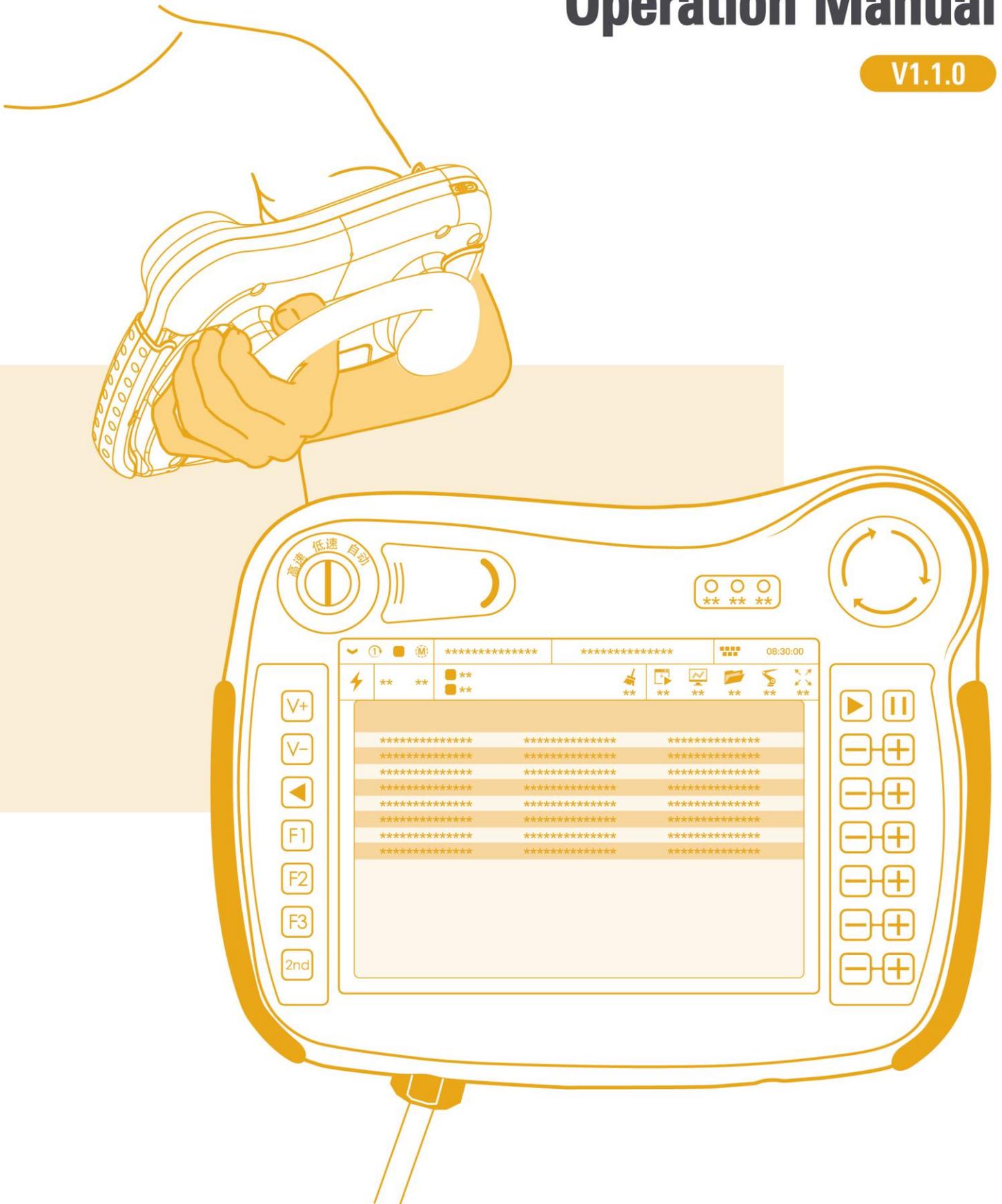


SCARA Teach Pendant Operation Manual

V1.1.0



Foreword

About this manual

This manual introduces how to use the SCARA teach pendant to operate the industrial robot system based on the AIR type industrial robot.

Prerequisites

safety instructions of the product carefully. Users must understand the safety knowledge and basic operation knowledge before using the teach pendant.

Please read the following documents when necessary:

- "ARL Programming Manual"
- "XX Horizontal Multi-joint Industrial Robot Manipulator Manual"
- "inCube2S control cabinet manual"

Target groups

- Operators
- Product technicians
- Technical service personnel
- Robot teachers

Meaning of common signs

The signs and their meanings in this manual are detailed in Table 1.

Table 1 Signs used in this manual

Sign	Meaning
 Danger	Failure to follow the instructions may result in an accident causing the severe or fatal injury or the great losses of property.
 Warning	Failure to follow the instructions may resulting in moderate injuries or minor injuries, or only material damage may occur.
 Caution	Prompt for the environmental conditions and important things or shortcuts you shall pay attention to

Sign	Meaning
 Prompt	Prompt for additional literature and instructions for additional information or more detailed operating instructions

Manual description

The contents of this manual are subject to supplementation and modification. Please visit "Download Center" on the website regularly to obtain the latest version of this manual in a timely manner.

Website URL: <http://robot.peitian.com/>

See Table 2 for manual related information.

Table 2 Related information of this manual

Manual name	<i>SCARA type teach pendant operation manual</i>
Manual number	UM-P05070000001-005
Manual version	V1.1.0
Software version	2.6.3

Revision history

The revision history contains the instructions for each document update. The latest version of the document contains updates to all previous versions of the document.

Table 3 Signs used in this manual

Version	Publication date	Modification description
V1.0.0	2020.06.30	1st official publication
V1.1.0	2020.10.30	The corresponding software version is upgraded from 2.6.2 to 2.6.3

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1 Safety Precautions

The robot owner and operator must be responsible for their own safety. Petian Robotics Co, Ltd. is not responsible for the safety of the robot. The user must pay attention to the use of safety equipment when using the robot and must abide by the safety provisions.

1.1 Use environment

Robot could not be used in below environments

- Burning environment
- Potential explosive environment
- Radio interference environment
- In water or other liquids

1.2 Safety operating procedures

Teaching and manual operation of the robot

- Please do not operate the teach pendant and operation panel with gloves
- Use lower speed multiplier to jog the robot for better controllability.
- The movement trend of the robot should be considered before pressing the jog button on the teach pendant.
- It is necessary to pre-consider the movement trajectory of the robot so as to avoid interference.
- The area around the robot must be clean and free of oil, water and impurities.



Never assume that the reason the robot is not moving is that its program has already been completed. Because at this time, the robot is probably waiting for the input signal to keep it moving

2 Overview of the teach pendant

2.1 Overview

The Robot Teach Pendant (AIR-TP) is a handheld device for operating and controlling the robot. The weight of the AIR-TP Teach Pendant is 1.2kg. It can be used by hand or placed flat on the desktop. It is usually placed directly above the control cabinet when stored (reference Figure 2-1) or hang on the side of the control cabinet.



Figure 2-1 Where and how to place the robot teach pendant

 Caution	If the teach pendant is placed incorrectly, the teach pendant may fall or be damaged.
--	---

Normally, the teach pendant is operated in a handheld mode. Users who are accustomed to right-handed operation need to hold the teach pendant with their left hand, and then use the right hand to operate the buttons and touch screen on the teach pendant. The recommended holding method is shown in Figure 2-2.



Figure 2-2 The correct posture of holding the teach pendant

2.2 Label

The position of the nameplate and matching label of the teach pendant is shown in Figure 2-3.

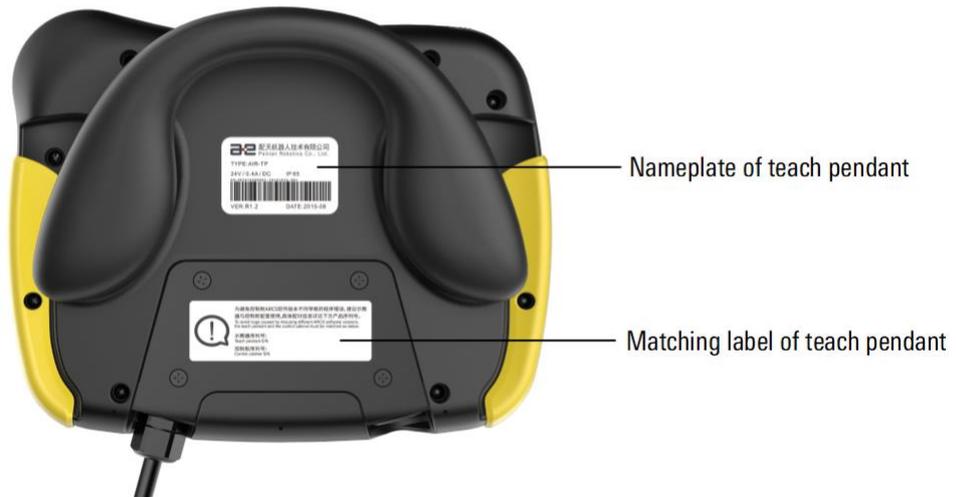


Figure 2-3 The position of the nameplate and matching label of the teach pendant

Please refer to Figure 2-4 for the contents of the nameplate of the teach pendant, which contains the product model, version number, production date and other information. The serial number of the teach pendant will be printed on the nameplate when the product is shipped.



Figure 2-4 The location of the nameplate of the teach pendant and the matching label

Please refer to Figure 2-5 for the contents of the matching label of the teach pendant, please confirm:

- The serial number of the teach pendant in Figure 2-5 is consistent with the serial number on the nameplate of the teach pendant;
- The serial number of the control cabinet in Figure 2-5 is consistent with the serial number on the nameplate of the connected control cabinet.



为避免控制柜ARCS软件版本不同导致的程序错误,建议示教器与控制柜配套使用,具体配对信息详见下方产品序列号。
To avoid bugs caused by misusing different ARCS software versions, the teach pendant and the control cabinet must be matched as below.

示教器序列号:
Teach pendant S/N

控制柜序列号:
Control cabinet S/N

Figure 2-5 The position of the nameplate of the teach pendant and the matching label

2.3 Composition

The position of the components of the teach pendant is shown in Figure 2-6, and the description of the corresponding components of the teach pendant is shown in Table 2-1.



(a) Front view



(b) Top view



(c) Right side view
Figure 2-6 Contents of the components of the teach pendant

Table 2-1 Description of the components of the teach pendant

No.	Name	Description
1	Mode switch key	Manual high speed, manual low speed, automatic three modes
2	USB interface protection cover	Protect the USB interface
3	Indicator light	Indicate power, operation and error status
4	Emergency stop button	Press the emergency stop button, the robot stops moving; after the robot stops moving, turn the button clockwise and manually clear the error alarm to release the emergency stop state and return to the normal state
5	Control key	Run the program and manually control the movement of the mechanical unit.
6	Function keys	Provide shortcut keys for some functions
7	Display (touch screen)	HMI operating area
8	Enable key	For specific usage, please refer to Chapter 2.3.2.
9	Multi-grip handle	Hand-held part, refer to Figure 2-2 for holding posture
10	Teach pendant connection cable	The cable has been connected at the factory, no user connection is required, and the default connection is on the left.
11	Stylus	Used to tap the touch screen

Next, the use of several commonly used components will be described in detail.

2.3.1 Mode switch key

Refer to Figure 2-7 for the three modes of the mode switch key on the upper left of the front of the robot teach pendant.

Mode switch key

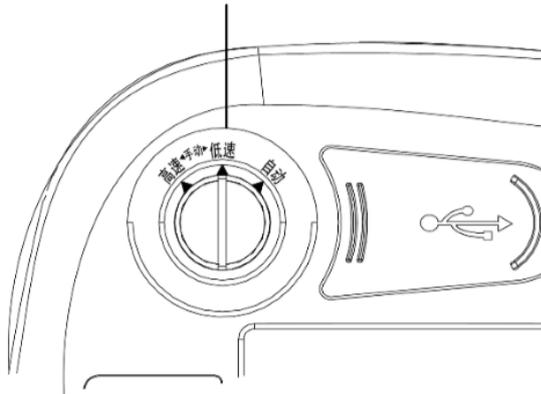


Figure 2-7 Mode switch key



Figure 2-8 Running status bar

The mode switch determines the mode status by turning the key. It is located at the upper left of the teach pendant. The main function is to switch the mode. There are three main modes provided (refer to Table 2-2).

Table 2-2 Mode switch key description

Name	Description	function
Manual high speed mode	Turn the key to the left to switch to manual high-speed mode, and the control mode icon status in the "running status bar" of the teach pendant (refer to Figure 2-8) is "M"	For detailed functions, please refer to Chapter 4.1.4
Manual low speed mode	Turn the key to the middle to switch to manual low speed mode, and the control mode icon status in the "running status bar" of the teach pendant is "M"	
Automatic mode	Turn the key to the right to switch to automatic mode, the status of the control mode icon in the "operation status bar" of the teach pendant is "A"	



Caution

Two keys for operating mode switching are usually provided. Please keep them properly to avoid losing them.

2.3.2 Enable button

The enable buttons can be installed on the left or right sides of the rear housing of the teach pendant. The default installation is on the right side when leaving the factory, as shown in Figure 2-6.

Steps for usage:

- Step1. When the enable key is fully released, the natural state is the first key position, and the robot is not enabled and cannot be operated.
- Step2. Gently buckle the enable key (located on the right side of the teach pendant in Figure 2-9) to make it stay in the second key position, and the robot is then enabled(a "click" sound is heard). At the same time, the lightning icon in status bar is displayed as "⚡" (highlighted), the "Run" indicator of the control cabinet turns on, and then manual operation can be carried out (you need to keep pressing the enable key).

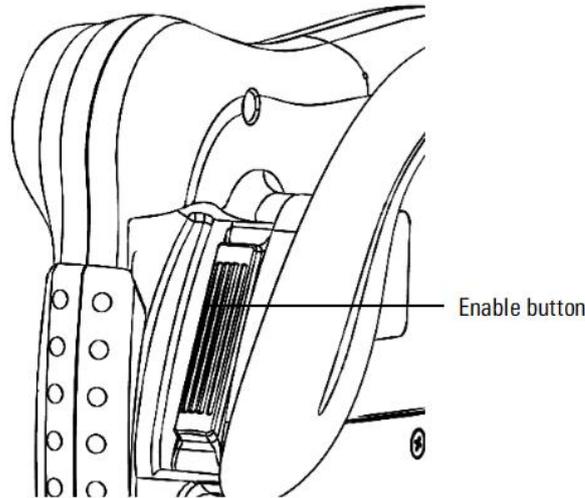


Figure 2-9 Teach pendant enable button



Figure 2-10 Enable status bar

- Step3. Continue to press down firmly. At this time, it is the third key position. The robot is enabled (a "click" sound is heard), and the lightning icon in the enable status bar (see Figure 2-10) is displayed as "⚡" (gray). The "Run" indicator light of the control cabinet goes out.
- Step4. When the enable key is in the second key position, release the key to return to the first key position, the robot is disabled, and the lightning icon in the enable status bar (see Figure 2-10) is displayed as "⚡" (gray).

2.3.3 Control keys

There are two ways to operate the robot manually, please refer to Chapter 4.10.1:

- Single-axis mode operation: Each axis can run forward or reverse independently.
- Cartesian mode operation: TCP (TOOL CENTER POINT, robot end execution point) moves forward or backward along the axis of the coordinate system.
- Tool mode: The user can control the TCP of the manipulator to move linearly along the positive or negative direction of the X/Y/Z axis of the tool coordinate system, and can also control the TCP of the manipulator to rotate around the X/Y/Z axis of the tool coordinate system.

Refer to Figure 2-11 for the contents of the operation control keys when running the robot manually. The corresponding functions and meanings of each key (in single-axis mode and Cartesian mode) are shown in Table 2-3. "System sidebar (axis indication)" is related Please refer to Chapter 4.13 for instructions.

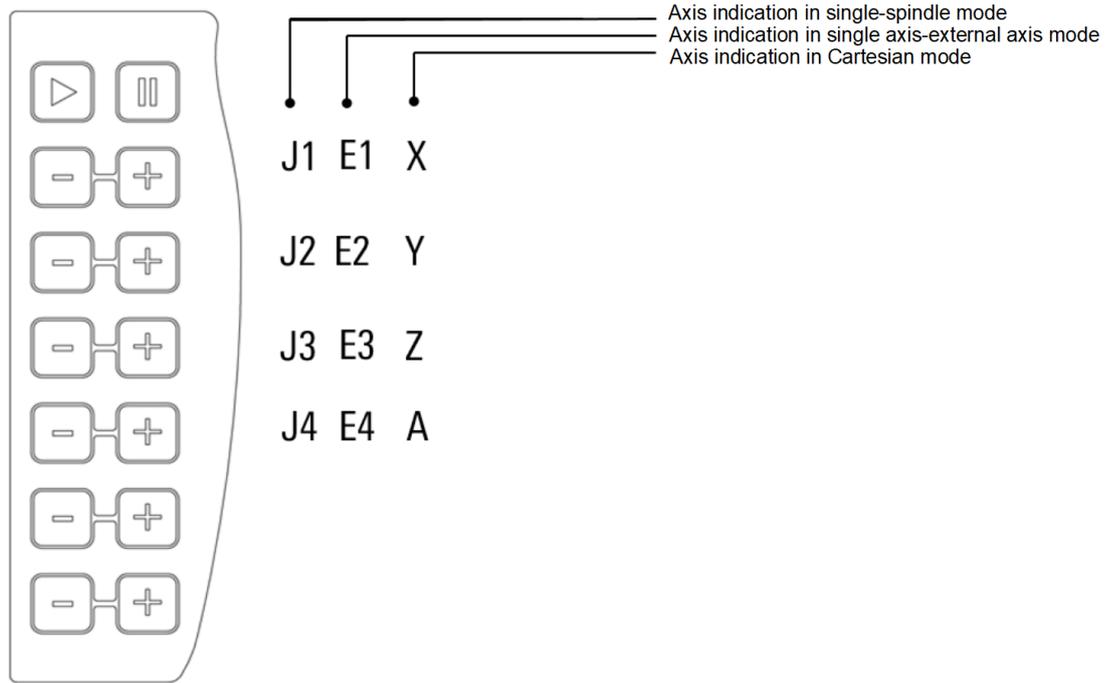


Figure 2-11 Teach pendant control keys

Table 2-3 Operating instructions for teach pendant control keys

Sign	Single axis mode	Cartesian mode	Tool mode
	Start running program operation		
	Pause program operation		
	Control a certain axis of the manipulator to move forward	Control the TCP point of the manipulator to move in the positive direction of the X axis, Y axis, or Z axis, and also control the TCP of the manipulator to rotate around the Z axis	Control the TCP point of the manipulator to move along the positive direction of the X, Y, or Z axis of the tool coordinate system, and also control the TCP point of the manipulator to rotate around the Z axis of the tool coordinate system
	Control a certain axis of the manipulator for negative movement	Control the TCP point of the manipulator to move along the negative direction of the X axis, Y axis, or Z axis, and also control the TCP point of the manipulator to rotate around the Z axis	Control the TCP point of the manipulator to move along the negative direction of the X, Y and Z axis of the tool coordinate system, and also control the TCP point of the manipulator to rotate around the Z axis of the tool coordinate system

2.3.4 Function keys

Please refer to Chapter 8.3.2 for the configuration and usage of all buttons on the left side of the front of the teach pendant.

2.3.5 Emergency stop button

The emergency stop button is located at the upper right corner of the front of the teach pendant, as shown in Figure 2-12. The emergency stop button is when an emergency occurs, the user can quickly press this button to achieve protection.

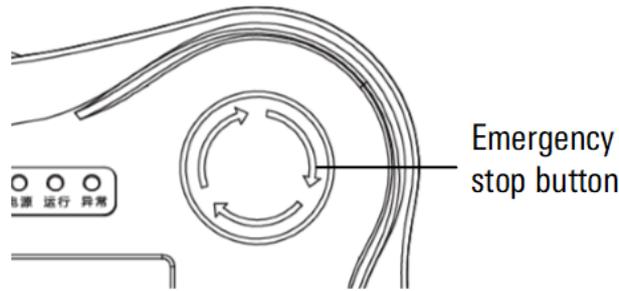


Figure 2-12 Emergency stop button of teach pendant

Steps for usage:

Step1. In case of emergency, press the emergency stop button, the robot will stop moving, and the "message bar" of the teach pendant displays the relevant alarm information of "Teach pendant emergency stop button is pressed", refer to Figure 2 13. The "Alarm" indicator of the teach pendant turns red.



Figure 2-13 Teach pendant "message bar" alarm

Step2. After the robot movement stops, turn the button clockwise to release the emergency stop state, the emergency stop button pops up, click the "👉" icon in the message bar of the teach pendant to manually clear the relevant alarms, and the "alarm" indicator of the teach pendant goes out , Return to normal state.

2.3.6 Indicator

The indicator light is located on the upper right side of the front of the robot teach pendant. Refer to Figure 2-6 for specific locations. There are three indicators: power supply, operation and alarm. The meanings and functions of each are shown in Table 2-4.

Table 2-4 Teach pendant indicator light description

Sign	Description
Power supply	After the teach pendant is activated, the white light is on
Run	During manual or automatic operation, the green light is on
Alert	When there is an alarm, the red light is on

2.3.7 Stylus

It is recommended to connect the stylus to the teach pendant through a cord to prevent loss. The position of the cord hole is shown in Figure 2-14.

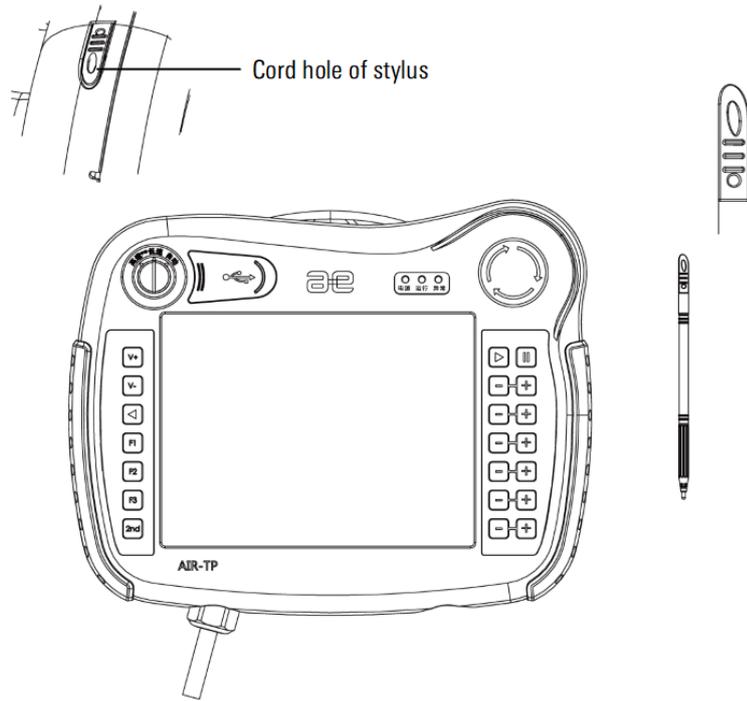


Figure 2-14 AIR-TP Teach Pendant Stylus

2.4 Connect the control cabinet

For the connection between the teach pendant and controls of different models, please refer to "XX Control Cabinet Manual".

 Caution	Incorrect connection may cause the teach pendant to be unusable or damaged.
--	---

3 Login Interface

3.1 Login permission

When started for the first time, you must log in with the teacher permission, as shown in Figure 3-1.

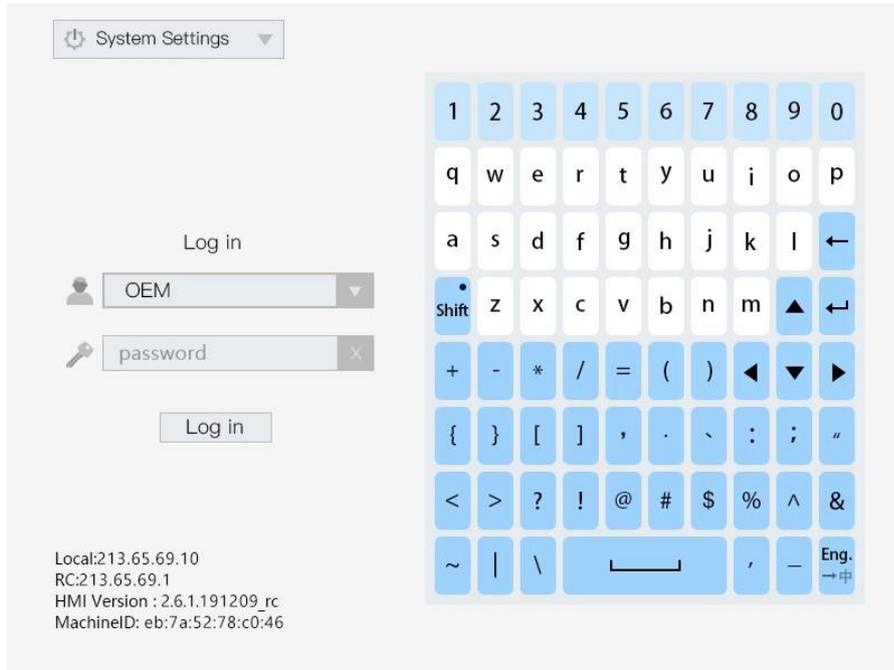


Figure 3-1 HMI login interface

Teacher permission:

You can write the robot operating programs, and modify some parameters. The initial login password is "PEACE".

Operator permissions:

You can view the robot's position parameters and operating conditions, without program/parameter modification permissions. The initial login password is "LOVE".



Prompt For other related login passwords, please contact our after-sales personnel.

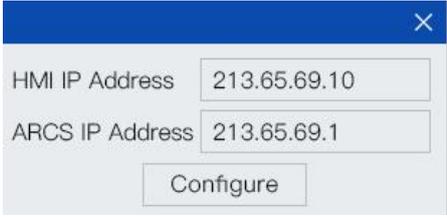
3.2 Login interface related settings

Click <System Settings> button at the top left shown in Figure 3-1, and a drop-down list will pop up, as shown in Figure 3-2. You can perform operations such as "System Upgrade", "Import Authorization" and "Configure IP". Please refer to Table 3-1 for related descriptions.



Figure 3-2 <Settings> list of login interface

Table 3-1 Description of "Settings" on the login interface

Name	Description
System Upgrade	The "system upgrade" method here is the same as the "version update" method in Chapter 8.6.2, you can directly refer to it
Authorized guide	The "import authorization" method here is the same as the "authorization import" method in Chapter 8.6.5, you can directly refer to it
Configure IP	<p>Click the "System Settings > Configure IP" option in Figure 3-3, and the dialog box shown in Figure 3-3 will pop up, in which you can view, configure or change the IP addresses of HMI and ARCS.</p>  <p>Figure 3-3 "Configure IP" pop-up window</p>
Shield teach pendant	Control the enable and shield of the teach pendant, please refer to chapter 8.7.5 for detailed usage

3.3 Login interface information

The information (see Figure 3-4) displayed in the bottom left corner in Figure 3-1 includes HMI version number, machine code, etc. More detailed information can be found in "System Information", please refer to Section 8.6.1.



Figure 3-4 "Configure IP" window

4 Main Interface

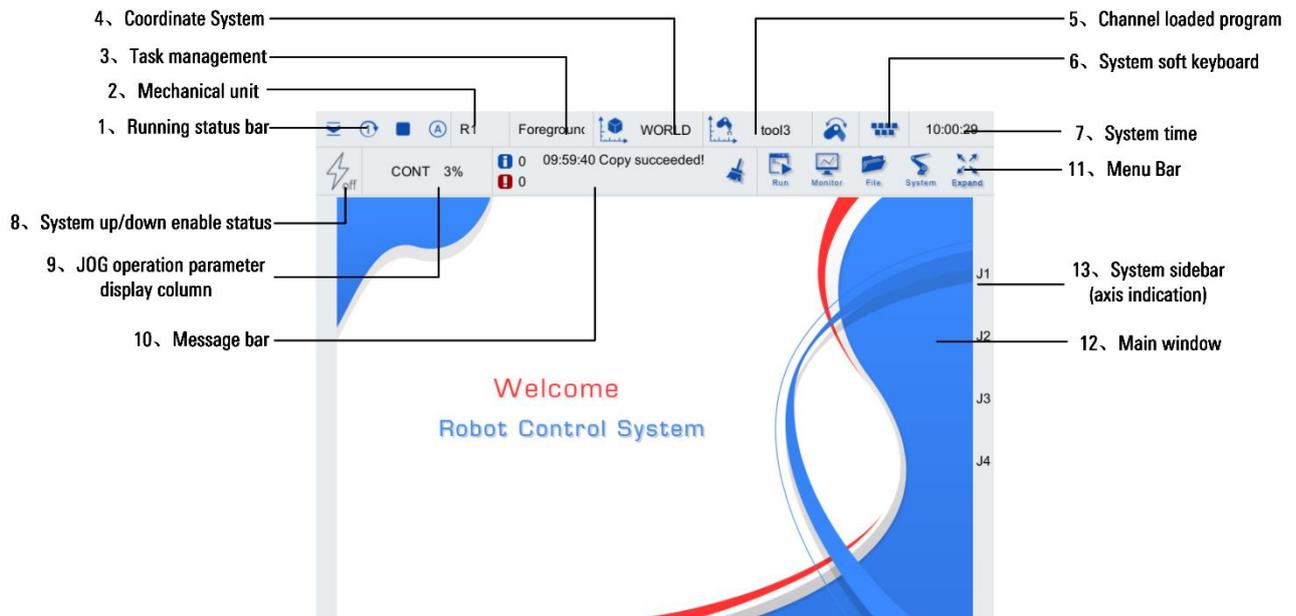


Figure 4-1 Division of function zones on main interface

The roles of function zones are shown in Table 4-1.

Table 4-1 Description of function zones on main interface

No.	Name	Description
1	Running status bar	To display the current system running status. For details, please refer to Section 4.1
2	Mechanical unit	To display the name channel switching of mechanical unit in the current channel. For details, please refer to Section 4.2
3	Task management	Display and set the current task, please refer to Chapter 4.3 for details
4	Coordinate system	To display the current coordinate system. For details, please refer to Section 4.4
5	Channel loaded program	To display the programs loaded in the current channel. For details, please refer to Section 4.5
6	System soft keyboard	To display and set the system time. For details, please refer to Section 4.7
7	System time	To display and set the system time. For details, please refer to Section 4.8
8	System enable/disable status	System enable/disable status display icon when manual, system enable/disable button when automatic. For details, please refer to Section 4.9
9	JOG operation parameter display column	To set and display the running parameters of the current JOG. For details, please refer to Section 4.10
10	Message bar	To scroll to display the latest system message, being the entry of the system message interface. For details, please refer to Section 4.11
11	Menu bar	To provide various function options. For details, please refer to Section 4.12
12	Main window	Display zone of function interface, please refer to Section 4.12

No.	Name	Description
13	System sidebar (axis indication)	The contents of the axis indication correspond to the function buttons on the right side of the teach pendant. For details, please refer to Section 4.13

4.1 Running status bar

The contents of the running status bar is shown in Figure 4-2, which mainly contains 4 types, representing "Continuous Mode Status", "Cycle Mode Status", "Program Running Status", and "Control Mode" from front to back.



Figure 4-2 Running status bar

4.1.1 Continuous mode status

"Continuous mode status" includes 3 types, as shown in Table4-2. For switching between different statuses, please refer to Section 5.1.

Table4-2 Description of 3 types of "Continuous Mode Status"

Icon	Meaning
	The program is in continuous running status
	The program is in single step running status
	The program is in segment debugging running status

4.1.2 Cyclic mode status

"Cyclic mode status" includes 2 types, as shown in Table4-3. For switching between different statuses, please refer to Section 5.1.

Table4-3 Description of 2 types of "Cyclic Mode Status"

Icon	Meaning
	The program is in cyclic running status
	The program is in single running status

4.1.3 Program running status

"Program running status" includes 4 types, as shown in Table4-4. For "Loading" and "Stop" of the program, please refer to Section 5.1 and Section 5.2. For "Pause" and "Run" of the program, please refer to Section 2.3.3.

Table4-4 Description of 4 types of "Program Running Status"

Icon	Meaning
	The program is in unloaded status
	The program is in stop status
	The program is in pause status

Icon	Meaning
	The program is in running status

4.1.4 Control mode

"Control mode" includes 3 types, as shown in Table4-5. For switching between different modes, please refer to Section 2.3.1.

Table4-5 Description of 3 types of "Control Mode"

Icon	Meaning	Description
	Manual high-speed control mode (T2)	It is used for test running. The teach pendant will run at programmed speed in this mode
	Manual low speed control mode (T1)	It is used for test running and teaching. PTP movement speed limit is 10%, and CP movement speed limit is 250mm/s
	Automatic control mode (AUT)	It is used for running. The teach pendant will run at programmed speed in this mode

4.2 Mechanical unit

When there are multiple mechanical units, it is used to switch the mechanical unit currently manually controlled by the controller (refer to Figure 4-3 and Figure 4-4). For the specific setting method, please refer to the "Multi-machine Linkage Operation Manual".



Figure 4-3 Display position of channel mechanical unit name



Figure 4-4 "Mechanical unit" selection interface

4.3 Channel task management

Task 1 supports loading arbitrary programs, and background task 1 only support loading programs that do not contain motion instructions, refer to Figure 4-5 and Figure 4-6. (For example, the background task can be used to load and run programs including logic operations, TCP/IP communication and serial communication, and to calculate the variable data or external equipment required by the foreground task for communication).



Figure 4-5 Task management

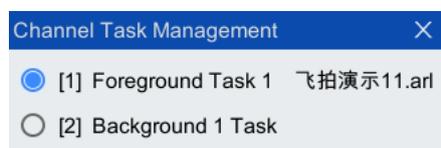


Figure 4-6 "Task Management" Select interface

4.4 Workpiece coordinate system

Display the workpiece coordinate system selected by the user in the current JOG mode (refer to Figure 4-7, BASE"0" is selected), and the method of selecting the coordinate system can refer to Chapter 4.10.4.



Figure 4-7 Workpiece coordinate system display position

4.5 Tool coordinate system

Display the tool coordinate system selected by the user in the current JOG mode (refer to Figure 4-8 Tool coordinate system display position, FLANGE is selected). For the method of selecting the tool coordinate system, refer to chapter 4.10.3.



Figure 4-8 Tool coordinate system display position

4.6 Axis control mode status

Display the currently selected axis control mode (refer to Figure 4-9 and Table 4-6). For the method of selecting the axis control mode, please refer to Chapter 4.10.1.



Figure 4-9 Axis control mode status display position

Table 4-6 Introduction to 3 states of "Axis Control Mode State"

Icon	Meaning
	The currently selected axis control mode is single axis mode
	The currently selected axis control mode is Cartesian mode
	The currently selected axis control mode is tool mode

4.7 System soft keyboard

Select " " icon shown in Figure 4-10 in the menu area on main interface to display or hide the system soft keyboard (see Figure 4-11), or click any editable box to call out the system soft keyboard.



Figure 4-10 The location of the system soft keyboard

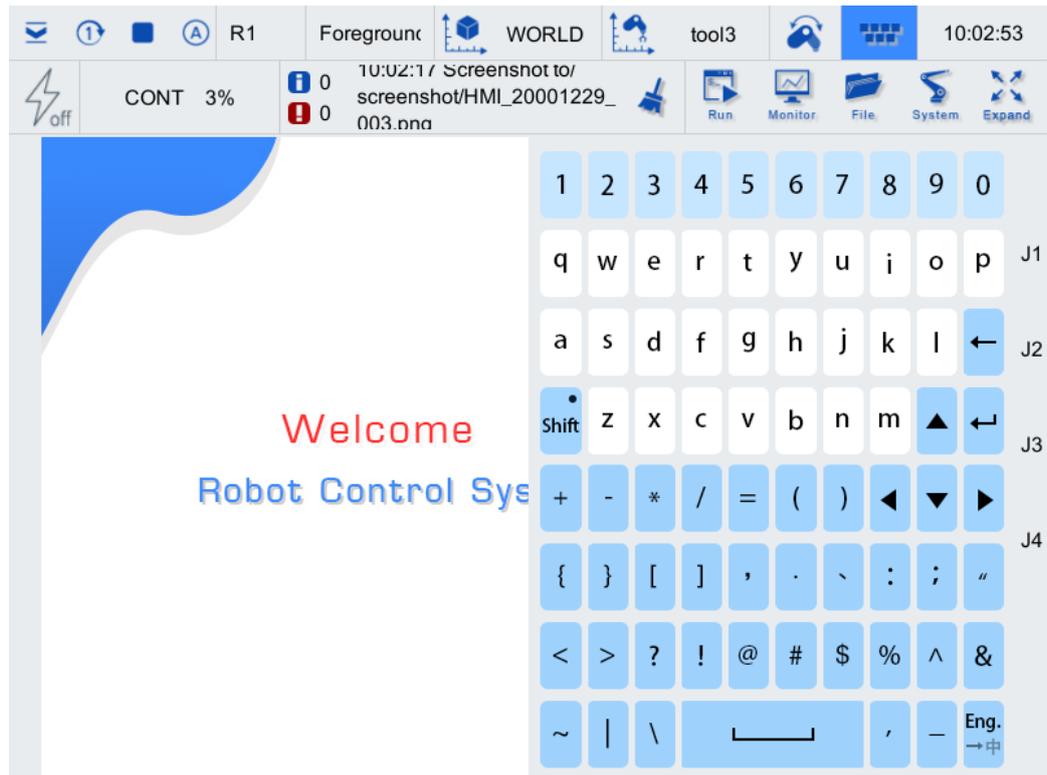


Figure 4-11 System soft keyboard

4.8 System time

Click " 14:15:44 " icon in the top right corner on main interface to pop up "Time Setting" dialog box in Figure 4-12, displaying the specific date and time. You can set the date and time using "+" and "-" buttons on the left and right of the number.



Figure 4-12 Time setting dialog box

4.9 System enable/disable

"System Enable/Disable" includes 2 statuses, as shown in Table 4-7.

Table 4-7 Description of 2 statuses of "System Enable/Disable"

Icon	Meaning
 (high brightness)	The system is in the enabled status
 (gray)	The system is in the disabled status

For enable/disable method in manual mode, please refer to Section 2.3.1 and Section 2.3.2.

In auto mode, click the flash icon in the enable status bar (see Figure 2-10), the status will be switched from "  " (gray) to "  " (high brightness), indicating that the enable is successful.

4.10 JOG running settings

Click "  " icon in the upper left corner on main interface to pop up "JOG" running parameter setting dialog box, as shown in Figure 4-13. It mainly includes the settings of axis control mode, speed, step, tool, coordinate system and other related parameters.

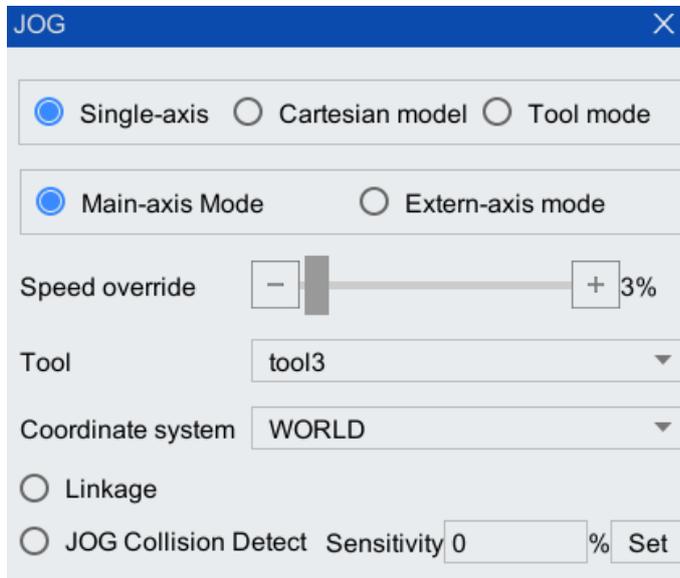


Figure 4-13 JOG running settings interface

4.10.1 Axis control mode

The user can select multiple axis control modes when controlling the manipulator. Refer to Figure 4-14. For details, refer to Table 4-8.

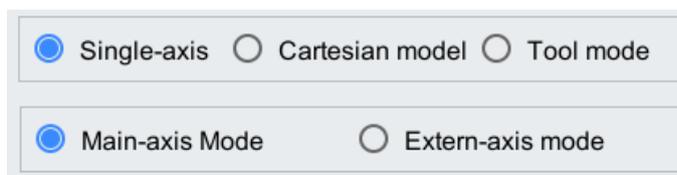


Figure 4-14 Axis control mode options

Table 4-8 Description of axis control modes

Options	Description	Remarks
Single-axis mode	The user can control each rotation axis of the manipulator to move in a positive or	Can only choose

Options	Description	Remarks
	negative direction In this mode, the "axis control mode status" icon at the top of the main interface of the teach pendant is displayed as "  "	one of three
Cartesian mode	The user can control each rotary axis of the manipulator to move in a positive or negative direction. In this mode, the "axis control mode status" icon at the top of the main interface of the teach pendant is displayed as "  "	
Tool mode	The user can control the TCP of the manipulator to move linearly along the positive or negative direction of the X/Y/Z axis of the tool coordinate system, and can also control the TCP of the manipulator to rotate around the Z axis of the tool coordinate system In this mode, the "axis control mode status" icon at the top of the main interface of the teach pendant is displayed as "  "	
Main-axis mode	The user can control the 1~4 axis movement of the manipulator	Can only choose one of two
External-axis mode	The user can control the extended 1~4 axis movement of the manipulator	

4.10.2 Speed override

The speed override of the manipulator can be adjusted in Figure 4-15, and can also be adjusted by the "" and "" buttons on the left side of the teach pendant (this method does not affect the use of the <+> and <-> buttons on the left and right sides of the speed override bar Key to adjust the speed).



Figure 4-15 Speed setting

- The adjustment effect of clicking the "" and "" buttons is: micro speed-low speed -1%-5%-100% (where: 1%-5% is changed in 1% increments, and 5%-100% is changed in 5% increments).
- The adjustment effect of long pressing the "" and "" buttons: the speed continuously increases/decreases.

Micro-speed and low-speed performance

Table 4-9 Micro-speed and low-speed performance

Operating mode	Speed override performance
The program runs	In T1, T2, AUTO mode, all run at 1% speed
JOG operation	T1: Low speed—0.5DEG/MM; Slight speed—0.1DEG/MM (speed override for stepping action is 1%)
	T2: No action
	AUTO: No action

Speed override performance when operating mode switching

Table 4-10 Speed override performance when operating mode switching

Operation mode switching method	Speed override performance
T1->T2	Speed multiplier reduced to 3%

Operation mode switching method	Speed override performance
T2->T1	Speed magnification unchanged
T1->AUTO	Speed magnification unchanged
AUTO->T1	Speed magnification unchanged

4.10.3 Tool

The tool coordinate system selection interface is shown in Figure 4-16, which can implement the coordinate system selection of the current tool. The flange coordinate system is the default tool coordinate system defined by the system. The coordinate system data of other tools are customized by the user. For the custom method, please refer to Section 5.5.

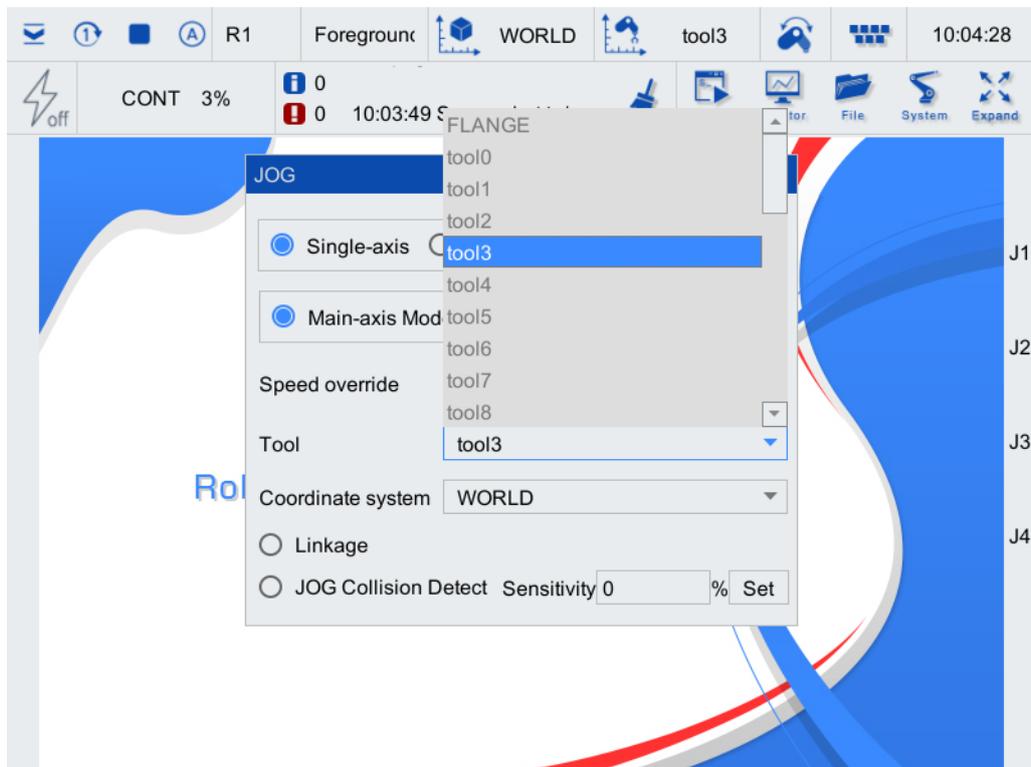


Figure 4-16 Tool coordinate system selection interface

Table 4-11 Tool description

Name	Definition
FLANGE Flange coordinate system	<ul style="list-style-type: none"> The flange coordinate system is the axis coordinate system of the 4th axis The origin is at the center of the flange surface, the X-axis and Y-axis rotate with the 4-axis rotation, and the Z-axis is perpendicular to the flange surface upward
tool Tool coordinate system	<ul style="list-style-type: none"> Its origin is the tool center point (TCP, Tool Centre Point) The sixth axis of the robot is connected to the working point of the end effector. The movement trajectory programmed by the user is actually the trajectory of this point Unless otherwise specified, the coordinates of TCP are relative to the workpiece coordinate system The specific coordinate system can be customized by the user, but must meet the right-hand rule

4.10.4 Coordinate system

The coordinate system is used to select the coordinate system referenced by the current manual control. The manual reference coordinate system selection page is shown in Figure 4-17. For detailed description of each coordinate system, please refer to Table 4-12. The user can also customize the coordinate system.

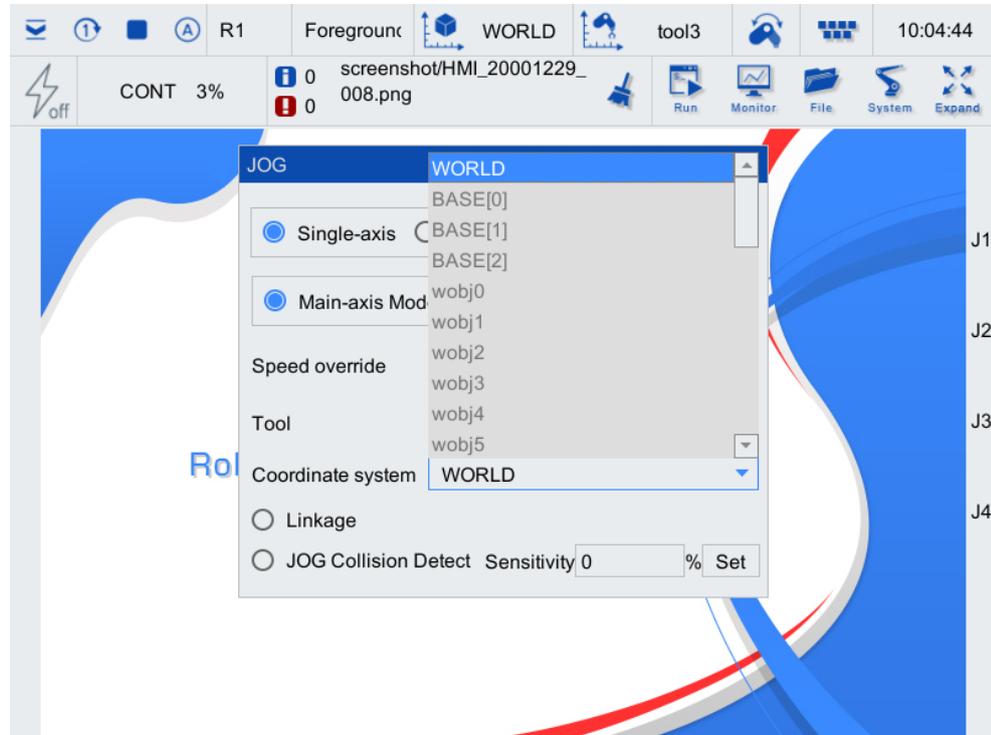


Figure 4-17 Manual reference coordinate system selection interface

Table 4-12 Coordinate system description

Name	Description
<p>WORLD</p> <p>World coordinate system</p>	<ul style="list-style-type: none"> Also called absolute coordinate system, it is an invariable Cartesian coordinate system with reference to the earth, and is the origin coordinate system of the robot coordinate system and the workpiece coordinate system When the manipulator is configured with an external moving axis for overall movement, the absolute coordinate system position does not change with the manipulator The absolute coordinate system is generally customized by the user. In the default configuration, the world coordinate system is located at the foot of the robot to describe the position of the mechanical unit
<p>BASE</p> <p>Base coordinate system</p>	<ul style="list-style-type: none"> Also called robot coordinate system, the inherent coordinate system on the robot body Fixed at the feet of the robot, using the world coordinate system as the reference datum, which can be used to illustrate the position of the robot <p>One channel can be configured with three mechanical units at most, corresponding to three base coordinate systems Base"0"\"1"\"2", Base"0" is the base coordinate system of robot, Base"1"\"2" is the base coordinate system of position machine/conveyor/base axis.If the latter two mechanical units are configured, the user can select Base"1"\"2"</p>
<p>wobj</p> <p>Workpiece coordinate system</p>	<ul style="list-style-type: none"> The coordinate system used to describe the position of the workpiece, taking the world coordinate system as the reference datum. In the default configuration, it coincides with the world coordinate system

Name	Description
	<ul style="list-style-type: none"> ■ The workpiece coordinate system is also the user's programming coordinate system, and the coordinates of the teaching point stored by the user are the coordinate values in this coordinate system ■ The workpiece coordinate system can be specified by the user in the world coordinate system according to the programming convenience

4.10.5 Other

The "Linkage" and "JOG collision detection" in the "JOG" operating parameter setting dialog box (refer to Figure 4-18) are not currently supported.

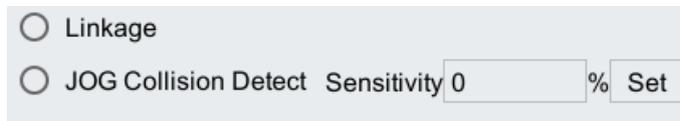


Figure 4-18 Other option settings

4.11 Message bar

The "Message Bar" on main interface of the teach pendant is shown in Figure 4-19. For details, please refer to Table 4-13.



Figure 4-19 Message bar

		<input checked="" type="radio"/> Current alarm <input type="radio"/> Historical alarm		Time order	Unlimited ▼
	Time	Type	Content		
1	2000-12-29 10:04:45	Info	Screenshot to/screenshot/HMI_20001229_009.png		
2	2000-12-29 10:04:29	Info	Screenshot to/screenshot/HMI_20001229_008.png		
3	2000-12-29 10:03:49	Info	Screenshot to/screenshot/HMI_20001229_007.png		
4	2000-12-29 10:03:26	Info	[3086][0]Servos were disabled		
5	2000-12-29 10:03:23	Info	Screenshot to/screenshot/HMI_20001229_006.png		
6	2000-12-29 10:03:21	Info	[3085][0]Servos were enabled.		
7	2000-12-29 10:03:08	Info	Screenshot to/screenshot/HMI_20001229_005.png		
8	2000-12-29 10:02:54	Info	Screenshot to/screenshot/HMI_20001229_004.png		
9	2000-12-29 10:02:17	Info	Screenshot to/screenshot/HMI_20001229_003.png		
10	2000-12-29 10:01:28	Info	Screenshot to/screenshot/HMI_20001229_002.png		
11	2000-12-29 10:00:30	Info	Screenshot to/screenshot/HMI_20001229_001.png		
12	2000-12-29 09:59:40	Info	Copy succeeded!		

Page 1 of 2

Last 5 Next 5 << >>

Figure 4-20 Message list

Table 4-13 Description of system message

Icon	Description
 0	Warning type messages and quantity
 0	Error type messages and quantity
10:04:45 Screenshot to/	Current message, displaying the latest message, including time and content. Clicking the button can display or hide the message list (see Figure 4-20)
	Clear warning button to clear all current warnings

The message list (see Figure 4-20) includes options such as message category, time sequence, message type and message content. For relevant description, please refer to Table 4-14.

Table 4-14 Description of message list

Name	Description
Message category	It is used to select whether the displayed content is "Current Warning" or "Historical Warning". For details, please refer to Section 4.11.1
Time sequence/set time	When displayed as current warning: You can change the time sequence of the warning display. When displayed as historical warning: You can set the start/end time of the warning display. For details, please refer to Section 4.11.2
Message type	Through the setting, you can select the warning type to be displayed. For details, please refer to Section 4.11.3
Message content	It displays the specific contents of the warning. For details, please refer to Section 4.11.4
Page turning button	You can page up and down with "Previous" and "Next"

4.11.1 Message category

There are two types of messages: "Current alarm" and "Historical alarm", as shown in Figure 4-21 and Figure 4-22. The user can choose it according to the needs.

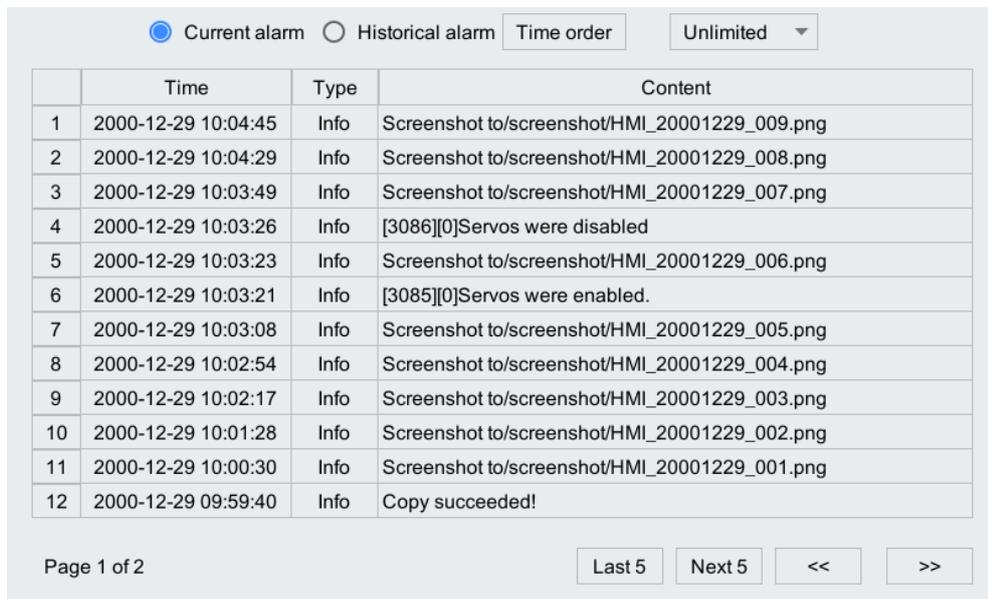


Figure 4-21 Current alarm

	Time	Type	Content
1	2000-12-29 10:03:26	Info	[3086][0]Servos were disabled
2	2000-12-29 10:03:21	Info	[3085][0]Servos were enabled.
3	2000-12-29 09:57:32	Error	*[7000][0]servo card lost heartbeat.
4	2000-12-29 09:56:13	Info	[3018][0]Servo is not enabled
5	2000-12-29 09:53:45	Info	[3086][0]Servos were disabled
6	2000-12-29 09:53:44	Info	[3085][0]Servos were enabled.
7	2000-12-29 09:53:43	Info	[3086][0]Servos were disabled
8	2000-12-29 09:53:43	Info	[3085][0]Servos were enabled.
9	2000-12-29 09:53:39	Info	[3086][0]Servos were disabled
10	2000-12-29 09:53:38	Info	[3085][0]Servos were enabled.
11	2000-12-28 16:43:19	Info	[3086][0]Servos were disabled
12	2000-12-28 16:03:13	Info	[6501][0]The starting point of program / home point has been

Figure 4-22 Historical alarm

4.11.2 Time sequence/set time

When displayed as "Current alarm", click <Time order> button to change the time sequence of the warning display.

When displayed as "Historical alarm", The "Time Sort" button is switched to the <Set Time> button. Click the button to pop up "Set the start time" window in Figure 4-23. You can set the start time for the warning display.

Figure 4-23 "Set start time" dialog box

4.11.3 Message type

There are 4 types of "Message Type": Unlimited, Info, Warning and Error (see Figure 4-24). The user can choose the type of message to view according to the needs.

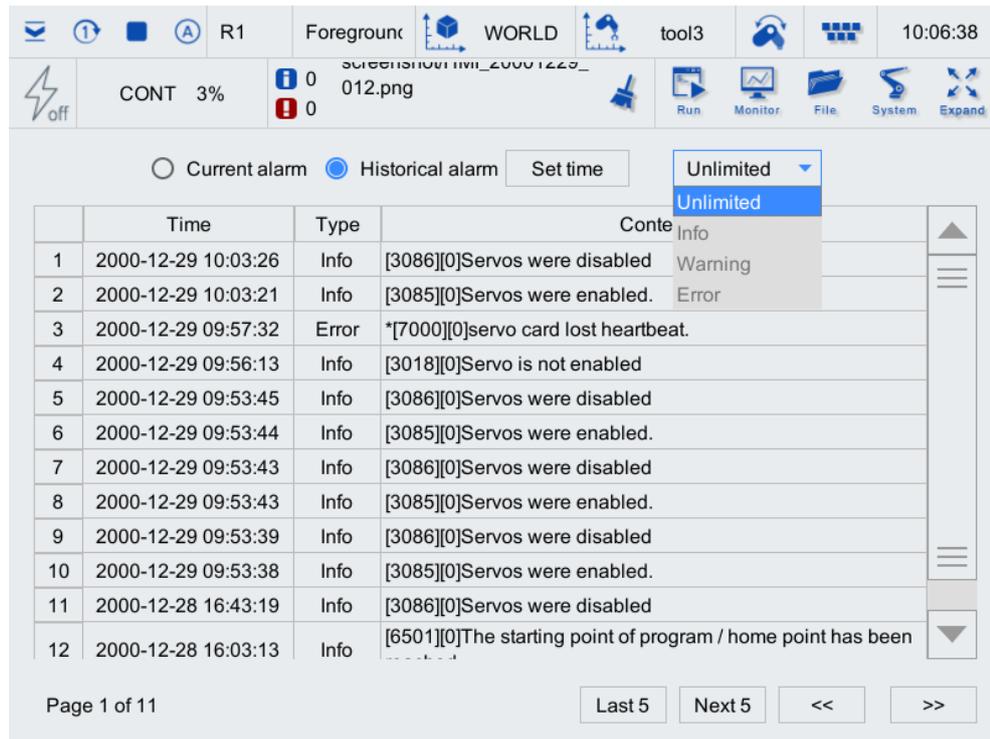


Figure 4-24 "Message Type" list

4.11.4 Message content

"Content" mainly includes the generation time of message, type of message, and content of message, as shown in Figure 4-25. It should be noted that when the content of some messages is incomplete or there are some types of "error" messages, you can try to click on the content of the line where they are located to obtain the method to eliminate the warning in the pop-up "Alarm Details" dialog box. Here the 3rd warning is taken as an example. When clicking on the warning content of the line where it is located, "Alarm Details" will pop up, as shown in Figure 4-26 and Figure 4-27.

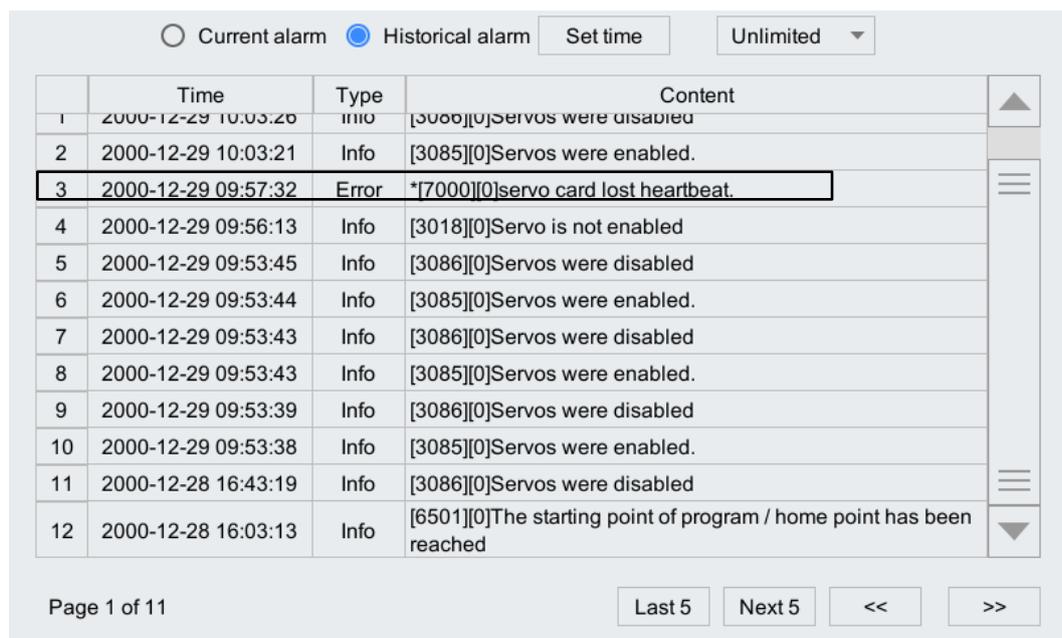


Figure 4-25 "Message Content" interface

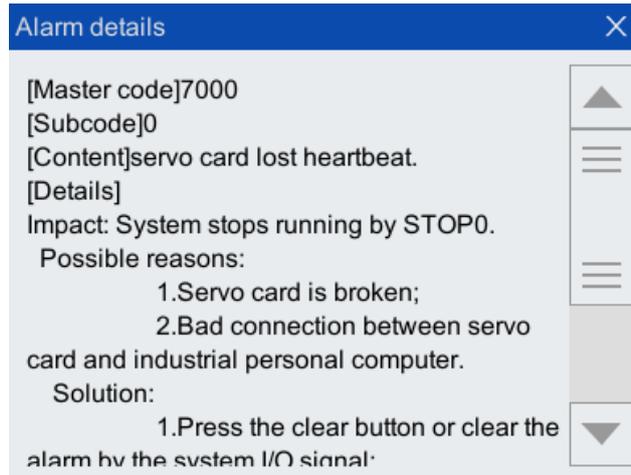


Figure 4-26 Alarm details for "Main Code" 8002

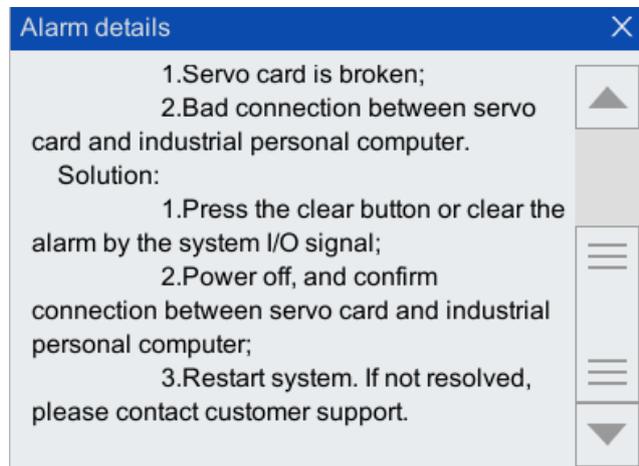


Figure 4-27 The detailed information of the alarm with the "Master Code" 7009

4.12 Menuarea

The menu area is shown in Figure 4-28. The description of each option in the menu area is shown in Table 4-15.



Figure 4-28 Menu area

Table 4-15 Description of menu area

Menu	Description
Run	Open the window or dialog box related to the robot operation. For details, please refer to Section 5.
Monitor	Open the real-time position and IO status window or dialog box. For details, please refer to Section 6.
File	Perform file management and program editing related operations. For details, please refer to Section 7
System	Open a window or dialog box related to system settings. For details, please refer to Section 8
Expand	Not currently supported

4.13 System sidebar (axis indication)

The "System Sidebar" can be displayed or hidden through "Appearance and Personalization Settings" of the "system". For the specific setting method, please refer to Section 8.4.

The right side of "System Sidebar" is the axis indication, which corresponds to the control button functions on the right side of the teach pendant, as shown in Figure 4-29.

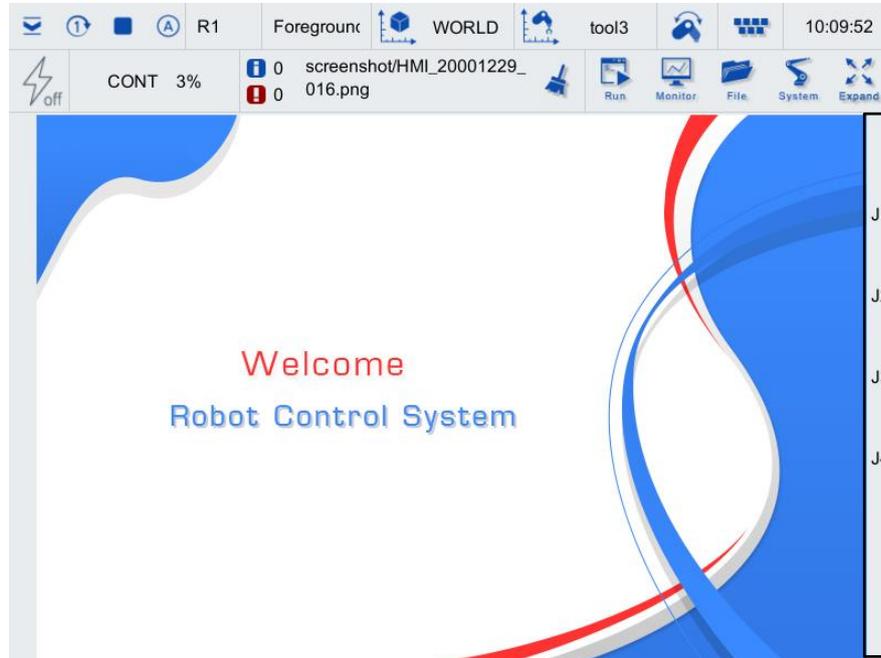


Figure 4-29 "System Sidebar" right axis indication in "Cartesian Mode"

5 Running

The expanded view of "Run" menu is shown in Figure 5-1. The entry of "Run Menu" is shown in Figure 5-2. The contents of parts in "Run" menu are described below.

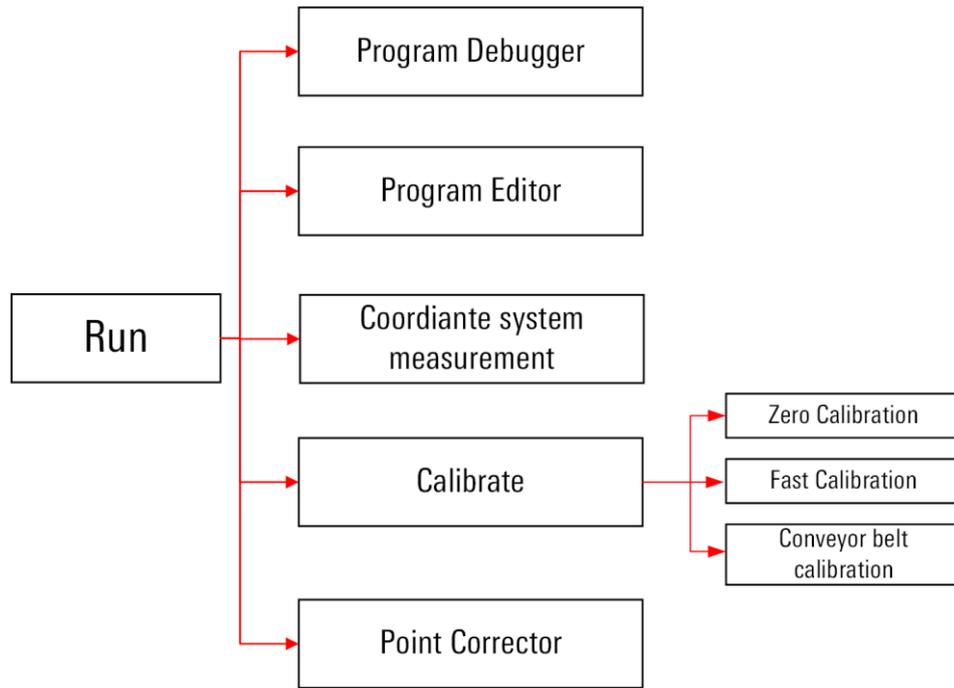


Figure 5-1 Expanded view of "Running Menu"

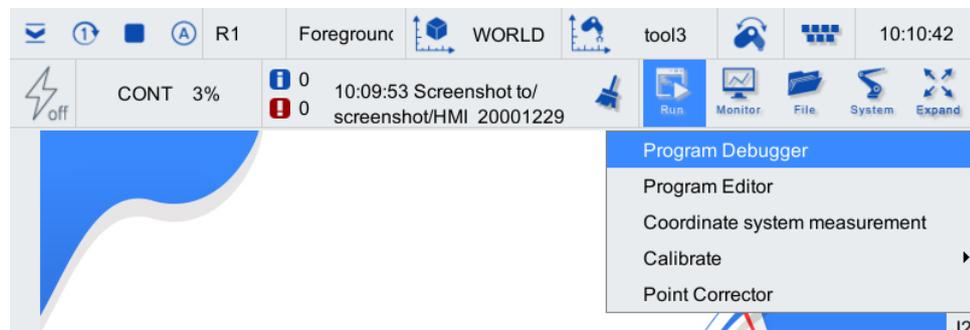


Figure 5-2 "Running Menu" interface

5.1 Program debugger

On the main interface of the teach pendant, click "Run > Program Debugger" option to enter the loaded program or empty "Program Debugger" interface, refer to Figure 5-3.

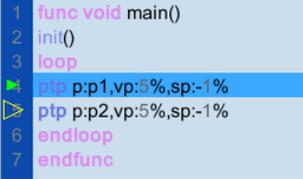
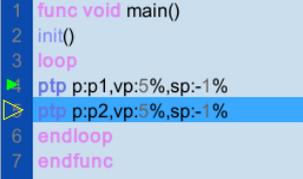
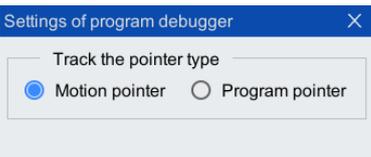


Figure 5-3"Program Debugger" Interface

For details about function on "Tool Bar" of the program debugger, please refer to Table 5-1.

Table 5-1 Description of "Tool Bar" of program debugger

Icon	Name	Function
	Open	<p>Load any ARL program in "File Manager". After loaded successfully, open the program in the program debugger and display "Program Pointer" yellow (hollow) triangle symbol, as shown in Figure5-4; if failed to load, the error program will be opened in the program editor and the first error line will be highlighted.</p> <p>Figure5-4 Program is loaded into "Program Debugger Interface"</p>
<code>/script/new_file7.arl</code>		Display of the path of the loaded arl file
	Continuous mode	Each time the start button is pressed, the program will execute an instruction, which may be a non-moving statement. In this mode, "Continuous Mode" icon in "Running Status Bar" on main interface of the teach pendant will be ""
		Each time the start button is pressed, the program will run continuously until the user presses the pause button or the program execution is completed. In this mode, "Continuous Mode" icon in "Running Status Bar" on main interface of the teach pendant will be ""
		Each time the start button is pressed, the program will execute until the next movement trajectory is completed. In this mode, "Continuous Mode" icon in "Running Status Bar" on main interface of the teach pendant will be ""
	Cyclic mode	The program runs for a single time. In this mode, "Cyclic Mode" icon in "Running Status Bar" on main interface of the teach pendant will be ""
		The program runs cyclically. In this mode, "Cycle Mode" icon in "Running Status Bar" on main interface of the teach pendant will be ""
	Reset	The program will be reset immediately after clicking "Reset" button; it can be reset only when the program is paused.

Icon	Name	Function
	Skip	Click "Skip" button, the program pointer will skip to the line where the cursor is located; "Skip" can only be performed in manual mode.
	Get location	When the ARL program containing motion instructions is successfully loaded, and the program is in a paused state, select a line of motion instructions with the cursor and click "Get Position" to obtain the current pose information of the robot. And write the pose information into the point position of the motion instruction, when the motion instruction is reached, the target point pose will change
	Unload	Unload the loaded program. Click the <Uninstall> button to uninstall the currently loaded program
	Analog trigger	If the program is executing and ended at "waituntil" statement, click <Analog Trigger> button, and then the program will meet the conditions of waituntil statement and continue to execute downward; "Analog Trigger" can only be performed in manual mode.
	Pointer type	<p>Tracking pointers include two types of pointers: "motion pointer" and "program pointer", as shown in Figure5-5 and Figure5-6.</p> <p>"Motion pointer" points to the line where the movement instruction is located during program running. At this time, the pointer will be a green (solid) triangle symbol. When returning to the home point or stopping, the pointer will be a red (solid) triangle symbol</p> <p>"Program Pointer" points to the line where the program is located and is a yellow (hollow) triangle symbol.</p>  <p>Figure5-7 Tracking "Motion pointer"</p>  <p>Figure5-8 Track "Program Pointer"</p>  <p>Figure5-6 Tracking pointer type selection window</p>

5.2 Program Editor

On the main interface of the teach pendant, click "Run > Program Editor" option to enter the "Program Editor" interface as shown in Figure 5-9. Refer to Table 5-2 for detailed description of each function on the "Toolbar" of the program editor.

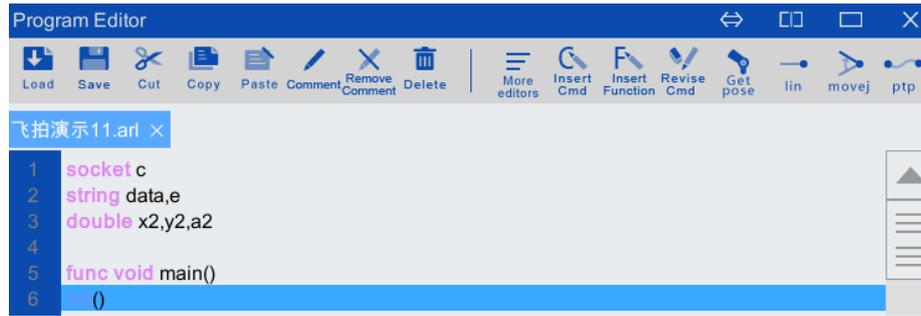


Figure 5-9 Program editor interface

Table 5-2 Description of program editor "Toolbar"

Icon	Name	Function		
	Load	Load the current program file into the program debugger		
	Save	Save a program file		
	Cut	Cut the selected text		
	Copy	Copy the selected text		
	Paste	Paste the selected text to the current cursor position		
	Comment	Click <Comment>` button to comment out the current line with "//"		
	Remove Comment	Cancel the original comment		
	Delete	Delete the currently selected text content		
	Open	Open the program file		
	Save as	Save a program file as another		
	Delete	Delete the currently selected text content		
	Query	Click "Query" button for operations such as find and replace	"Find" input box	Enter the character you want to find
			"Replace with" input box	Enter the characters to replace with
			<Find Behind> button	Query backward from the current position
			<Replace> button	Perform one-by-one replacement
			<Close> button	Close the query interface
<Replace All> button	Perform all replacements			
Function list	In the "Function List" interface, a list of sub-functions called by the current arl program is displayed. Double-click any sub-function in the list to open the corresponding arl program file in the program editor and jump to the sub-function line			
Back	Cancel the last operation			

Icon	Name	Function
	Advance	Restore the last operation
	Insert Cmd	Quickly add the instruction to the program file. For details, please refer to Section 5.2.
	Insert function	Quickly add the function to the program file. For details, please refer to Section 5.4
	Revise Cmd	Open the auxiliary programming interface and modify the instruction content in the line where the cursor is located
	Get pose	Get the current position information
	"Lin" instruction	Quickly insert "lin" instruction. For details, please refer to Section 5.3.1.3.
	"movej" instruction	Quickly insert "movej" instruction. For details, please refer to Section 5.3.1.1.
	"PTP" instruction	Quickly insert "PTP" instruction. For details, please refer to Section 5.3.1.2.

5.3 Insert instruction

Through the auxiliary programming system, the user can complete the teaching of robot operations or write ARL programs more quickly.

Click <Insert Cmd> button in the toolbar of the program editor to pop up a menu of instruction to be inserted, including logic control, process control, movement instructions, etc. For details, please refer to the instruction menu shown in Figure 5-10.

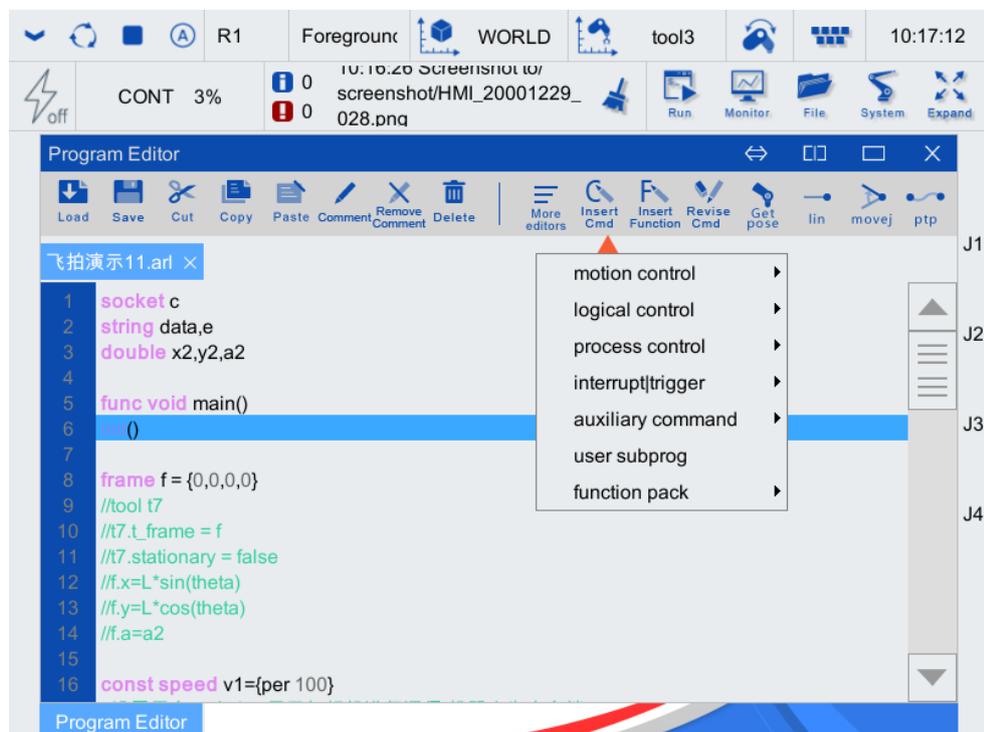


Figure 5-10 Insert instruction interface

The auxiliary programming table for each instruction is briefly described below. For more details about instruction writing, please refer to "ARL Programming Manual".

5.3.1 Movement instruction

See Table 5-3 for the list of motion instructions.

Table 5-3 Motion instruction list

Name	Meaning	Remarks	
movej	Moving axis	-	
ptp	Point to point	-	
lin	Linear motion	-	
cir	Circular motion	-	
Jump	Portal movement		
Conveyor belt	waitwobj	Waiting for work object	For the specific usage of "conveyor belt" related instructions, please refer to our company's "Conveyor Belt Tracking Manual"
	dropwobj	Release work object	
	actunit	Activate mechanical unit	
	deactunit	Release mechanical unit	

5.3.1.1 movej instruction

Instruction introduction:

The movej instruction is used to move the robot axis or external axis to a specified position.

Insert steps:

Step1. Click " " icon in the toolbar of the program editor to pop up "movej" instruction box, as shown in Figure 5-11.



Figure 5-11 "movej" instruction box

Step2. Click <...> button after the axis position variable j to pop up "j variable" display box in Figure 5-12, which displays the current position information of the robot body axis (J1-J4) and the external axis (EJ1-EJ4) . The position is displayed but cannot be modified. Click <Yes> button, and then the current position information can be obtained automatically after the instruction is inserted; if you want to modify it, you must complete the modification through "Revise Cmd" or "Get pose" in the toolbar of the program editor.

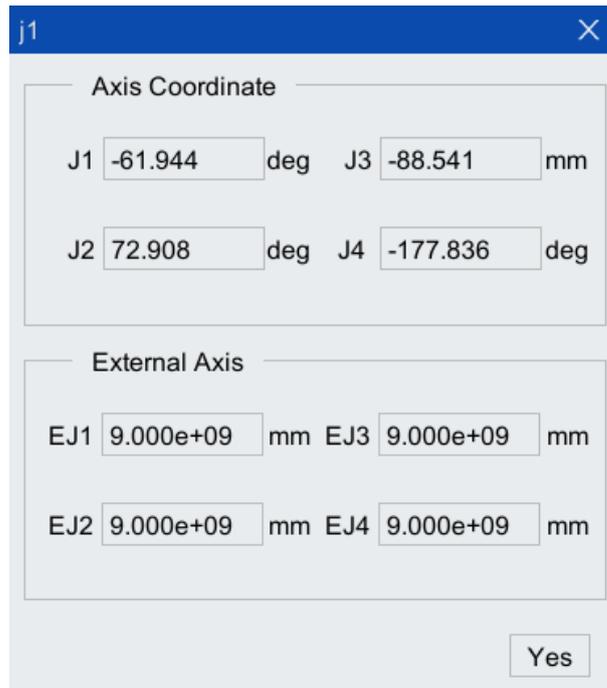


Figure 5-12 "j" variable display box

Step3. For the speed parameter v, you can enter the value directly in the edit box to complete the speed percentage setting. You can also click <...> button to modify the specific velocity value in "v" variable setting box, as shown in Figure 5-13. After modification, click <Yes> button.

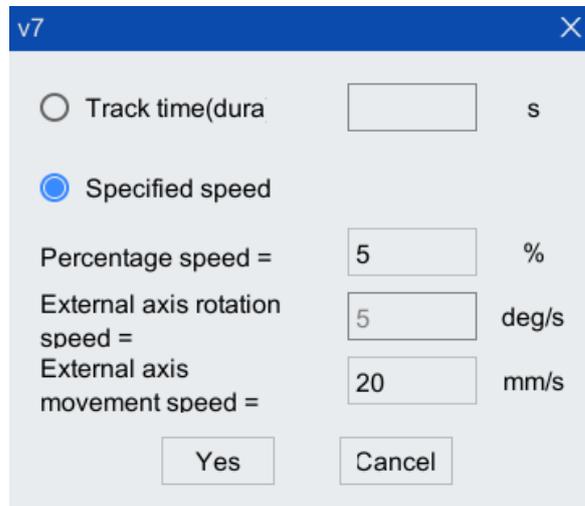


Figure 5-13 "v" variable setting box

Step4. For the slip parameter s, you can enter the value directly in the edit box to complete the slip percentage setting. You can also click <...> button to modify the specific slip value in "s" variable setting box, as shown in Figure 5-14. After modification, click <Yes> button.

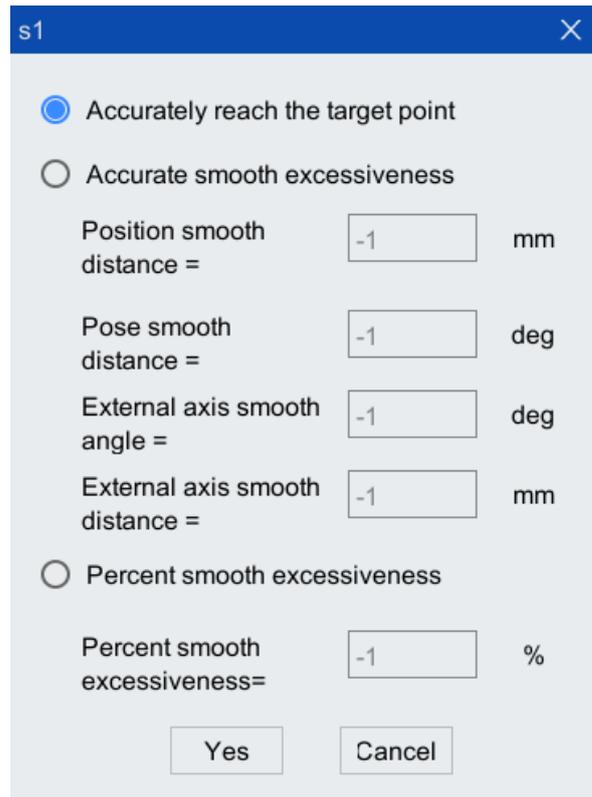


Figure 5-14 "s" variable setting box

- Step5. The text box behind the trajectory time dura is read-only. The displayed data needs to be set in the "v" variable configuration interface as shown in Figure 5-13. After modification, click the <Yes> button.
- Step6. Click <Insert> button shown in Figure 5-11 to pop up "Are you need to create the variable j1" dialog box in Figure 5-15, and click <Yes> button. The instruction is inserted successfully.

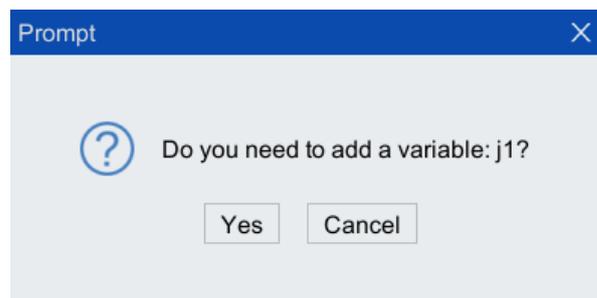


Figure 5-15 "Are you sure to create the variable j1" dialog box

- Step7. Instructions generally use the speed value and smoothing value of the previous sentence, so when inserting a point, you can just click <insert instruction> to quickly insert the point.



Prompt

For details about "movej" instruction, please refer to "ARL Programming Manual".

5.3.1.2 PTP instruction

Instruction introduction:

The point-to-point (PTP) movement instruction is used to quickly move the robot from one point to another without requiring the shape of the trajectory of the TCP. All axes can reach the target point simultaneously.

Insert steps:

Step1. Click "  " icon in the toolbar of the program editor to pop up "PTP" instruction box, as shown in Figure 5-16.



Figure 5-16 "PTP" instruction box

Step2. Click <...> button after the position variable p to pop up "p" variable display box in Figure 5-17, which displays the position information of the current TCP of the robot body relative to the workpiece coordinate system and the current position information of the external axis. The position is displayed but cannot be modified. Click <Yes> button, and then the current position information can be obtained automatically after the instruction is inserted.

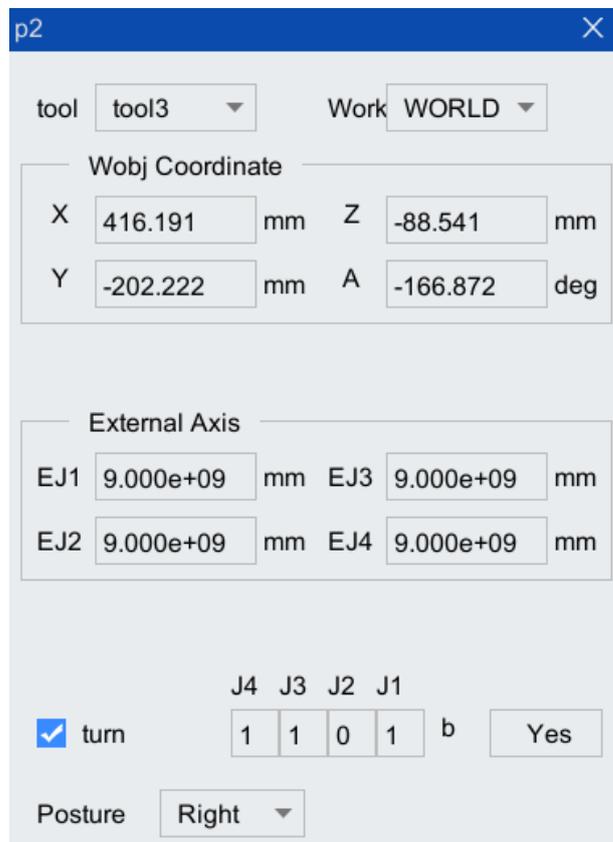


Figure 5-17 "p" variable display box

Step3. Figure 5-17 As shown in , you can re-select the tool/workpiece coordinate system, or select or cancel the turn value. After clicking <Yes> button, the parameters t and w in the PTP instruction box will display the currently

selected tool or workpiece coordinate system (see Figure 5-18); if you want to modify it, you must complete the modification through "Revise Cmd" or "Get pose" in the toolbar of the program editor.

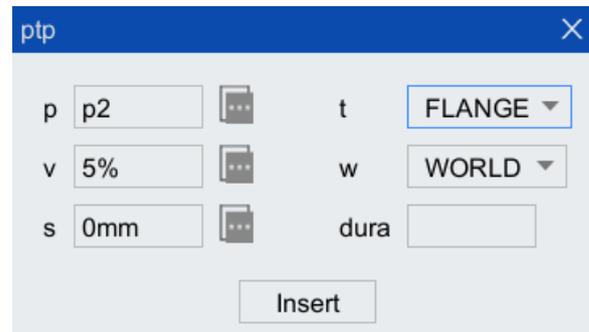


Figure 5-18 "t/w variable" display box

Step4. To modify the parameters v and s, refer to the "movej" instruction.

Step5. Click <Insert> button in Figure 5-18 to pop up "Are you sure to create the variable p1" dialog box, as shown in Figure 5-15. Click <Yes> button, and then the instruction will be inserted successfully.

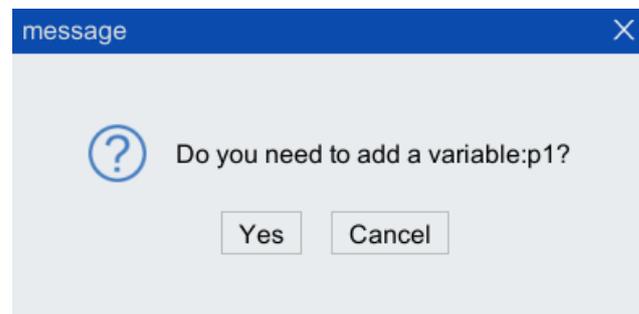
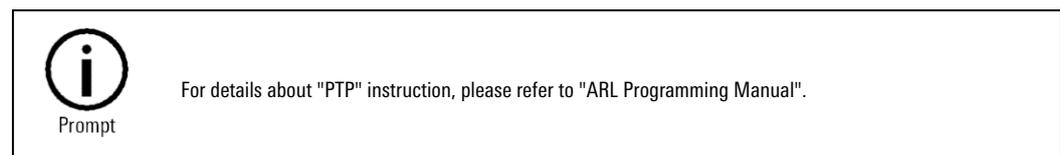


Figure 5-19 "Are you need to create the variable j1" dialog box

Step6. Instructions generally use the speed value and smoothing value of the previous sentence, so when inserting a point, you can just click <insert instruction> to quickly insert the point.



5.3.1.3 lin instruction

Instruction introduction:

The lin linear movement instruction is used to move the TCP of the robot along a straight path to the target point pose; the position movement is synchronized with the posture rotation.

Insert steps:

Step1. Click " " icon in the toolbar of the program editor to pop up "lin" instruction box, as shown in Figure 5-20.

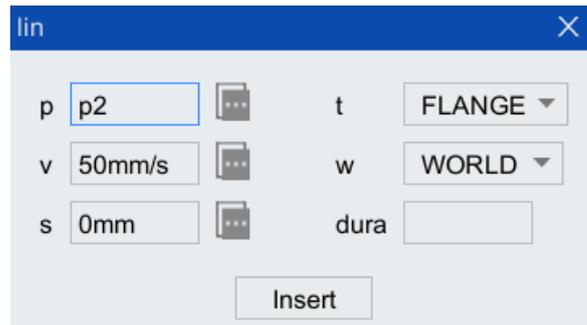


Figure 5-20 "lin" Instruction configuration interface

- Step2. For the view and modification of the target point p, please refer to the modification method of the target point p in "PTP" instruction.
- Step3. For the modification of the parameters v,s and dura, please refer to the modification of the corresponding parameters in "movej" instruction.
- Step4. For the modification of the parameters t and w, please refer to the modification of the corresponding parameters in "PTP" instruction.
- Step5. Click <Insert> button in Figure 5-20 to pop up "Are you need to create the variable ***" dialog box. Click <Yes> button, and then the instruction will be inserted successfully.
- Step6. Instructions generally use the speed value and smoothing value of the previous sentence, so when inserting a point, you can just click <Insert instruction> to quickly insert the point.



5.3.1.4 cir instruction

Instruction introduction:

The cir circular movement instruction is used to move the TCP of the robot along the circular path to the target point; the translation movement is synchronized with the rotation movement.

Insert steps:

- Step1. Click "Insert instruction > Motion instruction > cir" option in the toolbar of "Program editor", and the "cir" instruction configuration interface as shown in Figure 5-21 will pop up.

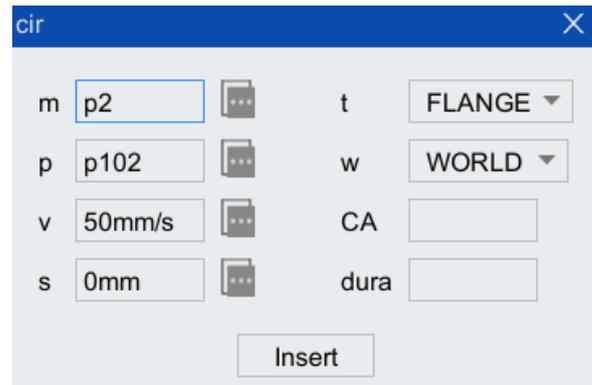
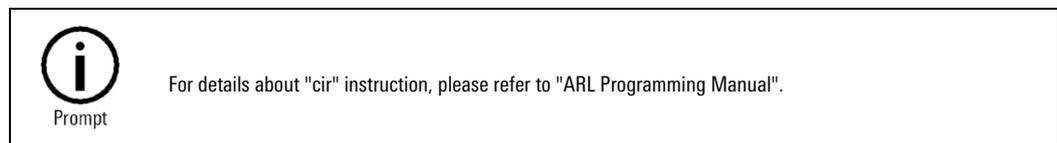


Figure 5-21 "cir" Instruction configuration interface

- Step2. For the view and modification of the auxiliary point m and the target point p, please refer to the modification method of the target point p in "cir" instruction.
- Step3. For the modification of the parameters v, s, t and w, please refer to the modification of the corresponding parameters in "lin" instruction. It is worth noting that there is a certain difference between the parameter v and movej, which is mainly reflected in the fact that in addition to using %, cir can also choose the speed in mm/s.
- Step4. If the auxiliary points and target points are available, you do not need to set the parameter CA. If you do not directly specify the target point, you can enter the central angle in the edit box behind CA. At this time, the target point is only used to determine the circular geometry together with the auxiliary points, but not a real target point.
- Step5. Click <Insert> button in Figure 5-21 to pop up "Are you need to create the variable ***" dialog box. Click <Yes> button, and then the instruction will be inserted successfully.



5.3.1.5 jump instruction

Instruction introduction:

"jump" refers to when the robot is quickly lifted from one point and moved to another point without requiring the shape of the trajectory of the TCP point. All axes reach the target point at the same time.

Insert steps:

- Step1. Click "Insert instruction > Motion instruction > jump" option in the toolbar of "Program editor", and the "jump" instruction configuration interface as shown in Figure 5-22 will pop up.

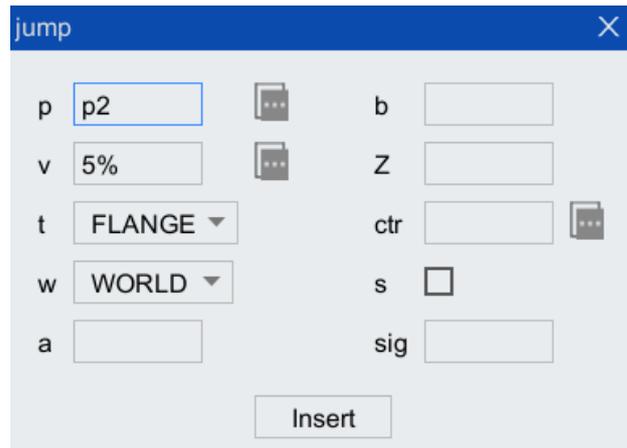


Figure 5-22"Jump"Instruction configuration interface

- Step2. To view and modify the target point p, refer to the modification method of the target point p in the "lin" instruction.
- Step3. Enter the relative distance of the vertical ascent of the arch instruction from the starting point in the text box behind a. The unit is mm. Default 25mm when not input.
- Step4. In the text box behind b, enter the relative distance of the arch instruction before reaching the target point. The unit is mm. Default 25mm when not input.
- Step5. Enter the maximum absolute height allowed in the Z direction of the arch instruction in the text box behind Z. The unit is mm. When not input, the default is 0 (maximum height limit).
- Step6. If smoothing is required, check s.
- Step7. If you need to set up and down speed and acceleration separately, click the ellipsis after ctr, and the "control-ctr" parameter setting interface as shown in Figure 5 23 will pop up. Set the percentage of each parameter. 0 means the default value. For details, see "ARL Programming Manual".

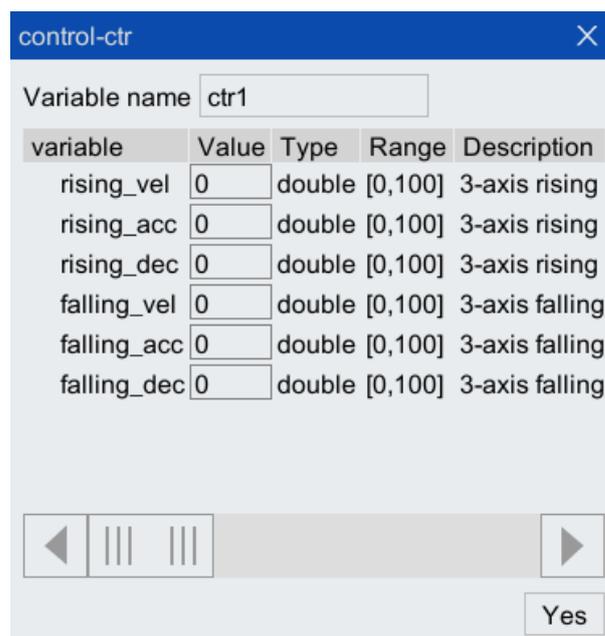


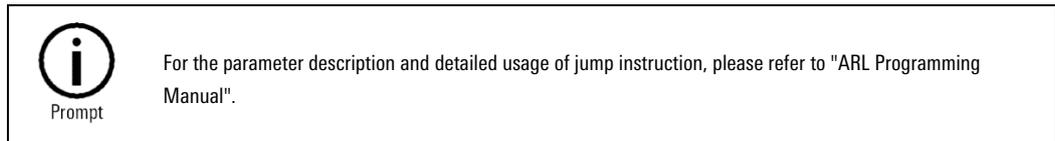
Figure 5-23 "control-ctr" parameter setting interface

Step8. If you want to pass the judgment condition to make the robot stop directly above the target point and the three axes do not descend, you need to set the sig parameter. The place must be a bool type or an expression that can be implicitly converted to a bool type. This expression is the same as the judgment statement in if and while statements.

For example, the following expressions are all of this type of expression:

```
1
true
getdi(5)
getdi(5) == true
getdi(5) && getdi(6)
counter >= 20
T(3.4)
```

Step9. Click the <insert instruction> button in Figure 5-22, and the "prompt" box of "Create Variable***" pops up, click the <OK> button, the instruction is inserted successfully.



5.3.2 Logic control

See Table 5-4 for the list of logic control instructions.

Table 5-4 List of logic control instructions

Name	Meaning
If	Conditional instruction
while	while loop
for	for loop
break	Out of the loop
continue	Continue to the next cycle
switch	Conditional branch
goto	Jump
return	Function returns
loop	Infinite loop
repeat	repeat loop
compact if	Compact conditional instruction

Instruction introduction:

Logic control instructions include "if" conditional branch, "while" loop, etc. When inserting one of the logic control instructions, the auxiliary programming will provide the program frame of the instruction.

Insert steps:

The "if" instruction is taken as an example to describe the steps of inserting the logic control instructions, and "if" is a conditional execution statement.

Step1. Place the cursor on any blank line in the program file.

Step2. Click "Insert instruction > Logic control > if" option in the program editor toolbar, and the program frame of the if instruction is inserted. Please refer to Figure 5-24.

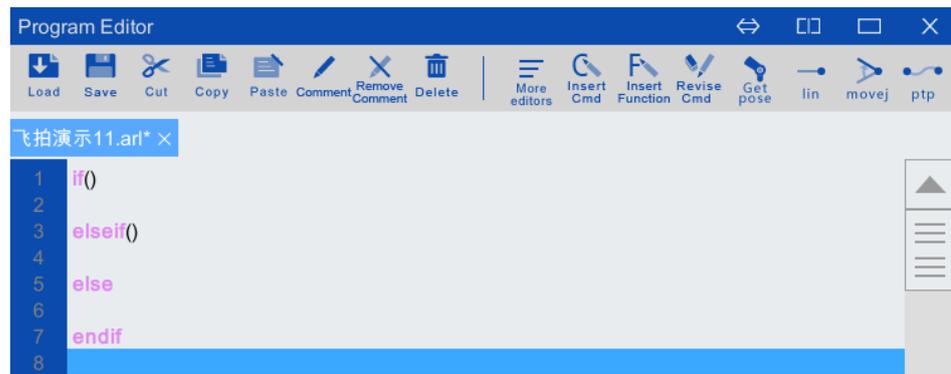


Figure 5-24 Contents of the program frame with the "if" instruction inserted

Step3. The system will calculate the value of the bool type expression after if from top to bottom, until a certain expression is true, then execute the instruction between this "if" and the next "elseif" or "else", and jump after execution continue execution to endif. The number of "elseif" is not limited, and there may be no "elseif" and/or "else" part.



Prompt For the operation method of all instructions in logic control, please refer to "ARL Programming Manual".

5.3.3 Process control

Refer to Table 5-5 for the list of process control instructions.

Table 5-5 List of process control instructions

Name	Meaning
waittime	Delayed wait
waituntil	Condition wait
exit	Exit the program
pause	Pause
restart	Restart program
stopmove	Stop current movement
startmove	Restart a stopped movement

5.3.3.1 waittime instruction

Instruction introduction:

The waittime instruction is used to delay waiting for a period of time.

Insert steps:

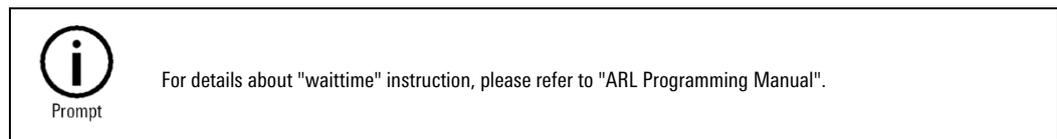
Step1. Click "Insert Cmd> Logic Control> waittime" option in the toolbar of the program editor to pop up "waittime" instruction box, as shown in Figure 5-25.



Figure 5-25 "waittime" instruction box

Step2. Click the edit box behind the parameter "time" and enter the waiting time.

Step3. Click <Insert> button, and then the instruction is inserted successfully.



5.3.3.2 waituntil instruction

Instruction introduction:

The waituntil instruction is used to wait until an event occurs.

Insert steps:

Step1. Click "Insert Cmd> Process Control> waituntil" option in the toolbar of the program editor to pop up "waituntil" instruction box, as shown in Figure 5-26.

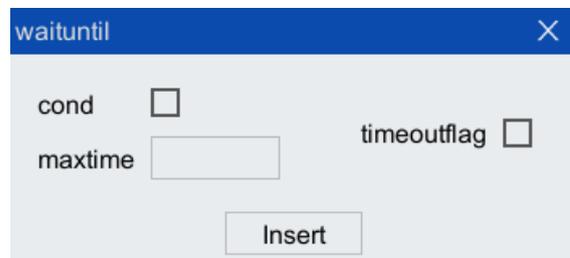


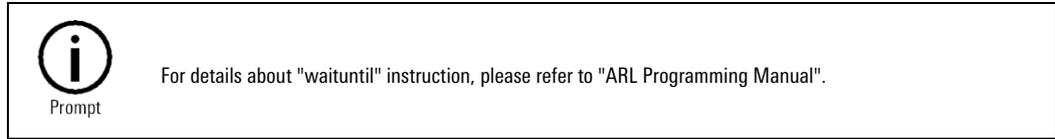
Figure 5-26 "waituntil" instruction configuration interface

Step2. Click the edit box behind the parameter "cond" and enter the conditional expression.

Step3. Click the edit box behind the parameter "maxtime" and enter the max waiting time. The parameter may not be set according to actual needs.

Step4. If the parameter maxtime is set, click the edit box behind the parameter timeoutflag and enter a bool variable expression.

Step5. Click <Insert> button, and then the instruction is inserted successfully.



5.3.3.3 exit instruction

Instruction introduction:

The exit instruction is used to exit the program execution. Even if the cyclic running mode is set, the program execution will be exited when an exit instruction is encountered, without restarting the program. If you want to restart the program after exiting, please use the restart instruction (please refer to Section 5.3.3.5).

Insert steps:

Step1. Click "Insert Cmd> Process Control> exit" option in the toolbar of the program editor to pop up "exit" instruction interface, as shown in Figure 5-27.

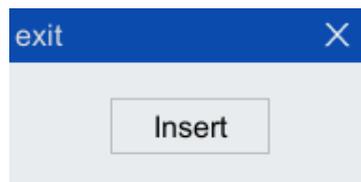
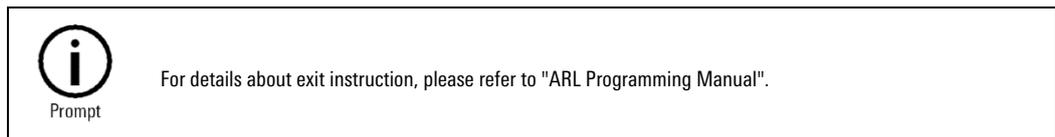


Figure 5-27 "exit" Instruction configuration interface

Step2. Click <Insert> button, and then the instruction is inserted successfully.



5.3.3.4 pause instruction

Instruction introduction:

The pause instruction is used to suspend the program execution. When the instruction is executed, the program will be in the pause status. At this time, the START button on the teach pendant must be pressed to run the program continuously.

Insert steps:

Step1. Click "Insert cmd> Process Control> pause" option in the toolbar of the program editor to pop up "pause" instruction interface, as shown in Figure 5-28.

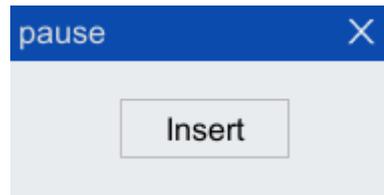
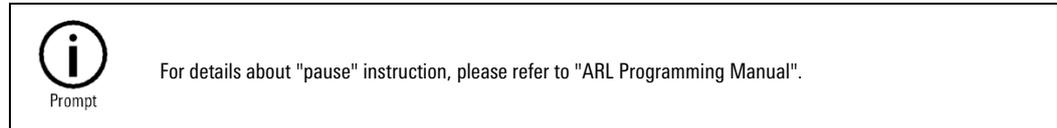


Figure 5-28 "Pause" Instruction configuration interface

Step2. Click <Insert> button, and then the instruction is inserted successfully.



5.3.3.5 restart instruction

Instruction introduction:

The restart instruction is used to restart the program. After executing the instruction, the program will reset and return to the main function entry for execution.

Insert steps:

Step1. Click "Insert Cmd> Process Control> restart" option in the toolbar of the program editor to pop up "restart" instruction interface, as shown in Figure 5-29.

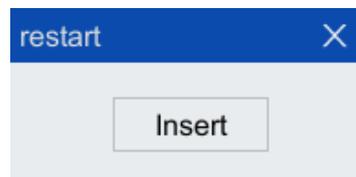
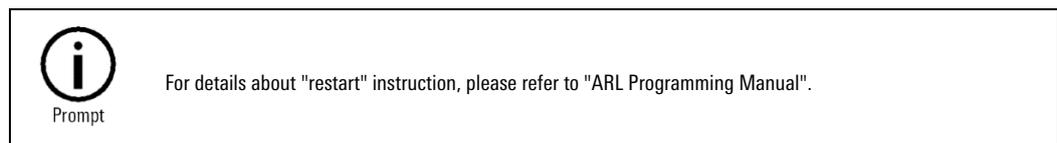


Figure 5-29 "Restart" Instruction configuration interface

Step2. Click <Insert> button, and then the instruction is inserted successfully.



5.3.3.6 stopmove instruction

Instruction introduction:

The stopmove instruction is used to suspend the execution of movement. The instruction is generally used in interrupt sub-functions. When the user wants a signal to come or an event to occur and the current movement is immediately decelerated and ended, you can declare an interrupt for the event in the program and execute the stopmove instruction in the interrupt processing sub-function. For example:

Interrupt sub-function:

```
func void zhongduan()
```

```
stopmove fast
```

```
waituntil getdi(6)
```

```
startmove true
```

```
endfunc
```

Main function:

```
func void main()
```

```
init()
```

```
interrupt 0,when:getdi(6),do:zhongduan()
```

Insertion steps:

- Step1. Click "Insert Cmd> Process Control> stopmove" option in the toolbar of the program editor to pop up "stopmove" instruction interface, as shown in Figure 5-30.

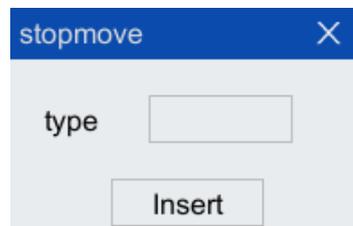
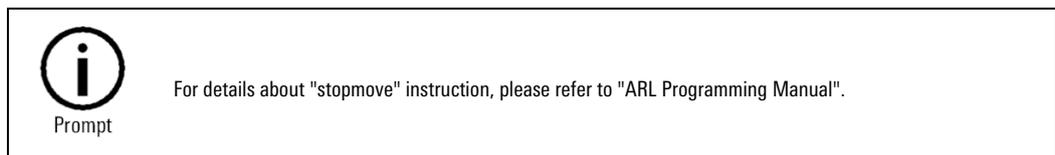


Figure 5-30 "Stopmove" instruction configuration interface

- Step2. Click the edit box behind the parameter "type", and enter the stop type "general" or "fast" according to the actual needs.

- Step3. Click <Insert> button, and then the instruction is inserted successfully.



5.3.3.7 startmove instruction

Instruction introduction:

"startmove" restores the running execution. startmove is used together with stopmove to restore the movement instructions that are previously ended by stopmove.

Insertion steps:

- Step1. Click "Insert Cmd> Process Control> startmove" option in the toolbar of the program editor to pop up "startmove" instruction interface, as shown in Figure 5-31.



Figure 5-31 "Startmove" instruction configuration interface

Step2. Click the edit box behind the parameter "skip", and enter the corresponding value according to the actual needs. The number behind "skip" indicates the number of trajectory to jump after restarting, which is calculated from the number of lines ended.

Step3. Click <Insert> button, and then the instruction is inserted successfully.



For details about "startmove" instruction, please refer to "ARL Programming Manual".

Prompt

5.3.4 Interrupt trigger

Refer to Table 5-6 for the list of interrupt trigger instructions.

Table 5-6 List of interrupt trigger instructions

Name	Meaning
interrupt	Interrupt statement
enableint	Enable interrupt
disableint	Shield interrupt
delint	Delete interrupt
trigger	Trajectory trigger statement
timer	Timed interrupt
setdoimv	Non-stop forward-looking asynchronous output single DO

5.3.4.1 Interrupt instruction

Instruction introduction:

The interrupt instruction is used to declare an interrupt. If you want to execute a program when an asynchronous event occurs, you can use the interrupt declaration instruction. When the defined interrupt event occurs, the program will enter the interrupt sub-function defined in the interrupt declaration for execution.

Insertion steps:

Step1. Click "Insert Cmd> Interrupt Trigger> Interrupt" option in the toolbar of the program editor to pop up "interrupt" instruction interface, as shown in Figure 5-32.

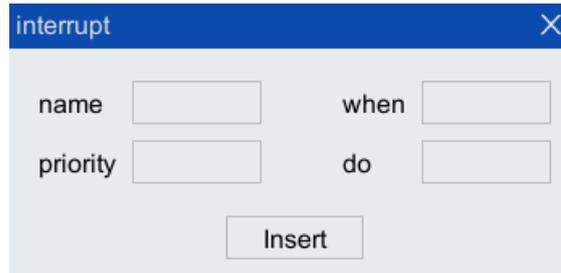


Figure 5-32 "Interrupt" instruction configuration interface

- Step2. Click the edit box behind the parameter "name" and enter the interrupt name.
- Step3. Click the edit box behind the parameter "priority" and enter the interrupt priority. The parameter can be defaulted. If it is default, the default priority will be 10.
- Step4. Click the edit box behind the parameter "when", and enter the interrupt event.
- Step5. Click the edit box behind the parameter "do", and enter the interrupt sub-function.
- Step6. Click <Insert> button, and then the instruction is inserted successfully.



For details about "interrupt" instruction, please refer to "ARL Programming Manual".

Prompt

5.3.4.2 enableint instruction

Instruction introduction:

The enableint instruction is used to enable interrupts that are shielded previously.

Insertion steps:

- Step1. Click "Insert Cmd> Interrupt Trigger> enableint" option in the toolbar of the program editor to pop up "enableint" instruction interface, as shown in Figure 5-33.

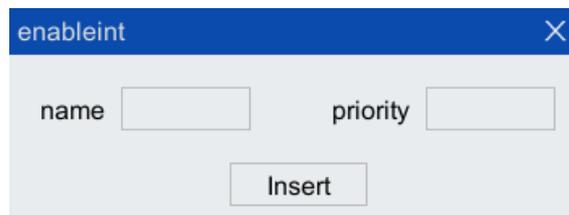


Figure 5-33 "enableint" instruction configuration interface

- Step2. Click the edit box behind the parameter "name" and enter the interrupt name.
- Step3. Click the edit box behind the parameter "priority", and enter the interrupt priority. The parameter can be defaulted.
- Step4. Click <Insert> button, and then the instruction is inserted successfully.



For details about enableint instruction, please refer to "ARL Programming Manual".

5.3.4.3 disableint instruction

Instruction introduction:

The disableint instruction is used to shield the interrupts that are declared previously. For the insertion steps, please refer to "enableint" instruction.

Insertion steps:

For the insertion steps, please refer to "enableint" instruction.

5.3.4.4 delint instruction

Instruction introduction:

The delint instruction is used to delete the interrupts that are declared previously. For the insertion steps, please refer to "enableint" instruction.

Insertion steps:

For the insertion steps, please refer to "enableint" instruction.

5.3.4.5 trigger instruction

Instruction introduction:

The trigger instruction is used to declare a trigger. You can use the trigger function when you want to trigger a certain operation at a certain point on the trajectory. The format of the trigger declaration is basically identical with that of the interrupt declaration instruction, except that the trigger declaration must be written on the previous line of the movement instruction to be triggered.

Insertion steps:

Step1. Click "Insert Cmd> Interrupt Trigger> trigger" option in the toolbar of the program editor to pop up "trigger" instruction interface as shown in Figure 5-34.

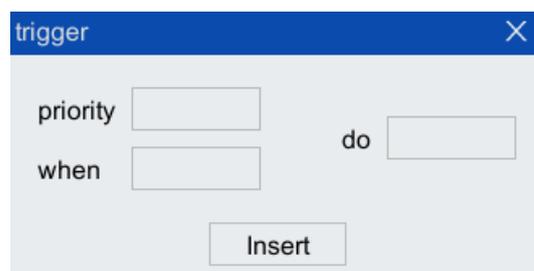


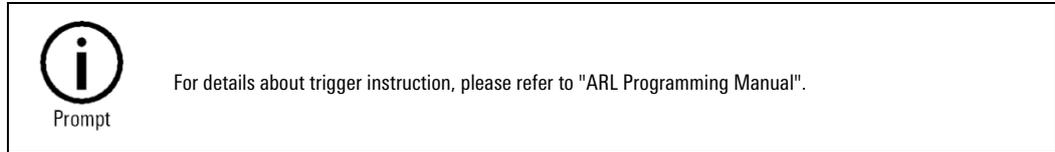
Figure 5-34 "Trigger" Instruction configuration interface

Step2. Click the edit box behind the parameter "priority", and enter the priority. The parameter can be defaulted.

Step3. Click the edit box behind the parameter "when", and enter the interrupt event.

Step4. Click the edit box behind the parameter "do", and enter the interrupt sub-function.

Step5. Click <Insert> button, and then the instruction is inserted successfully.



5.3.4.6 timer instruction

Instruction introduction:

The timer instruction is a special interrupt instruction. It uses the clock as the interrupt source, which can be applied to the scenarios that need to implement an interrupt after a period of time or at regular intervals.

Insertion steps:

Step1. Click "Insert Cmd> Interrupt Trigger> timer" option in the toolbar of the program editor to pop up "timer" instruction interface, as shown in Figure 5-35.

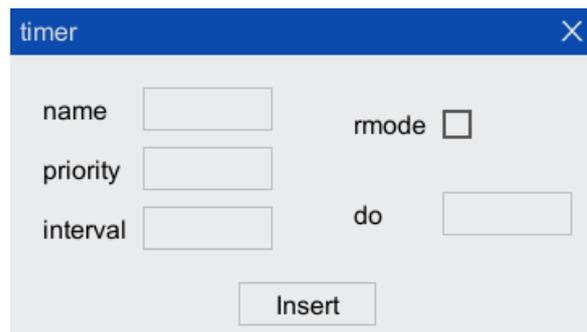


Figure 5-35 "Timer" instruction configuration interface

Step2. Click the edit box behind the parameter "name", and enter the interrupt name.

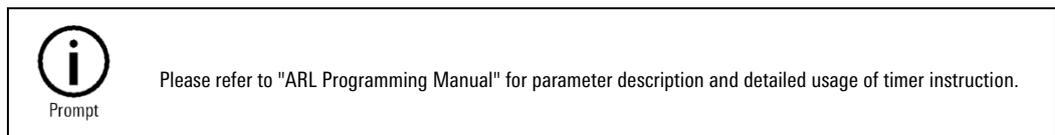
Step3. Click the edit box behind the parameter "priority", and enter the interrupt priority.

Step4. Click the edit box behind the parameter "interval", and enter the interrupt interval.

Step5. Click the edit box behind the parameter "rmode", and enter the repeat mode.

Step6. Click the edit box behind the parameter "do", and enter the interrupt sub-function.

Step7. Click <Insert> button, and then the instruction is inserted successfully.



5.3.4.7 setdoimv instruction

Instruction introduction:

The setdoimv instruction means to trigger the setdo function when the next line of motion instruction starts to execute.

Insertion steps:

Step1. Click "Insert Cmd> Interrupt Trigger> setdoimv" option in the toolbar of the program editor to pop up "setdoimv" instruction interface, as shown in Figure 5-36.



Figure 5-36 "Setdoimv" instruction configuration interface

Step2. Click the edit box behind the parameter "Bit", and enter the DO port.

Step3. Click the edit box behind the parameter "value", and enter the output value of DO.

Step4. Click <Insert> button, and then the instruction is inserted successfully.



Prompt

- Please refer to "ARL Programming Manual" for parameter description and detailed usage of setdoimv instruction.
- If smoothing is set between two motion tracks and setdo is set at the same time, there will be no smoothing between the two tracks. Because when using the setdo instruction to set DO, the forward look will be stopped, and the smoothing between trajectories will be invalid.
- In order to avoid smooth failure between the two trajectories after setting setdo, the trajectory trigger instruction is encapsulated into the setdoimv instruction, and the trajectory trigger defaults to setting DO at the beginning of the next trajectory.

5.3.5 Auxiliary instructions

See Table 5-7 for the list of auxiliary instructions.

Table 5-7 List of auxiliary instructions

Name	Meaning
print	Printout
scan	Scan input
import	Import ARL module
velset	Speed adjustment
accset	Acceleration adjustment
toolload	Tool load setting
toolswitch	Tool load switching

5.3.5.1 print instruction

Instruction introduction:

The print instruction is used to print the output to a certain position. You can use the function to print the value of one or more expressions to the HMI message bar, USB, a specified file, or a string. The instruction is mostly used for program debugging. Of course, the user can also use the function to output the logs.

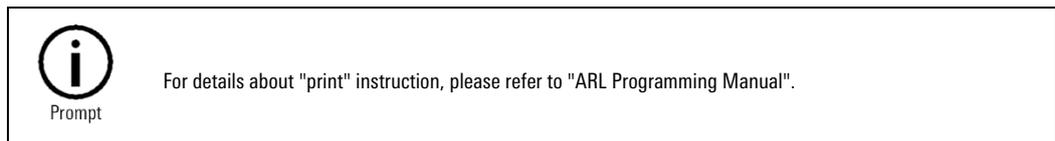
Insertion steps:

Step1. Click "Insert Cmd> auxiliary instruction> Print" option in the toolbar of the program editor to pop up "print" instruction interface, as shown in Figure 5-37.

Figure 5-37 "Print" Instruction configuration interface

Step2. Click the corresponding parameter edit box according to the actual needs, and enter the parameter value.

Step3. Click <Insert> button, and then the instruction is inserted successfully.



5.3.5.2 scan instruction

Instruction introduction:

The scan instruction is used to scan a string, and read a series of substrings separated by a delimiter into a series of variables according to their types.

Insertion steps:

Step1. Click "Insert Cmd> auxiliary instruction> scan" option in the toolbar of the program editor to pop up "scan" instruction interface, as shown in Figure 5-38.

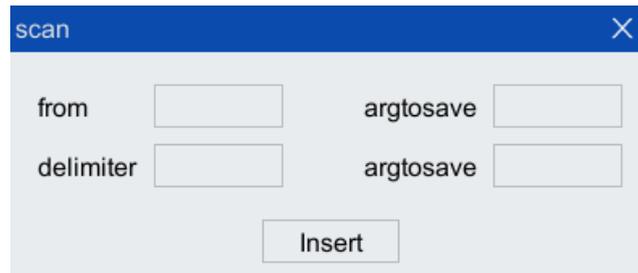
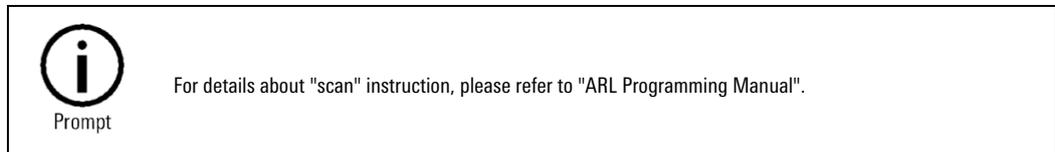


Figure 5-38 "scan" instruction configuration interface

- Step2. Click the edit box behind the parameter "from", and enter the defined string variable name.
- Step3. Click the parameter "delimiter", and enter the delimiter.
- Step4. Click the parameter "argtosave", and enter the name of the variable to which it is saved.
- Step5. Click <Insert> button, and then the instruction is inserted successfully.



5.3.5.3 import instruction

Instruction introduction:

The import instruction is used to import an ARL module.

Insertion steps:

- Step1. Click "Insert Cmd> auxiliary instruction> import" option in the toolbar of the program editor to pop up "import" instruction interface, as shown in Figure 5-39.

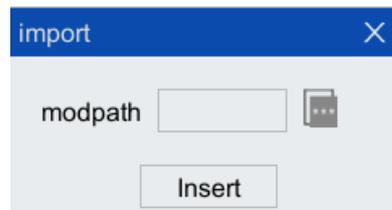
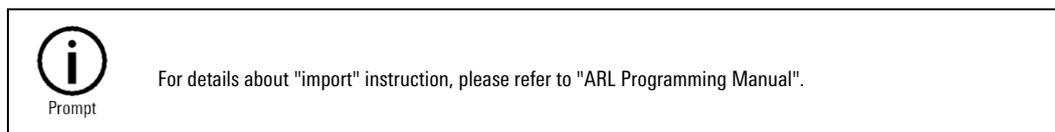


Figure 5-39 "import" instruction configuration interface

- Step2. Click the edit box behind the parameter "modpath", and enter the arl file path to be imported.
- Step3. Click <Insert> button, and then the instruction is inserted successfully.



5.3.5.4 velset instruction

Instruction introduction:

The velset instruction can be used to reduce or increase the programming planning speed of all subsequent movement instructions, and can also be used to set the max speed of the movement segment.

Insertion steps:

Step1. Click "Insert Cmd> auxiliary instruction> velset" option in the toolbar of the program editor to pop up "velset" instruction box, as shown in Figure 5-40.

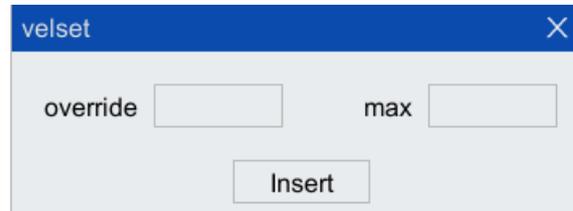
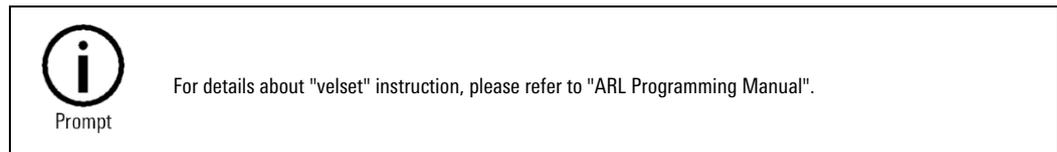


Figure 5-40 "velset" instruction configuration interface

Step2. Click the edit box behind the parameter "overside", and enter the speed percentage value.

Step3. Click the edit box behind the parameter "max", and enter the max TCP speed value for programming planning.

Step4. Click <Insert> button, and then the instruction is inserted successfully.



5.3.5.5 accset instruction

Instruction introduction:

The accset instruction is used to adjust the acceleration and jerk of the robot's movement, and is often used when the robot is holding a fragile load. Low acceleration and deceleration are allowed. As a result, the robot's movement is more flexible.

Insertion steps:

Step1. Click "Insert Cmd> auxiliary instruction> accset" option in the toolbar of the program editor to pop up "accset" instruction interface, as shown in Figure 5-41.

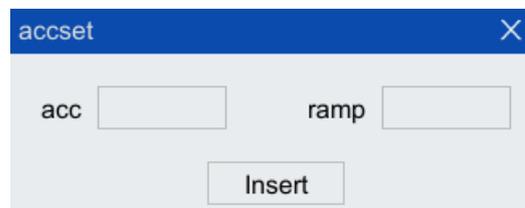
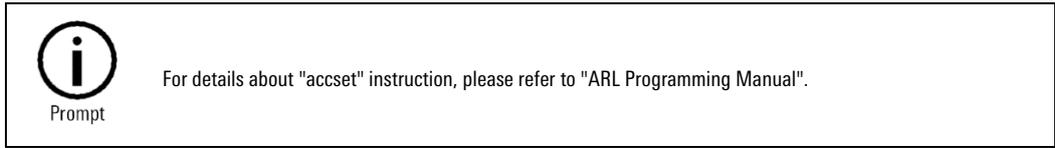


Figure 5-41 "accset" instruction configuration interface

Step2. Click the edit box behind the parameter "acc", and enter the percentage of actual acceleration relative to the max value.

Step3. Click the edit box behind the parameter "ramp", and enter the percentage of actual jerk relative to the max value.

Step4. Click <Insert> button, and then the instruction is inserted successfully.



5.3.5.6 toolload instruction

Instruction introduction:

The toolload instruction is used to set the load parameters when the program is running.

Insertion steps:

Step1. Click "Insert Cmd> auxiliary instruction> toolload" option in the toolbar of the program editor to pop up "toolload" instruction interface, as shown in Figure 5-42.

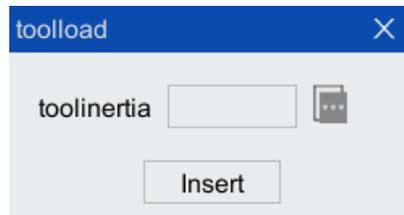


Figure 5-42 "Toolload" instruction configuration interface

Step2. Click <...> button on the right side to pop up "ToolInertiaPara-ToolInertia" parameter list, as shown in Figure 5-43. The variable m represents the tool mass, centroid_pos represents the position of centroid, centroid_dir represents the direction of the inertia main axis, and moment_inertia represents the main moment of inertia. After setting according to the actual needs, click <Yes> button.

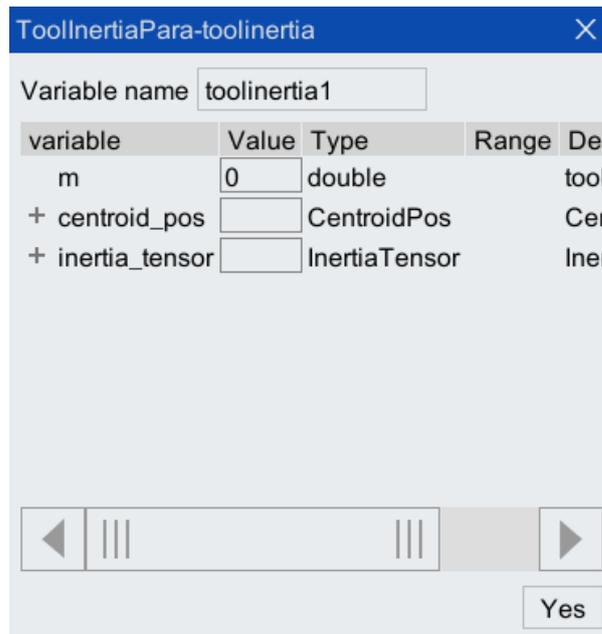


Figure 5-43 "Tool Load Inertia" parameter list

Step3. Click <Insert> button, and then the instruction is inserted successfully.



For details about "toolload" instruction, please refer to "ARL Programming Manual".

Prompt

5.3.5.7 toolswitch instruction

Instruction introduction:

The toolswitch instruction is used to switch the load serial number when the program is running. The inertia represented by the serial number can be modified and viewed in "System> Parameter Configuration> Global> TOOLINERTIA".

Insertion steps:

Step1. Click "Insert Cmd> auxiliary instruction> Tool Offset> toolswitch" option in the toolbar of the program editor to pop up "toolswitch" instruction interface, as shown in Figure 5-44.

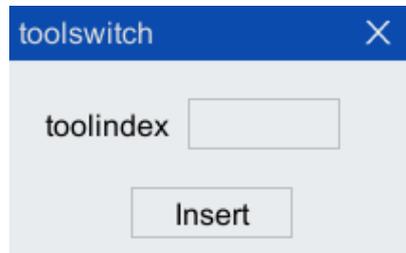


Figure 5-44 "Toolswitch" instruction configuration interface

Step2. Enter the tool serial number in the pop-up toolswitch instruction box, and the inertia represented by the serial number can be modified and viewed in "System> Parameter Configuration> Global> TOOLINERTIA".

Step3. Click <Insert> button, and then the instruction is inserted successfully.



For details about "toolswitch" instruction, please refer to "ARL Programming Manual".

Prompt

5.3.6 User subprogram

Instruction introduction:

The user subprogram function can insert a subprogram at any position in the main program.

When the program pointer is executed to the subprogram block, it will skip to the func function of the SubProg program. The structure of the subprogram will not be significantly different from that of the ordinary program, except that the main function may not be included. After the called function of the subprogram ends (that is, after execution to endfunc), the program pointer will return to the calling position. If you want to end the subprogram in advance, you can insert a return instruction in the place where you want to end. As a result, the subprogram's running will be ended in advance.

When the program pointer is executed to the above block, it will skip to the func function of the SubProg program. The structure of the subprogram will not be significantly different from that of the ordinary program, except that the main function may not be included.

Insertion steps:

- Step1. In the main program (the program currently in use), position the cursor where you want to insert the subprogram.
- Step2. Click "Insert Instruction> User Subprog>" option in the toolbar of the program editor to pop up "Insert User Subprogram" interface, as shown in Figure 5-45. Click <Browse> button, find and highlight the folder where the subprogram to be inserted is located in the pop-up "Path Selection" dialog box, and click <Select> button, as shown in Figure 5-46.

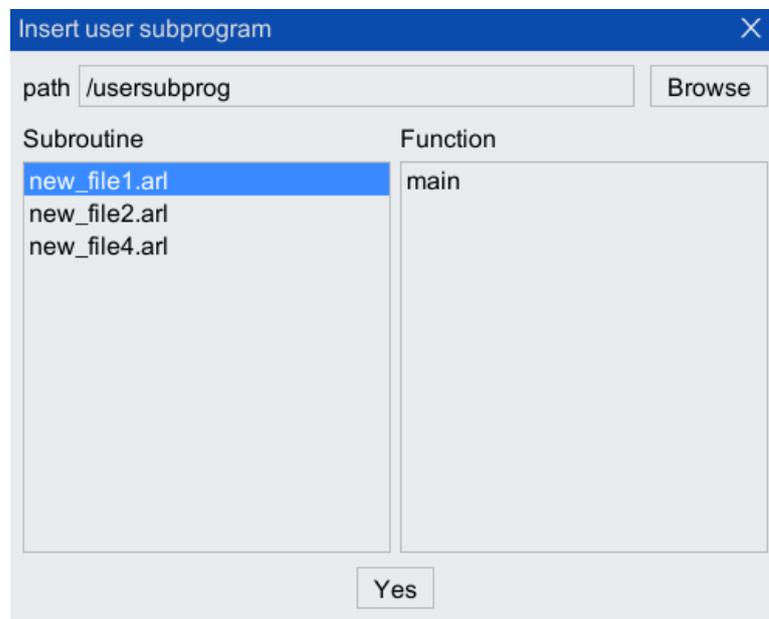


Figure 5-45 "Insert User Subprogram" interface

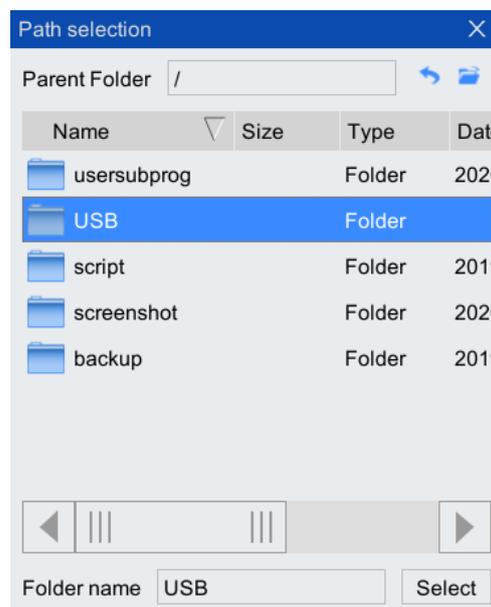


Figure 5-46 "Path selection" list box

Step3. The programs that can be inserted under the folder (the program contains the subprograms that can be inserted) will be displayed in "Insert User Subprogram" interface, as shown in Figure 5-47.



Figure 5-47 Subprogram is inserted along with its path

Step4. In "Subprogram" display box, click the program to which the subprogram belongs (EXT_CTRL_TESTIuan + 0723.arl). At this time, "Function" display box will list all the subprograms contained in the selected program. Highlight the subprogram to be inserted and click "Yes" button.

Step5. If the subprogram (senddata) to be inserted is not in the same path as the main program, "The subprogram is not in the same path as the current program. Does it import the path?" dialog box will pop up, as shown in Figure 5-48. Click <Yes> button, and then the subprogram will be inserted into the main program along with its path, as shown in Figure 5-49.

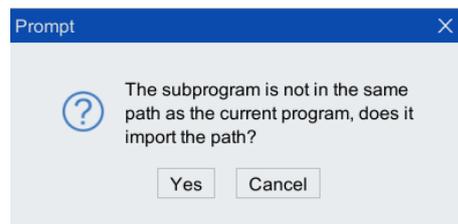


Figure 5-48 "Are you sure to Import Path" dialog box

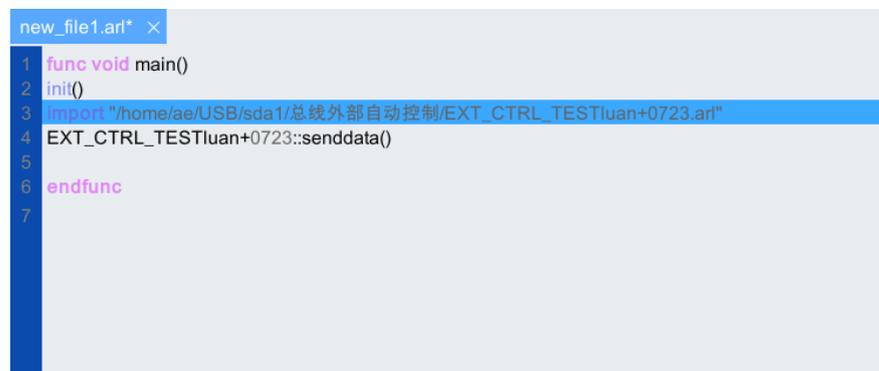


Figure 5-49 Subprogram is inserted along with its path (if it is not in the same path as the main program)

Step6. If the subprogram to be inserted is in the same path as the main program, highlight the subprogram to be inserted and click <Yes> button. Then the subprogram will be inserted into the main program, as shown in Figure 5-50.



```

new_file1.arl* x
1 func void main()
2 init()
3 import "/home/ae/USB/sda1/总线外部自动控制/EXT_CTRL_TESTIuan+0723.arl"
4 EXT_CTRL_TESTIuan+0723::senddata()
5 socket_acc::main()
6 endfunc
7

```

Figure 5-50 Subprogram is inserted (if it is in the same path as the main program)

5.4 Insert function

Please refer to the "ARL Programming Manual" of our company for the usage of all functions in the function menu.

5.5 Coordinate system measurement

Select "Run> Coordinate System Measurement" option to enter "Coordinate System Measurement" interface, as shown in Figure 5-51. The coordinate system measurement includes "Tool Coordinate System Measurement", "Workpiece Coordinate System Measurement" and "Base Coordinate System Measurement".

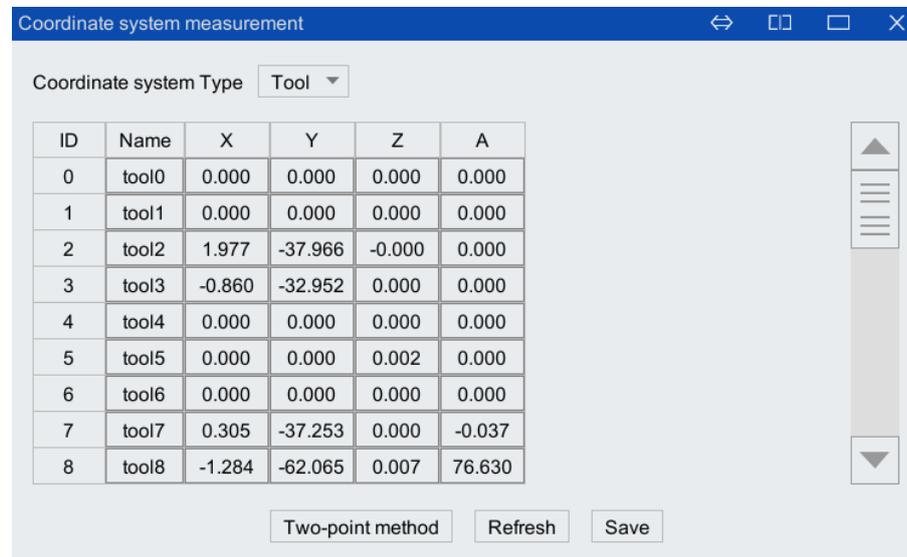


Figure 5-51 "Coordinate System Measurement" interface

"Tool/workpiece coordinate system measurement" has two methods: "input method" and "calibration method".

5.5.1 Input method

Tool coordinate system

You can set the tool coordinate system by inputting, as shown in Figure 5-52. The table shows the position of the origin of the tool coordinate system and the posture of the coordinate system.

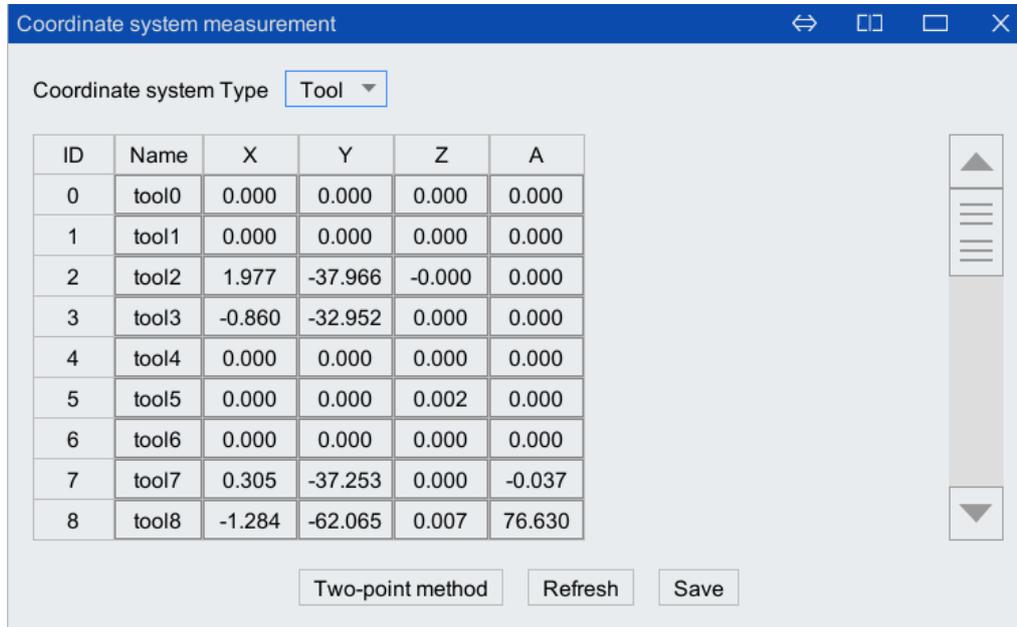


Figure 5-52 Interface of setting tool coordinate system by input method

Setting method:

- Step1. Select "Tool Coordinate System" in "Coordinate System Type", as shown in Figure 5-52.
- Step2. Click the cell in the line of "Tool Coordinate System" to be set, keep it editable, and modify X, Y, Z, A, B, C to the required values through the keypad. Refer to Figure 5-53.

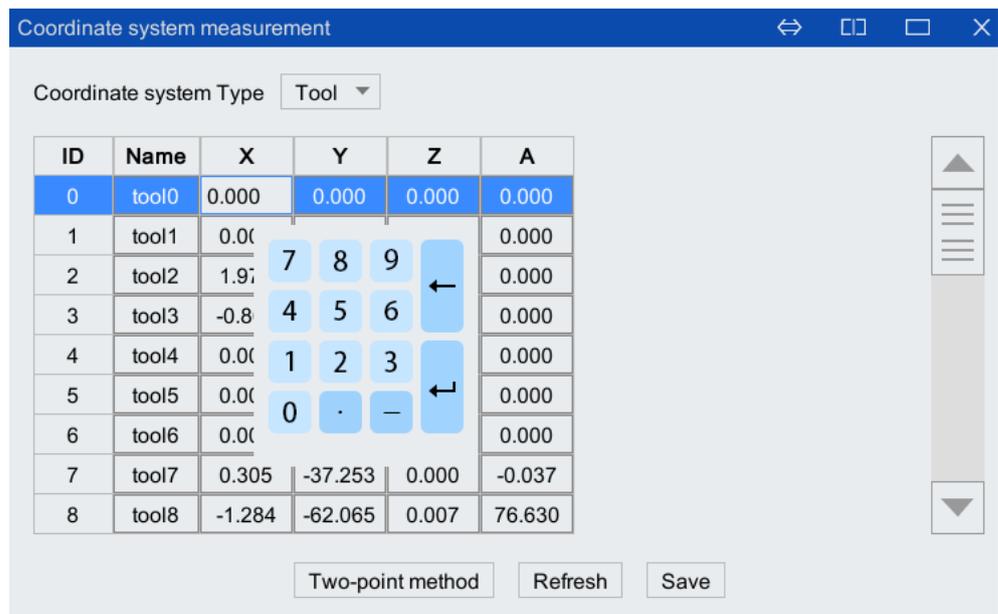


Figure 5-53 Modify the value of X, Y, Z, A through the small keyboard

- Step3. Click <Save> button below to pop up "Saved Succeeded" dialog box in Figure 5-54, and then the setting will be completed.

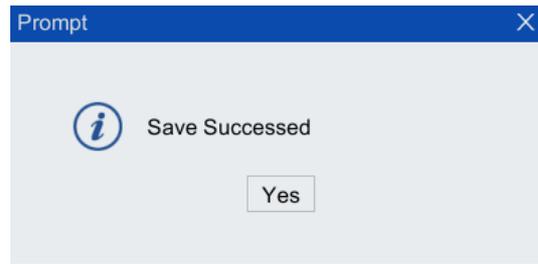


Figure 5-54 Save successful prompt box

The "Input Method" can be used only when the specific values of the tool coordinate system X, Y, Z, A, B, C are known.

Prompt

Workpiece coordinate system

You can set the workpiece coordinate system by inputting, as shown in Figure 5-55. The table shows the position of the origin of the workpiece coordinate system and the posture of the coordinate system.

↔ □ □ ×
Coordinate system measurement

Coordinate system Type Tool ▾

ID	Name	X	Y	Z	A
0	tool0	0.400	0.000	0.000	0.000
1	tool1	0.000			0.000
2	tool2	1.900	7 8 9		0.000
3	tool3	-0.800	4 5 6	←	0.000
4	tool4	0.000	1 2 3		0.000
5	tool5	0.000	0 . -	↩	0.000
6	tool6	0.000			0.000
7	tool7	0.305	-37.253	0.000	-0.037
8	tool8	-1.284	-62.065	0.007	76.630

Two-point method
Refresh
Save

Figure 5-55 Interface of setting workpiece coordinate system by input method

Setting method:

- Step1. Select "Workpiece Coordinate System" in "Coordinate System Type", as shown in Figure 5-55.
- Step2. Click the cell in the line of "Workpiece Coordinate System" to be set, keep it editable, and modify X, Y, Z, A, B, C to the required values through the keypad.
- Step3. Click "Save" button below to pop up "Save Succeeded" dialog box in Figure 5-56, and then the setting will be completed.

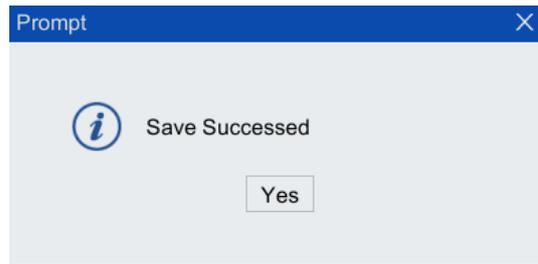
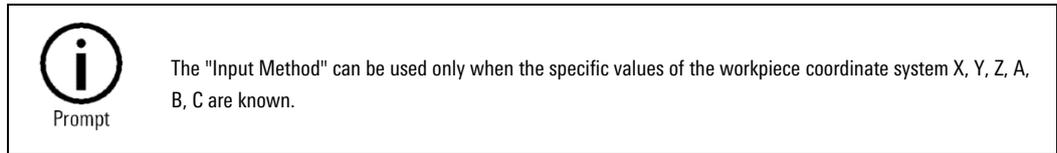


Figure 5-56 "Save Succeeded " dialog box



5.5.2 Calibration method

Tool coordinate system

Calibration method:

Step1. Select "Tool Coordinate System" in "Coordinate System Type" shown in Figure 5-52. Assuming that the name of "Tool Coordinate System" to be calibrated is tool0, highlight the line where tool0 is located, click <Two-point Method> button below to enter "Two-point method "calibration interface,as shown in Figure 5-57.

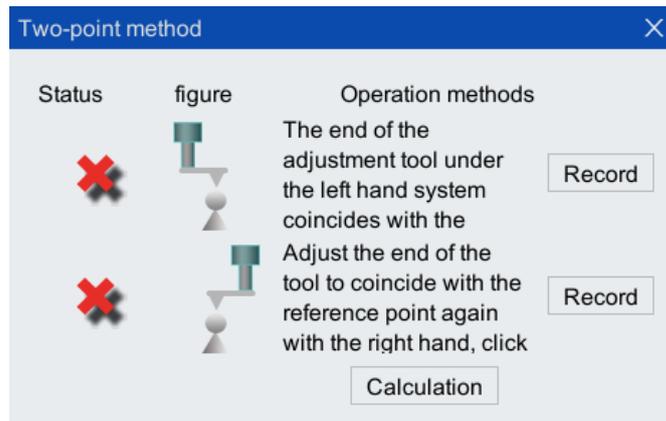
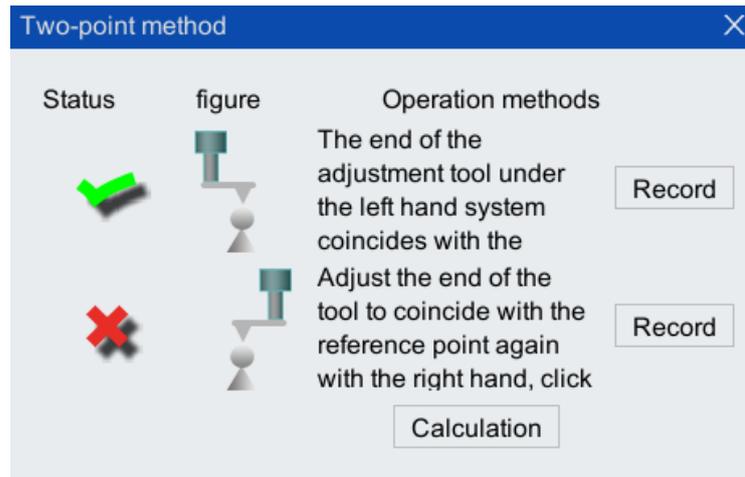
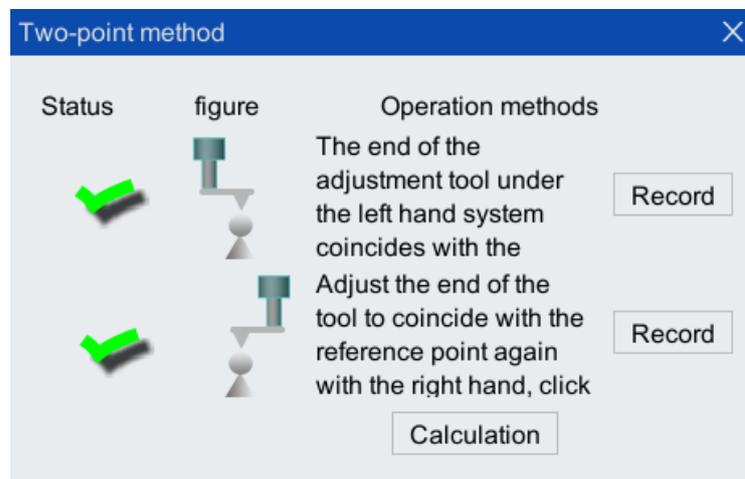


Figure 5-57 "Two-point method" Calibration interface

Step2. Next, follow the instructions given in the figure to perform the calibration. After each point is calibrated successfully, the front status will change from X into ✓ (see Figure 5-58 (a)-(c)). The interface for completion of all calibrations is shown in Figure 5-58.



(a) 1 point calibrated successfully



(b) 2 points calibrated successfully

Figure 5-58 Status change in "Two-point Method" calibration process

Step3. After all calibrations are completed, click <Calculation> button at the bottom of Figure 5-58 to calculate the error. If the error exceeds the range, "Calibration Failed, Please measure it again!" dialog box will pop up, as shown in Figure 5-59. Then you need to re-calibrate until the error is within the range; if the error is within the range, "Calibration successfully,save it or not?" dialog box will pop up, as shown in Figure 5-59. Click <Yes> button, and "Save succeeded" dialog box will pop up, as shown in Figure 5-61. Then the calibration is completed.

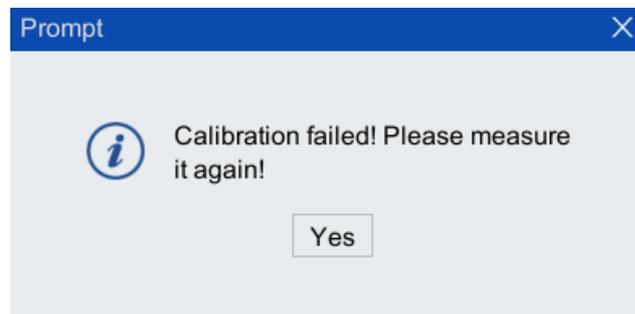


Figure 5-59 "Calibration failed, please re-measure!" prompt dialog box

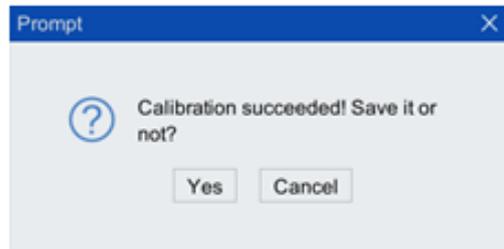


Figure 5-60 "Calibration is successful, save it?" prompt dialog box



Figure 5-61 "Save successfully" prompt dialog box

Step4. After the calibration is completed, return to the interface shown in Figure 5-62, you can see the specific values of X, Y, Z, and A after calibration.

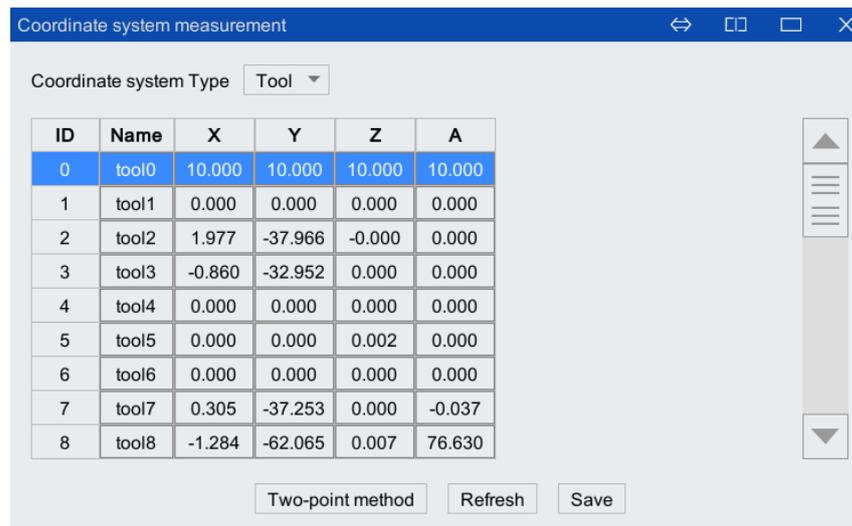


Figure 5-62 "Tool coordinate system" calibration complete interface

Workpiece coordinate system

Calibration method:

- Step1. If the coordinate system of the moving workpiece to be calibrated is wobj0, select the row where wobj0 is located, and click the <3-point method> button below to enter the <3-point method> calibration interface as shown in Figure 5-63
- Step2. Select the tool coordinate system to be used in the "Tool" list in Figure 5-63, for example, tool0.

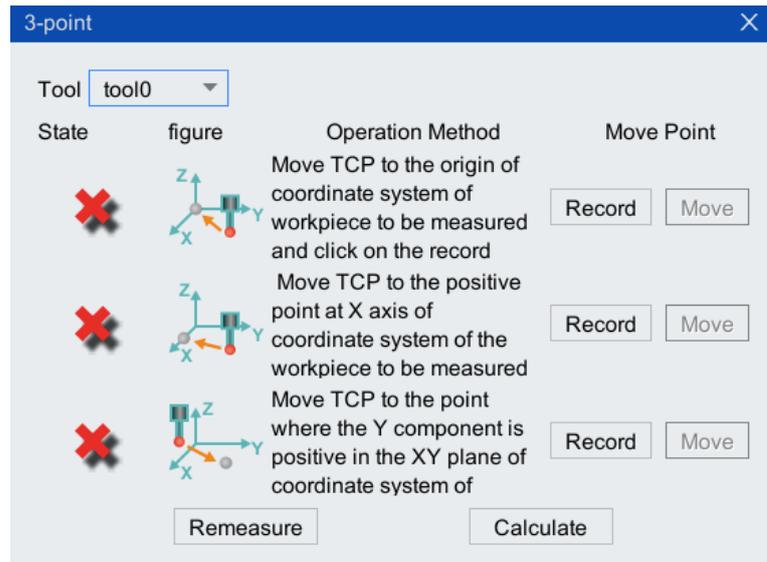
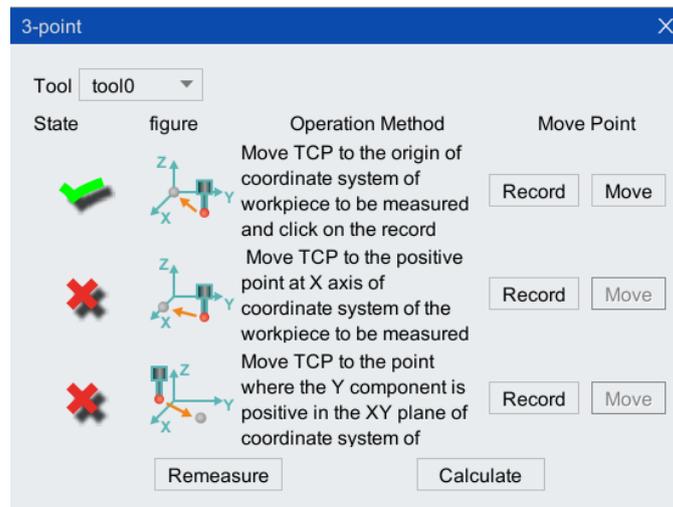
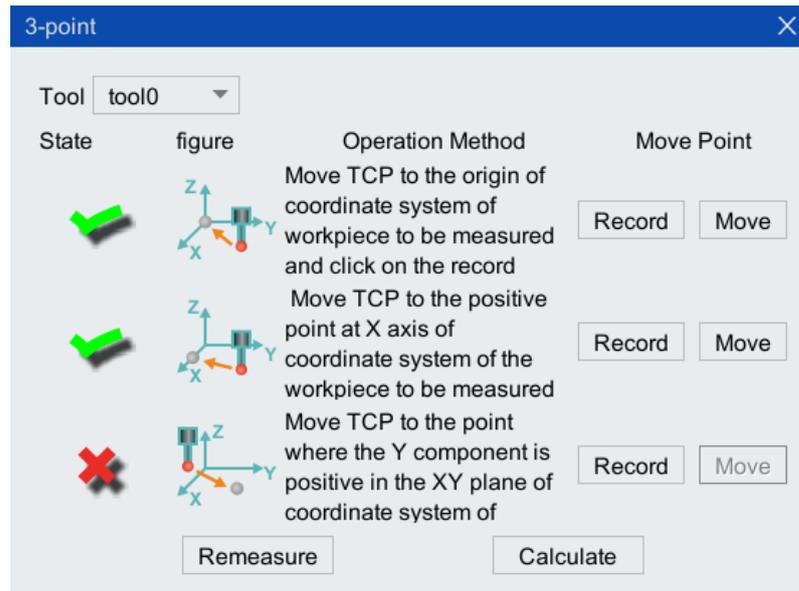


Figure 5-63"3-point method" Calibration interface

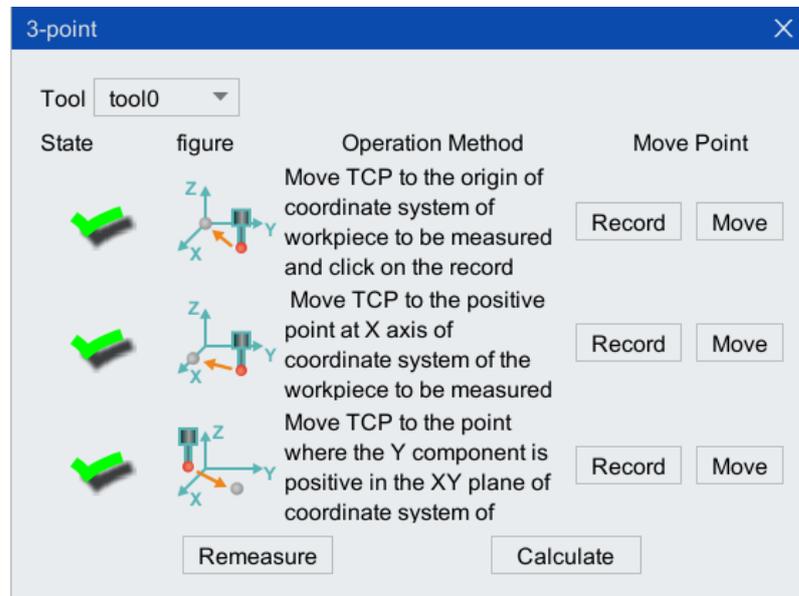
Step3. Next, calibrate according to the operation instructions in the figure. After each point is successfully calibrated, the front status will change from X to (refer to Figure 5-64 (a)-(c)), and all calibration is completed The interface is shown in Figure 5-64 (d).



(a) 1 point of successful calibration



(b) 2 points for successful calibration



(c) 3 points for successful calibration

Figure 5-64 "3-point method" calibration process status change

Step4. After all calibrations are successful, click the <Calculate> button at the bottom of Figure 5-64 to calculate the error. If it exceeds the error range, the "Calibration failed, please re-measure!" prompt box as shown in Figure 5-65 will pop up. Then you need to re-calibrate until the error is within the allowable range; if the error is within the allowable range, the "Calibration is successful, save?" prompt dialog box as shown in Figure 5-66 will pop up, click the <OK> button, and a pop-up like Figure 5-67 shows the "save successfully" prompt box, that is, the calibration is completed.

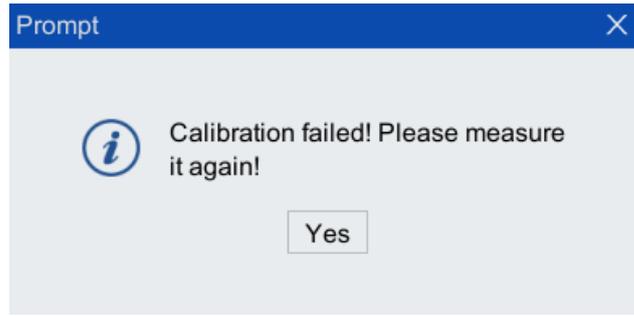


Figure 5-65 "Calibration failed, please re-measure!" prompt dialog box



Figure 5-66 "Calibration is successful, save it?" prompt dialog box

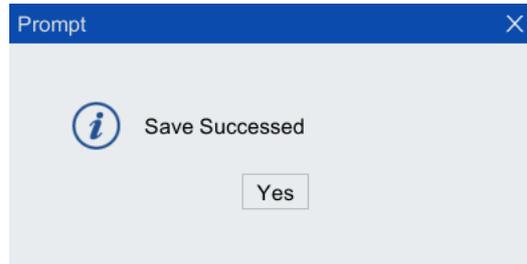


Figure 5-67 "Save successfully" prompt dialog box

5.6 Zero calibration

For details about "Zero Calibration", please refer to Table 5-8

Table 5-8 Description of calibration scenario

No.	Calibration scenario
1	Routine maintenance of the robot, such as replacing the encoder line battery, causes the encoder position analysis value to be lost
2	The manipulator has carried out a certain axis or overall disassembly
3	The manipulator collided during operation, causing the shaft position information of the encoder to be different from the actual shaft position
4	When there is a deviation between the zero position and the calibration slot position

For the specific method of zero calibration, please refer to "XX Industrial Robot System Quick Start Manua" of each model.

5.7 Fast calibration

Description:

"Fast Calibration" can record the current position in any pose. It should be noted that "Fast Calibration" can be performed only when the motor or reducer is faulty or damaged and needs to be replaced.

Calibration method:

Step1. The precondition for calibration is that the robot cannot move when the motor/reducer is faulty or damaged.

Step2. On the main interface of the teach pendant, click "Run > Calibration > Quick Calibration" option to enter the "Quick Calibration" interface shown in Figure 5-68. Click <Save Current Position> button, and then the system will record the robot's current axis position.

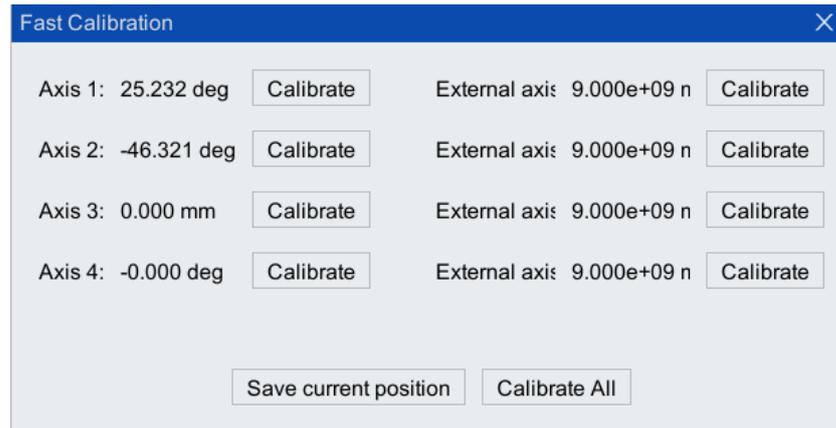


Figure 5-68 "Quick Calibration" Interface

Step3. Turn off the power, replace the motor/reducer (keep the shaft position still, no displacement), and restart the system.

Step4. Re-enter "Fast Calibration" interface in Figure 5-68, and click <Calibration> button behind any axis or <All Calibrations> button below, and "Do you need to re-calibrate?" dialog box will pop up, as shown in Figure 5-69. Click <Yes> button, and "Message Bar" of the system will display "One axis or all axes are calibrated successfully", and the corresponding axis will be completed to the previously recorded position.

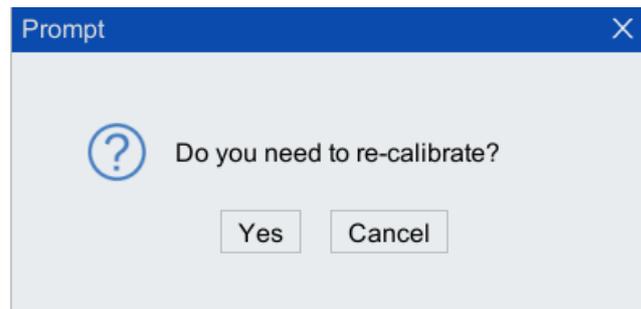


Figure 5-69 "Are you sure to recalibrate?" dialog box

5.8 Conveyor calibration

For the specific method of conveyor calibration, please refer to "Operation Instructions for Conveyor Tracking".

5.9 Positioner calibration

The "Point Corrector" function can help correct points in the program.

Operation steps:

Step1. On the main interface of the teach pendant, click "Run > Point Corrector" option to enter the "Point Corrector" interface as shown in Figure 5-70.

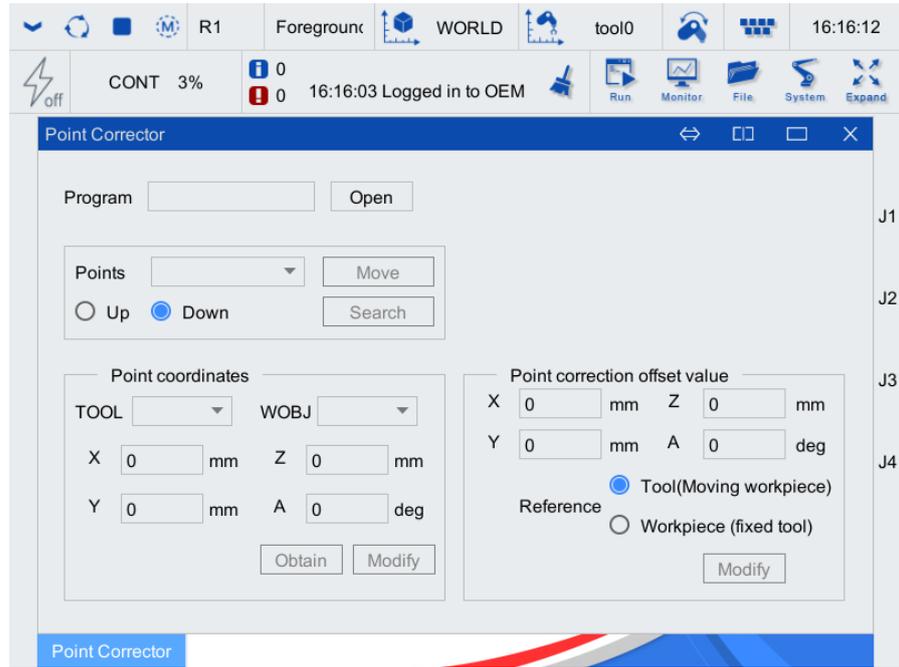


Figure 5-70 "Point Correction" Interface

Step2. Click the <Open> button above, and the "Select File" list box as shown in Figure 5-71 will pop up, select the file to be opened, and click the <Select> button. The program is opened in the "Program Editor" interface at the same time, its related information is also displayed in the "Point Corrector" interface, as shown in Figure 5-72.

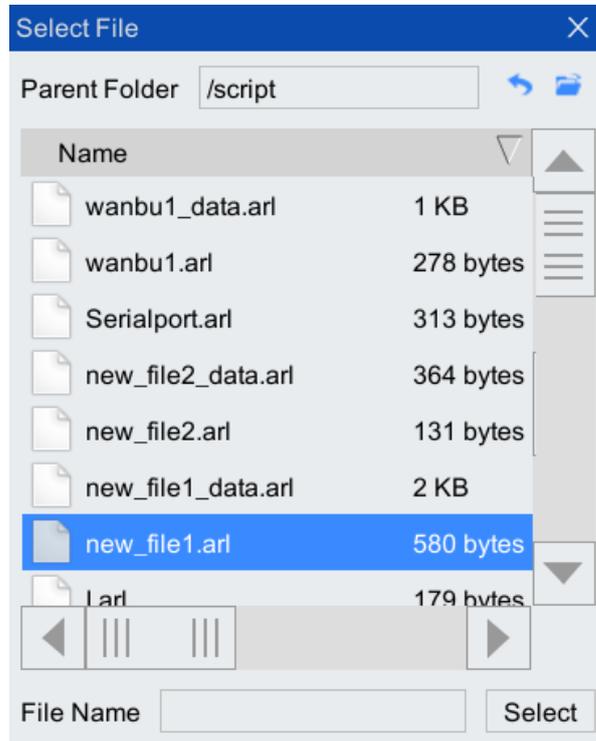


Figure 5-71 "select file" list box

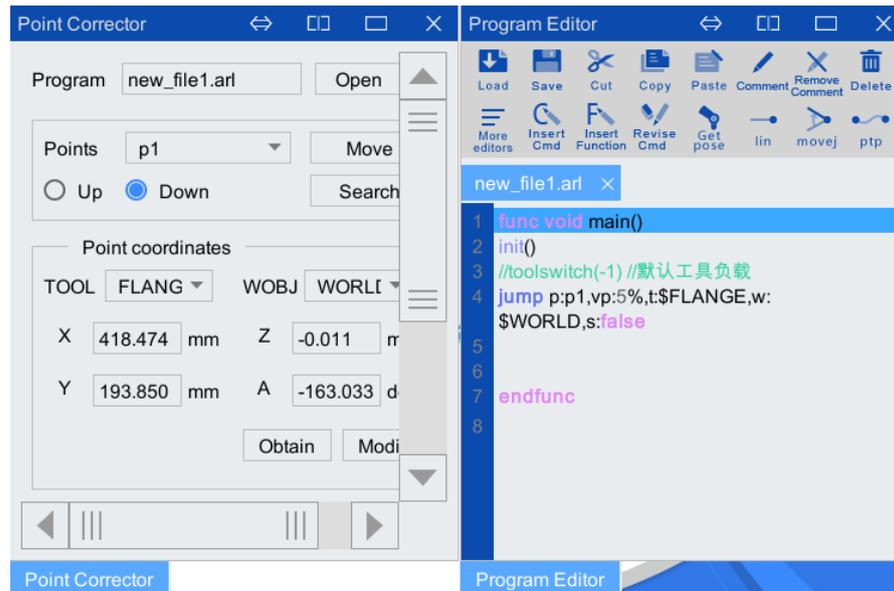


Figure 5-72 "point corrector" and "program editor" interface after opening the file

- Step3. Click the drop-down box of "Point List" in Figure 5-73 to display all point data in the program. The <Up>, <Down> buttons and the <Search in Program> button are used together, meaning to search the selected point in the "Point List" from the current position in the program "up" or "down".

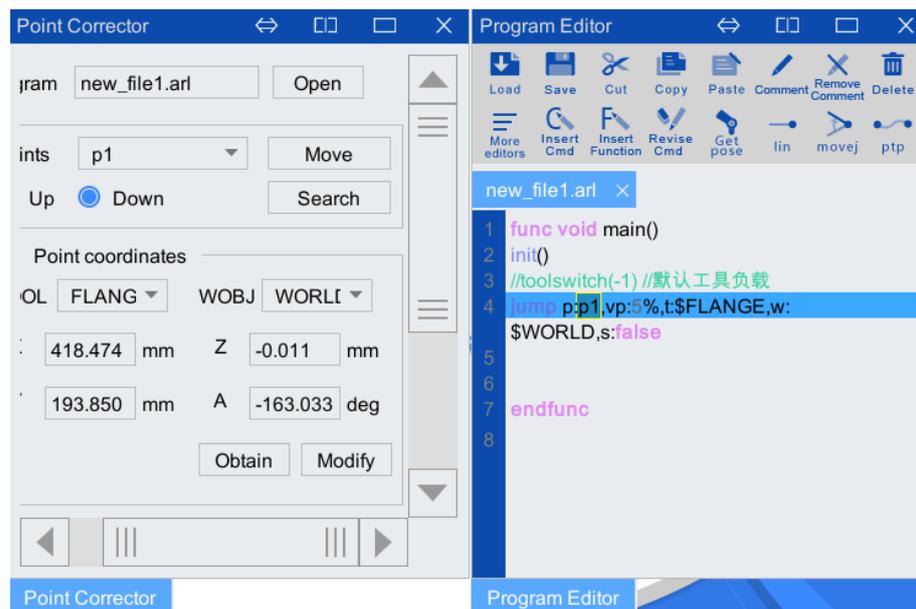


Figure 5-73 "Point List" Related button introduction

- Step4. After opening the program in the "Point Correction" interface, the "Point Coordinates" area box displays the "coordinate system" information and "pose" information of the current point selected in the "Point List". You can directly change the "reference coordinate system" and "pose" data of the current point manually, and you can also use the <Get> button to record the current robot's pose data in the current point into the current point. Then click the <OK> button to write the modified current point data into the data file.
- Step5. You can also modify the current point data in the "Point Correction Offset Value" area box. Select the reference coordinate system of the current point offset. If the "Workpiece (fixed tool)" option is checked, it means that

the current point is offset relative to the workpiece coordinate system. The offset value only supports the input of position data XYZ, as shown in Figure 5-74 shown.

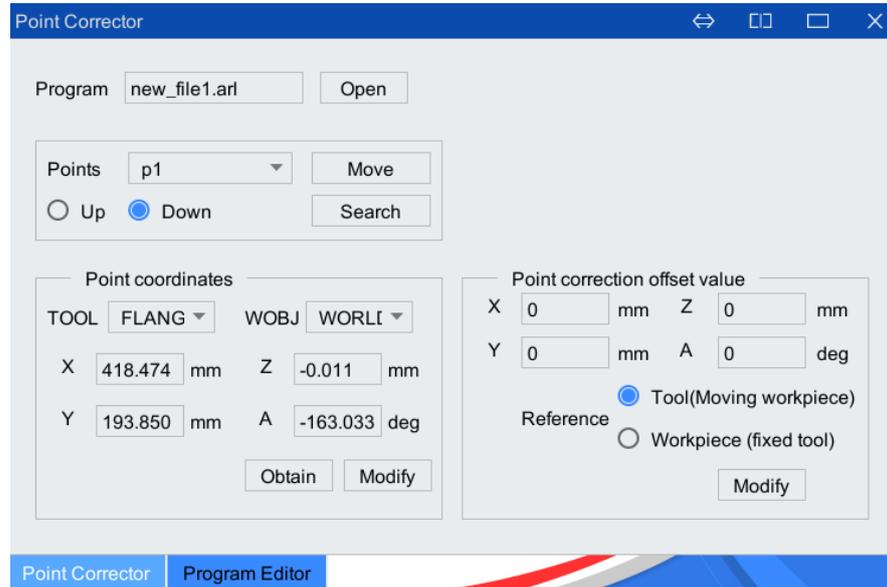


Figure 5-74 Modify the point coordinates through the "Point Correction Offset Value" area box

Step6. If the "Tool (Move Workpiece)" option is checked, it means that the current point position is offset relative to the tool coordinate system. The offset value supports the input of pose data XYZABC. After manually inputting the offset value, click the <Modify> button, and the data information of the current point in the point coordinate column will be modified according to the offset value. After modification, click the <OK> button in the point coordinate column, and then you can write data files.



For special conditions, such as grinding, a fixed tool is equivalent to a workpiece, and a moving workpiece is equivalent to a tool.

The "point corrector" function also supports the "one-key movement to this point" function.

Operation steps:

Step1. Select the point you want to move to in "Point List" in Figure 5-74.

Step2. Then click the <Move to this point> button, as shown in Figure 5-75, "The system will move to this point in manual override PTP mode. There may be interference during the movement, "please pay attention!" prompt box. After clicking <OK>, the robot starts to move. At this time, the display of the <Move to this point> button immediately changes to <Stop>. If there is interference during the movement, you can directly click the <Stop> button to stop the movement, and wait until the robot moves to the selection after the selected point, the <Stop> button returns to the <Movement to this point> button.

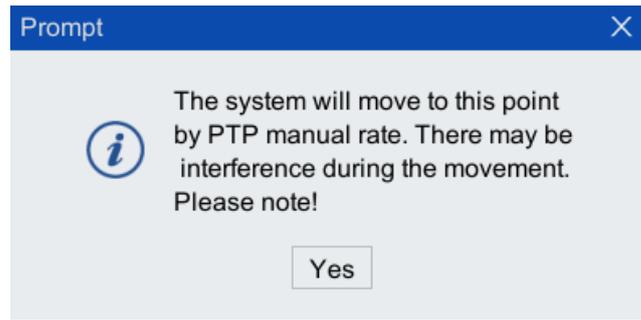


Figure 5-75 "Prompt" Box

6 Monitoring

The expanded view of "Monitoring Menu" is shown in Figure 6-1. The entry of "Monitoring Menu" is shown in Figure 6-2. The contents of parts in "Monitoring Menu" are described below.

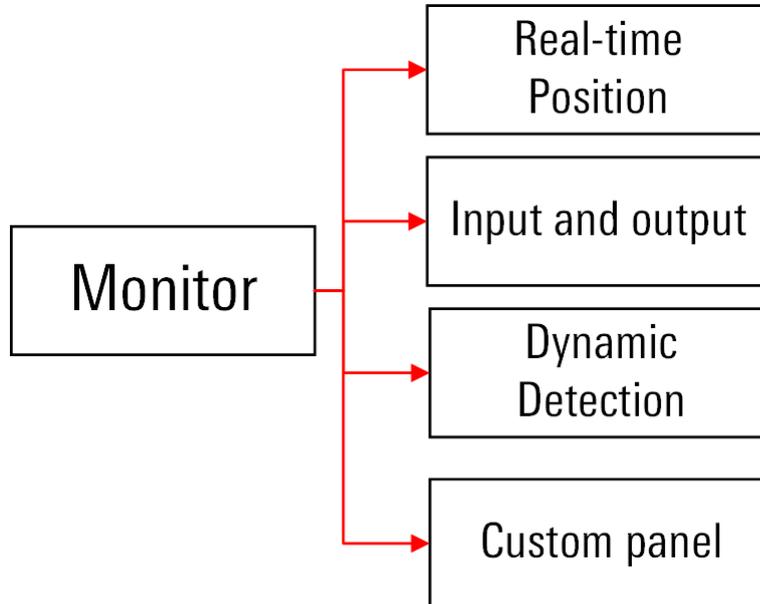


Figure 6-1 Expanded view of "Monitoring Menu"

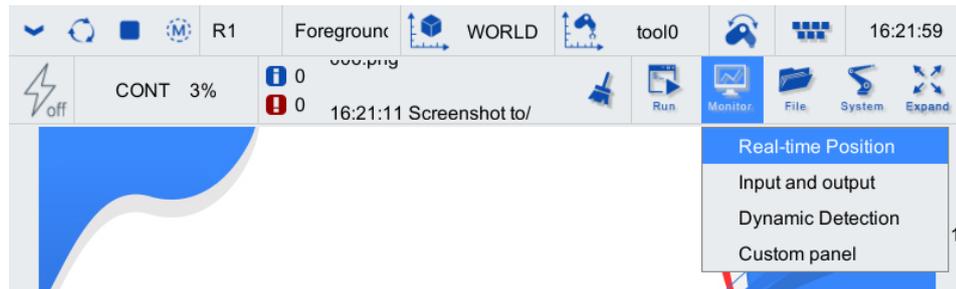


Figure 6-2 "Monitoring Menu" page

6.1 Real-time position

On the main interface of the teach pendant, click "Monitor > Real-time Position" option to enter the "Real-time Position" interface shown in Figure 6-3. Please refer to Table 6-1 for each description.

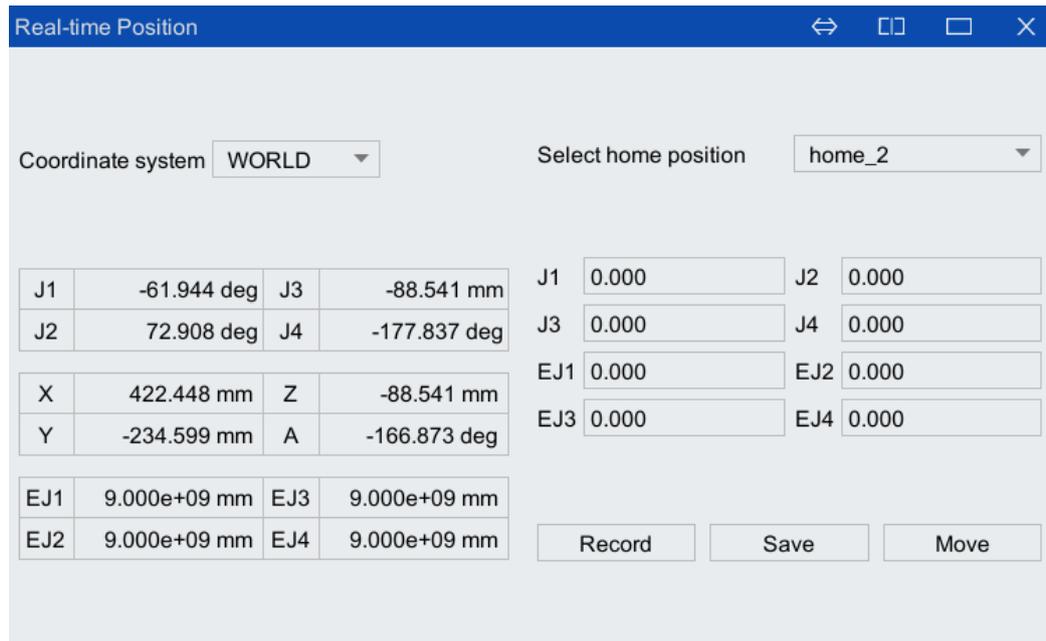
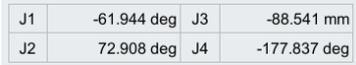
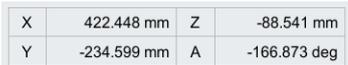
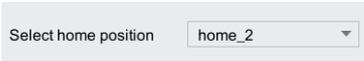
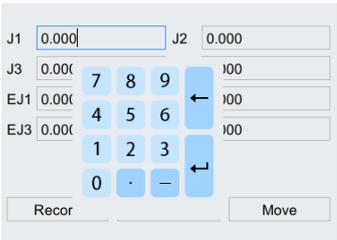
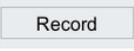
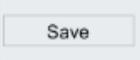
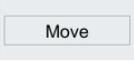


Figure 6-3 "Axis Real-time Position" interface

Table 6-1 Explanation of each part of the "Real-time location" interface

No.	Interface	Description
1		The user can choose the cartesian position coordinate system, which can refer to the world coordinate system, the basic coordinate system or the user-defined user coordinate system
2		"J1~J4" is the current actual position of each axis of the manipulator, the unit is degree
3		"X, Y, Z, A" indicates the current cartesian position of the manipulator "X, Y, Z" represents TCP point coordinates, the unit is mm "A" represents TCP attitude, the unit is degree
4		The user can select the home point from the drop-down list behind "Select home point", there are 5 home points to choose from
5		Click on the text box behind "J1-J4" and "EJ1-EJ4", you can use the pop-up numeric keypad to input numbers that do not exceed the single-axis motion limit  Prompt When the entered number exceeds the limit of the robot's single-axis motion, the background color of the number box turns red and cannot be saved. When saving, a prompt "there is an axis beyond the motion range and the home point

No.	Interface	Description
		cannot be saved" pops up. When clicking to move, a prompt "there is an axis beyond the motion range, and the one-key home point operation cannot be performed" pops up. When the external axis is not configured, when the position of the external axis is 9e+09, it can be saved and moved normally
6		Record the current pose of the robot and fill it in the axis position information of the home point
7		Save the edited or recorded axis position data information of the home point
8		Save and move the edited or recorded axis position data of the home point. If there is no enable signal, execute the save function separately; if there is a manual enable signal, execute the operation of saving and moving the robot to the home point



Prompt One-key home operation is not allowed in automatic mode, please switch to manual mode to perform the operation.

6.2 IO

On the main interface of the teach pendant, click "Monitor > Input/Output" option to enter the "Display IO" interface.

6.2.1 DI signal

"User DI" The 1-26 DIs in the option card are all available DIs provided on the control cabinet. The 26 DIs are shared by the system DI and the user DI. Refer to Figure 6-4. See Table 6-2 for the allocation method.

Table 6-2 Logical address usage allocation of control cabinet DI

Logical address of DI	Distribution
1-26	User DI
	System DI

6.2.1.1 User DI

For user DI, 1-26 DIs are all available. If 1-26 DIs are inadequate, the external MF can be configured to increase the number of IO.

The "User DI" option card supports comments on each signal. The "User DI" annotation related button description in the interface is shown in Table 6-3.

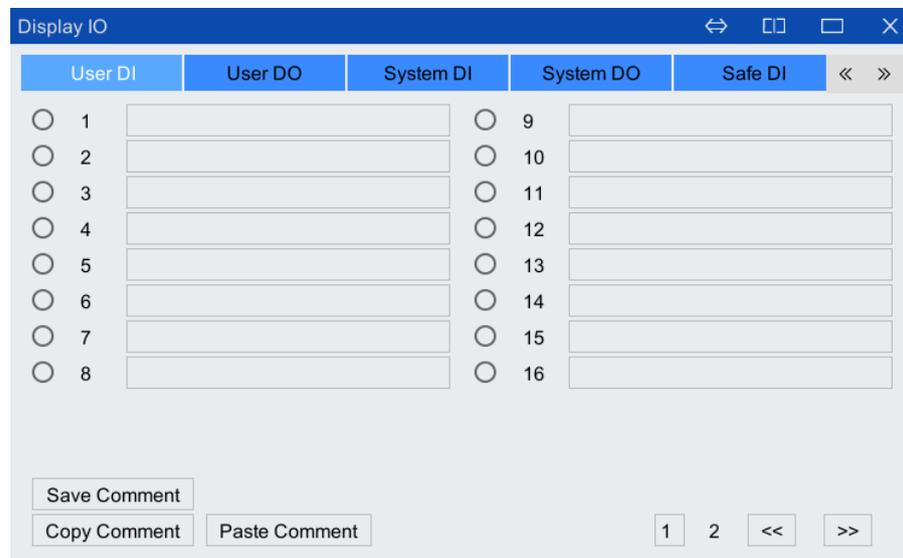
Table 6-3 "User DI" interface annotation related button description

Name	Function
Save (edit) comments	Click on the text box of the user DI/DO annotation to edit and save the annotation content in the text box
Copy comment	Click the text box of the user DI/DO comment, and click the <Copy Comment> button to copy the comment content in the text box
Paste comment	Click the text box of the user DI/DO comment, and click the <Paste Comment> button, the copied comment content will be pasted into the comment text box

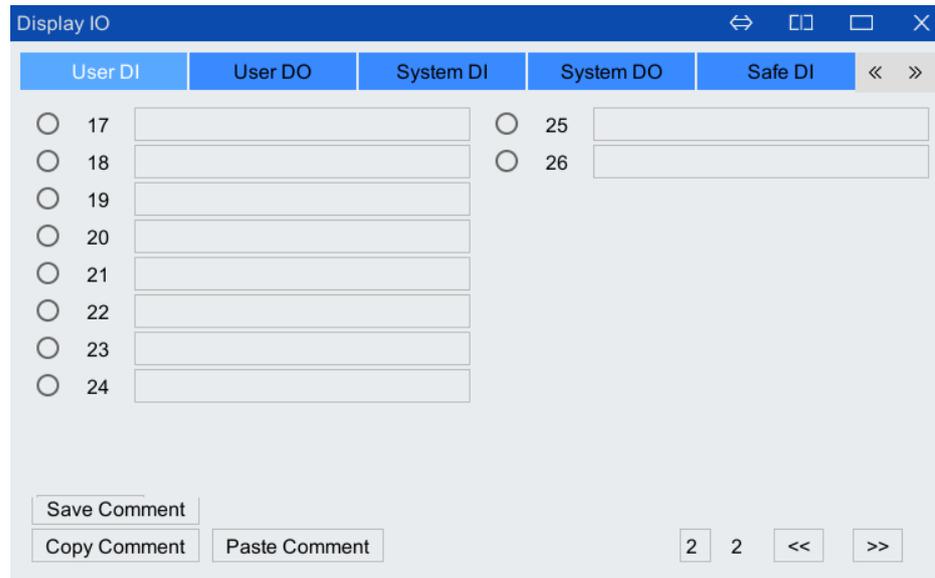
Operation steps:

Step1. Enter the content to be added in the text box behind each signal, and click the <Save Comment> button.

Step2. The "Save comments succeeded!" prompt interface as shown in Figure 6-5 pops up. Click the <OK> button to complete the comment on the signal.



(a) Route 1-16



(b) Route 17-26

Figure 6-4 "User DI" tab

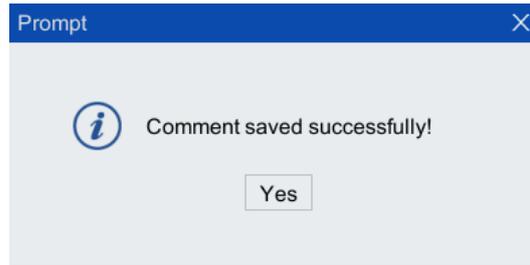


Figure 6-5 "Save the comment successfully!" prompt interface

6.2.1.2 System DI

The status of function of the system DI is displayed on the "system DI" interface, as shown in Figure 6-6. If an external control function is triggered, the corresponding signal indicator will come on. The robot control cabinet calculates the program number according to the relevant system DI, that is, the PGNO value, and then executes the corresponding subprogram according to the program number.

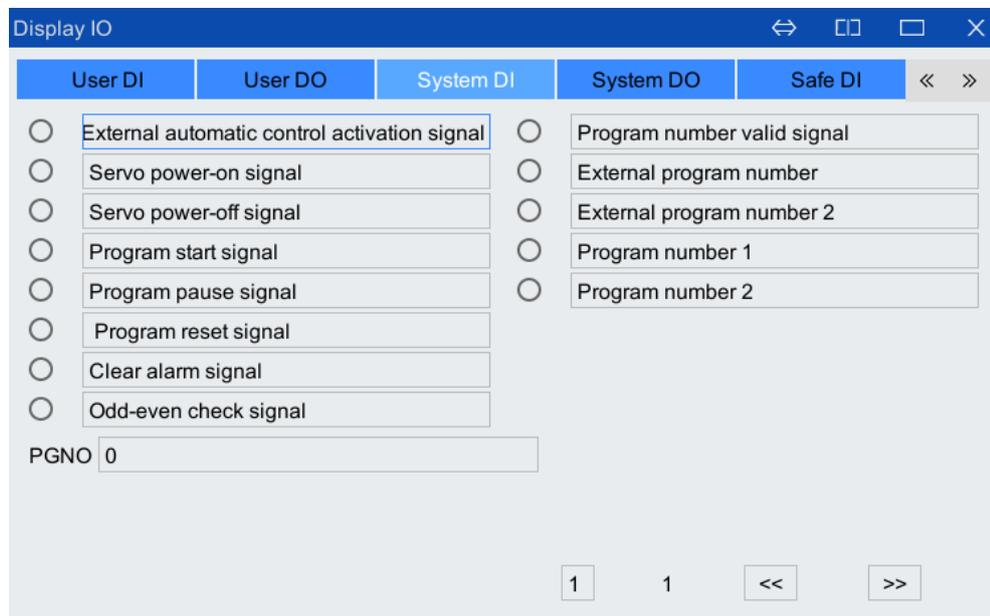


Figure 6-6 "System DI" tab

For system DI, when users use it, they need to configure the corresponding DI logical address for each function in the "External Control" tab in "System > Parameter Configuration" before they can be used, as shown in Figure 6-7.

Parameters For configuration instructions, please refer to Chapter 8.1.

Variable	Name	Value	Unit	Type	Validity
EXT_CTL_ENABLE	EXT_CTL Enable	false		bool	Immediate
EXT_CTL_ACT_DI	EXT_CTL Active DI	0		int	Immediate
SERVO_ON_DI	Servo On DI	0		int	Immediate
SERVO_OFF_DI	Servo Off DI	0		int	Immediate
START_PROG_DI	Start Program DI	0		int	Immediate
PAUSE_PROG_DI	Pause Program DI	0		int	Immediate
RESET_PROG_DI	Reset Program DI	0		int	Immediate
CLEAR_ALARM_DI	Clear Alarm DI	0		int	Immediate
PGNO_TYPE	PGNO Type	0		int	Immediate
PGNO_LENGTH	PGNO Length	4		int	Immediate
PGNO_FBIT_DI	PGNO FBit DI	0		int	Immediate
PGNO_PARITY_DI	PGNO Parity DI	0		int	Immediate

Figure 6-7 "External Control" tab in "Parameter Configuration"

Correspondence between logical address and pin number:

If you configure the functions of the system DI to 1-26 DIs, you need to trigger the corresponding system DI on the pins of the User DI external device. Please refer to Table 6-4 for the correspondence between the pin numbers on the external terminals of User DI and the logical addresses corresponding to 1-26 DIs.

Table 6-4 Correspondence between the logical address of 1-26 DI and the pin number of User DI

The logical address of 1-26 DI	The pin number of User DI
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15

The logical address of 1-26 DI	The pin number of User DI
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24
25	25
26	26

6.2.1.3 Safety DI

The status of the safety DI signal is displayed in the "safety DI" tab, as shown in Figure 6-8. The safety DI signal is configured by default and does not need to be configured by yourself.

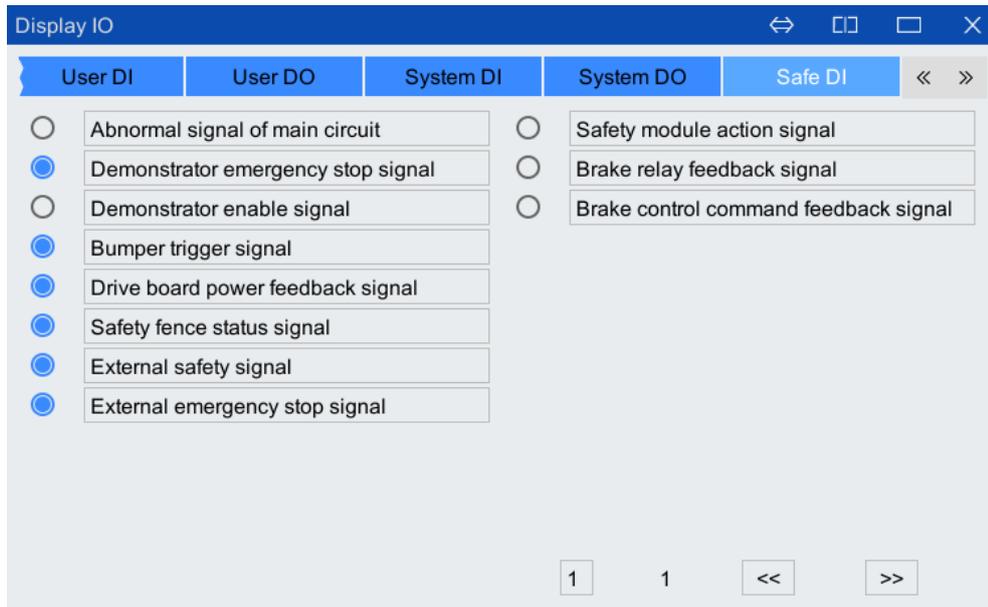


Figure 6-8 Safety DI interface

6.2.2 DO signal

The 1-26 DOs in the "user DO" tab are all available DOs provided on the control cabinet. The 26 DOs are shared by the system DO and the user DO. See Table 6-5 for the allocation method.

Table 6-5 The use and distribution of the logical address of the control cabinet DO

DO logical address	Distribution
1-26	User DO

DO logical address	Distribution
	System DO

6.2.2.1 User DO

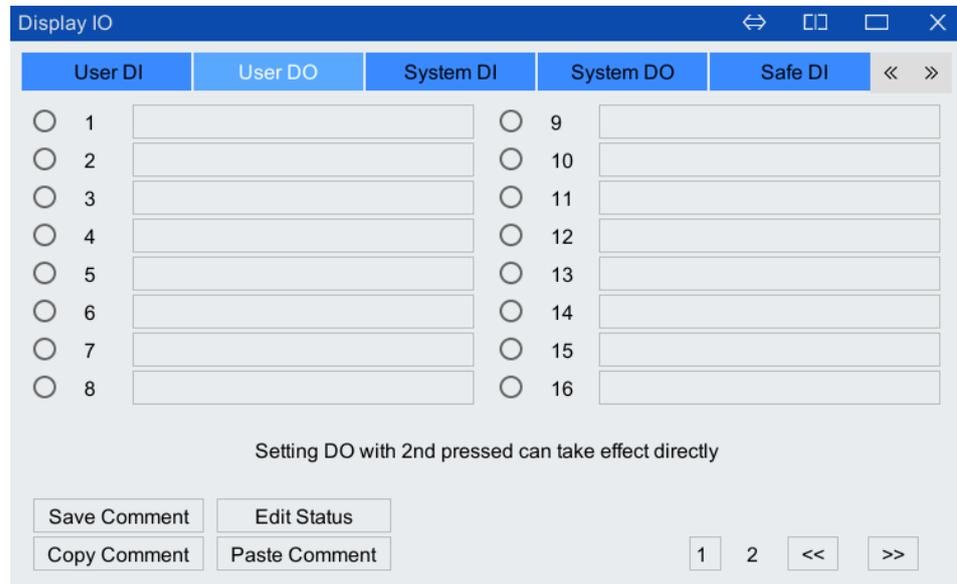
For user DO, 1-26 DO is available. If it is not enough, external MF can be configured to increase the number of IOs. The "User DO" annotation related button description in the interface is shown in Table 6-6.

Table 6-6 "User DO" interface annotation related button description

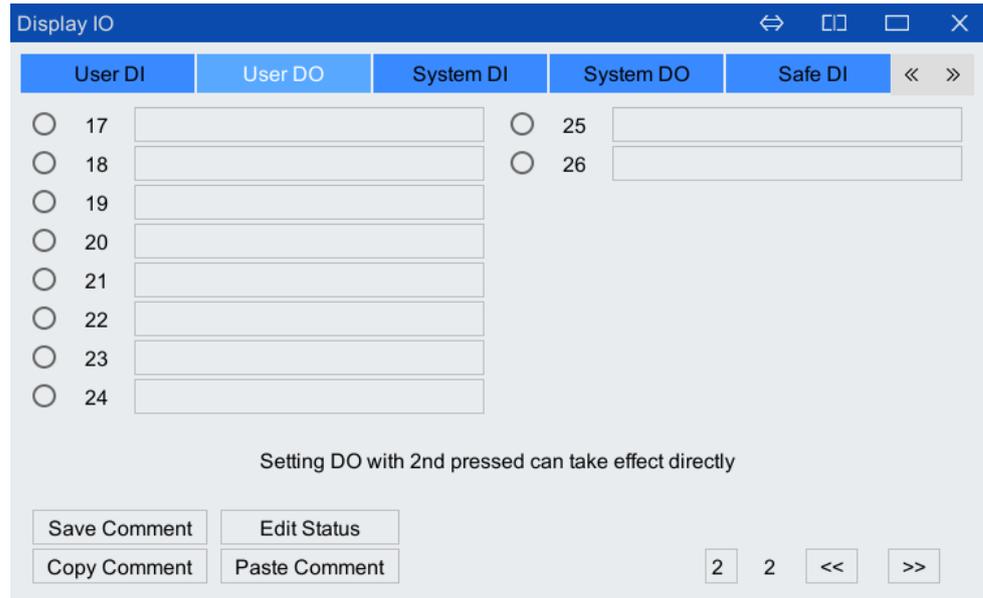
Name	Function
Save (edit) comments	Click on the text box of the user DI/DO annotation to edit and save the annotation content in the text box
Save (edit) state	Click the text box of the user DI/DO comment, and then click the button to change the state of the DO signal
Copy comment	Click the text box of the user DI/DO comment, and click the <Copy Comment> button to copy the comment content in the text box
Paste comment	Click the text box of the user DI/DO comment, and click the <Paste Comment> button, the copied comment content will be pasted into the comment text box

There are 2 ways to set user DO signal status:

- Click the <Edit State> button, manually set 1-26 DO signals, and click the <Save State> button to change the state of the DO signal.
- After clicking the <Edit Status> button, press and hold the "2nd" key to directly set the DO signal status manually, and the DO signal status will take effect directly without clicking the <Save Status> button.



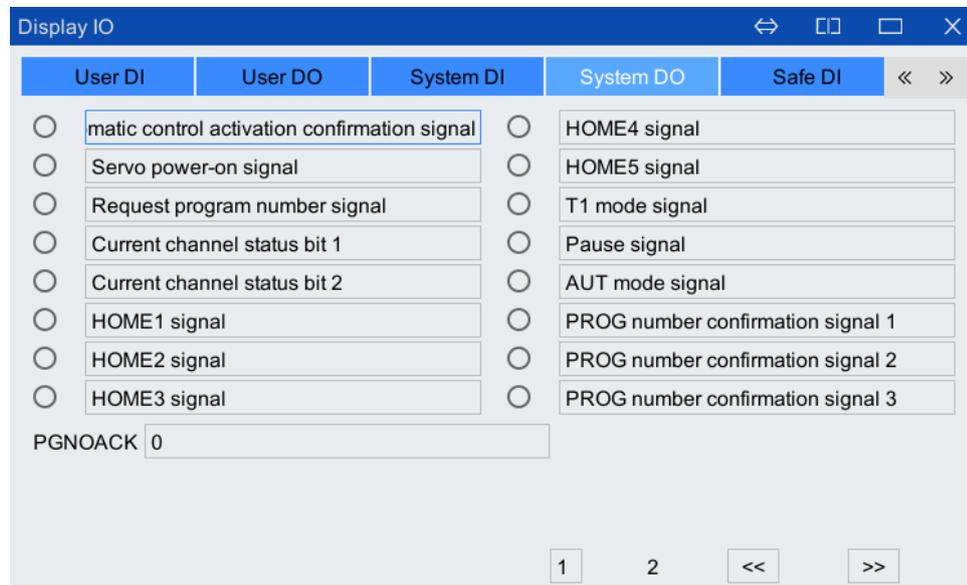
(a) Route 1-16



(b) Route 17-26
Figure 6-9 "User DO" tab

6.2.2.2 System DO

The output status of function of the system DO is displayed on the "system DO" interface, as shown in Figure 6-10. If the DO function of a system is output, the corresponding signal indicator will come on. The robot control cabinet uses the received legal program number as the PGNOACK value and outputs it to the external controller through the relevant system DO, so as to check whether the program number is correct.



(a)



(b)
Figure 6-10 System DO interface

For system DO, when users use it, they need to configure the corresponding DO logic address for each function in the "External Control" tab in "System > Parameter Configuration" before it can be used. As shown in Figure 6-11. For details about parameter configuration, please refer to Section 8.1.

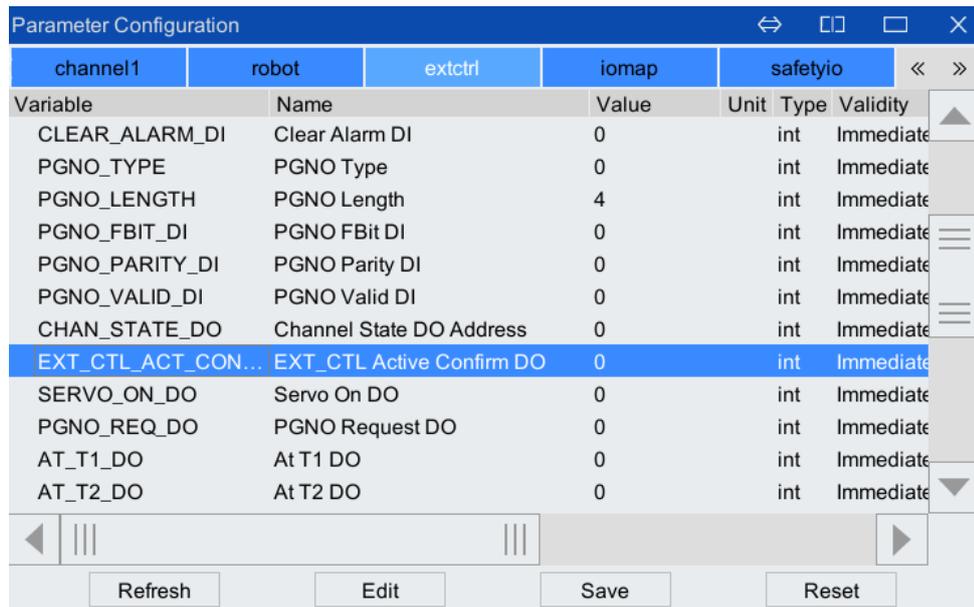


Figure 6-11 Interface of "External Control" tab in parameter configuration

Correspondence between logical address and pin number:

Therefore, if the system DO functions are configured to 1-26 DO, the corresponding DO signal is output to the port signal corresponding to the pin of the User DO external device. For the correspondence between the pin numbers on the external terminals of User DO and the logical addresses corresponding to 1-26 DO, please refer to Table 6-7.

Table 6-7 Correspondence between the logical address of 1-26 DO and the pin number of User DO

1-26 DO logical address	User DO pin number
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10
11	11
12	12
13	13
14	14
15	15
16	16
17	17
18	18
19	19
20	20
21	21
22	22
23	23
24	24
25	25
26	26

6.2.2.3 Safety DO

The status of the safety DO signal is displayed in the "safety DO" tab, as shown in Figure 6-12. The safety DO signal is configured by default and does not need to be configured by the user.

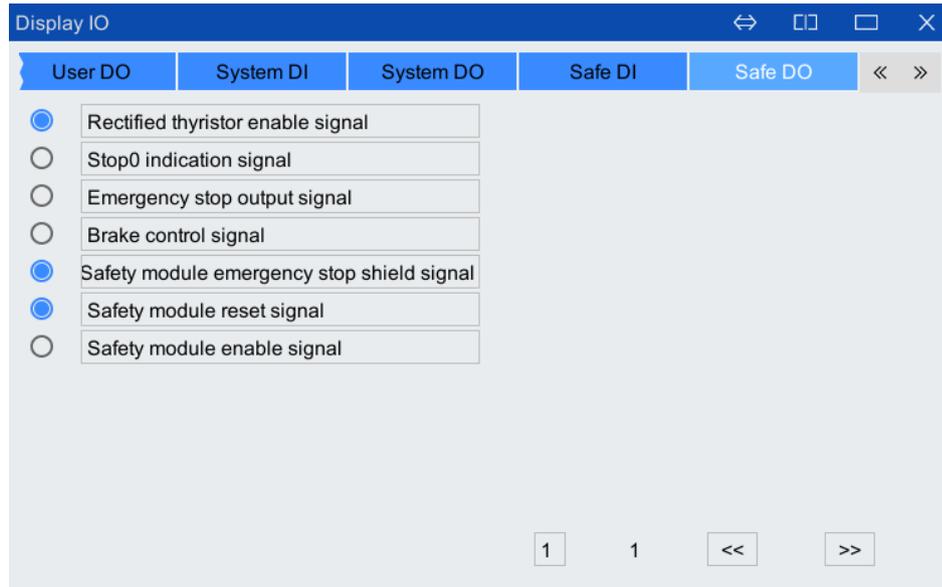


Figure 6-12 "Safety DO" interface

6.2.3 Network control input and output

Use the user's network port with a background program to realize the function of automatic external control of the bus. Based on the socket (socket type, used to communicate with external devices through the network port), the network frame can be sent to the control cabinet through the upper computer (PC side), The background program parses the network frame information and then realizes related functions by changing system variables.

6.2.3.1 Network control input

On the main interface of the teach pendant, click the "Monitor > Input and Output" option to enter the "Display IO" interface, and click the "Network Control Input" tab to switch to the "Network Control Input" display interface, as shown in Figure 6 1.

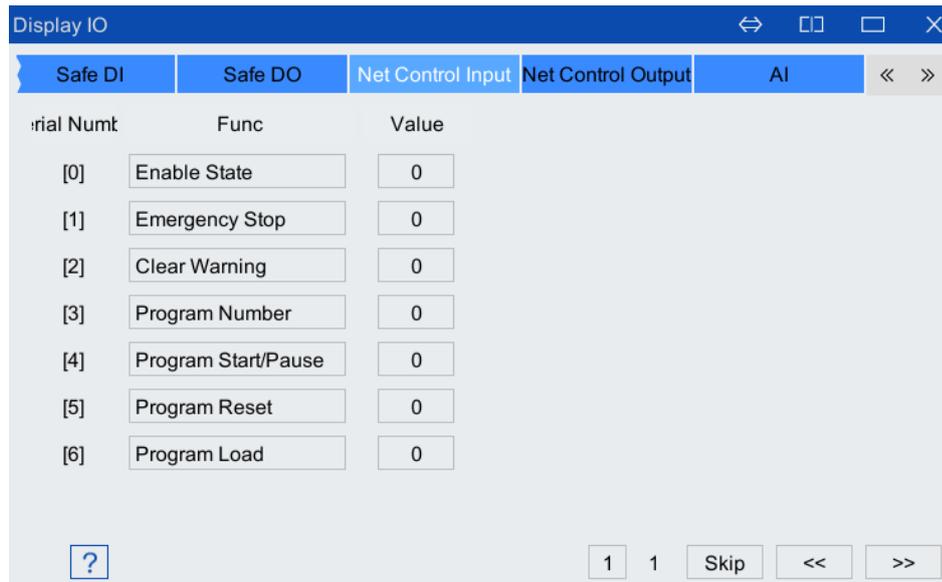


Figure 6-13 "Network control input" Display interface

"Network control input" Please refer to Table 6-8 for the setting description in the display interface.

Table 6-8 "Network control input" Setting instructions in the interface

Name	Description
Num	The serial number corresponds to the value in the system variable EXT_CTRL_IN "serial number", and the system variable EXT_CTRL_IN records the external control input value. For example, EXT_CTRL_IN"1" corresponds to serial number 1, and the function is "emergency stop"
function	The corresponding function when the system variable EXT_CTRL_IN takes different values
value	For the meaning of the value of the system variable EXT_CTRL_IN, please refer to "Appendix D Bus External Automatic Control Interface Data Sheet", or click the "?" at the bottom left of the interface to find it in the "Help" interface shown in Figure 6-14.

The value of the variable corresponds to the meaning:

No.	Variable
0	0: No action 1: Servo Off 2: Servo On
1	0: No action 1: Emergency Stop
2	0: No action 1: Clear Warning
3	Decimal: Corresponding line program number
4	0: No action 1: Program Pause 2: Program Start
5	0: No action 1: Program Reset
6	0: No action 1: Program Load

Yes

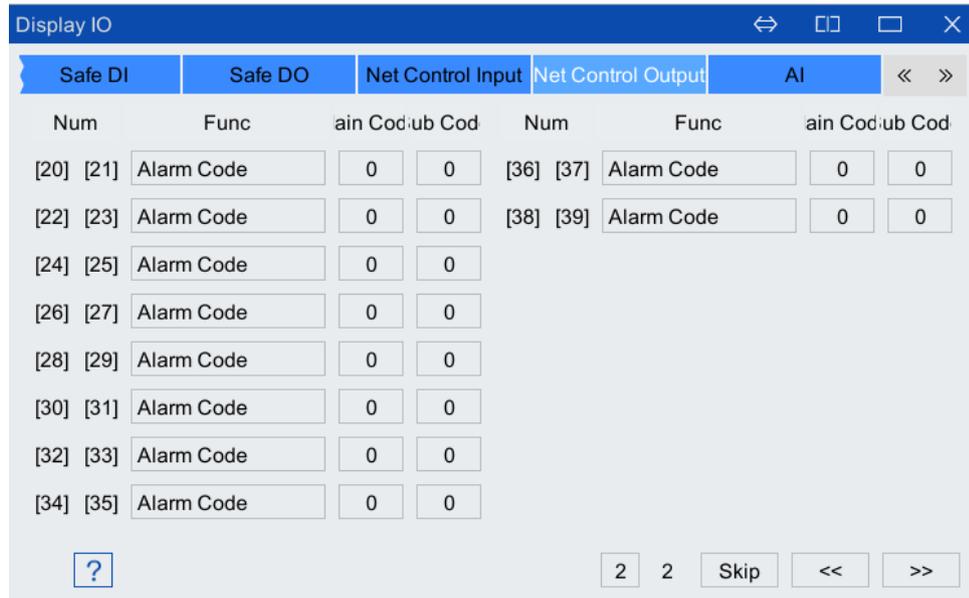
Figure 6-14 "Help" interface

6.2.3.2 Network control output

On the main interface of the teach pendant, click "Monitor > Input/Output" option, enter the "Display IO" interface, click the "Network Control Output" tab, switch to the "Network Control Output" display interface, as shown in Figure 6-15.

Num	Func	Value	Num	Func	Value
[0]	Enable State	0	[8]	Emergency Stop	0
[1]	Whether in home point 1	0	[9]	Safety Door	0
[2]	Whether in home point 2	0	[10]	Drive Ready	1
[3]	Whether in home point 3	0	[11]	program running status	3
[4]	Whether in home point 4	0	[12]	request program number	0
[5]	Whether in home point 5	0	[13]	Whether in T1 mode	1
[6]	whether on track	0	[14]	Whether in T2 mode	0
[7]	Alarm Info/Alarm code	0	[15]	Whether in AUT mode	0

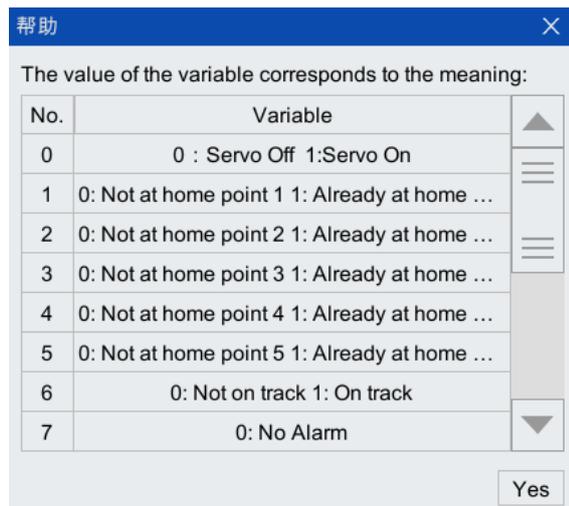
(a) Serial number "1"- "15"



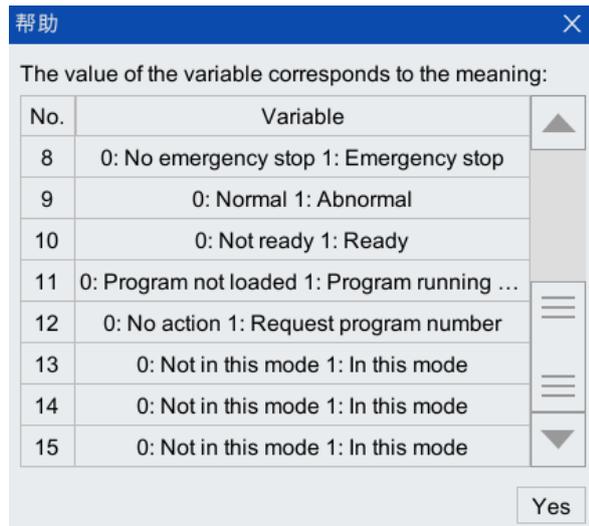
(b) Serial number "20"- "39"
Figure 6-15 "Network control output" display interface

Table 6-9 "Network control output" Setting instructions in the interface

Name	Description
Num	The serial number corresponds to the value in the system variable EXT_CTRL_OUT "serial number", and the system variable EXT_CTRL_OUT records the external control output value. For example, EXT_CTRL_OUT"1" corresponds to serial number 1, and the function is "Whether it is at home point"
function	The corresponding function when the system variable EXT_CTRL_OUT takes different values
Value	For the meaning of the value of the system variable EXT_CTRL_OUT, please refer to "Appendix D Bus External Automatic Control Interface Data Sheet", or click the "?" icon at the bottom left of the interface to find it in the "Help" interface that pops up as shown in Figure 6-16



(a) Serial number "1"- "7"



(b) Serial number "8"-"15"
Figure 6-16 "Help" interface

6.2.4 Analogue real-time display

After the user configures the analog interface, the value of the analog can be displayed or modified in the "AI/AO" interface.

Take the IEB_BASE slave station as an example to introduce how to use the "AI/AO" interface.

Configuration steps:

Step1. Connect IEB and IEB_BASE for inCube20/21 control cabinet expansion analog interface, encoder interface, magnetic scale interface or PWM output interface. For the specific connection method, please refer to our company's "Multifunctional Interface Expansion System User Manual".

Step2. Configure IEB_BASE slave station. Please refer to Chapter 8.3.4 for the configuration method. Please refer to Figure 6-17 for the completed configuration interface.

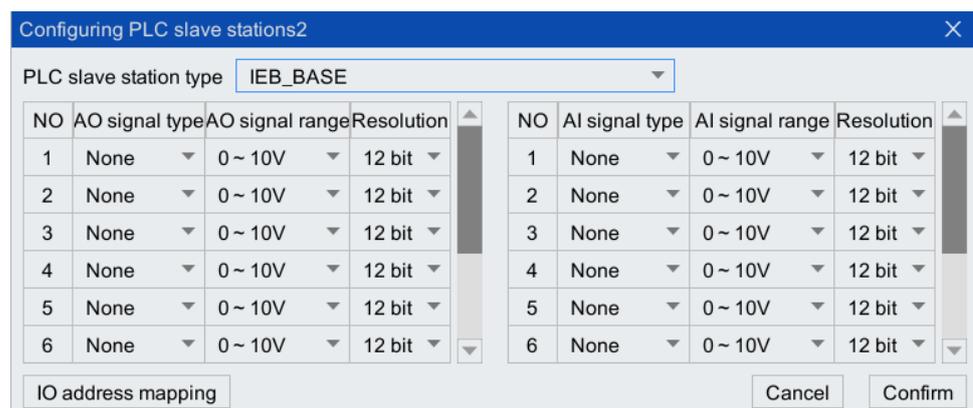


Figure 6-17 IEB_BASE slave configuration

Step3. On the main interface of the teach pendant, click "Monitor > Input/Output" option to enter the "Display IO" interface, and click the "AI/AO" tab to switch to the "AI/AO" display interface.

Step4. The "Port Number" 1-6 shown in Figure 6-18 corresponds to the "AI signal type" 1-6 in Figure 6-17; the "Port Number" 1-3 shown in Figure 6-19 corresponds to Figure 6-17. The "AO signal type" in 1-3 corresponds to 1-3. Please refer to Table 6-10 for the setting description in the "AI/AO" interface.

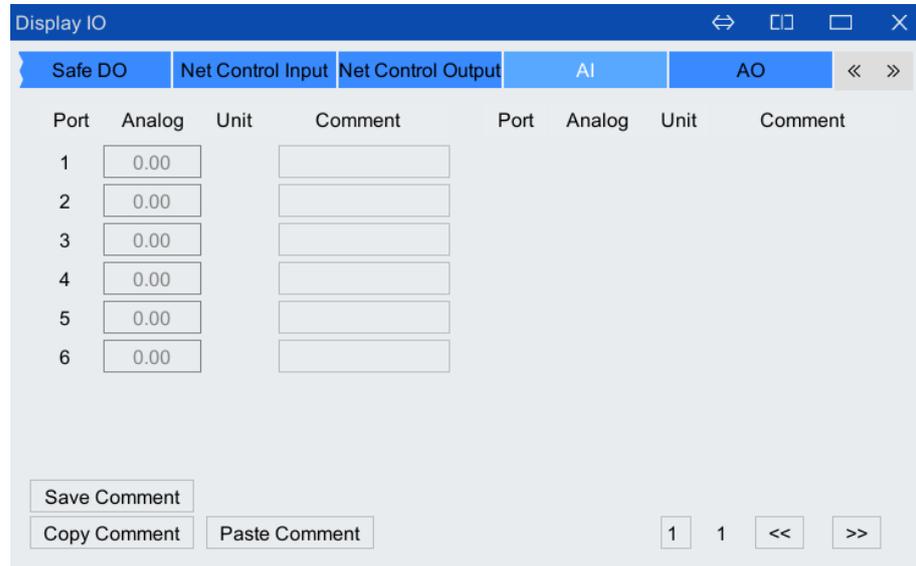


Figure 6-18 "AI" Real-time display of analog in the interface

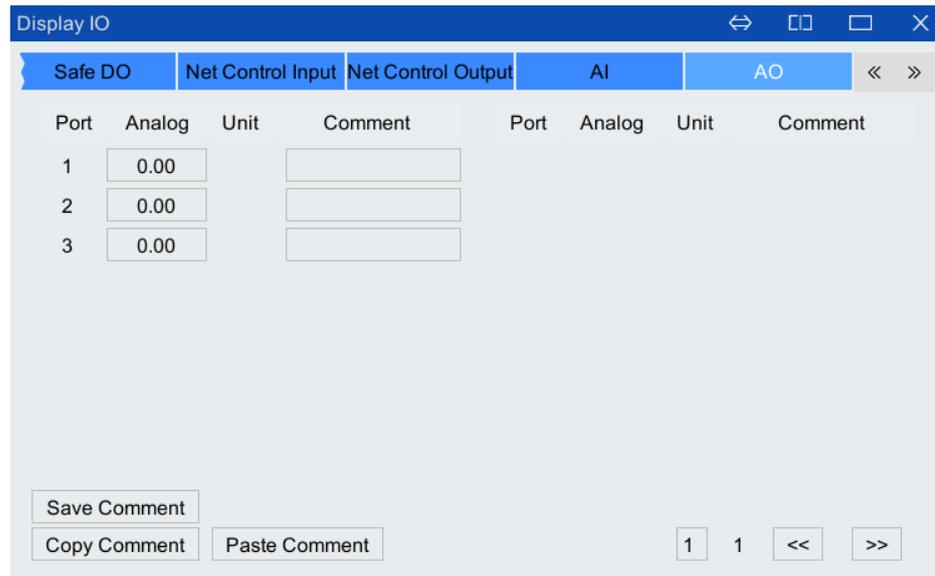


Figure 6-19 Real-time display of analog quantity in "AO" interface

Table 6-10 Setting instructions in "AI/AO" interface

Name	Description	Remarks
Port number	The number of AI/AO port numbers varies with the number of analog ports actually connected to the control cabinet	The number of ports varies with the actual configuration of the PLC
Analog	Display analog value	In the "AO" interface, click the "Analog" text box and a pop-up window will pop up. You can modify the value in the new window, and use the <Confirm/Cancel> button to determine whether the modification is effective or not.

Name	Description	Remarks
		In the "AI" interface, the value displayed after "Analog" cannot be modified
Unit	mA or V	The specific unit is determined by the PLC configuration type (current type displays mA, voltage type displays V)
Comment	The default is empty, the user can modify	Same as user DI/DO, please refer to Chapter 6.2.1-Chapter 6.2.2

6.3 Dynamic Monitoring

On the main interface of the teach pendant, click "Monitor > Dynamic Monitoring" to enter the "Dynamic Monitoring" interface shown in Figure 6-20. The dynamic monitoring function can dynamically monitor the instruction position, feedback position, and Data such as rotation speed, torque and current. Refer to Table 6-11 for the description of each item in the interface.

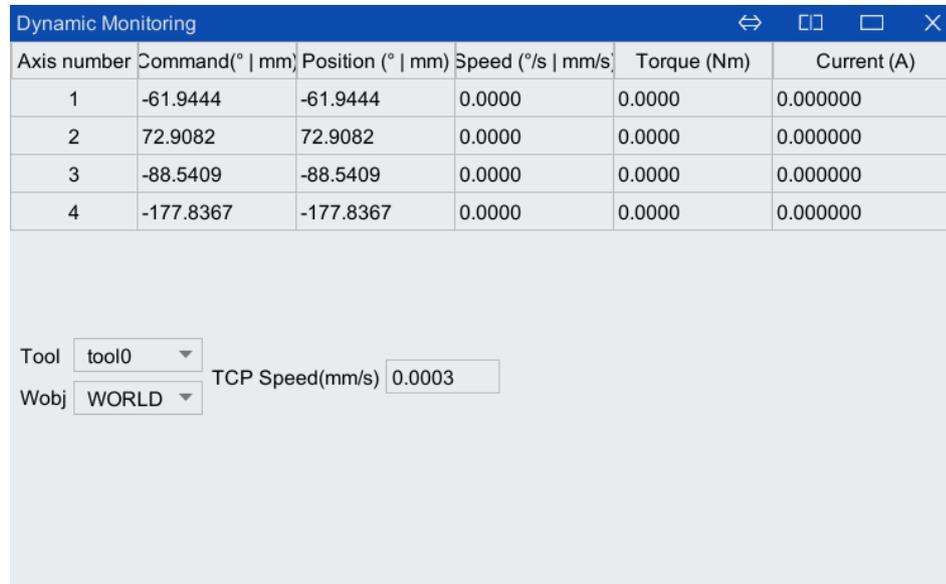


Figure 6-20 "Dynamic Monitoring" interface

Table 6-11 "Dynamic Monitoring" Setting instructions in the interface

Name	Description
Shaft number	1-4 axes of the robot
Instruction position (° or mm)	Instruction position of each axis of the robot
Position (° or mm)	Feedback position of each axis of the robot
Speed (°/s or mm/s)	The rotation speed of each axis motor of the robot
Torque (Nm)	The torque of each axis motor of the robot
Current (A)	The current of each axis motor of the robot
Tool coordinate system	Specify the tool coordinate system used for the linear velocity of the robot TCP point
Workpiece coordinate system	Specify the workpiece coordinate system used by the robot TCP point linear velocity
TCP speed (mm/s)	Real-time display of the line speed of the robot TCP point

6.4 Custom Panel

6.4.1 Custom panel setting screen

On the main interface of the teach pendant, click "Monitor > Custom Panel" option to enter the "Custom Panel" interface shown in Figure 6-21. The user-defined panel is an operation panel that can be configured with indicator lights to display signal status, ON/OFF buttons to execute signals, etc. For the types of buttons that make up the screen, please refer to Figure 6-22.

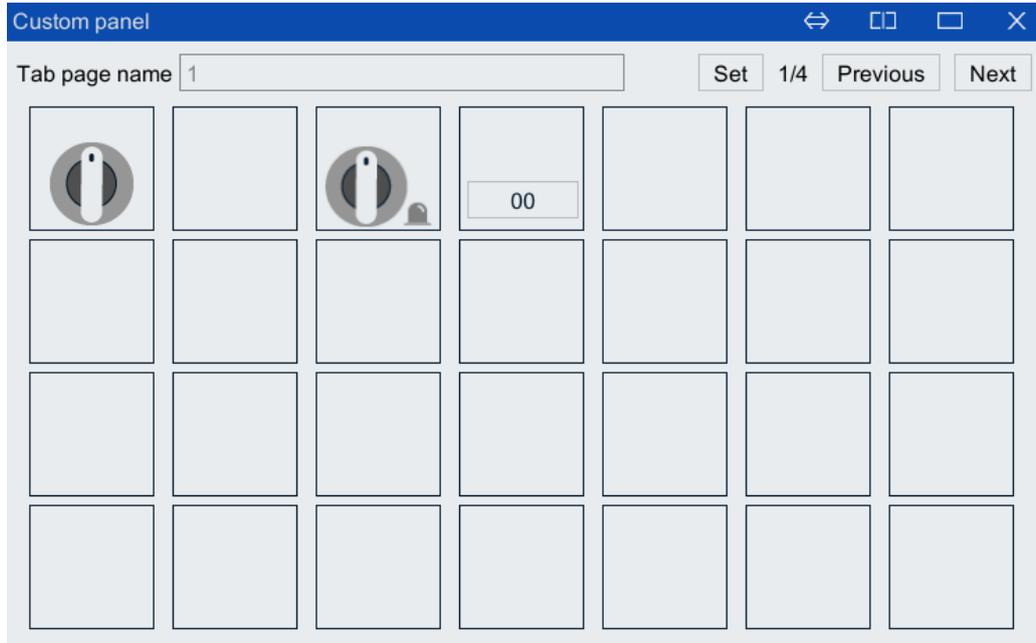


Figure 6-21 Custom panel setting screen

6.4.2 Switch/lamp type setting screen

Figure 6-22 is the screen for determining the switch/lamp type. Displayed when the <Settings> button is pressed on the custom panel screen.

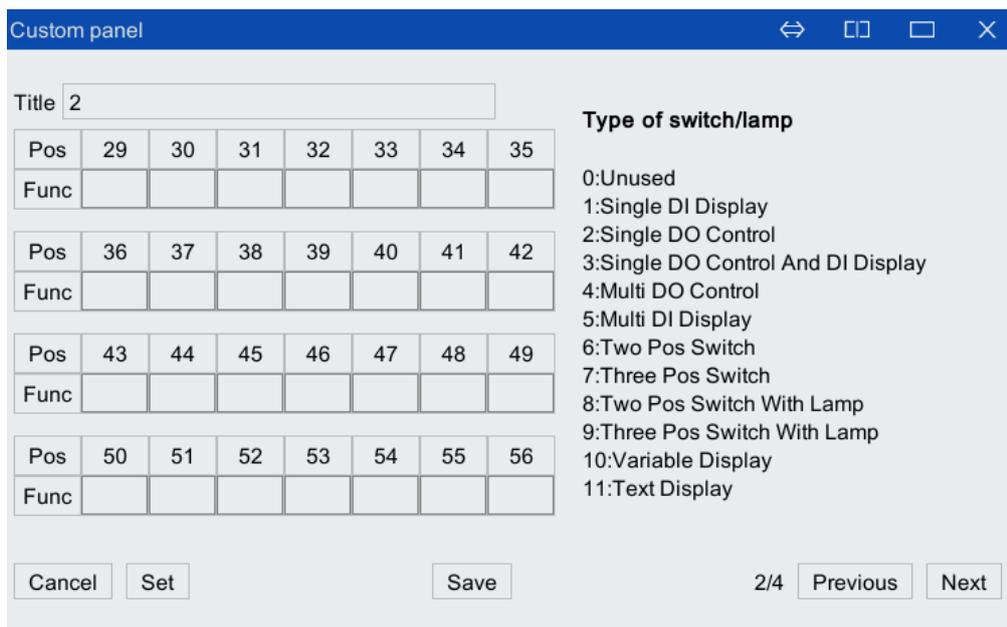
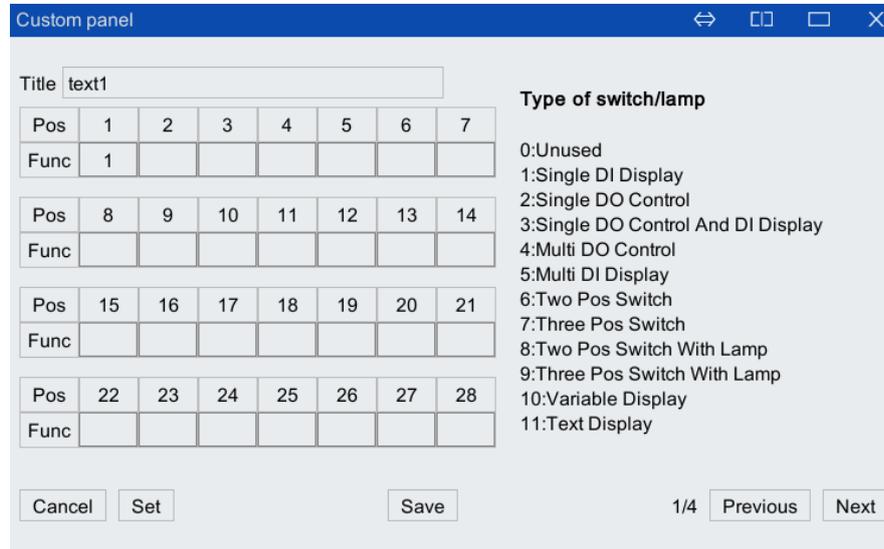


Figure 6-22 Switch/lamp type setting screen

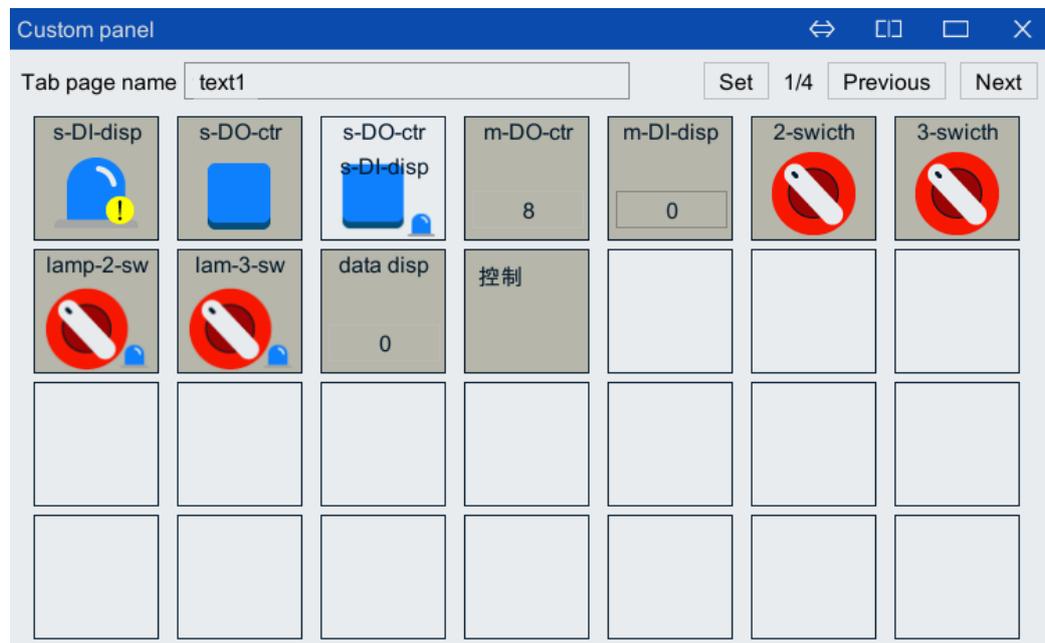
Screen title

In the "Screen Title" in Figure 6-22, you can set the "Label Page Name" that defines each panel screen.

For example, enter "text1" in the input box behind "Screen Title" and click the <Save> button at the bottom of the interface to jump to its corresponding custom setting screen. "Label Page Name" is displayed as "text1", refer to Figure 6-23.



(a) Screen title



(b) Tab name
Figure 6-23 Setting and display of screen title

Position number

The "position number" in the switch/indicator type setting screen corresponds to the monitoring position in the custom panel. Please refer to Figure 6-24. Each page has 28 numbers, totaling 112.

Title text1							
Pos	1	2	3	4	5	6	7
Func	1						
Pos	8	9	10	11	12	13	14
Func							
Pos	15	16	17	18	19	20	21
Func							
Pos	22	23	24	25	26	27	28
Func							

(a) "Position number" in the switch/lamp type setting screen



(b) Custom panel monitoring position number
Figure 6-24 Position number correspondence

Function display bar

Below the position number is used to fill in the serial number of the selected switch/indicator, please refer to Figure 6-25.

Type of switch/lamp	
0:	Unused
1:	Single DI Display
2:	Single DO Control
3:	Single DO Control And DI Display
4:	Multi DO Control
5:	Multi DI Display
6:	Two Pos Switch
7:	Three Pos Switch
8:	Two Pos Switch With Lamp
9:	Three Pos Switch With Lamp
10:	Variable Display
11:	Text Display

Figure 6-25 Position number correspondence

6.4.3 Switch setting method

This section explains the switch functions and setting methods provided by the controller.

6.4.3.1 Single DI display

After inputting "25" in the desired switch position, click the <Set> button to enter the "Single DI Display" interface as shown in Figure 6-26. For the setting instructions in the interface, see Table 6-12.

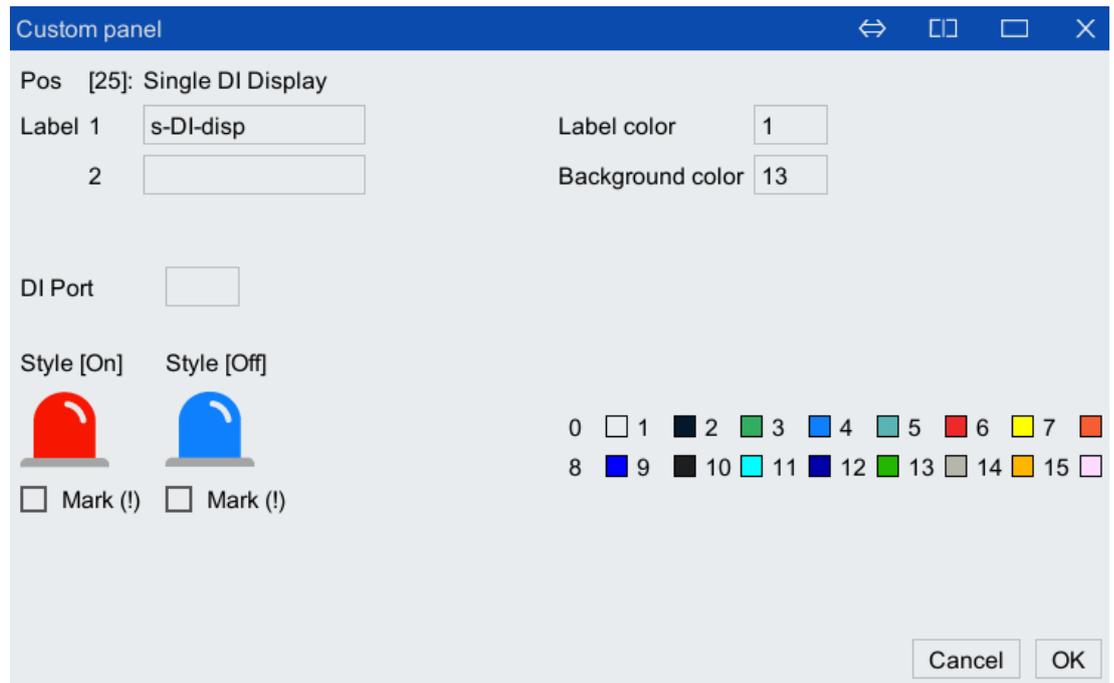
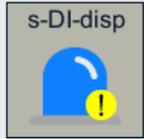


Figure 6-26 "Single DI display" Setting interface

Table 6-12 Setting instructions in "Single DI display" interface

Name	Description
Label 1	You can enter up to 10 characters in the text box behind "Label 1". When editing, clicking the text box will display the soft keyboard for entering the label name, and the label name after setting will be displayed at the top of the switch. In this example, the label name is set to s-DI-disp
Label 2	Up to 10 characters can be entered in the text box behind "Label 2". When editing, clicking the text box

Name	Description
	will display the soft keyboard for entering the label name. In this example, do not set
Label color	Set the color of the label name in "Label Color". For details, please refer to Chapter 6.4.3.11. In this example, the label name is set to grayish blue
Background color	Set the background color of "Single DI Display" in "Background Color". For details, please refer to Chapter 6.4.3.11. In this example, the background color is set to gray
Corresponding DI port number	In this example, the corresponding DI port number is set to 1
Style "on"	<p>After the previous settings are completed, in the custom panel, when DI port number 1 turns ON, the indicator light turns red, as shown in Figure 6 29</p>  <p>Figure 6-27 Customized panel display when DI port number 1 turns ON</p>
Style "OFF"	<p>After the previous settings are completed, in the custom panel, when DI port number 1 turns OFF, the indicator light turns blue, as shown in Figure 6 29</p>  <p>Figure 6-28 Customized panel display when DI port number 1 turns OFF</p>
Exclamation point (!)	<p>Check this option under the style "On/Off", the indicator will display an exclamation mark when DI port number 1 turns ON/OFF. Take DI port number 1 as an example, as shown in Figure 6 30</p>  <p>Figure 6-29 When DI port number 1 turns OFF (check the exclamation mark) custom panel is displayed</p>

6.4.3.2 Single DO control

After inputting "25" in the desired switch position, click the <Set> button to enter the "Single DO control" interface as shown in Figure 6-30. For the setting instructions in the interface, see Table 6-13.



Figure 6-30 "Single DO control" setting interface

Table 6-13 Setting instructions in "Single DO control" interface

Name	Description
Label 1	You can enter up to 10 characters in the text box behind "Label 1". When editing, clicking the text box will display the soft keyboard for entering the label name, and the label name after setting will be displayed at the top of the switch. In this example, the tag name is set to s-DO-ctr
Label 2	Up to 10 characters can be entered in the text box behind "Label 2". When editing, clicking the text box will display the soft keyboard for entering the label name. In this example, do not set
Label color	Set the color of the label name in "Label Color". For details, please refer to Chapter 6.4.3.11. In this example, the label name is set to grayish blue
Background color	Set the background color of "Single DO control" in "Background Color". For details, please refer to Chapter 6.4.3.11. In this example, the background color is set to gray
Corresponding DO port number	In this example, the corresponding DO port number is set to 2
Style "on"	<p>After the previous settings are completed, in the custom panel, the switch turns red and the DO port number 2 turns ON, as shown in Figure 6 32</p>  <p>Figure 6-31 Customized panel display when DO port number 2 turns ON</p>
Style "OFF"	<p>After the previous settings are completed, in the custom panel, the switch turns blue and the DO port number 2 turns OFF, as shown in Figure 6 33</p>  <p>Figure 6-32 Customized panel display when DO port number 2 turns OFF</p>
Allow operation	Set "Allow Operation" to "No", no operation, only the current status of DO is displayed

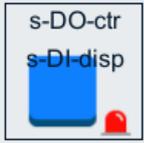
6.4.3.3 Single DO control and DI display

After inputting "25" in the required switch position, click the <Set> button to enter the "Single DO control and DI display" interface as shown in Figure 6-33. For the setting instructions in the interface, see Table 6-14.



Figure 6-33 "Single DO control and DI display" Setting interface

Table 6-14 Setting instructions in "Single DO control and DI display" interface

Name	Description
Label 1	You can enter up to 10 characters in the text box behind "Label 1". When editing, clicking the text box will display the soft keyboard for entering the label name, and the label name after setting will be displayed at the top of the switch. In this example, the tag name is set to s-DO-ctr
Label 2	Up to 10 characters can be entered in the text box behind "Label 2". When editing, clicking the text box will display the soft keyboard for entering the label name. In this example, the label name is set to s-DI-disp
Label color	Set the color of the label name in "Label Color". For details, please refer to Chapter 6.4.3.11. In this example, the label name is set to grayish blue
Corresponding DO port number	In this example, the corresponding DO port number is set to 3
Corresponding DI port number	In this example, the corresponding DI port number is set to 4
Style "on"	After the previous settings are completed, in the custom panel, when the DO port number 4 turns ON, the switch turns red, as shown in Figure 6 32 
Style "OFF"	After the previous settings are completed, in the custom panel, when the DO port number 4 turns OFF, the switch turns blue, as shown in Figure 6 33

Name	Description
	 <p>Figure 6-35 Customized panel display when DO port number 2 turns OFF</p>
Allow operation	Setting "Allow Operation" to "No" will make the switch on the custom panel inoperable

6.4.3.4 Multi DO control

After inputting "1" in the desired switch position, click the <Set> button to enter the "Multi DO control" interface as shown in Figure 6-36. For the setting instructions in the interface, see Table 6-15.

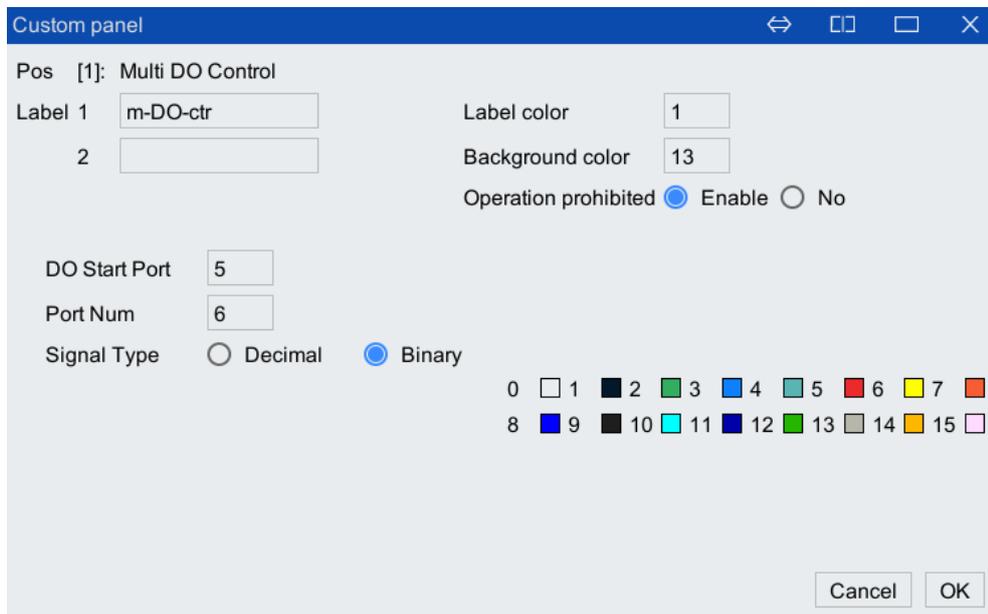


Figure 6-36 "Multi DO control" setting interface

Table 6-15 Setting instructions in "Multi-channel DO control" interface

Name	Description
Label 1	You can enter up to 10 characters in the text box behind "Label 1". When editing, clicking the text box will display the soft keyboard for entering the label name. The label name after setting will be displayed at the top of the switch. In this example, the tag name is set to m-DO-ctr
Label 2	You can enter up to 10 characters in the text box behind "Label 2". When editing, clicking the text box will display the soft keyboard for entering the label name. In this example, do not set
Label color	Set the color of the label name in "Label Color". For details, please refer to Chapter 6.4.3.11. In this example, the label name is set to grayish blue
Background color	Set the background color of "Multi-channel DO control" in "Background Color". For details, please refer to Chapter 6.4.3.11. In this example, the background color is set to gray
Corresponding to the starting DO port number	In this example, the corresponding start DO port number is set to 5
Number of corresponding ports	In this example, the number of corresponding ports is set to 6

Name	Description
Signal display type	In this example, the signal display type is selected as "Binary"
	<p>After the previous settings are completed, they will be displayed in the custom panel, as shown in Figure 6-38 below</p>  <p>Figure 6-37 Custom panel display</p>
Allow operation	<p>Setting "Allow Operation" to "No" will make the switch on the custom panel inoperable;</p> <p>Set "Allow Operation" to "Yes", if it is set to 000001, then the corresponding output DO5 is high</p>

6.4.3.5 Multi DI display

After inputting "1" in the desired switch position, click the <Set> button to enter the "Multi DI display" interface as shown in Figure 6-38. The setting instructions in the interface are shown in Table 6-16.

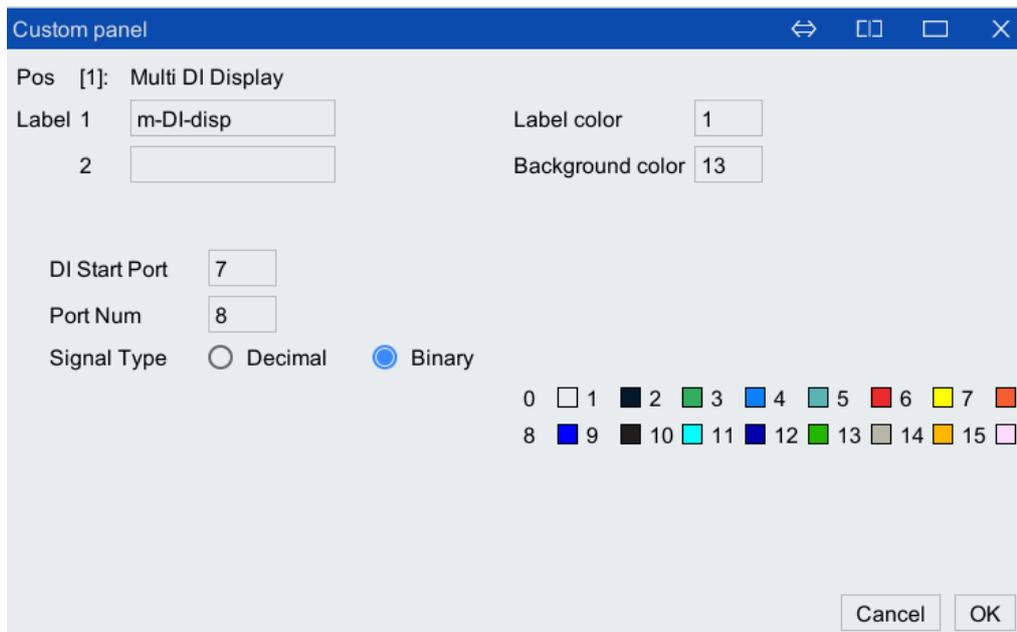


Figure 6-38 "Multi DI display" setting interface

Table 6-16 Setting instructions in "Multi-channel DI display" interface

Name	Description
Label 1	You can enter up to 10 characters in the text box behind "Label 1". When editing, clicking the text box will display the soft keyboard for entering the label name. The label name after setting will be displayed at the top of the switch. In this example, the label name is set to m-DI-disp
Label 2	You can enter up to 10 characters in the text box behind "Label 2". When editing, clicking the text box will display the soft keyboard for entering the label name. In this example, do not set
Label color	Set the color of the label name in "Label Color". For details, please refer to Chapter 6.4.3.11. In this example, the label name is set to grayish blue
Background color	Set the background color of "Multiple DI Display" in "Background Color". For details, please refer to

Name	Description
	Chapter 6.4.3.11. In this example, the background color is set to gray
Corresponding to the starting DI port number	In this example, the corresponding start DO port number is set to 7
Number of corresponding ports	In this example, the number of corresponding ports is set to 8
Signal display type	In this example, the signal display type is "Hexadecimal"
	After the previous settings are completed, they will be displayed in the custom panel, as shown in Figure 6-40 below 

Figure 6-39 Custom panel display

6.4.3.6 Two pos switch

After inputting "1" at the desired switch position, click the <Set> button to enter the "Two pos switch" setting interface as shown in Figure 6-40. For the setting instructions in the interface, see Table 6-17.

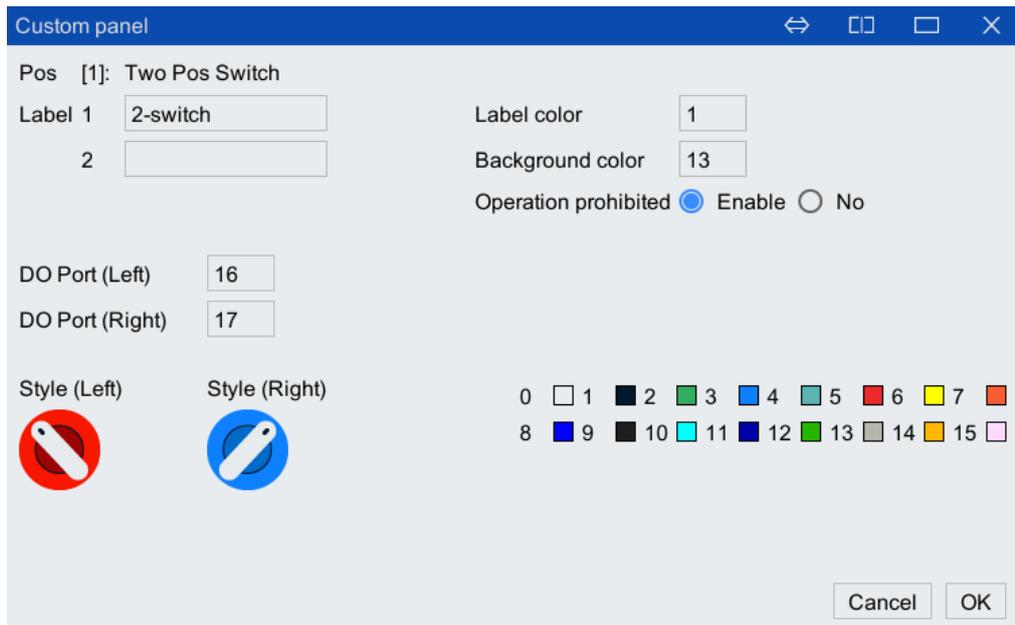


Figure 6-40 "Two pos switch" setting interface

Table 6-17 Setting instructions in "Two pos switch" interface

Name	Description
Label 1	You can enter up to 10 characters in the text box behind "Label 1". When editing, clicking the text box will display the soft keyboard for entering the label name, and the label name after setting will be displayed at the top of the switch. In this example, the label name is set to "2-switch"
Label 2	Up to 10 characters can be entered in the text box behind "Label 2". When editing, clicking the text box will display the soft keyboard for entering the label name. In this example, do not set

Name	Description
Label color	Set the color of the label name in "Label Color". For details, please refer to Chapter 6.4.3.11. In this example, the label name is set to grayish blue
Background color	Set the background color of the "Two pos switch" in "Background Color". For details, please refer to Chapter 6.4.3.11. In this example, the background color is set to gray
DO port (Left)	In this example, the corresponding DO port number is set to 16
DO port (Right)	In this example, the corresponding DO port number is set to 17
Style (Left)	<p>After the previous settings are completed, in the custom panel, the switch turns red when it is turned (left), as shown in Figure 6 42 and the DO port number 16 turns ON, and at the same time, D017 is low.</p>  <p>Figure 6 The custom panel display when the switch is turned to (left)</p>
Style (Right)	<p>After the previous settings are completed, in the custom panel, the switch turns blue when it is turned (right) as shown in Figure 6 43 and the DO port number 17 becomes ON, and at the same time, D016 will become low.</p>  <p>Figure 6 The custom panel display when the switch is turned to (right)</p>
Operation prohibited	Setting "Operation prohibited" to "No" will make the switch on the custom panel inoperable.

6.4.3.7 Three pos switch

After inputting "1" at the desired switch position, click the <Set> button to enter the "Three pos switch" setting interface as shown in Figure 6-41. For the setting instructions in the interface, see Table 6-18.

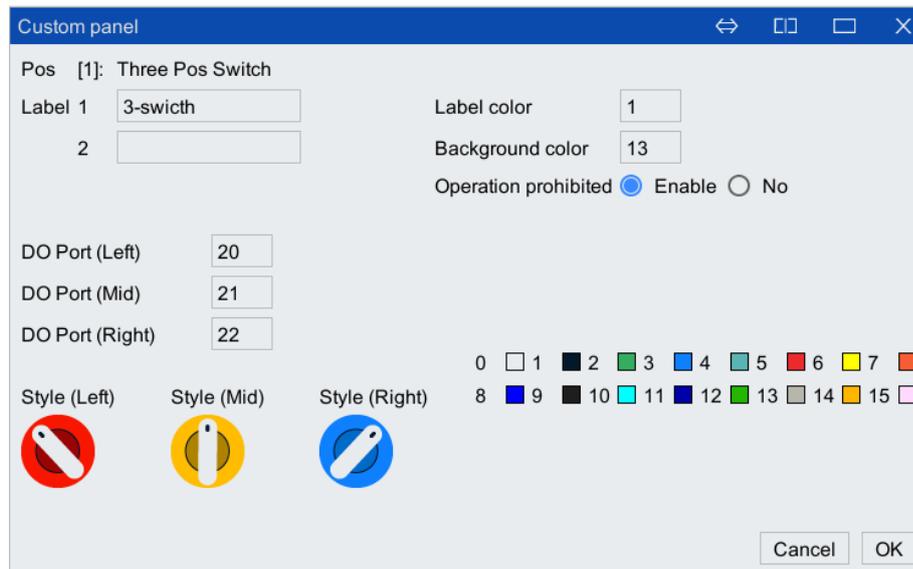
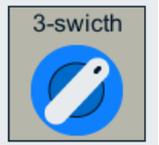


Figure 6-41 "Three pos switch" setting interface

Table 6-18 Setting instructions in "Three pos switch" interface

Name	Description
Label 1	You can enter up to 10 characters in the text box behind "Label 1". When editing, clicking the text box will display the soft keyboard for entering the label name, and the label name after setting will be displayed at the top of the switch. In this example, the label name is set to "3-switch"
Label 2	Up to 10 characters can be entered in the text box behind "Label 2". When editing, clicking the text box will display the soft keyboard for entering the label name. In this example, do not set
Label color	Set the color of the label name in "Label Color". For details, please refer to Chapter 6.4.3.11. In this example, the label name is set to grayish blue
Background color	Set the background color of the " Three pos switch" in "Background Color". For details, please refer to Chapter 6.4.3.11. In this example, the background color is set to gray
DO port (Left)	In this example, the corresponding DO port number is set to 20
DO port (Mid)	In this example, the corresponding DO port number is set to 21
DO port (Right)	In this example, the corresponding DO port number is set to 22
Style (Left)	<p>After the previous settings are completed, in the custom panel, the switch turns red when it is turned (left), as shown in Figure 6 45 and the DO port number 20 turns ON at the same time, DO21 and DO22 will turn low</p>  <p>Figure 6-42 Customize the panel display when the switch is turned to (left)</p>
Style (Mid)	<p>After the previous settings are completed, in the custom panel, the switch turns blue when it is turned to (Mid), as shown in Figure 6 46 and the DO port number 21 turns ON, DO20 and DO22 will turn low</p>  <p>Figure 6-43 Customize the panel display when the switch is turned to (Mid)</p>
Style (Right)	<p>After the previous settings are completed, in the custom panel, the switch turns blue when it is turned (right) as shown in Figure 6 47 and the DO port number 22 turns ON</p>  <p>Figure 6-44 Customize the panel display when the switch is turned (right)</p>
Operation prohibited	Setting "Operation prohibited" to "No" will make the switch on the custom panel inoperable

6.4.3.8 Two pos switch with lamp

After inputting "1" at the desired switch position, click the <Set> button to enter the "Two pos switch with lamp" setting interface as shown in Figure 6-45. The setting description in the interface is shown in Table 6-19.

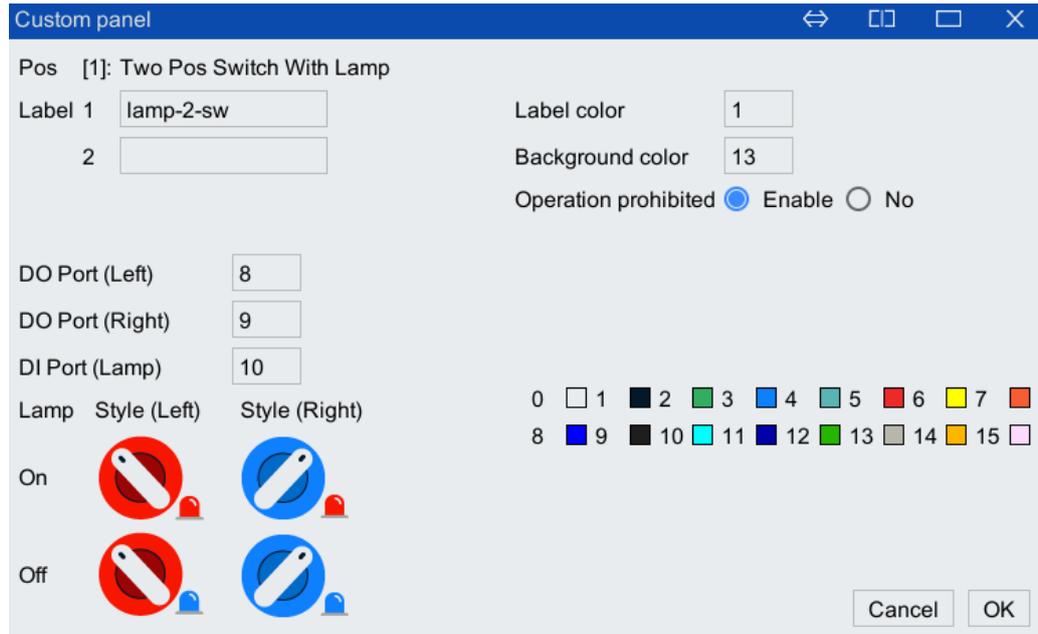


Figure 6-45 "Two pos switch with lamp" Setting interface

Table 6-19 Setting instructions in "Two pos switch with lamp" interface

Name	Description
Label 1	You can enter up to 10 characters in the text box behind "Label 1". When editing, clicking the text box will display the soft keyboard for entering the label name, and the label name after setting will be displayed at the top of the switch. In this example, the label name is set to "lam-2-sw"
Label 2	Up to 10 characters can be entered in the text box behind "Label 2". When editing, clicking the text box will display the soft keyboard for entering the label name. In this example, do not set
Label color	Set the color of the label name in "Label Color". For details, please refer to Chapter 6.4.3.11. In this example, the label name is set to grayish blue
Background color	Set the background color of the "Two pos switch with lamp " in "Background Color". For details, please refer to Chapter 6.4.3.11. In this example, the background color is set to gray
DO port (Left)	In this example, the corresponding DO port number is set to 8
DO port (Right)	In this example, the corresponding DO port number is set to 9
DI port (Lamp)	In this example, the corresponding DI port number is set to 10, when the port number is ON/OFF, it corresponds to the on/off of the switch indicator.

Name	Description
Style (Left)	<p>After the previous settings are completed, in the custom panel, the switch turns red when it is turned (left) and the DO port number 8 becomes ON; if the DI port number 10 is ON, the indicator color changes to red (bright) , As shown in Figure 6 49 below</p>  <p>Figure 6-46 When the switch is turned to (left) and DI port number 10 is ON, the custom panel display</p> <p>After the previous settings are completed, in the custom panel, the switch turns red when it is turned (left) and the DO port number 8 turns ON; if the DI port number 10 is OFF, the indicator color changes to blue (off) , as shown in Figure 6 50</p>  <p>Figure 6-47 When the switch is turned (left) and the DI port number 10 is OFF, the custom panel display</p>
Style (Right)	<p>After the previous settings are completed, in the custom panel, the switch turns blue when it is turned (right) and the DO port number 9 becomes ON; if the DI port number 10 is ON, the indicator color changes to red (bright)), as shown in Figure 6 51 below</p>  <p>Figure 6-48 When the switch is turned to (right) and DI port number 10 is ON, the custom panel display</p> <p>After the previous settings are completed, in the custom panel, the switch turns blue when it is turned (right) and the DO port number 9 becomes ON; if the DI port number 10 is OFF, the indicator color changes to blue (Off), as shown in Figure 6 52 below</p>  <p>Figure 6-49 When the switch is turned to (right) and DI port number 10 is OFF, the custom panel display</p>
Operation prohibited	Setting "Operation prohibited" to "No" will make the switch on the custom panel inoperable

6.4.3.9 Three pos switch with lamp

After inputting "1" at the desired switch position, click the <Set> button to enter the "Three pos switch with lamp" setting interface as shown in Figure 6-50. For the setting instructions in the interface, see Table 6-20.

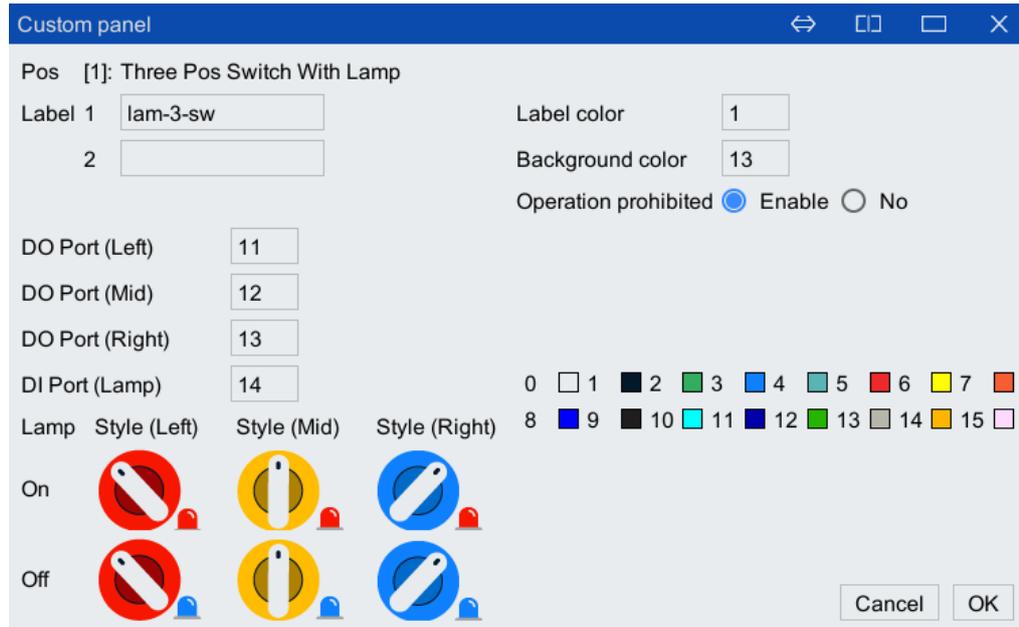


Figure 6-50 "Three pos switch with lamp" setting interface

Table 6-20 Setting instructions in "Three pos switch with lamp" interface

Name	Description
Label 1	You can enter up to 10 characters in the text box behind "Label 1". When editing, clicking the text box will display the soft keyboard for entering the label name, and the label name after setting will be displayed at the top of the switch. In this example, the label name is set to "lam-3-sw"
Label 2	Up to 10 characters can be entered in the text box behind "Label 2". When editing, clicking the text box will display the soft keyboard for entering the label name. In this example, do not set
Label color	Set the color of the label name in "Label Color". For details, please refer to Chapter 6.4.3.11. In this example, the label name is set to grayish blue
Background color	Set the background color of the "Three pos switch with lamp" in "Background Color". For details, please refer to Chapter 6.4.3.11. In this example, the background color is set to gray
DO port (Left)	In this example, the corresponding DO port number is set to 11
DO port (Mid)	In this example, the corresponding DO port number is set to 12
DO port (Right)	In this example, the corresponding DO port number is set to 13
DI port (Lamp)	In this example, the corresponding DI port number is set to 14, when the port number is ON/OFF, the corresponding switch indicator lights are on/off respectively

Name	Description
<p>Style (Left)</p>	<p>After the previous settings are completed, in the custom panel, the switch turns red when it is turned (left) and the DO port number 11 turns ON; if the DI port number 14 is ON, the indicator color turns red (bright) , As shown in Figure 6 49 below</p>  <p>Figure 6-51 When the switch is turned to (left) and the DI port number 14 is ON, the custom panel display</p> <p>After the previous settings are completed, in the custom panel, the switch turns red when it is turned (left) and the DO port number 11 turns ON; if the DI port number 14 is OFF, the indicator color changes to blue (off), as shown in Figure 6 50</p>  <p>Figure 6-52 When the switch is turned (left) and the DI port number 14 is OFF, the custom panel display</p>
<p>Style (Mid)</p>	<p>After the previous settings are completed, in the custom panel, the switch turns red when it is turned (left) and the DO port number 12 turns ON; if the DI port number 14 is ON, the indicator color turns red (bright) , As shown in Figure 6 49 below</p>  <p>Figure 6-53 When the switch is turned to (mid) and the DI port number 14 is ON, the custom panel display</p> <p>After the previous settings are completed, in the custom panel, the switch turns red when it is turned (left) and the DO port number 12 turns ON; if the DI port number 14 is OFF, the indicator color changes to blue (off), as shown in Figure 6 50 below</p>  <p>Figure 6-54 When the switch is turned to (mid) and the DI port number 14 is OFF, the custom panel display</p>

Name	Description
Style (Right)	<p>After the previous settings are completed, in the custom panel, the switch turns blue when it is turned (right) and the DO port number 13 turns ON; if the DI port number 14 is ON, the indicator color changes to red (bright), as shown in Figure 6 51 below</p>  <p>Figure 6-55 When the switch is turned to (right) and the DI port number 14 is ON, the custom panel display</p> <p>After the previous settings are completed, in the custom panel, the switch turns to (right) to blue and the DO port number 13 turns ON; if the DI port number 14 is OFF, the indicator color changes to blue (Off), as shown in Figure 6 52 below</p>  <p>Figure 6-56 When the switch is turned to (right) and the DI port number 14 is OFF, the custom panel display</p>
Operation prohibited	Setting "Operation prohibited" to "No" will make the switch on the custom panel inoperable

6.4.3.10 Variable display

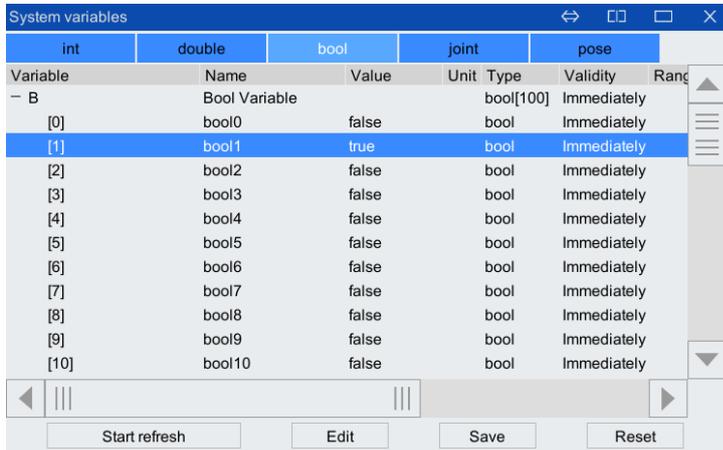
After inputting "1" at the required switch position, click the <Set> button to enter the "Variable Display" setting interface as shown in Figure 6-57. For the setting description in the interface, see Table 6-21.

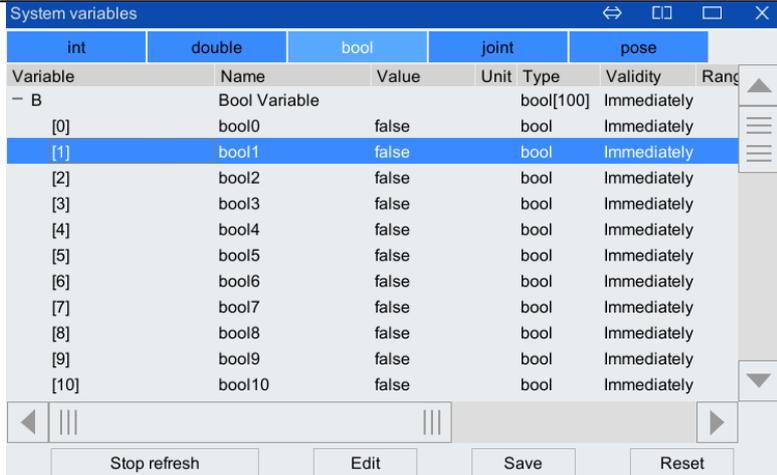
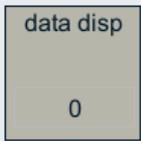


Figure 6-57 "Variable display" setting interface

Table 6-21 Setting instructions in "Variable Data Display" Interface

Name	Description
Label 1	You can enter up to 10 characters in the text box behind "Label 1". When editing, clicking the text box will display the soft keyboard for entering the label name, and the label name after setting will be

Name	Description																																																																																											
	displayed at the top of the switch. In this example, the tag name is set to s-DO-ctr																																																																																											
Label 2	Up to 10 characters can be entered in the text box behind "Label 2". When editing, clicking the text box will display the soft keyboard for entering the label name. In this example, do not set																																																																																											
Label color	Set the color of the label name in "Label Color". For details, please refer to Chapter 6.4.3.11. In this example, the label name is set to grayish blue																																																																																											
Background color	Set the background color of "Single DO control" in "Background Color". For details, please refer to Chapter 6.4.3.11. In this example, the background color is set to gray																																																																																											
Operation prohibited	Setting "Operation prohibited" to "No" will make the switch on the custom panel inoperable																																																																																											
System variable; \$	<p>In this example, select the variable \$B"1"</p> <p>Note: System variables only support integer variables, floating-point variables, and Boolean variables. Joint variables and pose variables are not supported.</p>																																																																																											
	<p>On the main interface of the teach pendant, click the "System > System Variable" option, and set the value of variable B"1" to true in the "Boolean Variable" tab (refer to Figure 6-58). The definition panel is shown in Figure 6-59</p>  <table border="1"> <thead> <tr> <th>Variable</th> <th>Name</th> <th>Value</th> <th>Unit</th> <th>Type</th> <th>Validity</th> <th>Range</th> </tr> </thead> <tbody> <tr> <td>- B</td> <td>Bool Variable</td> <td></td> <td></td> <td>bool[100]</td> <td>Immediately</td> <td></td> </tr> <tr> <td>[0]</td> <td>bool0</td> <td>false</td> <td></td> <td>bool</td> <td>Immediately</td> <td></td> </tr> <tr> <td>[1]</td> <td>bool1</td> <td>true</td> <td></td> <td>bool</td> <td>Immediately</td> <td></td> </tr> <tr> <td>[2]</td> <td>bool2</td> <td>false</td> <td></td> <td>bool</td> <td>Immediately</td> <td></td> </tr> <tr> <td>[3]</td> <td>bool3</td> <td>false</td> <td></td> <td>bool</td> <td>Immediately</td> <td></td> </tr> <tr> <td>[4]</td> <td>bool4</td> <td>false</td> <td></td> <td>bool</td> <td>Immediately</td> <td></td> </tr> <tr> <td>[5]</td> <td>bool5</td> <td>false</td> <td></td> <td>bool</td> <td>Immediately</td> <td></td> </tr> <tr> <td>[6]</td> <td>bool6</td> <td>false</td> <td></td> <td>bool</td> <td>Immediately</td> <td></td> </tr> <tr> <td>[7]</td> <td>bool7</td> <td>false</td> <td></td> <td>bool</td> <td>Immediately</td> <td></td> </tr> <tr> <td>[8]</td> <td>bool8</td> <td>false</td> <td></td> <td>bool</td> <td>Immediately</td> <td></td> </tr> <tr> <td>[9]</td> <td>bool9</td> <td>false</td> <td></td> <td>bool</td> <td>Immediately</td> <td></td> </tr> <tr> <td>[10]</td> <td>bool10</td> <td>false</td> <td></td> <td>bool</td> <td>Immediately</td> <td></td> </tr> </tbody> </table>	Variable	Name	Value	Unit	Type	Validity	Range	- B	Bool Variable			bool[100]	Immediately		[0]	bool0	false		bool	Immediately		[1]	bool1	true		bool	Immediately		[2]	bool2	false		bool	Immediately		[3]	bool3	false		bool	Immediately		[4]	bool4	false		bool	Immediately		[5]	bool5	false		bool	Immediately		[6]	bool6	false		bool	Immediately		[7]	bool7	false		bool	Immediately		[8]	bool8	false		bool	Immediately		[9]	bool9	false		bool	Immediately		[10]	bool10	false		bool	Immediately	
	Variable	Name	Value	Unit	Type	Validity	Range																																																																																					
	- B	Bool Variable			bool[100]	Immediately																																																																																						
[0]	bool0	false		bool	Immediately																																																																																							
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[3]	bool3	false		bool	Immediately																																																																																							
[4]	bool4	false		bool	Immediately																																																																																							
[5]	bool5	false		bool	Immediately																																																																																							
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[7]	bool7	false		bool	Immediately																																																																																							
[8]	bool8	false		bool	Immediately																																																																																							
[9]	bool9	false		bool	Immediately																																																																																							
[10]	bool10	false		bool	Immediately																																																																																							
Figure 6-58 Variable B"1" value setting interface																																																																																												
Figure 6-59 Custom panel display when the value of variable B"1" is set to true	<p>On the main interface of the teach pendant, click the "System > System Variable" option, and set the value of variable B"1" to false in the "Boolean Variable" tab (refer to Figure 6-60). The definition panel is shown in Figure 6-61</p>																																																																																											

Name	Description
	 <p>Figure 6-60 Variable B"1" value setting interface</p>  <p>Figure 6-61 The custom panel is displayed when the value of variable B"1" is set to false</p>

6.4.3.11 Text display

After inputting "1" at the desired switch position, click the <Set> button to enter the "Text Display" setting interface as shown in Figure 6-62. The setting description in the interface is shown in Table 6-22.

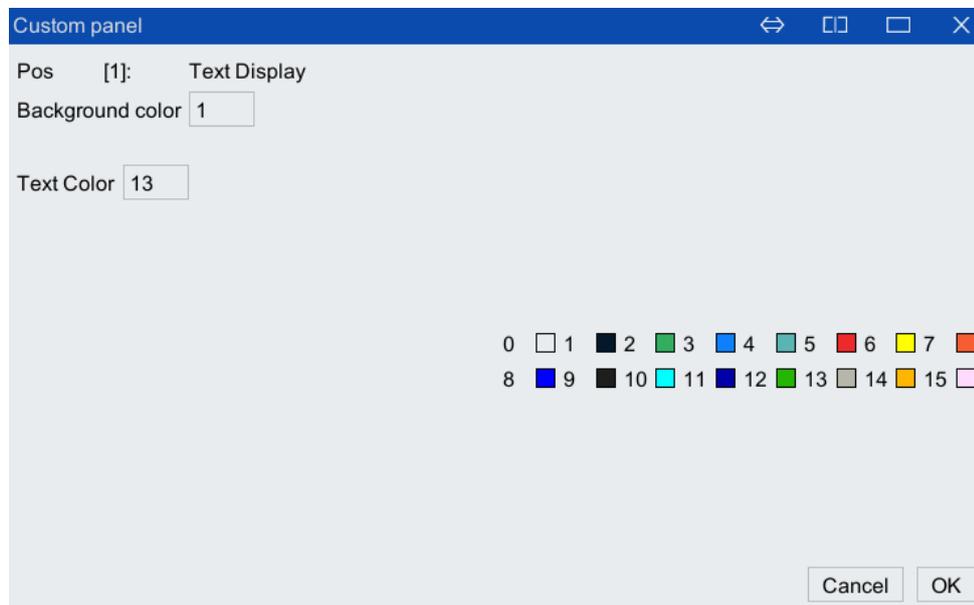


Figure 6-62 "Text display" setting interface

Table 6-22 Setting description in "Text Display Window" Interface

Name	Description
Text Color	Set the color of the label name in "Text Color". For details, please refer to Chapter 6.4.3.11. In this example, the label name is set to grayish blue

Name	Description
Background Color	Set the background color of "Single DI Display" in "Background Color". For details, please refer to Chapter 6.4.3.11. In this example, the background color is set to gray

After completing the settings in Table 6-22, enter "Control" through the keyboard in the corresponding position in the custom panel, and the display is shown in Figure 6-63.



Figure 6-63 Customize panel display after keyboard input "control"

6.4.3.12 Label color

There are 15 colors to choose from in the "Custom Panel" Switch Setting Interface" (refer to Figure 6-64). Use the numbers 0 to 15 to select the desired color. The corresponding relationship between the label color and the number is shown in Table 6-23.



Figure 6-64 The label color display in the "Custom Panel" Switch Setting interface

Table 6-23 Correspondence between label color and number

Num	Colour	Num	Colour	Num	Colour	Num	Colour
0	White	4	Dry blue	8	Blue	12	Green
1	Gray blue	5	Red	9	Black	13	Gray
2	Light green	6	Yellow	10	Green orange	14	Dark yellow
3	Sky blue	7	Orange	11	Navy blue	15	Pink

7 File

The expanded view of "File Menu" is shown in Figure 7-1. The entry of "File Menu" is shown in Figure 7-2. The contents of parts of "File Menu" are described below.

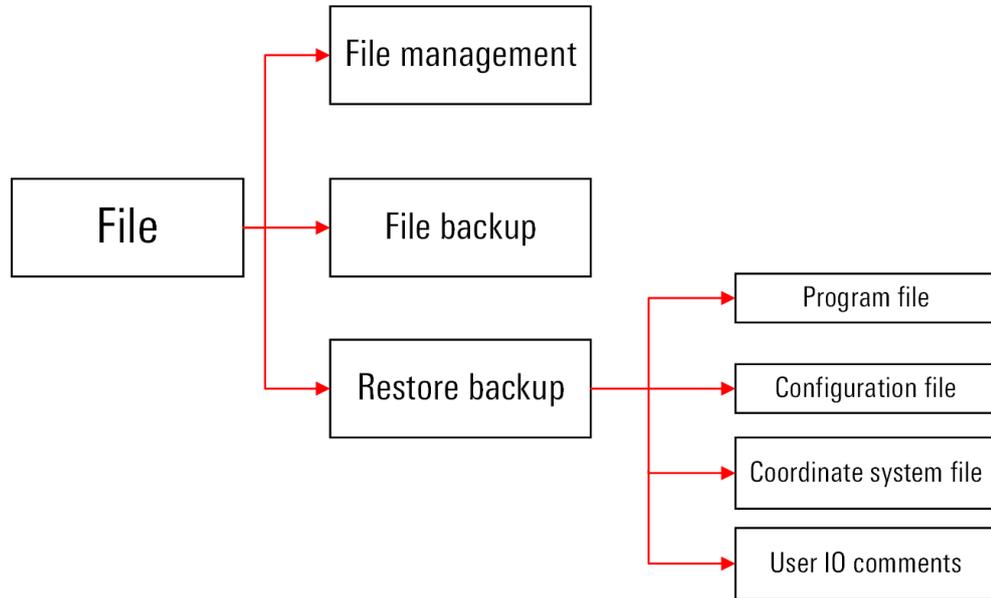


Figure 7-1 Expanded view of "File Menu"

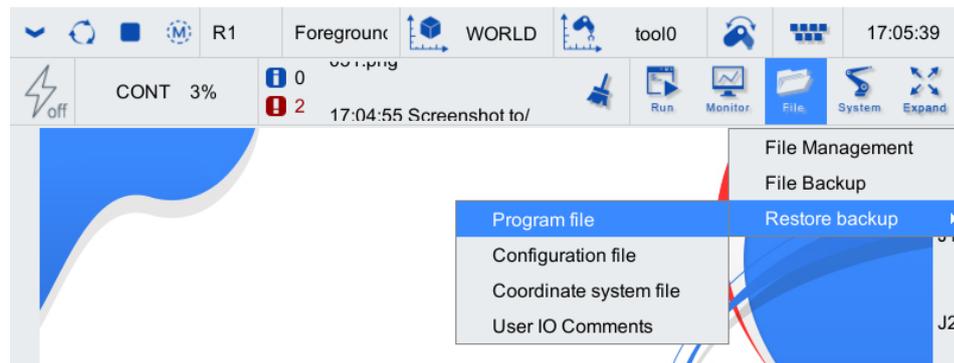


Figure 7-2 "File Menu" interface

7.1 File management

On the main interface of the teach pendant, click the "File > File Management" option to enter the "File Management" interface as shown in Figure 7-3. The file management mainly provides users with new, delete, copy and paste files (file Folder) and other file operation functions.

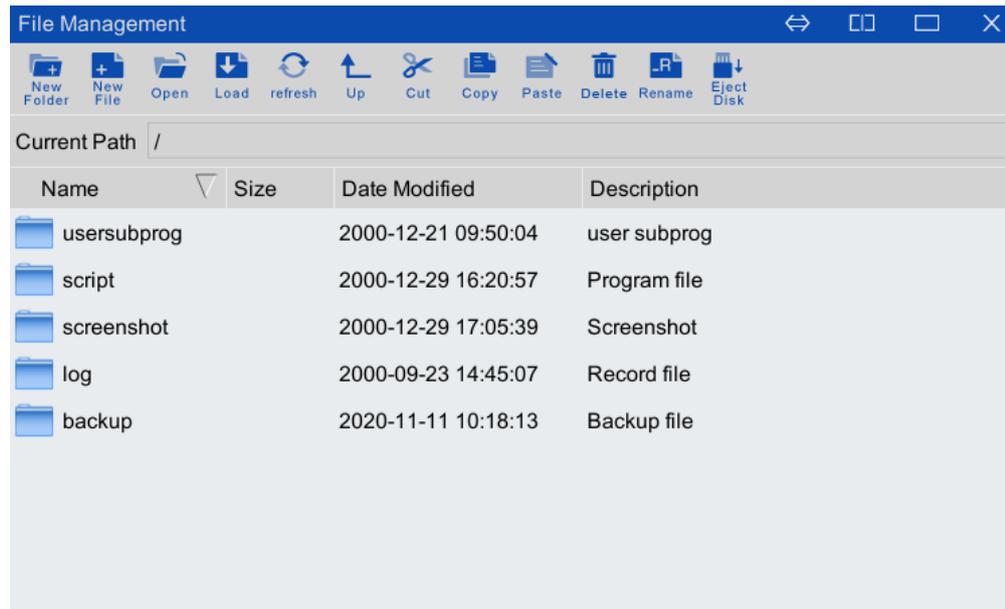


Figure 7-3 "File Management" interface

For details about functions on file management "Toolbar", please refer to Table 7-1.

Table 7-1 Description of functions of file management "Toolbar"

Icon	Name	Function
	New Folder	Create a folder in the current directory. At this time, the user can rename the created folder via the system soft keyboard.
	New File	Create a file in the current directory. At this time, the user can rename the created file via the system soft keyboard.
	Open	If a file is selected, the currently selected file will be opened in the editor. If a folder is selected, the folder will be opened in file management.
	Load	Load the currently selected program in the current channel and display it in the debugger
	Refresh	The resource manager will automatically refresh the file tree. The user can also click "Refresh" to manually refresh the contents displayed on the resource manager.
	Up	Open the parent directory. At most home directory
	Cut	Highlight one or more file or folder and click "Cut" button. Move the file or folder to the clipboard
	Copy	Highlight one or more file or folder and click "Copy" button. Copy the file or folder to the clipboard
	Paste	Copy the file or folder in the clipboard to the current path. Copy the file and subfolder in the folder to the path
	Delete	Highlight one or more file or folder and click "Delete" button to delete the selected file or folder. Delete the file and subfolder in the folder. It should be noted that the deleted file or folder will not enter the recycle bin, and cannot be restored
	Rename	The user can rename the selected file via the system soft keyboard

Icon	Name	Function
	Eject Disk	Clicking the function button can eject the USB safely from the teach pendant
	Current Path	Display the current path

7.2 File backup

"File backup" mainly refers to the backup of programs, configurations, coordinate systems, log files and user IO comments.

Operation steps :

- Step1. On the main interface of the teach pendant, click "File > File Backup" to enter the "File Backup" interface as shown in Figure 7-4, and select the desired backup in the "Backup Content" check box Options, here take <program>, <configuration> and <coordinate system> as examples.
- Step2. Then select the position to save. By default, it is saved in "Local TP" (that is, saved to "Backup" folder of the teach pendant). The user can also save it to "USB" (the root directory of USB on the teach pendant), click <Yes> button, "Backup Succeeded" dialog box in Figure 7-5 will pop up, as shown in . Then click <Yes> button to complete the backup.
- Step3. After the backup is completed, you can click on the "File > File Management > backup" option on the main interface of the teach pendant to enter the interface as shown in Figure 7-6 to view the backed up files.

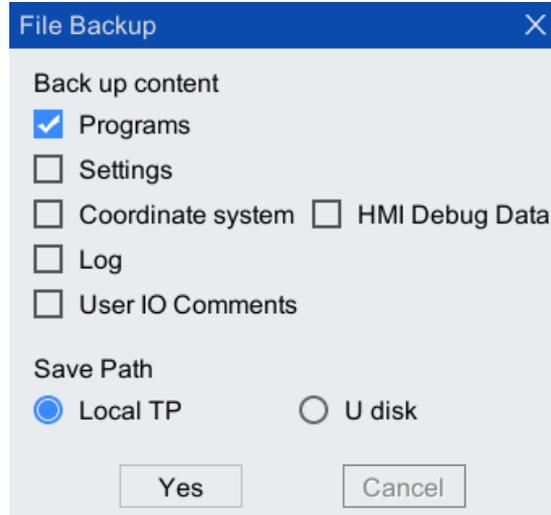


Figure 7-4 "File Backup" interface

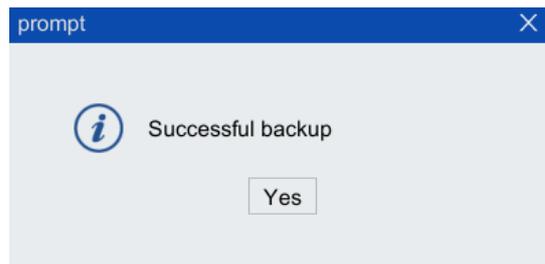


Figure 7-5 "Backup Succeeded" dialog box

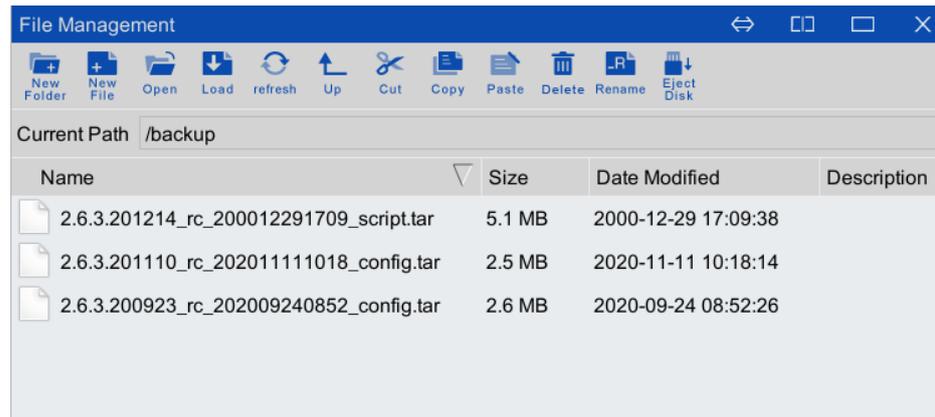


Figure 7-6 Path of file backed up

7.3 Restore backup

"Restore Backup" mainly refers to re-importing the required program, configuration and coordinate system files from the specified path.

7.3.1 Program file

Operation steps :

Step1. In the main interface of the teach pendant, click "File > Restore Backup > Program File" option, and the "Import Program" list box as shown in Figure 7-7 will pop up.

Step2. The user can find and highlight the program file to be imported in USB, and click <Select> button to import the program into the system.

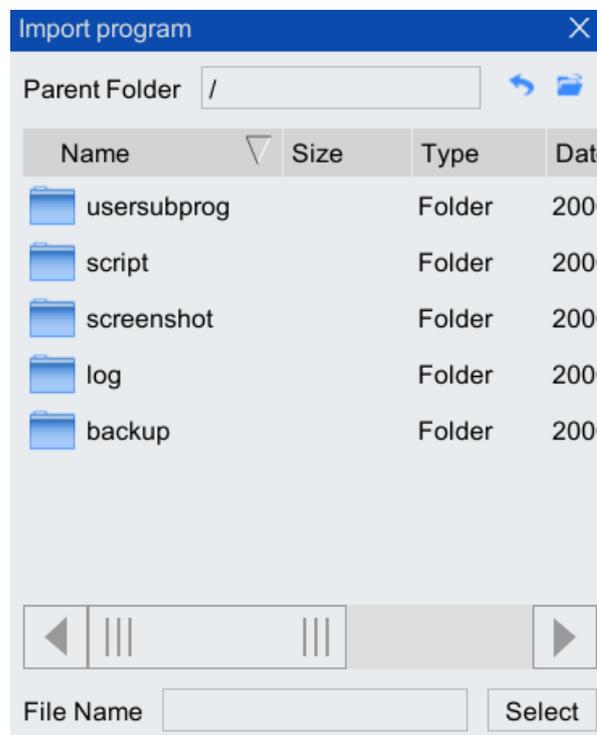


Figure 7-7"Import Program" interface

7.3.2 Configuration file

 Prompt	The "import configuration" operation needs to be performed when the control system is powered off, select the compressed package of the configuration file, and after the prompt "Please restart the robot control system", power off the control system and power it on again. After the system is powered on, it will automatically import the configuration.
---	---

Operation steps :

- Step1. On the main interface of the teach pendant, click "File > Restore Backup > Configuration File" option, and the "Import Configuration" list box as shown in Figure 7-8 will pop up.
- Step2. Find and select the configuration file compression package (XXX.tar) you want to import in the U disk, and click the <Select> button to import it into the system.

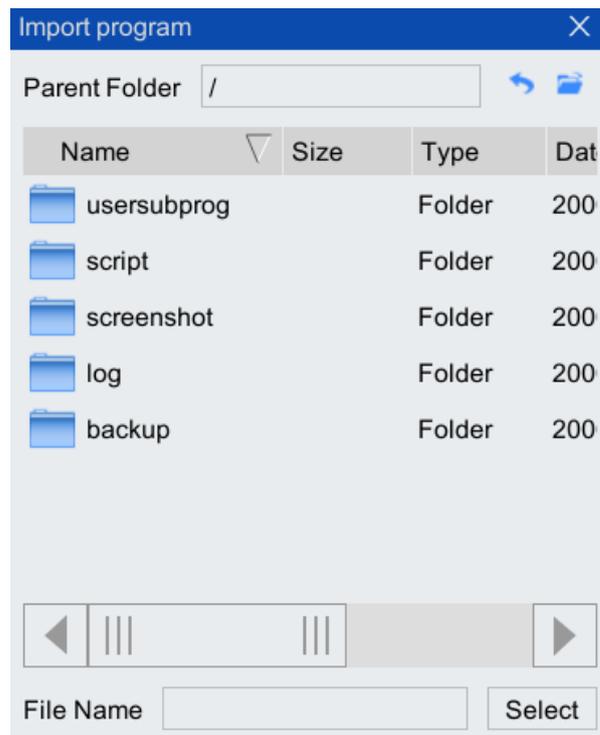


Figure 7-8 "Import configuration" list box

7.3.3 Coordinate system file

 Prompt	The "import coordinate system" operation needs to be performed when the control system is powered off, select the compressed package of the coordinate system file, and after the prompt "Please restart the robot control system", power off the control system and power it on again. After the system is powered on, it will automatically import the coordinate system.
---	---

Operation steps :

- Step1. In the main interface of the teach pendant, click "File > Restore Backup > Coordinate System File" option, and the "Import Coordinate" list box as shown in Figure 7-9 will pop up.
- Step2. Find and select the coordinate system file compression package (XXX.tar) you want to import in the U disk, and click the <Select> button to import it into the system.

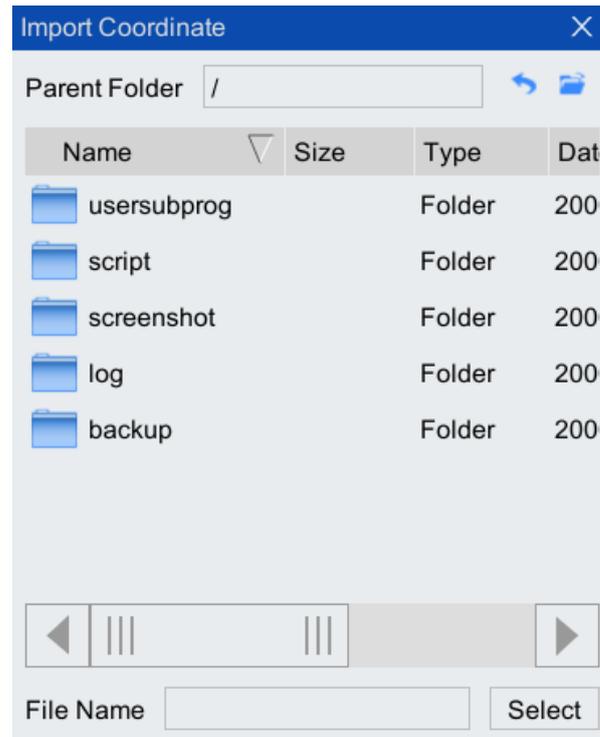


Figure 7-9 "Import coordinate system" list box

7.3.4 User IO comment

"User IO comment" is convenient for users to backup/restore user IO comment information.

Operation steps :

Step1. In the main interface of the teach pendant, click "File > Restore Backup > User IO Comment" option, and the "Import User IO Comment" list box as shown in Figure 7-10 will pop up.

Step2. Find and select the user IO comment file compression package (XXX.tar) you want to import in the U disk, and click the <Select> button to import it into the system.

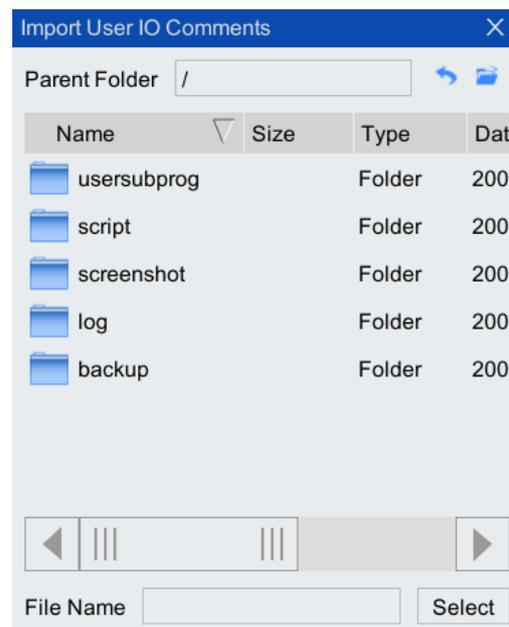


Figure 7-10 "Import user IO comments" list box

8 System

The expanded view of "System Menu" is shown in Figure 8-1. The entry of "System Menu" is shown in Figure 8-2. The contents of parts of "System Menu" are described below.

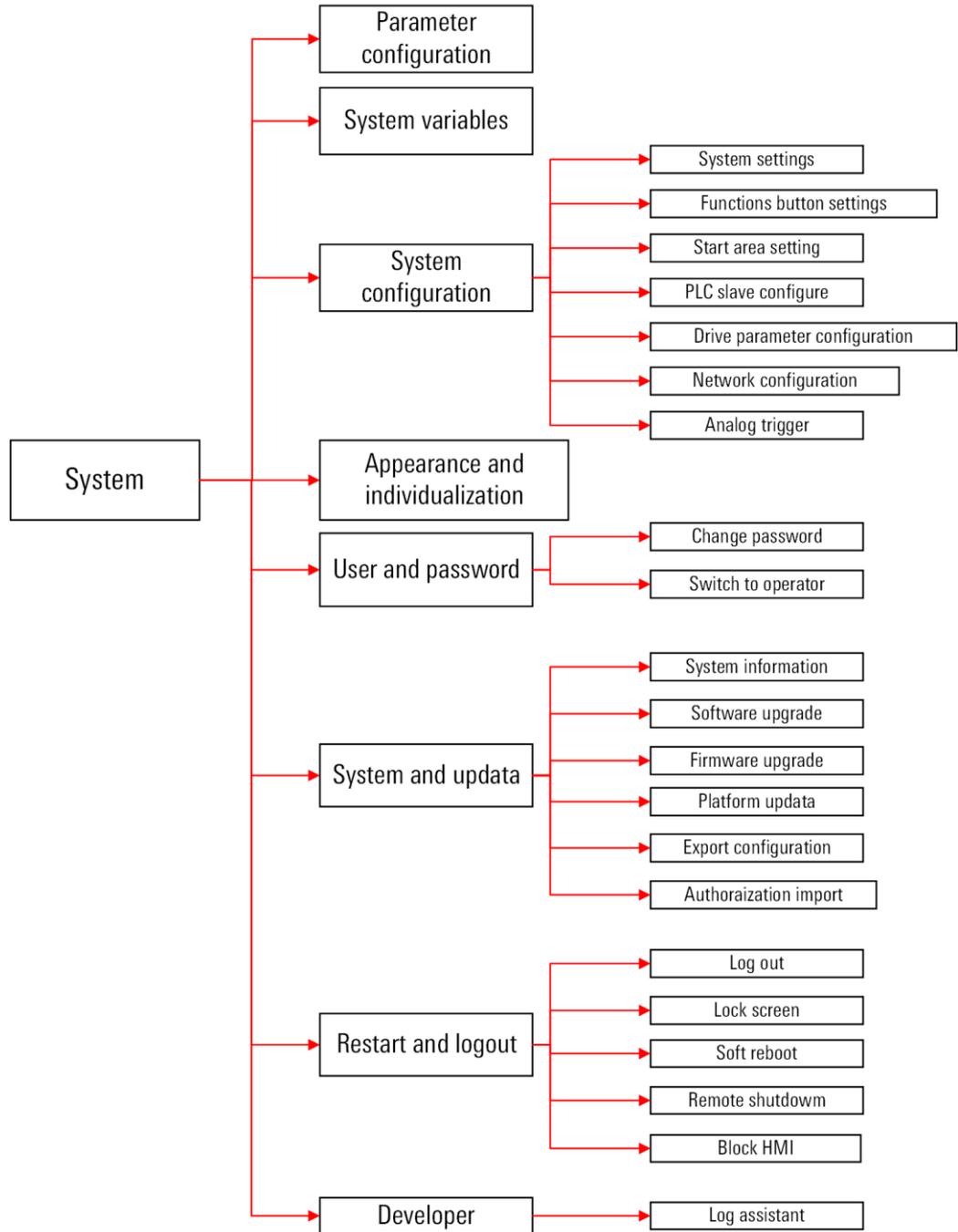


Figure 8-1 Expanded view of "File Menu"

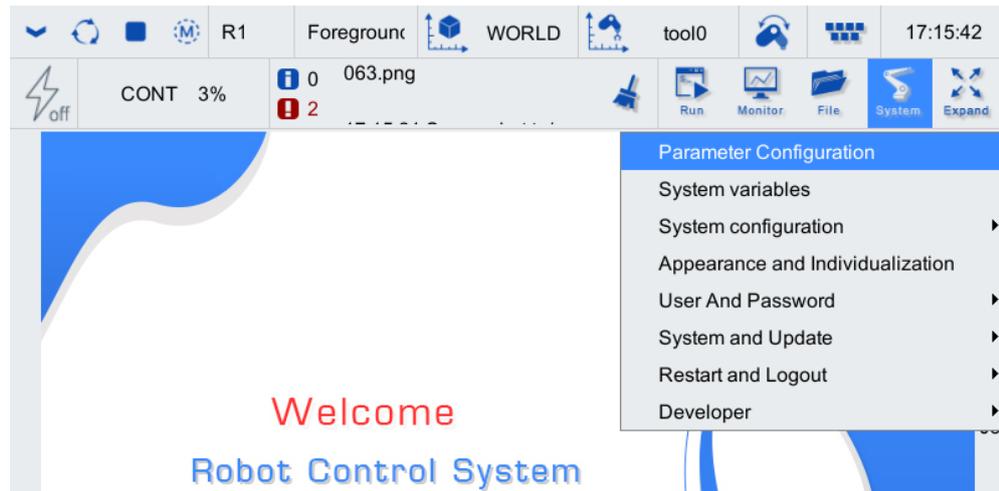


Figure 8-2 "Program Menu" interface

8.1 Parameter configuration

On the main interface of the teach pendant, click "System > Parameter Configuration" option to enter the "Parameter Configuration" interface as shown in Figure 8-3.

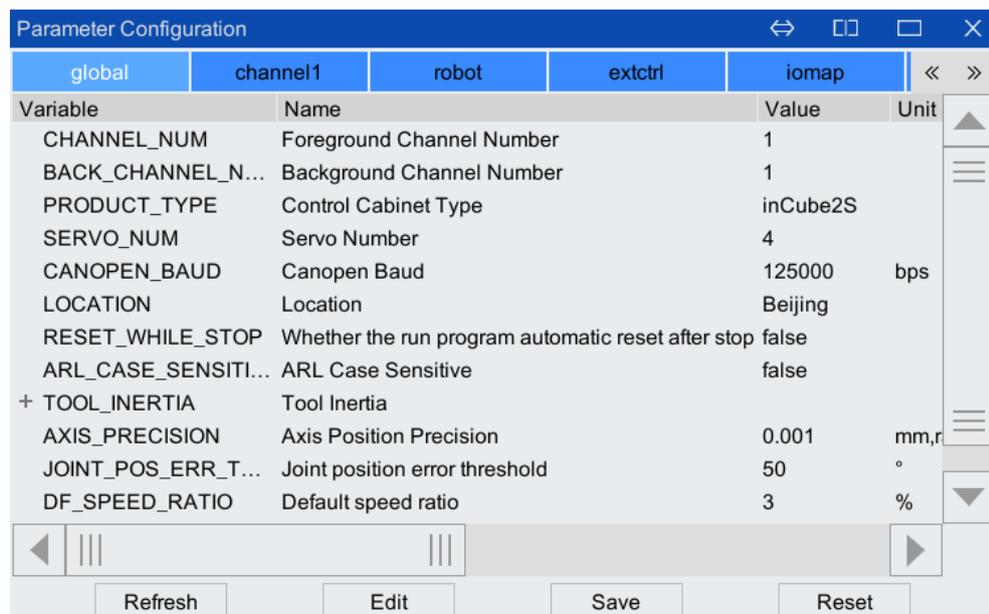


Figure 8-3 "Parameter Configuration" interface

8.1.1 Description of variables

From the configuration file tab, you can select the corresponding tab to configure the parameters. The tab mainly includes the following parts:

- Global: Global variables tab.
- Channel 1: Control channel configuration tab.
- Robot: Robot system parameter configuration tab.
- External: External control variables tab.
- IOma: Input/output configuration tab.
- Safety IO: The safety IO configuration tab. The default parameter configurations already exist, and do not need to be modified by the user.
- Conveyor C1: Conveyor related parameter configuration tab.



Prompt

For all variable names and permissions contained in each tab, please refer to Appendix A "Summary of Parameter Configuration Permissions".

Each variable in the tab itself contains information such as variable, name, value, unit, type, etc. For details, please refer to Table 8-1.

Table 8-1 Description of information contained in variables

Name	Description
Variable	To display the list of variables under the current tab
Name	To display the list of names corresponding to variables under the current tab
Value	To display the value of variable corresponding to the current variable
Unit	To display the variable unit corresponding to the current variable
Type	To display the type of the current variable
Effective way	To remind the user of the effective method after changing the value of the current variable
Value range	To display the valid value range of the current variable
Authority	The authority level is divided into from low to high: operator, instructor, integrator, after-sales personnel and administrator.
Description	To describe the functional attributes corresponding to the variable

8.1.2 Setting of variables

The "SERVO_NUM (number of slaves)" in "Global" tab is taken as an example to describe the method of setting, modifying and saving the variables.

Operation steps :

Step1. In "global" tab, find and highlight the line where "SERVO_NUM (number of slaves)" is located (see Figure 8-4), click <Edit> button below to pop up the edit box, as shown in Figure 8-5.

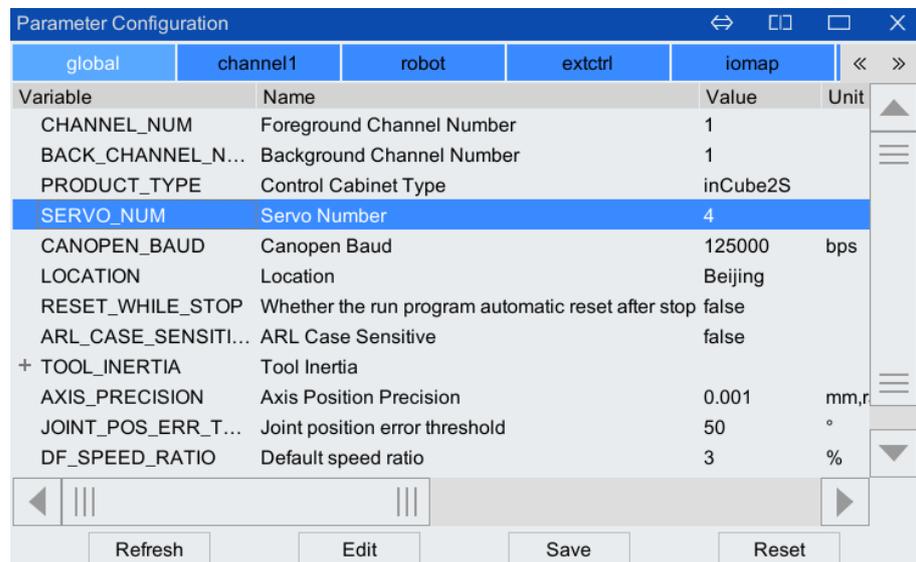


Figure 8-4 "Global" tab

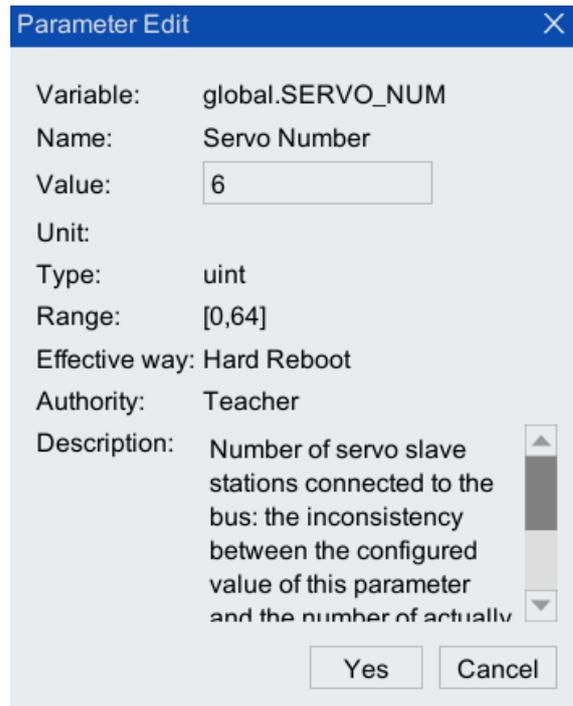
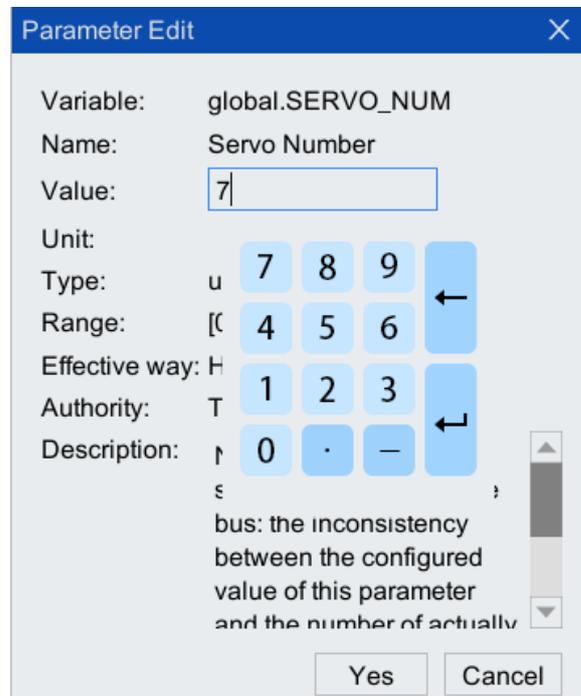
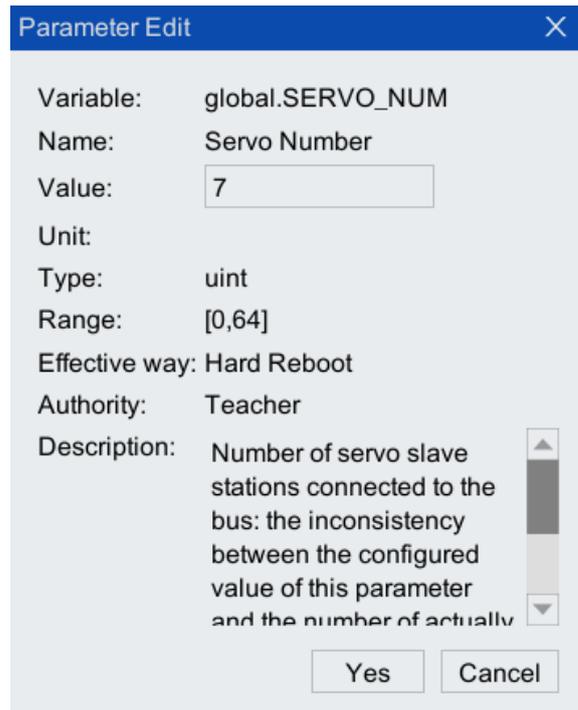


Figure 8-5 "Parameter Configuration" interface

Step2. Click the edit box behind the variable value shown in Figure 8-6, and modify the value you want to set via the small keyboard (please set according to the actual needs, 7 is taken as an example here). After the setting is completed, click <Yes> button to return to "Global" tab interface. You can see that the value of "SERVO_NUM (number of slaves)" has changed to 7 (see Figure 8-7).



(a)



(b)
Figure 8-6 Modification of variable value

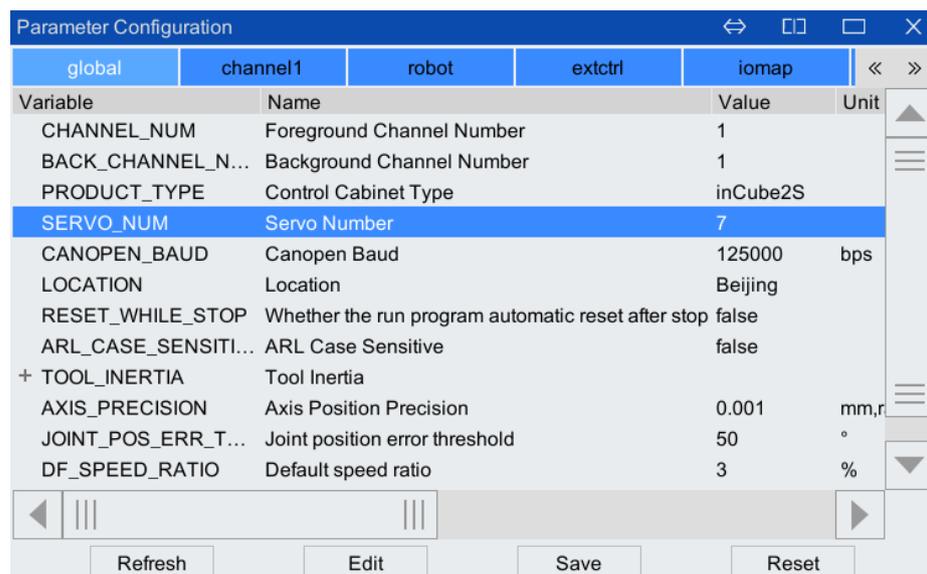
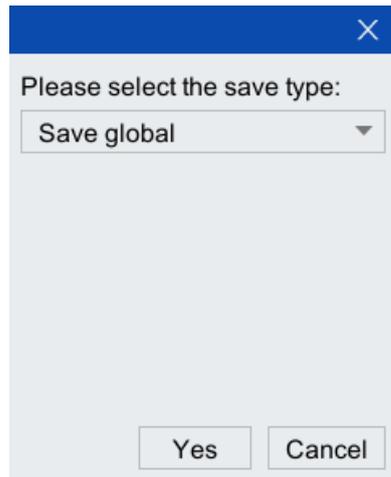
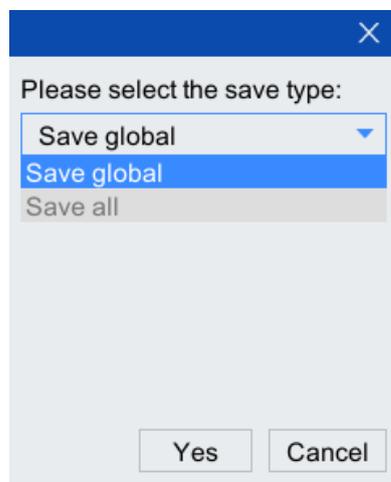


Figure 8-7"Modification of variable value completed" interface

Step3. Click "Save" button at the bottom of Figure 8-7, and the system will pop up "Save Selection" dialog box, as shown in Figure 8-8. The user can select "Save configuration data of the current tab" or "Save configuration data of all tabs". Only the variable values in "Global" tab are modified here. Then select "Save Global" and click "Yes" button to pop up "Confirm save global?" dialog box, as shown in Figure 8-9. Click <Yes> button, and "Parameter saved successfully!" dialog box will pop up, as shown in Figure 8-10. That is, the parameters have been saved successfully.



(a)



(b)

Figure 8-8 "Save Selection" dialog box

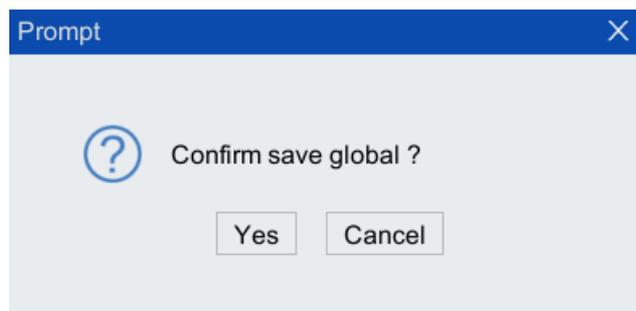


Figure 8-9 "Confirm save global" dialog box

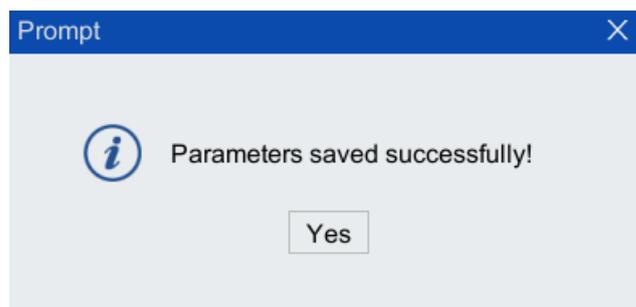


Figure 8-10 "Parameter Saved Successfully!" dialog box

Step4. If you want to return to the interface before setting the variable value, click <Refresh> button at the bottom of Figure 8-7, click <Refresh> button below to return to the interface shown in Figure 8-11.

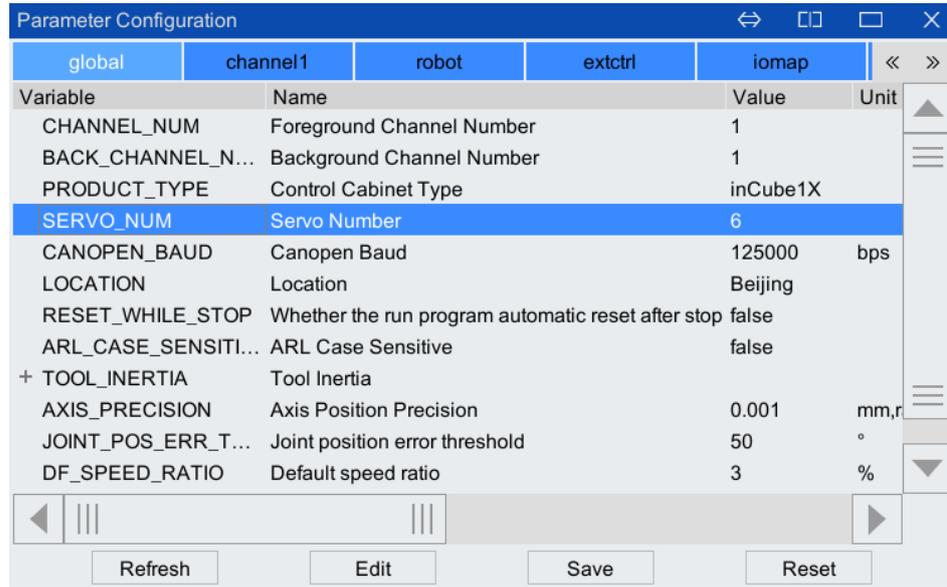
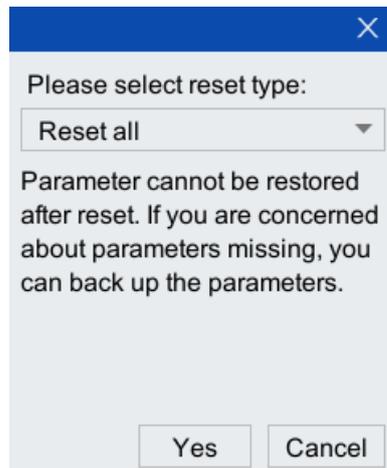
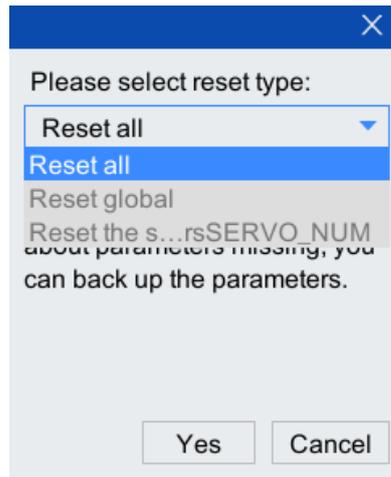


Figure 8-11 Refreshed interface

Step5. If you want to reset the parameter configuration of the current tab or all parameter configurations, click <Reset> button at the bottom of Figure 8-7, and the system will pop up "Restore Selection" dialog box (see Figure 8-12). The user can select "Reset the configuration data of the current tab" or "Reset the configuration data of all tabs". After selecting the save type, click the <Yes> button to pop up "Confirm all reset" dialog box in Figure 8-13. Click the <OK> button, and "All Parameters are reset successfully! System is reboot after Power off." dialog box in Figure 8-14 will pop up. Then you can power off and restart it.



(a)



(b)
Figure 8-12 "Restore Selection" dialog box

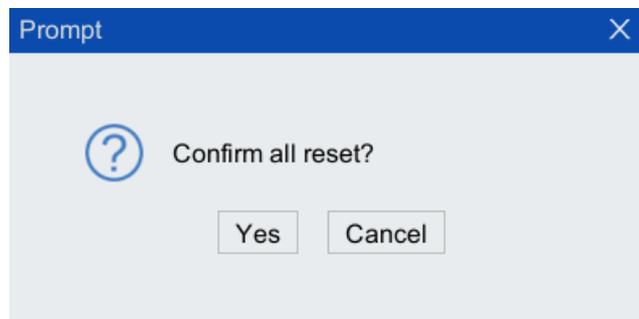


Figure 8-13 "Confirm all reset" dialog box

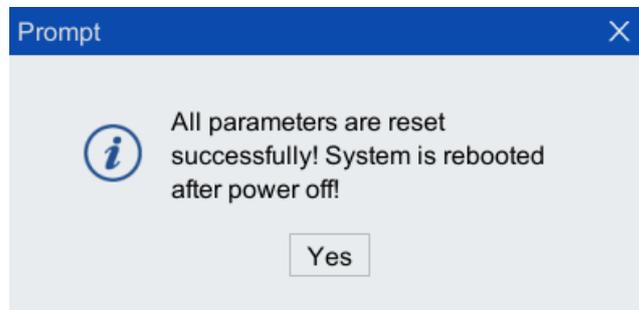


Figure 8-14 "Restore Selection" dialog box

8.2 System variables

On the main interface of the teach pendant, click the "System > System Variable" option to enter the "System Variable" interface as shown in Figure 8-15. For the setting, modification and saving methods of variables in each tab, please refer to "Variable Settings" in Chapter 8.1.2.

 Prompt	<ul style="list-style-type: none"> ■ For all variable names and usage permissions contained in each tab, please refer to Appendix B for the list of system variable permissions. ■ For the difference between "system variables" and "common variables", please refer to "ARL Programming Manual".
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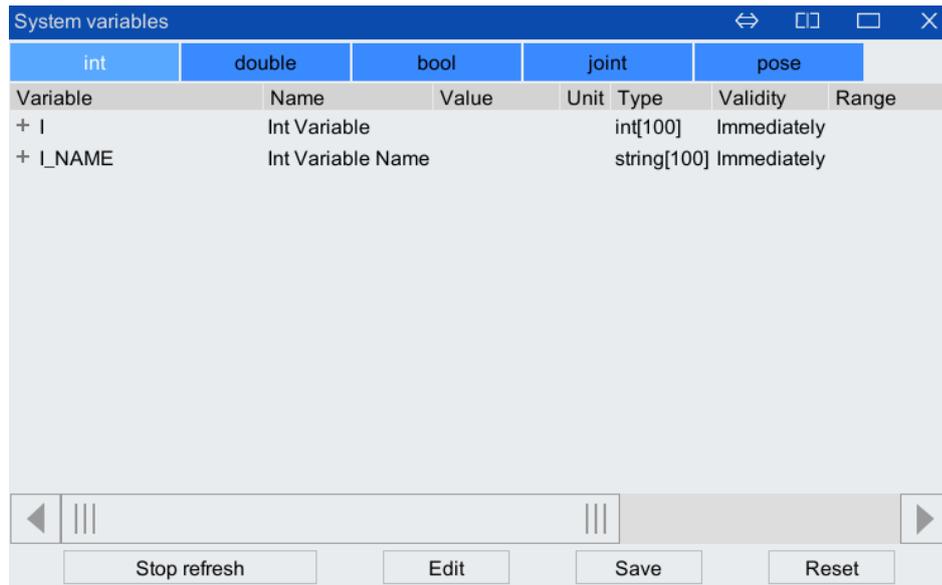


Figure 8-15 "Parameter Configuration" interface

8.3 System configuration

8.3.1 System settings

Operation steps :

Step1. On the main interface of the teach pendant, click "System > System Configuration > "System Settings" to enter the "System Settings" interface as shown in Figure 8-16. Please refer to the table for the description of each interface Table 8-2

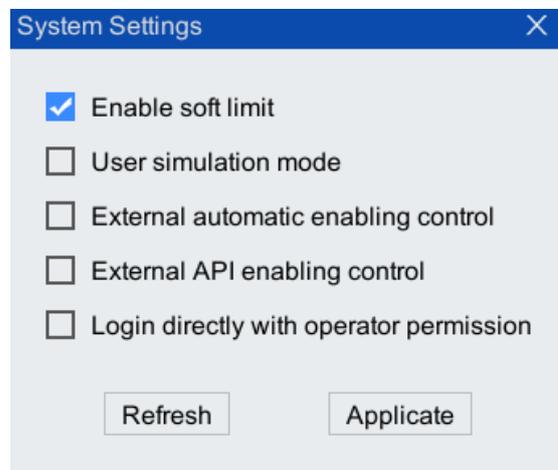


Figure 8-16 "System Settings" dialog box

Step2. After the setting is completed, click the <Apply> button, and the "System settings have been changed" prompt box as shown in Figure 8-30 will pop up to complete the setting; if you click the <Refresh> button, it will return to the initial setting.

Table 8-2 Description of "System Settings" interface

Name	Function
Enable soft limit	The soft limit value of each axis is configured in the configuration file. When "Enable software limit" function is checked, if any axis is not within the software limit, no axis

Name	Function
	movement is allowed and a warning will be sent. When an axis reaches the limit point, the movement planning will be ended and a warning will be sent.
User simulation mode	After the user has written the program, he can run it in simulation mode to check the correctness of program syntax, logic and action, and then switch to running in actual mode.
External automatic enabling control	To set whether to enable external control. When not enabled, the robot can be only controlled by the teach pendant. After the external auto control is enabled, the user can control the robot's movement via external IO signals. If the value of the DI of the start program is set to 5, the instruction of the start program can be executed by changing the external IO signal of DI5.
External API enabling control	<p>To set whether to enable external API control. When not enabled, the robot can be only controlled by the teach pendant. After the external API control is enabled, the user can, after connecting to the computer, edit the robot's motion instructions and control the robot's operation by writing programs in VisualStudio.</p> <p>The programming interface library is a software product provided by Peking Robot for secondary development. Through the programming interface library, the customer can send control instructions to the robot or obtain various states of the robot through the interface</p> <p>For the use of the programming interface library, as well as the functions and sample codes of each interface function, please refer to the "Programming Interface Library User Manual" of our company. For the related programming interface library functions, please refer to Appendix C Interface Functions</p>
Login directly with operator permission	To log into the teach pendant directly with operator permission after startup by default
ARL program Chinese display	Set whether to enable the display of ARL program in Chinese. After enabling, the program editor will display the motion instructions and their parameters in Chinese

8.3.2 Function key settings

Operation steps :

- Step1. On the main interface of the teach pendant, click "System > System Configuration > Function Buttons Settings" option to enter the "Function Buttons Settings" interface as shown in Figure 8-17. Refer to Table 8-3.
- Step2. After the setting is completed, click the <Save> button to complete the setting.

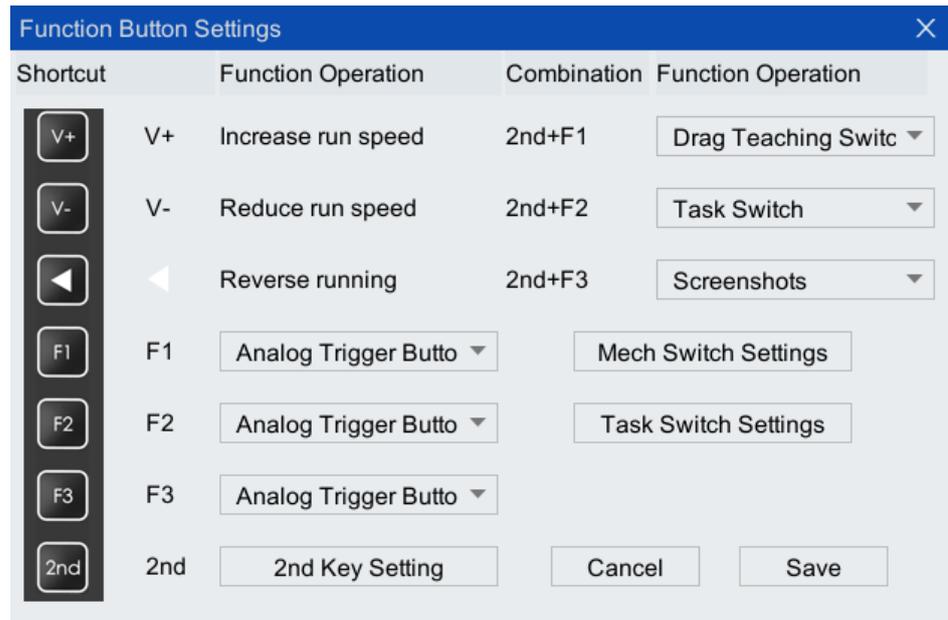
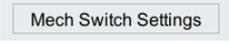
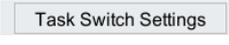


Figure 8-17"Function key setting"interface

Table 8-3 Setting instructions for teach pendant control function keys

Shortcut keys	Function operation
	Increase running speed
	Slow down running speed
	Reverse operation of the program
(Optional)	The default function is mechanical unit switching. The function of the F1 button can be configured through the drop-down option box. The supported functions include: <ul style="list-style-type: none"> ■ Analog trigger button 1 ■ Analog trigger button 2 ■ Analog trigger button 3 ■ Drag the teaching function switch ■ Screenshot ■ Mechanical unit switching ■ Spindle/external axis switch ■ Channel task switching ■ No welding
(Optional)	The default function is spindle/external axis switching, the F2 button supports the same function as F1
(Optional)	The default function is analog IO trigger, the function supported by F3 button is the same as F1
(Optional)	Single-axis/Cartesian/tool mode switch, you can switch between single-axis mode, Cartesian mode (BASE, WORLD, WOBJ) and tool mode through configuration selection
2nd+F1 (Optional)	The default function is to drag the teaching switch, the 2nd+F1 button supports the same function as F1

Shortcut keys	Function operation
2nd+F2 (Optional)	The default function is channel task switching. The 2nd+F2 button supports the same function as F1
2nd+F3 (Optional)	The default function is a screenshot, and the 2nd+F3 button supports the same function as F1.
	When the button is configured with the function of "mechanical unit switching", several mechanical units can be selected through configuration, and the mechanical unit can be cyclically switched by configuring the button
	When the button is configured with the function of "Channel Task Switching", several channel tasks can be selected through configuration, and the channel task can be switched cyclically through the configuration button

8.3.3 Setting of starting area

When the program starts, ARCS will check the initial position of each axis (or external axis) of the robot. The robot can be started normally only when the initial position of each axis (or external axis) of the robot is within the safe starting area.

Select "System> System Configuration> Start area setting " option to enter "Start area setting" interface shown in Figure 8-18. In this interface, the safe starting area of each axis (J1-J4) and external axis (EJ1-EJ4) of the robot can be set.



	Min	Max		Min	Max
J1	-10000.000	10000.000	EJ1	-10000.000	10000.000
J2	-10000.000	10000.000	EJ2	-10000.000	10000.000
J3	-10000.000	10000.000	EJ3	-10000.000	10000.000
J4	-10000.000	10000.000	EJ4	-10000.000	10000.000

Figure 8-18 "Safety Zone Settings" interface

Operation steps:

Step1. Fill in or modify the max. and min. angles of the safe starting area of each axis (including the external axis).

Step2. Click <Applicate> button to complete saving.

8.3.4 Setting of PLC slaves

The PLC slave configuration function can help the user realize the configuration of some external expansion equipment. Here the configuration of PEB (Profinet External Board, namely the expansion board that supports Profinet protocol equipment) is taken as an example to describe the operation method.

Operation steps:

Step1. Under the access level of OEM or teacher, select "Main Interface> System> System Configuration> PLC Slave Configure" option to pop up "PLC Slave Configure" interface shown in Figure 8-19. Click <Configure> button behind the number 2 to enter "Configure PLC Slave station2" interface, as shown in Figure 8-20.



Figure 8-19 "PLC Slave Configuration" interface

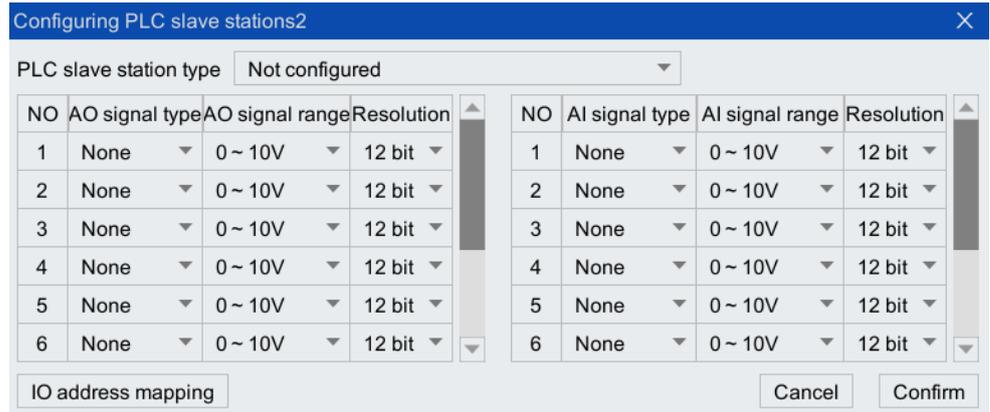


Figure 8-20 "Configure PLC Slave-2" interface

Step2. Select "PEB" from the drop-down list on the right of "PLC Slave station Type", as shown in Figure 8-21. Click <Confirm> button in the bottom right corner of the interface. After "Configuring PLC Slave station-2 succeeded, please reboot the system!" dialog box in Figure 8-22 pops up, click <Yes> button, power off and restart the control cabinet. Refer to Table 8-4 for the description of slave station types, and Table 8-5 for the description of PLC slave station configuration.

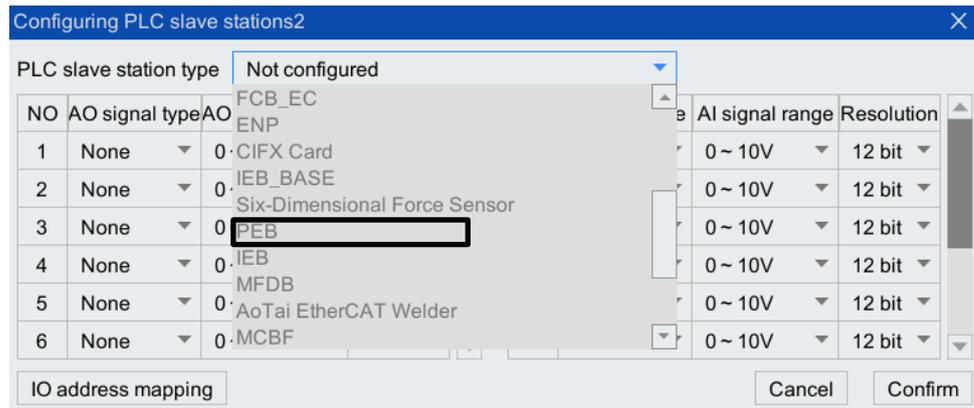


Figure 8-21 PLC slave-2 configured as PEB

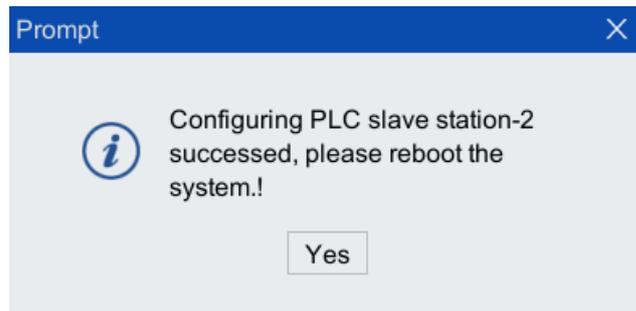


Figure 8-22 "PLC Slave-2 Configured Successfully" dialog box

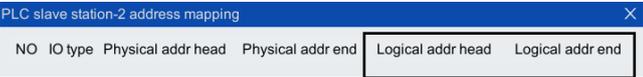
Table 8-4 PLC slave type description

Slave type	Description
MF	Used to expand the number of user DI/DO, the slave station type needs to be configured after the PLC-MF module is connected to the control cabinet
INT	The internal function modules of ARCC/ARC4 control cabinet are automatically configured by software, without manual configuration by the user
CCB	InCube10/12 control cabinet internal functional modules, software automatic configuration, no manual configuration by the user
MCBS	InCube20/21/22 control cabinet internal functional modules, software automatic configuration, no manual configuration by the user
ACRC_MB	The internal function modules of the ACRC control cabinet are automatically configured by the software without manual configuration by the user
Hilscher DeviceNet Conversion Module	Used to convert EtherCAT interface to DeviceNet interface, the slave station type needs to be configured after the control cabinet is connected to the module
Beckhoff DeviceNet conversion module	Used to convert EtherCAT interface to DeviceNet interface, the slave station type needs to be configured after the control cabinet is connected to the module
MFDB_BASE	Used for inCube10/12 and ARC4 control cabinets to extend analog interface, encoder interface or magnetic scale interface. After the control cabinet expands these interfaces, the slave station type needs to be configured
FCB_EC	It is used for the sensor drag teaching function, and the slave station type needs to be configured after the module outside the Yuli six-dimensional force sensor
ENP	Adapt to the internal functional modules of inCube20, the software is automatically configured, no manual configuration by the user

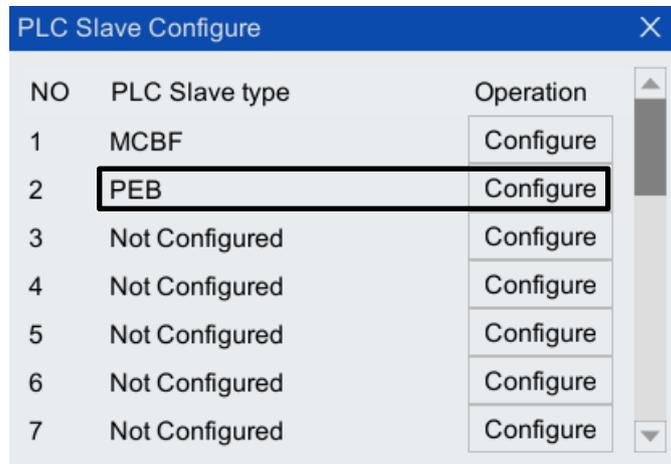
Slave type	Description
CIFX card	The industrial computer used in the ARCC control cabinet expands the DeviceNet interface. After the industrial computer is installed with this board, the slave station type needs to be configured
IEB_BASE	Used for inCube20/21/22 control cabinet to extend the analog interface, encoder interface, magnetic scale interface or PWM output interface. After the control cabinet expands these interfaces, the slave station type needs to be configured
Yuli six-dimensional force sensor	Used for sensor drag and teaching function, the slave station type must be configured after the control cabinet is connected to the Yuli six-dimensional force sensor
PEB	It is used to convert EtherCAT interface to Profinet interface or analog interface. After the control cabinet is connected to the module, the slave station type needs to be configured. For details, please refer to "PEB Operation Manual"
IEB	Used for inCube20/21/22 control cabinet to expand CANopen interface, after the control cabinet expands this interface, the slave station type needs to be configured
MFDB	Used for inCube10/12 and ARC4 control cabinets to extend the CANopen interface. After the control cabinet expands this interface, the slave station type needs to be configured
Otai EtherCAT welding machine	Used to build a welding workstation, the slave station type needs to be configured after the control cabinet is connected to the Otai EtherCAT welder
MCBF	The internal function modules of inCube2S control cabinet are automatically configured by software, without manual configuration by users
HPS_FT	Used for sensor drag and teaching function, the slave station type needs to be configured after the control cabinet is connected to the HPS_FT six-dimensional force sensor
WRIST	Used for the sensor drag and teaching function, the slave station type needs to be configured after the control cabinet is connected to the WRIST six-dimensional force sensor

Table 8-5 Description of PLC slave configuration

Name	Description
AO signal type	Voltage type
	Current type
AI signal type	Voltage type
	Current type
Signal range	0-10V
	0-5V
	-10-10V
	4-20mA
	0-20mA
Resolution	12bit~20bit 9 kinds
IO address mapping	Click the "IO Address Mapping" button in the lower left corner of the "Configure PLC

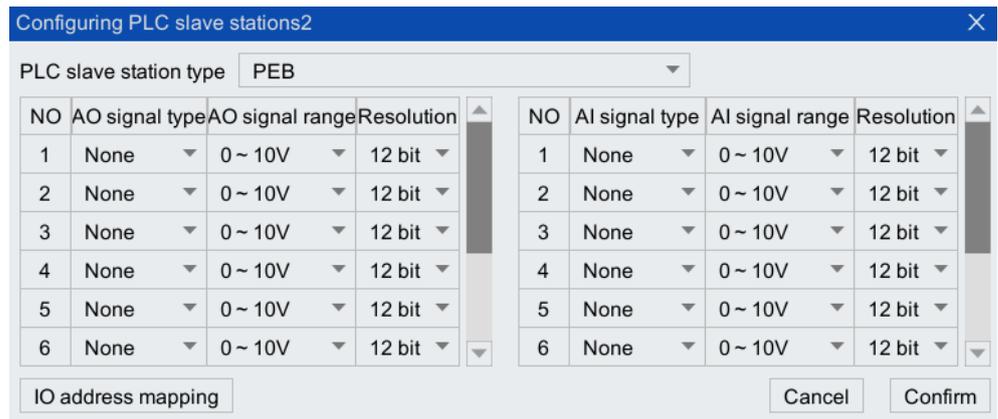
Name	Description
AO signal type	Voltage type
	Current type
	Slave-2" interface, and the "PLC Slave-2 Address Mapping" interface will pop up. You can see DO (digital output) and DI (digital input) on this page.) Start logical address and end logical address, as shown inFigure 8-23
	
	Figure 8-23 IO address mapping of PEB module

Step3. After restarting, in the main interface of the teach pendant, click "System > System Configuration > PLC Slave Configuration" option to enter the "PLC Slave Configuration" interface shown in Figure 8-24, the serial number is The PLC slave type of 2 has been successfully configured as "PEB".



NO	PLC Slave type	Operation
1	MCBF	Configure
2	PEB	Configure
3	Not Configured	Configure
4	Not Configured	Configure
5	Not Configured	Configure
6	Not Configured	Configure
7	Not Configured	Configure

Figure 8-24 The type of PLC slave with serial number 2 is configured as "PEB"



PLC slave station type				PEB
NO	AO signal type	AO signal range	Resolution	
1	None	0 ~ 10V	12 bit	
2	None	0 ~ 10V	12 bit	
3	None	0 ~ 10V	12 bit	
4	None	0 ~ 10V	12 bit	
5	None	0 ~ 10V	12 bit	
6	None	0 ~ 10V	12 bit	

NO	AI signal type	AI signal range	Resolution
1	None	0 ~ 10V	12 bit
2	None	0 ~ 10V	12 bit
3	None	0 ~ 10V	12 bit
4	None	0 ~ 10V	12 bit
5	None	0 ~ 10V	12 bit
6	None	0 ~ 10V	12 bit

IO address mapping Cancel Confirm

Figure 8-25 "Configure PLC Slave-2"Interface

8.3.5 Drive parameter configuration

The user cannot change the drive parameters by himself. If you need to change it, you must contact the company's after-sales personnel to assist in the change.

8.3.6 Network configuration

On the main interface of the teach pendant, click the "System > System Configuration > Network Configuration" option, and the "Network Configuration" interface shown in Figure 8-26 will pop up, and each user's network port can be configured through this interface. Click the icon of any user network port, and the "User Network Port Settings" interface as shown in Figure 8-27 pops up, through which the IP address, subnet mask and gateway of the user's network port can be set.

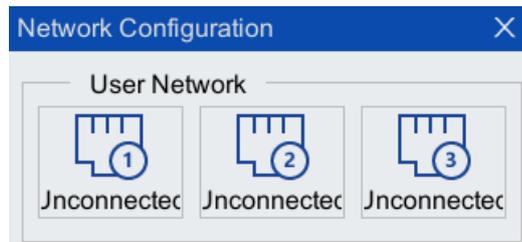


Figure 8-26 "Network Configuration"Interface

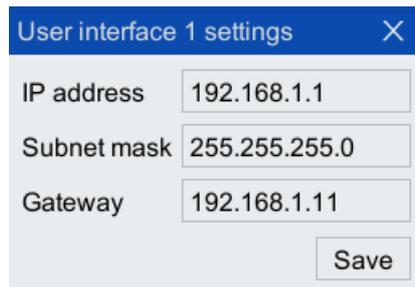


Figure 8-27 "User network port settings" interface

8.3.7 Analog trigger

On the main interface of the teach pendant, click "System > System Configuration > Analog Trigger" option, the "Analog Trigger" interface as shown in Figure 8-28 will pop up. For the setting description in the interface, please refer to Table 8-6.

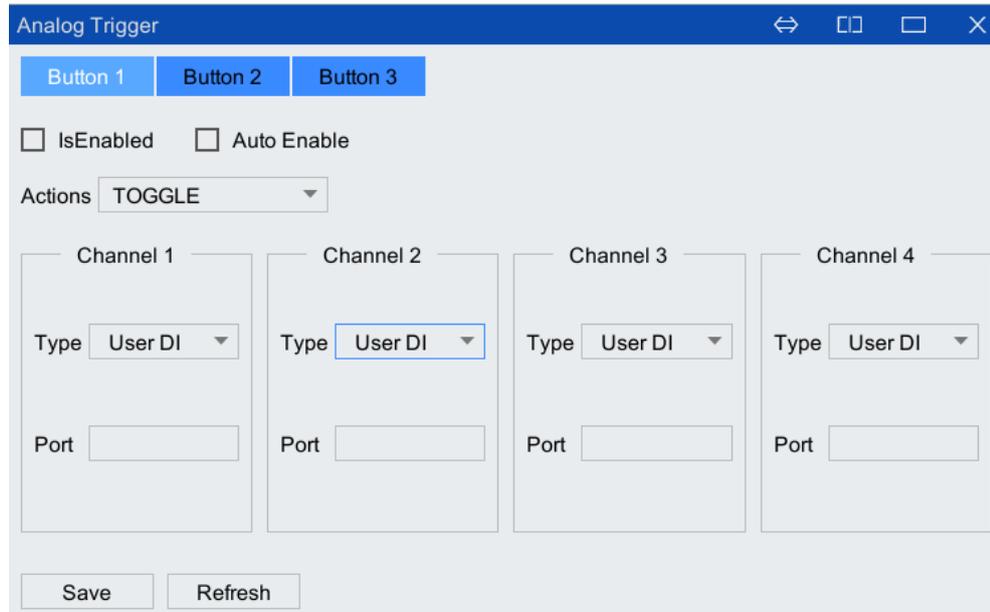


Figure 8-28 "Analog trigger" interface

Table 8-6 "Analog Trigger" Interface Setting Instructions

Name	Description
"Button 1-3" tab	<p>Corresponding to the "analog trigger button 1/2/3" that can be set in the function key "F1/F2/F3" in Figure 8 17</p> <p>Note: A single analog trigger button allows control of multiple IOs (maximum number of channels: 4)</p> <p>Please refer to chapter 8.3.2 for the setting method of "analog trigger button 1/2/3"</p>
"Enable" checkbox	<p>If checked, it will respond to the key press; otherwise, it will not respond to the key press and give a prompt in the message bar</p>
"Allow automatic mode" checkbox	<p>In automatic mode, you need to turn on "Allow automatic mode" to respond to the analog IO button; otherwise, it will not respond to the button action and give a prompt in the message bar</p> <p>In the "other mode", the analog trigger function and the program are simultaneously effective for IO control</p> <p>When the analog trigger function is turned on and the program is running:</p> <ul style="list-style-type: none"> ■ Actual DO: respond to the program's control of DO (that is, in any case, the state of DO can be controlled by the program, such as: setdo) ■ Actual DI: Does not respond to these external signals. The state of analog DI shall prevail, and a "Prompt" window will pop up: "The DI port with logical address... has been configured for analog IO button triggering and cannot continue to respond to external signals. Continue to run?" (Note: ... represents all DI port numbers that are configured to take effect)
Perform actions	<p>Switch:</p> <ul style="list-style-type: none"> ■ It was high level state before, switch to low level state ■ It was in low level state before, switch to high level state
	Set to 1: Regardless of the previous level state, the state is set to true (high level state)
	Set to 0: Regardless of the previous level state, the state is set to false (low level state)
	Press/release: the specific performance depends on the IO state before triggering

Name		Description
		When the level state is high, it becomes low after pressing, and it returns to high when released When the original level state is low level, it will become high level after pressing, and it will return to low level after release.
		Pulse: The specific performance depends on the IO state before the trigger Each press changes the state and outputs a pulse. If it is originally high, it will output a low-level pulse for about 1s after pressing it once; if it is originally low, it will output a high-level pulse for about 1s after pressing it once
"4-way" IO area frame	type	Can trigger two types of signals, user DI and user DO
	port number	Set the port number corresponding to the selected user DI/DO
save		Save only the content in the current page
Refresh		Restore to the last saved state of the current page

8.4 Appearance and Individualization

Operation steps :

- Step1. On the main interface of the teach pendant, click "System > Appearance and Personalization" option to enter the "Appearance and Personalization" setting interface as shown in Figure 8-29, screen saver time, lock screen time, language, The interface style and background picture can be set here (see Table 8-7 for each item description).
- Step2. After the setting is completed, click the <Apply> button, and the "System settings have been changed" "Prompt" box as shown in Figure 8-30 will pop up to complete the setting; if you click the <Refresh> button, it will return to the initial setting.

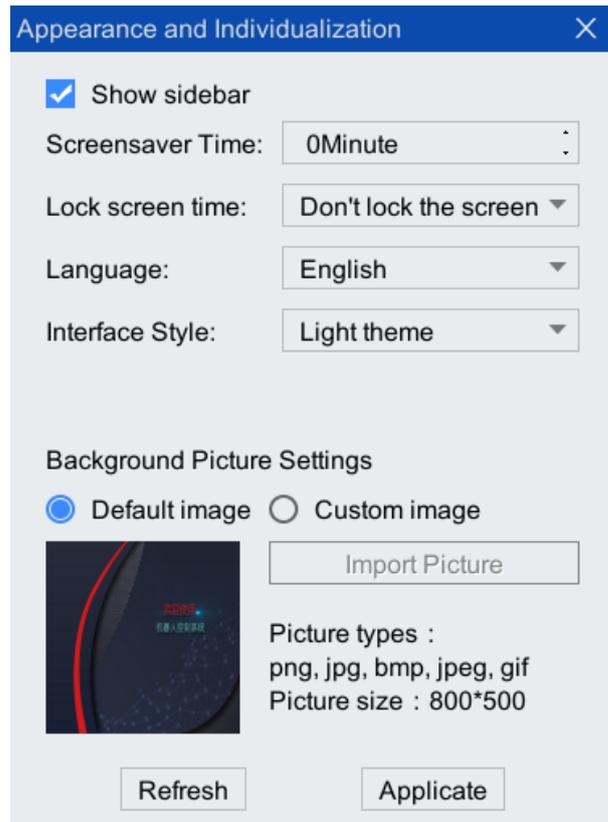


Figure 8-29 "Appearance and Invididualization" setting interface

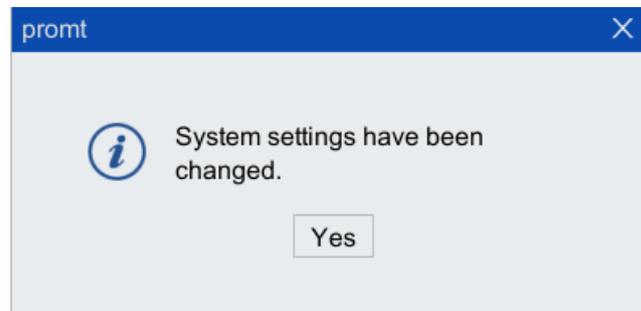


Figure 8-30 "System settings have been changed" dialog box

Table 8-7 Description of "Appearance and Invididualization" interface

Name	Description
Show sidebar	To display or hide the sidebar
Screensaver time	The screen saver trigger time can be changed via the system soft keyboard.
Lock screen time	The time required to trigger the lock screen function can be set.
Language	To display or modify the currently supported languages. Chinese by default
Interface style	To display or modify the currently supported theme styles. Dark theme by default
Background picture setting	The user can use the default background picture or customize the desired picture. The type and size requirements of the picture are shown below.

8.5 User and password

8.5.1 Password change

Operation steps :

Step1. On the main interface of the teach pendant, click "System > User and Password > Change Password" option, and the interface as shown in Figure 8-31 will pop up.

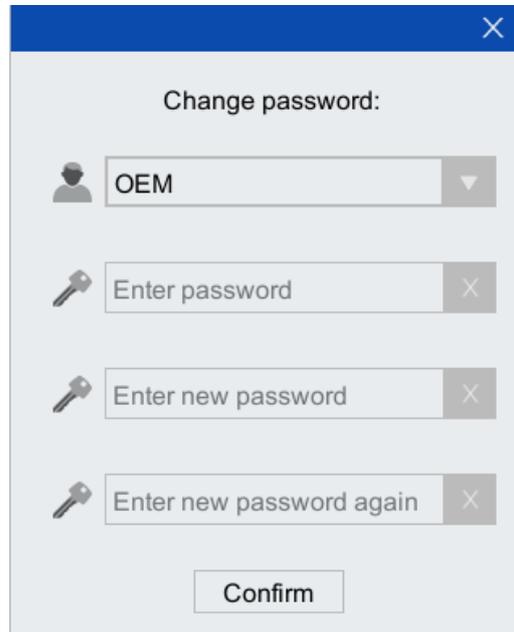


Figure 8-31 Modify password interface

Step2. The user can first enter the new password according to the prompt in the text box. After the input is completed (refer to Figure 8-32), click the <OK> button, and the "prompt" box of "Modify Password Successfully!" as shown in Figure 8-33 will pop up , The password is changed successfully.

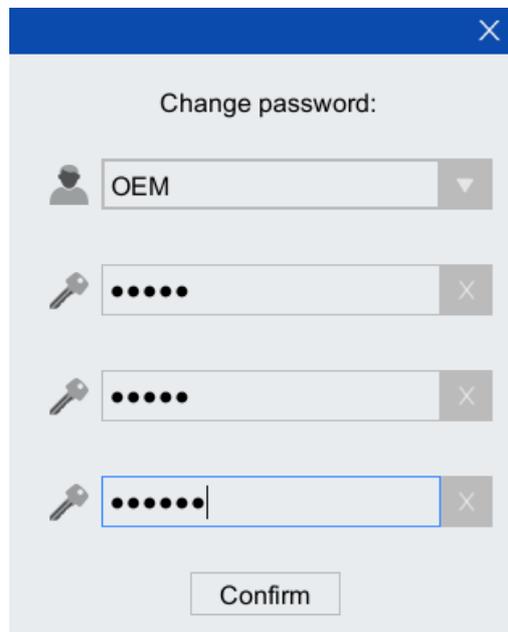


Figure 8-32 Password input complete interface

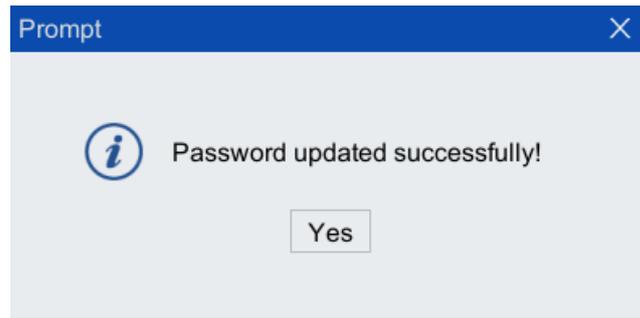


Figure 8-33 "Modify the password successfully!" "Prompt" box

8.5.2 Switch to operator

In the main interface of the teach pendant, click "System > User and Password > Switch to Operator" option, the user can quickly switch the current identity to the operator (Operator), without the need to "log out" and other operations, After the switch is successful, the "Message Bar" of the system displays "Switched to Operator", as shown in Figure 8-34.

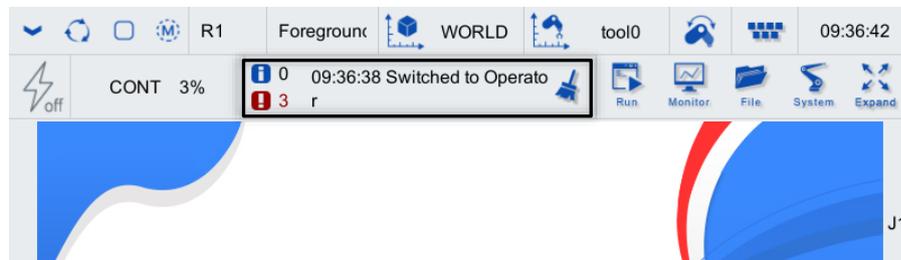


Figure 8-34 The message bar shows that it has been switched to operator authority

8.6 System and update

8.6.1 System message

On the main interface of the teach pendant, click "System > System and Update > System Information" option to enter the "System Information" interface shown in Figure 8-35. The interface contains detailed information such as version, time, authorization, storage, and IP. For instructions, please refer to Table 8-8.

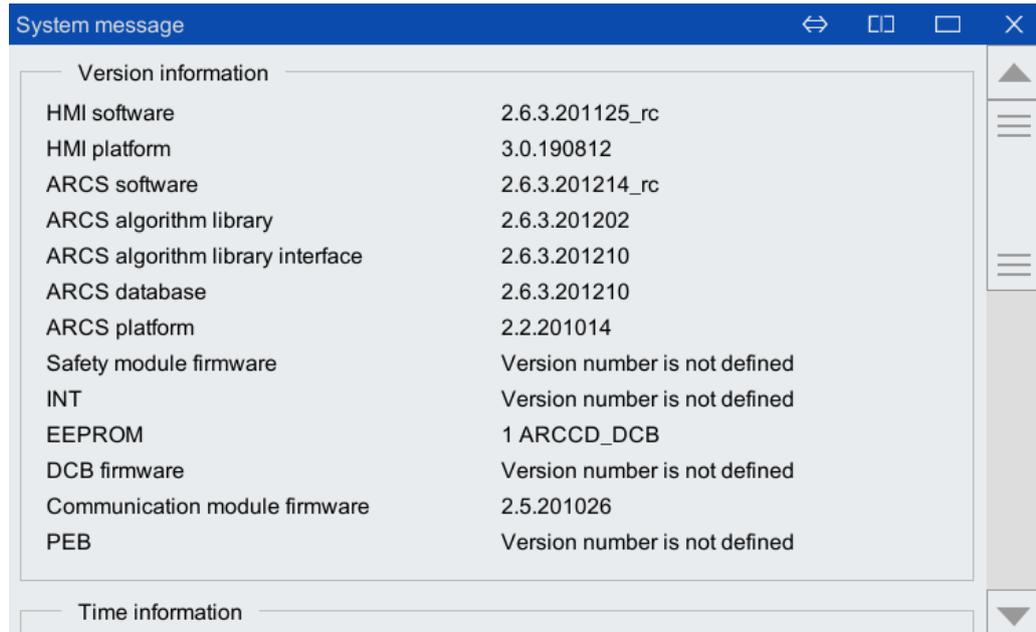


Figure 8-35 "System Information" interface

Table 8-8 Description of "System Information"

Name	Description
Version information	It contains information such as the currently used HMI version number, controller RC version number, communication card firmware version number, etc.
Time information	It contains information such as cumulative enable, cumulative startup, cumulative action time, etc.
Authorization information	It contains information such as remaining usage times, accumulative time, and absolute time with authorized equipment ID, ARCS and HG.
Storage information	It contains information such as total system space, used system space, remaining system space, etc.
IP information	You can view the IP information of HMI, ARCS and user.

8.6.2 Version update

8.6.2.1 HMI upgrade

Operation steps :

- Step1. On the main interface of the teach pendant, click "System > System and Update > Software Update" option, the "Select Version" list box pops up, as shown in Figure 8-36.

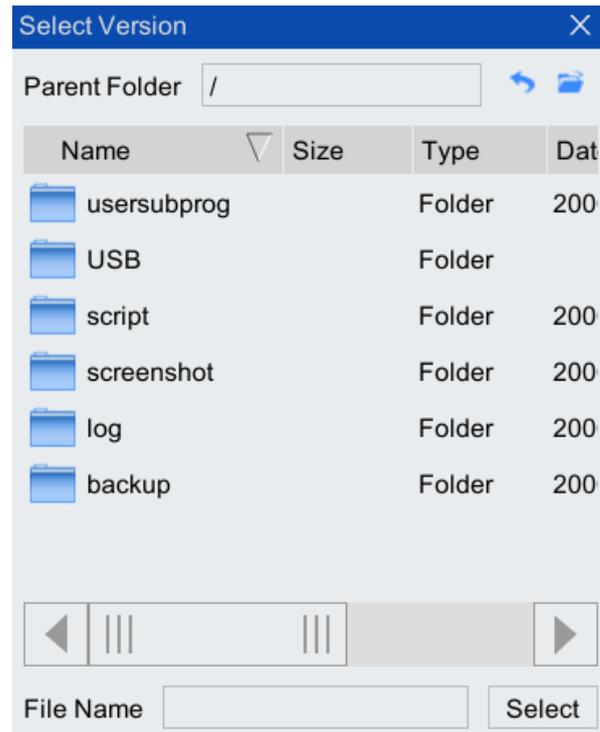


Figure 8-36 "Version Update" interface

- Step2. As shown in Figure 8-37 switch the path to the path where the HMI upgrade file is located, select the HMI upgrade file, click <Select> button to pop up "Upgrade AIR-TP to ****?" dialog box in Figure 8-38, and click <Yes> button. When "Please power off and reboot to complete the HMI upgrade!" dialog box in Figure 8-39 pops up, click <Yes> button to restart the control cabinet to complete the HMI upgrade.

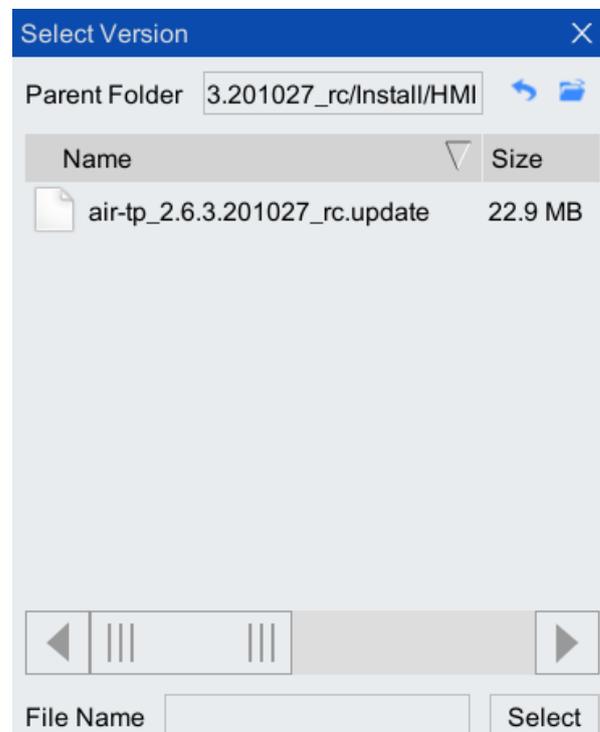


Figure 8-37 Path where HMI upgrade file is located

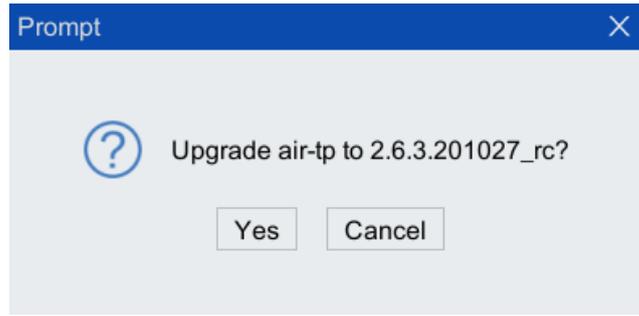


Figure 8-38 "Upgrade HMI to the corresponding version" dialog box

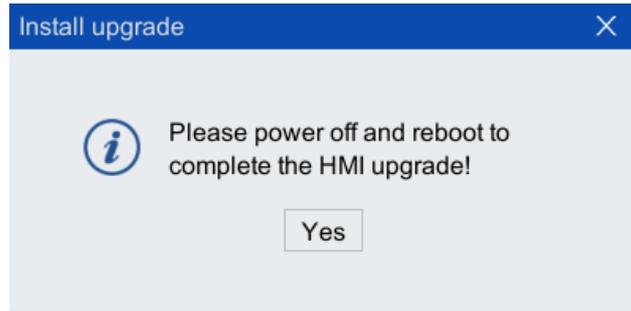


Figure 8-39 "Power off and restart to complete HMI upgrade" dialog box

8.6.2.2 ARCS upgrade

Operation steps :

- Step1. On the main interface of the teach pendant, click "System > System and Update > Software Update" option, and the "Select Version" list box pops up, as shown in Figure 8-40.

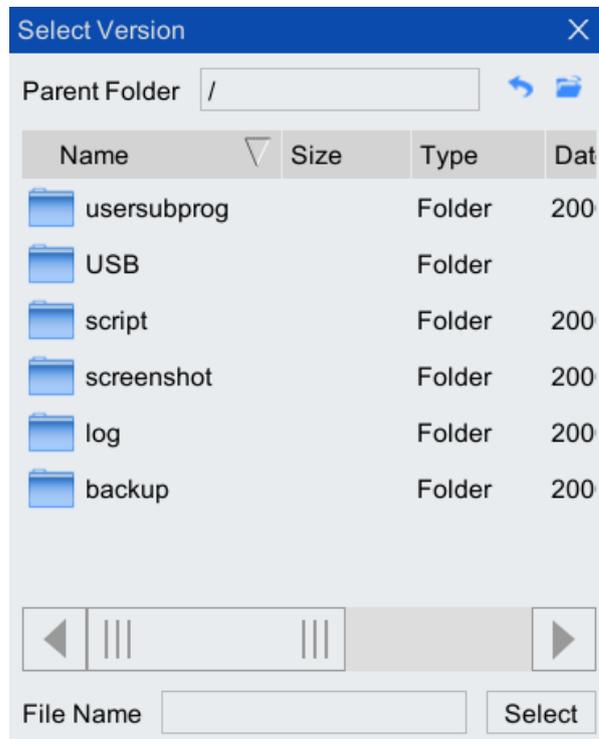


Figure 8-40 "Select Version" interface

Step2. As shown in Figure 8-41, switch the path to the path where the ARCS upgrade file is located, select the ARCS upgrade file, click <Select> button to pop up "Are you sure to upgrade ARCS to the corresponding version" dialog box in Figure 8-42, and click <Yes> button.

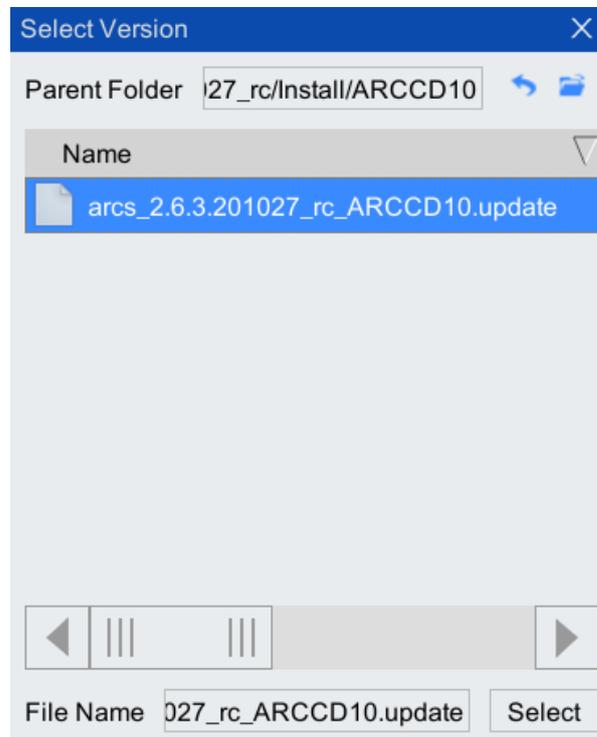


Figure 8-41 Path where ARCS upgrade file is located

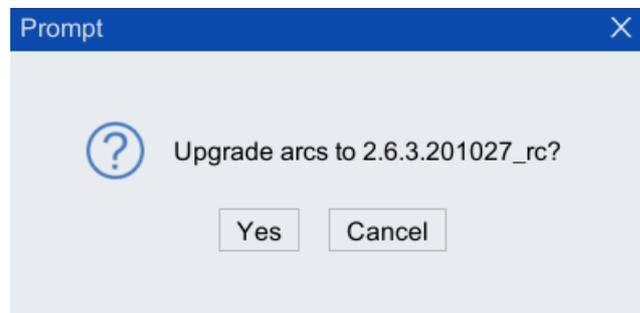


Figure 8-42 "Are you sure to upgrade ARCS to the corresponding version" dialog box

Step3. Pop up "Upgrade the Database Option" interface shown in Figure 8-43, configure the options according to the needs (for details, please refer to Table 8-9. You can only select one of the first 2 items in the table, and the last three items can be selected in multiples), and then click <Yes> button.

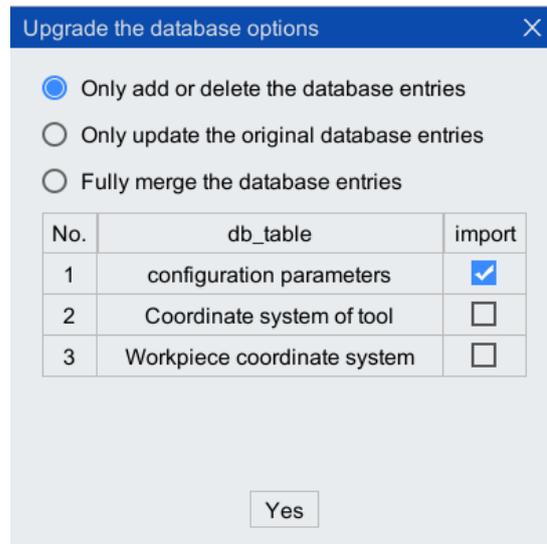


Figure 8-43 "Upgrade Database Option" interface

Table 8-9 Description of "Upgrade Database Option"

Num	Name	Description
1	Only update new or deleted parameters	Compared with the database before the upgrade, the upgraded database only adds or deletes parameters, and does not change the parameter content (this option is generally checked by default)
2	Fully updated	After the upgrade, the database in the upgrade file completely replaces the original database. This option will cause the parameter values in the original database to be initialized. Use it with caution
3	Configuration parameter	It needs to be used in conjunction with the first and second options to upgrade the parameter configuration. "Configuration parameters" option is checked by default, if unchecked, no parameter configuration upgrade will be performed

Step4. When "Please power off and reboot to complete the ARCS upgrade!" dialog box in Figure 8-44 pops up, click <Yes> button to restart the control cabinet to complete the ARCS upgrade.

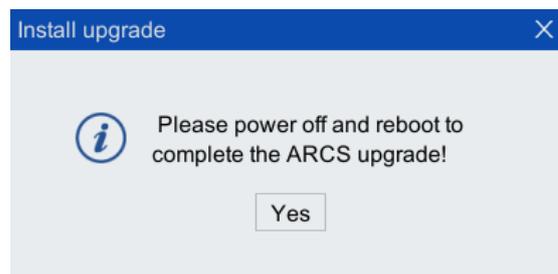


Figure 8-44 "Please power off and restart to complete the ARCS upgrade!" prompt box

8.6.3 Firmware upgrade

The firmware update function can complete the upgrade of DCB, CCB and MF firmware versions and the upgrade of corresponding configuration files.

8.6.3.1 Compact cabinet firmware update

When the control cabinet is a compact cabinet, the update of the DCB firmware version is taken as an example to describe the update process.

Update process:

Step1. Select "System> System and Update> Firmware Update" option to pop up "Firmware Update" interface shown in Figure 8-45.

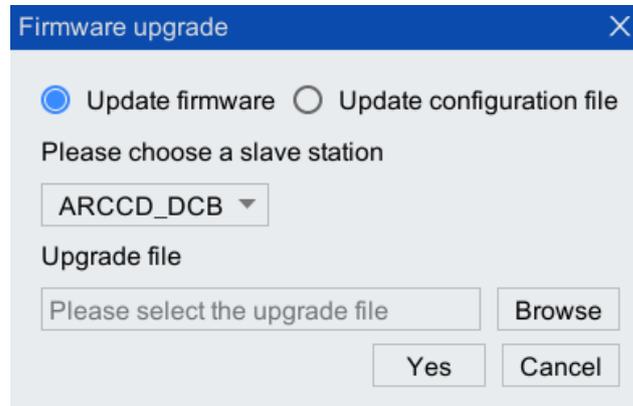


Figure 8-45 "Firmware Upgrade" interface

Step2. As shown in Figure 8-45, select "Upgrade Firmware", select "DCB" as slave, and then click <Browse> button to pop up "Please select the upgrade file" dialog box, as shown in Figure 8-46. Find the path where the DCB firmware upgrade file is located, select the upgrade file, and click <Select> button.

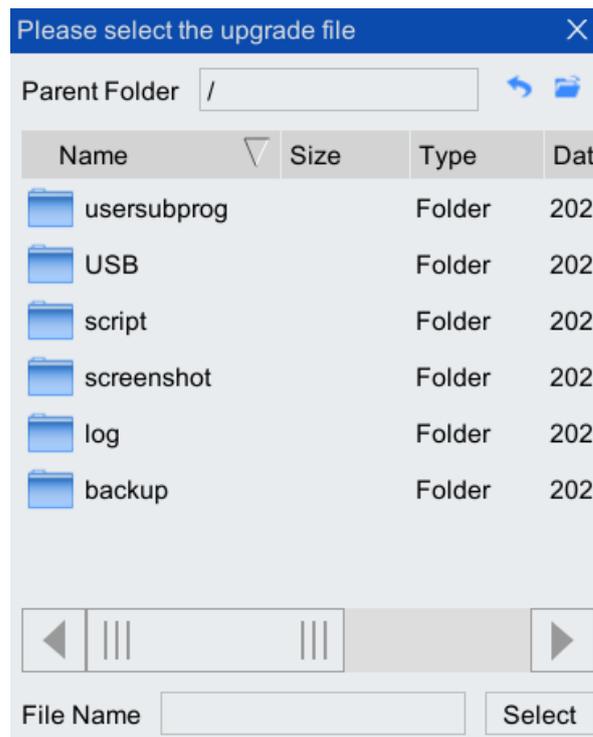


Figure 8-46 "Please select the upgrade file" dialog box

Step3. After "Are you sure to upgrade?" dialog box in Figure 8-47 pops up click <Yes> button to pop up the upgrade progress bar. The CCB file upgrade will take about 1 min.

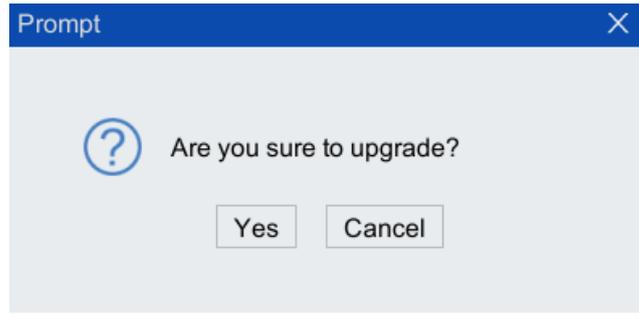


Figure 8-47 "Are you sure to upgrade?" dialog box

Step4. After upgrade, "Please power off and reboot to complete the upgrade!" dialog box in Figure 8-48 click <Yes> button, and power off and restart to complete the DCB firmware upgrade.

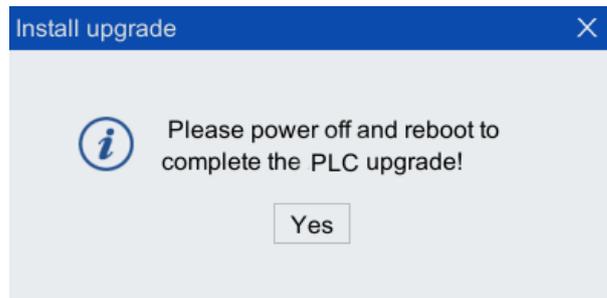
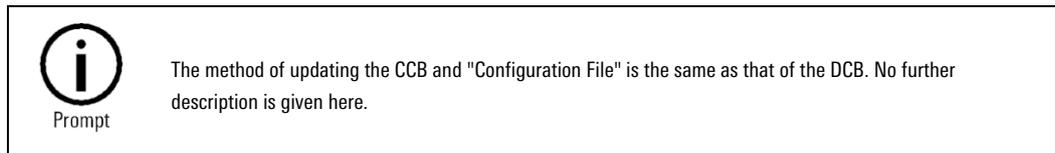


Figure 8-48 "Please power off and reboot to complete the upgrade!" dialog box



8.6.4 Platform update

Update process:

Step1. On the main interface of the teach pendant, click "System > System and Update > Version Update" option, the "Select Platform Version" list box pops up, as shown in Figure 8-49.

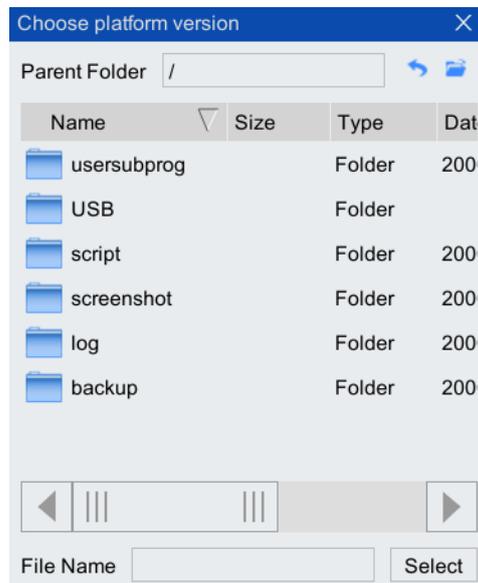


Figure 8-49 "Select platform version" list box

Step2. Switch the path from Figure 8-50 to the path where the platform upgrade file is located, select the platform upgrade file, click the <Select> button, and the "Upgrade os to **?" prompt dialog box shown in Figure 8-51 will pop up, Click the <OK> button.

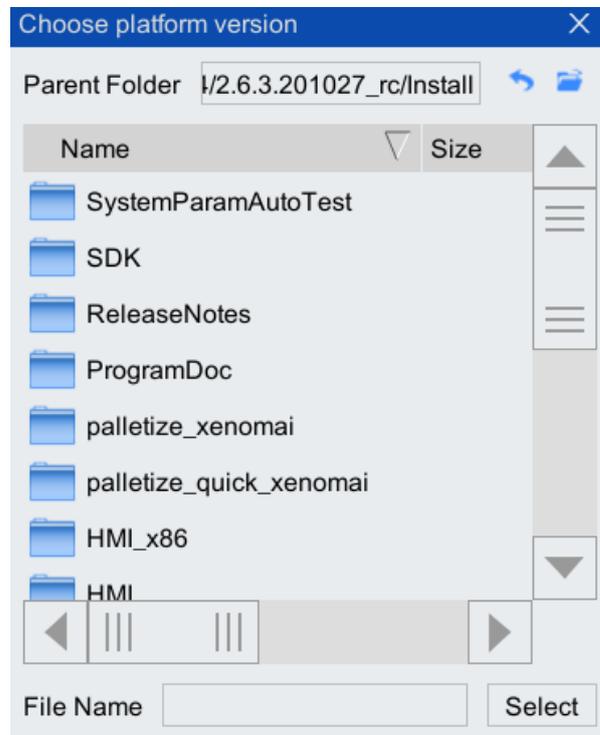


Figure 8-50 "Please select upgrade file"list box

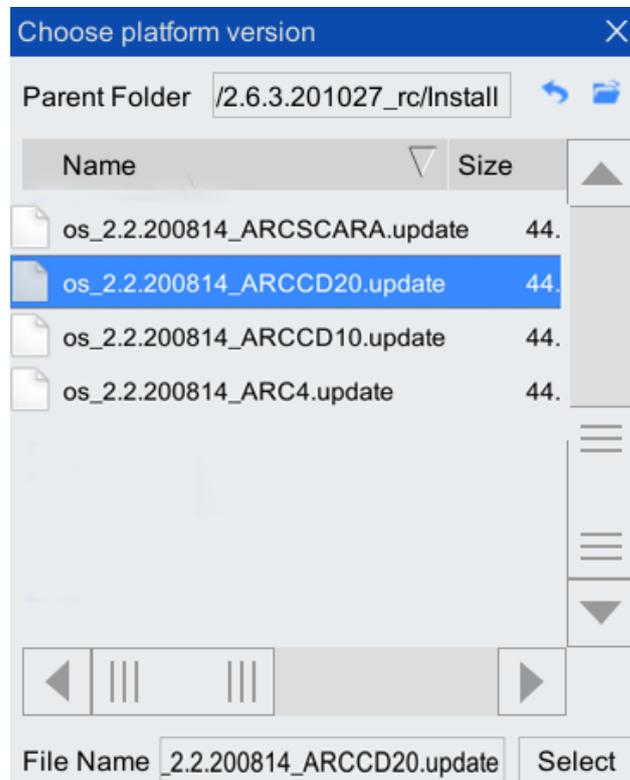


Figure 8-51 The path of the platform upgrade file

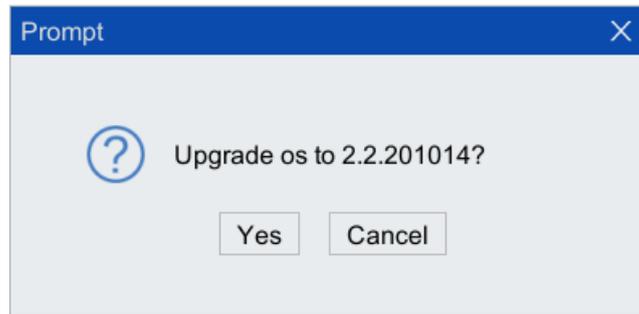


Figure 8-52 "Upgrade os to **?" "Prompt" dialog box

Step3. After the upgrade is completed, the "Please power off and restart to complete the ARCS platform upgrade!" prompt box as shown in Figure 8-53 pops up. After clicking the <OK> button, power off and restart to complete the platform update.

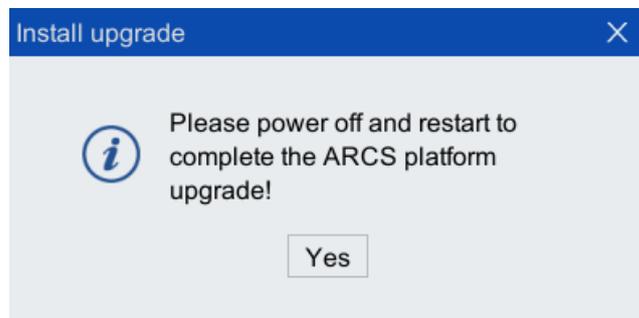


Figure 8-53 "Please power off and restart to complete the ARCS platform upgrade!" prompt box

8.6.5 Export configuration

The export configuration function can complete the export of DCB and CCB configuration files.

Specific process:

Step1. On the main interface of the teach pendant, click "System > System and Update > Export Configuration" option, and the "Save Configuration" interface as shown in Figure 8-54 pops up.

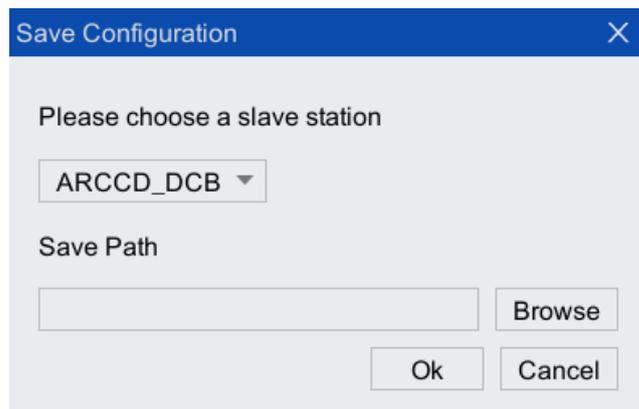


Figure 8-54 Export Configuration File

Step2. Select "D_DCB" or "EtherCAT Slave CCB" as slave, click "Browse" button, select the save path, then click <OK> button to pop up "Save configuration or not?" dialog box in Figure 8-55 and click <Yes> button.

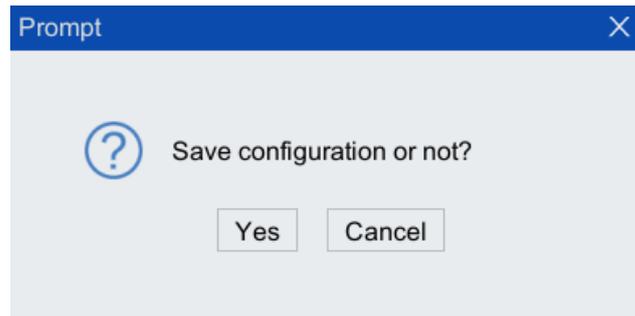


Figure 8-55 "Save Configuration" dialog box

Step3. The message bar prompts "EEPROM configuration file has been saved!", as shown in Figure 8-56. Then the configuration file is exported to the selected path.

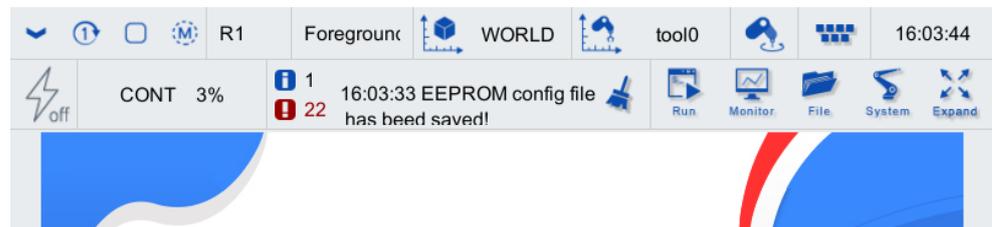


Figure 8-56 "Configuration file is exported successfully" prompt message

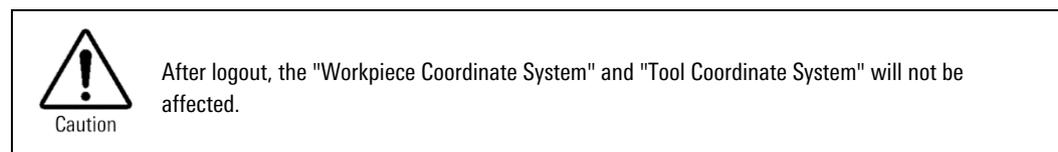
8.6.6 Authorized import

When the user is restricted by the trial period or needs to activate the extended feature pack, the authorized file (License) officially released by Peitian must be imported for activation. Related operations such as feature packs are not currently supported.

8.7 Restart and logout

8.7.1 Logout

On the main interface of the teach pendant, click "System > Restart and Logout > Logout" to log out the current user identity and return to the login interface. The user needs to log in to the teach pendant again.



8.7.2 Lock screen

On the main interface of the teach pendant, click "System > Restart and Logout > Lock Screen" option to quickly lock the current operation page and display the login interface to prevent misoperation. At the same time, the user can log in to the current identity again with a password, or switch to another identity to log in.

8.7.3 System restart

On the main interface of the teach pendant, click "System > Restart and Logout > System Restart" option, the "Are you sure to restart the system?" prompt box pops up, as shown in Figure 8-57. If you need to restart the system, You can click the <OK> button to restart the system; click the <Cancel> button to give up restarting the system.

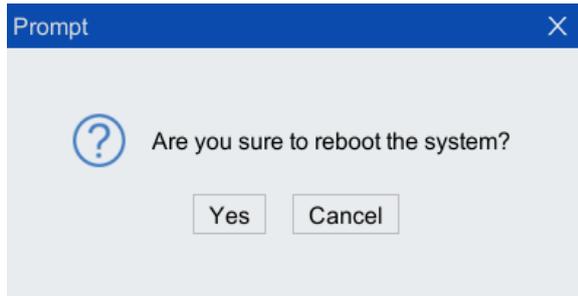


Figure 8-57 "Restart System" Interface

8.7.4 Remote shutdown

 Prompt	In order to protect the device more safely, the "remote shutdown" option is set. Remote shutdown is soft shutdown, and the difference between directly turning off the power switch of the control cabinet is similar to the difference between turning off the computer by pressing the power and turning off in the start bar.
---	--

On the main interface of the teach pendant, click "System > Restart and Logout > Remote Shutdown" option to enter the "Remote Shutdown" interface as shown in Figure 8-58, click the <OK> button to close the control system. At the same time, the teach pendant will also be closed; click the <Cancel> button to abandon the remote shutdown operation.

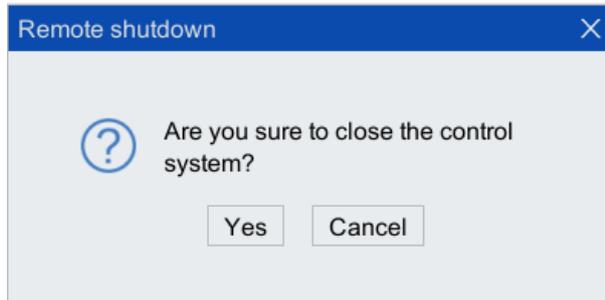


Figure 8-58 "Remote Shutdown" interface

8.7.5 Shield the teach pendant

On the main interface of the teach pendant, click "System > Restart and Logout > Teach Pendant Block" option to enter the "Lock Screen" interface as shown in Figure 8-59, and the middle of the interface displays "Teach Pendant is If it is shielded, the emergency stop function of the teach pendant is invalid, please unplug the teach pendant in time, and click the <Unlock> button at this time to unlock the invalid. You can switch to the interface shown in Figure 8-60 by clicking <Enable Teach Pendant> at the upper left of the interface, and then click the <Unlock> button to re-enter the main interface of the Teach Pendant.

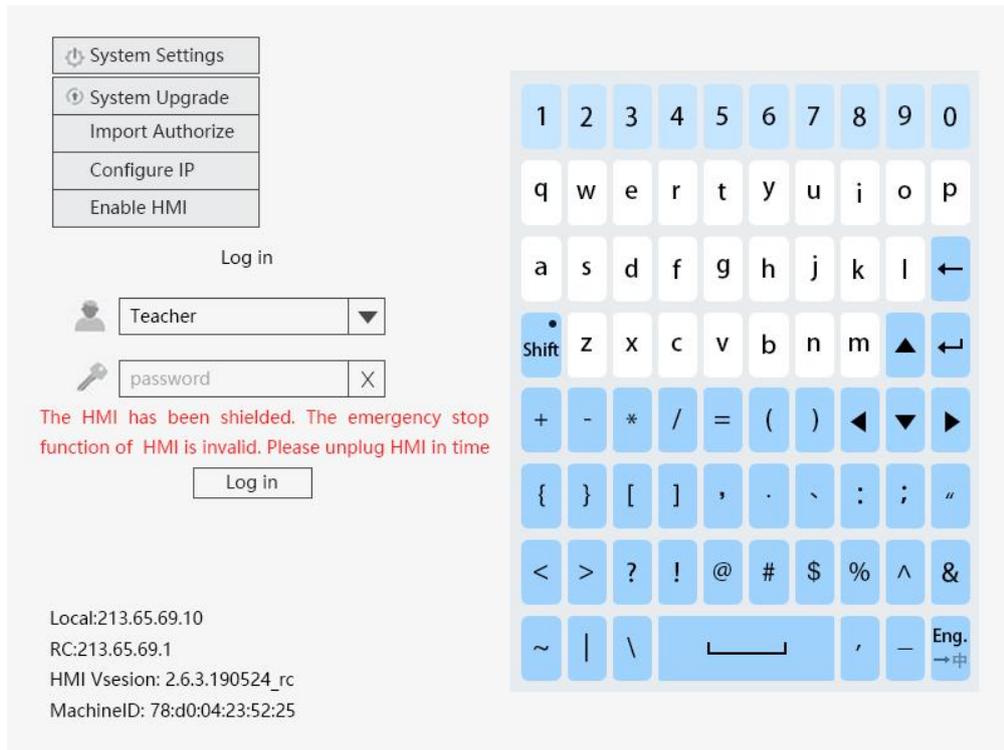


Figure 8-59 Teach Pendant "Lock Screen" Interface 1

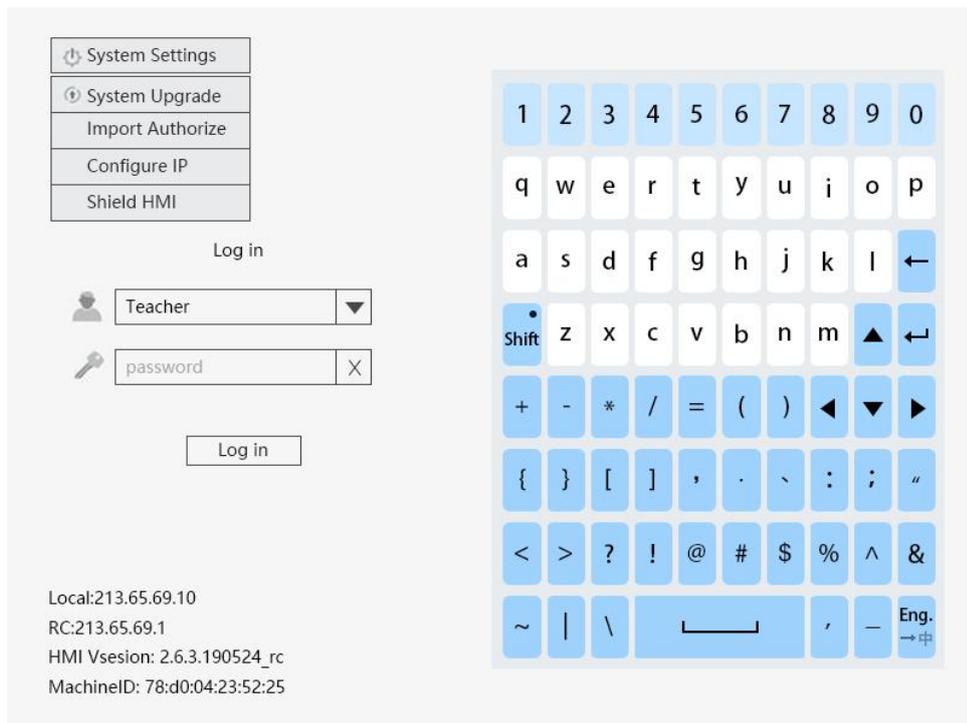


Figure 8-60 Teach Pendant "Lock Screen" Interface 2

8.8 Developer

8.8.1 Log assistant

On the main interface of the teach pendant, click "System > Developer > Log Assistant" to open the "Log Assistant" interface as shown in Figure 8-61.

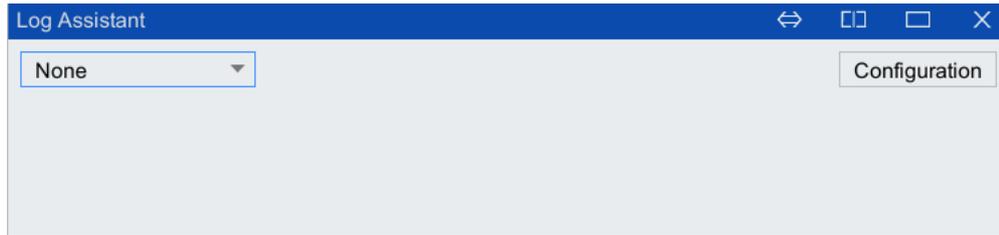


Figure 8-61 "Log Assistant" interface

Click the drop-down list in the top left corner in Figure 8-61 to pop up the 4 display content types in Figure 8-62. For details, please refer to Table 8-10.

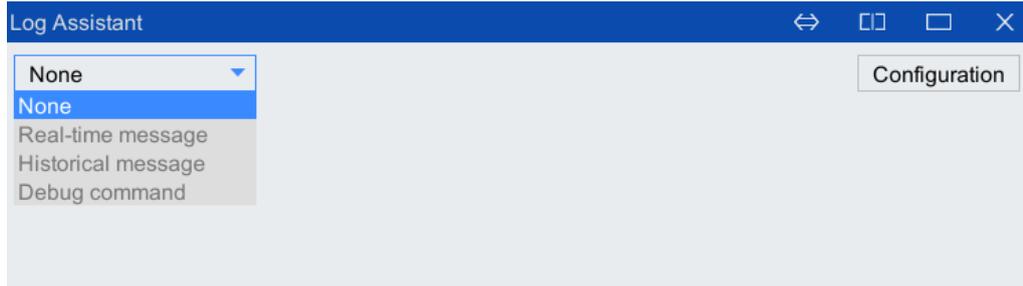


Figure 8-62 Display content list

Table 8-10 Description of "Display Content"

Name	Description
None	It represents that no information will be output in "Log Assistant" interface
Real-time message	It represents that real-time operation message will be output. For details, please refer to Section 8.8.1.1
Historical message	It represents that the historical messages recorded by the system will be output. For details, please refer to Section 8.8.1.2
Debug instruction	It represents that the system data information obtained through some debugging instructions will be output. For details, please refer to Section 8.8.1.3

Click <Configuration> button in the top right corner in Figure 8-61 to pop up the log assistant "Configuration" interface shown in Figure 8-63. The interface can configure "Source", "Message Purpose" and "Tracking Level". For details, please refer to Table 8-11. After setting, click <Applicate> button and then click <Yes> button to complete the configuration.

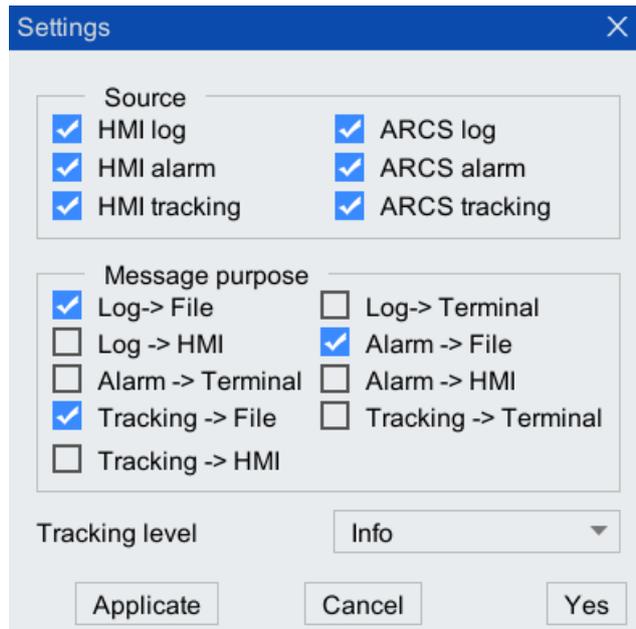
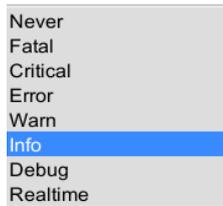


Figure 8-63 Log assistant "Configuration" interface

Table 8-11 Description of "Configuration" interface

Name	Description
Source	It mainly includes log information, warning message and tracking information from HMI; log information, warning message and tracking information from ARCS.
Message Purpose	The obtained message is output to the file (the log file in the/log/log directory)
	The obtained message is output to HMI (log assistant interface)
	The obtained message is output to the terminal (usually used by R&D personnel for debugging, and not used by the user)
Tracking level	It will be used together with "HMI Tracking" and "ARCS Tracking" options in the message source
	 <p>Figure8-64"Tracking Level" interface</p> <p>If "HMI Tracking" or "ARCS Tracking" in "Message Source" is checked, you need to specify the tracking level. As shown in Figure8-64, the tracking level is increasing from Never to Realtime. If the specified tracking level is Critical, the output tracking information will include Critical and Fatal below Critical, and if the specified tracking level is Realtime, the output tracking information will include Realtime and all levels below Realtime.</p>

8.8.1.1 Real-time message

In addition to the existing "Configuration" options, the "Real-Time Messaging" interface (see Figure 8-65) also includes the "Message Type", "Message Source" and "Clear" options. For details, please refer to Table 8-12. When selecting "Message Type" and "Source", you must ensure that the corresponding "Message Source" has been set in the configuration.



Prompt

If you want to print "real-time messages" to the log assistant interface, you also need to set the "message purpose" in the "configuration" interface to HMI, such as selecting "Log -> HMI", "Alarm -> HMI" or "Tracking->HMI" to display the corresponding "real-time message" on the log assistant interface.

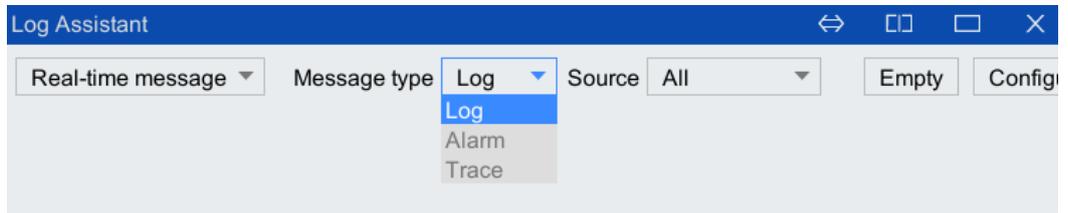


Figure 8-65 "Real-Time Message" interface

Table 8-12 Description of "Real-Time Message" interface

Name	Description
Message type	"Log" represents the output of real-time operation information on the interface; "Warning" represents the output of warning message; "Tracking" is an option used by the developer for debugging, and mainly outputs the auxiliary debugging information added by the developer during operation.
Source	Include the options such as all, ARCS only and HMI only
Clean up	To clear all messages output to the log assistant interface

8.8.1.2 Historical message

In addition to the existing "Configuration" option, the "Historical Message" interface (see Figure 8-66) also includes "Message Type", "Clear" and "Page Turn" options.

Different from "Real-Time Message", the display of "Historical Message" does not need to select the corresponding message source and message destination in "Configuration" interface. After selecting "Message Type" shown in Figure 8-66 and clicking <Page Turn Right> button, the corresponding type of "Historical Message" will be displayed. Clicking <Empty> button will clear the content displayed in the log assistant interface. Click <Page Turn Right> button again to display "Historical Message" again.

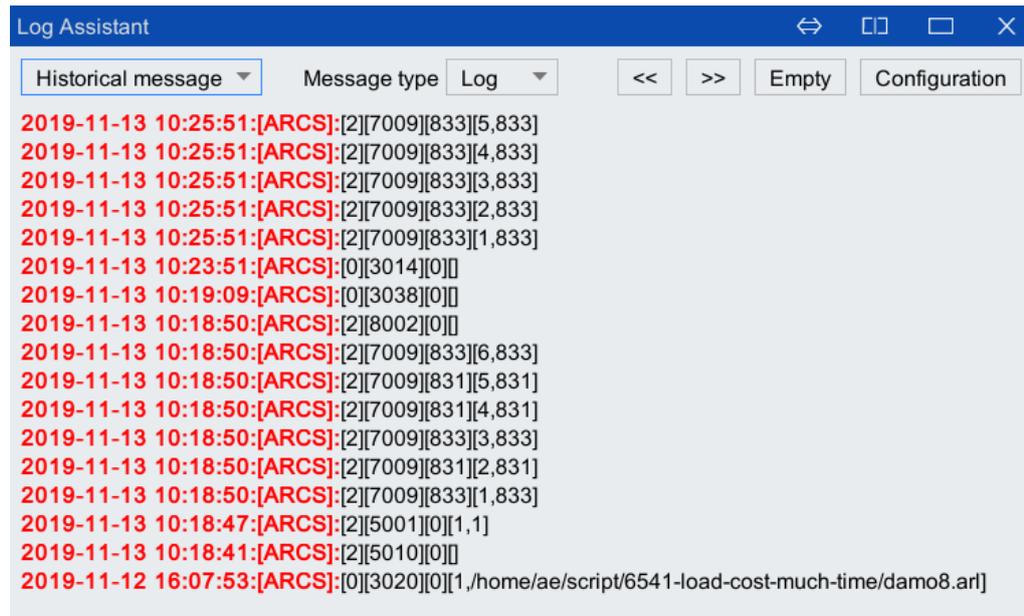


Figure 8-66 "Historical Message" interface

8.8.1.3 Debug instruction

In addition to the existing "Configuration" options, the "Debug instruction" interface (see Figure 8-67) also includes the "Instruction Input" and "Clear Historical instructions" options.

Enter the instruction to be sent in "Instruction Input Box" and click <Send> button. The instruction will be displayed on the log assistant interface. The information obtained by some instructions will be displayed on the log assistant interface, and the information obtained by some instructions will be directly output to the txt file. Clicking <Clear historical instructions> button will clear all the contents displayed in the log assistant interface.

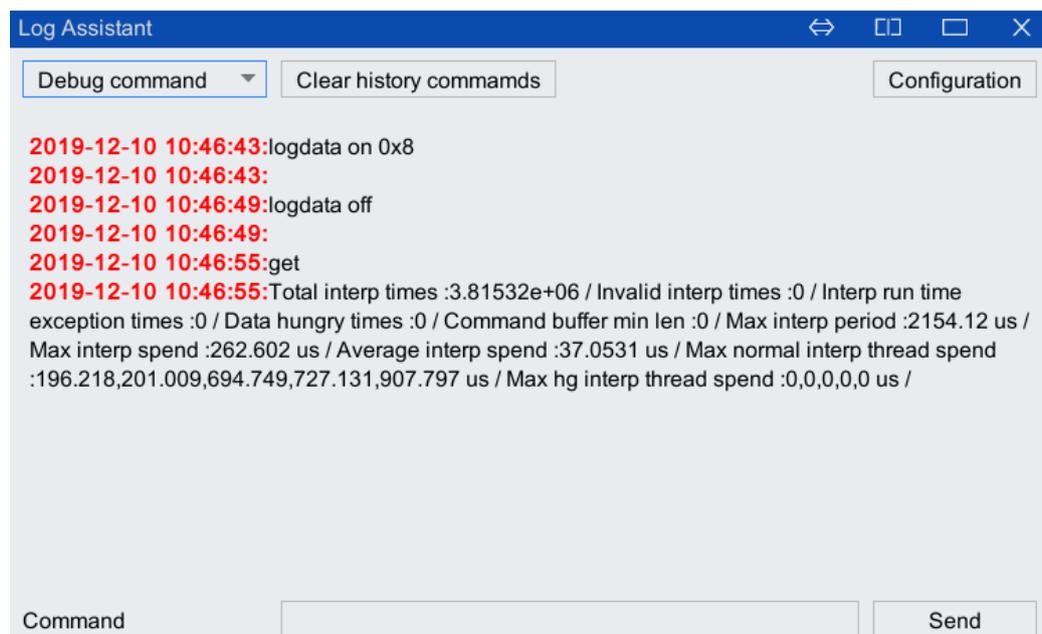


Figure 8-67 "Debug Instruction" interface



Prompt

"Debug instruction" is used by R&D personnel for debugging and is usually not open to the user.

Appendix A Summary of Parameter Configuration Permissions

Permissions 1-5 correspond to the administrator, maintainer, OEM, teacher and operator respectively.

Schedule 1 Summary of "Global" Tab Variables

Name	Meaning	Read permission	Write permission
CHANNEL_NUM	Number of foreground channels	5	4
BACK_CHANNEL_NUM	Number of background channels	5	4
PRODUCT_TYPE	Product type	5	1
SERVO_NUM	The number of servo slaves connected on the bus. If the number of slaves configured by the parameter is different from the I number of slaves connected actually, the bus connection may fail during system startup.	5	4
CANOPEN_BAUD	Set the canopen bus transmission baud rate	4	4
LOCATION	The place where the equipment is located. The user can freely modify the parameter to indicate the place where the equipment is located.	5	4
USER_IP	Local IP address when communicating with other network nodes	5	4
USER_GATE	Local gateway when communicating with other network nodes	5	4
USER_MASK	Local subnet mask when communicating with other network nodes	5	4
RESET_WHILE_STOP	Whether to reset the program while stopping (including emergency stop)	4	4
ARL_CASE_SENSITIVE	Whether ARL program text is case sensitive	4	4
AXIS_PRECISION	Confirmation of axis position accuracy	5	4
TOOL_INERTIA	Inertial parameters of tool	5	4
JOINT_POS_ERR_THRESHOLD	Excessive position deviation warning threshold	4	4

Schedule 2 Summary of "Channel" Tab Variables

Name	Meaning	Read permission	Write permission
BASE	The basic coordinate system of the mechanical unit of the channel (defined relative to the world coordinate system)	5	4
EX_JOINT_NUM	Number of external axes controlled by this channel	5	4
MECH_UNIT_NUM	Number of mechanical units in the channel	5	4
MECH_UNIT_MODEL	Model of mechanical unit controlled by this channel	5	4
MECH_UNIT_NAME	The name of the mechanical unit controlled by this channel, the user can set this parameter to distinguish the mechanical unit of different channels	5	4
VIRTUAL_AXIS_MAP	Virtual axis configuration. This parameter can be used to set some axes of the mechanical unit body or some of the external axes as virtual axes. This parameter is only used for robot debugging	5	4
HAS_FOLLOW_AXIS	Configure whether each axis in the channel has a following axis	5	4

Name	Meaning	Read permission	Write permission
MAX_ALLOW_FOLLOW_ERROR	Configure the maximum allowable following error, the unit is the number of pulses. When the following error is greater than this value, the system will alarm	5	4
EXJOINT_TYPE	External axis type	5	4
EXJOINT_OFFSET	Zero offset of external axis	5	1
EXJOINT_ENCODER_RESO	Number of single-turn pulses of external axis encoder	5	4
EXJOINT_REDUCER_RATIO	Reduction ratio of external axis reducer	5	4
EXJOINT_MAX_STROKE	Positive limit of external axis	5	4
EXJOINT_MIN_STROKE	External axis negative limit	5	4
EXJOINT_MAX_SPEED	Maximum speed of external axis	5	4
EXJOINT_MAX_ACC	Maximum acceleration of external axis	5	4
EXJOINT_MAX_JERK	Maximum jerk of external axis	5	4
CALL_JOINT_POS	The position of each axis recorded during fast calibration	5	1
EXJOINT_ENCODER_TYPE	External axis encoder type	5	4
EXJOINT_EXT_CONTROL	Whether the external axis uses external control	5	4
MECH_UNIT_HG	Mechanical unit type that supports dragging and teaching	0	0
SUPPORT_HG	Whether to support drag teaching	4	4
HOME_DEFAULT_INDEX	Select the home point by default	4	4
HOME_POSITION	A set of HOME points for each channel	4	4
MECH_UNIT_MODEL_ALIAS	Mechanical unit model alias	5	4
TOOL_INDEX	Choose which process	5	4
JOG_COLLISION_DETECT	Whether JOG mode collision detection is enabled	4	4
JOG_COLLISION_SENSITIVITY	JOG mode collision detection sensitivity	4	4
MAX_COM_VALUE	Maximum settable compensation number of tool position compensation	5	4
REF_COM_VALUE	The maximum speed of tool position compensation can set the compensation value	5	4
SLOPE_INSTALL_ANGLE	The maximum speed of tool position compensation can be set compensation value	5	4
ENABLE_VIBRATE_SUPPRESSION	Whether to enable jitter suppression	4	4
VIBRATE_FREQUENCY	Jitter suppression frequency	4	4
AUTO_LOAD_PROGRAM_PATH	Start the autoloader path. When a program is successfully loaded, the system will automatically record the program path to the variable, and the program will be automatically loaded when it is started next time	5	1

Schedule 3 Summary of "Robot" Tab Variables

Name	Meaning	Read permission	Write permission
MECH_UNIT_MODEL_NO	Mechanical unit model	5	0
MECH_UNIT_TYPE	The type of mechanical unit controlled by this channel. cartesian is a Cartesian coordinate robot, palletizer is a palletizing robot, and the robot is a general 6-axis robot	5	0
JOINT_OFFSET	Zero offset of each axis of mechanical unit	5	1
JOINT_ENCODER_RESO	Number of single-turn pulses of each shaft encoder of mechanical unit	5	2
JOINT_REDUCER_RATIO	Reducer ratio of each axis of mechanical unit	5	2
JOINT_MAX_STROKE	Positive limit of each axis of mechanical unit	5	3
JOINT_MIN_STROKE	Negative limit of each axis of mechanical unit	5	3
JOINT_MAX_ACC	Maximum acceleration of each axis of mechanical unit	5	4
JOINT_MAX_JERK	Maximum jerk of each axis of mechanical unit	5	4
TCP_MAX_SPEED	TCP maximum moving speed of mechanical unit	5	4
TCP_MAX_ACC	Maximum moving acceleration of mechanical unit TCP	5	4
TCP_MAX_JERK	Mechanical unit TCP maximum movement jerk	5	4
TCP_MAX_ROTATE_SPEED	Mechanical unit TCP maximum movement jerk	5	4
TCP_MAX_ROTATE_ACC	Maximum rotational acceleration of mechanical unit TCP	5	4
TCP_MAX_ROTATE_JERK	Maximum rotational jerk of mechanical unit TCP	5	4
GEOMETRY	Geometric parameters of arm length of general 6-axis robot body	5	2
COUPLE45	Coupling coefficient between 4-axis and 5-axis of mechanical unit	5	1
COUPLE46	Coupling coefficient between 4-axis and 6-axis of mechanical unit	5	1
COUPLE56	Coupling coefficient between 5-axis and 6-axis of mechanical unit	5	1
ROBOT_STICTION	Static friction parameters of each axis of mechanical unit	5	4
AXIS_SPEED_BUFFER_WIDTH	Width of mechanical unit axis speed buffer	5	4
AXIS_POS_BUFFER_WIDTH	Buffer width of mechanical unit axis position	5	4
AXIS_MAX_RESISTANCE_TORQUE	Maximum additional resistance torque of mechanical unit axis	5	4
TCP_SPEED_BUFFER_WIDTH	TCP speed buffer width of mechanical unit	5	4
TCP_MAX_RESISTANCE_FORCE	Maximum additional resistance value limited by TCP motion state	5	4
JOINT_MAX_SPEED_HG	Maximum drag speed of each axis of mechanical unit	5	4
TCP_MAX_SPEED_HG	Drag and teach TCP maximum moving speed	5	4
USE_DH	Whether to use DH model parameters	5	4
DH_INDEX	Select which set of DH model parameters	5	4
DH_PARAMETER_1	DH model parameters 1	4	1

Name	Meaning	Read permission	Write permission
DH_PARAMETER_2	DH model parameters 2	4	1
DH_PARAMETER_3	DH model parameters 3	4	1
DH_PARAMETER_4	DH model parameters 4	4	1
DH_PARAMETER_5	DH model parameters 5	4	1
J3_ENVELOP_RADIUS	Three-axis joint envelope radius	5	4
J5_ENVELOP_RADIUS	Five-axis joint envelope radius	5	4
HG_JOINT_MAX_STROKE	Drag the positive limit of each axis of the mechanical unit in the teaching mode	5	4
HG_JOINT_MIN_STROKE	Drag the negative limit of each axis of the mechanical unit in the teaching mode	5	4
JOINT_MAX_SPEED_SF	Maximum speed of each axis of mechanical unit when soft floating	5	4
TCP_MAX_SPEED_SF	TCP maximum moving speed during soft float	5	4
IMPEDANCE_CTRL_CARTESIAN_INERTIA	Cartesian impedance control inertia parameters	5	2
IMPEDANCE_CTRL_CARTESIAN_DAMPING	Cartesian impedance control damping parameters	5	2
IMPEDANCE_CTRL_CARTESIAN_STIFFNESS	Cartesian impedance control stiffness parameter	5	2
IMPEDANCE_CTRL_JOINT_INERTIA	Axis impedance control inertia parameter	5	2
IMPEDANCE_CTRL_JOINT_DAMPING	Axis impedance control damping parameters	5	2
IMPEDANCE_CTRL_JOINT_STIFFNESS	Axis impedance control stiffness parameter	5	2
JOINT_STIFFNESS	Stiffness parameters of each axis of mechanical unit	5	2
JOINT_VIBRATE_SPEED_WIDTH	Shaking width of each axis of mechanical unit	5	2

Schedule 4 Summary of "External Control" Tab Variables

Name	Meaning	Read permission	Write permission
EXT_CTL_ENABLE	External automatic control enable	5	4
EXT_CTL_ACT_DI	DI logic address number of external automatic control activation	5	4
SERVO_ON_DI	DI logic address number of servo on	5	4
SERVO_OFF_DI	DI logic address number of servo off	5	4
START_PROG_DI	DI logic address number of program start	5	4
PAUSE_PROG_DI	DI logic address number of program pause	5	4
RESET_PROG_DI	DI logic address number of program reset	5	4
CLEAR_ALARM_DI	DI logic address number of clear warning	5	4
PGNO_TYPE	Program number type	5	4

Name	Meaning	Read permission	Write permission
PGNO_LENGTH	Program number digit	5	4
PGNO_FBIT_DI	DI logic address number of program number start digit	5	4
PGNO_PARITY_DI	DI logic address number of program number parity digit	5	4
PGNO_VALID_DI	DI logic address number of program number ready	5	4
CHAN_STATE_DO	Start logic address number of current channel status	5	4
EXT_CTL_ACT_CONF_DO	DI logic address number of external automatic control activation confirmation	5	4
SERVO_ON_DO	DI logic address number of servo on status	5	4
PGNO_REQ_DO	DI logic address number of request program number	5	4
AT_T1_DO	DO logic address number in T1 mode	5	4
AT_T2_DO	DO logic address number in T2 mode	5	4
AT_AUT_DO	DO logic address number in AUT mode	5	4
PGNO_ACK_FBIT_DO	DI logic address number of program number confirmation start digit	5	4
EXT_CTL_NET_ENABLE	External network bus automatic control enable	5	4
AT_HOME_DO_1	DO logic address number in HOME status	5	4
AT_HOME_DO_2	DO logic address number in HOME status	5	4
AT_HOME_DO_3	DO logic address number in HOME status	5	4
AT_HOME_DO_4	DO logic address number in HOME status	5	4
AT_HOME_DO_5	DO logic address number in HOME status	5	4

Schedule 5 Summary of "IO Mapping" Tab Variables

Name	Meaning	Read permission	Write permission
SIM_IO	-	5	4
F1	-	5	4
F2	-	5	4
F3	-	5	4

Schedule 6 Summary of "Safety IO" Tab Variables

Name	Meaning	Read permission	Write permission
SAFETY_DI_SIGNALS	Definition of safety DI signal	5	1
TP_ENABLE_INDEX	Teach pendant enable signal index number	5	1

Name	Meaning	Read permission	Write permission
TP_ESTOP_INDEX	Teach pendant emergency stop signal index number	5	1
SAFETY_MODULE_ACTION_INDEX	Safety module action signal index number	5	1
TP_ESTOP_DISABLE_BIT_ADDRESS	Teach pendant emergency stop mask signal bit address number	5	1
SAFETY_DO_SIGNALS	Definition of safety DO signal	5	1
CHAN_RUN_STATE_BIT_ADDRESS	Output current channel running status signal bit address number	5	1
STOPO_INDICATE_BIT_ADDRESS	STOPO_INDICATE signal bit address number	5	1
MAIN_POWER_SWITCH1_BIT_ADDRESS	Main circuit switch signal bit address number	5	1
MAIN_POWER_SWITCH2_BIT_ADDRESS	Bit address number of main circuit switch signal	5	1
ENABLE_SAFETY_MODULE1_BIT_ADDRESS	Bit address number of enable safety module signal 1	5	1
ENABLE_SAFETY_MODULE2_BIT_ADDRESS	Bit address number of enable safety module signal 2	5	1
RESET_SAFETY_MODULE1_BIT_ADDRESS	Bit address number of reset safety module signal 1	5	1
RESET_SAFETY_MODULE2_BIT_ADDRESS	Bit address number of reset safety module signal 2	5	1
USER_SAFETY_DI_SIGNALS	User-defined safety DI signal	5	4
EXTERNAL_ACTION_DO_INDEX	DO logic address of body programming external action	5	1

Schedule 7 Summary of "Conveyor C1" Tab Variables

Name	Meaning	Read permission	Write permission
MECH_UNIT_MODEL_NO	Mechanical unit model number	3	0
MECH_UNIT_TYPE	Sub-mechanical unit type. conveyor refers to the conveyor	3	0
CONV_TYPE	Sub-mechanical unit type. conveyor refers to the conveyor	3	3
CONV_USE_EXAXIS_NO	External axis number used by conveyor	3	3
MM_PER_PULSE	Conveyor distance per pulse	3	3
PULSE_NUM_PER_CIRCLE	Number of pulses per circles of encoder used by conveyor	3	3
WOBJCS_RELATED_MIN_DIS	Min distance associated with workpiece coordinate system	3	3
WOBJCS_RELATED_MAX_DIS	Max distance associated with workpiece coordinate system	3	3
PROCESS_START_AREA_DIS	Processing start zone	3	3
QUEUE_TRACK_DIS	Queue tracking distance	3	3
SYNC_TRIGGER_SIG_MIN_DIS	Min distance of synchronization trigger signal	3	3

Name	Meaning	Read permission	Write permission
GET_ON_OR_OFF_ACC	Get on/off jerk	3	3
ADJUST_SPEED	Adjustment speed	3	3
ENCODER_TYPE	Encoder type	3	3
CONV_SYNC_TRIGGER_DI	Conveyor triggers the switch DI	3	3
REMOVE_WOBJ_LIST_RO_DI	Conveyor removes the waiting-associated workpiece DI	3	3
CLEAR_WOBJ_LIST_DI	Conveyor clears the current queue DI	3	3
DROP_WOBJ_LIST_RELATED_RO_DI	The conveyor releases the currently moving workpiece coordinate system DI	3	3
CLEAR_WOBJ_LIST_NEVER_RECORD_DI	Clear the current workpiece queue and no longer record DI	3	3
WORKPIECE_MIN_DIS	Min distance between different workpieces	3	3
TRIGGER_TYPE	Workpiece trigger type	3	3

Appendix B Summary of System Variable Permissions

Schedule 1 Schedule 8 Summary of "Integer Variables" Tab Variables

Name	Meaning	Read permission	Write permission
I	System predefined int array type system variables	5	4
I_NAME	\$I array element variable name, you can set a significant name for each element of \$I array, and then you can access the variable by this name in ARL.	5	4

Schedule 2 Summary of "Float Variables" Tab Variables

Name	Meaning	Read permission	Write permission
D	System-predefined bool array system variable	5	4
D_NAME	\$D array element variable name, you can set a significant name for each element of \$D array, and then you can access the variable by this name in ARL.	5	4

Schedule 3 Summary of "Boolean Variable" Tab Variables

Name	Meaning	Read permission	Write permission
B	System-predefined double array system variable	5	4
B_NAME	\$B array element variable name, you can set a significant name for each element of \$B array, and then you can access the variable by this name in ARL.	5	4

Schedule 4 Summary of "Joint Variable" Tab Variables

Name	Meaning	Read permission	Write permission
J	System-predefined joint array system variable	5	4
J_NAME	\$J array element variable name, you can set a significant name for each element of \$J array, and then you can access the variable by this name in ARL.	5	4

Schedule 5 Summary of "Pose Variable" Tab Variables

Name	Meaning	Read permission	Write permission
P	System-predefined array system variable	5	4
P_NAME	\$P array element variable name, you can set a significant name for each element of \$P array, and then you can access the variable by this name in ARL.	5	4

Appendix C List of Interface Functions

Schedule 1 List of interface functions

Num	Interface function	function
Robot management		
1	ConnectRobot	Initialize and connect the robot
2	DisconnectRobot	Disconnect the robot
3	EnableApiControl	Enable or disable external API control
4	SetControlMode	Set robot control mode
5	SwitchChannel	Switch channel
6	PowerOn	Power on the robot
7	PowerOff	Power off the robot
8	ClearAlarm	Clear robot alarm
Movement		
1	Move2Home	Robot return to zero
2	Move2Joint	The movej instruction controls the movement of each axis to a certain angle
3	Move2Pos (Single Position)	The ptp instruction controls the robot to move to a certain pose
4	Move2Pos (Multi Position)	The ptp instruction controls the robot to move to several poses in sequence
5	Line2Pos (Single Position)	The lin instruction controls the robot to move to a certain pose in a straight line
6	Line2Pos (Multi Position)	The lin instruction controls the robot to move to several positions in a straight line
7	Circle2Pos	The cir instruction controls the robot to move to a certain pose
8	StopMove	Control the robot to stop moving
IO		
1	GetDigitalIn	Get the digital input value of a certain way
2	GetDigitalOut	Get the digital output value of a certain way
3	SetDigitalOut	Set the digital output value of a channel
Configuration		
1	SetSpeedRatio	Set speed override
2	SetToolCoordinate	Set tool coordinate system value
3	SetWorkpieceCoordinate	Set workpiece coordinate system value
4	SetIntVariable	Set integer variable value
5	SetDoubleVariable	Set floating-point variable value
6	SetBoolVariable	Set Boolean variable value
Query		
1	GetControlMode	Query the current robot control mode

Num	Interface function	function
2	GetProgramState	Query current robot running status
3	GetSpeedRatio	Query current speed override
4	IsPowerOn	Query whether it is currently powered on
5	GetPos24	Query the current robot pose
6	GetJoint	Query the current angle of each axis of the robot, unit: degree
7	GetAlarmState	Query current alarm status
8	GetAlarmList	Query the current alarm list
9	GetIntVariable	Query integer variable value
10	GetDoubleVariable	Query floating-point variable value
11	GetBoolVariable	Query Boolean variable value
The program runs		
1	SendProgram	Send ARL program
2	LoadProgram	Load ARL program
3	StartProgram	Start the ARL program
4	PauseProgram	Pause the program
5	ResetProgram	Reset procedure

Appendix D Data Sheet of Bus External Automatic Control Interface

Schedule 1 Correspondence between EXT_CTRL_IN and its function

Variable name	Function	Variable value		
EXT_CTRL_IN"0"	Enable state	0: No action	1: Servo off	2: Servo on
EXT_CTRL_IN "1"	Emergency stop	0: No action	1: Emergency stop	
EXT_CTRL_IN "2"	Clear alarm	0: No action	1: Clear alarm	
EXT_CTRL_IN "3"	Program number	Decimal: Corresponding program number		
EXT_CTRL_IN "4"	Program start/pause	0: No action	1: Program pause	2: Program start
EXT_CTRL_IN "5"	Program reset	0: No action	1: Program reset	
EXT_CTRL_IN "6"	Program loading	0: No action	1: Program loading	

Schedule 2 Correspondence between EXT_CTRL_OUT and its function

Variable name	Function	Variable value			
EXT_CTRL_OUT"0"	Enable state	0: Servo off	1: Servo on		
EXT_CTRL_OUT"1"	Whether it is at home point 1	0: Not at home point 1	1: Already at home point 1		
EXT_CTRL_OUT"2"	Whether it is at home point 2	0: Not at home point 2	1: Already at home point 2		
EXT_CTRL_OUT"3"	Whether it is at home point 3	0: Not at home point 3	1: Already at home point 3		
EXT_CTRL_OUT"4"	Whether it is at home point 4	0: Not at home point 4	1: Already at home point 4		
EXT_CTRL_OUT"5"	Whether it is at home point 5	0: Not at home point 5	1: Already at home point 5		
EXT_CTRL_OUT"6"	Whether at the track	0: Not on track	1: On track		
EXT_CTRL_OUT"7"	Alarm information/alarm code	0: No alarm			
EXT_CTRL_OUT"8"	Emergency stop	0: No emergency stop	1: Emergency stop		
EXT_CTRL_OUT"9"	Safety door	0: Normal	1: Abnormal		
EXT_CTRL_OUT"10"	Drive ready	0: Not ready	1: Ready		
EXT_CTRL_OUT"11"	Current channel program running status	0: Program not loaded	1: The program is running	2: Program pause	3: Program stop
EXT_CTRL_OUT"12"	Request program number	0: No action	1: Request program number		
EXT_CTRL_OUT"13"	Whether in T1 mode	0: Not in this mode	1: In this mode		
EXT_CTRL_OUT"14"	Whether in T2 mode	0: Not in this mode	1: In this mode		
EXT_CTRL_OUT"15"	Whether it is in AUT mode	0: Not in this mode	1: In this mode		
EXT_CTRL_OUT"20~39"	Alarm code	Two as a group	The low bit is the alarm main code	The high bit is the alarm subcode	



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