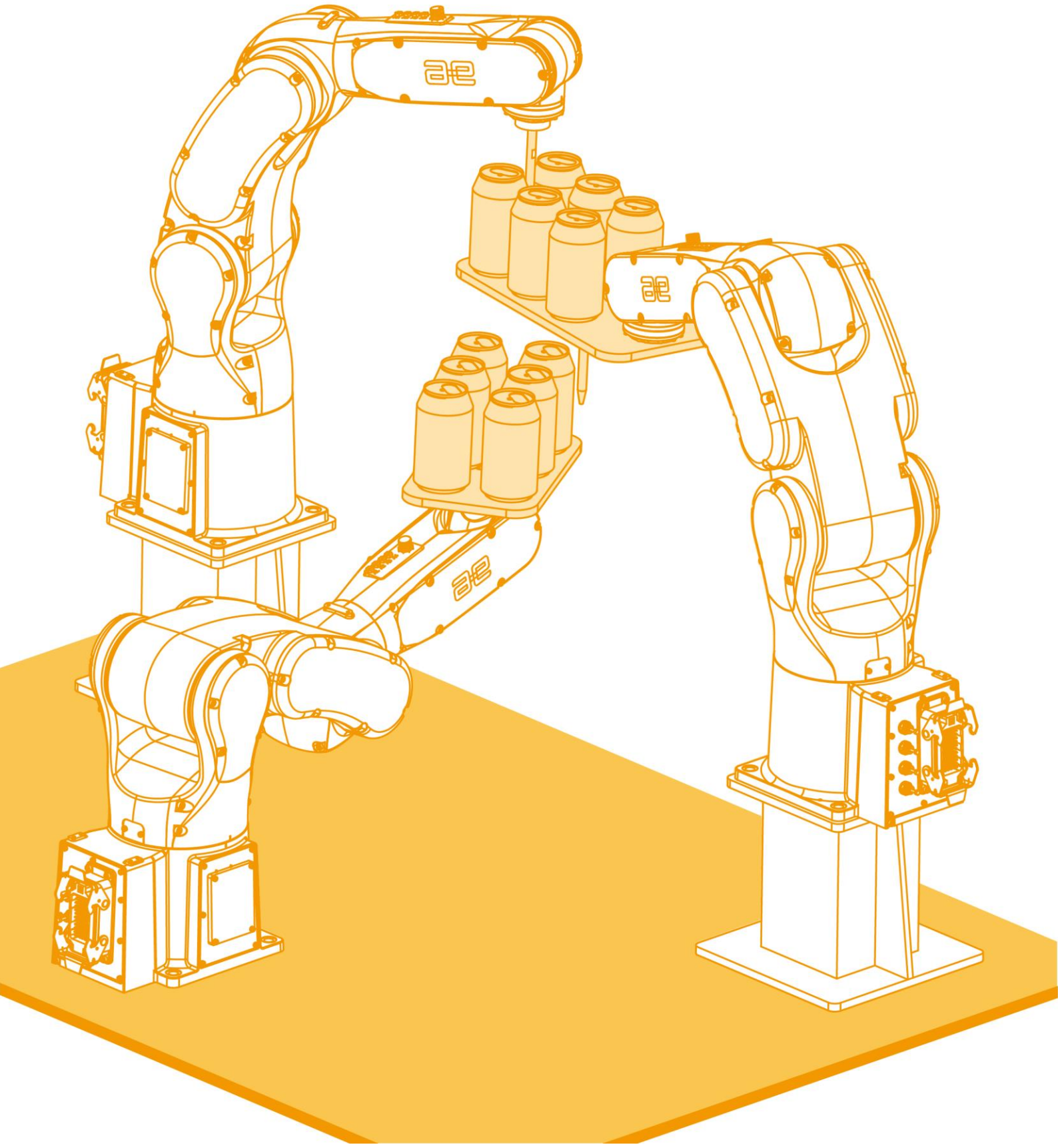
PEITIAN ROBOTICS

MultiMove user manual

V1.2.1



Foreword

About This Manual

This manual introduces the application of robot MultiMove, and describes in detail the hardware connection, configuration and verification process of MultiMove. Reading this document will help readers master the working principle and configuration method of MultiMove.

Prerequisites

Before operating the robot, be sure to read the relevant safety instructions and operation instructions of the product carefully. Users must understand the safety knowledge and basic operation knowledge before using the robot's MultiMove.

Please read the following documents when necessary:

- "AIR-TP Teach Pendant Operation Manual "
- "ARL Programming Manual"
- "Fault and Troubleshooting Manual of AIR Series Industrial Robot System"

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 cause accidents, resulting in serious or fatal personal injury.
 Warning	Failure to follow the instructions may cause accidents, resulting in moderate or minor personal injury, and may also cause damage to materials only.
 Notice	You are prompted to keep in mind environmental conditions and important matters, or quick operation methods.

Sign	Meaning
 Tip	You are prompted to refer to other literature and instructions for additional information or more details about operation 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/

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 2 Signs used in this manual

Version	Publication date	Modification description
V1.0.0	2020/03/17	1st official publication
V1.1.0	2020/10/15	2nd official release Upgrade software version to v2.6.3
V1.2.0	2021/03/20	3rd official release Upgrade software version to v2.6.4 Add "manipulator + external axis" application scenario
V1.2.1	2023/04/06	4th official release Add "Internal connection method for cabinets"

Document Number and Version

The document-related information is shown in Table 3.

Table 3 Document-related information

Document name	MultiMove user manual
Document number	UM-S01500000003-008
Document version	V1.2.1
Software version	2.6.4

Convention of symbols

See Table 4 for the relevant symbol conventions of the document.

Table 4 convention of symbols

Symbol	Significance
<>	"< >" indicate the button name, such as "click <YES> button".
[]	"[]" indicate window name, menu name and data table, such as "pop up [new user] window".
/	Multi-level menus are separated by "/". For example, the [file / new / folder] multi-level menu indicates the [folder] menu item under the [new] submenu under the [file] menu.

Contents

Foreword I

Contents i

1 Function introduction 1

1.1 Outline 1
1.2 Application scenario 1
1.3 Coordinate system definition 1

2 Hardware connection 3

2.1 "Multi robot linkage + positioner" scenario 3
2.1.1 inCube 10/12 3
2.1.2 inCube 20/21/22 3
2.2 "Multi robot linkage" scenario 4
2.2.1 inCube 10/12 4
2.2.2 inCube 20/21/22 7

3 Privilege level 13

4 Multi-robot linkage + positioner 15

4.1 Configure basic parameters 15
4.2 Check configuration 31
4.3 Coordinate system calibration 32
4.4 JOG configuration 40
4.5 Teaching practice 45

5 Multi-robot linkage 53

5.1 Configure basic parameters 53
5.2 Coordinate system calibration 63
5.3 Jog configuration 71
5.4 Teaching practice 73

6 Robot + external axis 81

6.1 Configure basic parameters 81
6.2 Teaching practice 92

1 Function introduction

1.1 Outline

The purpose of MultiMove is to operate several manipulators through one teach pendant, and coordinate the movement between different manipulators and other mechanical units, while saving the hardware cost. Linkage of up to 6 mechanical units can be realized. The diagram of MultiMove is shown in Figure 1-1.

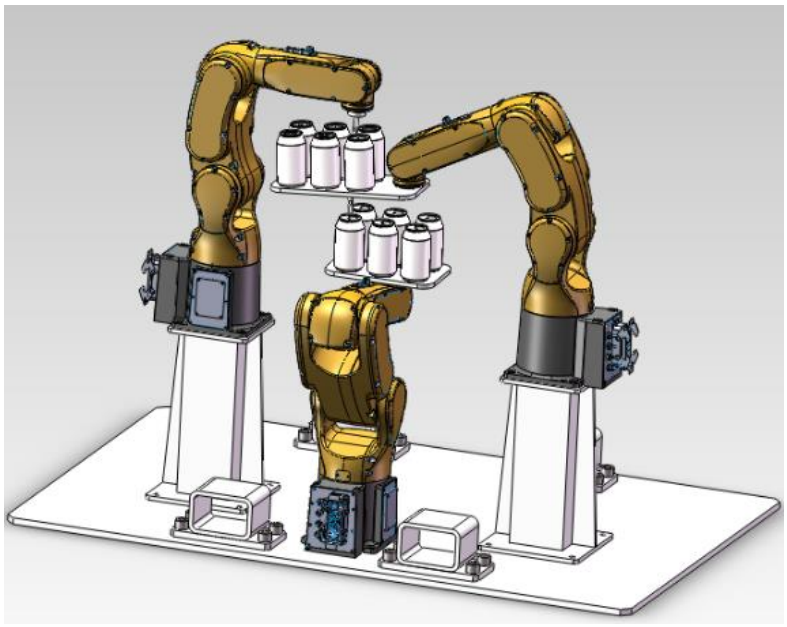


Figure 1-1 Diagram of MultiMove

1.2 Application scenario

In some scenarios, relying on the action range of the robot limits the production efficiency and automation. It is necessary to increase auxiliary equipment to cooperate with the robot to achieve the required pose, or two robots need to move together for operation. In the production of industrial robots, the peripheral equipment often equipped are the rotary table for rotating workpieces, the mobile table for moving workpieces, the guide rail of mobile robots, etc. The motion and position control of these peripheral devices need to match with industrial robots and require corresponding accuracy.

The supported application scenarios are as follows:

- Single robot + positioner
- Linkage of multiple robots (multiple robots grasp or operate a workpiece at the same time)
- Two robots + positioner (two robots operate one positioner at the same time)
- One robot + two positioners (one robot operates two positioners, and the positioner can switch position through the external axes)
- Multiple robots + external axis (the robot is not linked with the external axis)

1.3 Coordinate system definition

- World coordinate system: a static Cartesian coordinate system defined in the real environment. For MultiMove function, all mechanical units need to use the same world coordinate system. As shown in Figure 1-2.
- Base coordinate system (robot, positioner): fixed on the base of the mechanical unit, it is used to represent the installation position and attitude of the mechanical unit in the world coordinate system. When the robot is

installed on the base axis, the base coordinate system refers to the axis coordinate system at the end of the base axis, as shown in Figure 1-2.

- Axis coordinate system (robot, positioner): a coordinate system fixed on an axis of a mechanical unit and moving with the axis, which is used to describe the installation position and motion state of the axis. Its z axis is along the axis of the rotating axis or the moving direction of the moving axis. Its numbering rule is that the 1 axis is installed on the base coordinate system, the 2 axis is installed on the 1 axis, and so on. The n-axis coordinate system is represented by referring to the N-1 axis coordinate system, and the 1 axis coordinate system is represented by reference to the base coordinate system. As shown in Figure 1-2.
- Workpiece coordinate system (robot and positioner): the coordinate system describing the position and attitude of the workpiece to be processed, which can be divided into three types: world, robot and positioner The (default) workpiece coordinate system refers to the world coordinate system; the robot type workpiece coordinate system refers to the flange coordinate system of the robot; the positioner type workpiece coordinate system refers to the axis coordinate system of the end axis of the positioner, as shown in Figure 1-2.

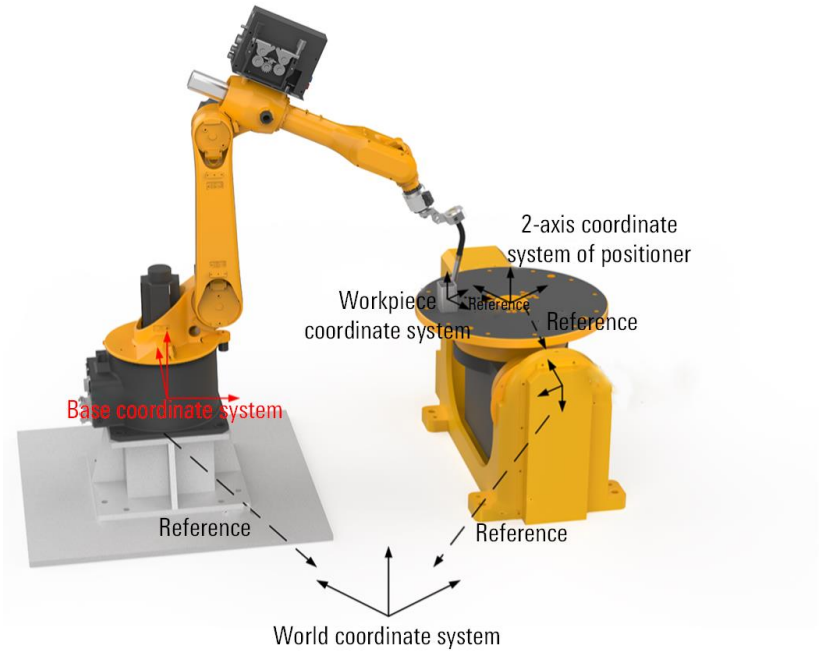


Figure 1-2 Diagram of coordinate system definition

2 Hardware connection

2.1 "Multi robot linkage + positioner" scenario

2.1.1 inCube 10/12

Figure 2-1 shows the connection mode between two inCube10/12 control cabinets and two external motors.

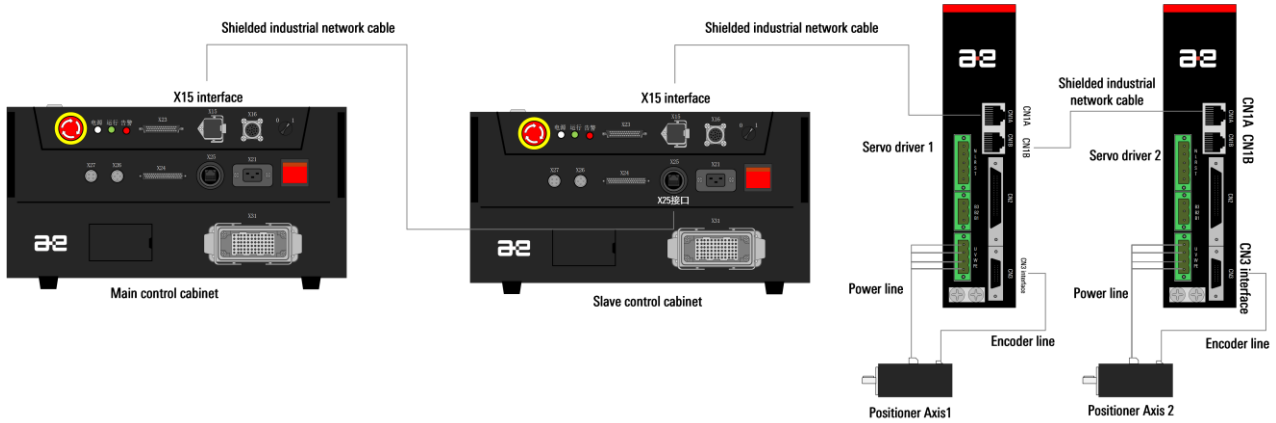


Figure 2-1 Connection diagram between inCube10/12 control cabinet and external motor

The positioner axis 1 refers to the axis closest to the base, the positioner axis 2 refers to the axis placed on the positioner axis 1 (as shown in Figure 2-2), and so on. See "1.3 Coordinate system definition" for the definition of axis coordinate system.

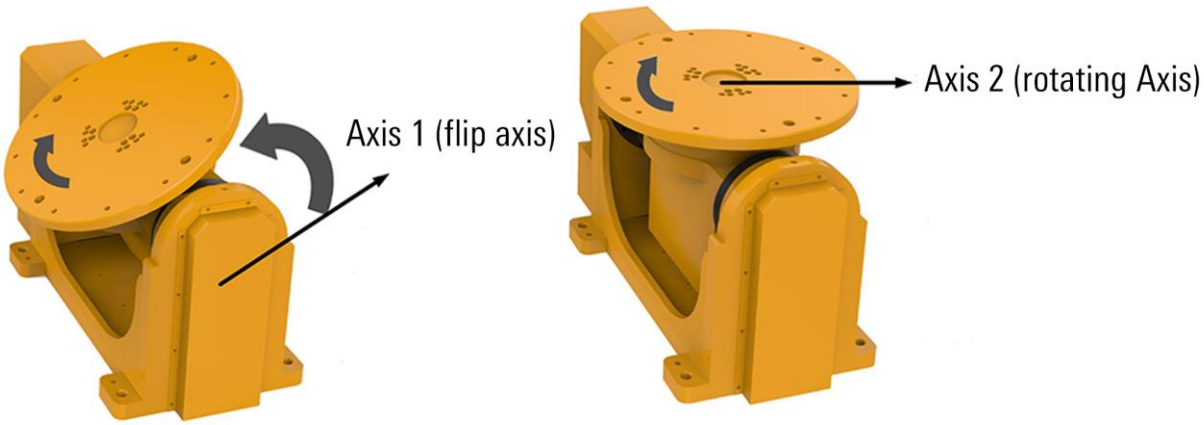


Figure 2-2 Diagram of base axis

2.1.2 inCube 20/21

Figure 2-3 shows the connection mode between an inCube20/21 control cabinet and two external motors.

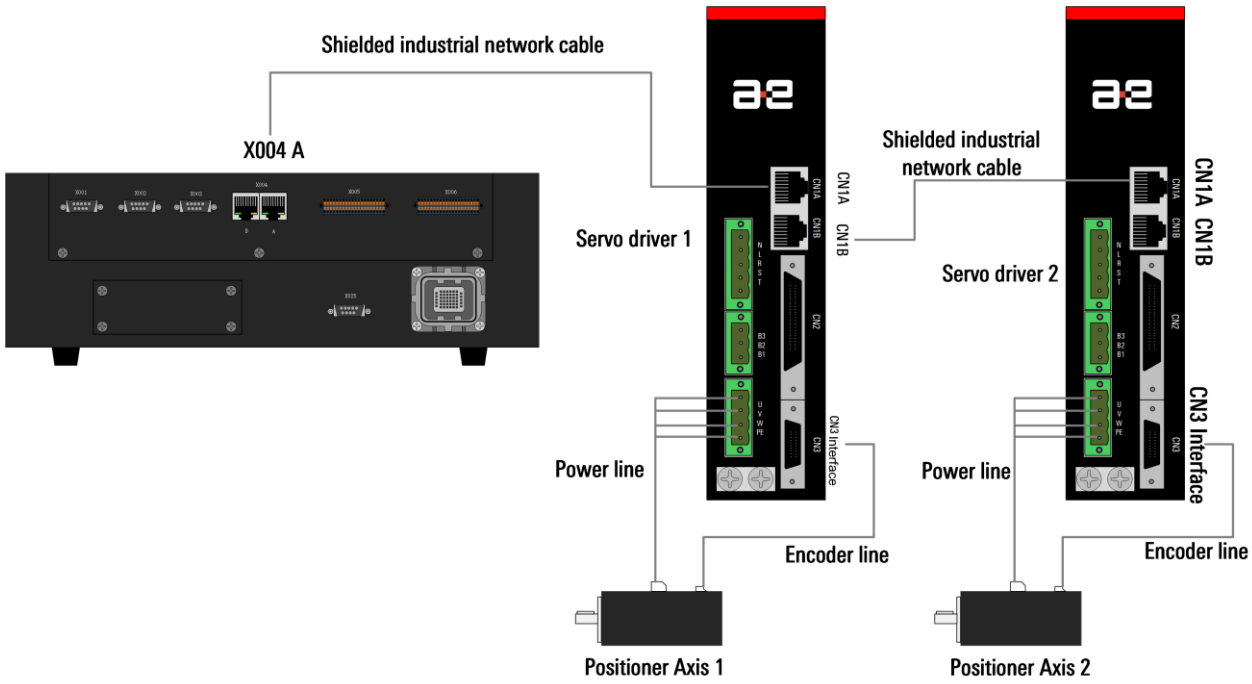


Figure 2-3 Connection diagram between inCube20/21 control cabinet and external motor

The diagram of each axis of the positioner is shown in Figure 2-2.

2.2 "Multi robot linkage" scenario

2.2.1 inCube 10/12

Wiring modification method inside the main control cabinet

Figure 2-4 and Figure 2-5 show the wiring modification method of the main control cabinet:

- Connect the LAN13 port of CCB to MCB EtherCAT
- Connect the LAN12 port of CCB to DCB
- The LAN11 port of CCB is connected to the external axis (X15)

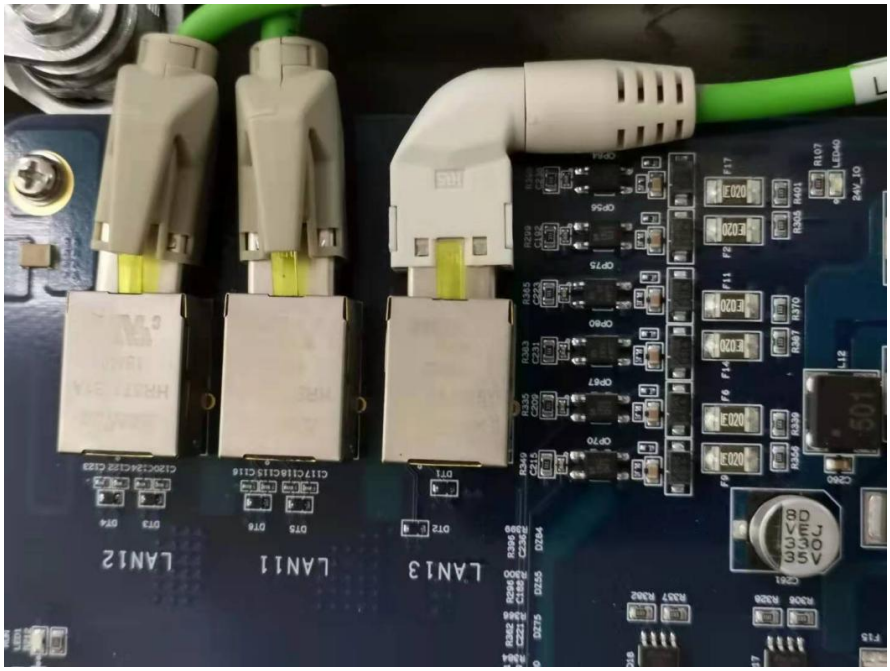


Figure 2-4 LAN12, LAN11, and LAN13 interfaces on CCB

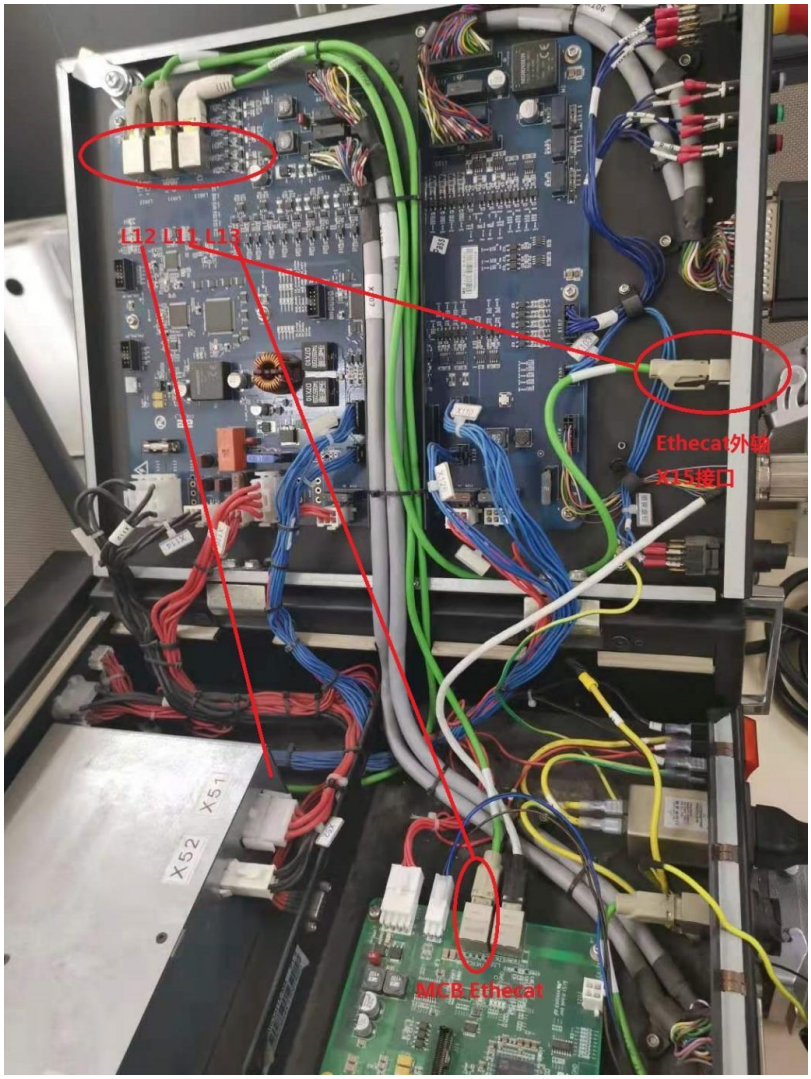


Figure 2-5 Wiring method inside the main control cabinet

Wiring modification method inside the slave control cabinet

Figure 2-6 shows the wiring method from the slave control cabinet:

- Connect the LAN13 port of CCB to the user network port (X25)
- Connect the LAN12 port of CCB to DCB
- The LAN11 port of CCB is connected to the external axis (X15)

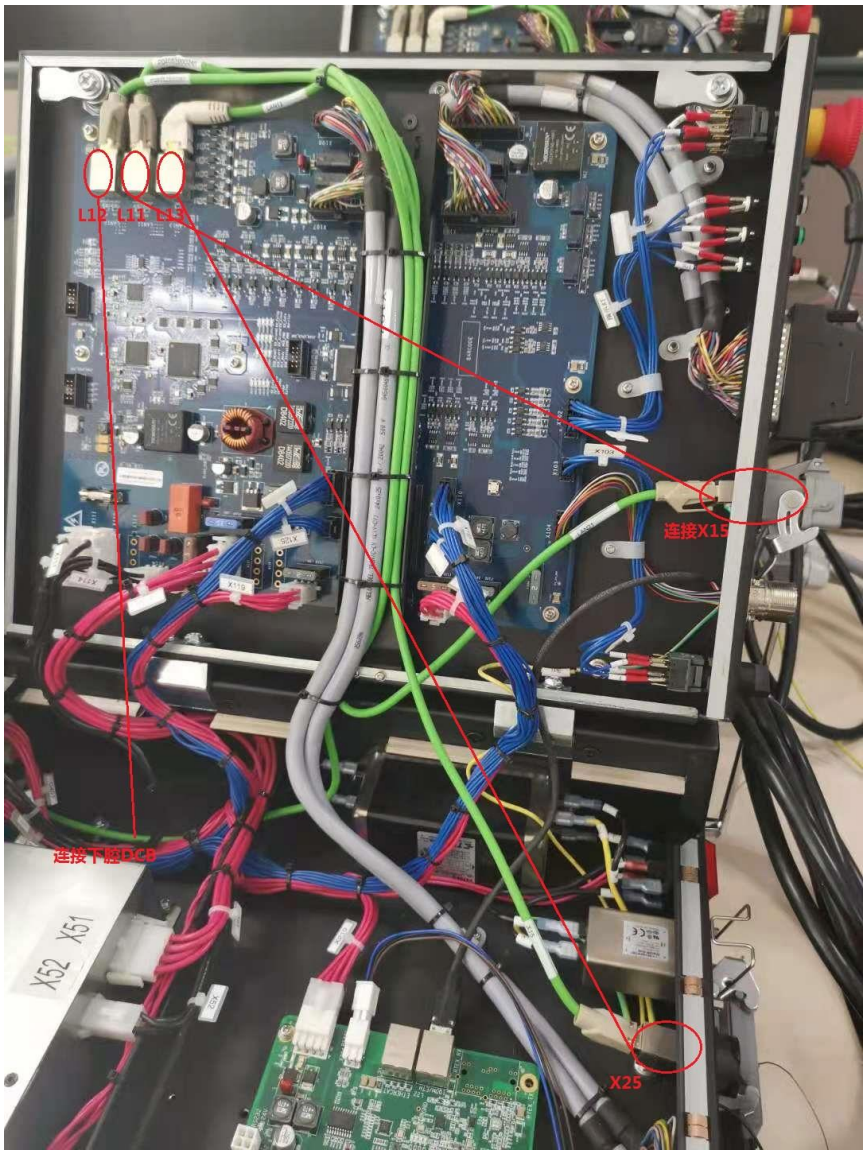


Figure 2-6 Connection method from slave control cabinet

Wiring method outside the cabinet

- Master slave mode for two control cabinets:

  The X15 interface of the main control cabinet is connected to the user network port X25 of the slave control cabinet.

- Connection method with external axis:

  The X15 interface of the main control cabinet is connected to the Ethercat interface of the external axis;

  The Ethercat interface of the external axis is connected to the user network port X25 of the slave control cabinet.

Figure 2-7 shows the connection mode of three inCube10/12 control cabinets.

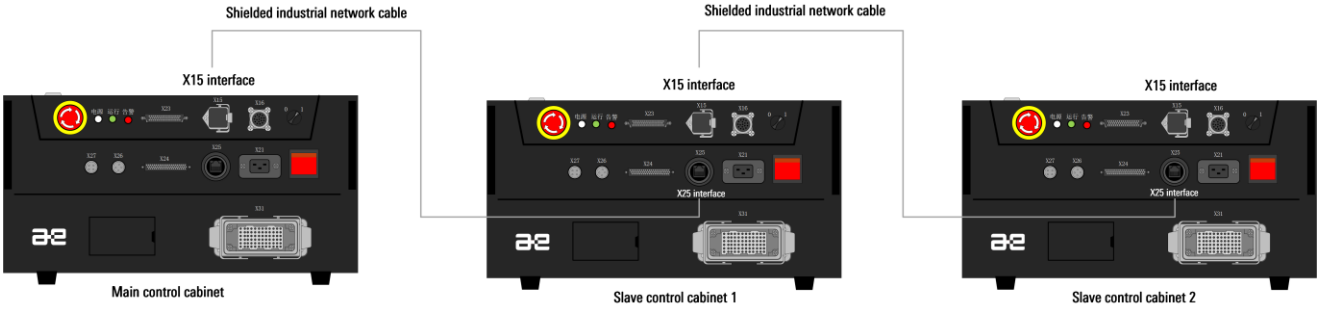


Figure 2-7 Connection diagram of three inCube10/12 control cabinets

2.2.2 inCube 20/21/22

inCube 20/21 (P1.0) cabinet wiring modification method

No modifications required for the main control cabinet

The following modifications need to be made to the MCBS board of the control cabinet:

Step1. Short circuit and weld the three corners on the right side of U43 together. As shown in Figure 2-8.

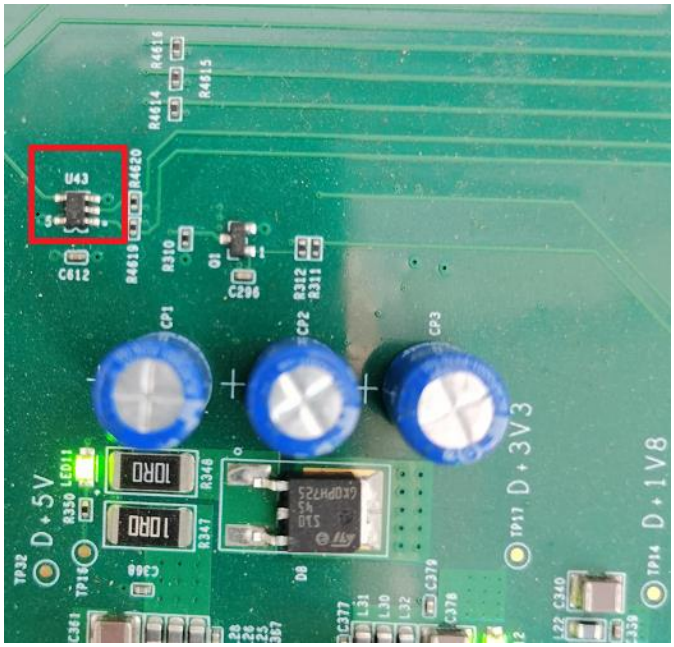


Figure 2-8 Location diagram of U43 on MCBS board

Step2. Short circuit the first two legs of PS105 with a jumper cap. As shown in Figure 2-9.

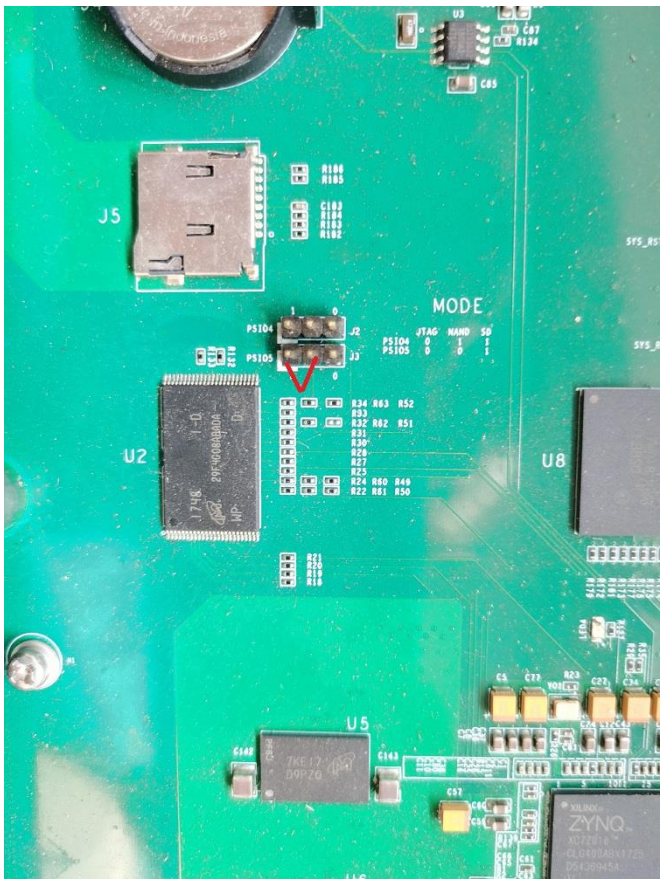


Figure 2-9 Location diagram of PS105 on MCBS board

Step3. Unplug the F2 fuse, as shown in Figure 2-10.

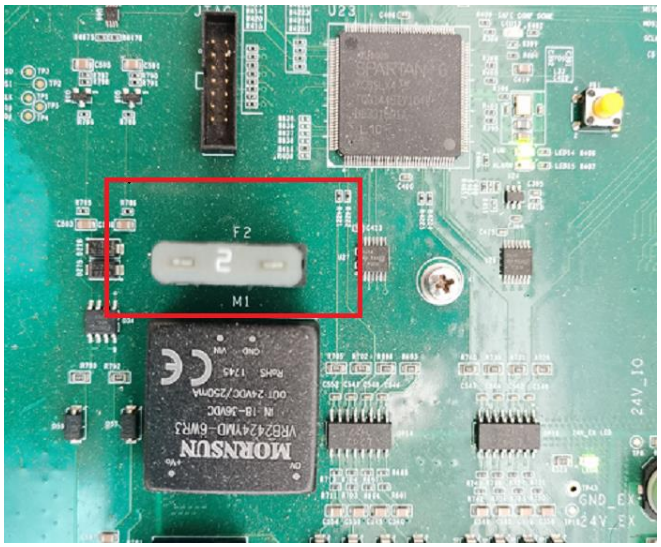


Figure 2-10 F2 Insurance Location Map on MCBS Board

Step4. Unplug one of the two EtherCat network cables that connect (MCBS) to the DCBS board. As shown in Figure 2-11.

Figure 2-11 EtherCat Network Cable Location Map on DCBS Board

inCube 20/22（P2.0）cabinet wiring modification method

No modifications required for the main control cabinet

The following modifications need to be made to the MCBS board of the slave control cabinet:

Step1. Short circuit and weld the three corners on the right side of U43 together. As shown in Figure 2-12.

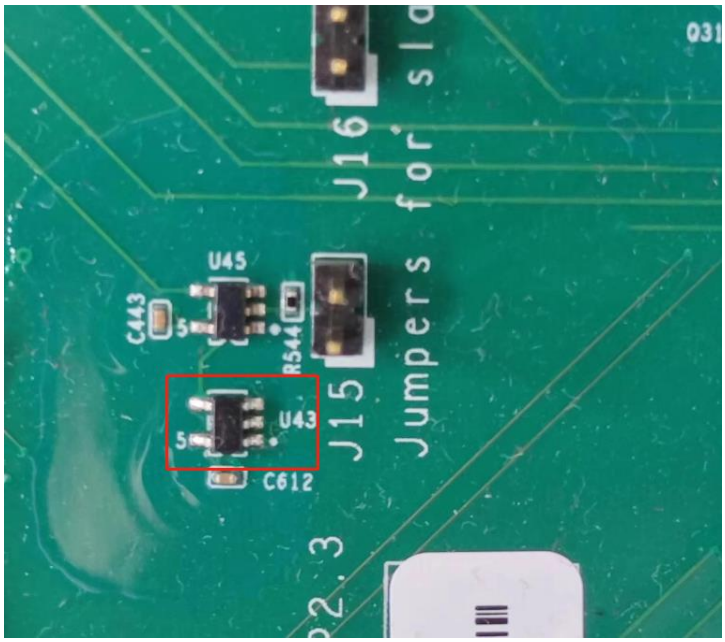


Figure 2-12 Location diagram of U43 on MCBS board

Step2. Short circuit the 2 pins of PS105 with a jumper cap. As shown in Figure 2-13.

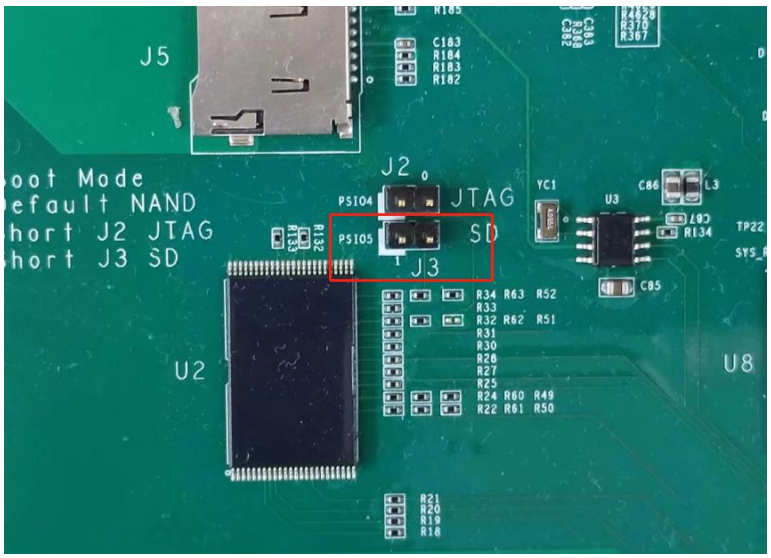


Figure 2-13 Location diagram of PS105 on MCBS board

Step3. Unplug the F6 fuse. As shown in Figure 2-14.

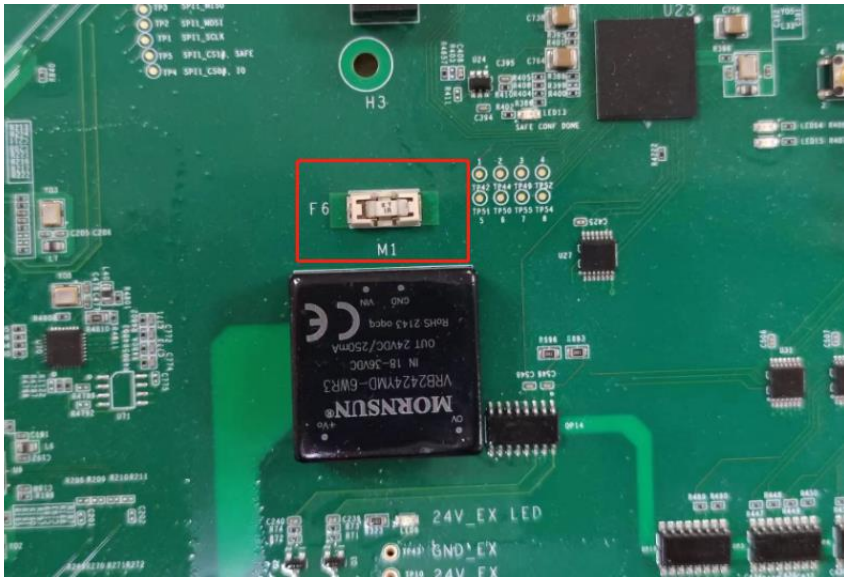


Figure 2-14 Location diagram of F6 fuse on MCBS board

Step4. Unplug one of the two Ethercat network cables that connect (MCBS) to the DCBS board. As shown in Figure 2-15.

Figure 2-15 Ethercat Network Cable Location Map on DCBS Board

Wiring method outside the cabinet

- Master slave mode for two control cabinets:

  The Ethercat interface of the main control cabinet is connected to the Ethercat interface of the slave control cabinet.

- Connection method with external axis:

  Connect the Ethercat interface of the main control cabinet to the Ethercat interface of the external axis;

  The Ethercat interface of the external axis is connected to the Ethercat interface of the slave control cabinet.

Figure 2-16 shows the connection mode of two inCube20/21 control cabinets.

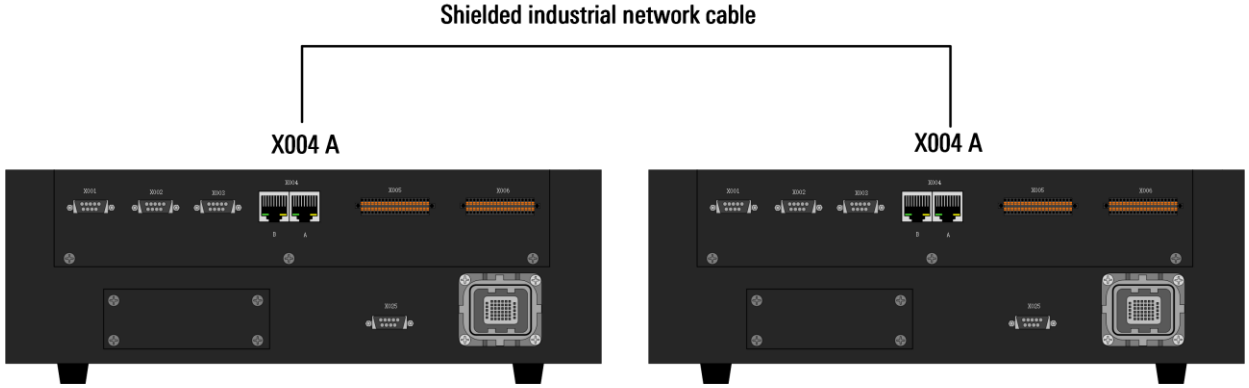


Figure 2-16 Connection diagram of two inCube20/21 control cabinets

3 Privilege level

When using the AIR-TP teaching pendant for the first time, the user interface at the first login will be prompted. The user can choose:

- Teacher: Authority 4

  Under this permission, you can write the robot working program and modify some parameters. The initial login password is: PEACE.

- Operator: Authority 5

  Under this permission, you can simply view the operation of the robot's position parameters, without program modification and parameter modification permission. The initial login password is: LOVE.


Tip

Ordinary users can only log in to the teaching pendant with the authority of teacher and operator.

4 Multi-robot linkage + positioner

4.1 Configure basic parameters

The following describes the configuration steps by taking "two manipulators + positioner" as an example.

Configure global parameters

Step1. As shown in Figure 4-1, select [System] in the upper right corner of the main interface, and then select [Parameter Configuration] in the drop-down list to enter various tab selection interfaces shown in Figure 4-2.

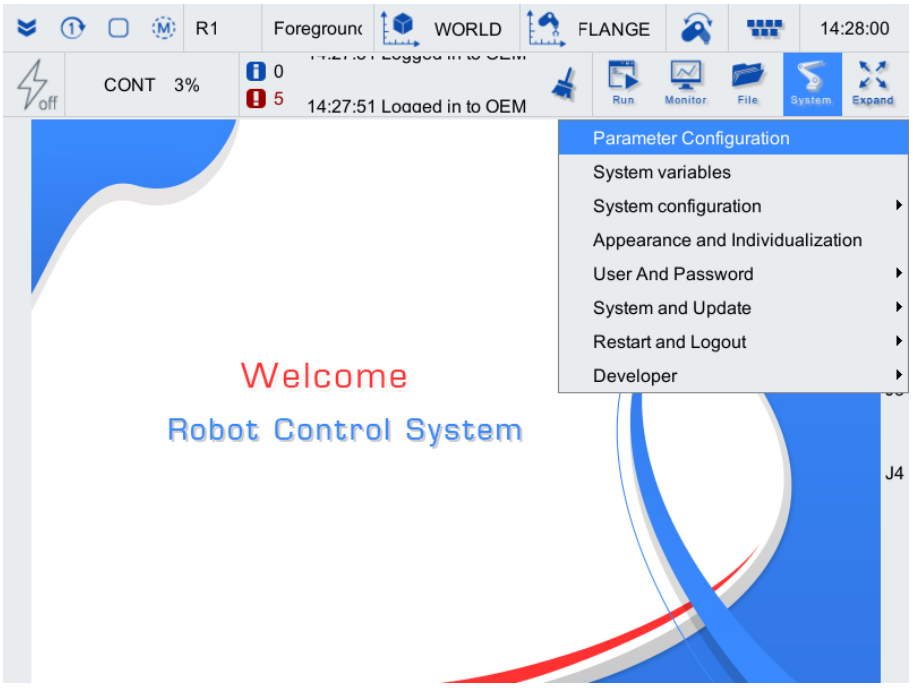


Figure 4-1 Parameter configuration selection list

Figure 4-2 Parameter configuration tab display area

Step2. In the [global] interface, click to select the [CHANNEL_NUM (Foreground Channel Number)] parameter.

Step3. Click <Edit>, and a dialog box as shown in Figure 4-3 will pop up. Configure the parameter in [Value] as 3, and click <Yes>.

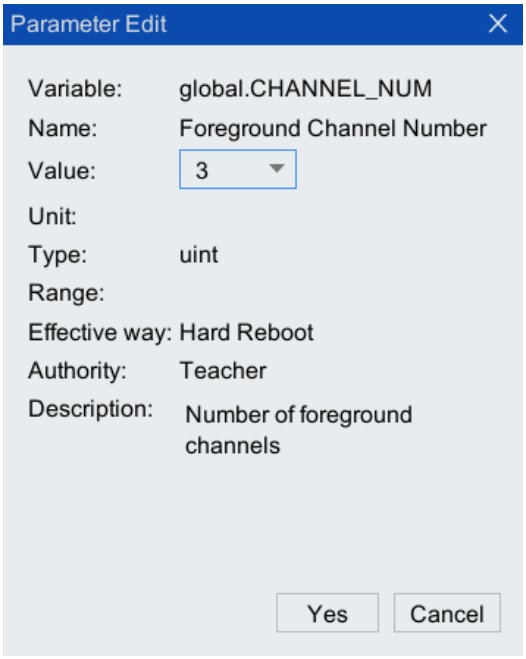


Figure 4-3 Foreground channel parameter configuration interface

Table 4-1 Parameter description

Parameter	Description
Value	Number of foreground channels. Each mechanical unit needs to occupy a separate channel. This configuration includes two manipulators and one positioner, so it is configured as 3 here.

Step4. In the [global] interface, click to select the [SERVO_NUM (Servo number)] parameter.

Step5. Click <Edit>, and a dialog box as shown in Figure 4-4 will pop up. Configure the parameters in [Value] and click <Yes>. The parameter description is shown in Table 4-2.

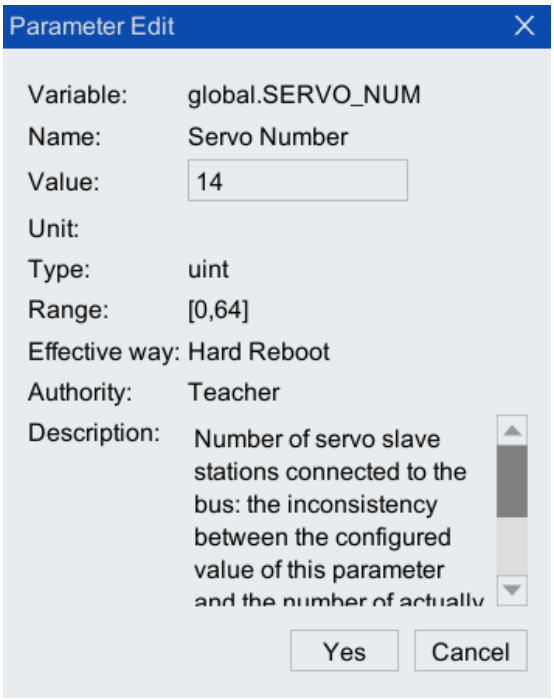


Figure 4-4 Configuration interface of servo slave stations

Table 4-2 Parameter description

Parameter	Description
Value	The number of servo slave stations connected on the bus, including the servo slave station of the manipulator and the external servo slave station. The configuration case includes 12 (2 manipulators) servo slaves and 2 (1 positioner) external axis servo slaves. Tip: The configuration of this parameter is inconsistent with the actual number of slave stations, which may cause bus connection failure when starting the system.

Step6. After the configuration is completed, click <Save>, and it will take effect after restarting the control cabinet.

Configure channel 1 parameters (R1)

Step1. Click the <Mechanical Unit> (R1) button on the interface, as shown in Figure 4-5. After clicking [R1], click the "" button.

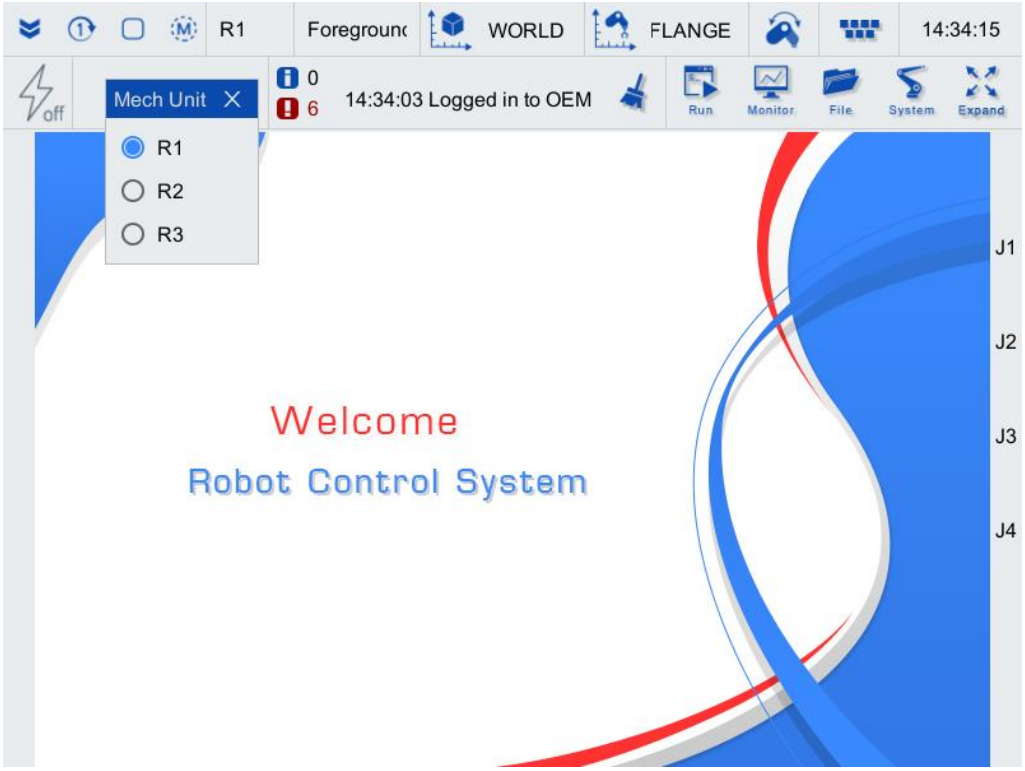


Figure 4-5 Interface for mechanical unit switching

Step2. In the [channel 1] interface, click to select the [EX_JOINT_NUM (External Axes Num)] parameter;

Step3. Click <Edit>, and a dialog box as shown in Figure 4-6 will pop up. Configure the parameter in [value] as 0, and click <Yes>. The parameter description is shown in Table 4-3.

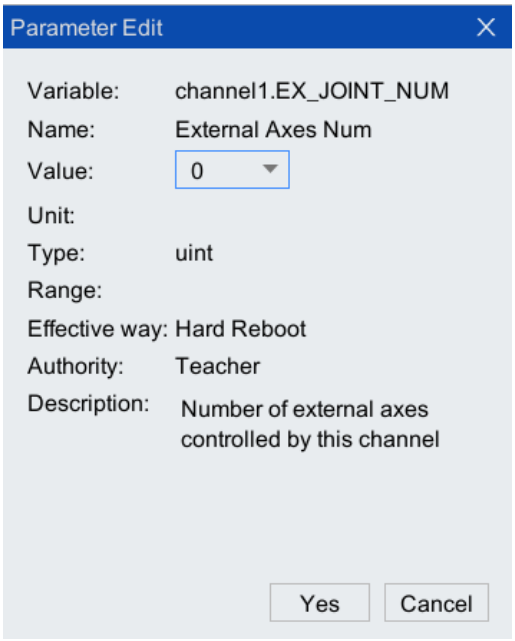


Figure 4-6 External axis quantity configuration interface

Table 4-3 Parameter description

Parameter	Description
Value	This channel controls the number of external axes. In integer form, the value range is 1-6.

Step4. In the [Channel 1] interface, click to select the [MECH_UNIT_NUM (Number of mechanical units)] parameter.

Step5. Click <Edit>, and a dialog box as shown in Figure 4-7 will pop up. Configure the parameter in [Value] as 1, and click <Yes>. The parameter description is shown in Table 4-4.

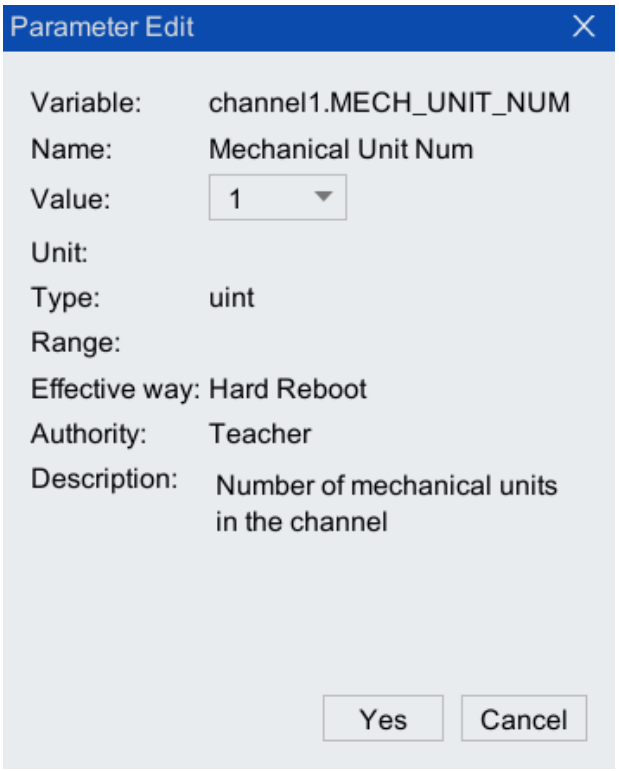


Figure 4-7 Interface of mechanical unit quantity configuration

Table 4-4 Parameter description

Parameter	Description
Value	Number of mechanical units in this channel.

Step6. In the [Channel 1] interface, click [+] on the left side of the [MECH_UNIT_MODEL (Mechanical unit model)] parameter, and click to select "[0]" ([0] is the robot body) in the expanded sub-items item.

Step7. Click <Edit>, and the dialog box shown in Figure 4-8 will pop up. The parameter in the configuration [Value] is the actual robot model, click <Yes>. The parameter description is shown in Table 4-5.

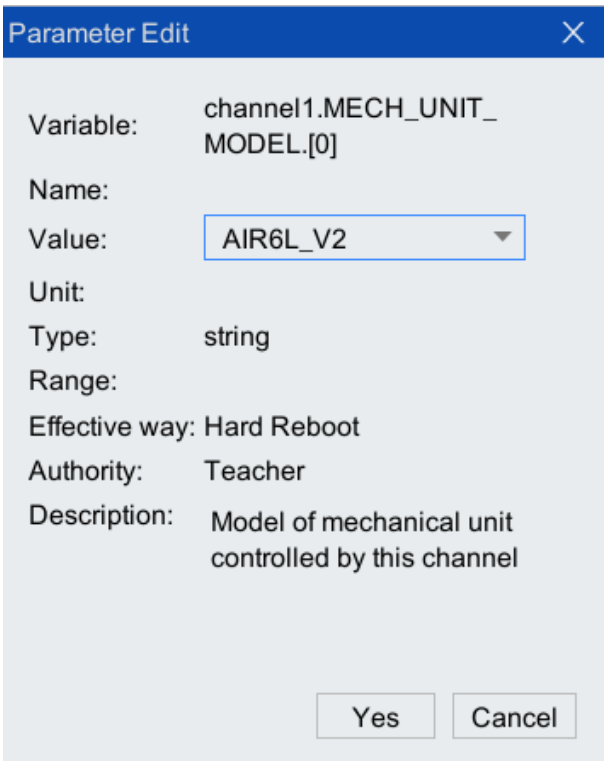


Figure 4-8 Mechanical unit model configuration interface

Table 4-5 Parameter description

Parameter	Description
Value	The model of the mechanical unit controlled by this channel.

Step8. In the [Channel 1] interface, click [+] to the left of the [MECH_UNIT_NAME (Mechanical unit name)] parameter, and click to select the sub-item "[0]" ([0] is the robot body) among the expanded sub-items.

Step9. Click <Edit>, and the dialog box shown in Figure 4-9 will pop up. Configure the parameters in [Value] (for example: R1), and click <Yes>.

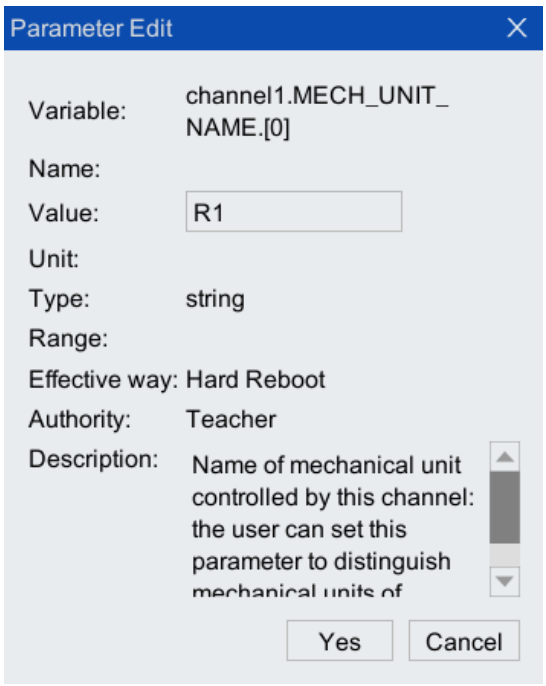


Figure 4-9 Configuration interface of mechanical unit name

Step10. After the parameter configuration is complete, click <Save>, and the dialog box shown in Figure 4-10 will pop up. Select "Save all" in [Please select the save type], and click <Yes>.

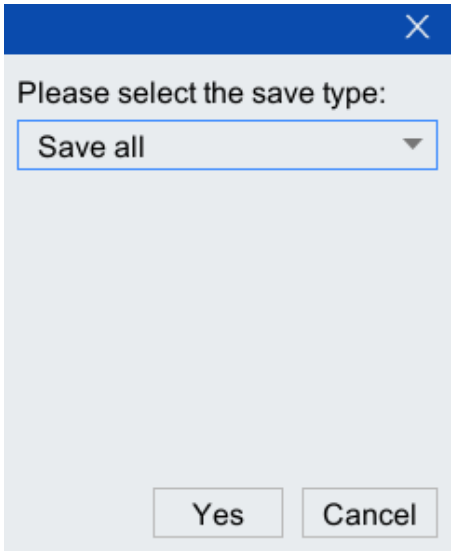


Figure 4-10 Dialog to select save type

Step11. Click <Yes> in the prompt dialog box that pops up. As shown in Figure 4-11.

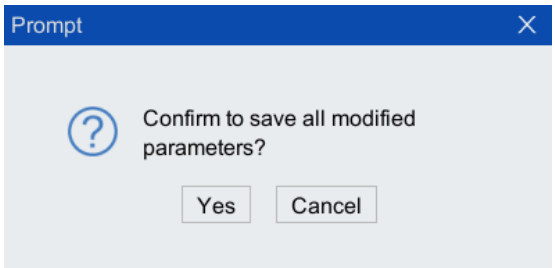


Figure 4-11 Confirm to save the modification prompt box

Step12. Click <Yes> in the pop-up dialog box of successful parameter saving. As shown in Figure 4-12.

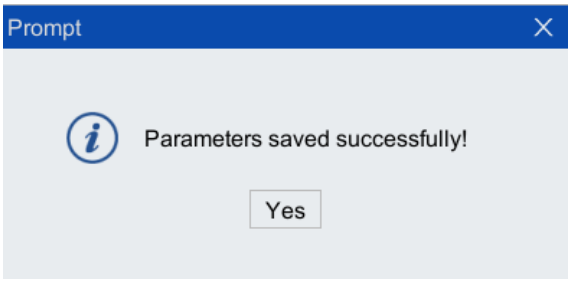


Figure 4-12 Save successful prompt box

Configure channel 2 parameters (R2)

Step1. Click the <Mechanical unit switch> button on the interface, as shown in Figure 4-13, click [R2], and then click the "" button.

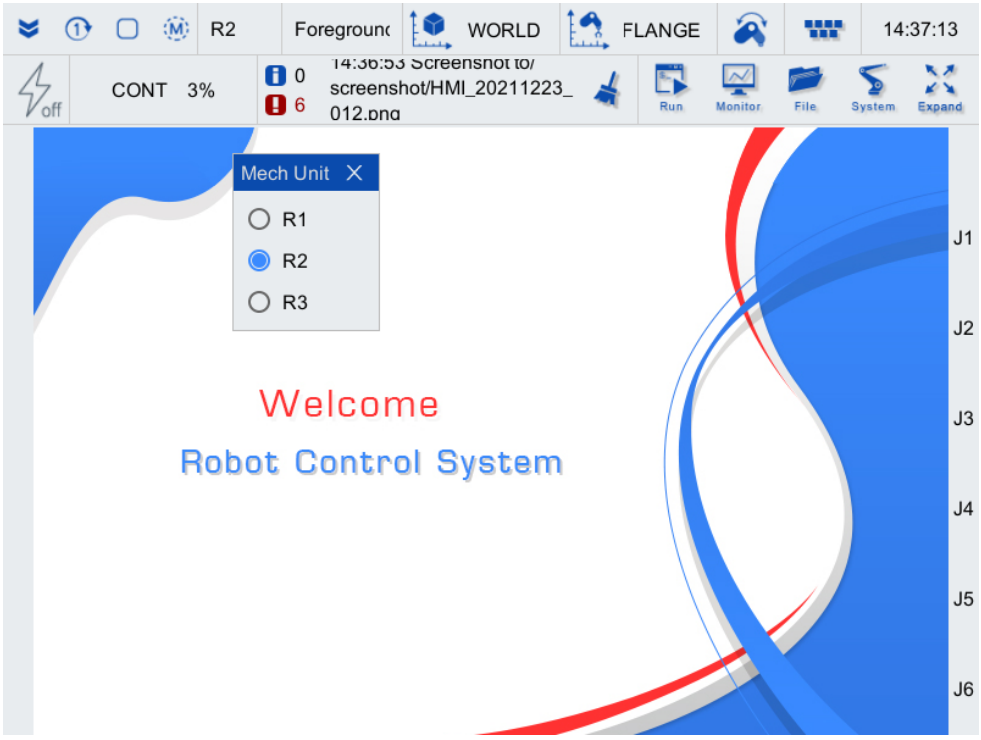


Figure 4-13 Mechanical unit switching interface

Step2. In the [Channel 2] interface, click to select the [EX_JOINT_NUM (External Axis number)] parameter.

Step3. Click <Edit>, and the dialog box shown in Figure 4-14 will pop up. Configure the parameter in [Value] to 0, click <Yes>. The parameter description is shown in Table 4-6.

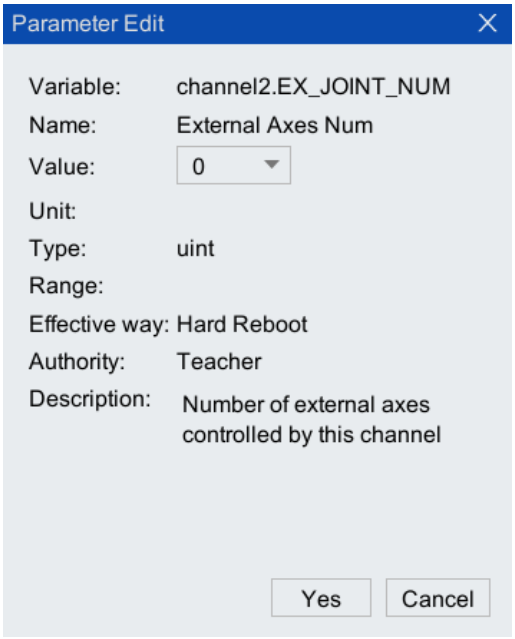


Figure 4-14 Configuration interface for the number of external axes

Table 4-6 Parameter description

Parameter	Description
Value	The number of external axes controlled by this channel. The value is an integer, ranging from 1 to 6.

Step4. In the [Channel 2] interface, click to select the [MECH_UNIT_NUM (Number of mechanical units)] parameter.

Step5. Click <Edit>, and the dialog box shown in Figure 4-15 will pop up. Configure the parameter in [Value] to 1, and click <Yes>. The parameter description is shown in Table 4-7.

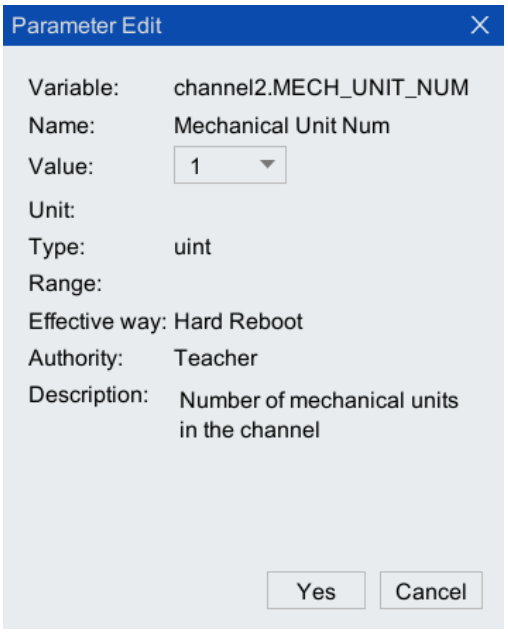


Figure 4-15 Configuration interface for the number of mechanical units

Table 4-7 Parameter description

Parameter	Description
Value	The number of mechanical units in this channel.

Step6. The number of mechanical units in this channel.

Step7. Click <Edit>, and the dialog box shown in Figure 4-16 will pop up. The parameter in the configuration [value] is the actual robot model, click <Yes>. The parameter description is shown in Table 4-8.

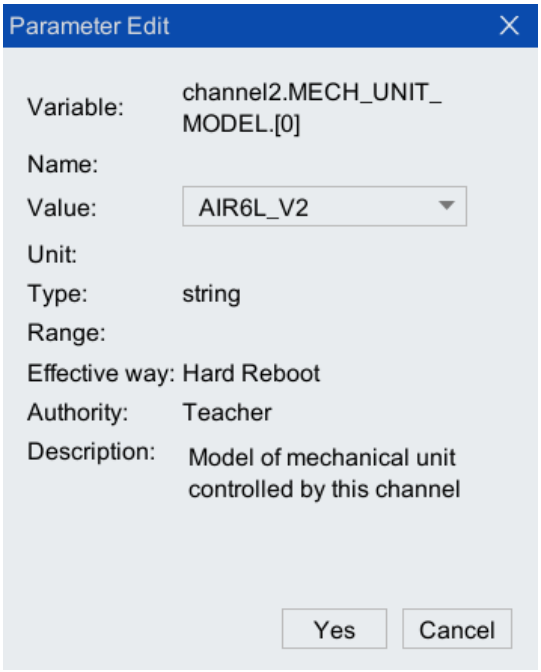


Figure 4-16 Configuration interface of mechanical unit model

Table 4-8 Parameter description

Parameter	Description
Value	The model of the mechanical unit controlled by this channel.

Step8. In the [Channel 2] interface, click [+] to the left of the [MECH_UNIT_NAME (mechanical unit name)] parameter, and click to select the sub-item "[0]" ([0] is the robot body) among the expanded sub-items.

Step9. Click <Edit>, and the dialog box shown in Figure 4-17 will pop up. Configure the parameters in [Value] (for example: R2), and click <Yes>.

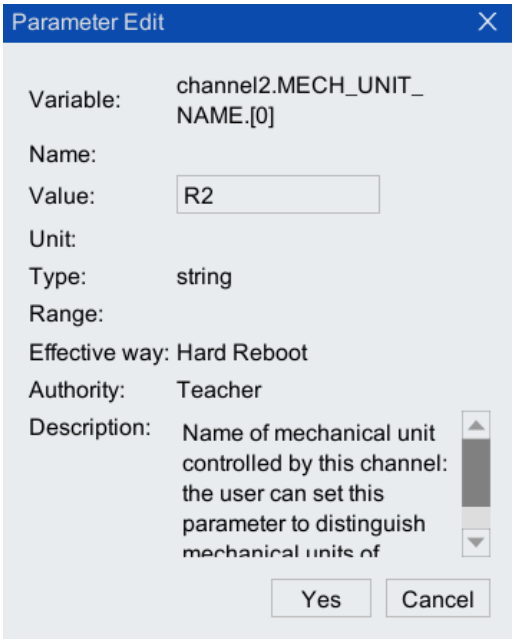


Figure 4-17 Configuration interface of mechanical unit name

Step10. After the parameter configuration is complete, click <Save>, and the dialog box shown in Figure 4-18 will pop up. Select "Save all" in [Please select the save type], and click <Yes>.

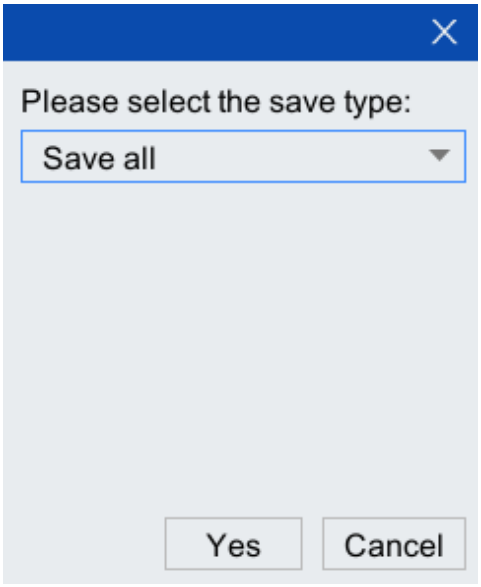


Figure 4-18 Dialog to select save type

Step11. Click <Yes> in the prompt dialog box that pops up. As shown in Figure 4-19.

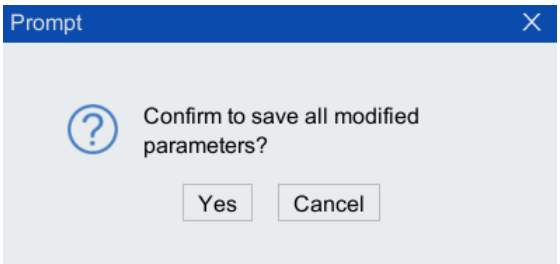


Figure 4-19 Prompt box to confirm the saved modification

Step12. Click <Yes> in the pop-up dialog box of successful parameter saving. As shown in Figure 4-20.

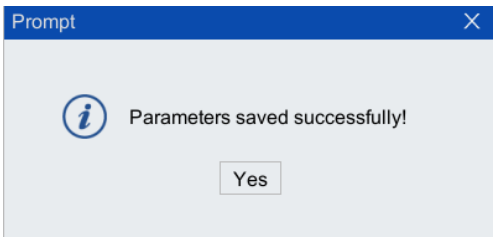


Figure 4-20 Prompt box of successful save

Configure channel 3 parameters (P1)

Before using the positioner, please complete the relevant parameter configuration of the system.

Step1. Click the <Mechanical unit switching> button on the interface, as shown in Figure 4-21. After clicking [R3], click the "" button.

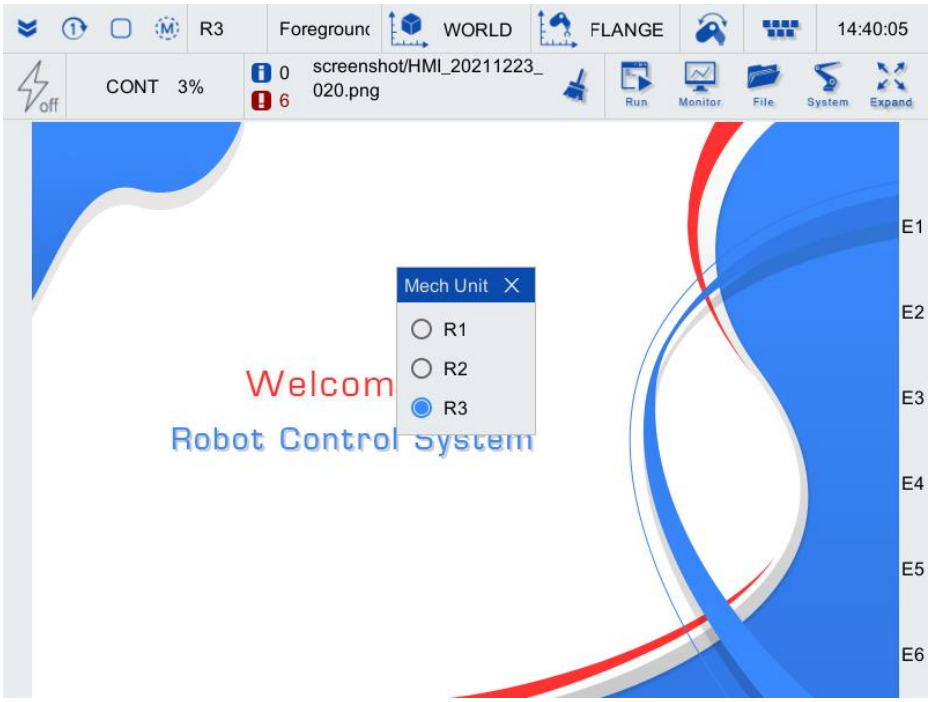


Figure 4-21 Switch channel interface

Step2. In the [Channel 3] interface, click to select the [EX_JOINT_NUM (External axis number)] parameter.

Step3. Click <Edit>, and a dialog box as shown in Figure 4-22 will pop up. Configure the parameters in [Value], and click <Yes>. Parameter description is shown in Table 4-9.

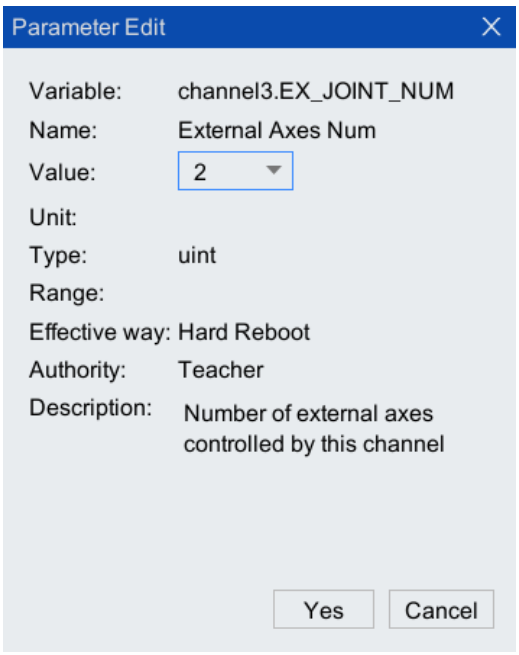


Figure 4-22 Configuration interface of external axis quantity

Table 4-9 Parameter description

Parameter	Description
Value	This channel controls the number of external axes. In integer form, the value range is 1-6. When the external axis is a positioner, the value range is 1-3.

Step4. In the [Channel 3] interface, click to select the [MECH_UNIT_NUM (Number of mechanical units)] parameter.

Step5. Click <Edit>, and a dialog box as shown in Figure 4-23 will pop up. Configure the parameter in [Value] as 2, and click <Yes>. Parameter description is shown in Table 4-10.

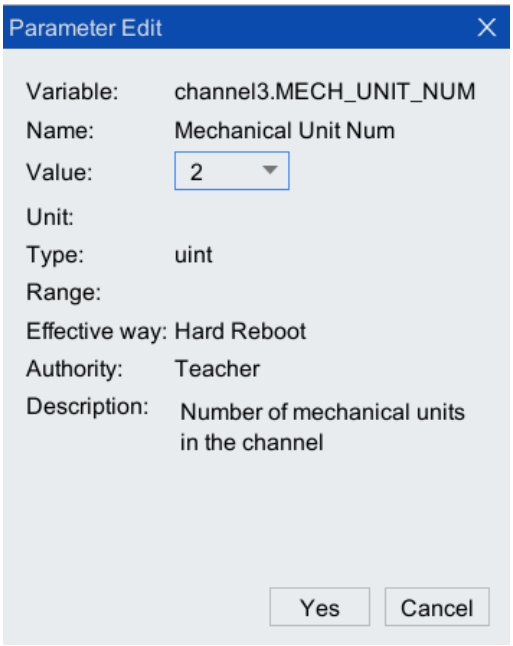


Figure 4-23 Configuration interface of mechanical unit quantity

Table 4-10 Parameter description

Parameter	Description
Value	Number of mechanical units in this channel. When configuring the positioner function, the mechanical unit includes the manipulator and the positioner, so the value is configured as 2.

Step6. In the [Channel 3] interface, click [+] on the left side of the [MECH_UNIT_MODEL (Mechanical unit model)] parameter, and select the sub item "[0]" ([0] is the manipulator and [1] is the positioner) among the expanded sub items.

Step7. Click <Edit>, and a dialog box as shown in Figure 4-24 will pop up. Configure the parameter in [Value] as virtualrobot, and click <Yes>.

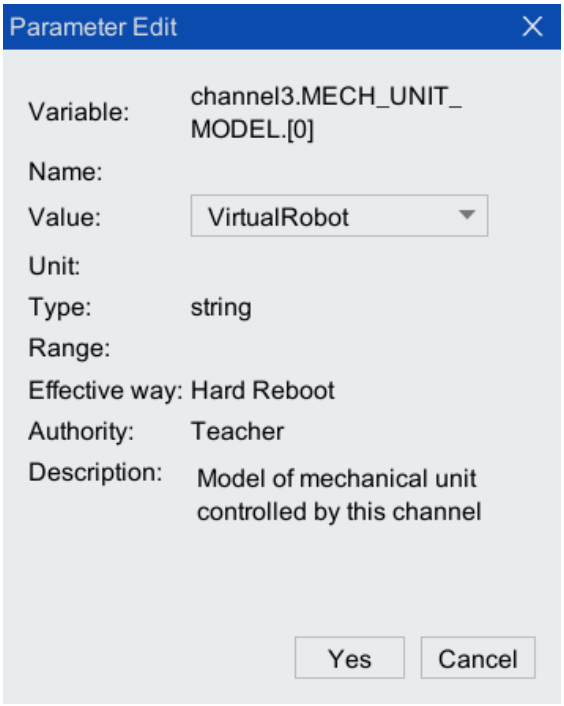


Figure 4-24 Configuration interface of mechanical unit model

Step8. In the [Channel 3] interface, click [+] on the left side of the [MECH_UNIT_MODEL (Mechanical unit model)] parameter, and click to select the sub item "[1]" ([0] is the manipulator and [1] is the positioner) among the expanded sub items.

Step9. Click <Edit>, and a dialog box as shown in Figure 4-25 will pop up. Configure the parameter in [Value] as positioner, and click <Yes>.

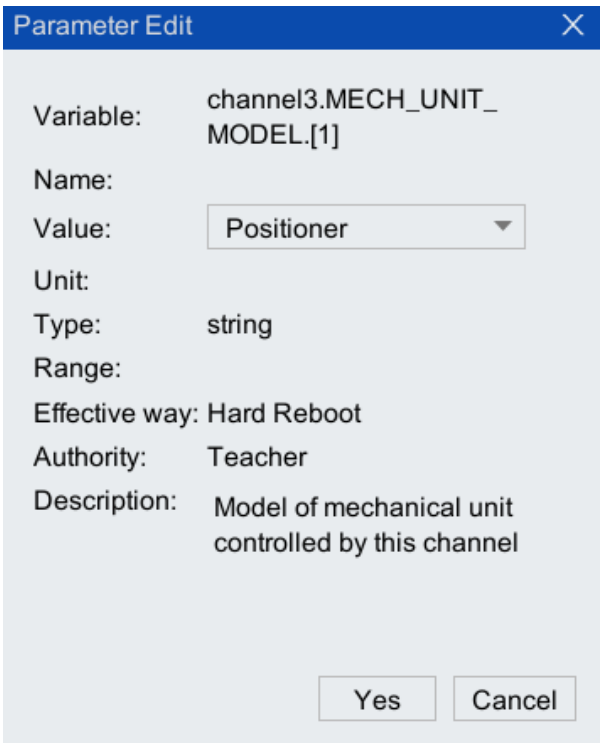


Figure 4-25 Configuration interface of mechanical unit model

Step10. In the [Channel 3] interface, click [+] on the left side of the [MECH_UNIT_NAME (Mechanical unit name)] parameter, and select "[1]" in the expanded sub items ([0] is the manipulator and [1] is the positioner.).

Step11. Click <Edit>, and a dialog box as shown in Figure 4-26 will pop up. Configure the parameters in [Value] (e.g. P1) and click <Yes>.

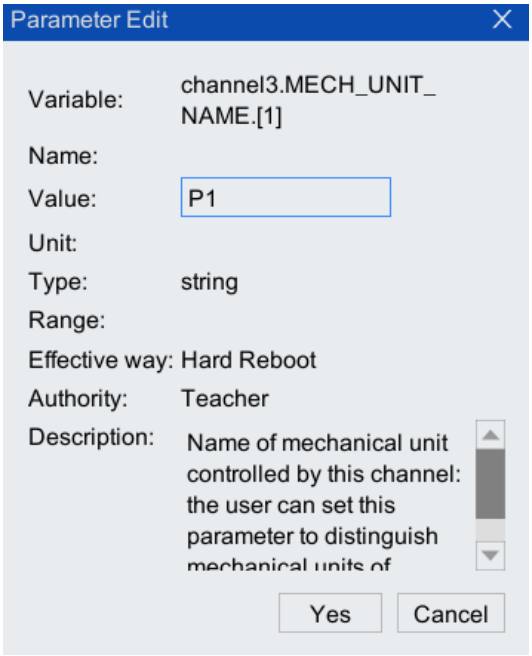


Figure 4-26 Configuration interface of mechanical unit name

Step12. In the [channel 3] interface, click [+] on the left side of the [EXJOIN_TYPE (external axis)] parameter, and click to select "[0] and [1]" (when the number of external axes is 2) among the expanded sub items.

Tip

When configuring, you need to select several sub items for several external axes according to the actual situation. For example, if there are two external axes, select [0] and [1] for configuration; When there are three external axes, select [0], [1] and [2] for configuration.

Step13. Click <Edit>, and a dialog box as shown in Figure 4-27 will pop up. The parameters in the configuration [value] are all 0 (rotation axis), and click <Yes>.

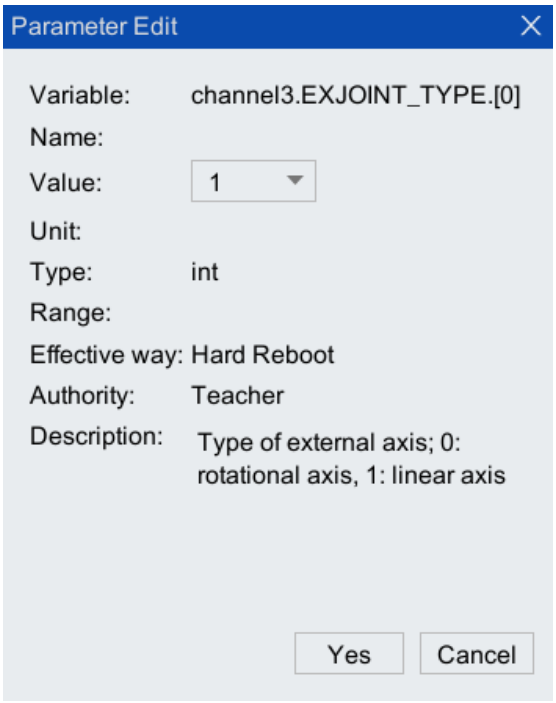


Figure 4-27 Configuration interface of external shaft type

Step14. If the external shaft is connected with a reducer, in the [channel 3] interface, click [+] on the left side of the [EXJOINT_REDUCER_RATIO (Reduction ratio of external shaft reducer)] parameter, and click to select the [1] (when the number of external shafts is 1) sub item among the expanded sub items.

Tip

When configuring, you need to select several sub items for several external axes according to the actual situation. For example, if there are two external axes, select [0] and [1] for configuration; When there are three external axes, select [0], [1] and [2] for configuration.

Step15. The dialog box as shown in Figure 4-28 pops up. Configure the parameters in [value] (the value shall be determined according to the parameters of the actual connected positioner), and click <Yes>.

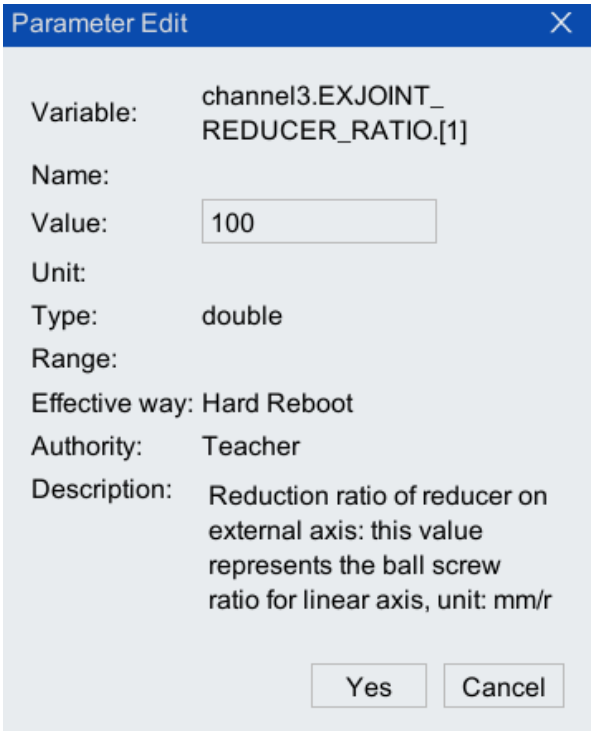


Figure 4-28 Configuration interface of reduction ratio of external shaft reducer

Tip

After the parameter configuration is completed, "zero calibration" and "positive/negative limit configuration" need to be done for the positioner. Please refer to the operation manual of positioner for detailed configuration steps.

Step16. After the parameter configuration is completed, click <Save>, and a dialog box as shown in Figure 4-29 will pop up. Select "Save all" in [Please select the save type], and click <Yes>.

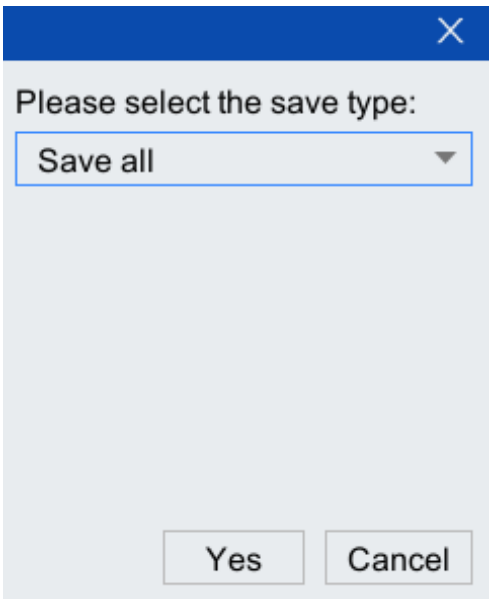


Figure 4-29 Save type dialog box

Step17. Click <Yes> in the pop-up prompt dialog box. As shown in Figure 4-30.

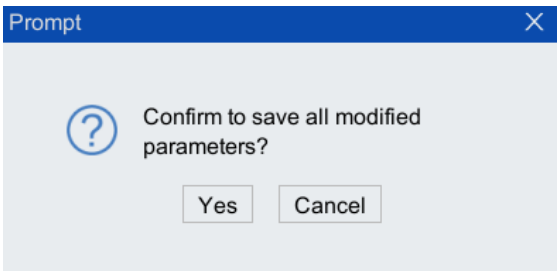


Figure 4-30 Prompt box to confirm saving changes

Step18. Click <Yes> in the pop-up dialog box of successful parameter saving. As shown in Figure 4-31. The parameters take effect after power failure and restart the control cabinet.

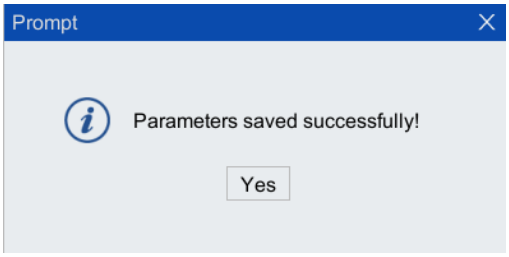


Figure 4-31 Prompt box for successful saving

4.2 Check configuration

The inspection steps are as follows:

Step1. After power failure and restart, click the <Mechanical unit switching> (e.g. <P1>) button on the interface, as shown in Figure 4-32. After clicking [P1], click the "" button.

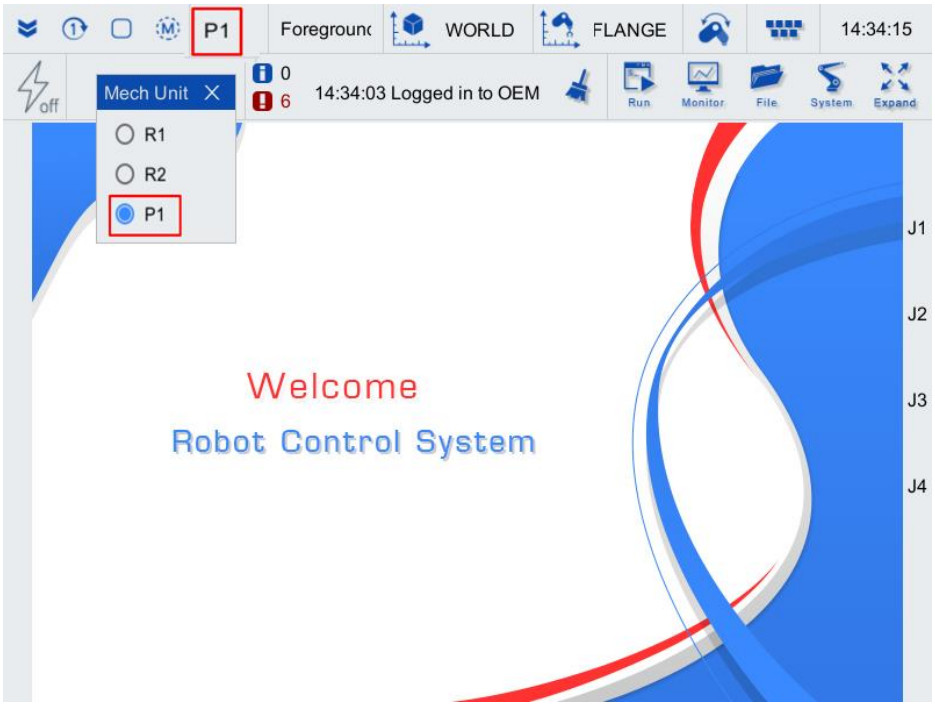


Figure 4-32 Interface for mechanical unit switching

Step2. Click [System/Parameter Configuration] in the main interface of teaching pendant, and the newly created [Positioner P1] tab is added in the [Parameter Configuration] interface. Click this tab to enter the interface

shown in Figure 4-33 for parameter viewing and modification. The parameter configuration of positioner is the same as that in [Channel 1]. Parameter description is shown in Table 4-4.

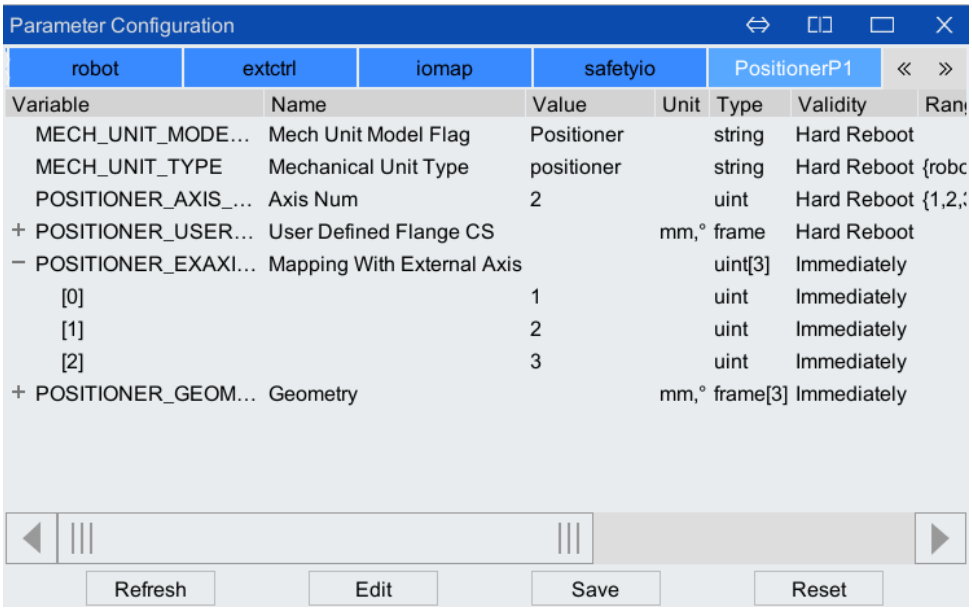


Figure 4-33 Configuration interface of positioner T1 parameters

Table 4-11 Parameter description

Parameter	Description
POSITIONER_AXIS_NUM (Number of axes)	Number of axes of the positioner.
POSITIONER_EXAXIS_MAP (Mapping of axes to external axes)	The mapping relationship between each axis of the positioner and the external axis. The default configuration is that the positioner 1 axis corresponds to the external axis 1, the positioner 2 axis corresponds to the external axis 2, and the positioner 3 axis corresponds to the external axis 3. The user does not need to modify the configuration. When installing the positioner, it needs to be installed according to this mapping order. Tip: If the wiring is carried out according to Section 2.1, this item does not need to be configured.

4.3 Coordinate system calibration

Calibration tool coordinate system

Before calibrating the tool coordinate system, you need to install a tool with a tip on R1 and R2 and use the tip as TCP.

The calibration steps of coordinate system are as follows:

Step1. Select [Run/Calibrate/Coordinate Calibration] on the main interface of the teaching pendant, as shown in Figure 4-34.

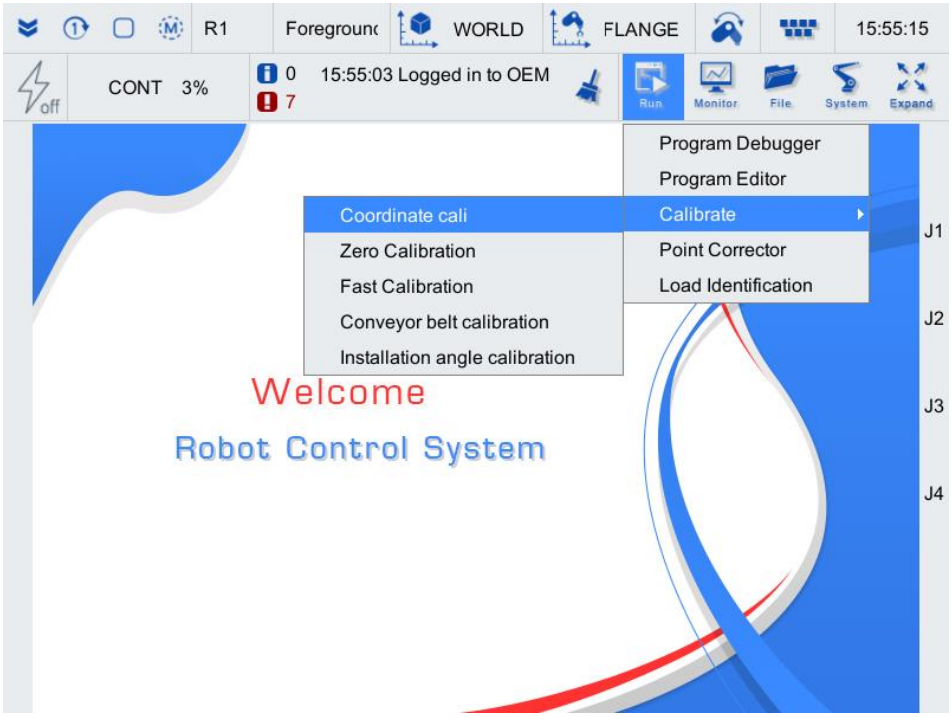


Figure 4-34 Main interface diagram

Step2. In the pop-up [Coordinate system measurement] interface, select [Coordinate system Type] as "Tool", as shown in Figure 4-35.

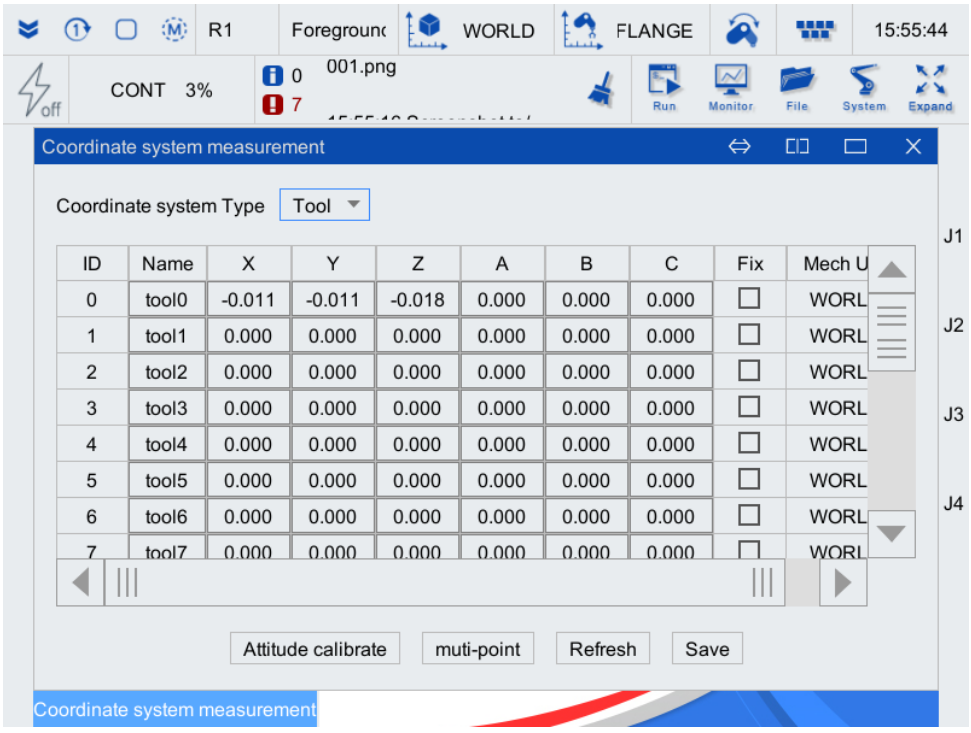


Figure 4-35 Zero calibration interface

Step3. Click to select the line of the tool used by R1 (e.g. tool0), and click <multi-point>.

Step4. In the pop-up interface as shown in Figure 4-36, select the value of [Calibration point number]. The multi-point method supports 4-9 calibration points. The more points, the higher the calibration accuracy.

Step5. Calibrate each point according to the operation steps prompted in the [muti-point] interface, when " × " change all to "√", and click <Calculate>.

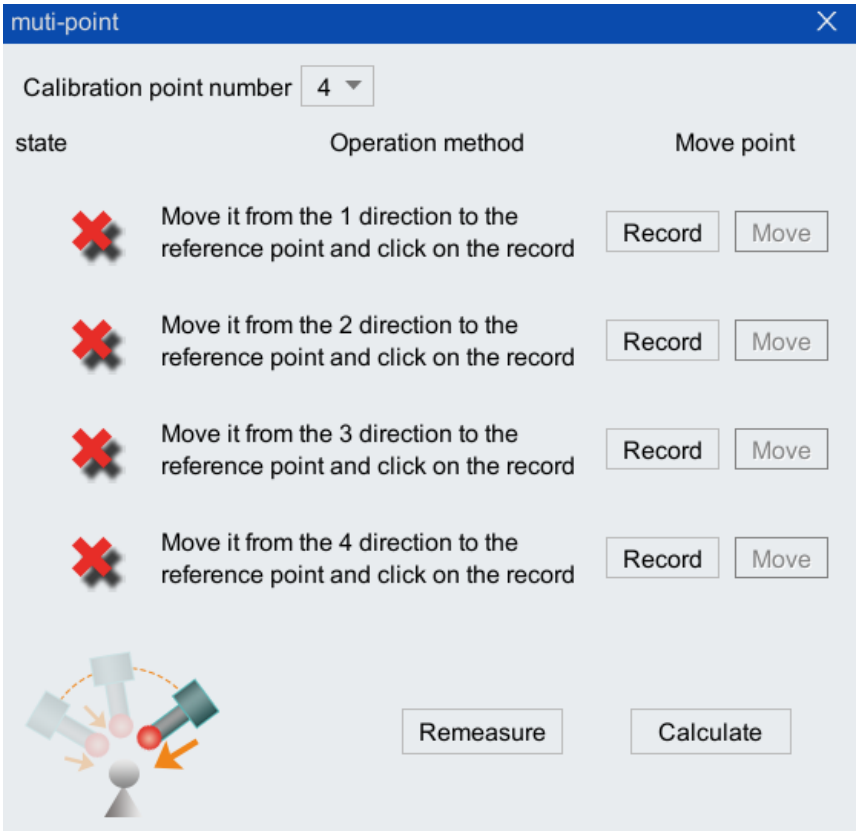


Figure 4-36 Multi-point calibration interface

Step6. Click <Yes> in the pop-up prompt dialog box to complete the calibration.

Step7. After the tool calibration of R1 is completed, calibrate the tool of R2 in the same way.

Step8. After R2 calibration, click <Save> to save the calibration results.

Calibration base coordinate system

After the tool coordinate system calibration of R1 and R2 is completed, it is necessary to calibrate the base coordinate system of R2 and positioner (P1). The calibration steps of coordinate system are as follows:

Step1. Select [Run/Calibrate/Coordinate calibration] on the main interface of the teaching pendant, as shown in Figure 4-37.

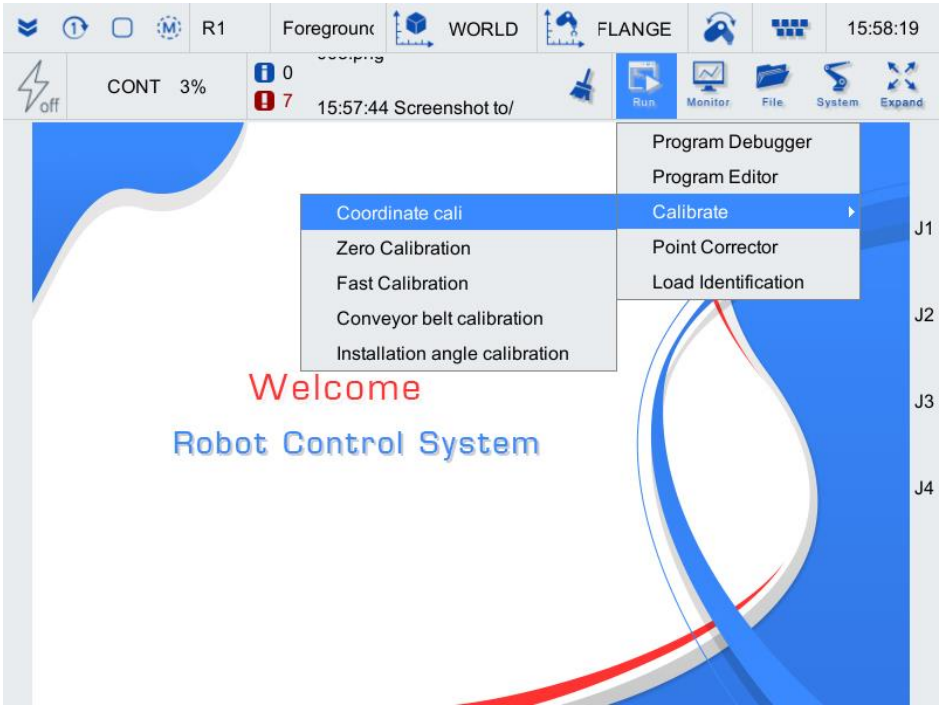


Figure 4-37 Main interface diagram

Step2. In the pop-up [Coordinate system measurement] interface, select [Coordinate system Type] as "Base", as shown in Figure 4-38.

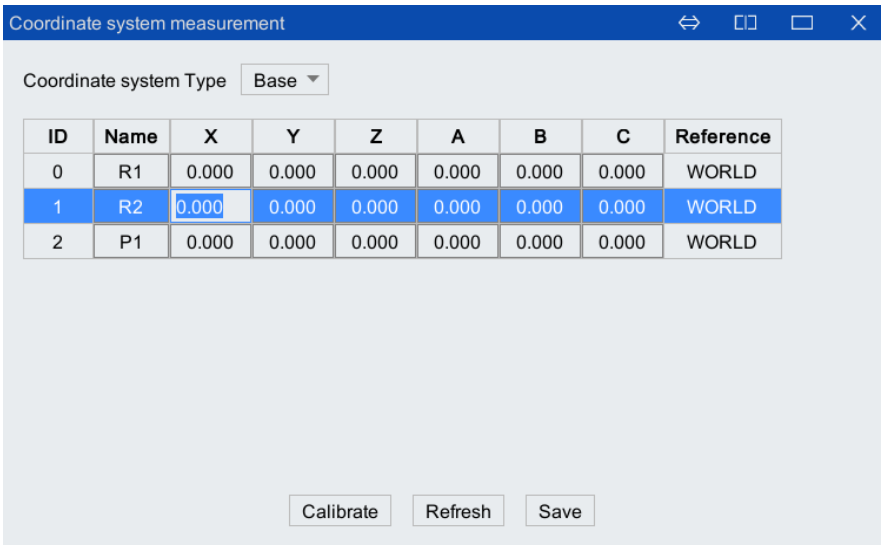


Figure 4-38 Zero calibration interface

Step3. Click to select the row of R2 and click <Calibrate>. The interface shown in Figure 4-39 will pop up.

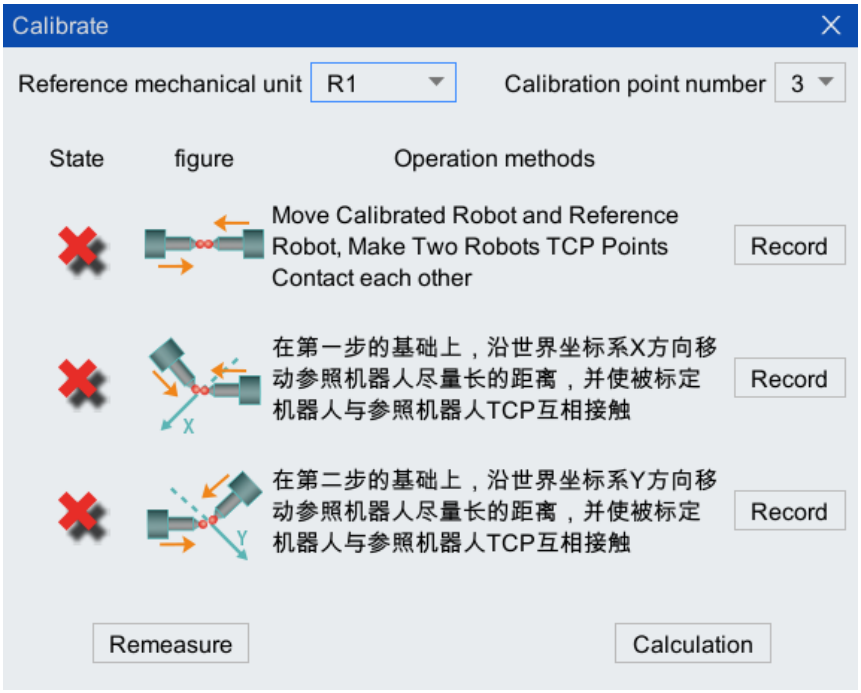


Figure 4-39 R2 base coordinate system calibration interface

Step4. In the pop-up [Calibrate] interface (as shown in Figure 4-39), select [Reference mechanical unit] as "R1" and [Calibration point number] as "3" (the more points, the higher the calibration accuracy. Here, take the 3-point method as an example).

Step5. Calibrate each point according to the operation steps prompted in the [calibrate] interface, when " × " change all to "√", and click <Calculation> to complete the calibration.

Step6. Click to select the row in P1 and click <Calibrate>. The interface as shown in Figure 4-40 will pop up.

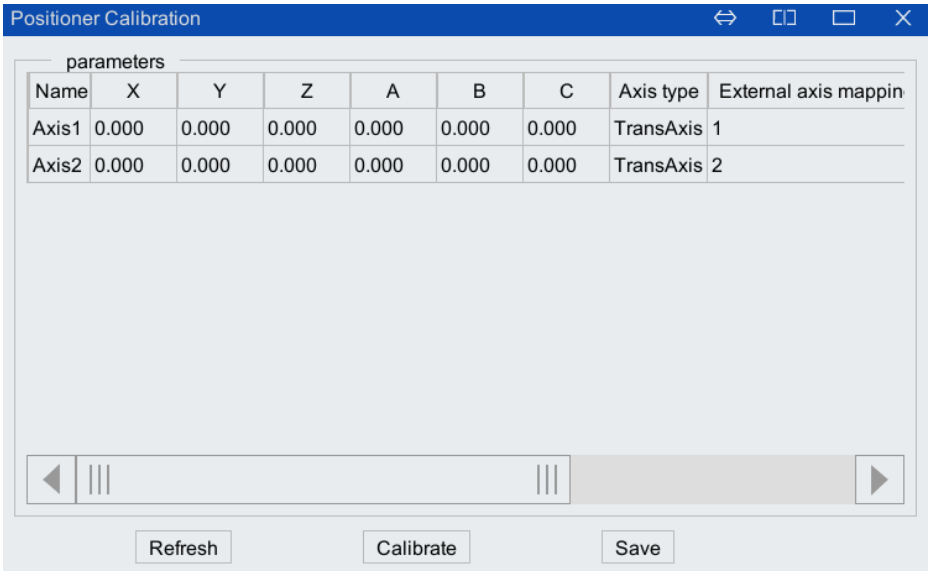


Figure 4-40 Positioner calibration interface

Step7. In the pop-up [Calibrate] interface (as shown in Figure 4-41), select [Reference mechanical unit] as "R1", [base] as "Positioner", and [Calibration point number] as "3" (the more points, the higher the calibration accuracy. Here, take the 3-point method as an example).

Figure 4-41 Calibration interface

Step8. Calibrate each point according to the operation steps prompted in the [Calibrate] interface, when" × " change all to "√", and click <Calibrate>. As shown in Figure 4-42.

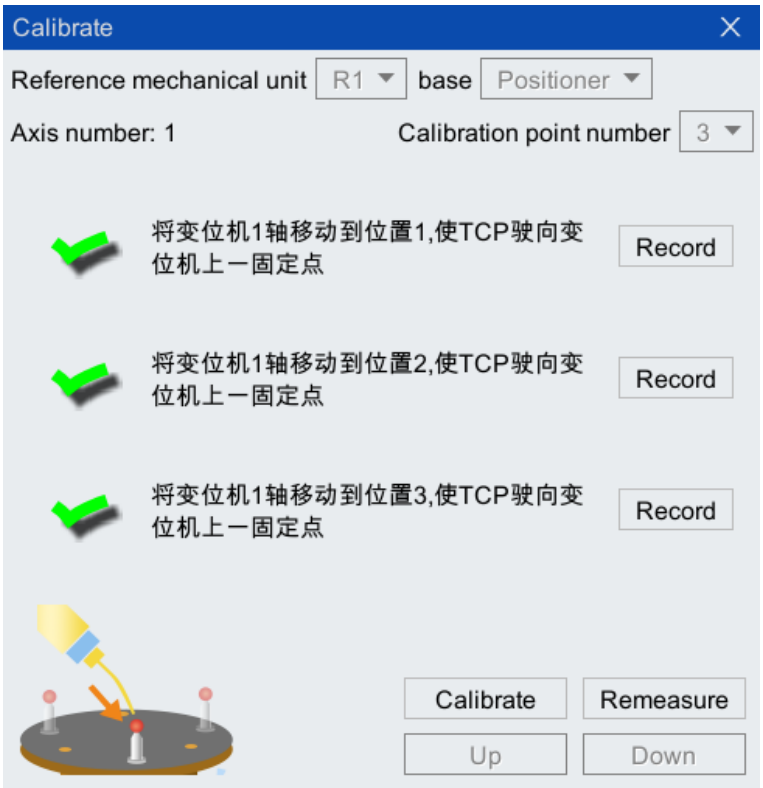


Figure 4-42 Calibration success interface

Step9. Click the <Calibrate> button at the bottom of the interface. After successful calibration, click <Down> to calibrate the next external axis in the same way.

Step10. After all external axes are calibrated, click <Calculate>, and the calibration success interface will pop up, Click <Yes> to save the calibrated data.

Step11. Click <Yes> in the pop-up prompt dialog box.

Calibrate workpiece coordinate system

When R1 and P1 are linked, the workpiece coordinate system of R1 needs to be fixed on the positioner. The setting and calibration steps are as follows:

Step1. Select [Run/Calibrate/Coordinate calibration] on the main interface of the teaching pendant, as shown in Figure 4-43.

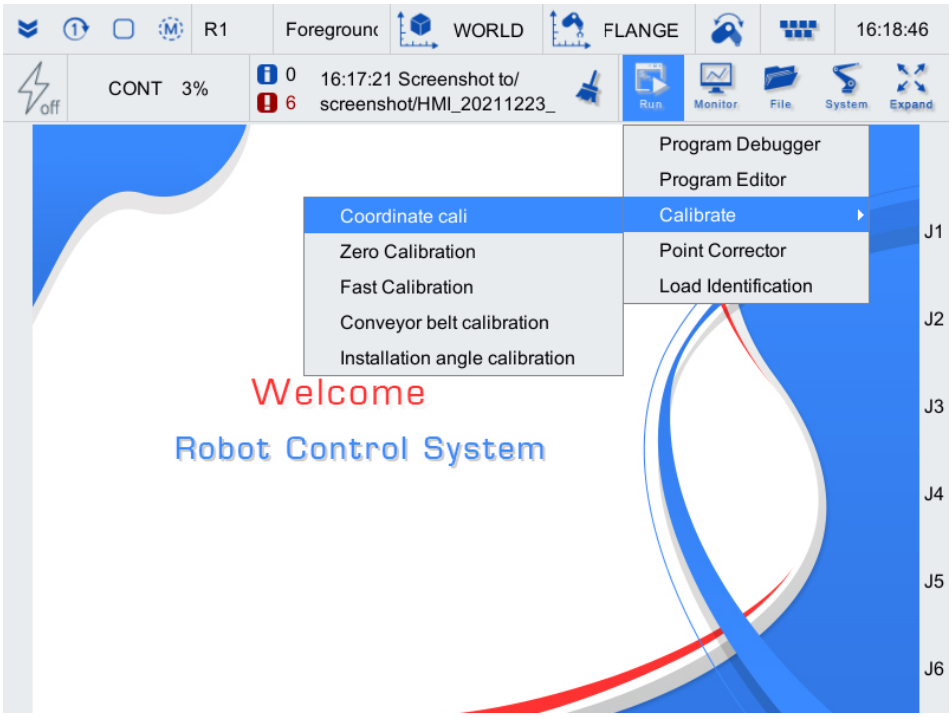


Figure 4-43 Main interface diagram

Step2. In the pop-up [Coordinate system measurement] interface, select [Coordinate system Type] as "Wobj", as shown in Figure 4-44.

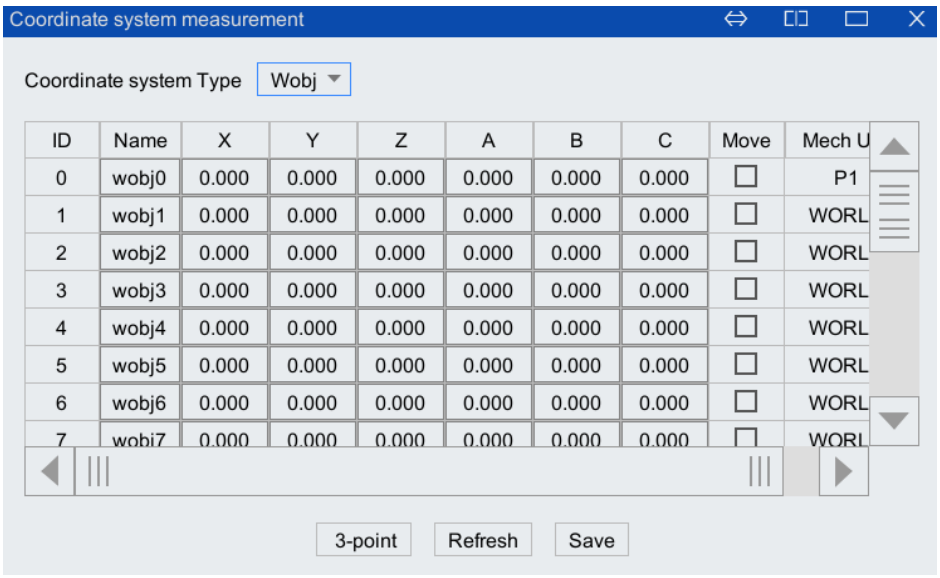


Figure 4-44 Zero calibration interface

Step3. Select the line of any workpiece coordinate system and select [Mech unit] as "P1", which means that the workpiece coordinate system is fixed on the positioner and moves with the positioner.

> Tip
>
> If there are no special requirements for the pose of the workpiece coordinate system, the default value of all zeros can be used without step 4-step 8.

Step4. (Optional) Click to select the line in P1 and click <3-point>. The interface shown in Figure 4-45 will pop up.

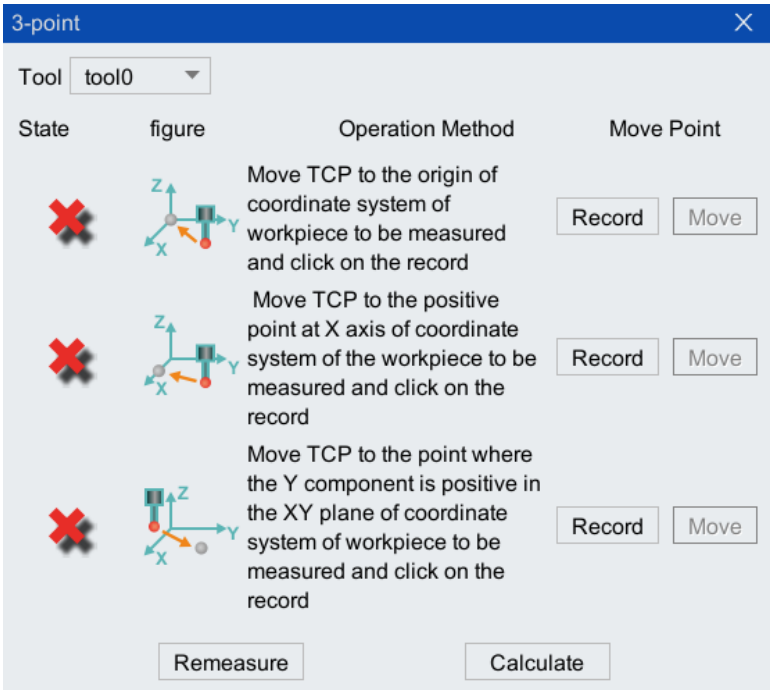


Figure 4-45 3-point calibration interface

Step5. (Optional) In the pop-up [3-point] interface, select [Tool] as the calibrated tool (e.g. "tool0").

Step6. (Optional) Use R1 (when "tool0" is selected) to calibrate each point according to the operation steps prompted on the interface, when " × " change all to "√", and click <Calculate>. As shown in Figure 4-46.

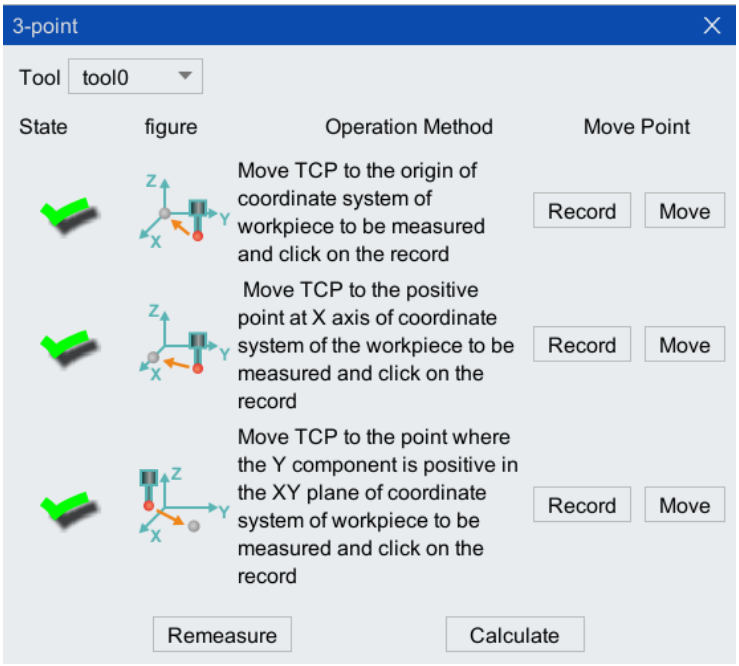


Figure 4-46 Calibration success interface

Step7. (Optional) After all external axes are calibrated, click <Calculate>, and the calibration success interface will pop up. Click <Yes> to save the calibrated data.

Step8. (Optional) Click <Yes> in the pop-up prompt dialog box.

4.4 JOG configuration

The workpiece coordinate system of the robot is the coordinate system associated with the positioner, and the robot is linked with the workpiece, that is, the position and posture of the robot's TCP remain relatively static relative to the workpiece coordinate system, as shown in Figure 4-47.

Figure 4-47 Diagram of robot linkage operation

The setting steps of this method are as follows:

Step1. Click the <Mechanical unit switch> (R1) button on the interface, as shown in Figure 4-48, click [R1], and then click the "" button.

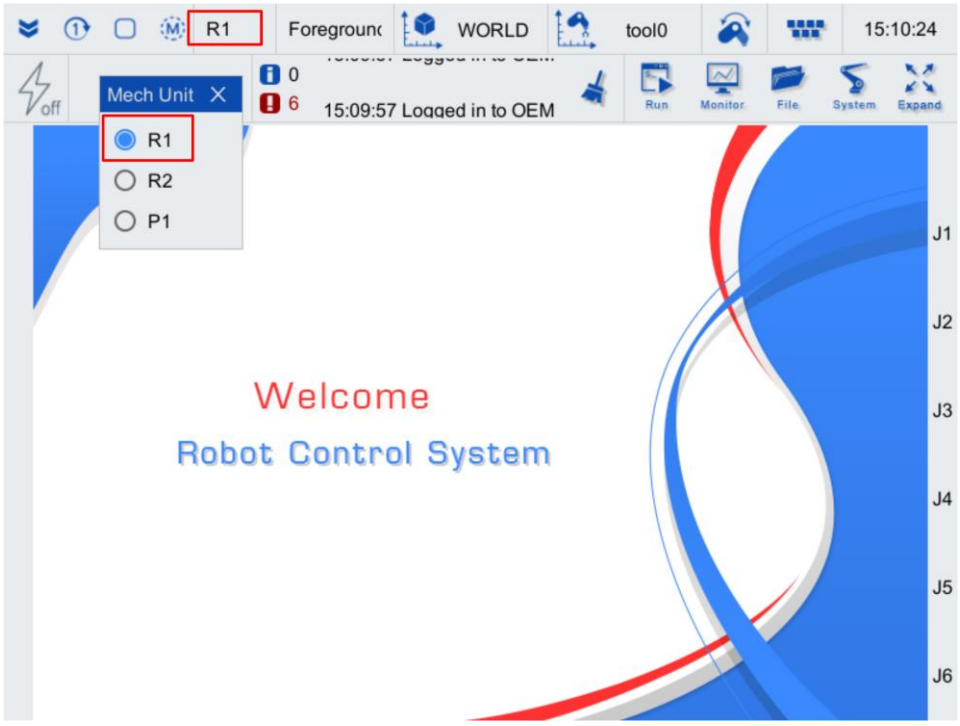


Figure 4-48 Mechanical unit switching interface

Step2. Click the " CONT 3% " icon in the upper left corner of the main interface, and the [JOG] operation parameter configuration interface will pop up. As shown in Figure 4-49.

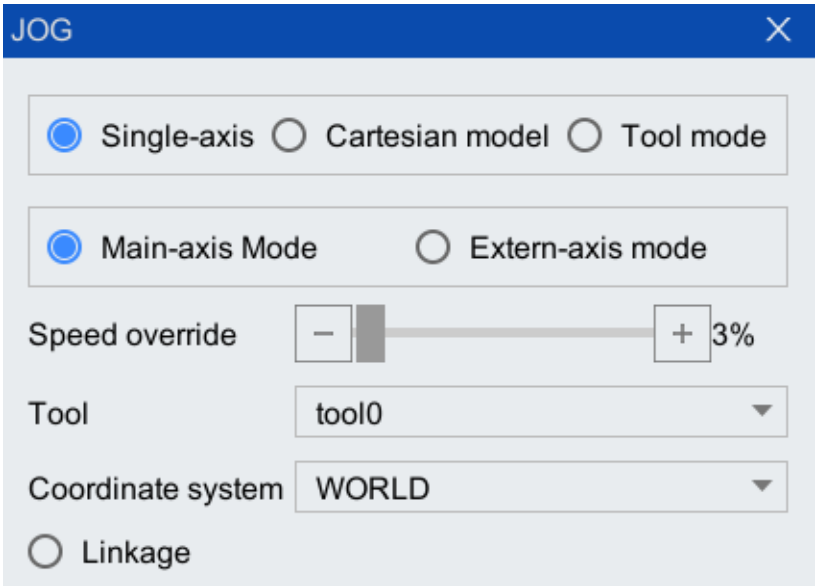


Figure 4-49 Running parameter configuration interface

Step3. Move the TCP point to a fixed sharp point, and configure the parameters of the [JOG] interface. The configuration method is shown in Table 4-12.

Table 4-12 Configuration steps and instructions

Steps	Parameter	Configuration instructions
1	Single-axis Cartesian model Tool mode	Click to select [Cartesian model]. In this mode, the TCP point of the manipulator can be controlled to move along the positive or negative directions of the X, Y or Z axes, and the TCP of the manipulator

Steps	Parameter	Configuration instructions
		can also be controlled to rotate around the Z, Y or X axes.
2	Main-axis Mode Extern-axis mode	Click to select [Main-axis Mode].
3	Speed override − + 3%	In JOG mode, this item means that the speed magnification of the lower ″JOG″ can be adjusted through ″V+″ and ″V−″ in the function keys of the teach pendant.
4	Tool	Select tool "tool0" for R1.
5	Coordinate System	Select the calibrated workpiece coordinate system "wobj0".
6	Linkage	Click to select the [Linkage] check box.

Tip

In the case of multiple robots, after checking [Linkage] on the [JOG] interface, each robot is in a linked state. At this time, the linkage can be controlled by selecting [Coordinate System] in the [JOG] interface of a robot.

- If "wobj (workpiece coordinate system)" is selected for [Coordinate System], and the mechanical unit of the workpiece coordinate system belongs to other robots, when other robots jog, the robot will follow the linkage;
- If the [Coordinate System] of the robot selects "WORLD", or selects "wobj (workpiece coordinate system)" and the mechanical unit of the workpiece coordinate system belongs to WORLD, it will not be linked.

Step4. Rotate the axis 1 or axis 2 of the positioner, the robot TCP moves with the positioner, and keeps the relative position unchanged with the cusp on the positioner, and there is no obvious error. If the error visible to the naked eye is too large, recalibration is required.

Step5. Click the <Mechanical Unit Switch> button on the interface, as shown in Figure 4-50, click [R2], and then click the "" button.

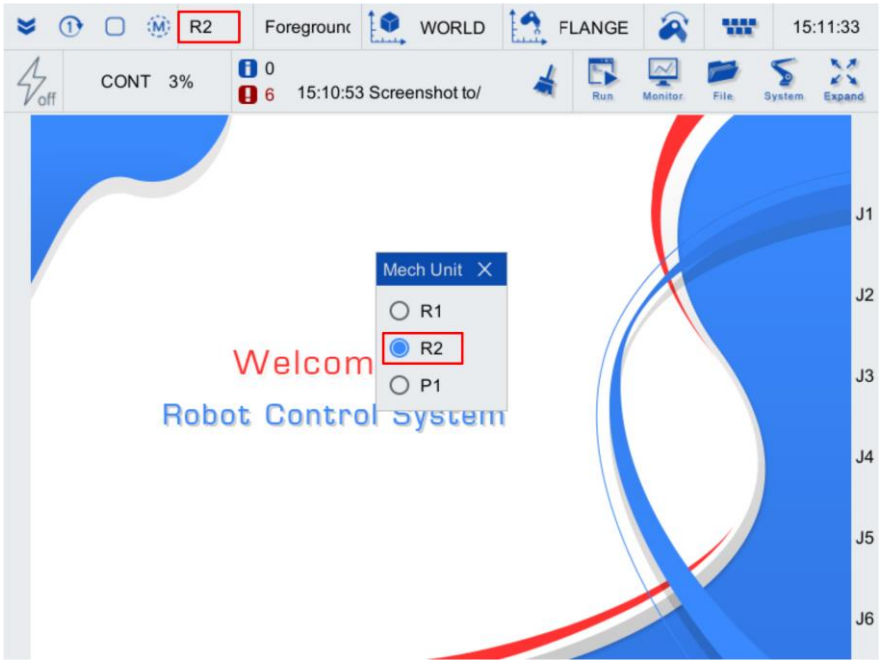


Figure 4-50 Mechanical unit switching interface

Step6. Click the " CONT 3% " icon in the upper left corner of the main interface, and the [JOG] operation parameter configuration interface will pop up. As shown in Figure 4-51.

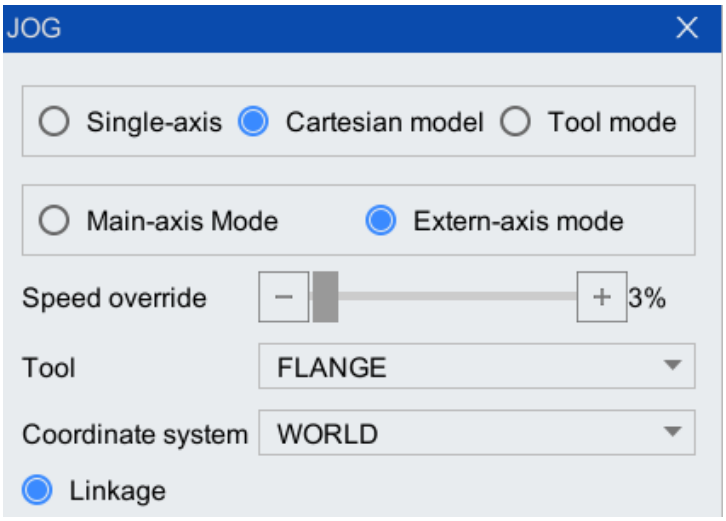


Figure 4-51 Configuration interface of running parameters

Step7. Move the TCP point to a fixed sharp point, and configure the parameters of the [JOG] interface. The configuration steps and descriptions are shown in Table 4-13.

Table 4-13 Configuration steps and instructions

Steps	Parameter	Configuration instructions
1	Single-axis Cartesian model Tool mode	Click to select [Cartesian model]. In this mode, the TCP point of the manipulator can be controlled to move in the positive or negative direction of the X-axis, Y-axis or Z-axis, or the TCP of the manipulator can be controlled to rotate around the Z-axis, Y-axis or X-axis.

Steps	Parameter	Configuration instructions
2	Main-axis Mode Extern-axis mode	Click to select [External-axis mode].
3	Speed override − + 3%	In JOG mode, this item means that the speed magnification of the lower "JOG" can be adjusted through "V+" and "V−" in the function keys of the teach pendant.
4	Tool	Select the tool "tool1" for R2.
5	Coordinate system	Select the calibrated workpiece coordinate system "wobj0".
6	Linkage	Click to select the [Linkage] check box.

Step8. Click the <Mechanical unit switch> button on the interface, as shown in Figure 4-52, click [P1], and then click the "" button.

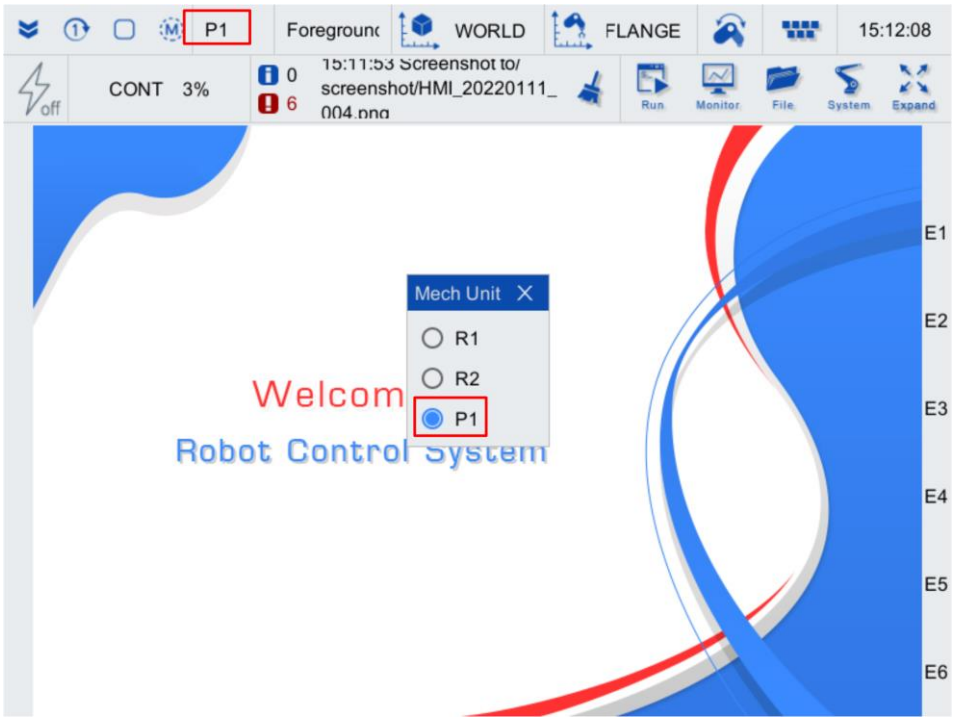


Figure 4-52 Mechanical unit switching interface

Step9. Click the " CONT 3% " icon in the upper left corner of the main interface, and the [JOG] operation parameter configuration interface will pop up. The parameter configuration is shown in Figure 4-53.

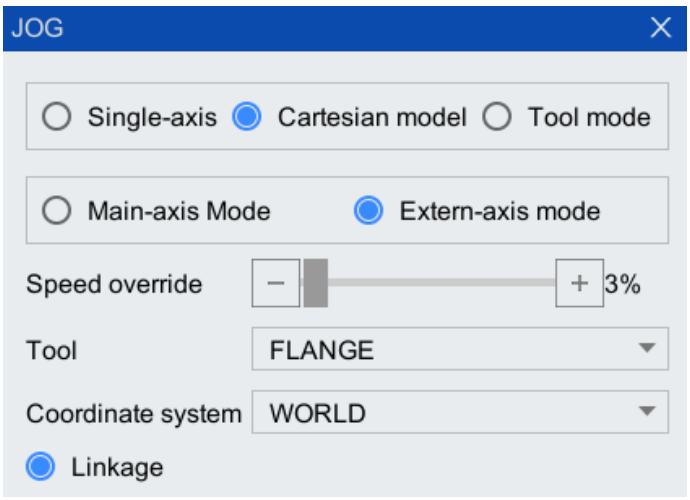


Figure 4-53 Running parameter configuration interface

4.5 Teaching practice

Enable button description

The enable buttons can be installed on the left and right sides of the rear housing of the teach pendant. The default is to install on the right side when leaving the factory, as shown in Figure 4-54.

The enable button provides 3 key positions. The specific operation methods are as follows:

- When the enable key is completely released, the natural state is the first key position, the robot is not enabled and cannot be operated.
- Gently hold the enable key (located on the right side of the teach pendant) in Figure 4-54, this is the second key position, enable it on the robot (you hear a "click" sound), and at the same time, enable the status bar (See Figure 4-55), the lightning bolt icon is displayed as "" (highlighted), and the "run" indicator of the control cabinet will be on, and then manual operation can be performed (keep the enable key pressed).

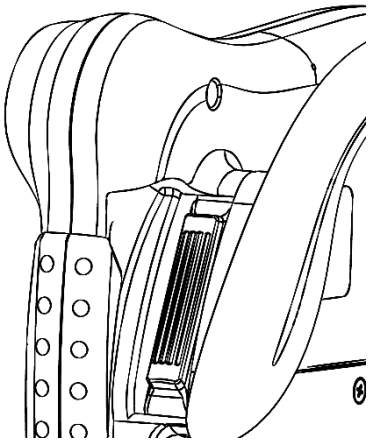


Figure 4-54 Teach pendant enable button

Figure 4-55 Enable status bar

- Continue to press hard, this time is the 3rd key position, the robot is disabled (you hear a "lick" sound), and the lightning icon in the enable status bar (see Figure 4-55) is displayed as "" (gray), the "Operation" indicator of the control cabinet goes out.

Teaching practice

The teaching steps are as follows:

Step1. Set the "Single-axis" operation. Click the " CONT 3% " key in Figure 4-55, and the [JOG] dialog box will pop up, as shown in Figure 4-56, select [Single-axis], [JOG] represents the speed in manual mode, here it is recommended to set 5%.

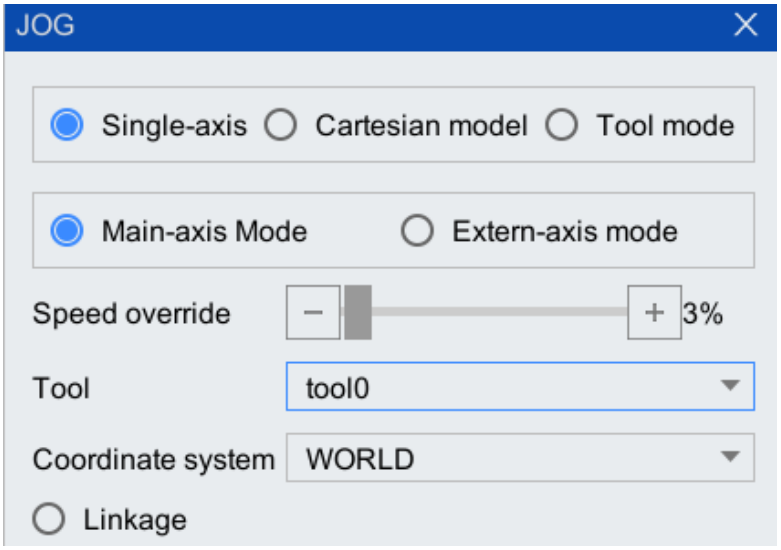


Figure 4-56 JOG run settings dialog box

Step2. Single axis operation. Press and hold the enable button with the left hand and do not release it, then click the control buttons shown in Figure 4-57 with the right hand in turn ("⊕" and "⊖" can control the forward and reverse directions of each axis movement) to confirm that all six axes can operate normally. Release the enable key or continue to push it in, the robot stops moving and disconnects the enable (a "click" sound is heard). At the same time, the lightning icon in the enable status bar (see Figure 4-55) displays as " " (Grey).

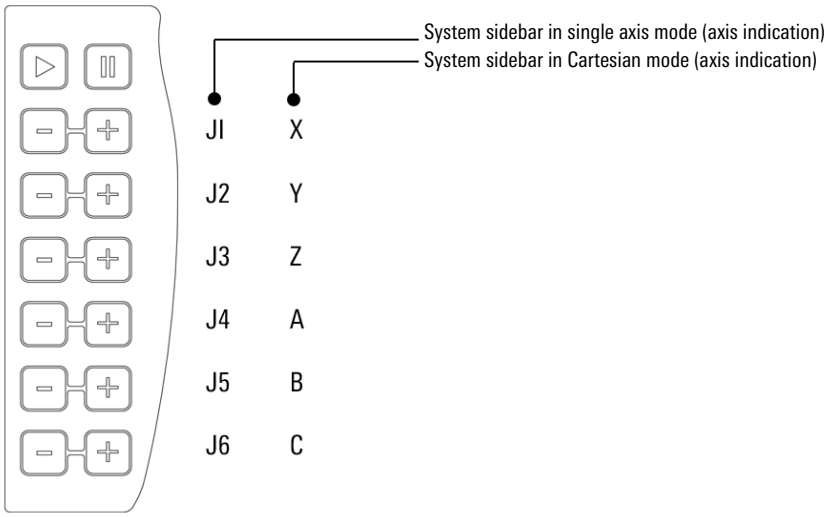


Figure 4-57 Control keys on the right side of the teach pendant

Notice

If the enable is disabled during the robot movement, an alarm will be generated. After the alarm is cleared, the robot needs to be enabled again to continue running the robot.

Step3. Click [Run/Program Editor] on the main interface of the teach pendant.

Step4. In the pop-up [Program Editor] interface, click [More Editors/Open] to open the created arl program file.

Step5. Click [Insert Cmd/Motion Control/Group Move/use], as shown in Figure 4-58.

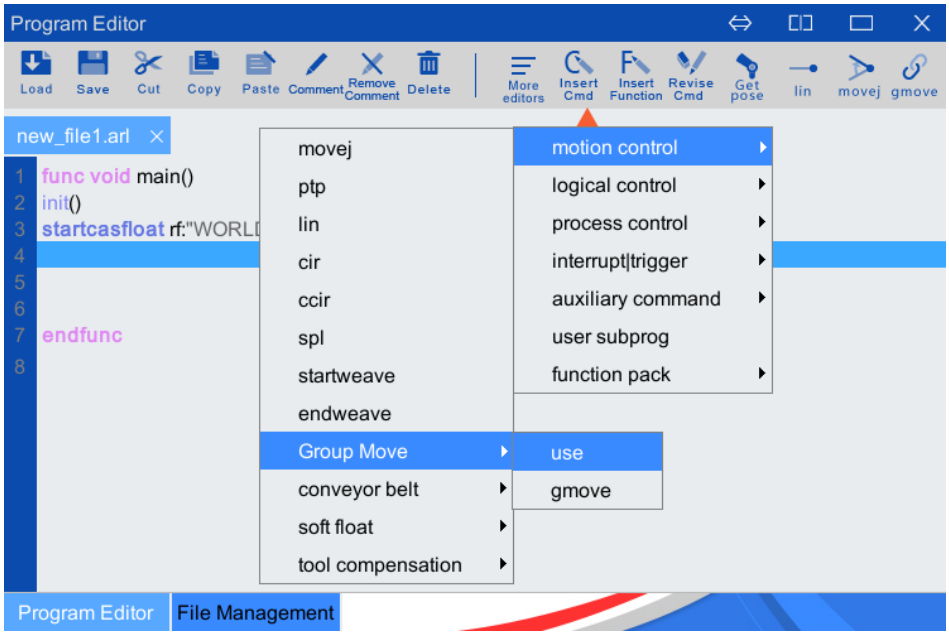


Figure 4-58 Insert use

Step6. The configuration interface shown in Figure 4-59 will pop up. Click to select the mechanical unit to be linked, and click <Insert>.

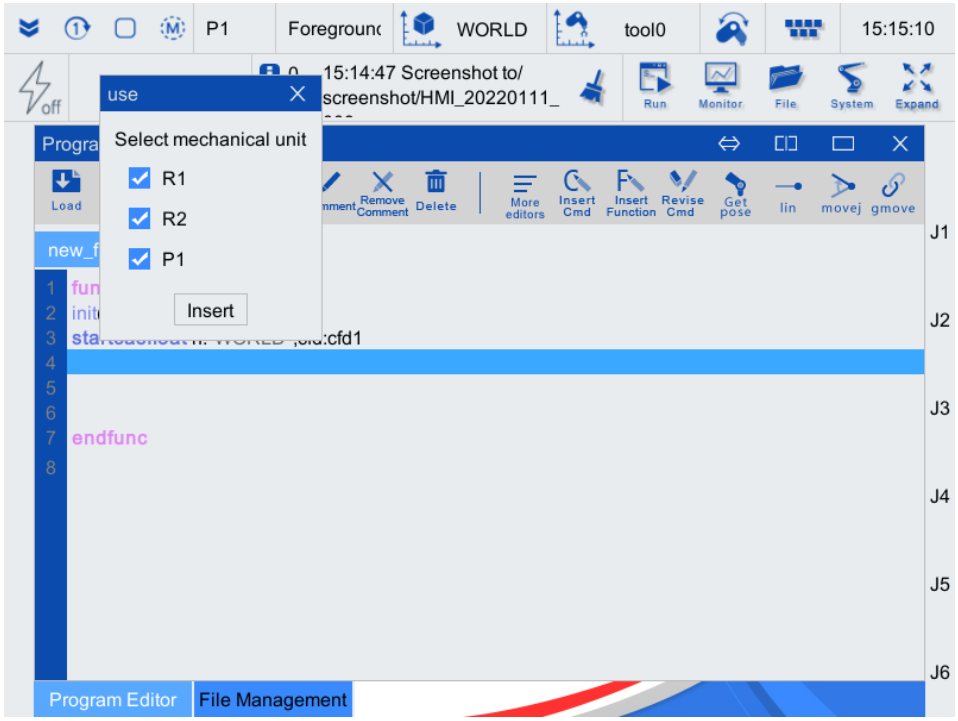


Figure 4-59 Insert command interface

Step7. Instructions inserted in [Program Editor] are shown in Figure 4-60.

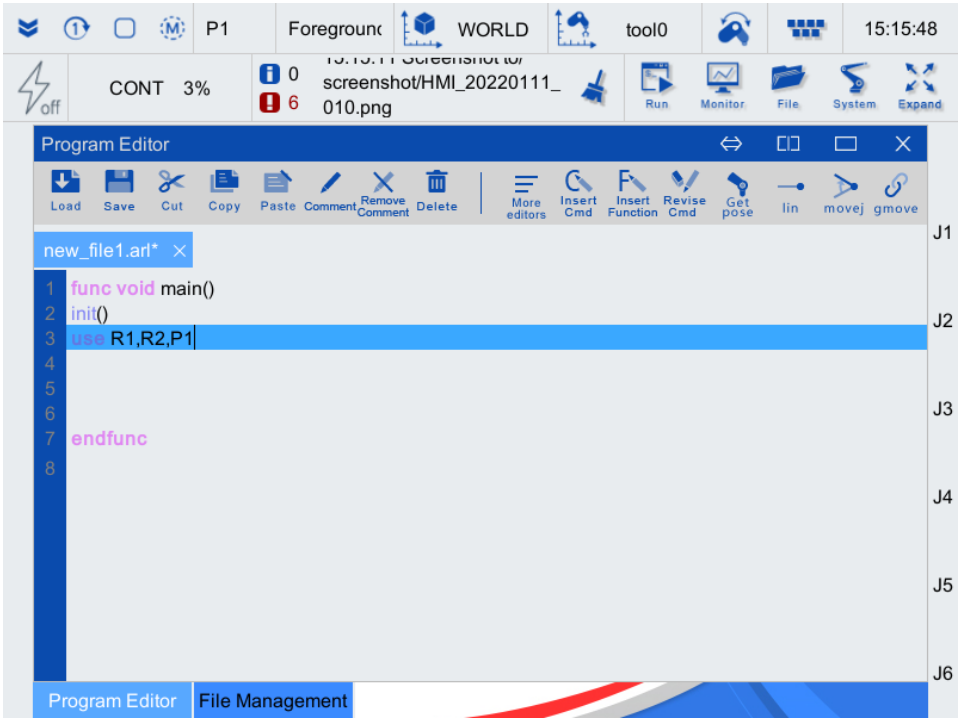


Figure 4-60 Program editor interface

Step8. Click [Insert Cmd/Motion Control/Group Move/gmove] to pop up the configuration interface as shown in Figure 4-61. The parameter description is shown in Table 4-14.

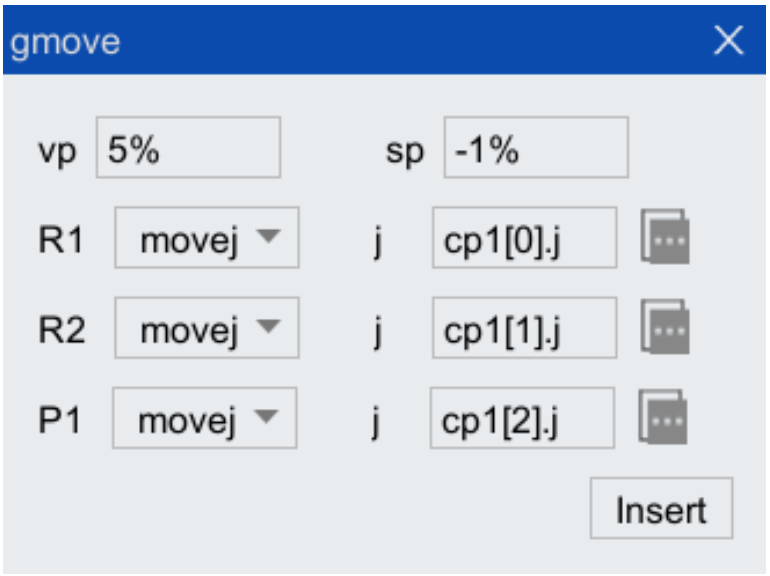


Figure 4-61 Insert command interface

Table 4-14 Parameter Description

Parameter	Description
vp	TCP speed. This parameter specifies the movement speed percentage. It can be used as an alternative to the speed parameter v, which is used for occasions where it is not necessary to specify the speed value precisely. Format vp: 10%, indicating that the current line speed is 10% of the maximum speed of the robot
sp	Smoothness of TCP. This parameter specifies the smoothing percentage. An alternative to the smoothing parameter s, which is used when it is not necessary to precisely specify the smoothing value. The format is sp:10%, indicating that the smoothing distance of the current line target point is

Parameter		Description	
		10% of the maximum smoothing distance	

R1/R2	movej	The movej command is used to move the robot axis to a specified axis position. All axes reach the target axis position at the same time.	The comppos structure is as follows:
			pose p; // Cartesian target point
			joint j; // Axis target point
			unsigned int w // Tool coordinate system serial number;
			unsigned int t; // Workpiece coordinate system serial number
			For parameter explanation, see "ARL Programming User Manual".

	ptp	The ptp command is used to quickly move the robot from one point to another without requiring the shape of the trajectory taken by the TCP point. All axes reach the target point at the same time.	
	lin	The lin command is used to move the robot TCP point to the target point pose along a linear path; the position movement and the attitude rotation are synchronized.	
	ccir	The ccir command is used to move the robot TCP point to the target point along an arc path; the translational motion and the rotational motion are synchronized.	

Step9. When the motion command of R1 is not selected as "movej", click the drop-down triangle to select other motion commands. And click " " behind the point data, the configuration interface as shown in Figure 4-62 will pop up.

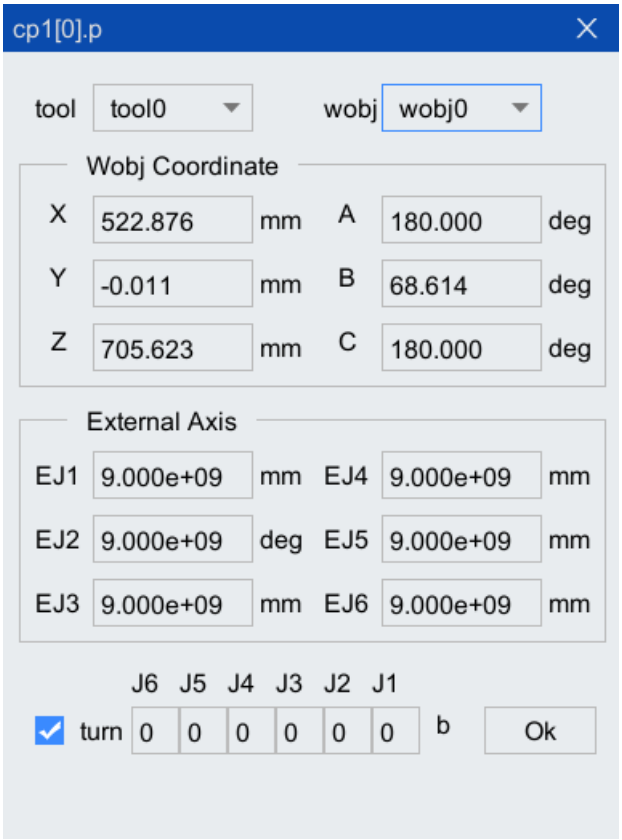


Figure 4-62 Interface for configuring point data

Step10. Select [Tool] as "tool0". If you need to make linear or circular motion relative to the workpiece fixed on the positioner, the [Workpiece] coordinate system needs to select the workpiece coordinate system "wobj0" of P1 set in Section 4.3, and in other cases, the workpiece coordinate system can be selected "WORLD".

Step11. When the motion command of R2 is not selected as "movej", click the drop-down triangle to select other motion commands. And click " " after the point data, the configuration interface as shown in Figure 4-63 will pop up.

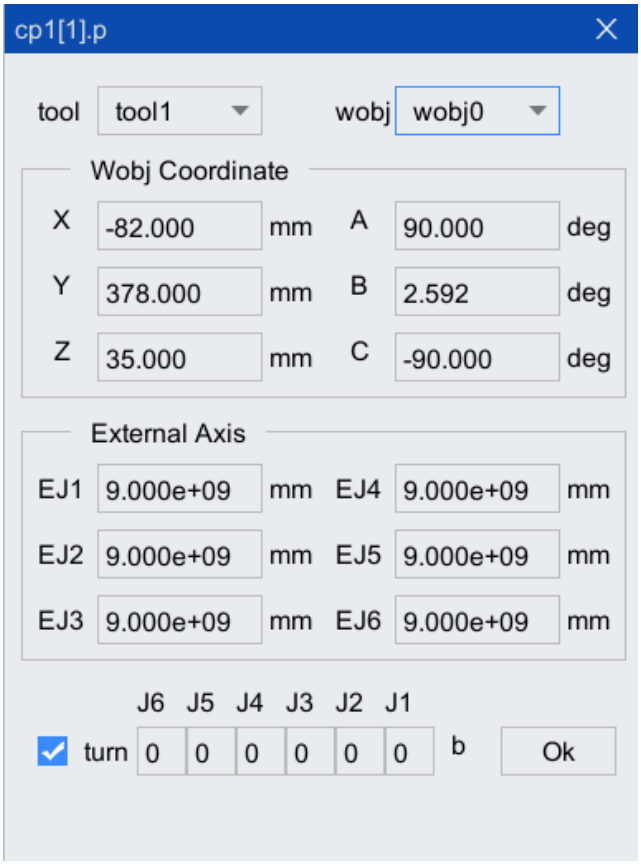


Figure 4-63 Interface for configuring point data

Step12. Select [Tool] as "tool1". If you need to make linear or circular motion relative to the workpiece fixed on the positioner, the [Wobj] coordinate system needs to select the workpiece coordinate system "wobj0" of P1 set in Section 4.3, and in other cases, the workpiece coordinate system can be selected "WORLD".

Tip

When the workpiece coordinate system refers to the positioner, it is in the linked state, and the "&" symbol will appear before the inserted command; in other cases, it is in the non-linked state, and the "@" symbol will appear before the inserted command.

Step13. After the configuration is complete, click <Insert>, and insert the motion instruction in the [Program Editor] as shown in Figure 4-64.

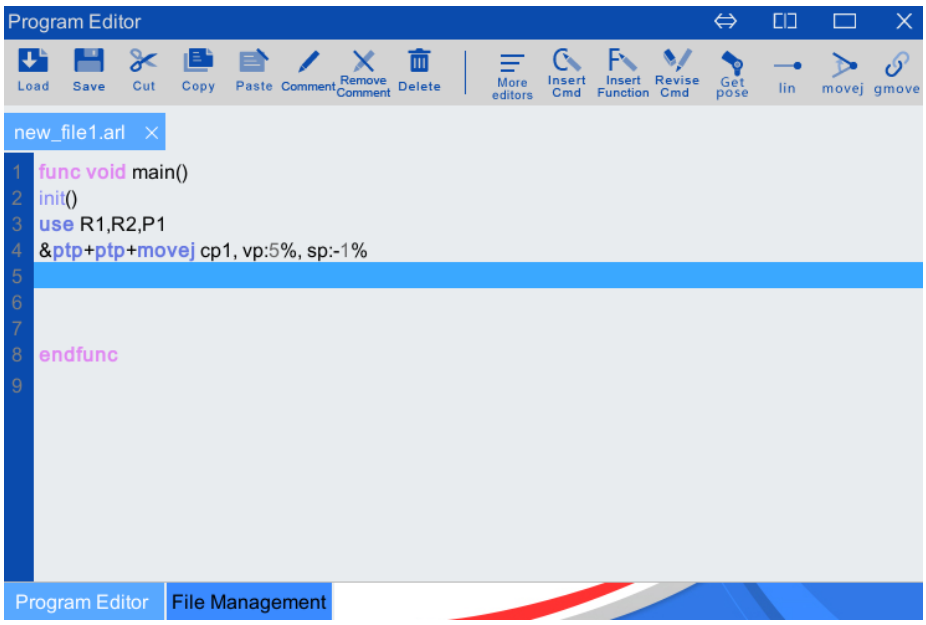


Figure 4-64 Program editor interface

Program execution

The program execution steps are as follows:

Step1. After the code is generated, click <Load> to load the code into the program debugger.

Step2. Turn the mode switch key on the upper left of the robot teach pendant to the [Manual Low Speed] mode. As shown in Figure 4-65.

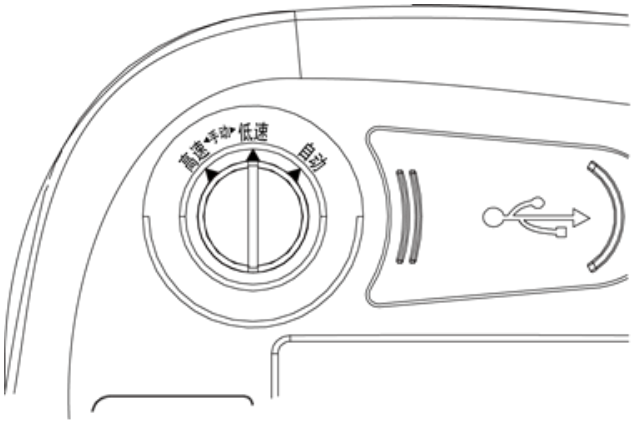


Figure 4-65 Teach pendant mode switch key

Step3. Press the enable button of the rear casing of the teach pendant to the Ⅱ (middle) key position and not release it (as shown in Figure 4-66), the upper left corner of the teach pendant interface " " lights up (as shown in Figure 4-67), indicating that the motor is powered on.

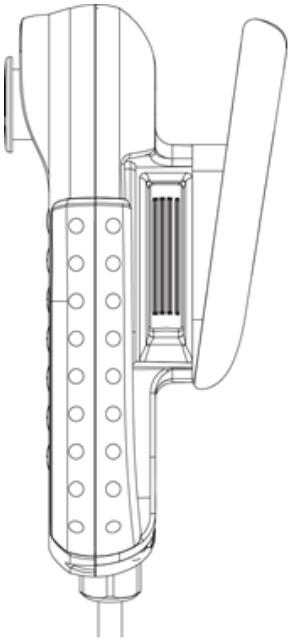


Figure 4-66 Teach Pendant Enable Switch

Figure 4-67 The motor is powered up

Step4. Select the debug mode in the debugger (for details, please refer to "Section 5.1 Program Debugger" in the "AIR-TP Teaching Pendant Operation Manual"), and simultaneously press the "" button on the front panel of the teaching pendant to start the executing code. Run the program in low-speed mode to check whether the program is running correctly, and whether the robot interferes with the surrounding environment, causing safety hazards and other problems.

Step5. After confirming that the program is correct and there are no other faults, directly release the enable button, and turn the mode switch key on the upper left of the front of the robot teach pendant to the [Auto] mode. Press the <Enable> button to power on the motor, and click the "" button to make the robot run automatically.

5 Multi-robot linkage

5.1 Configure basic parameters

The following uses "two robot manipulators" as an example to describe the configuration steps.

Configure global parameters

Step1. As shown in Figure 5-1, select [System] in the upper right corner of the main interface, and then select the [Parameter Configuration] option in the drop-down list, and then enter the various tab selection interface shown in Figure 5-2.

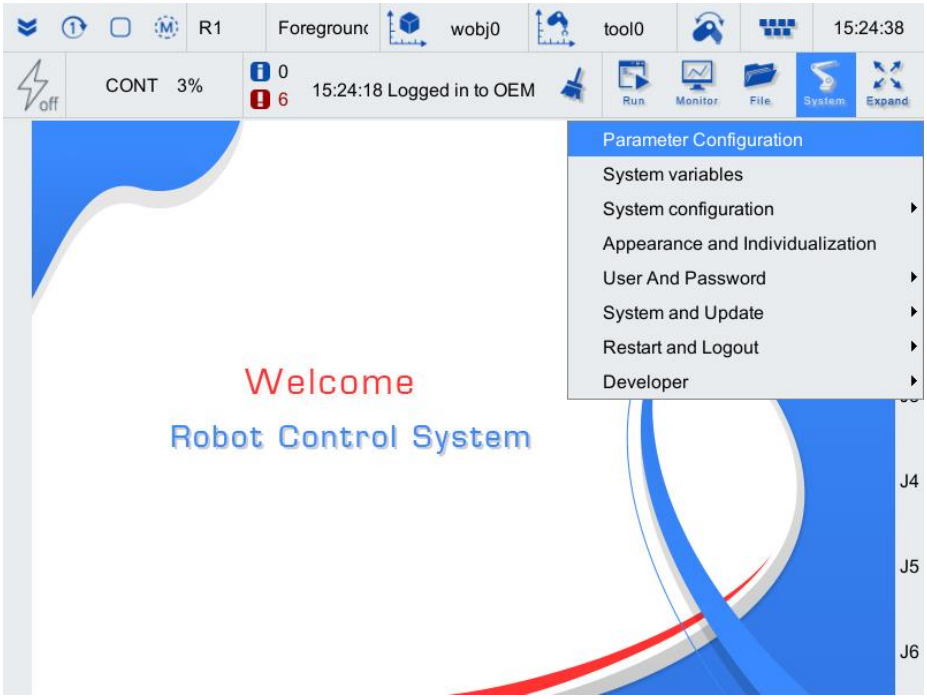


Figure 5-1 "Parameter configuration" selection list

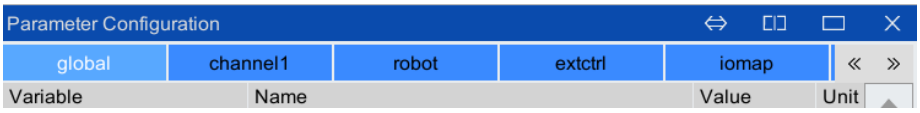


Figure 5-2"Parameter configuration" tab display area

Step2. In the [Global] interface, click to select the [CHANNEL_NUM (Foreground Channel Number)] parameter.

Step3. Click <Edit>, the dialog box shown in Figure 5-3 will pop up. Set the parameter in [Value] to 2, and click <Yes>.

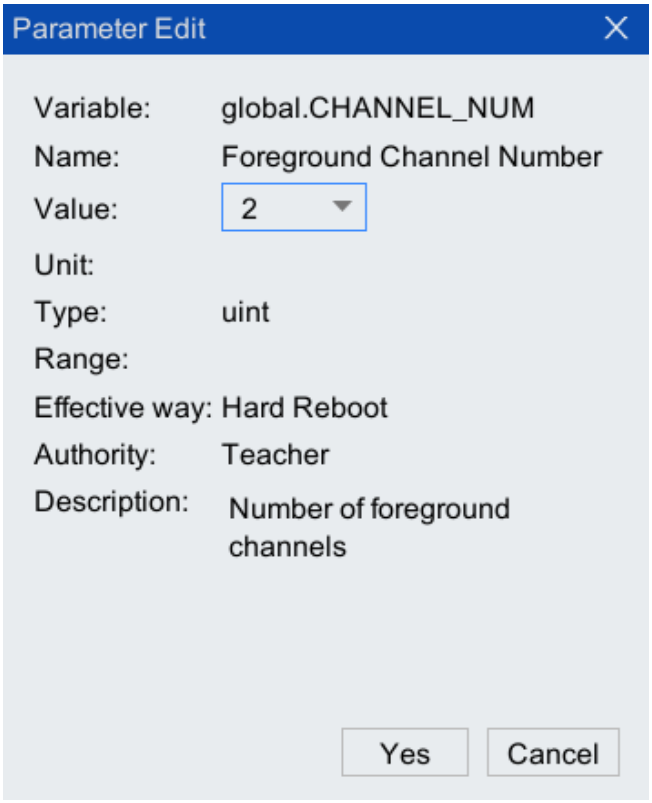


Figure 5-3 Interface of the number of foreground channels

Step4. In the [Global] interface, click to select the [SERVO_NUM (Servo Number)] parameter.

Step5. Click <Edit>, the dialog box shown in Figure 5-4 will pop up. Configure the parameters in [Value] and click <Yes>. The parameter description is shown in Table 5-1.

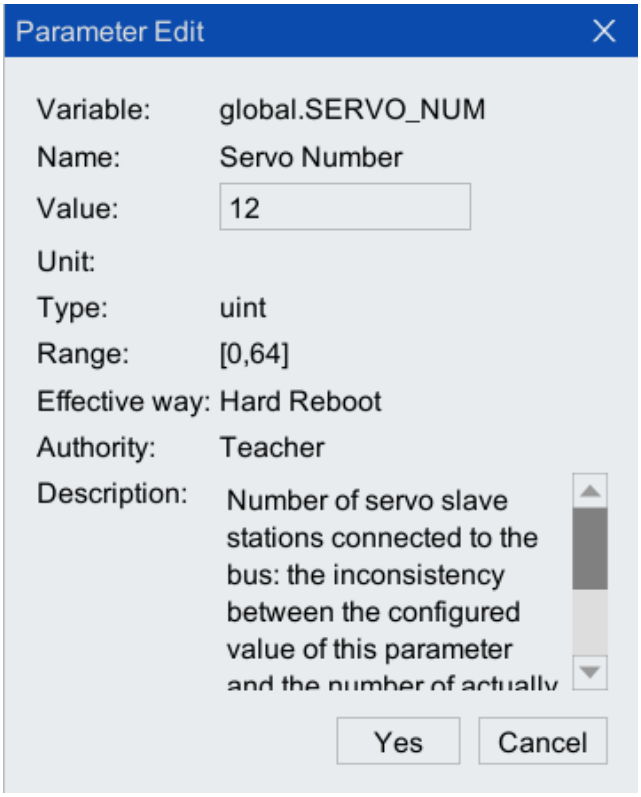


Figure 5-4 The configuration interface of the number of servo slaves

Table 5-1 Parameter Description

Parameter	Description
Value	The number of servo slaves connected to the bus, including the servo slaves of the robot manipulator and the external servo slaves. Tip: The parameter configuration does not match the actual number of slave stations, which may cause the bus connection failure when starting the system.

Step6. It will take effect after restarting the control cabinet.

Configure channel 1 Parameters (R1)

Step1. Click the <Mechanical unit switch> button on the interface, as shown in Figure 5-5, click [R1], and then click the "" button.

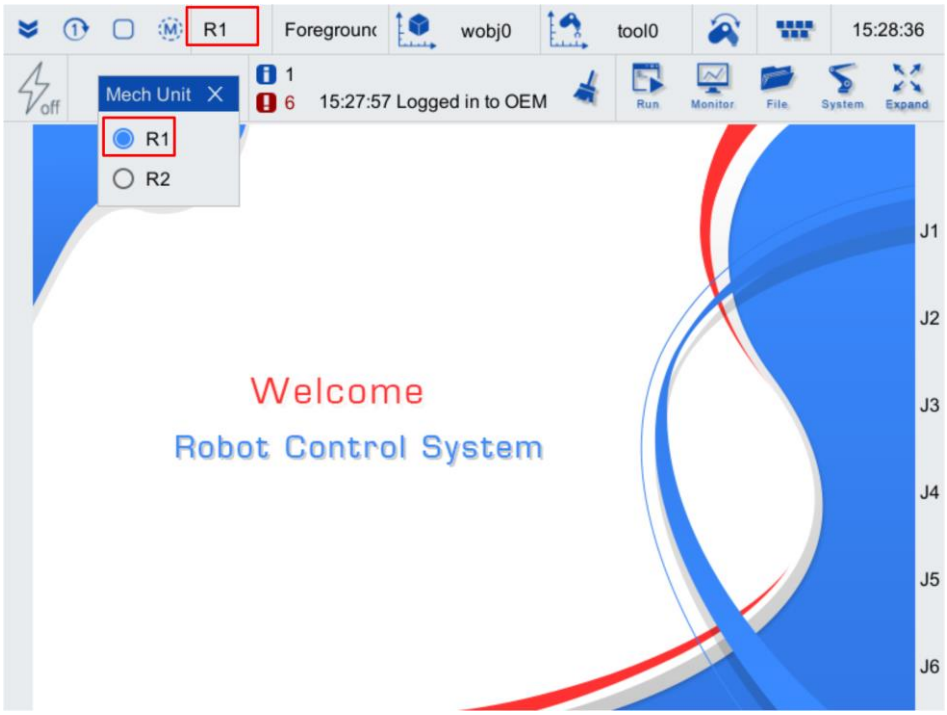


Figure 5-5 Mechanical unit switching interface

Step2. On the [Channel 1] interface, click to select the [EX_JOINT_NUM (External Axis Num] parameter.

Step3. Click <Edit>, the dialog box shown in Figure 5-6 will pop up. Set the parameter in [Value] to 0, click <Yes>. The parameter description is shown in Table 5-2.

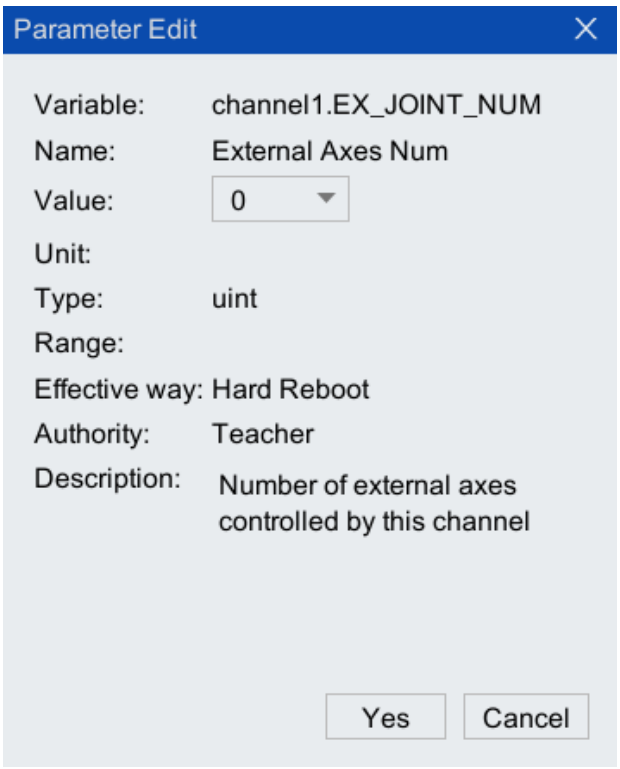


Figure 5-6 Configuration interface for the number of external axes

Table 5-2 Parameter Description

Parameter	Description
Value	The number of external axes controlled by this channel. Integer form, the value range is 1 to 6.

Step4. On the [Channel 1] interface, click to select the [MECH_UNIT_NUM (Mechanical unit num)] parameter.

Step5. Click <Edit>, the dialog box shown in Figure 5-7 will pop up. Set the parameter in [Value] to 1, and click <Yes>. The parameter description is shown in Table 5-3.

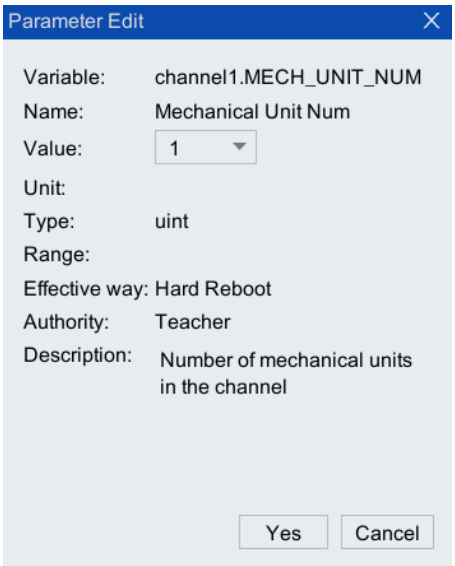


Figure 5-7 Configuration interface for the number of mechanical units

Table 5-3 Parameter Description

Parameter	Description
Value	The number of mechanical units in this channel.

Step6. In the [Channel 1] interface, click the [+] on the left side of the [MECH_UNIT_MODEL (Mechanical unit model)] parameter, and click to select "[0]" in the expanded sub-items ([0] is the robot manipulator).

Step7. Click <Edit>, the dialog box shown in Figure 5-8 will pop up. Configure the parameters in [Value] as the actual robot manipulator model, and click <Yes>. The parameter description is shown in Table 5-4.

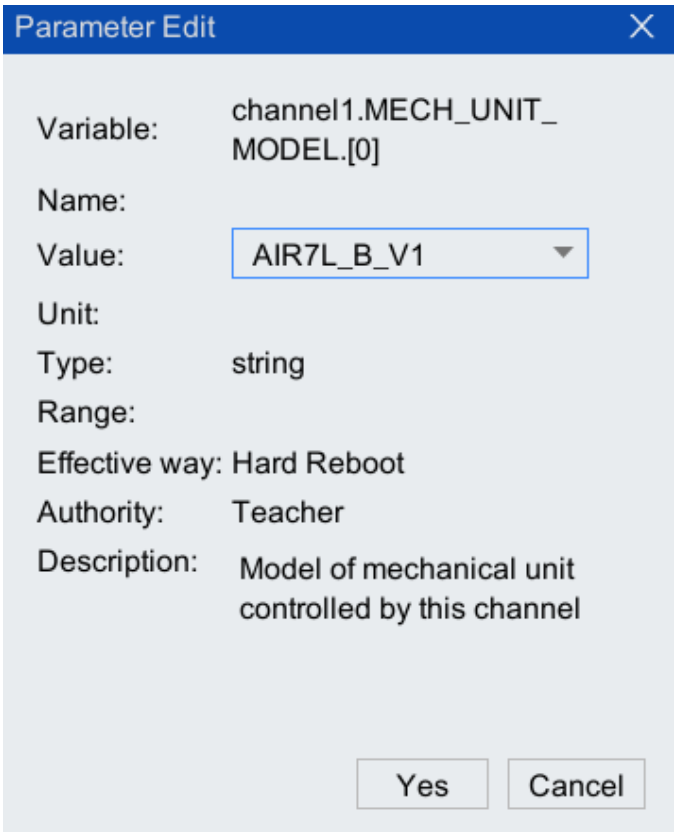


Figure 5-8 Configuration interface for mechanical unit models

Table 5-4 Parameter Description

Parameter	Description
Value	The model of the mechanical unit controlled by this channel.

Step8. In the [Channel 1] interface, click the [+] on the left side of the [MECH_UNIT_NAME (Mechanical unit name)] parameter, and click to select "[0]" in the expanded sub-items ([0] is the robot manipulator).

Step9. Click <Edit>, the dialog box shown in Figure 5-9 will pop up. Configure the parameters in [Value] (for example: R1), and click <Yes>.

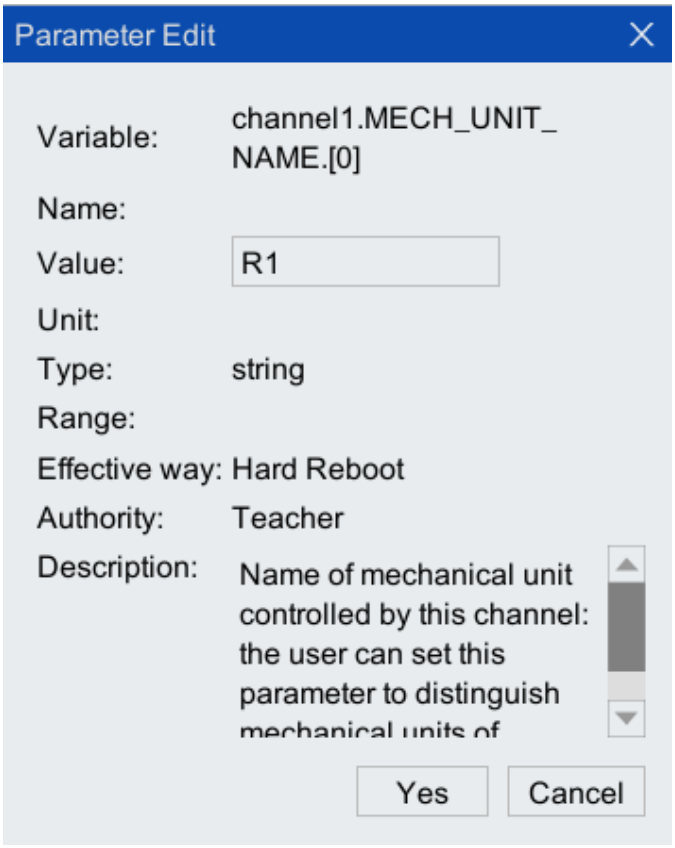


Figure 5-9 Configuration interface for mechanical unit names

Configure channel 2 Parameters (R2)

Step1. Click the <Mechanical Unit Switch> button on the interface, as shown in Figure 5-10, click [R2], and then click the "" button.

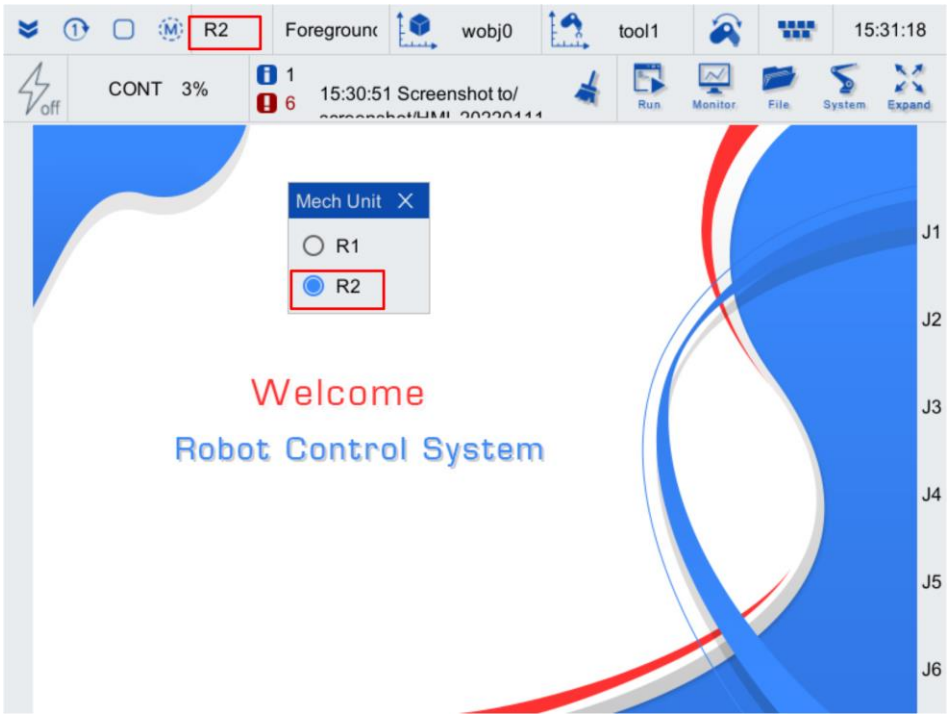


Figure 5-10 Mechanical unit switching interface

Step2. On the [Channel 2] interface, click to select the [EX_JOINT_NUM (external axis number)] parameter.

Step3. Click <Edit>, the dialog box shown in Figure 5-11 will pop up. Set the parameter in [Value] to 0, click <Yes>. The parameter description is shown in Table 5-5.

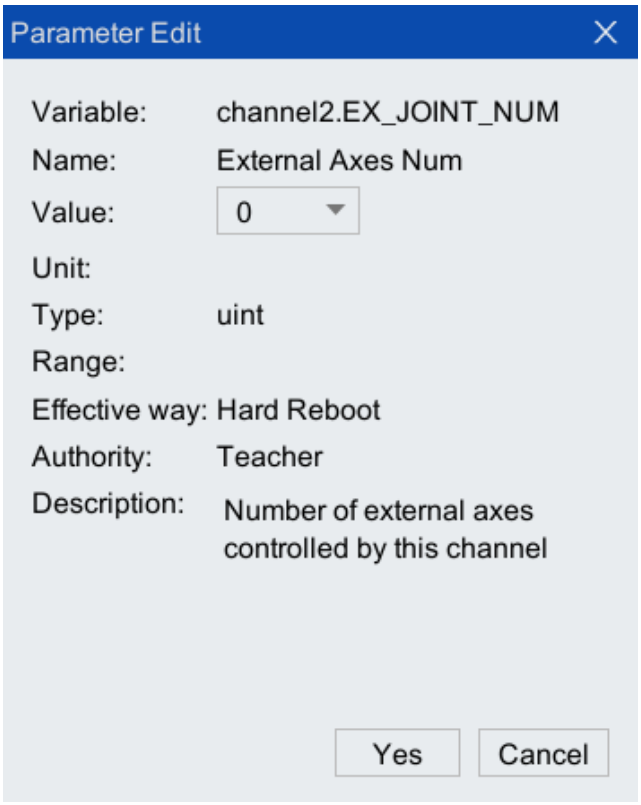


Figure 5-11 Configuration interface for the number of external axes

Table 5-5 Parameter Description

Parameter	Description
Value	The number of external axes controlled by this channel. Integer form, the value range is 1-6.

Step4. On the [Channel 2] interface, click to select the [MECH_UNIT_NUM (Mechanical unit num)] parameter.

Step5. Click <Edit>, the dialog box shown in Figure 5-12 will pop up. Set the parameter in [Value] to 1, and click <Yes>. The parameter description is shown in Table 5-6.

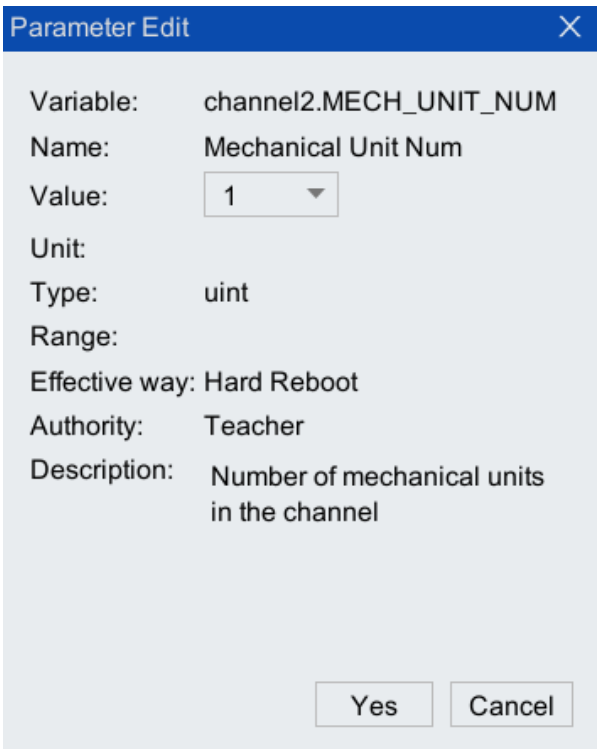


Figure 5-12 Configuration interface for the number of mechanical units

Table 5-6 Parameter Description

Parameter	Description
Value	The number of mechanical units in this channel.

Step6. In the [Channel 2] interface, click the [+] on the left side of the [MECH_UNIT_MODEL (mechanical unit model)] parameter, and click to select "[0]" in the expanded sub-items ([0] is the robot manipulator).

Step7. Click <Edit>, the dialog box shown in Figure 5-13 will pop up. Configure the parameters in [Value] as the actual robot manipulator model, and click <Yes>. The parameter description is shown in Table 5-7.

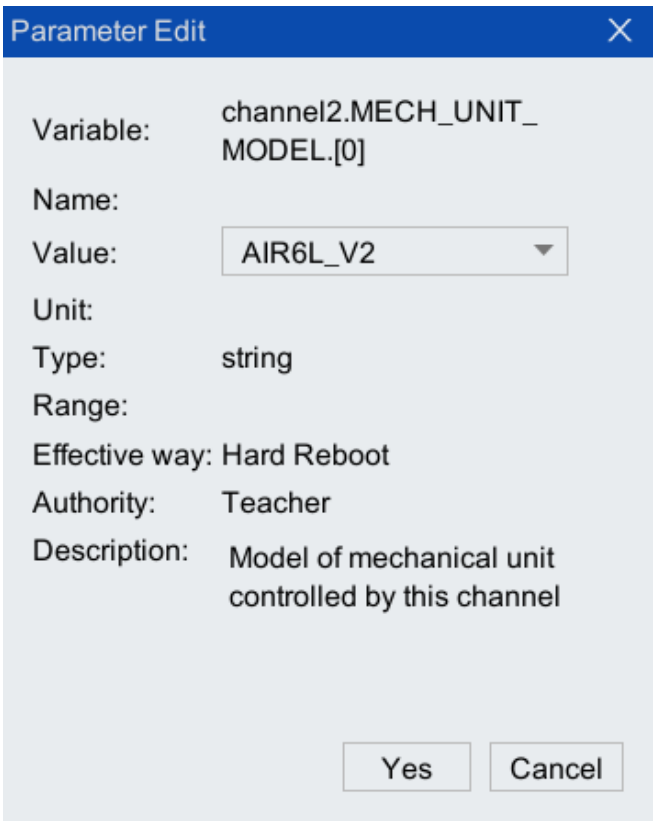


Figure 5-13 Configuration interface for mechanical unit models

Table 5-7 Parameter Description

Parameter	Description
Value	The model of the mechanical unit controlled by this channel.

Step8. In the [Channel 2] interface, click the [+] on the left side of the [MECH_UNIT_NAME (mechanical unit name)] parameter, and click to select "[0]" in the expanded sub-items ([0] is the robot manipulator).

Step9. Click <Edit>, the dialog box shown in Figure 5-14 will pop up. Configure the parameters in [Value] (for example: R2), and click <Yes>.

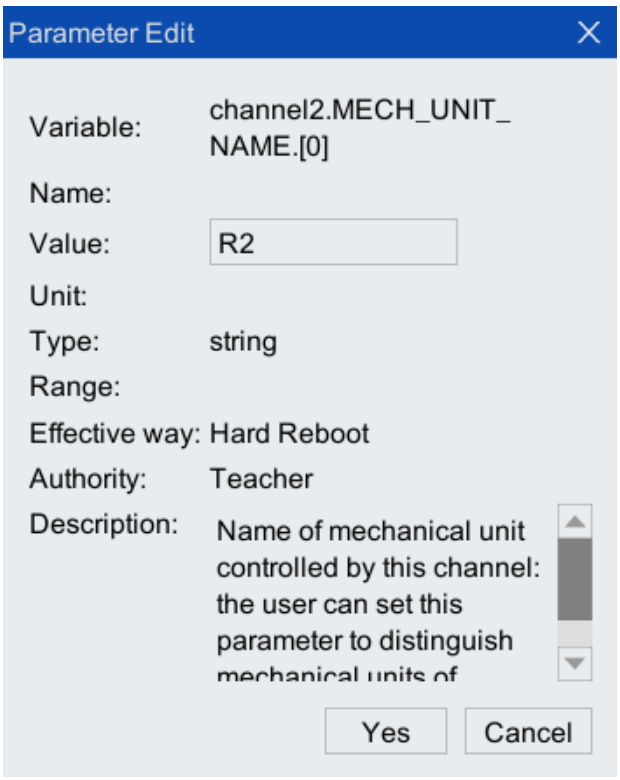


Figure 5-14 Configuration interface for mechanical unit names

Step10. Click <Save> after parameter configuration is complete, and the dialog box shown in Figure 5-15 will pop up. Select "Save All" in [Please select the save type], and click <Yes>.

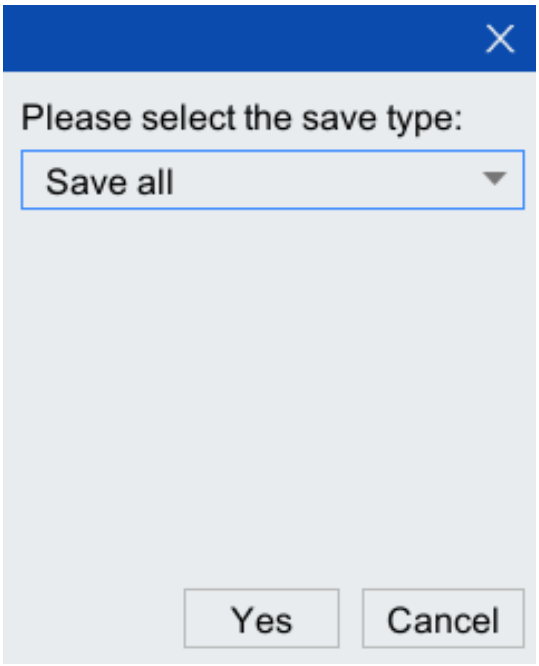


Figure 5-15 Save type dialog

Step11. Click <Yes> in the pop-up prompt dialog box. As shown in Figure 5-16.

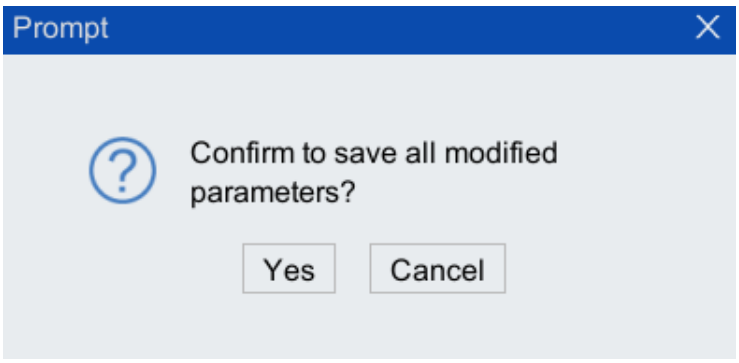


Figure 5-16 Confirm save changes prompt box

Step12. Click <Yes> in the pop-up parameter save successfully dialog box. As shown in Figure 5-17.

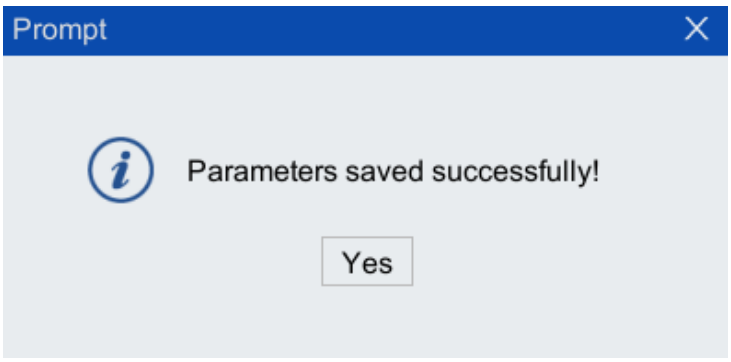


Figure 5-17 Save successful prompt box

5.2 Coordinate system calibration

Calibration tool coordinate system

Before calibrating the tool coordinate system, it is necessary to install a tool with a tip on R1 and R2, and use the tip as a TCP.

The coordinate system calibration steps are as follows:

Step1. Select [Run/Calibrate/Coordinate Calibration] on the main interface of the teach pendant, as shown in Figure 5-18.

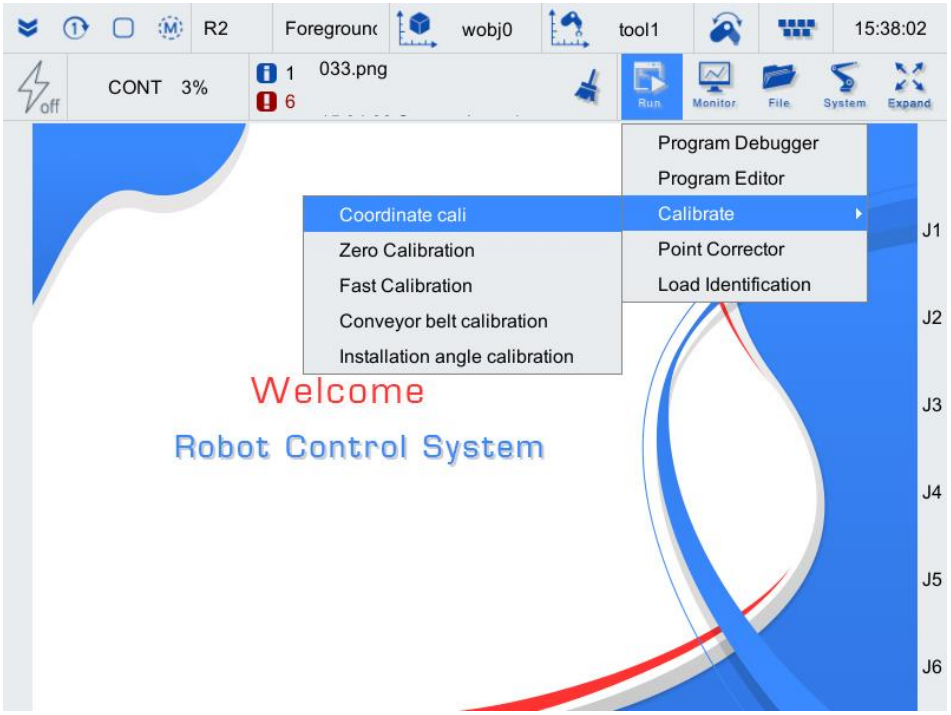


Figure 5-18 Main interface diagram

Step2. In the pop-up [Coordinate System measurement] interface, select [Coordinate System Type] as "Tool", as shown in Figure 5-19.

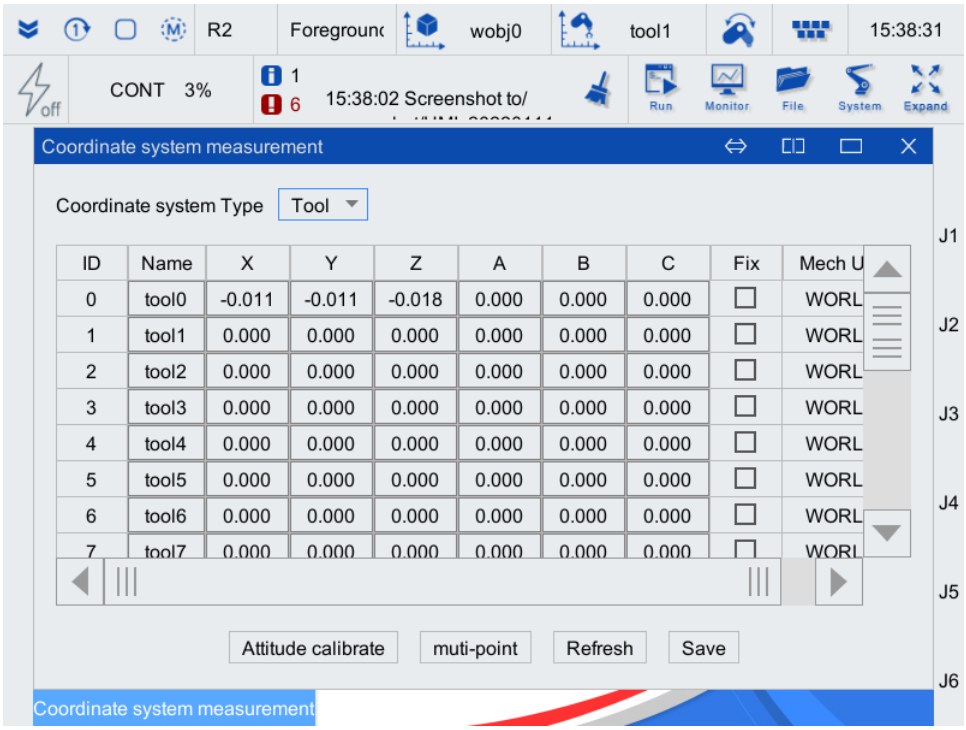


Figure 5-19 Zero calibration interface diagram

Step3. Click to select the row of the tool used in R1 (for example: tool0), and click <Multi-Point>.

Step4. In the pop-up interface as shown in Figure 5-20, select the value of [Calibration Point number]. The number of calibration points supported by multi-point method calibration is 4 to 9. The more the number of points, the higher the calibration accuracy.

Step5. Follow the operation steps indicated on the [Position Calibration] interface to calibrate each point. When all the " × " become "√", click <Calculate>.

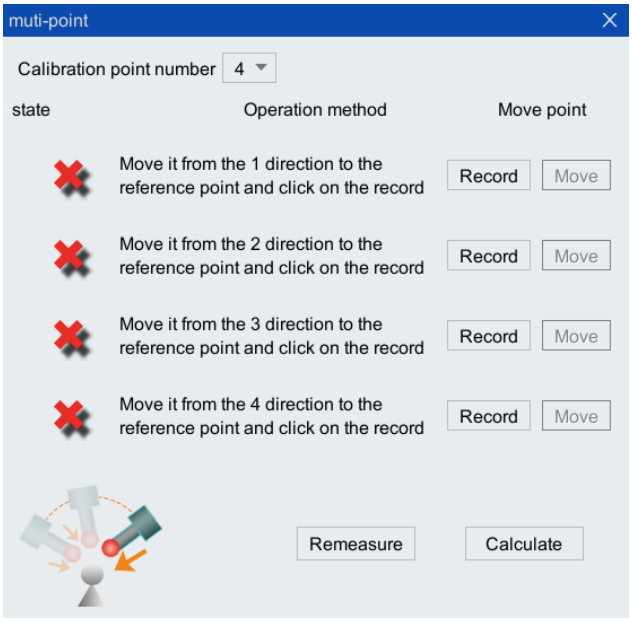


Figure 5-20 Multipoint calibration interface

Step6. Click <Yes> in the pop-up prompt dialog box to complete the calibration.

Step7. After the tool calibration of R1 is completed, calibrate the tool of R2 in the same way.

Step8. After R2 calibration, click <Save> to save the calibration results.

Calibration of base coordinate system

After the calibration of the tool coordinate system of R1 and R2 is completed, it is necessary to calibrate the base coordinate system of R2 based on R1. The calibration steps of coordinate system are as follows:

Tip

If three robots are linked, R3 also needs to be calibrated based on R1, and the calibration steps are the same as R2.

Step1. Select [Run/Calibrate/Coordinate calibration] on the main interface of the teaching pendant, as shown in Figure 5-21.

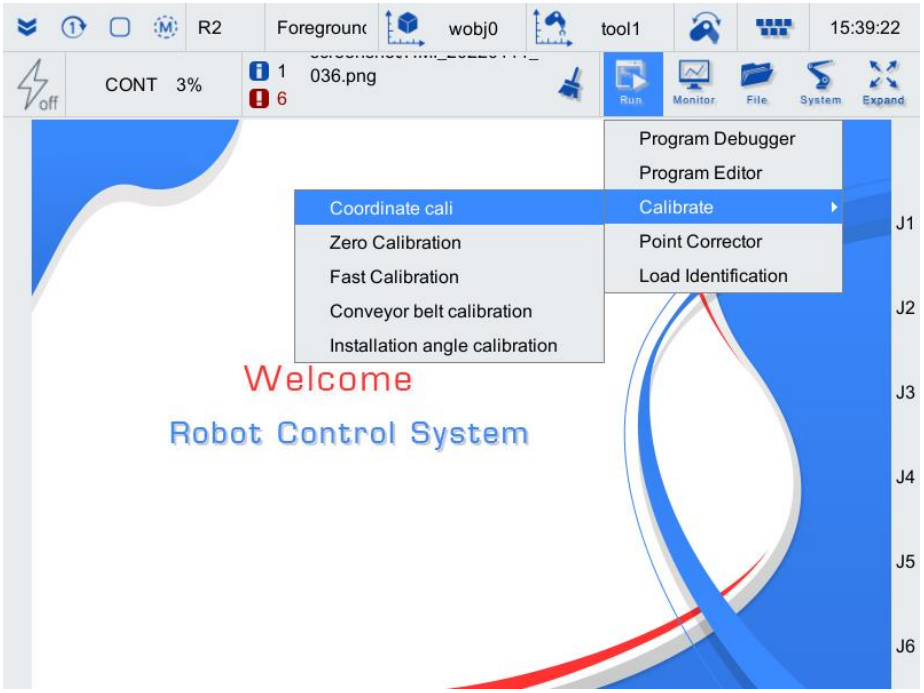


Figure 5-21 Main interface diagram

Step2. In the pop-up [Coordinate system measurement] interface, select [Coordinate system Type] as "Base", as shown in Figure 5-22.

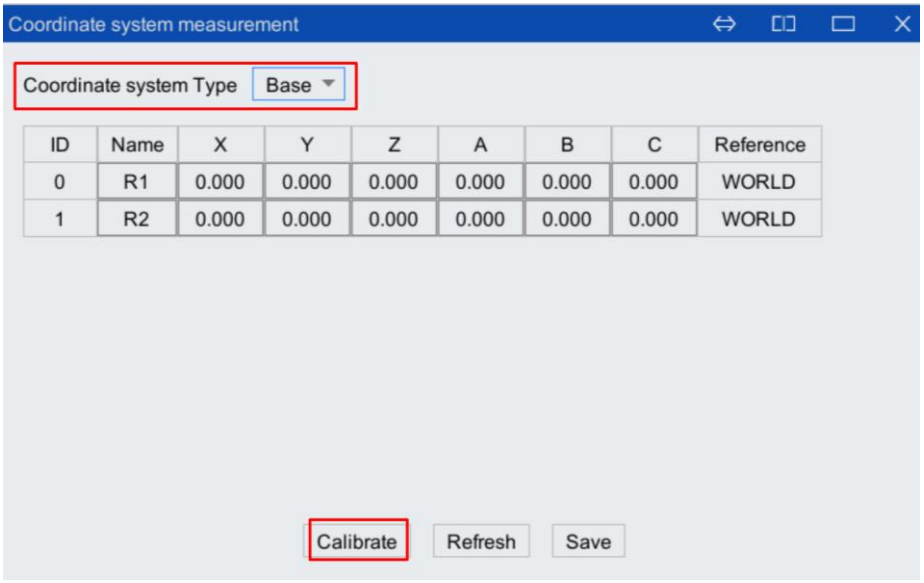


Figure 5-22 Zero calibration interface

Tip

If there are no special requirements for the pose of the base coordinate system, the default value of all zeros can be used without step 3 to step 6.

Step3. (Optional) Click to select the row of R1 and click <Calibrate>. The interface shown in Figure 5-23 will pop up.

Step4. (Optional) In the pop-up [Calibrate] interface, select [Reference mechanical unit] as "WORLD", and [Calibration point number] is "3" by default.

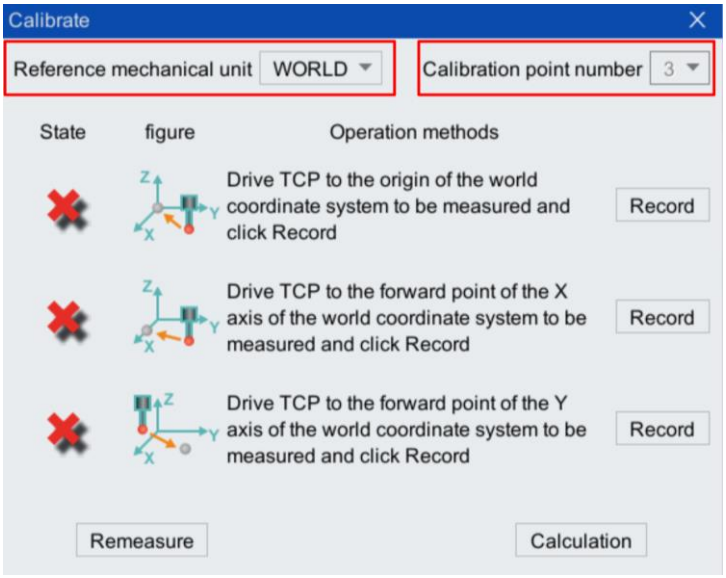


Figure 5-23 Three point calibration interface

Step5. (Optional) Calibrate each point according to the operation steps prompted in the [Calibrate] interface. When "×" When all become "√", click <Calculate >. As shown in Figure 5-24.

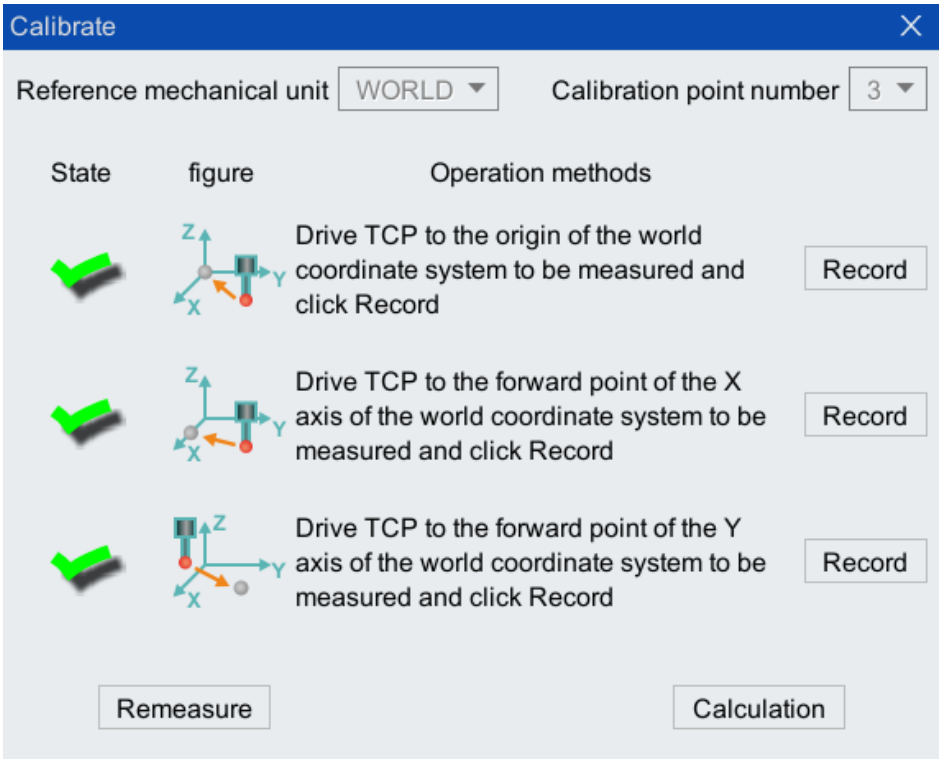


Figure 5-24 Interface for successful calibration

Step6. (Optional) Click the <Calculation> button at the bottom of the interface to complete the calibration.

Step7. Click to select the row of R2 and click <Calibration>. The interface shown in Figure 5-25 will pop up.

Step8. In the pop-up [Calibrate] interface, select [Reference mechanical unit] as "R1" and [Calibration point number] as "3" (the more points, the higher the calibration accuracy. Here, take the 3-point method as an example).

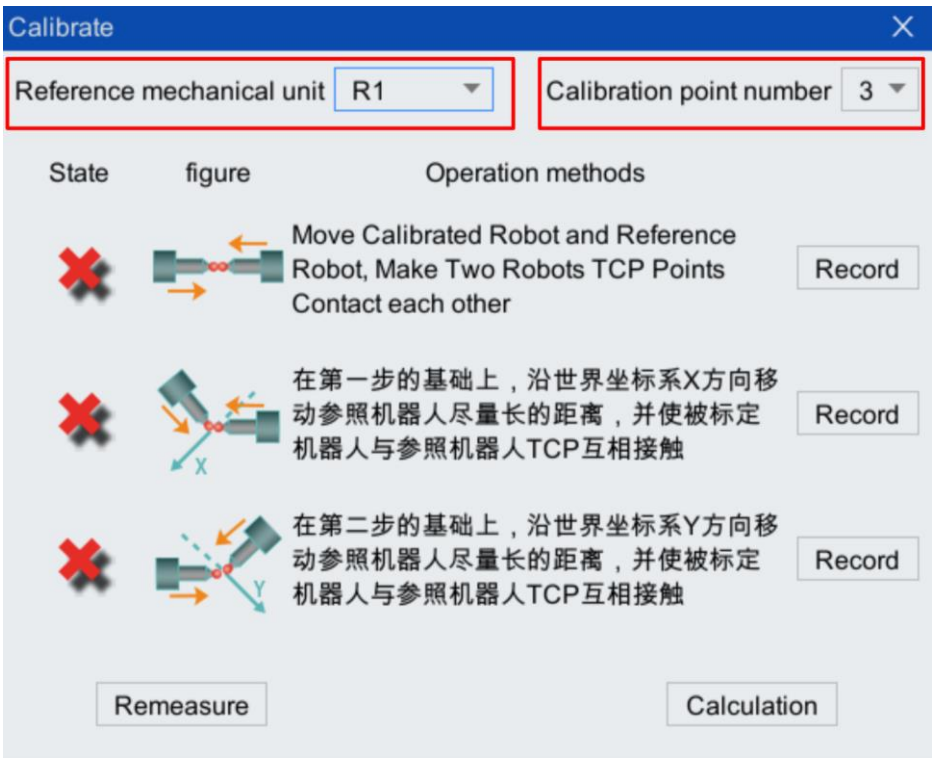


Figure 5-25 Three point calibration interface

Step9. Calibrate each point according to the operation steps prompted in the [Calibrate] interface. When " × " Change all to "√", and click <Calculation>. As shown in Figure 5-26.

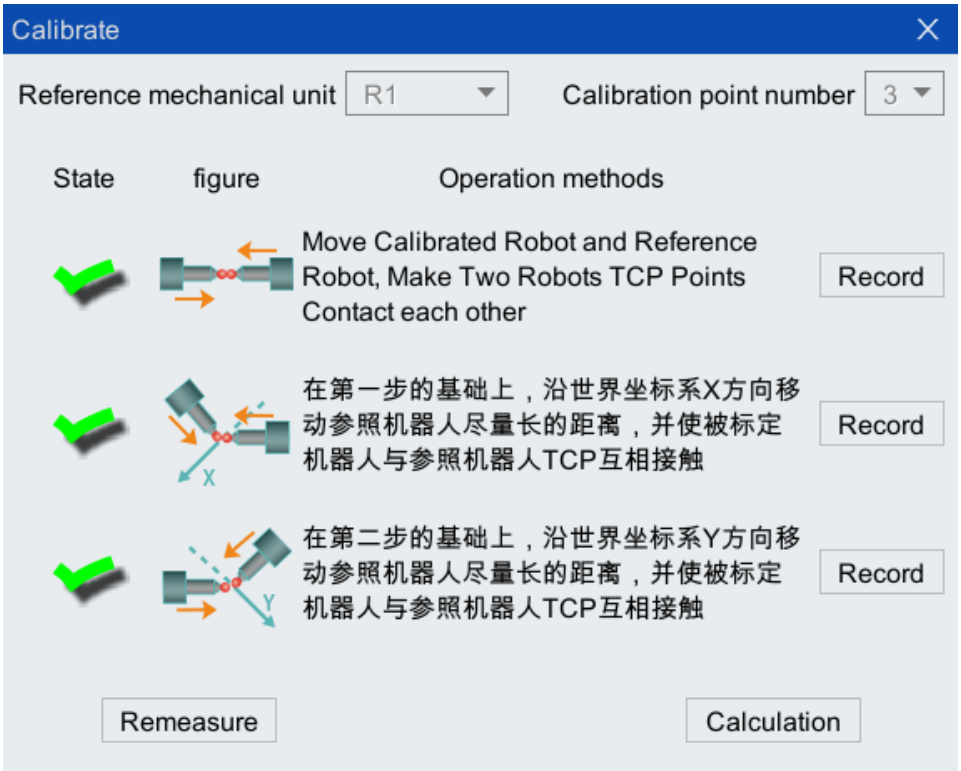


Figure 5-26 Interface for successful calibration

Step10. Click the <Calculation> button at the bottom of the interface to complete the calibration.

Step11. Click <Save> to save the calibrated data.

Calibration of workpiece coordinate system

If the workpiece is placed on R1, the workpiece coordinate system needs to be calibrated with reference to R1. The calibration steps of coordinate system are as follows:

Step1. Select [Run/Calibrate/Coordinate calibration] on the main interface of the teaching pendant, as shown in Figure 5-27.

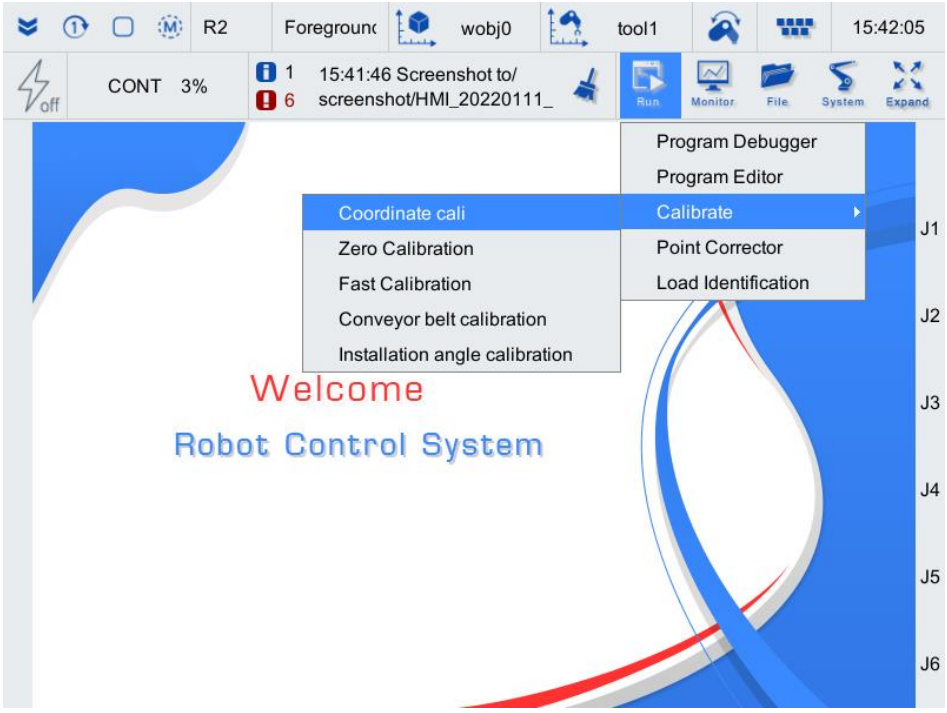


Figure 5-27 Main interface diagram

Step2. In the pop-up [Coordinate system measurement] interface, select [Coordinate system type] as "Wobj", as shown in Figure 5-28.

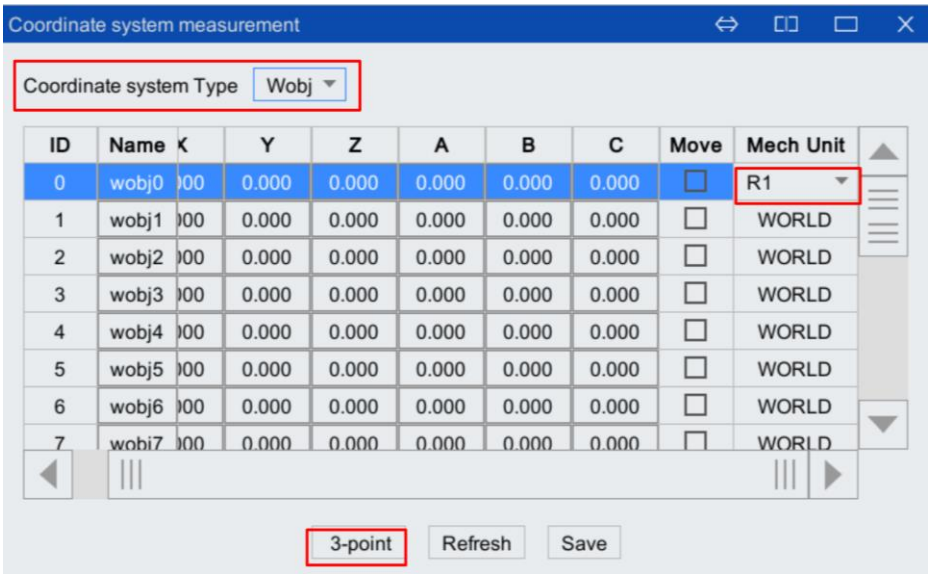


Figure 5-28 Zero calibration interface

Step3. Select the row of any workpiece coordinate system and select [Mech Unit] as "R1".

Step4. Click to select the row of R1 and click <3-point>. The interface shown in Figure 5-29 will pop up.

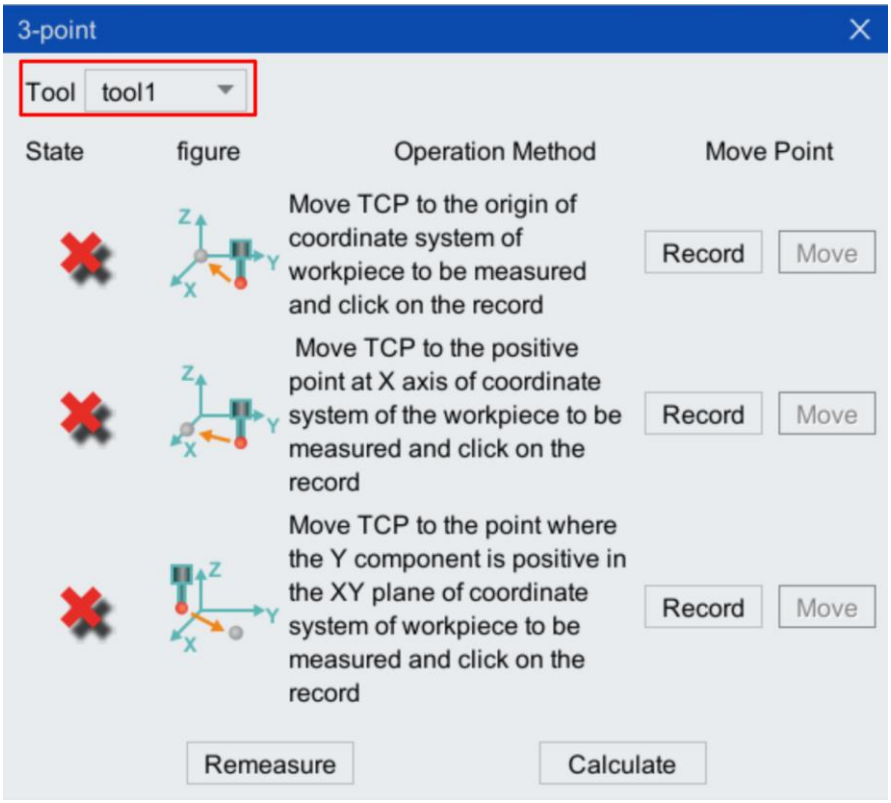


Figure 5-29 Calibration interface

Step5. In the pop-up [3-point] interface, select [tool] as the calibrated tool (e.g. "tool1").

Tip

When the workpiece is placed on the manipulator R1, it needs to be calibrated with the tool1 of the manipulator R2.

Step6. Calibrate each point according to the operation steps prompted on the interface. When " × " Change all to "√", and click <Calculate>. As shown in Figure 5-30.

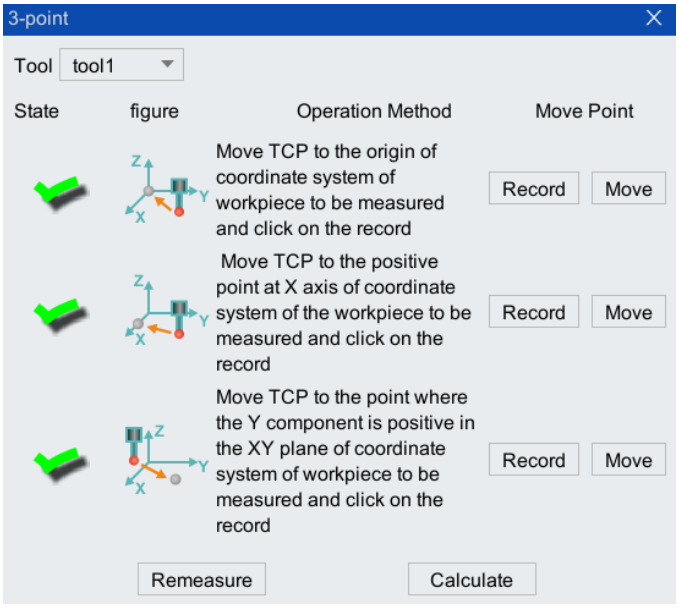


Figure 5-30 Interface for successful calibration

Step7. After all external axes are calibrated, click <Calculate>, and the calibration success interface will pop up. Click <Yes> to save the calibrated data.

Step8. Click <Yes> in the pop-up prompt dialog box.

5.3 Jog configuration

The following configuration takes "workpiece on robot R1" as an example. The workpiece coordinate system of robot R2 is the coordinate system associated with robot R1. Robot R2 is linked with robot R1, that is, the position and attitude of robot R2 remain relatively stationary relative to the workpiece coordinate system.

The setting steps of this mode are as follows:

Step1. Click the <Mechanical unit switching> button on the interface, as shown in Figure 5-31. Click and select [R2] and click the "" button.

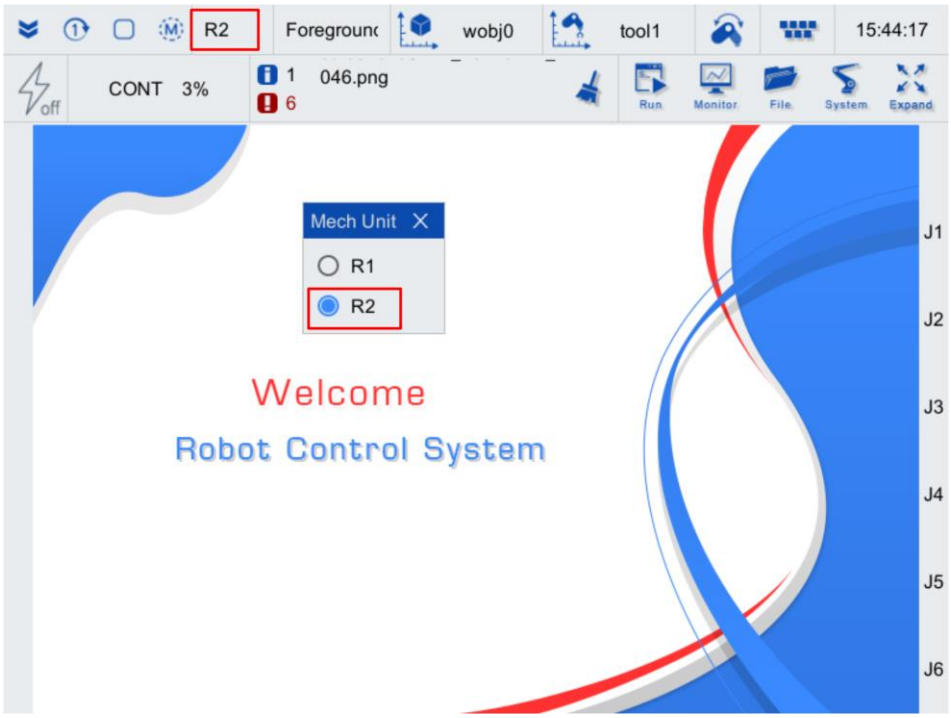


Figure 5-31 Switching mechanical unit

Step2. Click the " CONT 3% " icon in the upper left corner of the main interface to pop up the [JOG] operation parameter configuration interface. As shown in Figure 5-32.

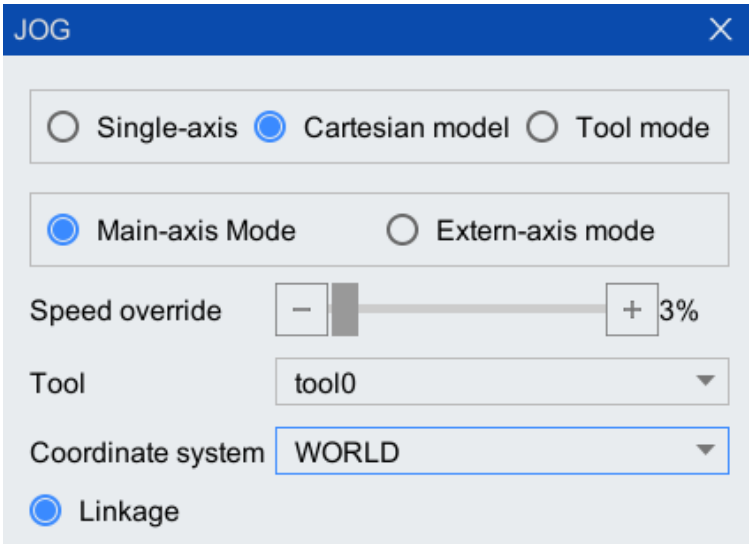


Figure 5-32 Interface of operation parameter configuration

Step3. Move the TCP of R2 to a sharp point on the coordinate system of R1 workpiece, and configure the [JOG] interface parameters of R2. The configuration method is shown in Table 5-8.

Table 5-8 Configuration steps and instructions

Step	Parameter	Configuration description
1	Single-axis Cartesian model Tool mode	Click to select [Cartesian mode]. In this mode, the TCP point of the manipulator can be controlled to move along the positive or negative direction of X axis, Y axis or Z axis, and the TCP of the manipulator can also be controlled to rotate around Z axis, Y axis or X axis.
2	Main-axis Mode Extern-axis mode	Click to select [Extern-axis Mode].
3	Speed override 3%	In jog mode, this item indicates that the speed magnification of the lower "jog" can be adjusted through "V+" and "V-" in the function keys of the teaching pendant.
4	Tool	Select "tool1" of manipulator R2.
5	Coordinate system	Select the calibrated workpiece coordinate system "wobj0".
6	Linkage	Click to select the [Linkage] check box.

Tip

In the case of multiple robots, check [Linkage] in the [JOG] interface, and all robots are in linkage state. At this time, you can select [Coordinate system] in the [JOG] interface of a robot to control whether it is linked.

- If "wobj (workpiece coordinate system)" is selected for [coordinate system], and the mechanical unit of the workpiece coordinate system belongs to other robots, the robot will follow the linkage when other robots jog move;
- If the [coordinate system] of the robot selects "world" or "wobj (workpiece coordinate system)" and the mechanical unit of the workpiece coordinate system belongs to world, it will not be linked.

Step4. Move R1 and check for errors. If the visible error is too large, it needs to be recalibrated.

5.4 Teaching practice

Enable key description

Enable buttons can be installed on the left and right sides of the rear shell of the teaching pendant. By default, they are installed on the right side when leaving the factory, as shown in Figure 5-33.

The enable key provides three key positions. The specific operation methods are as follows:

- 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.
- Gently fasten the enable key (located on the right side of the teaching pendant) in Figure 5-33. This is the second key position. It is enabled on the robot (hear the "click" sound). At the same time, the lightning icon in the enable status bar (see Figure 5-34) is displayed as " " (highlighted), the "run" indicator light of the control cabinet turns on, and then manual operation can be carried out (keep pressing and holding the enable key).

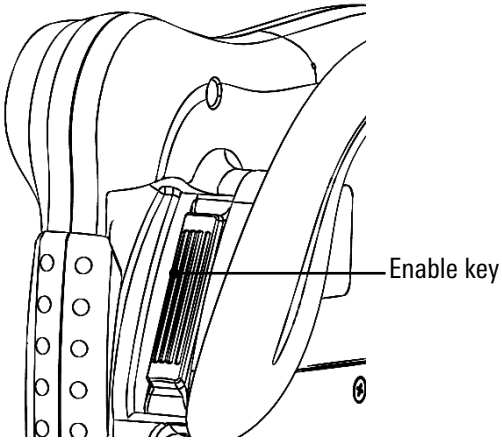


Figure 5-33 Teaching pendant enable button

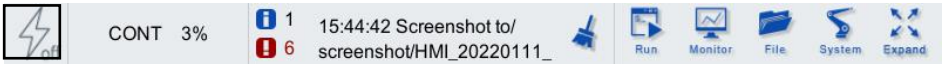


Figure 5-34 Enable status bar

- Continue to press hard. This is the third key position. The robot is enabled (hear the "click" sound). At the same time, the lightning icon in the enabling status bar (see Figure 5-34) is displayed as " " (gray), and the "operation" indicator of the control cabinet is off.

Teaching practice

The teaching operation steps are as follows:

Step1. Set "single axis mode" operation. Click the " CONT 3% " key in Figure 5-33 to pop up the [JOG] dialog box, as shown in Figure 5-35. Select [Single-axis], [jog] represents the speed in manual mode, which is recommended to be set to 5%.

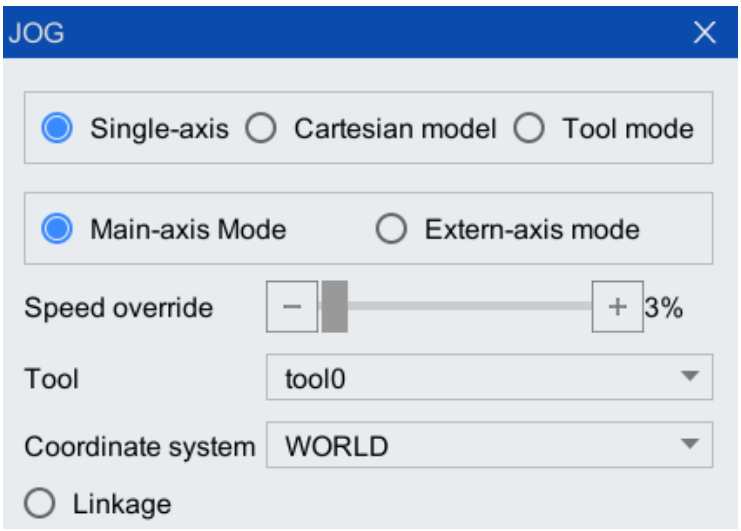


Figure 5-35 Jog run settings dialog box

Step2. Single axis operation. Press the enable key with the left hand for a long time without releasing it, and jog the control keys shown in Figure 5-36 with the right hand in turn ("⊞" and "⊟" can control the positive and negative directions of the movement of each axis) to confirm that all six axes can operate normally. Release the enable key or continue to buckle in, the robot stops moving and the enable is broken (hear the "click" sound). At the same time, the lightning icon in the enable status bar (see Figure 5-34) is displayed as " " (gray).

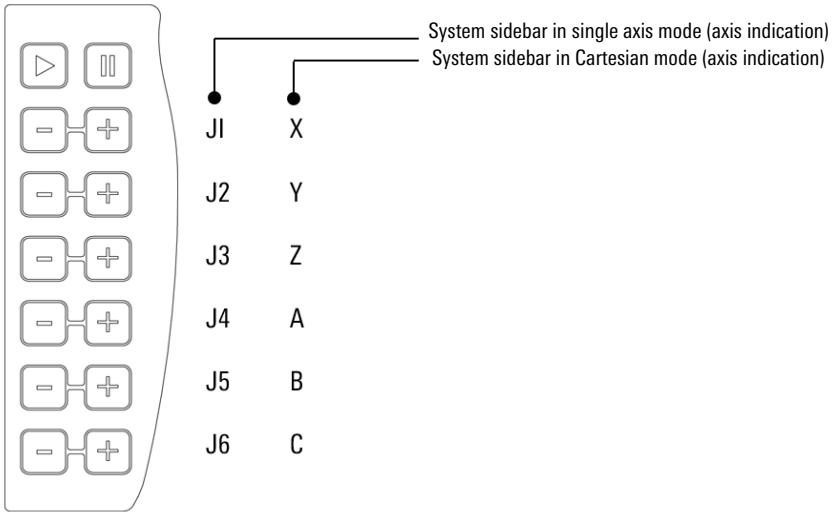


Figure 5-36 Right control key of teaching pendant

Notice

If the enable is disconnected during the movement of the robot, an alarm will be given. After the alarm is cleared, the robot needs to be enabled again to continue to run.

Step3. Click [Run/Program Editor] on the main interface of teaching pendant.

Step4. In the pop-up [Program Editor] interface, click [More editors/Open] to open the created ARL program file.

Step5. Click [Insert Cmd/motion control/Group Move/use], as shown in Figure 5-37.

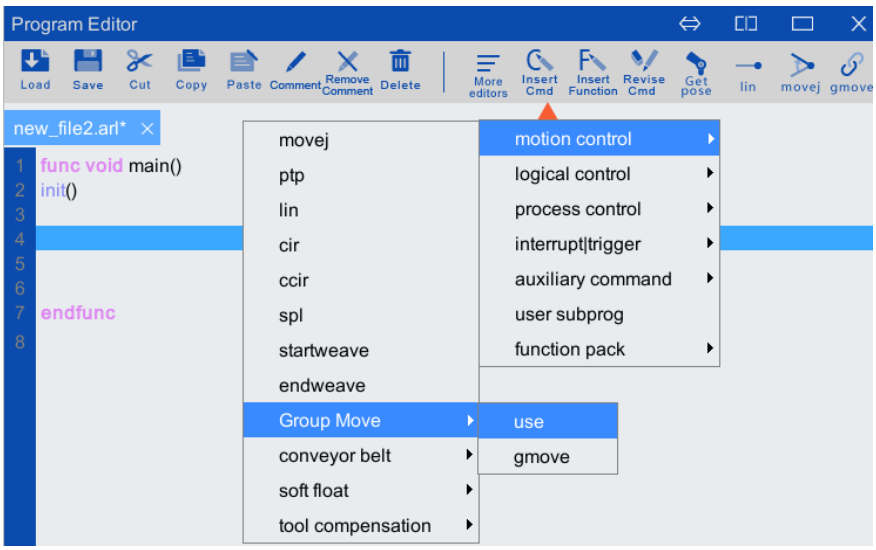


Figure 5-37 Insert instruction

Step6. The configuration interface as shown in Figure 5-38 pops up. Click to select the mechanical unit to be linked, and click <Insert>.

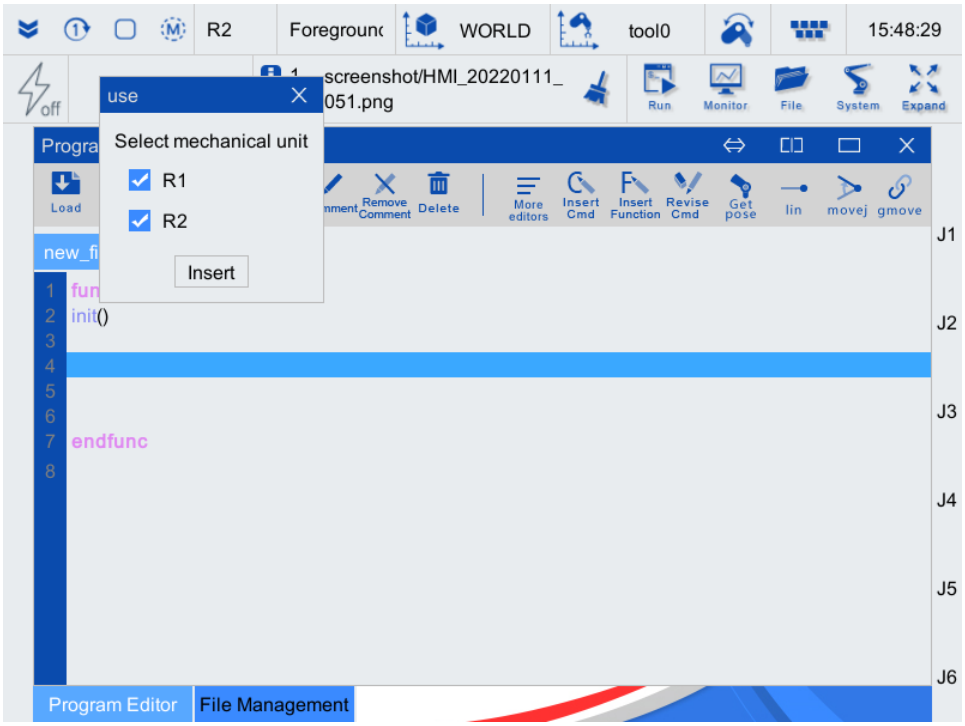


Figure 5-38 Insert use

Step7. The instructions inserted in [Program Editor] are shown in Figure 5-39.

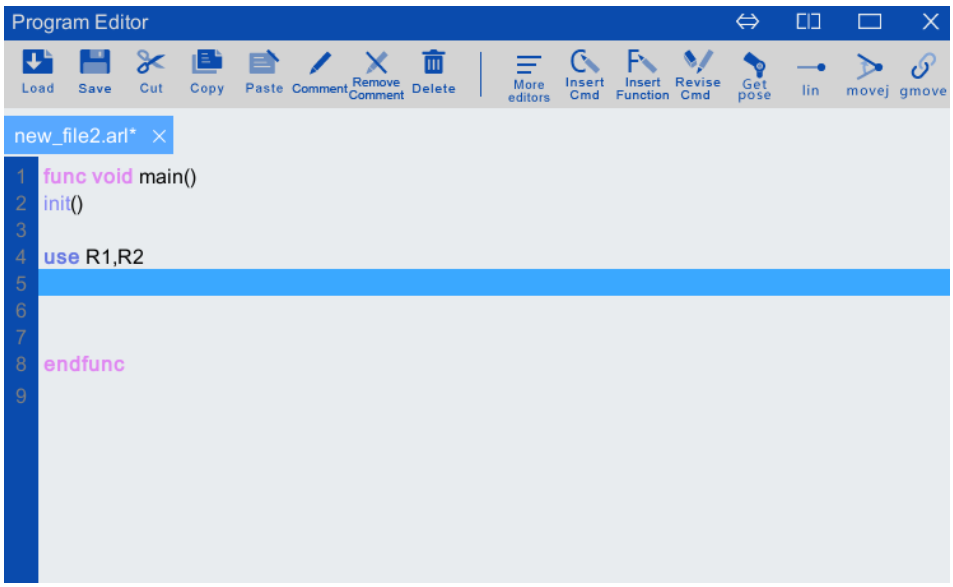


Figure 5-39 Program editor

Step8. Click [Insert Cmd/motion control/Group Move/gmove] to pop up the configuration interface as shown in Figure 5-40. The parameter description is shown in Table 5-9.

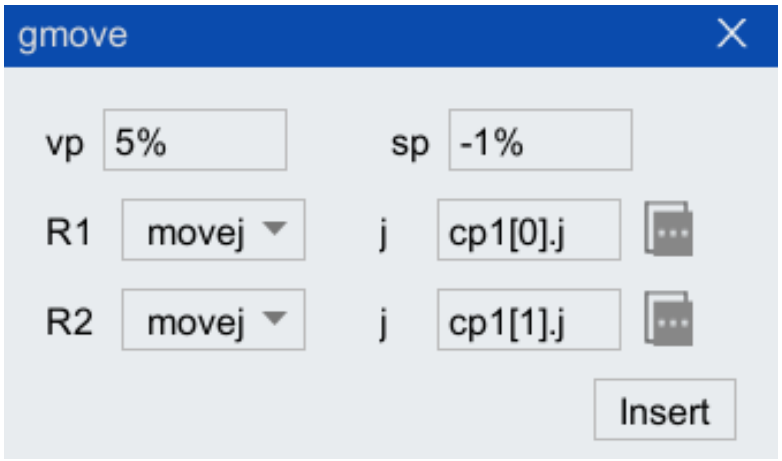


Figure 5-40 Insert gmove

Table 5-9 Parameter description

Parameter		Description	
vp		TCP speed. This parameter specifies the percentage of motion speed. It can replace the speed parameter V, which is used when it is not necessary to specify the speed accurately. Format VP: 10%, indicating that the current line speed is 10% of the maximum speed of the robot	
sp		Smoothness of TCP. This parameter specifies the smoothing percentage. It can replace the smoothing parameter s, which is used when it is not necessary to specify the smoothing value accurately. The format is SP: 10%, indicating that the smoothing distance of the target point in the current line is 10% of the maximum smoothing distance	

R1/R2	movej	The movej instruction is used to move the robot axis to a specified axis position. All axes reach the target axis position at the same time.	The comppos structure is as follows:
			pose p; // Cartesian target point
			joint j; // Axis target point
			unsigned int w // Tool coordinate system serial number;
			unsigned int t; // Workpiece coordinate system serial number

	ptp	PTP instruction is used to quickly move the robot from one point to another without requiring the trajectory shape of TCP point. All axes reach the	

Parameter		Description	
		target point at the same time.	See "ARL programming manual" for parameter explanation.
	lin	The Lin instruction is used to move the TCP point of the robot to the pose of the target point along the linear path; Position movement and attitude rotation are synchronized.	
	ccir	The ccir instruction is used to move the robot TCP point to the target point along the arc path; Translational motion and rotational motion are synchronized.	

Step9. When the motion command of R1 is not "movej", click the drop-down triangle to select other motion commands. Click " " after the point data to pop up the configuration interface as shown in Figure 5-41.

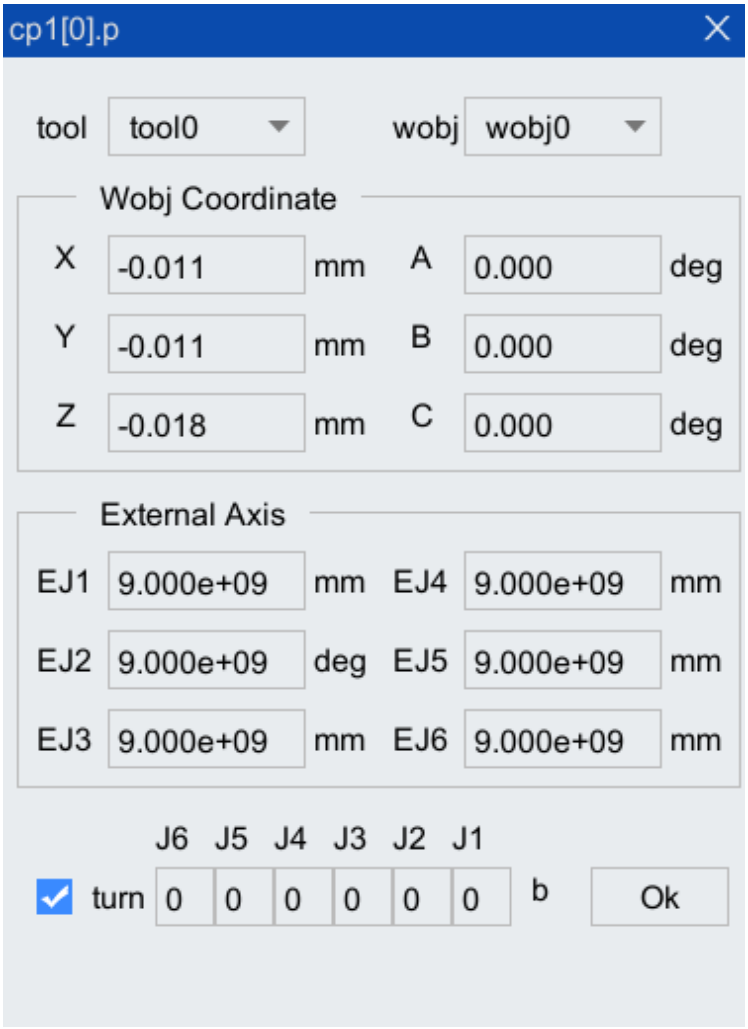


Figure 5-41 Configure point data interface

Step10. Select [tool] as "tool0". If it is necessary to move in a straight line or circular arc relative to the workpiece fixed on the positioner, select the workpiece coordinate system "wobj0" of P1 set in Section 5.2 for the [wobj] coordinate system. In other cases, select "WORLD" for the workpiece coordinate system.

Step11. When the motion command of R2 is not "movej", click the drop-down triangle to select other motion commands. Click " " after the point data to pop up the configuration interface as shown in Figure 5-42.

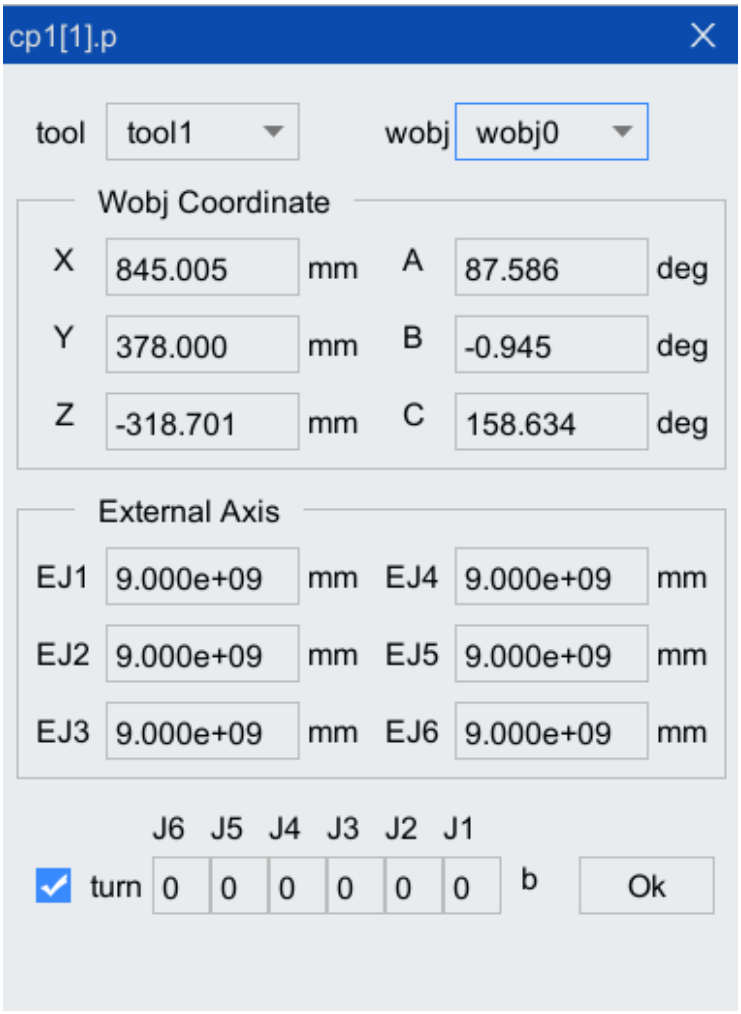


Figure 5-42 Configure point data

Step12. Select [tool] as "tool1". If you need to move in a straight line or circular arc relative to the workpiece fixed on the positioner, select the workpiece coordinate system "wobj0" of P1 set in Section 5.2 for the [wobj] coordinate system. In other cases, select "world" for the workpiece coordinate system.

> Tip
>
> When the workpiece coordinate system refers to the positioner, it is in linkage state, and the "&" symbol will appear before the inserted instruction; In other cases, it is not linked, and the "@" symbol will appear in front of the inserted instruction.

Step13. After the configuration is completed, click <Insert>, and insert the motion instruction in the [Program Editor], as shown in Figure 5-43.

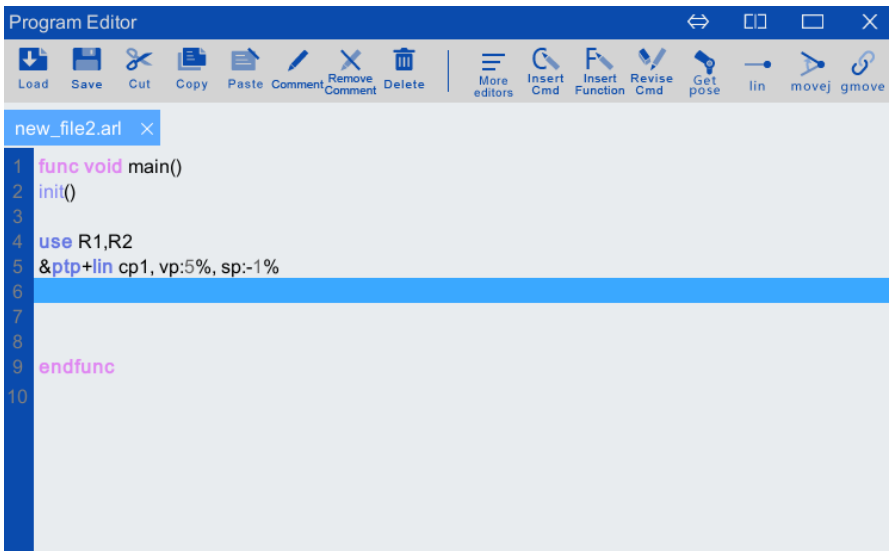


Figure 5-43 Program editor

Step14. After the program is inserted, execute the program.

Program execution

The procedure is as follows:

Step1. After the code is generated, click <Load>, and load the code into the program debugger.

Step2. The mode switching key at the top left of the front of the robot teaching pendant rotates to the [Manual low speed] mode. As shown in Figure 5-44.

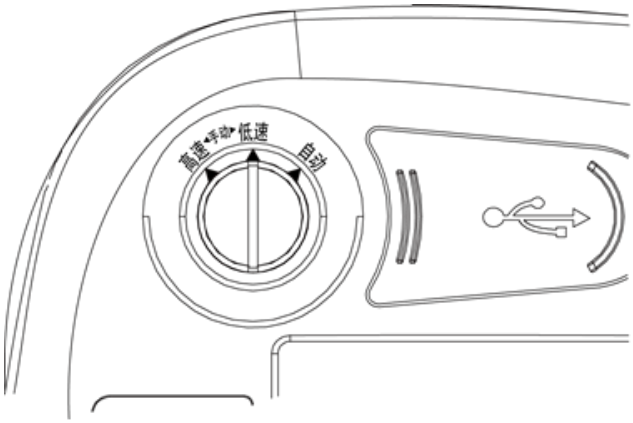


Figure 5-44 Teaching pendant mode switching key

Step3. Press the enable button of the rear shell of the teaching pendant to the II (middle) key position without loosening (as shown in Figure 5-45), and the " " in the upper left corner of the teaching pendant interface lights up (as shown in Figure 5-46), indicating that the motor has been powered on.

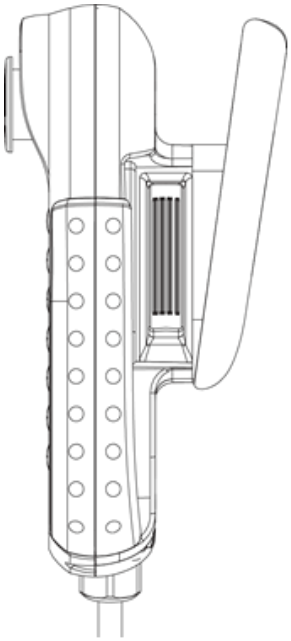


Figure 5-45 Teaching pendant enable switch

Figure 5-46 The motor is powered on

Step4. Select the debugging mode in the debugger (refer to "section 5.1 program debugger" in the operation manual of "AIR-TP teaching pendant" for the specific use method), and press the "" key on the front panel of the teaching pendant to start executing the program. Run the program in the low-speed mode to detect whether the program runs correctly and whether the robot interferes with the surrounding environment, causing potential safety hazards and other problems.

Step5. After confirming that the program is correct and there are no other faults, directly release the enable button and rotate the mode switching key at the top left of the front of the robot teaching pendant to the [automatic] mode. Press the <Enable> button to power on the motor, and click the "" button to make the robot run automatically.

6 Robot + external axis

6.1 Configure basic parameters

The following takes "one robot + one external axis" as an example to illustrate the configuration steps.

Configure global parameters

Step1. As shown in Figure 6-1, select [System] in the upper right corner of the main interface, and then select the [Parameter Configuration] option in the drop-down list to enter the various tab selection interfaces shown in Figure 6-2.

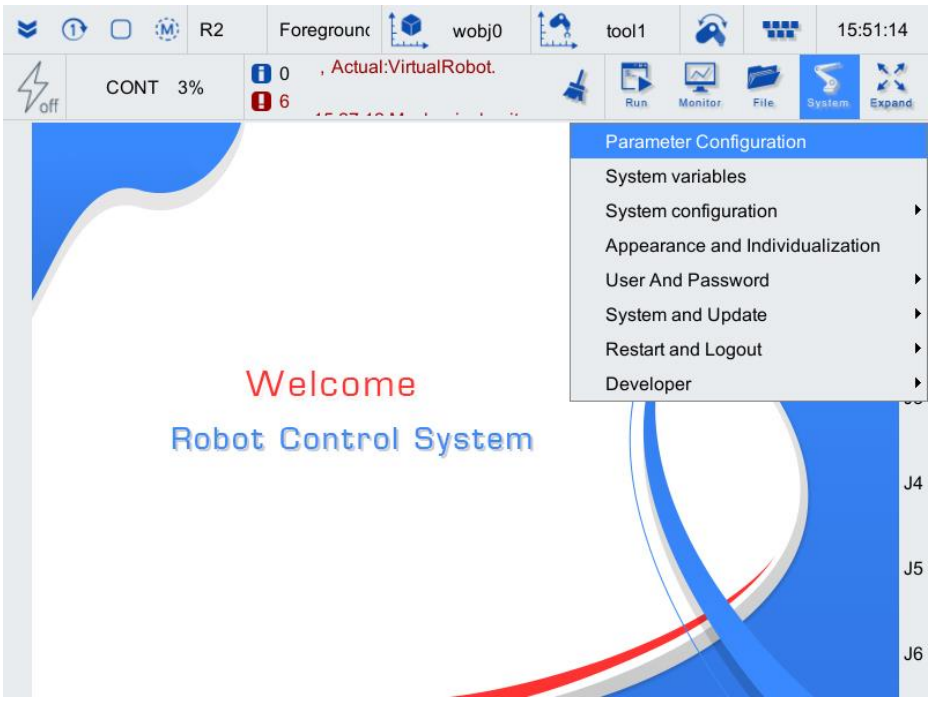


Figure 6-1 Parameter configuration selection list

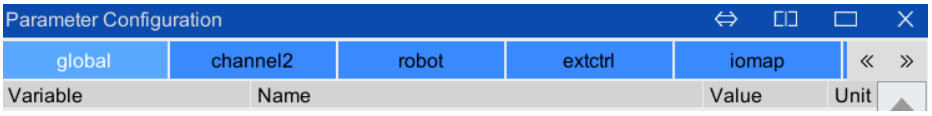


Figure 6-2 Parameter configuration tab display area

Step2. In the [global] interface, click to select the [CHANNEL_NUM (Number of foreground channels)] parameter.

Step3. Click <Edit>, and a dialog box as shown in Figure 6-3 will pop up. Configure the parameter in [value] as 2, and click <Yes>.

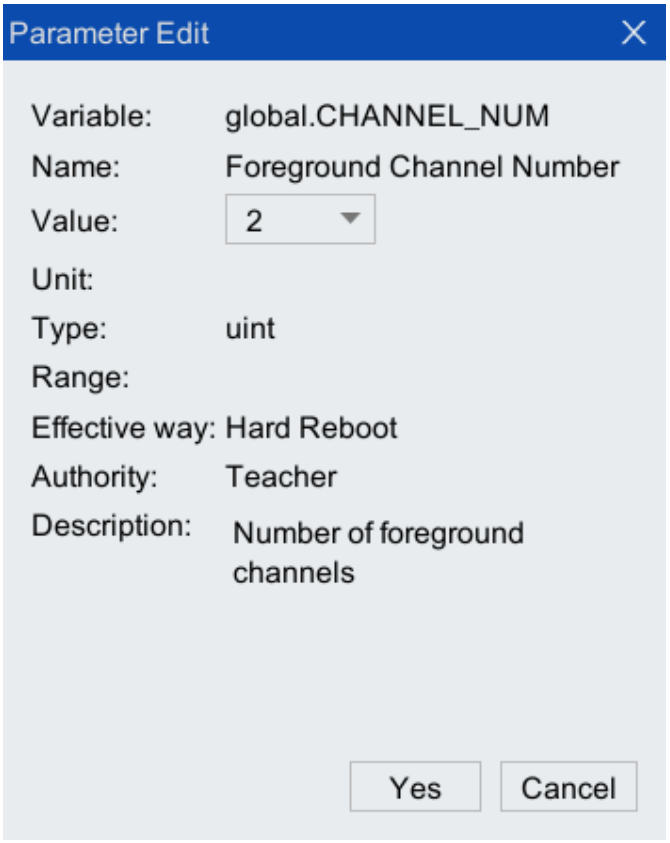


Figure 6-3 Foreground channel parameter configuration

Table 6-1 Parameter description

Parameter	Description
Value	Number of foreground channels. Each mechanical unit needs to occupy a separate channel. This configuration includes two robots and an external axis, so it is configured as 2 here.

Step4. In the [global] interface, click to select the [SERVO_NUM (Servo slave)] parameter.

Step5. Click <Edit>, and a dialog box as shown in Figure 6-4 pops up. Configure the parameters in [value], and click <Yes>. The parameter description is shown in Table 6-2.

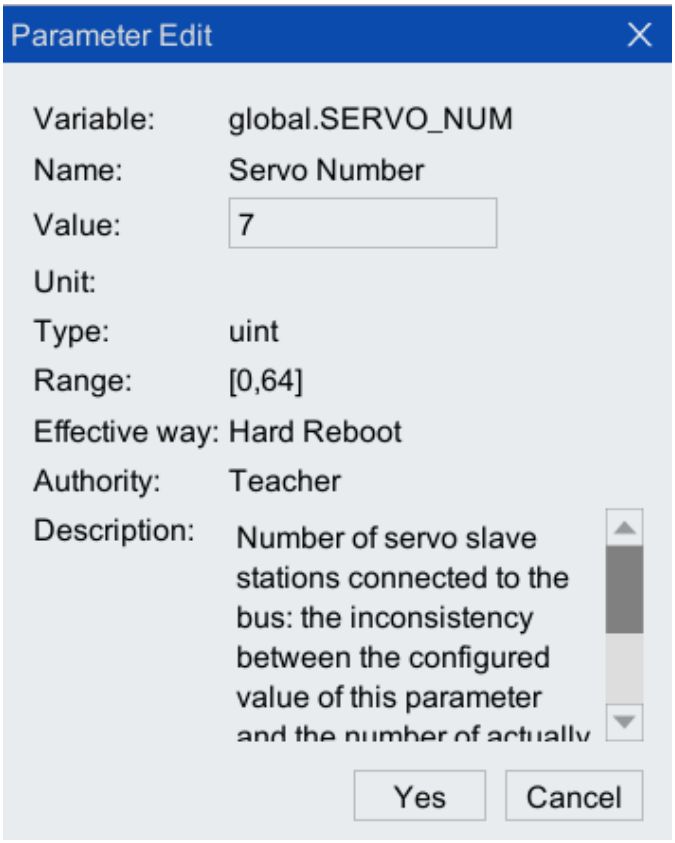


Figure 6-4 Servo slave station number configuration

Table 6-2 Parameter description

Parameter	Description
Value	The number of servo slave stations connected on the bus, including the servo slave station of the robot and the servo slave station of the external axis. The configuration case includes 6 (1 Robot) main body servo slave stations and 1 external axis servo slave station. Tip: The configuration of this parameter is inconsistent with the actual number of slave stations, which may cause bus connection failure when starting the system.

Step6. After the configuration is completed, click <Save>, and it will take effect after restarting the control cabinet.

Configure channel 1 parameters (R1)

Step1. Click the <Mechanical unit switching> button on the interface, as shown in Figure 6-5. After clicking [R1], click the "" button.

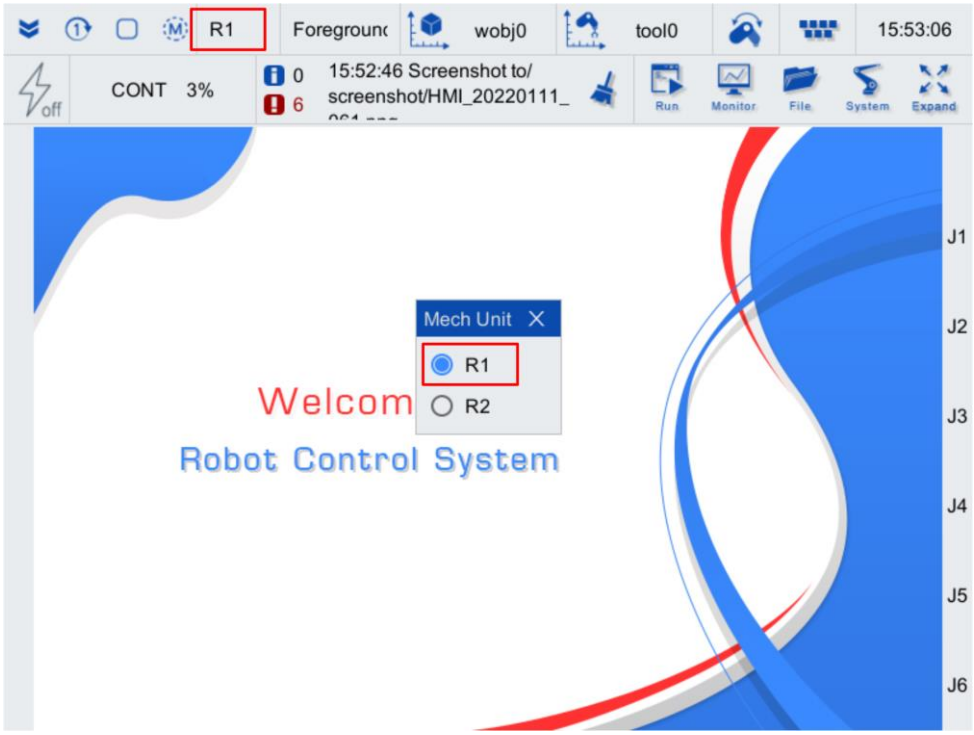


Figure 6-5 Switching mechanical unit

Step2. In the [System/Parameter Configuration/Channel 1] interface, click and select the [EX_JOINT_NUM (number of external axes)] parameter;

Step3. Click <Edit>, and a dialog box as shown in Figure 6-6 will pop up. Set the parameter in [value] to 0, and click <Yes>. The parameter description is shown in Table 6-3.

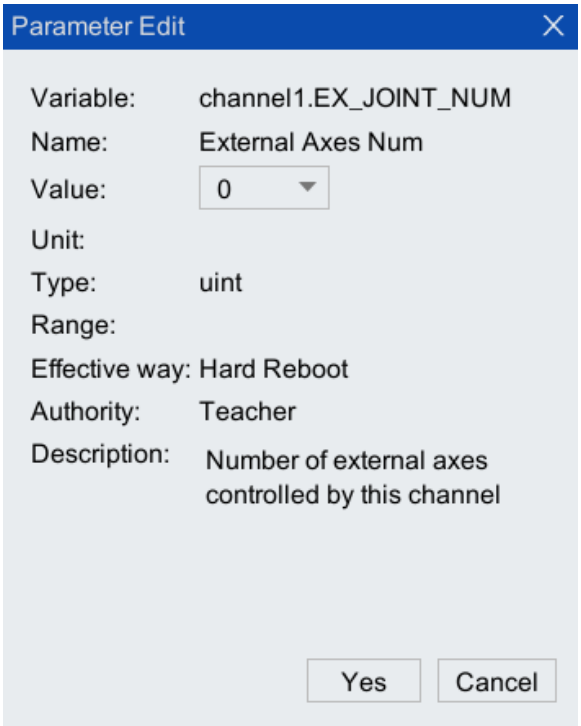


Figure 6-6 Number configuration of external axes

Table 6-3 Parameter description

Parameter	Description
Value	This channel controls the number of external axes. In integer form, the value range is 0 - 6.

Step4. In the [Channel 1] interface, click to select the [MECH_UNIT_NUM (Number of mechanical units)] parameter.

Step5. Click <Edit>, and a dialog box as shown in Figure 6-7 pops up. Configure the parameter in [value] as 1, and click <Yes>. The parameter description is shown in Table 6-4.

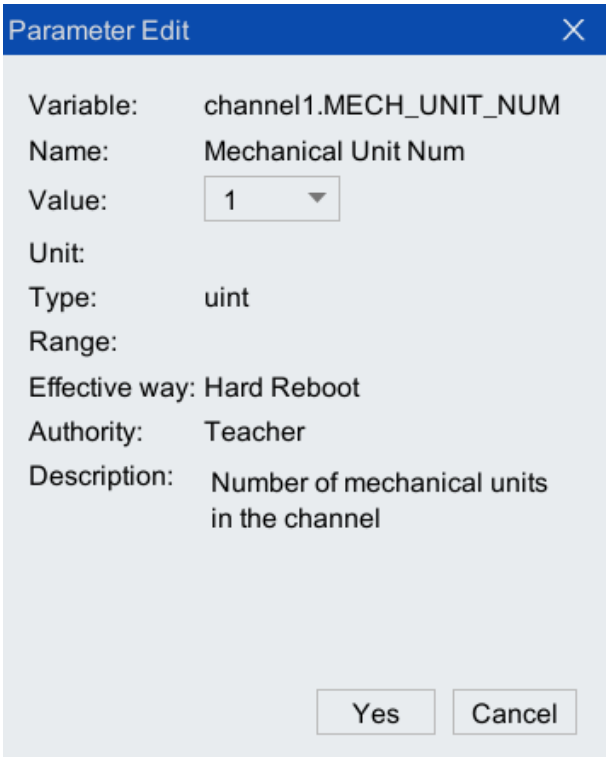


Figure 6-7 Mechanical unit quantity configuration

Table 6-4 Parameter description

Parameter	Description
Value	The number of mechanical channels in the unit.

Step6. In the [Channel 1] interface, click [+] on the left side of the [MECH_UNIT_MODEL (Mechanical unit model)] parameter, and click to select the sub item "[0]" ([0] is the robot manipulator) among the expanded sub items.

Step7. Click <Edit>, and a dialog box as shown in Figure 6-8 will pop up. The parameter in the configuration [Value] is the actual robot model, and click <Yes>. The parameter description is shown in Table 6-5.

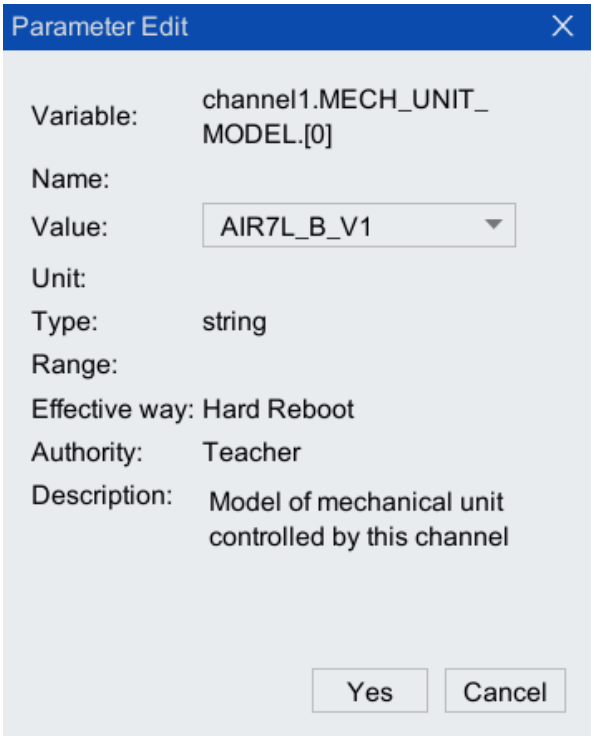


Figure 6-8 Mechanical unit model configuration

Table 6-5 Parameter description

Parameter	Description
Value	Model of mechanical unit controlled by this channel.

Step8. In the [Channel 1] interface, click [+] on the left side of the [MECH_UNIT_NAME (Mechanical unit name)] parameter, and click to select the sub item "[0]" ([0] is the robot manipulator) among the expanded sub items.

Step9. Click <Edit>, and a dialog box as shown in Figure 6-9 pops up. Configure the parameters in [value] (for example: R1), and click <Yes>.

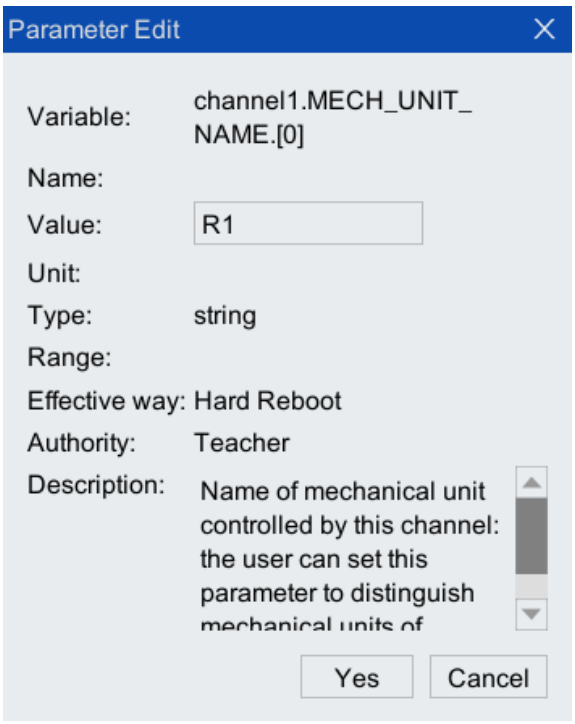


Figure 6-9 Mechanical unit name configuration

Configure channel 2 parameters (E1)

Before using the positioner, please complete the relevant parameter configuration of the system.

Step1. Click the <Mechanical unit switching> button on the interface, as shown in Figure 6-10. After clicking [R2], click the "" button.

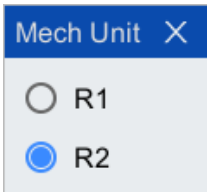


Figure 6-10 Switch channel interface

Step2. In the [System/Parameter configuration/Channel 2] interface, click and select the [EX_JOINT_NUM (Number of external axes)] parameter.

Step3. Click <Edit>, and a dialog box as shown in Figure 6-11 will pop up. Configure the parameters in [Value], and click <Yes>. The parameter description is shown in Table 6-6.

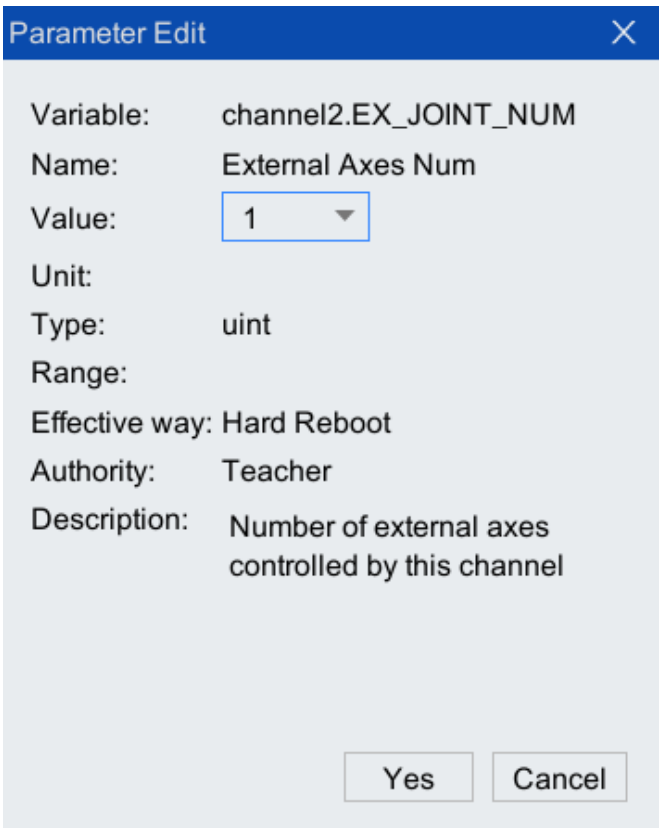


Figure 6-11 Number configuration of external axes

Table 6-6 Parameter description

Parameter	Description
Value	This channel controls the number of external axes. In integer form, the value range is 0-6.

Step4. In the [Channel 2] interface, click to select the [MECH_UNIT_NUM (Number of mechanical units)] parameter.

Step5. Click <Edit>, and a dialog box as shown in Figure 6-12 will pop up. Configure the parameter in [Value] as 2, and click <Yes>. The parameter description is shown in Table 6-7.

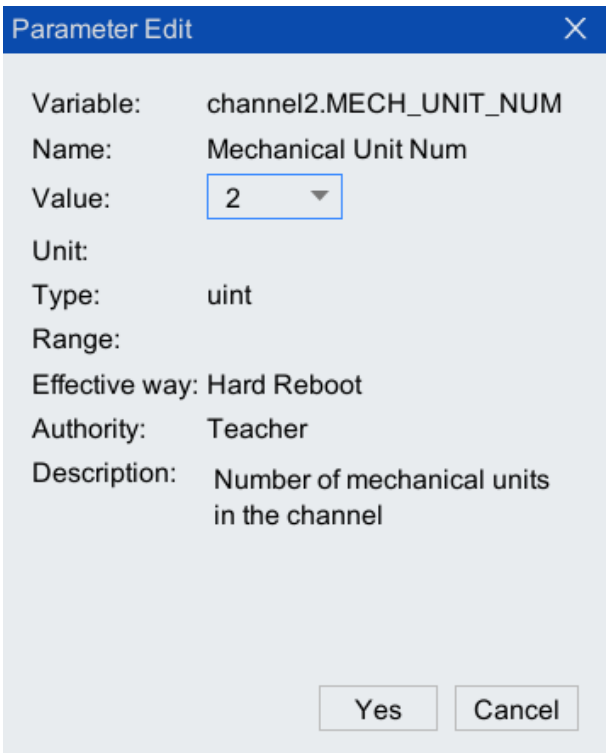


Figure 6-12 Mechanical unit quantity configuration

Table 6-7 Parameter description

Parameter	Description
Value	The number of mechanical channels in the unit. When configuring the positioner function, the mechanical unit includes the robot manipulator and external axis, so the value is configured as 2.

Step6. In the [Channel 2] interface, click [+] on the left side of the [MECH_UNIT_MODEL (Mechanical unit model)] parameter, and click to select the sub item "[0]" ([0] is the robot manipulator and [1] is the external axis) among the expanded sub items.

Step7. Click <Edit>, and a dialog box as shown in Figure 6-13 will pop up. Configure the parameter in [Value] as virtualrobot, and click <Yes>.

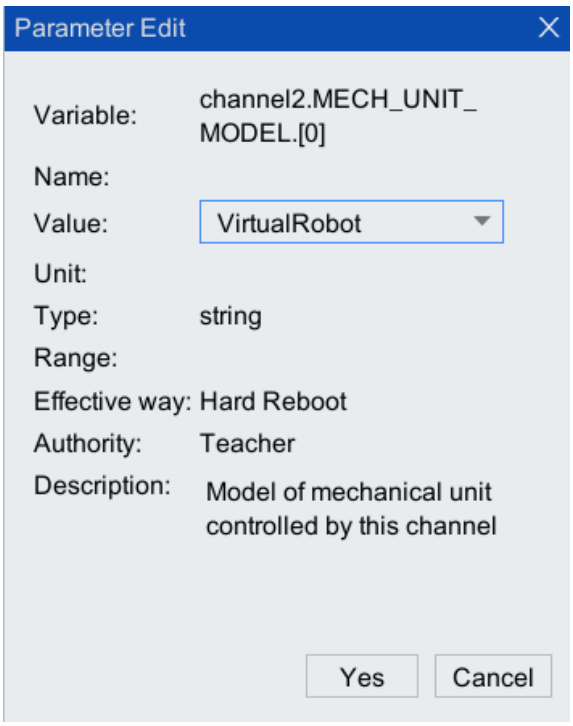


Figure 6-13 Mechanical unit model configuration

Step8. In the [Channel 2] interface, click [+] on the left side of the [MECH_UNIT_MODEL (Mechanical unit model)] parameter, and click to select the sub item "[1]" ([0] is the robot manipulator and [1] is the external axis) among the expanded sub items.

Step9. Click <Edit>, and a dialog box as shown in Figure 6-14 will pop up. Configure the parameter in [Value] as ExtJoint, and click <Yes>.

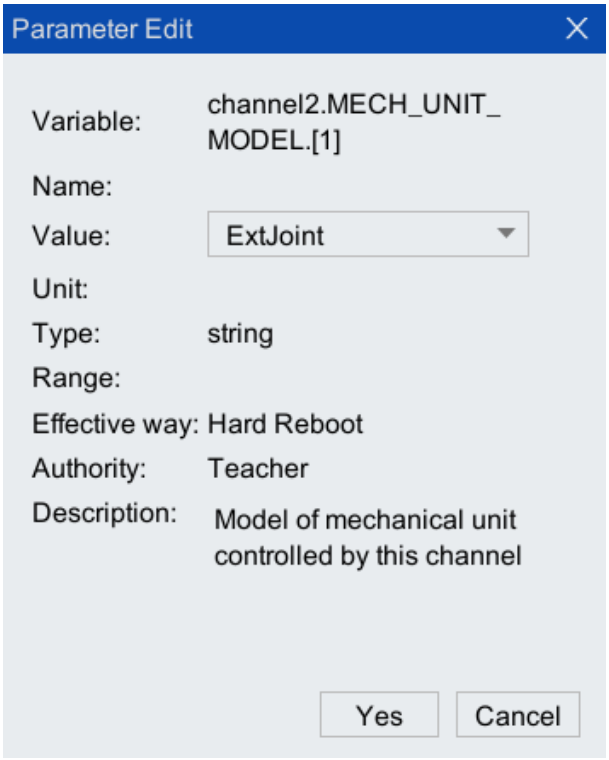


Figure 6-14 Mechanical unit model configuration

Step10. In the [Channel 2] interface, click [+] on the left side of the [MECH_UNIT_NAME (Mechanical unit name)] parameter, and click to select the sub item "[1]" ([0] is the robot manipulator and [1] is the external axis) among the expanded sub items.

Step11. Click <Edit>, and a dialog box as shown in Figure 6-15 will pop up. Configure the parameters in [value] (e.g. E1), and click <Yes>.

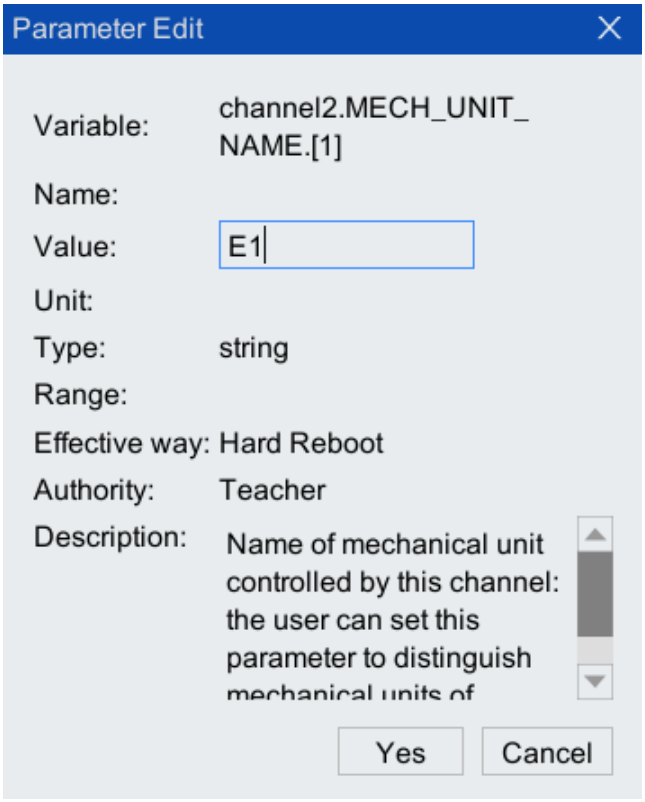


Figure 6-15 Mechanical unit name configuration

Step12. After the parameter configuration is completed, click <Save>, and a dialog box as shown in Figure 6-16 will pop up. Select "Save all" in [Please select the save type], and click <Yes>.

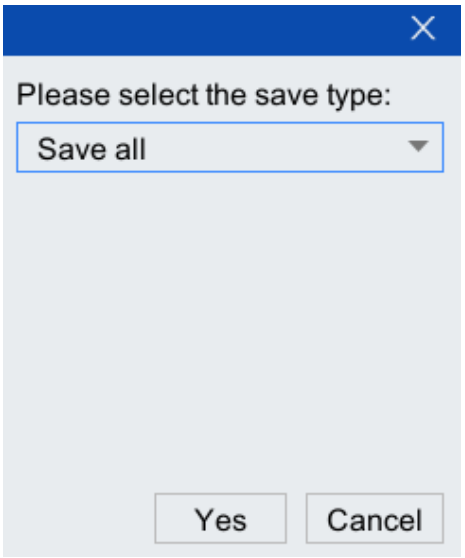


Figure 6-16 Save type dialog box

Step13. Click <Yes> in the pop-up prompt dialog box. As shown in Figure 6-17.

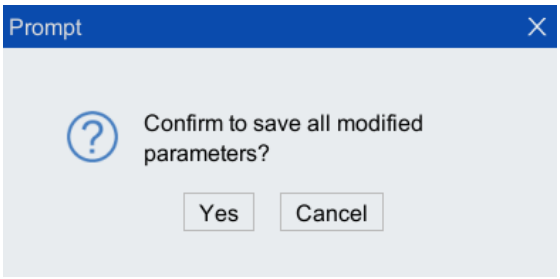


Figure 6-17 Confirm to save the changes

Step14. Click <Yes> in the pop-up dialog box of successful parameter saving. As shown in Figure 6-18. The parameters take effect after power failure and restart the control cabinet.

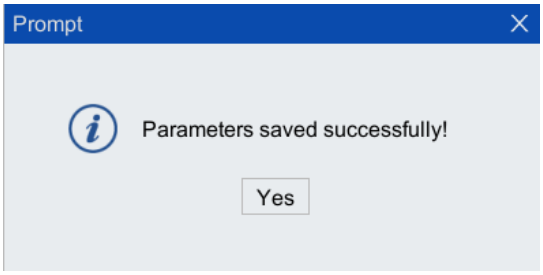


Figure 6-18 Prompt box for successful saving

Step15. After restart, click R1, and the names of the configured robot R1 and external axis E1 can be viewed on the pop-up [Mech Unit] interface. As shown in Figure 6-19.

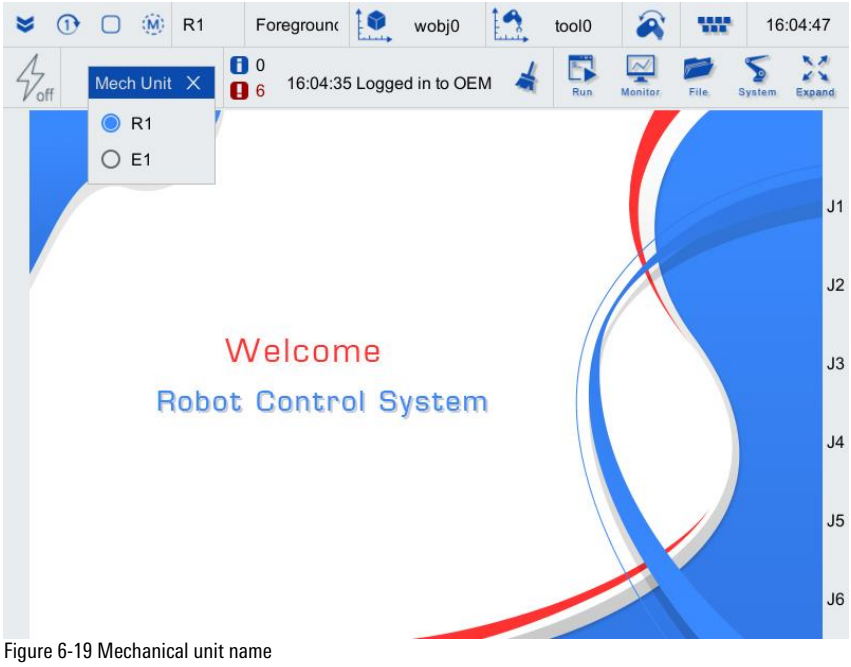


Figure 6-19 Mechanical unit name

6.2 Teaching practice

Teaching practice

The teaching operation steps are as follows:

Step1. Click [Foreground task] on the main interface, select [[1] Foreground Task 1] in the pop-up channel task management interface, and close the page. As shown in Figure 6-20.

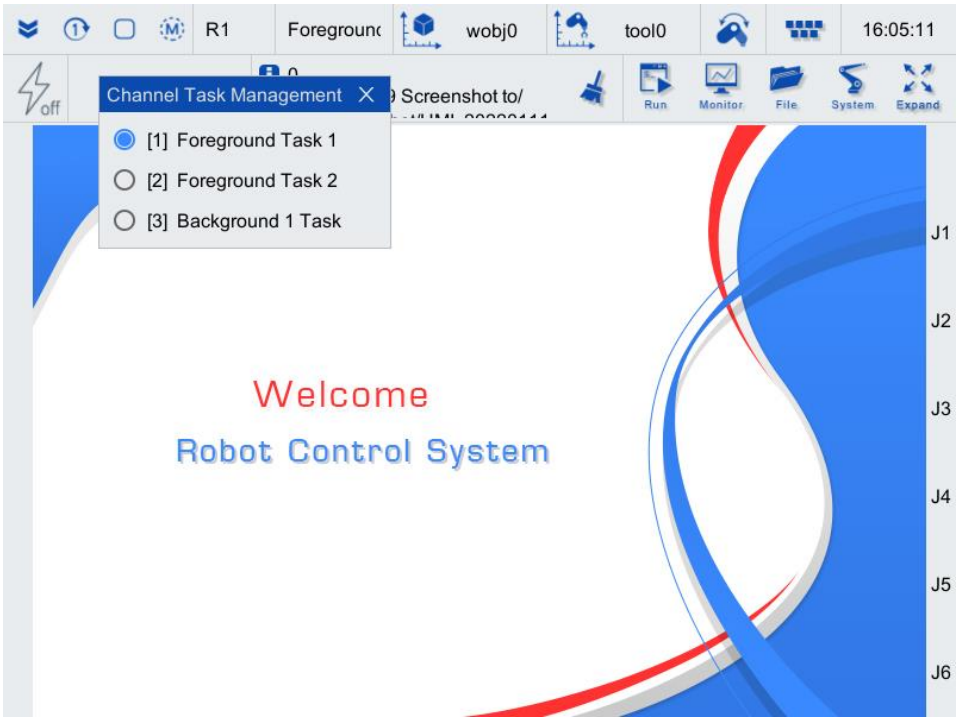


Figure 6-20 Channel task management interface

Step2. Click [Run/Program Editor] on the main interface of teaching pendant.

Step3. In the pop-up [Program Editor] interface, click [More Editors/Open] to open the created ARL program file.

Step4. Click [Insert Cmd/motion control/Group Move/use], as shown in Figure 6-21.

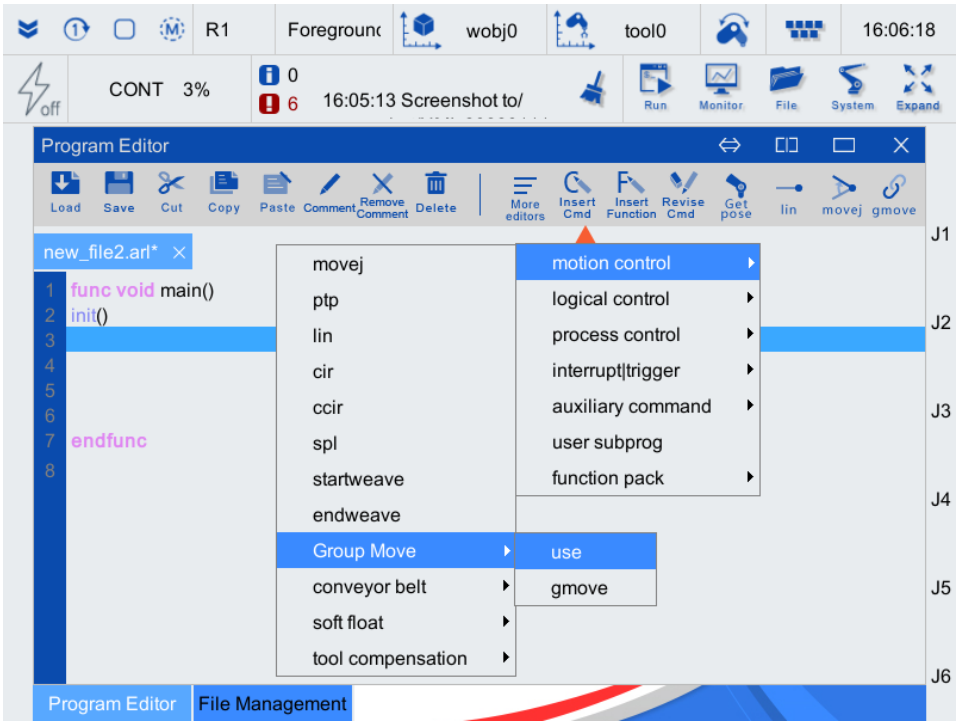


Figure 6-21 Insert instruction

Step5. The configuration interface as shown in Figure 6-22 pops up. Click to select the mechanical unit R1 to run and click <Insert>.

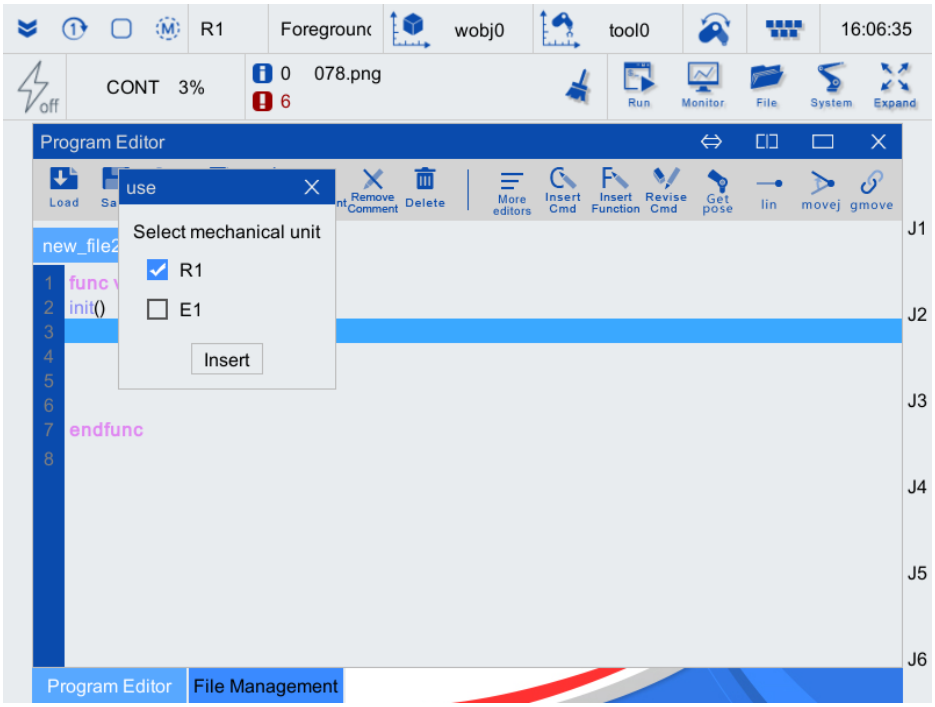


Figure 6-22 Insert use

Step6. The instructions inserted in [Program Editor] are shown in Figure 6-23.

Figure 6-23 Program editor interface

Step7. Insert other motion instructions in [Program Editor] and click <load>.

Step8. Click [Foreground task] on the main interface, select [[2] foreground task 2] in the pop-up channel task management interface, and close the page. As shown in Figure 6-24.

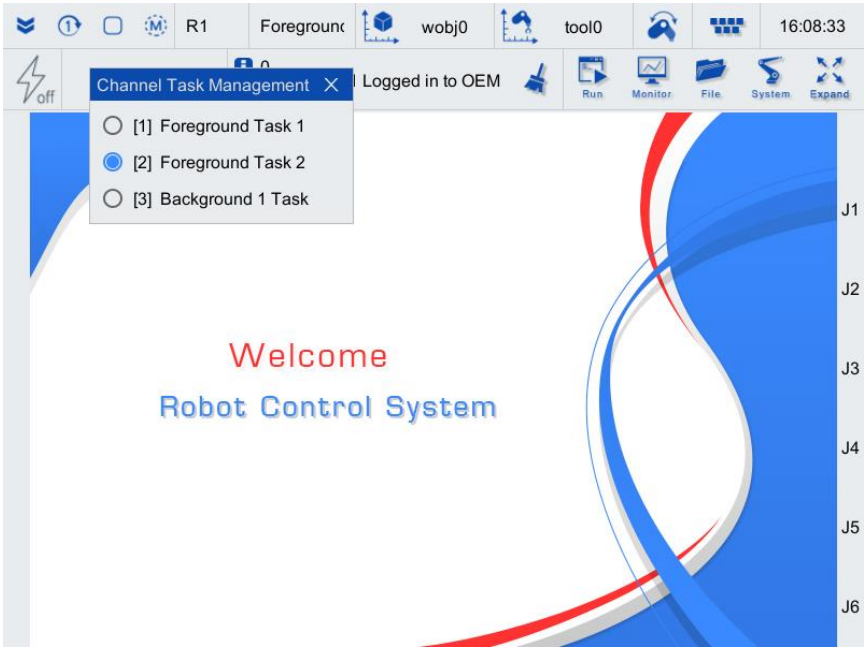


Figure 6-24 Channel task management interface

Step9. Click [Run/Program Editor] on the main interface of teaching pendant.

Step10. In the pop-up [Program Editor] interface, click [More Editors/Open] to open the created ARL program file.

Step11. Click [Insert Cmd/motion control/Group Move/use], as shown in Figure 6-25.

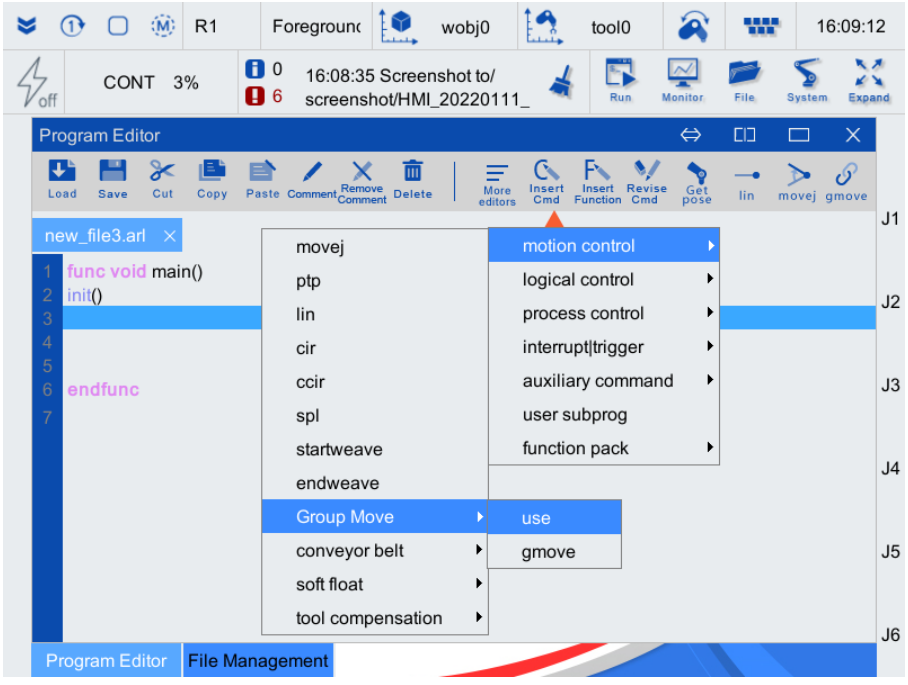


Figure 6-25 Insert use

Step12. The configuration interface as shown in Figure 6-26 pops up. Click to select the mechanical unit E1 to be run, and click <Insert Cmd> the instruction inserted in the [Program Editor].

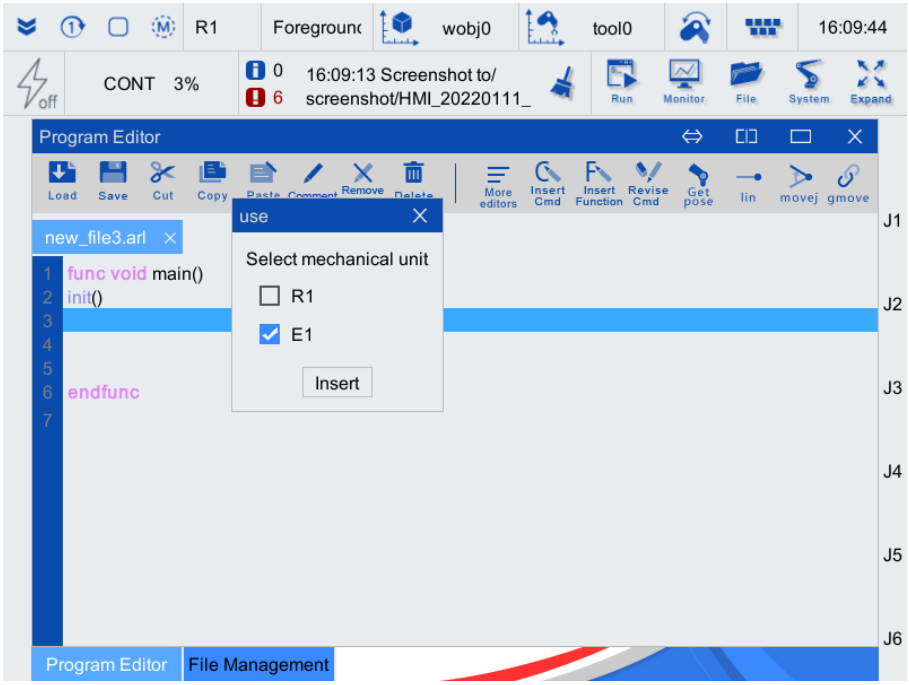


Figure 6-26 Insert mechanical unit

Step13. Insert "movej" motion instruction in [program editor] and click <load>.

Step14. Click [Foreground task] again, and you can see the name of the loaded program file in the pop-up [Channel Task Management] interface, as shown in Figure 6-27.

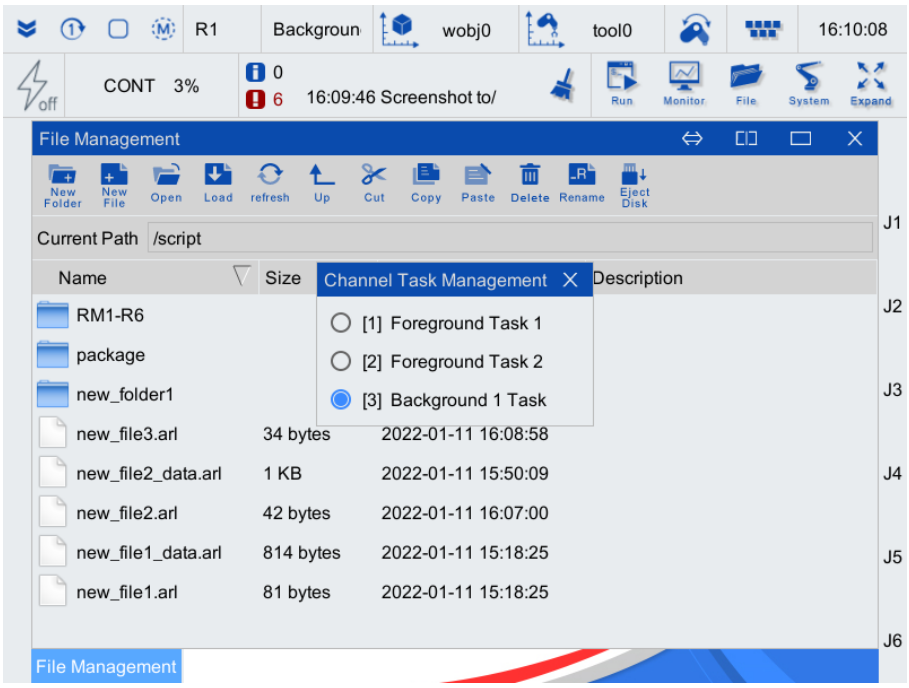


Figure 6-27 Channel task management file

Program Execution

R1 and E1 are not linked, so it is necessary to run the procedures of R1 and E1 respectively according to the following steps. The procedure is as follows:

Step1. After the code is generated, click <Load>, and load the code into the program debugger.

Step2. The mode switching key at the top left of the front of the robot teaching pendant rotates to the [manual low speed] mode. As shown in Figure 6-28.

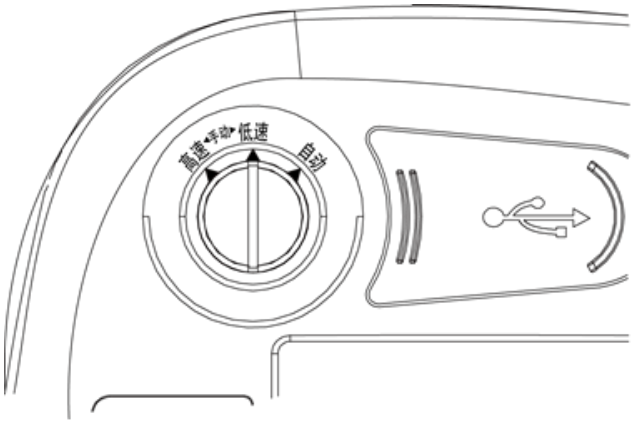


Figure 6-28 Teaching pendant mode switching key

Step3. Press the enable key of the rear shell of the teaching pendant to the II (middle) key position without loosening (as shown in Figure 6-29), and the " " in the upper left corner of the teaching pendant interface lights up (as shown in Figure 6-30), indicating that the motor has been powered on.

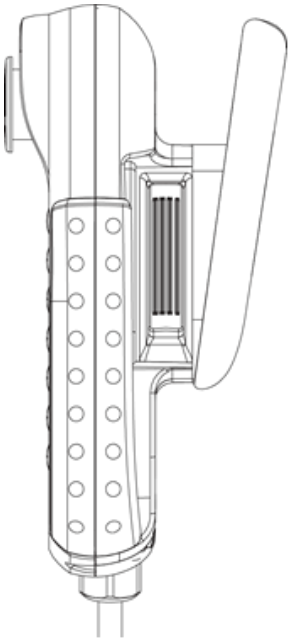


Figure 6-29 Teaching pendant enable switch

Figure 6-30 The motor is powered on

Step4. Select the debugging mode in the debugger (refer to "section 5.1 program debugger" in the *AIR-TP teaching pendant user manual* for the specific use method), and press the " " key on the front panel of the teaching pendant to start executing the program. Run the program in the low-speed mode to detect whether the program runs correctly and whether the robot interferes with the surrounding environment, causing potential safety hazards and other problems.

Step5. After confirming that the program is correct and there are no other faults, directly release the enable button and rotate the mode switching key at the top left of the front of the robot teaching pendant to the [Automatic] mode. Press the <Enable> button to power on the motor, and click the "  " button to make the robot run automatically.

PEITIAN ROBOTICS

WeChat Official Account

Official Website

Sevice Hotline : 400-990-0909
Official Website : http://robot.peitian.com

UM-S01500000003-008 / V1.2.1 / 2023.04.15