment flow blocks. Right click can quit drawing. The demonstration effect as shown figure below:



After drawing complete, double click the block or right click choose attribute, it will pop up a corner flow block dialog, as shown figure below:



- Color: Set the color properties of the Flow block.
- Flow block foreground color: Click on the color button to set the Flow block foreground color;
- Flow block background color: Click on the color button to set the Flow block background color;
- Pipe foreground color: Click on the color button to set its foreground color;
- Pipe background color: Click on the color button to set the pipe background color;
- Border color: Click on the button to set the border color of the Flow block control;
- Pattern: Click to select the pattern of the Flow block control; the default setting is "Solid".
- Trigger Address: Address that controls the stationary or moving of the Flow block; when the value of the address is 1, then the block flows.
- Attribute: Set the properties of the Flow block, such as direction, flow speed.
- Display Mode: Select "Horizontal" to make the Flow block move horizontally; and select "Vertical" to make it flow vertically.
- Direction: When the display mode is "Horizontal", you can choose "Left" or "Right"; in another case, "Up" or "Down".

Change the flow direction to the opposite direction through the trigger address: when the "Trigger address" value is equal to that of the "Effective status" set by user, the Flow direction is switched to the opposite.

For example, if "Flow direction" is "Left", this option is selected, "Trigger address" is LB2, and "Effective Status" is set to 1, then when the value of LB2 is 1, the direction of the Flow block is switched to "Right", while when the value of LB2 is 0, the direction is changed back to the original "Left".

- Blocks: The number of Flow units, ranging from 1 to 30;
- No Border: When this attribute is selected, the edges of the Flow block are hidden.
- Flow rate: Either fixed rate or dynamic rate
- Fixed Flow rate: High, Middle or Low.
- Dynamic Flow rate: The Flow rate is determined by the value of a word address, which should be between 1 and 10. When the value is 0, the Flow block does not flow; When the value is 1, the Flow block flows at the lowest rate; When the value is 10, the Flow block flows at the highest rate.

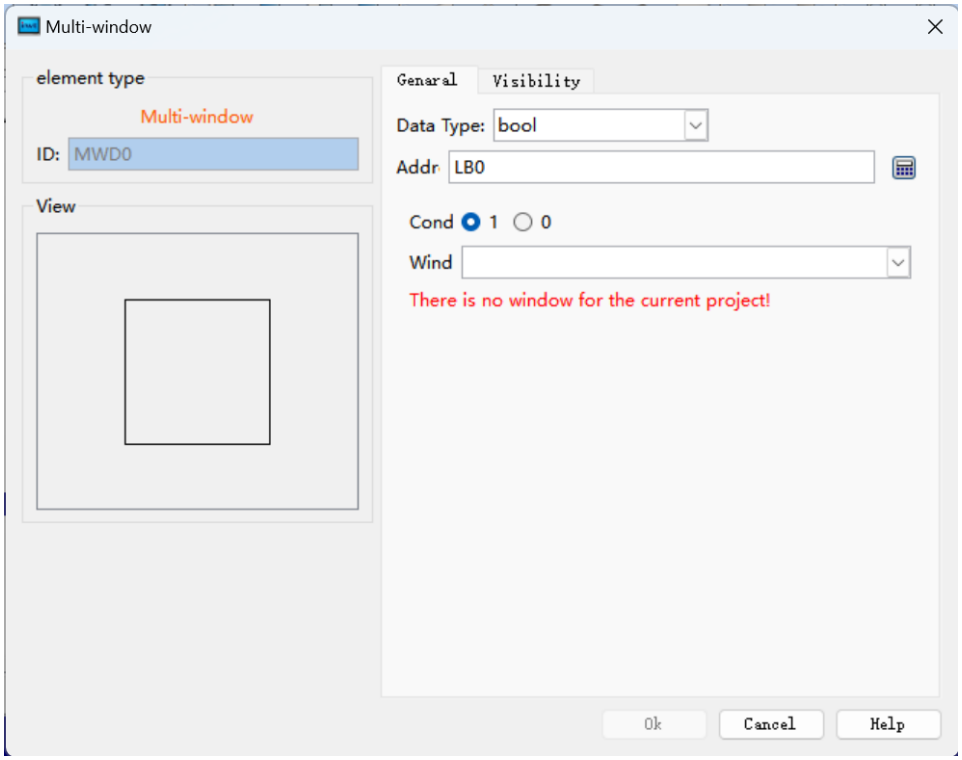
Note:

The "Visibility" page can refer to that of "Bit Button" control.

4.6.15 Multi-window

Multi-window provides a rectangle area to show assigned window.

Click  icon on the Toolbox, it will pop up a multi-window dialog, as shown figure below.

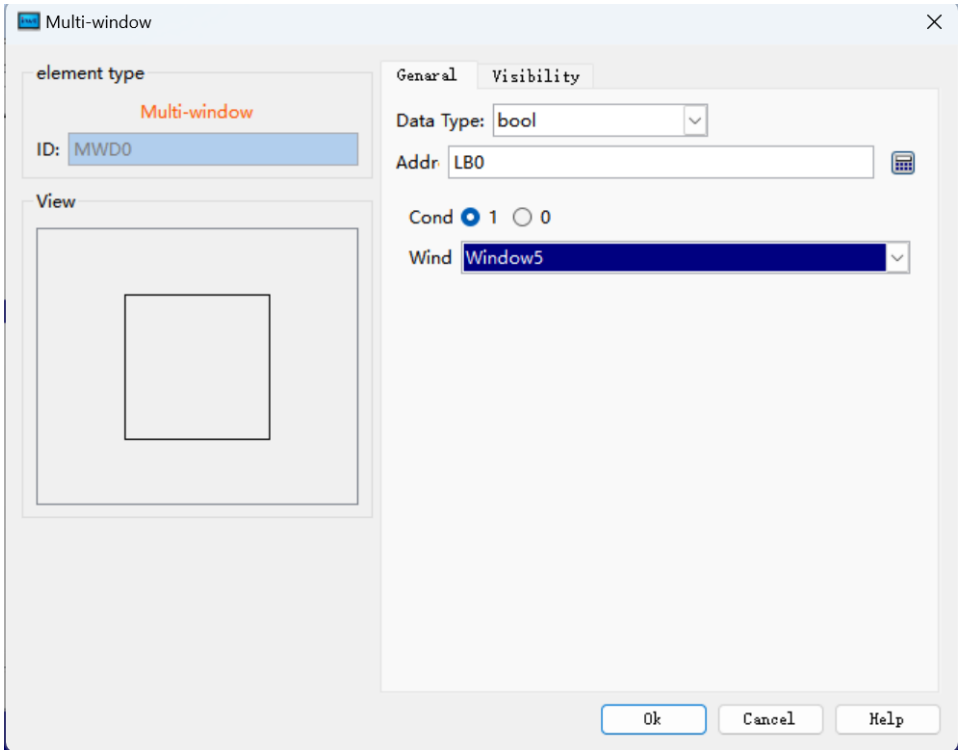


- Data Type: Type of data that control the showed window, including bool and word.

  "bool": opening the assigned window on the rectangle area are judged by suit the condition.

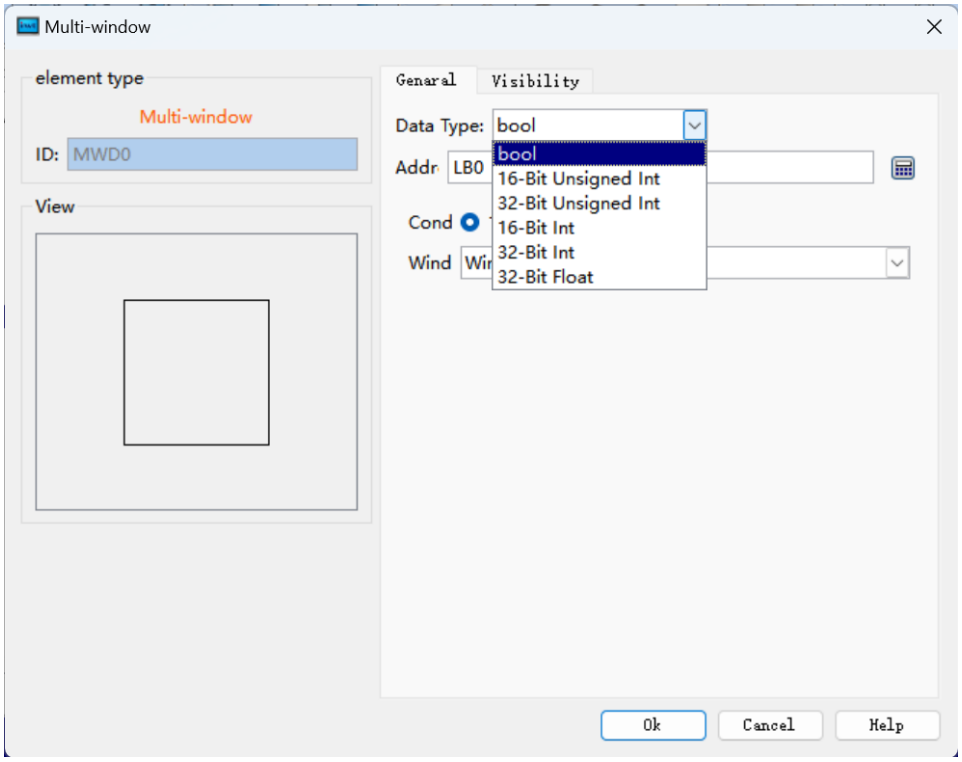
  "Word": Choose the control address, and check "Bind with window" or "Not bind with window", as figure below shown.

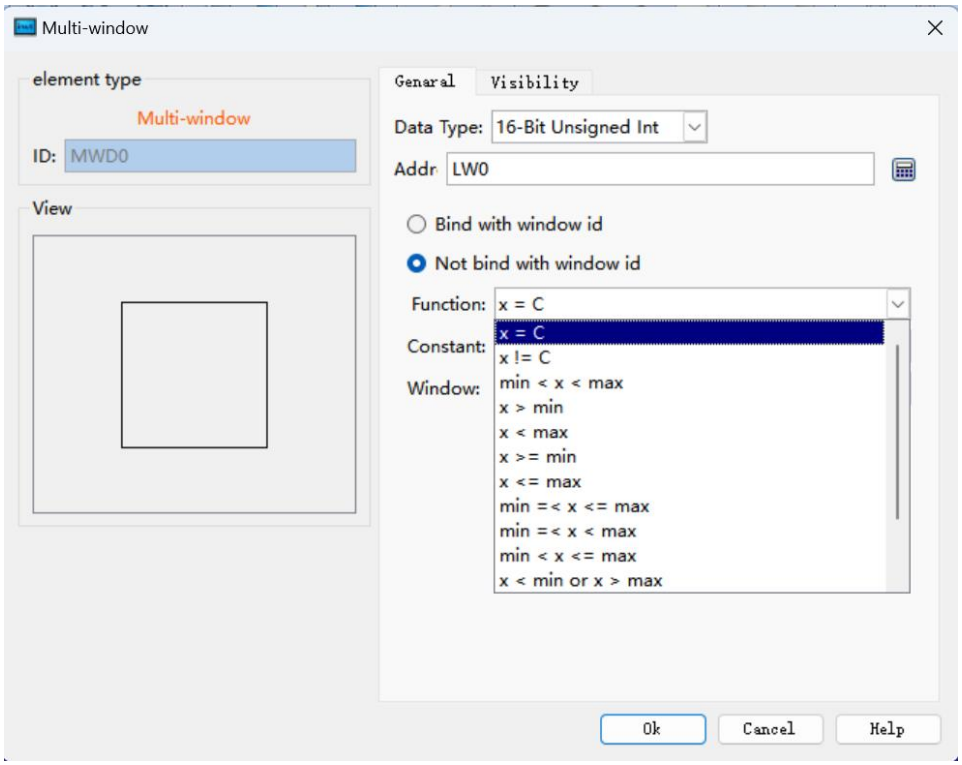
- Address: the value of address controls the window opening;



- "Bind with window": The value of address is the ID of assigned window.
- "Not Bind with window": Check a function, when fit the condition of function, open the assigned window.

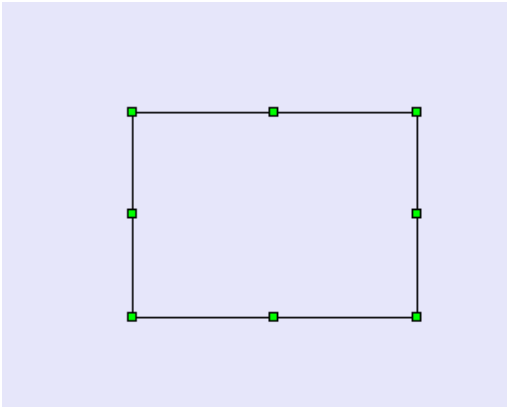
The functions are as shown follow.





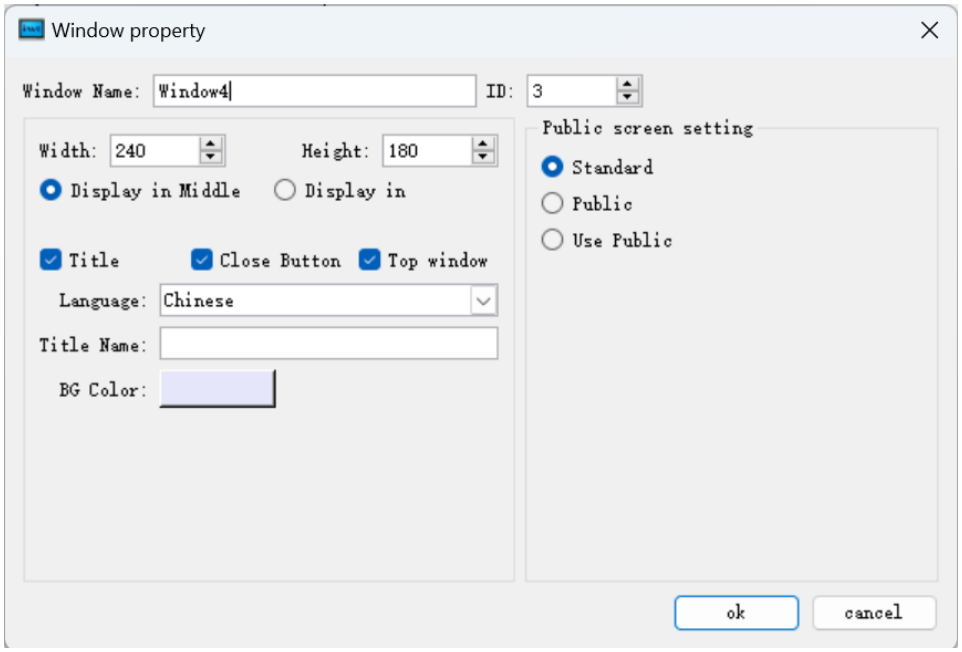
Refer to "Bit button" for the application of "Visibility" page.

After setting parameter of multi-window, click "Ok", drag mouse on Picture area window, and create a rectangle area. The area would display the multi-window, as shown figure below:



Note:

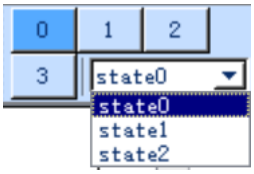
When creating a new window, "Top window" is defaulted, as shown below. It means that you cannot operate other screen or window when this window pops up. So you should add a screen button on the window to close it.



4.7 HMITOOL control instructions

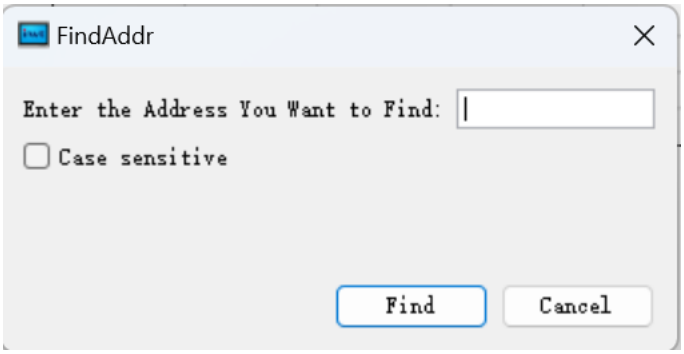
HMITOOL configuration software provides full-featured basic controls. Users can double-click or right-click the control in the view area to set the properties. The position and size of controls can be modified manually in the status bar below or directly drag the mouse.

- Address input of controls: It is available to input an address directly through a keyboard when it needs to operate on the PLC address. The address name is case-insensitive.
- Status combo box: In the toolbar, there is a combo box where to display and change the state of bit button, bit indicator, multi-state button, multi-state indicator, graphics move, message display and picture display.

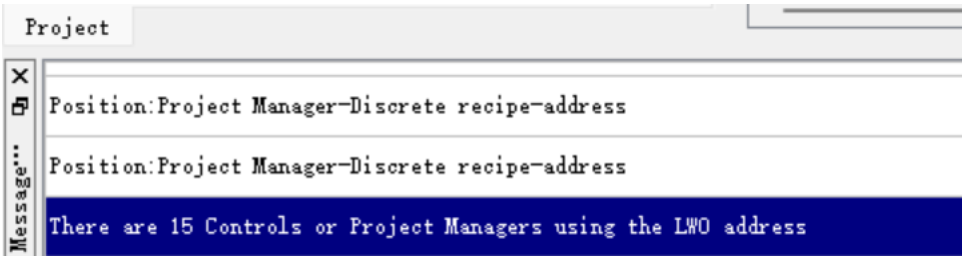


When a control of the above type is selected, its current state is displayed in the status combo box that users can pull down to change the current state.

- Address Search: Query the use of an address and list the information of control occupying this address; double-click the information item to select the control.

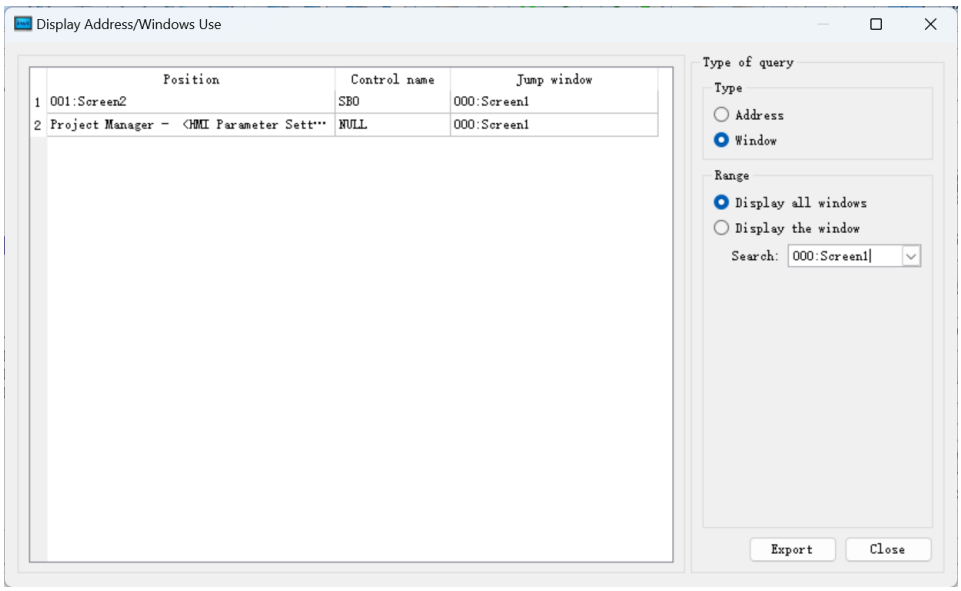


Enter the address and select "Find", then the information output window will list the search results:



Choose the search result and double-click to select the control occupying the address currently.

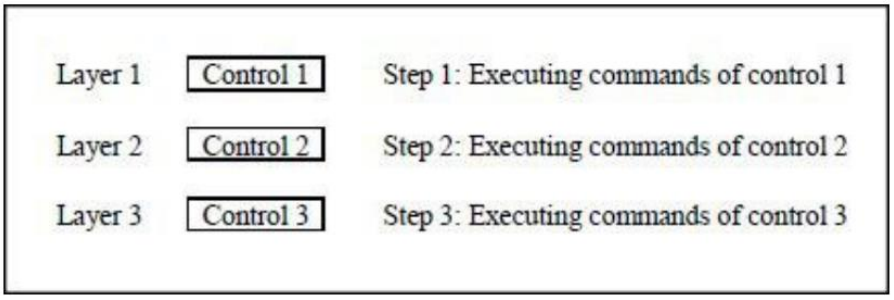
Address Display: Click the "Address Display" to show the list of addresses used by the configuration project; double-click a message, then it will pop up the property page of control using this address so as to set the property settings easily and quickly.



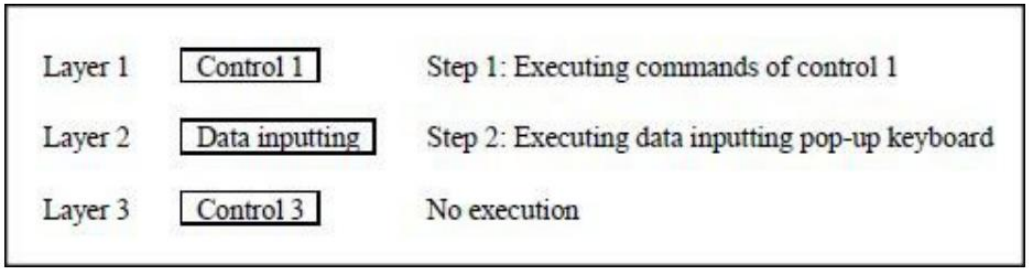
In the Display Mode, you can specify the selected address information or display all the screens.

Overlay of control: You can execute multiple controls by one operation through stacking controls. HMITOOL supports stacking up to 32 controls. When multiple controls are overlaid and touched, the corresponding operations are performed in the order in which they are superimposed, as shown in Figure below:

Superimposing the control 1, 2 and 3, after the touch, execute in turn the command 1, 2 and 3.



If there is a screen switch button in the overlaid control, it will switch the screen when it comes to the turn of this command. The superimposed button commands that are after the screen button will not be executed. Similarly, if there is a pop-up input keyboard, it will pop up a keyboard while without executing the after commands.



5 Script

Script is an advanced control method for HMI, which provides more strong functions for HMI. Through programming for script command, the HMI is given the same functions as logic and arithmetic operation with PLC. Using the macro flexibly is capable to achieve many strong functions that are unavailable for conventional components and to perfect the human-computer interface more.

HMITOOL provides new full scripts that are different from the script language mode of other human-computer interfaces, and these scripts are compatible with standard C Language (ANSI C89). As there are many literatures about C Language and this information are available easily, this chapter will not introduce syntax and basic knowledge in details to review the relevant basis of different macros but emphasize the establishment and usage of macros by instances.

This chapter will explain basic C Language briefly, relevant usage of script instruct on and considerations.

5.1 Introduction to C language

5.1.1 Data type of C language

■ **Integer**

Integer includes integer constant and integer variable. The integral constant is the integer constant. In C language, there are three kinds of integer constant: octal, hexadecimal and decimal.

■ **Integer constant**

1. Octal integer constant

The octal integer constant must begin with 0. That is to say, 0 is the prefix of octal integer constant. Its value is 0-7.Octal constant is usually unsigned.

The followings are the legal octal:

- 015 (decimal:13)
- 0101 (decimal:65)
- 0177777 (decimal:65535)

The followings are the illegal octal:

- 256 (without prefix 0)
- 03A2 (contained non-octal codes)
- -0127(with negative sign)

2. Hexadecimal integer constant

The hexadecimal integer constant is prefixed with 0X or 0x. Its value is 0-9, A-F or a-f.

The followings are the legal hexadecimal:

- 0X2A (decimal:42)
- 0XA0 (decimal:160)
- 0XFFFF (decimal: 65535)

The followings are the illegal hexadecimal:

- 5A (without prefix 0X)
- 0X3H (contained non-hexadecimal codes)

3. Decimal integer constant

The octal integer constant has no prefix. Its value is 0-9.

The followings are the legal decimal: 237 -568 65535 1627

The followings are the illegal decimal:

- 023 (prefix 0 is forbidden)
- 23D (contained non-decimal codes)

In the program, these notations are distinguished by prefix. Therefore, do not mistake the prefix in writing to avoid incorrect result.

When the suffix of integer constant is on the 16-bit computer, its basic integer is 16-bit. Therefore, the indicated figure value is limited. The decimal unsigned constant is within 0 – 65535, and the signed range is -32768 – +32767.The unsigned octal number is ranged within 0 – 0177777. The unsigned hexadecimal number is within 0X0 – 0XFFFF or 0x0 – 0xFFFF.If the figure is beyond the above range, it must indicate with long integer. The long integer is suffixed with "L" or "l".

For example:

Decimal long integer constant: 158L (decimal: 158) 358000L (decimal: -358000)

Octal long integer constant: 012L (decimal: 10) 077L (decimal: 63) 0200000L (decimal: 65536)

Hexadecimal long integer constant 0X15L (decimal: 21) 0XA5L (decimal: 165) 0X10000L (decimal: 65536).

There is no difference between long int 158L and basic int constant 158. As 158L is the long integer, C compiling system will assign 4-bit space for storage. As 158 is the long integer, C compiling system will assign 2-bit space for storage. Therefore, pay attention to operation and output format to avoid mistakes. The unsigned number can be indicated with suffix. The unsigned number of integer constant is suffixed with "U" or "u". For example: 358u,0x38Au, 235Lu are the unsigned number. Use prefix and suffix together to indicate different figures. For example, 0XA5Lu indicates the hexadecimal unsigned long int A5 and the corresponding decimal is 165.

■ **Integer variable**

The integer variable can be classified as following:

1. Int

Its type specifier is int, which occupies 2 bytes in the memory. Its value is always basic integer.

2. Short int

Its type specifier is short int or short'C110F1. The occupied bytes and value range is same to basic int.

3. Long int

Its type specifier is long int or long, which occupies 4 bytes in the memory. Its value is always long integer.

4. Unsigned int

Its type specifier is unsigned.

The unsigned int can be integrated with the above three types:

- The type specifier of unsigned int is unsigned int or unsigned.
- The type specifier of unsigned short int is unsigned short.
- The type specifier of unsigned long int is unsigned long.

All unsigned int occupies the same memory bytes with the signed int. As the sign bit is omitted, it cannot indicate the negative number. The following table lists the assigned memory bytes and number range of various integers in ARM.

Type specifier	Number range	Assigned bytes
int	-2147483648 – 2147483647	4

Type specifier	Number range	Assigned bytes
short int	-2147483648 – 2147483647	4
signed int	-2147483648 – 2147483647	4
unsigned int	0 – 4294967295	4
long int	-922337203685477808 – 922337203685477807	8
unsigned long	0 – 18446744073709551615	8

Integer variable declaration

The general form of variable declaration: type specifier, variable name identifier, ···. Take examples as following:

int a,b,c; (a,b,c is integer variable)

long x,y; (x,y is long integer variable)

unsigned p,q; (p,q is unsigned integer variable)

Announcements in writing variables should be paid attention as following:

- Several same type of variables can be allowed to indicate after the same type specifier. Space the variable names with comma. There must be a space at least between the type specifier and variable name.
- The last variable name must be ended with ";".
- The variable declaration must be in front of variable usage. It is always at the head of function body.

[Practice] //1int a,b;

short int c;

short d=100;

a=d-20;

b=a+d;

c=a+b+d;

d=d-a+c-b;

5.Float constant

Real constant is also called float constant. Real constant is also called float constant. In the C language, the float is indicated with decimal only. It has two forms as following: Decimal form and exponential form

- Decimal form

It is composed with figure 0-9 and decimal point. For example: 0.0,.25,5.789,0.13,5.0,300.,-267.8230 are the legal float number.

- Exponential form

It is composed of decimal digit, exponent symbol "e" or "E" and exponent (be integer only, symbol is possible). The basic form is an E n (a is decimal, n is decimal integer) and the value is a*10,n. For example, 2.1E5 (equal to 2.1*10,5), 3.7E-2 (equal to 3.7*10,)-2*) 0.5E7 (equal to 0.5*10,7), -2.8E-2 (equal to -2.8*10,)-2*). The following are the illegal float number: 345 (without decimal point) E7 (without figure before exponent symbol) -5 (without exponent symbol) 53.-E3 (negative sign is incorrect) 2.7E (without exponent)

The standard floating number in C language has suffix. The figure with suffix "f" or "F" is the floating number.

For example, 356f and 356 is equivalent.

6. Float variable

The float variable includes single and double. Their type specifiers are float and double. In the Turbo C, the single occupies four bytes (32-bit) memory, and it is ranged between 3.4E-38 – 3.4E+38, which provides seven effective figures only. The double occupies 8 bytes (64-bit) memory, and the value is ranged between 1.7E-308 – 1.7E+308, which provides sixteen effective figures.

The form and written rules for float variable declaration is same with that of integer.

For example: float x,y; (x,y is single float)

double a,b,c; (a,b,c is double float)

The float constant is not classified into single and double. All float constants are processed as double.

a ■■■■

b ■■■■■■■■

a<---33333.33333

b<---33333.33333333333;;

[Practice] //floatint a=32;

float b;

double d;

b=12345678;

d=b*100;

d=d+a;

d=d+58.123456;

7.Character

Characters include character constant and character variable.

Character constant

Character constant is a character within single quote. For example, 'a'. 'b', '=', '+', , '?' are the legal character constants. In the C language, the character constants are always characterized as following:

- Character constant must be included in single quote rather than double quotes or other brackets.
- Character constant must be single character rather than character string.
- Character may be any character in the character set. However, the figure cannot be involved in numerical operation after been defined as character. For example, '5' and 5 is different. '5' is character constant that are not involved in operation.

8. Character variable

The character variable value is character constant, i.e. single character. Its type specifier is char. The form and written rules of character variable declaration is same with that of integer variable.

For example:

char a,b; As each character variable is assigned to a byte memory, one character is saved only. The character

value is kept in the memory unit with ASCII code. For example, the decimal ASCII code for x is 120, and the decimal ASCII code for y is 121. Give 'x' and 'y' to character variable a and b: a='x', b='y'. Actually, it is to store 120 and 121 BC in a and b unit:

a 0 1 1 1 1 0 0 0

b 0 1 1 1 1 0 0 1

Therefore, they can be regarded as integer. C language allows to give character value to integer variable and give integer to character variable as well. It can output character variable as integer and output integer as character. The integer is 2-byte, and character is single byte. When the integer is processed as character, the low eight bytes are involved only.

[Practice] //charint a=49;

char b;

char d;

b=a+10;

d=a+b;

[Practice] //char c1,c2;

c1='a';c2='b';

c1=c1-32;c2=c2-32;

9. Character string constant

Character string constant is a character string included in double quotes. For example: "CHINA". "C program", "$12.5", they are legal character string constants. The character string constant is different from character constant. Their differences are described as following:

- Character constant is included in single quotes while character string constant is included in double quotes.
- Character constant is single character only while character string constant contains one or several characters.
- A character can be given to a character variable, but a character string constant cannot. In the C language, there is no corresponding character string variable.
- The character constant occupies one byte in the memory. The bytes of character string constant are equal to the bytes of character string plus 1. Save character "\0" (ASCII code:0) in the increased byte. This is the ending symbol of character string. For example, the byte of "C program" in memory is C program\0. Although the character constant 'a' and character string constant ''a'' has one character both, their memory occupation is different.

'a' occupies one byte in the memory, which is indicated as a

''a'' occupies two bytes in the memory, which is indicated as a\0 symbol constant.

10. Symbol constant

In the C language, a constant can be expressed with an identifier, which is called symbol constant. It must be defined before usage. Its general form is:

#define symbol constant

Wherein, #define is a preprocessor directive, which is called macro definition directive. It is used to define the identifier to the constant value. Upon definition, all of this identifier in the future program will be replaced by the constant value. Usually, the identifier of symbol constant is expressed with capital letter and the variable identifier is expressed with lowercase letter for distraction.

```
#define PI 3.14159
void main(){
float s,r;
r=5;
s=PI*r*r;
printf("s=%f\n",s);
}
```

It is defined by macro definition directive. P1 is defined to be 3.14159, and s,r is defined to be float.

5->r PI*r*r->s

Display program result float s,r. wherein, r=5, s=PI*r*r. This program is defined by macro definition directive before main function. P1 is 3.14159, which substitutes for P1 in the program. s=PI*r*r is equivalent to s=3.14159*r*r. Pay attention: symbol constant is not variable. Its value cannot be changed in the overall action scope. That is to say, assignment statement is forbidden to re-assign in the program.

5.1.2 Initial value of variable and type conversion

1.Initial value assignment for variable

In the program, it is usually to assign initial value for the variable. There are many methods for initial value assignment in the language program, which are called initialization. In the variable declaration, the general form of initial value assignment is:

Type specifier variable 1 = 1, variable 2 = 2, ……; for example:

```
int a=b=c=5;
float x=3.2, y=3f, z=0.75;
char ch1='K', ch2='P';
```

Note: no continuous assignment is forbidden in the declaration, for instance a=b=c=5 is illegal.

2. Type conversion of variable

The variable type is convertible. There are two methods for conversion. One is automatic conversion, the other is forced conversion.

Automatic conversion

When the different types of data are involved in hybrid operation, the automatic conversion is completed by compilation system. The auto conversion should conform to the following rules:

- If the data types involved in operation are different, first convert them into one type, then make operation.

- Conversion is made as the data length so as to ensure the high precision. For example, when int and long is in operation, convert int into long, then make operation.
- All float operations are double. Even the expression contains float only, it must be converted to double for operation.
- Char and short must be converted into int for operation.
- In the assignment operation, when the data types on both sides of assignment sign are different, the right data type will be converted to the left type. If the right data is longer than left one, it will loss a part of data. In this case, the precision will be reduces. The lost data will be rounded off.

3. Forced type conversion

The forced type conversion is achieved by type conversion operation. Its general form is (type specifier) (expression). It is used to convert the operation results into the specified type of type specifier by force. Take an example of (float) a. convert a to float (int)(x+y), convert the result of x+y into integer. In forced conversion, there are some points to be noted:

- Type specifier and expression must be included in the bracket (the single variable may not be bracketed). If (int)(x+y) is written to be (int)x+y, it means to convert x into int and plus y.
- Either forced conversion or auto conversion is just the temporary conversion of data length for convenience of the operation. It will not change the variable type in the data declaration.

5.1.3 One-dimensional array

In the program design, the array organizes several variables with same category in ordered form for convenience. The set containing data elements with the same category in order is called array. In C language, the array belongs to construction data. One array can be split into several array elements. These array elements are either basic data or construction data. Therefore, the array can be classified into numerical array, character array, pointer array, structure array according to the category of array element.

This section will introduce the numerical array and character array, others will be described in the successive sections. If the array type declaration uses array in C language, it must be made type declaration first. The general form of array declaration is: type specifier array name [constant expression]. Wherein, type specifier refers to any basic data or construction data. Array name refers to the array identifier defined by users. The constant expression in square bracket indicates the quantity of data elements, which is also called array length.

For example:

int a[10]; int array a contains 10 elements.

float b[10],c[20]; float array b contains 10 elements; float array c contains 20 elements.

char ch[20]; character array ch contains 20 elements.

For the array type declaration, there are several points as following:

- The array type actually refers to the value type of array element. For the same array, the data type of all elements is the same.
- The writing rules for array name should conform to that of identifier.

- The array name should not be same with other variable name. For example:

```
void main()
{
int a;
float a[10];
……
}is incorrect
```

- The constant expression in the square bracket refers to the element quantity. For example, a [5] indicates that array a contains 5 elements. However, its subscript is started from 0. Therefore, the five elements are a[0],a[1],a[2],a[3],a[4].
- The square bracket cannot include the element quantity of variables but symbol constant or constant expression is available. For instance:

```
#define FD 5
void main()
{
int a[3+2],b[7+FD];
……
}
```

is legal. However, the following expression form is incorrect.

```
void main()
{
int n=5;
int a[n];
……
}
```

- It is allowed that the same type declaration can describe several arrays and several variables.

For example: int a,b,c,d,k1[10],k2[20];

1. Representation of array element

Array elements are the basic unit of array. It is also a variable, which is identified with array name and a subscript. The subscript indicates the sequence number of element in the array. The general form of array element is: array name [subscript]. Wherein, subscript is integer constant or integer expression only. If it has decimal, this value will be integer automatically by C programming. For example, a[5],a[i+j],a[i++] are the legal array elements. Array element is usually called subscript variable. The subscript variable could not be used unless array is defined. In C language, the subscript variable is used one by one rather than the whole array.

The general form of initialization assignment is: static type specifier array name [constant

expression]=[value……]. Wherein, static refers to the static storage type. It is specified that only static storage array and external storage array can be initialized assignment (the relevant static storage and external storage concepts will be introduced in Chapter 5) in C language. The data in { } are the initial value of each element, and the elements are spaced with comma such as static int a[10]={ 0,1,2,3,4,5,6,7,8,9 }, which is equivalent to a[0]=0;a[1]=1...a[9]=9;

2. There are several provisions for initial assignment of array in C language:

- It is allowed to assign initial value for partial elements. When the elements in { } is less than element quantity, the initial value is assigned for the front only. For example: static int a[10]={0,1,2,3,4}, it indicates that the initial value will be assigned for the first 5 elements a[0] – a[4], and the last 5 elements will be assigned 0 automatically
- Assign initial value for element one by one, and the overall assignment for array is unavailable. For example, if assigning 1 for 10 elements, it can write to be static int a[10]={1,1,1,1,1,1,1,1,1,1} rather than static int a[10]=1.
- If the initial value assignment is unavailable for all arrays with initialization, all elements will be 0.
- If assigning all elements, the array element quantity may not be given in the array declaration. For example: static int a[5]={1,2,3,4,5} can be written as static int a[]={1,2,3,4,5}. The dynamic assignment can be made during program execution. In this case, it can use do statement and scanf function to assign the array elements one by one.

3. Character array

The array for storing characters is called character array. The form of type declaration for character array is same to that of numerical array as previous introduction. For example: char c[10]. As the character and integer is similar, it can be defined as int c[10], but each array element occupies 2 bytes in memory. The character array may be two-dimensional array. For instance, char c[5][10] is a two-dimensional character array. The character array is allowed to made initialization assignment in type declaration. Take static char c[10]={'c',' ','p','r',o','g',r','a','m'} as an example. After assignment, the element value is c[0]c[1]c[2]c[3]c[4]c[5]c[6]c[7]c[8]c[9] for array C. Wherein, c[9] is not assigned and assigned to 0 by system automatically. When assigning initial value for all elements, the length declaration can be omitted such as static char c[]={'c',' ','p','r','o','g','r','a','m'}, in which the length of C array is set to 9.

C language allows for initialization assignment for array in character string. For example, static char c[]={'c', ' ','p','r','o','g','r','a','m'} can be written to static char c[]={"C program"} or static char c[]="C program" without {}. The assignment in character string occupies one more byte than assignment one by one. It is used to store the ending sign of character string '\0'. The actual storage of array c in memory is C program\0. Wherein, '\0' is added by C programming system automatically. As '\0' sign is adopted, the array length is not normally defined in initialization assignment of character string but processed by system automatically. If in the mode of character string, the input and output of character array becomes simple and convenient. Except the initial value assignment with character string, it can input and output the character string of one character array with printf function and scanf function at one time not requiring input/output each character with do statement one by one.

5.1.4 Basic operator and expression

Category, priority and associativity of operator

There are many operators and expressions in C language, which is seldom in the high-level language. It is the rich operator and expression that complete the C language. This is one of main features of C language.

The operators of C language have different priorities. In addition, they have individual associativity. In the expression, the data for operation should not only conform to the priority of operators but also subjected to the associativity so as to confirm the operation direction from left to right or from right to left. This associativity is unavailable for other high-level language, which increases the complexity of C language.

Operator Category

The operators of C language can be classified as following:

1. Arithmetic operator

It is used for different data operations, including addition (+), subtraction (-), multiplication (*) and division(/) (or modular arithmetic, %), increment (++) and decrement (--).

2. Relational operator

It is used for comparison operation, including greater than (>), less than (<), equal to (==), be equal or greater than (>=), be equal or less than (<=) and unequal to (! =).

3. Logical operator

It is used for logical operation, including And (&&), Or (||) and Not (!).

4. Bit operation operator

The data for operation is taken as binary bit, including bit and (&), bit or (|), bit not (–), bit or (^), left shift (<<) and right shift (>>).

5. Assignment operator

It is used for assignment operation, including simple assignment (=), composite arithmetic assignment (+=,-=,*=, /=, %=) and composite bit operation assignment (&=,|=, ^=,>>=,<<=).

6. Conditional operator

This is a ternary operator for conditional evaluation (?:).

7. Comma operator

It is used for combining several expressions to one expression (,).

8. Pointer operator

It is used for two operations as content-of (*) and address-of (&).

9. Size-of operator

It is used for size-of operation of data.

5.1.5 Section summary

1.C data type

Basic type, construction type, pointer type and void type

2. Classification and characteristics of basic type

Type Specifier	Byte	Number Range
char	1	C character set
int	4	-214783648 – 214783647
short int	4	-214783648 – 214783647
long int	8	-922337203685477808 – 922337203685477807
unsigned	4	0 – 4294967295
unsigned long	8	0 – 1844744073709551615
float	4	3/4E-38 – 3/4E+38
double	8	1/7E-308 – 1/7E+308

3. Constant suffix

L or l for long int

U or u for unsigned

F or f for float

4. Constant type

Int, long int, unsigned, float, char, char string, symbol constant, and escape character

5. Data type conversion

Auto conversion

The system realizes auto conversion for the hybrid operation of different types of data, which converts from small byte data to big byte data. For the mutual assignment of different data, the system also converts automatically, which converts the right data type into left one.

Forced conversion

It is converted by forced conversion operator.

6. Priority and associativity of operator

Generally speaking, the unary operator has higher priority and the assignment operator has lower priority. The arithmetic operator has higher priority, and the relational and logical has lower priority. Most operators have left associativity, unary operator, ternary operator and assignment.

7. Expression

Expression is the recipe composed with connection constant, variable and function of operator. Each expression has one value and type. The evaluation of expression is made according to the sequence specified by priority and associativity of operator.

8. Array

- Array is the commonest data structure in program design. The array contains numerical array (int array, float array), character array and pointer array, structure array to be described later.
- Array may be one-dimensional, two-dimensional or multi-dimensional.
- The type declaration of array consists of type specifier, array name and array length (elements quantity of array). The array element is also called subscript variable. The array type refers to the value type of subscript variable.
- Make array assignment with three methods: initialization assignment, dynamic assignment by inputting function and assignment statement. The numerical array cannot be overall assigned, input or output with assignment statement but assigned for array element one by one with do statement.

5.2 C language programming preliminary

5.2.1 Statement of C program

1. Expression statement

Expression statement consists of expression and semicolon. Its general form is expression;. Execution of expression statement is to compute the expression value. For example, x=y+z; assignment statement y+z; operate statement with addition, but the result is not kept. It has no actual significance i++. Increment 1 statement, i value increases 1.

2. Control statement

Control statement is to control the program process so as to realize various structures of program.

It is composed of special statement delimiter. There are nine control statements in C language, which can be classified into three kinds:

- Conditional judgment statement

if statement, switch statement

- Looping execution statement

do while statement, while statement, for statement

- Go to statement

break statement, go to statement, continue statement, return statement

3. Null statement

The statement with semicolon only is called null statement. Null statement executes nothing. In the program, null statement can be the null loop body. Take an example of while (getchar()!='\n'). For this statement, if the character input from keyboard is not Enter, it requires re-input. Here, the loop body is null statement.

4. Assignment statement

Assignment statement consists of assignment expression and semicolon. Its general form is variable = expression. Its functions and features are same to that of assignment expression. It is one of the most popular statements in the program. There are some points to be noted in the usage of assignment statement:

- As the expression on the right of assignment sign "=" can be an assignment expression, the following form Variable=(variable=expression); is established, then the nestification is formed. Its expanded expression is Variable=Variable=…=Expression;

For example:

a=b=c=d=e=5; according to the right associativity of assignment operator, it is equivalent to:

e=5;

d=e;

c=d;

b=c;

a=b;

- Pay attention to the difference between assigning initial value and statement for variable in the variable declaration. Assigning initial value to variable is a part of variable declaration. The variable with initial value assignment should be spaced with comma to other similar variable, but the assignment statement must be ended with semicolon.
- In the variable declaration, it is forbidden to assign initial value for several variables successively. For

example, the following declaration is incorrect. Int a=b=c=5 must be written to int a=5,b=5,c=5. However, the assignment statement must be assigned continuously.

- Note the difference between assignment expression and assignment statement. Assignment expression is a kind of expression, which can be used in any allowable place. But the assignment statement cannot. The following statement is legal: if((x=y+5)>0) z=x; the function of statement: if expression x=y+5 is greater than 0, then z=0.

The following statement is illegal: if((x=y+5;)>0) z=x; as x=y+5; is a statement, it cannot be used in expression.

5.2.2 Branch structure program

Relational operator and expression

In the program, it usually compares the size of two data so as to confirm the next process. The operator for comparing data size is called the relational operator. There are such relational operators in C language as following:

< less than

<= less than or equal to

> greater than

>= greater than or equal to

== equal to

!= unequal to

The relational operator is binary operator, which is left associative. Its priority is lower than that of arithmetic operator and higher than that of assignment operator. In the six relational operators, <,<=,>,>= has the same priority, which is higher than == and !=. While == and != has the same priority.

Relational expression

The general form of relational expression is Expression Relational operator Expression. For example, a+b>c-d,x>3/2,'a'+1<c,-i-5*j==k+1 are legal relational expression. As the expression is relational expression concurrently, the nestification may occur such as a>(b>c),a!=(c==d) etc. The value of relational expression is "true" and "false", which is expressed with "1" and "0".

1. Logical operator and expression

In C language, the logical operators include AND operator &&, OR operator || and NOT operator !. AND operator && and OR operator || are binary operators with left associativity. NOT operator ! is unary operator with right associativity. The priority relation between logical operator and other operators can be expressed as following:

The following can be derived depending on the priority of operator:

a>b && c>d is equivalent to (a>b) && (c>d)

!b==c||d<a is equivalent to ((!b)==c)||(d<a)

a+b>c && x+y<b is equivalent to ((a+b)>c) && ((x+y)<b)

Evaluation of logical operation

The evaluation of logical operation may be true or false expressed with 1 and 0 individually. Its evaluation rules are as following:

- When the two values of AND operation && are true, the results are true; otherwise they are false. For example, 5>0&& 4>2. As 5>0 is true and 4>2 is true, the corresponding result is true.
- When one of two values involved in OR operation || is true, the result is true. When two values are false, the result is false. Take an example of 5>0||5>8. As 5>0 is true, the corresponding result is true.
- When the NOT operation! involved in operation is true, the result is false; when the involved operation is

false, the result is true.

For example, the result of !(5>0) is false.

In the logical operation value of C programming, it represents "true" with "1" and represents "false" with "0". Vice versa, when judging a value is true or false, 0 represents false and the non-zero data represents true. For example, as 5 and 3 are non zero, the value of 5&&3 is "true" (i.e. 1).

Another example: the value of 5||0 is "true" (i.e. 1).

The general form of logical expression is Expression – Logical operator – Expression. Wherein, the expression can be logical expression as well, which forms nestification? Take the (a&&b) &&c as an instance. The above expression can be written to a&&b&&c according to the left associativity of logical operator. The value of logical expression is the final value of various logical operation, which represents "true" and "false" with "1" and "0" respectively.

2. if statement

The branch structure can be constituted with if statement. It makes judgment according to the given conditions so as to confirm what branch program period is to be executed. If statement of C language has three basic forms.

- The first form is: basic form. if (expression) statement

It's semanteme: if the expression value is true, the following statement will be executed, otherwise not.

- The second form is if-else. if(expression)

statement 1; else statement 2;

Semanteme: if the expression value is true, it will execute statement 1; otherwise statement 2.

Input two integers, and output the bigger one. Judge a and b size with if-else statement. If a is bigger, it outputs a;

otherwise b.

- The third form is if-else-if form.

In the first two forms, if statement is normally used for two branches. When there are several branches for selection, if-else-if statement is adopted. Its basic form is:

if(expression 1)

statement 1;

else if(expression 2)

statement 2;

else if(expression 3)

statement 3;

…

else if(expression m)

statement m; else statement n;

Semanteme: judge the expression value in sequence. When a value is true, it executes the corresponding statement. Then it executes program out of if statement. If all expressions are false, it will execute statement n. Then continue to execute the subsequent program.

There are some points to be noted in if statement:

- In the three forms of if statement, the one behind if is expression. This expression is usually the logical expression or relational expression. But it may be other expressions such as assignment expression even a variable. For example, if(a=5) statement and if(b) statement are allowable. As long as the expression value is not 0, it is true. If the expression value in if(a=5)…; expression is always not 0, the subsequent statement will be executed. This kind of situation may not take place in the program, but the syntax is legal.

Another example, program segment: if(a=b)

printf("%d",a)

;

else

printf("a=0");

Semanteme of the statement: assign b to a. if it is not 0, this value is output; otherwise it outputs "a=0" character string. This kind of application usually occurs in the program.

- In if statement, the conditional judgment expression must be included in bracket, and ended with semicolon.
- In the three forms of if statement, all statements should be single statement. If a group (several) statements are required execution with conditions, this group of statements must be bracketed with {} to form a compound statement. Pay attention that no semicolon is allowed behind }.

For example:

```
if(a>b){
a++;
b++;
}
else{ a=0;
b=10;
}
```

3. Conditional operator and conditional expression

If the single assignment statement is executed only in the conditional statement, it is usually realized by conditional expression, which not only simplifies the process but also improves the operation efficiency

Conditional operator ? and : is a ternary operator, which means three values are involved in operation. The general form of conditional expression composed by conditional operators is:

Expression 1 ? Expression 2: Expression 3

Its evaluation rule: if the expression 1 is true, its value of expression 2 will be the value of conditional expression; otherwise, the value of expression 2 will be the value of whole conditional expression. Conditional expression is normally applied in assignment statement. For example:

```
if(a>b) max=a;
else max=b;
```

max=(a>b)?a:b; is expressed with conditional expression. Its semanteme is: if a>b is true, assign a to max; otherwise assign b to max.

In the application of conditional expression, there are some points to be noted as following:

- The operation priority of conditional operator is lower than that of relational operator and arithmetic operator but higher than assignment operator. Therefore, max=(a>b)?a:b can be removed the bracket to

be max=a>b?a:b.

- Conditional operator ? and : is a pair of operator, which cannot be separated in application.
- The associative direction of conditional operator is from right to left.

5.2.3 switch statement

C language provides another switch statement for selection of multiple branches. Its general form is:

switch(expression){

case constant expression 1: statement 1;

case constant expression 2: statement 2;

…

case constant expression n: statement n;

default: statement n+1;

}

Semanteme: calculate the expression value, and compare with the subsequent constant expression value one by one. When the expression value is equal to a constant expression value, the subsequent statement is executed. Then judgment is not made. Continue the statement behind all case. If the expression value is different from the constant expression behind case, it will execute the statement behind default.

There are several points to be noted in switch statement:

- All constant expression values behind case must be different, otherwise there will be mistake.
- Several statements are allowed behind case, and they cannot be bracketed with {}.
- The sequence of case and default clauses may be changed and will not affect the program execution.
- Default clause may be omitted

5.2.4 Loop structure program

The loop structure is an important structure of program. When the given condition is satisfied, one program segment is executed repeatedly until the condition is unsatisfied. The given condition is called loop condition, and the program segment executed repeatedly is called loop body. C language provides many loop statements, which may compose different loop structures.

1. While statement

The general form of while

statement: While (expression)

statement;

wherein, the expression is loop condition, and the statement is loop body.

Semanteme of while statement: compute the expression value. When the value is true (not 0), the loop body statement is executed.

There are some points to be noted in while statement:

- The expression of while statement is usually the relational expression or logical expression. As long as the expression value is true (not 0), it can continue loop.
- If the loop body contains one or more statements, it must be bracketed with {} to form the compound statement.
- Note the loop conditions to avoid endless loop.

2. Do-while statement

General form of do-while statement:

do

statement;

while

(expression);

Wherein, the statement is loop body, and the expression is the

loop condition. Semanteme of do-while statement:

First execute the loop body statement for one time, then judge the expression value. If the value is true (not 0), the loop is continuous; otherwise the loop ends.

The difference between do-while statement and while statement is that do-while executes first and judges late. Therefore, do-while will execute the loop body for one time at least. But while statement judges first and executes late. If the condition is unsatisfied, the loop body statement is not executed for one time.

while statement and do-while statement is usually mutual re-write.

In this example, the loop condition is rewritten to be –n. Otherwise, one more loop will be executed. There are some points to be noted in do-while statement:

- In the if statement and while statement, no semicolon is added behind the expression; while the expression of do-while statement must be ended with semicolon.
- do-while statement may be composed to the nested loop and nested with while statement mutually
- The loop body between do and while is made up of several statements, and bracketed with {} to form a compound statement.
- When converting do-while and while statement mutually, pay attention to modify the loop control conditions.

5.2.5 for statement

For statement is a kind of loop statement with stronger function and wider application provided by C language. Its general form is:

For (Expression 1;Expression 2;Expression 3)

statement;

Expression1: it is usually to assign initial value to loop variable, and it is assignment expression. It also allows to assign initial value to loop variable except for statement. In this case, the expression may be omitted.

Expression 2: it is usually the loop condition, and it is relational expression or logical expression.

Expression 3: it is usually for modifying the value of loop variable, and it is assignment statement.

These three expressions may be comma expression. That is to say, each expression can be composed with several expressions. Three expressions are options and can be omitted.

The "statement" in general form is loop body statement. Semanteme of for statement is:

1. First, calculate the value of expression 1.
2. Then, compute the value of expression 2. If the value is true (not 0), loop body is executed once more; otherwise exit the loop.
3. Calculate the value of expression 3 and return to execute step 2 again. During the for process, expression 1 is calculated for one time, and expression 2 and 3 may repeat for several times. The loop body may be executed for many times or not executed.

There are several points to be noted in for statement:

- Each expression in for statement can be omitted, but the semicolon must exist. For example:

<1>for(expression; expression) expression is omitted

<2>for(expression; expression;)expression is omitted

<3>for(;expression; expression) all expression is omitted

- When the loop variable has assigned initial value, Expression 1 may be omitted as shown in Example 3.27. If Expression 2 or 3 is omitted, the endless loop may be caused. In this case, the loop should be ended in loop body.
- The loop body may be void statement.

```
#include<stdio.h>
void main()
{
int n=0;
printf("input a string:\n");
for(;getchar()!='\n';n++)
printf("%d",n);
}
```

In this example, the expression 1 in for statement is omitted, and the expression 3 is not for modifying loop variable but for inputting the characters counting. Thus, the counting that should be completed in loop body has completed in the expression. Therefore, the loop body is void statement. Pay attention, the semicolon behind void statement is essential. If this semicolon is missed, the following printf statement will be executed as loop body. On the other hand, if the loop body is not void statement, it is forbidden to add semicolon behind the bracket of expression. In this case, the loop body will be regarded as void statement and not executed repeatedly. All of these are the common mistakes in programming, which must be attached great importance.

5.2.6 break statement

Break statement is used in switch statement or loop statement only. It is for exiting switch statement or local loop and directing to the subsequent program. As the transferring direction of break statement is specific, the statement marks are not required. The general form of break statement is break. As shown in the above example, the break statement is used in switch statement and for statement for skip. Break statement provides several exits for loop statement, which makes programming more flexible and convenient in some circumstances.

5.2.7 continue statement

Continue statement is used in loop body only. Its general form is

continue;

Semanteme: finish this loop and not execute the other statement behind continue statement in the loop body any more, turn to judge and execute the next loop condition. Pay attention: this statement only ends the loop on this layer and will not exit the loop.

5.2.8 Section summary

1.From the execution process, the program is basically classified into three basic structures: sequence structure, branch structure and loop structure.

2.The most basic unit in program execution is statement. There are five kinds of statements in C language:

(1)Expression statement any expression and semicolon forms the expression statement. The general expression statement is assignment statement.

(2)Function call statement the function call and semicolon constitutes the function call statement.

(3)Control statement it is used for control program process, and composed of special statement delimiter and required expression. It mainly includes conditional judgment execution statement, loop execution statement, go to statement etc.

(4)Compound statement it is composed by several statements included in {}. Compound statement is regarded as single statement. It can be used in any place allowing statement such as loop body.

(5)Void statement it is composed by semicolon only without actual function.

3. Relational expression and logical expression are two important expressions, which are mainly used for judgment of conditional execution and loop execution.

4. C language provides many forms of conditional statement to form the branch structure.

(1) if statement is mainly for one-way selection.

(2) if-else statement is mainly for two-way selection.

(3) if-else-if statement and switch statement are for multiway selection. These forms of conditional statement are normally mutual substituted.

5. C language provides three loop

(1)For statement is mainly used to assign initial value for loop variable, step increment and loop structure of loop times.

(2) The loop times and control condition can be confirmed during loop process, and the confirmed loop may use while or do-while statement.

(3) Three loop statements can be nested mutually to form the nested loop. The loops may be in parallel but not crossed.

(4) Branch statement can transfer the process out of loop body, but it cannot transfer process from outside to loop body.

(5) Avoid endless loop in the loop program. That is to say, the loop variable must be ensured to be modified during operation. Change the loop condition to be false gradually, thus finish the loop.

6. Statement summary in C language

Name	General Form
Simple statement	Expression statement;
Void statement	;

Conditional statement if(expression)statement;

if(expression)statement 1; else statement 2;

if(expression 1)statement 1; else if(expression 2) statement 2…else statement n;

switch statement switch(expression){ case constant statement: statement…default: statement; }

loop statement while statement

while(expression)statement;

for statement for(expression 1; expression 2; expression 3) statement;

break statement break;

continue statement continue;

return statement return(expression);

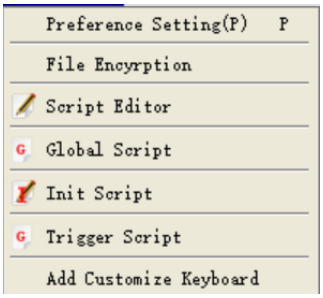
5.3 Script function introduction

5.3.1 Use script function to program

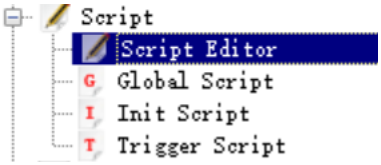
This section will introduce the basic functions of script and describe the relevant control functions and application method briefly.

There are ways to access script :

Method 1: select "Setting (S) -> Macro" from the menu (script menu), and pop up interface as shown in figure below(script editor).

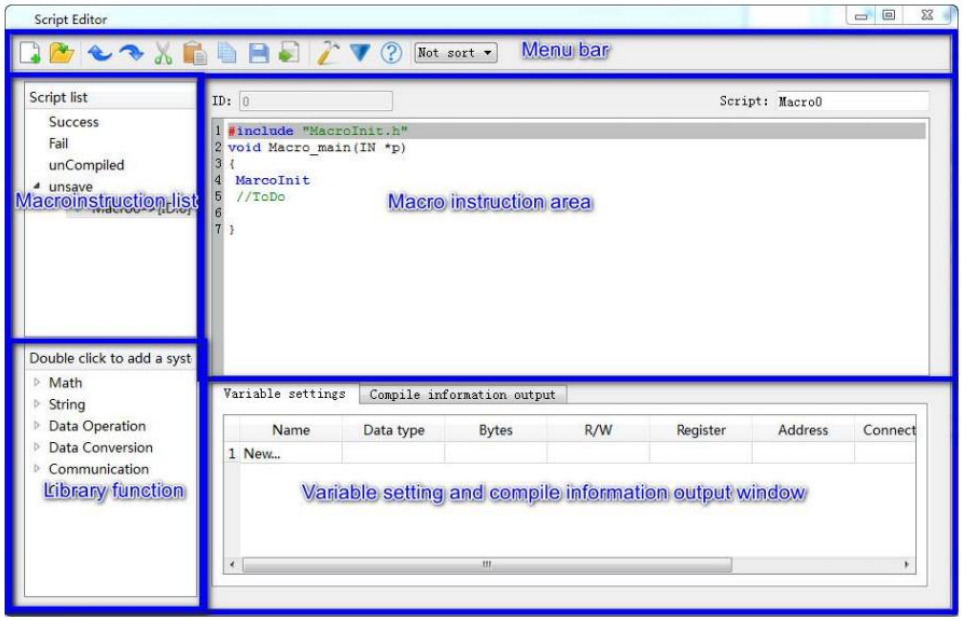


Method 2: click shortcut button "script " as shown in figure below(script button)



5.3.2 Function button introduction in script editor

The functional controls are arranged in script editor window as shown in figure below (Script Editor).



<1> Script List:

 : New: new create a script

 : Import: import an existence script.

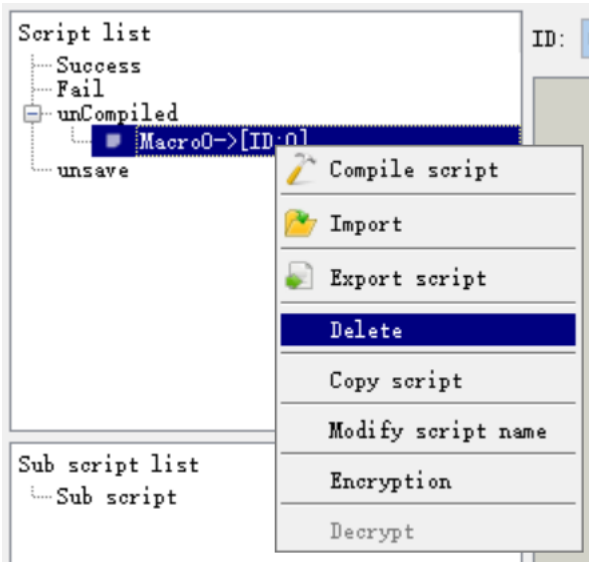
Success : the scripts have been successful completed

Fail : the scripts have been failed completed

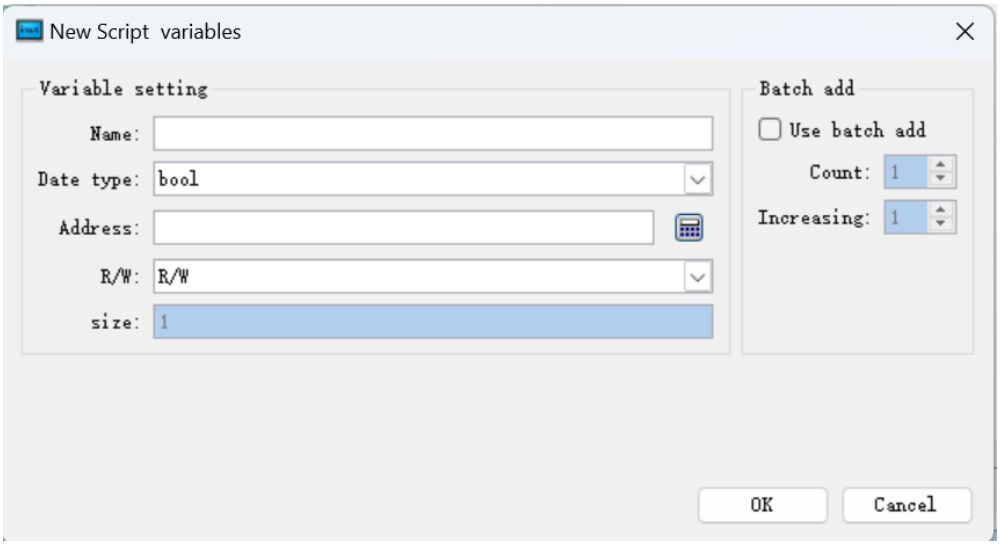
Not complited: the scripts have not been completed

Not save : the scripts have been saved

Delete : 'left click' chooses the script, then 'right click' pop out 'Deletes script', click the delete



<2>Script Edit window: Edit and compile script on this window. "ID": The number of the current edit script, "Script": Modify the name of the current edit script.



 : Script Edit Menu: there are ten button totally, as follows:

 Undo: cancel the last operation.

 Redo: redo the next operation.

 Cut: cut the chosen script.

 Paste: paste script.

 copy: copy script.

 Save: save script.

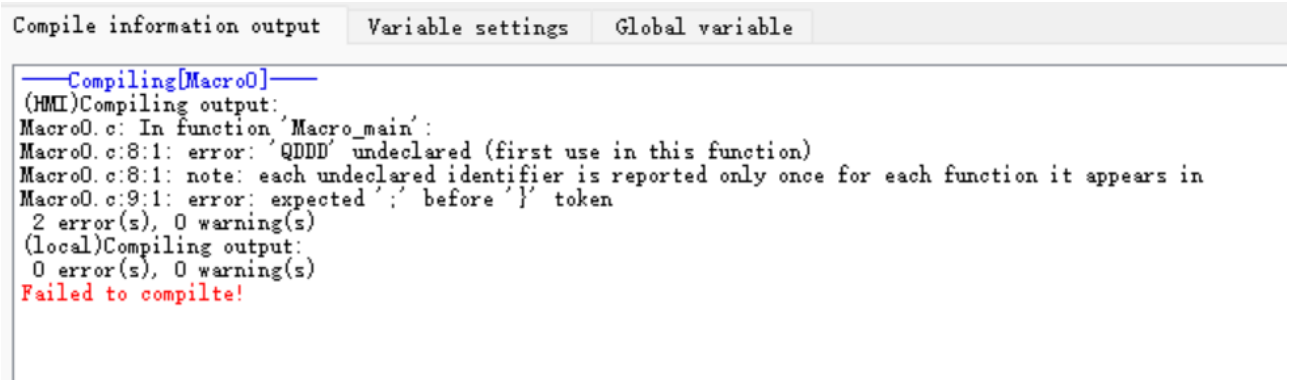
 Export: Pop the file save dialog, modify the root and name, save the script as a *.csv file.

 Compile: Compile the current script source code, and check the syntax error.

 Pack/Show the setting and output window.

 Help: Show the help file.

<3>Setting and output window: the window sets variable and outputs compiled information.



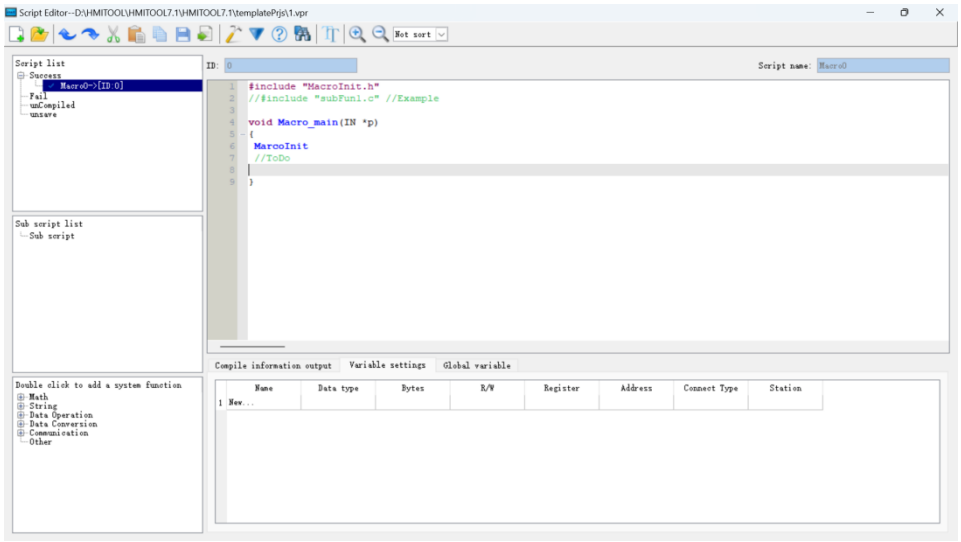
Click on "Compile Information Output" to view the compilation status, if there is an error, it will provide relevant hints as shown in the figure above. If the compilation is successful, executable macros will be

generated.

<4>"Compile information output"Page: The window outputs the information of compilation and connection state of program. Users may make debugging and modification according to the information prompt.

5.3.3 New create script

Click  button and create a new script on the "Not save" list as shown in figure below (Script Compiler)



Instructions:

Instruction 1: convention introduction of program compilation

Create the source program of C language conforming to ANSI C standard in the edition window.

Instruction 2: information output window

The window outputs the information of compilation and connection state of program. Users may make debugging and modification according to the information prompt.

Instruction 3: variable setting

Variable name: input the variable name required in the program.

Data type: select the corresponding data class of variable name so as to distribute the corresponding memory size.

Bytes: set the occupied memory of corresponding variable automatically depending on the data class.

Read/write: set the read-write property of variable in the memory cell of HMI.

Address: the defined physical memory address of variable in the HMI.

Variable setting instruction: when the external requires interaction with HMI such as data exchange and data acquisition, it provides the interface to change the behavior characteristics of HMI dynamically.

Special Note:the variables required in the program should be put in the variable definition part (the variable definition starts from code).

5.3.4 Use internal storage area in script

HMITOOL configuration software provides the operation interface for HMI internal storage area. Users can

make direct operations for the internal storage area in the script. Detailed methods have two kinds:

1. Access storage area with keywords

LocalBit: reference of internal storage area LB;

LocalWord: reference of internal storage area LW;

RWIWord: reference of internal storage area RWI.

The keyword can be used directly in macro. For example:

```
if(LocalBit[5])
{
    LocalWord[1]=0;
}
else
{
    LocalWord[1]=1;
}
```

2. Establish a linkage between variable and internal storage area by setting of variable.

Detailed usage refers to script instance.

5.4 String handling functions

Function name	Function
StringCat	Joint two character strings
StringCompare	Compare the values of two character strings; case sensitive
StringCompareNoCase	Compare the values of two character strings; case insensitive
StringCopy	String copy
StringFind	Return to the position of the first occurrence of target string in the source string; if there is no found in the source string, return to -1.
StringFindOneOf	Return to the position of the first character in the source string that matches any character in target string; if there is no found in the source string, return to -1.
StringIncluding	Retrieve a substring of the source string that contains characters in the set string.
StringInsert	Insert a string into a specific position within the destination string content.
StringLength	Obtain the length of a string.
StringMid	Retrieve some characters sequence from the specified offset of the source

Function name	Function
	string.
StringSplit	Split out the string.
StringToLower	Convert the characters of a string to lowercase.
StringToUpper	Convert the characters of a string to uppercase.
StringTrim	Split the source2 out from source1 to form a new one with the rest.
StringTrimLeft	Split out any character of source2 in source1; Return the result to the dest.

1. StringCat

[Description]

Append source string to destination string.

[Usage]

result=StringCat(dest[start],source);

[Example]

```
char a[8]="abcd";
char *b="efg";
char *c;
c=StringCat(a,b); // c="abcdefg", it is better if a is a character array.
```

2. StringCompare

[Description]

Do a case-sensitive comparison of two strings.

[Usage]

result = StringCompare(source1,source2);

[Example]

```
int result;
char *a="abcd";
char *b="efg";
result = StringCompare(a,b); //result=-1(if a>b, result=1;if a=b, result=0; if a<b then result=-1).
```

3. StringCompareNoCase

[Description]

Do a case-insensitive comparison of two strings.

[Usage]

result = StringCompareNoCase(source1,source2)

[Example]

```
int result;
char *a="abcd";
char *b="EFG";
result=StringCompare(a,b);              //result=1;
result=StringCompareNoCase(a,b);    //result=-1;
```

4. StringCopy

[Description]

Copy ons string to another.

[Usage]

result = StringCopy(dest,source);

[Example]

```
char a[4]="abcd";
char* b="efg";
char* c;
c=StringCopy(a,b);     //c="abcdefg"; it is better if a is a character array.
```

5. StringFind

[Description]

Return the position of the first occurrence of target string in the source string.

[Usage]

index=StringFind(source1,source2);

[Example]

```
char a[8]="ab1c123d";
char* b="123";
char* c="ef";
int index;
index=StringFind(a,b);    //index=4;
index=StringFind(a,c);    //index=-1;
```

6. StringFindOneOf

[Description]

Return the position of the first character in the source string that matches any character in target string.

[Usage]

index=StringFindOneOf(source1,source2);

[Example]

```
char a[8]="ab1c123d";
```

```
cahr* b="1b";
in index;
index=StringFindOneOf(a,b); //index=2;
```

7. StringIncluding

[Description]

Retrieve a substring of the source string that contains characters in the set string.

[Usage]

StringIncluding(source1,source2,dest);

[Example]

```
char a[8]="aB1Eree";
char* b="aBe";
char dest[8];
StringIncluding(a,b,dest);     //dest="aBee"; it is better if dest is a character array.
```

8. StringInsert

[Description]

Insert a string in a specific within the destination string content. Notice it that the destination string has sufficient buffer.

[Usage]

StringInsert(pos,source,dest);

[Example]

```
char a[8] = "aB1e";
char *b ="kdr";
int pos=2;
StringInsert(pos,b,a);     //a="aBkdr1e".
```

9. StringLength

[Description]

Obtain the length of a string.

[Usage]

result = StringLength(source);

[Example]

```
char a[8]="ABerer";
int length;
length = StringLength(a);     //length=6;
```

10. StringMid

[Description]

Retrieve some characters sequence from the specified offset of the source string and store it in the destination buffer.

[Usage]

StringMid(source,count,dest);

[Example]

char a[8]="aB1e";

char b[3];

StringMid(a,2,b); //b="B1" it is better if b is a character array and it has enough memory to save the fetched character.

11. StringSplit

[Description]

Split out the string.

[Usage]

StringSplit(dest1,dest2,source,pos);

[Example]

char a[8]="aB1edge";

char b[5];

char c[5];

StringSplit(b,c,a,3); / it is better if b and c are character arrays.

12. StringToLower

[Description]

Convert the characters of a string to lowercase.

[Usage]

StringToLower(source,dest); // it is better if dest is a character array.

[Example]

char a[8]="ABeRe";

char b[8];

StringToLower(a,b); //b="abere".

13. StringToUpper

[Description]

Convert the characters of a string to uppercase.Notice if there is sufficient buffer.

[Usage]

StringToUpper(source,dest);

[Example]

char a[8]="ab1ere";

```
char b[8];              // it is better if b is a character array.
StringToUpper(a,b);   //b="AB1ERE";
```

14. StringTrim

[Description]

split the source2 out from source1,return the result to dest.

[Usage]

StringTrim(source1.source2,dest);

[Example]

```
char a[12]="a1erd1esw";
char *b="1e";
char c[10];
StringTrim(a,b,c)          //c="ardsw" . It is better if c is a character array.
```

15. StringTrimLeft

[Description]

split out any character of source2 in source1,Return the result to the dest.

[Usage]

StringTrimLeft(source1,source2,dest);

[Example]

```
char a[8]="aB1edge";
char* b="be";
char c[8];
StringTrimLeft(a,b,c);       //c="aB1dg", It is better if c is a character array.
```

5.5 Data operation function

Function name	Function
GETBIT	Get bit value.
HIByte	Retrieve the high byte from the low word of a specified value.
HIWord	Retrieve the high word from the specified value.
INVBIT	Set specific bit to be inversed (ON->OFF, OFF->ON).
LOByte	Retrieve the low byte from the specified value.
LOWord	Retrieve the low word from the specified value.
SWAPB	Swap the low byte and high byte of the specified value.

SWAPW	Swap the low word and high word of the specified value.
SETBIT	Set specific bit to be ON or OFF.

1. GETBIT

[Description]

Get bit value.

[Usage]

result = GETBIT(source, bit_pos);

[Example]

short source = 0x5, bit_pos = 0 ,result;

result = GETBIT(source,bit_pos); // result == 1

2. HIByte

[Description]

Retrieve the high byte from the low word of a specified value.

[Usage]

result=HIByte(source);

[Example]

short source = 0x1234,result;

result=HIByte(source); // result = 0x12

3. HIWord

[Description]

Retrieve the high word from the specified value.

[Usage]

result=HIWord(source);

[Example]

int source = 0x45232568,result;

result=HIWord(source); // result = 0x4523

4. INVBIT

[Description]

Set specific bit to be inversed (ON->OFF, OFF->ON).

[Usage]

result = INVBIT(source, bit_pos);

[Example]

short source = 0x6, bit_pos =1 ,result;

result=INVBIT(source, bit_pos); // result = 4

5. LOByte

[Description]

Retrieve the low byte from the specified value.

[Usage]

result=LOByte(source);

[Example]

short source = 0x1234,result;

result= LOByte(source); // result = 0x34

6. LOWord

[Description]

Retrieve the low word from the specified value.

[Usage]

result=LOWord(source);

[Example]

int source = 0x12345678,result;

result=LOWord(source); // result == 0x5678

7. SWAPB

[Description]

Swap the low byte and high byte of the specified value.

[Usage]

result=SWAPB(source);

[Example]

short source = 0x1234,result;

result=SWAPB(source); // result = 0x3412

8. SWAPW

[Description]

Swap the low word and high word of the specified value.

[Usage]

result=SWAPW(source);

[Example]

int source = 0x12345678, ;

int result;

result=SWAPW(source);// result = 0x56781234

9. SETBIT

[Description]

Set specific bit to be ON or OFF.

[Usage]

result = SETBIT(source,bit_pos,1);

[Example]

```
short    source = 0x4;
short bit_pos = 1, result;
result = SETBIT(source,bit_pos,1);//    result = 0x6
```

5.6 Data switch function

Function name	Function
ASCII2DEC	Convert a string to a decimal value.
ASCII2FLOAT	Convert a string to a floating value.
ASCII2HEX	Convert a string to a hexadecimal value.
BCD2BIN	Convert a BCD value to a BIN value.
BIN2BCD	Convert a binary value to a BCD value.
DEC2ASCII	Convert a decimal value to a string.
FLOAT2ASCII	Convert a floating value to a string.
HEX2ASCII	Convert a hexadecimal value to a string.

1. ASCII2DEC

[Description]

Convert a string to a decimal value.

[Usage]

result=ASCII2DEC(source , sizeof(source));

[Example]

```
char source[4] = {'2', '3', '4', '5'};
short result;
result=ASCII2DEC(source , 4);//    result=2345
```

2. ASCII2FLOAT

[Description]

Convert a string to a floating value.

[Usage]

result=ASCII2FLOAT(source,sizeof(source));

[Example]

```
char source[4] = {'5', '.', '7', '8'};
float result;
result=ASCII2FLOAT(source,4);//    result = 5.78
```

3. ASCII2HEX

[Description]

Convert a string to a hexadecimal value.

[Usage]

result=ASCII2HEX(source,sizeof(source));

[Example]

```
char source[5] = {'1','6','3','4'};
short result;
result=ASCII2HEX(source,4);//    result = 0x1634
```

4. BCD2BIN

[Description]

Convert a BCD value to a BIN value.

[Usage]

result=BCD2BIN(source);

[Example]

```
short source = 0x2648;
short result;
result=BCD2BIN(source);    //    result = 2648
```

5. BIN2BCD

[Description]

Convert a binary value to a BCD value.

[Usage]

result=BIN2BCD(source);

[Example]

```
short source = 1234;
short result;
result=BIN2BCD(source);//    result = 0x1234
```

6. DEC2ASCII

[Description]

Convert a decimal value to a string.

[Usage]

DEC2ASCII(result ,source,sizeof(source));

[Example]

short source = 5678;

char result[4];

DEC2ASCII(result ,source,4);

// result[0] == '5', result[1] == '6', result[2] == '7', result[3] == '8'

7. FLOAT2ASCII

[Description]

Convert a floating value to a string.

[Usage]

result=FLOAT2ASCII(source);

[Example]

float source = 56.8;

char result[4];

result=FLOAT2ASCII(source);

// result[0] = '5',result[1] = '6',result[2] = '.',result[3] = '8'

8. HEX2ASCII

[Description]

Convert a hexadecimal value to a string.

[Usage]

HEX2ASCII(source, result[start]);

[Example]

short source = 0x5678;

char *result;

result = HEX2ASCII(source);

// result[0] = '5', result[1] = '6', result[2] = '7', result[3] = '8'

5.7 Math arithmetic function

Function name	Function
ACOS	The result is equal to the arcosine of the source.
ADDSUM	Use addition to calculate checksum.
ASIN	The result is equal to the arcsine of the source.

Function name	Function
ATAN	The result is equal to the arctangent of the source.
COT	The result is equal to the cotangent of the source.
COS	The result is equal to the cosine of the source.
CRC	Get 16-bit CRC.
CSC	The result is equal to the cosecant of the source.
LOG	Calculate the natural logarithm of a number.
LOG10	Calculate the base-10 logarithm of a number.
POW	Calculates x raised to the power of y.
RAND	Produces a pseudorandom number (range:0 – 65535)
SEC	The result is equal to the secant of the source.
SIN	The result is equal to the sine of the source.
SQRT	The result is equal to the square of the source.
TAN	The result is equal to the tangent of the source.
XORSUM	Use XOR to calculate checksum.

1. ACOS

[Description]

The result is equal to the arcosine of the source.

[Usage]

result=ACOS(source);

[Example]

float source=0.5;

float result;

result=ACOS(source);

2. ADDSUM

[Description]

Use addition to calculate checksum.

[Usage]

checksum=ADDSUM(data,sizeof(data));

[Example]

char data[5]={0x1,0x2,0x3,0x4,0x20};

```
int checksum;
checksum=ADDSUM(data,5);//checksum=0x2a;
```

3. ASIN

[Description]

The result is equal to the arcsine of the source.

[Usage]

result = ASIN(source);

[Example]

```
float source=0.5;
float result;
result=ASIN(source);
```

4. ATAN

[Description]

The result is equal to the arctangent of the source.

[Usage]

result = ATAN(source);

[Example]

```
float source=1;
float result;
result=ATAN(source);
```

5. COT

[Description]

The result is equal to the cotangent of the source.

[Usage]

result = COT(source);

[Example]

```
float source=45(度);
float result;
result=COT(source);      //result = 1
```

6. COS

[Description]

The result is equal to the cosine of the source.

[Usage]

result = COS(source);

[Example]

float source=60(度);

float result;

result=COS(source); //result = 0.5

7. CRC

[Description]

Get 16-bit CRC.

[Usage]

bit_CRC=CRC(source,sizeof(source));

[Example]

char source[5] = {0x1, 0x2, 0x3, 0x4, 0x5};

short bit_CRC;

bit_CRC=CRC(source,5);

8. CSC

[Description]

The result is equal to the cosecant of the source.

[Usage]

result = CSC(source);

[Example]

float source=30(degrees);

float result;

result=CSC(source); //result = 2

9. LOG

[Description]

Calculate the natural logarithm of a number.

[Usage]

result = LOG(source);

[Example]

float source =100,result;

result = LOG(source); //result =4.61

10. LOG10

[Description]

Calculate the base-10 logarithm of a number.

[Usage]

result = lOG10(source)

[Example]

float source=100,result;

result = LOG10(source); //result = 2.00

11. POW

[Description]

Calculates x raised to the power of y.

[Usage]

result = POW(x,y); note:x must be constant

[Example]

float result,y;

y=0.5;

result=POW(25,y); //result = 5

12. RAND

[Description]

Produces a pseudorandom number (range:0 – 65535)

[Usage]

Random= RAND()

[Example]

unsigned short random;

random =RAND(); //random = 363

13. SEC

[Description]

The result is equal to the secant of the source.

[Usage]

result = SEC(source);

[Example]

float source=60(度);

float result;

result=SEC(source); //result = 2

14. SIN

[Description]

The result is equal to the sine of the source.

[Usage]

result = SIN(source);

[Example]

float source=30(度);

float result;

result=SIN(source); //result = 0.5

15. SQRT

[Description]

The result is equal to the square of the source.

[Usage]

result = SQRT(source);

[Example]

float source=16;

float result;

result=SQRT(source); //result = 4

16. TAN

[Description]

The result is equal to the tangent of the source.

[Usage]

result = TAN(source);

[Example]

float source=45(度);

float result;

result=TAN(source); //result = 1

17. XORSUM

[Description]

Use XOR to calculate checksum.

[Usage]

checksum = XORSUM(source, sizeof(source));

[Example]

char source[5] = {0x1, 0x20, 0x3, 0x48, 0x5};

short checksum;

checksum = XORSUM(source, 5); // checksum =0x6f;

5.8 Communication function

Function name	Function
CLEARBUFFER	Clear buffer of communication port.
DELAY	Set a delayed time
FillLW_8	Give 8-bit dates to LW register
FillLW_16	Give 16-bit dates to LW register.
FillLW_32	Give 32-bit dates to LW register.
FillLW_Float	Give float dates to LW register.
GETCHARS	Get data from communication port.
GETBUFFERLENGTH	Get buffer length from communication port.
PUTCHARS	Send data to communication port.
InitEthernet	TCP/IP client mode initial connect.
readEthernet	TCP/IP client mode read receive data.
writeEthernet	TCP/IP client mode write send data.
CountsEthernet	TCP/IP client mode counts in receive buffer;
ClearEthernet	TCP/IP client mode delete all data in receive buffer.

1. CLEARBUFFER

[Description]

Clear buffer of communication port.

PortID--Serial Port ID,COM1=0, COM2=1.

Returns 1 if the operation succeeds and 0 if it fails.

[Usage]

int CLEARBUFFER(PortID);

[Example]

int Clearresult,PortID;

PortID=0;

Clearresult= CLEARBUFFER(PortID);

2. DELAY

[Description]

Set a delayed time;

[Usage]

void DELAY(int dwMilliseconds);

[Example]

int dwMilliseconds=1000;

DELAY(dwMilliseconds);// Delay 1s.

3. FillLW_8

[Description]

Give 8-bit dates to LW register;

[Usage]

FillLW_8(&LocalWord[i],a,NULL,count);

FillLW_8(&LocalWord[i],NULL,a,count);

[Example-1]

char a[6]="arsdw";

FillLW_8(&LocalWord[6],a,NULL,5); //LW6='a',LW7='r',LW8='s',LW9='d'LW10='w'.

[Example-2]

char a[6]={1,2,-1,3,4};

FillLW_8(&LocalWord[6],NULL,a,5); //LW6=1,LW7=2,LW8=-1,LW9=3,LW10=4.

4. FillLW_16

[Description]

Give 16-bit dates to LW register.

[Usage]

FillLW_16(&LocalWord[i],a,NULL,count);

FillLW_16(&LocalWord[i],NULL,a,count);

[Example]

short a[6]={12,1,2,-3,4};

unsigned short b[6]={12,5,4,7,8};

FillLW_16(&LocalWord[0],b,NULL,5); //LW0=12,LW1=5,LW2=4,LW3=7,LW4=8.

FillLW_16(&LocalWord[6],NULL,a,5); //LW6=12,LW7=1,LW8=2,LW9=-3,LW10=4.

5. FillLW_32

[Description]

Give 32-bit dates to LW register.

[Usage]

FillLW_32(&LocalWord[i],a,NULL,count);

FillLW_32(&LocalWord[i],NULl,a,count);

[Example]

int a[6]={12,1,2,-3,4};

unsigned int b[4]={0x123465,0x541245,0x4444444};

FillLW_32(&LocalWord[0],b,NULL,3); //LW0=1193061,LW2=5509701,LW4=71582788.

FillLW_32(&LocalWord[6],NULL,a,5); //LW6=12,LW8=1,LW10=2,LW12=-3,LW14=4.

6. FillLW_Float

[Description]

Give float dates to LW register.

[Usage]

FillLW_Float(&LocalWord[i],source,count)

[Example]

float a[3]={1.2,3.6,4.5};

FillLW_Float(&LocalWord[8],a,3); //LW8=1.2,LW10=3.6,LW12=4.5.

7. GETCHARS

[Description]

Get data from communication port.

[Usage]

GETCHARS(PortID, Data);

[Example]

char Data[20];

int Length,PortID,Result;

Length=5;

PortID=0;

Result=GETCHARS(PortID,Data);

8. GETBUFFERLENGTH

[Description]

Get buffer length from communication port.

[Usage]

int GETBUFFERLENGTH(PortID);

[Example]

int bufferlen,PortID;

PortID=0;

bufferlen=GETBUFFERLENGTH(PortID).

9. PUTCHARS

[Description]

Send data to communication port.

[Usage]

PUTCHARS(PortID, Data, Length);

[Example]

char Data[5] = {0x02, 0x30, 0x31, 0x4d, 0x5e};

int Length,PortID;

Length=5;

PortID=0;

PUTCHARS(PortID, Data, Length);

10. InitEthernet

[Description]

TCP/IP client mode initial connect.

IPAdd--server IP address;

networkPort--connect port number;

Success return 1, fail return 0.

[Usage]

int InitEthernet(char *IPAdd, int networkPort);

[Example]

char *IPAdd="192.168.1.100";

int networkPort=5;

int result;

result= InitEthernet(IPAdd, networkPort) ;

11. readEthernet

[Description]

TCP/IP client mode read receive data.

cBuffer--data buffer;

Success return receive counts, fail return -1.

[Usage]

int readEthernet(char *cBuffer);

[Example]

char cBuffer[]={22,33};

int result;

result=readEthernet(cBuffer);

12. writeEthernet

[Description]

TCP/IP client mode write send data.

cBuffer--data need to send;

iSize--counts need to send;

Success return 1, fail return 0.

[Usage]

int writeEthernet(char *cBuffer,int isize);

[Example]

char cBuffer[]={22,33};

int isize=8;

int result;

result=writeEthernet(cBuffer,isize);

13. CountsEthernet

[Description]

TCP/IP client mode counts in receive buffer;

Success return counts in receive buffer, fail return 0

[Usage]

int CountsEthernet();

[Example]

int result;

result= CountsEthernet();

14. ClearEthernet

[Description]

TCP/IP client mode delete all data in receive buffer.

Success return 1, fail return 0.

[Usage]

int ClearEthernet();

[Example]

int result;

result= ClearEthernet();

5.9 CAN communication function

Function name	Function
onCanxStart	Enable CAN communication
onCanxstop	Close CAN communication
setBitrate	Set CAN communication rate
addFillter	Set the ID filter
reciveData	Receive CAN data
sendData	Send CAN data

1. onCanxStart

[Description]

Enable CAN communication

Normal return value =0, error return value <0

Enable CAN communication.

It returns 0 in normal case; it returns a value less than 0 if an error occurs.

[Usage]

int onCanxStart(PortID);

[Example]

```
int PortID , Result;
PortID = 0; //0: COM0      1: COM1
Result = 0;
Result = onCanxStart (PortID);
```

2. onCanxstop

[Description]

Close CAN communication

Normal returns 0, error returns non-0

[Usage]

int onCanxstop (PortID);

[Example]

```
int PortID , Result;
PortID = 0; //0: COM0      1: COM1
Result = 0;
Result = onCanxstop (PortID);
```

3. setBitrate

[Description]

Set CAN communication rate

Normal returns 0, error returns non-0

[Usage]

int setBitrate (Bitrate ,PortID);

[Example]

int PortID, Bitrate, Result;

PortID = 0; //0: COM0 1: COM1

Bitrate = 5000; // Set the baud rate 5K set range 5K 10K 20K maximum to 1M

Result = 0;

Result = setBitrate (Bitrate, PortID) //COM0 sets the communication rate to 5000;

4. addFillter

[Description]

Set the ID filter

Normal returns 0, error returns non-0

[Usage]

int onCanxstop (CanID, CanMask, PortID);

[Example]

Int PortID, Result, CanID, CanMask;

PortID = 0; //0: COM0 1: COM1

Result = 0;

CanID = 0x11; // Set the filter start ID number

CanMask = 0x11; // Set the filter end ID number, and start and end can be the same

Result = onCanxstop (CanID, CanMask, PortID); //Set to receive only data with CAN ID 0x11 normally returns 0 error returns non-0 value

5. reciveData

[Description]

Receive CAN data

Normal return received data length, error return data length <0

[Usage]

int reciveData (data, Len, PortID, &CanId)

[Example]

int PortID, Result, Len;

unsigned int CanId;

```
unsigned char data[128];            // Receive data buffer
PortID   = 0;                       //0: COM0      1: COM1
Len = 8;                    // Receive buffer length
Result = reciveData ( ( unsigned char * ) data, Len, PortID, &CanId );
```

6. sendData

[Description]

Send CAN data

Normal returns 0, error returns non-0

[Usage]

int sendData (data, Len, PortID, CanId, CanType)

[Example]

```
int PortID, Result, Len, CanType, CanId, i;
unsigned char data[128];
PortID   = 0;         //0: COM0      1: COM1
Result   = 0;
Len              = 8;
CanId    = 0x22;
CanType      = 0;         // Frame type: standard frame: 0 extended frame:0x80000000
for ( i = 0; i < Len; ++i )
{
    data[i] = i;
}
Result = sendData ( ( unsigned char * ) data, Len, PortID, CanId, CanType );    //Standard frame, COM0 sends data data, length 127,CAN ID 0x22
```

6 Simulation

This chapter mainly introduces usage and steps for offline simulation and online simulation.

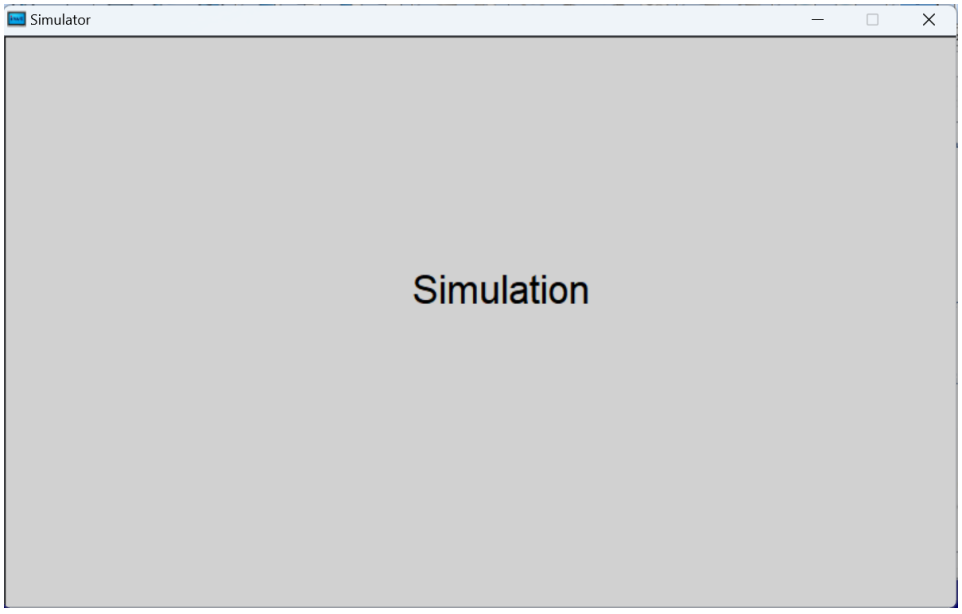
"Run HMITOOL as Administrator" is necessary to execute functions of Offline simulation and Online simulation.

6.1 Offline simulation

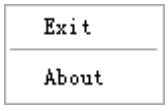
You can check the correctness of the configuration project with the off-line simulation provided by HMITOOL before transferring it to the HMI and connecting the HMI to connected devices.

Operation process:

Save the current project, select the offline menu to execute the simulation command, then it appear a pop-up offline simulation window where you can control the project to realize part of HMI functions by clicking the mouse instead of touching the HMI, as shown in figure below:



In the simulation window, right click to bring up the following menu:



Exit: Close the offline simulation window; press the keyboard ESC can also exit the offline simulation.

About: About the dialog box.

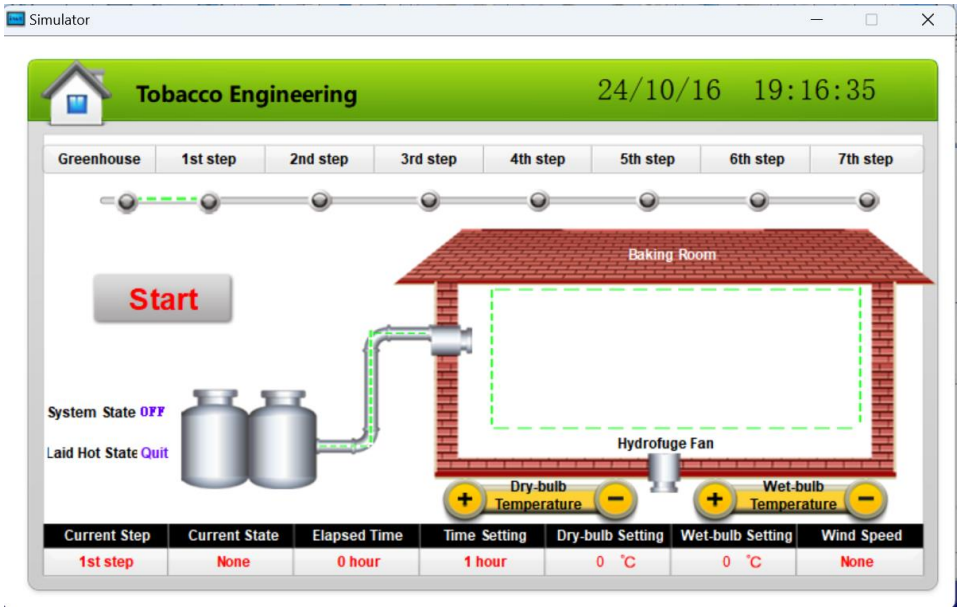
Note:

You can close offline simulation through taskbar "Right Key"-"Close".

Offline simulation example

As shown in figure below, the edited configuration project can be off-line simulated so as to check and find errors in engineering configuration screens, such as whether the monitor address is correct and so on. Just

in case.



Steps to execute offline simulation:

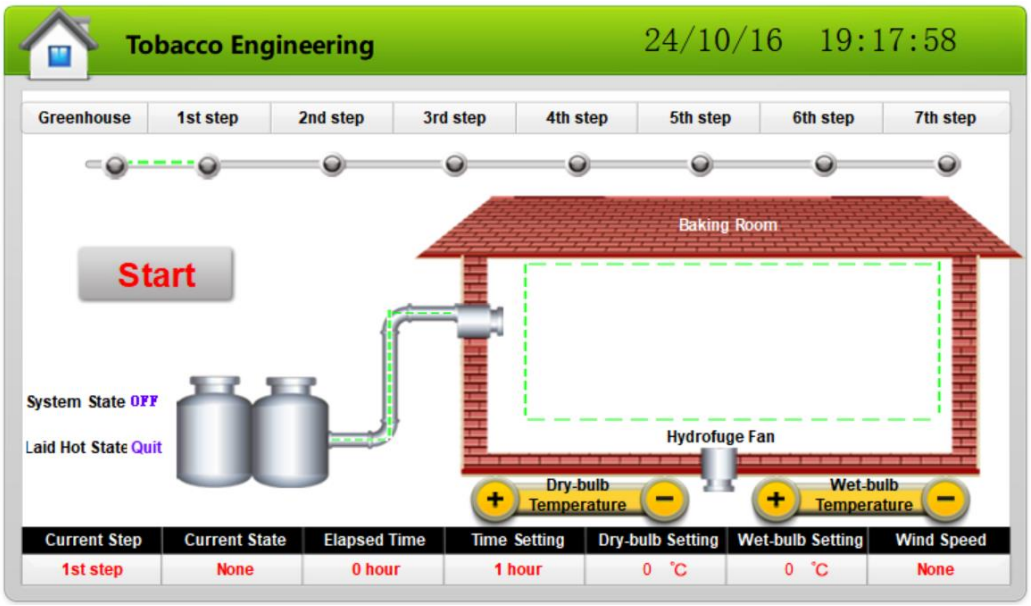
Install HMITOOL Software first;

Run HMITOOL as Administrator.

Note:

In the offline simulation, only these functions of Function button are available: "Previous recipe", "Next recipe", "Save current recipe", "Change User's Level", "Logoff" and "Touch Sound ON / OFF ". The Historical Alarm, Historical Data Display, Historical Trend Graph, Timer, and Macro on the Toolbar cannot be simulated.

The other controls are the same operation. After setting properties of each control, click "Save" and then select Offline simulation, as shown in figure below:



6.2 Online simulation

Online simulation allows communicating between PC and PLC or other related devices without VS-Q Series HMI. It is employed to debug the configuration project and conduct testing work when the HMI fails through simulating its operation status. Refer to offline simulation for configuration editing.

Online simulation requires the connection to PLC, so it needs to ensure that the cable connecting PLC and PC functions properly. The online simulation runs in 30 minutes, after that, it will quit automatically.

Note:

It is the download cable that is needed for common PLC, but not that connecting PLC to HMI. Please contact technical support staff in case of communication failure.

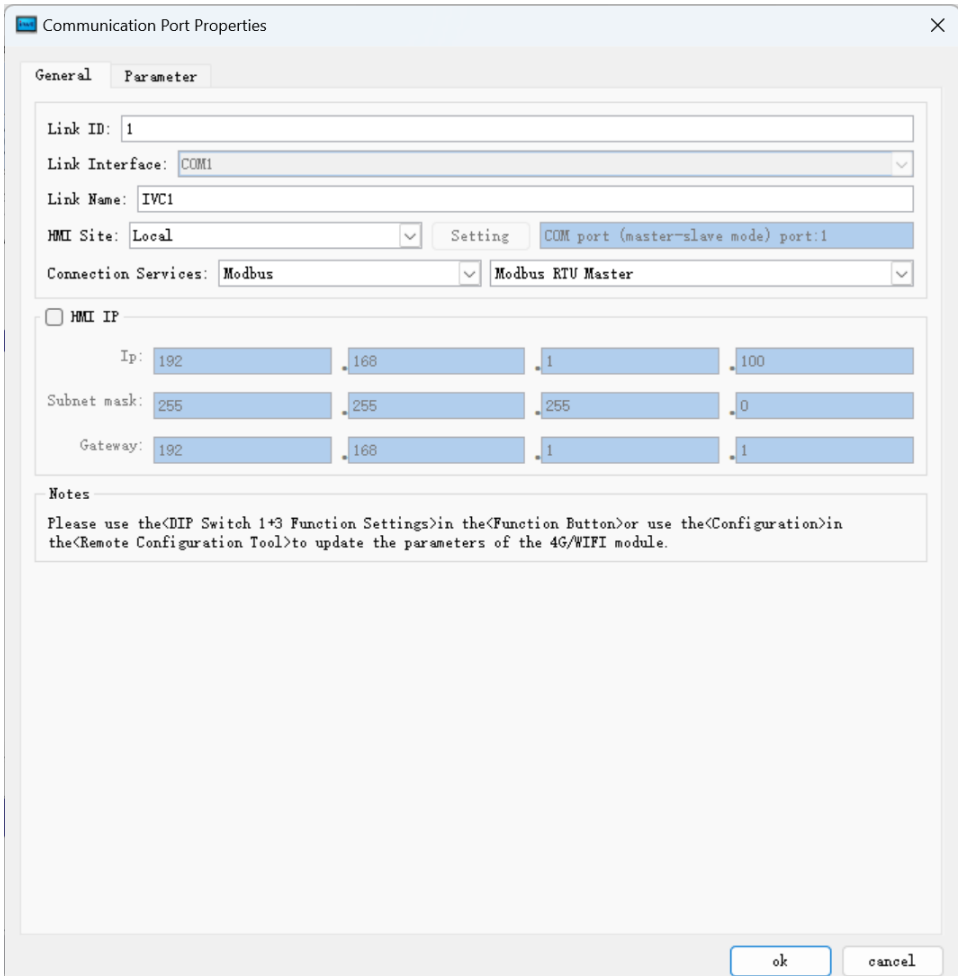
7 System settings

This chapter introduces setting functions of HMITOOL system. It is necessary to set them up in order to ensure normal running of HMI, including that of PLC.

7.1 Communication port property

Communication port property is applied to set the communication parameters between HMI and connected devices.

Double click "Link" and " Link 1", as shown in figure below:

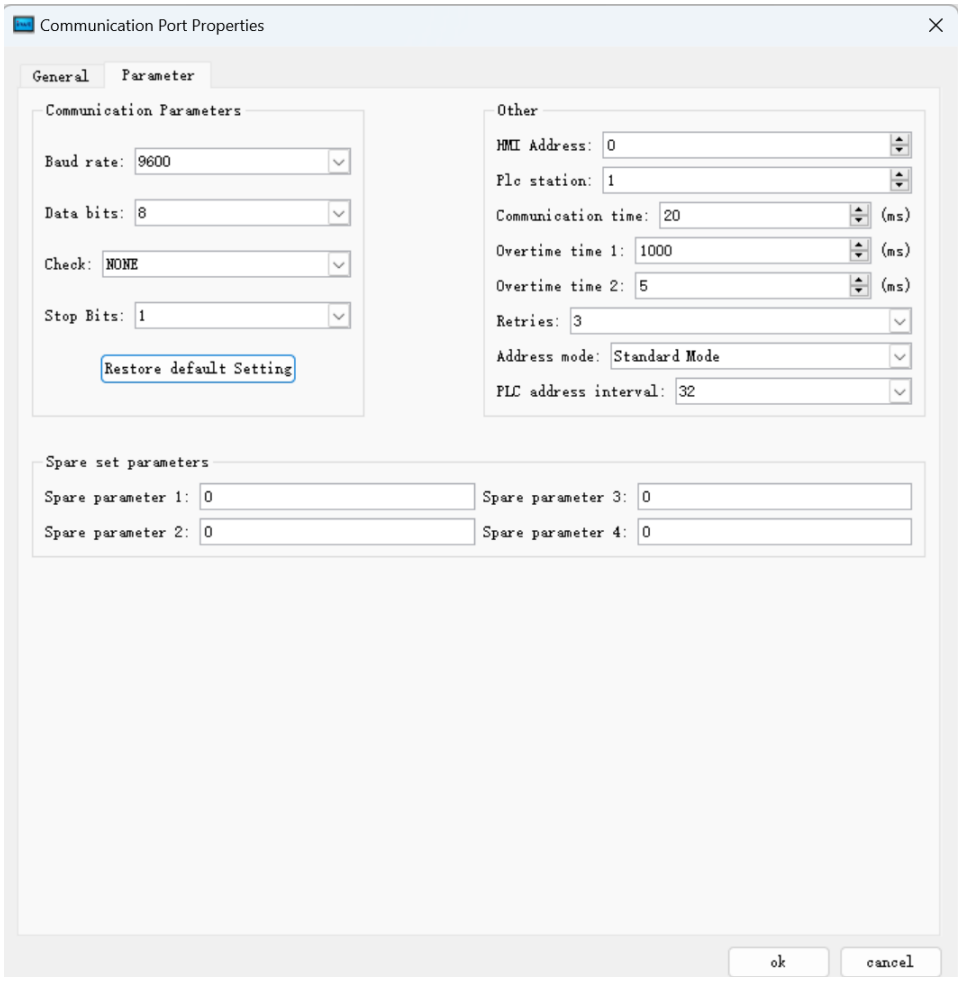


- Link Name: Set the name of this connection.
- Link Interface: User can select COM port and Ethernet port for communication. When you select serial port, the connection service only shows the connection service for serial port; when you select Ethernet port, the connection service only shows the connection service for Ethernet port.
- Connection service: select different PLC manufacturers in the first column and PLC model in the second column.

There are different ways to set up COM port and Ethernet communication as follows:

■ **COM port parameter settings**

Click "Parameter" and the following screen display appears:



Parameter settings:

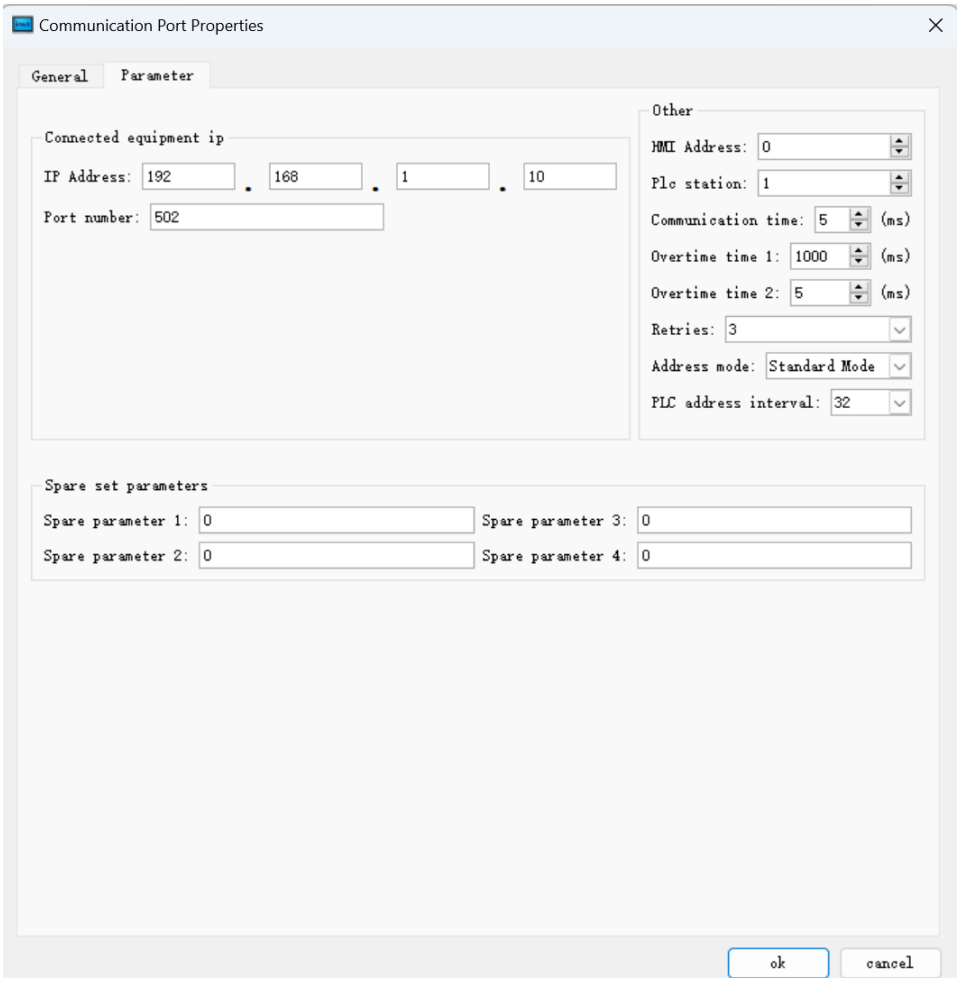
- Baud rate: 1200/2400/4800/9600/19200/38400/57600/115200 / 187.5k
- Data bits: 7/8
- Check: Odd / Even / None
- Stop bits: 1/2
- Model: PLC model
- HMI Address: set the station number of the HMI
- PLC Station: Consistent with the station number set in the PLC
- Communication time: After the HMI sends data to the PLC and receives the data from the PLC, the data can be sent again only after the value of communication time is set.
- Overtime time 1 and Overtime time 2: first calculate the Overtime time 1 divided by the value of the Overtime time 2, such as shown in the figure above, the timeout time is 200ms, if the HMI sends the data after 200ms has not received the data, it is known as a timeout
- Retries: the number of times to resend this data after the timeout period
- Address Mode: ① Standard Mode: one serial port connected to one PLC; ② Extended Mode: one serial

port connected to multiple PLCs of the same type

- PLC address interval: the longest number of words that can be read at one time by the PLC

■ **Ethernet parameter settings**

The Ethernet communication standard mode and extended mode settings are slightly different, please refer to the following steps for specific settings.

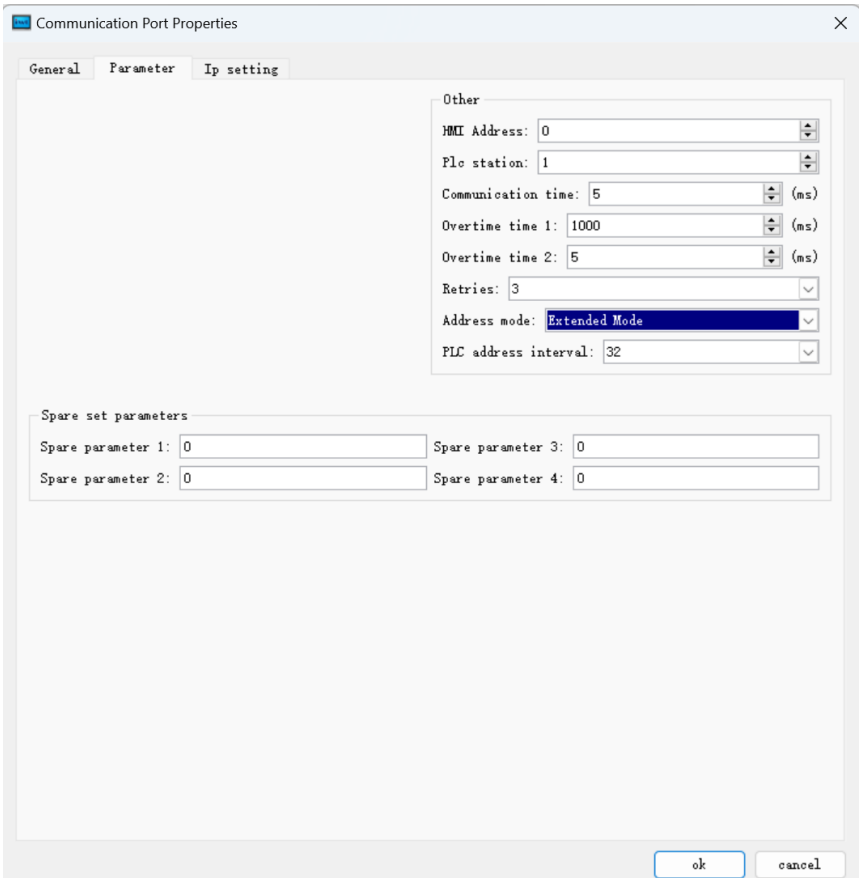


Parameter settings:

- IP Address: Ethernet communication IP setting
- Port number: Ethernet communication port setting
- HMI Address: set the station number of the HMI
- PLC Station: Consistent with the station number set in the PLC
- Communication time: After the HMI sends data to the PLC and receives the data from the PLC, the data can be sent again only after the value of communication time is set.
- Overtime time 1 and Overtime time 2: first calculate the Overtime time 1 divided by the value of the Overtime time 2, such as shown in the figure above, the timeout time is 200ms, if the HMI sends the data after 200ms has not received the data, it is known as a timeout
- Retries: the number of times to resend this data after the timeout period
- Address Mode: ① Standard Mode: one serial port connected to one PLC; ② Extended Mode: one serial

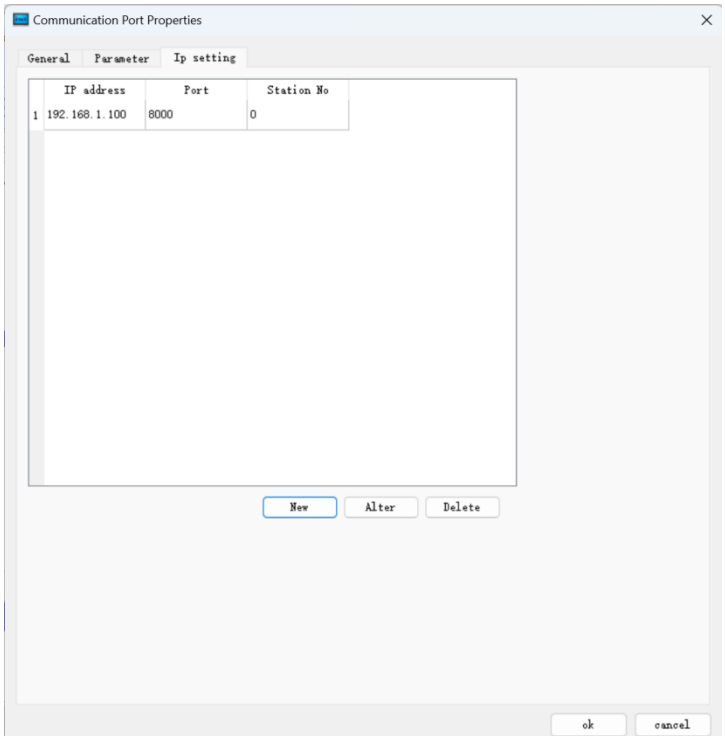
port connected to multiple PLCs of the same type

- PLC address interval: the longest number of words that can be read at one time by the PLC
- Extended Mode: Address Mode Select Extended Mode and the following display appears:



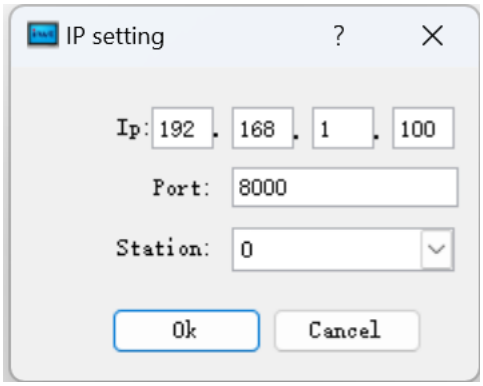
The meanings of the parameters are as above.

IP Setting: Click IP Setting and the following figure appears



- Added: Add IP address
- Modify: Modify added IP settings
- Delete: Delete the existing IP address settings

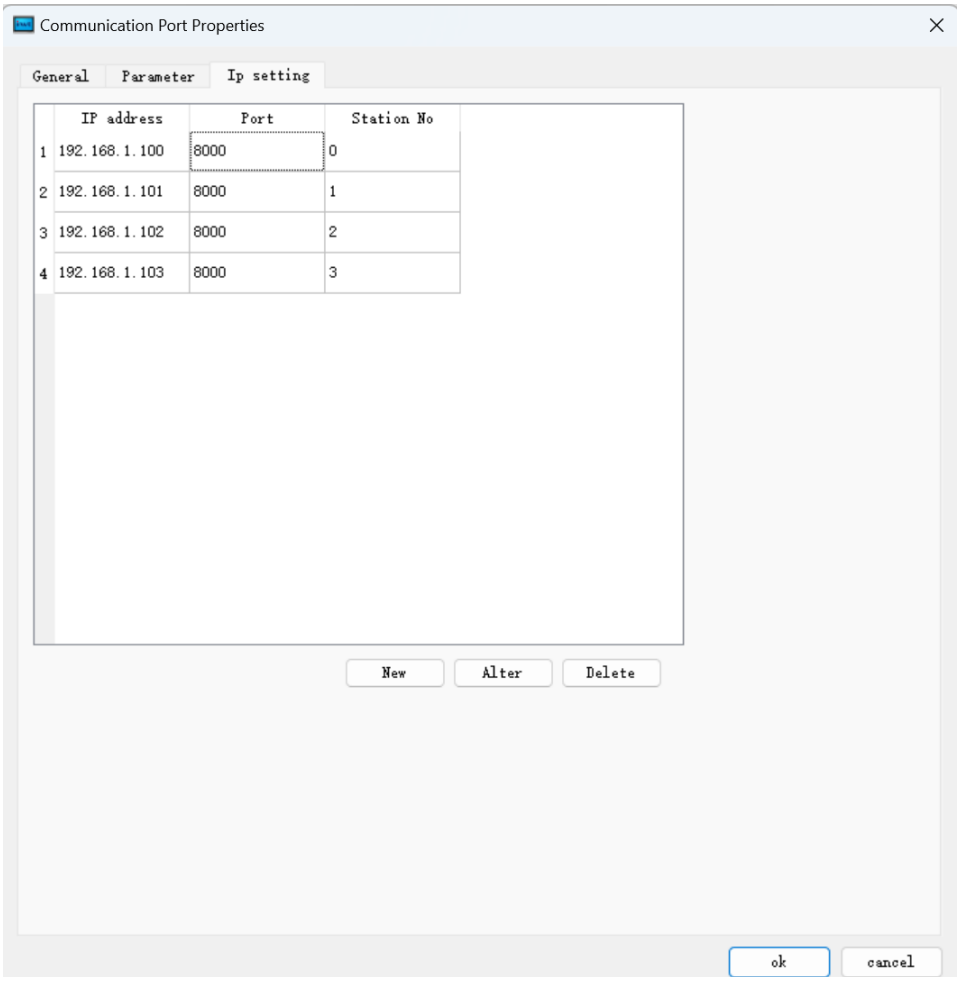
Click the "Add" button and the following figure appears



Set IP address, port number and station number.

Note: The station number is an important basis for distinguishing different IP addresses, and different IP station numbers cannot be repeated.

The following figure appears.



IP setting is completed and used in the same way as COM port expansion mode.

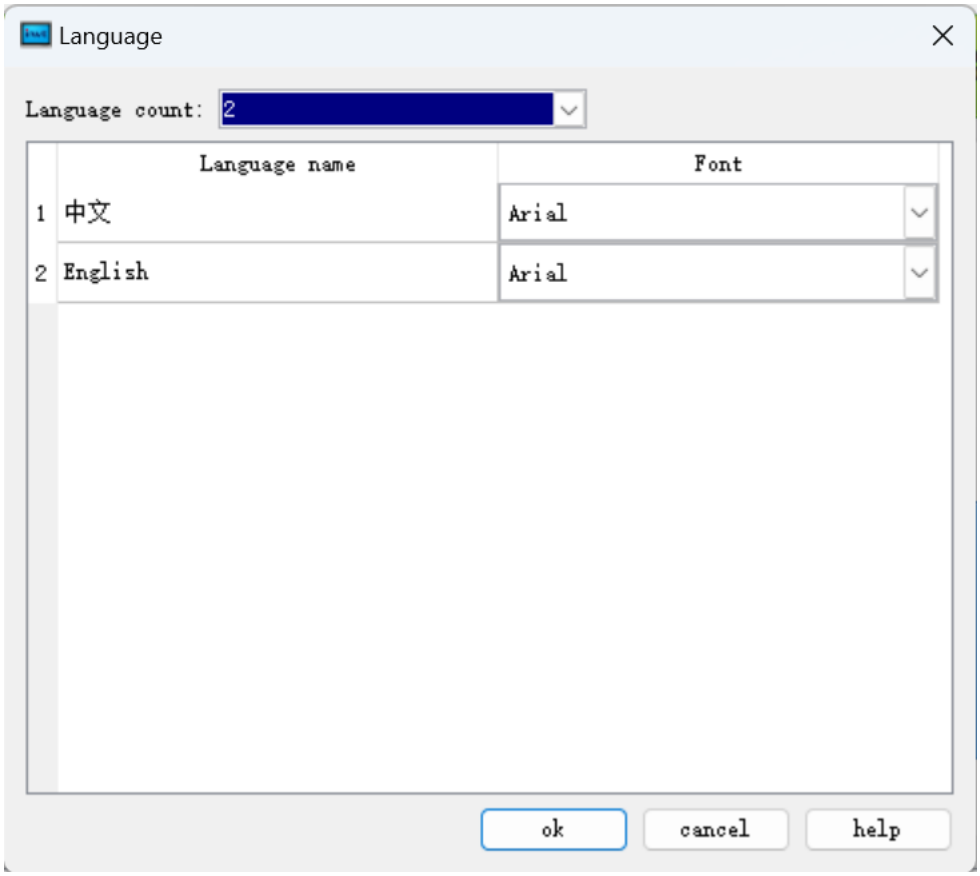
7.2 Setting

Let's come to some settings of HMI. It is also important for project configuration. We can change HMI system settings in a narrative way to achieve the expected effect of users.

7.2.1 Language

Language: This function realizes multiple languages; it is necessary to preserve languages employed in configuration in character library of PC.

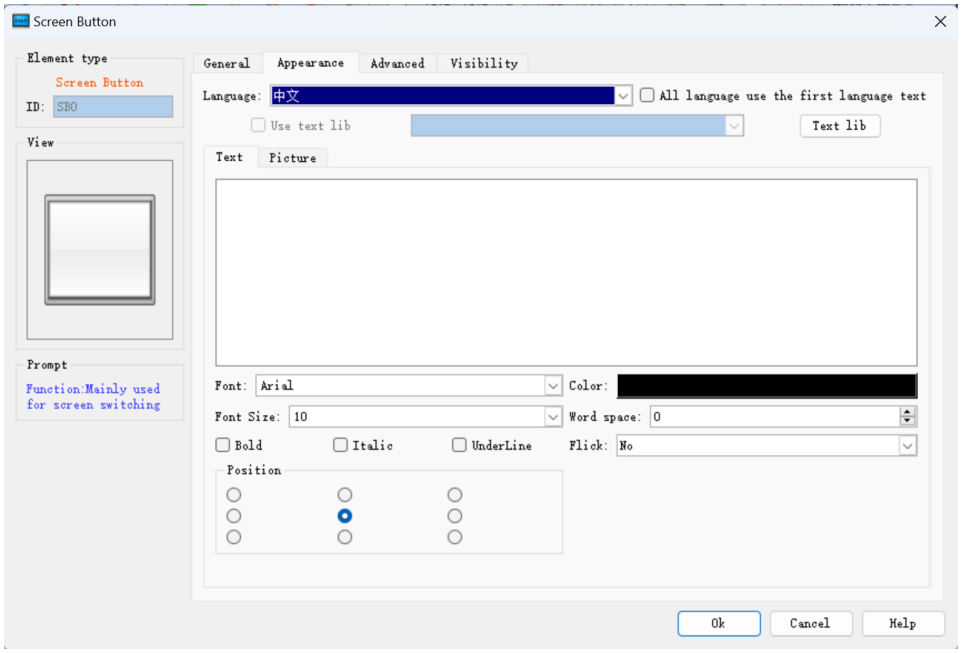
Double click the Language option or right click to open the dialog box of Language Setting.

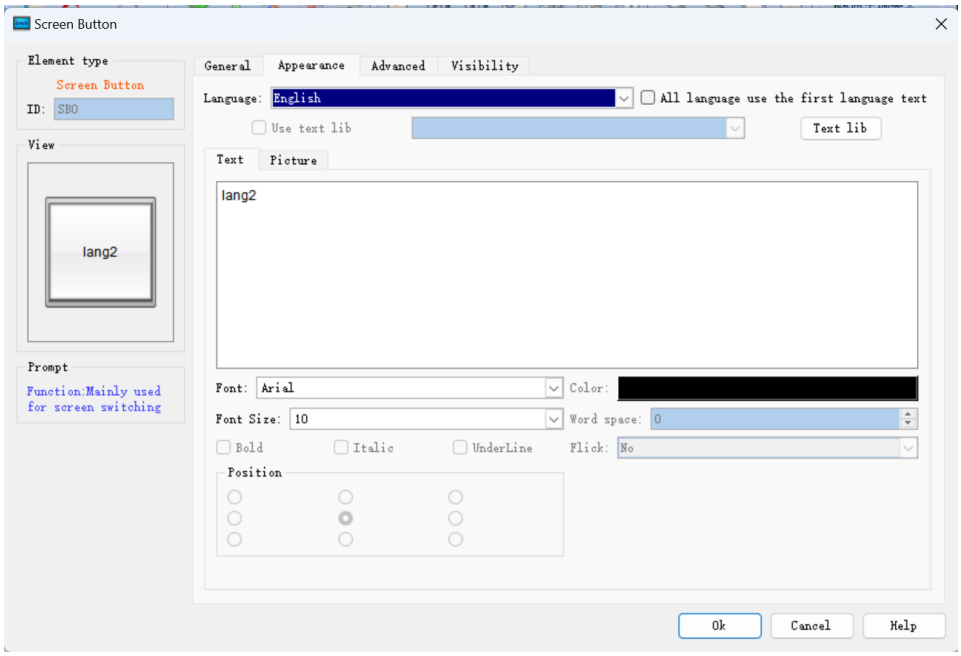


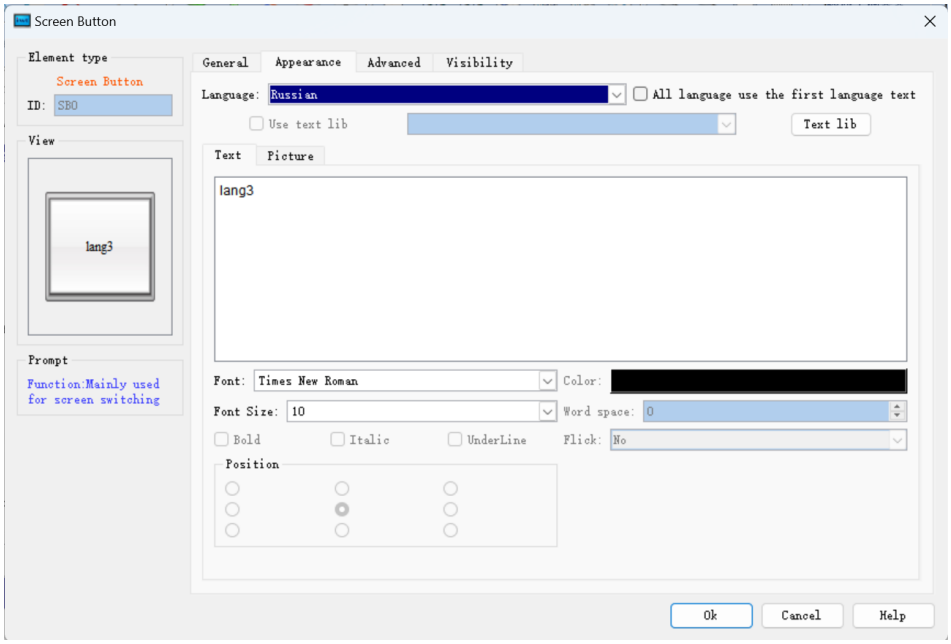
- Language count: Set total number of the system language, at most fifty languages.
- Language name: Set a name for each language.

Example:

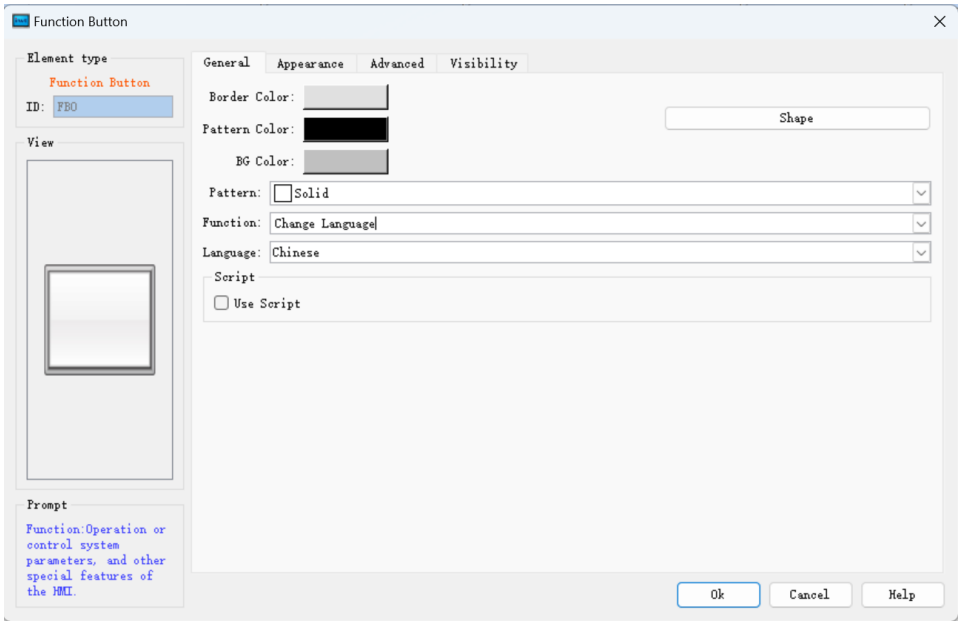
1. As shown above, set the total number of languages to 3, and the language name is by default; create a new text input control, such as Screen button, select Language 1 in the language drop-down box, enter in the text box "lang1", and then set the parameters of font size and color, etc.; select Language 2 in the language drop-down box, then enter "lang2"; select Language 3 in the language drop-down box, then enter in the text box "lang3", as shown below:

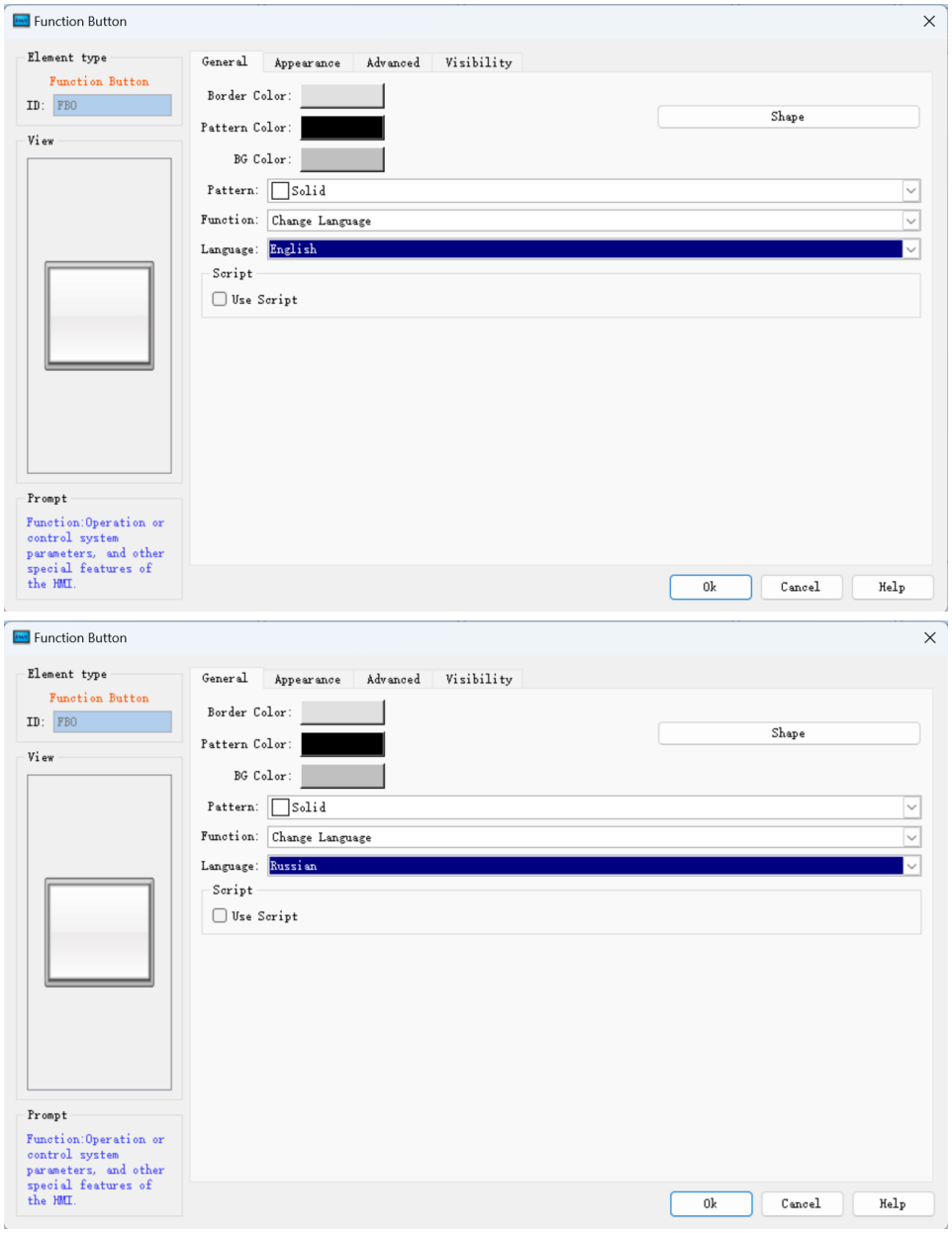

Screen Button
Element type
Screen Button
ID: SBO
View
Prompt
Function:Mainly used for screen switching
General
Appearance
Advanced
Visibility
Language: 中文
All language use the first language text
Use text lib
Text lib
Text
Picture
Font: Arial
Color:
Font Size: 10
Word space: 0
Bold
Italic
UnderLine
Flick: No
Position
Ok
Cancel
Help


Screen Button
Element type
Screen Button
ID: SBO
View
lang2
Prompt
Function:Mainly used for screen switching
General
Appearance
Advanced
Visibility
Language: English
All language use the first language text
Use text lib
Text lib
Text
Picture
lang2
Font: Arial
Color:
Font Size: 10
Word space: 0
Bold
Italic
UnderLine
Flick: No
Position
Ok
Cancel
Help

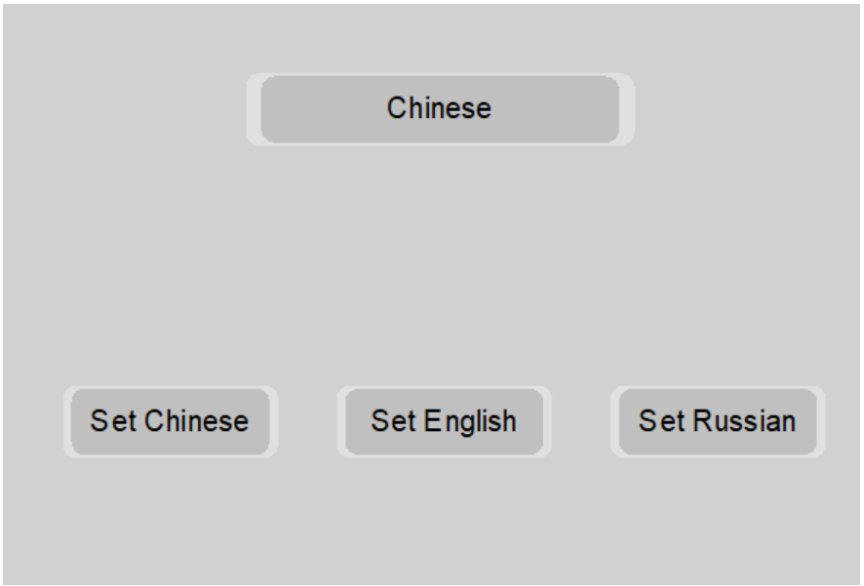


2. Click "OK" after the settings, and then left click on the screen to add this Screen control button when the mouse cursor shows a cross shape; adjust its size. It should note that "Function" options below "General" page of each button are the same: "Switch language"; while options of "Language" are different: Language1, Language2 and Language3, respectively.





3. Save the project after the settings, as shown below:



4. Simulate (or download to HMI)

All controls with text will be presented in the according language when click Function button 1, 2 or 3. As shown below:

The figure above shows the state after clicking Function button 1 to switch the language to Set Chinese

The figure above shows the state after clicking Function button 2 to switch the language to Set English.

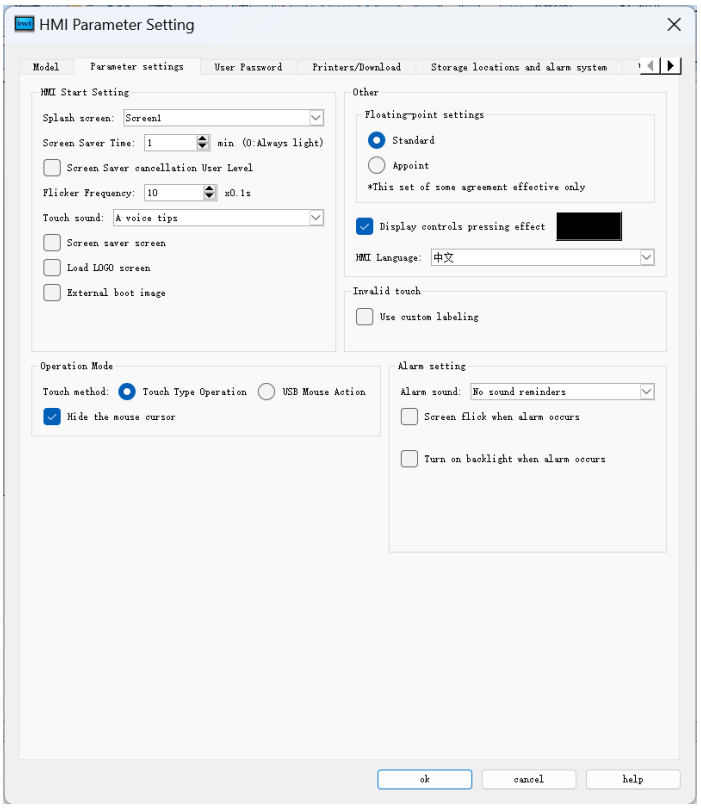
The figure above shows the state after clicking Function button 3 to switch the language to Set Russian.

To achieve the multi-language function in the entire project, it is necessary to input different texts for each control or object with text (same operation with the first point). This enables the entire project to be switched to the specified language when execute the command.

7.2.2 HMI parameter settings

HMI model can be assigned when create a project or be modified during the configuration through HMI parameter settings in the Project Manager.

Double click "HMI Parameter Setting: in the Project Manager, then a dialog box pops up, as shown in figure below:



Parameter Setting:

1. You can modify the parameter settings through Preference Setting in the drop-down menu Settings, or double-click the HMI Parameter Settings in Setting, Project Manager. Then a pop-up dialog box is shown as figure above:

- HMI Model: Change model of HMI
- Display mode: Adjust horizontal or vertical display screen.
- HMI Start Setting

  Splash screen: The start screen of HMI when powered on

  Screen Saver Time: Set screensaver time
- Flicker Frequency: Set the flicker frequency of objects or controls which can blink; you can change the speed of flicker by inputting directly a value and clicking the spin button.
- Alarm sound: When the alarm occurs, the HMI can remind users through sound; the right drop-down menu contains two cases, with or without sound reminder.
- Touch sound: Options in the right drop-down menu can decide Sound reminder or No sound reminder.
- Screensavers screen: Select a screen among the existing screens as screensaver screen; just touch the screen to return the former screen.
- If Load Screen: If choose this option, the HMI will display the selected loading screen after power-on for a certain while, and then switch to the splash screen; thus users can give some tips or notes.
- Screen flicker in case of alarm: switch background colors between that of Alarm control or Alarm Bar and screen background color; flicker frequency is in accordance with the above. This function doesn't work when the background is a picture or the background pattern is transparent.

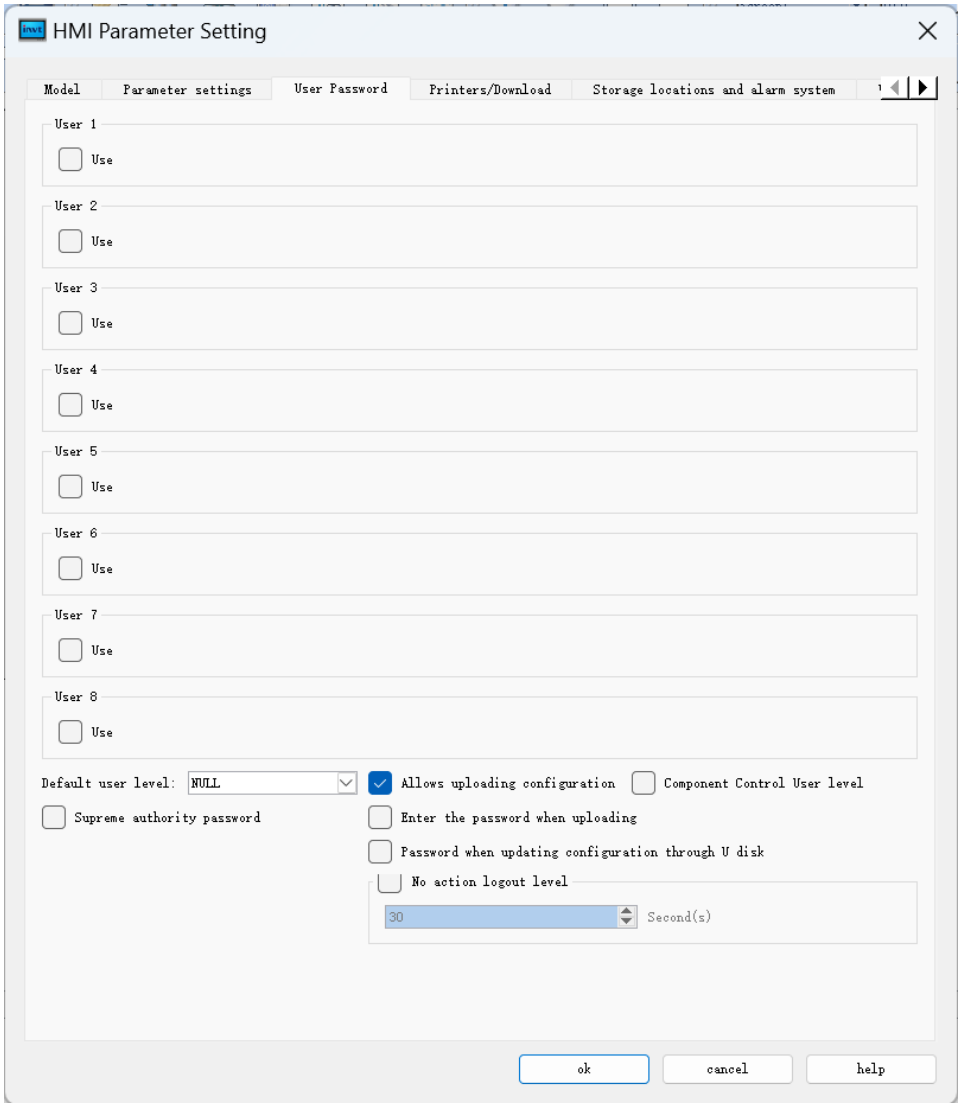
Other settings

- Hide mouse cursor: Whether to display the mouse
- Floating-point settings:

  [Standard]: High byte floating point ahead while the low one behind;

  [Appoint]: users determine the order.
- Invalid touch: Select the "Use custom labeling", which means touchable controls cannot be touched, then the picture marking the control chosen by user is untouchable.
- Operation Mode: Choose one mode between traditional touch operation and USB mouse operation.
- Display controls pressing effect: HMITOOL is newly added pressing effect display. When the pressing effect is applied, rectangular pressing trace will appear if users touch the control. The pressing trace color depends on user's preference. Currently Bit switch, Word switch, Screen button, Function button, Numeric input and ASCII input controls support this effect. The default is no effect.

2. Set user password:

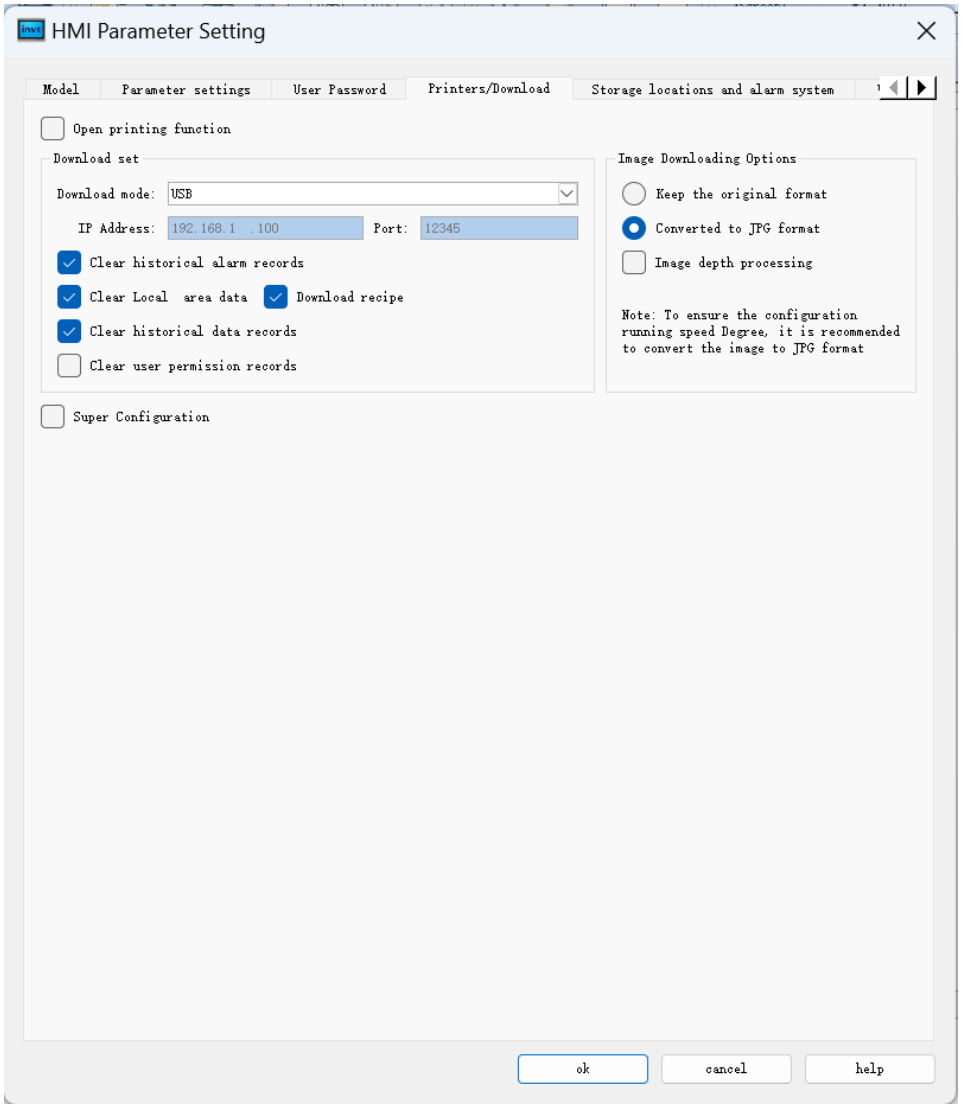


This function supports 8 sets of user password, each of which has eight levels of password for users to choose.

- The default user level: The current default user class is NULL.
- Allow uploading configuration: If select this option, you can upload the project from HMI to PC; otherwise it cannot be uploaded.
- Enter the password when uploading: Whether uploading projects requires a password.
- Password when updating configuration through U disk: The password set up, the password is necessary when you update the HMI configuration projects through U disk.
- Supreme authority password: This password can operate all controls limited by grades.
- Make can upload: Whether this password enables upload configuration projects from HMI to PC.
- Authority: Whether this password can perform all limiting operations.

3. Settings of connection to the printer and downloading

Click "Settings of connection between HMI and printer" button, as shown in figure below:



This page contains parameter settings of connection between the printer and the HMI; users can select corresponding parameters according to printer models.

- Download settings:

Download mode: Users need to select USB or Ethernet connection to download. If choose the Ethernet, it's necessary to set the IP address and port number (IP address and port number are those of the HMI).

Clear historical alarm records: Whether to clear the history alarm information before downloading.

Clear historical data records: Whether to clear the history data information before downloading.

Download recipe: Whether to download recipes in the current project to the HMI.

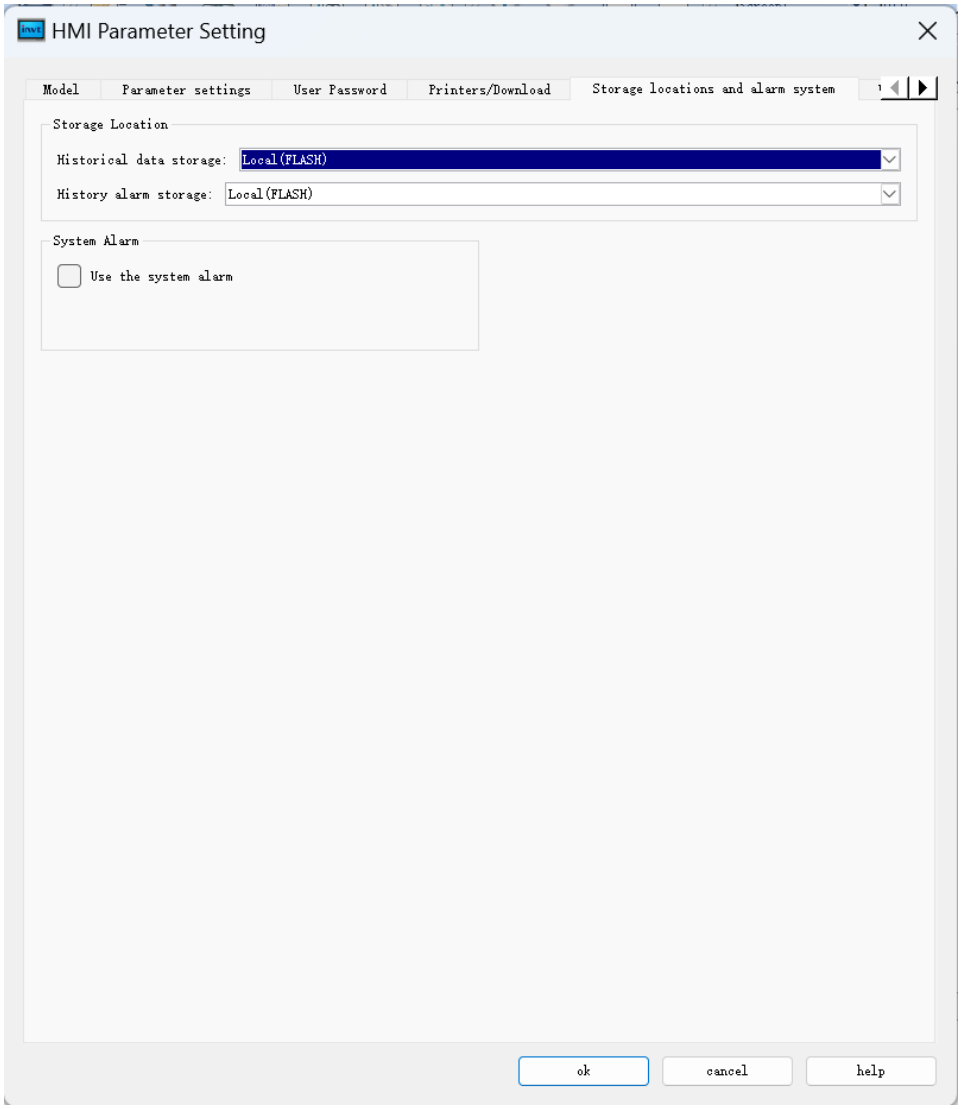
- Image Downloading Options:

Keep the original format: Selecting this option means retain the image format unchanged when downloading.

Convert to JPG format: Convert all images to JPG format before downloading them into HMI.

(Note: Due to the larger space occupied by BMP format images, it's suggested to select this option.)

4. Storage location and alarm system, as shown below



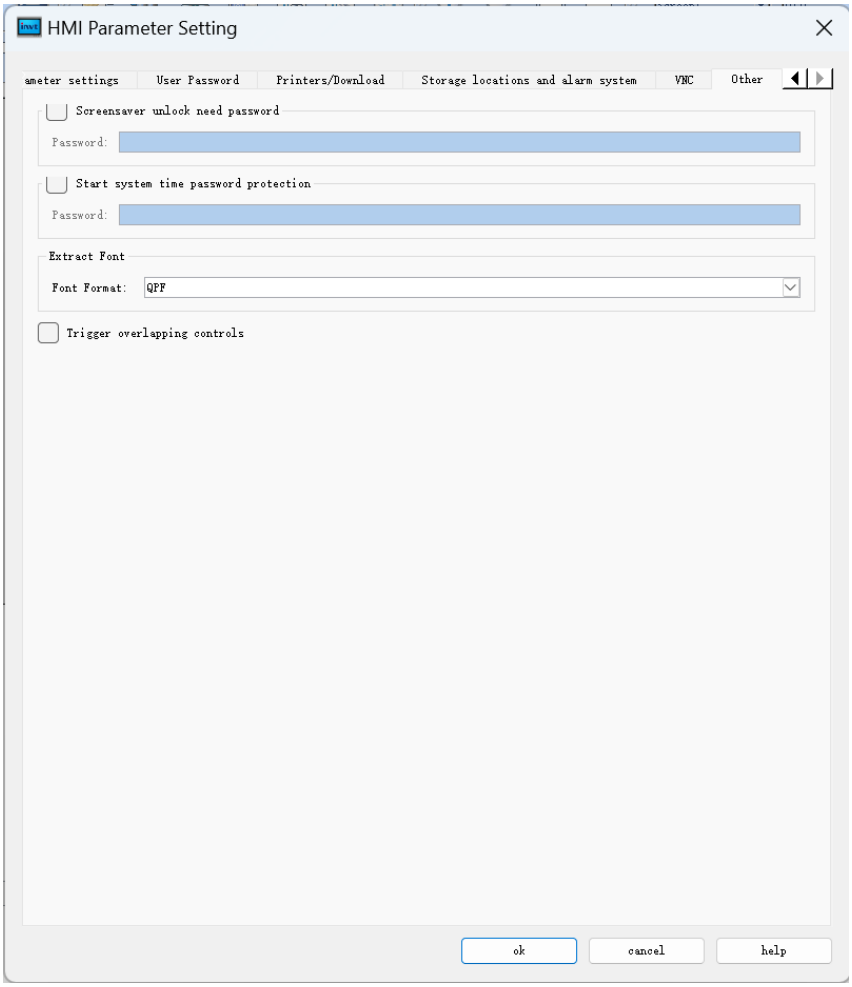
- Storage location: Location for historical data, historical alarm and screen shots. Provide "Local (FLASH)", "U disk" two options for users to choose according to their need. The default is Local (FLASH).
- Alarm system

Use the alarm system: Whether to use the system alarm. When an alarm occurs, the alarm system displays the current alarm information at the top or bottom of each screen according to the options set by users.

Alarm background color, Text color, Font and Font size, these are attributes options of the alarm display system. Users can set these options as needed.

- Way of display: "Always display" refers to the alarm displayed all the time; "Cyclic display" means that alarm display or disappear within a certain period to achieve the flicker effect.
- Position of alarm bar: Choose the position where the alarm bar appears.

Other, as shown below



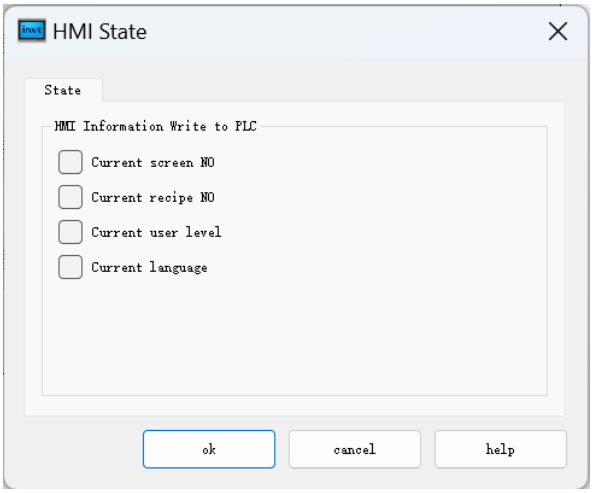
Use the Screensaver unlock password, when unlocking screensaver, you need to input the correct password as the edit.

Note: Change of the screen saver time is not valid until "Screensaver screen" is chosen; just touch the screen of screensaver to return to the former screen.

7.2.3 HMI state

HMI state setting is employed to write the current HMI state information to the data register of PLC.

Double click the "HMI State" item in the Project Manager, a dialog box will pop up as shown in figure below:



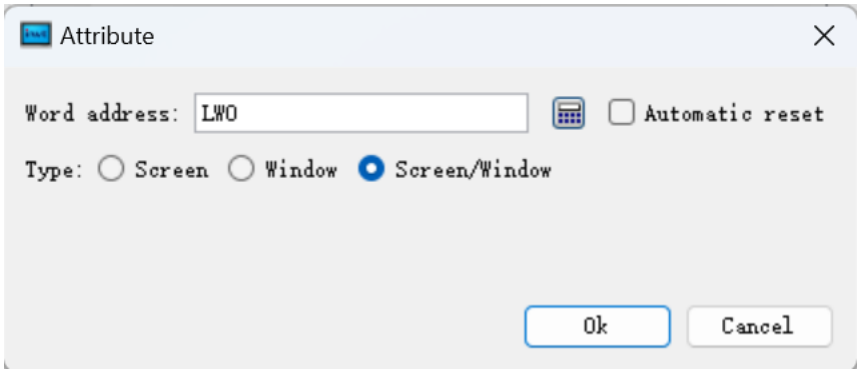
- Current screen NO: Write the serial number of the current HMI screen to the PLC.
- Current recipe NO: When the serial number of the current recipe to the PLC.
- Current user level: Write the current user level to the PLC.
- Current language: Write the serial number of the currently applied language to the PLC

Click "OK" HMI to complete the settings.

7.2.4 PLC control

PLC control means realizing operations of screen switching, change user level, change recipe and write recipe through PLC. Double click "PLC Control" in the "Project Manager", the dialog box shown in figure below will pop up:

- Change recipe: HMI changes the recipe according to its address value.
- Write recipe: HMI controls the write of the recipe based on its address value.
- Current user level: HMI controls the current user level according to this address value.
- Screen switch through Word address: Control screen switch through the word address. HMI switches the screen according to this word address value; if the address value is n, it jumps to the nth screen.
- Screen switch through Word address: Double click the "New" line; a pop-up dialog box will appear as shown in figure below:



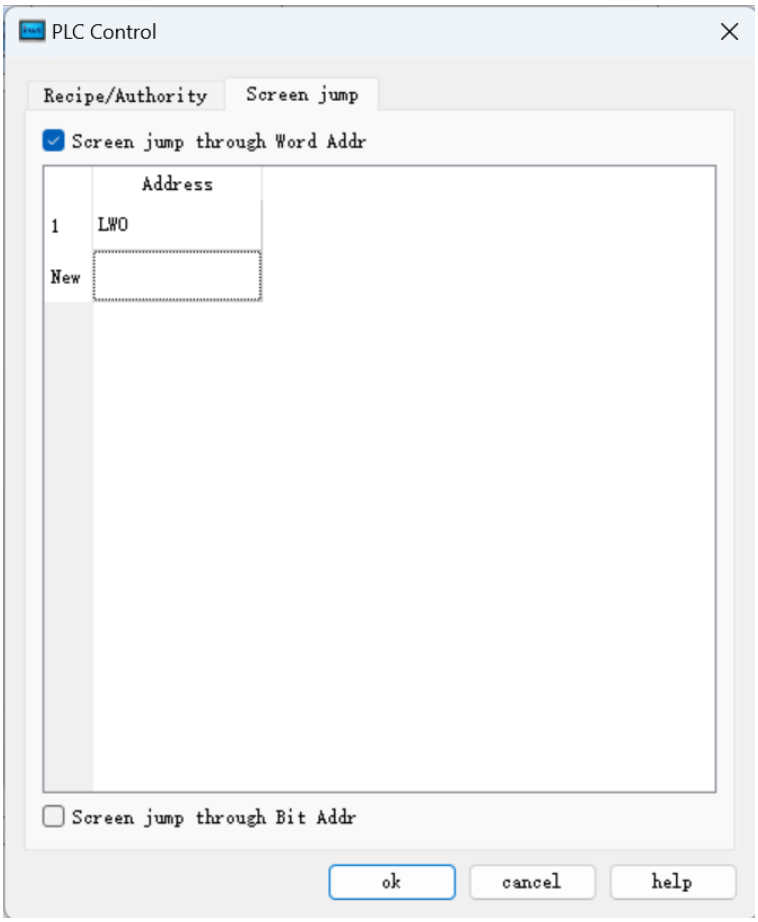
- Word Address: Set the word address. It will be adjusted to the corresponding screen according to the value of this word address. If the value does not exist in the current screen serial number, the screen stays at the current screen.
- Automatic Reset: After checking this option, the reset bit will be set to 0xffff automatically after the screen jumps, users can judge whether to check this option or not according to their needs.

- Type: The specific execution method of the control screen jump.

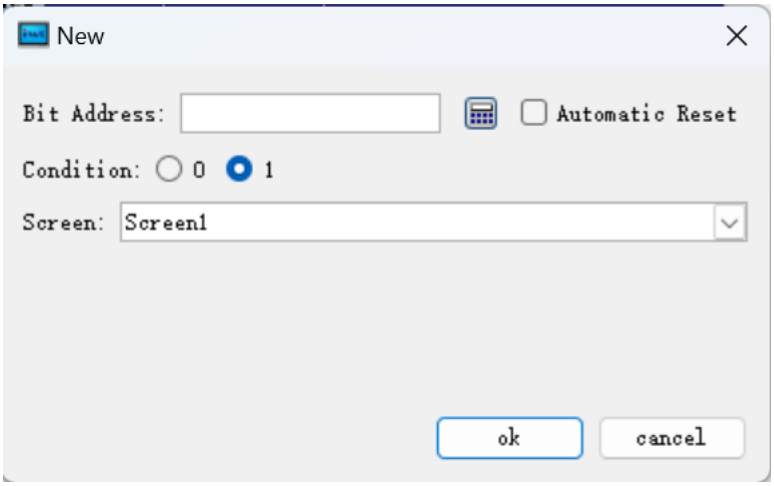
  Screen: PLC word control can only jump between pictures

  Windows: PLC word control can only jump between windows

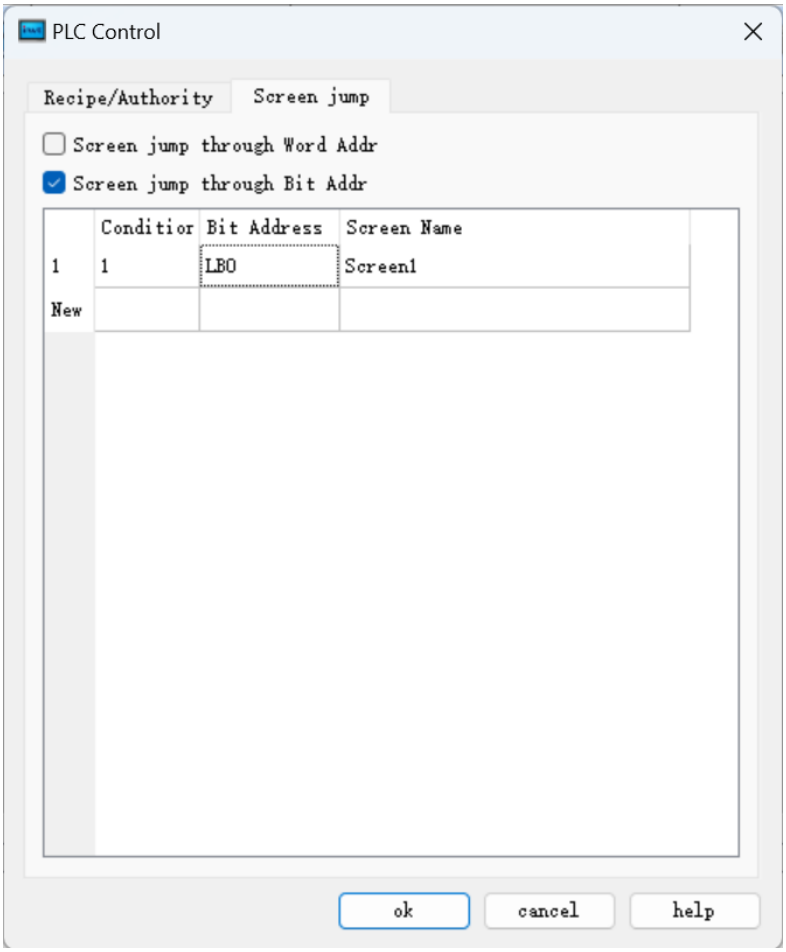
  Screen / window: PLC character control jumps between picture and window



Bit control screen switching: Double click the "New" line, the following dialog box will pop up:



Input the "Bit Address", select the "conditions" to be met and the screen to be jumped to, and click "OK" to add the contents of a bit control screen. The following figure shows the contents of a bit control screen:



Similarly, numerous bit control screens can be created, and the sequence of switching bit control screens is executed according to the number. Right-clicking on each bit control information brings up a right-click menu for users to "New", "Edit" and "Delete".

As shown in the above figure: its function is: when the value of bit address LB0 is equal to 1, jump to screen 1.

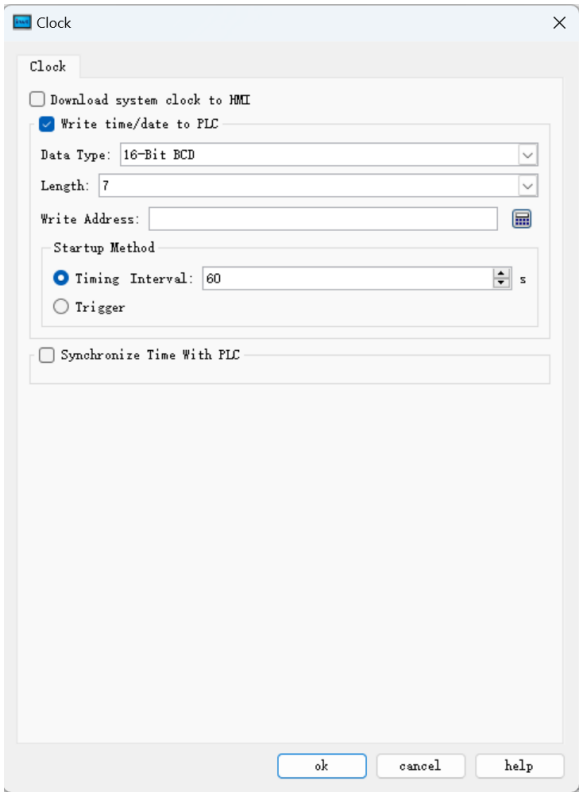
Click the "OK" button, the PLC control is set.

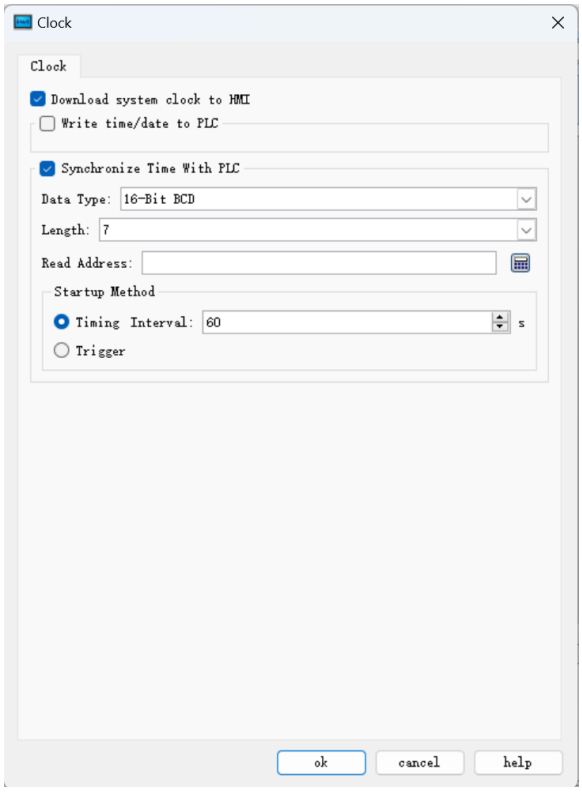
Note: When switch screens through PLC, the value read for the first time does not affect the screen switching. It functions only when the value of PLC register is different from the first read value.

7.2.5 Clock

Clock setting includes three functions: downloading system time to HMI, writing time to PLC and synchronization with PLC.

Double click "Clock" in the Project Manager to open the attribute setting box of Clock.





Download system clock to HMI: Whether to download the system clock information to HMI.

Write time/date to PLC:

- ✧ The Data type and Length are default values.
- ✧ Time: Year-Month-Day-Hour-Minute-Second-Week. Refer to LW 60000 – LW 60006 in Register Address for detailed information. It cannot modify the week in the system time.

Write address: The system time information will be written into this PLC address.

Startup Method:

- ✧ Timing: Write the system time information into the specified PLC address periodically at specified time internal.
- ✧ Trigger: The system time information will be written into the specified PLC address when the trigger address is 1.
- ✧ Auto Reset: Reset automatically the trigger address to 0 when it is 1.

Synchronization with PLC time:

- ✧ The Data type and Length are default values.
- ✧ Time: Year-Month-Day-Hour-Minute-Second-Week. Refer to LW 60000 – LW 60006 in Register Address for detailed information. It cannot modify the Week in the system time.
- ✧ Read address: The information in the PLC address will be read.

Startup Method:

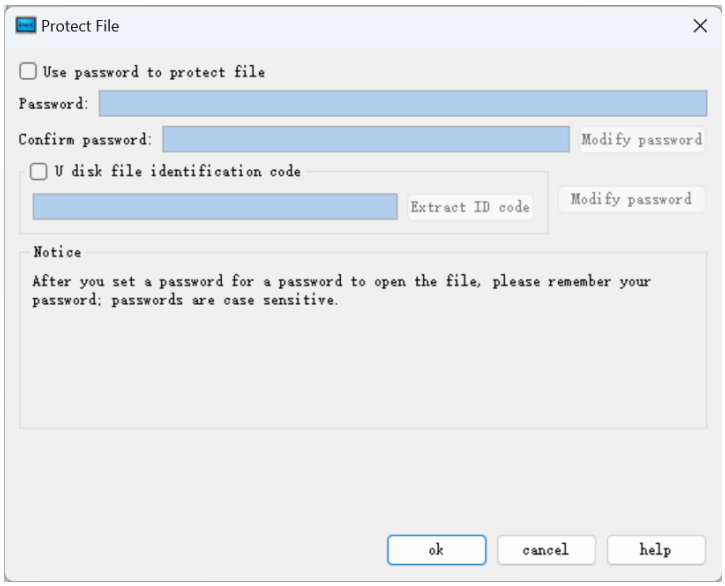
- ✧ Timing: Write the system time information into the specified PLC address periodically at specified time internal.
- ✧ Trigger: The system time information will be synchronized with the PLC when the trigger address is 1.

Auto Reset: Reset automatically the trigger address to 0 when it is 1.

7.2.6 File encryption

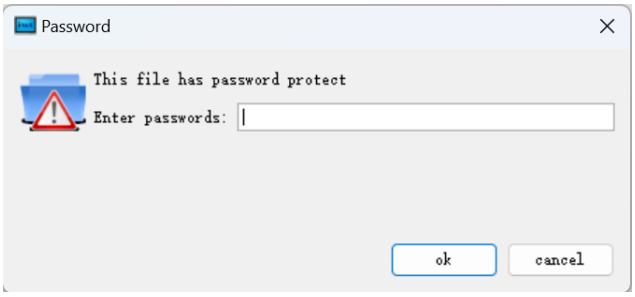
It means whether a password is necessary to open the project file.

Double click the "File Encryption" option in the "Project Manager", as shown in figure below pop-up dialog box:



Select the "Use password to protect file" in the above dialog box; enter in the Password and Confirm Password; click "OK" to complete.

In this case, if user reopens the project, a password input box will be displayed as shown in figure below:

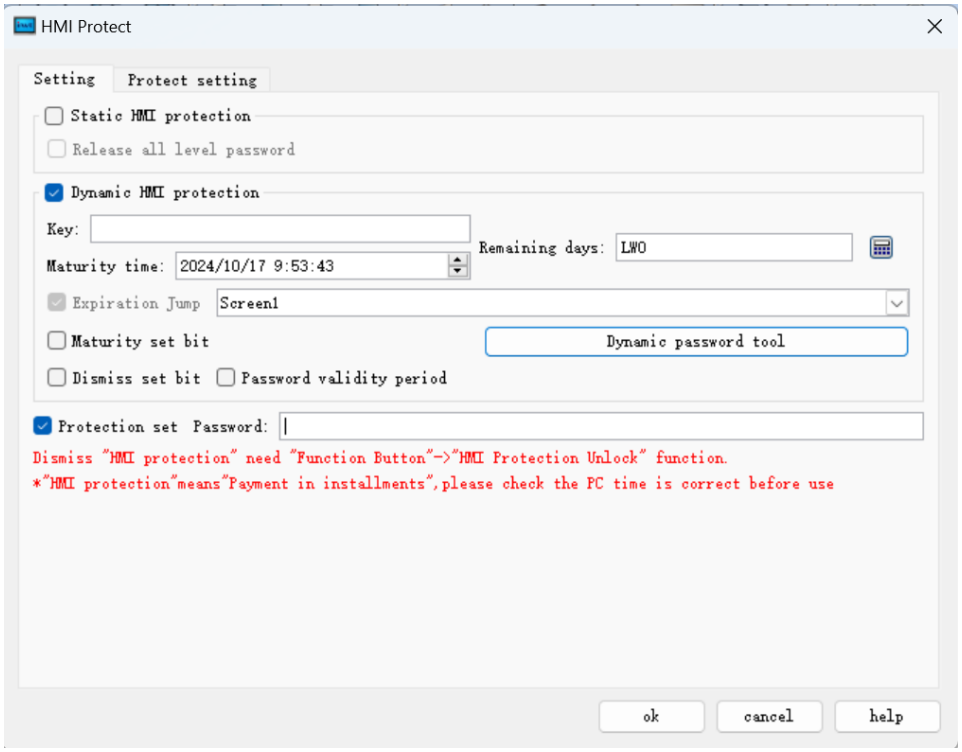


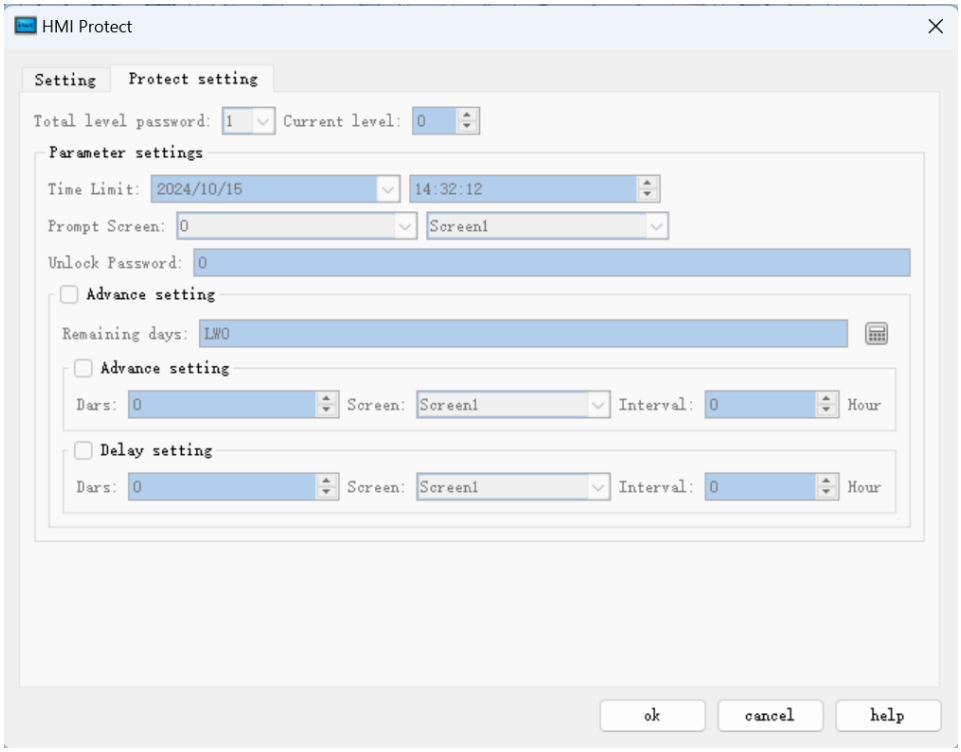
Users need to input secret to open project.

7.2.7 HMI protect

HMI protection is mainly employed to set a certain period of time during which HMI can functions normally. If the time is beyond the set period, HMI will jump to a specify screen where a password is necessary to re-use the HMI.

Double click the "HMI protection" option in the "Project Manager" to pop up dialog box shown in figure below:





Example to illustrate the application of this function:

Select "Password to unlock": A password is required to enter the HMI protection the next time.

Select "Release all level pass": If input this password when unlocking HMI protect, it would release all the HMI protect level.

Select "HMI Protect": automatically go to "Protect setting" page, as shown below:

- Protection Settings:
  - ✧ Total Level Password: Set HMI protection for different periods of time as needed, up to 15 levels.
  - ✧ Current level: Set the following parameters for the current password level.
- Parameter Settings:
  - ✧ Term of use: HMI protection expiry date
  - ✧ Deadline prompt screen: prompt screen when HMI protection expires
  - ✧ Unprotect password: the password that is unprotected by HMI when it expires
- Advanced Settings:

  View the remaining days: see the remaining days that are now up to the HMI protection set lifetime
- In advance:

  Set the distance between the remaining set days of HMI protection service life and the HMI protection service life
- Delay:

  After setting the HMI protection service life to set the number of days, the interval specified time prompts the specified screen

Advance and delay priorities

- Advance selection, delayed selection, effective in advance
- No selection in advance, delay selection, delay effective
- Advance selection, delay selection, function button HMI protection delay unlock is not used, it is effective in advance
- Advance selection, delay selection, function button HMI protection delay unlock, delay effective

Then illustrate the function of the method of use:

Suppose the total number of password levels we set in this dialog is 3; After that, select 0 in "current password level". In "parameter setting", select the date of use in the "usage period" column. Suppose to select 2009/04/01 here. Enter the usage time in the next column, assuming the option is 12:00:00;Select the screen when the deadline arrives in the "deadline prompt screen" option, assuming that it is screen 1;Enter the password needed to unprotect the password when "unprotect password", assuming 1111.Level 1 HMI protection setup completed.

Again, at the level of the "current password" selected 1, inside the "parameter setting", in the "service life" column choose to use date, suppose in the choose the 2009-04-05;Enter the usage time in the next column, and suppose to select 12-00-00;Select the screen when the deadline arrives in the "deadline prompt screen" option, assuming that it is screen 2;Enter the password needed to unprotect the password when "unprotect password". Suppose it is 2222.Level 2 HMI protection setup completed.

Again, at the level of the "current password" selected 2, inside the "parameter setting", the "service life" column choose to use date, suppose in the choose the 2009-04-10;Enter the usage time in the next column, and suppose to select 12-00-00;Select the screen of time limit prompt screen in the option of "deadline prompt screen", and suppose it is picture 3.Enter the secret required to unlock the password protection when "unprotect password", assuming 3333.Level 3 HMI protection setup completed.

3 HMI protection Settings after click "ok" button.

Suppose today's date is 2009-04-01, the time is 08-00-00, because the use period of level 1 HMI protection set before this time is 12-00-00 of 2009-04-01. Since the deadline has not arrived, this HMI can still be used normally. Suppose after 4 hours, the time is 12-00-00 of 2009-04-01. At this time, HMI will automatically jump to the screen set by the user for this period. The user wants to continue to use the HMI, to HMI to can operate on other images, the user can in the picture (picture 1) add a function button and select "remove HMI lock" function in the button, when the level 1 HMI protection using the time to use, click the function button, and input the password in the pop-up box input level 1 password protection solution, in this input 1111 can remove password protection.

When level 1 HMI password is unblocked, HMI can be used normally. Hypothesis for a period of time, the time is 12 2009-04-05-00-00, because now it's time to set the level 2 HMI protection, so the HMI automatically adjust to the HMI set protection screen (picture 2), by the same token, the user need to use the function button and select the "cancel the HMI lock" function button function, input level 2 password protection (2222), HMI can normal use.

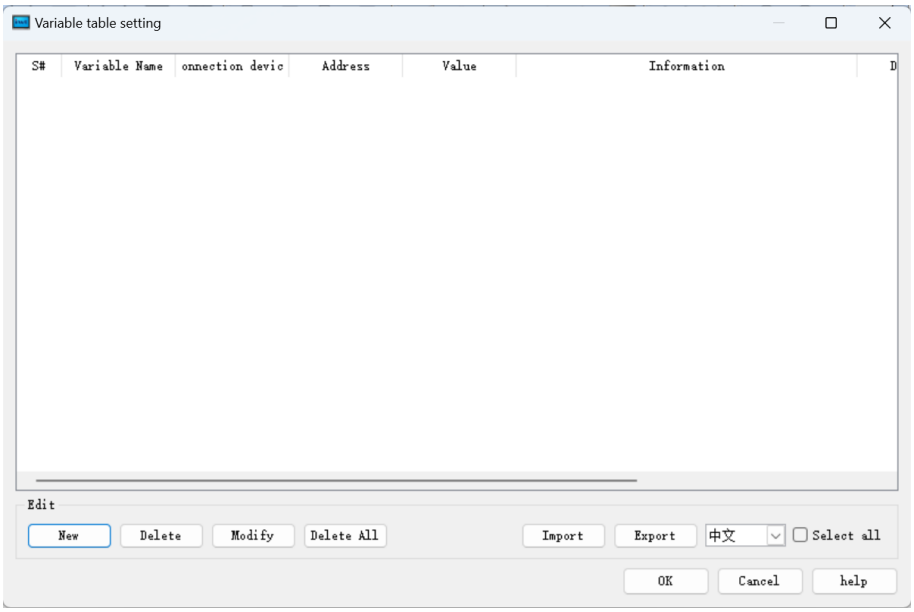
Because we set level 3 HMI protection here, similarly, when the time is 12-00-00 of 2009-04-10, the user needs to use the function button and select the "unlocking HMI" function in the function button. Enter the level 3 unlocking protection password (3333), and HMI can be used normally.

HMI protection fails when all level 3 passwords are unblocked. HMI can be used normally.

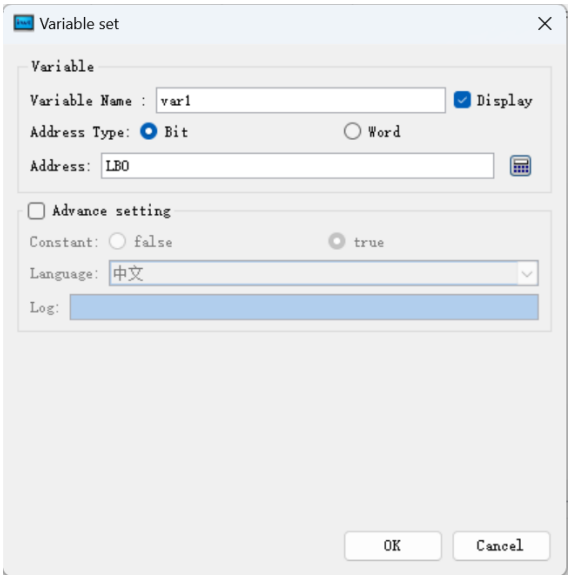
The above examples illustrate the use of HMI protection function. For setting different password levels, the operation is similar. Users can refer to the above.

7.2.8 Variable table

Define a tag with an address. When the tag is employed, it corresponds to the corresponding address. To configure the variable settings, double click the "variable table" option in the "Project Manager", then a dialog box will pop up as shown in figure below:



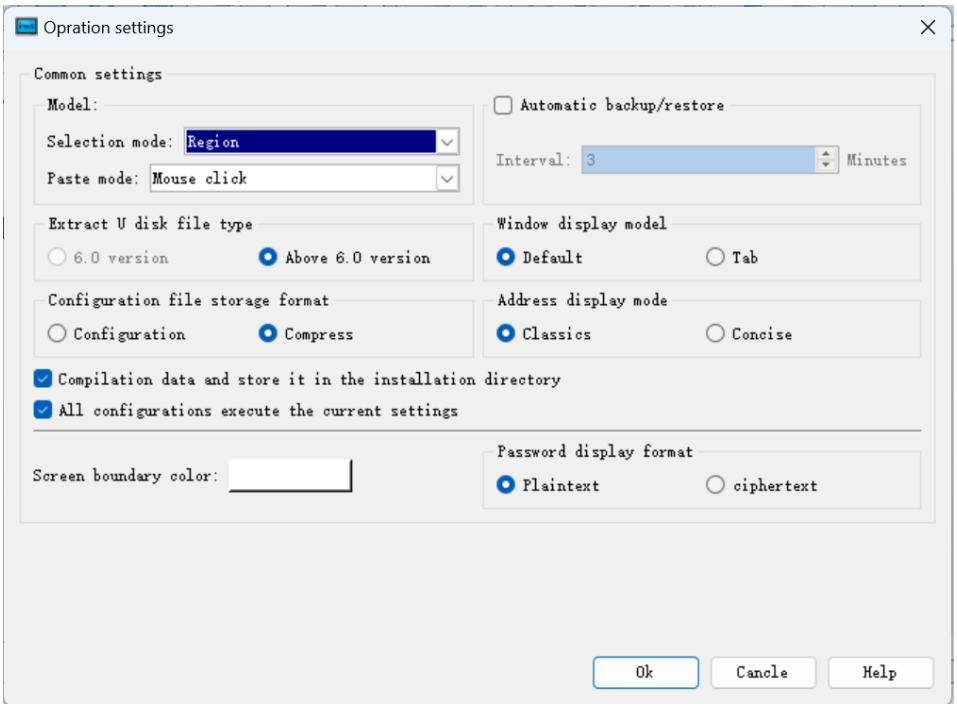
- New: Add a new tag; the maximum total number is 1000
- Delete: Delete the selected tag.
- Modify: Modify the selected tag or double click the selected tag.
- Delete all: Delete all variable tags.
- Import: pop up an open file dialog, import variable table file.
- Export : pop up a save as dialog, Export current variable table.



- Variable name: Set the name of the newly created variable.
- Address type: Select the data type of the address.
- Address: Select the address of the connection.

7.2.9 Operation settings

Configuration operation settings:



1. Select a model

- Regional choice: when the mouse choose regional section contains selected area can be selected to the control
- Controls selection: when the mouse choose region completely contains selected control can be selected to the control

2. Paste mode

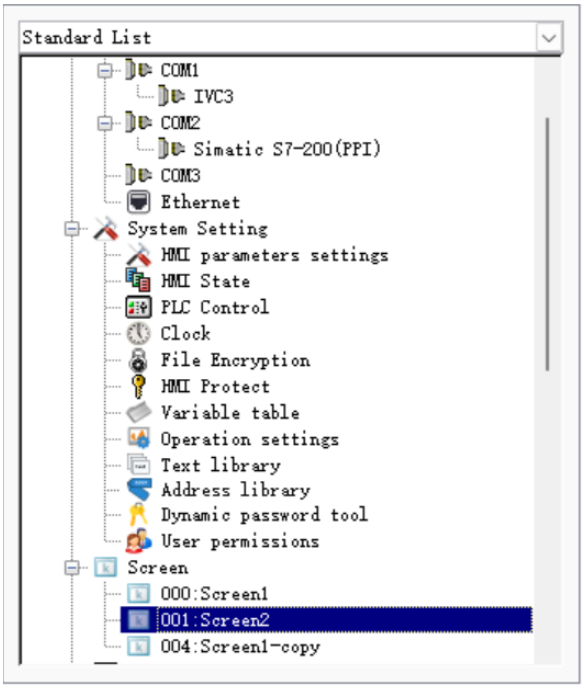
- Mouse click paste: copy control, click paste the user to choose paste placed control
- Same position paste: copy control, click paste, paste controls in place to be copied controls peripheral location

3. Extract U disk file type

- Version 6. 0: generate version 6.0 U disk file
- Higher than version 6.0: generate higher than version 6.0 U disk file

7.3 Screen

Create a new screen as shown in figure below:



Right click the "Screen" in the Project Manager, and then select "Add Screen" to create a new one. In the pop-up dialog box, set the properties such as "Screen Name"; click "OK".

Two ways to open other screens: double click the screen name in the "Project Manager"; right click the screen name and select "Open" in the pop-up menu.

Delete: Delete the screen by right clicking the screen name and selecting "Delete" in the pop-up menu.

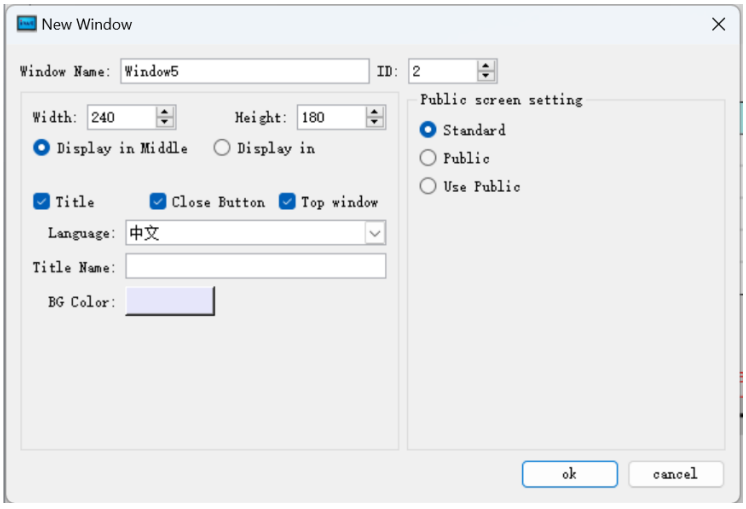
Property: Right click the screen name, and select "Property" in the pop-up menu; or, the select "Screen Properties" in the menu bar.

Copy: Right click the screen name, and select "Copy" in the pop-up menu to copy; set the new screen name and click "OK" to complete.

7.4 Window

Way to add a new window is similar to that to create a new screen. Refer to screen operations for the open, delete, copy or properties of window. The Properties dialog box of the window is shown in figure below.

Open a window in screen, and a window will display in the screen.



- Height, Width: Set the height and width of the window respectively.
- Display in Middle: When the window pops up, it is displayed in the center of the HMI.
- Display in: Set the X-coordinate and Y-coordinate point on which to display the window. The origin of coordinates is the top left corner of the HMI screen.
- Title: Enter the title name that will pop up as a title bar with the window.
- Close Button: Whether the window has a close button.
- Top window: Whether lock other screen and window when this window opening.
- Background Color: Set the background color of the window.
- Standard: Not as a public window, and not use public window.
- Public: show the window's all objects on the windows that select "use public".
- Use Public: The window can show the "Public" window's all objects and controls.

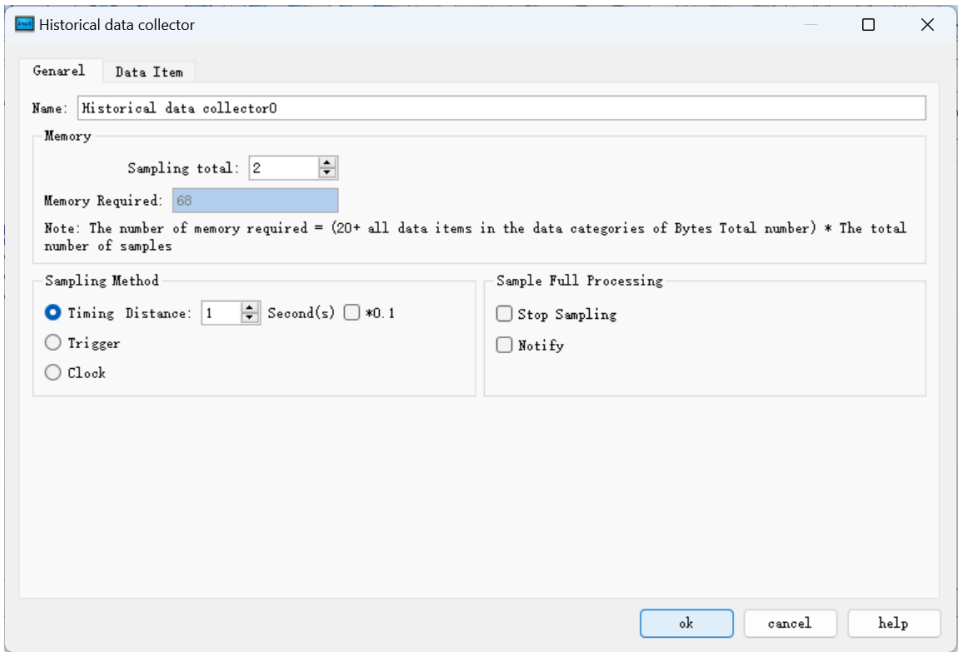
7.5 Historical data collector

The Historical Data Collector functions in conjunction with the Historical Data Display on the toolbar. The former is mainly applied for parameter settings while the later is mainly to display the historical data.

Create a historical data collector by right clicking "Historical Data Collector" and select "New Historical Data Collector" in the pop-up menu.

Note: HMITOOL newly supports multiple sets of historical data; up to four historical data collectors can be built. You cannot create more than four sets; otherwise an error dialog box will pop up.

Double click "Historical Data Collector 0" in "Project Manager" to open a dialog box as shown in figure below:



- Name: Set the name displayed in the Project Manager.
- Sampling length: Number of data to be read each time from the memory.
- Total number of samples: Times of extracting data.

Note:

The memory required = (20 + total bytes of data types occupied by all data items) * total number of samples.

"20" refers to the bytes occupied by time and date;

"Total bytes of data types occupied by all data items" refers to the sum of the data types selected for each item on the Data Items page.

For example:

a. if the data type of each item is "16-bit positive integer", then "total bytes of data types occupied by all data items " = 2 +2 +2 +2 +2; that "all data items (20 + 10) * 2, which is equal to 60; the bytes number of "16-bit data " is 2 while "32-bit data occupies 4 bytes.

b. If the data type selected for "LH1" and "LH3" is "32-bit positive integer" (when the data type selected for "LH1" and "LH3" is "32-bit positive integer", the address of the "Data item" displays as LH0, LH1, LH3, LH5, LH6), then "the total number of bytes occupied by all data items" = 2 + 4 + 4 + 2 + 2= 14; then the required memory = (20 + 14) * 2= 68.

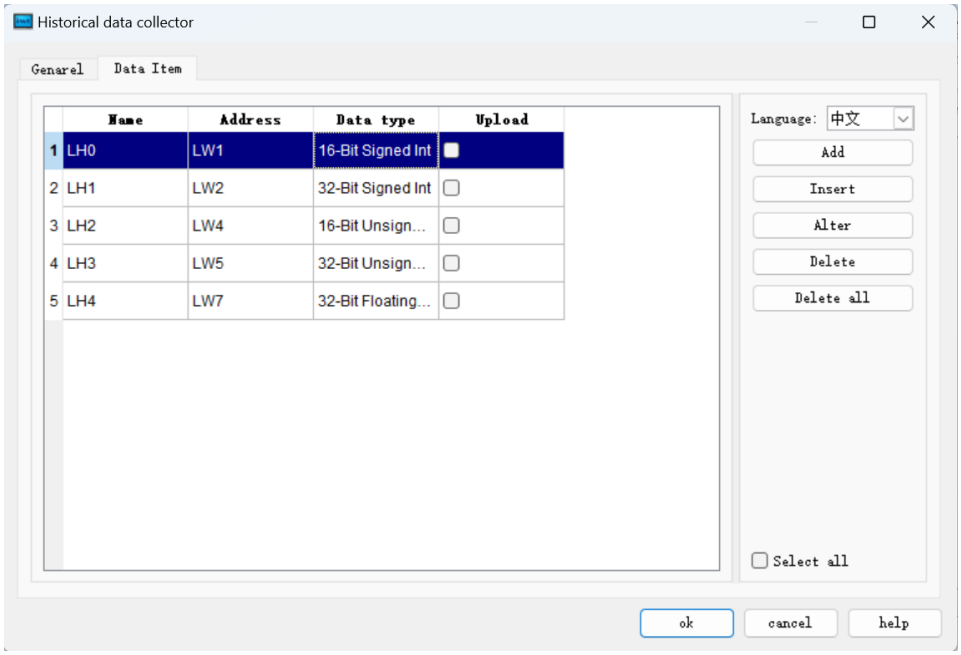
Read Address: Start address to read data (Refer to Data Item for detailed information)

Sampling method:

- Timing: Read data at set interval.
- Trigger: Read data when the value of the trigger address is 1.
- Clock: Start reading data at a user-set time interval.

- Full sampling disposal manner: Disposal when the data sampling reaches the maximum total number
- Stop sampling: Stop data sampling in case of full sampling; if this option is not selected, the new read data will replace the oldest one.
- Notify: Inform an address whose value is 1 when the sampling number reaches the maximum.

Click the "Data Item" tab, set the page properties, as shown in figure below;



If multi-language is selected, it is necessary to set names for each language when adding new data items;

otherwise it cannot add new items.

In HMITOOL, the address of each group of historical data can be set discrete, according to the actual situation of LW register, for example: S1 is LW1, S2 is LW89, S3 is LW8905.

	Name	Address	Data type
1	S1	LW1	16-Bit Signed Int
2	S2	LW89	16-Bit Unsign...
3	S3	LW8905	16-Bit Unsign...

Click on any item in the list box to set the properties.

An example in detail: Set the read address to LW1 on the General page, the register address is set consecutively and the sampling length is 5; click the Data Item tab and add 5 columns of data (LH0-LH4) in the list. Select each to set the properties such as name, address, data type, total digits decimal places and whether to scale.

Assuming that the names, data type and scaling of LH0-LH4 are set as shown in figure below; other attributes are default values:

- LH0-16 bit Positive integer, Scaling, with a gain of 3 and an offset of 2
- LH1-32 bit positive integer, Scaling, with a gain of 2 and an offset of 1
- LH2-16-bit integer, Scaling is not selected
- LH3-32-bit integers, Scaling is not selected
- LH4-Floating point, Scaling, with a gain of 4 and an offset of 5

After the settings, since the sample length is 5 (set in General page), it reads out 5 address values consecutively starting with "Read Address". Addresses are read according to the data type of each item.

If select 16-bit data, the extracted address is continuous. If 32-bit data is selected, the fetched addresses are separated. If the scaling function is selected, the final read value is equal to the value of read address multiplied by the gain plus the offset.

Note:

Set up each data type and whether to scale; the addresses to be read are as follows:

- LH0-LW1 (16-bit data, read address + 1) Final value of LH0 = Address value of LW1 × 3 + 2
- LH1-LW2 (32-bit data, read address +2) Final value of LH1 = Address value of LW2 × 2 + 1
- LH2-LW4 (16-bit data, read address +1) Final value of LH2 = Address value of LW4
- LH3-LW5 (32-bit data, read address +2) Final value of LH3 = Address value of LW5
- LH4-LW7 (32-bit data, read address +2) Final value of LH4 = Address value of LW7 × 4 + 5

After settings, click "OK". Click "Historical data display" icon on the toolbar; set the row number to 5 in the pop-up dialog box, the other attribute values are by default.

Click "OK" to generate a table automatically in the screen, as shown in figure below:

Time	Date	LH0	LH1	LH2	LH3	LH4
10:59	17/10/24					

Application of the above table:

- Date: The date on which the address value is read
- Time: The time when to read the address value
- "LH0": Display the value of the LW1 at a certain time.
- "LH1": Display the value of the LW2 at a certain time.
- "LH2": Display the value of the LW4 at a certain time.
- "LH3": Display the value of the LW5 address at a certain time.
- "LH4": Display the value of the LW7 address at a certain time.

For example, the read address is LW1, the user-defined data sampling length is 3, the total number of samples is 10, the sampling method is Trigger, the time interval is 1 second, and the data type of each data is the default;

1). The option of Stop Sampling is not selected:

The LW1, LW2, LW3 address values are read every 1 second. Since the total number of samples is 10, 10 sets of data are read out at the tenth second. Because the "Stop sampling" option is not selected, the process continues. A fixed memory area depending on the sampling length, total number of samplings and data type is allocated to store the read data, so when the number of data groups has reached the "total number of samplings," the latest read data will replace the first one.

2). The option of Stop Sampling option is selected:

The only difference is that it stops sampling when achieve the total number of samplings.

Note:

Employ "Historical Trends" or "Historical Data Display" to read the values more intuitively.

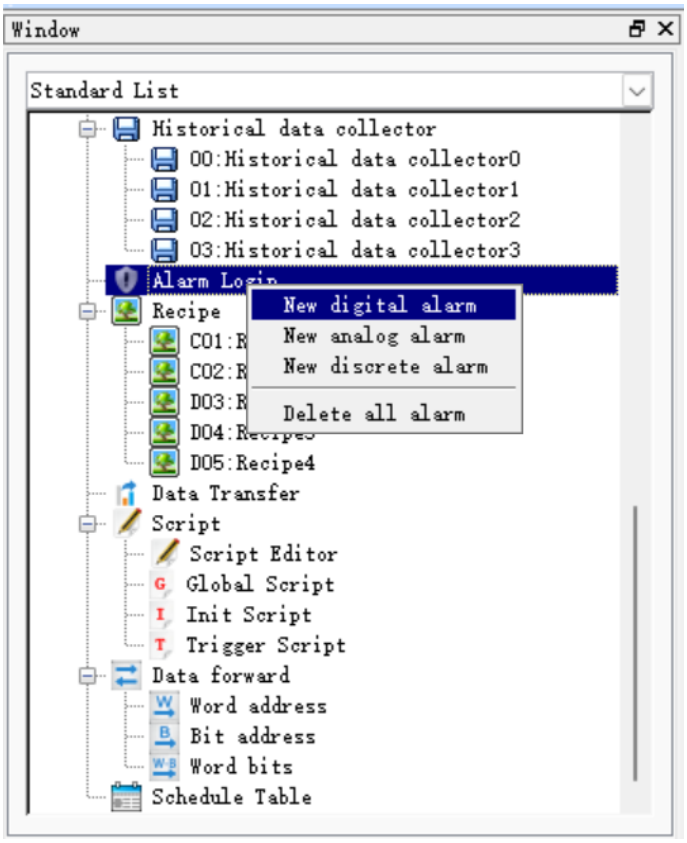
7.6 Alarm settings

HMITOOL alarm settings consist of digital alarm login and analog alarm login. Users can view the alarm type and the occurrence time through Alarm control or Alarm Bar after setting up the alarm login.

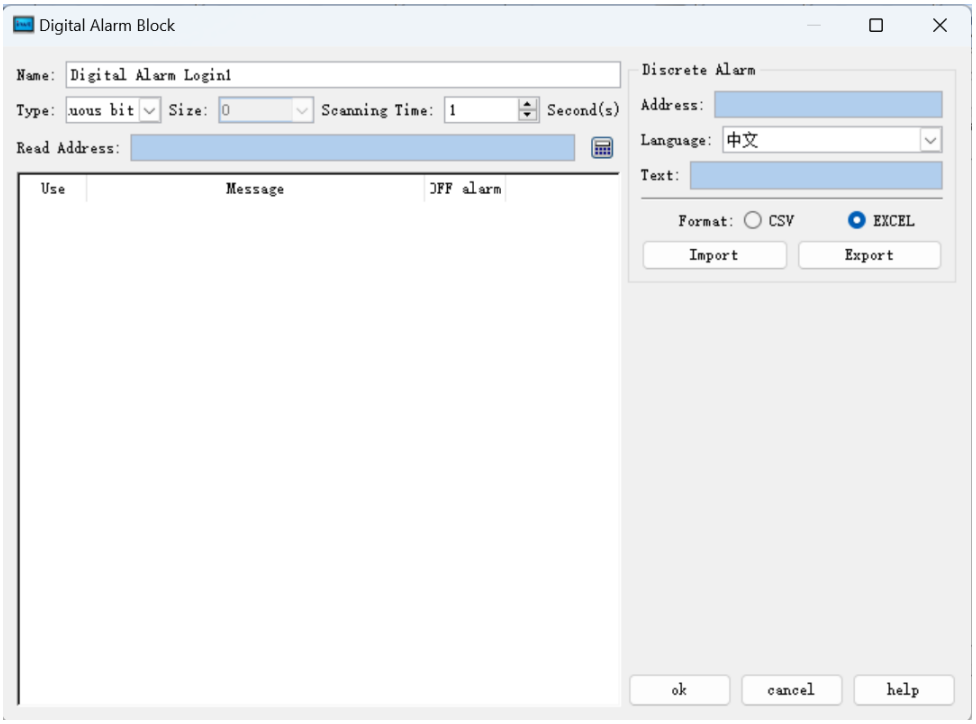
7.6.1 Digital alarm login

Alarm Setting is employed to display alarm information, only with which the alarm control and alarm bar run normally (in fact, the alarm control and alarm bar displays the alarm message of "digital alarm login" and "analog alarm login").

Right click the "Alarm landing" in the Project Manager and select "New digital alarm", as shown in figure below:



Double click the "digital alarm login" option to open the digital alarm settings dialog box, as shown in figure below:



Steps to build a digital alarm log are as follows:

1. Enter the read address first; it is assumed here that the internal address LB1 is set.

2. In the "Size" column, select the total number of alarms, i.e. the total number of bit addresses, which is

continuous. It is assumed here that the set value is six.

3. Set the bit alarm "Scanning time", that is, the scanning frequency.

4. Click an item in the list box, and then move the mouse to the right of the "Message" module; input text information in the "Text" edit box serving as the alarm content. Here assume that the alarm messages are as shown in figure above.

If "Use" is selected, the alarm information will be displayed in "Alarm Control" or "Alarm Bar". Otherwise the alarm message will not appear even if the corresponding address is 1. If the address value of this item is 0, the alarm information does not show.

- OFF Alarm: When this option is selected, the alarm will be generated when the corresponding address value is 0 (OFF value). Otherwise, an alarm will be generated when the address value is 1 (ON value). By default, an alarm occurs when the address value is 1 (ON).
- Export: export alarm settings information
- Import: import alarm settings information

Here is an example: Suppose the choice of type is "Continuous bit".

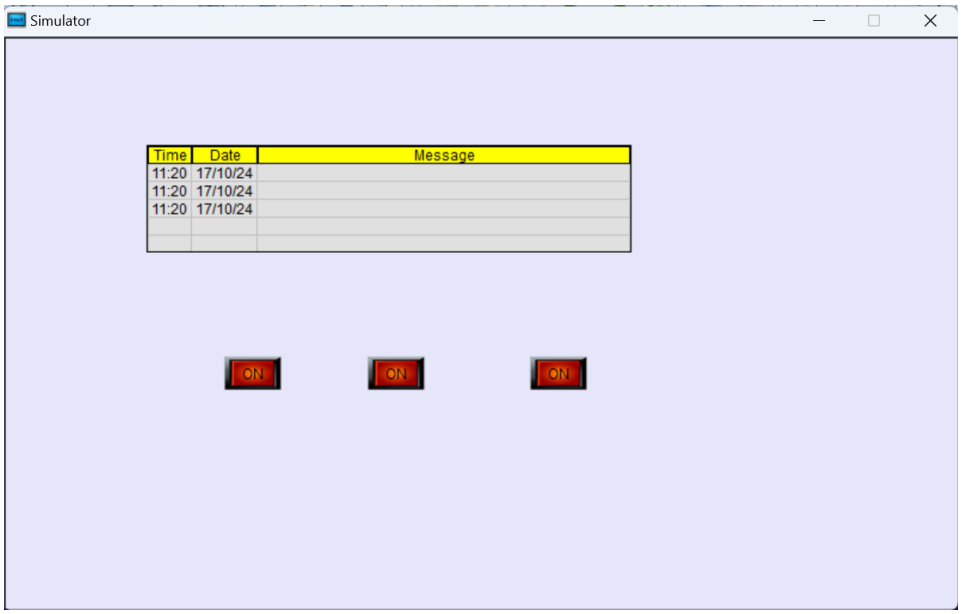
If the value of LB1 address is 0, the alarm information will not be displayed in "Alarm Control" and "Alarm Bar", regardless of whether the "Use" option is selected or not.

If the value of the LB1 address is 1 and the "Use" option is not selected, the alarm information is not displayed in the "Alarm Control" and "Alarm Bar".

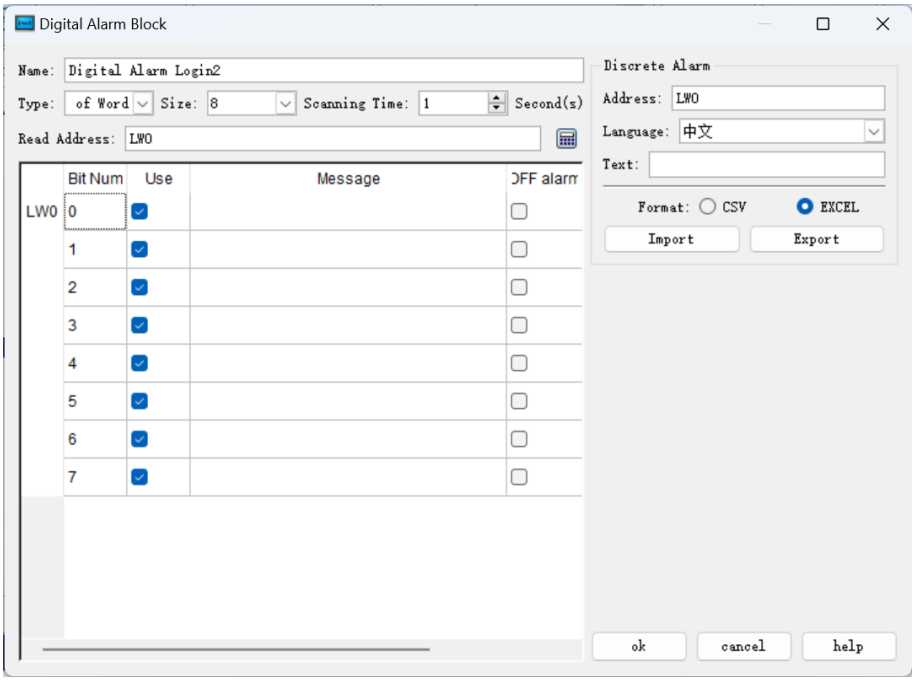
If the value of LB1 is 1 and the "Use" option is selected, the alarm information will be displayed in "Alarm Control" and "Alarm Bar".

5. Click "OK" to complete digital alarm settings. Users can add 6 bit buttons with the function of Alternation whose address is LB1-LB6; place controls of "Alarm" and "Alarm Bar" on the screen; then execute offline simulation to check whether it displays alarm information.

The following is an example of offline simulation as shown in figure below:



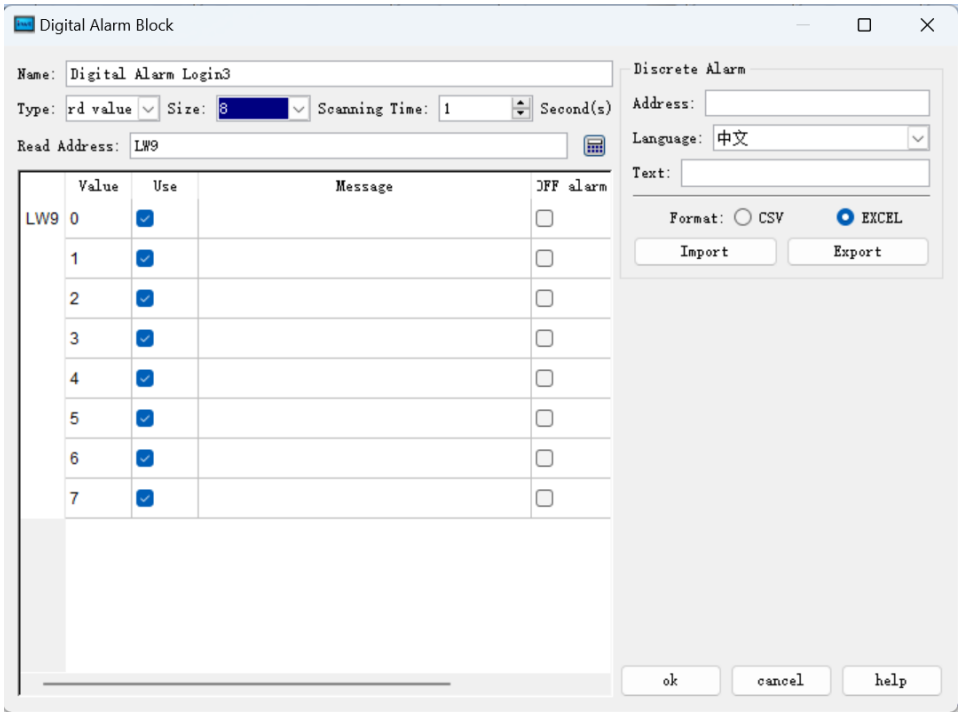
When "Continuous Bit of Word" is selected as the Type, as shown in figure below:



If the "Use" of a certain bit number is selected, an alarm will be generated when the value of this bit value is 1.

Note: When copying the contents of alarm messages from other documents to the alarm text of digital alarm log and analog alarm log, please make sure that there is no line break (invisible) in the message. It is recommended to input the message manually rather than copy and paste, in case of display error of alarm message.

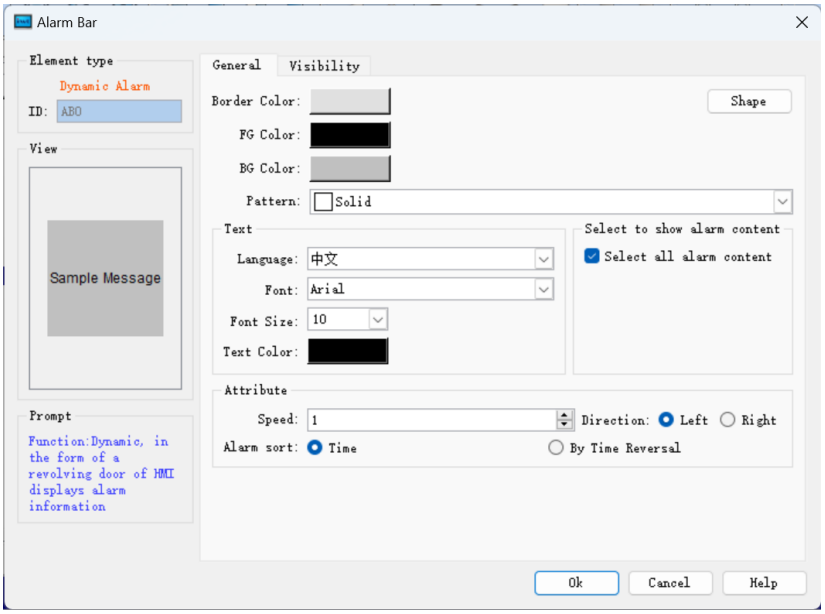
If "Word value" is selected for the type, as shown in figure below:



When a value of the address is selected, the alarm is generated when the value of the address is equal to the value selected in the list.

Place an Alarm control with 7 lines as the example and a Dynamic alarm bar whose attributes are set as

shown in figure below:



Add lastly six bit buttons whose write address is LB1-LB6 with the "Alternation", "Monitor" and "Monitor Address identical to Write Address" functions set for each. After the settings, click the "Save" button on the toolbar to save the project, execute the "Offline" command in the "Download" item in the menu bar, and then click the bit buttons LB1, LB2, LB4 and LB6. In this case, the Alarm control and Dynamic Alarm Bar will display the alarm information of LB1, LB2, LB4, and LB6 in the "Digital Alarm" When click them again, "Alarm Control" and "Dynamic Alarm Bar" will display nothing since their values are 0 because of the alternation function.

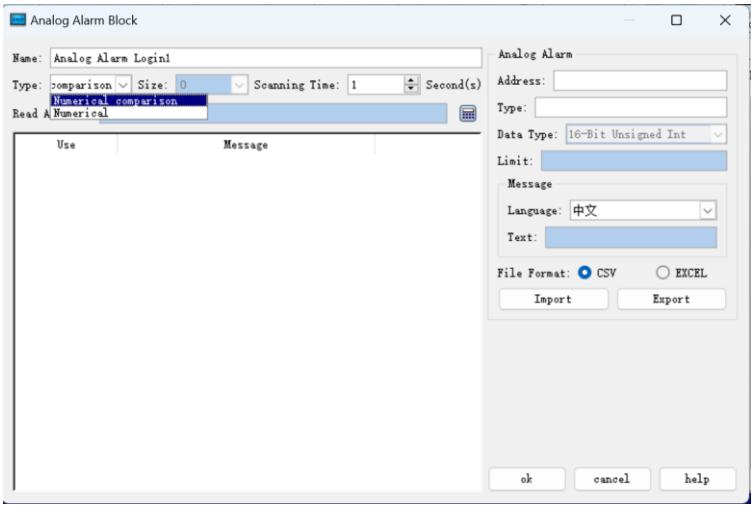
Note:

- ✧ Different alarm information is available for corresponding language through the function of switching language.
- ✧ Number of digital alarm is up to 10 for VS-Q series HMI.

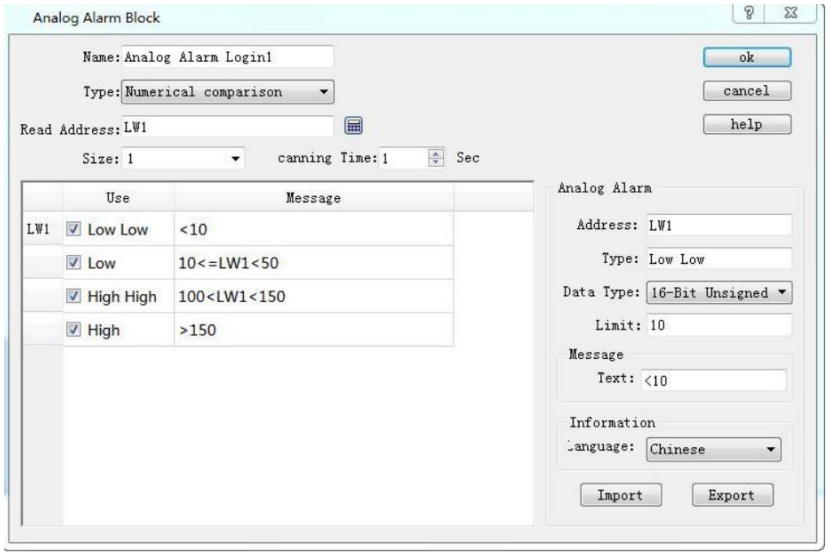
7.6.2 Analog alarm login

Open the analog alarm settings dialog box, as shown in figure below:

It has two types: Numerical value and Numerical comparison.



The numerical comparison alarm is as shown below:



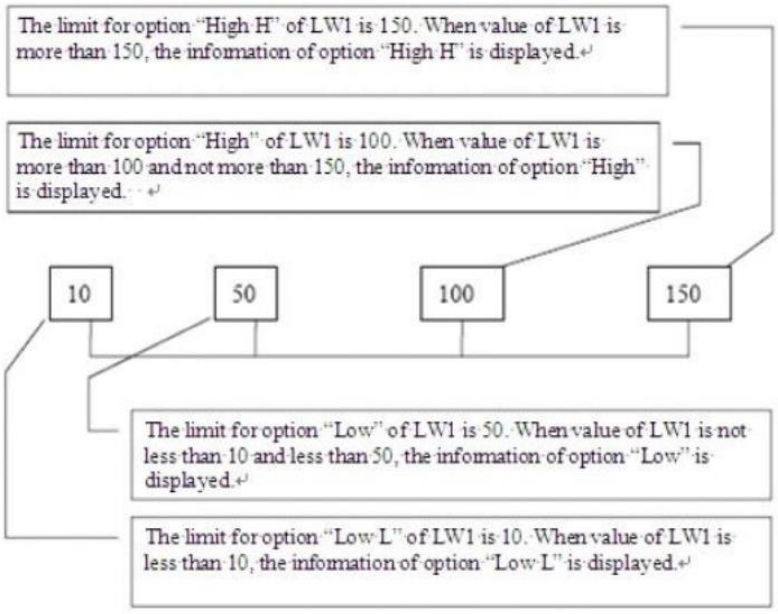
If user needs to use the analog alarm, steps are as follows:

1. First input the address in the "Read Address" column to alarm. It is assumed here that the internal address LW1 is set.

2. Select the total number of alarms in the "Size" option, which means the total number of addresses; data type decides the way to read address. Each address value is set firstly as the 16-bit data type and it is continuous. But the data type can be changed. As shown in Figure above, the LW1 address chooses a 32-bit positive integer while LW3 and LW4 values are 16-bit positive integers. Therefore, when 32-bit data is selected for an address, the later address value to be read is added by 2 on the basis of the former address value; and if the 16-bit data type is selected, the later address value to be read is the former value plus 1.

Users can set the "Scanning time" of the alarm, which means the scanning frequency.

3. Click each item to input a value in the "Limit" box on the right; then enter the text information (alarm content) in the "Text" box. Here assume that the message is as shown in figure above: each address value can be classified into one of four ranges-- Low, Low Low, High, High High. See figure below:

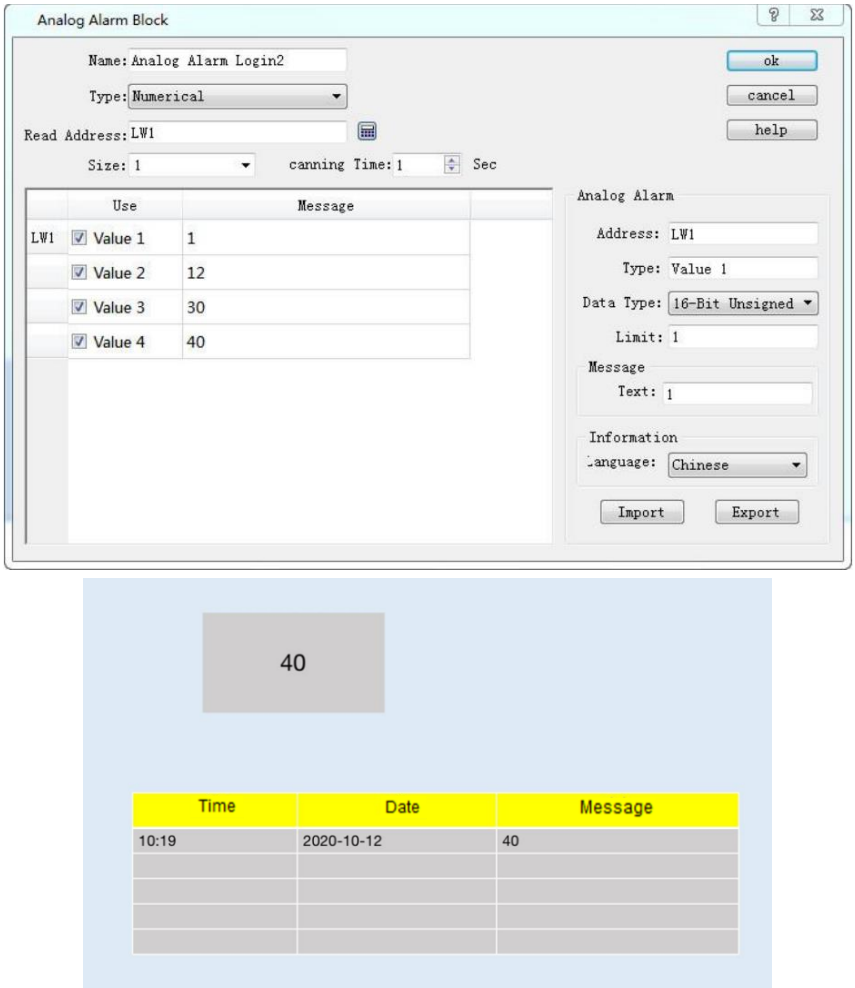


- Low Low: When the value of this item is less than the limit of this setting and the "Use" option is selected, the alarm information of this item will be displayed in "Alarm Control" or "Dynamic Alarm Bar";
- Low: When the value of this item is no less than the "Low Low" limit while less than the "Low" limit and the "Use" option is selected, the alarm information of this item will be displayed in "Alarm Control" or "Dynamic Alarm Bar";
- High: When the value of this item is greater than the "High" limit while no greater than the "High High" limit and the "Use" option is selected, the alarm information of this item will be displayed in "Alarm Control" or "Dynamic Alarm Bar".
- High High: When the value of this item is greater than the limit of this setting and the "Use" option is selected, the alarm information of this item is displayed in "Alarm Control" or "Dynamic Alarm Bar".
- Export: export alarm settings information
- Import: import alarm settings information

Refer to "Digital Alarm Login" for the application of "Use".

Numerical value alarm means an alarm occurs when the value reaches the set limit value.

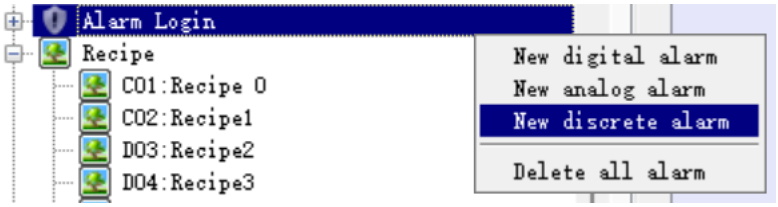
The settings are as follows: Alarm is triggered when the alarm value reaches 1, 12, 30 and 40.



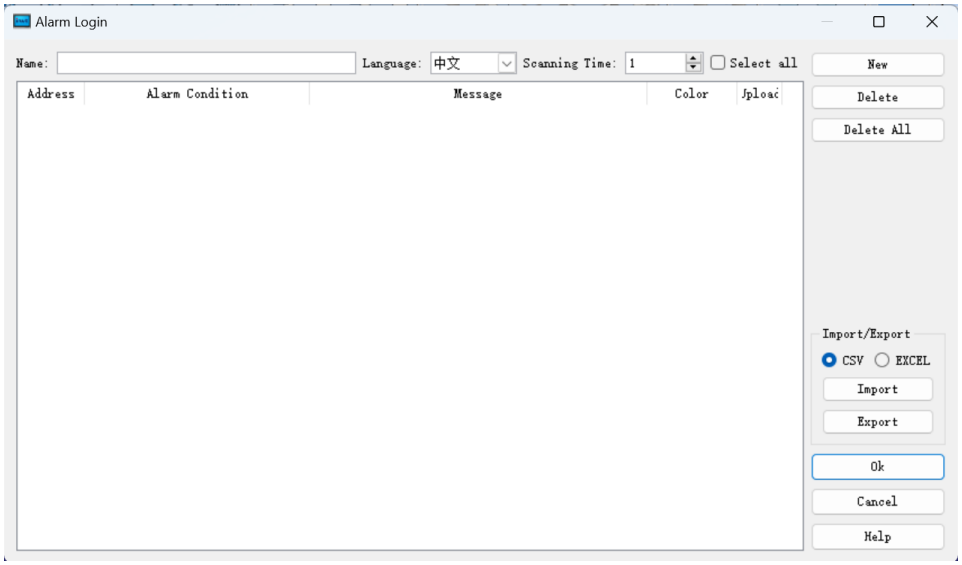
Note: Number of analog alarm is up to 10 for VS-Q series HMI.

7.6.3 Discrete alarm login

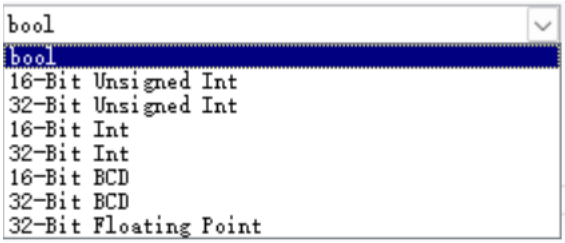
■ **New discrete alarm login**



In the expansion of the alarm login options, double-click the "new discrete alarm login" option, you can open the discrete alarm settings dialog box.

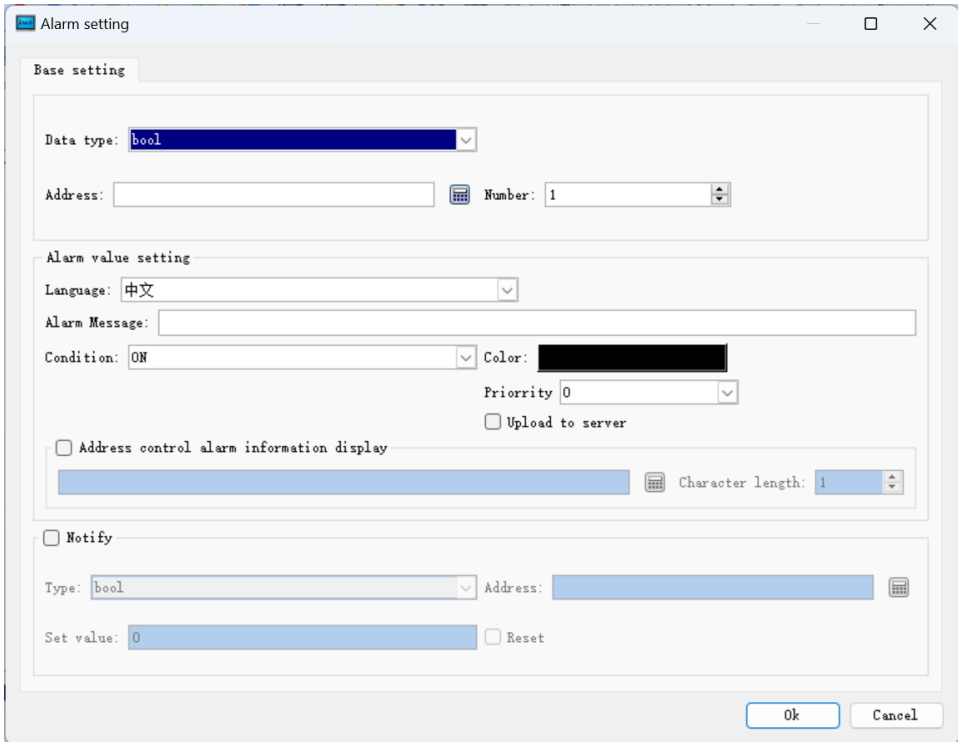


- New: a new alarm content, data categories can be freely selected

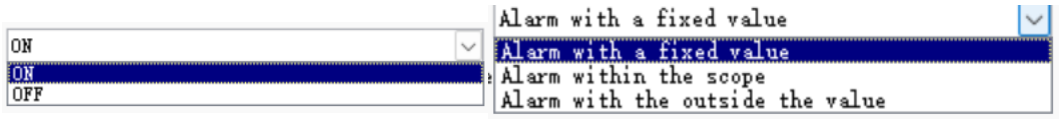


- Delete: delete an alarm content
- Delete all: delete all alerts
- Export: set up a good alarm content
- Import: import and set up the alarm content

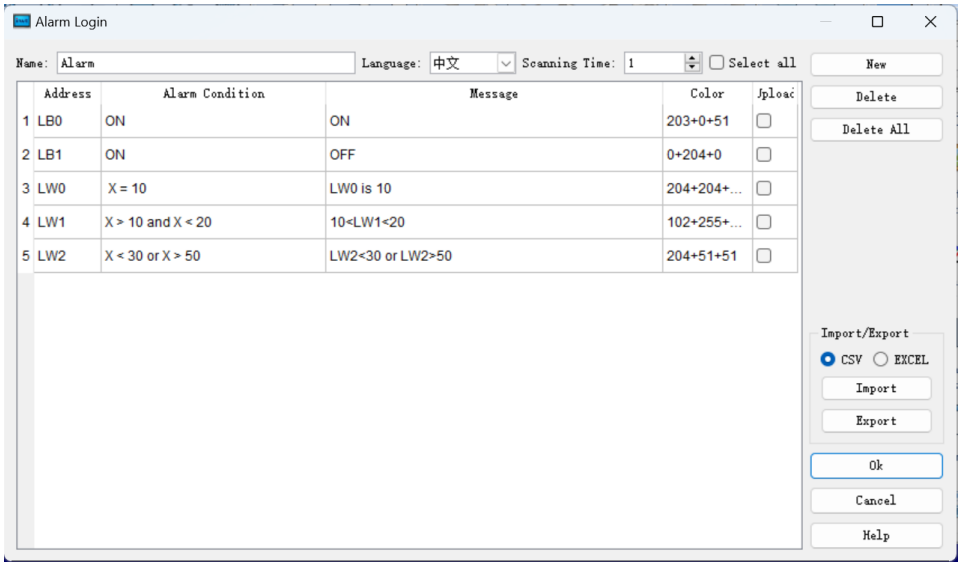
New alarm setting screen:



- Data categories: according to the need to choose the appropriate data categories to determine the alarm conditions
- Address: set the address that needs to be monitored and alarm
- The number of consecutive: according to the need to set whether the need for continuous N address monitoring
- Alarm information: the alarm information displayed when the address value is set to alarm condition
- Alarm condition: set the alarm condition of the address value, and the alarm condition is shown below:

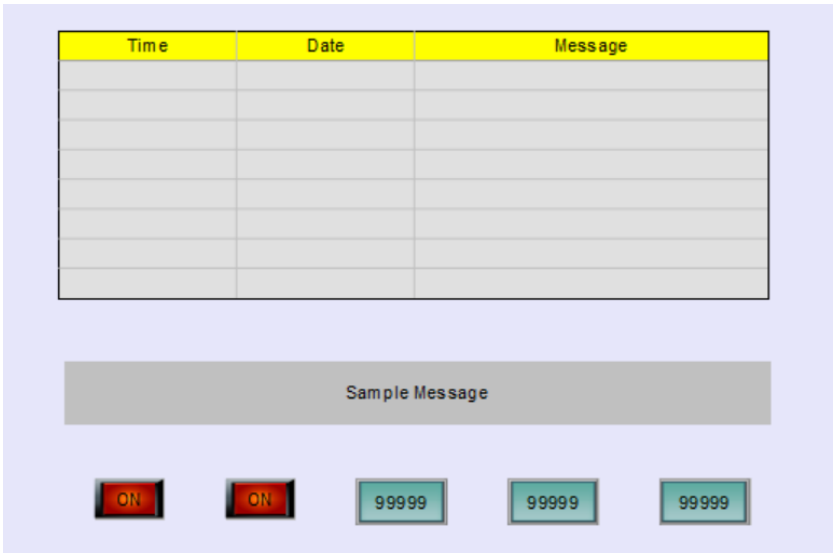


- L bit ON alarm: when the data category is bool, the address is ON trigger alarm
- L bit OFF alarm: when the data category is bool, the address is OFF trigger alarm
- L fixed value alarm: when the address value is set value, the alarm is triggered
- L range alarm: when the address value is within the set range to trigger alarm
- L out of range alarm: when the address value is not within the set range, the alarm is triggered
- Alarm color: set the address value to trigger the alarm is the color of the alarm information



Edit the configuration and add the appropriate controls.

Perform a test and the following figure appears:

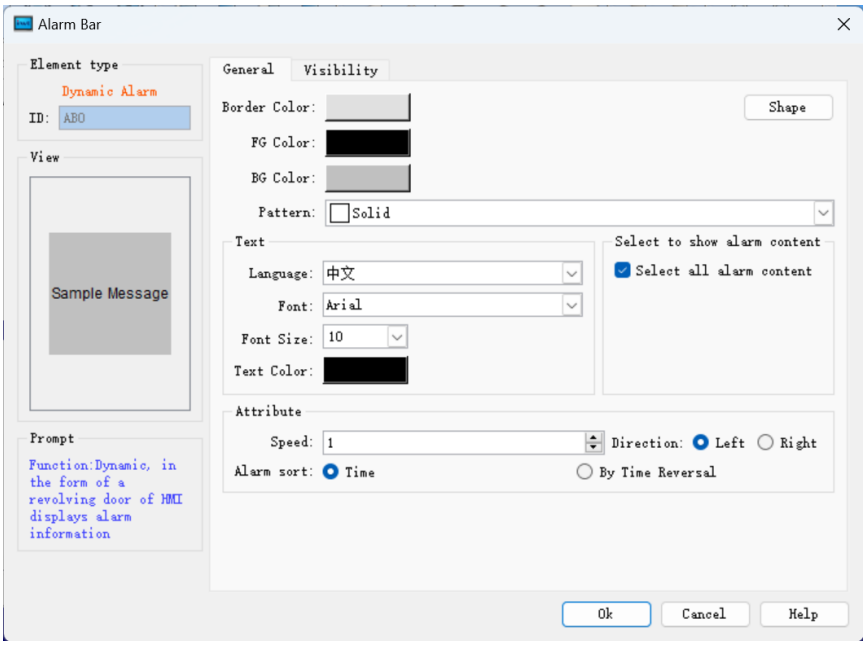


Note: Analog alarm number: at present, VS-Q series HMI can only set up 5 analog alarms.

7.6.4 Alarm display controls

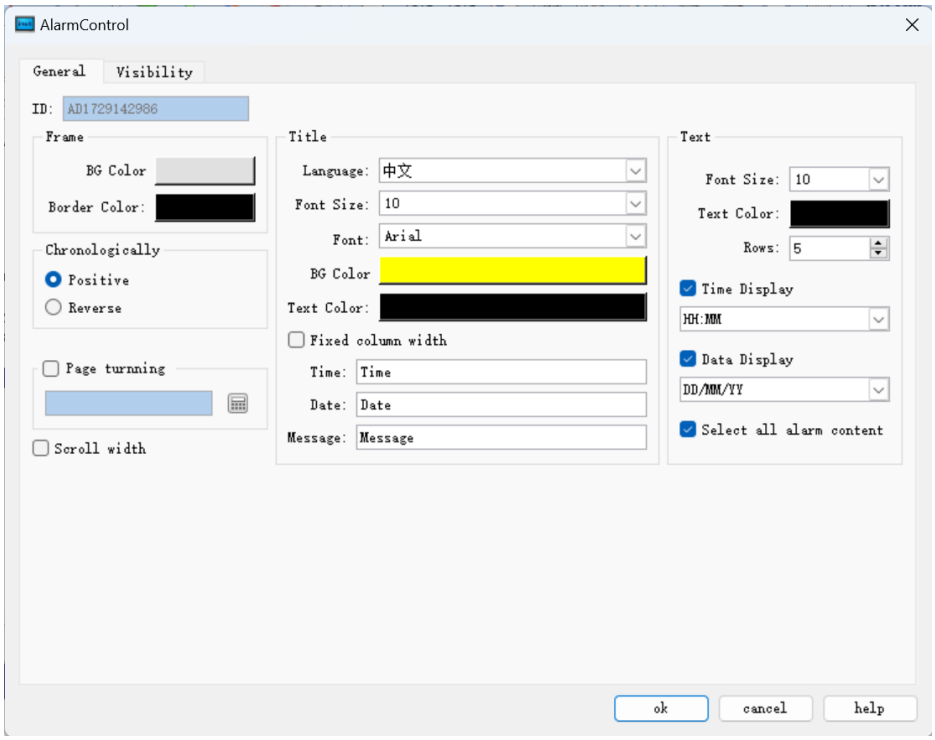
It can add alarm display control after the settings: Alarm Display, Alarm Bar and Historical Alarm Display.

Select  in the toolbar menu to set the alarm bar display parameters in the dialog box, as shown in figure below:

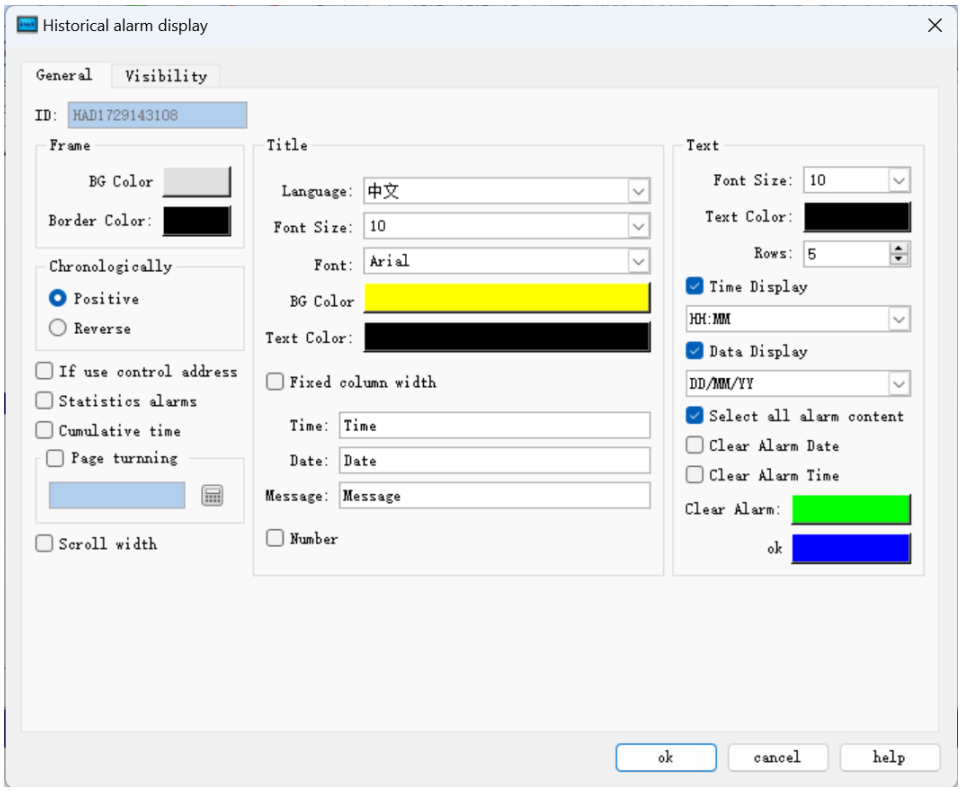


- Speed: the movement speed of the alarm information;
- Direction: The alarm bar moves from right to left or left to right;
- Alarm sort: The display order of alarms by chronological order or by traverse chronological order.

Select the alarm control in the toolbar menu to set the alarm display text and parameters in the dialog box, as shown in figure below:



Select the historical alarm display control in the toolbar menu to set the display content and parameters in the dialog box, as shown below:

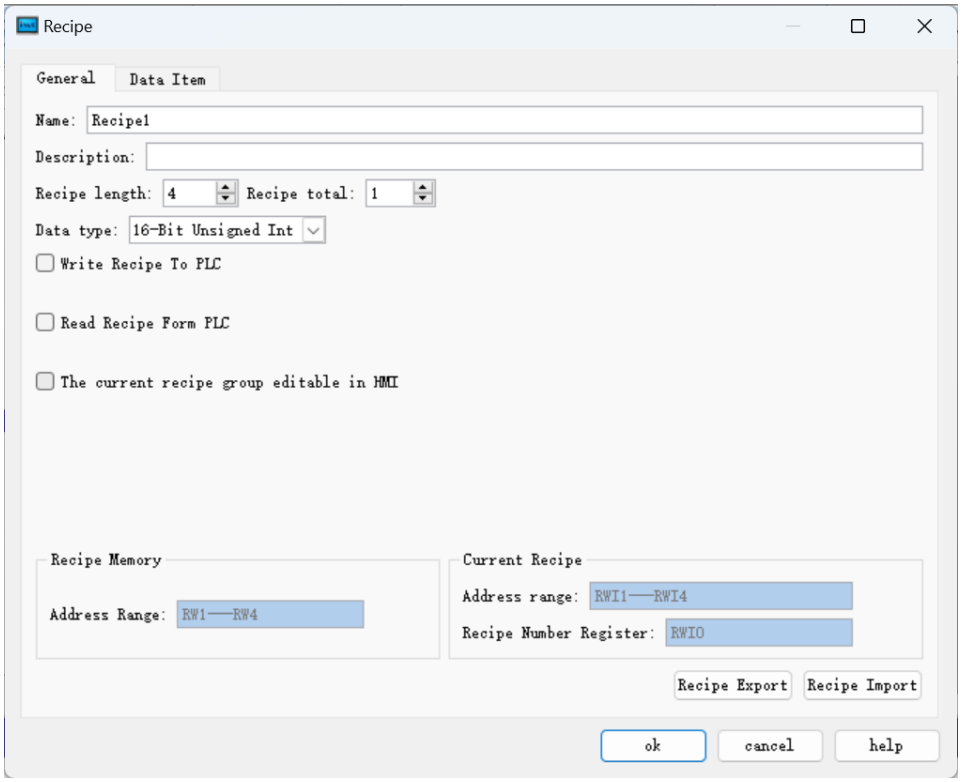


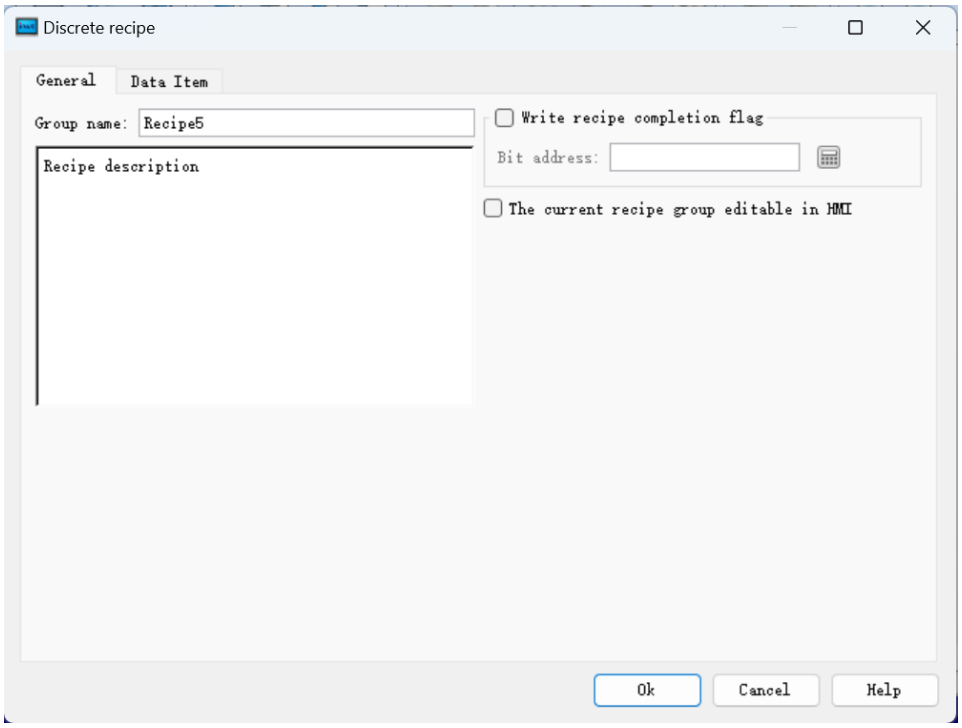
7.7 Recipe

In the field of manufacturing, recipe is used to describe the proportions of materials used to produce a product, and is a set of parameter settings of variables used during production. For example, a basic recipe is necessary for bread making, and this recipe may list the weights or proportions of all materials used to make bread, such as water, flour, sugar, egg, oil, and so on. In addition, it may also list some optional materials such as fruit, nut, chocolate, and so on. These optional materials may be added to the basic recipe to make bread of different flavors. Take iron works for another example. A recipe in an iron works may be a set of machine parameters. For batch processing machines, a recipe may be used to describe different steps of the batch processing.

A machine may make both bread and cakes, including bread of different flavors and cakes of various forms. Here, we call the material proportions of bread as a recipe, and call the different material proportions of different flavors of bread as a file. Obviously, recipe records are contained in recipe files.

HMITOOL provides the function of recipe configuration that is available in the Recipe of the menu bar or in the Project Manager, you can enter the recipe configuration dialog box, add a new set of recipe functions. See the figure below:





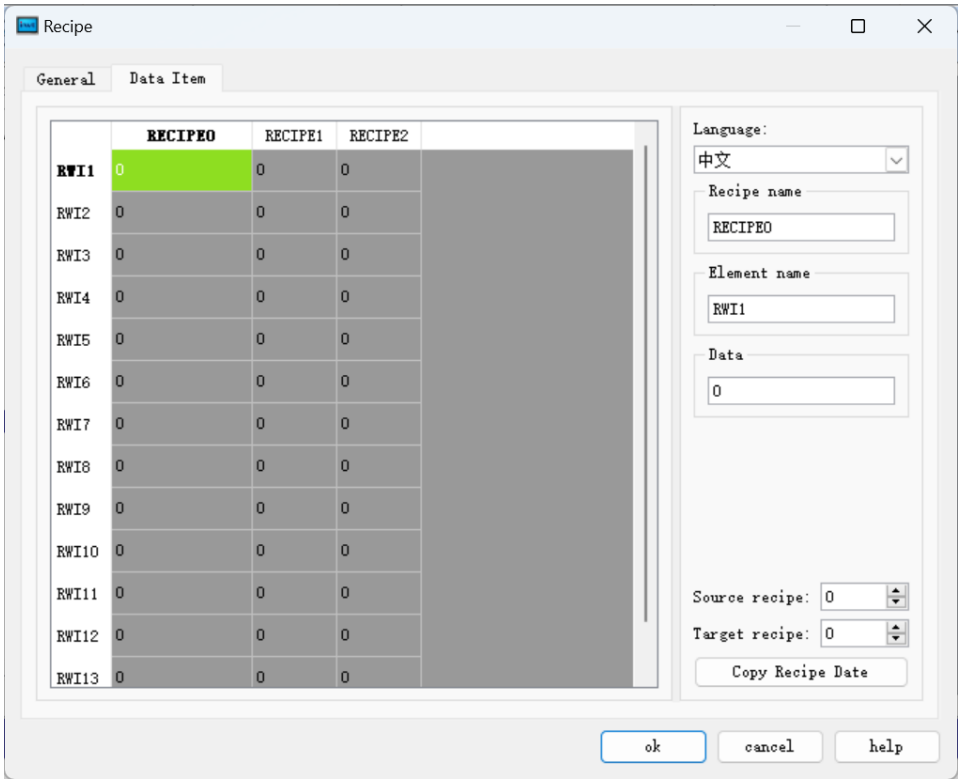
- Name: Name of the current recipe file.
- Description: Description: Name description of the current recipe file;
- Recipe length: Set the length and quantity of the recording address to be read by the current recipe. Addresses of recipe record form are arranged in sequence automatically by the system, and cannot be changed. The maximum length of recipe is 4096.
- Total Number: Number of recipes, up to 512.
- The current recipe group editable in HMI: Enable Edit the recipe in HMI.

- Write recipe completion flag: after current recipe is written to PLC, the value of bit address set 1;
- The current recipe group editable in HMI: Enable Edit the recipe in HMI

Note: Recipe length * Bytes occupied by data type * Total number <= 512KB

- Data Type: Data type of the data register;
- Write recipe to PLC: Set related data register address of recipe and PLC;
- Read recipe from PLC: Set related data register address of recipe and PLC;
- Recipe memory: The memory address range of the recipe in the HMI that is automatically generated and cannot be changed;
- Current recipe: The recipe memory address in the HMI and the data register of PLC is automatically generated by order and cannot be changed;
- Recipe Number Register: the recipe is arranged automatically by the order of serial number, and it cannot be changed; it corresponds the order of recipe name in the data item.

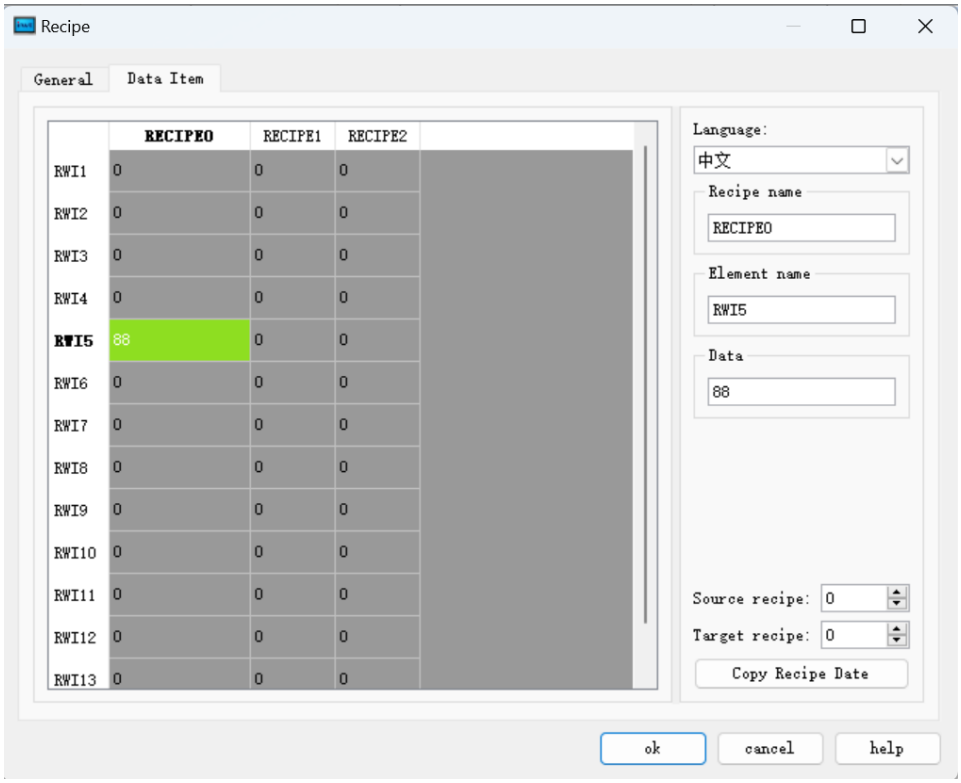
The continuous recipe data item, as shown in figure below:



- Name: The name of the current recipe;
- Data: Write and display each address value of the current recipe;
- Copy Recipe Data: Copy the data from the source recipe to the destination recipe. Click "OK" to save the current one and click "Cancel" to exit the dialog box. Once the recipe configuration has been completed, the interface can be designed to operate the recipe in the HMI.

Application example of recipe:

1. Create a recipe configuration as described above. The effect is shown in figure below:



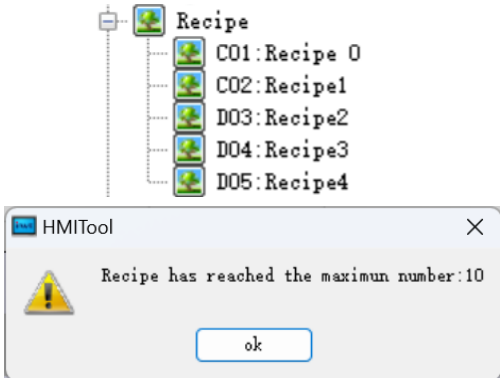
This recipe has a total of 4 sub-recipes, each containing 16 items. The storage addresses are from RWI: 1 to RWI: 16 in the memory of HMI.

2. After the recipe configuration, display the recipe on the screen, modify it or directly download it to the PLC. So we will use the following essential functional controls.

- Recipe display: Click numeric display / input (refer to "Numerical display / input")
- Select the internal memory address RWI: 0 to create a numerical display and input control on the screen. The input and display value is the recipe serial number. The value 0 of RWI0 means recipe serial number 1; the value 1 means recipe number 2, etc.
- Click the function button: Refer to the "Function button" for operation.

Buttons can be created to write recipe to PLC, read recipe from PLC, save recipe, select the previous recipe and the later one through the function button with relevant function setting.

Application of multiple recipes: HMITOOL provides new function of multi-group recipe, but it supports only ten groups, otherwise a limit message will be prompted as shown in figure below:



The LW61141 is employed to enter the recipe group. The original RWI0 is also used to input the recipe

number. Therefore, it needs to set values of LW61141 and RWI0 at the same time when select one. For example: Enter recipe group 0 to LW61141, serial number 2 for RWI0; it means selecting the recipe data of Recipe 2 in recipe group 0.

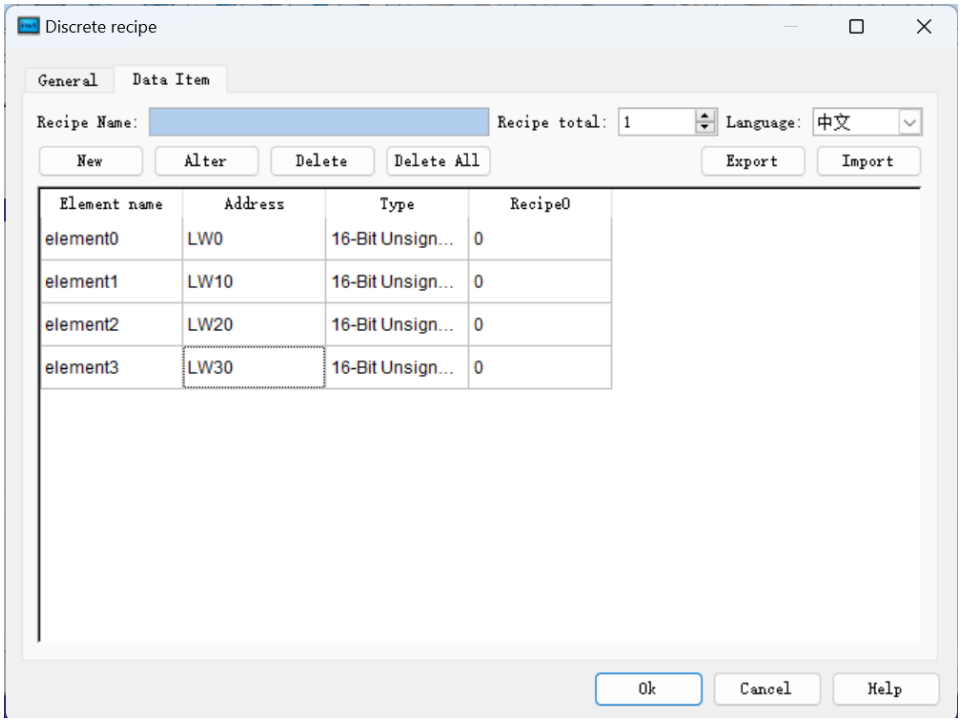
3. According to the above operation, a screen can be created as shown in figure below:

Assume that all monitor address to be written is D0, the length of the recipe is 16 and the total number is 4.

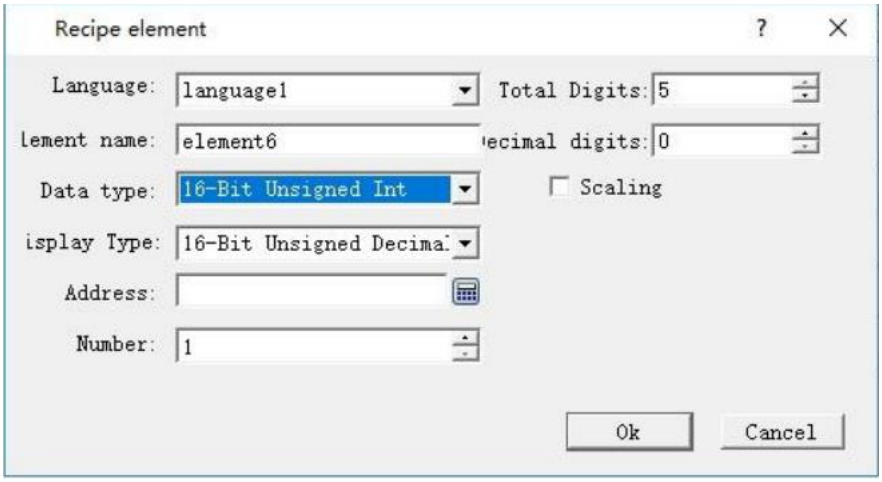
It is easily available to modify, preserve, read and write recipe through the function buttons and numerical display / input settings. But it should pay attention to the following points:

- Recipe list should be established before use of Recipe functions.
- When writing recipe parameters into the recipe list, pay attention to the data type. 16-bit datum occupies only one word, and 32-bit datum occupies two words. Consistent data type should be chosen. Particularly, pay special attention to use of 32-bit data address. As 32-bit datum occupies two words, prevent address overlapping when entering write-in address and monitored address.
- Address RWI0 is for fixed use, and can be used to change recipe number only. If value of RWI0 is 0, it indicates the first recipe number, and so on.
- Recipe parameter addresses are continuous.

The discrete recipe data item, as shown in figure below:



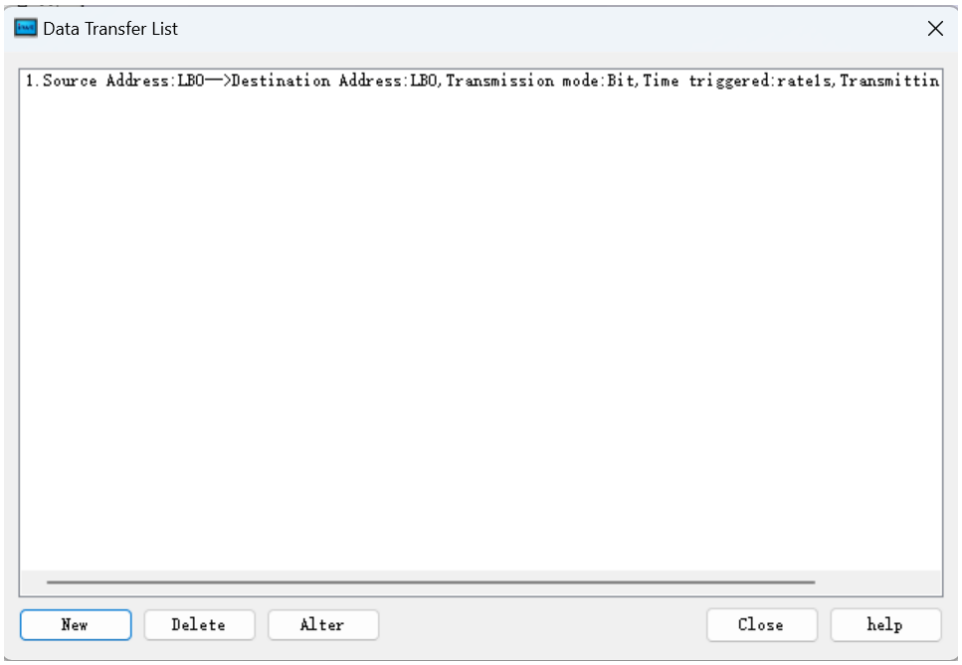
- Recipe total: Number of recipes, up to 128;
- Language: Users can set different languages' Element name and recipe name.
- Recipe name: Modify current recipe name, such as "recipe1","recipe2".
- New: Pop up a "recipe element"dialog, create an element, as shown follow figure.



- Delete: delete current recipe element.
- Delete All: Delete all element in this recipe.
- Alter: Pop up the current element's Recipe element box, modify the information.
- Export: Pop up a save as dialog, save the recipe as a *.csv file by assign root and name.
- Import: Pop up an open dialog, choose a *.csv file as current recipe.

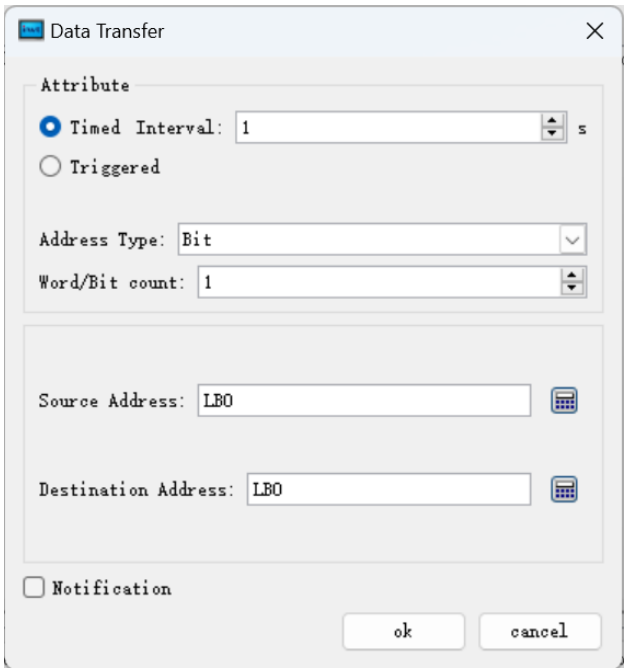
7.8 Data transmission

It is used to transmit data between PLC and HMI or between PLC and PLC. Click "Data Transmission" in the Project Manager to show the current data transmission list.



The transmission list lists details of all the current transmission items. Users can create, delete and modify them. HMITOOL configuration software supports up to 512 data transmission items.

To create a new one or modify an existing transmission item, it needs to enter the Property Setting page:



1. Attribute

- Timing / Trigger: Select the trigger mode for data transfer.
- Timing: Perform data transfer at the set interval.
- Triggering: The transmission signal is controlled by specified address. Execute this command when the address value is 1.
- Automatic reset: When the value of address trigger is 1, set it automatically to 0.
- Address Type: Select the address type to transfer data: Bit / Word / Double Word.
- Word / Bit: Input the length of the data to be transferred. The length range is 1 – 64.

2. Address

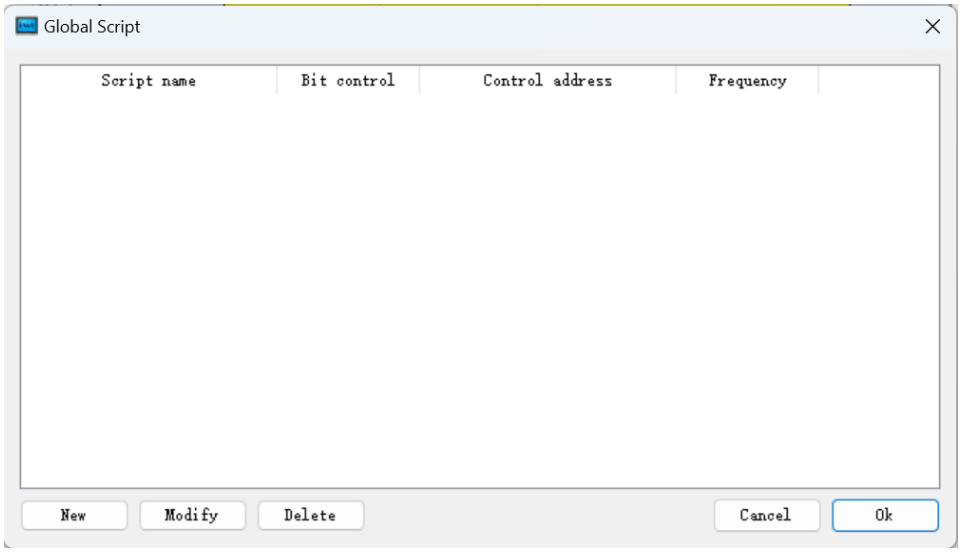
- Source Address: The source address of the transmitted data, which must be of the same type as the type of address set in the "Property".
- Destination Address: The destination address of the transmitted data, which must be of the same type as the type of address set in the "Property".

Note: Destination address and Source address cannot be on the same PLC.

7.9 Global script

Set a script that has been successfully compiled into a global script, meaning executing this script when the configuration starts running, and it will be executed during the run time without being limited by screens. A maximum of 64 global scripts can be added, and they are executed in the set order.

Click "Global Script " on the menu "Settings", as shown in the dialog box:

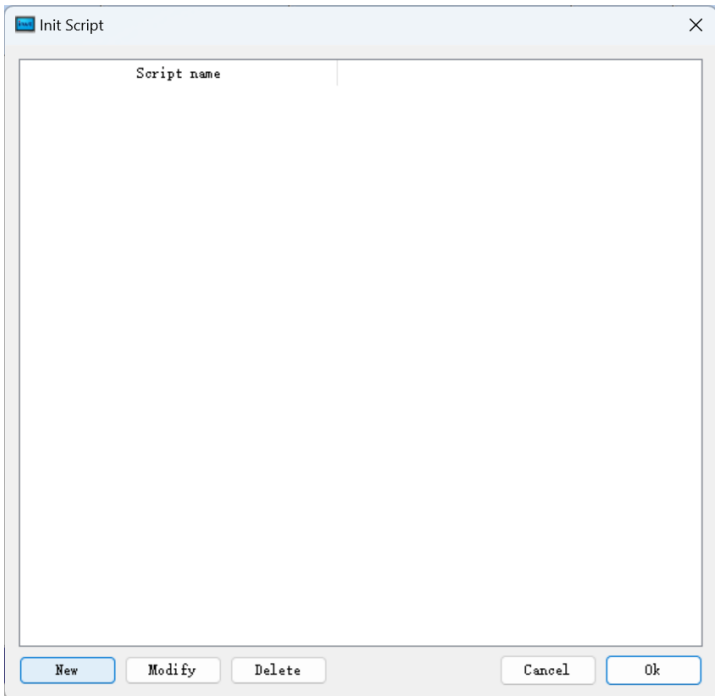


Click the list item to list all the script names that have been compiled successfully, and then decide whether the script is controlled by bit and the execution frequency. The selected script is executed as a global script during configuration run time.

7.10 Init Script

Set a script that has been successfully compiled into an Init script, meaning executing this script only one time without being limited by screens. A maximum of 64 init scripts can be added, and they are executed in the set order.

Click "Init Script " on the menu "Setting", as shown in the dialog box:

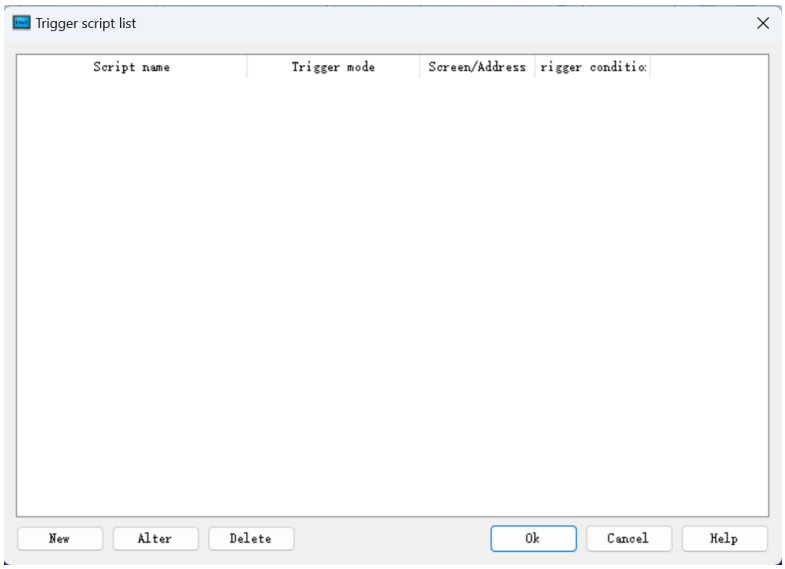


Click the list item to list all the script names that have been compiled successfully. The selected script is executed as an init macro during configuration run time.

7.11 Trigger_Script

Set a script that has been successfully compiled into a trigger script, executing this script when the assigned condition is triggered. The trigger condition include screen/window skip, and address value change.

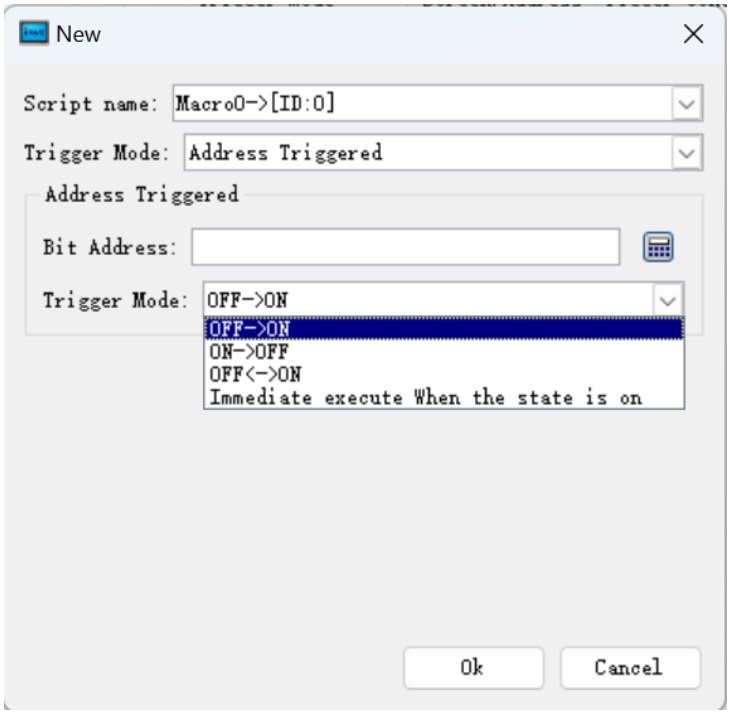
Click "Trigger Script" on the menu "Setting", as shown in the dialog box:

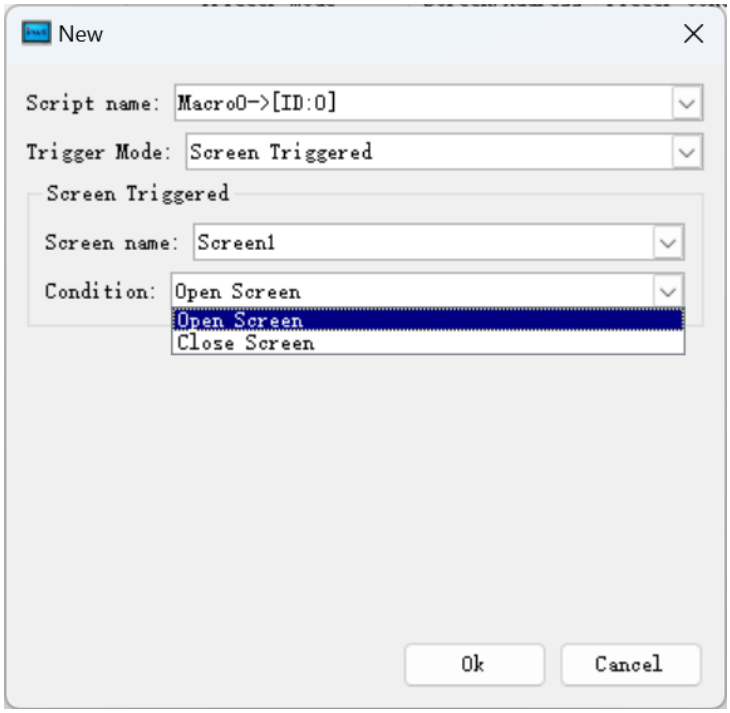


Click the "New" button to pop up a new dialog. Then select a script is executed as a trigger script when the condition occurs.

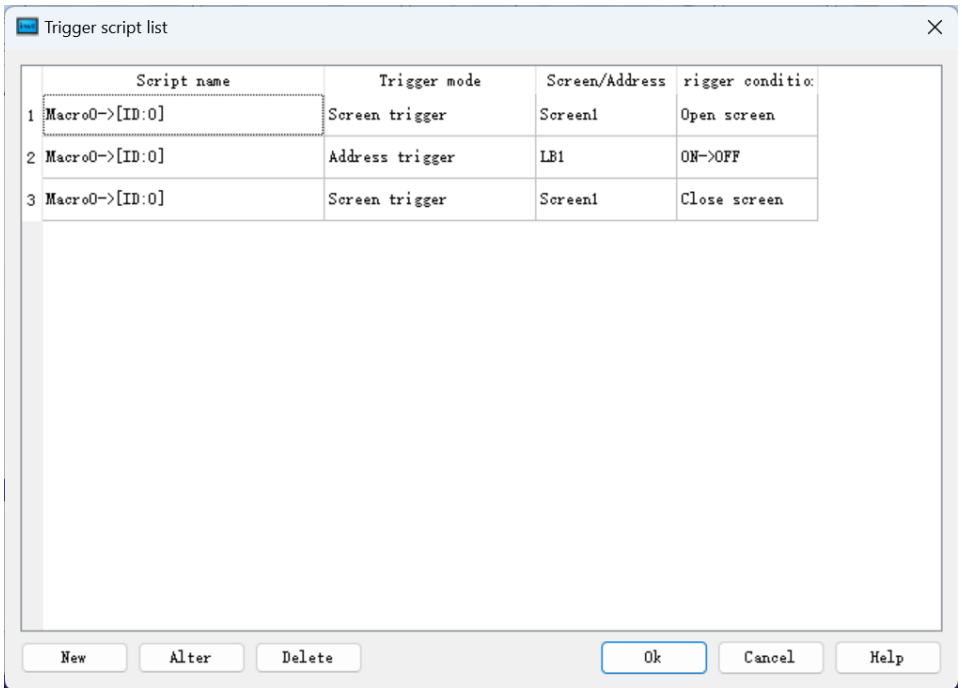
The trigger mode includes address triggered and screen triggered.

- Address Trigger: Set a Bit Address, select a trigger mode, include of OFF->ON,ON->OFF,OFF<->ON, Immediate execute when the status is ON.
- Screen Trigger: Set a screen Name as trigger condition, select a trigger mode, include of Open Screen and Close Screen.





You can use "Alter" and "Delete" buttons to operate the scripts, finally create a trigger script list.



7.12 Data forwarding

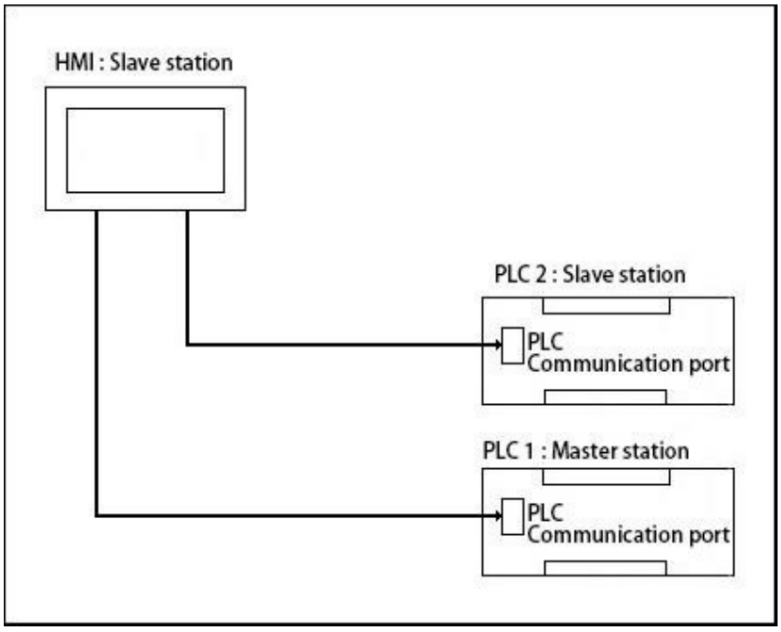
Function of Data Forwarding:

1. Data Forwarding apply to transfer data between devices connected to two ports of HMI.

Example:

Select Modbus RTU Slave protocol for Port 1; Take HMI as slave station; master station Device 1 read the address of LW0 in HMI.

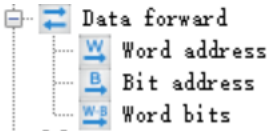
Select Modbus RTU Master protocol for Port 2; HMI reads the address of 4x11 of Slave station 2.



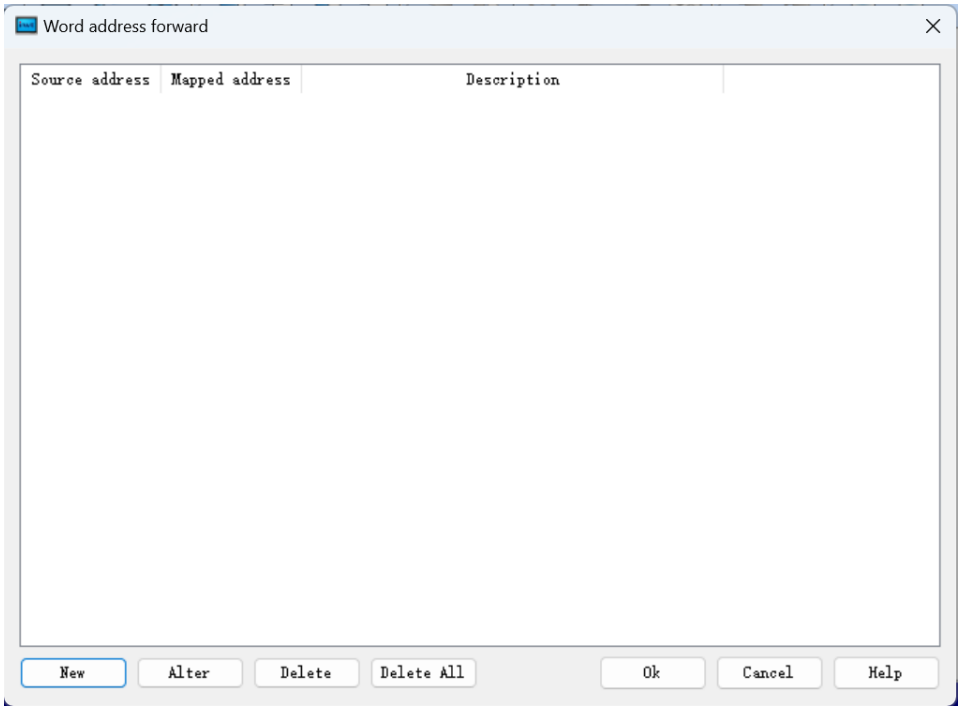
This can be achieved by creating a word-address correspondence inside the data forwarding function, with the source address set to LW0 and the mapped address set to the 4x11 address of serial port 2.

The following is an example of creating a "word address":

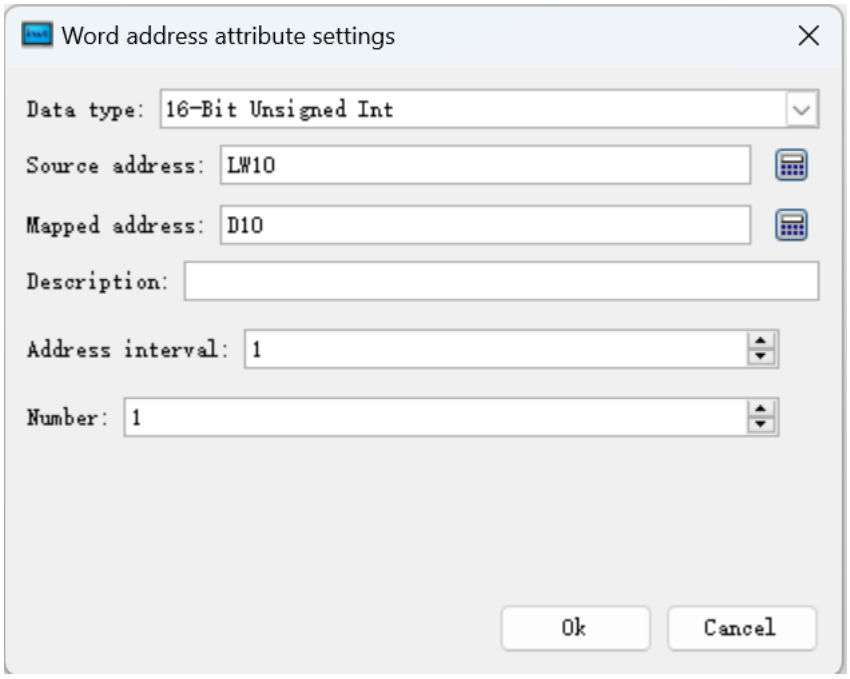
First, double-click on "Word Address" in Data Forwarding.



The following dialog box will pop up:



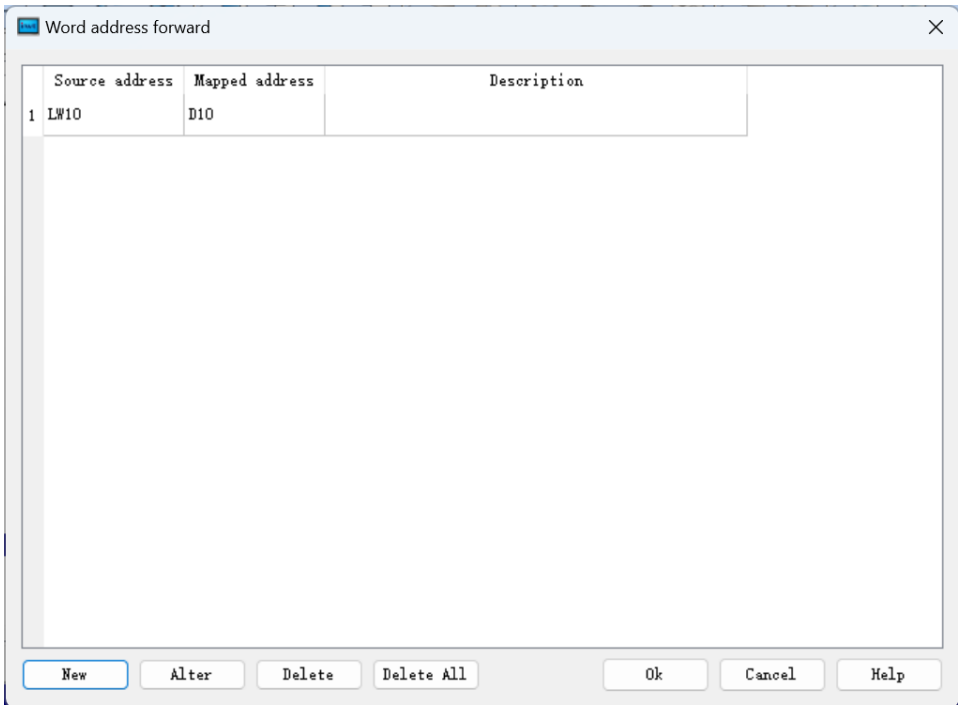
Click "New", the following dialog box will pop up, enter the address and click "OK".



Address interval: the interval between each address when forwarding multiple addresses

Number of consecutive: number of data to be forwarded.

After clicking "OK", the dialog box will be displayed as follows:

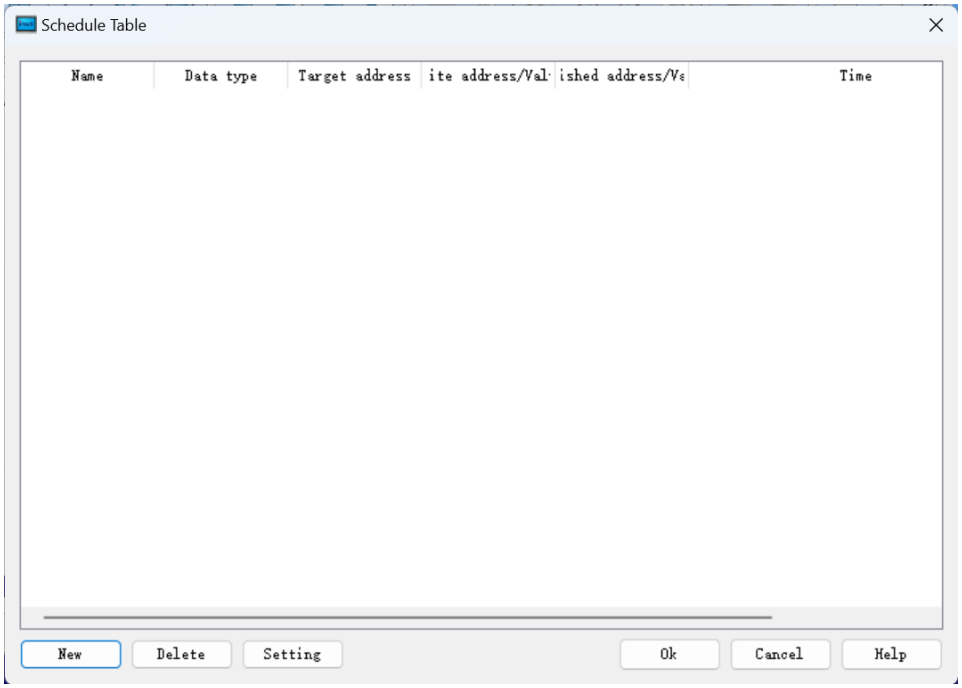


It is the same for the other two types.

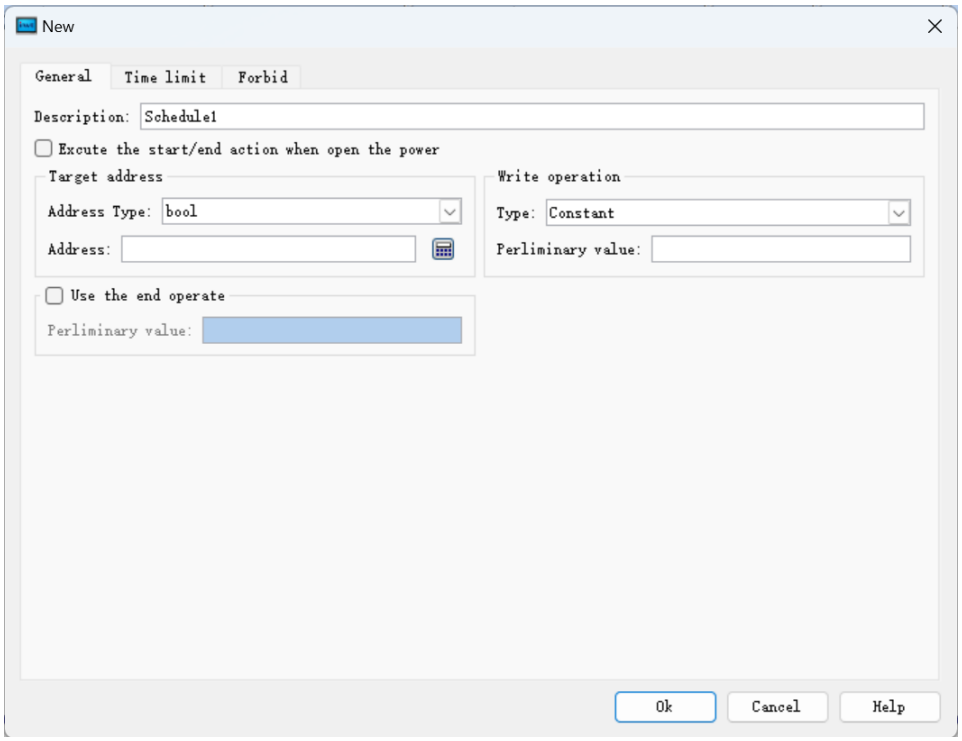
7.13 Schedule table

User can project some events according to the setting of schedule table. For example, a factory starts machines at 8:00 am, and closes machines at 18:00pm on weekday.

Click "Schedule Table" on "Standard List", it will pop up a schedule table dialog, as shown follow.



Click the "New" button, pop up a new dialog, as shown follow. The General page is first display.



Description:

Input text here in order to convenient for users to understand this schedule table's function.

Execute the start/end action when open the power:

If the power (HMI)open time is after the start time, Execute the start/end action.

Target address:

Input the target address type and address, the value of address will be written when the start/end time occurs.

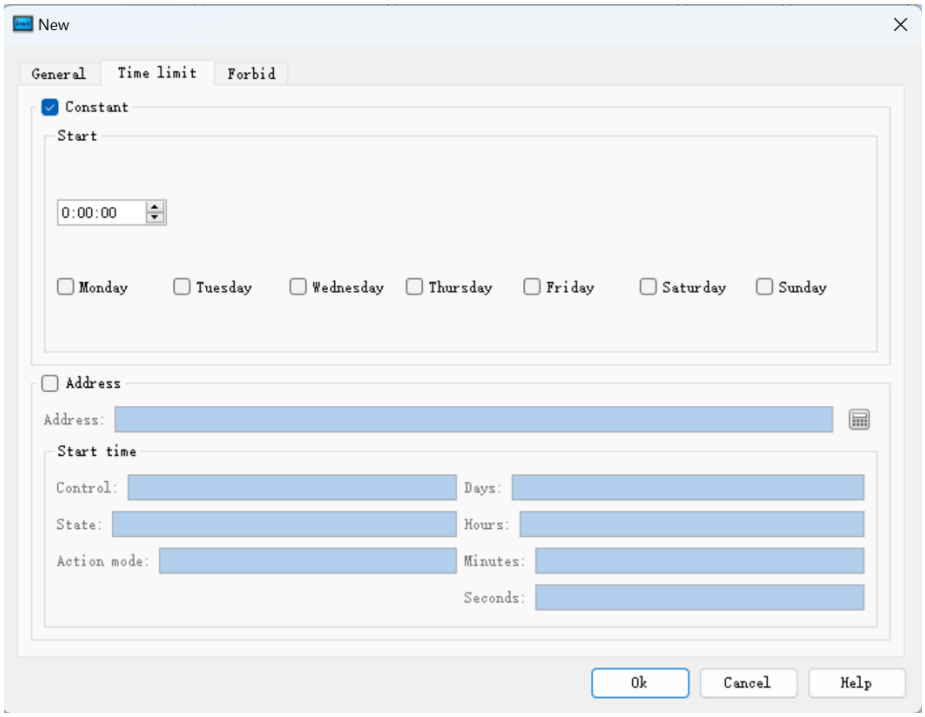
Write operation:

Types include "Constant" and "Address". Below "Constant" type corresponds to Value that be written to target address. Below "Address" type corresponds to an address edit, the value of address will be written to target address value when start/end time occurs.

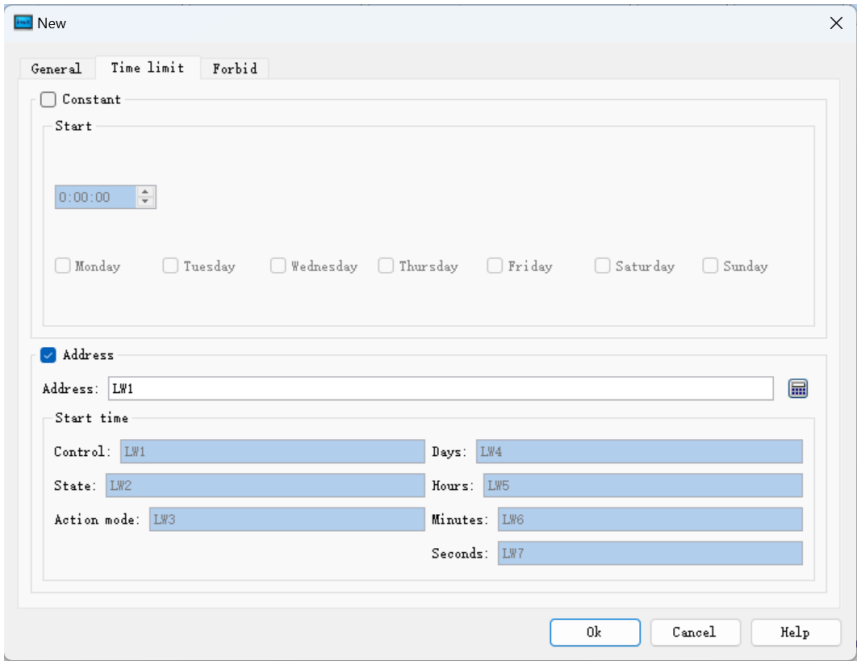
Use the end operate:

If this section is selection, the value of write operation will be written in target address when end time occurs.

After setting General, click "Time limit" page, as shown follow.



- Constant: Check the Start/Finish time, when the tomes occur, it will operate the relevant write-in.
- Address: Using a piece of address to control the schedule table's start and end time, as shown follow.



It can to realize the flexible modification of start and end times by modifying the control address during use.

Among them, in the control address, "control" is used for triggering, and when it is 1, the set parameters will be written into the system parameters, and after the writing is completed, it will be reset to 0 no matter whether it succeeds or fails;

The "status" flag bit, when the "control" trigger, whether the time parameter is written successfully, if successful, the flag is 1, otherwise it is 0, if the next time to modify, you also need to manually set it to non-zero or non-1;

The function of "Action Mode" is similar to that of "Power On Execute Start/End Operation", and when the parameter is set to 1 here, judgment will be executed to determine whether the current time is within the scheduled time period, and if it is, the purpose of the operation will be executed;

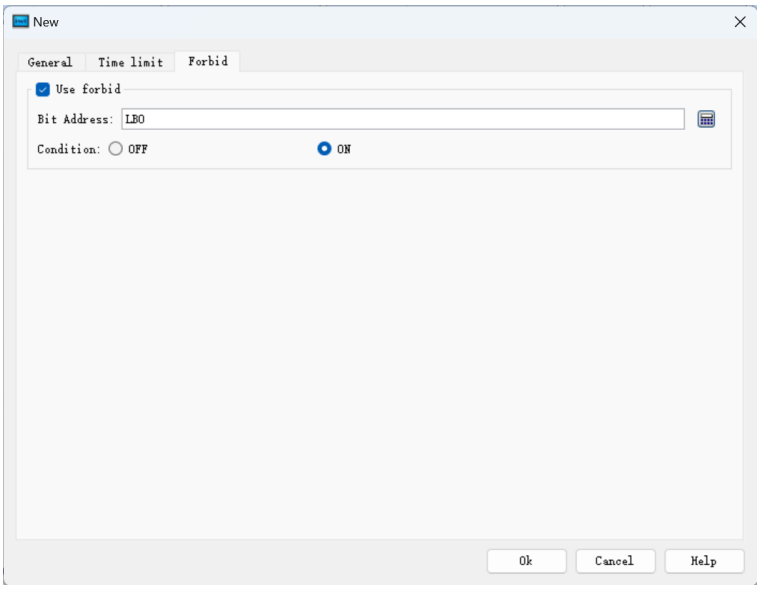
Time (day): Used to set the day of the week, here the parameter setting requirements are as follows:

Time	Parameter
Monday	1
Tuesday	2
Wednesday	4
Thursday	8
Friday	16
Saturdays	32
Sunday	64
Monday+Tuesday	1+2 = 3
Wednesday+Thursday+Friday	4+8+16
ceteris paribus	...

The time (hour), time (minute), and time (second) data are all 16-bit positive integer types.

The end time is set the same as the start;

Note: When using address control, when setting the scheduling start/end time, you need to set the control address to 1 to load the scheduling table to take effect. Disable page, as shown below:



If the prohibition is used, the scheduling operation is prohibited when the bit address meets the condition.

8 Reserved registers of HMITOOL system

HMITOOL reserves some registers for special use, and users must refer to the related instructions when using these registers, including LB (Local Memory Bit); LW (Local Memory Register) and RWI (recipe Index).

- LB: LB0-LB65535 and LB50000-LB51999 belong to the area of power failure protection;
- LW: LW0-LW65535 and LW50000-LW51993 belong to the area of power failure protection. And LW51994 – LW51999 are used by interior, not external;
- RWI: RWI0 – RWI65535.

8.1 LB

Address	Instruction	Notes	Read and write properties
60000-60099	Initial setting ON	These bits can be initialized to ON at system startup	R/W
60100	Recipe download	Triggering this bit can write the data in the current RWI to the device, and reset it after completion	R/W
60101	recipe upload	Triggering this bit can read the recipe from the device to the RWI register area, reset after completion	R/W
60102	Recipe save	Triggering this bit can write the recipe from RWI to FLASH, reset after completion	R/W
60103	Recipe Download Instructions	When the recipe is being written to the device, this bit is ON, and it is OFF after downloading	R
60104	Recipe upload instructions	When the recipe is reading the device, this bit is ON, and it is OFF after downloading	R
60105	Restart the HMI	Triggering this bit restarts the system	R
60106	Backlight Control	Control this bit to ON to turn off the LCD backlight, OFF to turn on the LCD backlight	R/W
60107	COM1 communication status	When ON, the communication is normal or there is no communication, and when OFF, the communication fails abnormally.	R
60108	COM2 communication status	When ON, the communication is normal or there is no communication, and when OFF, the communication fails abnormally.	R
60186	COM3 communication	When ON, the communication is normal or there is no communication, and when OFF, the	R

Address	Instruction	Notes	Read and write properties
	status	communication fails abnormally.	
60109	COM1 communication parameter modification storage	Triggering this bit can write the modified communication parameters into the FLASH storage area, and turns OFF after completion	R/W
60110	COM2 communication parameter modification storage	Triggering this bit can write the modified communication parameters into the FLASH storage area, and turns OFF after completion	R/W
60187	COM3 communication parameter modification storage	Triggering this bit can write the modified communication parameters into the FLASH storage area, and turns OFF after completion	R/W
60111	Confirmation and modification of system parameters	Triggering this bit can write the modified system parameters into the FLASH storage area, and turns OFF after completion	R/W
60112	Communication exception window	When ON, the exception window is allowed to pop up, and when OFF, the exception window is prohibited from popping up.	R/W
60113	mouse cursor control	When ON, the mouse cursor appears, and when OFF, the cursor is disabled (only when using touch)	R/W
60114	USB connection status	When ON, there is a USB device connected, and when OFF, no USB device is connected.	R
60116	touch sound	Whether there is a sound when touched or clicked with the mouse	R/W
60117	alarm sound	Is there a sound when an alarm occurs	R/W
60118	Clear the historical alarm record	The number of historical alarm records is cleared (automatic reset)	R/W
60119	Operation record clear	The number of operation records is cleared (automatic reset)	R/W

Address	Instruction	Notes	Read and write properties
60120	Clear historical data records	Historical data record reset (automatic reset)	R/W
60121	Overload recipe	Reload the recipe data of the current recipe serial number, this bit is ON, and it is OFF after reloading	R/W
60123	Save history alarms	When ON, save historical alarm records to flash, and automatically OFF after saving	R/W
60124	save historical data	When ON, save historical data to flash, and automatically OFF after saving	R/W
60127	Send historical alarm files to U disk	Send historical alarm files to U disk, automatically OFF after sending	R/W
60128	Send historical data files to U disk	Send historical data files to U disk, automatically OFF after sending	R/W
60129	Send current project to U disk	Send the project file to the U disk, and automatically turn off after sending	R/W
60133	The current user is logged in and out	When ON, cancels user login and automatically resets after completion	R/W
60141	There is a real-time alarm happening	When a real-time alarm occurs, this bit is ON	R
60142	The system is in a screen saver state	When in the screen saver state, this bit is ON	R
60143	Copy the operation record to the U disk	When ON, send the operation record file to th disk, and automatically OFF after sending	R/W
60145	Copy all recipes to U disk	When ON, send the recipe file to the U disk, and automatically OFF after sending	W
60147	USB two-digit barcode scanner scan end mark	When ON, triggers	R/W
60148	Import historical data	When ON, trigger; auto reset. The file name of historical data imported by this function must be	R/W

Address	Instruction	Notes	Read and write properties
	from U disk trigger bit	hisdata+group number.csv, otherwise this function will be invalid.	
60150	Export the specified ID recipe to the trigger bit of the U disk	When ON, trigger; automatically reset	R/W
60152	Import the specified ID recipe from the U disk to the HMI trigger bit	When ON, trigger; automatically reset	R/W
60154	Clear the specified ID recipe trigger bit	When ON, trigger; automatically reset	R/W
60155	Override Recipe Trigger Bit	When ON, trigger; automatically reset	R/W
60156	Recipe read and save trigger bits	When ON, trigger; automatically reset	R/W
60163	Export recipes to USB stick by group	When ON, trigger; automatically reset	R/W

8.2 LW

Address	Instruction	Notes	Read and write properties
60000	local time seconds	BCD code, valid value range 0-59	R/W
60001	local time minutes	BCD code, valid value range 0-59	R/W
60002	local time hours	BCD code, valid value range 0-23	R/W
60003	local time day	BCD code, valid value range 1-31	R/W
60004	local time month	BCD code, valid value range 1-12	R/W
60005	local time year	BCD code, valid value range 0-9999	R/W
60006	local time week	BCD code, valid value range 1-7	R
60007	system runtime hours	System elapsed time, hours	R
60008	system runtime minutes	System elapsed time, minutes	R
60009	system runtime seconds	System elapsed time, seconds	R
60010	Current screen window number	The serial number of the current screen	R
60012	current language	Corresponding language serial number	R
60013	Numerical input allowable upper limit value	When the custom keyboard pops up, the upper limit of the allowed input is displayed in ASCII	R
60023	Numerical input allowable lower limit value	When the custom keyboard pops up, the lower limit of the allowed input is displayed in ASCII	R
60033	The input data content displayed on the keyboard	The input data content displayed on the keyboard, the characters input from the keyboard, ASCII display	R
60065	The current system login user	current user serial number	R
60066	Current system login user password	Display the current user's password, 16 characters, ASCII display	R
60074	The current system login user name	Display the current user name, 32 characters, ASCII display	R
60090	Whether user 1 is enabled	0 - not enabled, 1 - enabled	R
60091	Whether user 2 is enabled	0 - not enabled, 1 - enabled	R
60092	Whether user 3 is	0 - not enabled, 1 - enabled	R

Address	Instruction	Notes	Read and write properties
	enabled		
60093	Whether user 4 is enabled	0 - not enabled, 1 - enabled	R
60094	Whether user 5 is enabled	0 - not enabled, 1 - enabled	R
60095	Whether user 6 is enabled	0 - not enabled, 1 - enabled	R
60096	Whether user 7 is enabled	0 - not enabled, 1 - enabled	R
60097	Whether user 8 is enabled	0 - not enabled, 1 - enabled	R
60098	User 1 first name	32 characters, ASCII display	R
60114	User 2 first name	32 characters, ASCII display	R
60130	User 3 first name	32 characters, ASCII display	R
60146	User 4 first name	32 characters, ASCII display	R
60162	User 5 first name	32 characters, ASCII display	R
60178	User 6 first name	32 characters, ASCII display	R
60194	User 7 first name	32 characters, ASCII display	R
60210	User 8 first name	32 characters, ASCII display	R
60226	User 1 password	16 characters, ASCII display	R
60234	User 2 password	16 characters, ASCII display	R
60242	User 3 password	16 characters, ASCII display	R
60250	User 4 password	16 characters, ASCII display	R
60258	User 5 password	16 characters, ASCII display	R
60266	User 6 password	16 characters, ASCII display	R
60274	User 7 password	16 characters, ASCII display	R
60282	User 8 password	16 characters, ASCII display	R
60290	screen saver time	Display the screen saver time specified during configuration, the setting range is 0 – 60	R/W
60291	Indicator flashing cycle	The blinking period of the indicator light control, the minimum value is 0.1, the unit is s	R/W
60292	The position of the X	The position of the X coordinate when	R

Address	Instruction	Notes	Read and write properties
	when touched	touched	
60293	The position of the Y when touched	The position of the Y coordinate when touched	R
60294	The position of the X when the touch leaves	The position of the X coordinate when the touch leaves	R
60295	The position of the Y when the touch leaves	The position of the Y coordinate when the touch leaves	R
60296	touch state	1-touch, 0-release	R
60297	Checkout of COM1	Communication parameters, calibration, 0-NONE, 1-EVEN, 2-ODD	R/W
60298	Baud rate of COM1	Communication parameters, baud rate,0-1200, 1-2400, 2-4800, 3-9600, 4-19200, 5-38400, 6-57600, 7-115200	R/W
60299	stop bit of COM1	Communication parameters, stop bits, 0-1stops, 1-2stops	R/W
60300	Data length of COM1	Communication parameters, data length, 0-7bits, 1-8bits	R/W
60301	HMI address of COM1	Communication parameters, HMI address	R/W
60302	PLC address of COM1	Communication parameters, PLC address	R/W
60303	COM1 PLC consecutive address interval	The length of the maximum continuous address that can be read in a single communication	R/W
60304	COM1 communication time	Communication delay time	R/W
60305	COM1 retries	The number of times the system resends when the communication is abnormal	R/W
60306	COM1 address mode	Address mode, 0-standard mode, 1-extended mode	R
60307	COM1 communication timeout time	Set the communication timeout time, in ms	R/W
60308	COM1 communication current wait time	The current waiting time of communication, in ms	R/W
60309	COM1 HMI location	0-local 1-remote	R/W
60312	Checksum of COM2	Communication parameters, calibration, 0-NONE, 1-EVEN, 2-ODD	R/W
60313	Baud rate of COM2	Communication parameters, baud rate,	R/W

Address	Instruction	Notes	Read and write properties
		0-1200, 1-2400, 2-4800, 3-9600, 4-19200, 5-38400, 6-57600, 7-115200	
60314	stop bit of COM2	Communication parameters, stop bits, 0-1stops, 1-2stops	R/W
60315	Data length of COM2	Communication parameters, data length, 0-7bits, 1-8bits	R/W
60316	HMI address of COM2	Communication parameters, HMI address	R/W
60317	PLC address of COM2	Communication parameters, PLC address	R/W
60318	COM2 PLC continuous address interval	The length of the maximum continuous address that can be read in a single communication	R/W
60319	COM2 communication time	Communication delay time	R/W
60320	COM2 retries	The number of times the system resends when the communication is abnormal	R/W
60321	COM2 address mode	Address mode, 0-standard mode, 1-extended mode	R
60322	COM2 communication timeout time	Set the communication timeout time, in ms	R/W
60323	COM2 communication current wait time	The current waiting time of communication, in ms	R/W
60324	COM2 HMI location	0-local, 1-remote	R/W
60327	Number of historical alarms	The total number of historical alarms that occurred that were recorded	R/double word
60329	Number of historical records	The total number of historical data records recorded	R/double word
60333	keyboard language switch	1-Chinese keyboard, 0-English keyboard, for standard keyboard	R/W
60334	CPU usage	CPU runtime usage of the current system	R
60335	The current brightness value of the backlight	The current brightness value of the backlight (140 – 450)	R/W
60337	Current project creation time year	Current project file creation time year	R
60338	Current project creation time month	Current project file creation time month	R
60339	Current project creation date and time	The current project file creation date and time	R

Address	Instruction	Notes	Read and write properties
60340	current user language	set current language	W
60359	When equal to 1, copy the historical alarms of the specified serial number range to the U disk		R/W
60361	When equal to 1, copy the historical alarms of the specified time range to the U disk		R/W
60363	Export historical alarm start sequence number		R/W
60365	Export historical alarm end sequence number		R/W
60367	Export history alarm start time	The length is 6 characters, which are the year, month, day, hour, minute and second.	R/W
60373	Export historical alarm end time	The length is 6 characters, which are the year, month, day, hour, minute and second.	R/W
60379	File name when exporting historical alarms to U disk	22 characters long	R/W
60408	The current group number control address of the historical data	Specify the current group number of historical data	R/W
60409	When equal to 1, copy the historical data of the specified serial number range to the U disk		R/W
60411	When equal to 1, copy the historical data of the specified time range to the U disk		R/W
60413	Export historical data start sequence number		R/W
60415	Export historical data end sequence number		R/W

Address	Instruction	Notes	Read and write properties
60417	Export historical data start time	The length is 6 characters, which are the year, month, day, hour, minute and second.	R/W
60423	End time of exporting historical data	The length is 6 characters, which are the year, month, day, hour, minute and second.	R/W
60429	File name when exporting historical data to U disk	24 characters long	R/W
60441	Modify User 1 Password Cache	16 characters long, ASCII display	R/W
60449	Enable to modify the password of user 1	When it is 1, the password of user 1 will be changed to the password of the cache area, and it will be reset automatically after setting.	R/W
60451	Modify User 2 Password Cache	16 characters long, ASCII display	R/W
60459	Enable to modify the password of user 2	When it is 1, the password of user 2 will be changed to the password of the cache area, and it will be reset automatically after setting.	R/W
60461	Modify User 3 Password Cache	16 characters long, ASCII display	R/W
60469	Enable to modify the password of user 3	When it is 1, the password of user 3 will be changed to the password of the cache area, and it will be reset automatically after setting.	R/W
60471	Modify User 4 Password Cache	16 characters long, ASCII display	R/W
60479	Enable to modify the password of user 4	When it is 1, the password of user 4 will be changed to the password of the cache area, and it will be reset automatically after setting.	R/W
60481	Modify User 5 Password Cache	16 characters long, ASCII display	R/W
60489	Enable to modify the password of user 5	When it is 1, the password of user 5 will be changed to the password of the cache area, and it will be reset automatically	R/W

Address	Instruction	Notes	Read and write properties
		after setting.	
60491	Modify User 6 Password Cache	16 characters long, ASCII display	R/W
60499	Enable to modify the password of user 6	When it is 1, the password of user 6 will be changed to the password of the cache area, and it will be reset automatically after setting.	R/W
60501	Modify User 7 Password Cache	16 characters long, ASCII display	R/W
60509	Enable to modify the password of user 7	When it is 1, the password of user 7 will be changed to the password of the cache area, and it will be reset automatically after setting.	R/W
60511	Modify User 8 Password Cache	16 characters long, ASCII display	R/W
60519	Enable to modify the password of user 8	When it is 1, the password of user 8 will be changed to the password of the cache area, and it will be reset automatically after setting.	R/W
60520	HMI model	40 characters	R
60540	bootloader version number	40 characters	R
60560	OS version number	40 characters	R
60580	software version number	40 characters	R
60600	Operation record enable	When it is 1, the operation record is allowed to be recorded	R/W
60601	Number of operation records	Display the number of current operation records	R
60602	Screen capture enabled	When it is 1, enable screen capture and reset automatically after setting	R/W
60603	Screenshot storage location	0-U disk	R/W
60604	Enable HMI protection	When 1, use HMI protection	R/W
60605	Set the total number of password levels for HMI	Set the total number of password levels for HMI protection, up to 15 passwords	R/W

Address	Instruction	Notes	Read and write properties
	protection	can be set	
60606-60835	Setting the lifetime of the HMI protection	60606-60628 is the year, month, day, hour, minute, second and expiration prompt screen of the level 1 password and the unlock password(the password length is 16 characters) 60629-60651 is the year, month, day, hour, minute, second and expiration prompt screen of the level 2 password, and the unlock password (password length is 16 characters) 60652-60674 are the year, month, day, hour, minute, second, and expiration prompt screens for level 3 passwords, as well as the unlock password (password length is 16 characters) 60675-60697 is the year, month, day, hour, minute, second and expiration prompt screen of the 4-level password and the unlock password (password length is 16 characters) 60698-60720 is the year, month, day, hour, minute, second and expiration prompt screen of the 5-level password and the unlock password (the password length is 16 characters) 60721-60743 are the year, month, day, hour, minute, second and expiration prompt screen of the 6-level password and the unlock password (password length is 16 characters) 60744-60766 is the year, month, day, hour, minute, second and expiration prompt screen of the 7-level password and the unlock password (the password length is 16 characters) 60767-60789 is the year, month, day,	R/W

Address	Instruction	Notes	Read and write properties
		hour, minute, second and expiration prompt screen of the 8-level password and the unlock password (the password length is 16 characters) 60790-60812 is the year, month, day, hour, minute, second and expiration prompt screen of the 9-level password and the unlock password (the password length is 16 characters) 60813-60835 is the year, month, day, hour, minute, second and expiration prompt screen of the 10-level password and the unlock password (the password length is 16 characters)	
63000-63114	Setting the lifetime of the HMI protection	63000-63022 is the year, month, day, hour, minute, second and expiration prompt screen of the 11-level password and the unlock password (the password length is 16 characters) 63023-63045 is the year, month, day, hour, minute, second and expiration prompt screen of the 12-level password and the unlock password (the password length is 16 characters) 63046-63068 is the year, month, day, hour, minute, second and expiration prompt screen of the 13-level password and the unlock password (the password length is 16 characters) 63069-63091 is the year, month, day, hour, minute, second and expiration prompt screen of the 14-level password and the unlock password (the password length is 16 characters) 63092-63114 are the year, month, day, hour, minute, second and expiration prompt screens for the 15-level password and the unlock password (the password	

Address	Instruction	Notes	Read and write properties
		length is 16 characters)	
60836	Enable store to HMI	When it is 1, the HMI protection setting is stored in the HMI, and the setting is automatically reset.	R/W
60837	Initialize HMI protection state	Reset the HMI protection to the initial state. Unlocked users need to unlock again	W
60997	USB input function assignment.	Default is 0, USB keyboard input or USB mouse operation When it is 1, it is used for scanning gun scanning input	R/W
60998	USB two-digit barcode scanning end symbol definition 0-ENTER, 1-TAB+ENTER		R/W
60999	USB two-digit barcode scan code length		R/W
61000 - 61127	Two-digit barcode scanning code storage and use		R/W
61128	Use of printer parameters		R/W
61138	Import recipe source recipe ID number		R/W
61139	Import recipe destination recipe ID number		R/W
61140	Clear recipe ID number	-1 when the initial value is displayed using a 16-bit integer; otherwise, 65535	R/W
61141	Switch the current recipe group number when the HMI is running		R/W
61143	Specify the group number when importing and exporting the recipe U disk		R/W
62020-62039	Current recipe name	ASCII display control, unicode encoding, length 20, Display the current recipe name	R

8.3 RWI

Address	Instruction	Notes
RWI0	Recipe number register	Displays the recipe specified by the recipe number
RWI1	Recipe memory address	Specifying the recipe number can display the data corresponding to the recipe in RWI

9 Connection among multiple HMIs and machines

This chapter introduces multipoint connection of VS-Q HMI that is "one machine with multiple HMIs" connection, "one screen with multiple machines" connection, and the very useful function penetration connection.

9.1 "One machine with multiple HMIs" connection

INVT VS-Q series HMI allows "one machine with multiple HMIs" connection for PLC via MODBUS protocol. All HMIs are connected one by one, and the first screen is connected with PLC. All HMIs may be set as Slave Station, and PLC set as Master Station. Double click "COM1 connection" on the project manager, and then a communication port attribute-setting box will pop up. In Equipment Service item of General option in this box, choose Modbus RTU, and choose Modbus RTU Slave on the right; alternatively, set the first HMI connected with the PLC as the Master Station, and set the PLC and other screens as the Slave Station. In this case, when setting the communication port attributes of the first screen, choose Modbus RTU in Equipment Service item of General option, choose Modbus RTU Master on the right, change the mode to Extended Mode in the Parameter option, and allocate addresses of HMIs. Thus, the HMIs set as Slave Station may communicate with PLC through the first HMI. In both of these two arrangements, only Master Station can communicate with Slave Station, and no communication among Slave Stations can be achieved.

When the PLC is set as Master Station and all HMIs are set as Slave Station:

1. The communication port of the PLC connected is RS232; connection methods and system settings are as shown in figure below:

Figure 9-1 Sketch map of "One machine with multiple machines" when PLC (RS232) is Master station

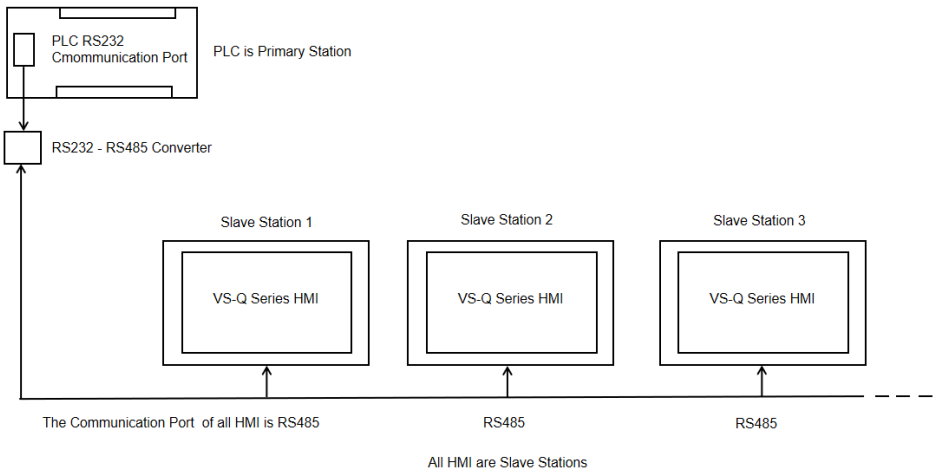


Figure 9-2 Choose MODBUS protocol, and set it as Slave Station

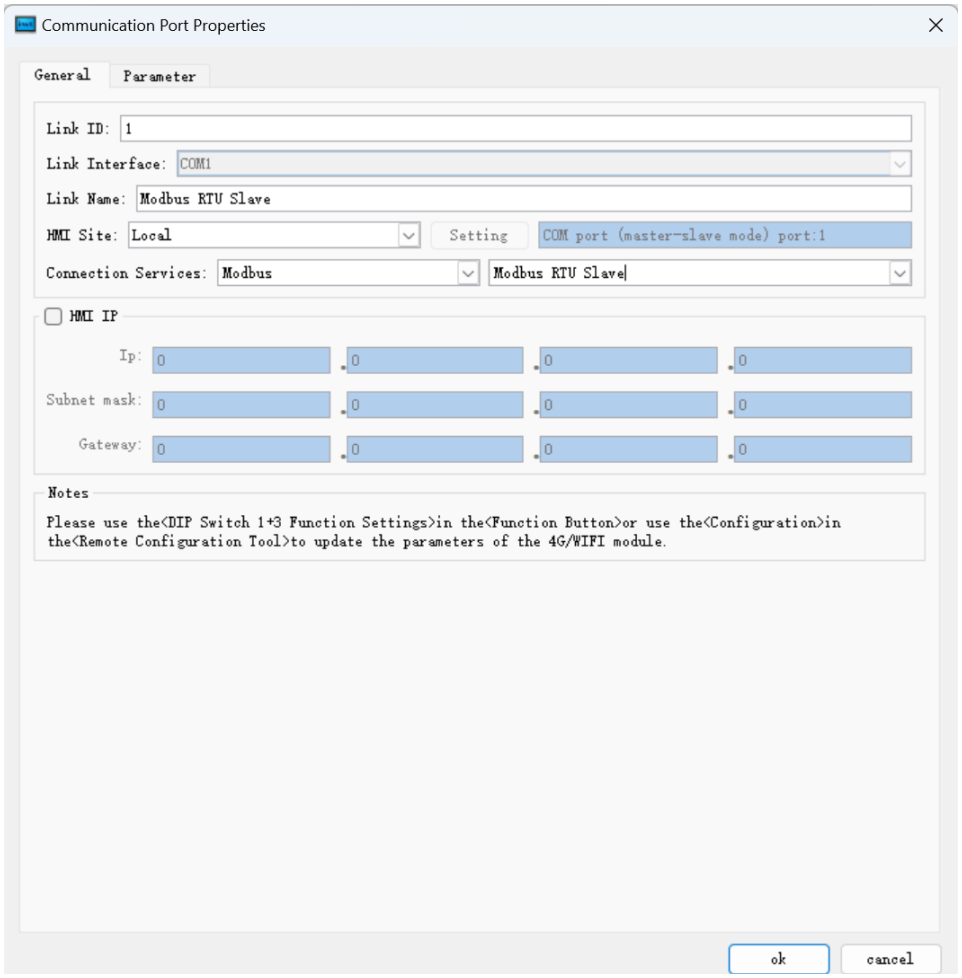
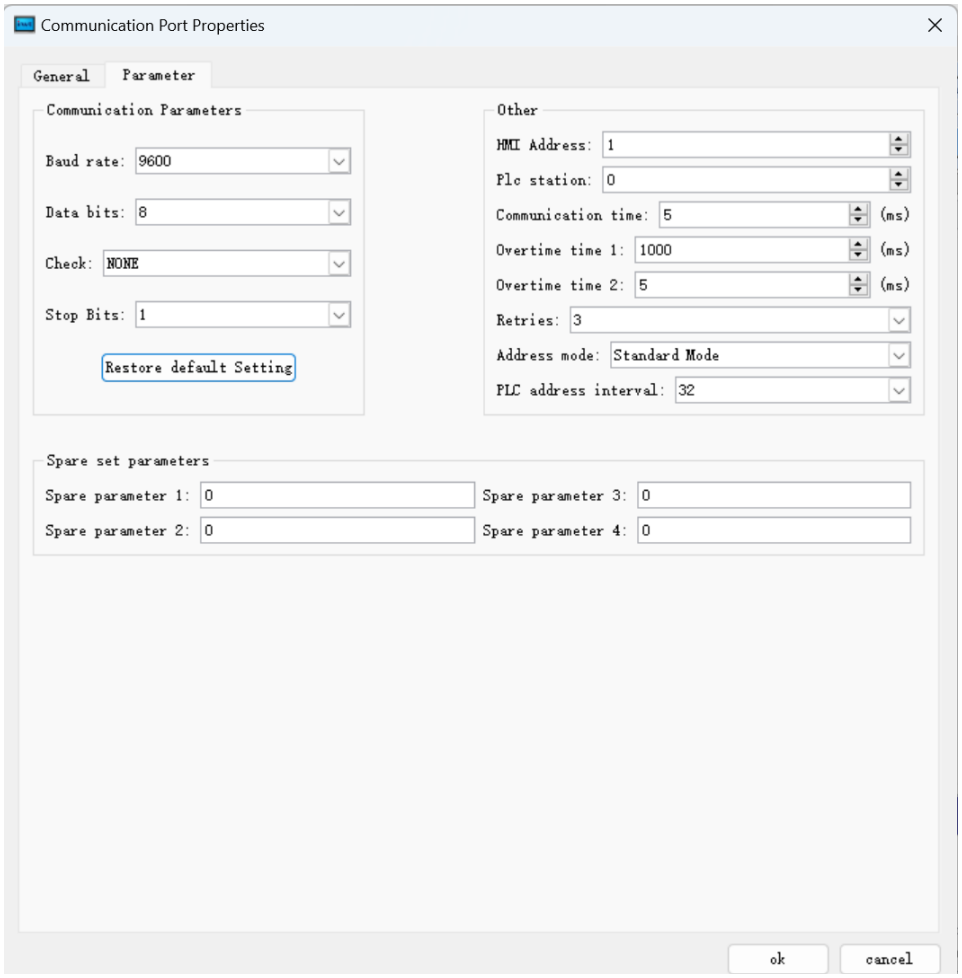
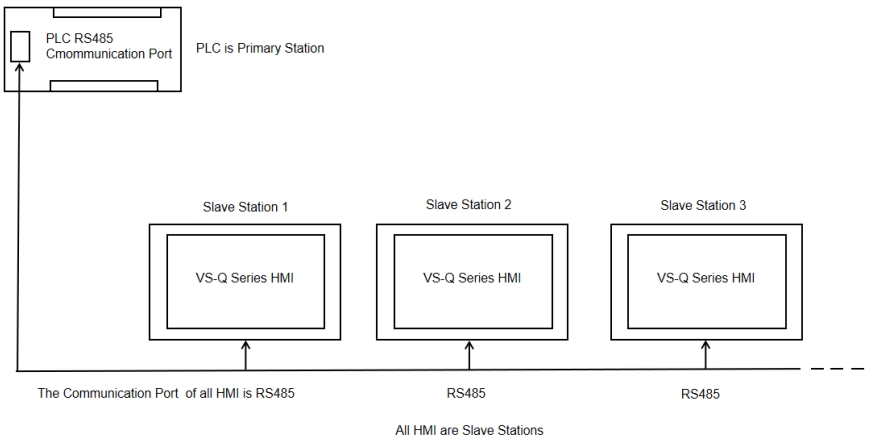


Figure 9-3 Allocation station address of HMI



2. The communication port of the PLC connected is RS485, connection method is as shown in figure below:

Figure 9-4 Sketch map of "One machine with multiple machines" when PLC(RS485) is Master station



When the communication port of PLC is RS485, as all HMIs are Slave Station, the system settings are the same as those when the communication port is RS232.

When all HMI series screens are set as Slave Station, up to 255 screens may be connected. However, if many HMI are connected, the response will be slow.

When the first HMI is set as Master Station, and the PLC and all other screens are set as Slave Station:

The communication port of the PLC connected is RS232; connection methods and system settings are as shown in figure below:

Figure 9-5 Sketch map of "One machine with multiple machines" when PLC (RS232) is Slave station

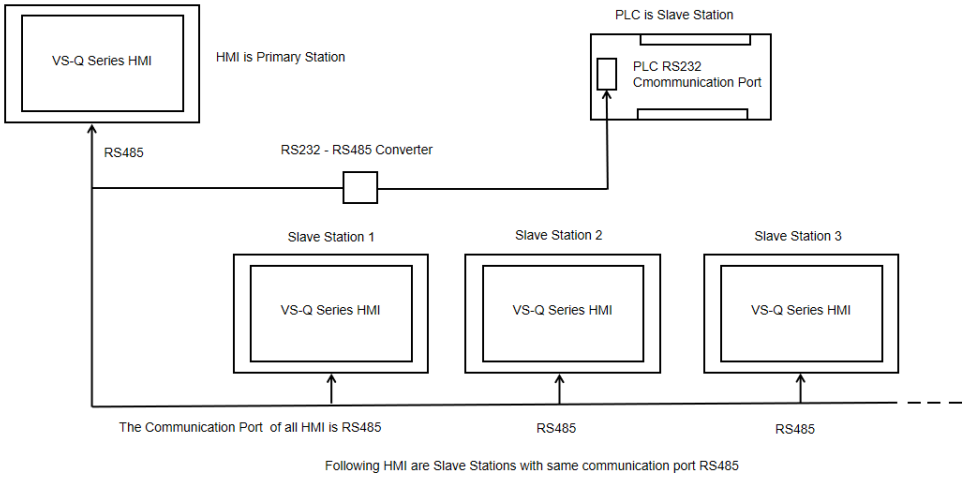


Figure 9-6 Choose MODBUS protocol for the first screen and set it as Master Station

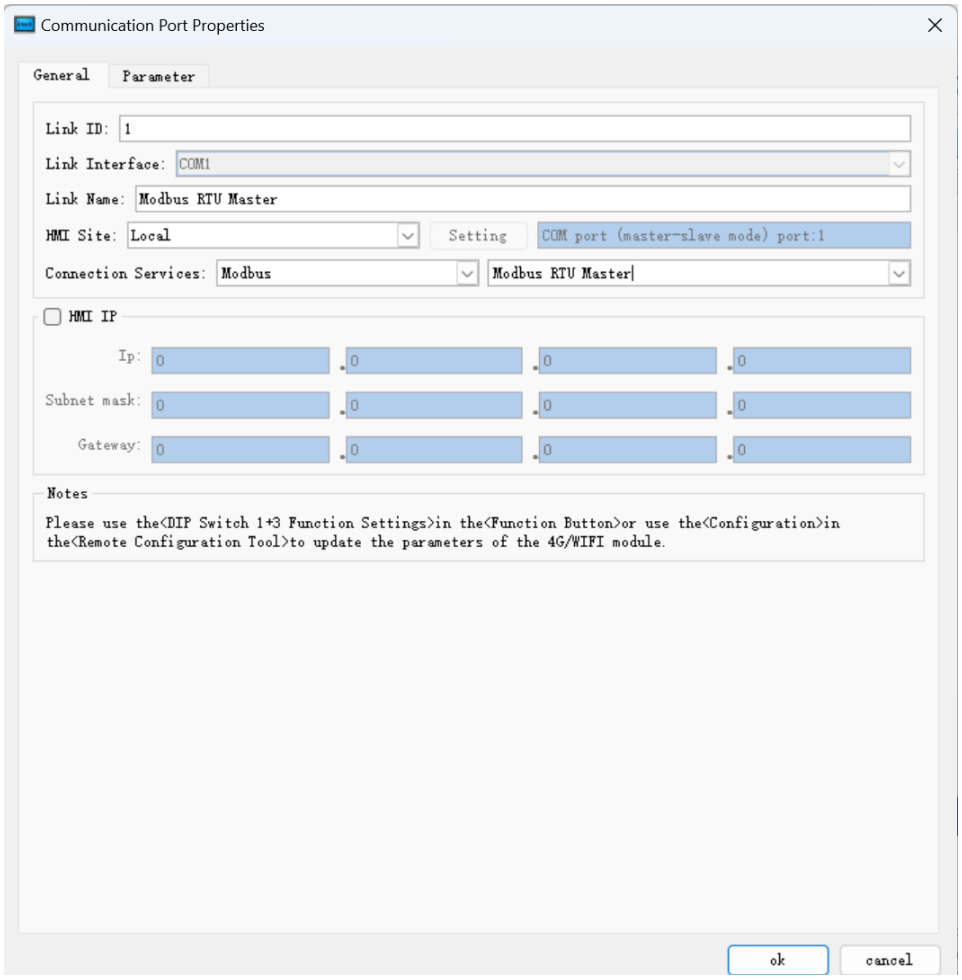
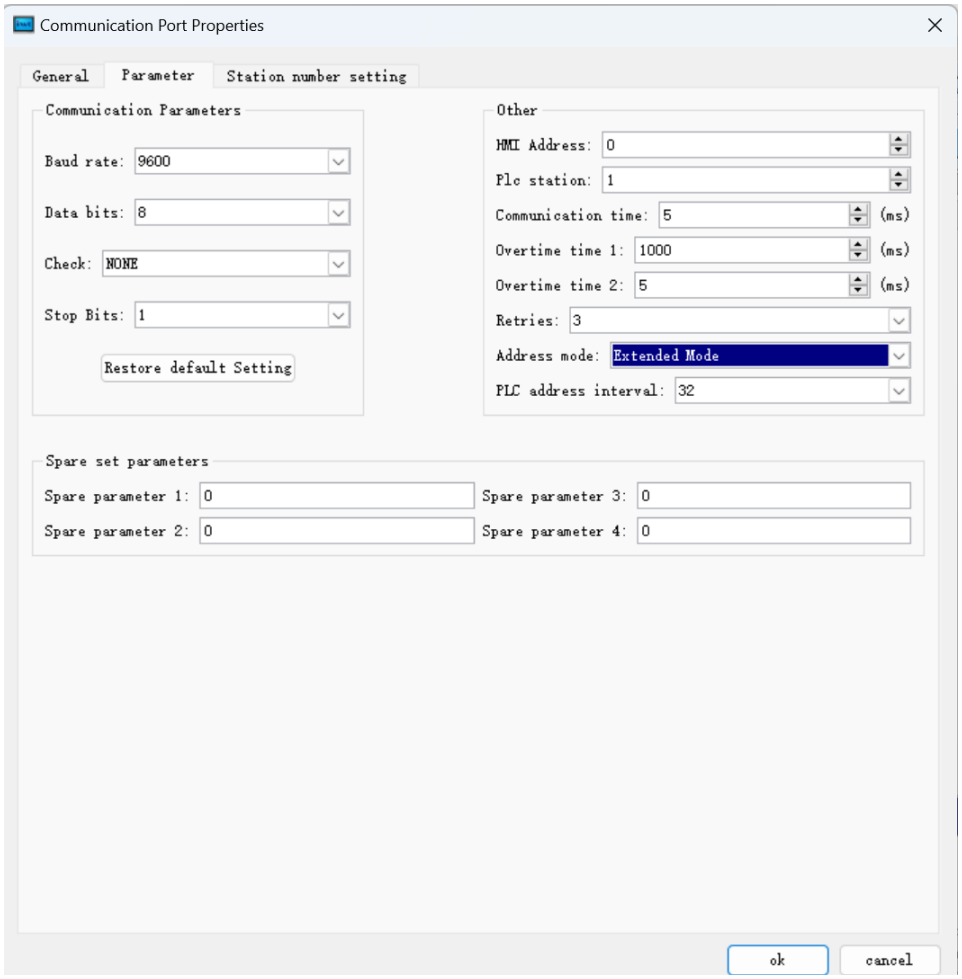


Figure 9-7 Extended are required when the first HMI is set as Master Station



Note:

- ✧ As RS232 cannot support multi-drop connection, when the PLC in the "one machine with multiple HMIs" connection does not support RS485 port, a communication adapter is required to convert RS485 signal to RS232 signal.
- ✧ When HMI series HMI is set as master station in the "one machine with multiple screens" connection, multiple protocols must be set for the address mode of the HMI used as master station.
- ✧ When set Modbus as Master station, it can add up to 255 Slave stations in principle; however, the more slave stations are set, the slower communication speed will be.

9.2 "One HMI with multiple machines" connection

VS-Q Series HMI allows not only "one machine with multiple HMIs" connection but also "one HMI with multiple machines" connection for PLC via MODBUS protocol. In "one HMI with multiple machines" connection, one touch HMI may be used to directly operate the register address of several PLCs connected with it, so long as the PLCs support MODBUS protocol. At the time of system setting, choose Modbus RTU in Equipment Service item of General option and choose Modbus RTU Master on the right, so that the HMI is set as Master Station and all PLCs are set as Slave Screens. Then, the HMI may operate the register address of the PLCs. The register names of the PLCs correspond to the register names in MODBUS protocol.

Figure 9-8 "One screen with multiple machines" connection

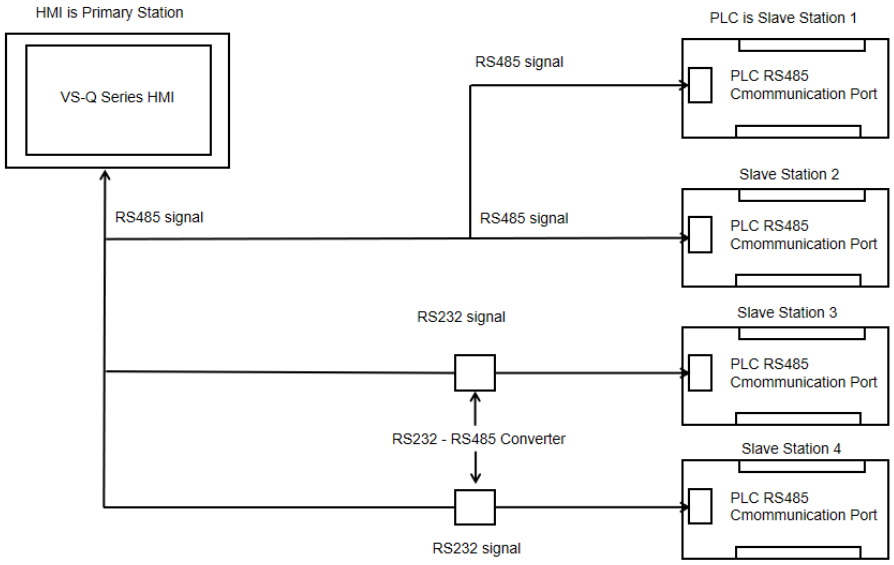


Figure 9-9 Set the HMI as Master Station

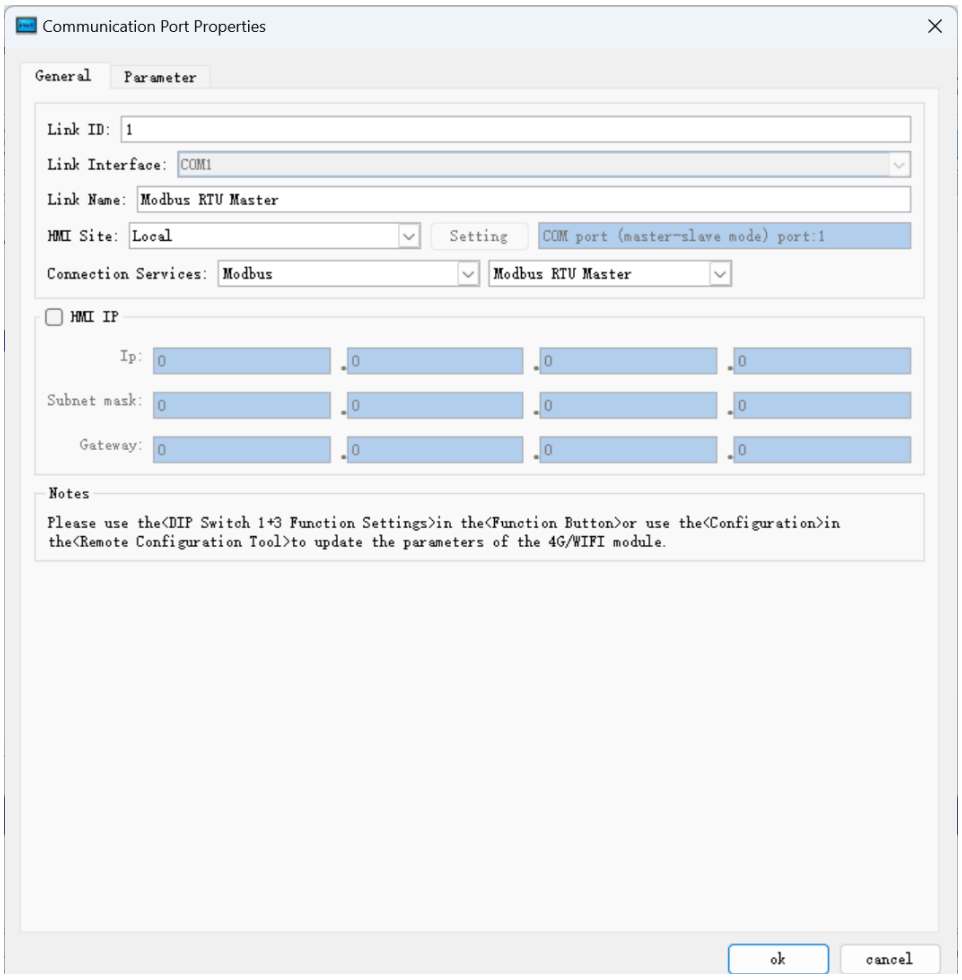
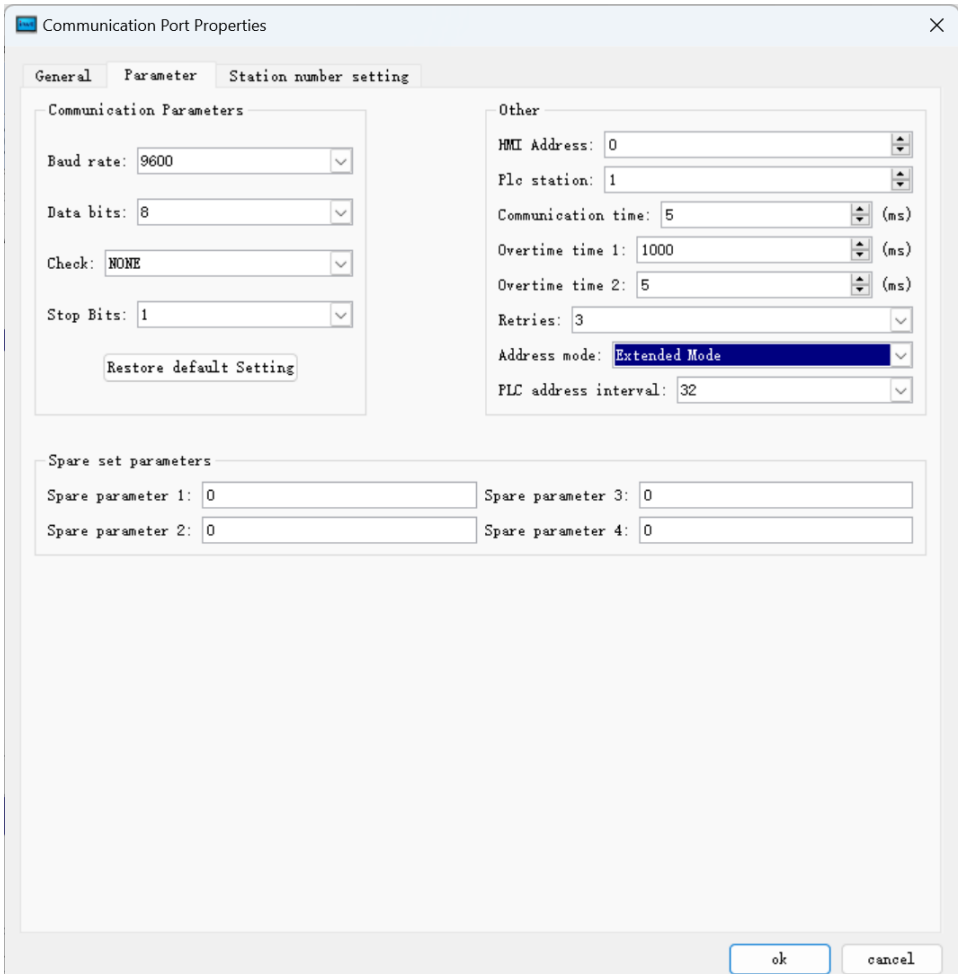
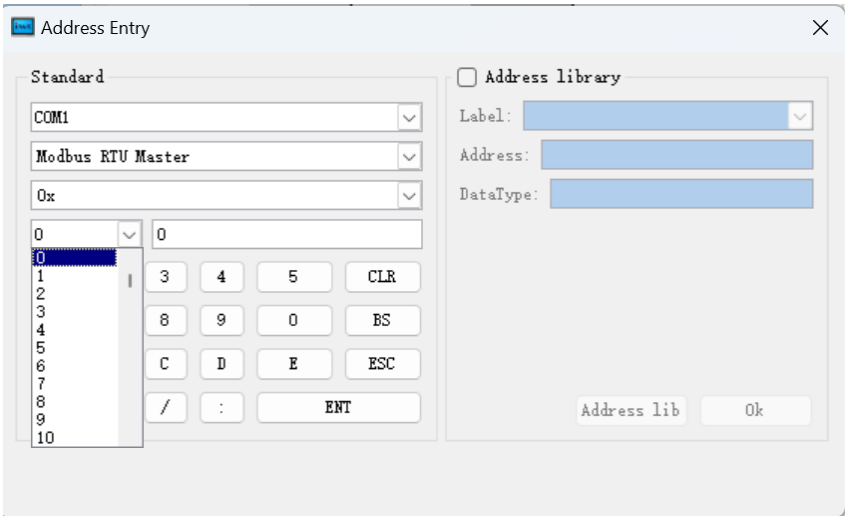


Figure 9-10 Extended Mode are required when the HMI is set as Master Station



After above setting, the PLC addresses in the communication port attributes become ineffective. When user clicks a control to input address, an address input box as shown in Figure below will pop up. There is a dropdown menu on the right of the register name, and the protocol chosen from the dropdown menu is the Slave Station address of the PLC.

Figure 9-11 Address input box



Note:

Instruction of extended mode stations enabling communication to control address:

The address correspondence relation occupied by the control station number is 16 words corresponding to a serial port, that is, the maximum number of control enabling stations is 256, with LW59000 as the base address

COM1 corresponds to 59010 – 59025, LW59010 to station number 0 – 15, LW59011 to station number 16 – 31, and so on

COM2 corresponds to: 59026 – 59041, LW59026 corresponds to station number 0 – 15, LW59027 corresponds to station number 16 – 31, and so on

Ethernet correspondence: 59026 – 59041, LW59026 corresponds to station number 0 – 15, LW59027 corresponds to station number 16 – 31, and so on

The default is all on when HMI is open, you can use macro controlling every bit to start or stop connecting station number.

Note: As RS232 cannot support multi-drop connection, when the PLC in the "one screen with multiple machines" connection does not support RS485 port, a communication adapter is required to convert RS485 signal to RS232 signal.

9.3 Penetration connection

VS-Q Series HMI allows a special connection manner, in which a remote HMI can monitor or control PLC or other devices via the serial port of another HMI connected with the PLC or device. In this case, there are two or more control terminals to operate the device connected. Penetration connection is a very useful function of HMI.

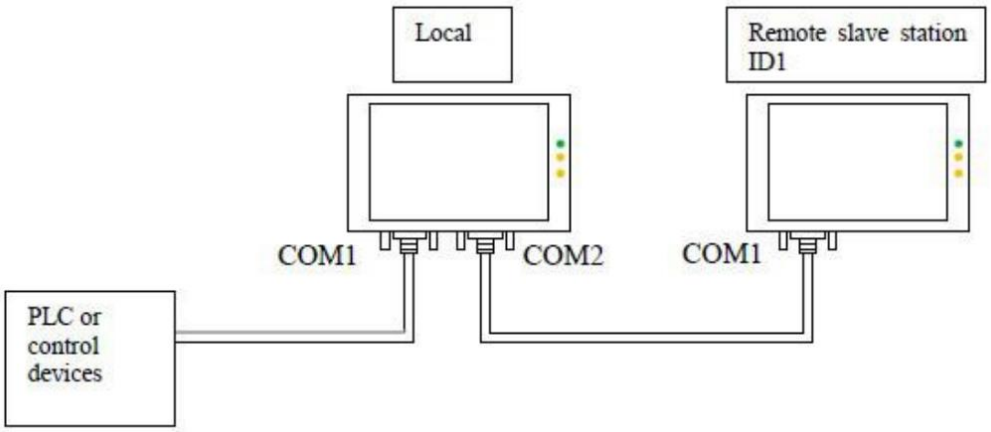
Before use penetration connection, the following terms should be understood:

- Local HMI: The HMI connected with the PLC or other device.
- Remote HMI: The HMI connected with the local machine that controls the devices connected through penetration.

To realize penetration connection, the local HMI must have two serial ports. The sketch map of penetration connection is shown in figure below:

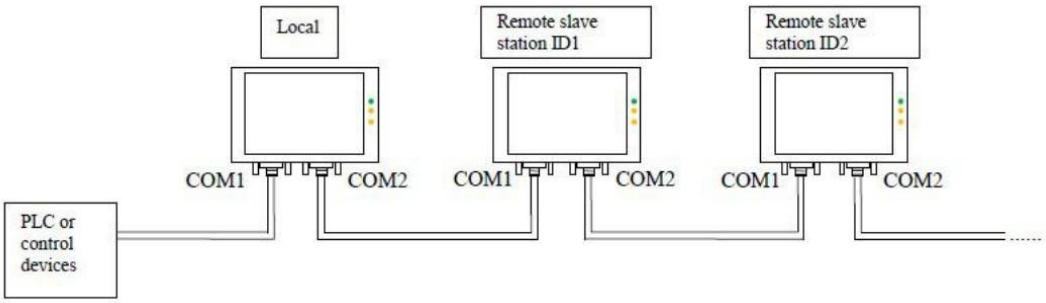
Penetration connection involving two screens:

Figure 9-12 Sketch map of penetration connection involving two screens



Penetration connection involving multiple screens:

Figure 9-13 Sketch map of penetration connection involving multiple screens



Local HMI: Software setting:

Double click the connection established, and then a communication port attribute-setting box will pop up. Choose COM1 for connection port. Taking MITSUBISHI penetration for example, the COM1 of the local HMI is connected with MITSUBISHI FX2N PLC. The communication parameters set in Communication Parameter should be consistent with the PLC or other devices connected. See figure below:

Figure 9-14 General page of local HMI communication port attribute setting

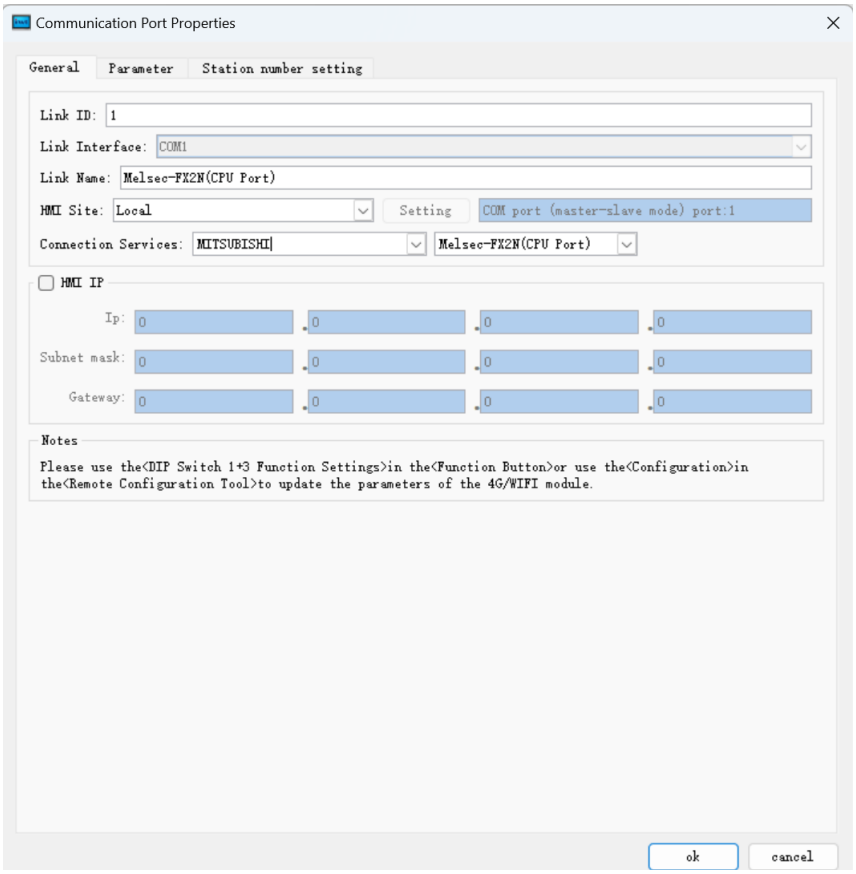
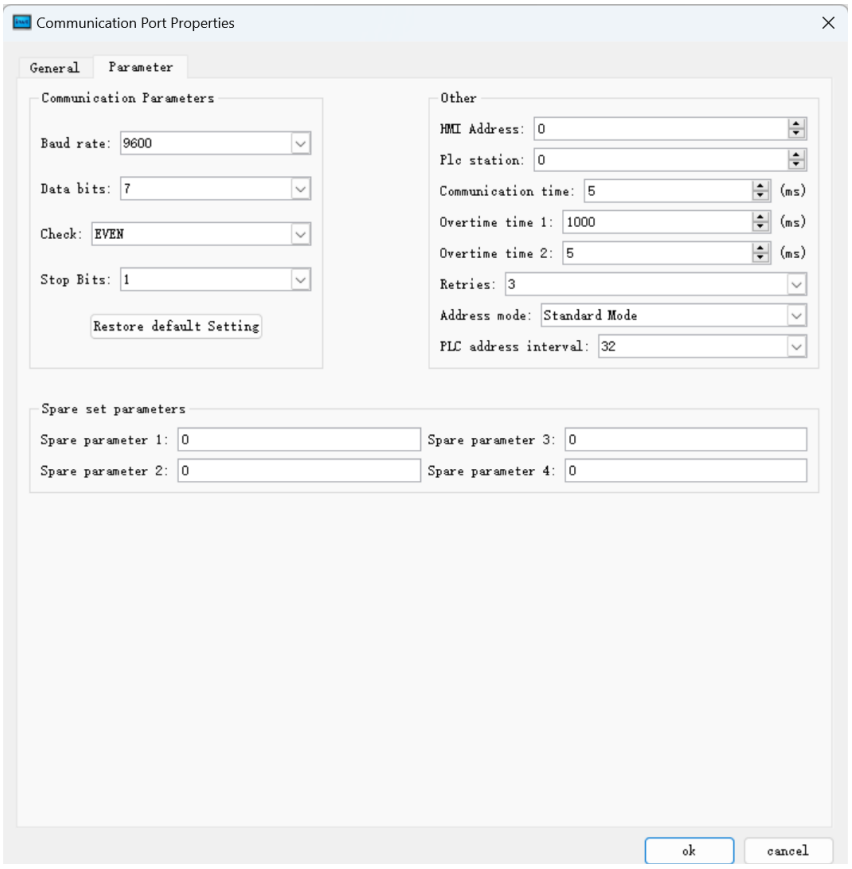


Figure 9-15 COM1 setting page of local HMI communication port attribute setting



Create a new connection, choose COM2 for the connection port, add no protocol in Connection, set attributes as follows, and set the same serial port attributes as serial port 1. The recommended parameters are 9600, 8, None, 1. Choose Connect Slave Screen Port for penetration attribute, and set the number of screens according to actual condition. See figure below:

Figure 9-16 General page of local HMI communication port attribute setting

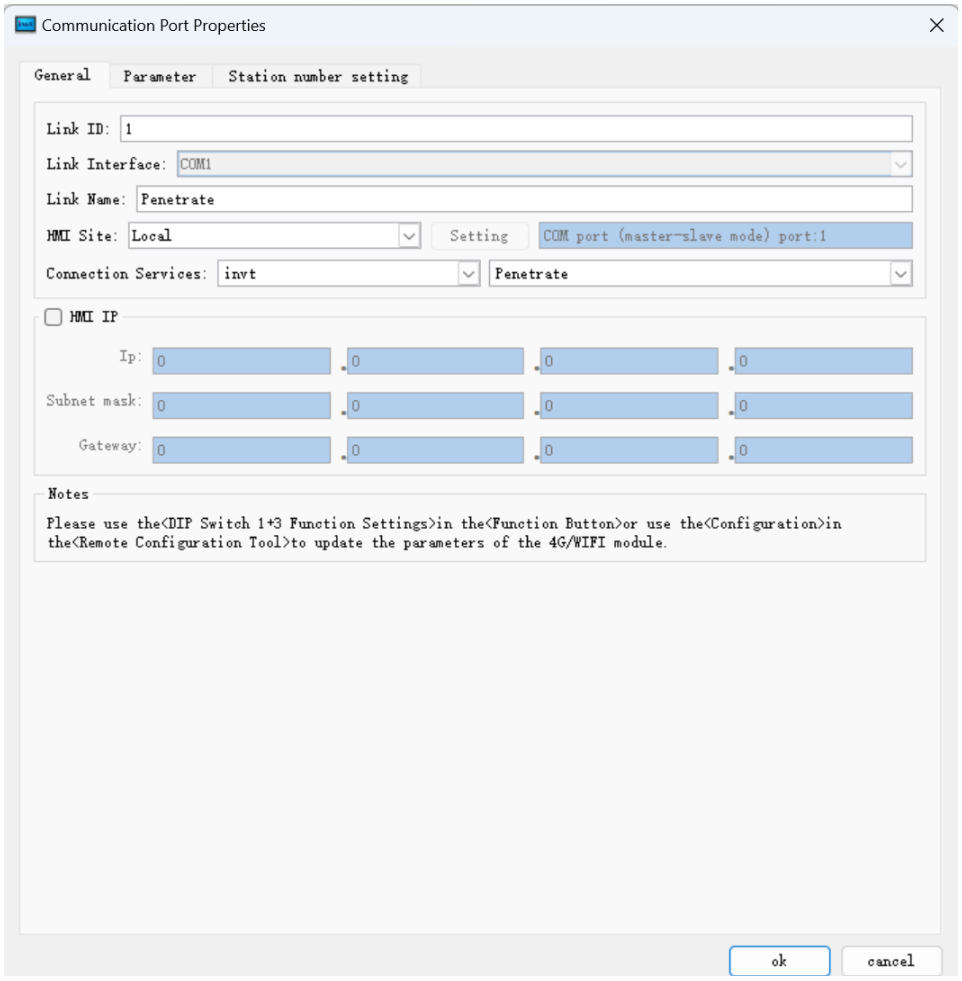
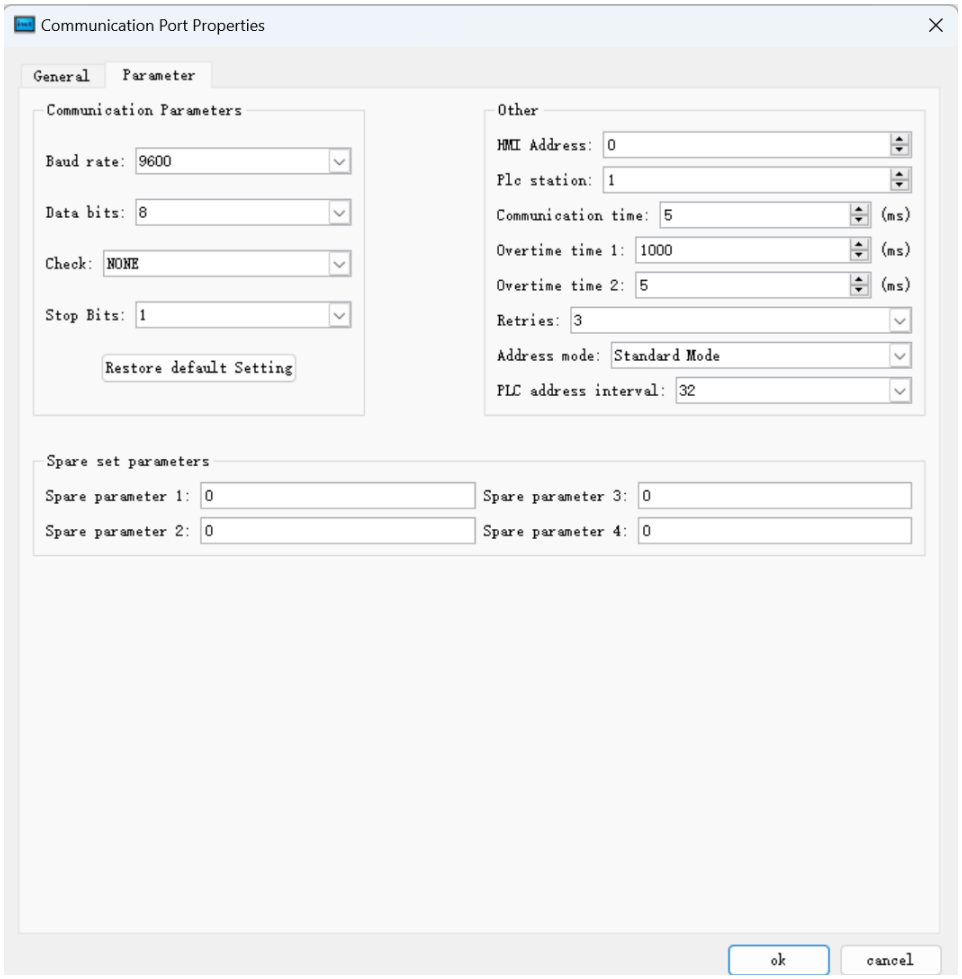


Figure 9-17 Parameter setting page of local HMI communication port attribute setting



Choose default values for other parameters. At this moment, the parameter setting for local HMI is completed.

Remote HMI: Software setting:

Double click the connection established, and then a communication port attribute-setting box will pop up. Choose COM1 for connection port, choose Remote for HMI Site, and set the same communication parameters as those in the COM2 parameter setting page of local HMI communication port attribute setting, as shown in figure below:

Figure 9-18 General page of remote HMI communication port attribute setting

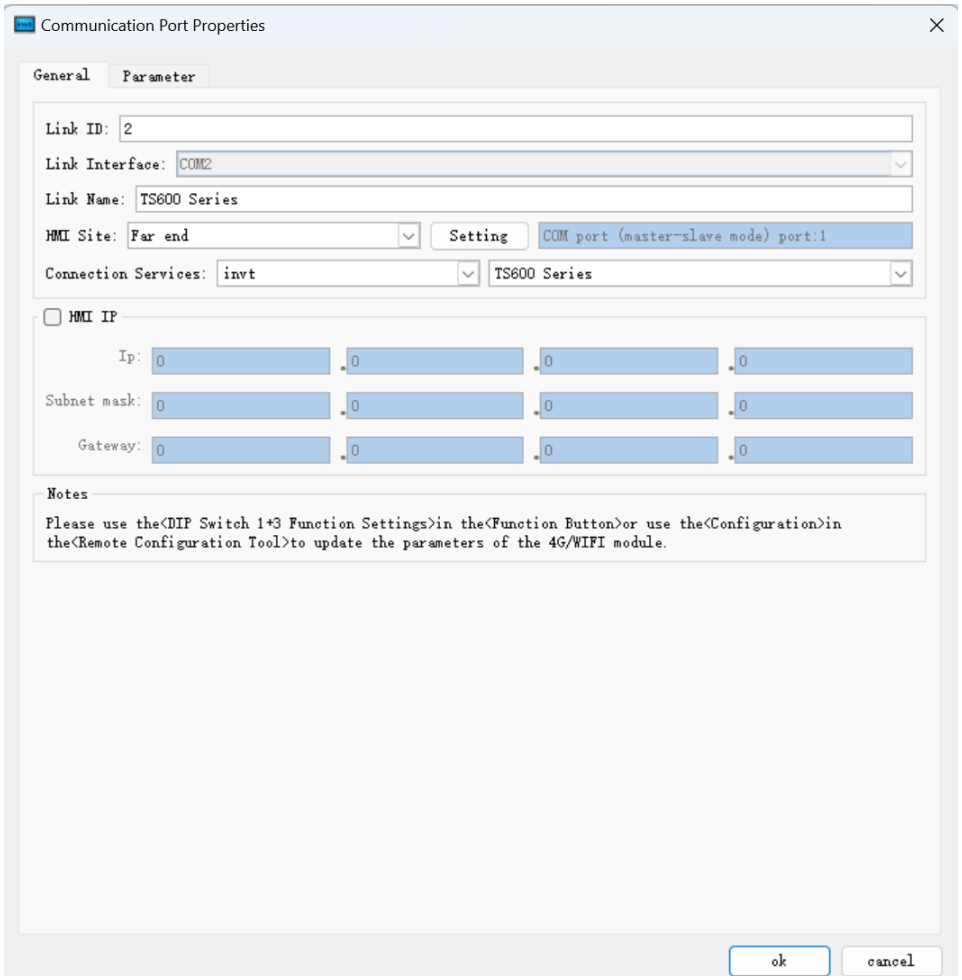
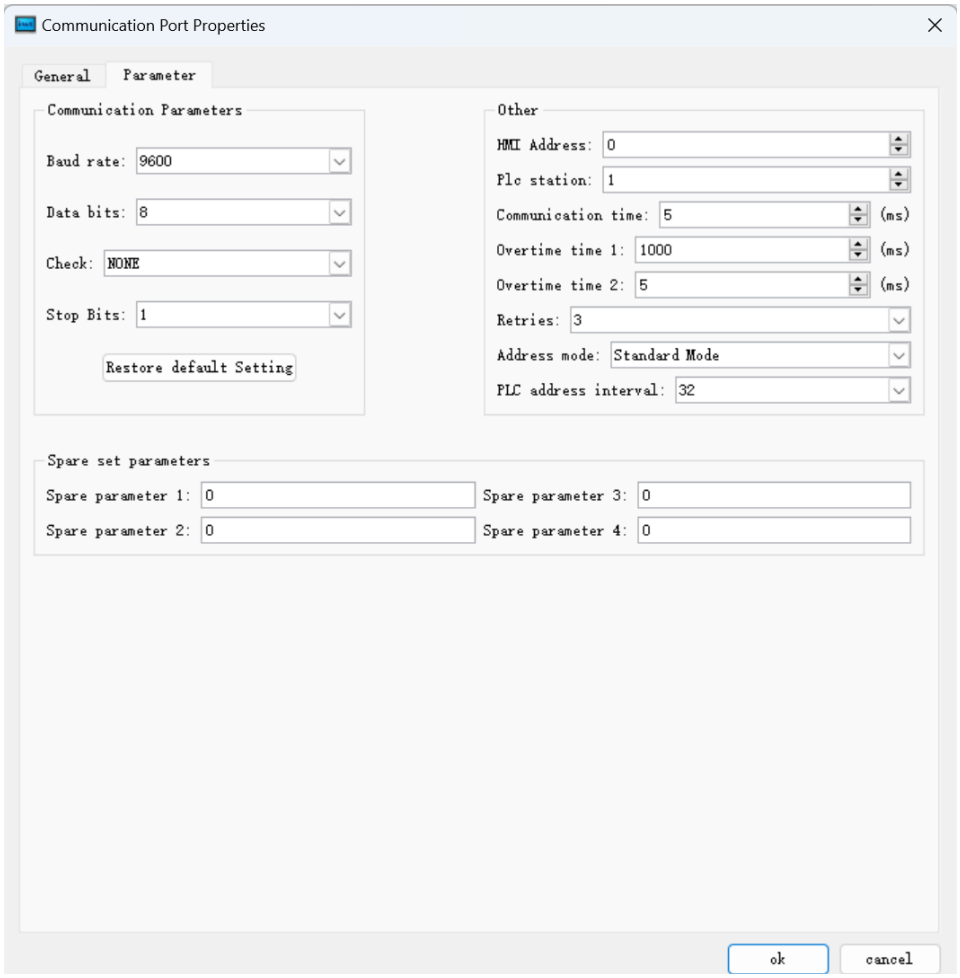


Figure 9-19 Parameter setting page of remote HMI communication port attribute setting



Choose default values for other parameters. At this moment, the parameter setting for remote HMI is completed.

Note:

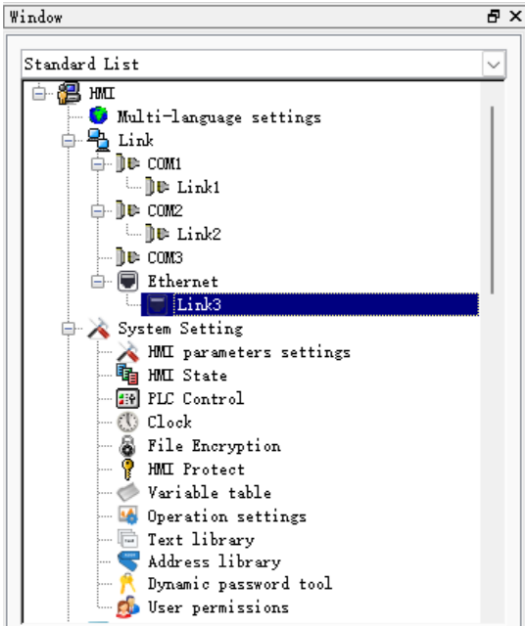
- The above settings are software setting for penetration involving two screens.
- In penetration connection involving multiple screens, COM setting in remote HMI is the same as COM setting in local HMI.
- As all communication data are exchanged with PLC through COM1 of local HMI, the communication rate will be low in the case of penetration connection involving multiple screens.

9.4 Modbus TCP/IP

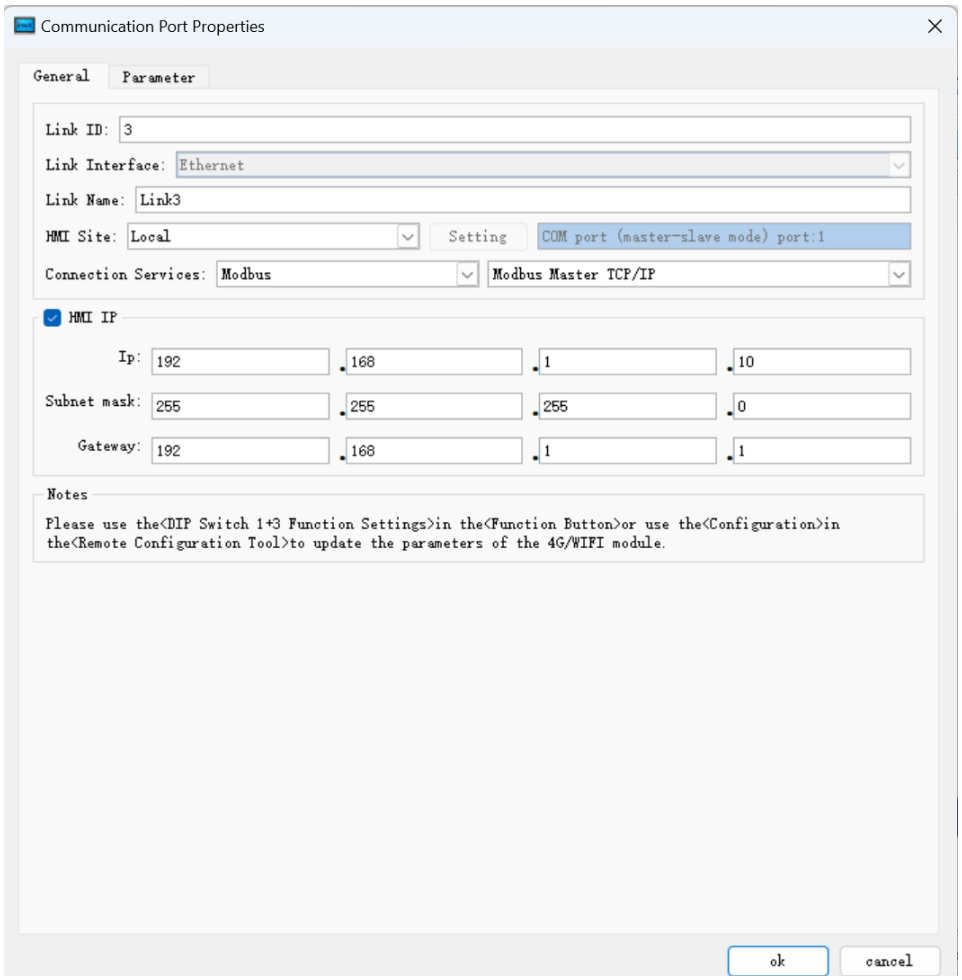
It is available to execute remote communication and control to HMI through the MODBUS TCP.

Settings when set HMI as Master station:

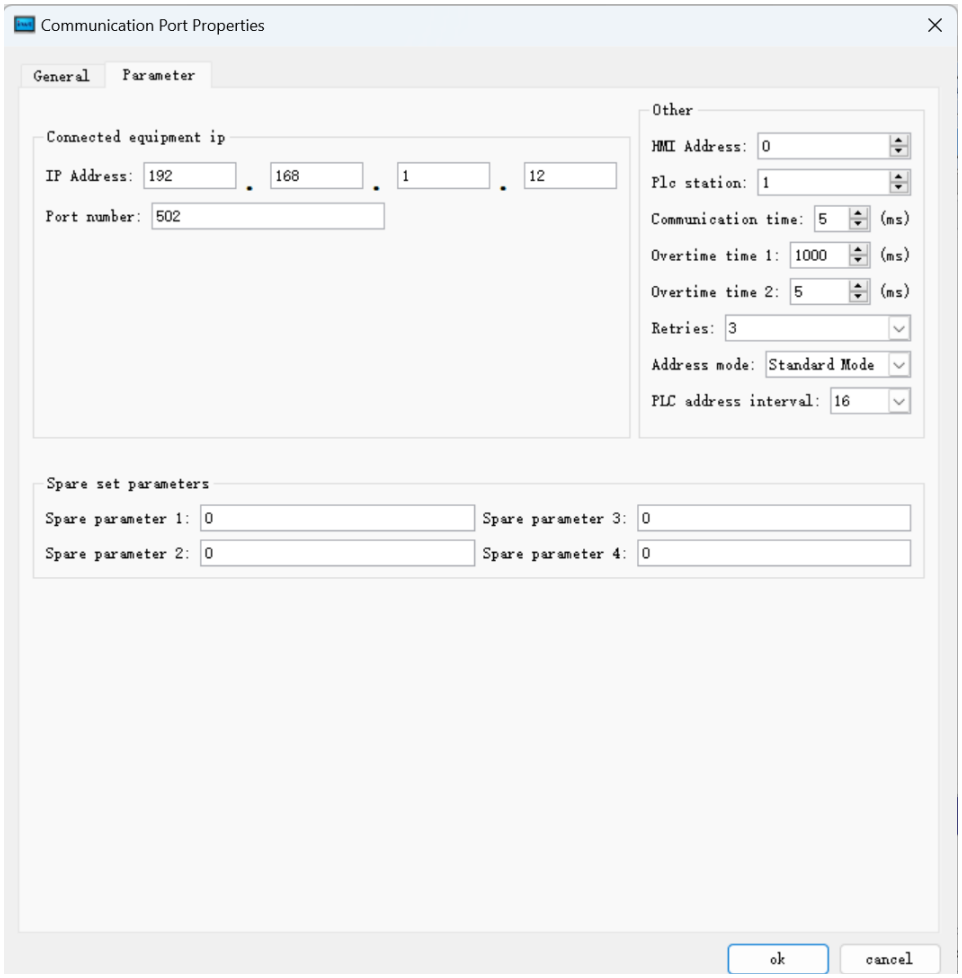
Double click "Link3" after creating a project, as shown below:



The "Communication Port Properties" dialog box is displayed (shown below).



Click "Parameter" in the pop-up "Port Properties" dialog box, enter the following dialog box to set the IP address and the port number (IP address and port are those of monitoring device). Choose standard address mode; Click "OK" to complete the settings



If select "Extended Mode" for Address Mode, set the IP address by referring to the communication port settings.

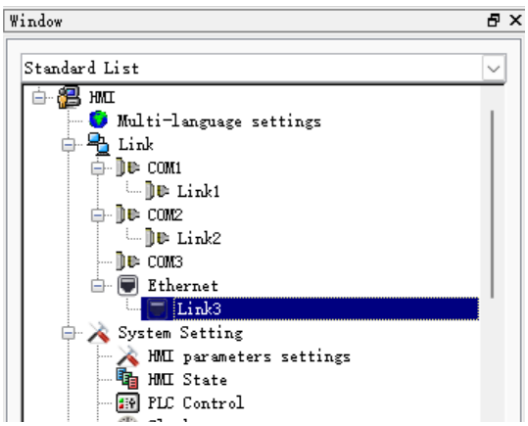
Settings of slave station:

1. Set the IP

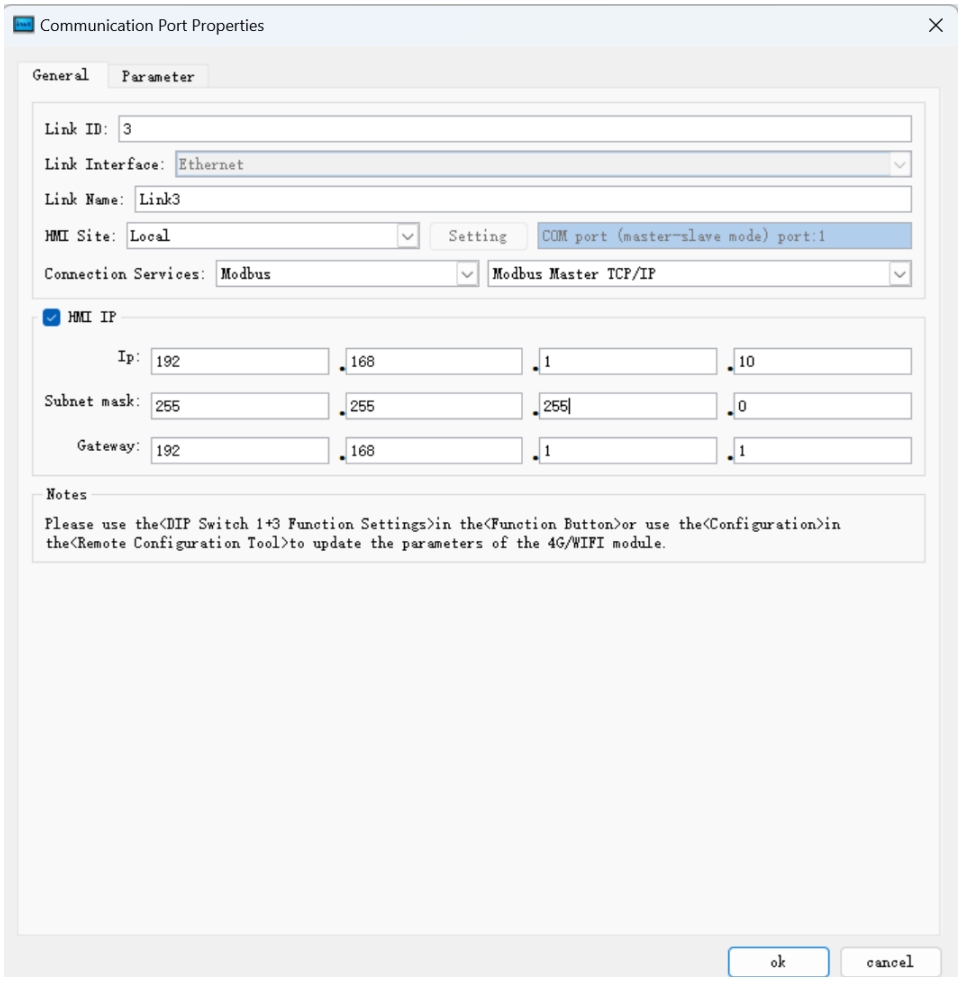
First, use DIAL switches 1, 3 to set the IP address of HMI; in the pop-up IP setting interface, enter the IP address. In this example, set the IP address of slave station to 192.168.1.12.

2. Establish connections

After creating the project, double click "Link3" in the following picture, as shown below:

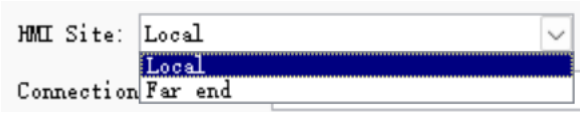


The "Communication Port Properties" dialog box is displayed (shown below).

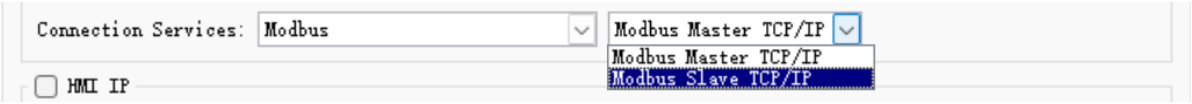


In the dialog box shown above, execute the following settings:

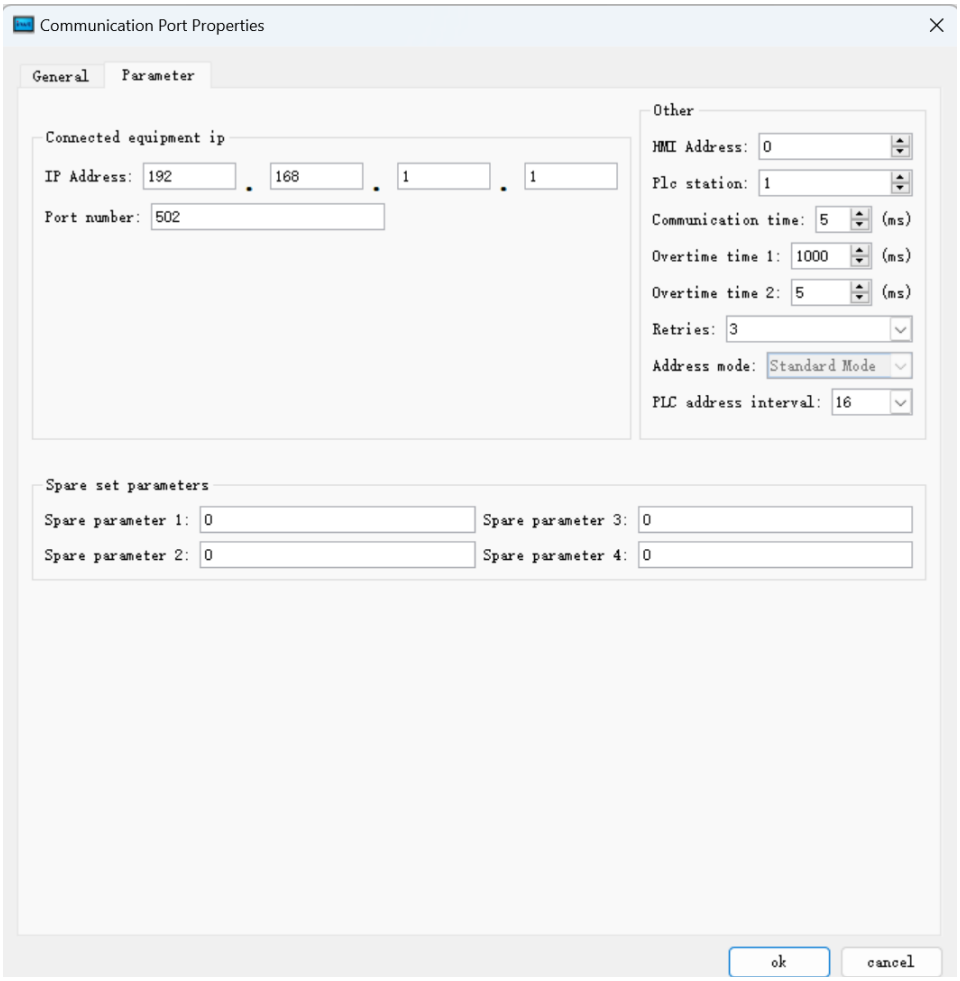
HMI Site: Select "Local" (as shown).



Connection Service: Select "Modbus" - "Modbus Slave TCP / IP" (as shown).



Click "Parameter" in the pop-up "Port Properties" dialog box, enter the following dialog box to set the IP address (IP address of the slave station) and the port number. Click "OK" to complete the settings.



Download the project into HMI; connect the master and slave station directly or through a router in order to perform operations of monitoring and control.

Note: Address is the internal address when HMI is set as slave station.

10 Device driver

This chapter details connected devices compatible with the VS-Q series HMI.

It is important for the configuration to set I / O of device driver. VS-Q series HMI can communicate with PLC, MCU, inverter and other industrial equipment, including the vast majority of PLCs: INVT, MITSUBISHI, OMRON, SIEMENS, ALLEN-BRADLEY Rockwell, MATSUSHITA, DELTA, FATEK, etc. Or it can also monitor and control certain industrial control equipment via specific protocol, such as MODBUS RTU / ASCII, HOSTLINK and some other custom protocols.

I / O driver of each PLC or device is made into a file, so it only needs to select the corresponding PLC or device when creating a configuration project without the necessity for engineers to perform other complex programming operation. HMITOOL is the configuration software of VS-Q series HMI, which can realize functions of all kinds of registers or relays of most PLCs or devices through simple and convenient configuration operations. There are three operation modes: read only, write only, read and write, meeting various requirements of industrial control.

In order to facilitate the user to connect different devices, device driver development can be carried out according to the user's needs, only the user needs to provide the corresponding communication device protocol documents. Users with this requirement can follow the contact information provided at the end of this manual to contact our company.

PLCs supported by VS-Q series HMI:

Manufacturer (Brand)	Model	Communication protocol	Connection mode
INVT	IVC, TS, AX, TM Series	User-defined protocol	Direct connection (Serial port/Ethernet)
Advantech Distributed I/O	ADAM-4017, ADAM-4060	Proprietary protocol of Advantech	Direct connection (Serial port)
AIBUS	AI series	AIBUS protocol	Direct connection (Serial port)
Allen-Bradley	MicroLogix series	DF1 protocol	Direct connection (Serial port)
Altec Electronics	AL series	Proprietary protocol of Altec	Direct connection (Serial port)
Can	Can	Can	Direct connection (Serial port)
Delta Corporation	DVP series	Proprietary protocol of Delta	Direct connection (Serial port)
Emerson Network	EC series	Proprietary	Direct connection

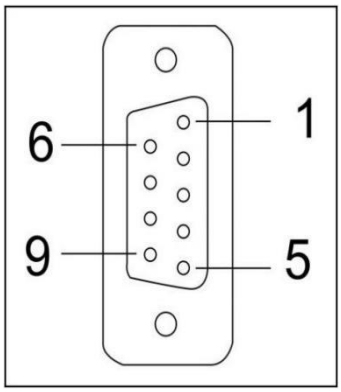
Manufacturer (Brand)	Model	Communication protocol	Connection mode
Power		protocol of Emerson	(Serial port)
Fatek Automation Corporation	FB series	Proprietary protocol of Fatek	Direct connection (Serial port)
Fuji Electric Corporation	NB series	Proprietary protocol of Fuji	Direct connection (Serial port)
GE Corporation	GE SNP-X/CCM	Proprietary protocol of GE	Direct connection (Serial port)
Haiwell Technology Corporation	E/S/H series	Proprietary protocol of Corporation	Direct connection (Serial port)
Hitachi Industrial	E/EH series	Proprietary protocol of Hitachi	Direct connection (Serial port)
HollySys Group	LM series	Proprietary protocol of HollySys	Direct connection (Serial port)
IDEC Corporation	FC4A/FC5A series	Proprietary protocol of IDEC	Direct connection (Serial port)
Inovance Technology Corporation	H1u/H2u series	Proprietary protocol of Inovance	Direct connection (Serial port)
JiaChuang Technology	JiaChuang	Proprietary protocol of JiaChuang	Direct connection (Serial port)
KDN Automation Corporation	K3 series	Proprietary protocol of KDN	Direct connection (Serial port)
Keyence Corporation	KV-1000/700 KV-L20(R), KV-10/16/24/40 KV-P16	Proprietary protocol of Keyence	Direct connection (Serial port)
Koyo Electronics	SN series	Proprietary protocol of KoYo	Direct connection (Serial port)
Kstar Technology	Kstar Equipment	Proprietary protocol of Kstar	Direct connection (Serial port)
Letrun Technology	LC series	Proprietary protocol of Letrun	Direct connection (Serial port)
LG Industrial Systems	Master-K series	Proprietary protocol of LG	Direct connection (Serial port)
Matsushita	FP series	Proprietary protocol of	Direct connection (Serial port)

Manufacturer (Brand)	Model	Communication protocol	Connection mode
		Matsushita	
Mitsubishi	Melsec-FX/FX2N/FX3U/FX3G, Melsec-Q_C24N, Q00U series	Proprietary protocol of Mitsubishi	Direct connection (Serial port)
Mikom	Mx1H	Modbus rtu	Direct connection (Serial port)
Modbus	RTU/ASCII Equipment, RTU TCP/IP Equipment	Modbus Protocol	Direct connection (Serial port/Ethernet)
Modicon Corporation	NEZA/TWIDO/M218 series	Modbus Protocol	Direct connection (Serial port)
Nanda Auto Technology	NA-200/NA-400 series	Proprietary protocol of Nanda Auto	Direct connection (Serial port)
Omron	C/CPM series, CS/CJ series	Proprietary protocol of Omron	Direct connection (Serial port)
RUNPOWER	RPC2000 series	Proprietary protocol of RUNPOWER	Direct connection (Serial port)
SEARI	VP series	Proprietary protocol of SEARI	Direct connection (Serial port)
Shimaden	MR13	Proprietary protocol of Shimaden	Direct connection (Serial port)
Siemens	S7-200(PPI), S7-300(MPI)	Proprietary protocol of Siemens	Direct connection (Serial port)
TaiAn Technology	TP03 series	Proprietary protocol of TaiAn Technology	Direct connection (Serial port)
TaiLing Electric	DX series	Proprietary protocol of TaiLing Electric	Direct connection (Serial port)
Techwayson Technology	V series	Proprietary protocol of Techwayson Technology	Direct connection (Serial port)
Vigor Electric Corporation	V/VH/VB/M series	Proprietary protocol of Vigor	Direct connection (Serial port)

Manufacturer (Brand)	Model	Communication protocol	Connection mode
		Electric Corporation	
Xinje Electronic	XC/XCM series	Proprietary protocol of Xinje Electronic	Direct connection (Serial port)
Yokogawa Electric Corporation	FA-M3 series	Proprietary protocol of Yokogawa Electric Corporation	Direct connection (Serial port)
ZhengHang Electronics	A4/A5 series	Proprietary protocol of ZhengHang Electronics	Direct connection (Serial port)

Pin definitions of VS-Q series HMI COM1/COM2/COM3

VS-Q Series HMI employs nine-pin plug so that it should be nine-pin receptacle for the connection cable. Pin definitions are shown below:



This port is used to connect PLC or other devices with RS232/RS422/RS485 communication port. The number of COM ports of different models of DB9 interface is different, the specific number of COM ports and the definition of COM ports are shown in the VS-Q series HMI selection manual, and its pin definition is shown in the following table:

Pin	COM1:RS232	COM2:RS422	COM2:RS485	COM3:RS485
1				B-
2	RX			
3	TX			
4				A+
5	GND			
6		RX-		
7		RX+		
8		TX-	B-	
9		TX+	A+	

A+: RS485 Communication+

B-: RS485 Communication-

RX: RS232 Receiver of communication

TX: RS232 Sender of communication

GND: Ground terminal

RX-: RS422 Communication receiving-

RX+: RS422 Communication receiving +

TX-: RS422 Communication transporting -/RS485 Communication B

TX+: RS422 Communication transporting +/RS485 Communication A

Note:

- ✧ Terminals of 2/3/5 in case of RS232 communication;
- ✧ Terminals of 6/7/8/9 in case of RS422 communication;
- ✧ Terminals of 8/9 in case of RS485 communication.

10.1 Invt device driver

The device driver is used for VS-Q series HMI to read and write the data or state of INVT series PLC. The serial communication connection is established through the serial port of the HMI and the serial port of INVT series PLC, so as to operate INVT device. Prior to use of the driver, please carefully read this chapter and the related technical specifications of the INVT device.

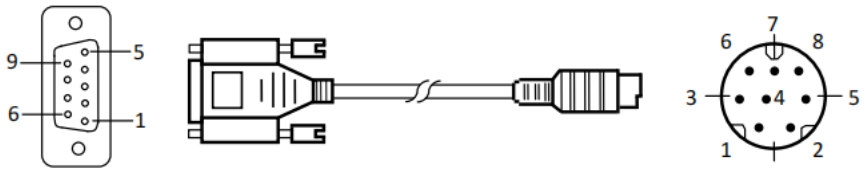
How to establish connection with INVT IVC series PLC

1. Hardware connection

Connecting cable:

RS232

VS-Q Series HMI COM1/COM2/COM3		INVT IVC Series	
2	RX	5	TX
3	TX	4	RX
5	GND	3	GND



Terminal of VS-Q series HMI is DB9F; that of INVT IVC series PLC is MD8M.

2. Software settings

- Select INVT in connection device service.
- Select the corresponding item in connection device service according to the connected PLC model or supported protocol.
- Ensure that the communication parameters in HMI connection parameters and PLC station number are consistent with the PLC connected.
- For settings of the PLC, refer to the technical documents of the INVT IVC series PLC.

Setting item	Default parameter value	Setting scope
PLC type	IVC1,IVC1L,IVCIS,IVC2L,IVC3	IVC1,IVC1L,IVCIS,IVC2L,IVC3
Communication port type	RS232	RS232/RS422/RS485
Baud rate	9600	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	8	7/8
Parity bit	NONE	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	1	0 – 255
HMI station number	0	0 – 255

Supporting function	Whether it is supported
Off-line simulation	yes
On-line simulation	yes
Extended mode	yes

3. (IVC1,IVC1L,IVCIS,IVC2L,IVC3)Operational register and address range

Register name	Address format	Input range	Remarks
X	ooo	0 – 377	Bit: input connection point, read only
Y	ooo	0 – 377	Bit: output connection point
M	dddd	0 – 7999	Bit: internal relay
SM	ddd	0 – 255	Bit: Special internal relay
S	ddd	0 – 999	Bit: stepping relay
T	ddd	0 – 255	Bit: timer status
C	ddd	0 – 255	Bit: counter status
D	dddd	0 – 7999	Word: temporary data storage
SD	ddd	0 – 255	Word: special data register
TV	ddd	0 – 255	Word: Timer current value
CV	ddd	0 – 199	Word: Counter current value

Register name	Address format	Input range	Remarks
Z	dd	0 – 15	Word: Variable Addressing Register
D_Double	dddd	0 – 7999	Double word: data register
CV_Double	ddd	0 – 255	Double word: Counter current value
SV_Double	ddd	0 – 255	Double word: special data register
R	ddd	0 – 32767	Word
RD	ddd	0 – 32766	Double Word:32-bit R Register

Note:

- ✧ d represents decimal system, input range is 0-9;
- ✧ represents octal system, input range is 0-7;
- ✧ Word in the remarks: represents the register can only be used as word;
- ✧ Double-word in the remarks: represents that the data type of the register in configuration must be
- ✧ 32-bit;
- ✧ Bit in the remarks: represents the register can only be used as bit;
- ✧ Read only in the remarks represents that the register can only be read but not be written;
- ✧ The names of the registers supported by different equipment model may be different, and the scopes may also be different. For detailed name and scope, please consult related technical document of the connected device.

10.2 Modbus device driver

The device driver is used for VS-Q Series HMI to read and write the data or state of MODBUS device. The serial communication connection is established through the serial port of the HMI series HMI and the serial port of MODBUS device, so as to operate MODBUS device. Prior to use of the driver, please carefully read this chapter and the related technical specifications of the MODBUS series PLC device.

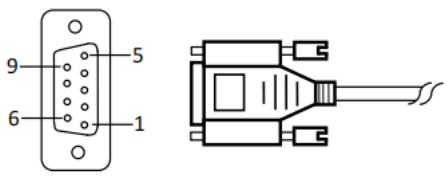
How to establish connection with MODBUS series PLC

1. Hardware connection

Connecting cable:

RS232

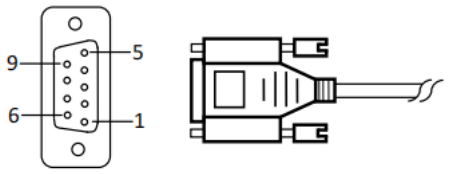
VS-Q Series HMI COM1/COM2/COM3		Modbus Device	
2	RX	User-defined pins	TX
3	TX	User-defined pins	RX
5	GND	User-defined pins	GND



Terminal of HMI is DB9F. Definitions of Modbus device pins depend on particular Modbus device.

RS422

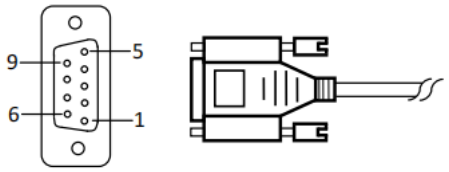
VS-Q Series HMI COM1/COM2/COM3		Modbus Device	
6	RX-	User-defined pins	TX-
7	RX+	User-defined pins	TX+
8	TX-	User-defined pins	RX-
9	TX+	User-defined pins	RX+



Terminal of HMI is DB9F. Definitions of Modbus device pins depend on particular Modbus device.

RS485

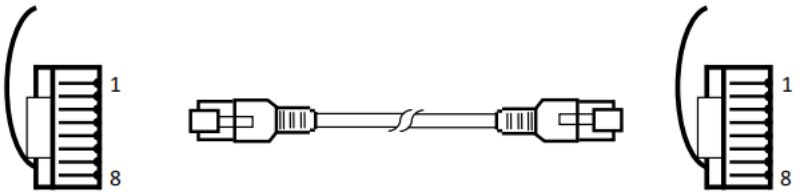
VS-Q Series HMI COM1/COM2/COM3		Modbus Device	
8	TX-	User-defined pins	B
9	TX+	User-defined pins	A



Terminal of HMI is RJ45, and that of Modbus device is RJ45.

TCP/IP(RJ45 direct connection)

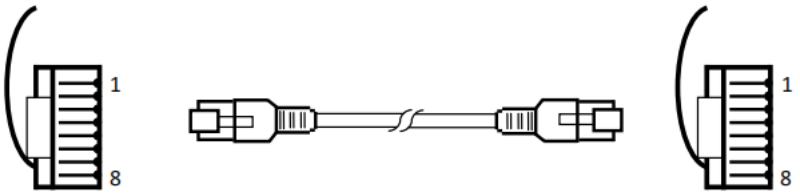
VS-Q Series HMI		Modbus Device	
1	TX+	3	RX+
2	TX-	6	RX-
3	RX+	1	TX+
4	BD4+	4	BD4+
5	BD4-	5	BD4-
6	RX-	2	TX-
7	BD3+	7	BD3+
8	BD3-	8	BD3-



Terminal of HMI is RJ45, and that of Modbus device is RJ45.

TCP/IP (RJ45 connection via router)

VS-Q Series HMI		Modbus Device	
1	TX+	3	RX+
2	TX-	6	RX-
3	RX+	1	TX+
4	BD4+	4	BD4+
5	BD4-	5	BD4-
6	RX-	2	TX-
7	BD3+	7	BD3+
8	BD3-	8	BD3-



Terminal of HMI is RJ45, and that of Modbus device is RJ45.

2. Software settings

- Select Modbus in connection device service.
- Select the corresponding item in connection device service according to the connected PLC model or supported protocol.
- Ensure that the communication parameters in HMI connection parameters and PLC station number are consistent with the PLC connected.
- For settings of the PLC connected, refer to the technical documents of the Modbus device.

Default connection parameters of VS-Q Series HMI

Setting item	Default parameter value	Setting scope
PLC type	RTU Master	RTU/RTU_S/ASCII/ASCII_S Master
Communication port type	RS485	RS232/RS422/RS485
Baud rate	9600	1200/2400/4800/9600/19200/38400/57600/115200

Setting item	Default parameter value	Setting scope
Data bit length	8	7/8
Parity bit	NONE	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	1	0 – 255
HMI station number	0	0 – 255

Supporting function	Whether it is supported
Off-line simulation	yes
On-line simulation	yes
Extended mode	yes

Note: The function code used in RTU_S and ASCII_S for data writing is 0x10 (regardless of length of the data written); If 0 is chosen for PLC station number, then the system is in broadcasting mode.

3. Operational register and address range

Register name	Address format	Input range	Remarks
0x	ddddd	0 – 65535	Bit: input coil
1x	ddddd	0 – 65536	Bit: input coil, read only
3x_Bit	ddddd.DD	0.00 – 65535.15	Bit: bit of 16-bit input register, read only
4x_Bit	ddddd.DD	0.00 – 65535.15	Bit: bit of 16-bit output register
3x	ddddd	0 – 65535	Word: 16-bit input register, read only
4x	ddddd	0 – 65535	Word: 16-bit output register
3x_D	ddddd	0 – 65535	Double word: input register, reversing the higher and lower 16 bits of 3x double word, read only
4x_D	ddddd	0 – 65535	Double word: output register, reversing the higher and lower 16 bits of 4x double word

Note:

- ✧ d represents decimal system, input range is 0-9;
- ✧ DD represents 16 bits, input range is 0-15;
- ✧ Word in the remarks: represents the register can only be used as word;
- ✧ Double-word in the remarks: represents that the data type of the register in configuration must be 32-bit;
- ✧ Bit in the remarks: represents the register can only be used as bit;
- ✧ Read only in the remarks represents that the register can only be read but not be written;
- ✧ The names of the registers supported by different equipment models may be different, and the scopes may also be different. For detailed name and scope, please consult related technical document of the connected device

11 IoT function

11.1 Brief

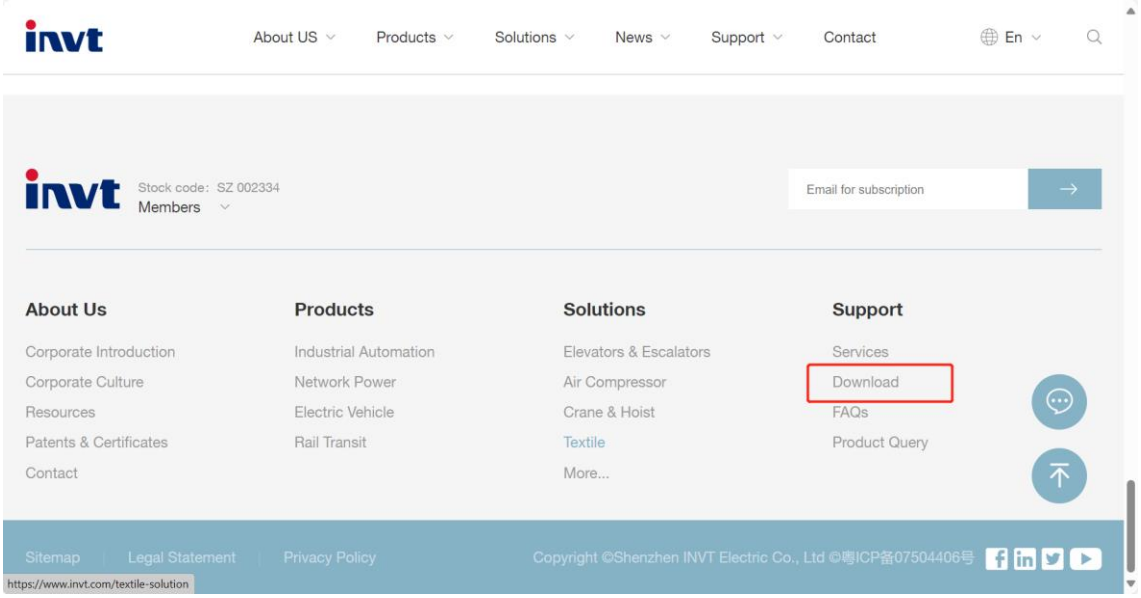
VS-Q series HMI, VS-070QS-G, VS-102QS-G, VS-156QS three HMI support WIFI Internet of Things function, in the HMI body to install the VS-Q-4G or VS-Q-WIFI module, that is, you can achieve remote monitoring of the HMI, remote on the download of the HMI configuration program, remote on the download of the PLC program and other operations. This chapter describes how to use VS-Q-4G or VS-Q-WIFI module. This chapter describes how to use the IOT function of VS-Q series.

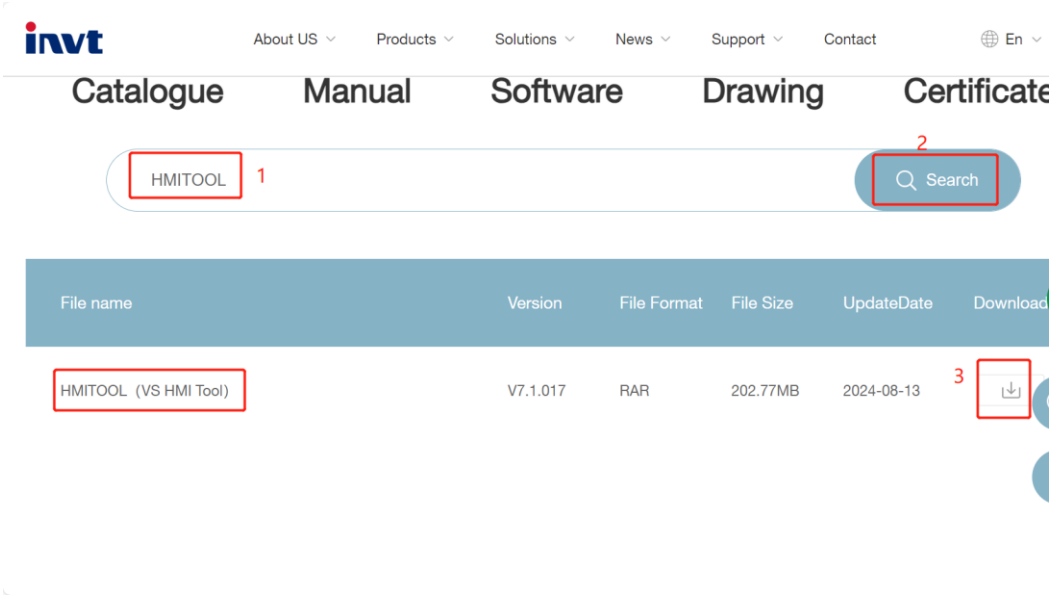
11.2 Software

(1) HMI software download website:

https://www.invt.com/download?keywords=HMITOOL

Search for "HMITOOL" and download HMITOOL, as shown below:

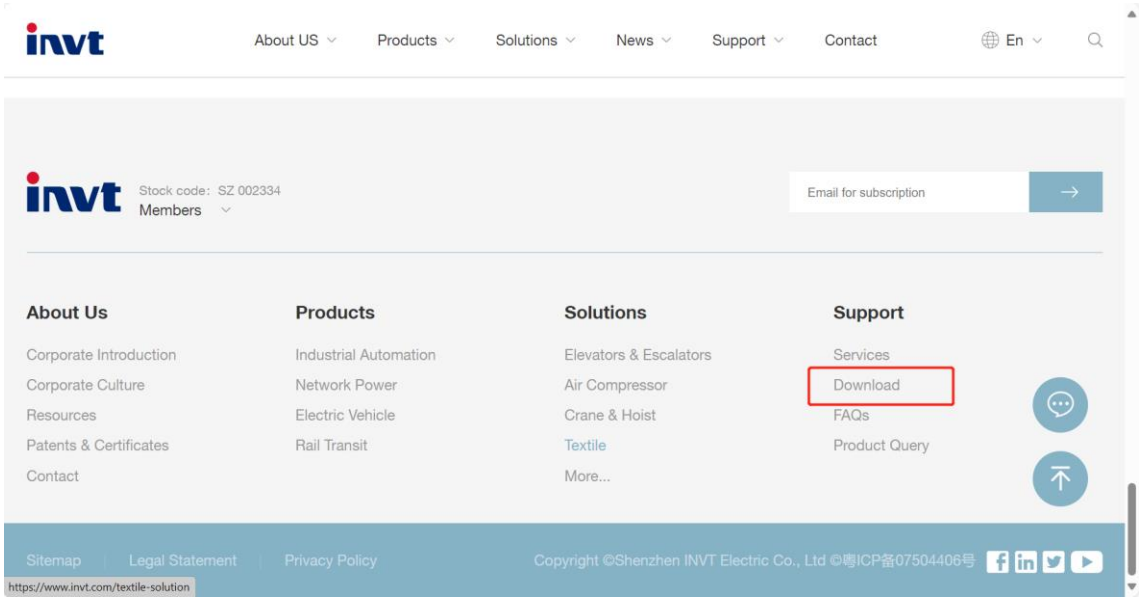


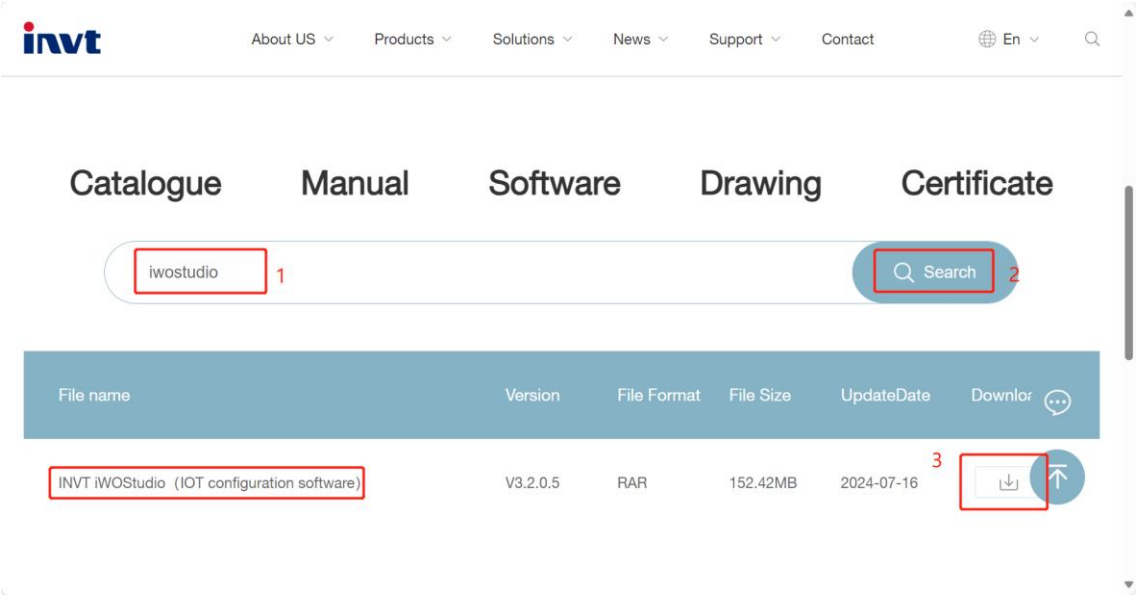


(2) INVT IoT software iWoStudio download website:

https://www.invt.com/download?keywords=iwostudio

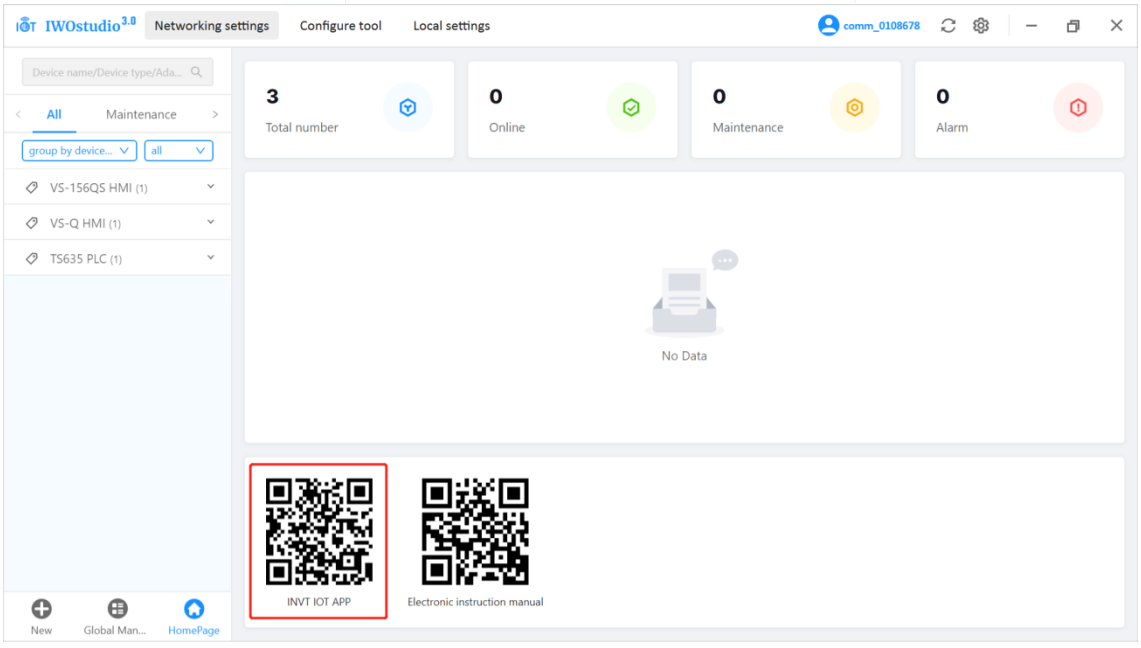
Search for "INVT iWoStudio" and download INVT iWoStudio, as shown below:





(3) Download the mobile app 'INVT IOT':

The Android system can be downloaded and installed through Google Play and mobile phone application market search "INVT IOT".IOS system can be downloaded and installed through APP Store search "INVT IOT".



11.3 IoT HMI installation and power supply

Installation

(1) In the case of HMI power failure, open the card slot baffle of the IoT module of the HMI back shell, insert the WIFI module vertically into the card slot, and then push the card locks on the top and bottom of the module to the LOCK position, and push the upper and lower card locks to the OPEN position when the module is removed.

(2) The 4G module requires a SIM card to be installed, use a thin screwdriver to push into the round hole, the SIM card tray pops out automatically, place the card on the tray and insert it.

Power Supply

DC24V is used to connect to the HMI power supply terminal. After powering up, the HMI lights up and completes the power supply to the module at the same time.

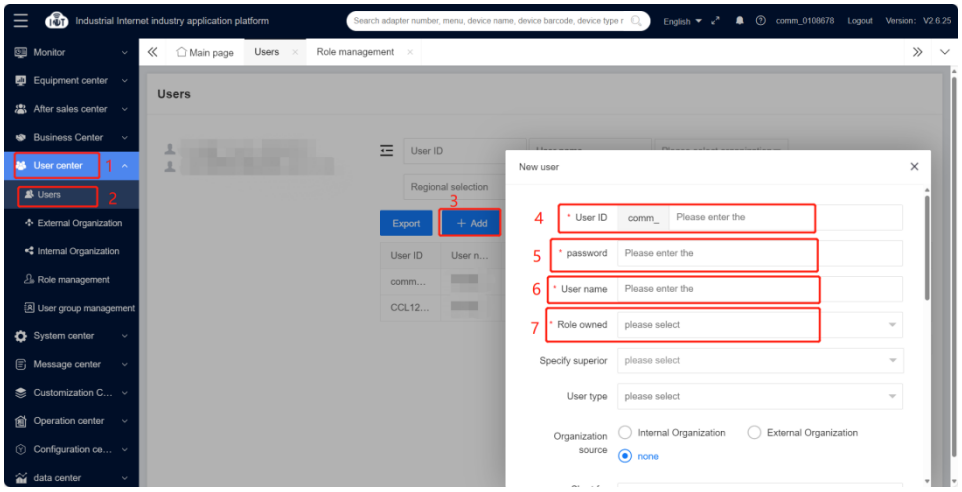
11.4 Adding an HMI to the IWOScene IoT Platform

To use the IoT function of HMI, you need to add HMI to the IoT platform first, and the following is the procedure to add HMI to the IoT platform:

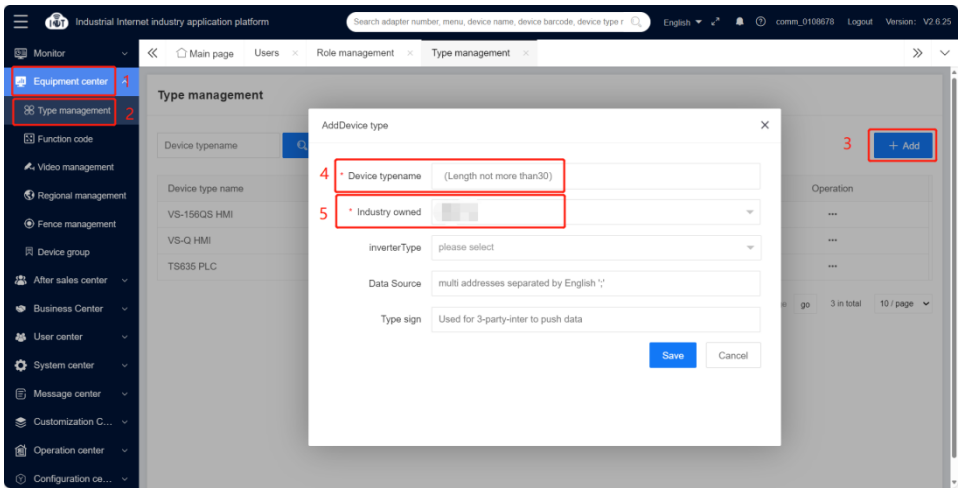
(1) Enter https://iot.invt.com/login in the address bar of Google Chrome to enter the login page of IWOScene IoT monitoring platform, as shown in the figure below. Enter your account number and password to complete the login.

(2) Enter the left menu of the User Center➔ User Management interface, click the Add button, enter the user account in the dialogue box, generally fill in the customer's company name pinyin initials; password length of 8-20 digits, need to include the letter case, numbers, do not allow spaces, the user's name is generally

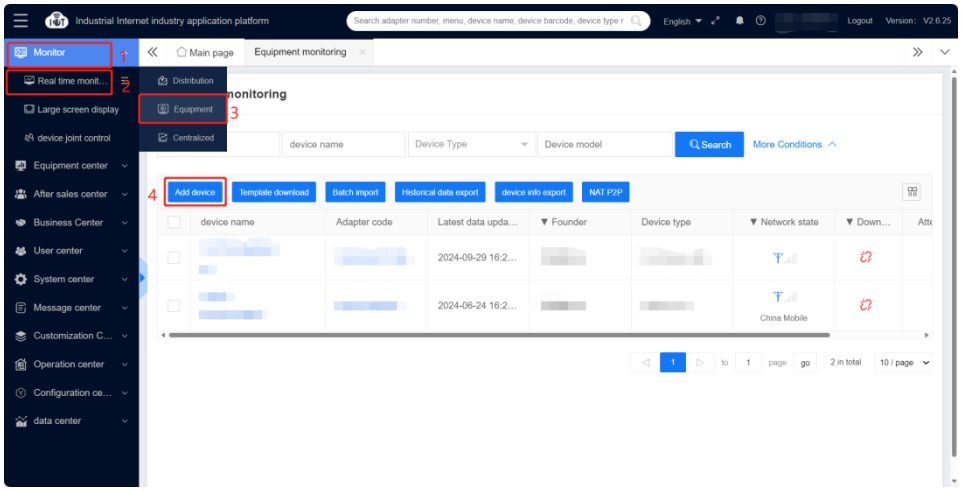
filled in the full name of the customer's company, belonging to the role of the default choice of manufacturers, click the "Save" button.



(3) Enter the "Equipment Center" > "Type Management" interface, click the "Add" button, enter the name of the device type in the dialog box, and generally fill in the device model or name of the downstream device; the industry to which it belongs select the first one by default, and click the "Save" button.

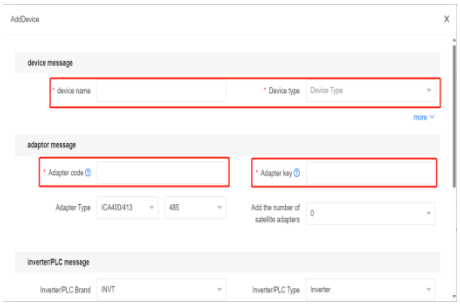


(4) Go to the "Monitoring" > "Real time monitor" > "Equipment monitoring", and click the "Add device" button.



(5) In the dialogue box, enter the device name (generally fill in the downstream device name), select the previously added device type for the device type, the adapter code is the SN number on the QR code on the

back shell of the HMI, the adapter key is the KEY number on the QR code on the back shell of the HMI, and select the HMI type for the inverter/PLC type, and then click "Save" when you are finished entering.



(6) After adding the module is completed, you will see the left "Monitoring" > "Real time monitor" > "Equipment monitoring" interface, and the added module entries will appear. Among them, the network status online icon 

has a signal grid, the network status offline icon  has no signal grid, you need to check the module networking configuration; the downlink status blue icon  marks the downlink device data communication is normal, the downlink status red icon  marks the downlink device data communication is abnormal, you need to check the module communication configuration.

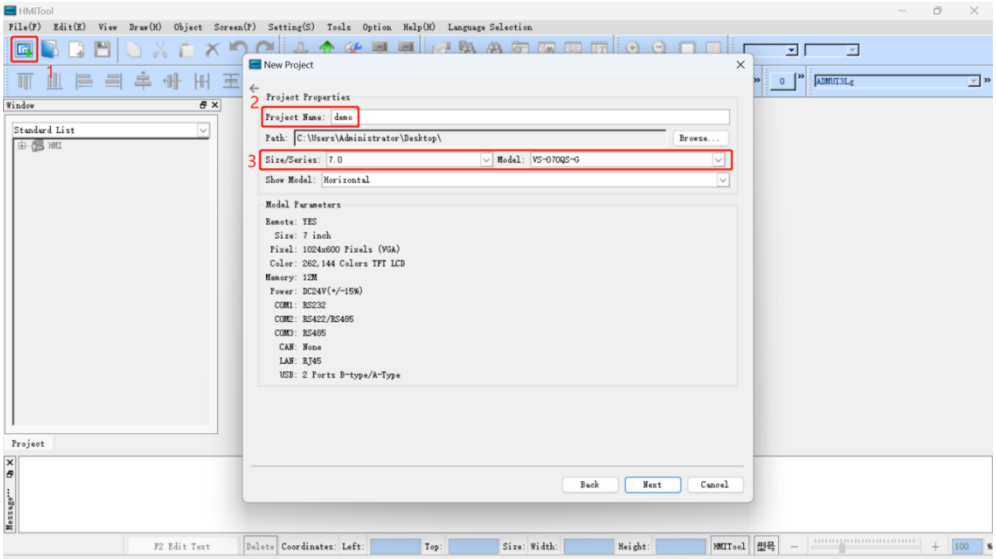
11.5 Connect the HMI to the computer

(1) Method 1: Use a Type C date cable. One end is Type C, and the other end can be connected to the USB port of the computer. The data cable needs to have a communication function. If it doesn't recognize, you can try changing a few more. (Note: Unplug the Type C download cable immediately after downloading the configuration program, otherwise it will affect the HMI to identify the IoT module)

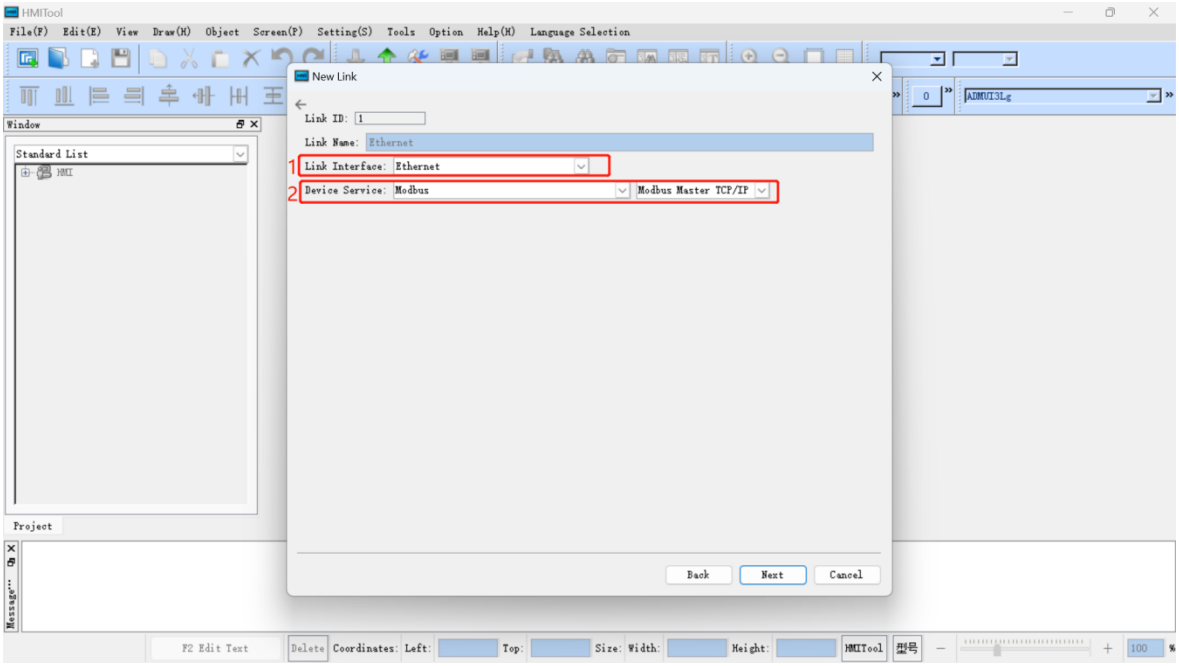
(2) Method 2: Use a network cable. The IPV4 of the computer is set up with the same network segment as the HMI.

11.6 New project

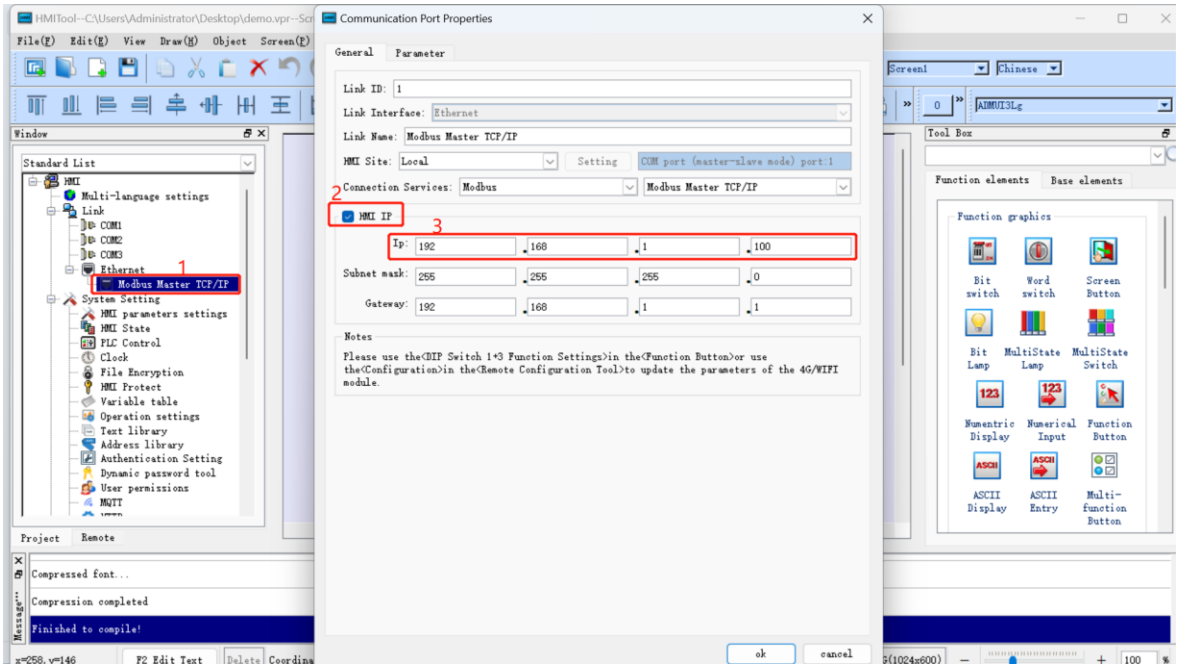
(1) Configuration: Open the HMITOOL software, create a new project, select the corresponding size and HMI model according to the model, and then go to the next step.



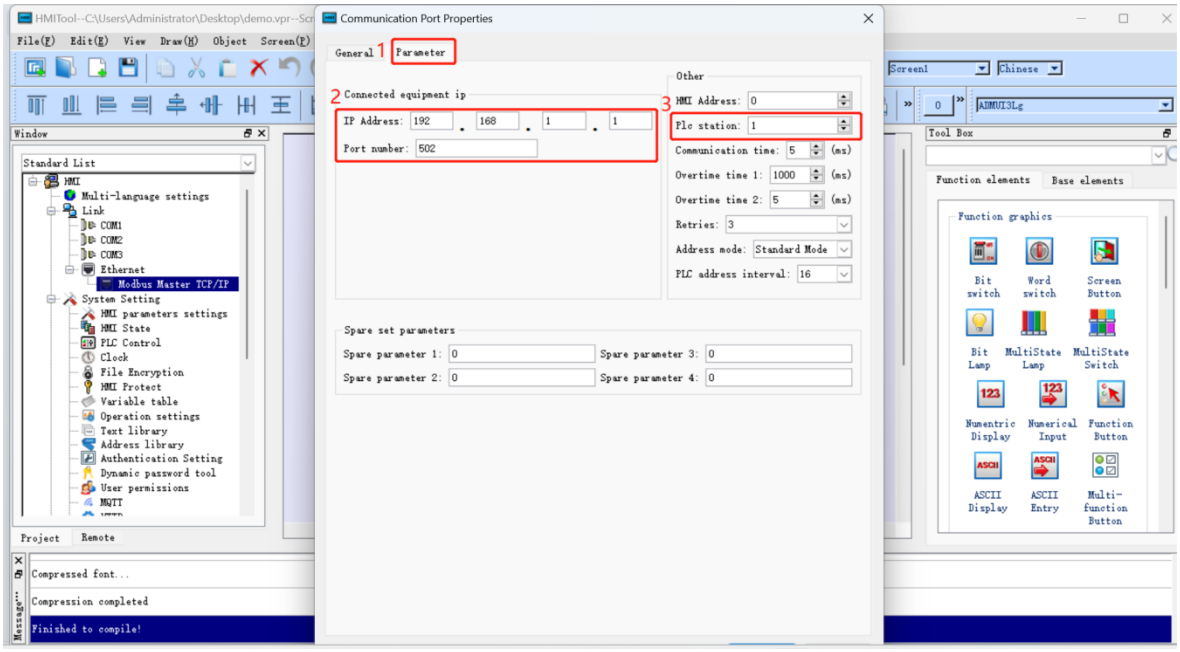
(2) The connection interface has Ethernet port, COM port, and the device service can choose the manufacturer brand and communication protocol of the corresponding equipment. Let's use the Ethernet port Modbus general protocol as an example, select Ethernet port, Modbus, and protocol select Modbus Master TCP/IP, and then ste up.



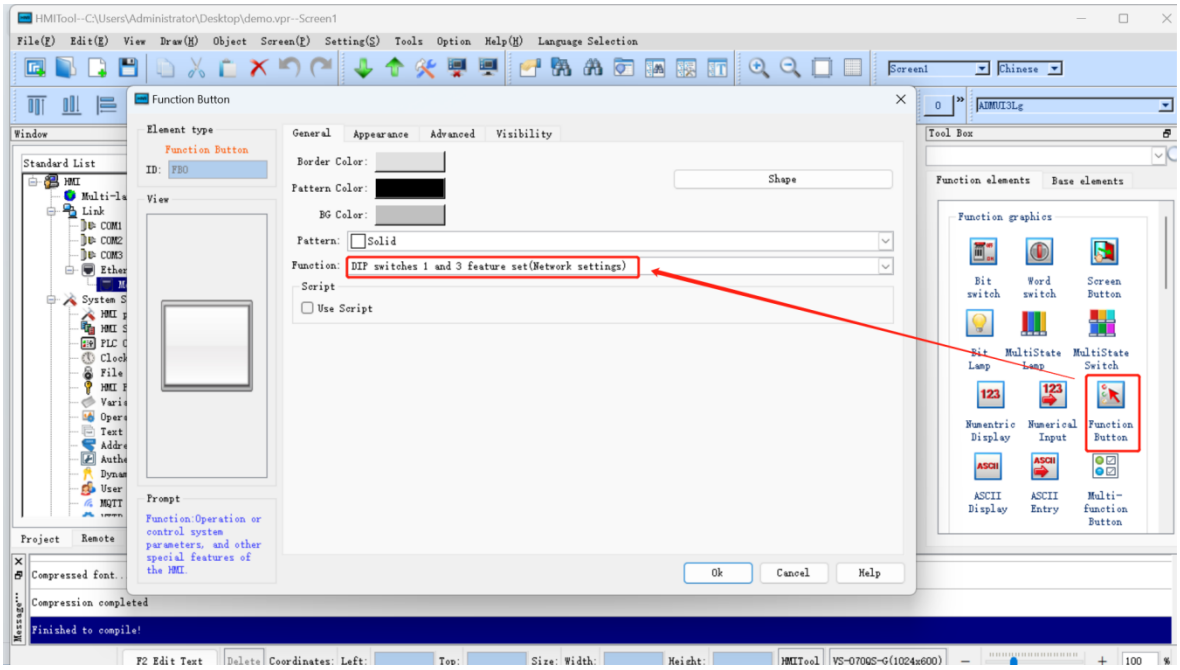
(3) On the left, choose "Moddbus Master TCP/IP"; in the pop-up dialog box, choose "HMI IP", and set IP address (HMI IP).



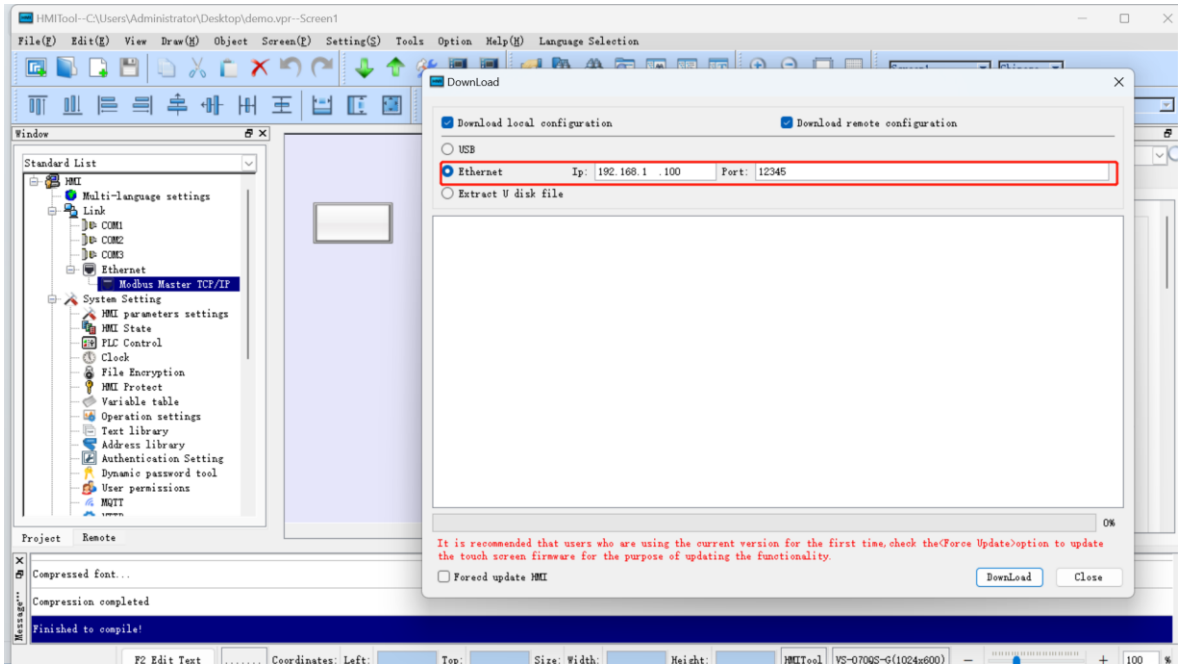
(3) On the left, choose "Moddbus Master TCP/IP"; in the pop-up dialog box, click "Parameter", set the IP address, port number, and PLC station number of the connected device, and use the IP address of the PLC as 192.168.16.20, port 502, and slave station number 1 as an example. (**Note:** The local IP address and the IP address of the connecting device must be on the same network segment).



(4) Function buttons must be added to the configuration interface, mainly to set the network, time/date, backlight, and language. Function Button: Select DIP switches 1 and 3 feature set (Network settings), click "Save".



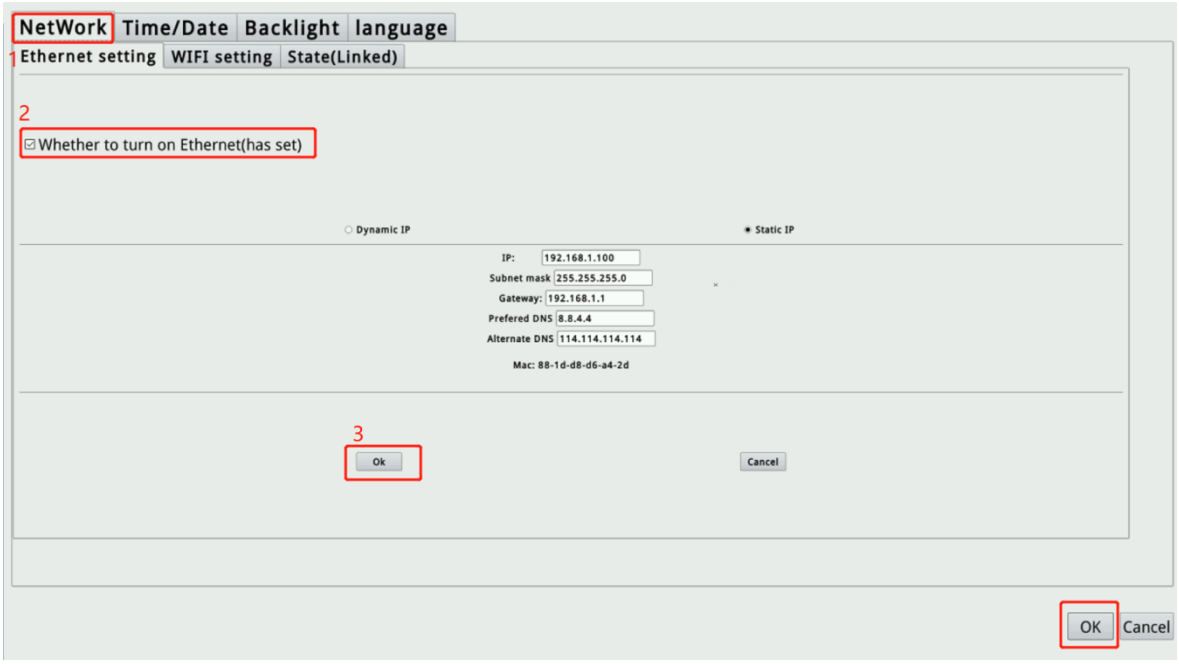
(5) Download to HMI. There are two ways to download the configuration to the HMI, the first is USB download (direct download is sufficient), and the second is to download with a network cable (enter the IP address of the machine, the default port of the machine is 12345).



11.7 Networking configuration

11.7.1 WiFi module networking

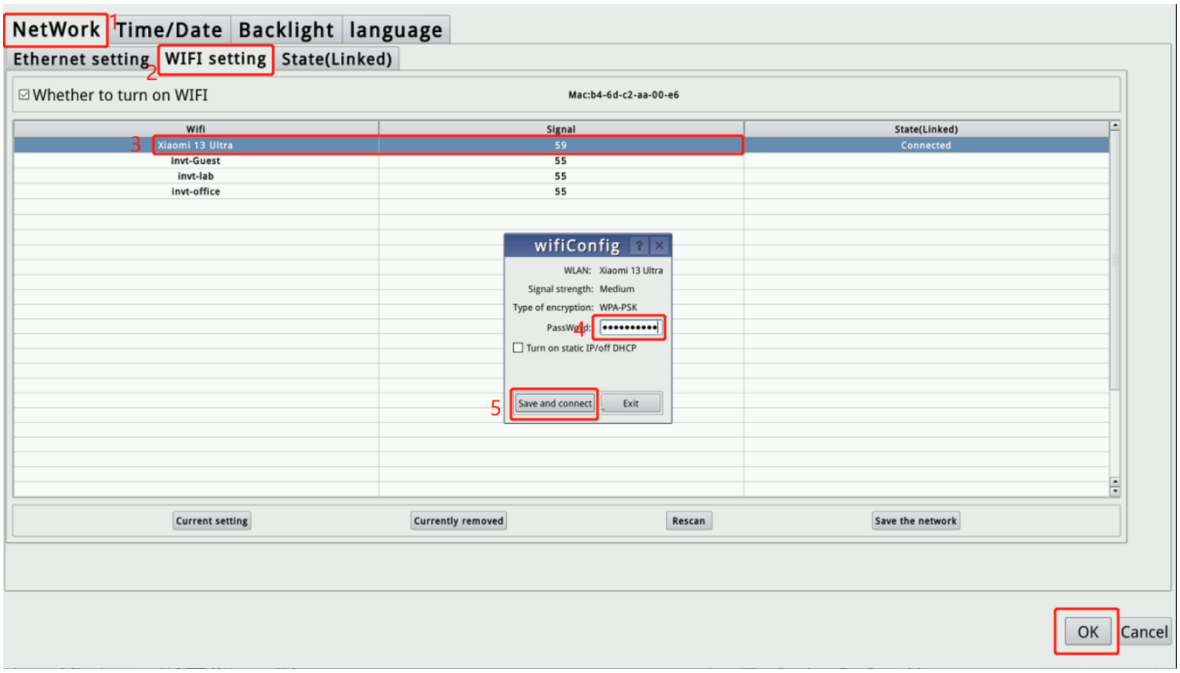
(1) After downloading the project, click the function button on the HMI screen. The following figure is the network configuration interface entered by clicking the function button on the HMI screen. On the Ethernet device page, select whether to enable Ethernet and click "OK" to save.



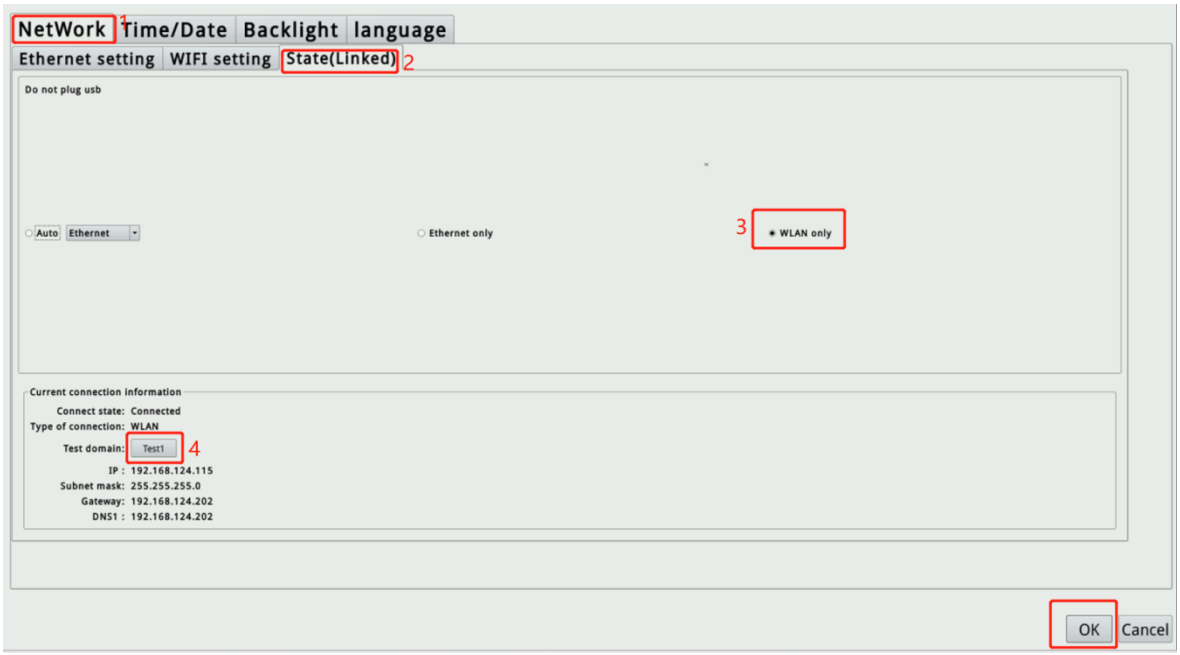
(2) The figure below shows the WIFI setup interface. Tick whether to play WiFi, find the target WiFi, click WiFi to enter the WiFi password to save, and it shows that it is connected.

(**Note:** The situations that do not recognize the WIFI module are: the Type C download cable is not unplugged. The module is not locked, resulting in poor contact; The WIFI is not compatible with the 2.4

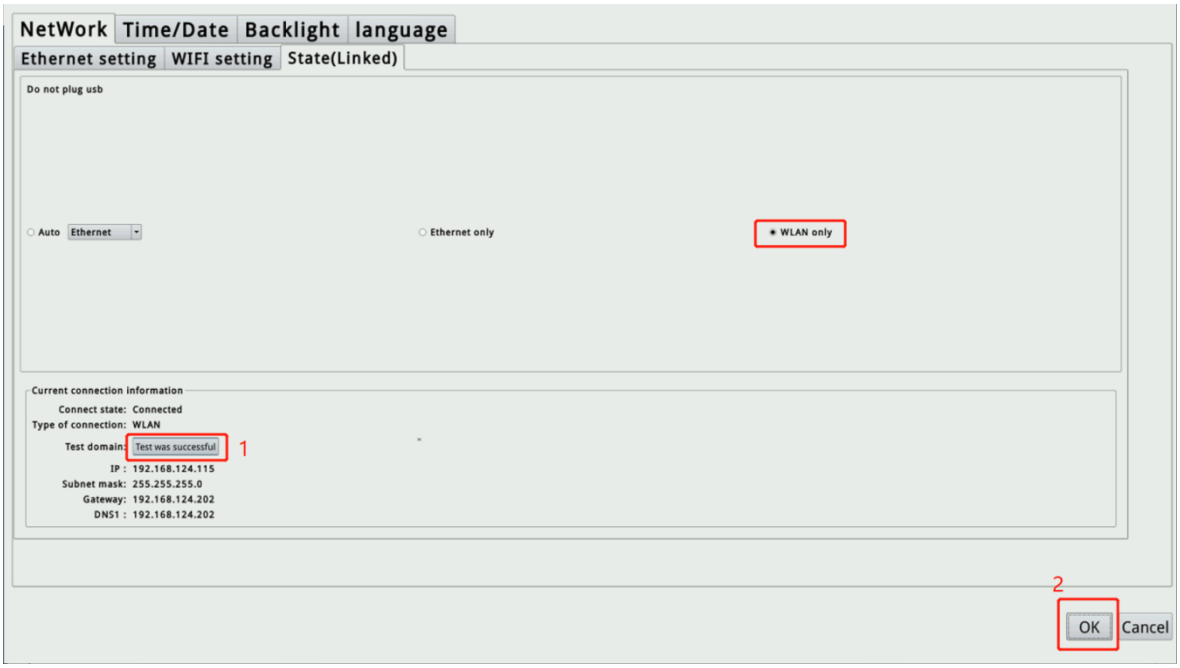
frequency band, and it needs to be re-scanned if it is not scanned).



(3) The following image shows the connection status screen. Select WLAN only and click "OK" to save.

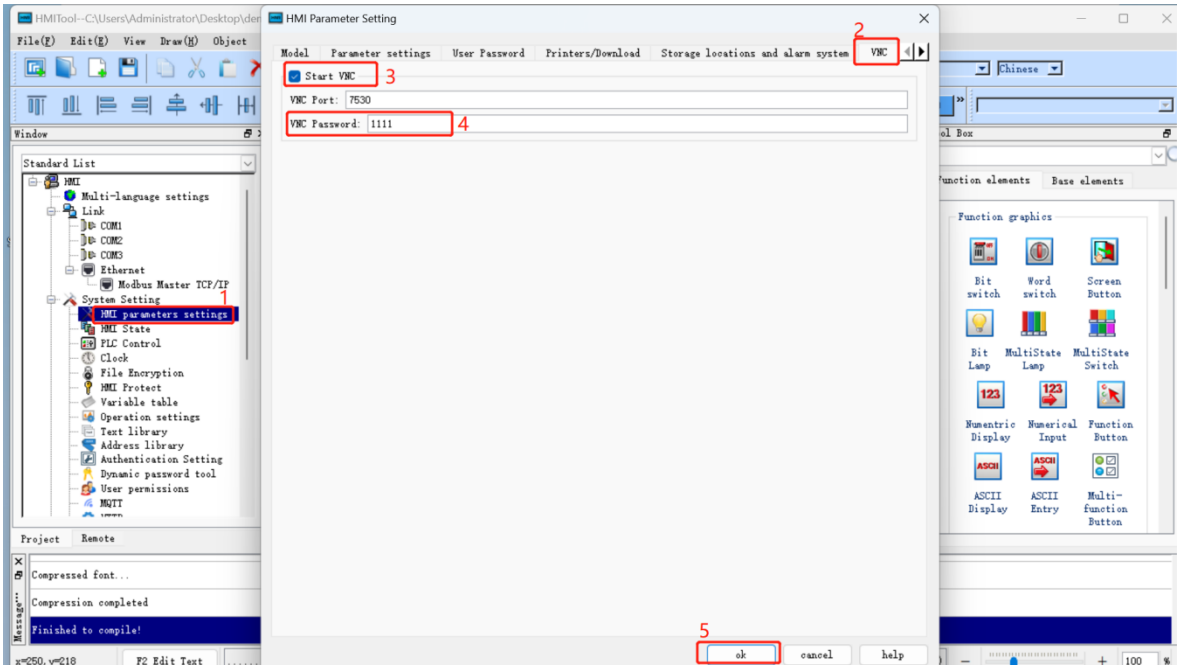


(4) Test if the HMI has a network. The following figure is the connection status interface, click Test 1, and the test success to indicate that the HMI has a network.

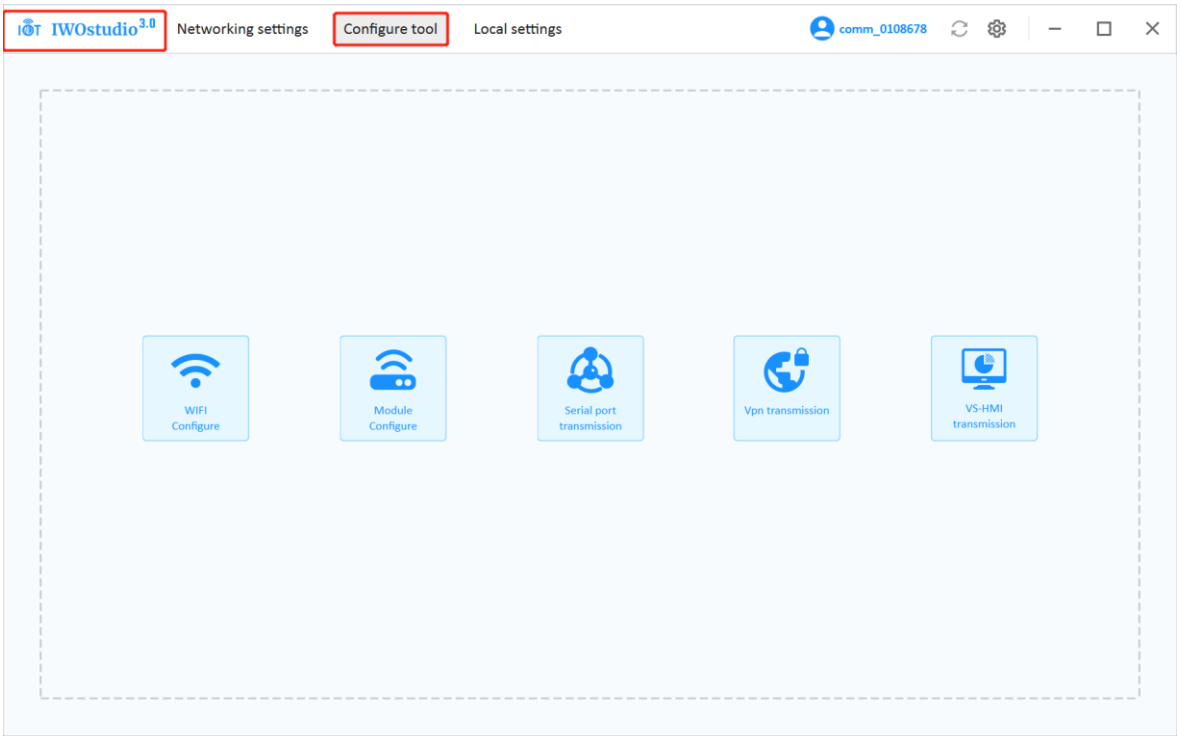


11.8 Remote HMI screen monitoring

(1) The precondition is that the configuration program must turn on the VNC function to use, open the HMITOOL software, then open the project, choose "HMI parameters settings" on the left; in the pop-up dialog box, click "VNC", choose "Start VNC", set a VNC password, and click "OK" to save, and finally download it to the HMI to take effect.

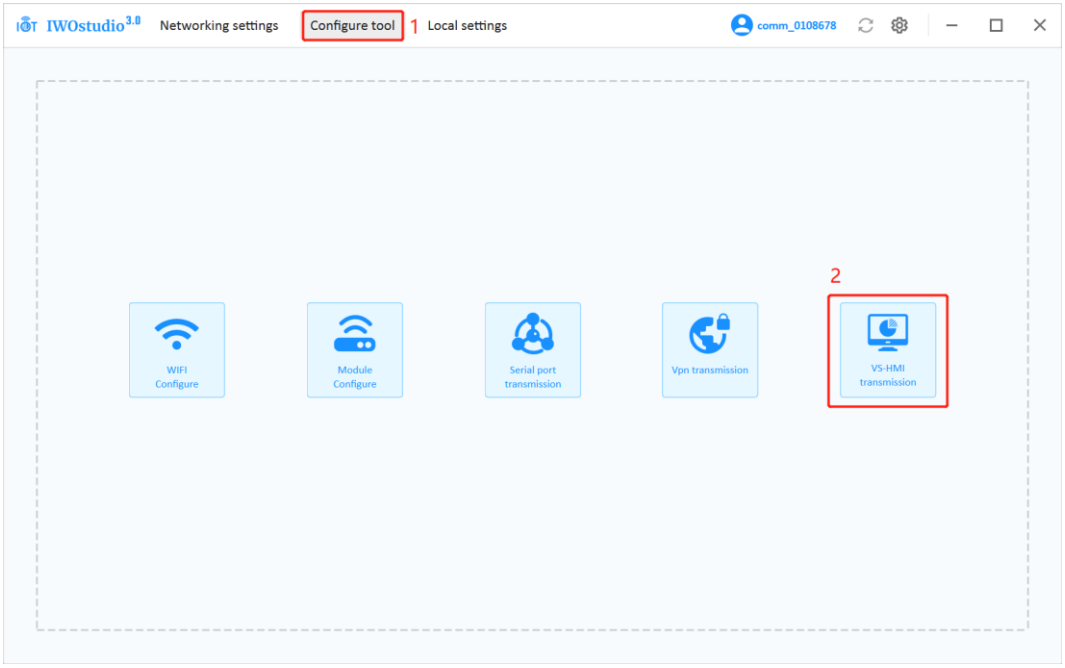


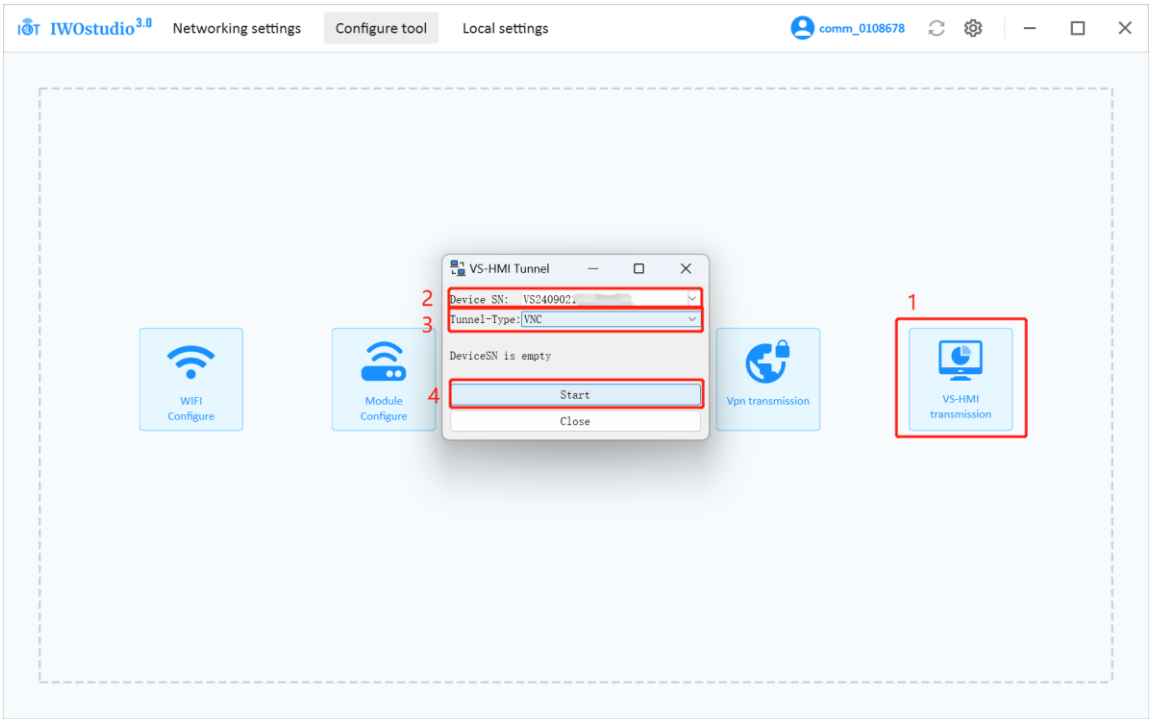
(2) Right click on the iWoStudio software, run it as administrator, enter your account password to log in, click on the Configuration tool icon at the top of the interface to enter the "Configuration tool" interface.

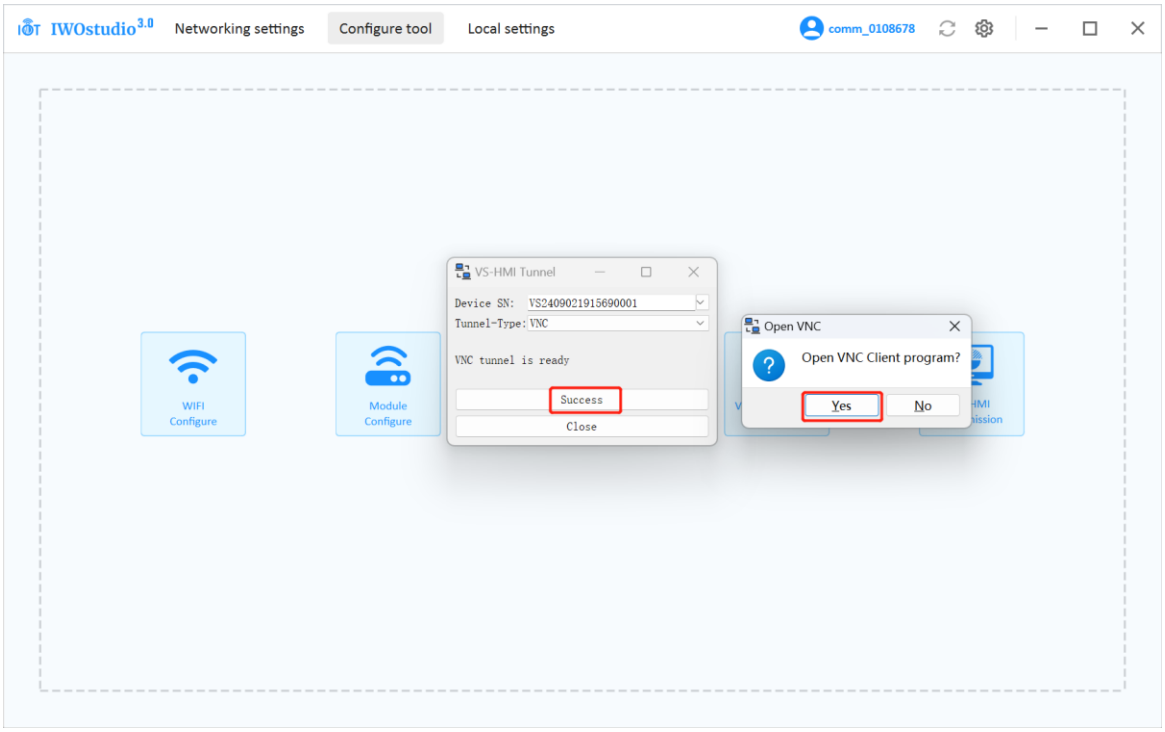


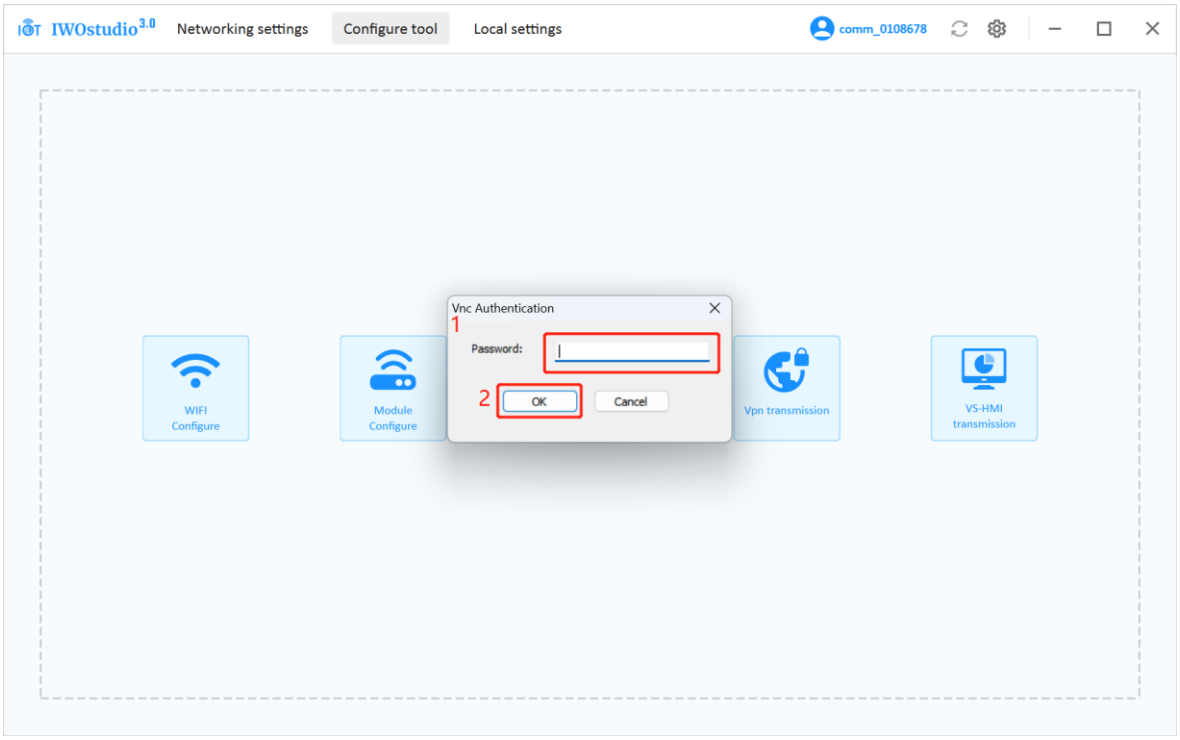
(3)In the VS-HMI Transmission Tool interface, enter the SN number of the HMI device being operated. (Device SN is the SN serial number on the back of HMI, and "Device Connection" is used to establish network port transmission, HMI channel (to download configuration program remotely), and VNC function (to monitor configuration program remotely)), select "VNC" for device connection, click to create the download channel, and wait for the HMI is ready. It will automatically pop up to create "VNC channel success whether to open the VNC monitor" dialogue box. Click "Yes".

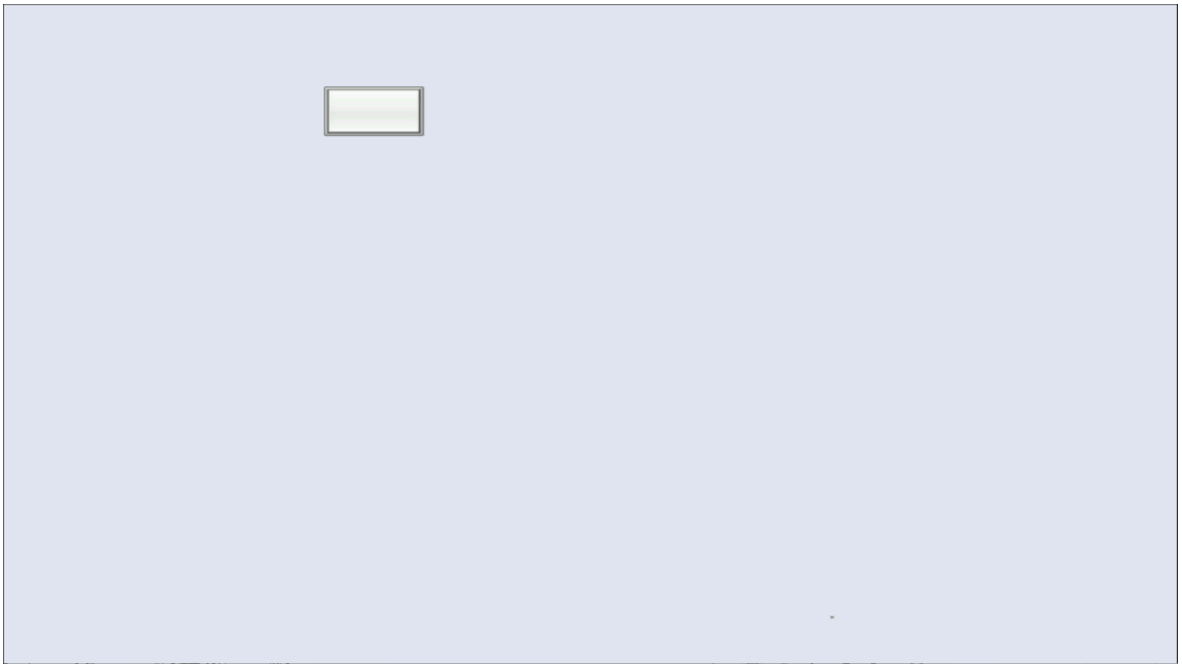
The dialogue box for entering password pops up automatically again, enter the password set in the first step above and click "OK" to enter the remote monitoring HMI configuration screen, and you can operate the HMI controls remotely.




IWOstudio3.0
Networking settings
Configure tool
Local settings
comm_0108678
VS-HMI Tunnel
Device SN: VS240902
Tunnel-Type: VNC
DeviceSN is empty
Start
Close
2
3
4
1
WIFI Configure
Module Configure
Vpn transmission
VS-HMI transmission

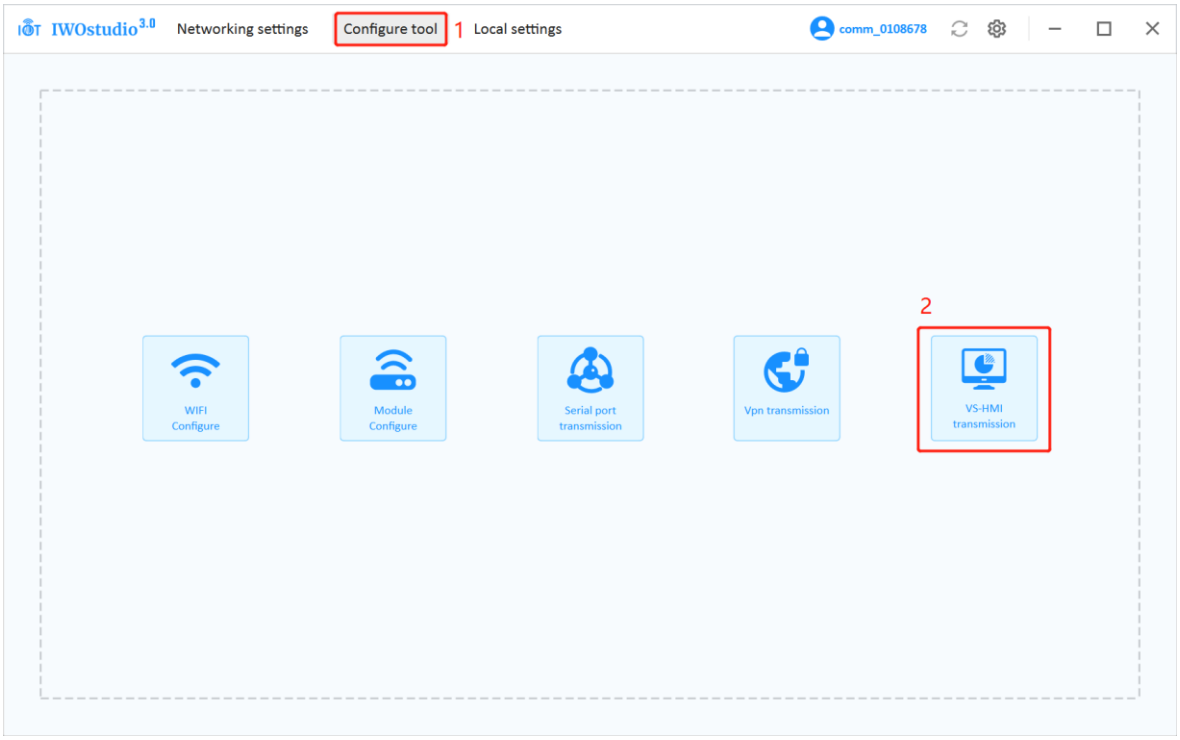

IWOstudio3.0
Networking settings
Configure tool
Local settings
comm_0108678
VS-HMI Tunnel
Device SN: VS2409021915690001
Tunnel-Type: VNC
VNC tunnel is ready
Success
Close
Open VNC
Open VNC Client program?
Yes
No
WIFI Configure
Module Configure

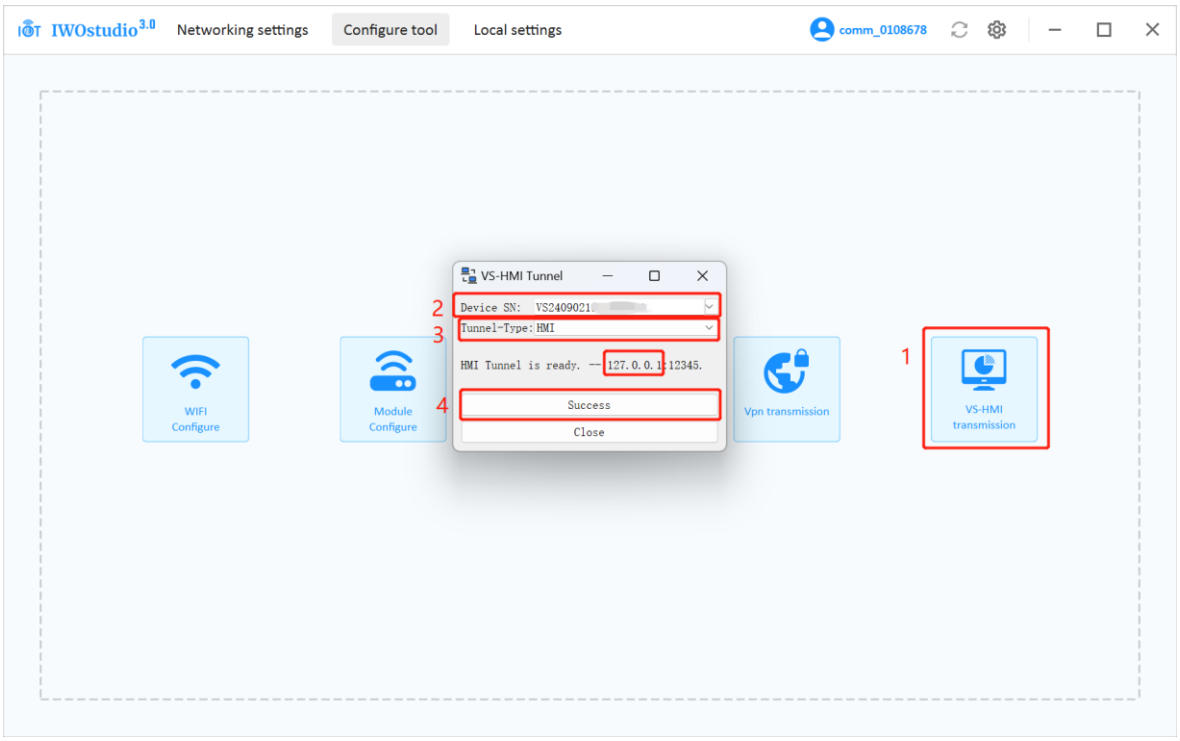




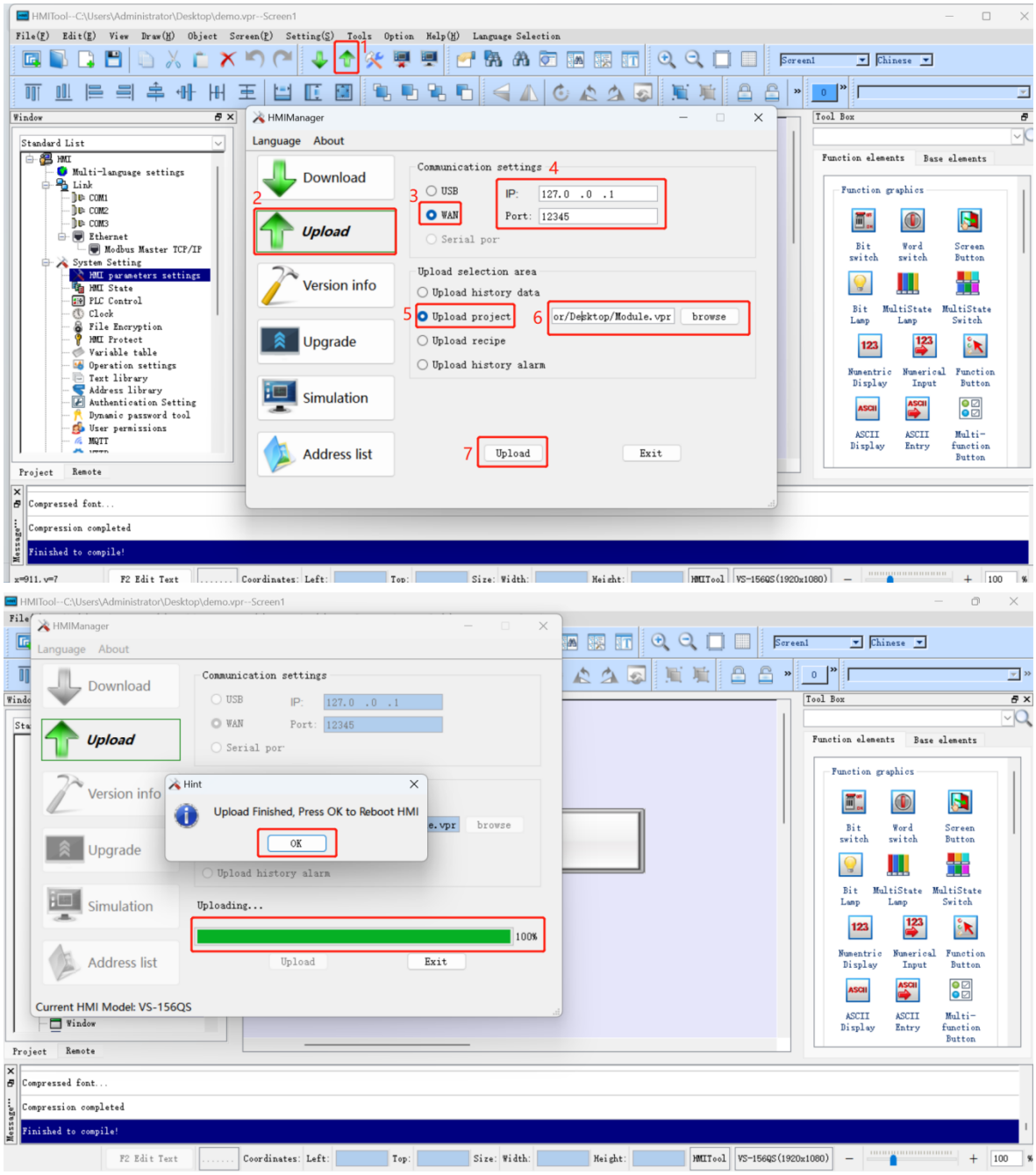
11.9 Remote upload and download HMI programs

(1) In the VS-HMI transmission tool interface, enter the SN number of the HMI device that is being operated, select HMI for the device connection, click "Create Download Channel", and wait for the HMI to be ready.

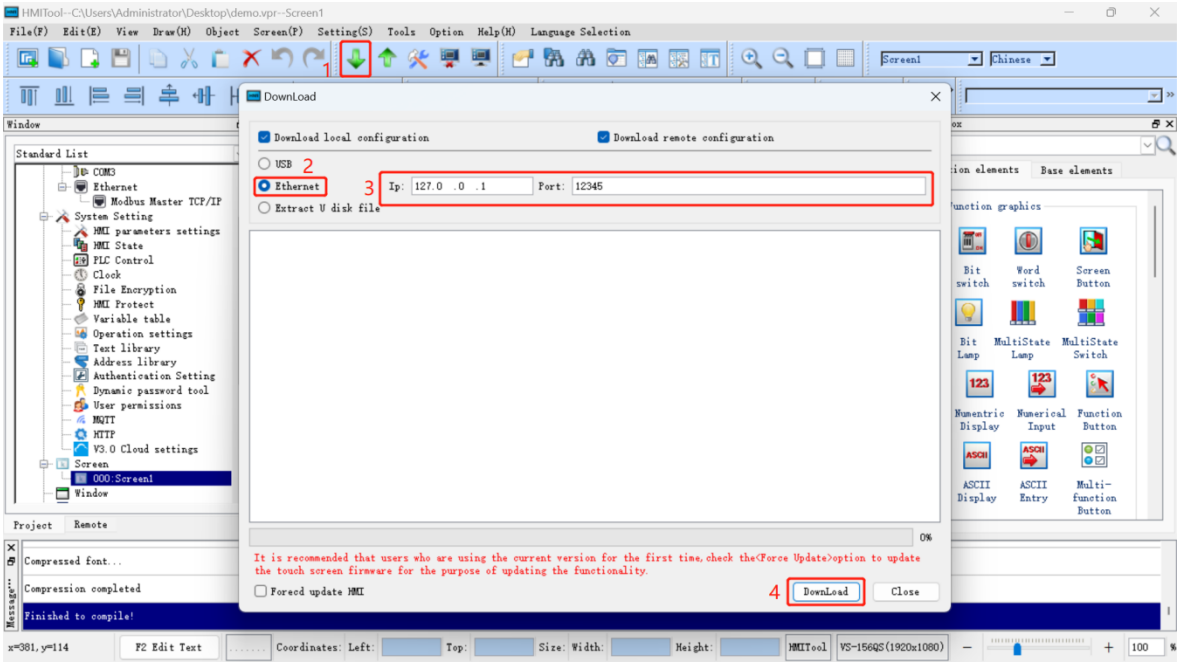


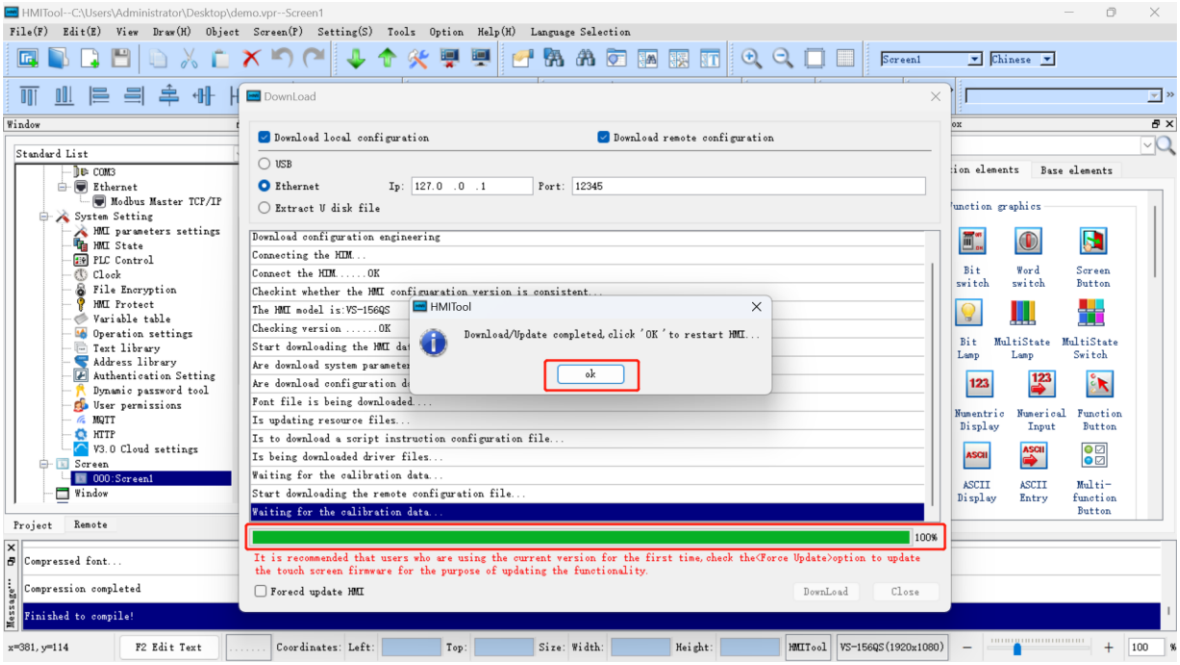


(2) Remote uploading of HMI configuration program operations: Open the HMITOOL software and click on the upload icon , the dialogue box of "Upload and Download Tool" pops up, click "Upload Processing", select network port for communication parameter setting, enter "127.0.0.1" for IP and "12345" for default port number, check "Upload Configuration", click "Browse", select the local save path, and finally click "Start Upload".



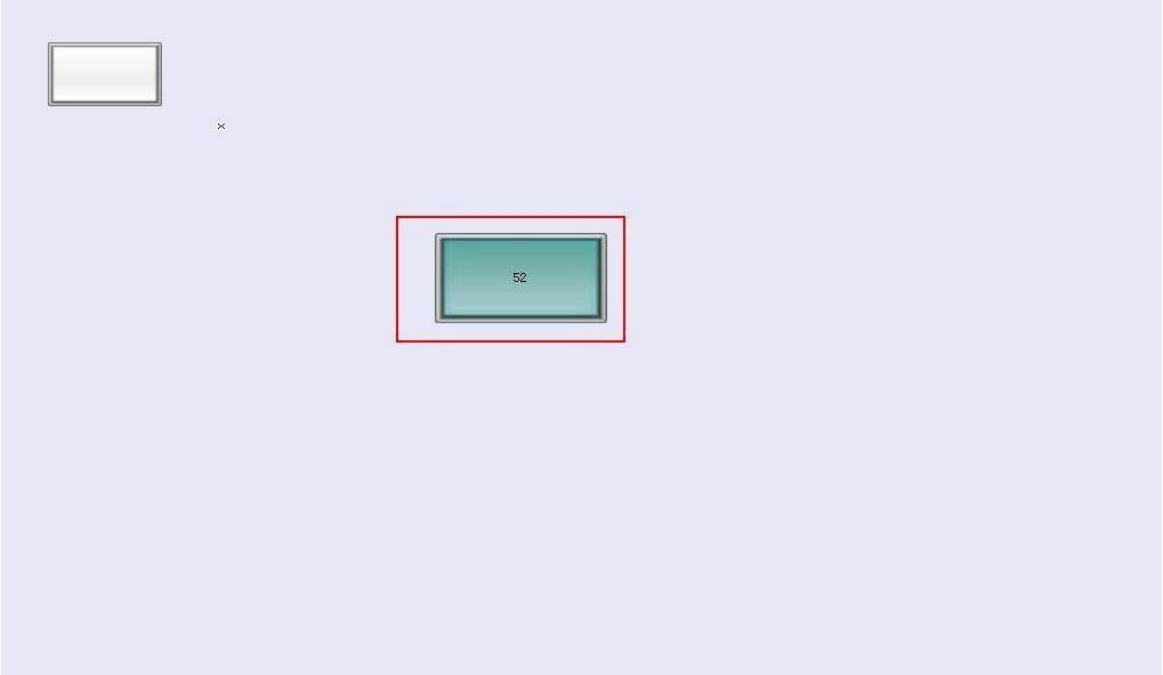
(3)Remote downloading of HMI configuration program operations: open the HMITOOL software and click on the download icon , the download dialogue box will pop up, choose to use Ethernet to download, enter "127.0.0.1" as the IP and "12345" as the default port number, and finally click "Download".



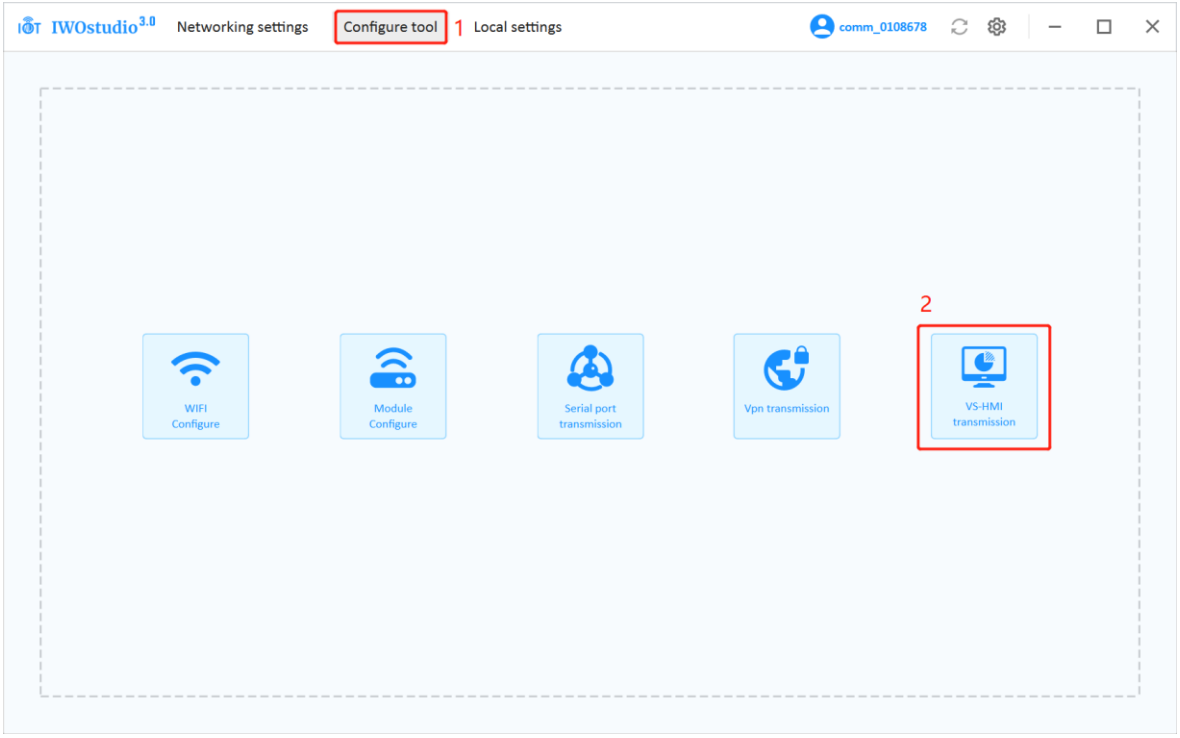


11.10 Remote upload and download of PLC programs

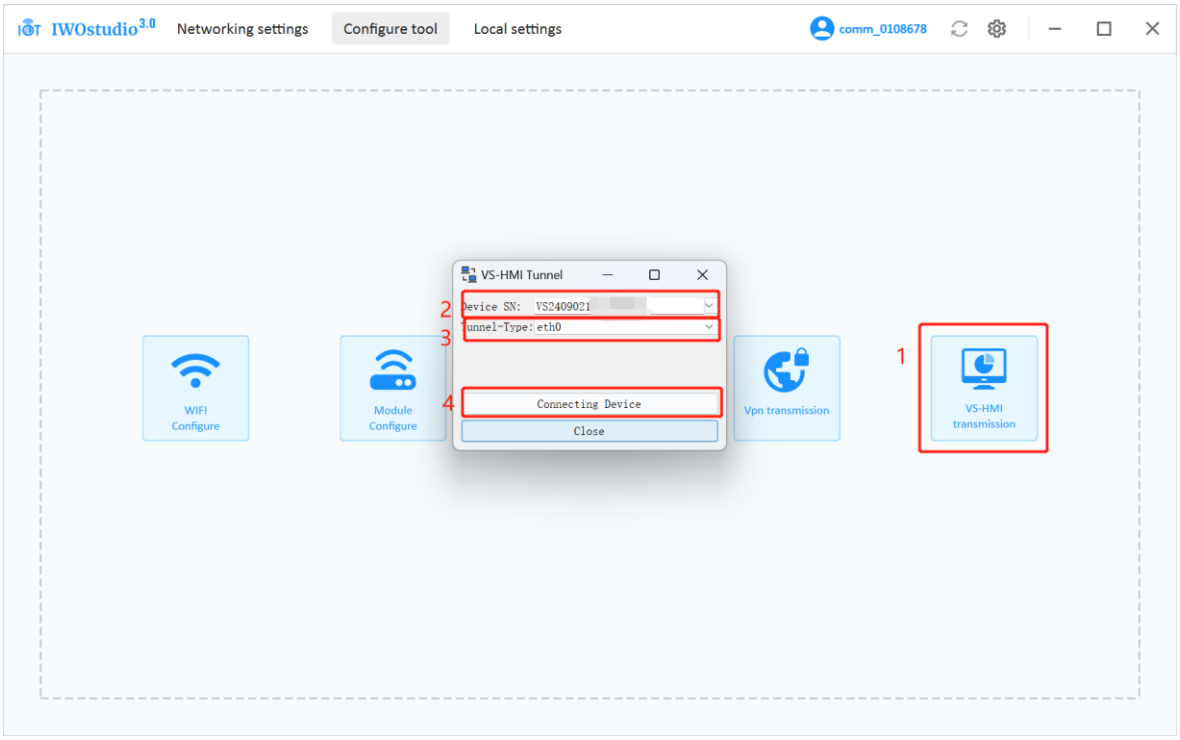
(1) First of all, make sure that the HMI and PLC can communicate, and secondly, verify whether the HMI currently has a network (refer to 2.5 and 2.6, step 4). The following figure shows that the HMI screen shows the PLC value collected, which proves that the HMI is communicating with the PLC.



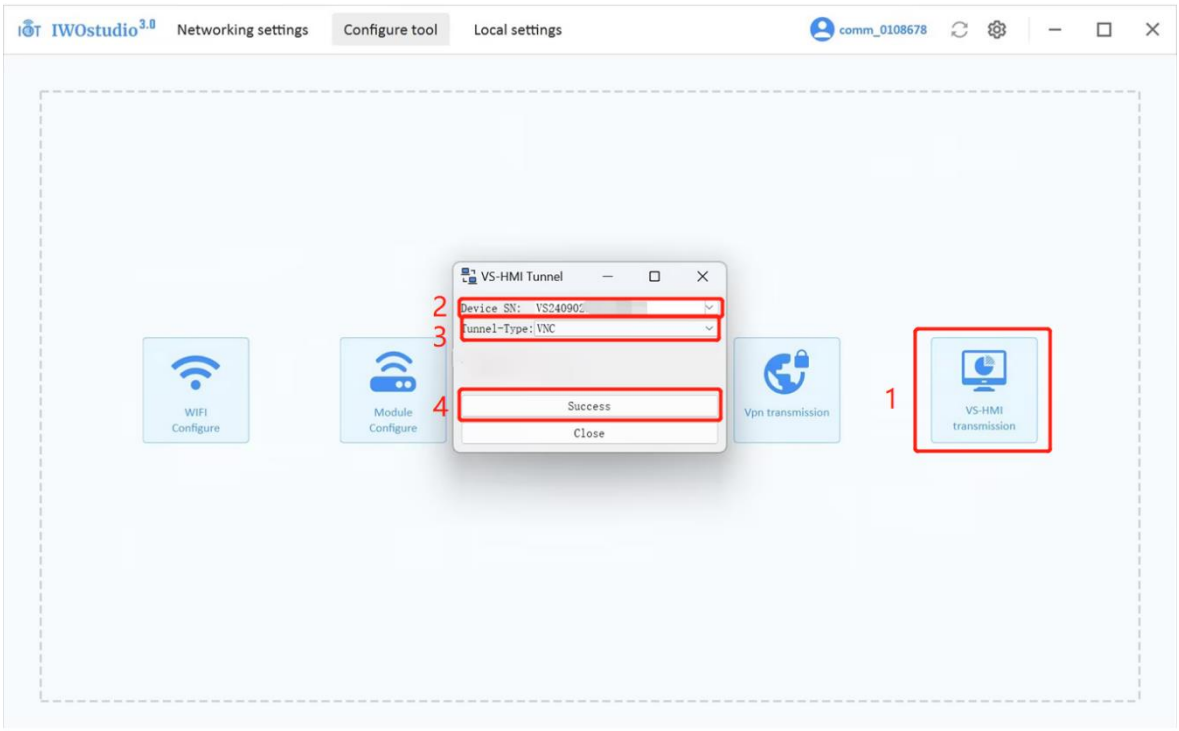
(2) Right click on the iWoStudio software, run it as administrator, enter your account password to log in, click "Configuration tool" at the top of the interface to enter the "Configuration tool" interface.



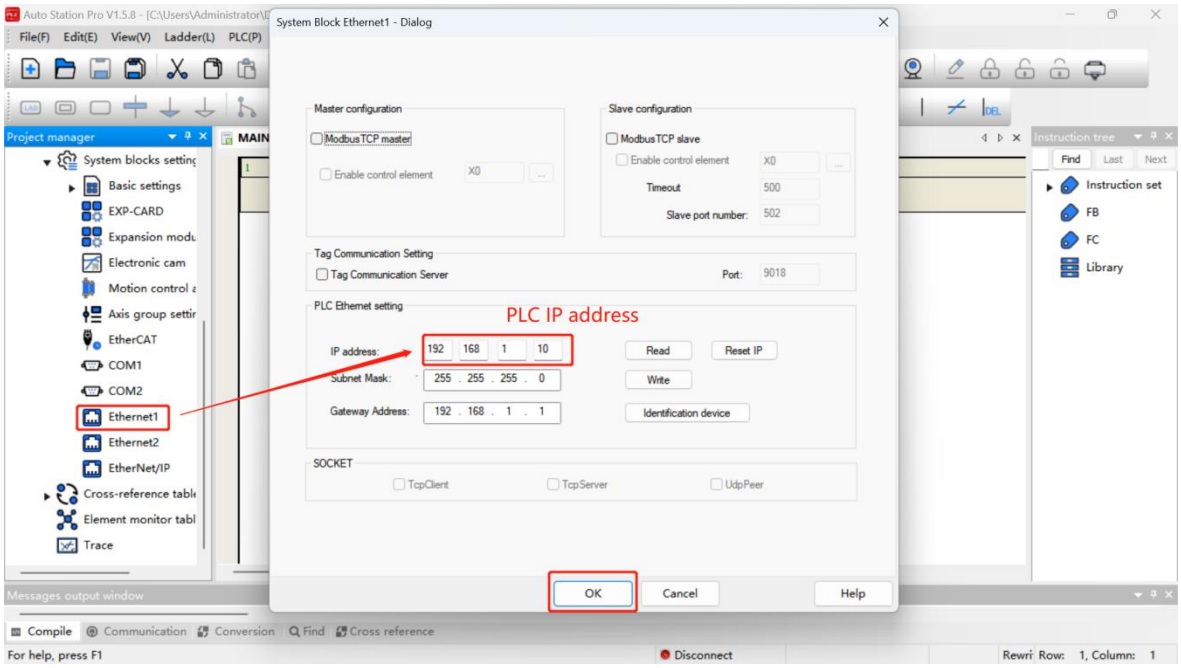
(3) Click "VS-HMI transmission" to enter the "VS-HMI transmission" interface, enter the SN number of the currently used HMI, and select "eth0" for device connection to establish a network port transmission channel.

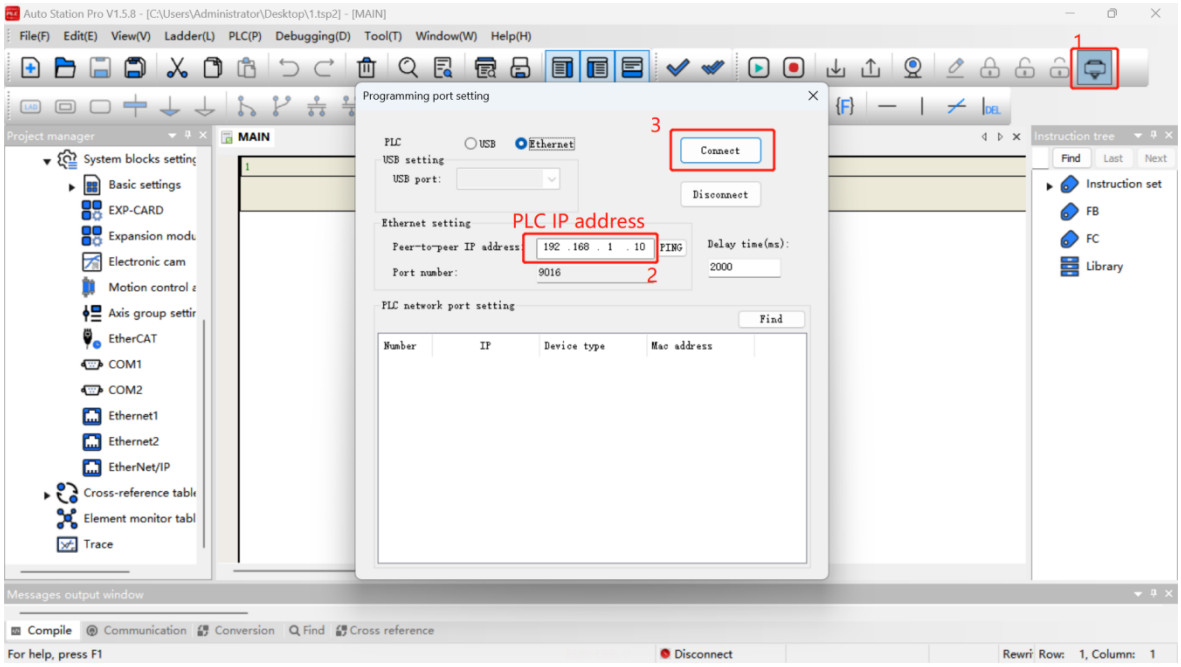


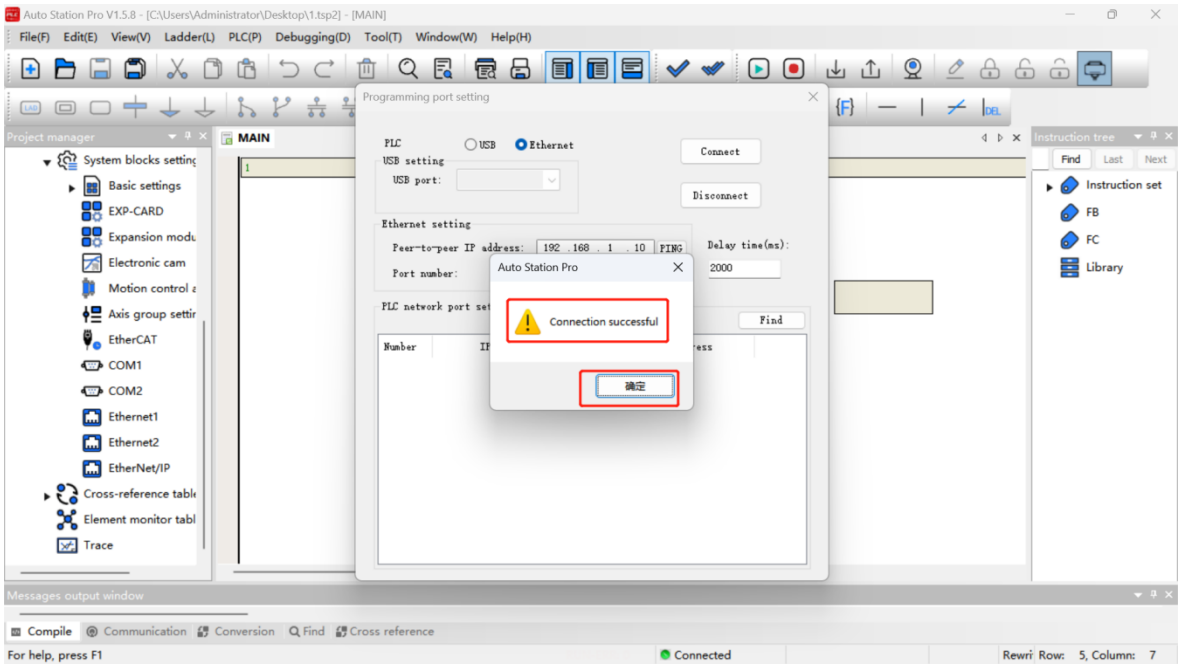
(4) Wait for the HMI to be ready.



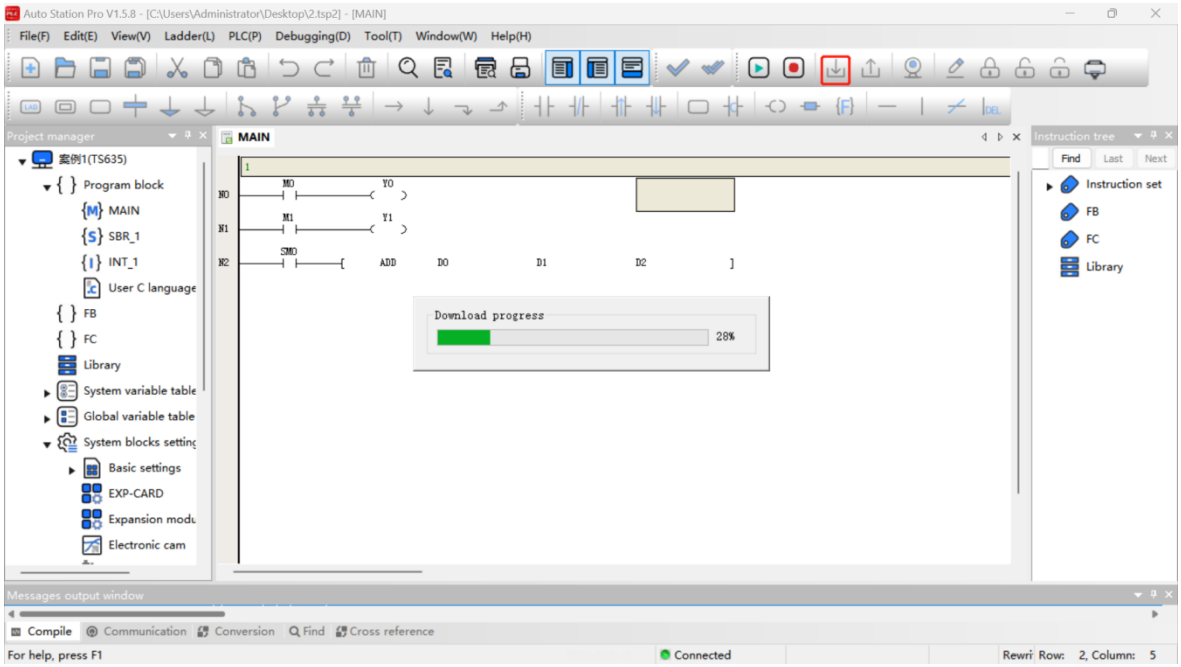
(5) Open the PLC's corresponding host computer software, use the Ethernet connection method, and enter the PLC's IP address. The following is an example of a PLC using Auto Station for INVT TS600 Series.


System Block Ethernet1 - Dialog
Master configuration
ModbusTCP master
Enable control element
X0
Slave configuration
ModbusTCP slave
Enable control element
X0
Timeout
500
Slave port number:
502
Tag Communication Setting
Tag Communication Server
Port:
9018
PLC Ethernet setting
PLC IP address
IP address:
192 168 1 10
Subnet Mask:
255 255 255 0
Gateway Address:
192 168 1 1
Read
Reset IP
Write
Identification device
SOCKET
TcpClient
TcpServer
UdpPeer
OK
Cancel
Help
Ethernet1
Ethernet2
EtherNet/IP
COM1
COM2
EtherCAT


1
Programming port setting
PLC
USB
Ethernet
3
Connect
Disconnect
USB setting
USB port:
Ethernet setting
PLC IP address
Peer-to-peer IP address:
192 168 1 10
PING
Delay time(ms):
2000
Port number:
9016
2
PLC network port setting
Find
Number
IP
Device type
Mac address
Ethernet1
Ethernet2
EtherNet/IP
COM1
COM2
EtherCAT



(6) After successful connection, you can download the PLC program in the normal way.



12 Error codes of communication between HMI and PLC

Error code	Information	Error code	Information
0x11	Local data-Real-time read-ECC Error	0x41	Local data-Real-time read-No data returned
0x12	Local data-Write operation-ECC Error	0x42	Local data-Write operation- No data returned
0x13	Local data-Read historical data-ECC Error	0x43	Local data-Read historical data- No data returned
0x14	Local data-Read alarm-ECC Error	0x44	Local data-Read alarm- No data returned
0x15	Local data-Read recipe-ECC Error	0x45	Local data-Read recipe- No data returned
0x16	Local data-Write recipe-ECC Error	0x46	Local data-Write recipe- No data returned
0x17	Local data-Read data transmission-ECC Error	0x47	Local data-Read data transmission-No data returned
0x18	Local data-Write data transmission-ECC Error	0x48	Local data-Write data transmission- No data returned
0x19	Local data-Read clock-ECC Error	0x49	Local data-Read clock- No data returned
0x20	Local data-Write clock-ECC Error	0x50	Local data-Write clock- No data returned
0x21	Local data-Read macro-ECC Error	0x51	Local data-Read macro- No data returned
0x22	Local data-Write macro-ECC Error	0x52	Local data-Write macro- No data returned
0x71	Local data-Real-time read-Wrong return length	0x111	Penetrating data-Real-time read-ECC Error
0x72	Local data-Write operation- Wrong return length	0x112	Penetrating data -Write operation-ECC Error
0x73	Local data-Read historical data- Wrong return length	0x113	Penetrating data-Read historical data-ECC Error
0x74	Local data-Read alarm- Wrong return length	0x114	Penetrating data-Read alarm-ECC Error
0x75	Local data-Read recipe- Wrong return length	0x115	Penetrating data-Read recipe-ECC Error
0x76	Local data-Write recipe- Wrong return length	0x116	Penetrating data-Write recipe-ECC Error

Error code	Information	Error code	Information
0x77	Local data-Read data transmission-Wrong return length	0x117	Penetrating data-Read data transmission-ECC Error
0x78	Local data-Write data transmission-Wrong return length	0x118	Penetrating data-Write data transmission-ECC Error
0x79	Local data-Read clock- Wrong return length	0x119	Penetrating data-Read clock-ECC Error
0x80	Local data-Write clock- Wrong return length	0x120	Penetrating data-Write clock-ECC Error
0x81	Local data-Read macro- Wrong return length	0x121	Penetrating data-Read macro-ECC Error
0x82	Local data-Write macro- Wrong return length	0x122	Penetrating data-Write macro-ECC Error
0x141	Penetrating data-Real-time read-No data returned	0x171	Penetrating data-Real-time read-Wrong return length
0x142	Penetrating data-Write operation- No data returned	0x172	Penetrating data-Write operation- Wrong return length
0x143	Penetrating data-Read historical data-No data returned	0x173	Penetrating data-Read historical data-Wrong return length
0x144	Penetrating data-Read alarm- No data returned	0x174	Penetrating data-Read alarm- Wrong return length
0x145	Penetrating data-Read recipe- No data returned	0x175	Penetrating data-Read recipe- Wrong return length
0x146	Penetrating data-Write recipe- No data returned	0x176	Penetrating data-Write recipe- Wrong return length
0x147	Penetrating data-Read data transmission-No data returned	0x177	Penetrating data-Read data transmission- Wrong return length
0x148	Penetrating data-Write data transmission- No data returned	0x178	Penetrating data-Write data transmission- Wrong return length
0x149	Penetrating data-Read clock- No data returned	0x179	Penetrating data-Read clock- Wrong return length
0x150	Penetrating data-Write clock- No data returned	0x180	Penetrating data-Write clock- Wrong return length
0x151	Penetrating data-Read macro- No data returned	0x181	Penetrating data-Read macro- Wrong return length
0x152	Penetrating data-Write macro- No data returned	0x182	Penetrating data-Write macro- Wrong return length
0x201	Handshake failure		

13 Appendix

13.1 Export data via U disk

VS-Q Series HMI supports exporting historical data, recipes, historical alarms and screenshots via U disk.

Group number is necessary to export historical data resulting from the added function of multiple groups of historical data in the HMITOOL. LW60408 is the group number of the selected history data. For example: Set LW60408 to 1, which means the current historical data for import and export via U disk is aims at historical data Group 0, instead of others.

Note: If the numerical input value exceeds the maximum group minus 1, this function does not work.

- **How to export historical data via U disk**

Step 1 Insert the USB disk.

Step 2 Set the group number of history data for import and export in the LW60480 register.

Step 3 Trigger LB60127 to ON and then HMI will copy the history data group file to USB disk, named hisdatai.csv; hisdata1.csv if the group number is 1.

Step 4 Trigger LB60128 to ON and then HMI will copy the history data group file to USB disk; if you want to import the Group 1, name the file hisdata1.csv.

Step 5 These triggers are automatically reset to OFF when the export is complete.

Step 6 When exporting local data, employ the LW register: LW60359-LW60429.

- **How to export recipe**

It needs to set LW61143 for recipe export operation result from multiple groups of recipe in the HMITOOL.

Step 1 Insert the USB stick.

Step 2 Set the group number in LW61143.

Step 3 Trigger LB60163 to ON; HMI will copy the group recipe file to U disk.

Step 4 These triggers are automatically reset to OFF when the export is complete.

Note:

It cannot open directly the historical data exported to the computer, so it needs a data conversion tool, SK_SQL_CSV.exe, which is under the root directory of HMITOOL configuration software.

Use this tool to convert the exported file into a CSV file that can be opened directly. Double-click to open the tool.

Progress: The progress of the file conversion.

File name: Select the file to convert.

Select historical data or alarm accordingly. The default encoding is ANSI that cannot be modified. After settings, click "Generate CSV". When the progress bar reaches 100%, the conversion is complete.

- **How to get screenshots via U disk**

Step 1 Insert the USB disk

Step 2 When configuring, create a Function button -> Screenshot, and select Export to U disk

Step 3 Touch this function button and then HMI will capture the current screen to the corresponding memory.

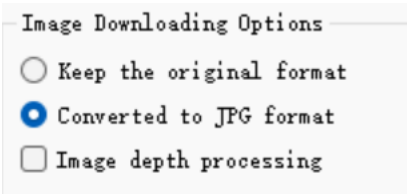
Note:

- Do not disconnect the USB disk during the export operation.
- Maintain the power ON during the export operation.
- Make sure that your USB disk has enough storage space.

13.2 Image format

VS-Q series HMI is compatible with a variety of image formats, such as JPG, BMP, GIF, PNG and so on. However, in order to ensure the display efficiency, the image format is compressed by default, and also converted into the JPG format (except GIF display control).

If you want to retain the original format, select HMI parameter settings > Printer downloading settings, and then set the image option to keep the original format.



Note:

✧ Conversion to JPG format is meant to ensure more images to be used;

✧ Employ of images whose resolution does not exceed that of the HMI can improve the display efficiency;

✧ The maximum number of frames for a GIF image is 32.

13.3 Update project via U disk

VS-Q Series HMI supports importing and updating project via U disk.

How to update the project file via U disk

(1) Compile the project

Run HMITOOL; open the project you want to update; click  to generate the compiled file.

Select Extract U disk file, select the corresponding version of the USB file, and select save directory.

(2) Click "Save Project As" in "Download", then select the save directory

The file **u-disk-prj.bin** will be stored in the selected directory.

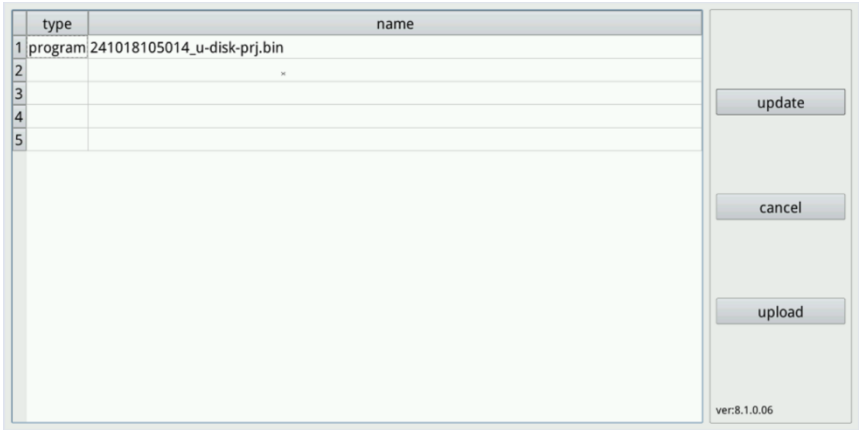
(3) Copy the compiled file to the USB disk

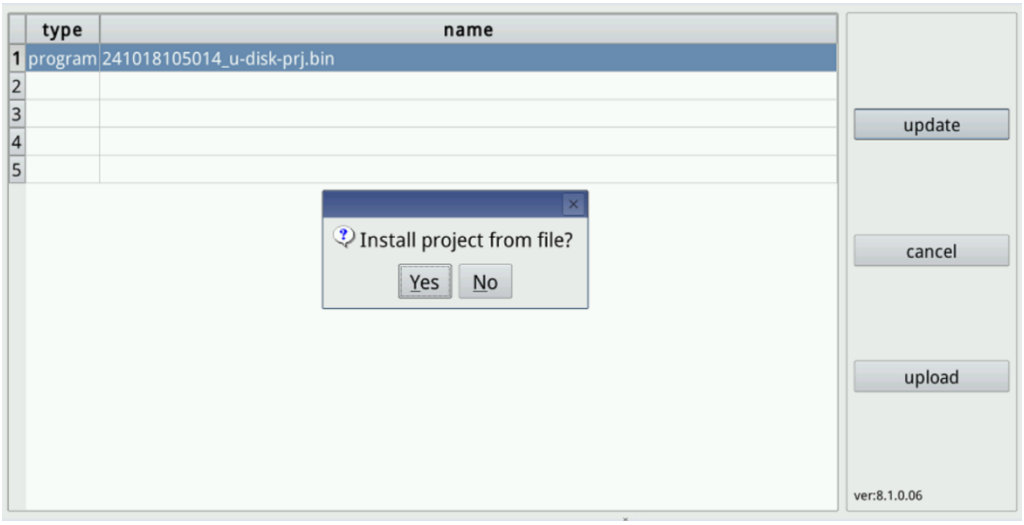
Open the directory, copy **u-disk-prj.bin** to the U disk.

(4) Insert the U disk to HMI.

(5) Copy the file and re-update the project

After inserting U disk into HMI, click Yes in the pop-up window to execute the update operation.





(6) Restart HMI to complete updating

Restart the power supply or restart the HMI by clicking the "Restart" button on the screen.

Note:

✧ Do not disconnect the USB flash drive during the update process;

✧ Maintain HMI ON during the update process.

13.4 Update recipe via U disk

VS-Q Series HMI supports importing and updating recipe via U disk.

How to update the recipe file via U disk

(1) Compile the project

Run HMITOOL; open the project you want to update; click  to generate the compiled file.

(2) Copy the compiled file to the USB disk

Open the directory, copy **u-disk-prj.bin** to the U disk.

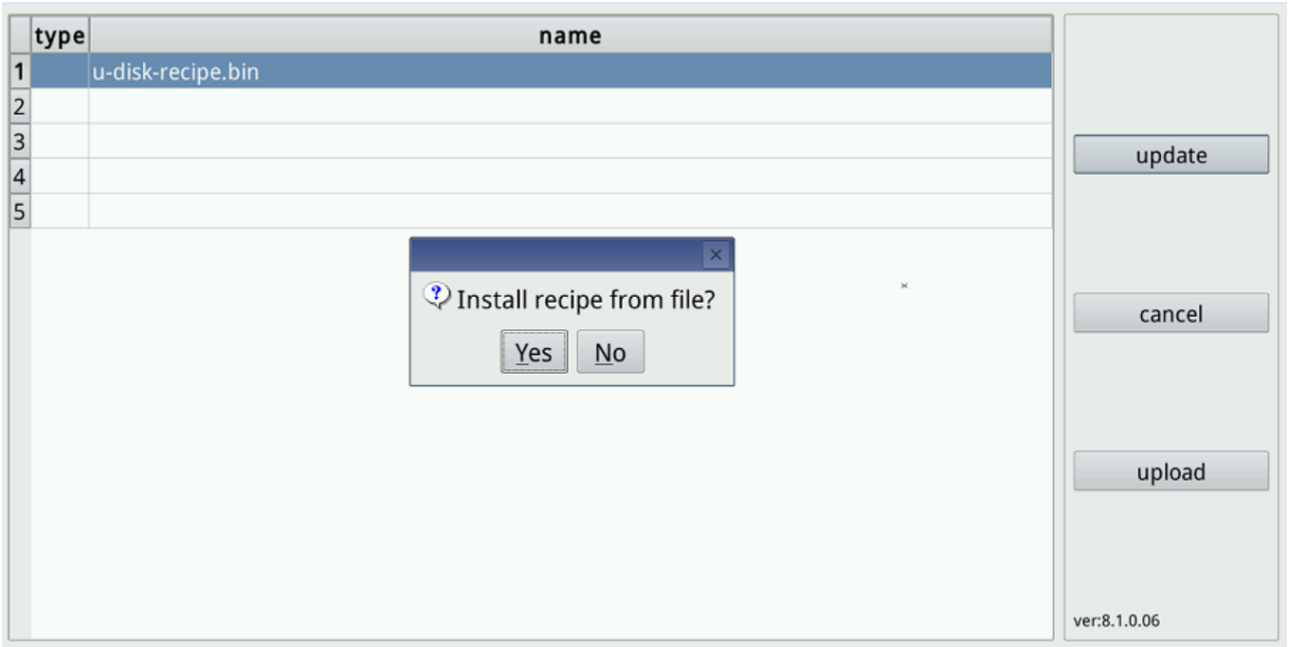
(3) Rename the **recipe.bin**.

Rename the **recipe.bin** as **u-disk-recipe.bin**.

(4) Insert the U disk to HMI.

(5) Copy the file and re-update the project.

After inserting U disk into HMI, click "Yes" in the pop-up window to execute the update operation.



(6) Restart HMI to complete updating

Restart the power supply or restart the HMI by clicking the "Restart" button on the screen.

Note:

- ✧ Do not disconnect the USB flash drive during the update process;
- ✧ Maintain HMI ON during the update process.

13.5 Dial switch

Each VS series HMI (older models) has dial switch, each of which has its functions.

Function list of dial switch

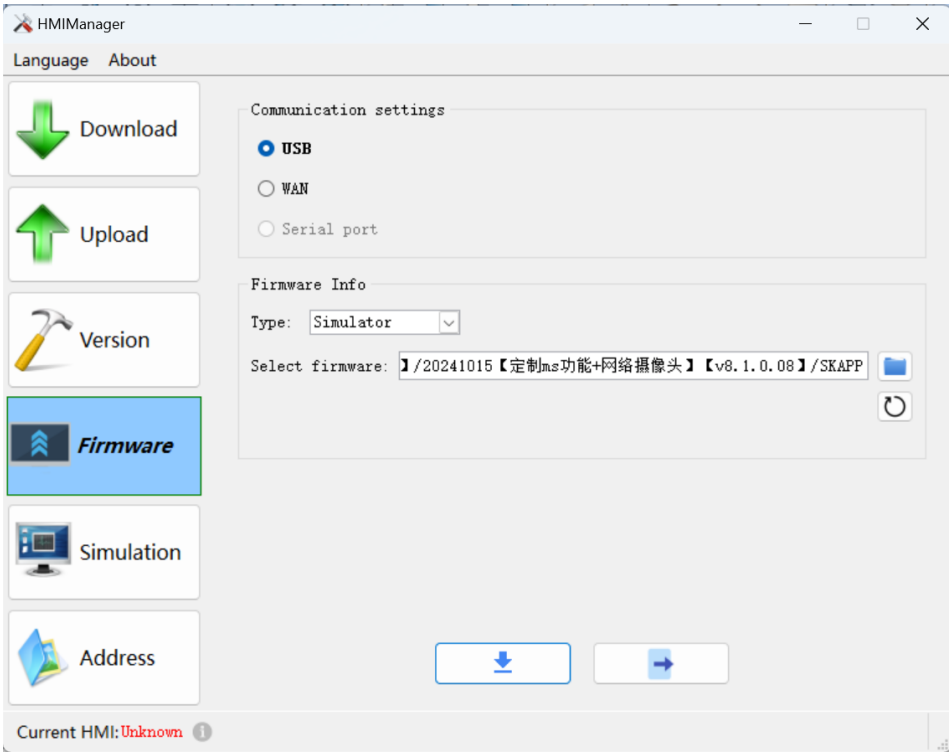
Dial switch (5-1)	Function
All off	Normal Operation Mode
On 1	Coordinate Calibration Mode
On 2	Parameter Display Mode
On 1 and On 2	Terminal Mode
On 1 and On 3	Parameter Setting Mode

Note:

- ✧ It needs to restart HMI after adjusting dial switch;
- ✧ Please apply the normal operation mode when using HMI normally;
- ✧ The parameter setting mode is applicable to set the time, luminance and IP address.

13.6 Upload and download tools

Upload and download tool interface



Download

- ■ Communication parameter setting

  USB: PC connects to HMI via USB

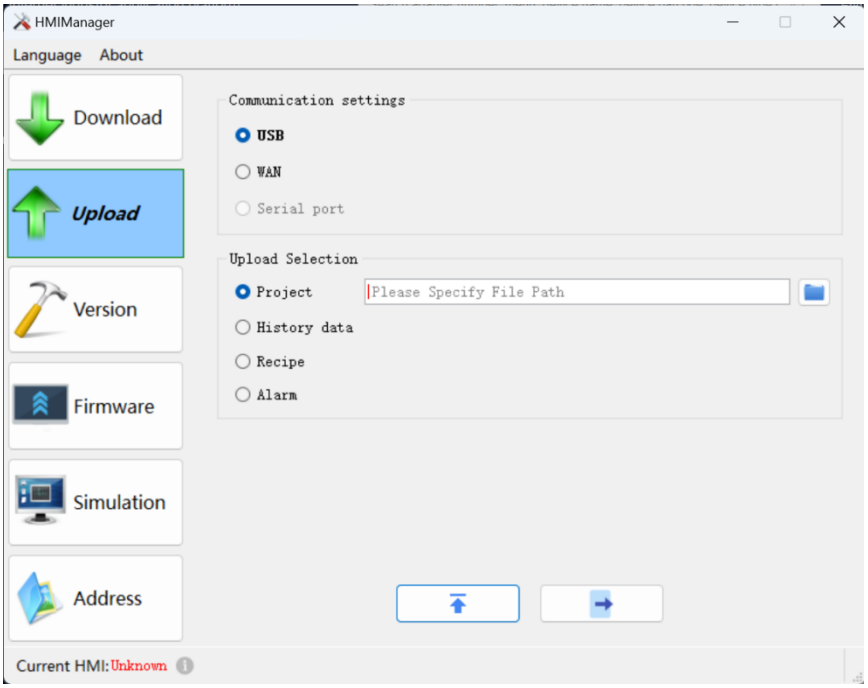
  Network port: PC connects to HMI via Ethernet

- ■ Download selection area

Download the configuration: you need to generate the configuration project file **u-disk-prj.bin**. In the

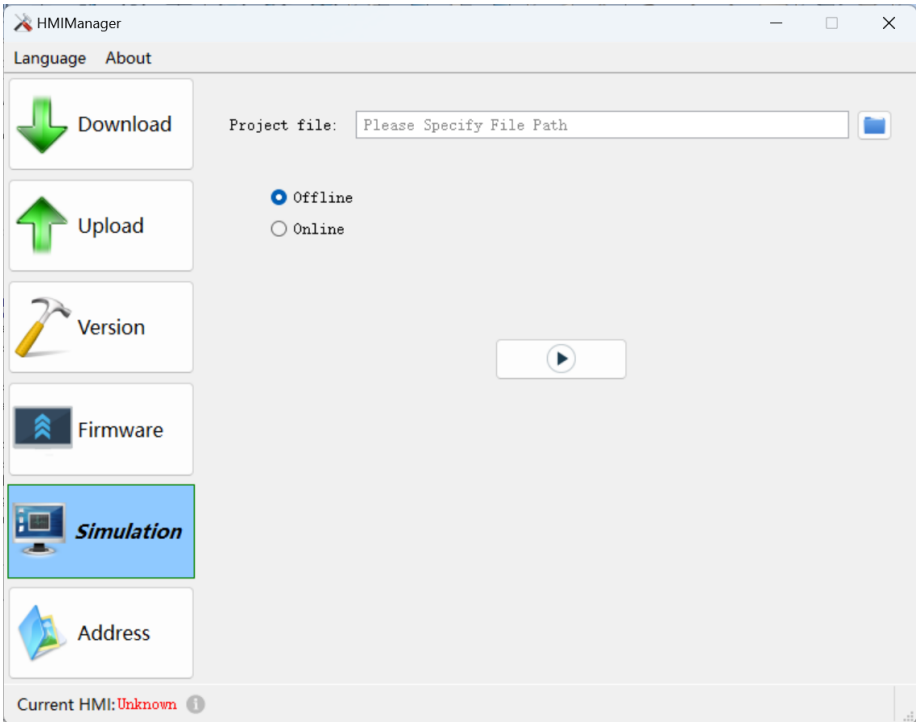
configuration software, choose "Download" > "Extract Project Save As" > "Generate **u-disk-prj.bin** configuration file", click "Browse" to select the file, and then click "Start Download" to update the configuration in the HMI.

Download the recipe: compile the edited HMI configuration project, enter the software installation directory under compile, generate **recipe60.bin** and **recipe62.bin** two files, for lower than or equal to version 6.0, choose **recipe60.bin** file, for higher than version 6.0, choose **recipe62.bin** file, click "Browse" to select the file. Click "Browse" to select the file, and then click "Start Download".



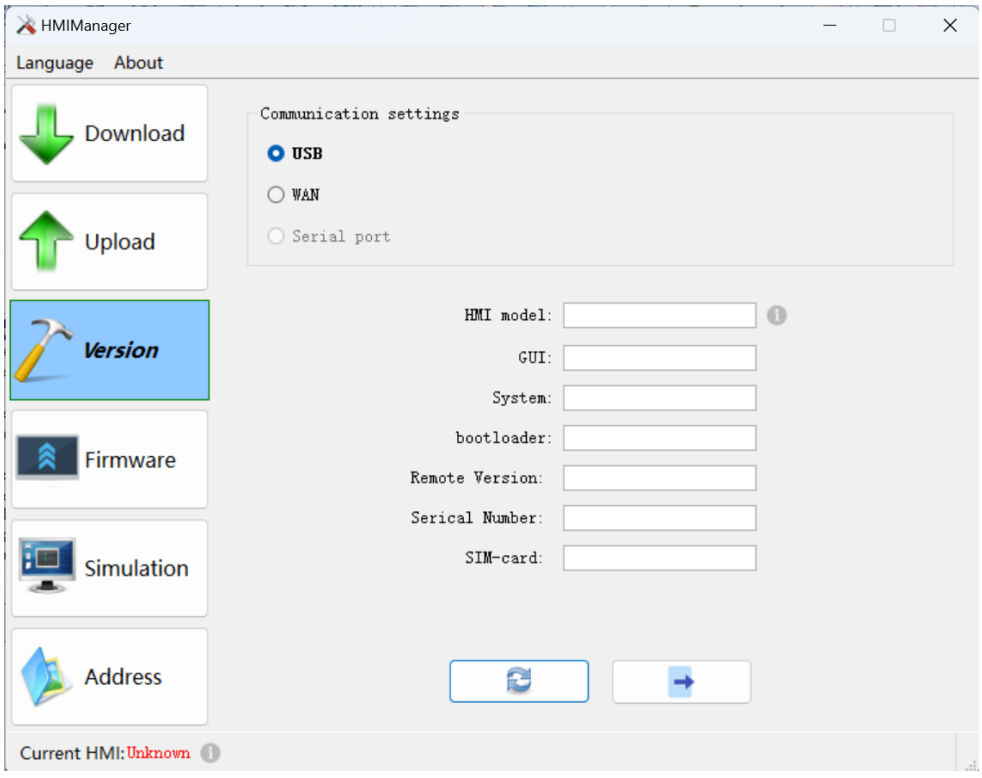
Upload

- Communication parameter setting: consistent with download processing.
- Communication parameter setting: consistent with download processing.
  - ✧ Upload selection area: HMI parameter settings are allowed to be uploaded configuration, HMI runtime procedures have recipes, historical data, historical alarms exist; otherwise, it is not possible to upload the corresponding files.
  - ✧ Upload historical data: Click Browse to set the save location and save file name of the uploaded file, click Start Upload to upload the historical data zip file and historical data **.csv** file, please refer to "Uploading historical data files" for details.
  - ✧ Upload configuration: Click Browse to set the save location and save name of the uploaded file, click Start Upload to upload the zip file of the configuration, and then unzip it to view and edit the configuration project file normally, please refer to "Uploading configuration procedures" for details.
  - ✧ Upload Recipe: Click "Browse" to set the save location and save file name of the uploaded file, click "Start Upload" to upload the recipe file in HMI.
  - ✧ Upload Historical Alarms: Click "Browse" to set the save location and save file name of the uploaded file, and click "Start Upload" to upload the alarm file in HMI.



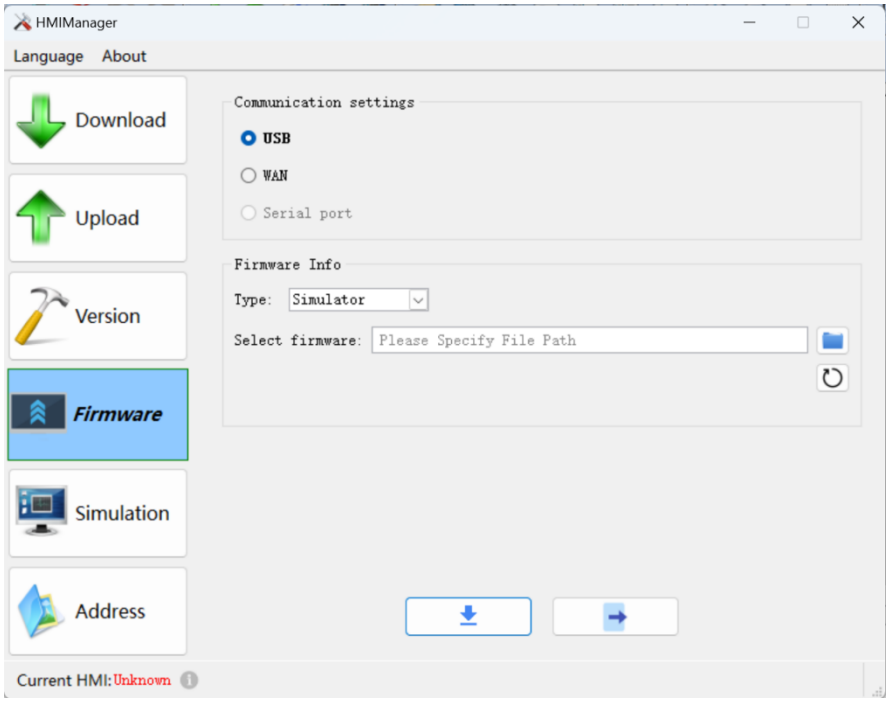
Simulation

Browse the selected configuration project file **.vpm** for online and offline simulation.



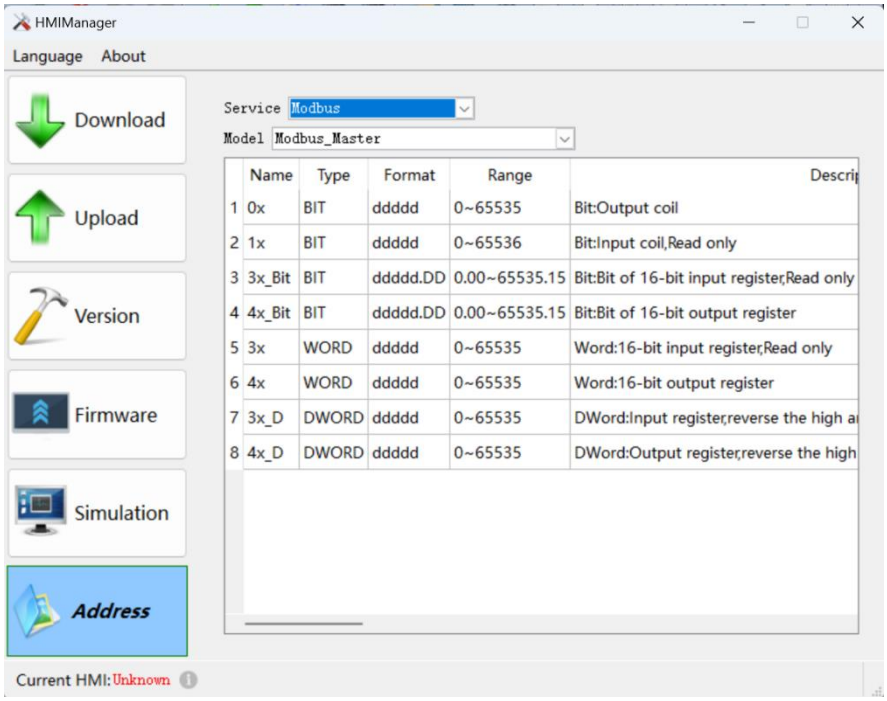
Get Version

- Communication parameter setting: consistent with the download processing communication parameter setting.
- Version information: current HMI version information.



Firmware updates

- Communication parameter settings: Consistent with the download processing communication parameter settings.
- Firmware Information: Browse to select the firmware that needs to be updated, click to upgrade.



Address browser

- Connection Service: Select different device vendors.
- Device Model: Select the corresponding device model.

It displays all the address information of the currently selected device.

14 Operation cases

This chapter introduces mainly several cases of HMITOOL configuration software meant for VS-Q Series HMI, for your reference.

14.1 A simple macroblock

Create a new project; select the appropriate HMI model. The script module will implement the following simple arithmetic functions: Initialize the "Numerical display" control with the array char source [4] = {2, 3, 4, 5} element value through the Init script; read the input data from the external through the numerical display control; and then the execution of the ADDSUM script will be triggered by pressing the "=" button and the result of its execution will be displayed via this control.

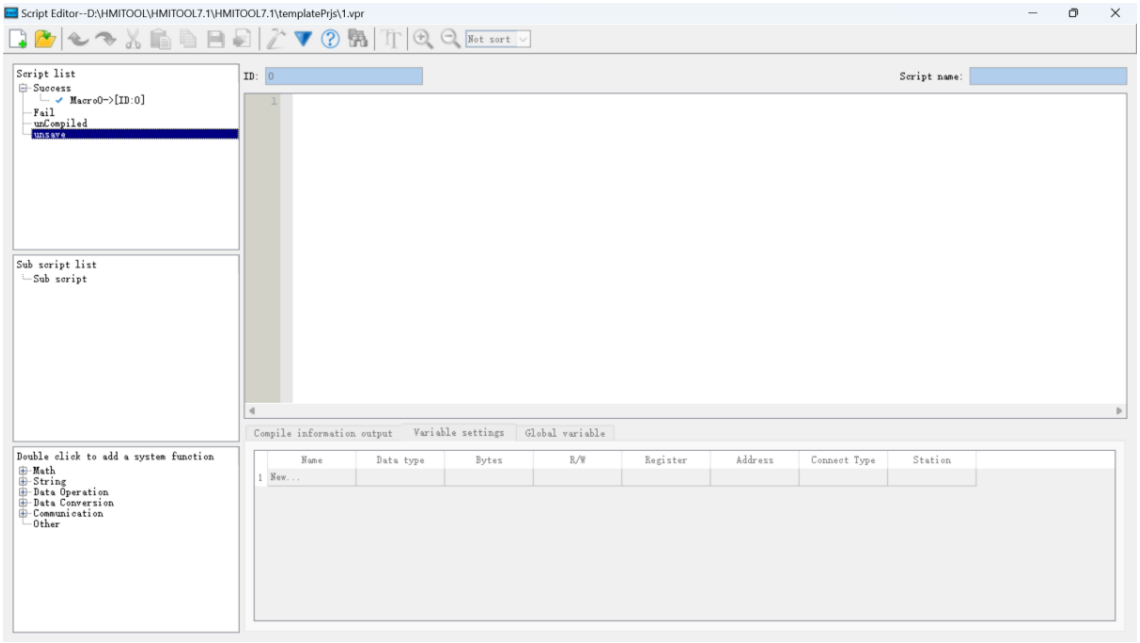
Detailed steps are as follows:

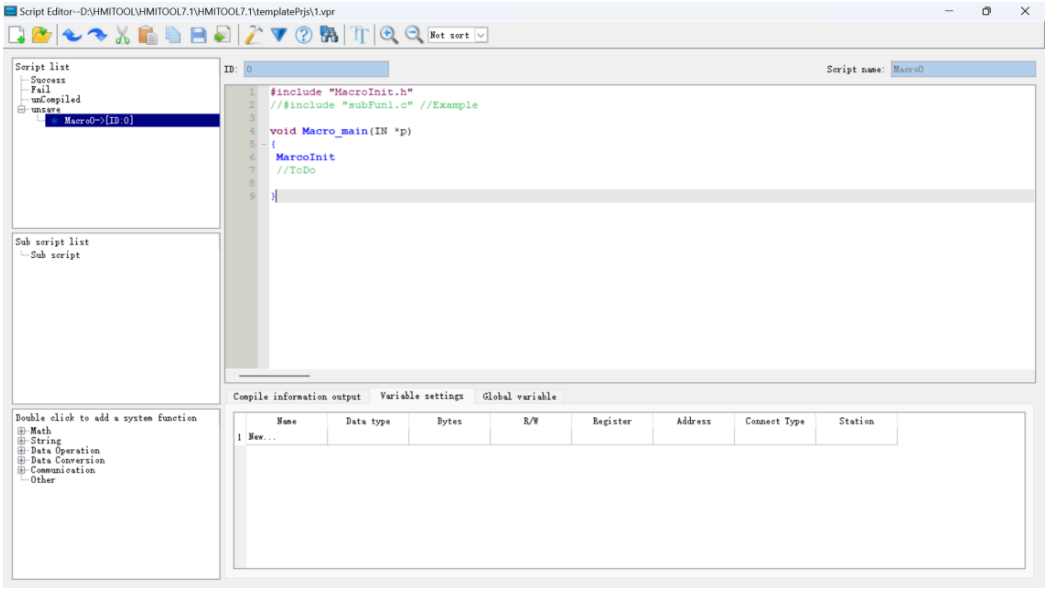
Step 1: <Create a new script>

Click the shortcut function button "script editor" on the left side of the toolbar, and then it will pop up a dialog box .

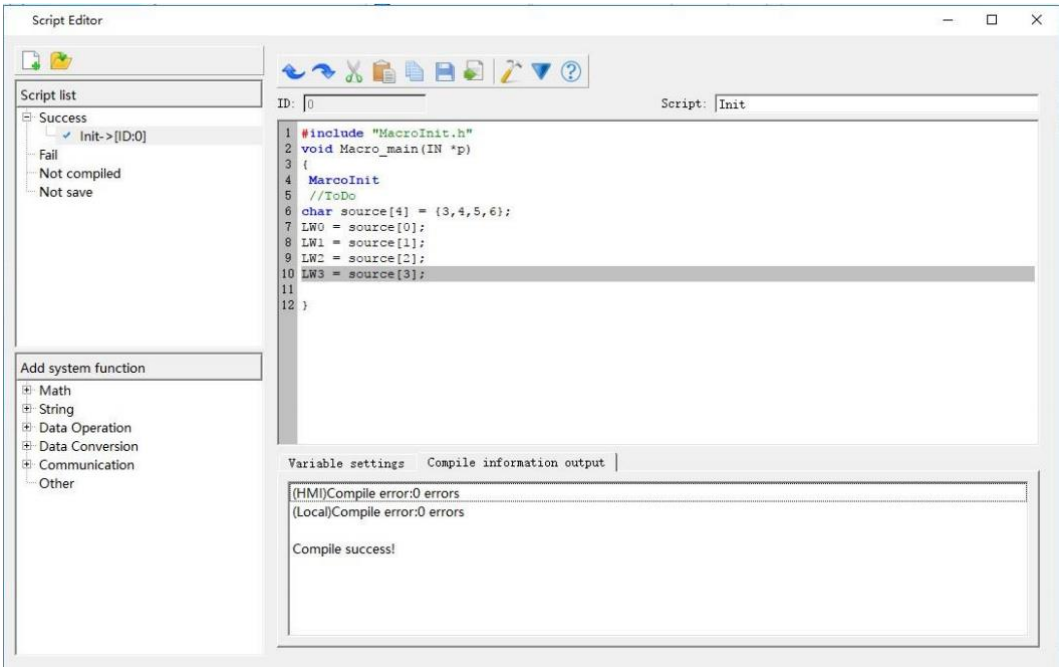
Step 2: <Create the macro Init>

Click the  button in the script editor interface, it will appear a new script on "Not Save"list, Modify the script name in Script edit control, and edit the source code on the Script Edit Window,as shown in figure below:



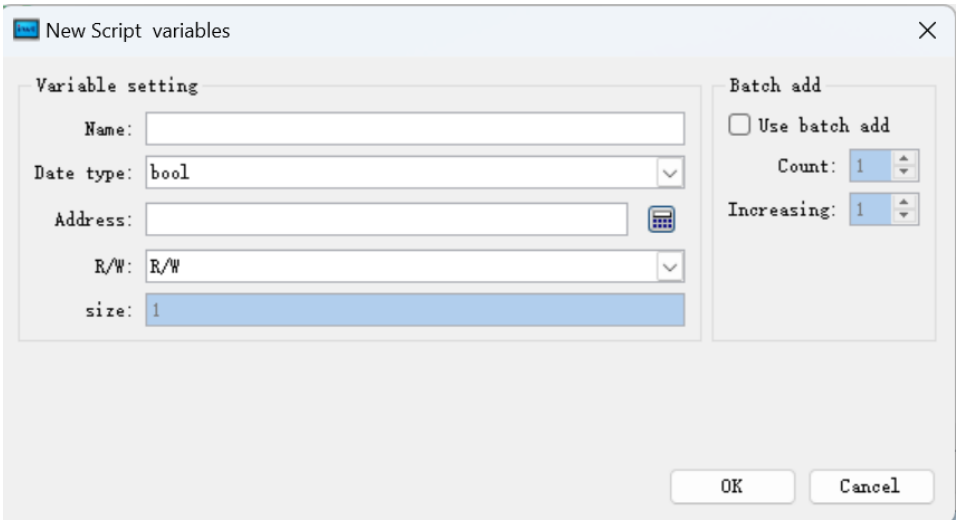


Note: Macro names can only consist of Arabic numerals (0-9), English characters (a-z, A-Z), and underline (_). Enter the following contents as shown in figure below:



Step 3: <Variable settings>

Record the attribute settings such as variable name, variable type, etc, in the window as shown in figure below. Double click in the "Variable Setting" window, or right click to pop up the shortcut menu, and then select "New Variable" item to pop up a dialog box where to set values of the external variables.



- Name: Input LW0, LW1, LW2, LW3 respectively in variable name;
- Data Type: Set the 16-bit integer;
- Read/write: Select to read and write (read and write);
- The address settings are: LW0 = 0, LW1 = 1, LW2 = 2, LW3 = 3;

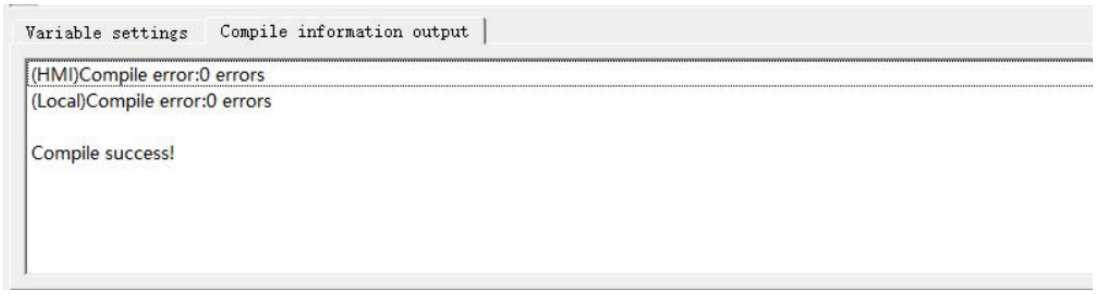
After the settings, the results are shown in figure below.

Variable settings | Compile information output |

	Name	Data type	Bytes	R/W	Register	Address	Connect Type	Station
1	LW0	16-Bit Unsig...	2	R/W	LW	0	Internal stor...	100
2	LW1	16-Bit Unsig...	2	R/W	LW	1	Internal stor...	100
3	LW2	16-Bit Unsig...	2	R/W	LW	2	Internal stor...	100
4	LW3	16-Bit Unsig...	2	R/W	LW	3	Internal stor...	100
5	New...							

Step 4: <Compile the source file>

After completing the above steps, the next is to compile; click the compile button as shown in figure below, it will save, compile, connect and check other errors automatically.



When the message output window displays "0 errors! Compile successfully", it indicates that this macro has been successfully created and will be automatically added to the compiled list box; otherwise, an error message will be displayed while the macro will be added automatically to the unsuccessful compilation list. Users can modify, edit the macro until the successful completion of the compilation.

Step 5: <Create the script ADDSUM>

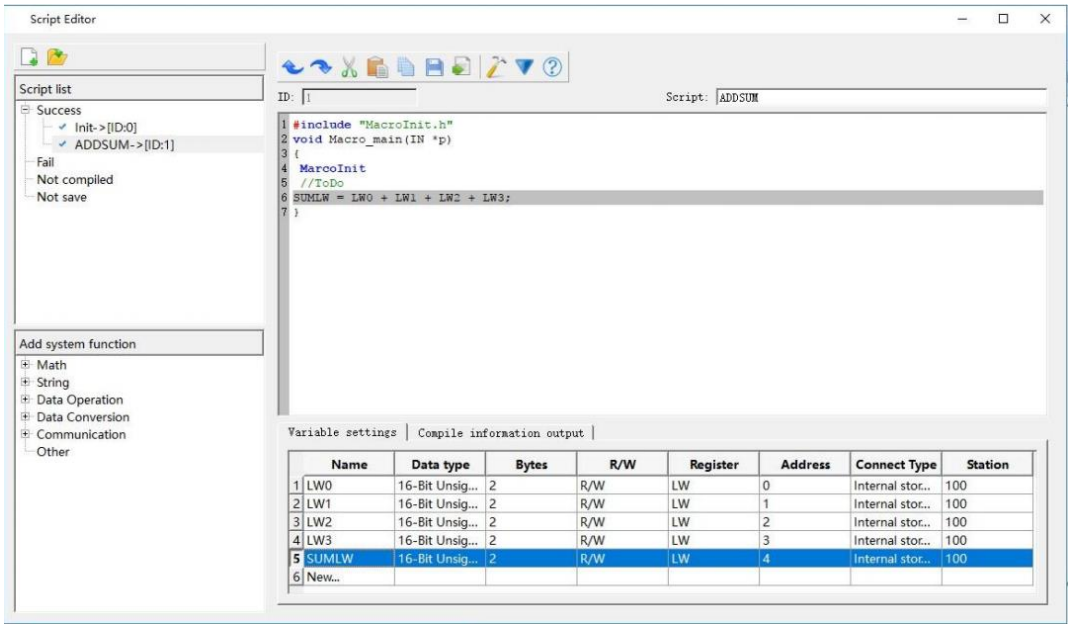
Follow steps B - D to create the script ADDSUM, as shown in figure below

A. Enter "ADDSUM" in the script name.

B. Enter the contents of the circle in the code-editing window.

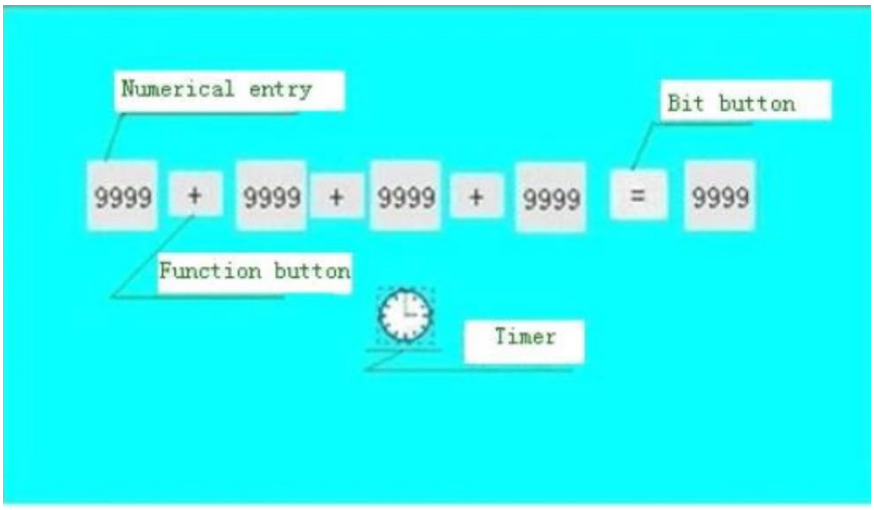
C. Set the corresponding variable attribute value in the variable setting window.

D. Click the Compile button.



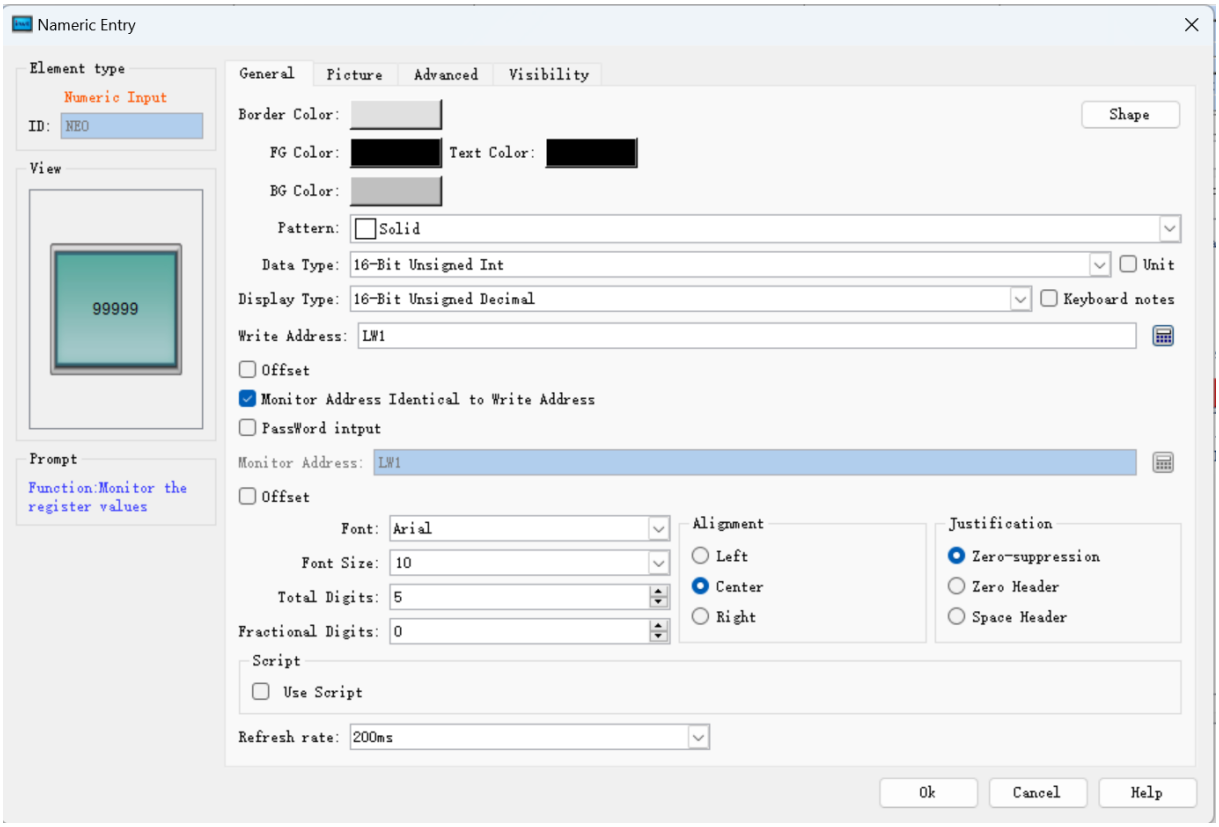
Step 6: <Edit Control>

A. Place controls on the project screen and adjust them to the appropriate size, as shown in figure below.



B. Set the corresponding control attribute parameters

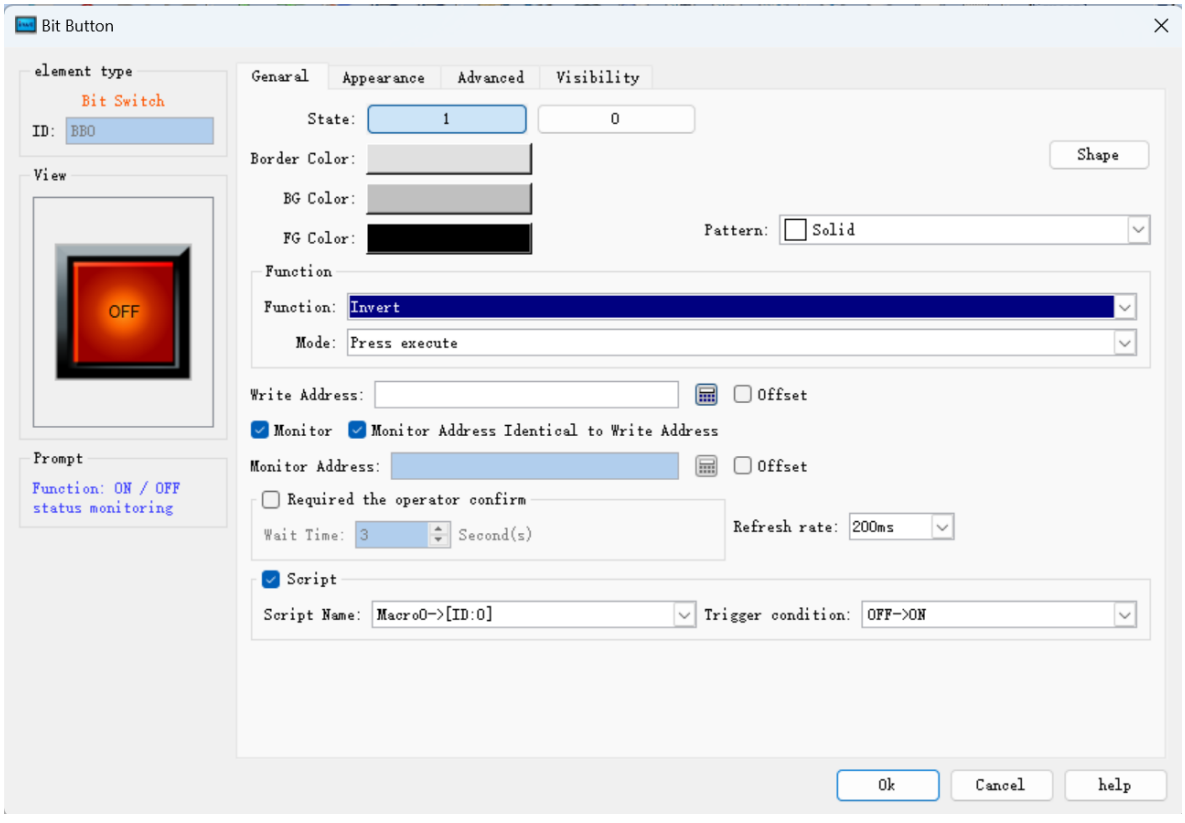
Right click on the "Numeric Input" control and set the address value and attribute of each control, as shown in figure below.



It is essential to ensure that the LW0, LW1, LW2, LW3, SumLW variable addresses correspond to the "write address" of each control. Click "OK" button to save the settings.

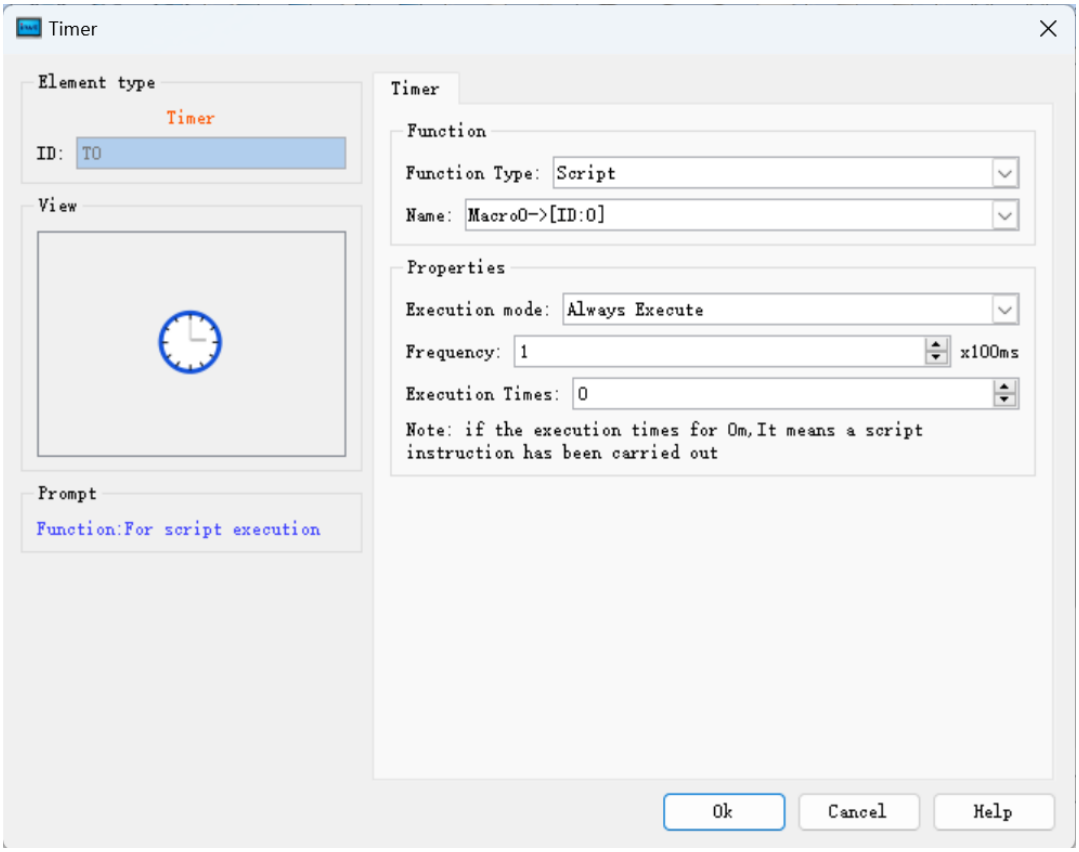
C. Set properties of Bit button control

Select the 'Bit Switch' control and right-click it to bring up the property box as shown in the figure below. In the property box that appears, set it according to the tips in the circle, and then click the 'OK' button to save the set property values.

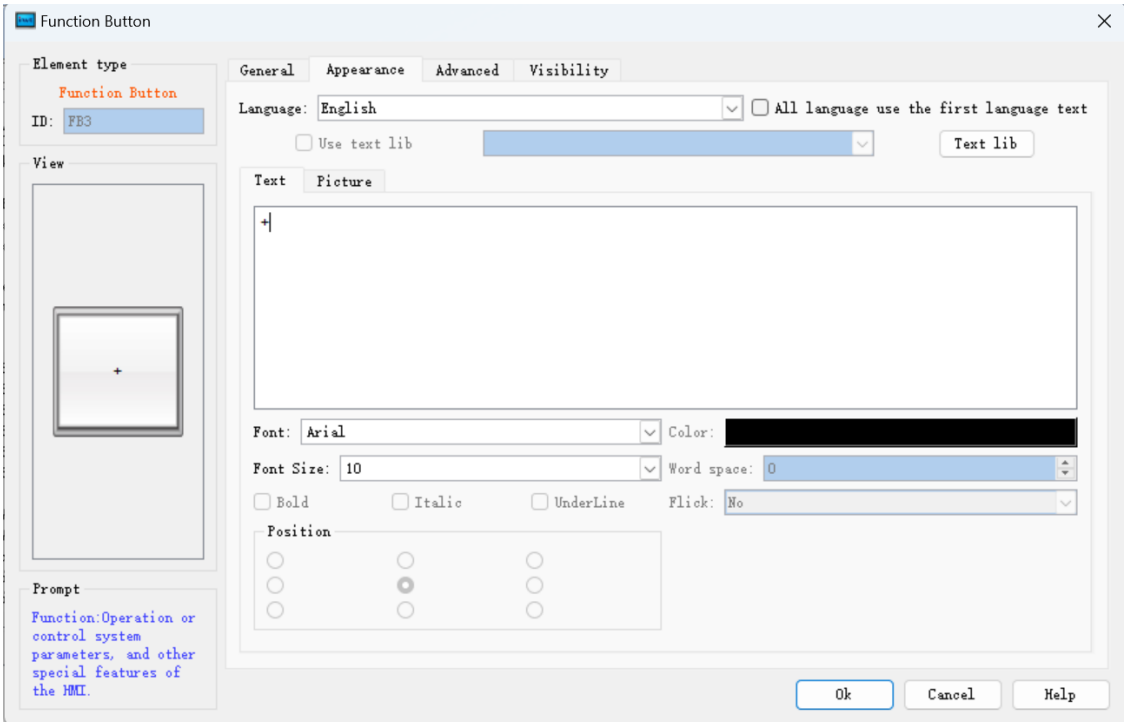


D. Property setting of Timer

Select the script Init; click "OK" to save the settings.



E. Select the "Label" > "Text" page of the Function button, and enter the "+" character in the text box, as shown in figure below.



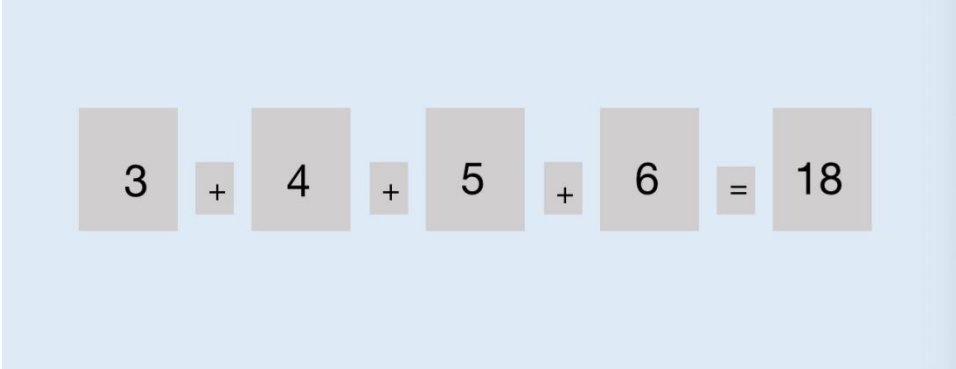
Step 7: Compile and download to HMI

After completing the above settings and saving the project, you can now compile and download the project to the HMI via USB.

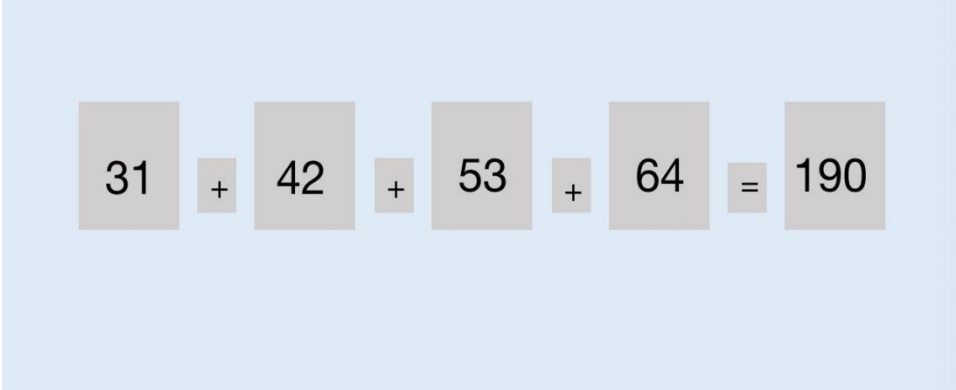
Select the menu "Download(D) > Download(D)" and choose "Download by USB" in the pop-up dialogue box. Finish the download and restart the HMI.

Step 8: <Result Test>

After restarting the HMI, the following screen appears .This is because at startup, the first instruction, Init, is the first to be executed by the timer.



Input data such as "31,42,53,64" respectively in the "Numeric display" control, click on the "=" button to implement the ADDSUM script and the output result will be 190, as shown in figure below:

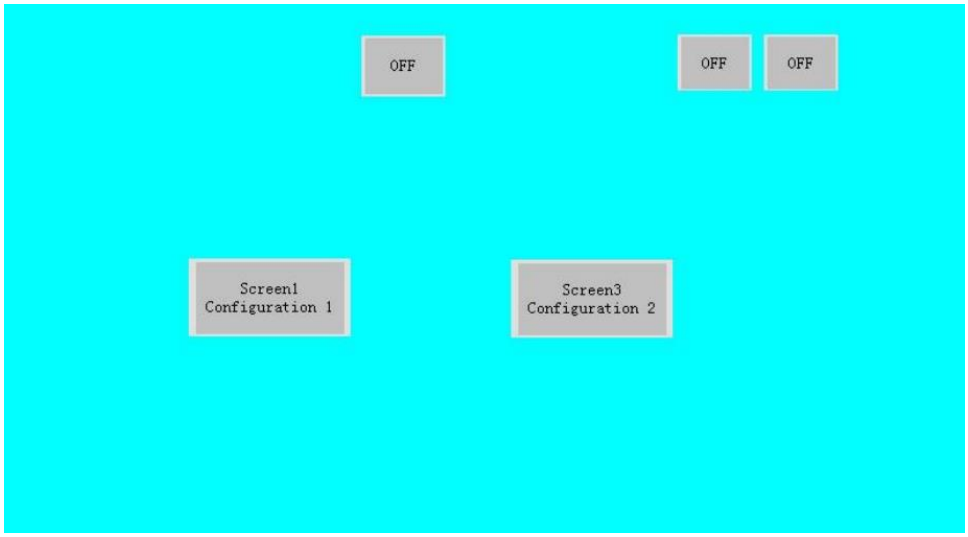


So far it has completed successfully the script editing, compiling, downloading, testing and all the necessary functions.

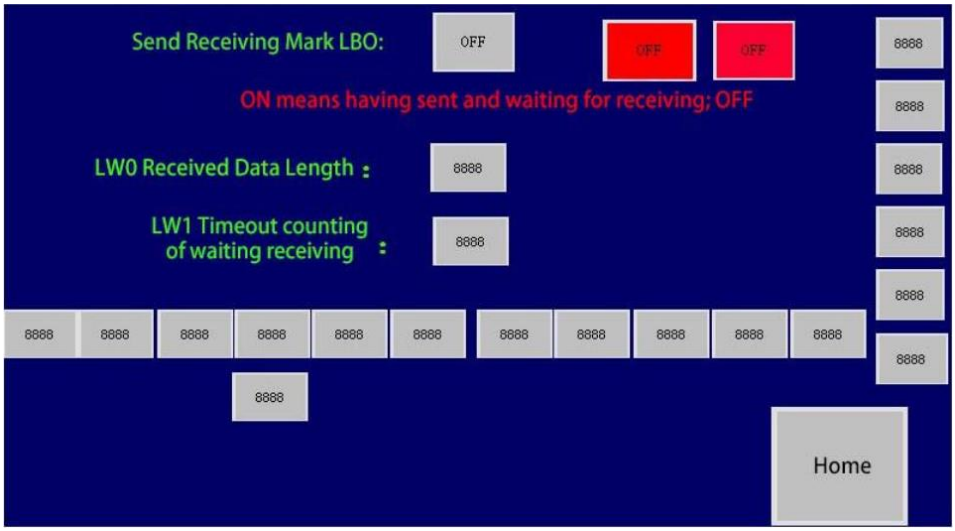
14.2 Free port communication protocol case

First, create three configurations:

Configuration 1



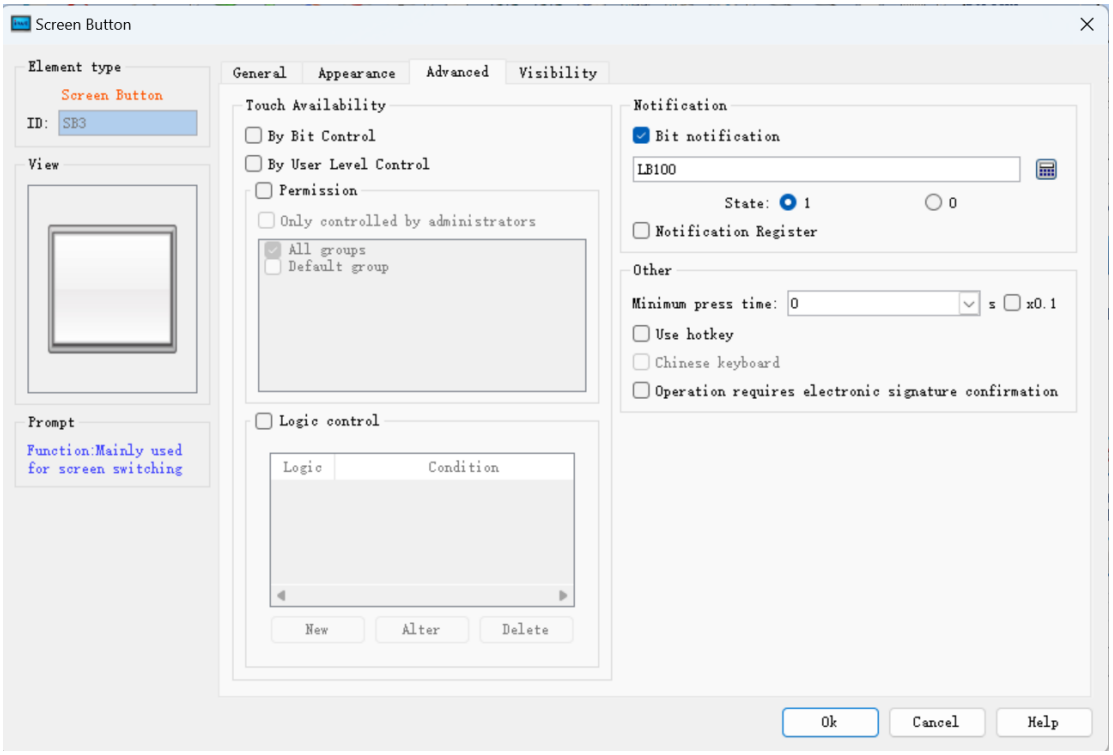
Configuration 2

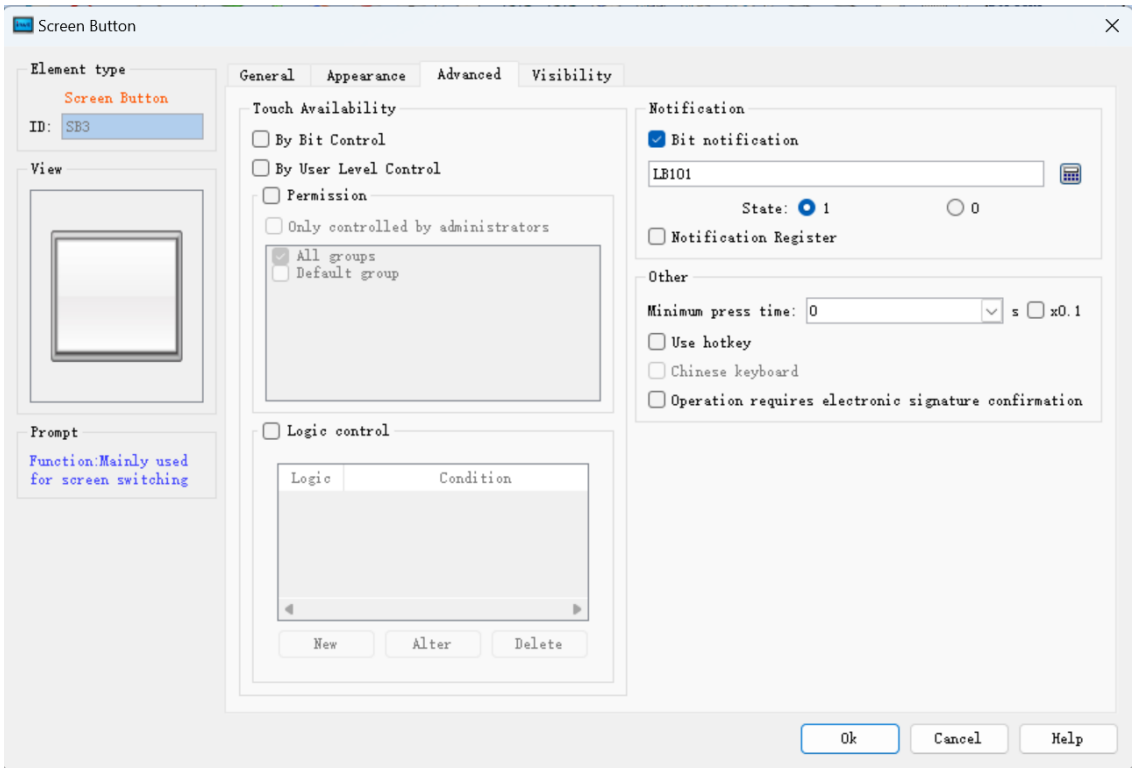


Configuration 3

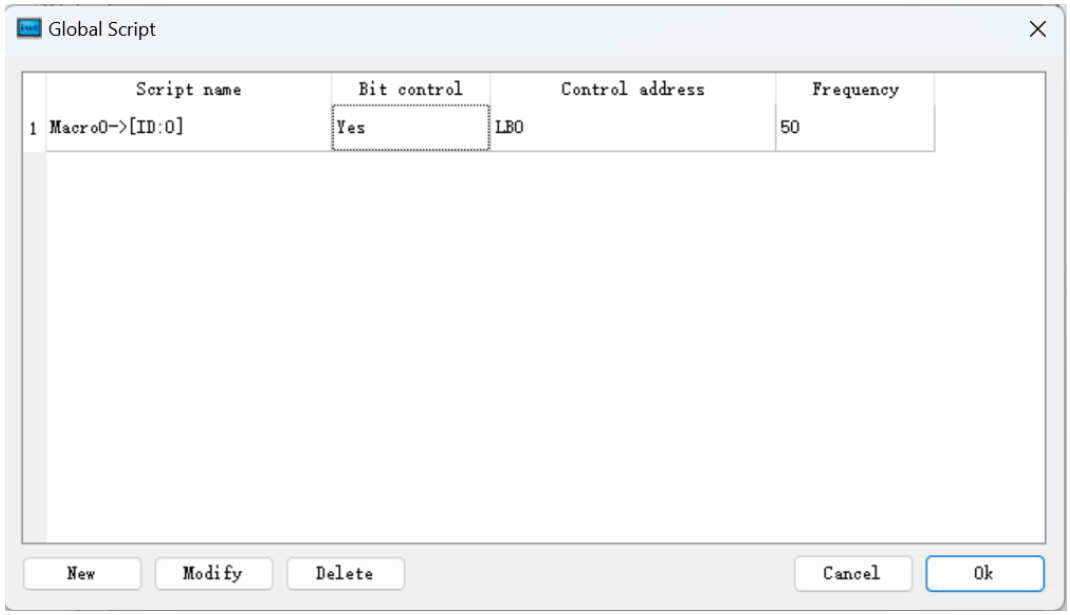
The six controls on the right side of Configuration 1 and 3 are numeric display controls whose monitoring addresses are respectively LW60297, LW60298, LW60299, LW60300, LW60301 and LW60302 = 1, from top to bottom. Two red controls are that of bit indicator light whose monitoring addresses are LB100 and LB101, respectively. Controls below Configuration 3 are numeric display controls, starting at address LW400 with an address interval of 1.

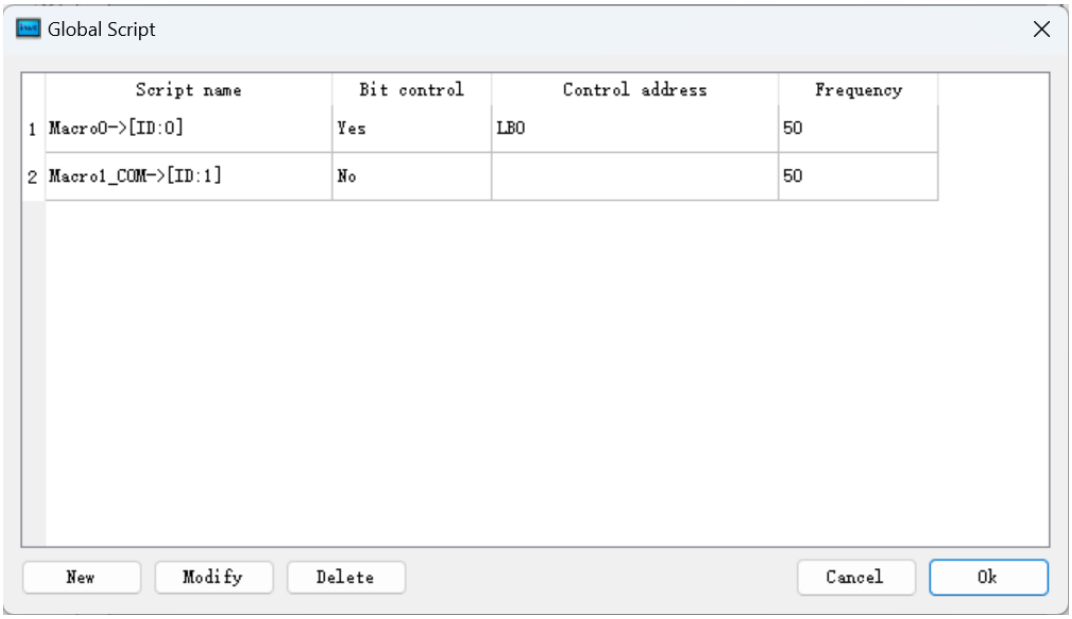
The "Advanced" settings for the two screen buttons in Configuration 2 are:





Global script setting:





Code of Marco_COM:

```
#include "MacroInit.h"

void Macro_main(IN *p)
{
   MarcoInit
   LocalWord[60297] = 0;
   LocalWord[60298] = 3;
   LocalWord[60299] = 0;
   LocalWord[60300] = 1;
   LocalWord[60302] = 1;

   char Pdata[20];
   char Gdata[100];
```

```
    int result;
    if (LocalBit[0] == 0)
    {
        Pdata[0] = LocalWord[200];
        Pdata[1] = LocalWord[201];
        Pdata[2] = LocalWord[202];
        Pdata[3] = LocalWord[203];
        PUTCHARS(0, Pdata, 4);
        LocalBit[0] = 1;
        return;
    }
    else
    {
    result = GETCHARS(0, Gdata);
    LocalWord[0] = result;
    if (result <= 0)
        {
    ++LocalWord[1];

    if (LocalWord[1] >= 3)
            {
            LocalWord[1] = 0;
            LocalBit[0] = 0;
            }
            return;
        }
        else
        {
            LocalWord[2] = Gdata[0] & 0xff;
            LocalWord[3] = Gdata[1] & 0xff;
            LocalWord[4] = Gdata[2];
            LocalWord[5] = Gdata[3];
            LocalBit[0] = 0;
            PUTCHARS(0, Pdata, 0);
        }
    }
}
Code of Macro1:
#include "MacroInit.h"
void Macro_main(IN *p)
{
  MarcoInit
  LocalWord[60297] = 0;
  LocalWord[60298] = 3;
  LocalWord[60299] = 0;
  LocalWord[60300] = 1;
  LocalWord[60302] = 1;

  char Pdata[20];
  char Mdata[100];
  unsigned short Wcrc;
```

```
    int result;

    if (LocalBit[0] == 0)
    {
        Pdata[0] = 0x02;
        Pdata[1] = 0x03;
        Pdata[2] = 0x00;
        Pdata[3] = 0x00;
        Pdata[4] = 0x00;
        Pdata[5] = 0x03;
        Wcrc = CRC(Pdata, 6);
        Pdata[6] = (Wcrc & 0xff);
        Pdata[7] = (Wcrc >> 8);
        PUTCHARS(0, Pdata, 8);
        LocalBit[0] = 1;
        return;
            }
    else
    {
        result = GETCHARS(0, Mdata);
        LocalWord[0] = result;
        if (result <= 0)
        {
            ++LocalWord[1];
            if (LocalWord[1] >= 3)
            {
                LocalWord[1] = 0;
                LocalBit[0] = 0;
            }
            return;
        }
        else
        {
            LocalWord[400] = Mdata[0]&0xff;
            LocalWord[401] = Mdata[1]&0xff;
            LocalWord[402] = Mdata[2]&0xff;
            LocalWord[403] = Mdata[3]&0xff;
            LocalWord[404] = Mdata[4]&0xff;
            LocalWord[405] = Mdata[5]&0xff;
            LocalWord[406] = Mdata[6]&0xff;
            LocalWord[407] = Mdata[7]&0xff;
            LocalWord[408] = Mdata[8]&0xff;
            LocalWord[409] = Mdata[9]&0xff;
            LocalWord[410] = Mdata[10]&0xff;
            LocalBit[0] = 0;
            PUTCHARS(0, Pdata, 0);
        }
    }
}
```

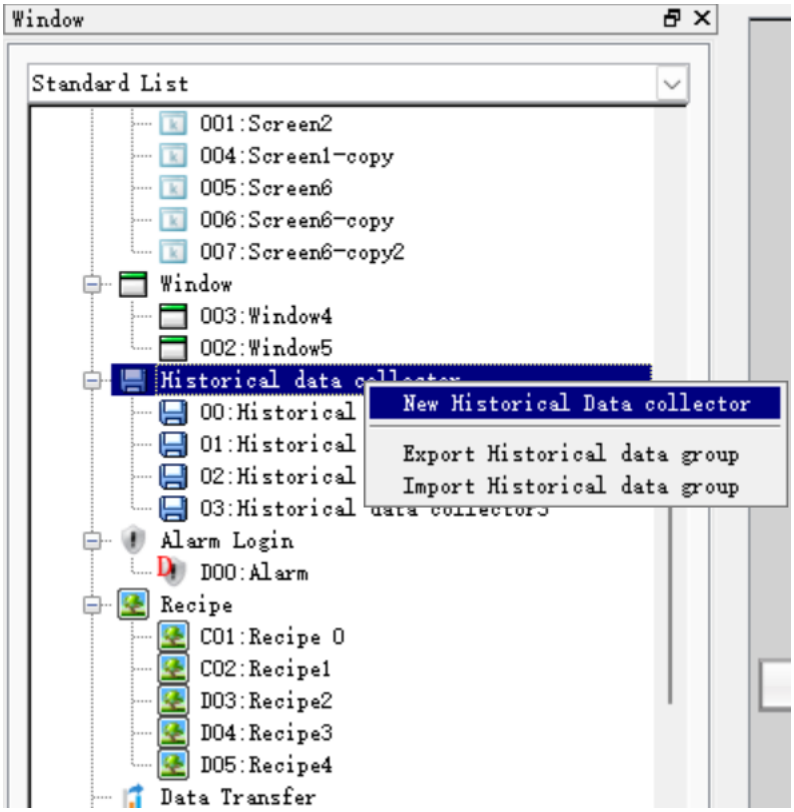
Note: Name and address of variable setting are the same in function compile box.

14.3 Historical data collector case

The following example illustrates the combined application of Historical Data Collector, Historical Data Display and Historical Trend Graph.

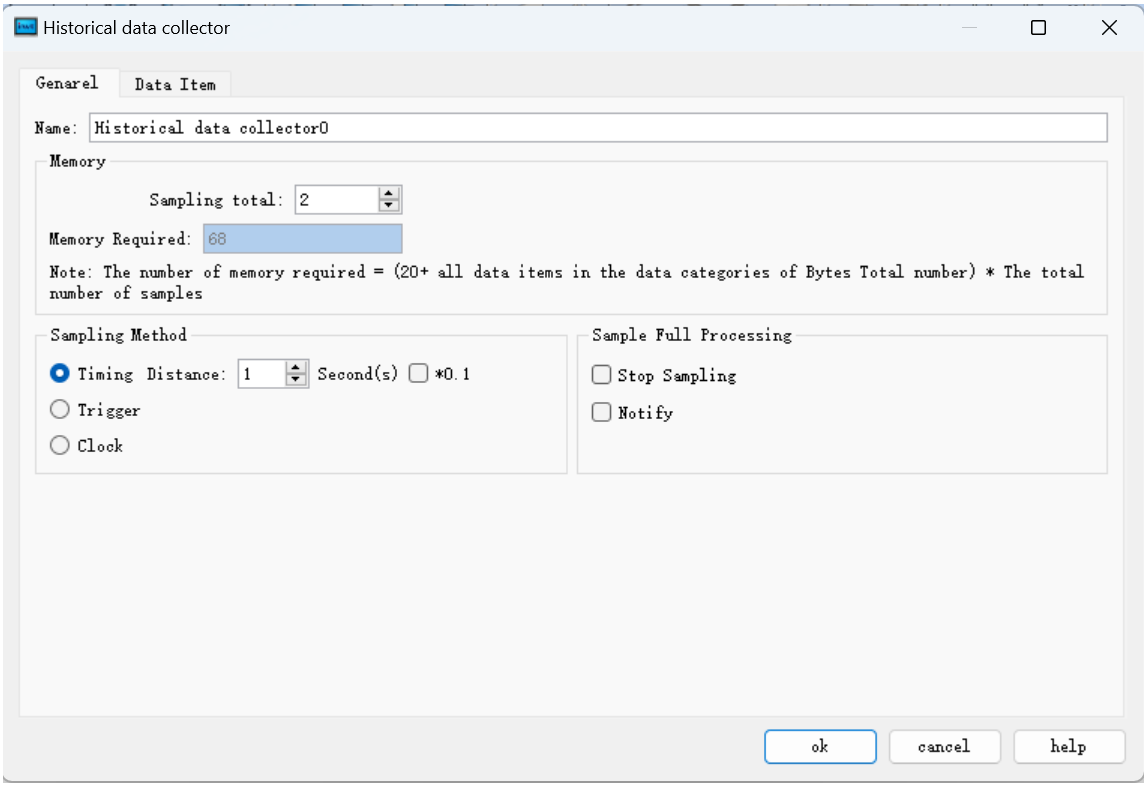
1. Create new historical data collector

Right click the "Historical Data Collector" in the "Project Manager" to create a new one, as shown in figure below.

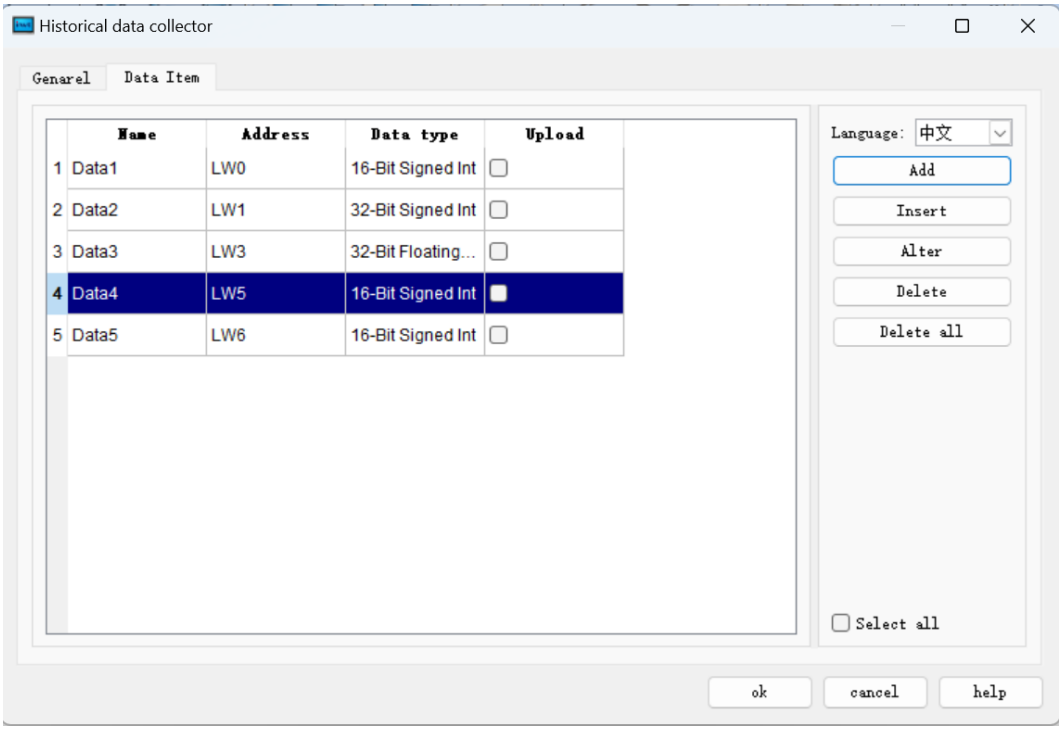


2. Settings of historical data collector

Double click to open Historical data collector, as shown in figure below:

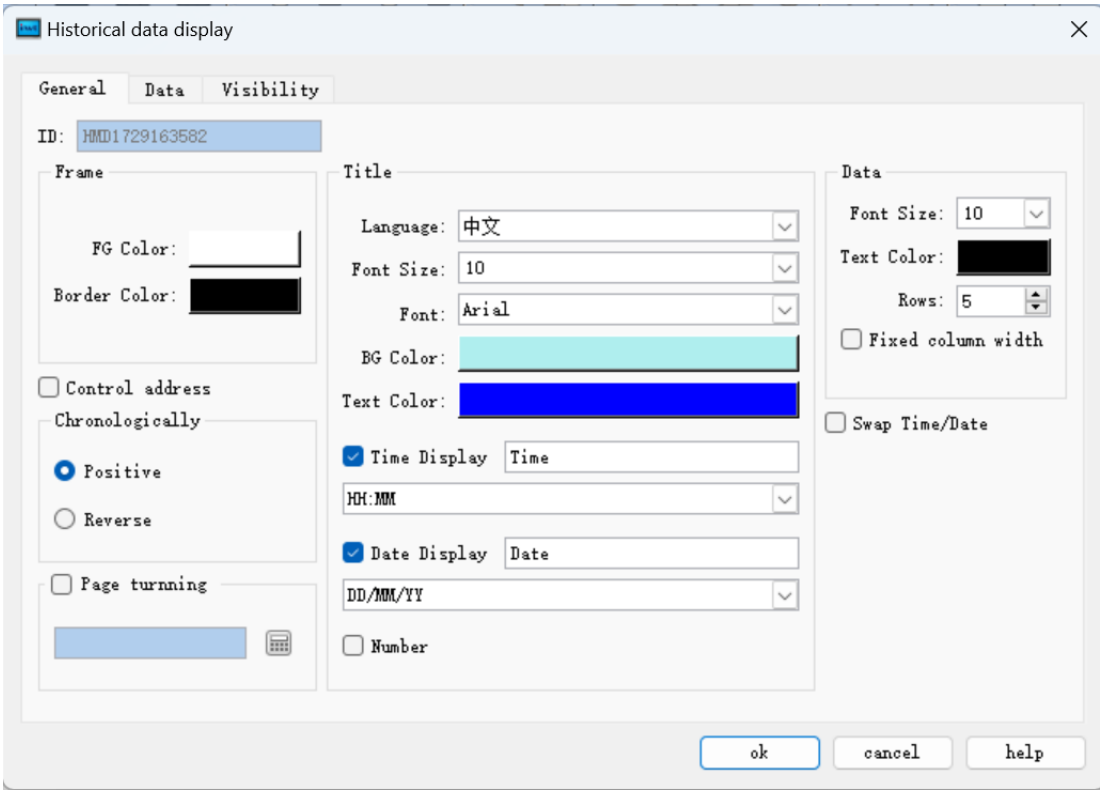


Here, we add five data collection items named "Data1", "Data2", "Data3", "Data4" and "Data5" whose addresses are set to "LW0", "LW1" "," LW3 "," LW5 "," LW6 "; set up the data type and name for each, as shown in Figure 3. Since the data 2 and data 3 are 32-bit, it will read the register values of the "LW0", "LW1 + LW2", "LW3 + LW4", "LW5" and "LW6" every time it takes sample. The total sampling here is set to 1000, that is, take a total of 1000 samples, until it is full.

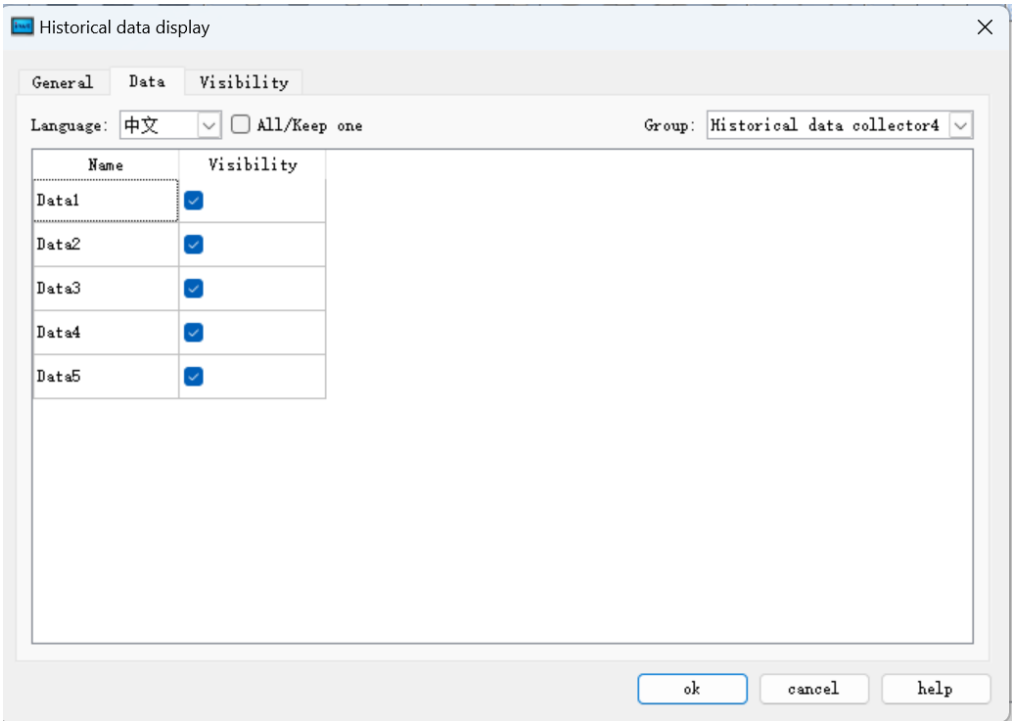


Click "OK" button; after settings, execute "Historical data display" if you want to view the historical data.

3. Settings of historical data display:



Select five for Display lines; Font and Background are up to you.

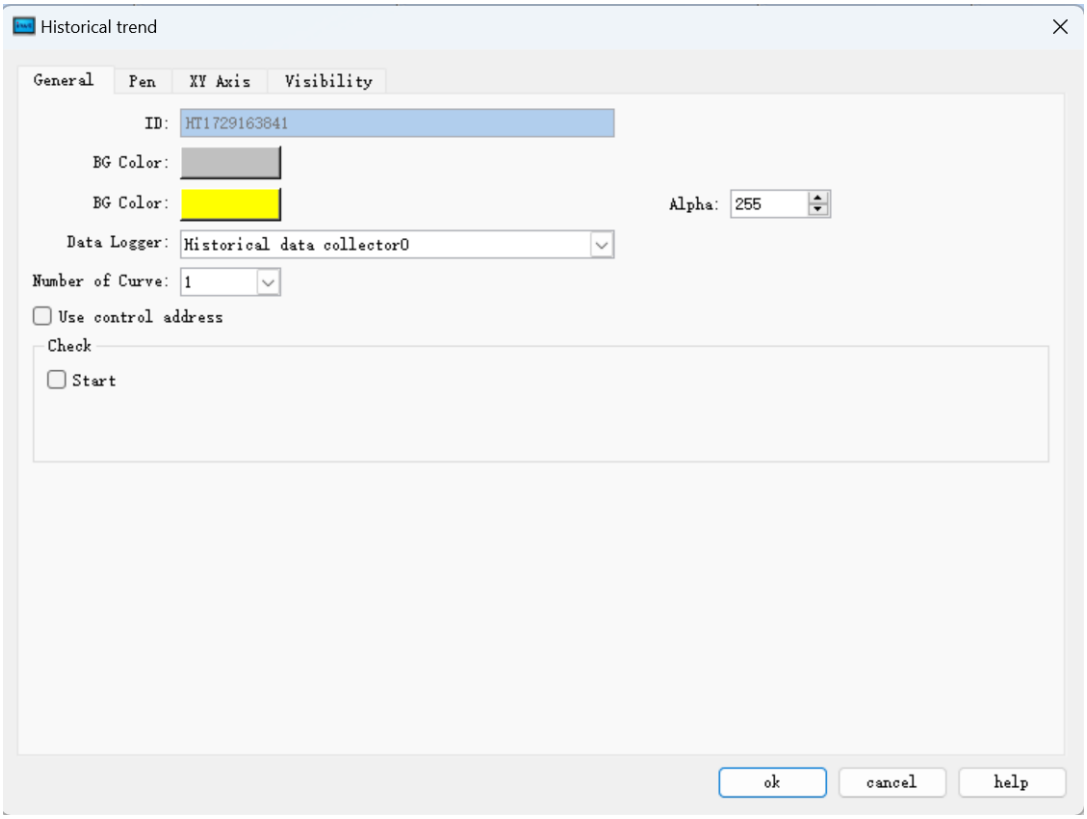


Check the data to be displayed; click "OK" button to complete; then a table appears on the screen, as shown below:

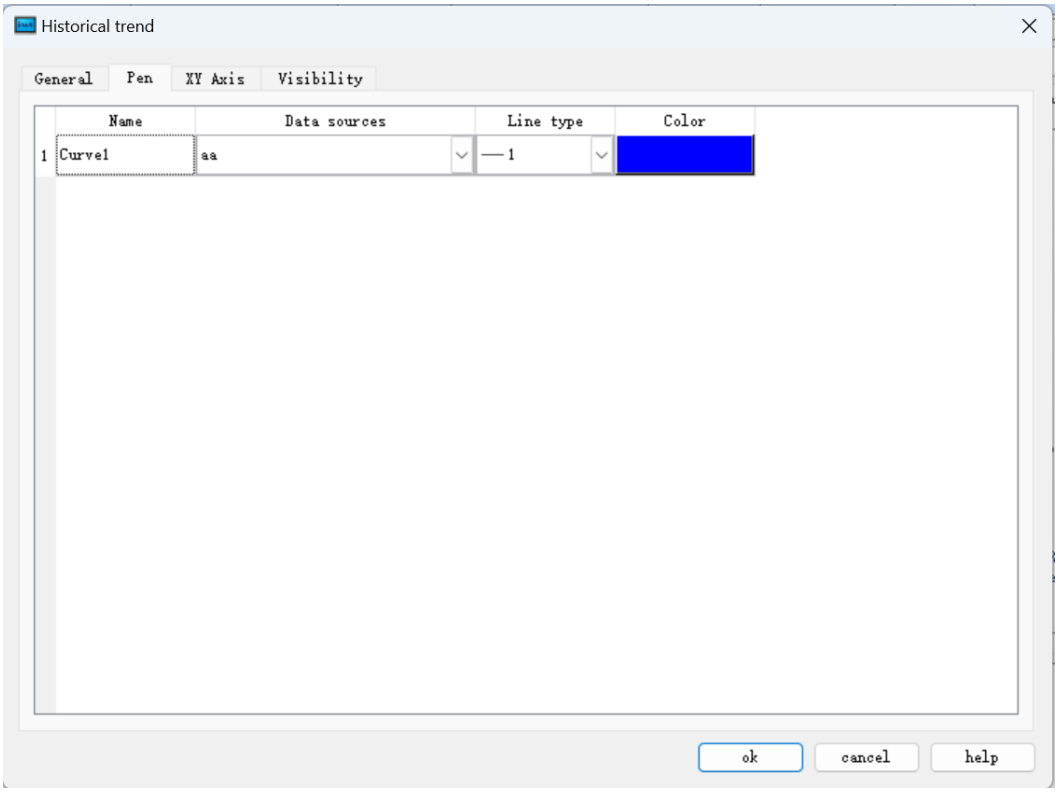
Time	Date	Data1	Data2	Data3	Data4	Data5
19:14	17/10/24					

Employ "Historical trend chart" to display the value change if it is needed.

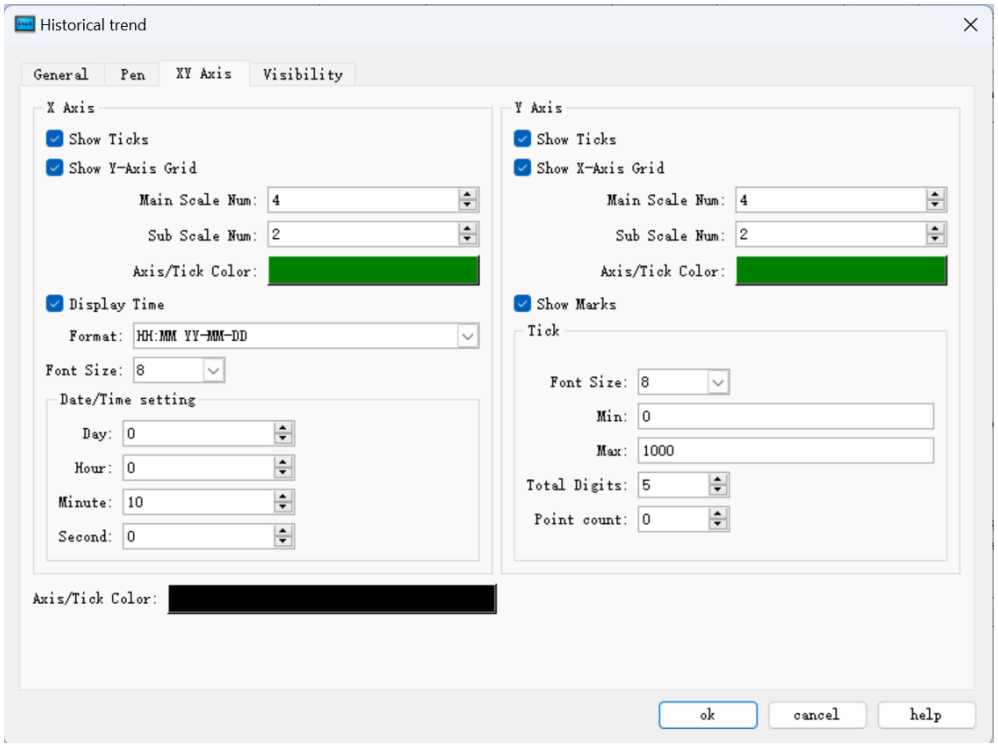
4. Open historical trend chart, as shown below



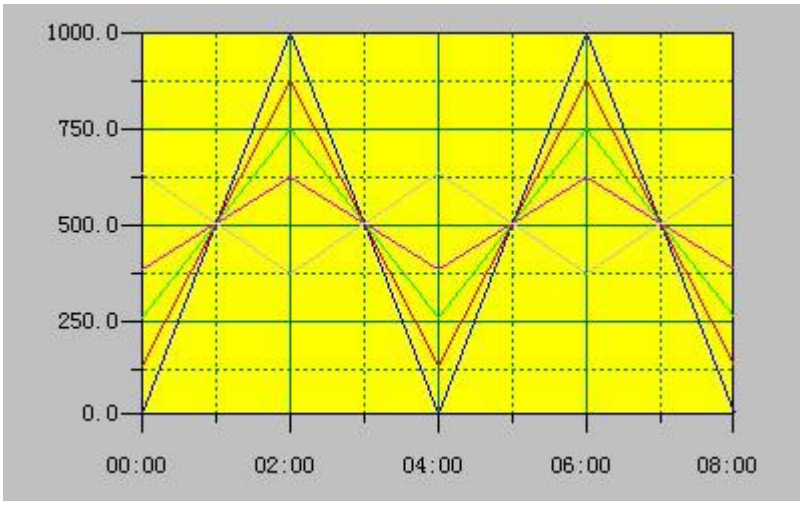
It needs to select the number of line to be displayed and its data source as well as color.



Set the maximum value and time at XY axis.



Click "OK" button to complete; draw the trend chart as shown below:

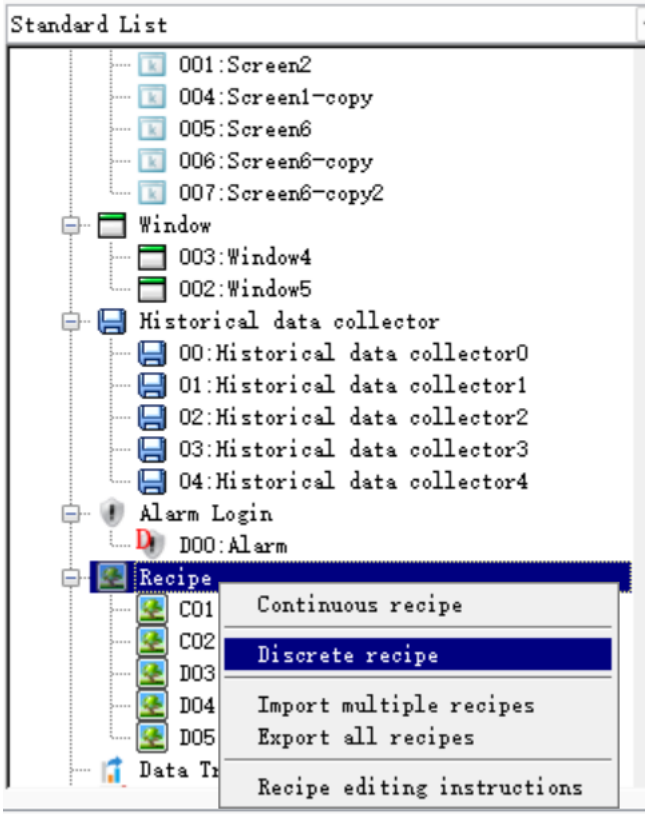


14.4 Recipe case

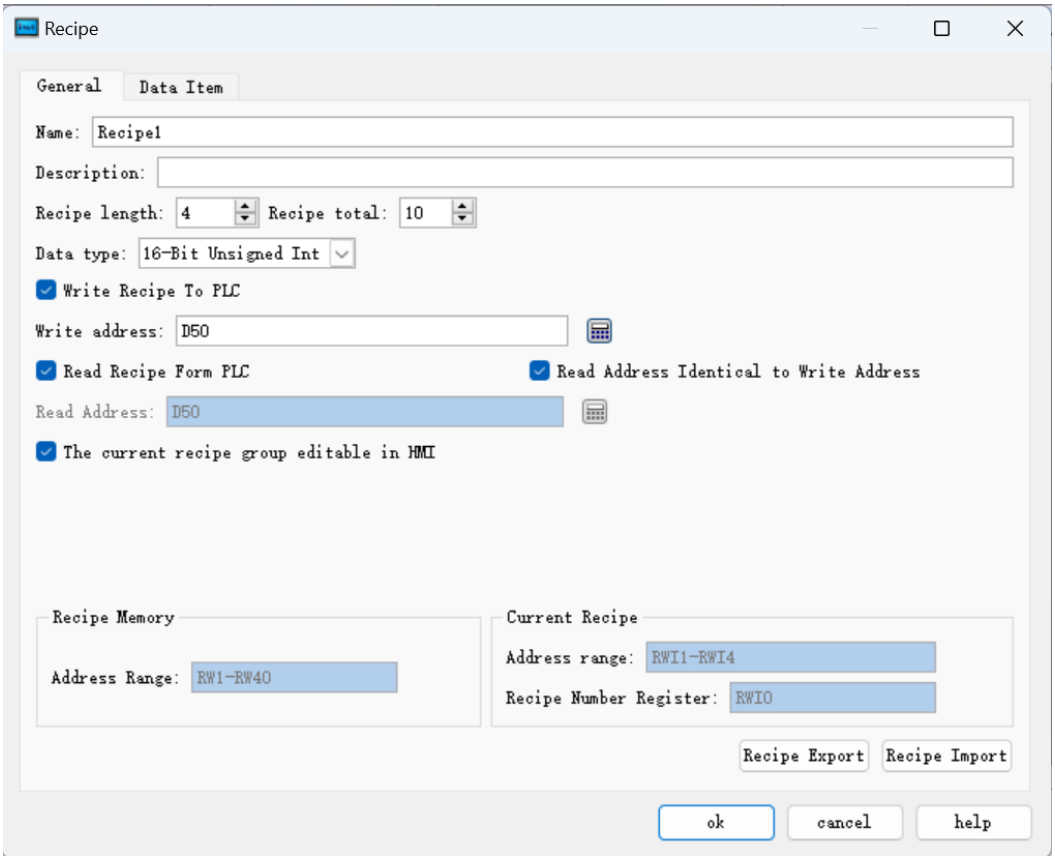
The following example shows the settings and display mode of recipe.

1. Create a new recipe

In the project manager, right click on the recipe, as shown in figure below:

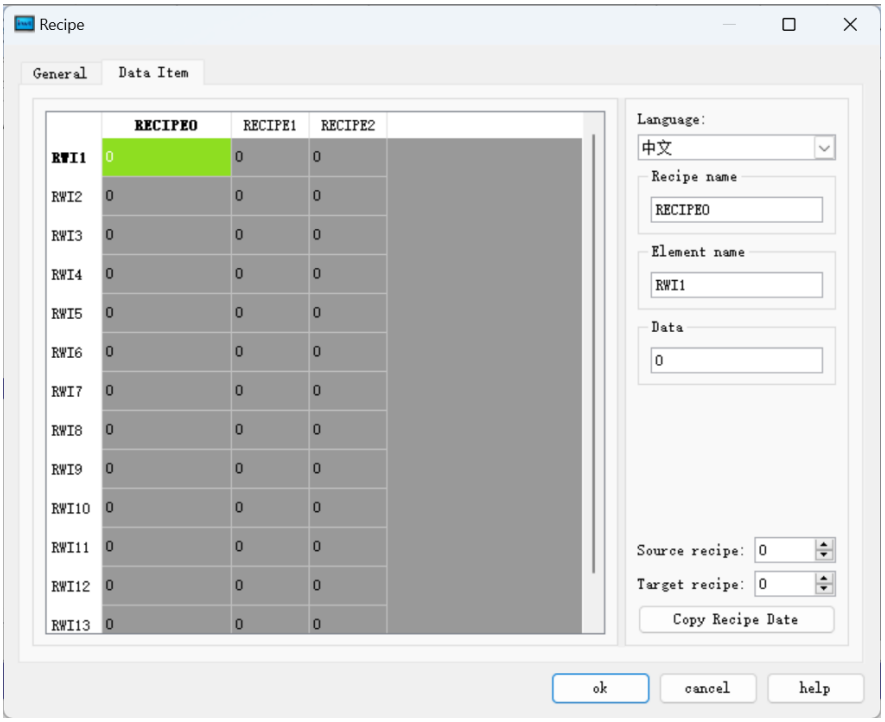


Double click to open the recipe, as shown in figure below:



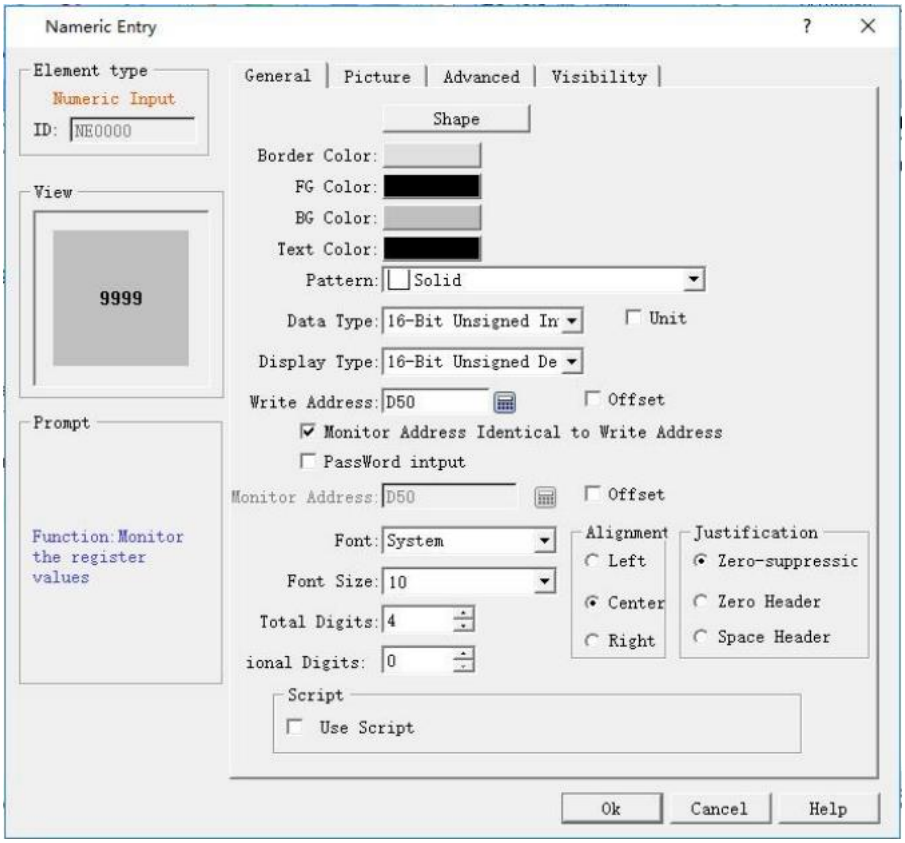
Set the recipe length to 4, which means each recipe contains 4 data. The total number is 10, that is, 10 recipes. Set the address for writing recipe to PLC to D50, and select the 16-bit positive integer; write the recipe to the register D50, D51, D52 and D53. Settings are the same as that of the write address.

2. Data item setting of recipe:



After setting the recipe name, select "OK" to complete. Employ Numeric Input and Display control to display recipe data on the HMI. Select the internal memory address RWI0 for the numerical display and input control; serial number of recipe is the value of input and display. The value of RWI0 stands for the serial number of

recipe; value of 2 means serial number of recipe 2, and so on. Employ the Numeric Input and Display control to display data from D50 to D53. You can execute functions of "Function button" for saving or reading a recipe. For details, refer to "Function button".



Set up the Numerical input and display control and place it on the screen:

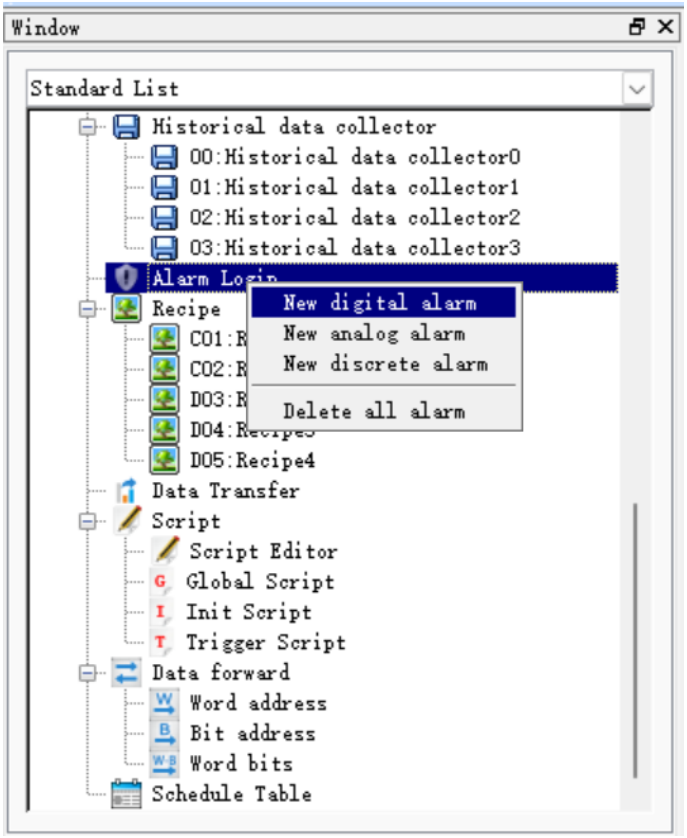
albumen	water	cream	sugar	milk
88.88	88.88	88.88	88.88	88.88

It can change recipe parameters via Numerical input and display; realize functions of checking recipe, reading recipe and writing recipe through function buttons.

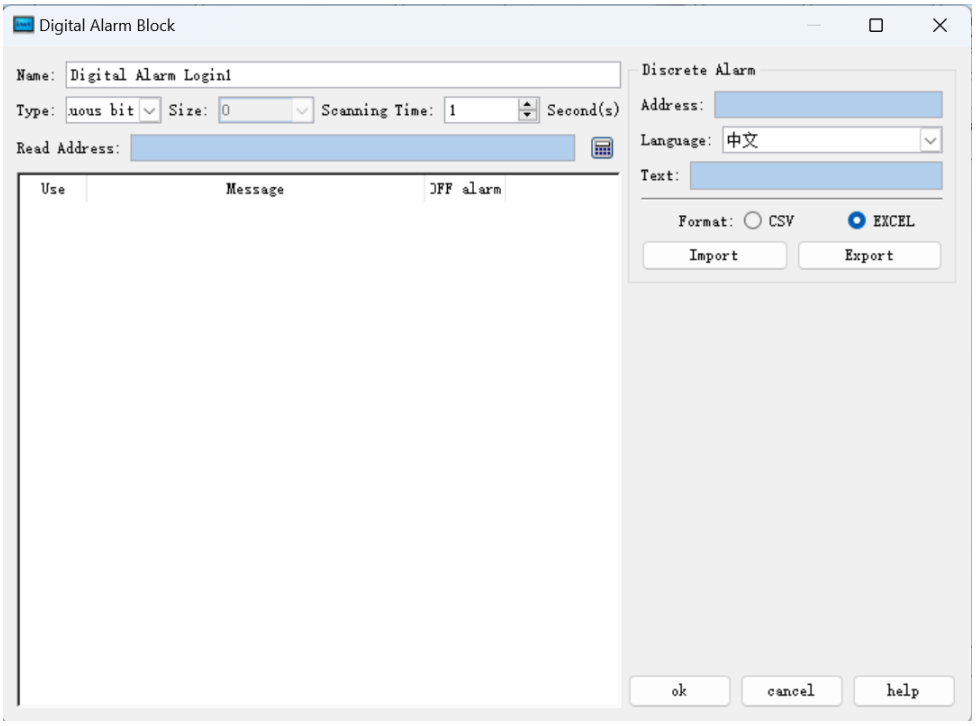
14.5 Digital alarm login

Alarm Setting is employed to display alarm information, only with which the alarm control and alarm bar run normally (in fact, the alarm control and alarm bar displays the alarm message of "digital alarm login" and "analog alarm login").

Right click the "Alarm landing" in the Project Manager and select "New digital alarm", as shown in figure below:



Double click the "digital alarm login" option to open the digital alarm settings dialog box, as shown in figure below:



Steps to build a digital alarm log are as follows:

1. Enter the read address first; it is assumed here that the internal address LB1 is set.

2. In the "Size" column, select the total number of alarms, i.e. the total number of bit addresses, which is continuous. It is assumed here that the set value is six.

3. Set the bit alarm "Scanning time", that is, the scanning frequency.

4. Click an item in the list box, and then move the mouse to the right of the "Message" module; input text information in the "Text" edit box serving as the alarm content. Here assume that the alarm messages are as shown in figure below.

If "Use" is selected, the alarm information will be displayed in "Alarm Control" or "Alarm Bar". Otherwise the alarm message will not appear even if the corresponding address is 1. If the address value of this item is 0, the alarm information does not show.

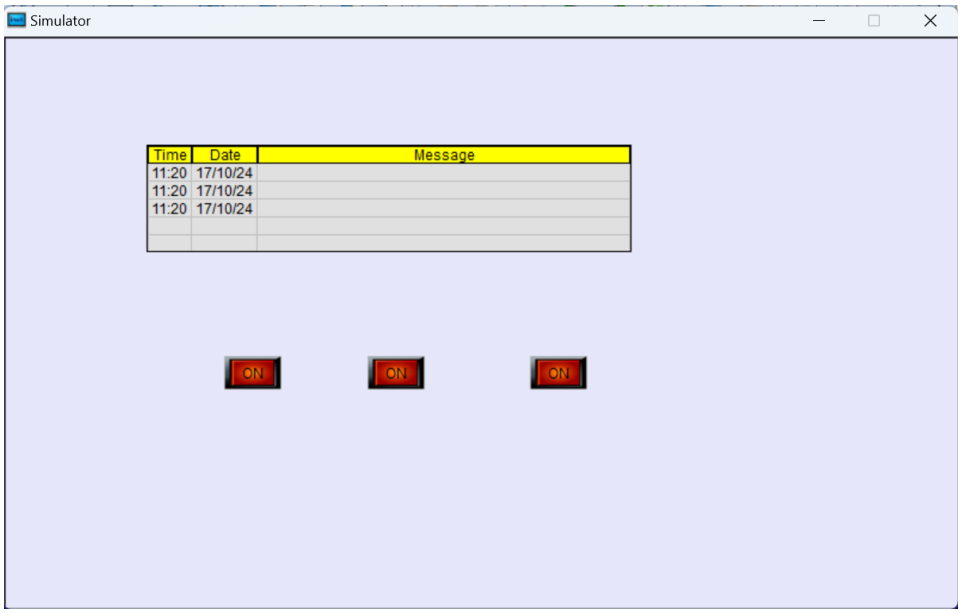
OFF Alarm: When this option is selected, the alarm will be generated when the corresponding address value is 0 (OFF value). Otherwise, an alarm will be generated when the address value is 1 (ON value). By default, an alarm occurs when the address value is 1 (ON).

Here is an example: Suppose the choice of type is "Continuous bit".

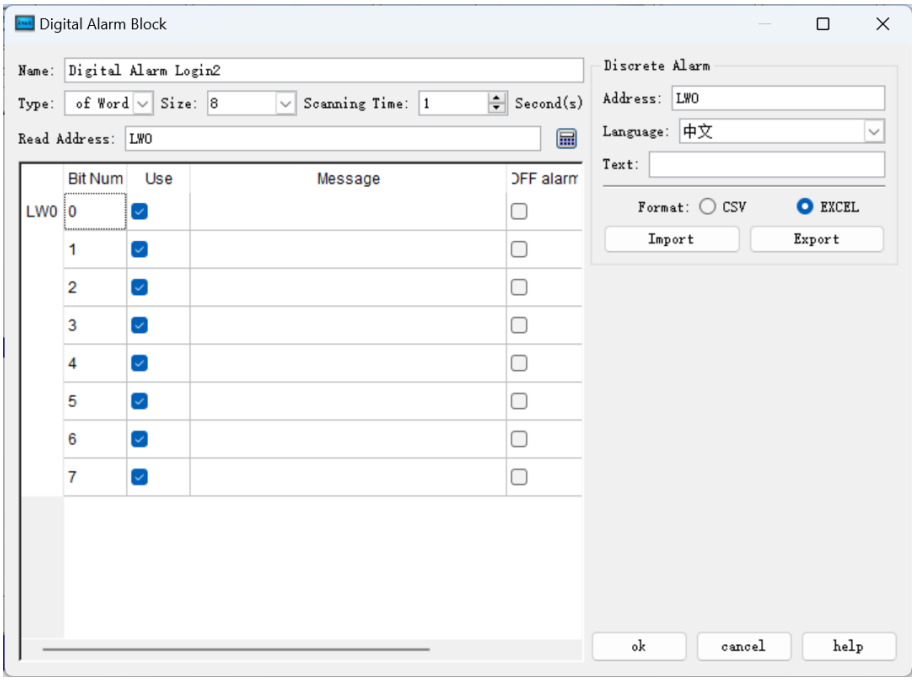
- If the value of LB1 address is 0, the alarm information will not be displayed in "Alarm Control" and "Alarm Bar", regardless of whether the "Use" option is selected or not.
- If the value of the LB1 address is 1 and the "Use" option is not selected, the alarm information is not displayed in the "Alarm Control" and "Alarm Bar".
- If the value of LB1 is 1 and the "Use" option is selected, the alarm information will be displayed in "Alarm Control" and "Alarm Bar".

5. Click "OK" to complete digital alarm settings. Users can add 6 bit buttons with the function of Alternation whose address is LB1-LB6; place controls of "Alarm" and "Alarm Bar" on the screen; then execute offline simulation to check whether it displays alarm information.

The following is an example of offline simulation as shown in figure below:



When "Continuous Bit of Word" is selected as the Type, as shown in figure below:



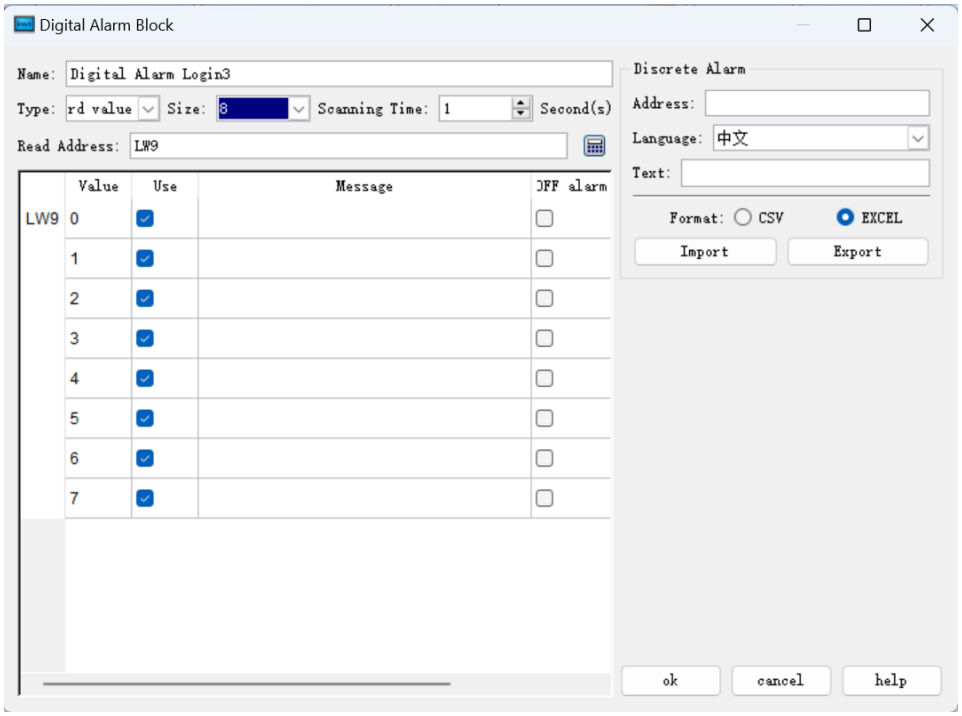
If the "Use" of a certain bit number is selected, an alarm will be generated when the value of this bit is 1.

- Export: export alarm settings information
- Import: import alarm settings information

Note:

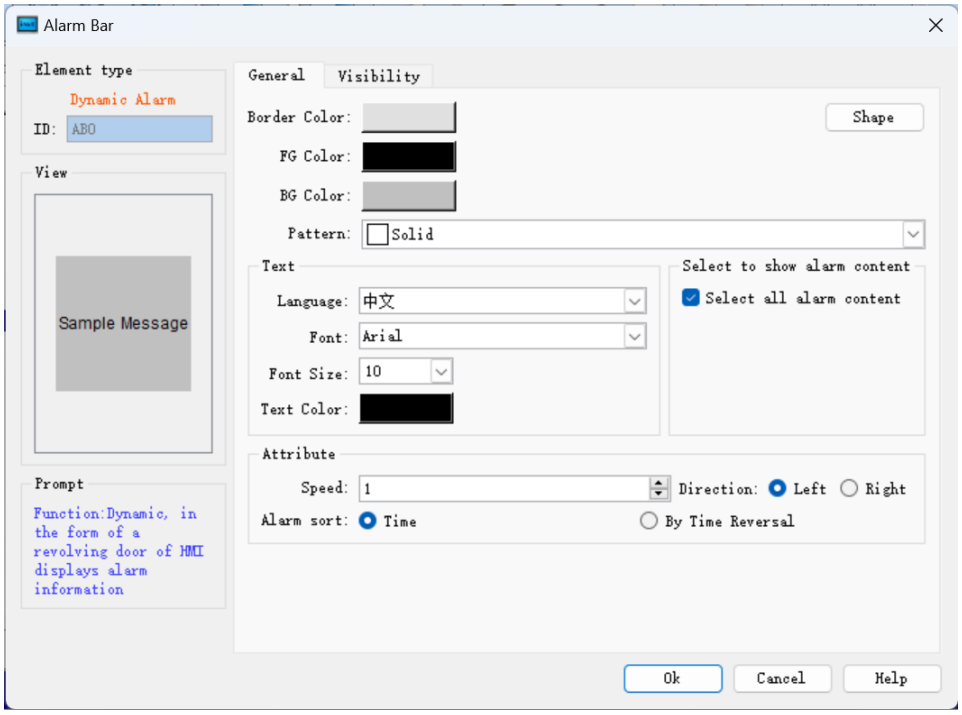
When copying the contents of alarm messages from other documents to the alarm text of digital alarm log and analog alarm log, please make sure that there is no line break (invisible) in the message. It is recommended to input the message manually rather than copy and paste, in case of display error of alarm message.

If "Word value" is selected for the type, as shown in figure below:



When a value of the address is selected, the alarm is generated when the value of the address is equal to the value selected in the list.

Place an alarm control with 7 lines as the example and a dynamic alarm bar whose attributes are set as shown in figure below:



Add lastly six bit buttons whose write address is LB1-LB6 with the "Alternation", "Monitor" and "Monitor Address identical to Write Address" functions set for each. After the settings, click the "Save" button on the toolbar to save the project, execute the "Offline" command in the "Download" item in the menu bar, and then click the bit buttons LB1, LB2, LB4 and LB6. In this case, the Alarm control and Dynamic Alarm Bar will display the alarm information of LB1, LB2, LB4, and LB6 in the "Digital Alarm" When click them again, "Alarm Control" and "Dynamic Alarm Bar" will display nothing since their values are 0 because of the alternation function.

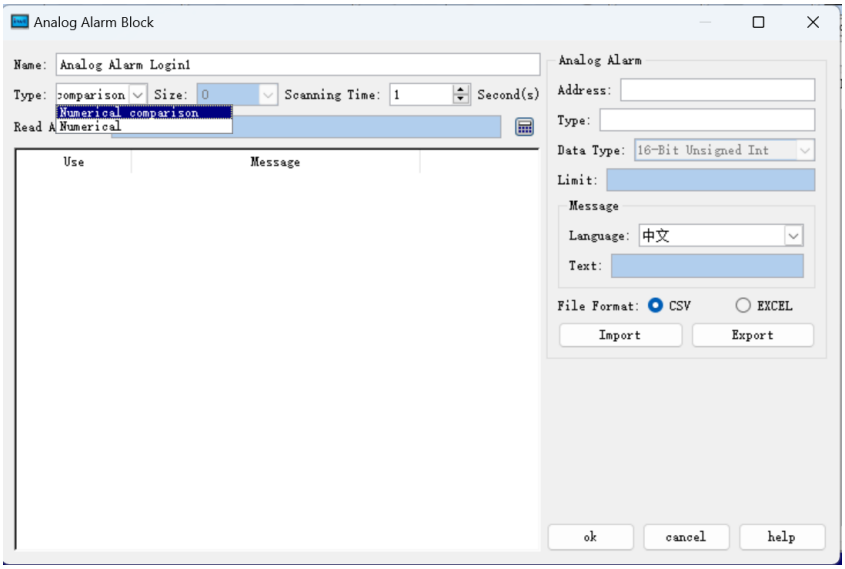
Note:

- Different alarm information is available for corresponding language through the function of switching language.
- Number of digital alarm is up to 10 for VS-Q series HMI.

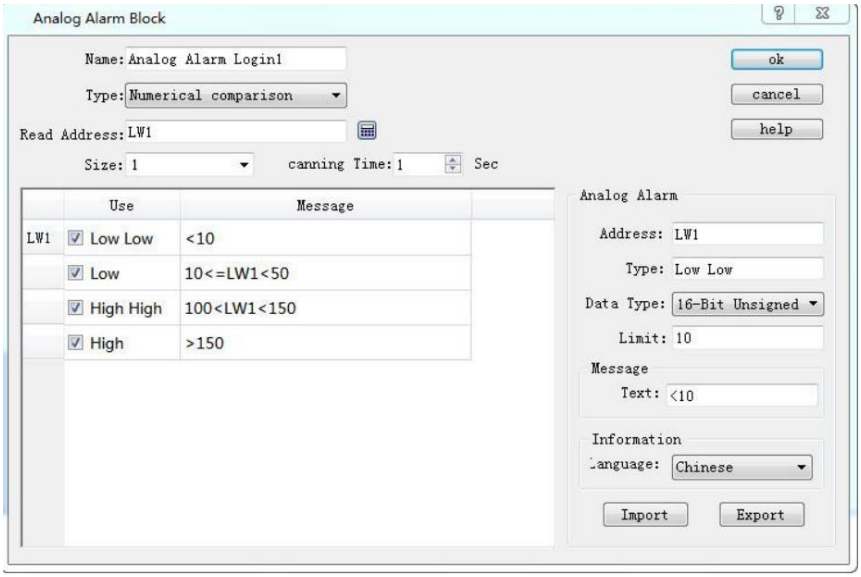
14.6 Analog alarm login

Open the analog alarm settings dialog box, as shown in figure below:

It has two types: Numerical value and Numerical comparison.



The numerical comparison alarm is as shown below:



If user needs to use the analog alarm, steps are as follows:

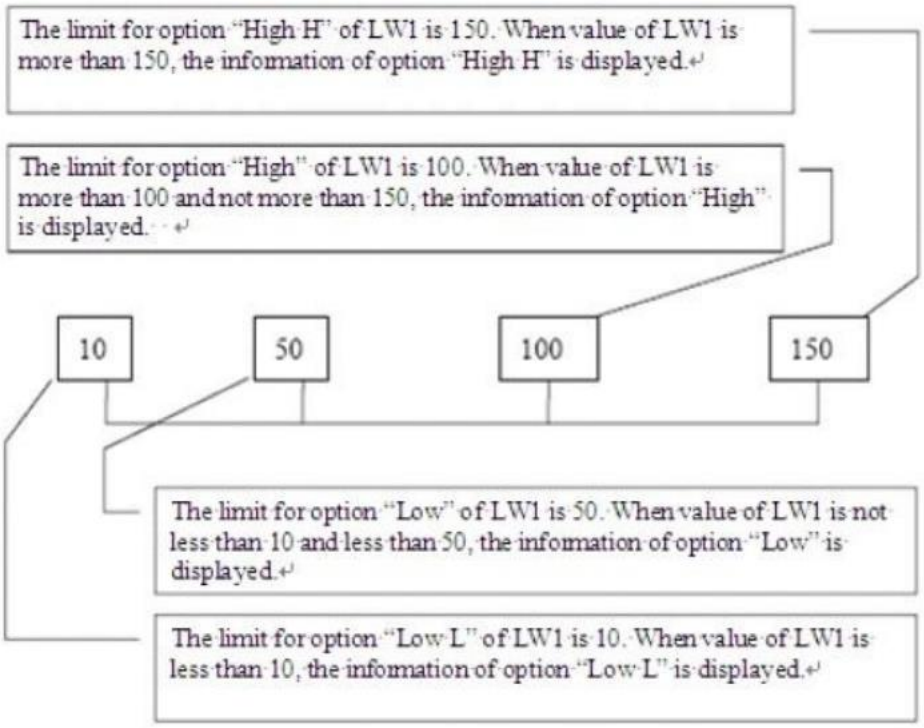
First input the address in the "Read Address" column to alarm. It is assumed here that the internal address LW1 is set.

Select the total number of alarms in the "Size" option, which means the total number of addresses; data type decides the way to read address. Each address value is set firstly as the 16-bit data type and it is continuous. But the data type can be changed. As shown in Figure above, the LW1 address chooses a 32-bit positive integer while LW3 and LW4 values are 16-bit positive integers. Therefore, when 32-bit data is selected for an address, the later address value to be read is added by 2 on the basis of the former address value; and if the 16-bit data type is selected, the later address value to be read is the former value plus 1.

Users can set the "Scanning time" of the alarm, which means the scanning frequency.

Click each item to input a value in the "Limit" box on the right; then enter the text information (alarm content) in the "Text" box. Here assume that the message is as shown in figure above: each address value can be classified into one of four ranges-- Low, Low Low, High, High High.

As shown in figure below:

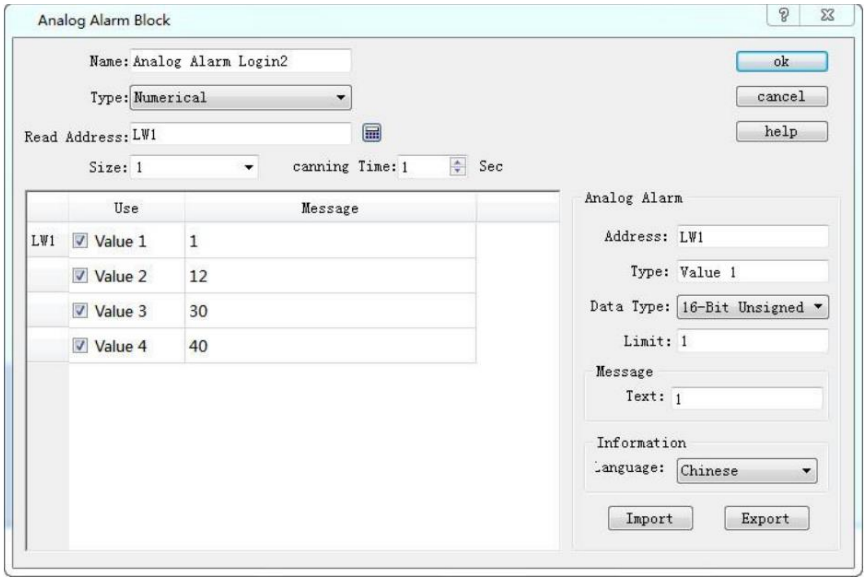


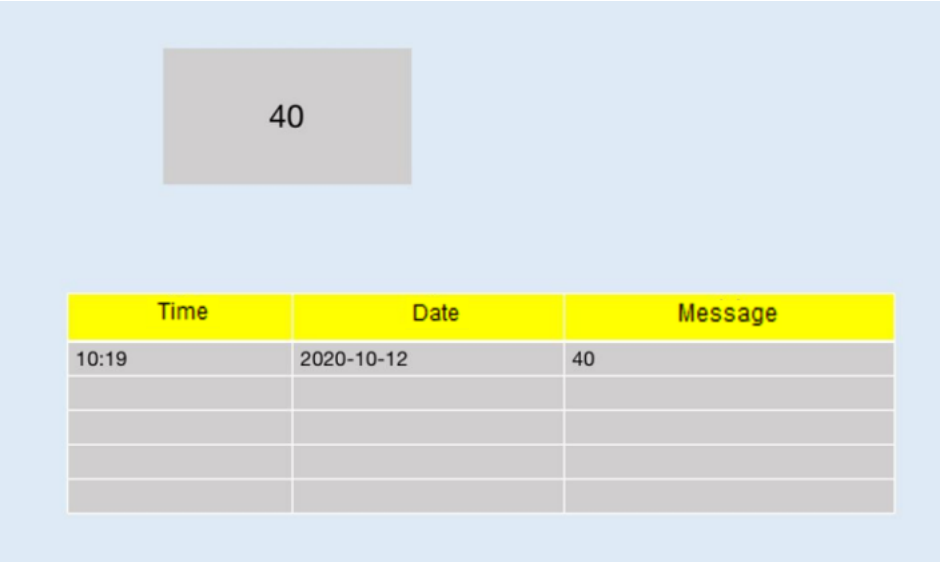
- Low Low: When the value of this item is less than the limit of this setting and the "Use" option is selected, the alarm information of this item will be displayed in "Alarm Control" or "Dynamic Alarm Bar";
- Low: When the value of this item is no less than the "Low Low" limit while less than the "Low" limit and the "Use" option is selected, the alarm information of this item will be displayed in "Alarm Control" or "Dynamic Alarm Bar";
- High: When the value of this item is greater than the "High" limit while no greater than the "High High" limit and the "Use" option is selected, the alarm information of this item will be displayed in "Alarm Control" or "Dynamic Alarm Bar".
- High High: When the value of this item is greater than the limit of this setting and the "Use" option is selected, the alarm information of this item is displayed in "Alarm Control" or "Dynamic Alarm Bar".
- Export: export alarm settings information
- Import: import alarm settings information

Refer to "Digital Alarm Login" for the application of "Use".

Numerical value alarm means an alarm occurs when the value reaches the set limit value.

The settings are as follows: Alarm is triggered when the alarm value reaches 1, 12, 30 and 40.

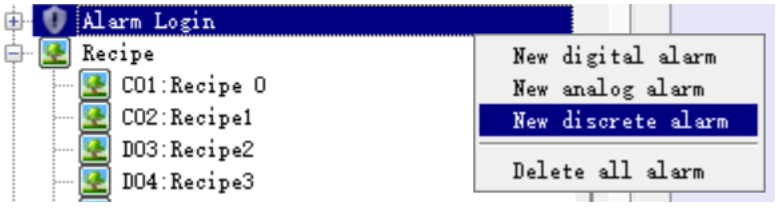




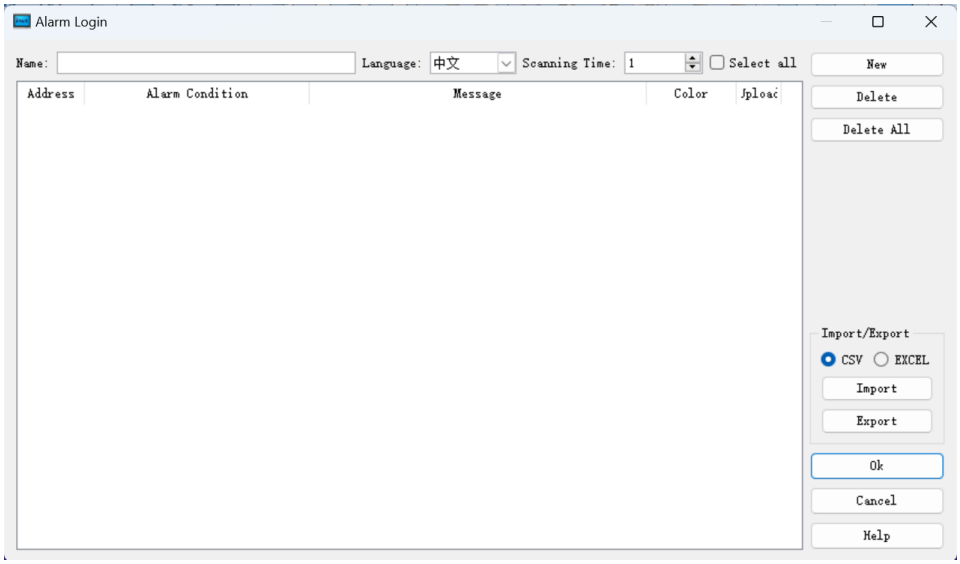
Note: Number of analog alarm is up to 10 for VS-Q series HMI.

14.7 Discrete alarm login

1. New Discrete Alarm Login

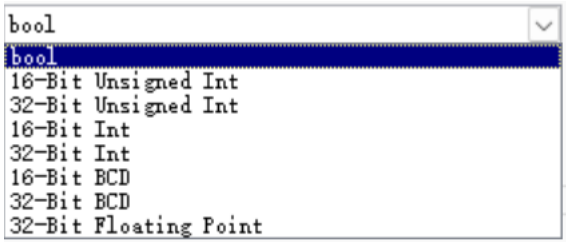


2. In the expansion of the alarm login options, double-click the "new discrete alarm login" option, you can open the discrete alarm settings dialog box

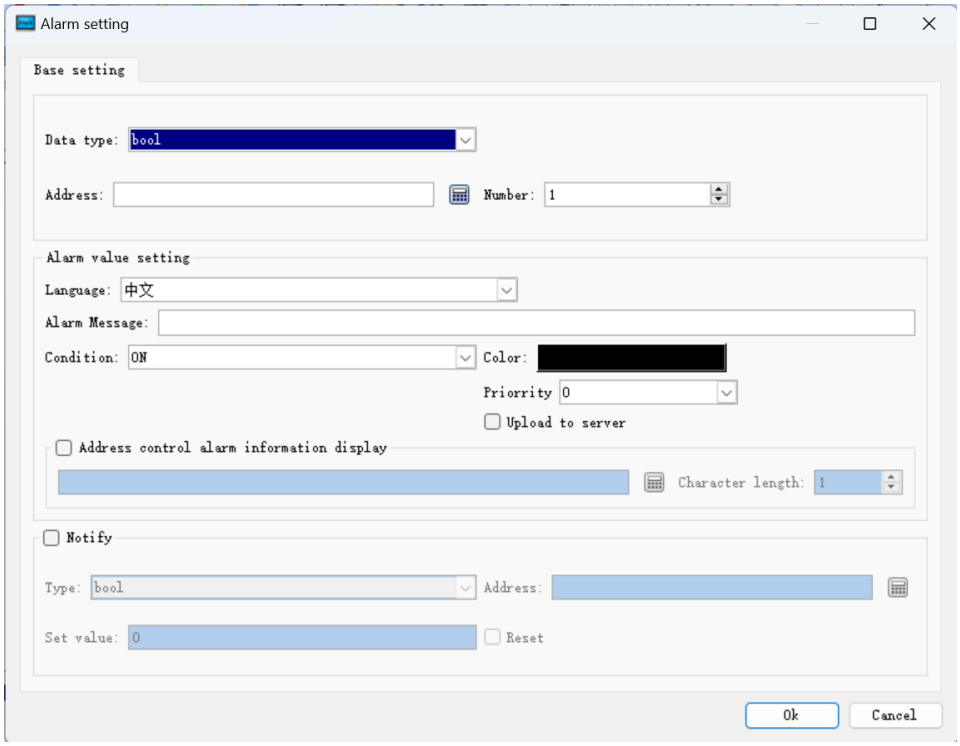


- New: a new alarm content
- Delete: delete an alarm content
- Delete all: delete all alerts
- Export: set up a good alarm content
- Import: import and set up the alarm content

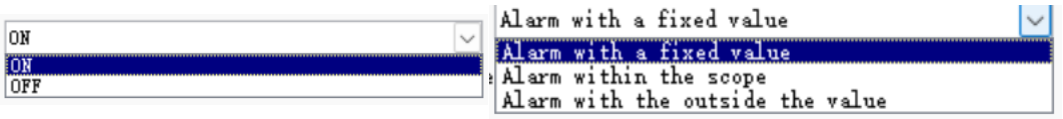
3. A new alarm content, data categories can be freely selected



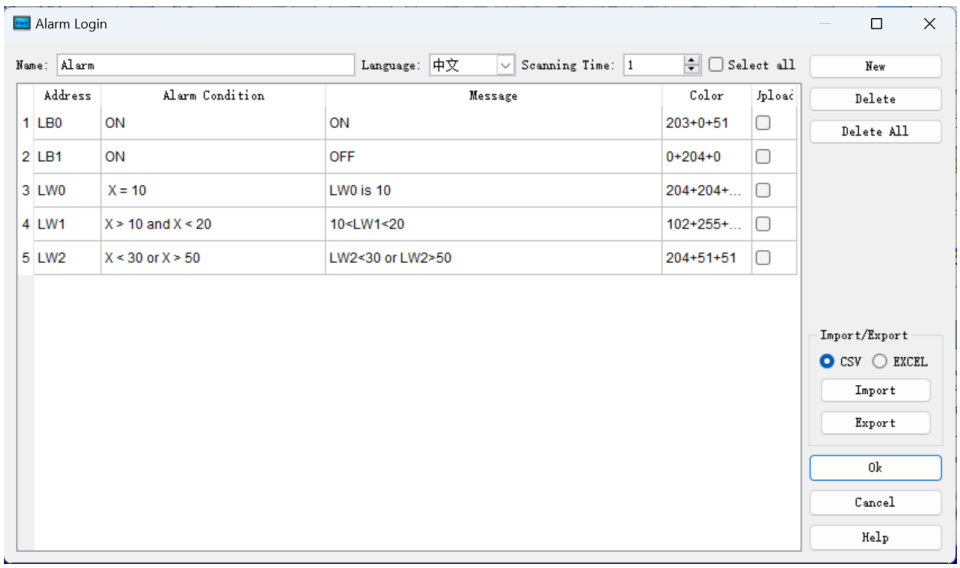
4. New alarm setting screen:



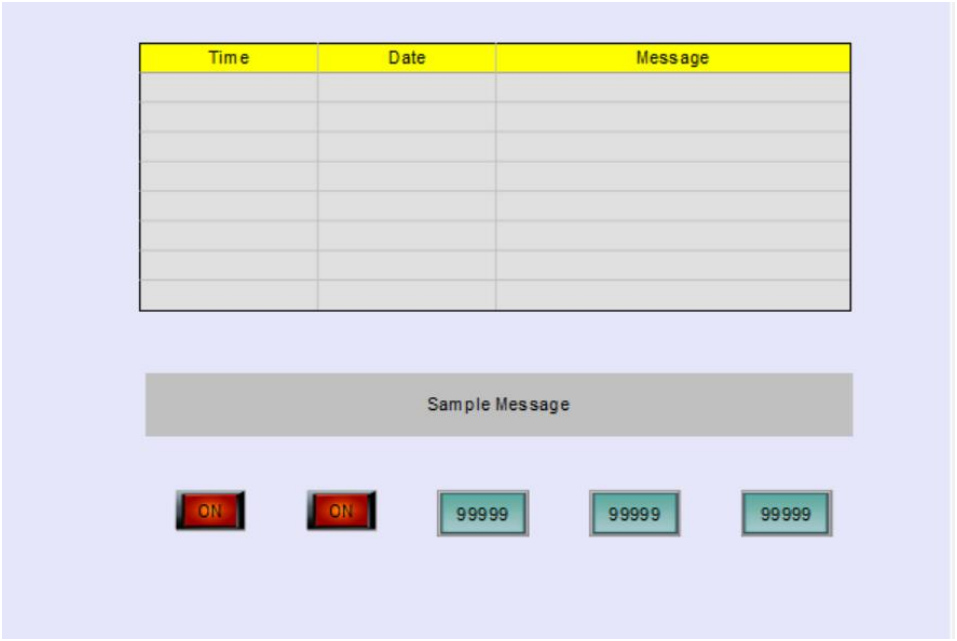
- Data categories: according to the need to choose the appropriate data categories to determine the alarm conditions
- Address: set the address that needs to be monitored and alarm
- The number of consecutive: according to the need to set whether the need for continuous N address monitoring
- Alarm information: the alarm information displayed when the address value is set to alarm condition
- Alarm condition: set the alarm condition of the address value, and the alarm condition is shown below:



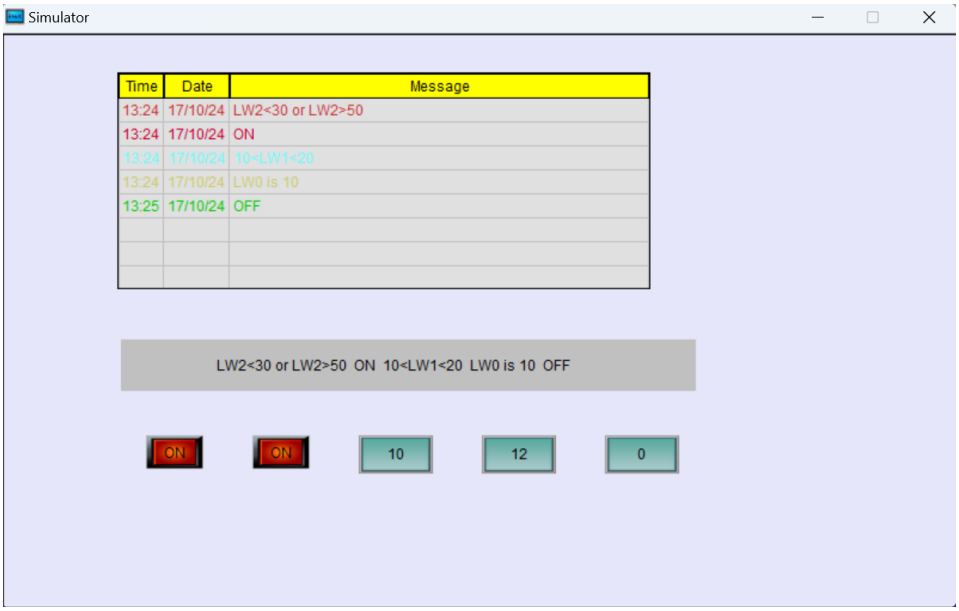
  - ✧ L bit ON alarm: when the data category is bool, the address is ON trigger alarm
  - ✧ L bit OFF alarm: when the data category is bool, the address is OFF trigger alarm
  - ✧ L fixed value alarm: when the address value is set value, the alarm is triggered
  - ✧ L range alarm: when the address value is within the set range to trigger alarm
  - ✧ L out of range alarm: when the address value is not within the set range, the alarm is triggered
- Alarm color: set the address value to trigger the alarm is the color of the alarm information



- Edit the configuration and add the appropriate controls.



- Perform a test and the following figure appears:



Note: Analog alarm number: at present, VS-Q Series HMI can only set up 5 analog alarm.

15 FAQs & solutions

Category	Phenomenon		Reason Analysis	Solution
Display	Black Screen	Black screen once powered on	Power problems	Check the power supply connection; Check the power type; change the type if it is not independent 24VDC (±20%).
			There is something wrong with the configuration project, such as wrong application of macro, including applying null pointer, wild pointer, off-normal array, and divisor of 0.	Use SKSys.bin file placed in not more than 32G FAT32 format of the root directory of the U disk, and then the HMI power off and restart to clear the program, and then download a simple project test, such as the configuration of the program macros are not used properly, you should modify the program, the use of the correct macro instruction programming.
			Main engine trouble: Flat cable corrosion of LCD, crystal oscillator problem, etc.	Contact to the after-sale service for depot repair.
		Sudden black screen during normal operation; or sometimes black screen, crash	Power problem	Check whether the power wire and the power are fine.
			Main engine trouble	Contact to the after-sale service for depot repair.
	Lines on the screen, vertical or horizontal line		LCD failure	Contact to the after-sale service for depot repair if each screen has the line phenomenon.

Category	Phenomenon		Reason Analysis	Solution
Touch	Slow touch response and difficulty to touch controls		Installation problem	1. Check whether the open whole is so small that it squeezes HMI and if so install it according to right hole size; 2. Check whether setscrews are too tight and ensure the stress of four corners as consistent as possible.
			Improper configuration project	Too much configuration project message, background macros and over range screen variables and controls; modify the configuration program, add or reduce controls and screens reasonably.
	Touch failure		Coordinate adjustment or touch panel damage	Dial the dial switch on 1 to execute coordinate adjustment; Contact to the after-sale service for depot repair if the former doesn't work.
	Jump wire (In Keyboard, press A but display X or others)		Touch panel failure	Contact to the after-sale service for depot repair.
Communication failure	Communication outage between HMI and controller	Communication is unavailable all the time	Failure of communication devices (PLC, SCM, etc.)	Ensure fine sate of communication port and rematch communication parameters.
			Communication port failure of HMI	Contact to the after-sale service for depot repair.
			Disconnection of communication cable	Employ Specific cable of INVT as far as possible.
		Communication interrupt after a period time of normal operation	Communication wire connection appears corrosion and oxidation due to long-time operation.	Change communication wire or re-weld it.

Category	Phenomenon		Reason Analysis	Solution
			Environment interference	Shied interference source reasonably; employ shielded wire; proper ground connection
			Main engine trouble of HMI (due to strong magnet and current or lightning at scene)	Contact to the after-sale service for depot repair.
	HMI cannot connect PC and downloading is unavailable.		Wrong installation of PC USB driver	Select corresponding system driver and reinstall USB driver.
			Size and model of HMI are inconsistent with the actual ones.	Modify and match the right model of HMI in configuration software.
			Damage of HMI downloading port	Contact to the after-sale service for depot repair. (check method: Connect another HMI with the same USB cable and PC to see whether downloading is available; if so, fault point locates on the USB communication port of HMI)
Application	Unavailable configuration		Illegal control or macro in configuration	Modify the configuration
	Unsuccessful macro compilation		Installation directory in environmental variables	Bring forward the installation directory of HMITOOL in environmental variables.
	Off-line and On-line simulation cannot function in the meantime.		Run without administrator rights	Run HMITOOL as administrator

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66001-01439

202503 (V1.0)