DobotSCStudio

User Guide (CR Robots)

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Shenzhen Yuejiang Technology Co., Ltd

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Preface

Purpose

This manual introduces the functions and usage of the robot control software DobotSCStudio, which is convenient for users to understand and use robot.

Intended Audience

This document is intended for:

- Customer
- Sales Engineer
- Installation and Commissioning Engineer
- Technical Support Engineer

Change History

Date	Change Description
2021/01/05	The fifth release Add appendix A and appendix B
2020/12/04	The forth release Add palletizing process
2020/11/19	The third release Add gripper installation chapter and description of virtual controller connection
2020/09/27	The second release Modify UI, add fast connection, safety setting chapters as
2020/06/03	The first release

Symbol Conventions

The symbols that may be founded in this document are defined as follows.

Symbol	Description
⚠DANGER	Indicates a hazard with a high level of risk which, if not avoided, could result in death or serious injury
⚠WARNING	Indicates a hazard with a medium level or low level of risk which, if not avoided, could result in minor or moderate injury, robot damage
⚠NOTICE	Indicates a potentially hazardous situation which, if not avoided, can result in equipment damage, data loss, or unanticipated result
🕮NOTE	Provides additional information to emphasize or supplement important points in the main text

Contents

1. Overview

DobotSCStudio is an industrial robot programming platform launched by Yuejiang, which is suitable for the whole series of industrial robots (SA / SR / CR). Friendly interface, innovative interactive programming, supporting user secondary development. It also provides kinematics algorithm of various mechanical structures and integrated virtual simulation environment to realize rapid deployment of various process applications on site.

1.1 Main Interface Description

Figure 1.1 shows the main interface of DobotSCStudio, Table 1.1 lists the interface description.

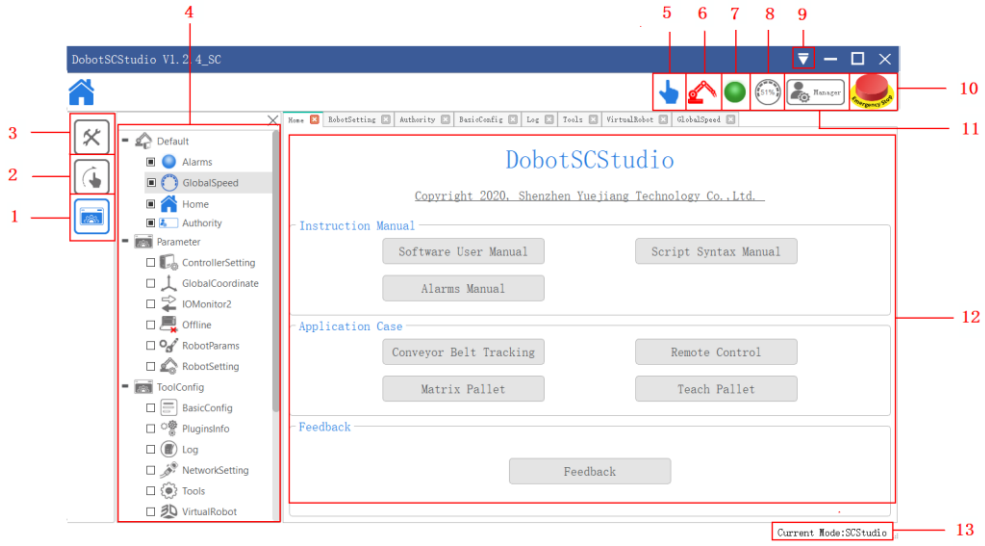


Figure 1.1 Main interface

Table 1.1 Interface description

No.	Description
1	Project You can build or import a project, and debug or run it
2	Jog Jog the robot in different coordinate systems. This function is valid only when DobotSCStudio is set to the manual mode Jog the robot in the Joint coordinate system: From top to bottom, jog J1, J2,…, and J6 Jog the robot in the Cartesian coordinate system: From top to bottom, jog the X, Y, Z, Rx, Ry, and Rz
3	System You can set system configurations. Such as Network Setting, RobotParams, Coordinate, Process,

No.	Description
	etc.
4	System bar
5	You can click the icon to change manual mode and auto mode. • : In manual mode, you can jog robot, write a program or set parameters • : In auto mode, you can view the robot trajectory, I/O status or debug program
6	• In manual mode, indicate the motor status (enabled or disabled) • In auto mode, indicate that you can click this button to control the motor
7	Check robot alarm When an alarm is triggered, this icon will turn red You can check the alarm details on the operation panel and clear it in the manual mode
8	Set global velocity rate in manual mode or auto mode
9	IP setting or check update • After connecting controller and PC with network cable, you need to select **Real** on the **IP Settings** page and select controller's IP address for connecting to DobotSCStudio • DobotSCStudio If there is no device, you can select Virtual on the IP Settings page to enjoy DobotSCStudio by connecting virtual controller
10	Emergency stop switch Press and hold it in an emergency, the drive power supply of robot motors will be powered off for emergency braking
11	Select user mode • Watcher: check the system status, I/O status, robot pose, and alarms • Operator: Operate a robot based on the existing scripts without programming • Programmer: On the basis of operator authority, you can program and teach • Manager: On the basis of programmer authority, you can set or modify parameters Please select user mode based on site requirements Default password: **admin**. You can modify the password on the **ToolConfig** > **BasicConfig** > **UserMode** page in the Manager mode
12	Interactive window
13	Show the current running mode Running mode: I/O, Modbus, SCStudio

2. Fast Connection

This topic only describes how to connect DobotSCStudio and controller. Please refer to *Dobot CR5 User Guide* to connect robot and controller.

2.1 Connecting to Controller with Network Cable

DobotSCStudio can communicate with the controller directly through network cable. At this point, the IP address of the controller should be in the same network segment as that of the PC. The default IP address of the controller is 192.168.5.1. Please modify the IP address of PC to make them in the same network segment.

📖NOTE

This section uses Win7 OS as an example to describe how to change the IP address. Please change it based on site requirements.

Step 1 Connect one end of the network cable to the LAN interface on the controller and the other end to the PC.

Step 2 Click **Start > Control Panel** on the PC and select **Network and Sharing Centre.**

The **Network and Sharing Centre** page is displayed.

Step 3 Click **Local Area Connection** on the **Network and Sharing Center** page.

Step 4 Click **Properties.**

Double-click **Internet Protocol Version 4(TCP/IPv4)**.

Step 5 Select **Use the following IP address**, and change the IP address, subnet mask, and gateway of the PC.

You can change the IP address of the PC to make it on the same network segment as that of the controller without conflict. The subnet mask and gateway of the PC must be the same as that of controller.

⚠NOTICE

If the PC is connected to controller over a network cable directly, you only need to set the IP address and subnet mask of the PC.

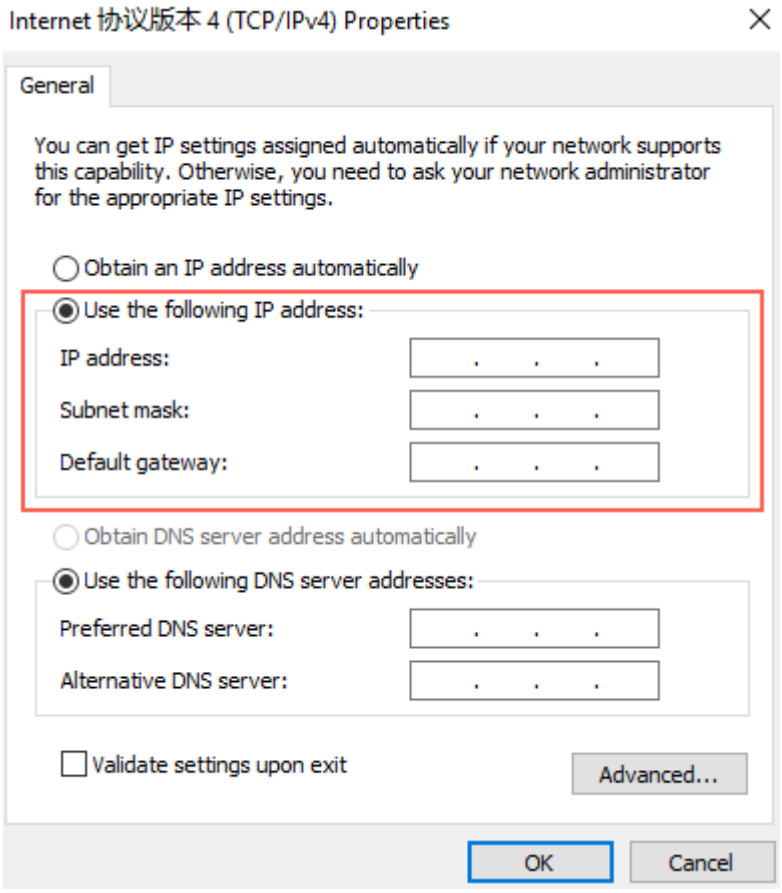


Figure 2.1 IP address modification

Step 6 Click **OK**.

Step 7 Click  **> IP settings…** on the upper right pane of the DobotSCStudio page and select the controller's IP address, then click **OK**.

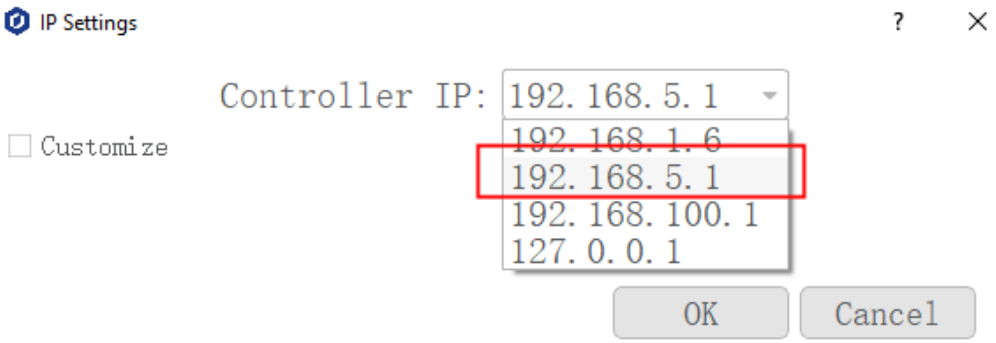


Figure 2.2 IP setting

If the controller's IP cannot be found, please select **Customize** to add it and then click **OK**.

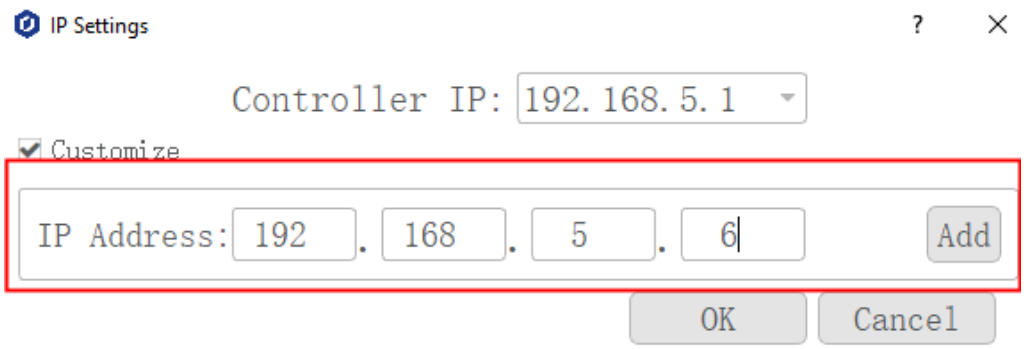


Figure 2.3 Add controller's IP address

After the connection is successful, the DobotSCStudio will be shown as below.

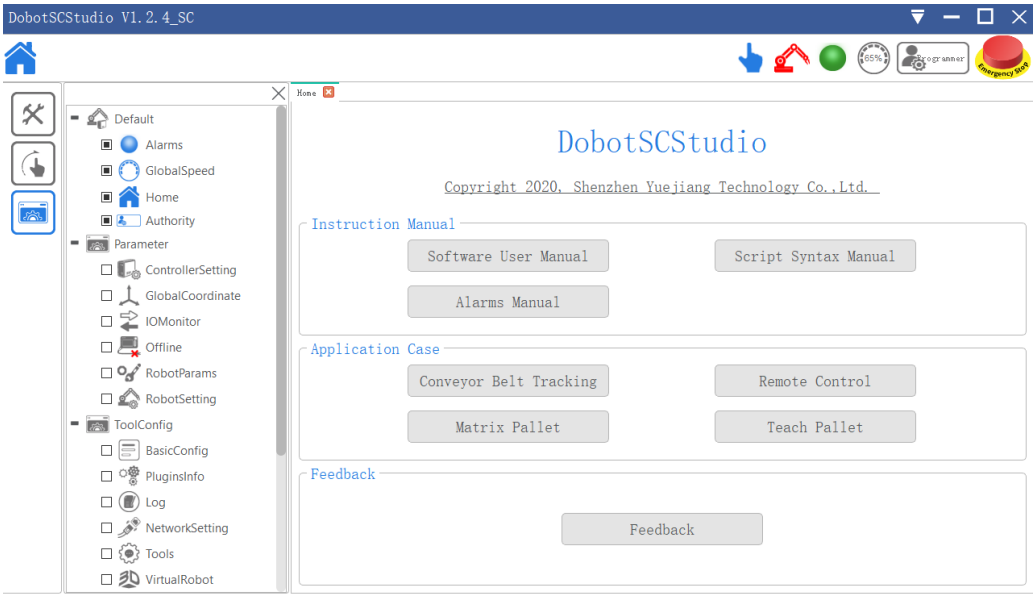


Figure 2.4 Connecting successful

2.2 Connecting to the Controller with WiFi Module

Prerequisites

- The controller has been connected to the WiFi module.
- The PC supports WiFi function.

Procedure

Step 1 Search Dobot controller WiFi name and connect it. The WiFi name is prefixed with **Dobot_WIFI_XXX**. The default WiFi password is **1234567890**.

Step 2 Click  **> IP settings…** on the upper right pane of the DobotSCStudio page and select the controller's IP address, then click **OK.**

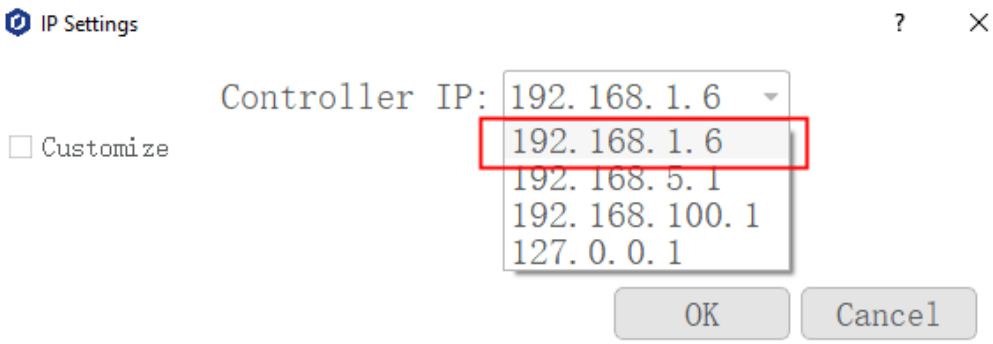


Figure 2.5 IP setting

After the connection is successful, the DobotSCStudio will be shown as below.

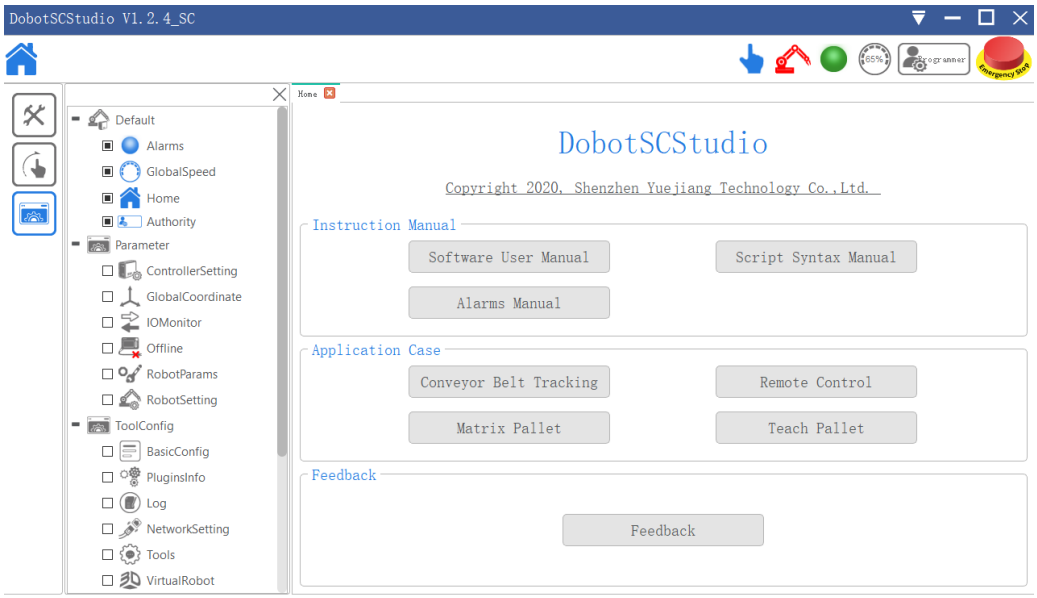


Figure 2.6 Connecting successful

3. Function Description

3.1 Parameter

Before teaching or running robot programs, a series of settings are required, including motion parameter setting, language selecting, user mode selecting and process setting, etc.

3.1.1 Setting User Coordinate System

When the position of workpiece is changed or a robot program needs to be reused in multiple processing systems of the same type, you can create coordinate systems on the workpiece to simplify programming. There are totally 10 groups of User coordinate systems, of which the first one is defined as the Base coordinate system by default and cannot be changed. And the others can be customized by users.

⚠NOTICE

When creating a User coordinate system, please make sure that the reference coordinate system is the Base coordinate system. Namely, the User coordinate system icon should be User: 0 when creating a User coordinate system.

- Point: move TCP to any point **A** to create origin, and create user coordinate system according to the default tool coordinate system As shown in Figure 3.1.

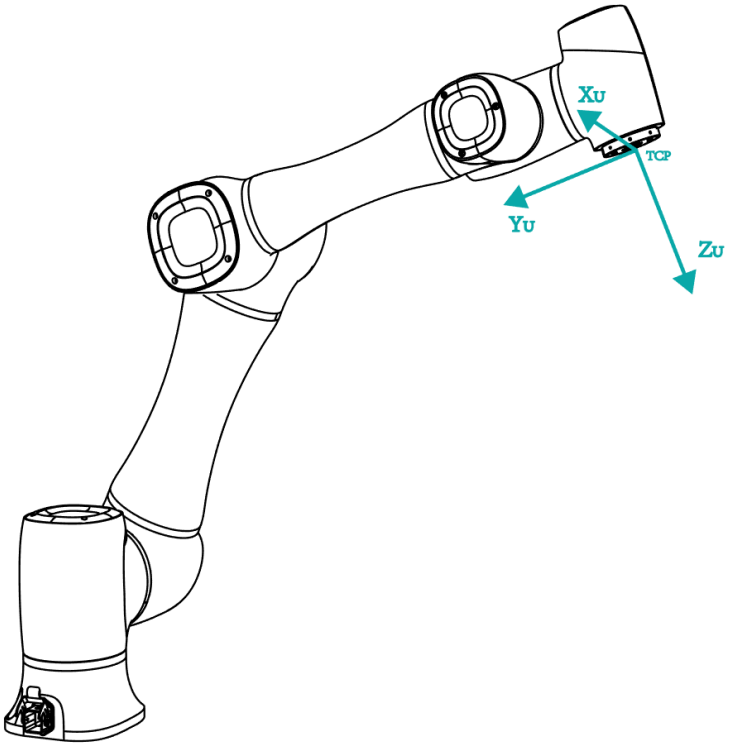


Figure 3.1 Point

- Line: Confirm a straight line by any two points **A** and **B**. The direction from A to B is

defined as the positive direction of Y-axis, The Z-axis of Tool coordinate system of which point A is the origin is projected into the vertical plane that confirmed by points A and point B, we can define it as the positive direction of Z-axis. and then the positive direction X axis can be defined based on the right-hand rule. As shown Figure 3.2.

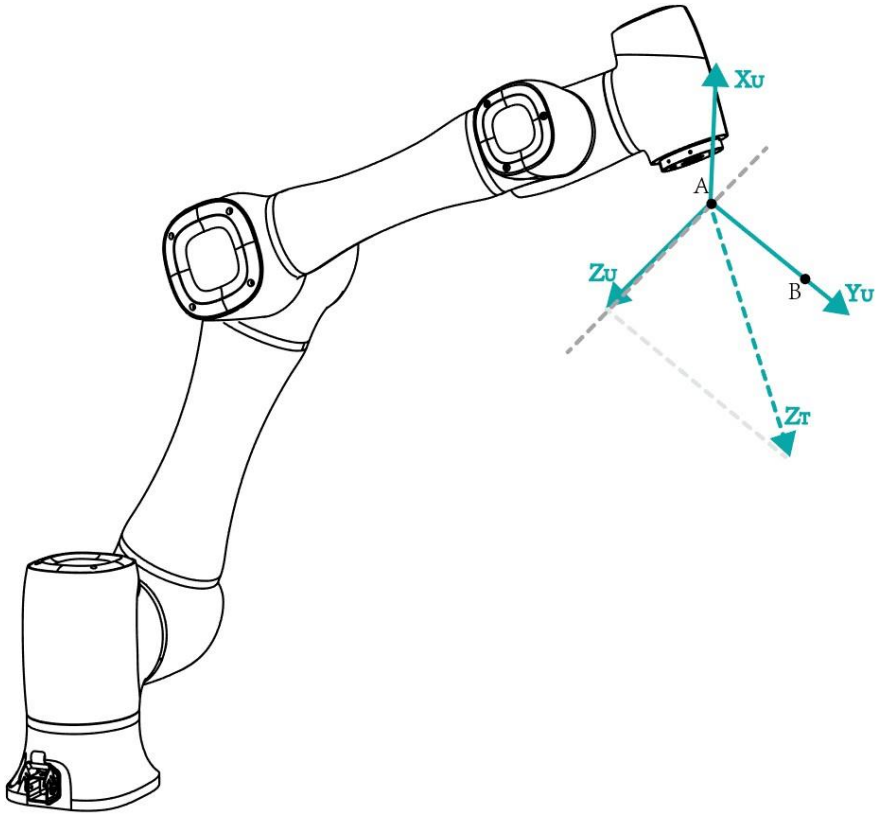


Figure 3.2 Line

- Area: User coordinate system is created by three-point calibration method. Move the robot to three points **A(x1, y1, z1)**, **B(x2, y2, z2)**, and C(**x3**, **y3**, **z3**). Point A is defined as the origin and the line from point A to Point B is defined as the positive direction of X-axis. The line that point C is perpendicular to X-axis is defined as the position direction of Y-axis. And then the Z-axis can be defined based on the right-handed rule, as shown in Figure 3.3.

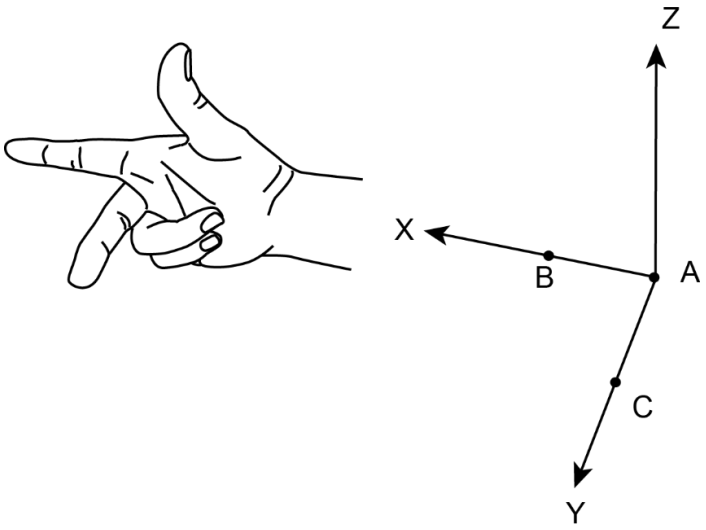


Figure 3.3 Area

Take the establishment of User 1 coordinate system as an example based on three-point calibration method.

Prerequisites

- The robot has been powered on.
- The controller has been in the manual mode.
- The robot motor has been enabled.
- The robot is in the Cartesian coordinate system.

Procedure

Step 1 Click > **Parameter** > **GlobalCoordinate** > **Coordinate User.**

The **Coordinate User** page is displayed, as shown in Figure 3.4.

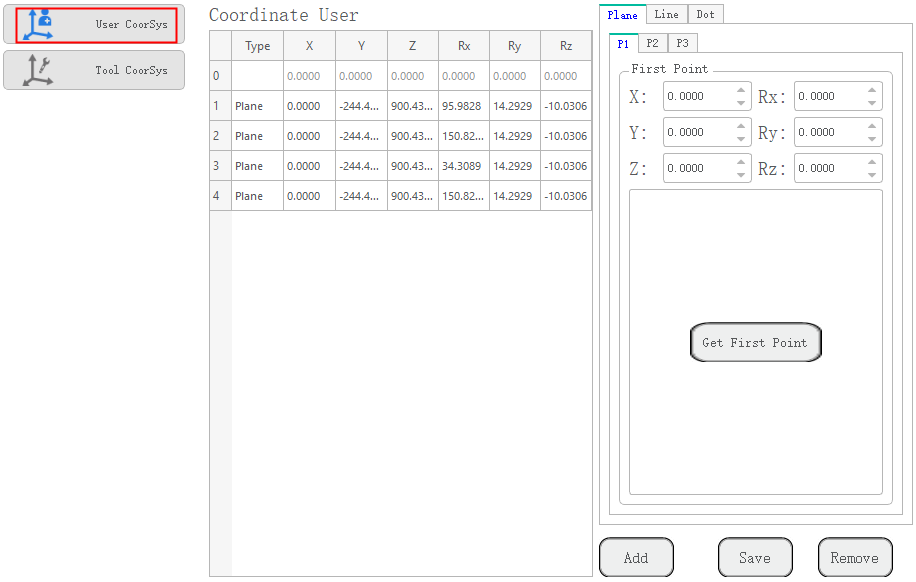


Figure 3.4 User coordinate system page

NOTE

Rx, **Ry**, **Rz** are the orientation data, which are designated by rotating the tool center point (TCP) around the X, Y, Z axes under the selected User coordinate system.

Step 2 Jog the robot to the first point, then click **Get First Point** on the **P1** tab to obtain the coordinates of the first point.

Step 3 Jog the robot to the second point, then click **Get Second Point** on the **P2** tab to obtain the coordinates of the second point.

Step 4 Jog the robot to the third point, then click **Get Third Point** on the **P3** tab to obtain the coordinates of the third point.

Step 5 Click **Add** and **Save** to generate the User 1 coordinate system.

Step 6 Select **User: 1** on Jog interface.

You can use the **User 1** coordinate system for teaching and programming.

3.1.2 Setting Tool Coordinate System

When an end effector such as welding gun, gripper is mounted on the robot, the Tool coordinate system is required for programming and operating a robot. For example, you can use multiple grippers to carry multiple workpieces simultaneously to improve the efficiency by setting each gripper to a Tool coordinate system.

There are totally 10 groups of Tool coordinate systems. Tool 0 coordinate system is the predefined Tool coordinate system which is located at the robot flange and cannot be changed.

NOTICE

When creating a Tool coordinate system, please make sure that the reference coordinate system is the predefined Tool coordinate system. Namely, the Tool coordinate system icon should be Tool: 0 when creating a Tool coordinate system.

Tool coordinate system of a CR robot is created by three-point calibration method (TCP +ZX): After the end effector is mounted, please adjust the direction of the end effector, to make TCP (Tool Center Point) align with the same point (reference point) in three different directions, for obtaining the position offset of the end effector, and then jog the robot to the other three points (**A**, **B**, **C**) for obtaining the angle offset, as shown in Figure 3.5.

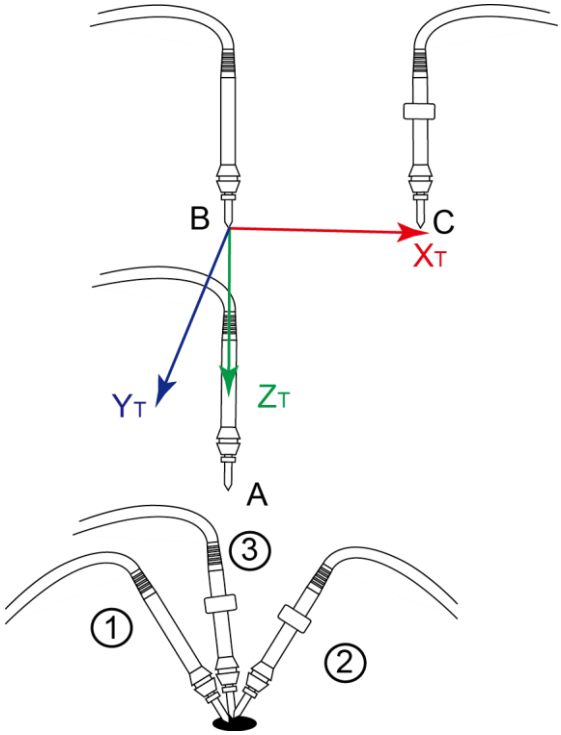


Figure 3.5 Three points calibration method (TCP+ZX)

Take the establishment of Tool 1 coordinate system as an example.

Prerequisites

- The robot has been powered on.
- The controller has been in the manual mode.
-

Procedure

Step 1 Mount an end effector on the robot. The detailed instructions are not described in this topic.

Step 2 Click > **Parameter > GlobalCoordinate > Coordinate Tool6Axis.**

The Coordinate Tool page is displayed, as shown in Figure 3.6.

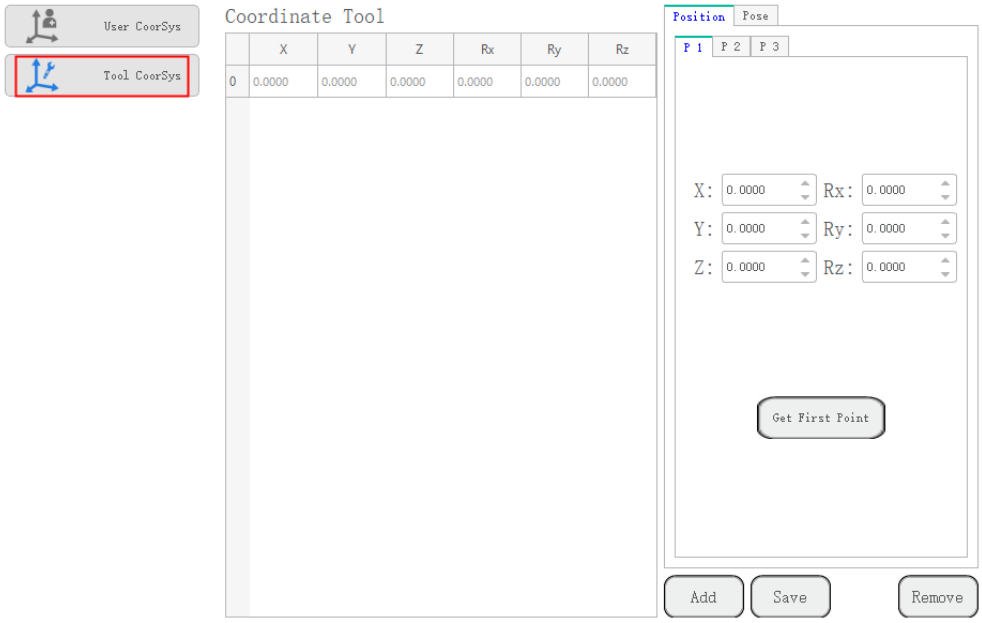


Figure 3.6 Tool Coordinate page

NOTE

Rx, **Ry**, **Rz** are the orientation data, which are designated by rotating the tool center point (TCP) around the X, Y, Z axes under the selected Tool coordinate system.

Step 3 Jog the robot to the reference point in the first direction, then click **Get First Point** on the **P1** tab of the **Position** page to obtain the coordinates of the first point.

Step 4 Jog the robot to the reference point in the second direction, then click **Get Second Point** on the **P2** tab of the **Position** page to obtain the coordinates of the second point.

Step 5 Jog the robot to the reference point in the third direction, then click **Get Third Point** on the **P3** tab of the **Position** page to obtain the coordinates of the third point.

Step 6 Jog the robot to the reference point (point **A)** in the vertical direction, then click **Get First Point** on the **P1** tab of the **Pose** page to obtain the fourth point.

Step 7 Jog the Z-axis to a point (point **B**) along the positive direction, then click **Get Second Point** on the **P2** tab of the **Pose** page to obtain the fifth point.

This step defines the Z-axis.

Step 8 Jog the X-axis to another point (point **C**), then click **Get Third Point** on the **P3** tab of the **Pose** page to obtain the sixth point.

The three points (A,B,C) cannot lie in the same line.

This step defines the X-axis, and the Y-axis can be defined based on the right-handed rule.

Step 9 Click **Add** and **Save** to generate the Tool 1 coordinate system.

Step 10 Click Select **User: 1** on Jog interface.

You can use the Tool 1 coordinate system for teaching and programming.

3.1.3 Home Point

DobotSCStudio supports to move robot to common points: factory point, homing point, user-defined point. Moving robot to the factory point can reduce the robot space, easy to pack and transport. Homing point is homing position. User-defined point is user-defined based on site requirements, which is convenient to move to this position quickly.

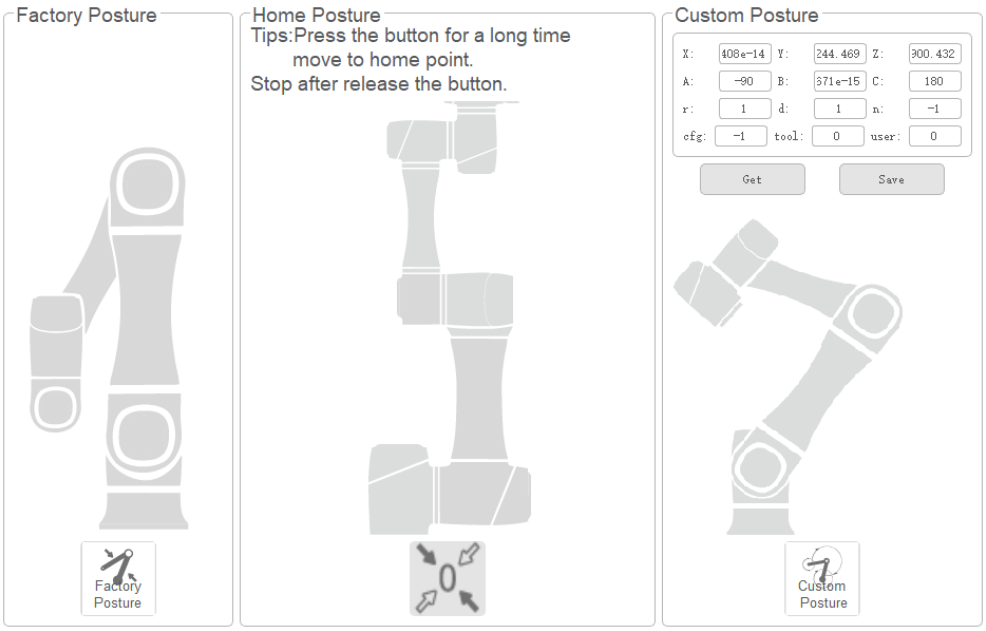


Figure 3.7 Posture setting

- Factory Posture: Click 

to move robot to the factory point.
- Home Posture: Long press  to move robot the homing point.
- Custom Posture: Click 

to move robot to the user-defined point.

Before moving to the user-defined point, you need to define this point: Jog robot to this point, click **Get** and **Save** on the **HomePoint** Page.

3.1.4 I/O Monitor

You can set or monitor the I/O status of the controller and robot on this page. Click  > **Parameter** > **IOMonitor** to enter the I/O monitor page, as shown in Figure 3.8.

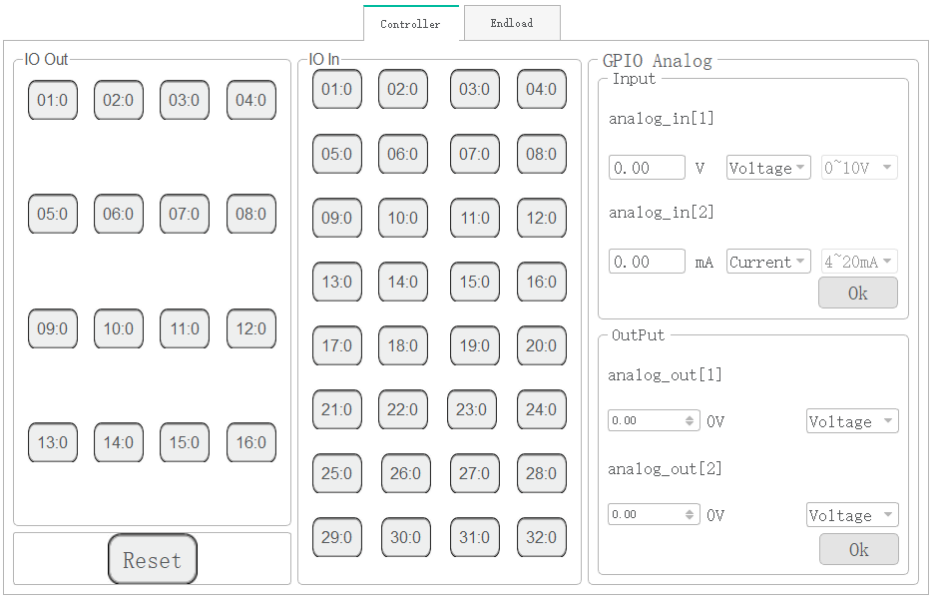


Figure 3.8 I/O monitor page

There are three features: Output, monitor and simulation.

- Output: Set the digital output or relay output in the manual mode.
- Monitor: Check the status of the input and output. In the auto mode, the status of the output and input cannot be modified.
- Simulation: Simulate the analog input in the manual mode or auto mode for debugging and running program, as shown in Figure 3.9.

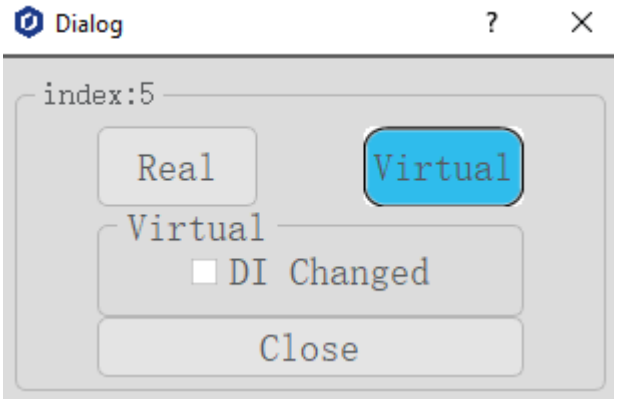


Figure 3.9 Simulation

For details about I/O interface, please see *Dobot CR5 User Guide*.

3.1.5 Controller Setting

3.1.5.1 Reboot

When the controller firmware has been updated or the controller is abnormal, you need to

reboot the controller. Now you can click Reboot to reboot it on the **Parameter** > **ControllerSetting** > **Reboot** page.

Tips:
It is used for the restart of the controller.
During the restart process, the APP displays the disconnected s
When the controller is restarted, the APP is reconnected.

Figure 3.10 Reboot

3.1.5.2 Update

When the controller firmware needs to be updated, you can import the latest firmware on this page. After importing the firmware, please reboot the controller.

Please contact the Dobot support engineer to obtain the latest firmware.

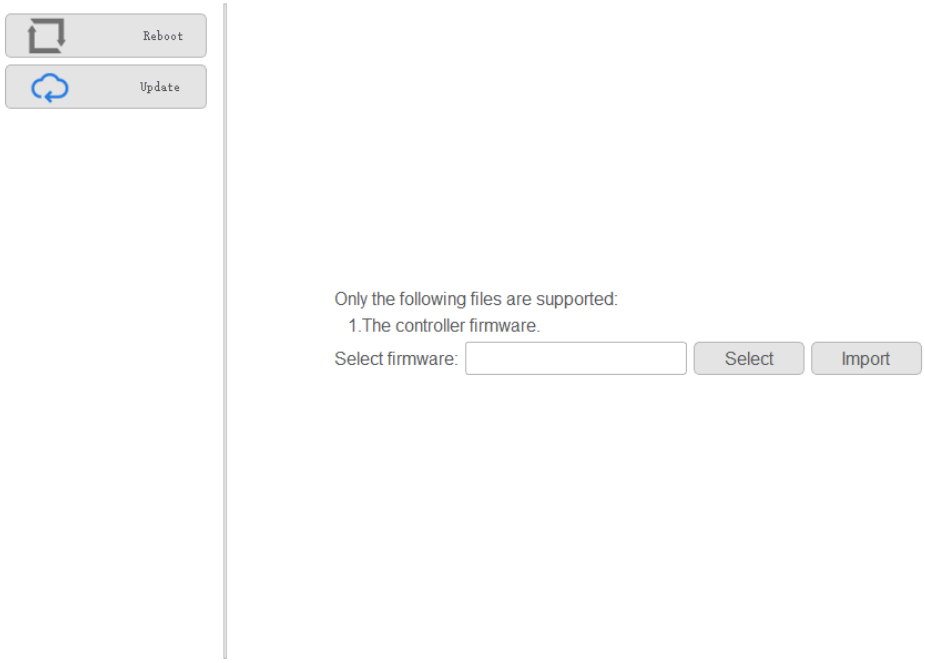


Figure 3.11 Update firmware

3.1.6 Remote Control

External equipment can send commands to a robot by different remote control modes, such as remote I/O mode and remote Modbus mode. The default mode is Teaching mode when the robot is shipped out. When you need to set the remote mode, please set it on DobotSCStudio with the robot motor in the disabled state.

⚠NOTICE

- Robot rebooting is not required when switching the remote mode.
- The emergency stop switch on the hardware is always available no matter what mode the robot system is in.
- Please DO NOT switch the remote mode when the robot is running in the current remote mode. You need to exit the current mode and then switch to the other remote mode. Namely, please stop the robot running and then switch the mode.
- If the robot motor is in the enabled status, the remote control cannot be used. Otherwise, an alarm will be triggered. Please activate the remote control in the disabled status.

3.1.6.1 Remote I/O

When the remote mode is I/O mode, external equipment can control a robot in this mode. The specific I/O interface descriptions are shown in Table 3.1.

Table 3.1 Specific I/O interface description

I/O interface	Description
Input (For external control)	

I/O interface	Description
DI 11	Clear alarm
DI 12	Continue to run
DI 13	Pause running in the I/O mode
DI 14	Stop running and exit the I/O mode
DI 15	Start to run in the I/O mode
DI 16	Emergency stop and exit the I/O mode
Output (For displaying the status)	
DO 13	Ready status
DO 14	Pause status
DO 15	Alarm status
DO 16	Running status

⚠NOTICE

All input signals are rising-edge triggered.

Prerequisites

- The project to be running in the remote mode has been prepared.
- The external equipment has been connected to the robot system by the I/O interface. The specific I/O interface description is shown in Table 3.1.
- The robot has been powered on.

  🕮NOTE

  The details on how to connect external equipment and use it are not described in this topic.

Procedure

Step 1 Click  **> Parameter > Offline.**

The remote control page is displayed, as shown in Figure 3.12.

Figure 3.12 Remote control page

Step 2 Select **IO** on the **Control Mode** section and select the offline project on the **Select Offline Project** section.

The **Save success, now remote control mode is IO** page is displayed.

Right now, only the emergency stop button is available.

Step 3 Trigger the starting signal on the external equipment.

The robot will move as the selected offline project. If the stop signal is triggered, the remote I/O mode will be invalid.

3.1.6.2 Remote Modbus

When the remote mode is Modbus mode, external equipment can control a robot in this mode. For details about Modbus registers. The specific Modbus register descriptions are shown in Table 3.2.

Table 3.2 Specific Modbus register description

Register address (Take a PLC as an example)	Register address (Robot system)	Description
Coil register		
00001	0	Start running in the remote Modbus mode
00002	1	Pause running in the remote Modbus mode
00003	2	Continue to run

Register address (Take a PLC as an example)	Register address (Robot system)	Description
00004	3	Stop to run and exit the remote Modbus mode
00005	4	Emergency stop and exit the remote Modbus mode
00006	5	Clear alarm
Discrete input register		
10001	0	Auto-exit
10002	1	Ready status
10003	2	Pause status
10004	3	Running status
10005	4	Alarm status

Prerequisites

- The project to be running in the remote mode has been prepared.
- The robot has been connected to the external equipment with the Ethernet interface. You can connect them directly or via a router, please select based on site requirements.

  The IP address of the robot system must be in the same network segment of the external equipment without conflict. You can modify the IP address on the **ToolConfig** > **NetworkSetting** page; the default port is **502** and cannot be modified.
- The robot has been powered on.

  NOTE

  The details on how to connect external equipment and use it are not described in this topic.

Procedure

Step 1 Click > **Parameter** > **Offline**.

The remote control page is displayed, as shown in Figure 3.13.

Figure 3.13 Remote control page

Step 2 Select **Modbus** on the **Control Mode** section and select the offline project on the **Select Offline Project** section.

The **Save success, now remote control mode is Modbus** page is displayed.

Right now, only the emergency stop button is available.

Step 3 Trigger the starting signal on the external equipment.

The robot will move as the selected offline project. If the stop signal is triggered, the remote Modbus mode will be invalid.

3.1.7 RobotParams

You can set the velocity, acceleration or other parameters in different coordinate systems when jogging a robot or running robot programs. After setting the parameters, please click **Save**. Click > **Parameter** > **RobotParams** to enter **RobotParams** interface.

- Teach Joint Parameter: Set the maximum velocity and acceleration in the Joint coordinate system when jogging a robot. The jogging parameters of a SR robot in the Joint coordinate system are as shown in Figure 3.14.

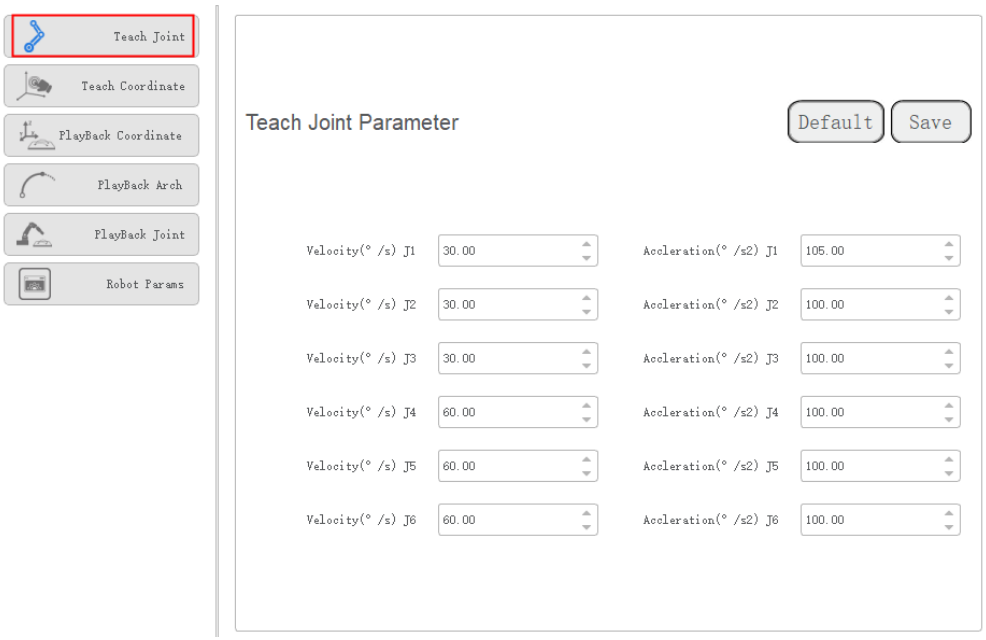


Figure 3.14 Jogging parameters in the Joint coordinate system

- Set the maximum velocity and acceleration in the Cartesian coordinate system when jogging a robot. The jogging parameters of a SR robot in the Cartesian coordinate system are as shown in Figure 3.15.

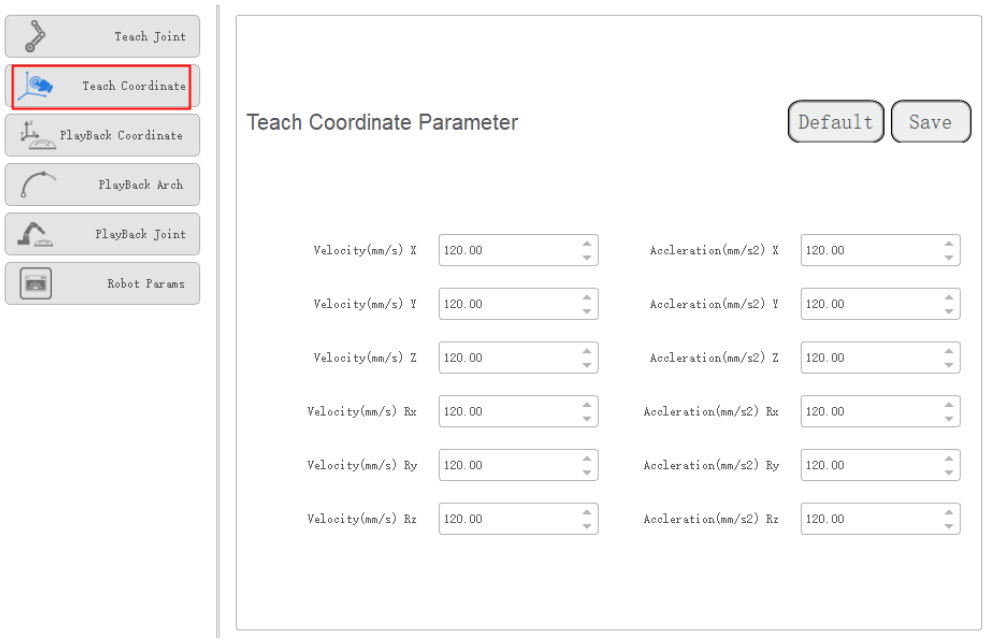


Figure 3.15 Jogging parameters in the Cartesian coordinate system

- Playback Joint Parameter: Set the maximum velocity, acceleration, and jerk in the Joint coordinate system when running robot programs. The playback parameters of a 6-axis

robot in the Joint coordinate system are as shown in Figure 3.16.

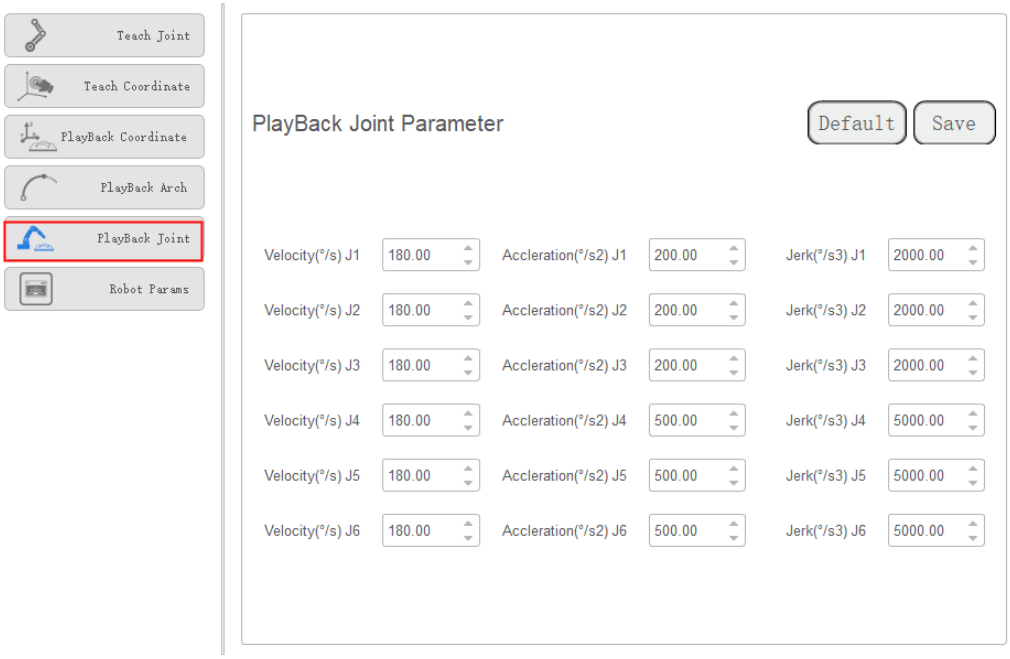


Figure 3.16 Playback parameters in the Joint coordinate system

- Playback Coordinate Parameter: Set the maximum velocity, acceleration and jerk in the Cartesian coordinate system when running robot programs. The playback parameters of a 6-axis robot in the Cartesian coordinate system are as shown in Figure 3.17.

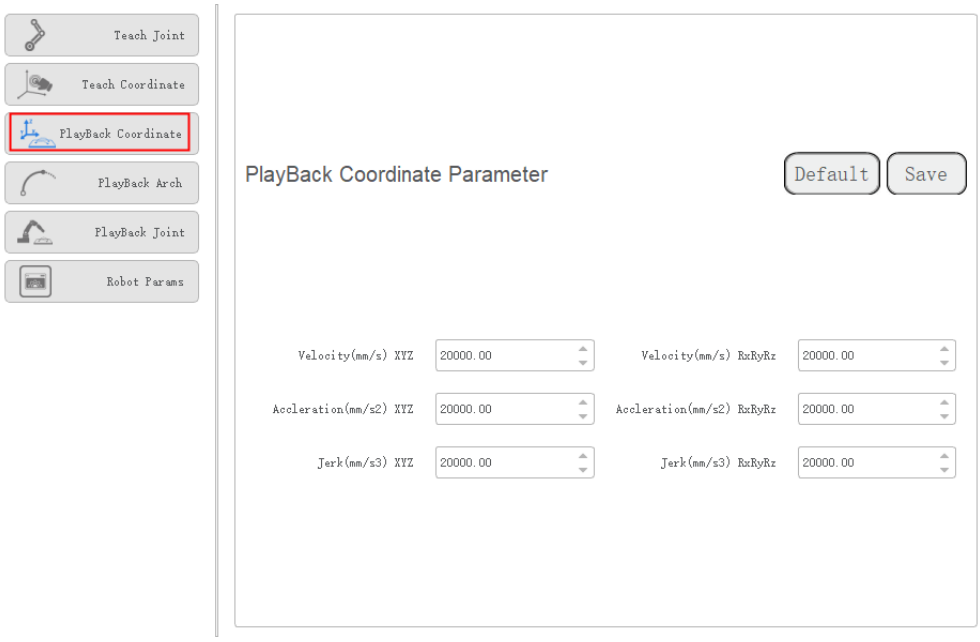


Figure 3.17 Playback parameters in the Cartesian coordinate system

- Playback Arch Parameter: If the motion mode is **Jump** when running robot programs, you need to set **StartHeight**, **EndHeight**, and **zLimit**.

  You can set 10 sets of Jump parameters. Please set and select any set of parameters for calling Jump command during programming, as shown in Figure 3.18.

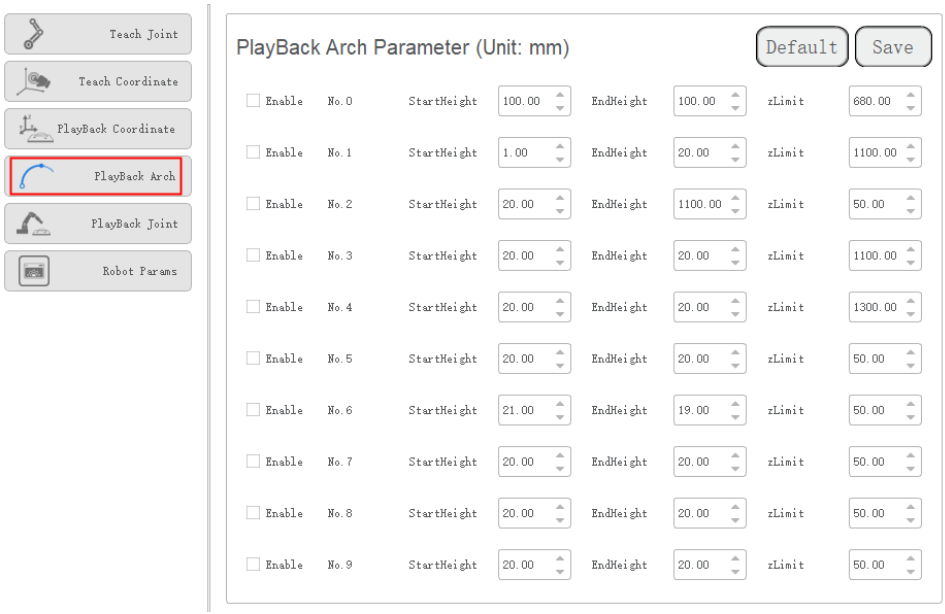


Figure 3.18 Jump parameters

- Robot Params: This function is only used for Dobot support engineer.

3.1.8 SafeSetting

3.1.8.1 Brake

If you want to drag joints by hand, please enable the braking function. Namely, Open each joint brake on the **Parameter** > **SafeSetting** > **Brake** page. When enable this function, please hold the robot arm to avoid damage.

Figure 3.19 Joint brake

3.1.8.2 Power

When the emergency stop switch is pressed, the robot will power off. You can click Power on the **Parameter** > **SafeSetting** > **Power** page to power on the robot. Also, you can power off the robot on this page.

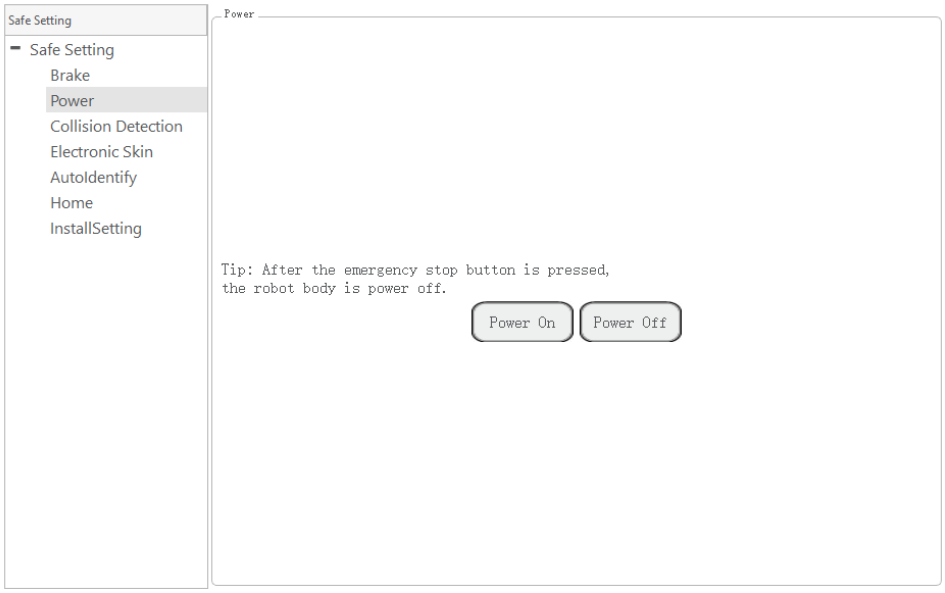


Figure 3.20 Control robot power on and off

3.1.8.3 Collision Detection

Collision detection is mainly used for reducing the impact on the robot arm, to avoid damage

to the robot arm or external equipment. If the collision detection is activated, the robot arm will stop running automatically when the robot arm hits an obstacle.

You can enable collision detection function on the **Parameter > SafeSetting > Collision Detection** page and set the collision level. Meanwhile, you can select **Automatically start dragging after collision**, namely, when the robot arm stops running after hitting an obstacle, you can drag robot to a safe position.

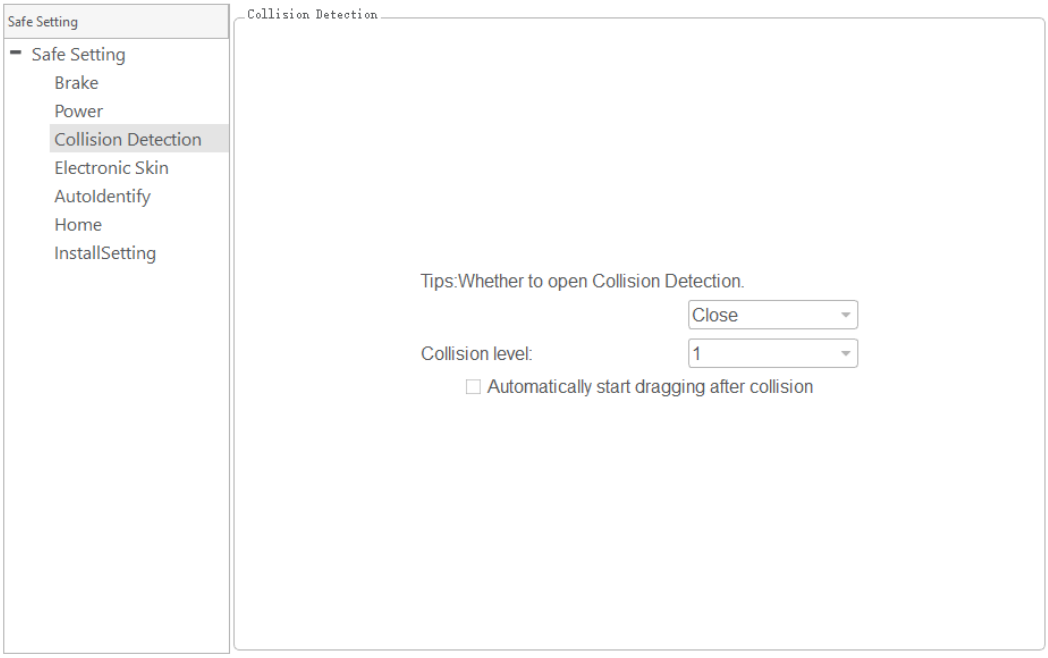


Figure 3.21 Collision detection

3.1.8.4 Electronic Skin

Electronic skin allows robot to respond in real time when robot meets an obstacle, helping robot avoid obstacle during running.

You can enable electronic skin function on the **Parameter > SafeSetting > Electronic Skin** page and set the robot status when meeting an obstacle. For example, robot can bypass the obstacle or stop running. You can also set the electronic skin parameters on this page, as shown in Figure 3.22.

Figure 3.22 Electronic skin

Table 3.3 Parameter setting

Parameter	Description
Avoid Velocity	Avoidance velocity when meeting obstacles Unit: mm/s Value range: 1~500. Recommended value: 100
Avoid Distance	Avoidance distance Unit: mm Value range: 0~200. Recommended value: 80
Avoid Acceleration	Avoidance acceleration when meeting obstacles Unit: mm/s^2 Value range: 1~50000. Recommended value: 1000
Resume Velocity	Recovery velocity after bypassing obstacles Unit: mm/s Value range: 1~500. Recommended value: 100
Resume Acceleration	Recovery acceleration after bypassing obstacles Unit: mm/s^2 Value range: 1~50000. Recommended value: 1000

3.1.8.5 Home

After some parts (motors, reduction gear units) of the robot have been replaced or the robot has

been hit, the origin of the robot will be changed. You need to reset the origin.

In the manual mode, put the robot in the original position where the keyways of the adjacent joints are aligned), and then enable robot motor and click  .

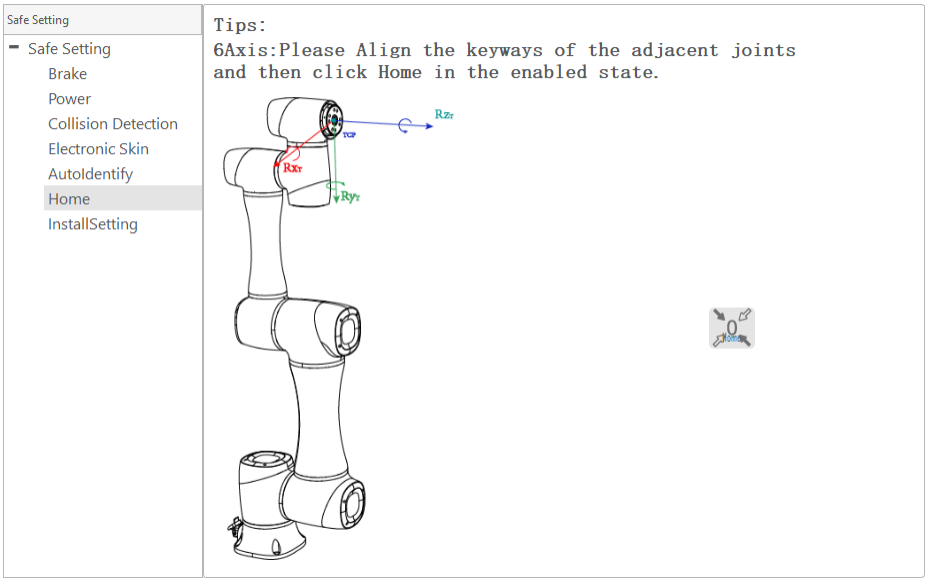


Figure 3.23 Homing operation

3.1.8.6 InstallSetting

The default is that the robot is mounted on a flat table or floor, in which case no change is needed on this page. However, if the robot is ceiling mounted, wall mounted or mounted at an angle, you need to set the rotation angle and slop angle in the disabled status.

Slop angle is the angle that robot rotates counterclockwise around X-axis at the origin point.

Rotation angle is the angle that robot rotates counterclockwise around Z-axis at the origin point.

Figure 3.24 Installation setting

3.2 ToolConfig

3.2.1 BasicConfig

User can view versions of software, controller, algorithm on the **ToolConfig > BasicConfig > Version** page and Select language on the **ToolConfig > BasicConfig > Language** page. Also, you can modify the password on the **ToolConfig > BasicConfig >UserMode** page.

3.2.2 PlugInfo

User can check the plug information on this page, including author, version, etc. The details will not be described in this topic.

3.2.3 EndEffector

User can install end-effector plugins on the ToolConfig > EndEffector. DobotSCStudio provides kinds of plugins stored on the **Installation directory/DobotSCStudio/endPackage** path. You can select a plugin to install based on site requirements.

We will take DH plugin as an example to describe how to install.

Step 1 Click **Install** on the **EndEffector** page, select **DH-V2.zip**, then click **Open** to install DH gripper.

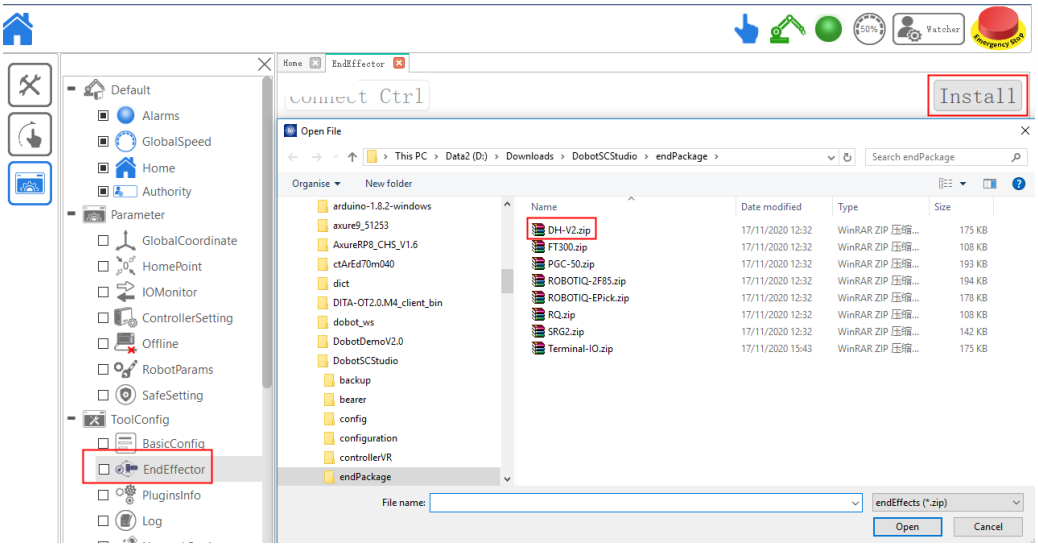


Figure 3.25 Install plugin

Figure 3.26 shows the DH gripper page.

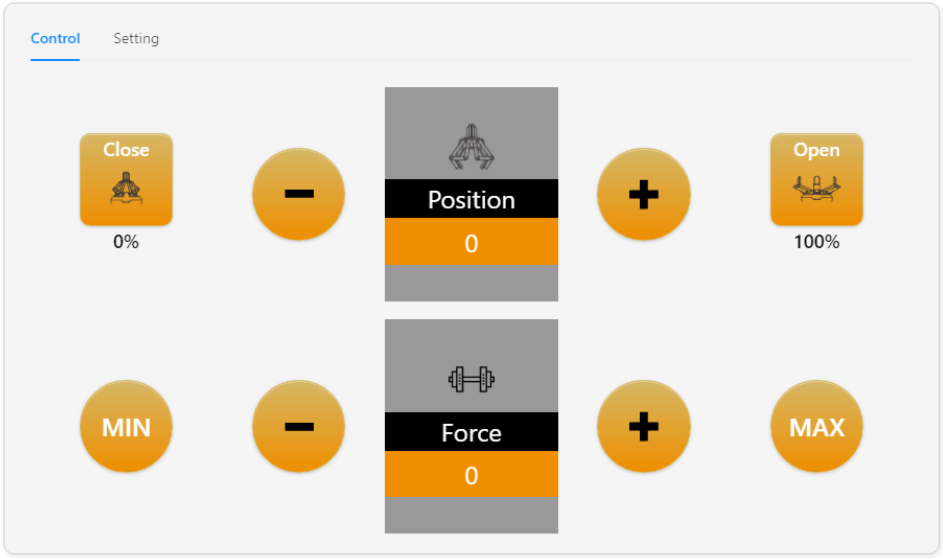


Figure 3.26 Installation finish

Step 2 Set **Baud** to 115200 and click **Init** on the **Setting** page.

Step 3 Set the gripper opening and closing position and force on the Control page.

3.2.4 Log

You can understand the historical operation of the robot by viewing the log. The log can be screened according to three types of logs: user operation, control error and servo error. Click **Reset** to clear the log.

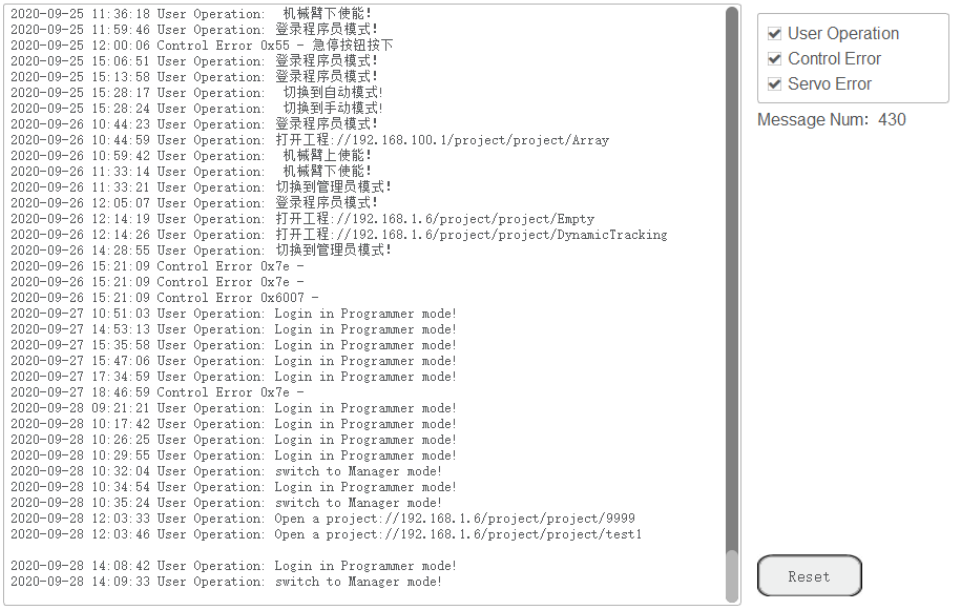


Figure 3.27 Log

3.2.5 Network Service

The robot system can be communicated with external equipment by the Ethernet interface which supports TCP, UDP and Modbus protocols. The default IP address is **192.16.5.1**. In real applications, if the TCP or UDP protocol is used, the robot system can be a client or a server based on site requirements; if the Modbus protocol is used, the robot system only can be the Modbus slave, and the external equipment is the master.

You can modify the IP address on the > **ToolConfig** > **NetworkSetting** page, as shown in Figure 3.28. The IP address of the robot system must be in the same network segment of the external equipment without conflict.

Figure 3.28 IP address setting

- If the robot system connects to the external equipment directly or with a switchboard, please select **Manual IP Address** and modify **IP Address**, **subnet mask**, **default gateway**, and then click **Save**.
- If the robot system connects to the external equipment with a router, please select **Auto IP Address** to assign IP address automatically, and then click **Save**.

⚠NOTICE

Please DO NOT insert the network cable into the WAN interface when using a router for the connection.

3.2.6 RobotState

In this page, you can view the robot's status, including controller temperature, voltage, current, etc.

Figure 3.29 Robot state

3.2.7 Tools

DobotSCStudio supports serial port debugging, TCP/UDP debugging and Modbus debugging for user. The details on how to use it will not be described in this topic.

3.2.8 VirtualRobot

When user jogs or runs a robot, the virtual simulation interface can be used to view the robot movement in real time.

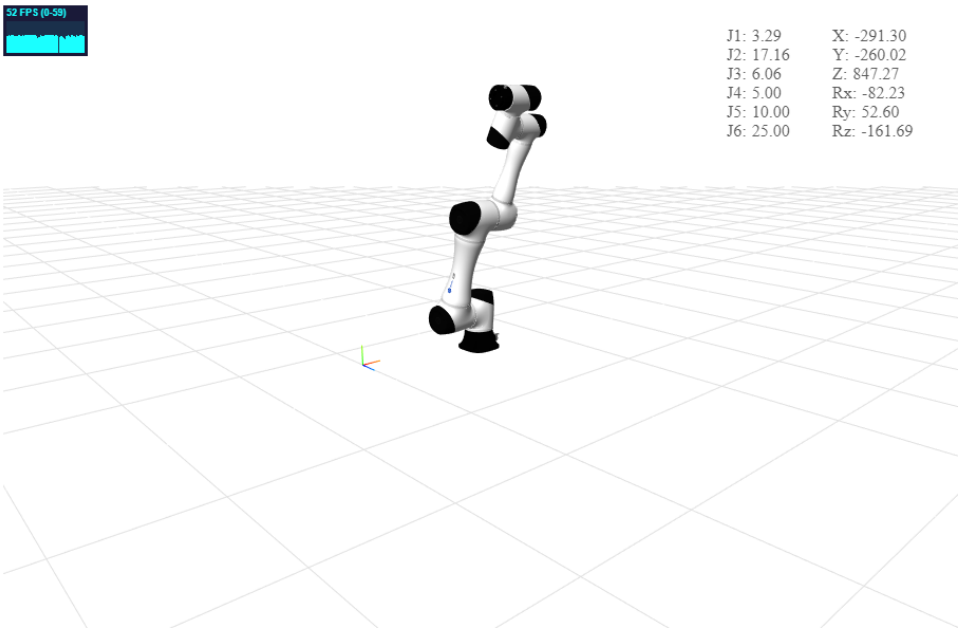


Figure 3.30 Virtual simulation

3.2.9 WiFi Setting

The robot system can be communicated with external equipment by the WiFi module. You can modify the WiFi name and password on the > **ToolConfig** > **WiFiSetting** page and then restart the controller to make effective. The default password is **1234567890**.

Figure 3.31 WiFi password

3.3 Programming

3.3.1 Project Description

The robot program is managed in project form, including teaching points list, global variables, and program files. Figure 3.32 shows the project structure.

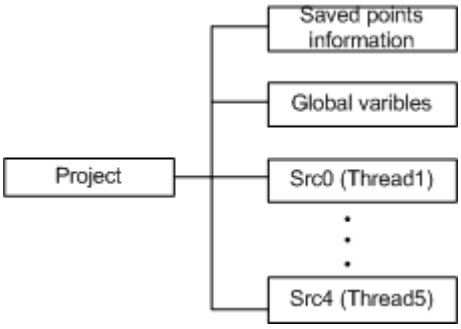


Figure 3.32 Project structure

3.3.2 Programming Interface Description

When programming a robot, please switch DobotSCStudio to the manual mode. Figure 3.33 shows the programming panel and Table 3.4 lists its description.

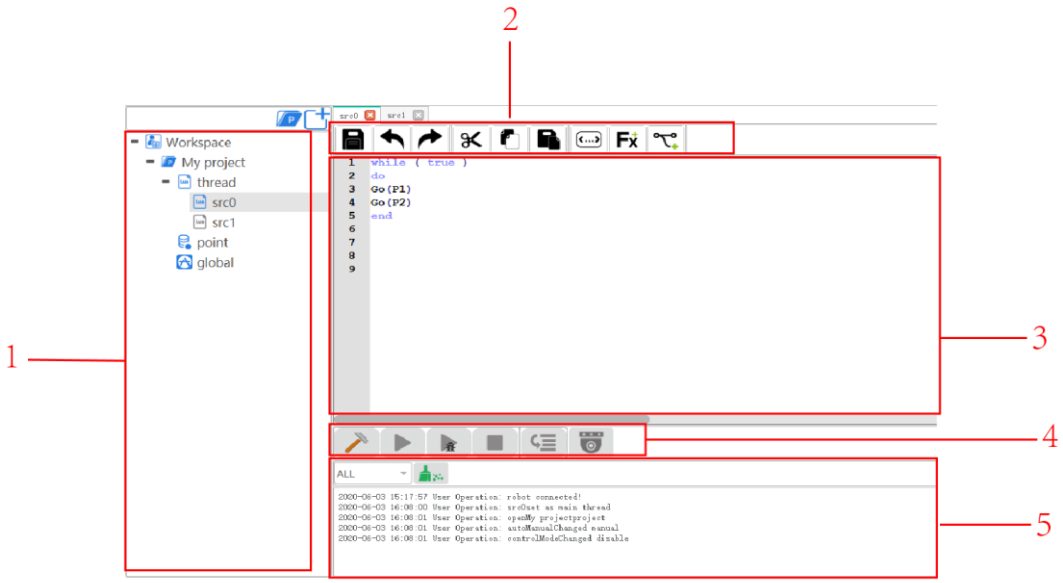


Figure 3.33 Programming panel

Table 3.4 Programming panel description

No.	Description
1	Project files • point: Teach points. For details, please see *3.3.3.2 Teaching points* • global: Define and initialize global variables or functions • Src0~Src4: Multithreaded files. The number of threads is related to **CPU** that is set when creating a project. Up to 5 threads can be executed simultaneously
2	Common buttons. For details, please see Table 3.5

No.	Description
3	Programming area
4	Running button, for details, please see Table 3.6
5	Debug result

Table 3.5 lists the common button description.

Table 3.5 Common button description

Icon	Description
	Save the project
	Cancel
	Redo
	Copy the selected codes
	Cut the selected codes
	Paste the selected codes
	Motion command libraries.
	Code comment
	Common operation instructions and process control instructions

3.3.3 Programming Description

Figure 3.34 shows the programming process.

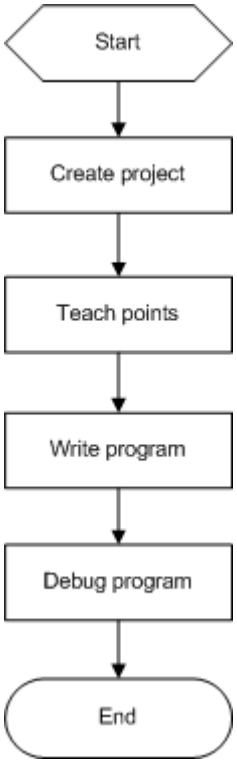


Figure 3.34 Programming process

3.3.3.1 Creating Project

Prerequisites

- The robot has been powered on.
- The controller has been in the manual mode.

Procedure

Step 4 Click  .

The programming page is displayed, as shown in Figure 3.35.

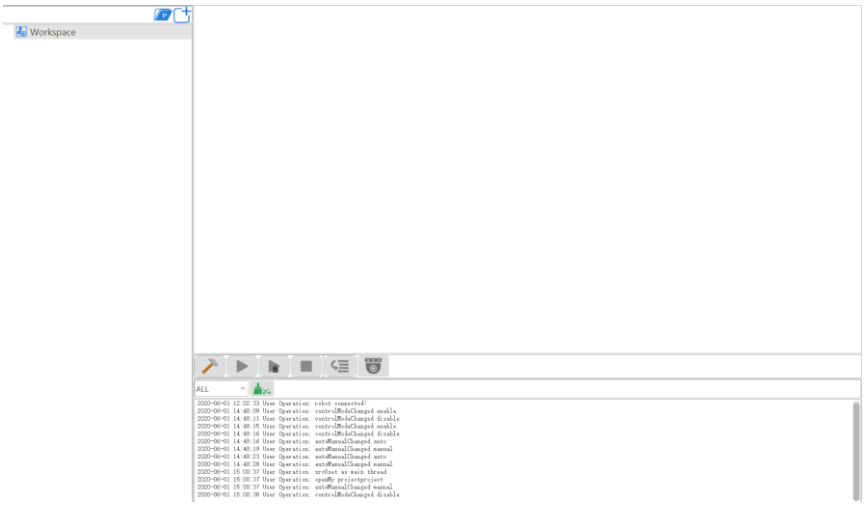


Figure 3.35 Programming page

Step 5 Click  to enter the project creating page, input the project name, you can also select a template. Click **OK**.

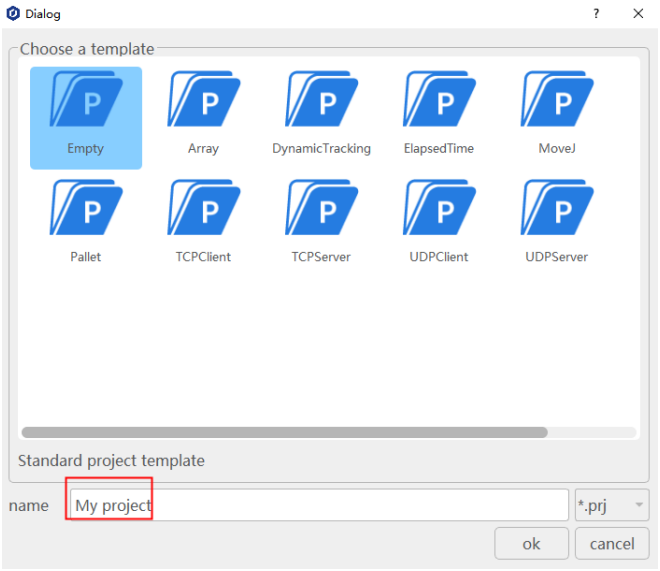


Figure 3.36 Create a project

Step 6 Set the number of threads based on site requirements, as shown in Figure 3.37. Click **thread** and right-click **New thread file**.

The maximum number of threads is **5**.

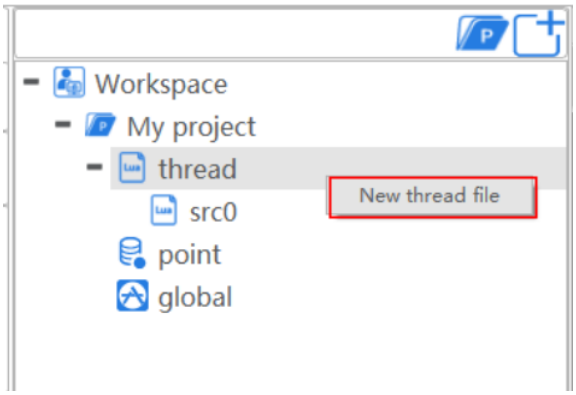


Figure 3.37 Create a project

Step 7 (Optional) Import the existing taught positions list.

If you want to reuse a taught positions list from an existing project, please right-click **Point** and click **import points file**, as shown in Figure 3.38.

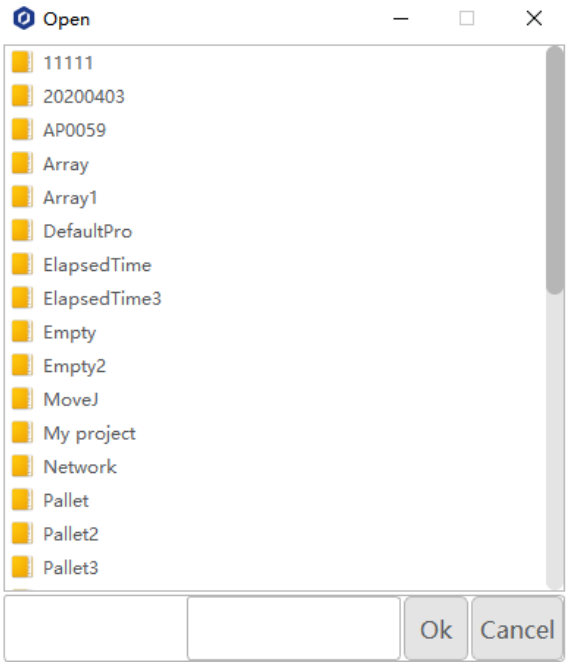


Figure 3.38 Import the existing teaching points list

3.3.3.2 Teaching points

Prerequisites

- The project has been created or imported.
- The controller has been in the manual mode.

Procedure

After creating a project, please teach positions on the **point** page for calling commands when programming a robot. If the existing taught positions list has been imported, this operation can be

skipped.

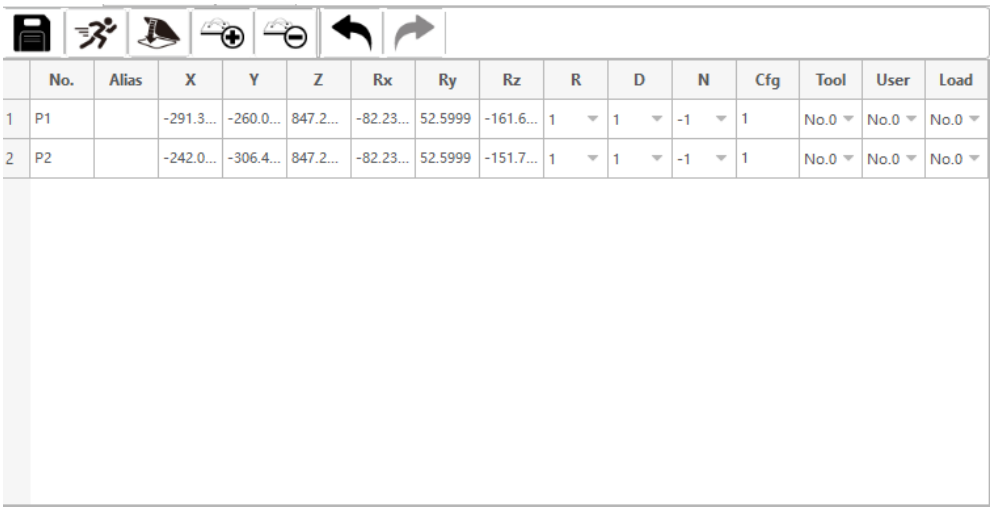
Step 1 Enable the robot motor.

Step 2 Click **Jog** buttons to move the robot to a point.

Step 3 Double click **Point** enter point page and click  to add a teaching point.

The teaching point information is displayed on the **point** page, as shown in Figure 3.39.

Arm is the arm orientation. **Tool** is the Tool coordinate system, **User** is the User coordinate system, and **Load** is the point load parameter.



	No.	Alias	X	Y	Z	Rx	Ry	Rz	R	D	N	Cfg	Tool	User	Load
1	P1		-291.3...	-260.0...	847.2...	-82.23...	52.5999	-161.6...	1	1	-1	1	No.0	No.0	No.0
2	P2		-242.0...	-306.4...	847.2...	-82.23...	52.5999	-151.7...	1	1	-1	1	No.0	No.0	No.0

Figure 3.39 Teaching points list of SCARA robot

Table 3.6 Button description

Button	Description
	Add a point
	Delete a point
	Cover a point. Select a teaching point, after jogging the robot to a point, click the icon to cover the selected teaching point
	Run to a point, select a point, click the button to run the robot to this point
	Save teaching point

Button	Description
	Cancel
	Recover

- You can select a taught position and double-click the parameters on the line to modify the relevant information.
- Also, you can select a taught position and click  to cover the current taught position.

Step 4 Add points by referring to Step 2 and Step 3.

Step 5 Click  to save the teaching points.

3.3.3.3 Writing a Program

Prerequisites

- The project has been created or imported.
- The points have been taught.

Procedure

In the robot system, we have encapsulated common commands for programming with Lua language.

Supposing that the **P1** and **P2** points have been taught on the **point** page. We call **Go** command on the Src0 Page, to make the robot move between point P1 and point P2 circularly, as shown in Figure 3.40.

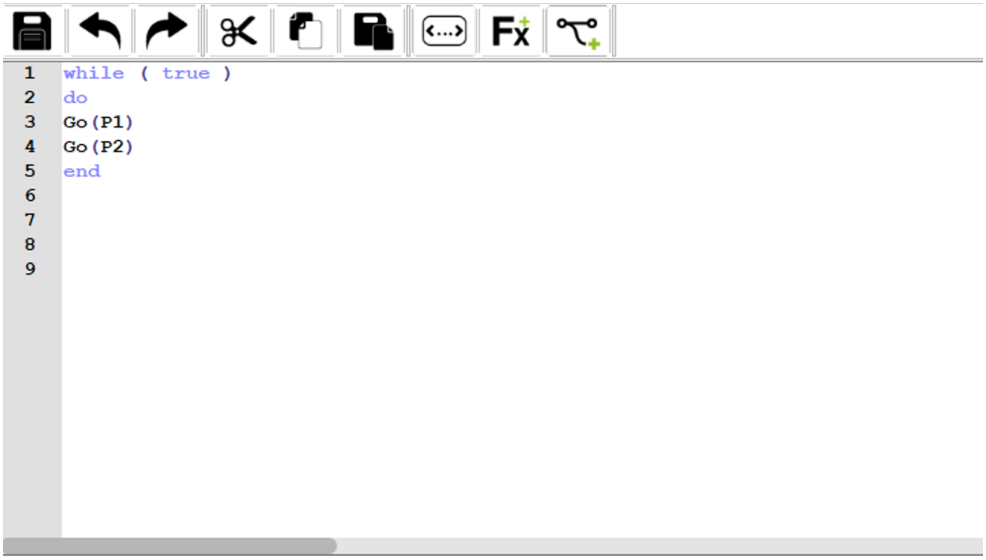


Figure 3.40 Lua program

Step 1 Click >Syntax, double click while to call the loop command, and set the loop condition to **True.**

Step 2 Add the motion commands between **do** and **end.**

1. Click > **Move**.

   The motion commands list is displayed, as shown in Figure 3.41.

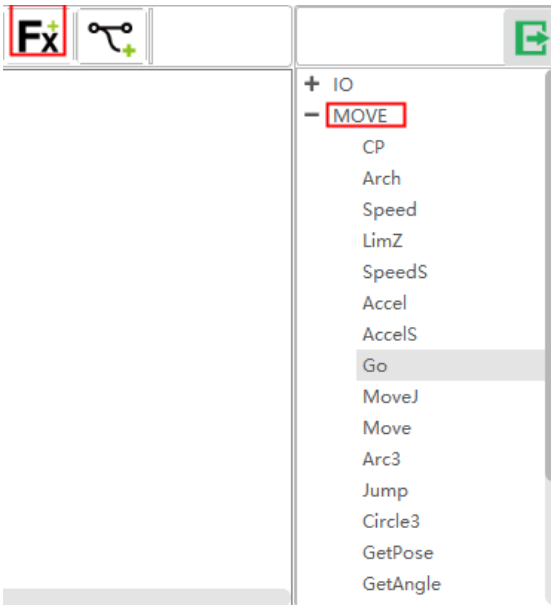


Figure 3.41 Motion commands list

2. Select a command from the motion commands list and click it on the edit window of the **Src0** page.

The parameter setting page of this command is displayed. Take the **Go** command as an example. You can set the point where the robot will move to in the **Go** mode.

3. Select **P1** on the **First Parameter** section of the Go command setting page, and then click **Insert**. Namely, the robot moves to **P1** point in the **Go** mode.

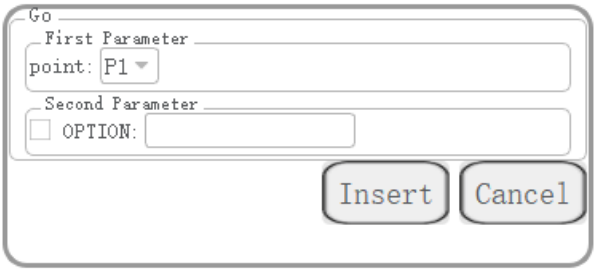


Figure 3.42 Call the **Go** command

If you want to set the motion speed, arm orientation, you can set them on the **Second Parameter** section, as shown in Figure 3.43.

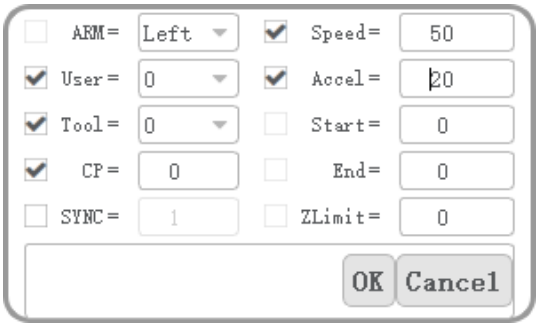


Figure 3.43 Set the optional parameters

4. Wrap and execute **2** again.
5. Select **P2** on the **First Parameter** section of the **Go** command setting page, and then click **Insert**. Namely, the robot moves to **P2** point in the **Go** mode.

📖NOTE

If you want to debug a robot program step by step, please set the breakpoint when writing the program. Click the right line to set, as shown in Figure 3.44.

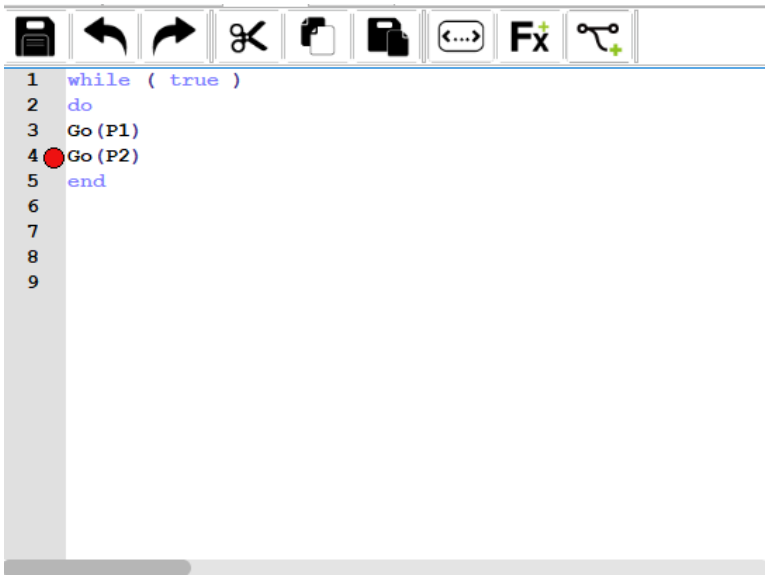


Figure 3.44 Set breakpoint

Step 3 Click  .

Now, a simple program has been written.

3.3.3.4 Debugging Program

Step 1 Switch DobotSCStudio to the auto mode.

Step 2 Click  to enable the motor.

Now, the programming page is as shown in Figure 3.45.

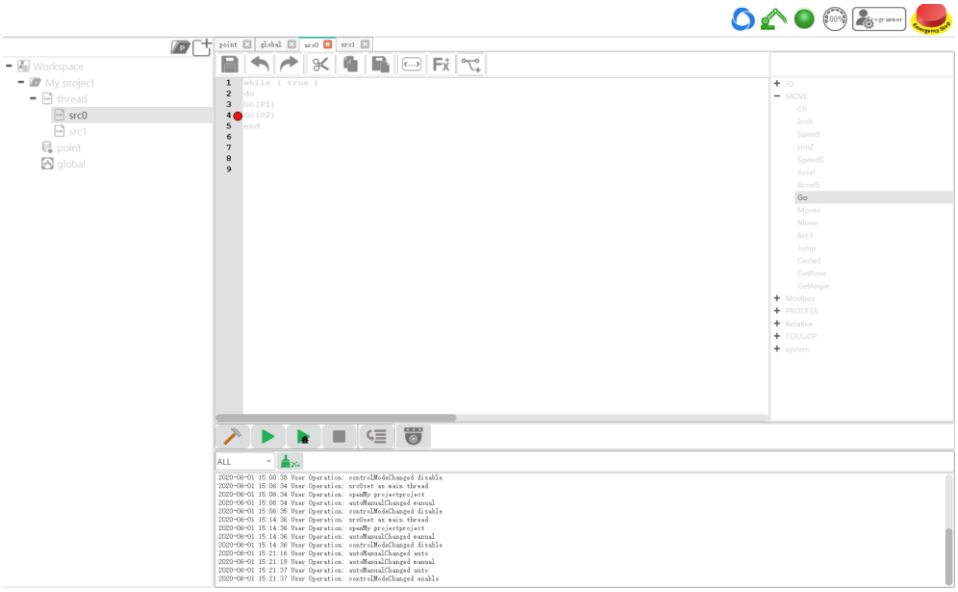


Figure 3.45 Programming page

Table 3.7 lists the description of the program-running buttons which are shown in Figure 3.45

Table 3.7 Program-running button description

Icon	Description
	Build program Check if the code is correct
	Once-click run After clicking this button,  turns into  and the program starts running If you need to pause the running program, please click 
	Start to run a program Click once: Start to debug a program,  turns into  Click twice: Start to run a program,  turns into  If you need to pause the running program, please click 
	Stop the running program
	Step into This button is valid only if  turns into 
	Monitor The debugging process can be monitored in real time while debugging the program

Step 3 Click  to start debugging the program.

- If you has been set a breakpoint, the program will be run to the previous line of the breakpoint and then be stopped. If the program need to be run again, please click  and then click  .
- If you want to run a program step by step, please click  . After  turns into  , please click  .

3.4 Enabling

- Enable the motor in the manual mode: Click  in manual mode. When the icon  turns into  , you can jog the robot normally.
- Enable the motor in the auto mode: Click  in auto mode. When the icon  turns into  , the robot arm can be controlled by running the program.

3.5 Setting Global Velocity Rate

Please click  and then click buttons to increase or decrease the global velocity ratio by **1%**, **5%** or 1**0%** on the operation panel, as shown in Figure 3.46.

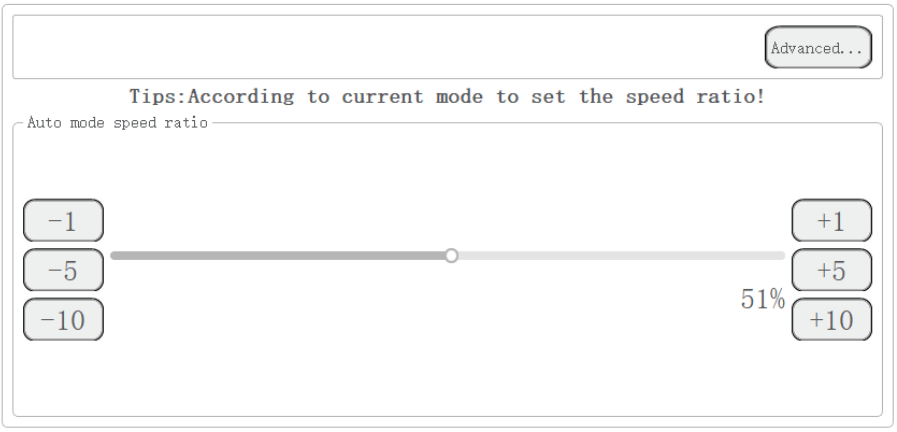


Figure 3.46 Modify the global velocity rate

When doing jogging or playback, the method calculating the velocity and acceleration for each axis (in Joint or Cartesian coordinate system) is shown as follows.

- Actual jogging velocity = the maximum jogging velocity * global velocity rate
- Actual jogging acceleration = the maximum jogging acceleration* global velocity rate
- Actual playback velocity = the maximum playback velocity * global velocity rate * the set velocity rate in the velocity function
- Actual playback acceleration = the maximum playback acceleration* global velocity rate * the set acceleration rate in the acceleration function
- Actual playback jerk = the maximum playback jerk * global velocity rate * the set acceleration rate in the jerk function

  NOTE

  - The maximum velocity, acceleration, or jerk can be set on the **Settings** page. For details, please see *3.1.7 RobotParams.*

- The rates (velocity rate, acceleration rate, or jerk rate) can be set in the related speed functions.

3.6 Alarm Description

If teaching point is incorrect, for example, a robot moves to where a point is at a limited position or a singular point, an alarm will be triggered.

If an alarm is triggered when running a robot, the alarm icon  on the DobotSCStudio turns into  . You can check the alarm information on the **Alarm** page, as shown in Figure 3.47.

Please clear the alarm as follows:

- If a limitation alarm is triggered, please jog the limited joint axis towards the opposite direction in the manual mode to clear the alarm.
- If other alarms are triggered, please click  in the manual mode on the alarm page to clear the alarm. If the alarm cannot be cleared, please reboot the robot.

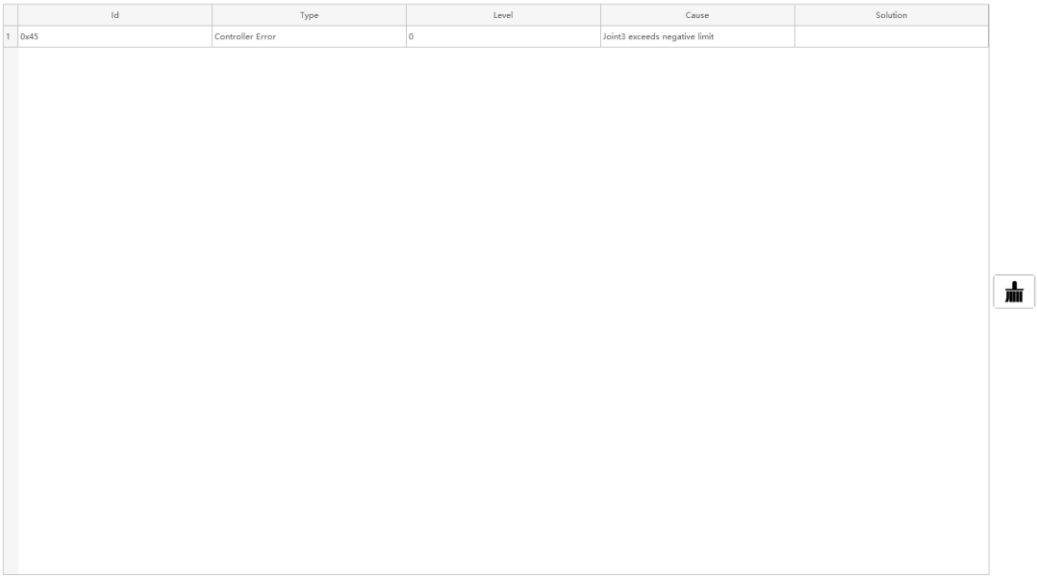


Figure 3.47 Alarm page

3.7 Point Load

To ensure optimum robot performance, it is important to make sure the load and inertia of the end effector are within the maximum rating for the robot.

The load is weight of the end effector and work piece, you can set the load when enabling the robot motor, as shown in Figure 3.48.

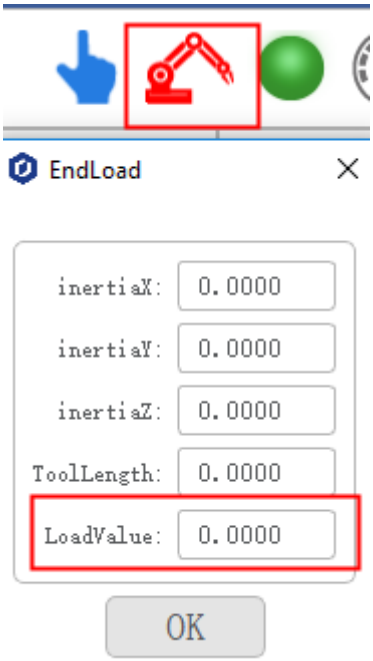


Figure 3.48 Set load

4. Process

4.1 Palletizing

4.1.1 Overview

In carrying applications, some parts are regularly arranged with uniform spacing and teaching part positions one by one results in a high error and poor efficiency. Palletizing process can resolve these problems.

A full palletizing process includes pallet parameters setting and pallet programming. After you set the pallet parameters on the teach pendant, the generated configuration file will be imported to the robot system automatically, then you can write a pallet program by calling pallet API based on site requirements.

4.1.2 Setting Pallet

Pallet parameter settings include basic parameter setting and path point setting. Basic parameter setting is to set pallet name, stack number, palletizing direction and stack spacing. Path points are the configured points on the assembly path or dismantling path.

- Transition point (point A): A point the robot must move to when assembling or dismantling stacks, which is fixed or varies with the pallet layer.
- Preparation point (point B): A point calculated by the target point and the set offset.

Target point (point C): The first stack point.

Figure 4.1 and Figure 4.2 show the assembly path and dismantling path.

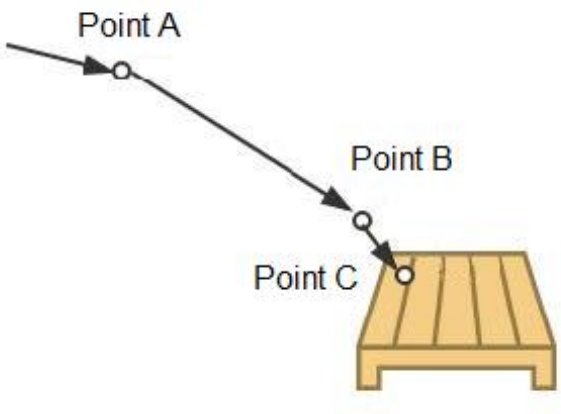


Figure 4.1 Assembly path

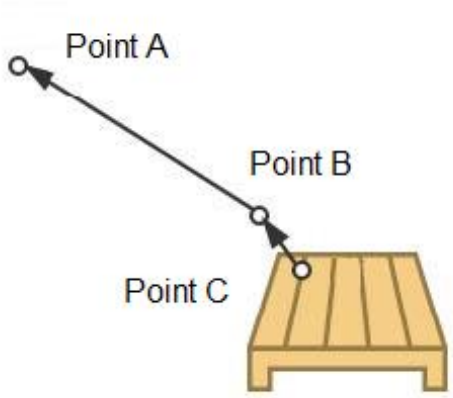


Figure 4.2 Dismantling path

Stack indicates parts or products to be carried. Pallet indicates an object which places the stacks. Assembling stack indicates that the robot places stacks to the pallet as the configured pallet type. Dismantling stack indicates that the robot takes out stacks from the pallet as the configured pallet type. Pallet type indicates the layout of all stacks placed on the pallet. In our robot system, only the matrix pallet is supported, on which the stacks are placed in regular intervals, as shown in Figure 4.3.

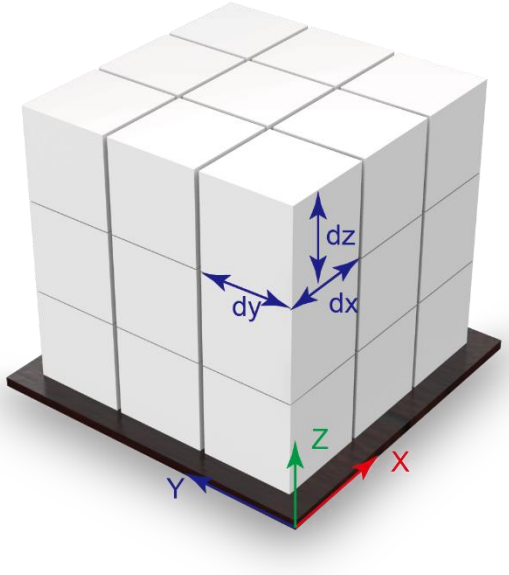


Figure 4.3 Matrix pallet

In this topic, we describe how to set pallet parameters. The 10 types of pallets can be defined.

Prerequisites

- The robot has been powered on.

- The suction cup or gripper kit has been mounted on the robot
- (Optional) The User coordinate system has been set on the pallet. When teaching positions, you can select the set User coordinate system based on site requirements.
- The robot motor has been enabled.
- The user's authority is programmer authority or higher authority.

Procedure

Step 1 Click **Process** > **MatrixPallet.**

The pallet page is displayed, as shown in Figure 4.4.

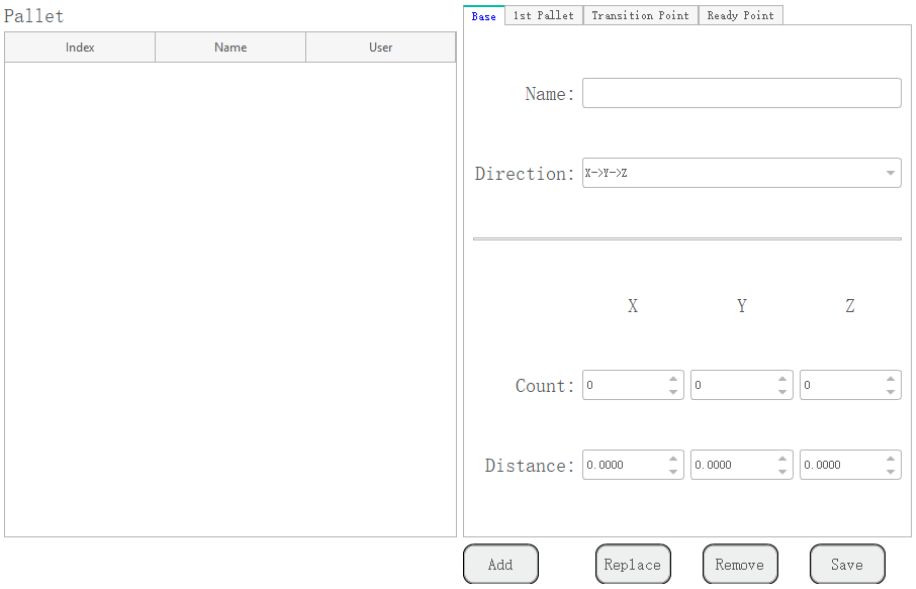


Figure 4.4 Pallet page

Step 2 Set the basic pallet parameters on the **Base** tab.

Table 4.1 shows the basic pallet parameter description.

Table 4.1 Basic pallet parameter description

Parameter	Description
Name	Pallet name
Direction	Palletizing direction Value: X->Y->Z or Y->X->Z In this topic, we select **X->Y->Z**
Count	Number of stacks in X, Y, Z direction respectively
Distance	Stack interval in X, Y, Z direction respectively

Step 3 Jog the robot to the first stack position and click **Get Pose** on the **1st Pallet** tab, as

shown in Figure 4.5.

UserCoord is the User coordinate system index, which needs to be consistent with the User coordinate system selected during teaching.

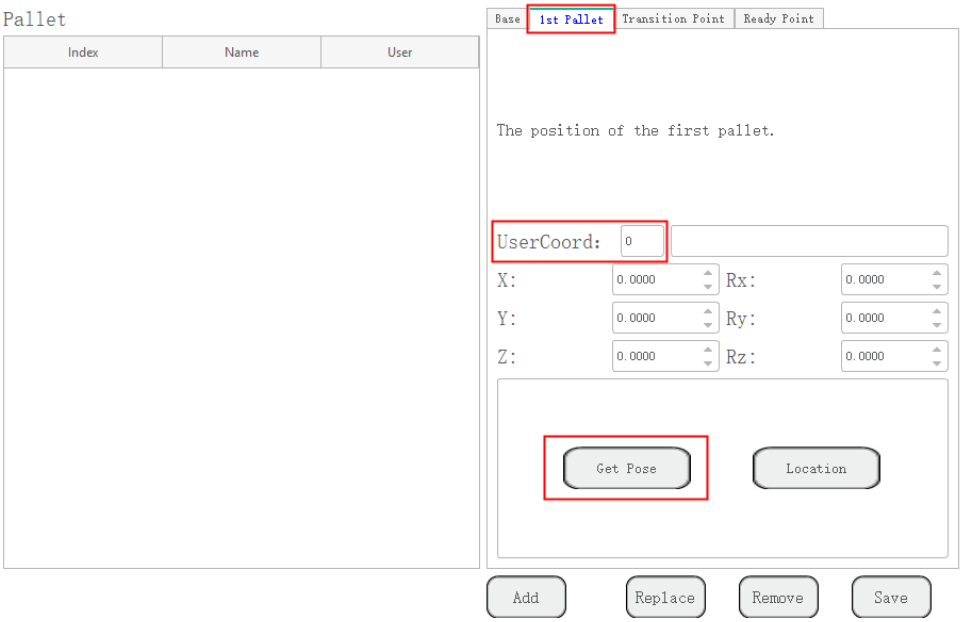


Figure 4.5 Teach the first stack position

Step 4 Jog the robot to the transition point and click **Get Pose** on the **Transition Point** tab, as shown in Figure 4.6.

UserCoord is the User coordinate system index, which needs to be consistent with the User coordinate system selected during teaching.

If **Variation with layer height** is selected, the transition point is varied with the pallet layer. If not, it is the fixed point.

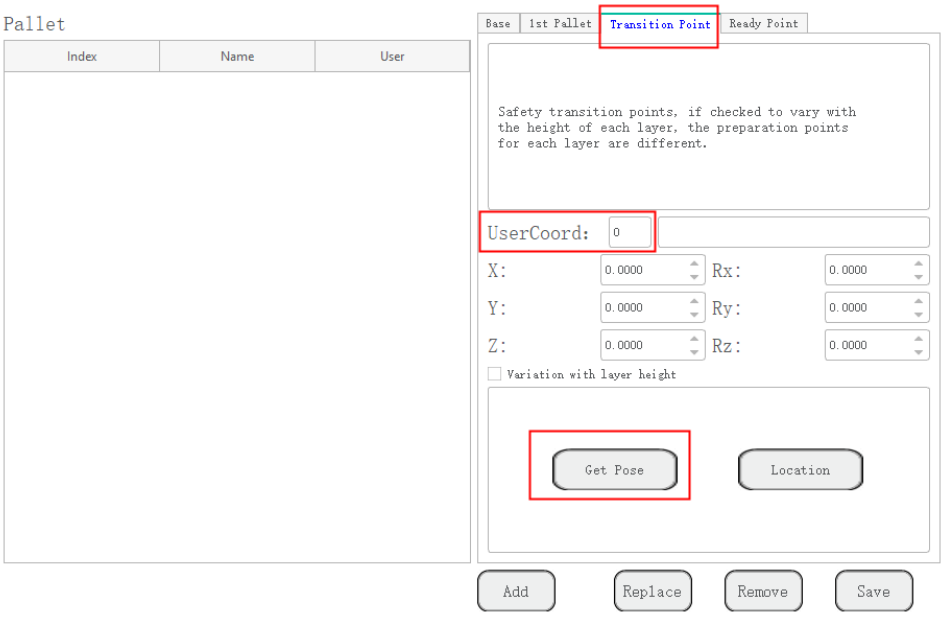


Figure 4.6 Teach the transition point

Step 5 Jog the robot to the position where is above the first stack, and click **Get Pose** on the **Ready Point** tab.

UserCoord is the User coordinate system index, which needs to be consistent with the User coordinate system selected during teaching.

Step 6 Click **Add** to generate the configuration file and import to the robot system automatically.

4.1.2.1 Example

After setting the pallet parameters, you can call pallet API for programming. This topic takes stack assembly as an example to describe.

Program 4.1 Stack assembly demo

```
local MPpick = MatrixPallet(0,1, "IsUnstack=true Userframe=8")          // Define the pallet instance
Reset(MPpick)                                                          // Initial the pallet instance
while true do
    MoveIn(MPpick,"velAB=90 velBC=50")                                 // Start to assemble
    MoveOut(MPpick)
    result=IsDone(MPpick)
    if (result == true)                                                // Check whether stack assembly is
complete
    then
        print("EXIT ...")
        break
```

```
    end
end
Release(MPpick)
```


Appendix A Servo Alarm Description

ID	Level	Description	Solution
2	0	SoftMotion axis is wrong	Check whether the communication of joints is working properly, then clear the alarm or contact technical support engineer
3	0	Bus synchronic mode is abnormal	Check whether the communication of joints is working properly, clear the alarm, or contact technical support engineer
10	5	The current position is out of Software limit	Jog the right joints towards the opposite direction
11	5	The current position is out of Hardware limit	Jog the right joints towards the opposite direction
12	5	The parameters of SoftMotion command are out of range	Enter the correct parameters
13	0	The servo does not support emergency stop or fast stop.	Please contact technical support engineer
14	0	The servo dose not power on	Check whether the hardware is working properly, and power on again, or contact technical support engineer
16	0	Difference between the set position and current position exceeds the range	Check whether the motor and circuit are working properly, and adjust the servo parameters
17	0	Homing error	Please operate homing procedure again
18	0	The license is lost	Re-acquire license
20	0	The servo is disabled	Enable the servo
21	0	Control mode of SoftMotion axis is wrong	System error, please contact technical support engineer
25	0	Invalid action at logical axis	System error, please contact technical support engineer
30	0	Interpolation module is not called again before the motion is over	System error, please contact technical support engineer
31	0	Input parameter type is not AXIS_REF	System error, please contact technical support engineer

ID	Level	Description	Solution
32	0	AXIS_REF variable has been replaced when the SoftMotion module was called	System error, please contact technical support engineer
33	0	The SoftMotion axis is disabled when it is running	System error, please contact technical support engineer
34	0	CAN NOT execute motion commands when the SoftMotion axis is in the current state	System error, please contact technical support engineer
35	0	The servo drive is abnormal when the SoftMotion is running	System error, please contact technical support engineer
40	0	Working speed is higher than the expected speed	System error, please contact technical support engineer
41	0	Working acceleration is higher than the expected acceleration	System error, please contact technical support engineer
42	0	Working deceleration is higher than the expected deceleration	System error, please contact technical support engineer
50	0	Invalid velocity or acceleration	Reset speed or acceleration
51	0	In this mode, the hardware limit is required, please set it	Please contact technical support engineer
60	0	Failed to open CNC file	System error, please contact technical support engineer
70	0	Invalid control mode	System error, please contact technical support engineer
71	0	In current mode, controller mode CAN NOT be modified	System error, please contact technical support engineer
72	0	SMC_SetControllerMode has been interrupted by MC_Stop or errorstop	System error, please contact technical support engineer
80	0	SoftMotion axes Initialization is wrong	Power on again
81	0	The SoftMotion axis is not in the required state	The SoftMotion axis switches to the corresponding state
85	0	The function does not support virtual or logical mode	System error, please contact technical support engineer
86	0	The bit width is invalid	Reset the bit width, value ranges from 8 to 32
91	0	Reduction ratio parameters does not be	System error, please contact technical

ID	Level	Description	Solution
		modified when the servo is working	support engineer
92	0	Invalid module period	Reset module period, it is lower than 0 or greater than half of the bandwidth, or please contact technical support engineer
93	0	The pulse value of module period is not an integer	System error, please contact technical support engineer
110	0	The fTaskCycle is set to 0	Reset the fTaskCycle
121	0	Servo has no response to the reset command	System error, please contact technical support engineer
122	0	Unable to reset	System error, please contact technical support engineer
123	0	The servo communication is abnormal	Check the EtherCAT node connection, or contact technical support engineer
170	0	Axis is not enabled	Enable axis
171	0	Homing operation is wrong. The SofotMotion axis is not operated homing procedure	System error, please contact technical support engineer
172	0	Homing operation is wrong. The SofotMotion has no response to the Homing operation	System error, please contact technical support engineer
173	0	Homing operation is wrong. The deceleration is not set.	Set deceleration
174	0	Homing operation is wrong. The servo is in the error status	System error, please contact technical support engineer
1000	0	CNC license is lost	Add CNC license
5000	0	Denominator of reduction ratio is 0	Reset the denominator of reduction ratio
60929	0	Communication error	Check whether the hardware is working properly, restart controller, or contact technical support engineer
8752	0	IPM abnormality	System error, please contact technical support engineer
8992	0	Software over-current	Power off and restart controller, or

ID	Level	Description	Solution
			please contact technical support engineer
9088	0	The current offset of homing point is too high	Reset the Zero point current offset
30080	0	EtherCAT communication is abnormal	System error, please contact technical support engineer
33920	0	Output speed is higher than the expected speed	Reduce the output speed
33921	0	Difference between the set speed and current speed exceeds the range	Check whether the hardware is working properly, restart the controller, or contact technical support engineer
33922	0	Motor is stalled	Check whether the motor is working properly, or contact technical support engineer
29568	0	Encoder communication is abnormal	Check whether the communication of encoder is working properly, or contact technical support engineer
29569	0	Encoder is abnormal	Check whether the hardware is working properly, or contact technical support engineer
29570	0	Encoder battery is abnormal	Please contact technical support engineer
29571	0	Encoder internal error	System error, please contact technical support engineer
29572	0	Encoder CRC check error	System error, please contact technical support engineer
29573	0	Auxiliary Encoder is disconnected	System error, please contact technical support engineer
29574	0	Auxiliary Encoder internal error	System error, please contact technical support engineer
29575	0	Auxiliary Encoder CRC check error	System error, please contact technical support engineer
34321	0	Difference between the set position and current position exceeds the range	System error, please contact technical support engineer
34322	0	Position is out of range	Enter the correct parameters

ID	Level	Description	Solution
12832	0	Voltage between PN is too low	System error, please contact technical support engineer
12816	0	Voltage between PN is too high	System error, please contact technical support engineer
17168	0	Driver temperature is too high	Check whether the hardware is working properly, or contact technical support engineer
9040	0	Module in overload status	Check whether the hardware is working properly, or contact technical support engineer
13184	0	Driver output phase is wrong	Wire as the correct phase sequence
13185	0	Driver output phase is lost	Check whether the hardware is working properly, or contact technical support engineer
12592	0	Driver input phase is lost	Check whether the hardware is working properly, or contact technical support engineer
21569	0	Driver connection is abnormal	Check whether the hardware is working properly, or contact technical support engineer
21008	0	Driver recognition is abnormal	Check whether the hardware is working properly, or contact technical support engineer
21120	0	FPGA configuration is wrong	System error, please contact technical support engineer
21121	0	System error	Please contact technical support engineer
21122	0	STO safety wiring is fault	System error, please contact technical support engineer
29056	0	Motor is in overload status	Check whether the hardware is working properly, or contact technical support engineer
16912	0	Motor temperature is too high	Check whether the hardware is working properly, or contact technical support engineer
29057	0	Brake malfunction	Check whether the hardware is

ID	Level	Description	Solution
			working properly, or contact technical support engineer
29058	0	External brake resistor is in overload status	Check the cable connection, and set an appropriate resistance value, reduce the load
29059	0	Failed to enable	Check the cable connection, and enable again

Appendix B Controller Alarm Description

ID	Level	Description	Solution
16	5	The planned point is closed to the shoulder singularity point	Reselect the movement points
17	5	Inverse kinematics error with no solution	Reselect the movement points
18	5	Inverse kinematics error with result out of working area	Reselect the movement points
19	5	The starting point and the end point are the same when the JUMP command, ARC command or Circle command is running	Reselect the movement points
20	5	The points of arc are wrong	Enter the correct points
21	5	Parameters of JUMP command are wrong, The starting height or end height is negative or the zLimit value is lower than the starting point or the end point	Enter the correct parameters
22	5	Arm orientation error	Reselect the movement points
23	5	The planned point is out of range of the workspace in MOVL mode	Reselect the movement points
24	5	The planned point is out of range of the workspace in ARC mode	Reselect the movement points
25	5	The planned point is out of range of the workspace in JUMP mode	Reselect the movement points"
26	5	The planned point is closed to the wrist singularity point	Reselect the movement points
27	5	The planned point is closed to the elbow singularity point	Reselect the movement points
28	0	The motion command is wrong	System error, please contact technical support engineer
29	5	Speed parameter is wrong	Enter the correct parameters
32	5	Inverse kinematics error with shoulder singularity when robot moving	Reselect the movement points

ID	Level	Description	Solution
33	5	Inverse kinematics error with no solution when robot moving	Reselect movement points
34	5	Inverse kinematics error with result out of working area when robot moving	Reselect movement points
35	5	Inverse kinematics with wrist singularity when robot moving	Reselect movement points
36	5	Inverse kinematics with elbow singularity when robot moving	Reselect movement points
37	5	The Joint angle is changed over 180 degree	Reselect movement points
48	5	Joint1 is overspeed	Reset the speed or reselect the movement point away from the singularity
49	5	Joint2 is overspeed	Reset the speed or re-select the movement point away from the singularity
50	5	Joint3 is overspeed	Reset the speed or re-select the movement point away from the singularity
51	5	Joint4 is overspeed	Reset the speed or reselect the movement point away from the singularity
52	5	Joint5 is overspeed	Reset the speed or reselect the movement point away from the singularity
53	5	Joint6 is overspeed	Reset the speed or reselect the movement point away from the singularity
54	0	Joint1 position lag error	System error, restart controller or contact technical support engineer
55	0	Joint2 position lag error	System error, restart controller or contact technical support engineer
56	0	Joint3 position lag error	System error, restart controller or contact technical support engineer
57	0	Joint4 position lag error	System error, restart controller or contact technical support engineer

ID	Level	Description	Solution
58	0	Joint5 position lag error	System error, restart controller or contact technical support engineer
59	0	Joint6 position lag error	System error, restart controller or contact technical support engineer
64	5	Positive limit alarm of Joint1	Jog the right joints towards the opposite direction
65	5	Negative limit alarm of Joint1	Jog the right joints towards the opposite direction
66	5	Positive limit alarm of Joint2	Jog the right joints towards the opposite direction
67	5	Negative limit alarm of Joint2	Jog the right joints towards the opposite direction
68	5	Positive limit alarm of Joint3	Jog the right joints towards the opposite direction
69	5	Negative limit alarm of Joint3	Jog the right joints towards the opposite direction
70	5	Positive limit alarm of Joint4	Jog the right joints towards the opposite direction
71	5	Negative limit alarm of Joint4	Jog the right joints towards the opposite direction
72	5	Positive limit alarm of Joint5	Jog the right joints towards the opposite direction
73	5	Negative limit alarm of Joint5	Jog the right joints towards the opposite direction
74	5	Positive limit alarm of Joint6	Jog the right joints towards the opposite direction
75	5	Negative limit alarm of Joint6	Jog the right joints towards the opposite direction
76	5	Posture joint self-interference: type1	Leave the wrong position and reselect the movement point
77	5	Posture joint self-interference: type2	Leave the wrong position and reselect the movement point
78	5	Posture joint self-interference: type3	Leave the wrong position and reselect the movement point

ID	Level	Description	Solution
80	0	Joint1 loses step	System error, restart controller or contact technical support engineer
81	0	Joint2 loses step	System error, restart controller or contact technical support engineer
82	0	Joint3 loses step	System error, restart controller or contact technical support engineer
83	0	Joint4 loses step	System error, restart controller or contact technical support engineer
84	0	Joint5 loses step	System error, restart controller or contact technical support engineer
85	0	Joint6 loses step	System error, restart controller or contact technical support engineer
96	0	Joint1 status is wrong	System error, restart controller or contact technical support engineer
97	0	Joint1 is disabled	Enable all joints
99	0	Joint2 status is wrong	System error, restart controller or contact technical support engineer
100	0	Joint2 is disabled	Enable all joints
102	0	Joint3 status is wrong	System error, restart controller or contact technical support engineer
103	0	Joint3 is disabled	Enable all joints, or contact technical support engineer
105	0	Joint4 status is wrong	System error, restart controller or contact technical support engineer
106	0	Joint4 is disabled	Enable all joints, or contact technical support engineer
108	0	Joint5 status is wrong	System error, restart controller or contact technical support engineer
109	0	Joint5 is disabled	Enable all joints, or contact technical support engineer
111	0	Joint6 status is wrong	System error, restart controller or contact technical support engineer
112	0	Joint6 is disabled	Enable all joints, or contact technical support engineer

ID	Level	Description	Solution
114	5	Homing error	Please operate homing procedure again
115	0	Fail to enable controller	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
116	0	The emergency stop button is pressed	Release emergency stop button， clear the alarm and power on again
117	5	Collision detection	Keep away from the obstruction, clear the alarm and continue to run robot
118	0	Security I/O is disconnected	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
119	0	Electronic skin collision detection	Keep away from the obstruction, clear the alarm and continue to run robot
120	5	Six dimension force is not enabled	Enable six dimension force
121	0	Fail to initialize the controller	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
122	0	Contactor is open	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
123	0	The feedback board did not feedback the power on signal	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
124	0	AC detection board status is wrong	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer

ID	Level	Description	Solution
125	0	The feedback board data is not updated	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
126	0	The switch on the controller board is pressed	Power on again, or contact technical support engineer
127	0	CAN NOT connect to Modbus of the feedback board	Power on again, or contact technical support engineer
128	0	Internal error - time overflow	System error, restart controller or contact technical support engineer
144	5	The selected points are wrong	Enter the correct parameters
146	5	The target point is out range of workspace when inching robot	Check whether the target point is in the workspace of the robot
161	0	Control mode switching error	System error, restart controller or contact technical support engineer
192	5	CAN NOT pause in tracking process	Rerun the script
193	5	CAN NOT run joint interpolated motion commands in tracking process	Select the correct motion command
194	5	Tracking limit	Increase tracking range or speed up
208	5	The fitting point is not enough	The trajectory needs 4 points at least
209	5	Playback preprocessing is failed	Record a new trajectory
1772	0	Contactor is open	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
1773	0	The feedback board fails to supply the power-on signal.	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
1775	0	The AC detection board status is error	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer

ID	Level	Description	Solution
1776	0	Data of the feedback board is not updated	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
4096	5	Failed to open the mechanical parameters file	Check the file path and restart the controller
8192	5	Failed to open the project file	Check the file path and restart the controller
8193	5	Failed to open the program file	Check the file path and restart the controller
8194	5	Failed to open the global variable file	Check the file path and restart the controller
8195	5	Failed to open the teaching point file	Check the file path and restart the controller
8196	5	Failed to run debugger	Rerun debugger
12288	5	Press the emergency stop button	Clear the alarm and power on again
12289	5	Detect external emergency-stopped status	Clear the alarm and power on again
12290	0	Axis1 is not in Bus Mode	System error, please contact technical support engineer
12291	0	Axis2 is not in Bus Mode	System error, please contact technical support engineer
12292	0	Axis3 is not in Bus Mode	System error, please contact technical support engineer
12293	0	Axis4 is not in Bus Mode	System error, please contact technical support engineer
12294	0	Axis5 is not in Bus Mode	System error, please contact technical support engineer
12295	0	Axis6 is not in Bus Mode	System error, please contact technical support engineer
12296	0	The robot is powered off	Clear the alarm and power on again, or contact technical support engineer
16384	5	Detect obstacles in the operation area	Clear obstacles and continue to operate the robot

ID	Level	Description	Solution
16386	5	The inverse kinematics solution is failed,the planned target points are wrong	Clear the alarm and re-teach point
20480	0	Modbus of feedback board is disconnected	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
20481	0	Before power supply, the voltage is higher than 51V	The voltage is too high,please contact technical support engineer
20482	0	Before power supply, the voltage is lower than 45V	The voltage is too low,please contact technical support engineer
20483	0	The hardware circuit related to the current-limiting chip is abnormal	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
20484	0	After power supply, the voltage is higher than 55V	The voltage is too high,please contact technical support engineer
20485	0	After power supply, the voltage is lower than 41.4V	The voltage is too low,please contact technical support engineer
20486	0	Internal first stabilized voltage is abnormal	System error, please contact technical support engineer
20487	0	Internal second stabilized voltage is abnormal	System error, please contact technical support engineer
20489	0	The feedback current is higher than 17A	The feedback current is too high, please contact technical support engineer
20490	0	Overpower protection of cement resistance	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
20491	0	DC bus current is higher than 26A	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer

ID	Level	Description	Solution
20493	0	The fan circuit of the feedback board is short-circuited	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
20494	0	The fan circuit of the feedback board is broken	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
24576	0	Modbus of I/O board is disconnected	Check whether the hardware is working properly, and restart the collaborative robot, or contact technical support engineer
24578	0	The contactor did not close as required	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
24579	0	The feedback board does not return an electrified signal during 2s	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
24581	0	AC status is abnormal	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
24582	0	After 5 minutes of powering on, the feedback board data did not update for 1 min	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
24583	0	The switch on the controller is pressed	Clear the alarm and power on again
24584	0	The communication of feedback board Modbus is interrupted	Check whether the hardware is working properly, and restart the controller, or contact technical support engineer
32768	5	SpeedFactor command has no input parameters	Enter the correct parameters
32769	5	Parameters of SpeedFactor command are out of range	Enter the correct parameters

ID	Level	Description	Solution
32770	5	Parameters of DO command are wrong	Enter the correct parameters
32771	5	Parameters of DI command are wrong	Enter the correct parameters
32785	5	Parameters of AI command are wrong	Enter the correct parameters
32801	5	Parameters number of AO command is wrong	Enter the correct parameters
32802	5	Index parameter of AO command is wrong	Enter the correct parameters, the index parameter can only be set to 1 or 2
32803	5	Voltage parameter of AO command is out of range	Enter the correct parameters, value ranges from 0 to 10
32849	5	AO mode error	Enter the correct parameters
33024	5	CP command has no input parameters	Enter the correct parameters
33025	5	Input parameters of CP command is out of range	Enter the correct parameters, value ranges from 0 to 100
33280	5	Arch command has no input parameters	Enter the correct parameters
33281	5	Index parameter of Arch command is out of range	Enter the correct parameters, value ranges from 0 to 9
33282	5	The parameters corresponding to index parameter of Arch command are not configured	Please set index parameter
33536	5	LimZ command has no input parameters	Enter the correct parameters
33537	5	Input parameters of LimZ command is out of range	Enter the correct parameters
33792	5	Speed command has no input parameters	Enter the correct parameters
33793	5	Parameter of Speed command is out of range	Enter the correct parameters, value ranges from 1 to 100
34048	5	Accel command has no input parameters	Enter the correct parameters
34049	5	Parameter of Accel command is out of range	Enter the correct parameters, value ranges from 1 to 100
34304	5	Jerk command has no input parameters	Enter the correct parameters

ID	Level	Description	Solution
34305	5	Parameter of Jerk command is out of range	Enter the correct parameters, value ranges from 1 to 100
34560	5	SpeedS command has no input parameters	Enter the correct parameters
34561	5	Parameter of SpeedS command is out of range	Enter the correct parameters, value ranges from 1 to 100
35072	5	AccelS command has no input parameters	Enter the correct parameters, value ranges from 1 to 100
35073	5	Parameter of AccelS command is out of range	Enter the correct parameters, value ranges from 0 to 100
35328	5	AccelR command has no input parameters	Enter the correct parameters
35329	5	Parameter of AccelR command is out of range	Enter the correct parameters, value ranges from 0 to 100
35584	5	JerkS command has no input parameters	Enter the correct parameters
35585	5	Parameter of JerkS instruction is out of range	Enter the correct parameters, value ranges from 0 to 100
35840	5	JerkR command has no input parameters	Enter the correct parameters
35841	5	Parameter of JerkR command is out of range	Enter the correct parameters, value ranges from 0 to 100
36096	5	Go command has no input parameters	Enter the correct parameters
36097	5	Go command has no point parameter	Enter the correct parameters
36098	5	Point parameter of Go command is wrong	Enter the correct parameters
36099	5	Control parameter of Go command is wrong	Enter the correct parameters
36100	5	MoveJ command has no input parameters	Enter the correct parameters
36102	5	MoveJ command has no point parameters	Enter the correct parameters
36103	5	Point parameter of RP command is wrong	Enter the correct parameter

ID	Level	Description	Solution
36104	5	Offset parameters of RP command are wrong	Enter the correct parameters
36105	5	Point parameter of RJ command is wrong	Enter the correct parameters
36106	5	Offset parameters of RJ command are wrong	Enter the correct parameters
36107	5	GoR command has no input parameters	Enter the correct parameters
36108	5	Point parameter of GoR command is wrong	Enter the correct parameters
36109	5	MoveJR command has no input parameters	Enter the correct parameters
36110	5	Point parameter of MoveJR command is wrong	Enter the correct parameters
36111	5	GoIO command has no input parameters	Enter the correct parameters
36112		Point parameter of GoIO command is wrong	
36113	5	I/O parameters of GoIO command are wrong	Enter the correct parameters
36114	5	MoveIO command has no input parameters	Enter the correct parameters
36115	5	Point parameter of MoveIO command is wrong	Enter the correct parameters
36116	5	I/O parameters of MoveIO command are wrong	Enter the correct parameters
36117	5	MoveJIO command has no input parameters	Enter the correct parameters
36118	5	Point parameter of MoveJIO command is wrong	Enter the correct parameters
36119	5	I/O parameters of MoveJIO command are wrong	Enter the correct parameters
36120	5	MoveJ command has no point parameters	Enter the correct parameters

ID	Level	Description	Solution
36121	5	MoveR command has no input parameters	Enter the correct parameters
36122	5	Point parameter of MoveR command is wrong	Enter the correct parameters
36352	5	Move command has no input parameters	Enter the correct parameters
36353	5	Move command has no point parameter	Enter the correct parameter
36354	5	Point parameter of Move command is wrong	Enter the correct parameters
36355	5	Control parameter of Move command is wrong	Enter the correct parameters
36608	5	Arch3 command has no input parameters	Enter the correct parameters
36609	5	Arch3 command has no point parameters	Enter the correct parameters
36610	5	Point parameter of Arch3 command is wrong	Enter the correct parameters
36611	5	Control parameter of Arch3 command is wrong	Enter the correct parameters
36864	5	Jump command has no input parameters	Enter the correct parameters
36865	5	Jump command has no point parameter	Enter the correct parameters
36866	5	Point parameter of Jump command is wrong	Enter the correct parameter
36867	5	Control parameter of Jump command is wrong	Enter the correct parameters
40960	5	Circle3 command has no input parameters	Enter the correct parameters
40961	5	Circle3 command has no point parameters	Enter the correct parameters
40962	5	Point parameters of Circle3 command are wrong	Enter the correct parameters
40963	5	Control parameter of Circle3 command is wrong	Enter the correct parameters

ID	Level	Description	Solution
45056	5	Optional parameters of Circle3 command are wrong	Enter the correct parameters
45057	5	Optional parameters of Jump command are wrong	Enter the correct parameters
45058	5	Optional parameters of Arch command are wrong	Enter the correct parameters
45059	5	Optional parameters of Arch3 command are wrong	Enter the correct parameters
45060	5	Optional parameters of Jerk command are wrong	Enter the correct parameters
45061	5	Optional parameters of JerkR command are wrong	Enter the correct parameters
45062	5	Optional parameters of JerkS command are wrong	Enter the correct parameters
45063	5	Optional parameters of Accel command are wrong	Enter the correct parameters
45064	5	Optional parameters of AccelR command are wrong	Enter the correct parameters
45065	5	Optional parameters of AccelS command are wrong	Enter the correct parameters
45066	5	Optional parameters of SpeedFactor command are wrong	Enter the correct parameter
45067	5	Optional parameters of Speed command are wrong	Enter the correct parameter
45068	5	Optional parameters of SpeedR command are wrong	Enter the correct parameter
45069	5	Optional parameters of LimZ command are wrong	Enter the correct parameter
45070	5	Optional parameters of CP command are wrong	Enter the correct parameter
45071	5	Optional parameters of DO command are wrong	Enter the correct parameter
45072	5	Optional parameters of Go command are wrong	Enter the correct parameters

ID	Level	Description	Solution
45073	5	Optional parameters of Move command are wrong	Enter the correct parameters
45074	5	Optional parameters of MoveJ command are wrong	Enter the correct parameters
45075	5	Optional parameter of ECP command is wrong	Enter the correct parameter
45076	5	Optional parameters of EcpSet command are wrong	Enter the correct parameter
45077	5	Optional parameters of SetExicit Mode command are wrong	Enter the correct parameter
45078	5	Optional parameters of Pallet command are wrong	Enter the correct parameters
45079	5	Optional parameter CP is wrong	Enter the correct parameter
45080	5	Optional parameter tool is wrong	Enter the correct parameter
45081	5	Optional parameter user is wrong	Enter the correct parameter
45082	5	Optional parameter speed is wrong	Enter the correct parameter
45083	5	Optional parameter SpeedS is wrong	Enter the correct parameter
45084	5	Optional parameter Accel is wrong	Enter the correct parameter
45085	5	Optional parameter AccelS is wrong	Enter the correct parameter
45086	5	Optional parameter Arch is wrong	Enter the correct parameter
45087	5	Optional parameter start is wrong	Enter the correct parameter
45088	5	Optional parameter zlimit is wrong	Enter the correct parameter
45089	5	Optional parameter end is wrong	Enter the correct parameter
45090	5	Optional parameter sync is wrong	Enter the correct parameter
45091	5	Optional parameter arm is wrong	Enter the correct parameter
45092	5	Optional parameter ForceControl is wrong	Enter the correct parameter
45136	5	Optional parameters of MoveR command are wrong	Enter the correct parameters
45137	5	Optional parameters of GoR command are wrong	Enter the correct parameters
45138	5	Optional parameters of MoveJR command are wrong	Enter the correct parameters

ID	Level	Description	Solution
45139	5	Optional parameters of GoIO command are wrong	Enter the correct parameters
45140	5	Optional parameters of MoveIO command are wrong	Enter the correct parameters
45141	5	Optional parameters of MoveJIO command are wrong	Enter the correct parameters
45142	5	Optional parameters of Path Recur command are wrong	Enter the correct parameter
45312	5	Optional parameters of LoadSwitch command are wrong	Enter the correct parameters
45313	5	Optional parameters of LoadSet command are wrong	Enter the correct parameters
45568	5	Optional parameters of SetABZ command are wrong	Enter the correct parameters
45569	5	Optional parameter are of GetABZ command are wrong	Enter the correct parameters
45824	5	Input parameters of SetToolBaudRate command are wrong	Enter the correct parameters
45825	5	Input parameters of SetDOMode command are wrong	Enter the correct parameters
45826	5	Input parameters of SetToolPower command are wrong	Enter the correct parameters
46080	5	Input parameters of setExcitMod command is wrong	Enter the correct parameters
46336	5	Input parameters of StartPath command are wrong	Enter the correct parameters
46337	5	StartPath command has no input parameters	Enter the correct parameters

