SKTOOL Help



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1. HMI Specification

Welcome to SKTOOL online help that is meant to help you learn with the application of SKTOOL.

1. Hardware Manual

Introduce hardware structure of Samkoon HMI.

2. Quick Start

   Introduce briefly features of the configuration software of Samkoon SK HMI, SKTOOL.

3. Create a New Project

   Describe methods and steps for creating a project with SKTOOL.

4. SKTOOL Configuration Guide

   Describe applications of other controls in SKTOOL.

5. Macro instruction

   Describe functions and applications of the SKTOOL macro.

6. SKTOOL simulation

   Introduce off-line simulation and online simulation functions of SKTOOL.

7. System settings

   Describe the HMI settings of system parameters for setting HMI on SKTOOL.

8. Reserved Registers of SKTOOL System

   Describe the registers reserved by the HMI system and their functions.

9. Device drivers

   Introduce how to connect SK series HMI (Samkoon) and PLC.

10. Contact information

2. Preface

Thank you for choosing the SK series HMI products of Shenzhen Samkoon Technology Corporation Ltd. HMI is commonly known as the touch screen.

Shenzhen Samkoon Technology Corporation Ltd., concentrated in industrial visual and touchable control products --- research and development of human-machine interface core technology, is a national high-tech enterprise that is professional in developing, manufacturing and distributing the most advanced industrial products. After the accumulation of 12 years, Shenzhen Samkoon Technology, with the profound knowledge, attracts domestic and global related industries via its strong R & D and innovation capabilities, 100% completely independent intellectual property rights of core technology without any system basement as well as cost-effective advantage.

Samkoon SK series human-machine interface (HMI) is mainly applied in the field of industrial control to achieve visual and touchable control with its excellent performance in various industries, such as textile machinery, jigger machinery, plastic and rubber machinery, injection molding machinery, packaging machinery, ultrasonic equipment, electronic welding equipment, printing machinery, food machinery, medical machinery, woodworking machinery, lifting equipment, intelligent buildings, water treatment equipment, power systems, rail transit, cola system, petrochemical system, air conditioning industry, tire industry, measurement and control equipment, teaching instrument, advanced manufacturing system and equipment and other common equipment control industry. Having occupied the leading position in the domestic market, it obtains a common reputation by virtue of its excellent product quality, stable software running and powerful product features.

In view of requirements of various industrial control engineering design and construction, software development staffs of Samkoon are committed to the development and application of universal configuration software. In order to meet the world's vast industrial configuration needs, Samkoon launches “SKTOOL” to the whole China and even the world, a universal version of industrial automation configuration screen editing software.

SKTOOL is a universal industrial automation configuration software meant for the rapid construction and production of embedded computer monitoring system. Based on the development and application experience of configuration software, adopting the advanced computer software technology to construct the graphical interface of the user running system by employing the window as the unit, it provides users with solutions to practical project problems through animation display, alarm processing, process control and report output etc., by collecting and processing filed data. It has a wide range of applications in the field of automation.
In order to satisfy the users’ needs to use SKTOOL, we have written this manual introducing details about system structure and features. Users can create own configuration only through simple operation so as to free users from cumbersome programming, making it handier for more users.

This manual explains how to operate the SK series configuration software SKTOOL. Please read it carefully to ensure correct applications.

When you cannot find a specific control in the help document, you can open the corresponding control in SKTOOL; click the “Help” button in the lower right corner of the control to jump to the corresponding help.

Due to the limited level of the author, errors or inappropriate places are inevitable. Criticism and correction are well welcome. If you need further information about SKTOOL configuration software and more technical support, please contact us through the following ways. Sincerely at your service.

3. Hardware Manual

This chapter summarizes the hardware part of SK series HMI, introduces the hardware dimension of products, including the models of SK-035F, SK-043F, SK-043H, SK-050H, SK-070F, SK-070H,SK-070F, SK-102H, SK-121F. Users can install them according to relevant dimensions. Refer to specific parameters for principle and composition of HMI, technical parameters of operating environment and correct method of wiring.

Contents：

- General
- Mounting dimensions
- HMI Structure
- Technical Parameters
- Wiring

3.1 General

SK Series HMI of Samkoon is a high-quality human machine interface product, integrating entirely CPU unit, input and output unit, display, memory and other module units. It can be widely applied in industrial control systems of all sectors of industry.

With the optimal design via hardware and software, it accords with requirements of machine control for touch precision and accuracy, as well as for screen colors.

On the basis of the previous version, SK Series HMI makes great improvements with a faster boot time, higher page switching speed, higher communication speed, and higher sensitivity than before.

The following is an introduction to the SK HMI:

1. CPU unit
Adopt ARM Cortex_A8 processor ensuring faster operation speed, less power dissipation as well as more stable operating.

2. Touch tablet display unit
Employ a four-wire resistive touch tablet responsible for a better touch precision and a long life of touch. The display is TFT LCD with 2,6 million color TFT.

3. Communication module
Design of anti-jamming, anti-hypertension and anti-lightning enhances the accuracy and reliability of communication. Support for RS232, 485, 422 communication modes.

4. Storage cell
Employ the Flash memory of preservation of digital as ROM; Available for a fast access speed; Capacity of all models reaches to 128M.

5. Power module
Inclusion of high-precision switching and regulated power supply; Low power consumption.

6. Chip
Employ TI AM3352 chip based on the core of ARM Cortex-A8. This chip has the following advantages: Firstly, the chip has the biggest open data in history; Secondly, it has the most clear product positioning: industrial control MCU; Thirdly, it is the only one MCU that integrates 2 MAC.

Models of HMI of Samkoon SK series:

Model	Size (Inch)	Resolution	Color	Memory	Length-width ratio	Number of COM	RJ45	USB-A	USB-B	Micro SD
SK-035FE	3.5	320×240	262144	12M	4:3	1	0	1	0	0
SK-043FE	4.3	480×272	262144	12M	16:9	1	0	1	1	0
SK-043HS	4.3	480×272	262144	12M	16:9	1	1	1	1	0
SK-043HE	4.3	480×272	262144	12M	16:9	1	0	1	1	0
SK-050HS	5.0	480×272	262144	12M	16:9	1	1	1	1	0
SK-050HE	5.0	480×272	262144	12M	16:9	1	0	1	1	0
SK-057FE	5.7	640×480	262144	12M	4:3	2	0	1	1	0

SK-070FS	7.0	800×480	262144	12M	16:9	2	1	1	1	1
SK-070FE	7.0	800×480	262144	12M	16:9	2	0	1	1	0
SK-070HS	7.0	800×480	262144	12M	16:9	2	1	1	1	1
SK-070HE	7.0	800×480	262144	12M	16:9	2	0	1	1	0
SK-102HS	10.2	1024×600	262144	12M	16:9	2	1	1	1	1
SK-102HE	10.2	1024×600	262144	12M	16:9	2	0	1	1	0
SK-104FS	10.4	800×600	262144	12M	4:3	2	1	1	1	1
SK-104FE	10.4	800×600	262144	12M	4:3	2	0	1	1	0
SK-121FS	12.1	800×600	262144	12M	4:3	2	1	1	1	1
SK-121FE	12.1	800×600	262144	12M	4:3	2	0	1	1	0



E.g. SK-035FE：

SK：It represents the SK series，

035：Size (3.5 Inch)，

F：It shows the model, the other is H，

E：It indicates the economical HMI, and S the standard HMI.

HMI of the Samkoon SK, as open HMI products, it provides a standard serial interface that can be connected to other devices. Mainly supporting serial communication, it can communicate with today's major PLC on the market, such as SAMKOON, MITSUBISHI, SIEMENS, OMRON, MODICON, etc.. Meantime we can also develop communication drivers according to customer’s demand.

The configuration software of the SK is SKTOOL providing users with functions of screen configuration, driver settings, and control and so on.

3.2 Mounting dimensions

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

The table below lists mounting dimensions of all SK series products:

Model	SK-035F
	SK-043F/SK-043H
	SK-050H
	SK-057F
	SK-070F/SK-070H

	SK-102H
	SK-104F
	SK-121F

3.2.1 SK-035

Figure 1-1 shows the product dimensions(mm) of SK-035FE

The outline dimension is 135×89×39

The mounting hole size is 123×80

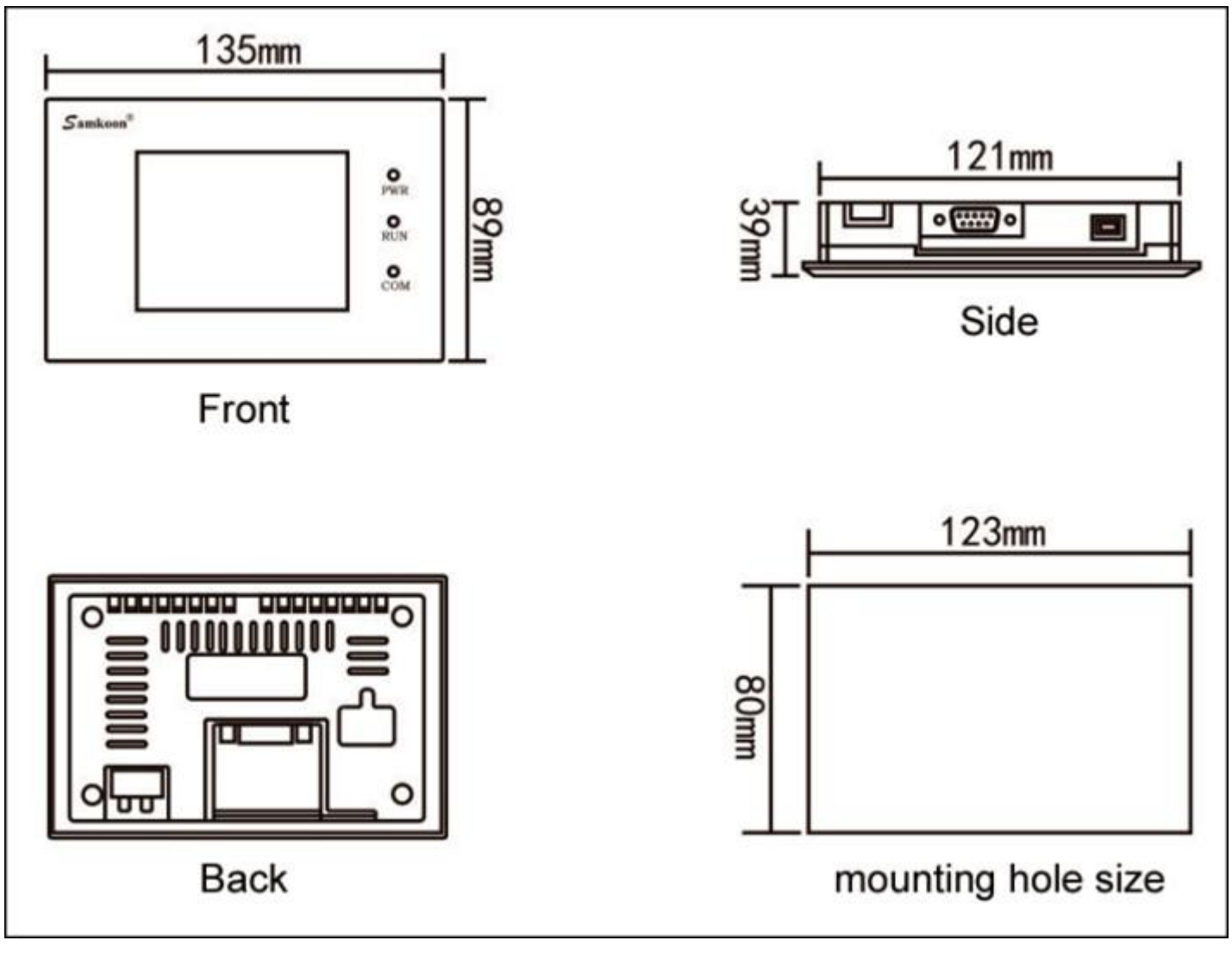


Figure 1-1SK-035FE mounting dimension

3.2.2 SK-043

Figure 1-2 shows the product dimensions(mm) of SK-043FE

The outline dimension is 150×93×39

The mounting hole size is 141×84

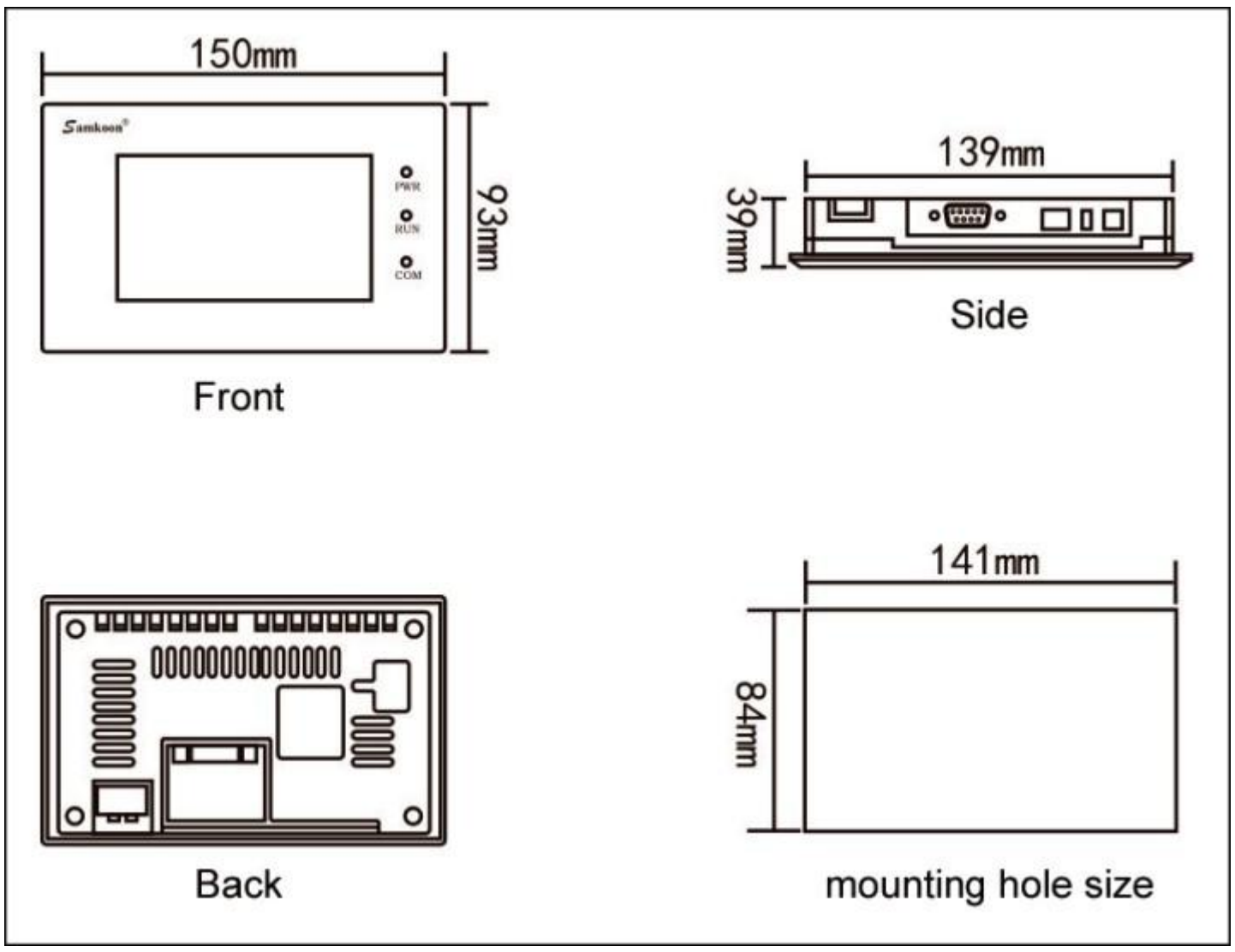


Figure 1-2 SK-043FE mounting dimension

Figure 1-3 shows the product dimensions(mm) of SK-043H

The outline dimension is 173×95×39

The mounting hole size is 163×85

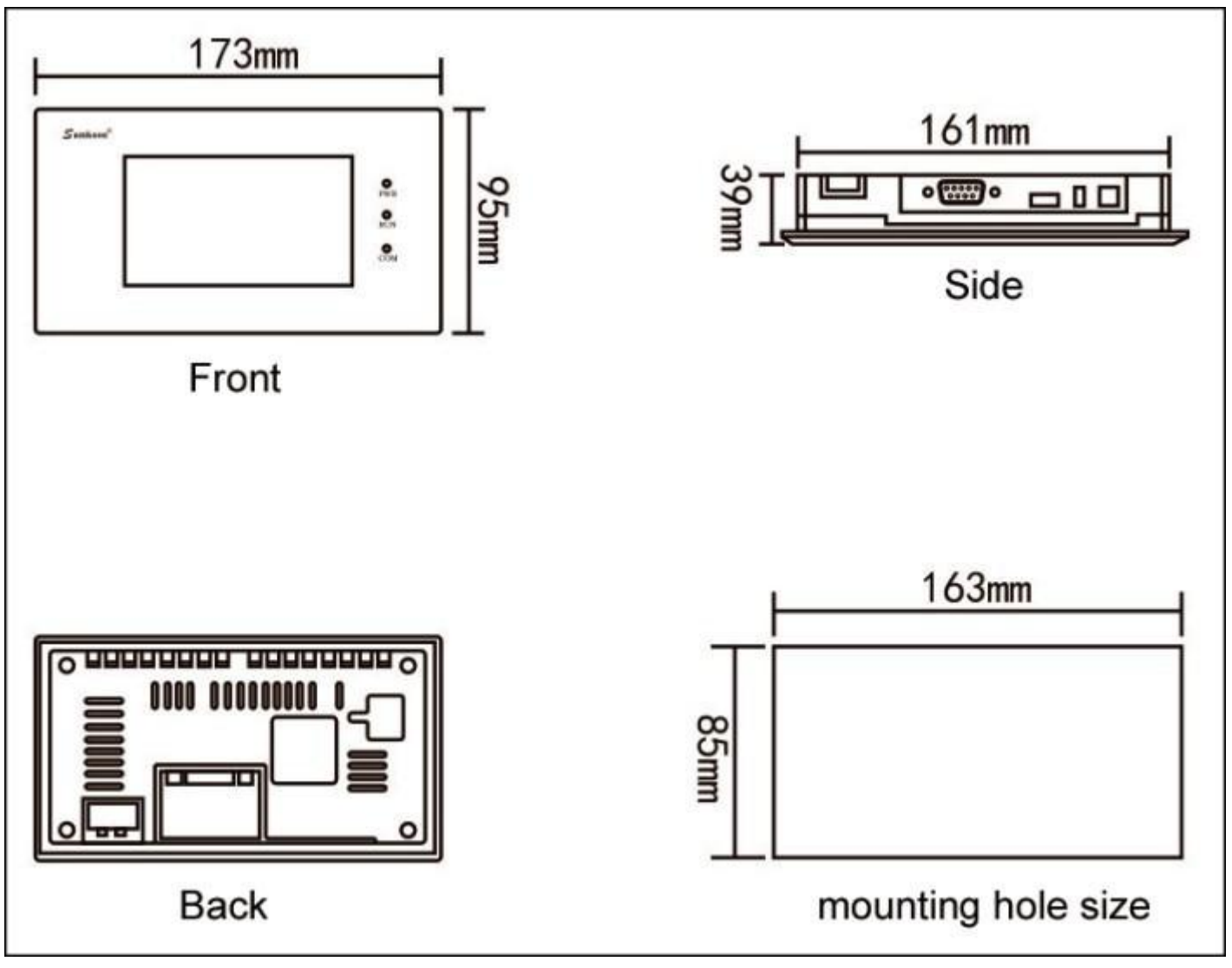


Figure 1-3 SK-043HS/SK-043HE mounting dimension

3.2.3 SK-050

Figure 1-4 shows the product dimensions(mm) of SK-050H

The outline dimension is 165×103×39

The mounting hole size is 157×95

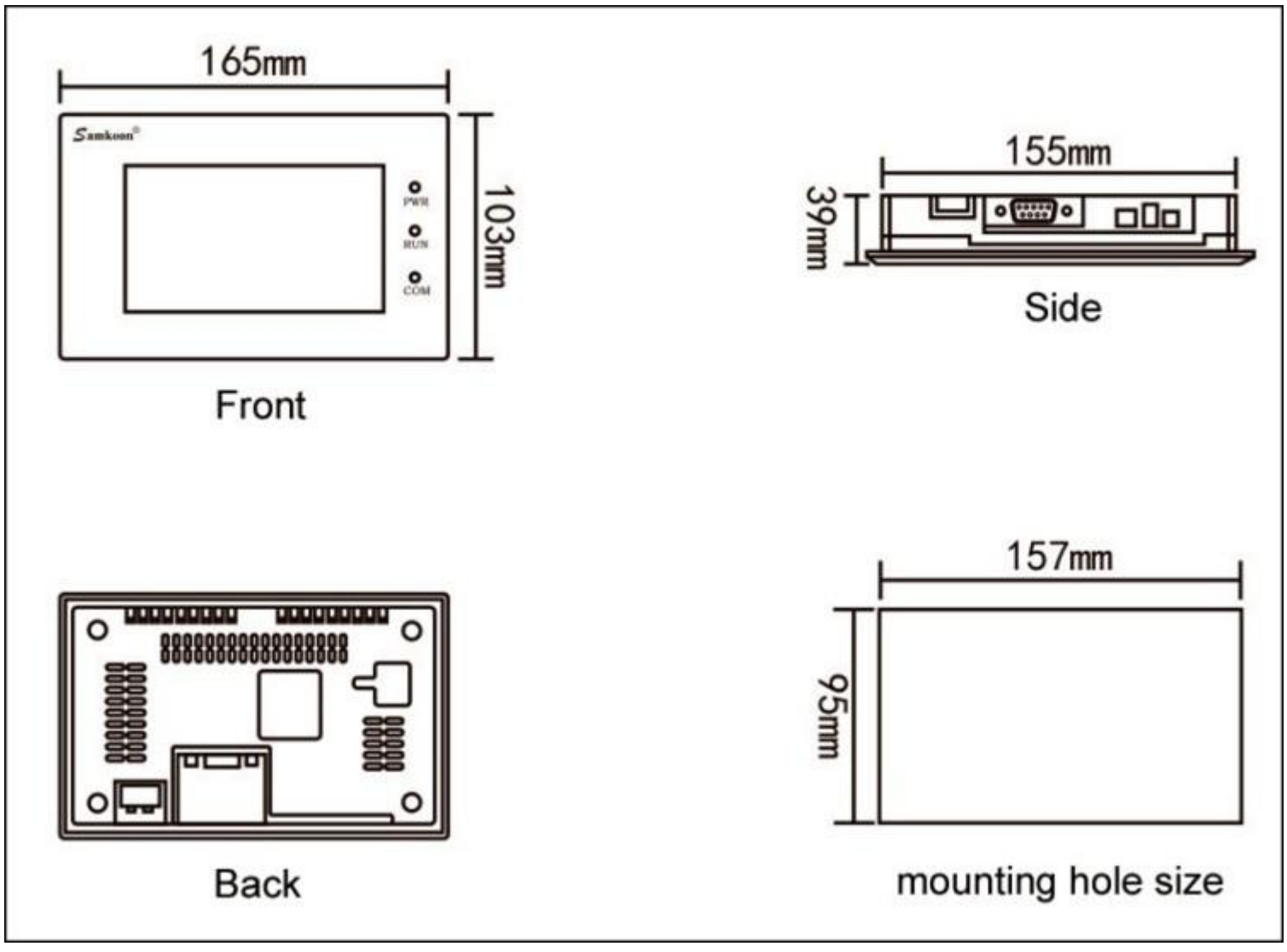


Figure 1-4 SK-050H mounting dimension

3.2.4 SK-057

Figure 1-5 shows the product dimensions(mm) of SK-057FE

The outline dimension is 177×140×40

The mounting hole size is 163×133

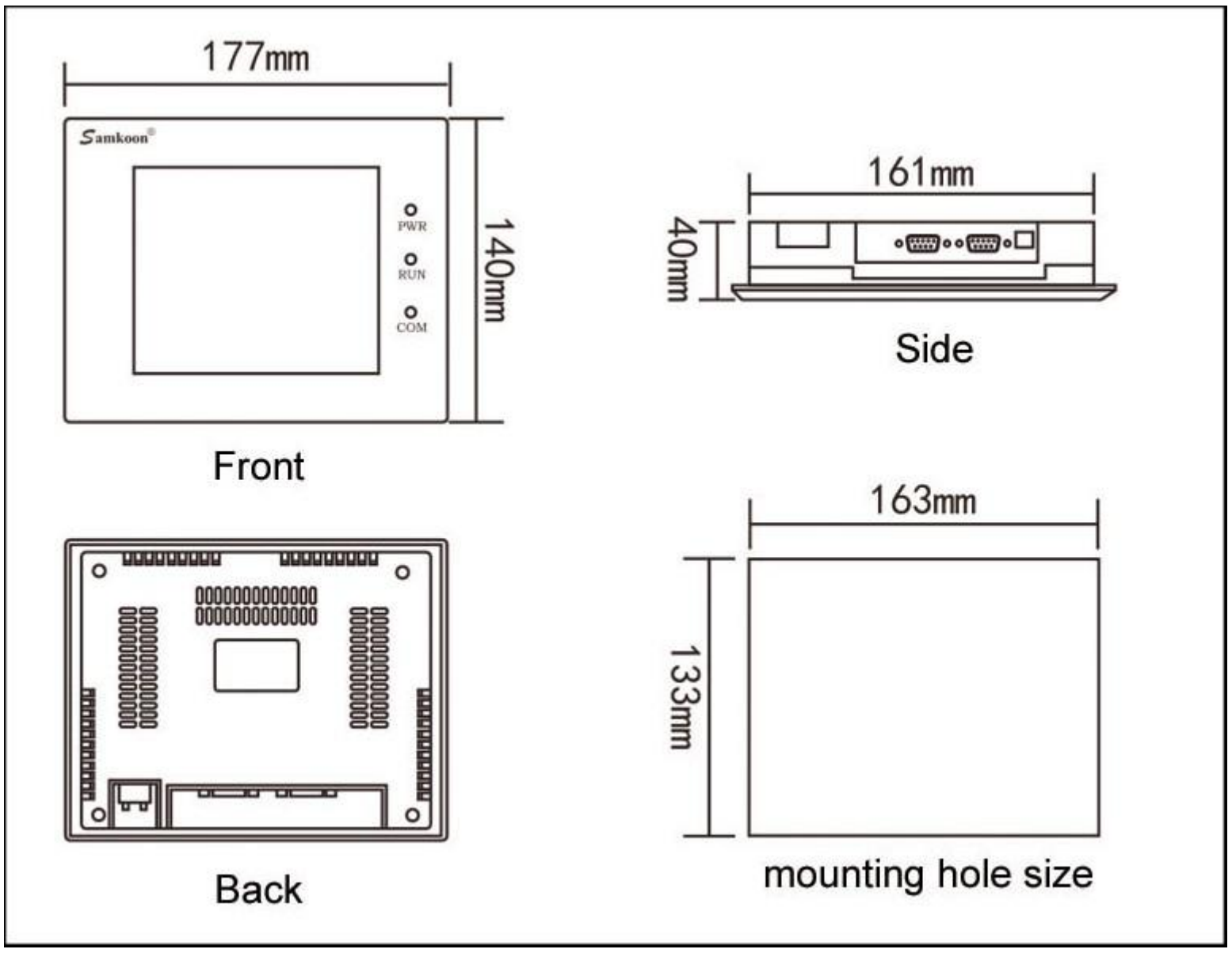


Figure 1-5SK-057FE mounting dimension

3.2.5 SK-070

Figure 1-6 shows the product dimensions(mm) of SK-070F

The outline dimension is 227×153×40

The mounting hole size is 210×144

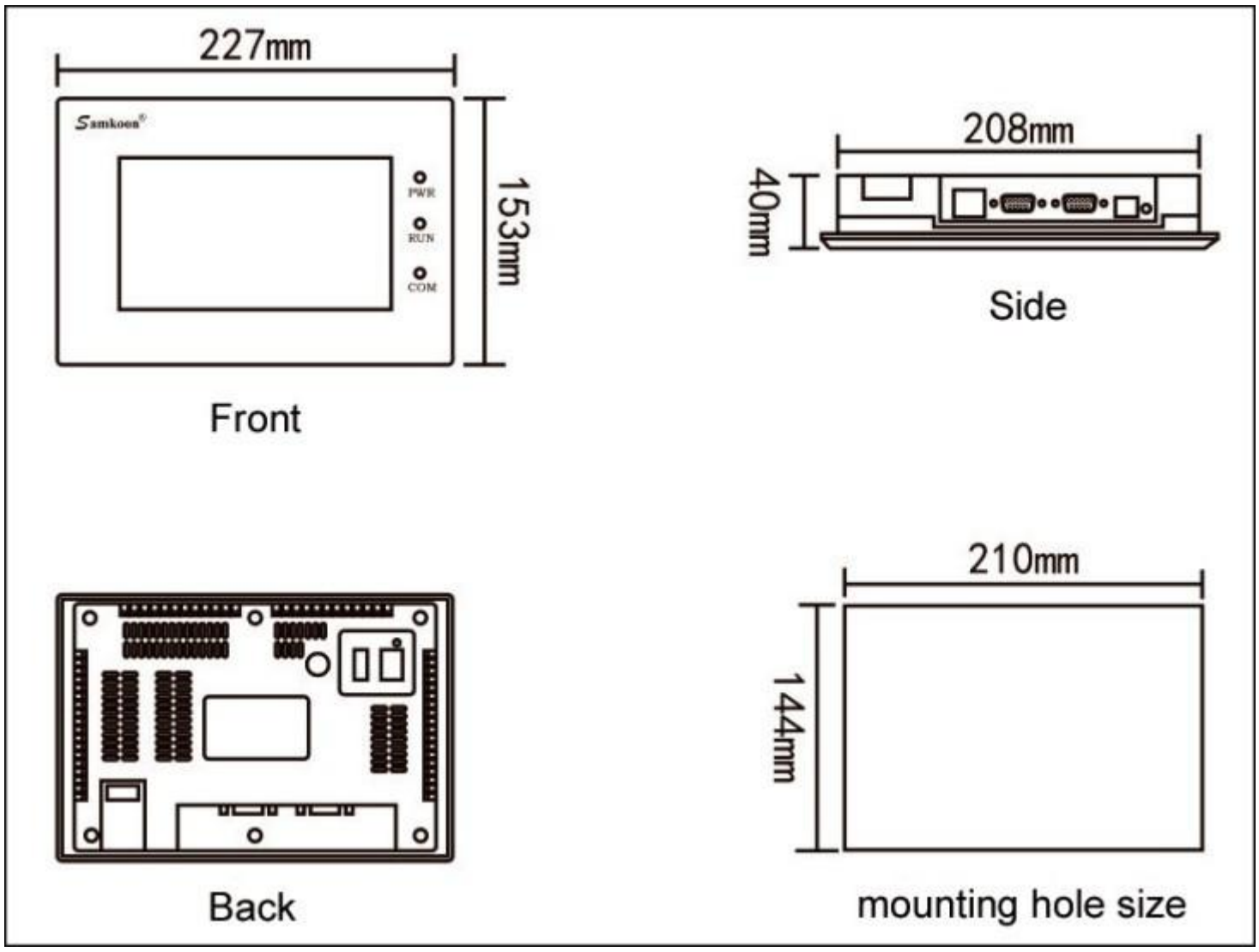


Figure 1-6 SK-070F mounting dimension

Figure 1-7 shows the product dimensions(mm) of SK-070H

The outline dimension is 203×145×40

The mounting hole size is 192×138

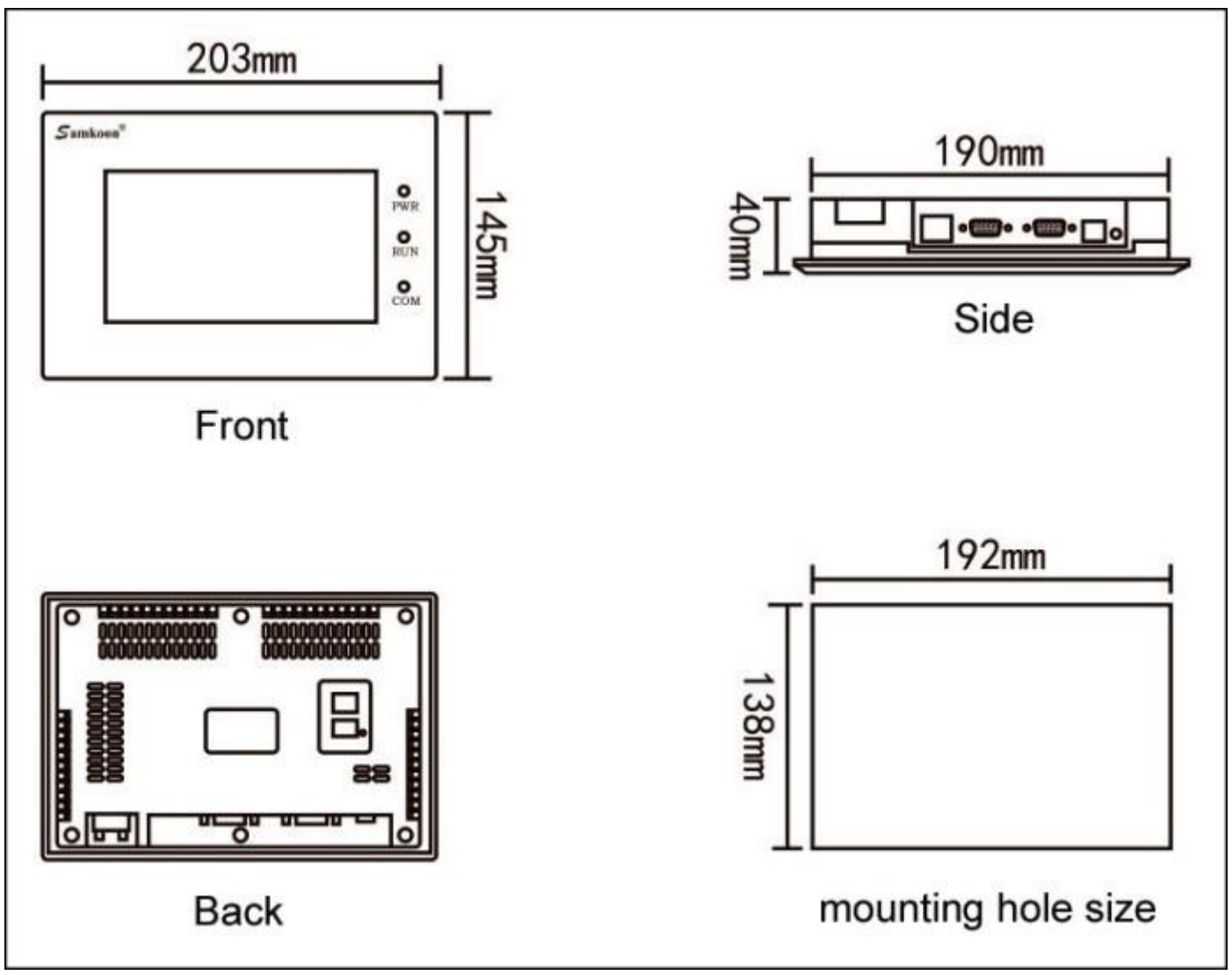


Figure 1-7 SK-070H mounting dimension

3.2.6 SK-102

Figure 1-8 shows the product dimensions(mm) of SK-102H

The outline dimension is 275×211×44

The mounting hole size is 259×201

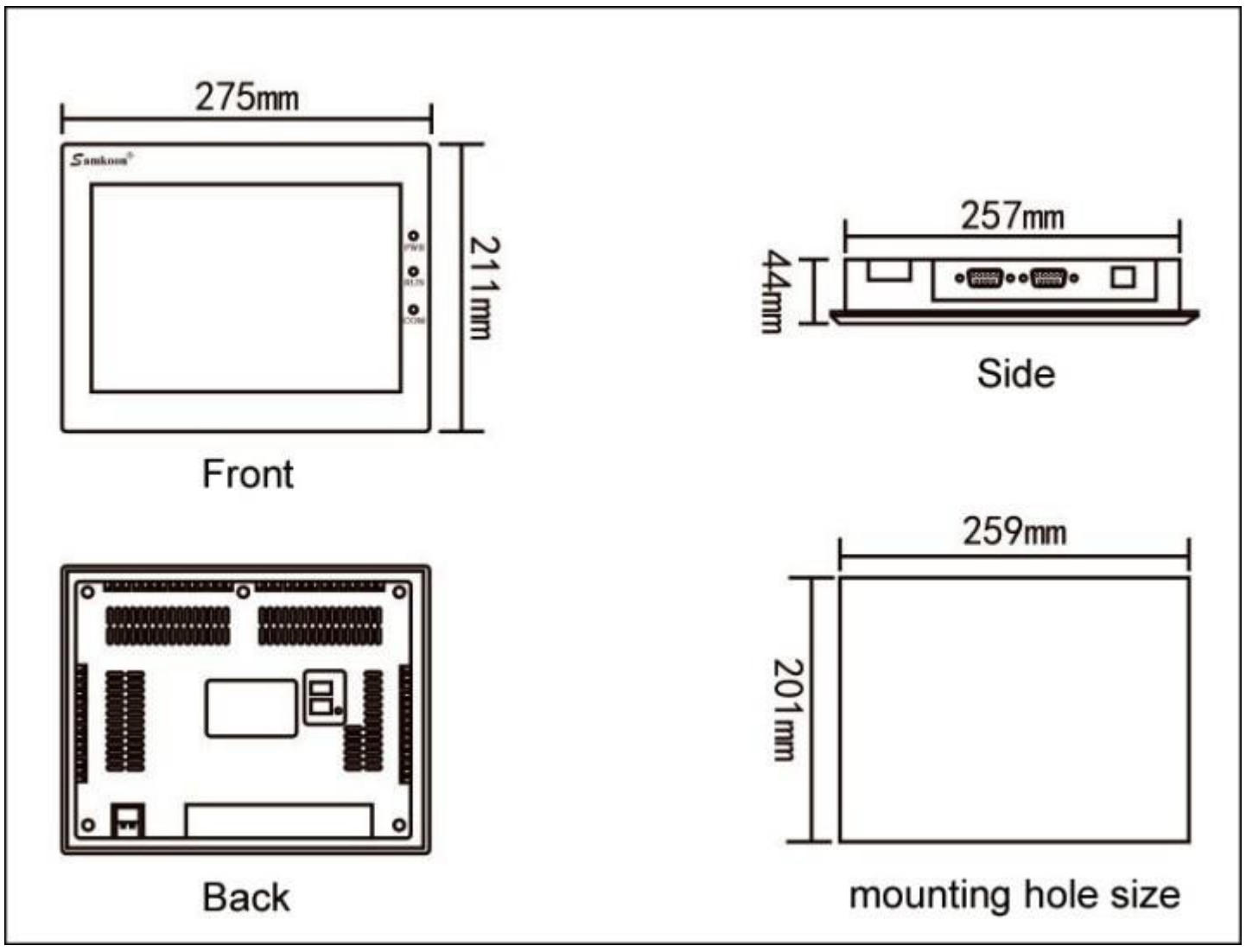


Figure 1-8 SK-102H mounting dimension

3.2.7 SK-104

Figure 1-9 shows the product dimensions(mm) of SK-104F

The outline dimension is 312×225×55

The mounting hole size is 285×212

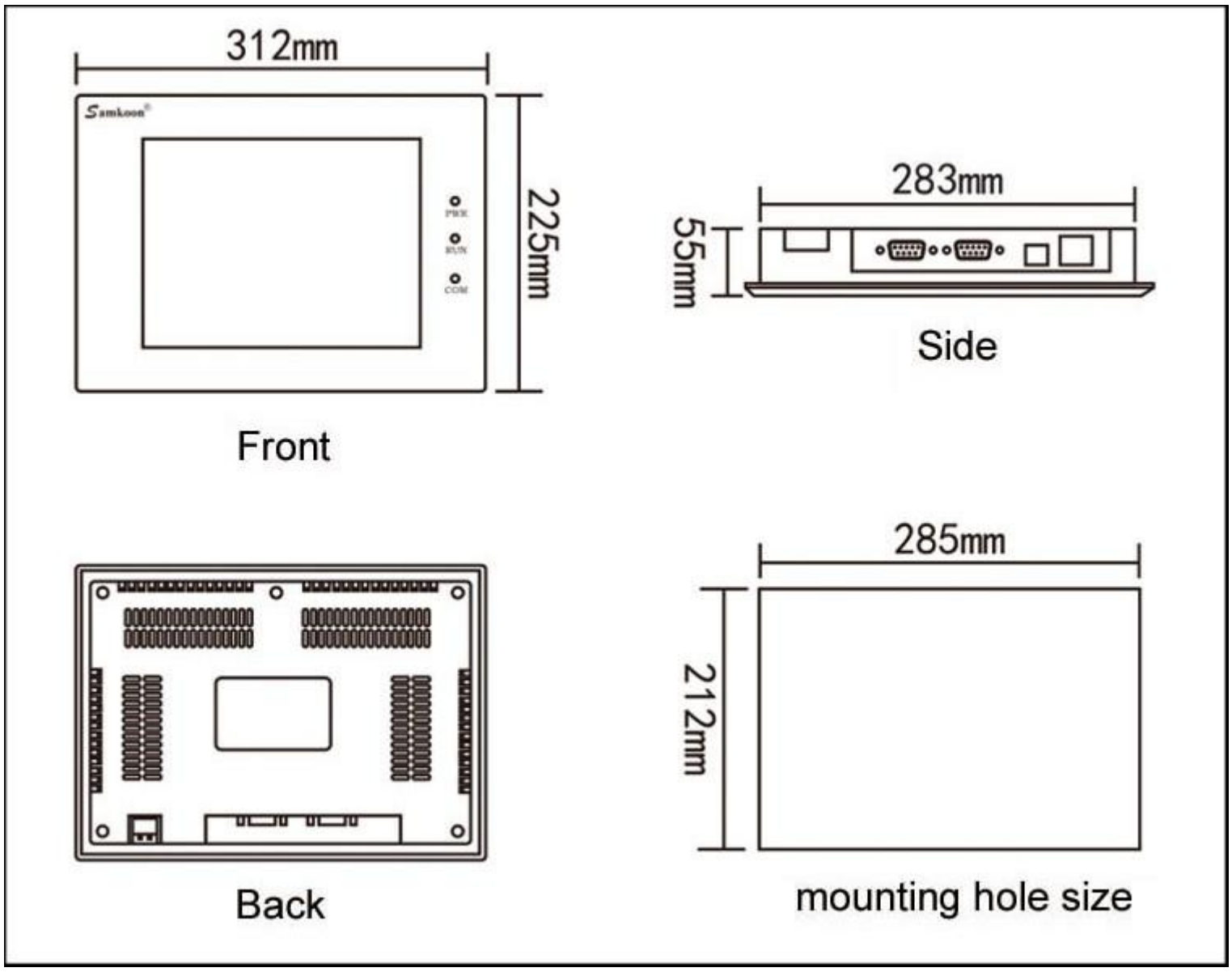


Figure 1-9SK-104F mounting dimension

3.2.8 SK-121

Figure 1-10 shows the product dimensions(mm) of SK-121F

The outline dimension is 340×256×54

The mounting hole size is 330×246

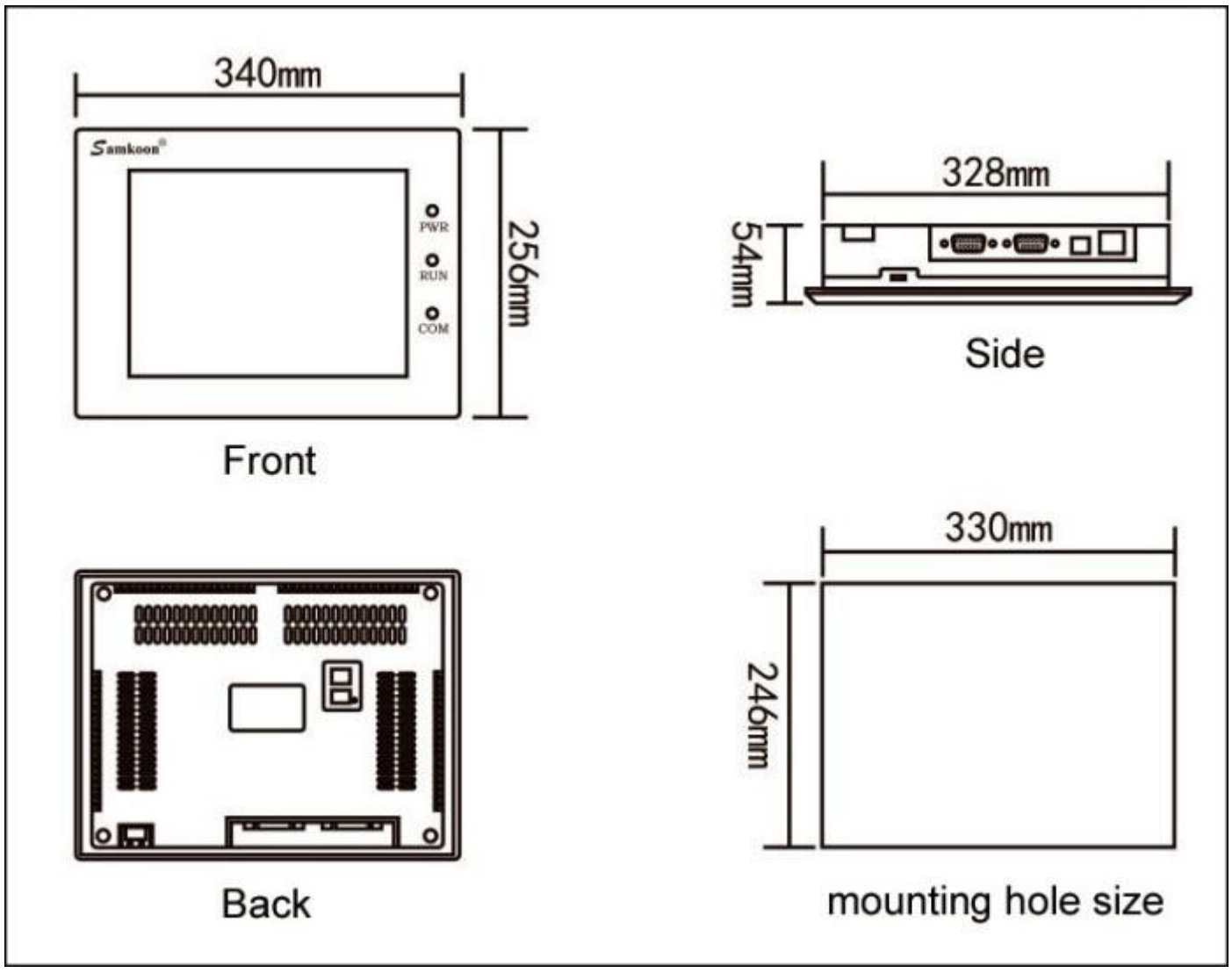


Figure 1-10 SK-121Fmounting dimension

3.3 HMI Structure

The entire structure of Samkoon SK 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. Power interface and communication ports are located at the bottom of the HMI, which meets the design criteria.
Figure 1-11 shows the structure of HMI.

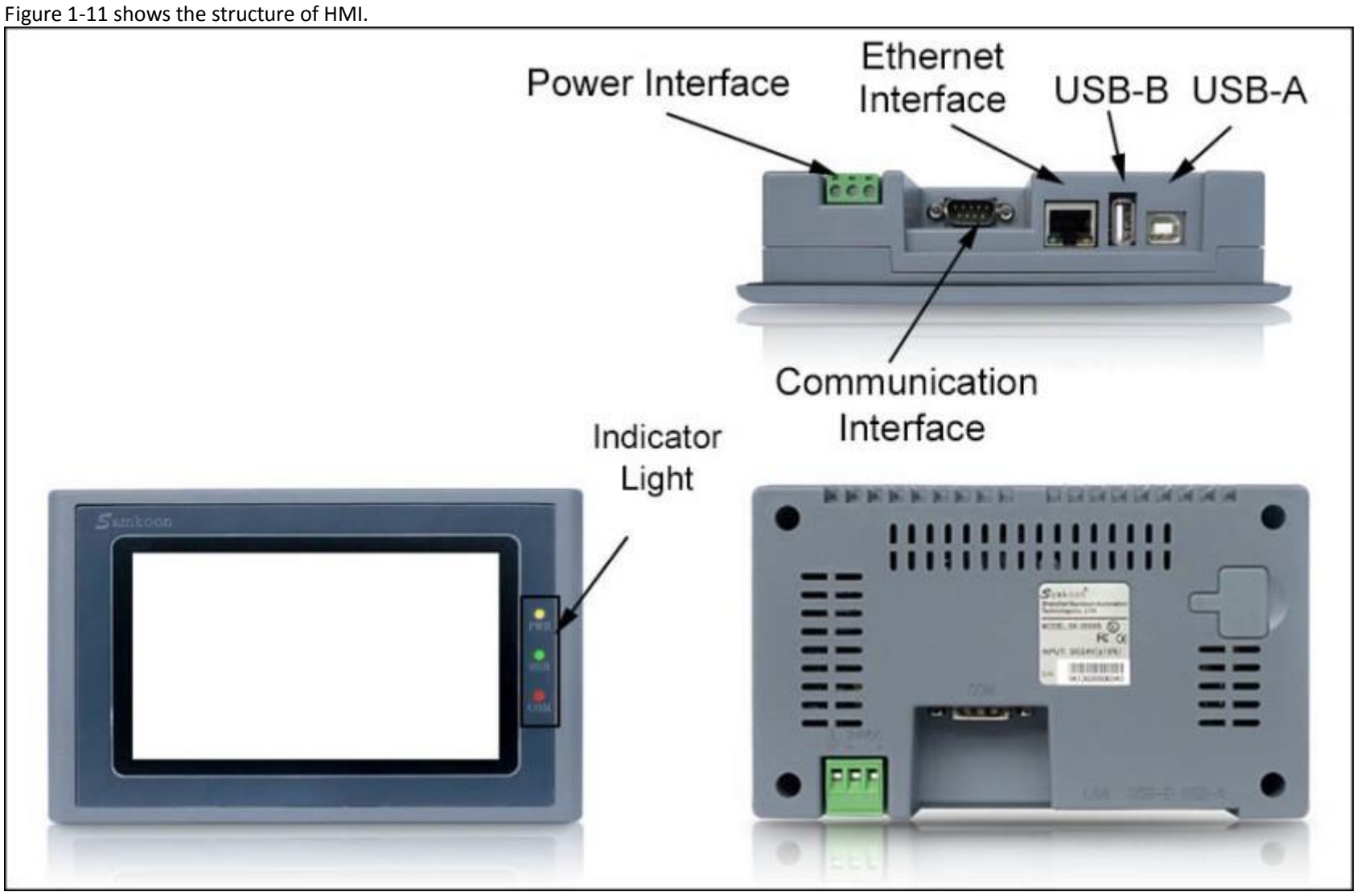


Figure 1-11 Structure

- Ethernet port: Connection of Ethernet cable
- USB-B: Insert the U disk

- USB-A: Connect with PC; download the configuration file from PC to HMI
- Communication Interface: Communicate with PLC

3.3.1 Power Interface

The power interface of the Samkoon SK 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. Figure 1-12 is a view of power interface:

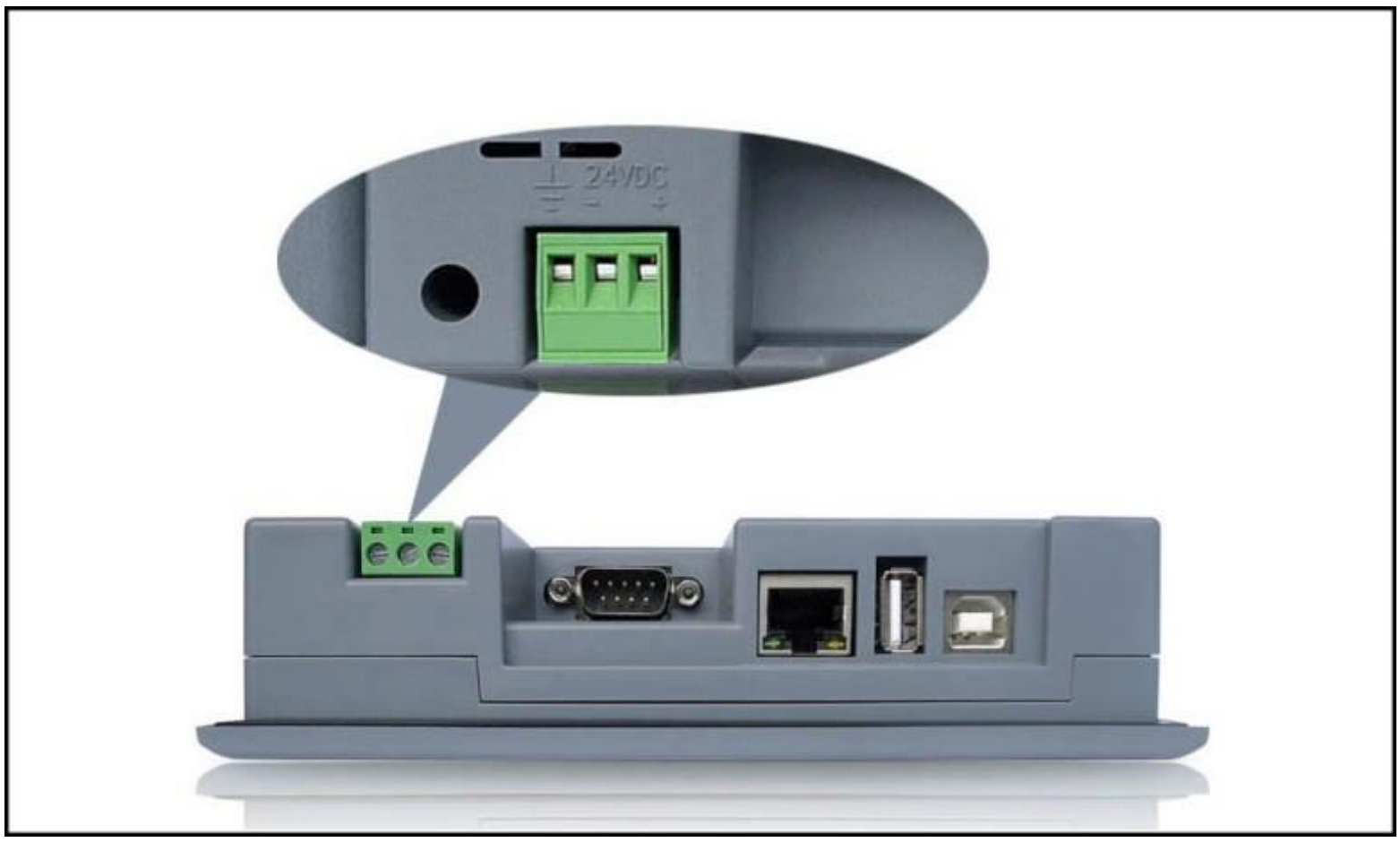


Figure 1-12 power interface

3.3.2 Front panel

Figure 1-13 is a view of front panel, including display screen and indicator lights:

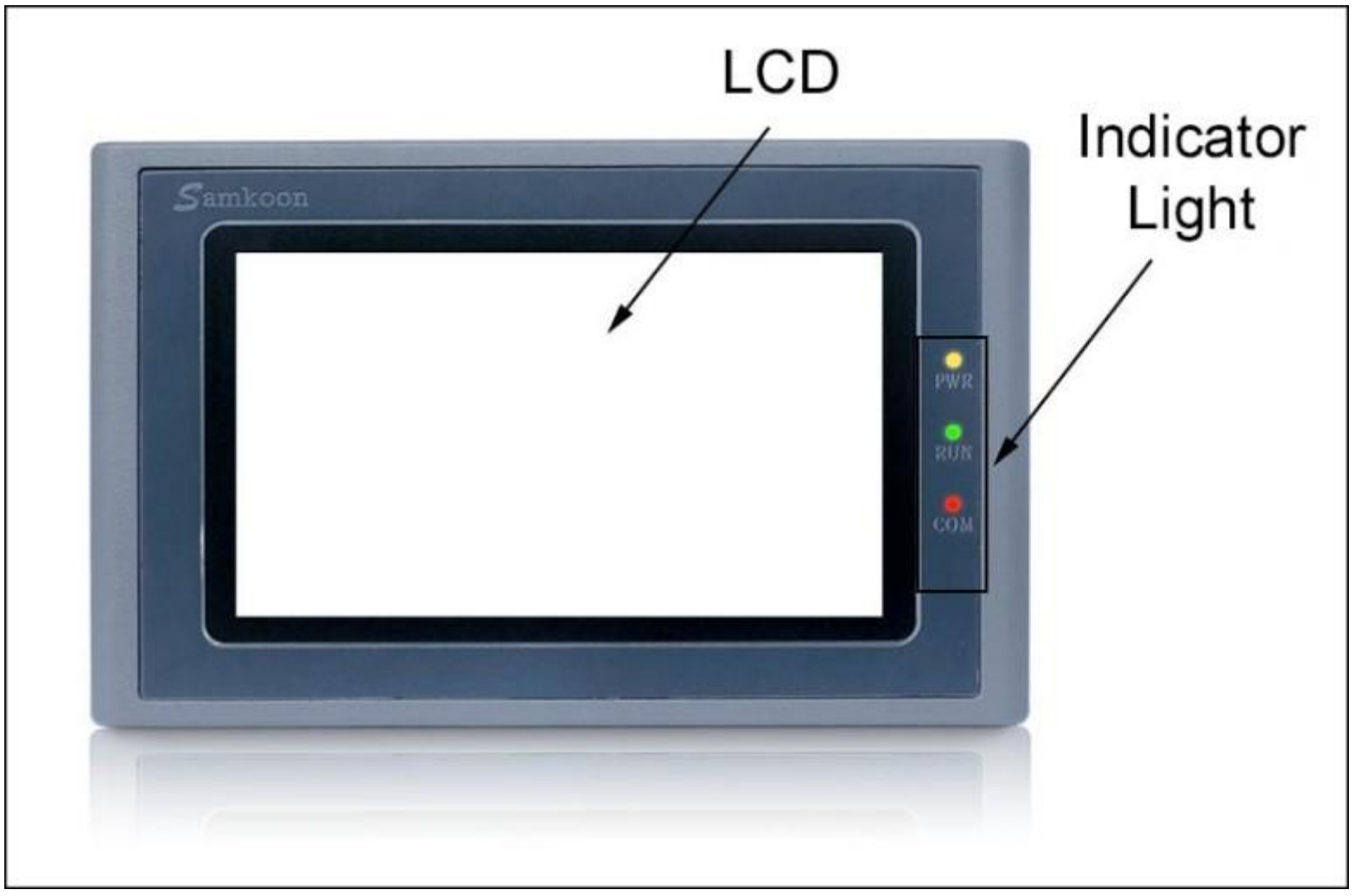


Figure 1-13 SK series front panel

3.3.3 Communication port

Communication ports of HMI are located in the bottom panel. Models of SK-121F，SK-102H，SK-070H，SK-070F provide two standard serial communication ports while those SK-035F，SK-043F，SK-043H，SK-050H adopting a 9-core D-type interface for connection to a PLC or other controller and also for communication, provide one standard serial communication port.

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).

The model in Figure 1-14 is equipped with double serial and USB-A port, the model in Figure 1-15 is equipped with single serial and USB-A port:

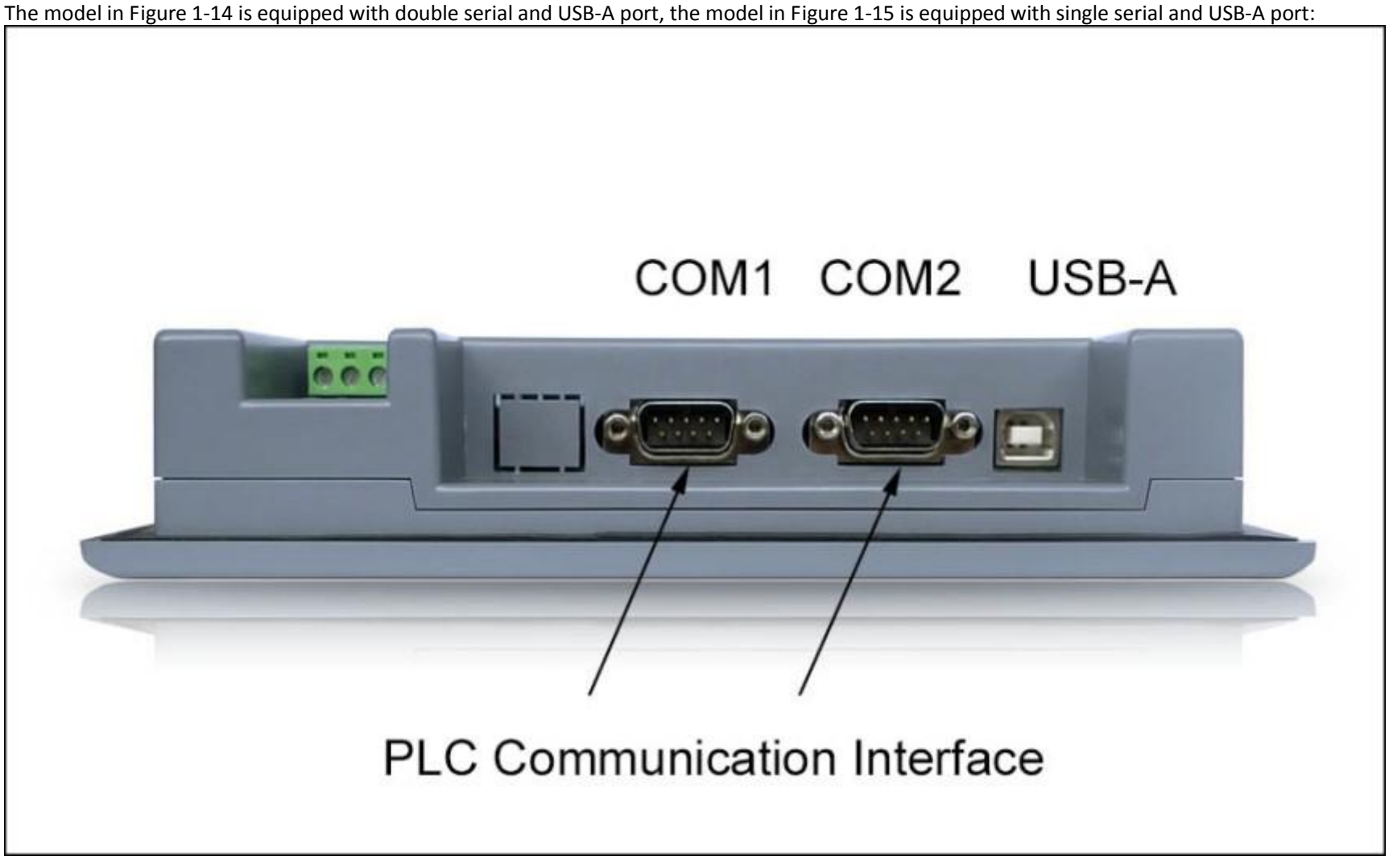


Figure 1-14 Side panels of SK（double serial）

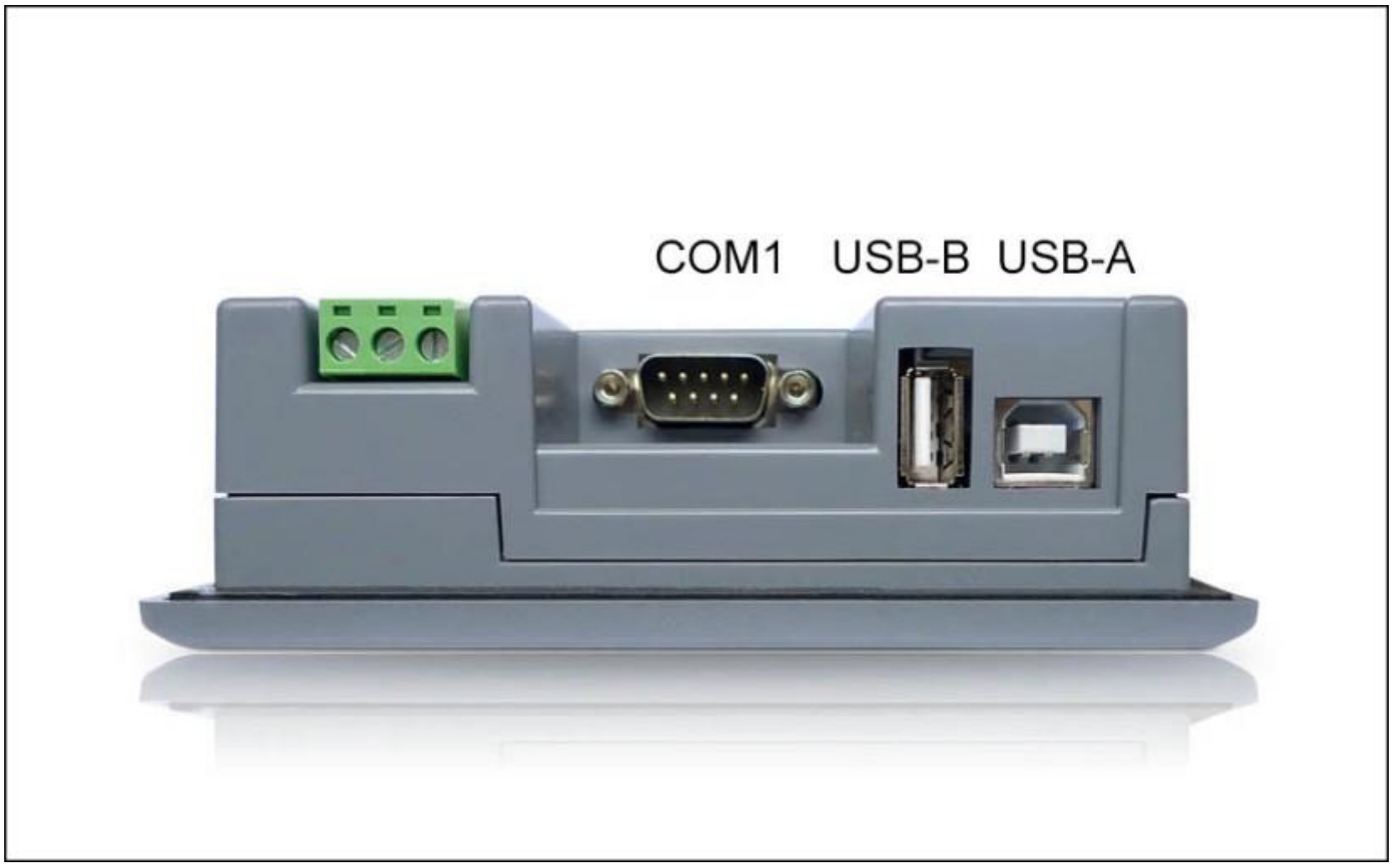


Figure 1-15 Side panels of SK（single serial）

3.3.4 Pin

Pareto diagram of 9-pin communication port，as figure 1-16：

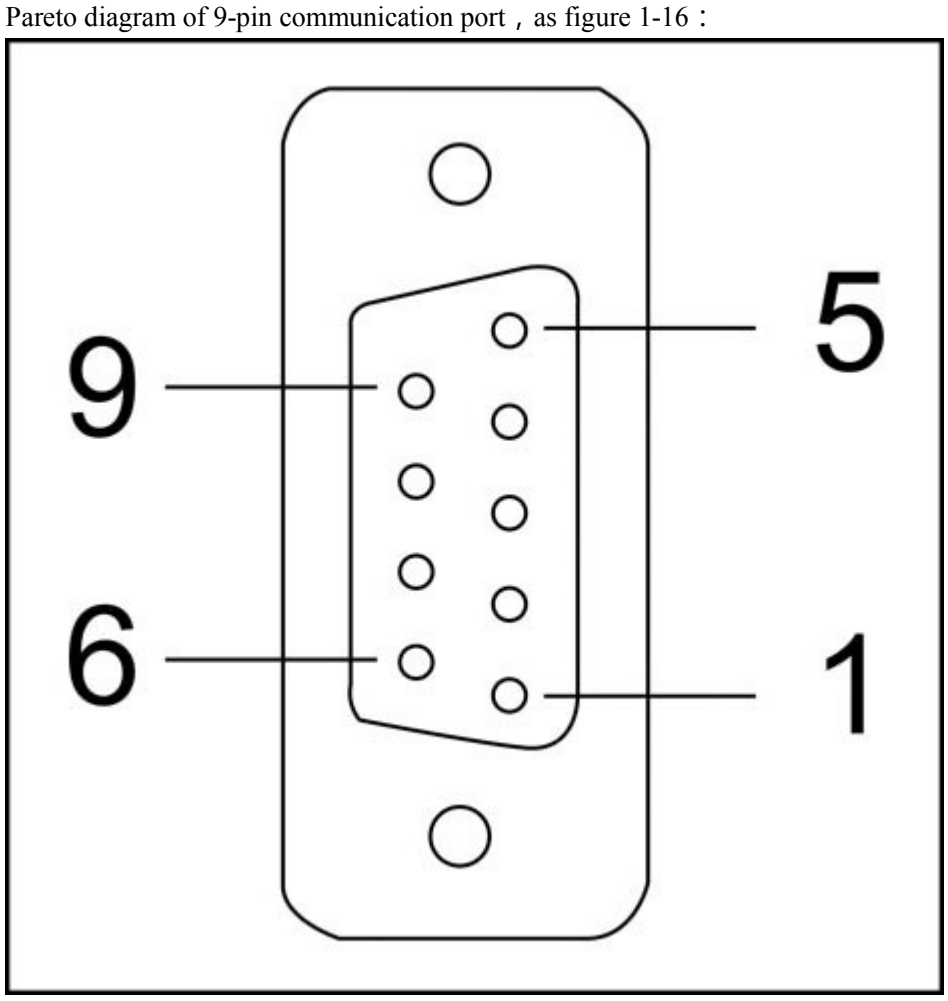


Figure 1-16 9-pin communication port

This port is used to connect PLC or other controllers with RS232 / RS422 / RS485 communication port

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

3.3.5 Running Indicator Lights

Indicator lights of the touch screen consist of three LEDs, including Power (PWR), Run (RUN) and communications (COM), just as shown in Figure 1-17.

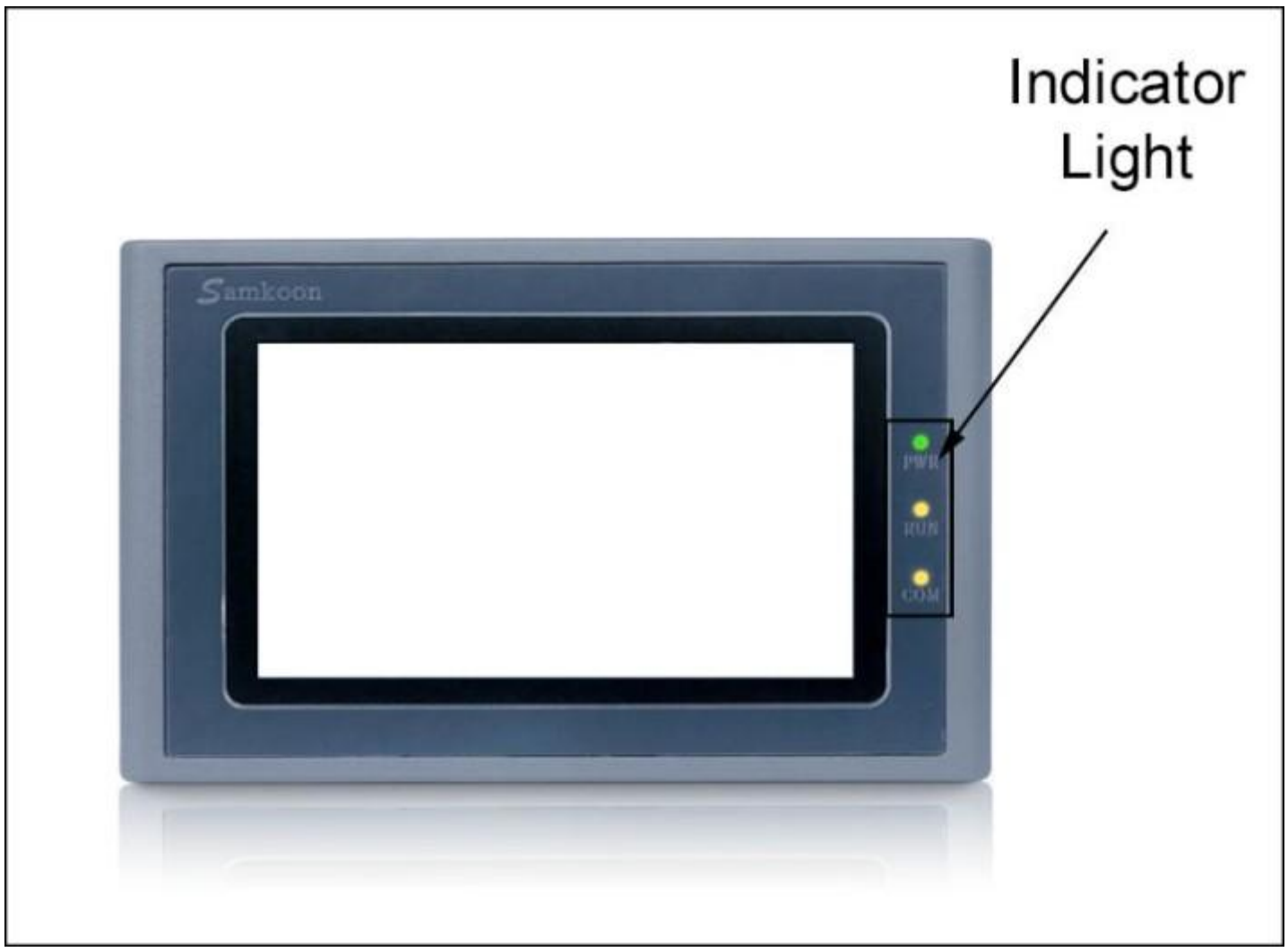


Figure 1-17 SK series Running Indicator Lights

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 touch screen is connected to PLC.

Table 1-1 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			

Table 1-1

3.4 Technical Parameters

This table lists major technical parameters of SK series products:

Model	SK-035F
	SK-043F/SK-043H
	SK-050H
	SK-057F
	SK-070F/SK-070H
	SK-102H
	SK-104F
	SK-121F

- Support up to ten formulas;
- Support up to 512 items of data transmission;
- Support up to 4sets of historical data collectors;
- Support up to ten sets of digital alarm;
- Support up to ten sets of analog alarm;
- Maximum number of screens and controls depends on the memory they occupy.

3.4.1 SK-035

Main technical parameters	
Model	SK-035FE
Network interfaces	0
SD cards	0
USB-B	0
USB-A	1
COM interfaces	COM1:RS232,RS422,RS485
Display specifications	3.5"(length:width = 4:3)
Resolution	320×240
Brightness	350cd/㎡
Color	262,144 pigments
Contrast	400 : 1
Life of back light	50,000 hours
Touch screen plate	4-wire high precision touch plate

User memory	12M
Power supply	DC24V(±15%)
Power consumption	3W
CE certification	Meeting EN50022 and EN50024
FCC compatibility	Meeting FCC,Class A
Dielectric strength test	1000V AC,1 minute
Protection grade	IP65（front panel）
Ambient temperature for running	-20～65℃
Ambient humidity for running	10～90%RH
Shell plastic	Engineering plastic ABS+PC
Outline dimension	135×89×39(mm)
Mounting hole size	123×80(mm)
Weight	About 0.2kg

3.4.2 SK-043

Main technical parameters			
Model	SK-043FE	SK-043HS	SK-043HE
Network interfaces	0	1	0
SD cards	0		
USB-A	1		
USB-B	1		
COM interfaces	COM1:RS232,RS422,RS485		
Display specifications	4.3"(length: width = 16:9)		
Resolution	480×272		
Brightness	400cd/㎡		
Color	262,144 pigments		
Contrast	400 : 1		
Life of back light	50,000 hours		
Touch screen plate	4-wire high precision touch plate		
User memory	12M		

Power supply	DC24V(±15%)	
Power consumption	3W	
CE certification	Meeting EN50022 and EN50024	
FCC compatibility	Meeting FCC,Class A	
Dielectric strength test	1000V AC,1 minute	
Protection grade	IP65（front panel）	
Ambient temperature for running	-20～65℃	
Ambient humidity for running	10～90%RH	
Shell plastic	Engineering plastic ABS+PC	
Outline dimension	150×93×39(mm)	173×95×39(mm)
Mounting hole size	141×84(mm)	163×85(mm)
Weight	About 0.2kg	

3.4.3 SK-050

Main technical parameters		
Model	SK-050HS	SK-050HE
Network interfaces	1	0
SD cards	0	
USB-A	1	
USB-B	1	
COM interfaces	COM1:RS232,RS422,RS485	
Display specifications	5.0"(length: width = 16:9)	
Resolution	800×480	
Brightness	350cd/㎡	
Color	262,144 pigments	
Contrast	400 : 1	
Life of back light	50,000 hours	
Touch screen plate	4-wire high precision touch plate	
User memory	12M	

Power supply	DC24V(±15%)
Power consumption	3W
CE certification	Meeting EN50022 and EN50024
FCC compatibility	Meeting FCC,Class A
Dielectric strength test	1000V AC,1 minute
Protection grade	IP65（front panel）
Ambient temperature for running	-20～65℃
Ambient humidity for running	10～90%RH
Shell plastic	Engineering plastic ABS+PC
Outline dimension	165×103×39(mm)
Mounting hole size	157×95(mm)
Weight	About 0.2kg

3.4.4 SK-057

	Main technical parameters
Model	SK-057FE
Network interfaces	0
SD cards	0
USB-B	1
USB-A	1
COM interfaces	COM1/COM2:RS232,RS422,RS485
Display specifications	5.7"(length:width = 4:3)
Resolution	640×480
Brightness	400cd/㎡
Color	262,144 pigments
Contrast	400 : 1
Life of back light	50,000 hours

Touch screen plate	4-wire high precision touch plate
User memory	12M
Power supply	DC24V(±15%)
Power consumption	4W
CE certification	Meeting EN50022 and EN50024
FCC compatibility	Meeting FCC, Class A
Dielectric strength test	1000V AC,1 minute
Protection grade	IP65（front panel）
Ambient temperature for running	-20～65℃
Ambient humidity for running	10～90%RH
Shell plastic	Engineering plastic ABS+PC
Outline dimension	177x140x40 (mm)
Mounting hole size	163x133 (mm)
Weight	About 0.8kg

3.4.5 SK-070

	Main technical parameters			
Model	SK-070FS	SK-070FE	SK-070HS	SK-070HE
Network interfaces	1	0	1	0
SD cards	1	0	1	0
USB-A	1			
USB-B	1			
COM interfaces	COM1/COM2:RS232,RS422,RS485			

Display specifications	7"(length: width = 16:9)	
Resolution	800×480	
Brightness	450cd/㎡	
Color	262,144 pigments	
Contrast	450 : 1	
Life of back light	50,000 hours	
Touch screen plate	4-wire high precision touch plate	
User memory	12 M	
Power supply	DC24 V (±15%)	
Power consumption	6 W	
CE certification	Meeting EN50022 and EN50024	
FCC compatibility	Meeting FCC,Class A	
Dielectric strength test	1000V AC,1 minute	
Protection grade	IP65（front panel）	
Ambient temperature for running	-20～65℃	
Ambient humidity for running	10～90%RH（non condensable）	
Shell plastic	Engineering plastic ABS+PC	
Outline dimension	227×153×40 mm	203×145×40 mm
Mounting hole size	210×144 mm	192×138 mm
Weight	About 1.5 kg	

3.4.6 SK-102

	Main technical parameters

Model	SK-102HS	SK-102HE
Network interfaces	1	0
SD cards	1	0
USB-A	1	
USB-B	1	
COM interfaces	COM1/COM2:RS232,RS422,RS485	
Display specifications	10.2"(length:width = 16:9)	
Resolution	1024×600	
Brightness	500cd/㎡	
Color	262,144 pigments	
Contrast	450 : 1	
Life of back light	50,000 hours	
Touch screen plate	4-wire high precision touch plate	
User memory	12 M	
Power supply	DC24V(±15%)	
Power consumption	7 W	
CE certification	Meeting EN50022 and EN50024	
FCC compatibility	Meeting FCC,Class A	
Dielectric strength test	1000V AC,1 minute	
Protection grade	IP65（front panel）	
Ambient temperature for running	-20～65℃	
Ambient humidity for running	10～90%RH（non condensable）	
Shell plastic	Engineering plastic ABS+PC	
Outline dimension	275×211×44 (mm)	
Mounting hole size	259×201(mm)	
Weight	About 2.2 kg	

3.4.7 SK-104

	Main technical parameters	
Model	SK-104FS	SK-104FE
Network interfaces	1	0
SD cards	1	0
USB-A	1	
USB-B	1	
COM interfaces	COM1/COM2:RS232,RS422,RS485	
Display specifications	10.4"(length: width = 4:3)	
Resolution	800×600	
Brightness	450cd/㎡	
Color	262,144 pigments	
Contrast	450 : 1	
Life of back light	50,000 hours	
Touch screen plate	4-wire high precision touch plate	
User memory	12 M	
Power supply	DC24V(±15%)	
Power consumption	8 W	
CE certification	Meeting EN50022 and EN50024	
FCC compatibility	Meeting FCC, Class A	
Dielectric strength test	1000V AC,1 minute	
Protection grade	IP65（front panel）	
Ambient temperature for running	-20～65℃	
Ambient humidity for running	10～90%RH（non condensable）	
Shell plastic	Engineering plastic ABS+PC	
Outline dimension	312×225×55 (mm)	
Mounting hole size	285×212 (mm)	
Weight	About 2.2 kg	

3.4.8 SK-121

	Main technical parameters	
Model	SK-121FS	SK-121FE
Network interfaces	1	0
SD cards	1	0
USB-A	1	
USB-B	1	
COM interfaces	COM1/COM2:RS232,RS422,RS485	
Display specifications	12.1"(length: width = 4:3)	
Resolution	800×600	
Brightness	450cd/㎡	
Color	262,144 pigments	
Contrast	450 : 1	
Life of back light	50,000 hours	
Touch screen plate	4-wire high precision touch plate	
User memory	12 M	
Power supply	DC24V(±15%)	
Power consumption	8 W	
CE certification	Meeting EN50022 and EN50024	
FCC compatibility	Meeting FCC,Class A	
Dielectric strength test	1000V AC,1 minute	
Protection grade	IP65（front panel）	
Ambient temperature for running	-20～65℃	
Ambient humidity for running	10～90%RH（non condensable）	
Shell plastic	Engineering plastic ABS+PC	
Outline dimension	340×256×54(mm)	
Mounting hole size	330×246(mm)	
Weight	About 1.8 kg	

3.5 Wiring

Samkoon SK series touch screen requires DC 24V power supply. Figure 1-18 shows the connection of the touch screen with PLC and PC:

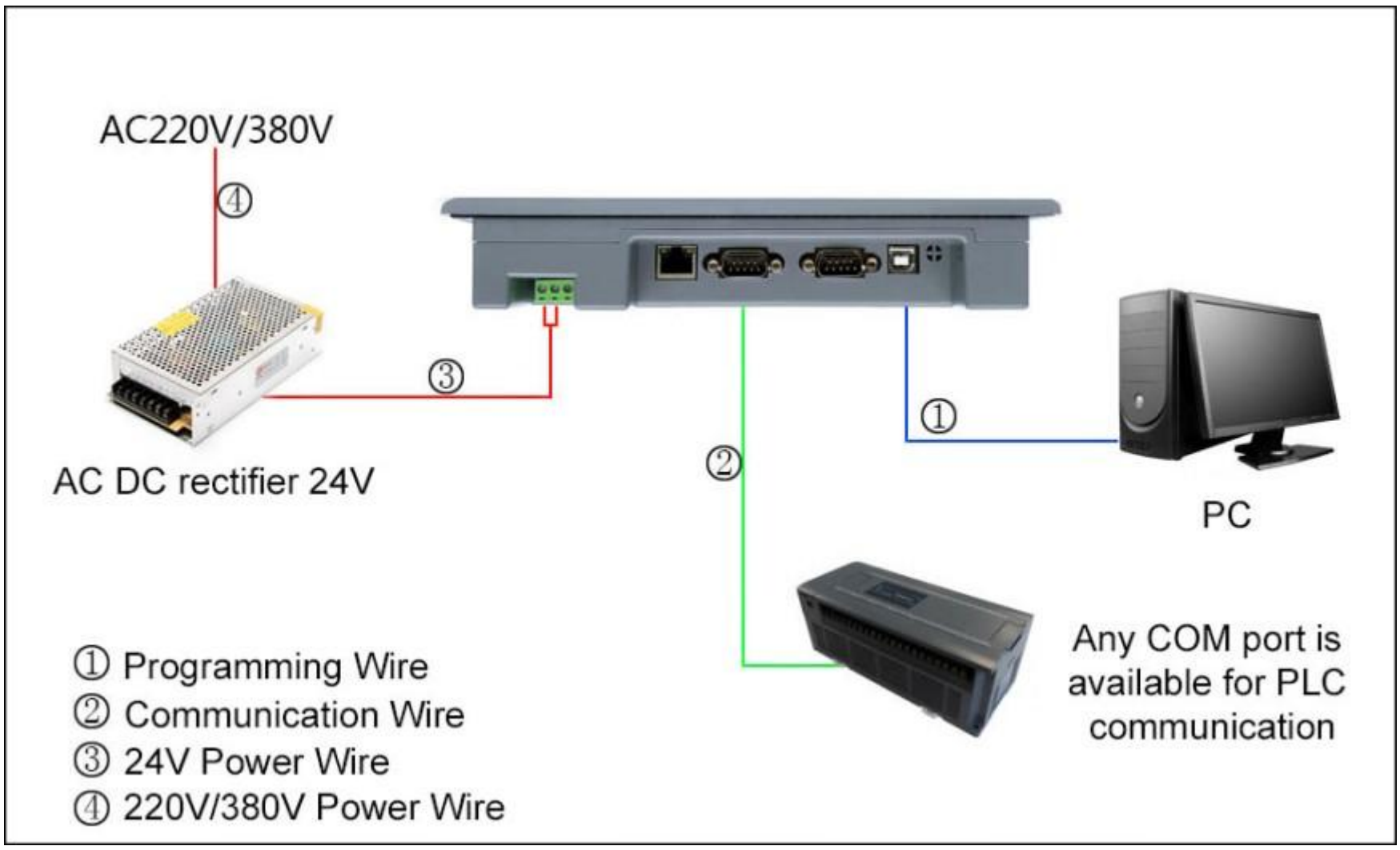


Figure 1-18 Connection diagram of SK series touch screen

USB cables for connection with PC are supplied along with the machine.

4. Quick start of SKTOOL

This chapter introduces installation of SKTOOL 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 SKTOOL configuration software. In addition, it introduces the hardware and software requirements of SKTOOL, and the installation process and working environment of SKTOOL, helping users to learn use of this software and create application projects.

Contents：

- What's SKTOOL
- System demand
- Set up SKTOOL Software
- Run SKTOOL
- Edit Interface and System Composition
- Basic Operations

4.1 What's SKTOOL

Created for the HMI of Samkoon SK series from Shenzhen Samkoon Technology Co., SKTOOL 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 SKTOOL. 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 SKTOOL are summarized below:

1. Screen
Samkoon SK HMI is equipped with 2,6 million display colors, much more bright compared with products of other manufacturers. Using SKTOOL, 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 SKTOOL 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
SKTOOL provides complete functions, including basic drawing shapes, color rendering, text rendering, library system, animation, bitmaps status, trend display, alarm control, etc.. SKTOOL is even equipped with new multiple sets of formulas 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.

果。

3. Communication
SKTOOL supports PLC communication drivers of major manufacturers in the world, such as Samkoon, 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. SK-121F，SK-102H，SK-070F，SK-070H from SK series can simultaneously load two communication drivers.

4. Resource

SKTOOL 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 vive animation. It supports a custom gallery and pictures inserted from Windows. SKTOOL also provides rich functions of controls, such as trends and alarm controls, etc., to meet the needs of various configurations.

4.2 System demand

Content :

- Hardware demand
- Software demand

4.2.1 Software demand

SKTOOL configuration software can run on the following operating systems:

- Microsoft Windows NT Server 4.0 or later;
- Microsoft Windows NT Workstation 4.0 or later;
- Microsoft Windows 98, Me, 2000, XP, win7 or later.



SKTOOL will refuse to install if it does not match the above versions of operating systems.

Recommended systems:

Windows XP SP3 version; windows7 32; windows7

There is no difference between Chinese and English operating system.

4.2.2 Hardware demand

Minimum hardware requirements for SKTOOL are:

CPU: Minimum Pentium 3-800MHz;

Memory: The memory should be 128MB or above if it is Windows 9X operating system;

System memory 256MB or above if Windows NT operating system;

System memory 256MB or above if Windows 2000 or XP operating system;

Graphics: Windows-compatible system, containing more than 1MB of video memory, compatible with 1024 * 768 resolution, 256-color mode;

Hard: A minimum of 200MB of hard-disk space occupied by SKTOOL configuration software.

Computer with a USB interface;

Mouse with two buttons and keyboard.



SKTOOL can possibly fail to install or run if the configuration of computer is inferior to the above.

Recommended configuration:

CPU: Equivalent to Intel's Pentium 800 or above;

Memory: The memory should be 256MB or above if it is Windows 9X operating system;

System memory 512MB or above if Windows NT operating system;

System memory 512MB or above if Windows 2000 or XP operating system.

Graphics card: Windows-compatible system, containing more than 1MB of video memory, compatible with 1024 * 768 resolution and 65535 color mode.

Hard disk: 200MB or more hard disk space.

4.3 Set up Software

SKTOOL is an application software designed for Microsoft Windows 32-bit system. Before installing the software, please make sure that the computer software and hardware meet the minimum requirements for installation.

Execute the installation disk distributed with the product to install SKTOOL. Specific steps are as follows:

Start Windows;

Insert the disc in the appropriate drive;

Contents of the disc are as shown in Figure 2-1, please verify them:



Figure 2-1 Disk content

Please contact us if anything is missing. Thank you for your support and we will serve you sincerely.

After inserting the disk it will automatically pop up SKTOOL setup window (if there is no pop-up window, directly open the disc, execute the file setup_SK.exe.

After launching the installation, a language selection box pops up as follows. According to user’s needs to select English or Simplified Chinese to install the configuration software. Now choose to install this "English" as an example. Select "English", click "OK", and after a few seconds the splash screen will pop up.



Figure 2-2

In the dialog box, select “Next” to continue the installation or choose “Cancel” to exit the installation program, as shown in Figure 2-3.

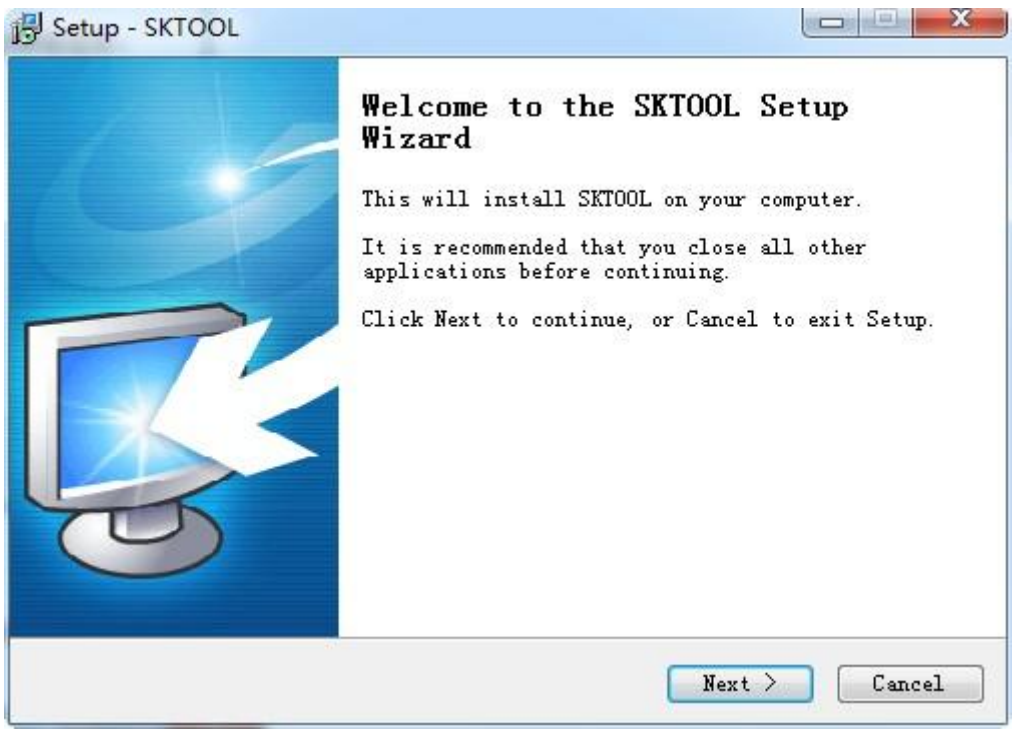


Figure 2-3 Installation Welcome Interface

In the License Agreement dialog box, please choose whether to accept the terms of the software, and then click Next, as shown in Figure 2-4:

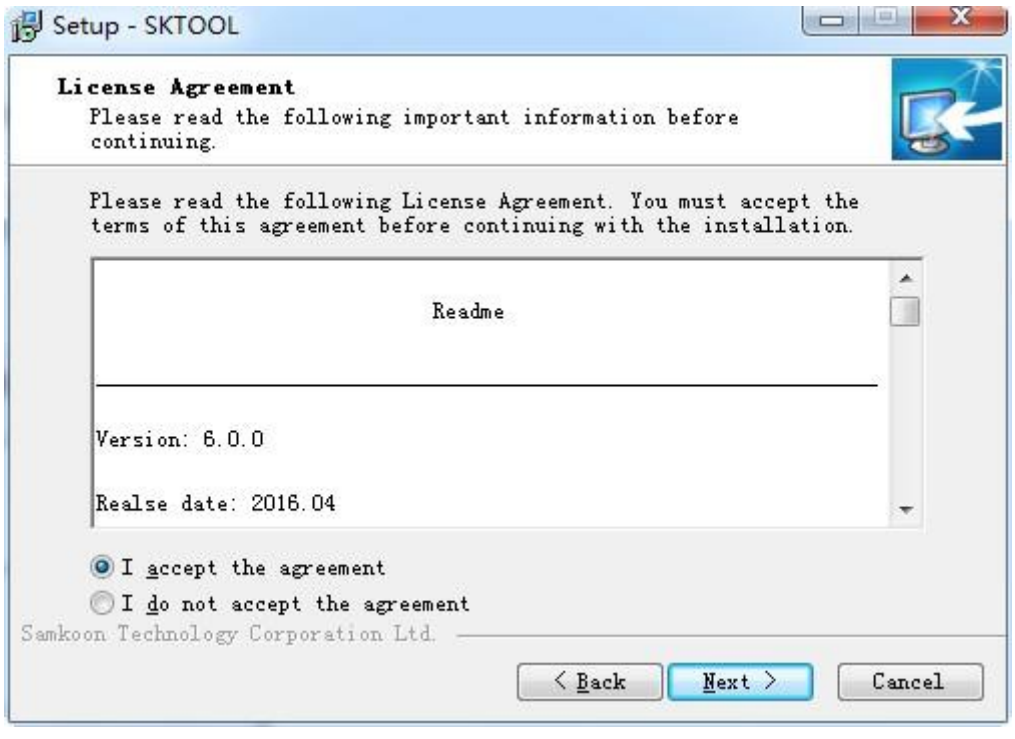


Figure 2-4 License Agreement dialog box

In the Destination Folders dialog box, select the installation folder. The default folder is "C: \ Program File \ SKTOOL\", click Change can select the installation path, then click Next

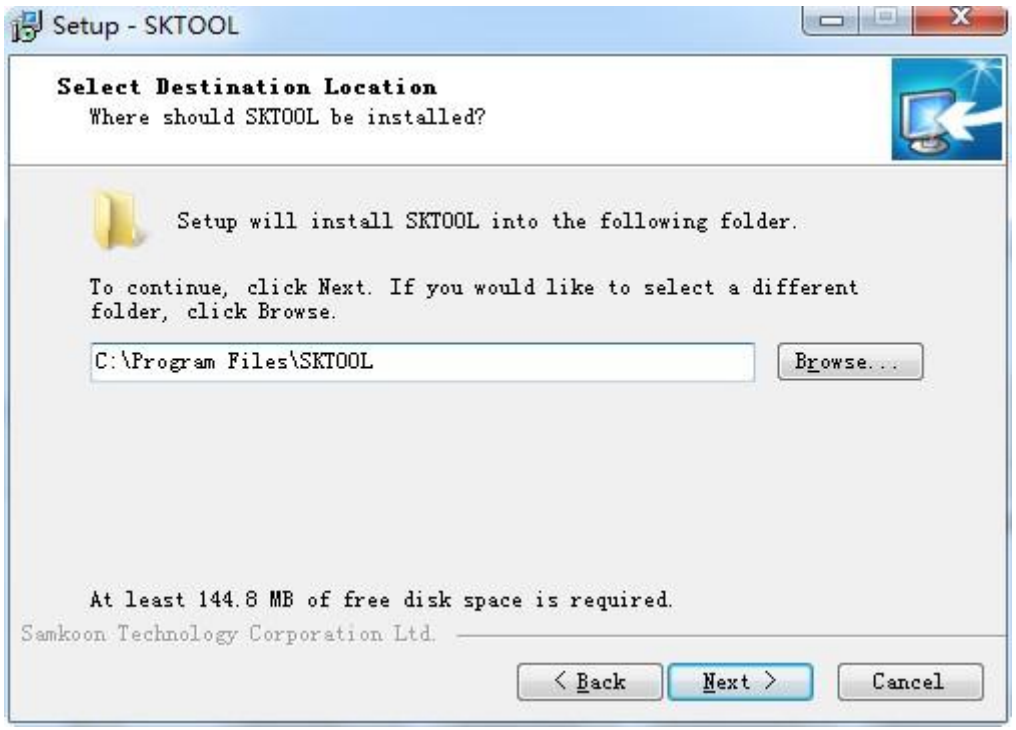


Figure 2-5 Installation Path Interface

Click Next in Figure 2-5, a selection interface shows where to store the file, the default file or others; click Next, as shown in Figure 2-6:

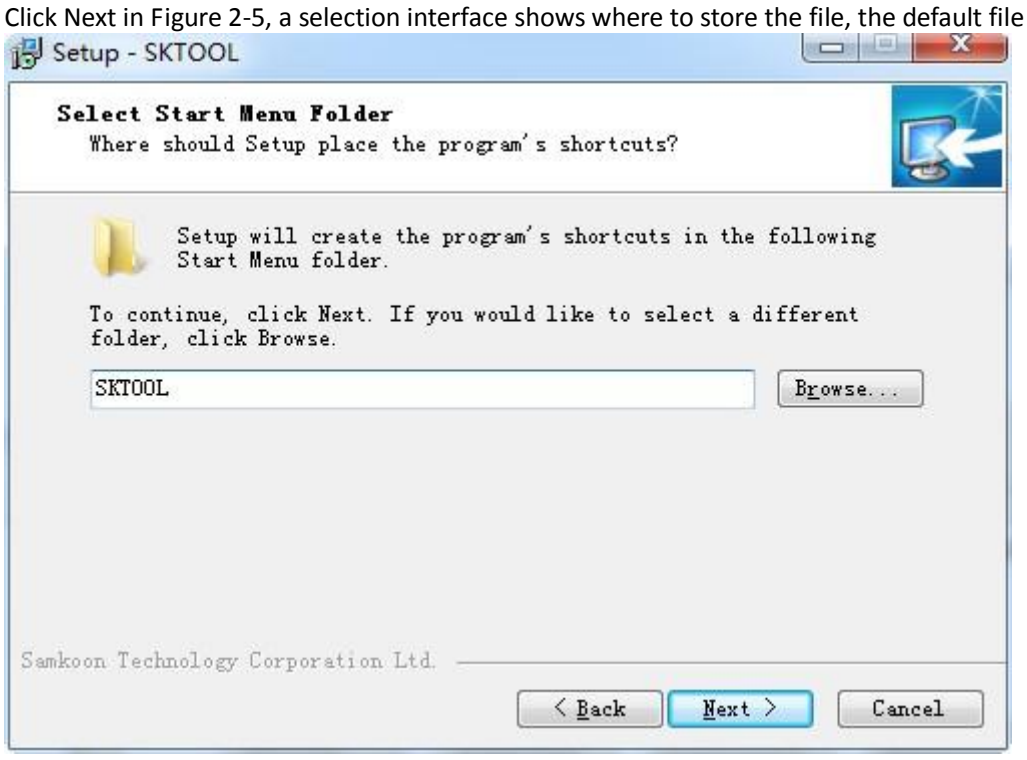


Figure 2-6 Installation File Interface

Whether to Create Desktop Shortcut Interface, click Next, as shown in Figure 2-7:

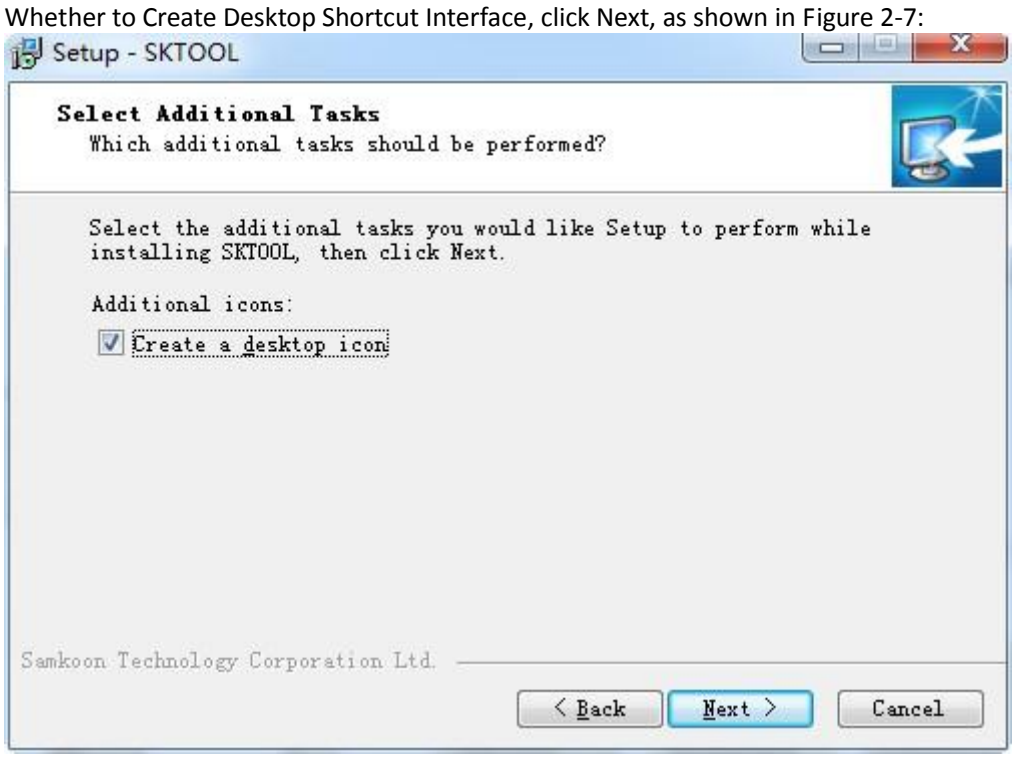


Figure 2-7 Whether to Create Desktop Shortcut Interface

Installation confirmation interface shows three elements: the installation path, files for the installation and whether to create a shortcut.

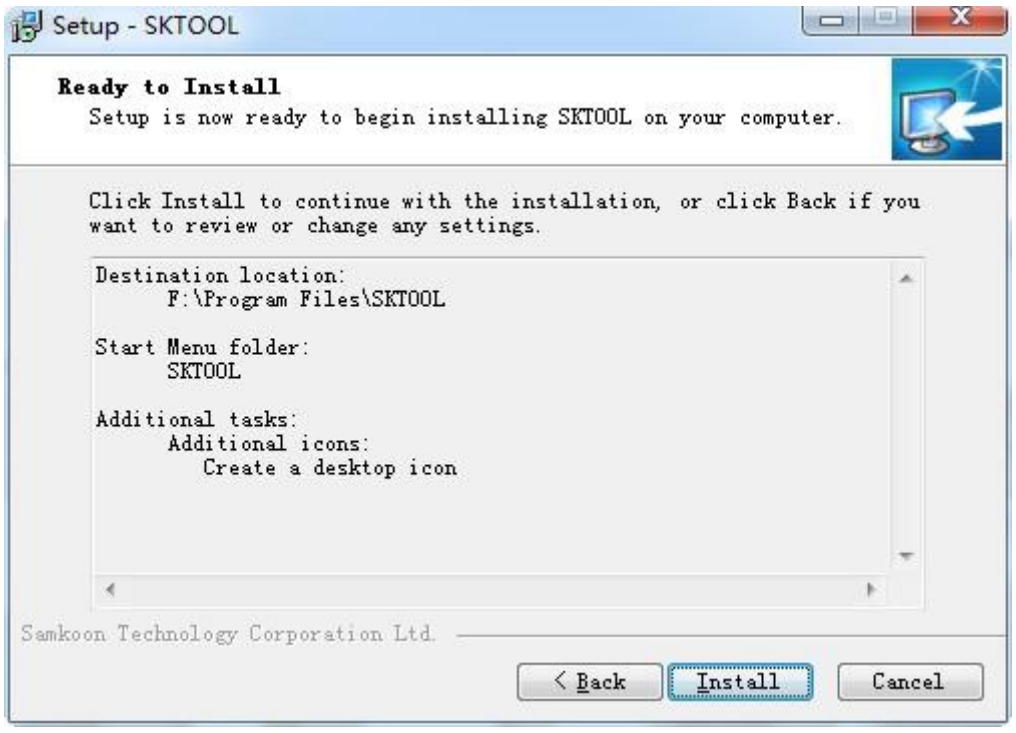


Figure 2-8 Installation Affirmation Interface

Installation Interface， Click Cancel to cancel the installation. As shown in Figure 2-9:

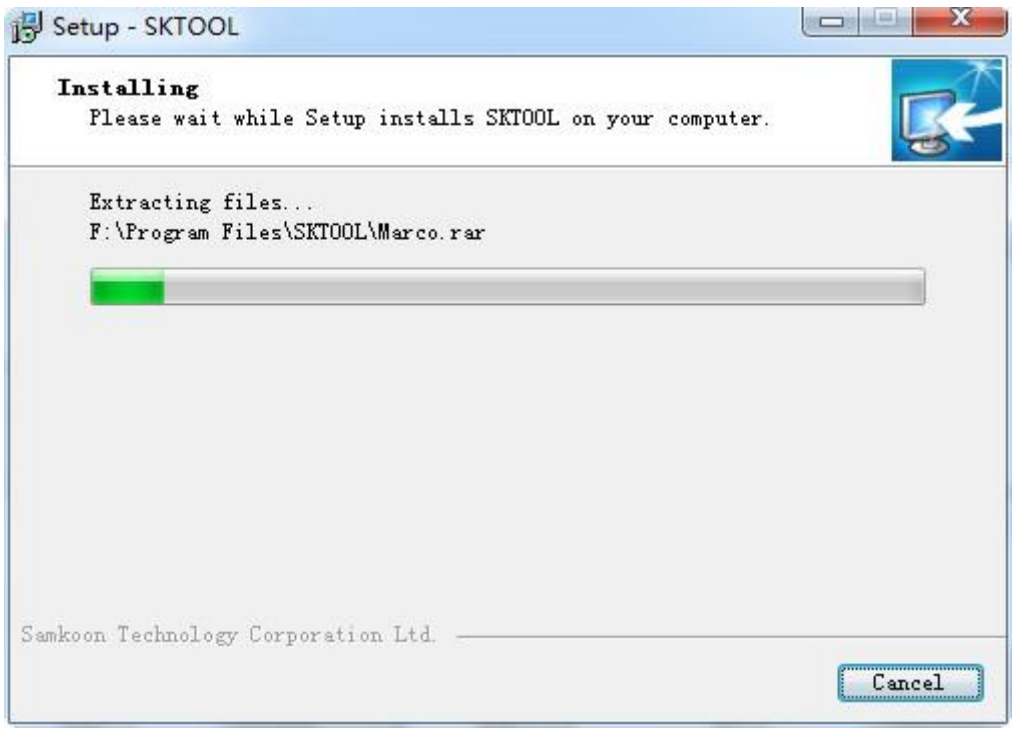
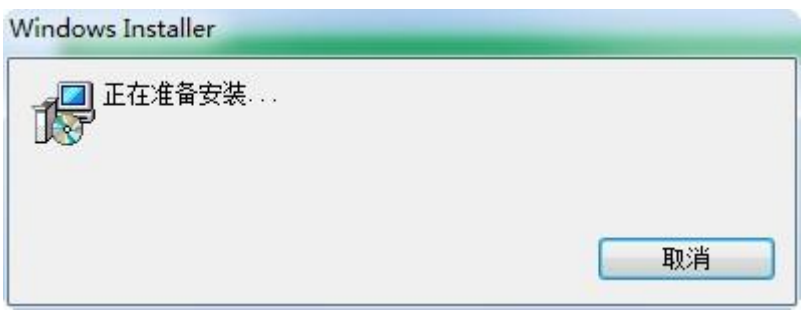


Figure 2-9 Installation Interface

Having installed the software, it will install USB driver automatically. As shown in Figure 2-10:



Having installed the driver, it will display Installation Completed Interface; click Finish to end the installation guide. As shown in Figure 2-11:

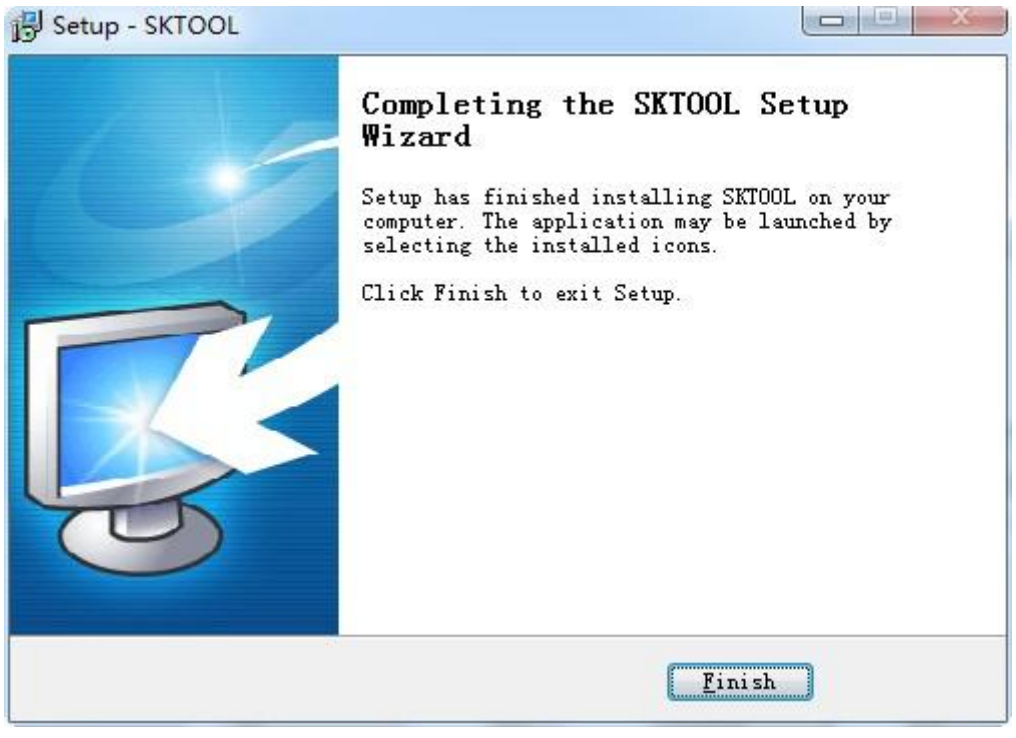


Figure 2-11 Installation Completed Interface

After the installation, the SKTOOL icon will appear on the desktop. As shown in Figure 2-12:



Figure 2-12 desktop shortcut

If installation CD is unavailable, please download the corresponding download package on Samkoon official website.

4.4 Uninstall Software

To uninstall SKTOOL configuration software, please follow these steps:
The first method:
Step one: Select the Windows "Start" - "Programs" - "SKTOOL", choose Uninstall SKTOOL option.
As Figure 2-13 shows:

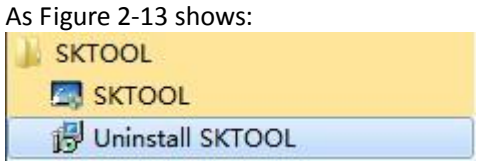


Figure 2-13 choose Uninstall SKTOOL option

Step Two: In the pop-up dialog box, left click "Yes" and wait for Windows system to automatically delete SKTOOL software. When the removal is completed, left click "Finish" button, as shown in Figure 2 -14 and Figure 2-15:



Figure 2-14 Confirm Uninstalling



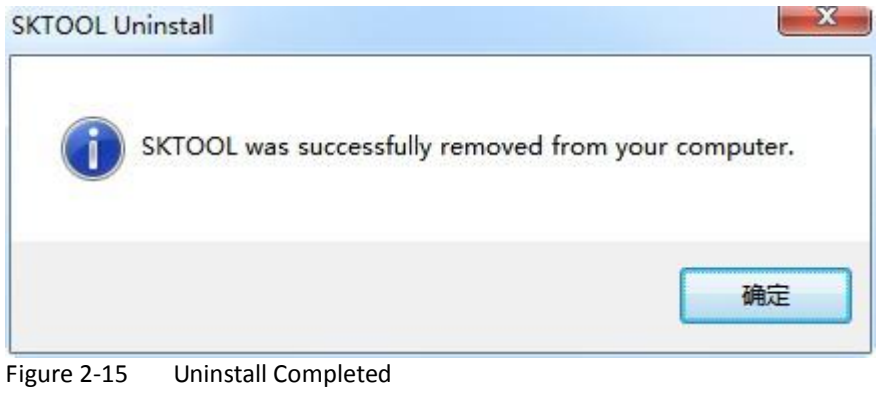


Figure 2-15 Uninstall Completed

The second method:
Step One: Select in the Windows "Start" - "Settings" - "Control Panel", go to the Control Panel interface and then select the "Add / Remove Programs" dialog box, as shown in Figure 2-16

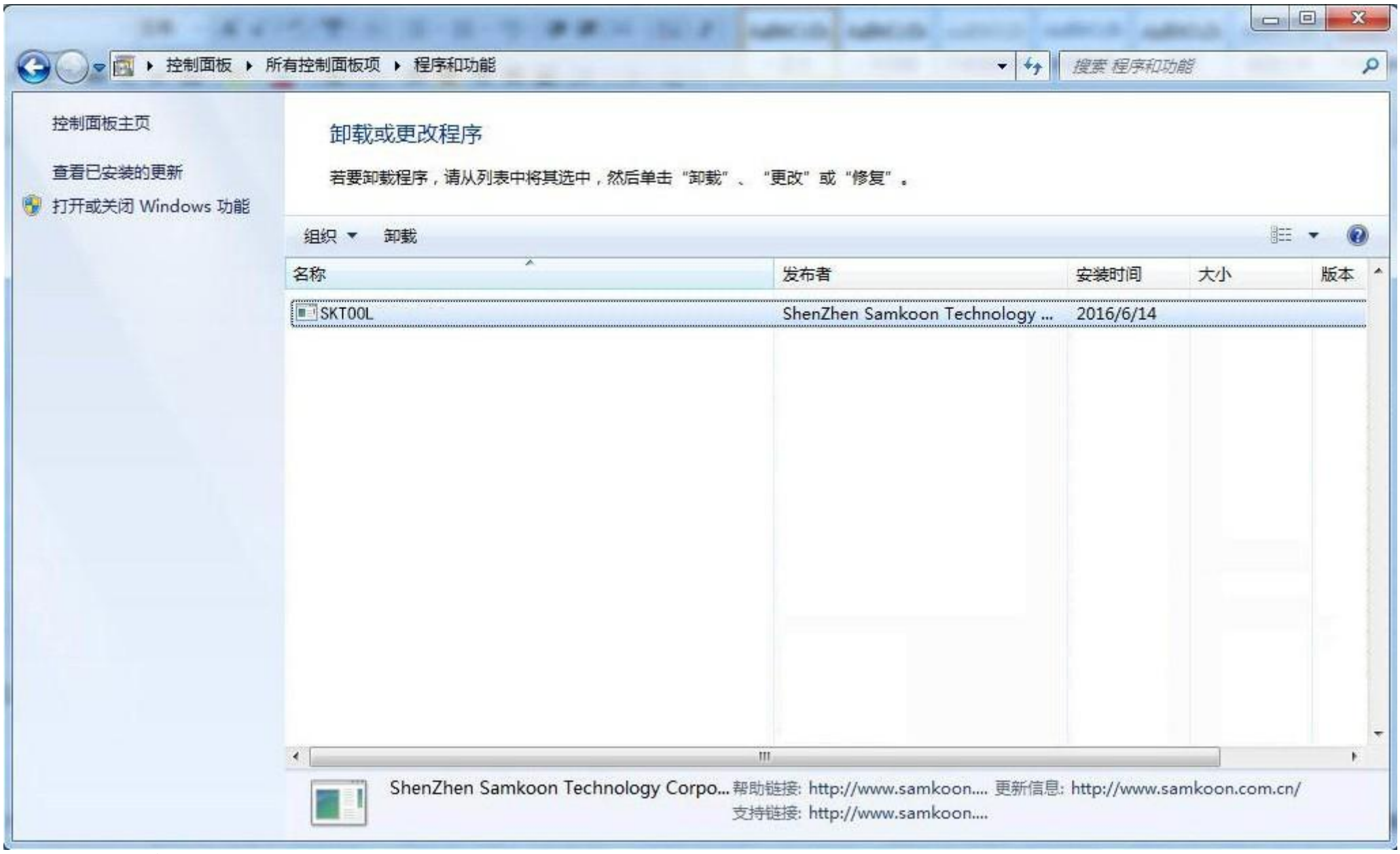


Figure 2-16 Add / Remove Programs

Step Two: Select SKTOOL in the left area of the Figure 2-16, click "Change / Remove" button and follow the second and third step of the first method. Then the system will automatically delete SKTOOL configuration software and its corresponding components.

4.5 Run SKTOOL

A shortcut will appear on the desktop after the installation of SKTOOL, as shown in Figure 2-17:



Figure 2-17 desktop shortcut

At the same time, program packages are added to the start menu of Windows, as shown in Figure 2-18

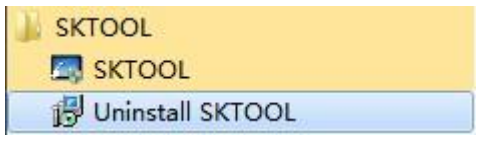


Figure 2-18 start menu program icon

Double click the shortcut on the desktop or the Start menu, click Run SKTOOL.exe SKTOOL configuration software program group, and the interface is shown as Figure 2-19:

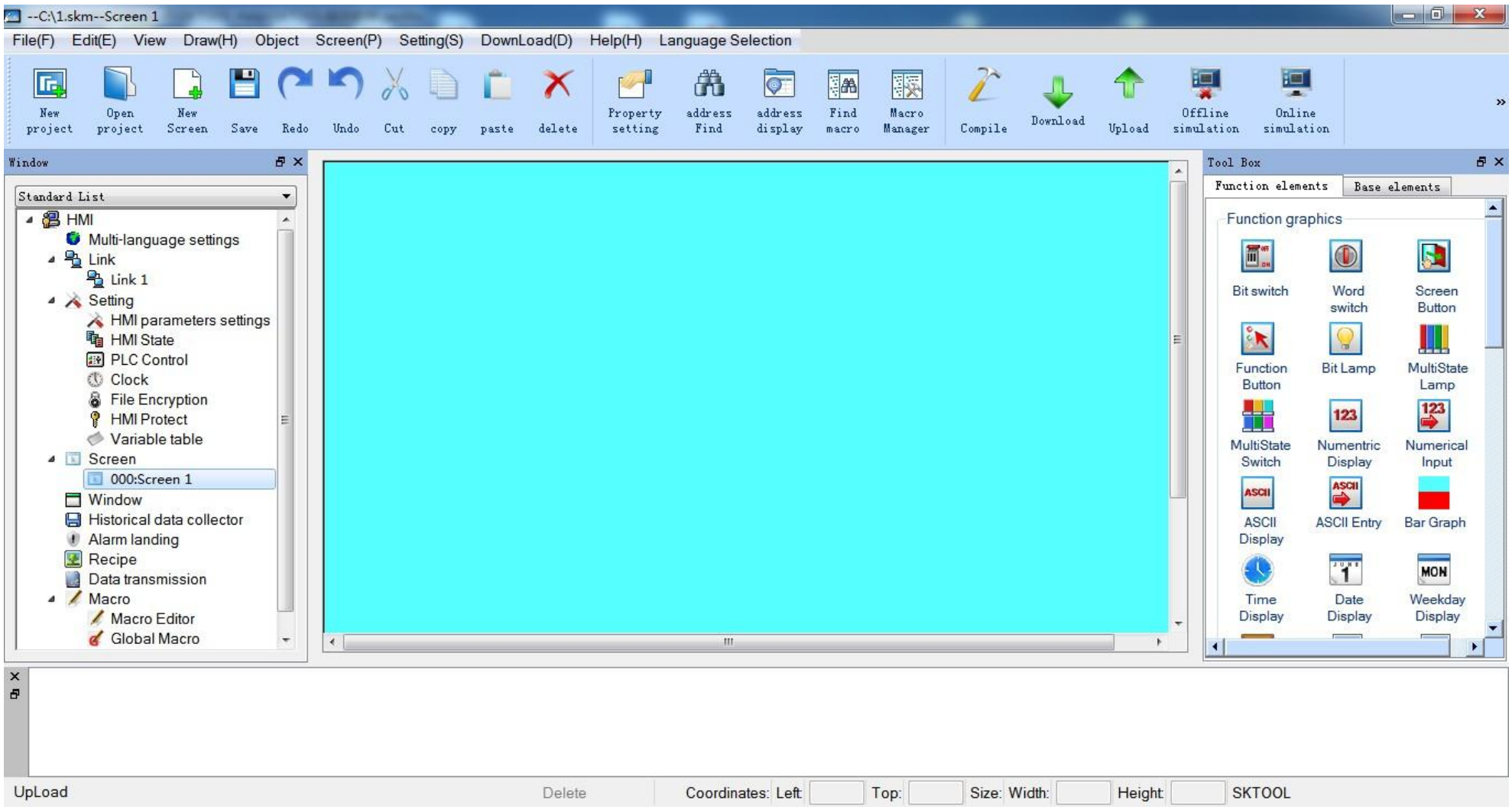


Figure 2-19 Software running interface

4.6 Edit Interface and System Composition

Simple and user-friendly, editing interface of SKTOOL is easy to operate. This chapter introduces configuration screens and each function button of this software.

Contents：

- Editing interface of SKTOOL
- System composition of SKTOOL

4.6.1 Edit Interface

Created for the HMI of Samkoon SK series from Shenzhen Samkoon Technology Corporation Ltd. SKTOOL 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 SKTOOL. Development interface and functional areas are as shown in Figure 2-27:

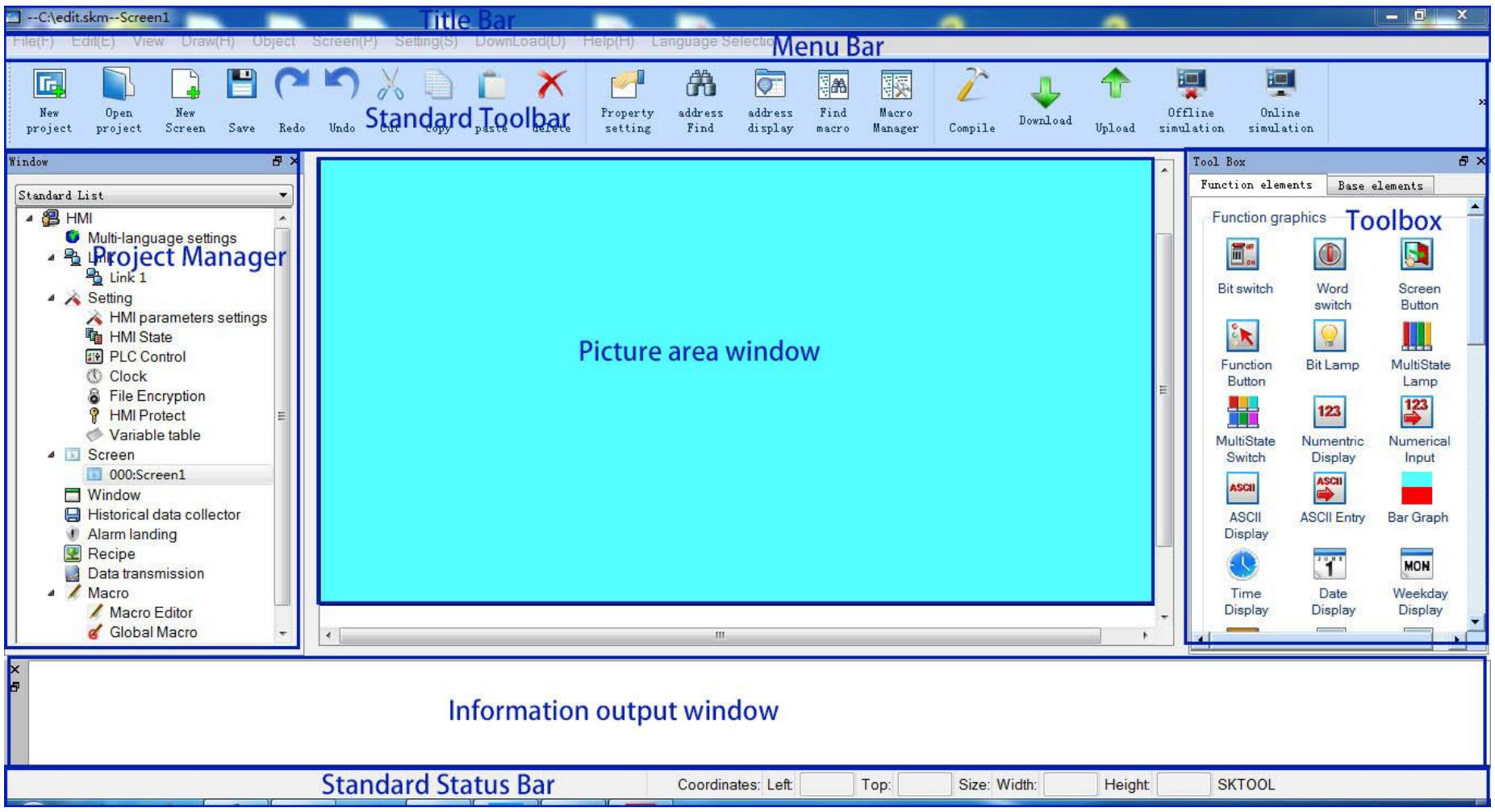


Figure 2-27 Interface and areas of the software

- Title Bar: Display the name of SKTOOL version.
- Menu Bar: Show various command menus of SKTOOL that are all drop-down menu.
- Standard Toolbar: Shortcuts to commands button; Display file; open project; new project; restoration and other function buttons.
- Toolbox: Basic configuration controls designed for engineers to configure; contain function controls and basic controls.
- Picture area window: Window for engineering staff to configure, edit graphic object.
- Project Manager: Communication connections, parameter settings, picture management, alarm settings, set formula and tree-form menu set by historical data collector.
- Information output window: Prompts concerning information input, output, error messages and other tips as engineers conduct configuration editing and compiling.
- Standard Status Bar: The current state of configuration, including the mouse coordinate, the control type, the control coordinate, the control size, etc..

4.6.1.1 menu bar

Editing menu bar of SKTOOL 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, Download menu, Help menu, Language selection menu, and also a Right-click menu.

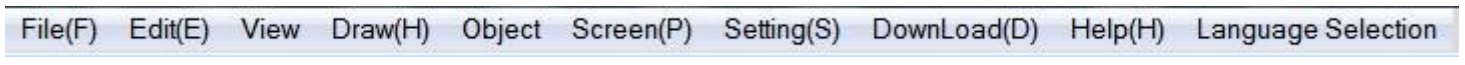


Figure 2-28 Menu bar

File menu

"File" menu supports operations of New project (N), Open Project (O), Close, Save (S), Save As and Quit (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, then ejects a pull-down File menu toolbar.



Figure 2-29 “File” menu

- 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 .skm.
- Close: to close the current project file without exiting SKTOOL 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 SKTOOL configuration software.

Edit menu

"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 mean 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.

- 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.



Figure 2-30 “Edit” menu

- Select: 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 picture 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 can’t be touchable after being downloaded to the touch screen. Layer is recommended if it is necessary to overlay touchable objects.



When using Assemble key, do not assemble objects to be touched, or it can’t be touched after downloading to the touch screen. Users may use Layer command to superpose touch 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.

View menu

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.



Draw menu

The menu is mainly used to draw graphics on the screen. SKTOOL 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 picture elements created by the Tools menu.

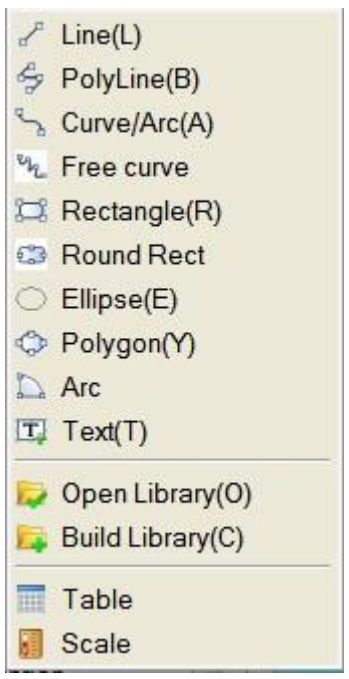


Figure 2-31 "Draw" menu

- 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 a current picture.
- 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 picture 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.

Object menu

"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. 'Object' menu corresponds to the third row of the toolbar.

- 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 Button: 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 picture 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 picture in the current screen monitoring the word status of multiple consecutive device addresses.

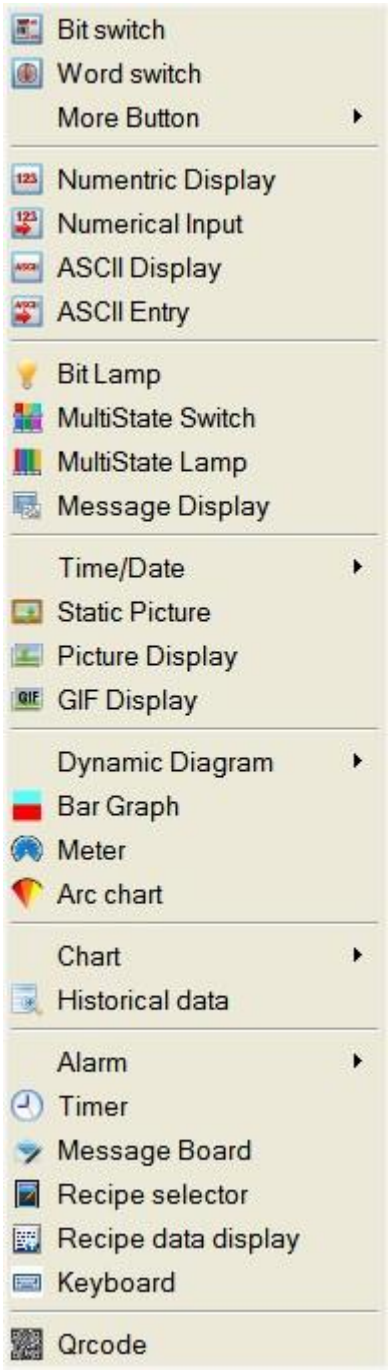


Figure 2-32 “Object” menu

- 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 picture display frame on the current screen for displaying a plurality of pictures.
- GIF Display: Execute this command to draw a picture 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 picture.
- 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.

Screen menu

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

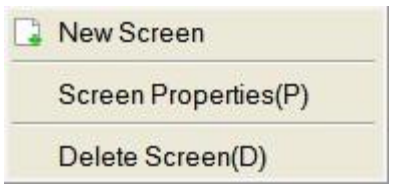


Figure 2-33 “Screen” menu

- 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.

Tips:

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

Setting Menu

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

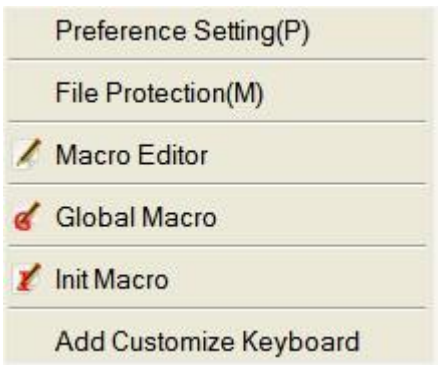


Figure 2-34 “Setting” menu

- 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.
- 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.

Tips:

Please keep in mind the password since password is necessary to open the project configuration file after the setting. And it is case-sensitive.

Download menu

Applied to compile and download the configuration project, “Download” menu contains eight commands, which are Compile (C), Off-line Simulation (M), Online simulation, USB download (D), Upload, Pack/Unpack, Extract project & save as and Extract Remote Simulation Engineering (A). Having connected PC to a touch screen through USB cable, the configuration project can be downloaded via USB download to the touch screen, but you have to compile it before downloading.

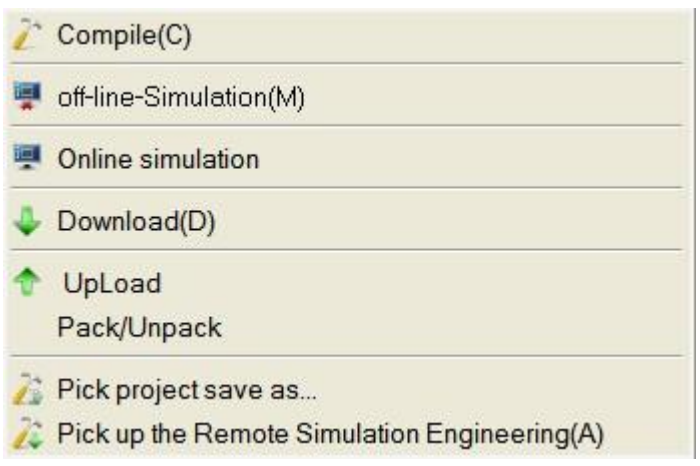


Figure 2-35 “Download” menu

- Compile: Execute this command to examine configuration projects created by users and prepare for download operations.
- Off-line Simulation: Execution of this command can invoke the application program of SKTOOL picture 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 SKTOOL 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 picture. 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.
- USB Download: Execution of this command can download engineering configuration compiled by SKTOOL software to HMI through a USB cable equipped with the touch screen. 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 equipped with the product.
- Pack/ Unpack: Execute this command to compress the project configuration into an XXX.skr file, or to extract the compressed file to the project configuration file .skm.
- Extract Project & Save As: Execute this command to compile the current configuration project to a binary file named u-disk-prj.bin. Saving it in the U disk, instead of USB cable downloading, can update it automatically to the HMI.

Extract Remote Simulation Engineering

Help menu

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



Figure 2-36 “Help” menu

The help file is shown in Figure 2-37:



Figure 2-37 Help file

Version number and copyright statement of SKTOOL are shown in Figure 2-38:

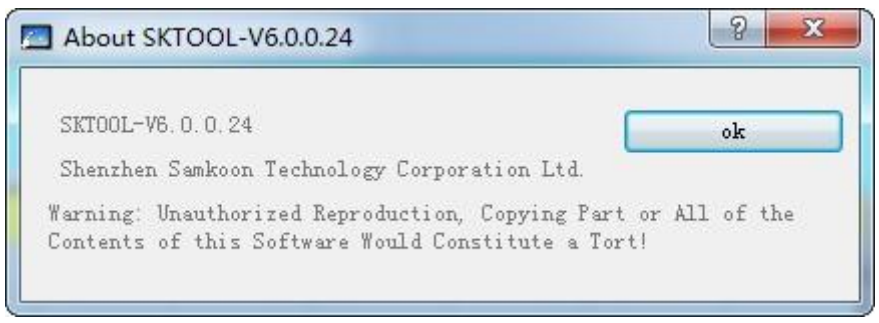


Figure 2-38 Version number statement

Language Selection menu
The menu can realize Chinese-English switch.

Select "Chinese", and the software is the version of simplified Chinese; or "English", then the English version.



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.

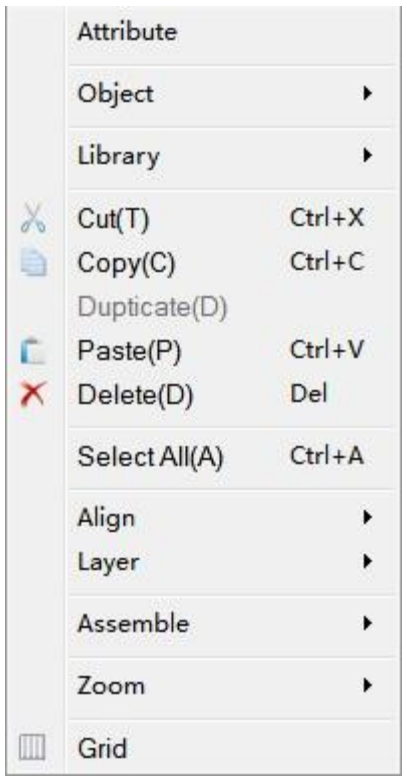


Figure 2-39 “Right click” menu

- 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 pictures.
- 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 picture 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.

Tips:

When using Group, please be sure not to assembly objects to touch, otherwise objects can’t be touchable after being downloaded to the touch screen. 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.

Tips:

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

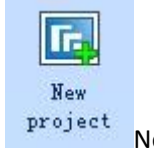
4.6.1.2 Standard Toolbar

SKTOOL 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. SKTOOL provides a total of 35 tool buttons, which will turn gray if the If the operation is invalid in the current environment.



Figure 2-40 Standard Toolbar

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



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 .skm.



New Screen: Execute this command to create a new screen in the current project.



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.



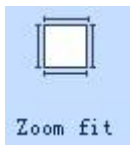
Flip Vertical: Execute this command to make a single graphic or multiple graphics pivot vertically.



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.



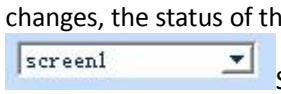
Zoom out: Execute this command to shrink the current screen half the size; to continue zooming out, proceed to execute the command.



Language: Execute this command to select the language you want.



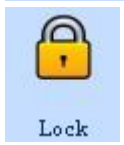
Status drop-down box: If select a control with status, the drop-down box will show the number of control status; if the number in the box changes, the status of the selected control will switch into corresponding status.



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 can not be moved after locking.



Unlock: Execute this command to remove the locking of screen buttons.



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.


Use this command to open the tool buttons that are not displayed; when the mouse moves away, the popup disappear.



Off-line simulation: Execute this command to run directly off-line simulation command.



Online simulation: Execute this command to run directly online simulation command.



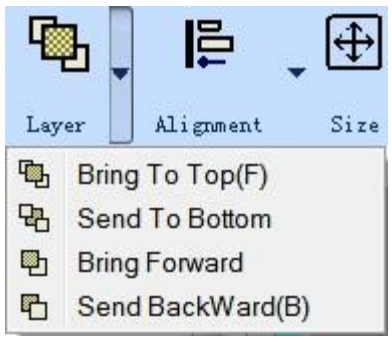
Compile: Execute this command to check user’s own configuration engineering and get ready to download.



Download: Execute this command to pop up the download dialog; after connecting the SK HMI to PC, you can download the configuration project to the touch screen.

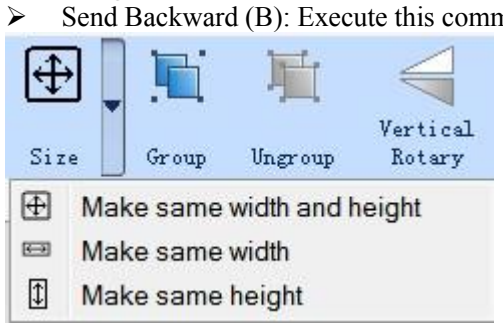


Upload: Execute this command to upload historical data, configuration, formulas and alarm history from a running HMI to a PC via the equipped USB cable.



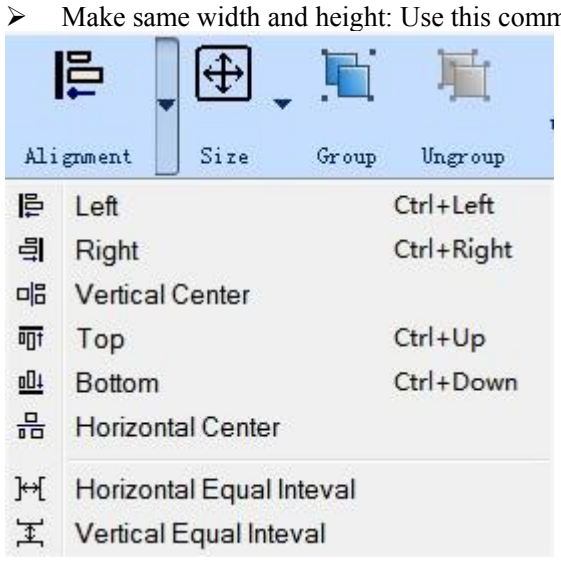
Layer: Level drop-down box, includes four operating controls: Bring to top, Send to bottom, Bring forward and Send backward

- 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.



Size: Size drop-down box includes three operating controls: same width and height, same height, same width.

- 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.



Alignment: Alignment drop-down box includes a total of eight operating controls: left-aligned, right-aligned, Vertical Center, Horizontal Center, Top, Bottom, Horizontal Equal Interval and Vertical Equal Interval.

- 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.
- 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.
- 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.

4.6.1.3 Project Manager

SKTOOL Project Manager window is in the left of configuration software window, below the toolbar. You can here set the parameters of the touch screen, including Multi-language Settings, Connection, Setting, Screen, Window, Historical data collector, Alarm landing, Formula, 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.

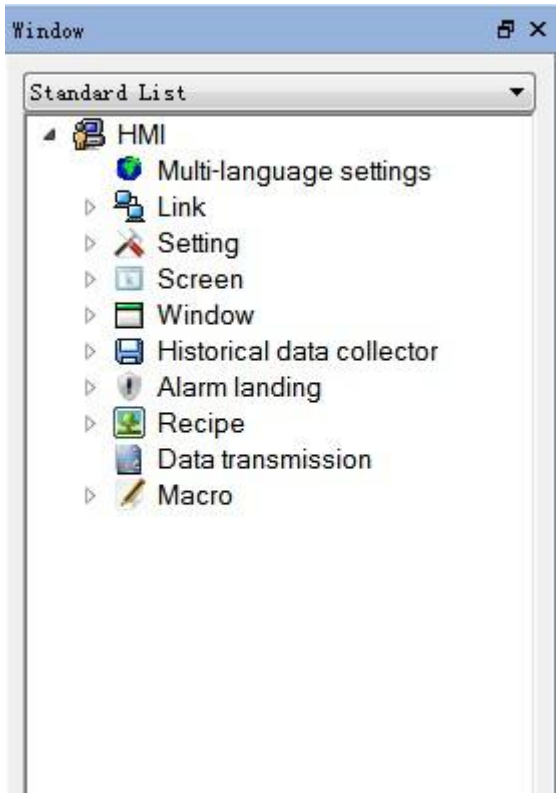


Figure 2-41 Project Manager window

4.6.1.4 Toolbox

SKTOOL 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. SKTOOL supports totally 47 function controls and 14 basic controls.

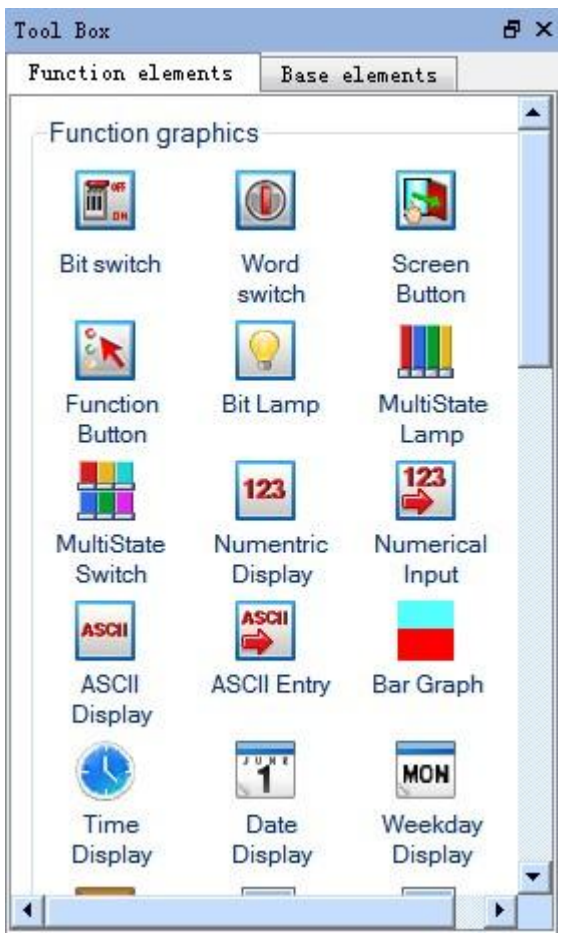


Figure 2-42 Toolbox functional control buttons

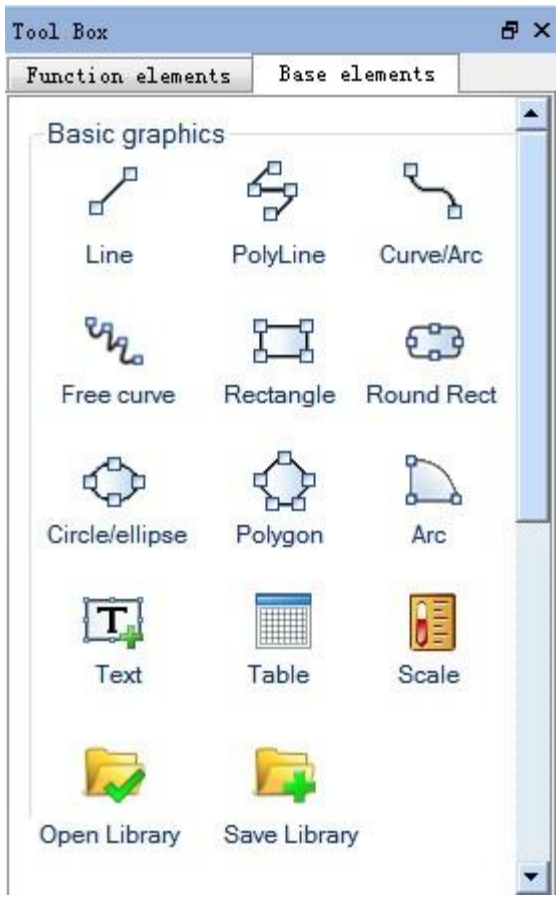


Figure 2-43 Toolbox basic control buttons

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

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 picture.

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.

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 picture library of the system.

Save as Library: Execute this command to convert the selected image control or the current screen or pictures imported from a file into a control or graph.

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.

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 config, 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 picture 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 picture 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.

 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 picture display frame on the current screen for displaying a plurality of pictures.

 GIF Display: Execute this command to draw a picture 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

 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 picture.

 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.

4.6.2 System Composition

SKTOOL is a configuration editing software of Samkoon HMI. SKTOOL 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 touch screen 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. Figure 2-44 shows SKTOOL system composition.

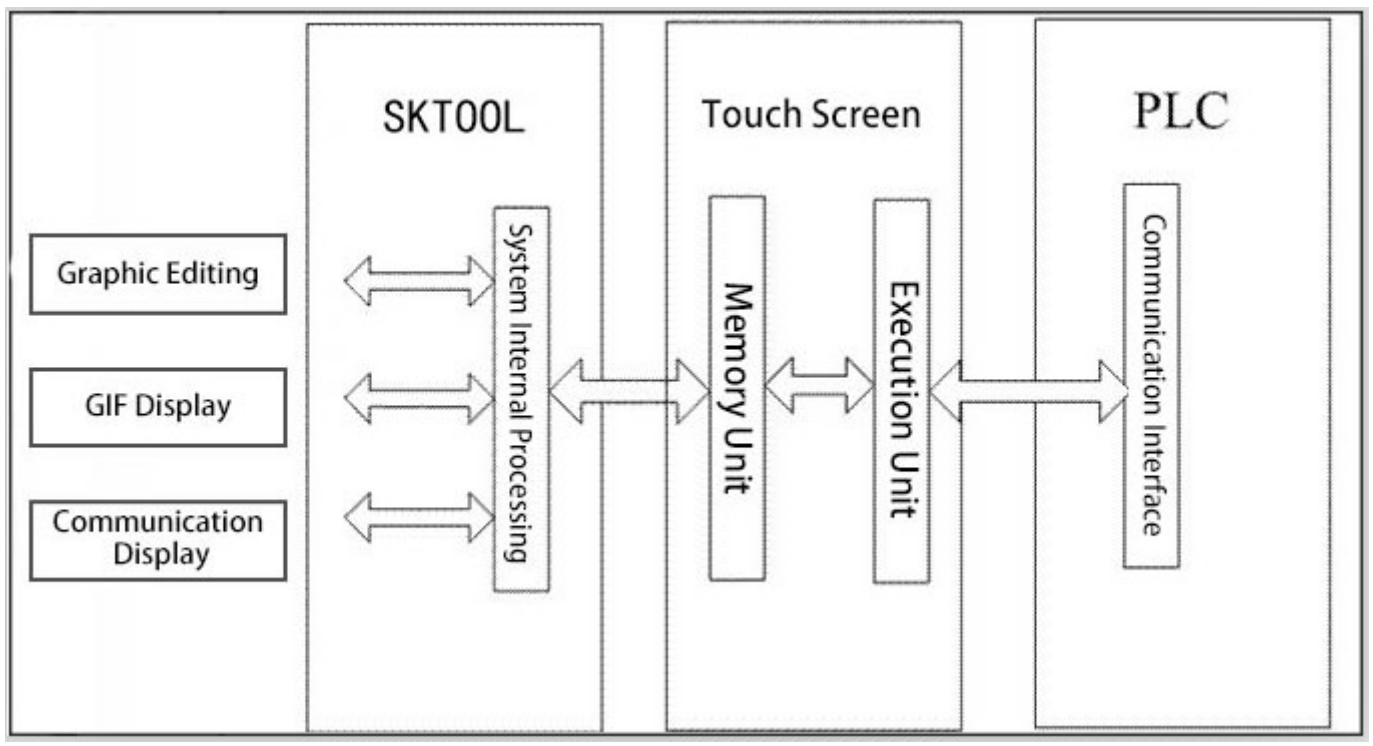


Figure 2-44 SKTOOL System Composition

4.7 Basic Operations

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

Contents：

- Mouse usage and shortcut keys
- SKTOOL's common terms

4.7.1 Mouse usage and shortcut keys

When use the mouse to create configuration screens on the configuration screen editor, the mouse is as shown in Figure 2-45:



Figure 2-45 Sketch of mouse

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 picture, 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, touch screen connection properties, set properties; to change settings of Historical data collector, formulas, 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.

Shapes of the mouse

While edit with SKTOOL configuration software, the shape of the mouse will changes with different operations to distinguish different types of operation.

The following table 2-1 shows available operations under various shapes of the mouse when edit screens:

	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 2-1 Shapes of the mouse and their meanings

Shortcut keys

Table 2-2 below lists common shortcut keys. Designers can use these keys to quicken the configuration.

CTRL+C	Copy
CTRL+V	Paste
CTRL+X	Cut
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

Table 2-2 Shortcut keys

4.7.2 Common terms

Table 2-3 below displays some common terms in configuration editing.

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 SKTOOL configuration is suffixed by .skm; 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
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. SKTOOL 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

Table 2-3 common terms

5. Basic steps of creating a new project

This chapter introduces basic steps of creating a new project.

Contents：

- Create new project
- Set parameters and add graphic object
- Download configuration engineering
- Upload configuration engineering
- Upload historical data record

- Pack/Unpack

5.1 Create 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 SKTOOL 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:

   Path: Storage path of new project file; the default is C: \

   Model: Available models for projects:

   SK-035FE(320*240)

   SK-043FE(480*272)

   SK-043HS(480*272)

   SK-043HE(480*272)

   SK-050HS(800*480)

   SK-050HE(800*480)

   SK-057FE(640*480)

   SK-070FS(800*480)

   SK-070FE(800*480)

   SK-070HS(800*480)

   SK-070HE(800*480)

   SK-102HS(1024*600)

   SK-102HE(1024*600)

   SK-121FS(800*600)

   SK-121FE(800*600)

   SK-104FS(800*600)

   SK-104FE(800*600)

The default model is SK-070FS(800*480), the screen resolution (800 * 480) in the bracket is not displayed in the dialog box.

Display mode: Display direction of the touch screen used by the project. Available models include:

Horizontal: Configuration with the touch screen being horizontal.

Vertical: Configuration with the touch screen being vertical.

The default mode is Horizontal.

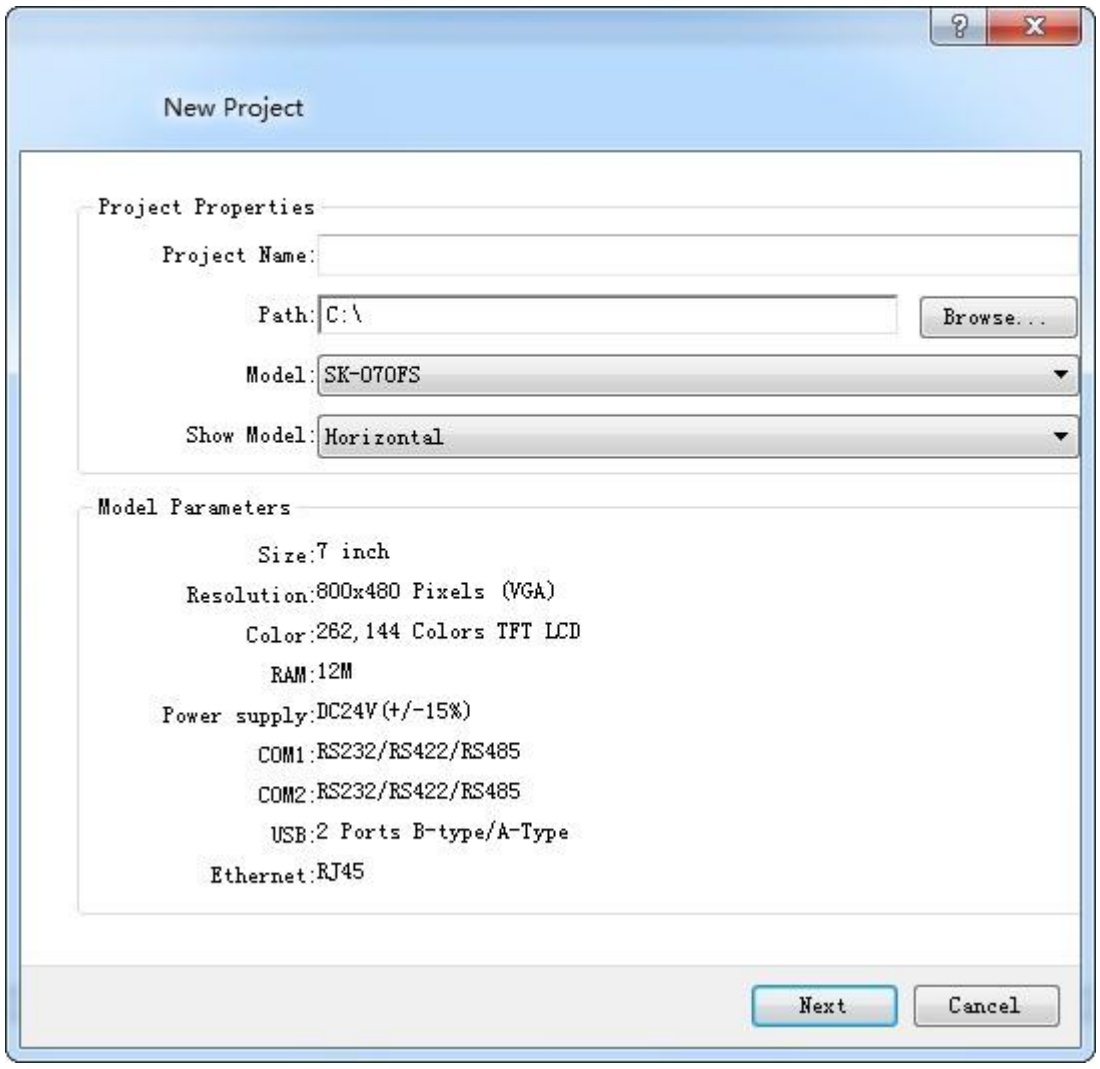


Figure 3-1 New project dialog box

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.

Tips:

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

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

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 touch screens. The specific communication parameters depend on the model of PLC to be connected.

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.

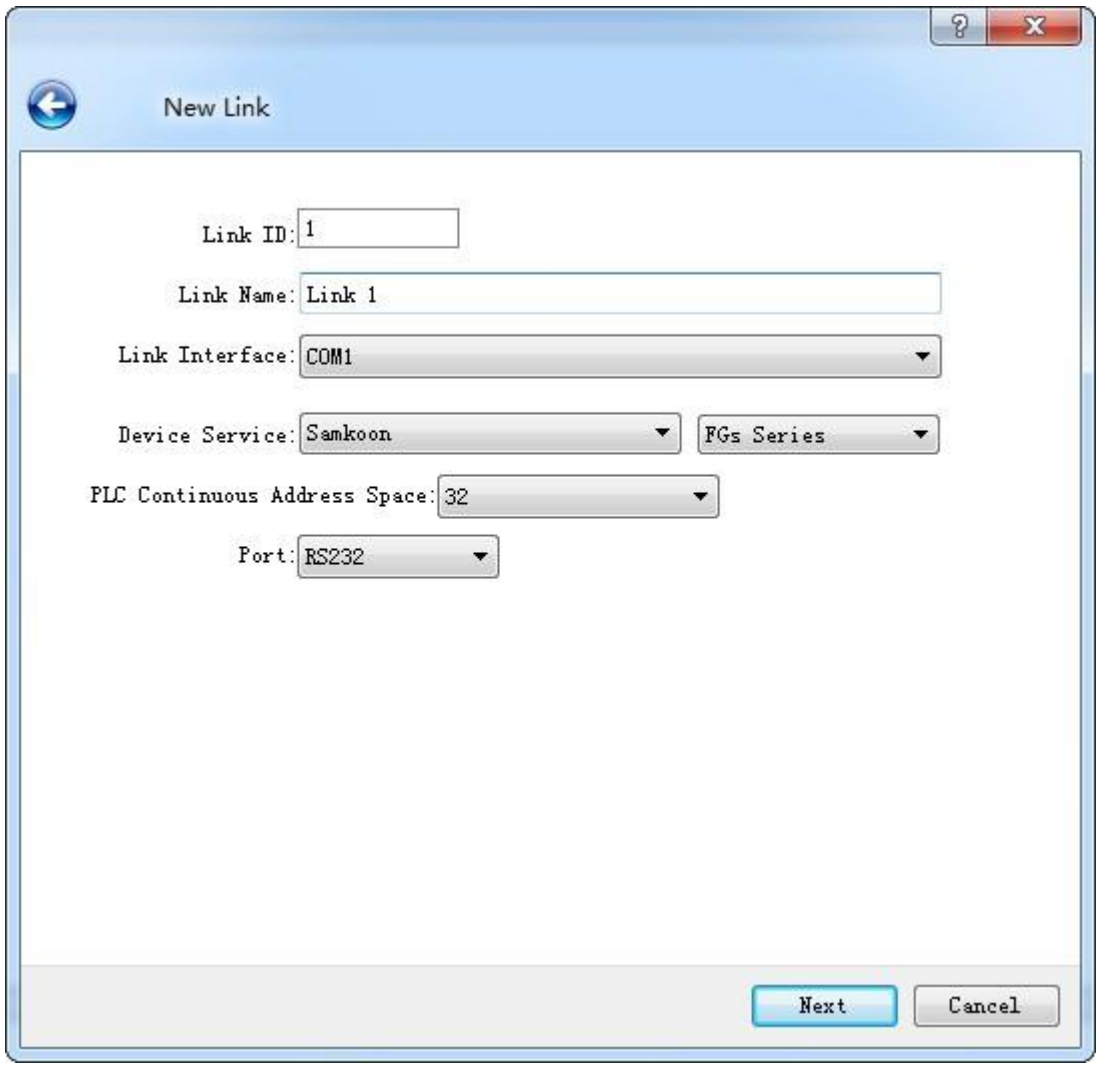


Figure 3-2 Communication setting dialog box

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”.



SK-070F，SK-070H，SK-102H，SK-121F, they all have two communication ports; it’s decided by the used port when connected to one PLC. SK-035F，SK-043F，SK-043H，SK-050H only have one COM port; just set COM1 port.

Connection ID: Internal parameters cannot be changed!

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 picture every time, SKTOOL 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, SKTOOL 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.

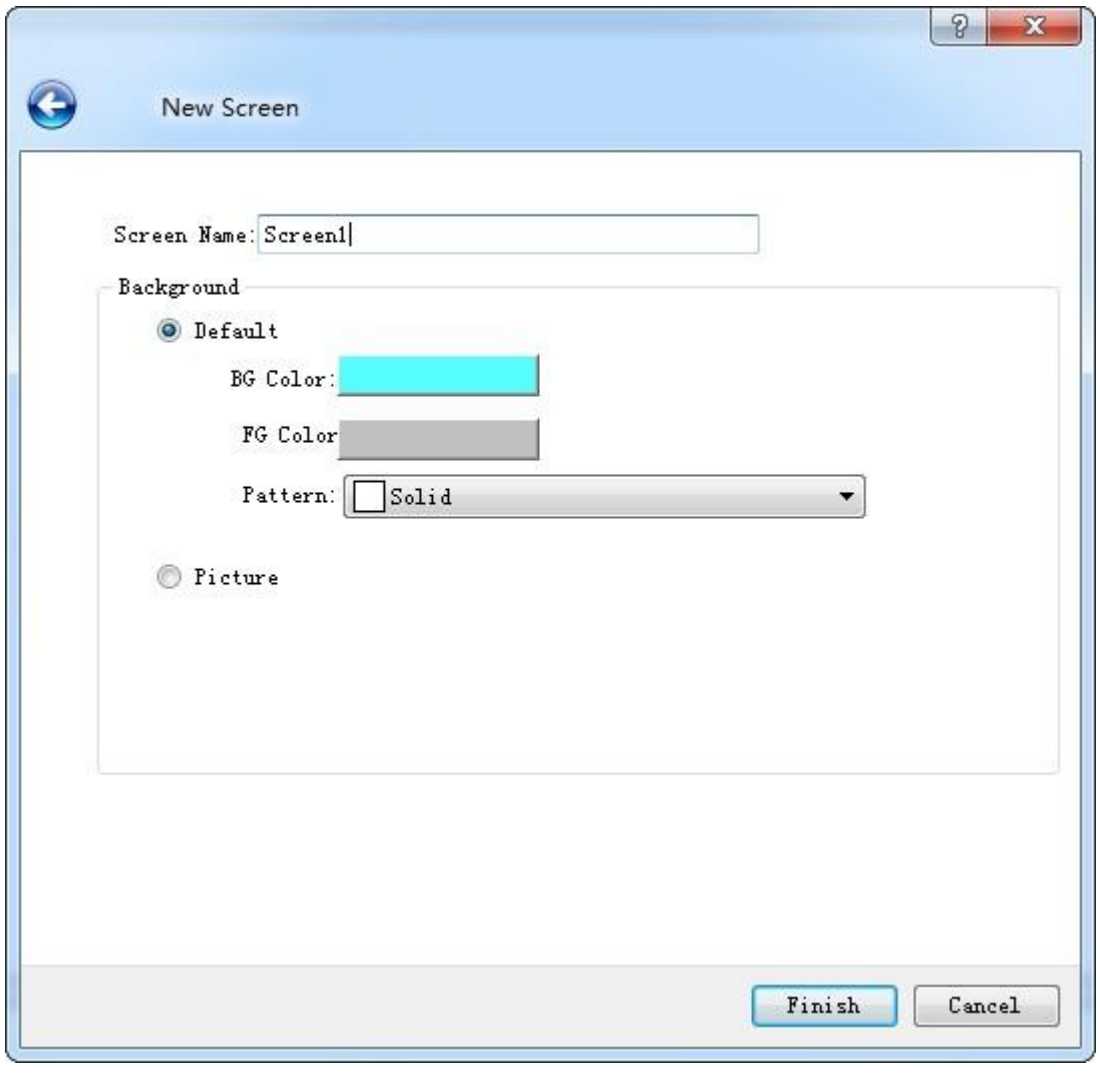


Figure 3-3 New screen dialog box

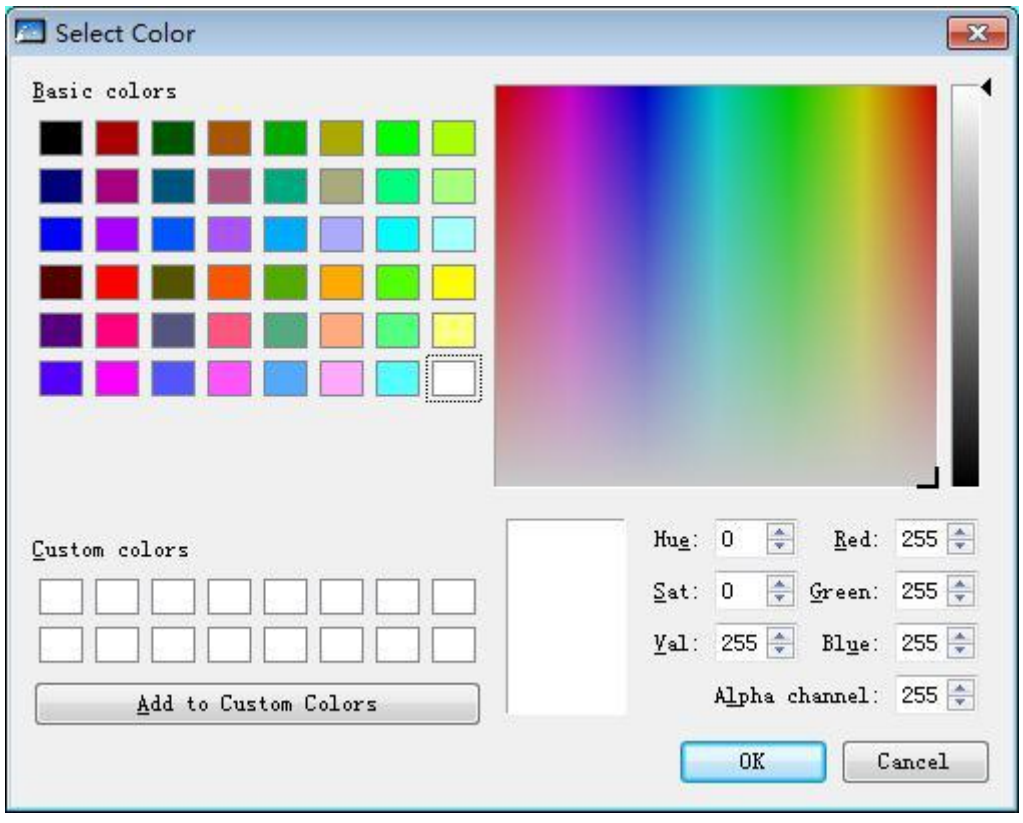


Figure 3-4 Color selection dialog box

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



Figure 3-5 Set the path of picture

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.

5.2 Set parameters and add graphic object

Parameter settings:

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 3-6 below:

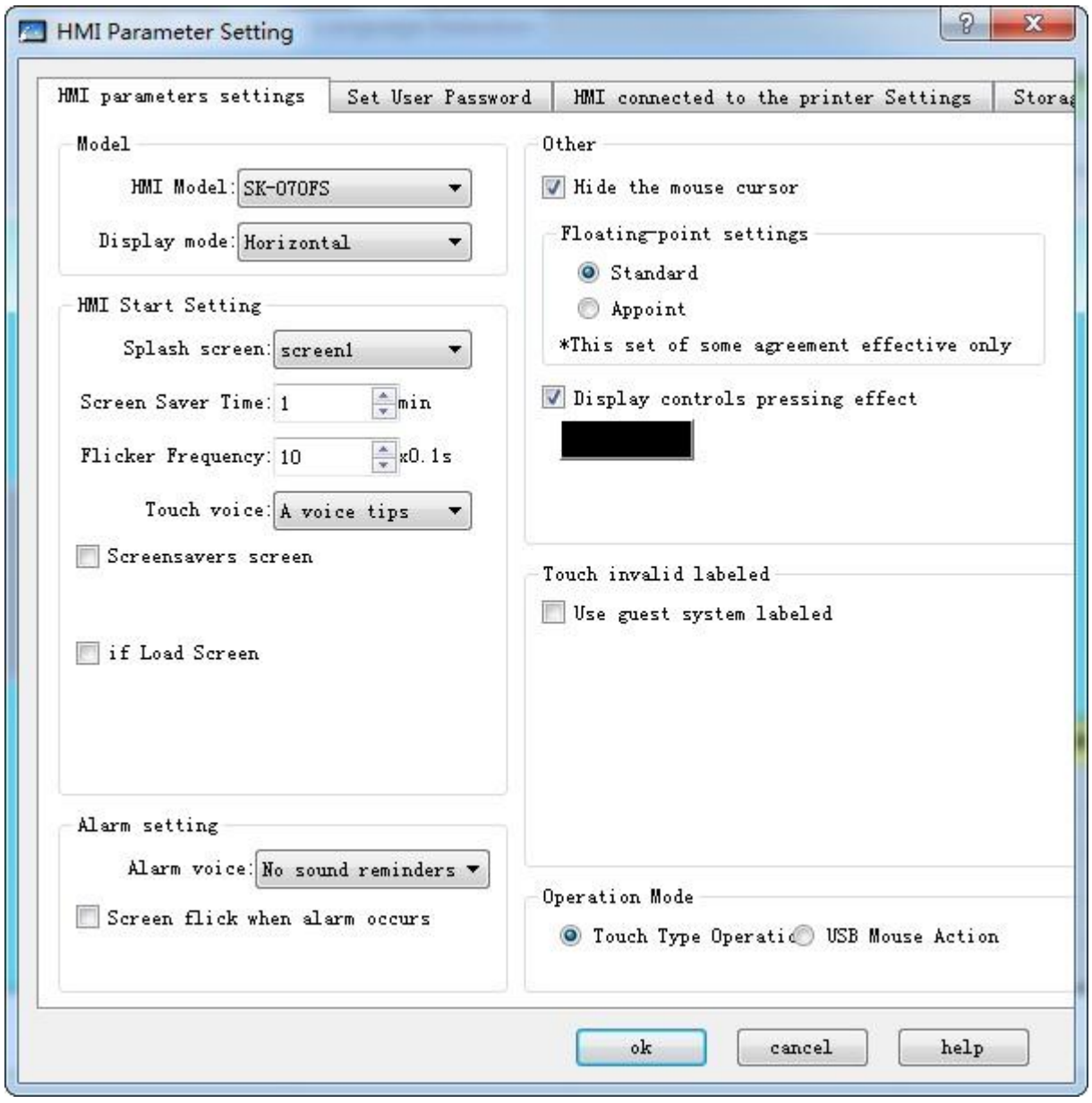


Figure 3-6 General parameter setting dialog box

- HMI Model: Change the HMI model through this option.
- 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 touch screen 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.

- 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.
  - Display controls pressing effect: SKTOOL 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.



Pressing effect of elliptical controls is still a rectangle.

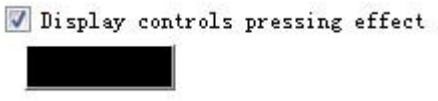


Figure 3-7

2、Set user password

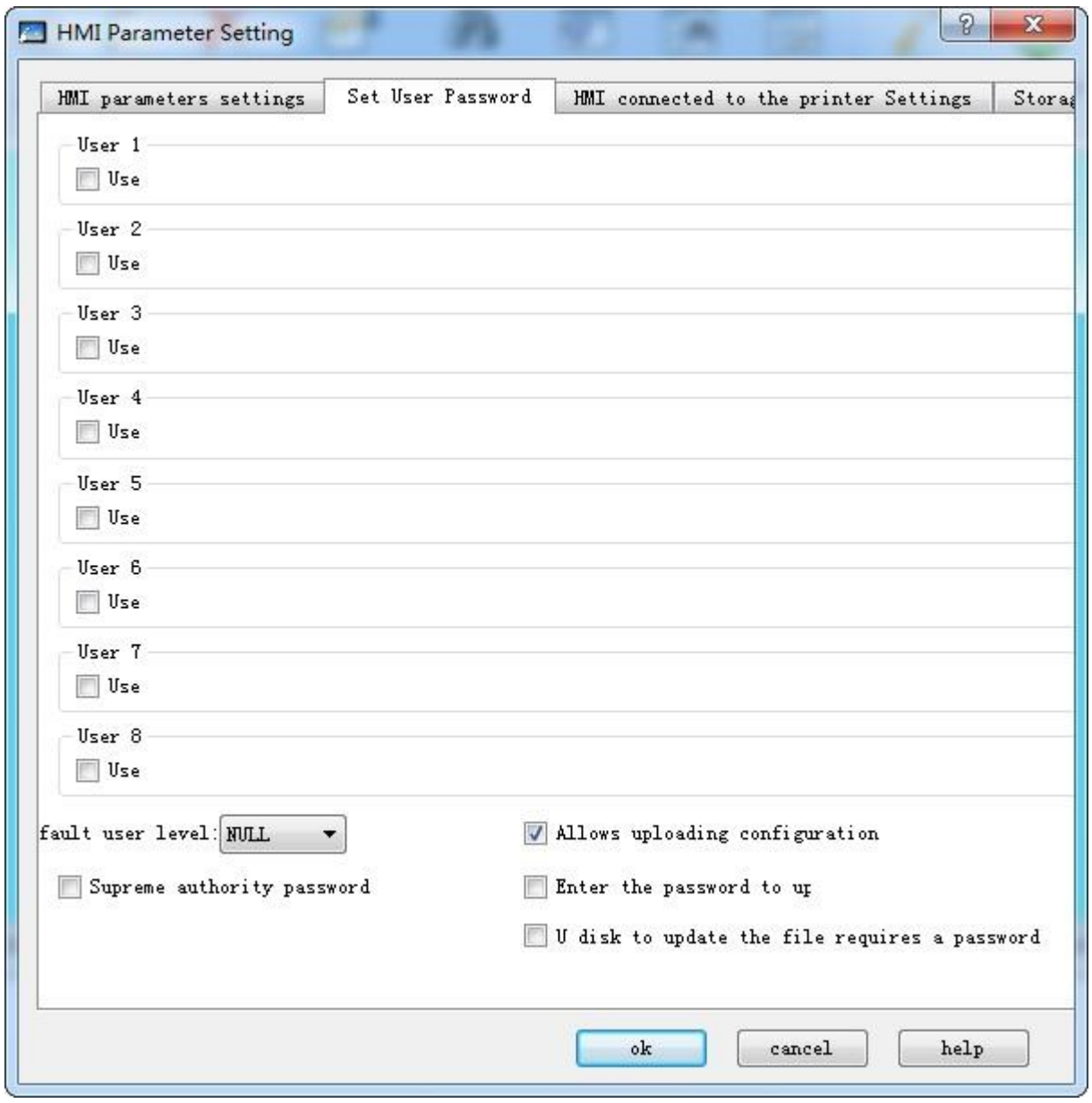


Figure 3-8 Set user password in HMI parameter setting dialog box

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.Settings of connection to the printer and downloading

Click "Settings of connection between HMI and printer" button, as shown in Figure 3-9:

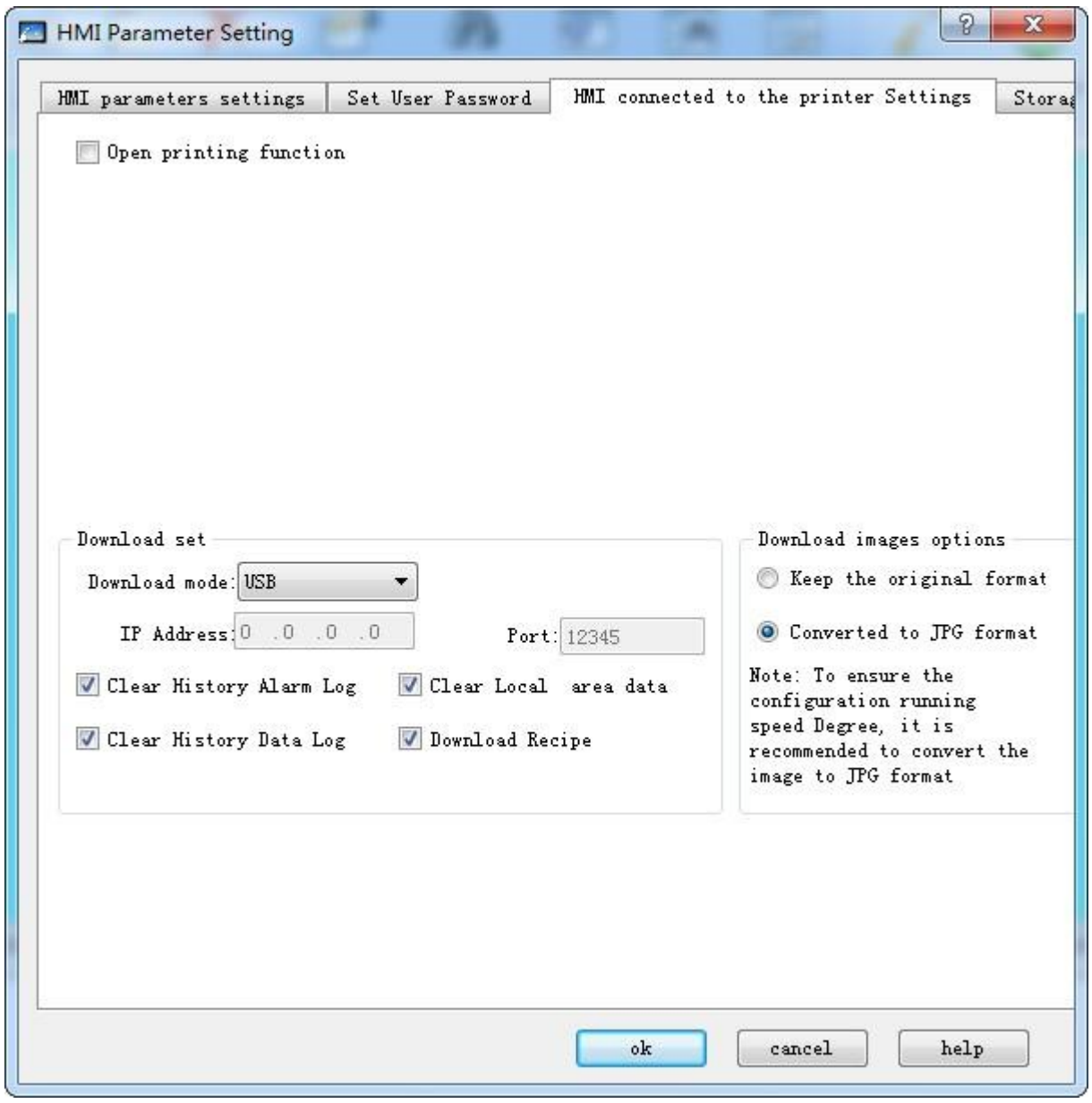


Figure3-9 Settings of connection between HMI and printer

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 Formula: Whether to download formulas 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

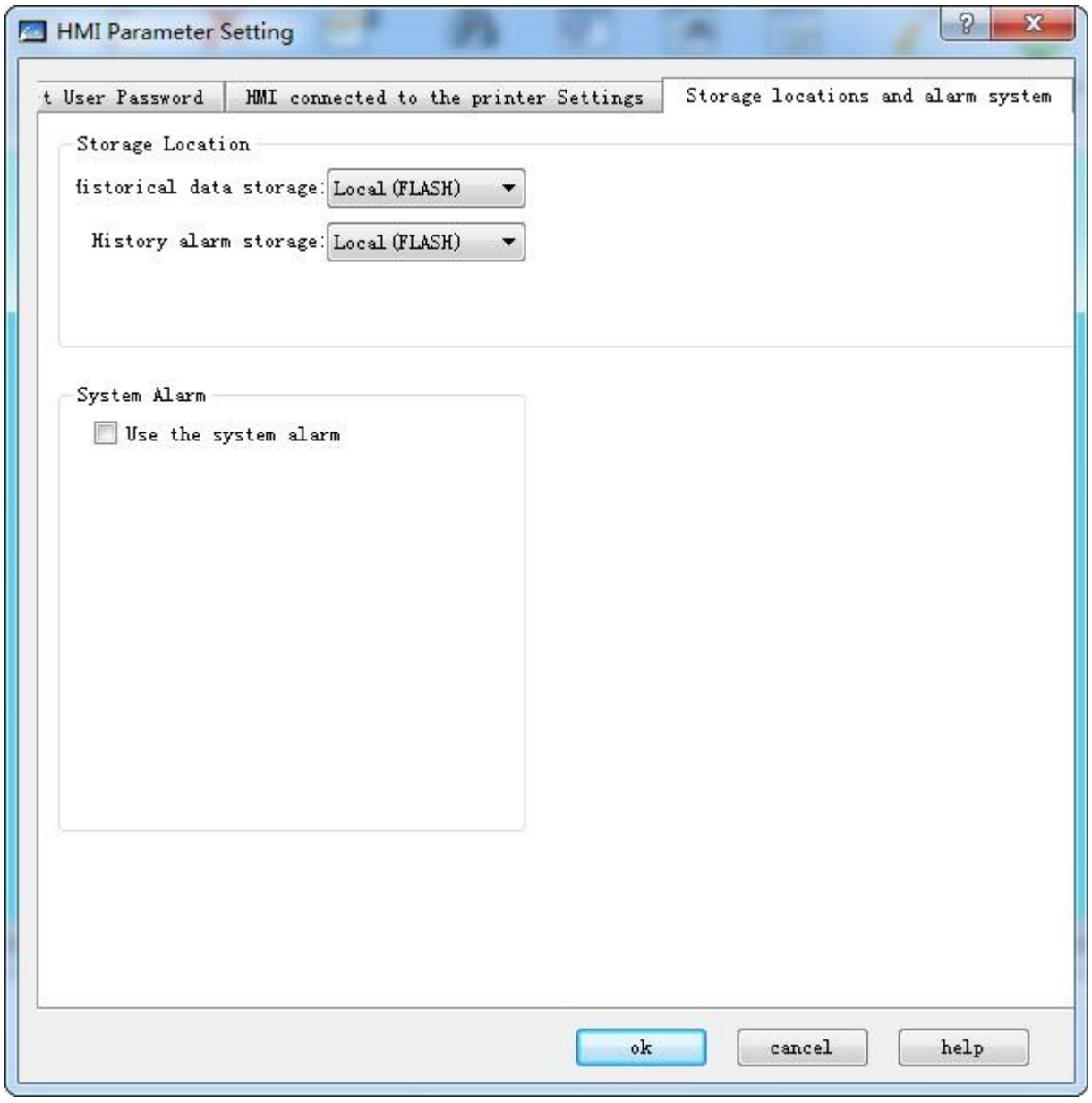


Figure 3-10 Saving position and system alarming setting dialog

- Storage location: Location for historical data, historical alarm and screen shots. Provide "Local (FLASH)", "U disk" and "SD card" three 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.

Tips:

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.

5.3 Download configuration engineering

When complete the editing of configuration, you need to click the button  on the toolbar or employ the shortcut Ctrl + S, and then click  or execute the Compile command in the Download menu to compile. During the compilation, the information output window will show the situation in real time. It can't complete the compilation if error exists. As shown in Figure 3-11:



Figure 3-11 Prompt of compiling error

You can modify it according to the error hint in the information output window; or you can also double-click the error, then SKTOOL 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 3-12:

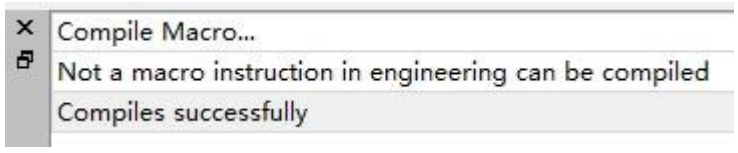


Figure 3-12 Information output window



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 3-11.

After compilation, if you modify again, you need to compile again.

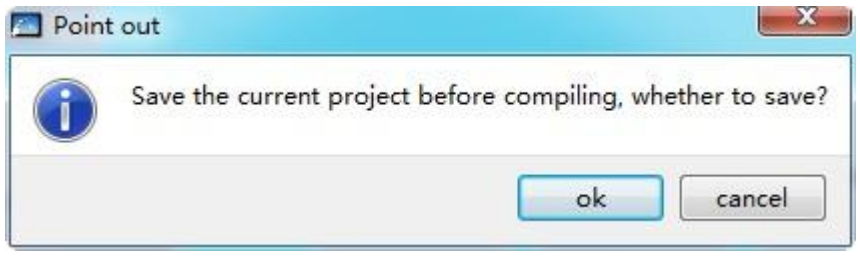


Figure 3-13 Compiling reminder

Finally, execute the command USB in Download menu to download through USB cable; engineers can also directly select the command Compile + Download in Download menu. The implementation of the operation brings up the following pop-up dialog box in Figure 3-12:

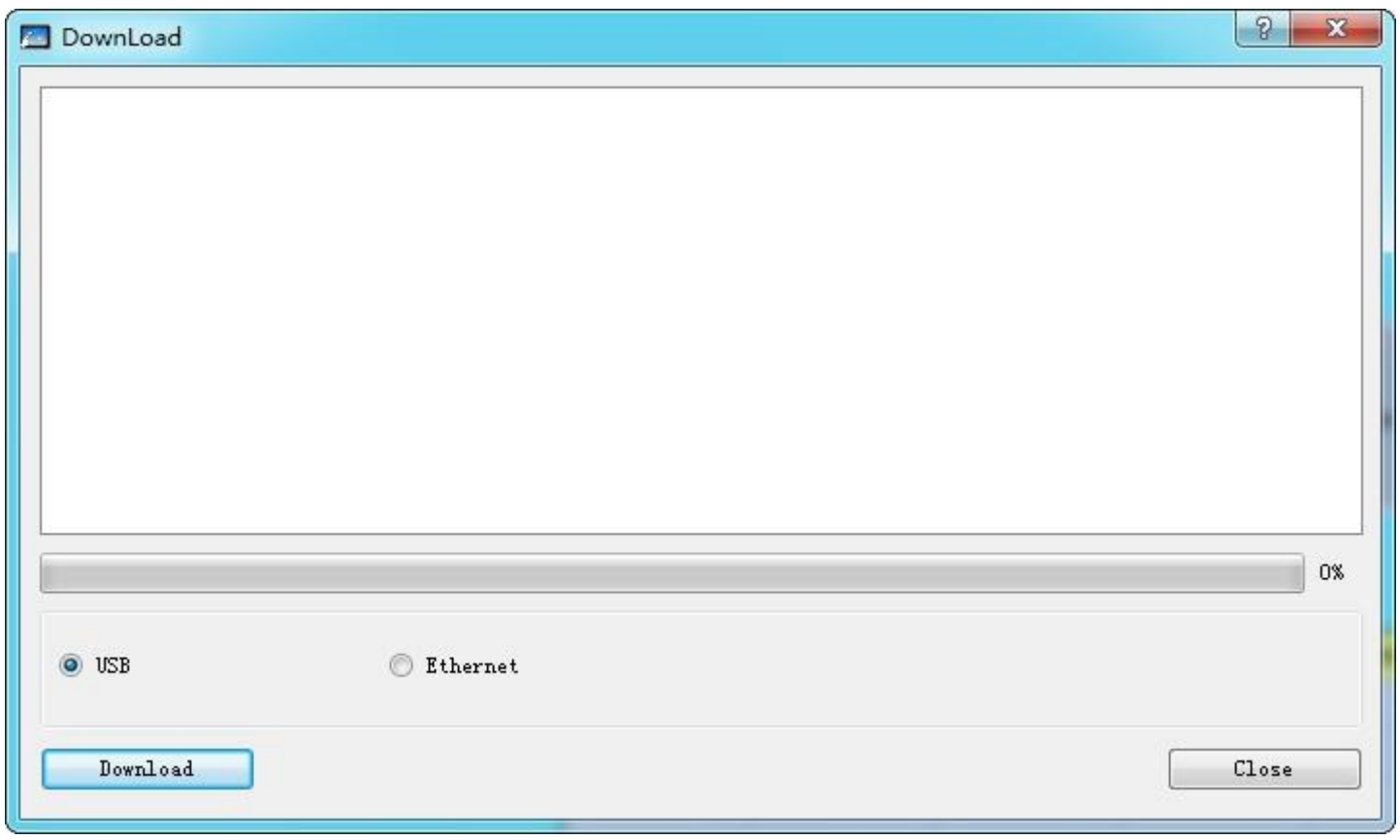


Figure 3-14 Download dialog

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 3-15:

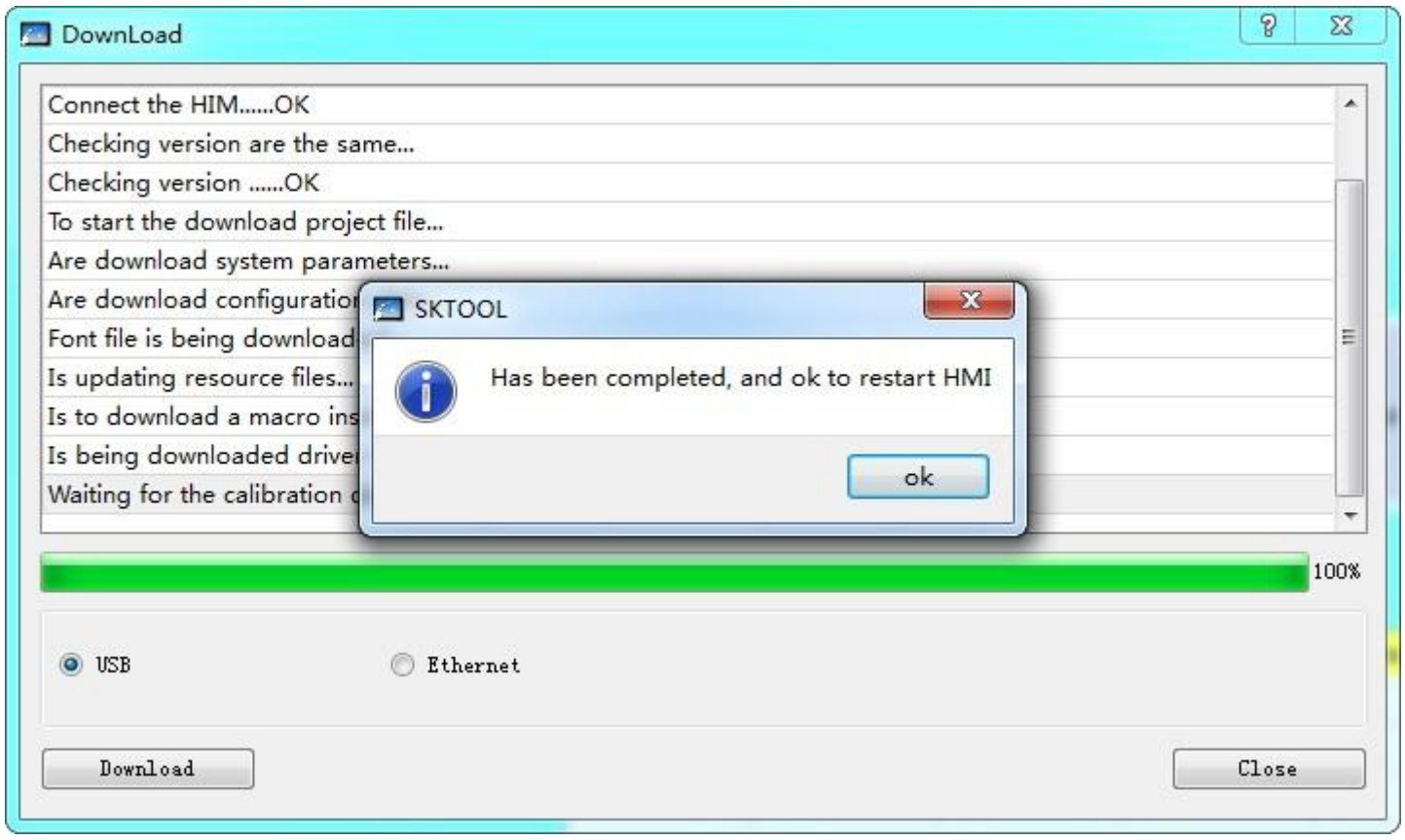


Figure 3-15 Downloading completed

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 “Connection” in Hardware handbook.

Tips:

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.

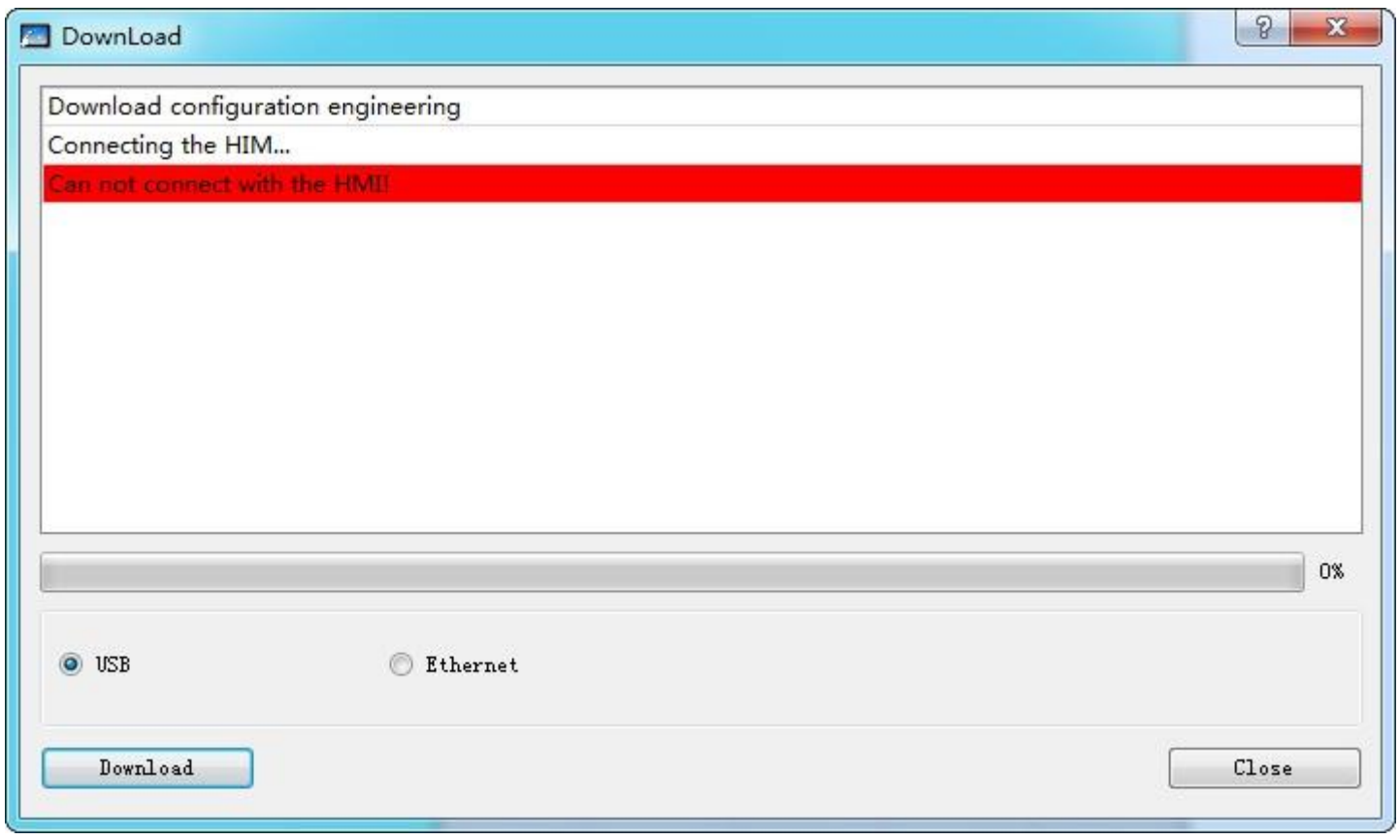


Figure 3-16 USB driver prompt

Tips:

The pop-up dialog box, as shown in Figure 3-16, means that the PC does not recognize the HMI. Now it is necessary to check whether the USB driver has been installed: Connect the PC and power-on HMI, and then search “Samkoon HMI Tech Corp USB drive” in the Windows "My Computer" - "Properties" - "Hardware" - "Device Manager" - "Universal Serial Bus controllers". Figure 3-17 (you can try to pull out the USB cable to check if the PC can recognize HMI):

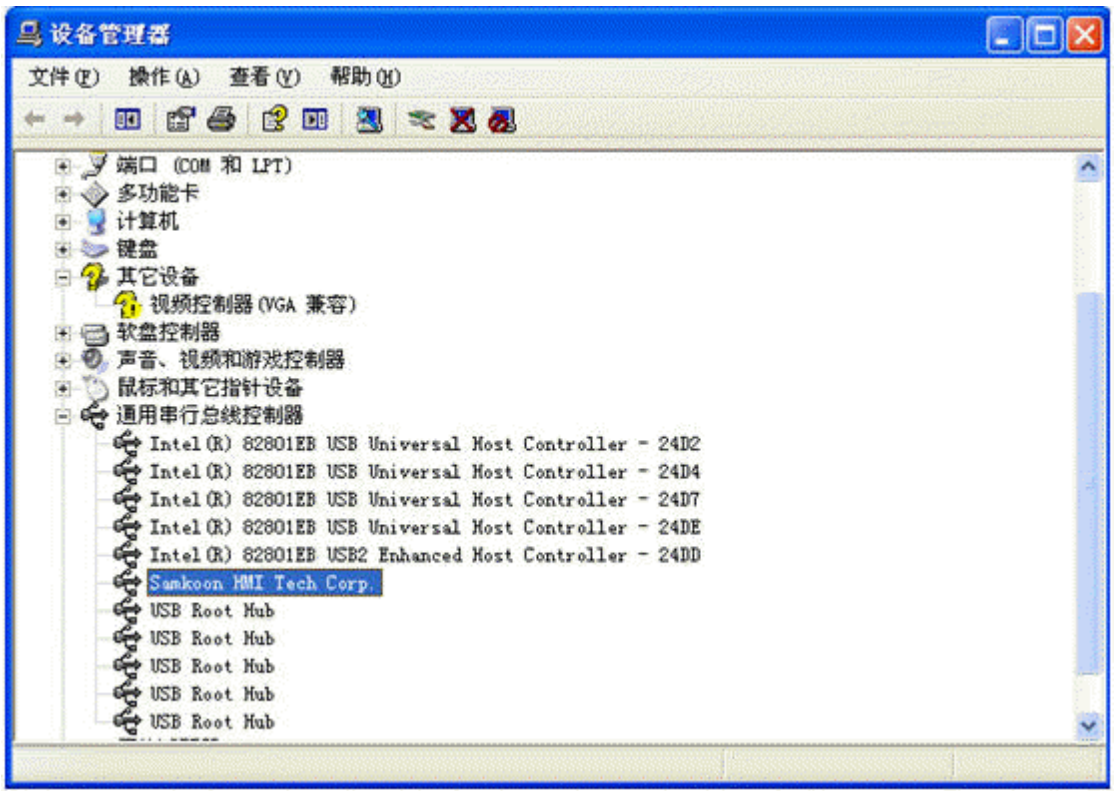


Figure 3-17 Search the HMI USB drive

Configuration downloading through Ethernet

- Set HMI network parameter settings

  Open the dial switch 1 and 3 together; set the IP that can be set accordingly (here set it as 192.168.1.61), gateway, subnet and port. Fix the port 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 192.168.1.61 as above, and the port is fixed to 12345. Then click to restart and download, as shown in Figure 3-18:

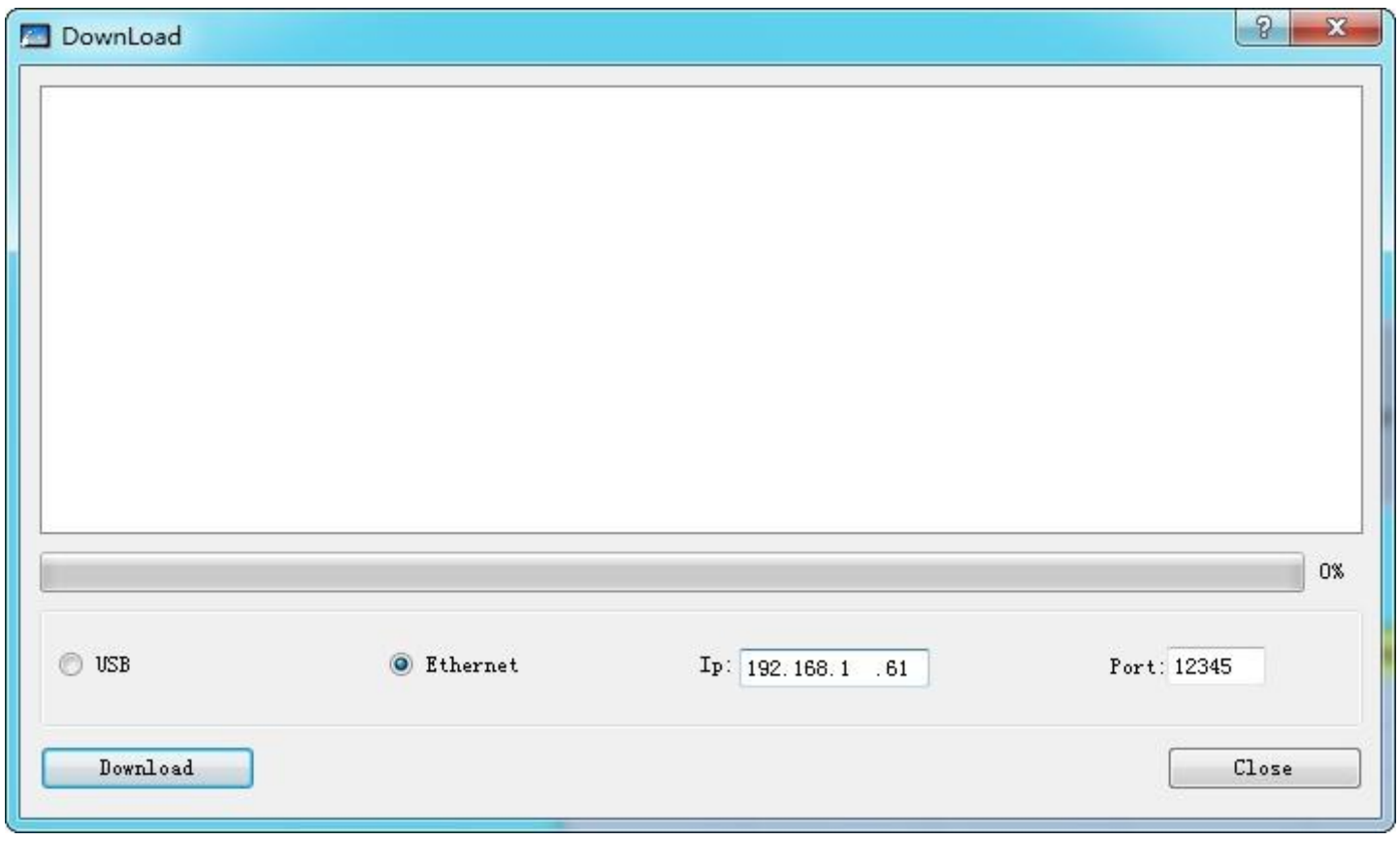


Figure 3-18 Configuration downloading through Ethernet

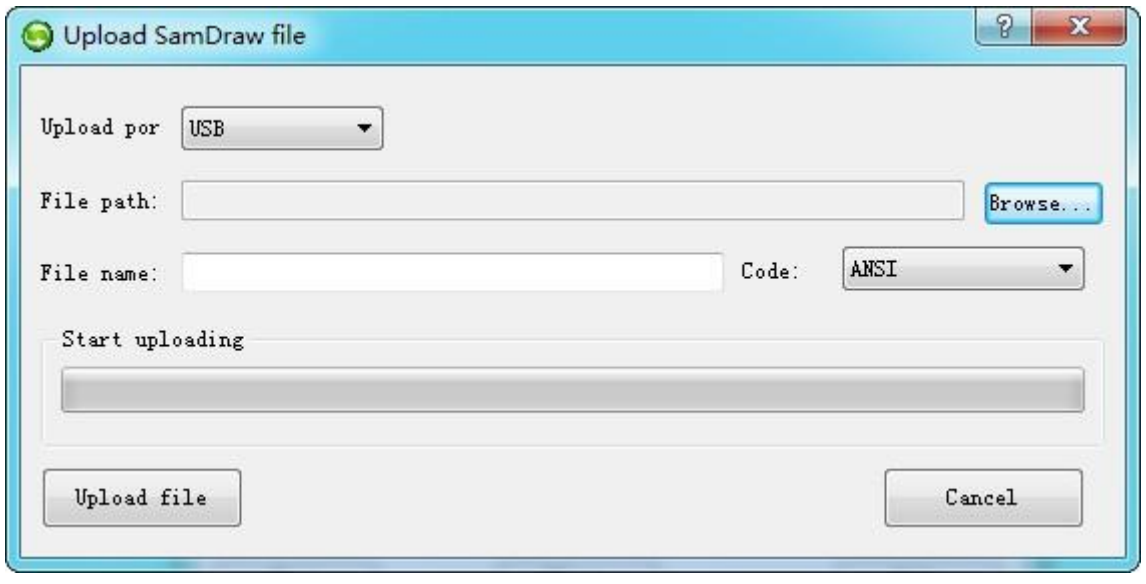
5.4 Upload configuration engineering

SKTOOL software supports uploading configuration program from the HMI to the hard disk. Connect HMI to PC; select the option of "Upload project file" in the pop-up dialog box, and then the user interface of "Upload Samdraw file" will appear.



- File Path: Click "Browse" to select the file in which you want to save the path.
- Project Name: Set the name of the project.
- Start uploading: Click Upload file to start.

After the success of the uploading, you can choose whether to open the project file.





It needs to extract the uploaded file before open it.

5.5 Upload historical data record

Run SKTOOL configuration software; click .



Selecting “Upload historical data record” means uploading it from HMI to the hard disk.



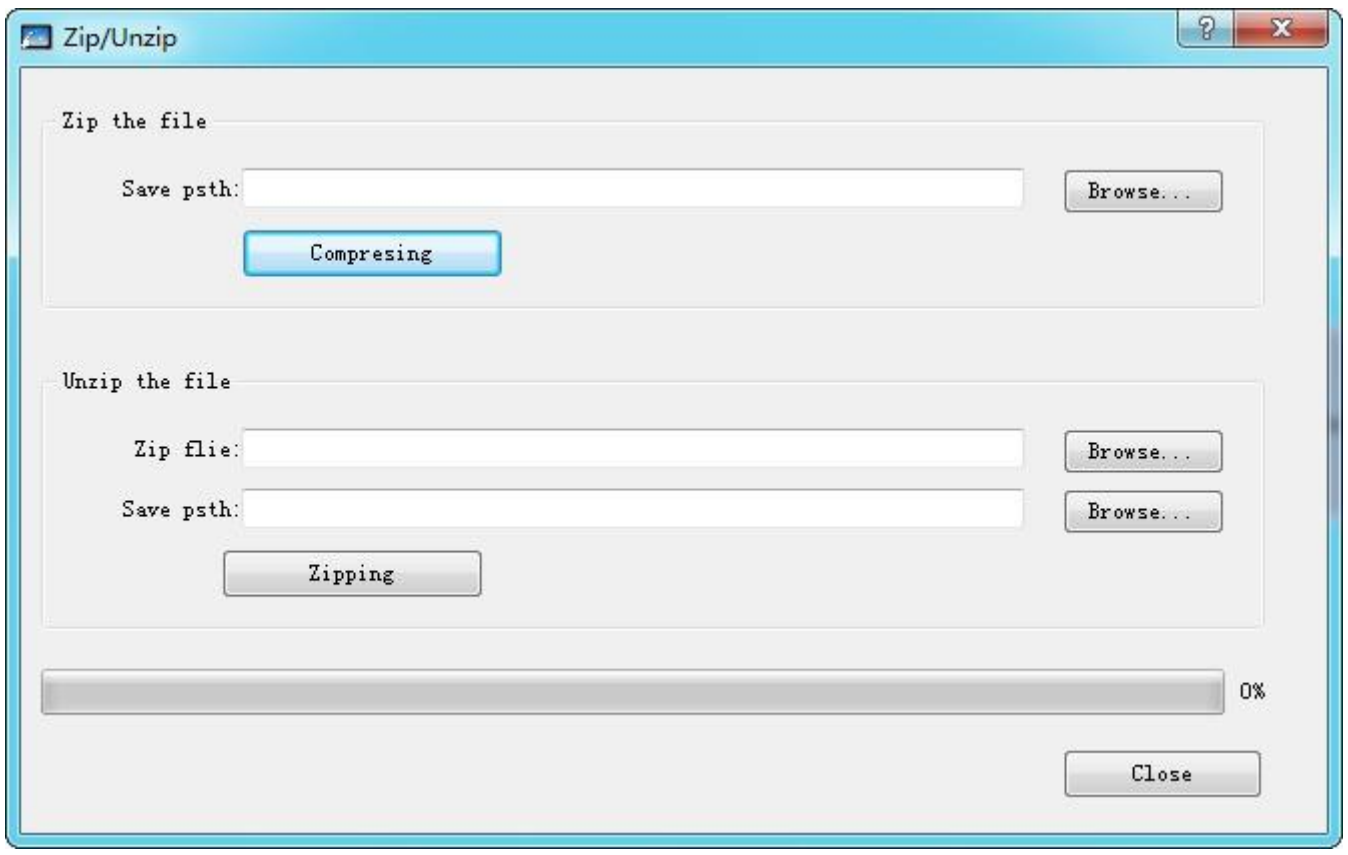
- File Path: Storage location; select "Browse" to choose your storage path.
- File name: Name of the uploaded file; the uploaded file cannot be opened directly, so a data conversion tool is necessary. Refer to “Export historical data and alarm to U disk” in the Help appendix for specific operation.
- Coding: The default is ANSI.
- Click "Upload File" to start uploading while the file is stored in the set location.
- SKTOOL newly add multiple set of historical data, so uploading historical data means, in addition to uploading historical database file, and also saving each set of historical data in the database file as a .CSV file. E.g., uploading a file called " temp ", then the according historical database file is named “temp”, and that of CSV in group 0 is “temp_hisdata0.csv” while that of CSV in group 1 is “temp_hisdata1.csv”, and so on.

Tips:

Operation of uploading historical data record is similar to that of uploading formula and project file; the function of converting files from Samdraw3.3 to SKTOOL is disabled.

5.6 Pack/Unpack

Select “Pack/Unpack” in the Download menu to open the dialog box.



- Zip the file: Zip the SK project file to generate a compressed file suffixed .sip. 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 send 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 .skr into that of .skm which can be opened directly in SKTOOL.
- Zip file: Choose files to be extracted.
- Save Path: Location to store the decompressed file suffixed .skm; after selecting the save path, Click "Zipping", and then close it when the progress bar reaches 100%.

6. SKTOOL Configuration Guide

This chapter introduces in detail the configuration methods using SKTOOL software.

Contents：

- Screen Operations
- Graphics editing commands
- Graphics editing commands
- Basic controls
- Advanced controls
- New controls
- SKTOOL Control Instructions

6.1 Screen Operations

This chapter details screen operations of SKTOOL configuration.

Contents：

- Create a New Screen
- Modify Screen Property
- Delete Screen
- Delete Screen

6.1.1 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 4 -1 below:

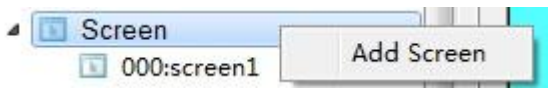


Figure 4-1 New Screen

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 4-2:

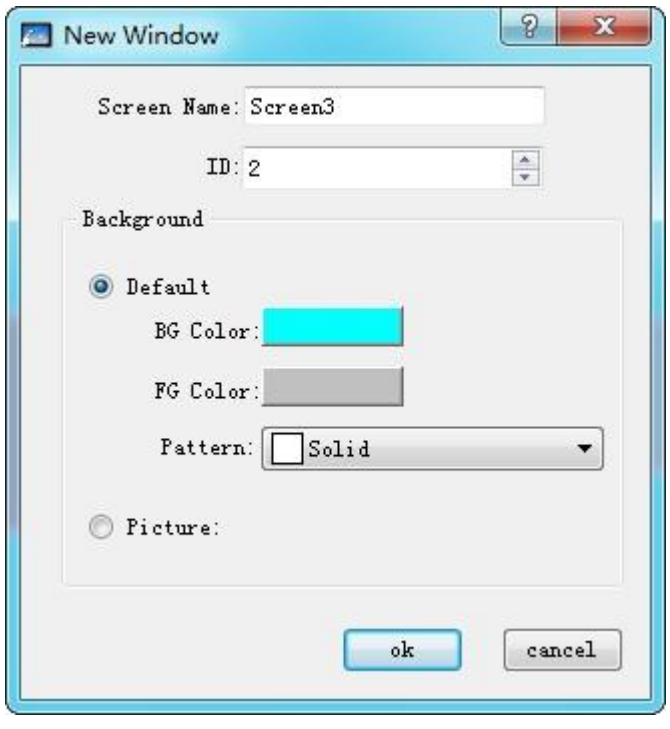


Figure 4-2 Add screen dialog

The Background color, Foreground color and Pattern of new screen can be set.

Picture: Picture can be set as background of new screen.

6.1.2 Modify Screen Property

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.

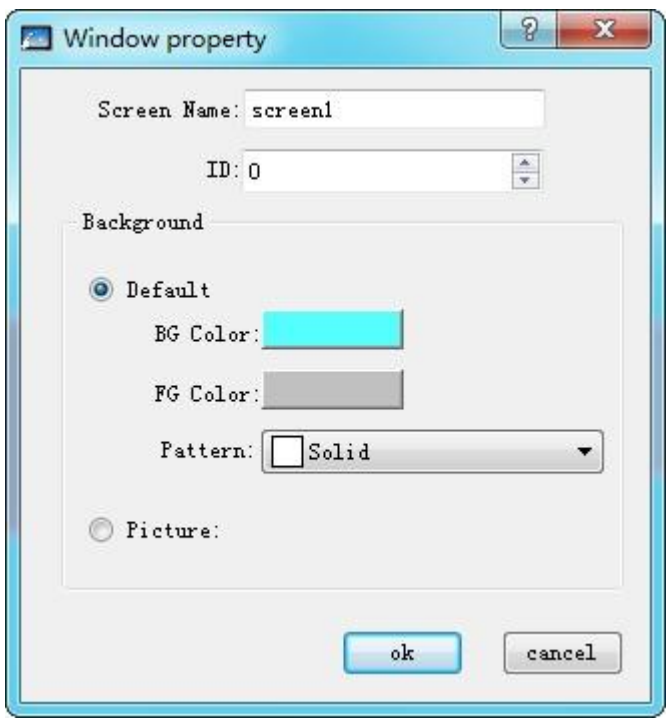


Figure 4-3 Screen Property settings

6.1.3 Delete 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.

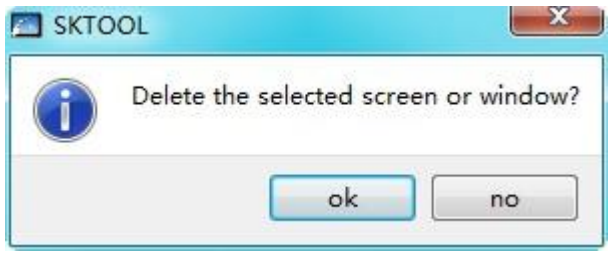


Figure 4-4 Delete screen

Click OK to complete the operation of deleting.

Tips:

Once deleted, the screen cannot get back! Execute this command with caution.

6.1.4 Copy 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", after that it will prompt to set the name and ID of the new screen (Figure 4-5), at last select "OK" to copy and list the screen; select "Cancel" to cancel the current operation.

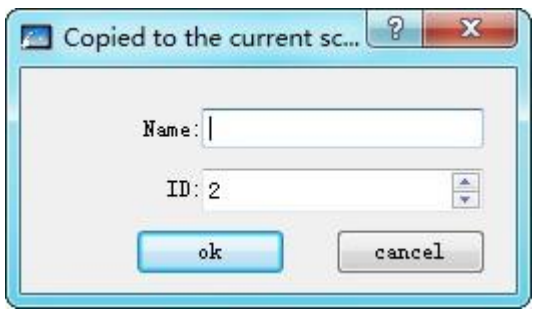


Figure 4-5 Copy Screen

6.2 Graphics editing commands

This chapter details SKTOOL graphical editing commands.

Contents：

- Group and Ungroup
- Layer
- Rotaty
- Align

6.2.1 Group and Ungroup

The command of Group is to combine selected objects (more than two) into one. Objects can be graphs drawn by engineering designers or yourself, also can be that of system library or other controls, as alarm control and trend chart and so on. Combination will not maintain the properties of the original graphic object. Objects, graphs and controls are only a picture after grouping, which can be saved as a library control, in case of usage next time for timesaver. Ungroup is to decompose a combination of graphic objects into the original elements; after ungrouping, all elements can restore their original property. It’s the inverse operation of Group.

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 4-6:

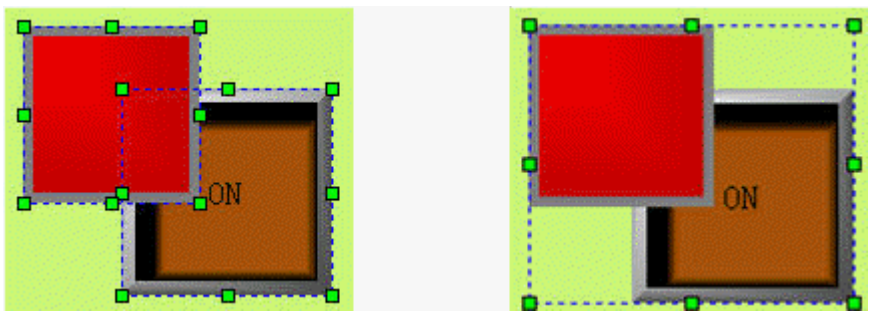


Figure 4-6 before and after group command

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 4-7:

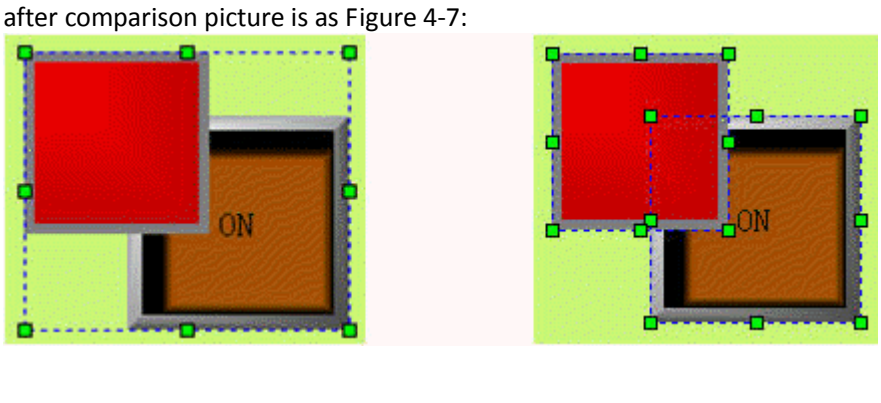


Figure 4-7 before and after ungroup command

Tips:

Select multiple objects through Ctrl key.

Before the combination, please make sure whether each any element still needs to be responsible for touch or surveillance work, because after the combination, it will be an image object, which you can not touch or monitor.

6.2.2 Layer

Layer Command is by group. It is used to adjust the display level of intersecting graphic objects. Each object SKTOOL 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. SKTOOL 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 4-8 for a comparison before and after combination.

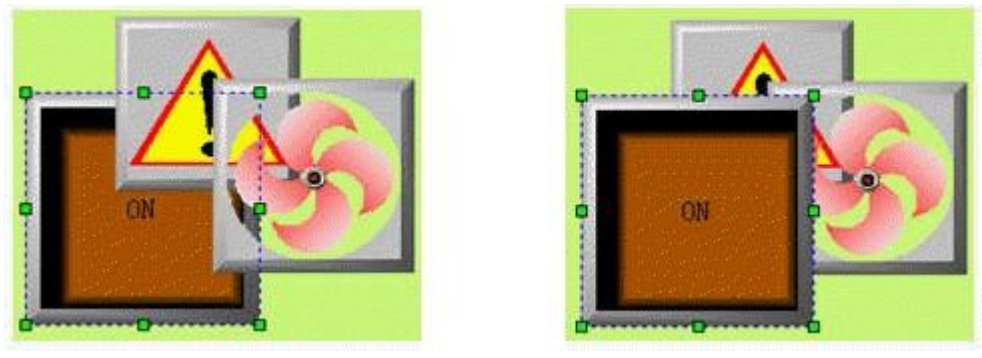


Figure 4-8 Contrast before and after Bring To Top

- **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 4-9 for a comparison before and after combination.

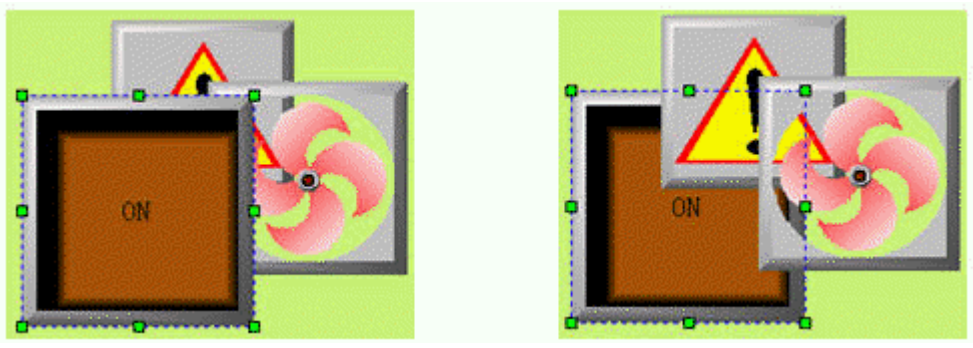


Figure 4-9 Contrast before and after Send To Bottom

- **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 4-10 for a comparison before and after combination.

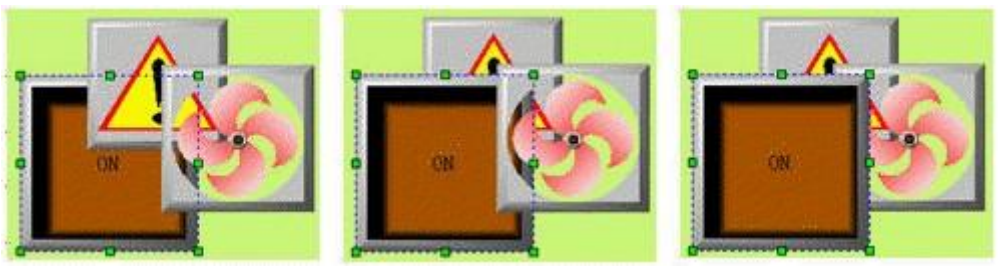


Figure 4-10 Contrast before and after Bring Forward

- **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 4-9 for a comparison before and after combination.

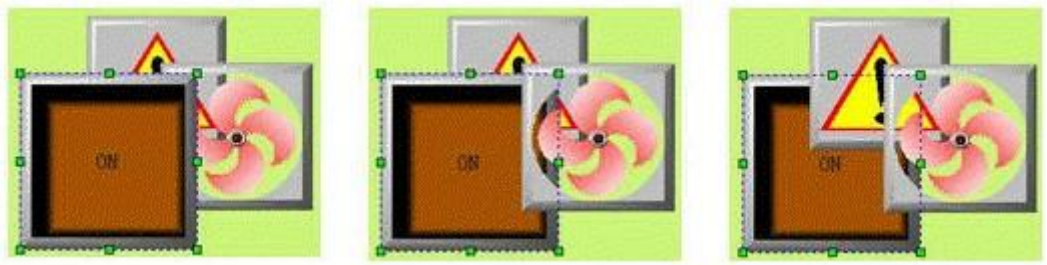


Figure 4-11 Contrast before and after Send Forward

6.2.3 Rotaty

This command is by group. SKTOOL 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 4-12:



Figure 4-12 Contrast before and after Flip Horizontal of single graph object

When a plurality of graphic objects are selected, as shown in Figure 4-13:

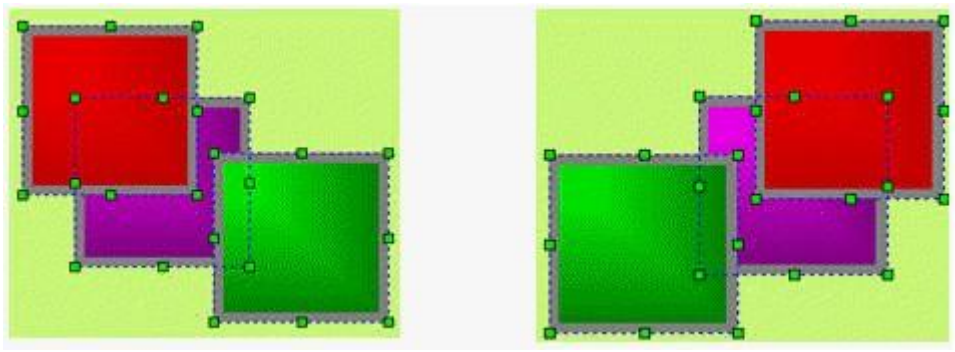


Figure 4-13 Contrast before and after Flip Horizontal of several graph objects

- **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 4-14:



Figure 4-14 Contrast before and after Flip Vertical of single graph object

When a plurality of graphic objects are selected, as shown in Figure 4-15:

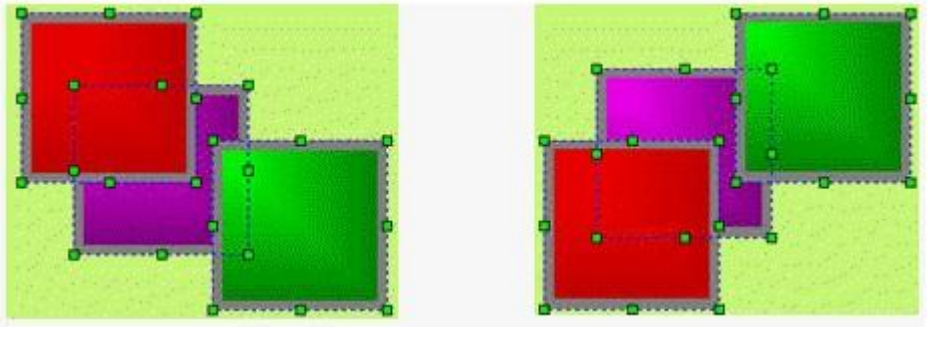


Figure 4-15 Contrast before and after Flip Vertical of several graph objects

6.2.4 Align

This command is by group, so is the Size. SKTOOL 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 4-16:



Figure 4-16 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 4-17:

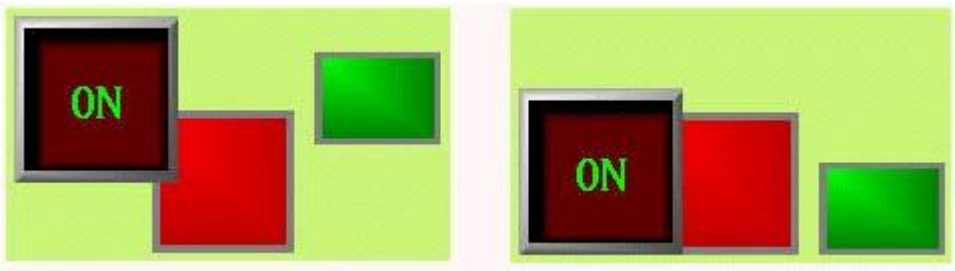


Figure 4-17 Before and after comparison diagram of Bottom Alignment

- **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 4-18:

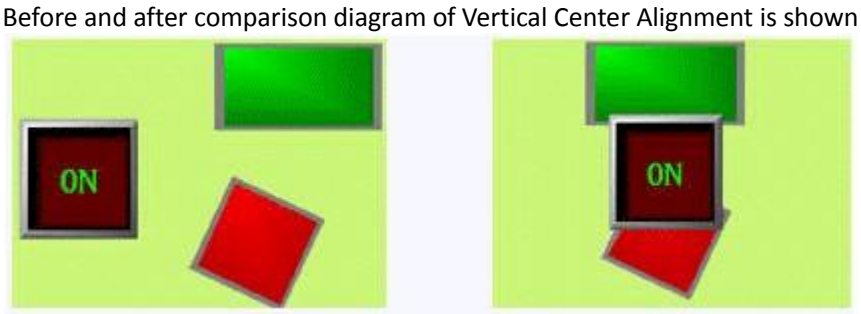


Figure 4-18 Before and after comparison diagram of Vertical Center Alignment

- **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 4-19:

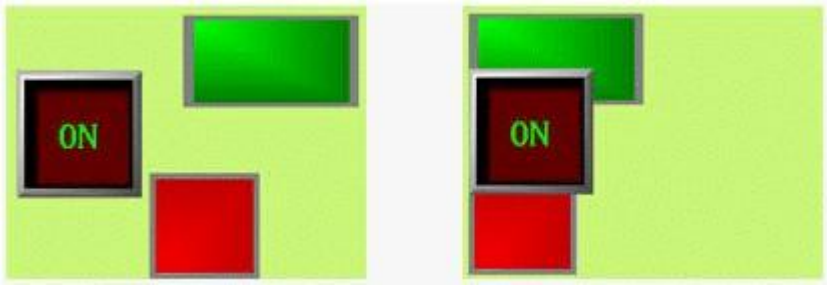


Figure 4-19 Before and after comparison diagram of Left Alignment

- **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 4-20:

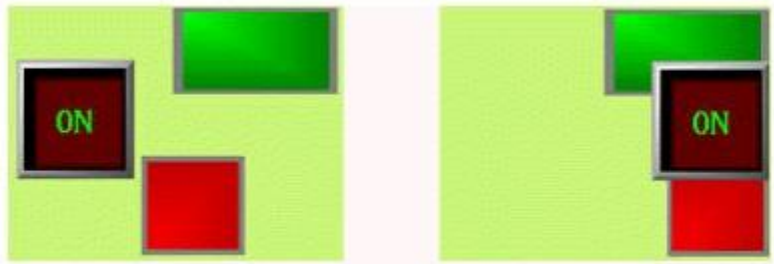


Figure 4-20 Before and after comparison diagram of Right Alignment

- **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 4-21:

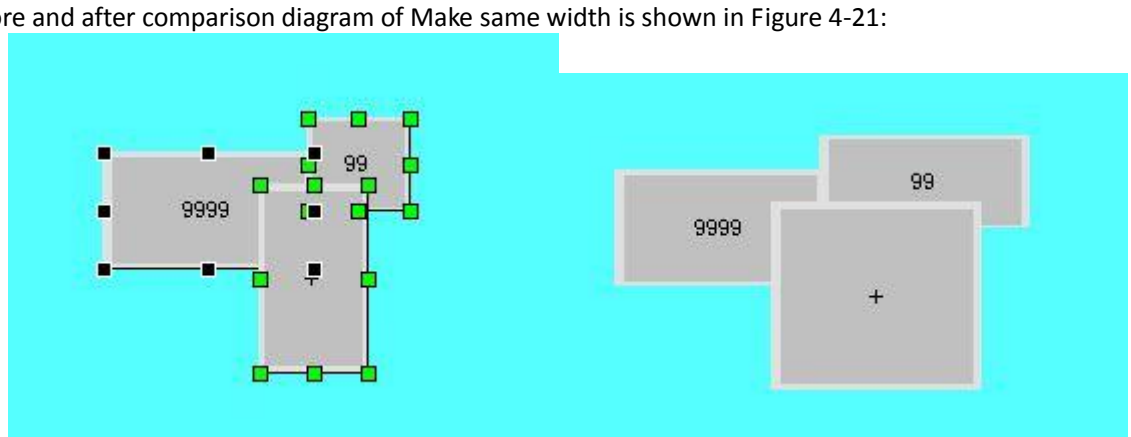


Figure 4-21 Before and after comparison diagram of Make same width

- **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 4-22:

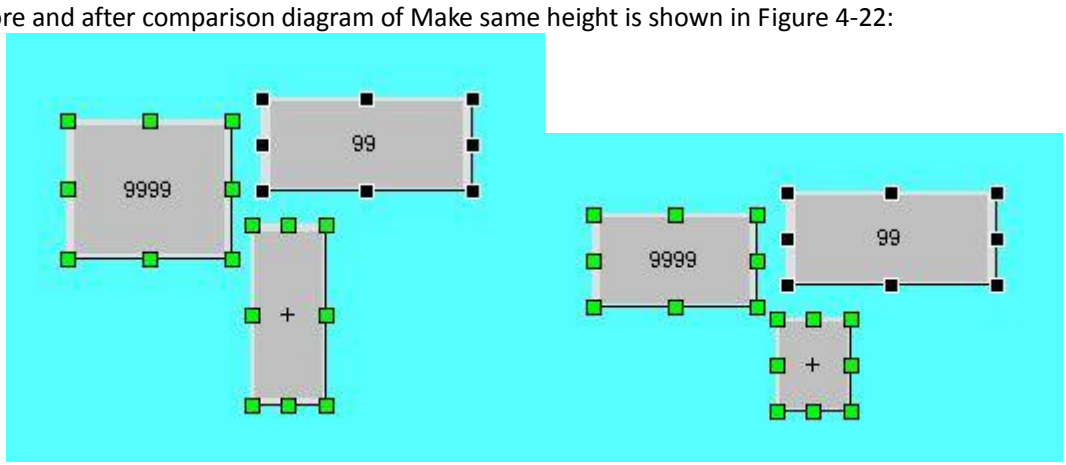


Figure 4-22 Before and after comparison diagram of Make same height

- **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 4-23:

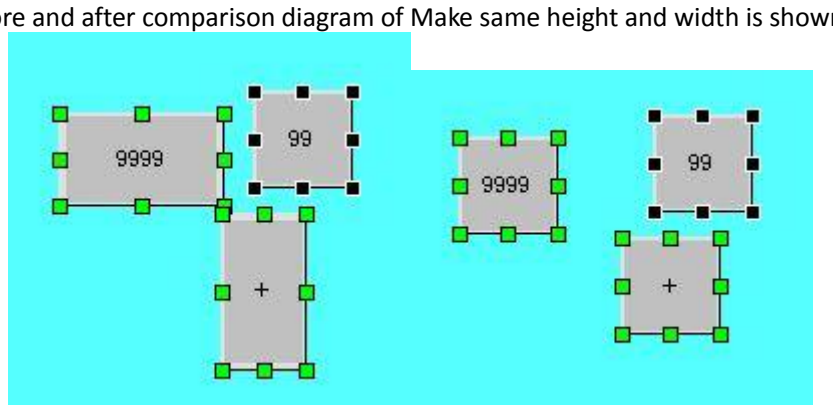


Figure 4-23 Before and after comparison diagram of Make same height and width

- **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.



Tips:

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.

6.3 Draw Basic graphics

This chapter details operations of drawing basic graphics with SKTOOL.

Contents：

- Line
- Polyline
- Curve / Arc
- Free Line
- Rectangle
- Rounded Rectangle
- Circle/Ellipse

- Polygon
- Sector
- Text
- Table
- Scale
- Open Library
- Save to Library

6.3.1 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 4-24:

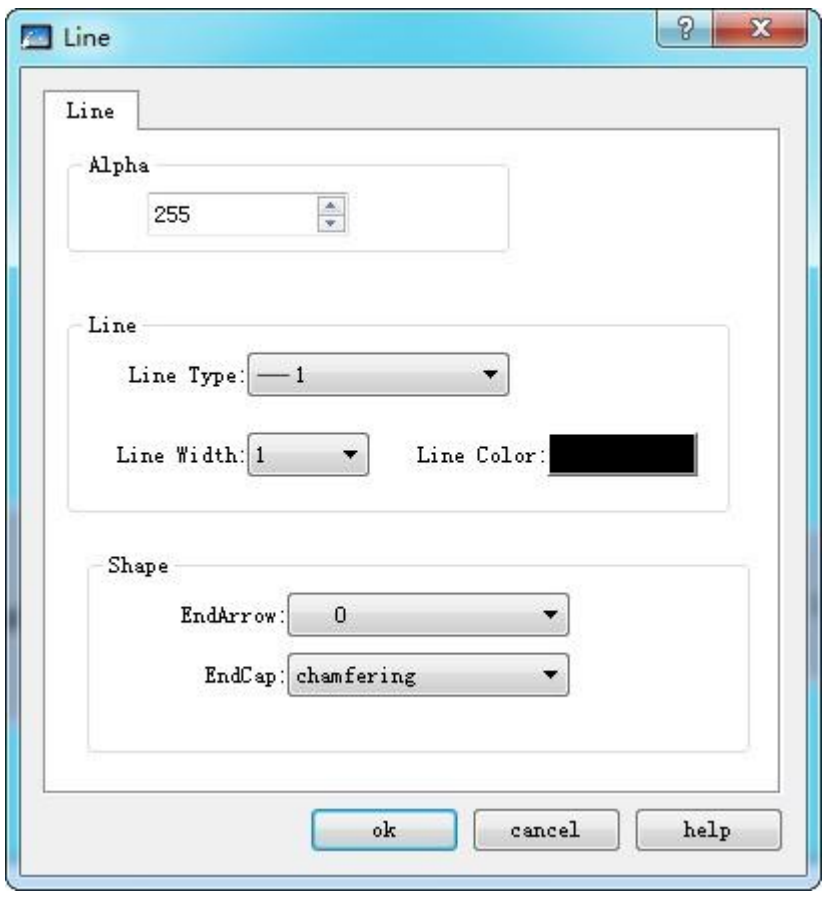


Figure 4-24 Line Property dialog box

SKTOOL 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.

6.3.2 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, 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. Lastly right click to complete drawing the polyline, as shown in Figure 4-25:

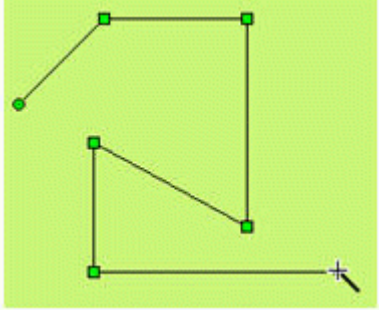


Figure 4-25 Polyline Operation

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 SKTOOL 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.

6.3.3 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. As shown in Figure 4-26:

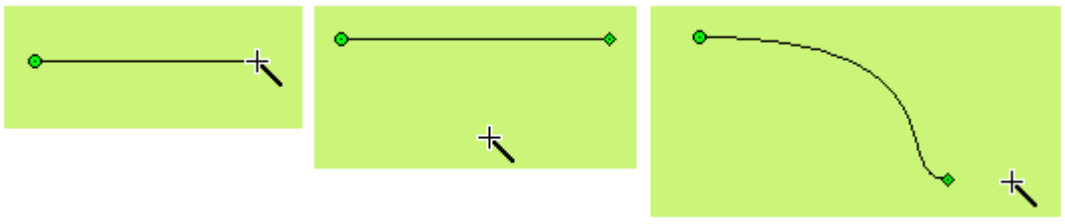


Figure4-26 Curve Operation

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. As shown in Figure 4-27:

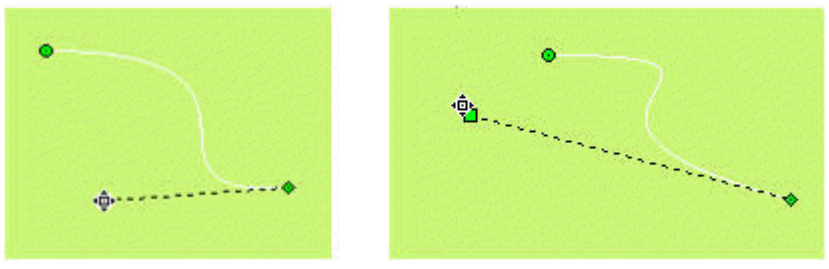


Figure4-27 Curve Operation

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 SKTOOL configuration software provides up to 15 line types, 10 kinds of line widths, and 6 straight-line end arrows for curves / arcs.

6.3.4 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. As shown in Figure 4-28:

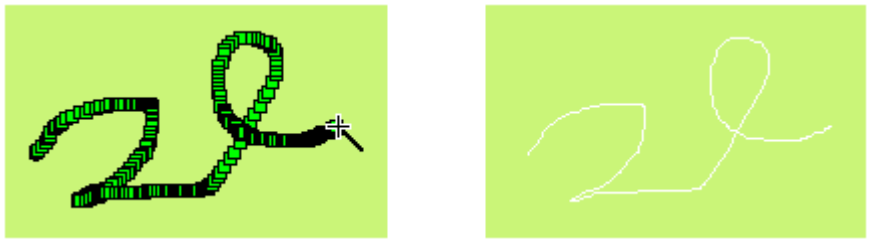


Figure4-28 Free Line Operation

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 SKTOOL 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.

6.3.5 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 4-29:

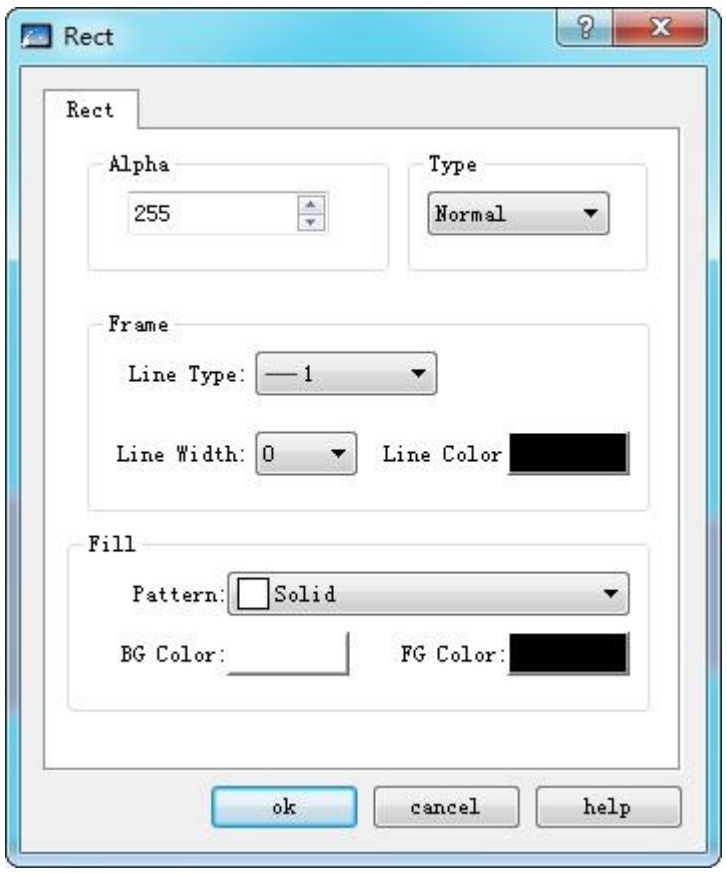


Figure 4-29 Rectangle properties dialog

You can adjust the properties of the rectangle through the pull-down and fine-tune buttons. SKTOOL configuration software provides up to 15 types of borderline, 10 kinds of borderline width and 21 kinds of fill patterns. As shown in Figure 4-30:

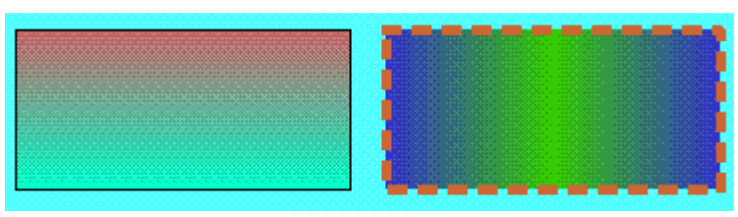


Figure 4-30 An example of a rectangle drawn

6.3.6 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 4-31

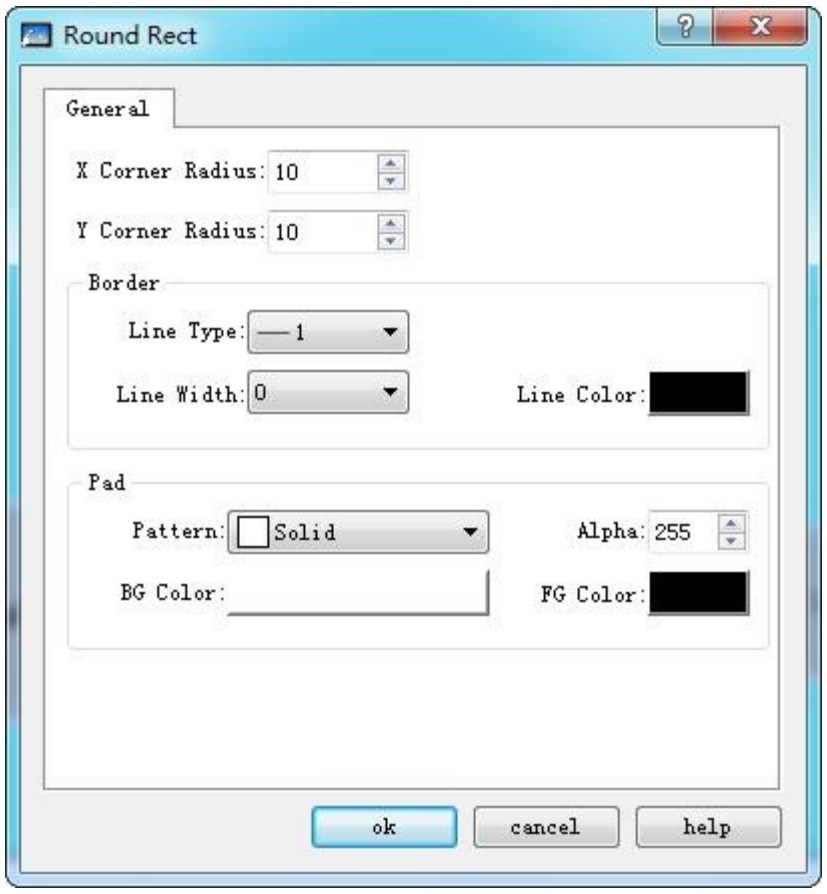


Figure 4-31 Rectangle properties dialog

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

6.3.7 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, 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 SKTOOL configuration software provides up to 15 types of border line, 10 kinds of border line width and 21 of fill patterns for ellipse / circle. As shown in Figure 4-32:

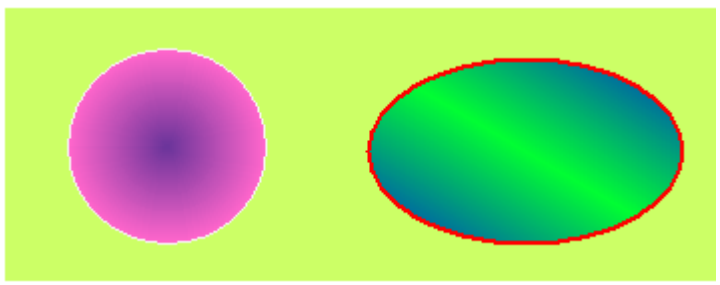


Figure4-32 Circle/Ellipse

6.3.8 Polygon

Select the Polygon command in the Draw menu or click the Polygon command button in the toolbar. Move the mouse to the editting 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 drawed; right click to complete drawing. As shown in Figure 4-33:

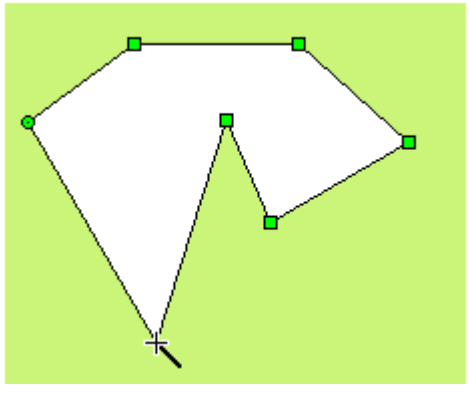


Figure 4-33 Polygon Operation

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. SKTOOL 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 4-34:

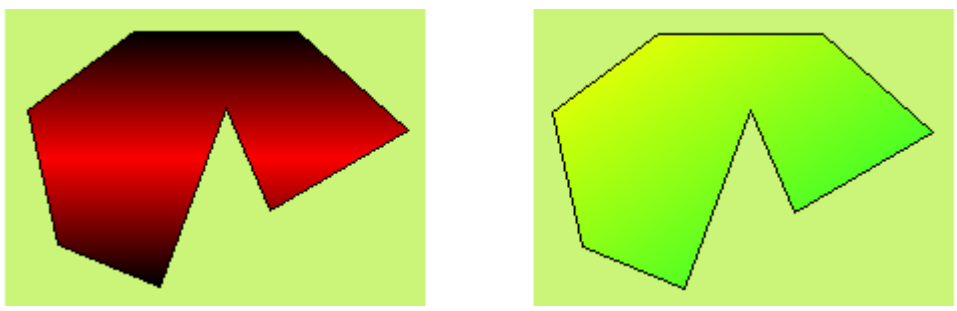


Figure 4-34 Polygon

6.3.9 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. As shown in Figure 4-35:

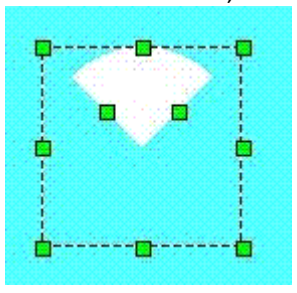


Figure 4-35 Sector Operation

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 th emouse.

6.3.10 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 4-36:

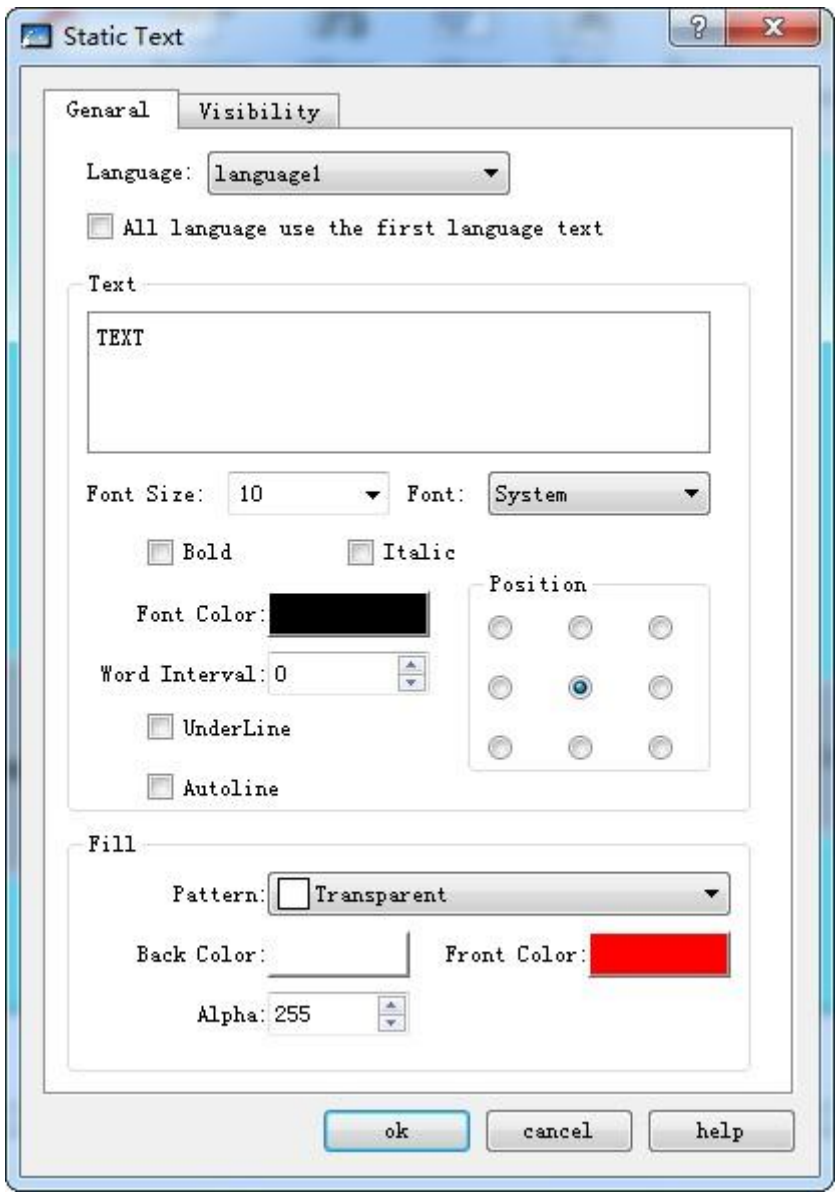


Figure 4-36 Static Text dialog box

- 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. SKTOOL 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. SKTOOL 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
- SKTOOL 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.

Text renderings

- 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

6.3.11 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 4-39:

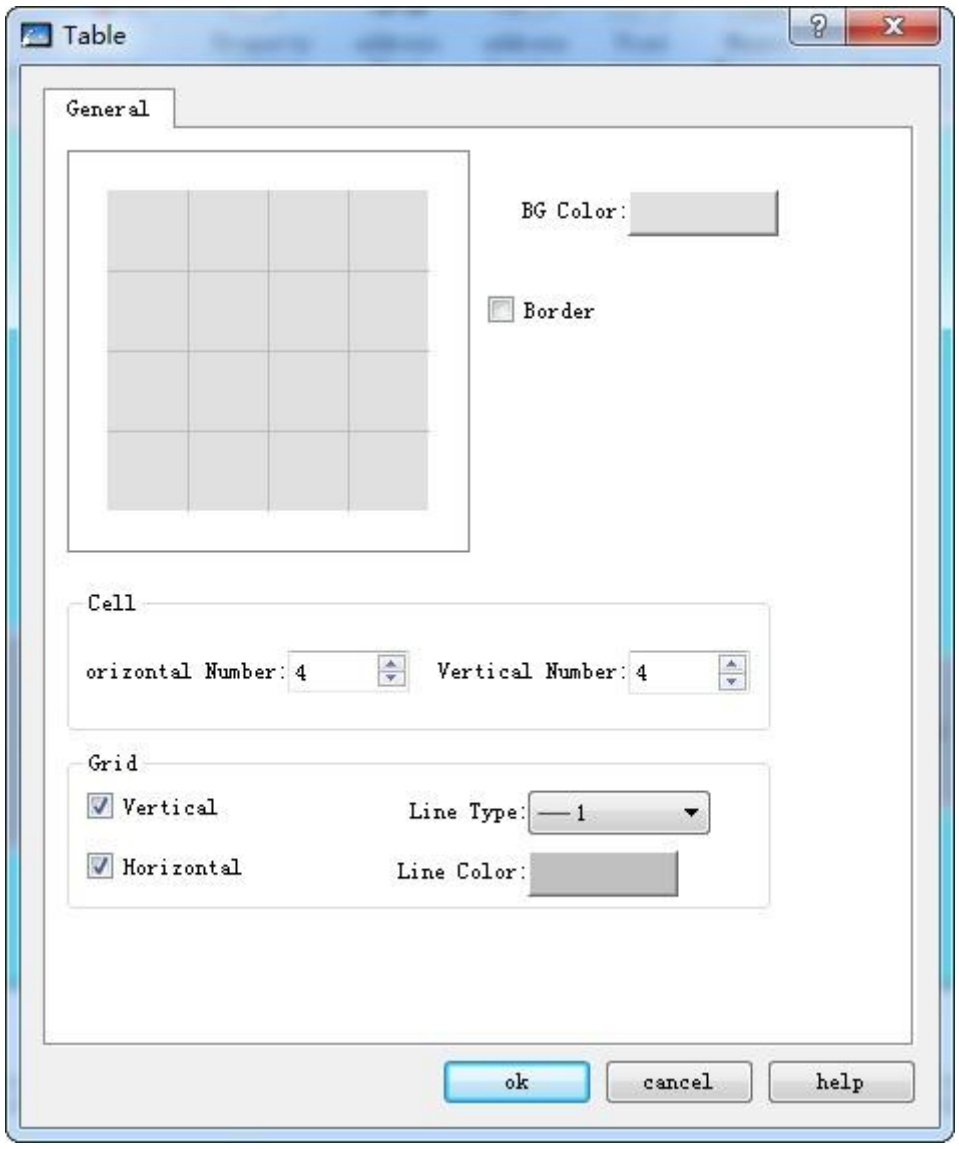


Figure 4-39 table dialog box

In the above dialog box of the above diagram, SKTOOL 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.

Tips:

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.

6.3.12 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 4-41:

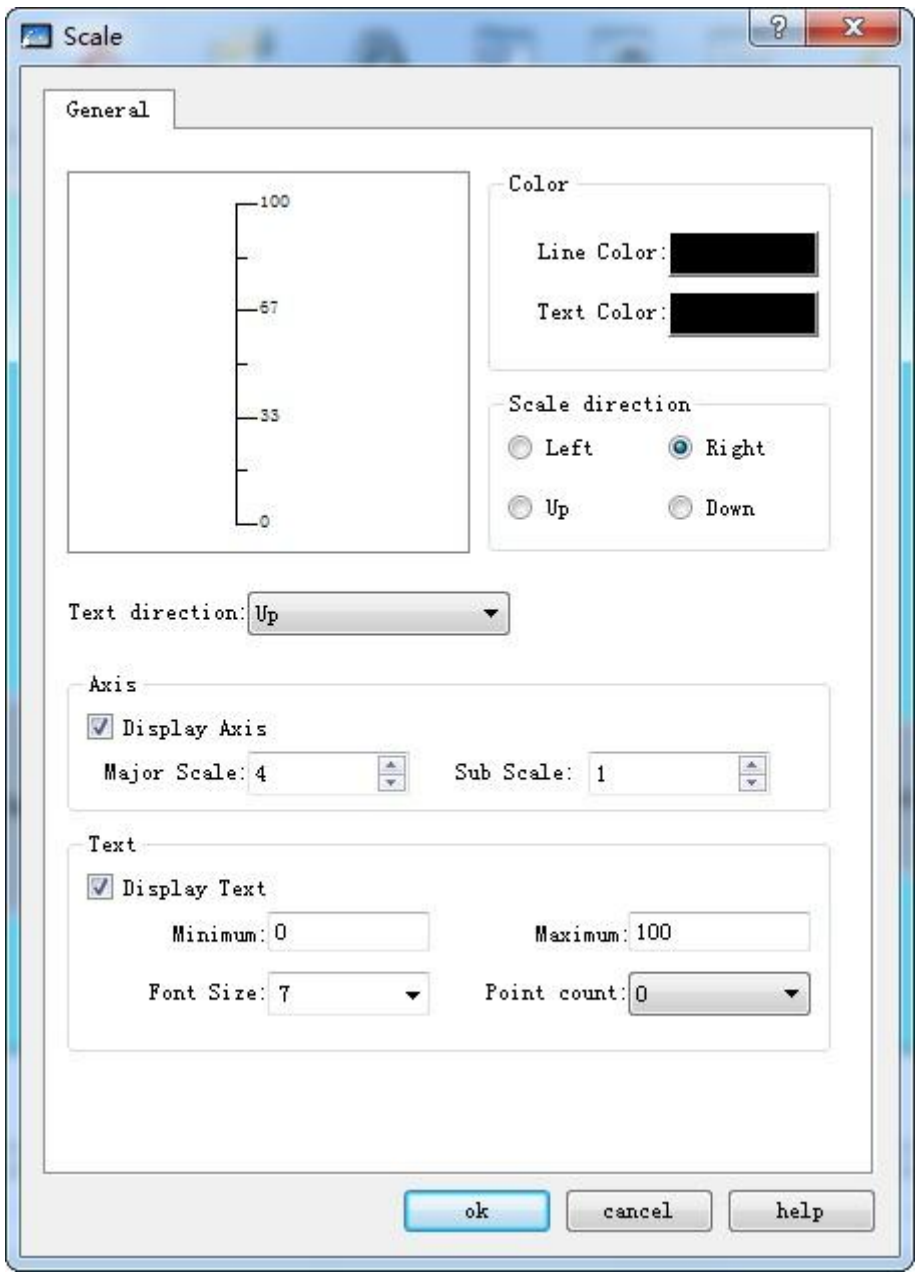


Figure 4-41 Scale Dialog Box

In the above dialog box, SKTOOL 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. As shown in Figure 4-42:

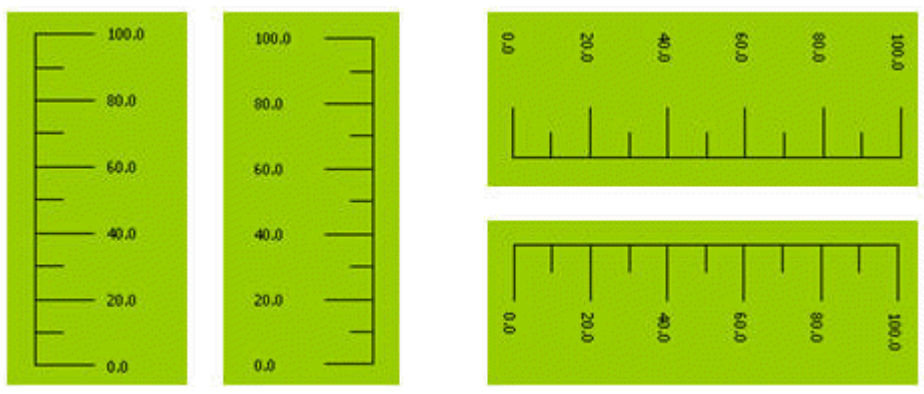


Figure 4-42 Scale effect diagram

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.

6.3.13 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 4-43:

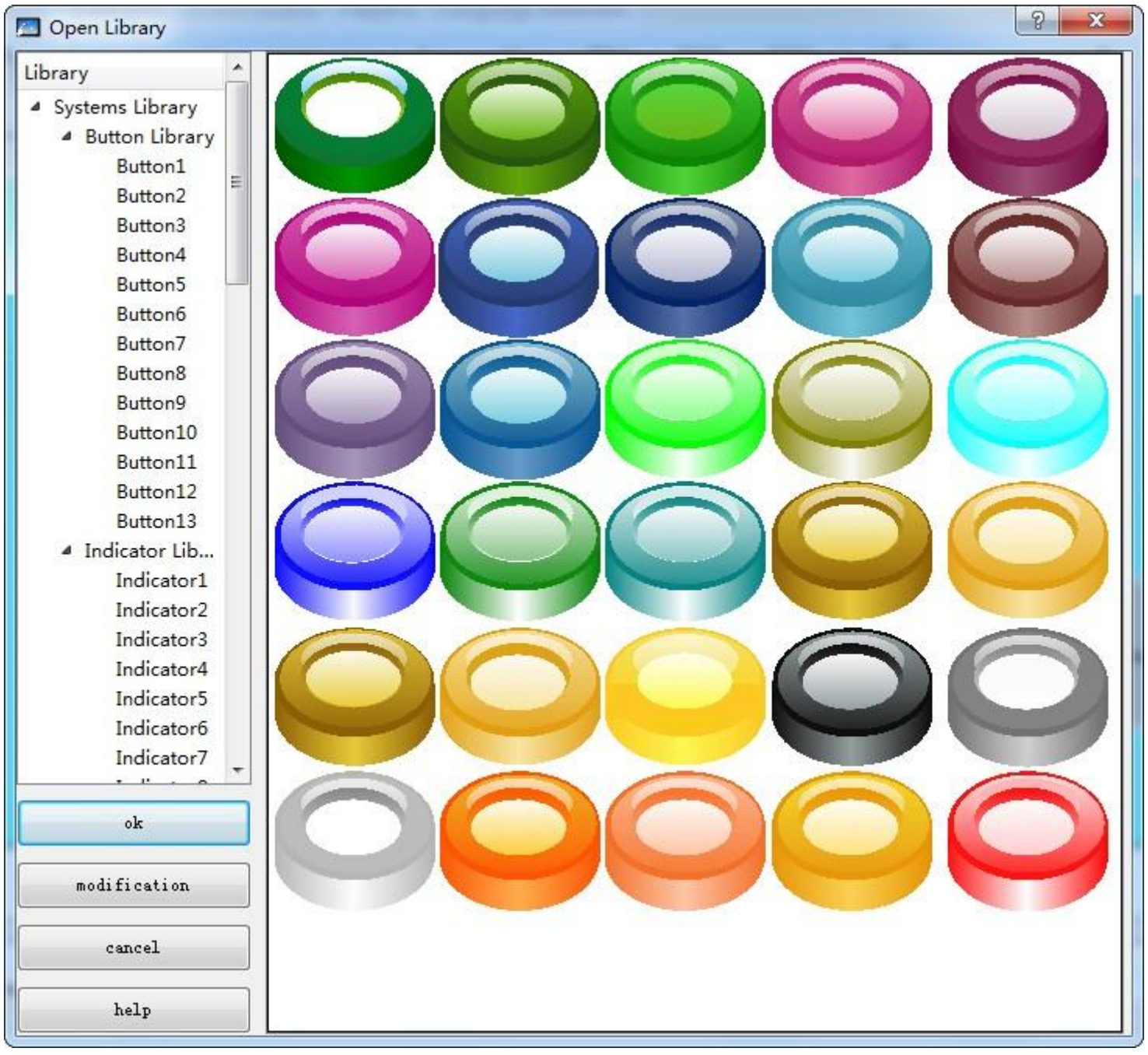


Figure 4-43 Library List

The system library of SKTOOL configuration editing software provides a wealth of graphic objects for engineering designers. SKTOOL 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 4-44:

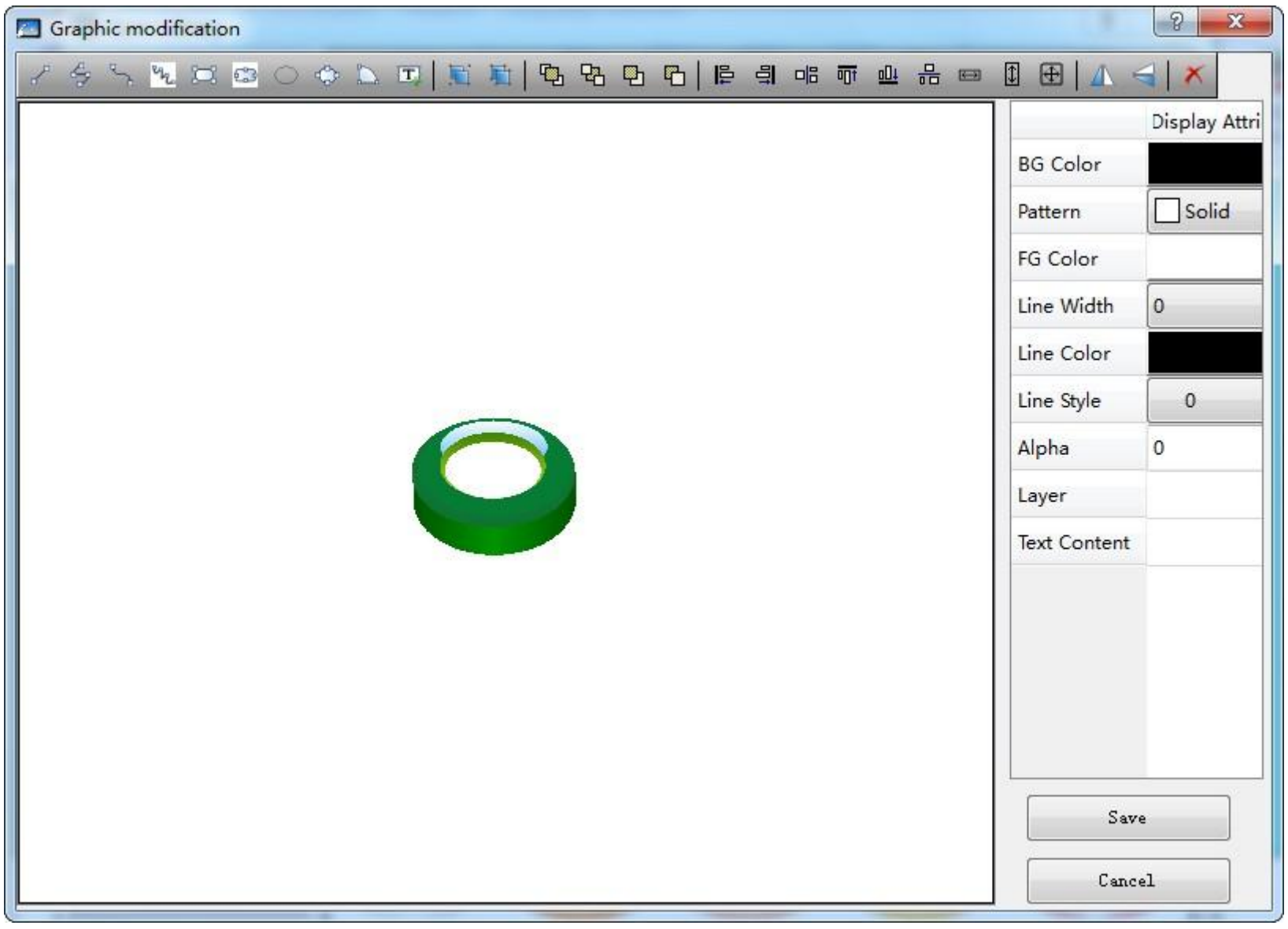


Figure 4-44 Library Modify Dialog Box

In the interface shown as Figure 4-44, 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".

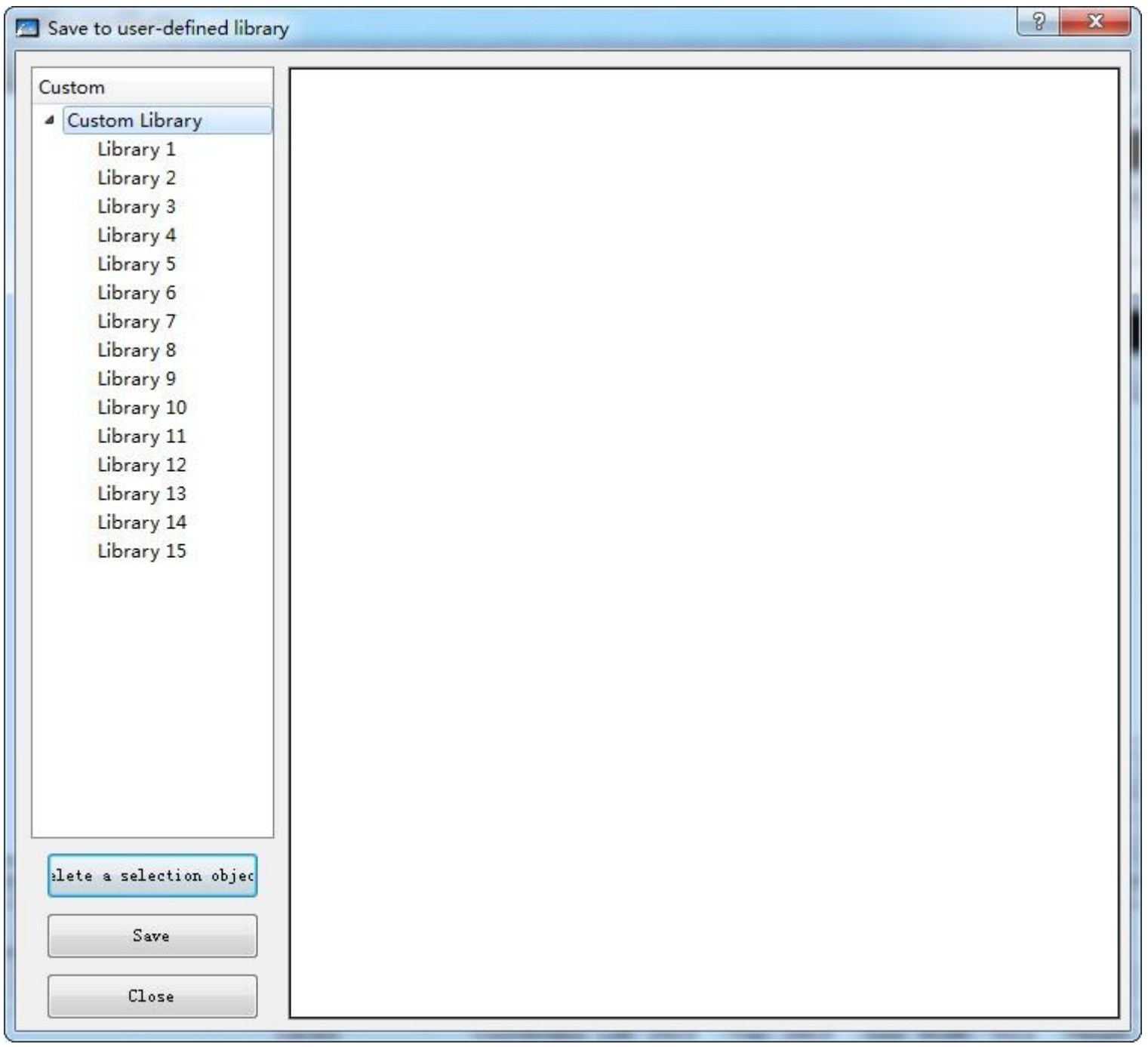


Figure 4-45 dialog box is displayed

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".

6.3.14 Save to Library

Select the Save to Library command in the Draw menu or click the Save to Library command button  in the toolbar to bring up the Library List dialog box, as shown in Figure 4-46:

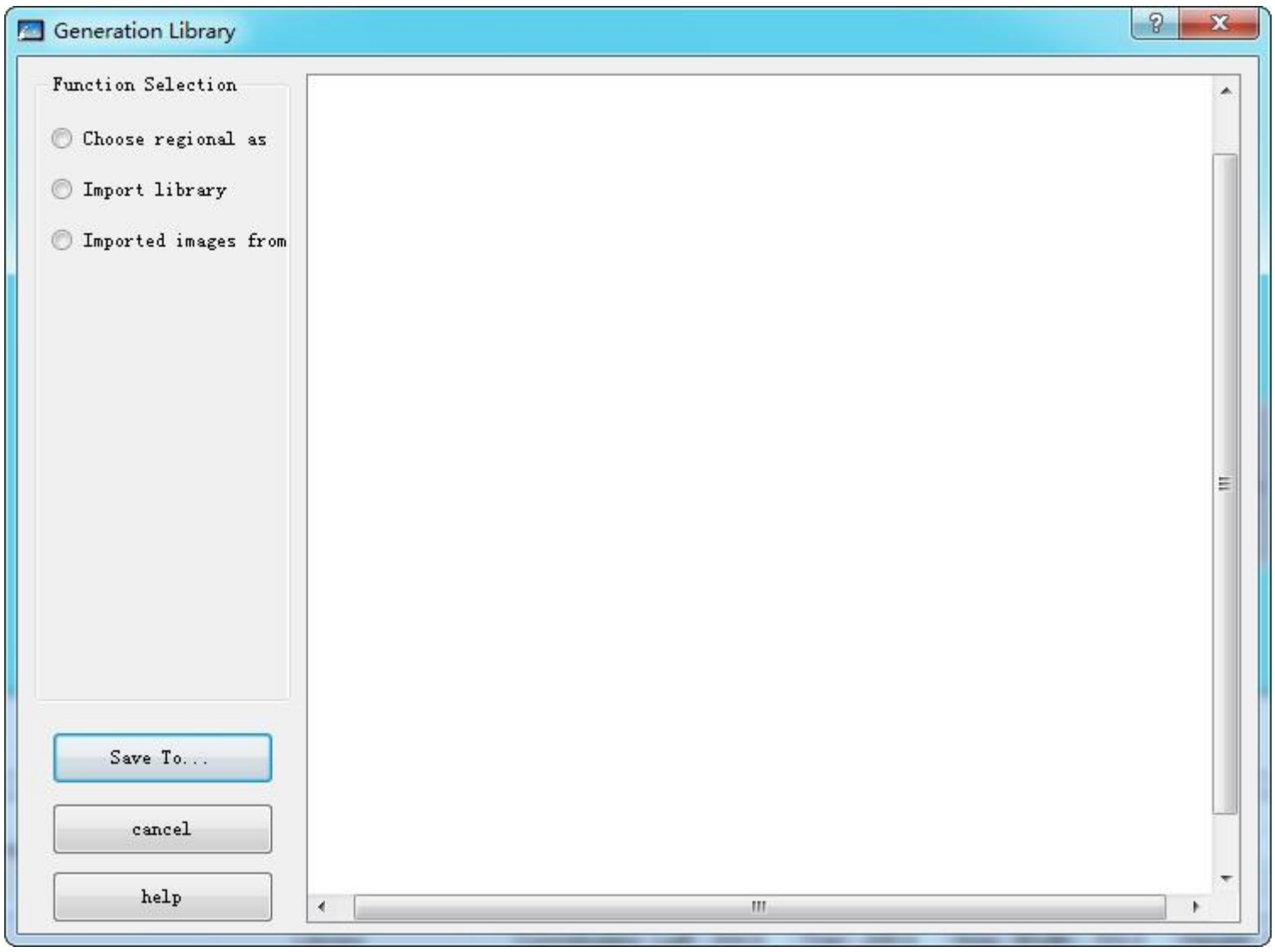


Figure 4-46 Save to Library dialog

- SKTOOL configuration editing software can save the completed configuration screen for engineering designers in order facilitate the next operation. After clicking Save to Library, as shown in the figure above, the graph object in the current screen will be displayed in the white area in the middle of the dialog.

- There are three options in the function selection:

Select the area as a library: Choose the selected object in the screen as a library object

Import Library: Import a library file suffixed sk from external (the file is generally provided by Samkoon).

Import a picture from a file: Import a picture from an external file as a library object.

- Click the "Save to..." button and select "Library II", as shown in Figure 4-47:

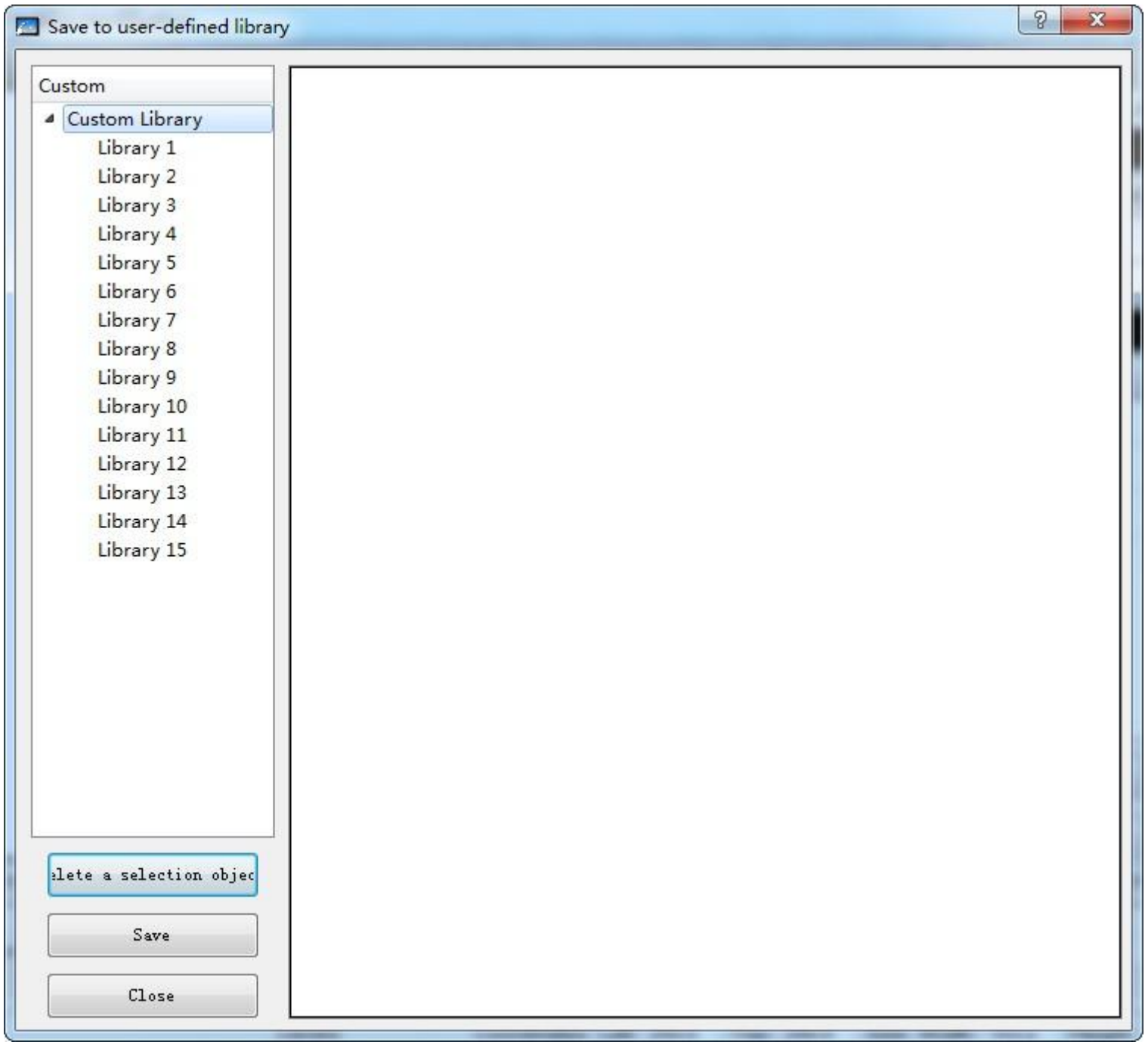
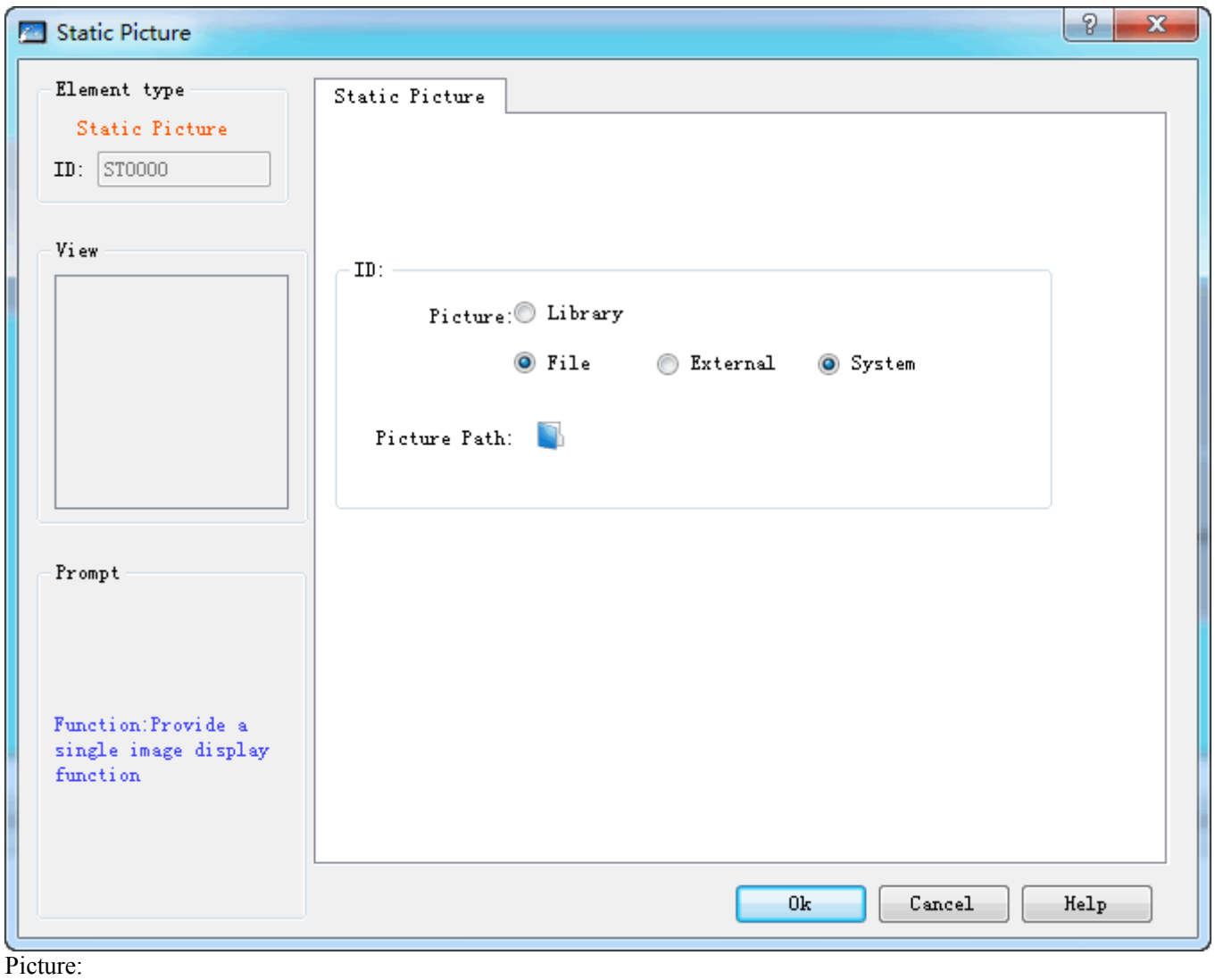


Figure 4-47 Save path selection dialog

Choose a save path in the selection box on the left. SKTOOL configuration editing software provides 8 custom control library and 8 custom graphics library eight, select the saved path, then click the bottom of the "Save" to save the graphics Object, the saved graphic object is displayed in the white area on the right. Then click the OK button to complete the operation. If you want to view the newly saved graphics, click the Open Lib command button , in the pop-up dialog box, pull the scroll bar to the bottom of the left list, then select the "Custom Gallery" in the "Gallery II" Save the modified graphics.

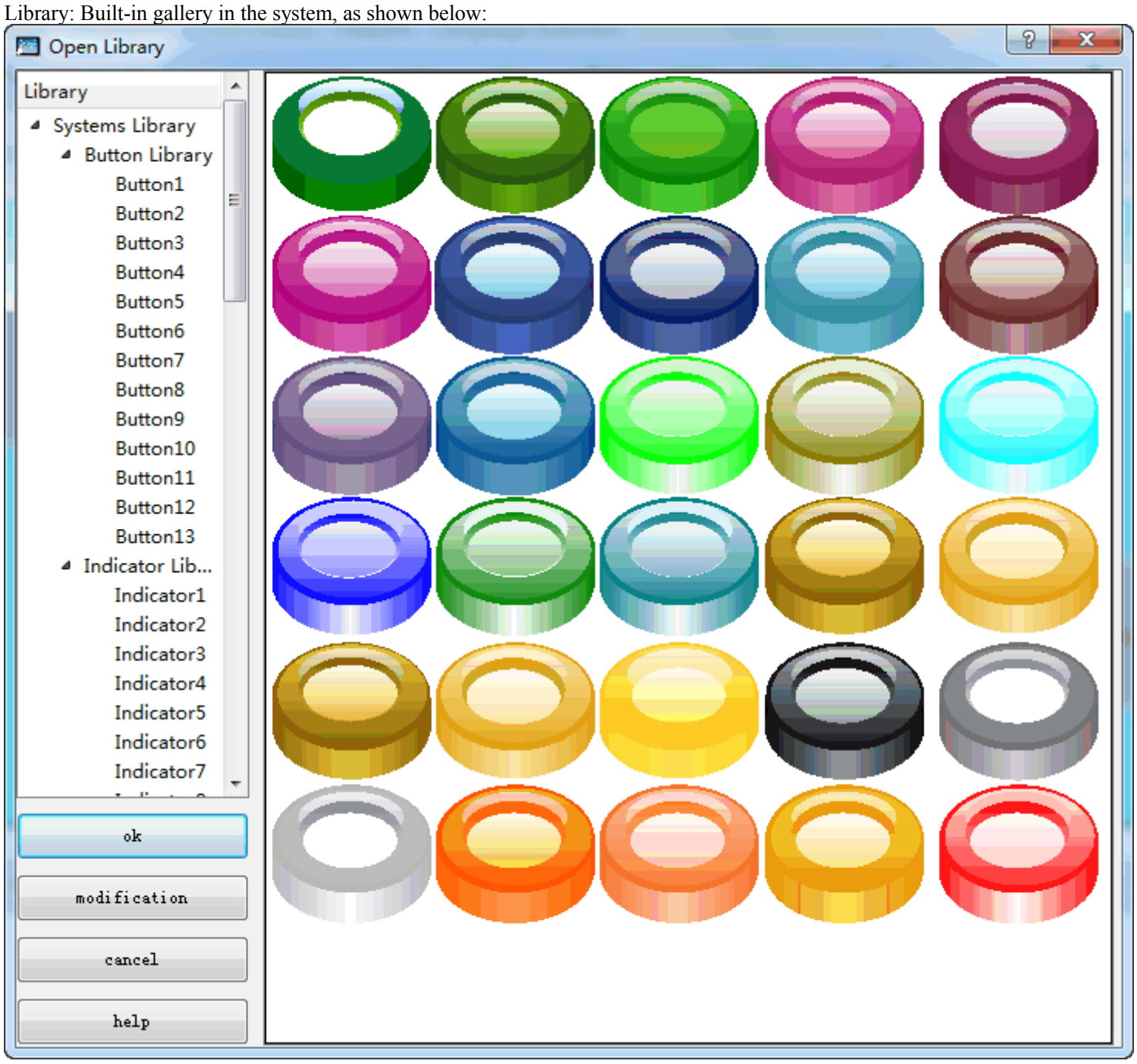
6.3.15 Extern Picture

In SKTOOL, 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:

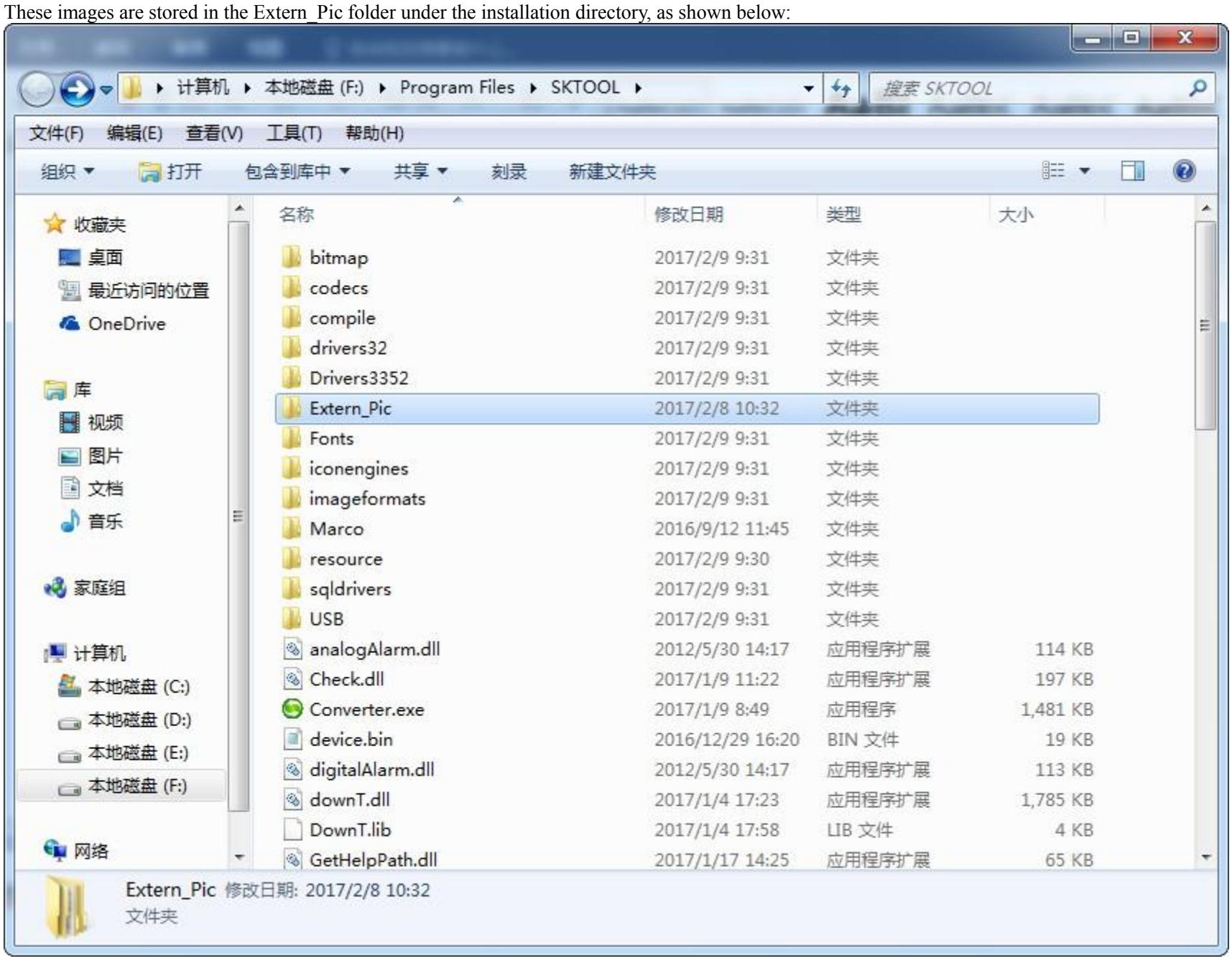


File: Consist of External File and System File. External pictures can be those in computer and system pictures are available for downloading on the official website, which will be saved in the folder of Extern_Pic under the installation directory.

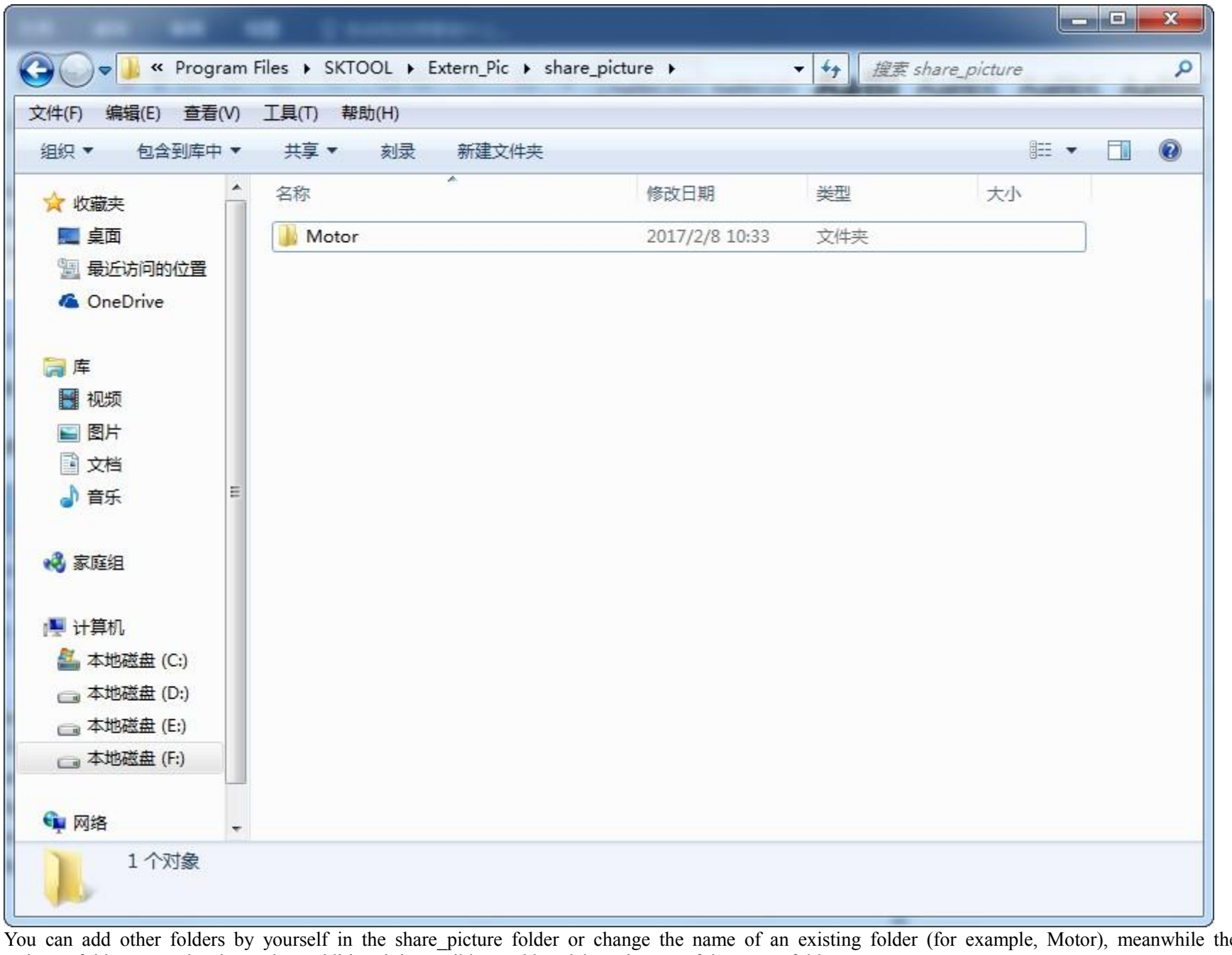
When "System" is selected, the following dialog box will pop up:



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.

Tips:

The compressed file of share_picture.rar is available for downloading on the official website; unzip it into PC after downloading; follow the above method to add it into the share_picture folder, and then it is also available in the Gallery image list.

6.4 SKTOOL Advanced controls

This chapter introduces the advanced controls.

Contents：

- GIF Display
- Trend Chart
- XY Trend Chart
- Dynamic Circle
- Dynamic Rectangle
- Alarm Display
- Alarm Bar
- Historical Alarm Display
- Graphics Move

- Meter
- Historical Data Display
- Message Display
- Flowing block
- Timers
- Multi-function keys
- Pie show

6.4.1 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 4-48.

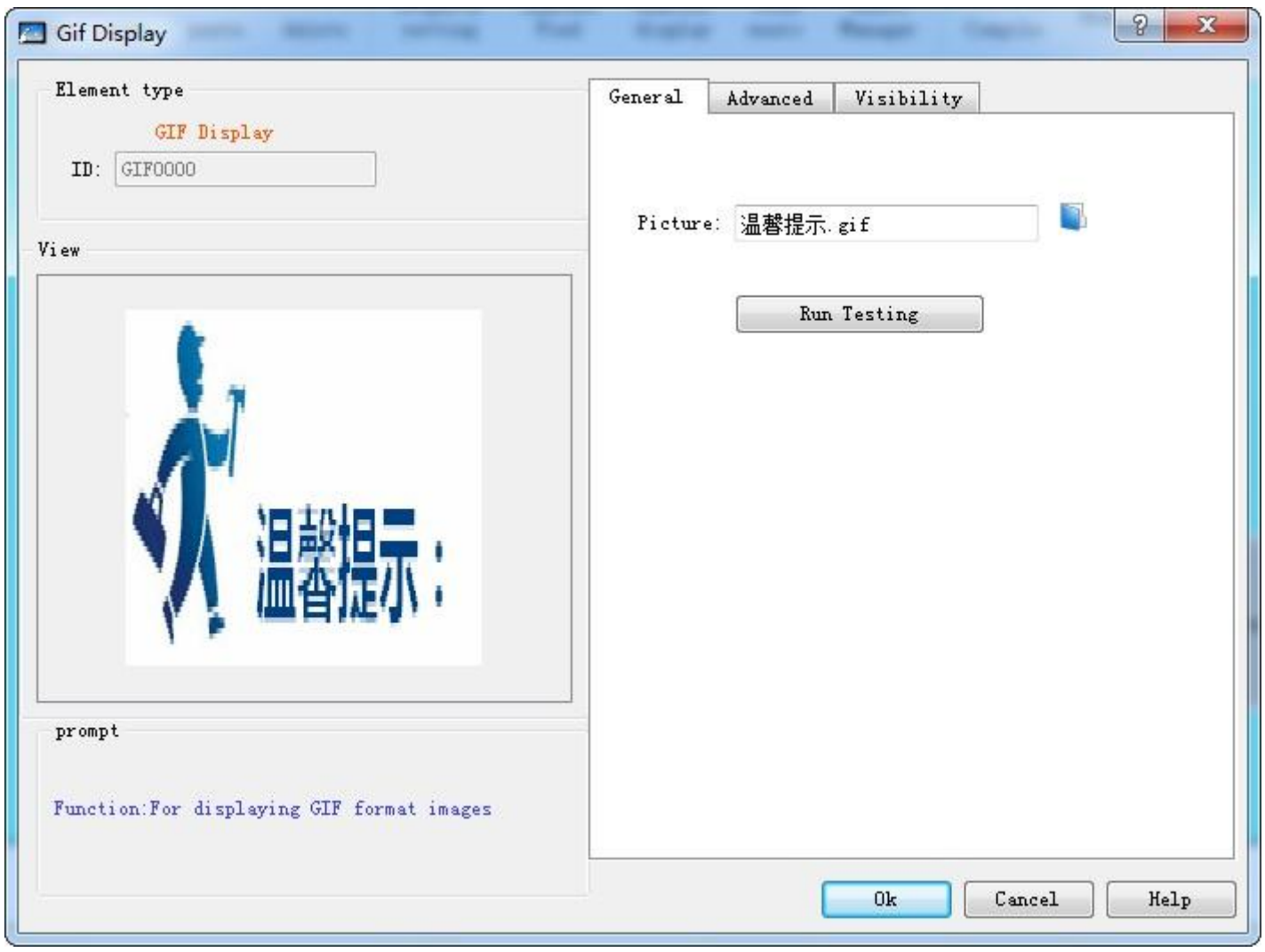


Figure 4-48 GIF Display dialog box

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.

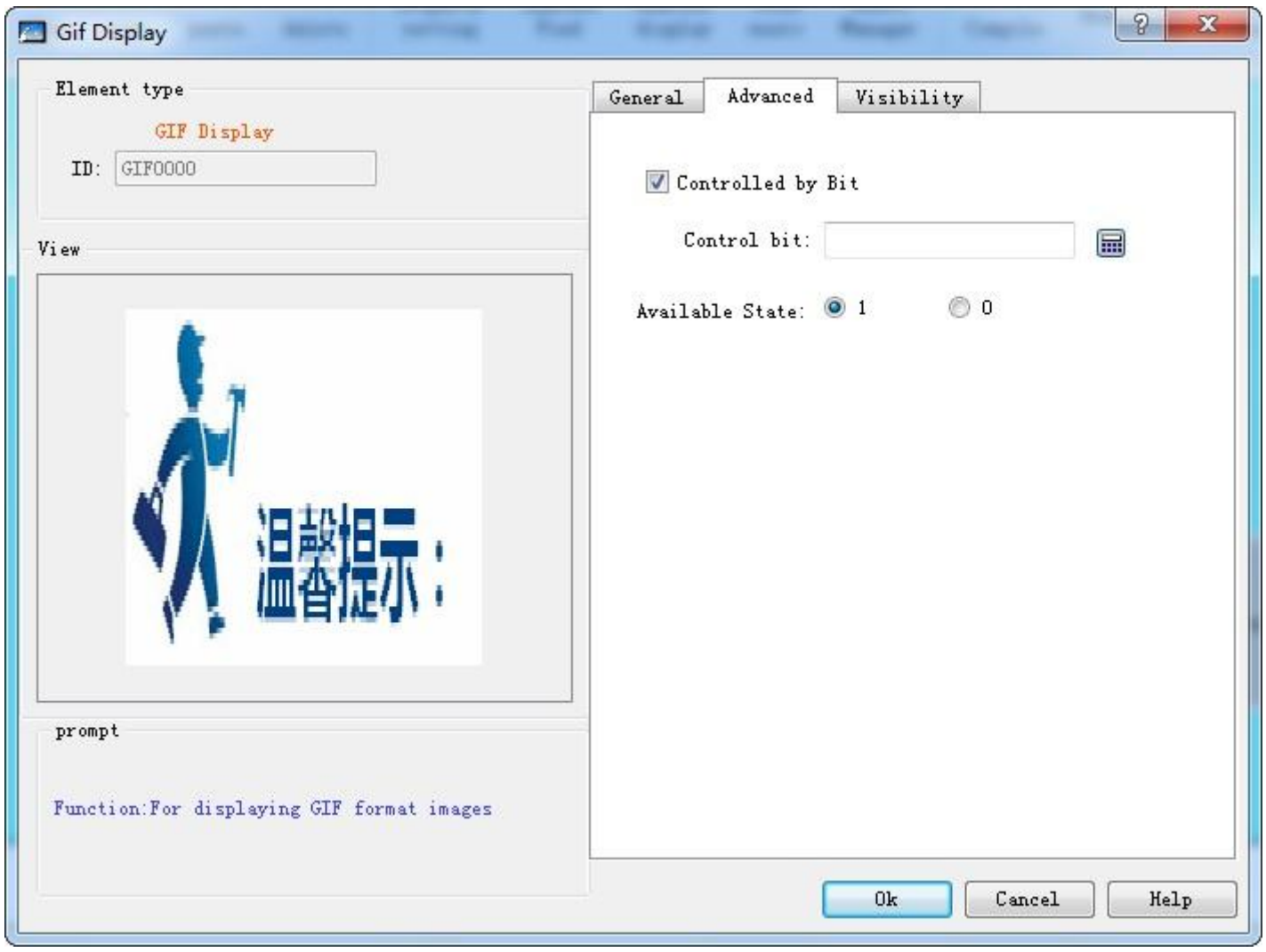


Figure 4-49 GIF Display "Advanced" page

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.

Tips:

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

6.4.2 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 4-50

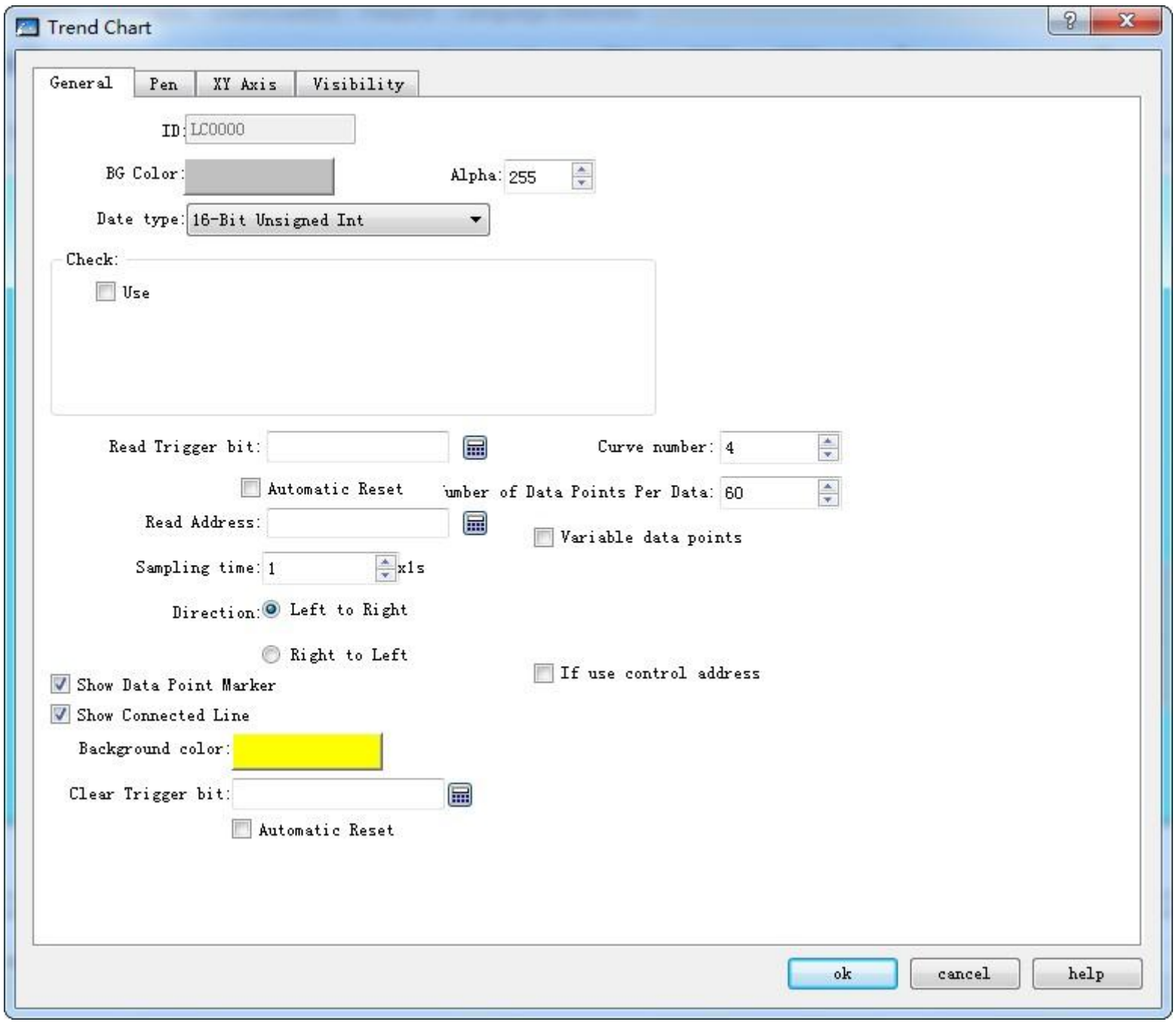


Figure 4-50 Trend Chart Common Dialog Box

- Background 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: Whe 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



Tips:

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

E.g.:

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,.

The "Line" page of the Trend Chart is shown in Figure 4-51: This page allows user to set the maximum value, minimum value, style and color of each pen.

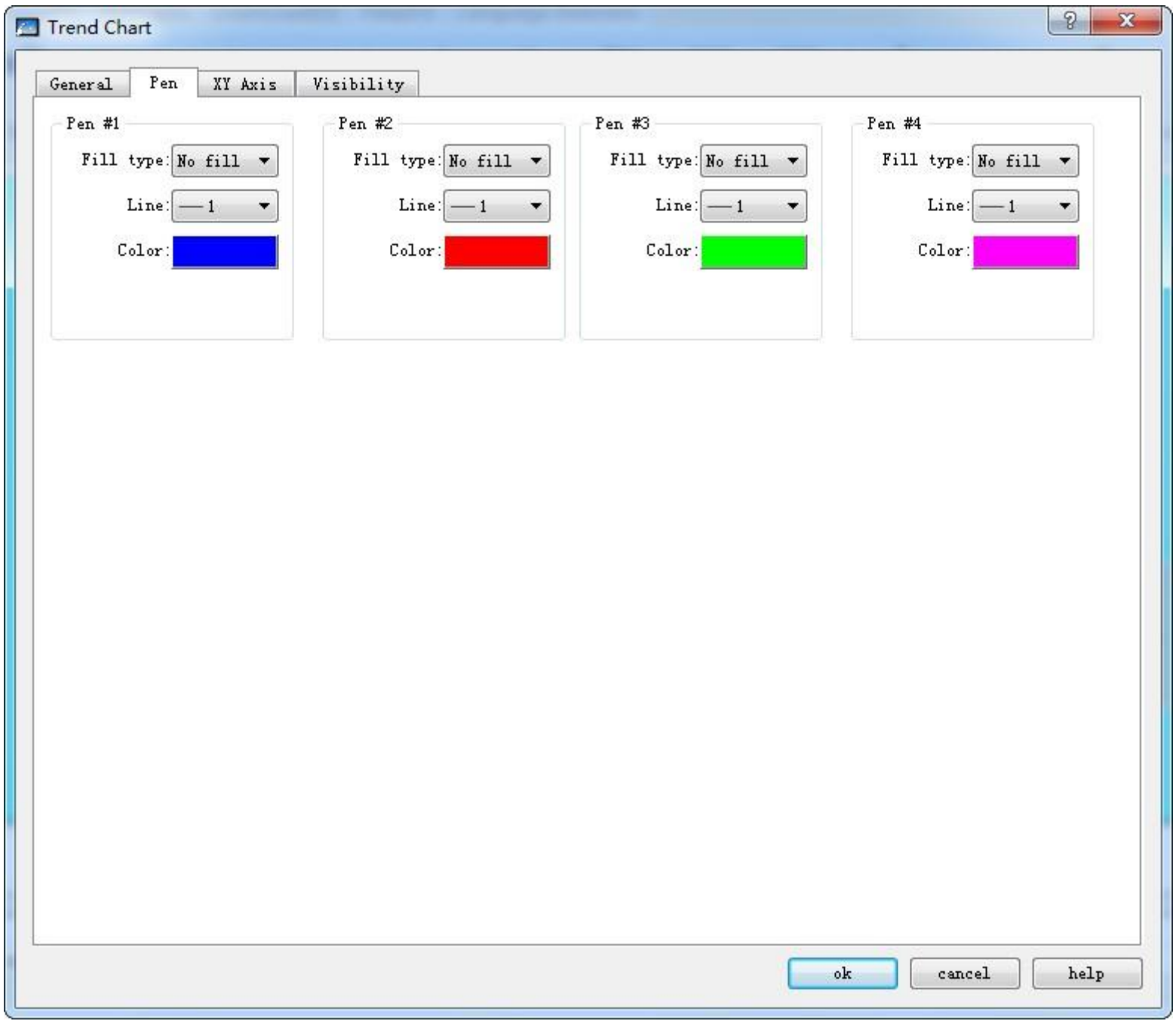


Figure 4-51 Trend Chart Pen Dialog Box

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 4-52:

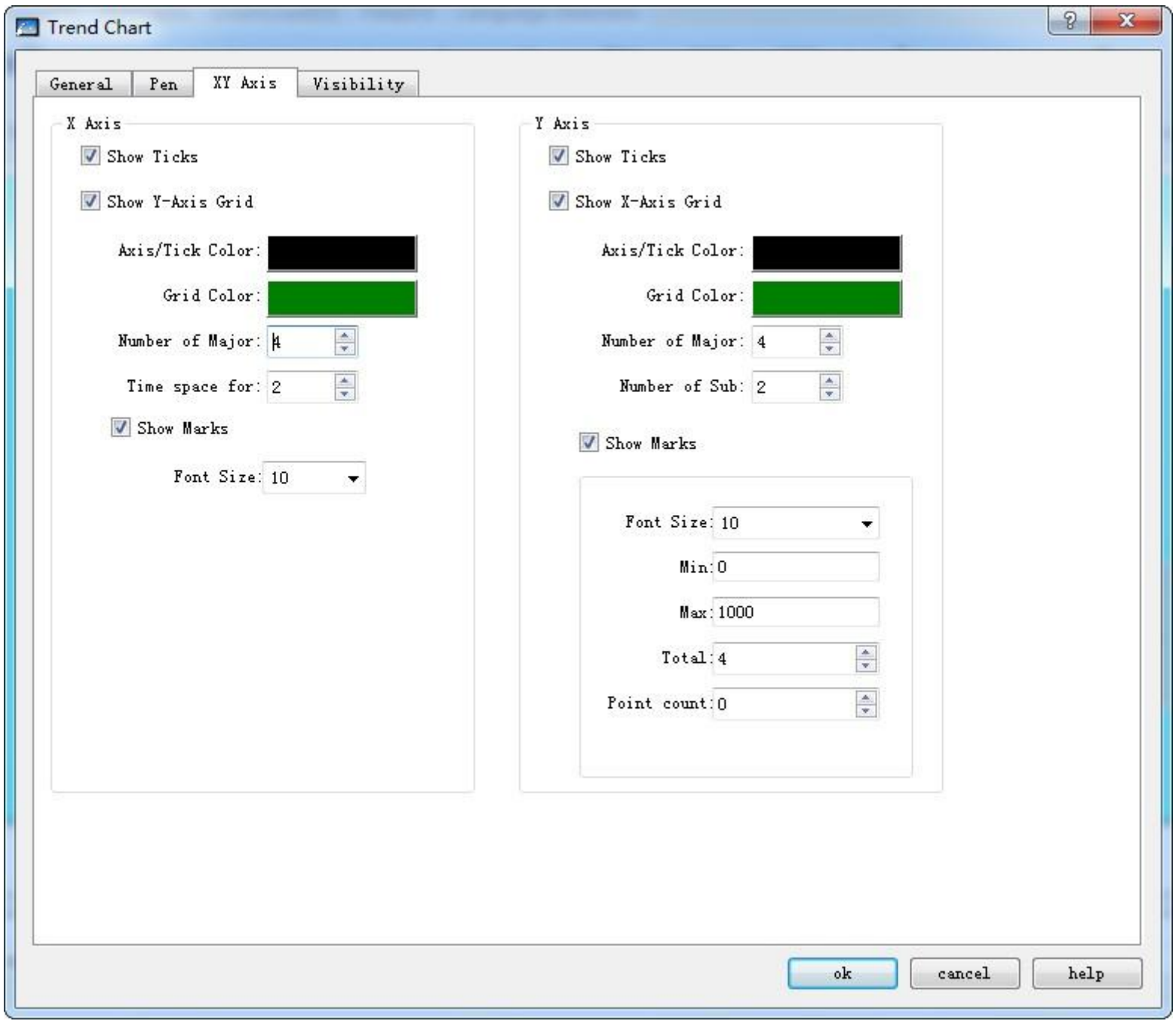


Figure 4-52 Trend Chart XY Axis Dialog Box

➢ 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.



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

6.4.3 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:

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.

For example, if 16-bit data type is selected and the number of data groups is 4, assuming that the user-input address is LW3, 8 sets of address values are continuously read,

LW3: Line1 Value of the X-axis

LW4: Line 1 Value of the Y-axis

LW5: Line 2 Value of the X-axis

LW6: Line 2 Value of the Y-axis

LW7: Line 3 Value of the X-axis

LW8: Line 3 Value of the Y-axis

LW9: Line 4 Value of the X-axis

LW10: Line 4 Value of the Y-axis

The addresses to be read are LW3-LW10, with 8 groups of addresses. Therefore, when select the 16-bit data and sets N groups of data, you can read values of 2 * N groups of address consecutively according to address rules of different PLC models.

When the 32-bit data type is selected and the number of data groups is 3, assuming that the user-input address is LW3, then it needs to read address values of 12 data groups in succession.

LW3: Line 1 Value of the X-axis

LW5: Line 1 Value of the Y-axis

LW7: Line 2 Value of the X-axis

LW9: Line 2 Value of the Y-axis

LW11: Line 3 Value of the X-axis

LW13: Pen 3 Value of the Y-axis

The addresses to be read are LW3-LW14, with 12 sets of address. Therefore, when select 32-bit data and set N groups of data, you can read address values of 2 * N data by plus 2 at interval according to address rules of different PLC models.

6.4.4 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 nvalue 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 Property dialog box appears, as shown in Figure 4-53:

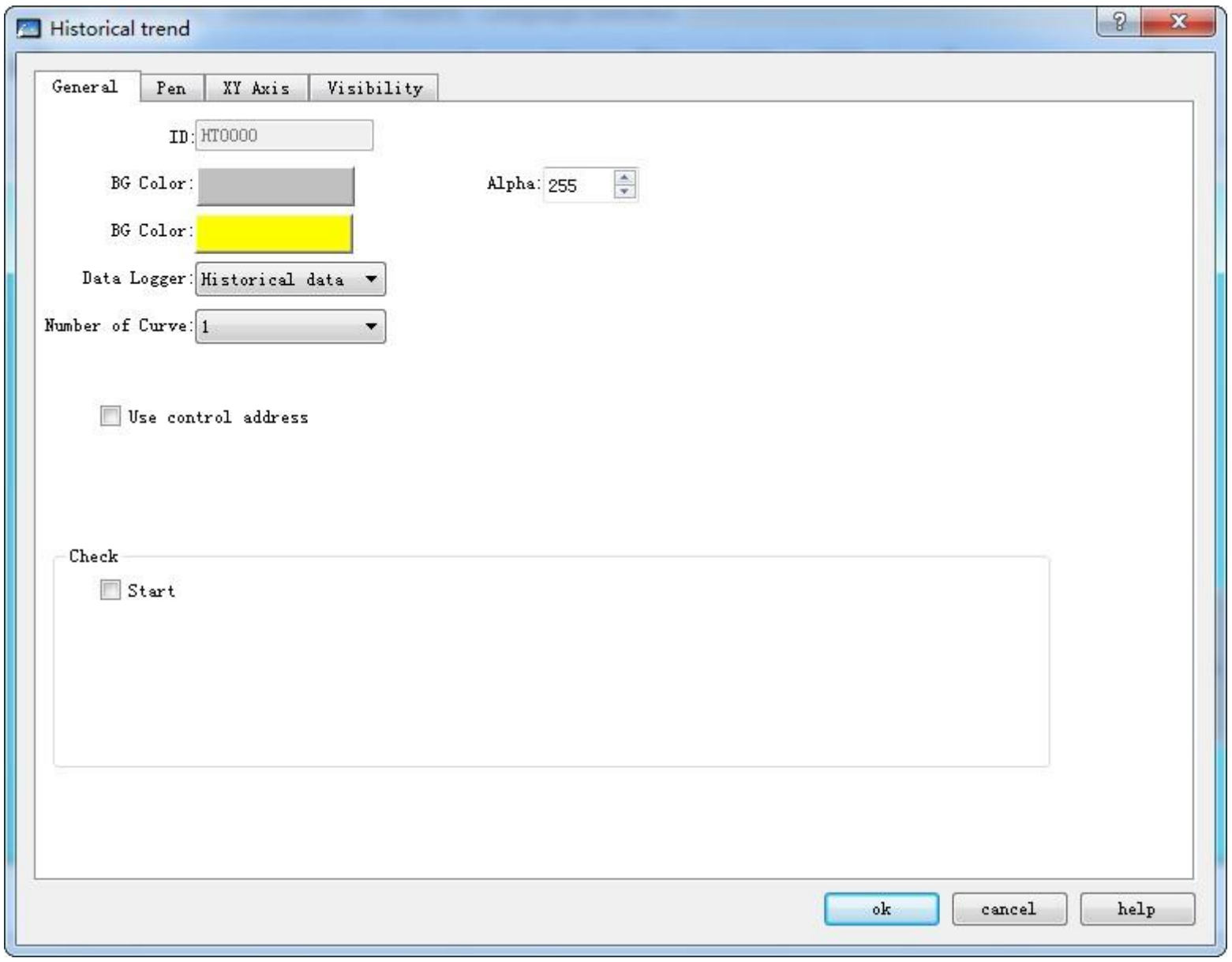
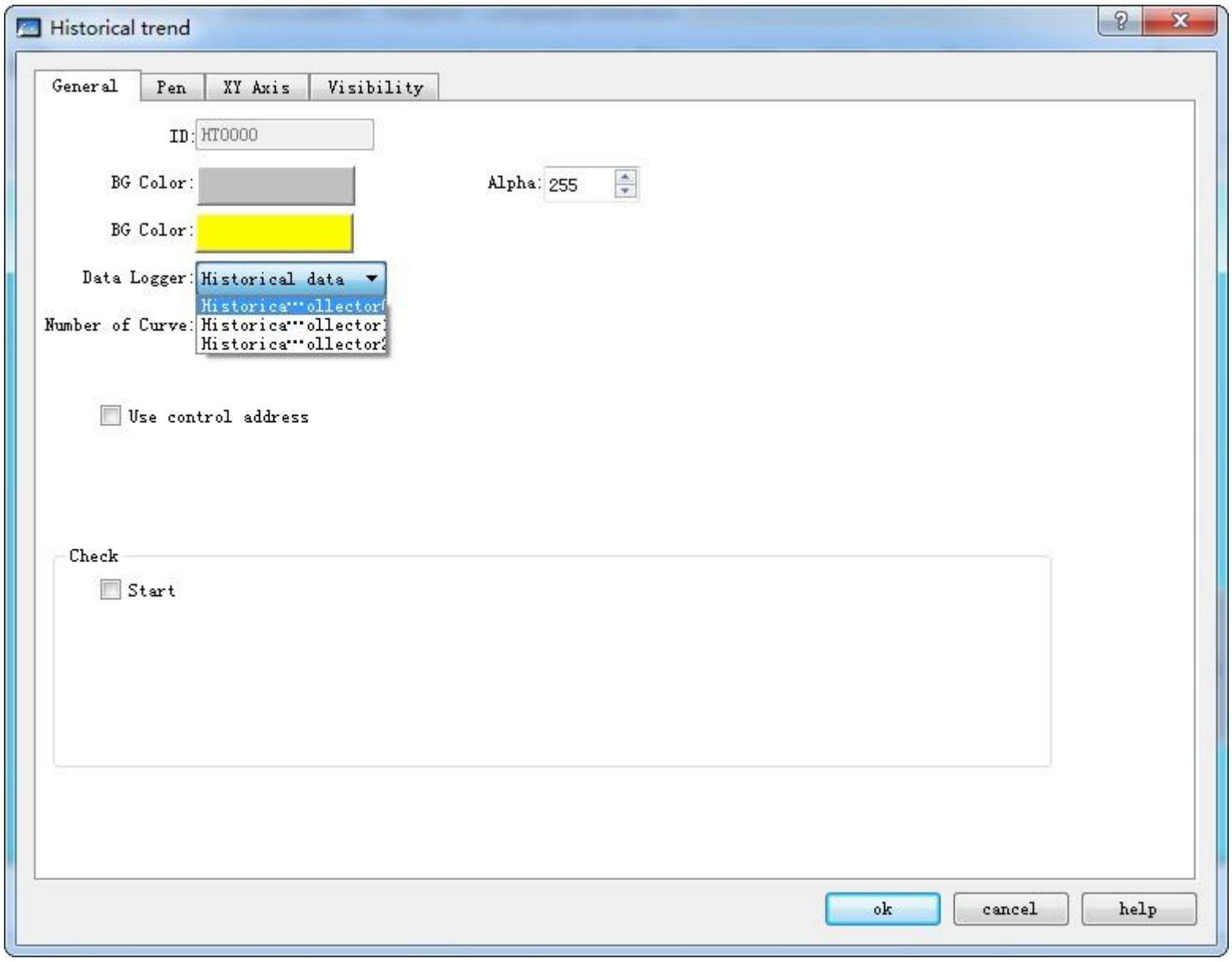


Figure 4-53 Historical Trend General page dialog box

- 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. SKTOOL 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	Controlled object by control register address
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
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 4-54.

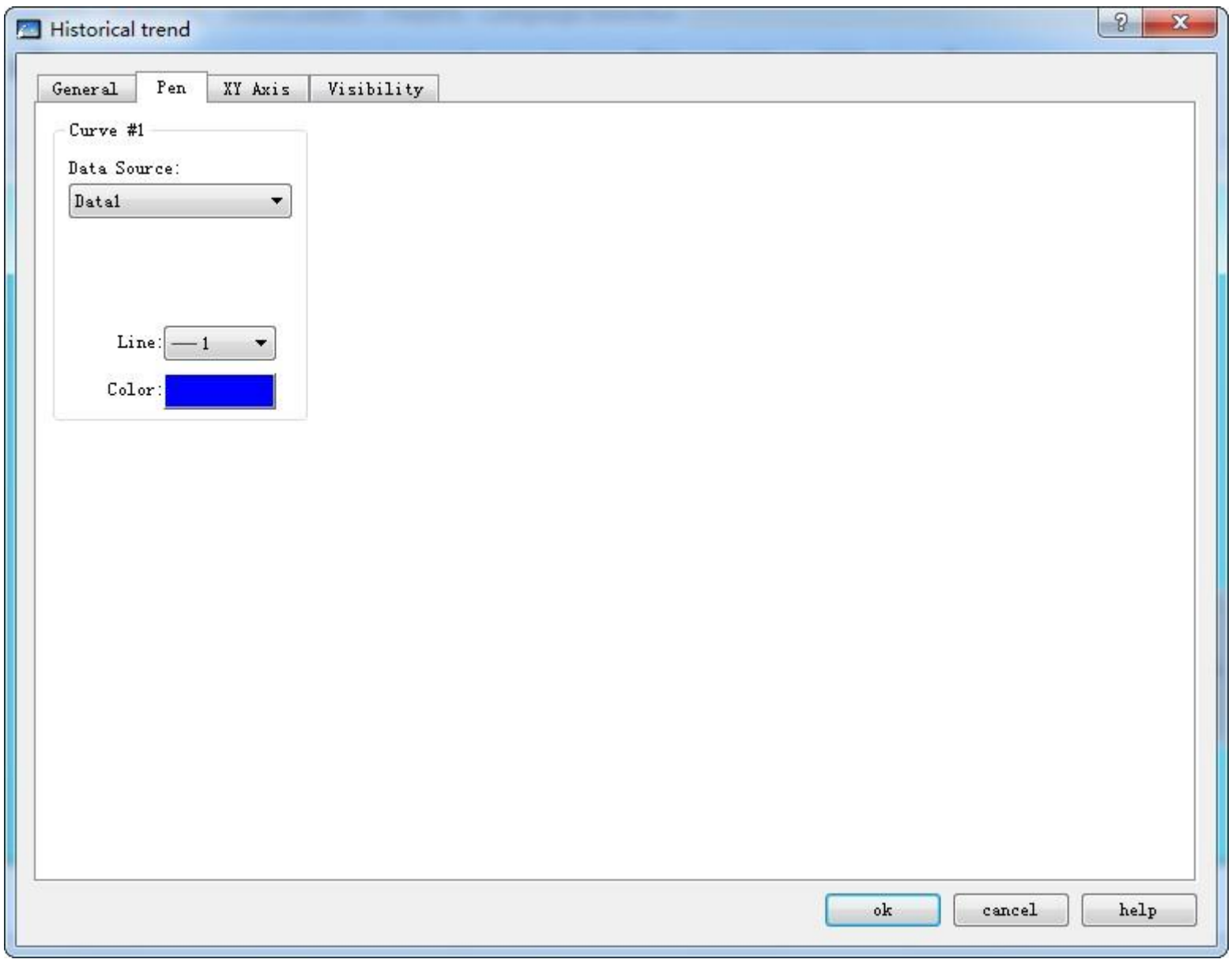


Figure 4-54 Pen tab of Historical trend

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 4-55.

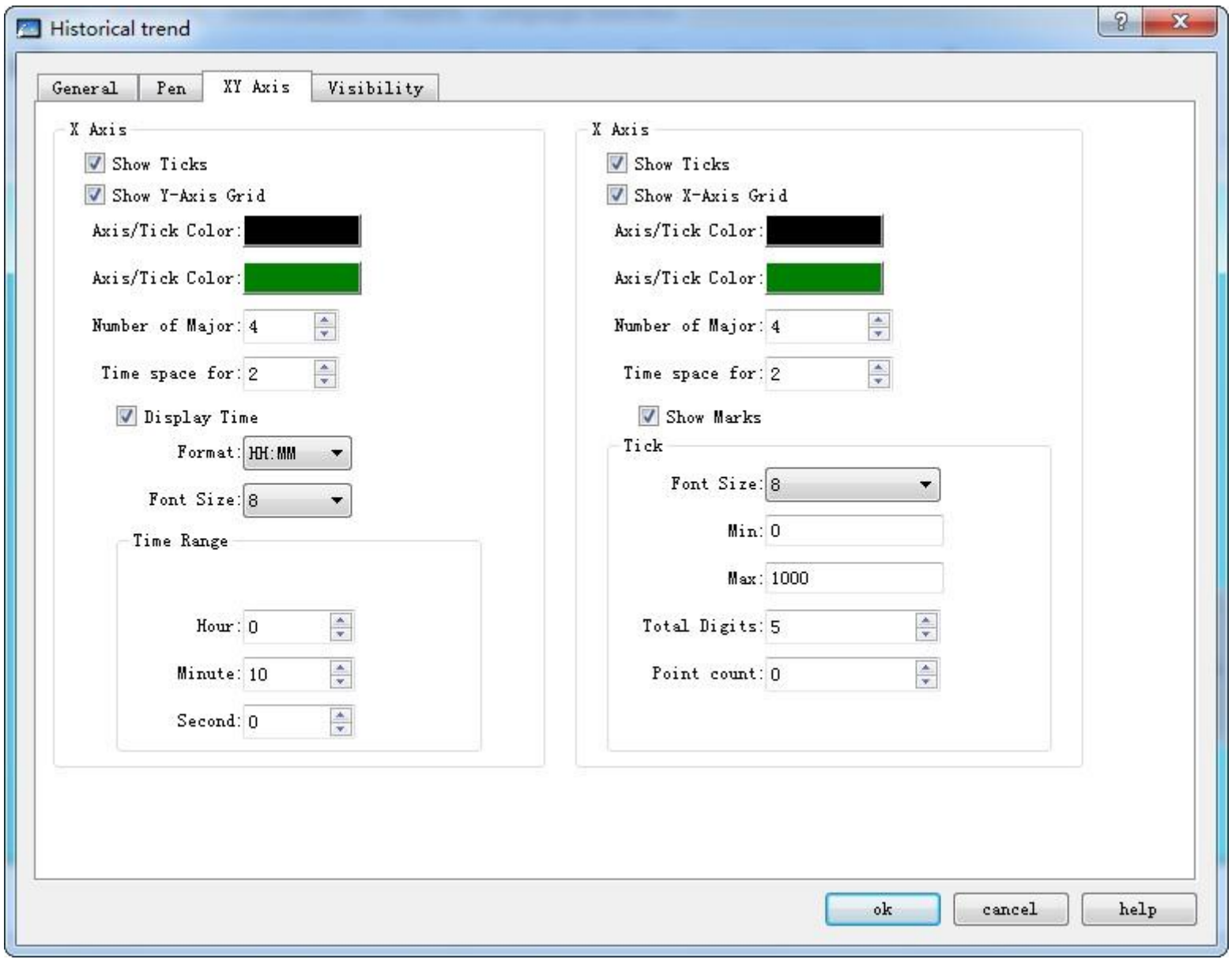


Figure 4-55 XY Axis tab of Historical Trend

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.

Tips:

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

6.4.5 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 4-56:

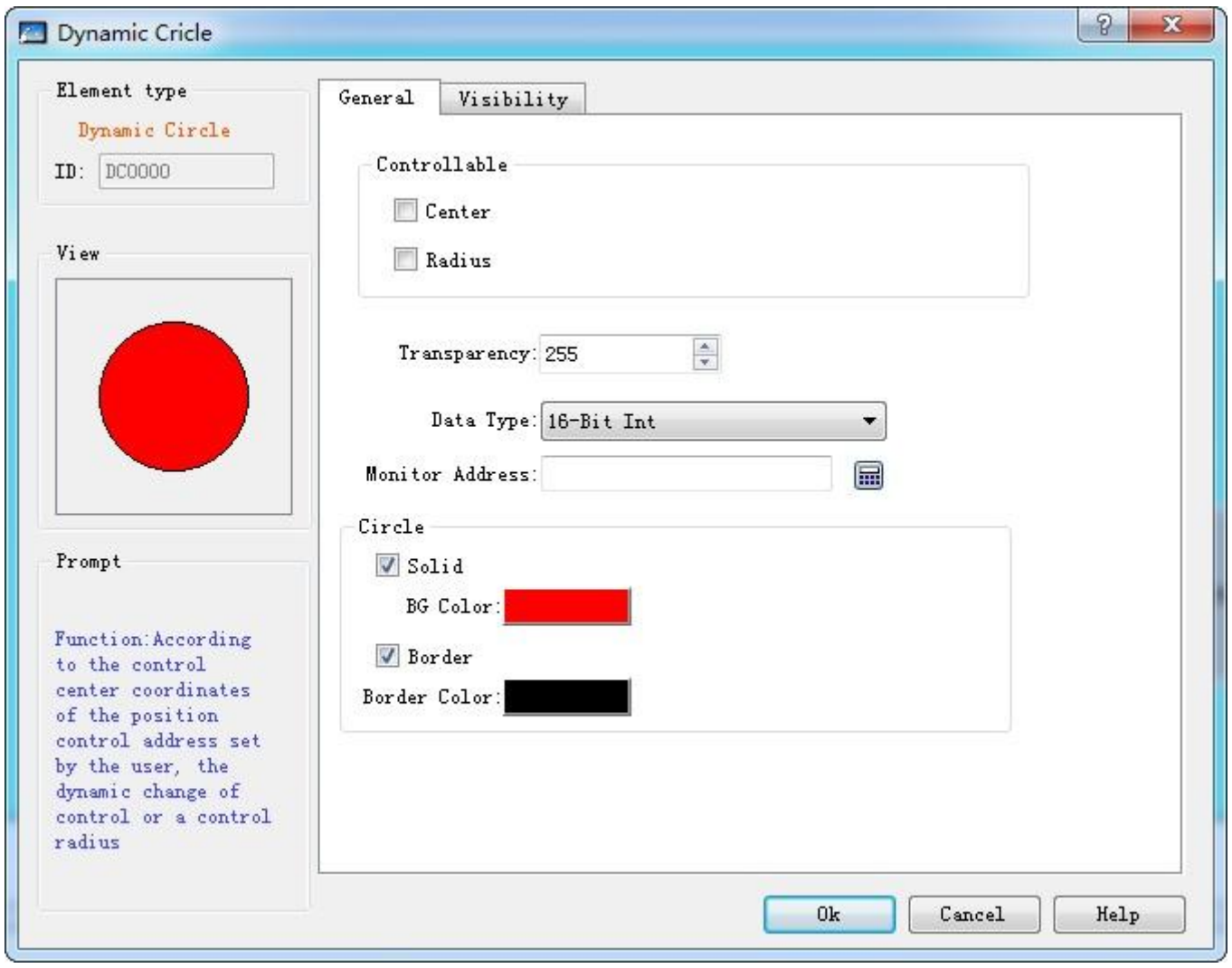


Figure 4-56 Dynamic circle dialog

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.

Tips:

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.



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

6.4.6 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 4-57.

Figure 4-57 Dynamic rectangle dialog

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.



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

6.4.7 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. SKTOOL 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 4-58 will pop up:

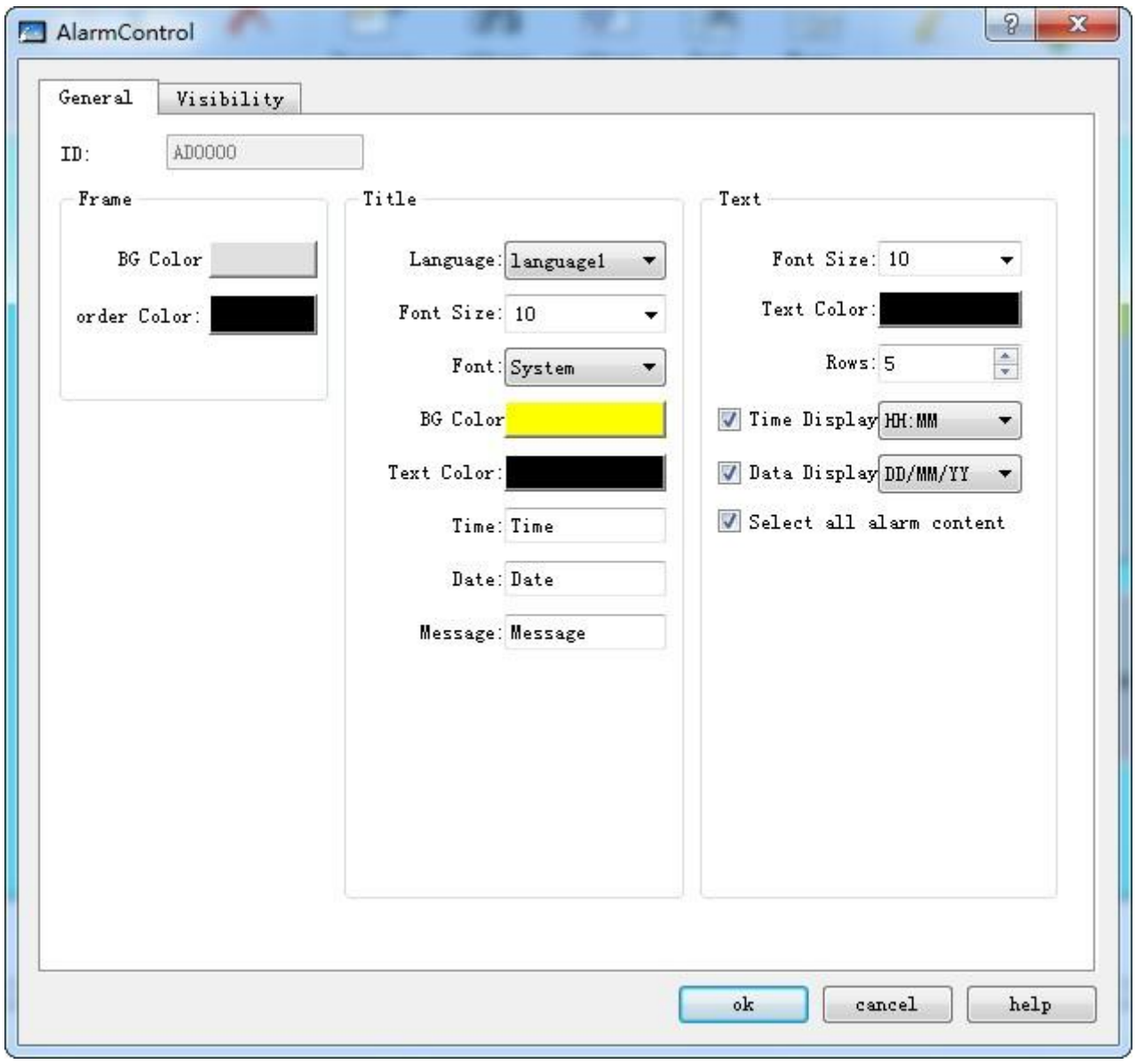


Figure 4-58 Alarm Display dialog

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 4-59:

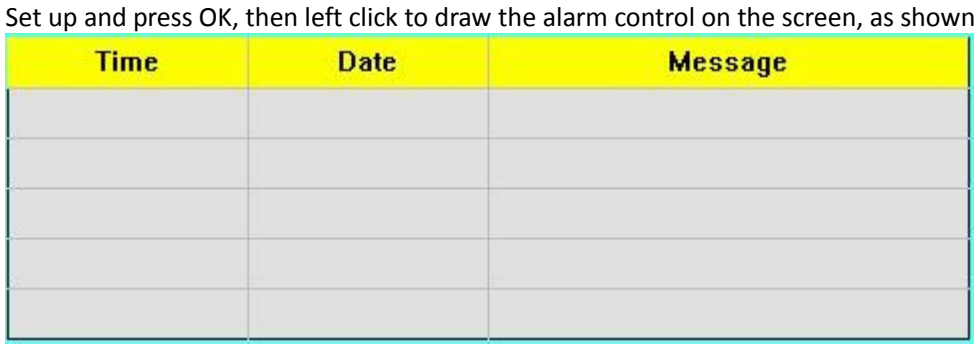


Figure 4-59 Alarm Display control

Tips:

- 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.

6.4.8 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 4-60:

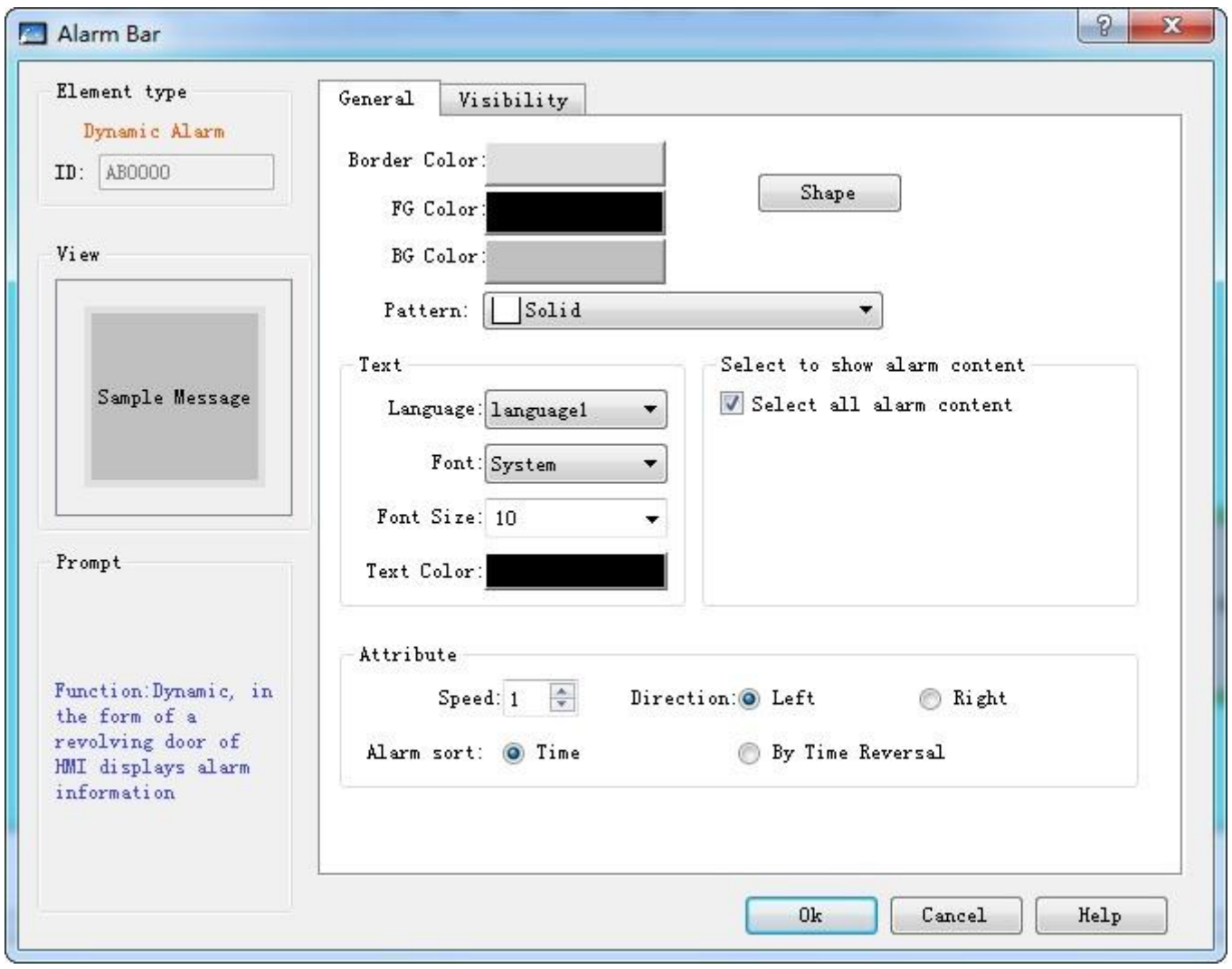


Figure 4-60 Alarm Bar dialog

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.

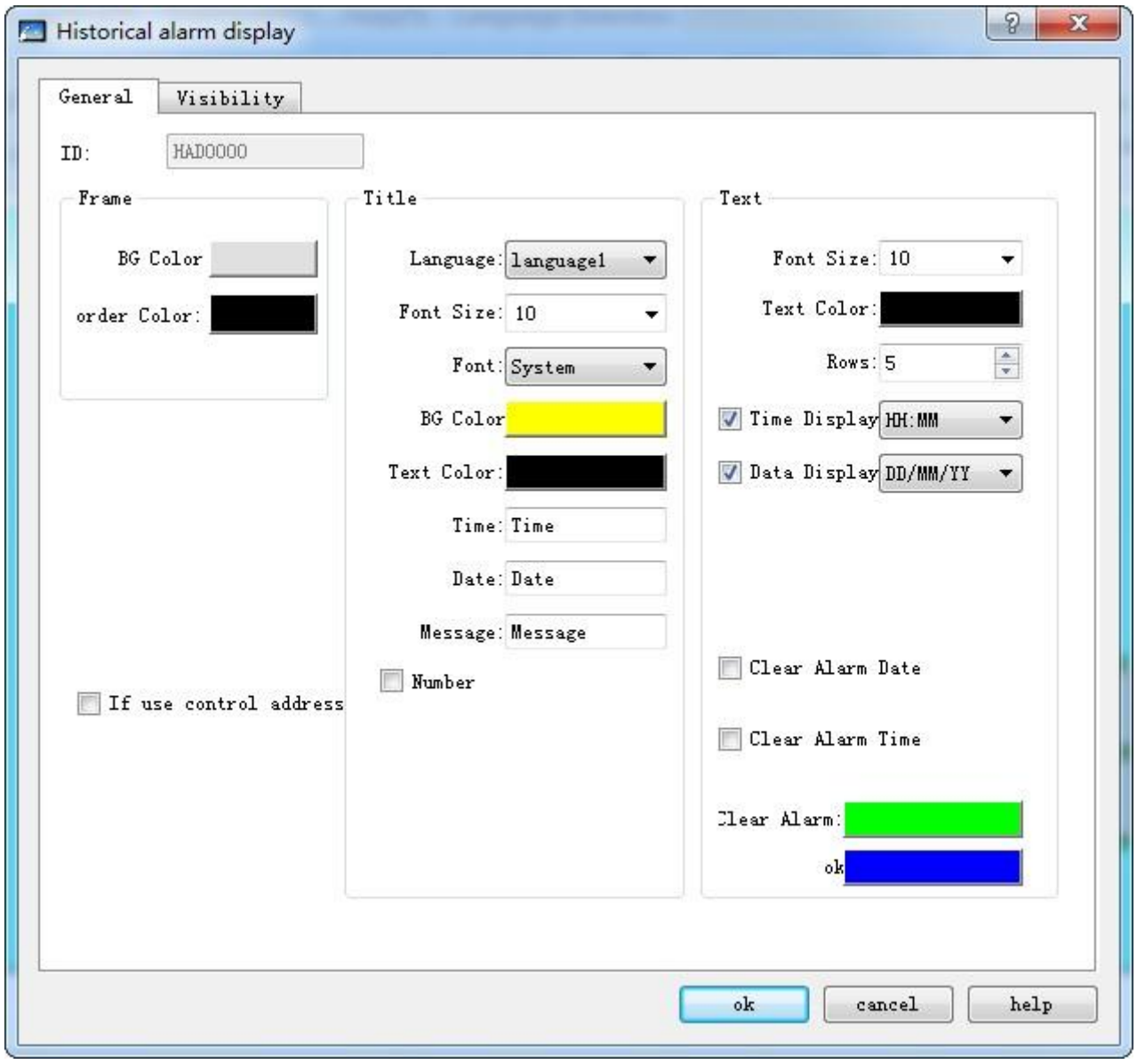
- Language: For different languages, font size, font, time, date and message content can be different, and the background color and text color are the same as the first language.
- Font: Change the font format of the alarm contents
- Font Size: Change the font size of the alarm content
- Text color: 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.

Tips:

- 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.

6.4.9 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	Controlled object by control register address
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	4Start Time (Hour)
5	Start Time (Min)
6	Start Time (Second)
7	End time (Year)
8	End Time (Month)
9	End Time (Day)
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
- OK: Indicate the alarm with this color when it is generated



The basic operation can refer to "Alarm Display" control.
The "Visibility" page can refer to that of "Bit Button" control.

6.4.10 Graphic Move

With the Graphic 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 4-61:

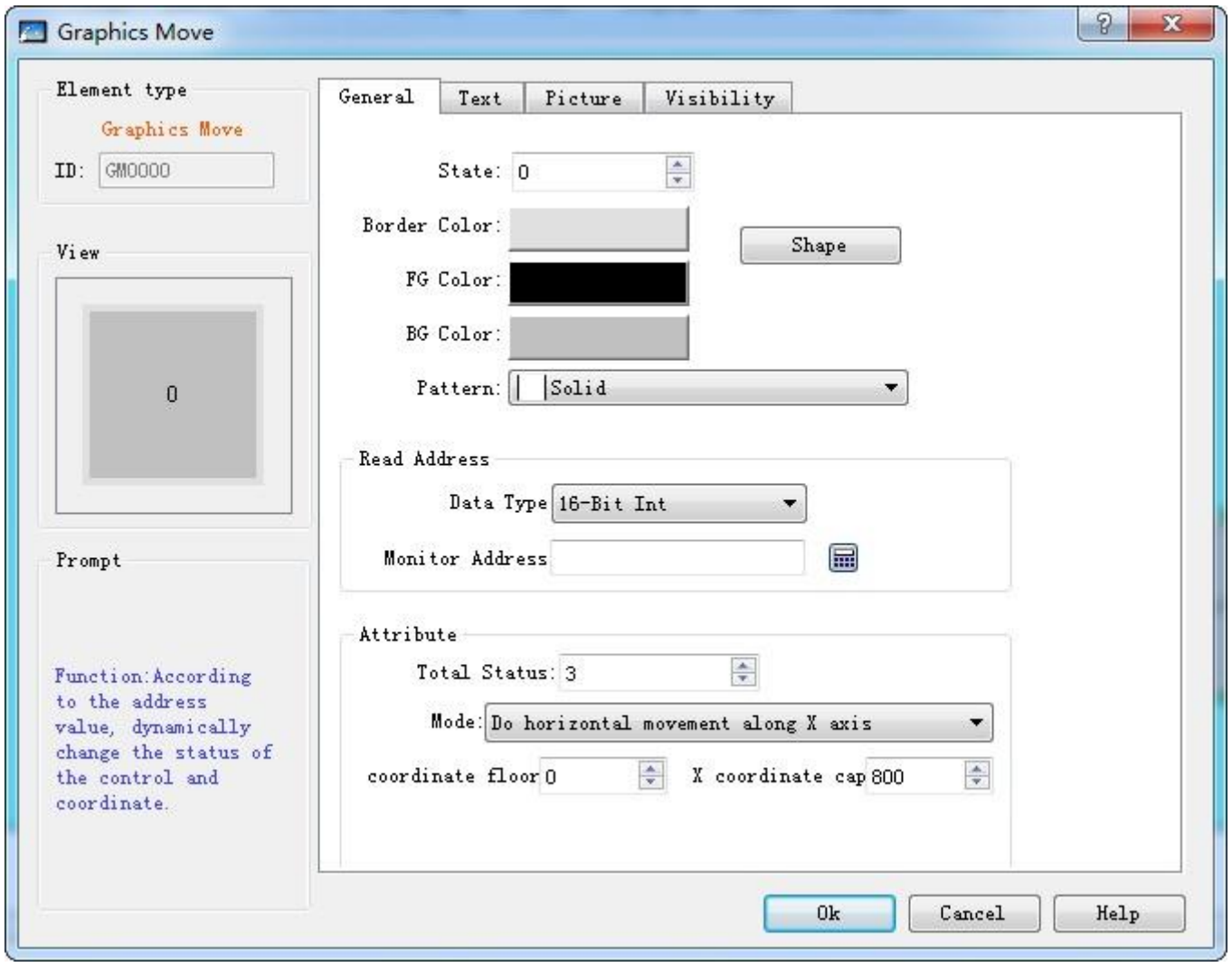


Figure 4-61 Graphic Move dialog

- 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; can not 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; can not 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; can not 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; can not 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; can not 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; can not 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.

Tips:

- 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.

6.4.11 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 4-62 appears:

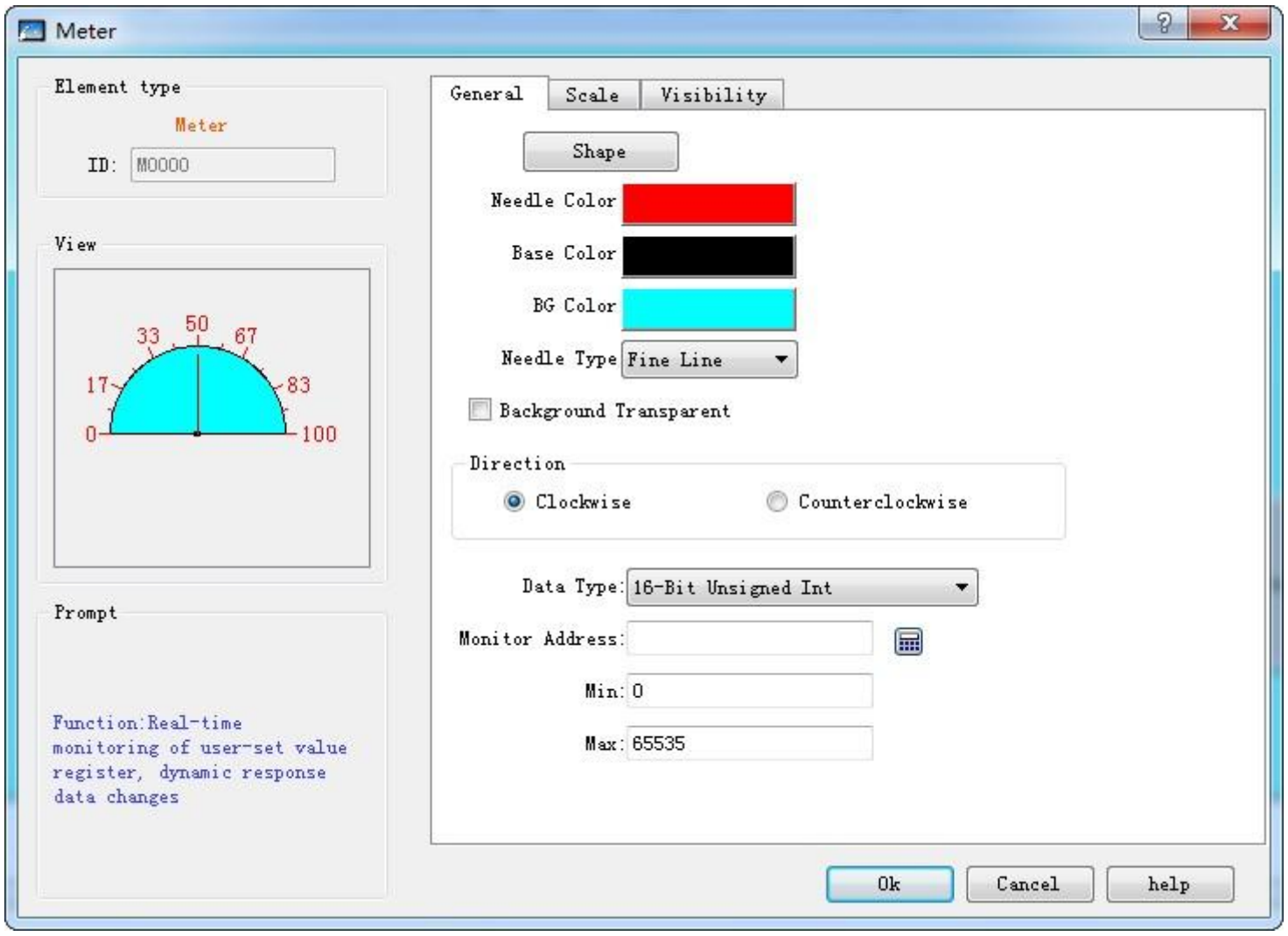


Figure 4-62 Meter dialog

- 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 4-63:

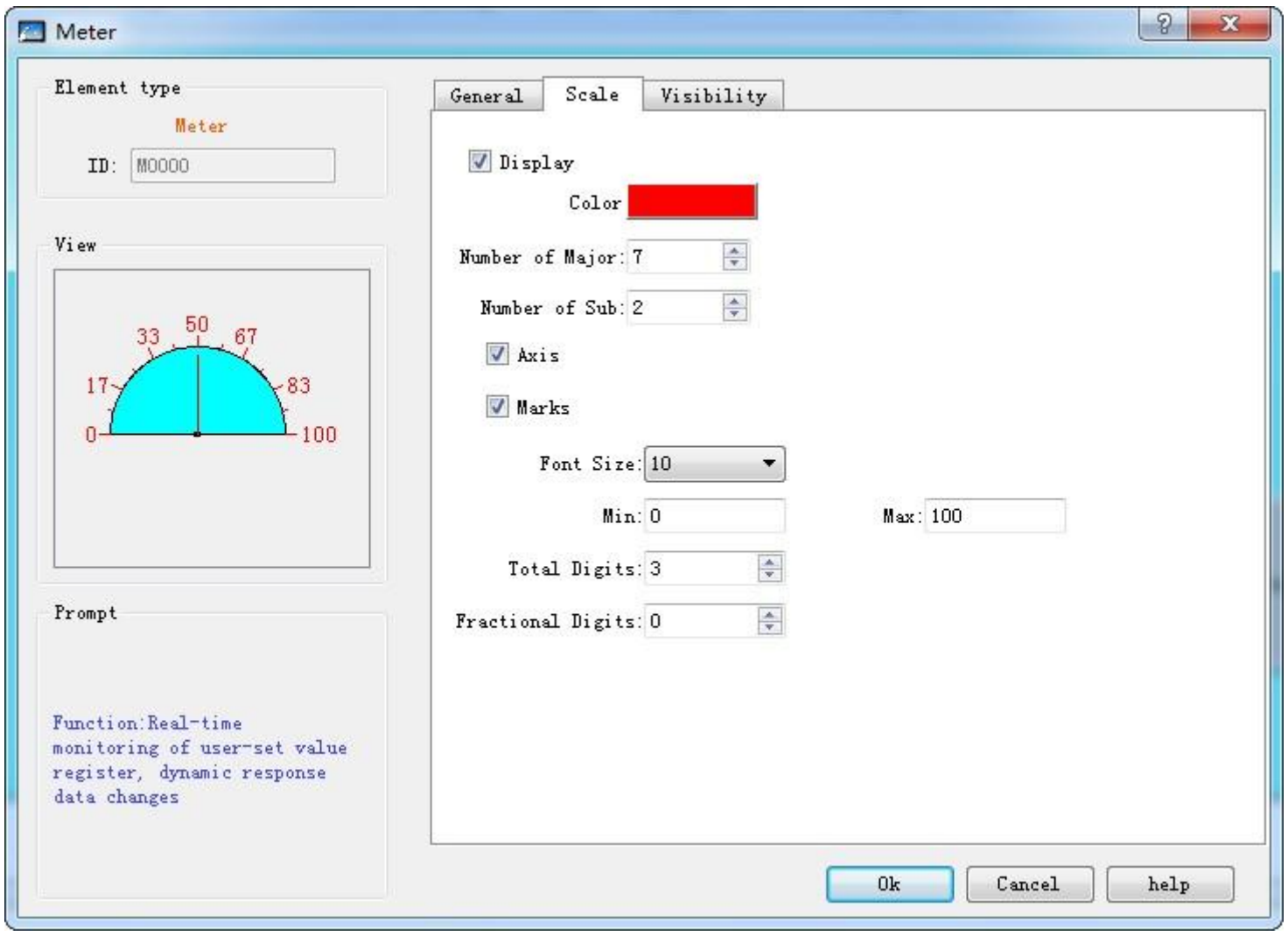


Figure 4-63 Scale tab of Meter

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:

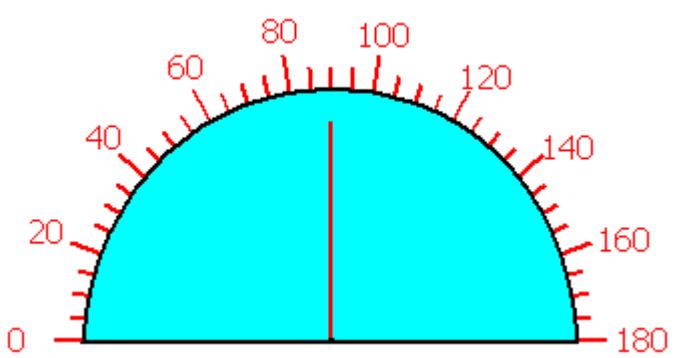


Figure 4-64 Meter control

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.



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.

6.4.12 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 SKTOOL to observe the historical data.

SKTOOL 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" in Chapter 6.

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

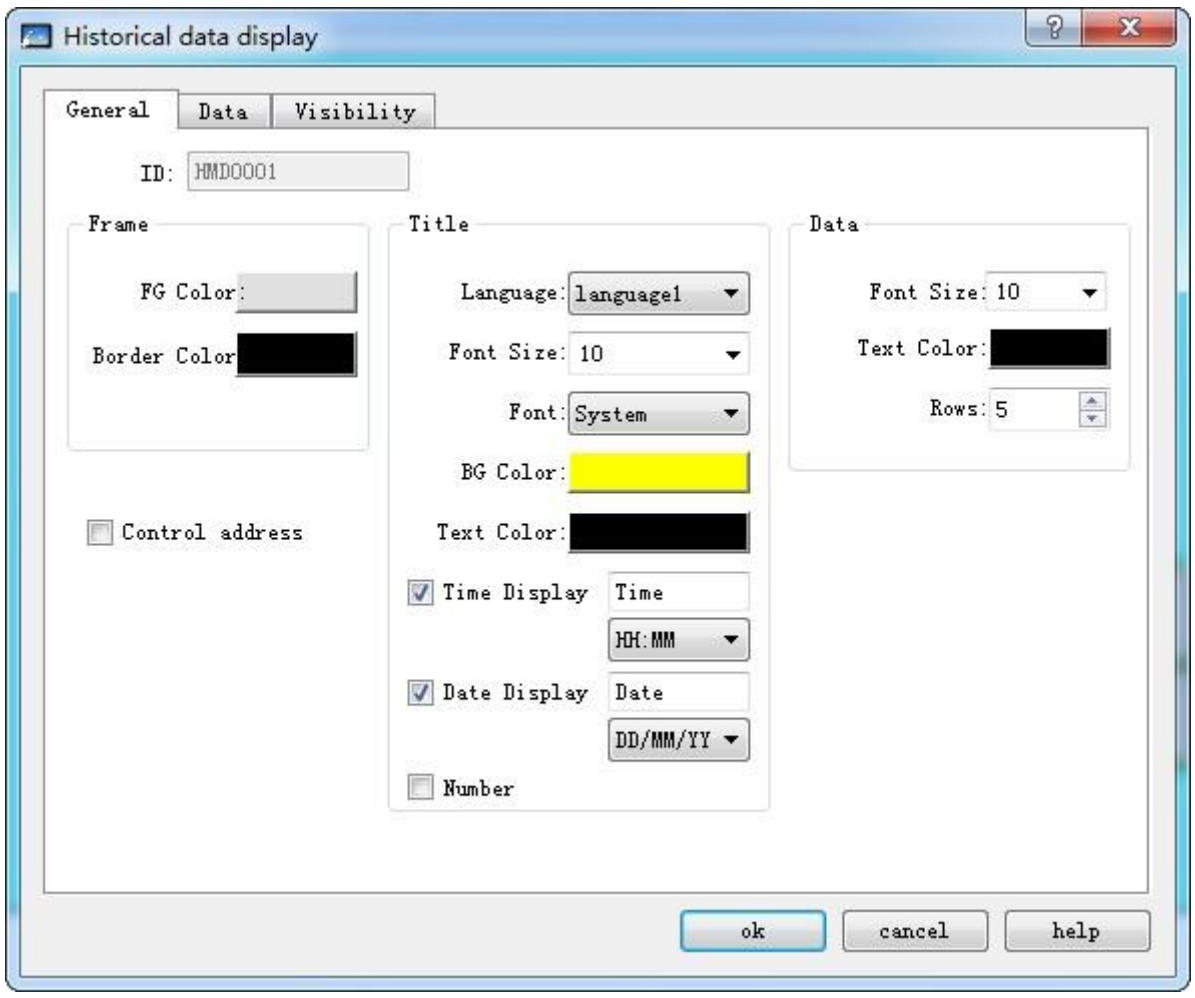


Figure 4-65 Historical Data Display dialog

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.

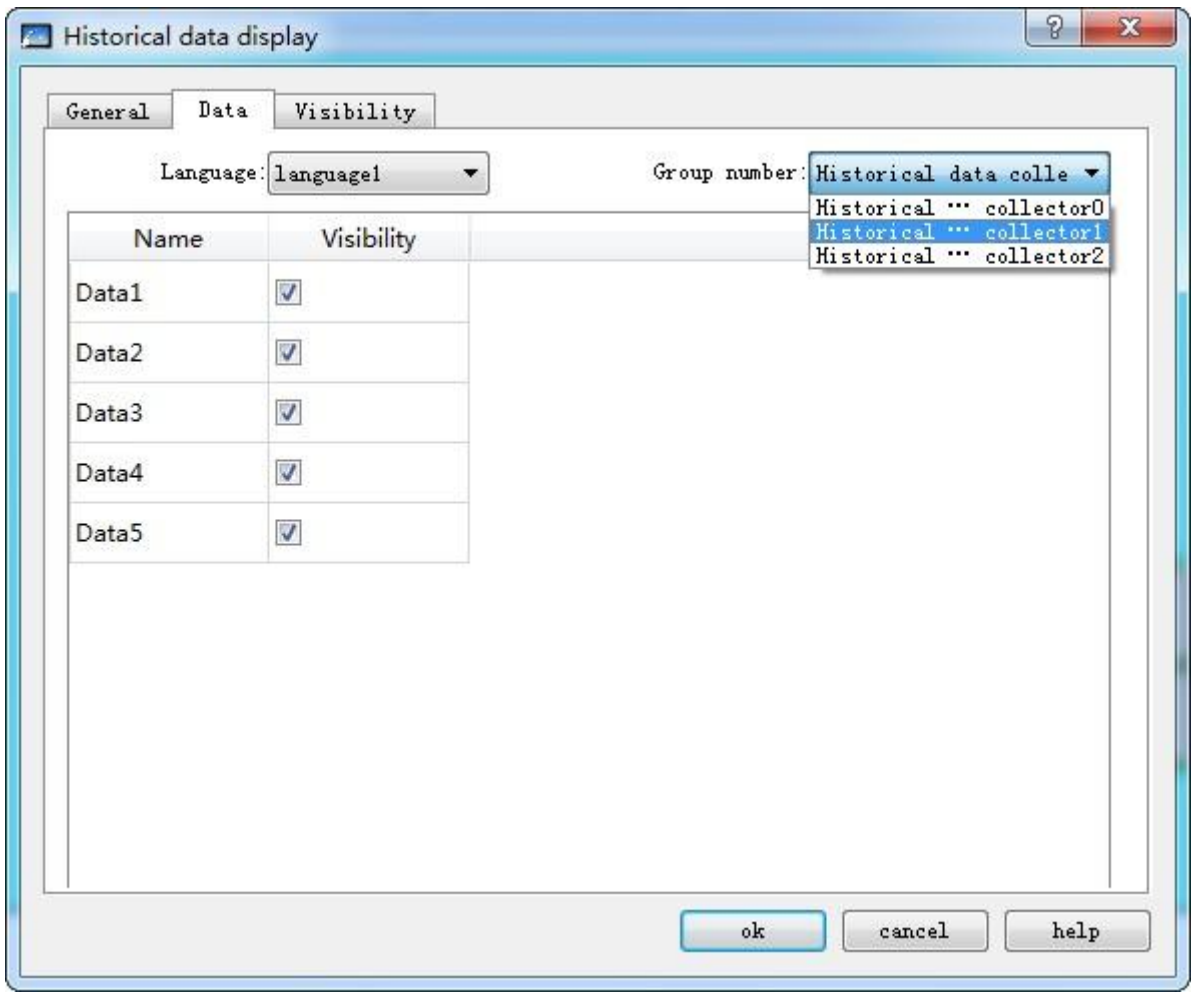
Control address:

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	Controlled object by control register address
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
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: SKTOOL provides multi-group historical data to choose.

Historical data display operation: When display historical data through control addresses, the configuration process is as follows 4-65-1:

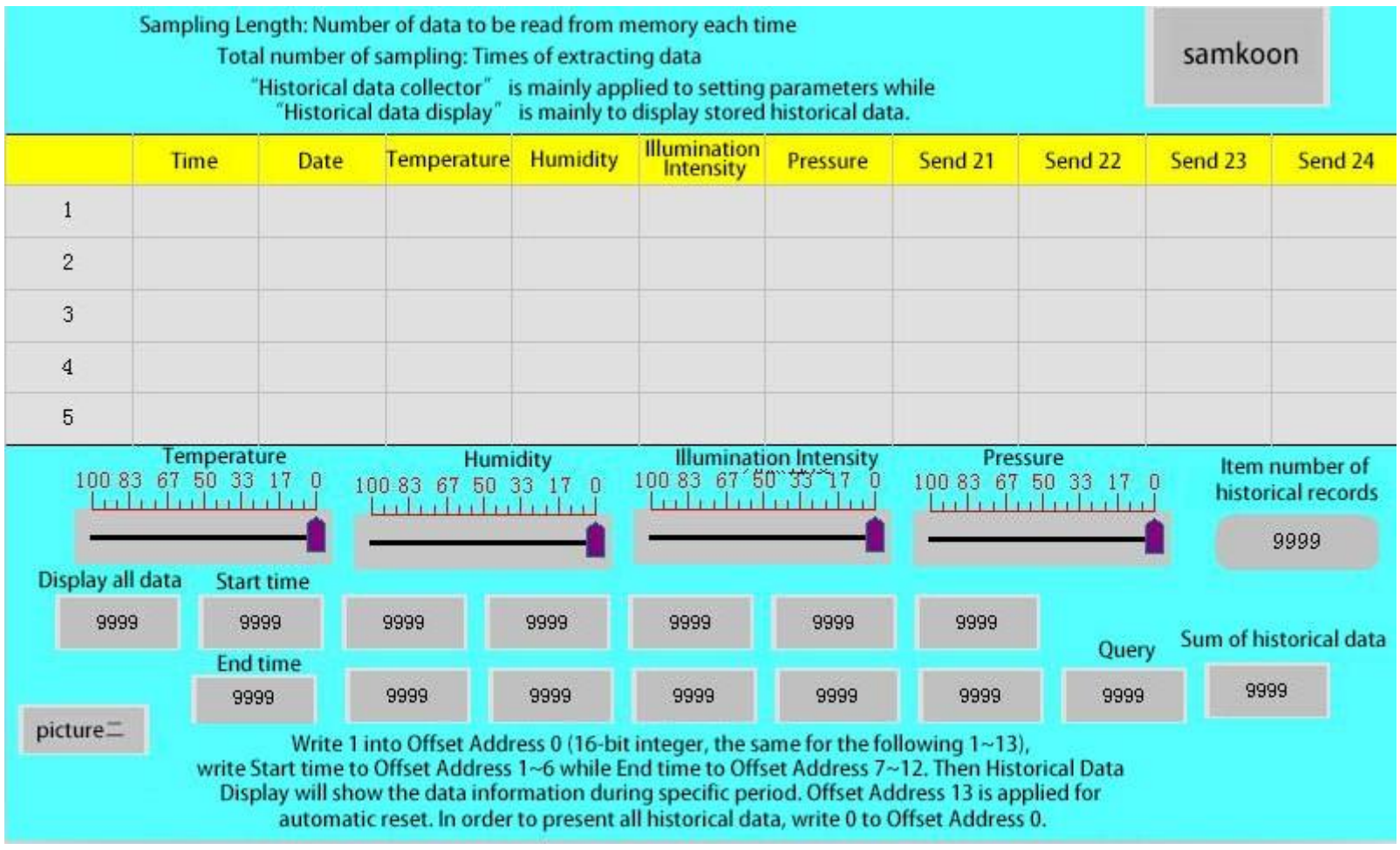


Figure 4-65-1

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. As shown in Figure 4-65-2

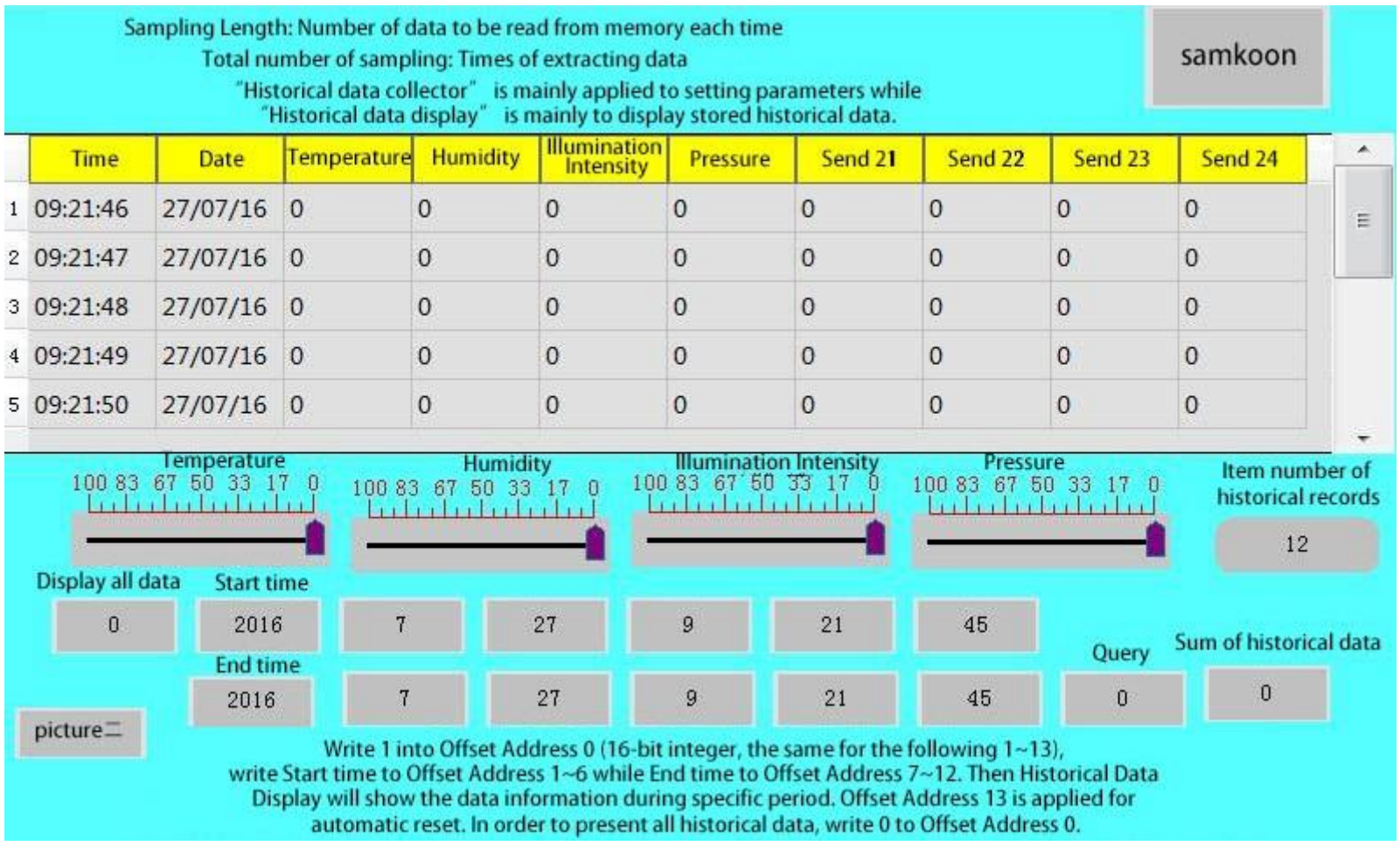


Figure 4-65-2

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.

Tips:

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

6.4.13 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 4-66:

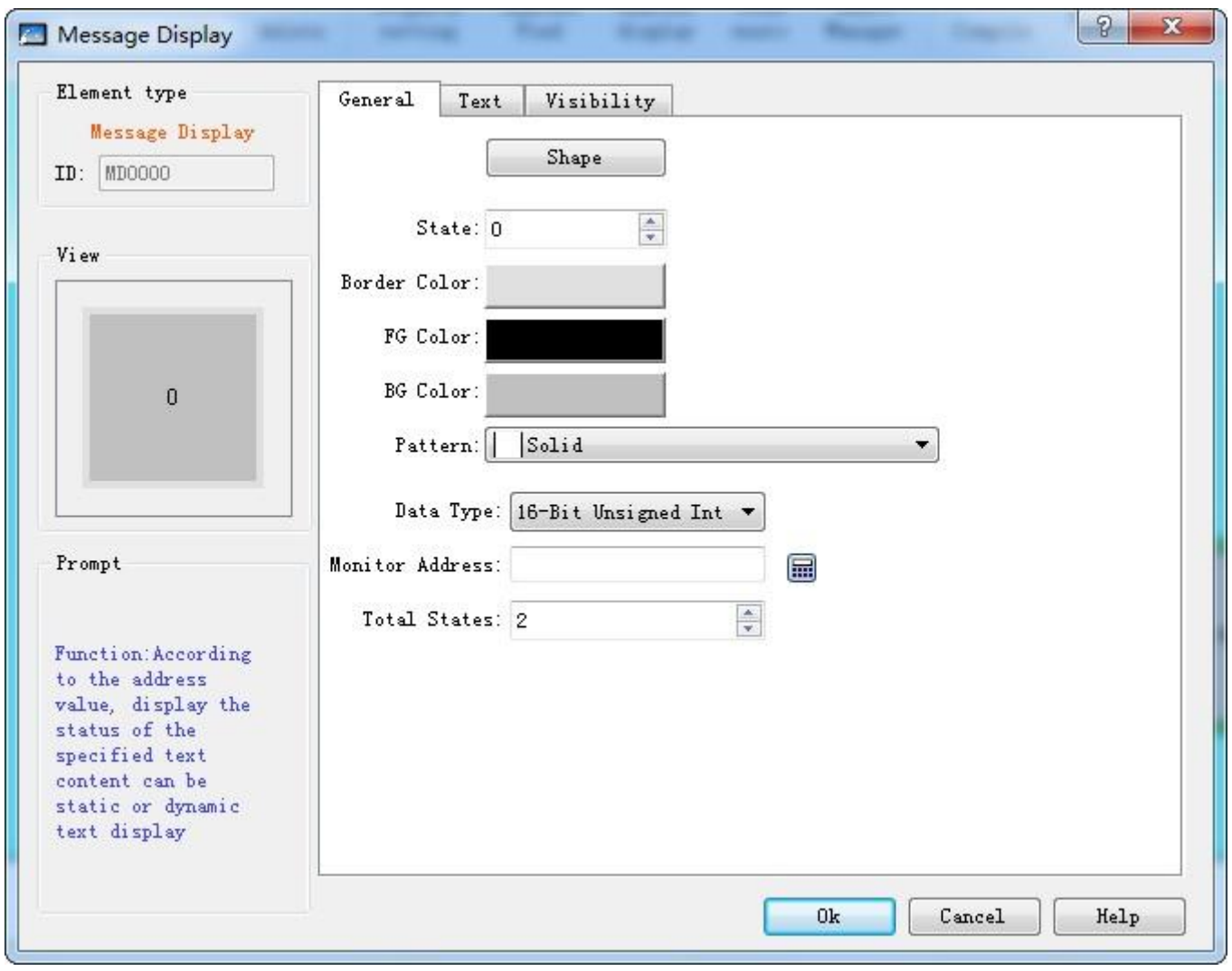


Figure 4-66 Message Display General page

The Text page of Message Display is shown in Figure 4-67：

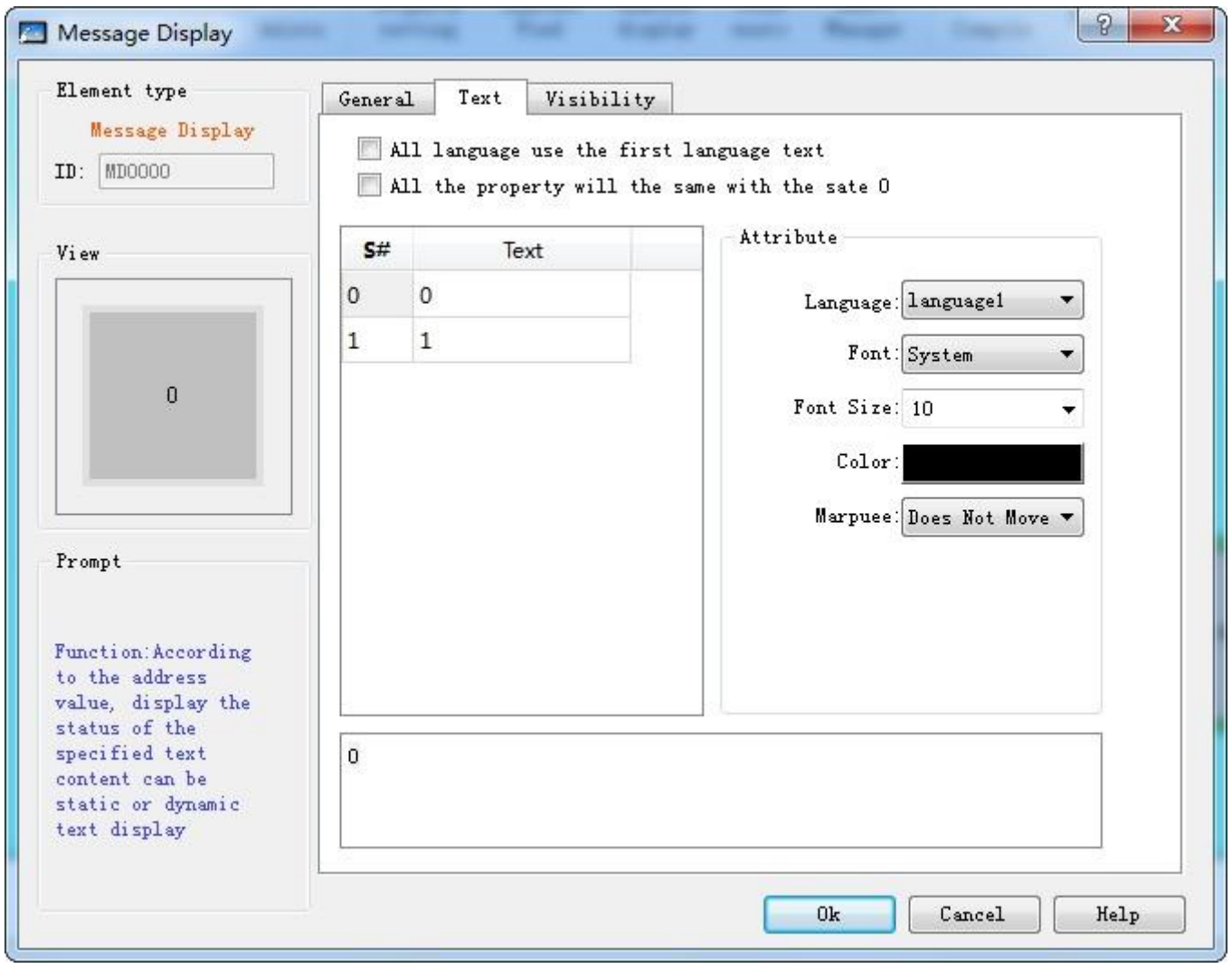


Figure 4-67 Text page of Message Display

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

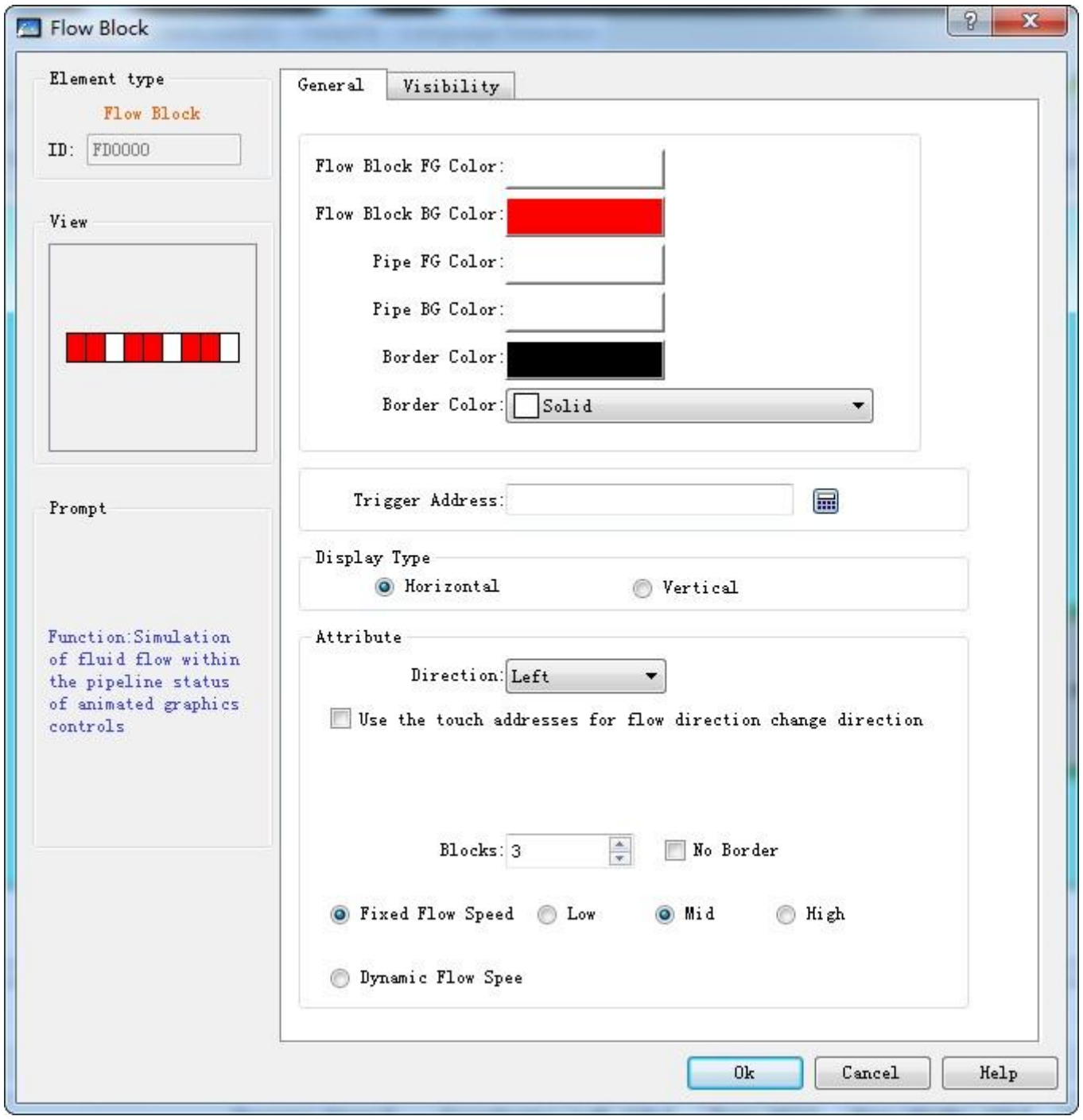
- Cursors: This item has three options-- Not move, Left and Right.
- Not move: The current state of text is static.
- Left: Text in the current state moves to the left at the speed (assumed to be n) set by user by n pixel value.
- Right: Text in the current state moves to the right at the speed (assumed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



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

6.4.14 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".

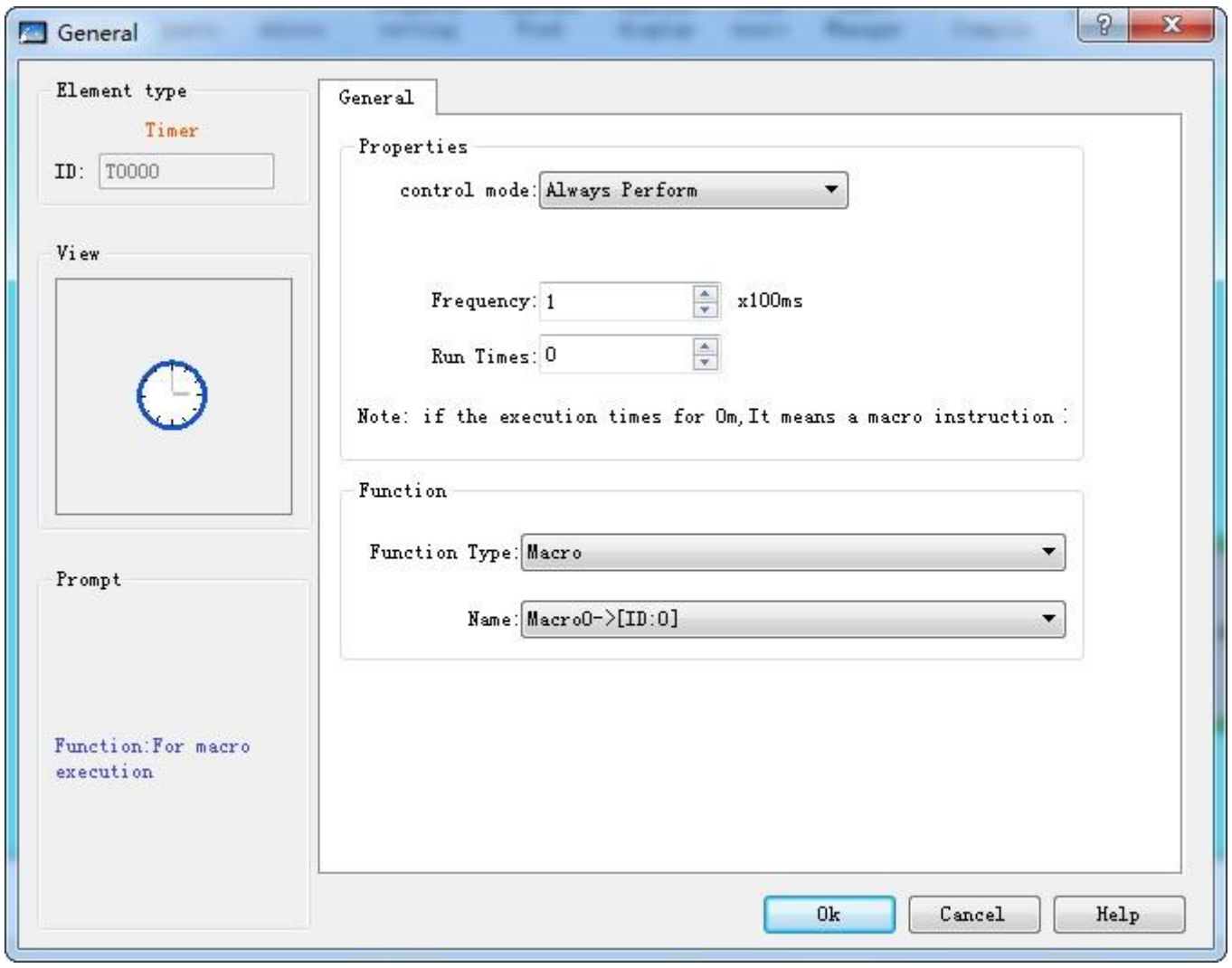
- Blocks: The number of Flow units, ranging from 1 to 30;
- No Border: When this attribute is selected, the edges of the Flow block are hidden.
- Flow rate: Either fixed rate or dynamic rate
- Fixed Flow rate: High, Middle or Low.
- Dynamic Flow rate: The Flow rate is determined by the value of a word 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.



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

6.4.15 Timer

Timer is a control whose function can be triggered by time. In SKTOOL configuration software, Timer is designed for a macro trigger control. Click  on the toolbar or double click the existing Timer to enter the setting page of Timer:



Control

- Execution mode: Choose an execution mode between Always Execute and Address Triggered.
  1. "Always Execute" means always executing the macro command at a certain frequency set by user.
  2. "Address Triggered" means executing the macro command at the set frequency when the value of the specified bit is 1 while no execution when the value of the specified bit is 0.
- Address: When "Address Triggered" mode is selected, the address input field appears where to input the bit address controlling the execution of the macro. When its value is 1, the macro runs.
- Frequency: The frequency at which the selected macro runs ranging from 0.1 to 60S.
- Execution Times: Run times of the selected macro. When the value is 0, the macro will be executed all the time.

Function

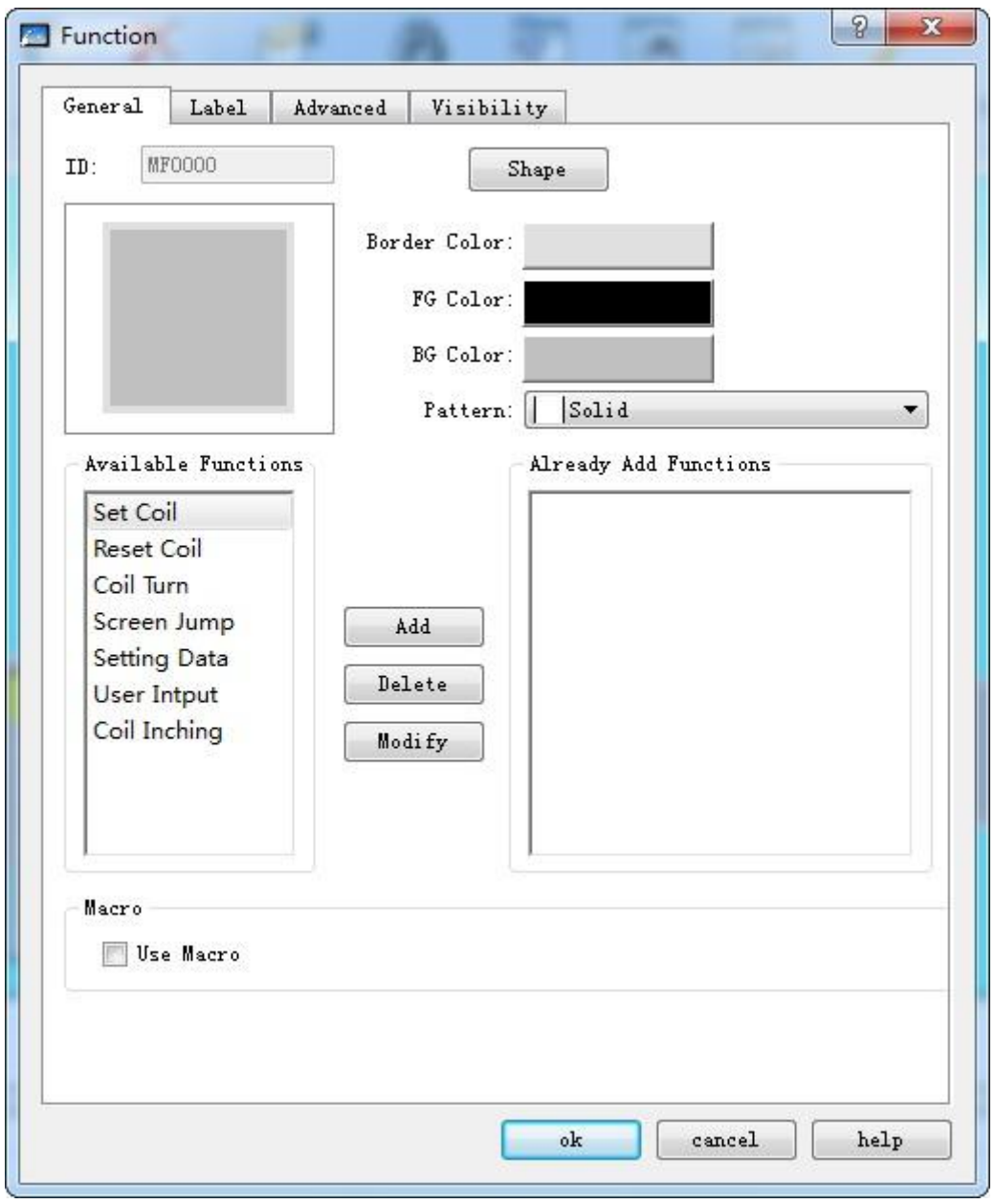
- Function type: Select the type of function to be executed. The function of timer control in SKTOOL configuration software is macro.
- Name: The name of the macro to be executed. The timer cannot be set when no macro is present.

Tips:

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

6.4.16 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.



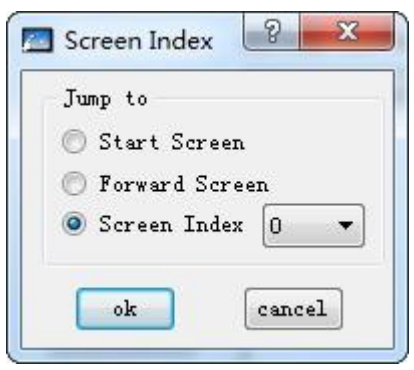
➢ General:

1. Button Appearance: shape, color, style, and other settings.

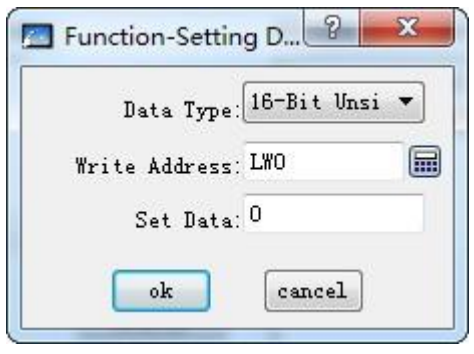
2. Available functions

Several functions are listed for user to select.

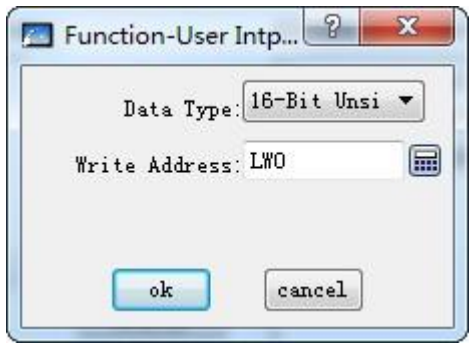
- Set Coil: Set the input address.
- Reset Coil: Reset the input address.
- Coil Alternation: Invert the input address value; if the address value is 0, then it becomes 1; if 1, it becomes 0;
- Coil Jog: When touched, the input address will be set; reset after releasing;
- Screen Jump: Jump to the selected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

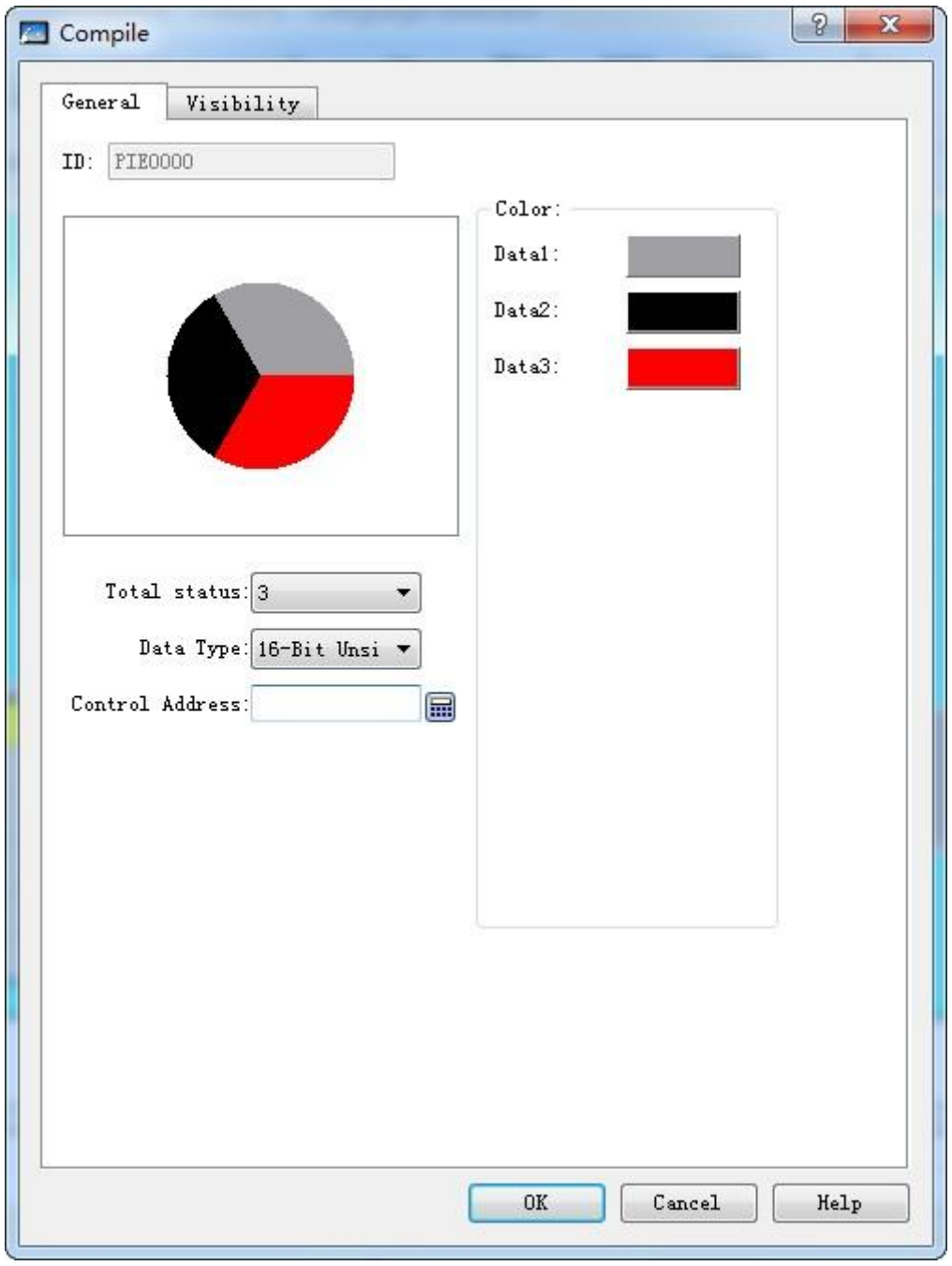
Select "Execute Macro" to see the list of macros. Choose a macro, and click the multi-function button to execute it when the project runs.



Label, Advanced and Visibility settings: Refer to those of the Bit Button.
Refer to “Bit Switch” for hot keys of Advanced.

6.4.17 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.

6.5 SKTOOL Basic controls

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

Contents：

- Bit Button
- Word Button
- Bit Lamp
- Screen Button
- Function Button
- Multi-state Indicator Lamp
- Multi-state Button

- Numeric Display
- Numeric Input
- ASCII Display
- ASCII Input
- Bar Chart
- Time Display
- Date Display
- Week Display
- Static Picture
- Picture Display

6.5.1 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 touch screen. 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 4-68:

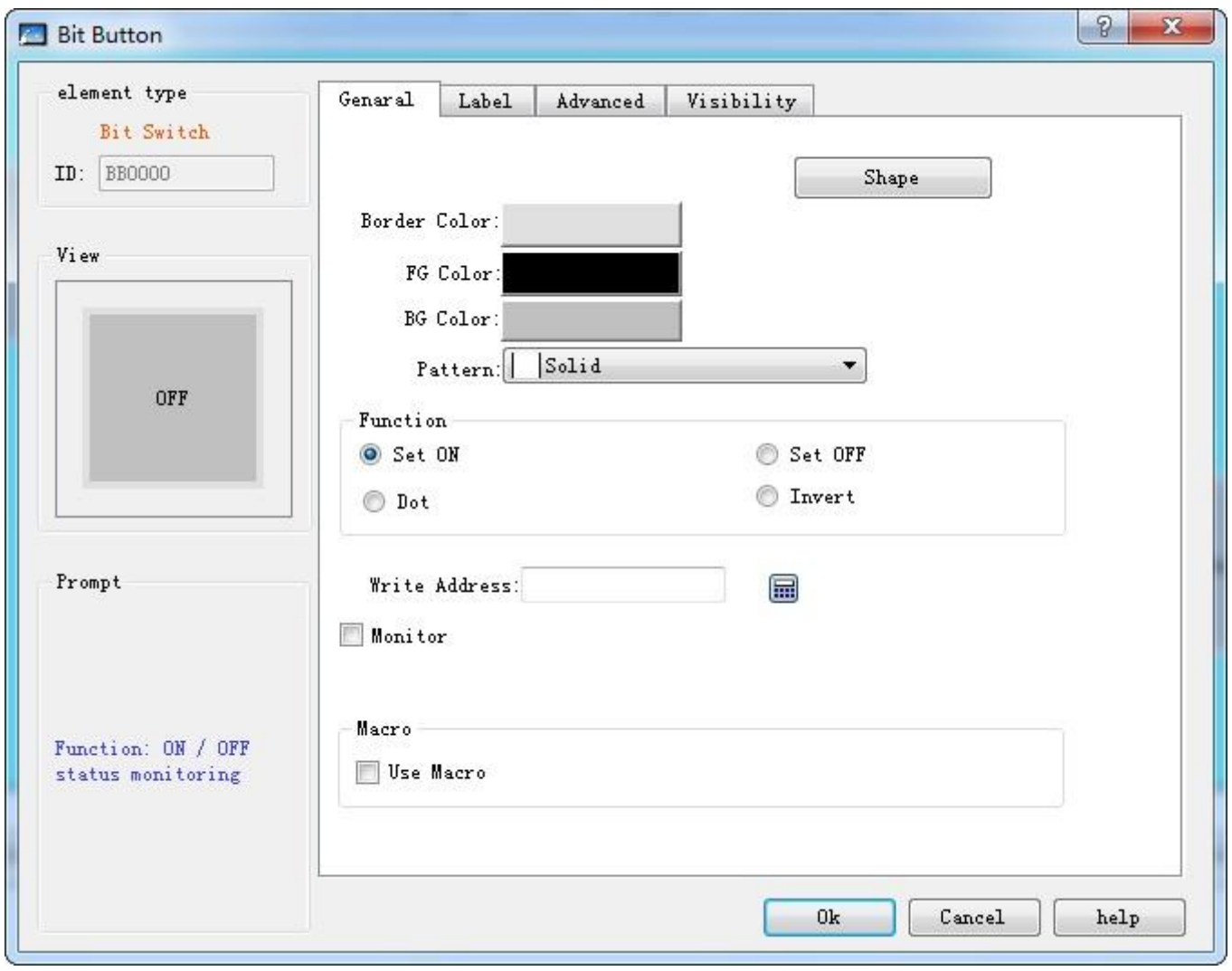


Figure 4-68 Bit Button dialog box

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

   Shape: Click the Shape button to select a shape for the control graph, as shown in Figure 4-69

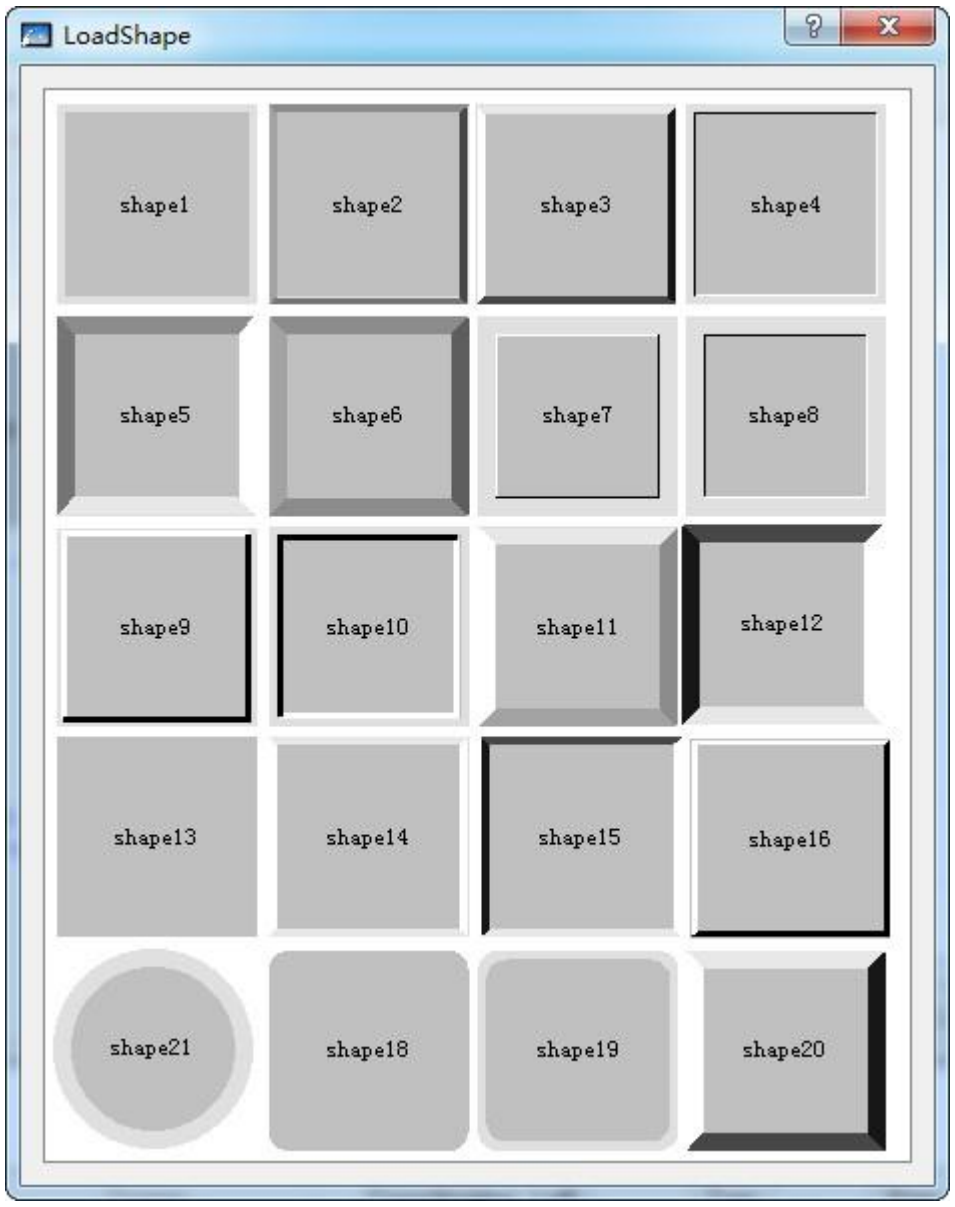


Figure 4-69 Shape pop-up dialog

- 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 4-70:

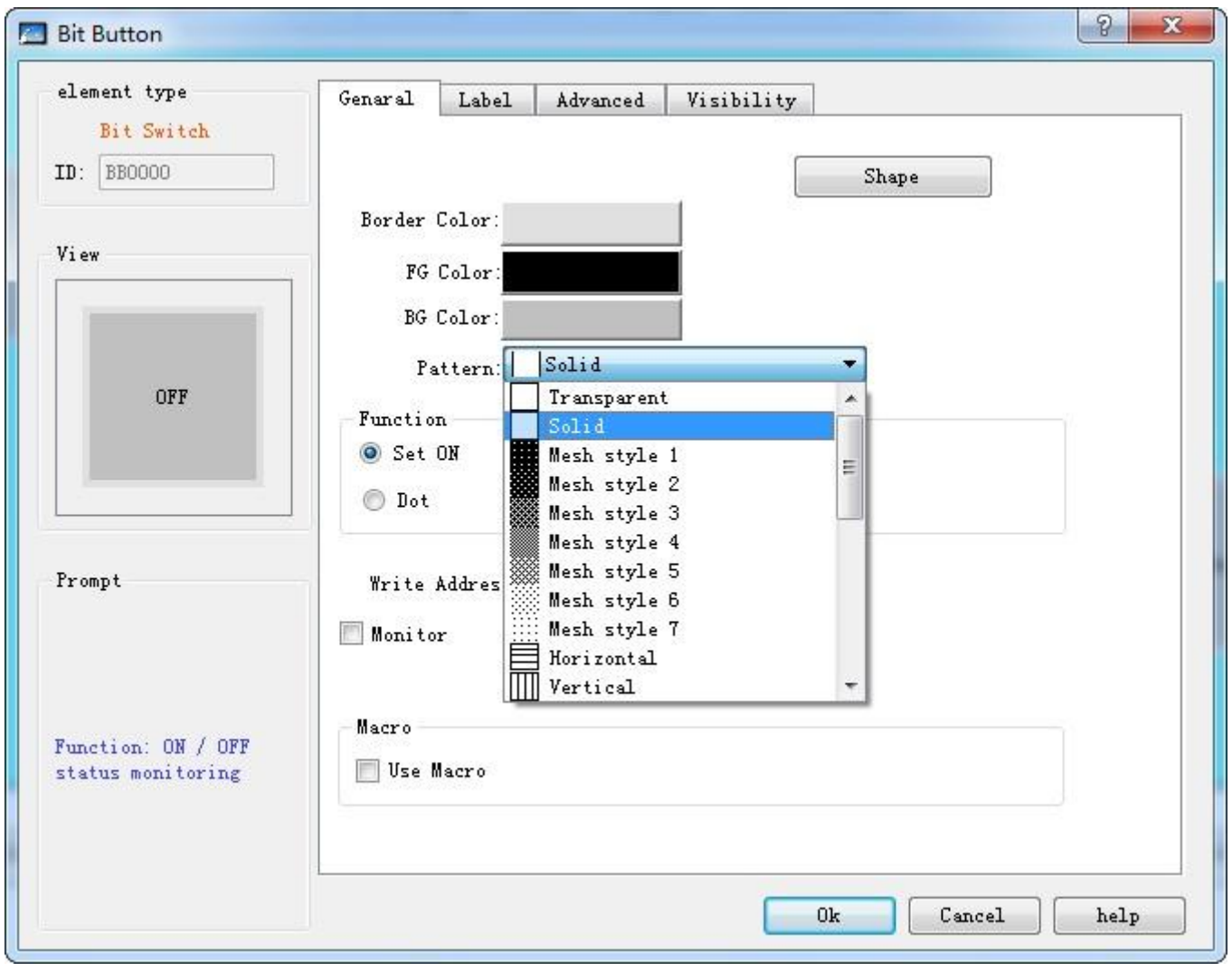


Figure 4-70 Change shape and pattern value

- 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. SKTOOL 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. As shown in Figure 4-71:

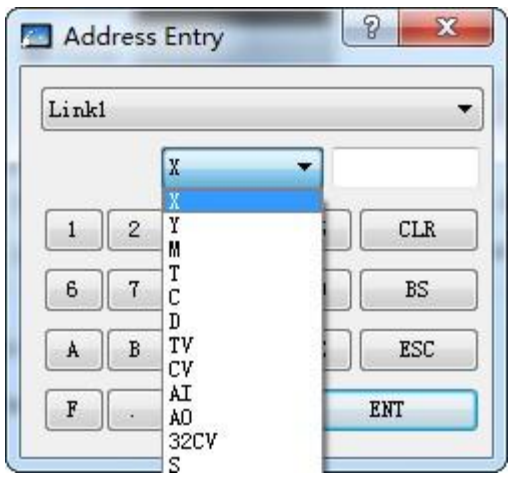


Figure 4-71 Input address

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.

Tips:

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 4-72:

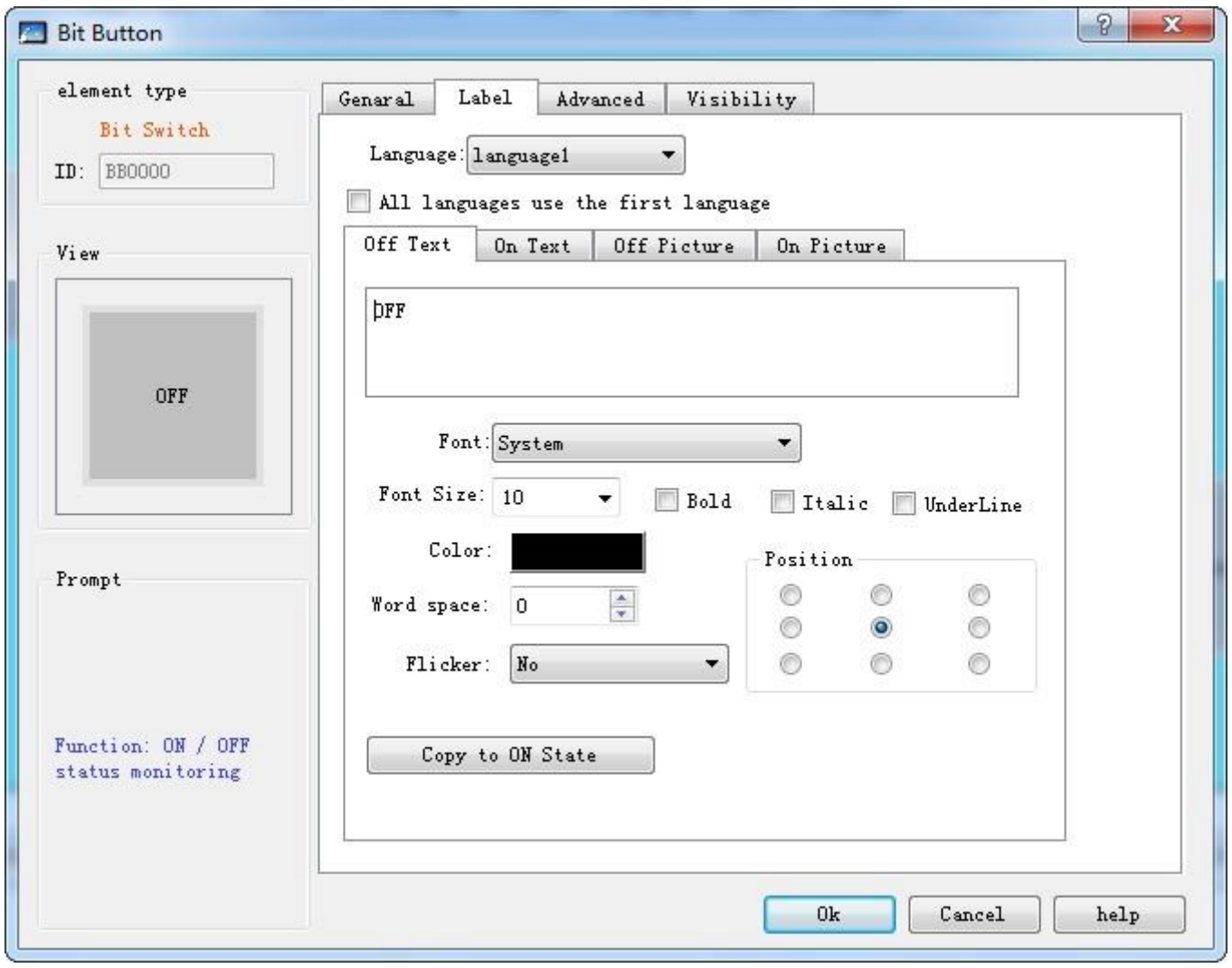


Figure 4-72 Bit Button Label page

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. SKTOOL 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



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.

Select the "Advanced" page to display the "Advanced" properties, as shown in Figure 4-73

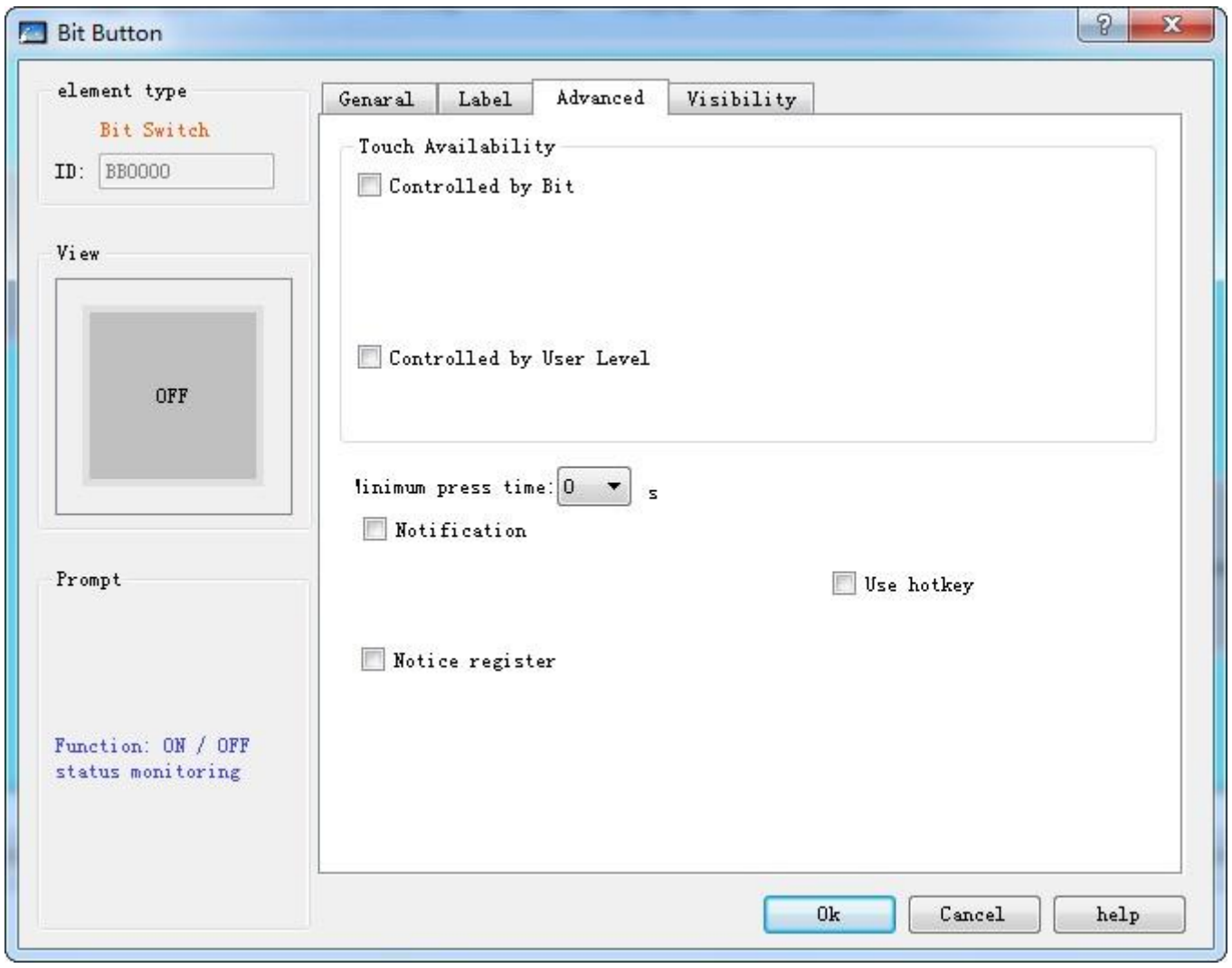


Figure 4-73 Bit Button Advanced page

- 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 Touch Screen Parameter Setting is as shown in Figure 4-74：

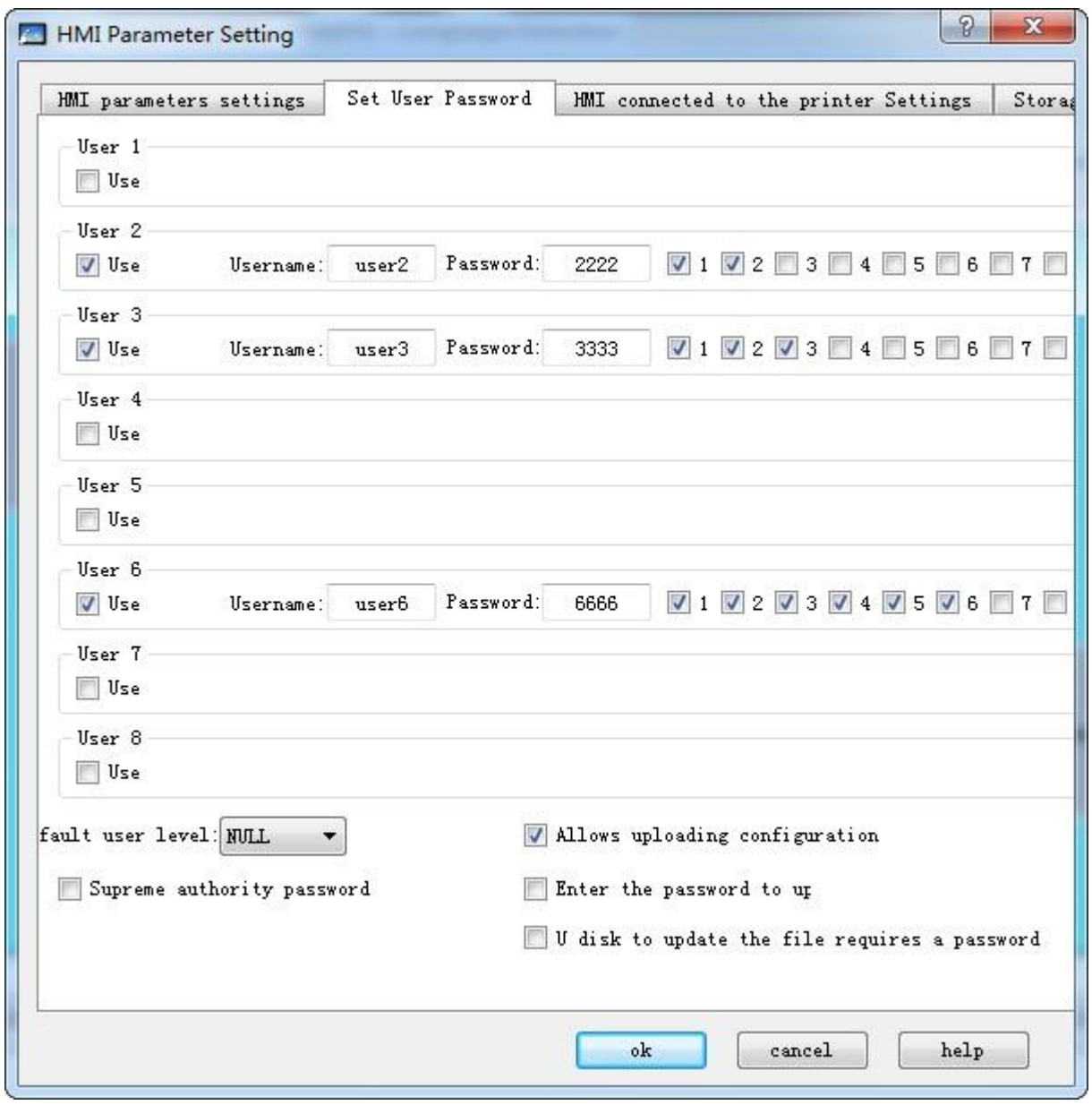
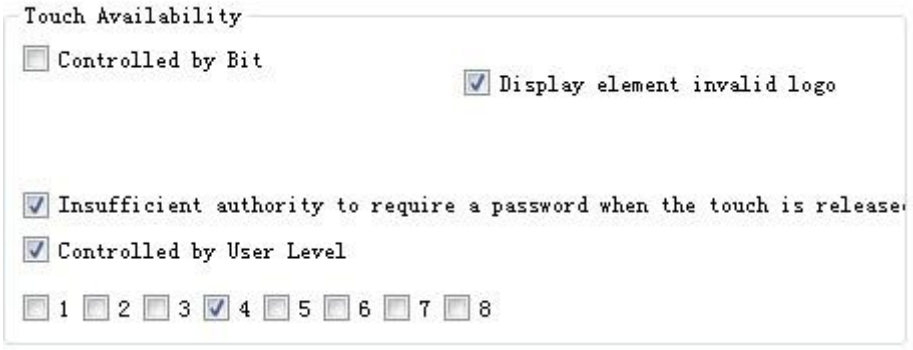


Figure 4-74 User Password Setting in the touch screen parameter setting

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 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:

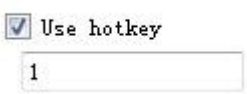


If select “change the user level is insufficient”, when the user level is not matched, a login interface will pop up so that user can select a matching level and log in again, as shown below:



In SKTOOL software, only bit button, drop-down box, ASCII input, function button, ASCII keyboard input, multi-function button, multi-state button, formula 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.





The default user level is NULL, which is the lowest level. Engineering designers can change the 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.

Select the "Show" page to display the "Show" property, which is used to set whether the control is displayed or hidden. As shown in Figure 4-75

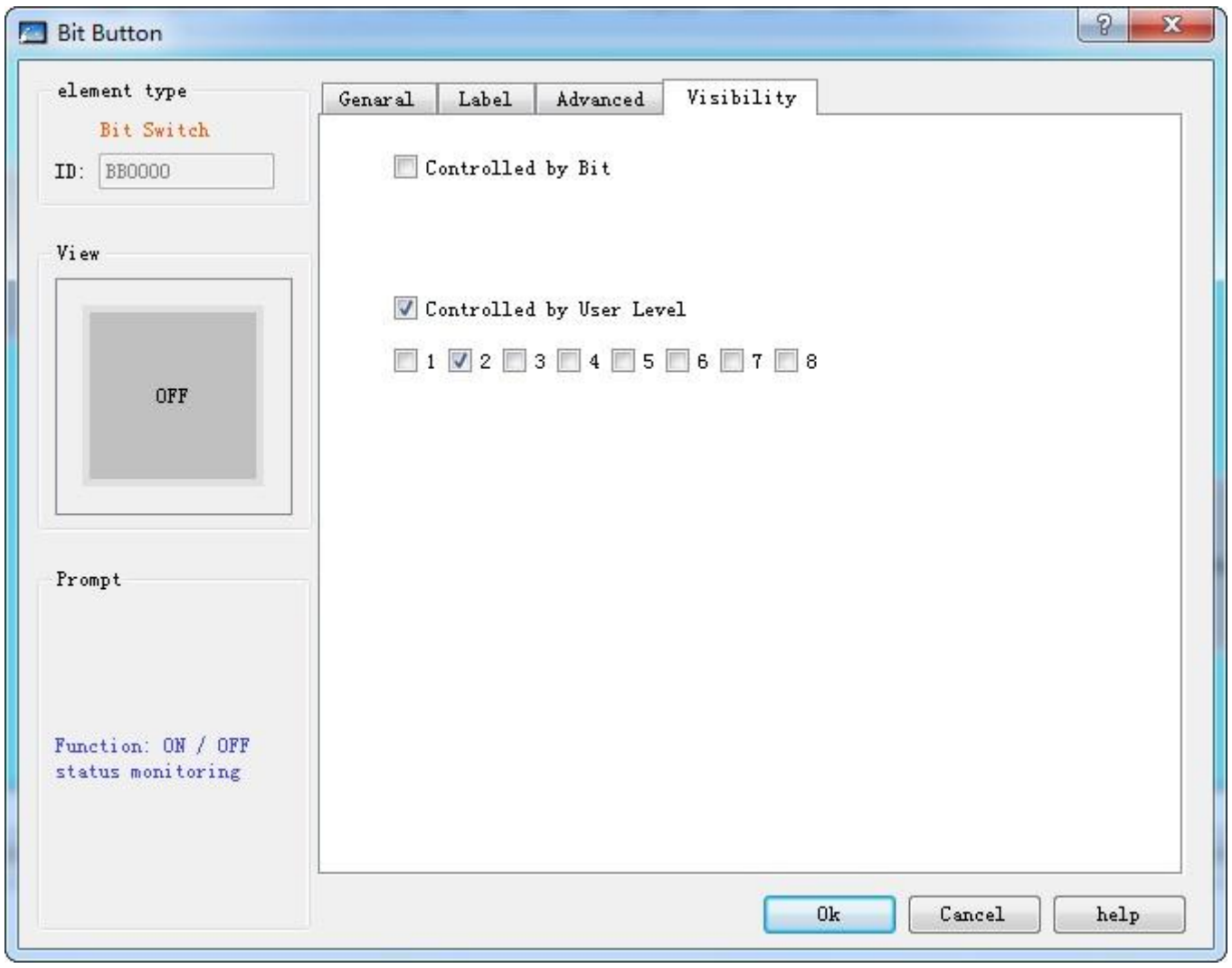


Figure 4-75 Bit Button Visibility page

- Controlled by bit: When this option is checked, if the Effective State is 1, then the Bit Button can be displayed on the touch screen 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 touch screen 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 touch screen.

Tips:

If neither of these two options is checked, the control will be always displayed on the touch screen.

6.5.2 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 he following dialog box is displayed, as shown in Figure 4-76:

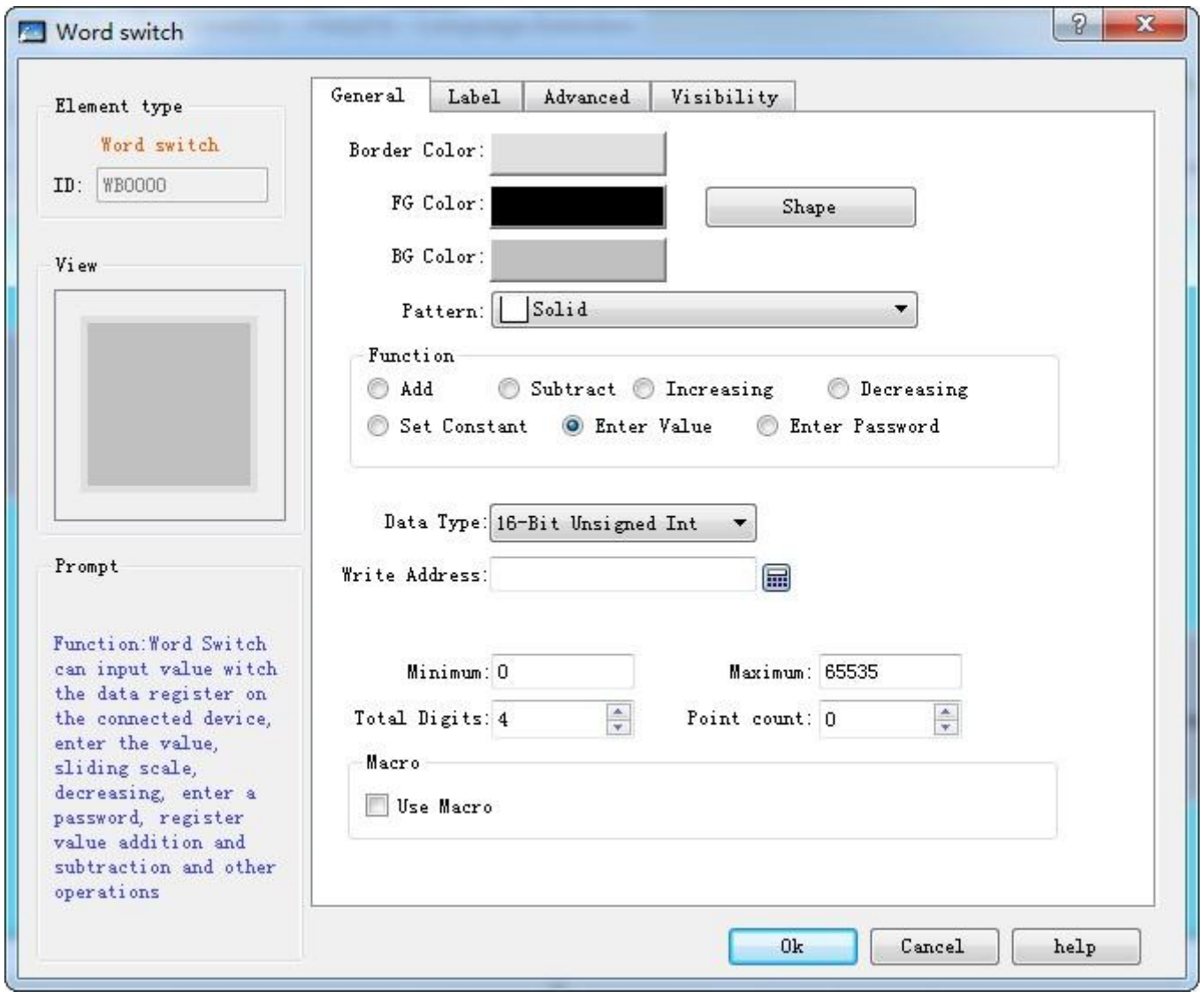


Figure 4-76 Word Button dialog box

Tips:

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, SKTOOL 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 poping up after the word button being touched.

  As shown in Figure 4-77:

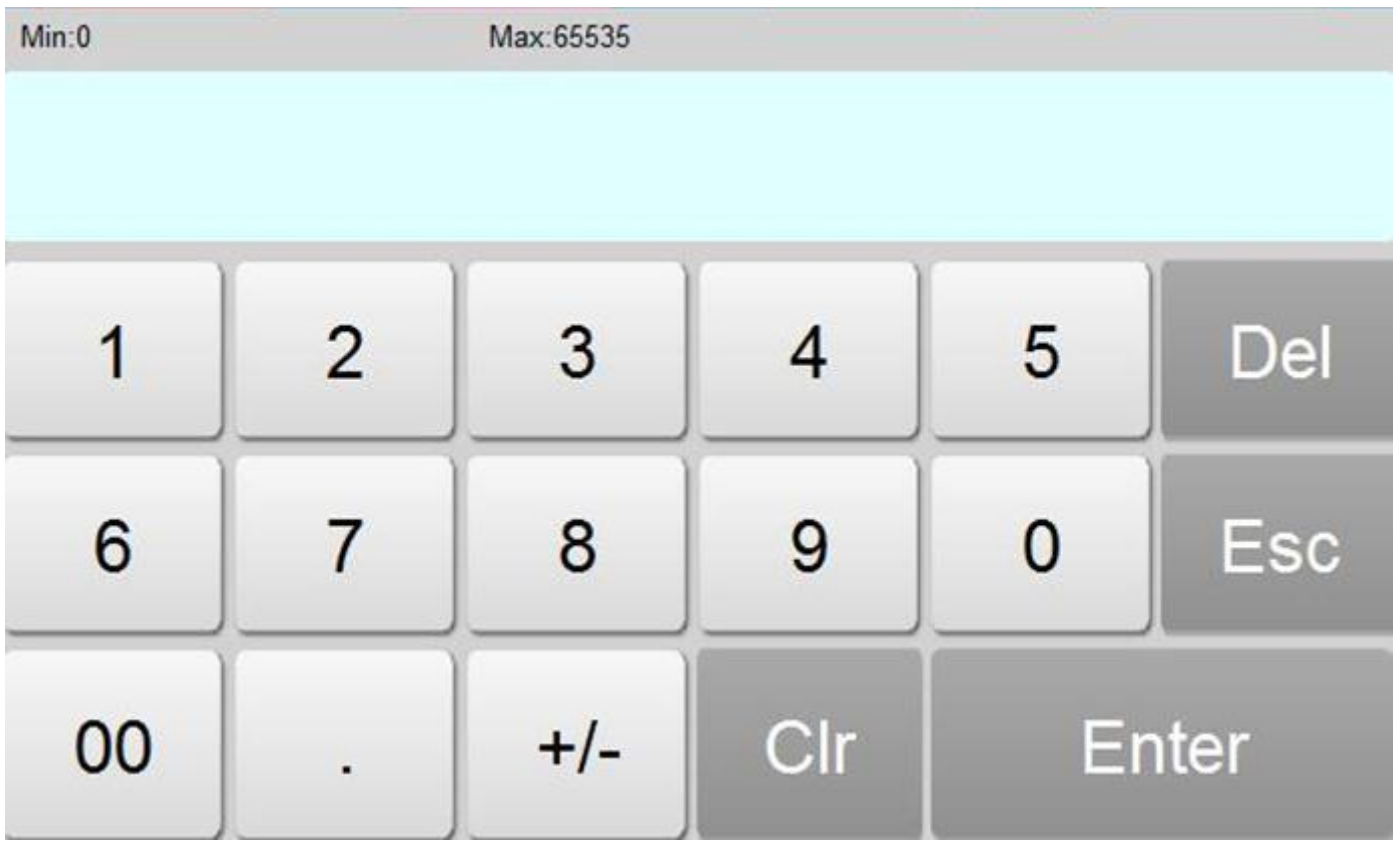


Figure 4-77

- 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.



Tips:

The "Mark" tab of the "Word Button" is similar to that of the "Bit Button" control. Except that the Word button has no Status Text 1 neither 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.

6.5.3 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.
As shown in Figure 4-78 below:

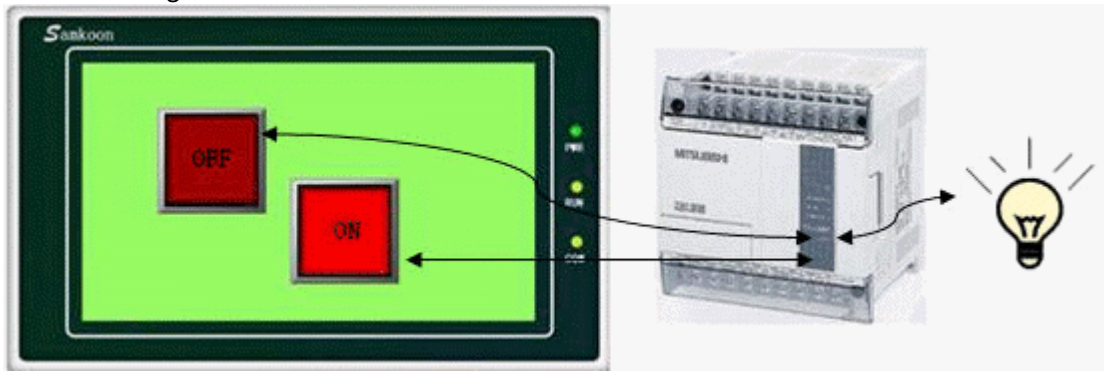


Figure 4-78

Set up a Bit Lamp:

1. Select the Bit Lamp button icon  on the toolbar: The dialog box shown in Figure 4-79 will pop up:

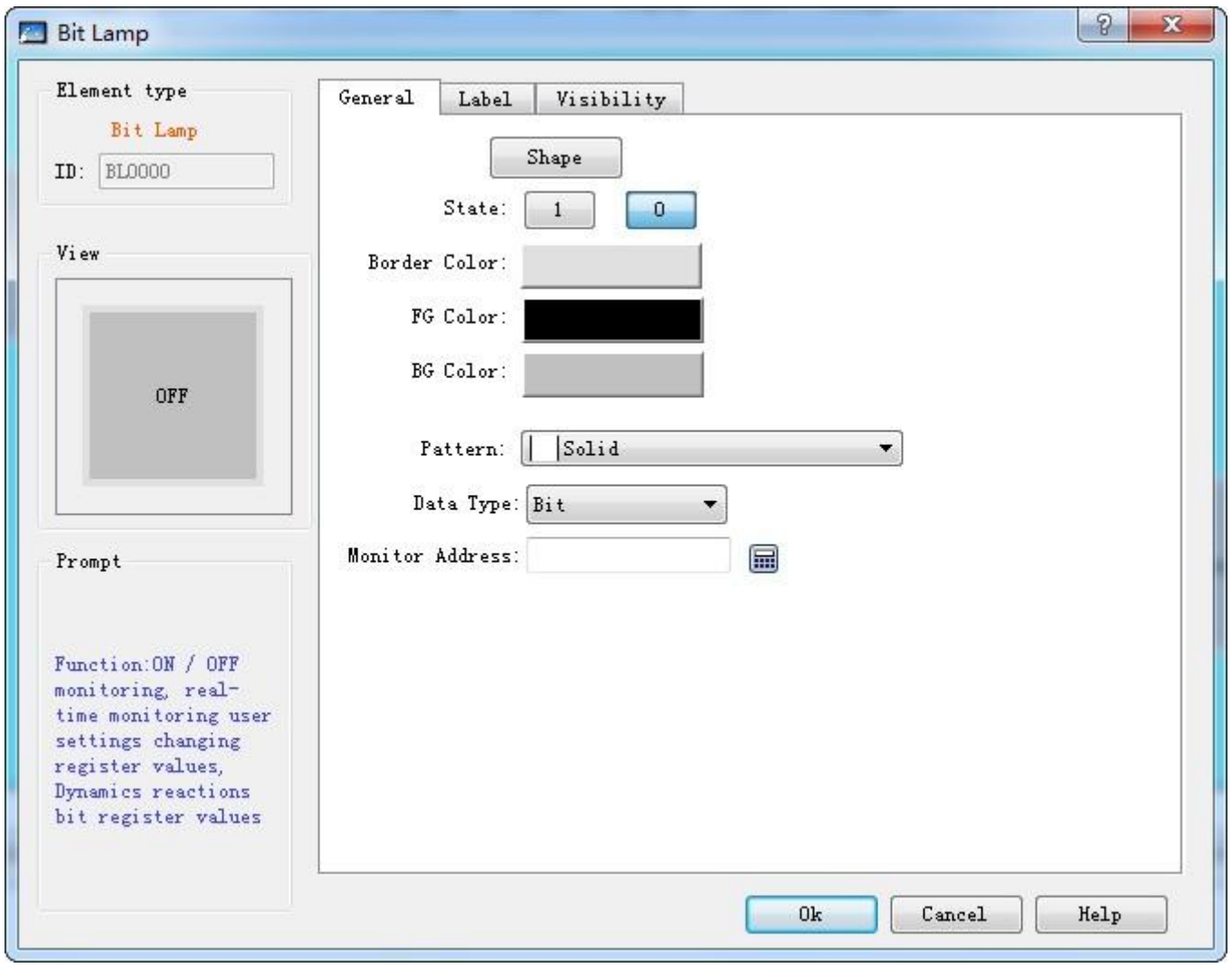


Figure 4-79 Bit Lamp dialog box

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

Tips:

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.

Tips:

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

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

Tips:

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

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

6.5.4 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 4-80.

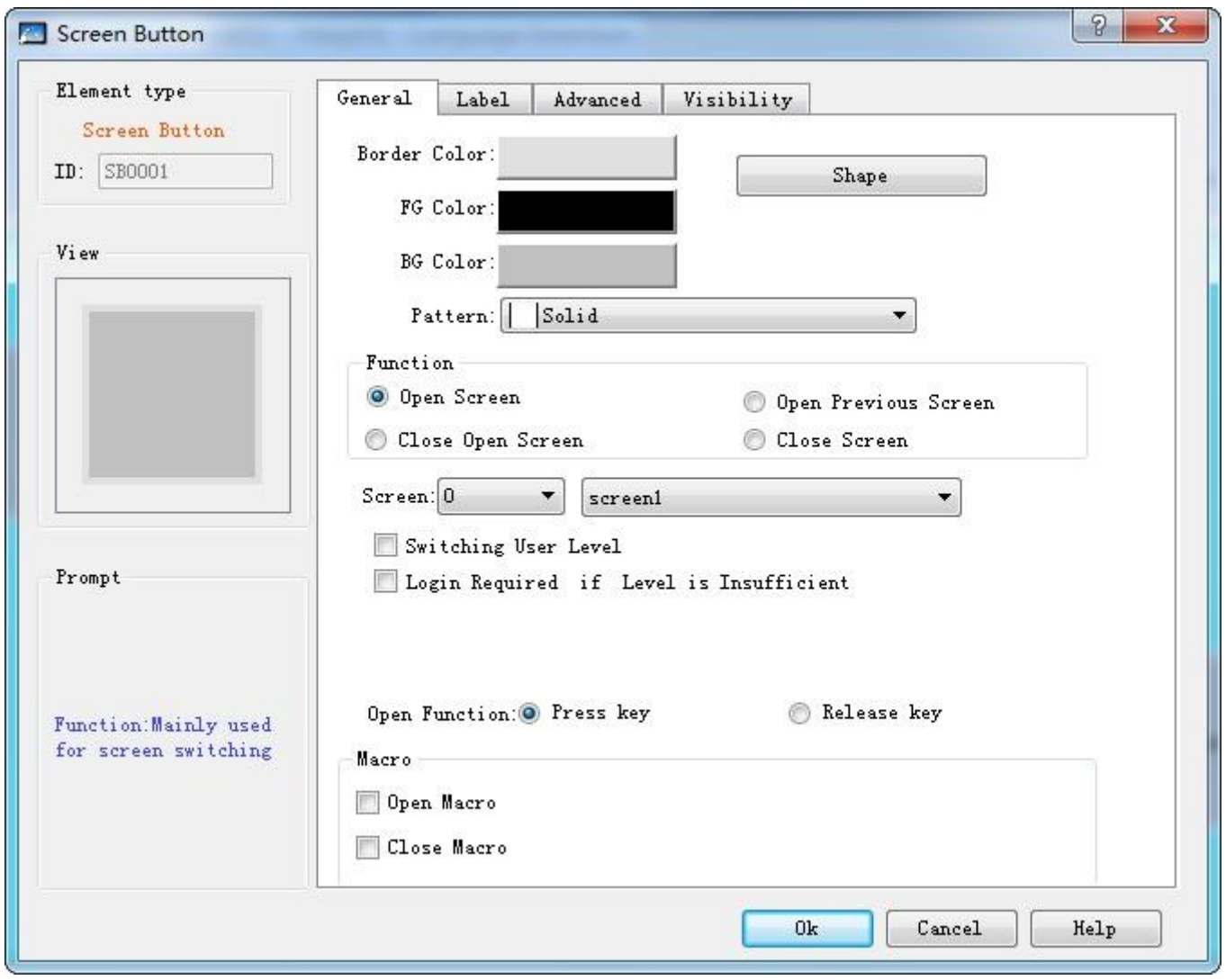


Figure 4-80 Screen Button Dialog Box

Tips:

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 touch screen, as shown in Figure 4-81:

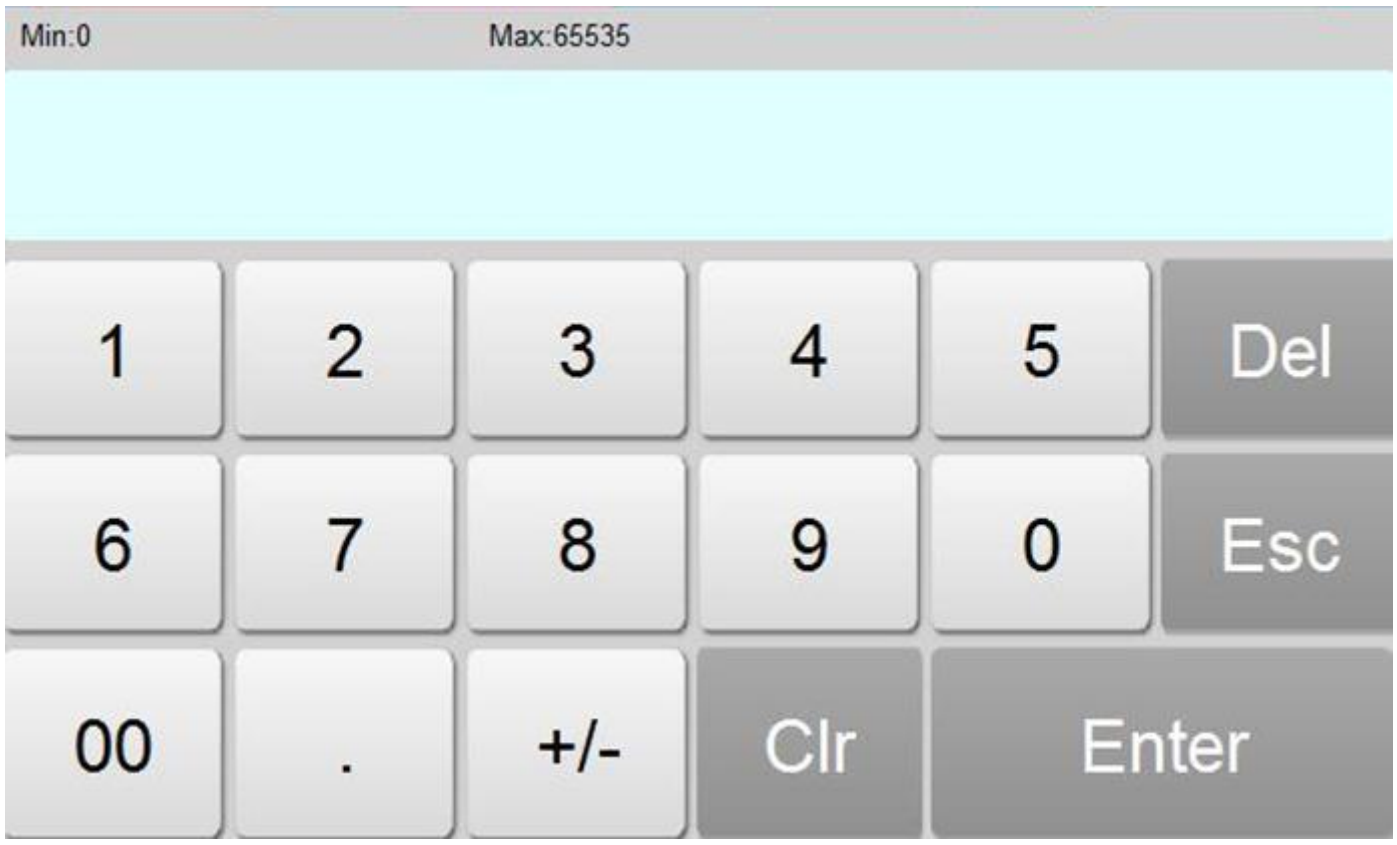


Figure 4-81 Password input keyboard

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.

Tips:

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.

6.5.5 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 4-82:

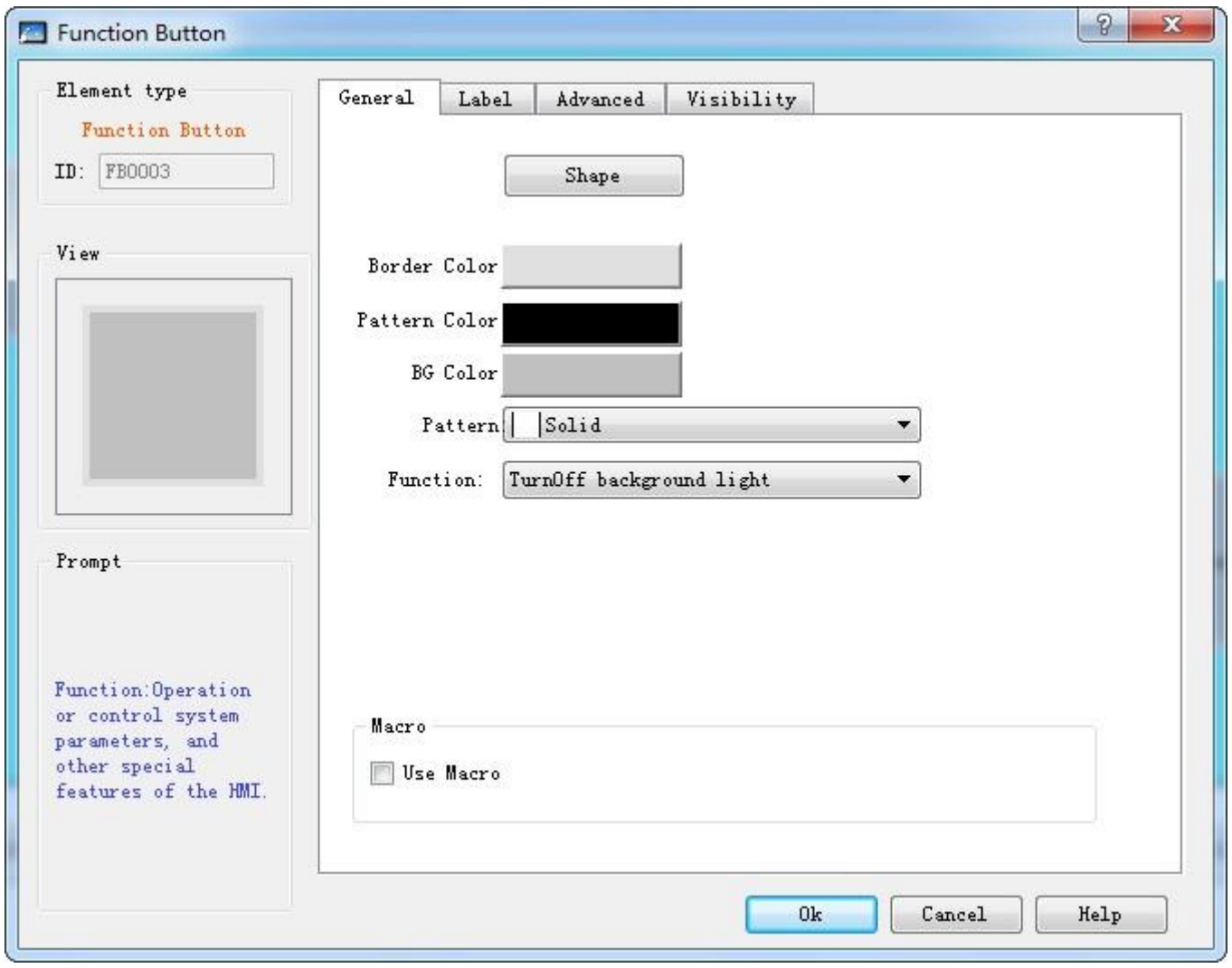


Figure 4-82 Function Button dialog box

Tips:

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 touch screen.

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 touch screen 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 touch screen 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 touch screen 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 touch screen to set the inner time and date.

8. Clear Alarm

Choose this function to clear the alarm; click the button on the touch screen 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 touch screen 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, then when 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 an access permission.

15. Cancel user login

Choose the function of cancel a user's login; click this button on the touch screen 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, 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 devices IP config

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.

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.

Note: 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 no Status Text 1 neither Status Picture 1 because it has only one state.

Note: 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.

Note: 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.

Note: 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)

6.5.6 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 32 states can be displayed.

Click the Multi-state indicator button  on the toolbar to bring up the dialog box as shown in Figure 4-83.

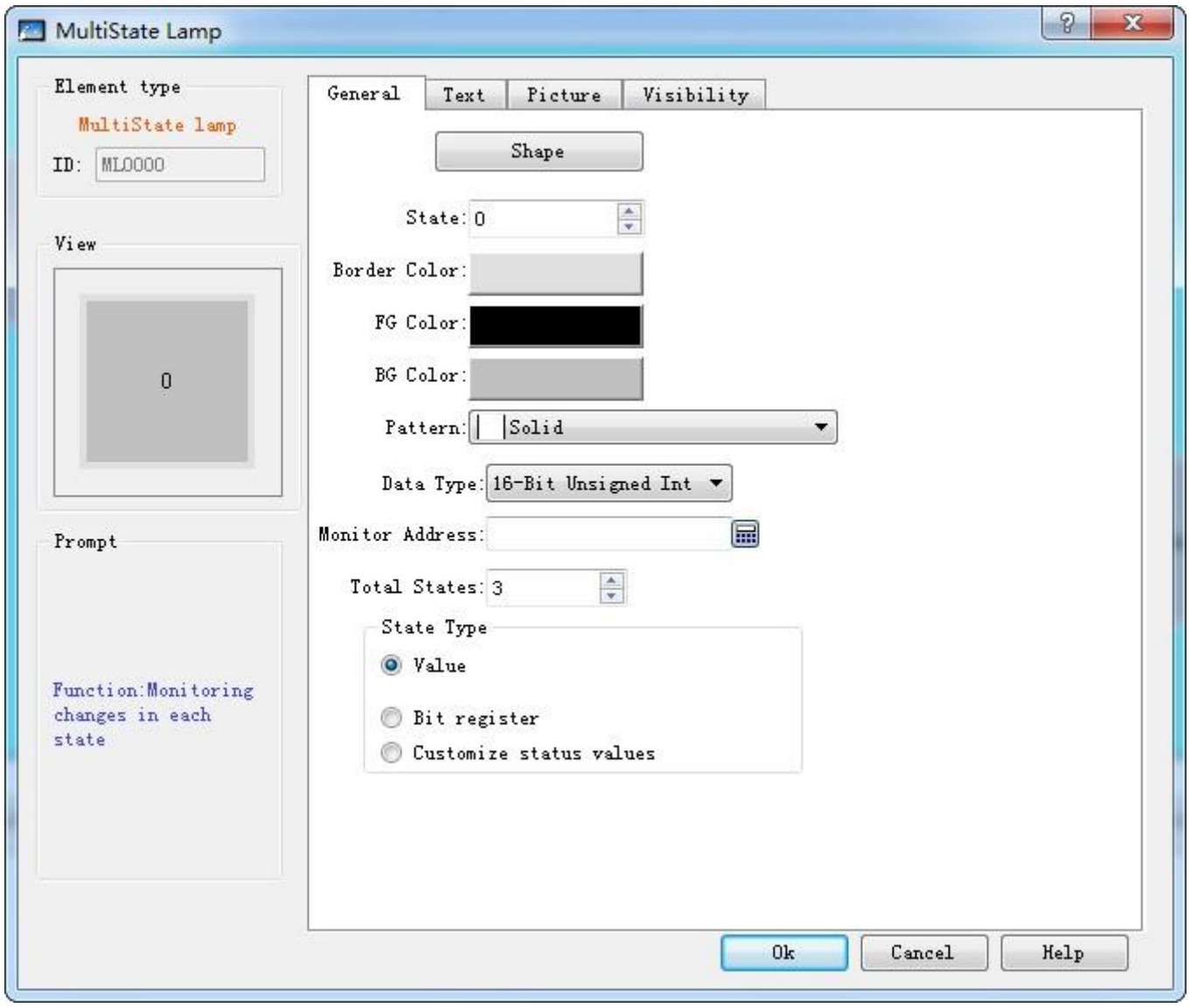


Figure 4-83 Multi-state Indicator Lamp dialog box

1. 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.

  E.g.:

  The monitor (read) address is LW3, 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 4-84:

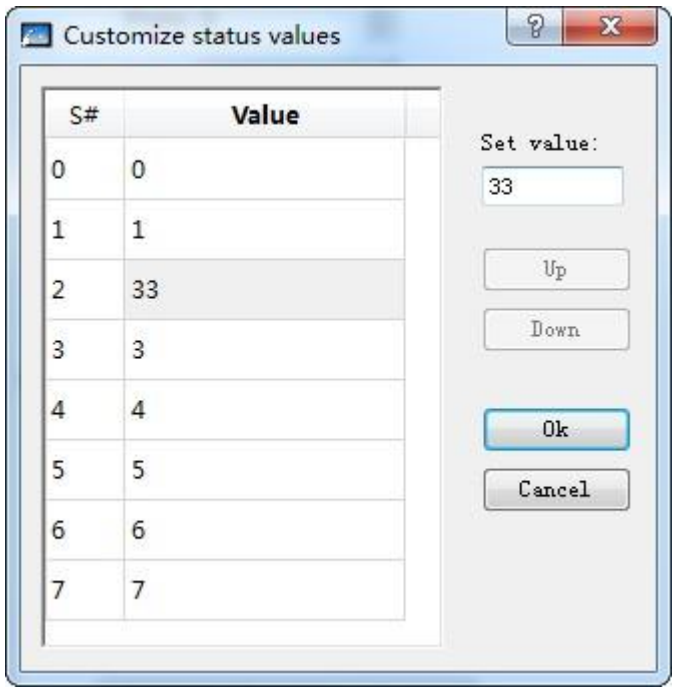


Figure 4-84 User-defined state value dialog box

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, 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 2. If a value of 2 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 32 states, that is from state 0 to state 31.

For example, selecting a data type of 16-bit positive integer, a total number of states of 32, 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 60, the Multi-state indicator will still display the message of the State 31, because the total number of states up to 32 states.

Tips:

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

Note: 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 ofNote data and address errors.

Note : The data category must be consistent with the data to be indicated.

2. Text:

Click the "Text" tab of the Multi-State Indicator Property box to display the text property settings screen as shown in Figure 4-85 below:

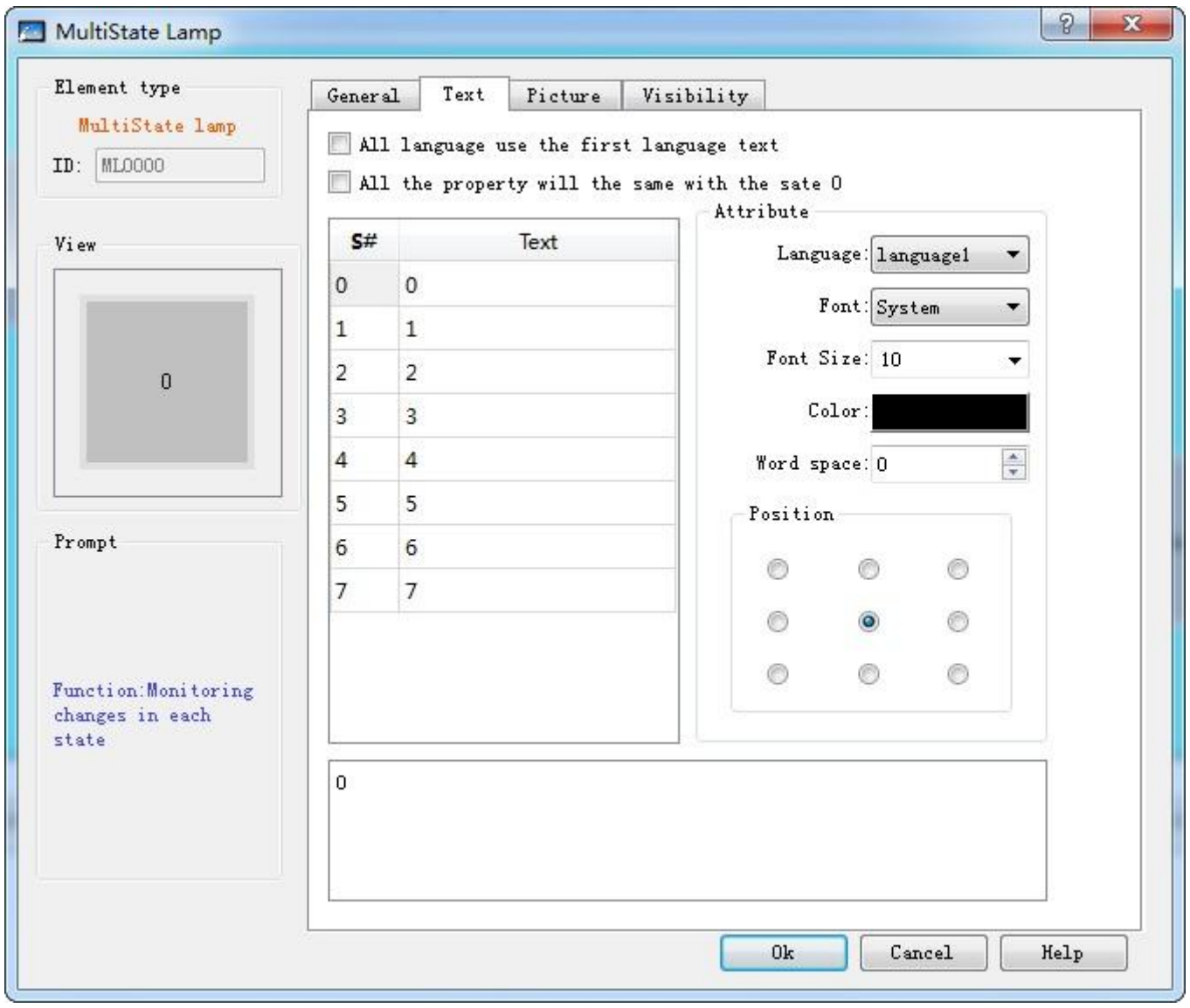


Figure 4-85 Multi-state indicator text page

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.

3. Picture:

Click the Picture tab of the Multi-State Indicator Property box to display the attribute settings as shown in Figure 4-86.

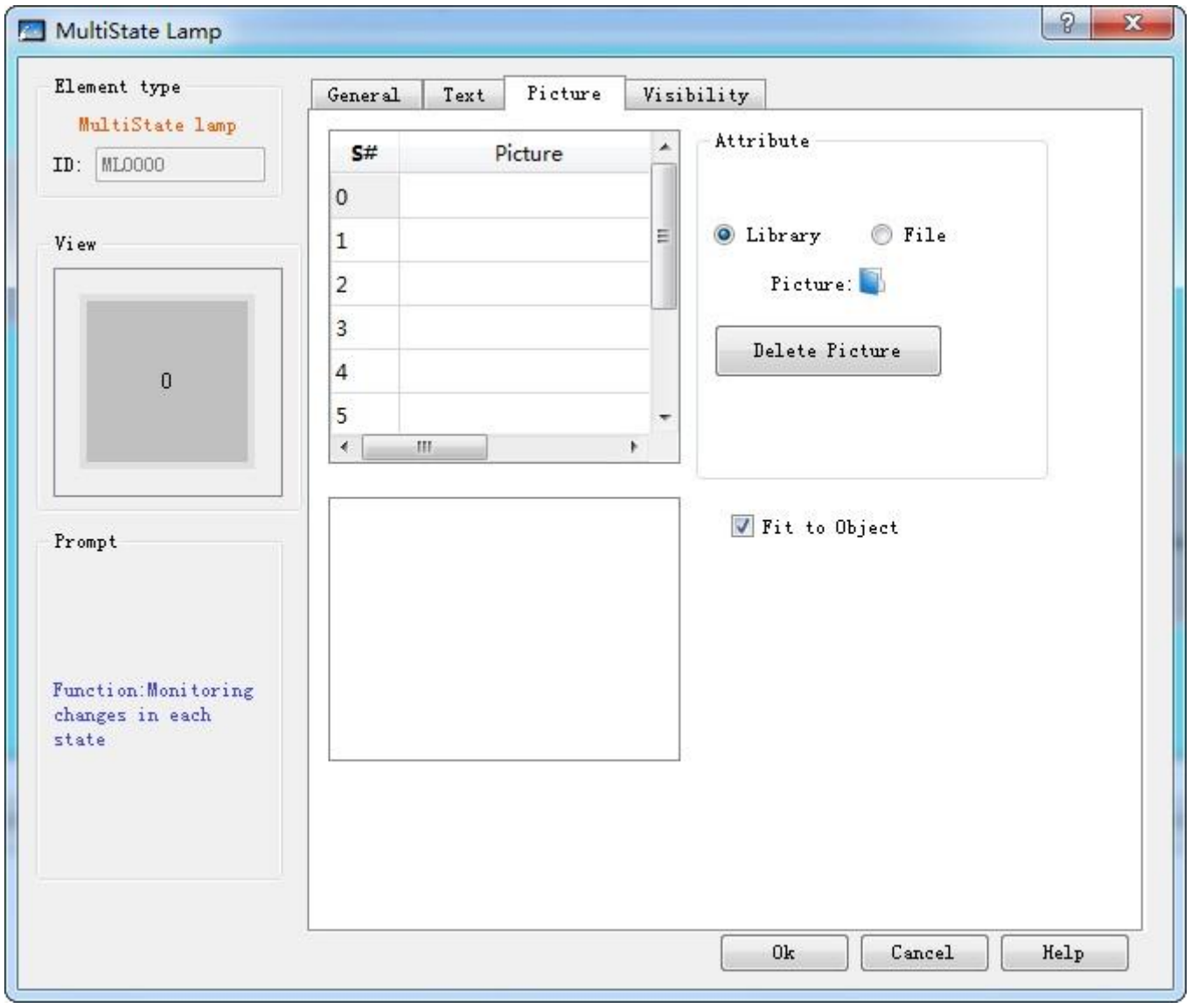


Figure 4-86 Multi-state indicator lamp picture page

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 import 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

6.5.7 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 in Figure 4-87.

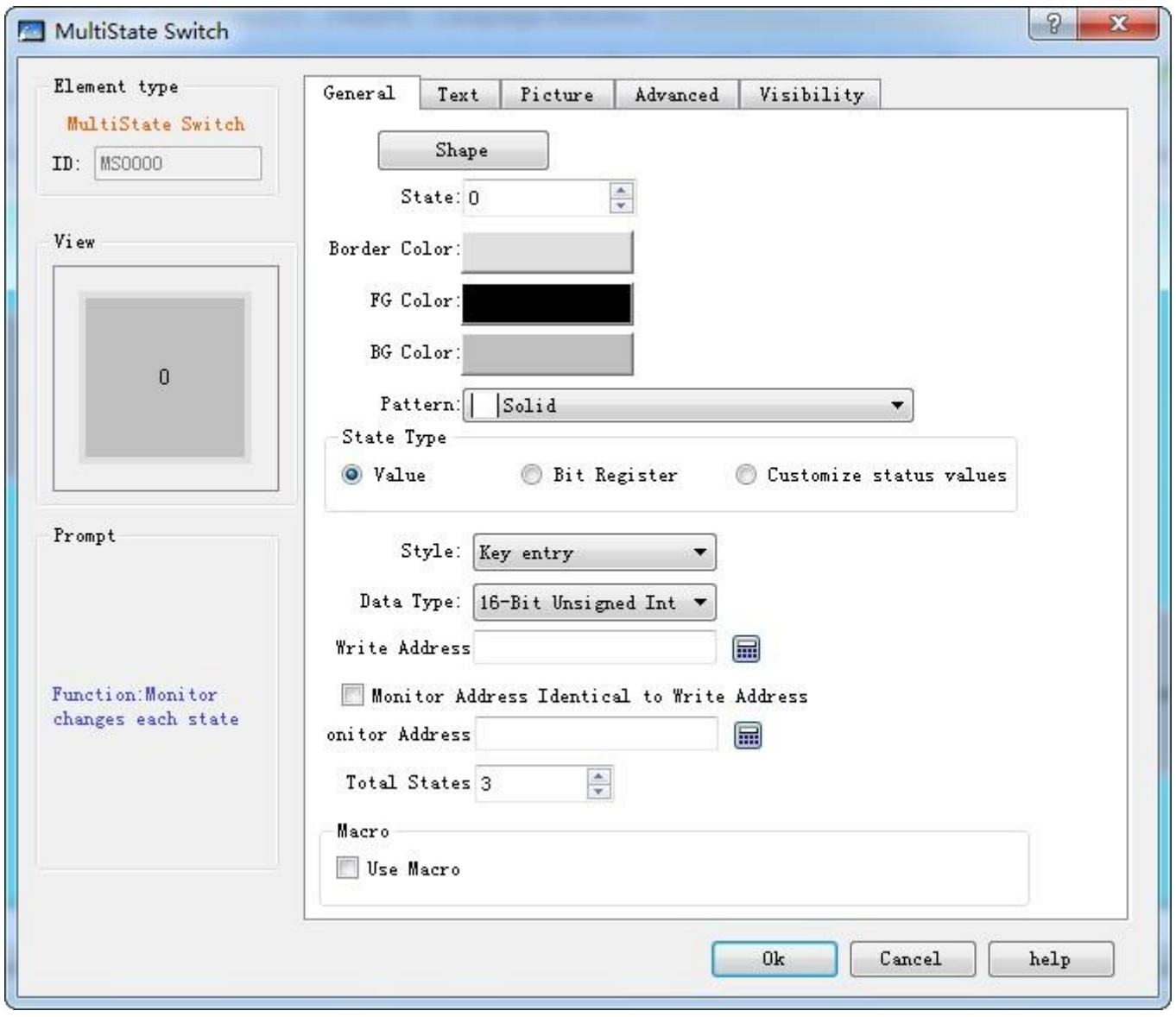


Figure 4-87 Multi-state button dialog box

- 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.

E.g:

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 4-88:

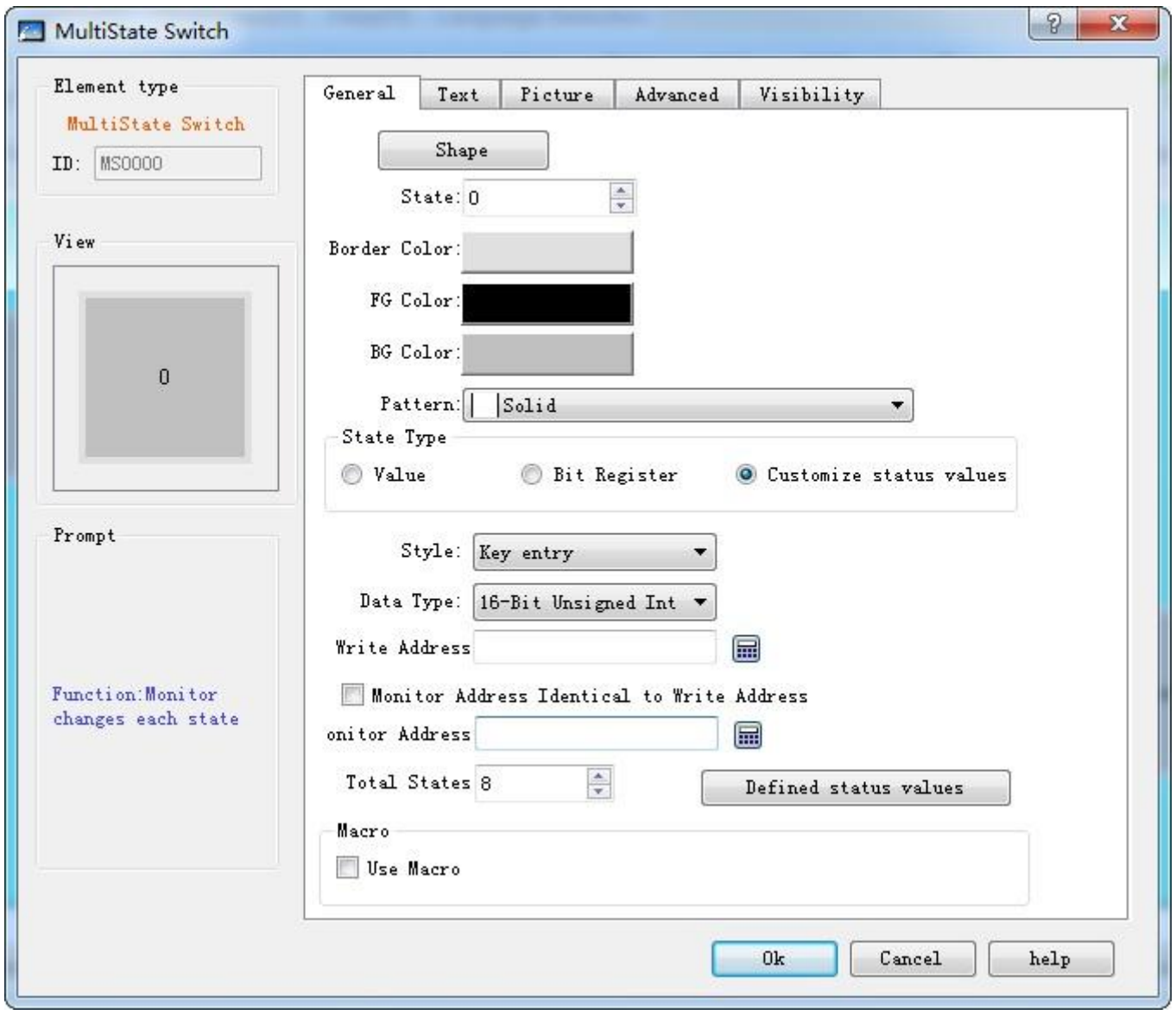


Figure 4-88 Multi-state button select Customize Status Value

Click "Define status value..." button, it will pop up a "Customize status value" dialog interface, as shown in Figure 4-89:

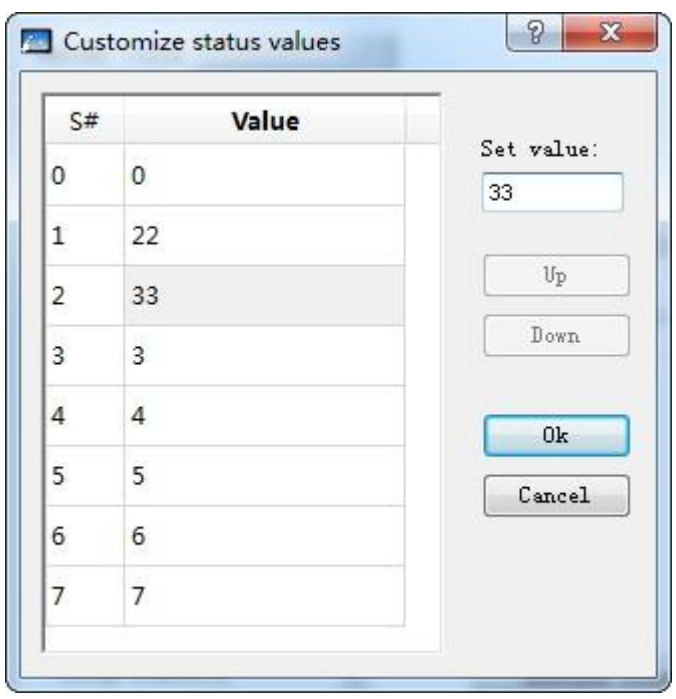


Figure 4-89 Define status value dialog box

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 4-90:

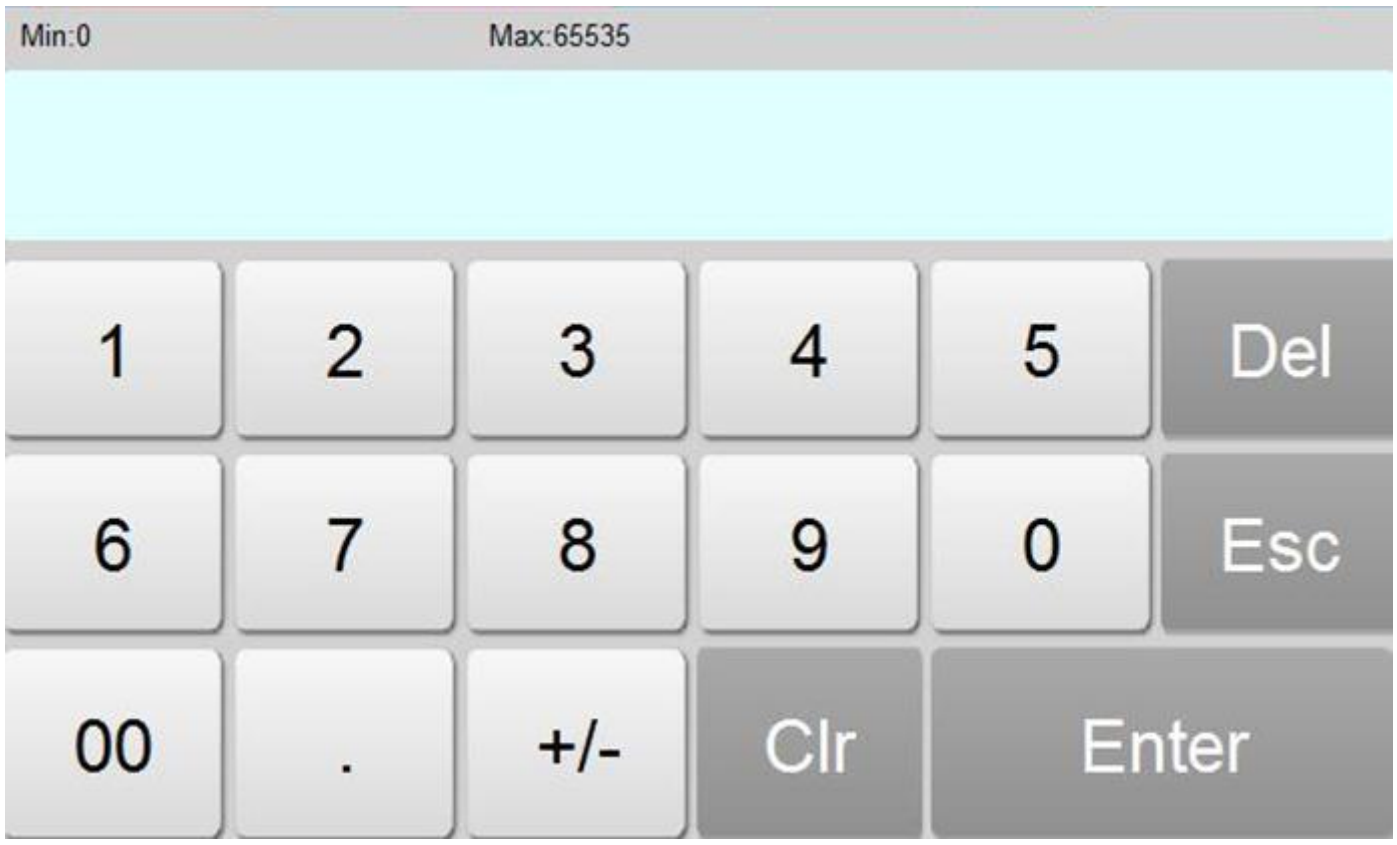


Figure 4-90 Keyboard

- 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.

Tips:

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

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

Note: 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)

6.5.8 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. As shown in Figure 4-91:

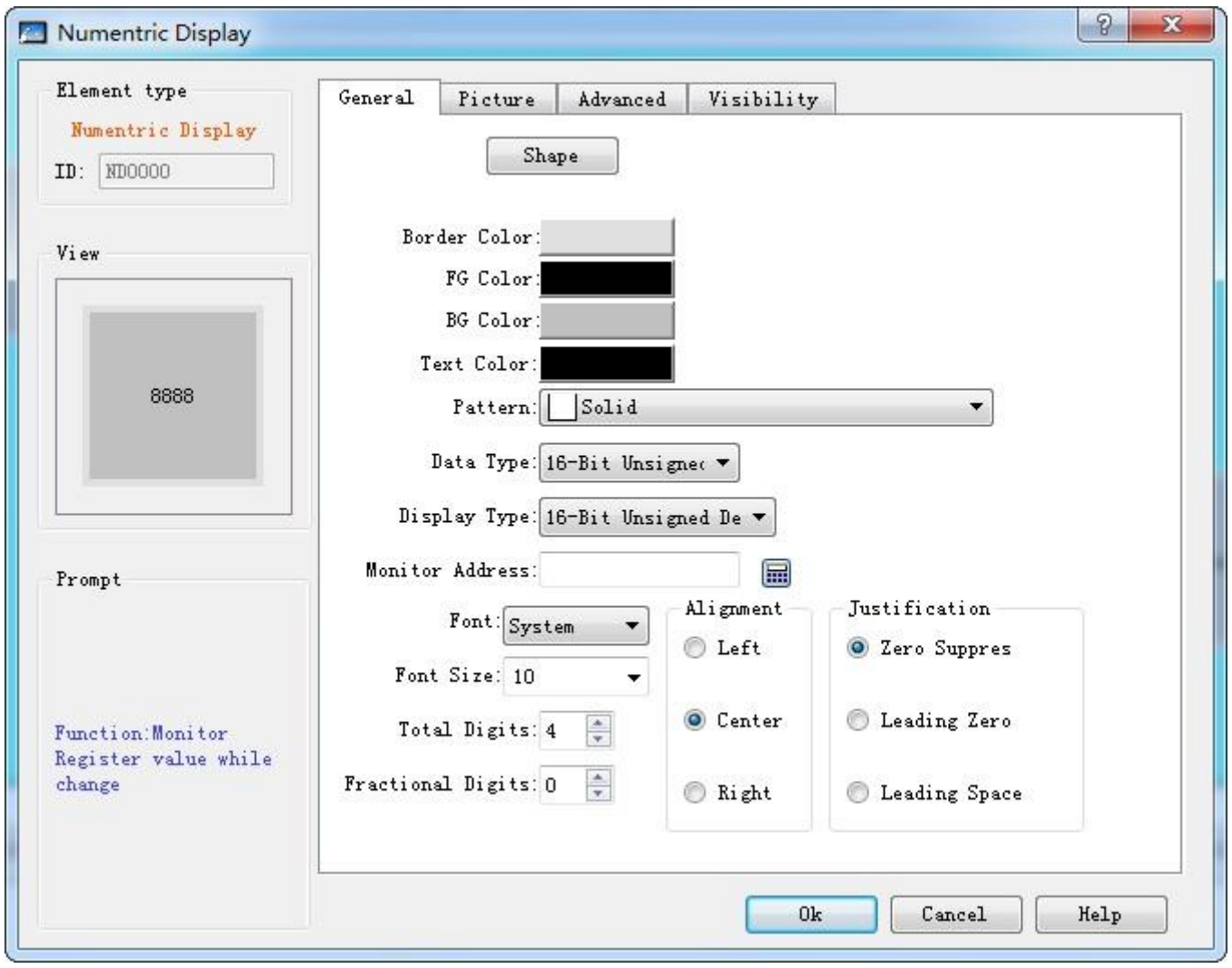


Figure 4-91 Numeric Display dialog box

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;

Tips:

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

Note: 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.

Note: 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.

Note: 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 4-92:

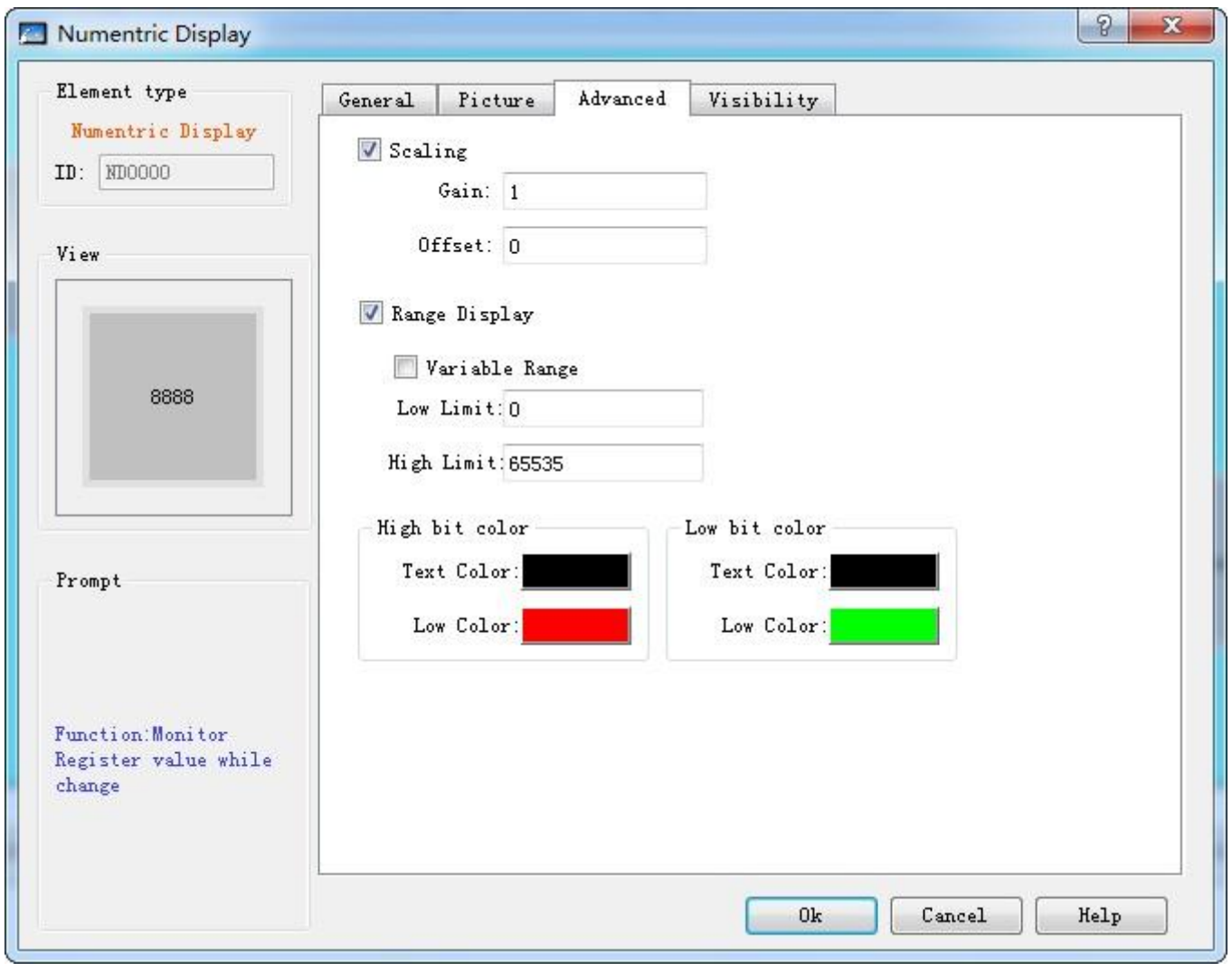


Figure 4-92 Numeric Display Advanced page

- 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 4-93:

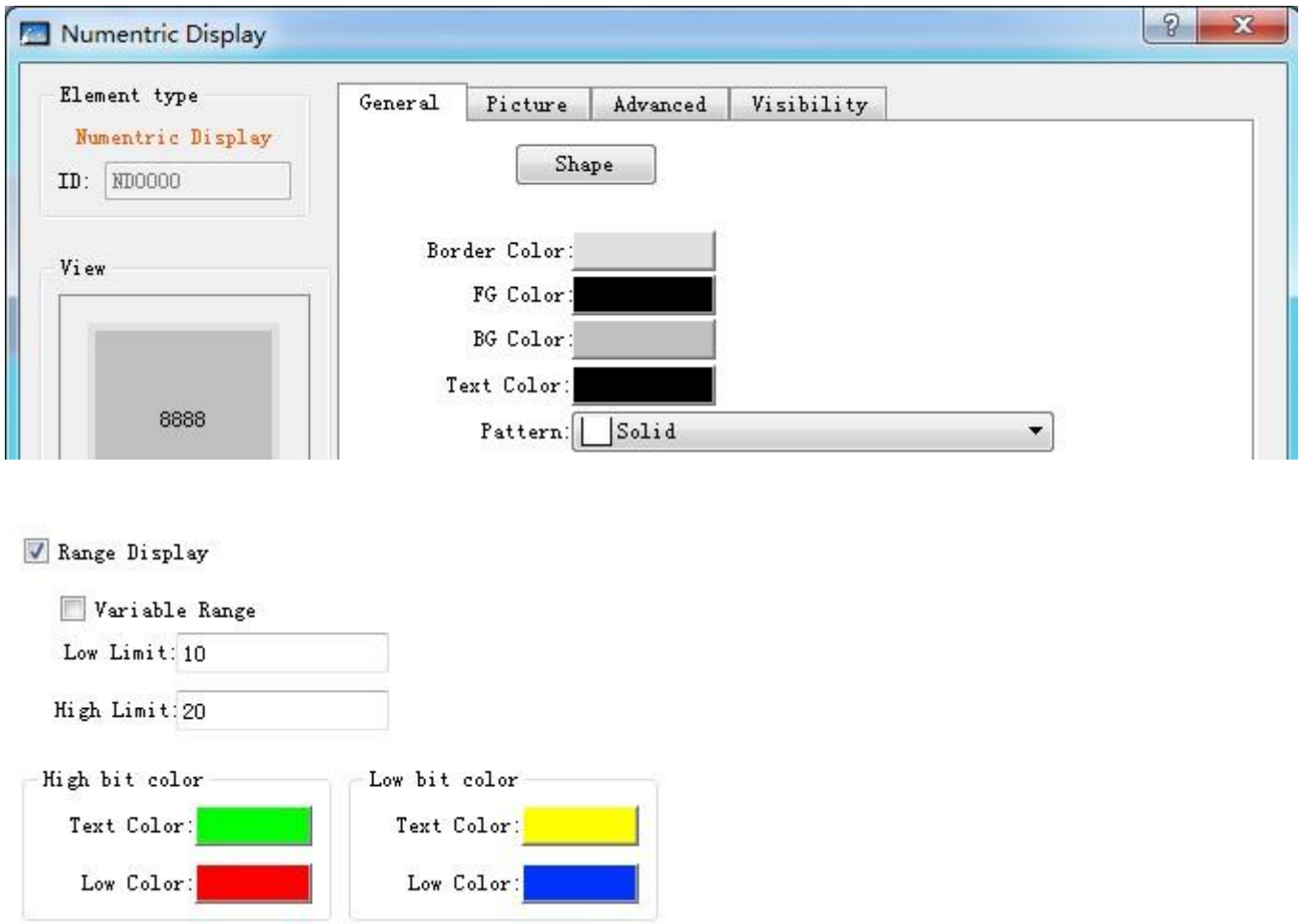


Figure 4-93 Range Display Property Settings

When the value of the monitored address changes, the text and background of the numeric display change accordingly, as shown in Figure 4-94:

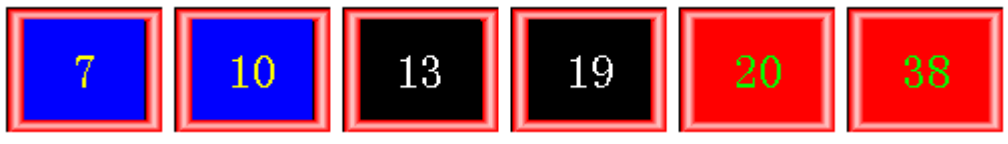


Figure 4-94 An example of numeric display



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

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 Note data and address errors.

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

6.5.9 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:

Select the Numerical input icon  in the toolbar, and a dialog box appears. As shown in Figure 4-95.

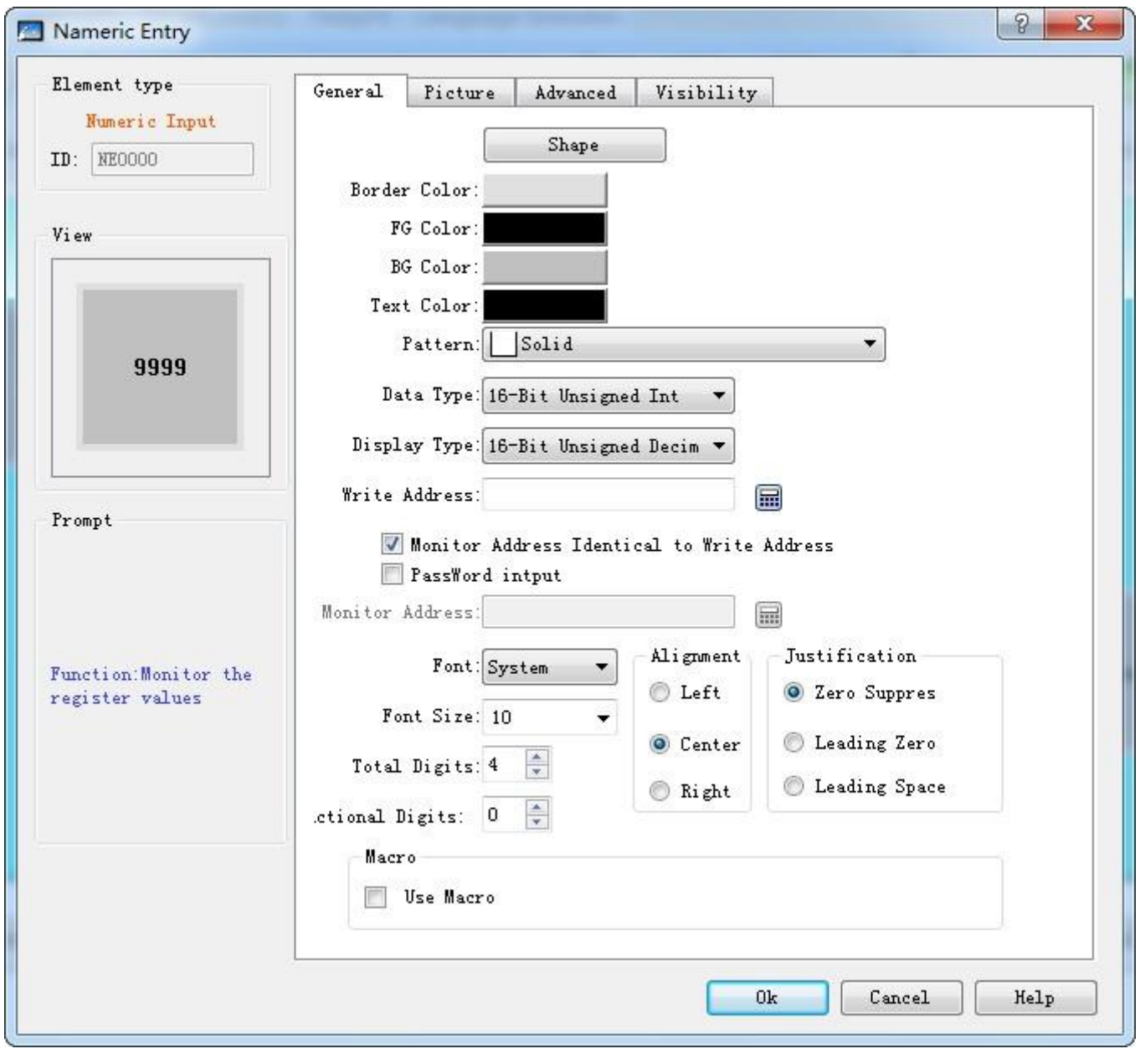


Figure 4-95 Numeric Input dialog box

Tips:

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

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

Note: 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 4-96.

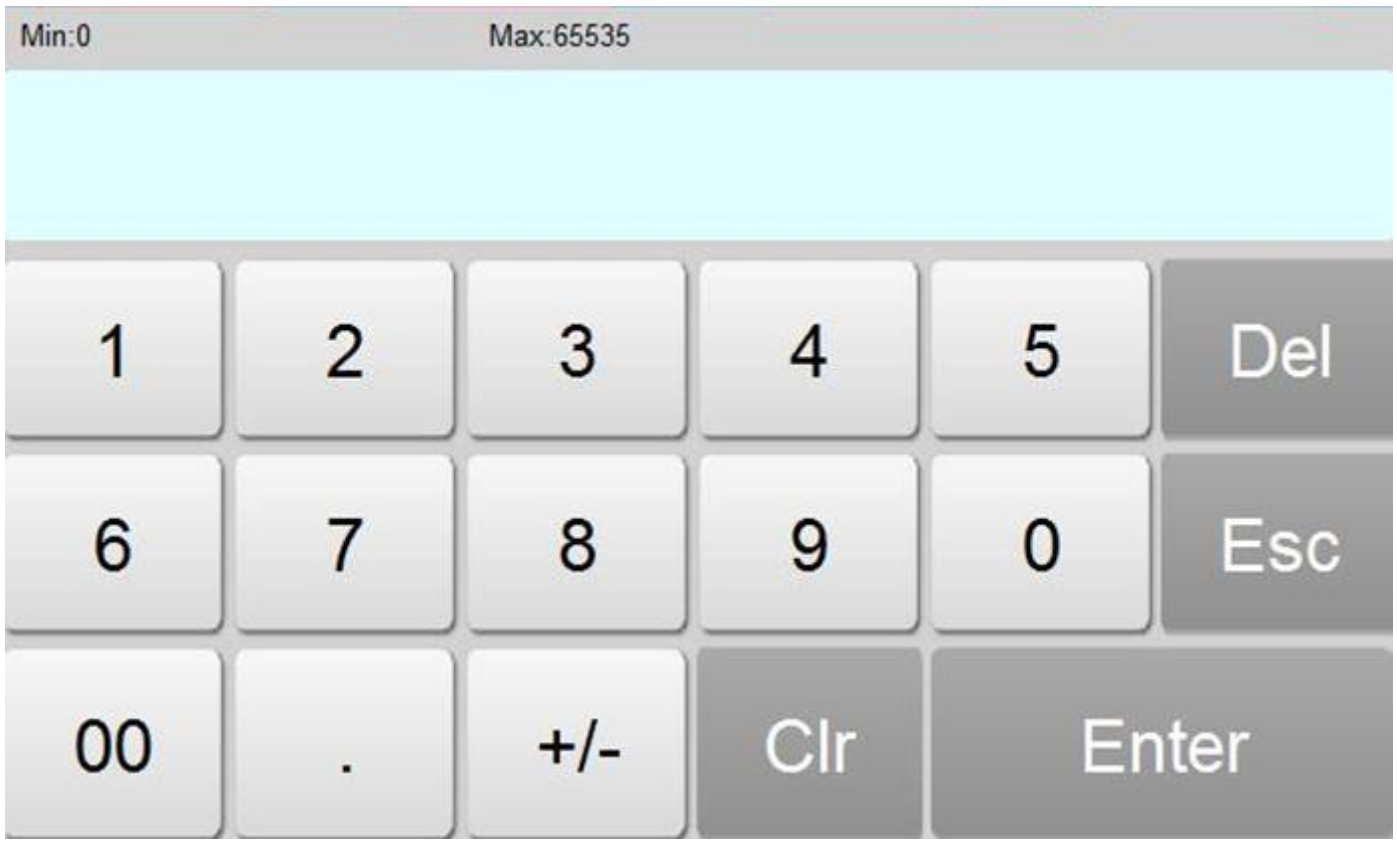


Figure 4-96 Number input keyboard

Tips:

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 ofNote data and address errors.

Note: 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.

Note: 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.

"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.

Click the "Advanced" tab, as shown in Figure 4-97:

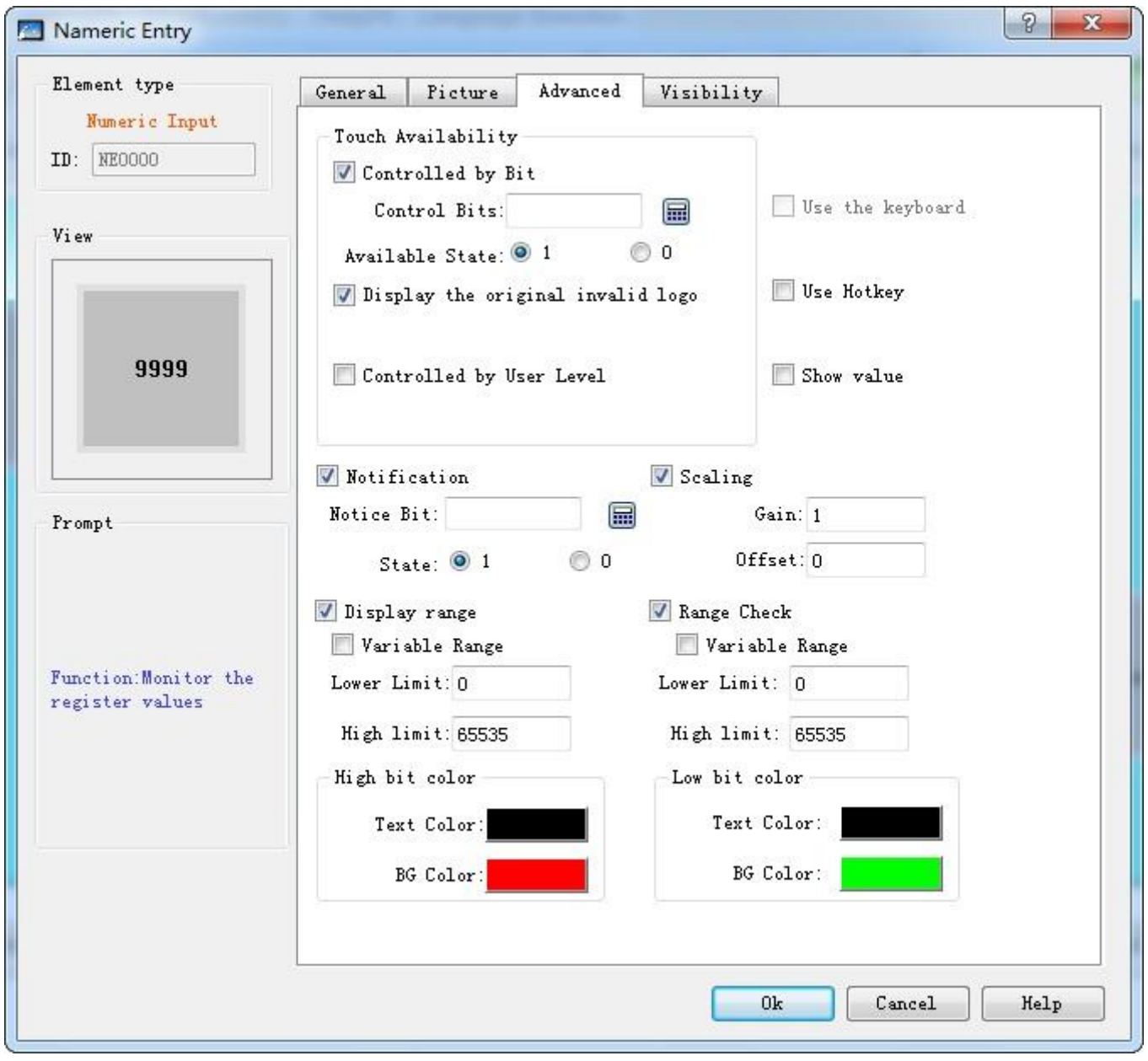
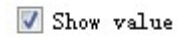


Figure 4-97 Numeric Input Advanced page

- 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 Touch Screen Parameter Setting is as shown in Figure 4-98：

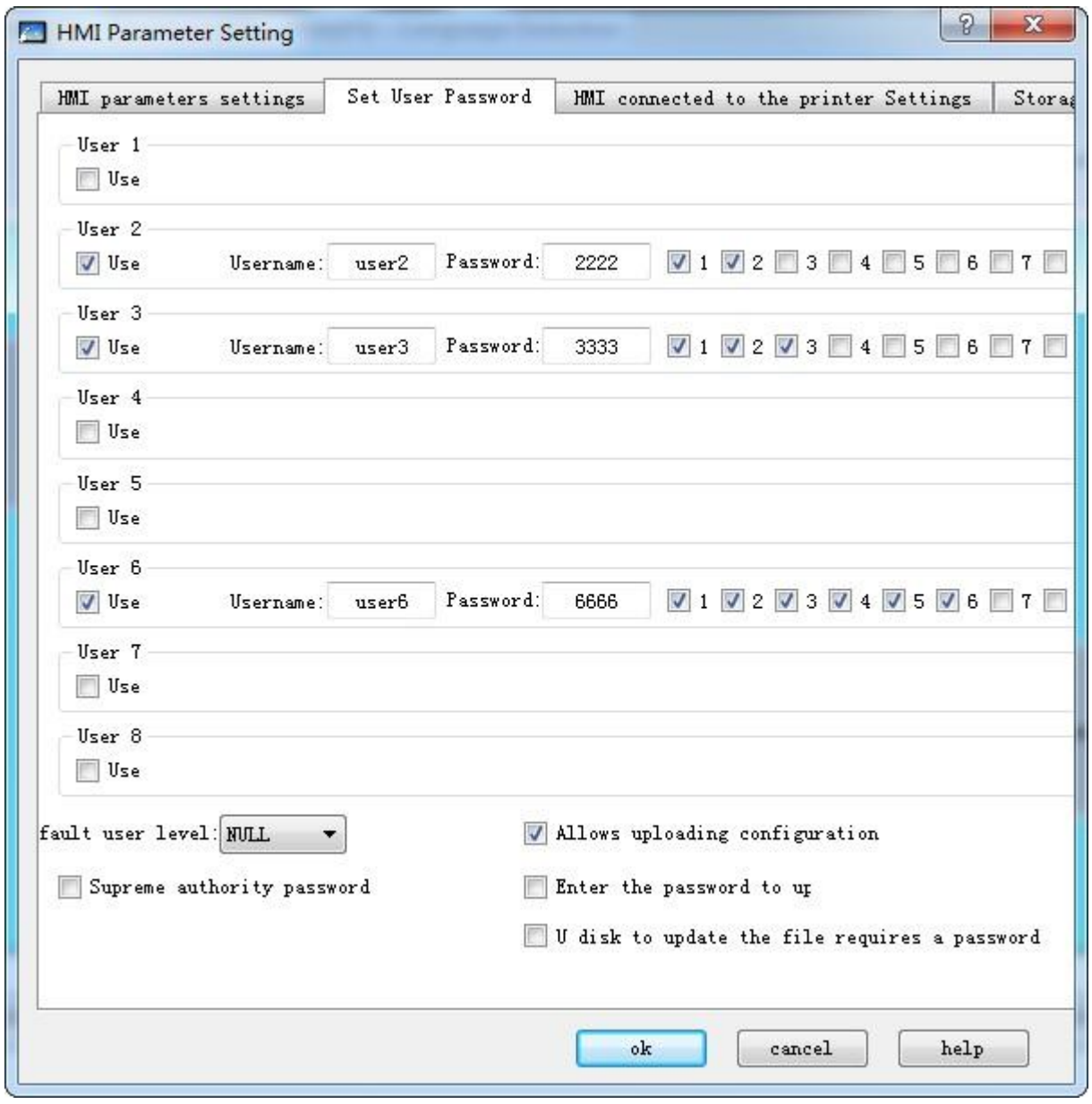
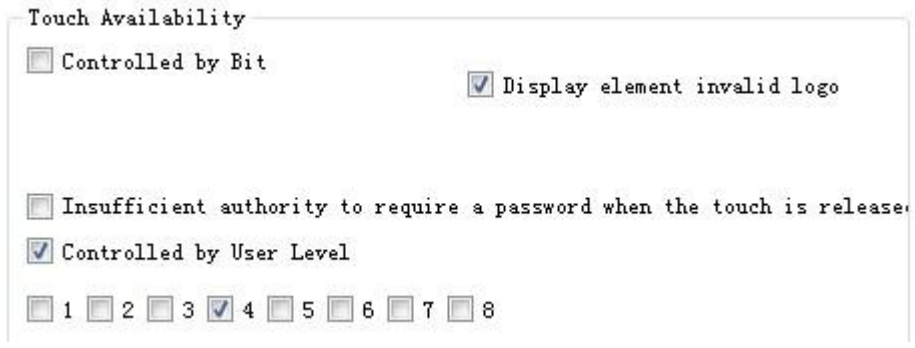


Figure 4-98 User Password Setting in the touch screen parameter setting

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 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:



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:

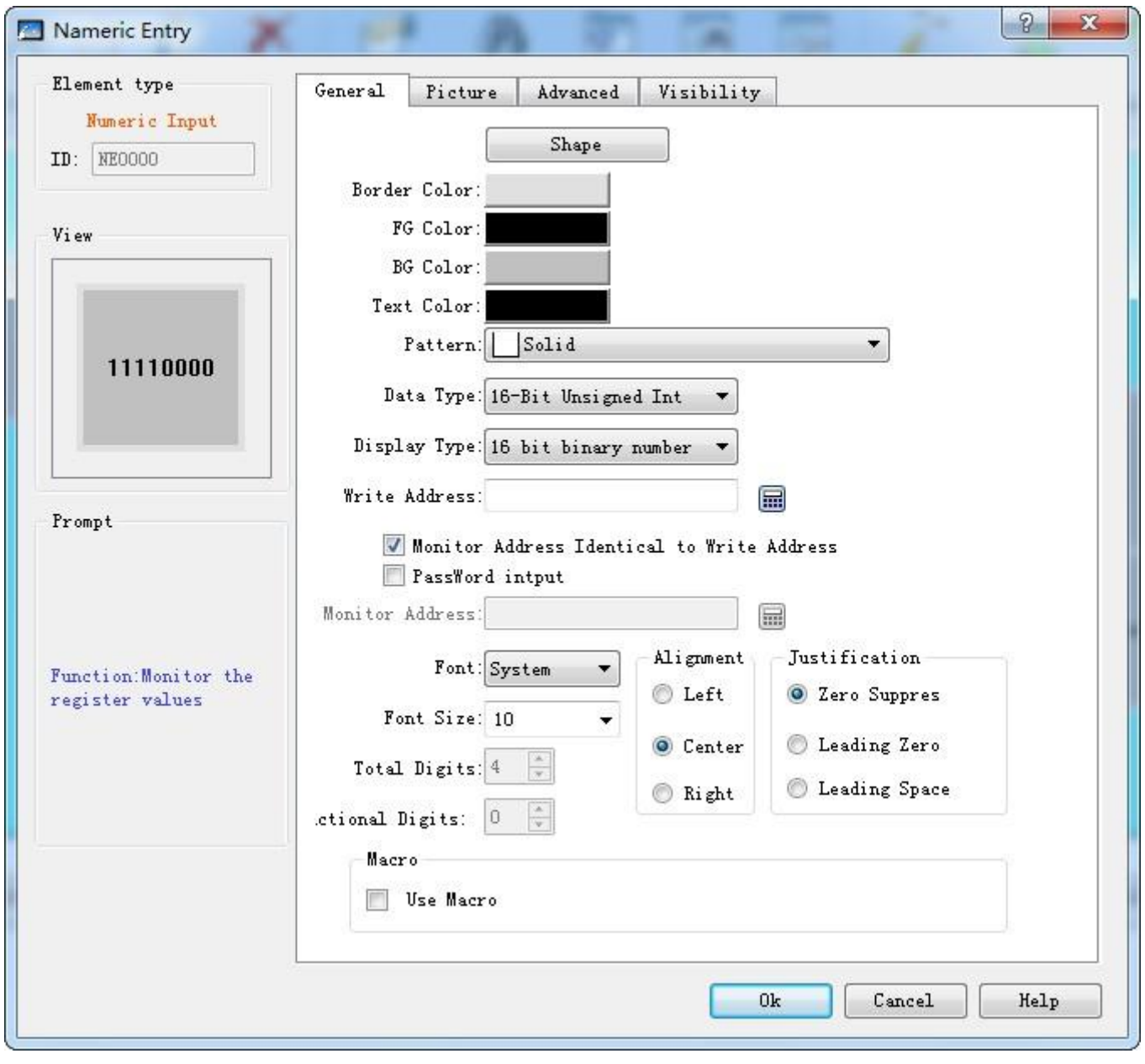


- Notification: In the case that the control can be touched, in the simulation or screen, click on the control to input a value through a pop-up input keyboard; then it will write the set state value (1 or 0) to the "Notice bit" address.
- Scaling: When this option is selected, the value written to the 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.

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.



➢ 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.

6.5.10 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 4-99:

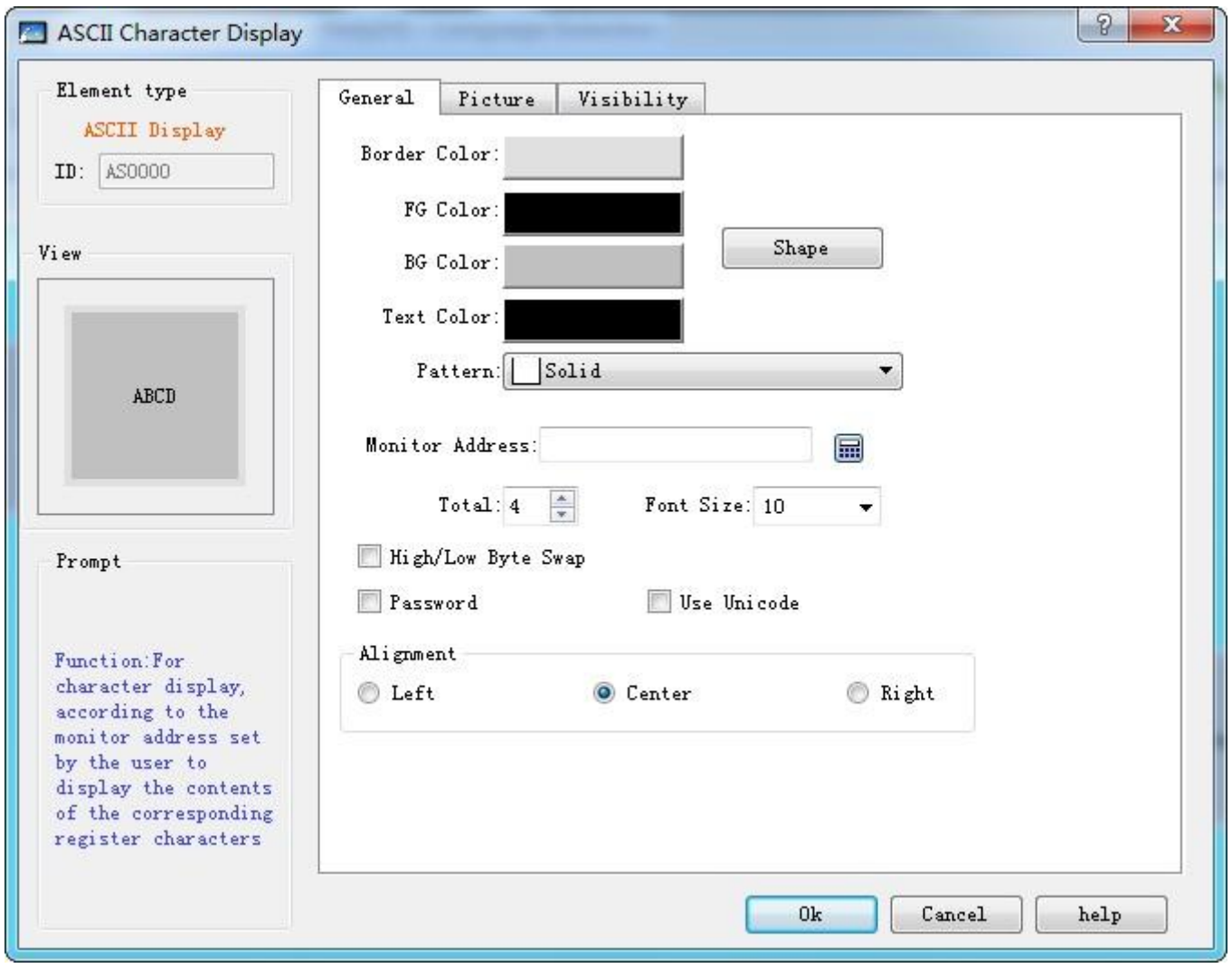


Figure 4-99 ASCII Display dialog box

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.

Tips:

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

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

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

6.5.11 ASCII Input

Click the ASCII Input button icon 

, then a dialog box pops up as shown in Figure 4-100:

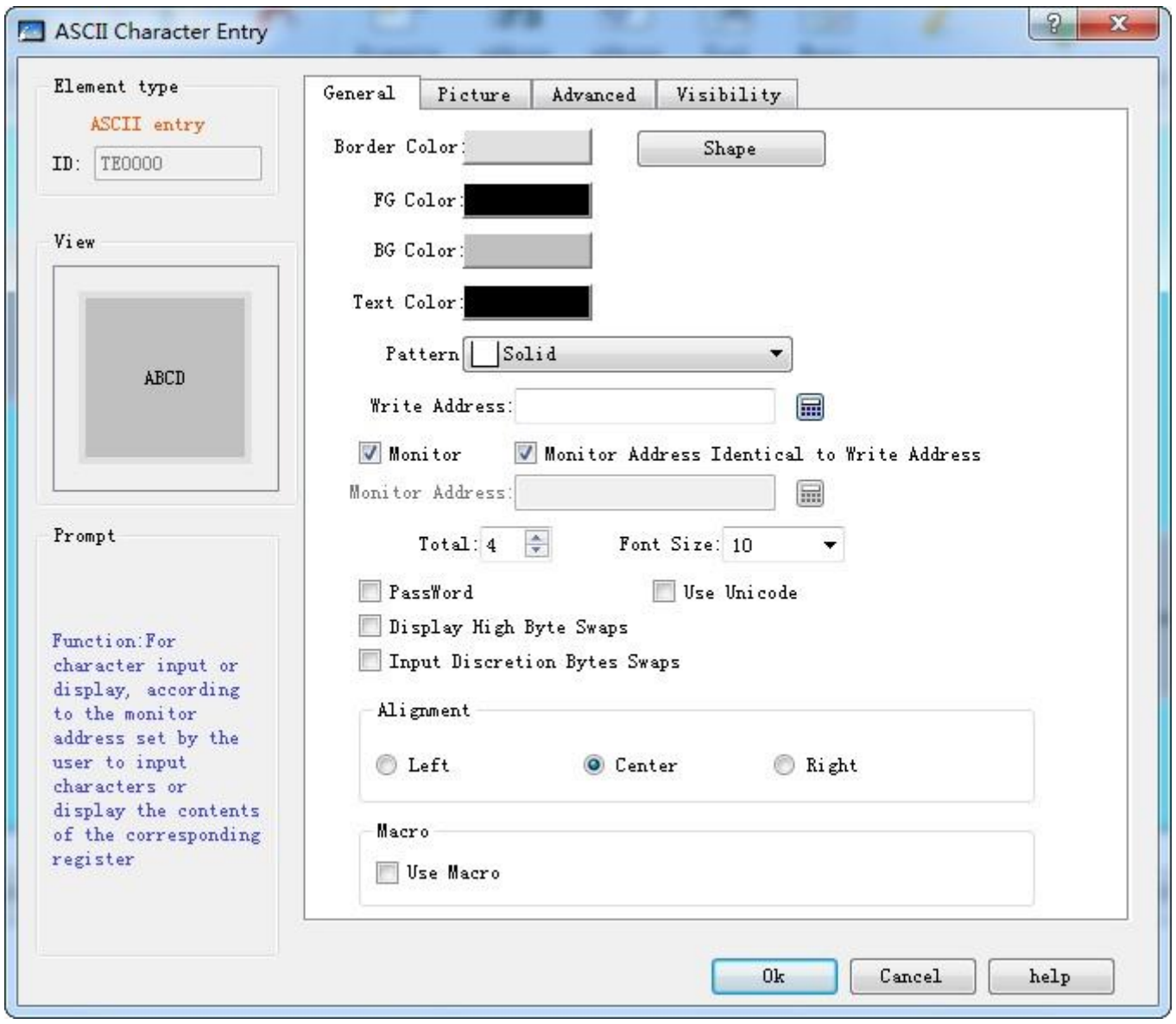


Figure 4-100 ASCII Input dialog box

- 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.

Tips:

Note: For example, when the 32-bit data type is selected, the stored address occupies 2 words. For example, when writting 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.

Note: Other functions in General page are the same with those of SCII Display which you can refer to.

Note: Refer to Bit Button for the application of “Advanced” and “Visibility” page.

6.5.12 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.

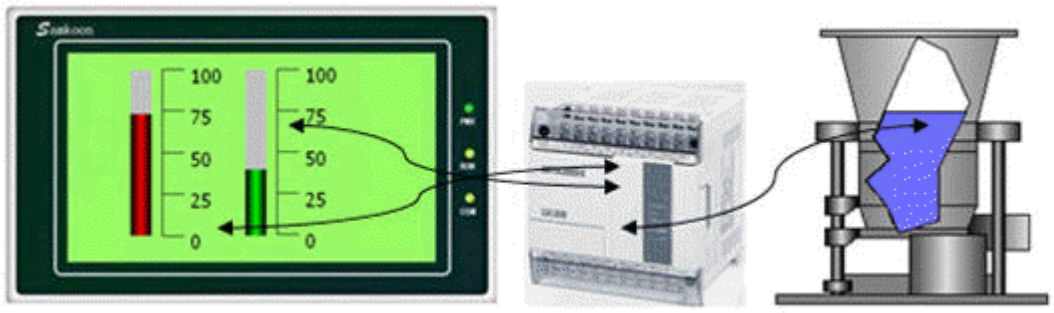


Figure 4-101 bar graph

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 4-102.

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.

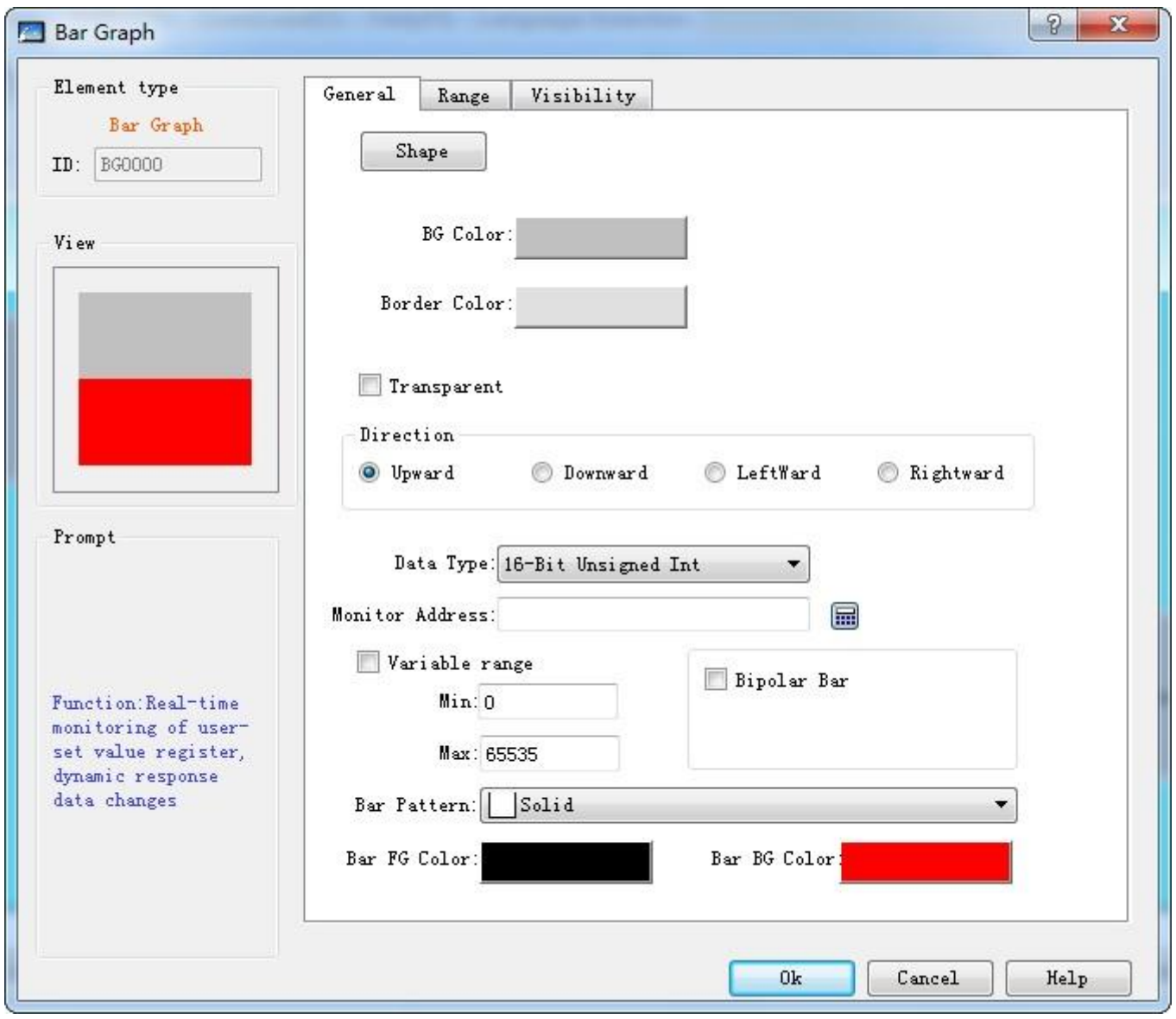


Figure 4-102 Bar chart dialog box

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 4-103.

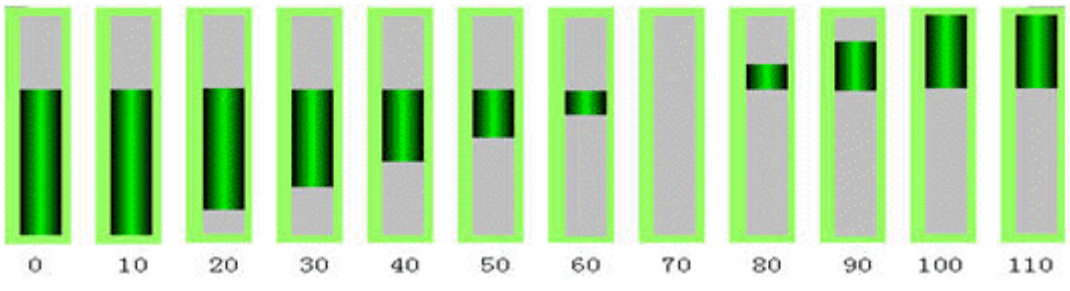


Figure 4-103 bipolar bar graph

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 4-104:

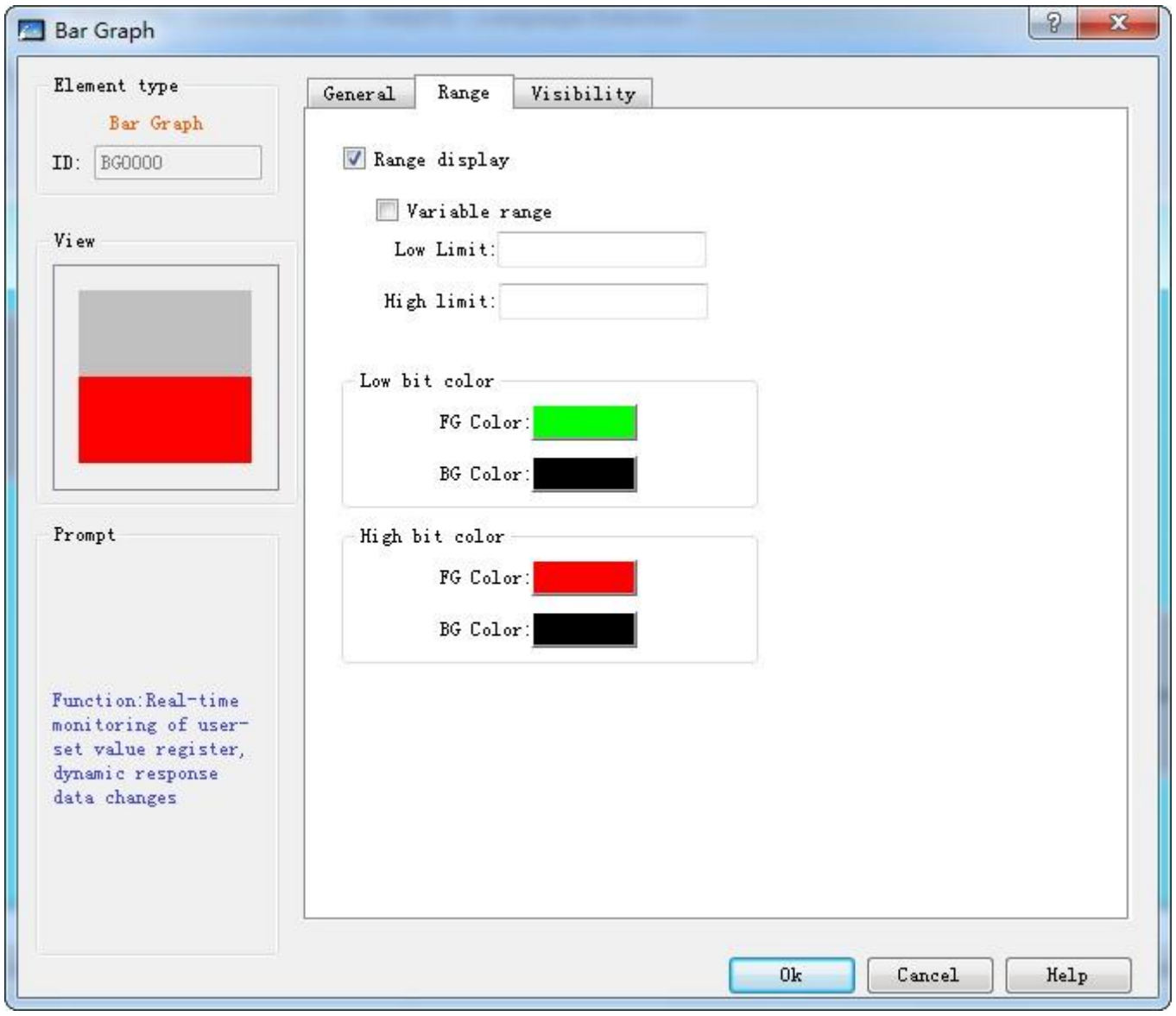


Figure 4-104 Bar Graph Range page

- 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.

Note: Refer to “Bit button” for the application of “Visibility”.

6.5.13 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 4-105.

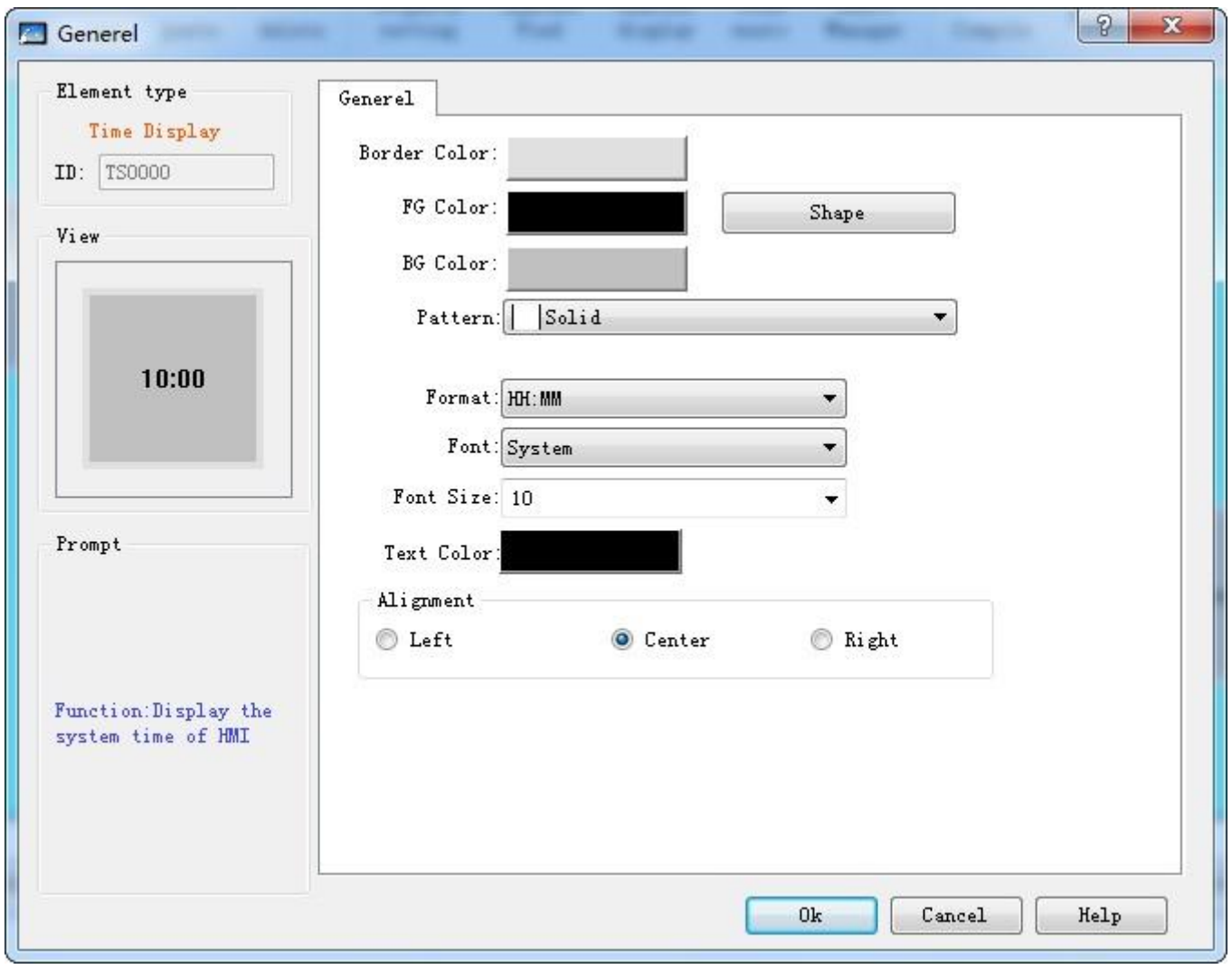


Figure 4-105 Time Display dialog box



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

- Format: Fours 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)

6.5.14 Date Display

The control of Date Display is mainly used to display the system date. Click in the button icon  in the toolbar, then it will appear a dialog box as shown in Figure 4-106:

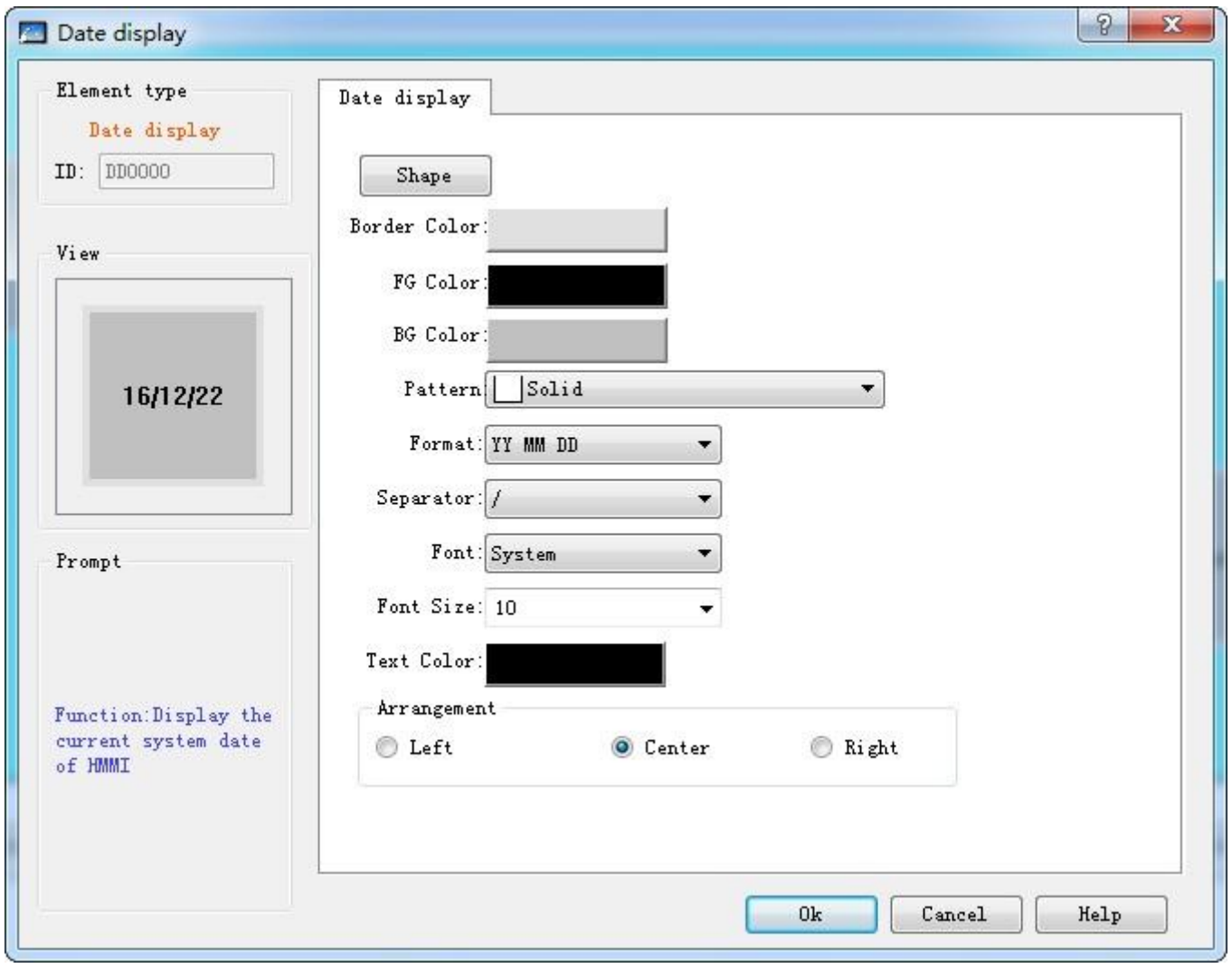


Figure 4-106 Date Display dialog box

- 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)

Tips:

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

6.5.15 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 4-107:

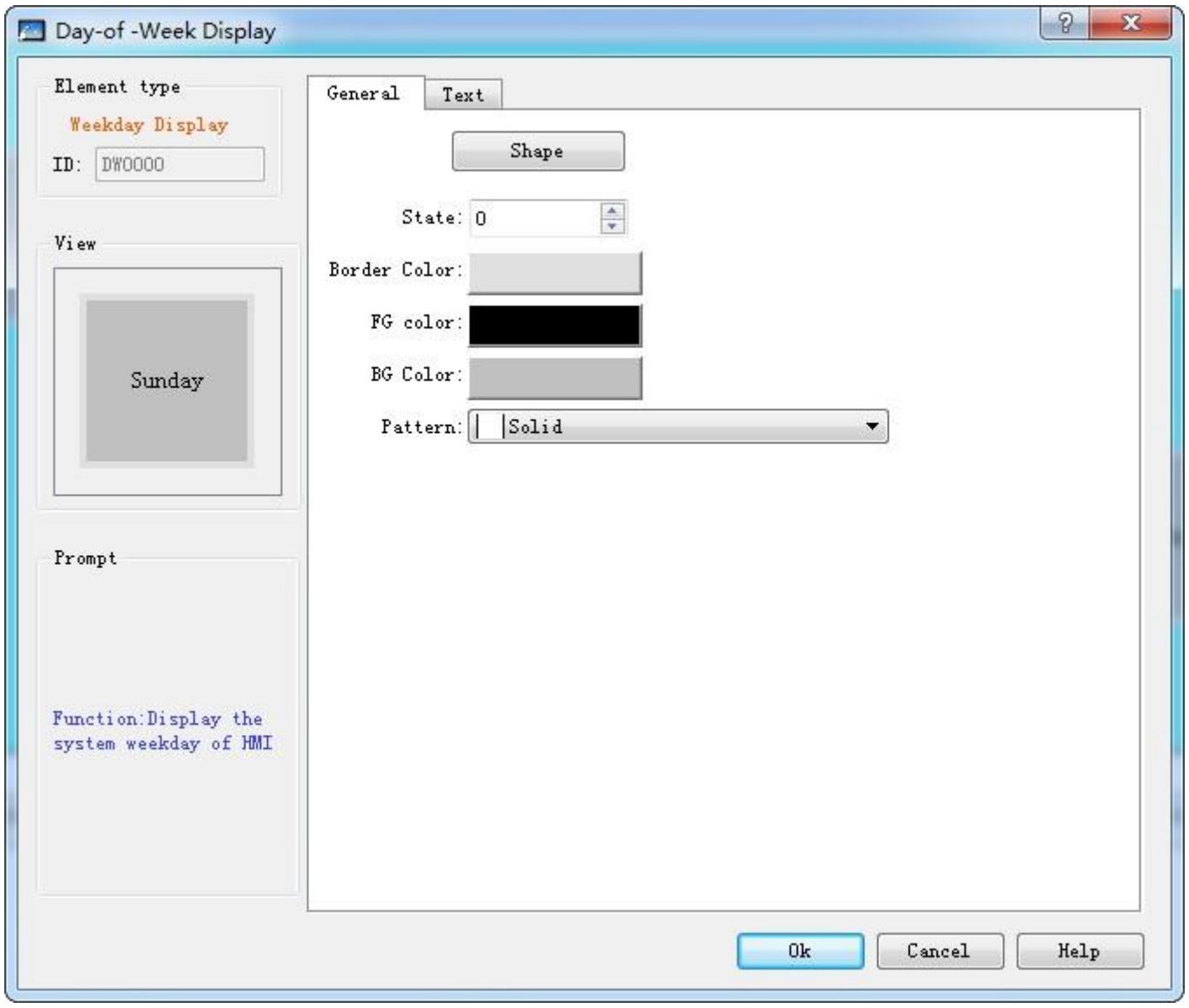


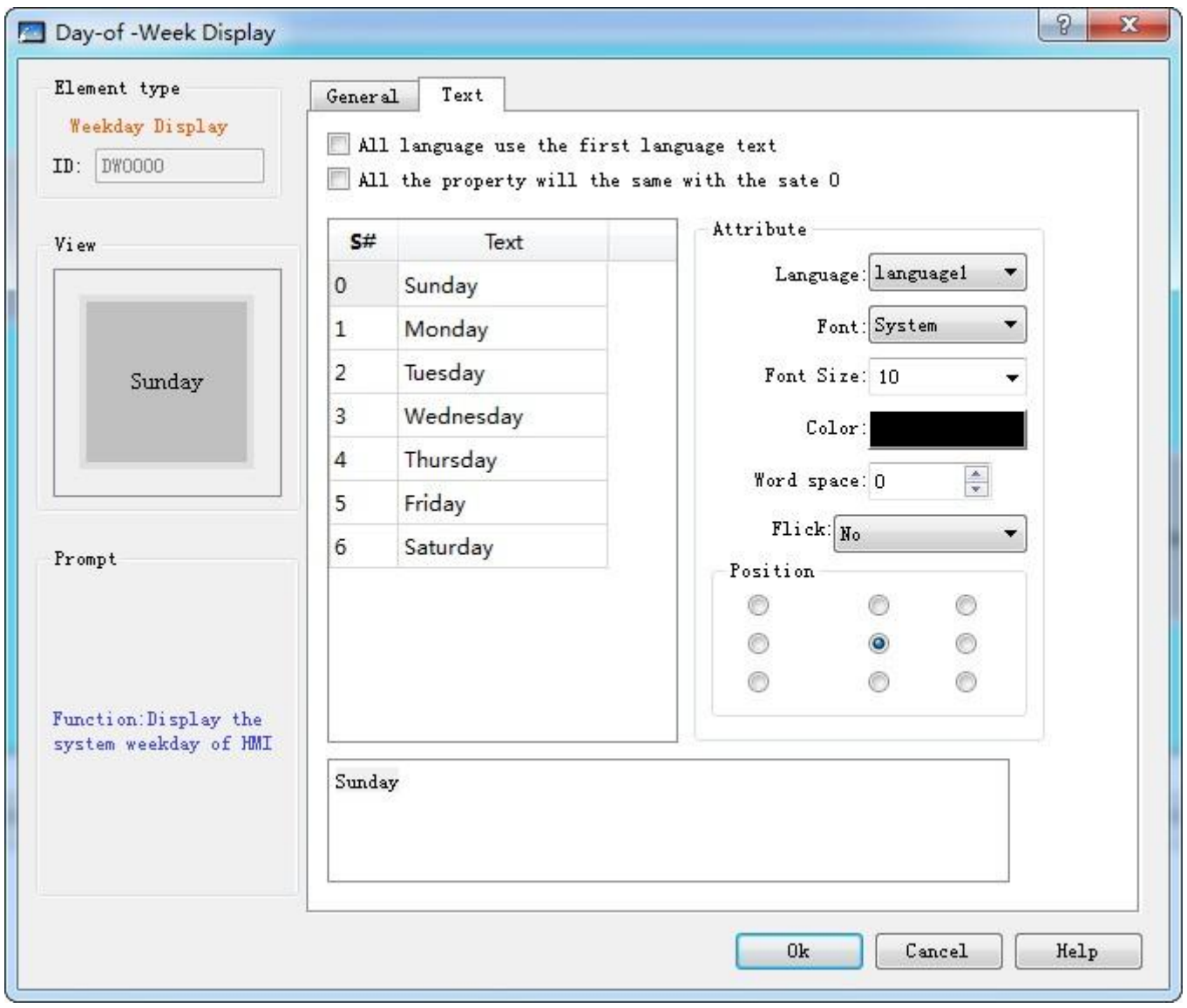
Figure 4-107 Week Display dialog box

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

Tips:

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 4-108:



- 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



Tips:

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 editting box.

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

6.5.16 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 4-109:

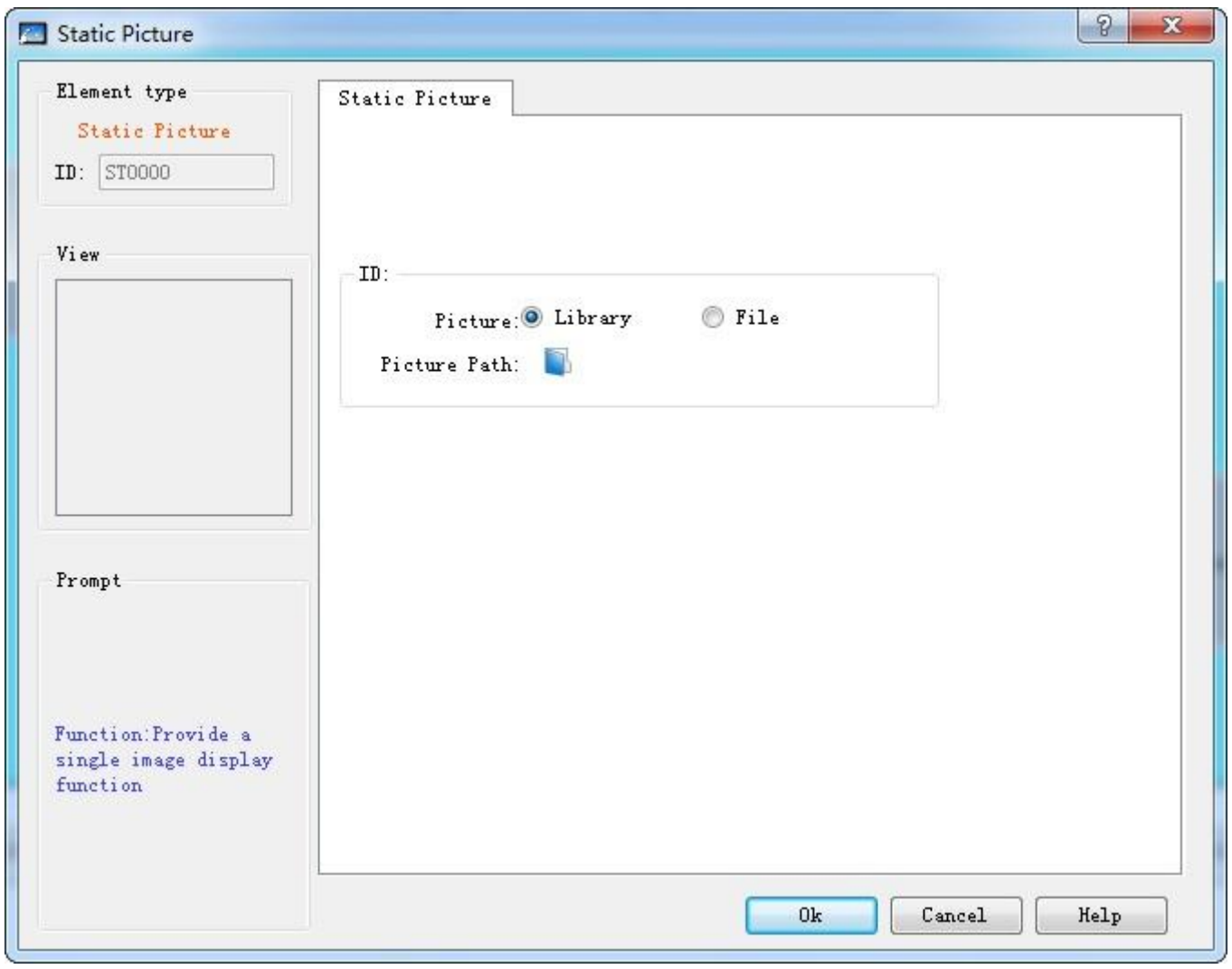


Figure 4-109 Static picture dialog box

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. SKTOOL configuration software supports various image formats: JPG, BMP, PNG, WMF, EMF, GIF.

6.5.17 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 4-110 pops up:

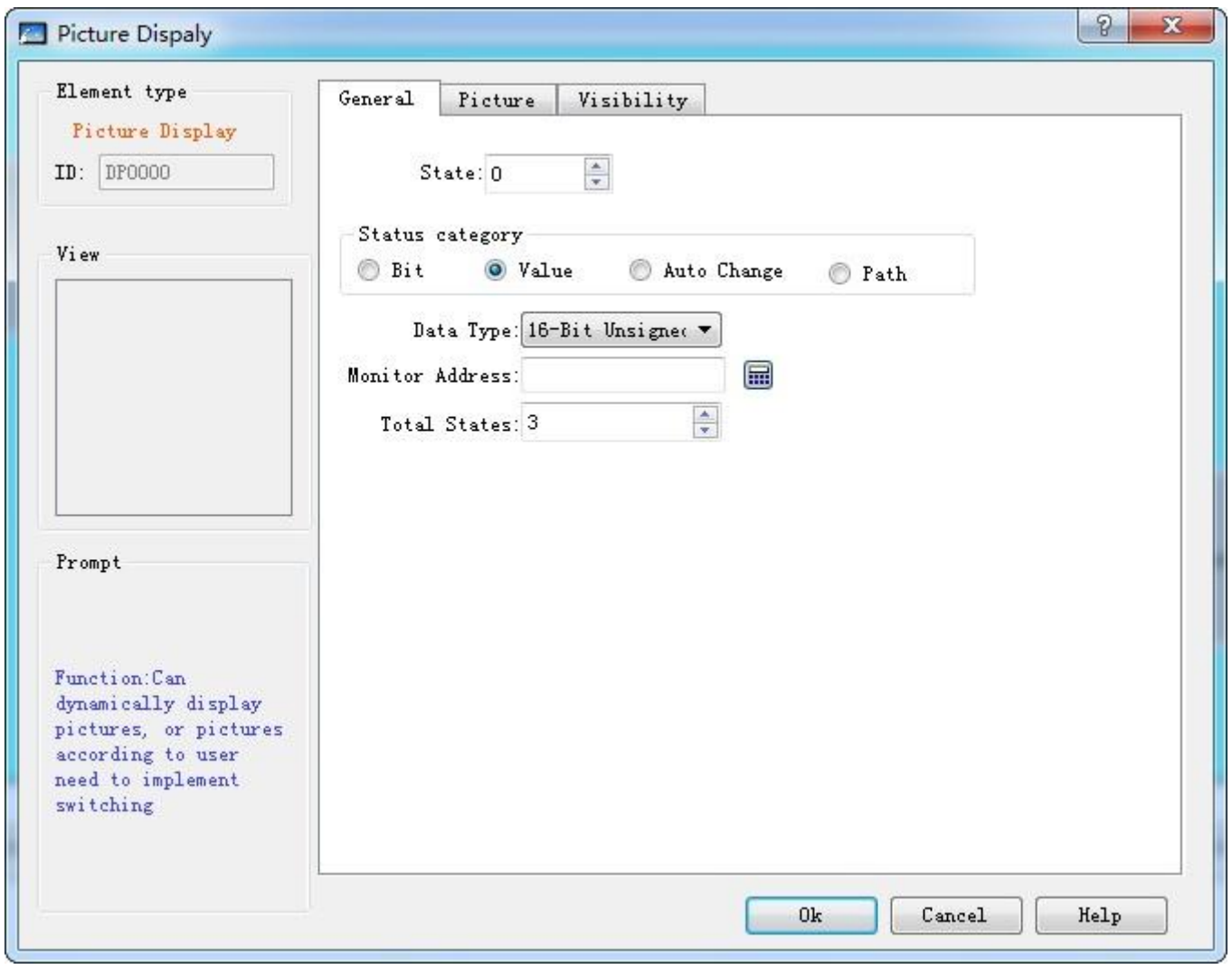


Figure 4-110 Picture Display dialog box

- 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.

Tips:

Note: The "Picture" page of the Picture Display is similar to that of the "Multi-state Indicator Lamp" control that you can refer to.

Note: 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).

6.6 SKTOOL New controls

This chapter introduces the new controls.

Contents：

- Arc Chart
- Stepping Button
- Radio Button
- Radio Button
- Slider

- Animation
- Message Board
- Data Group Display
- Keyboard
- Formula Selector
- Formula Display
- Qrcode
- Operation Log

6.6.1 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 4-111:

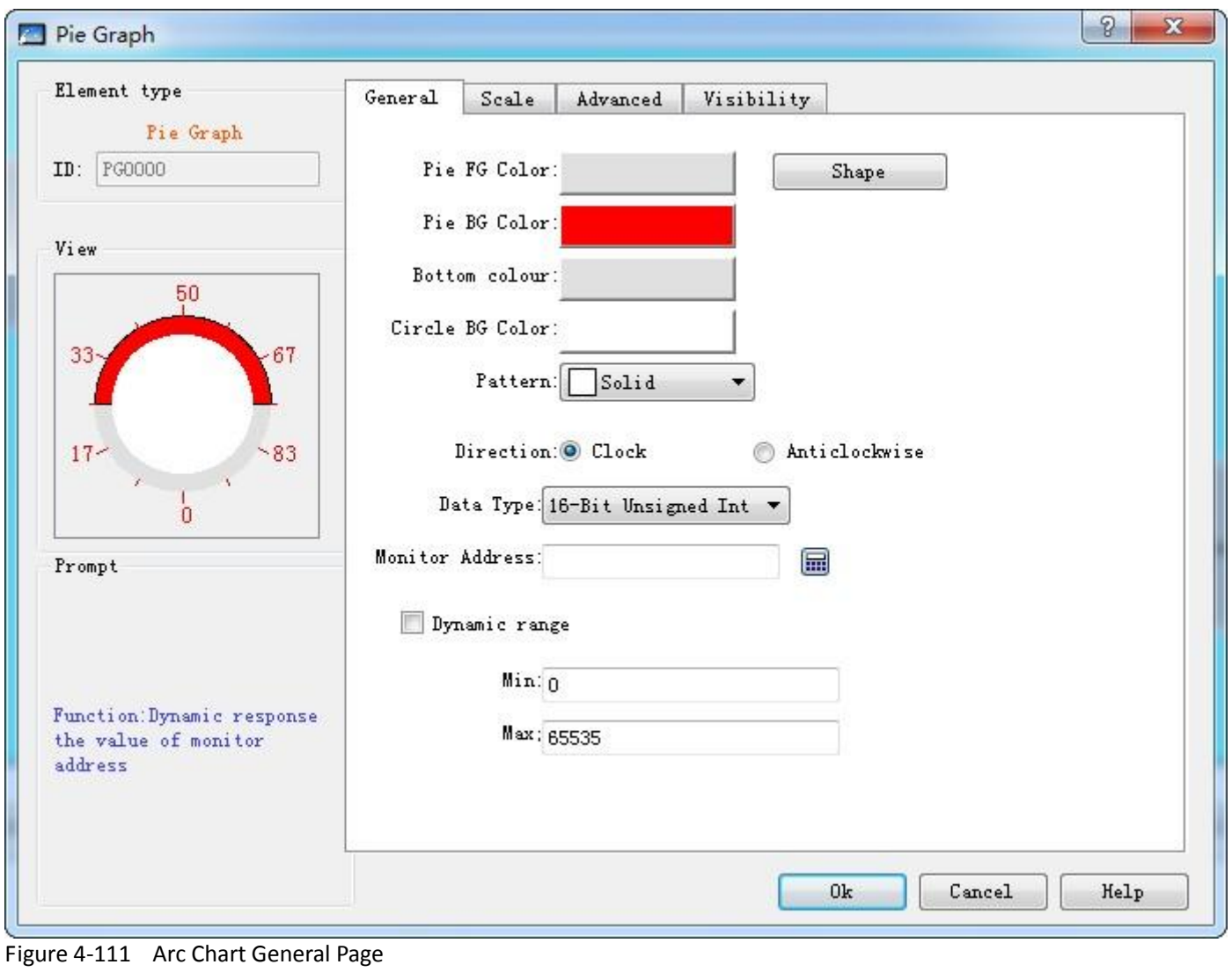


Figure 4-111 Arc Chart General Page

The Scale page dialog box, as shown in Figure 4-112:

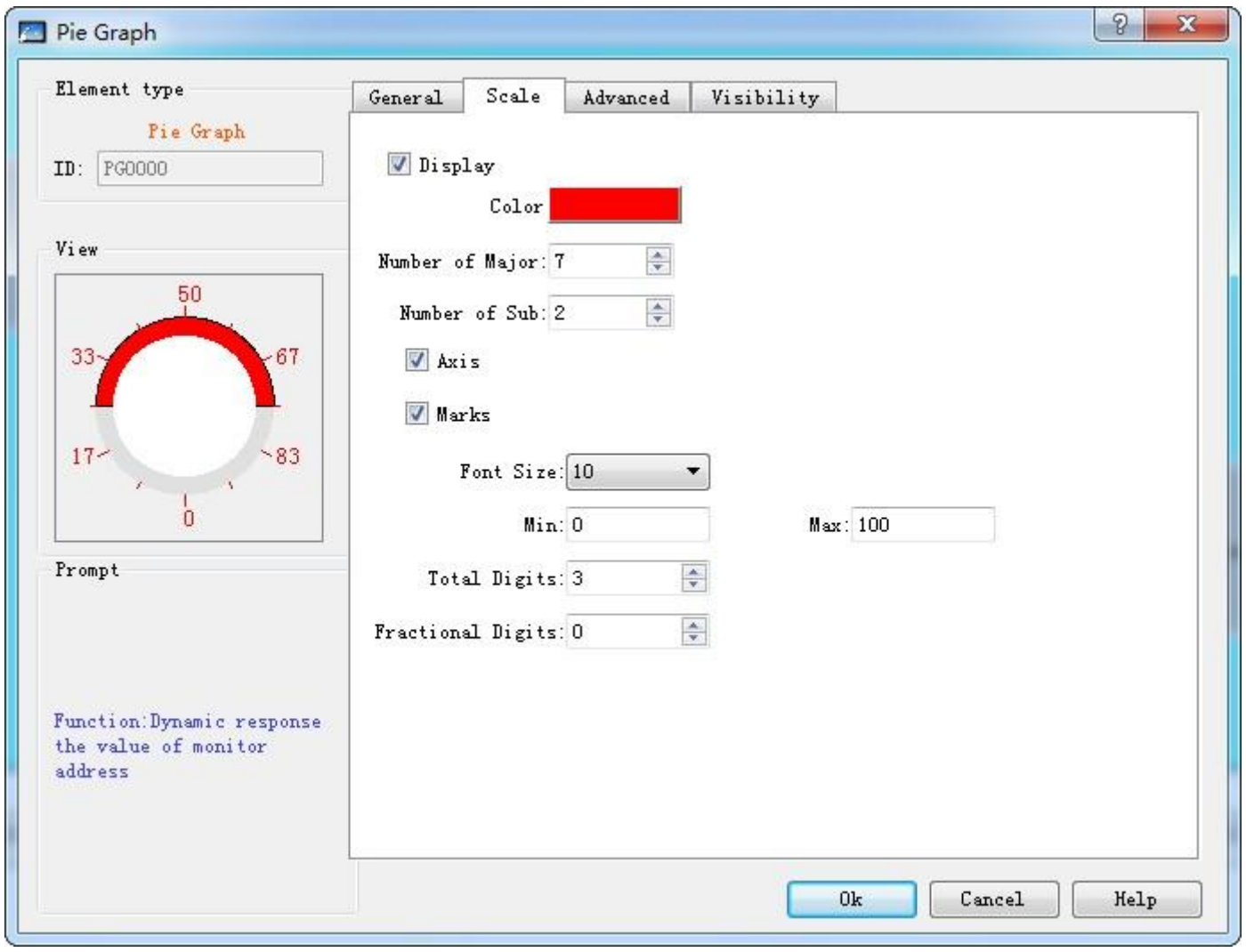


Figure 4-112 Fascicle Scale page

Refer to the scale page of “Meter” for the settings of scale.

Refer to “Numerical display” for the parameter settings of “Advanced”.

6.6.2 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 4-113:

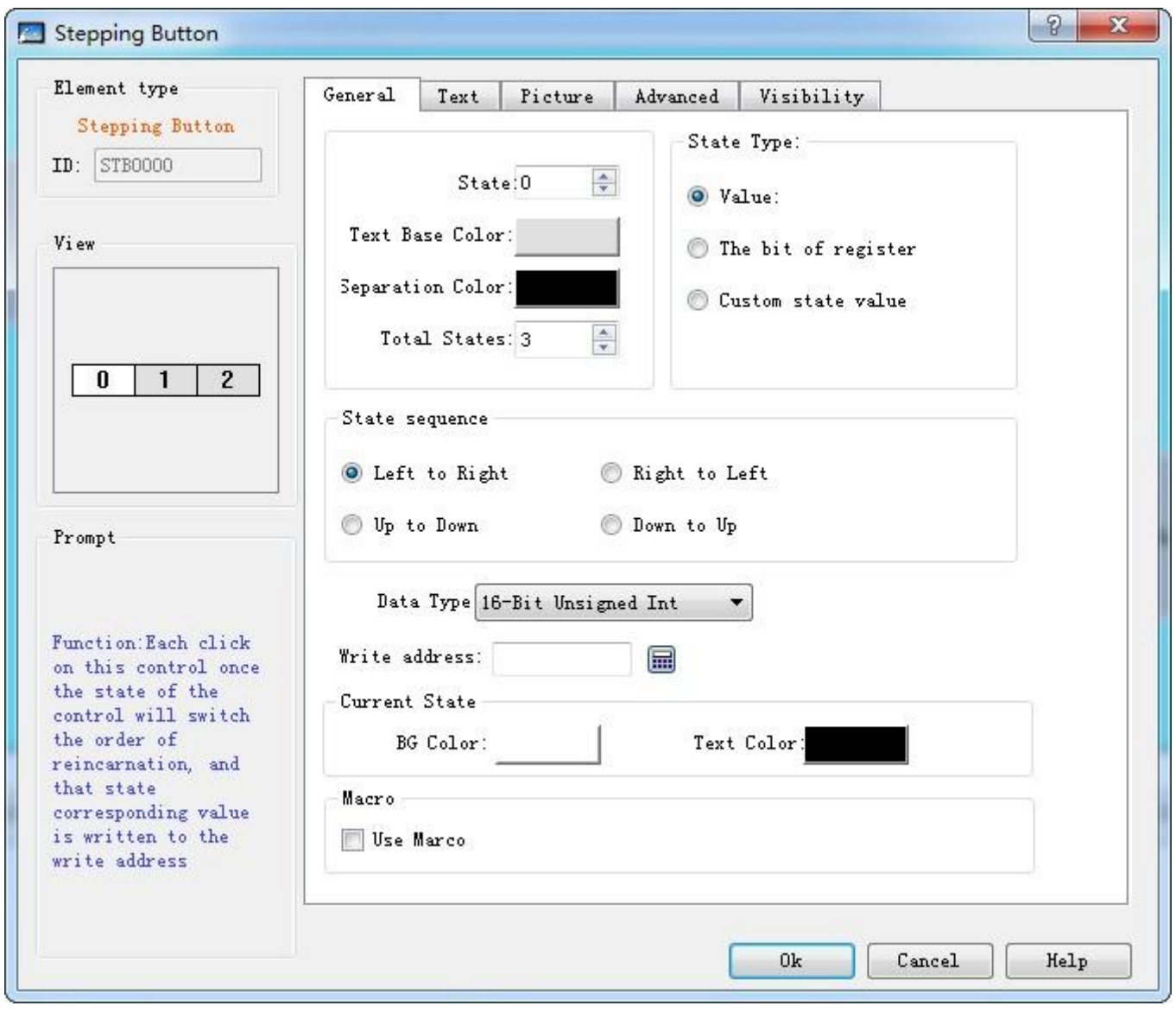


Figure 4-113 Stepping Button dialog box

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, ie the text is oriented from left to right: 0, 1, 2
- Right to Left: The control is placed horizontally, ie 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.

6.6.3 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 4-114:

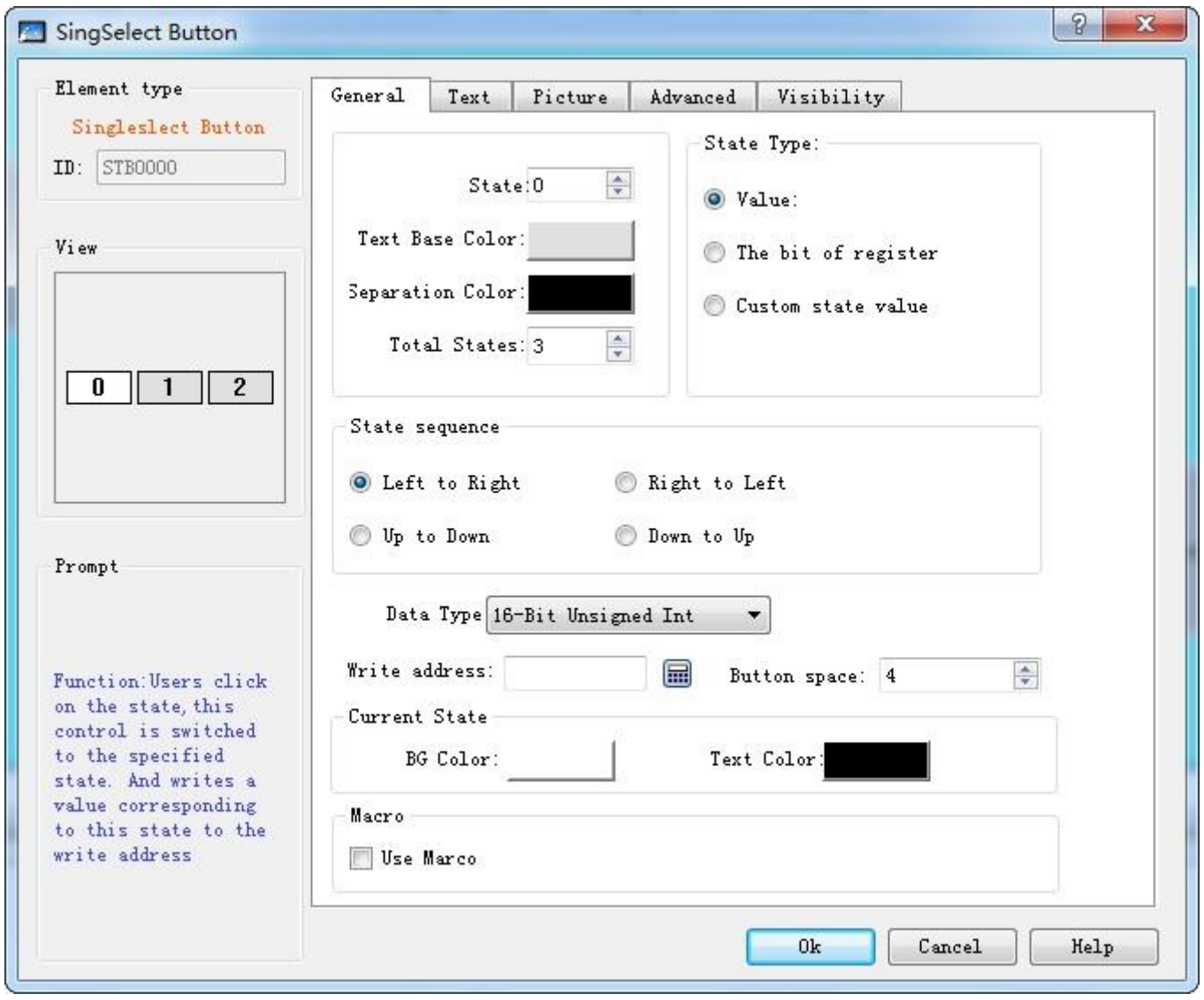


Figure 4-114 Radio Button dialog box

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, ie the text is oriented from left to right: 0, 1, 2
- Right to Left: The control is placed horizontally, ie 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”.

6.6.4 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 4-115:

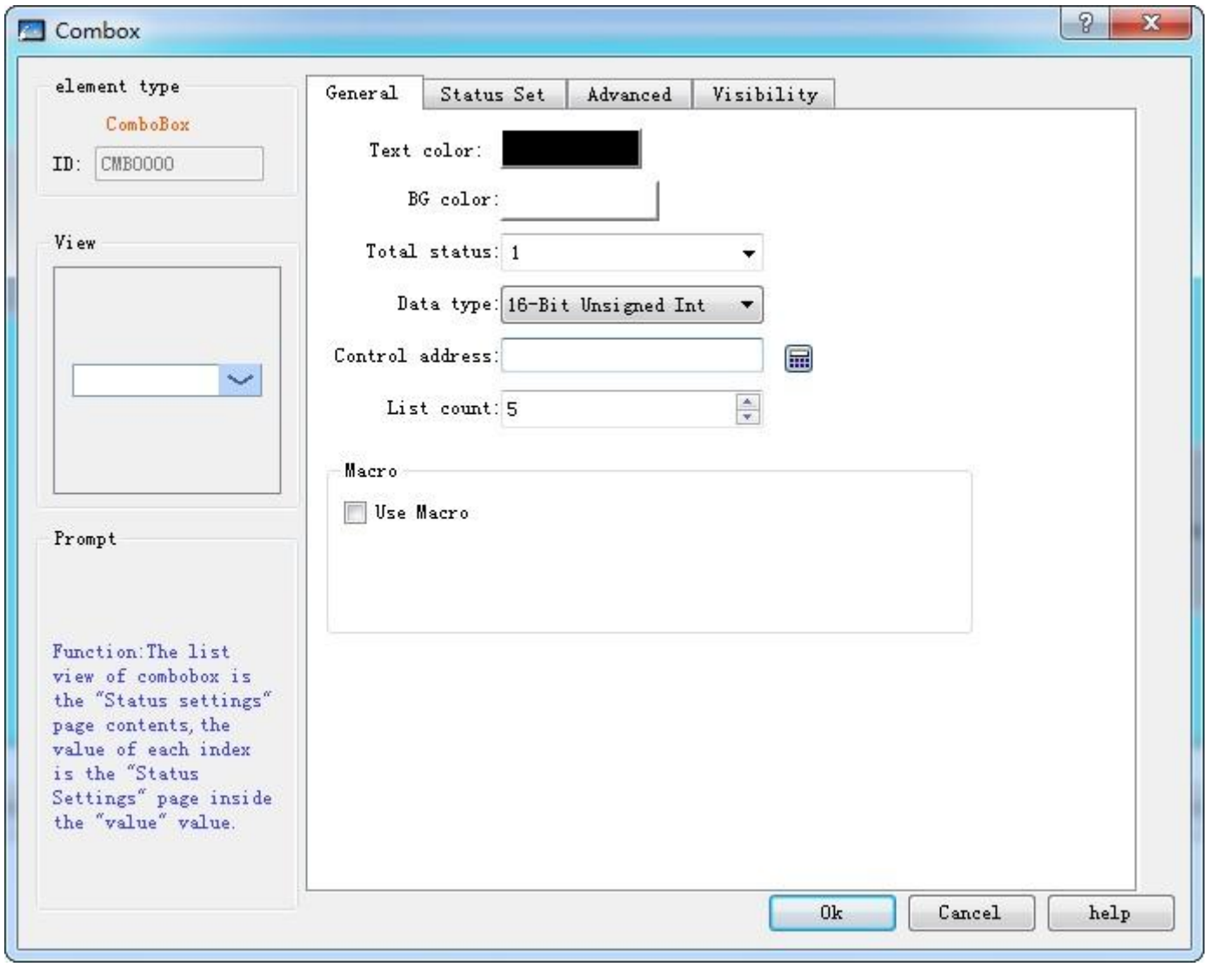


Figure 4-115 Combo box General page dialog box

- 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 (Figure 4-116):

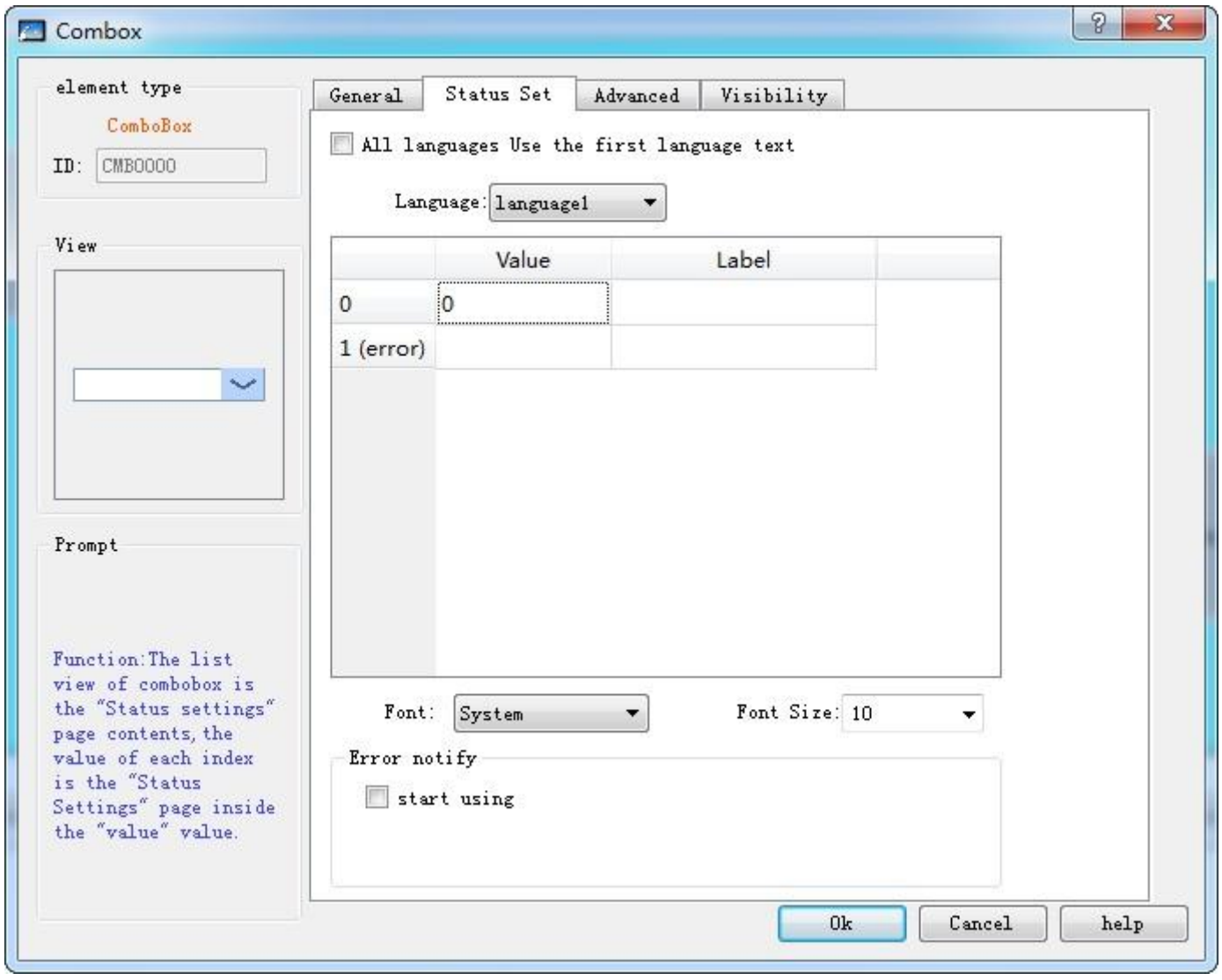


Figure 4-116 Combo box Status Set page dialog box

- 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:

a. [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 s9tate 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".

6.6.5 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 4-117:

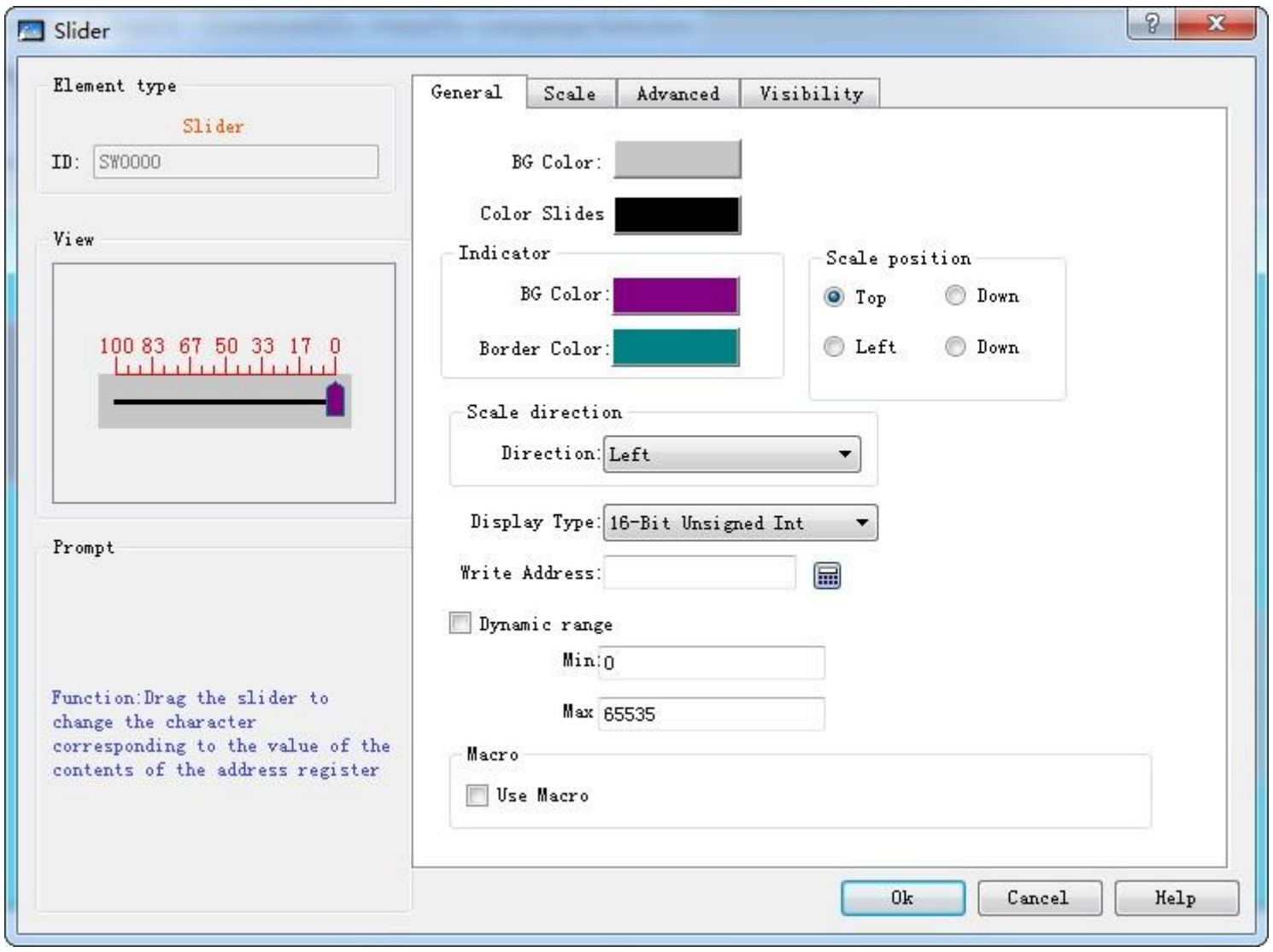


Figure 4-117 Slide dialog box

- 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”.

6.6.6 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 4-118:

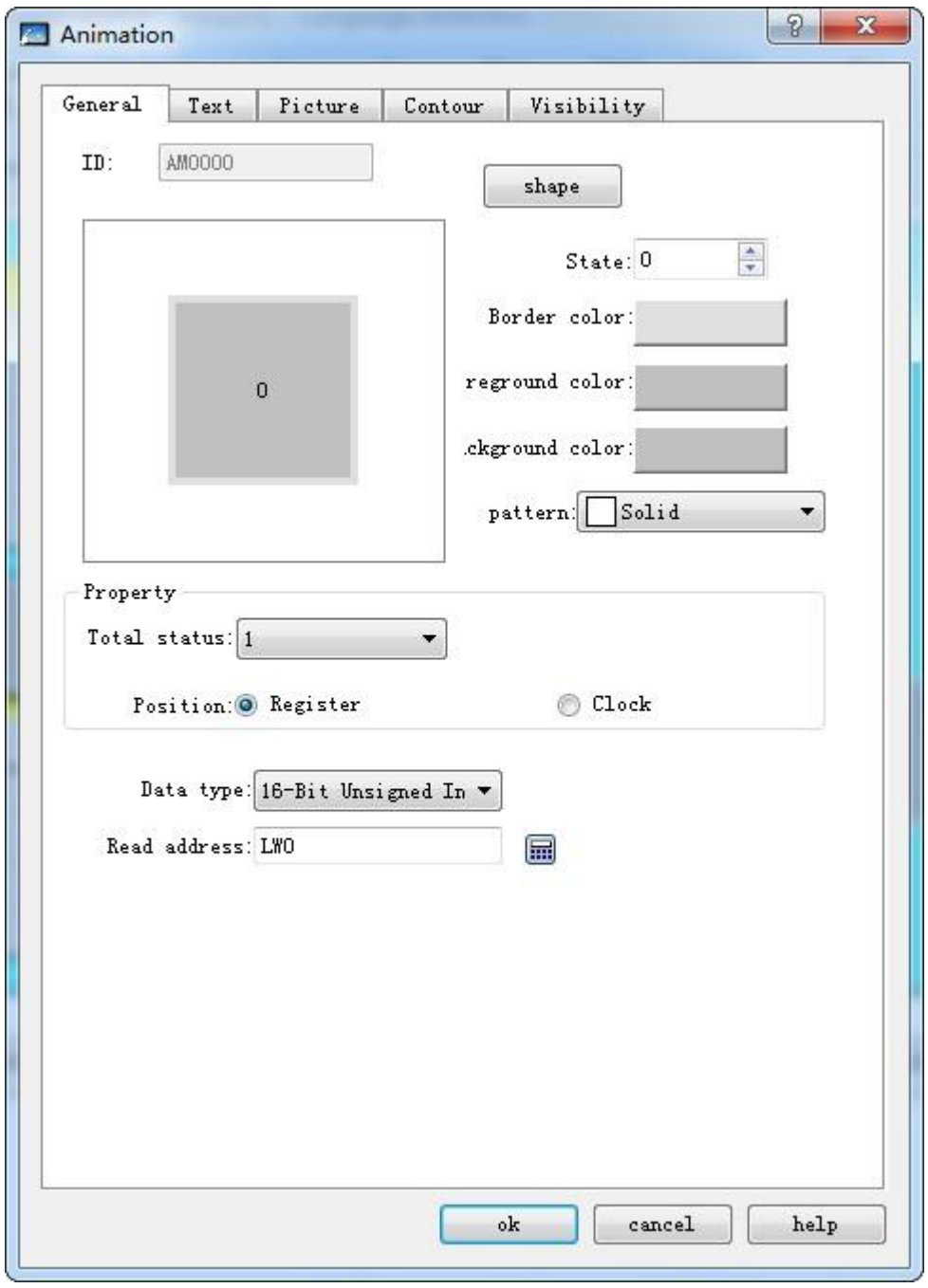


Figure 4-118 Animation General Page dialog box

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 4-119, for example, [LW100] = 2, [LW101] = 1, so the element displays state 2 and appears in position 1.

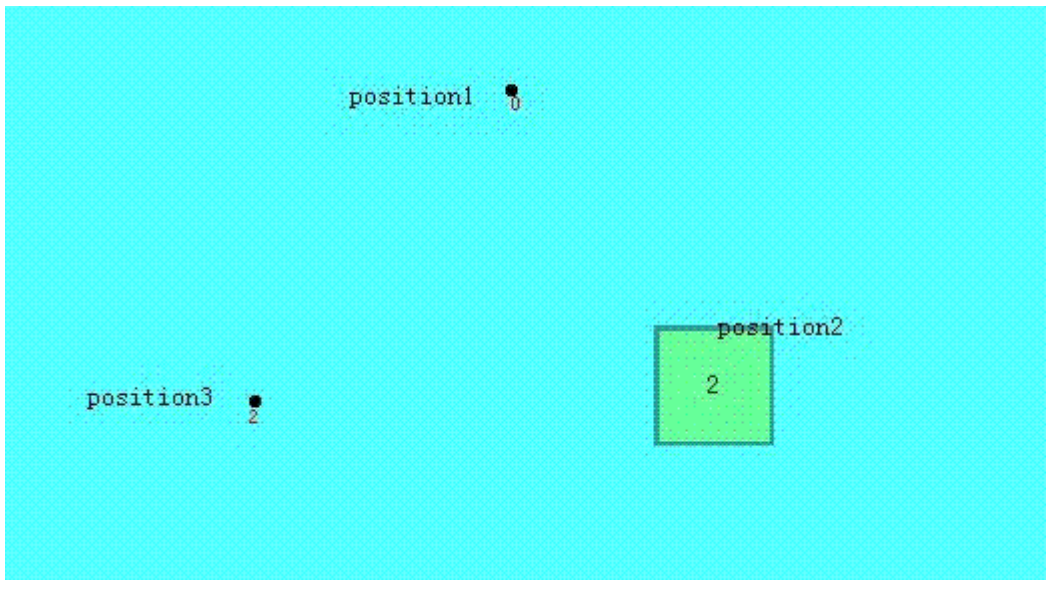


Figure 4-119

- 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.

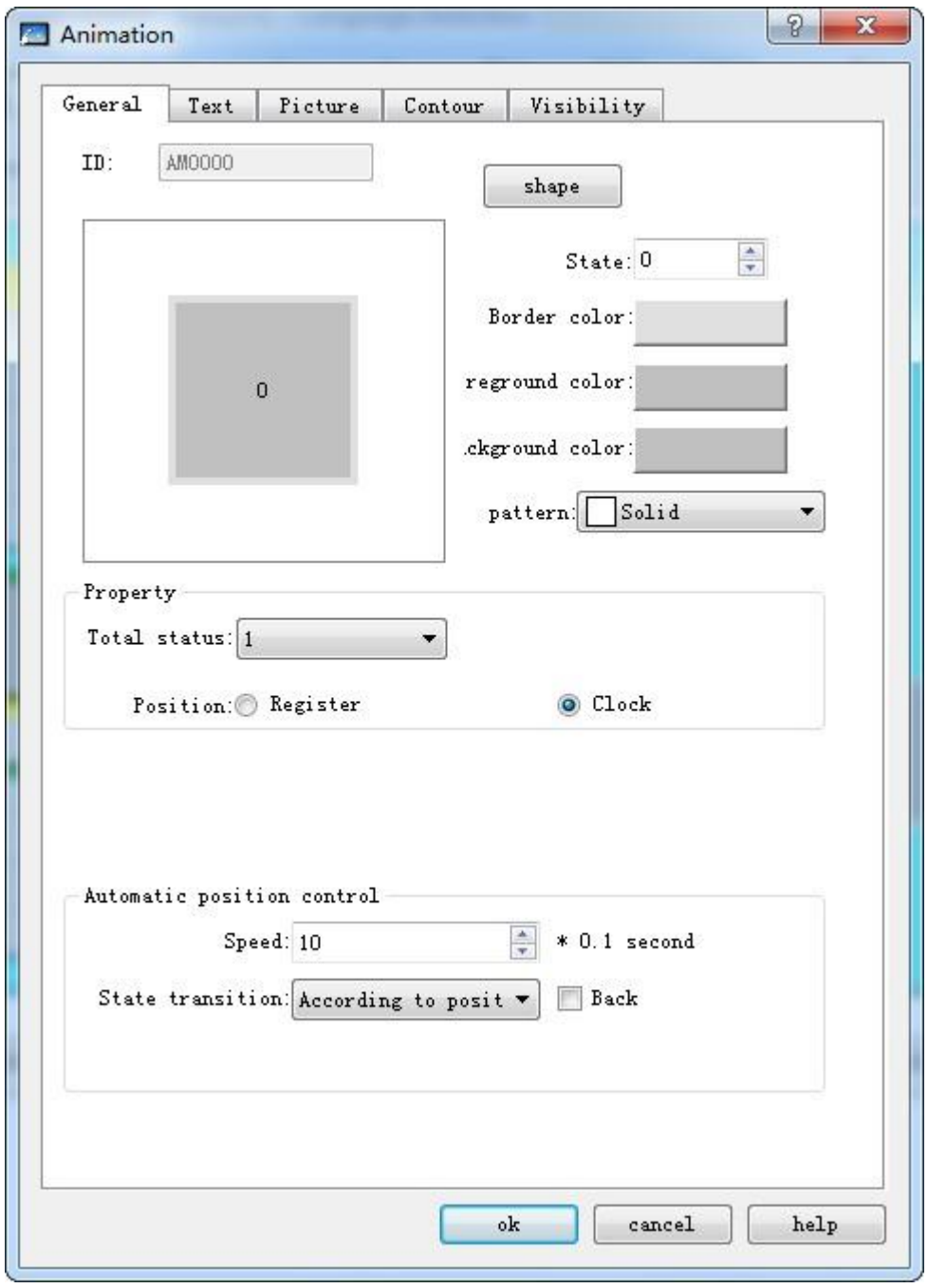
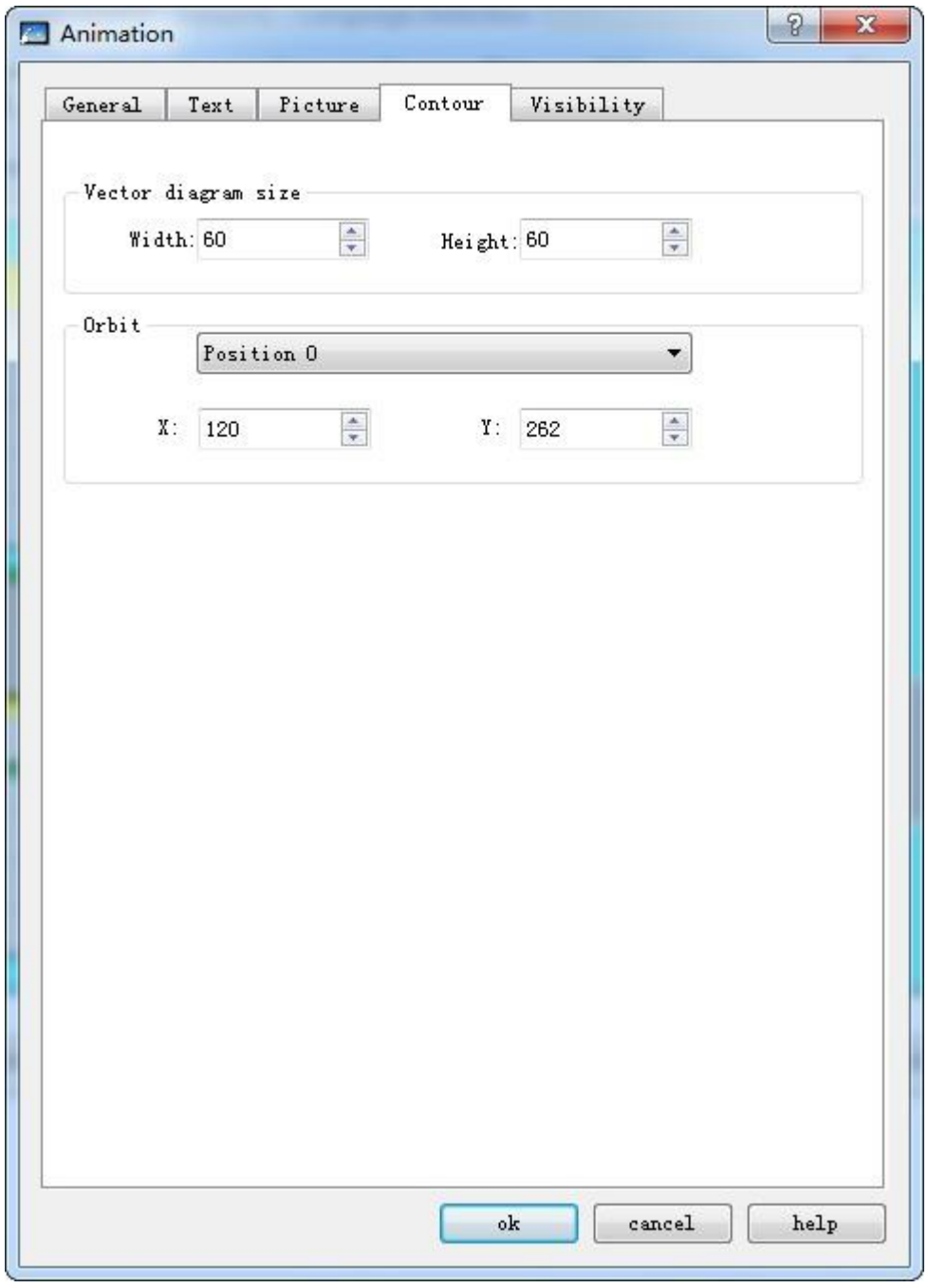


Figure 4-120 Auto control position

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.

6.6.7 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 4-121.

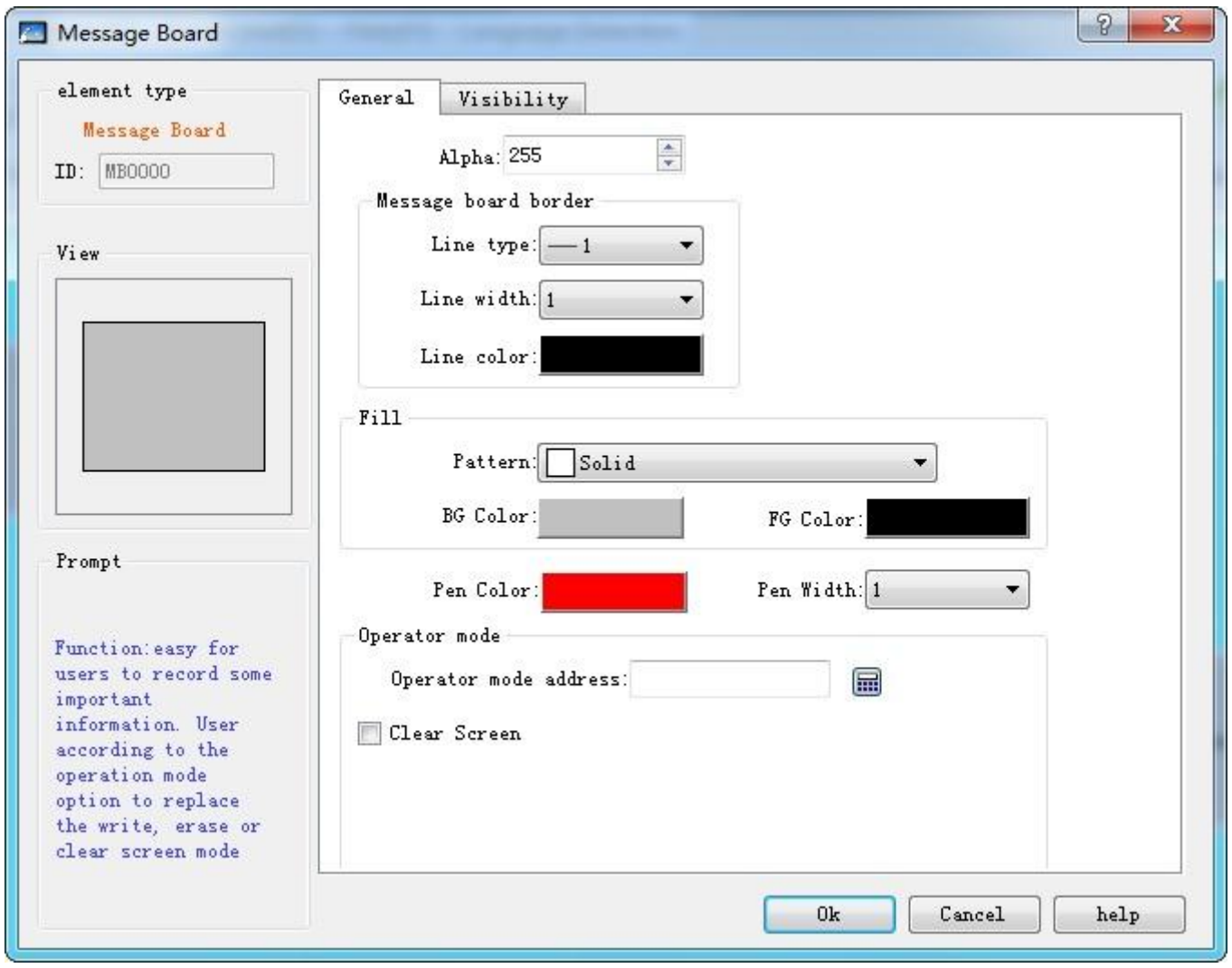


Figure 4-121 Message Board General Page dialog box

- 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.

6.6.8 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 fro 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 4-122:

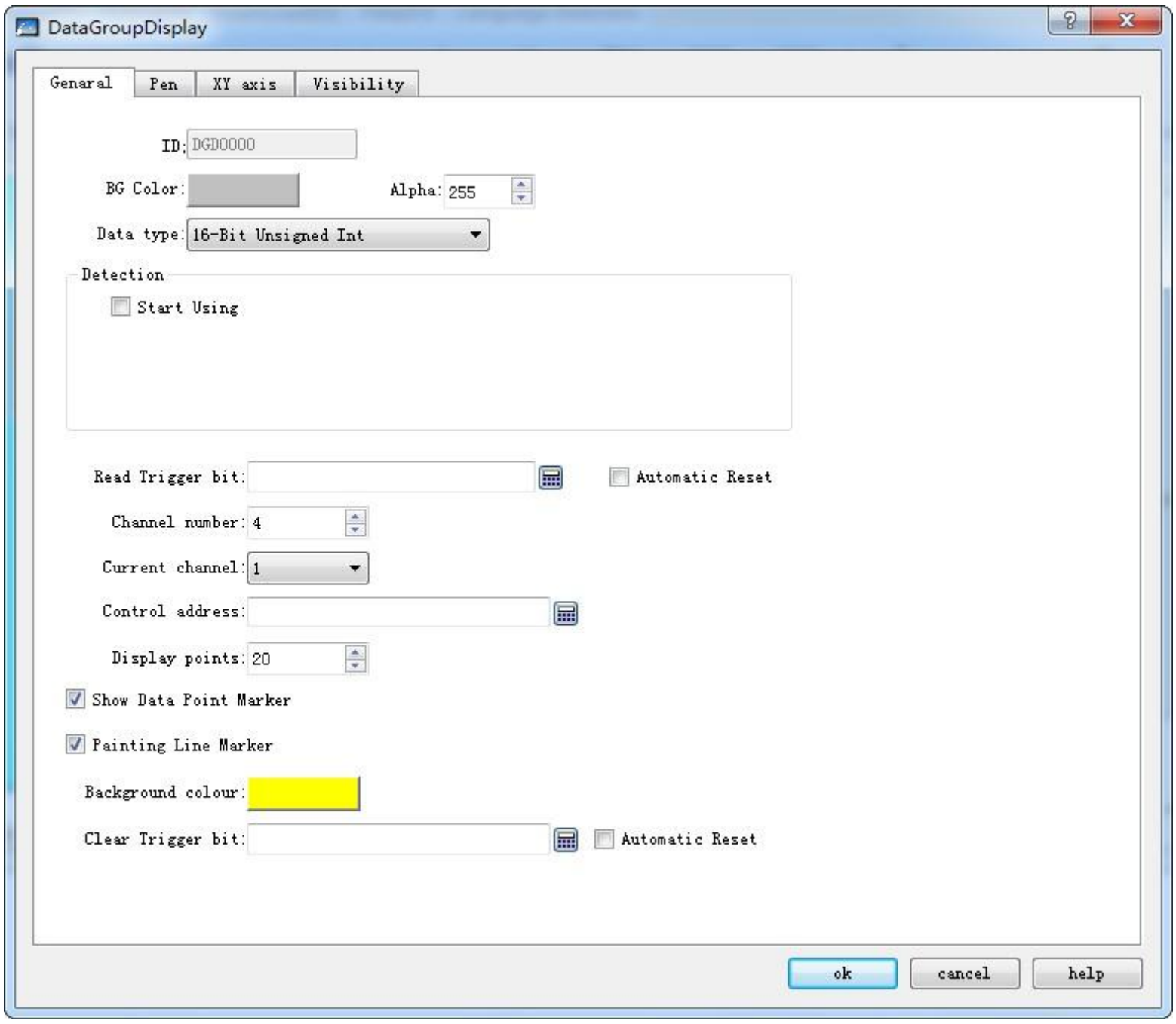


Figure 4-122 Data Group Display General dialog box

- 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.



Tips:

Refer to “Bit button” for the application of “Visibility” page.

6.6.9 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 4-123 will pop up.

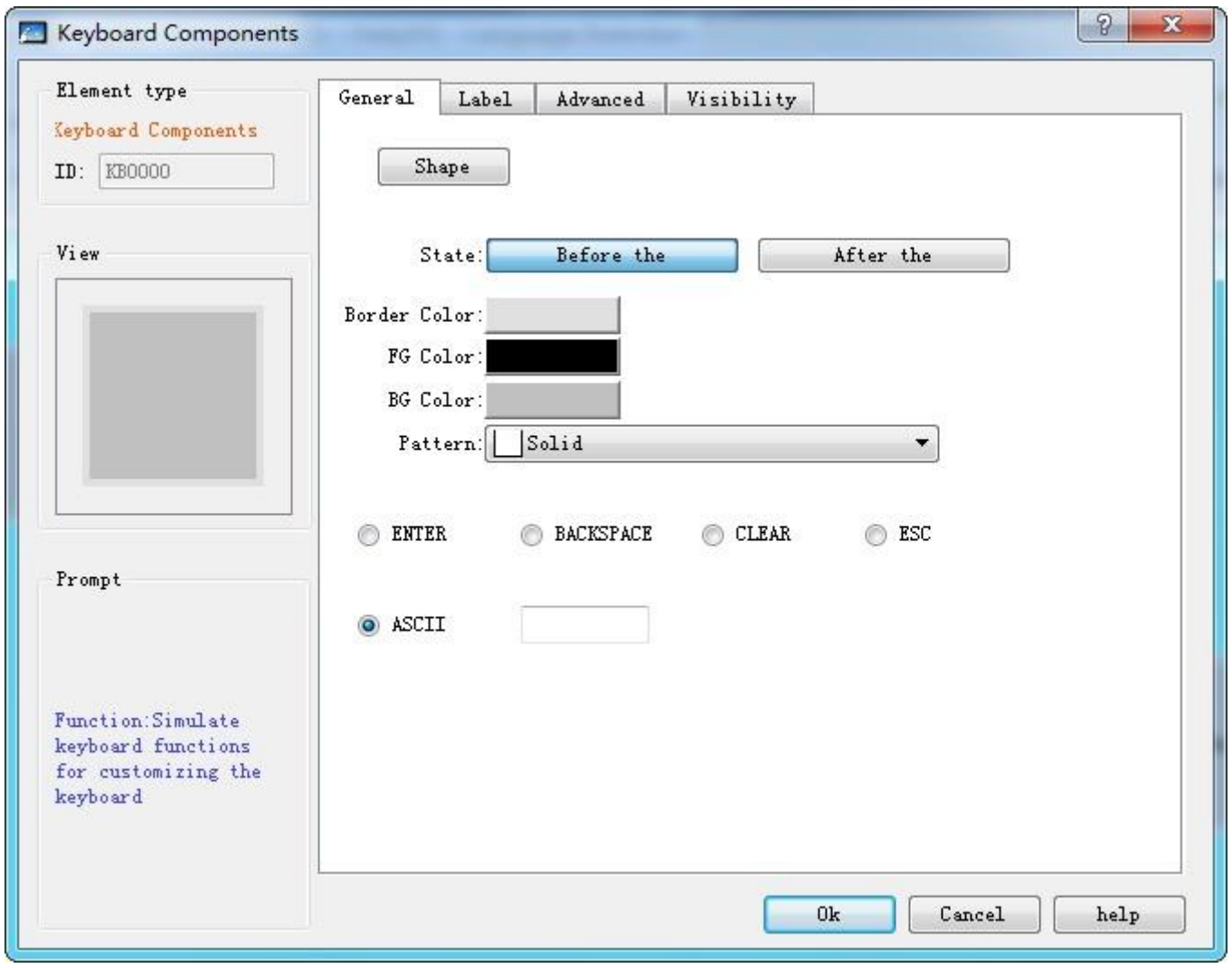


Figure 4-123 Keyboard General Page dialog box

- 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:



Figure 4-124 Page 1 of user-defined keyboard guide

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:



Figure 4-125 Page 2 of user-defined keyboard guide

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 4-126

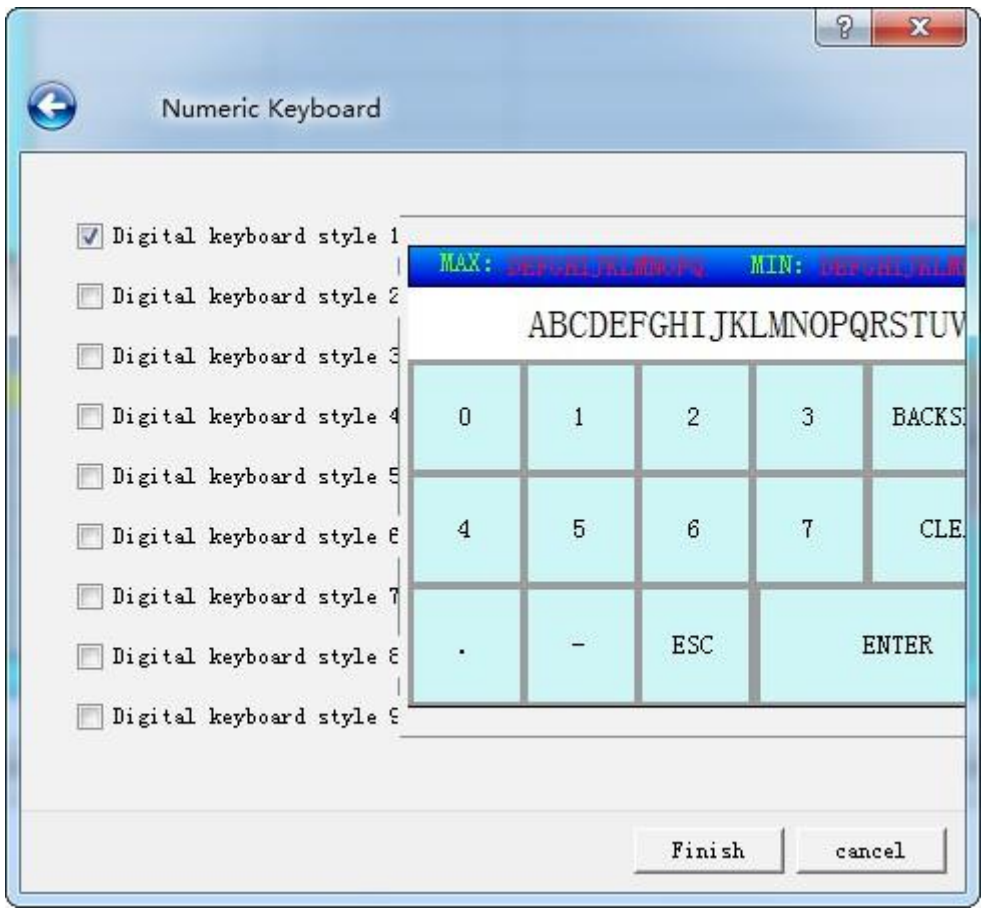


Figure 4-126 Page 3 of user-defined keyboard guide

Click OK to add the selected keyboard to the project.

6.6.10 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:

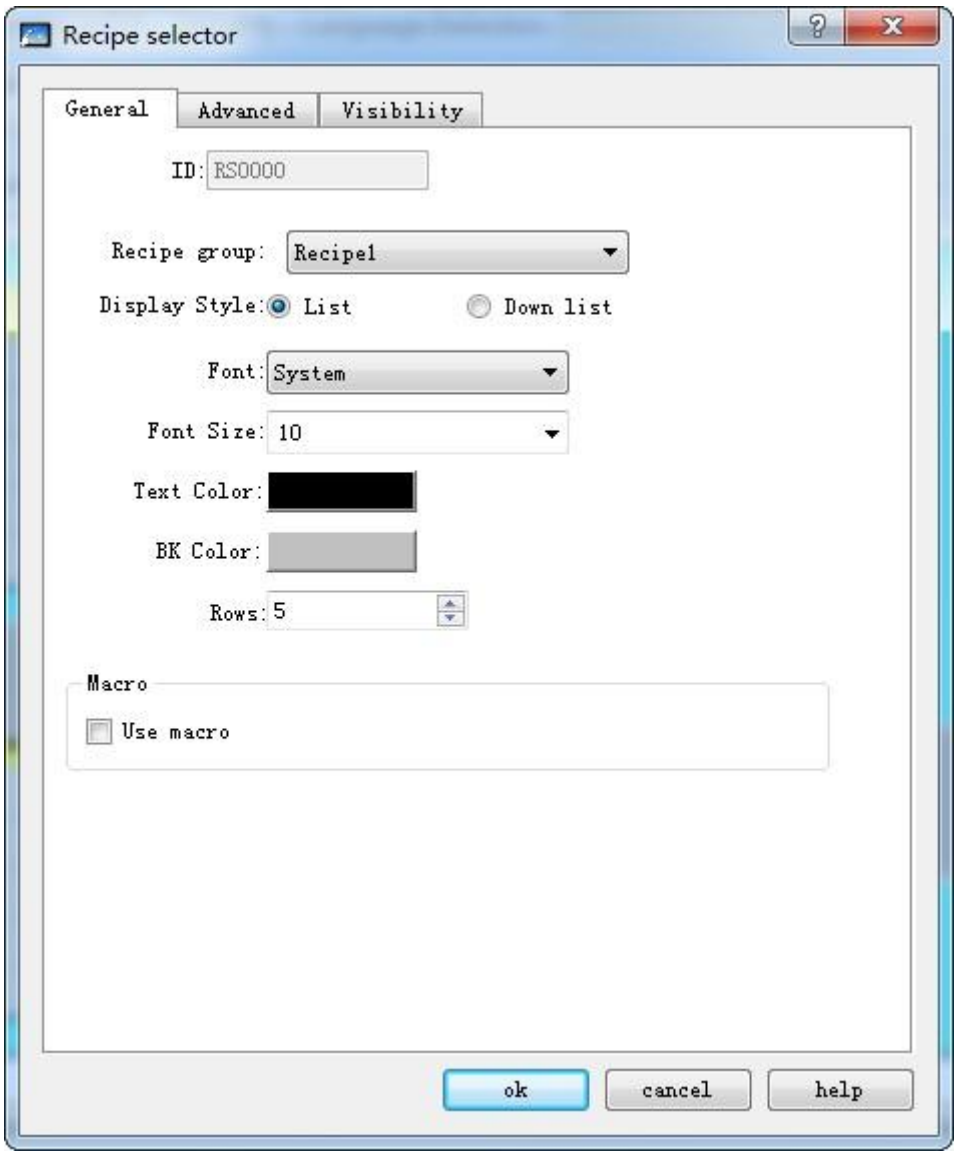


Figure 4-127 Recipe Selector dialog box

- 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.

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

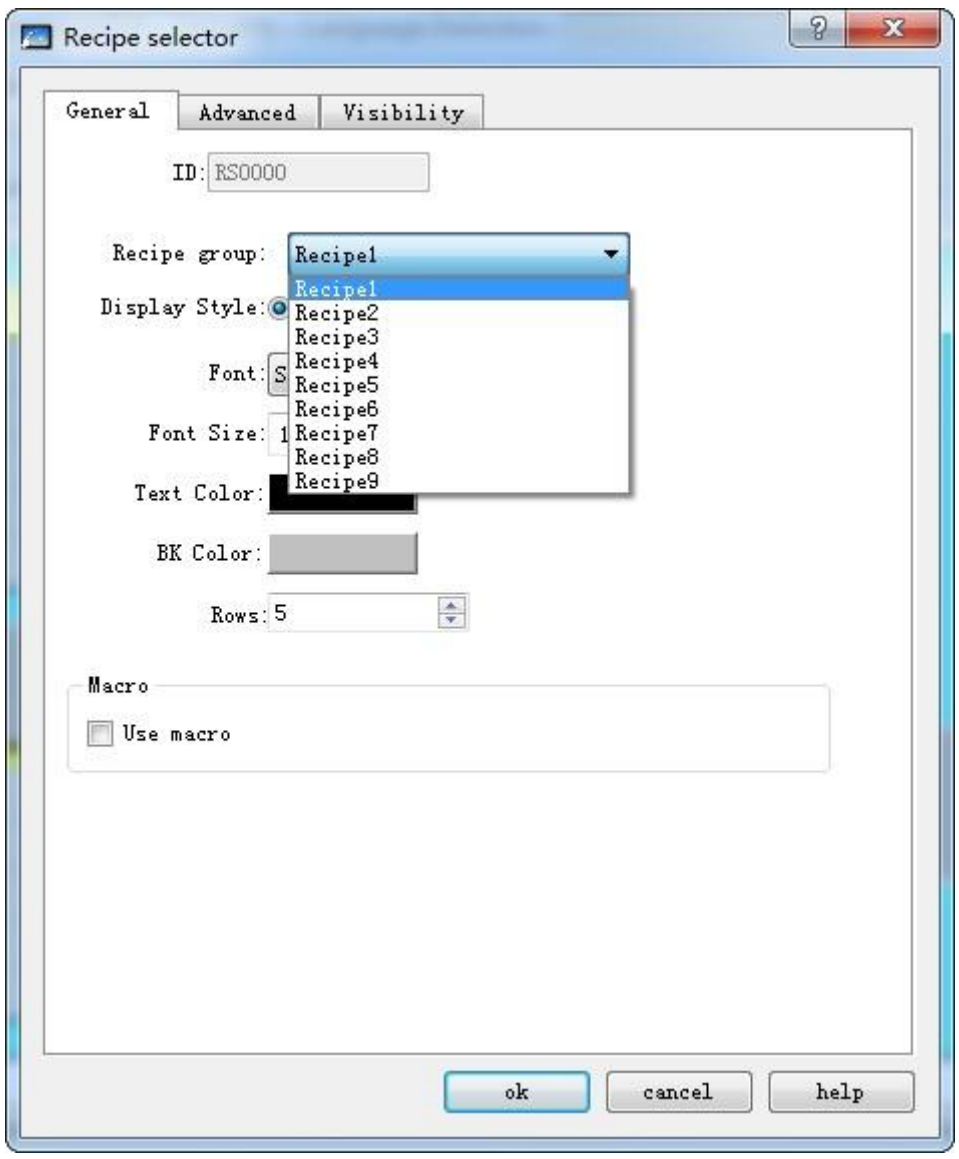


Figure 4-128 Select the Recipe displayed

6.6.11 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:

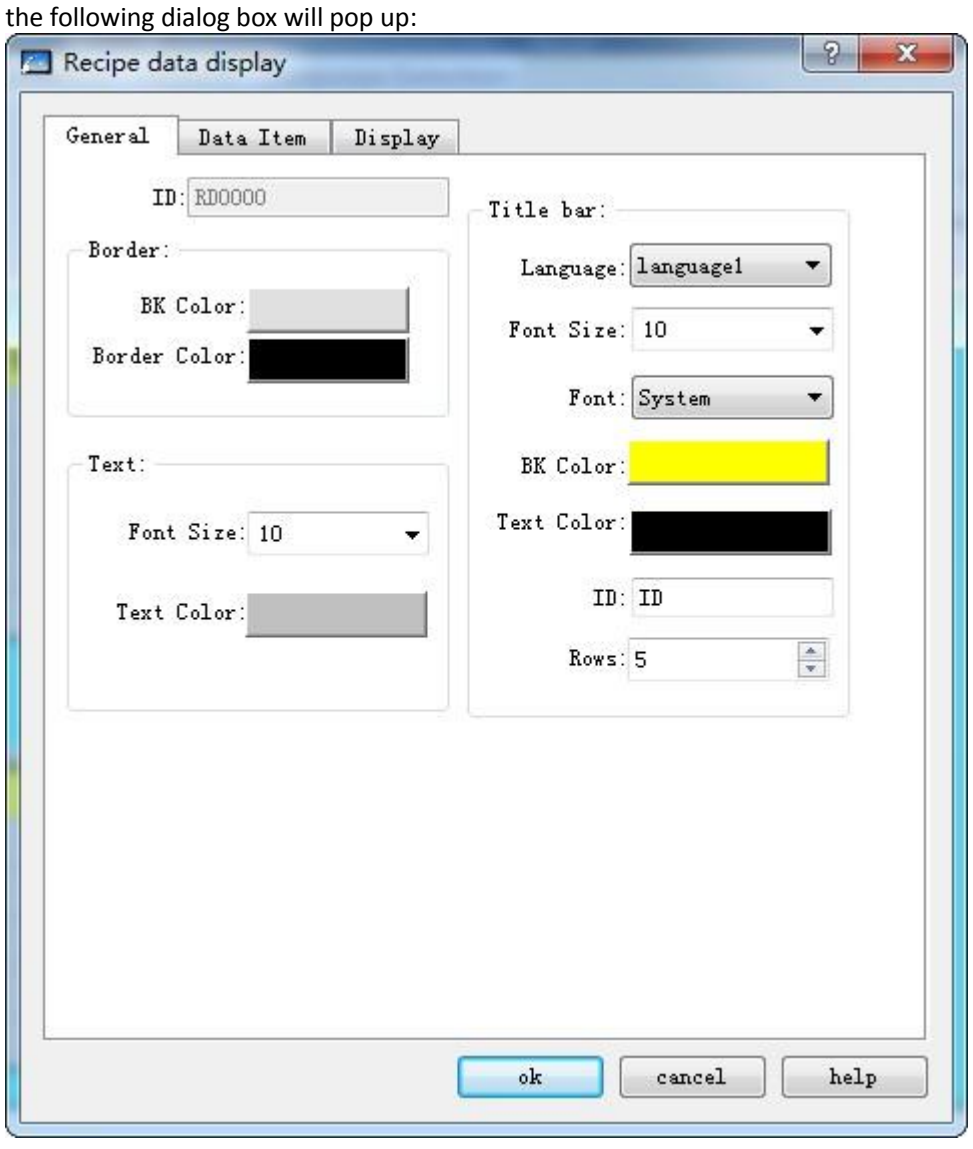


Figure 4-129 Recipe Display General page

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

Data Item page, as shown below

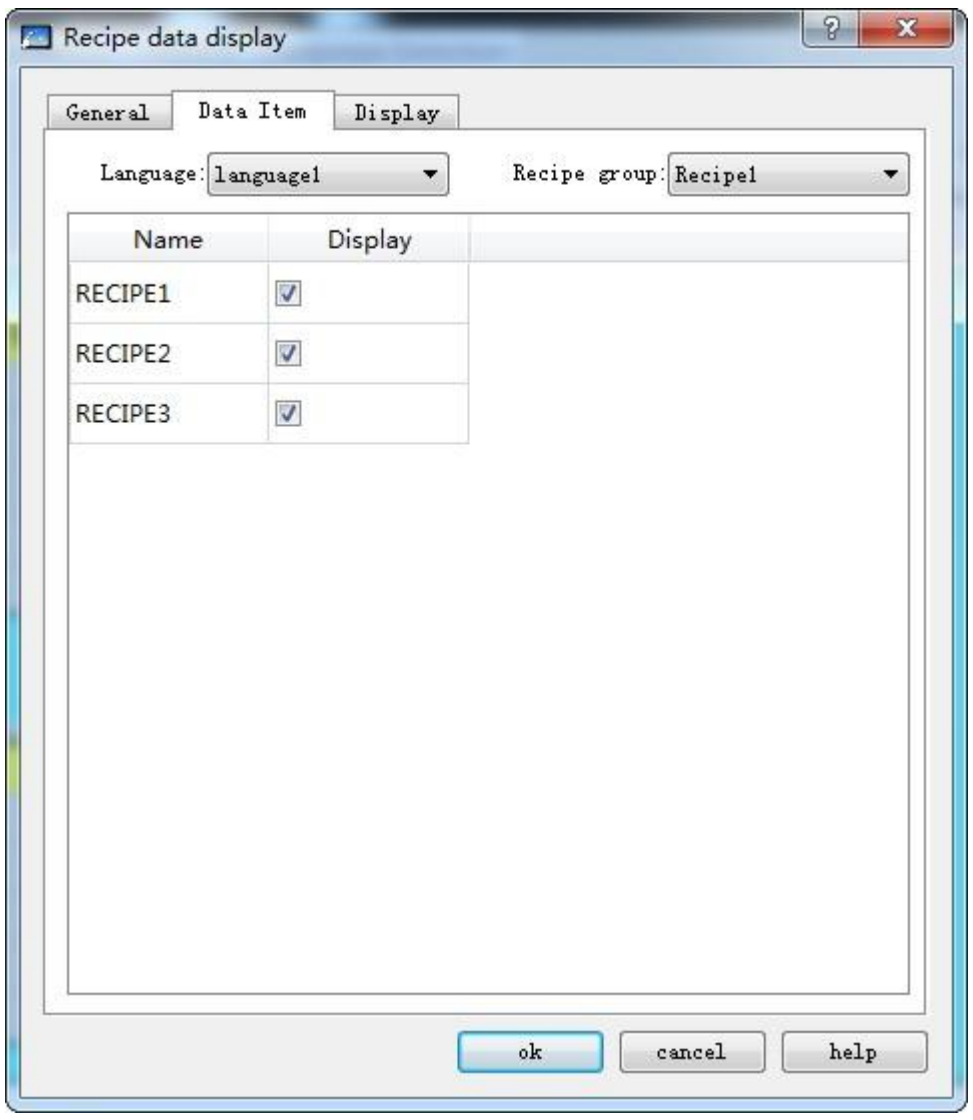


Figure 4-130 Recipe Display Data page

- 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.

SKTOOL adds the function of multiple groups of recipe; developers can choose which recipe to display while use this control, as shown below:

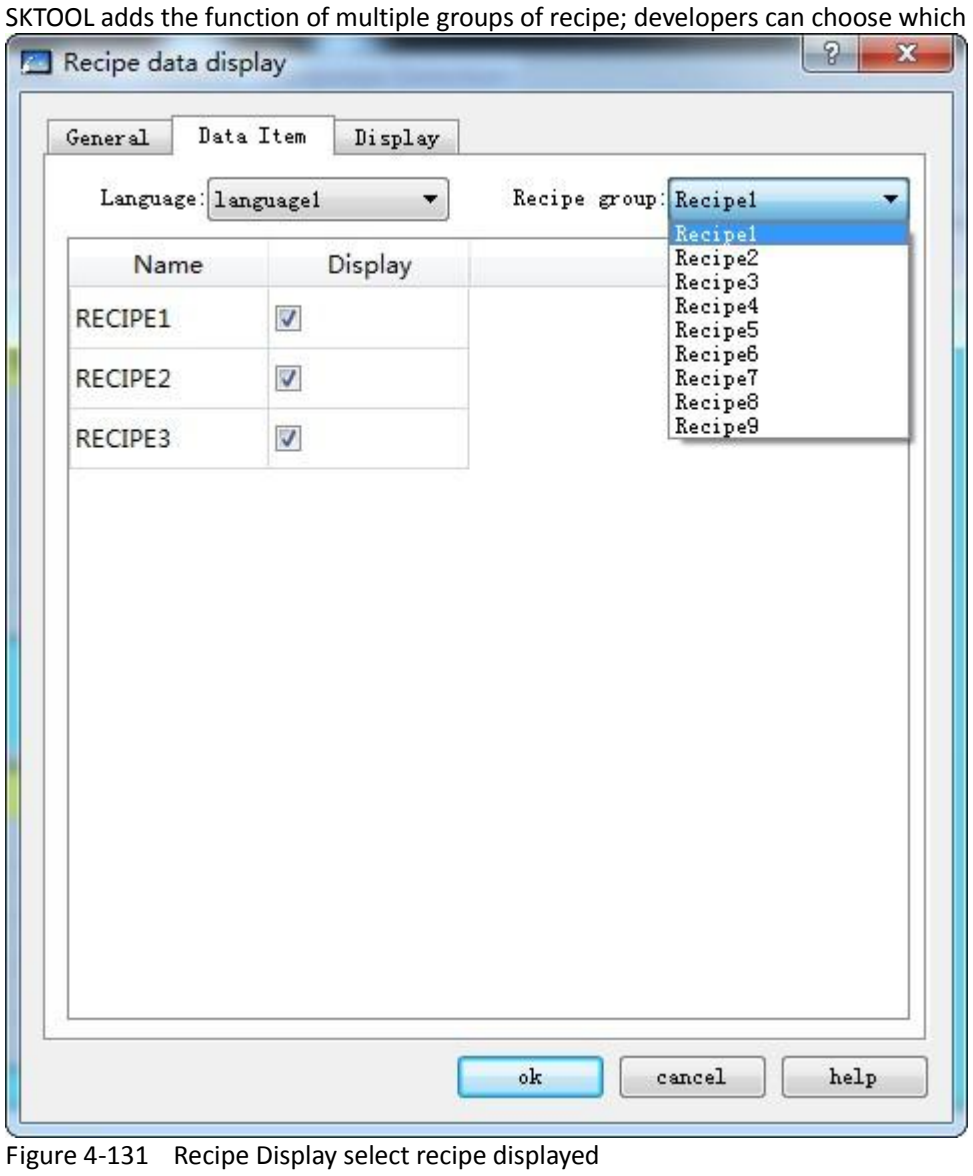


Figure 4-131 Recipe Display select recipe displayed

6.6.12 Qrcode

Select the control icon  on the toolbar and set its properties in the dialog box shown below:

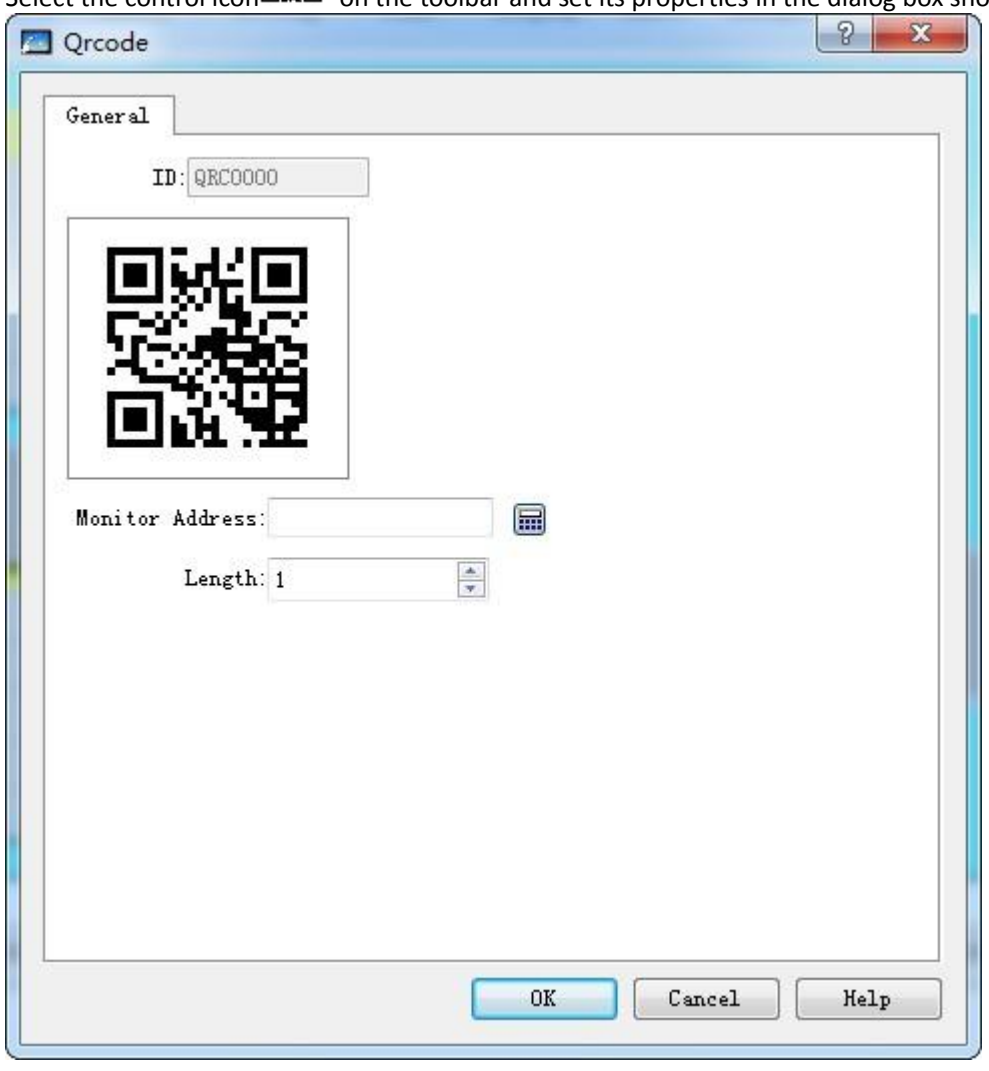


Figure 4-132 Qrcode dialog box

- Monitor Address: Address to monitor through Qrcode
- Length: The maximum length of the character that can be displayed

6.6.13 Operation Log

Select the control icon  on the toolbar and set its properties in the dialog box shown below:

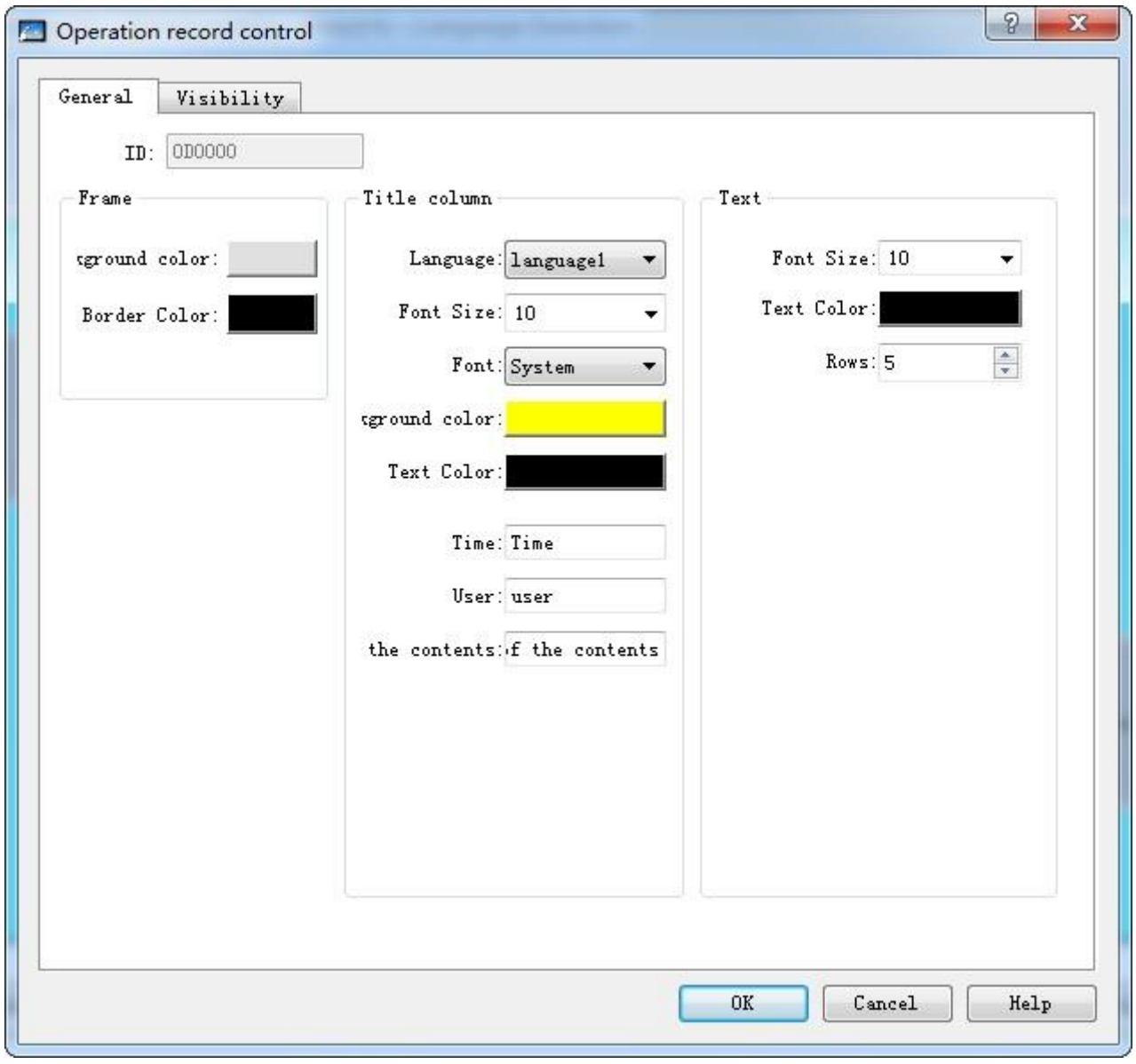


Figure 4-133 Operation Log General dialog box

- 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

Tips:

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.

6.7 SKTOOL Control Instructions

SKTOOL 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.

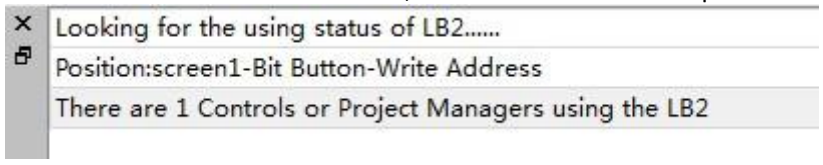


When a control of the above type is selected, its current state is displayed in the status combo box that users can pull down to change the current state.

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.

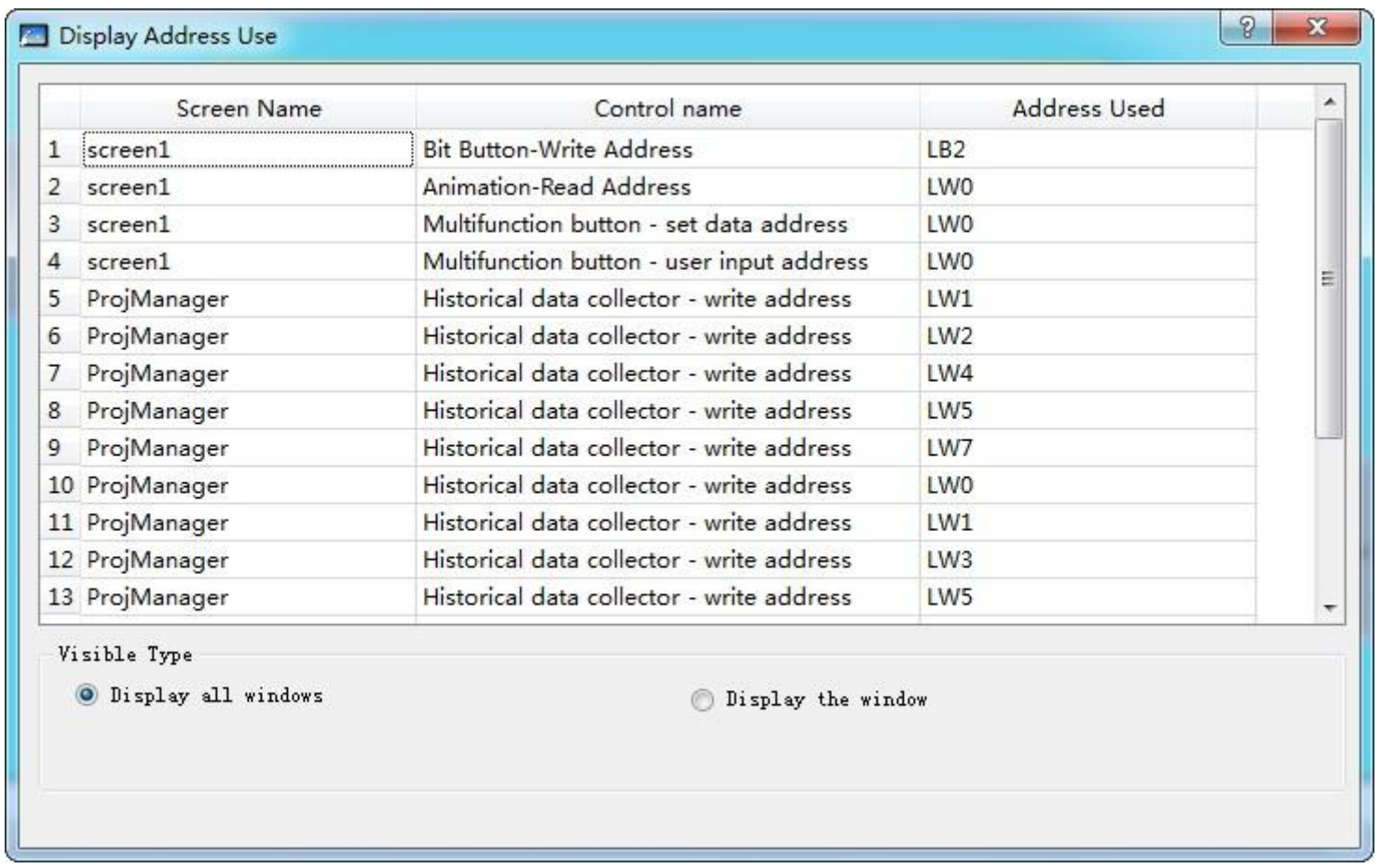


Enter the address and select "Find", then the information output window will list the search results:



Choose the search result and double-click to select the control occupying the address currently.

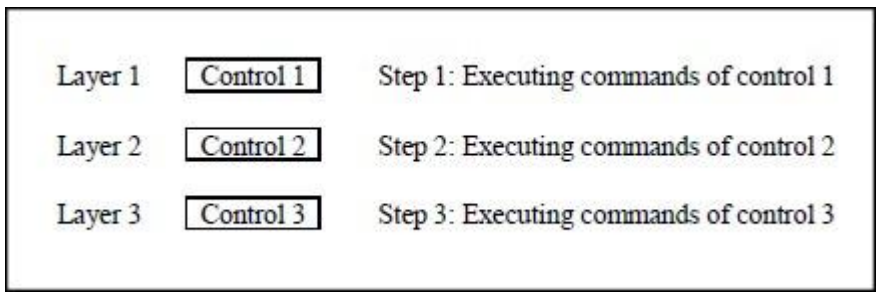
Address Display: Click the "Address Display" to show the list of addresses used by the configuration project; double-click a message, then it will pop up the property page of control using this address so as to set the property settings easily and quickly.



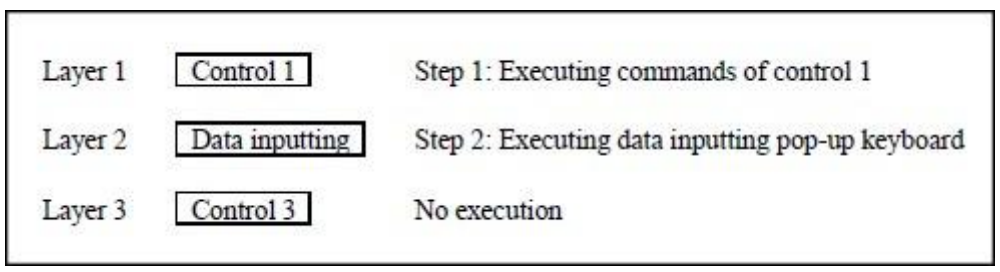
In the Display Mode, you can specify the selected address information or display all the screens.

Overlay of control: You can execute multiple controls by one operation through stacking controls. SKTOOL 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.



7. Macro

Macro is an advanced control method for touch screen, which provides more strong functions for touch screen. Through programming for macro command, the touch screen 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.

SKTOOL provides new full macros that are different from the script language mode of other human-computer interfaces, and these macros 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 macroinstruction and considerations.

Contents：

- Introduction to C language
- C language programming preliminary
- Macro function introduction

7.1 Introduction to C language

- Data type of C language
- Initial value of variable and type conversion
- One-dimensional array
- Basic operator and expression
- Section summary

7.1.1 Data type of C language

1. 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.

2. 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 ox. 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.

4. 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.

3. 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:

   (1) The type specifier of unsigned int is unsigned int or unsigned. (2) The type specifier of unsigned short int is unsigned short.

   (3) 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 can not 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	■■■■
Short int	-2147483648~2147483647	■■■■
Signed int	-2147483648~2147483647	■■■■
Unsigned int	0~4294967295	■■■■
Long int	-922337203685477808~922337203685477807	■■■■■■■■
Unsigned long	0~18446744073709551615	■■■■■■■■

4. 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:

1. 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.

2. The last variable name must be ended with ";".

3. 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

1. 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.

2. 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 [redacted]

b [redacted]

a<---33333.33333

b<---33333.33333333333;

[Practice] //float int 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:

1. Character constant must be included in single quote rather than double quotes or other brackets.

2. Character constant must be single character rather than character string.

3. 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:

1. Character constant is included in single quotes while character string constant is included in double quotes.

2. Character constant is single character only while character string constant contains one or several characters.

3. A character can be given to a character variable, but a character string constant can not. In the C language, there is no corresponding character string variable.

4. 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 can not be changed in the overall action scope. That is to say, assignment statement is forbidden to re-assign in the program.

7.1.2 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:

1. If the data types involved in operation are different, first convert them into one type, then make operation.

2. 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.

3. All float operations are double. Even the expression contains float only, it must be converted to double for operation.

4. Char and short must be converted into int for operation.

5. 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:

1. 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.

2. 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.

7.1.3 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:

1. 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.

2. The writing rules for array name should conform to that of identifier.

3. The array name should not be same with other variable name. For example: void main ()

{

int a;

float a[10];

……

} is incorrect

4. 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].

5. The square bracket can not 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];
……
}
```

6. 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:

1. 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.

2. 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.

3. If the initial value assignment is unavailable for all arrays with initialization, all elements will be 0.

4. 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.

7.1.4 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.

10. **Special operator**

    It includes bracket (), subscript [] etc.

7.1.5 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 formula 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

1. 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.
2. Array may be one-dimensional, two-dimensional or multi-dimensional.
3. 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.
4. Make array assignment with three methods: initialization assignment, dynamic assignment by inputting function and assignment statement. The numerical array can not be overall assigned, input or output with assignment statement but assigned for array element one by one with do statement.

7.2 C language programming preliminary

- Statement of C program
- Branch structure program
- switch statement
- Loop structure program
- for statement
- break statement
- continue statement
- Section summary

7.2.1 Statement of C program

The execution part of C program is constituted by statements, and the program function is also realized by execution statement. C statement is classified into five categories:

1. Expression statement
2. Control statement
3. Compound statement
4. Null statement

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:

(1) Conditional judgment statement if statement, switch statement

(2) Looping execution statement

do while statement, while statement, for statement

(3) 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:

1. 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 actually;

   d=e; c=d; b=c; a=b;

2. 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.

3. 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.

4. 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 can not.

   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 can not be used in expression.

7.2.2 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:

1. 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.

2. 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.

3. 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.

1. 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.

2. 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.

3. 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:

(1) 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.

(2) In if statement, the conditional judgment expression must be included in bracket, and ended with semicolon.

(3) 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;
}
```

4. 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:

1. 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.
2. Conditional operator ? and : is a pair of operator, which can not be separated in application.
3. The associative direction of conditional operator is from right to left.

7.2.3 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:

1. All constant expression values behind case must be different, otherwise there will be mistake.
2. Several statements are allowed behind case, and they can not be bracketed with {}.
3. The sequence of case and default clauses may be changed and will not affect the program execution.
4. Default clause may be omitted

7.2.4 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:

1. 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.
2. If the loop body contains one or more statements, it must be bracketed with {} to form the compound statement.
3. 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:

1. 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.
2. do-while statement may be composed to the nested loop and nested with while statement mutually.
3. The loop body between do and while is made up of several statements, and bracketed with {} to form a compound statement.
4. When converting do-while and while statement mutually, pay attention to modify the loop control conditions.

7.2.5 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:

1. 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

2. 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.

3. 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.

7.2.6 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.

7.2.7 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.

7.2.8 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 statements.

(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 can not 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);

7.3 Macro function introduction

- Use macro function to program
- Function button introduction in macro editor
- New create macro
- Insert library function in the program
- Use internal storage area in macro

7.3.1 Use macro function to program

This section will introduce the basic functions of macro and describe the relevant control functions and application method briefly.

There are ways to access macro:

Method 1: select “Setting (S) -> Macro" from the menu as shown in Figure 5-1 (macro menu), and pop up interface as shown in Figure 5-1(macro editor).



Figure 5-1 (Macro Menu)

Method 2: click shortcut button “Macro” as shown in Figure 5-2 (Macro button), and pop up interface as shown in Figure 5-3 (Macro Editor).



Figure 5-2 (Macro Button)

7.3.2 Function button introduction in macro editor

The functional controls are arranged in macro editor window as shown in Figure 5-3 (Macro Editor).



Figure 5-3 (Macro Editor)

<1> Button function description:

1. **New:** new create a macro.

2. **Delete:** delete the selected macro.

3. **Edit:** edit the selected macro (same with double click macro)
4. **Copy:** select one macro and click “copy” to copy the selected macro.
5. **Paste:** paste the copied contents, and the suffix of macro name adds one automatically.
6. **Help:** pop up the macro help.
7. **Quit:** close or exit the current dialog box.

<2> “Compile success” window: for recording all macro names with successful compilation in project as shown in (5-3). Select one and double click to enter into macro edition.

<3>“Unfinished compile” window: for recording all unfinished compile macro name in project as shown in (5-3). Select one and double click to enter into macro edition.

7.3.3 New create macro

Click “new add” button and pop up the dialog box of macro compiler as shown in Figure 5-4 (Macro Compiler)

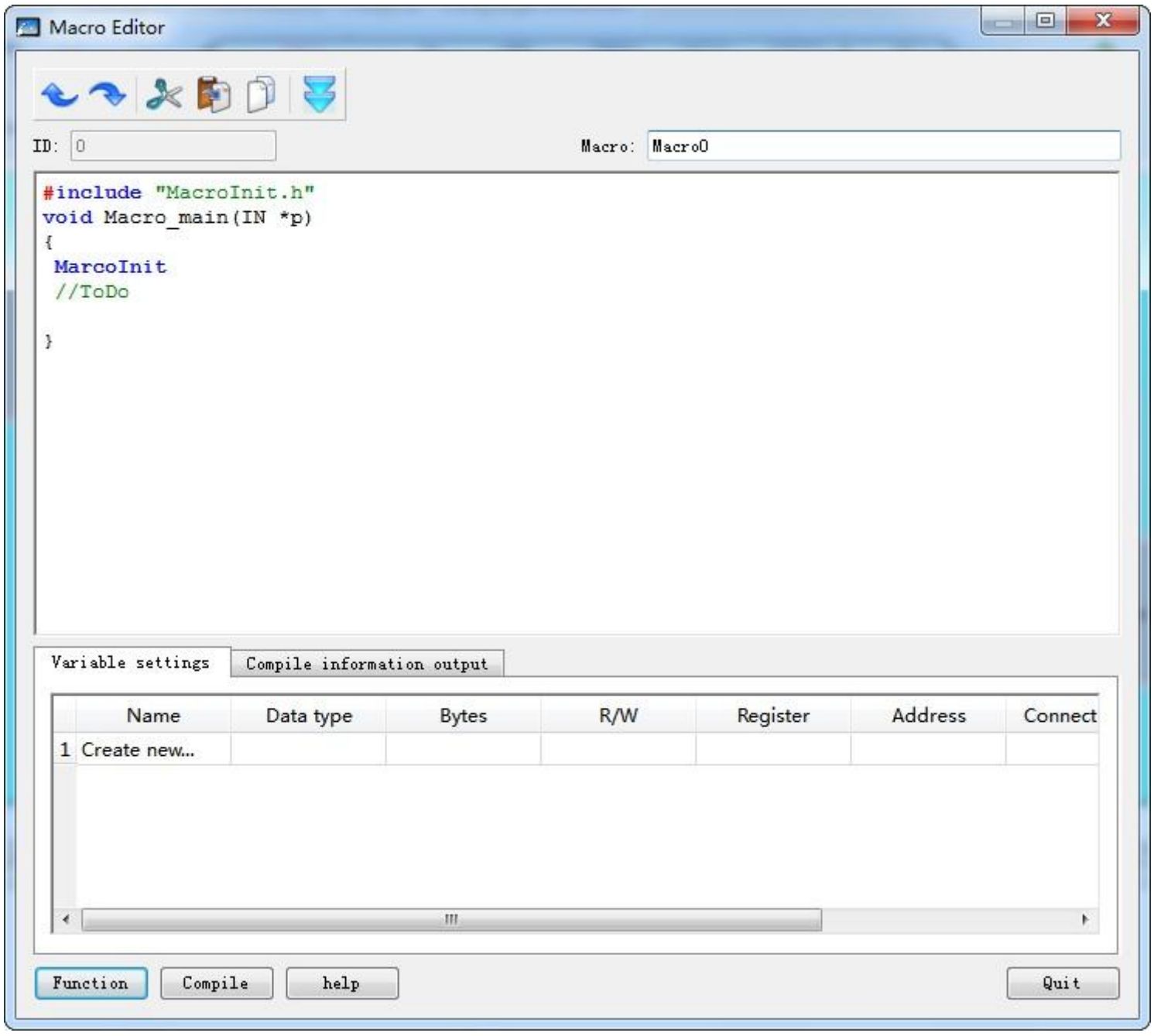


Figure 5-4 (Macro Compiler)

Button Function Description

Compile: Compile the current macro source code, and check the syntax error.

Function: Insert the selected library function at the cursor location in the edition window of source code.

Close: Close the current dialog box.

Description: pop up the help instruction of macro usage.

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: close/open window

In the variable setting, users can right click the edition window of source code, and it will pop up the shortcut as Figure 5-5 (window close/open). Click “close/display variable setting window” and “close/display information output window” to close/open the corresponding window. Users can adjust the edition box size as required.

Instruction 4: variable setting

Variable name: input the variable name required in the program.

Data class: select the corresponding data class of variable name so as to distribute the corresponding memory size. Word length: 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 touch screen.

Address: the defined physical memory address of variable in the touch screen.

Variable setting instruction: when the external requires interaction with touch screen such as data exchange and data acquisition, it provides the interface to change the behavior characteristics of touch screen dynamically.

Special tips: the variables required in the program should be put in the variable definition part (the variable definition starts from code).

7.3.4 Insert library function in the program

Click "function” button and pop up the dialog box as Figure 5-5. Select the corresponding library function in the function name list box, click “confirm” button and the function will be inserted to the cursor location of edition window automatically.

The functions, parameter types and other detailed instruction of library function refer to Appendix 1.

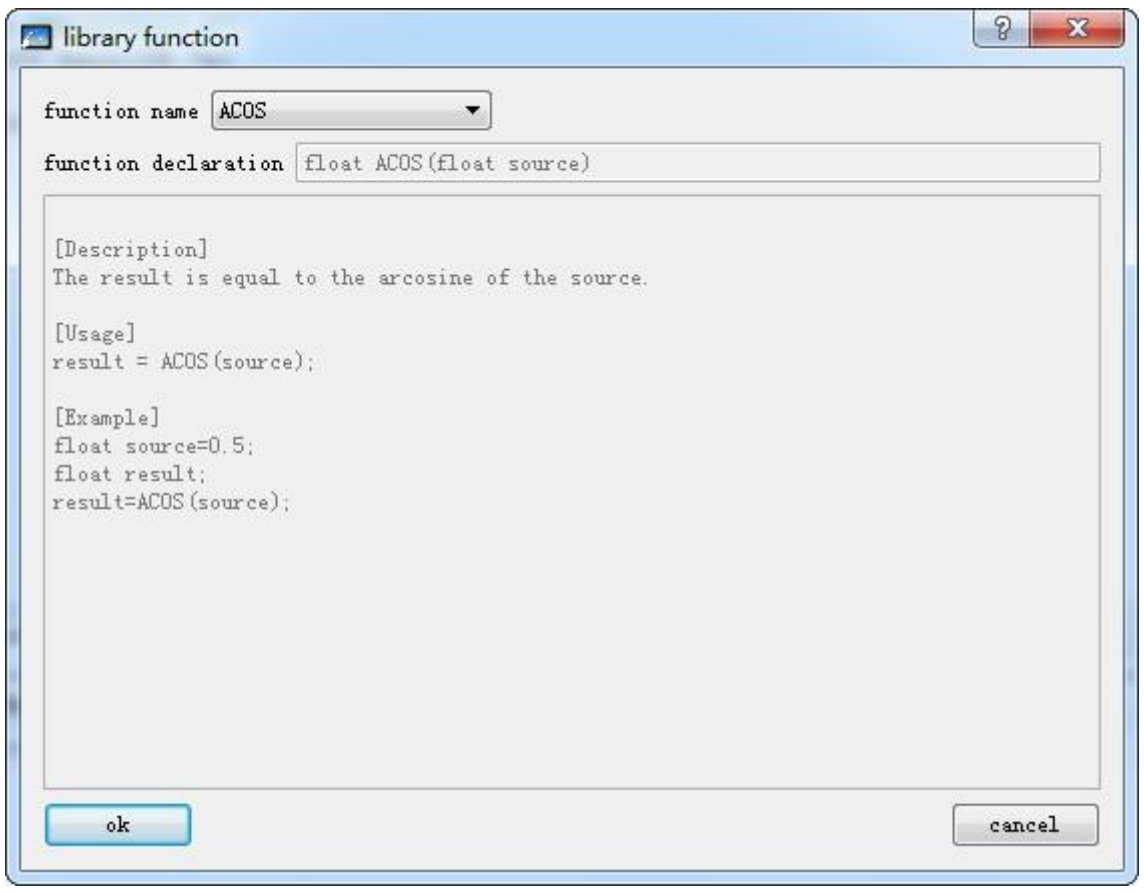


Figure 5-5 (Function Selection)

7.3.5 Use internal storage area in macro

SKTOOL configuration software provides the operation interface for HMI internal storage area. Users can make direct operations for the internal storage area in the macro. 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 macro instance.

7.4 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 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.

7.5 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
```

7.6 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]

result= DEC2ASCII(source,sizeof(source)) ;

[Example]

short source = 5678 ;

char *result ;

result= DEC2ASCII(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'

7.7 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.
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(度);

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;

7.8 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--串口 ID,COM1=0, COM2=1。

操作成功返回 1，失败返回 0。

[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);//延迟 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();

8. Simulation

This chapter mainly introduces usage and steps for offline simulation and online simulation.



“Run SKTOOL as Administrator” is necessary to execute functions of Offline simulation and Online simulation.

8.1 Offline Simulation

You can check the correctness of the configuration project with the off-line simulation provided by SKTOOL before transferring it to the HMI and connecting the HMI to connected devices.

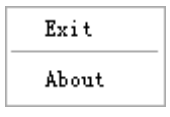
Operation process:

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 6-1:



Figure 6-1 Diagram of SK-070FS offline simulation

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.



You can close offline simulation through taskbar “Right Key”-“Close”.

Offline simulation example

As shown in Figure 6-2, 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.

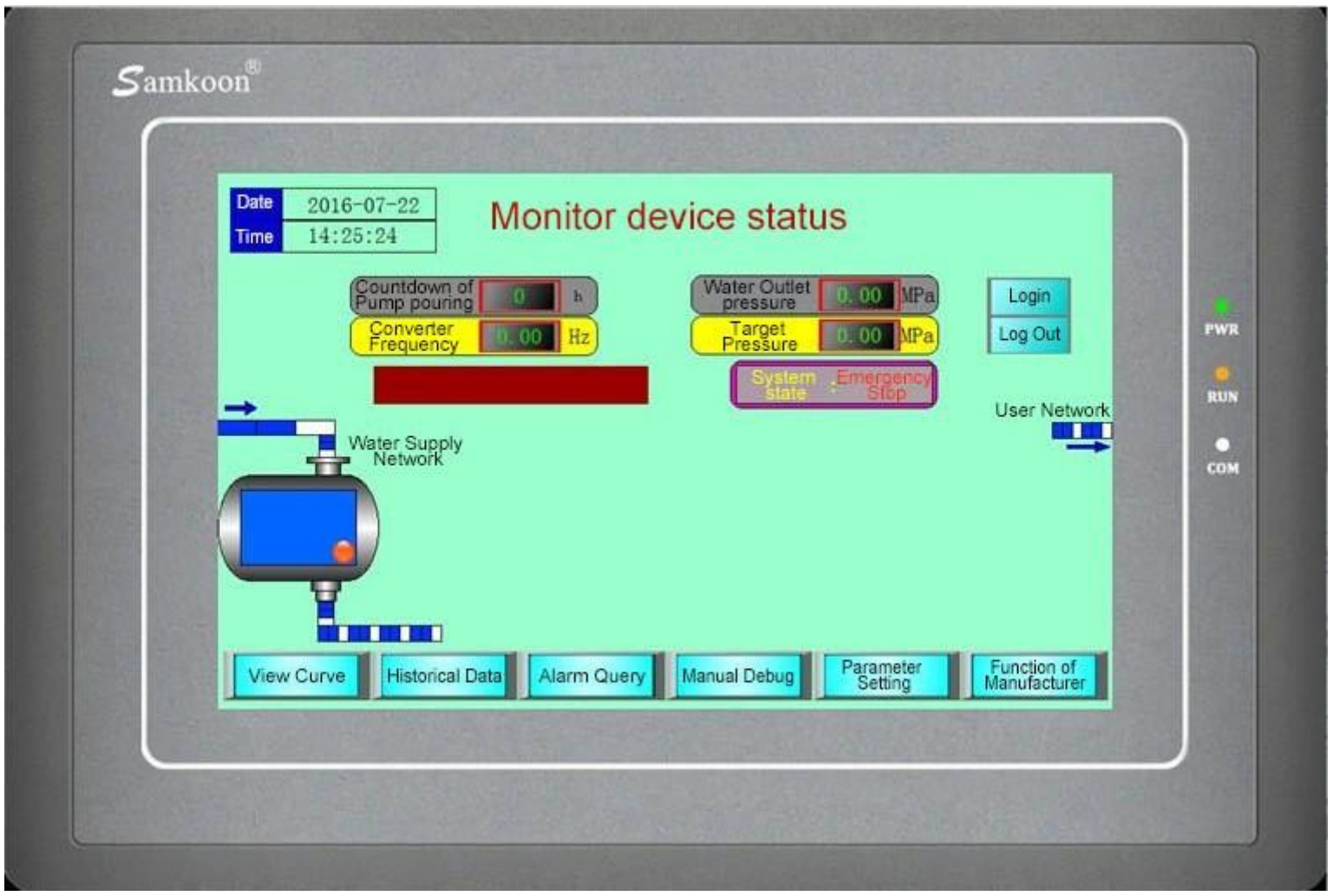


Figure 6-2 Example of SK-070FS offline simulation

Steps to execute offline simulation:

Install SKTOOL Software first;

Run SKTOOL as Administrator.

Tips:

Note: In the offline simulation, only these functions of Function button are available: “Previous formula", "Next formula", "Save current formula", "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 6-3:

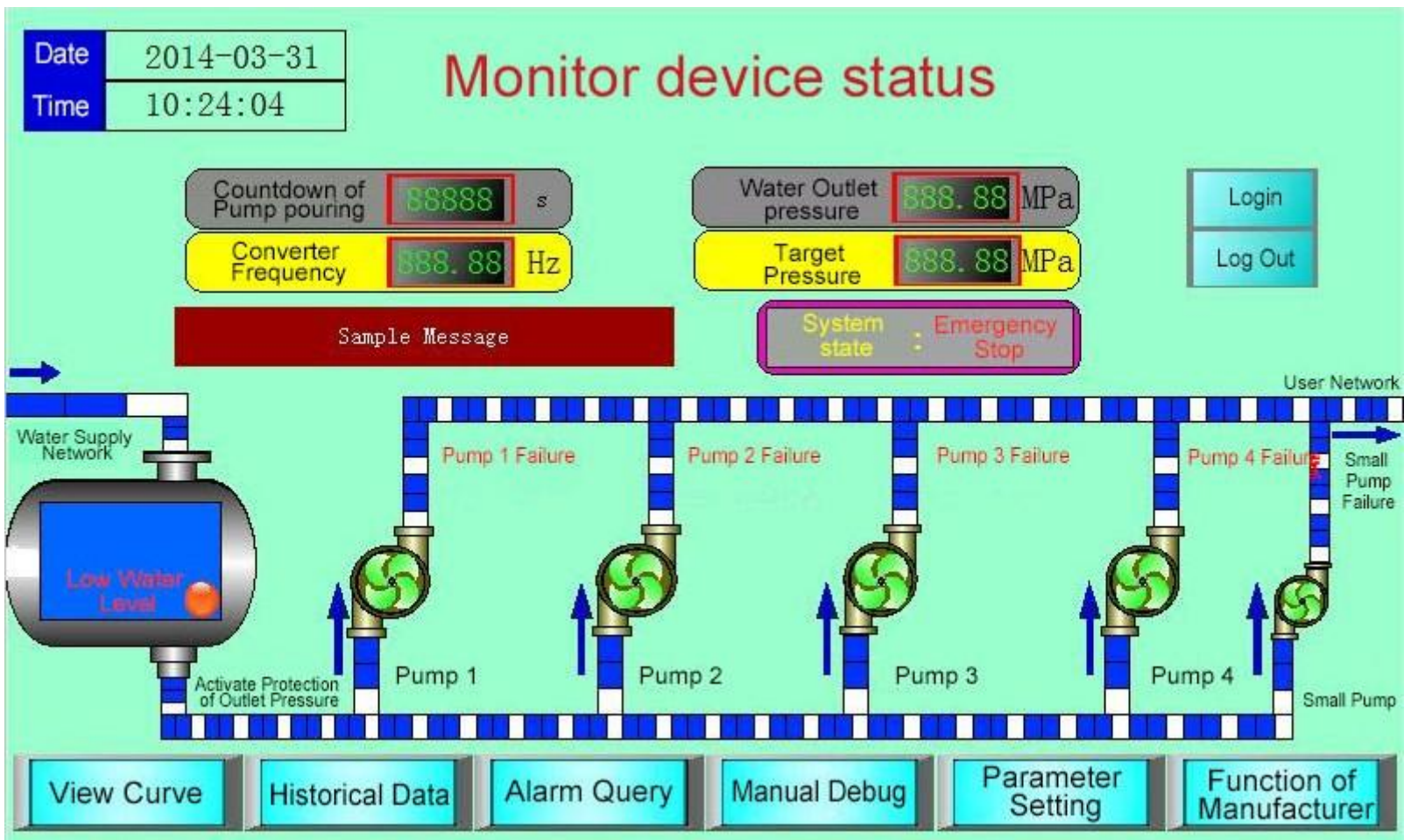
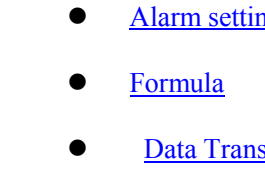


Figure 6-3Offline simulation

8.2 Online Simulation

Online simulation allows communicating between PC and PLC or other related devices without SK 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.

9. System Settings

This chapter introduces setting functions of SKTOOL system. It is necessary to set them up in order to ensure normal running of HMI, including that of PLC.

Contents：

- Communication Port Property
- Setting
- Screen
- Window
- Historical Data Collector
- Alarm settings
- Formula
- Data Transmission
- Global Macro
- Init Macro

9.1 Communication Port Property

Communication port property is applied to set the communication parameters between HMI and connected devices. HMIs like SK-121F，SK-102H，SK-070F，SK-070H are equipped with two communication ports, COM1 and COM2, supporting simultaneous communication with two different PLCs; and parameters of each port must be set. HMIs like SK-050H ,SK-043F ,SK-043H ,SK-035F have one communication port, COM1, and it communicate only with one connected device.

Double click "Link" and " Link 1", as shown in Figure 7-1:

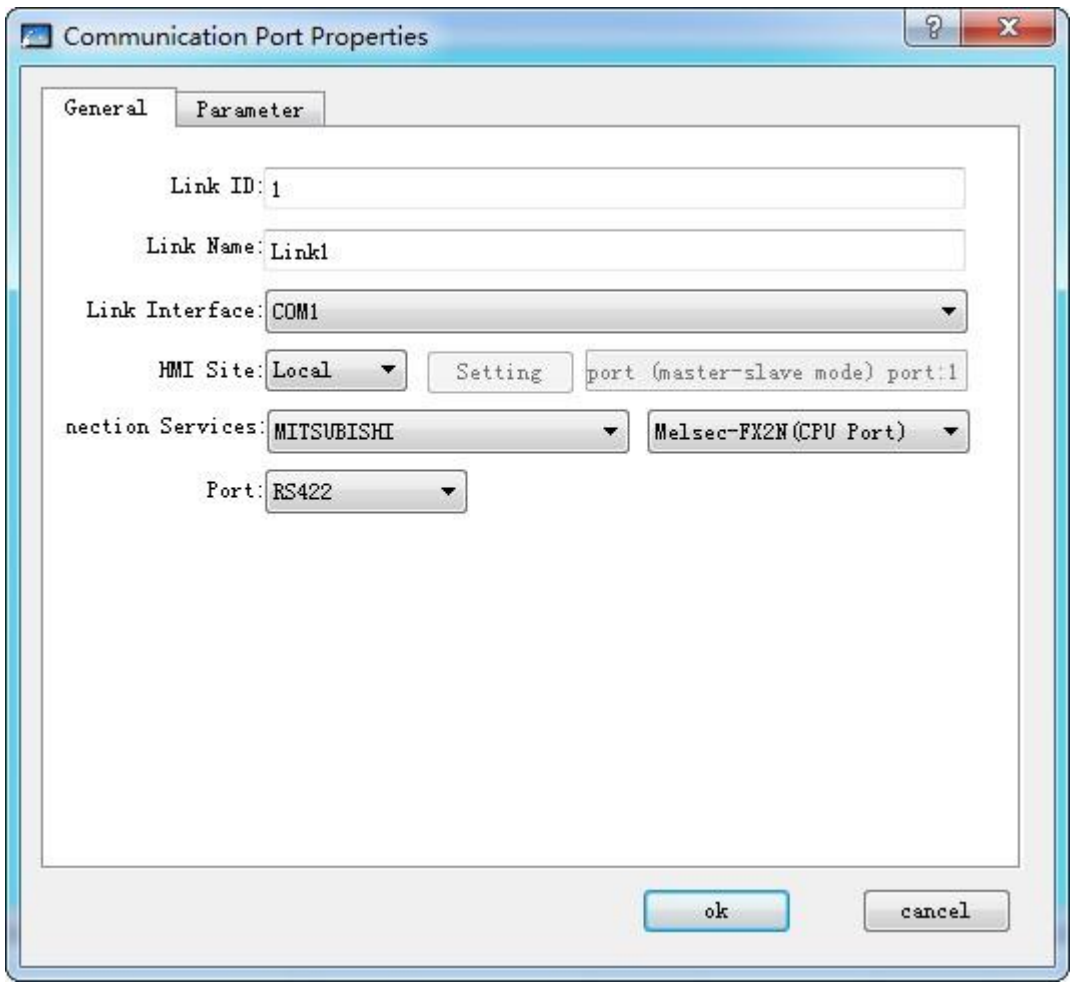


Figure 7-1 COM1 COM port property dialog box

In the "Link" page, various brands and models of PLC are available. In addition, the "Link name" and "PLC consecutive address interval"

Click the Parameter tab of the dialog box, as shown in Figure 7-2:

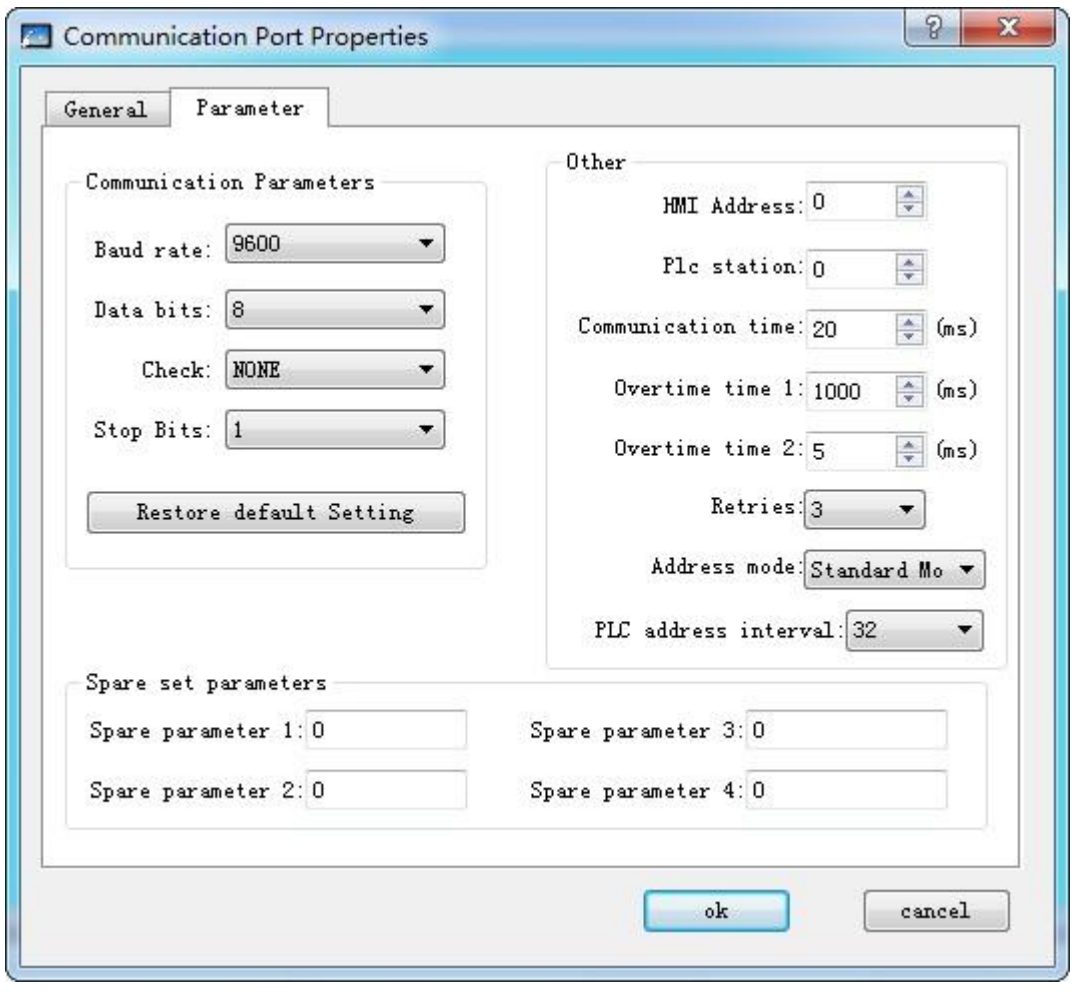


Figure 7-2 COM1 Communication port parameter setting

Parameter settings:

Equipment services: manufacturer, PLC brand and CPU model.

Port: RS232 / 485/ 422

Baud rate: 1200/2400/4800/9600/19200/38400/57600/115200 / 187.5k

Check: Odd / Even / None

Data bits: 7/8

Stop bits: 1/2

Model: PLC model

HMI station number: Set the station number of the HMI

Communication time: HMI sends data to the PLC and receives the data from PLC, and it cannot send data again until after the set communication time.

Overtime time 1 and Overtime time 2: Calculate first the value of Timeout 1 divided by that of Timeout 2, as shown in the figure above: the timeout period is

200ms. There is a situation called timeout if the HMI has not received the data 200ms after sending data.
Number of retries: The number of times that the data is retransmitted after a timeout
Address mode: ① Standard mode: One serial port connects one PLC; ② Extended mode: One serial port connects multiple PLCs of the same type
PLC Continuous Address Interval: The maximum number of words that PLC can read at one time

9.2 Setting

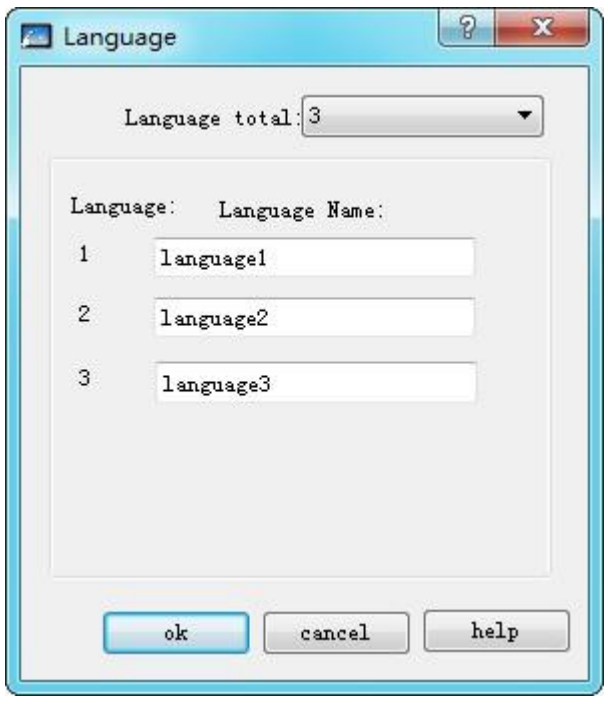
Let's come to some settings of HMI. It is also important for project configuration. We can change HMI system settings in a narrative way to achieve the expected effect of users.

Contents:

- Language
- HMI parameter settings
- HMI State
- PLC Control
- Clock
- File Encryption
- HMI Protection
- Variable Table

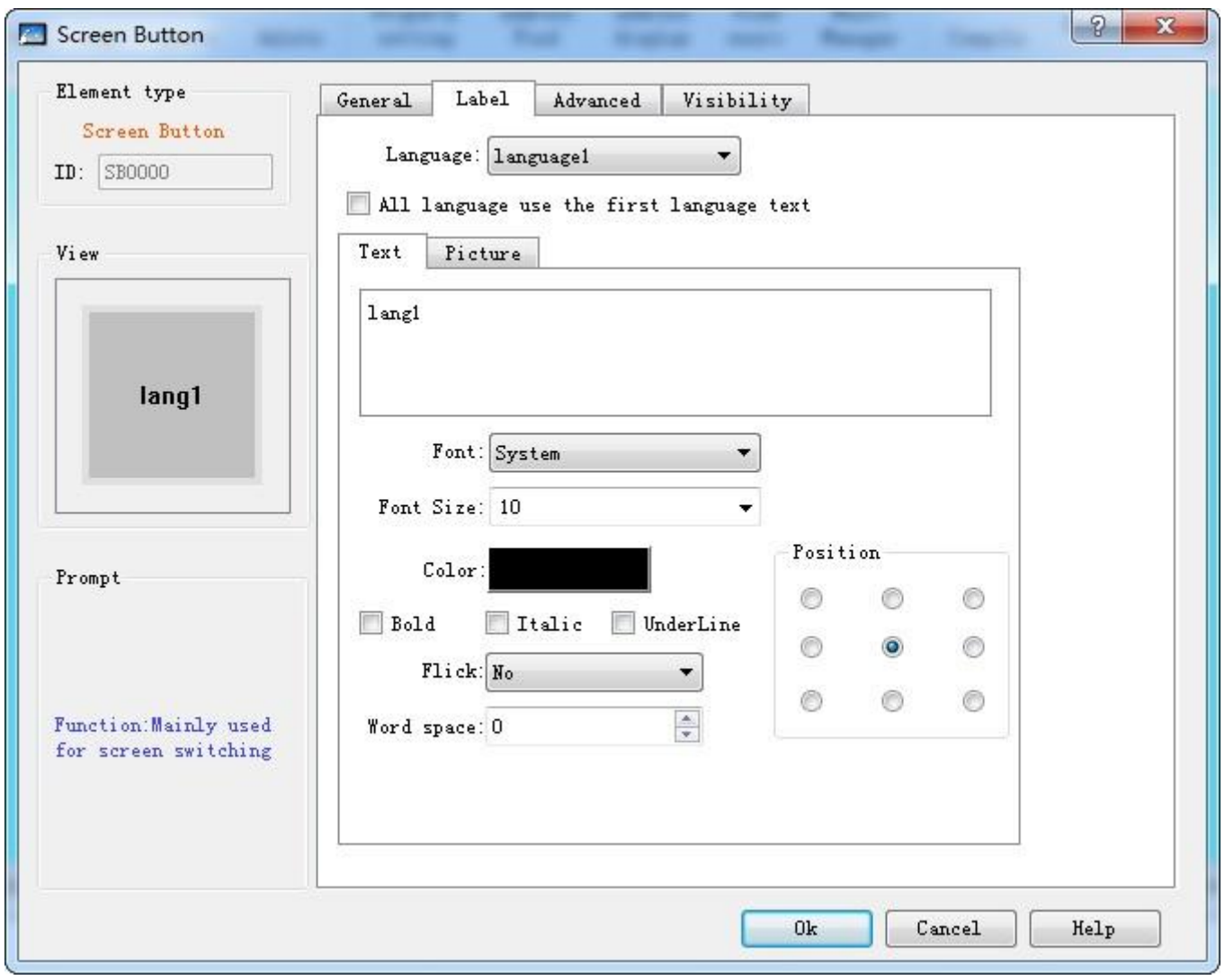
9.2.1 Language

Language: This function realize 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.

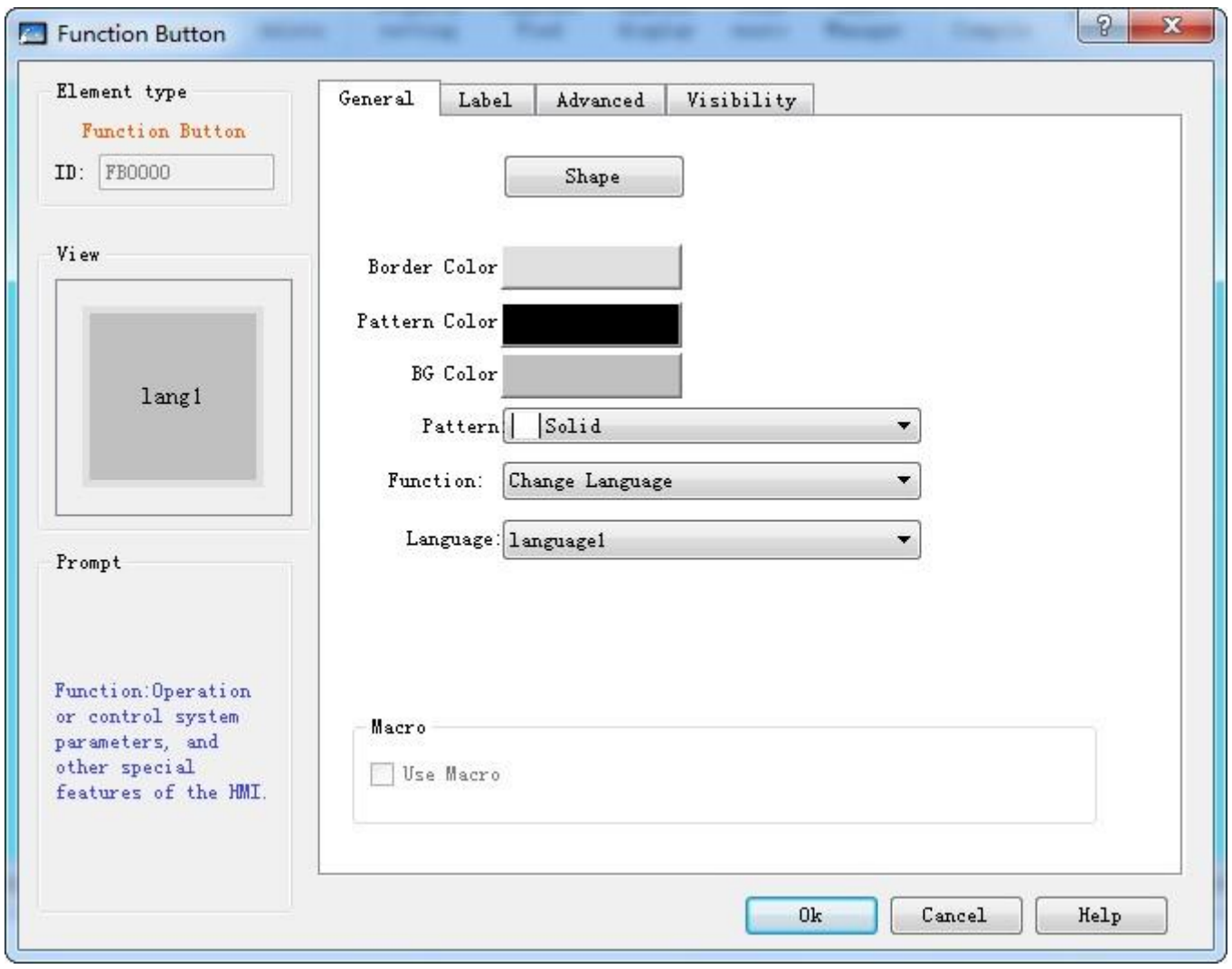


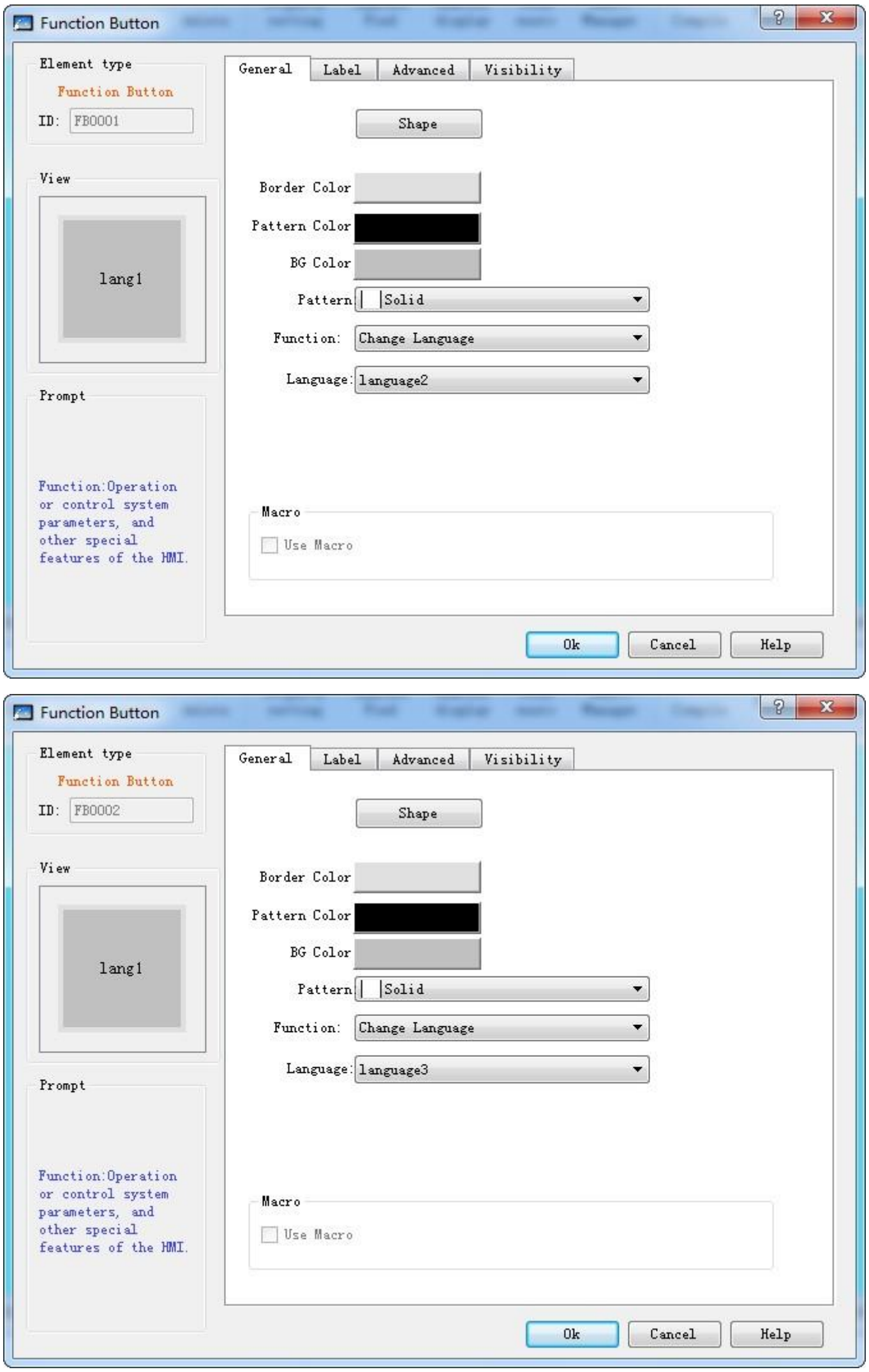
Language total: Set total number of the system language, at most five languages.
Language Name: Set a name for each language.
Example:
1. As shown above, set the total number of languages to 3, and the language name is by default; create a new text input control, such as Screen button,

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:

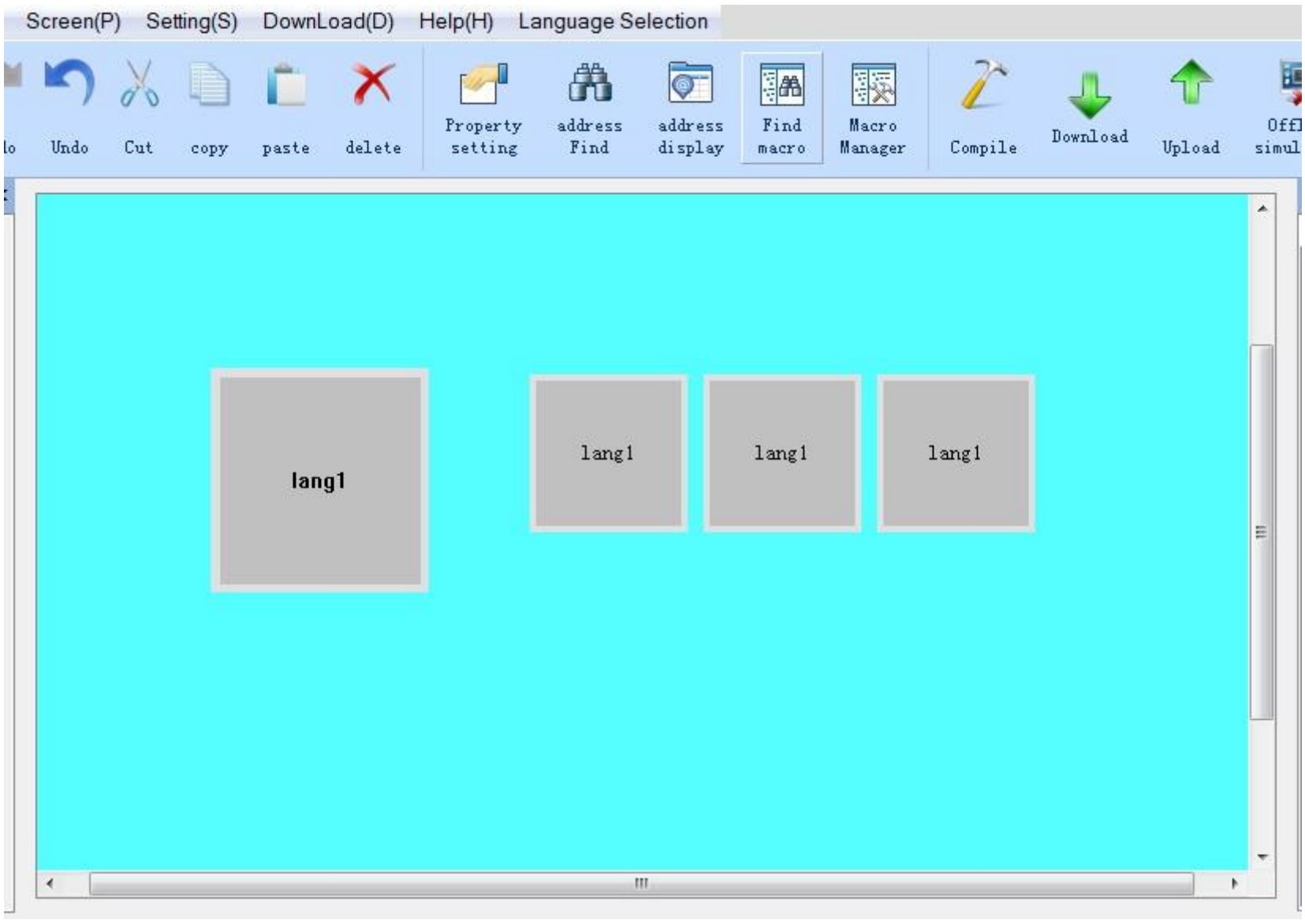


2. Click "OK" after the settings, and then left click on the screen to add this Screen control button when the mouse cursor shows a cross shape; adjust its size. It should note that "Function" options below “General” page of each button are the same: "Switch language"; while options of "Language" are different: Language1, Language2 and Language3, respectively.





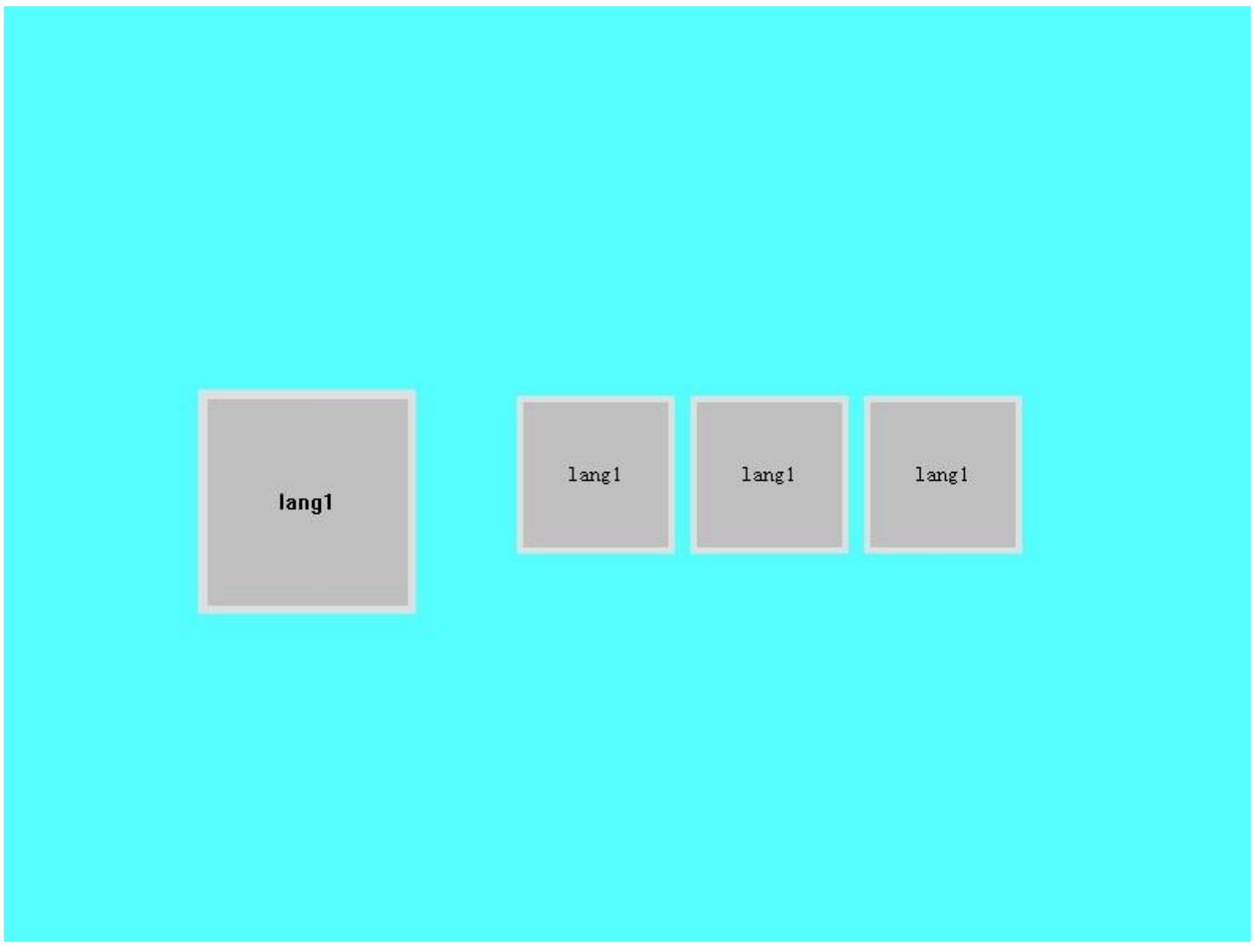
3. Save the project after the settings, as shown below:



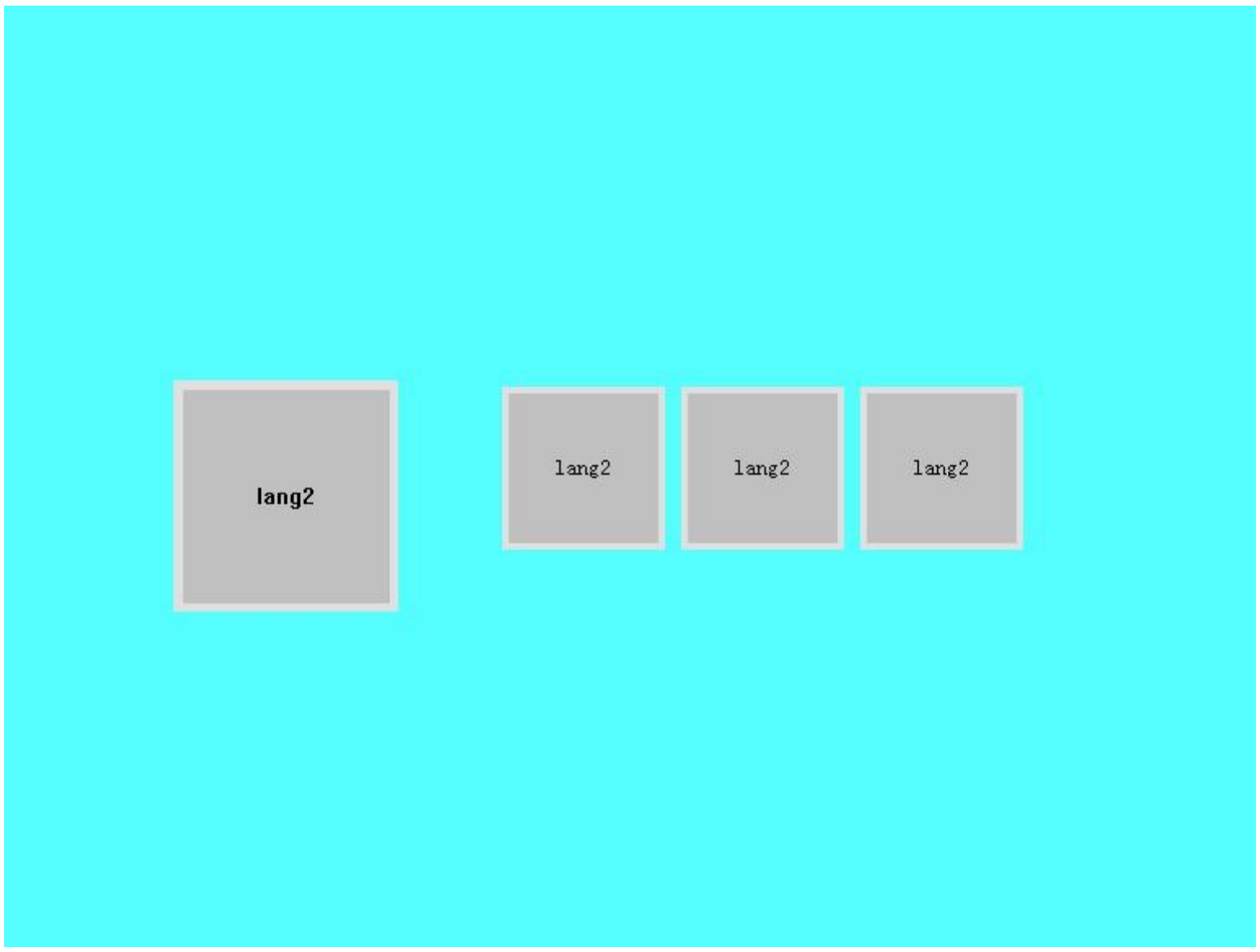
4. Simulate (or download to HMI)

All controls with text will be presented in the according language when click Function button 1, 2 or 3.

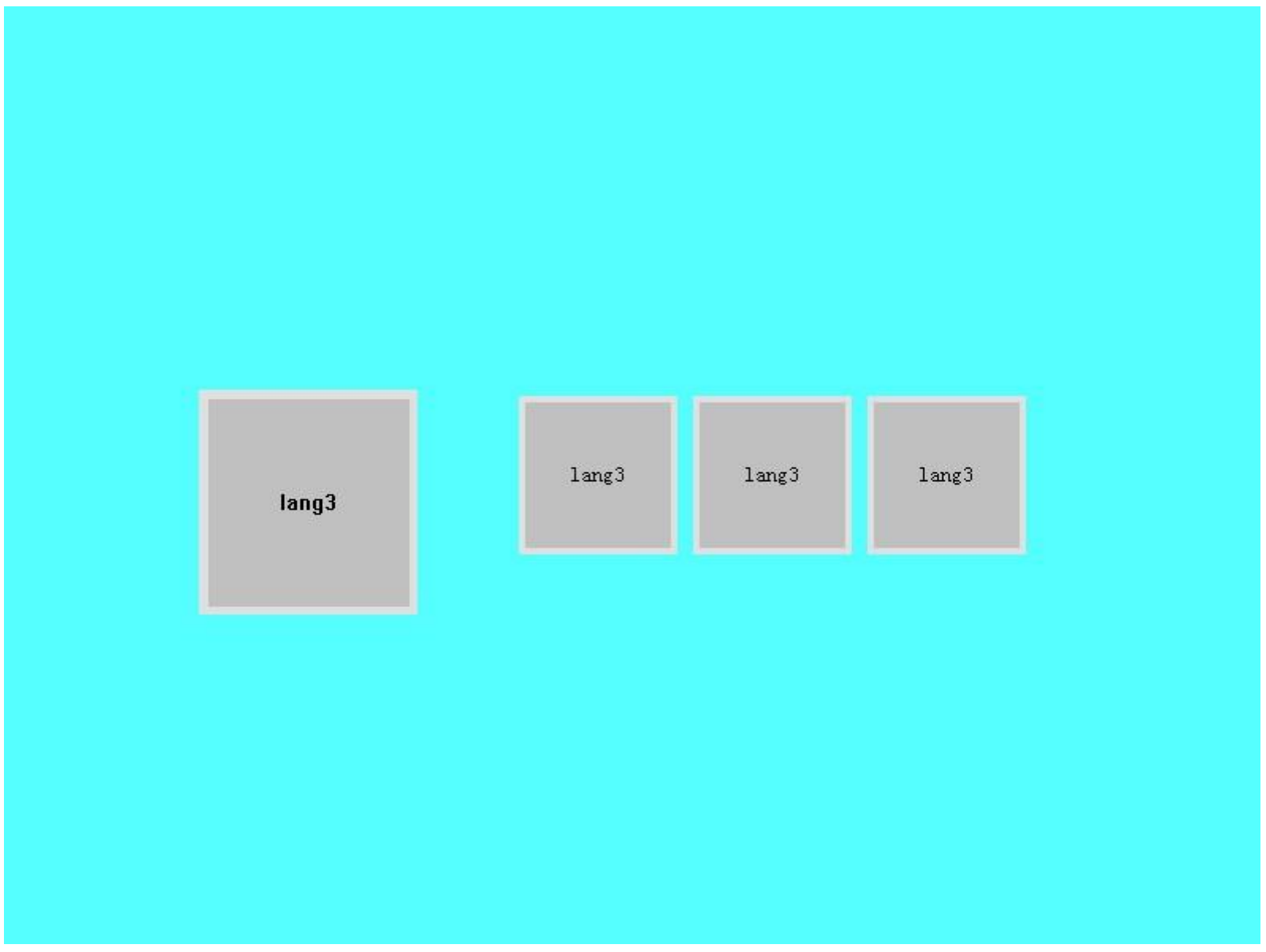
As shown below:



The figure above shows the state after clicking Function button 1 to switch the language to Language 1.



The figure above shows the state after clicking Function button 2 to switch the language to Language 2.



The figure above shows the state after clicking Function button 3 to switch the language to Language 3.

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 of "Switch Language".

9.2.2 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 7-3:

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 7-3 below:

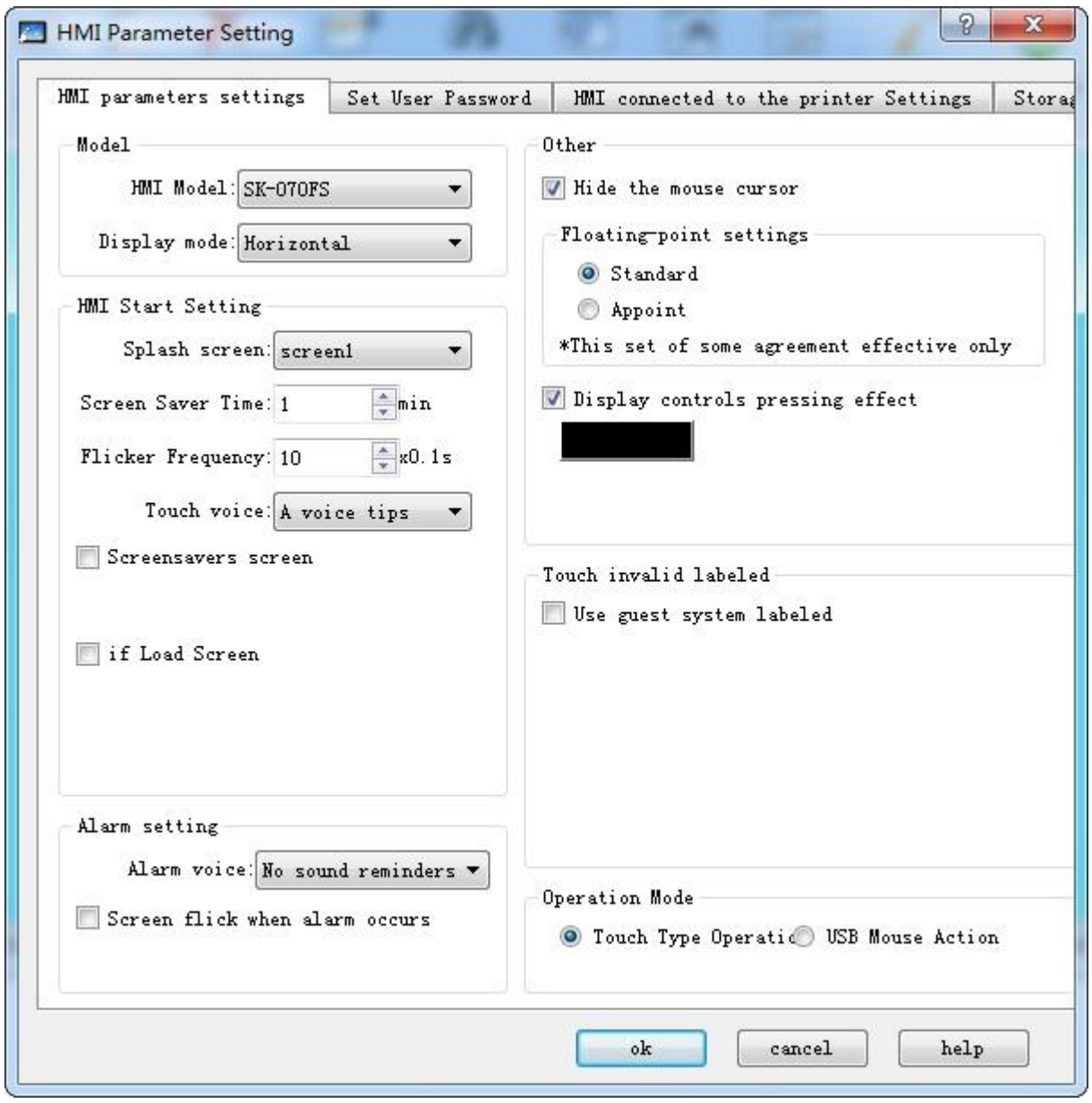


Figure7-3 HMI Parameter Setting dialog box

HMI Model: Change model of HMI

Model instruction:

E.g.: SK-070FS

SK: Samkoon SK series

070: Display size of HMI

F: F Type; there is also H type; different types have different resolution.

S: Standard type; also E for Economy 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 touch screen 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: SKTOOL 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.



Tips:

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

2、Set user password:

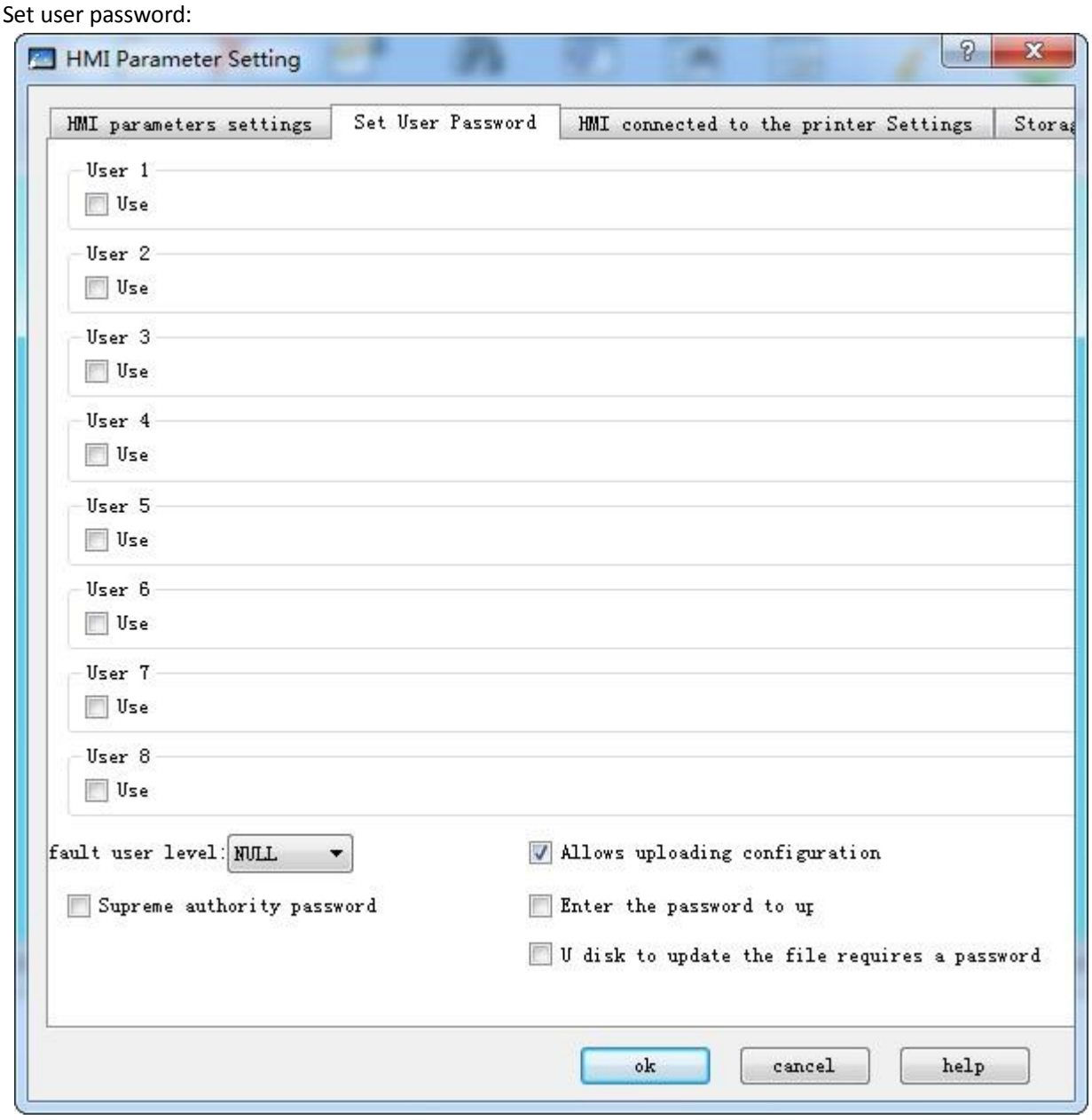


Figure 7-4 Set User Password

- 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.
- Upload: Whether this password enables upload configuration projects from HMI to PC.
- Permissions: 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 7-5:

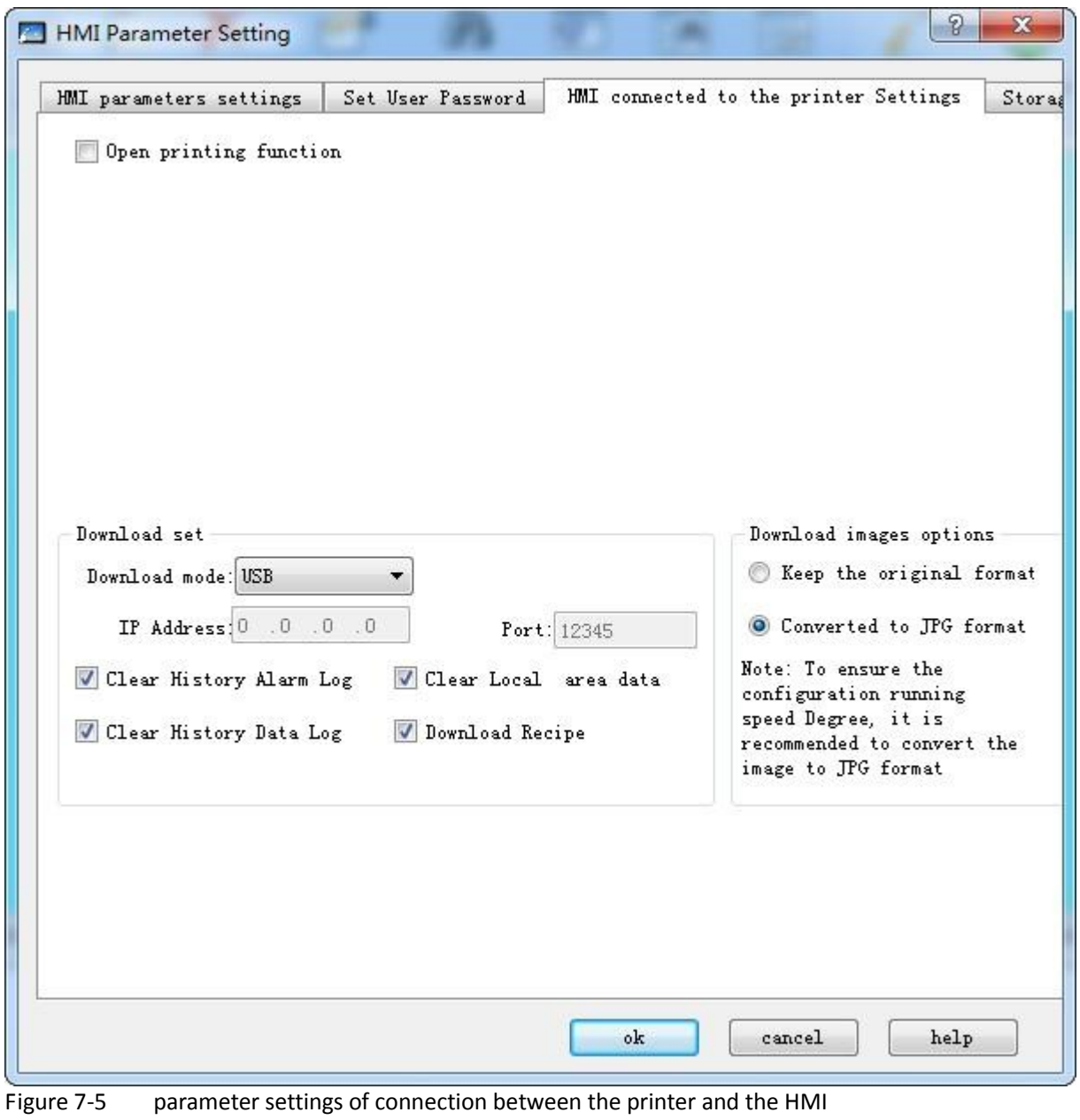


Figure 7-5 parameter settings of connection between the printer and the HMI

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 Formula: Whether to download formulas 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

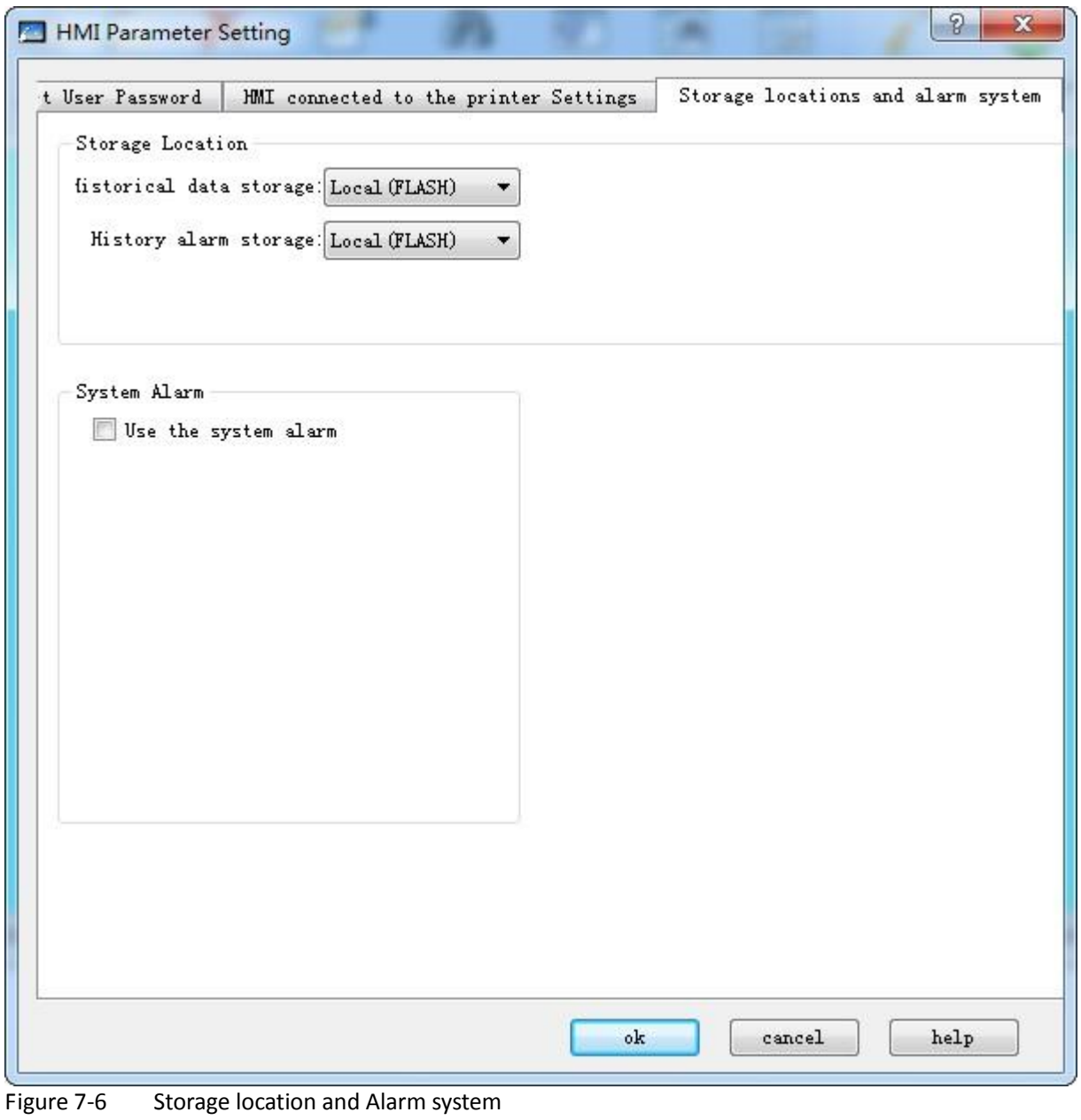


Figure 7-6 Storage location and Alarm system

- Storage location: Location for historical data, historical alarm and screen shots. Provide "Local (FLASH)", "U disk" and "SD card" three 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.



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.

9.2.3 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 7-7:

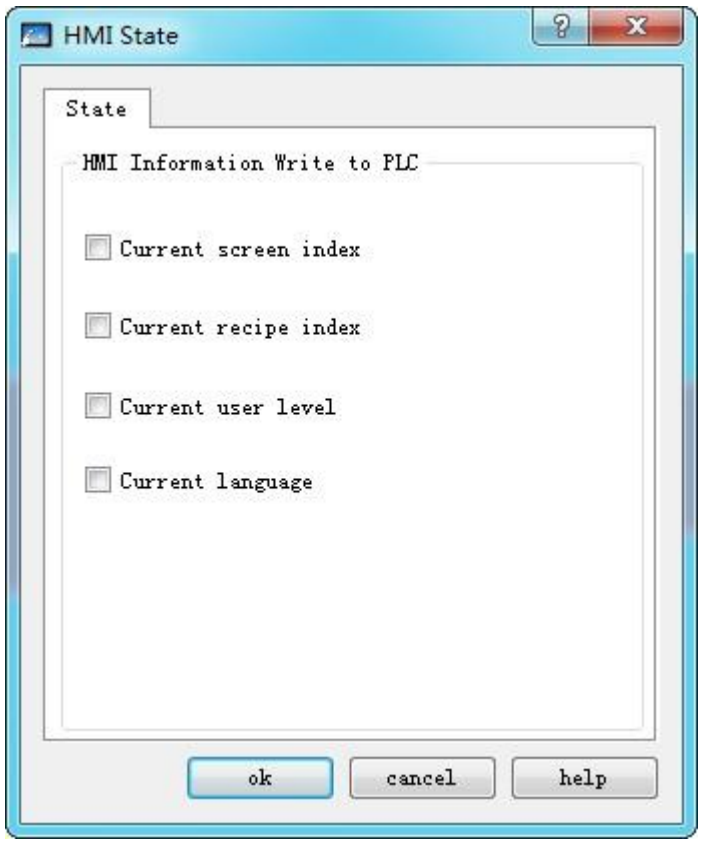


Figure 7-7 HMI Status Setting

- Current screen NO: Write the serial number of the current HMI screen to the PLC.
- Current formula NO: When the serial number of the current formula 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.

9.2.4 PLC Control

PLC control means realizing operations of screen switching, change user level, change formula and write formula through PLC. Double click "PLC Control" in the "Project Manager", the dialog box shown in Figure 7-8 will pop up:

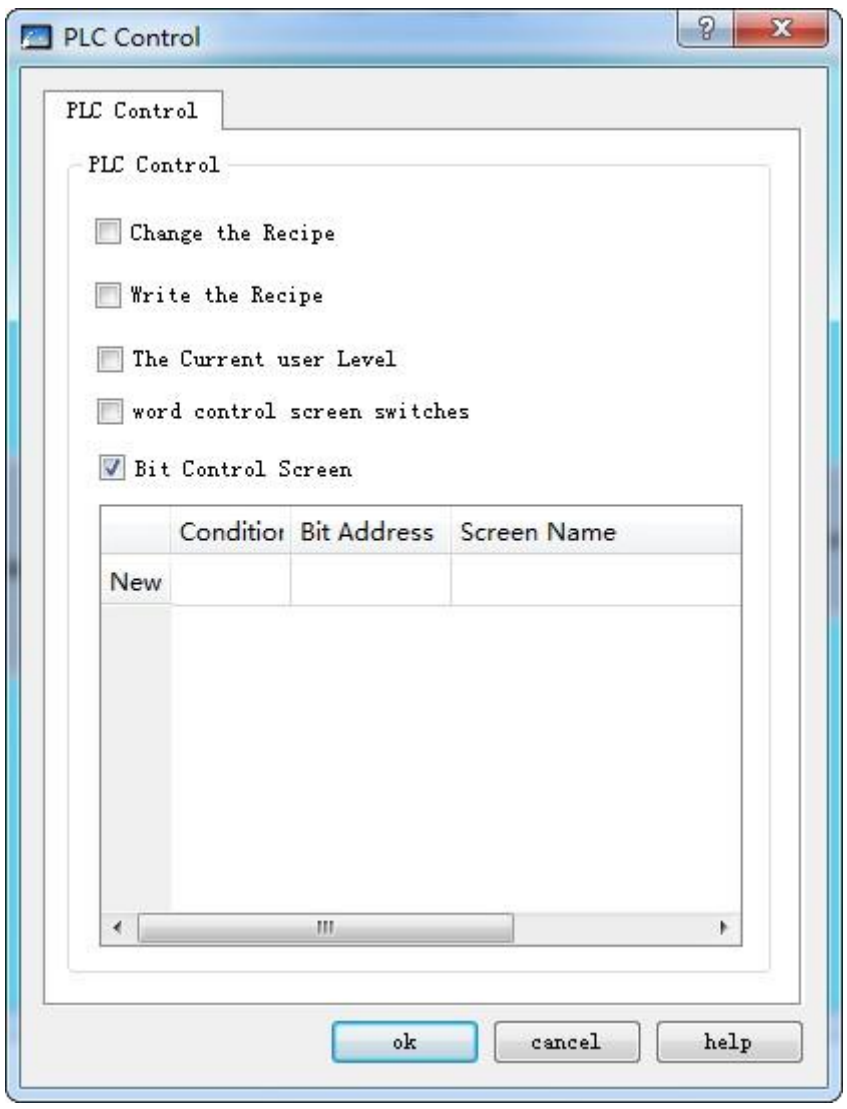


Figure 7-8 PLC control dialog box

- Change formula: HMI changes the formula according to its address value.
- Write formula: HMI controls the write of the formula 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 Bit address: Double click the "New" line; a pop-up dialog box will appear as shown in Figure 7-9:

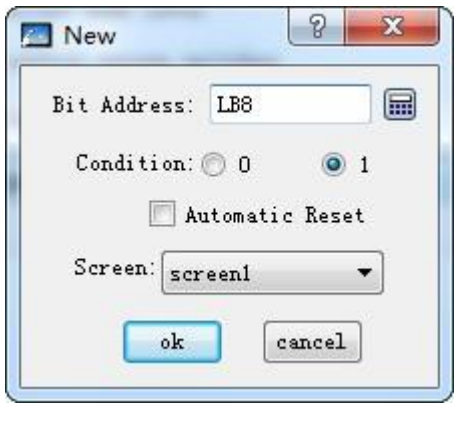


Figure 7-9 Create a new bit control screen switching dialog box

Input the "Bit Address", choose the "Condition" and the screen to jump to; click OK. Then a bit control is completed. As shown in Figure 7-10:

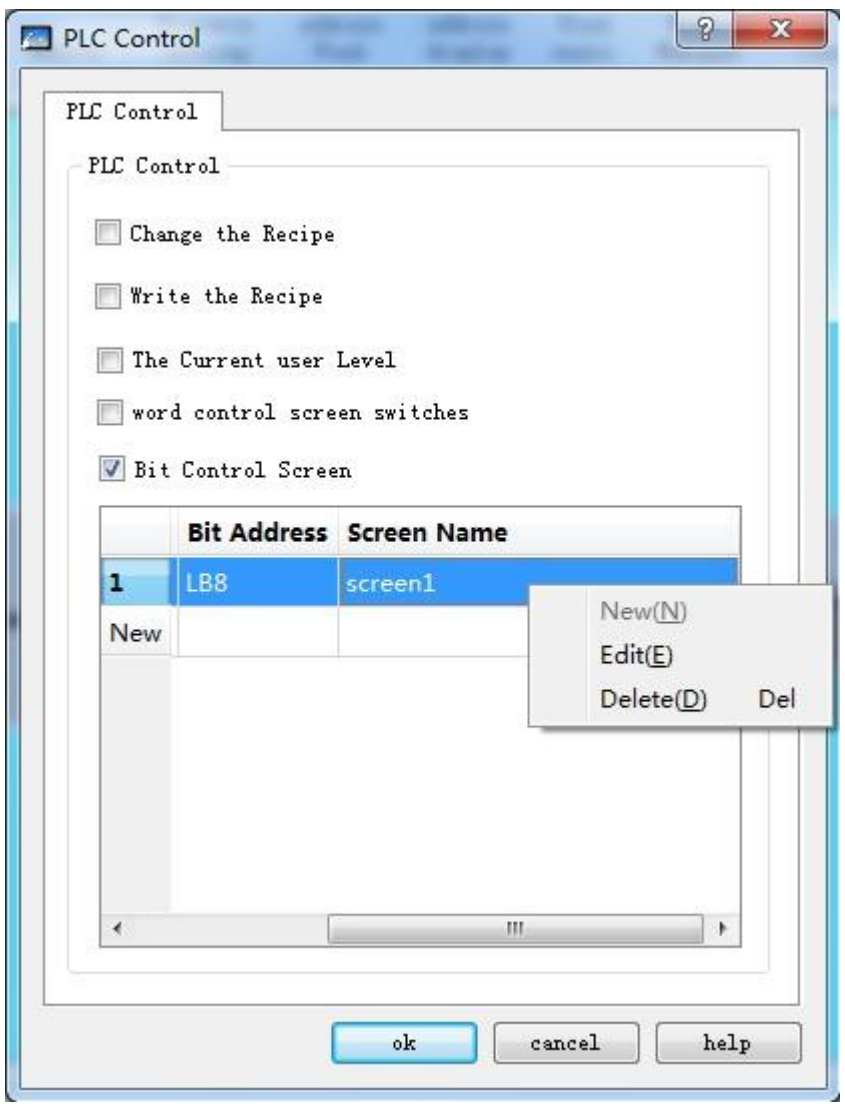


Figure 7-10 Add a bit control screen switch

Similarly, countless screen bit controls can be created; the order of screen switching implementation accords with the serial number. Right click on any information of bit control, a menu pops up then where to perform operations of "New", "Edit" and "Delete".

Figure 7-10: Its function is to jump to the scree 1 when the value of the bit address LB8 is equal to 1.

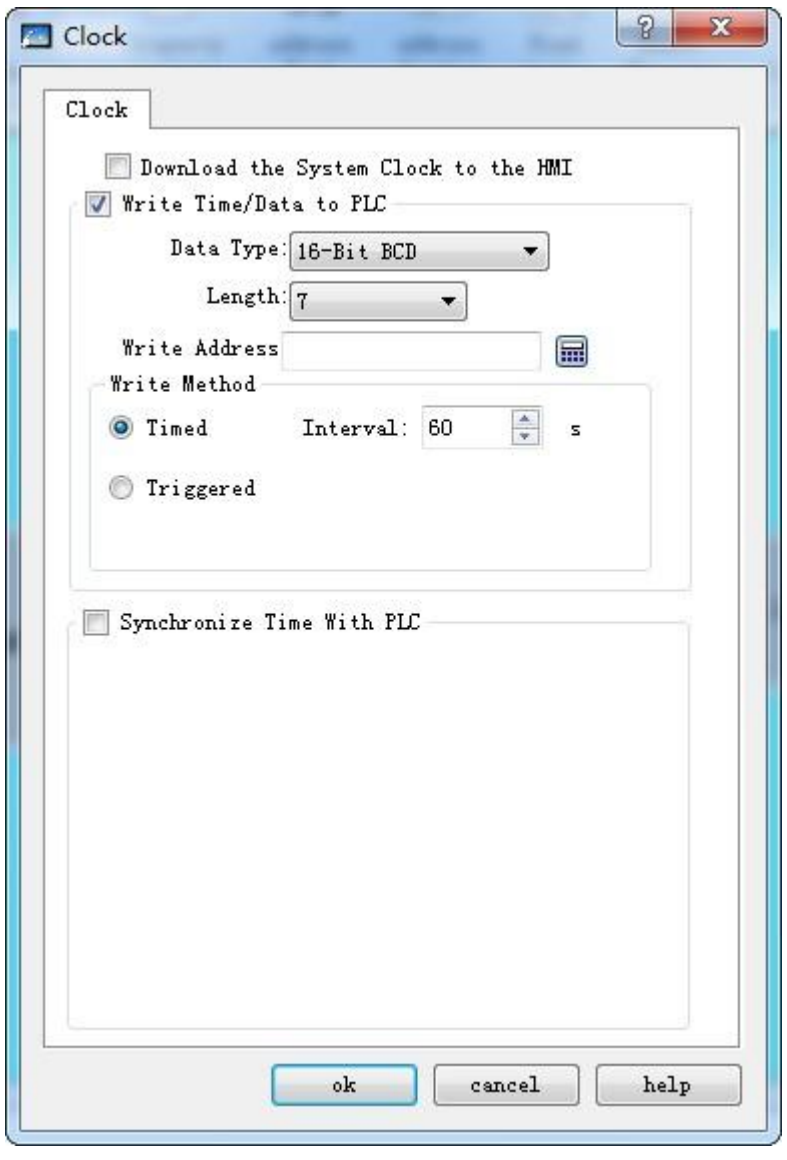


Note: When switch screens through PLC, the value read for the first time does not affect the screen switching. It functions only when the value of PLC register is different from the first read value.

9.2.5 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.



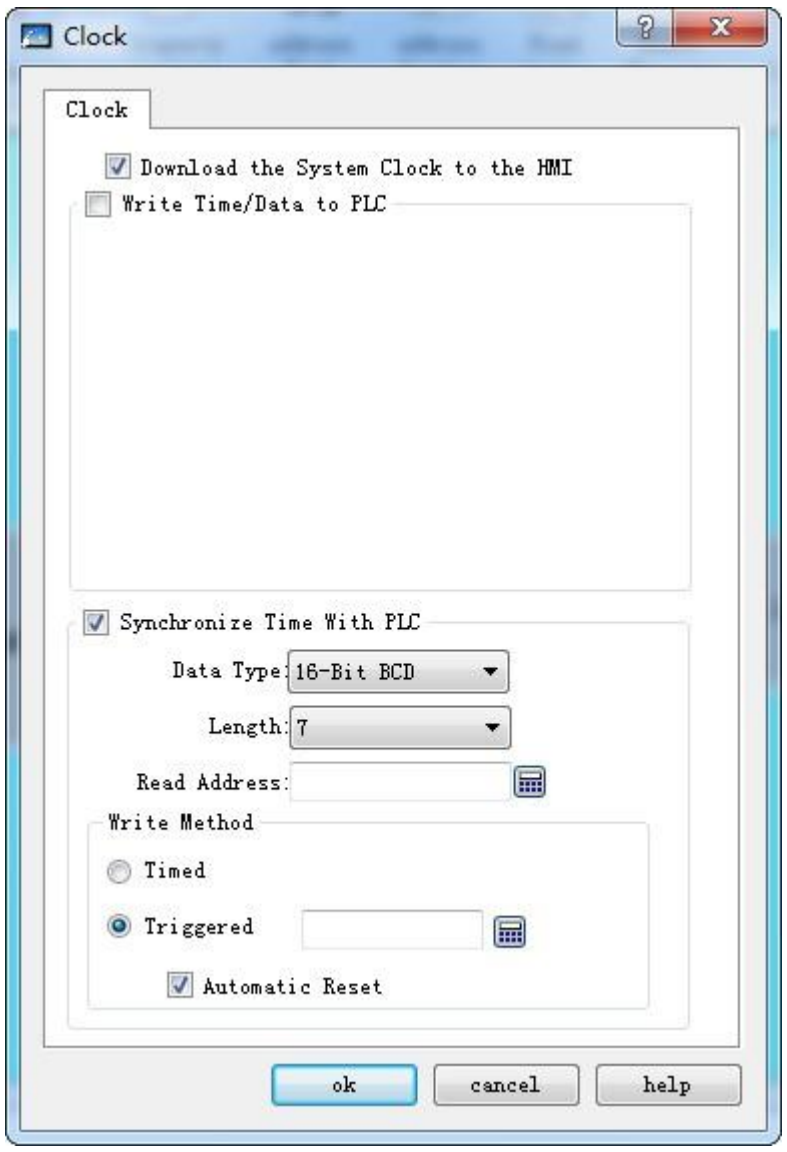


Figure 7-11 Clock Setting dialog box

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.

9.2.6 File Encryption

Whether a password is necessary to open the project file.

Double click the "File Encryption" option in the “Project Manager", as shown in Figure 7-12 pop-up dialog box:



Figure 7-12 File Encryption 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 7-13:



Figure 7-13 Password input box

Users need to input secret to open project.

9.2.7 HMI Protection

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 7-14:



Figure 7-14 HMI Protection dialog box

Example to illustrate the application of this function:

➢Select "Use password protection": A password is required to enter the HMI protection the next time.

➢Select "Use HMI protection"

Set the "Total level password" to 3; select the 1 button icon, choose 2009-04-01 and 12-00-00 in the Time Limit column under the "Parameter settings"; decide the screen 1 as the "Prompt Screen"; Set "Password to unlock" to 1111. Then the level 1 protection is set up.

As in the above case, set the time limits and passwords for level 2 and level 3.

Assuming it is 8 o'clock, 2009-04-01now, since the time limit of level 1 HMI protection is 12-00-00, 2009-04-01, the HMI can still runs normally; while 4 hours, when it is 12 o'clock, the HMI will automatically jump to the set prompt screen (screen 1). Add a function button with the function of "Unlock HMI" to this screen. Then enter 1111 in the pop-up password input box of this button so as to remove the level 1 password protection and continue to operate.

Similarly, it needs to input the corresponding passwords when it reaches the time limit. When the protection of level 3 is removed, the HMI protection is hereby invalid.

This example illustrates the application of HMI protection; settings of the password level are similar to the above case.

9.2.8 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 7-15:

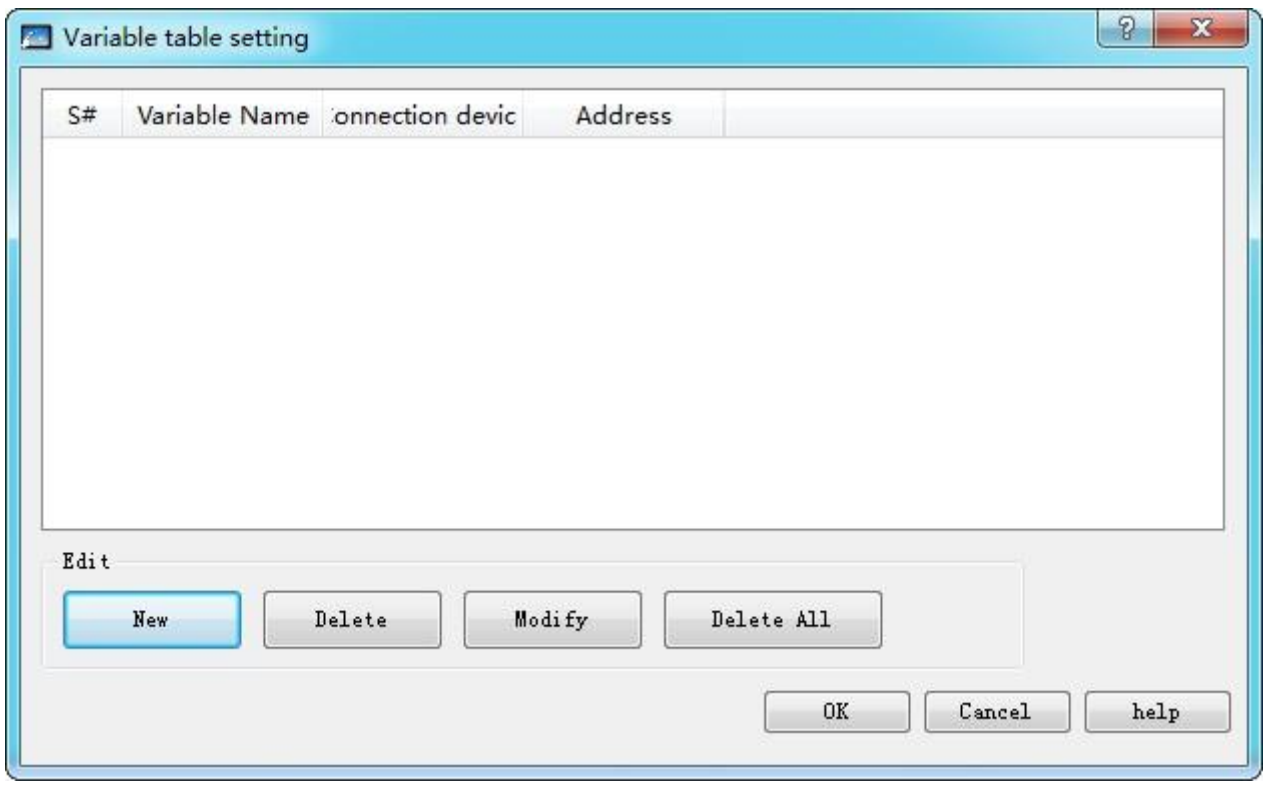


Figure 7-15 Variable Table Setting Dialog Box

- 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.



Figure 7-16 Create a screen switch through bit control dialog box

- 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.

9.3 Screen

Create a new screen as shown in Figure 7-17:

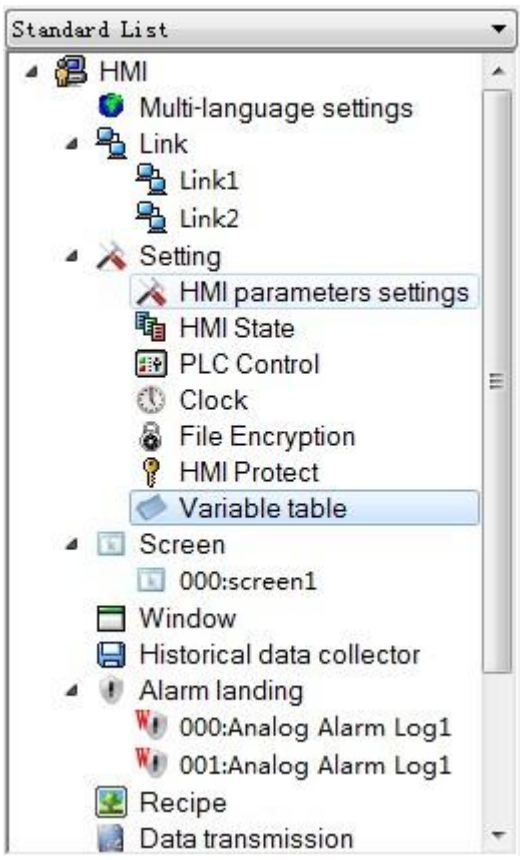


Figure 7-17 Right-click screen options

- 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.

9.4 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 7-18.

Open a window in screen, and a window will display in the screen.

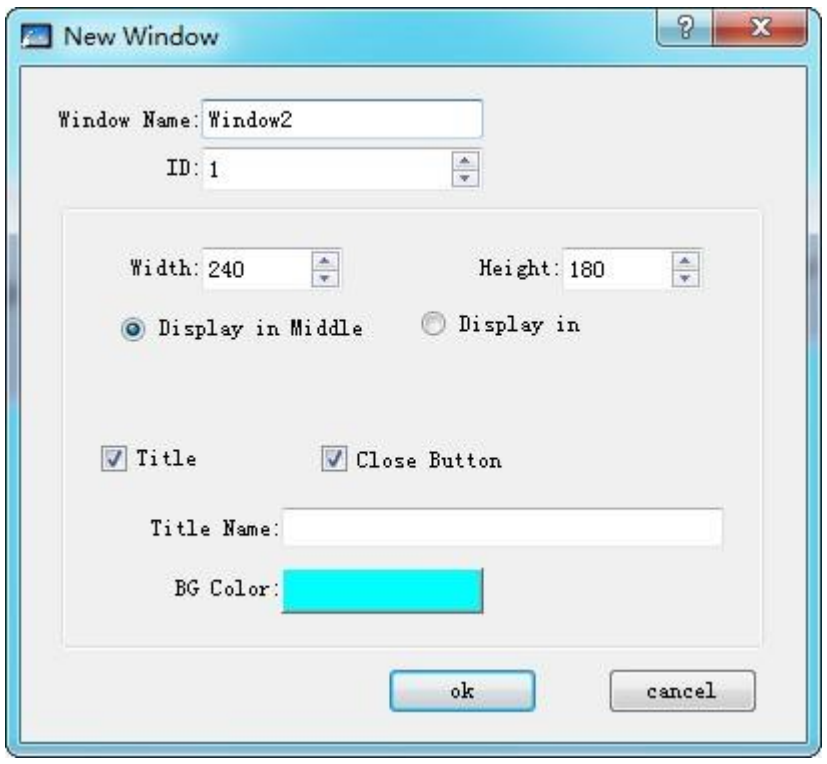


Figure 7-18 Window Properties dialog box

- 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.
- Background Color: Set the background color of the window.

9.5 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: SKTOOL newly supports multiple sets of historical data; up to four historical data collectors can be built.

Note that you cannot create more than four sets; otherwise an error dialog box will pop up as follows:



Double click "Historical Data Collector 0" in "Project Manager" to open a dialog box as shown in Figure 7-19:

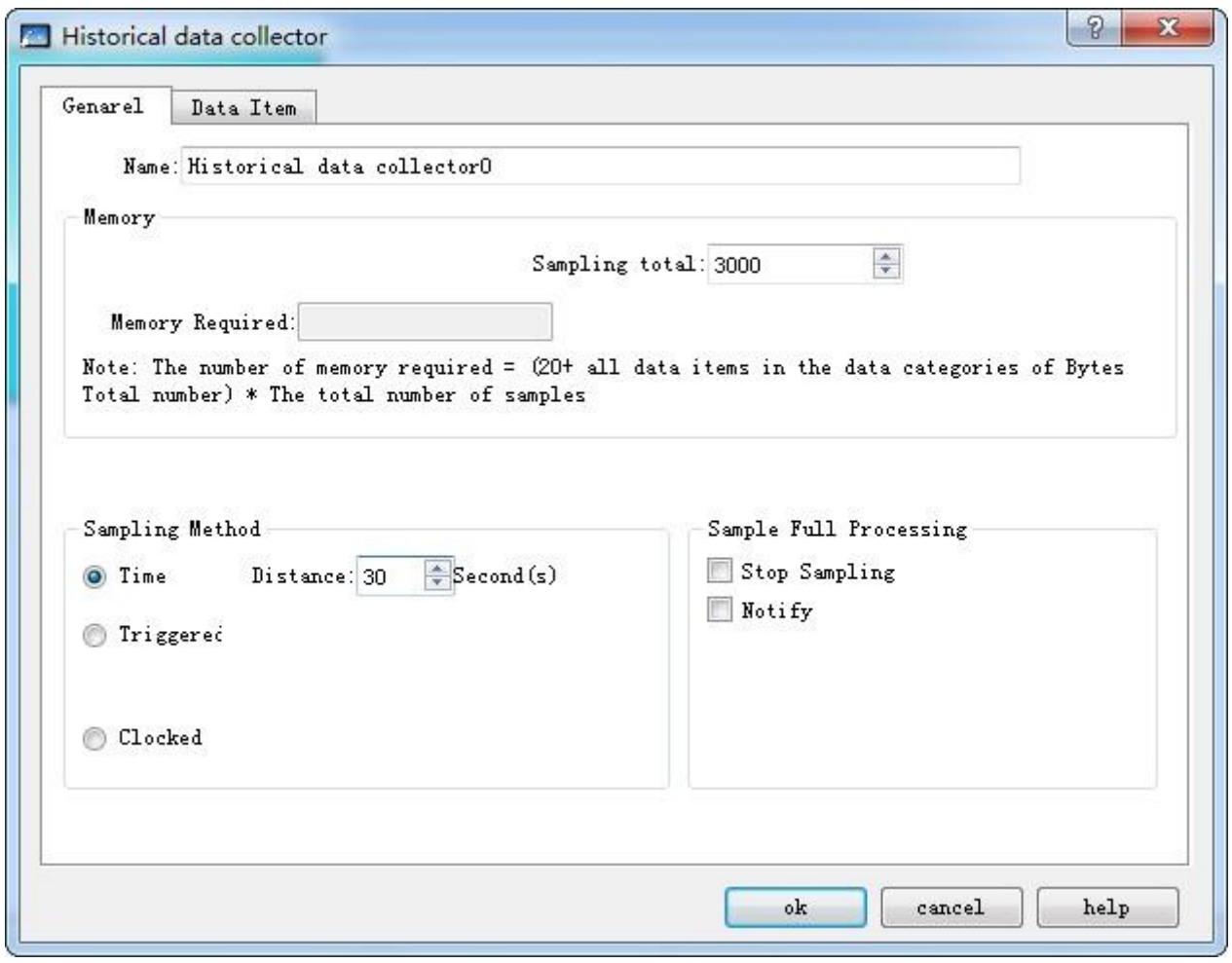


Figure 7-19 Historical Data Collector dialog box

- 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.



Tips:

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, as shown in Figure 7-20:

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 7-20:

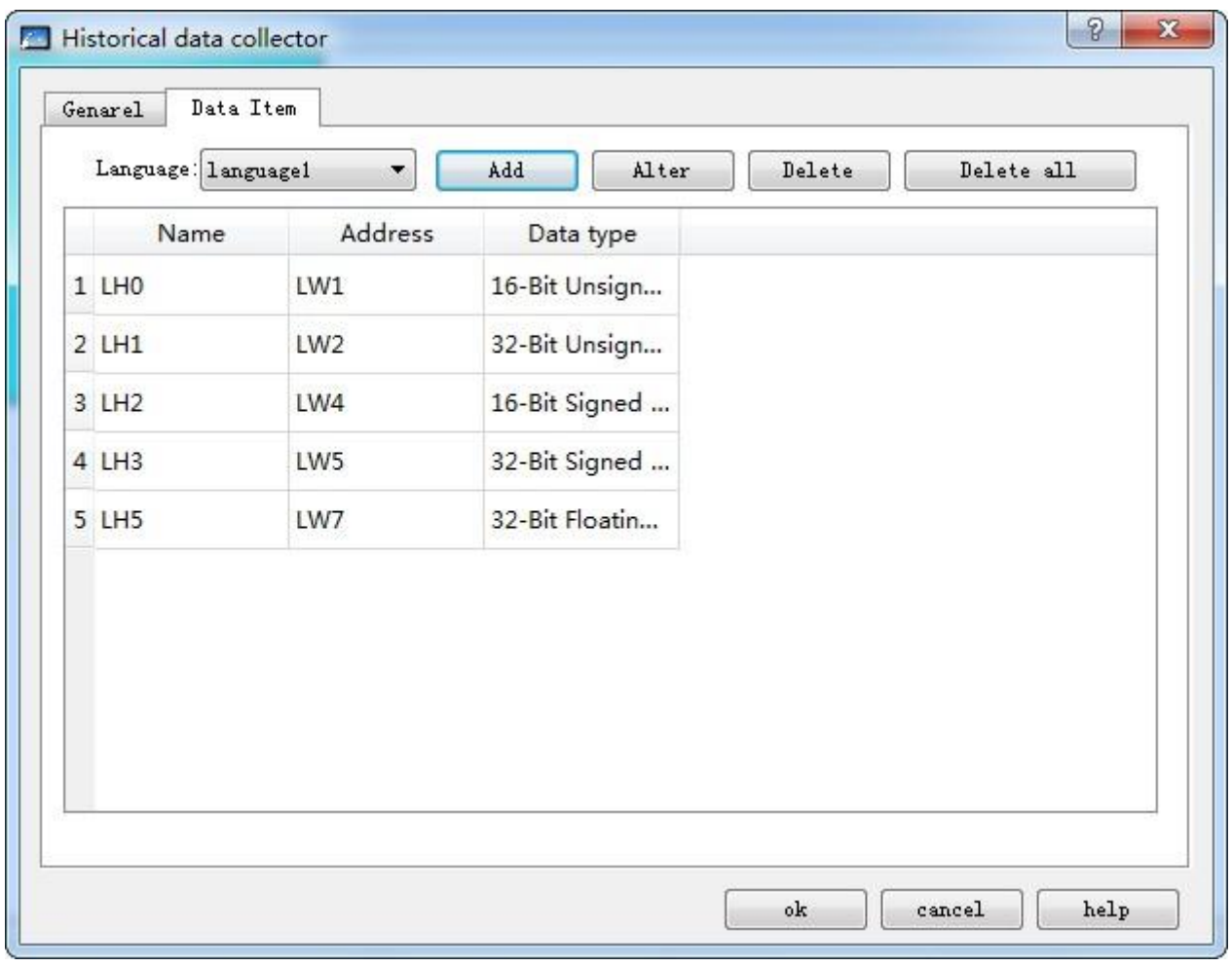


Figure 7-20 Data Item of Historical Data Collector

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 SKTOOL, 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.

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 7-20; 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: The gain value in scaling must be greater than 1!

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 7-21:

Time	Date	LH0	LH1	LH2	LH3	LH4

Figure 7-21 Data Table of Historical Data Display

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.



Employ “Historical Trends”or “Historical Data Display”to read the values more intuitively.

9.6 Alarm settings

SKTOOL 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.

Contents：

- Digital Alarm Login
- Analog Alarm Login
- Alarm Display Controls

9.6.1 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 log", as shown in Figure 7-22:

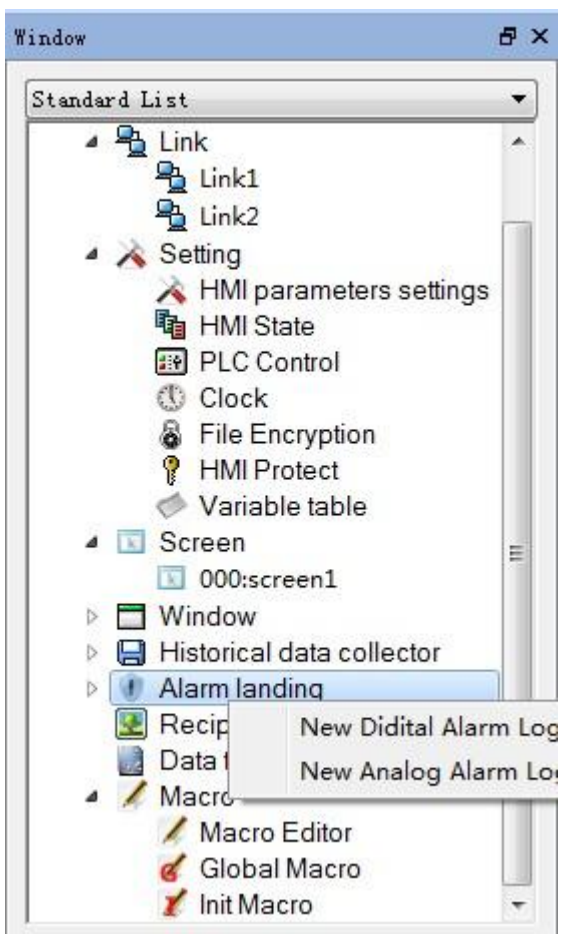


Figure 7-22 Select alarm log

Double click the "digital alarm login" option to open the digital alarm settings dialog box, as shown in Figure 7-23:

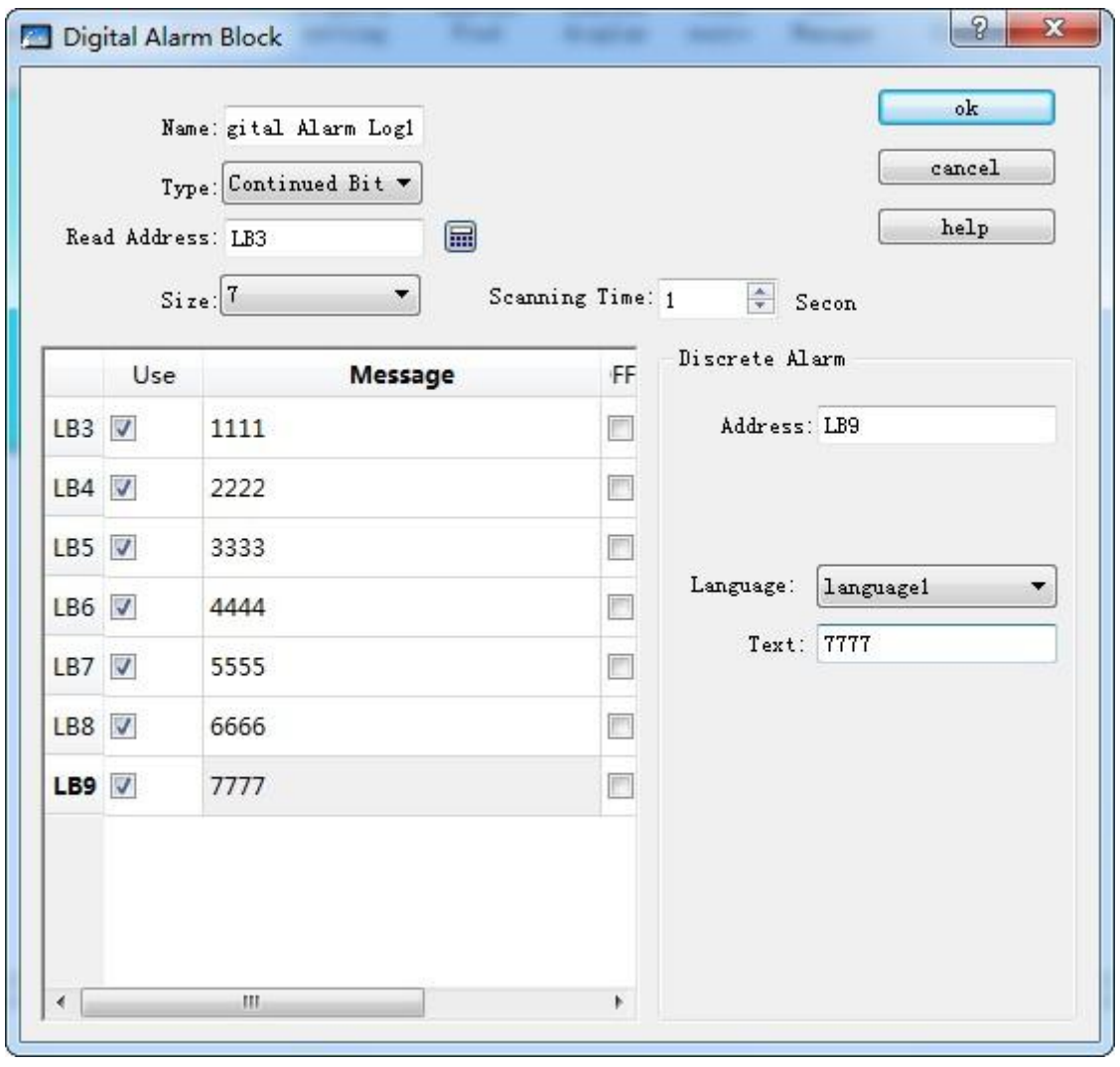


Figure 7-23 Select continuous digit

Steps to build a digital alarm log are as follows:

- Enter the read address first; it is assumed here that the internal address LB1 is set.
- 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.
- Set the bit alarm “Scanning time", that is, the scanning frequency.

- 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 7-23.
- 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".

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 7-24:

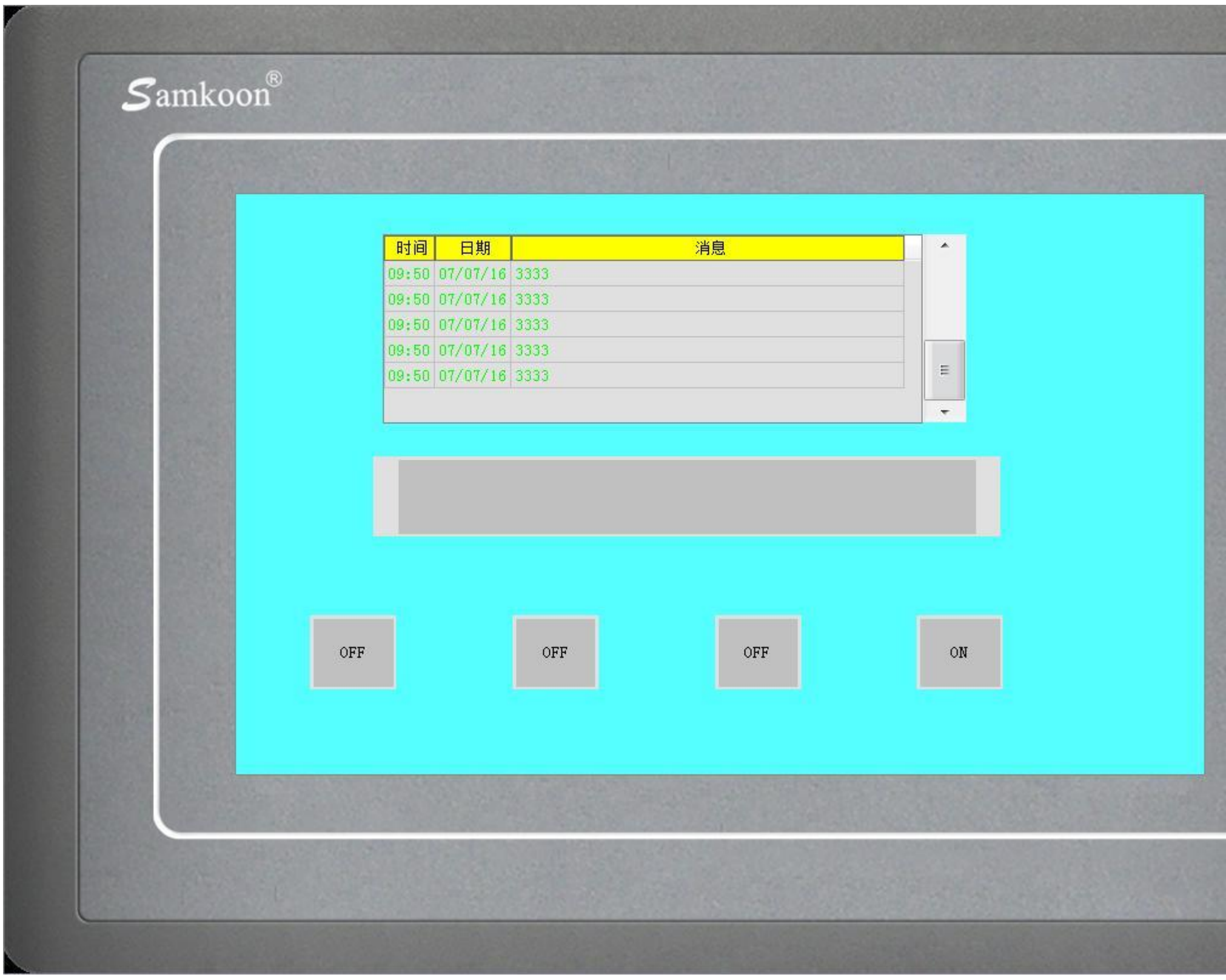


Figure 7-24 Offline simulation example of digit alarm

When "Continuous Bit of Word" is selected as the Type, as shown in Figure 7-25 below:

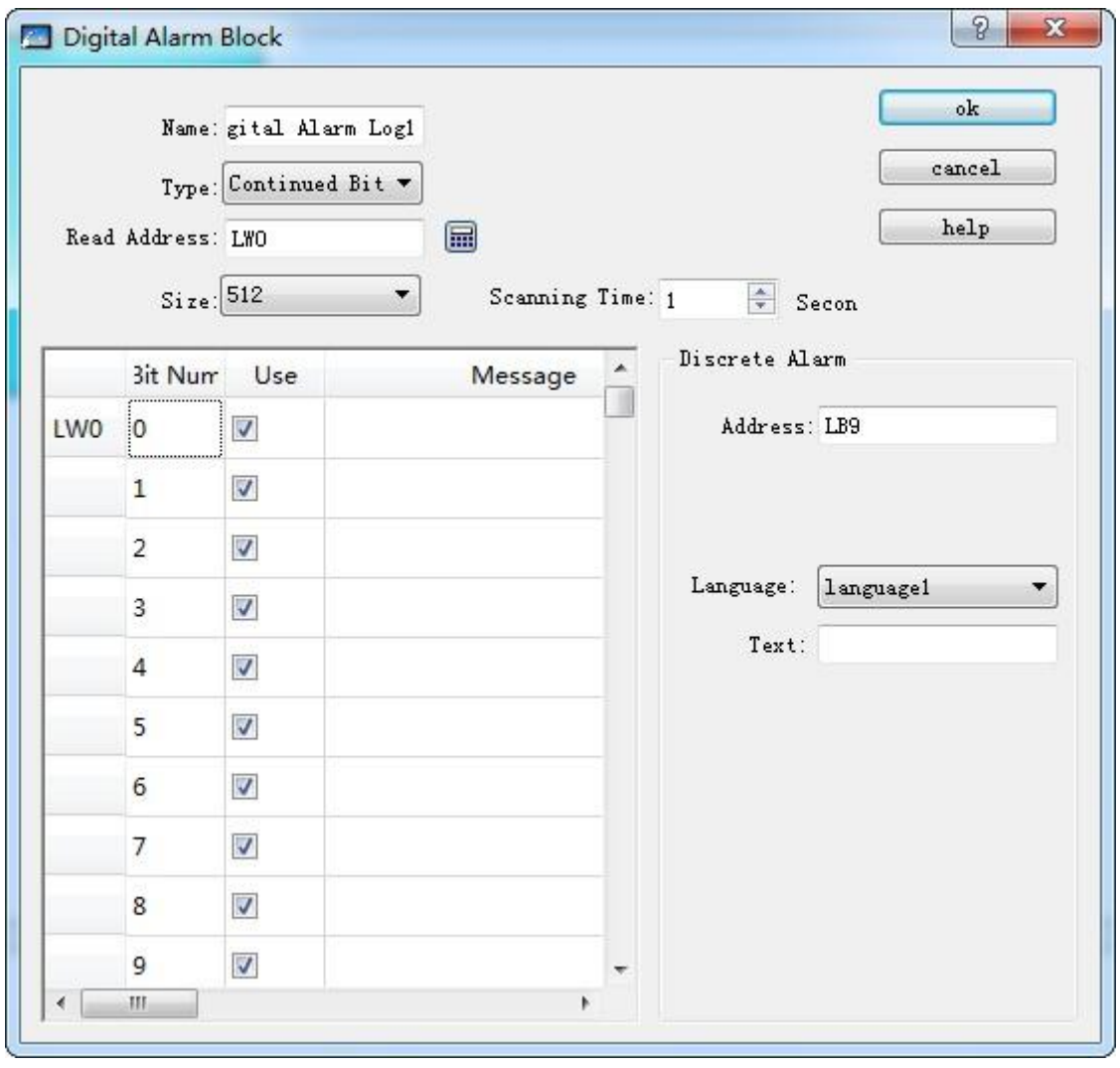


Figure 7-25 Select Continuous Bit of Word

If the “Use” of a certain bit number is selected, an alarm will be generated when the value of this bit value is 1.

Tips:

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 7-26 below:

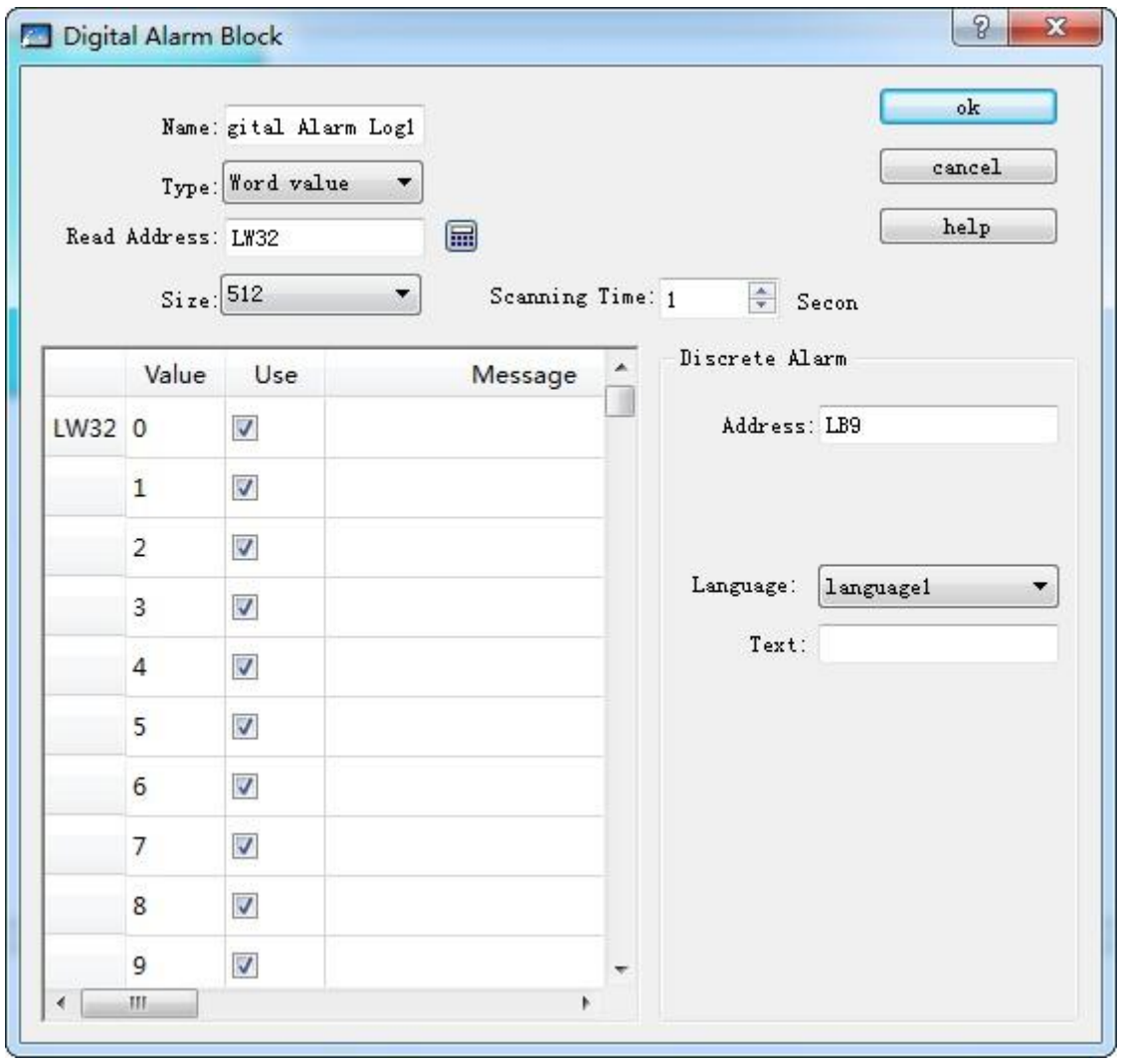


Figure 7-26 The "Word Value" digital alarm dialog box

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 in Figure 7-24 and a Dynamic alarm bar whose attributes are set as shown in Figure 7- 27:

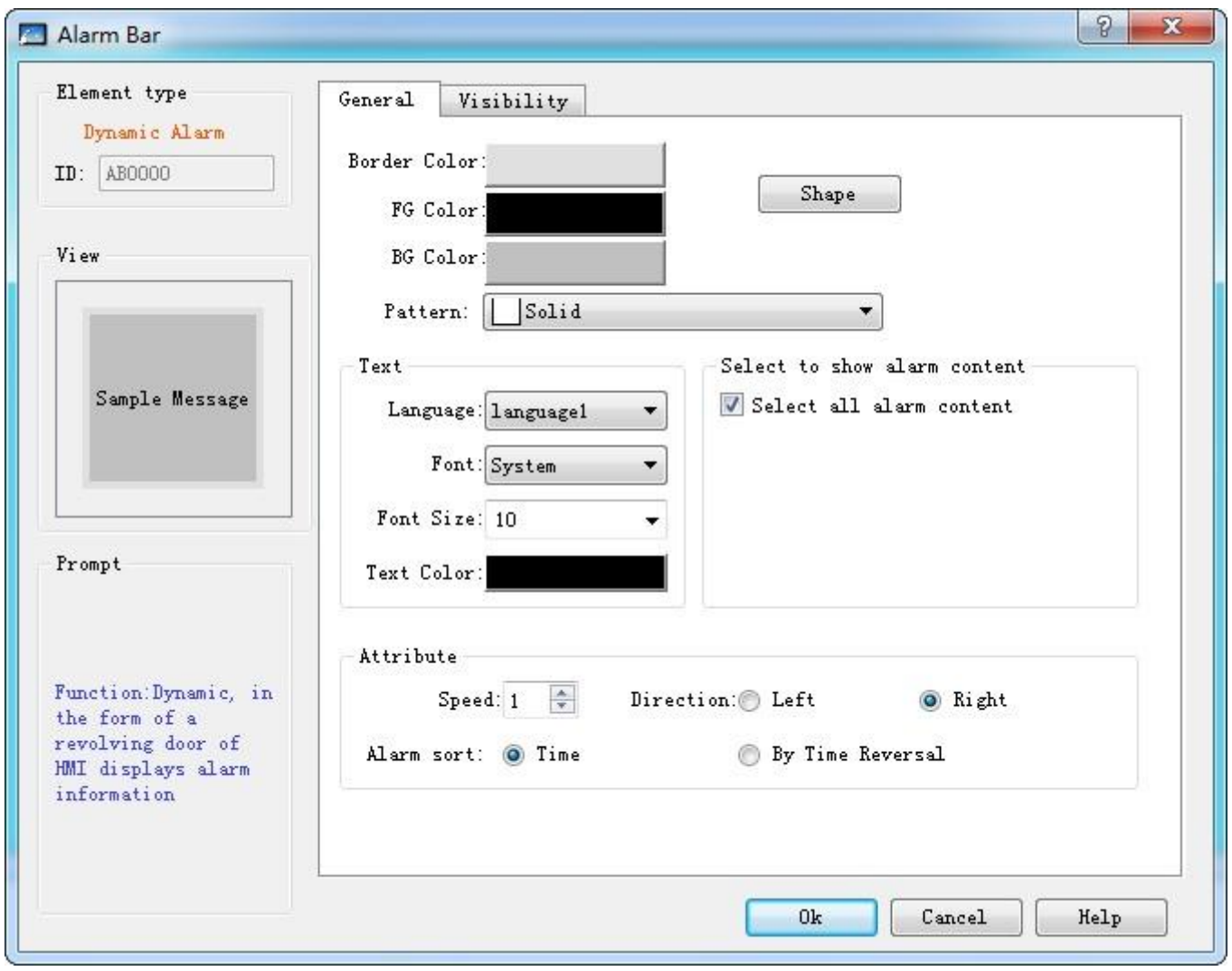


Figure 7-27 Dynamic Alarm Bar Properties dialog box

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.

Tips:

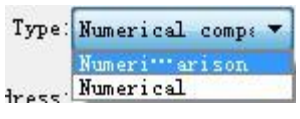
Note: Different alarm information is available for corresponding language through the function of switching language.

Note: Number of digital alarm is up to 10 for SK series HMI.

9.6.2 Analog Alarm Login

Open the analog alarm settings dialog box, as shown in Figure 7-28:

It has two types: Numerical value and Numerical comparison.



The numerical comparison alarm is as shown below:

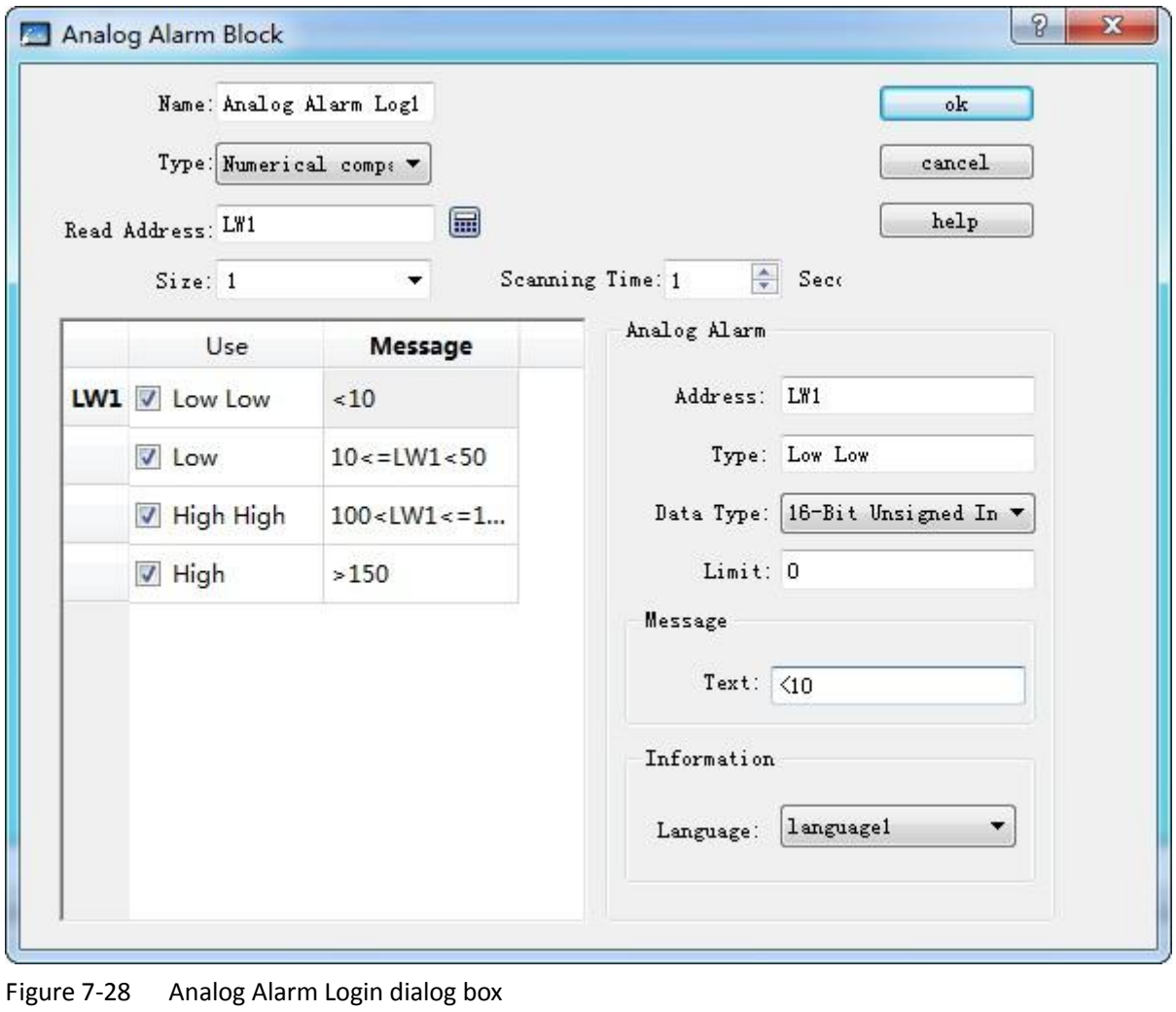


Figure 7-28 Analog Alarm Login dialog box

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 7-28, 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 7-28: each address value can be classified into one of four ranges-- Low, Low Low, High, High High.

As shown in Figure 7-29:

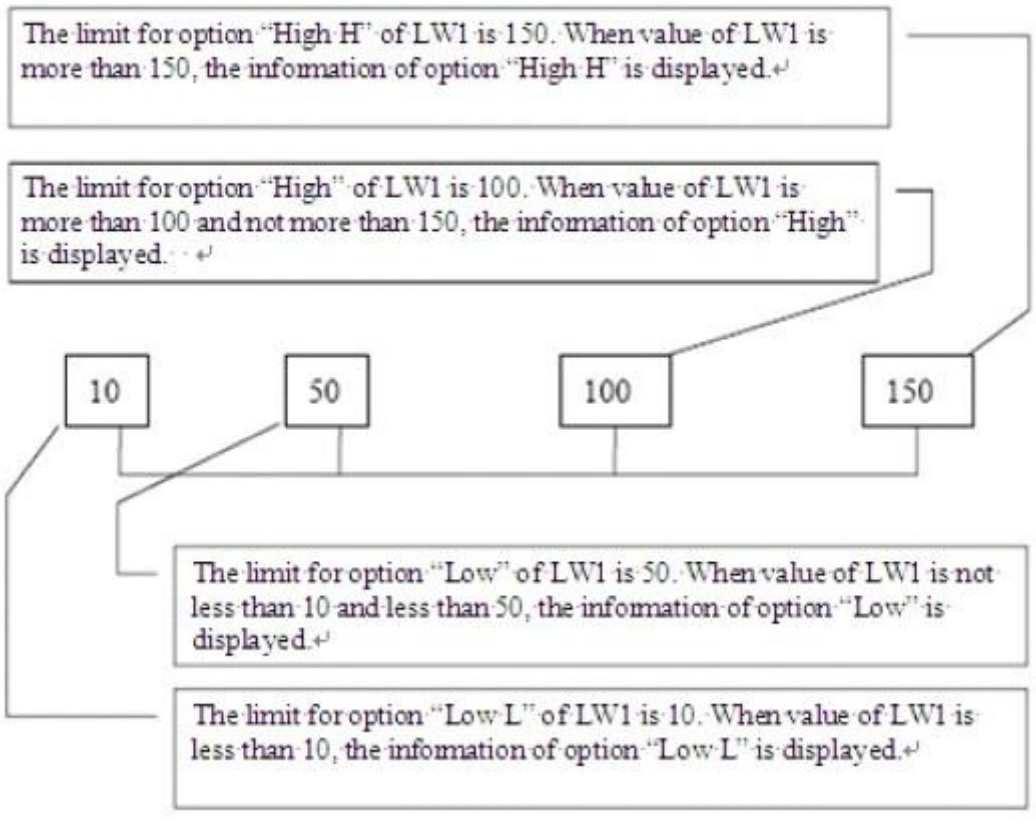


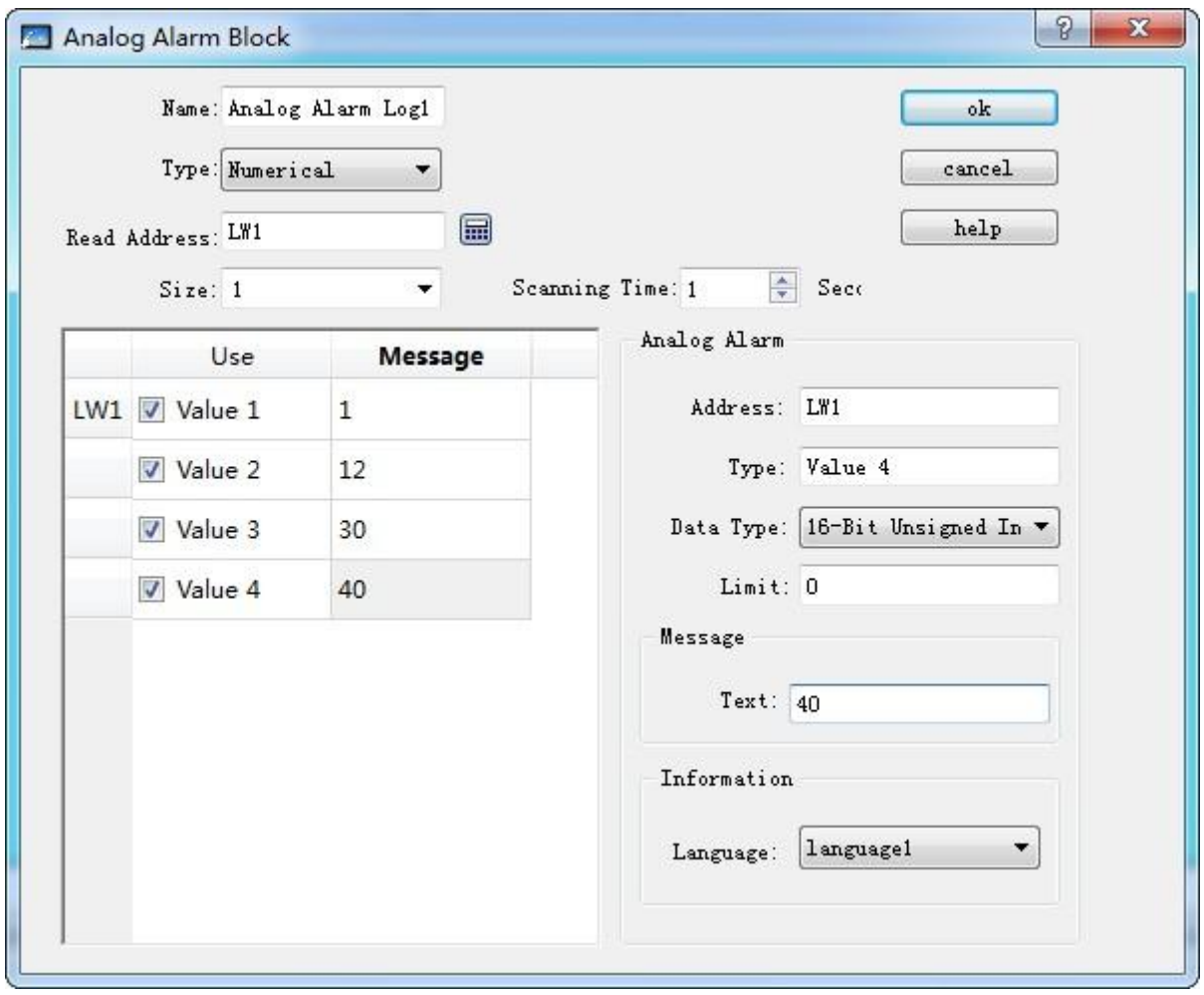
Figure 7-29 Diagram of the four address values for the LW1 address

- 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".

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.



Tips:

Note: Number of analog alarm is up to 10 for SK series HMI.

9.6.3 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 7-30:

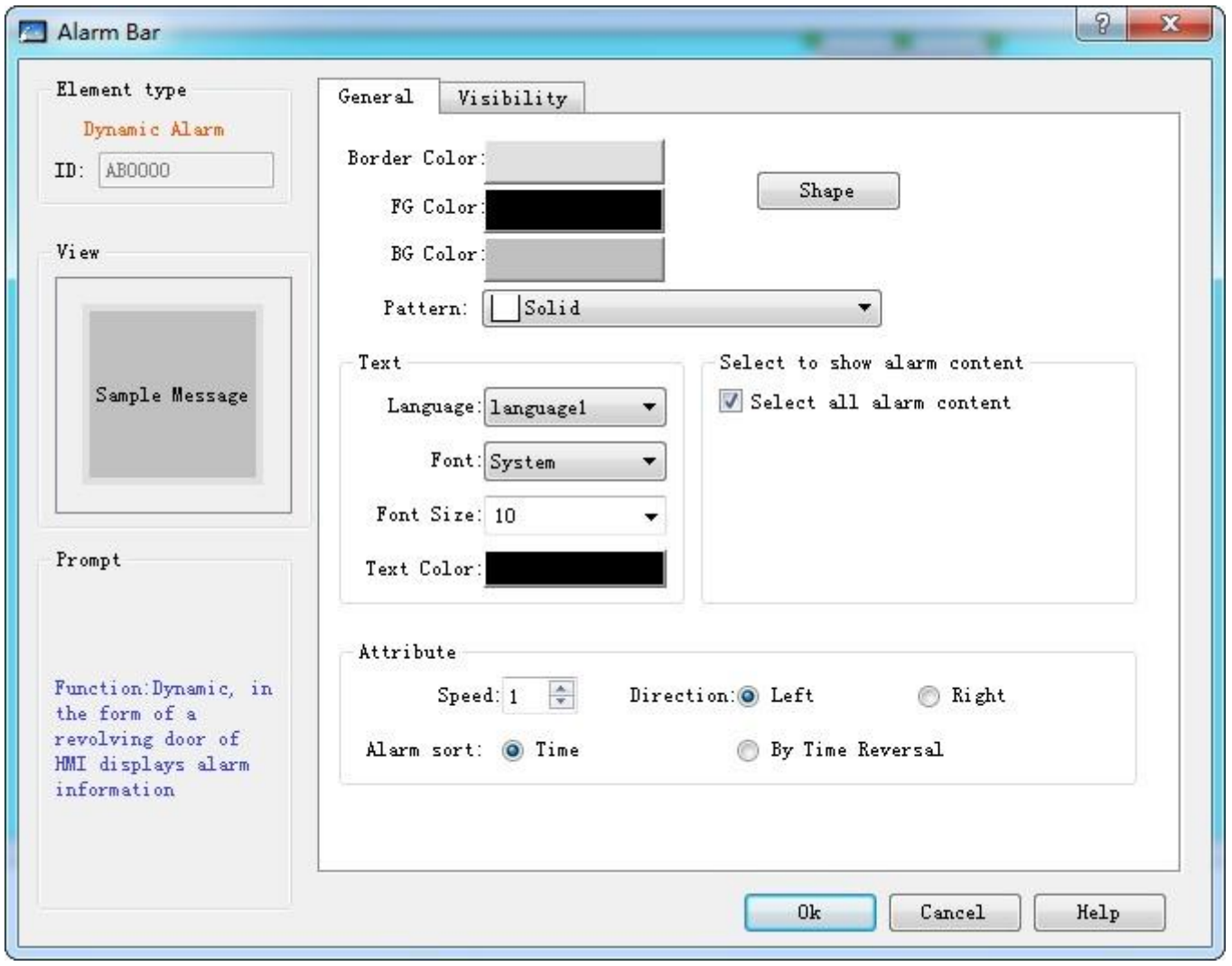


Figure 7-30 Alarm Bar dialog box

- 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 7-31:

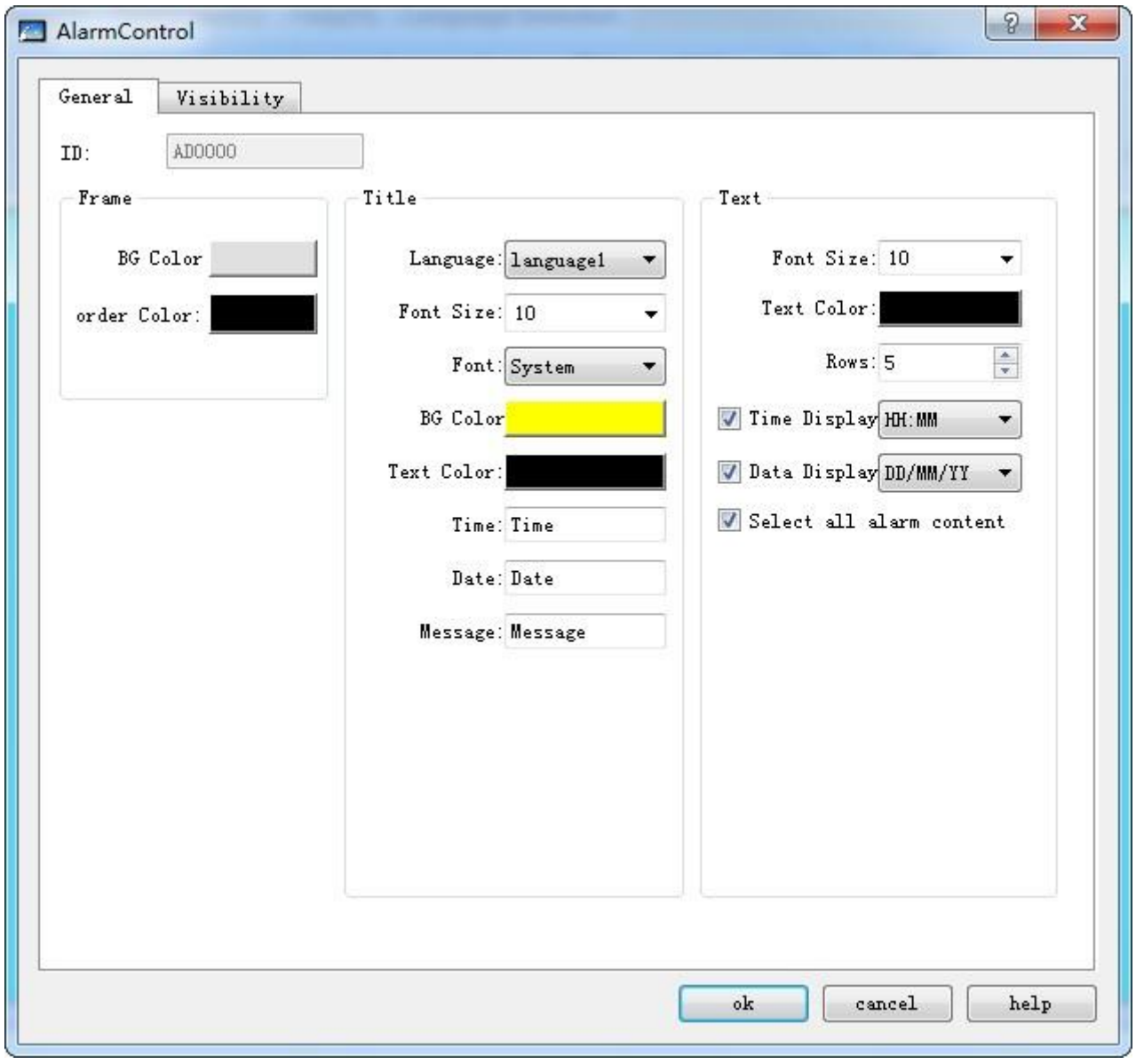
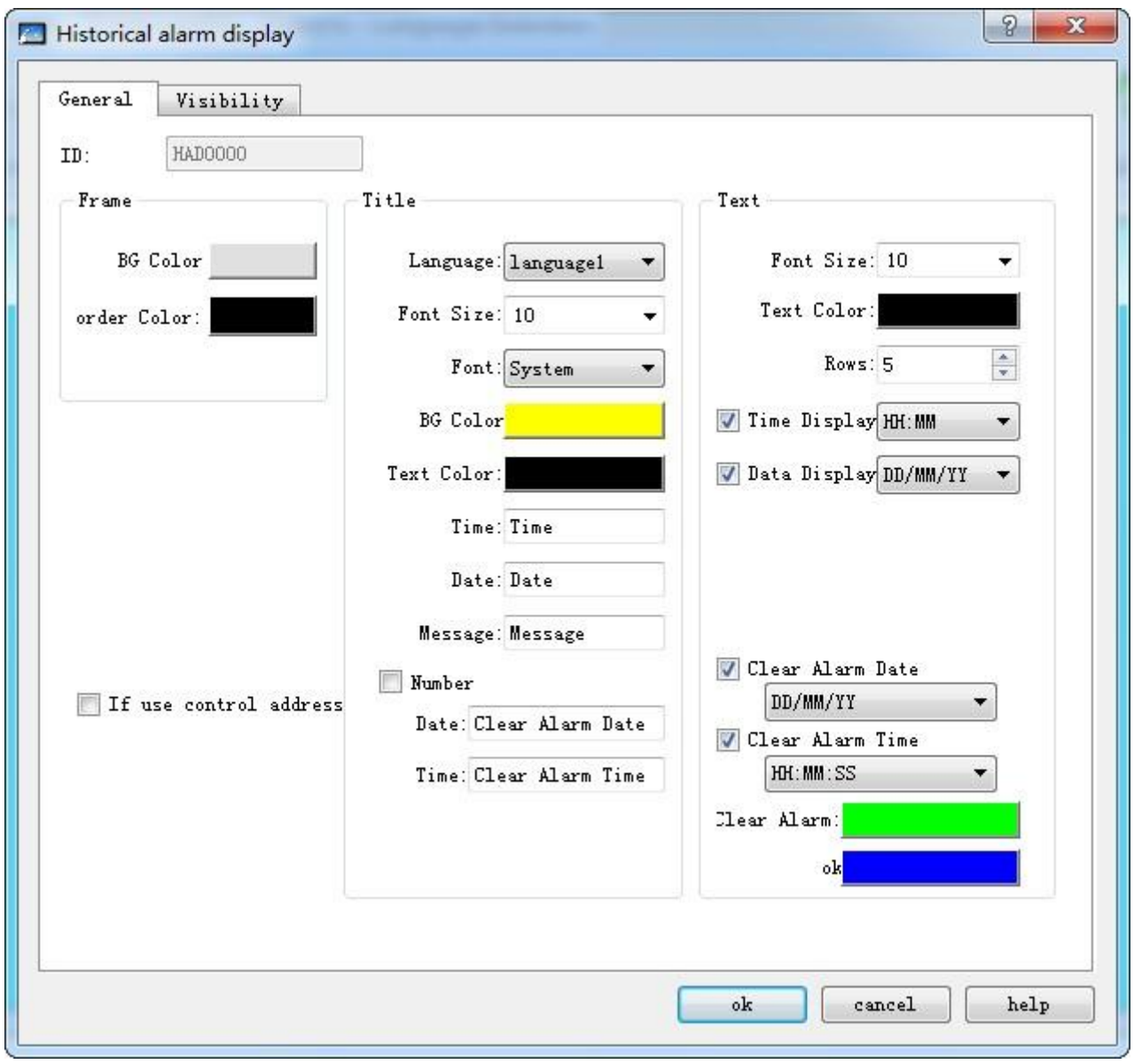


Figure 7-31 Alarm Display dialog box

Select the historical alarm display control in the toolbar menu to set the display content and parameters in the dialog box, as shown below:



Historical Alarm Display dialog box

9.7 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.

SKTOOL 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. As shown in Figure 7-32:

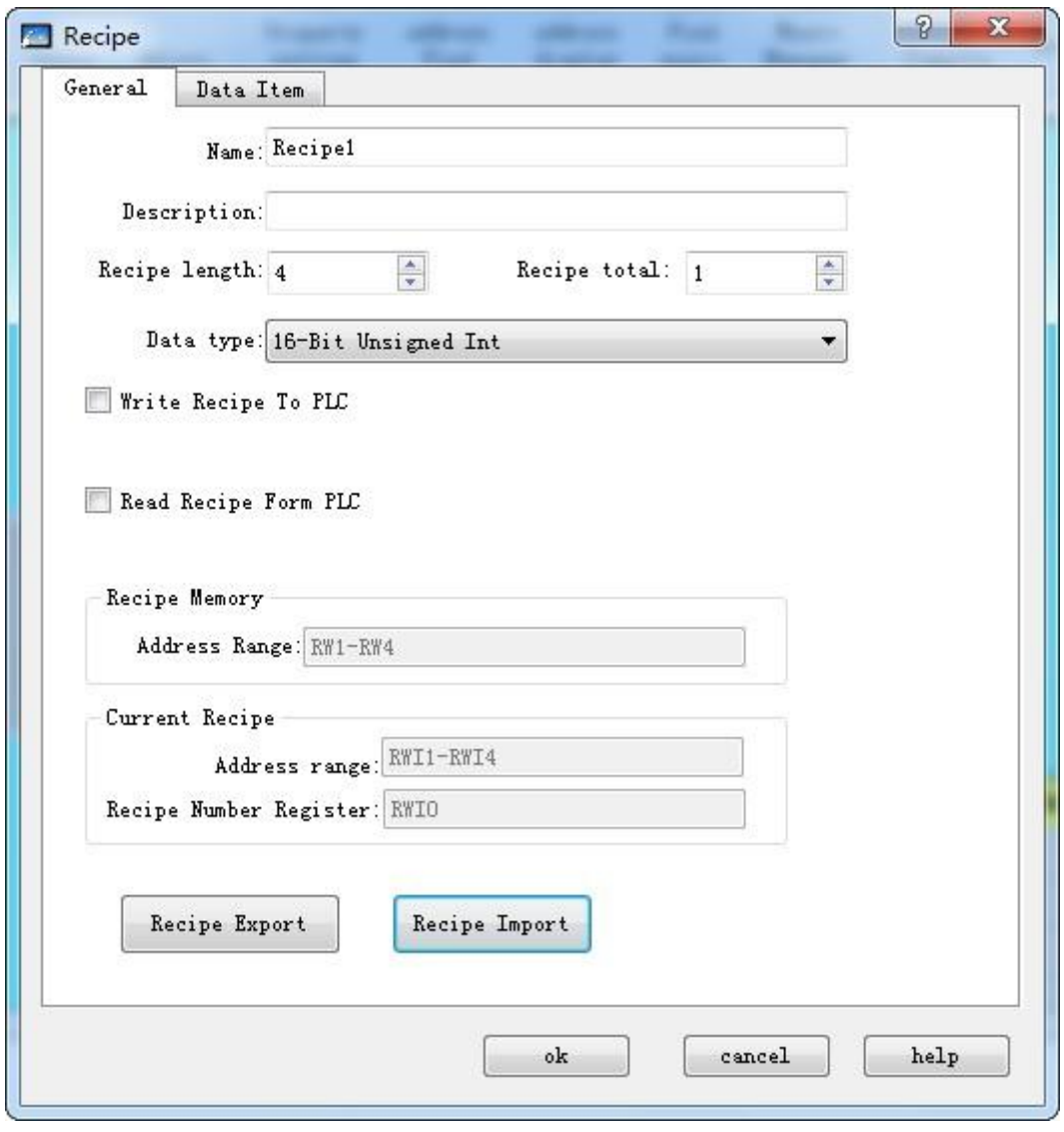


Figure 7-32 Recipe Property Settings Dialog Box

- 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;



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 recipe data item, as shown in Figure 7-33:

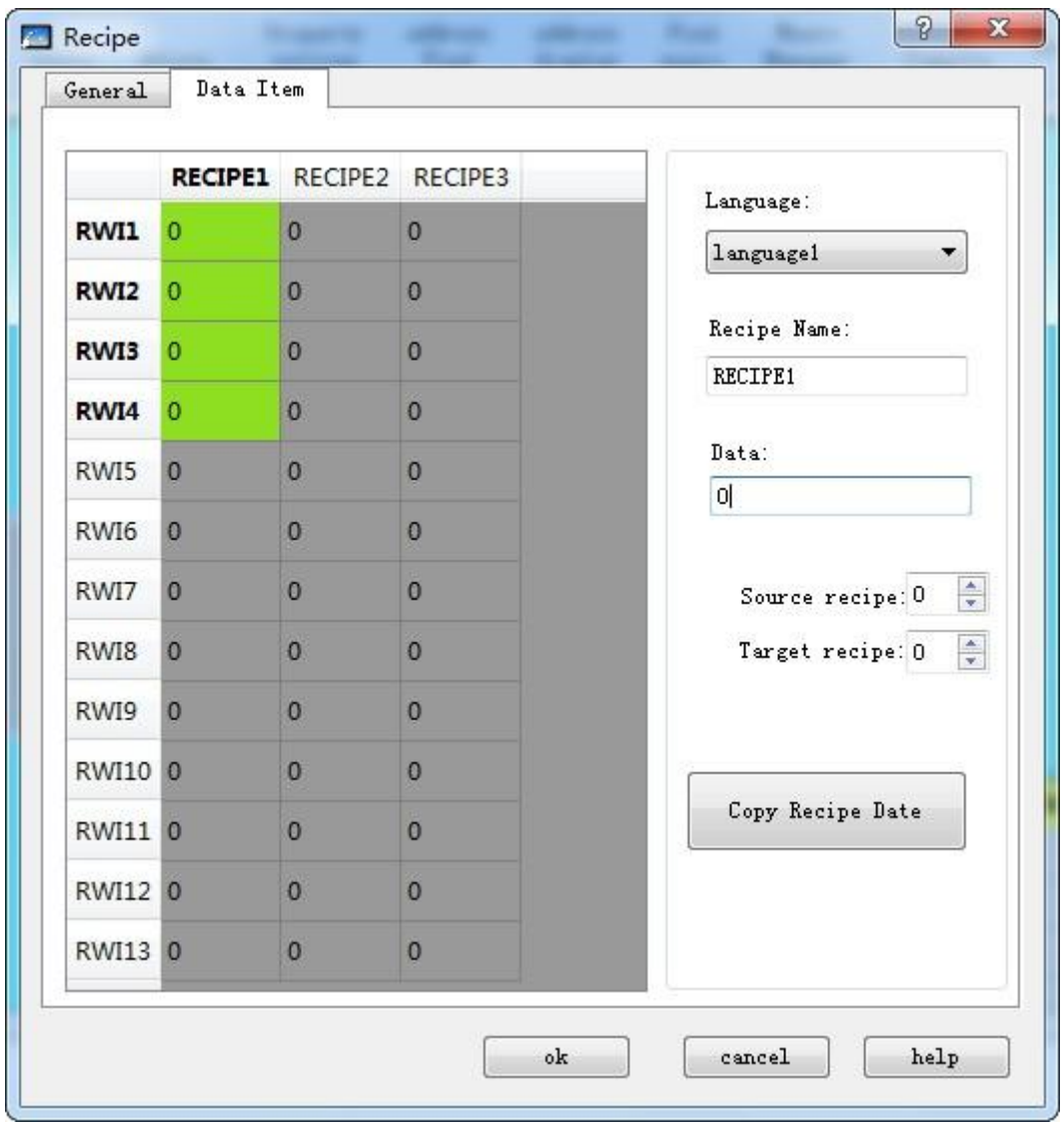


Figure 7-33 Recipe Data Item Page

- 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 7-34:

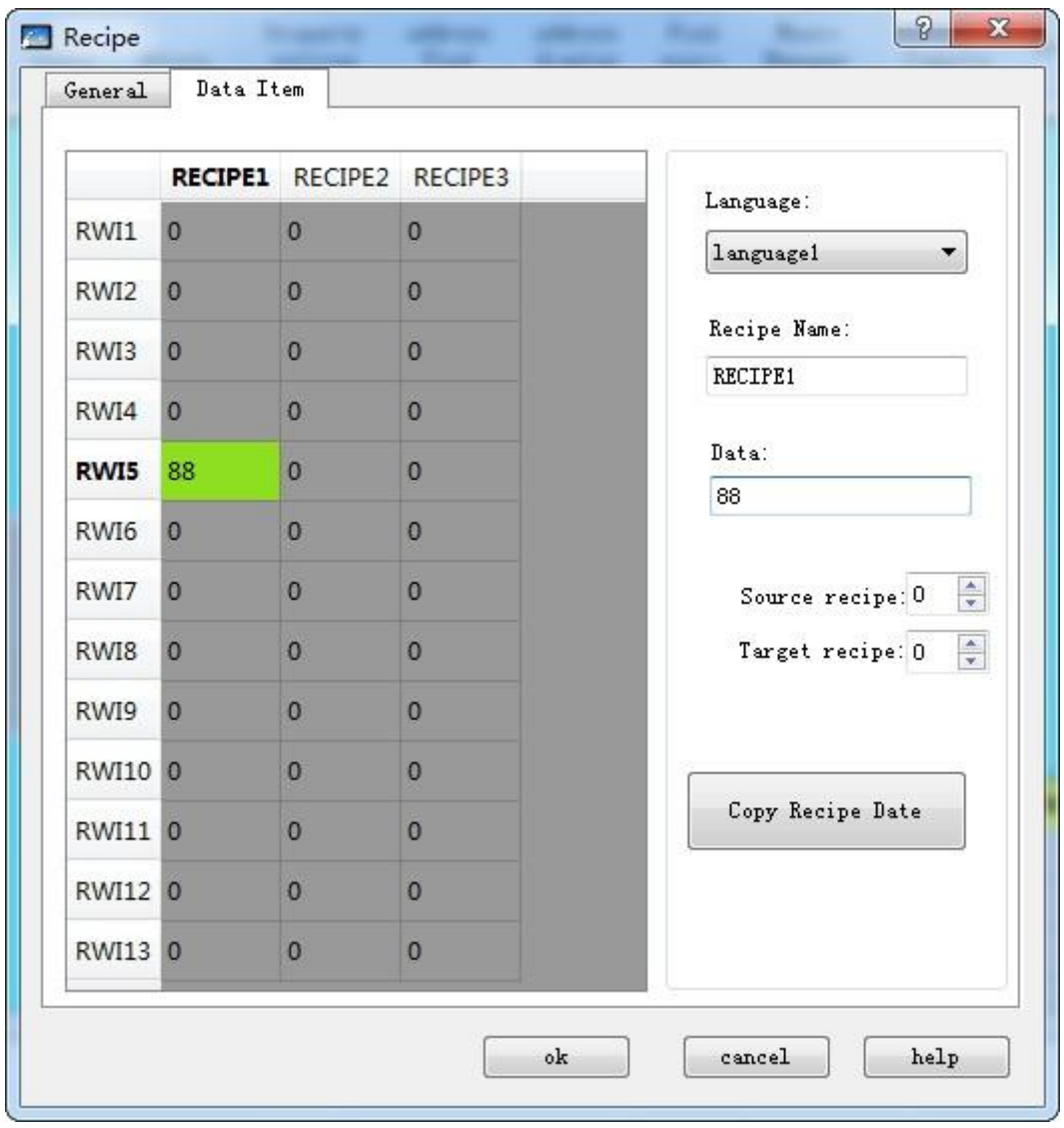


Figure 7-34　Function of recipe data copy

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: SKTOOL provides new function of multi-group recipe, but it supports only ten groups, otherwise a limit message will be prompted as shown in 7-34-2

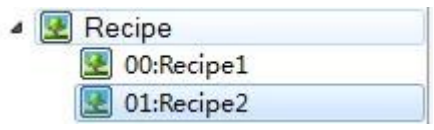


Figure 7-34-1

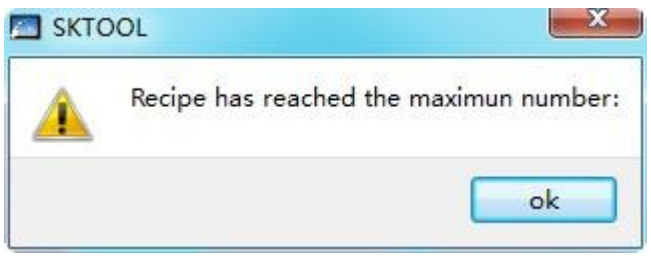


Figure 7-34-2

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 7-35:

Assume that all monitor address to be written is D0, the length of the recipe is 16 and the total number is 4.

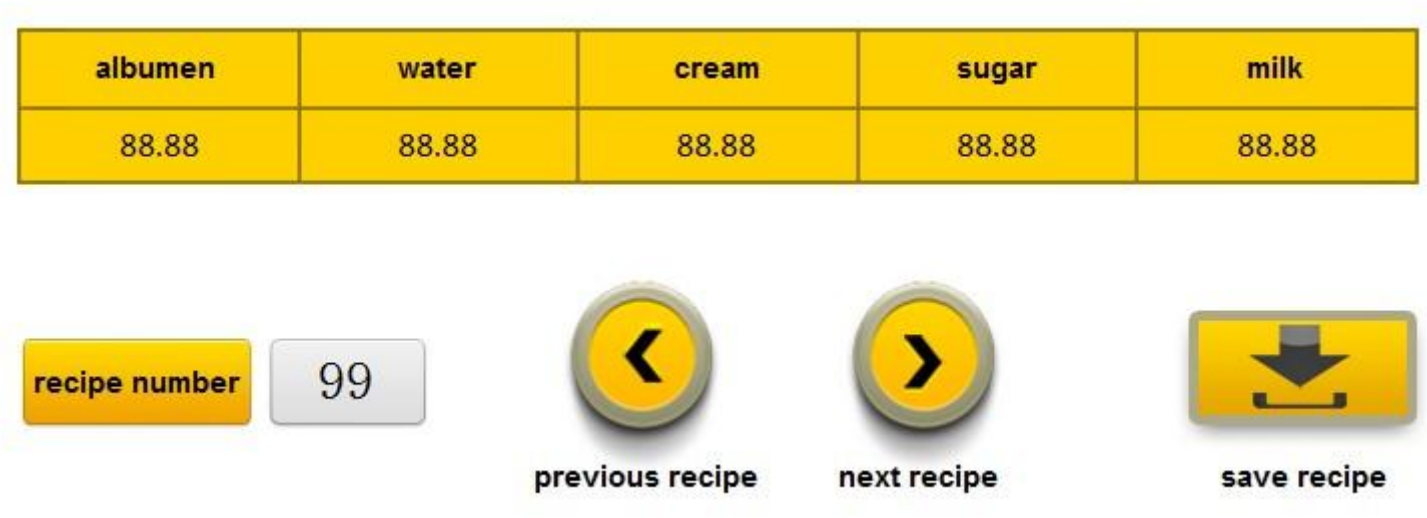


Figure 7-35　Effect of the Recipe

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.

9.8 Data Transmission

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.

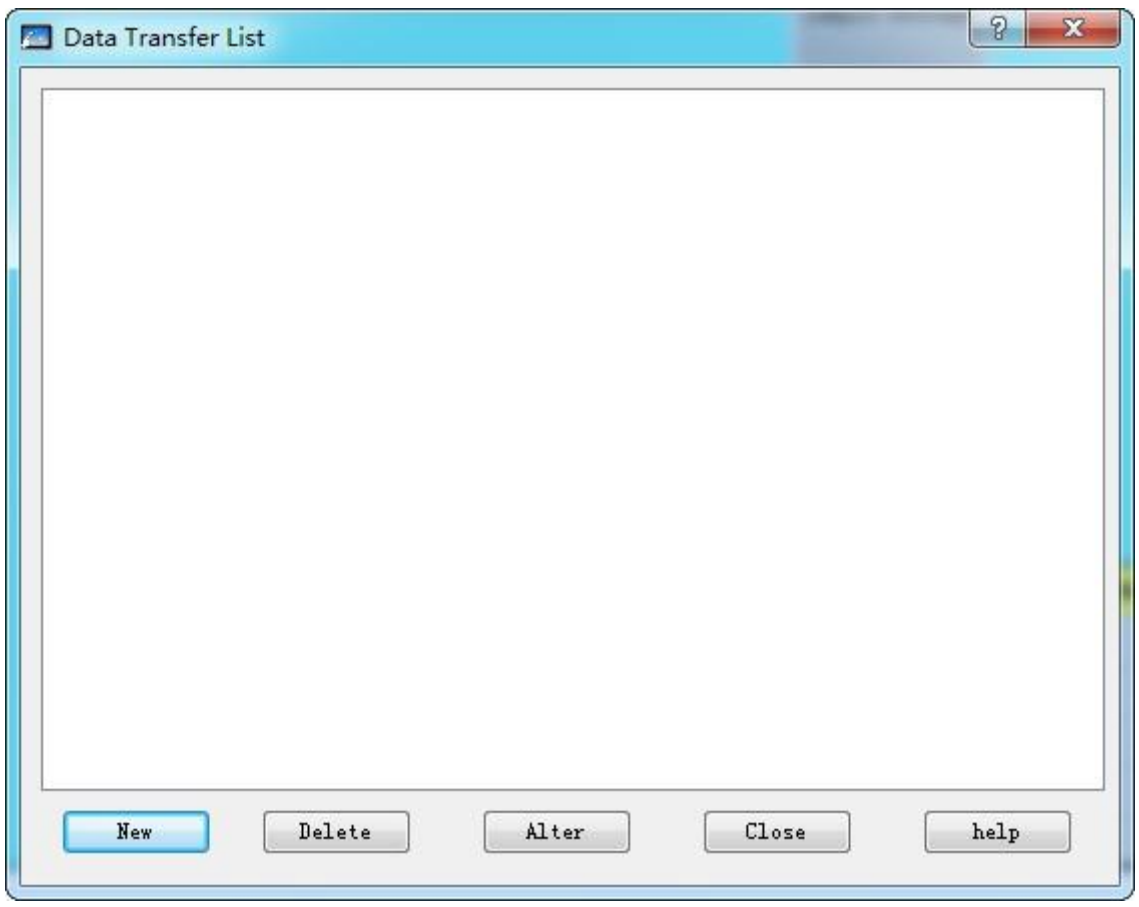


Figure 7-36

The transmission list lists details of all the current transmission items. Users can create, delete and modify them. SKTOOL 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:

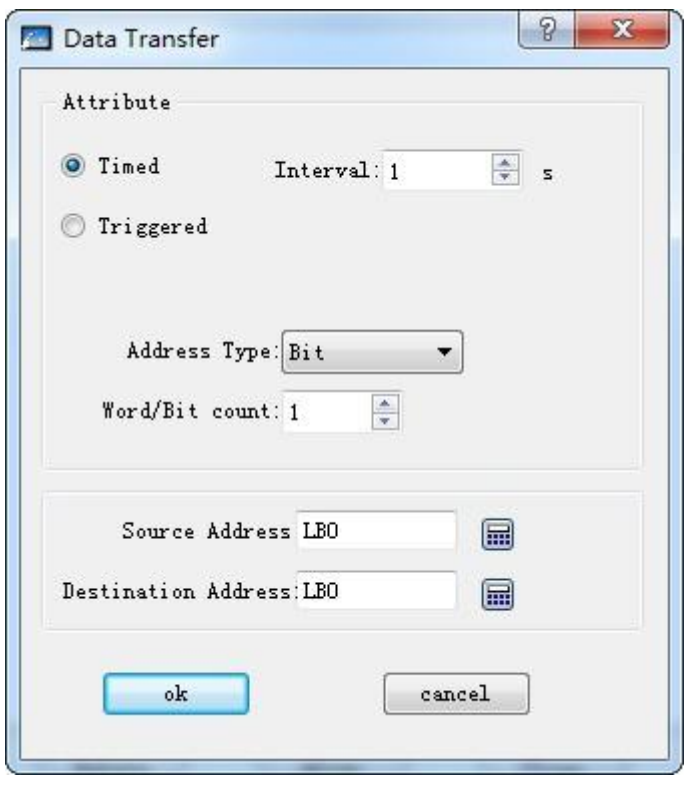


Figure 7-37

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.

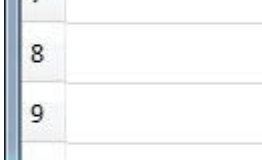
Address Type: Select the address type to transfer data: Bit / Word / Double Word.

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".



Destination address and Source address cannot be on the same PLC.

9.9 Global Macro

Set a macro that has been successfully compiled into a global macro, meaning executing this macro when the configuration starts running, and it will be executed during the run time without being limited by screens. A maximum of 64 global macros can be added, and they are executed in the set order.

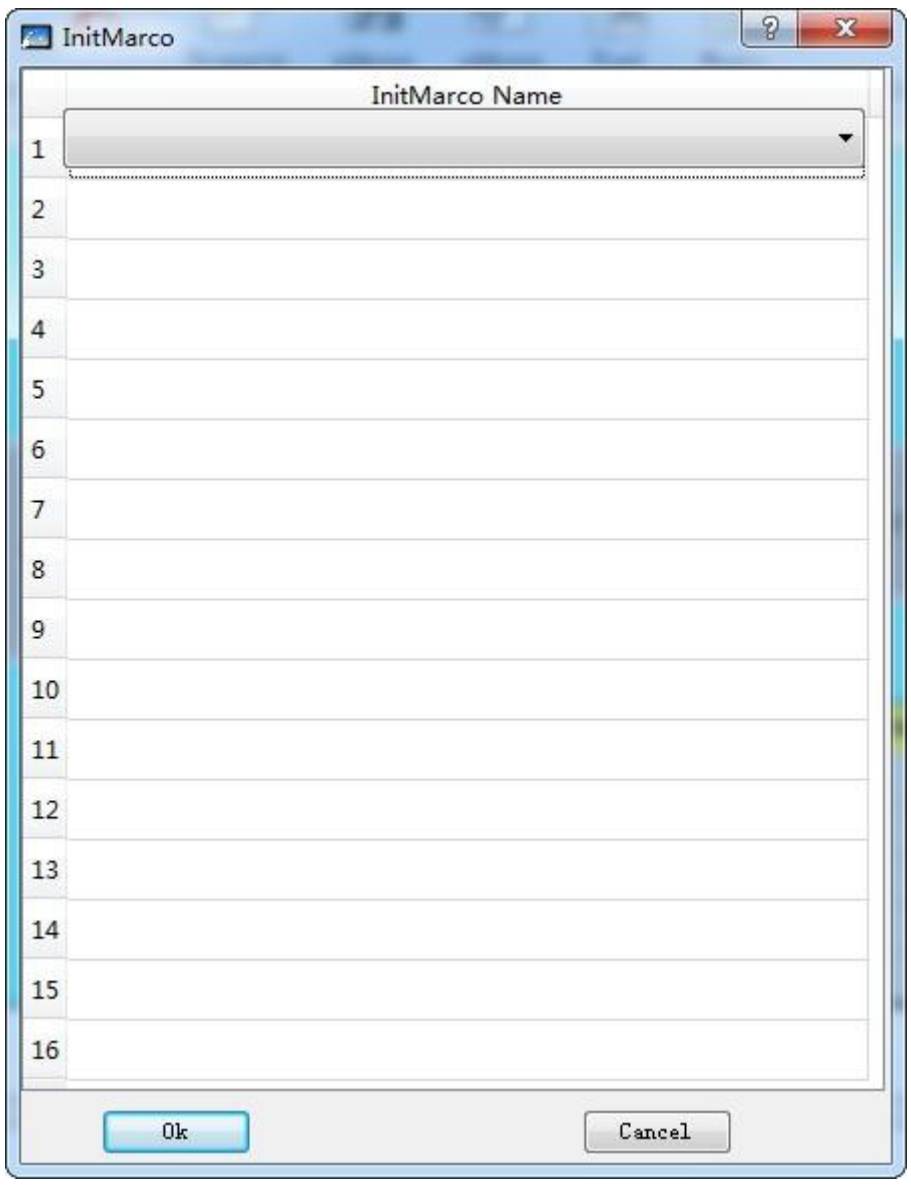
Click "Global Macro" on the menu "Settings", as shown in the dialog box:

Click the list item to list all the macro names that have been compiled successfully, and then decide whether the macro is controlled by bit and the execution frequency. The selected macro is executed as a global macro during configuration run time.

9.10 Init Macro

Set a macro that has been successfully compiled into an Init macro, meaning executing this macro only one time without being limited by screens. A maximum of 64 init macros can be added, and they are executed in the set order.

Click "Init Macro" on the menu "Setting", as shown in the dialog box:



Click the list item to list all the macro names that have been compiled successfully. The selected macro is executed as a init macro during configuration run time.

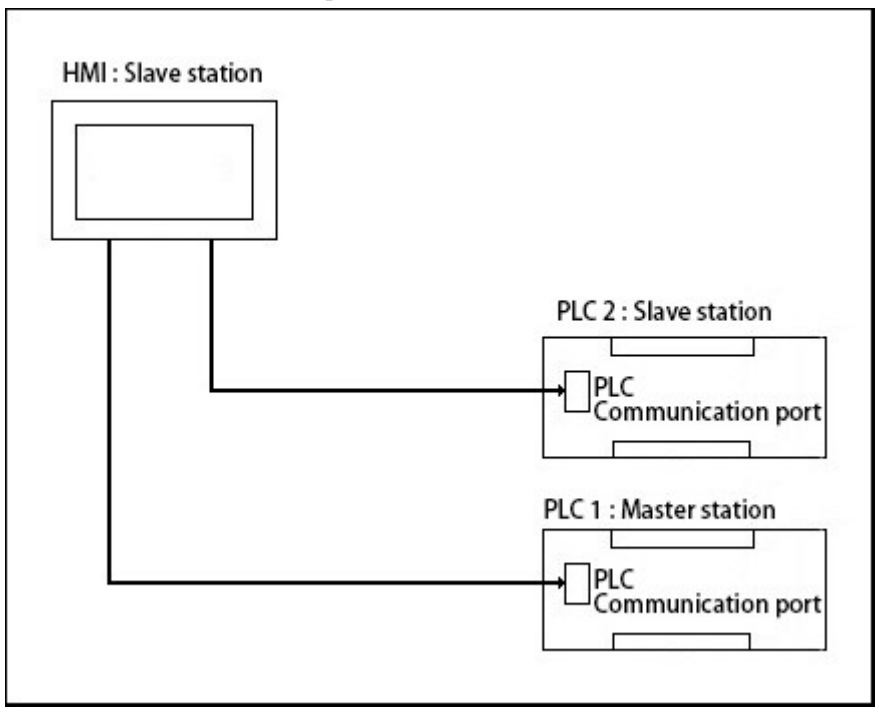
9.11 Data forwarding

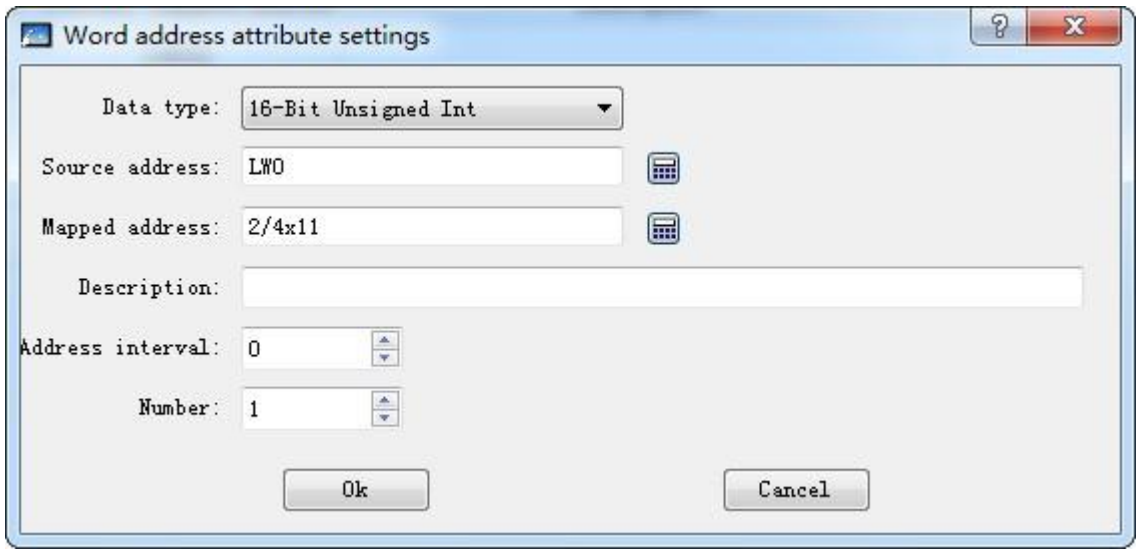
Function of Data Forwarding:

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.





10. Reserved Registers of SKTOOL System

SKTOOL 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 (Formula Index).

For example:

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.

Contents：

- LB
- LW
- RWI

10.1 LB

Register Address	Meaning	Note	Read/Write
60000-60099	Initialization Settings ON	Enable the initialization ON when system starts	R/W
60100	Download Formula	Write the data of this RWI to device if it is triggered; reset after execution	R/W
60101	Upload Formula	Read the formula data of device to RWI register if it is triggered; reset after execution	R/W
60102	Preserve Formula	Write Formula from RWI to FLASH if it is triggered; reset after execution	R/W
60103	Formula Downloading Indication	ON if formula is being written to device; OFF after the end of downloading	R
60104	Formula Uploading Indication	ON if formula is being read to device; OFF after the end of uploading	R
60105	Restart HMI	Restart system if it is triggered	R
60106	Backlight Control	Close Backlight when it is ON; Open Backlight when it is OFF	R/W
60107	Communication State of COM1	ON means normal communication or no communication; OFF means communication failure	R
60108	Communication State of COM2	ON means normal communication or no communication; OFF means communication	R

		failure	
60109	Modification preservation of COM1 communication parameters	Write modified communication parameters to FLASH if it is triggered; OFF after execution	R/W
60110	Modification preservation of COM2 communication parameters	Write modified communication parameters to FLASH if it is triggered; OFF after execution	R/W
60111	Modification confirmation of system parameters	Write modified communication parameters to FLASH if it is triggered; OFF after execution	R/W
60112	Abnormal communication window	ON means permission of exception window popping up; OFF means prohibition	R/W
60113	Mouse cursor control	ON means disolay of mouse censor; OFF means prohibition (Only available for touch)	R/W
60114	Connection state of USB	ON means with USB device connection; OFF means no connected USB device	R
60115	Coonection state of SD card	ON means with SD card connection; OFF means no connected SD card	R
60116	Touch Sound	Whether enable sound when touch or mouse click	R/W
60117	Alarm Sound	Whether enable alarm sound when alarm occurs	R/W
60118	Clear historical alarm record	Clear historical alarm record (Reset automatically)	R/W
60119	Clear operation record	Clear operation record (Reset automatically)	R/W
60120	Clear historical data	Clear historical data (Reset automatically)	R/W
60121	Reload Formula	Reload the formula data of the current one while it is ON; OFF when the reloading ends	R/W
60123	Save historical alarm	Save historical alarm record to disk when it is ON; OFF after the preservation	R/W
60124	Save historical data	Save historical data to disk when it is ON; OFF after the preservation	R/W
60125	Send historical alarm file to SD card	Send historical alarm file to SD card; OFF automatically after the sending	R/W
60126	Send historical data file to SD card	Send historical data file to SD card; OFF automatically after the sending	R/W
60127	Send historical alarm file to U disk	Send historical alarm file to U disk; OFF automatically after the sending	R/W
60128	Send historical data file to U disk	Send historical data file to U disk; OFF automatically after the sending	R/W
60129	Send the current project to U disk	Send the current project to U disk; OFF automatically after the sending	R/W
60130	Send the current project to SD card	Send the current project to SD card; OFF automatically after the sending	R/W
60133	User Logout	Cancel User Login when it is ON; Reset automatically after the cancelation	R/W
60141	Whether there is a real-time alarm	ON when a real-time alarm occurs	R
60142	Screen saver state of system	ON when it is under screen saver stat	R
60143	Copy operation record to U disk	Send operation record to U disk in case of ON; OFF automatically after the sending	R/W
60144	Copy operation record to SD card	Send operation record to SD card in case of ON; OFF automatically after the sending	R/W
60145	Copy all formulas to U disk	Send formulas to U disk in case of ON; OFF automatically after the sending	W
60146	Copy formulas to SD card	Send formula files to SD card incase of ON; OFF automatically after the sending	W
60147	End mark of Qrcode scanning USB	Triggered in case of ON	R/W
60148	Import historical trigger bit from U disk	Triggered in case of ON; reset automatically. Historical data file must be histdata.csv; otherwise the execution is invalid.	R/W
60149	Import historical trigger bit from SD card	Triggered in case of ON; reset automatically	R/W
60150	Export specific ID formula to U disk trigger bit	Triggered in case of ON; reset automatically	R/W
60151	Export specific ID formula to SD card trigger bit	Triggered in case of ON; reset automatically	R/W
60152	Export specific ID formula from U disk to HMI trigger bit	Triggered in case of ON; reset automatically	R/W
60153	Export specific ID formula from SD card to HMI trigger bit	Triggered in case of ON; reset automatically	R/W
60154	Clear trigger bit of specific ID formula trigger bit	Triggered in case of ON; reset automatically	R/W
60155	Cover formula trigger bit	Triggered in case of ON; reset automatically	R/W
60156	Read formula and save trigger bit	Triggered in case of ON; reset automatically	R/W
60163	Export formulas to U disk by groups		R/W
60164	Export formulas to SD card by groups		R/W

10.2 LW

Register Address	Meaning	Note	Read/Write
60000	Local time: second	Bcd code; effective value range: 0-59	R/W
60001	Local time: minute	Bcd code; effective value range: 0-59	R/W
60002	Local time: hour	Bcd code; effective value range: 0-23	R/W
60003	Local time: day	Bcd code; effective value range: 1-31	R/W
60004	Local time: month	Bcd code; effective value range: 1-12	R/W
60005	Local time: year	Bcd code; effective value range: 0-9999	R/W
60006	Local time: week	Bcd code; effective value range: 1-7	R
60007	System running hours	Hours of system running time	R
60008	System running minutes	Minutes of system running time	R
60009	System running seconds	Seconds of system running time	R
60010	Serial number of the current screen window	Serial number of the current screen	R
60012	Current language	Corresponding language serial number	R
60013	Upper limit of value input	Upper limit of allowable input in user-defined keyboard; ASC display	R
60023	Lower limit of value input	Lower limit of allowable input in user-defined keyboard; ASC display	R
60033	Data contents shown in keyboard	Data contents shown in keyboard; characters entered via keyboard; ASC display	R
60065	Current Logged in User	Current user serial number	R
60066	Current Logged in User Password	Display the current user password; 16 characters; ASC display	R
60074	Current logged in User name	Display the current user name; 32 characters; ASC display	R
60090	Whether enable User 1	0-inactivate; 1-activate	R
60091	Whether enable User 2	0-inactivate; 1-activate	R
60092	Whether enable User 3	0-inactivate; 1-activate	R
60093	Whether enable User 4	0-inactivate; 1-activate	R
60094	Whether enable User 5	0-inactivate; 1-activatev	R
60095	Whether enable User 6	0-inactivate; 1-activate	R
60096	Whether enable User 7	0-inactivate; 1-activate	R
60097	Whether enable User 8	0-inactivate; 1-activate	R
60098	Name of User 1	32 characters; ASC display	R
60114	Name of User 2	32 characters; ASC display	R
60130	Name of User 3	32 characters; ASC display	R
60146	Name of User 4	32 characters; ASC display	R
60162	Name of User 5	32 characters; ASC display	R
60178	Name of User 6	32 characters; ASC display	R
60194	Name of User 7	32 characters; ASC display	R
60210	Name of User 8	32 characters; ASC display	R
60226	Password of User 1	16 characters; ASC display	R
60234	Password of User 2	16 characters; ASC display	R
60242	Password of User 3	16 characters; ASC display	R
60250	Password of User 4	16 characters; ASC display	R
60258	Password of User 5	16 characters; ASC display	R
60266	Password of User 6	16 characters; ASC display	R
60274	Password of User 7	16 characters; ASC display	R
60282	Password of User 8	16 characters; ASC display	R
60290	Screen saver time	Display specific screen saver time; setting range: 0-60	R/W
60291	Flicker circle of Indicator light	Flicker circle of Indicator light; the minimum value is 0.1s	R/W
60292	X position in case of touch	Position of X coordinate in case of touch	R
60293	Y position in case of touch	Position of Y coordinate in case of touch	R
60294	X position at the end of touch	Position of X coordinate at the end of touch	R

60295	Y position at the end of touch	Position of Y coordinate at the end of touch	R
60296	Touch state	1-Touch; 0-Release	R
60297	Checking of COM1	Communication parameters, checking: 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 bit: 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	Continuous address interval of PLC to COM1	The maximum length of contiguous address that can be read by a single communication	R/W
60304	Communication time of COM1	Delay time of communication	R/W
60305	Retry number of COM1	Number of retries in case of abnormal system	R/W
60306	Address Mode of COM1	Address mode: 0-standard mode; 1-extended mode	R
60307	Time of COM1 timeout	Set communication timeout; unit: ms	R/W
60308	Current waiting time of COM1 communication	Current waiting time of communication; unit : ms	R/W
60309	HMI Site of COM1	0-Machine; 1-Far-end	R/W
60312	Checking of COM2	Communication parameters, checking: 0-NONE, 1-EVEN, 2-ODD	R/W
60313	Baud rate of COM2	Communication parameters, baud rate: 0-1200,1-2400,2-4800,3-9600,4-19200,5-38400,6-57600,7-115200	R/W
60314	Stop Bit of COM2	Communication parameters, stop bit: 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	Continuous address interval of PLC to COM2	The maximum length of contiguous address that can be read by a single communication	R/W
60319	Communication time of COM2	Communication delay time	R/W
60320	Retry number of COM2	Number of retries in case of abnormal system	R/W
60321	Address Mode of COM2	Address mode: 0-standard mode; 1-extended mode	R
60322	Time of COM2 timeout	Set communication timeout; unit: ms	R/W
60323	Current waiting time of COM2 communication	Current waiting time of communication; unit : ms	R/W
60324	HMI Site of COM2	0-Machine; 1-Far-end	R/W
60327	Number of historical alarm	Sum of recorded historical alarm	R/ Double word
60329	Number of historical data	Sum of recorded historical data	R/ Double word
60333	Keyboard Language Switch	1-Chinese keyboard, 0-English keyboard; aim at standard keyboard	R/W
60334	CPU usage	Current CPU usage rate during the running of system	R
60335	Backlight luminance value	Backlight luminance value	R/W
60337	Creation time of the current project: year	Creation time of the current project: year	R
60338	Creation time of the current project: month	Creation time of the current project: month	R
60339	Creation time of the current project: day	Creation time of the current project: day	R
60340	Current language	Set current language	W
60359	Copy historical alarm between specific serial number range to U disk when the value is 1		R/W
60360	Copy historical alarm between specific serial number range to SD card when the value is 1		R/W
60361	Copy historical alarm between specific time range to U disk when the value is 1		R/W
60362	Copy historical alarm between specific time range to SD card when the value is 1		R/W
60363	Export the start serial number of historical alarm		R/W
60365	Export the end serial number of historical alarm		R/W
60367	Export start time of historical alarm	Length: six characters; year, month, day, hour, minute and second	R/W
60373	Export end time of historical alarm	Length: six characters; year, month, day, hour, minute and second	R/W
60379	File name of historical alarm exported to U disk and SD card	Length: 24 characters	R/W
60408	Current group number of historical data imported or exported		R/W

60409	Copy historical data between specific serial number range to U disk when the value is 1		R/W
60410	Copy historical data between specific serial number range to SD card when the value is 1		R/W
60411	Copy historical data between specific time range to U disk when the value is 1		R/W
60412	Copy historical data between specific time range to SD card when the value is 1		R/W
60413	Export start serial number of historical data		R/W
60415	Export end serial number of historical data		R/W
60417	Export start time of historical data	Length: six characters; year, month, day, hour, minute and second	R/W
60423	Export end time of historical data	Length: six characters; year, month, day, hour, minute and second	R/W
60429	File name of historical data exported to U disk and SD card	Length: 24 characters	R/W
60441	Cache region of password modification of User 1	Length: 16 characters; ASC display	R/W
60449	Enable modify password of User 1	Modify the password of User 1 as that in cache region when the value is 1; reset automatically after setting	R/W
60451	Cache region of password modification of User 2	Length: 16 characters; ASC display	R/W
60459	Enable modify password of User 2	Modify the password of User 2 as that in cache region when the value is 1; reset automatically after setting	R/W
60461	Cache region of password modification of User 3	Length: 16 characters; ASC display	R/W
60469	Enable modify password of User 3	Modify the password of User 3 as that in cache region when the value is 1; reset automatically after setting	R/W
60471	Cache region of password modification of User 4	Length: 16 characters; ASC display	R/W
60479	Enable modify password of User 4	Modify the password of User 4 as that in cache region when the value is 1; reset automatically after setting	R/W
60481	Cache region of password modification of User 5	Length: 16 characters; ASC display	R/W
60489	Enable modify password of User 5	Modify the password of User 5 as that in cache region when the value is 1; reset automatically after setting	R/W
60491	Cache region of password modification of User 6	Length: 16 characters; ASC display	R/W
60499	Enable modify password of User 6	Modify the password of User 6 as that in cache region when the value is 1; reset automatically after setting	R/W
60501	Cache region of password modification of User 7	Length: 16 characters; ASC display	R/W
60509	Enable modify password of User 7	Modify the password of User 7 as that in cache region when the value is 1; reset automatically after setting	R/W
60511	Cache region of password modification of User 8	Length: 16 characters; ASC display	R/W
60519	Enable modify password of User 8	Modify the password of User 8 as that in cache region when the value is 1; reset automatically after setting	R/W
60520	HMI Model	40 characters	R
60540	Bootloader version number	40 characters	R
60560	Operation system version number	40 characters	R
60580	Software version number	40 characters	R
60600	Enable operation record	Enable record operation log when it is 1	R/W
60601	Number of operation record	Display the current number of operation record	R
60602	Enable screen shot	Enable screen shot when it is 1; reset after setting	R/W
60603	Storage location of screen shot	0-U disk; 1-SD card	R/W
60604	Enable HMI protection	Enable HMI protection when it is 1	R/W
60605	Set the level number of HMI protection password	Set the level number of HMI protection password; up to 10 passwords can be set	R/W
60606-60835	Set period of validity of HMI protection	60606-60628 is for year, month, day, hour, minute, second, deadline prompt and unlock password protection of Level 1 password (password length is 16 characters); 60629-60651 is for year, month, day, hour, minute, second, deadline prompt and unlock password protection of Level 2 password (password length is 16 characters); 60652-60674 is for year, month, day, hour, minute, second, deadline prompt and unlock password protection of Level 3 password (password length is 16 characters); 60675-60697 is for year, month, day, hour, minute, second, deadline prompt and unlock password protection of Level 4 password (password length is 16 characters); 60698-60720 is for year, month, day, hour, minute, second, deadline prompt and unlock password protection of Level 5 password (password	R/W

		length is 16 characters); 60721-60743 is for year, month, day, hour, minute, second, deadline prompt and unlock password protection of Level 6 password (password length is 16 characters); 60744-60766 is for year, month, day, hour, minute, second, deadline prompt and unlock password protection of Level 7 password (password length is 16 characters); 60767-60789 is for year, month, day, hour, minute, second, deadline prompt and unlock password protection of Level 8 password (password length is 16 characters); 60790-60812 is for year, month, day, hour, minute, second, deadline prompt and unlock password protection of Level 9 password (password length is 16 characters); 60813-60835 is for year, month, day, hour, minute, second, deadline prompt and unlock password protection of Level 10 password (password length is 16 characters)	
60836	Enable save to HMI	Preserve the HMI protection settings to HMI when it is 1; reset automatically after setting	R/W
60837	Initialize HMI protection	Set HMI protection to the initial state	W
60997	Keyboard input or USB mouse operation; Scanning machine input when the value is 1	Triggered when it is ON; reset automatically	R/W
60998	End Symbol definition of USB bar code scanning. 0-ENTER，1-TAB+ENTER		R/W
60999	Scan code length of USB bar code		R/W
61000 - 61127	Storage usage of bar code scanning		R/W
61128	Employed for printer parameters		R/W
61138	Source formula ID number of imported formula		R/W
61139	Target formula ID number of imported formula		R/W
61140	Clear formula ID number	-1 when initial value is presented as a 16-Bit integer; otherwise, 65535	R/W
61141	Switch formula group number		R/W
61143	Specific formula group number		R/W

10.3 RWI

Register address	Meaning	Note
RWI0	Formula number register	Display the formula specified by the formula number.
RWI1	Formula memory address	Specify a formula number to display corresponding formula data in RWI.

11. Connection among multiple screens and machines

This chapter introduces multipoint connection of Samkoon HMI series touch screen that is “one machine with multiple screens” connection, “one screen with multiple machines” connection, and the very useful function penetration connection.

Contents：

- “One machine with multiple screens” connection
- “One screen with multiple machines” connection

- Penetration connection
- Modbus TCP/IP

11.1 “One machine with multiple screens” connection

Samkoon HMI series touch screen allows “one machine with multiple screens” connection for PLC via MODBUS protocol. All touch screens are connected one by one, and the first screen is connected with PLC. All touch screens 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 touch screen 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 touch screens. Thus, the touch screens set as Slave Station may communicate with PLC through the first touch screen. 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 touch screens 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 8-1, 8-2 and 8-3：

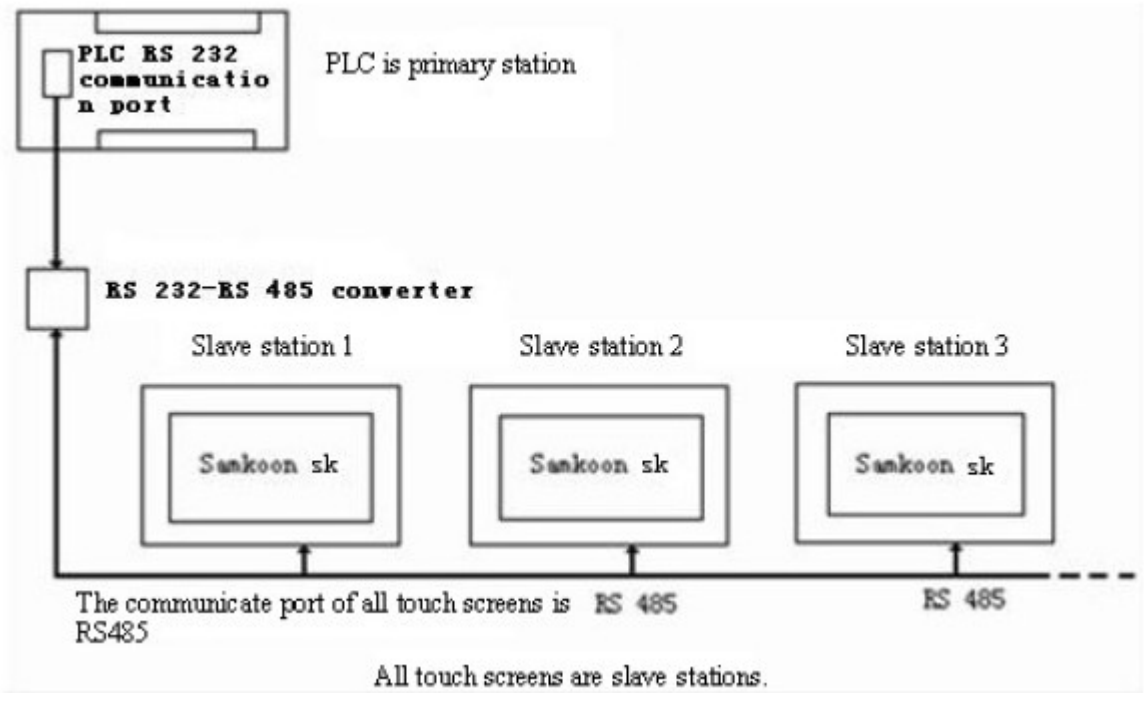


Figure 8-1 Sketch map of “One machine with multiple machines” when PLC(RS232) is Master station

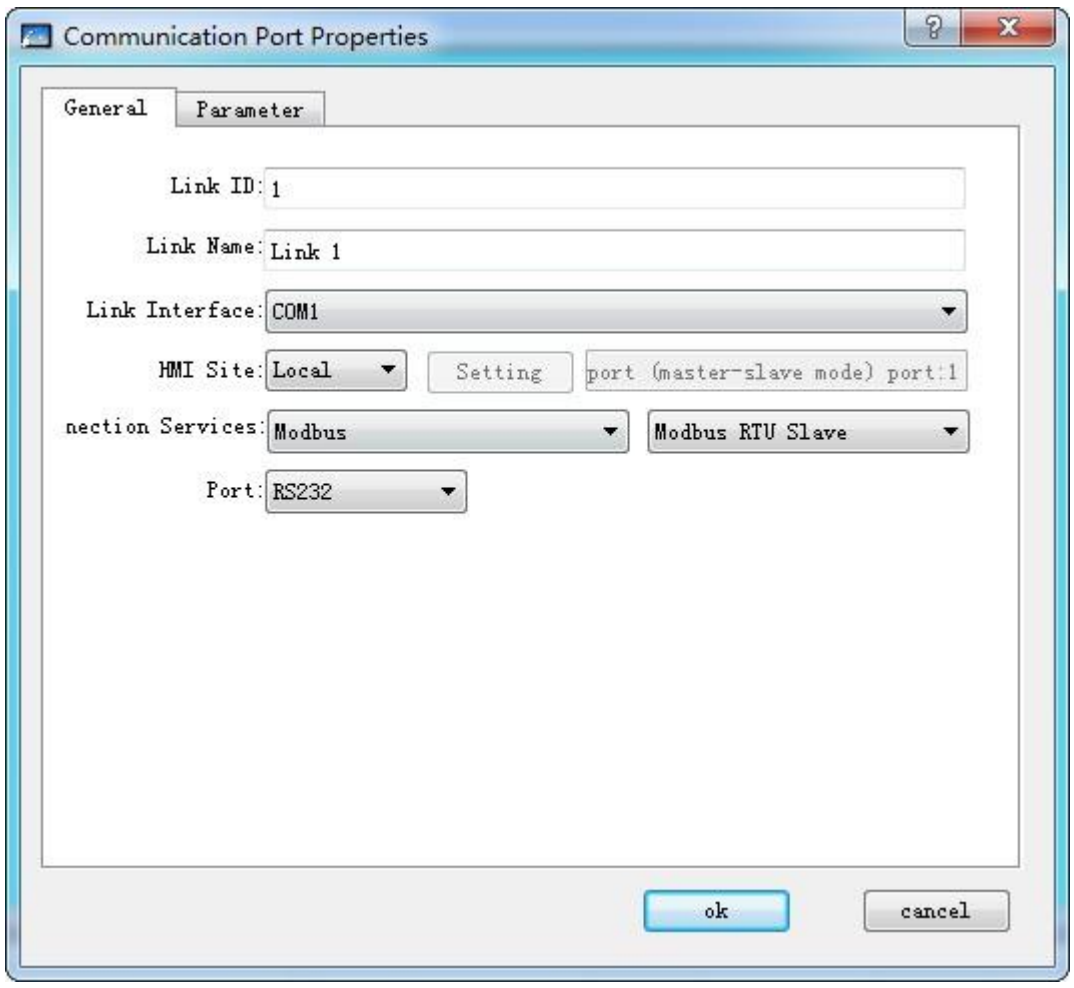


Figure 8-2 Choose MODBUS protocol, and set it as Slave Station

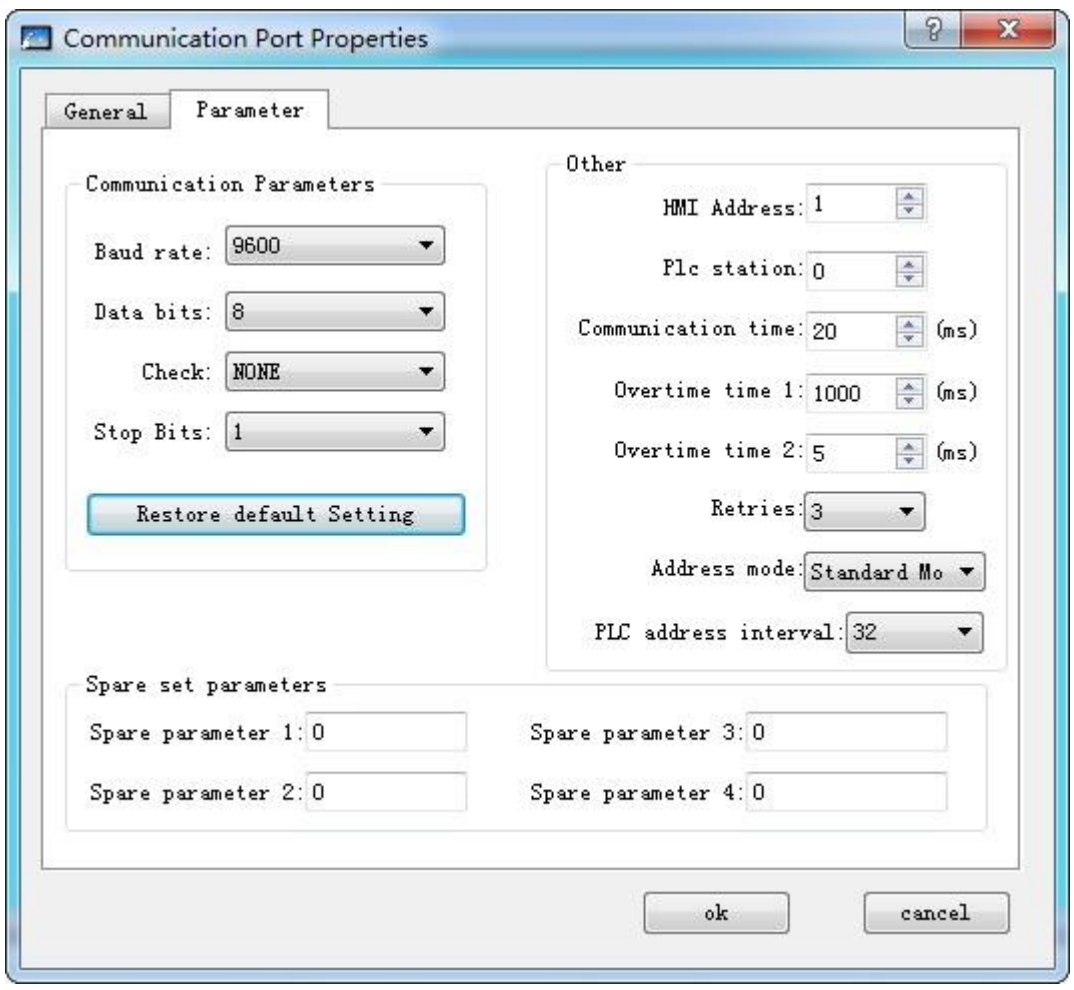


Figure 8-3 Allocation station address of HMI

2. The communication port of the PLC connected is RS485, connection method is as shown in Figure 8-4:

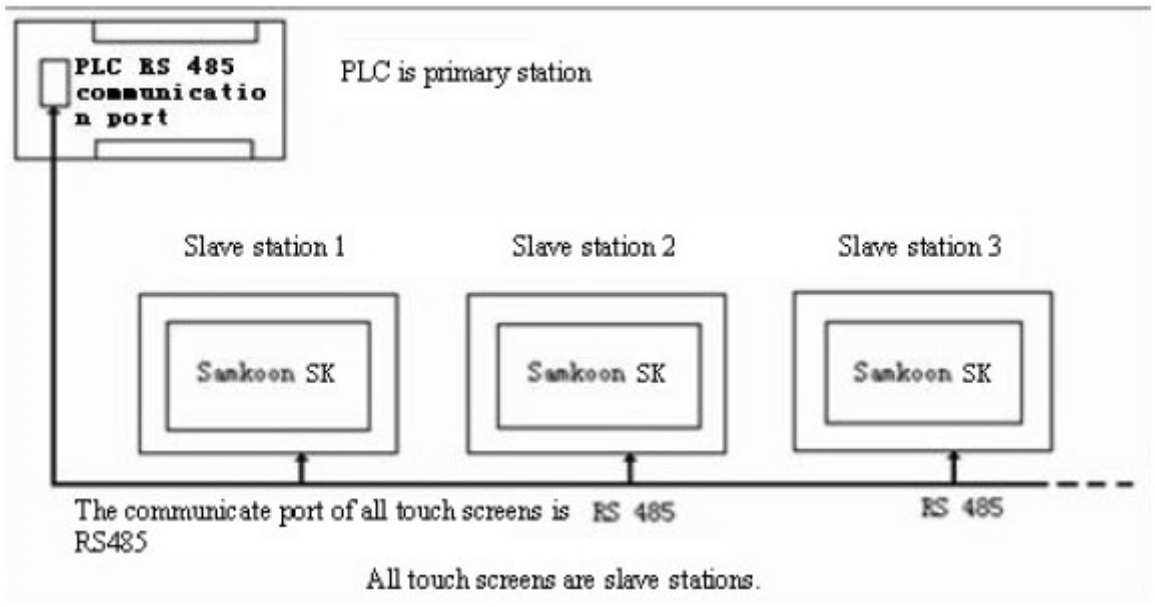


Figure 8-4 Sketch map of “One machine with multiple machines” when PLC(RS485) is Master station

When the communication port of PLC is RS485, as all touch screens are Slave Station, the system settings are the same as those when the communication port is RS232. Refer to Figure 8-2 and Figure 8-3.

When all HMI series screens are set as Slave Station, up to 255 screens may be connected. However, if many touch screens are connected, the response will be slow.

When the first touch screen is set as Master Station, and the PLC and all other screens 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 8-5, 8-6 and 8-7：

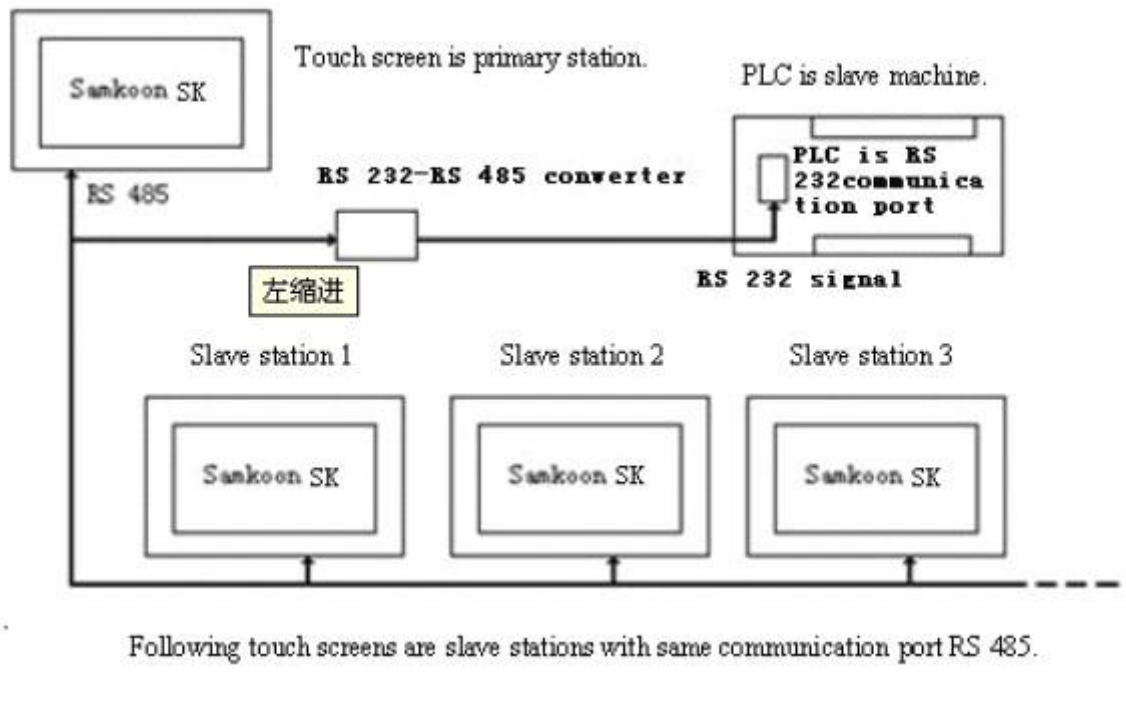


Figure 8-5 Sketch map of “One machine with multiple machines” when PLC (RS232) is Slave station

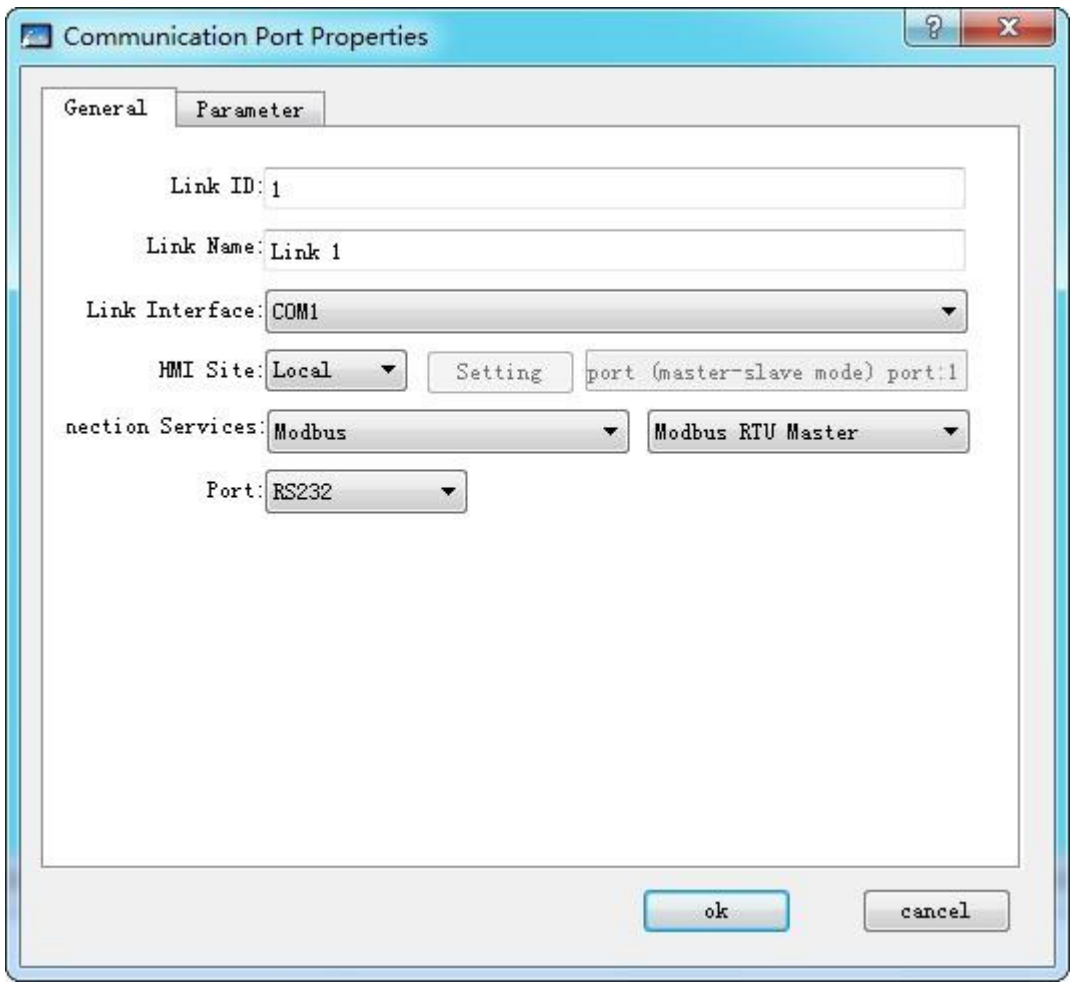


Figure 8-6 Choose MODBUS protocol for the first screen and set it as Master Station

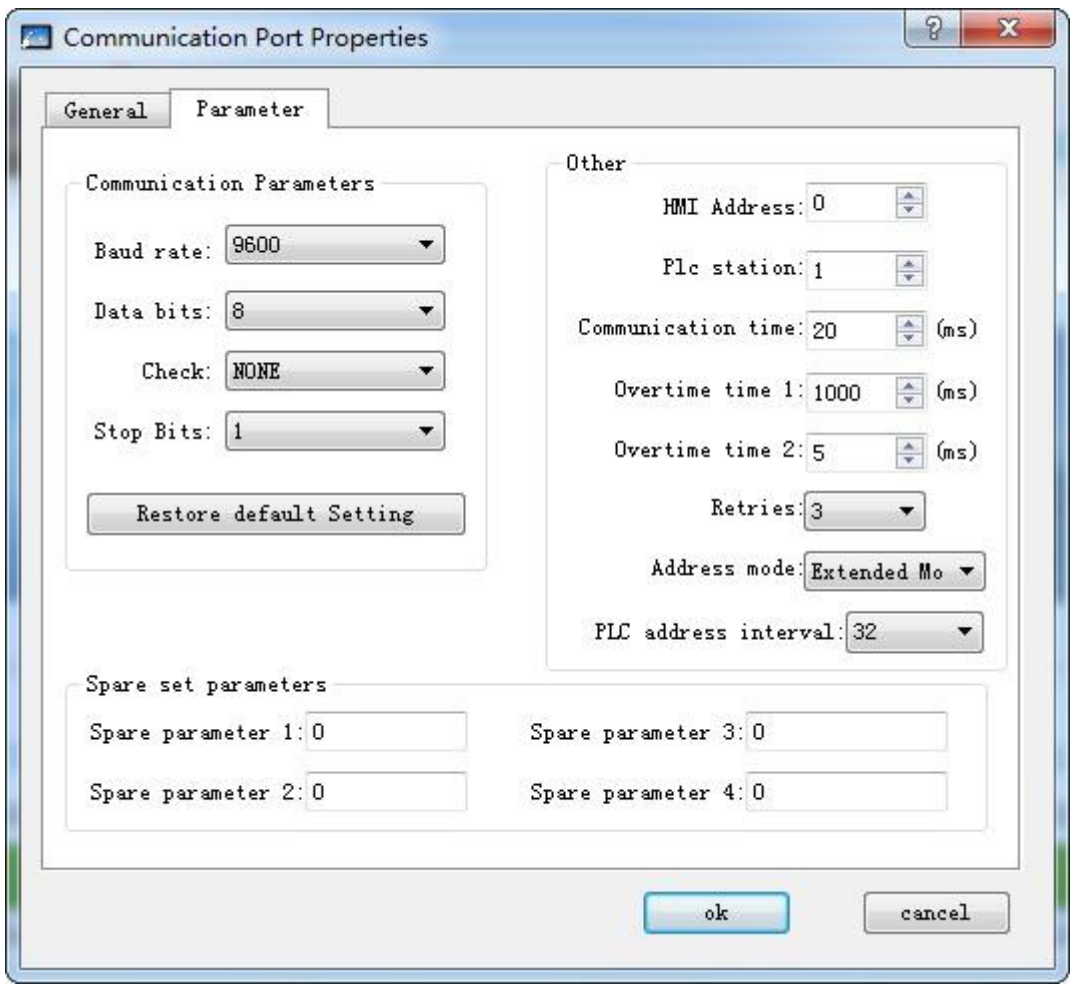


Figure 8-7 Extended are required when the first touch screen is set as Master Station

System setting of the touch screens set as slave station is similar as those shown in Figure 8-2 and Figure 8-3.

Tips:

Note: As RS232 cannot support multi-drop connection, when the PLC in the “one machine with multiple screens” connection does not support RS485 port, a communication adapter is required to convert RS485 signal to RS232 signal.

Note: When HMI series touch screen is set as master station in the “one machine with multiple screens” connection, multiple protocols must be set for the address mode of the touch screen 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.

11.2 “One screen with multiple machines” connection

HMI series allows not only “one machine with multiple screens” connection but also “one screen with multiple machines” connection for PLC via MODBUS protocol. In “one screen with multiple machines” connection, one touch screen 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 touch screen is set as Master Station and all PLCs are set as Slave Screens. Then, the touch screen may operate the register address of the PLCs. The register names of the PLCs correspond to the register names in MODBUS protocol.

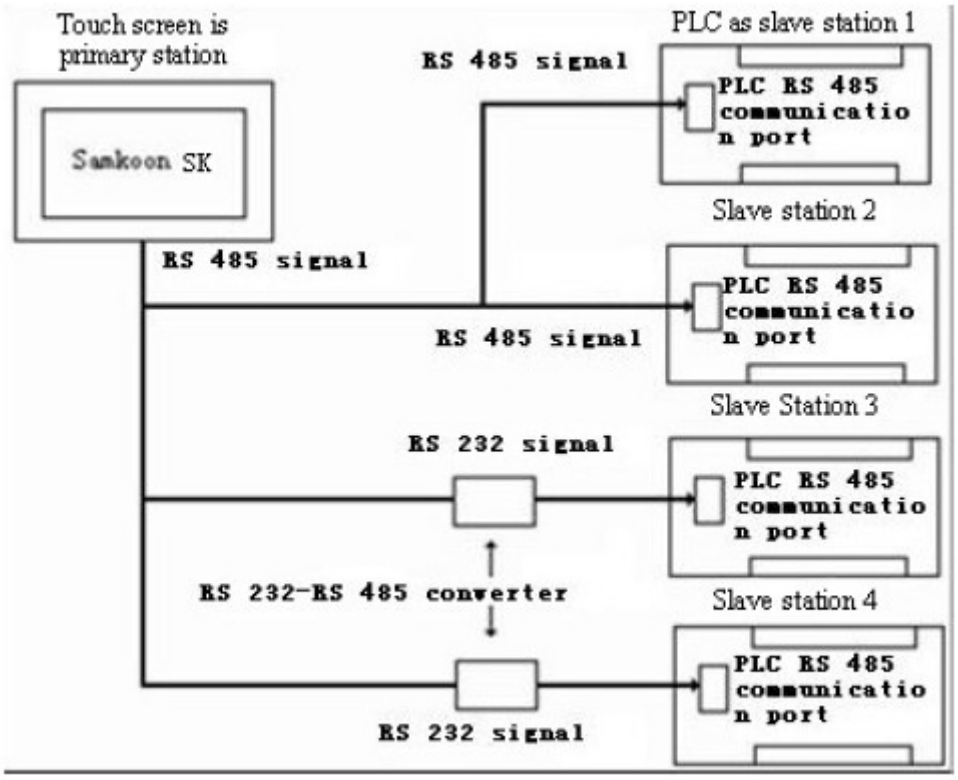


Figure 8-8 “One screen with multiple machines” connection

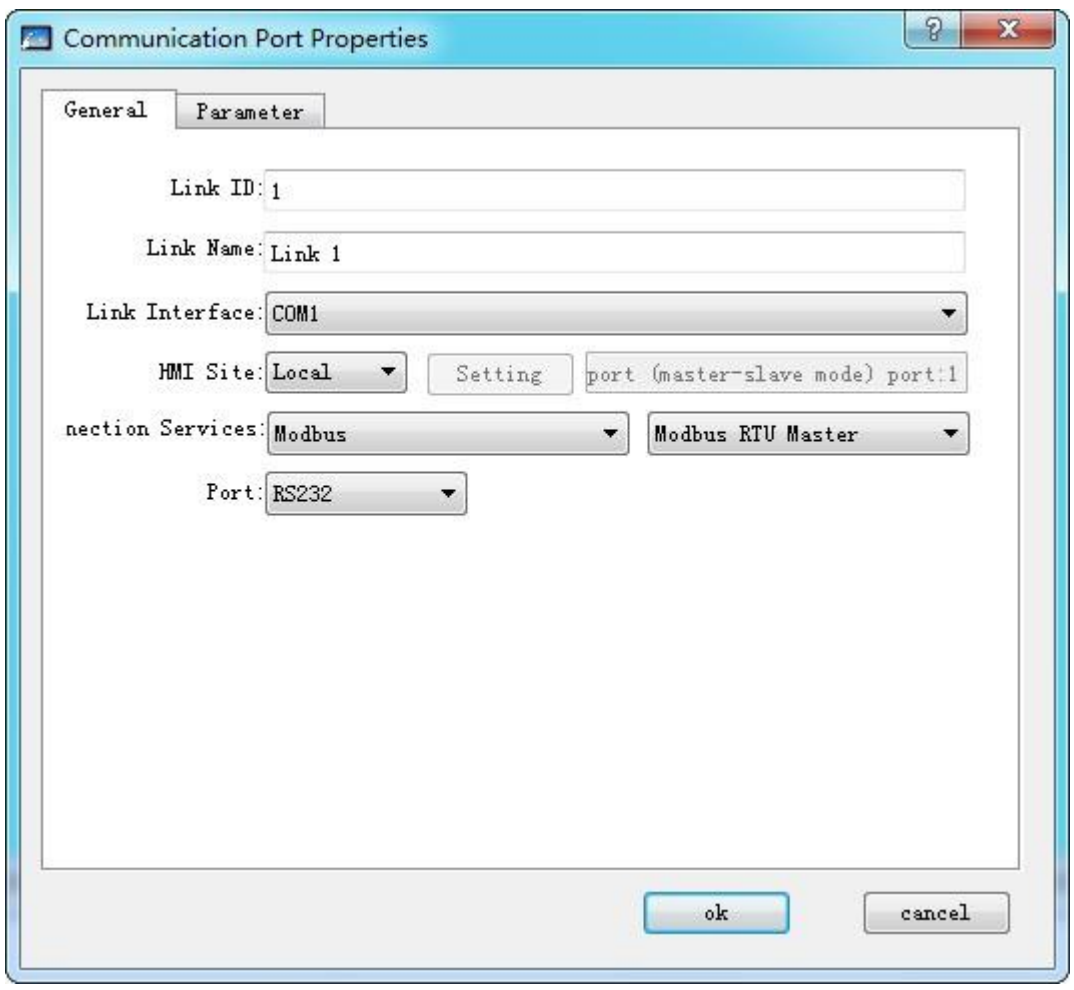


Figure 8-9 Set the touch screen as Master Station

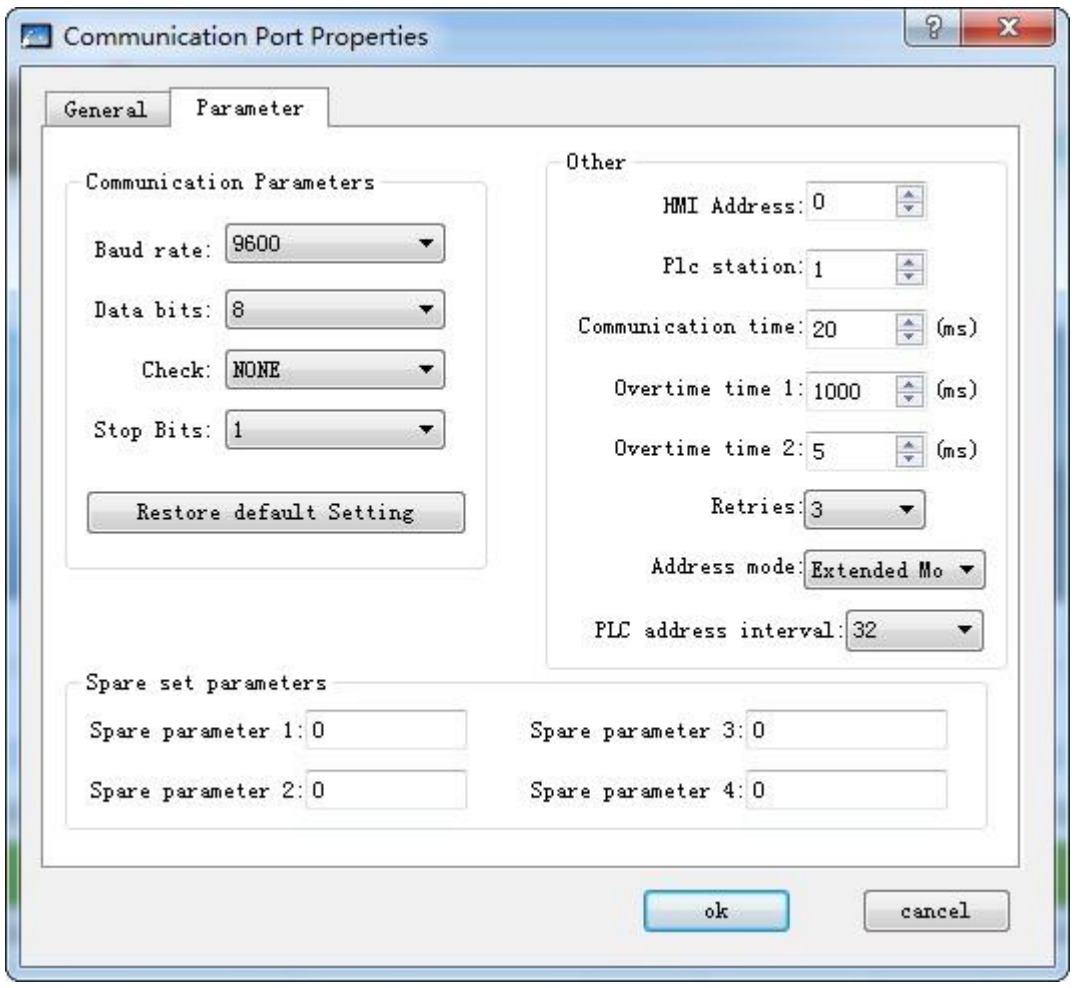


Figure 8-10 Extended Mode are required when the touch screen is set as Master Station

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 8-11 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.

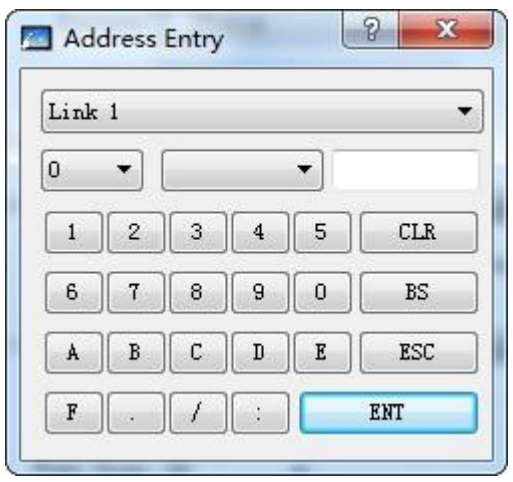


Figure 8-11 Address input box

Tips:

Instruction of extended mode stations enabling communication to control address:

Address occupied by control station corresponds to three words of a serial port, thus it can control at most 48 enabling stations and it takes LW59000 as the base address.

COM1 corresponds to 59000（Corresponding station number 1-16）、59001（Corresponding station number 17-32）、59002（Corresponding station number 33-48）

COM2 corresponds to 59003（Corresponding station number 1-16）、59004（Corresponding station number 17-32）、59005（Corresponding station number 33-48）

The default is all on when HMI is open, you can use macro controlling every bit to start or stop connect station number.

Tips:

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.

11.3 Penetration connection

HMI touch screen 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 8-12 and Figure 8-13:

Penetration connection involving two screens:

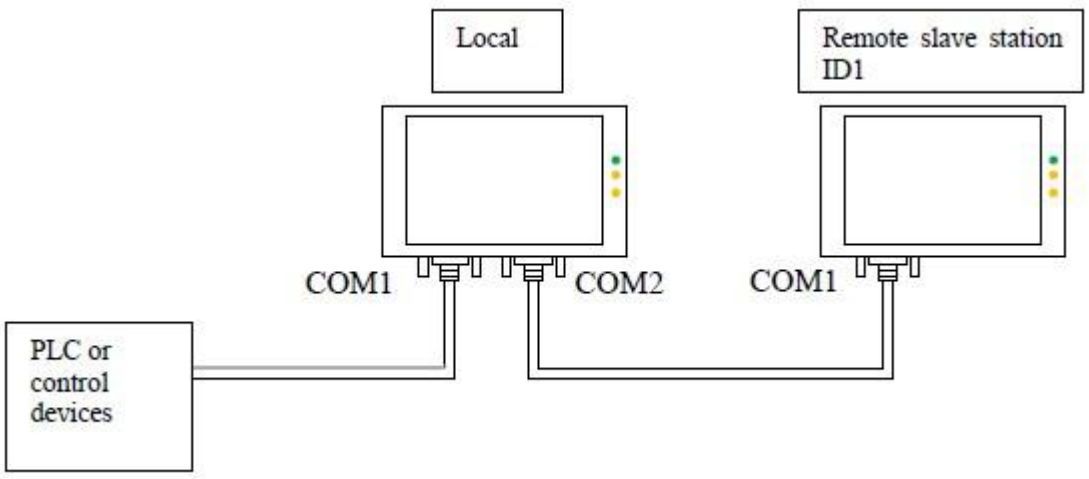


Figure 8-12 Sketch map of penetration connection involving two screens

Penetration connection involving multiple screens:

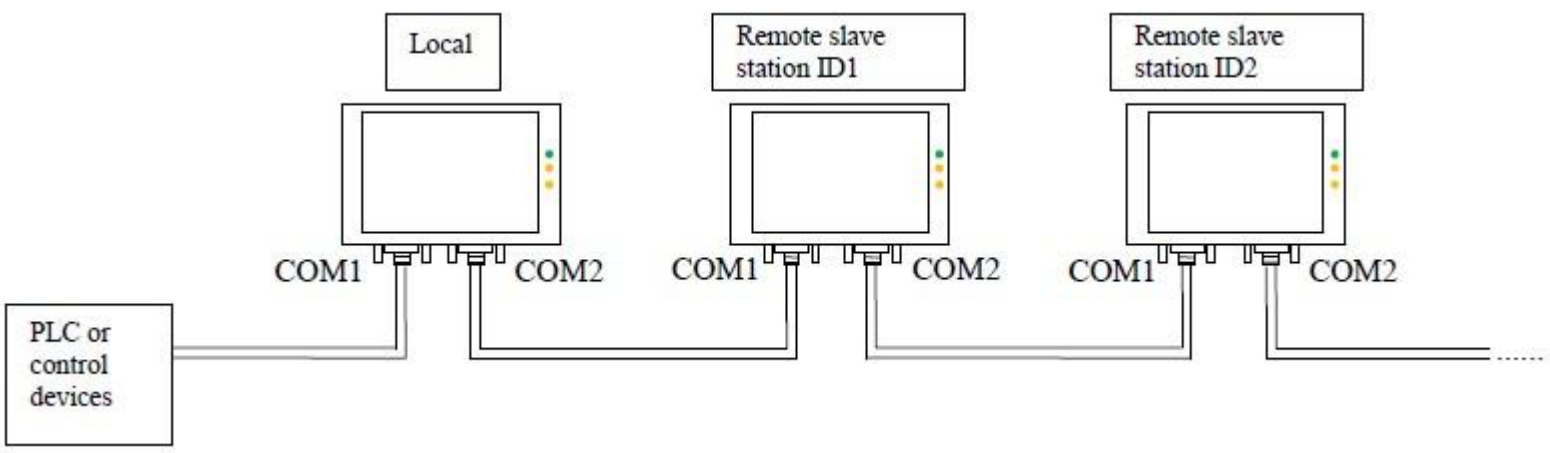


Figure 8-13 Sketch map of penetration connection involving multiple screens

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 8-14 and Figure 8-15:

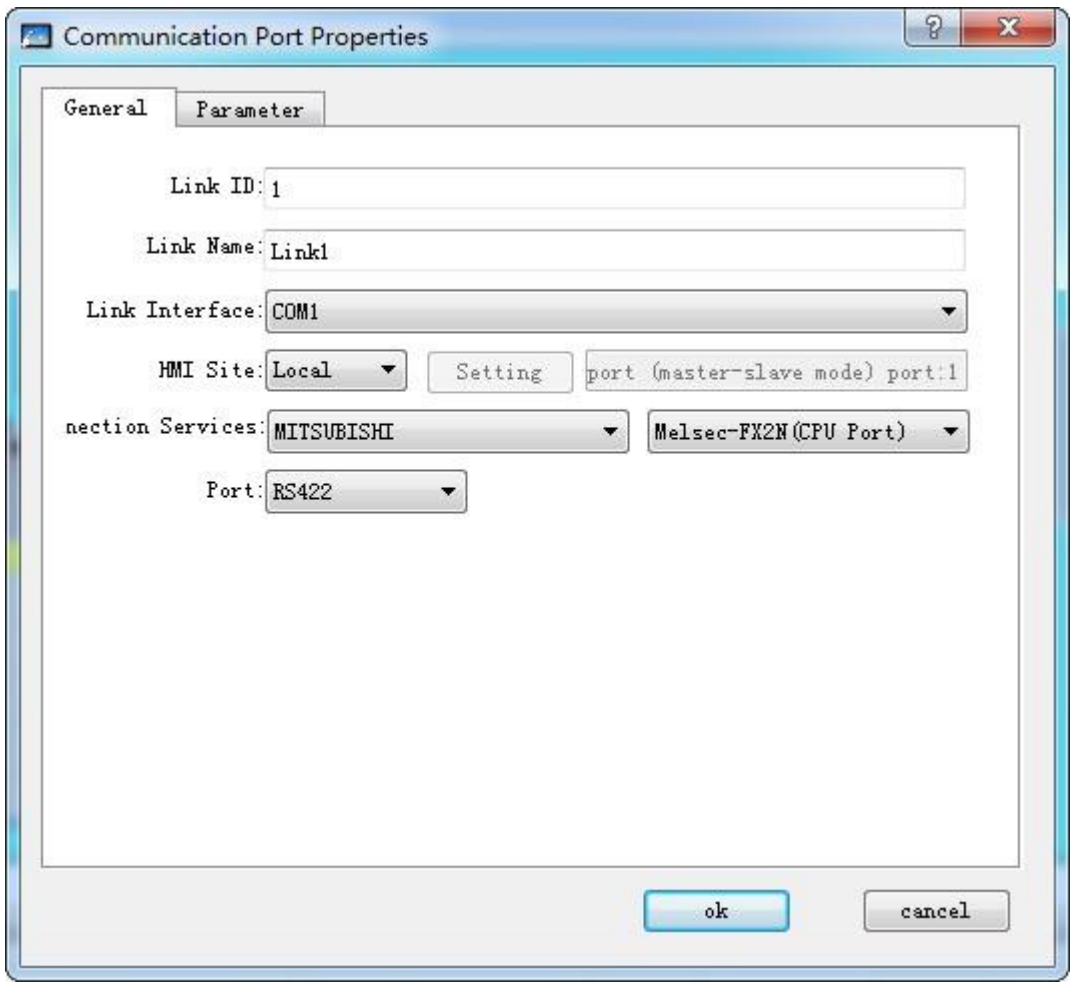


Figure 8-14 General page of local HMI communication port attribute setting

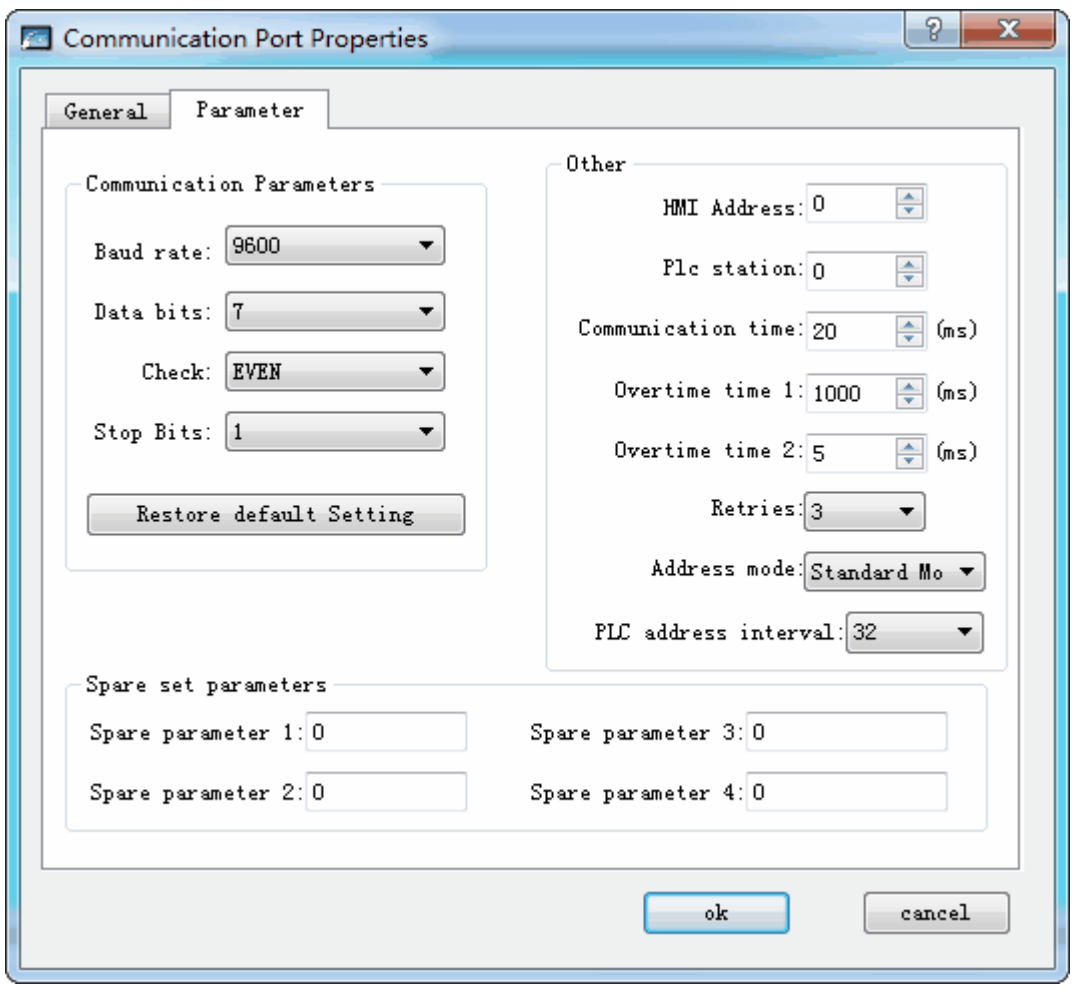


Figure 8-15: COM1 setting page of local HMI communication port attribute setting

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 8-16 and Figure 8-17.

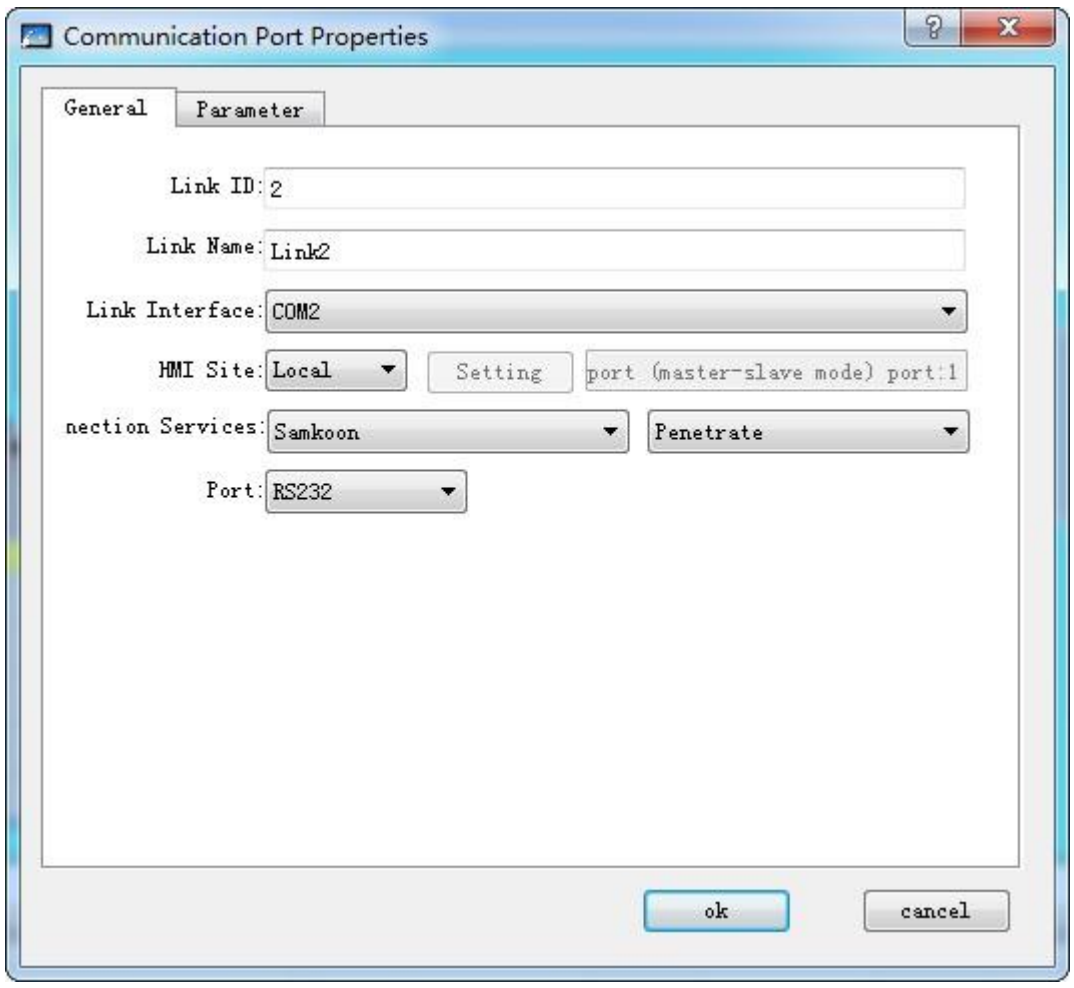


Figure 8-16 General page of local HMI communication port attribute setting

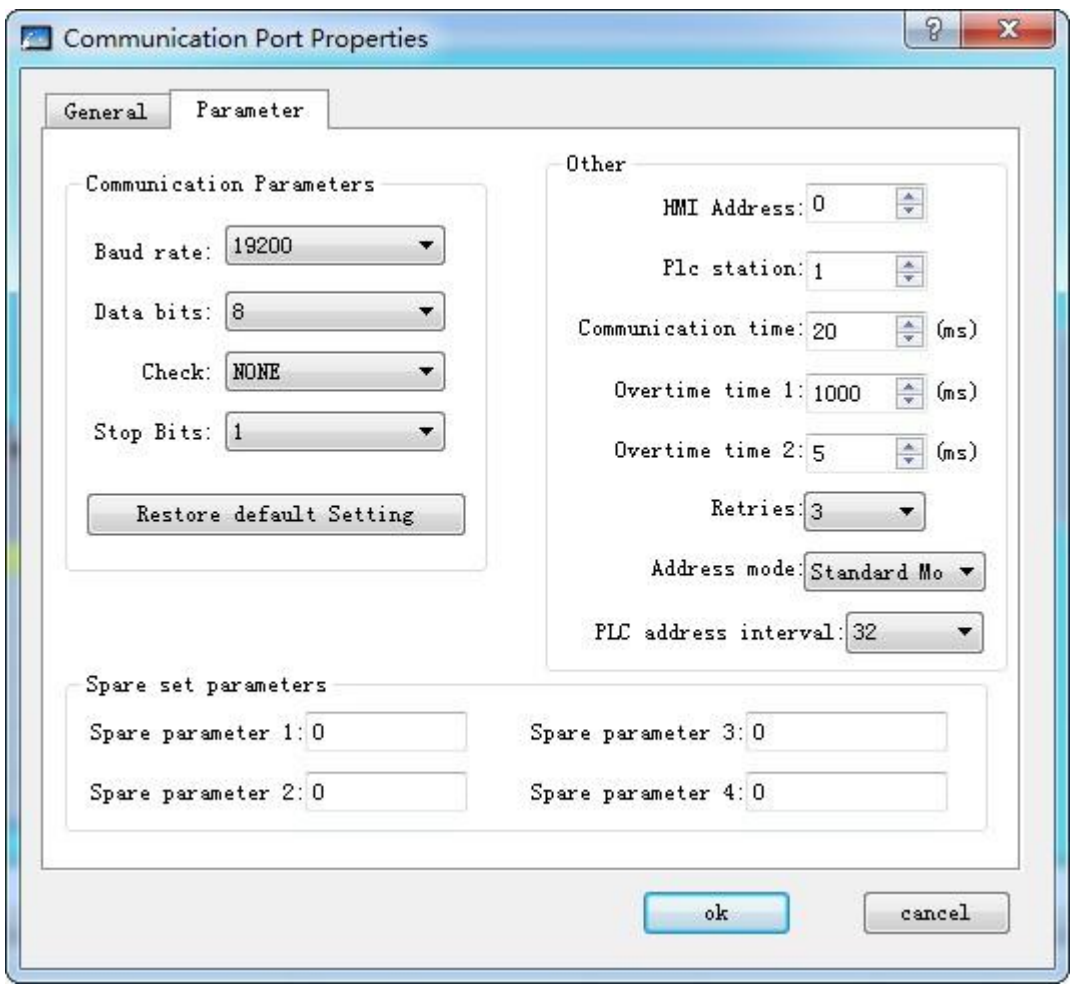


Figure 8-17 Parameter setting page of local HMI communication port attribute setting

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 6 above), as shown in Figure 8-18 and Figure 8-19.

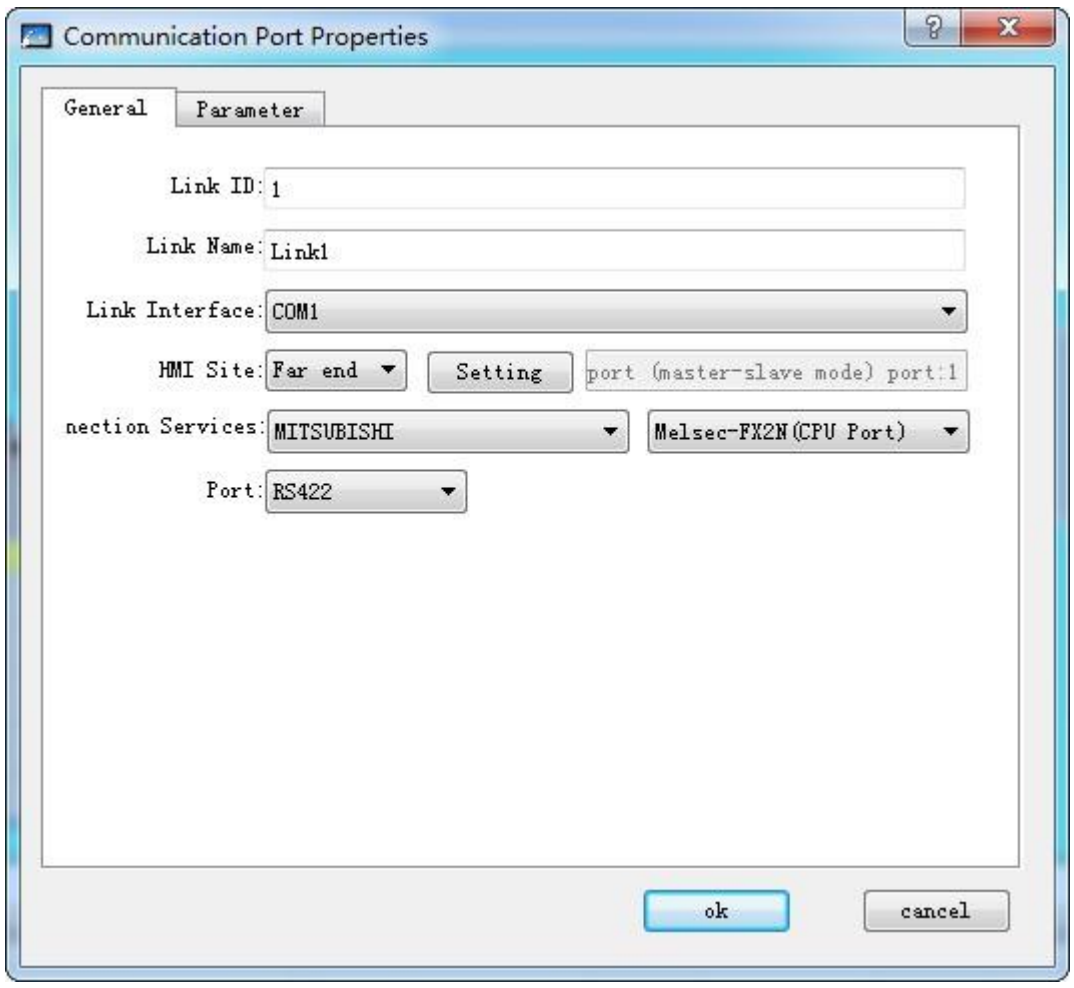


Figure 8-18 General page of remote HMI communication port attribute setting

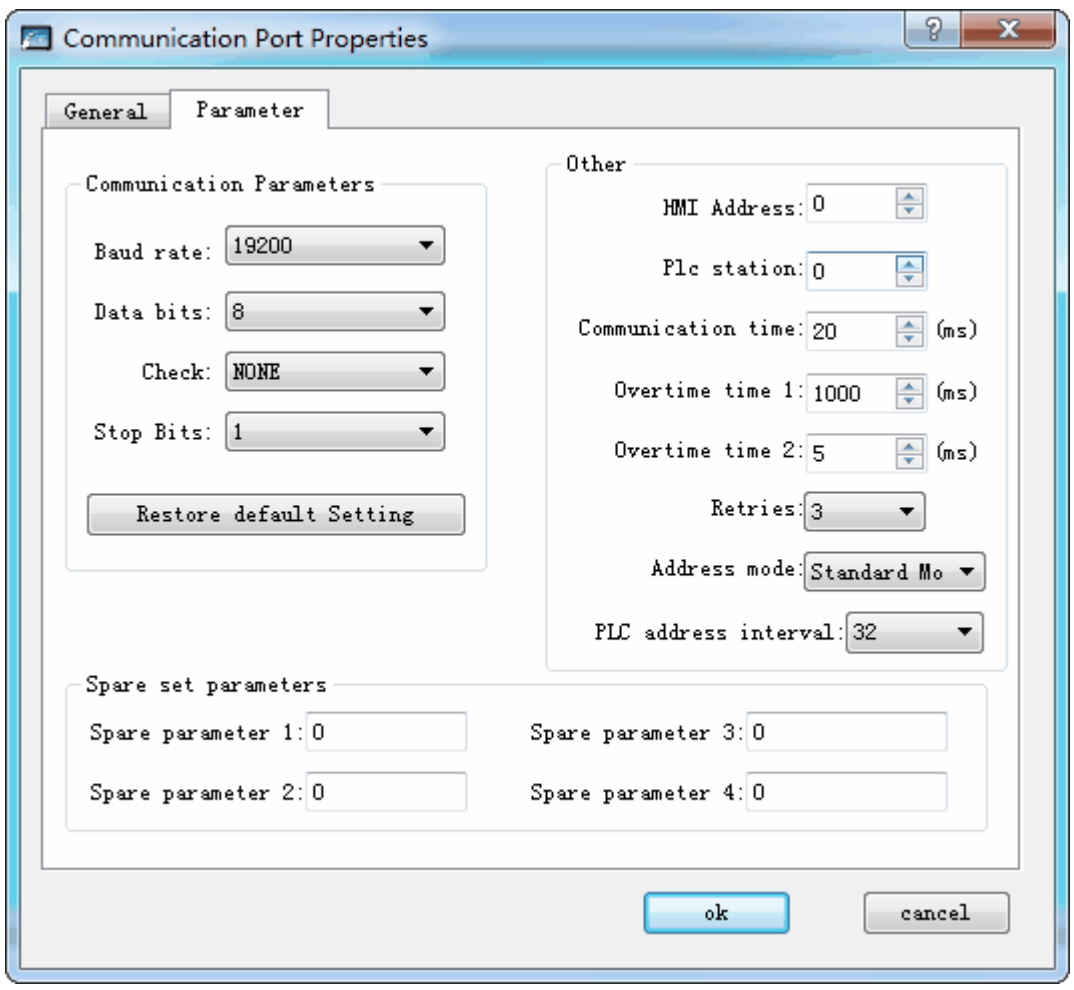


Figure 8-19 Parameter setting page of remote HMI communication port attribute setting

Choose default values for other parameters. At this moment, the parameter setting for remote HMI is completed.

Tips:

Note: The above settings are software setting for penetration involving two screens.

Note: In penetration connection involving multiple screens, COM setting in remote HMI is the same as COM setting in local HMI.

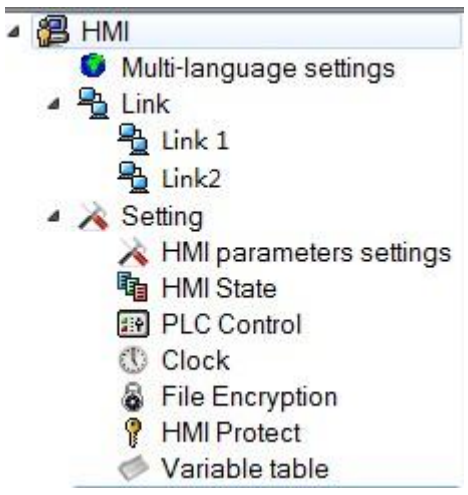
Note: As all communication data are exchanged with PLC through COM1 of local HMI, the communication rate will be low in the case of penetration connection involving multiple screens.

11.4 Modbus TCP/IP

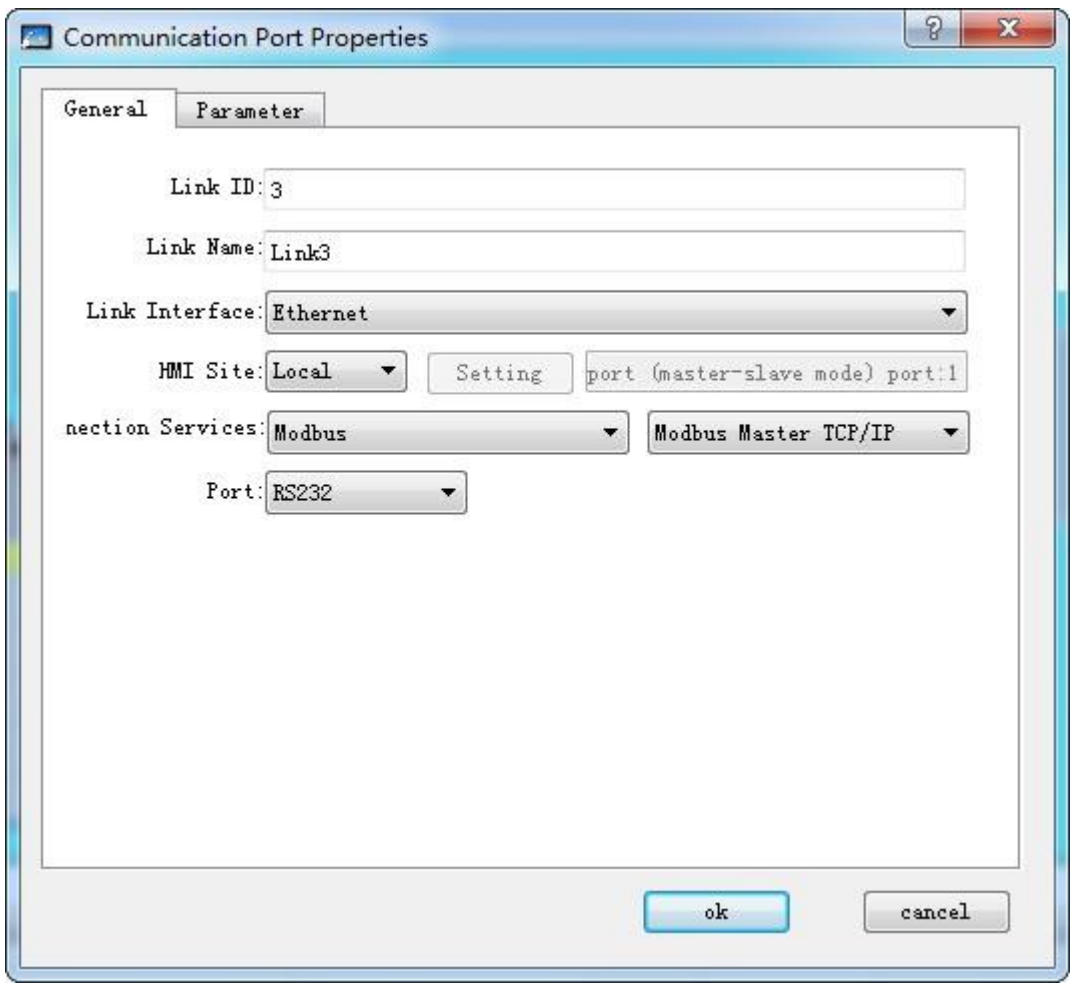
It is available to execute remote communication and control to HMI through the MODBUS TCP.

Settings when set HMI as Master station:

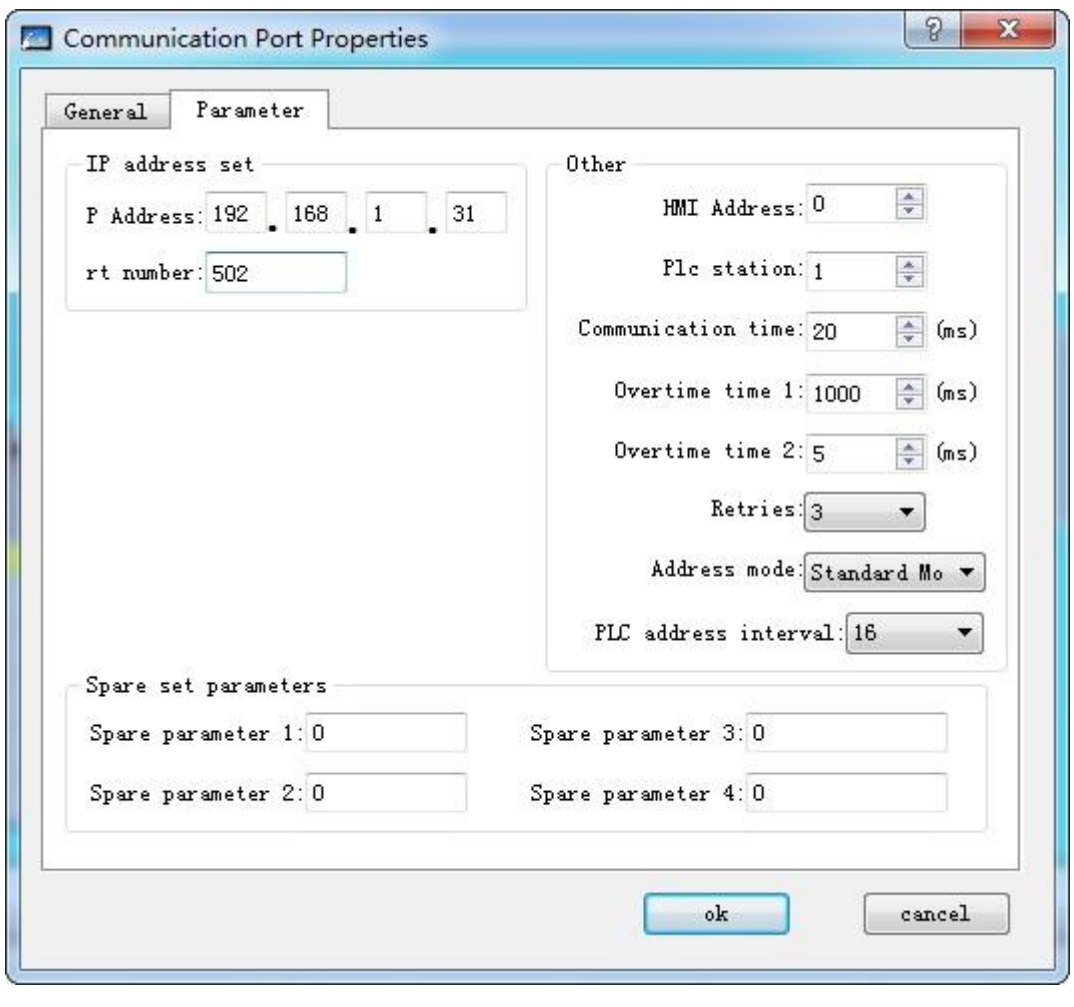
Double click “Connection 1” after creating a project, as shown below:



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, settings of IP address and port number here are invalid, while they can be set via the function button "Slave

devices IP config" in the configuration.

During the configuration runtime, click the button to pop up the window for inputting the station number; input the station number, and then enter into the interface for setting the slave IP and port number, as shown in the following figure:



After the above 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.

Settings of slave station:

1. Set the IP

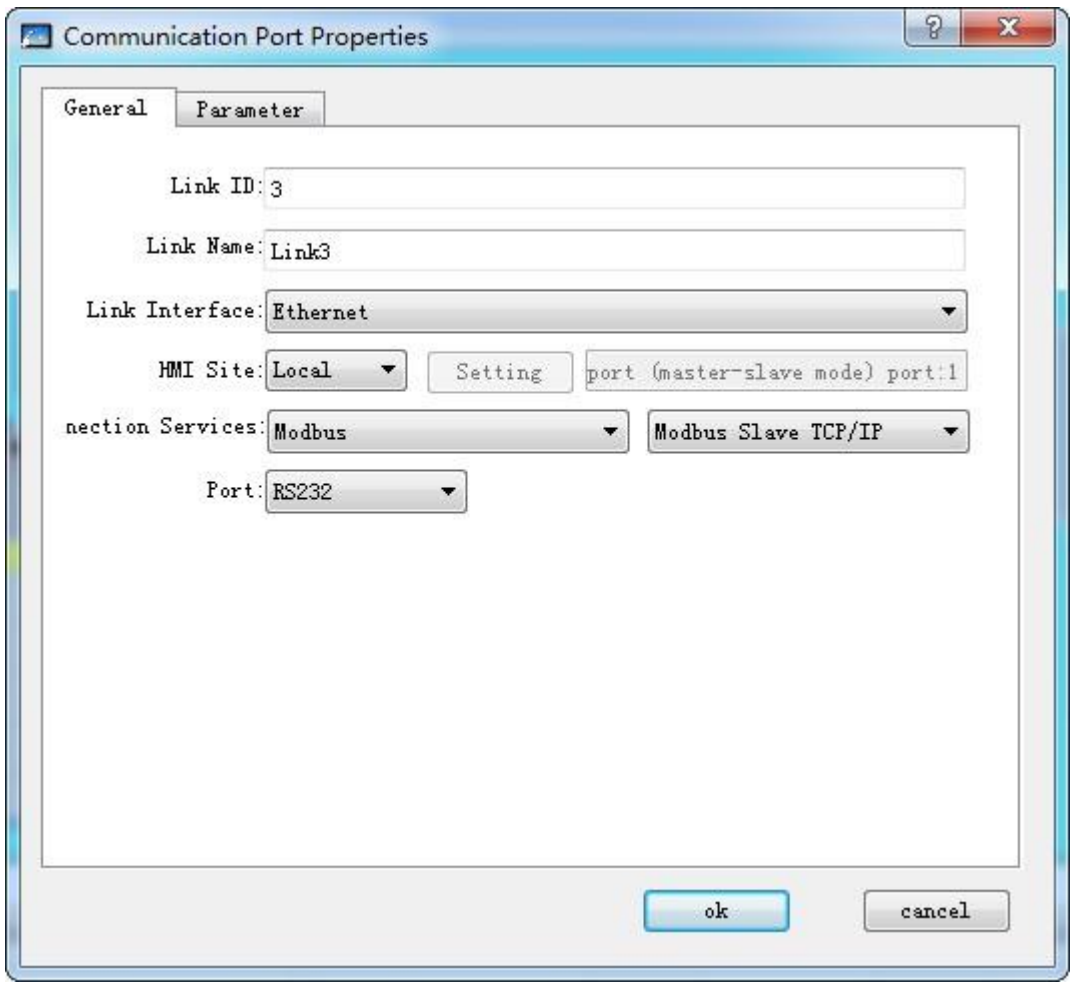
First, use DIAL switches 1, 3 to set the IP address of HMI; in the pop-up IP setting interface, enter the IP address. In this example, set the IP address of slave station to 192.168.1.31. 2.

2. Establish connections

After creating the project, double click "Connection 1" in the following picture, as shown below:



The "Communication Port Properties" dialog box is displayed (shown below).

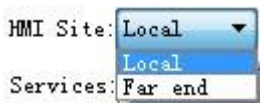


In the dialog box shown above, execute the following settings:

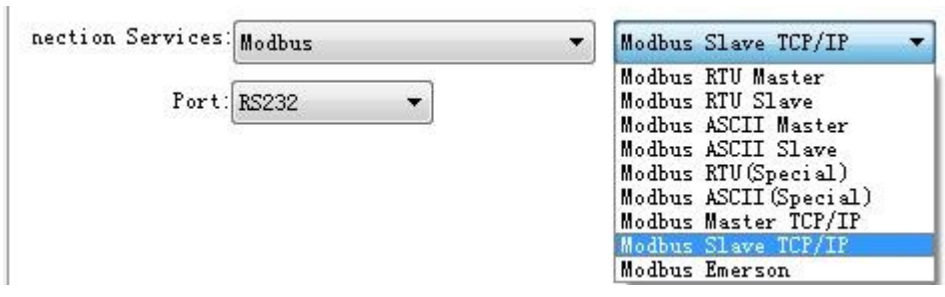
* Connection Port: "Ethernet" (as shown).



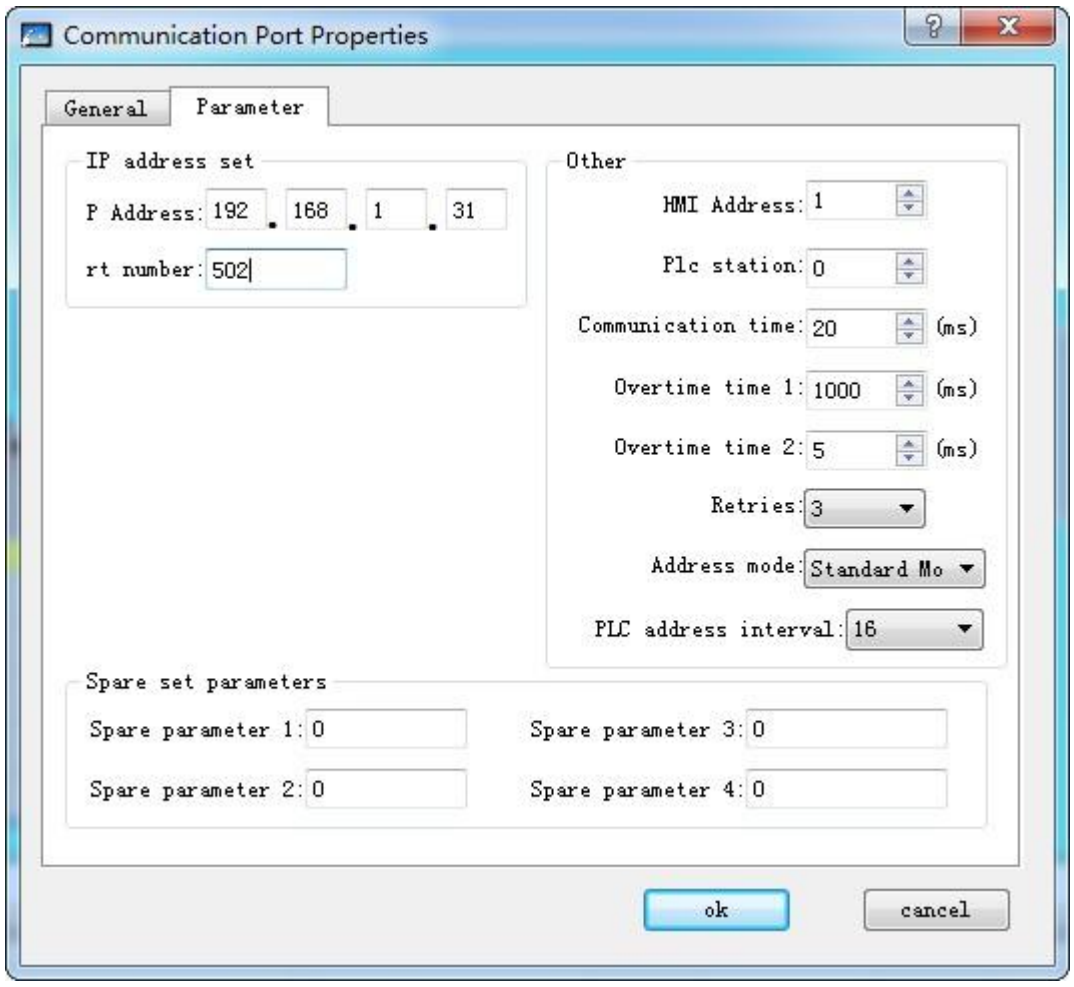
* HMI Site: Select "Local" (as shown).



* 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.

Tips:

Address is the internal address when HMI is set as slave station.

12. Device driver

This chapter details connected devices compatible with the SK series HMI of Shenzhen Samkoon Technology Co., Ltd.

It is important for the configuration to set I / O of device driver. SK series HMI can communicate with PLC, MCU, inverter and other industrial equipment, including the vast majority of PLCs: SAMKOON, 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. SKTOOL is the configuration software of SK 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.

To facilitate connections to different devices, Shenzhen Samkoon Technology Co., Ltd launches the service of developing device-driven according to the needs of users, simply with need of an appropriate protocol document of corresponding communication device. Users can contact Shenzhen Samkoon Technology Co., Ltd. via the contact information provided at the end of this manual.

PLCs supported by SK Series HMI:

Manufacturer (Brand)	Model	Communication Protocol	Connection Mode
Samkoon	FGs series	User-defined protocol	Direct connection (Serial port)
Advantech	ADAM-4017，ADAM-4060	Proprietary	Direct

Distributed I/O		protocol of Advantech	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)
Delta Corporation	DVP series	Proprietary protocol of Delta	Direct connection (Serial port)
Emerson Network Power	EC series	Proprietary protocol of Emerson	Direct connection (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	Direct

		protocol of HollySys	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 Matsushita	Direct connection (Serial port)
Mitsubishi	Melsec-FX/FX2N/FX3U/FX3G ,	Proprietary	Direct

	Melsec-Q_C24N series	protocol of Mitsubishi	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)
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), S7-1200	Proprietary protocol of Siemens	Direct connection (Serial port)
TaiAn Technology	TP03 series	Proprietary protocol of TaiAn	Direct connection (Serial port)
TaiLing Electric	DX series	Proprietary protocol of TaiLing	Direct connection (Serial port)
Techwayson Technology	V series	Proprietary protocol of Techwayson	Direct connection (Serial port)

Vigor Electric Corporation	V/VH/VB/M series	Proprietary protocol of Vigor	Direct connection (Serial port)
Xinje Electronic	XC/XCM series	Proprietary protocol of XinJe	Direct connection (Serial port)
Yokogawa Electric Corporation	FA-M3 series	Proprietary protocol of Yokogawa	Direct connection (Serial port)
ZhengHang Electronics	A4/A5 series	Proprietary protocol of ZhengHang	Direct connection (Serial port)

- Pin definitions of SK series HMI COM1/COM2

SK HMI employs nine-pin plug so that it should be nine-pin receptacle for the connection cable. Pin definitions are shown below:

SK HMI COM1/COM2	
1	
2	RX
3	TX
4	KZ
5	GND
6	RX-
7	RX+
8	TX-
9	TX+

- RX：RS232　Receiver of communication
- TX：RS232 Sender of communication
- KZ：Control port
- 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.

12.1 Samkoon device driver

The device driver is used for SK series HMI to read and write the data or state of Samkoon FGs series PLC. The serial communication connection is established through the serial port of the HMI and the serial port of Samkoon FGs series PLC, so as to operate Samkoon device. Prior to use of the driver, please carefully read this chapter and the related technical specifications of the Samkoon device.

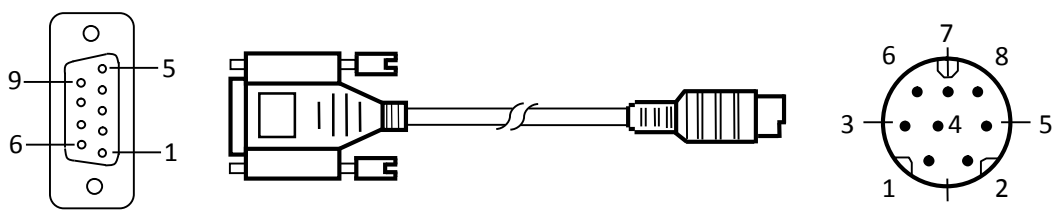
How to establish connection with Siemens S7-200/300 series PLC

1. Hardware connection

Connecting cable:

RS232

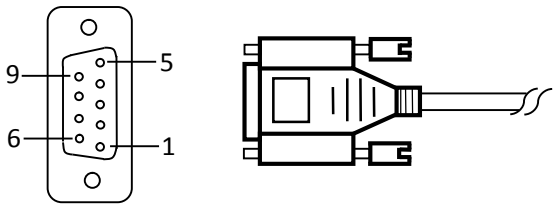
SK HMI COM1/COM2		Samkoon FGs series	
2	RX	5	TX
3	TX	4	RX
5	GND	3	GND



Terminal of SK series HMI is DB9F; that of Delta DVP series PLC is MD8M.

RS485

SK HMI COM1/COM2		Samkoon FGs series
8	TX-	B
9	TX+	A



Terminal of SK HMI is DB9F, and that of Samkoon series PLC is two-wire terminal.

2. Software settings

- ✓ Select Samkoon 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 touch screen connection parameters and PLC station number are consistent with the PLC connected.
- ✓ For settings of the PLC, refer to the technical documents of the Samkoon series PLC.

Default connection parameters of SK series HMI

Setting item	Default parameter value	Setting scope
PLC type	FGs Series (RTU)	FGs Series (RTU)/SamFGS
Communication port type	RS232	RS232/ RS485
Baud rate	9600	4800/9600/19200/38400/57600/115200
Data bit length	8	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. Operational register and address range

FGs Series (RTU)/SamFGS

Register name	Address format	Input range	Remarks
X	ooo	0~127	Bit: input connection point, read

			only
Y	ooo	0~127	Bit: output connection point
M	dddd	0~8191	Bit: internal relay
T	ddd	0~255	Bit: timer status
C	ddd	0~255	Bit: counter status
S	ddd	0~999	Bit: stepping relay
D	dddd	0~8191	Word: temporary data storage
TV	ddd	0~255	Word: current value of timer
CV	ddd	0~199	Word: current value of counter
V	d	0~7	Word: indexed addressing register
Z	d	0~7	Word: indexed addressing register
AI	dd	0~31	Word: analog input
AO	dd	0~31	Word: analog output
32CV	ddd	200~255	Double Word: current value of counter

Note:

d represents decimal system, input range is 0-9;

o 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

12.2 AIBUS device driver

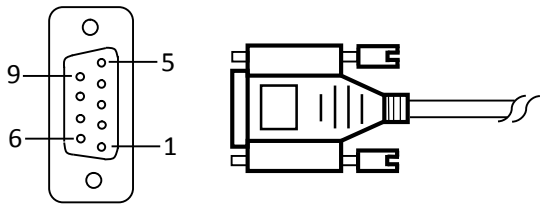
The device driver is used for SK series HMI to read and write the data or state of AIBUS device via AIBUS protocols. The serial communication connection is established through the serial port of the HMI and the serial port of AIBUS device, so as to operate AIBUS device. Prior to use of the driver, please carefully read this chapter and the related technical specifications of the AIBUS device.

1. Hardware connection

Connecting cable:

RS232 (serial port RS232 protocol)

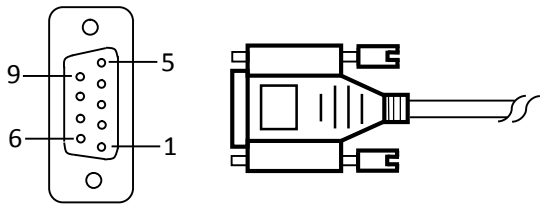
SK HMI COM1/COM2		AIBUS device	
2	RX	User-defined pins	TX
3	TX	User-defined pins	RX
5	GND	User-defined pins	GND



HMI series touch screen port is a 9P trapezoidal female connector. Definitions of AIBUS device pins depend on particular AIBUS device.

RS422 (Serial port RS422 protocol)

SK HMI COM1/COM2		AIBUS 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+



HMI series touch screen port is a 9P trapezoidal female connector. Definitions of AIBUS device pins depend on particular AIBUS device.

RS485 (Serial port RS485 protocol)

HMI series touch screen COM1/COM2		AIBUS device	
8	D-	User-defined pins	B
9	D+	User-defined pins	A

HMI series touch screen port is a 9P trapezoidal female connector. Definitions of AIBUS device pins depend on particular AIBUS device.

2. Software settings

- ✓ Select AIBUS Protocol 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 touch screen connection parameters and PLC station number are consistent with the AIBUS device.
- ✓ For settings of the AIBUS device, refer to the technical documents of the AIBUS device.

Default connection parameters of HMI series touch screen

Setting item	Default parameter value	Setting scope
PLC type	AIBUS Protocol	AIBUS Protocol
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	1~255
HMI station number	0	0~255

Supporting function	Whether it is supported
Off-line simulation	Yes
On-line simulation	Yes
Extended mode	Yes

3. Operational register and address range

Register name	Address format	Input range	Remarks
Parameter	ddd	0~255	Word: parameter item
PV	d	0	Word: Output value
SV	d	0	Word: Set value
MV	d	0	Word: State value
Status	d	0	Word: State value

Note:

- ·d represents decimal system, input range is 0-9;
- ·"Word" in the remarks: represents that the register can only be used as word;
- 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.

12.3 Allen-Bradley device driver

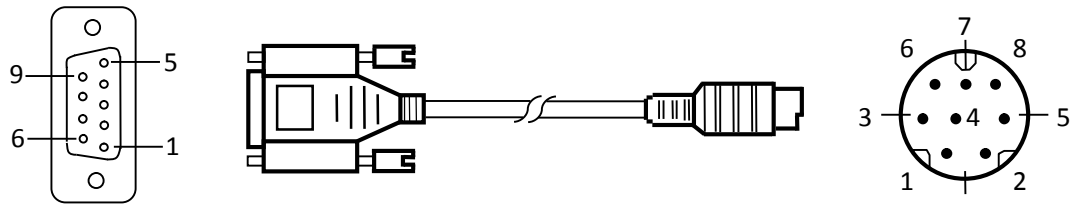
The device driver is used for SK series HMI to read and write the data or state of AIBUS device via AIBUS protocols. The serial communication connection is established through the serial port of the HMI and the serial port of AIBUS device, so as to operate AIBUS device. Prior to use of the driver, please carefully read this chapter and the related technical specifications of the AIBUS device.

How to establish connection with AIBUS device

1. Hardware connection

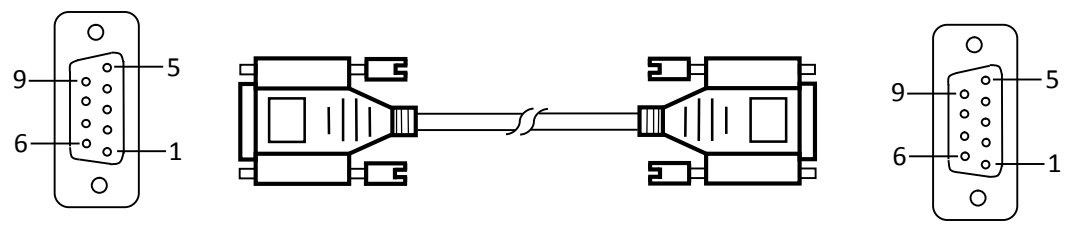
Connecting cable:
RS232 (serial port RS232 protocol)

SK HMI COM1/COM2		AIBUS device	
2	RX	User-defined pins	TX
3	TX	User-defined pins	RX
5	GND	User-defined pins	GND



ControlLogix/CompactLogix:

SK HMI COM1/COM2		Allen-Bradley（AB）	
2	RX	3	TX
3	TX	2	RX
5	GND	5	GND



SK HMI port is DB9F, and AB device port is MD8M.

2. Software settings

- ✓ Select Allen-Bradley 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 touch screen connection parameters and PLC station number are consistent with the PLC connected.
- ✓ For settings of the PLC connected device, refer to the technical documents of the Allen-Bradley PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	MicroLogix DF1_CRC	MicroLogix DF1_CRC/MicroLogix DF1_BCC
Communication port type	RS232	RS232/RS422/RS485
Baud rate	19200	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	1~31
HMI station number	0	0~255
Check	CRC	BCC

Supporting function	Whether it is supported
Off-line simulation	Yes
On-line simulation	Yes
Extended mode	No

3. Operational register and address range

SLC series/MicroLogix:

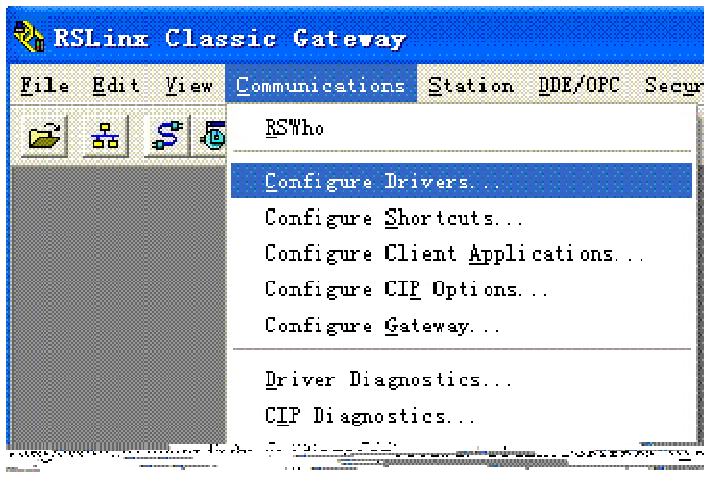
Register name	Address format	Input range	Remarks
I	1:ddd/o	1:0/0~1:255/15	Bit: input shadow register
O	0:ddd/o	0:0/0~0:255/15	Bit: output shadow register
B	ddd:ddd/o	3:0/0~255:255/15	Bit: bit memory
S_Bit	2:ddd/o	2:0/0~2:255/15	Bit: System state bit
N_Bit	ddd:ddd/o	7:0、10:0/0~255:255/15	Bit: Bit of data register word
S	2:ddd	2:0~2:255	Word: System state word
ST	ddd:ddd.dd	0:0.0~255:255.40	Word: System state word
N	ddd:ddd	7:0、10:0~255:255	Word: Data register
F	ddd:ddd	8:0~255:255	Word: Floating number register
T_ACC	ddd:ddd	4:0~255:255	Word: Timer ACC value
T_PRE	ddd:ddd	4:0~255:255	Word: Timer PRE value
C_ACC	ddd:ddd	5:0~255:255	Word: Counter ACC value
C_PRE	ddd:ddd	5:0~255:255	Word: Counter PRE value

ControlLogix/CompactLogix:

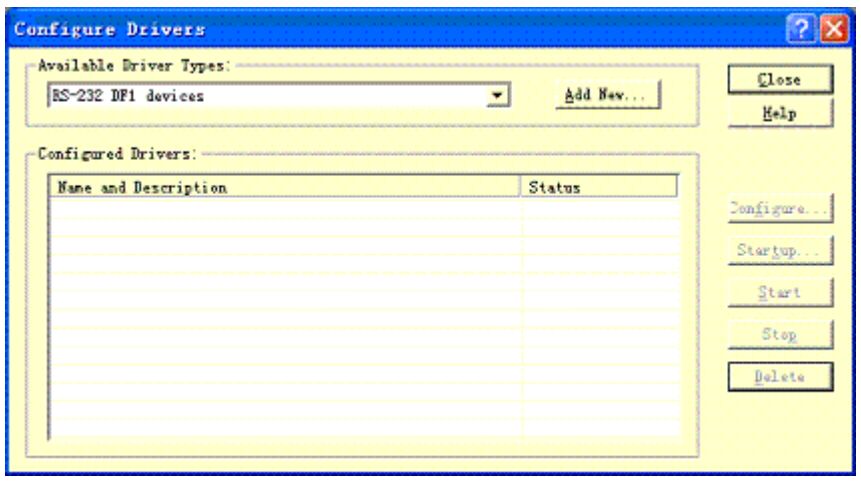
Register name	Address format	Input range	Remarks
B-Bit	ddd:ddd/dd	3~225:0~255/0~15	Bit: Bit of data register word
N_Bit	ddd:ddd/dd	7~225:0~255/0~15	Bit: Bit of data register word
N_Bit	ddd:ddd/o	7:0/0~255:255/7	Bit: Bit of data register word
S	2:ddd	2:0~2:255	Word: System state word
N	ddd:ddd	7:0~255:255	Word: Data register
F	ddd:ddd	8:0~255:255	Word: Floating number register

4. Instruction of connection between SK HMI and ControlLogix and CompactLogix series PLC of Alleb-Bradley Company

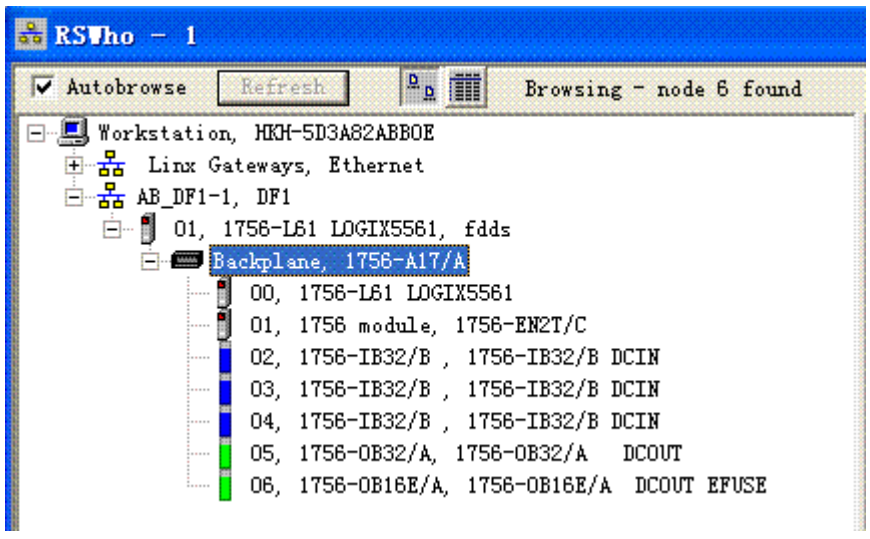
Open RSLinx and set corresponding PLC communication drivers



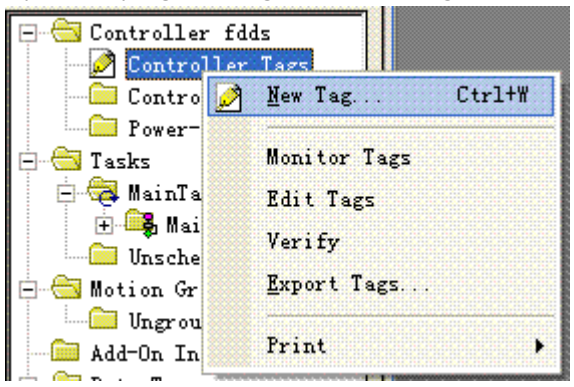
Create a driver; select serial port connection and RS-232 DF1 devices



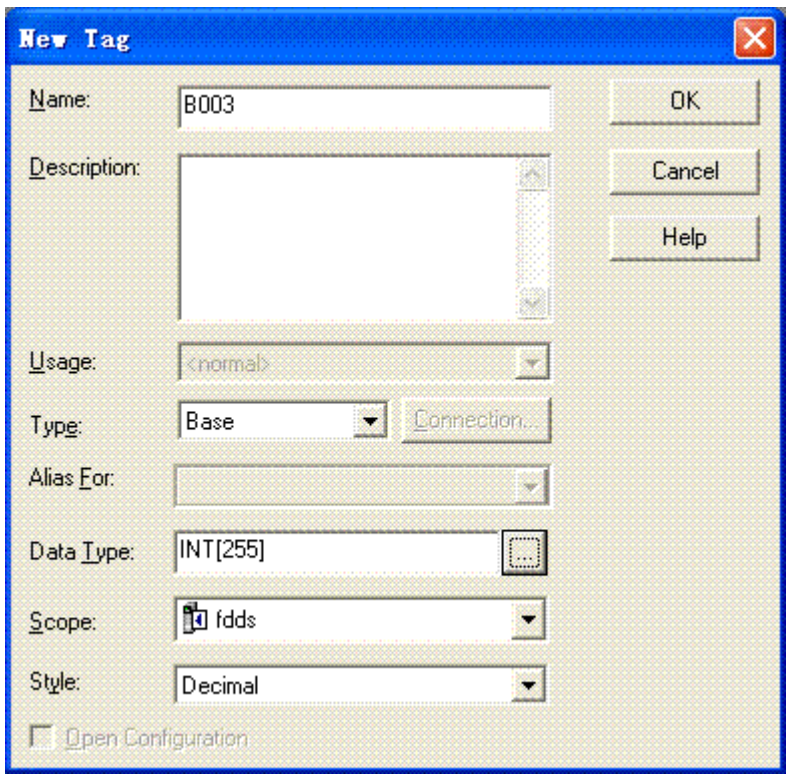
After the settings, the PLC device is available in RSLinx if there is a cable connecting PC and PLC



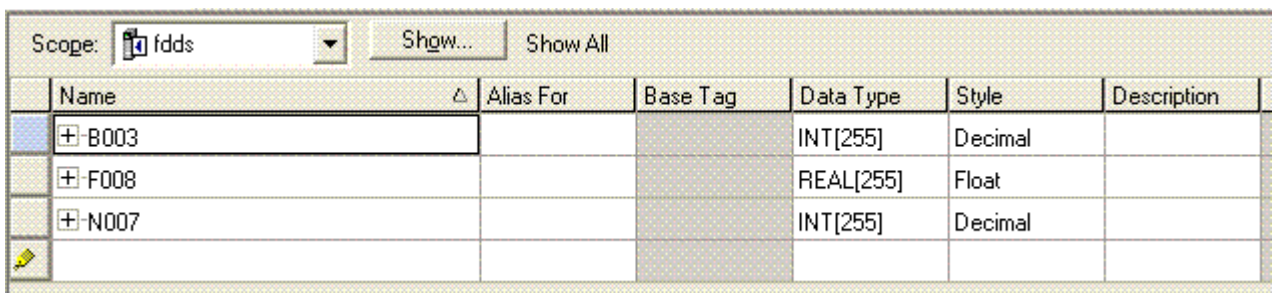
Open PLC programming software RSLogix 5000; create your project and new tags



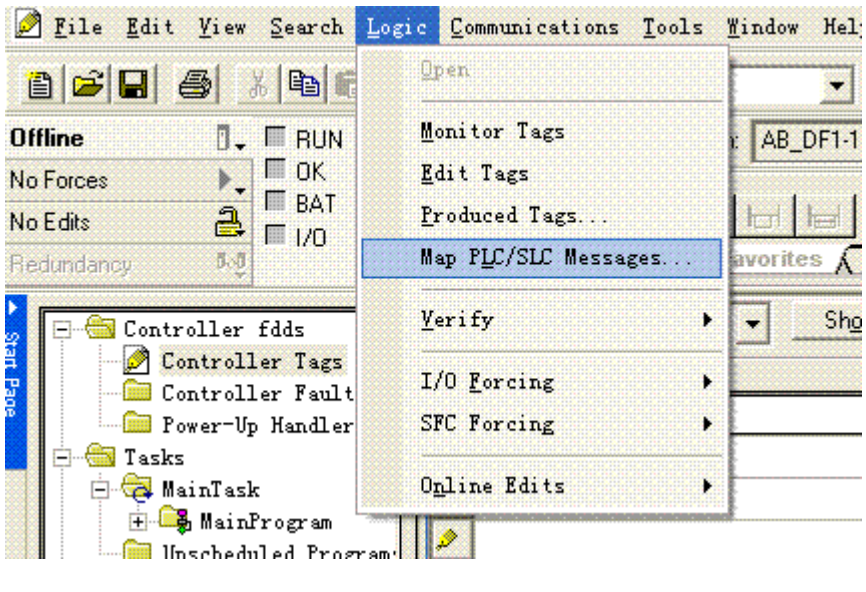
Create tags: B003, N007 and F008

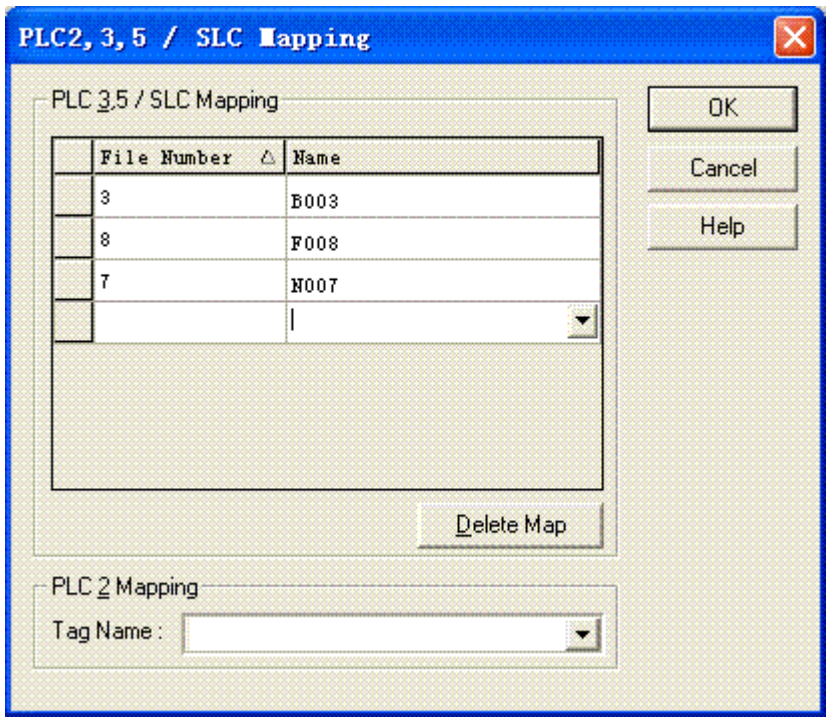


Tag list after creation:

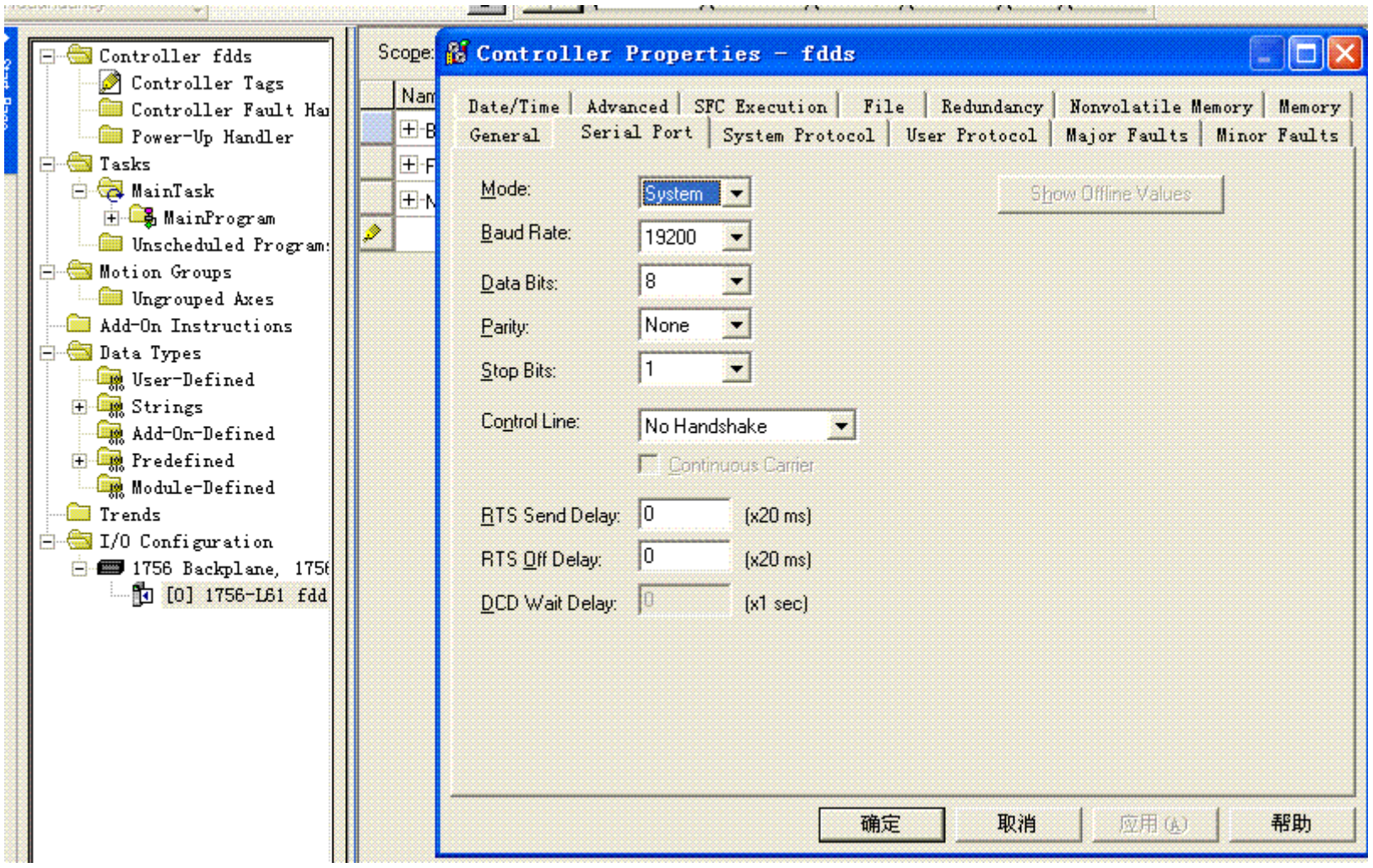


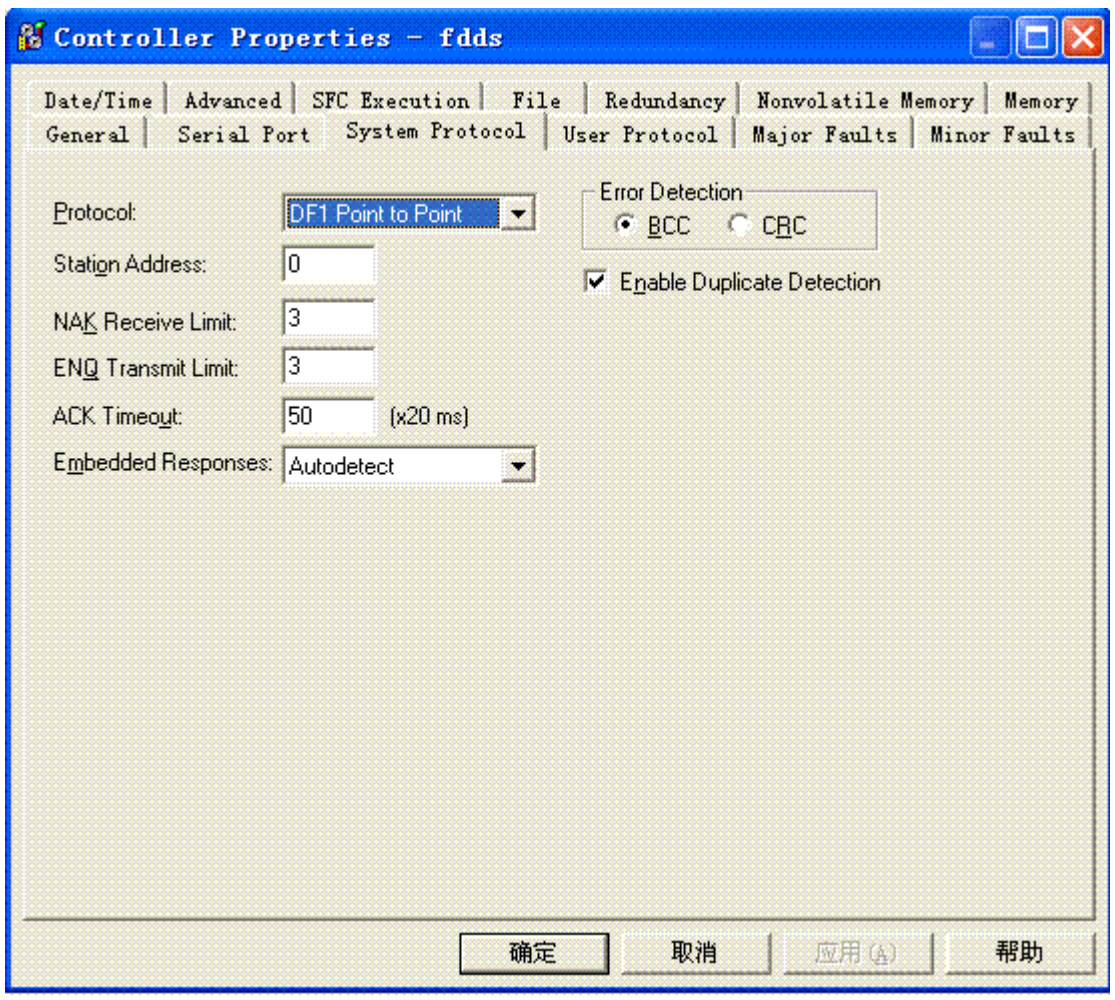
Build address mapping





Set PLC parameters





·d represents decimal system, input range is 0-9;
·o represents octal system, input range is 0-7;
·Bit in the remarks: represents the register can only used as bit;
·Word in the remarks: represents the register can only used as word;
·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

12.4 Delta device driver

The device driver is used for SK series HMI to read and write the data or state of Delta DVP series PLC register. The serial communication connection is established through the serial port of HMI and the serial port of Delta DVP series PLC, so as to operate Delta DVP series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Delta DVP series PLC.

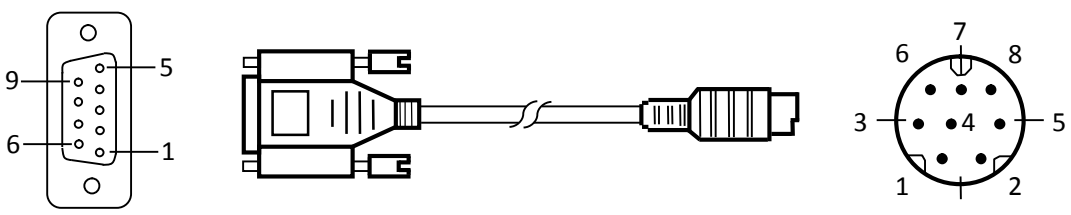
How to establish connection with Delta DVP series PLC

1. Hardware connection

Connecting cable:

RS232 (serial port RS232 protocol)

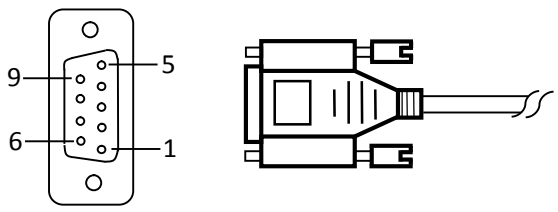
SK HMI	COM1/COM2	Delta DVP series	
2	RX	5	TX
3	TX	4	RX
5	GND	8	GND



Terminal of SK series HMI is DB9F; that of Delta DVP series PLC is MD8M.

RS485 (serial port RS485 protocol)

SK HMI COM1/COM2		Delta DVP series
8	TX-	B
9	TX+	A



Terminal of SK HMI is DB9F, and that of Delta DVP series PLC is two-wire terminal.

2. Software settings

✓ Select Delta Corporation 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 touch screen connection parameters and PLC station number are consistent with the PLC connected.
✓ For settings of the PLC, refer to the technical documents of the Delta DVP series PLC.

Default connection parameters of SK series HMI

Setting item	Default parameter value	Setting scope
PLC type	Delta DVP Series	Delta DVP Series
Communication port type	RS232	RS232/RS422/RS485
Baud rate	19200	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. 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	0~4095	Bit: auxiliary relay
S	dddd	0~1023	Bit: internal relay
T	ddd	0~255	Bit: timer status
C	ddd	0~255	Bit: counter status
D	dddd	0~9999	Word: temporary data storage
TV	ddd	0~255	Word: current value of timer
CV	ddd	0~199	Word: current value of counter
CV32	ddd	200~255	Double words: current value of 32-bit counter

Note:
d represents decimal system, input range is 0-9;
o represents octal system, input range is 0-7;
Bit in the remarks: represents the register can only used as bit;
Word in the remarks: represents the register can only used as word;
Double-word in the remarks: represents that the data type of the register in configuration must be 32-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.

12.5 Emerson device driver

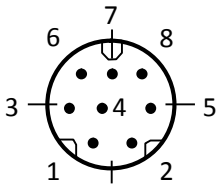
The device driver is used for SK series HMI to read and write the data or state of Emerson EC series PLC register. The serial communication connection is established through the serial port of HMI and the serial port of Emerson EC series PLC, so as to operate Emerson EC series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Emerson EC series PLC.

How to establish connection with Emerson EC series PLC

1. Hardware connection

Connecting cable:
RS232

SK series HMI COM1/COM2		Emerson EC	
2	RX	5	TX
3	TX	4	RX
5	GND	3	GND



Terminal of HMI is DB9F, and that of Emerson EC series PLC is MD8M.

2. Software settings

Select Emerson Network Power 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 touch screen 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 Emerson EC series PLC.

Default connection parameters of HMI series touch screen

Setting item	Default parameter value	Setting scope
PLC type	EC Series (RTU)	EC Series (RTU)
Communication port type	RS232	RS232/RS422/RS485
Baud rate	9600	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	7	7/8
Parity bit	EVEN	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. 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 temporary data storage
TV	ddd	0~255	Word: current value of timer
CV	ddd	0~255	Word: current value of counter
Z	dd	0~15	Word: indexed addressing register
D_Double	dddd	0~7999	Double word: temporary data storage

CV_Double	ddd	200~255	Double word: current value of counter
SD_Double	ddd	0~255	Double word: special temporary data storage

Note:

d represents decimal system, input range is 0-9;

o represents octal system, input range is 0-7;

Bit in the remarks: represents the register can only be used as bit;

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;

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.

12.6 Fatek device driver

The device driver is used for SK series HMI to read and write the data or state of Fatek FB series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of Fatek FB series PLC, so as to operate Fatek FB series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Fatek FB series PLC.

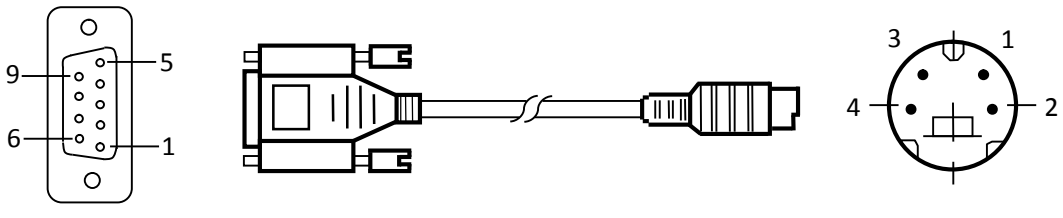
How to establish connection with Fatek device

1. Hardware connection

Connecting cable:

RS232 (serial port RS232 protocol)

SK HMI COM1/COM2		Fatek FB series	
	RX		TX
	TX		RX
	GND		GND



Terminal of SK series HMI is DB9F, and that of Fatek FB series PLC is MD8M.

2. Software settings

Select Fatek Automation Corp. 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 touch screen 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 Fatek FB series PLC.

Default connection parameters of HMI series touch screen

Setting item	Default parameter value	Setting scope
PLC type	Fatek FB Series	Fatek FB Series
Communication port type	RS232	RS232
Baud rate	9600	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	7	7/8
Parity bit	EVEN	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. Operational register and address range

Register name	Address format	Input range	Remarks
X	dddd	0~9999	Bit: input connection point, read only
Y	dddd	0~9999	Bit: output relay
M	dddd	0~9999	Bit: internal relay
S	dddd	0~9999	Bit: stepping relay
T	dddd	0~9999	Bit: timer status

C	dddd	0~9999	Bit: counter status
R	dddd	0~9999	Word: data register
D	dddd	0~9999	Word: data register
TR	dddd	0~9999	Word: current value of timer
CR	dddd	0~9999	Word: current value of counter
F	dddd	0~9999	Word: file register
DRC	ddd	200~255	Double word: current value of 32-bit counter

Note:

d represents decimal system, input range is 0-9;

o represents octal system, input range is 0-7;

Bit in the remarks: represents the register can only be used as bit;

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;

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

12.7 Fuji device driver

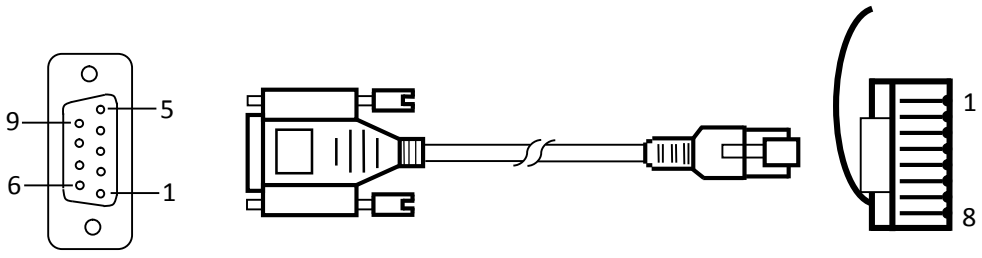
The device driver is used for SK series HMI to read and write the data or state of Fuji NB series PLC register. The serial communication connection is established through the HMI serial port and the serial port of Fuji NB series PLC, so as to operate Fuji NB series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Fuji NB series PLC.

How to establish connection with Fuji device

1. Hardware connection

Connecting cable:
RS422 (serial port RS422 protocol)

SK HMI COM1/COM2		Fuji NB series	
6	RX-	4	TX-
7	RX+	3	TX+
8	TX-	6	RX-
9	TX+	5	RX+



Terminal of SK HMI is DB9F, and that of Fuji NB series PLC is RJ45.

2. Software settings

Select Fuji Electric Corporation 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 touch screen 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 Fuji NB series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope

PLC type	Fuji NB Series	Fuji NB Series
Communication port type	RS422	RS422
Baud rate	19200	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	8	7/8
Parity bit	ODD	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	0	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. Operational register and address range

Register name	Address format	Input range	Remarks
X	hhh	0~7ff	Bit: input connection point, read only
Y	hhh	0~7ff	Bit: output connection point
M	hhhh	0~7fff	Bit: internal relay
SM	hhhh	8000~81ff	Bit: internal relay
L	hhh	0~5ff	Bit: Lockout relay
S	hh	0~ff	Bit: Stepping relay
T	hhh	0~1ff	Bit: Status of timer
C	hh	0~ff	Bit: Status of counter
D	hhhh	0~7fff	Word: Temporary data storage
SD	hhhh	8000~80ff	Word: Temporary data storage
TV	hhh	0~1ff	Word: Current value of timer
CV	hh	0~ff	Word: Current value of counter

Note:
h represents hexadecimal system, input range is 0-9, a-f;
Bit in the remarks: represents the register can only be used as bit;
Word in the remarks: represents the register can only be used as word;
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.

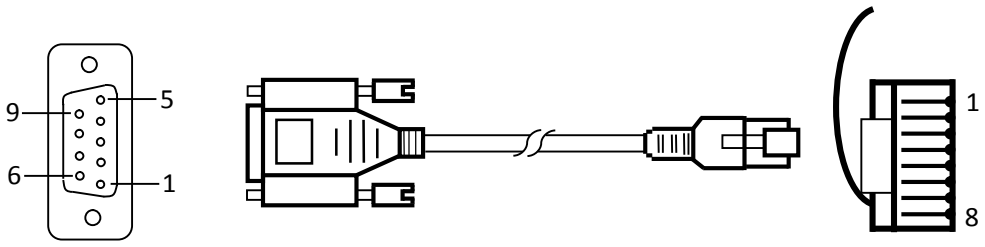
12.8 GE device driver

The device driver is used for SK series HMI to read and write the data or state of GE Fanuc series PLC register. The serial communication connection is established through the HMI serial port that of GE Fanuc series PLC, so as to operate GE Fanuc series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and GE Fanuc series PLC.

1. Hardware connection

Connecting cable:
RS232 (serial port RS232 protocol)

SK HMI COM1/COM2		GE Fanuc series	
2	RX	4	TX
3	TX	3	RX
5	GND	8	GND



Terminal of SK HMI is DB9F, and that of GE Fanuc series PLC is RJ45.

2. Software settings

Select GE Corporation 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 touch screen 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 GE Fanuc series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	GE Fanuc SNP-X	GE Fanuc SNP-X/ GE Fanuc CCM
Communication port type	RS232	RS232/RS422/RS485
Baud rate	19200	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	8	7/8
Parity bit	ODD	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	0	0~255
HMI station number	0	0~255

Supporting function	Whether it is supported
Off-line simulation	Yes
On-line simulation	Yes
Extended mode	No

3. Operational register and address range

Register name	Address format	Input range	Remarks
%I	ddddd	1~10000	Bit: Discrete Input
%Q	ddddd	1~10000	Bit: Discrete Output
%M	ddddd	1~10000	Bit: Internal Use
%S	ddd	1~128	Bit: System Use, Read only

%SA	ddd	1~128	Bit: System Use, Read only
%SB	ddd	1~128	Bit: System Use, Read only
%SC	ddd	1~128	Bit: System Use, Read only
%T	ddd	1~256	Bit: Temporary Status
%G	dddd	1~7680	Bit: Genius? Global
%AI	ddddd	1~10000	Word: Analog Input
%AQ	ddddd	1~10000	Word: Analog Output
%R	ddddd	1~32640	Word: Register memory

Note:

d represents decimal system, input range is 0-9;

o represents octal system, input range is 0-7;

Bit in the remarks: represents the register can only be used as bit;

Word in the remarks: represents the register can only be used as word;

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.

12.9 HaiWell device driver

The device driver is used for SK series HMI to read and write the data or state of Haiwell E/S/H series PLC register. The serial communication connection is established through screen and the serial port of Haiwell E/S/H series PLC, so as to operate Haiwell E/S/H series PLC. Prior to use of the driver, one shall carefully read related technical specifications E/S/H series PLC.

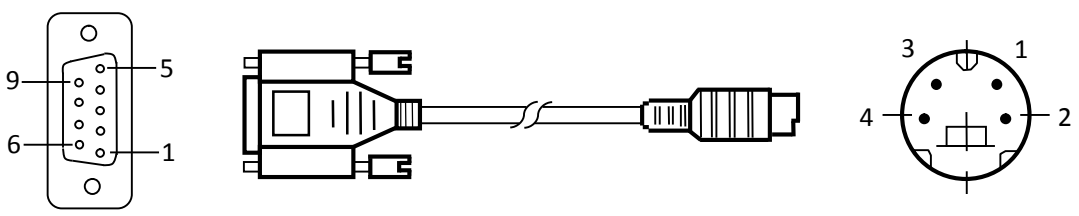
How to establish connection with HAIWELL device

1. Hardware connection

Connecting cable:

RS232 (serial port RS232 protocol)

SK HMI COM1/COM2		HaiWell E/S/H series	
2	RX	2	TX
3	TX	1	RX
5	GND	3	GND



Terminal of SK series HMI is DB9F, and that of Haiwell E/S/H series PLC is

MD4M.

2. Software settings

Select Haiwell Technology Corp. 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 touch screen 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 Haiwell E/S/H series PLC.

Default connection parameters of HMI series touch screen

Setting item	Default parameter value	Setting scope
Communication port type	RS232	RS232/RS422/RS485
Baud rate	19200	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	8	7/8
Parity bit	NONE	EVEN/ODD/NONE
Stop bit length	2	1/2
PLC station number	1	1~31
HMI station number	0	0~255

Supporting function	Whether it is supported
Off-line simulation	Yes
On-line simulation	Yes
Extended mode	No

3. **Operational register and address range**

Register name	Address format	Input range	Remarks
X	ddd	0~1023	Bit: External switch input
Y	ddd	0~1023	Bit: External switch output
M	ddd	0~12287	Bit: Internal relay
SM	ddd	0~215	Bit: System status
S	ddd	0~2047	Bit: Step status
T	ddd	0~1023	Word: Timer status
C	ddd	0~255	Word: Counter status
AI	ddd	0~255	Word: Analog input register
AQ	ddd	0~255	Word: Analog output register
V	ddd	0~14847	Word: Internal register
TCV	ddd	0~1023	Word: current value of Timer
CCV	ddd	0~47, 80~255	Word: Current value of counter
SV	ddd	0~154	Word: System register
CCV32	ddd	0~31	Double word: Current value of counter

Note:

d represents decimal system, input range is 0-9;

Bit in the remarks: represents the register can only be used as bit;

Word in the remarks: represents the register can only be used as word;

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.

12.10 Hitachi device driver

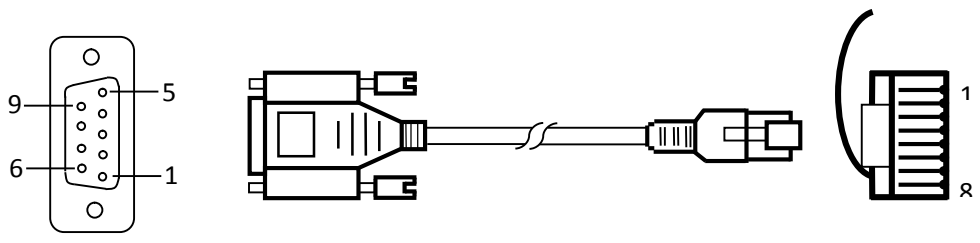
The device driver is used for SK series HMI to read and write the data or state of Hitachi E/EH series PLC register. The serial communication connection is established through the HMI serial port and that of Hitachi E/EH series PLC, so as to operate Hitachi E/EH series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Hitachi E/EH series PLC.

1. Hardware connection

Connecting cable:

RS232 (serial port RS232 protocol)

SK HMI COM1/COM2		Hitachi E/EH series		
2	RX	5	SD	
3	TX	6	RD	
5	GND	1	SG	
		4	PHL	4-7 Short circuit
		7	DR	



Terminal of SK HMI is DB9F, and that of AB device is RJ45.

2. Software settings

Select Hitachi Industrial 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 touch screen 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 Hitachi E/EH series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	Hitachi E/EH Series	Hitachi E/EH Series
Communication port type	RS232	RS232/RS422/RS485
Baud rate	19200	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	7	7/8
Parity bit	EVEN	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station	0	0~255

number		
HMI station number	0	0~255

Supporting function	Whether it is supported
Off-line simulation	Yes
On-line simulation	Yes
Extended mode	Yes

3. Operational register and address range

Register name	Address format	Input range	Remarks
X	hhhh	0~ffff	Bit: external switch quantity input, read only
Y	hhhh	0~ffff	Bit: external switch quantity output
M	hhhh	0~ffff	Bit: internal relay
R	hhhh	0~ffff	Bit: internal register
T	hhhh	0~ffff	Bit: status of timer
L	hhhh	0~ffff	Bit: link relay
WX	hhhh	0~ffff	Word: external switch quantity input
WY	hhhh	0~ffff	Word: external switch quantity output
WM	hhhh	0~ffff	Word: internal relay
WR	hhhh	0~ffff	Word: internal register
WL	hhhh	0~ffff	Word: link relay
TC	hhhh	0~ffff	Word: current value of timer/counter

Note：

h represents hexadecimal system, input range is 0-9, a-f;

Bit in the remarks: represents the register can only be used as bit;

Word in the remarks: represents the register can only be used as word;

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.

12.11 HollySys device driver

The device driver is used for HMI-TOOLS series touch screen to read and write the data or state of HollySys LM series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of HollySys LM series PLC, so as to operate HollySys LM series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and HollySys LM series PLC.

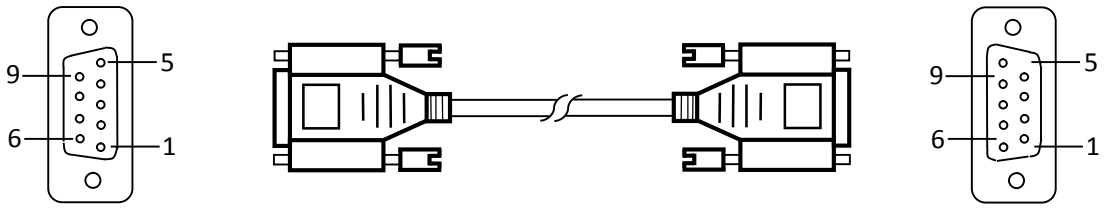
How to establish connection with HOLLYSYS series PLC

1. Hardware connection

Connecting cable:

RS232 (serial port RS232 protocol)

SK HMI COM1/COM2		HollySys LM series	
2	RX	3	TX
3	TX	2	RX
5	GND	5	GND



Terminal of SK series HMI is DB9F, and that of HollySys LM series PLC is DB9M.

2. Software settings

Select HollySys Group 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 touch screen 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 HollySys LM series PLC.

Default connection parameters of SK series HMI

Setting item	Default parameter value	Setting scope
PLC type	HollySys LM Series	HollySys LM Series
Communication port type	RS232	RS232/RS422/RS485
Baud rate	38400	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	51	0~255
HMI station number	0	0~255

Supporting function	Whether it is supported
Off-line simulation	Yes
On-line simulation	Yes
Extended mode	No

3. Operational register and address range

Register name	Address format	Input range	Remarks
IX	ddd.o	0.0~511.7	Bit: I storage area, read only
QX	ddd.o	0.0~511.7	Bit: Q storage area
MX	dddd.o	0.0~7816.7	Bit: M storage area
IW	ddd	0~510	Word: I storage area, 8-bit register, each word occupying two addresses
QW	ddd	0~510	Word: Q storage area, 8-bit register, each word occupying two addresses
MW	dddd	0~8190	Word: M storage area, 8-bit register, each word occupying two addresses

Note:

d represents decimal system, input range is 0-9;

o represents octal system, input range is 0-7;

Word in the remarks: represents the register can only used as word;

Bit in the remarks: represents the register can only used as bit;

8-bit register in the remarks: represents the address spacing between two adjacent words in the register is 2;

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

12.12 IDEC device driver

The device driver is used for SK series HMI to read and write the data or state of Macro Smart FC4A/FC5A series PLC register. The serial communication connection is established through the serial port of HMI and that of Macro Smart FC4A/FC5A series PLC, so as to operate Macro Smart FC4A/FC5A series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Macro Smart FC4A/FC5A series PLC.

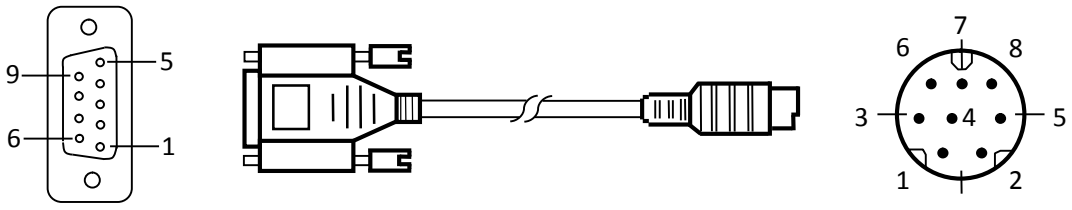
How to establish connection with Macro Smart FC4A/FC5A series

1. Hardware connection

Connecting cable:

RS232 (serial port RS232 protocol)

SK HMI COM1/COM2		Macro Smart FC4A/FC5A		
2	RX	3	TX	
3	TX	4	RX	
5	GND	6	GND	6-7 Short circuit
		7	GND	



Terminal of HMI is DB9F, and that of Macro Smart FC4A/FC5A series PLC is MD8M.

2. Software settings

Select Allen-Bradley 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 touch screen connection parameters and PLC station number are consistent with the PLC connected.

For settings of the PLC connected, refer to the relevant technical documents of the Macro Smart FC4A/FC5A series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	Macro Smart FC4A	Macro Smart FC4A/ Macro Smart FC5A
Communication port type	RS232	RS232/RS422/RS485
Baud rate	9600	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	7	7/8
Parity bit	EVEN	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	No

3. Operational register and address range

Macro Smart FC4A

Register name	Address format	Input range	Remarks
I	ddd	0~255	Bit: external switch quantity input, read only
Q	ddd	0~255	Bit: external switch quantity output
M	dddd	0~1023	Bit: internal relay
SM	ddd	0~215	Bit: internal register
R	ddd	0~255	Word: shift register
D	ddd	0~1299	Word: data register
TV	ddd	0~127	Word: current value of timer
CV	ddd	0~127	Word: current value of counter

Macro Smart FC5A

Register name	Address format	Input range	Remarks
I	ddd	0~255	Bit: external switch quantity input, read only
Q	ddd	0~255	Bit: external switch quantity output
M	dddd	0~2047	Bit: internal relay
SM	ddd	0~215	Bit: internal register
R	ddd	0~255	Word: shift register
D	ddd	0~42000	Word: data register
TV	ddd	0~255	Word: current value of timer
CV	ddd	0~255	Word: current value of counter

Note:

d represents decimal system, input range is 0-9;
Bit in the remarks: represents the register can only be used as bit;
Word in the remarks: represents the register can only be used as word;
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.

12.13 Inovance device driver

The device driver is used for SK series HMI to read and write the data or state of Inovance H1u/H2u series PLC register. The serial communication connection is established thro
and the serial port of Inovance H1u/H2u series PLC, so as to operate Inovance H1u/H2u series PLC. Prior to use of the driver, one shall carefully read related technical specifi
Inovance H1u/H2u series PLC.

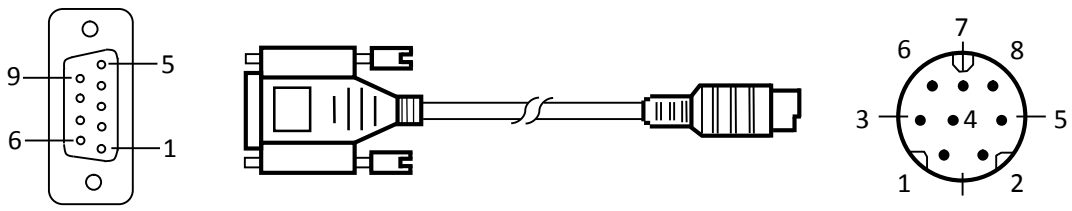
How to establish connection with Inovance H1u/H2u series PLC

1. Hardware connection

Connecting cable:

RS232 (serial port RS232 protocol)

SK	HMI COM1/COM2	Inovance H1u/H2u series	
6	RX-	4	TX-
7	RX+	7	TX+
8	TX-	1	RX-
9	TX+	2	RX+



Terminal of HMI is DB9F, and that of Inovance H1u/H2u series PLC is DB9M.

2. Software settings

Select Inovance Technology Corp. 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 touch screen 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 Inovance H1u/H2u series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	H1u/H2u	H1u/H2u
Communication port type	RS232	RS232/RS422/RS485
Baud rate	9600	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	7	7/8

Parity bit	EVEN	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	0	0~255
HMI station number	0	0~255

Supporting function	**Whether it is supported**
Off-line simulation	Yes
On-line simulation	Yes
Extended mode	No

3. Operational register and address range

Register name	**Address format**	**Input range**	**Remarks**
X	oooo	0~377	Bit: input coil, read only
Y	oooo	0~377	Bit: output coil
M	dddd	0~7999	Bit: intermediate relay
SM	dddd	8000~8999	Bit: special intermediate relay
S	dddd	0~999	Bit: status bit
T	dddd	0~256	Bit: status of timer
C	dddd	0~256	Bit: Status of counter
D	dddd	0~7999	Word: register
SD	dddd	8000~8999	Word: special register
TV	dddd	0~255	Word: current value of timer
CV	dddd	0~199	Word: current value of counter
CV32	dddd	200~255	Double word: current value of 32-bit counter

Note:

d represents decimal system, input range is 0-9;

o 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

12.14 Keyence device driver

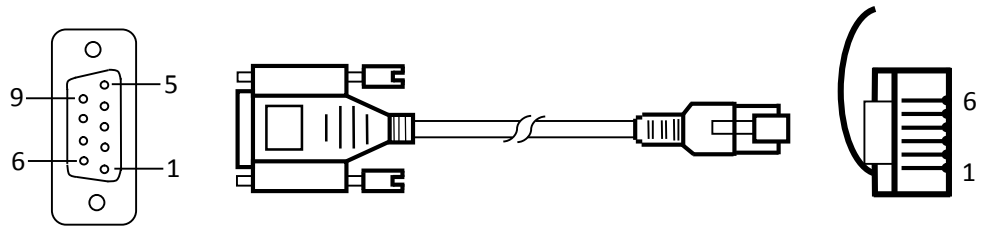
The device driver is used for SK series HMI to read and write the data or state of Keyence KV/VisualKV series PLC register. The serial communication co
established through the serial port on the touch screen and that of Keyence KV/VisualKV series PLC, so as to operate Keyence KV/VisualKV series PLC. Pri
the driver, one shall carefully read related technical specifications of the chapter and Keyence KV/VisualKV series PLC.

How to establish connection with Keyence KV/VisualKV series PLC

1. Hardware connection

Connecting cable:
RS232 (serial port RS232 protocol)

SK HMI COM1/COM2		Keyence KV/VisualKV series	
2	RX	2	TX
3	TX	4	RX
5	GND	3	GND



Terminal of HMI is DB9F, and that of Keyence KV/VisualKV series PLC is MD8M.

2. Software settings

Select Keyence Corporation 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 touch screen connection parameters and PLC station number are consistent with the PLC connected.
For setting of the PLC connected, refer to the technical documents of the Keyence KV/VisualKV series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	KV-1000/700 KV-L20(R)	KV-1000/700 KV-L20(R)/ KV-10/16/24/40 KV-P16
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	EVEN	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	0	0~255
HMI station number	0	0~255

Supporting function	Whether it is supported
Off-line simulation	Yes

On-line simulation	Yes
Extended mode	No

3. Operational register and address range

- KV-1000/700 KV-L20(R)

Register name	Address format	Input range	Remarks
R	dddDD	0~99915	Bit: input/output relay
MR	dddDD	0~3915	Bit: internal auxiliary relay
LR	dddDD	0~3999	Bit: latching relay
CR	ddDD	0~3999	Bit: control relay
T	dddd	0~65534	Bit: timer
C	dddd	0~65534	Bit: counter
DM	ddddd	0~32766	Word: data storage
EM	ddddd	0~511	Word: extended data storage
FM	ddddd	0~11998	Word: file register
TM	ddd	0~3999	Word: temporary data storage
CM	ddddd	0~3999	Word: control storage
TV	dddd	0~99915	Word: current value of timer
CV	dddd	0~3915	Word: current value of counter

- KV-10/16/24/40 KV-P16

Register name	Address format	Input range	Remarks
RLY	dddDD	0~99915	Bit: relay
T	dddd	0~999	Bit: timer
C	dddd	0~999	Bit: counter
DM	ddddd	0~9999	Word: data storage
TM	ddd	0~99	Word: temporary data storage
TV_c	dddd	0~999	Word: current value of timer
TV_p	dddd	0~999	Word: preset value of timer
CV_c	dddd	0~999	Word: current value of counter
CV_p	dddd	0~999	Word: preset value of counter
CTH	dddd	0~9	Word: current value of high speed counter

- KV-Nano

Register name	Address format	Input scope	Remarks
R	ddddd	0~59915	Position: relay
B	DDDD	0~1FFF	Link Relay
MR	ddddd	0~59915	Internal auxiliary relay
LR	ddddd	0~19915	Latching relay
CR	dddd	0~8915	Control relay
VB	DDDD	0~1FFF	Working relay

T	ddd	0~511	Bit timer
C	ddd	0~255	Bit: counter
DM	dddd	0~32767	Data memory
W	DDDD	0~3FFF	Link register
TM	dddd	0~511	Temporary data storage
Z	dddd	1~12	Index register
TC	dddd	0~511	Double word: timer (current value)
TS	dddd	0~511	Double word: timer (set value)
CC	ddd	0~255	Double word: counter (current value)
CS	ddd	0~255	Double word: counter (set value)
CTH	d	0~3	High speed counter
CTC	d	0~7	Double word: high speed comparator
CM	dddd	0~8999	Control memory
VM	dddd	0~9999	Working memory

Note:
d represents decimal system, input range is 0-9;
DD represents 16 bits, input range is 0-15;
Bit in the remarks: represents the register can only be used as bit;
Word in the remarks: represents the register can only be used as word;
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.

12.15 Koyo device driver

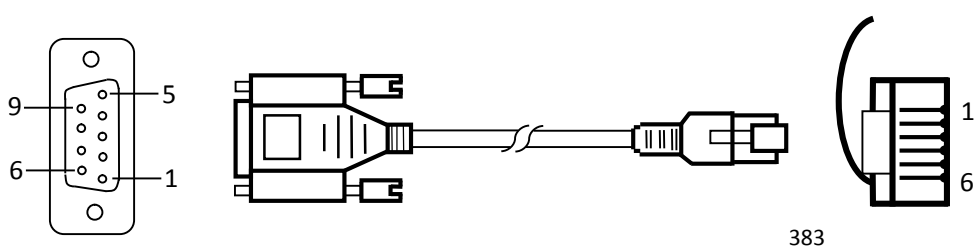
The device driver is used for SK series HMI to read and write the data or state of Koyo SN series PLC register. The serial communication connecti established through the serial port on the touch screen and the serial port of Koyo SN series PLC, so as to operate Koyo SN series PLC. Prior to use of the d one shall carefully read related technical specifications of the chapter and Koyo SN series PLC.

How to establish connection with Koyo SN series PLC

1. Hardware connection

Connecting cable:
RS232 (serial port RS232 protocol)

SK HMI COM1/COM2		Koyo SN series	
2	RX	4	TX
3	TX	3	RX
5	GND	1	GND



Terminal of HMI is DB9F, and that of Koyo SN series PLC is 6-pin registered jack.

2. Software settings

Select Koyo Electronics 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 touch screen 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 Koyo SN series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	Koyo SN Series	Koyo SN Series
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	ODD	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. Operational register and address range

Register name	Address format	Input range	Remarks
I	ooo	0~377	Bit: input relay, read only
O	ooo	0~377	Bit: output relay
M	oooo	0~1177	Bit: auxiliary relay
SP	ooo	0~777	Bit: special auxiliary relay
S	ooo	0~177	Bit: stepping relay
T	ooo	0~177	Bit: timer
C	ooo	0~177	Bit: counter
R	ooooo	0~13777	Word: data register
TR	ooooo	0~13777	Word: current value of timer
CR	ooooo	0~13777	Word: current value of counter
SR	ooooo	0~13777	Word: special data register

Note:
o 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

12.16 LG device driver

The device driver is used for SK HMI to read and write the data or state of LG Master-K series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of LG Master-K series PLC, so as to operate LG Master-K series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and LG Master-K series PLC.

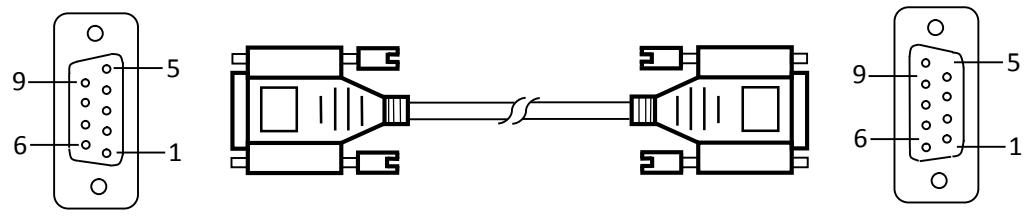
How to establish connection with LG Master-K series PLC

1. Hardware connection

Connecting cable:

RS232-using CNet protocol (serial port RS232 protocol)

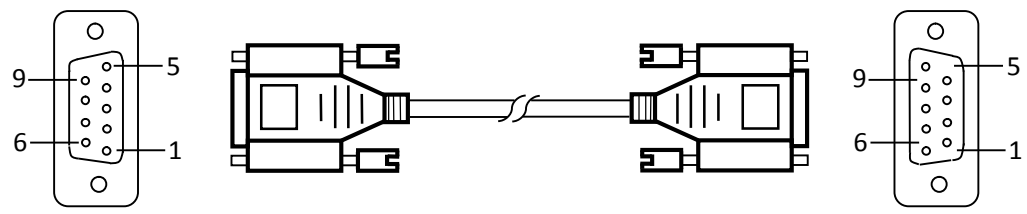
SK HMI COM1/COM2		LG Master-K	
2	RX	7	TX
3	TX	4	RX
5	GND	5	GND



Terminal of HMI is DB9F, and that of LG Master-K series PLC is DB9M.

RS232-Employ KLoader protocol

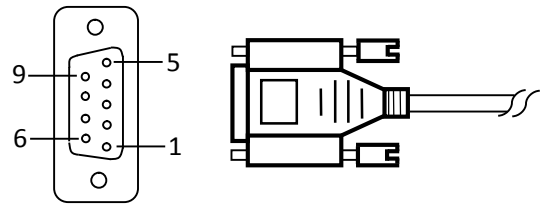
SK HMI COM1/COM2		LG Master-K	
2	RX	3	TX
3	TX	2	RX
5	GND	5	GND



Terminal of HMI is DB9F, and that of LG Master-K series PLC is DB9M.

RS485

SK HMI COM1/COM2		LG Master-K
8	D-	B
9	D+	A

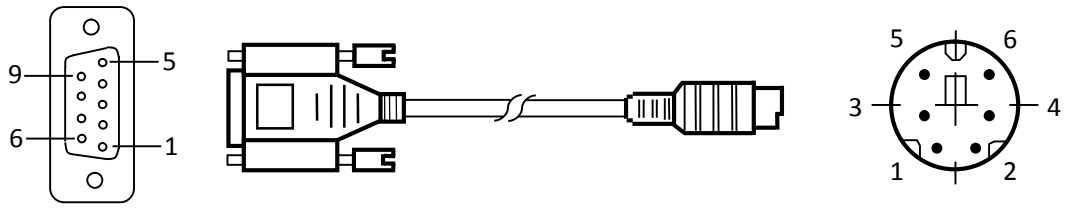


Terminal of HMI is DB9F, and that of LG Master-K series PLC is two-wire terminal.

RS232-K10S1

SK HMI COM1/COM2		LG Master-K	
2	RX	4	TX
3	TX	1	RX
5	GND	6	GND

Terminal of HMI is DB9F, and that of LG Master-K series PLC is MD6M.



2. Software settings

Select LG Industrial Systems 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 touch screen 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 LG Master-K series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	LG Master-K Cnet	LG Master-K Cnet/K Loader/K10s1
Communication port type	RS232	RS232/RS422/RS485
Baud rate	19200	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	0	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. Operational register and address range

Operational address range of Kxxx series PLC:

Register name	Address format	Input range	Remarks
P_Bit	dddh	0~255f	Bit: input/output area
M_Bit	dddh	0~255f	Bit: auxiliary relay
K_Bit	dddh	0~255f	Bit: protection relay
L_Bit	dddh	0~255f	Bit: link relay
F_Bit	dddh	0~255f	Bit: special relay
P	dddh	0~255f	Word: input/output area
M	dddh	0~255f	Word: auxiliary relay
K	dddh	0~255f	Word: protection relay
L	dddh	0~255f	Word: link relay
F	dddh	0~255f	Word: special relay

T	ddd	0~255	Bit: timer relay
C	ddd	0~255	Bit: counter relay
S	dddd	0~9999	Word: stepping register
D	dddd	0~9999	Word: data register
TV	ddd	0~255	Word: current value of timer
CV	ddd	0~255	Word: current value of counter

Operational address range of XGB CNET series PLC:

Register name	Address format	Input range	Remarks
P	dddh	0~127f	Word: input/output area
M	dddh	0~255f	Word: auxiliary relay
K	dddh	0~2559f	Word: protection relay
L	dddh	0~1279f	Word: link relay
F	dddh	0~255f	Word: special relay
T	ddd	0~255	Bit: timer relay
C	ddd	0~255	Bit: counter relay
S	ddd	0~127.99	Word: stepping register
D	dddd	0~5119	Word: data register
N	dddd	0~3935	
Z	ddd	0~127	
ZR	dddd	0~1023	
U	d	0~7.31	

Note:
d represents decimal system, input range is 0-9;
h represents hexadecimal system, input range is 0-9, a-f;
Word in the remarks: represents the register can only be used as word;
Bit in the remarks: represents the register can only be used as bit;
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

12.17 Matsushita device driver

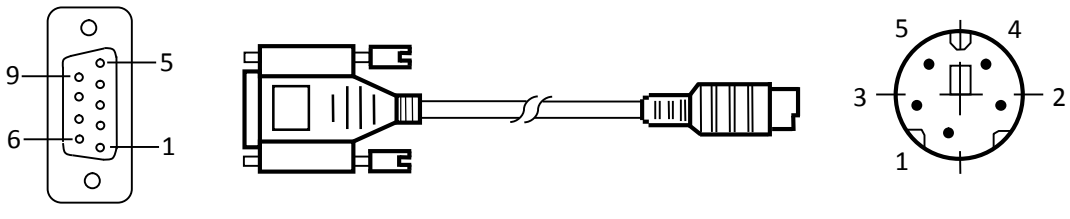
The device driver is used for SK HMI to read and write the data or state of Matsushita FP series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of Matsushita FP series PLC, so as to operate Matsushita FP series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Matsushita FP series PLC.

How to establish connection with Matsushita FP series PLC

1. Hardware connection

Connecting cable:
RS232-FP0/FP2/FP2SH/FPM

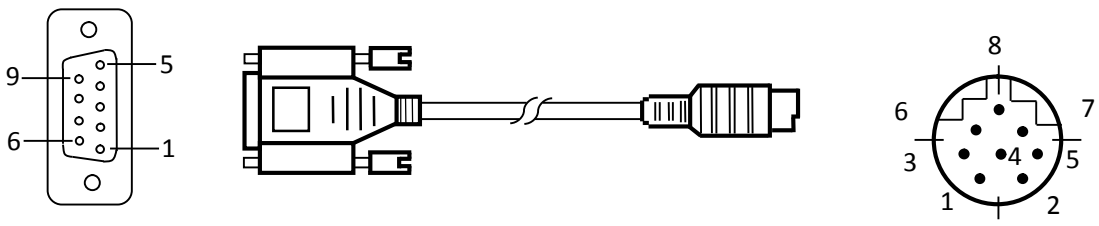
SK HMI COM1/COM2		Matsushita FP series	
2	RX	3	TX
3	TX	2	RX
5	GND	1	GND



Terminal of HMI is DB9F, and that of Matsushita FP series PLC is MD5M.

RS422-FP1

SK HMI COM1/COM2		Matsushita FP series	
6	RX-	2	TX-
7	RX+	5	TX+
8	TX-	3	RX-
9	TX+	6	RX+



Terminal of HMI is DB9F, and that of Matsushita FP series PLC is MD8M.

2. Software settings

Select MATSUSHITA 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 touch screen connection parameters and PLC station number are consistent with the PLC connected.
For settings of connecting PLC, please refer to the technical documents of the Matsushita FP series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	FP Series	FP Series
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	ODD	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	No

3. Operational register and address range

Register name	Address format	Input range	Remarks
X	ddddh	0~9999f	Bit: external input, read only
Y	ddddh	0~9999f	Bit: external output
R	ddddh	0~9999f	Bit: internal relay
L	ddddh	0~9999f	Bit: link relay
T	dddd	0~9999	Bit: status of timer, read only
C	dddd	0~9999	Bit: status of counter, read only
WX	dddd	0~9999	Word: external input, read only
WY	dddd	0~9999	Word: external output
WR	dddd	0~9999	Word: internal relay
WL	dddd	0~9999	Word: link relay
DT	ddddd	0~99999	Word: data register
LD	ddddd	0~99999	Word: link register
FL	ddddd	0~99999	Word: file register
SV	dddd	0~9999	Word: timer/counter set value area
EV	dddd	0~9999	Word: timer/counter process value area

Note:
d represents decimal system, input range is 0-9;
h represents hexadecimal system, input range is 0-9, a-f;
Word in the remarks: represents the register can only be used as word;
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

12.18 Mitsubishi device driver

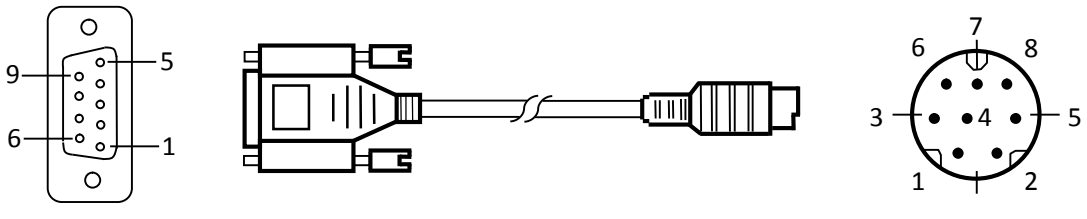
The device driver is used for SK HMI to read and write the data or state of Melsec FXxn/Q00J/C24N series PLC register. The serial communication connec
established through the serial port on the touch screen and the serial port of Melsec FXxn/Q00J/C24N series PLC, so as to operate Melsec FXxn/Q00J/C24N
PLC. Prior to use of the driver, one shall carefully read the related technical specifications of the chapter and Melsec FXxn/Q00J/C24N series PLC.

How to establish connection with Melsec FXxn/Q00J/C24N series PL

1. Hardware connection

Connecting cable:
RS422- Melsec-FXxn/FX3U/3G (serial port RS232 protocol)

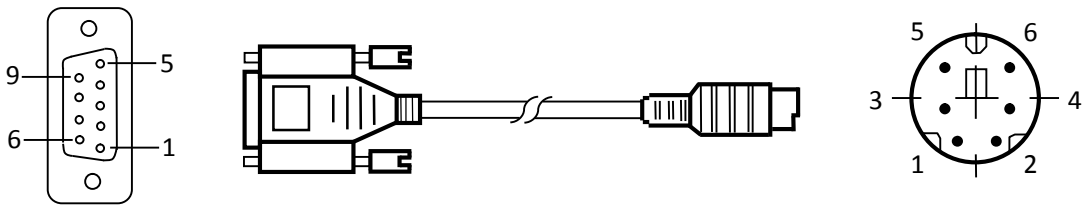
SK HMI COM1/COM2		Melsec-FXxn	
6	RX-	4	TX-
7	RX+	7	TX+
8	TX-	1	RX-
9	TX+	2	RX+



Terminal of HMI series touch screen is DB9F, and that of Melsec FXxn series PLC is MD8M.

RS232- Melsec-Q00J

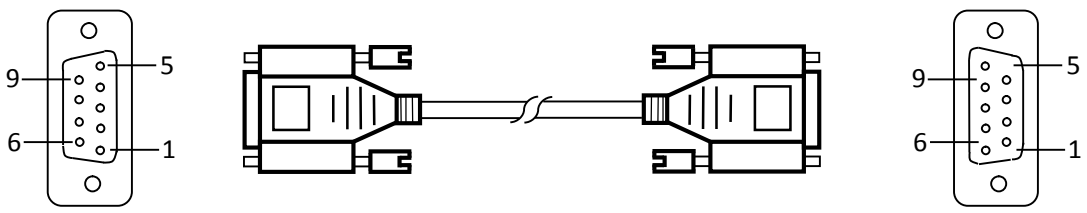
SK HMI COM1/COM2		Q00J CPU	
2	RX	2	TX
3	TX	1	RX
5	GND	3	GND



Terminal of HMI series touch screen is DB9F, and that of Melsec FXxn series PLC is MD8M.

RS232- Melsec-QC24N module

SK HMI COM1/COM2		Q00J CPU	
2	RX	3	TX
3	TX	2	RX
5	GND	5	GND



Terminal of HMI series touch screen is DB9F, and that of Melsec QC24N module is MB9M.

2. Software settings

Select MITSUBISHI 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 touch screen 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 Melsec FXxn/Q00J/C24N series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	Melsec-FX2N	Melsec-FX/ FX2N/ FX3U/3G /Q_C24N Q00J
Communication port type	RS232	RS232/RS422/RS485
Baud rate	9600	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	7	7/8
Parity bit	EVEN	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	0	0~255
HMI station number	0	0~255

Supporting function	Whether it is supported
Off-line simulation	Yes
On-line simulation	Yes
Extended mode	No

3. Operational register and address range

Melsec-FXxn/FX3U/3G/ FX3U-Ethernet

Register name	Address format	Input range	Remarks
X	oooo	0~377	Bit: input coil, read only
Y	oooo	0~377	Bit: output coil
M	dddd	0~7999	Bit: intermediate relay
SM	dddd	8000~8999	Bit: special intermediate relay
S	dddd	0~999	Bit: status bit
T	dddd	0~256	Bit: status of timer
C	dddd	0~256	Bit: status of timer
D_Bit	dddd.dd	0.00~7999.15	Bit: bit of 16-bit register
D	dddd	0~7999	Word: register
SD	dddd	8000~8999	Word: special register
TV	dddd	0~255	Word: current value of timer
CV	dddd	0~199	Word: current value of counter
CV32	dddd	200~255	Double word: current value of 32-bit counter

FX5U/FX5U-Ethernet

Register name	Address format	Input range	Remarks
X	oooo	0~1777	Bit: input coil, read only
Y	oooo	0~1777	Bit: output coil
M	dddd	0~7679	Bit: internal relay
L	dddd	0~7679	Bit: latching relay
F	ddd	0~127	Bit: alarm relay
TS	ddd	0~511	Bit: timer contact
CS	ddd	0~255	Bit: counter contact
S	dddd	0~4095	Bit: stepping relay
SM	dddd	0~9999	Bit: special relay
B	hh	0-ff（hexadecimal	Bit: 位：link relay

		notation)	
D_Bit	dddd.dd	0.0~7999.15	Bit: bit of 16-bit register
D	dddd	0~7999	Word: register
R	ddddd	0~32767	Word: cumulative current value of timer
W	hhh	0-1ff (hexadecimal notation)	Word: link register
CN	ddd	0~255	Word: current value of register
TN	ddd	0~511	Word: current value of timer
SD	ddddd	0~11999	Word: special register

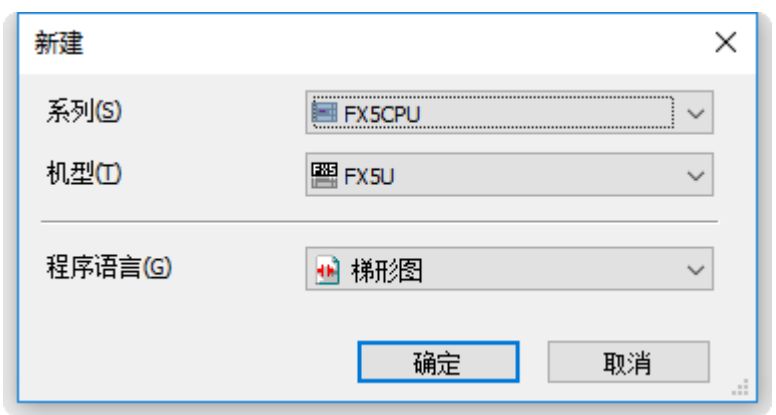
Melsec-Q00J/QC24N

Register name	Address format	Input range	Remarks
X	hhh	0~7ff	Bit: input relay, read only
Y	hhh	0~7ff	Bit: output relay
M	dddd	0~8191	Bit: internal relay
L	dddd	0~2047	Bit: latching relay
F	dddd	0~2047	Bit: alarm
V	dddd	0~2047	Bit: indexing relay
S	dddd	0~2047	Bit: stepping relay
B	hhh	0~7ff	Bit: conversion relay
SB	hhh	0~3ff	Bit: special link relay
T	ddd	0~511	Bit: status of timer
C	ddd	0~511	Bit: status of counter
D	ddddd	0~11135	Word: data register
W	hhh	0~7ff	Word: conversion register
SW	hhh	0~3ff	Word: special link register
Z	d	0~9	Word: index register
TV	ddd	0~511	Word: current value of timer
CV	ddd	0~511	Word: current value of counter

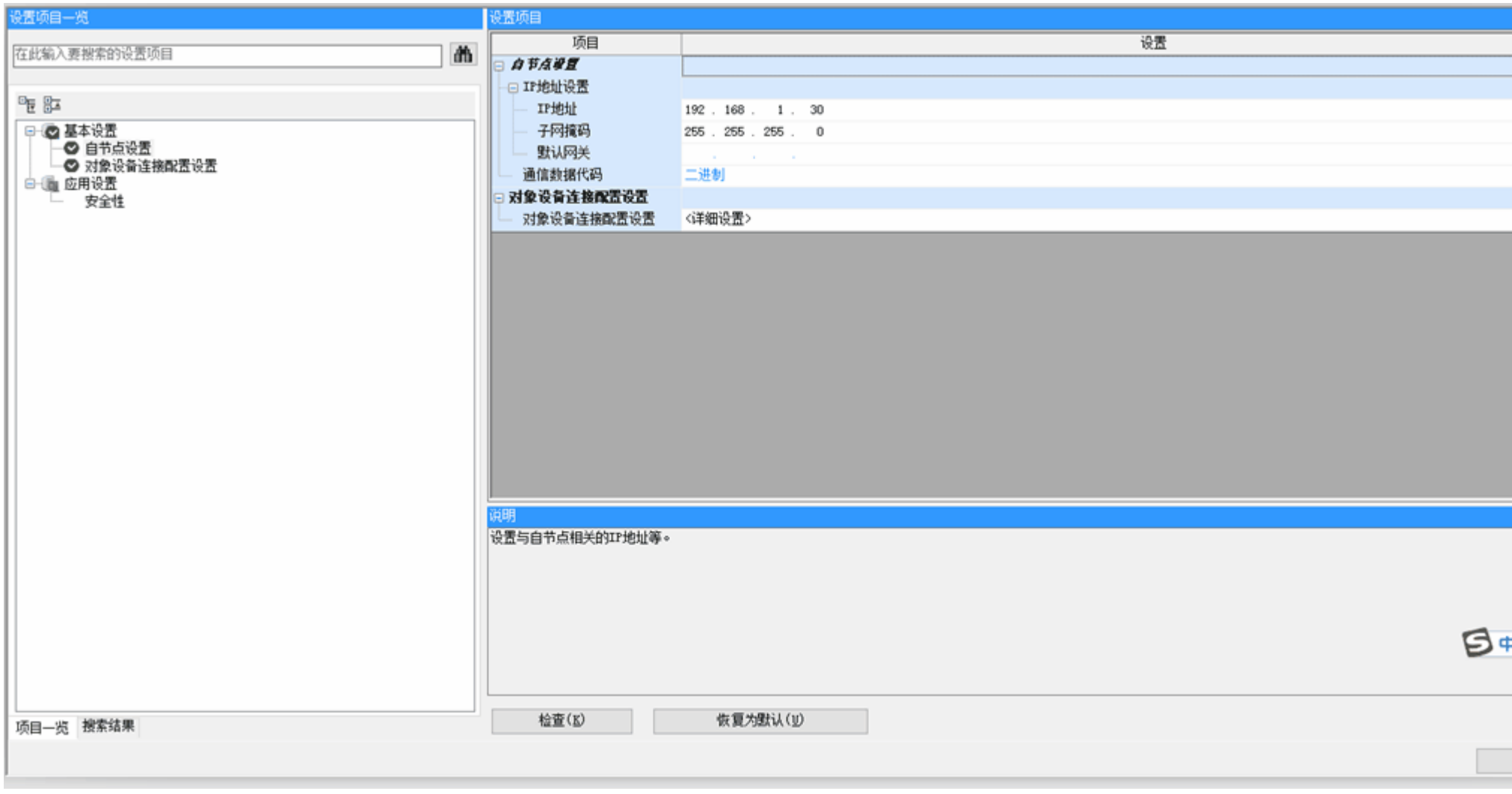
Note:
d represents decimal system, input range is 0-9;
o represents octal system, input range is 0-7;
h represents hexadecimal system, input range is 0-9, a-f;
Word in the remarks: represents the register can only be used as word;
Double-word in the remarks: represents that the data type of the register 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

4. Instruction of connection between SK HMI and FX5U PLC of Mitsubishi Company

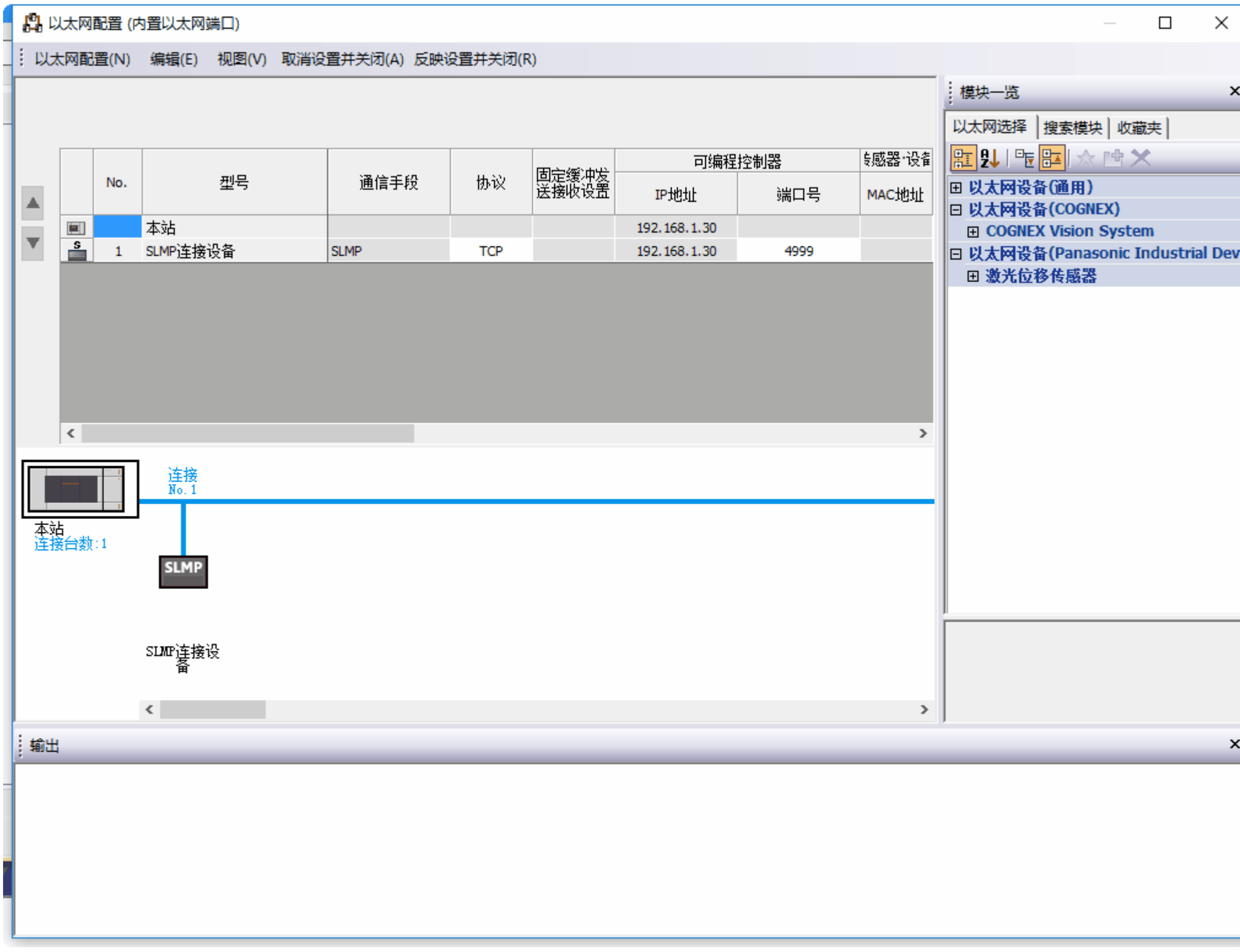
Open GX work3 Software-New file-Series FX5CPU-Type FX5U



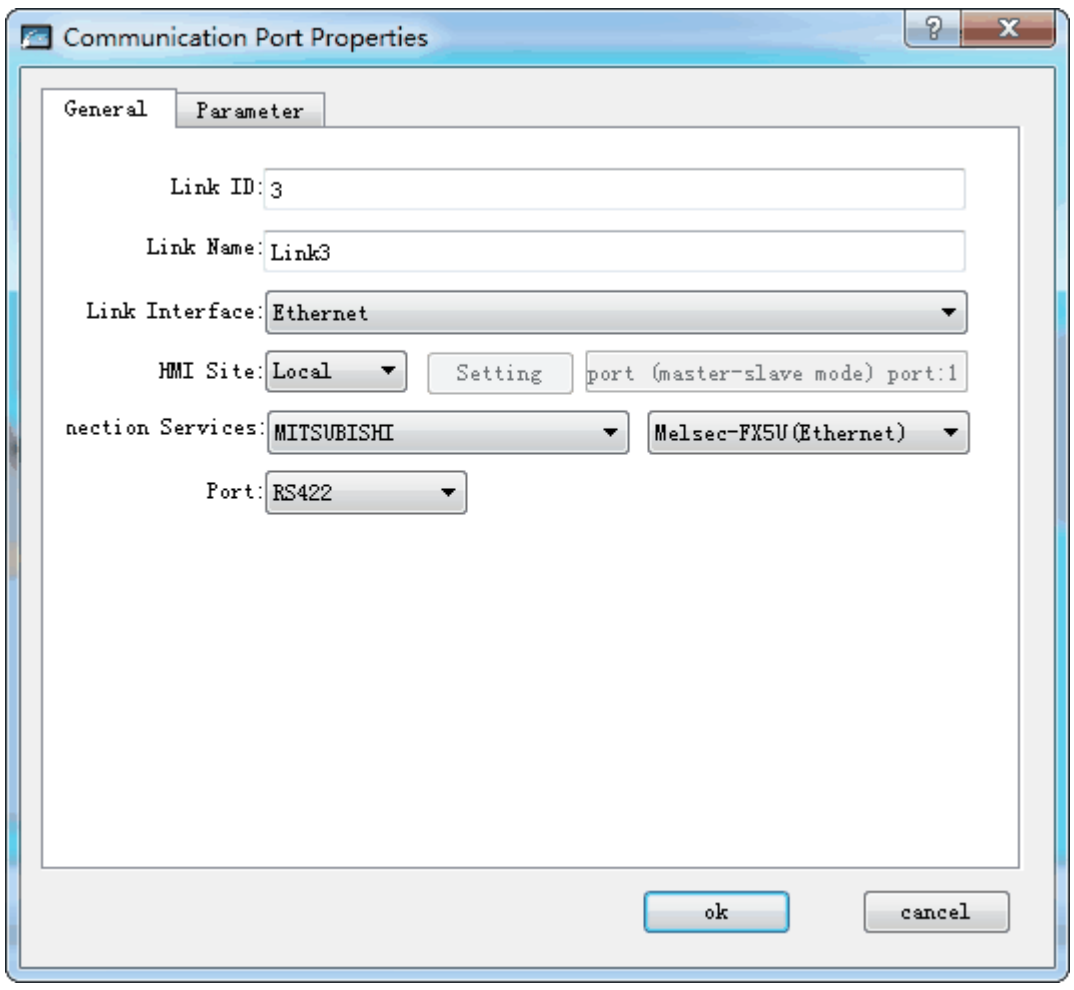
Navigation-Parameter-Module Parameter- Ethernet



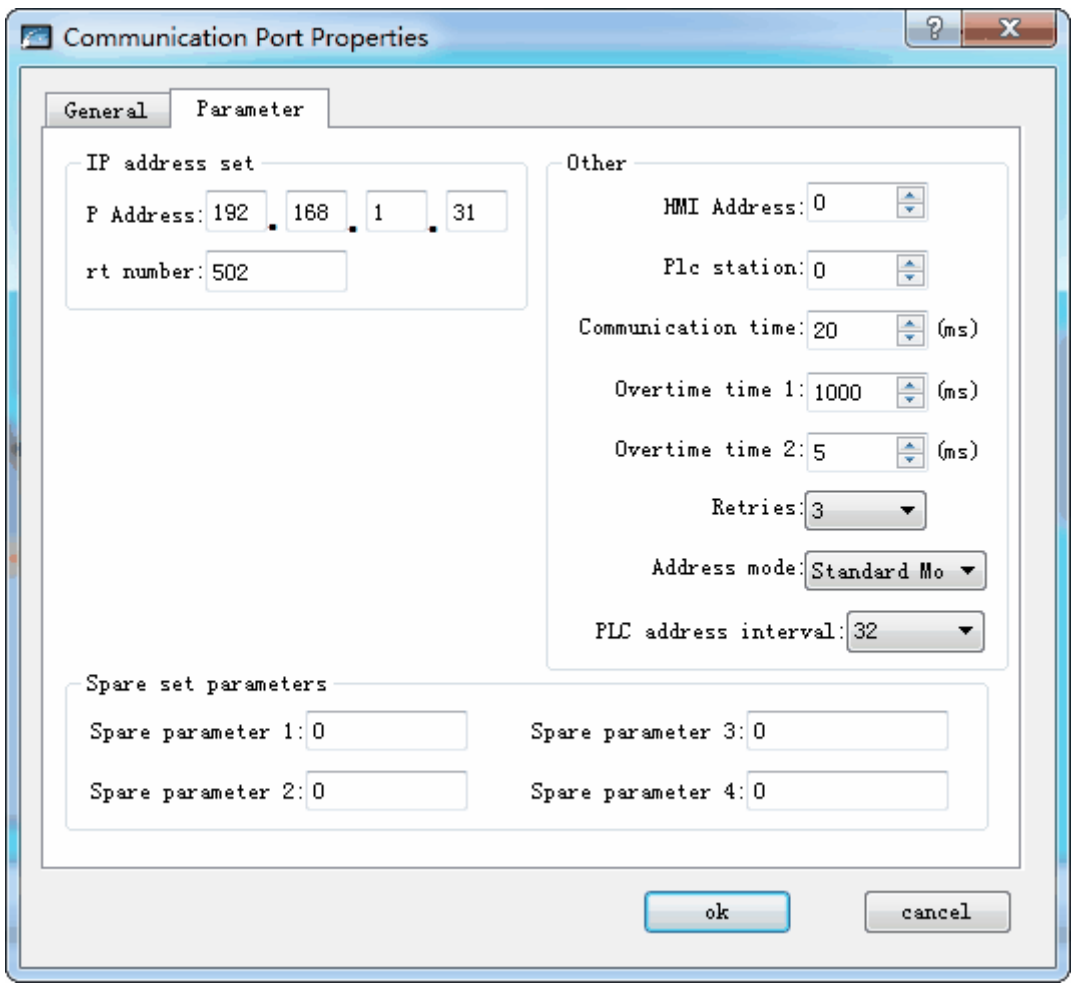
Object Link-Particular set



SKTOOL Software General



Link-Parameter



12.19 Modbus device driver

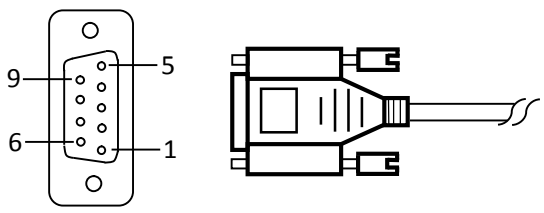
The device driver is used for SK HMI to read and write the data or state of MODBUS device. The serial communication connection is established throug
serial port of the HMI series touch screen and the serial port of MODBUS device, so as to operate MODBUS device. Prior to use of the driver, please car
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

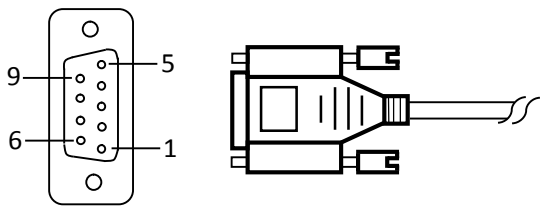
SK HMI COM1/COM2		Modbus device	
2	RX	User-defined pins	TX
3	TX	User-defined pins	RX
5	GND	User-defined pins	GND



Terminal of HMI is DB9F. Definitions of Modbus device pins depend on particular Modbus device.

RS422

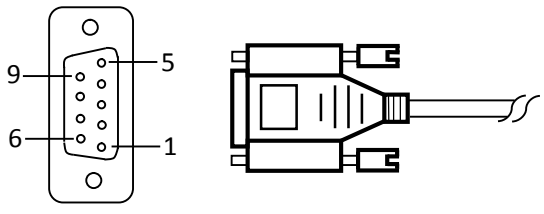
SK HMI COM1/COM2		Modbus device	
6	RX-	User-defined pins	TX-
7	RX+	User-defined pins	TX+
8	TX-	User-defined pins	RX-
9	TX+	User-defined pins	RX+



Terminal of HMI is DB9F. Definitions of Modbus device pins depend on particular Modbus device.

RS485

SK HMI COM1/COM2		Modbus device	
8	D-	User-defined pins	B
9	D+	User-defined pins	A

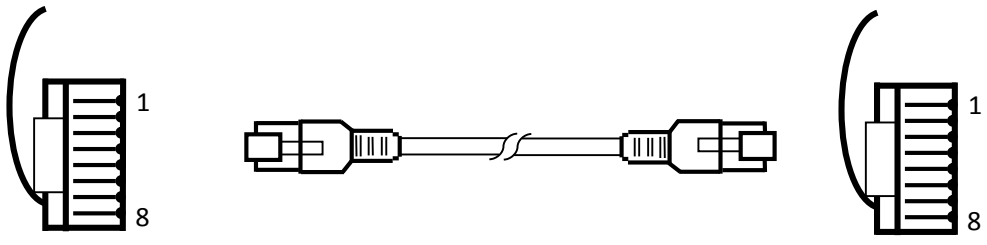


Terminal of HMI is a 9P trapezoidal female connector. Definitions of Modbus device pins depend on particular AIBUS device.

TCP/IP (RJ45 direct connection)

SK HMI COM1/COM2		Modbus device	
1	TX+	3	RX+
2	TX-	6	RX-

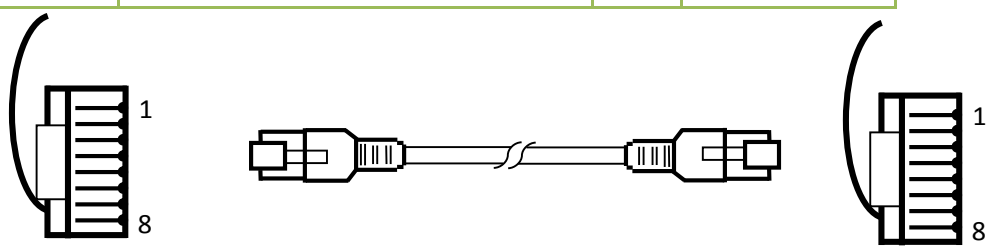
3	RX+	1	TX+
4	BD4+	4	BD4+
5	BD4-	5	BD4-
6	RX-	2	TX-
7	BD3+	7	BD3+
8	BD3-	8	BD3-



Terminal of HMI is RJ45, and that of Modbus device is RJ45.

TCP/IP (RJ45 connection via router)

SK	HMI COM1/COM2	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 touch screen 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 SK HMI

Setting item	Default parameter value	Setting scope
PLC type	RTU Master	RTU/RTU_S/ASCII/ASCII_S Master
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	Yes

simulation	
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

12.20 Modicon device driver

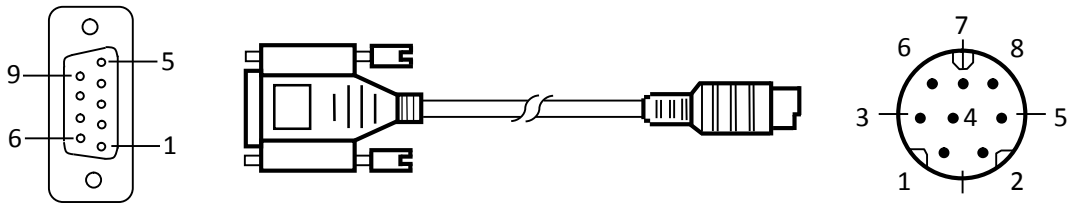
The device driver is used for SK HMI to read and write the data or state of Modicon NEZA/TWIDO/M218 series PLC register. The serial communication co
established through the serial port on the touch screen and the serial port of Modicon NEZA/TWIDO/M218 series PLC, so as to operate Modicon NEZA/TW
series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Modicon NEZA/TWIDO/M218 series PLC.

How to establish connection with Modicon NEZA/TWIDO/M218 series PLC

1. Hardware connection

Connecting cable:
RS485

SK HMI COM1/COM2		Modicon NEZA/TWIDO/M218	
8	TX-	2	TX-
9	TX+	1	TX+
5	GND	7	GND



Terminal of HMI is DB9F, and that of Modicon NEZA/TWIDO/M218 series PLC is MD8M.

2. Software settings

Select Modicon Corp. 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 touch screen 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 Modicon NEZA/TWIDO/M218 series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	NEZA Series	NEZA/TWIDO/M218 Series
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	ODD	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. Operational register and address range

NEZA Series

Register name	Address format	Input range	Remarks
%MW	ddddd	0~65535	Word: word data register

TWIDO Series

Register name	Address format	Input range	Remarks
%M	ddddd	0~65535	Bit: bit data register
%MW	ddddd	0~65535	Word: word data register

M218 Series

Register name	Address format	Input range	Remarks
%MX	ddddd.o	0~131071.7	Bit: bit data register
%MW	ddddd	0~65535	Word: word data register

Note:
d represents decimal system, input range is 0-9;
o represents octal system, input range is 0-7;
Word in the remarks: represents the register can only be used as word;
Bit in the remarks: represents the register can only be used as bit;
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

12.21 Nanda device driver

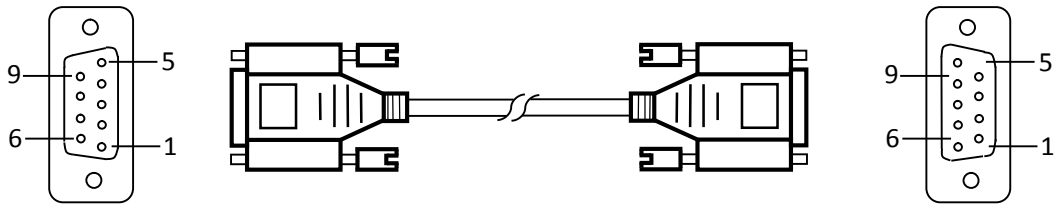
The device driver is used for SK HMI to read and write the data or state of Nanda NA-200/400 series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of Nanda NA-200/400 series PLC, so as to operate Nanda NA-200/400 series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Nanda NA-200/400 series PLC.

How to establish connection with Nanda NA-200/400 series PLC

1. Hardware connection

Connecting cable:
RS232

SK HMI COM1/COM2		Nanda NA-200/400	
2	RX	3	TX
3	TX	2	RX
5	GND	5	GND



Terminal of HMI is DB9F, and that of Nanda NA-200/400 series PLC is DB9M.

2. Software settings

Select Nanda Auto Technology 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 touch screen 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 Nanda NA-200/400 series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	Nanda NA-200	Nanda NA-200/400
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. Operational register and address range

Nanda NA-200

Register name	Address format	Input range	Remarks
I	ddd	1~128	Bit: digital quantity input, read only
Q	ddd	1~128	Bit: digital quantity output
M	dddd	1~1024	Bit: bit register

S	ddd	1~256	Bit: system bit register
N	ddd	1~256	Bit: bit register for power failure protection
IW	dd	1~32	Word: analog quantity input
QW	dd	1~32	Word: analog quantity output
MW	dddd	1~1024	Word: word register
SW	ddd	1~256	Word: system word register
NW	ddd	1~256	Word: word register for power failure protection

Nanda NA-400

Register name	Address format	Input range	Remarks
I	ddd	1~2048	Bit: digital quantity input, read only
Q	ddd	1~2048	Bit: digital quantity output
M	dddd	1~8192	Bit: bit register
S	ddd	1~4096	Bit: system bit register
N	ddd	1~2048	Bit: bit register for power failure protection
IW	dd	1~512	Word: analog quantity input
QW	dd	1~512	Word: analog quantity output
MW	dddd	1~8192	Word: word register
SW	ddd	1~2048	Word: system word register
NW	ddd	1~2048	Word: word register for power failure protection

Note:
d represents decimal system, input range is 0-9;
Word in the remarks: represents the register can only be used as word;
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

12.22 Omron device driver

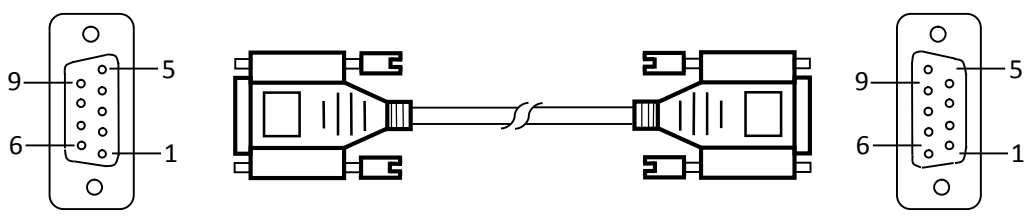
The device driver is used for SK HMI to read and write the data or state of SYSMAC C/CPM/CS/CJ series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of SYSMAC C/CPM/CS/CJ series PLC, so as to operate SYSMAC C/CPM/CS/CJ series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and SYSMAC C/CPM/CS/CJ series PLC.

How to establish connection with SYSMAC C/CPM/CS/CJ series PLC

1. Hardware connection

Connecting cable:
RS232

HMI series touch screen COM1/COM2		SYSMAC CS/CJ	
2	RX	2	TX
3	TX	3	RX
5	GND	9	GND



Terminal of HMI is DB9F, and that of SYSMAC C/CPM/CS/CJ series PLC is DB9M.

2. Software settings

Select OMRON 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 touch screen connection parameters and PLC station number are consistent with the PLC connected.
For settings of the PLC connected, please refer to the technical documents of the SYSMAC C/CPM/CS/CJ series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	SYSMAC C/CPM Series	SYSMAC C/CPM/CS/CJ Series
Communication port type	RS232	RS232/RS422/RS485
Baud rate	9600	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	7	7/8
Parity bit	EVEN	EVEN/ODD/NONE
Stop bit length	2	1/2
PLC station number	0	0~255
HMI station number	0	0~255

Supporting function	Whether it is supported
Off-line simulation	Yes
On-line simulation	Yes
Extended mode	No

3. Operational register and address range

SYSMAC C/CPM Series

Register name	Address format	Input range	Remarks
IR_Bit	dddd.DD	0.0~4095.15	Bit: input/output relay
HR_Bit	dddd.DD	0.0~4095.15	Bit: hold relay
LR_Bit	dddd.DD	0.0~4095.15	Bit: link relay
AR_Bit	dddd.DD	0.0~4095.15	Bit: auxiliary memory relay
T	ddd	0~255	Bit: status of timer
C	ddd	0~255	Bit: status of counter
IR	dddd	0~4095	Word: input/output relay
HR	dddd	0~4095	Word: hold relay
LR	dddd	0~4095	Word: link relay
AR	dddd	0~4095	Word: auxiliary memory relay
TC	ddd	0~255	Word: value of timer
DM	dddd	0~9999	Word: common data area

SYSMAC CS/CJ Series

Register name	Address format	Input range	Remarks
CIO_Bit	dddd.DD	0.0~3189.15	Bit: core I/O area
W_Bit	dddd.DD	0.0~6143.15	Bit: work area
H_Bit	dddd.DD	0.0~511.15	Bit: holding area
A_Bit	dddd.DD	0.0~959.15	Bit: auxiliary area, read only: 7,168Bit: A00000～A447.15
D_Bit	dddd.DD	0.0~32767.15	Bit: common data area
T	dddd	0~4095	Bit: status of timer
C	dddd	0~4095	Bit: status of counter
CIO	dddd	0~3189	Word: core I/O area
W	dddd	0~6143	Word: work area
H	dddd	0~511	Word: holding area
A	dddd	0~959	Word: auxiliary area, read only: 448Word: A000～A447
D	dddd	0~32767	Word: common data area

TV	dddd	0~4095	Word: current value of timer
CV	dddd	0~4095	Word: current value of counter

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;
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 documents of the connected device

12.23 Siemens device driver

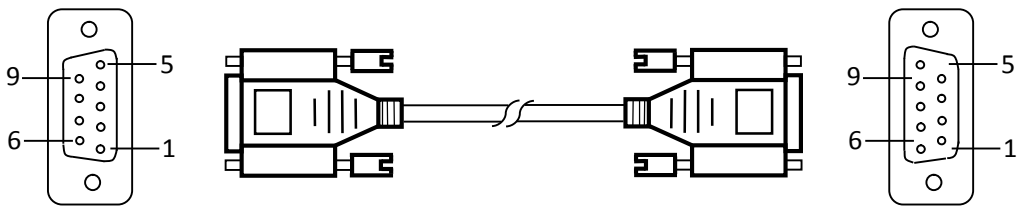
The device driver is used for SK HMI to read and write the data or state of Siemens S7-200/300/1200 series PLC register. The serial communication connectio established through the serial port on the touch screen and the serial port of Siemens S7-200/300 /1200tcp series PLC, so as to operate Sien S7-200/300/1200tcp series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Siemens S7-200/300/120 series PLC.

How to establish connection with Siemens S7-200/300/1200tcp series PLC

1. 1 Hardware connection

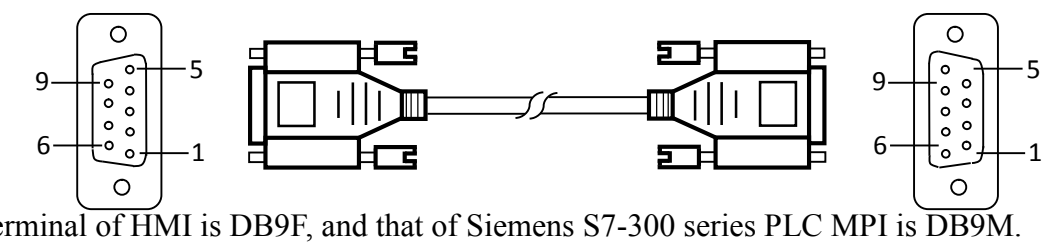
Connecting cable:
RS485-Siemens S7-200

SK HMI COM1/COM2		Siemens S7-200 series	
8	TX-	8	TX-
9	TX+	3	TX+



RS232-Siemens S7-300

SK HMI COM1/COM2		Siemens S7-300 series	
2	RX	3	TX
3	TX	2	RX
5	GND	5	GND

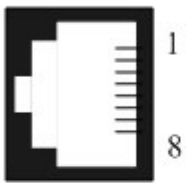


Terminal of HMI is DB9F, and that of Siemens S7-300 series PLC MPI is DB9M.

How to establish connection with Siemens S7-200/300/1200 series PLC

1. 2 Hardware connection

Connecting cable:
Cable RJ45；
Pins of RJ45:



1	TX+
2	TX-
3	RX+
4	BD4+
5	BD4-
6	RX-
7	BD3+
8	BD3-

1、Settings of IP and Port Number

Select “Ethernet Port” for Connection Interface in General page of Communication Port Properties and “SIEMENS”, “Siemens S7-200(TCP/IP)/Siemens S7-300(TCP/IP)/Siemens S7-1200(TCP)” for Connection Services;

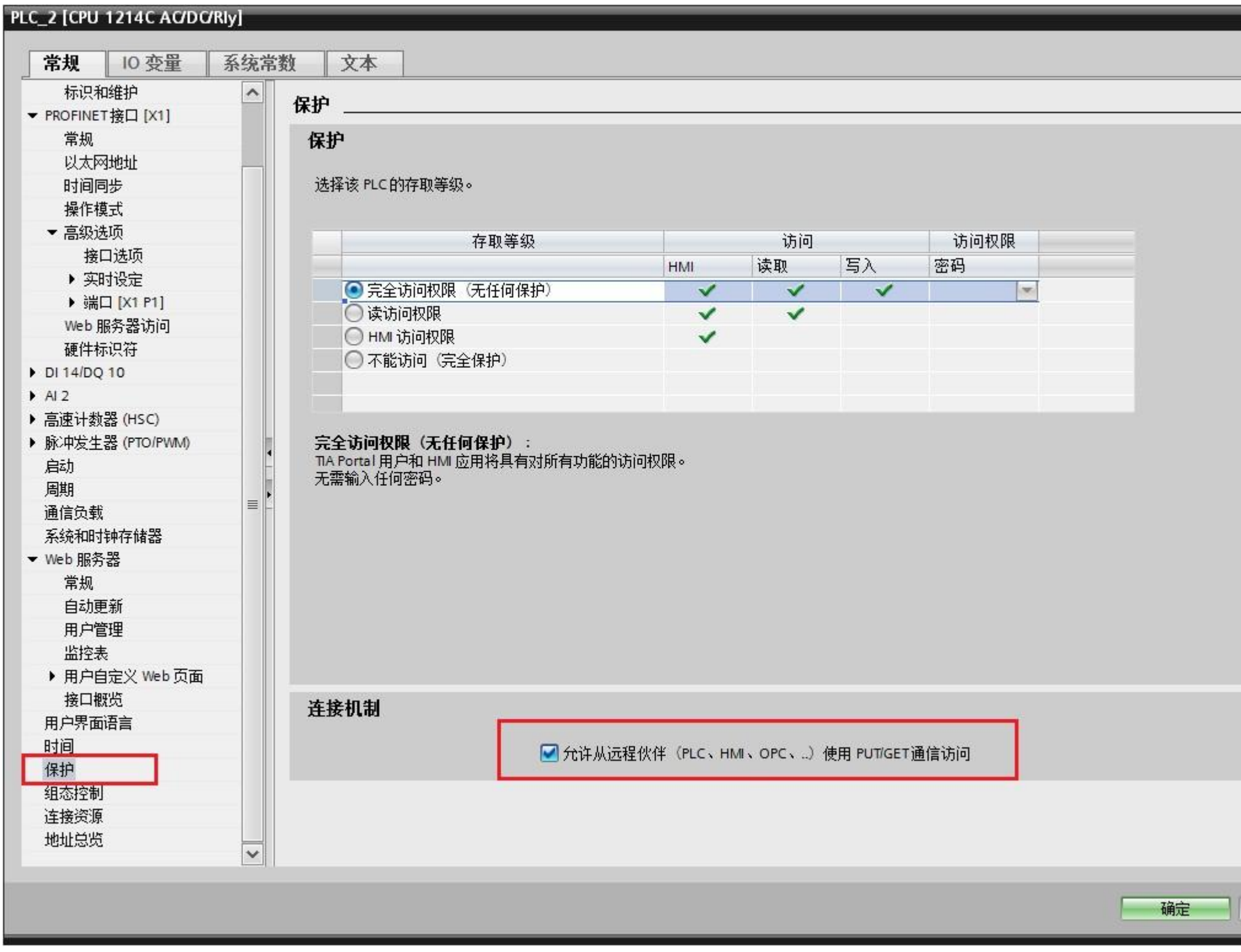
In the Parameter page of Communication Port Properties, set the IP and Port number.

Notice：

Addresses of PLC and IP must be under the same subnet with HMI, i.e. it only needs to set the subnet mask to 255.255.255.0.

2、In the settings of Siemens-1200 PLC, it is necessary to ensure whether the PLC has the protection function of connection; check the particular option if necessary after then recompile and download it to PLC.

Upload the PLC program or create a new one of Simens_1200 in the software of TIA Portal; right click the item and select “Property”; check “Permit communication access of PUT/GET to remote partners (PLC、HMI、OPC...) ” in “Protection”, as shown in the figure below:



2. Software Settings

Select SIEMENS in connection device service.
Select the corresponding item in connection device service according to the connected PLC model or supported protocol.
Guarantee that communication parameters in touch screen connection parameters and PLC station number are consistent with the connected PLC.
For settings of the connected PLC, please consult related technical documents of Siemens S7-200/300 series PLC

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	S7-200(PPI)	S7-200(PPI)/ S7-300(MPI)
Communication port type	RS485	RS232/RS422/RS485
Baud rate	19200	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	8	7/8
Parity bit	EVEN	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	2	1 to 255
HMI station number	0	0 to 255

Supporting function	Whether it is supported
Off-line simulation	Yes
On-line simulation	Yes
Extended mode	Yes: S7-200(PPI)/ No.: S7-300(MPI)

3. Operational register and address range

Siemens S7-200

Register name	Address format	Input range	Remarks
I	dd.o	0.0 to 4095.7	Bit: input shadow register, read only
Q	dd.o	0.0 to 4095.7	Bit: output shadow register
M	dd.o	0.0 to 4095.7	Bit: bit memory
S	dd.o	0.0 to 4095.7	Bit: sequence control relay
SM	ddd.o	0.0 to 4095.7	Bit: special bit memory, SM0.0-SM29.7 read only
T	ddd	0 to 255	Bit: timer state: read only
C	ddd	0 to 255	Bit: counter state: read only
VB_Bit	ddddd.o	0.0 to 10239.7	Bit: variable memory bit
IW	dd	0 to 4095	Word: input shadow register, read only, 8-digit register, each word occupies two addresses
QW	dd	0 to 4095	Word: output shadow register, 8-digit register, each word occupies two addresses
MW	dd	0 to 4095	Word: bit memory, 8-digit register, each word occupies two addresses
SW	dd	0 to 4095	Word: sequence control relay, 8-digit register, each word occupies two addresses
SMW	ddd	0 to 4095	Word: special bit memory, SMW0-SMW29 read only, 8-digit register, each word occupies two addresses
VB	ddddd	0 to 10239	Word: variable memory, 8-digit register
VW	ddddd	0 to 10238	Word: variable memory, 8-digit register, each word occupies two addresses
VD	ddddd	0 to 10236	Double-word: variable memory, 8-digit

			register, each double-word occupies four addresses
TV	ddd	0 to 255	Word: current value of the timer
CV	ddd	0 to 255	Word: current value of the counter
AIW	dd	0 to 62	Word: analog input, read only, 8-digit register, each word occupies two addresses
AQW	dd	0 to 62	Word: analog output, write only, 8-digit register, each word occupies two addresses

Siemens S7-300

Register name	Address format	Input range	Remarks
I	dddd.o	0.0 to 4095.7	Bit: input shadow register
Q	dddd.o	0.0 to 4095.7	Bit: output shadow register
M	dddd.o	0.0 to 4095.7	Bit: bit memory
DB_Bit	DDD:dddd.o	0:0.0 to 255:8192.7	Bit: bit of word of DB block storage area, block number DD 0 to 255, word of each block dddd 0 to 8192, bit of each word o 0 to 7
IW	dddd	0 to 4095	Word: input shadow register, 8-digit register, each word occupies two addresses
QW	dddd	0 to 4095	Word: output shadow register, 8-digit register, each word occupies two addresses
MW	dddd	0 to 4095	Word: bit memory, 8-digit register, each word occupies two addresses
DBW	DDD:dddd	0:0 to 255:8192	Word: DB block storage area, block number DD 0 to 255, word of each word dddd 0 to 8192, 8-digit register, each word occupies two addresses
DBD	DDD:dddd	0:0 to 255:8192	Double word: DB block storage area, block number DD 0 to 255, word of each word dddd 0 to 8192, 8-digit register, each double-work occupies four addresses

Siemens S7-1200tcp

Register name	Address format	Input range	Remarks
I	dddd.o	0.0~1024.7	Bit: input shadow register
Q	dddd.o	0.0~1024.7	Bit: output shadow register
M	dddd.o	0.0~8191.7	Bit: bit memory
DB_Bit	DDD:dddd.o	0:0.0~255:8192.7	Bit: bit of word of DB block storage area, block number DD 0 to 255, word of each block dddd 0 to 8192, bit of each word o 0 to 7
IW	dddd	0~1024	Word: input shadow register, 8-digit register, each word occupies two addresses
QW	dddd	0~1024	Word: output shadow register, 8-digit register, each word occupies two addresses
MW	dddd	0~8191	Word: bit memory, 8-digit register, each word occupies two addresses
DBW	DDD:dddd	0:0~255:8192	Word: DB block storage area, block number DD 0 to 255, word of each word dddd 0 to 8192, 8-digit register, each word occupies two addresses
DBD	DDD:dddd	0:0~255:8192	Double word: DB block storage area, block number DD 0 to 255, word of

			each word dddd 0 to 8192, 8-digit register, each double-work occupies four addresses

Note：
d represents decimal system, input range is 0-9;
o represents octal system, input range is 0-7;
DDD represents block number; input range is 0-255;
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

12.24 TaiAn device driver

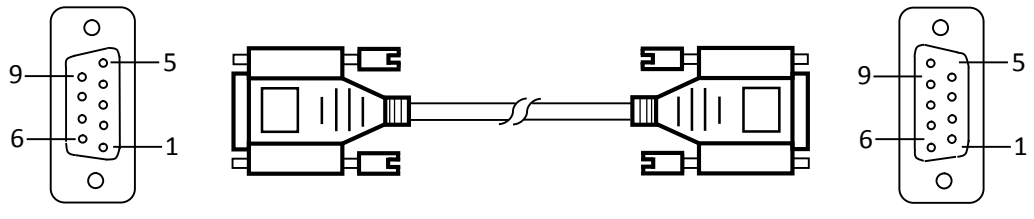
The device driver is used for SK HMI to read and write the data or state of TaiAn TP03 series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of TaiAn TP03 series PLC, so as to operate TaiAn TP03 series PLC. Prior to use of the driver, one shall carefully read the chapter and related technical specifications of TaiAn TP03 series PLC.

How to establish connection with HOLLYSYS series PLC

1. Hardware connection

Connecting cable:
RS232

SK HMI COM1/COM2		TaiAn TP03 series	
2	RX	3	TX
3	TX	2	RX
5	GND	5	GND



Terminal of HMI series touch screen is DB9F, and that of TaiAn TP03 series PLC is DB9M.

2. Software settings

Select TaiAn Technology in connection device service.
Select the corresponding item in connection device service according to the connected PLC model or supported protocol.
Guarantee that communication parameters in touch screen connection parameters and PLC station number are consistent with the connected PLC.
For setting of the connected PLC, please consult related technical documents of TaiAn TP03 series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	TP03 Series	TP03 Series
Communication port type	RS232	RS232/RS422/RS485
Baud rate	19200	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	8	7/8
Parity	NONE	EVEN/ODD/NONE
Stop bit length	2	1/2

PLC station number	1	0 to 255
HMI station number	0	0 to 255

Supporting function	Whether it is supported
Offline simulation	Yes
Online simulation	Yes
Extended mode	Yes

3. Operational register and address scope

Register name	Address format	Input scope	Remarks
X	ooo	0 to 377	Bit: input relay, read only
Y	ooo	0 to 377	Bit: output relay
M	dddd	0 to 7999	Bit: auxiliary relay
SM	dddd	8000 to 8511	Bit: special auxiliary relay
S	dddd	0 to 4095	Bit: stepping relay
T	ddd	0 to 511	Bit: timer
C	ddd	0 to 255	Bit: counter
D	dddd	0 to 7999	Word: data register
SD	dddd	8000 to 8511	Word: special data register
TV	ddd	0 to 511	Word: current value of the timer
CV	ddd	0 to 199	Word: current value of the counter
CV32	ddd	200 to 255	Double-word: current value of the counter

Note：
d represents decimal system, input scope is 0-9;
o represents octal system, input scope 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.

12.25 TaiLing device driver

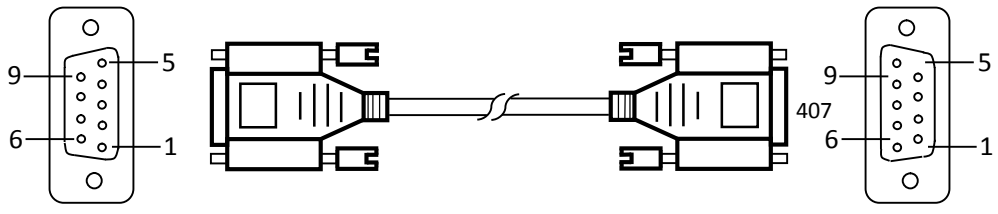
The device driver is used for SK HMI to read and write the data or state of TaiLing DX series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of TaiLing DX series PLC, so as to operate TaiLing DX series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and TaiLing DX series PLC.

How to establish connection with TaiLing DX series PLC

1. Hardware connection

Connecting cable:
RS232 (serial port RS232 protocol)

SK HMI COM1/COM2		TaiLing DX series	
2	RX	3	TX
3	TX	2	RX
5	GND	5	GND



Terminal of HMI is DB9F, and that of TaiLing DX series PLC is DB9M.

2. Software settings

Select TaiLing Electric in connection device service.

Select the corresponding item in connection device service according to the connected PLC model or supported protocol.

Guarantee that communication parameters in touch screen connection parameters and PLC station number are consistent with the connected PLC.

For setting of the connected PLC, please consult related technical documents of Siemens TaiLing DX series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	DX Series	DX Series
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	NONE	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	1	1 to 31
HMI station number	0	0 to 255

Supporting function	Whether it is supported
Offline simulation	Yes
Online simulation	Yes
Extended mode	No

3. Operational register and address scope

Register name	Address format	Input scope	Remarks
X	oooo	0 to 377	Bit: input coil, read only
Y	oooo	0 to 377	Bit: output coil
M	dddd	0 to 7999	Bit: intermediate relay
SM	dddd	8000 to 8999	Bit: special intermediate relay
S	dddd	0 to 999	Bit: state bit
T	dddd	0 to 256	Bit: timer state
C	dddd	0 to 256	Bit: counter state
D	dddd	0 to 7999	Word: register
SD	dddd	8000 to 8999	Word: special register
TV	dddd	0 to 255	Word: current value of the timer
CV	dddd	0 to 199	Word: current value of the counter
CV32	dddd	200 to 255	Double-word: current value of 32-bit counter

Note：

d represents decimal system, input scope is 0-9;

o represents octal system, input scope 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.

12.26 Techwayson device driver

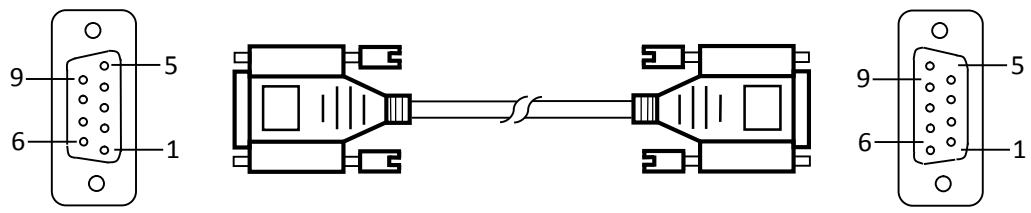
The device driver is used for SK HMI to read and write the data or state of TaiLing DX series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of TaiLing DX series PLC, so as to operate TaiLing DX series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and TaiLing DX series PLC.

How to establish connection with TaiLing DX series PLC

1. Hardware connection

Connecting cable:
RS232 (serial port RS232 protocol)

SK HMI COM1/COM2		TaiLing DX series	
2	RX	3	TX
3	TX	2	RX
5	GND	5	GND



Terminal of HMI is DB9F, and that of TaiLing DX series PLC is MD8M.

2. Software settings
Select TaiLing Electric in connection device service.
Select the corresponding item in connection device service according to the connected PLC model or supported protocol.
Guarantee that communication parameters in touch screen connection parameters and PLC station number are consistent with the connected PLC.
For setting of the connected PLC, please consult related technical documents of Siemens TaiLing DX series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	Techwayson V80 Series	Techwayson V80 Series
Communication port type	RS232	RS232
Baud rate	19200	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	8	7/8
Parity	EVEN	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
Offline simulation	Yes
Online simulation	Yes
Extended mode	Yes

3. Operational register and address scope

Register name	Address format	Input scope	Remarks
X	oooo	0 to 377	Bit: input coil, read only
Y	oooo	0 to 377	Bit: output coil
M	dddd	0 to 7999	Bit: intermediate relay

SM	dddd	8000 to 8999	Bit: special intermediate relay
S	dddd	0 to 999	Bit: state bit
T	dddd	0 to 256	Bit: timer state
C	dddd	0 to 256	Bit: counter state
D	dddd	0 to 7999	Word: register
SD	dddd	8000 to 8999	Word: special register
TV	dddd	0 to 255	Word: current value of the timer
CV	dddd	0 to 199	Word: current value of the counter
CV32	dddd	200 to 255	Double-word: current value of 32-bit counter

Register name	Address format	Input scope	Remarks
0x	dddd	1~9984	Bit: output coil
1x	dddd	1~2048	Bit: input coil, read only
3x	dddd	1~512	Word: 16-bit input register, read only
4x	dddd	1~9999	Word: 16-bit holding register

Note：
d represents decimal system, input scope is 0-9;
o represents octal system, input scope 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

12.27 Vigor device driver

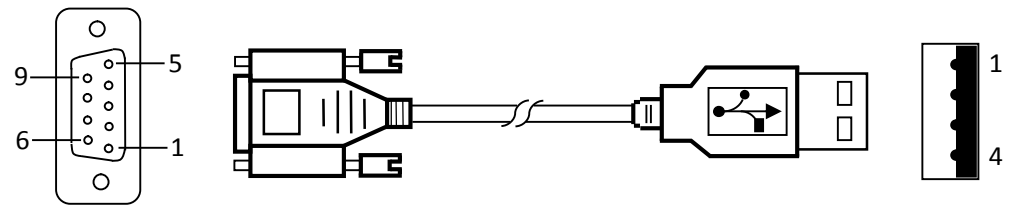
The device driver is used for SK HMI to read and write the data or state of Vigor V/VH/VB/M series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of Vigor V/VH/VB/M series PLC, so as to operate Vigor V/VH/VB/M series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Vigor V/VH/VB/M series PLC.

How to establish connection with Vigor V/VH/VB/M series PLC

1. Hardware connection

Connecting cable:
RS232

SK HMI COM1/COM2		Vigor V/VH/VB/M series	
2	RX	3	TX
3	TX	2	RX
5	GND	4	GND



Terminal of HMI is DB9F, and that of Vigor V/VH/VB/M series PLC is DB9M.

2. Software settings
Select Vigor Electric Corp. in connection device service.
Select the corresponding item in connection device service according to the connected PLC model or supported protocol.
Guarantee that communication parameters in touch screen connection parameters and PLC station number are consistent with the connected PLC.
For settings of the connected PLC, please consult related technical documents of Vigor V/VH/VB/M series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	V/VH/VB/M Series	V/VH/VB/M Series
Communication port type	RS232	RS232/RS422/RS485
Baud rate	19200	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	7	7/8
Parity	EVEN	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	0	0 to 255
HMI station number	0	0 to 255

Supporting function	Whether it is supported
Offline simulation	Yes
Online simulation	Yes
Extended mode	No

3. Operational register and address scope

Register name	Address format	Input scope	Remarks
X	ooo	0 to 777	Bit: input contact
Y	ooo	0 to 777	Bit: output contact
M	dddd	0 to 8999	Bit: internal relay
SM	dddd	9000 to 9255	Bit: special internal relay
S	dddd	0 to 999	Bit: stepping relay
T	ddd	0 to 255	Bit: timer state
C	ddd	0 to 255	Bit: counter state
D	dddd	0 to 8999	Word: data register
SD	dddd	9000 to 9255	Word: special data register
TV	ddd	0 to 255	Word: current value of the timer
CV	ddd	0 to 199	Word: current value of the counter
CV32	ddd	200 to 255	Word: current value of 32-bit counter

Note:
d represents decimal system, input scope is 0-9;
o represents octal system, input scope 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.

12.28 Xinje device driver

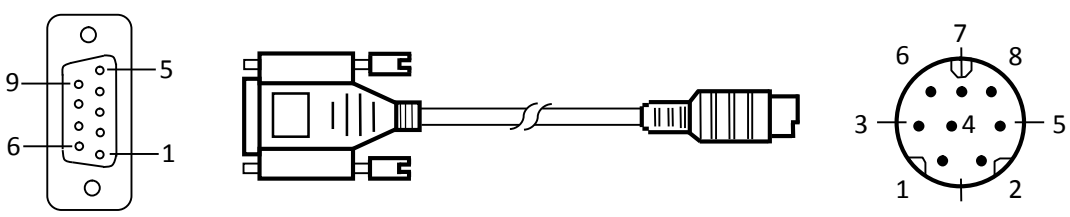
The device driver is used for SK HMI to read and write the data or state of Thinget XC/XCM/XD series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of Thinget XC/XCM/XD series PLC, so as to operate Thinget XC/XCM/XD series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Thinget XC/XCM/XD series PLC.

How to establish connection with Thinget XC/XCM/XD series PLC

1. Hardware connection

Connecting cable:
RS232

HMI series touch screen COM1/COM2		Thinget XC/XCM/XD series	
2	RX	5	TX
3	TX	4	RX
5	GND	8	GND



Terminal of HMI is DB9F, and that of Thinget XC/XCM/XD series PLC is MD8M.

2. Software settings

Select Xinje Electronic in connection device service.
Select the corresponding item in connection device service according to the connected PLC model or supported protocol.
Guarantee that communication parameters in touch screen connection parameters and PLC station number are consistent with the connected PLC.
For settings of the connected PLC, please consult related technical documents of Thinget XC/XCM/XD series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	Thinget XC Series	Thinget XC/XCM/XD Series
Communication port type	RS232	RS232/RS422/RS485
Baud rate	19200	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	8	7/8
Parity	EVEN	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	1	0 to 255
HMI station number	0	0 to 255

Supporting function	Whether it is supported
Offline simulation	Yes
Online simulation	Yes
Extended mode	Yes

3. Operational register and address scope

Thinget XC/XCM Series

Register name	Address format	Input scope	Remarks
X	dddd	0 to 1037	Bit: input coil
Y	dddd	0 to 1037	Bit: output coil
M	dddd	0 to 8767	Bit: internal coil
S	dddd	0 to 1023	Bit: process
T	ddd	0 to 639	Bit: timer state
C	ddd	0 to 639	Bit: counter state
D	dddd	0 to 9023	Word: data register
TD	ddd	0 to 639	Word: current value of the timer

CD	ddd	0 to 639	Word: current value of the counter
FD	dddd	0 to 9023	Word: FlashROM register
ED	ddddd	0 to 16383	Word: extended internal register

Thinget XD2 Series

Register name	Address format	Input scope	Remarks
X	o	0~7	Input coil
Y	o	0~7	Output coil
M	dddd	0~7999	Internal relay
HM	ddd	0~959	Internal relay
SM	dddd	0~2047	Special internal relay
S	dddd	0~1023	Technological process
HS	ddd	0~127	Technological process
T	ddd	0~575	timer
TD	ddd	0~575	Timer current value
HT	dd	0~95	timer
ET	dd	0~31	Precision timer
ETD	ddd	0~31	Extended internal register
C	ddd	0~575	Counter
CD	ddd	0~575	Counter current value
HC	dd	0~95	Counter
HSC	dd	0~31	High-speed counter
D	dddd	0~7999	Data register
HD	ddd	0~999	Data register
SD	dddd	0~2047	Special data register
HSD	ddd	0~499	Special data register
FD	dddd	0~4095	FlashROMregister
SFD	dddd	0~1999	FlashROMregister
FS	dd	0~47	Special security register
SEM	dd	0~31	Sequential function block WAIT Command coil

Thinget XD3 Series

Register name	Address format	Input scope	Remarks

X	ooooo	0~20077	Input coil (X10000~X11177 belongs to extended module) (X20000~X20277 belongs to extended BD module)
Y	ooooo	0~20077	The output coil (Y10000~Y11177 belongs to the extended module) (Y20000~Y20277 belongs to the extended BD module)
M	dddd	0~7999	Internal relay
HM	ddd	0~959	Internal relay
SM	dddd	0~2047	Special internal relay
S	dddd	0~1023	Technological process
HS	ddd	0~127	Technological process
T	ddd	0~575	timer
TD	ddd	0~575	Timer current value
HT	dd	0~95	timer
ET	dd	0~31	Precision timer
ETD	ddd	0~31	Extended internal register
C	ddd	0~575	Counter
CD	ddd	0~575	Counter current value
HC	dd	0~95	Counter
HSC	dd	0~31	High-speed counter
D	dddd	0~7999	Data register
HD	ddd	0~999	Data register
SD	dddd	0~2047	Special data register
HSD	ddd	0~499	Special data register
FD	dddd	0~4095	FlashROM register
SFD	dddd	0~1999	FlashROM register
FS	dd	0~47	Special security register
ID	ddddd	0~20099	Ontology (ID10000~ID10999 is an extension module) (ID20000~20099 belongs to the extended BD module)
QD	ddddd	0~20099	Ontology (QD10000~QD10999 is an extension module) (QD20000~QD20099 belongs to the extended BD module)
SEM	dd	0~31	Sequential function block WAIT Command coil

Register	Address	Input	Remarks

name	format	scope	
X	ooooo	0~20077	Input coil (X10000~X11177 belongs to extended module) (X20000~X20277 belongs to extended BD module)
Y	ooooo	0~20077	The output coil (Y10000~Y11177 belongs to the extended module) (Y20000~Y20277 belongs to the extended BD module)
M	ddddd	0~20479	Internal relay
HM	ddddd	0~11999	Internal relay
SM	dddd	0~4095	Special internal relay
S	dddd	0~7999	Technological process
HS	ddd	0~999	Technological process
T	dddd	0~4095	timer
TD	ddd	0~575	Timer current value
HT	dddd	0~1023	timer
ET	dd	0~39	Precision timer
ETD	ddd	0~39	Extended internal register
C	dddd	0~4095	Counter
CD	ddd	0~4095	Counter current value
HC	dddd	0~1023	Counter
HSC	dd	0~36	High-speed counter
D	ddddd	0~20479	Data register
HD	ddddd	0~6143	Data register
SD	dddd	0~4095	Special data register
HSD	dddd	0~1023	Special data register
FD	dddd	0~4095	FlashROM register
SFD	dddd	0~5999	FlashROM register
FS	dd	0~47	Special security register
ID	ddddd	0~20099	Ontology (ID10000~ID10999 is an extension module) (ID20000~20099 belongs to the extended BD module)
QD	ddddd	0~20099	Ontology (QD10000~QD10999 is an extension module) (QD20000~QD20099 belongs to the extended BD module)
SEM	ddd	0~127	Sequential function block WAIT Command coil

Note:

d represents decimal system, input scope is 0-9;
o represents octal input range 0-7;
Word in the remarks: represents the register can only be used as word;
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

12.29 Yokogawa device driver

The device driver is used for SK HMI to read and write the data or state of Yokogawa FA-M3 series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of Yokogawa FA-M3 series PLC, so as to operate Yokogawa FA-M3 series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and Yokogawa FA-M3 series PLC.

How to establishment connection with Yokogawa FA-M3 series PLC

1. Hardware connection

Connecting cable:
RS232

SK HMI COM1/COM2		Yokogawa FA-M3 series		
5	GND	5	SG	4-5 short-circuited 220Ω resistor in series
6	RX-	4	SDB	
7	RX+	3	SDA	2-3 short-circuited 220Ω resistor in series
8	TX-	2	RDB	
9	TX+	1	RDA	
		6	CSA	6-7 short-circuited
		7	ERA	
		8	CSB	8-9 short-circuited
		9	ERB	

Terminal of HMI is DB9F, and that of Yokogawa FA-M3 series PLC is SIO.

2. Software settings

Select Yokogawa Electric Corp. in connection device service.
Select the corresponding item in connection device service according to the connected PLC model or supported protocol.
Guarantee that communication parameters in touch screen connection parameters and PLC station number are consistent with the connected PLC.
For settings of the connected PLC, please consult related technical documents of Yokogawa FA-M3 series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	Yokogawa FA-M3	Yokogawa FA-M3
Communication port type	RS422	RS232/RS422/RS485
Baud rate	9600	1200/2400/4800/9600/19200/38400/57600/115200
Data bit length	8	7/8
Parity	EVEN	EVEN/ODD/NONE
Stop bit length	1	1/2
PLC station number	1	0 to 255
HMI station number	0	0 to 255

Supporting function	Whether it is supported
Offline	Yes

simulation	
Online simulation	Yes
Extended mode	No

3. Operational register and address scope

Register name	Address format	Input scope	Remarks
X	ddddd	0 to 71664	Bit: input, discontinuous, determined by the slot number
Y	ddddd	0 to 71664	Bit: output, discontinuous, determined by the slot number
M	ddddd	0 to 16384	Bit: special relay
I	ddddd	0 to 71024	Bit: internal relay
L	ddddd	0 to 9984	Bit: link relay, discontinuous
D	ddddd	0 to 8192	Word: data register
B	ddddd	0 to 32768	Word: file register
V	ddddd	0 to 64	Word: external switching value output
W	ddddd	0 to 71024	Word: link register, discontinuous
Z	ddddd	0 to 512	Word: special register

Note:
d represents decimal system, input scope is 0-9;
Word in the remarks: represents the register can only be used as word;
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

12.30 ZhengHang device driver

The device driver is used for SK HMI to read and write the data or state of ZhengHang A5 series PLC register. The serial communication connection is established through the serial port on the touch screen and the serial port of Yokogawa FA-M3 series PLC, so as to operate ZhengHang A5series PLC. Prior to use of the driver, one shall carefully read related technical specifications of the chapter and ZhengHang A5 series PLC.

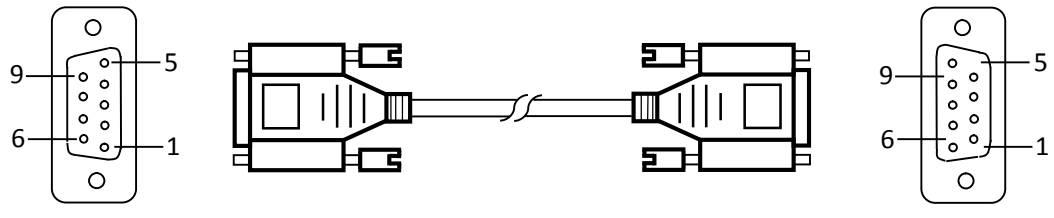
How to establishment connection with ZhengHang A5 series PLC

4. Hardware connection

Connecting cable:

RS232

SK HMI COM1/COM2		ZhengHang A5	
2	RX	2	TX
3	TX	3	RX
5	GND	5	GND



Terminal of HMI is DB9F, and that of ZhengHang A5 series PLC is DB9M.

5. Software settings

Select ZhengHang Electronics in connection device service.

Select the corresponding item in connection device service according to the connected PLC model or supported protocol.

Guarantee that communication parameters in touch screen connection parameters and PLC station number are consistent with the connected PLC.

For settings of the connected PLC, please consult related technical documents of ZhengHang A5 series PLC.

Default connection parameters of SK HMI

Setting item	Default parameter value	Setting scope
PLC type	A5 Series	A5 Series
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	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
Offline simulation	Yes
Online simulation	Yes
Extended mode	Yes

6. Operational register and address scope

Register name	Address format	Input scope	Remarks
I	dd.o	0.0 to 15.7	Bit: input image register, read only
Q	dd.o	0.0 to 15.7	Bit: output image register
M	dddd.o	0.0 to 4095.7	Bit: bit memory
VW	dddd	0 to 1998	Word: variable memory, 8-digit register, each word occupies two addresses
AIW	d	0 to 9	Word: analog input, read only
AQW	d	0 to 9	Word: analog output, write only

Note:

d represents decimal system, input scope is 0-9;

o represents octal system, input scope is 0-7;

Word in the remarks: represents the register can only be used as word;

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

13. Number signals of communication errors 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 formula-ECC Error	**0x45**	Local data-Read formula- No data returned
0x16	Local data-Write formula-ECC Error	**0x46**	Local data-Write formula- 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 formula- Wrong return length	**0x115**	Penetrating data-Read formula-ECC Error
0x76	Local data-Write formula- Wrong return length	**0x116**	Penetrating data-Write formula-ECC Error
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 formula- No data returned	**0x175**	Penetrating data-Read formula- Wrong return length
0x146	Penetrating data-Write formula- No data returned	**0x176**	Penetrating data-Write formula- 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		

14. Appendix

- Export data via U disk and SD card
- Picture format
- Import project via U disk and SD card
- Import formula via U disk and SD card
- Dial switch

14.1 Export data via U disk

SK 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 SKTOOL. 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

1. Insert the USB disk

2. Set the group number of history data for import and export in the LW60480 register.

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.

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.

These triggers are automatically reset to OFF when the export is complete

When exporting local data, employ the LW register: LW60359-LW60429

How to export formula

It needs to set LW61143 for formula export operation result from multiple groups of formula in the SKTOOL.

1. Insert the USB stick.

2. Set the group number in LW61143.

3. Trigger LB60163 to ON; HMI will copy the group formula file to U disk

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 SK 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

1. Insert the USB disk

2. When configuring, create a Function button -> Screenshot, and select Export to U disk

3. Touch this function button and then HMI will capture the current screen to the corresponding memory

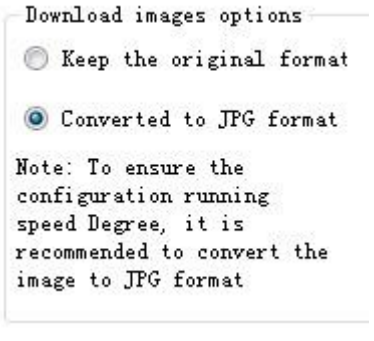
Note:

- 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.

14.2 Picture Format

SK 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 picture 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 picture option to keep the original format.



Note:

• Conversion to JPG format is meant to ensure more pictures to be used;

• Employ of pictures whose resolution does not exceed that of the touch screen can improve the display efficiency;

• The maximum number of frames for a GIF image is 32.

14.3 Update project via U disk

SK Series HMI supports importing and updating project via U disk.

How to update the project file via U disk

1. Compile the project

Run SKTOOL; open the project you want to update; click 

to generate the compiled file.

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.

14.4 Update recipe via U disk

SK Series HMI supports importing and updating recipe via U disk.

How to update the recipe file via U disk

1. Compile the project

Run SKTOOL; 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.

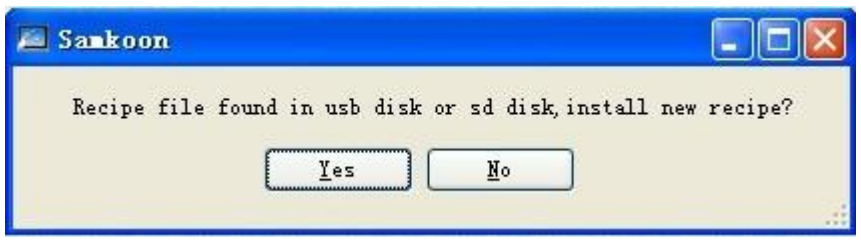
3. Rename the recipe.bin

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.

14.5 Dial switch

Each SK series HMI 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 3	Terminal Mode
On 1 and On3	Parameter Setting Mode

Note:

It needs to restart HMI after adjusting dial switch;

Please apply Normal Operation Mode when using HMI normally;

Parameter Settings Mode applies to set the time, luminance and IP address.

15. Operation case (Supplement)

This chapter introduces mainly several cases of SKTOOL configuration software meant for SK series HMI, for your reference.

Contents:

- QuickStart：A Simple Macroblock
- Free Port Communication Protocol Case
- Historical Data Collector Case
- Recipe Case
- Digital Alarm Login
- Analog Alarm Login

15.1 A simple macroblock

Create a new project; select the appropriate HMI model. The macro 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 macro; read the input data from the external through the numerical display control; and then the execution of the ADDSUM macro 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 macro>

Click the shortcut function button "Macro" on the left side of the toolbar, and then it will pop up a dialog box (Macro Editor) as shown in Figure 5-7.

Step 2: <Create the macro Init>

Click the "New" button in the macro editor interface, it will appear a dialog box as shown in Figure 5-8; enter the macro name (Init), and Figure 5-9 will be shown in the source code.



Figure 5-7 Macro List

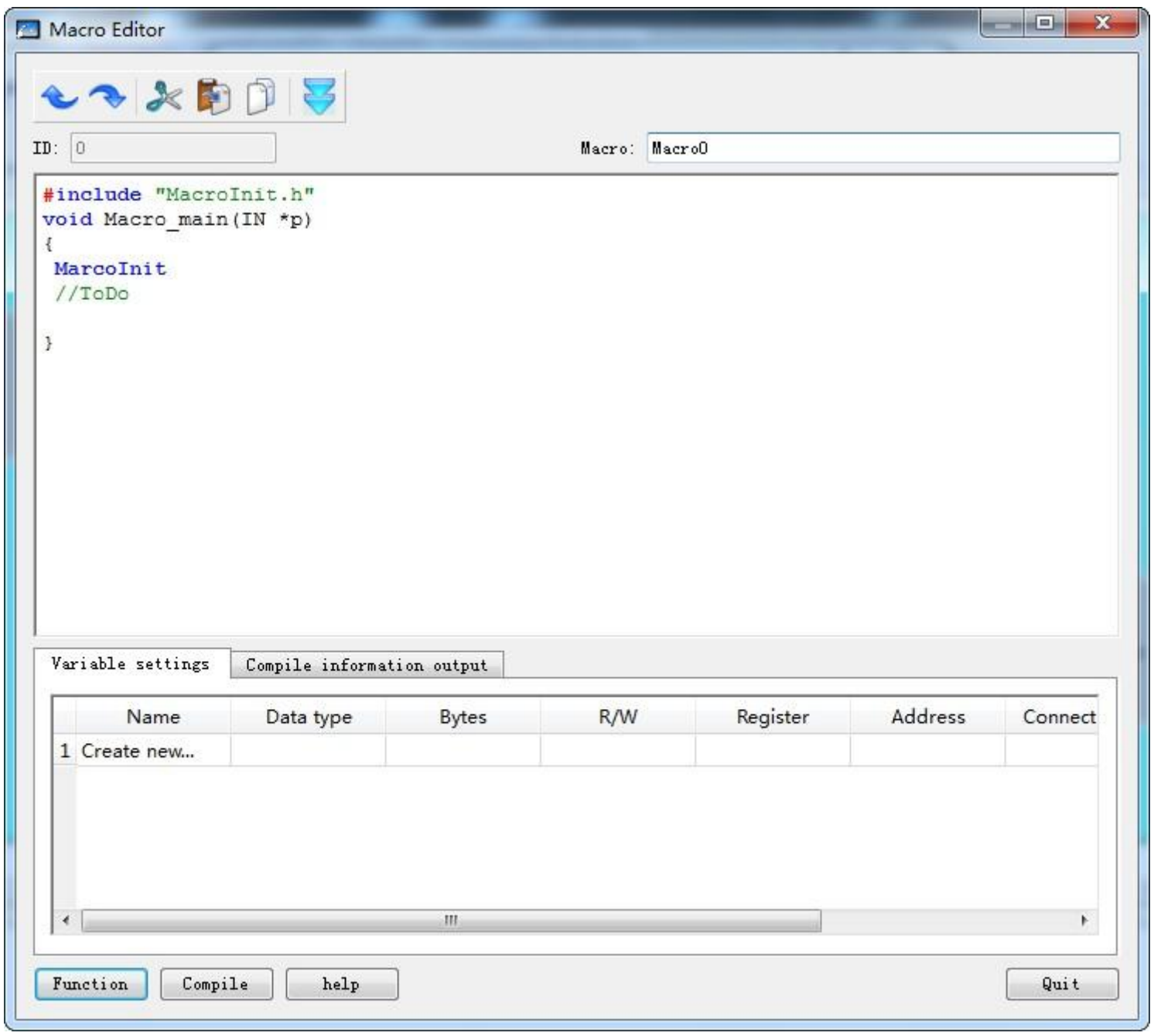


Figure 5-8 Macro Editor



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 5-9:

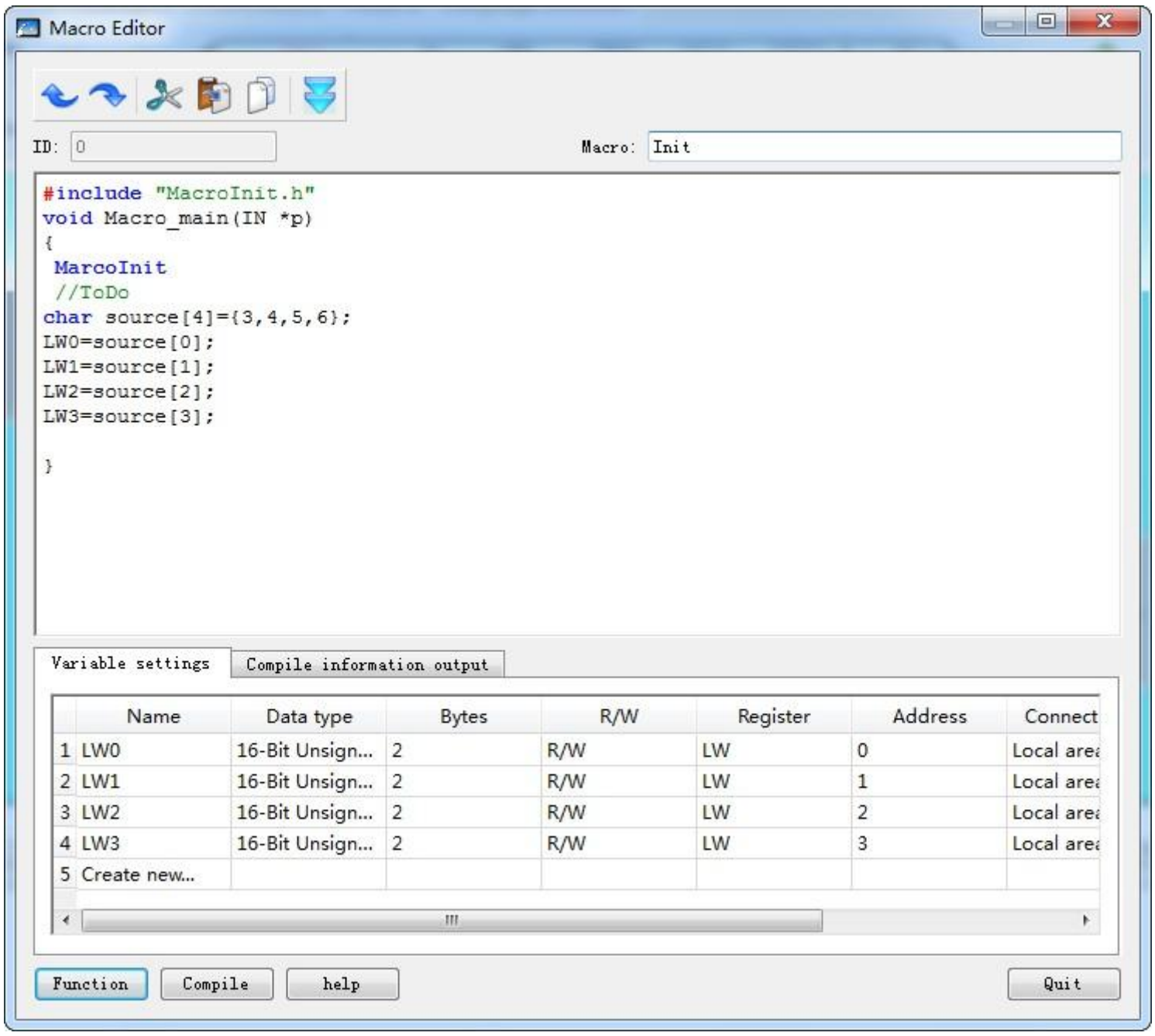


Figure 5-9 Code Compile in Macro Compiler

Step 3: <Variable settings>

Record the attribute settings such as variable name, variable type, etc, in the window as shown in Figure 5-8. 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 as shown in Figure 5-10 where to set values of the external variables.

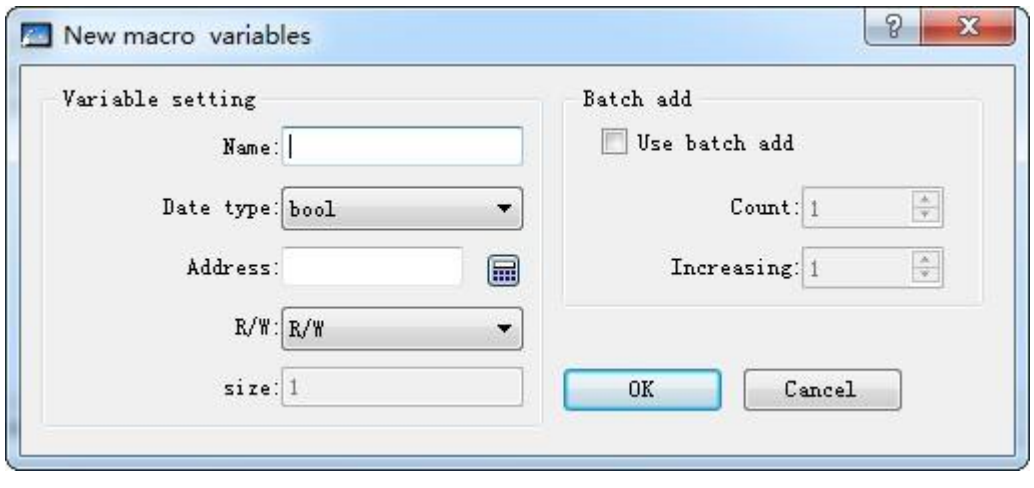


Figure5-10 Macro Code Tag

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 5-11.

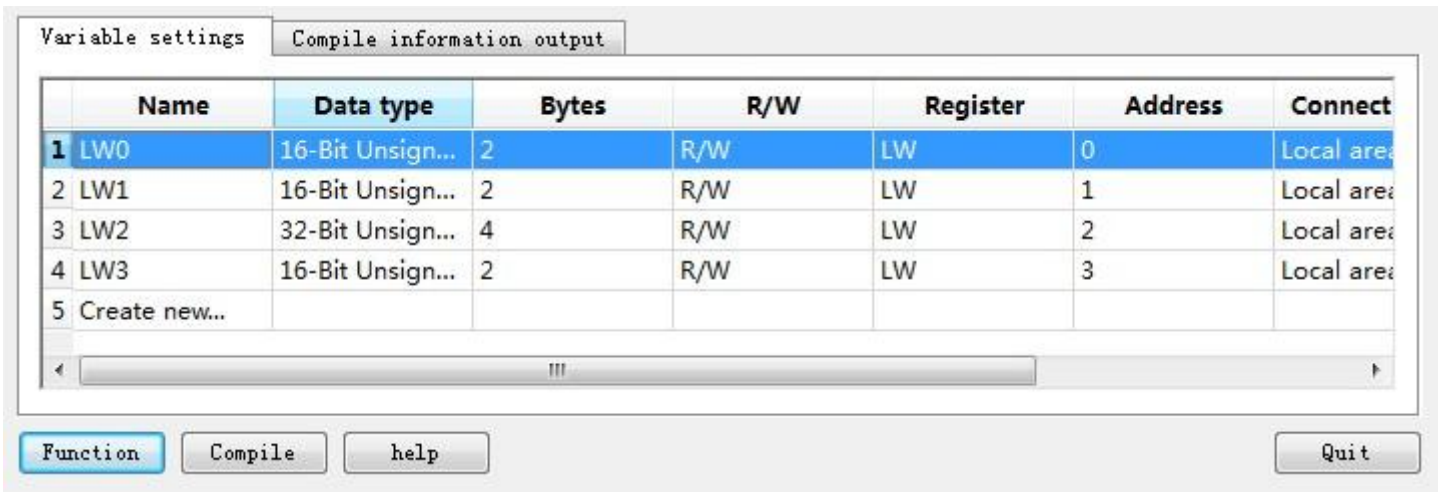


Figure5-11 Variable Setting

Step 4: <Compile the source file>

After completing the above steps, the next is to compile; click the compile button as shown in Figure 5-12, it will save, compile, connect and check other errors automatically.



Figure 5-12 Information Output

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 macro ADDSUM>

Follow steps 2 - 4 to create the macro ADDSUM, as shown in Figure 5-13

<1>: Enter "ADDSUM" in the macro name.

<2>: Enter the contents of the circle in the code-editing window.

<3>: Set the corresponding variable attribute value in the variable setting window.

<4>: Click the Compile button.

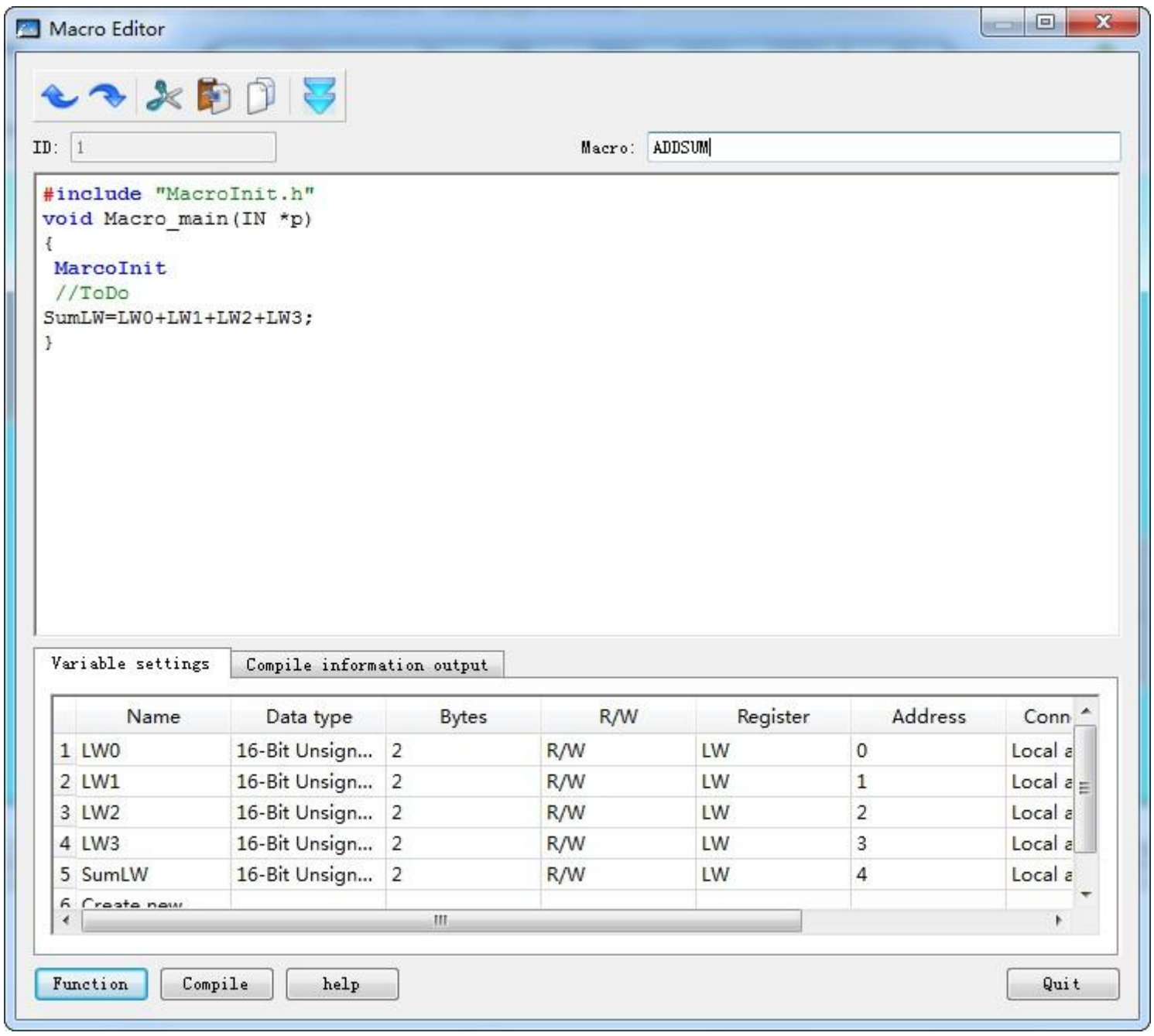


Figure 5-13 Creating the macro ADDSUM

Step 6: <Edit Control>

<1>. Place controls on the project screen and adjust them to the appropriate size, as shown in Figure 5-14.

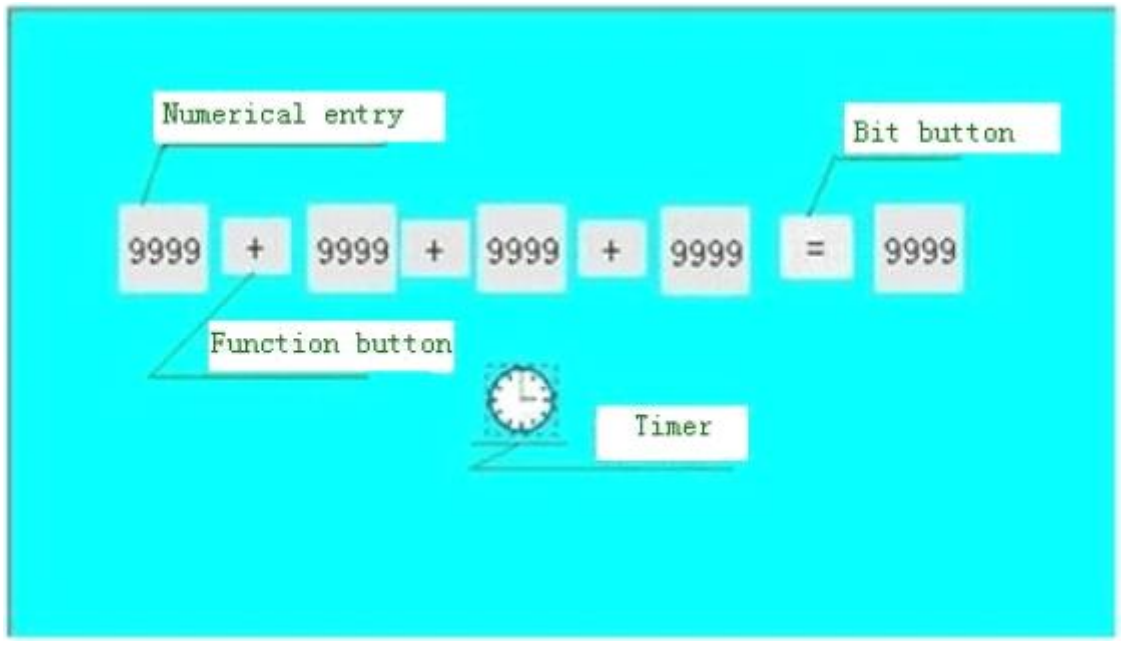


Figure 5-14 Control Layout

<2>. Set the corresponding control attribute parameters

Right click on the "Numeric Display" control and set the address value and attribute of each control, as shown in Figure 5-15.

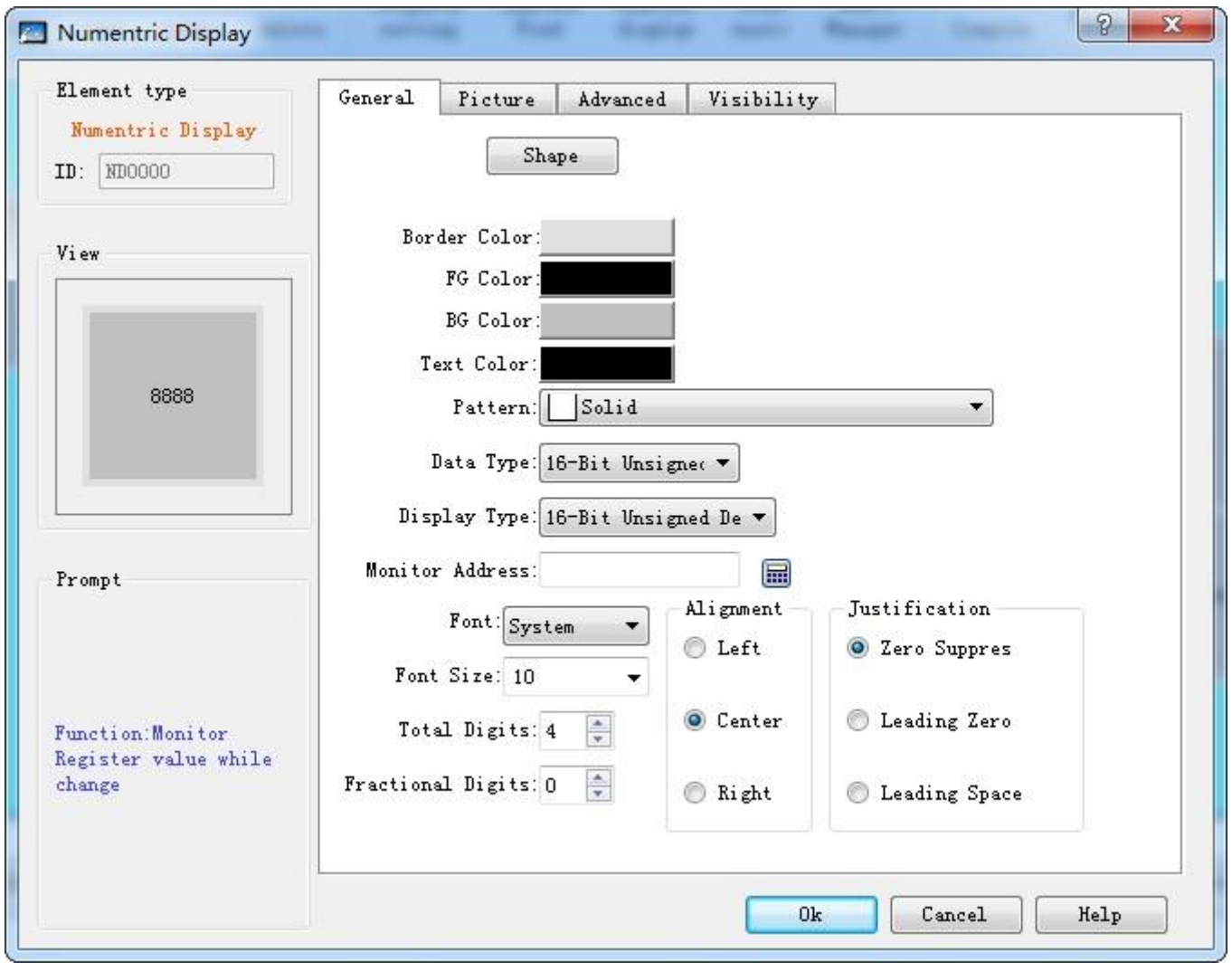


Figure 5-15 numeric display property setting

It is essential to ensure that the LW0, LW1, LW2, LW3, SumLW variable addresses correspond to the "write address" (shown in Figure 5-15) of each control.

Click "OK" button to save the settings.

<3>. Set properties of Bit button control

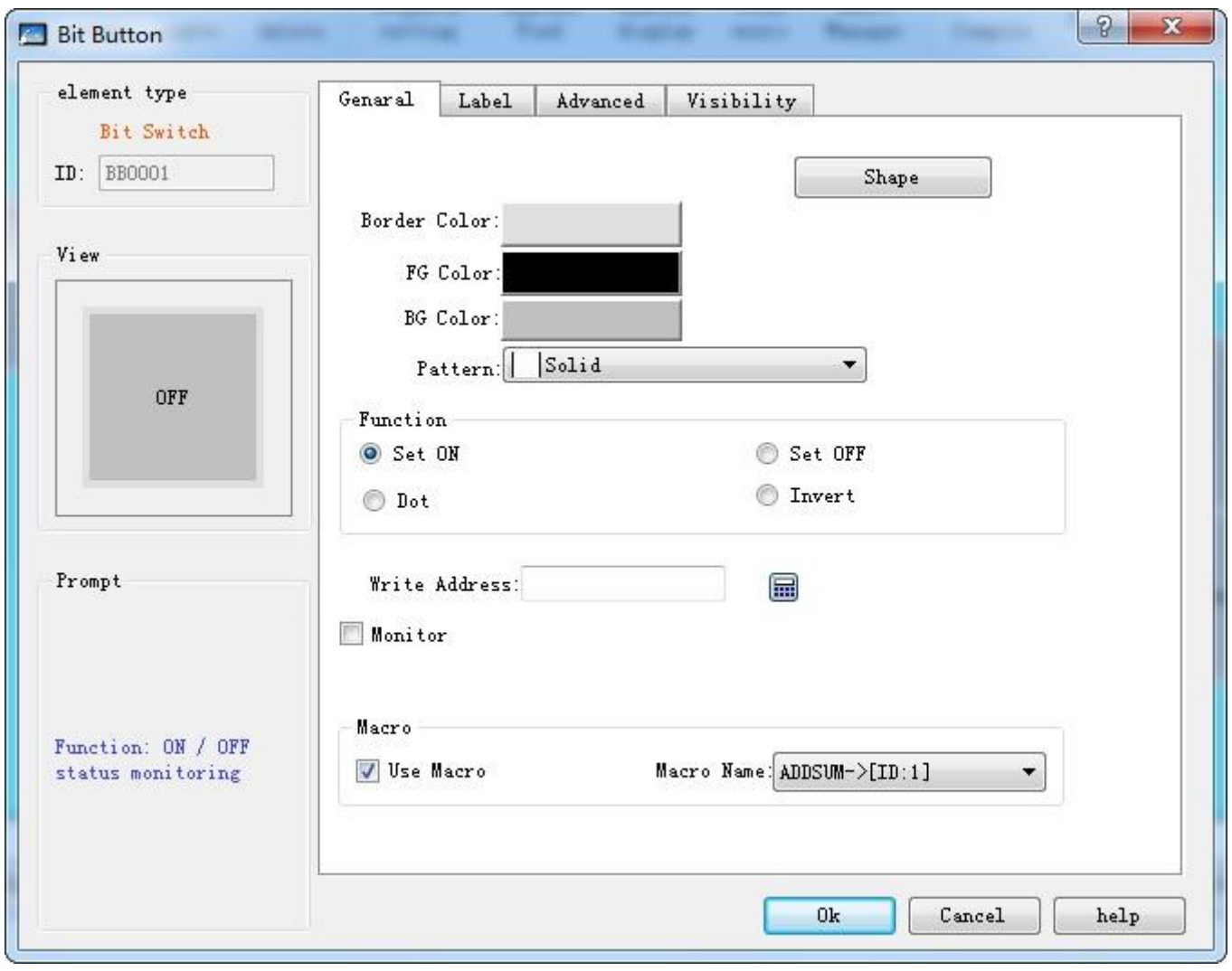


Figure 5-16 (Bit Button Property Setting)

<4>. Property setting of Timer

Select the macro Init; click "OK" to save the settings.

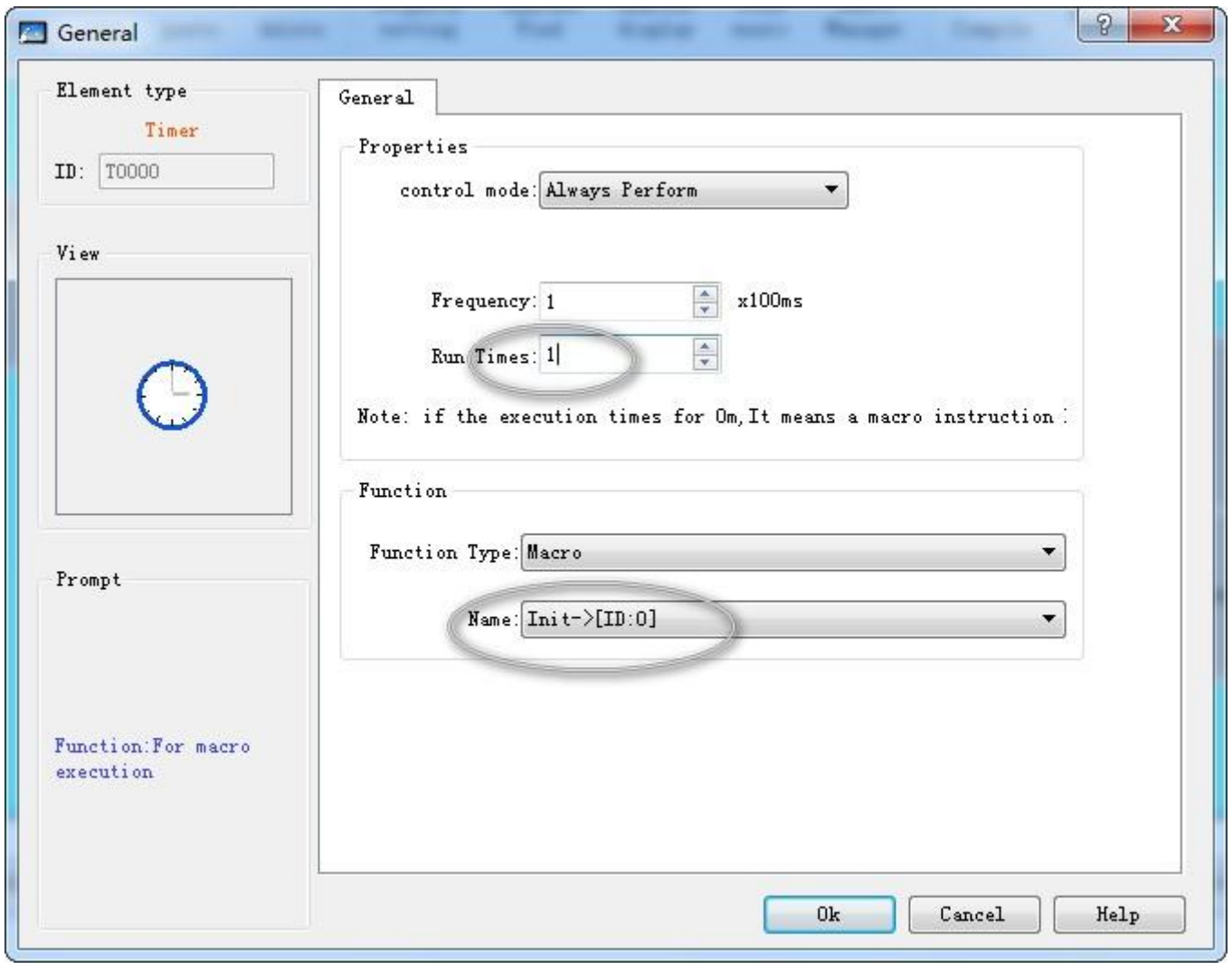


Figure 5-17 Timer Property Setting

<5>. Select the "Label" -> "Text" page of the Function button, and enter the "+" character in the text box, as shown in Figure 5-18.

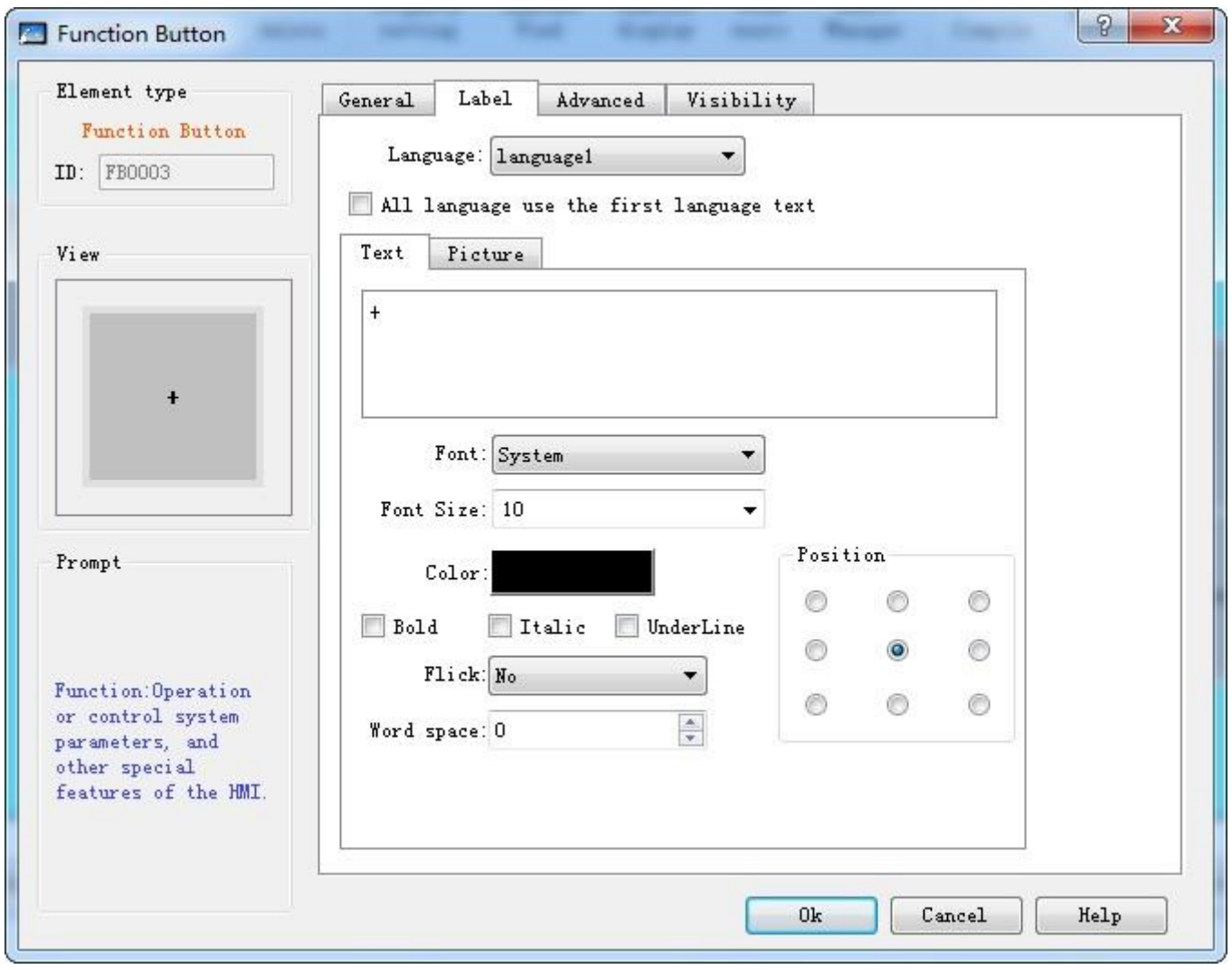


Figure 5-18 Function Button Property Setting

Step 7: Compile and download to HMI

<1>: Click the compile icon to execute the operation.



Figure 5-19 General Project Compile

<2>: Select "Download (D) -> USB download (D)", then click “Download” in the pop-up dialog box. Restart the HMI.

You can also click the shortcut function button Compile Download.

Step 8: <Result Test>

After restarting the HMI, the following screen appears (Figure 5-20).

This is because at startup, the first instruction, Init, is the first to be executed by the timer.

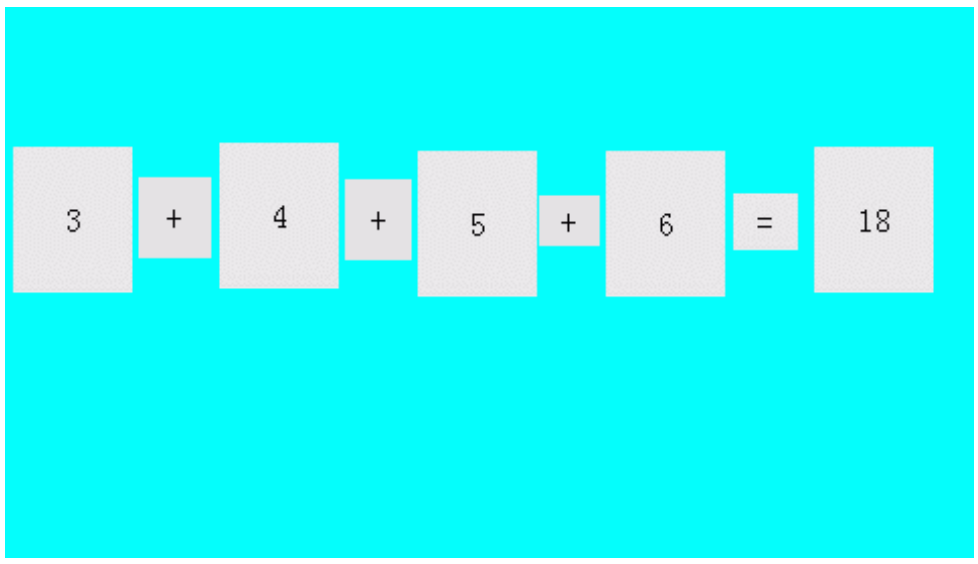


Figure 5-20 showing the initial value

Input data such as "31,42,53,64" respectively in the "Numeric display" control, click on the "=" button to implement the ADDSUM macro and the output result will be 190, as shown in Figure 5-21:

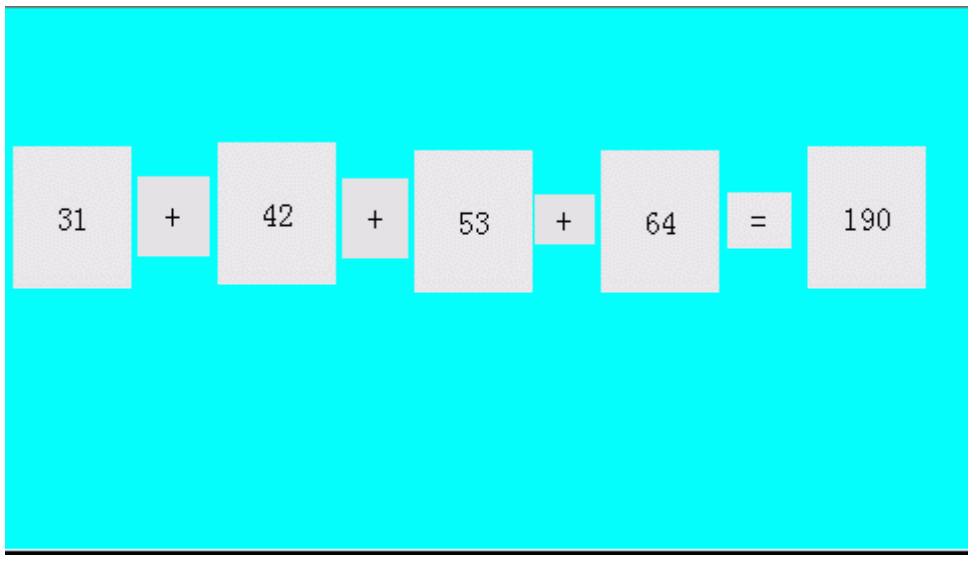
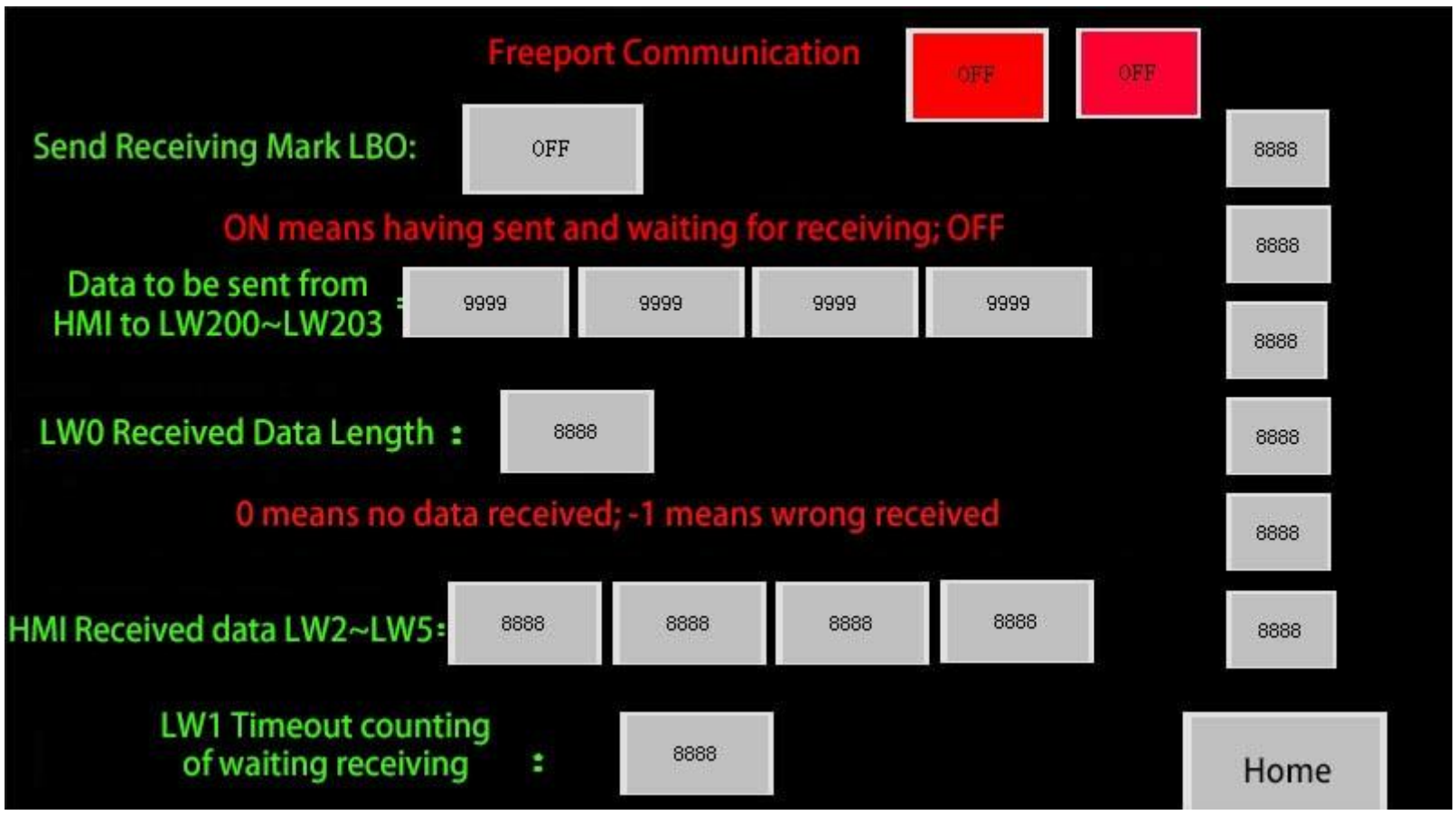


Figure5-21 result display

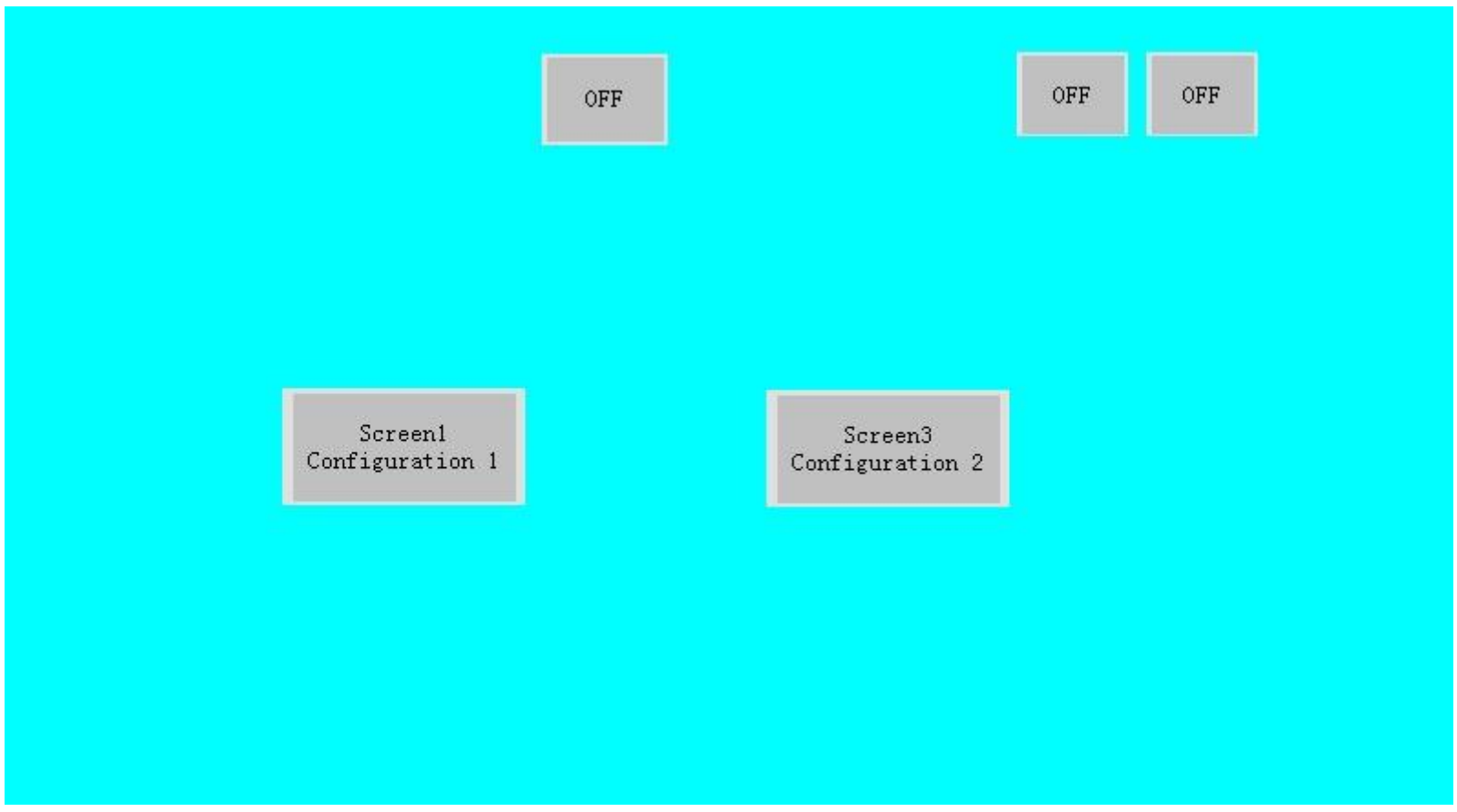
So far it has completed successfully the macro editing, compiling, downloading, testing and all the necessary functions.

15.2 Free Port Communication Protocol Case

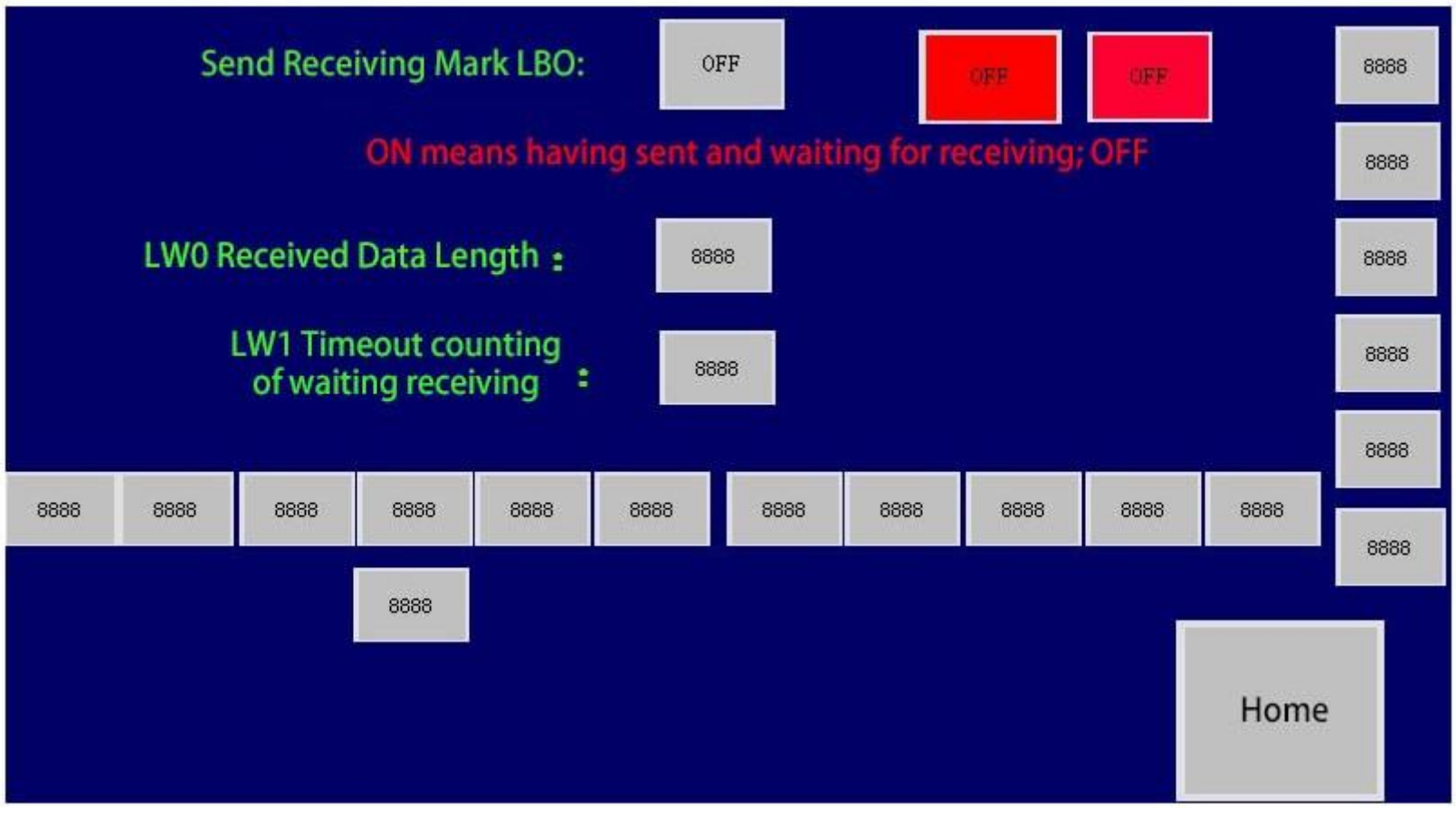
First, create three configurations:



Configuration 1



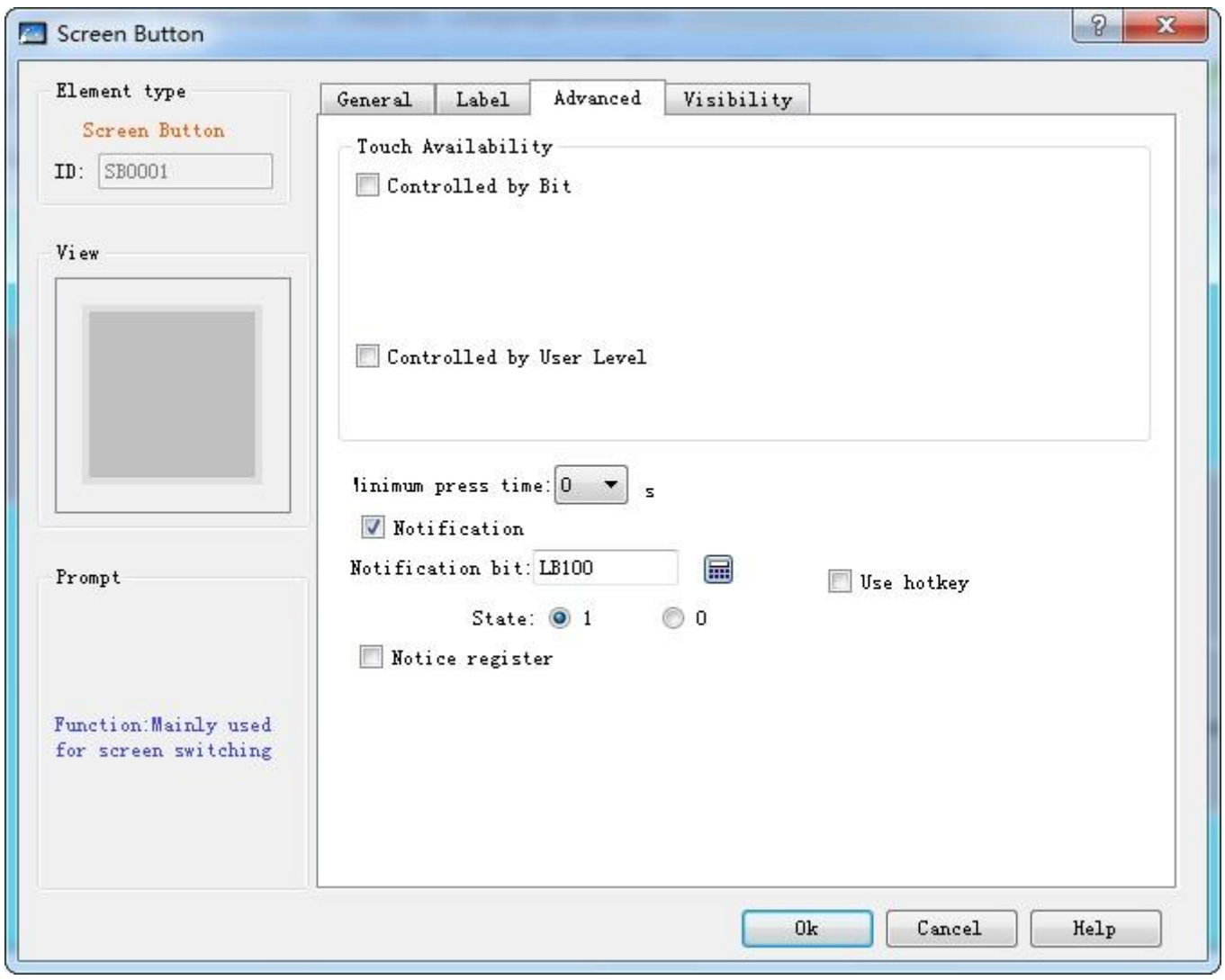
Configuration 2

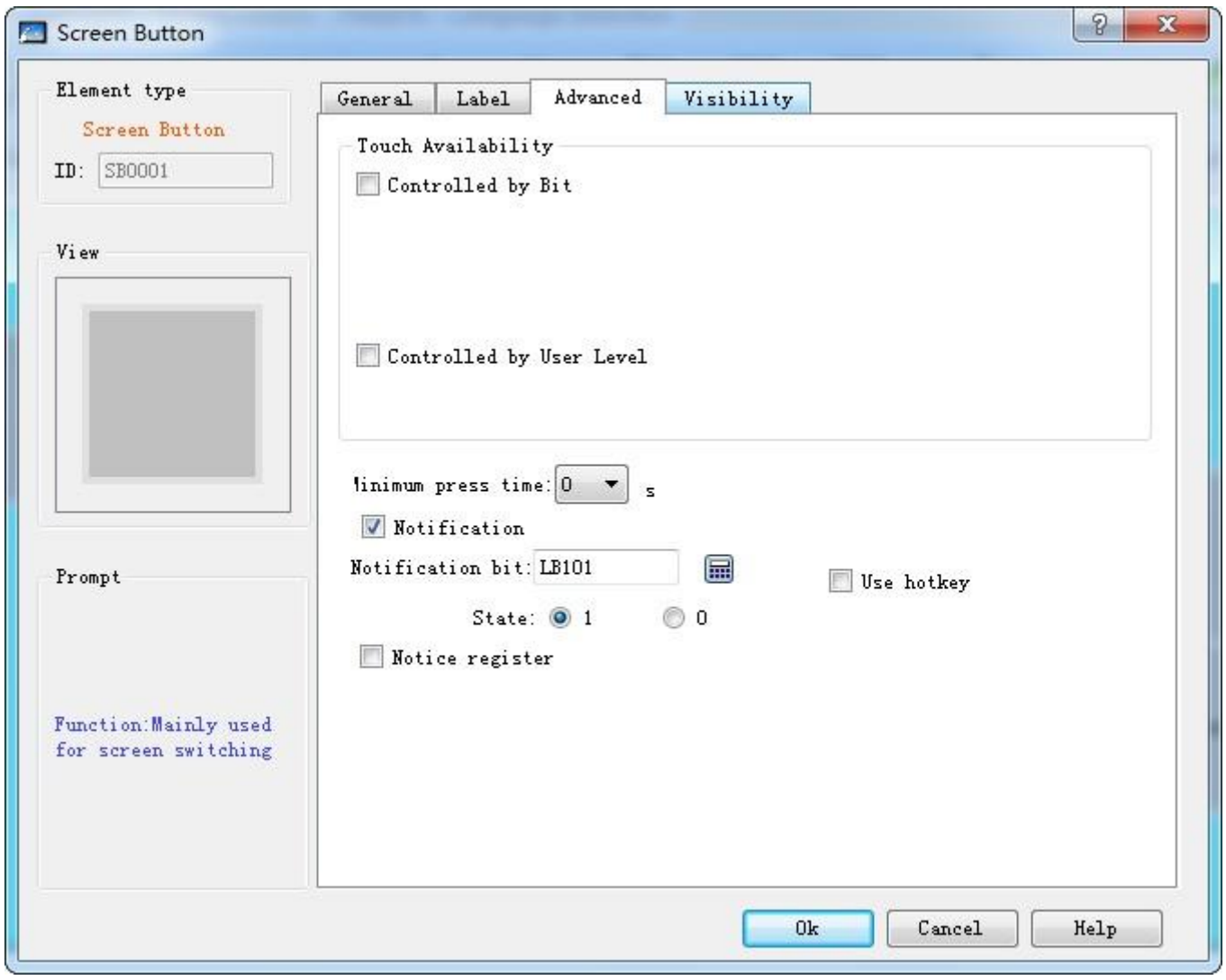


Configuration 3

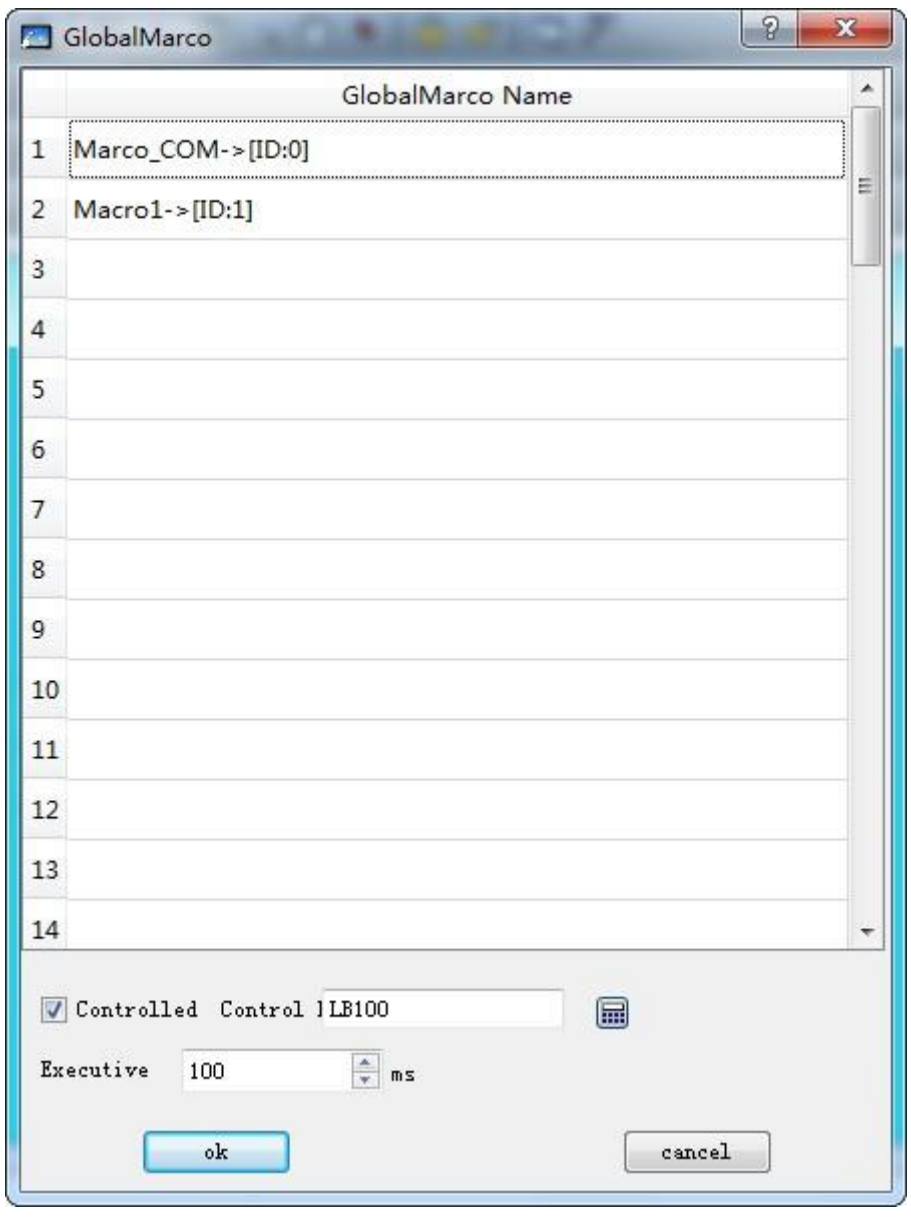
The six controls on the right side of Configuration 1 and 3 are numeric display controls whose monitoring addresses are respectively LW60297, LW60298, LW60299, LW60300, LW60301 and LW60302 = 1, from top to bottom. Two red controls are that of bit indicator light whose monitoring addresses are LB100 and LB101, respectively. Controls below Configuration 3 are numeric display controls, starting at address LW400 with an address interval of 1.

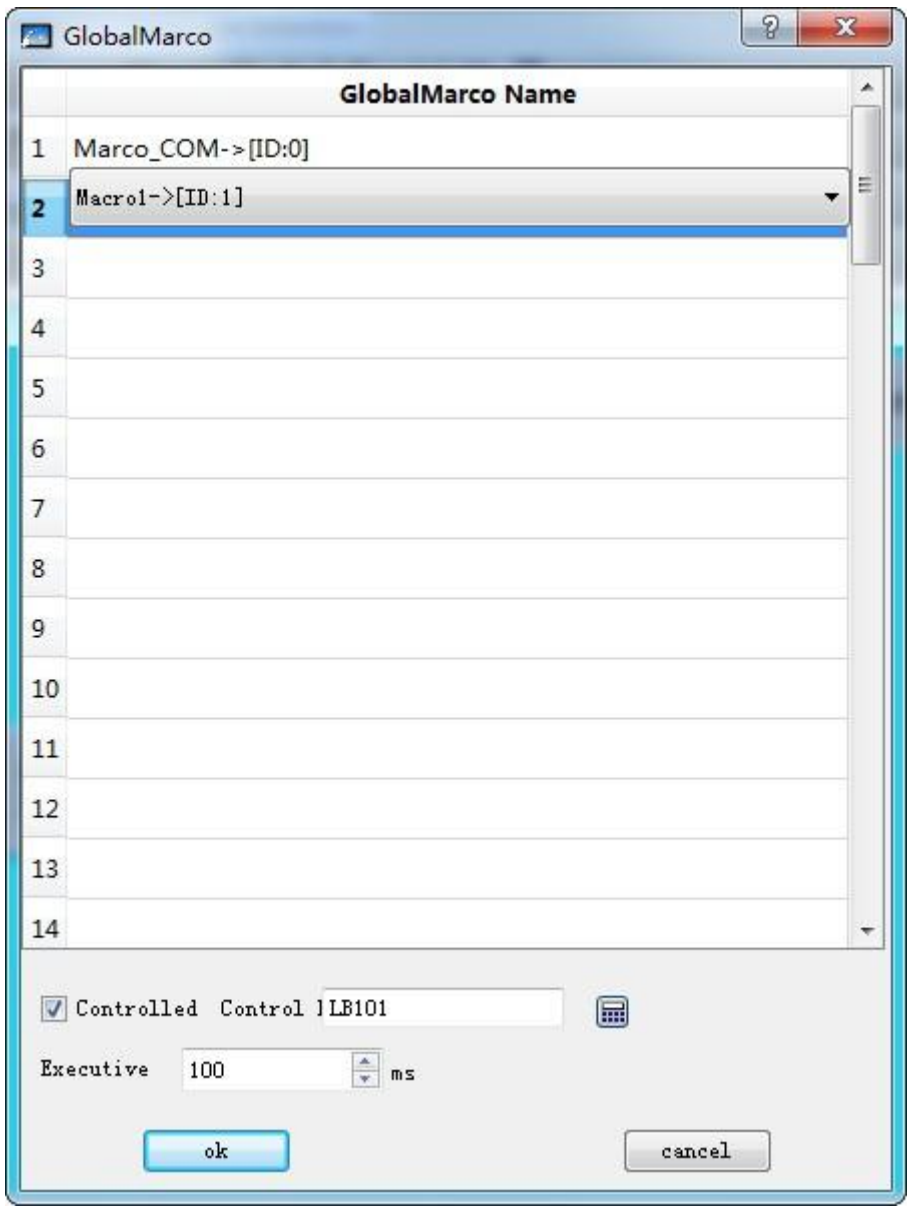
The "Advanced" settings for the two screen buttons in Configuration 2 are:





Global macro setting:





Code of Marco_COM：

```
#include "MacroInit.h"
void Macro_main(IN *p)
{
    MarcoInit
    LW60297=0;
    LW60298=3;
    LW60299=0;
    LW60300=1;
    LW60302=1;
    char Pdata[20];
    char Gdata[100];
    int result;
    if (LB0==0) // 0 means state of sending; 1 means state of waiting reception
    {
        Pdata[0]=LW200;
        Pdata[1]=LW201;
        Pdata[2]=LW202;
        Pdata[3]=LW203;
        PUTCHARS(0,Pdata,4);
        LB0=1; //
        return; //
    }
```

```
else
{
    result=GETCHARS(0,Gdata);
    LW0=result;
    if (result<=0) // 0 means no reception while 1 means wrong reception
    {
        LW1++; // timeout, start to count
        if (LW1>=3) // Wait for execution time of 3 macros
        {
            LW1=0; // zero clearing
            LB0=0; // send the mark of zero clearing; send it the next time
        }
        return; // quit directly
    }
        else // correct reception
        {
            LW2=Gdata[0]&0xff; // data reception processing
            LW3=Gdata[1]&0xff;
            LW4=Gdata[2];
            LW5=Gdata[3];
            LB0=0; // processing completed; send it the next time of entrance
            PUTCHARS(0,Pdata,0); //clear buffer
        }
    }
}
```

Code of Macro1：

```
#include "MacroInit.h"
void Macro_main(IN *p)
{
  MarcoInit
LW60297=0;
LW60298=4;
LW60299=0;
LW60300=1;
LW60302=2;
char Pdata[20]; //send data and save arrays
char Mdata[100]; //receive data and save arrays
int result; //length of received returning data
if (LB0==0) //LB0 stands for sending accepted flag, 0 for state of sending and 1 for state of waiting reception
 {
  Pdata[0]=0x02; //send data, read holding register and the first byte is the address of slave station
  Pdata[1]=0x03; //function code; read holding register
  Pdata[2]=0x00; // starting address of data to be read
  Pdata[3]=0x00;
```

```
Pdata[4]=0x00; //word length of data to be read
Pdata[5]=0x03;
Wcrc=CRC(Pdata,6); //CRC check the previous data
Pdata[6]=(Wcrc&0xff); //execute high-low interchange of CRC; P6 takes the low one
Pdata[7]=(Wcrc>>8); //P7 takes the high one
PUTCHARS(0,Pdata,8); //send function; send the whole data to serial port
LB0=1; // complete sending; wait for reception instead of sending the next time of entrance
return; //quit to wait for reception
}
else
{
    result=GETCHARS(0,Mdata);//receive function; save the received data to Gdata array
    LW0=result; //check the receiving length
    if (result<=0) //0 means no reception while 1 means wrong reception
    {
        LW1++; //timeout; start to count
        if (LW1>=3) //wait for execution time of 3 macros
        {
            LW1=0; //zero clearing
            LB0=0; //send the mark of zero clearing; send it the next entrance
        }
return; //quit directly
}
else //correct reception
{
        LW400=Mdata[0]&0xff; //data reception processing
        LW401=Mdata[1]&0xff;
        LW402=Mdata[2];
        LW403=Mdata[3];
        LW404=Mdata[4];
        LW405=Mdata[5];
        LW406=Mdata[6];
        LW407=Mdata[7];
        LW408=Mdata[8];
        LW409=Mdata[9];
        LW410=Mdata[10];
        LB0=0; //processing completed; send it the next entrance
        PUTCHARS(0,Pdata,0); //clear buffer
    }
}
}
```



Name and address of variable setting are the same in function compile box.

15.3 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 1 below

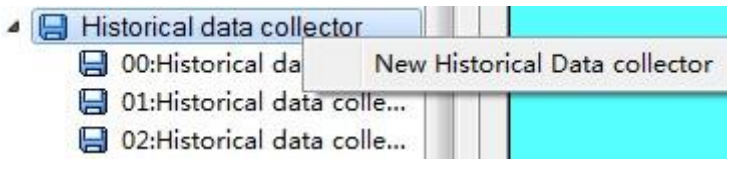


Figure 1 Create a new historical data collector

2. Settings of Historical data collector

Double click to open Historical data collector, as shown in Figure 2

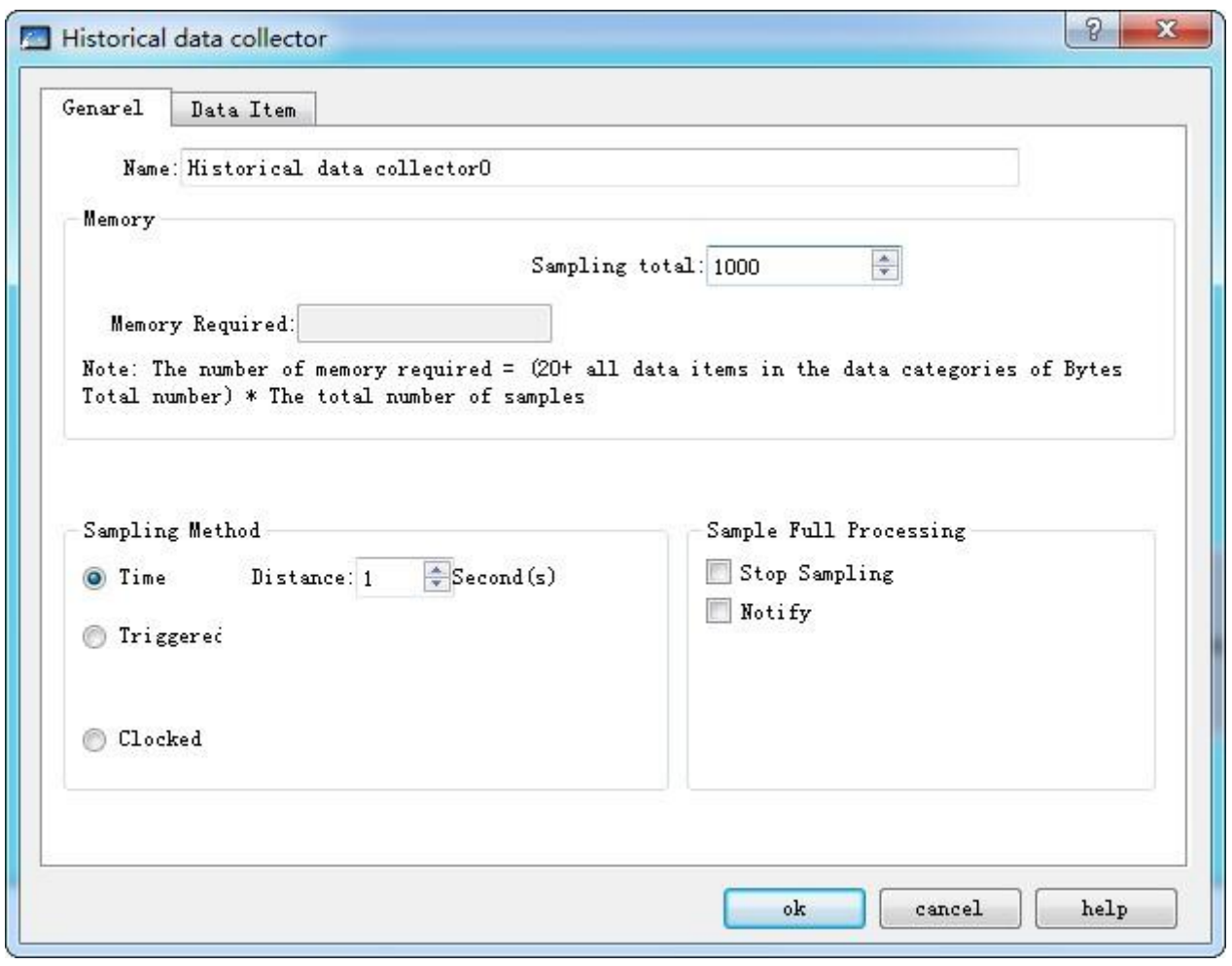


Figure 2 General settings of Historical data collector

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.

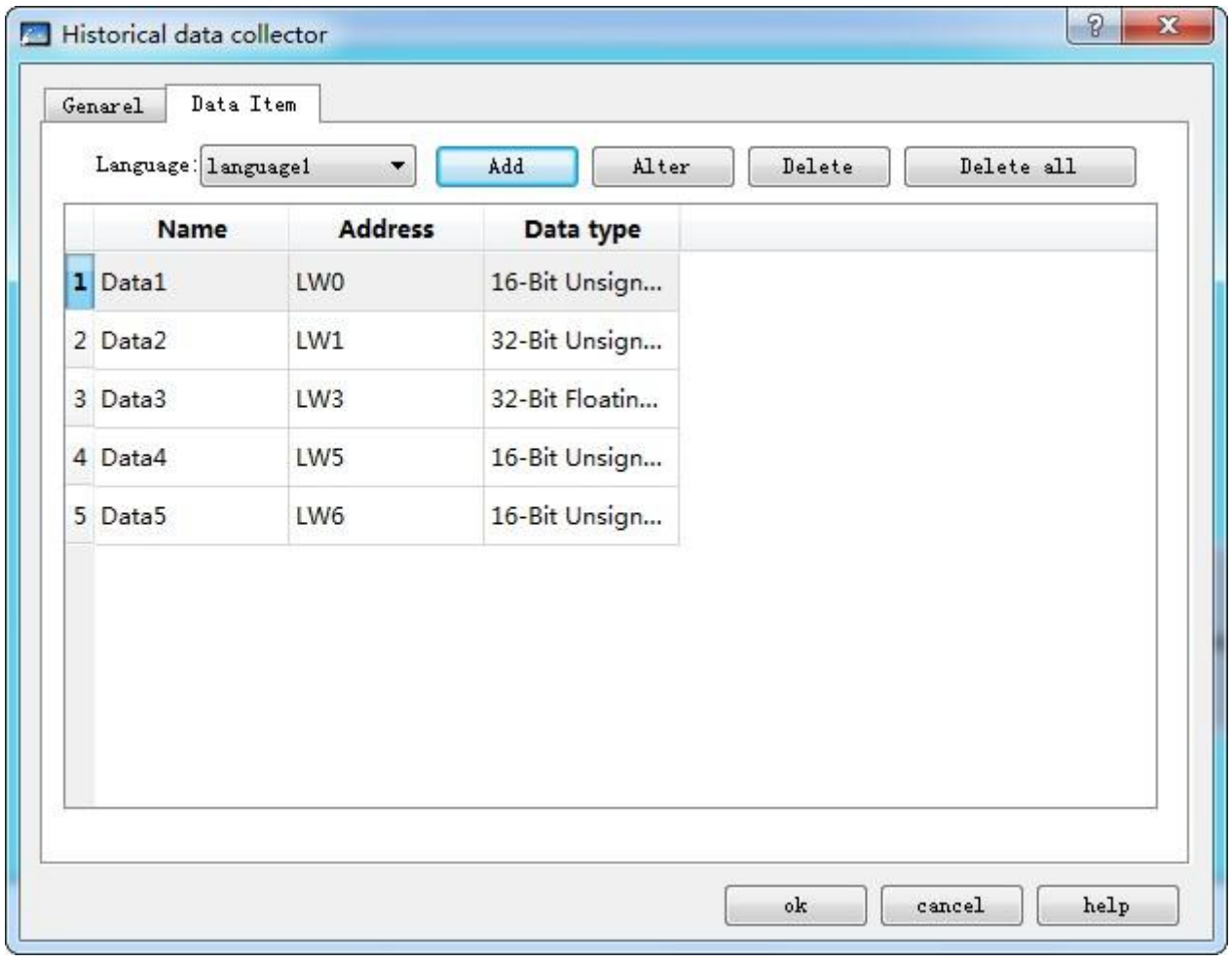


Figure 3 Data item setting of Historical Data Collector

Click “OK” button; after settings, execute “Historical data display” if you want to view the historical data.

3. Settings of Historical data display：

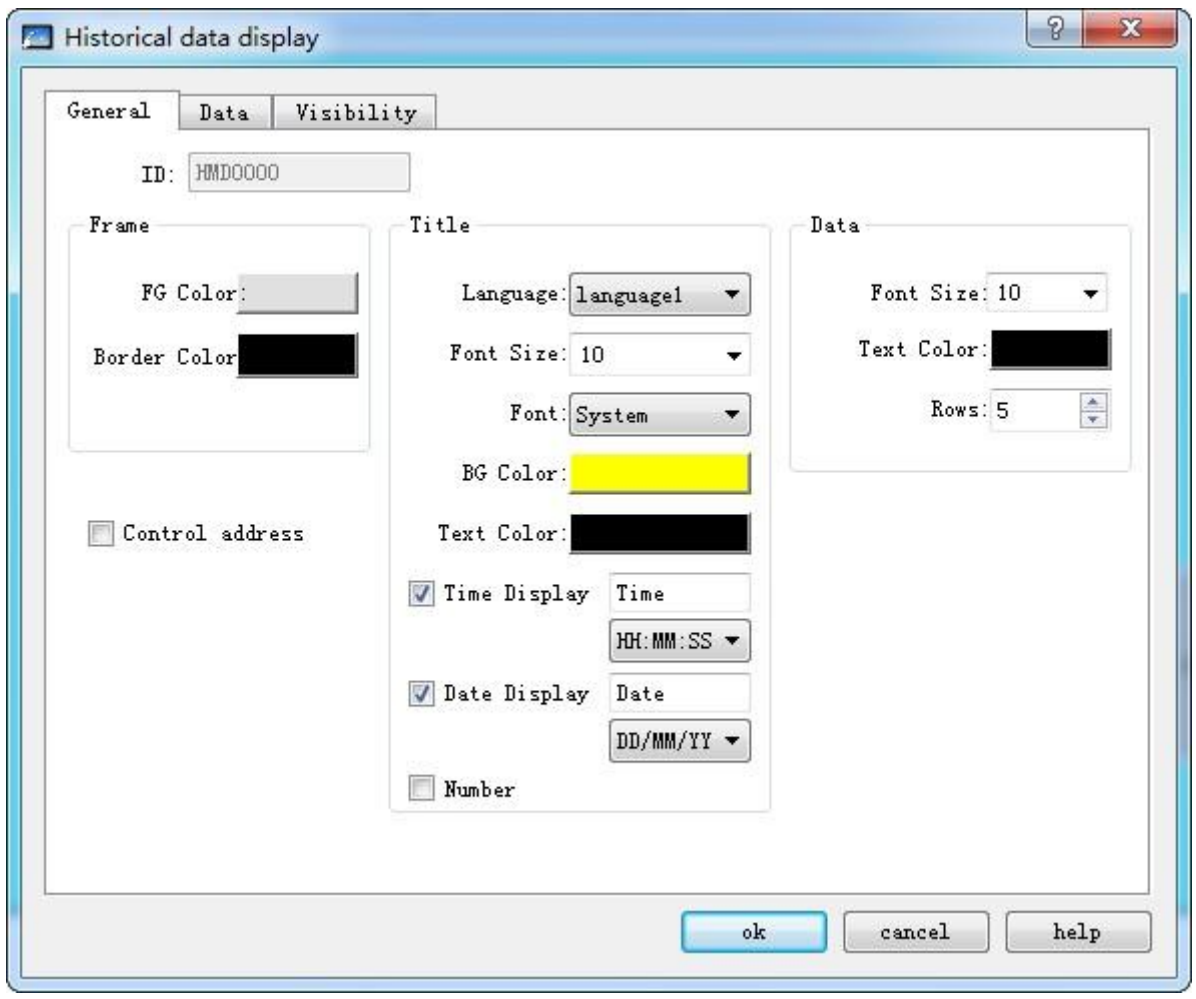


Figure 4 General settings of Historical data display

Select five for Display lines; Font and Background are up to you.

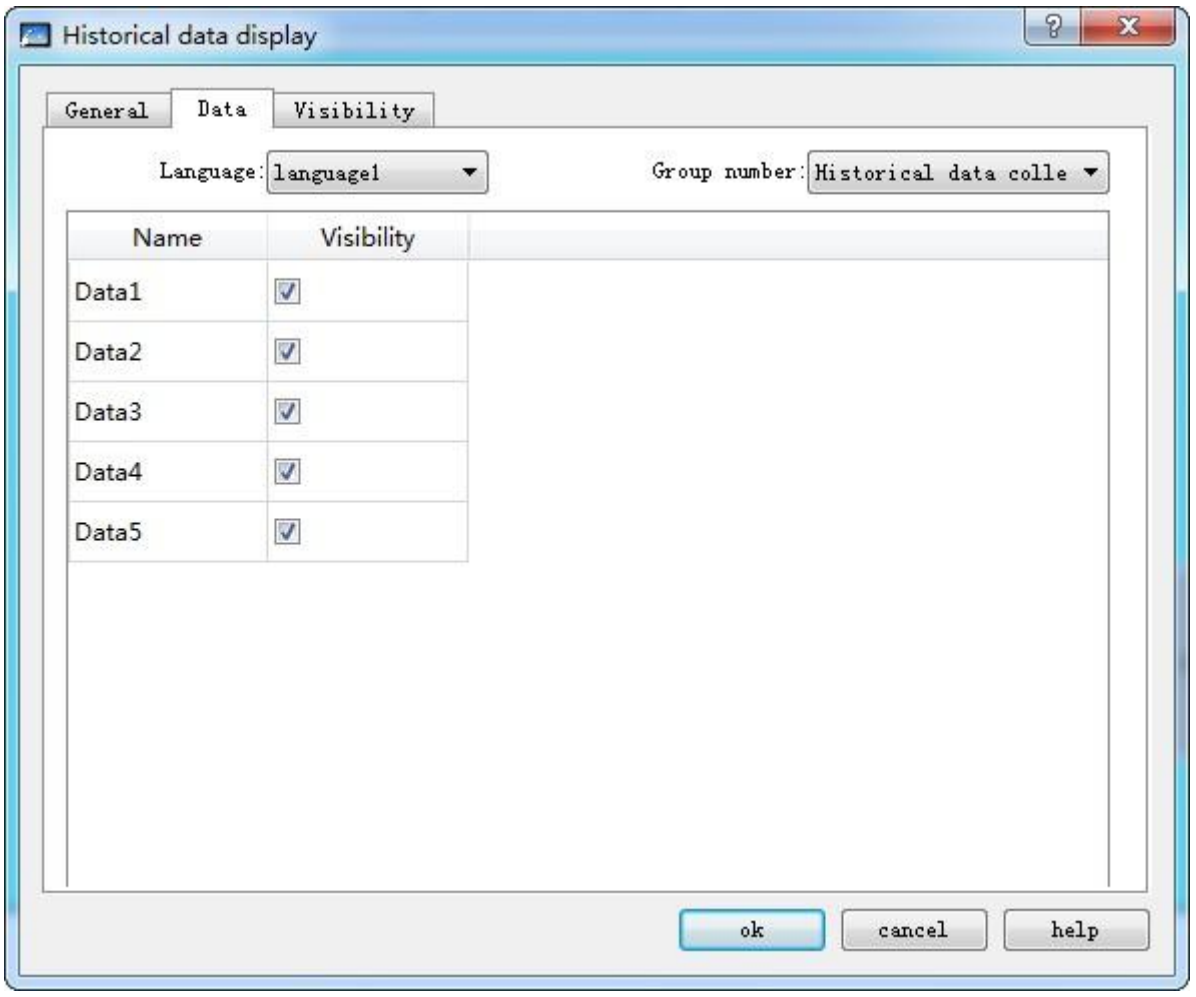


Figure 5 Data item settings of Historical data display

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

Figure 6 Historical data display on the screen

Employ “Historical trend chart” to display the value change if it is needed.

4. Open Historical trend chart, as shown below

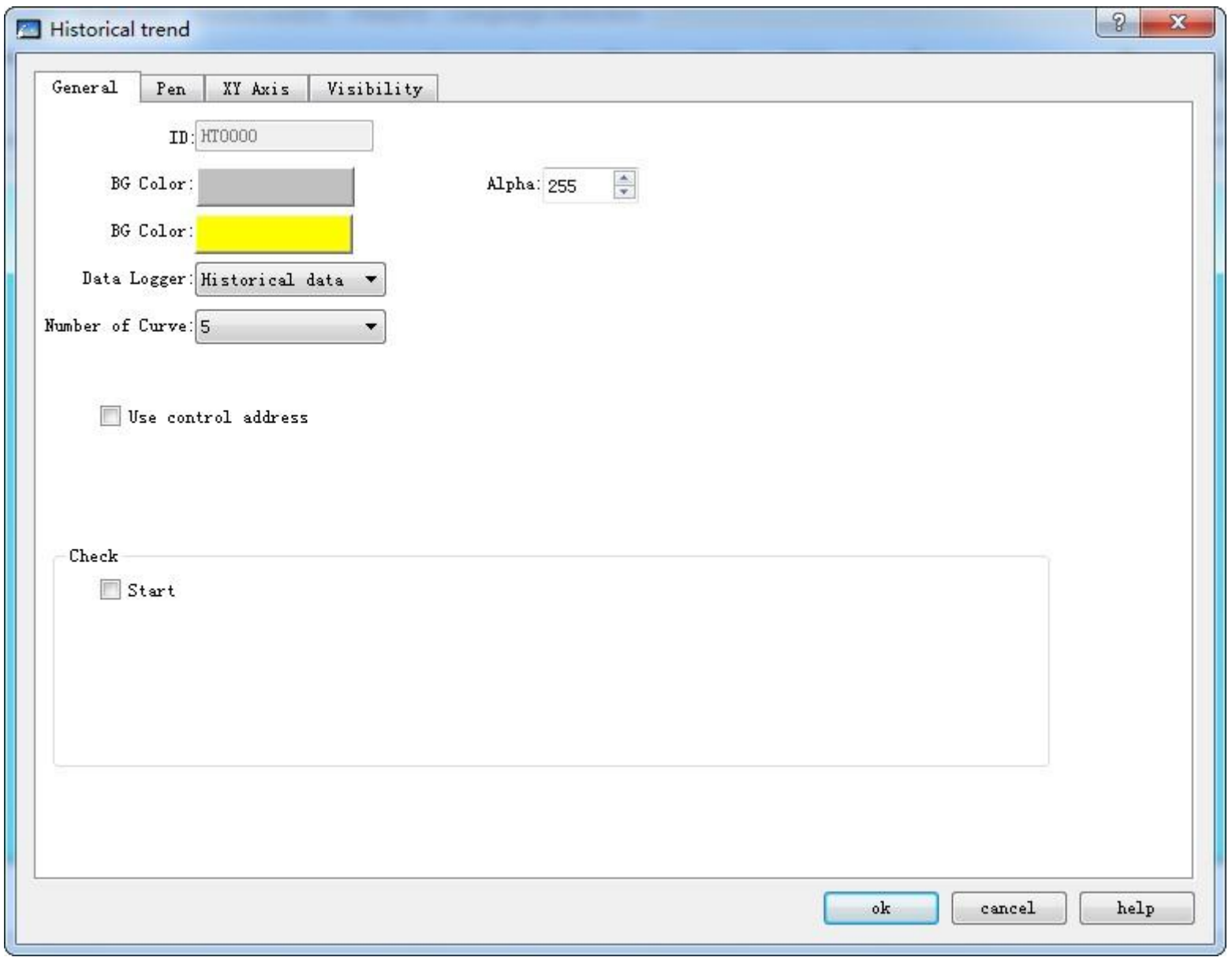


Figure 7 General setting of Historical trend chart

It needs to select the number of line to be displayed and its data source as well as color.

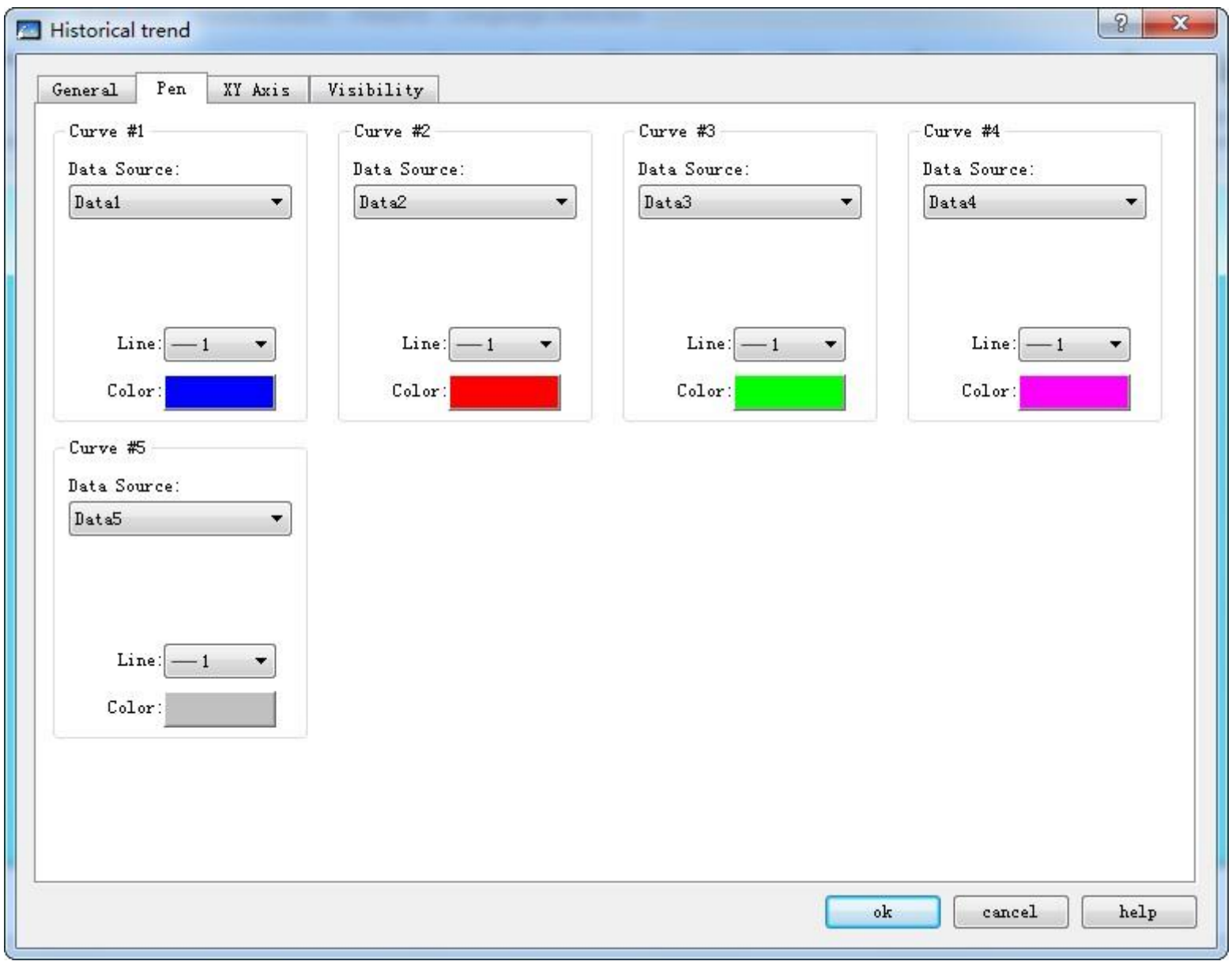


Figure 8 Line settings of Historical trend chart

Set the maximum value and time at XY axis.

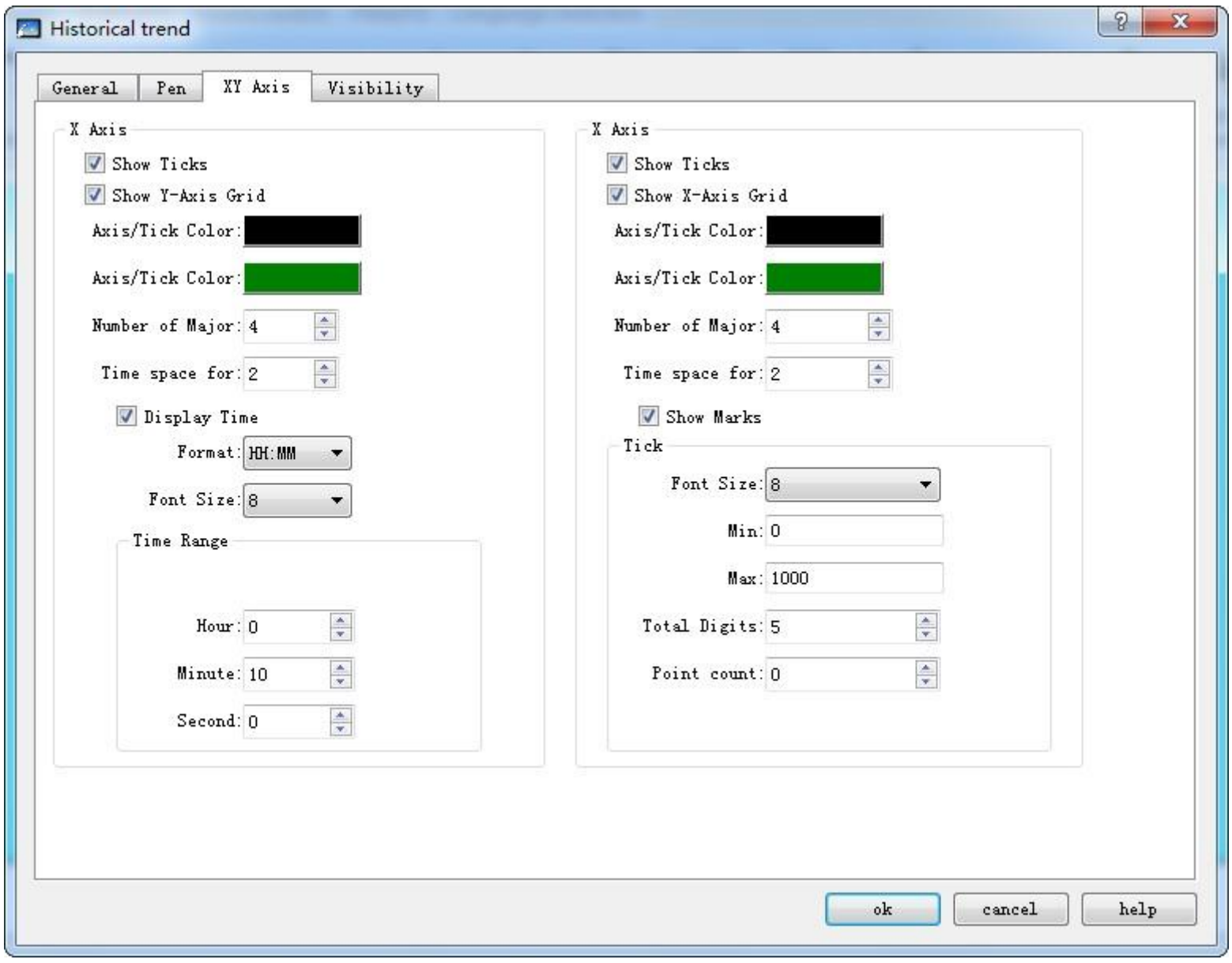


Figure 9 XY axis settings of Historical trend chart

Click "OK" button to complete; draw the trend chart as shown below:

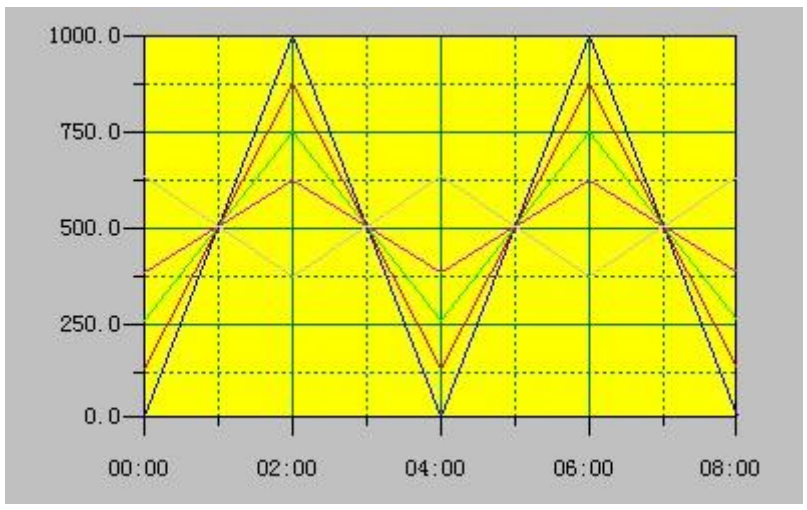


Figure 10 Historical trend chart display on screen

15.4 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 1:

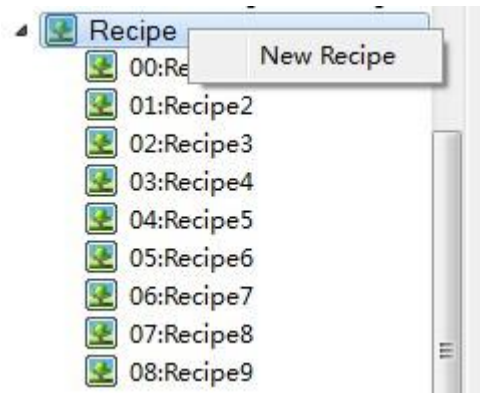


Figure 11 Create new recipe

Double click to open the recipe, as shown in Figure 2:

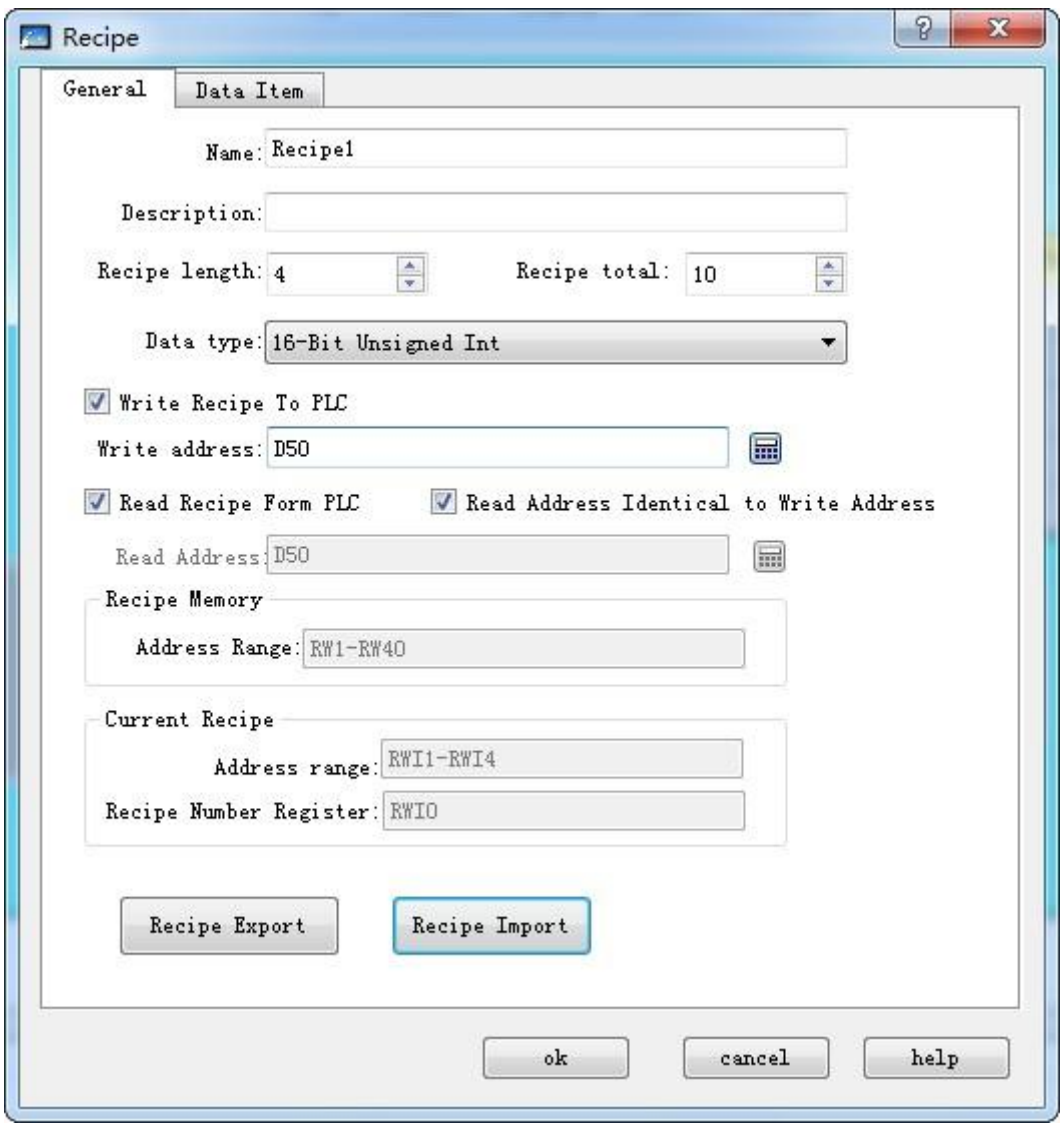


Figure 12 General settings of Recipe

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：

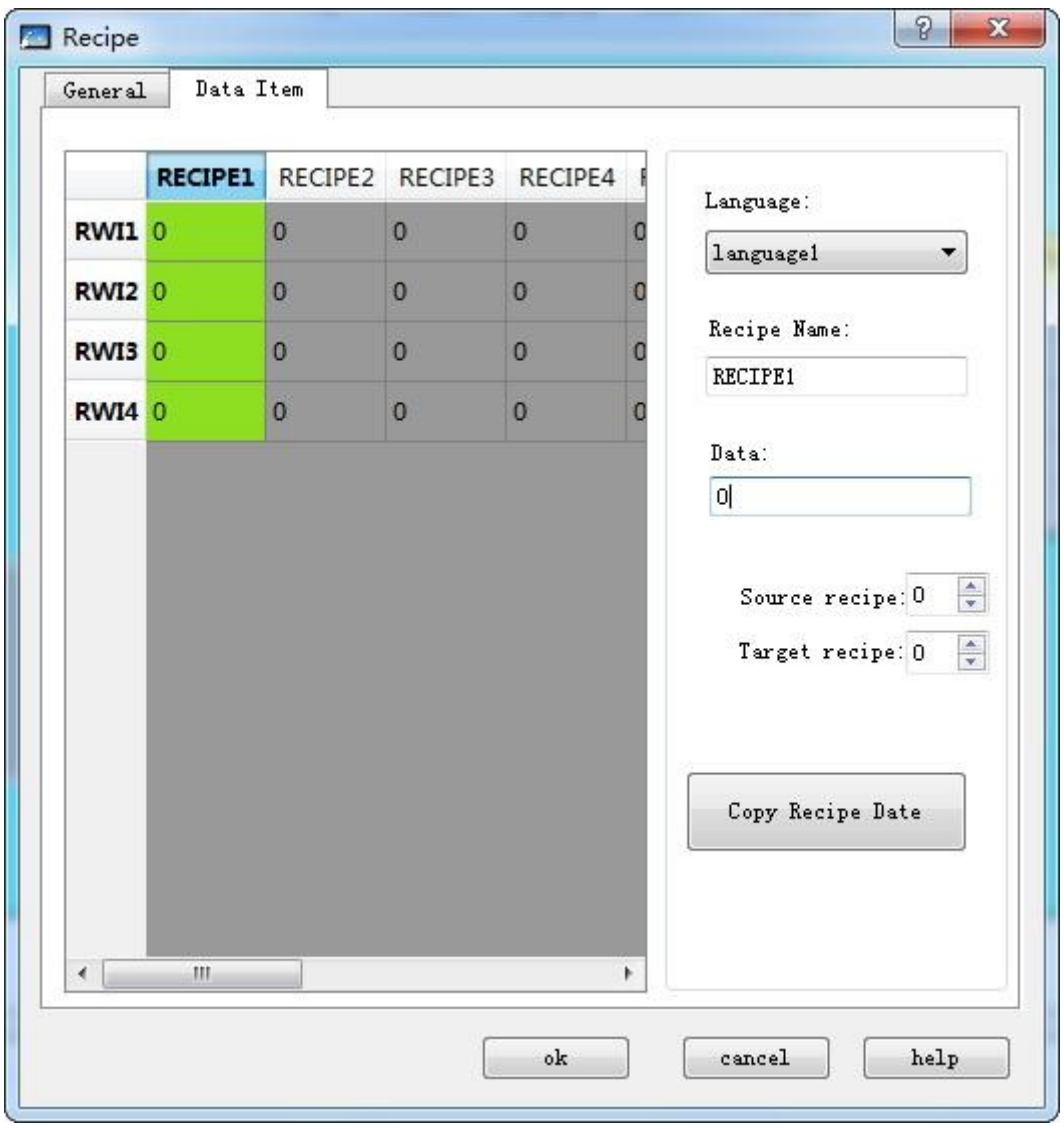


Figure 13 Data item settings of recipe

After setting the recipe name, select "OK" to complete. Employ Numeric Input and Display control to display recipe data on the touch screen. 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 RWI 0 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".

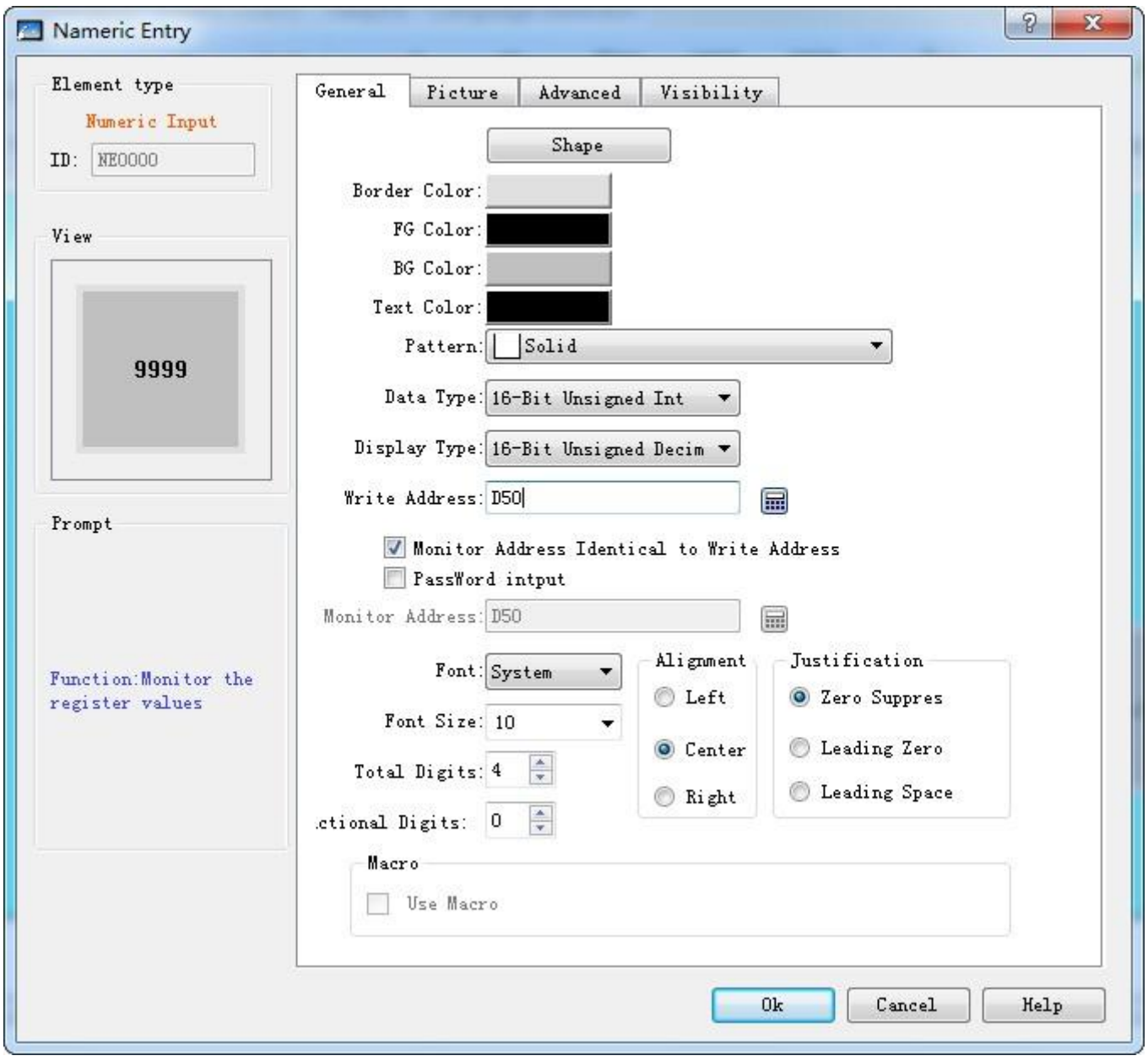


Figure 14 “Numerical input and display” control for recipe data D50

Set up the Numerical input and display control and place it on the screen：



Figure 15 Screen view of Recipe display

It can change recipe parameters via Numerical input and display; realize functions of checking recipe, reading recipe and writing recipe through function buttons.

15.5 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 log", as shown in Figure 7-22:

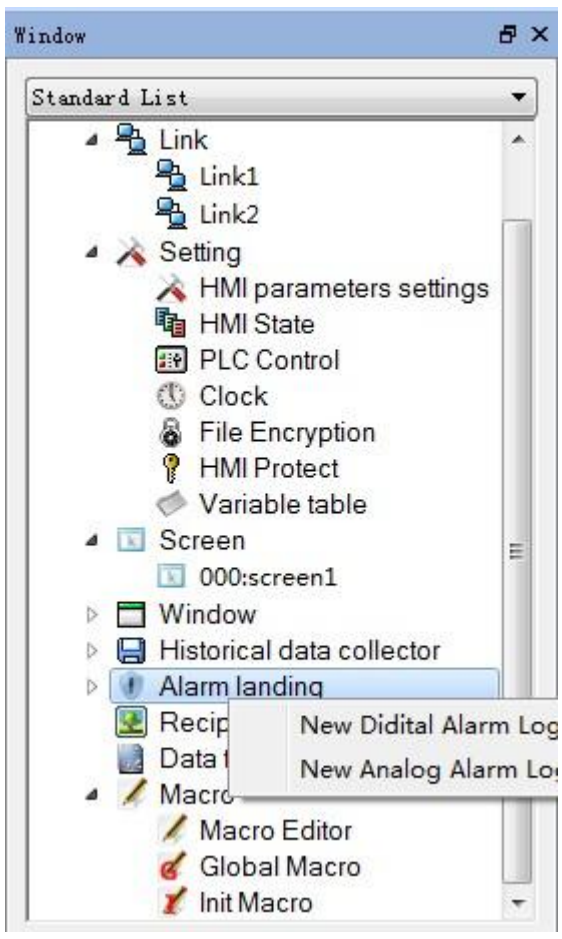


Figure 7-22 Select alarm log

Double click the "digital alarm login" option to open the digital alarm settings dialog box, as shown in Figure 7-23:

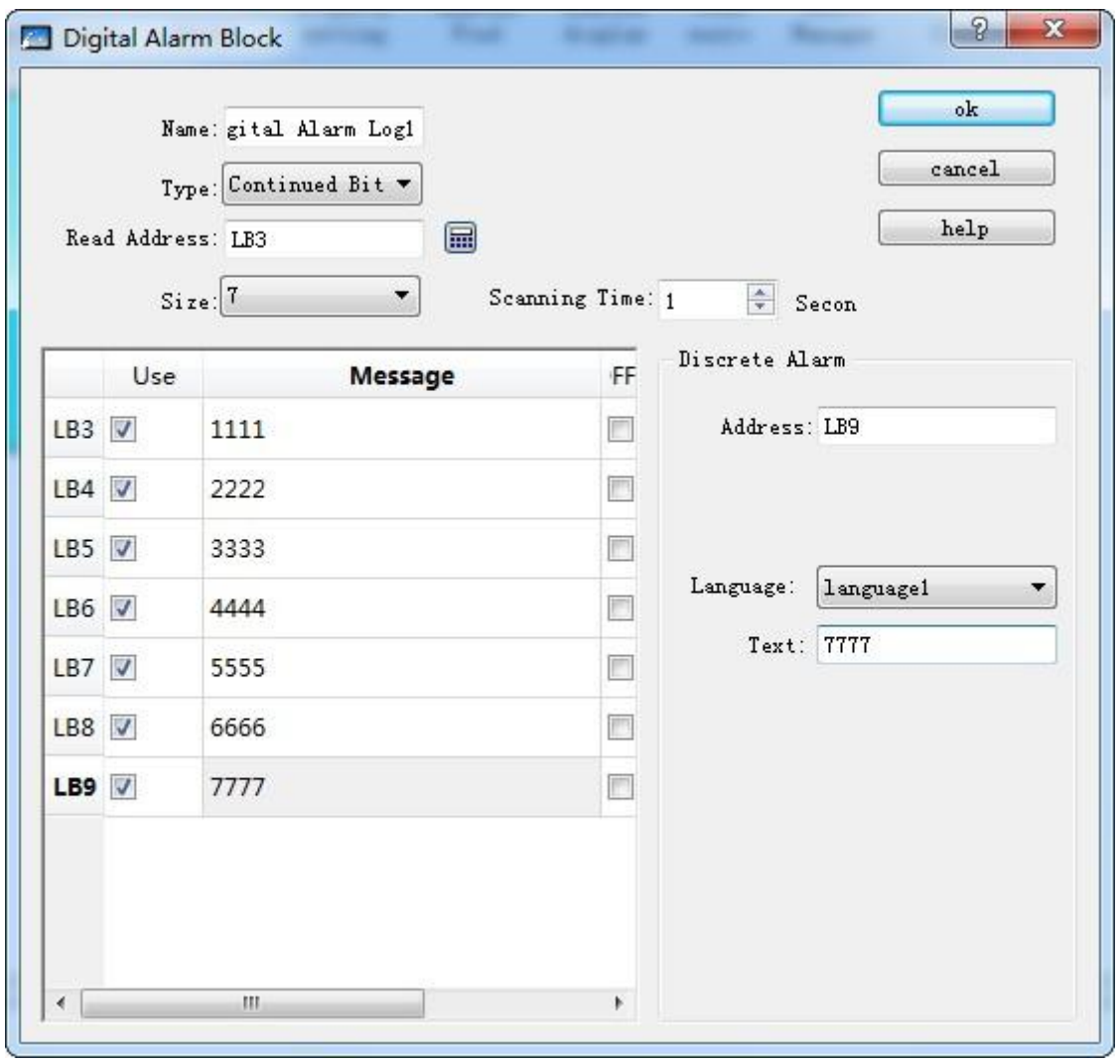


Figure 7-23 Select continuous digit

Steps to build a digital alarm log are as follows:

- Enter the read address first; it is assumed here that the internal address LB1 is set.
- 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.
- Set the bit alarm “Scanning time", that is, the scanning frequency.

- 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 7-23.
- 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".

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 7-24:

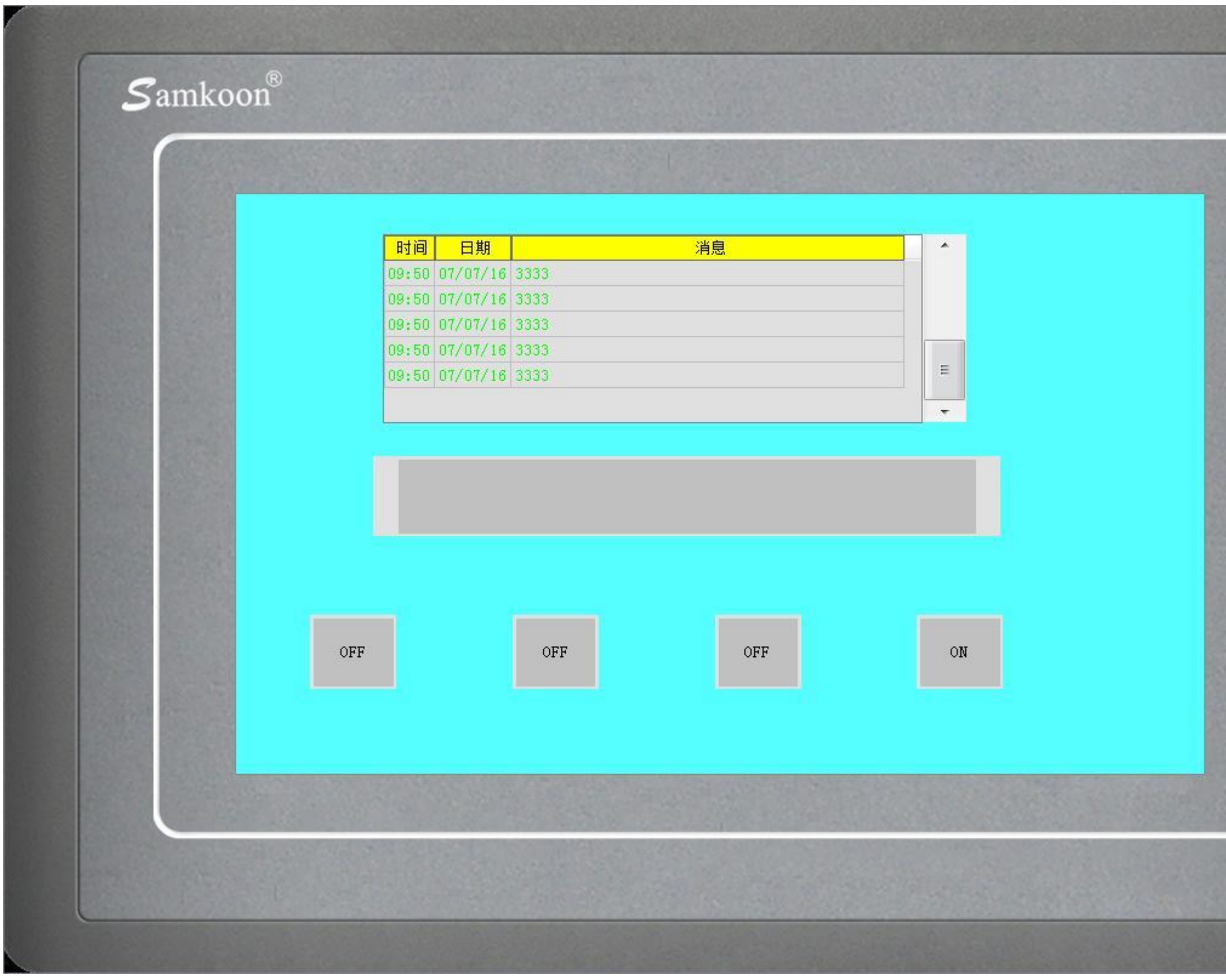


Figure 7-24 Offline simulation example of digit alarm

When "Continuous Bit of Word" is selected as the Type, as shown in Figure 7-25 below:

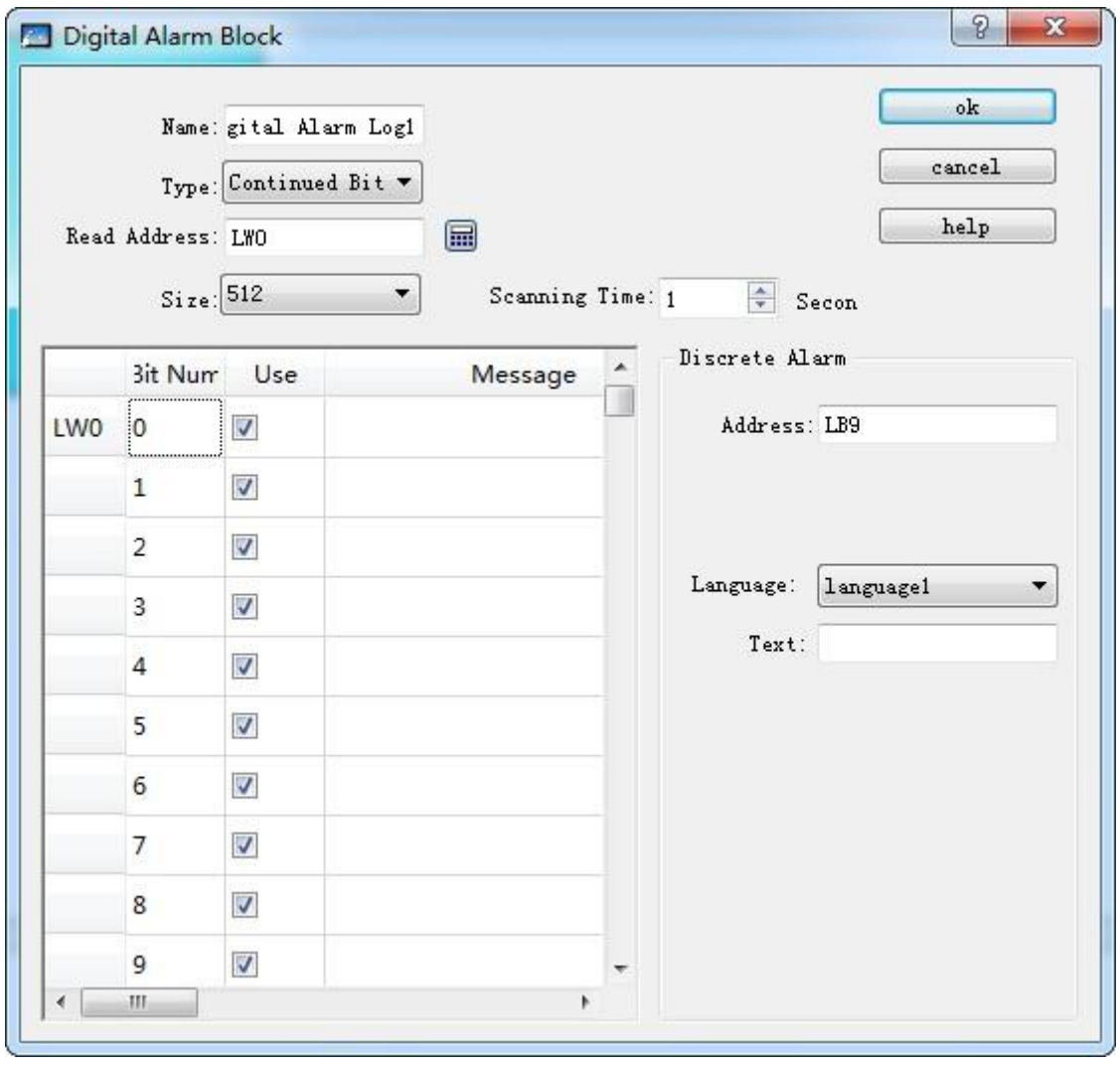


Figure 7-25 Select Continuous Bit of Word

If the “Use” of a certain bit number is selected, an alarm will be generated when the value of this bit value is 1.

Tips:

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 7-26 below:

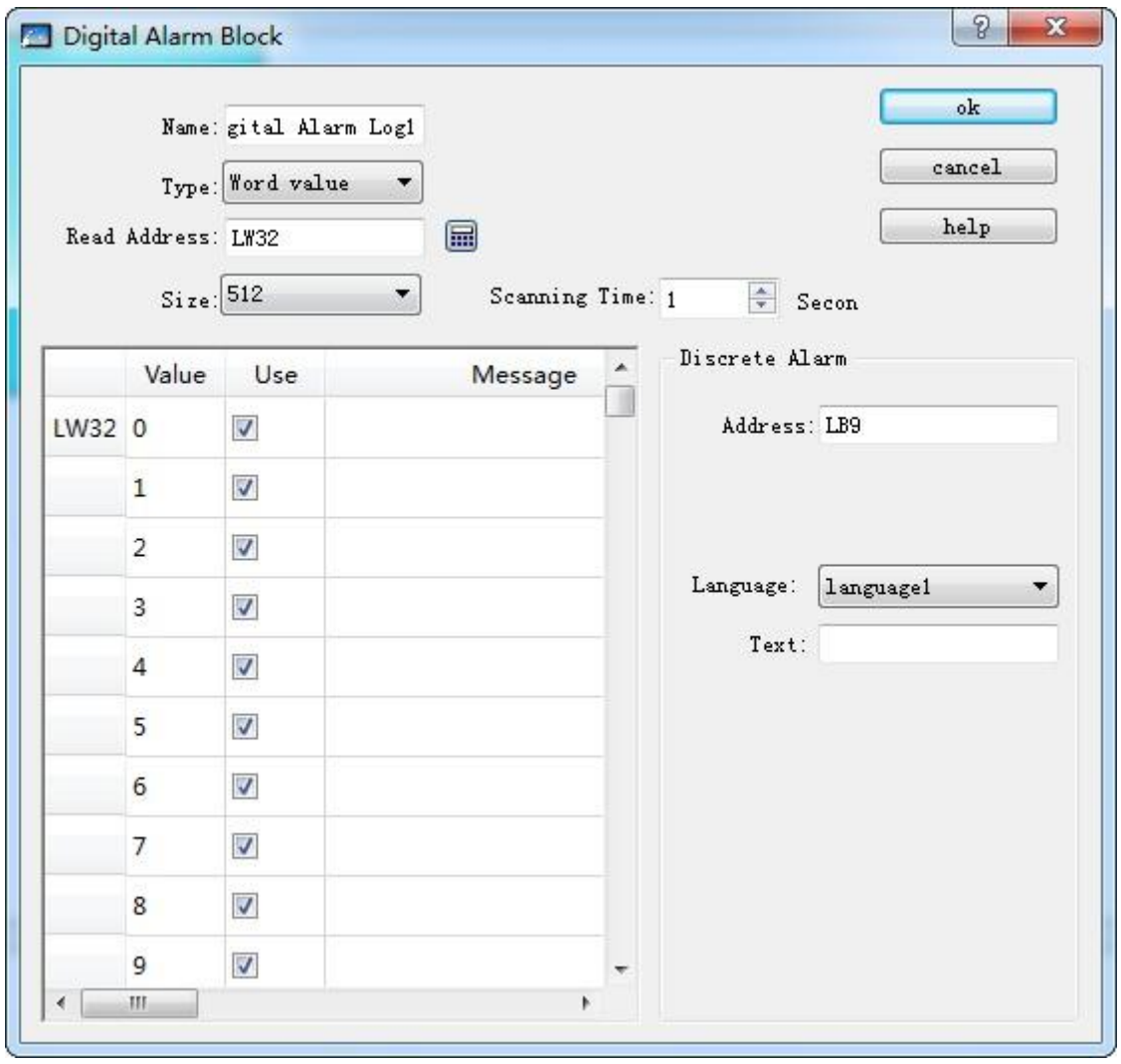


Figure 7-26 The "Word Value" digital alarm dialog box

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 in Figure 7-24 and a Dynamic alarm bar whose attributes are set as shown in Figure 7- 27:

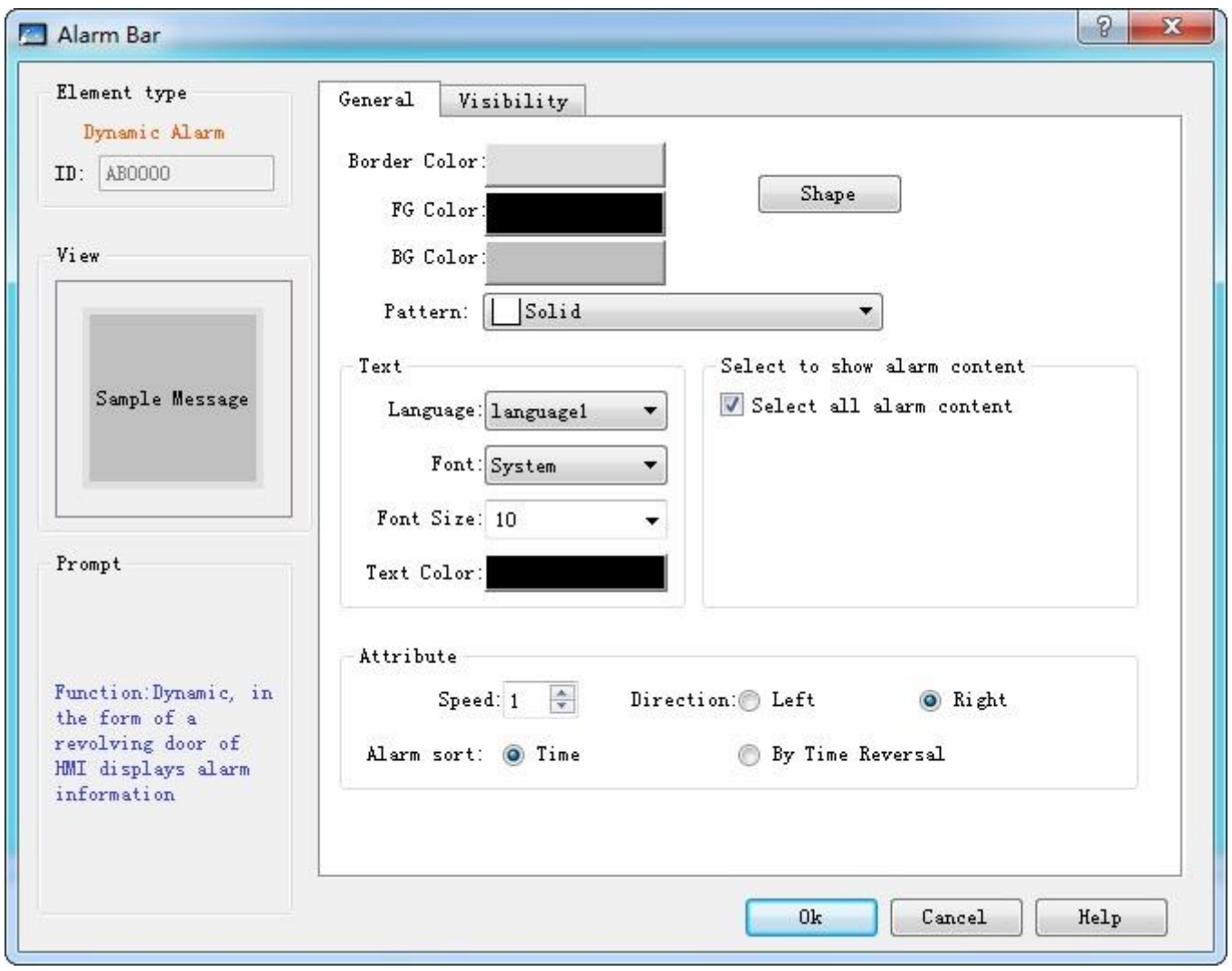


Figure 7-27 Dynamic Alarm Bar Properties dialog box

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.



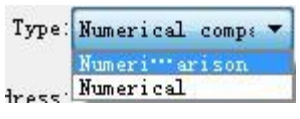
Note: Different alarm information is available for corresponding language through the function of switching language.

Note: Number of digital alarm is up to 10 for SK series HMI.

15.6 Analog Alarm Login

Open the analog alarm settings dialog box, as shown in Figure 7-28:

It has two types: Numerical value and Numerical comparison.



The numerical comparison alarm is as shown below:

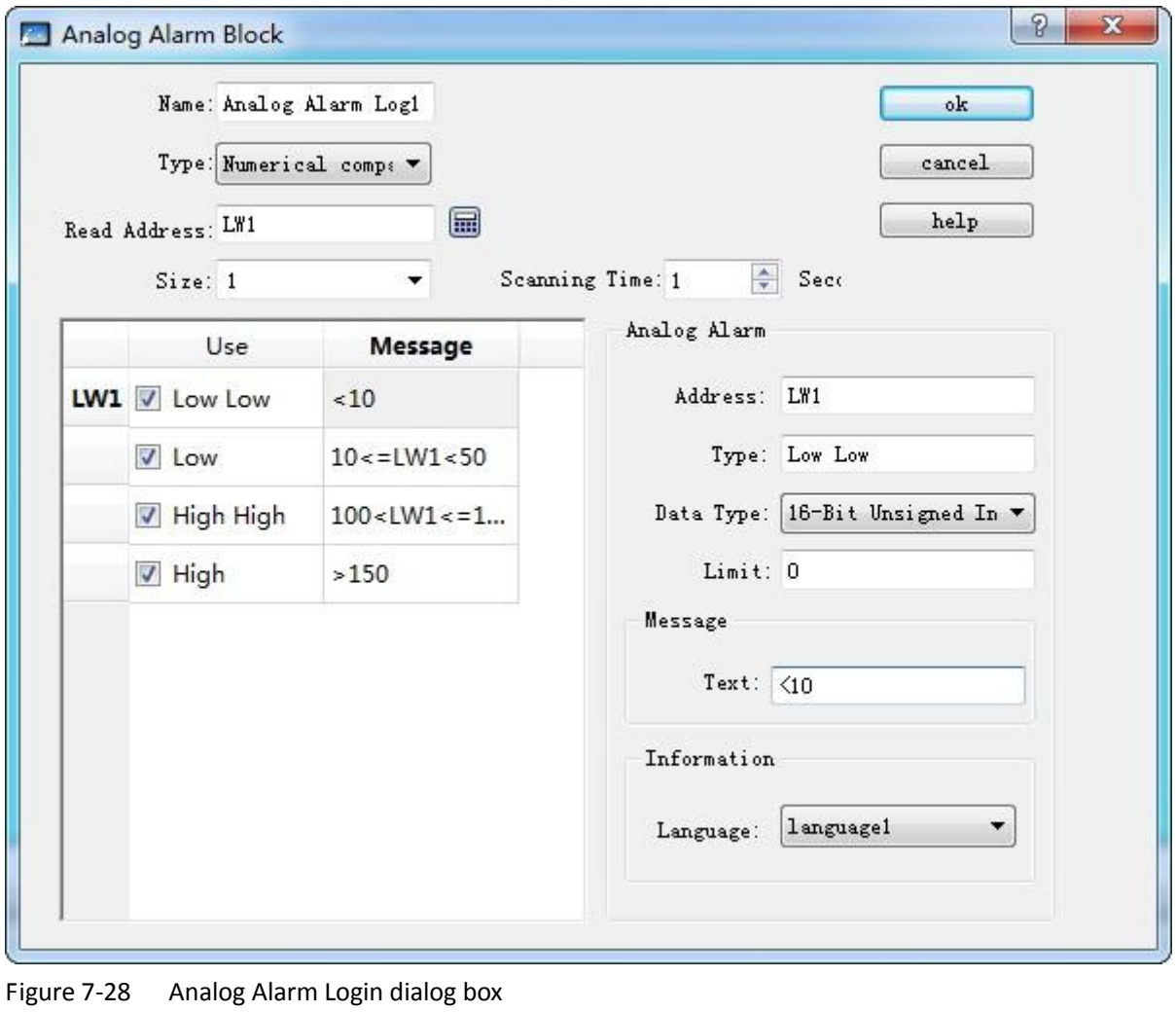


Figure 7-28 Analog Alarm Login dialog box

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 7-28, 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 7-28: each address value can be classified into one of four ranges-- Low, Low Low, High, High High.

As shown in Figure 7-29:

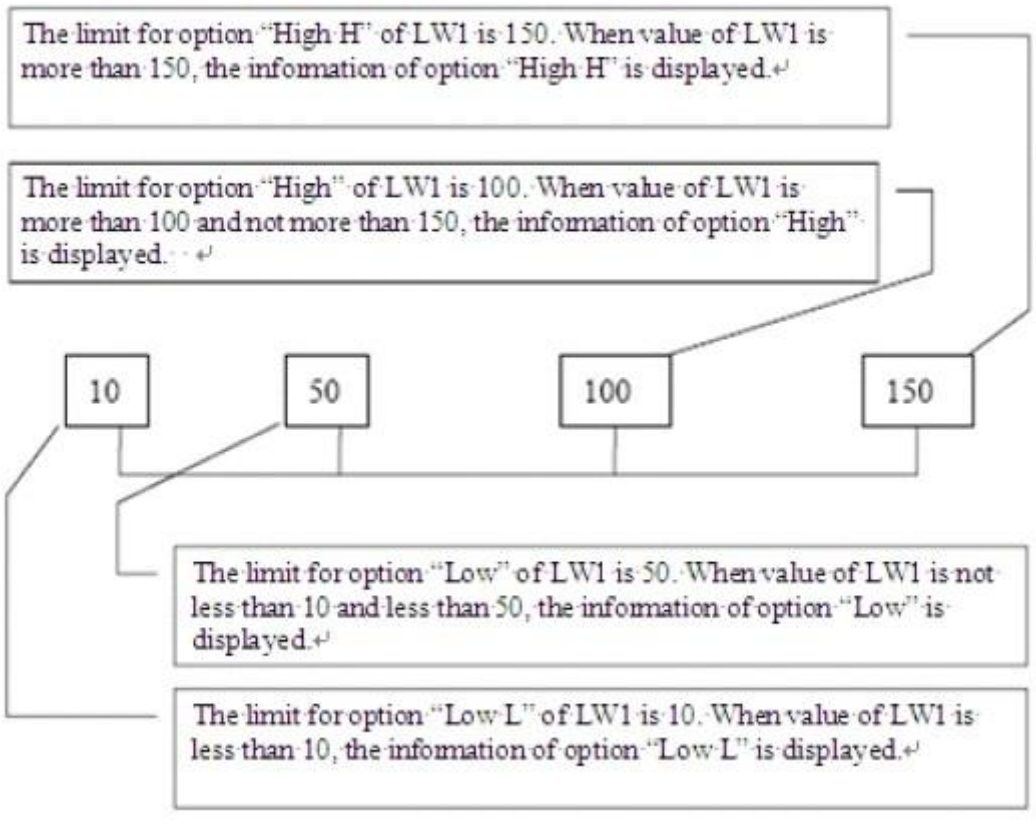


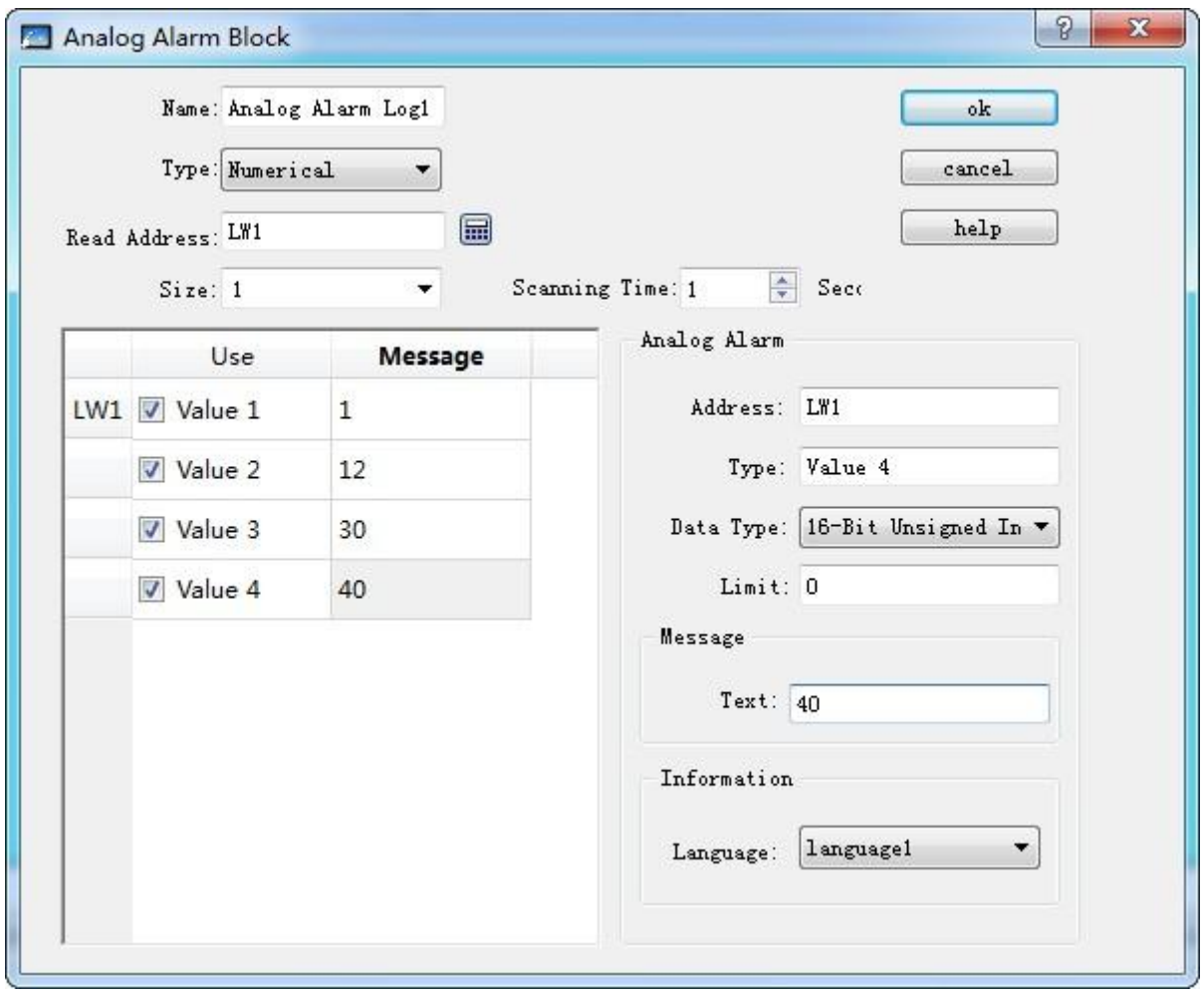
Figure 7-29 Diagram of the four address values for the LW1 address

- 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".

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.



Tips:

Note: Number of analog alarm is up to 10 for SK series HMI.

16. FAQ & Solutions

No.	Phenomenon		Reason analysis	Solution
Display	Black Screen	Black screen once powered on	Power problems	1、Check the power supply connection; 2、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.	Dial the Dial switch 2 to ON and re-download configuration project to test simply; if macro runs improperly, debug it and apply correct macro programming methods.
			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.
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	1. Dial the dial switch on 1 to execute coordinate adjustment; 2. 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 Samkoon 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.
			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	Modify and match the right model of

		inconsistent with the actual ones.	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 of SK in environmental variables	Bring forward the installation directory of SKTOOL in environmental variables.
	Off-line and On-line simulation cannot function in the meantime.	Run without administrator rights	Run SKTOOL as administrator

17. Contact

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