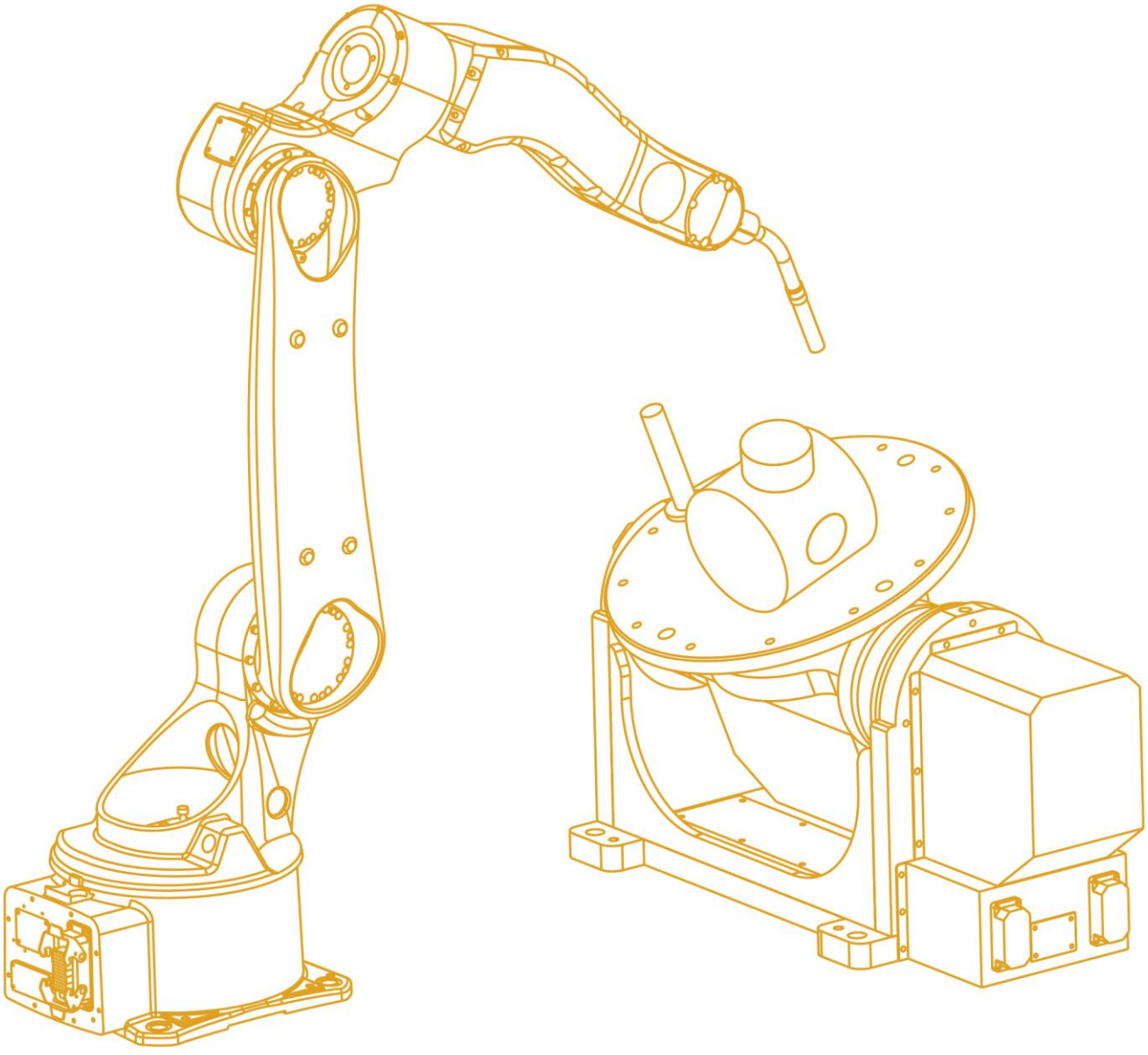
PEITIAN ROBOTICS

Positioner user manual

V1.3.0



Foreword

About This Manual

This manual introduces the application of the robot positioner, and describes in detail the hardware connection and software configuration process when the positioner is used. Reading this document will help readers to master the working principle and use method of the positioner.

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 positioner function.

Please read the following documents when necessary:

- "Operation Manual of AIR-TP Teach Pendant"
- "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	2020/6/30	2nd official publication Upgrade the software version to V2.6.2
V1.2.0	2020/10/15	3rd official release Upgrade the software version to V2.6.3
V1.3.0	2020/11/15	4th official release Upgrade the software version to V2.6.4

Document Number and Version

The document-related information is shown in Table 3.

Table 3 Document-related information

Document name	"Positioner instruction manual"
Document number	UM-ZY0212-BJ-001
Document version	V1.3.0
Software version	2.6.5

Symbol convention

Refer to Table 4 for document related symbol conventions.

Table 4 Symbol convention

Format	Significance
<>	The angle bracket "< >" indicates the button name, such as "click the <OK> button".
[]	"[]" with square brackets indicates the window name, menu name and data table, such as "pop up [New User] window".
/	Multi-level menus are separated by "/". Such as [File/New/Folder], the multi-level menu represents the [Folder] menu item under the [New] submenu under the [File] menu.

Contents

1 Positioner overview

1.1 Definition of positioner

Positioner is one of the most widely used welding auxiliary equipment in the field of welding at home and abroad. The positioner mainly has the functions of rotation and flip, and is a typical representative of the tooling shaft. in:

- The rotation function can realize the purpose of automatic welding of the circular seam of the cylindrical workpiece.
- The flip function can make the workpiece in the best welding position.

The AIR series industrial robot of Petian Robot Technology Co., Ltd. can form an arc welding system with a positioner (as shown in Figure 1-1), which improves the efficiency and quality of welding.

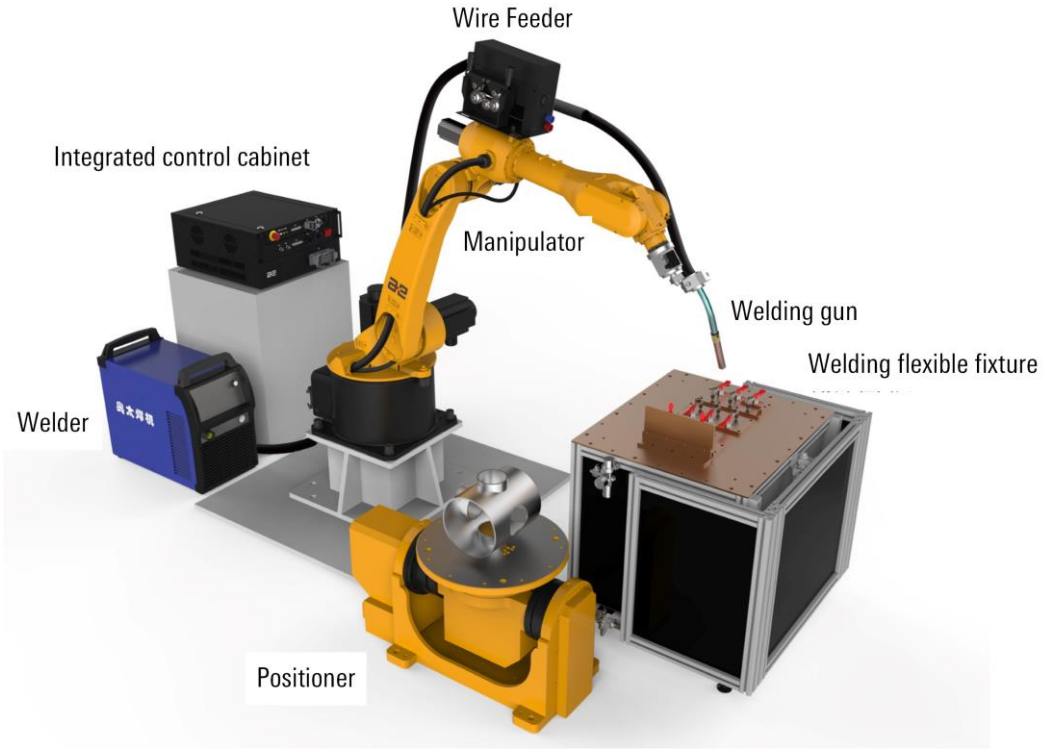


Figure 1-1 AIR series industrial robots can be combined with positioners to form an arc welding system diagram

1.2 Features of positioner

The two outstanding features of positioner applications in the welding field are as follows:

- Realize all-position welding.
- Clamping, welding all weld beads at one time.

1.3 Application scenarios of positioner

The selection of the positioner must be provided by the positioner supplier according to the needs of the customer. At present, the AIR series industrial robots of Petian Robotics Co., Ltd. are calibrated to support up to three-axis positioners.

Support "single robot + one axis/dual axis positioner" scenario: a robot is linked with a one axis or two axis positioner to cooperate with each other to complete the workpiece welding.

2 Servo drive connection and debugging

2.1 Connection method

In Figure 2-1, the AE5115 series AC servo drive is taken as an example to illustrate the connection method between the servo drive and the control cabinet and multiple motors. Please refer to "AE5115 AC Servo Drive User Manual" for the connection mode and interface description of each interface of the AE5115 series servo drive.

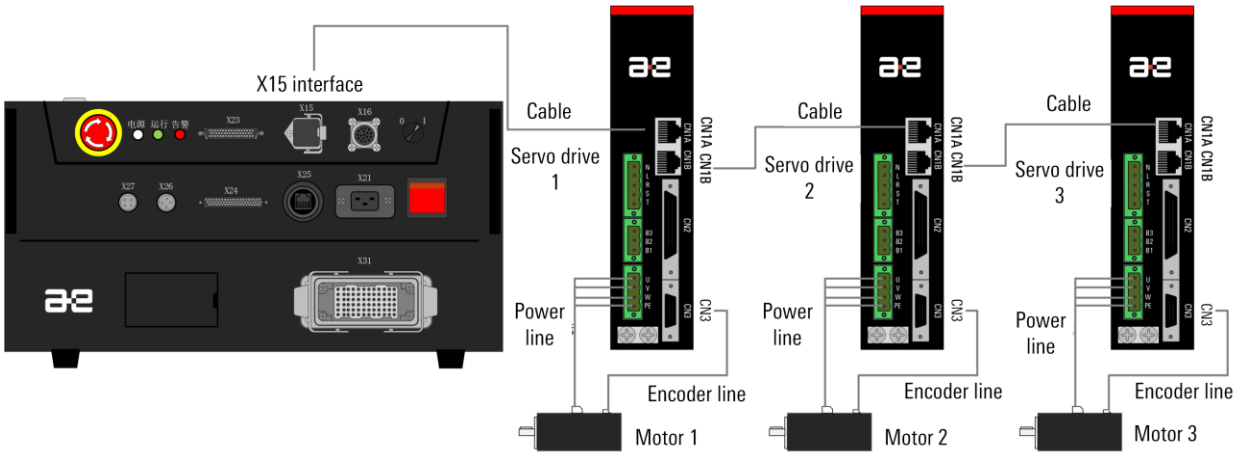


Figure 2-1 Diagram of AE5115 driver connected to three motors

Among them, the positioner axis 1 refers to the axis closest to the base, and the positioner axis 2 refers to the axis placed on the positioner axis 1 (as shown in Figure 22), and so on, as shown in Figure 2-2.

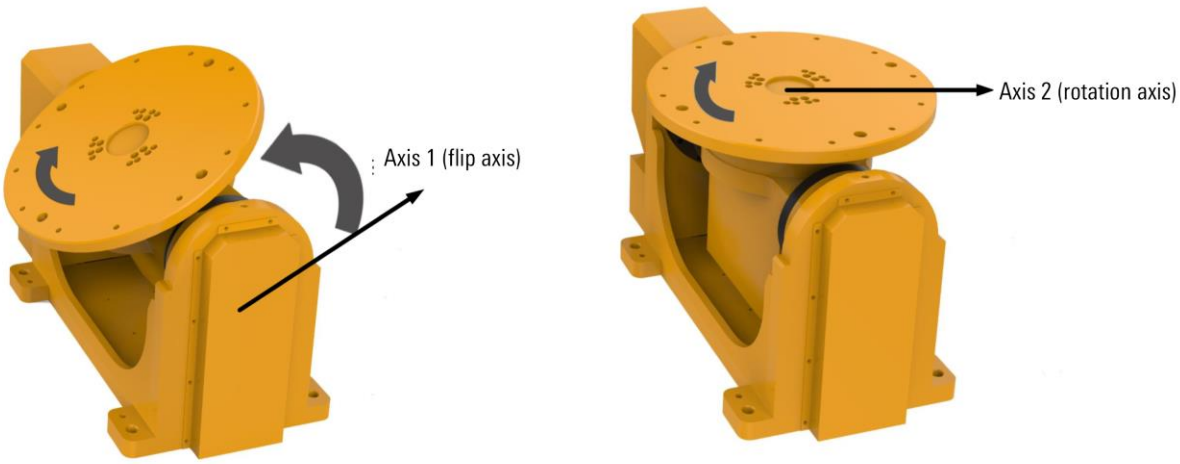


Figure 2-2 Diagram of base shaft

The connection mode of the servo drive and the motor brake is shown in Figure 2-3.

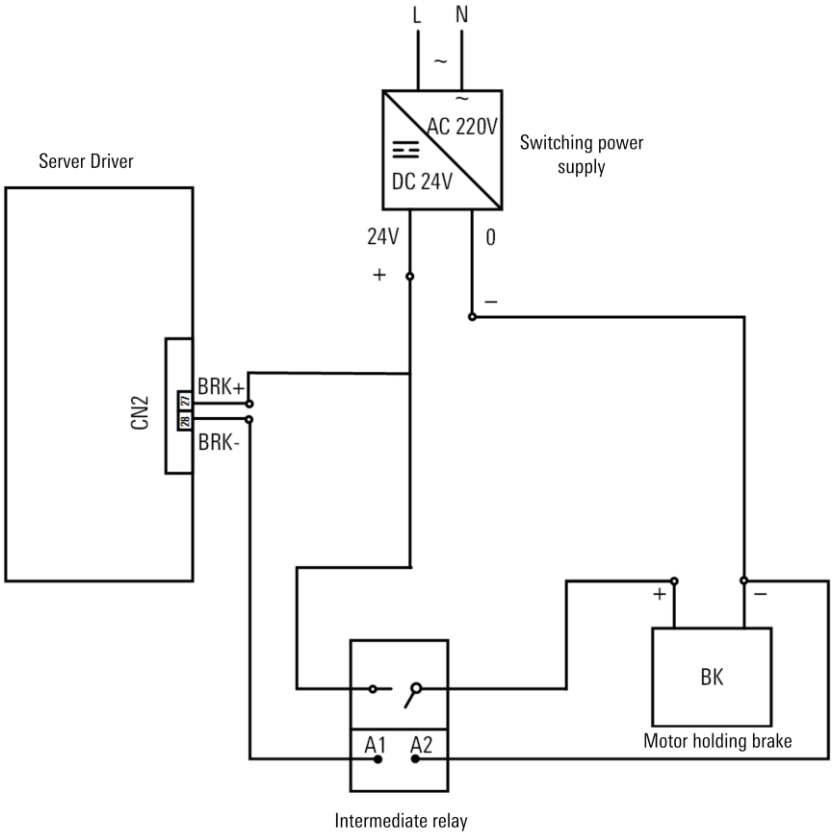


Figure 2-3 Diagram of the connection between the servo drive and the motor brake

2.2 Debugging method

After completing the equipment connection, you need to debug the parameters of the servo drive according to the actual load. For the parameter debugging method of AE5115 series servo drive, please refer to "AE5115 AC Servo Drive User Manual".

3 Basic operation

3.1 Permission level

When using the AIR-TP teach pendant for the first time, it will prompt the user interface when logging in for the first time, and the user can choose:

- Teacher: Permission 4

  It can perform operations such as writing the robot working program, and has the authority to modify some parameters. The initial login password is: PEACE.

- Operator: Permission 5

  The robot's position parameter operation status can be simply checked, and there is no program modification or parameter modification authority. The initial login password is: LOVE.


Tip

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

3.2 Confirm version information

3.2.1 Version number requirements

The software version numbers of ARCS and HMI need to be higher than "V 2.6.4" in order to realize the positioner function. Therefore, before using the positioner and setting relevant parameters, you need to confirm whether the current version information matches the required version information.

3.2.2 Version information viewing process

The detailed steps for viewing version information are as follows:

Step 1. Log in to the teach pendant with the authority above "Teacher" and enter the main interface of the teach pendant as shown in Figure 3-1.

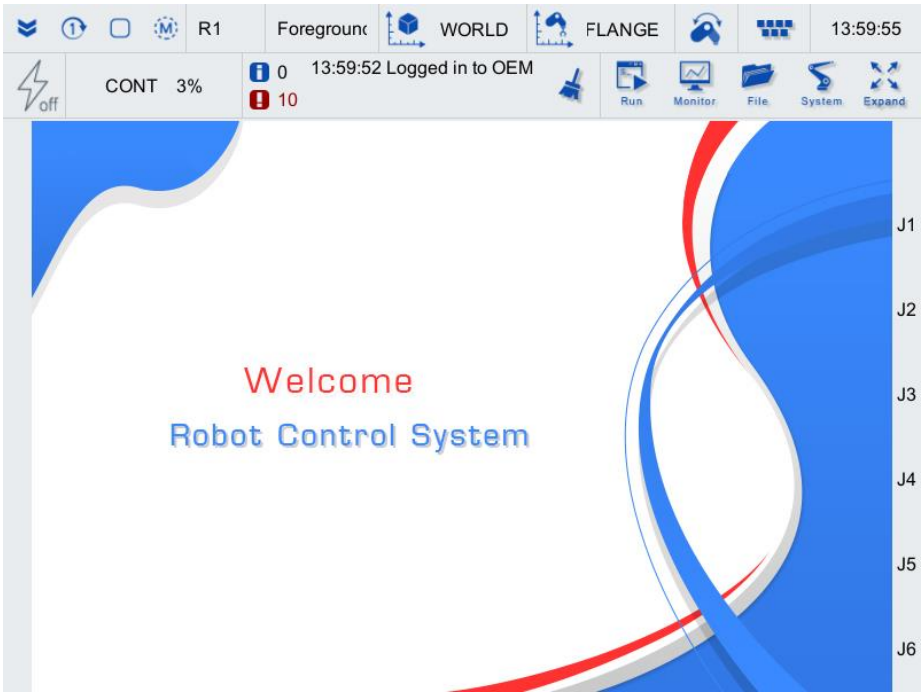


Figure 3-1 Teach Pendant Main Interface

Step 2. Click [System/System and Update/System Information] in the menu area at the upper right corner.

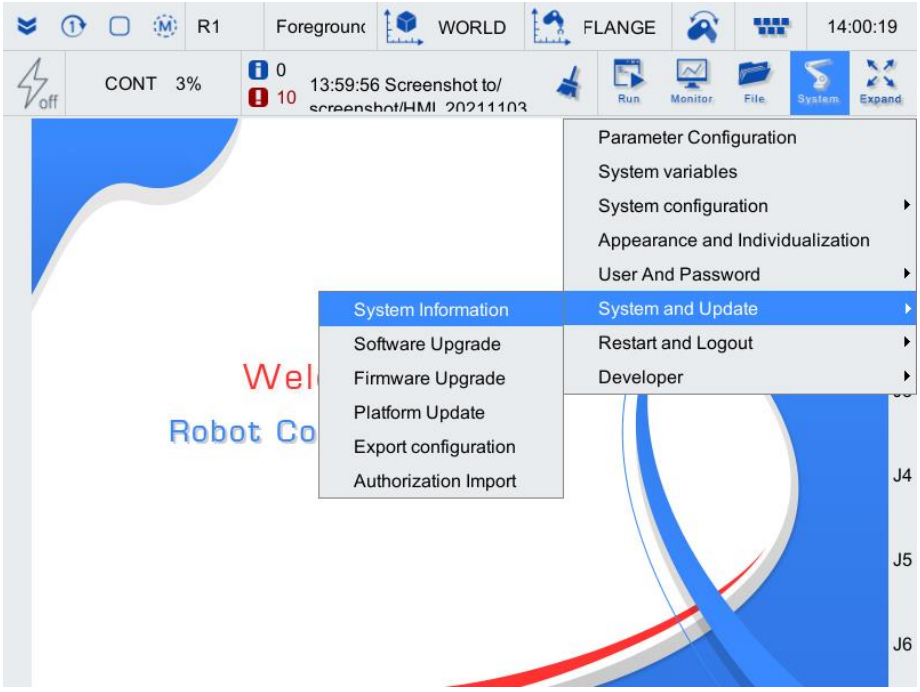


Figure 3-2 System related drop-down list

Step 3. The [Coordinate system measurement] dialog box shown in Figure 3-3 pops up, carefully check whether the [ARCS software] and [HMI software] in the [Version Information] column are both higher than "2.6.4". If yes, you can continue the parameter configuration later; if not, please contact our company's after-sales engineer in time.

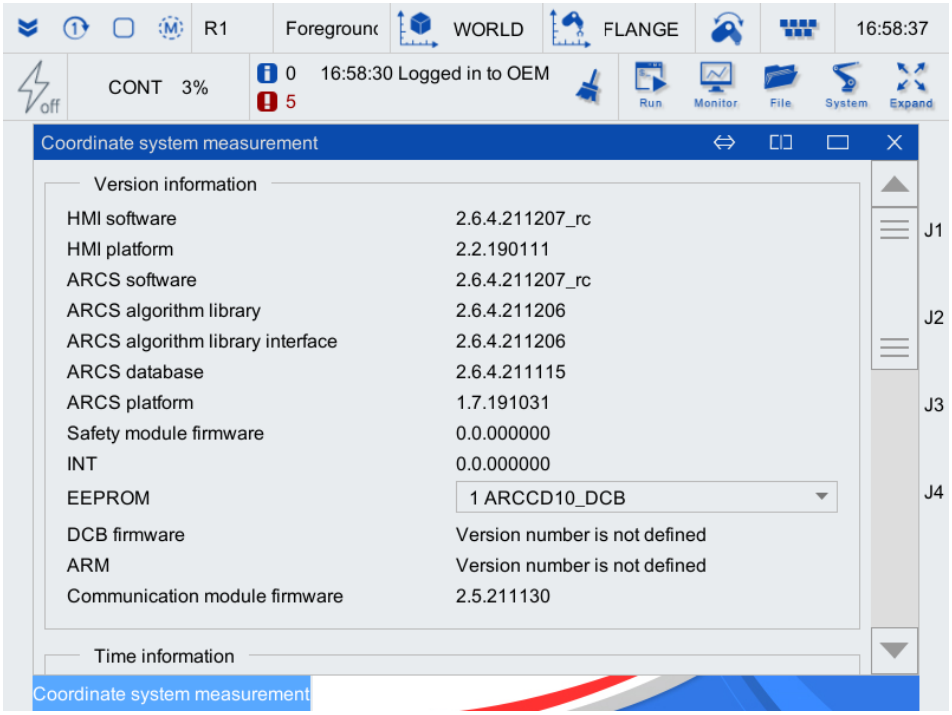


Figure 3-3 System message

4 System parameter configuration

4.1 General parameter configuration

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

Step 1. As shown in Figure 4-1, select [System/Parameter Configuration] in the upper right corner of the main interface to enter each [Parameter Configuration] interface shown in Figure 4-2.

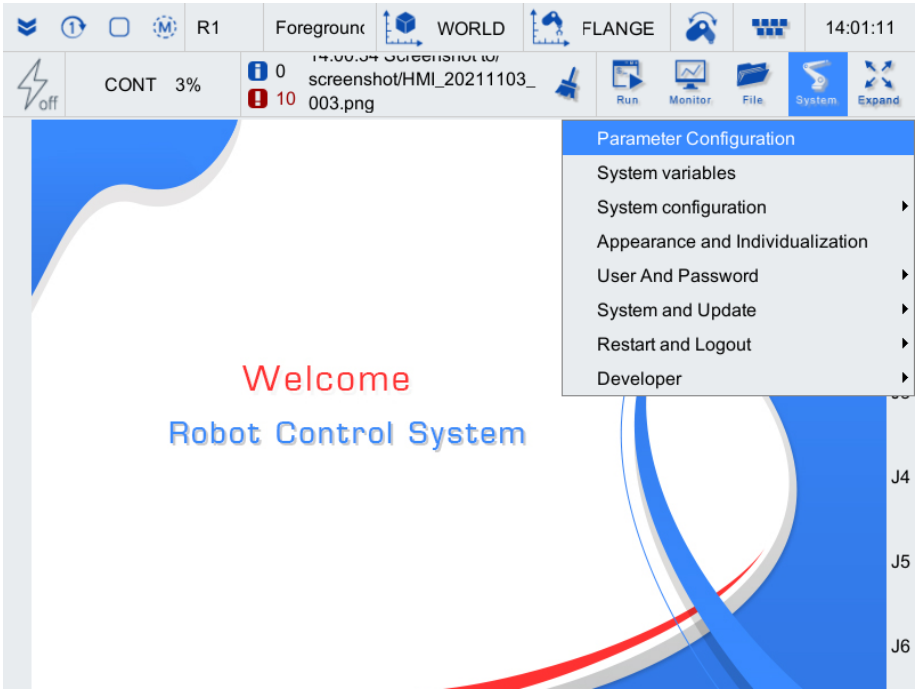


Figure 4-1 [Parameter configuration] selection list

Figure 4-2 [Parameter configuration] tab display area

Step 2. In the [Global] interface, click to select the [SERVO_NUM (Servo Number)] parameter.

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

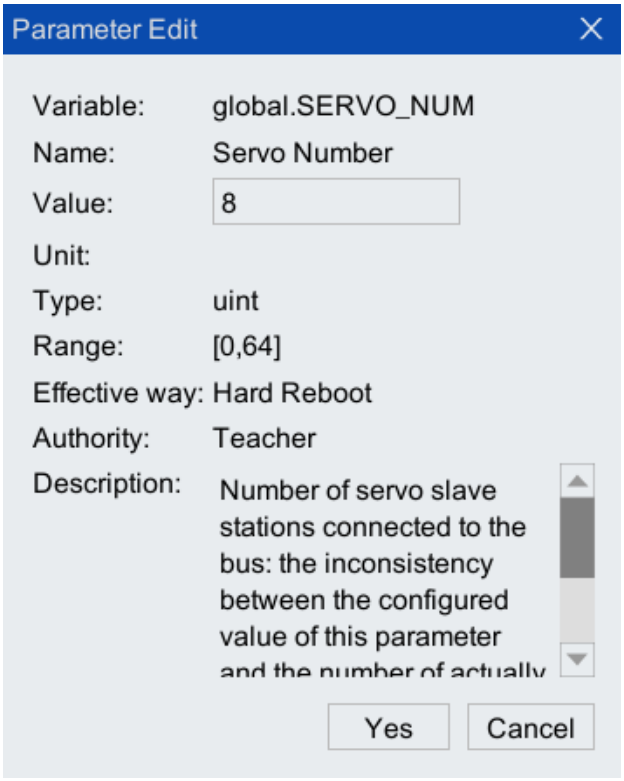


Figure 4-3 Servo slave number configuration interface

Table 4-1 Parameter description

Parameter	Description
Value	The number of servo slaves connected to the bus includes the 6 servo slaves of the robot body and the external servo slaves. The external servo slave station can be configured with 1 to 6, the value is 6+n (n is an integer, and the value range is 1 to 6). When the outer axis is a positioner, 3 axes can be selected as long, and the value is 6+n (n=1, 2, 3). Tip: The configuration of this parameter does not match the actual number of slaves, which may cause the bus connection to fail when the system is started.

Step 4. In the [Channel 1] interface, click to select the [EX_JOINT_NUM (External Axis Number)] parameter.

Step 5. Click <Edit>, and the dialog box shown in Figure 4-4 will pop up. Configure the parameters in [Value] (see Table 4-2 for parameter descriptions) and click <Yes>.

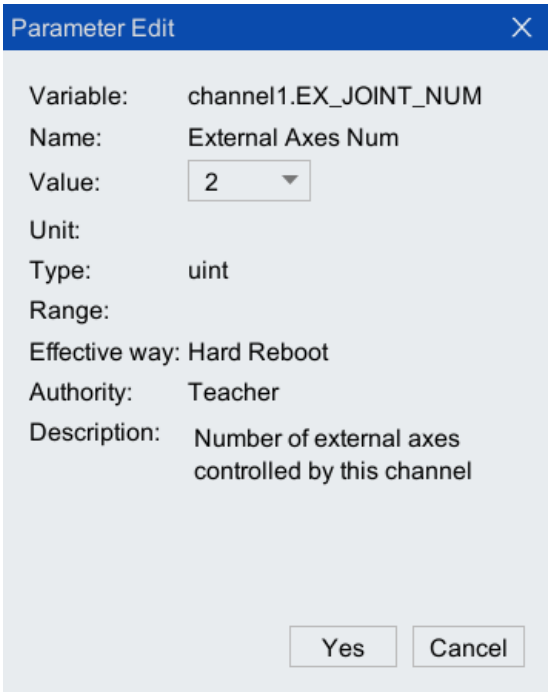


Figure 4-4 External axis quantity configuration interface

Table 4-2 Parameter description

Parameter	Description
Value	The number of external axes controlled by this channel. The value is an integer, ranging from 1 to 6. When the outer shaft is a positioner, the value range is 1-3.

Step 6. In the [Channel 1] interface, click to select the [MECH_UNIT_NUM (Mechanical Units Number)] parameter.

Step 7. Click <Edit>, and the dialog box shown in Figure 4-5 will pop up. Configure the parameter in [Value] to 2 (see Table 4-3 for parameter description), click <Yes>.

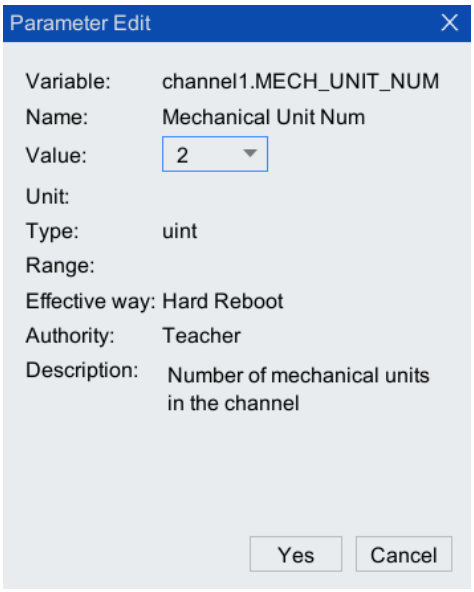


Figure 4-5 Number of mechanical units configuration interface

Table 4-3 Parameter description

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

Step 8. In the [Channel 1] interface, click [+] to the left of the [MECH_UNIT_MODEL (Mechanical Unit Model)] parameter, and click to select "[1]" ([0] is the robot body, [1] is the sub-item of positioner).

Step 9. Click <Edit>, and the dialog box shown in Figure 4-6 will pop up. Configure the parameter in [Value] as "Positioner", click <Yes>.

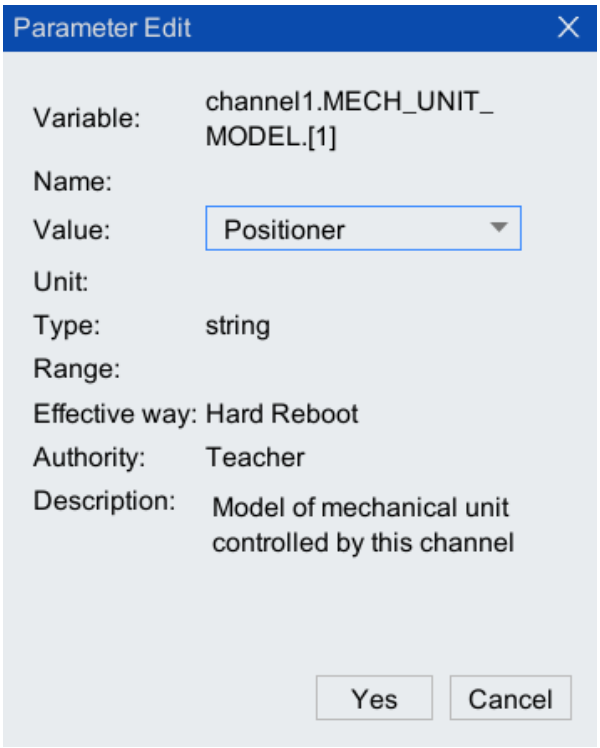


Figure 4-6 Mechanical unit model configuration interface

Step 10. In the [Channel 1] interface, click [+] to the left of the [MECH_UNIT_NAME (mechanical unit name)] parameter, and click to select "[1]" ([0] is the robot body, [1] is the positioner.) sub-items.

Step 11. Click <Edit>, and the dialog box shown in Figure 4-7 will pop up. Configure the parameters in [Value] (for example: P1), and click <Yes>.

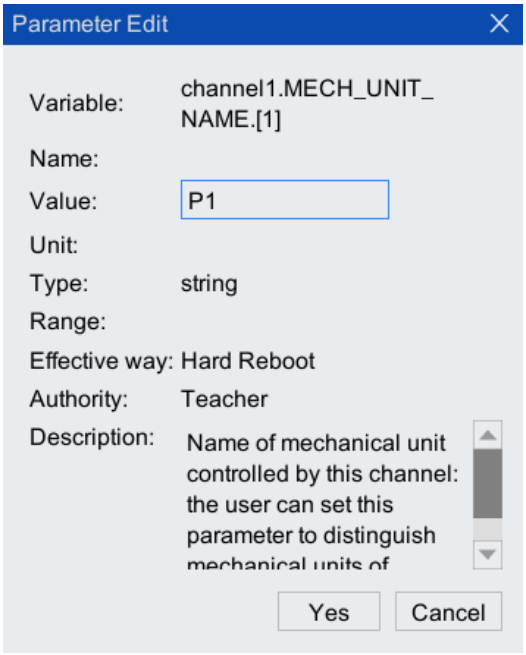


Figure 4-7 Mechanical unit name configuration interface

Step 12. In the [Channel 1] interface, click [+] on the left side of the [EXJOINT_TYPE (external axis type)] parameter, and click to select "[0]" (when the number of external axes is 1) in the expanded sub-items item.

Tip

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

Step 13. Click <Edit>, the dialog box shown in Figure 4-8 pops up. Configure the parameter in [Value] to 0 (rotation axis), and click <Yes>.

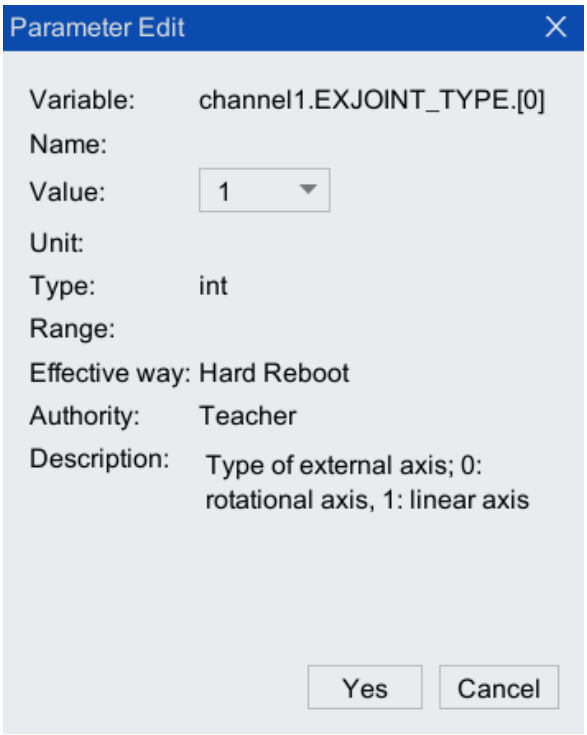


Figure 4-8 External shaft type configuration interface

Step 14. If the external shaft is connected with a reducer, in the [Channel 1] interface, click [+] to the left of the [EXJOINT_REDUCER_RATIO (external shaft reducer reduction ratio)] parameter, and click to select [0] in the expanded sub-items (When the number of external axes is 1).

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

Step 15. The dialog box shown in Figure 4-9 pops up. Configure the parameter in [Value] (this value needs to be determined according to the actual connection positioner parameters), and click <Yes>.

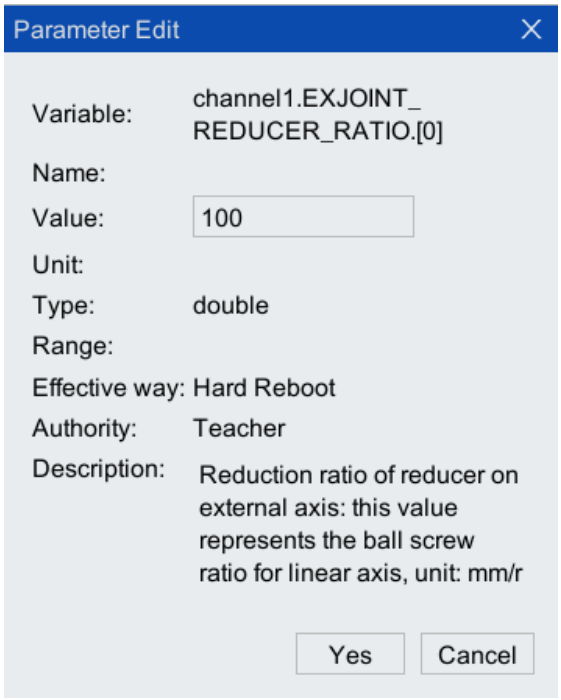


Figure 4-9 External shaft reducer reduction ratio configuration interface

Step 16. After the parameter configuration is completed, click <Save>, and the dialog box shown in Figure 4-10 will pop up. Select "Save all" in [Please select save type], and click <Yes>.

Figure 4-10 Save as type dialog

Step 17. Click <Yes> in the prompt dialog box that pops up. As shown in Figure 4-11.

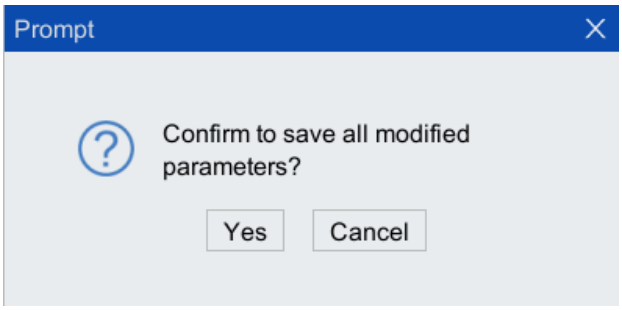


Figure 4-11 Confirm to save the modification prompt box

Step 18. Click <Yes> in the pop-up dialog box of successful parameter saving. As shown in Figure 4-12. Power off and restart the control cabinet, and the parameter configuration takes effect.

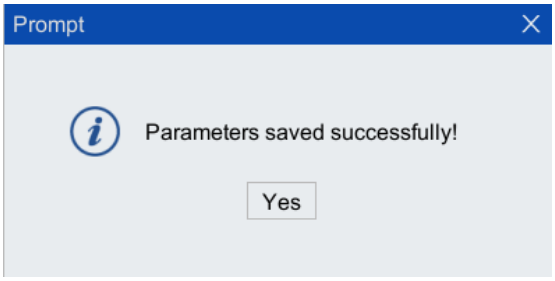


Figure 4-12 Save successful prompt box

4.2 Zero calibration

Before configuring the positive and negative limit positions, you need to calibrate the zero point of the external axis first. The calibration steps are as follows:

Step 1. Move the external axis to the zero-point desired by the user.

Step 2. Select [Run/Calibrate/Zero Calibration] on the main interface of the teach pendant, as shown in Figure 4-13.

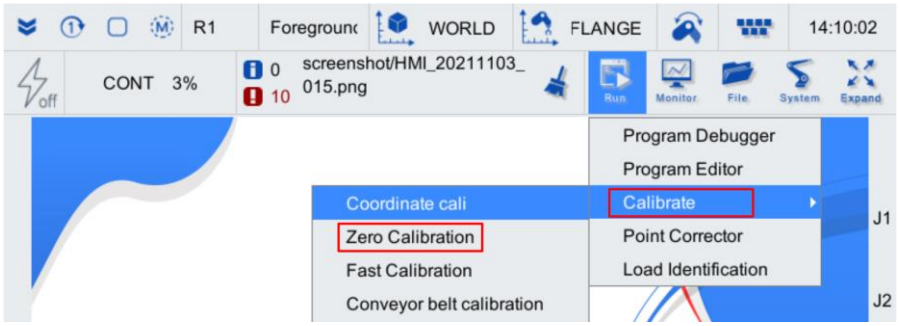


Figure 4-13 Main interface diagram

Step 3. In the pop-up [Zero Calibration] interface, select the external axis to be calibrated, and click the <Calibrate> button. As shown in Figure 4-14.

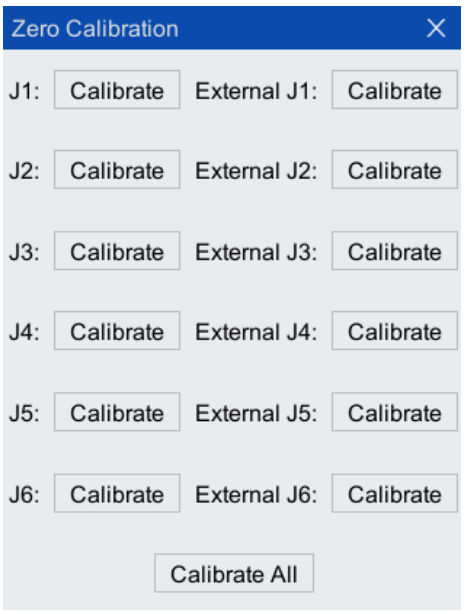


Figure 4-14 Zero point calibration interface diagram

Step 4. Click <Yes> in the prompt dialog box that pops up, as shown in Figure 4-15. After the calibration is successful, the calibration success will be displayed in the alarm information prompt column of the main interface.

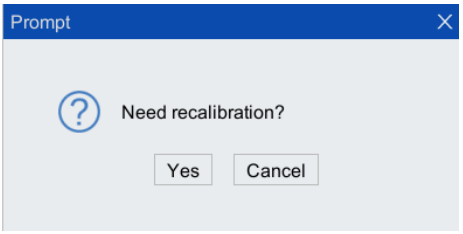


Figure 4-15 Prompt interface diagram

4.3 Positive and negative limit configuration

By configuring the positive and negative limit of the positioner, the maximum range of the robot body can be specified. Before setting the positive and negative limits, you need to complete the zero-point calibration of the positioner and make the zero-point effective.

The configuration steps of positive and negative limit parameters are as follows:

Step 1. As shown in Figure 4-16, select [System/Parameter Configuration] in the upper right corner of the main interface, and then enter the various tab selection interfaces shown in Figure 4-17.

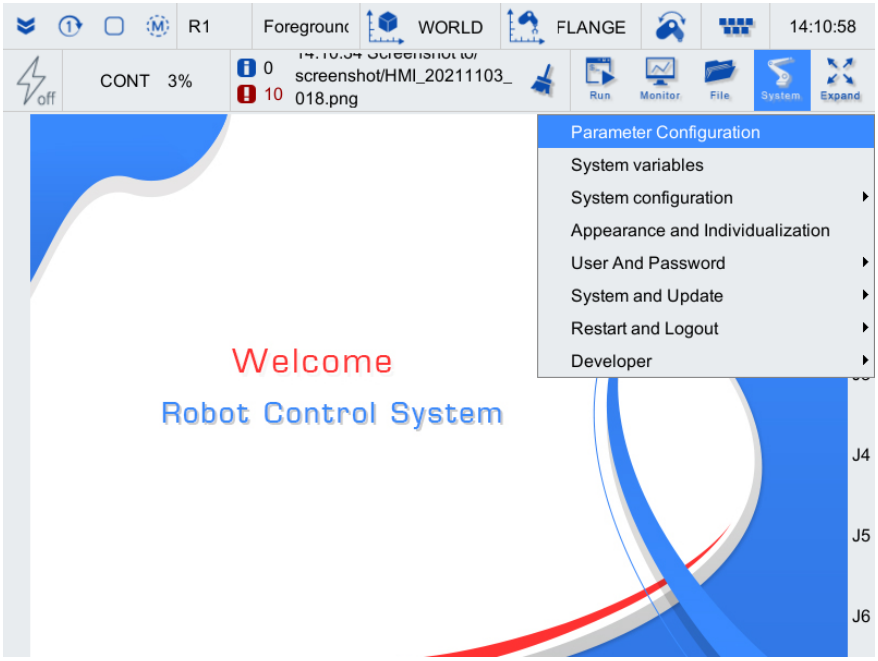


Figure 4-16 "Parameter configuration" selection list

Figure 4-17 "Parameter Configuration" tab display area

Step 2. In the [Channel 1] interface, click [+] on the left side of the [EXJOINT_MAX_STROKE (external axis positive limit)] parameter, and click to select [0] in the expanded sub-items (when the number of external axes is 1).

Tip

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

Step 3. The dialog box shown in Figure 4-18 pops up. Configure the parameter in [Value] (this value is the actual positive limit value of the positioner), and click <Yes>.

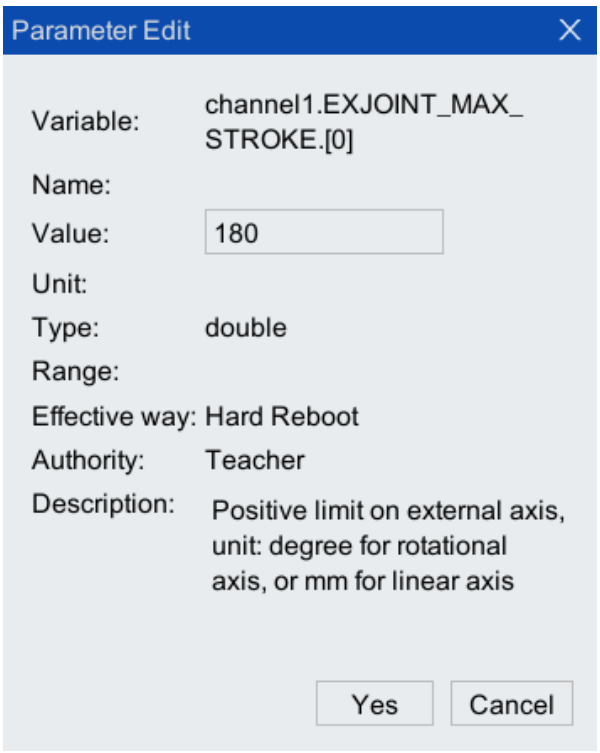


Figure 4-18 External axis positive limit configuration interface

Tip

Setting the actual positive and negative limit value range of the positioner should be determined according to the maximum movement range of the actual positioner.

Step 4. In the [Channel 1] interface, click [+] on the left side of the [EXJOINT_MIN_STROKE (external axis negative limit)] parameter, and click to select [0] in the expanded sub-items (when the number of external axes is 1).

Tip

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

Step 5. The dialog box shown in Figure 4-19 pops up. Configure the parameter in [Value] (this value is the actual negative limit value of the positioner), and click <Yes>.

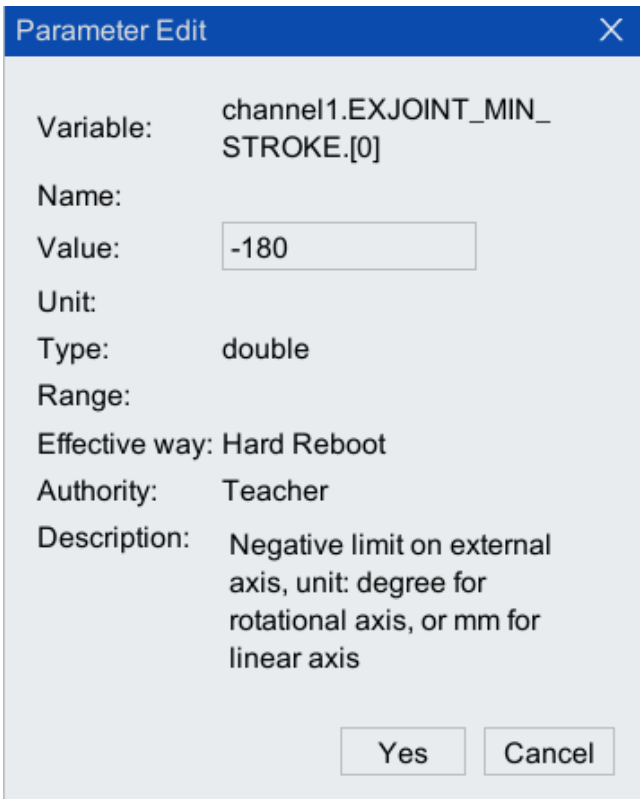


Figure 4-19 External axis negative limit configuration interface

Step 6. After the parameter configuration is completed, click <Save>, and the dialog box shown in Figure 4-20 will pop up. Select "Save all" in [Please select save type], and click <Yes>.

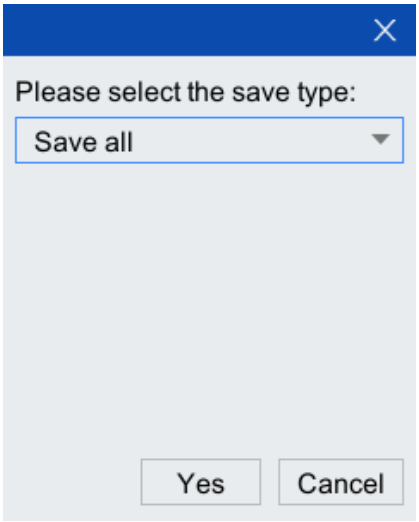


Figure 4-20 Save as type dialog

Step 7. Click <Yes> in the prompt dialog box that pops up. As shown in Figure 4-21.

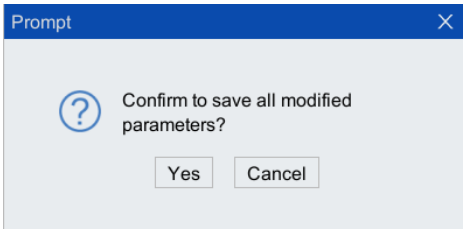


Figure 4-21 Confirm to save the modification prompt box

Step 8. Click <Yes> in the pop-up dialog box of successful parameter saving. As shown in Figure 4-22. Power off and restart the control cabinet, and the parameter configuration takes effect.

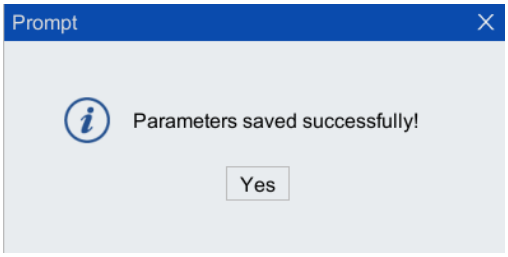


Figure 4-22 Save successful prompt box

4.4 Check the configuration

After power off and restart, click [System/Parameter Configuration] on the main interface of the teach pendant, and add the newly created [Positioner P1] tab in the [Parameter Configuration] interface. Click this tab to enter the interface shown in Figure 4-23 to view and modify parameters. The parameter configuration of the positioner is the same as the parameter configuration method in [Channel].

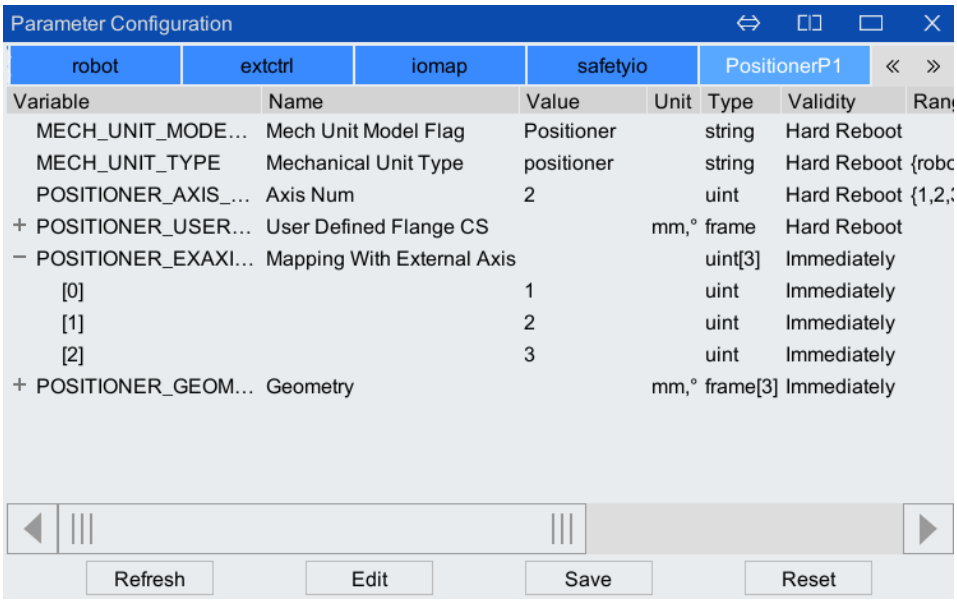


Figure 4-23 Positioner T1 parameter configuration interface

The parameter description is shown in Table 44.

Table 4-4 Parameter description

Parameter	Description
POSITIONER_AXIS_NUM (Number of axes)	The number of axes of the positioner. Notice: The number of shafts of the positioner shall be consistent with that of channel 1.
POSITIONER_EXAXIS_MAP (Mapping of each axis and outer axis)	The mapping relationship between each axis of the positioner and the outer axis. The default configuration is that the positioner 1 axis corresponds to the outer axis 1, the positioner 2 axis corresponds to the outer axis 2, and the positioner 3 axis corresponds to the outer axis 3. The user does not need

Parameter	Description
	to modify the configuration, and the positioner needs to be installed according to this mapping sequence when installing the positioner.

5 Coordinate system calibration

When performing positioner linkage, by calibrating the coordinate system related to the positioner linkage function, the robot TCP can be made to move relative to the moving workpiece on the positioner according to the program setting, as shown in Figure 5-1.

Figure 5-1 Diagram of positioner linkage

5.1 Calibration of Tool Coordinate System

The calibration steps of tool coordinate system are as follows:

Step 1. Enter the [Coordinate System Measurement] dialog box through the [Run/Coordinate System Measurement] path, and select the "Tool Coordinate System" option in the [Coordinate System Type].

Step 2. Click to select the row where the tool coordinate system tool0 is located, and click <Multi-point method> to pop up the interface as shown in Figure 5-2. Calibrate the direction of the coordinate system XYZ.

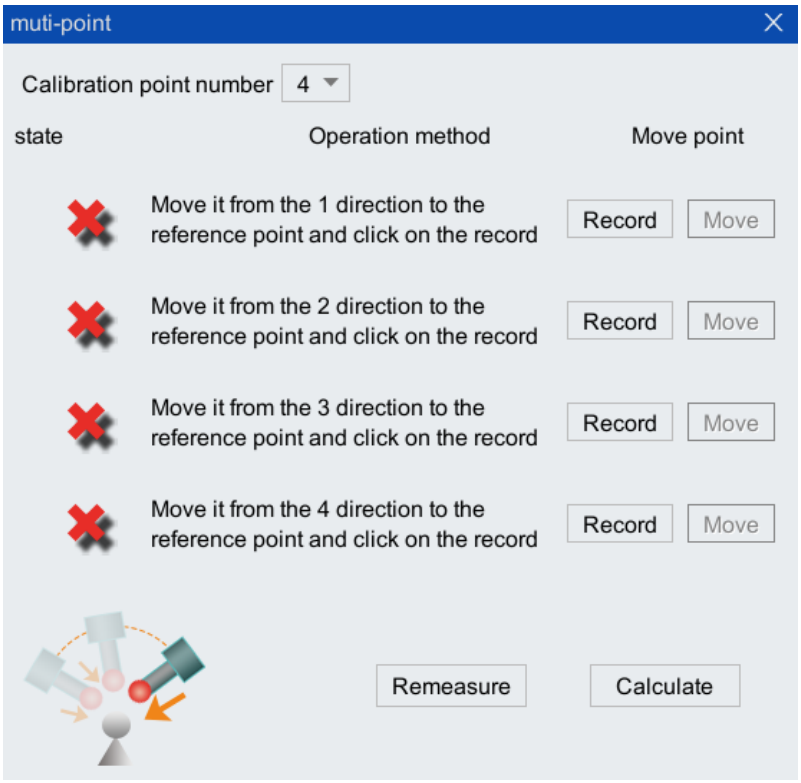


Figure 5-2 Multi-point calibration

Step 3. Follow the operation method prompted on the interface to complete the <Record> of each point. When all " × " changes to "√" (as shown in Figure 5-3), click <Calculate> to complete the calibration.

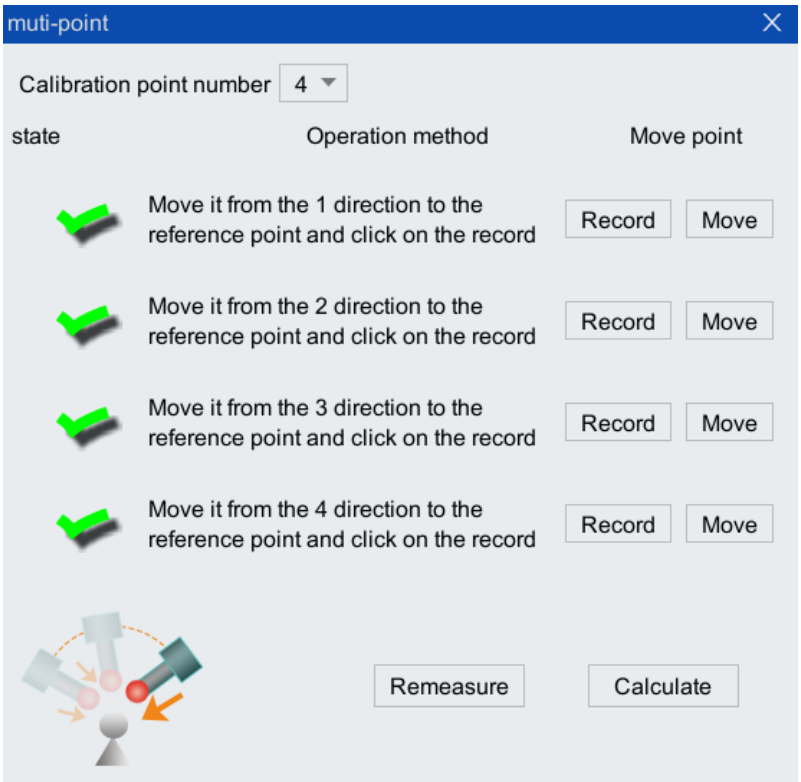


Figure 5-3 Successful multi-point calibration

Tip

When you need to specify the direction of each axis of the tool coordinate system, you need to follow the steps 4 to 5 below.

Step 4. (Optional) Click to select the row where the tool coordinate system tool0 is located, and click <Three Point Method> to pop up the interface as shown in Figure 5-4. By calibrating the posture ABC of the coordinate system.

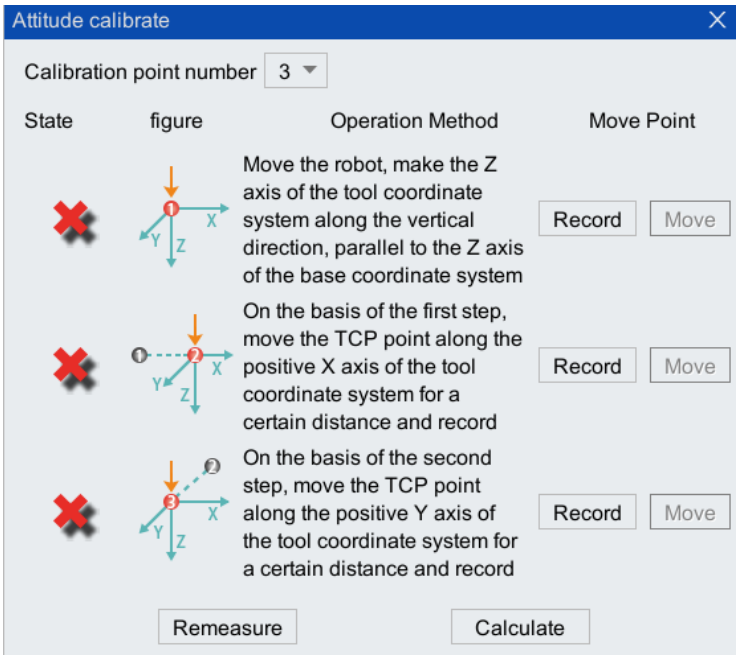


Figure 5-4 Three-point calibration

Step 5. (Optional) Follow the instructions on the interface to complete the <Record> of each point. When all the " × " changes to "√" (as shown in Figure 5-5), click <Calculate> to complete the calibration.

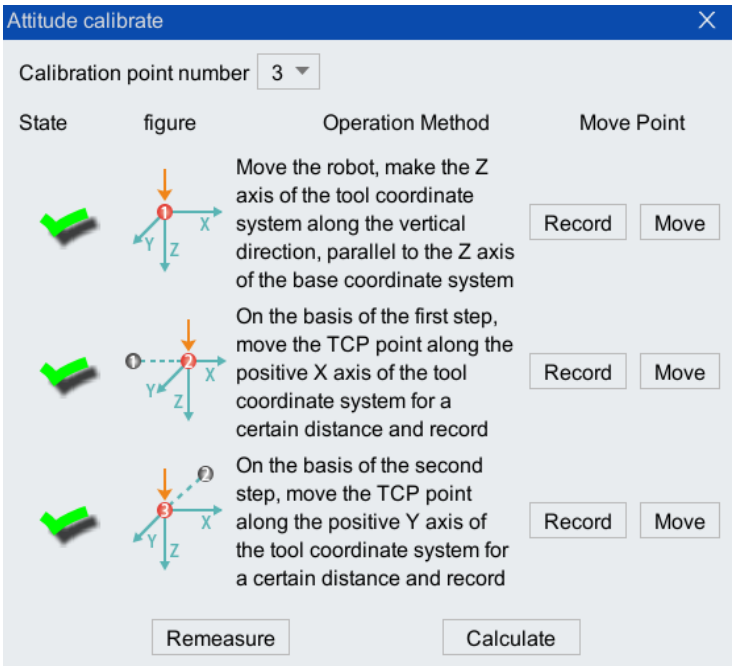


Figure 5-5 Successfully calibrated by three-point method

Step 6. Click the <Save> button to complete the calibration.

Notice

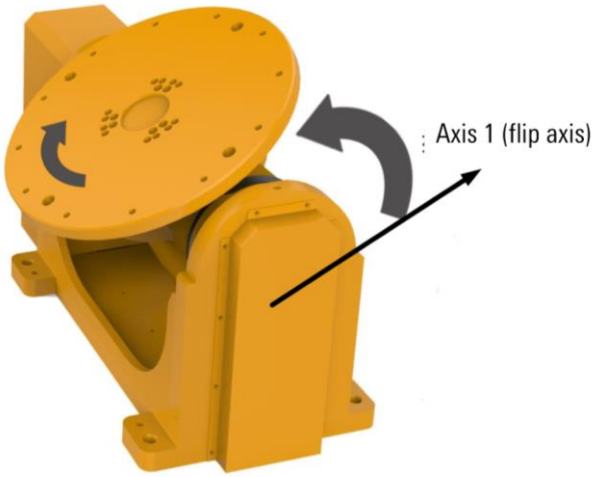
It is recommended to limit the calibration error to within 1mm, if it is within 2mm, it is barely usable.

5.2 Positioner calibration

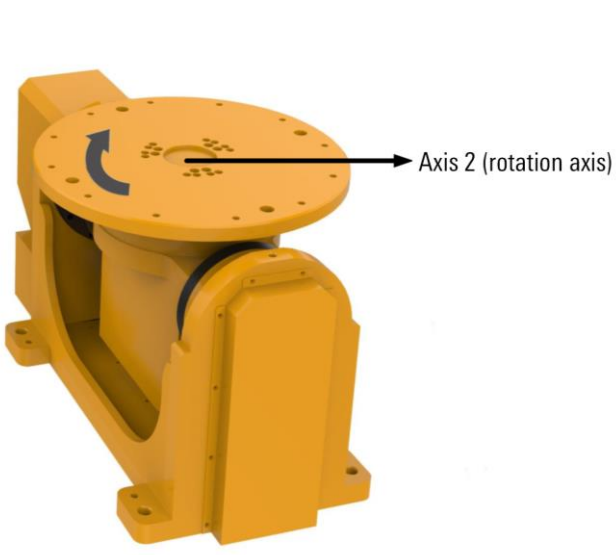
The joint coordinate system represents the location of a joint when the joint is at the zero position, and its representation is in the form of x, y, z, a, b, c, and the default z-axis is along the axis of the joint, that is, for rotation axis, the joint rotates around the z-axis, and for the movement axis, the joint moves along the z-axis.

Tip

When the geometric parameters between the axis of the positioner are unknown, the multi-point method can be used for axis-by-axis calibration (refer to Figure 5-6). The axis 1 coordinate system and the base coordinate system are coincident, so there is no need to specifically calibrate the base coordinate system of the positioner.



(a)Schematic diagram of axis 1



(b)Schematic diagram of axis 2

Figure 5-6 Schematic diagram of positioner shaft serial number

The specific steps for calibrating the joint coordinate system of the positioner are as follows:

Step 1. Before calibrating the positioner, click [Continuous] in the upper left corner of the teach pendant interface, as shown in Figure 5-7.

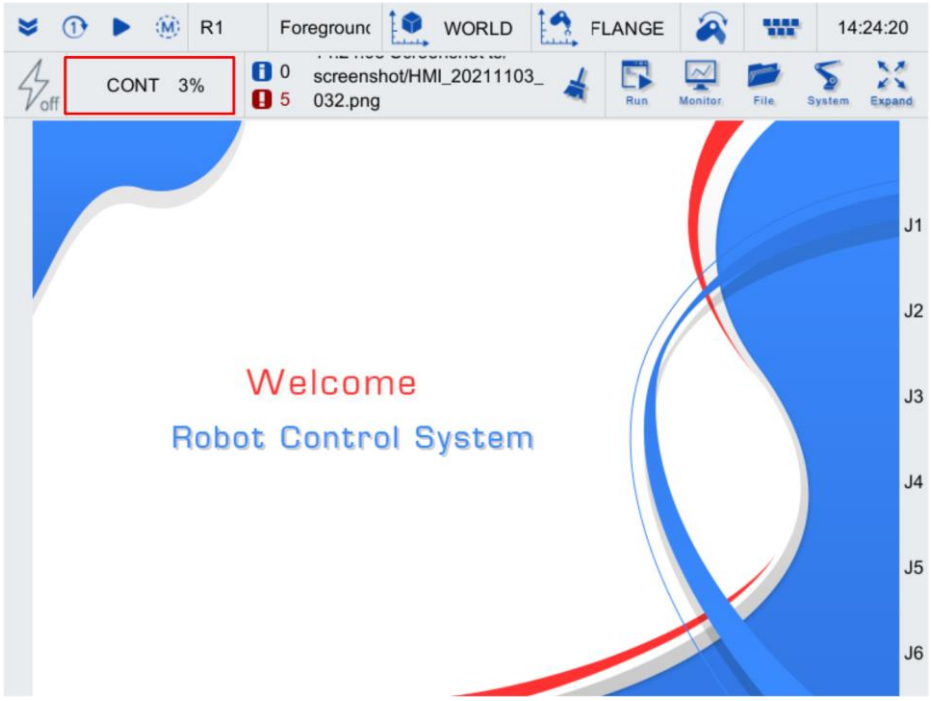


Figure 5-7 Teach Pendant Interface

Step 2. In the axis control mode setting interface that pops up, select [Tool] as "tool0" as a reference, as shown in Figure 5-8.

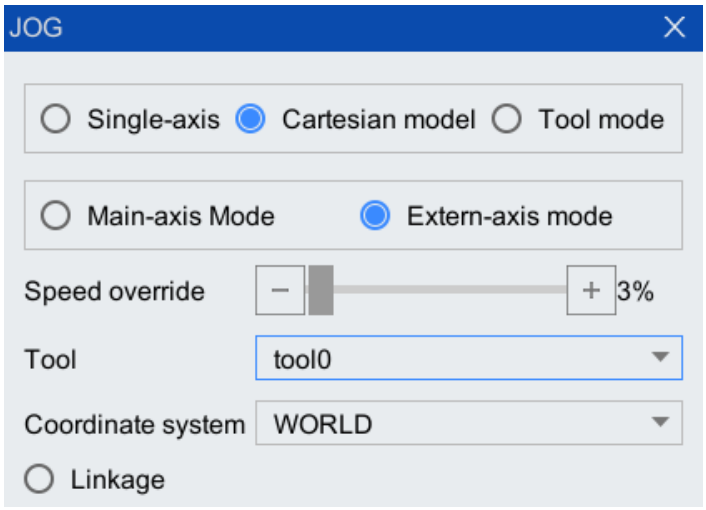


Figure 5-8 Axis control mode setting interface

Step 3. Click [Run/Coordinate System Measurement] in the menu area at the upper right corner of the teach pendant interface.

Step 4. The interface shown in Figure 5-9 pops up, and select "Base Coordinate System" in [Coordinate System measurement]. Click to select the row where "P1" is located, and click <Calibration> to pop up the [Positioner Calibration] interface.

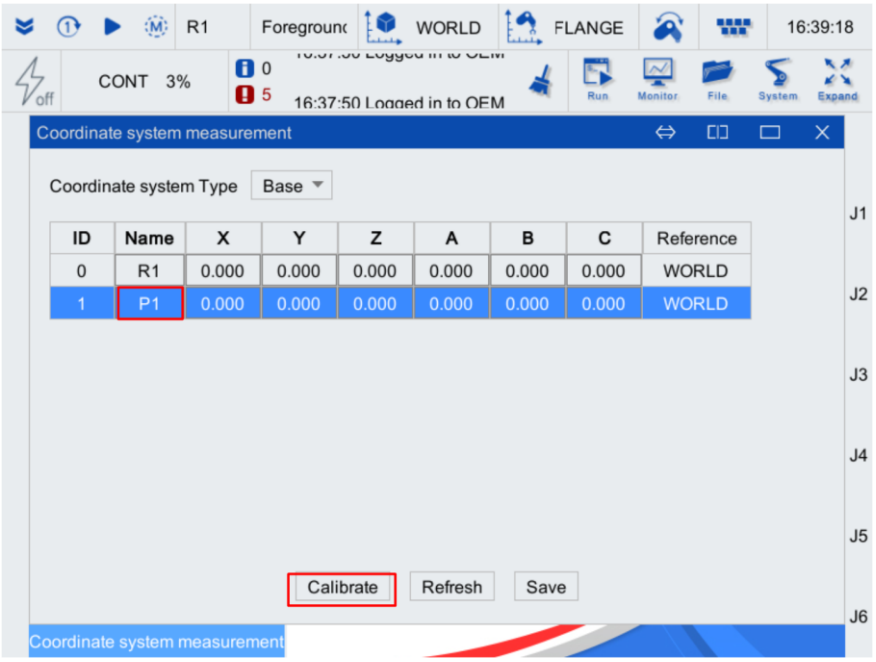


Figure 5-9 Base coordinate system calibration interface

Step 5. When calibrating, you need to determine a sharp point on the second axis of the positioner (this sharp point should be far away from the axis of the second axis), and then the TCP of the robot should be aligned with this sharp point when calibrating the positioner.

Step 6. First calibrate the axis 1 coordinate system (axis 2 remains unchanged), click to select the row where "Axis 1" is located, and click <Calibration> to pop up the calibration interface as shown in Figure 5-10.

Step 7. Configure [Reference Mechanical Unit], [base], and [Calibration point number]. Refer to Table 5-1 for the configuration method. Follow the prompt operation steps to <Record> each point. After all records are completed, click <Calibrate >. When [Status] shows that the calibration is successful, click <Next> to calibrate the axis 2 coordinate system.

Figure 5-10 Axis 1 coordinate system calibration

Table 5-1 Parameter Description

Parameter	Description
Reference mechanical unit	The mechanical unit referenced by the positioner coordinate system. When there are only robots and positioners in the system, this value is R1.
base	Reference benchmark. The values are as follows: ■ Robot: The use scene is "one robot + one positioner" or "one robot + multiple positioners". ■ Positioner: The use scene is "multiple robots + one positioner".((see "multimove user manual" for details))
Calibration point number	The number of calibration points, the values are as follows: ■ 3 ■ 4(More accurate)

Step 8. Calibrate the axis 2 coordinate system (axis 1 remains stationary), the calibration method is the same as that of axis 1. When the [Status] column shows that the calibration is successful, the calibration is completed, click the <Save> button to end the calibration of the positioner, and restart the control cabinet after power off.

Tip

■ When the positioner is calibrated, there is no restriction on the rotation direction and starting point of a single axis.

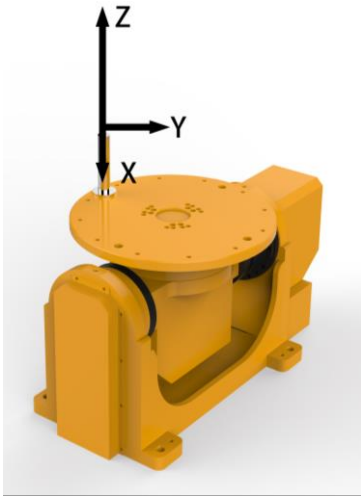
■ When calibrating each point, first move the external axis to a certain position, and then align the robot TCP to the sharp point of the positioner at this time, then the calibration can be successful.

■ When the calibration of the positioner is completed, if the value in the [error] column is too large, it needs to be re-calibrated. When the axis 1 or 2 of the positioner is rotated, the robot TCP can meet the requirements to keep relative to the sharp point on the positioner ,if the position is unchanged and there is no obvious error, the calibration is successful. If the error visible to the naked eye is too large, it still needs

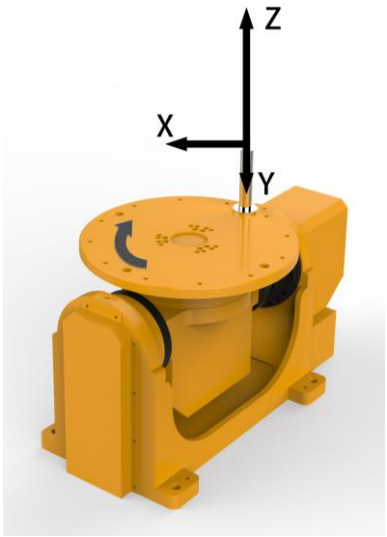
to be re-calibrated.

5.3 Workpiece coordinate system

When the user calibrates the workpiece coordinate system, the workpiece can be set as the reference mechanical unit. For example, if the workpiece coordinate system refers to the positioner, then when the positioner is moving, the workpiece coordinate system will also move, as shown in Figure 5-11.



(a)



(b)

Figure 5-11 Diagram of the workpiece coordinate system on the positioner moving with the movement of the positioner

The specific steps for calibration of the workpiece coordinate system are as follows:

Step 1. Enter the [Coordinate System Measurement] interface as shown in Figure 5-12 through the [Run/Coordinate System Measurement] path, and select the "Workpiece Coordinate System" option from the [Coordinate System Type].

Step 2. Change the name of the [mechanical unit] corresponding to the workpiece coordinate system wobj0 to "P1".

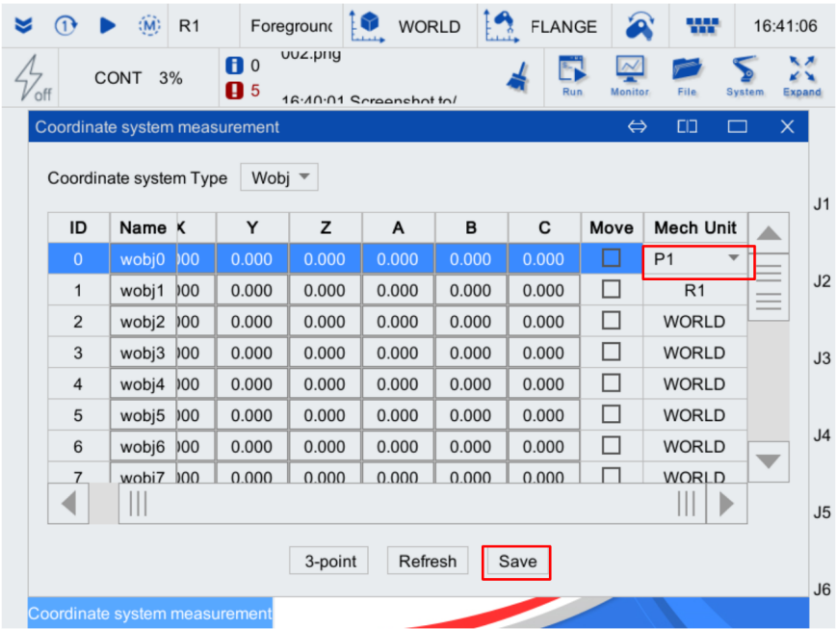


Figure 5-12 Workpiece coordinate system calibration

Step 3. (Optional) Click the cell in the row of the "workpiece coordinate system" to be set to make it editable, and modify x, y, Z, a, B and C to the required values through the keypad.

Step 4. After configuration, click < Save >.

6 Jog operation of positioner linkage function

There are 3 jog operation modes of positioner linkage function, including 2 non linkage modes and 1 linkage mode.

6.1 No linkage jog operation mode

6.1.1 The robot is not linked with the positioner

The workpiece coordinate system of the robot is a coordinate system not associated with the positioner, and the robot is not linked. In this case, no additional axis control mode setting is required.

6.1.2 The robot is linked with the positioner

The workpiece coordinate system of the robot is the coordinate system associated with the positioner, and the robot is not linked.

Figure 6-1 Diagram of robot non linkage operation

The setting steps of this mode are as follows:

Step 1. Click the "CONT 3%" icon in the upper left corner of the main interface, and the [JOG] operating parameter configuration interface will pop up. As shown in Figure 6-2.

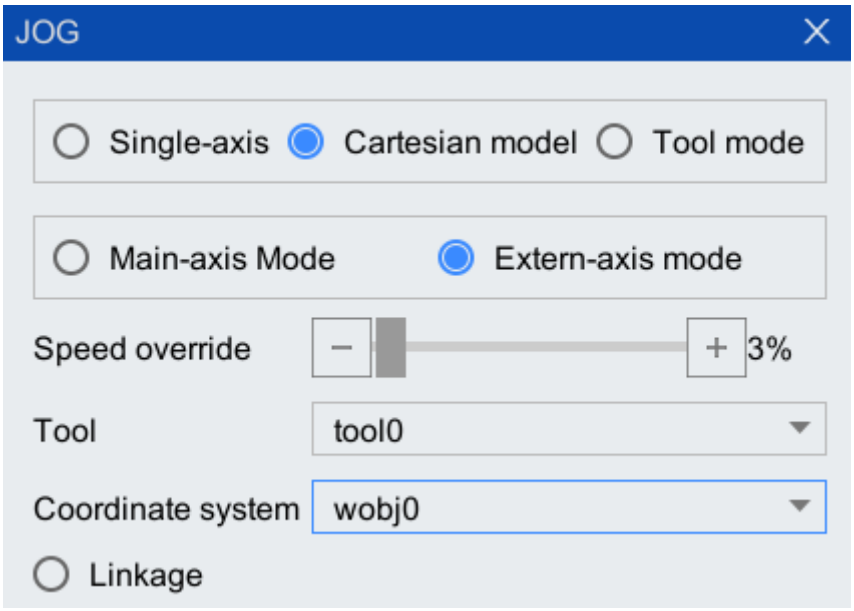
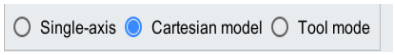


Figure 6-2 JOG interface

Step 2. Move the TCP point to a fixed sharp point, and configure the parameters of the [JOG] interface. The configuration method is shown in Table 6-1.

Table 6-1 Configuration steps and instructions

Steps	Parameter	Configuration instructions
1		Click and select [Cartesian mode]. In this mode, the TCP point of the operator can be controlled to move along the positive or negative direction of X axis, Y axis or Z axis, or the TCP of the manipulator can be controlled to rotate around Z axis, Y axis or X axis.
2		Click and select [external axis mode], or you can switch the mode by pressing the shortcut key < F2 >.
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 the tool "tool0".
5	Coordinate system	Select "wobj0".
6	Linkage	Uncheck the [linkage] check box.

6.2 Linkage jog operation mode

The workpiece coordinate system of the robot is the coordinate system associated with the positioner. The robot is linked with the positioner, that is, the position and attitude of the TCP of the robot remain relatively stationary relative to the workpiece coordinate system, as shown in Figure 6-3.

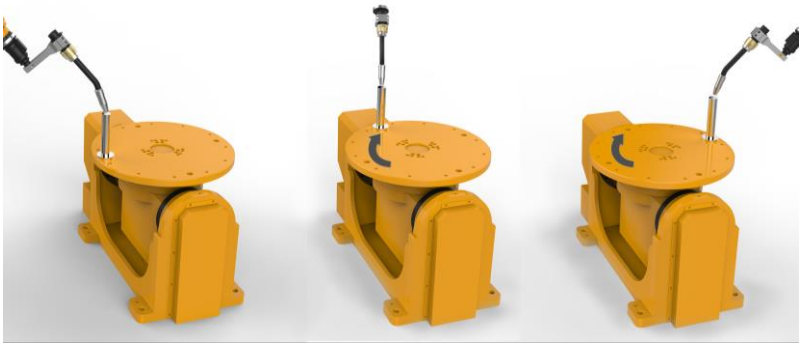


Figure 6-3 Diagram of robot linkage operation

The setting steps of this mode are as follows:

Step 1. Click the " 

" icon in the upper left corner of the main interface, and the [JOG] operating parameter configuration interface will pop up. As shown in Figure 6-4.

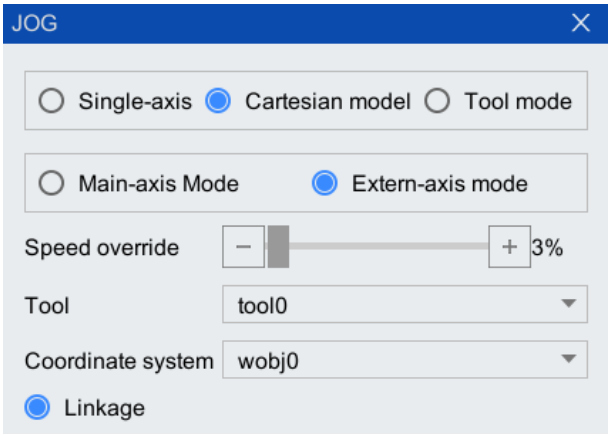
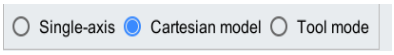


Figure 6-4 Operation parameter configuration interface

Step 2. Move the TCP point to a fixed sharp point, and configure the parameters of the [JOG] interface. The configuration method is shown in Table 6-2.

Table 6-2 Configuration steps and instructions

Steps	Parameter	Configuration instructions
1		Click and select [Cartesian mode]. In this mode, the TCP point of the operator can be controlled to move along the positive or negative direction of X axis, Y axis or Z axis, or the TCP of the manipulator can be controlled to rotate around Z axis, Y axis or X axis.
2		Click and select [external axis mode], or you can switch the mode by pressing the shortcut key < F2 >.
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 the tool "tool0".

Steps	Parameter	Configuration instructions
5	Coordinate system	Select "wobj0".
6	Linkage	Uncheck the [linkage] check box.

After the calibration is completed, rotate the axis 1 or axis 2 of the positioner, and the robot TCP should keep the relative position unchanged with the sharp point on the positioner, and there is no obvious error. If the error visible to the naked eye is too large, it needs to be re-calibrated.

7 Teaching practice

The enable buttons can be installed on the left and right sides of the rear shell of the teach pendant. The default installation is on the right side when leaving the factory, as shown in Figure 4-9.

The <Enable> button provides 3 key positions, the specific operation method is as follows:

- The power is turned on when the first key position is pressed lightly.
- The teach pendant in the second (middle) key position can operate the robot manipulator.
- The power is cut off when the button is completely released.

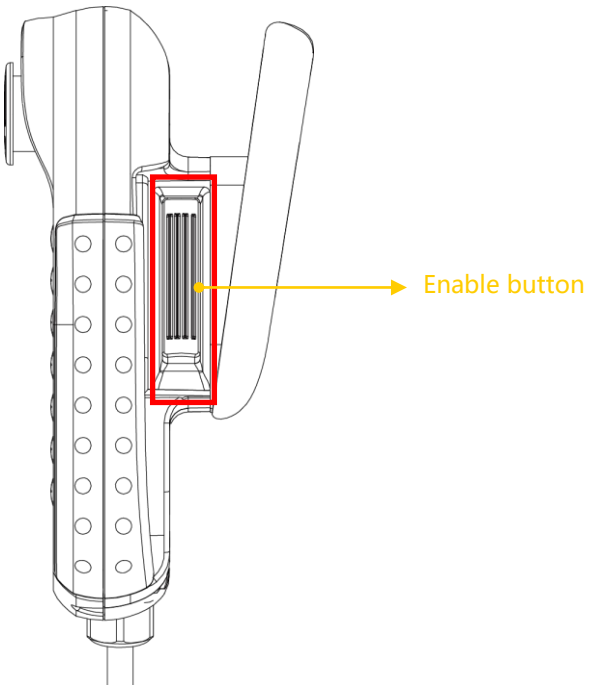


Figure 7-1 Teach pendant enable button

The operation steps of drag teaching are as follows:

Step 1. In the drag teaching mode, while pressing the <Enable> button I of the teach pendant, manually drag the robot to move.

Step 2. After moving to the target point, release the <Enable> button.

Step 3. Click [Run/Program Editor] on the main interface of the teach pendant.

Step 4. In the pop-up [Program Editor] interface, click [More Edit/Open] to open the created arl program file.

Step 5. Manually enter the instructions to be inserted. If the robot manipulator needs to be linked with the positioner, the lin and cir instructions should be inserted. (As shown in Figure 71)

Figure 7-2 Insert lin command interface

Step 6. Click the "  " after [p], and select [Workpiece Coordinate System] as the calibrated workpiece coordinate system of the positioner (as shown in Figure 72). Click <Yes>.

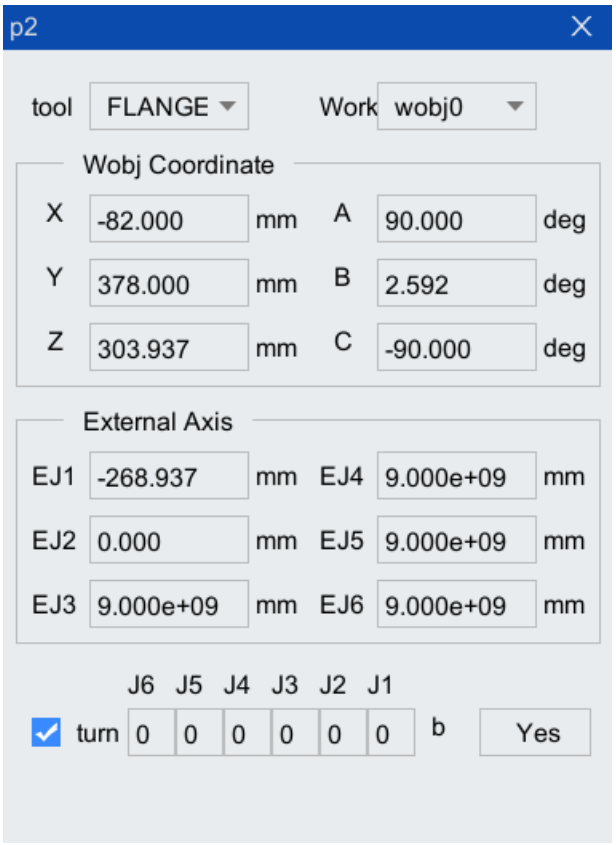


Figure 7-3 Workpiece coordinate system selection interface

Step 7. On the motion instruction interface as shown in Figure 7-1, click <Insert > to complete the insertion of the motion instruction.

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