X CORE User Manual

（X Series Robot Software Manual）
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Guangzhou Auctech Automation Technology Ltd

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Content

1 Preface

1.1. Intended Audience

This document provides operating instructions for the AUCTECH Cobot, so that users can learn more about the robot basic information and use the robot more safely and conveniently. Be sure to operate this robot on the basis of careful reading and full understanding of this document.This document applies for the following users:

- **On site robot engineer**
- **Robot software engineer**
- **Hardware installation engineer**
- **On-site Maintenance engineer**
- **System maintenance engineer**

Operators with basic training are allowed to operate the robot.

1.2. Representation of Warnings and Notes

The table below defines general hazards related symbols, please read through the description carefully.

Symbol	Description
	Used to warn of emergency situations that, if not avoided, could result in death or serious personal injury.
	Used to warn of potentially dangerous situations that, if not avoided, could result in death or serious personal injury.
	Used to warn of potentially dangerous situations that, if not avoided, may result in moderate or minor personal injury.
	Used to convey device or environmental safety warnings that, if not avoided, may result in damage to the device, loss of data, degradation of device performance, or other unpredictable results. Caution does NOT involve personal injury.
	Used to highlight important / critical information, best practices and tips. "Tips" is not a safety warning message, does not involve personal, equipment and environmental damage information.

1.3. Special Statement

This manual is only used as a guide. Its content (such as equipment appearance, software interface) is based on laboratory equipment information. The content provided in this manual is of general guidance and does not guarantee that all usage scenarios cover all models. Due to the software upgrade and equipment model inconsistency, the content provided in the manual may NOT be consistent with the robot used by the user. Please take the information of user equipment as the standard, this manual will no longer address the differences caused by the above situations.

The maximum value provided in this manual is the maximum that a device achieves in a lab-specific scenario that meets the appropriate standards (For example, constant temperature, humidity, interference free environment, typical operating conditions and etc.). In reality working situation, the maximum value of equipment testing may NOT be consistent with the data provided in the manual, due to different working conditions, specific working conditions and inconsistent testing methods.

2. Safety

2.1. Abstract

This section describes important safety and risk assessments that you need to be aware when installing, applying, and maintaining on robot and its components. The user must read and fully understand this information before the robot is powered on for the first time.

Before performing any operations, be sure to read all operating instructions provided with the equipment, in particular, instructions that may endanger personal safety and equipment safety, such as hazards, warnings, and cautions, to minimize the chance of an accident. When this document differs from the documentation shipped with the device, the documentation shipped with the device shall prevail.

The technicians responsible for installing and maintaining the equipment must be a trained person who has proper methods of operation and all safety precautions. Only trained and qualified technicians are able to perform equipment installation and maintenance.

2.2. Limitation of Liability

This information neither includes how to design, install and operate a complete robot system, nor any peripherals that affect the overall system. In order to protect personal safety, an outstanding system must be designed and installed in accordance with the safety requirements stipulated in the standards and regulations of the country where the robot is installed.

The robot integrator is responsible for ensuring that the robot system complies with the applicable safety laws and regulations of the country or region where the robot is located and that the necessary safety equipment for the protection of the robot system operator is properly designed and correctly installed. Limitation of Liability

Specifically including but not limited to the following:

- **Ensure that the robot system meets all basic requirements；**
- **Perform a risk assessment of the complete system；**
- **Ensure the design and installation of the entire system is accurate；**

- **Make appropriate safety settings in the software and ensure that it will not be modified by the user；**
- **Develop detailed operating instructions；**
- **Issue a declaration of conformity；**
- **Collect all information in technical documents；**
- **Label the interrogator's logo and contact information on the installed robot system.**

AUCTECH, Ltd. is committed to providing reliable safety information and will not be liable unless there is intentional or gross negligence by **AUCTECH, Ltd.** in providing reliable safety information. It is important to declare that even if all operations are carried out in a safe manner, there is no guarantee that the robot system will not cause personal and property damage to the user.

AUCTECH, Ltd. will not be liable for the loss of users caused by the following reasons:

- **Force Manure events (e.g., natural disasters, fires, wars, etc.);**
- **Natural damage or wear of the robot system;**
- **The site operating environment (e.g., voltage, temperature, humidity, etc.) or external factors (e.g., external interference, etc.) cannot meet the environmental requirements for normal operation as indicated;**
- **The robot system is not installed correctly (including not reinstalled correctly after relocation);**
- **due to the willful or negligence of the user or a third party, improper use (including the user's failure to use in accordance with this User's Manual and/or other requirements of AUCTECH, Ltd.) or willful sabotage.**

Unless otherwise agreed, AUCTECH, Ltd. will not be liable for the indirect, special and incidental losses caused by the use of the robot system, including but not limited to the loss of revenue, actual or expected revenue, business loss, opportunity loss, goodwill loss, reputation loss, data loss, damage or leakage, etc.

2.3. Risk Assessment

Risk assessment is one of the most important tasks that integrators must accomplish. The robot itself is a partially completed machine, and the safety of the robot installation depends on how the robot is integrated (e.g. tools, obstacles and other machines).

It is recommended that integrator perform risk assessment in accordance with ISO12100 (GB 15706) and ISO10218-2 (GB 11291.2). Alternatively, technical specification ISO/T 15066 (GB/T 36008） may be selected as additional guidance. Integrator performing a risk assessment should consider all procedures during the entire lifespan of the robot, including but not limited to:

- **Teach robots when developing robots；**
- **Fault diagnosis and maintenance；**
- **General operation of robot installation.**

Risk assessment must be performed before the robot arm is powered on for the first time. Part of the risk assessment performed by the integrator is the necessity to identify the correct safety configuration settings, emergency stop buttons and additional protections for specific robot applications.

The following list identifies the significant risks that integrator must consider. Please note that there may be other significant hazards from certain robot devices.

- **Finger is clamped between joint 4 and joint 5;**
- **Sharp edges and sharp spots on the tool or the tool connector may cause damage to human skin;**
- **The obstacles sharp edges and sharp spots, which is closed by the robot track, may be dangerous to human skin;**
- **Sprains or fractures due to impact between the robot payload and a solid surface;**
- **Consequences due to loosening of bolts used to safety robot or tools;**
- **Items fall off the tool. For example, due to insufficient clamping or accidentally power down;**
- **Operating error due to different emergency stop button allocation and types.**

If the robot is installed in a non-cooperative application (e.g. using dangerous tools) where the risk cannot be adequately eliminated by using its internal safety

functions, the system integrator must install other protective devices based on the risk assessment (e.g. Installing a safety enclosure that can provide protection to the integrator during installation and programming).

2.4. Safety Operations

2.4.1. Emergency Stop

Emergency stop takes precedence over all the other robot control operations. Pressing emergency stop will cause all controlled hazards to stop, removing the motor power from the robot drive. It will remain in effect until reset manually.

Activate emergency stop to immediately stop the robot from any motion. The user must perform a restoration procedure, resetting the emergency stop button and pressing the "Power On" button on demonstrator, to resume normal operation. Emergency stop shall not be used as a risk reduction measure, but as a secondary protective device.

Emergency stop must not be used for normal program stop; constantly pressing may result in additional unnecessary wear on the robot.

2.5. Safety-related Functions and Interfaces

2.5.1. Introduction

X series robots are equipped with a range of built-in safety functions as well as safety I/O, digital and analog control signals to connect to other machines and additional protective devices.

	• **The use and configuration of safety functions and interfaces must follow the risk assessment procedures for each robot application.** • **If the robot discovers a fault or violation in the safety system (e.g. if one of the wires in the Emergency Stop circuit is cut or a safety limit is violated) then a Stop Category 0 is initiated.** • **The stopping time should be taken into account as part of the application risk assessment.**

	• **The use of safety configuration parameters different from those determines by the risk assessment can result in hazards that are not reasonably eliminated or risks that are not sufficiently reduced.** • **Ensure tools and grippers are connected appropriately so if there is an interruption of power, no hazards occur.** • **The end effector is not protected by the GCR safety system. The end effector and / or connection cable is not monitored.**

2.5.2. Stop Categories

Depending on the circumstances, the robot can initiate three types of stop categories defined according to IEC 60204-1. These categories are defined in the following table.

Stop Category	Description
0(SS0)	Stop the robot by immediate removal the power
1(SS1)	Reduce joints acceleration to 0 as soon as possible. Once each joint stopped, brake applied and power removed
2(SS2)	Stop the robot with power available to the drives, while maintaining the trajectory. Drive power is maintained after robot is stopped; no brake applied.

Swap between each stop categories:

The timer runs as soon as any stop category 1 occurs. At 500ms, if the robot is still running over speed, the stop category will be automatically swapped to category 0.

2.5.3. Safety functions

The GCR robot safety functions, are meant to control the robot system, such as the robot with its attached tool/ end effector. The robot safety functions are used to reduce robot system risks determined by the risk assessment. Positions and speeds are relative to the base of the robot.

The control unit safety functions are listed as follow:

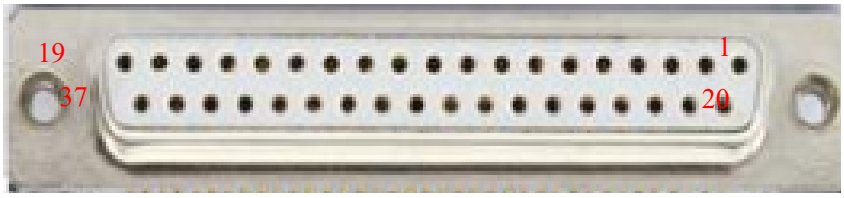
Safety Function	Description
Emergency stop (ES)	Perform SS1
Protective stop	Perform SS2
Safe Operating Stop (SOS)	After SS2 is executed, SOS monitoring will be triggered to monitor the current position deviation of the robot. If it is violated, SS0 will be triggered
Joint Safe limited position (SLP)	According to the threshold setting, SS2 is triggered when the joint position reaches the threshold. If the trigger joint is limited, SS0 is fired directly
Joint Safe limited speed (SLS)	According to the threshold setting, SS2 is triggered when the joint velocity reaches the threshold. If the joint speed limit is triggered, SS0 is fired directly
TCP position limit	The safe plane can be set to limit the operating area of the robot, which is set according to the threshold value. When the threshold value is reached, SS2 is triggered. If the safety plane is triggered, the safety controller directly triggers SS0. Up to 6 safety planes and 3 TCP coordinate systems are allowed
Tcp speed limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If the TCP speed limit is triggered, the safety controller directly triggers SS0
elbow pos limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If the Elbow position limit is triggered, the safety controller fires SS0 directly
elbow speed limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If the Elbow speed limit is triggered, the safety controller fires SS0 directly
joint force limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If joint torque limits are triggered, the safety controller directly triggers SS0
tcp force limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If the end force limit is triggered, the safety controller directly triggers SS0
elbow force limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If the Elbow force limit is triggered, the safety controller fires SS0 directly

power limit	According to the threshold setting, SS2 is triggered when the threshold is reached. If power limits are triggered, the safety controller directly triggers SS0
mode switch input	You can optionally enable this input , you can toggle through the UI; But not both. SS2 is triggered when the mode is switched. If the script is currently running, the script is paused and can continue to run later.
enable device input	You can optionally enable this input. This input is valid only in manual mode, not in automatic mode. Violation triggers SS2.
protective stop input	Valid in all modes, triggering SS2. If the reset input is not activated, after the signal disappears, it will reset automatically. Otherwise, it can reset only when the reset input is triggered.
protective stop reset input	You can optionally reset the signal input. If the safety protection reset is activated, when the trigger safety protection stops and the trigger signal disappears, the channel signal input is required before the movement. The rising edge is effective and the high level needs to be maintained at 500ms
automatic protective stop input	Only valid in automatic mode, triggering SS2. After the signal disappears, the safe mode resumes Normal
automatic protective stop reset input	Similar to the Protective Stop Reset Input, only valid for protective stops triggered by Automatic Protective Stop Input.
system emergency stop output	This signal will be output only when the system is triggered by an emergency stop
protective stop output	Protective Stop output. This signal is emitted when the Protective Stop Input is triggered
automatic protective stop output	Automatic mode protective stops output, only when the protective stops triggered in automatic mode, the signal will be output.
reduce mode	Trigger the reduction mode, using the parameters associated with the reduction mode.
reduce mode output	Globally, the signal can be output.
recovery mode	When the joint limit, or TCP limit, is exceeded, a reboot is required to enter recovery mode. Recovery mode to limit speed not more than 30 deg/s, the end of the speed of less than 250 mm/s

2.5.4. Safety IO port

Safety IO port is to provide external control box scram and safety input and output port, including 1 road stop signal input (passive signal), and 1 road stop output feedback (active), 1 road protective stop input (passive), 2 road safety input can be configured (passive), 2 way configurable safety output (active), Among them, the emergency stop signal input, protective stop input and configurable safety input are valid for high level, and the effective level is 11V-30VDC; In addition, when using configurable safety output and emergency stop feedback output, relay is needed for switching. Can be configured for safety input: protective reset input, automatic mode protective stop input, automatic mode protective reset input, reduce mode input. Configurable safety output can be configured as: guard stop output, automatic mode guard stop output, reduce mode output. Its interface definition is shown in Table 11:

Safety IO port definition



No.	Signal Definition	No.	Signal Definition
1	EI1+ (Emergency stop signal input 1+)	2	EI1- (Emergency stop signal input 1-)
3	EI2+ (Emergency stop signal input 2+)	4	EI2- (Emergency stop signal input 2-)
5	PS1+ (Protective stop input 1+)	6	PS1- (Protective stop input 1-)
7	PS2+ (Protective stop input 2+)	8	PS2- (Protective stop input 2-)
9	CI1_1+ [Safety inputs can be configured 1（1+）]	10	CI1_1- [Safety inputs can be configured 1（1-）]
11	CI1_2+ [Safety inputs can be configured 1（2+）]	12	CI1_2- [Safety inputs can be configured 1（2-）]
13	CI2_1+ [Safety inputs can be configured 2（1+）]	14	CI2_1- [Safety inputs can be configured 2（1-）]
15	CI2_2+ [Safety inputs can be configured 2（2+）]	16	CI2_2- [Safety inputs can be configured 2（2-）]
17	Reserved	18	Reserved
19	Reserved	20	Reserved
21-23	Reserved	24-25	Reserved
26	CO2_2- [Safety output can be configured 2（2-）]	27	CO2_2+ [Safety output can be configured 2（2+）]
28	CO2_1-	29	CO2_1+

	[Safety output can be configured 2（1-）]		[Safety output can be configured 2（1+）]
30	CO1_2- [Safety output can be configured 1（2-）]	31	CO1_2+ [Safety output can be configured 1（2+）]
32	CO1_1- [Safety output can be configured 1（1-）]	33	CO1_1+ [Safety output can be configured 1（1+）]
34	EO1-(Emergency stop feedback output 1-)	35	EO1+(Emergency stop feedback output 1+)
36	EO2-(Emergency stop feedback output 2-)	37	EO2+(Emergency stop feedback output 2+)

2.6. The Risk of Collision and Nip

There is still a collision detection blind zone during the actual operation of the robot. Users must pay attention to the risk of collision detection failure under special working conditions. Typical three types of operating conditions are as follows.

Scenario 1: When the robot end position is outside the 1000mm from the center of the robot base, if the robot moves along the direction of the red arrow in Figure 2.6.1 and Figure 2.6.2, the robot is less sensitive to external forces in the moving direction. The risk of pinching is more likely to occur; when the robot moves along the direction of the green arrow in Figure 2.6.1 and Figure 2.6.2, if the robot collides with the external environment, the external force generated by the collision is more sensitive.

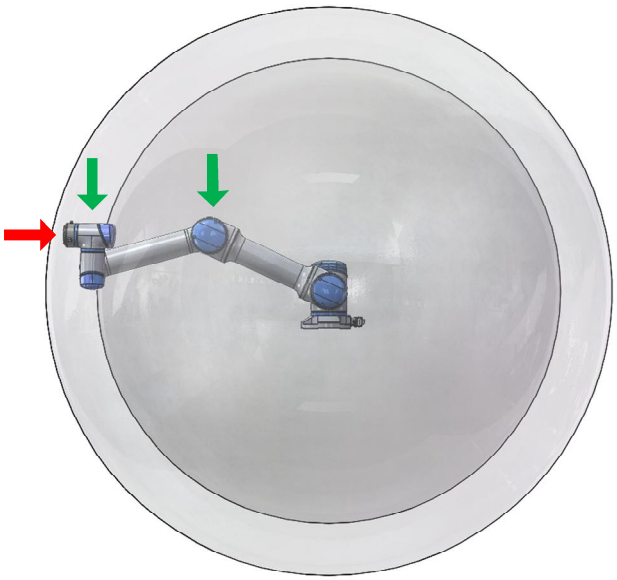


Image 2.6.1 Scenario 1: robot front view

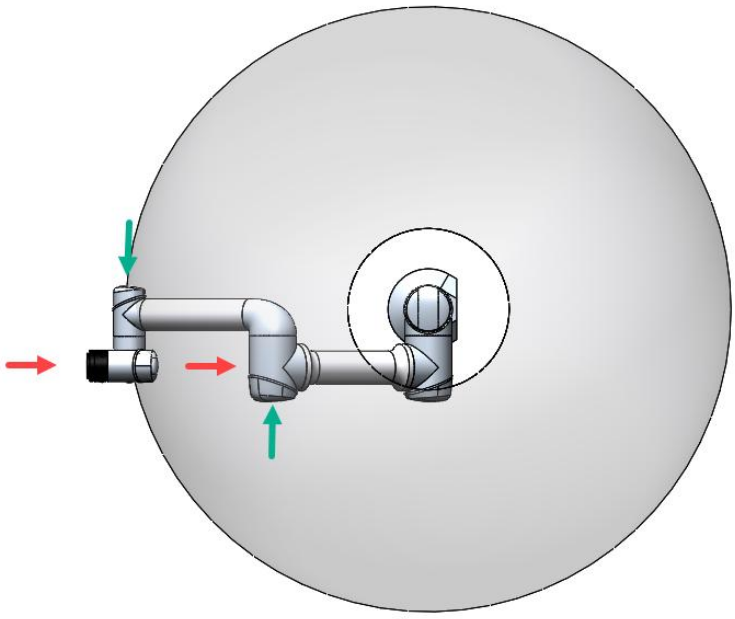


Image 2.6.2 Scenario 1: robot top view

Scenario 2: Centering on the Z-direction of the robot base coordinate system， the radius is in the range of 350mm. If the contact point is within this range, and the contact force direction is perpendicular to the plane of the joints of the joints 2 and joint 3, the collision detection function is difficult to detect collisions between the robot and the outside world. As the red arrow shown in Figure 2.6.3 in Figure 2.6.4; if the force direction between the robot and the outside is consistent with the Z direction of the robot base, the robot is more sensitive to the external force generated by the collision, as the green arrow shown in Figure 2.6.3.

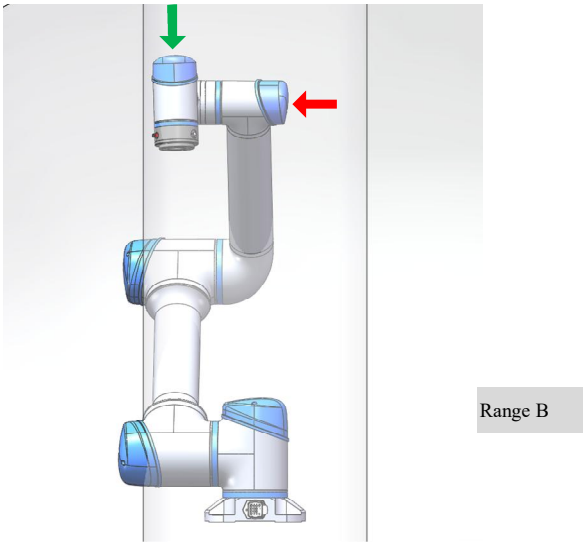


Image 2.6.3 Scenario 2: robot front view

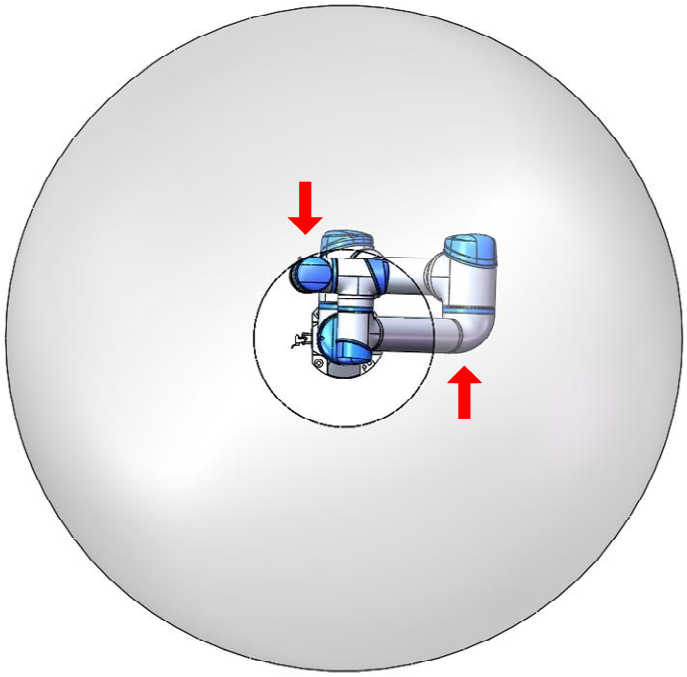


Image 2.6.4 Scenario 2: robot front view

Scenario 3: When the robot collides with the outside world, and if the collision point is located in the spherical range with a radius about 350mm on the robot base, the robot is more difficult to detect the collision regardless of the pose and state of the robot. It is more prone to the risk of pinching, as the red arrow shown in Figure 2.6.5 and in Figure 2.6.6; when the collision point is outside the range, and does not meet the conditions of the collision detection zone described in scenario 1 and scenario 2. At the time, the robot is more likely to detect collisions with the outside world, as the green arrow shown in Figure 2.6.5 and in Figure 2.6.6.

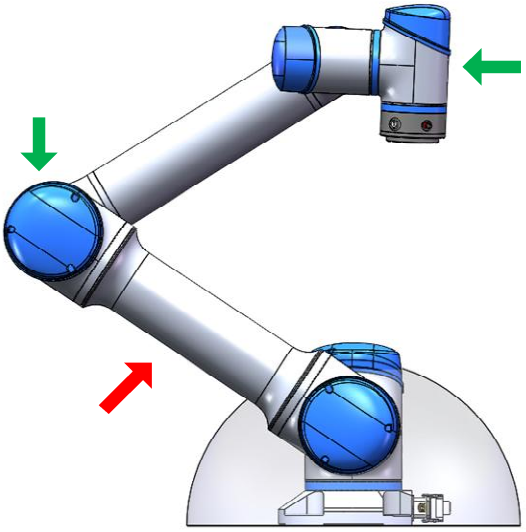


Image 2.6.5 Scenario 3: robot side view

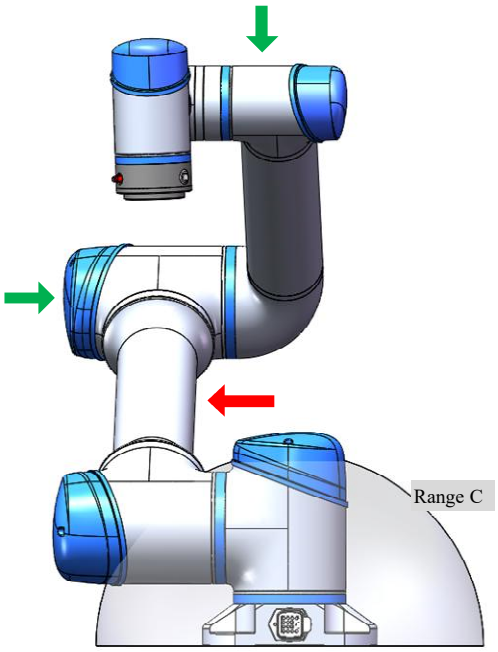
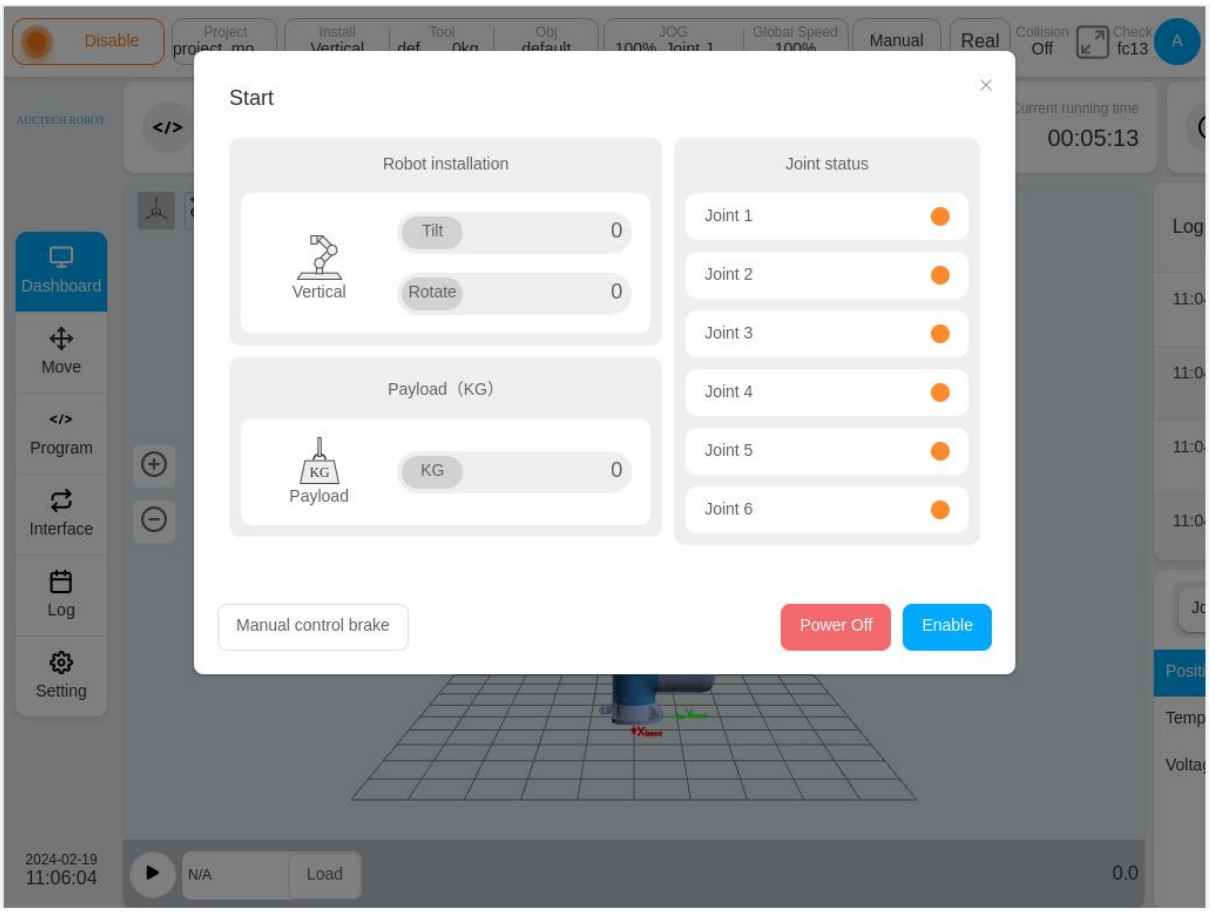


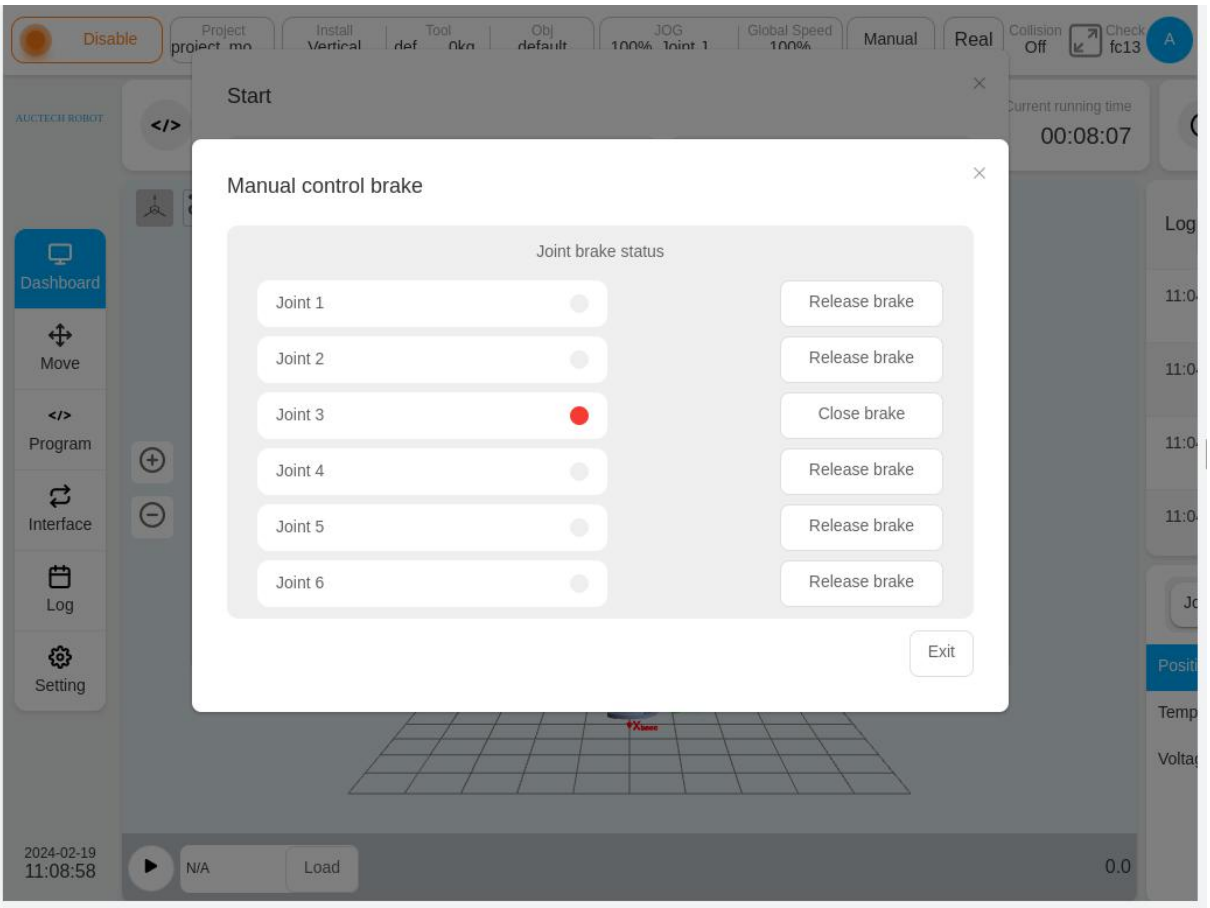
Image 2.6.6 Scenario 3: robot front view

For all above-described scenarios, if the robot moves in a direction that is insensitive to external collision detection, considering the limitation of the cooperation between the robot and the outside world, the running speed at this time should be reduced as much as possible.

When the nip accident unfortunately occurs, the manual brake release function can be used to reduce the loss caused by the accident.



When the robot is powered but not enabled, the “manual brake release” function at the lower left corner of the page can be started. After clicking the “manual brake release” button, the page will switch as the following picture:



Clicking the “release brake” button, the holding brake of the corresponding joint can be release, and the joint is allowed to be driven without power at the point. The red light on the left of the page indicates the lock status. Clicking the “lock brake” will get the holding brake of the corresponding joint locked again.

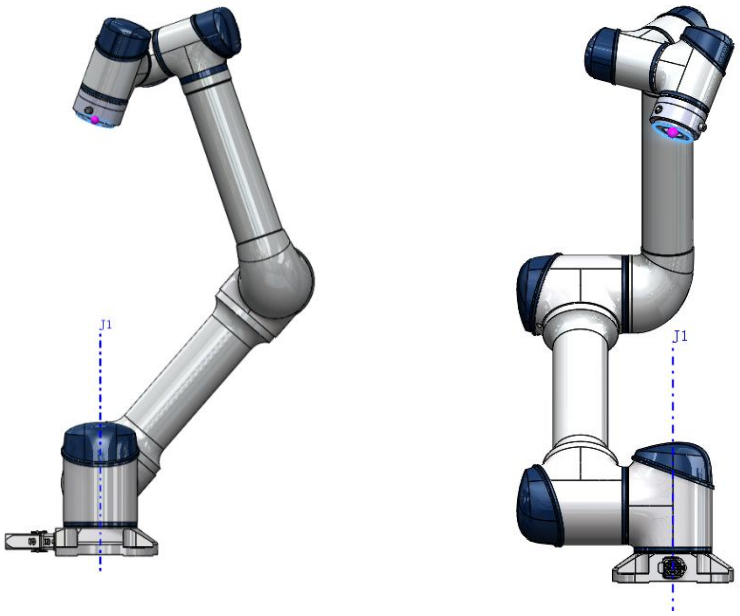
2.7. Risk of Stall at Robot Singularity

When the robot performs motion planning (straight line, arc, etc., excluding joint motion) near the singularity point, it will automatically reduce speed. When teaching, avoid the singularity point or pass the singularity point with joint motion. For the GCR series configuration, there are shoulder singularities, elbow singularities and wrist singularities.

2.7.1. Shoulder Singularity

When the wrist joint center O6 is on a joint axis J1, the shoulder singularity is caused at this time, resulting in no solution for joint 1. When O6 is located very close to J1, it will also be affected strangely. At this time, moving the end may

cause joint 1 to overspeed. Refer to the picture below for the singular pose near the shoulder.



O6

Image 2.7.1 Shoulder singularity pose reference pose

2.7.2. Elbow singularity

When the axes of the two, three, and four joints J2, J3, and J4 are coplanar, at this time, the two joints have no solution. Simply, when joint 3 is near 0 degrees in a near singularity, moving the end may cause 2 joints, 3 joints, and 4 joints to overspeed. Refer to the figure below near the elbow singularity:

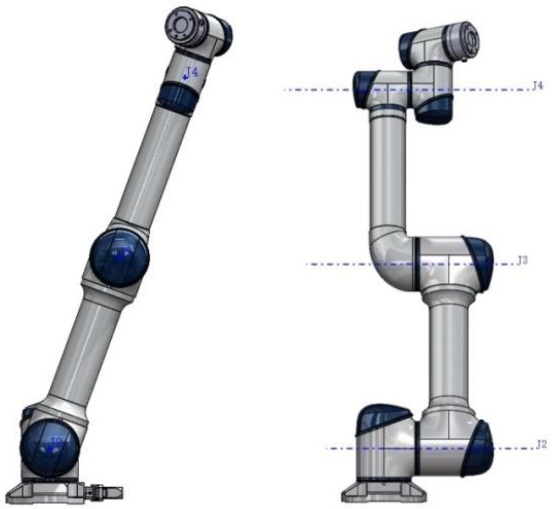


Image 2.7.2 Elbow Singularity Pose Reference

2.7.3. Wrist singularity

When the joint 5 is 0 degrees, the joint 6 has no solution at this time, causing the wrist to be singular. When joint 5 is close to 0 degrees, it is a strange posture near the wrist. At this time, moving the end may cause 4 joints, 5 joints, and 6 joints to overspeed. Refer to the following figure:

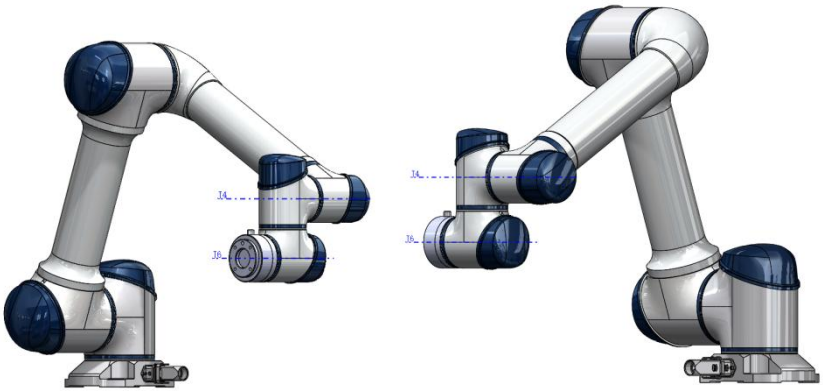


Image 2.7.3 Wrist Singularity Reference

When the robot reaches or approaches the singularity, the planned movement based on Cartesian coordinates cannot be correctly reversed to the joint motion of

each axis, and the movement planning cannot be performed correctly. The off motion or move j motion instruction can be used.

	• **Avoid using commands such as straight lines, arcs, and moving the ends in the directions of X, Y, Z, RX, RY, and RZ near the singularity points. The robot is at risk of stalling.** • **For trajectories with singular risks, they must be fully evaluated before running.**

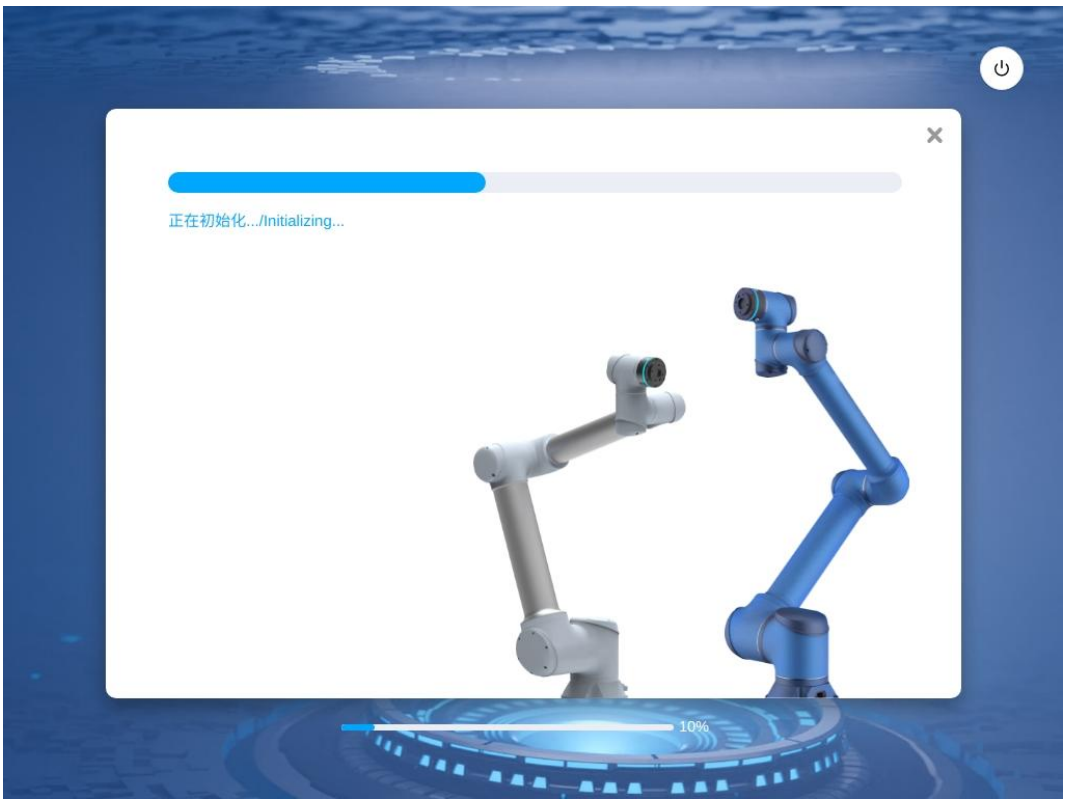
3. Quick Start

3.1. First boot

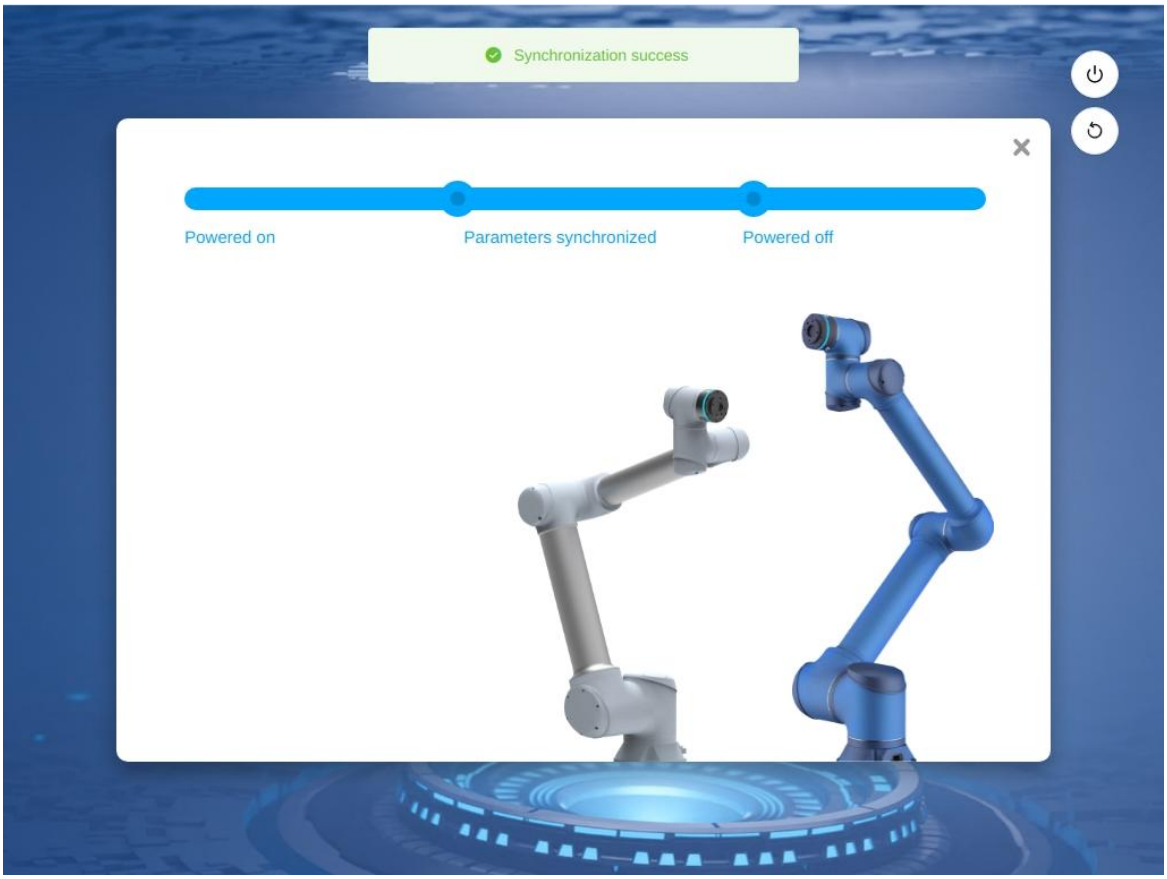
At first boot, the configuration information of the robot arm should be imported into the control cabinet. The detailed steps are as follows:

1. By default, the system will display "Welcome to AUCTECH Collaborative Robot" and enter the "Start" page.

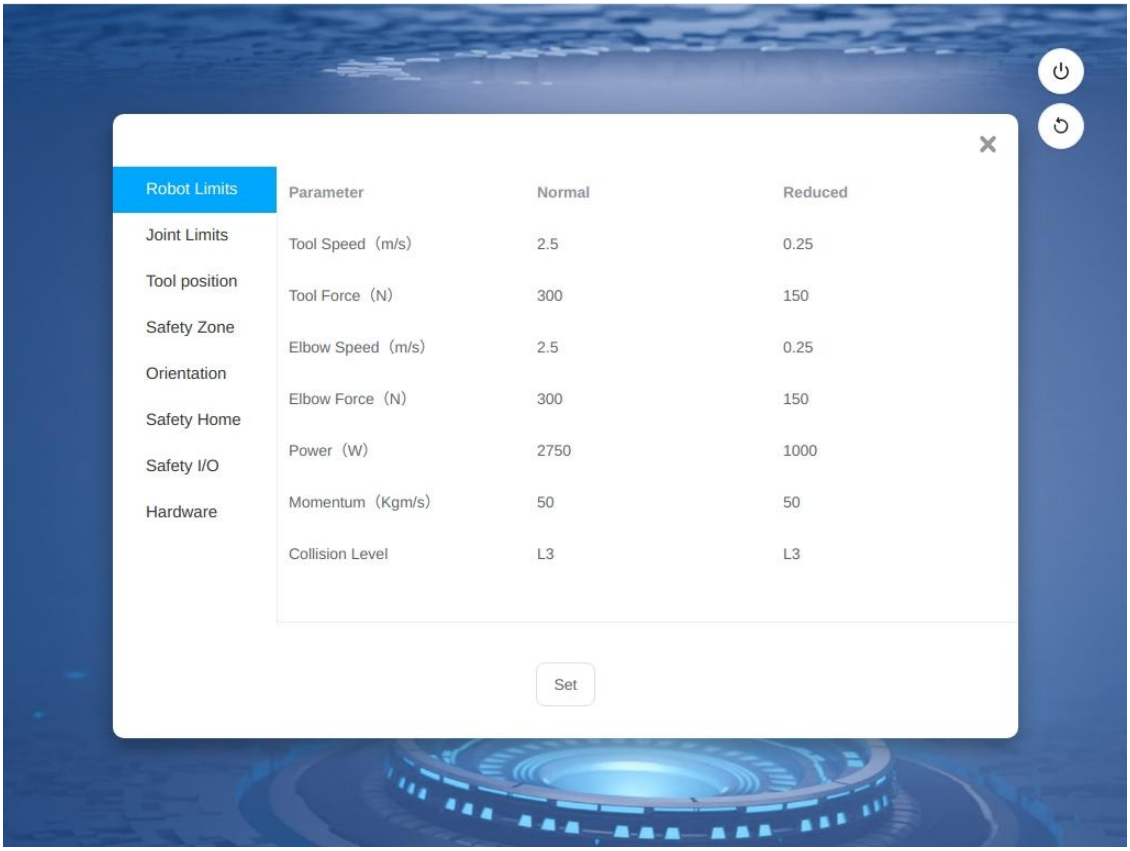
1. Clicking the “start” button, the robot will be initialized. The “Initializing” progress bar is displayed, and “Initialization complete” will be displayed after the progress is complete.



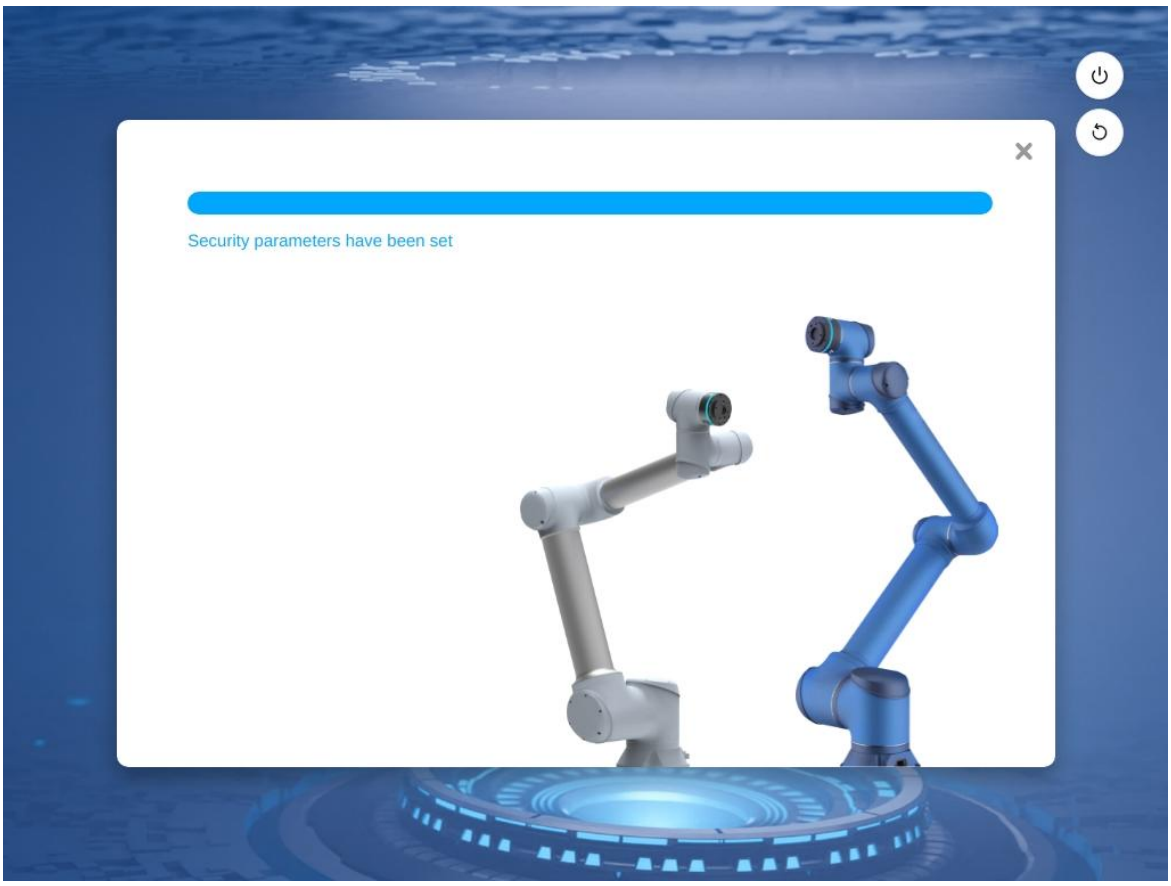
2. After the robot initialization is complete, the robot parameter sync interface is displayed. Clicking the “SyncParam”, the robot will power on, synchronize parameters,



3. After the synchronization succeeds, the page for setting safety parameters is displayed.



4. After confirming the safety parameters are normal, click “Setting the Safety Parameters”. After the safety parameters are set, the robot is initialized and the control cabinet should be restarted according to the prompts.



3.2. Booting and Login

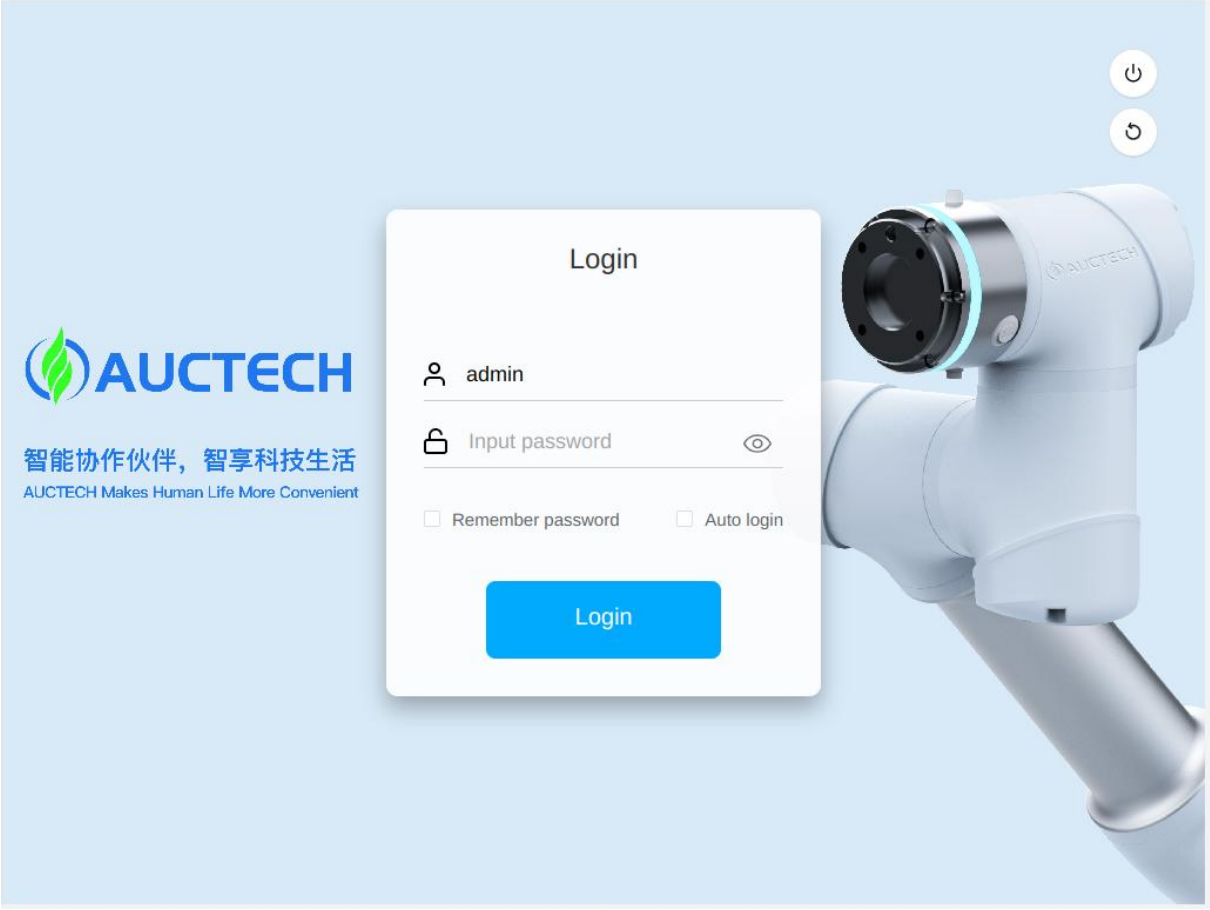
Users can connect to the control cabinet using an teach pendant or their own mobile devices. The robot can be accessed through a browser (Chrome is recommended) when using a mobile device. The connection modes are as follows:

Teach pendant Connection: Directly insert the indicator, the system will automatically start the page program when starting.

Wired Connection: After connecting PC to the control cabinet by the network cable, enter the IP address and the port number 7000 in the address box of the browser, such as: 192.168.1.10:7000 (the IP address can be modified in the “System Settings”). The default IP address is dynamically assigned by DHCP.

Wireless connection: After starting the power supply of the control cabinet, use the mobile device or PC to find the wireless network "AUCTECHCobot_xxxxx" (five digits after the SN number of the control cabinet), and input the default password "1234567890", (The wireless network name and password can be modified in "System Settings") to connect to the network. Enter http:AUCTECH-cobot.com:7000 in the browser address bar.

After confirming address, the login page can be entered after several seconds, as shown in the figure.



Login page

On the upper right of the login page there are the shutdown button and the restart button (adapting to

DC00/DC15S/DC30D control cabinet), and the user entering username and password are in the middle. Above the login button, there are the remembering password and the automatic login options, and the users can choose to remember the password or log in automatically. If the “remembering password” option is chosen, the user can log in again after logging out without entering the password, and log in directly only by clicking the “login” button; if “automatic login” option is chosen, the “remembering password” option will be chosen by default, users can automatically log in without clicking the “login” button when they enter the login page to log in again after shutdown or restart. When the users enter the login page after logging out or restoring factory settings, the “automatic login” option will be cancelled, the users need to manually click the login button to log into the system.

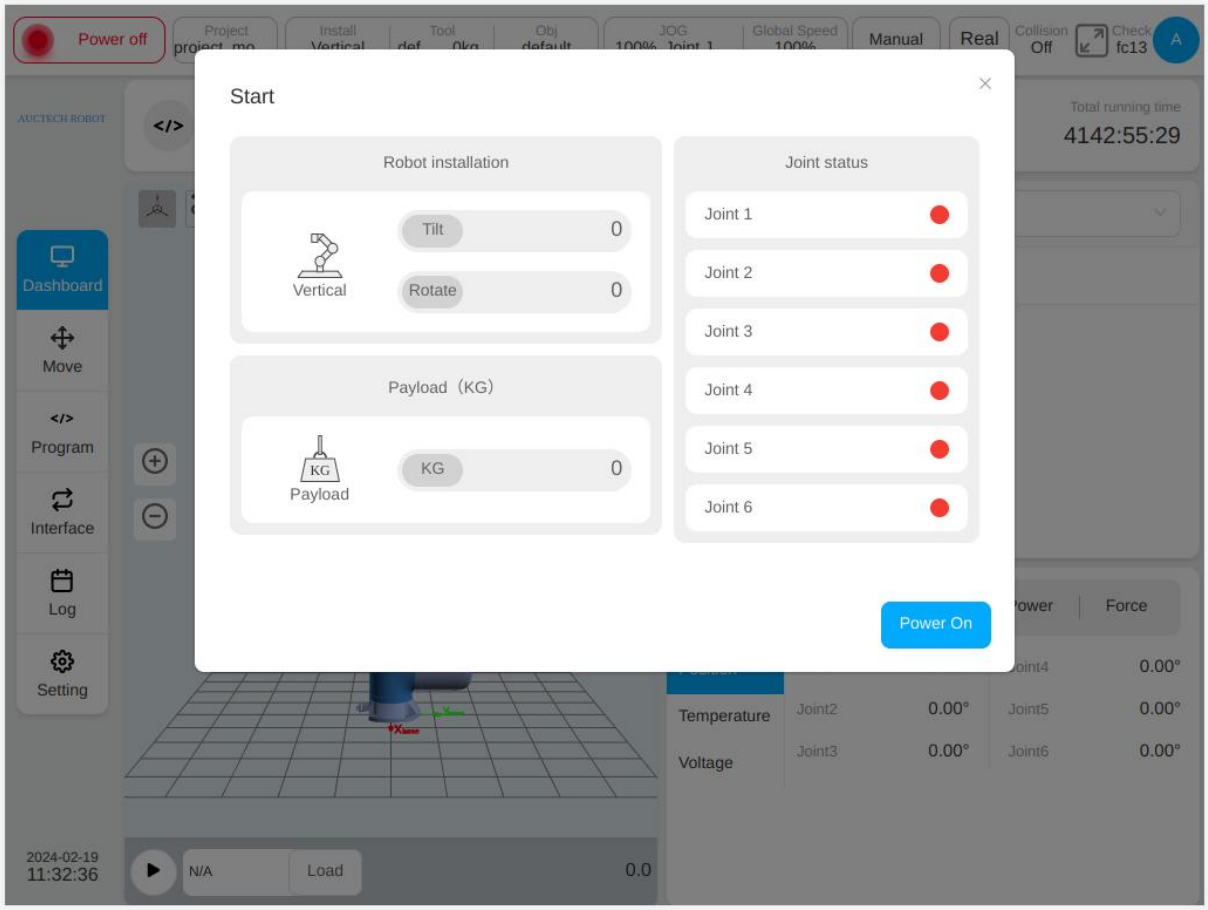
Tips	“Remembering password” and “automatic login” rely on the browser’s own functions. Changing the source of operations or changing the browser cannot retain the original settings.

Virtual keyboard

There are two factory default accounts. One default account is default; another administer account is admin. The passwords of both are 123. Clicking the username or password input box, the keyboard will pop up from the bottom of the page, as shown in the figure. After entering the username and the password (which can also be entered through external physical keyboard), click the “login” button, and then log in successfully.

3.3. Robot Startup

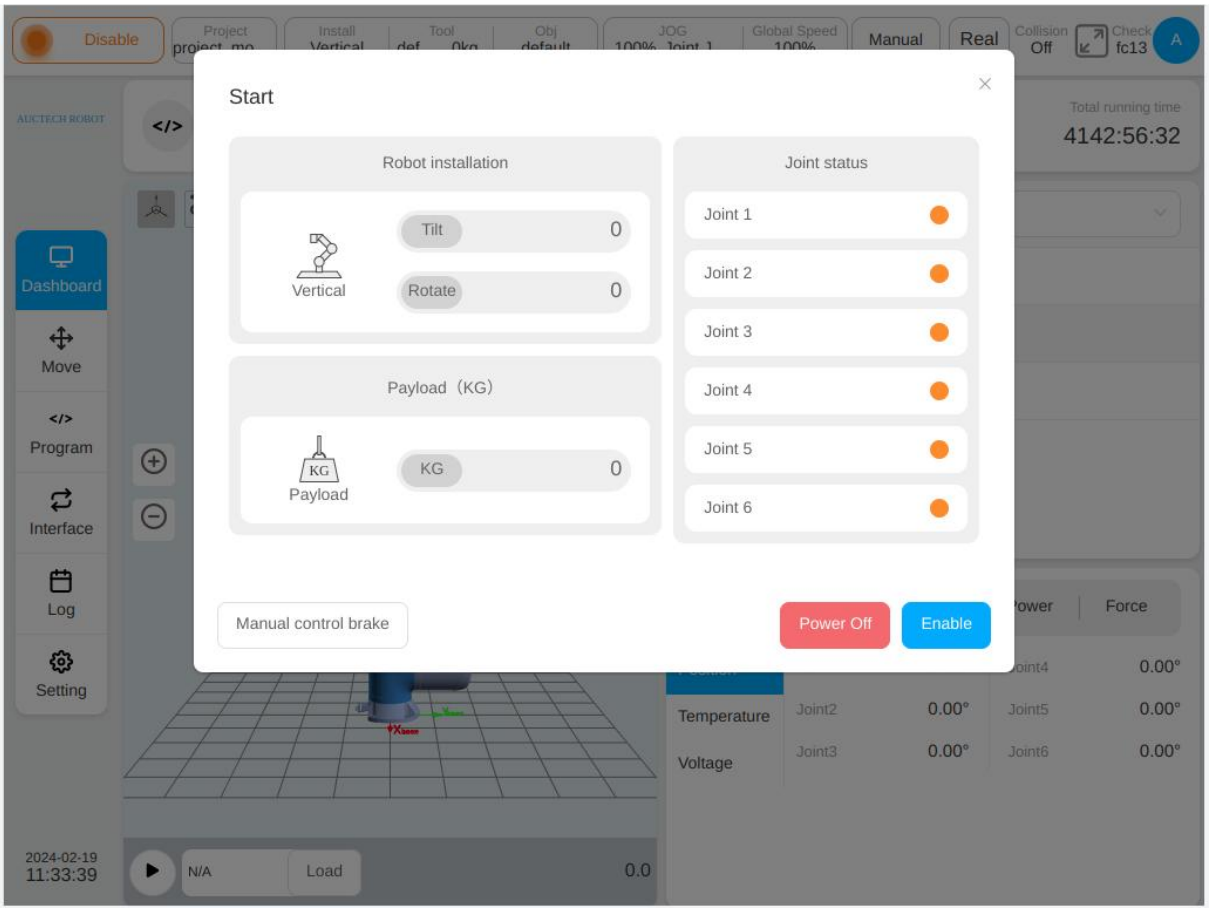
After successful login, the user will enter the overview interface by default. When the robot is not powered on, the robot startup interface will automatically pop up, as shown in the figure.



Startup page (robot is not powered on)

The left side of the startup page displays the robot installation direction and the end load information, and the right side displays the robot joint status. When the robot is not powered on initially, the indicator lights of joints are red. Clicking the “Power On” button in the lower right corner of the startup page, the robot starts power-on process.

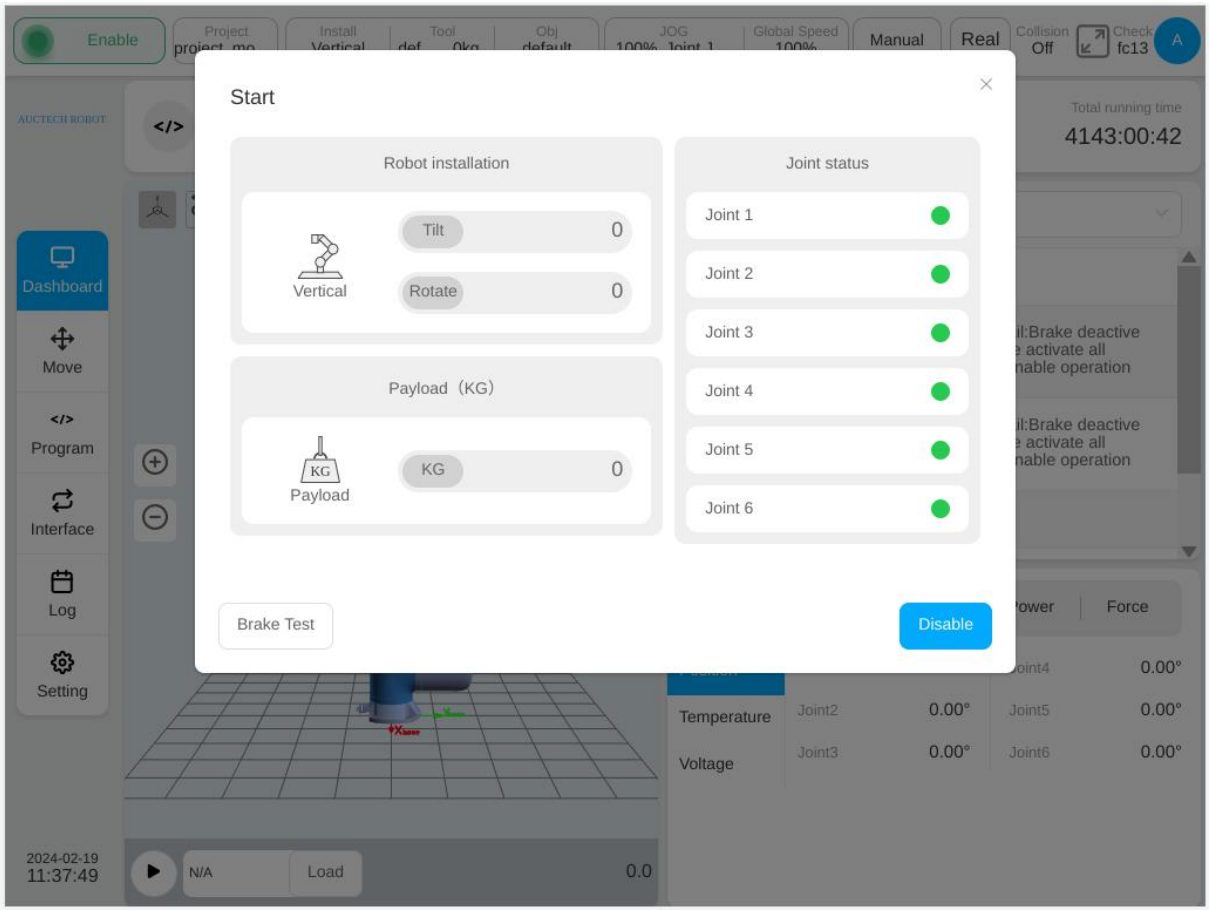
After the robot is powered on, the joint indicator light turns orange, indicating the joints are powered on. The robot is powered on but not enabled. The “Power Off” and “Enable” button will appear in the lower right corner of the page, as shown in the figure.



Startup page (robot is powered on but not enabled)

Clicking the “Power Off” button, the robot status will return to the initial status without power. Click the “Enable” button to enter the enabling state, as shown in the figure.

After each joint is enabled, the color of the joint status indicator light is green. At this time, the robot enter the enabled state and completes the power-on process of the robot, as shown in the figure.

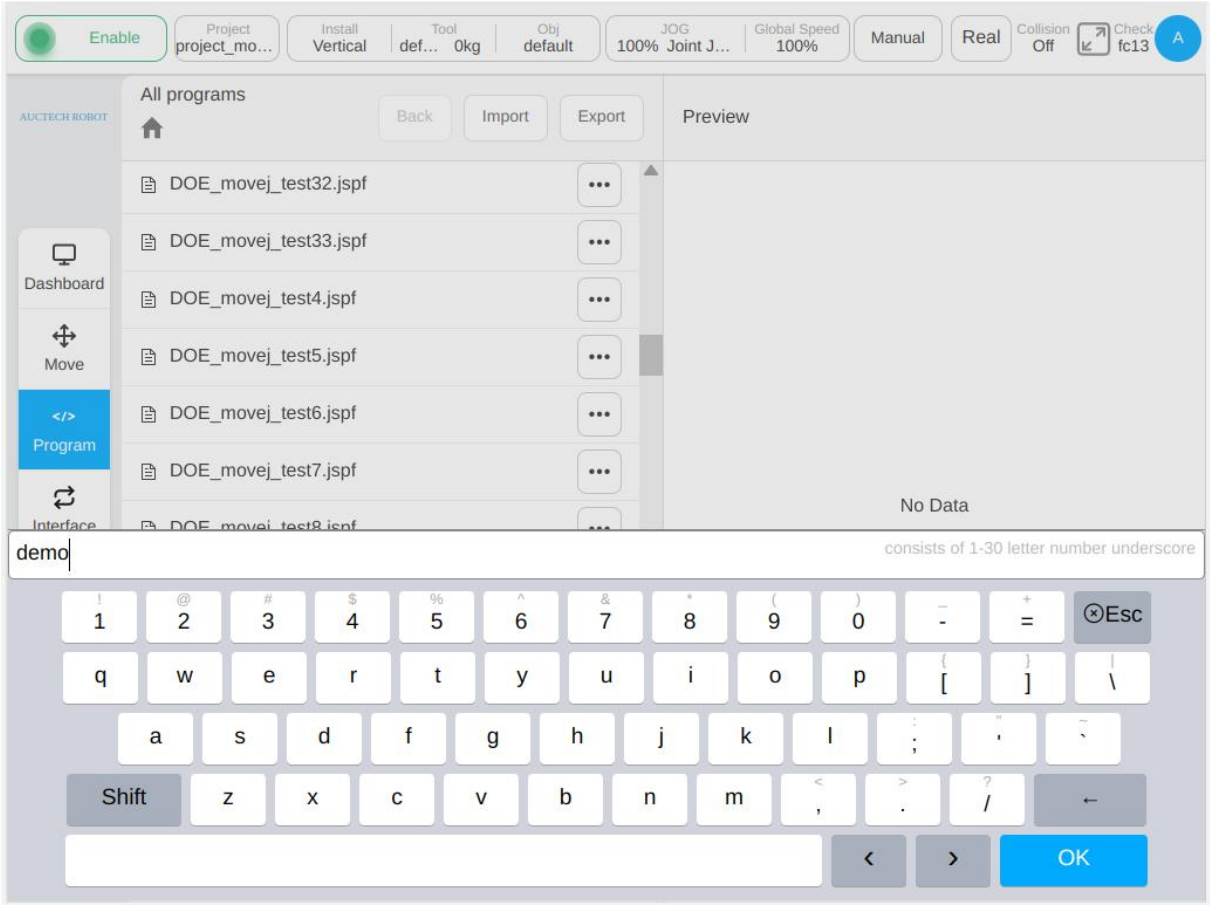


Startup page (robot in enabled)

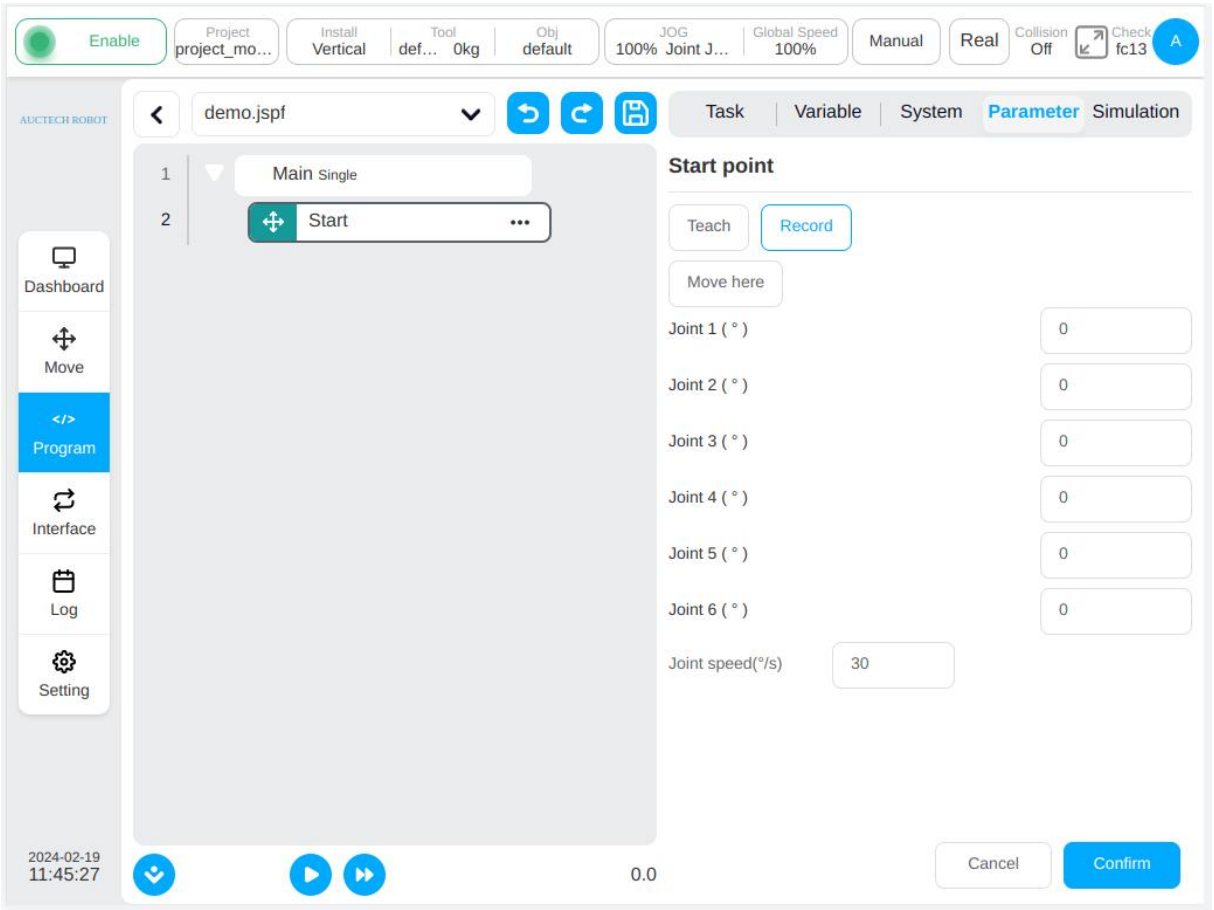
After the robot is enabled, the startup page will disappear automatically.

3.4. Create a Program

Click “Program” in the left navigation bar to switch to the program page, and click the “Create a Program” at the bottom, and enter the procedure name: “demo”. Click “Enter” to create a new program demo.jspf, and enter the programming page.

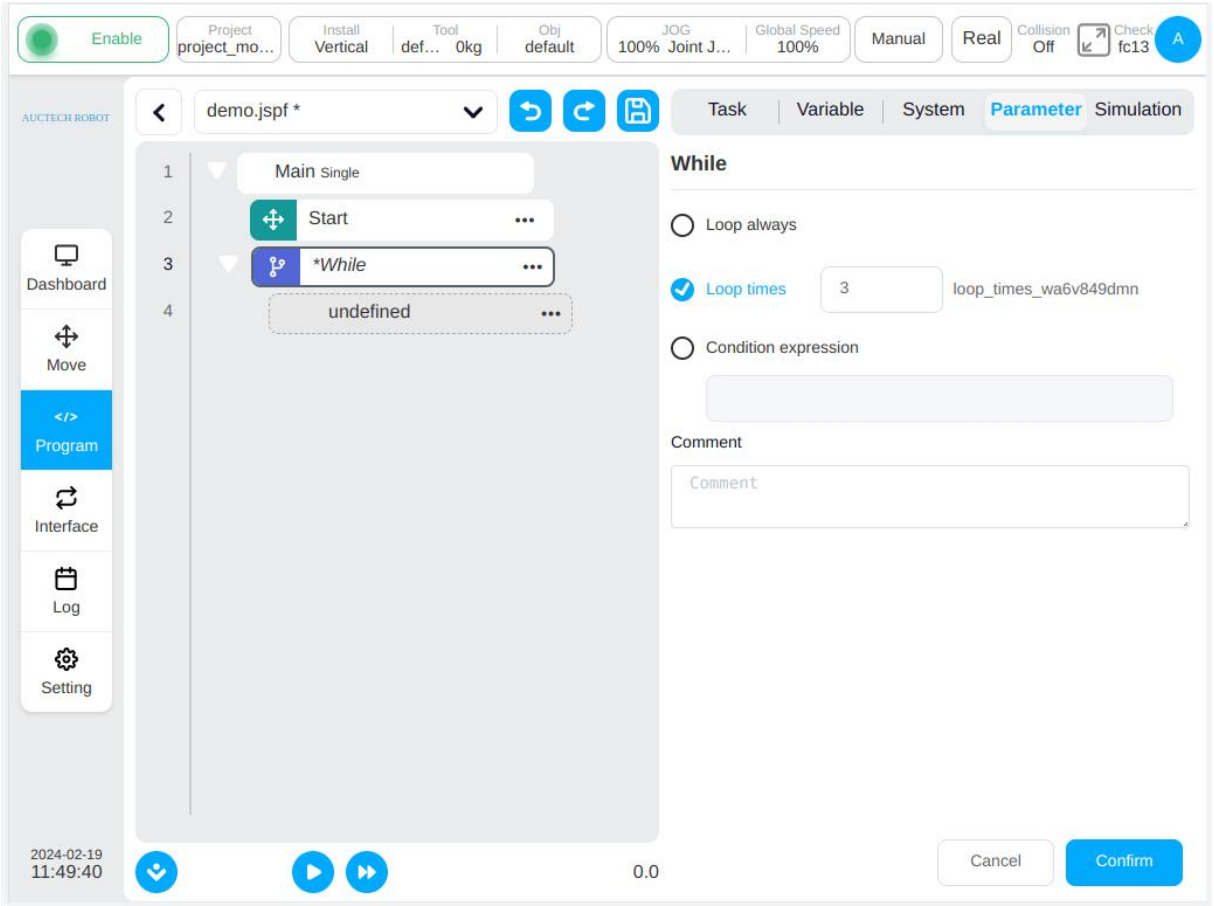


The demo program contains a “Start” function block by default to set the starting waypoint of the robot. Double-click Start or click the “Parameters” on the right side to view or set the starting point.

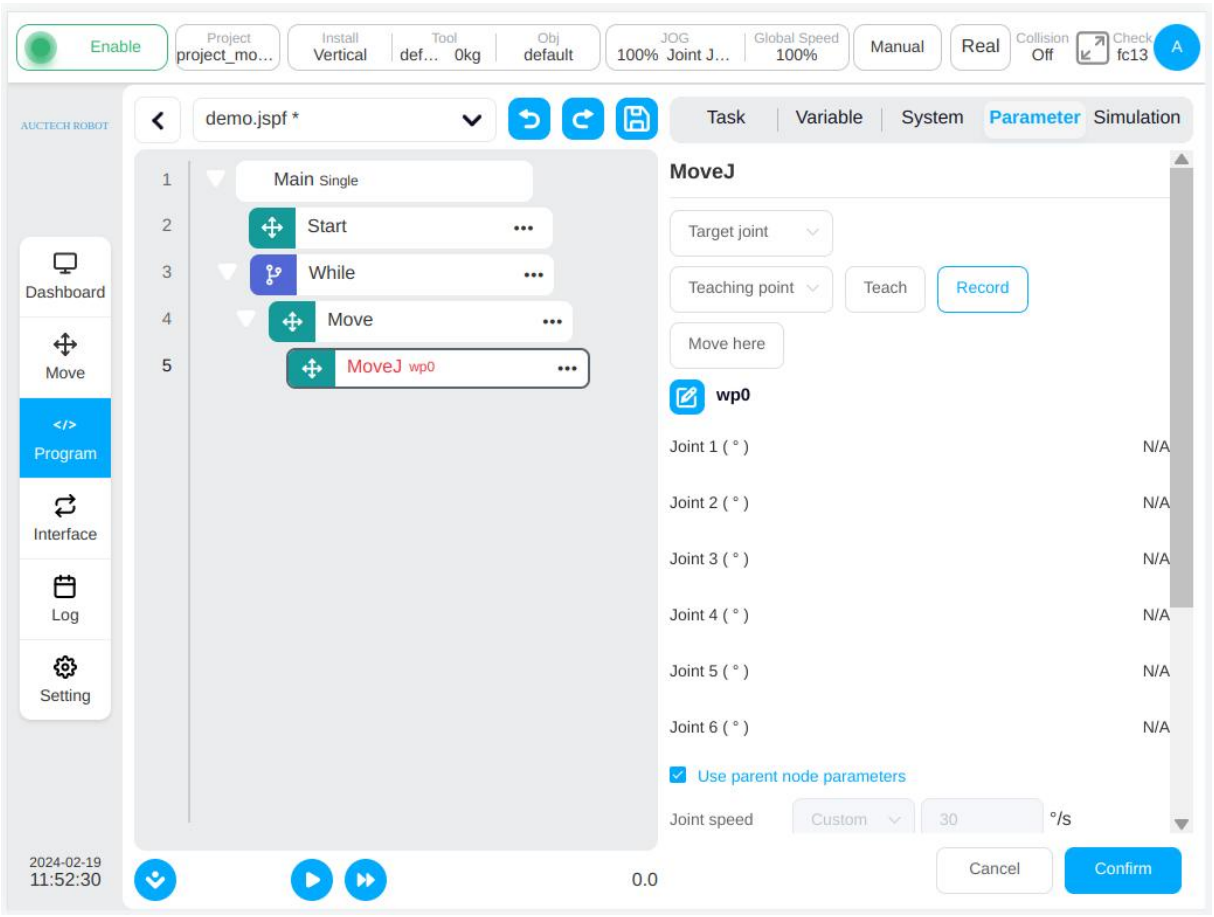


Now we implement such a function: the robot moves to the ready point, moves down to an operating point, waits for 2s, sets the digital output port 1 to high level, waits for 1s, reverts the digital output port 1 to low level, and the process will repeat for 3 times.

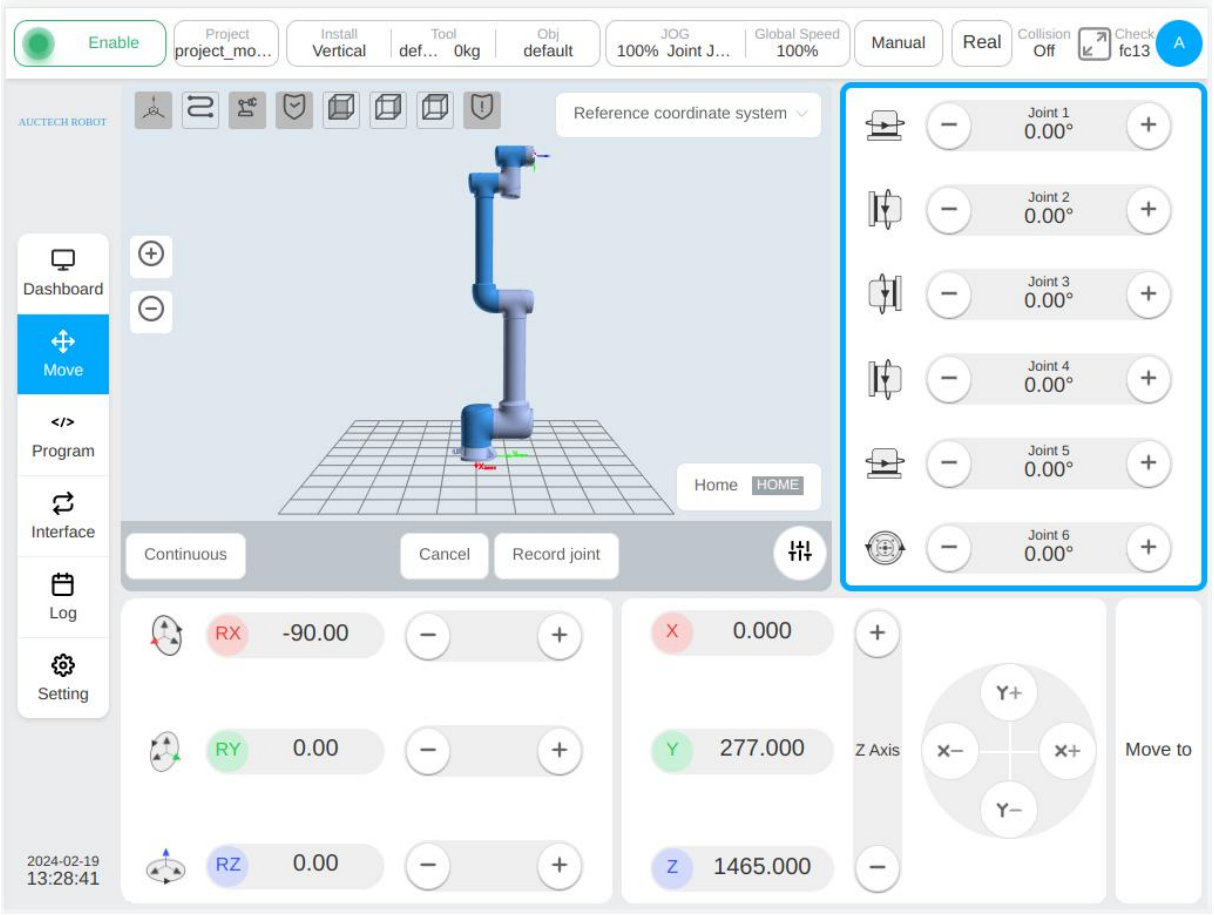
In the “Add” TAB – “Process Control”, find the While function block, which can implement the loop process. Hold down and drag it to the left program tree, and then release it to add the While function block to the program tree. Double-click the While function block to configure its parameters, select “number of cycles”, and enter 3, indicating that all program segments under the While function block will loop 3 times.



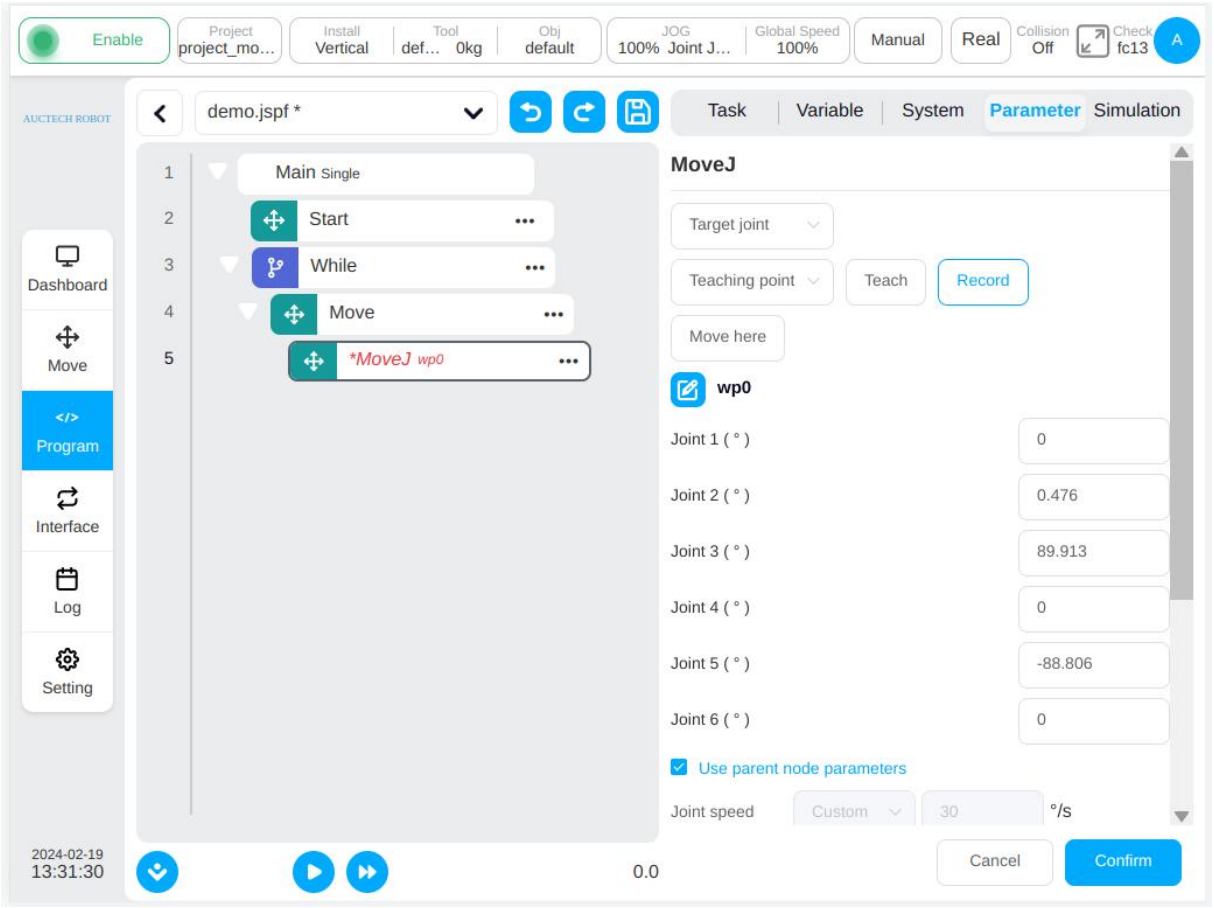
In the “Add” TAB – “Move” find the MoveJ function block and drag it to the sub function block of While in the program tree, as shown in the figure. Double-click the MoveJ function block and configure its parameters. Click the "Select point" button to switch to the point position of the mobile page to teach the robot.



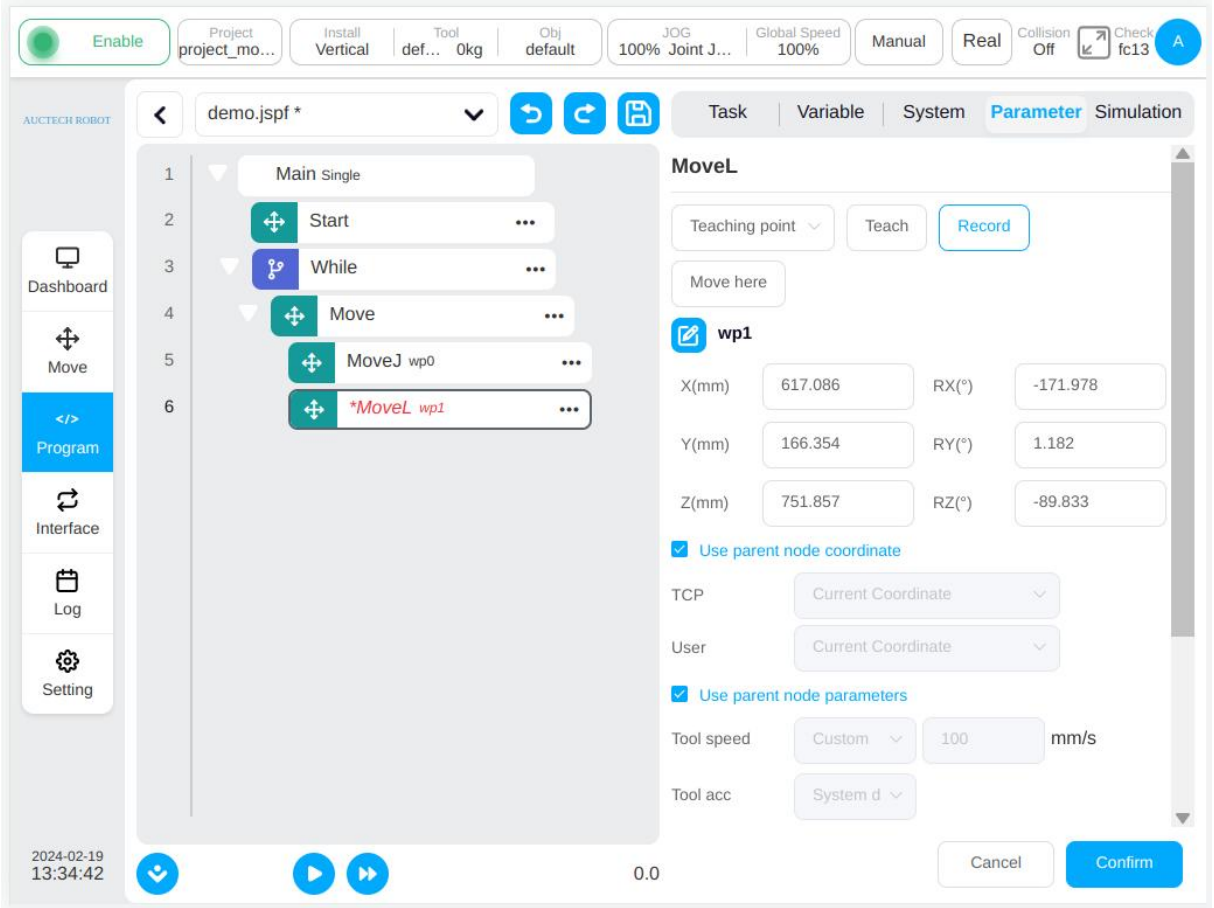
After the point position is set, click "Record current joint" to record the current robot posture.



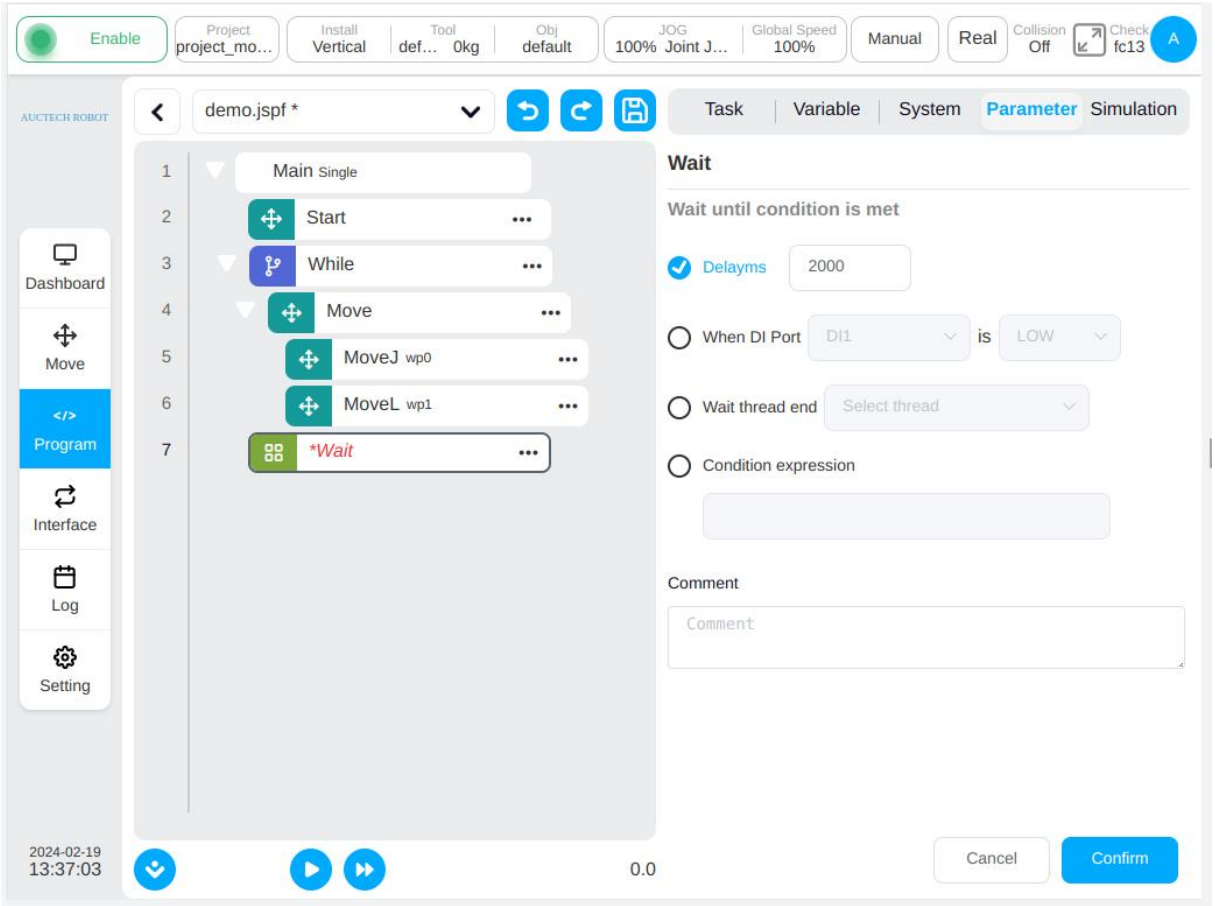
The set point information is displayed in the parameter configuration area of the MoveJ function block. The joint angular velocity and joint angular acceleration can be further set. Click the “Confirm” button below to save the parameters of this function block.



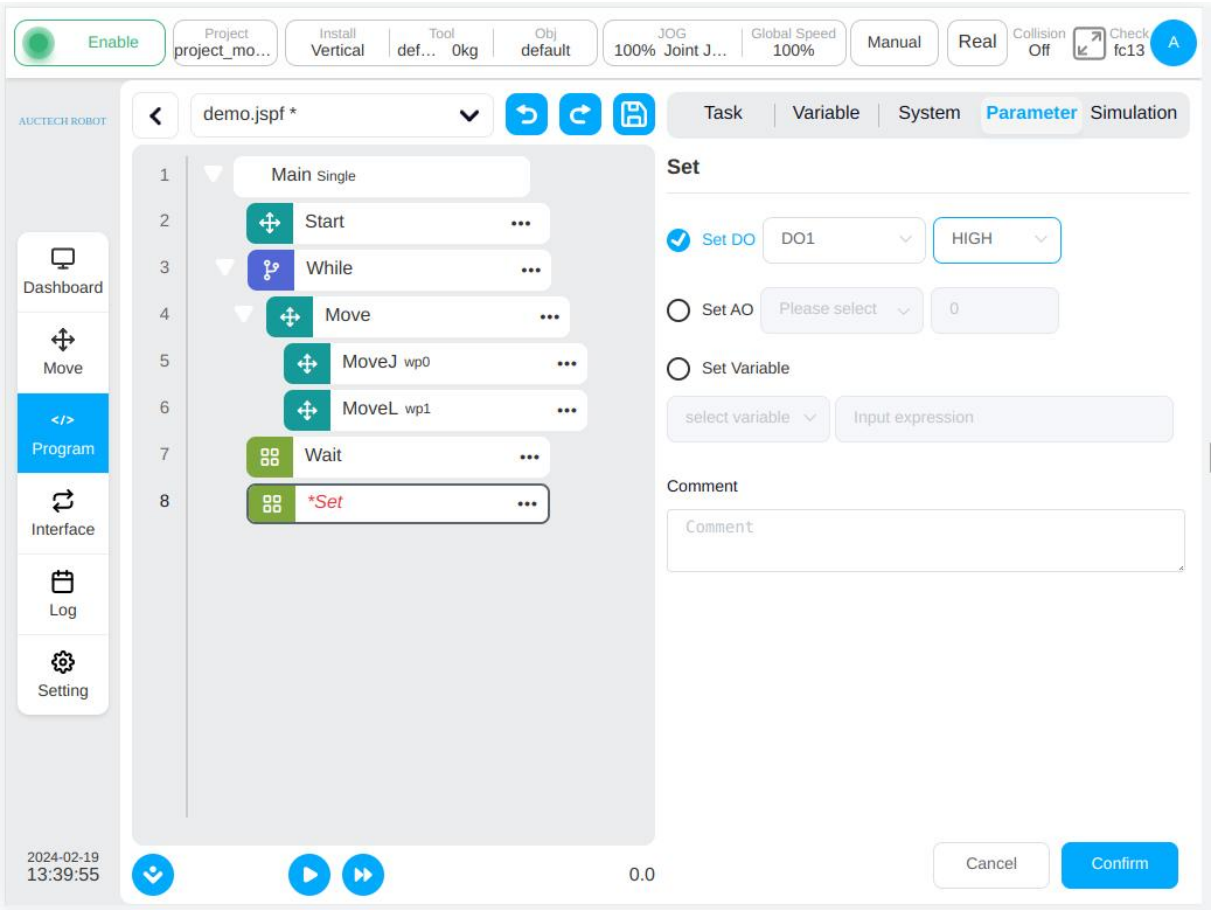
In the same way, add the MoveL function block below the MoveJ function block and set the point.



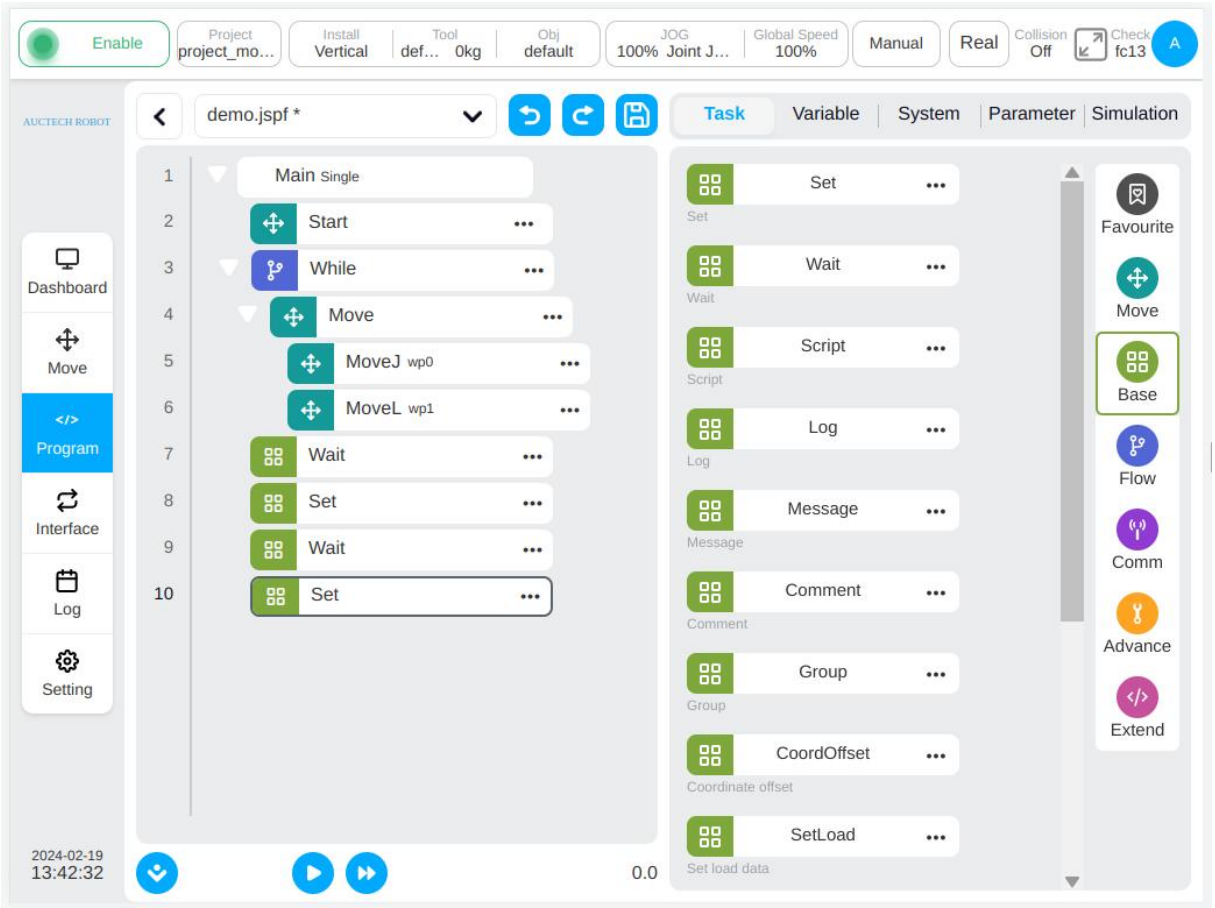
Find the Wait function block in the “Add” TAB – “Foundation” area, drag it to the position as shown in the figure, select “Delay” in its parameter configuration area, and enter the parameter 2000, which means that the program execution will delay two seconds to execute the subsequent function block.



Select the Set function block in the “Add” TAB – “Base” area, and drag it under Wait. In the parameter configuration area, select “Set Digital Output” and select DO1 and HIGH. Indicates that when the program is executed to this function block, the digital output port 1 is set to high level.

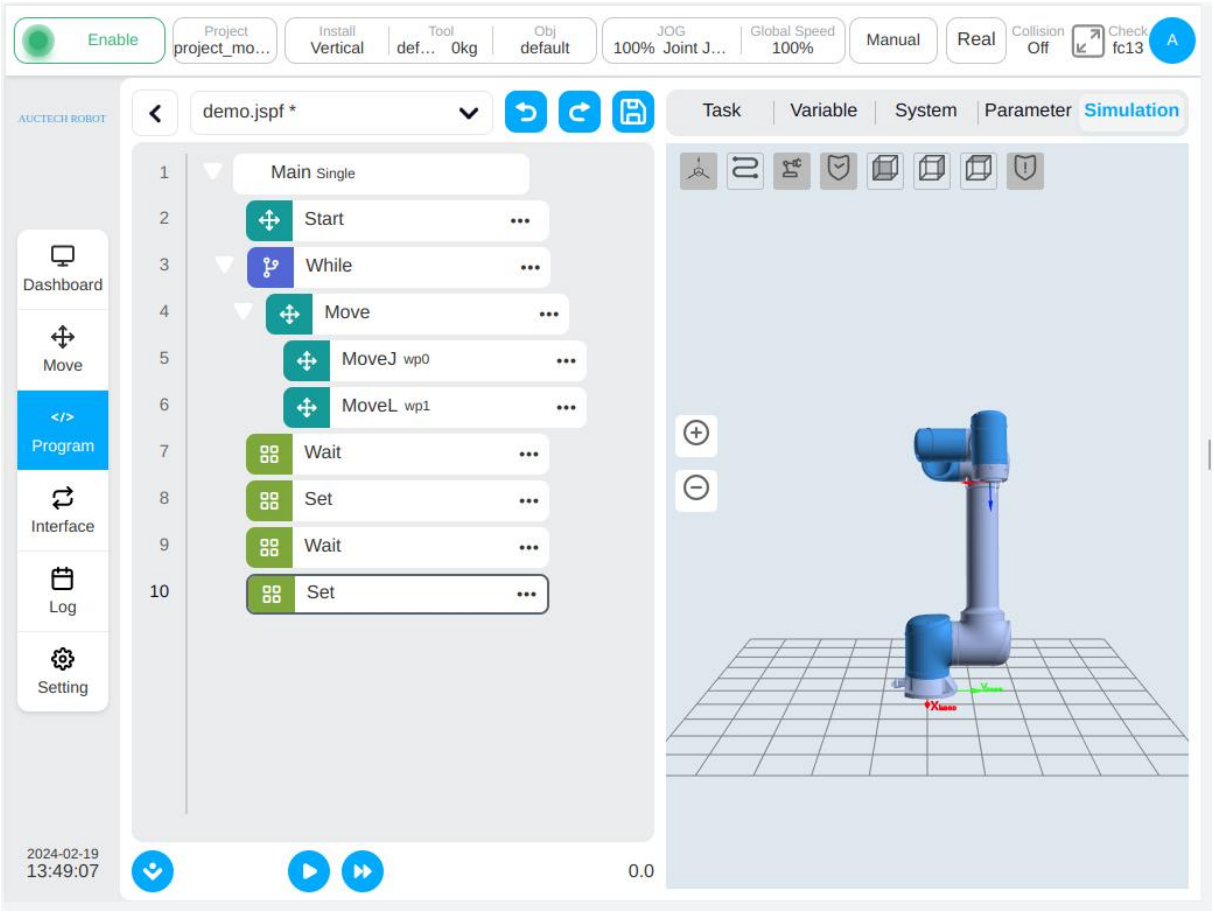


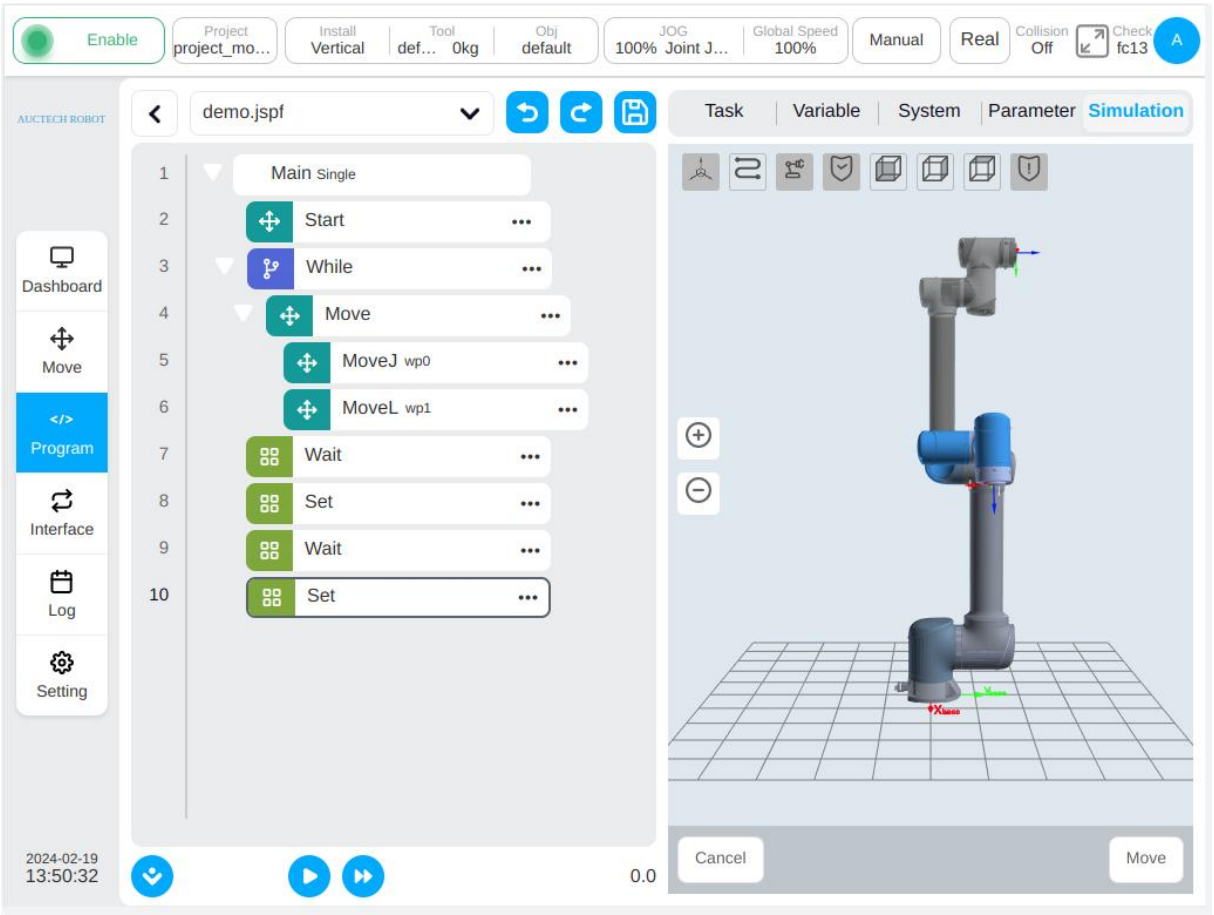
Similarly, add a Wait block to set the delay for 1s, and add a Set block to set DO1 to low. The above is to complete the program of the function, click the “Save program” button above to save the program.


Enable
Project
project_mo...
Install
Vertical
Tool
def... 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
Off
Check
fc13
A
AUCTECH ROBOT
demo.jspf *
Task
Variable
System
Parameter
Simulation
Dashboard
Move
Program
Interface
Log
Setting
1 Main Single
2 Start
3 While
4 Move
5 MoveJ wp0
6 MoveL wp1
7 Wait
8 Set
9 Wait
10 Set
Set
Wait
Script
Log
Message
Comment
Group
CoordOffset
Coordinate offset
SetLoad
Set load data
Favourite
Move
Base
Flow
Comm
Advance
Extend
2024-02-19
13:42:32
0.0

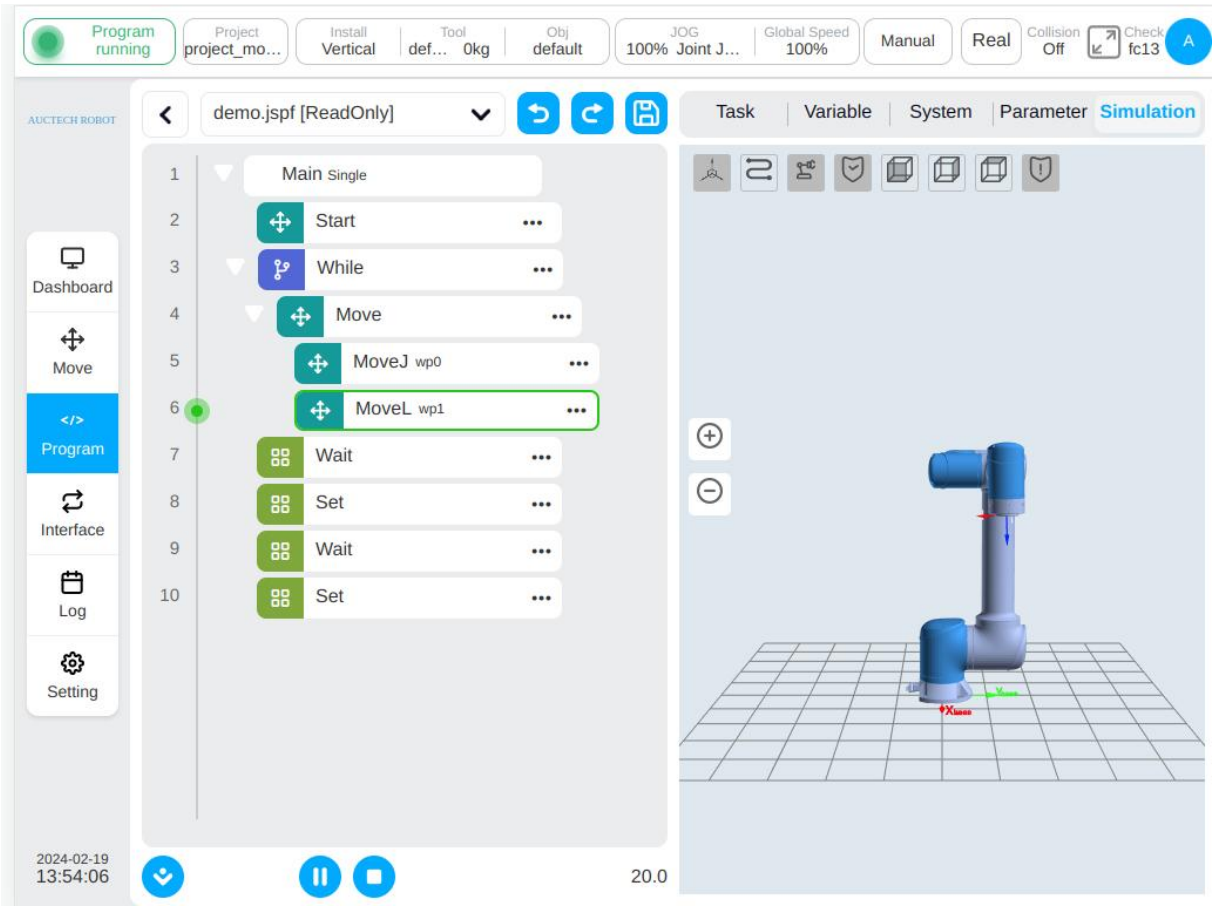
3.5. Run the Program

Switch to the “Run” TAB and click the “Run” button below. If the current position of the robot is different from the starting point of the program, the “Press and move” button will be displayed, and the starting position of the robot will also be displayed on the 3D image display. Hold on the “Hold and move” button to move the robot to the starting position. Click the Run button again to run the program.





When the program is executed, as shown in the figure below, the green dot in front of the program tree is used to indicate the currently executing function block, and the currently executing function block displays a green highlighted border, and the real-time posture of the robot can be displayed in the 3D model. You can pause or stop the program while it is running.


Program running
Project project_mo...
Install Vertical
Tool def... 0kg
Obj default
JOG 100% Joint J...
Global Speed 100%
Manual
Real
Collision Off
Check fc13
A
AUCTECH ROBOT
demo.jspf [ReadOnly]
Task
Variable
System
Parameter
Simulation
Dashboard
Move
Program
Interface
Log
Setting
1 Main Single
2 Start
3 While
4 Move
5 MoveJ wp0
6 MoveL wp1
7 Wait
8 Set
9 Wait
10 Set
2024-02-19
13:54:06
20.0

4. System Overview

4.1. Project Management

The system supports multi-project management, and the project data includes robot program, project global variables, project settings and other information. When the system starts loading, the current project data is loaded according to the system settings. Other project data cannot be used in the current project.

- All the project data, such as the settings on the port page, settings on the settings page, etc. need to be saved after setting the project, so that it will be correctly loaded on the next boot.

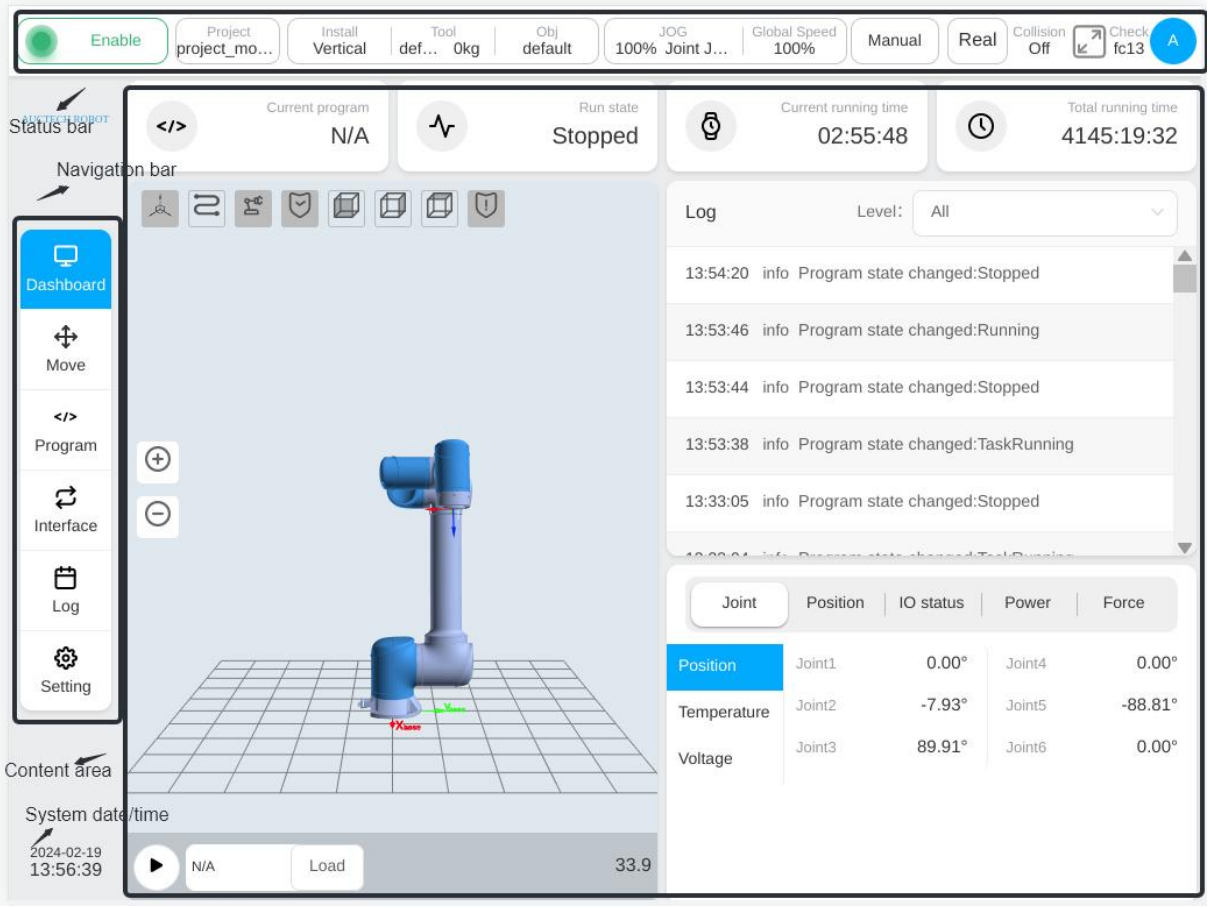
4.2. User Management

The system supports multi-user management. The level of user permissions include operator, programmer, maintainer, and admin. Specific permissions are described as follows:

User permission level	Permission specification
Operator	• Allowed to select engineering, running program, manual jog program, viewing robot status, etc.
Programmer	• Operator user permission • Programming robot program, engineering configuration • The default user name is default and the initial password is 123
Maintainer	• Operator user permission • System update
Admin	• Maintainer user permission • User management • The user name is admin and the initial password is 123

4.3. User Page Overview

As shown in the figure, the overall page is mainly divided into three parts: the head status bar, the left navigation bar, and the right content area. The content area presents different contents (subpages) according to the selection of the left navigation bar. Below the navigation bar is the plugin entry and system date and time.

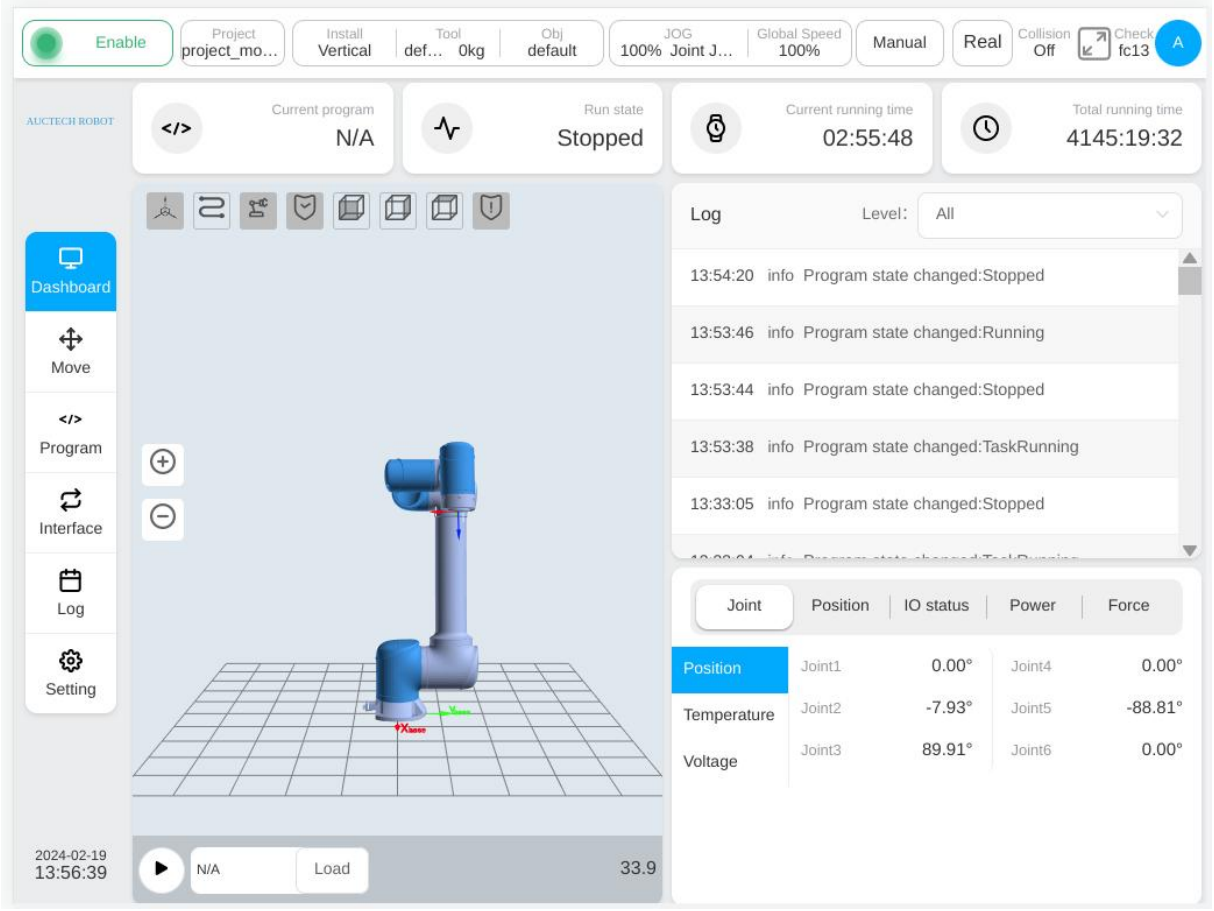


Page overview structure

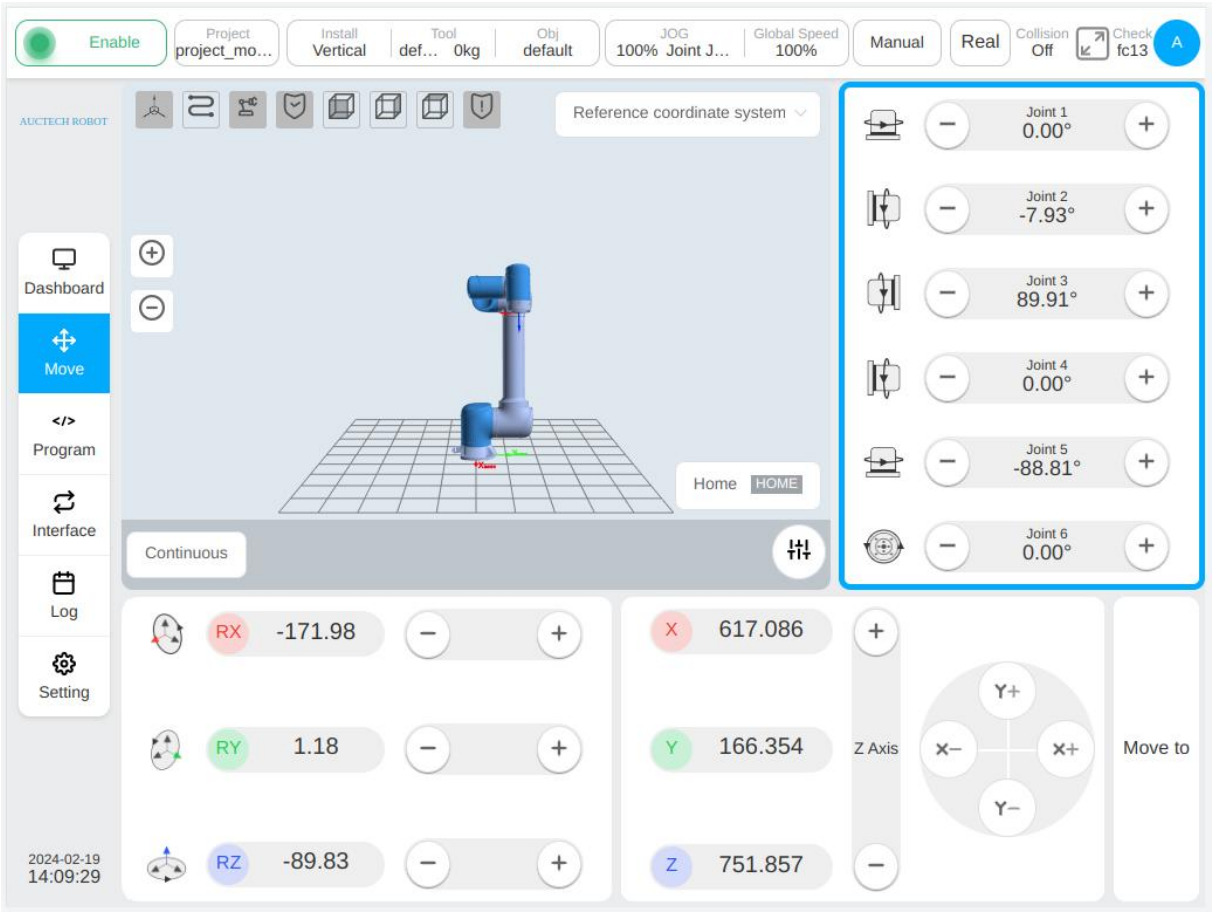
The main information displayed in the status bar includes: robot joint status indicator light, status display, current project, robot installation direction, information about the current tool coordinate system and workpiece coordinate system, speed percentage, operation mode, collision detection setting information, safety check code, and user information.

The navigation bar contains six navigation icons: Overview, Move, Program, Port, Logs and Settings. Click the icon of the navigation bar to switch the content displayed in the content area. The main contents of each page are as follows:

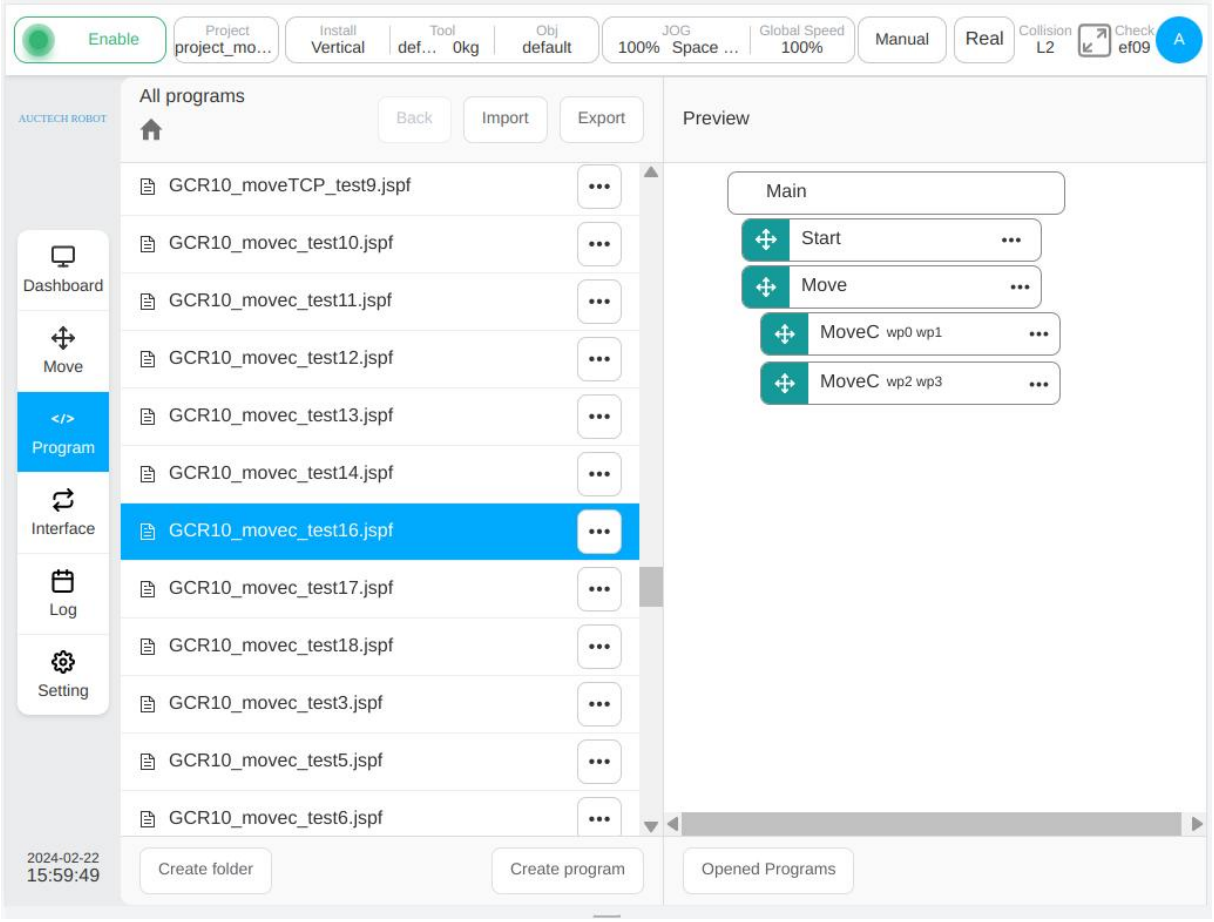
The overview page is a production view page that allows users to select programs to run, and displays basic information such as program status, system running time, system logs, and joint positions.



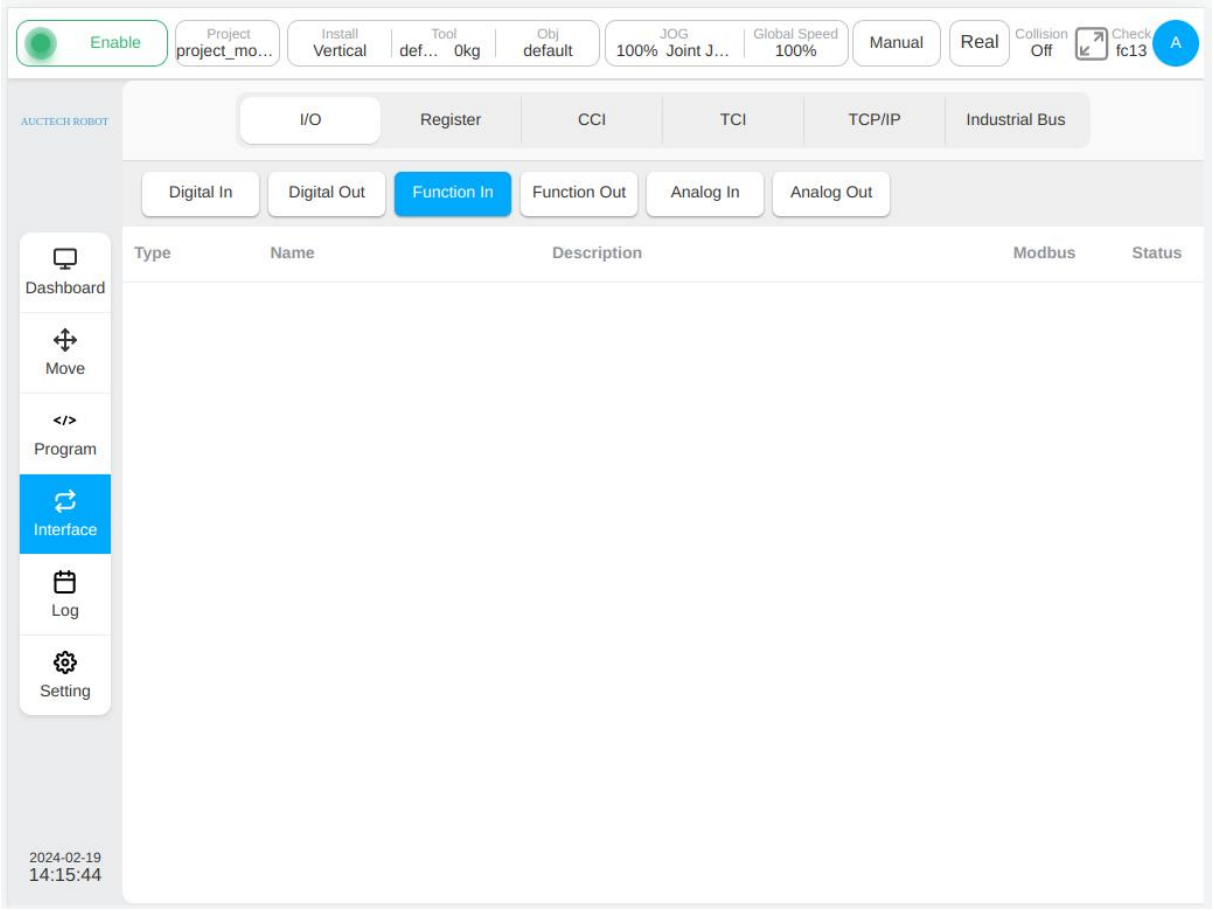
The move page allows the user to manually operate the robot, set the coordinate system and movement mode of manual movement.



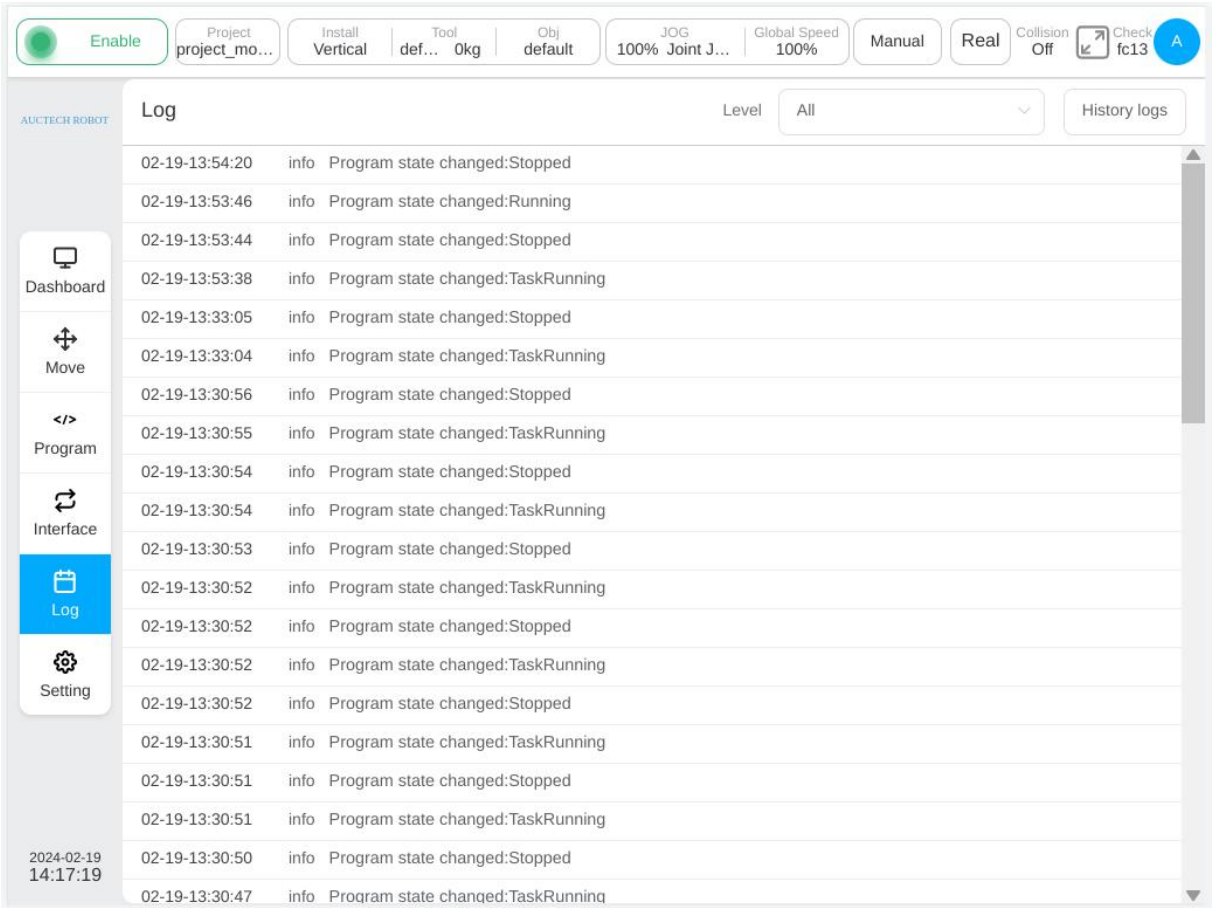
The program page is the main programming page of the robot, where the user can manage the program files in the project, as well as write the robot tasks through the provided graphical programming environment.



The port page allows users to configure all external ports of the robot under this page, including digital input and output, analog input and output, TCP/IP ports, and other industrial fieldbus ports.

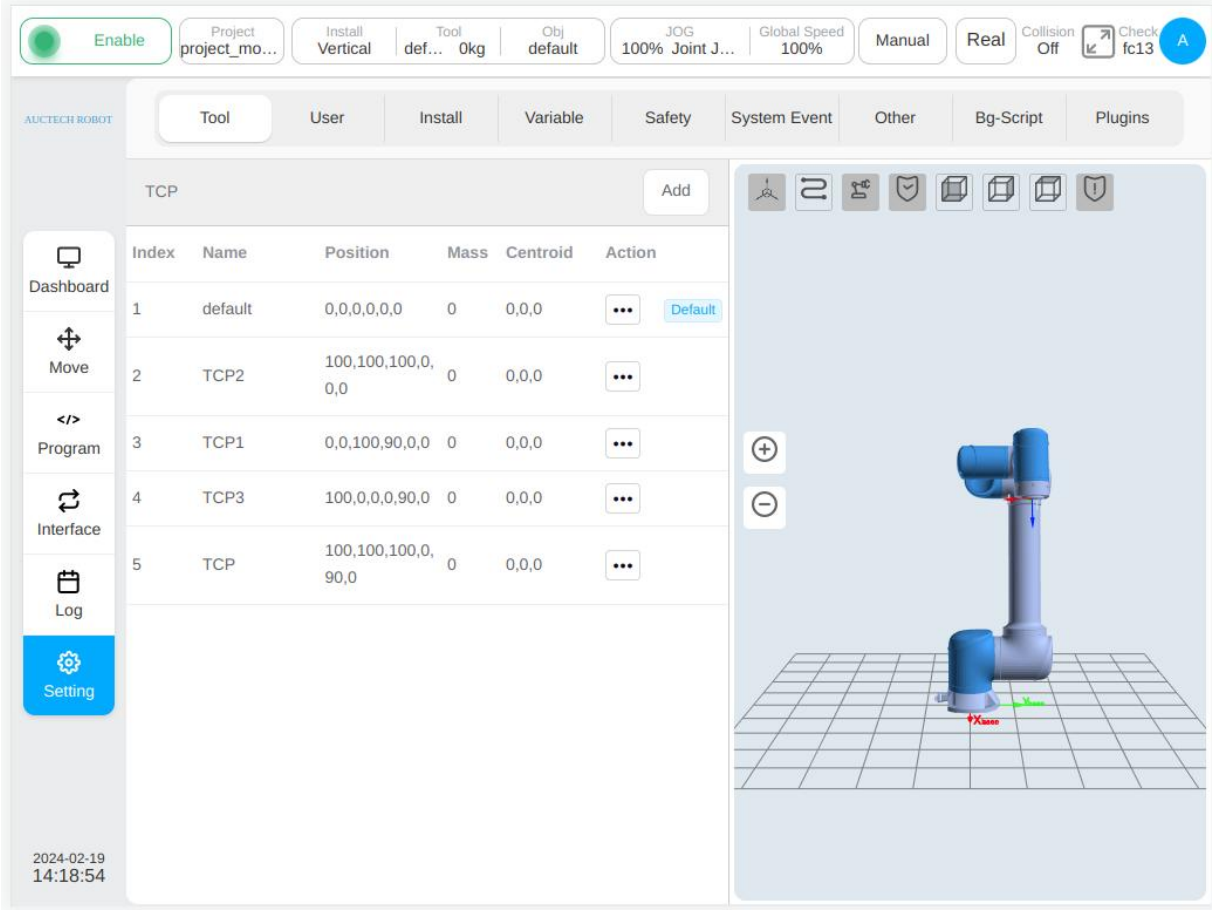


The log page displays system logs of this startup.



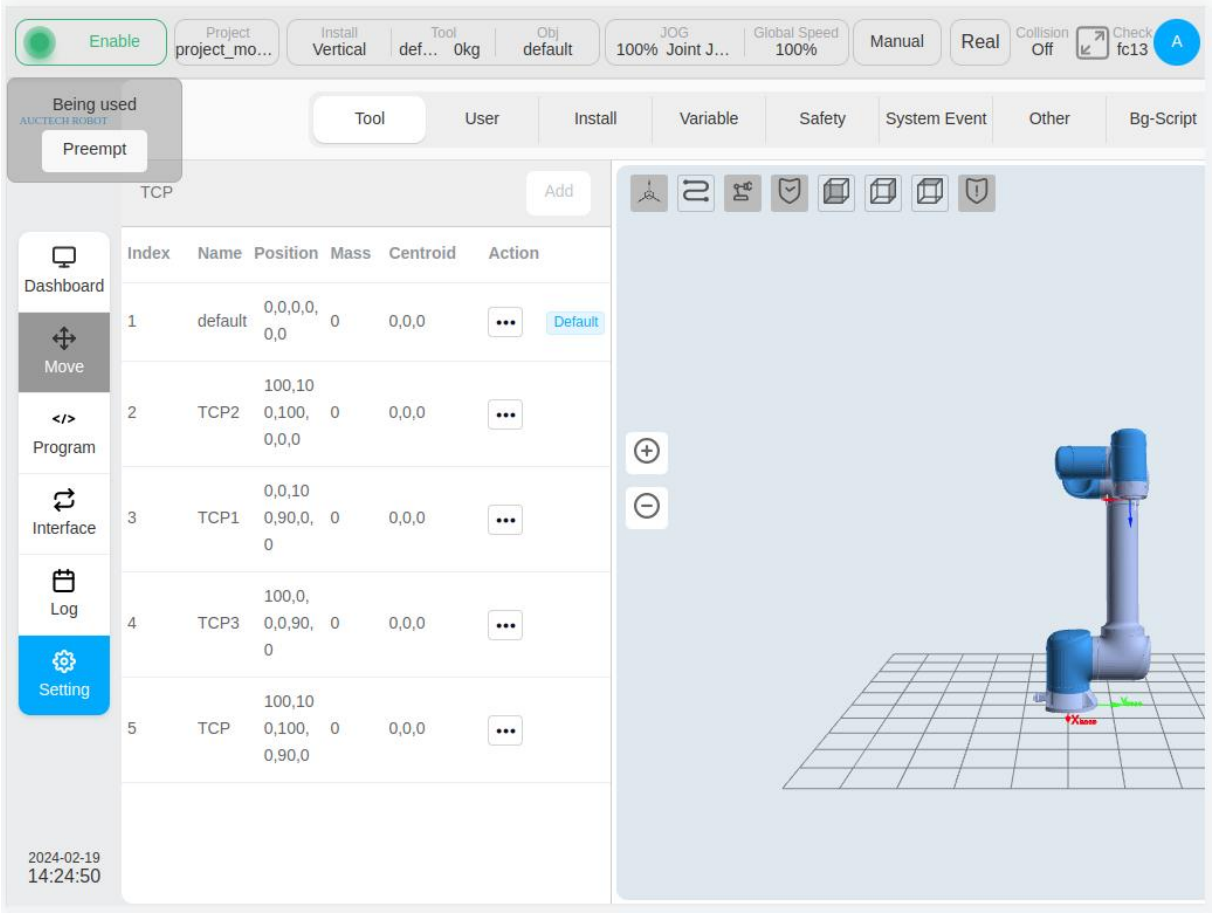
Setting page, current project configuration settings, including coordinate system settings, installation

direction settings, and safety settings.

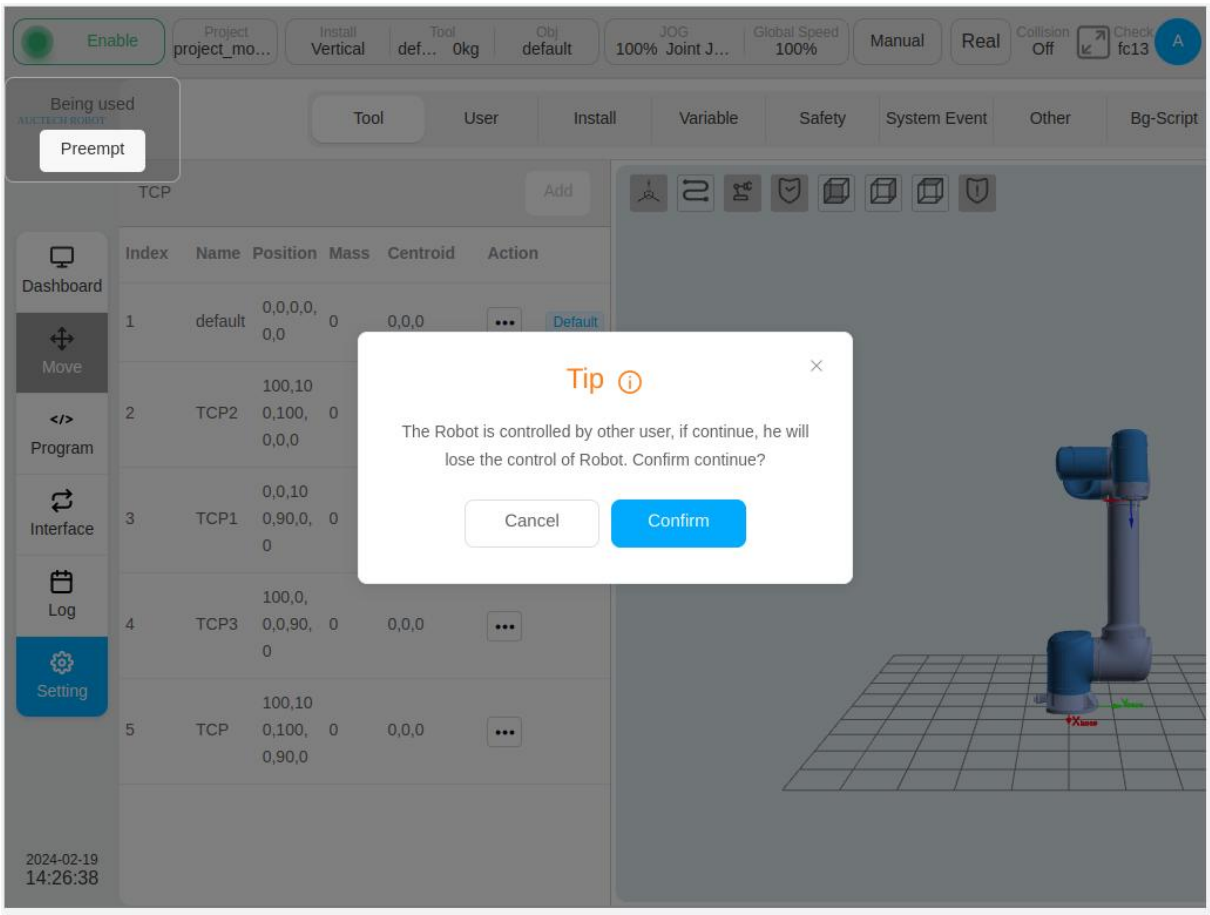


4.4. Multi-terminal Connection

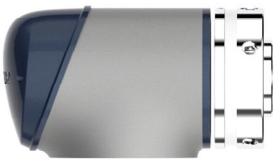
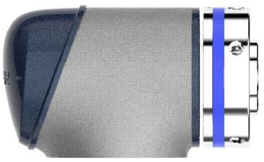
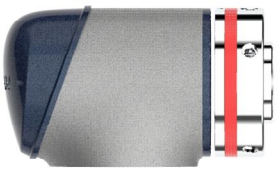
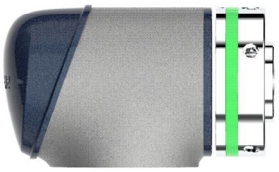
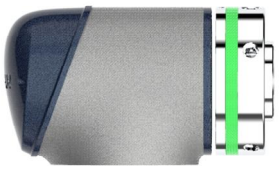
The system supports multiple terminals to be connected at the same time, but only one terminal has the control, and can carry out all functions such as program operation and system configuration. Other terminals only have the permission to view, and cannot run the robot arm or modify settings. The terminal without control is shown as follows:



When other terminals want to get control, click the "Get Control" button in the upper left corner. The following dialog box pop up, click "Confirm" button to obtain the control of the system, and then the terminal obtaining initial control will lose control.


Enable
Project
project_mo...
Install
Vertical
Tool
def... 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
Off
Check
fc13
A
Being used
Preempt
Tool
User
Install
Variable
Safety
System Event
Other
Bg-Script
TCP
Add
Dashboard
Move
Program
Interface
Log
Setting
Index
Name
Position
Mass
Centroid
Action
1
default
0,0,0,0,0,0
0
0,0,0
Default
2
TCP2
100,100,100,0,0,0
0
3
TCP1
0,0,100,90,0,0
0
4
TCP3
100,0,0,0,90,0
0
0,0,0
5
TCP
100,100,100,0,90,0
0
0,0,0
Tip
The Robot is controlled by other user, if continue, he will lose the control of Robot. Confirm continue?
Cancel
Confirm
2024-02-19
14:26:38

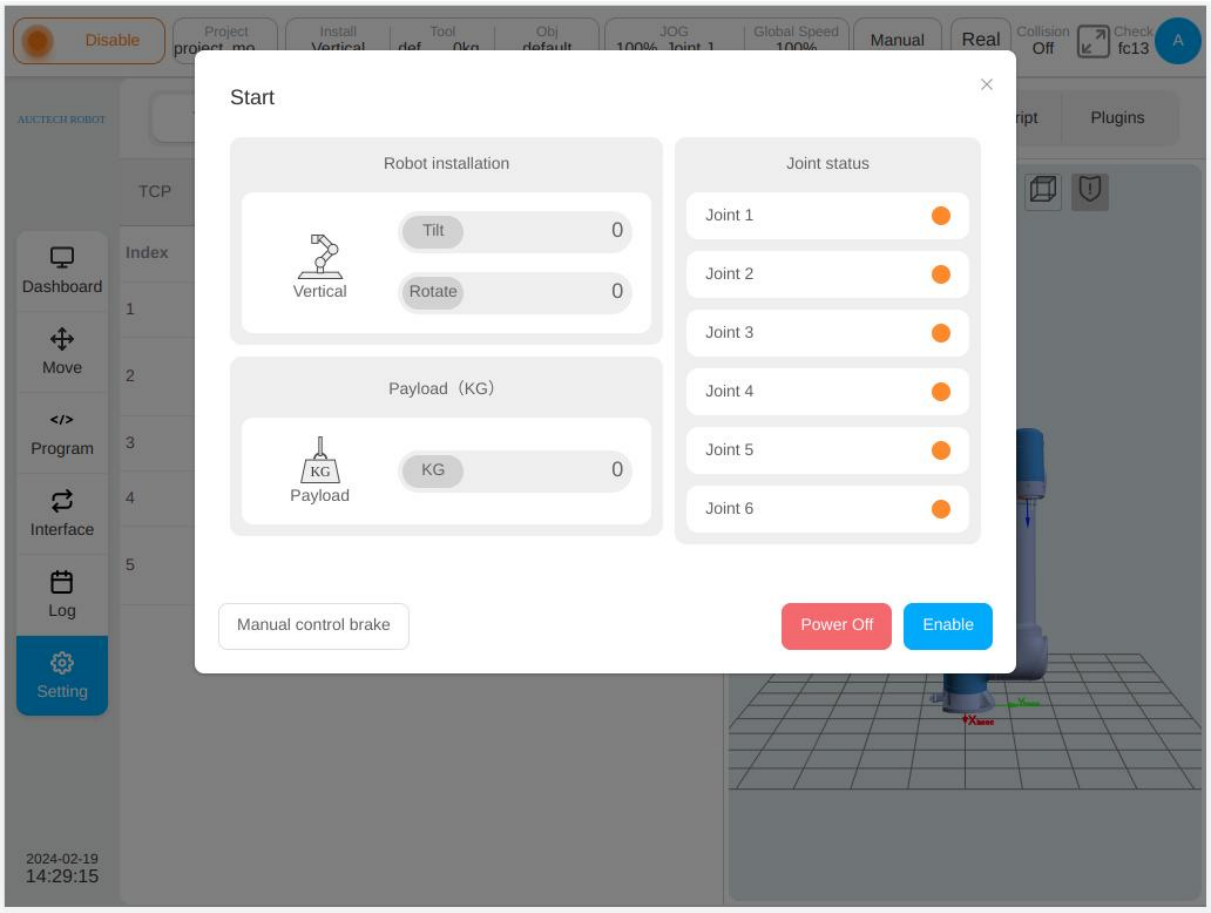
4.5. End Light Belt Indication

State definition	Color definition	Schematic drawing
1. The robot is powered on. 2. The robot establishes communication.	Constant white	
1. The robot stands by.	Constant blue	
1. The safety stop triggers.	Constant red	
1. The program is running. 2. The Robot returns to zero. 3. The robot is manually moved to a point.	Constant green	
1. Traction and teaching	Flicker green	

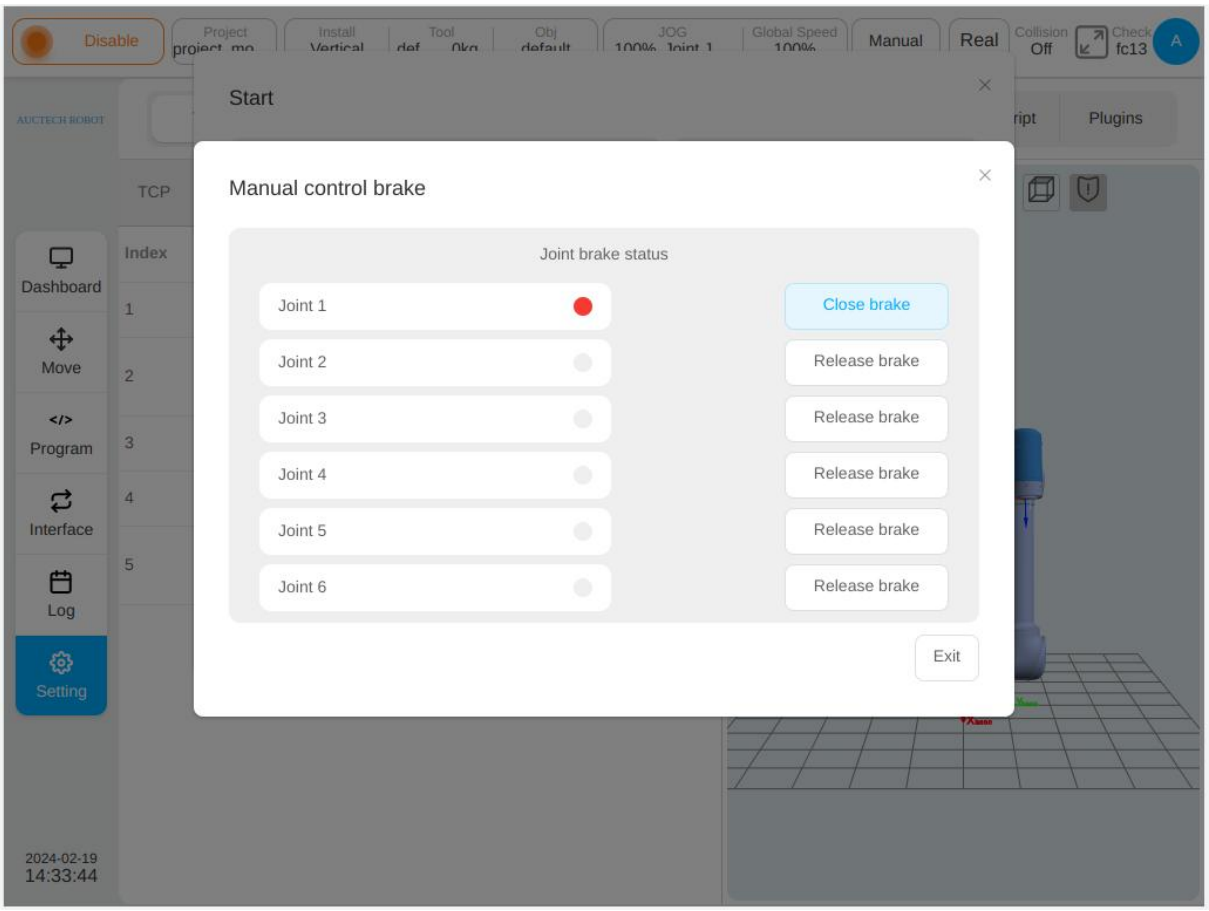
5. Safety Maintenance

5.1. Manually Release the Brake

In some cases, the user needs to manually release the holding brake of a single joint. When the robot is powered on and not enabled, an entrance to manually release the brake will appear on the startup page, as shown in the figure.



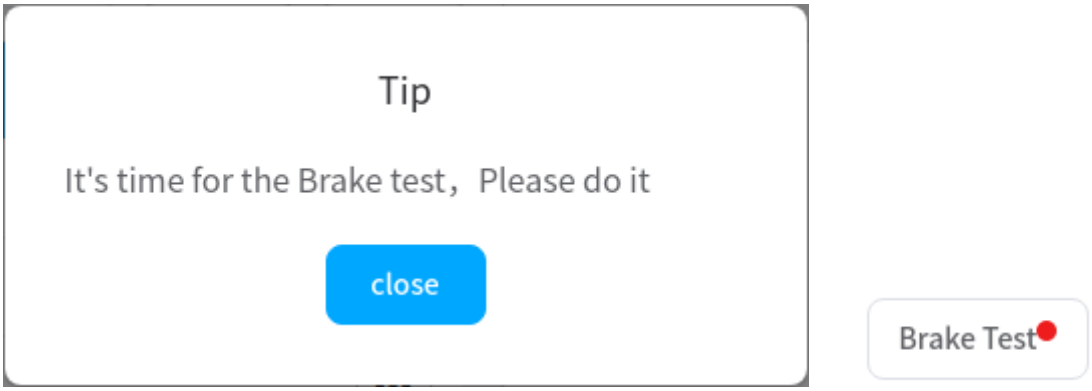
Click to enter the manual brake release page, as shown in the figure. The left side of the page shows the brake status of each joint, gray means the brake is closed, red means the brake is released; the brake control button is on the right side, and click it to control the opening and closing of the brake.


Disable
Project
Install
Tool
Obj
JOG
Global Speed
Manual
Real
Collision
Off
Check
fc13
Start
Plugins
TCP
Index
Dashboard
Move
Program
Interface
Log
Setting
Manual control brake
Joint brake status
Joint 1
Joint 2
Joint 3
Joint 4
Joint 5
Joint 6
Close brake
Release brake
Release brake
Release brake
Release brake
Release brake
Exit
2024-02-19
14:33:44

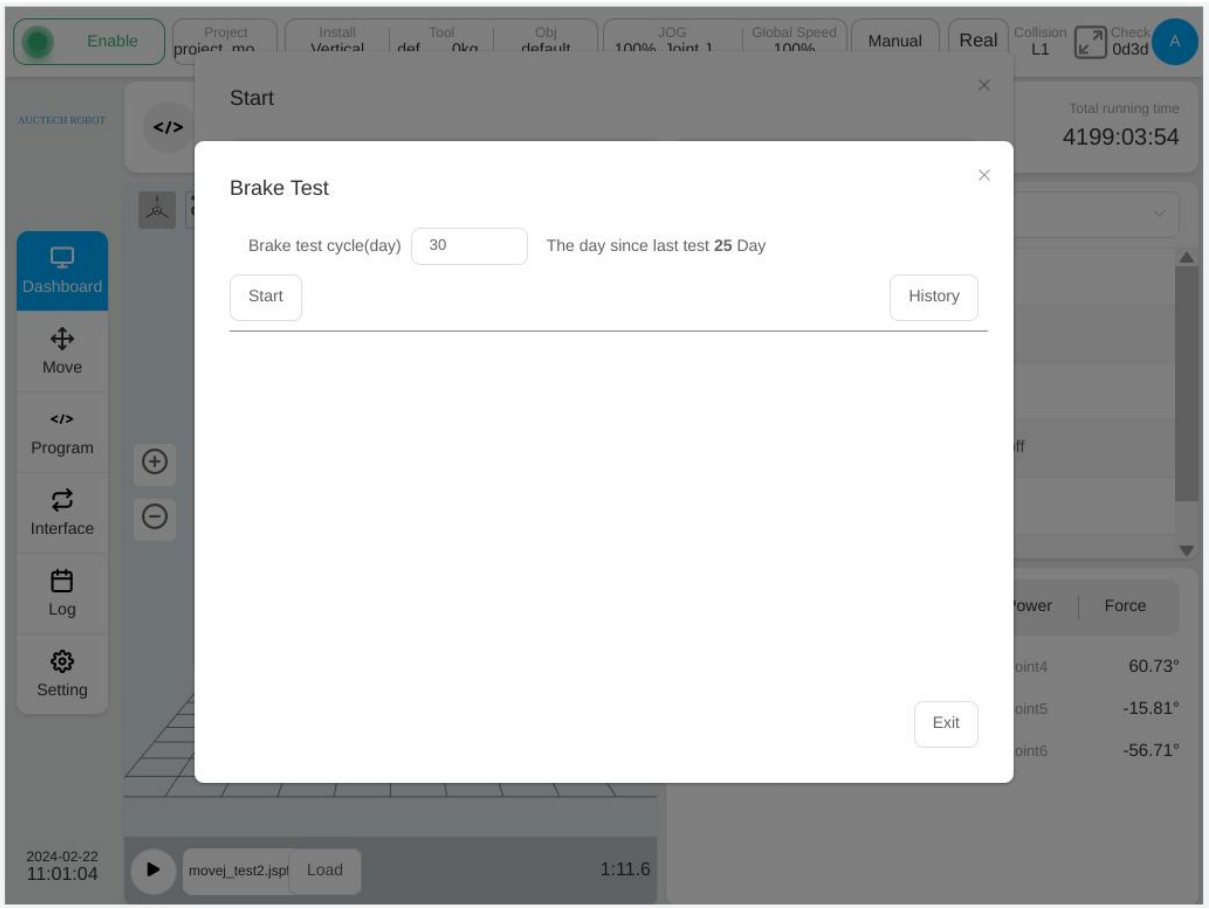
5.2. Brake Detection

The user needs to carry out the brake detection on schedule to prevent the robot arm from risks due to the failure of the brake. The system will periodically remind the user to carry out lock brake detection, and the factory default reminder is every 30 days.

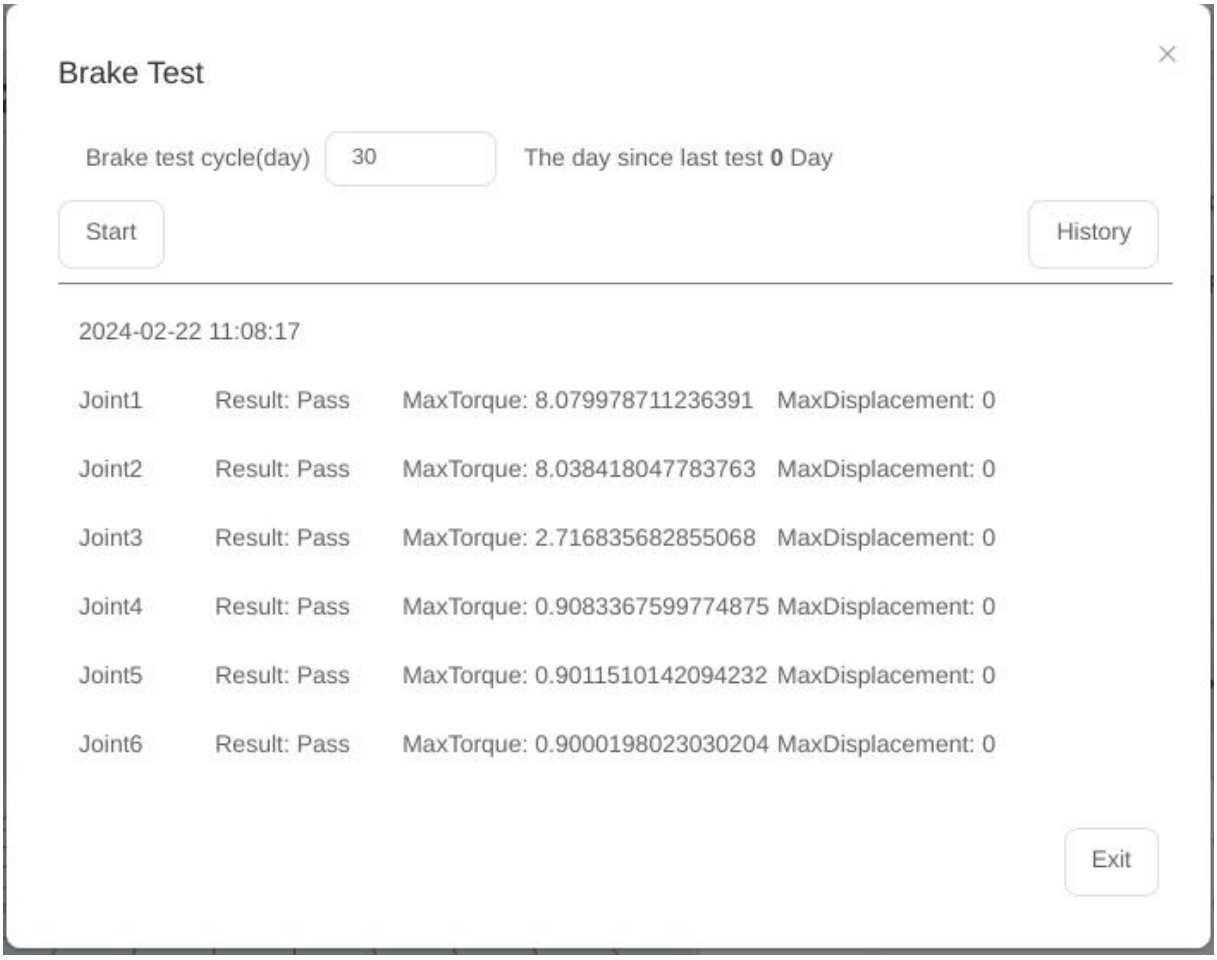
When the set time has elapsed since the last brake detection, the system will pop up the following dialog box, prompting the user to perform the brake detection. The brake detection entrance on the startup page will display a small red dot to remind the user.



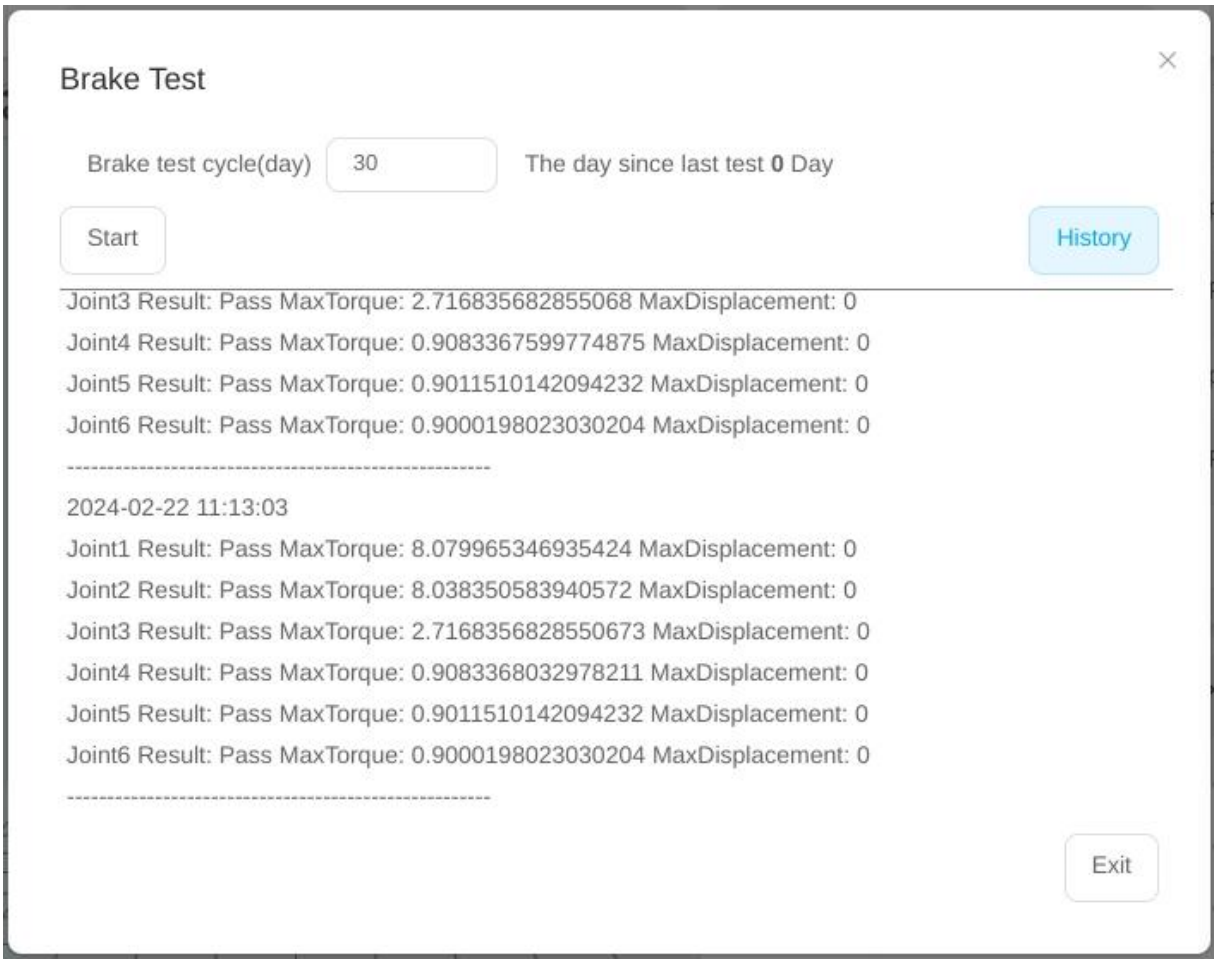
When the robot arm is enabled, an entry to the brake detection function will appear on the startup page. Click to enter the brake detection page, as shown in the figure. This page displays the brake detection period and the number of days since the last detection.



Click "Start detection", the following dialog box will pop up, and follow the prompts to perform operations. In the process of detection, users can pause and stop the detection process. After the detection is completed, the result of the detection is displayed.



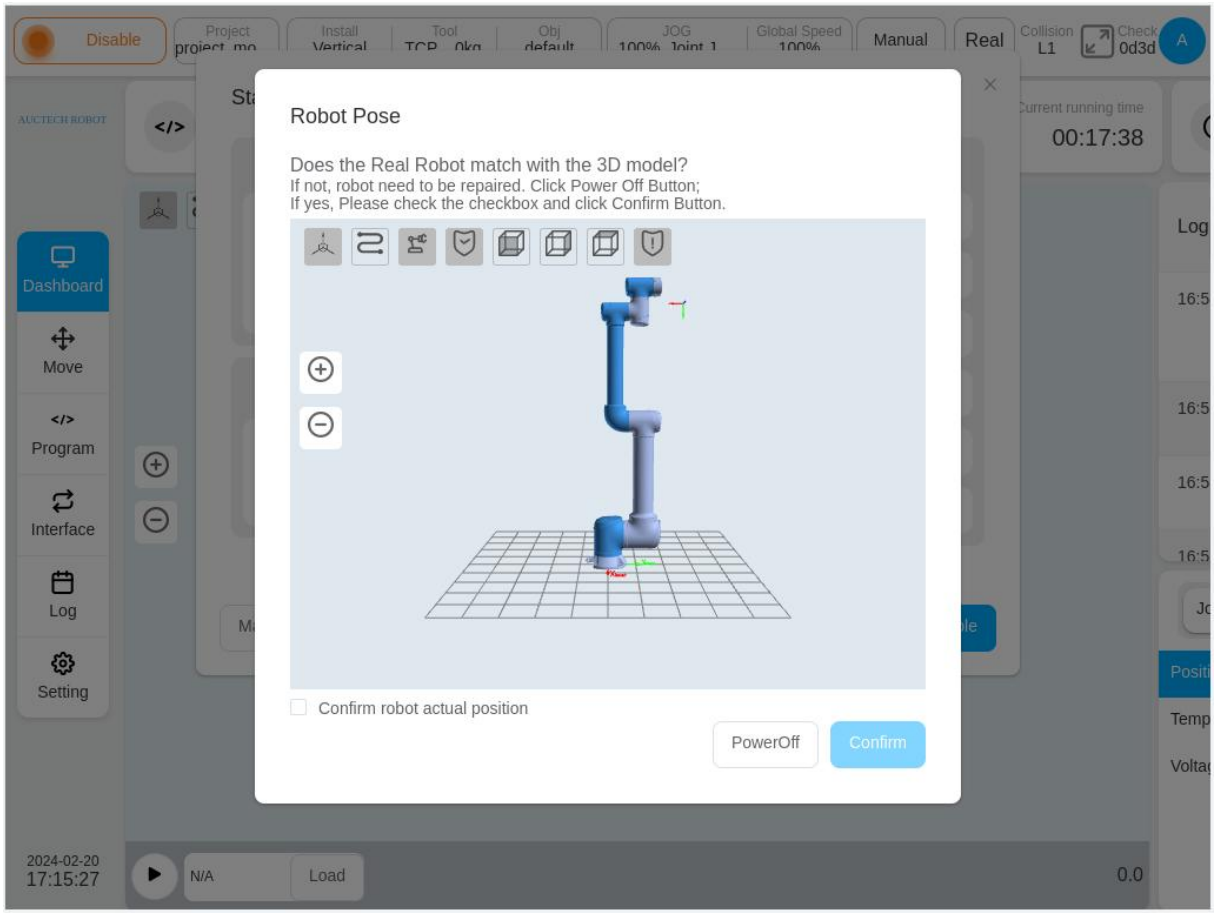
Click "History" to view the time and results of previous brake inspections


Brake Test
Brake test cycle(day)
30
The day since last test 0 Day
Start
History
Joint3 Result: Pass MaxTorque: 2.716835682855068 MaxDisplacement: 0
Joint4 Result: Pass MaxTorque: 0.9083367599774875 MaxDisplacement: 0
Joint5 Result: Pass MaxTorque: 0.9011510142094232 MaxDisplacement: 0
Joint6 Result: Pass MaxTorque: 0.9000198023030204 MaxDisplacement: 0
2024-02-22 11:13:03
Joint1 Result: Pass MaxTorque: 8.079965346935424 MaxDisplacement: 0
Joint2 Result: Pass MaxTorque: 8.038350583940572 MaxDisplacement: 0
Joint3 Result: Pass MaxTorque: 2.7168356828550673 MaxDisplacement: 0
Joint4 Result: Pass MaxTorque: 0.9083368032978211 MaxDisplacement: 0
Joint5 Result: Pass MaxTorque: 0.9011510142094232 MaxDisplacement: 0
Joint6 Result: Pass MaxTorque: 0.9000198023030204 MaxDisplacement: 0
Exit

5.3. Power-on Joint Position Detection

When the robot arm is powered on, it will detect whether the joint has been significantly rotated in the power off state to ensure the safety of use.

If the joint has been significantly rotated, the following dialog box will appear. The user confirms whether the pose of the real robot is consistent with the 3D model on the interface. If yes, check "Confirm that the pose of the robot shown above is consistent with the actual one" and click "Confirm" button to continue the power-on operation. If not, click the "power off" button to disconnect the power supply of the robot arm and contact maintenance personnel.



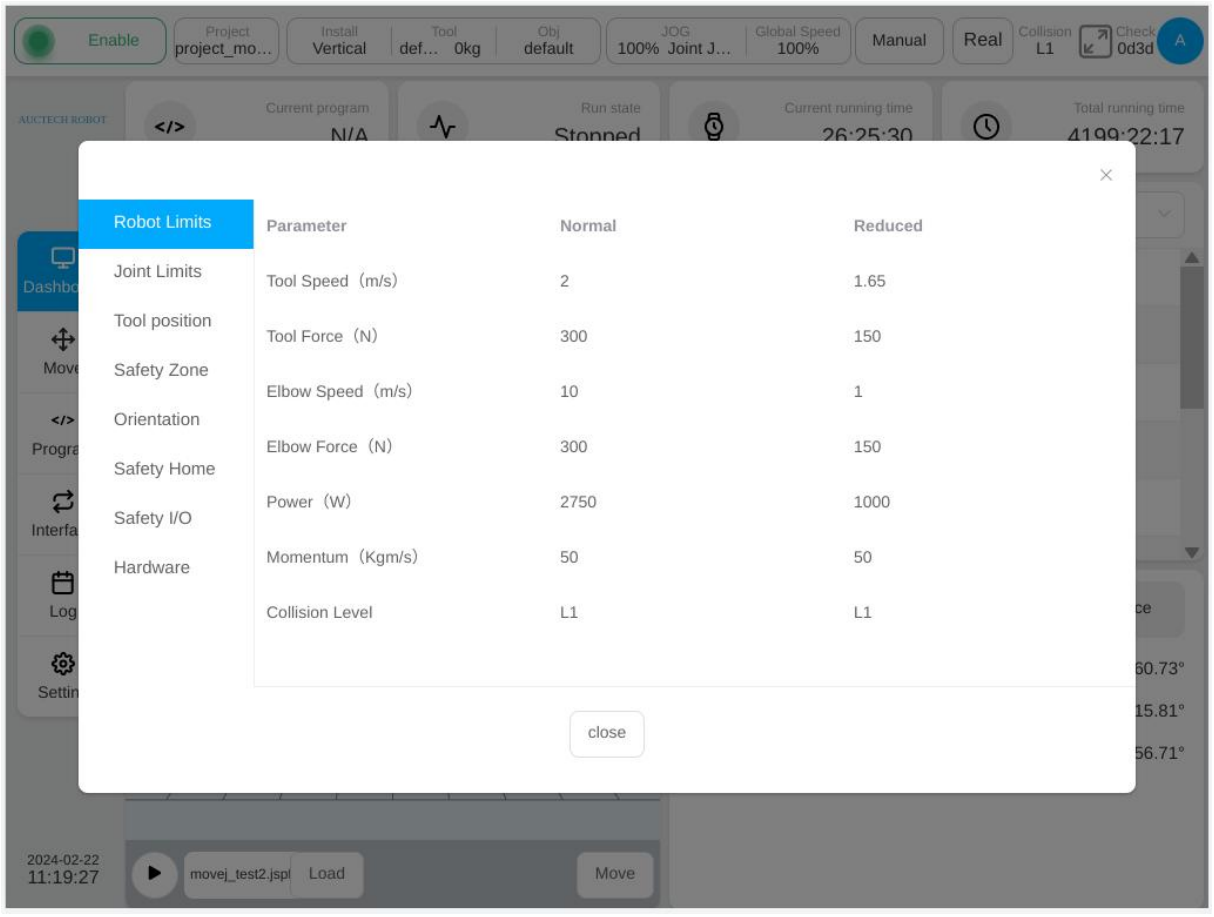
6. Safety Settings

This section describes how to view safety configurations and change application safety configurations. There are currently two types of safety controllers, AUCTECHSafety V1.0 for DC30 control cabinets. AUCTECHSafetyV2.0 adapts to DC00 / DC15S/ DC30D control cabinets.

6.1. AUCTECH Safety V1.0

6.1.1. View Safety Application

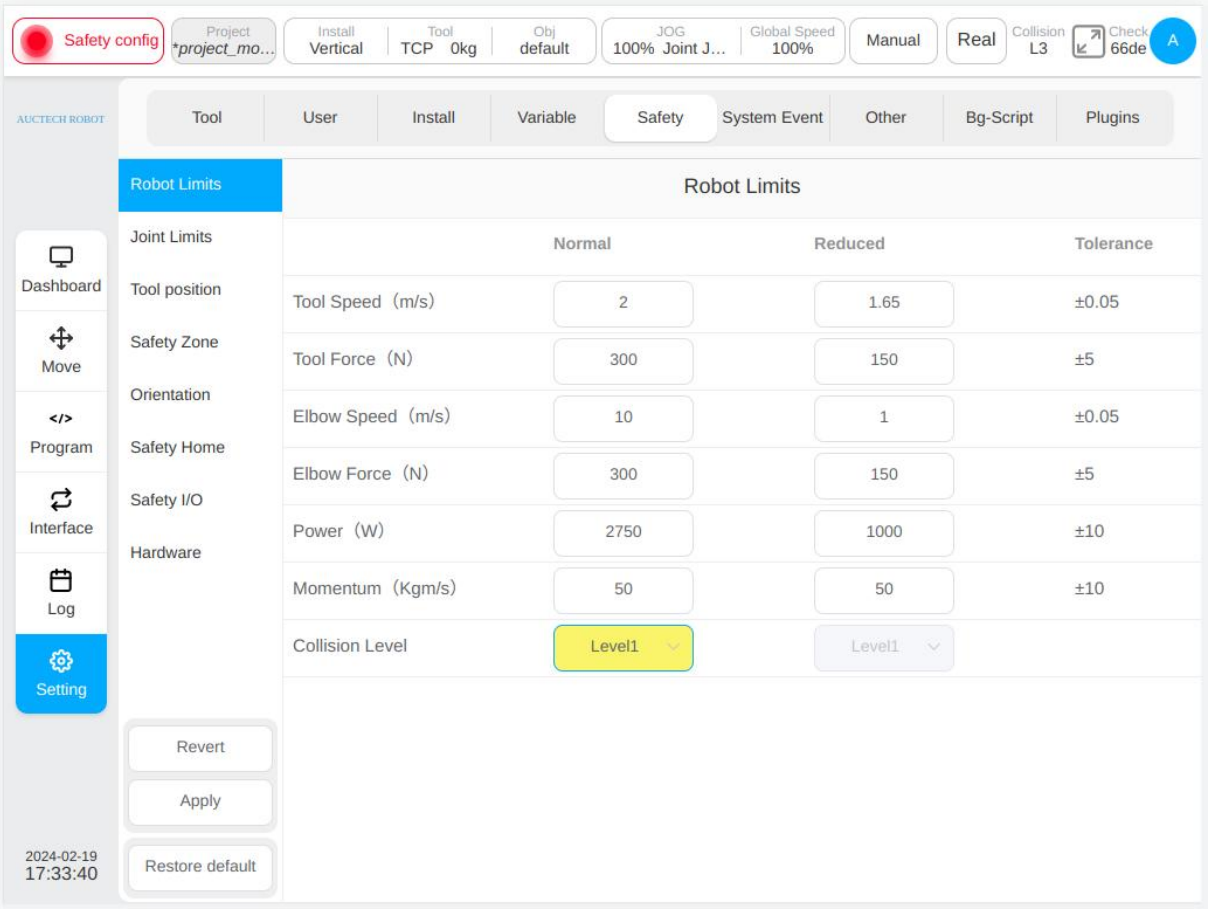
Click “Safety Verification” on the status bar above. The following dialog box is displayed to view the currently activated safety configuration parameters. The safety configuration parameters can also be viewed on the settings page - Safety Settings.

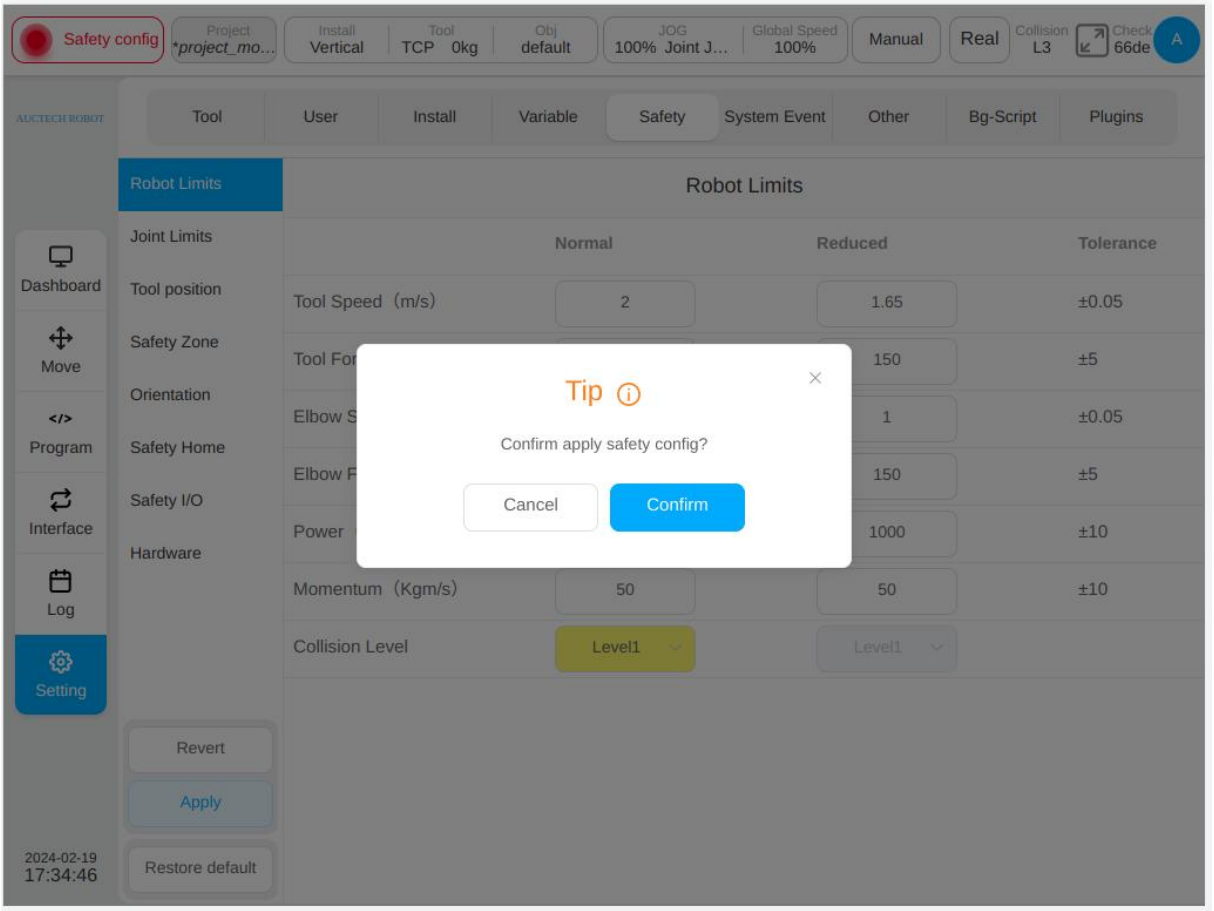


6.1.2. Safety configuration change application

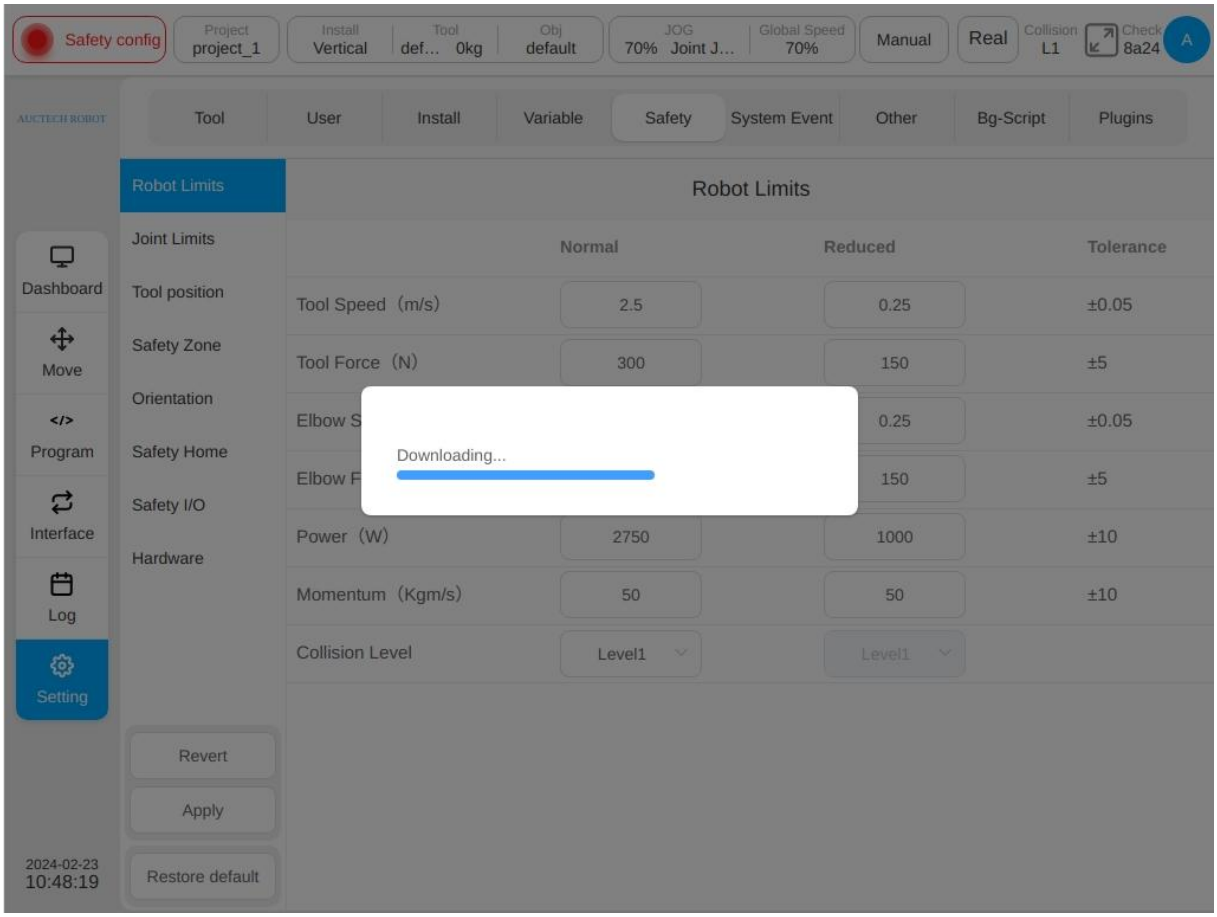
The password must be entered to unlock the account before changing the safety configuration. Enter the setting page -- safety configuration, click the “Unlock” button at the bottom left, and unlock the robot only when the power is off. Enter the password (login password of the current user), and enter the safety

parameter configuration mode after the verification is passed. The status area on the status bar is displayed as “Safety Parameter Settings”.

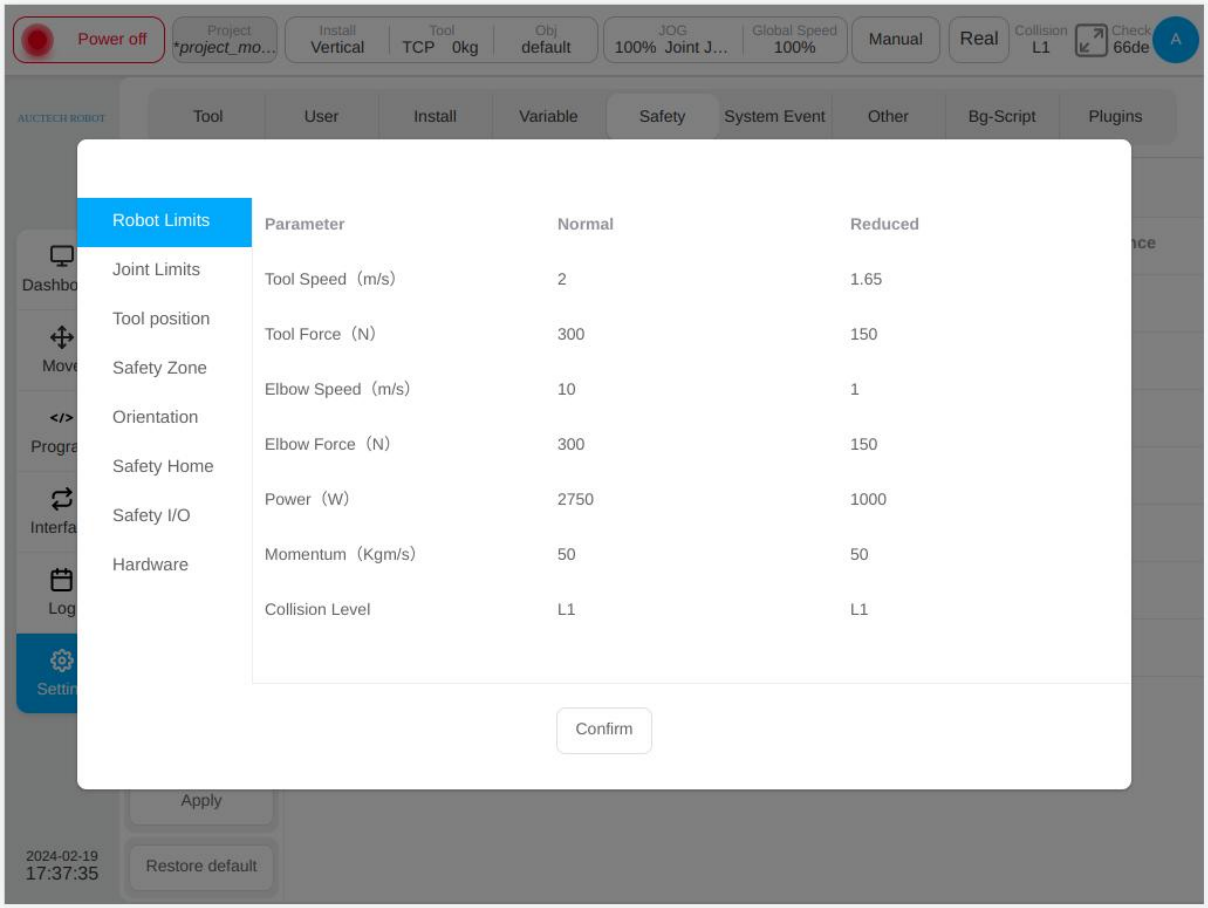
- 



After clicking the “Confirm” button, a prompt box for loading safety parameters will be displayed, as shown in the figure.



After the safety parameters are configured, the system displays the configured safety parameters in a dialog box for users to check. As shown in the following figure, after checking and confirming, click the “Confirm” button to set the safety parameters. After the configuration is successful, the safety verification above the status bar changes.



6.1.3. Safety Parameters

This section describes the safety configuration parameters of the robot.

6.1.3.1. Safety Mode

Normal mode: The safety mode is activated by default.

Reduce mode: This mode can be activated using safe input IO.

Recovery mode: When the actual motion parameters of the robot exceed the safety limit, causing the robot to stop, the recovery mode will be activated, and the user can move the robot within the safety limit.

6.1.3.2. Robot Safety Parameter

Robot parameters are used to limit general robot motion. Its parameter values can be configured in normal mode and reduce mode.

Maximum end speed: limiting the maximum linear speed in space of the robot's safety tcp sphere center

Maximum force: limiting the maximum force applied externally by the robot safe tcp

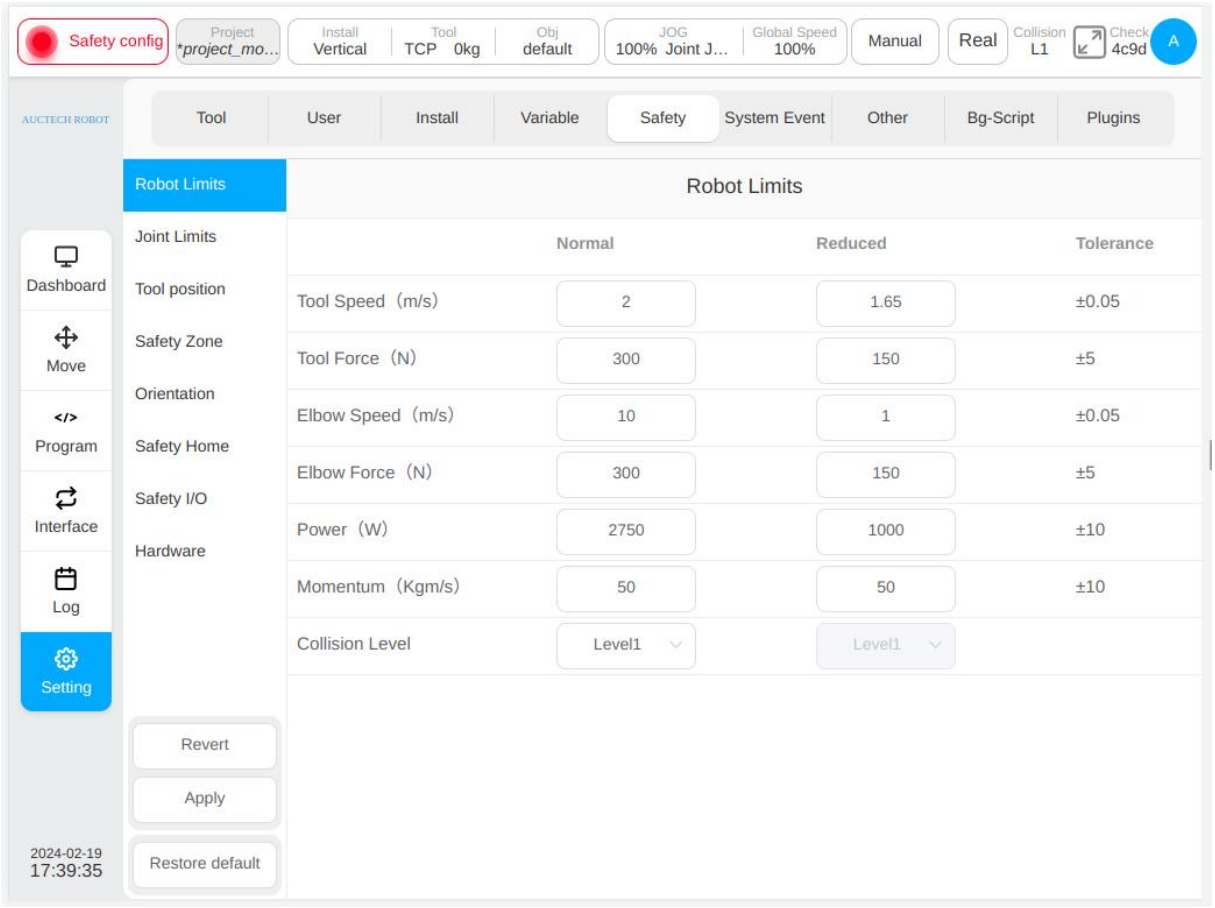
Elbow maximum speed: limiting the maximum linear speed of the robot's elbow center in space

Maximum elbow force: limiting the maximum external force applied by the robot's elbow

Power: limiting the maximum mechanical work done by the robot, and the end load of the robot is regarded as part of the robot body

Maximum momentum: limiting the maximum momentum output of the robot, and the end load of the robot is regarded as part of the robot body

Collision detection level: The sensitivity of the robot to detect a collision with the outside world. The higher the level is, the more sensitive the detection is.



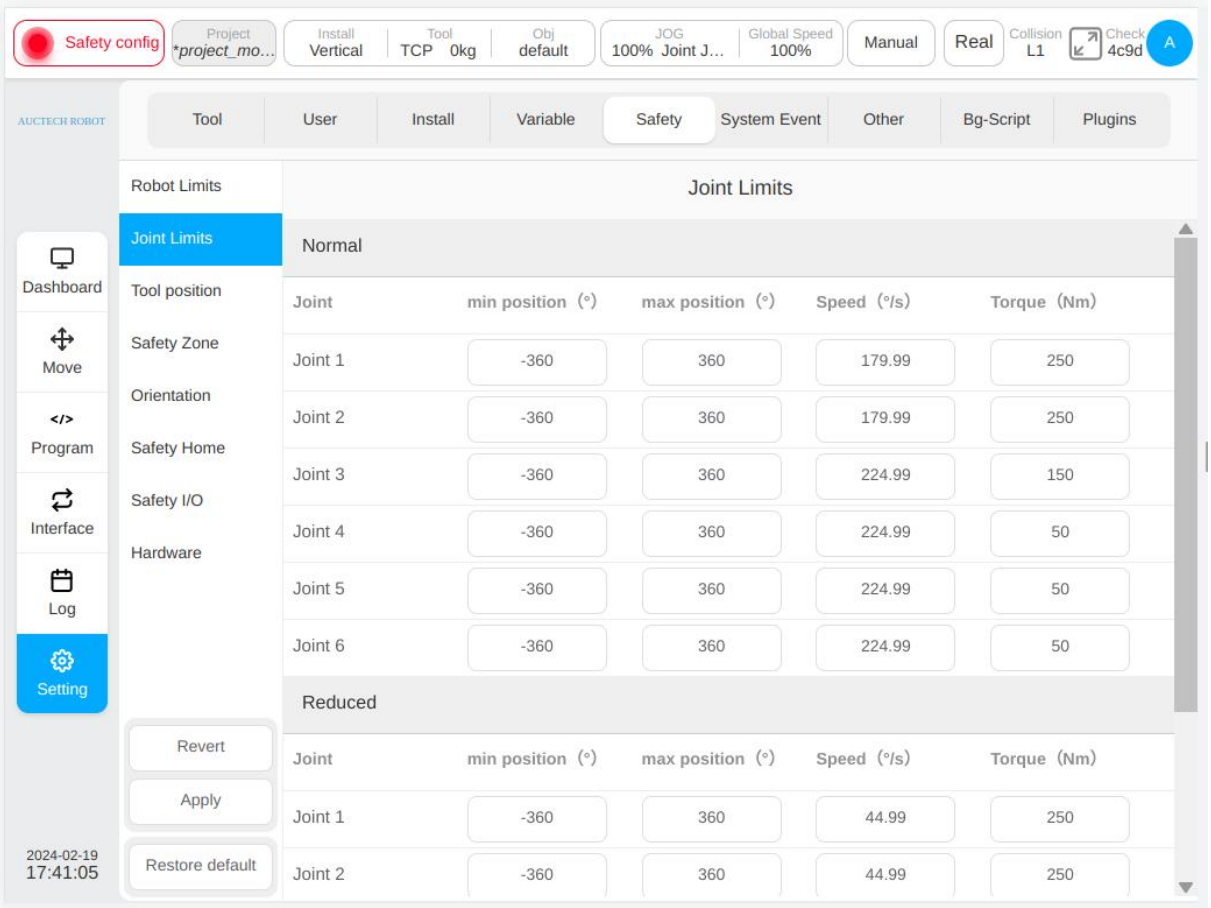
6.1.3.3. Joint Safety Parameter

Joint parameter limit is used to limit the position range, maximum velocity and maximum torque of each joint of the robot. Its parameter values can be configured in normal mode and reduce mode.

Position range: defining the minimum and maximum positions of each joint

Maximum velocity: defining the maximum angular velocity of each joint

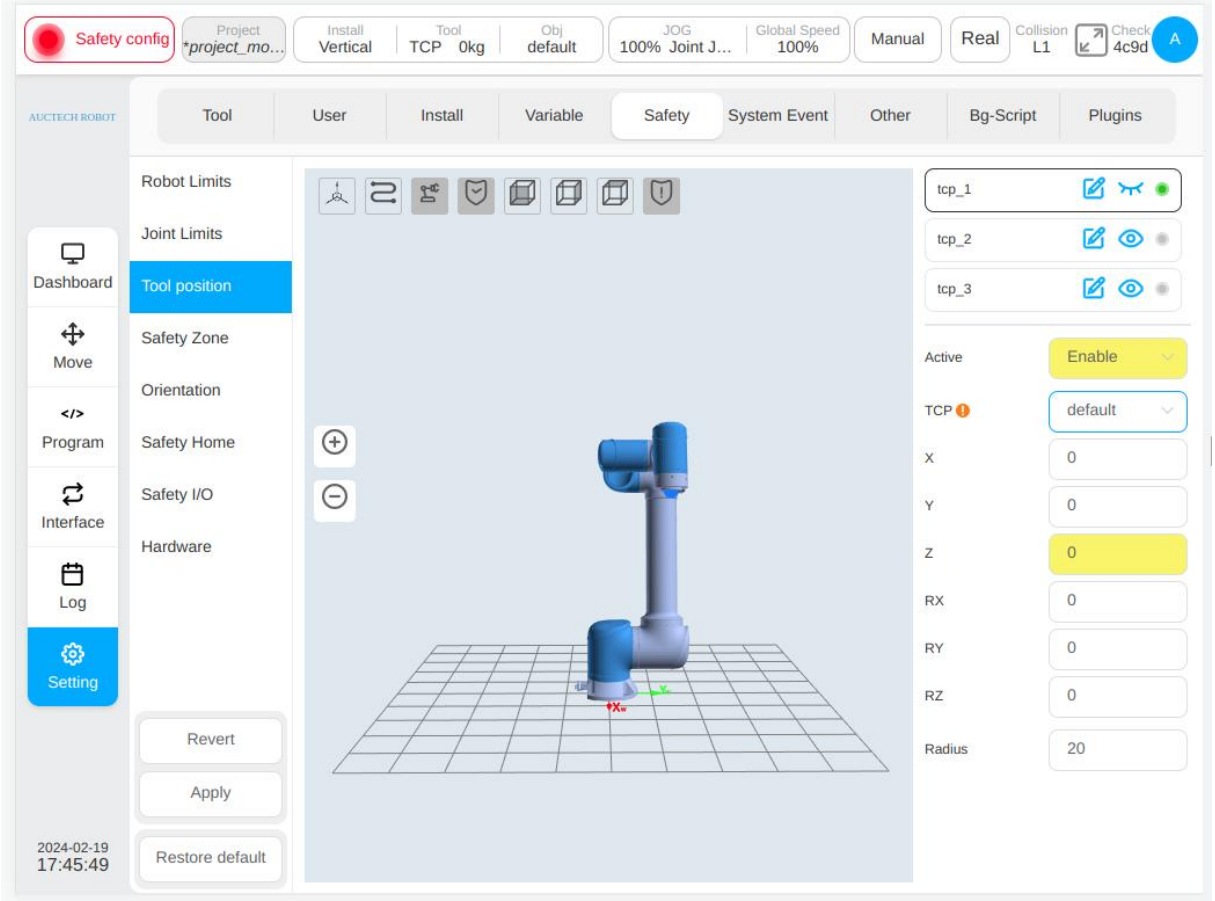
Maximum moment: defining the maximum moment for each joint



6.1.3.4. Safety TCP/Tools

The safety system can define three sets of TCP offsets that, when configured, the robot will use these three sets for speed monitoring and position monitoring. Any TCP position or speed exceeding the safety setting will trigger a safety violation.

Speed monitoring is the maximum linear speed of the robot safe tcp sphere center in space in the “robot safety parameters”, and position monitoring is the “safe area”. Users can set up three safety TCP, and there are two ways to define TCP: the tool coordinate system defined in the global variable can be chosen, or the value of the input coordinate system can be customized by users. When using a predefined tool coordinate system, select the tool coordinate system, and the values of the tool coordinate system are displayed in the X, Y, and Z input boxes. If the values of X, Y, and Z are modified, the coordinate system becomes custom. If the value in the corresponding coordinate system in the global variable is changed to be different from the value of the coordinate system used in the current safety settings, an alert icon is displayed at the tool definition. When selecting custom input data, directly edit the values of X, Y, Z, Rx, Ry, Rz and the sphere radius of the envelope sphere.



Each safety TCP can be set: disabled, always valid, automatic mode valid, safety combination configuration 1, safety combination configuration 2, five kinds of activation conditions. When three TCPs are disabled, the safety control system defaults to a flanged coordinate system with a sphere radius of 50mm. The TCP configuration status is displayed on the TCP configuration list. If a certain TCP is disabled, the corresponding status is displayed in grey. The configured safety TCP can display the coordinate system and envelope sphere in the 3D display area, and can be switched between display and hide by the icon after the corresponding TCP name. Click the icon next to the TCP name to modify the TCP default name. will be displayed if the safety TCP is not disabled, otherwise will be displayed.

6.1.3.5. Safety Zone

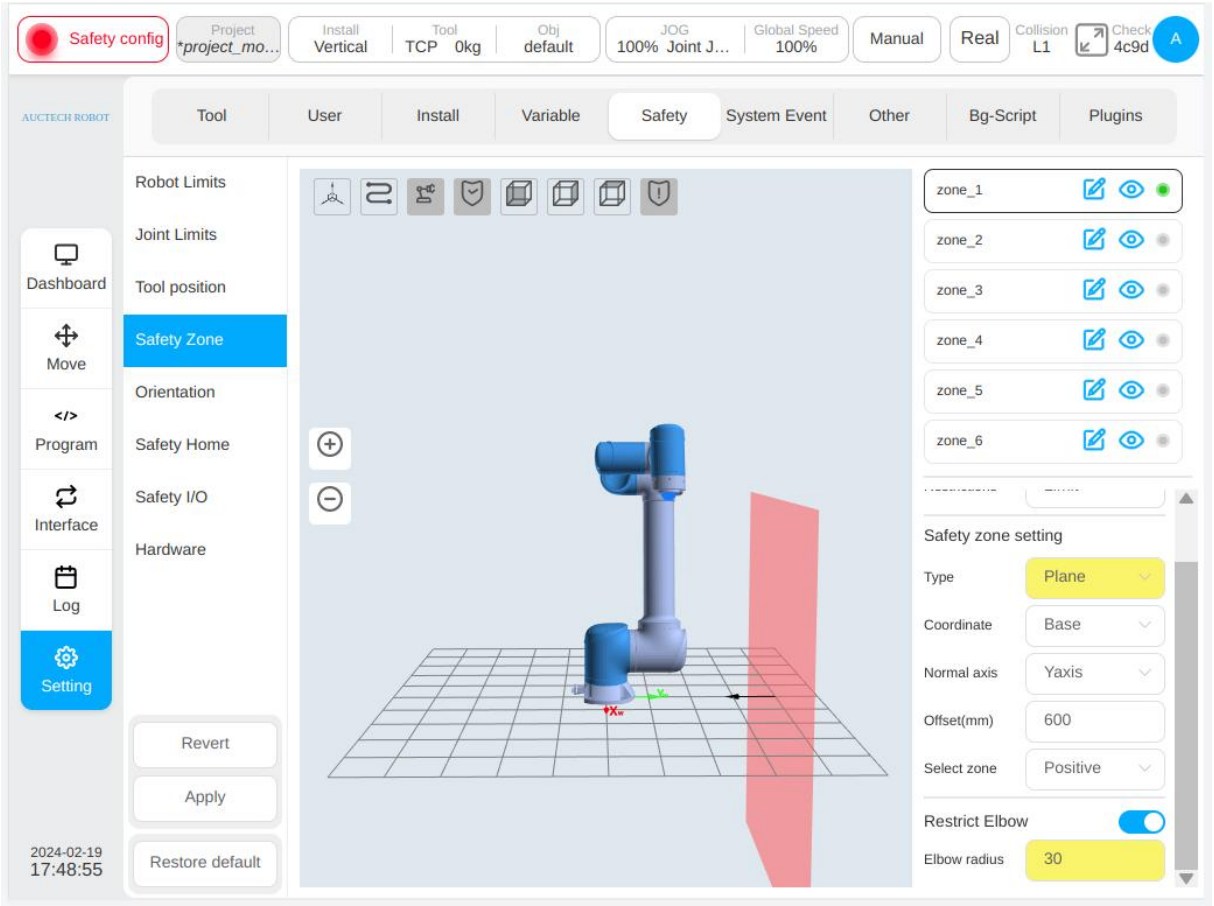
The definition types of safety zones include plane, cuboid and cylinder. Users can set up to six independent space areas. The icon next to the safe zone name can be clicked to display or hide the configured safety zone in the 3D display area. And the icon next to the safety zone name (for example, the default name zone_1) can be clicked to change its name. will be displayed if the safety zone is not disabled, otherwise will be displayed.

Safety zone activation configurations include: Disabled, Always valid, Automatic mode valid, safety Group Configuration 1, and Safety group configuration 2.

The boundary response of the safety area refers to the response of the robot entering the safety area from

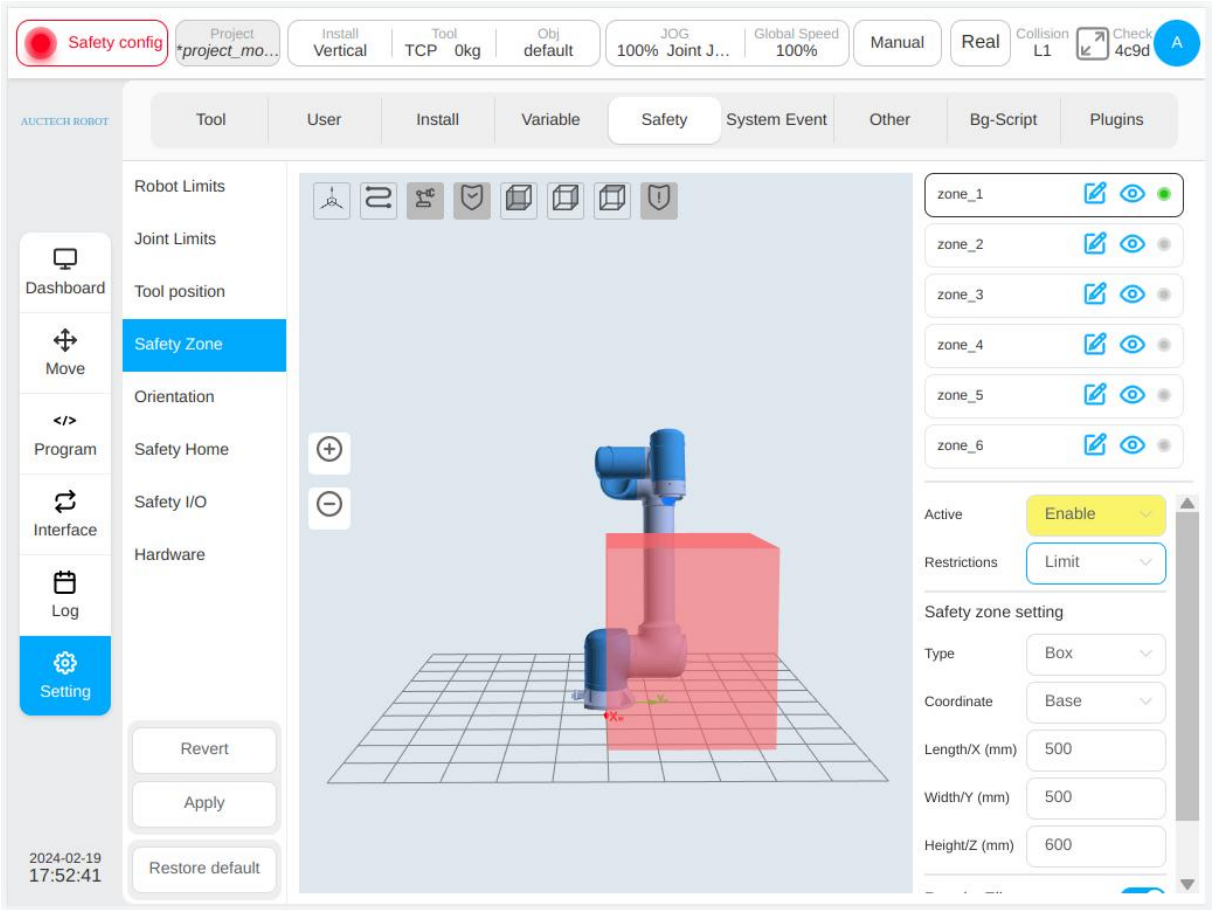
outside and moving beyond the boundary inside. There are two response modes, limiting the movement beyond the boundary and triggering the reduce mode when entering the area. When the selection limit exceeds the boundary, the response of the robot moving beyond the boundary is described. When selecting to trigger reduce mode, the response of the robot entering the area from the outside is described, and the normal mode is restored when the robot leaves the area.

The space area can also be set to include elbow limits, and the space range of the elbow is set in the form of a spherical radius.

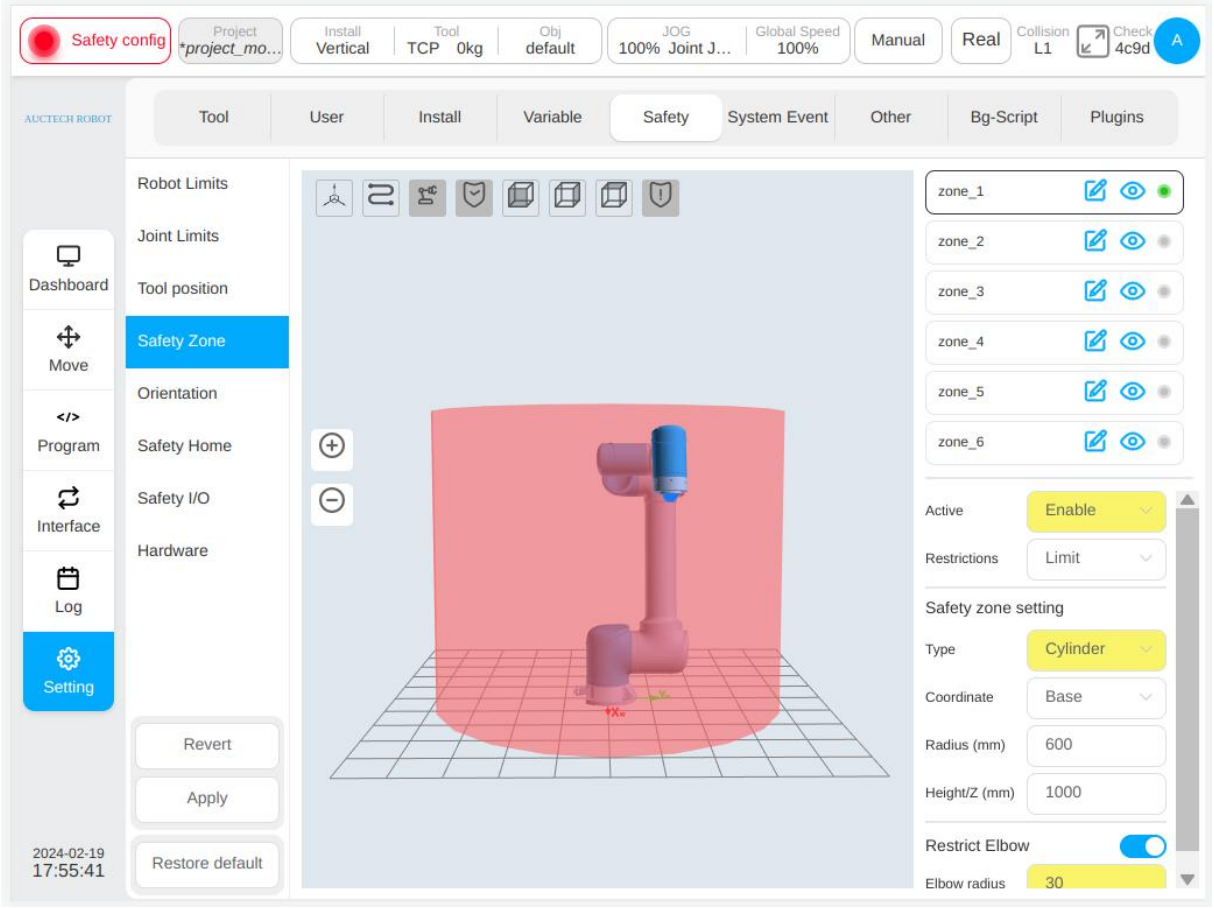


When the configuration area type is plane, the reference of the plane area is based on the world coordinate system/base/set workpiece coordinate system, and the plane is determined by setting the normal and normal offset of the plane. The plane settings can be set to take effect by “Selecting a Region”, and the corresponding direction is displayed through a black arrow in the 3D area.

When the configuration area type is space cuboid, the setting basis of the cuboid area is based on the world coordinate system/base/set workpiece coordinate system, and the workpiece coordinate system is used as a corner point of the cuboid, and the three coordinate axis directions correspond to the length (X), width (Y) and height (Z) respectively. The length, width and height ranges from -3000mm to 3000mm.

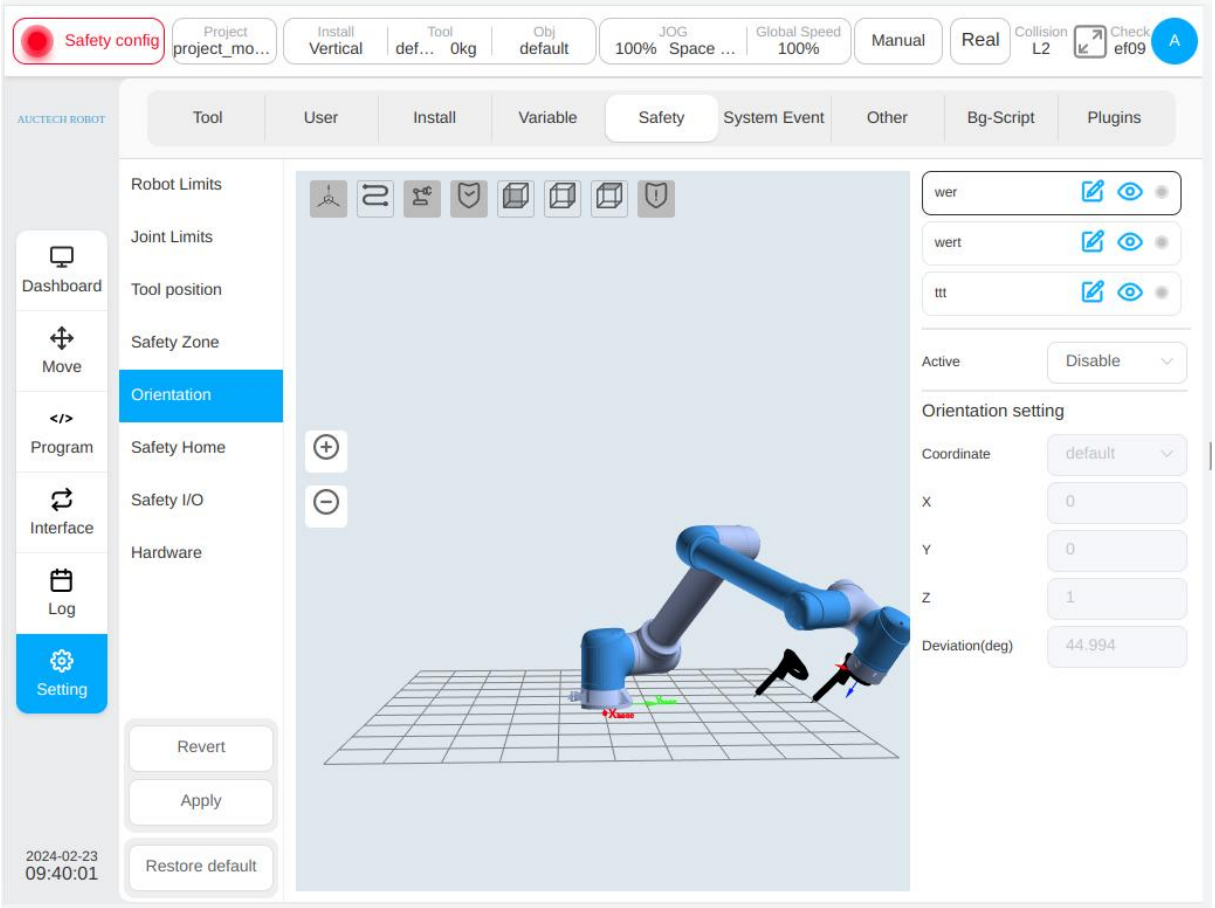


When the configuration area type is a space cylinder, the setting reference is based on the world coordinate system/base/set workpiece coordinate system, with the workpiece coordinate system as the center of the circle plane. The Z direction points to the height direction, and the radius and height can be set. The radius ranges from 0 to 3000mm, and the height ranges from -3000mm to 3000mm.



6.1.3.6. Safety Posture Area

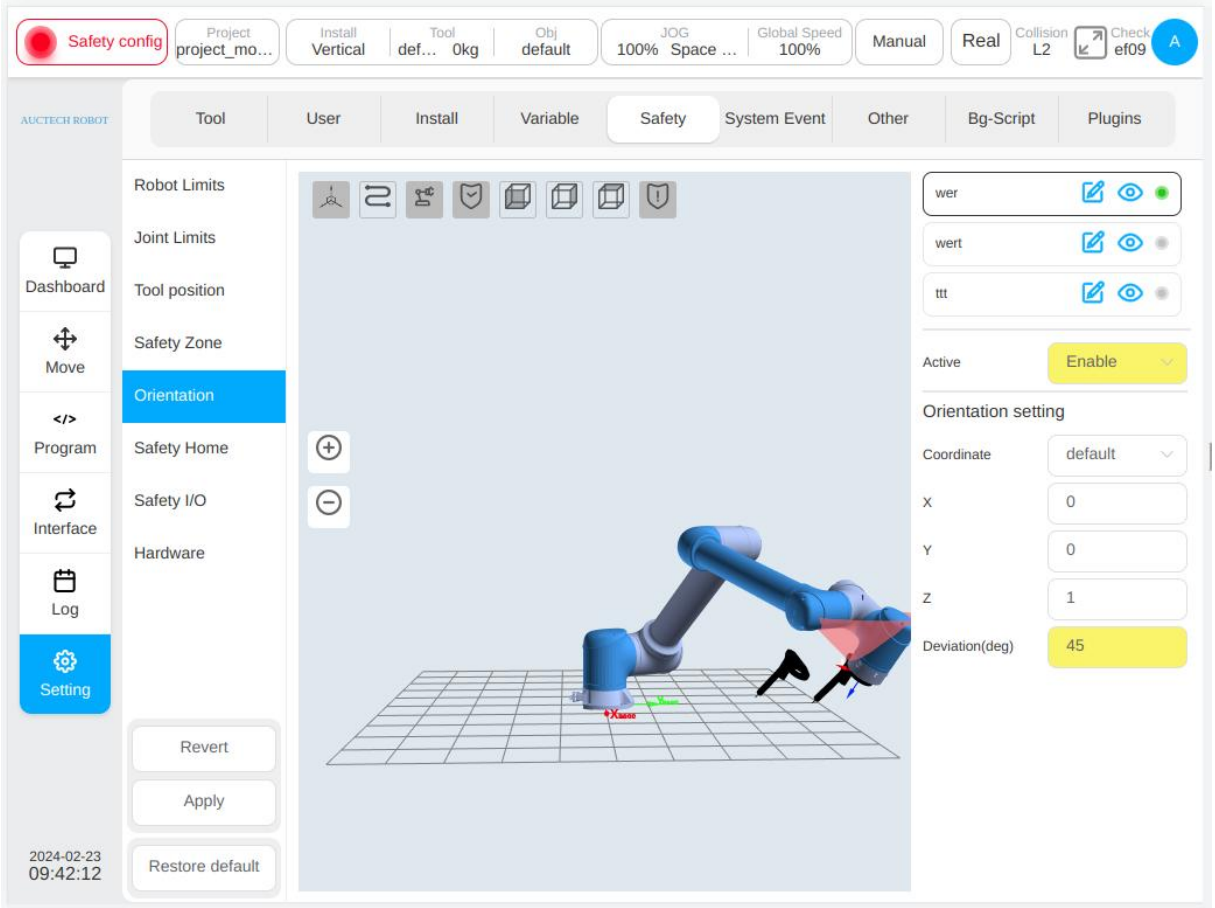
The safety posture area is set. The posture area refers to forming a conical Angle around a direction vector in the base coordinate system of the robot. The posture restriction only restricts the Z-axis of the robot TCP to the posture region. Users can set up to three posture areas at most. A single posture area can be shown or hidden by clicking the icon next to the name on the right of the posture area, which is default to display. The icon after the name can be clicked to modify the pose area name. will be displayed if the posture area is not disabled, otherwise will be disabled.



The safe posture area can be activated in five modes: disabled, always valid, automatic mode valid, safety group configuration 1, and safety group configuration 2. The safety posture area is different from the safety zone in that only the Z axis direction of TCP is restricted, and there is only one response protective stop mode triggered after the area is exceeded.

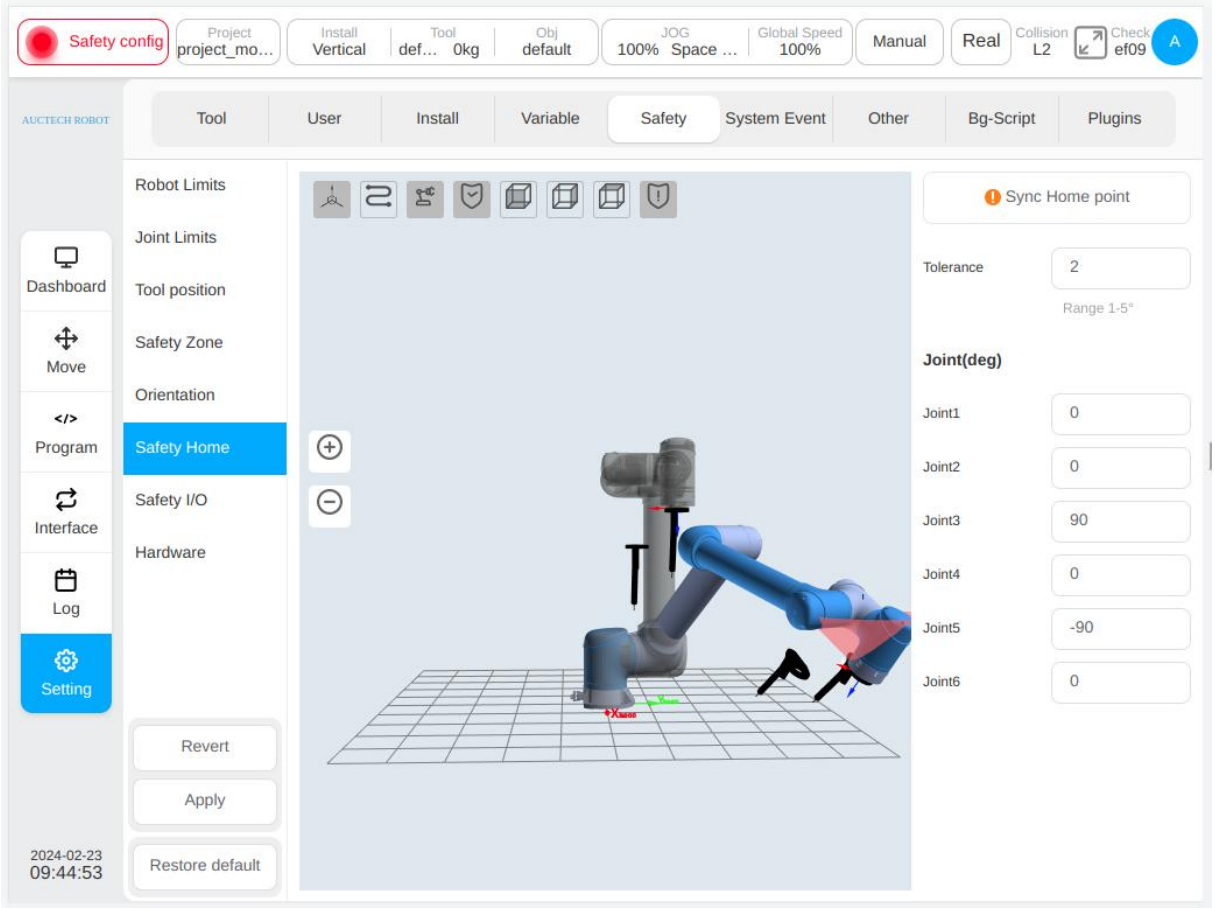
There are three ways to define a reference coordinate system for the safety posture area: custom, capturing the current TCP pose, and defining it through a predefined workpiece coordinate system. When custom is selected, manually modify the value of the direction vector X, Y, Z, which describes the value in the robot base coordinate system; When the current TCP posture is selected, the z-axis direction of the current TCP is taken as the reference direction of the posture area, and the direction is converted to the robot base coordinate system to describe the vector direction X, vector direction Y, vector direction Z. If the value is manually modified, it will become a custom mode. When defined by the workpiece coordinate system, the Z-axis direction of the workpiece coordinate system is taken as the reference direction of the posture area, and converted to the robot base coordinate system, the value will be changed into a custom mode after manual modification.

If the orientation of the workpiece coordinate system has been changed externally, a reminder icon is displayed at the reference coordinate system. The area deviation angle ranges from 5 to 180 degrees. For example:



6.1.3.7. Safety Home

Safety Home Settings. The safety Home monitoring will synchronize the Home location settings on the “Other Settings” page. If the location in the safety Home settings is different from the Home location in “Other Settings”, a reminder icon is displayed under “Sync Home Settings”. If the settings are not synchronized, the Home location of the system is subject to the safety Settings. The settings of the safety controller prevail for the “Press Home” Home point on the moving page and the output of home signals from other ports (such as port 2001) of the robot. The Home point in the “Other Settings” page is only used as a record and does not serve as a basis for judging the Home point. The monitoring threshold of the Home point can be set. The value ranges from 1 to 5°.



When the sync Home position is selected, the joint angle of the Home position is displayed. And the robot model in the 3D model display area is refreshed to the corresponding position.

When the safety home position is set and the home position output is configured in the safety I/O (see Section 6.2.3.8), all joint angles of the robot are within the set home position range (setpoint-threshold, setpoint + threshold) and the speed is close to 0°/s (to filter out normal encoder run-out). The system preset joint speed is less than 2°/s), and lasts for 500 milliseconds (system predefined and cannot be configured), and the signal is reached by the safety output external output home position.

6.1.3.8. Safety I/O

The safety I/O module contains two configurable safety input ports and two configurable safety output ports.

Safety input functions include:

Protection reset input: When guard stop occurs, this port is triggered and the robot returns to normal state.

Automatic mode protection stop input: After configuration, when the robot triggers the port in auto mode, the robot performs a protective stop.

Automatic mode protection reset input: When automatic mode protection stops, the port is triggered and the robot returns to normal state.

Reduce mode input: After configuration, this port is triggered and the robot transitions to the reduce mode. The robot will slow down so that the parameter limits meet the safety parameter limits in reduce

mode.

Safety combination Configuration 1/2: When the port of safety combination configuration 1 or safety combination configuration 2 is triggered, all safety features configured in safety combination configuration 1 or safety combination configuration 2 are activated and monitored, including safe tools, safe zones, and safe posture areas.

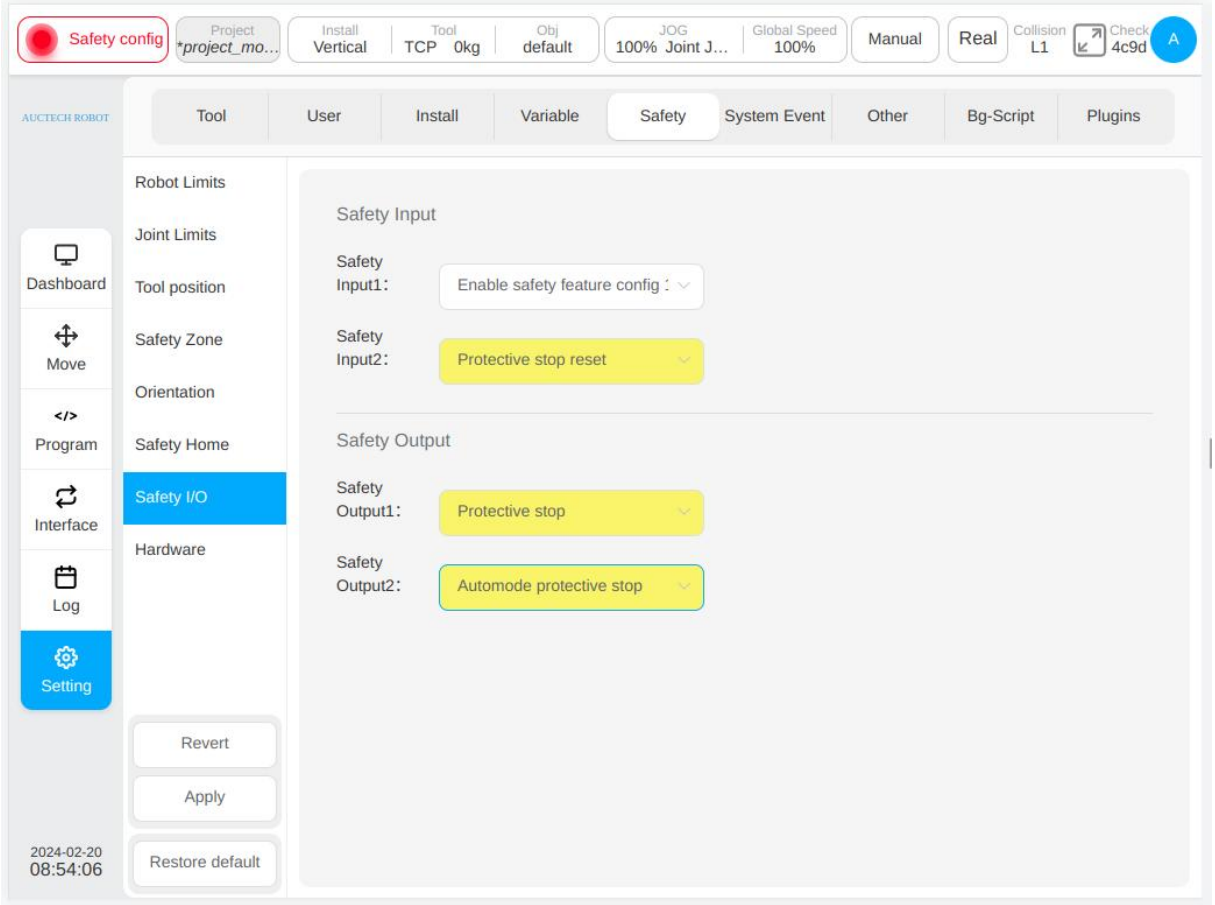
Safety output functions include:

Protection stop output: This port is triggered when the robot is in guard stop state.

Automatic mode guard stop output: This port is triggered when the robot stops in automatic mode guard.

Reduce mode output: This port is triggered when the robot is in reduce mode.

HOME position: This port is triggered when the robot is near the safe HOME position.



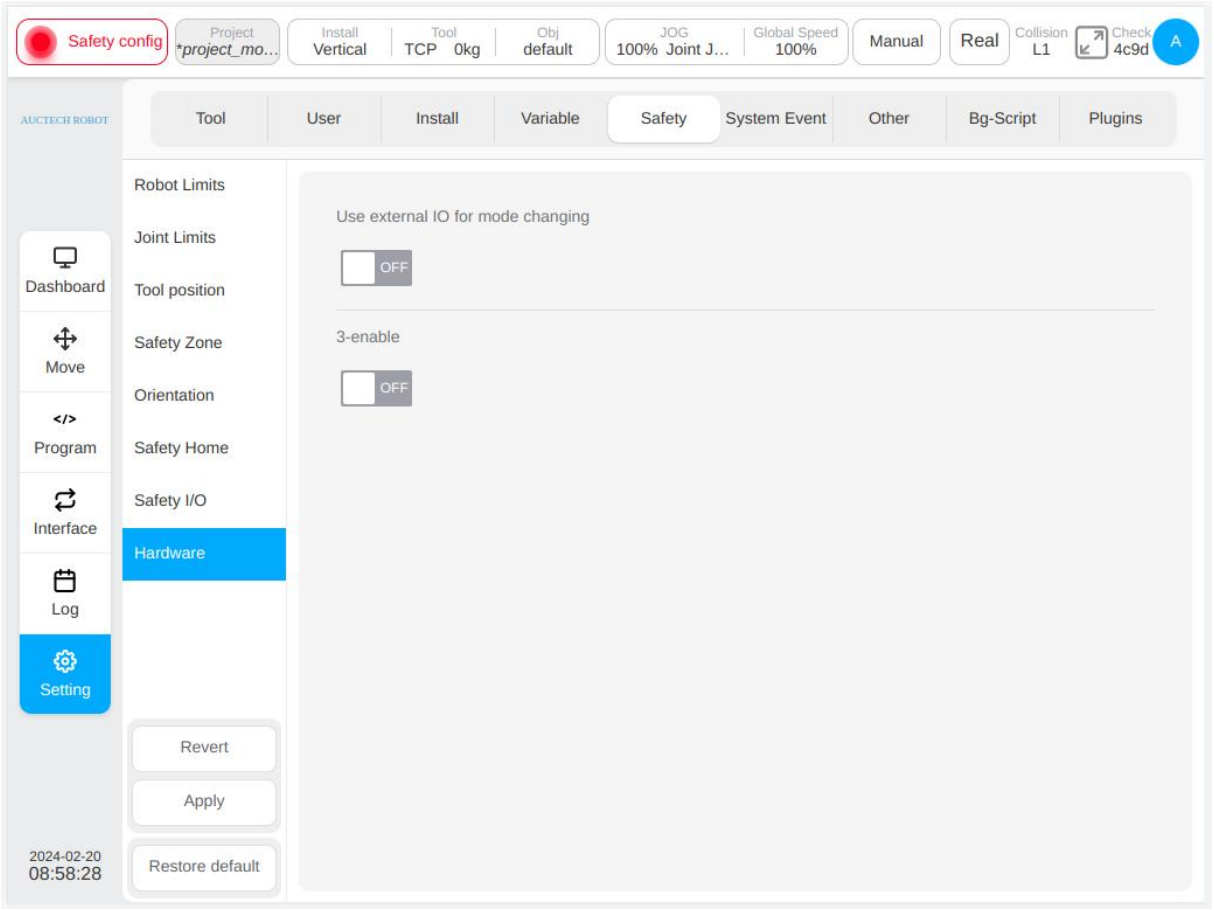
6.1.3.9. Hardware

This section includes enabling external IO for mode switching and three-position enabling input

Enable external I/O Mode switching: After this option is enabled, the external I/O mode can be manually switched. In this case, the mode switching function on the status bar of the page is invalid.

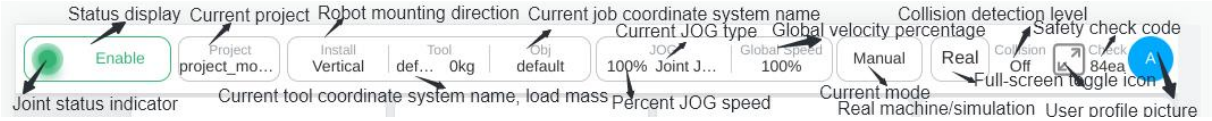
Three-position enabling input: When the robot is in manual mode, it can move the robot only when the

three-position switch on the teach pendant is in the middle position. When the three-position switch is in the non-middle position at any time during the movement of the robot, the robot will be paused.



7. Status Bar

The status bar on the page is shown as the figure:



- **Joint status indicator light:**

  The robot is not powered on initially, and the indicator light is red. The robot is not powered on and the indicator light turns orange. Robot enabled status, indicator light is green. The color of this indicator is the same as that of the joint status indicator on the startup page.

- **Status display area:**

  This area will display three types of information: safety status, program status and robot status.

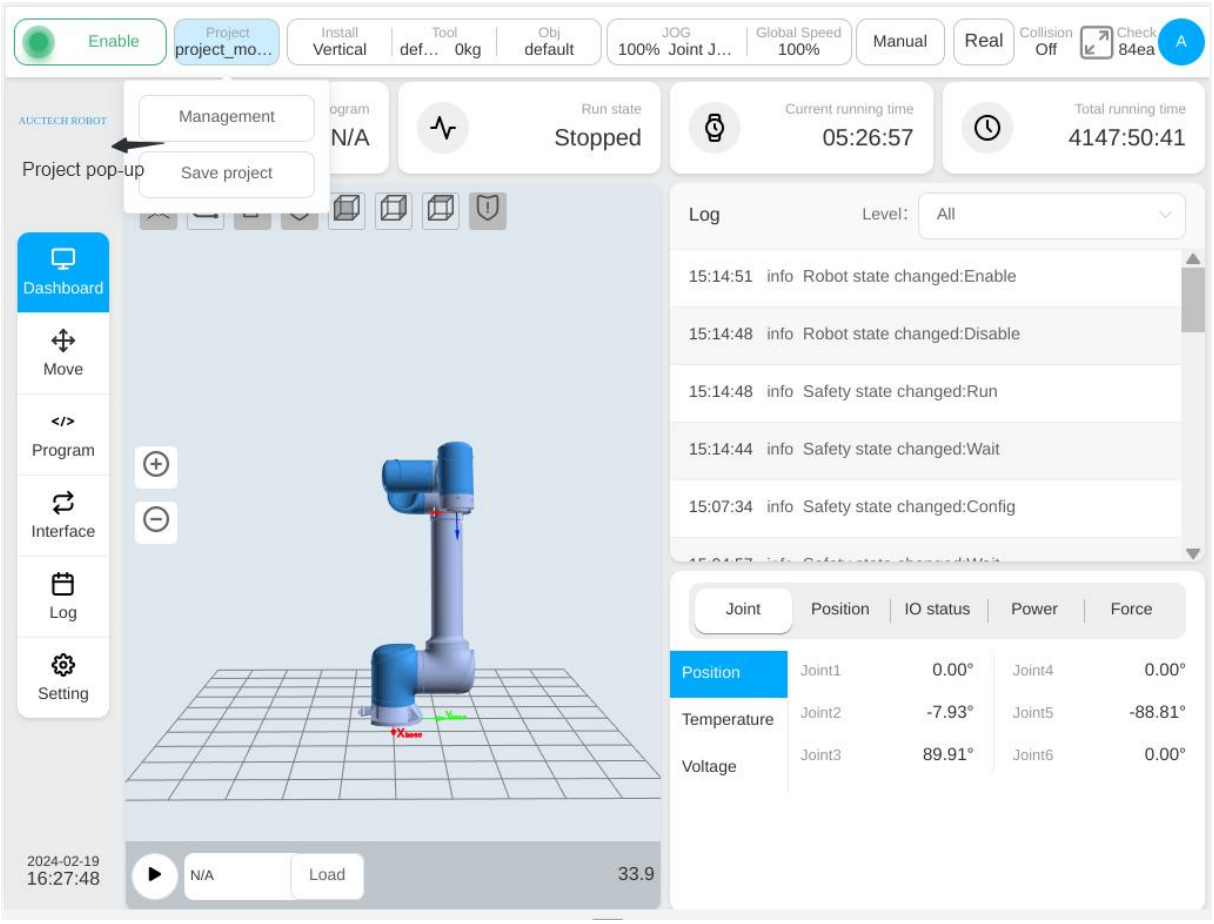
  The safety status displays Reduce mode, Recovery mode, Safety parameter configuration, safety board firmware upgrade, Stop0, Stop1, Stop2, safety board error, and robot arm firmware upgrade.

  Program status display words are: program stop, program execution, program suspension, program in pause, task execution;

  Robot status display words: not powered on, not enabled, standby, firmware update.

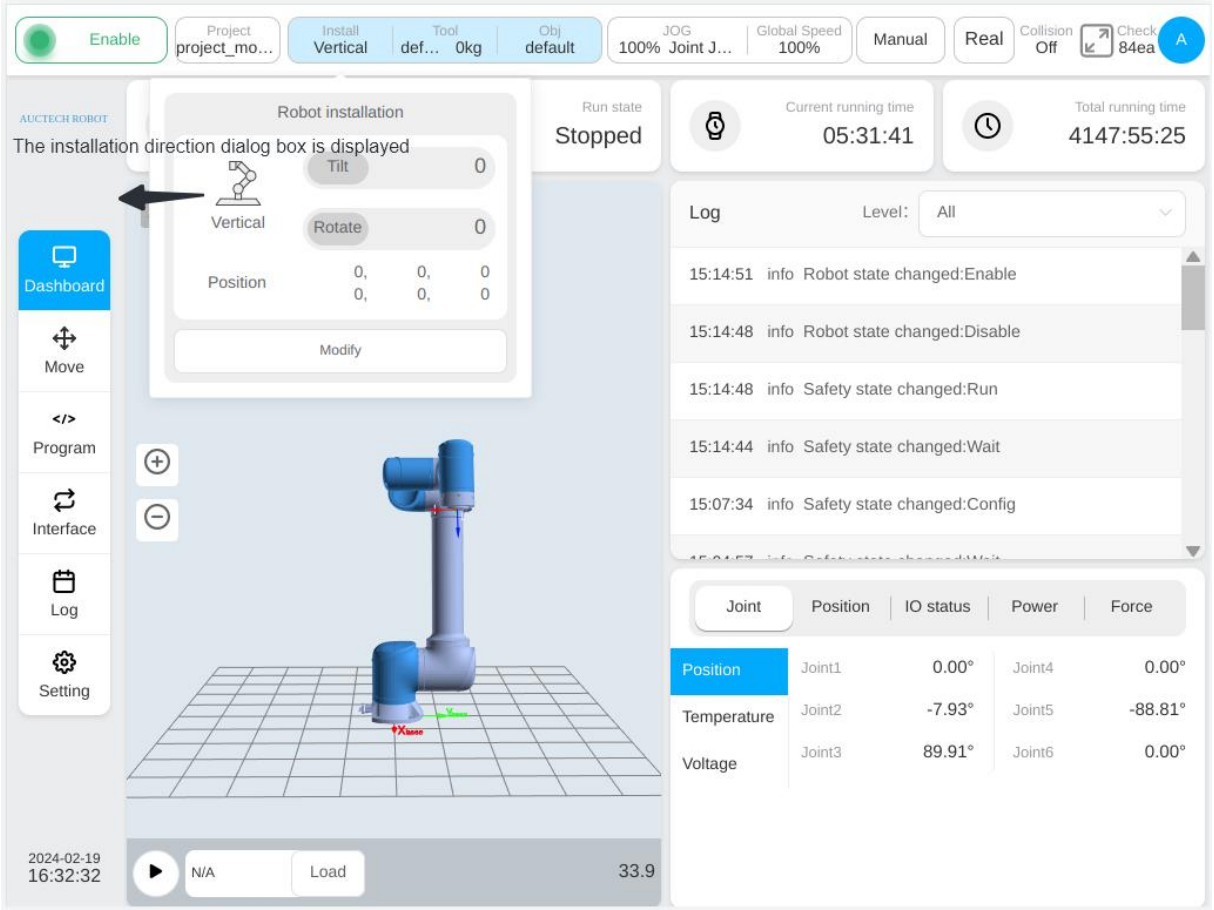
- **Engineering:**

  The current project name is displayed. Click “Project”, a pop-up box containing “Project Management” and “Save Project” buttons will be displayed, as shown in the figure. In the project management section, users can create, import, export, restore, save projects to the local computer, back up projects to the cloud, delete projects, and modify project names.

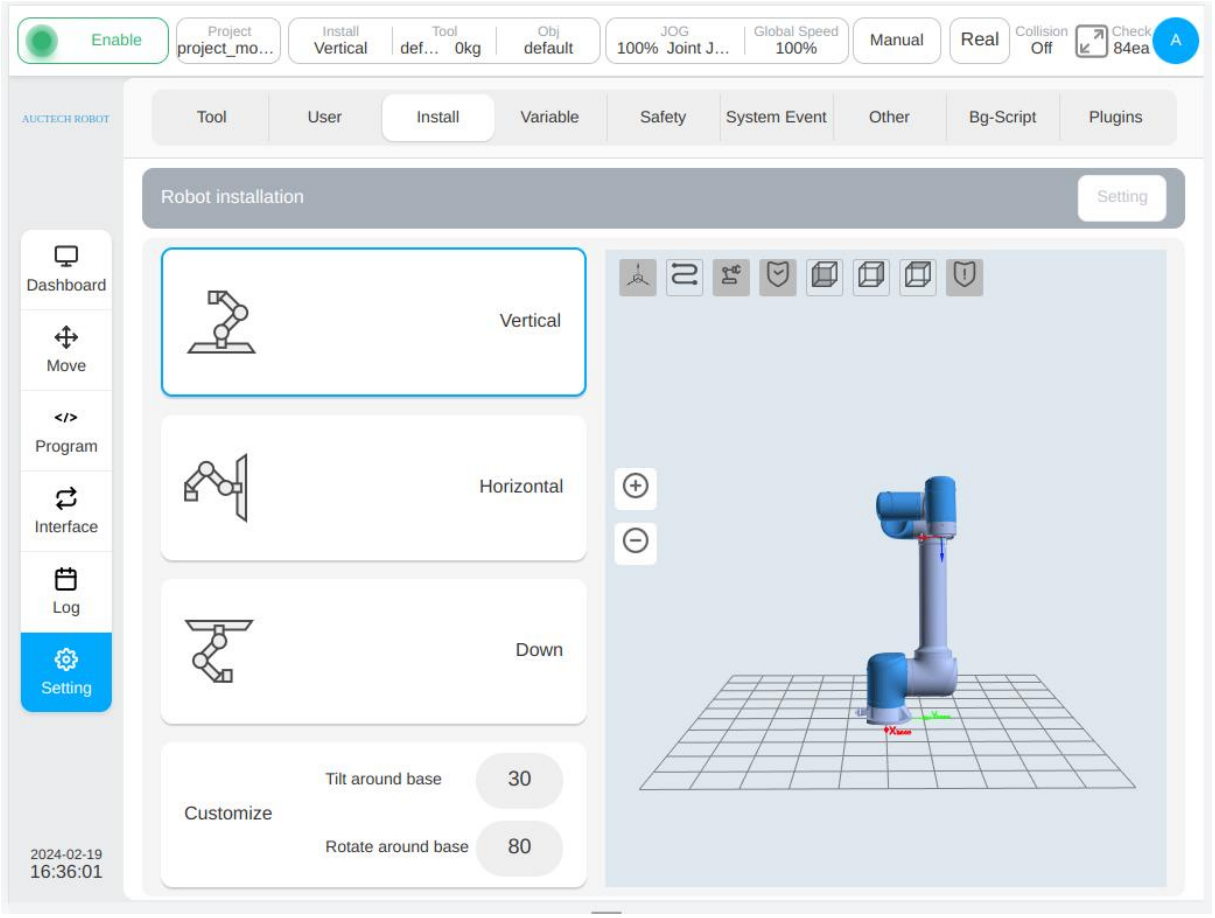

Enable
Project
project_mo…
Install
Vertical
Tool
def… 0kg
Obj
default
JOG
100% Joint J…
Global Speed
100%
Manual
Real
Collision
Off
Check
84ea
A
AUCTECH ROBOT
Management
Save project
Project pop-up
ogram
N/A
Run state
Stopped
Current running time
05:26:57
Total running time
4147:50:41
Dashboard
Move
Program
Interface
Log
Setting
Log
Level:
All
15:14:51 info Robot state changed:Enable
15:14:48 info Robot state changed:Disable
15:14:48 info Safety state changed:Run
15:14:44 info Safety state changed:Wait
15:07:34 info Safety state changed:Config
Joint
Position
IO status
Power
Force
Position
Temperature
Voltage
Joint1 0.00°
Joint2 -7.93°
Joint3 89.91°
Joint4 0.00°
Joint5 -88.81°
Joint6 0.00°
2024-02-19
16:27:48
N/A
Load
33.9

- **Installation：**

  Displaying the robot's current installation direction and installation posture description. Click the “Install” display box to display the robot installation direction and installation posture description, as shown in the figure.

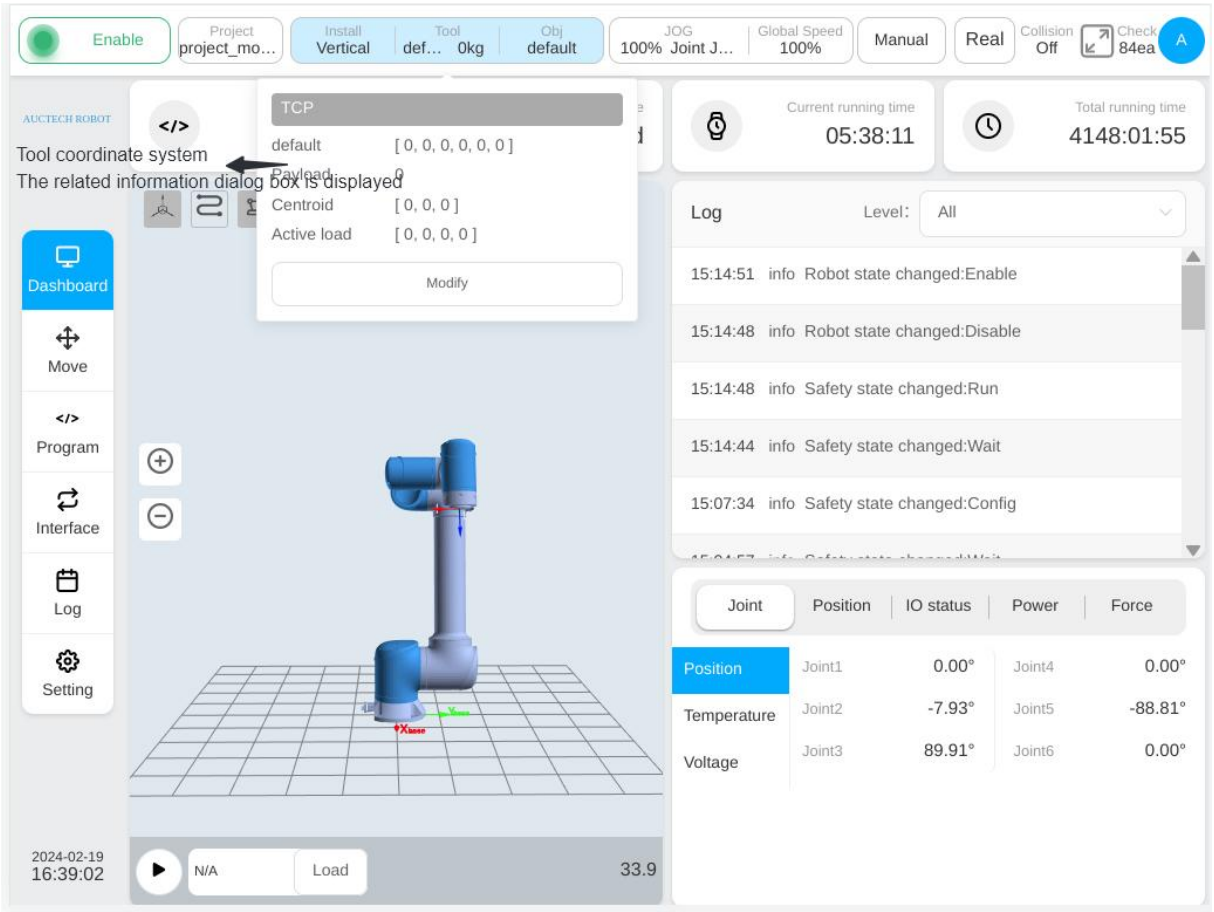


Click the “Modify” button to jump to the installation setting subpage in the settings page, as shown in the figure. The user can set the robot installation direction on this page.


Enable
Project
project_mo...
Install
Vertical
Tool
def... 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
Off
Check
84ea
A
AUCTECH ROBOT
Tool
User
Install
Variable
Safety
System Event
Other
Bg-Script
Plugins
Robot installation
Setting
Dashboard
Move
Program
Interface
Log
Setting
Vertical
Horizontal
Down
Customize
Tilt around base
30
Rotate around base
80
2024-02-19
16:36:01

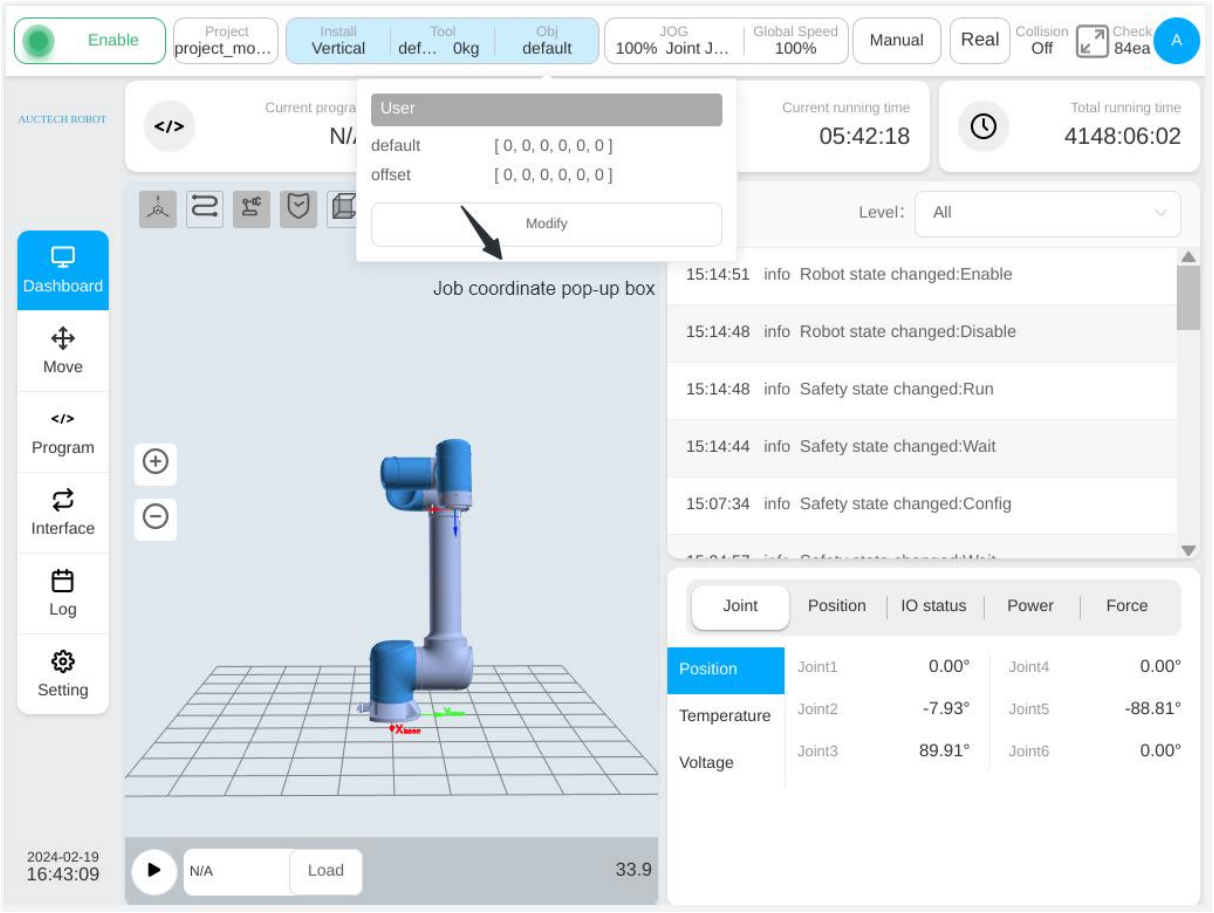
- **Tools:**

  Displaying the robot's current tool coordinate system name and load mass. Click the “Tools” display box, and a pop-up box showing the relevant information of the robot tool coordinate system is displayed, as shown in the figure. Click the “Modify” button to enter the tool settings subpage in the Settings interface, similar to the above the operation of jumping to the installation settings page.



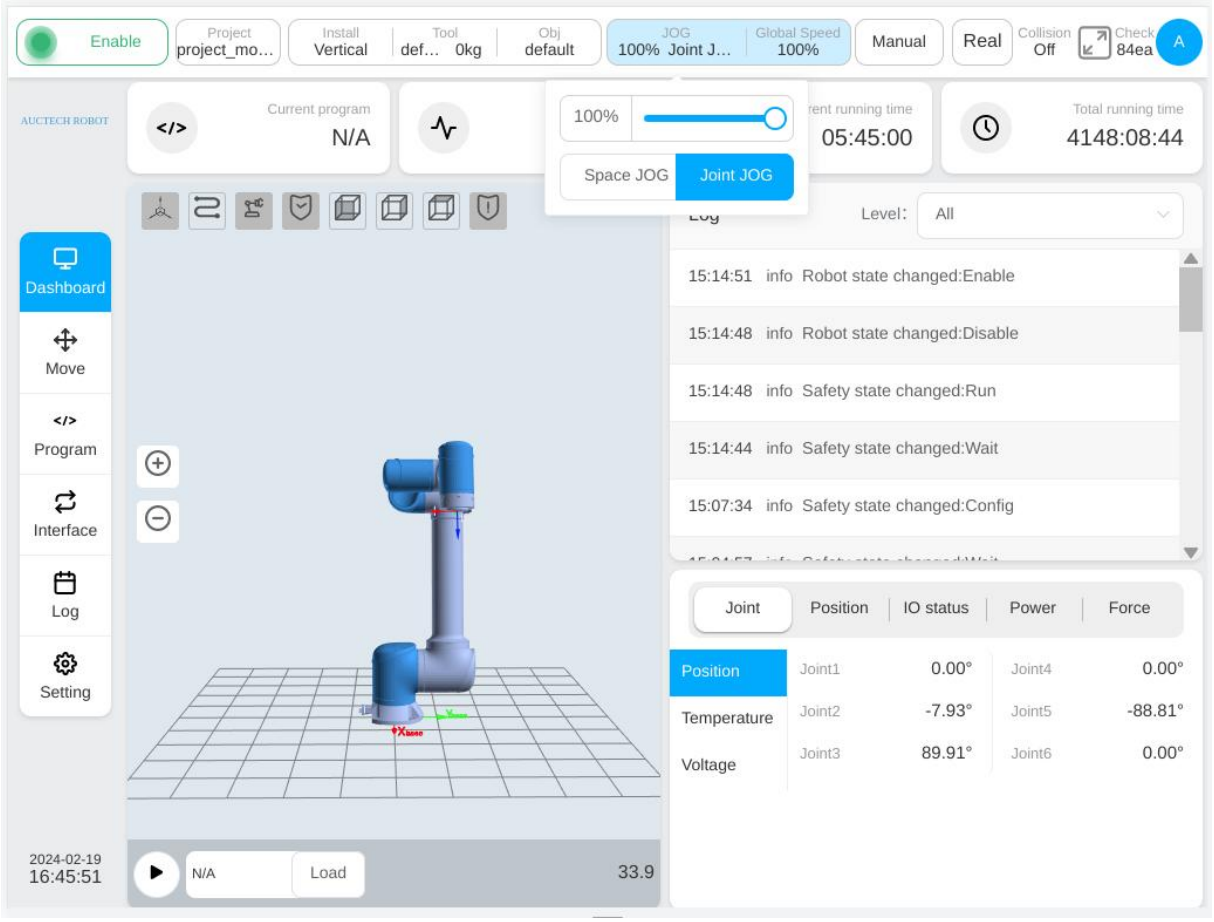
- **Workpiece:**

  Displaying the name of the robot's current workpiece coordinate system. Click the "Workpiece" display box to display the robot workpiece coordinate system information, as shown in the figure. Click the "Modify" button to enter the workpiece setting subpage in the setting interface, similar to the above the operation of jumping to the installation settings page.



- **JOG Speed/type:**

  Displaying the percentage of the robot's current JOG speed. Click the "JOG" display box to display the JOG speed adjustment slider and JOG type selection button to adjust JOG speed or manual input and to switch between spatial JOG or joint JOG. Note: Only the JOG speed of the robot at this startup is affected, and it will fail at the next startup. If users need to change the JOG speed at each startup, please set the default JOG speed in "Settings" – "Other Settings" – "Startup Settings"



- **Global speed:**

  Displaying the percentage of the robot's current global speed. Click the “Speed” display box to display the speed adjustment slider. Users can adjust the global speed or enter it manually. Note: Only the global speed of the robot at this startup is affected, and it will fail at the next startup. If users need to change the global speed at each startup, please set the default global speed in “Settings” – “Other Settings” – “Startup Settings”.

- **Operation mode:**

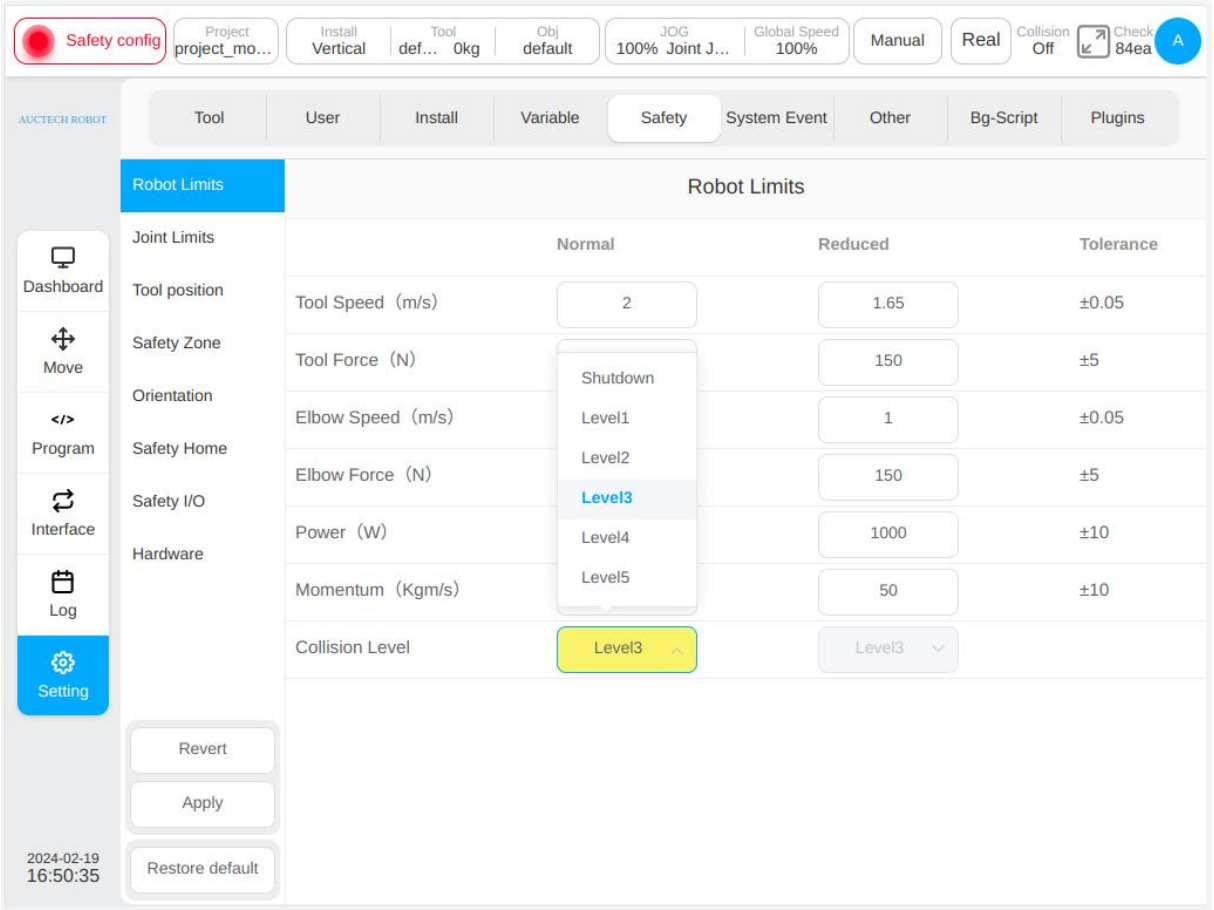
  Displaying robot operation mode, manual mode and automatic mode. Click the display box, and a pop-up box containing the Manual Mode and Automatic Mode buttons is displayed. Click the corresponding buttons to switch the operation mode. When the user switches between manual mode and automatic mode, the user needs to enter the current login password. After entering the correct password, the mode can be switched. When the physical hardware mode switching signal is enabled, the mode switching button in the interface is invalid.

- **Real machine:**

  Switching between real and simulation modes. The simulation mode can only be set when the robot is in enabled standby and the program is stopped.

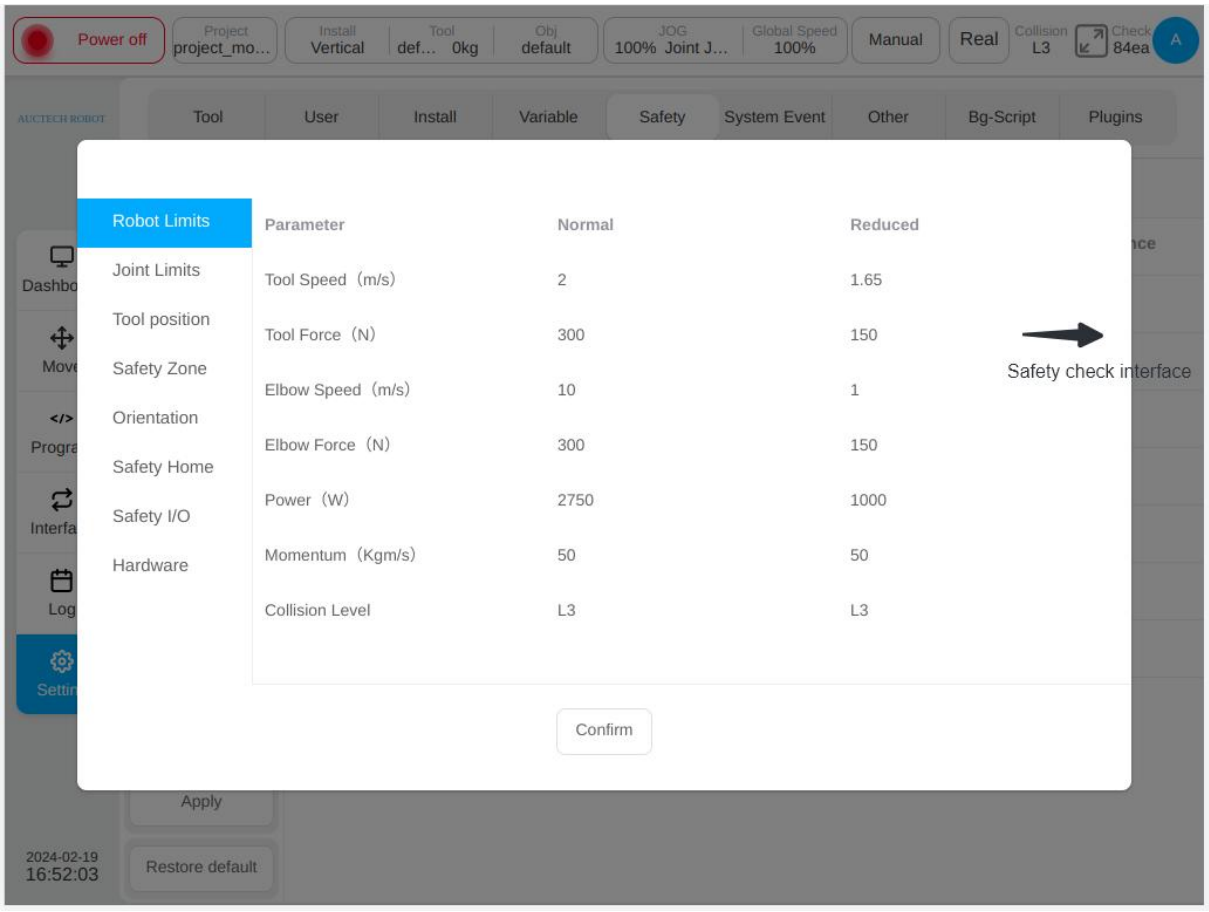
- **Collision detection:**

Collision detection displays the current status of the collision detection settings, as well as the safety level. See Section 6.3.2 for more details on safety level settings.



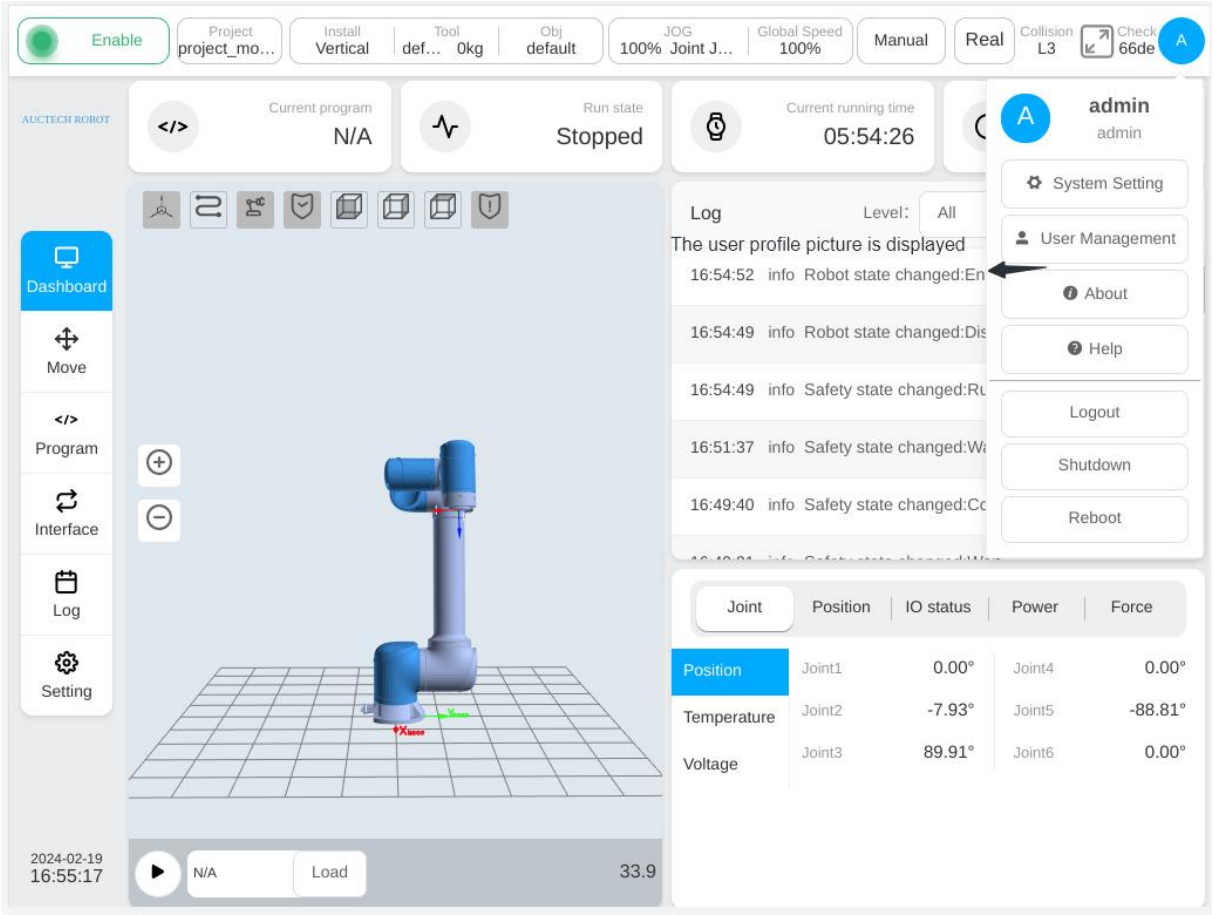
- **Safety verification code:**

  Displaying the safety verification code. Click the “Safety Verification” area, and the safety verification page is displayed, as shown in the picture. This page displays the safety configuration parameters set under the safety settings subpage of the settings page. To close the page, click “Close” at the bottom of the safety verification page or the cross mark in the upper right corner of the page.



- **User profile picture:**

  Displaying the uppercase letter of the login user name. Click the user profile picture to display the pop-up box as shown in the figure. These buttons include “Change Password” (displayed for users other than admin), “System Settings”, “Account Management” (displayed only for users with admin rights), “About”, “Help”, “Logout”, “Shutdown”, and “Restart”.



Click the “Help” button, and a “Help Document” window will appear, which can be used to search the error code.

8. Input Keyboard

8.1. Normal Input Keyboard

When you click the input box, the following input keyboard will pop up

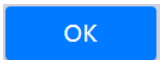
Input prompts are displayed on the left of the keyboard input box, and format requirements are displayed on the right.

Keys can be divided into character keys and function keys

The layout of the character key is basically the same as that of the common keyboard. You can switch case and character by “Shift” key.

Function keys have the following functions:

To exit keyboard

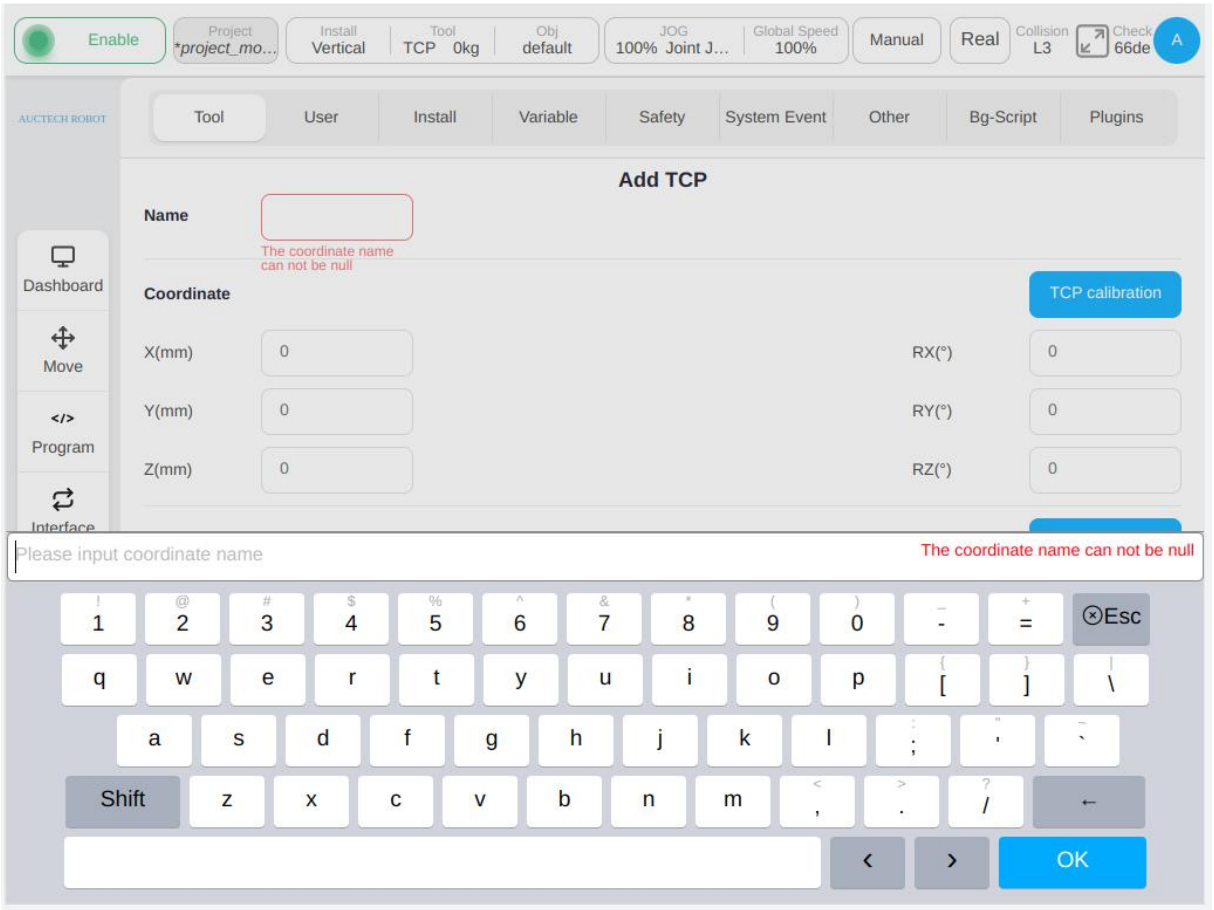


To confirm the input, it will be invalid if the input format isn’t matched.

Switching case and characters


To delete the characters in front of the current cursor, press and hold to continuously delete the characters in front of the current cursor


To move the cursor left and right, and press and hold to move continuously



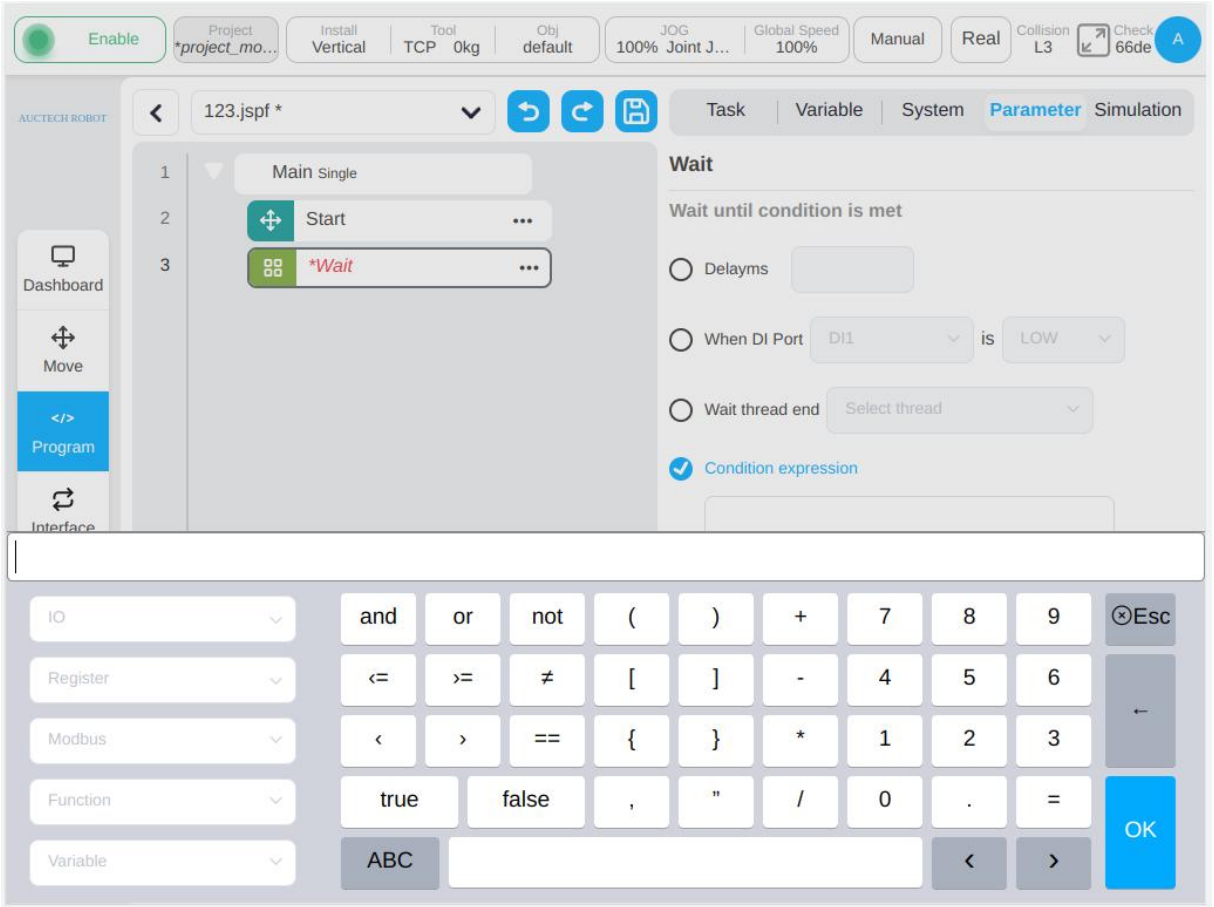
After the input keyboard is displayed, users can still enter on the physical keyboard. Press “Enter” on the physical keyboard to confirm the input, press “Esc” to exit the keyboard directly, press the left and right arrow keys to move the cursor left and right, and press the up and down arrow keys to move the cursor to the first or last place.

8.2. Expression input keyboard

During programming, some function blocks require input expressions, and the expression keyboard pops up. The expression keyboard is mainly used to enter the expression quickly, and the expression keyboard will automatically convert the expression to generate the script statement of the robot, and the expression keyboard will also check whether the expression is legitimate.

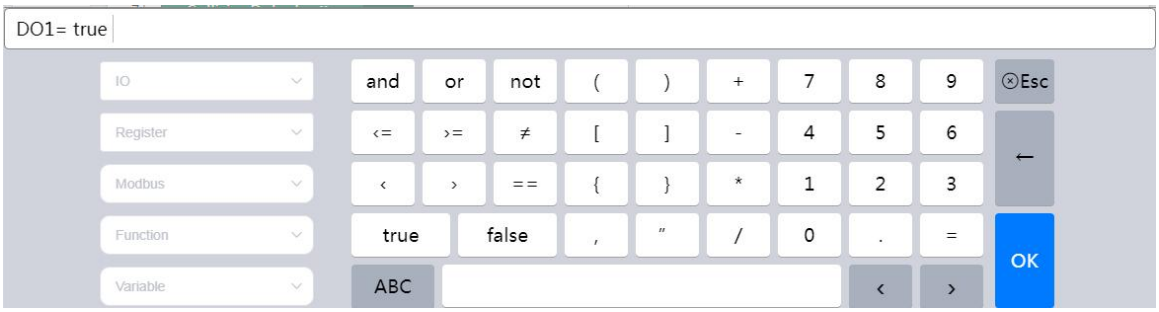
The drop-down input box on the left of the expression keyboard can be selected to quickly input IO, registers, Modbus, functions and variables. On the right side, users can enter common logical operators: and, or, not, relational operators: <=, >=, <, >, ==, ≠, arithmetic operators: +, -, *, /, boolean values: true, false, and common symbols and numbers.

The function keys of an expression keyboard are similar to those of a normal input keyboard. Users can switch to the normal input keyboard by pressing the key ABC.



Different from the robot script, the input of the expression keyboard is relatively simple, and it can be automatically converted into the robot script. For example, to set the digital output port 1 to high level, the expression keyboard can be entered as follows. It is automatically converted into a script for the robot when actually executed:

set_standard_digital_out(1,true)



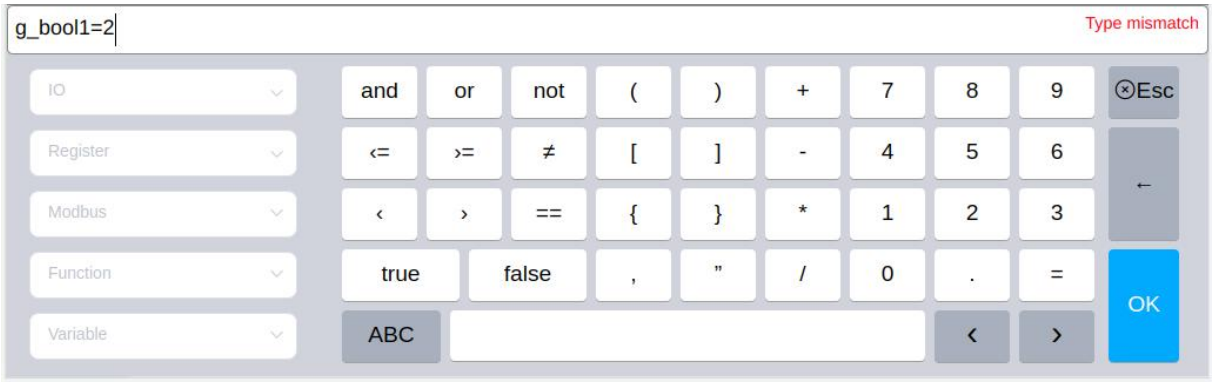
Here are some input examples of expressions.

	Expressions	Input
IO	The conditional expression: DI1 is high and DI2 is low.	DI1 == true and DI2 == false
	The conditional expression: the end digital intput port 1 is high.	Tool_DI1 == true
	DO1 is set to high.	DO1 = true
	DO2 is set to low.	DO2 = false
Register	The conditional expression: bool Input register 1 is true.	bool_reg_in1 == true
	The conditional expression: word input register 2 is 32.	word_reg_in2 == 32
	The conditional expression: float input register 1 is less than or equal to 2.5.	float_reg_in1 <= 2.5
	The bool output register 1 is set to true.	bool_reg_out1 = true
	The word output register 1 is set to 16.	word_reg_out1 = 16
	The float output register 1 is set to 1.2.	float_reg_out1 = 1.2
	The conditional expression: the value of the read-write coil mb1 is 1.	mb1 == 1

	The conditional expression: the read-write register mb3 has a value greater than 10	mb3 > 10
	The read-write coil mb1 is set to 1.	mb1 = 1
	The read-write register mb3 is set to 12.	mb3 = 12
Variable	The conditional expression: the global variable g_bo has a value of true	g_bo == true
	The global variable g_num has a value of 3	g_num = 3

When the input is complete and "OK" is clicked, the legitimacy of the expression will be checked.

As shown in figure, assigning a number to a variable of type global boolean results in an error.



8.3. Numeric input keyboard

When users click the number input box, the number keyboard will pop up in the input box attachment, as shown in the figure.

The numeric keyboard is used to enter numbers. After the keyboard pops up, the user can still enter through the physical keyboard.

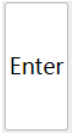
The function of each function key on the numeric keyboard:

To clear input box

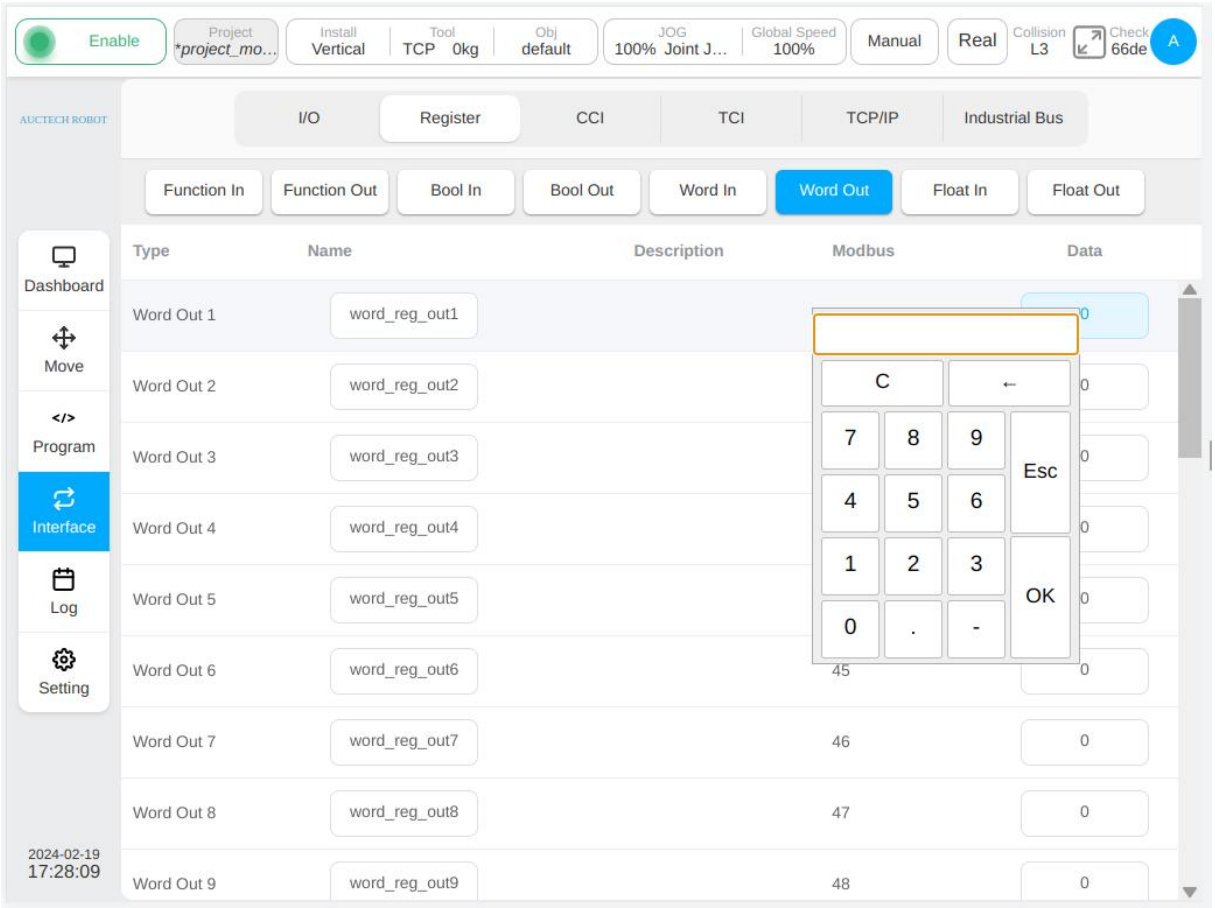
To delete characters

To change the symbol of the number

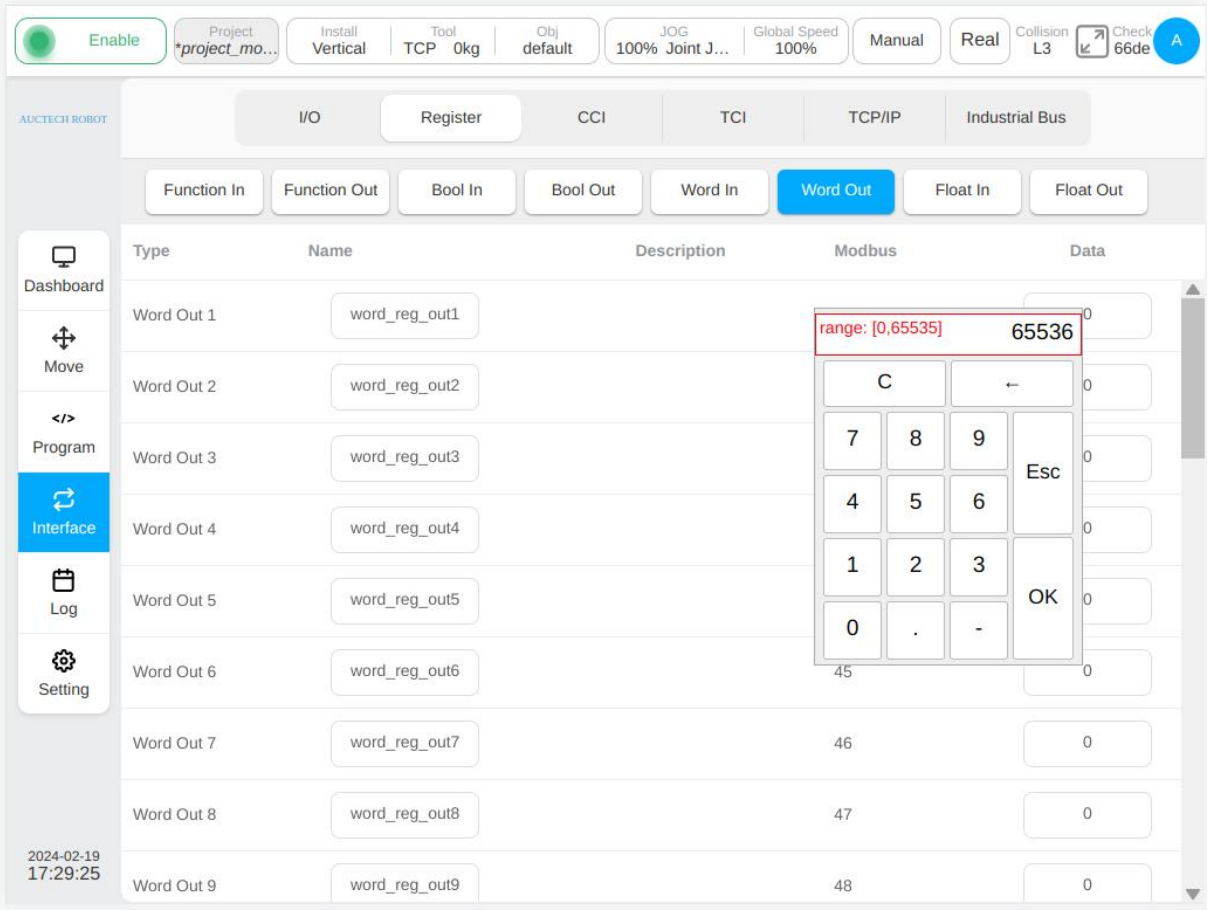
To cancel keyboard input



To confirm keyboard input



The numeric keypad will detect whether the entered number is legitimate. As shown in the picture, when the entered number exceeds the range, an error will be reported on the left side of the input box, and a valid input range will be prompted


Enable
Project
*project_mo...
Install
Vertical
Tool
TCP 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L3
Check
66de
A
AUCTECH ROBOT
I/O
Register
CCI
TCI
TCP/IP
Industrial Bus
Function In
Function Out
Bool In
Bool Out
Word In
Word Out
Float In
Float Out
Dashboard
Move
Program
Interface
Log
Setting
Type
Name
Description
Modbus
Data
Word Out 1
word_reg_out1
Word Out 2
word_reg_out2
Word Out 3
word_reg_out3
Word Out 4
word_reg_out4
Word Out 5
word_reg_out5
Word Out 6
word_reg_out6
45
Word Out 7
word_reg_out7
46
0
Word Out 8
word_reg_out8
47
0
Word Out 9
word_reg_out9
48
0
range: [0,65535]
65536
C
←
7
8
9
Esc
4
5
6
1
2
3
OK
0
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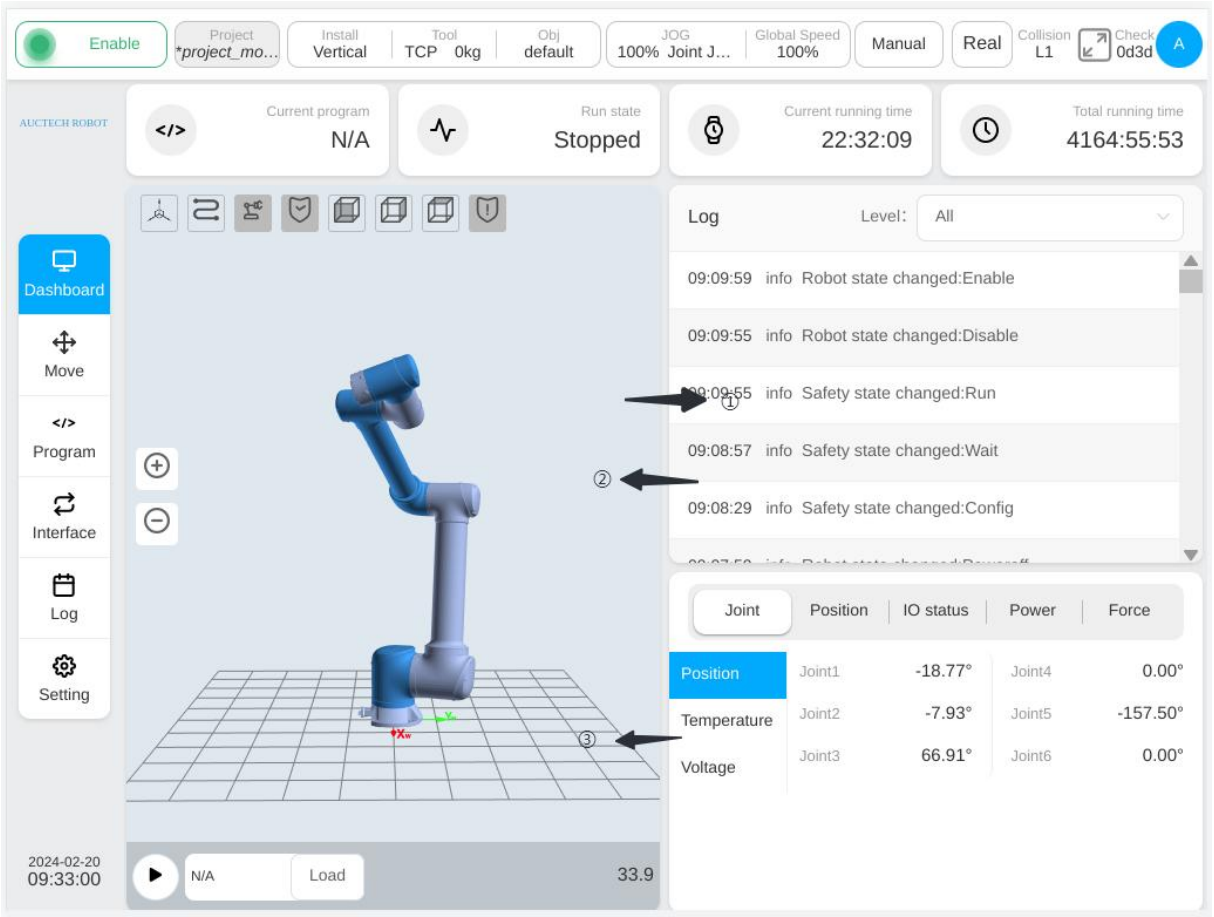
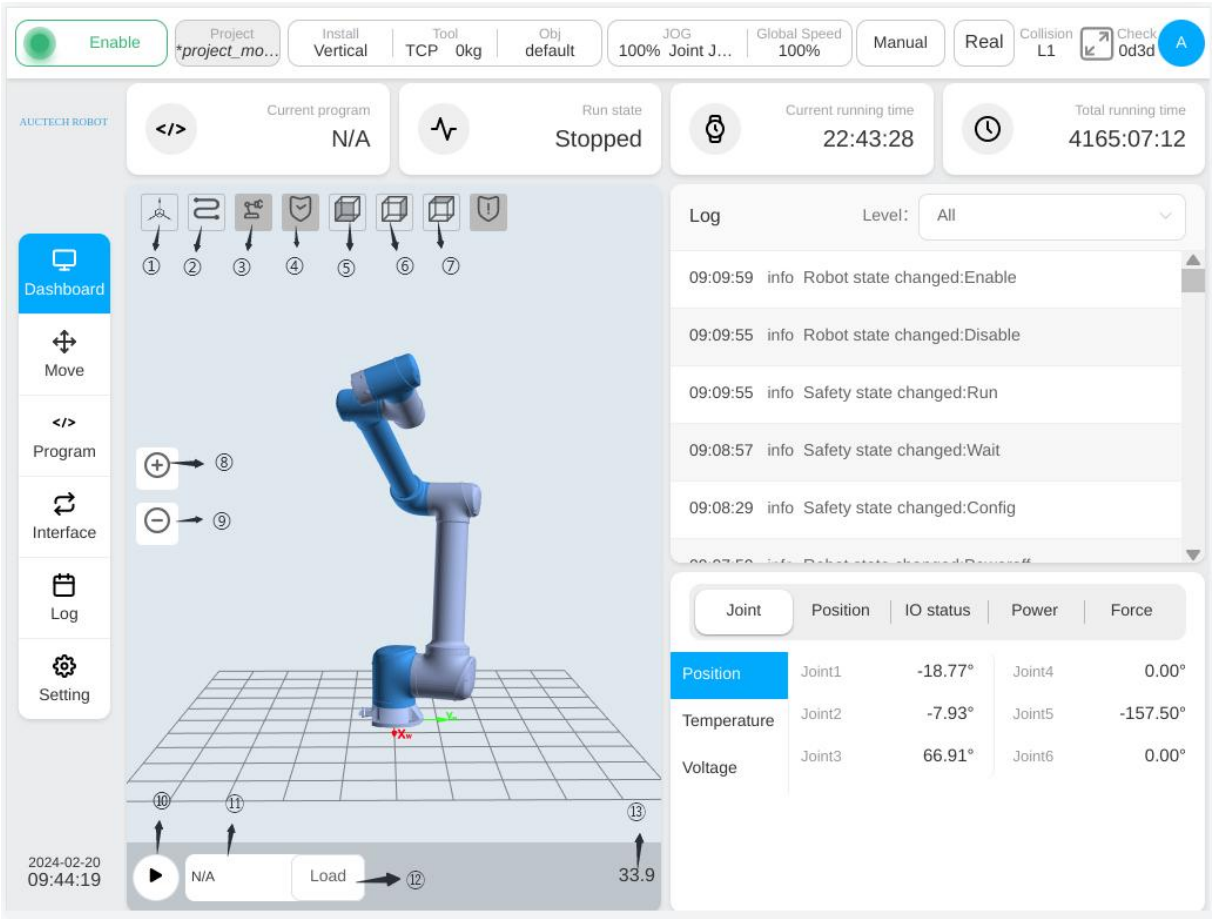
9. Overview Page

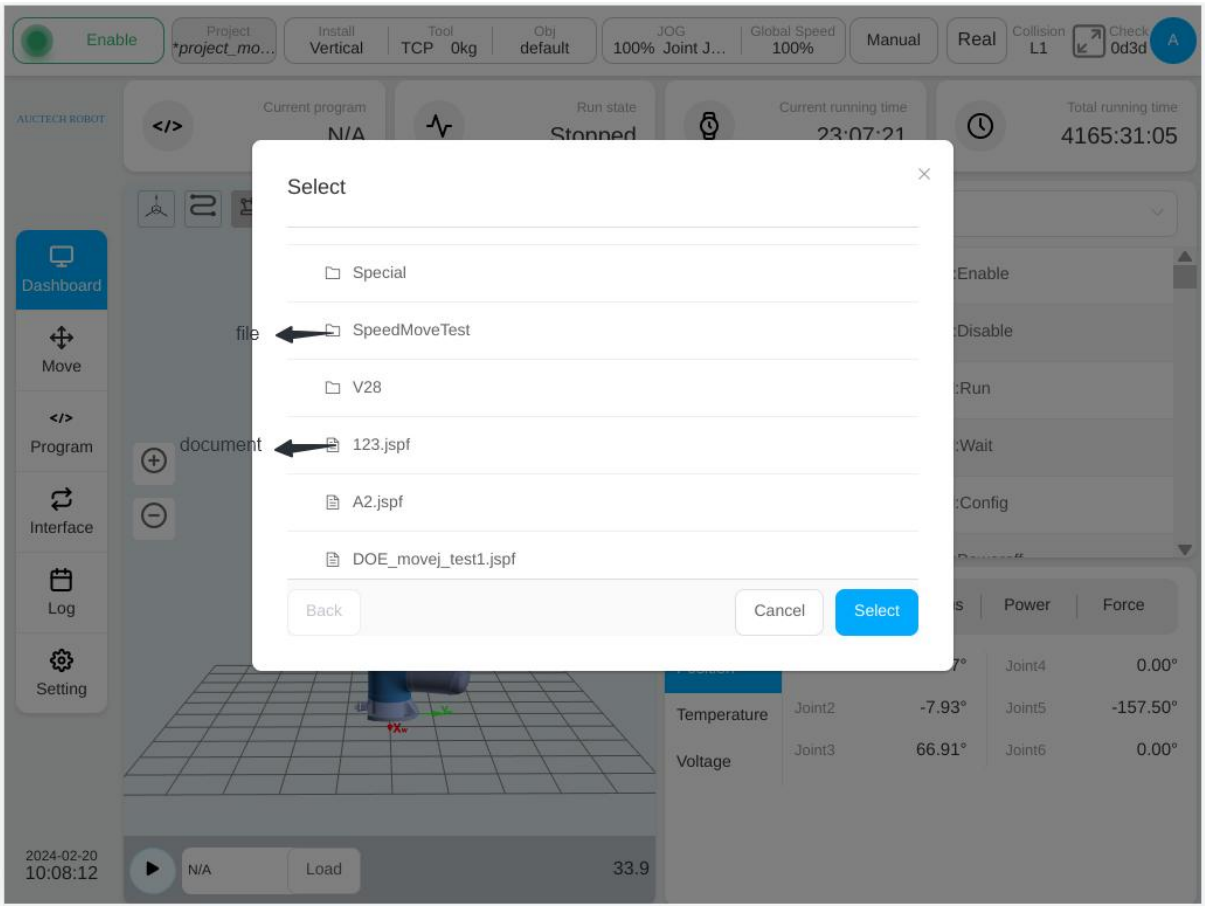
Click "Overview" in the navigation bar to enter the overview page, as shown in the figure. Above the content area of the page: the current running program, program running status, this running time and machine running time. The 3D simulation model is displayed at ① on the left side of the page. Log information is displayed at ② in the upper right corner. Users can select All, Critical, Error, Warning, and Message from the drop-down list to view logs. At ③on the lower right side, the robot joint information (position/temperature/voltage), spatial position (base coordinate system), IO status, power supply information (control cabinet) and force information are displayed.



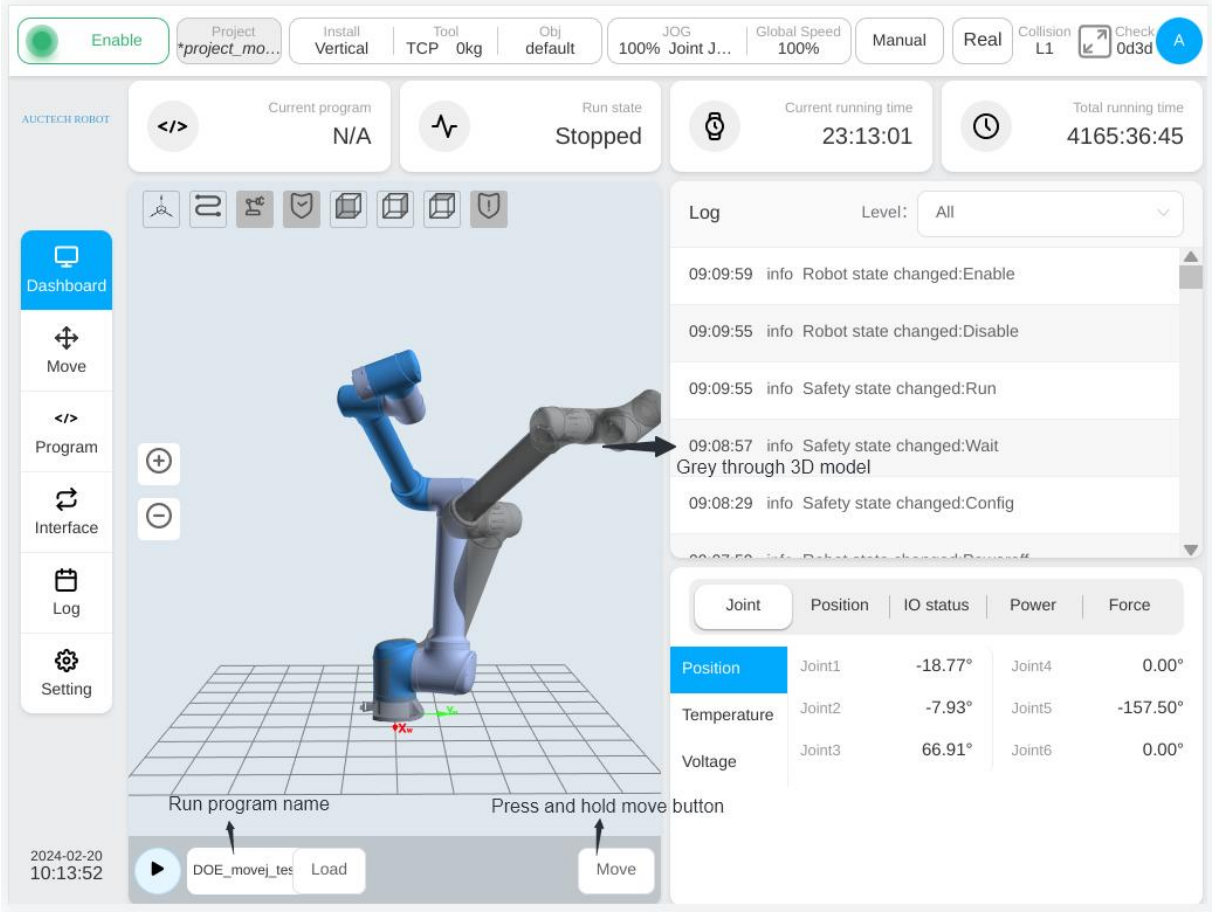
The 3D simulation model area is shown in the figure, and the icons ①-⑦ in the upper left corner indicate whether to display: workpiece coordinate system and tool coordinate system, end trajectory, robot 3D simulation model, safety area, front view, right view and top view. Icons ⑧ and ⑨ are respective buttons to zoom in and out of the 3D model. Icons ⑩-⑬ are respectively the program running button, the current running program display box, the loading program button and the program run time display.



Clicking the "Load" button, the program list interface will pop up, as shown in the figure. The program list lists all folders (for example, Test_1) and program files with the “. jspf” extension (for example, ee.jspf). There are three buttons at the bottom of the page: “Return to the upper layer”, “Cancel”, and “Select”.

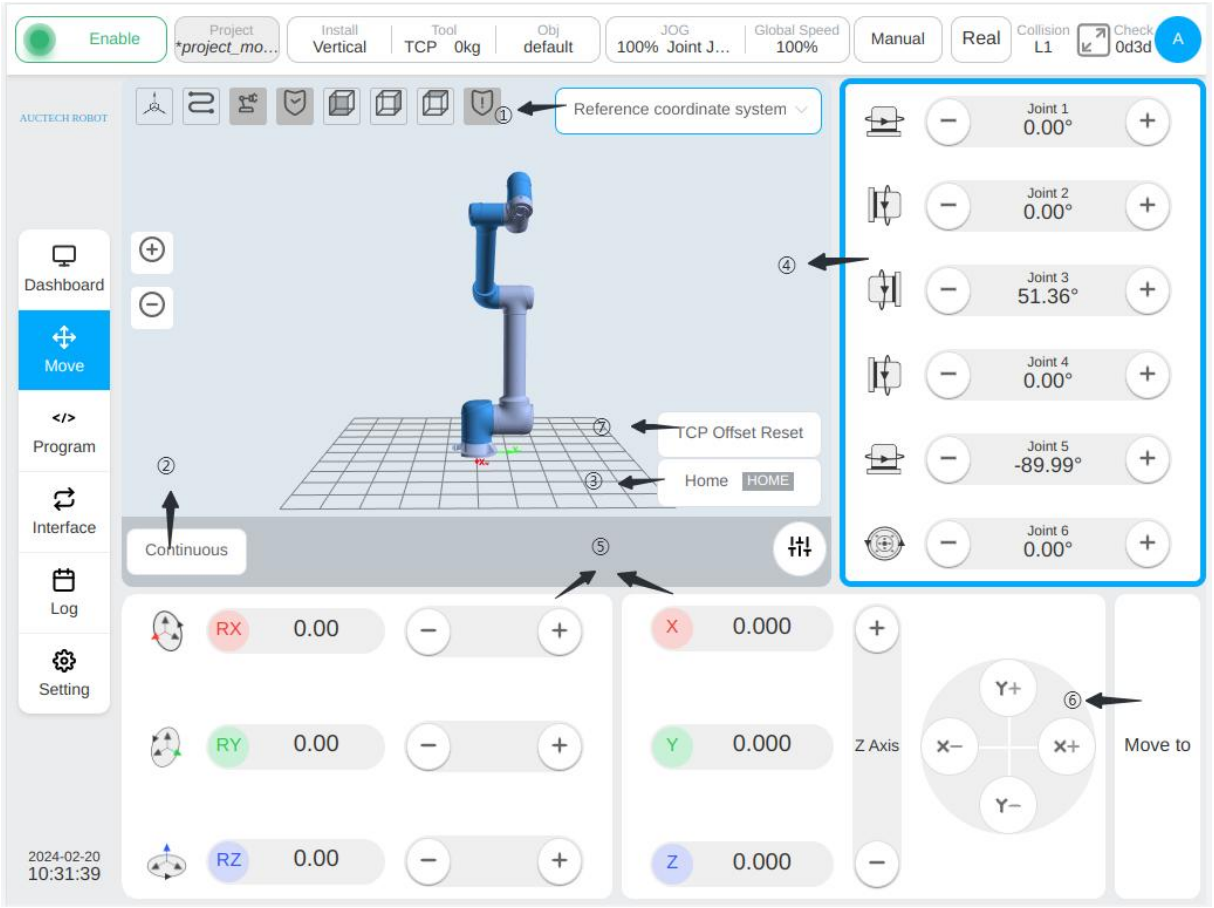


After selecting the program file to be loaded and run and clicking the “Select” button on the page, the program list page automatically disappears, and the name of the selected program file or the name marked with “.../” (there are folder nested, such as: ... /4560.jspf) is displayed on the icon ⑪. And then clicking the "Run" button, the "Hold and move" button will appear and the gray perspective 3D model (hereinafter referred to as the gray 3D model), as shown in the figure. Pressing and holding the "Press and move" button, and the robot will move to the initial position set in the program, that is, the gray perspective 3D model. Releasing the button will stop the movement. When the robot moves to the 3D model, the "Hold to move" button disappears. Then click the "Run" button to run the program.



10. Move Page

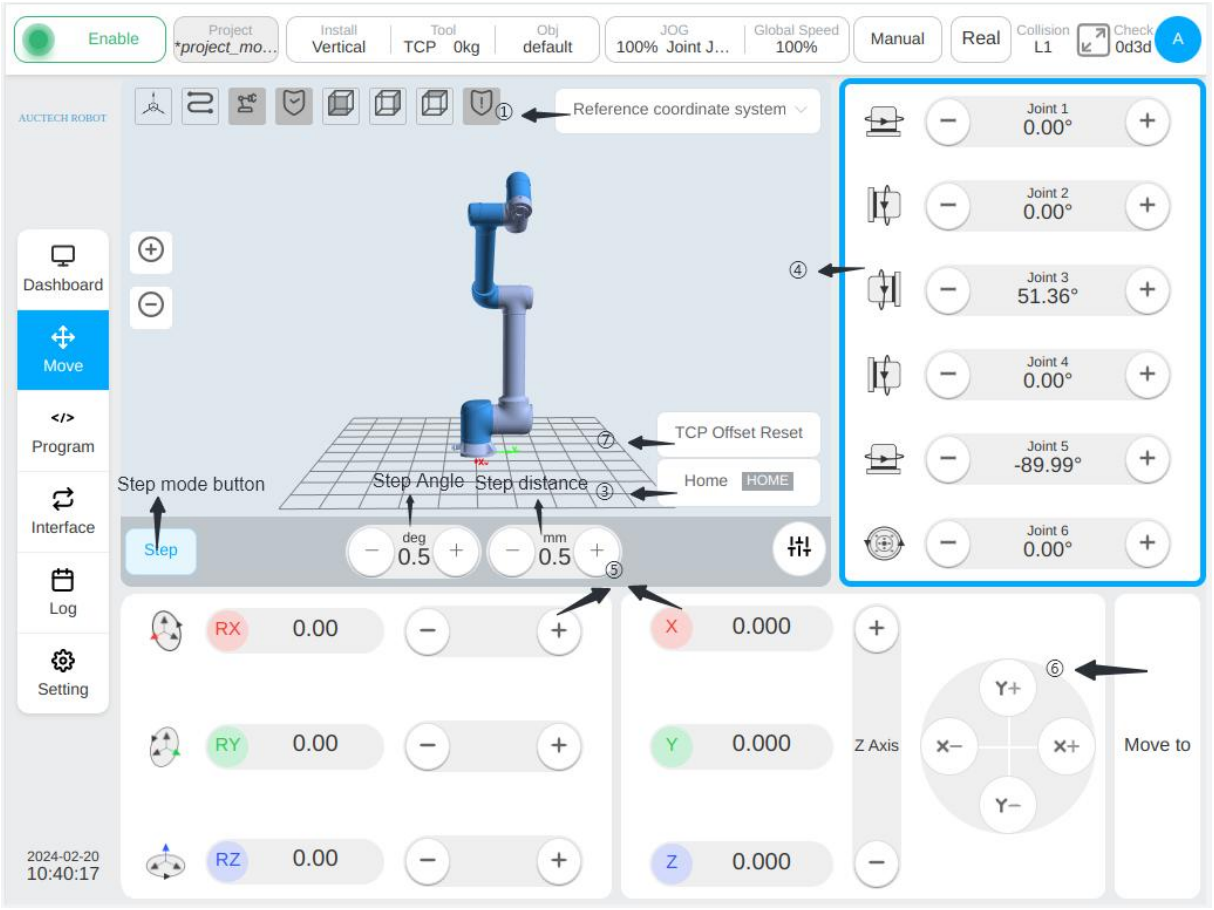
Click "Move" in the navigation bar to enter the move page, as shown in the figure.



The 3D stimulation model is displayed on the upper left of the page. Click the selector at the icon ① to select the coordinate system the robot used currently and the reference system of manually operated robot. The world coordinate system is used by default (same as the settled coordinate system in this system), indicating that the robot base is the coordinate base. The tool coordinate system and the workpiece system can also be selected, which tool coordinate system takes the end point of the end tool as the coordinate point and the workpiece coordinate system is freely set by the user. After switching the reference coordinate system, the position and posture data of the robot in Cartesian coordinates displayed on the page will change accordingly.

The icon ② is a button for the user to switch modes. The display mode of the button is the currently selected moving mode. Click the “Continuous Mode” button to switch to the “Step Mode”. The button for adjusting the step angle and distance and the data display box will be displayed. The default value of the step angle and step distance for user-defined movement is 0.5deg and 0.5mm, the minimum allowable setting is 0.1deg and 0.1mm, and the maximum allowable setting is 5deg and 5mm. Users can adjust the step Angle and step distance by "-" and "+".

The icon ③ is the “Press and back to HOME” button. If the button is pressed, the robot will move to the set home point. If the button is released, the robot will stop moving. The default HOME point is the point that each joint angle value is 0° and the robot is in an upright position. When the robot moves to the "Press and back to HOME" button, the background of "HOME" will turn green, indicating that the robot has reached HOME, as shown in the figure.

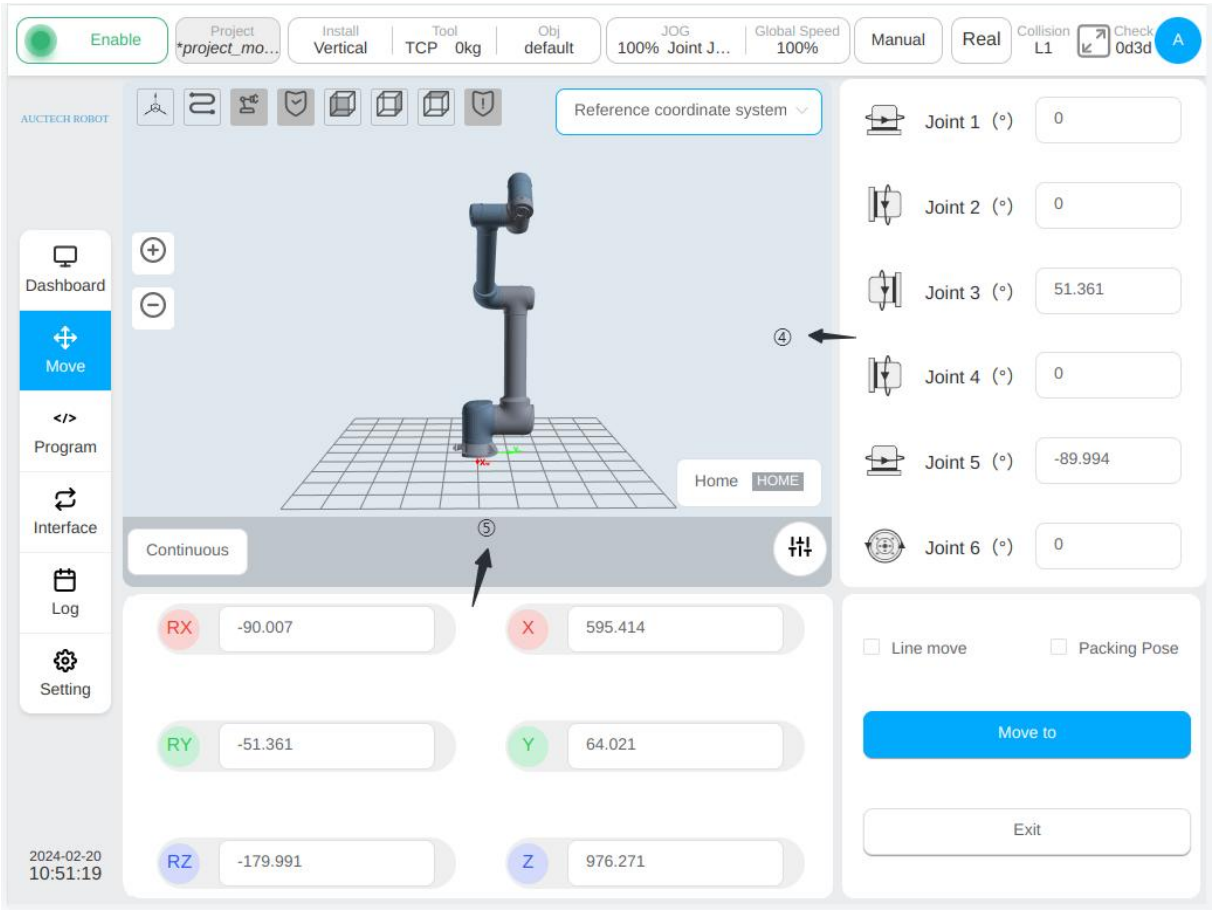


The area ④ is the area where the manually operated robot joint moves. When the user clicks anywhere in the area, a blue border will be displayed in the area, representing that the current manually operated robot joint moves. Press the left arrow or right arrow button of a joint to move the joint in a positive or negative direction. Releasing the button will stop the robot joint from moving. The user can also move the joints by holding down the “+” and “-” buttons on the right side of the teach pendant. The buttons correspond to joints 1 to 6 from top to bottom.

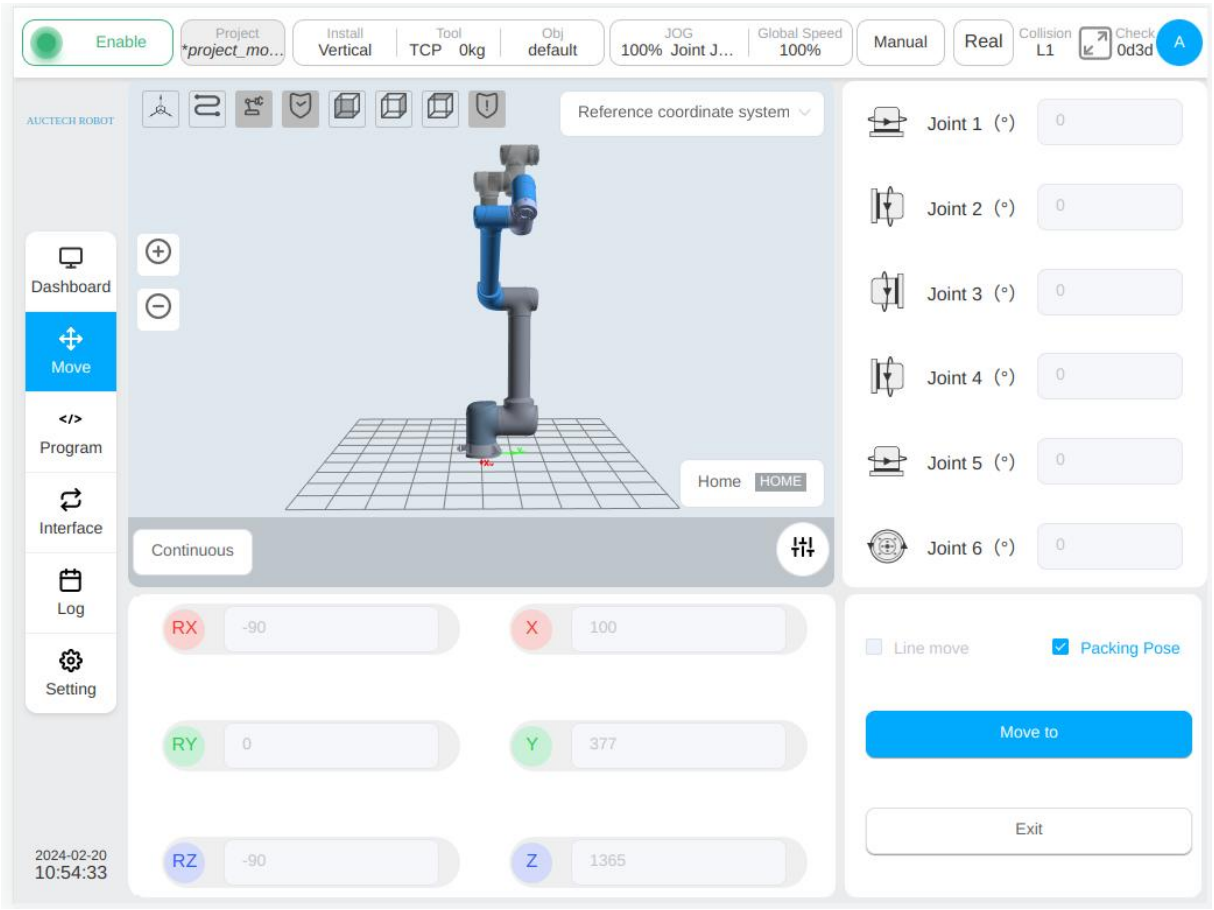
The area ⑤ is the area where the end of the manually operated robot moves in the Cartesian coordinate system. Similarly, when the user clicks anywhere in the area, a blue border will be displayed in the area, representing the current manually operated robot's end movement. Hold down the X, Y and Z axis direction buttons to change the position of the robot in Cartesian coordinate system; hold down the RX, RY and RZ direction buttons to change the posture of the robot in Cartesian coordinate system; Release the corresponding buttons and the robot will stop moving. Similarly, the user can change the position and posture of the robot by holding down the right "+" and "-" buttons on the teach pendant, which correspond to the six moving directions of X, Y, Z, RX, RY and RZ from top to bottom respectively.

Caution	● **When using the physical button Jog robot on the teach pendant, it is essential to confirm whether joint space motion or Cartesian space motion is controlled according to the current active state (blue border).**

The icon ⑥ is a switch button for the user between manually entering the joint angle or pose value and holding down the button to move the robot. Clicking the "Move to" button, and the input boxes for entering the joint Angle and pose value will be displayed respectively in area ④ and area ⑤. In the 3D model area, a gry-through robot model at the target point will be displayed. As shown in the figure:



Click the input box of joint angle and pose value to pop up the virtual numeric keyboard. After entering the target position data in the virtual numeric keyboard, click “Esc” to close the virtual numeric keyboard. Then, by pressing and holding the “Move to” button, the robot will move to the target position, and releasing the button will stop the robot from moving. When the “Line Move” box is checked, it means that the robot moves to the target position in a straight line. Otherwise, the robot is jointed to the target position. When the “Pack Posture” is checked, the “Line Move” option box will be disabled, and the joint angle and Cartesian position posture input boxes will be disabled respectively. For the checked “Line Move” option, the check box will be unchecked, and the joint angle and position posture value will display the fixed value when packing posture, indicating that the robot is jointed to the packing position. Click the "Exit" button to exit the page for manually entering the target location and return to the original move page. As shown in the figure:



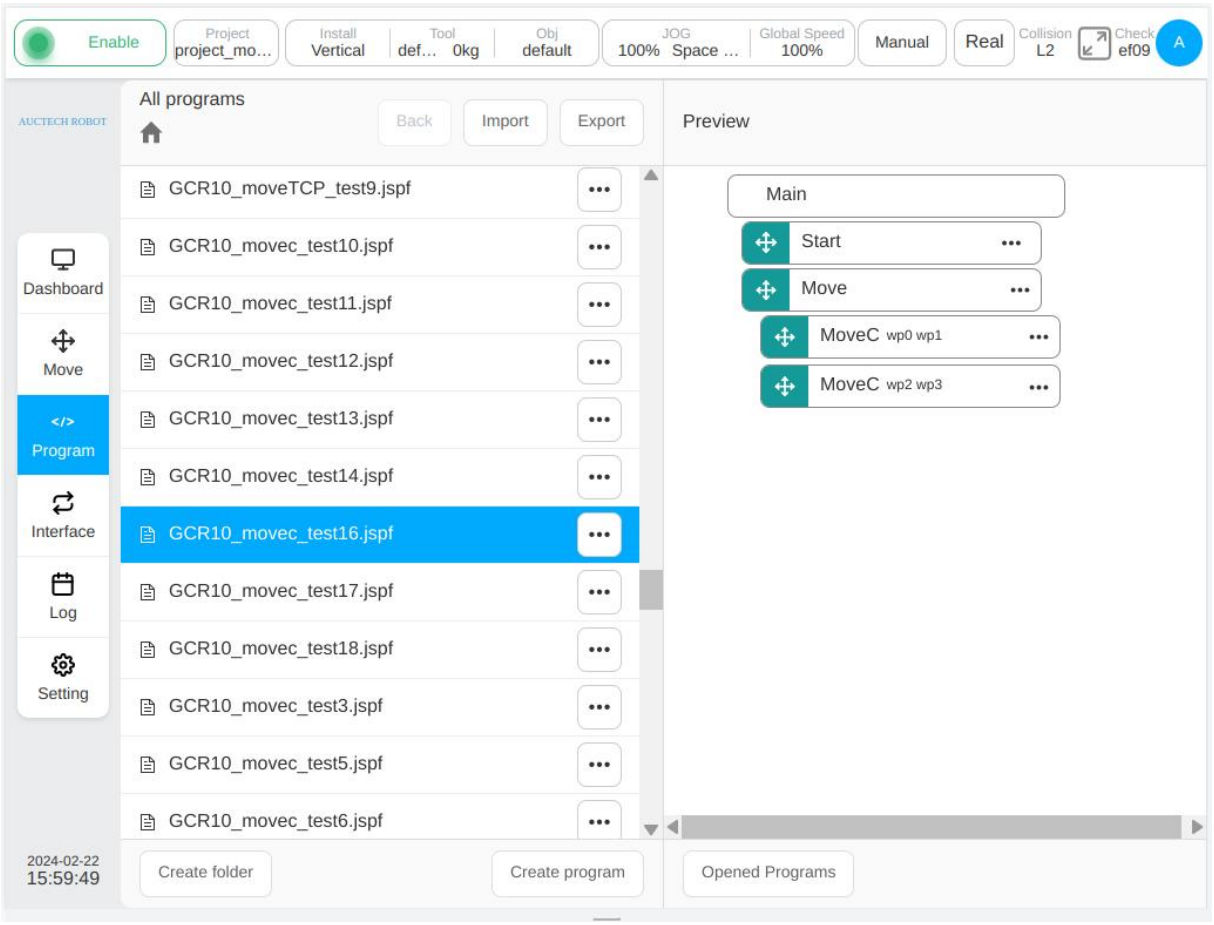
The icon ⑦ is the "Tool Offset Reset" button, which is displayed only when the reference coordinate system of the move page is selected as the tool coordinate system. When the user clicks the button, the position of the click moment will be used as the reference starting point, and the offset of the reference starting point of the robot position reference when the button is clicked will be displayed in real time in the area ⑤ when the robot is operated. The reference starting point for calculating TCP offsets is not updated until the user clicks the Tool Offset Reset button again.

11. Program Page

Click "Program" in the navigation bar to enter the program page. Program page can manage the program list, edit the program, run the program.

11.1. Program List Page

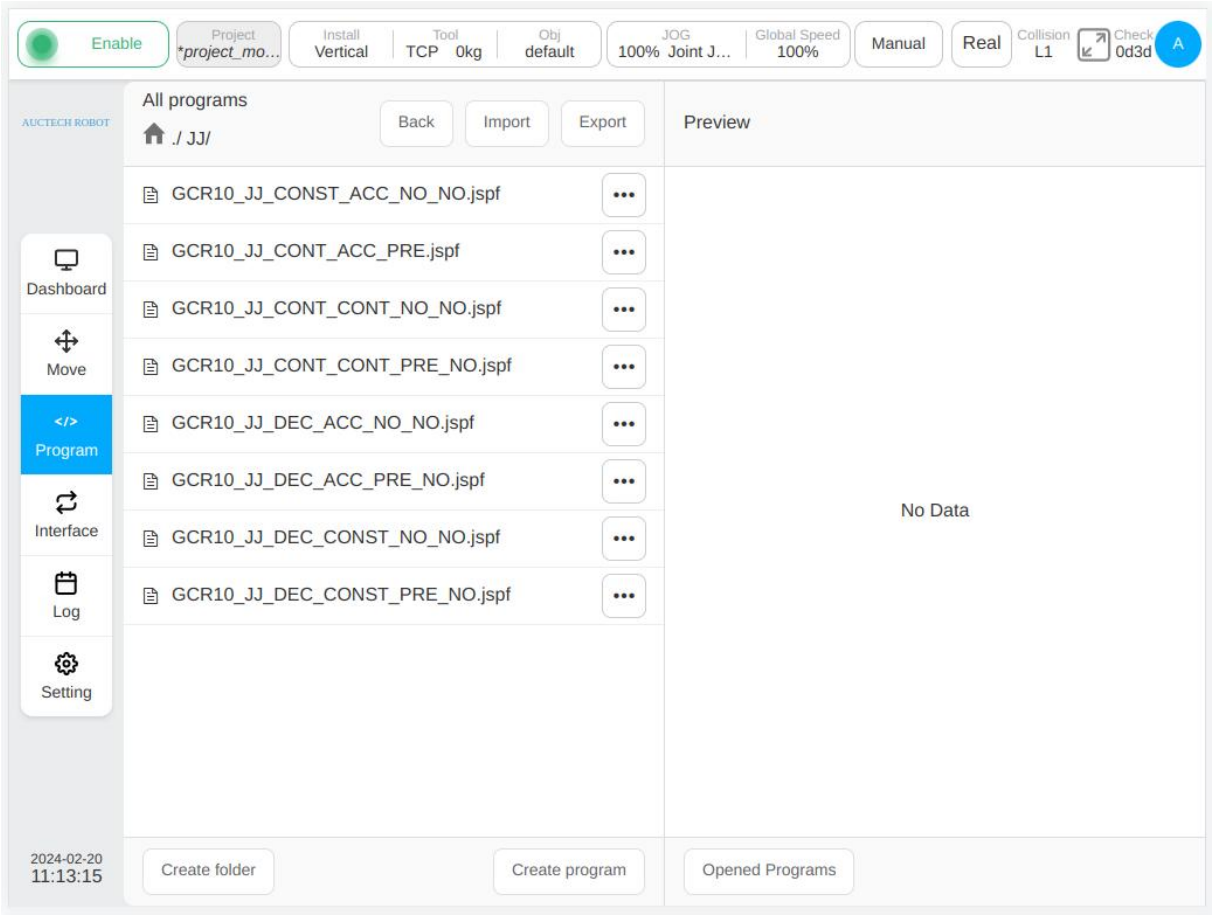
The list page is used to manage all the applications in the current activated project. The figure is the program list page, which shows all the programs and folders in the root directory of the program.



Select the folder, and click the ••• button, click the “Enter the program”, you can switch to the file directory, view all the programs and folders in the folder.

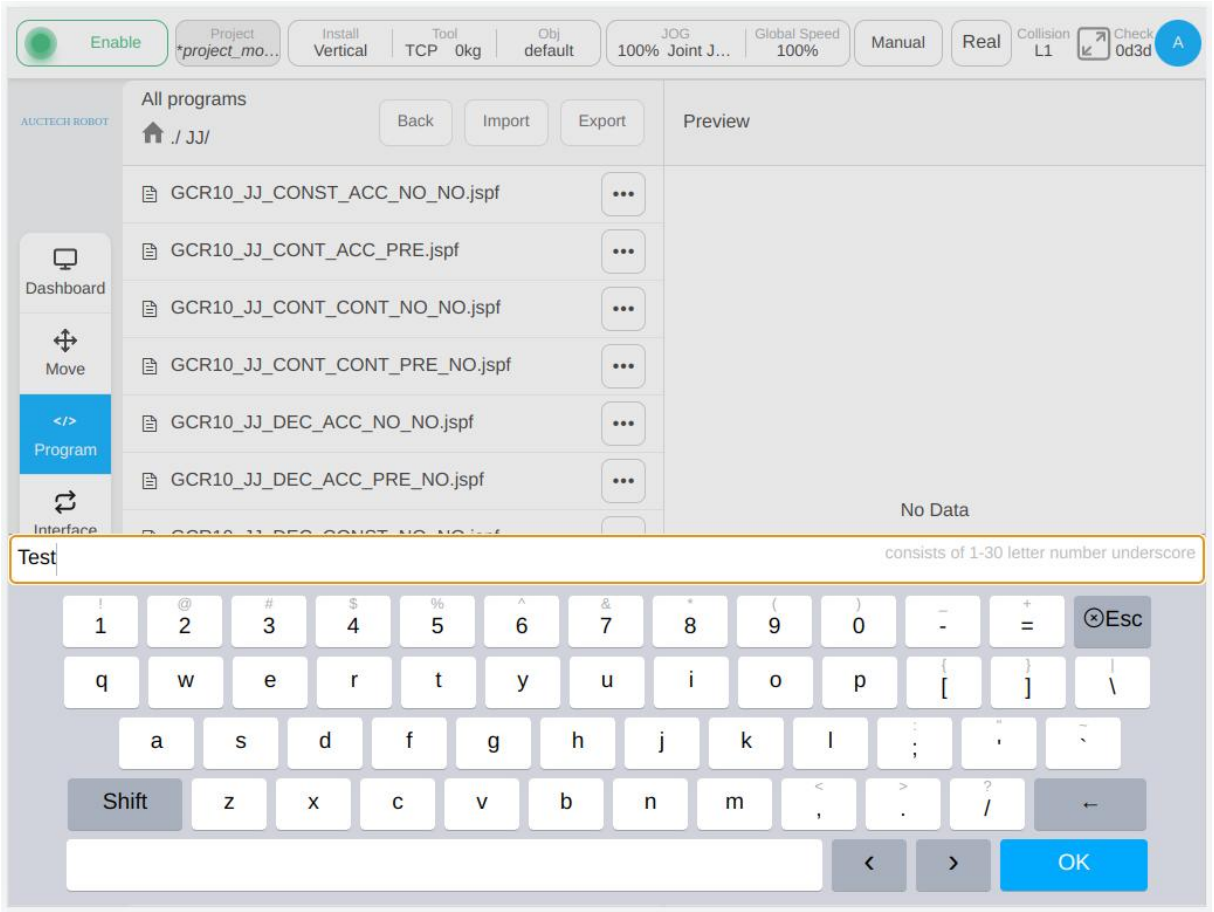
Selecting the program, the “Program Preview” area on the right can display the content of the program. click the “Enter the program” to open the program.

The upper left can display the current directory, as shown in the figure. Click the "Return to the upper level" button to return to the upper level directory, click the path to switch directories, and click ⌂ to switch to the root directory.



11.1.1. New Program

Click the “Create a Program” button, the keyboard. Enter the program name, click “OK” to create a program in the current folder.

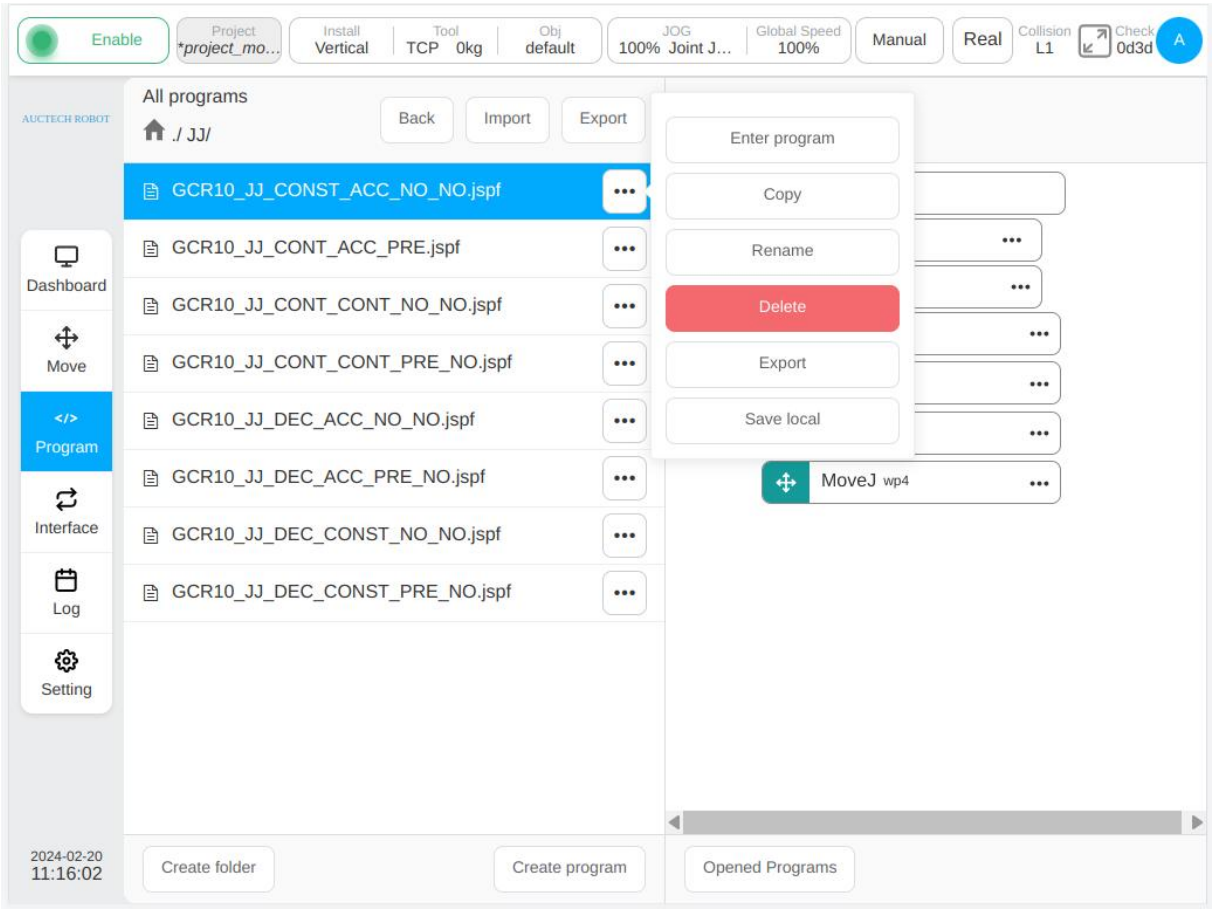


11.1.2. New Folder

Click the "Crate a Folder" button, the keyboard will pop up, enter the folder name, and click "OK" to create a folder in the current folder.

11.1.3. Program File Operation

click the button ••• on the right of the list item, the menu will pop up as shown in the figure:



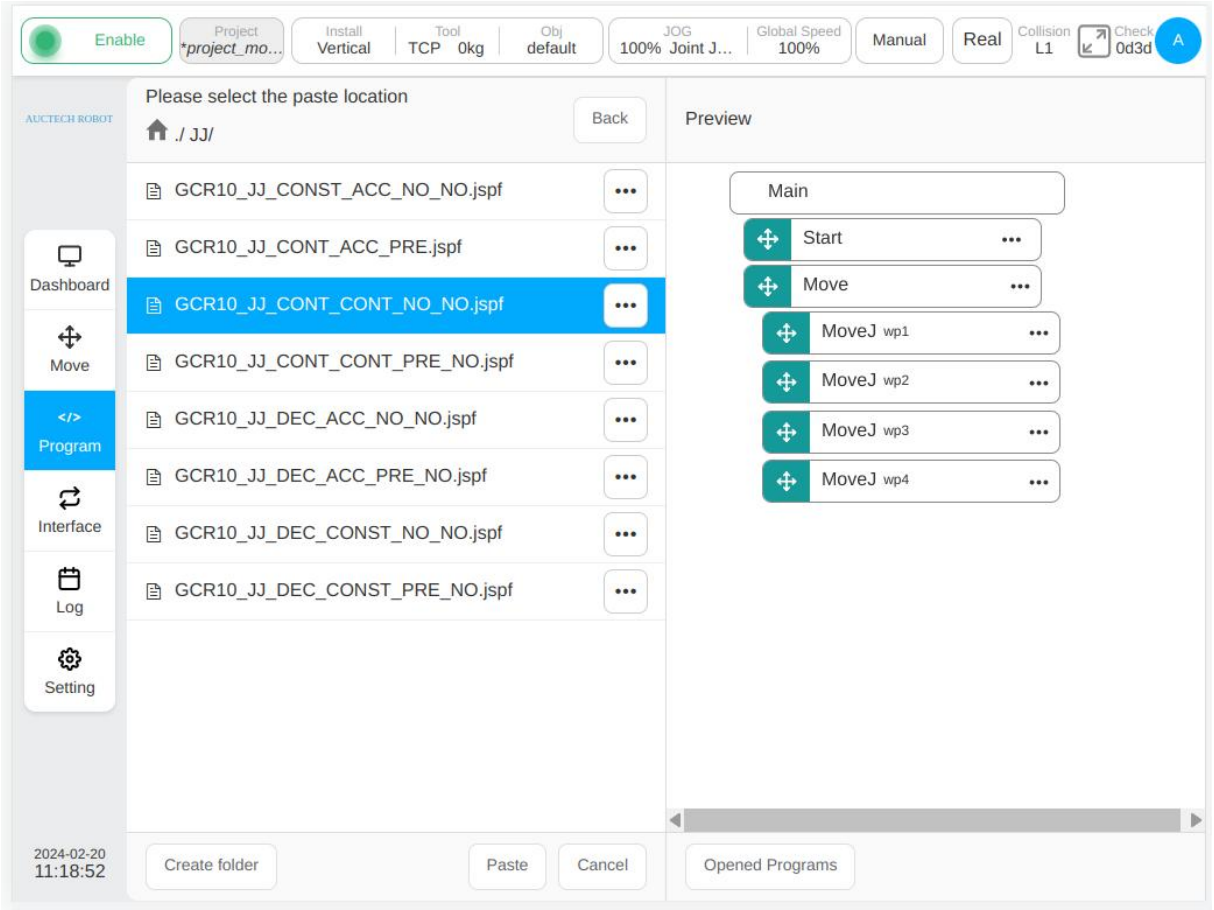
For the program file, the following operations can be performed:

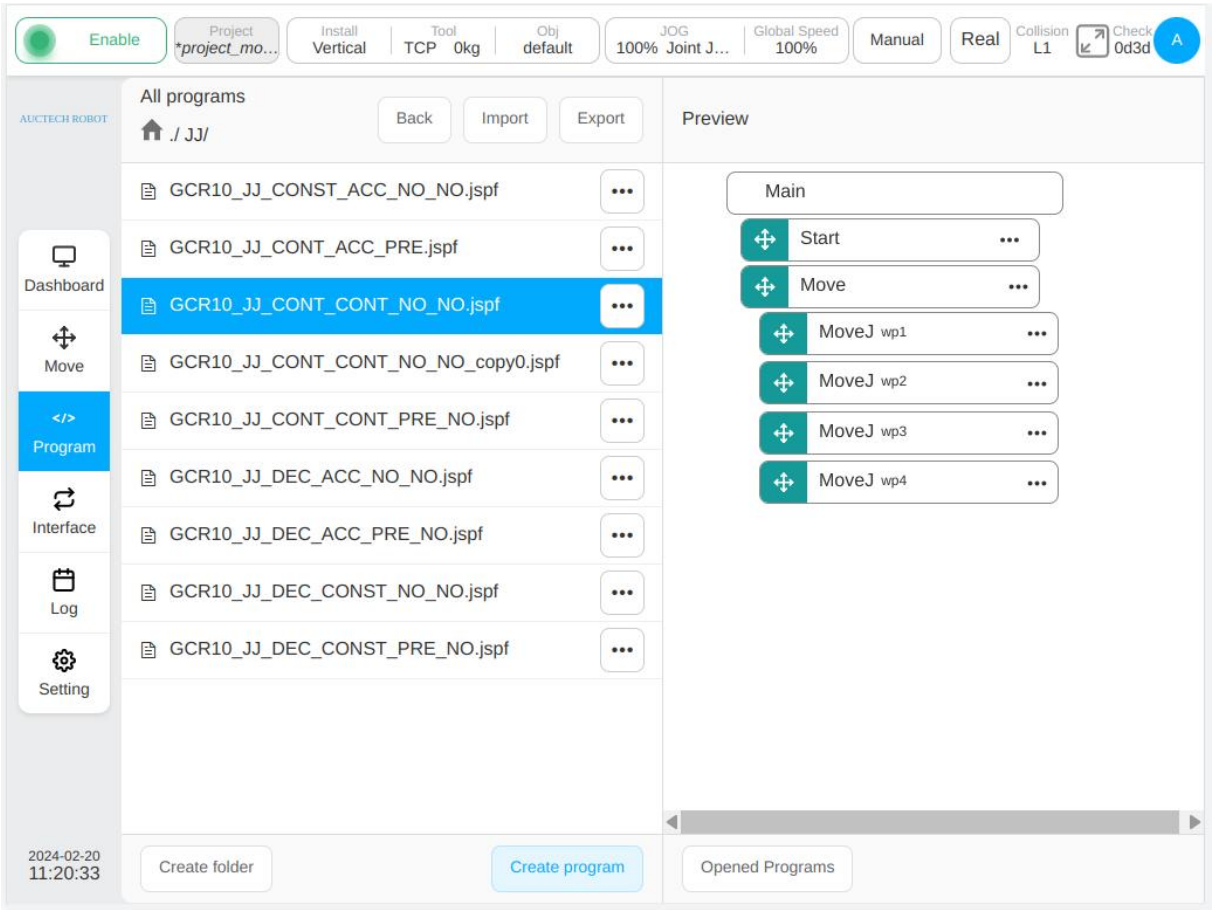
Enter the program

Click to open the program.

Copy

Click the "Copy" button to copy the program file. The program list page is as follows. At this time, you can choose the pasting location. Click the "Paste" button to copy the program to the current folder, click the "Cancel" button to cancel the copy. When pasting, if the current folder has a file of the same name, the suffix "_copyXX" will be automatically added after the paste

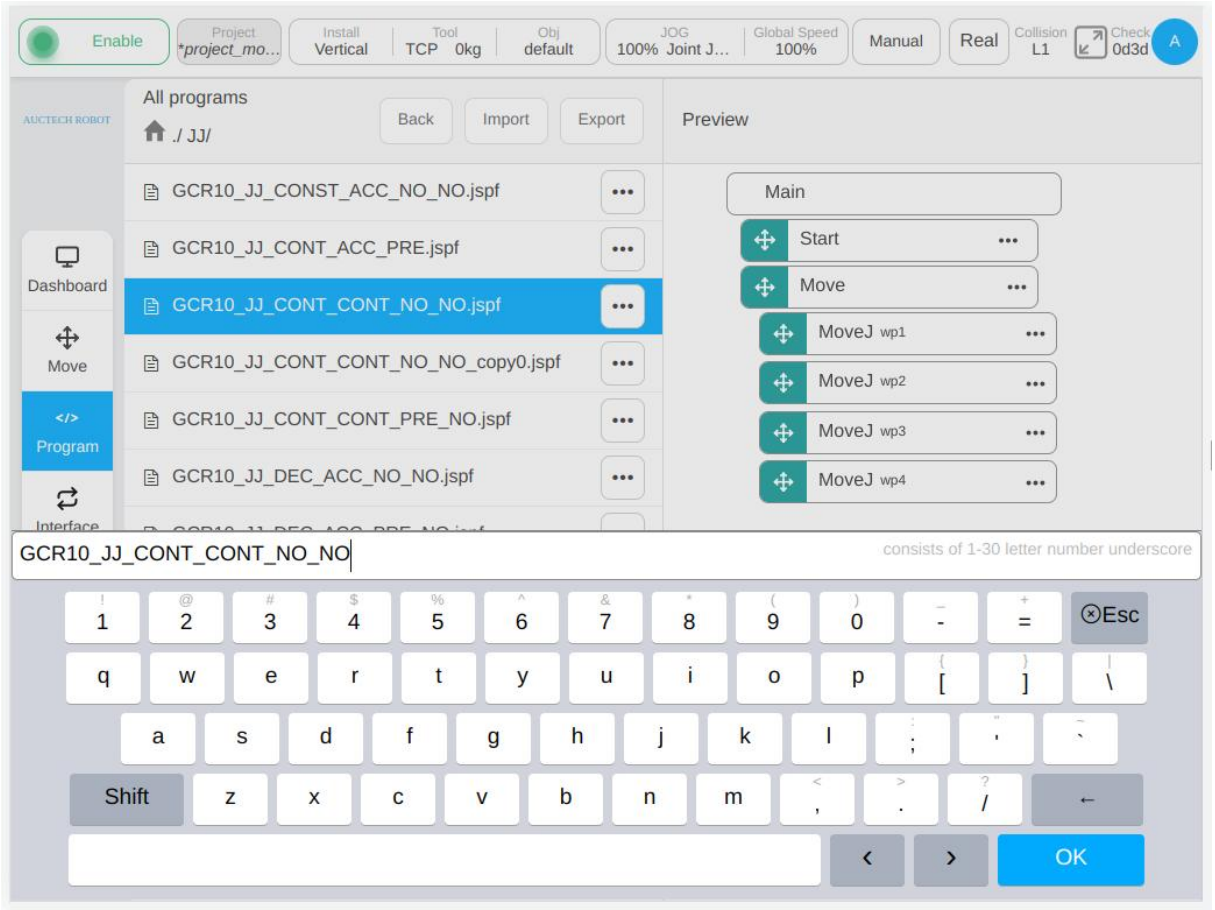

Enable
Project
*project_mo...
Install
Vertical
Tool
TCP 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
Please select the paste location
./ JJ/
Back
Preview
GCR10_JJ_CONST_ACC_NO_NO.jspf
GCR10_JJ_CONT_ACC_PRE.jspf
GCR10_JJ_CONT_CONT_NO_NO.jspf
GCR10_JJ_CONT_CONT_PRE_NO.jspf
GCR10_JJ_DEC_ACC_NO_NO.jspf
GCR10_JJ_DEC_ACC_PRE_NO.jspf
GCR10_JJ_DEC_CONST_NO_NO.jspf
GCR10_JJ_DEC_CONST_PRE_NO.jspf
Main
Start
Move
MoveJ wp1
MoveJ wp2
MoveJ wp3
MoveJ wp4
Dashboard
Move
Program
Interface
Log
Setting
2024-02-20
11:18:52
Create folder
Paste
Cancel
Opened Programs


Enable
Project
*project_mo...
Install
Vertical
Tool
TCP 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
All programs
./ JJ/
Back
Import
Export
Preview
GCR10_JJ_CONST_ACC_NO_NO.jspf
GCR10_JJ_CONT_ACC_PRE.jspf
GCR10_JJ_CONT_CONT_NO_NO.jspf
GCR10_JJ_CONT_CONT_NO_NO_copy0.jspf
GCR10_JJ_CONT_CONT_PRE_NO.jspf
GCR10_JJ_DEC_ACC_NO_NO.jspf
GCR10_JJ_DEC_ACC_PRE_NO.jspf
GCR10_JJ_DEC_CONST_NO_NO.jspf
GCR10_JJ_DEC_CONST_PRE_NO.jspf
Main
Start
Move
MoveJ wp1
MoveJ wp2
MoveJ wp3
MoveJ wp4
Dashboard
Move
Program
Interface
Log
Setting
2024-02-20
11:20:33
Create folder
Create program
Opened Programs

Rename

Click the "Rename" button, and the keyboard will pop up. Enter the new name, and then you can modify it.

Note: already open programs or running applications cannot be renamed.



Delete

Click "delete" button, the dialog box will pop up, click “Confirm” to delete this program.

Note: after open programs or running program cannot be deleted.

Export

You can export the program file to the U disk. Read program import and Export for details.

Save local

You can download the program files locally through a browser

11.1.4. Folder Action

Click the button ••• on the right of the folder item, the following operations can be performed on the pop-up menu: Enter the program, rename and delete.

Enter the program

Click to switch to the folder and view all programs and subfolders under this folder.

Rename

Folders can be renamed. Note: If there are open or running programs in this folder, you cannot rename them.

Export folder

The entire program folder can be compressed into a compressed package exported to the U disk.

Delete

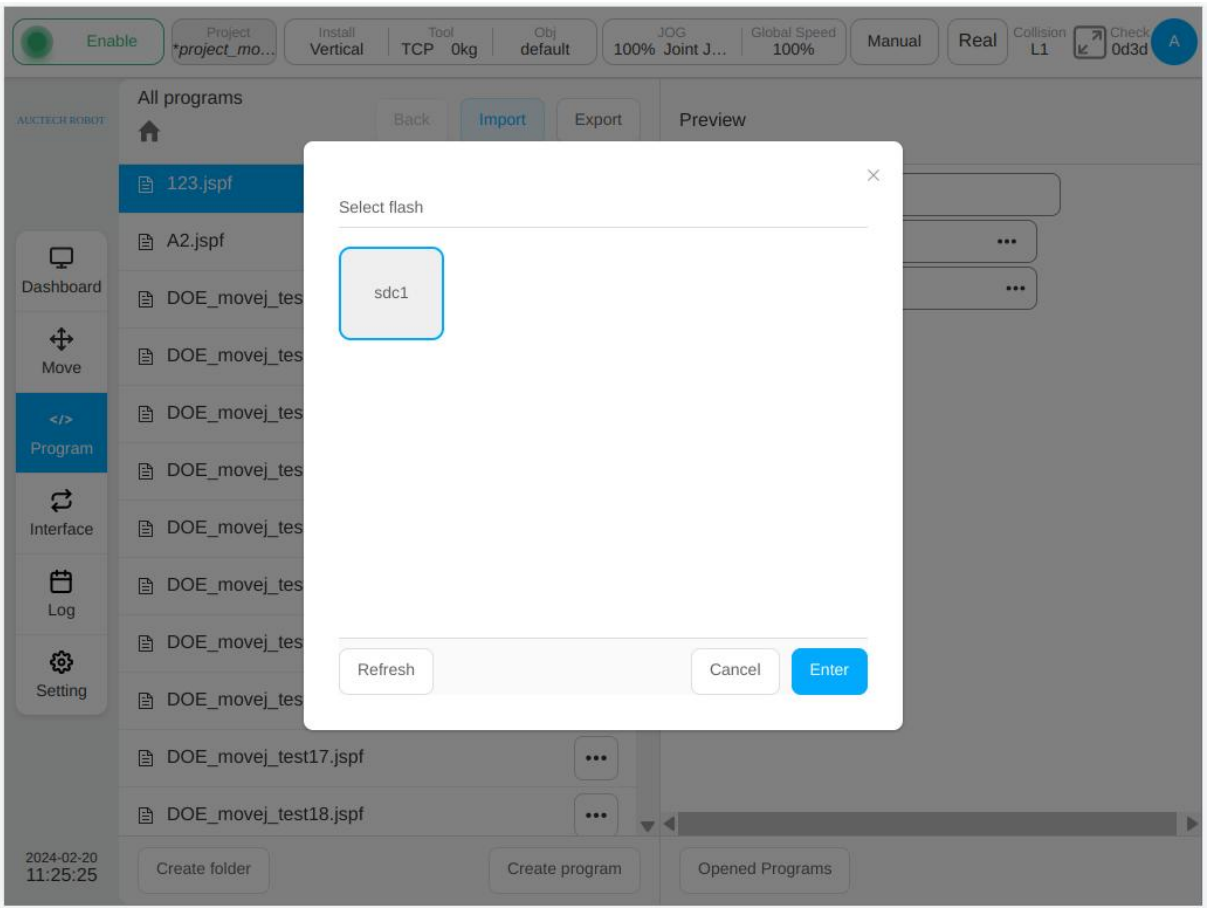
All contents of the folder can be deleted. If there are open or running programs in this folder, you cannot delete them.

11.1.5. Import and Export of the Program

It supports importing or exporting programs and folders from external devices to external devices. External devices refer to storage devices connected to the USB port of the control cabinet, such as U disk, mobile hard disk, etc.

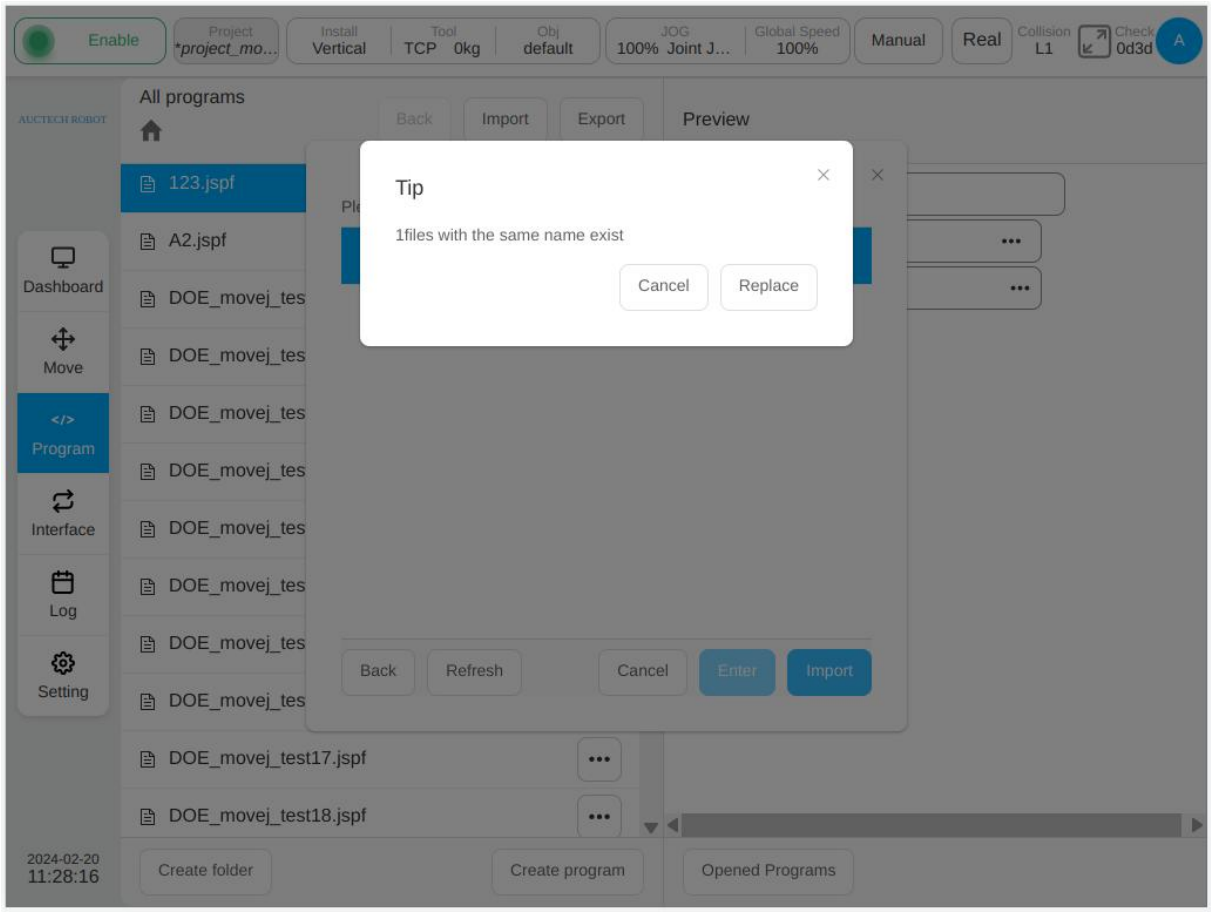
Program/folder import

Click the "Import" button, the following window pops up, showing the USB storage device mounted on the current control cabinet, and select a device.



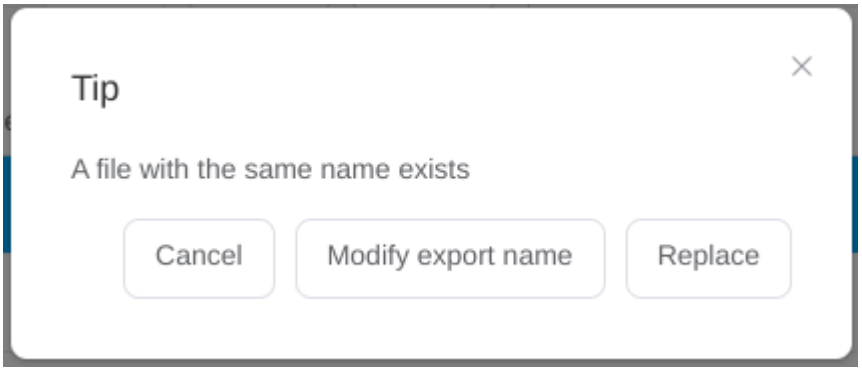
Folders in the device and the qualified files (suffix name is jspf, script, or program) are displayed on the page. Select a file and click “Select” to decompress the file or the compressed file package (suffix name is program) and import it to the control cabinet. When importing a file, if the file name is the same as the

program file on the control cabinet. If a file with the same name exists is imported into a folder (suffix name is program), the system displays the number of files with the same name. the user can click “Cancel” or “Overwrite”.



Program/folder export

Select a program on the program list page and select "Export" in its interactive menu to perform the export operation. Similar to import, a pop-up window displays the USB storage devices mounted on the current control cabinet. After selecting a device, you can view the files and folders of the device, select a folder to export, and export the program to the folder of the device. If the exported program file has the same name as the file in the device, the following window is displayed. Users can choose to cancel the export, or re-export after changing the export name, or simply overwrite the files in the device. If a folder is selected, packages the folder, which is named after the folder name and compresses it into “Folder Name. program”. The compressed package contains the folder of this level.



Click "Export" at the top of the program list page to package all files and folders in the current directory into a compressed package named "Current program list Name. program" and export the package to the specified path on the external device. The compressed package does not contain the folder of this level. Similar to the export program, when a file with the same name exists, the operation prompt box of the same name will be displayed.

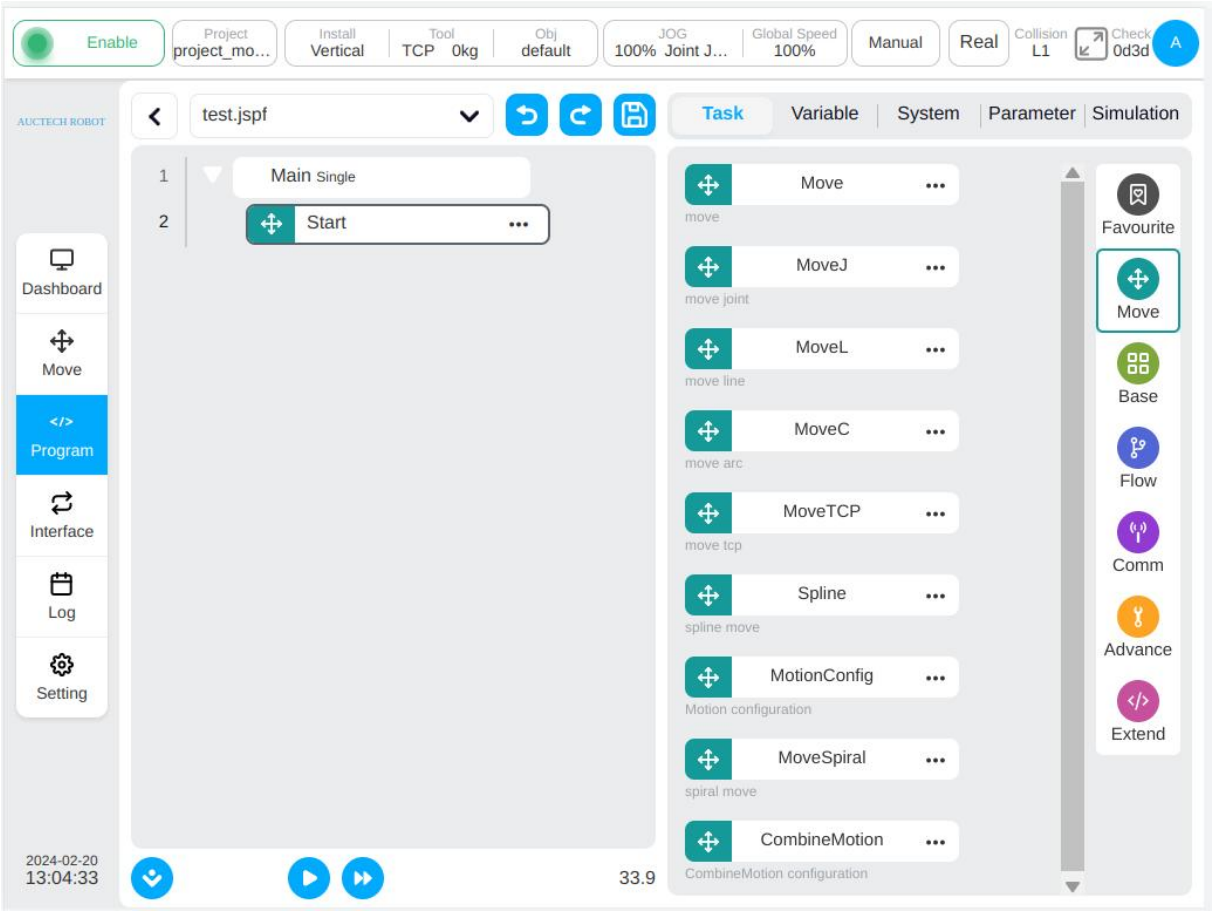
11.2. Programming

11.2.1. Overall Layout

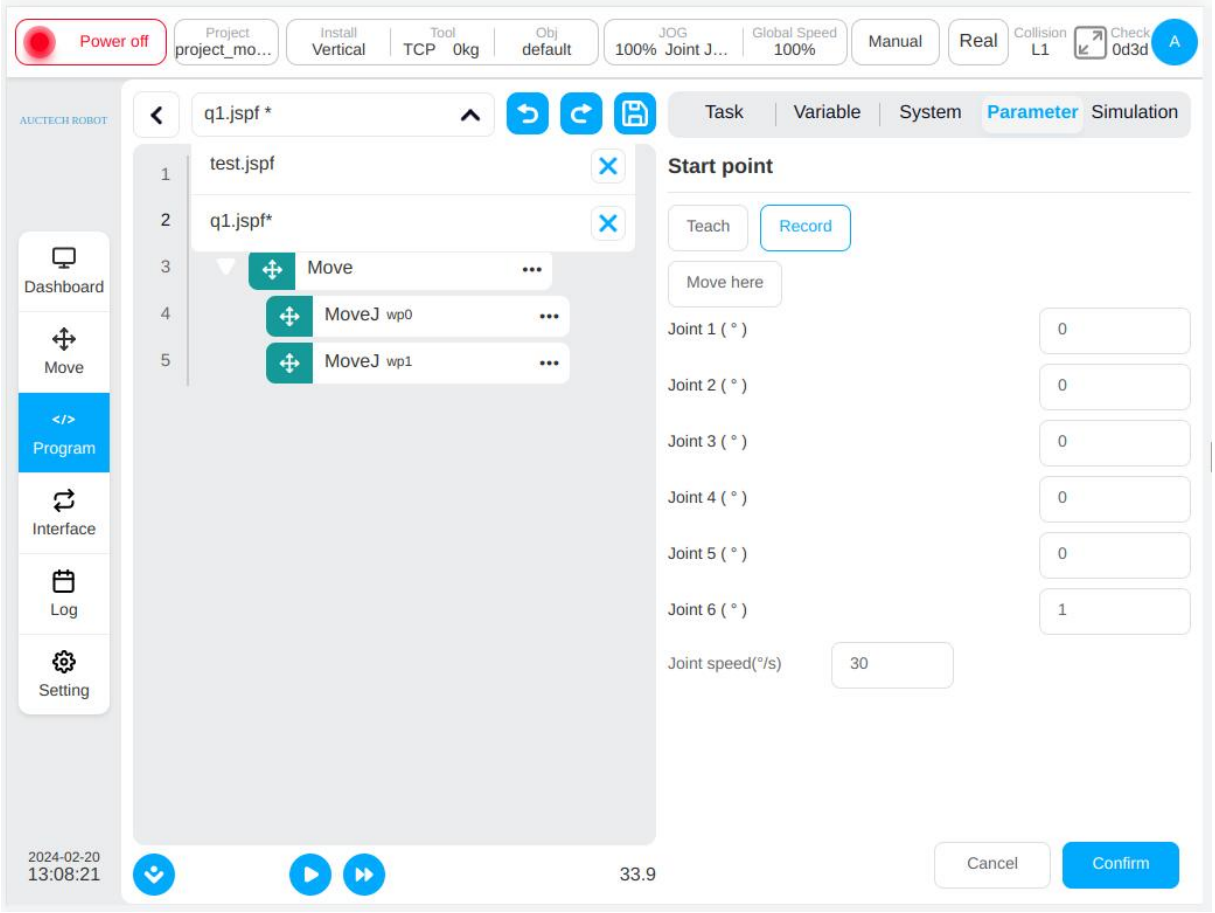
After creating a new program or opening the program in the program list page, you can enter the programming page, as shown in the figure below.

On the left side of the programming page is the programming area, where you can edit the program tree. The right side can be divided into four parts: "Add" TAB is the function block list area, showing the available graphical programming function block; The "Variables" TAB is a variable area, which can create program variables and monitor the values of program variables and system variables when the program is running. The "Parameters" TAB is the parameter configuration area to view and edit the parameters of the selected function block in the program tree. The "Run" TAB is the program run area, where you can start and stop the program and display the 3D model of the robot.

Therefore, click the right side ••• of any type of function block in the list area of "Move", "Basic", "Flow control", "Communication", "Advanced", "Extension" in the "Instruction".The icon can pop up the operation dialog box, click the "Add to common" button in the operation dialog box, you can add the instruction block to the "common" class; Click to the right icon ••• of the feature block in the Common class Feature Block list area will also pop up the operation dialog box, click the "remove" button in the pop-up operation dialog box, you can remove the command block from the "commonly used" class.



The top left shows the current program name, and the * after the program name indicates that the program has changed. Click the "Open Program" button in the top right, and the list of open programs will be displayed on the right of the page.



As shown in the figure above, the list of open programs shows that there are two open programs in the current system, click button in the drop-down box to the right of the name to close the program; Click the drop-down list item bar to switch to the corresponding program.

When you close the program, if the program changes, a dialog box will pop up asking you to save the program or abandon the modification.

11.2.2. Programming Operation

Programming using drag and drop and double-click to add.

Drag:

You can hold down the function block in the function block list area and drag it to the programming area. The corresponding position of the program tree will show a blue horizontal line indicating that the function block will be inserted there. To release is to add a function block there.

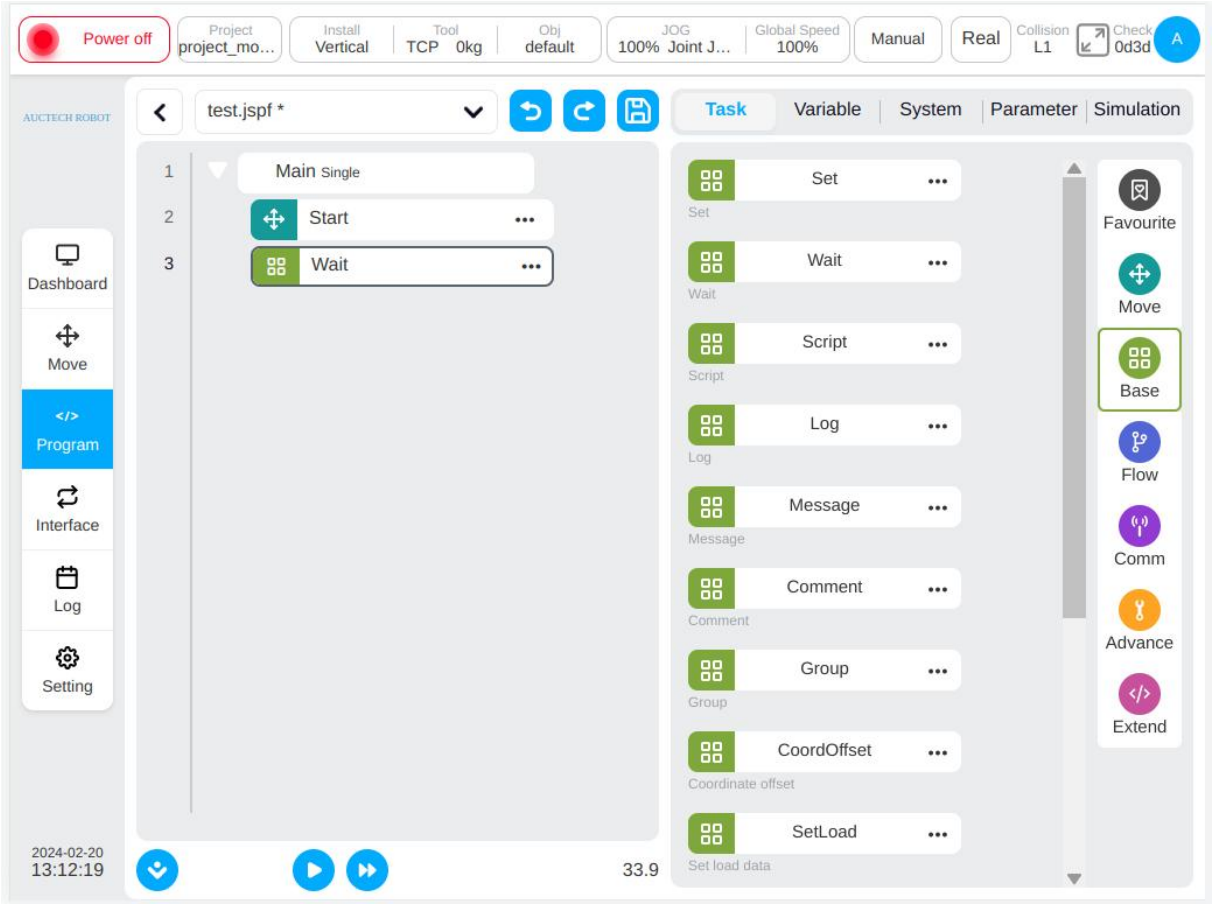
Double-click to Add:

Click any function block in the program tree to select the function block. At this time, double-click the function block in the list area of function blocks. The function block in the list area will be added below the selected function block in the program tree. (Note: Double-click operation is not supported on mobile devices.)

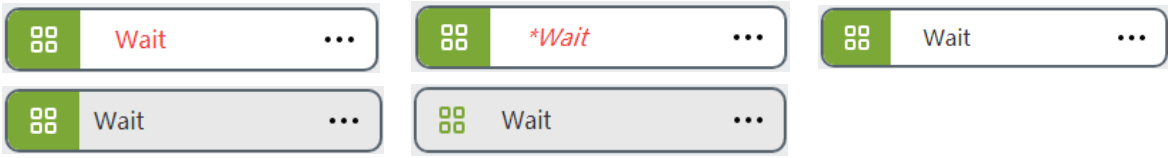
Supports dragging blocks of functionality directly from the program tree to other locations.

Select a function block, manually switch to the parameter configuration area, and set the parameters of the function block. Read the following chapter for details about each function block and the corresponding

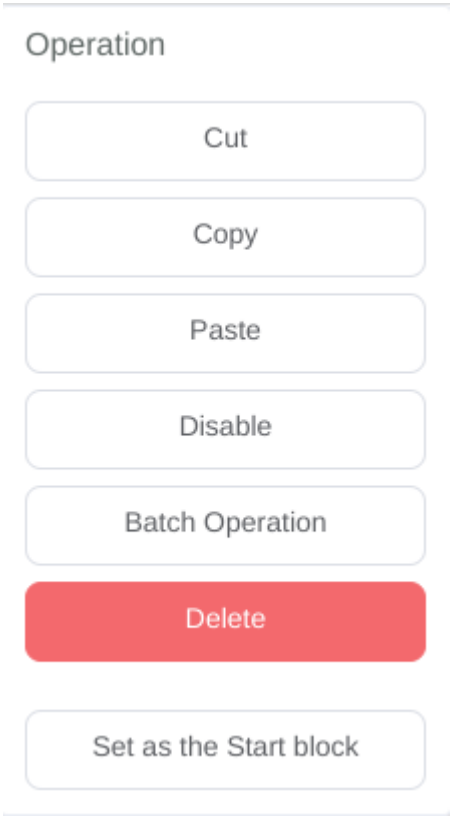
parameter configuration page.



The function block in the program tree has the following five states. Red indicates that the function block is not configured with valid parameters; the * in italics indicates that the parameter of the function block has changed, but it is not saved to the program tree; The black body indicates that the parameters of the function block are valid and unchanged. The gray part of the function block indicates that the state is selected for dragging and dropping. If all function blocks are gray, the function block is disabled.



Click ••• on the right of the program tree function block to pop up the following operation dialog box, including the following operations:



Cut: Cut the function block.

Copy: Copy the function block.

Paste： You can paste the copied function block below the selected function block.

Disable/Enable： Click to select whether to enable the function block. If not, the function block will be grayed out and the program will not execute the function block.

Batch operation: Function blocks can be copied, cut, and deleted in batches. If you select any function block for batch operation, the icon is displayed within the line number of the function block.

Delete： You can remove this function block.

Set as the Start block： Click to select this function block as the starting line of operation. At this time, there will be an icon in front of this function block. Run the program at this time and the program will execute from this function block. Click "Cancel selected start block" at the bottom to deselect the start block.

During program editing, you can undo or redo changes at any time by using the and buttons below. Note: Undo changes support Undo up to 10 times.

Once the program tree is changed, * will be displayed after the current program name, indicating that the program has been changed. At this time, you can save the program to the controller through the button.

11.3. Function Block and Parameter Configuration

The function block list area shows the currently available graphical programming function blocks, which are packaged according to the scenarios commonly used in robot programming. The function blocks provided by this system and their configuration parameters are as follows.

11.3.1. Move Function Block

When dragging function blocks such as MoveJ, MoveL, etc., if there is no Move node, a Move function block will be automatically created, which contains the following parameters:

End speed: unit mm/s

End acceleration: unit mm/s^2

joint angular velocity: unit ° /s

Joint angular acceleration: unit ° /s^2

Fusion radius: Unit mm

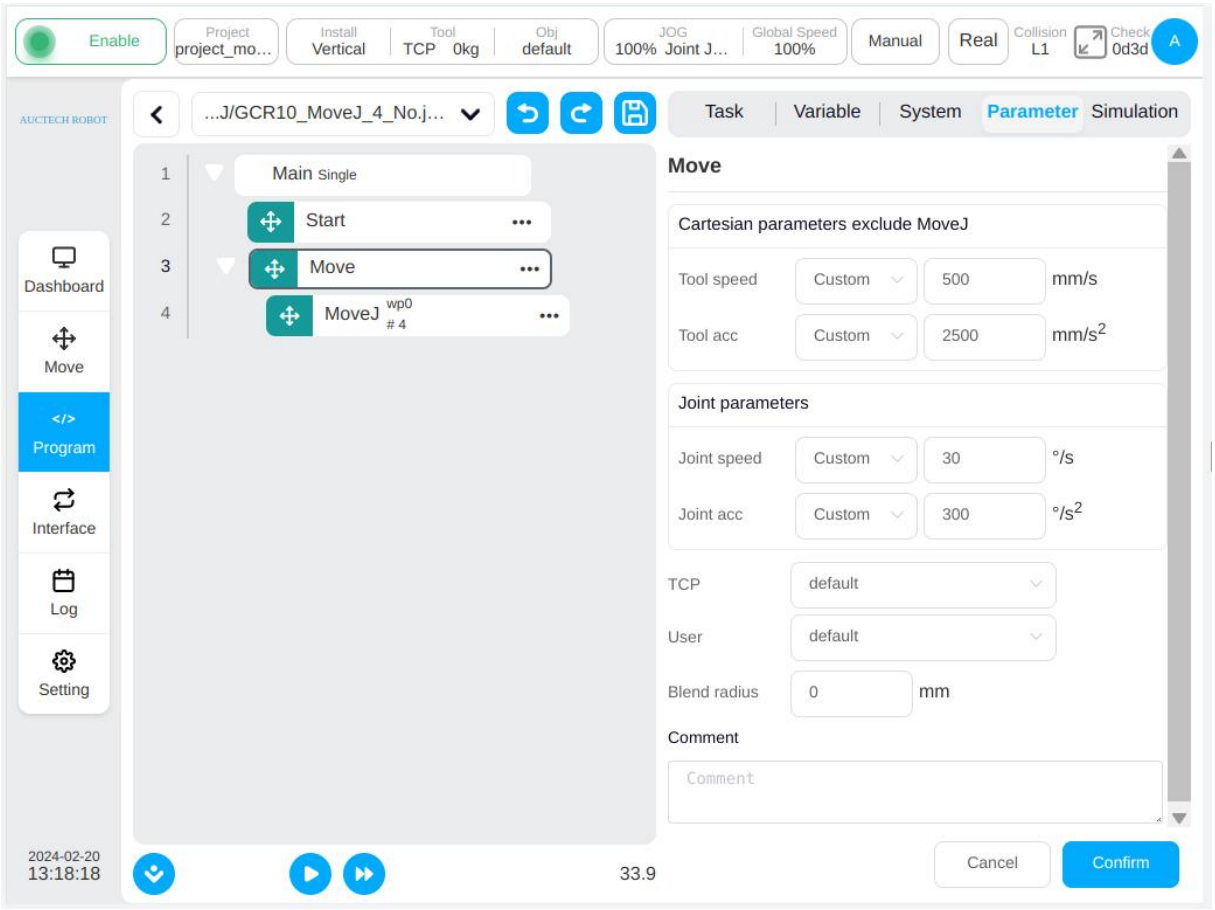
Reference coordinate system: tool coordinate system and workpiece coordinate system, which can be changed manually.

Among them, the terminal velocity, terminal acceleration, joint angular velocity and joint angular acceleration can be entered directly by means of numerical values or selected variables. Note: The unit of the corresponding parameter will be displayed only when entering directly; When selecting variables, you can only select specific type variables, pose_speed type variables for end speed, pose_acc type variables for end acceleration, joint_speed type variables for joint angular velocity, and joint_acc type variables for joint angular acceleration.

When generating the Move function block, by default, it will get whether all parent nodes of Move have a reference coordinate system set, and if not, the coordinate system currently set by the system will be used. For example, the conveyor belt function block has a set reference coordinate system, that is, the calibrated conveyor belt coordinate system, so when dragging the Move function block to the transmission belt sub-node, the generated Move function block uses the conveyor belt coordinate system by default.

The Cartesian space motion parameters set by Move function block are only for the MoveL, MoveC,, MoveTCP and MoveSpiral function blocks, and have no effect on other sub-function blocks. The set joint motion parameters are only for MoveJ function block and have no influence on other sub-function blocks.

The reference coordinate system set by the Move function block is only for the MoveJ, MoveL, MoveC, MoveTCP, MoveSpital function blocks, and has no effect on other function blocks.



The function blocks that control the movement of the robot are of the following types

MoveJ

The robot moves according to the motion of the joint and can choose to move to the target joint or target position. Parameters can be set::

Enable OP: The OP function can set the state of generic digital outlet or manipulate custom events during track execution.

Target position: it can be set by teaching or set as a variable. After teaching, it can be changed manually.

Use parent node coordinate system: This parameter can be set when the target position attitude is selected. If this parameter is selected, the function block uses the reference coordinate system set by the parent node Move function block

Reference coordinate system: can be set when the target position attitude is selected. If the parent coordinate system is not checked, its reference coordinate system can be set separately for the function block

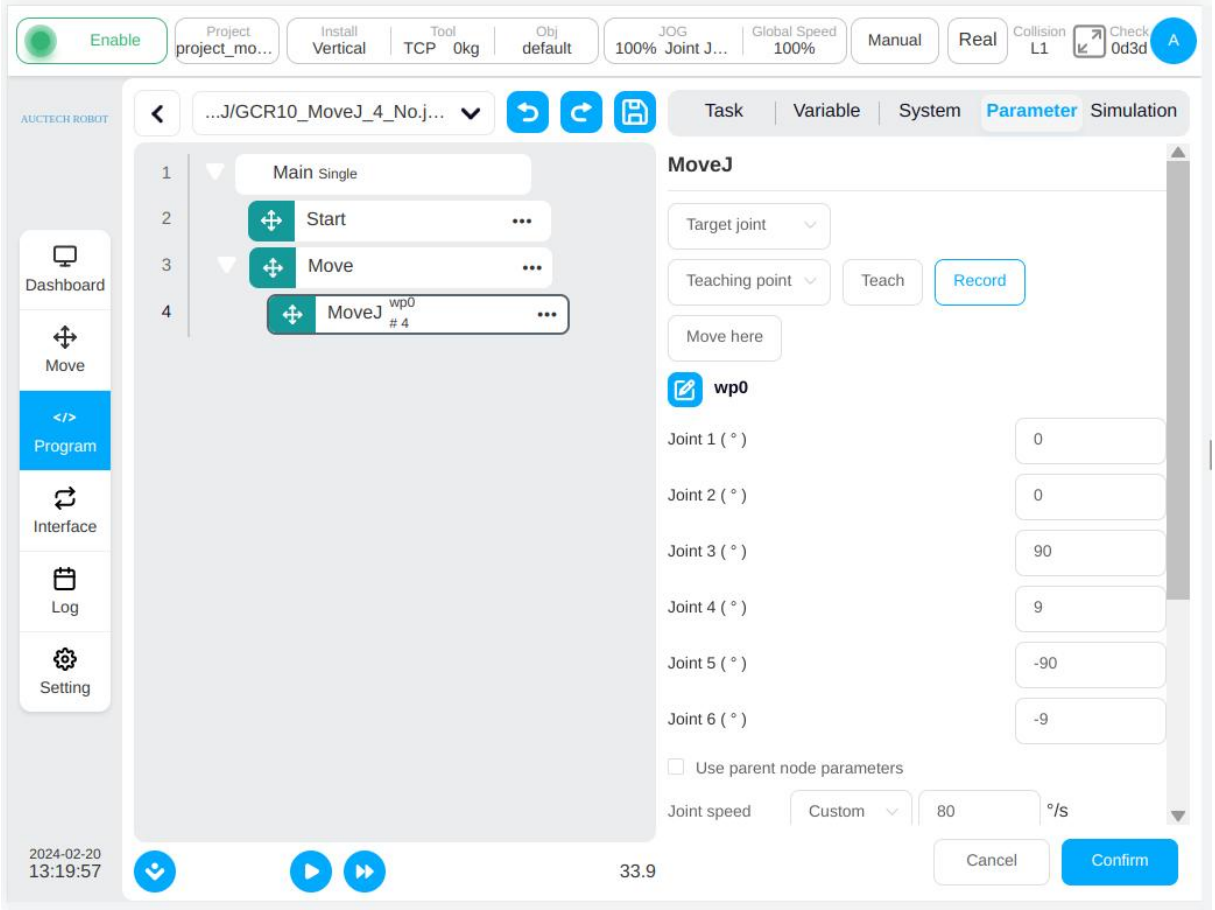
Use parent node parameters: When selected, the function block uses the joint angular velocity and joint angular acceleration parameters set by the parent node Move function block. If this parameter is not selected, you need to set the joint angular velocity and joint angular acceleration for this function block. This parameter is selected by default.

Joint angular velocity: unit rad/s (You can output directly or select variables)

Joint angular acceleration: unit rad/s2 (You can output directly or select variables

Parent node Fusion radius: If this parameter is selected, the fusion radius parameter set by the parent node Move function block is used. If this parameter is not selected, you need to set the fusion radius for this function block. This parameter is selected by default.

Fusion radius: The unit mm0 indicates no fusion



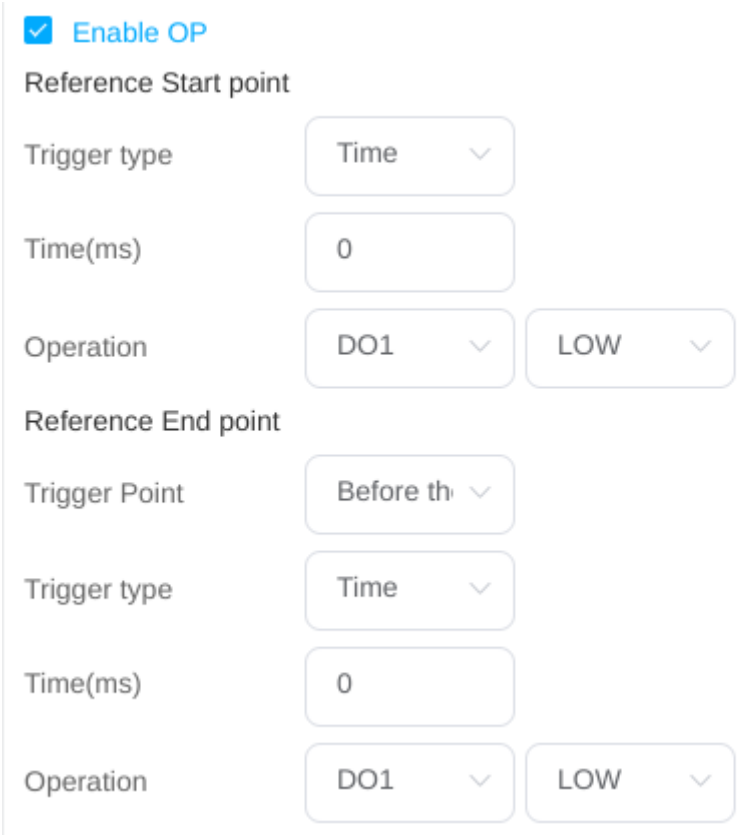
If OP is enabled, you need to perform the following configurations:

It can be triggered after the start of the trajectory and before/after the end of the trajectory

Trigger type: You can select no trigger, time trigger, distance trigger

Trigger delay: Set time (unit: ms)

Trigger action: Select a port and port status, or perform a custom event



MoveL

The robot moves to the target position in a straight line. Parameters can be set as follows:

Enable OP: The OP function can set generic digital outlet states or manipulate custom events during track execution.

Target position: it can be set by teaching or set as a variable. After teaching, it can be changed manually.

Use parent node coordinate system: When checked, the function block uses the reference coordinate system set by the parent node Move function block.

Reference coordinate system: When the use of parent node coordinate system is not checked, the reference coordinate system can be set separately for the function block.

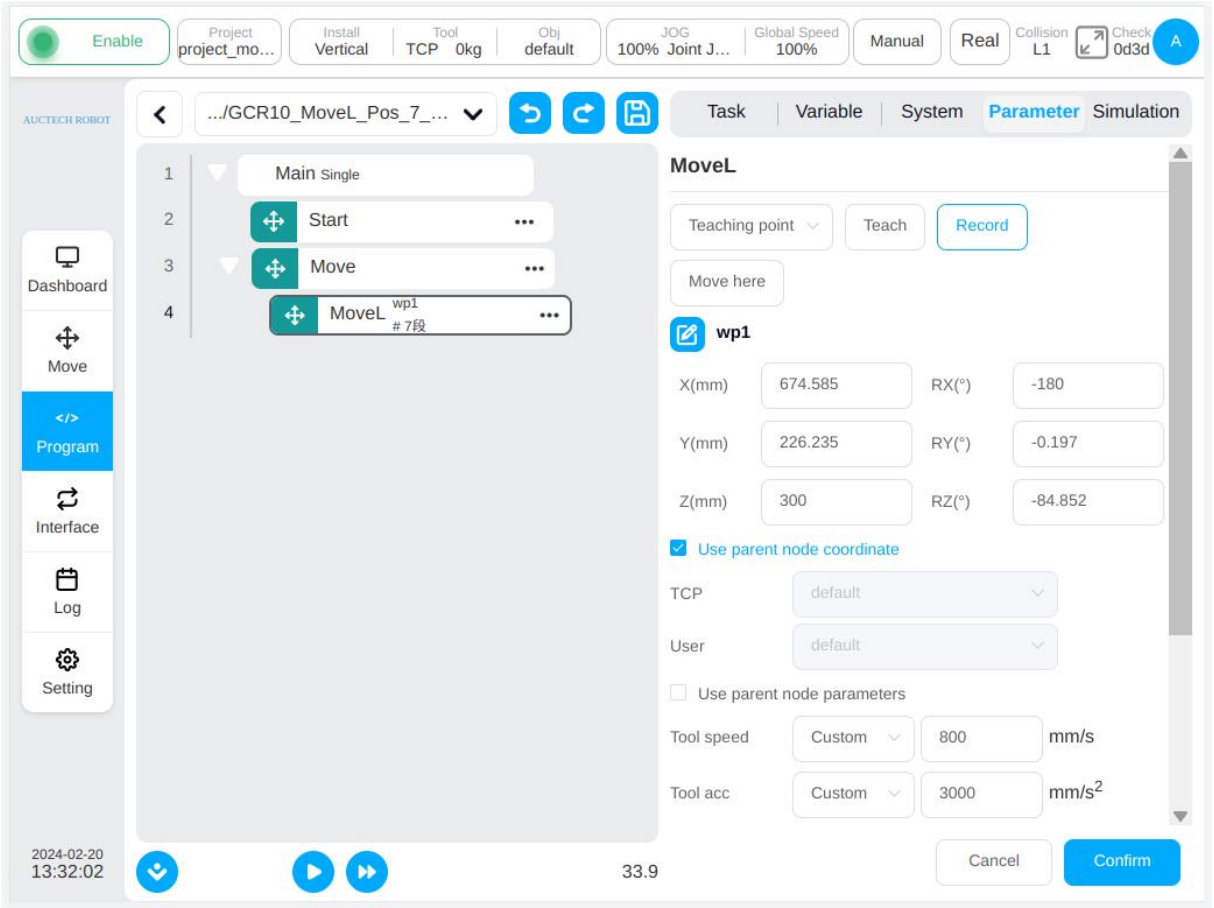
Use parent node parameters: When checked, the function block uses the speed and acceleration parameters set by the parent node Move function block; when it is not checked, the speed and acceleration need to be set separately for the function block.

End speed: mm/s (You can output directly or select variables)

End acceleration: mm/s2 (You can output directly or select variables)

Parent node Fusion radius: If this parameter is selected, the fusion radius parameter set by the parent node Move function block is used. If this parameter is not selected, you need to set the fusion radius for this function block. This parameter is selected by default.

Fusion radius: unit mm, 0 means no fusion.



If OP is enabled, you need to do the following configuration:

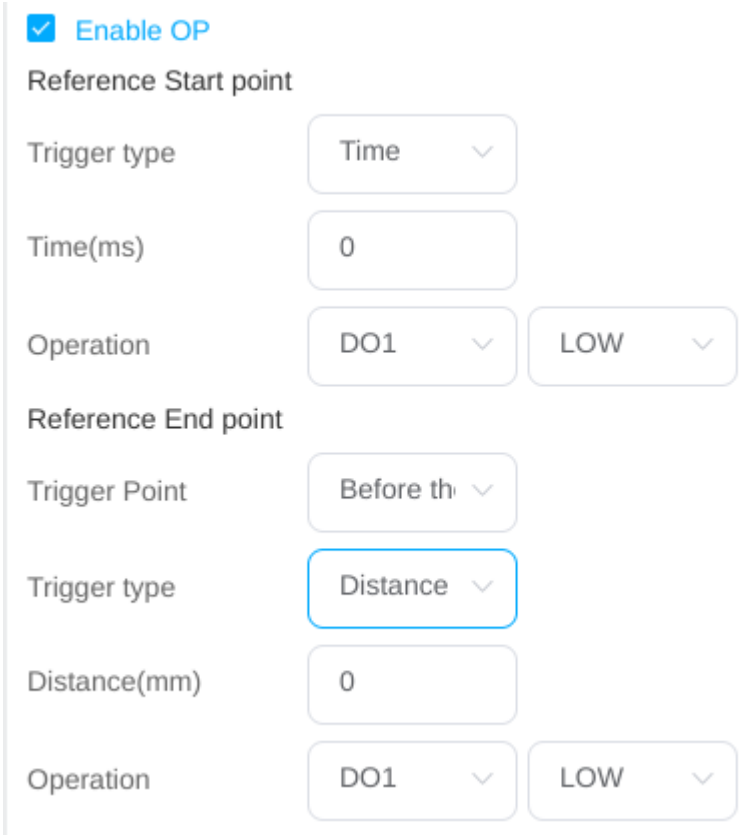
It can be triggered after the start of the trajectory and before/after the end of the trajectory.

Trigger type: You can select no trigger, time trigger, distance trigger.

Trigger delay: Set time (unit: ms)

Trigger distance: Set the distance, in mm

Trigger action: Select a port and port status, or perform a custom event



MoveC

Robot moves according to circular arc or whole circle, parameters can be set:

Enable OP: The OP function can set generic digital outlet states or manipulate custom events during track execution.

Mode: Arc or full circle

Intermediate point attitude/intermediate point 1: can be set by teaching or set as a variable, and can be changed manually after teaching setting.

Target pose/middle point 2: It can be set by teaching or as a variable, and can be changed manually after teaching setting.

Use parent node coordinate system: When checked, the function block uses the reference coordinate system set by the parent node Move function block.

Reference coordinate system: When the use of parent node coordinate system is not checked, the reference coordinate system can be set separately for the function block.

Use parent node parameters: When checked, the function block uses the speed and acceleration parameters set by the parent node Move function block; when it is not checked, the speed and acceleration need to be set separately for the function block.

End speed: mm/s (You can output directly or select variables)

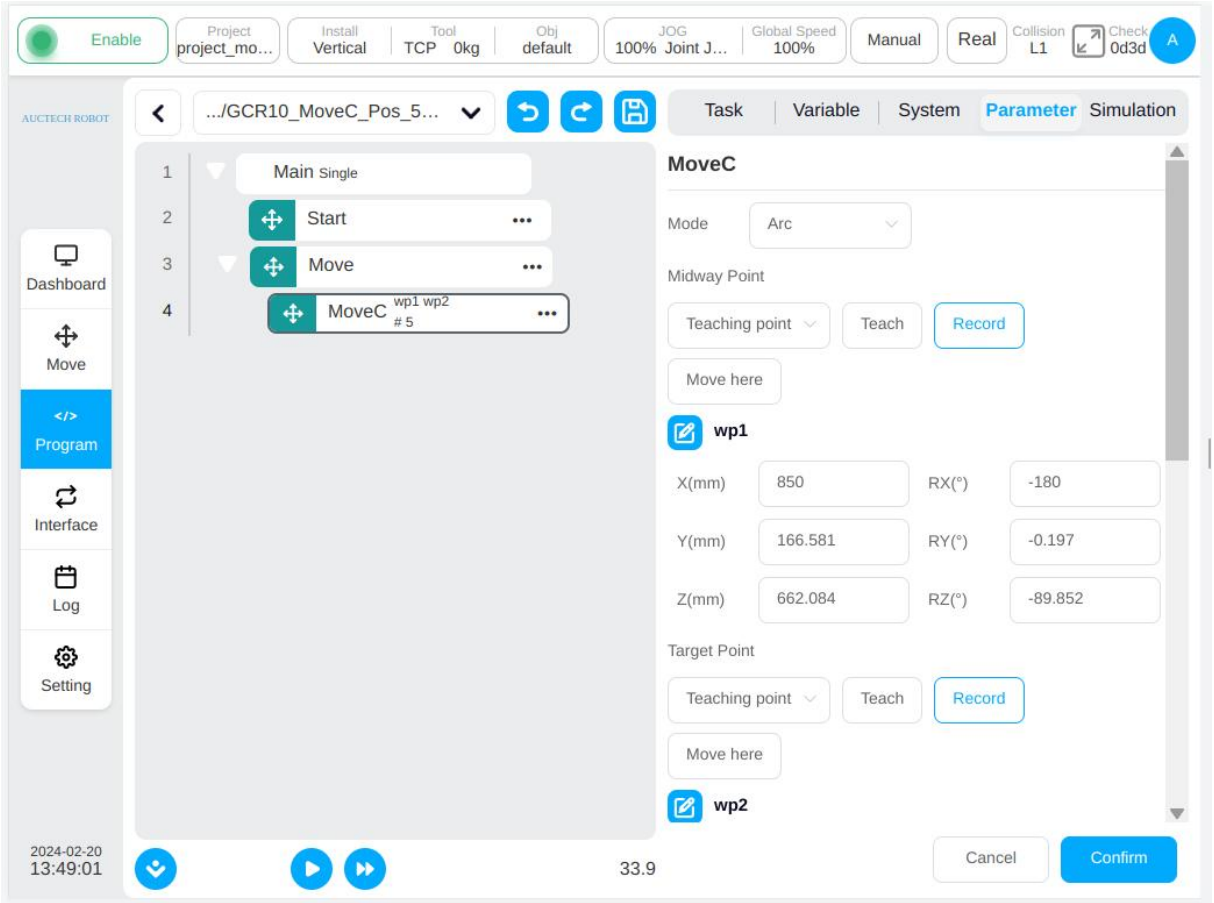
End acceleration: mm/s2 (You can output directly or select variables)

Parent node Fusion radius: If this parameter is selected, the fusion radius parameter set by the parent node Move function block is used. If this parameter is not selected, you need to set the fusion radius for this function block. This parameter is selected by default.

Fusion radius: unit mm, 0 means no fusion.

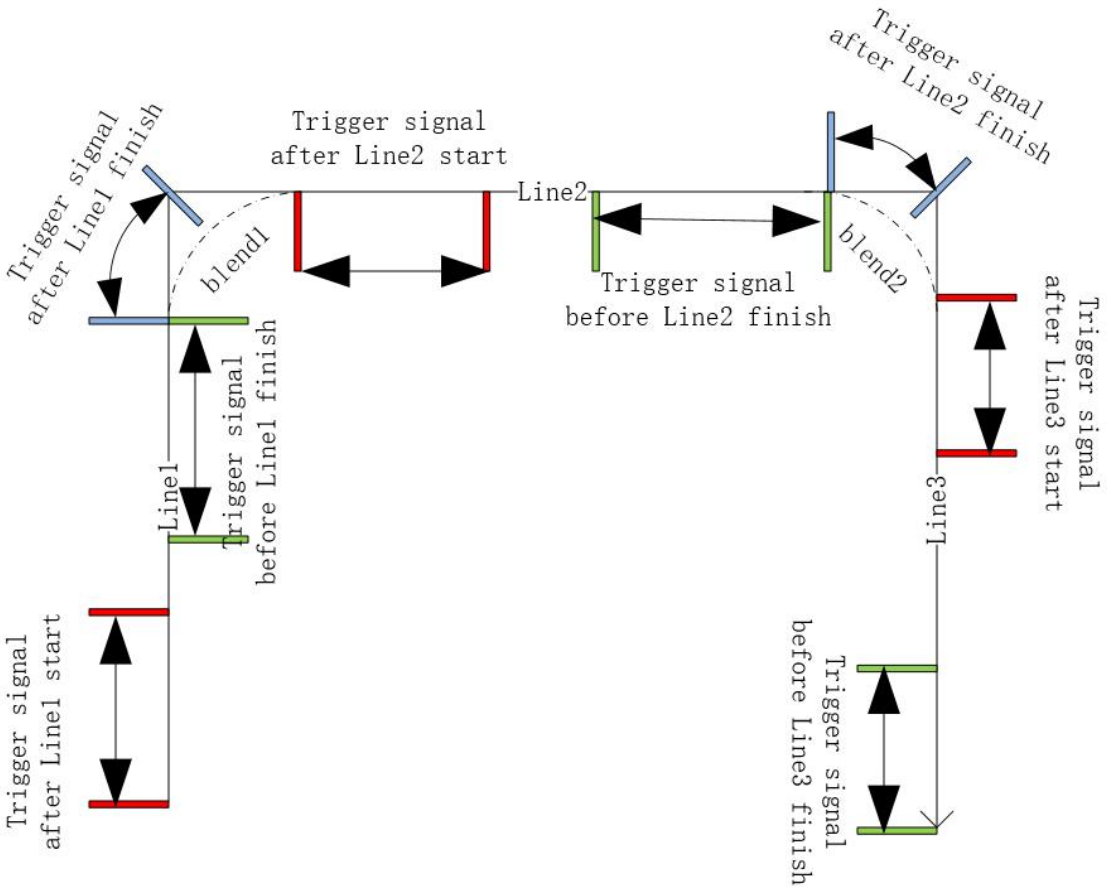
Posture control mode: If "consistent with the end point" is selected, the robot's posture plans the posture in the arc path according to the end point; If "consistent with the starting point" is selected, the robot's posture in the arc path is planned according to the starting point's posture, and the posture in the path process is consistent with the starting point. If "constrained by the center of the circle" is selected, the posture of the robot is constrained relative to the posture change generated by the arc motion.

The OP parameter configuration is the same as MoveL.



OP operation in fusion:

The robot sets the general digital output state during the trajectory execution. When used with fusions, the three moveL fusions, for example, have the following effect:



MoveTCP

The robot moves along the tool coordinate system.

You can enter offsets in each direction directly, or you can use variables. You can teach two points with the offset between them as the offset for the move. Other configurable parameters:

Enable OP: The OP function allows you to set generic digital outlet states or manipulate custom events during track execution.

Parent coordinate system: If this parameter is selected, the function block uses the reference coordinate system set by the parent Move function block. This parameter is selected by default.

Reference coordinate system: If the parent coordinate system is not selected, the reference coordinate system can be set for the function block separately. If you choose to set incremental mode, just select the tool coordinate system; If you choose to set two points, you need to set the tool coordinate system and the workpiece coordinate system.

Use parent node parameters: When checked, the function block uses the end speed and end acceleration parameters set by the parent node Move function block. If you do not select this option, you need to set the end speed and end acceleration for this function block. They are selected by default.

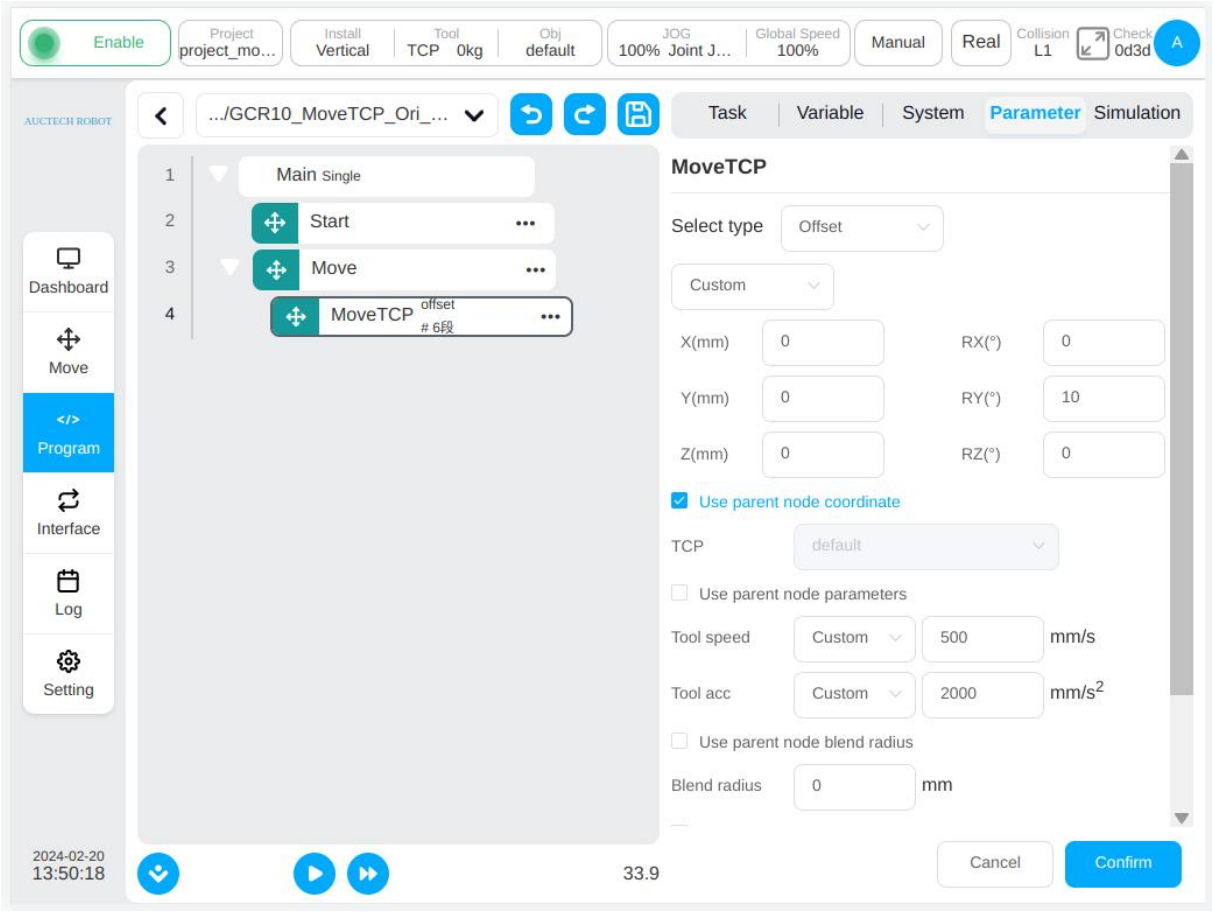
End speed: mm/s (You can output directly or select variables)

End acceleration: mm/s2 (You can output directly or select variables)

Parent node Fusion radius: If this parameter is selected, the fusion radius parameter set by the parent node Move function block is used. If this parameter is not selected, you need to set the fusion radius for this function block. This parameter is selected by default.

Fusion radius: unit mm, 0 means no fusion.

The OP parameter configuration is the same as MoveL.


Enable
Project
project_mo...
Install
Vertical
Tool
TCP 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
.../GCR10_MoveTCP_Ori_...
Task
Variable
System
Parameter
Simulation
Dashboard
Move
Program
Interface
Log
Setting
1 Main Single
2 Start
3 Move
4 MoveTCP offset
MoveTCP
Select type
Offset
Custom
X(mm) 0
Y(mm) 0
Z(mm) 0
RX(°) 0
RY(°) 10
RZ(°) 0
Use parent node coordinate
TCP default
Use parent node parameters
Tool speed Custom 500 mm/s
Tool acc Custom 2000 mm/s²
Use parent node blend radius
Blend radius 0 mm
2024-02-20
13:50:18
33.9
Cancel
Confirm

Spline

Control the end of the robot to move according to the spline curve. You can choose direct input or direct teaching point, or select variables. When selecting variables, you can only select pose_list variables. Parameters can be set:

Enable OP: The OP function allows you to set generic digital outlet states or manipulate custom events during track execution.

Spline waypoint: add, edit, delete waypoint, generate spline curve according to waypoint

Reference coordinate system: when teaching points, the default is the current tool and workpiece coordinate system, which can be changed manually

End speed: mm/s

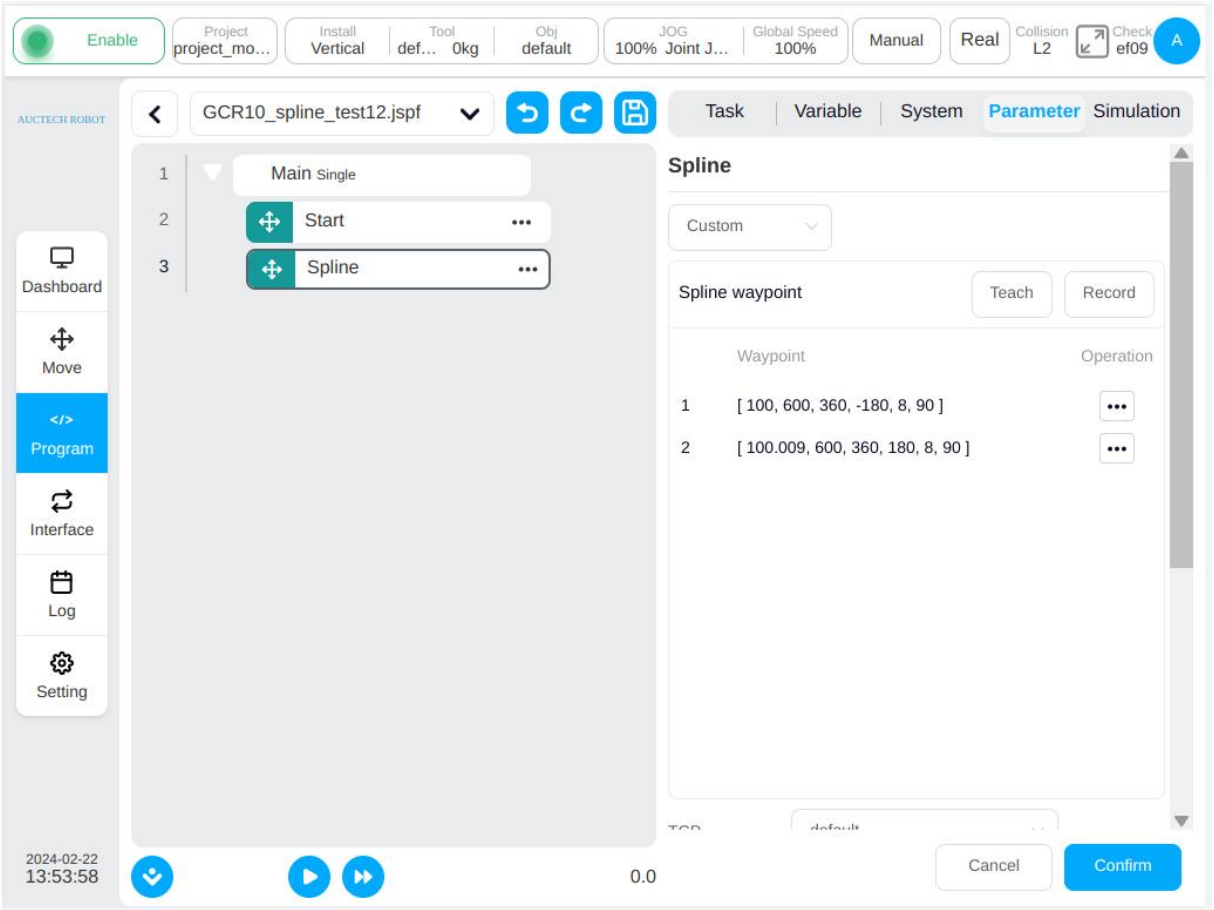
End acceleration: mm/s2

Parent node Fusion radius: If this parameter is selected, the fusion radius parameter set by the parent node Move function block is used. If this parameter is not selected, you need to set the fusion radius for this function block. This parameter is selected by default.

Fusion radius: Unit: mm. 0 indicates no fusion.

Enable OP: The OP feature allows you to set generic digital outlet states or manipulate custom events during track execution.

The OP parameter configuration is the same as MoveL.



Care	● When two splines are used together, the end point of the former spline cannot be the same as the start point of the latter spline.

MotionConfig

Turn on or off sports-related configurations. Optional configuration:

Speed optimization: After speed optimization is turned on, the robot arm will execute the motion command at the highest possible speed under the premise of meeting the system constraints.

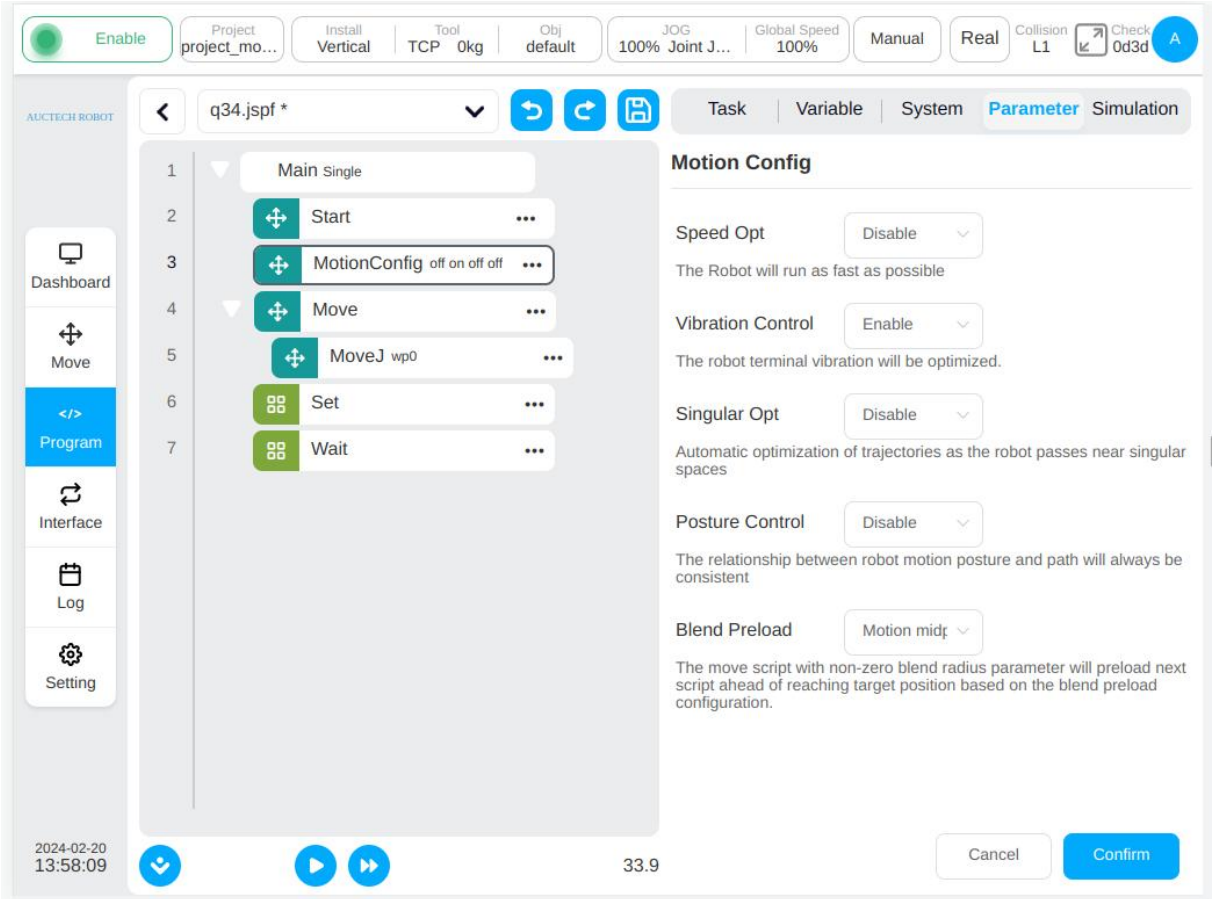
Acceleration optimization: After acceleration optimization is enabled, the acceleration parameters in the script will be automatically optimized, and will no longer strictly run according to the set acceleration.

Vibration control: When the vibration control is turned on, it is optimized for the end vibration of the robot.

Singularity avoidance: After singularity avoidance is turned on, the trajectory of the robot will be automatically optimized when it passes near the strange space.

Posture constraint: After the posture constraint is opened, the robot motion posture will always be consistent with the relationship between the path.

Fusion prefetch: You can select the motion middle point or the motion start point. A motion script with the fusion radius configured prereads subsequent scripts to the fusion radius based on this parameter.



Care	● **When the singular escape function is enabled, the previously set path will be affected if the path passes through a singular point.** ● When the singularity avoidance function is enabled, if the singularity

	is passed, the speed of individual joints will be accelerated, and the robot arm may report an incorrect power failure due to joint overspeed.

- **MoveSpiral**

Robot does spiral trajectory movement; parameters can be set:

Enable OP: The OP feature allows you to set generic digital outlet states or manipulate custom events during track execution.

Spiral teaching mode: Parameter setting or end point setting.

Total number of turns: The total number of turns of the robot, positive number is clockwise rotation, negative number is counterclockwise rotation.

Helix center point: can be set by teaching or set as a variable, can be manually changed after teaching setting.

Axial moving distance: When the teaching mode is set to parameter setting, the parameter must be set. The positive and negative signs follow the right hand rule (unit: mm).

End point radius: This parameter is required when the teaching mode is set to parameter setting. The unit is mm.

End point of track: When the teaching mode is set to end point, it can be set by teaching mode, or set to variable, which can be manually changed after teaching setting.

Parent coordinate system: If this parameter is selected, the function block uses the reference coordinate system set by the parent Move function block. This parameter is selected by default.

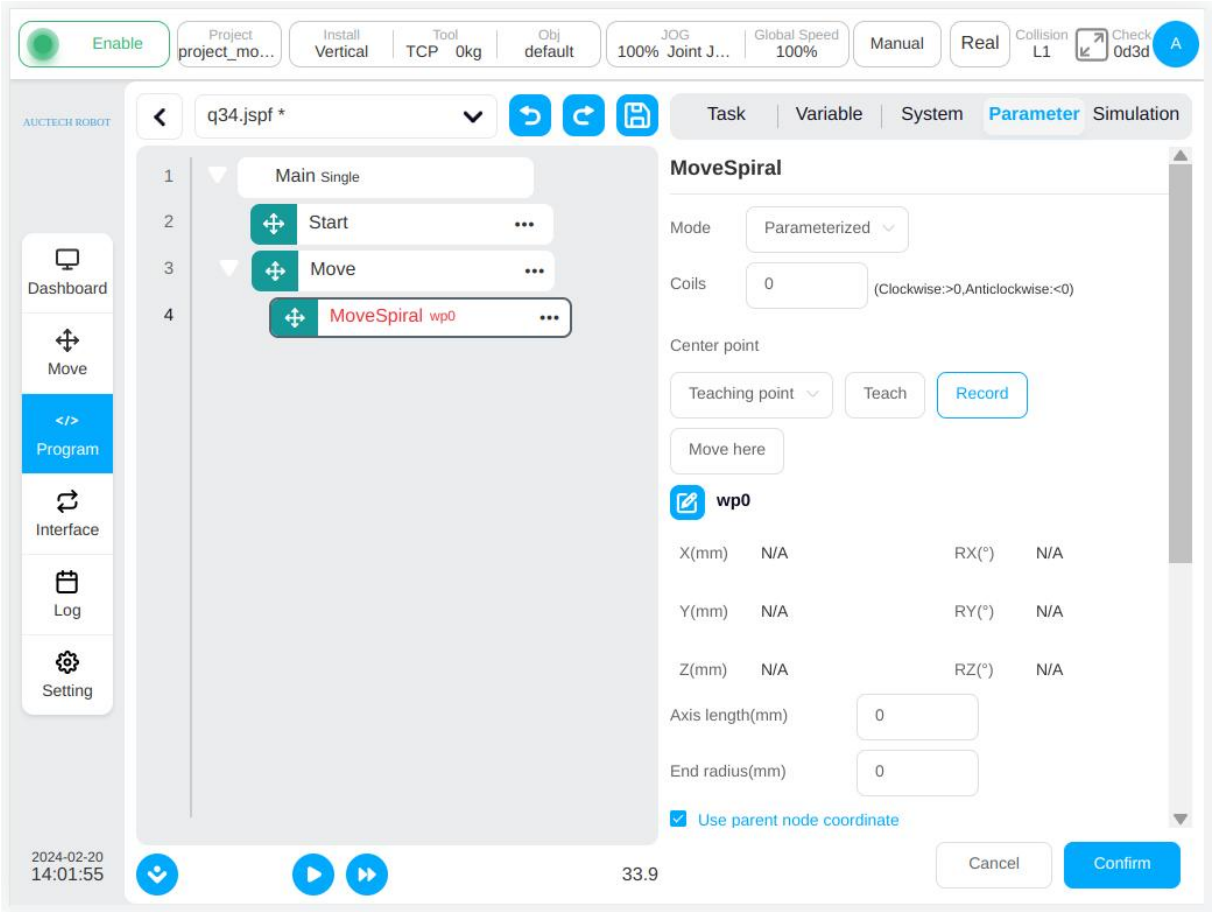
Reference coordinate system: If the parent coordinate system is not selected, the reference coordinate system can be set separately for the function block.

Use parent node parameters: When checked, the function block uses the end speed and end acceleration parameters set by the parent node Move function block. If you do not select this option, you need to set the end speed and end acceleration for this function block. They are selected by default.

Terminal speed: Unit mm/s. , you can directly enter or select variables.

Terminal acceleration: Unit mm/s2, can be directly entered or selected variables.

The OP parameter configuration is the same as MoveL.



- **CombineMotion**

Only for the linear and circular motion control robot to do compound trajectory motion, parameters can be set:

Trajectory type: The default is triangle, optional triangle, sine, arc, trapezoid, 8.

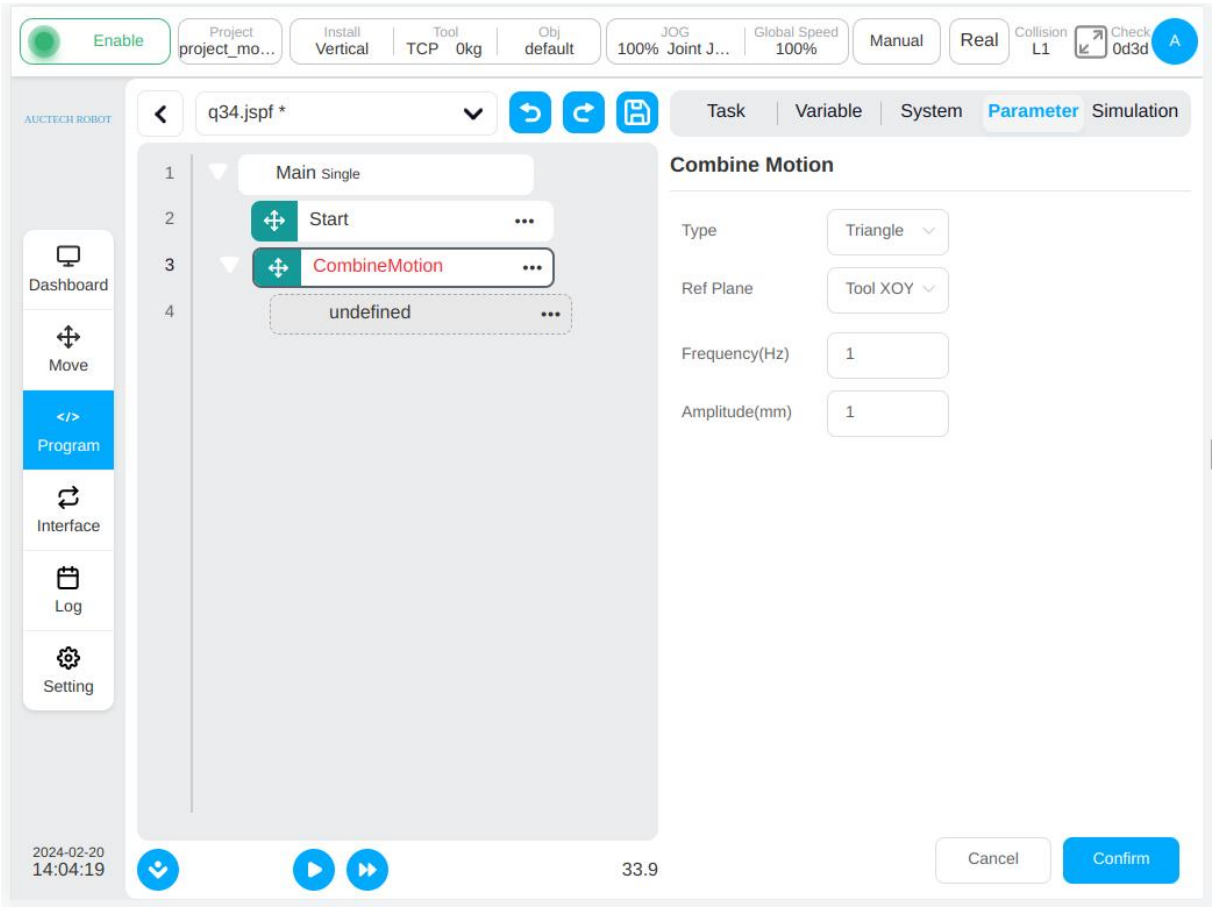
Reference plane: The default is tool XOY, optional tool XOY or tool XOZ or tool YOZ.

Frequency: The default value is 1, in Hz.

Amplitude: The default value is 1 in mm.

Left residence time: specifies the parameter to be configured when the trajectory type is trapezoid. The unit is ms.

Right residence time: specifies the parameter to be configured when the trajectory type is trapezoid, in ms.

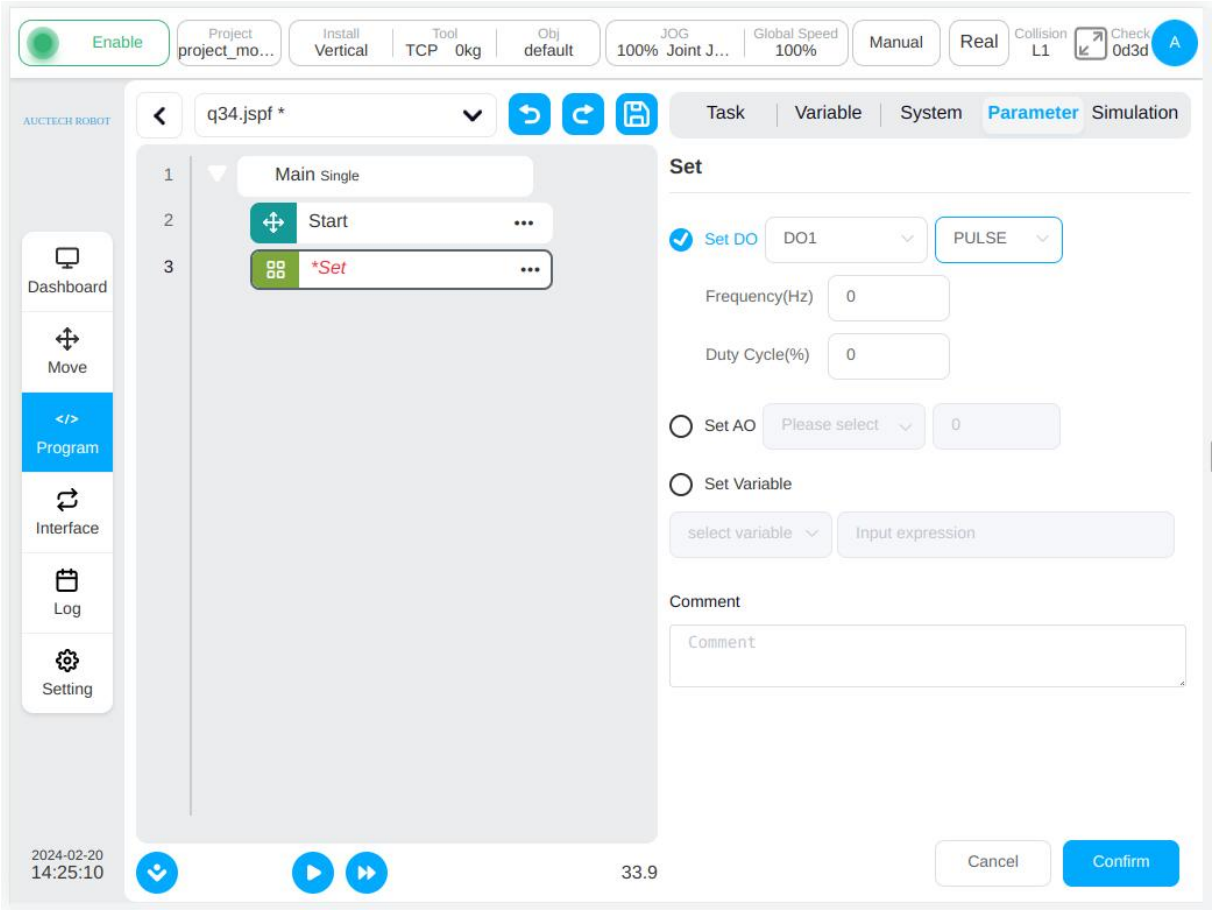


11.3.2. Basic Function Block

Set

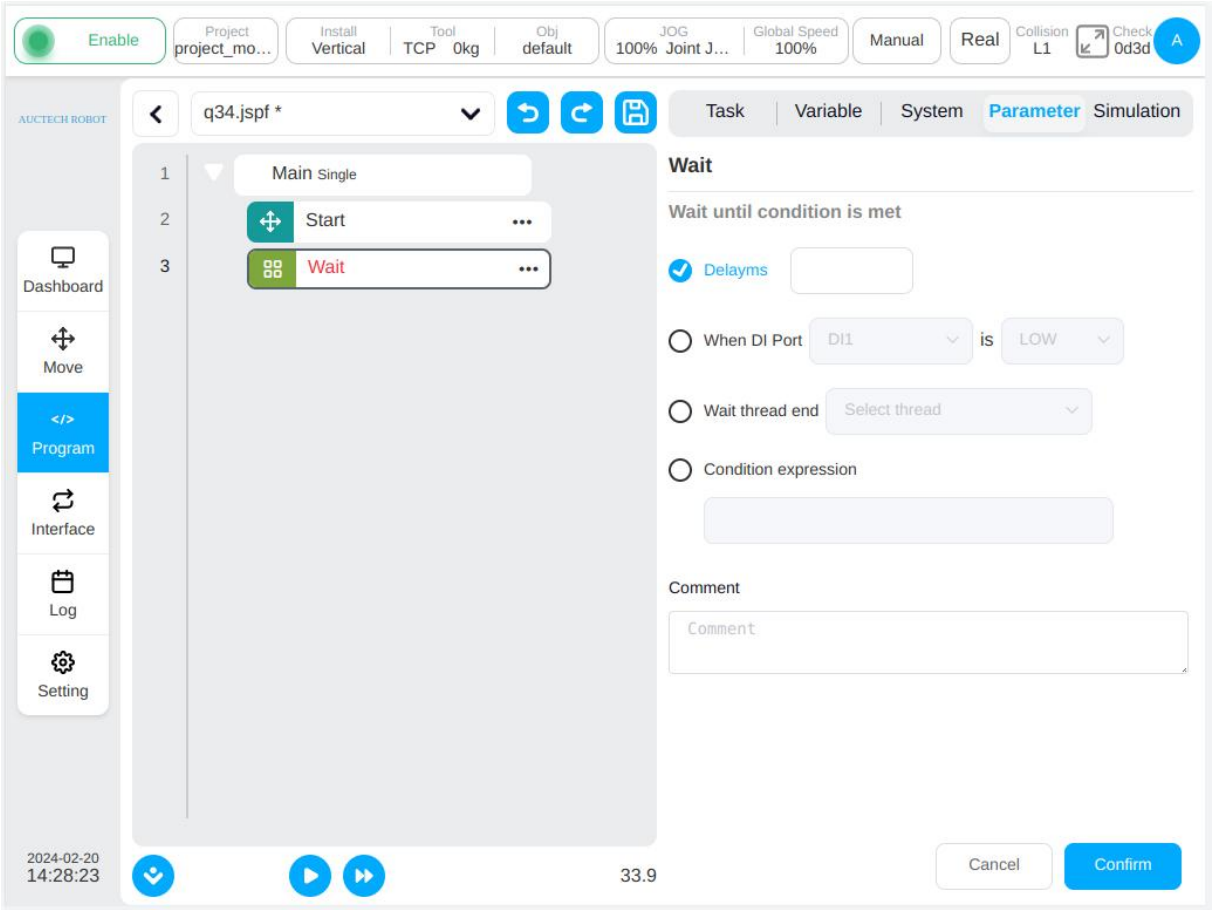
Set function blocks. The digital output port of the control cabinet and the digital output port at the end of the manipulator can be set to high or low level; Assign values to program or system variables.

Care	● **When you assign a variable, the expression keyboard will pop up. Please fill in the assignment according to the expression syntax. If you assign "Hello" to a string variable, enter "Hello" on the keyboard (double quotes cannot be omitted).**



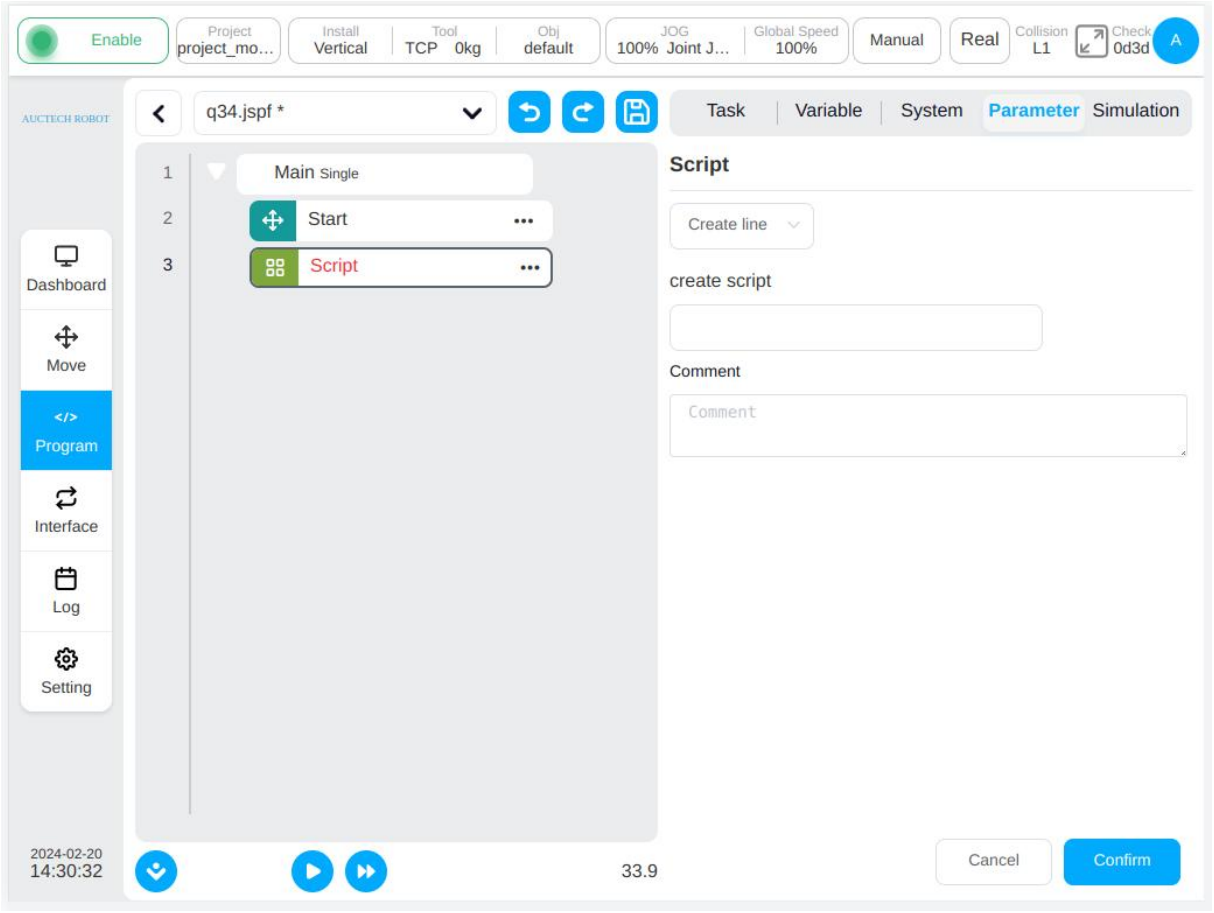
Wait

"Wait" function block. Optionally wait for a period of time, a DI signal, and an expression. When the program reaches this function block, it waits until a set condition is met.

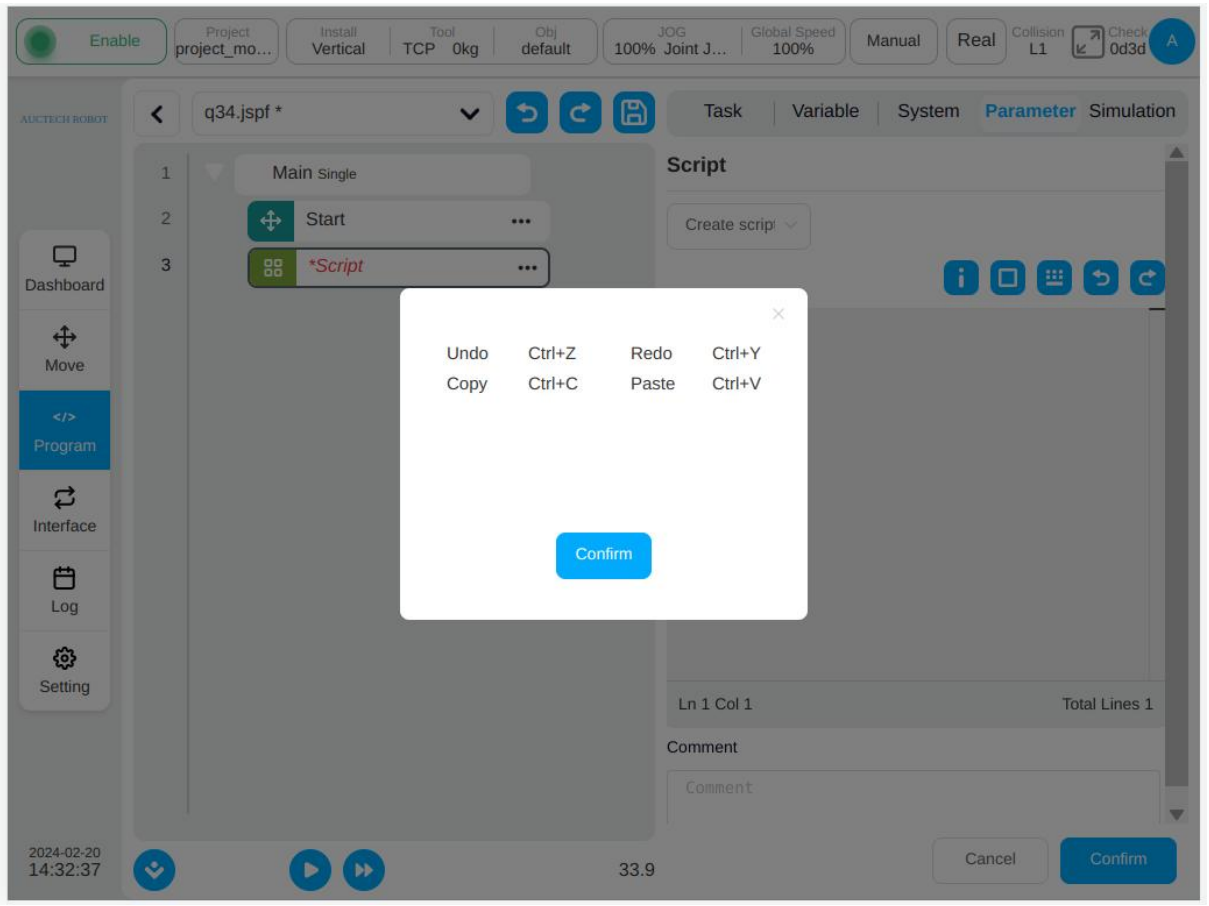


Script

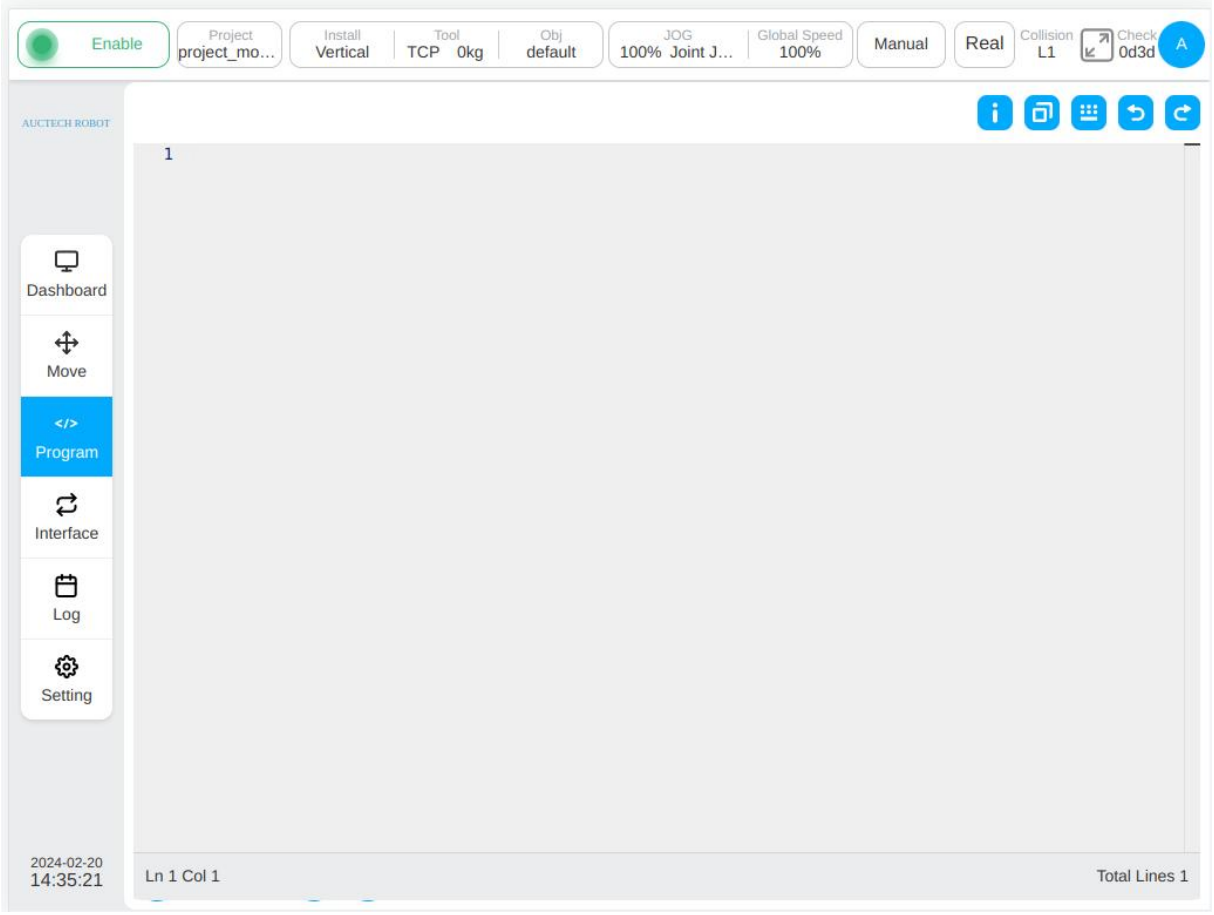
Script function block. You can select an expression, script, or script file. You can use the expression editor to create a line of scripts. For the input of expressions, read Section 8: Input Keyboard (Expression input keyboard). The script can be used to write the entire script code. A script file can be selected from the script file. Refer to the script manual for instructions on the script code.



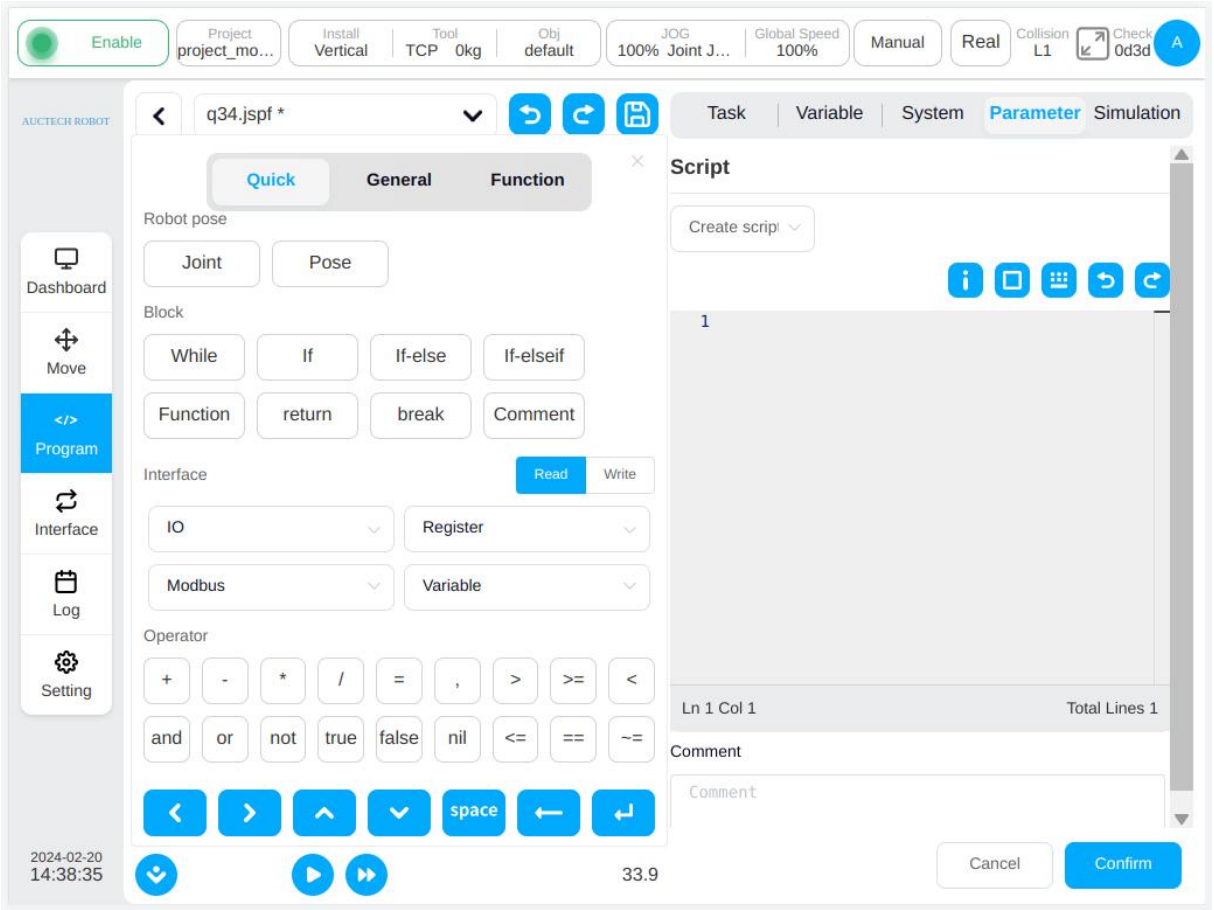
Select the script to write the whole code, click the prompt icon  above the editing area the editing shortcut key prompt box will pop up, as shown below.



Click the maximization icon above the editing area, and the script editing area will be maximized as follows. Click the restore icon at the top right of the maximization interface to restore the original interface size. is the undo icon, is the restore icon. The number of lines and columns where the cursor is located is displayed in the lower left corner of the editing area, and the total number of script lines is displayed in the lower right corner.



In script writing mode, you can use the built-in shortcut box and external keyboard for input. Click the icon above the script area to pop up the system shortcut input box, which is suspended above the editor as shown below, and the pop-up box can be held down and dragged.



The shortcut box has three labels: shortcut, universal keyboard, and script functions. The lower bar of the input box shows some commonly used control keys, including cursor left, cursor right, cursor up, cursor down, input space, delete, and line feed.

Shortcut input will perform shortcut input for some commonly used functions. Main functions:

Point position: Click "Joint" to input the joint value of the current robot arm in rad; click "Pose" to input the current position and posture of the robot arm tool on the set workpiece, in m, rad.

Function: You can enter While loops, conditional branches, function definitions, single-line comments, etc.

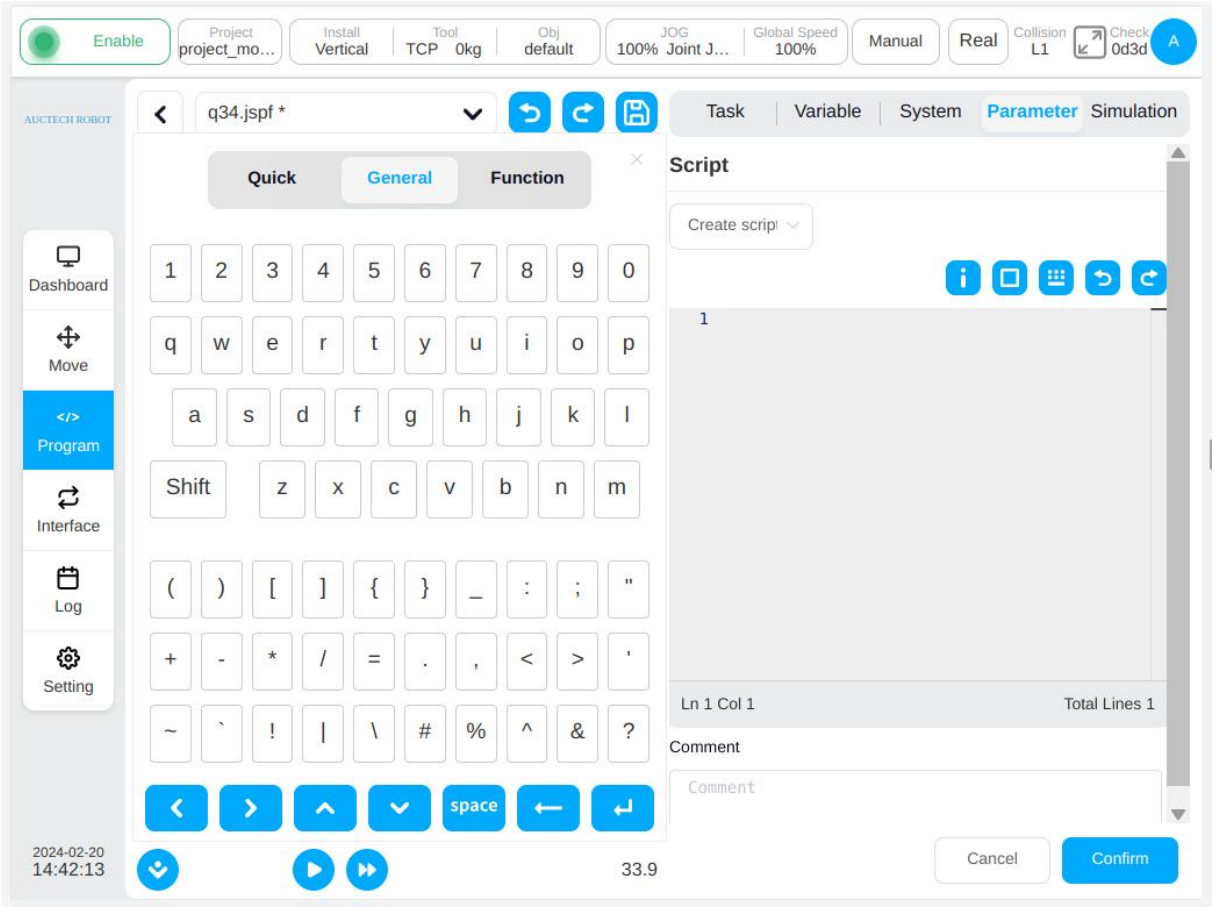
```
while()
do
    |
end
```

```
if()
then
    |
end
```

```
function fun()
    |
end
```

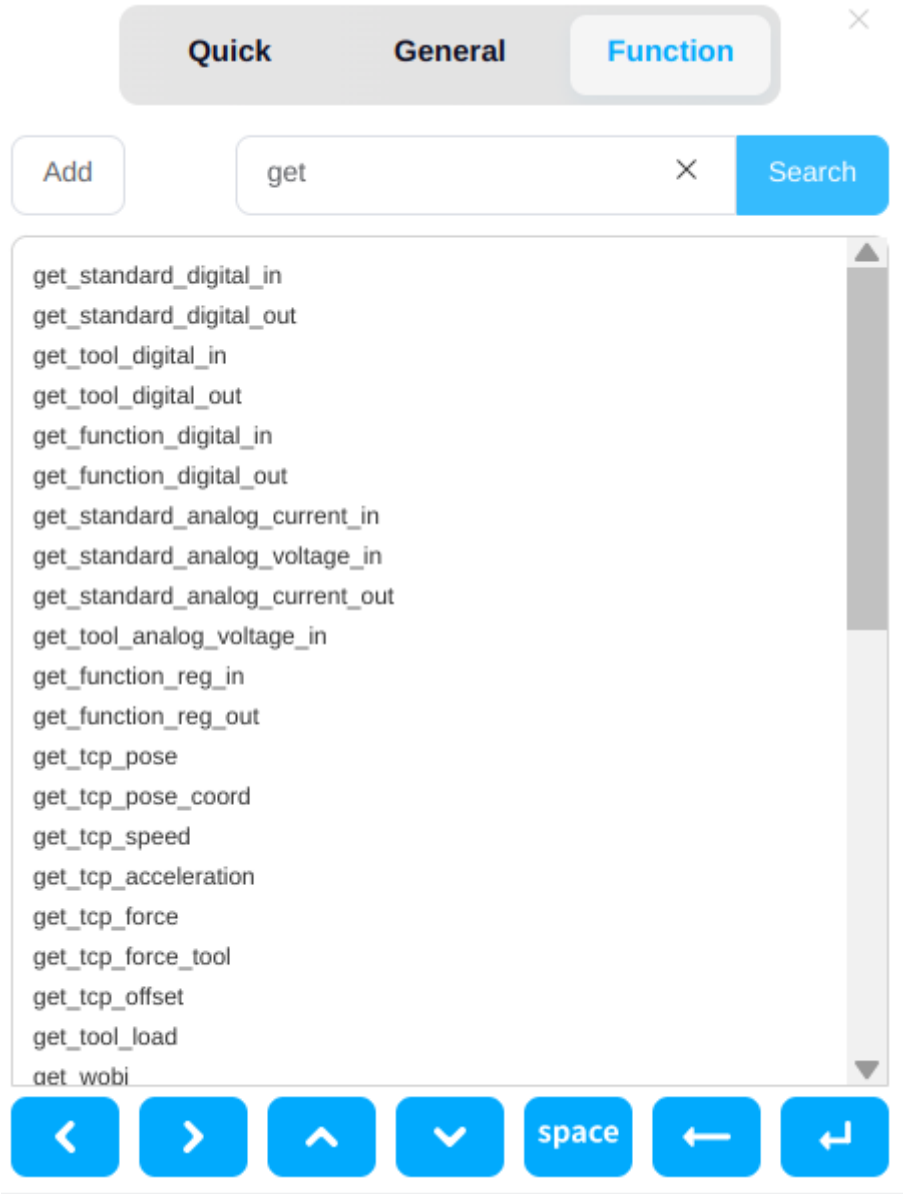
IO/register/Modbus/variable: You can choose whether to read or write, and the system will automatically convert to the corresponding script function. If you select "Read", select general input DI1, and the system automatically enters the corresponding script function get_standard_digital_in(1)

Operator: Enter some commonly used operators.



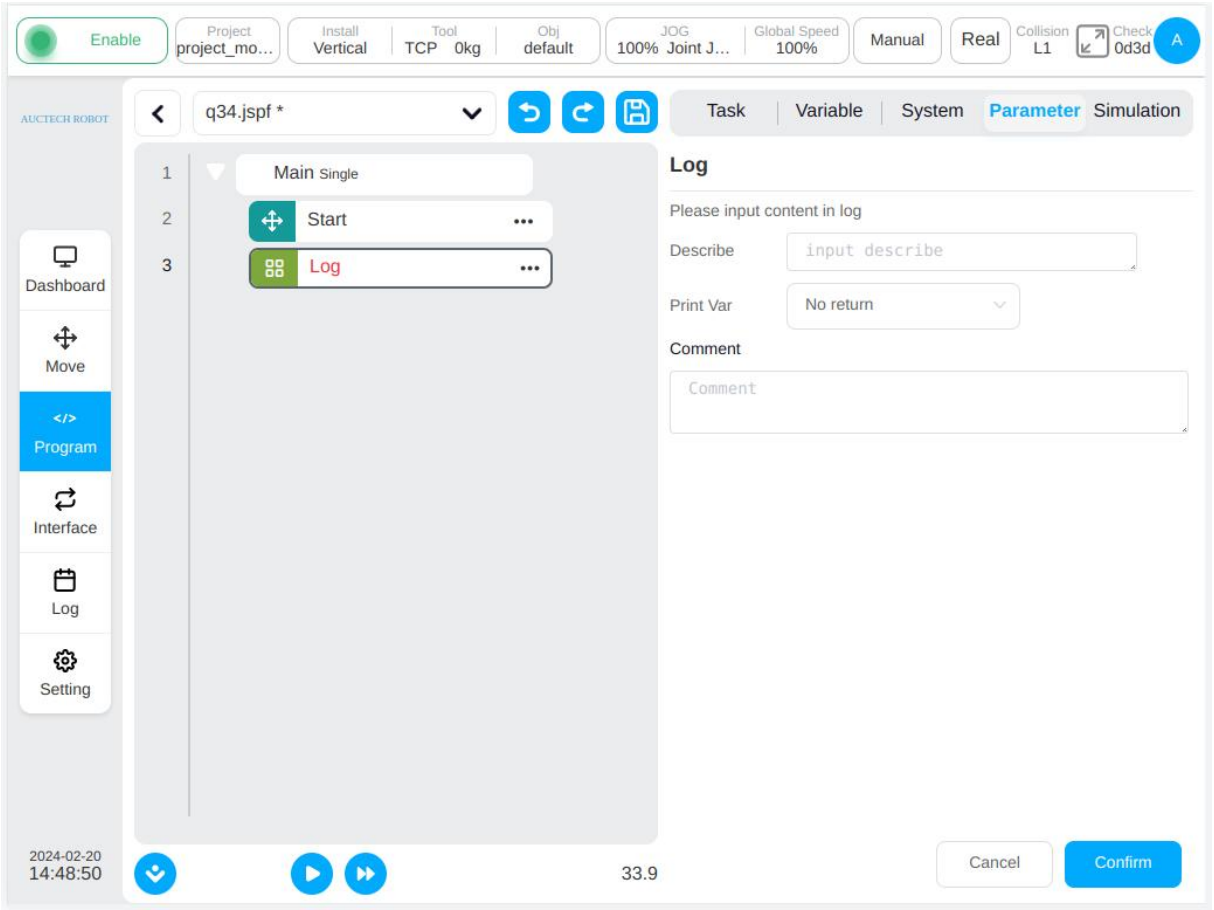
The universal keyboard is similar to the physical keyboard, you can enter uppercase and lowercase letters, numbers, and symbols.

Script functions can be selected from the list of script functions. After selection, the description and examples of the script function will be displayed at the bottom. Double-click or click the "Add" button on the upper left to enter the script into the script area. Support script search.



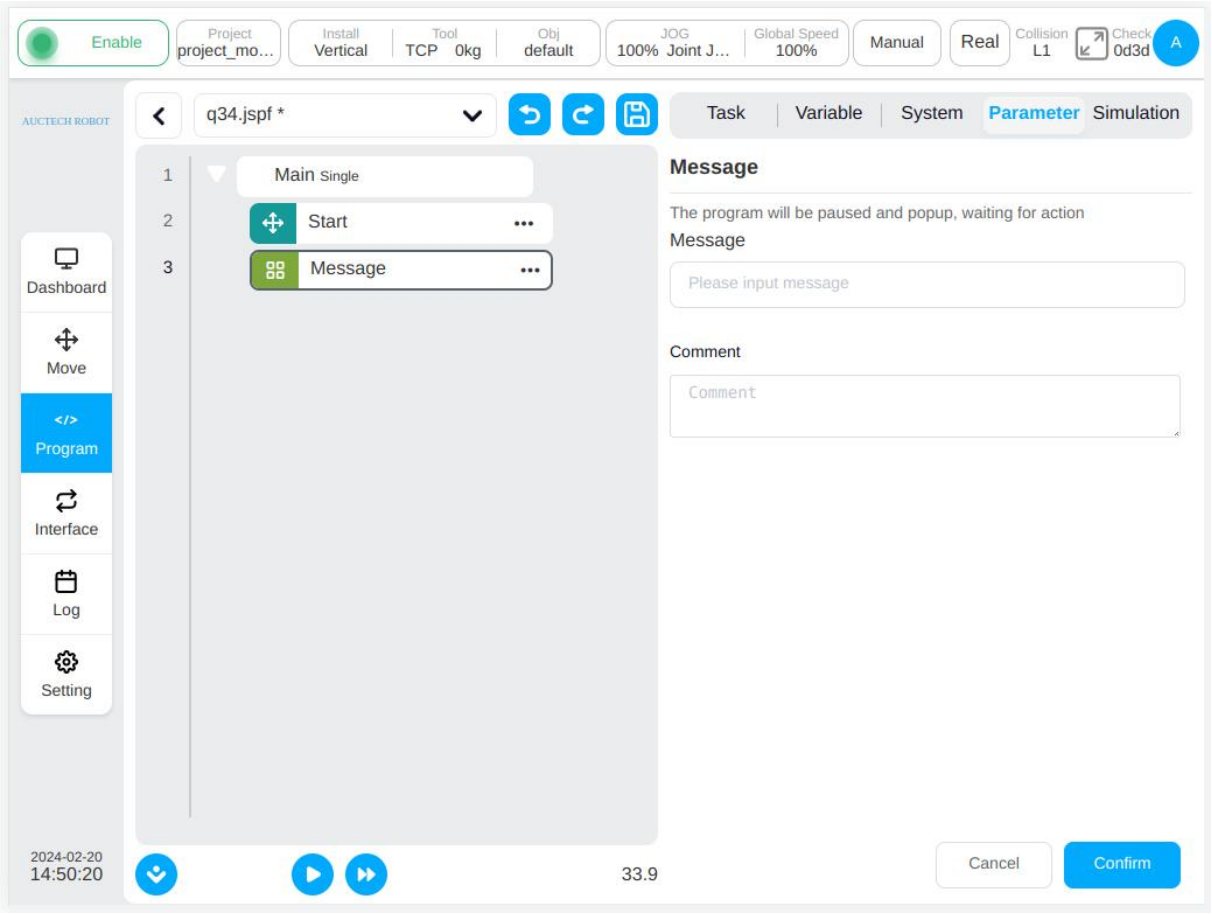
Log

Log function block. You can print messages or variable values to log files.



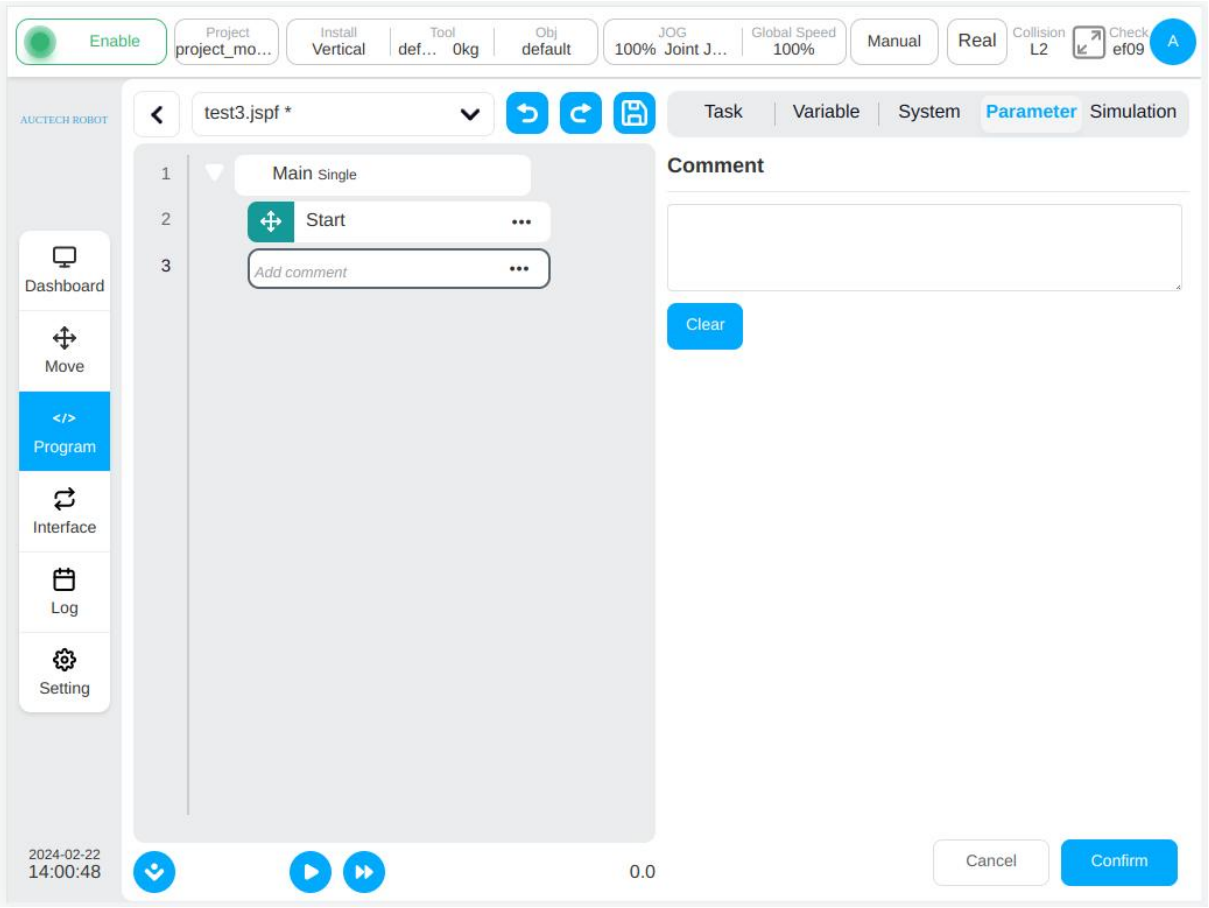
Message

Message pop-up function block A message can be set. When the program runs to this function block, a dialog box will pop up to display the message and the program will stop running. Users can choose to stop or continue running the program.



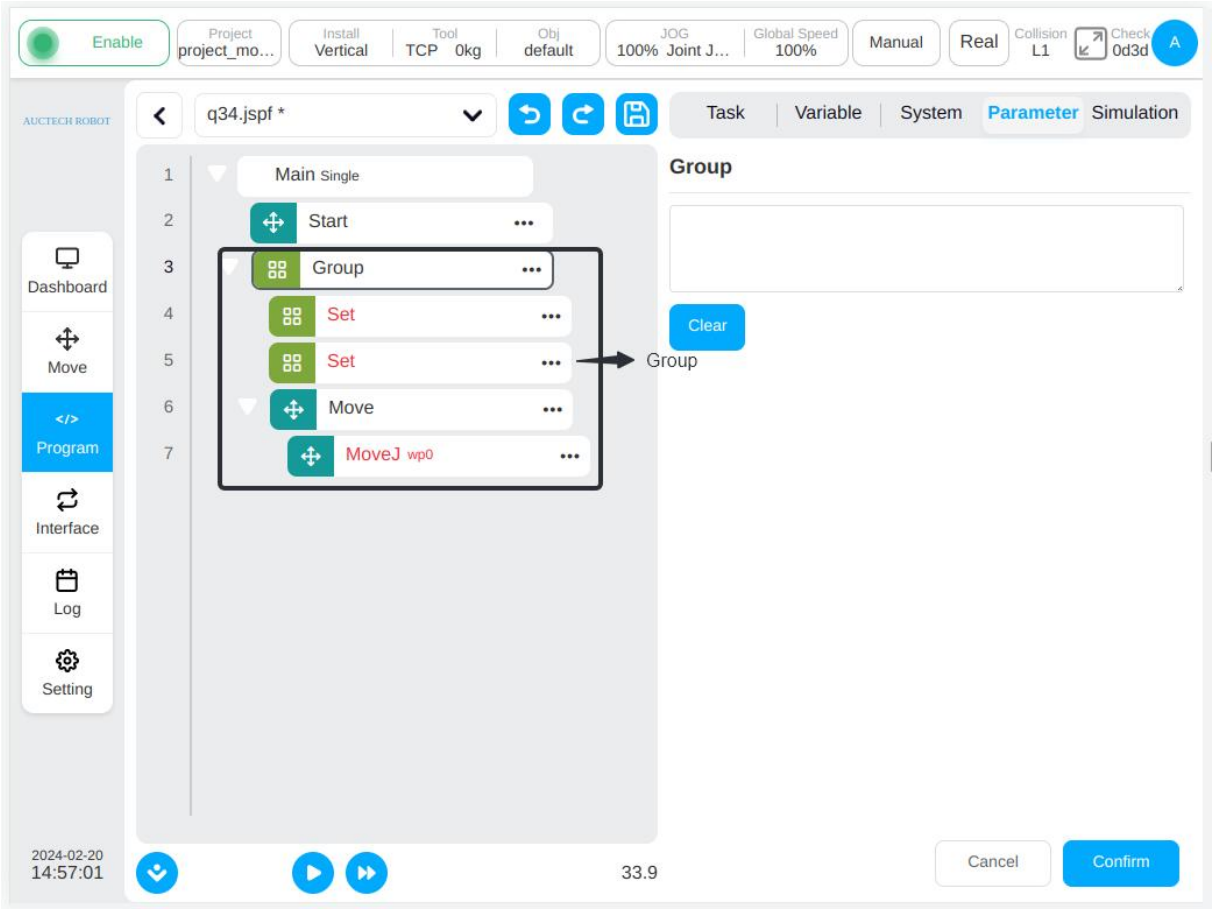
Comment

Comment function block. Adds a comment to the program tree. This block does not perform any action when the program runs.



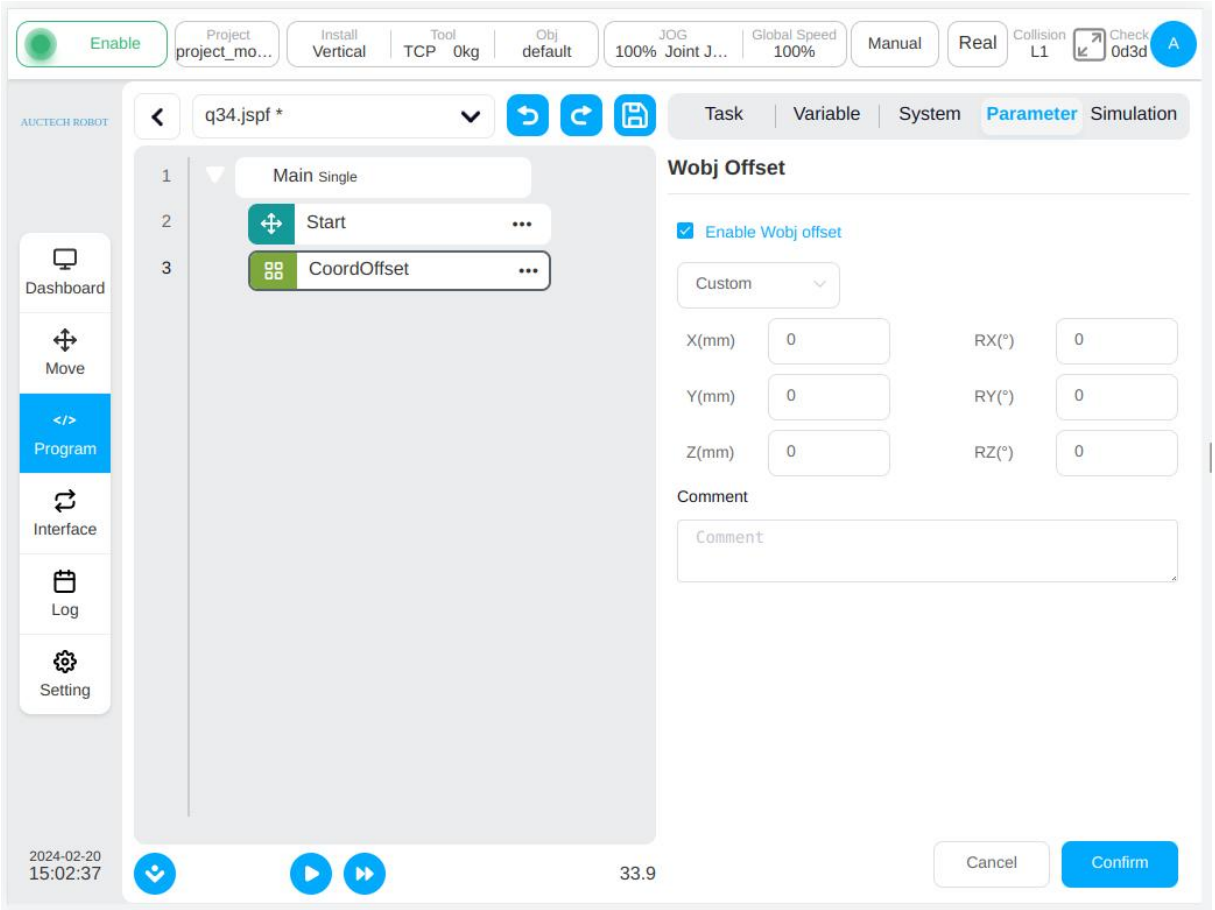
Group

Group functional blocks. It is used to organize programs. Some functional blocks can be placed under a Group to facilitate the organization and reading of programs. No effect on program execution.



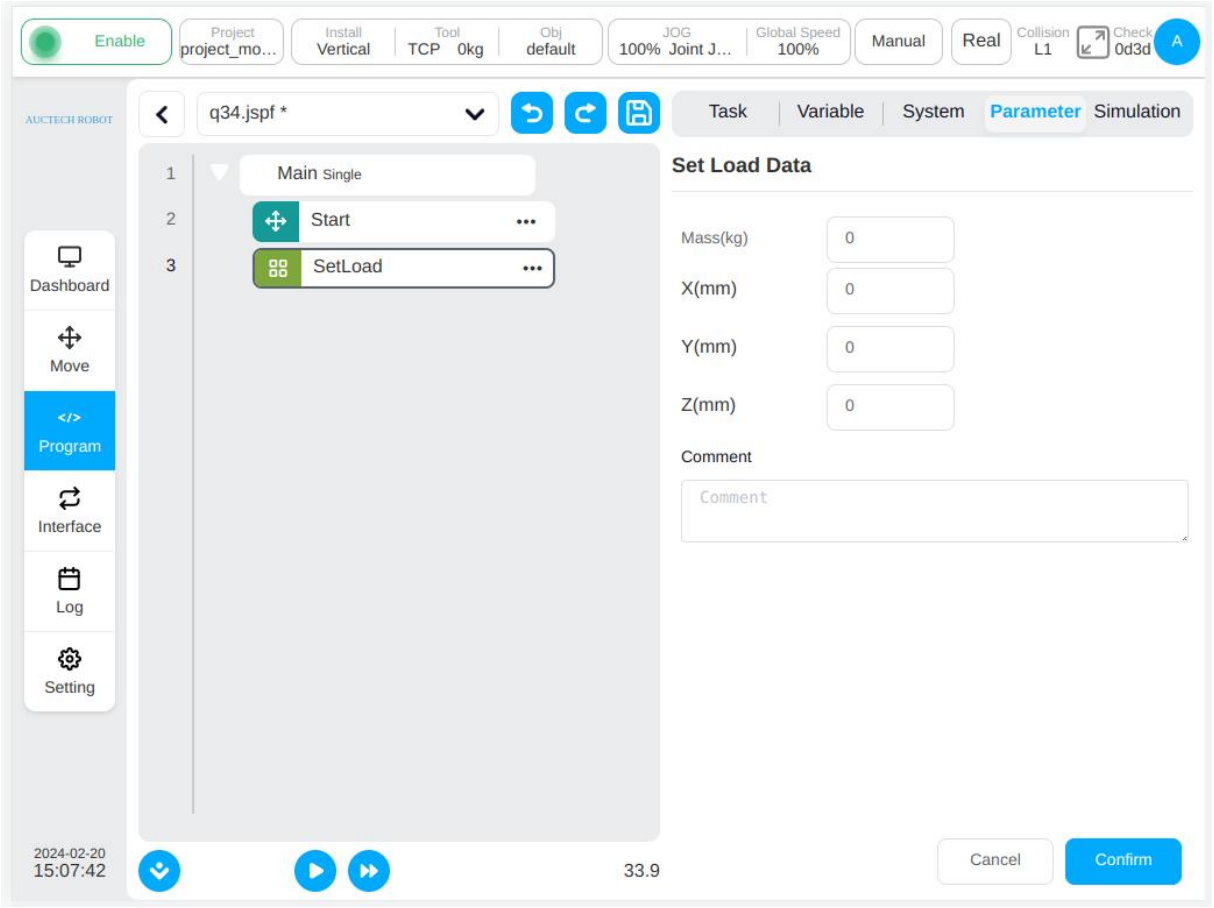
CoordOffset

The coordinate system offset function block sets an offset based on the workpiece coordinate system. This offset will be added to the reference workpiece coordinate system of subsequent Move function blocks. It takes effect during the program running, and the program stops the coordinate system offset is cancelled.

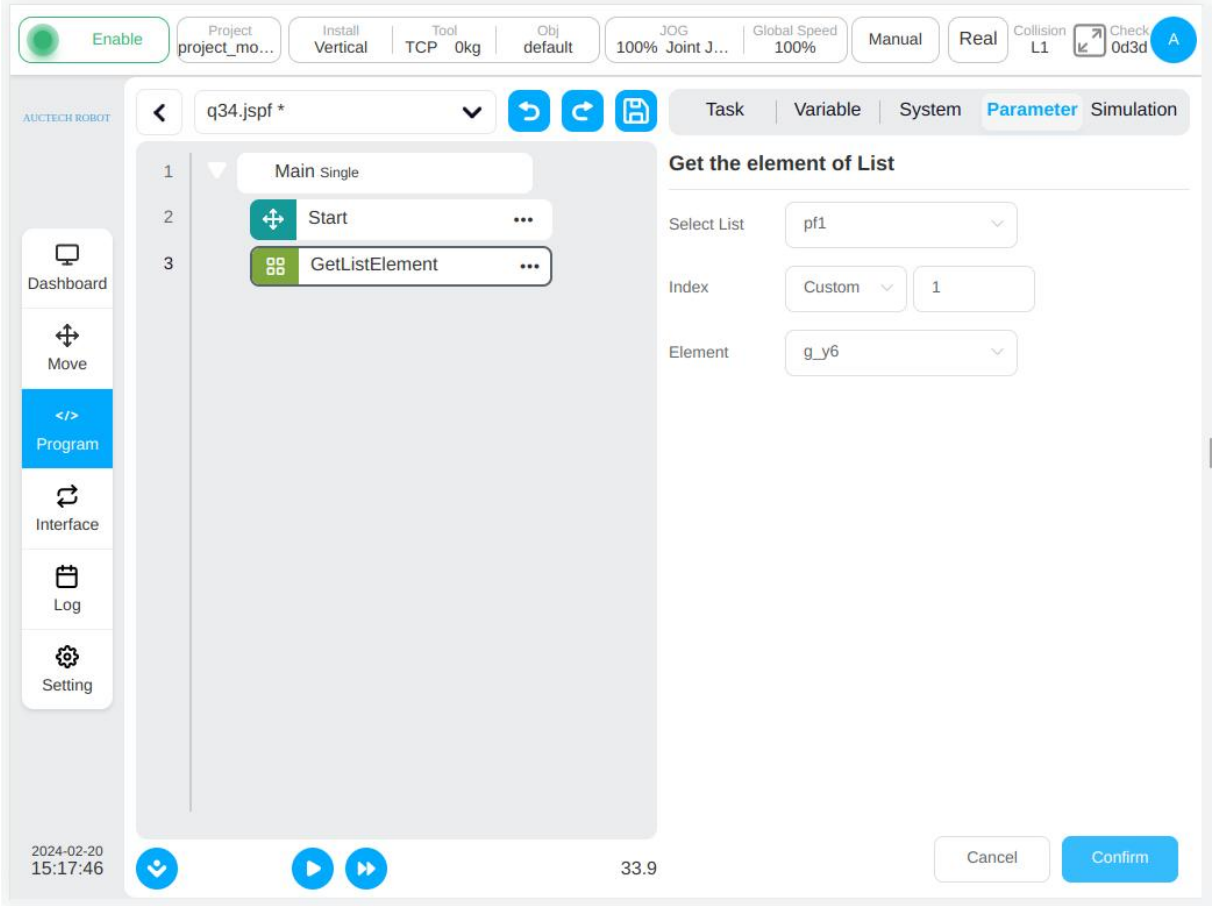


SetLoad

Set the grab load function block. The current load (mass, center of mass) of the robot can be set during the running of the program.


Enable
Project
project_mo…
Install
Vertical
Tool
TCP 0kg
Obj
default
JOG
100% Joint J…
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
q34.jspf *
Task
Variable
System
Parameter
Simulation
Dashboard
Move
Program
Interface
Log
Setting
1
2
3
Main Single
Start
SetLoad
Set Load Data
Mass(kg)
0
X(mm)
0
Y(mm)
0
Z(mm)
0
Comment
Comment
2024-02-20
15:07:42
33.9
Cancel
Confirm

GetListElement



GetListElement function block. This function block is used to get one of the elements from a variable of type list and dump the value of that element into the specified variable.

Select the list type: Currently three types of variables is supported, including num_list, pose_list,j oints_list,. To use it, you first need to create the desired list class variable.

Index: The position of the desired element in the list, counting from 1. You can enter an index value directly or obtain an index value from a variable.

Element: Specifies the corresponding variable to which the obtained element needs to be transferred. Support number, pose, joints three types of variables. To use it, you need to first establish the desired variables.

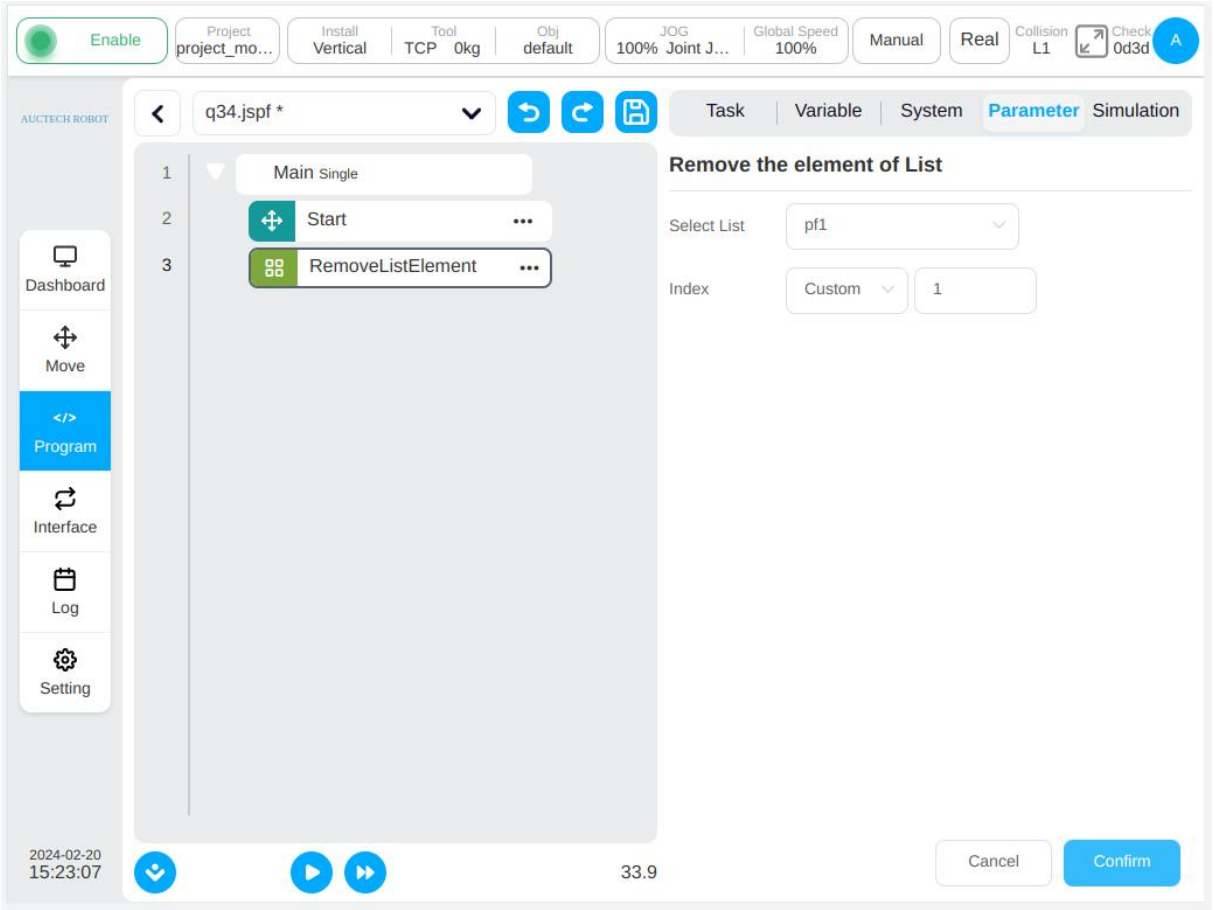
Care	• **GetListElement function block does not change the data in the original list variable. It does not delete the obtained element. It copies instead of cutting.** • **The type of the transferred variable needs to be the same as the type of the element in the list variable. For example, the pose variables obtained from the pose_list variable cannot be stored into the joints variable.**

RemoveListElement

Remove the list element function block. This function block is used to delete an element in a variable of the list type from the list type.

Select the list type: Currently three types of variables is support, including num_list, pose_list, joints_list, To use it, you first need to create the desired list class variable.

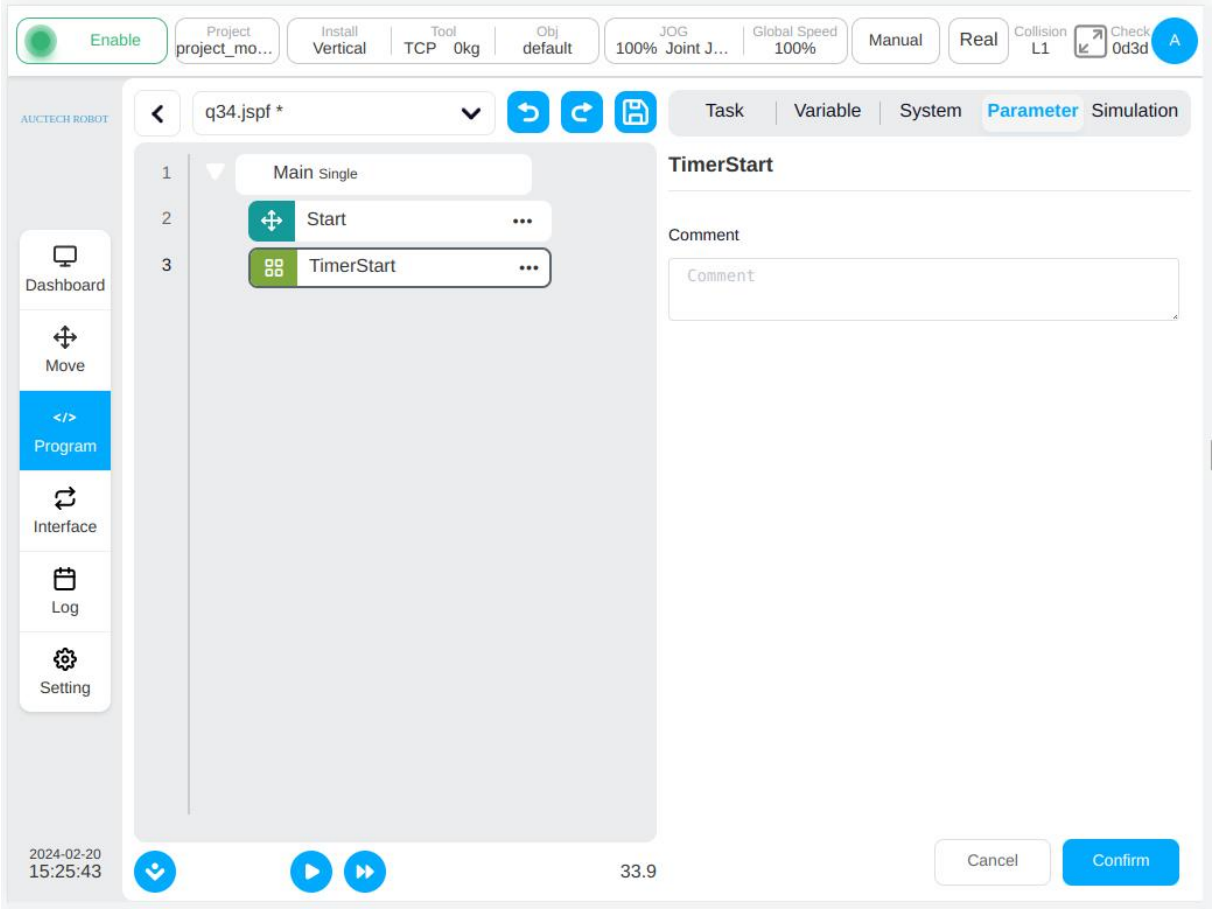
Index: The position of the desired element in the list, counting from 1. You can enter an index value directly or obtain an index value from a variable.



Care	● **RemoveListElement block changes the data in the original list variable and the position of the element after the index number. For example, pose_list contains the pose variable {A,B,C,D}. When you use the RemoveListElement block and remove the variable B, the element in the new pose_list becomes {A,C,D} instead of {A,null,C,D}., and null indicates that there is a pose variable, but the value is empty.**

TimerStart

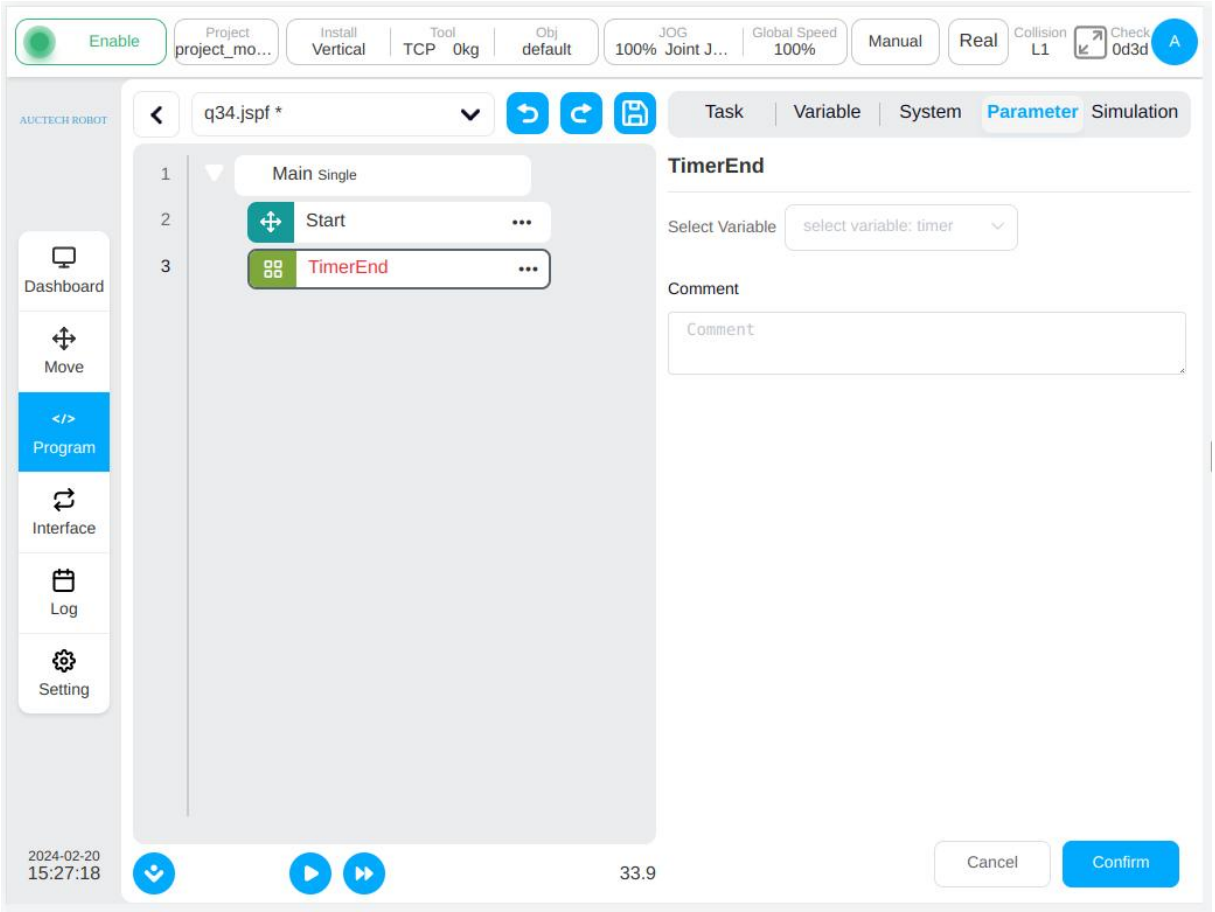
Timerstart function block. This function block is used to start the timer.



TimerEnd

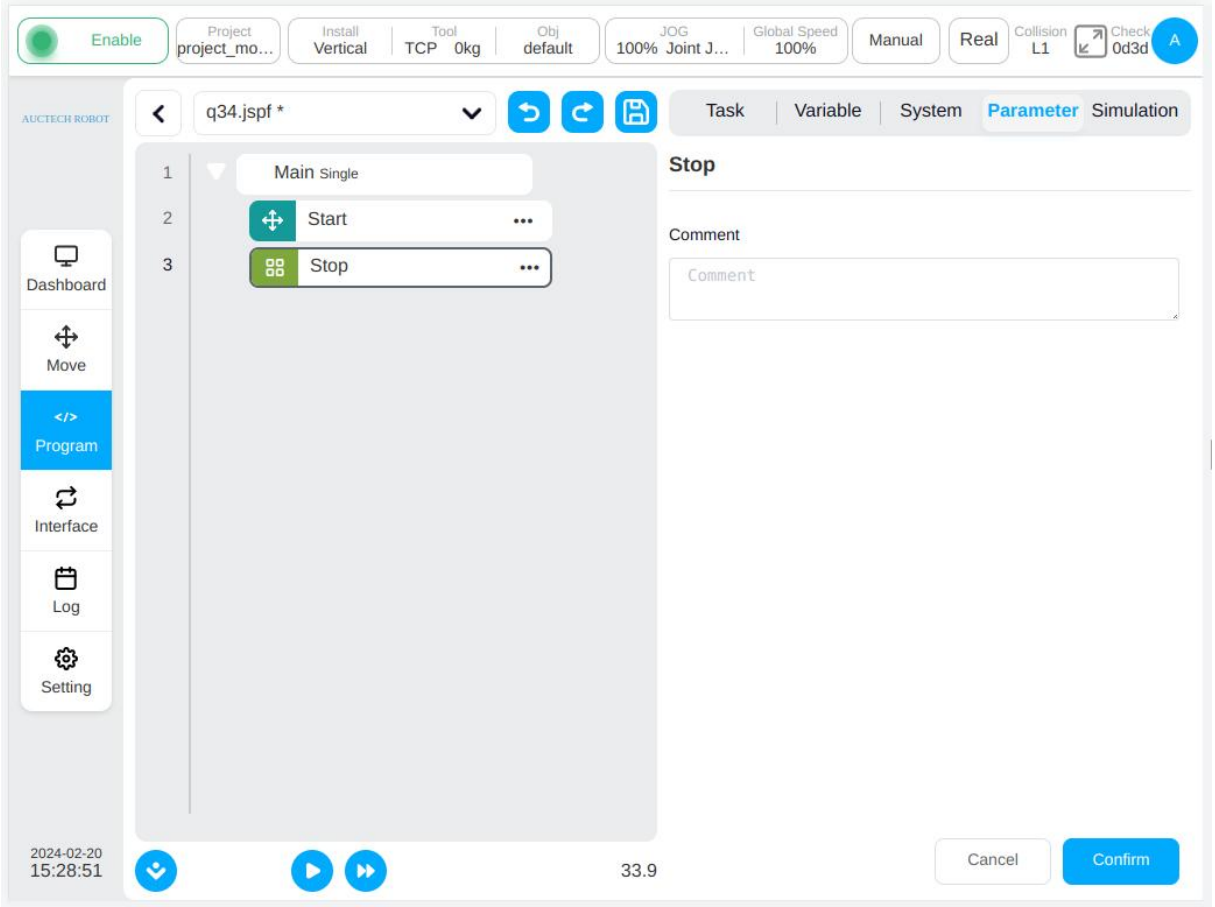
Timerend function block. This function block is used to end of the timer.

Select variables: Only variables of the global timer type are supported. To use it, you need to create the global timer class variable first.



Stop

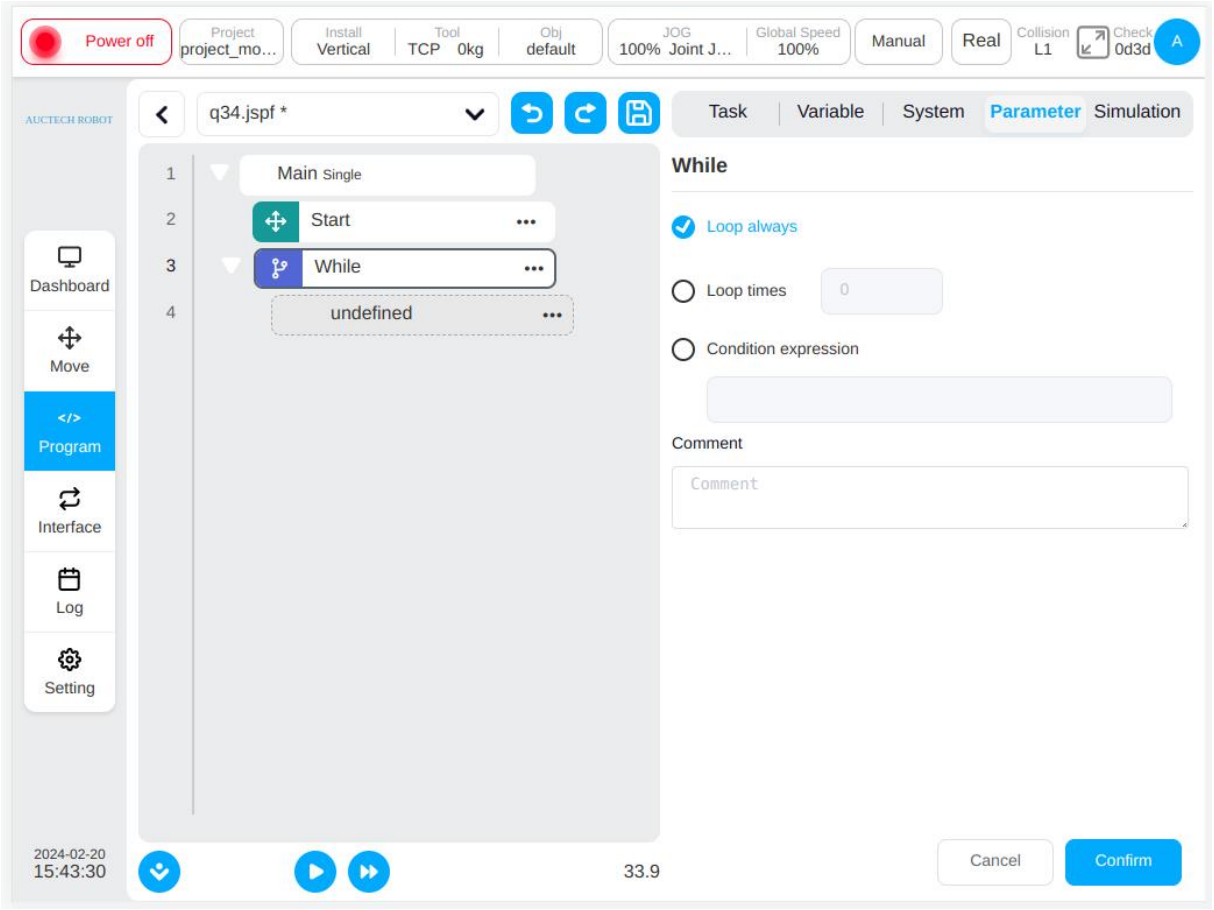
Stop function block. This function block is used to issue program stop instructions.



11.3.3. Process Control

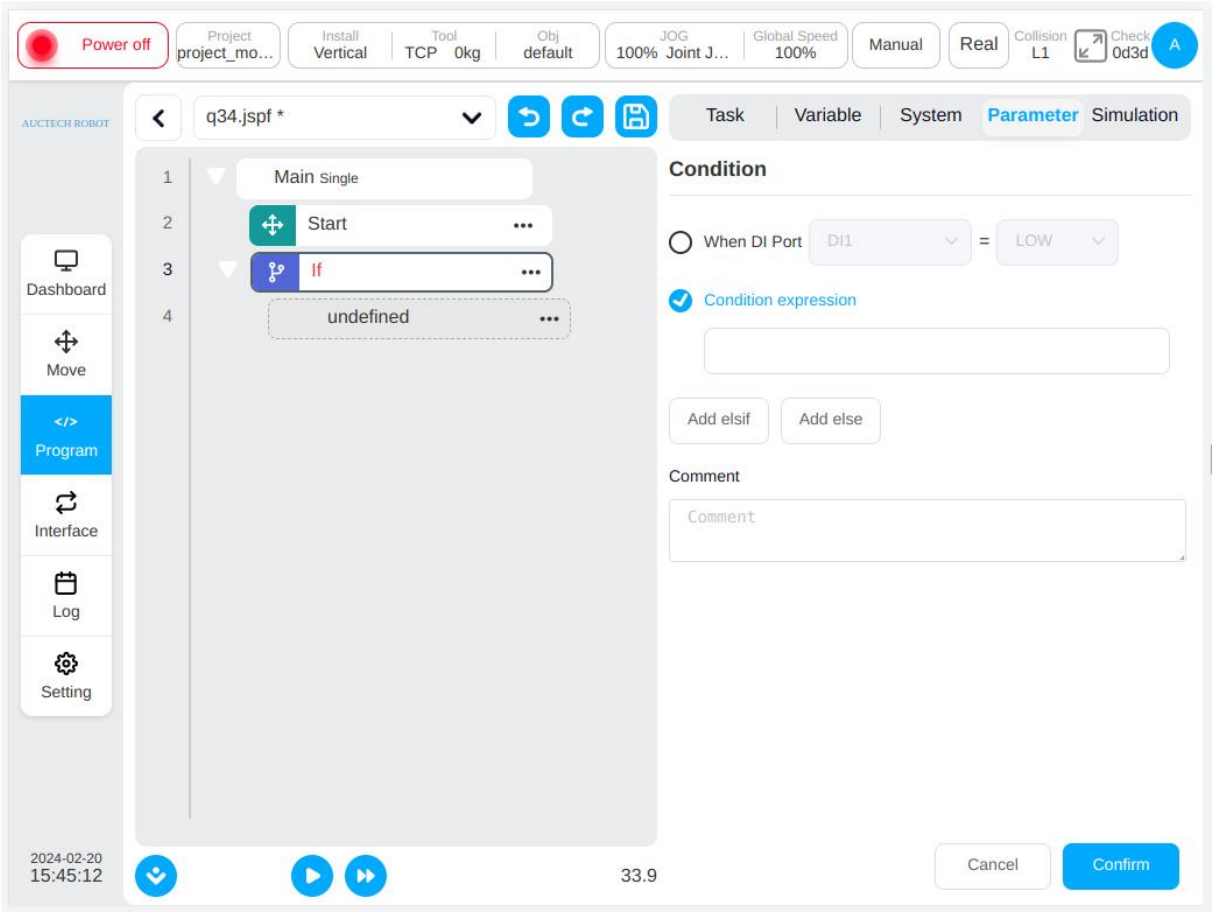
While

Loop function blocks. A loop executes its internal blocks of functionality. You can set it to loop all the time; Specifies the number of loops; Specifies a loop condition. As long as the loop condition is true, the loop runs.


Power off
Project
project_mo…
Install
Vertical
Tool
TCP 0kg
Obj
default
JOG
100% Joint J…
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
q34.jspf *
Task
Variable
System
Parameter
Simulation
Dashboard
Move
Program
Interface
Log
Setting
1
Main Single
2
Start
3
While
4
undefined
While
Loop always
Loop times
0
Condition expression
Comment
Comment
2024-02-20
15:43:30
33.9
Cancel
Confirm

If

Conditional function block. You can set a digital input port condition or a condition expression, and “If” this condition is met, the function block in “If” can be executed, and subsequent “elsif” or else function blocks can be added.

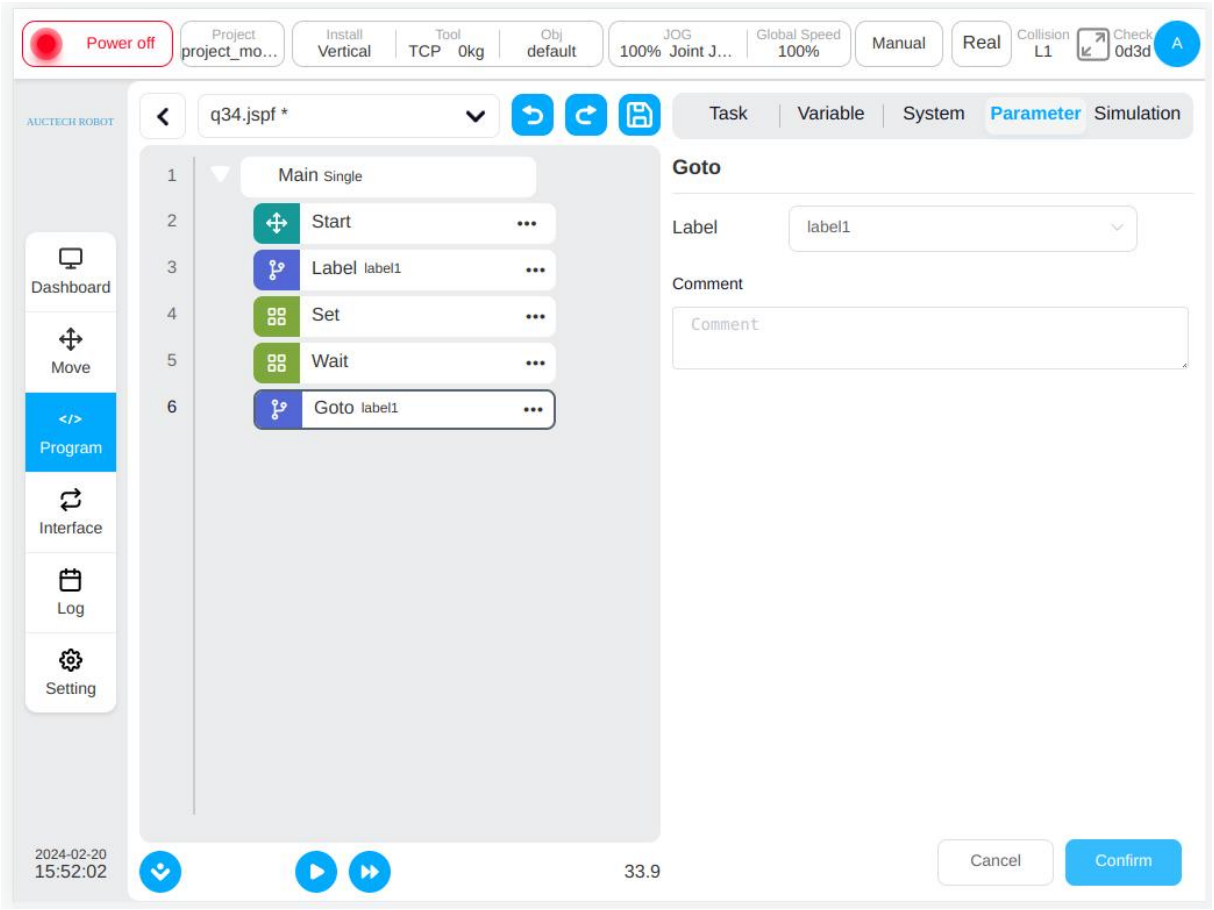


Goto&Label

Goto function, used in conjunction with Label, can transfer the control point of the program to Label.

First, create a Label function block, mark the jump point, and name the jump point. Use the goto block, select the location you want to jump to.

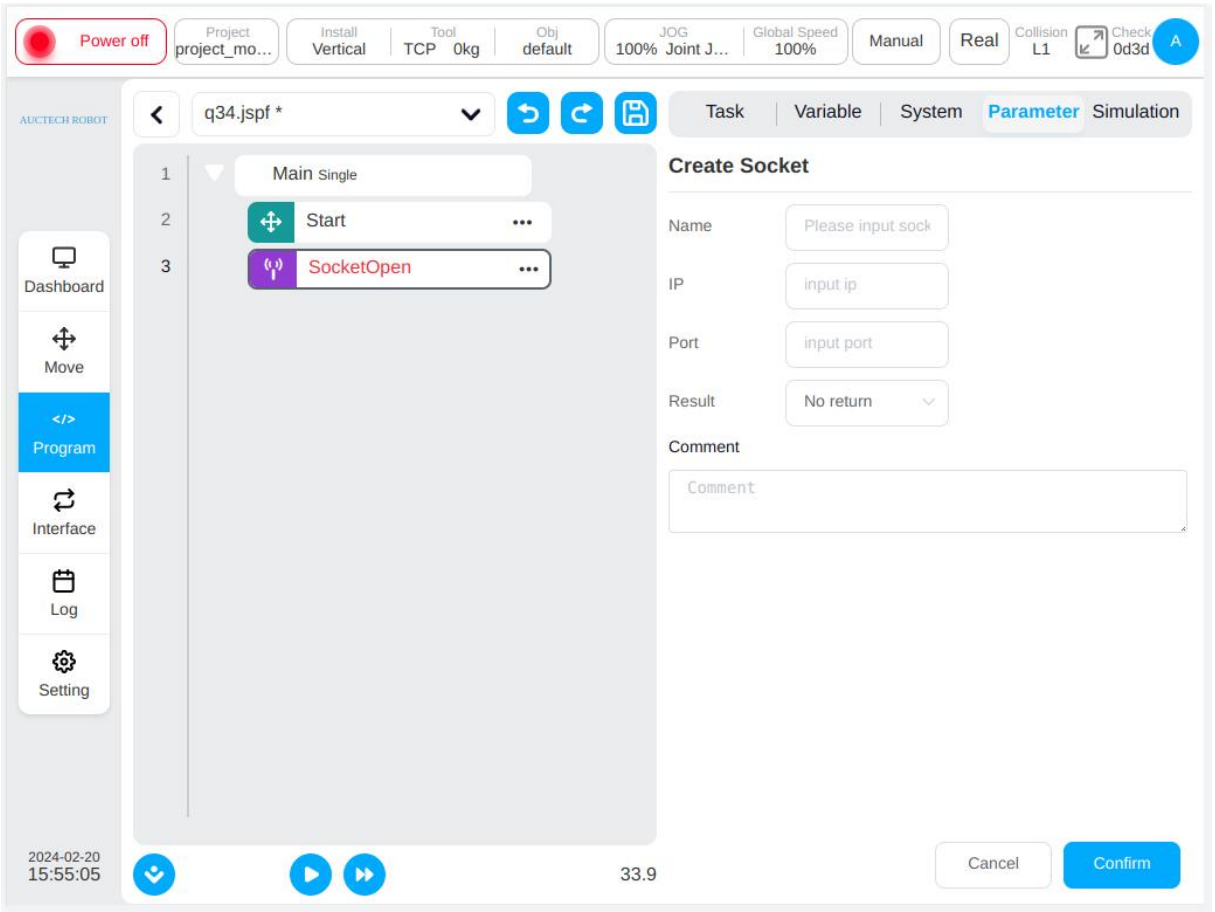
The example program as shown in the figure indicates that when the program runs to line 6, it will jump to label1 in line 3 and then execute downward, that is, the Set function block in line 4 and the Wait function block in line 5 will run twice.



11.3.4. Communication

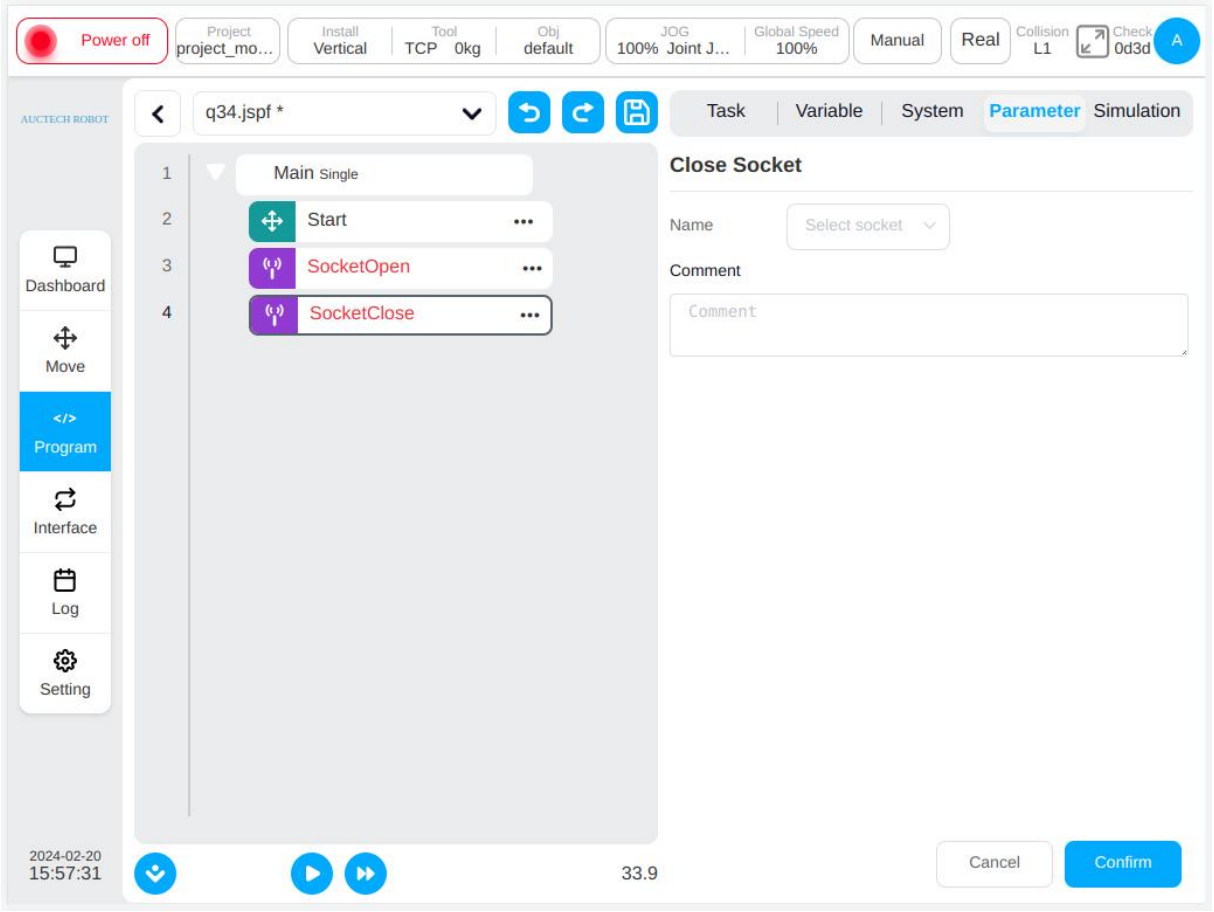
SocketOpen

To establish a Socket, the parameters page needs to set the name of the connection, configure the IP address and port number of the target Server, and choose whether to bind the return value to a variable.


Power off
Project
project_mo...
Install
Vertical
Tool
TCP 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
q34.jspf *
Task
Variable
System
Parameter
Simulation
Dashboard
Move
Program
Interface
Log
Setting
1
Main Single
2
Start
3
SocketOpen
Create Socket
Name
Please input sock
IP
input ip
Port
input port
Result
No return
Comment
Comment
2024-02-20
15:55:05
33.9
Cancel
Confirm

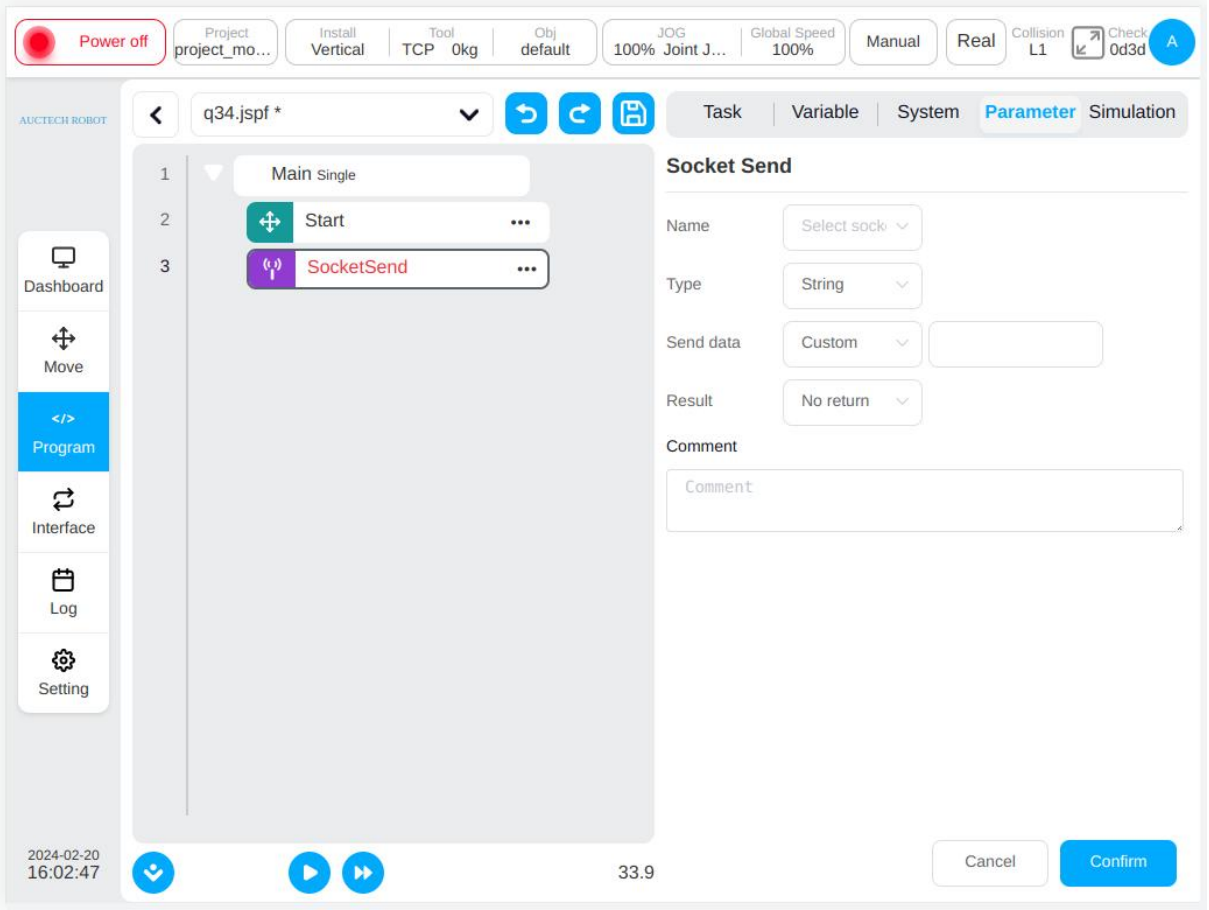
SocketClose

To close a socket connection, you need to select the name of the connection to close.



SocketSend

Socket sends data. Send data to an established socket connection. Send data as a string or as a floating-point array, send data as a variable or as a direct input, and bind the return value to a variable to obtain the send status.



SocketRecv

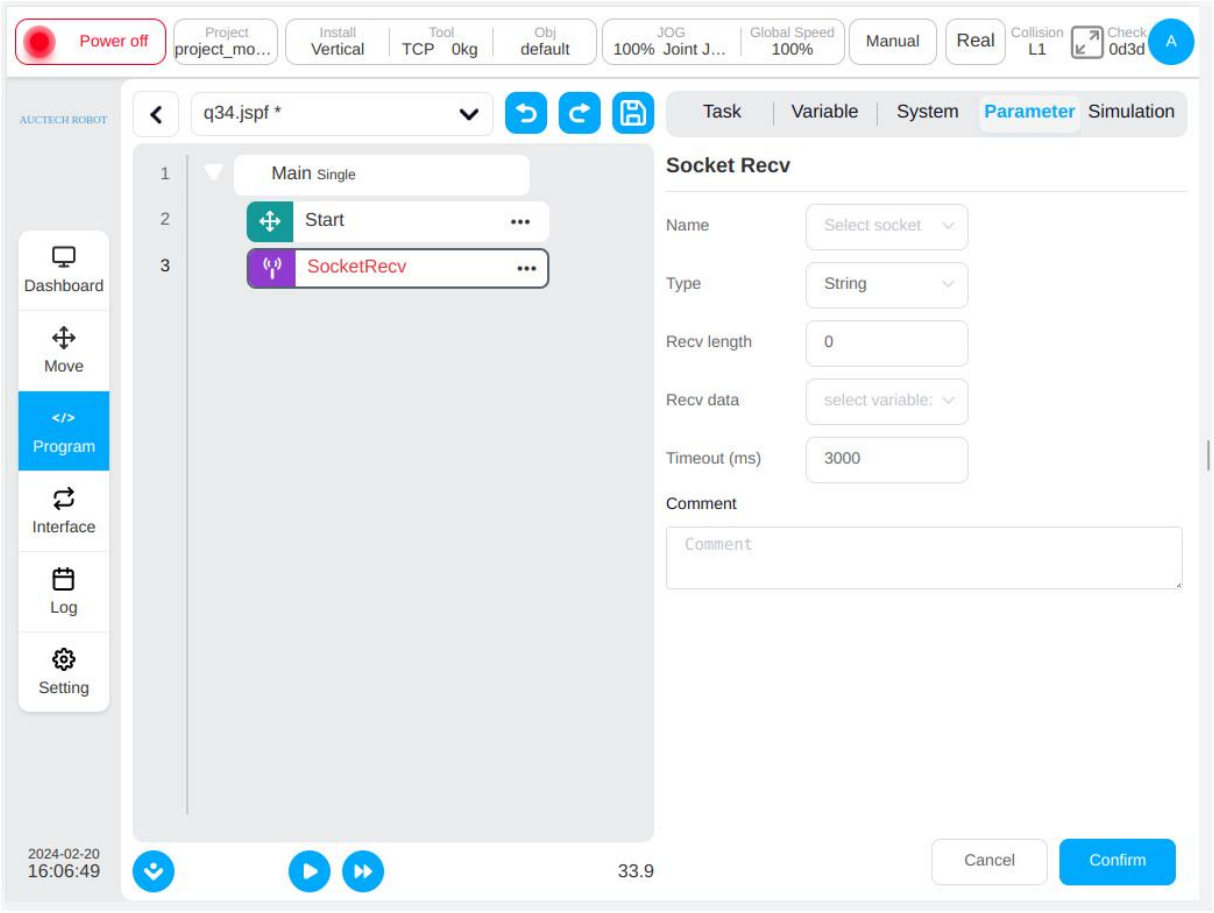
Socket receives data. Receive data from the established socket connection, receive type optional string, string array, float array, receive information configuration receive variable.

String type, given the received length, the program will receive the length of the data and process it as a string, saving it to the “Receive Message” configuration.

\String array type, the program will parse the received string into numeric values, all numeric values in "()", use ", "separated between numeric values. For example, if a string "(12,1.23)" is received from a socket, the block will convert it to a num_list type with a value of {12,1.23} and save it to a variable in the "Receive Message" configuration.

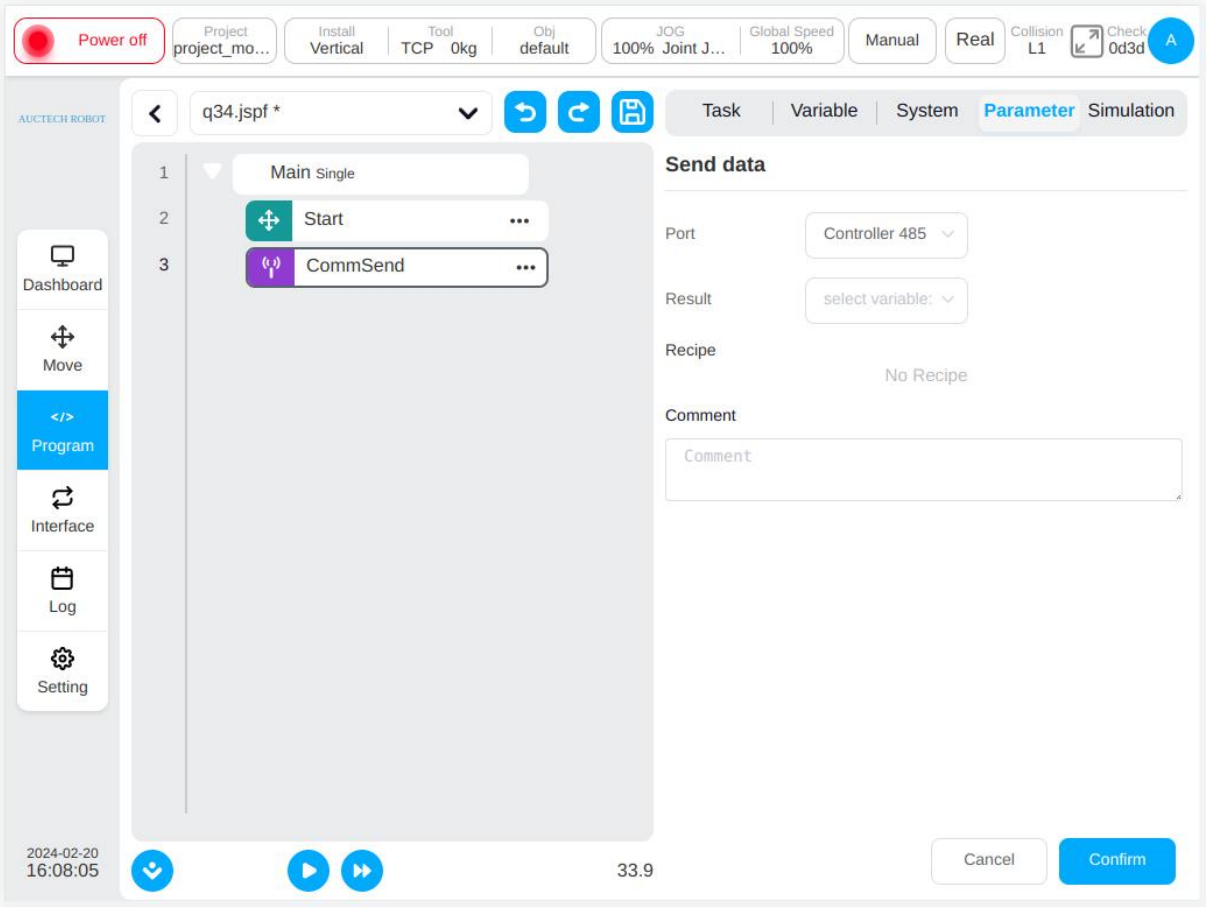
Float array, given the received length, the program converts the received data to a set of single-precision float numbers (converted according to the IEEE 754 standard) and saves it to a variable configured in the “Receive Message” configuration.

A receive timeout can be configured to execute the next statement if no data conforming to the rule is received within the timeout.


Power off
Project
project_mo...
Install
Vertical
Tool
TCP 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
q34.jspf *
Task
Variable
System
Parameter
Simulation
Dashboard
Move
Program
Interface
Log
Setting
1
Main Single
2
Start
3
SocketRecv
Socket Recv
Name
Select socket
Type
String
Recv length
0
Recv data
select variable:
Timeout (ms)
3000
Comment
Comment
2024-02-20
16:06:49
33.9
Cancel
Confirm

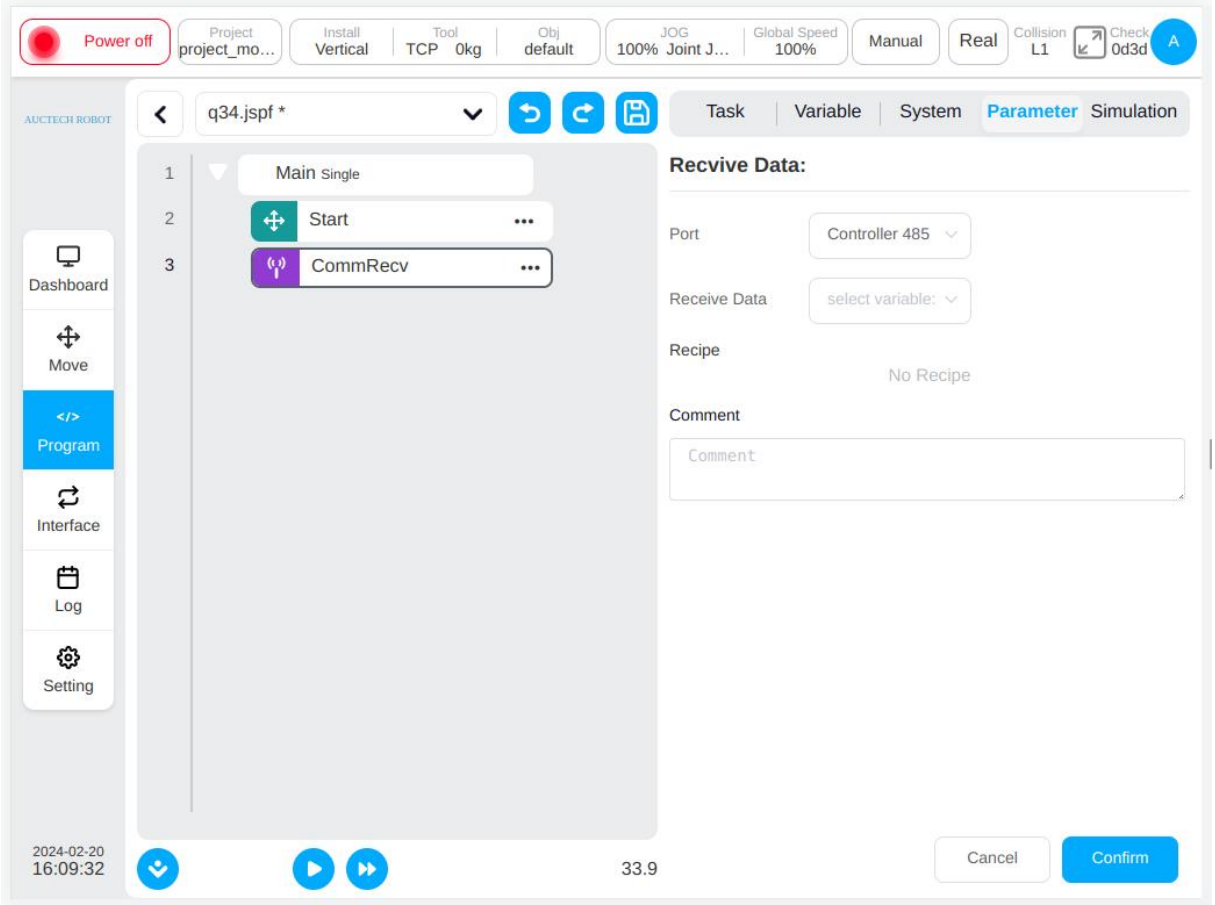
CommSend

Formula data sent. When the robot's “485 port” or “CAN port” is set with the formula, this function block can be used to set the value for the data in the formula and send it. You can set the return variable to get the state of the formula data sent.



CommRecv

Formula data received. When the “485 port” or “CAN port” of the robot is set with a formula, this function block is used to receive data, and after processing according to the formula, the obtained num_list data is assigned to the receiving variable.



11.3.5. Advance

Subprogram

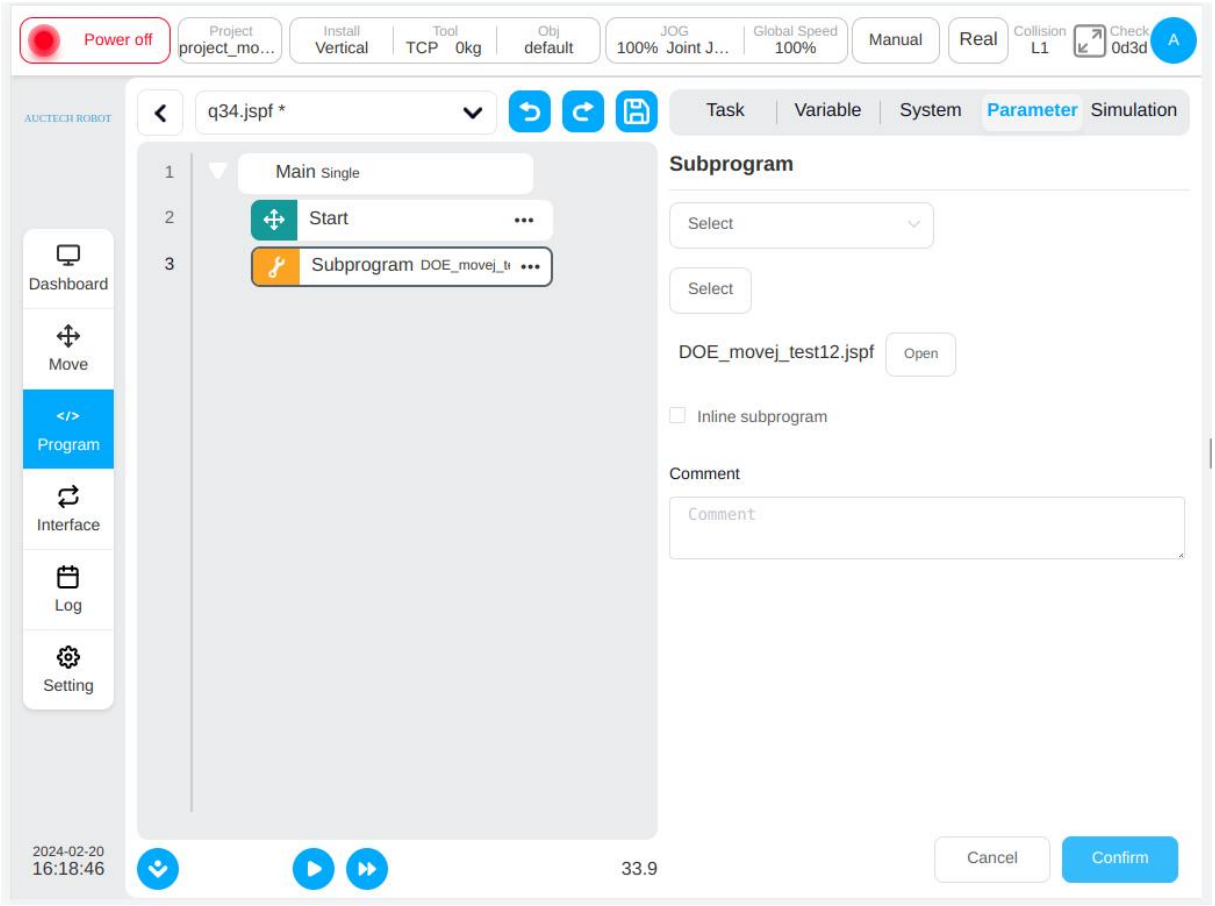
A subroutine. You can embed other programs into the current program. There are two ways:

Directly select the embedded subprogram from the program list. If you do not check the "Inline subprogram" option, you will load the subprogram from the file each time when the program runs. That means, changes in the subprogram file will affect the main program. If checked the "Inline subprogram" option, it is to copy the subprogram directly to the main program, since the change of the subprogram file has no effect on it.

Set as a string variable, the main programs at run time, according to the value of the variable as the subprogram name to dynamically load the corresponding subroutine.

Caution	● For the “Inline subprogram”, the program variables in the subprogram will also be copied to the main program. If there is a variable with the same name in the main program, it may have some impact on the main program. So, when you use it, carefully check the behavior of this variable to make sure it doesn't affect the original

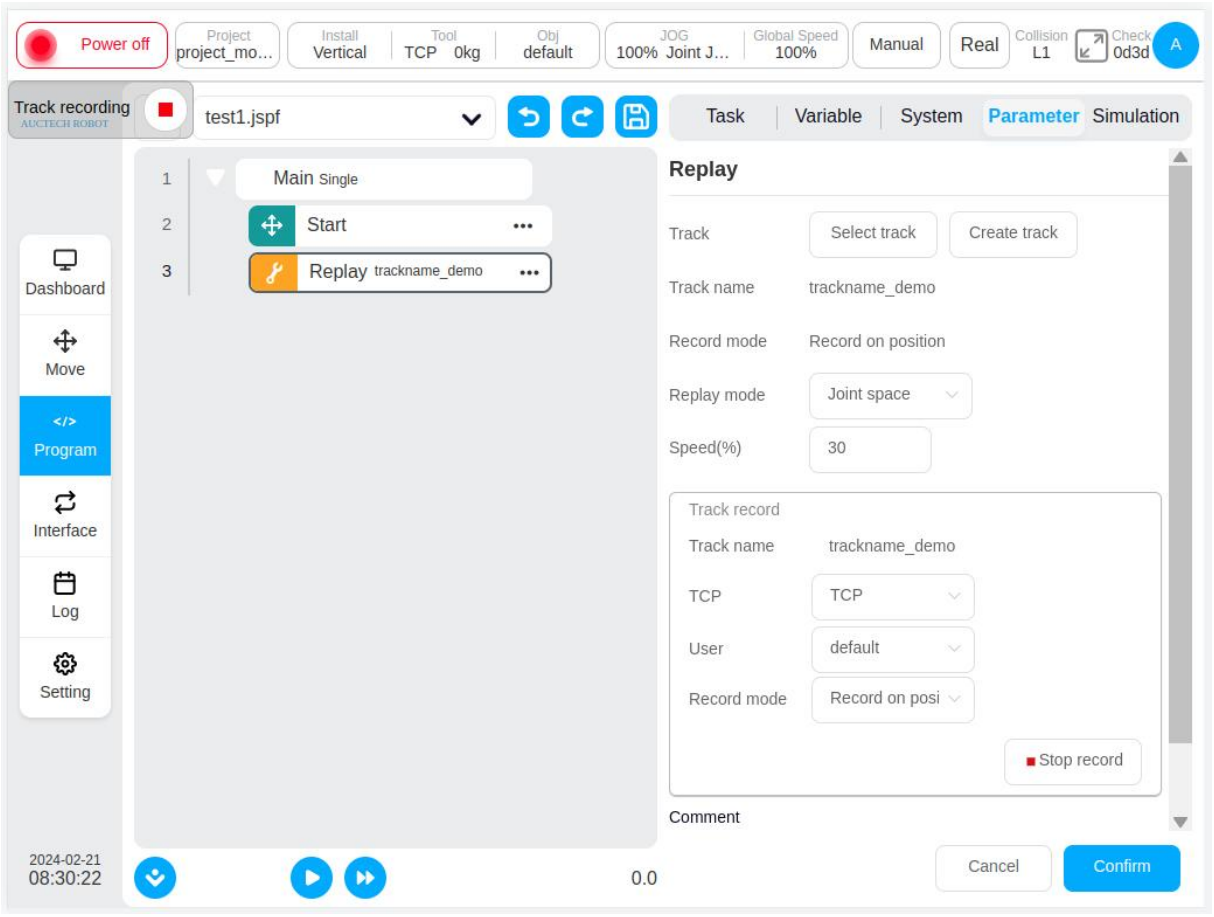
	execution logic of your program. ● When referring to a subprogram with a string variable, do not check "Inline subprogram".



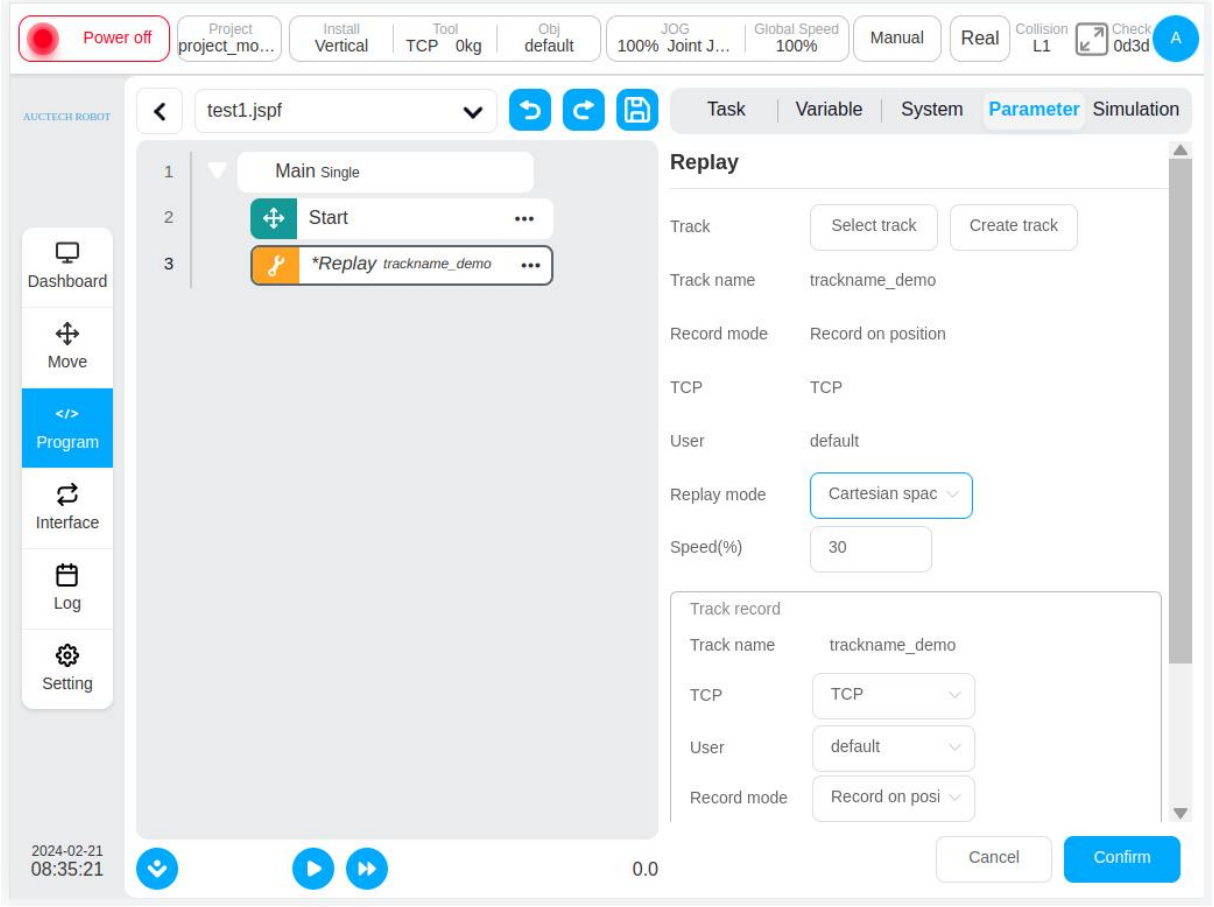
Replay

The trajectory is repeated. You can create a robot motion track whose recording mode is position-based recording or time-based recording. When the program is executed to this function block, the robot moves the trajectory according to the joint space-based or Cartesian space-based reproduction mode. You can select an existing track file or create a new track.

To create a new track, click "New track" and enter the track name, the "track record" box will be displayed. After selecting the tool coordinate system, the workpiece coordinate system and the recording mode, click "Start Record" to start recording the track data. At this time, a semi-transparent suspension box will be displayed on the page indicating that the track is being recorded. Click "Stop Recording" or the Stop button on the hover box to complete the creation of the track file. During the track recording process, the user modifies the coordinate system or switches the current coordinate system, terminates the current track recording, and the "track recording" suspension frame disappears.

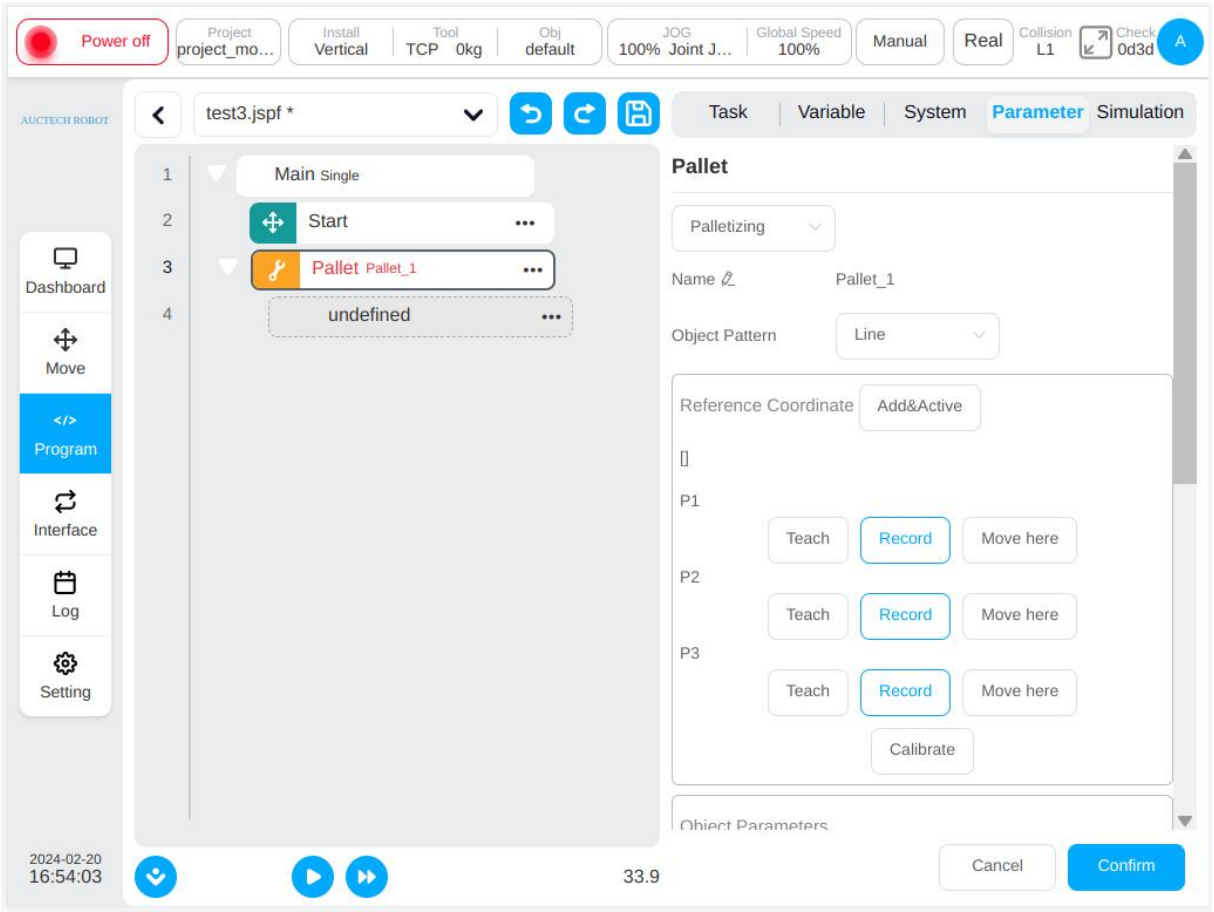

Power off
Project
project_mo...
Install
Vertical
Tool
TCP 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
Track recording
AUCTECH ROBOT
test1.jspf
Task
Variable
System
Parameter
Simulation
1
Main Single
2
Start
3
Replay trackname_demo
Dashboard
Move
Program
Interface
Log
Setting
Replay
Track
Select track
Create track
Track name
trackname_demo
Record mode
Record on position
Replay mode
Joint space
Speed(%)
30
Track record
Track name
trackname_demo
TCP
TCP
User
default
Record mode
Record on posi
Stop record
Comment
2024-02-21
08:30:22
0.0
Cancel
Confirm

For the selected track, when the recurrence mode is based on joint space, the track name and recording mode of the track will be displayed. When the reproduction mode is based on Cartesian space, the track name, recording mode, tool coordinate system and workpiece coordinate system of the recording time are displayed.



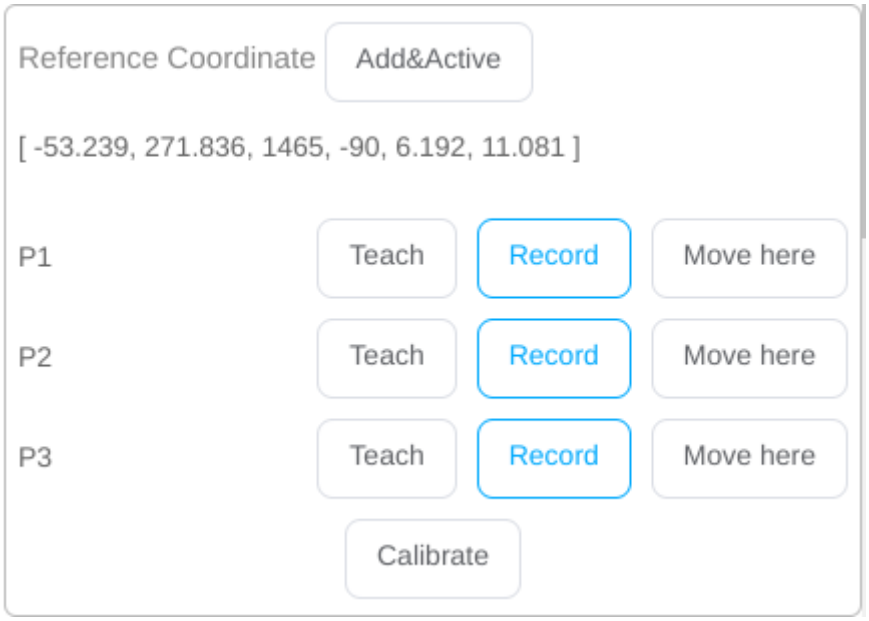
Pallet

Palletizing/depalletizing. Through some simple parameter settings, a standard palletizing/depalletizing program templates can be automatically loaded, and adaptive changes can be made on this basis.

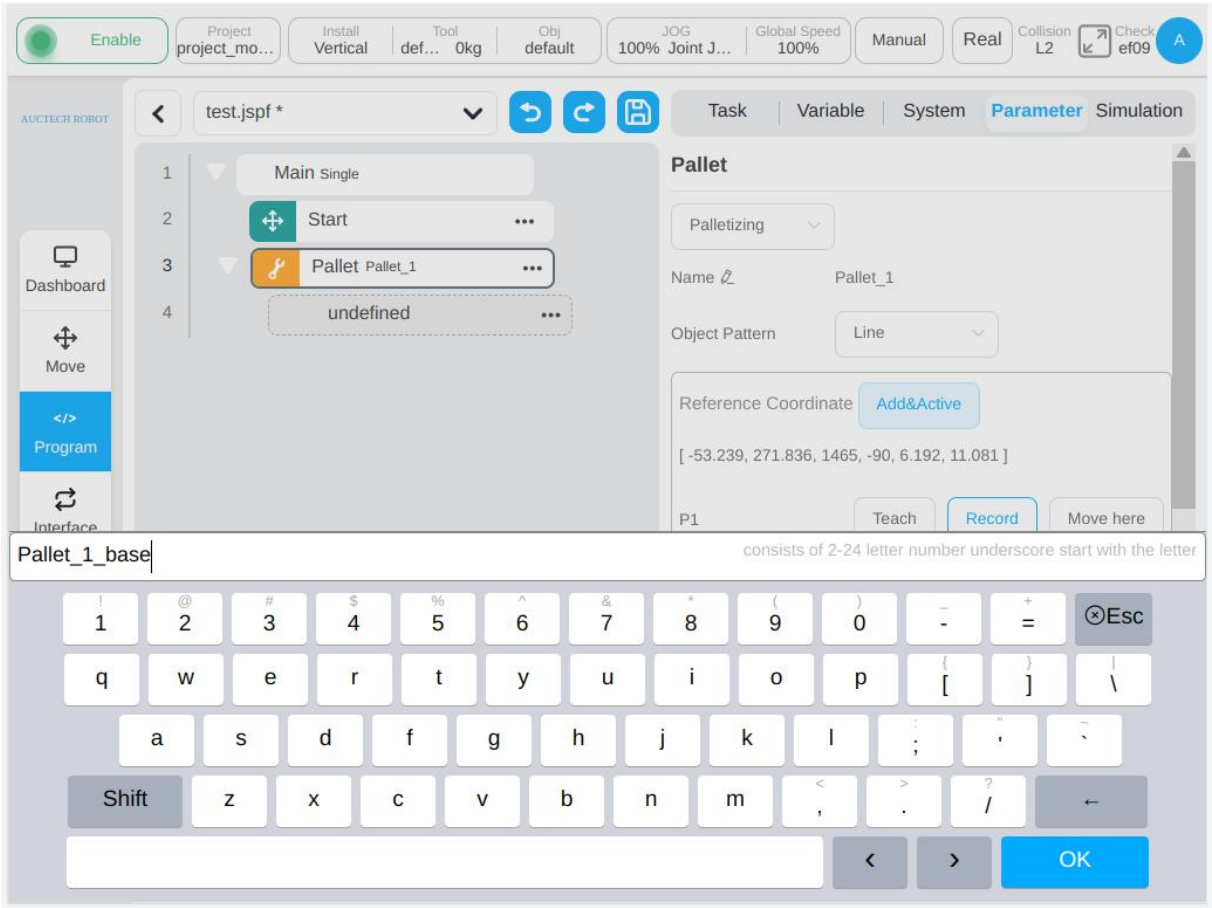


Follow the steps below to use the palletizing/depalletizing function block:

1. Determine whether to use palletizing or depalletizing, palletizing is to move the workpiece to the pallet, and depalletizing is to remove the workpiece from the pallet
2. You can specify a name, and a default name will be generated every time Pallet is added
3. Select the placement mode of the workpiece on the pallet, linear or grid mode
4. The reference coordinate system used to calibrate the pallet, the calibration method: calibrate based on the first workpiece placed on the pallet, point P1 is a point taught to the workpiece, and point P2 is taught to the row direction (reference coordinate system X axis Direction), P3 is taught to the column direction. Click the "Calibrate" button to complete the calibration of the coordinate system. The value of the reference coordinate system will be displayed on the top.

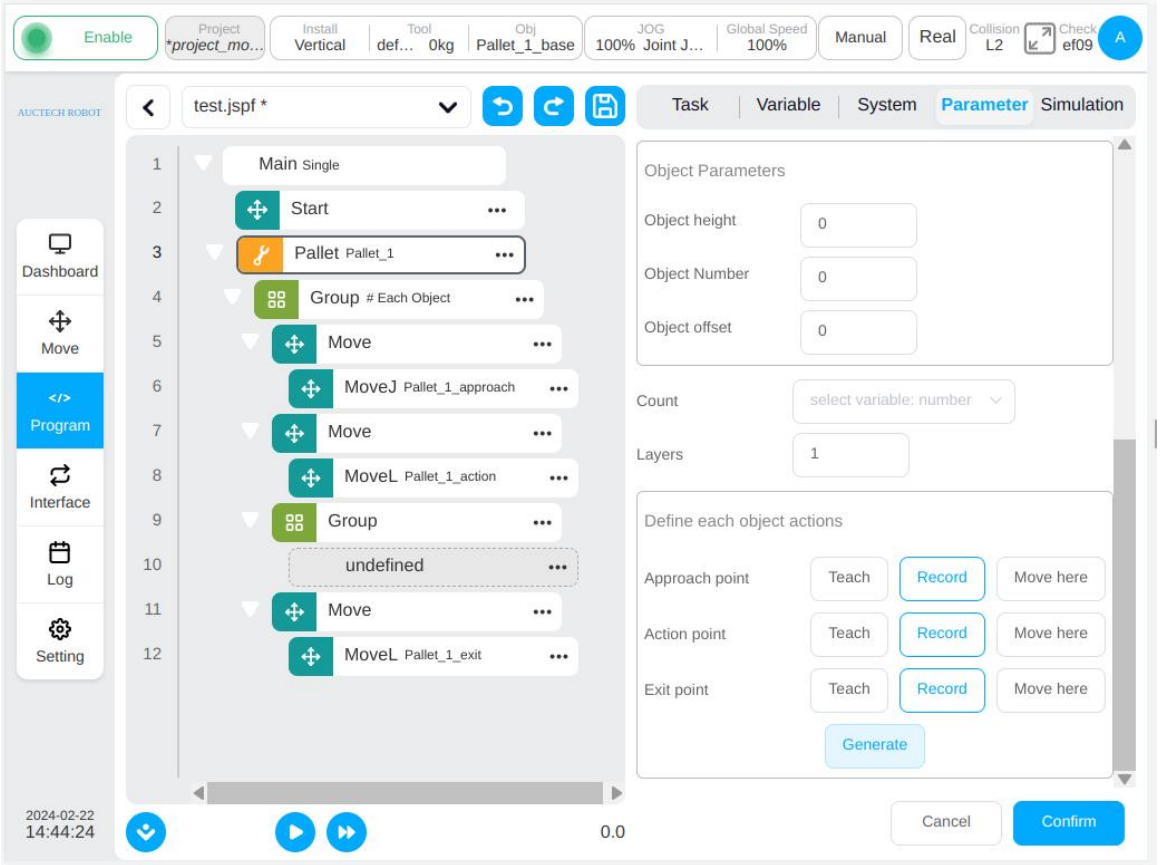


Click the "Add & Activate" button and a dialog box will pop up. After entering the name of the coordinate system, it will be added to the system and set as the current coordinate system.



5. To set the workpiece placement parameters, you need to set the height of the workpiece, the number of workpieces placed in the row and column directions, and the distance between the workpieces in the row and column directions.

6. To set the count variable of the workpiece, you need to create a new variable of type number in the program variable area
7. Set the number of layers
8. Define the points to perform actions on each workpiece, which can be divided into three approach points, action points, and exit points. Teach these three points at the first workpiece placed on the pallet. The approach point is when the robot moves to the position above the pallet where it is planned to place/grab the workpiece; the action point is the position where the robot places/grabs the workpiece; the exit point is where the robot leaves the pallet after placing/grabbing. Note: The teaching of these three points must be carried out in the reference coordinate system of the pallet.
9. After the teaching is completed, click the "Generate Script" button to automatically add a series of function blocks to the program. Among them, the corresponding execution actions can be added under the Group function block, such as the opening and closing of the gripper.

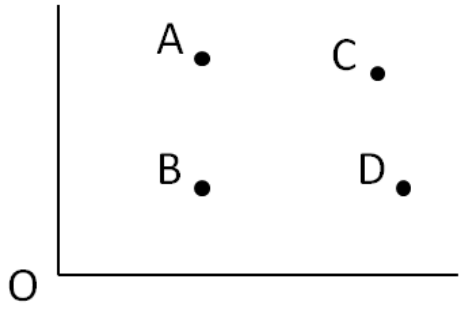


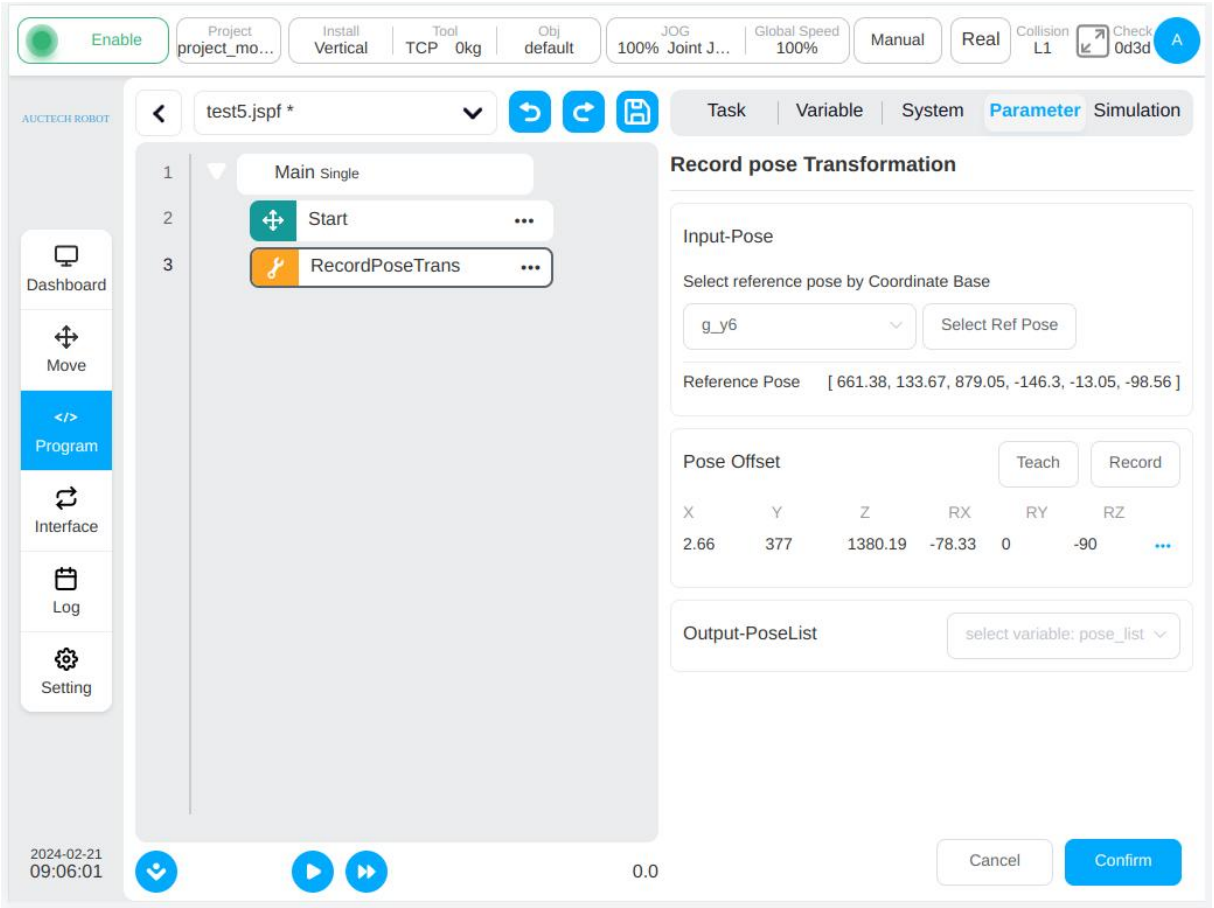
10. The program is set in a continuous cycle mode, and the palletizing program will calculate the offset according to the set parameters each time it is executed, and determine the position and posture of the next palletizing/depalletizing. In the variable area, you can view the current number of palletizing/depalletizing workpieces according to the set workpiece count variable

RecordPoseTrans

Operation point conversion teaching function block, used to do point conversion.

In the figure below, point O is the reference point, and the pose of points A, B, C, and D with respect to reference point O is unchanged. The operation point conversion teaching function block records the relative pose relationship of these points relative to reference point O, and outputs the pose of A ', B ', C 'and D' points when the pose of O changes. It is commonly used in visual identification positioning, laser locating and other occasions. For example, in the visual identification positioning scene, reference point O is the marker block of A station, and A, B, C, and D are the four workpieces of the station, and the workpieces are fixed relative to the pose of the marker block. The pose of the marking block in the robot base coordinate system is identified by the camera, and the pose of the workpiece in the robot base coordinate system is calculated by the operation point teaching function block.





The configuration page is shown in the figure, which consists of three parts: the reference point (point O) is set in "Input-reference pose", the operation point (A, B, C, D) is set in "Operation point offset", and the

variables are set to store the calculated operation point (A ', B ', C ', and D ') in "Output-conversion pose". In the configuration phase, the function block will record the deviation of the operating point (A, B, C, D) from the reference point (O); When the program is running, the pose of the operation point (A ', B ', C ', D ') is calculated according to the value of the current input variable (point O') plus the deviation.

Select a pose type global variable as the reference pose, click "Set as base", the current value of the variable will be used as the reference base (point O). Click "Teach to Add" in the operation point offset to jump to the mobile page, you can move the robot arm to select a point (A, B, C, D), and a new point is added after selection, and the configuration page will display the value of the added point under the base label. In the output field, select a pose_list variable to store the results of the calculation (A ', B ', C ', D ').

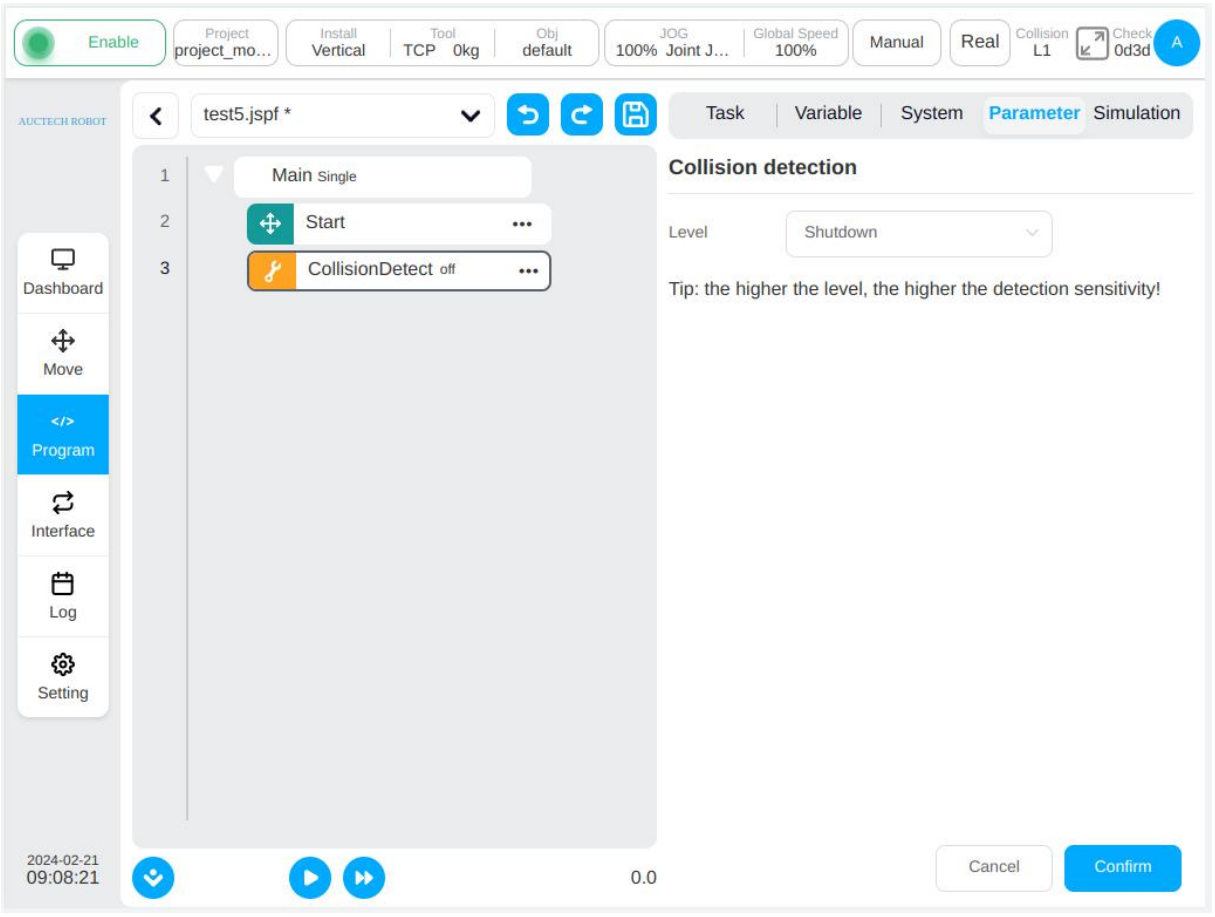
Force control related scripts

Current force control related scripts include Force, ForceGuard, ForceSetZero, ForceWait, ForceMove. For detailed application introduction, please refer to "AUCTECH CORE End Force Control Function Operation Manual".

CollisionDetect

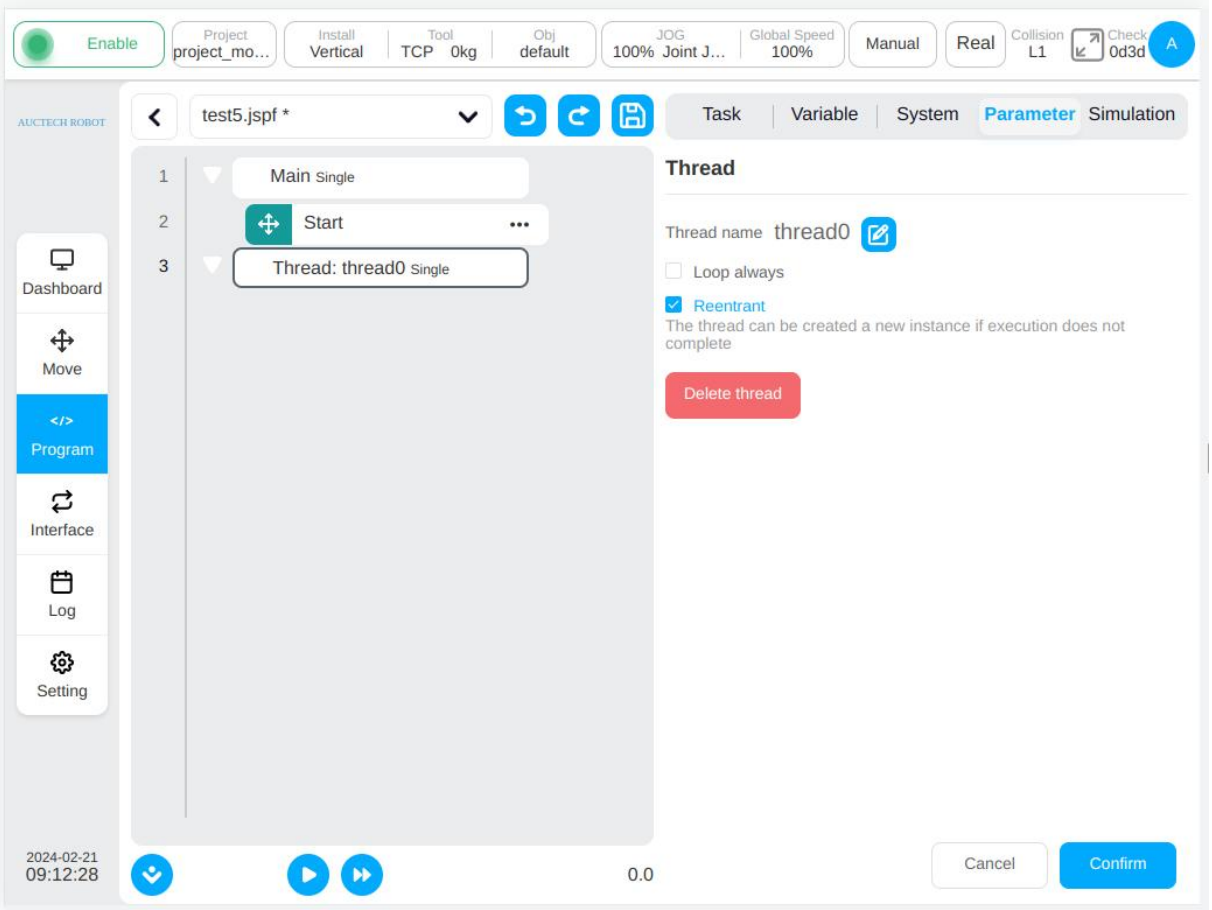
Collision detection level. This script can be used to set the sensitivity of collision detection during the running of the program.。

Care	● **The parameters set in this function block only affect the robot startup state and will not be saved when powered off. If you want to permanently set the collision detection sensitivity, set it in "Settings" - "Other Settings" - "Collision Settings" and save the project.**


Enable
Project
project_mo...
Install
Vertical
Tool
TCP 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
test5.jspf *
Task
Variable
System
Parameter
Simulation
Dashboard
Move
Program
Interface
Log
Setting
1
2
3
Main Single
Start
CollisionDetect off
Collision detection
Level
Shutdown
Tip: the higher the level, the higher the detection sensitivity!
2024-02-21
09:08:21
0.0
Cancel
Confirm

Thread

Threads that execute in parallel with the main program and interact with the main program through variables. In the parameter configuration area, you can set whether the thread is always looping. A maximum of 10 threads are allowed to be created in a program.



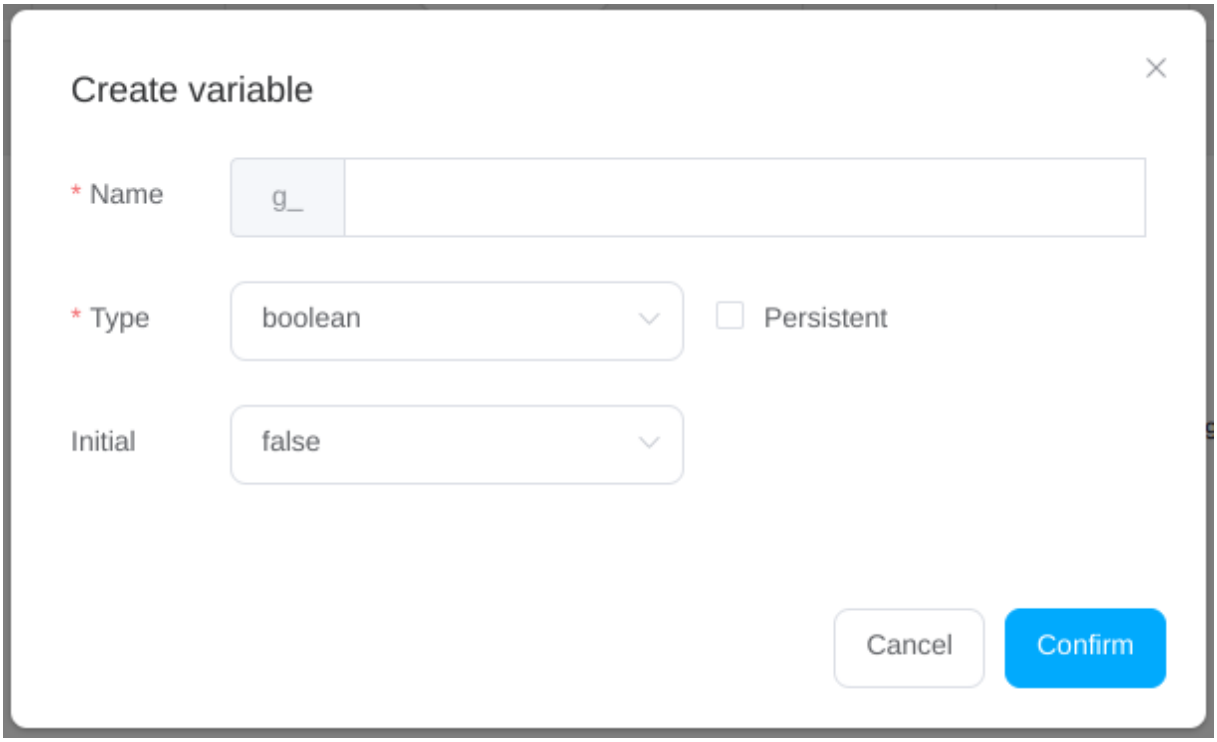
Care	• **Robot motion instructions are not allowed in the thread.**

11.4. Variable area

This page allows you to create values for program variables, monitor variables, and system variables. Program variables are different from system variables. System variables are applied to the whole project, while program variables only exist in the program.

11.4.1. Add Variable

Click the "Add Variable" button to pop up a dialog box, as shown in the figure. Enter the name of the variable, select the type and give the initial value to create it.



Program variables have the following types:

boolean: the Boolean, only to false or true

number: numeric types

string: the string type

num_list: array numeric type

pose: a data type that represents the Cartesian position of the robot

joints: a data type that represents the position of the robot's joints

joints_list： a list type that represents the position of the robot’s joints

pose_list：a list data that represents the Cartesian position of the robot

pose_speed：a data type that represents the end speed of the robot

pose_acc：a data type that represents the end acceleration of the robot

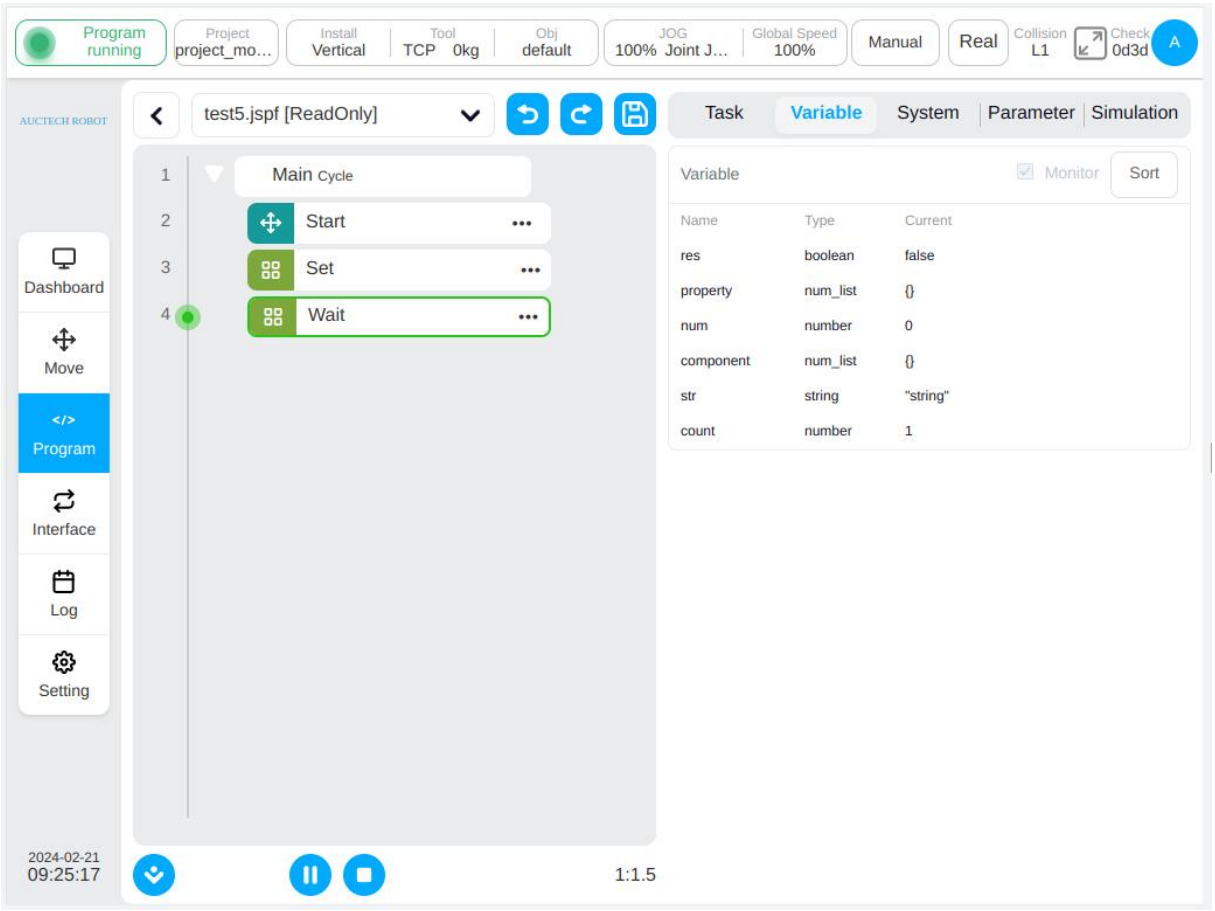
joint_speed：a data type that represents the angle velocity of the robot’s joints

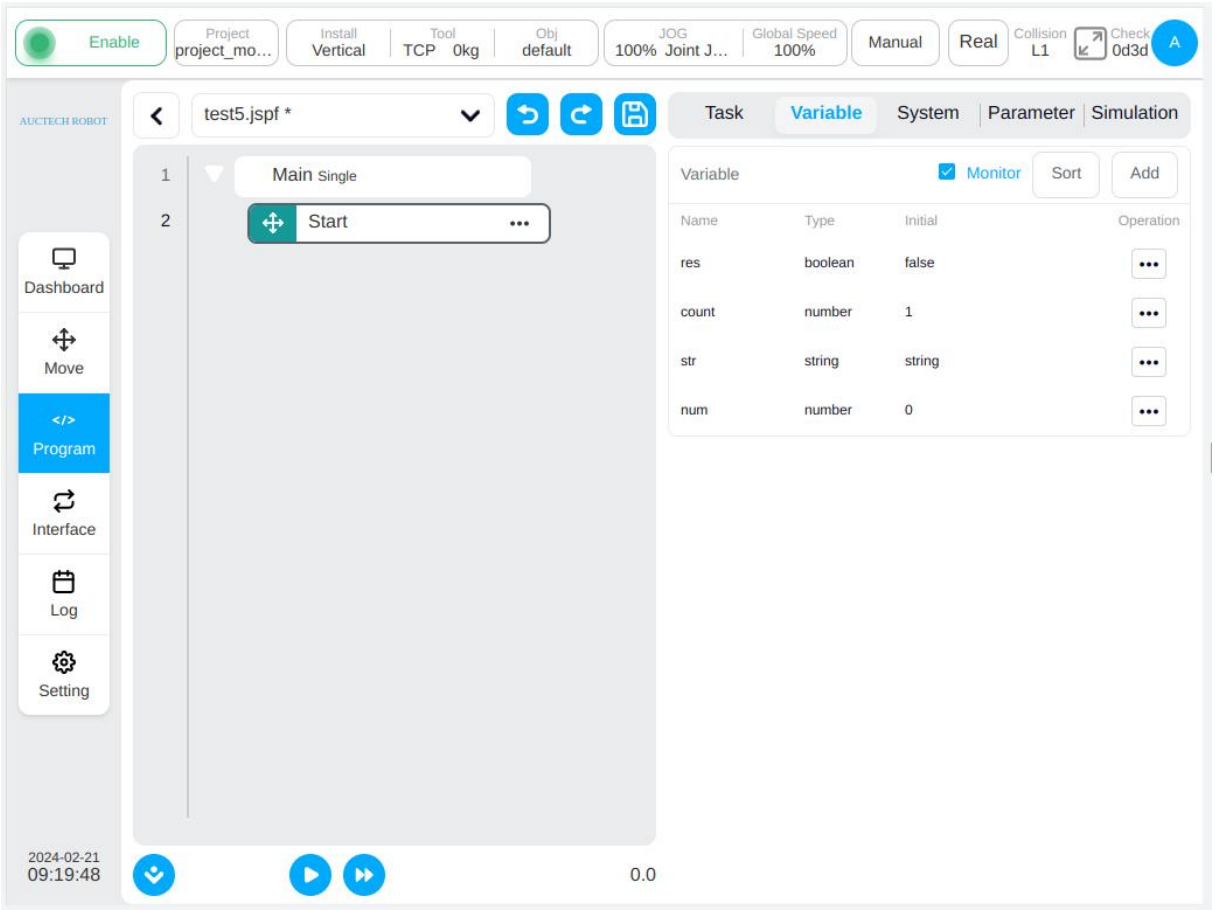
pose_acc：a data type that represents the angle acceleration of the robot’s joints

11.4.2. Variables Monitored

When "Variable Monitoring" is selected, the current value of the program variable can be displayed on this page during the running of the program. Click the Sort button to also sort the program variable names alphabetically.

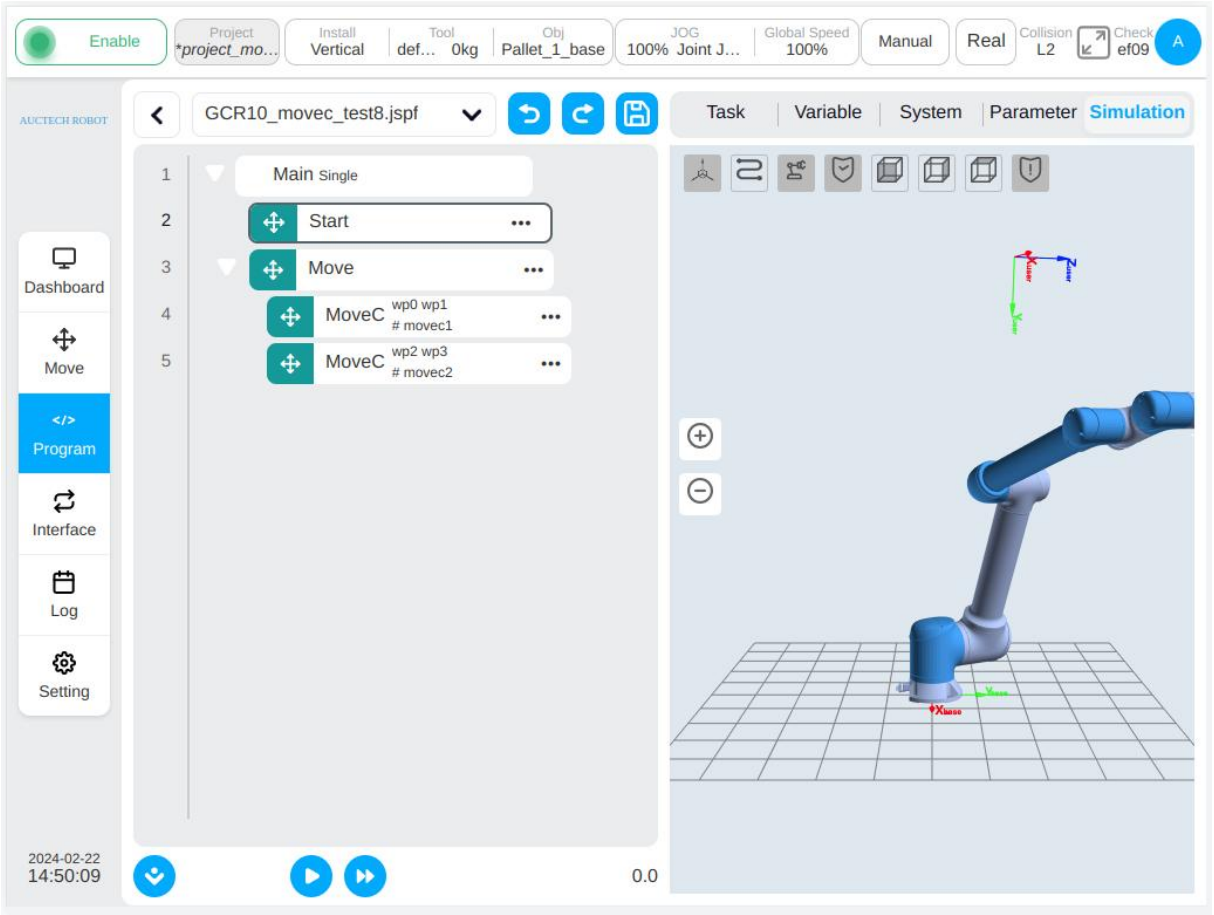
Caution	• **joints and pose variables should be monitored as num_list and the data unit are m/rad.**




Enable
Project
project_mo…
Install
Vertical
Tool
TCP 0kg
Obj
default
JOG
100% Joint J…
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
test5.jspf *
Task
Variable
System
Parameter
Simulation
Dashboard
Move
Program
Interface
Log
Setting
1
Main Single
2
Start
Variable
Monitor
Sort
Add
Name
Type
Initial
Operation
res
boolean
false
count
number
1
str
string
string
num
number
0
2024-02-21
09:19:48
0.0

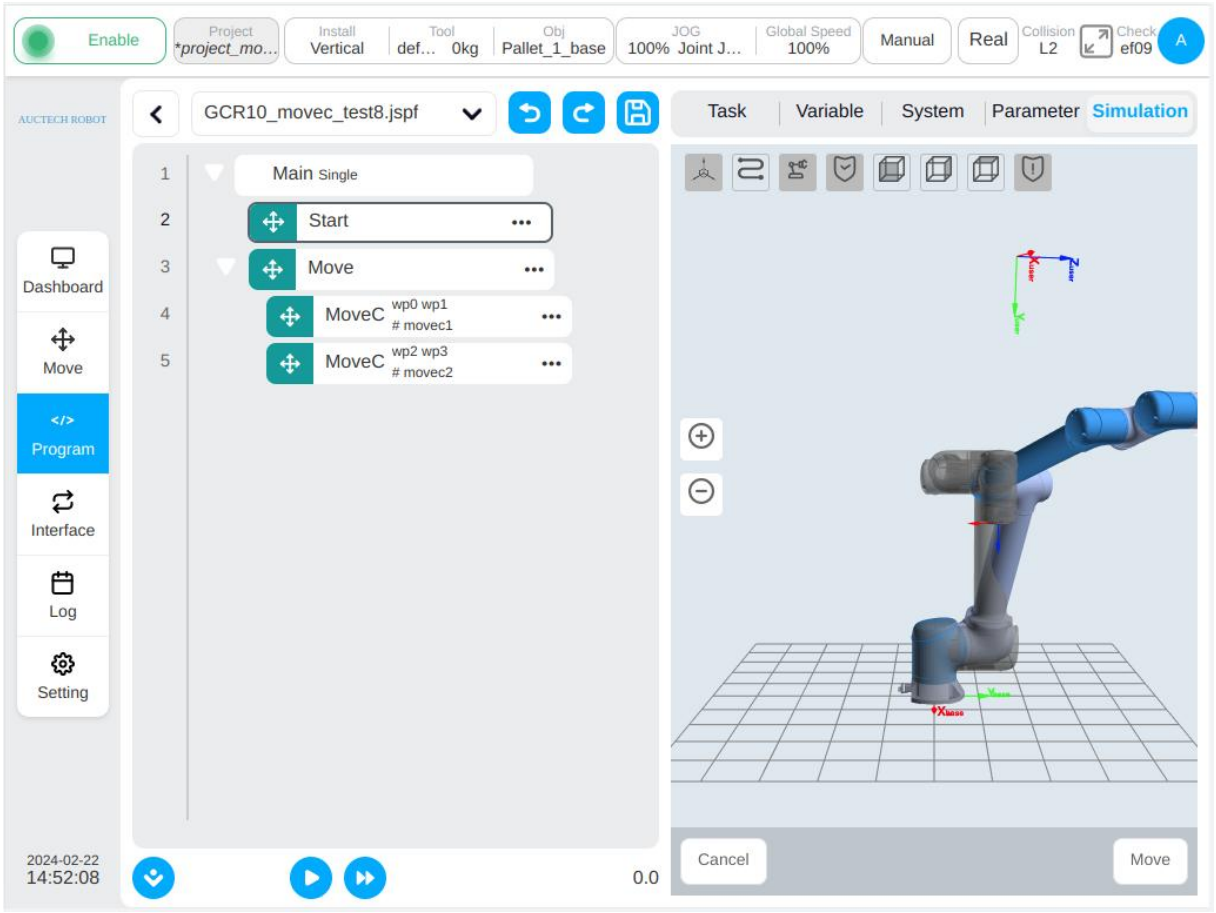
11.5. Run

Click on the "Simulation" TAB to go to the 3D model page, which shows the 3D model of the robot. The icon at the bottom left of the program tree controls the start and stop of the program, click icon button to run the program, click icon button steps the program. You can pause or stop the program at any time while it is running. Tap icon button set the program running process, the cursor automatically follow the command block, click icon enable automatically followed of program running.

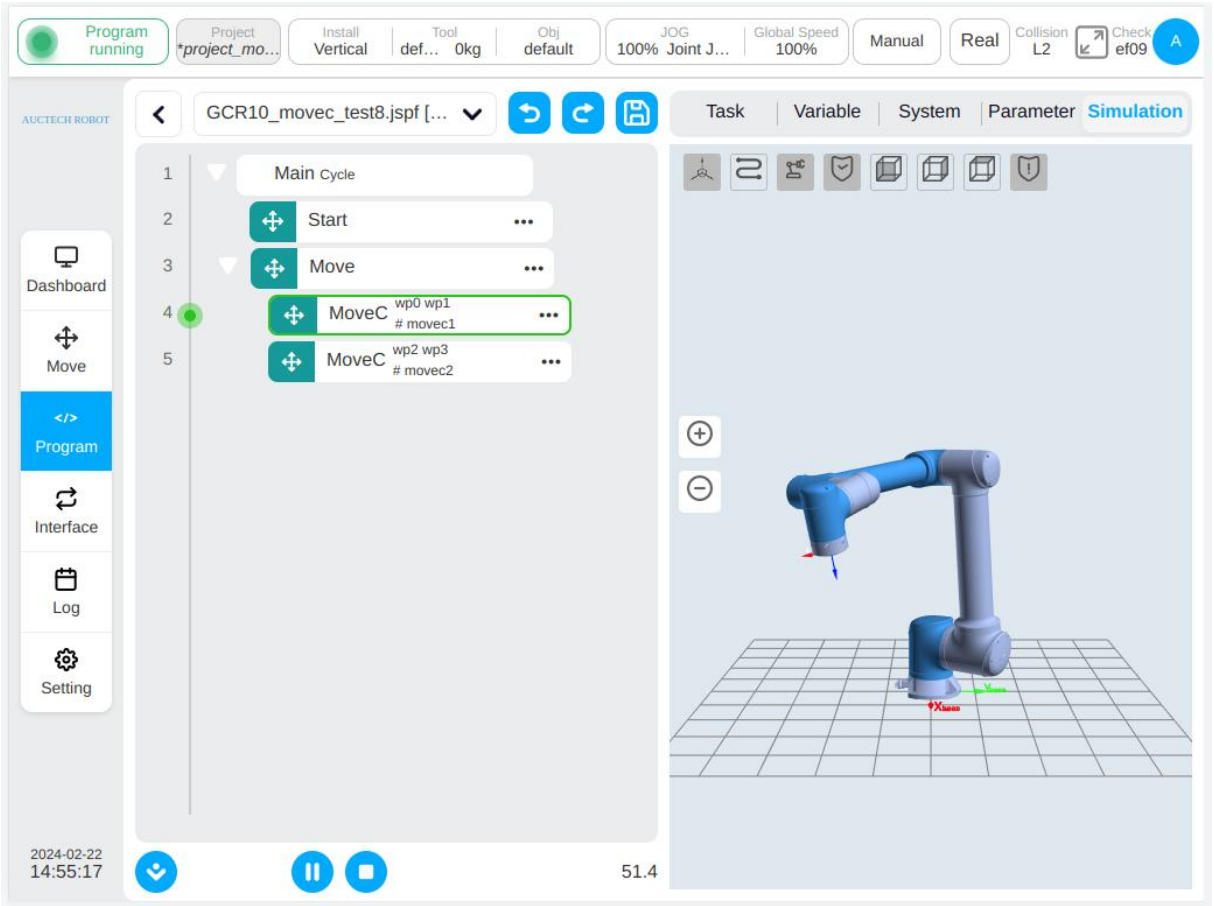


11.5.1. Run Program

When running the program, it will check whether the starting point of the program is consistent with the current point of the robot. If not, move to the starting point first, as shown in the figure, the 3D model will show the robot at the starting point (shown in gray). Click "Move" button, and the robot will move to the starting point.



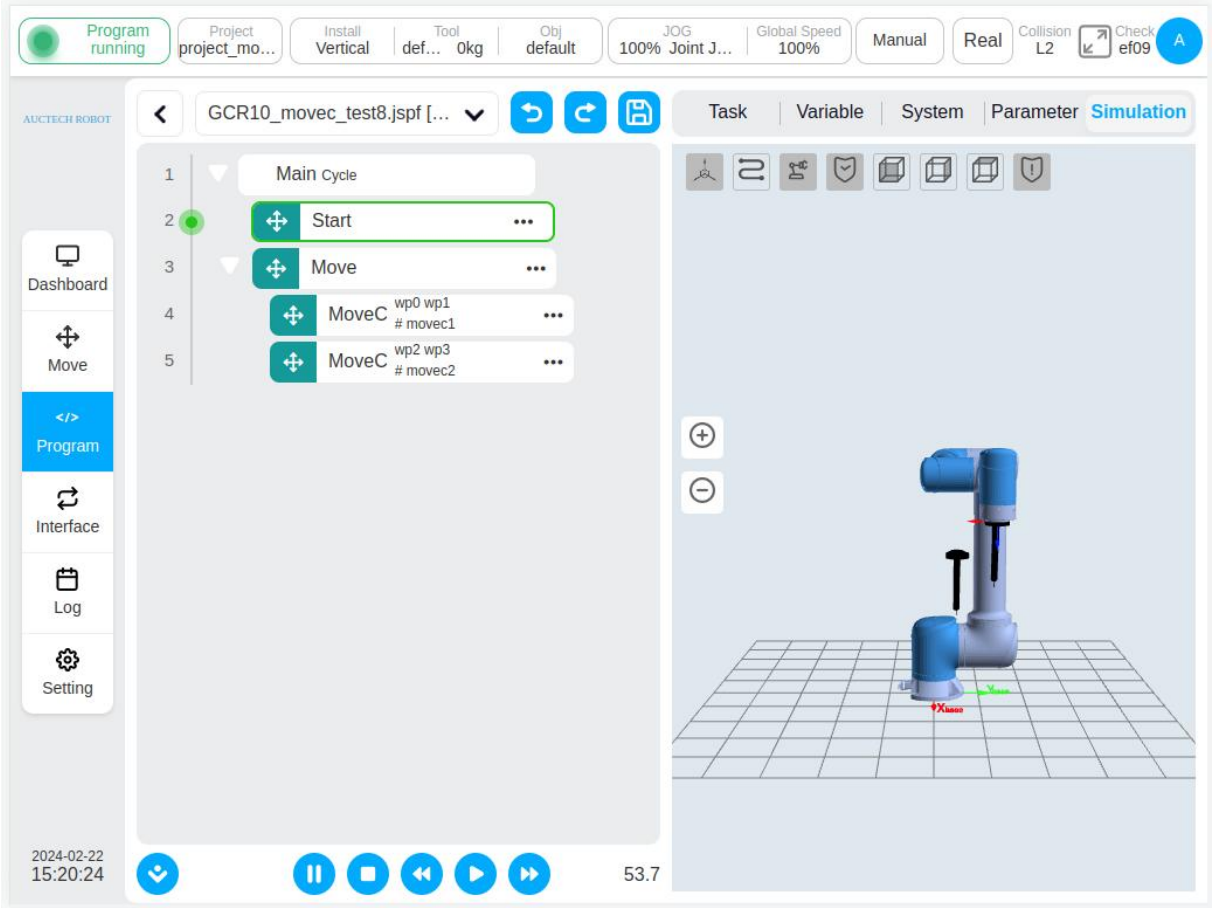
After moving to the starting point, click the button ▶ again and the program runs. As shown in the following figure, the running time of the program can be displayed below. The real-time position of the robot can be observed on the 3D model. The program tree on the left can display the currently executing function blocks. Click the control button below to suspend, resume and stop the program.



11.5.2. Program Step Mode

Click the button ⏩ to program step mode. When stepping, the starting point of the program will be checked first, and the robot will be moved to the starting point of the program. With each click of ⏩, the program moves down next function block. Click the button ▶ and the program will exit the single step mode and run continuously. You can pause and resume the program during a single step. Click button ⏪, and the backward operation will be executed. At this time, the robot will move backward to the last function block, and the backward operation is only for the function block of sports class.

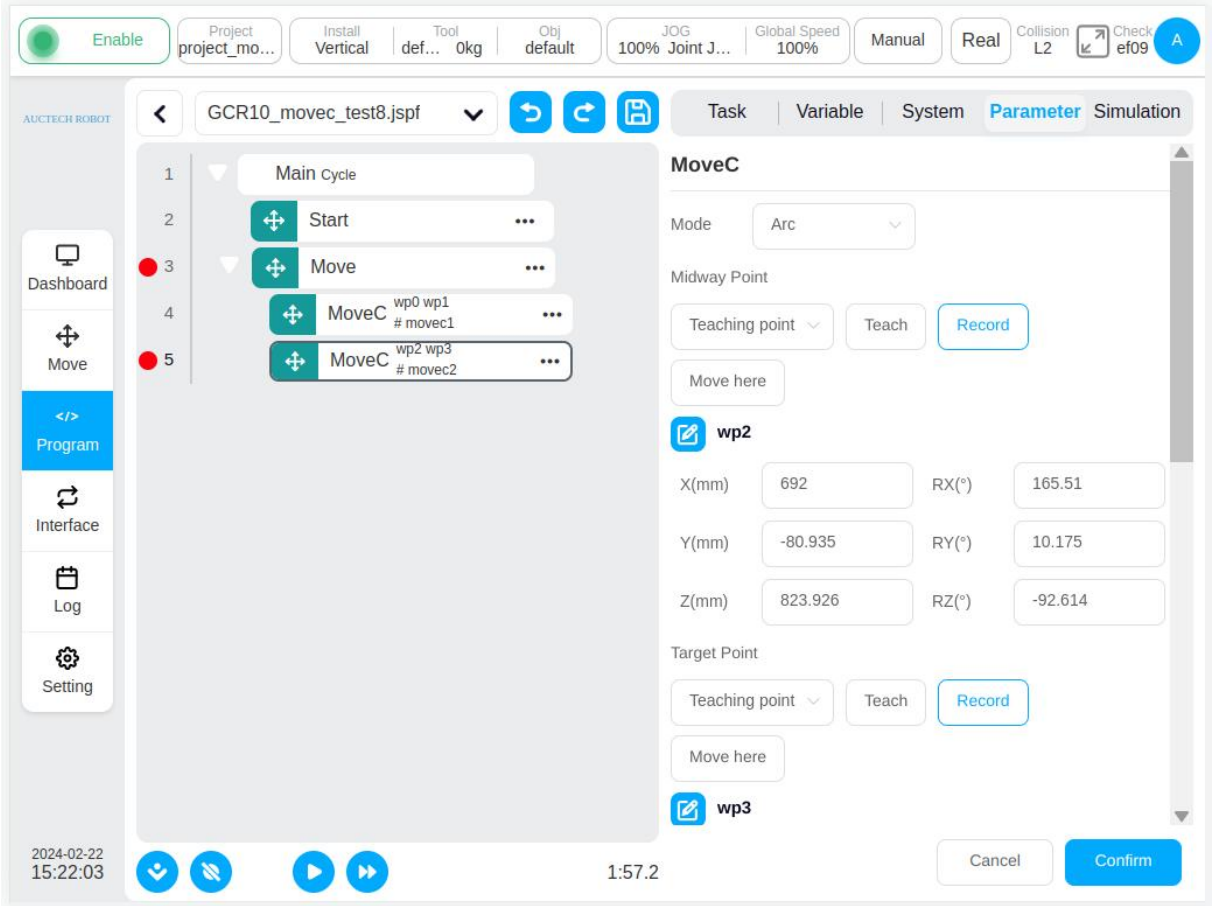
Click the Stop button, the program will stop running and exit the step state.



11.5.3. Breakpoint

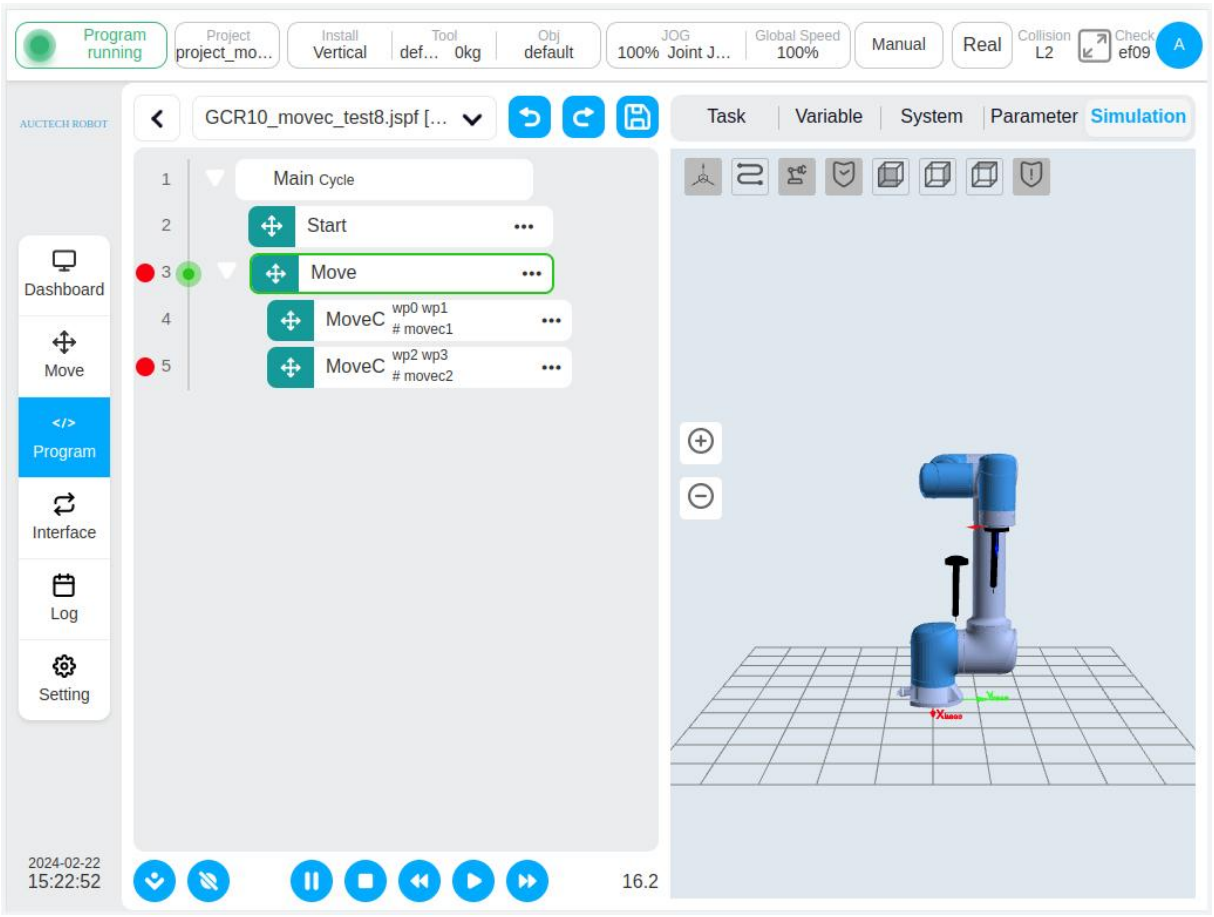
Support breakpoint debugging function, program will stop at the breakpoint and enter the program step mode.

In the program tree and script editing area, click on the left side of the program tree line number or the left side of the script line number to insert the breakpoint. Click the breakpoint again to cancel it. Click “Clear Breakpoint” button below to cancel all breakpoints.



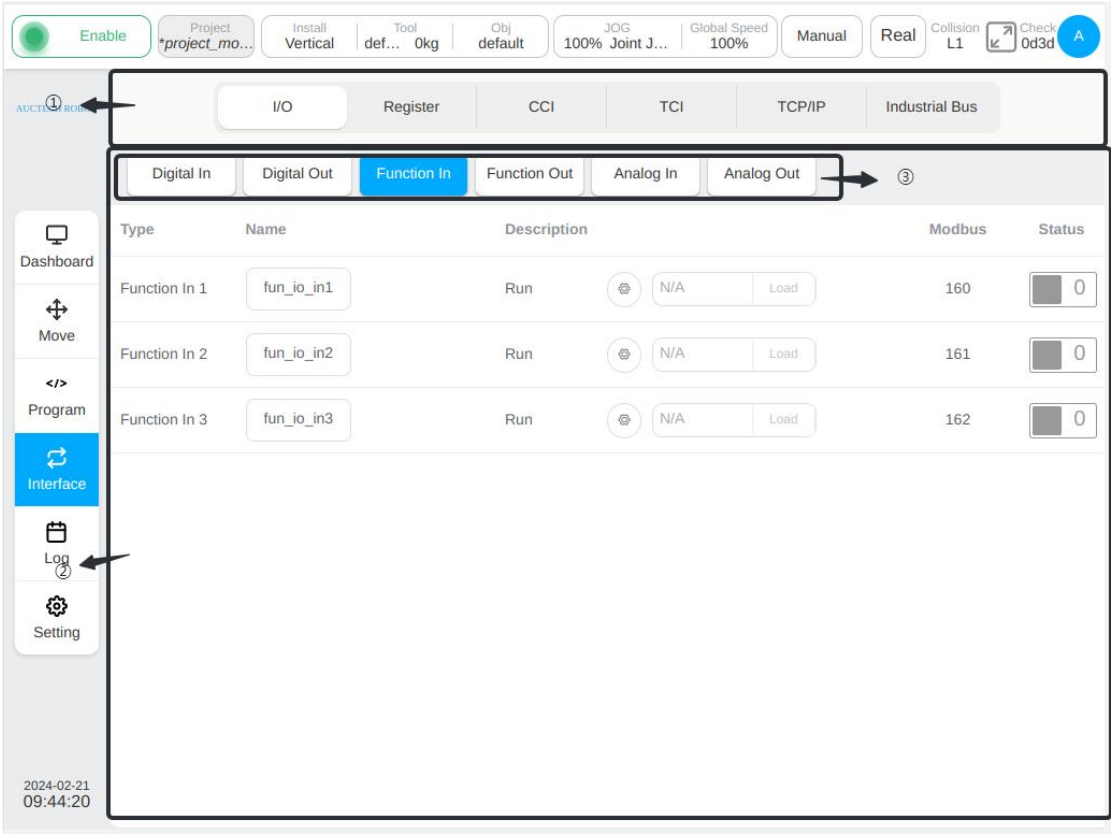
If the program is executing, it will stop at the breakpoint. And the program entre the program step mode, as show in the figure. Click ⏩ button, the program will execute step by step, (When run to a Script function block, it executes in a single line); Click ▶ button, the program will execute until next breakpoint or finish.

In the manual mode, the breakpoint can be insert or cancel at any moment.

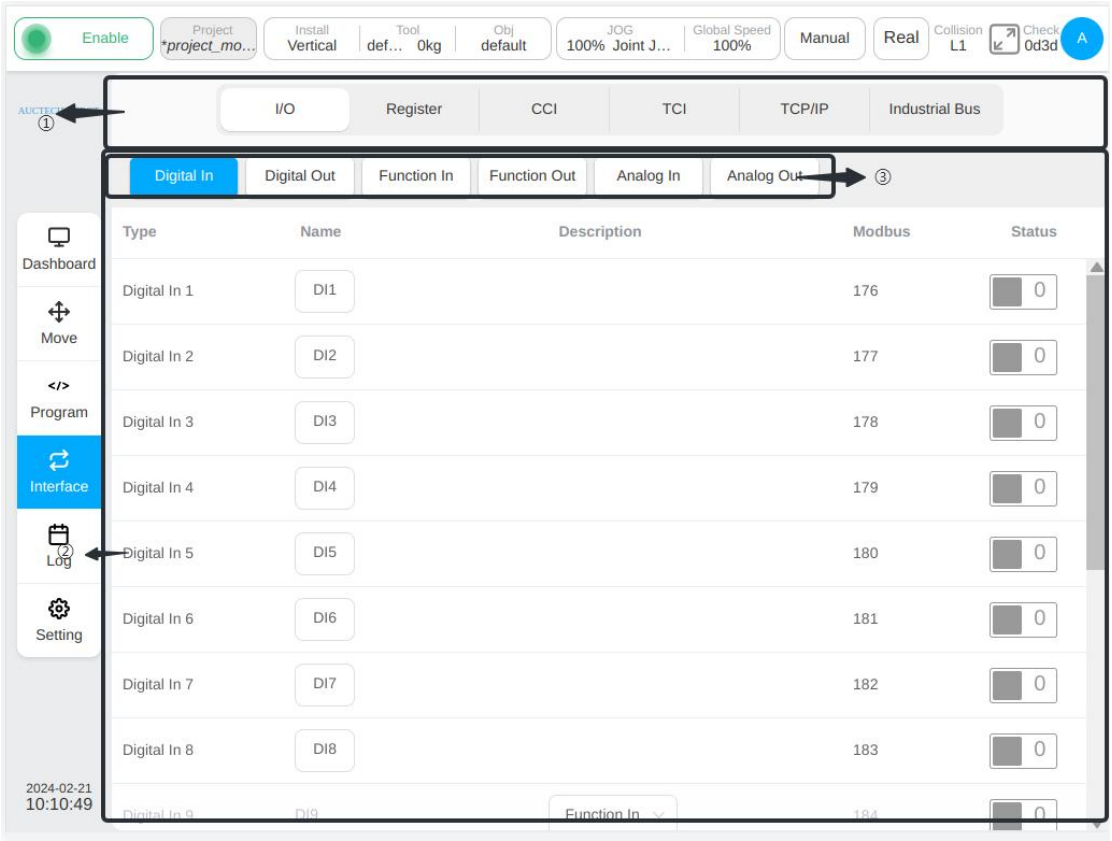

Program running
Project project_mo...
Install Vertical
Tool def... 0kg
Obj default
JOG 100% Joint J...
Global Speed 100%
Manual
Real
Collision L2
Check ef09
A
AUCTECH ROBOT
GCR10_movec_test8.jspf [...
Task
Variable
System
Parameter
Simulation
Dashboard
Move
Program
Interface
Log
Setting
1 Main Cycle
2 Start
3 Move
4 MoveC wp0 wp1 # movec1
5 MoveC wp2 wp3 # movec2
2024-02-22
15:22:52
16.2

12. Interface Page

Click "Interface" in the navigation bar to enter the I/O subpage under the interface page by default. Interface page has I/O, register, CCI, TCI, TCP/IP, industrial bus a total of 6 subpages. According to the model of the control cabinet, it is divided into two kinds of pages, as is shown in the figure:



Adaptive to DC30D control cabinet



Adaptive to DC00 / DC15S-J9E3 / DC30D-J9E3 control cabinet

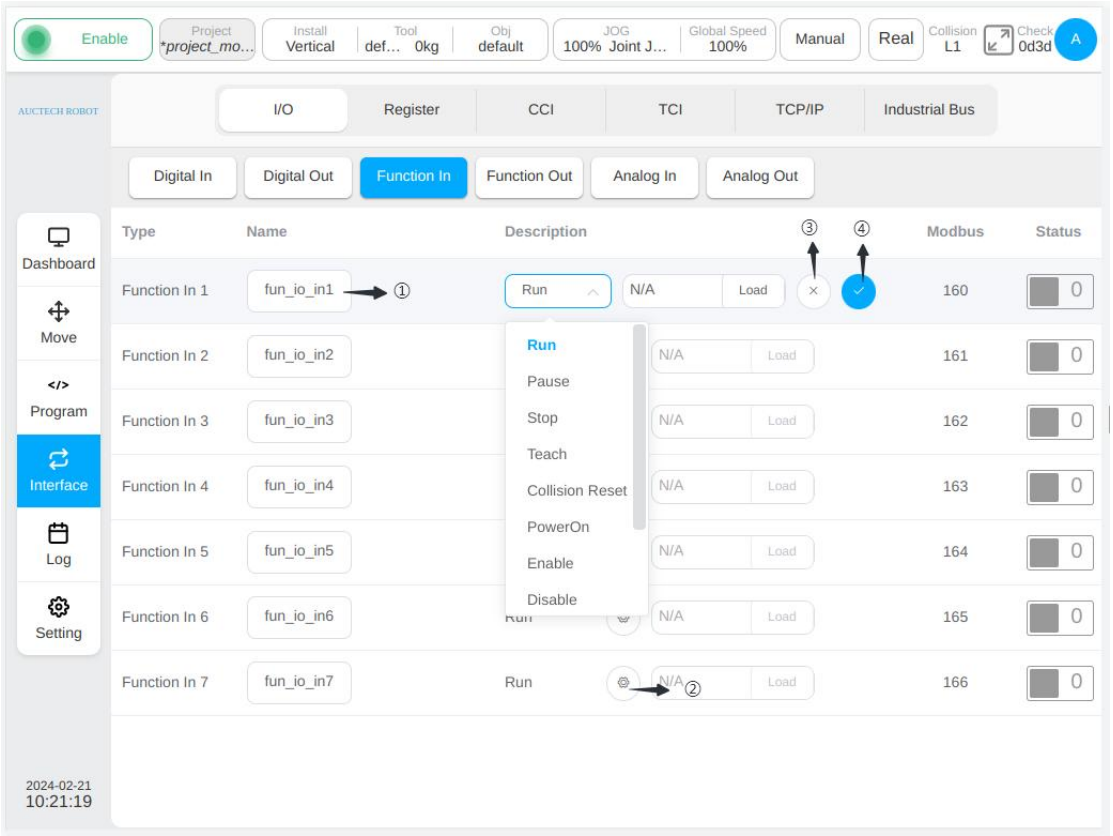
The top of the page ① is the interface page subpage TAB, the bottom ② is the corresponding subpage display area. When the user selects a different subpage option, the area ② corresponds to the display content of the option.

12.1. I/O

The area ② in the figure shows the corresponding content of different tabs of the I/O subpage, and ③ above the display area of the I/O subpage is the label made for different input and output under the I/O subpage.

For the DC30D control cabinet, there are 5 types of function input, function output, general input, general output and analog input in the I/O subpage, respectively. Click different label bars to switch and display input or output status information of 5 types.

The function input interface can monitor the 8-way digital input state and basic information of a specific function that can be set in the control cabinet. Click the function input name, the ordinary virtual keyboard will pop up, you can modify the function input default name. When the function is modified and the default name is entered, the icon as shown in the figure ① will appear on the right side of the name display box. Click the icon to restore the function input name to the corresponding default name.

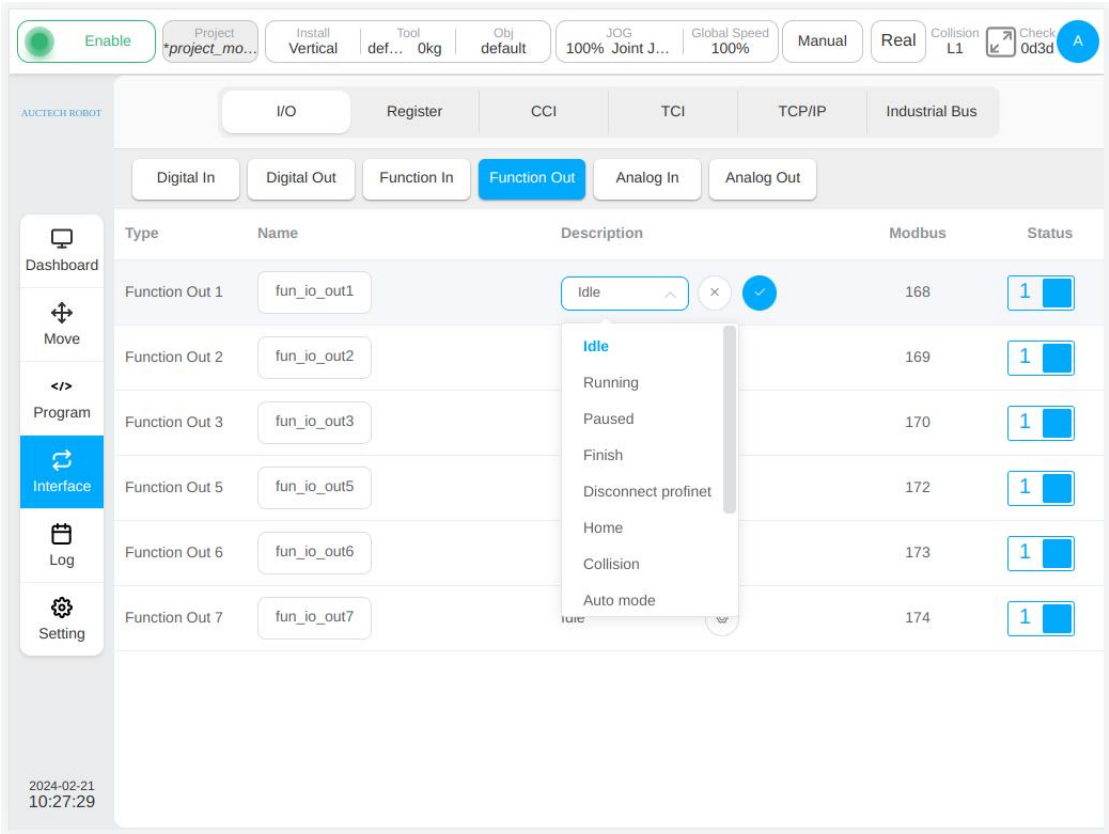


Click the icon ② corresponding to function input in the figure, and the function Settings selector, icons ③ and ④ will be displayed to select function Settings for function input. In the display function selector drop-down box, select the function to input the desired function, and click the icon ④ to determine the selected function. You can also click the icon ③ to cancel the selected function. When the function input signal is triggered, the set function is started. At present, the function input supports the following functions: running program, suspending program, stopping

program, traction teaching, collision detection reset, powered on, enabled on, enabled off, powered off, and system shutdown.

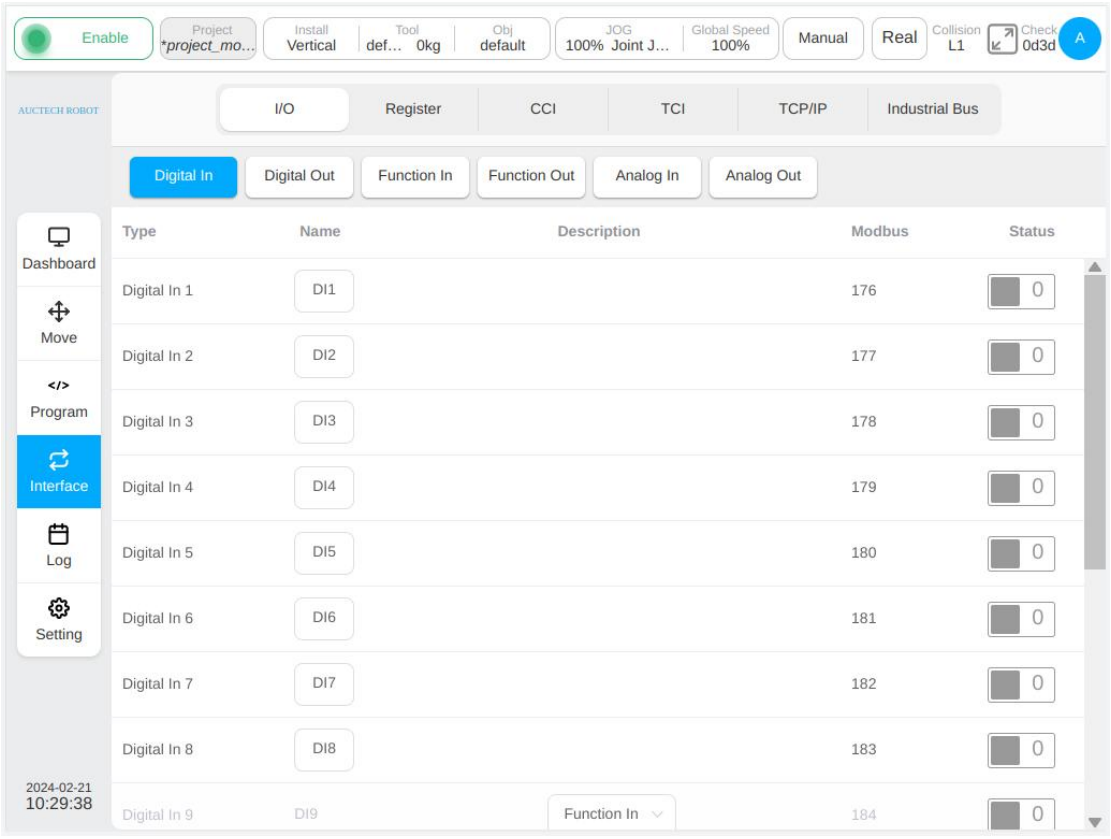
Care	• **Running program, suspending program, stopping program is triggered by rising edge trigger signals.**

The function output interface can monitor the 8-way digital output state and basic information of a specific function that can be set in the control cabinet, as shown in the figure. Similar to the function input interface, it can modify the corresponding name of the function output and select the function settings of the function output. In the function Settings selector drop-down box, select the predefined system status quantity bound to the function output. After clicking the OK icon, the function output will reflect the status of the set system status quantity. Currently, the states supported by the functional output for binding are: IDLE, Program Run, Pause, Program End, profinet disconnect, Home position, collision, automatic mode, not powered on, not enabled, robot arm moving and ethernet disconnect.

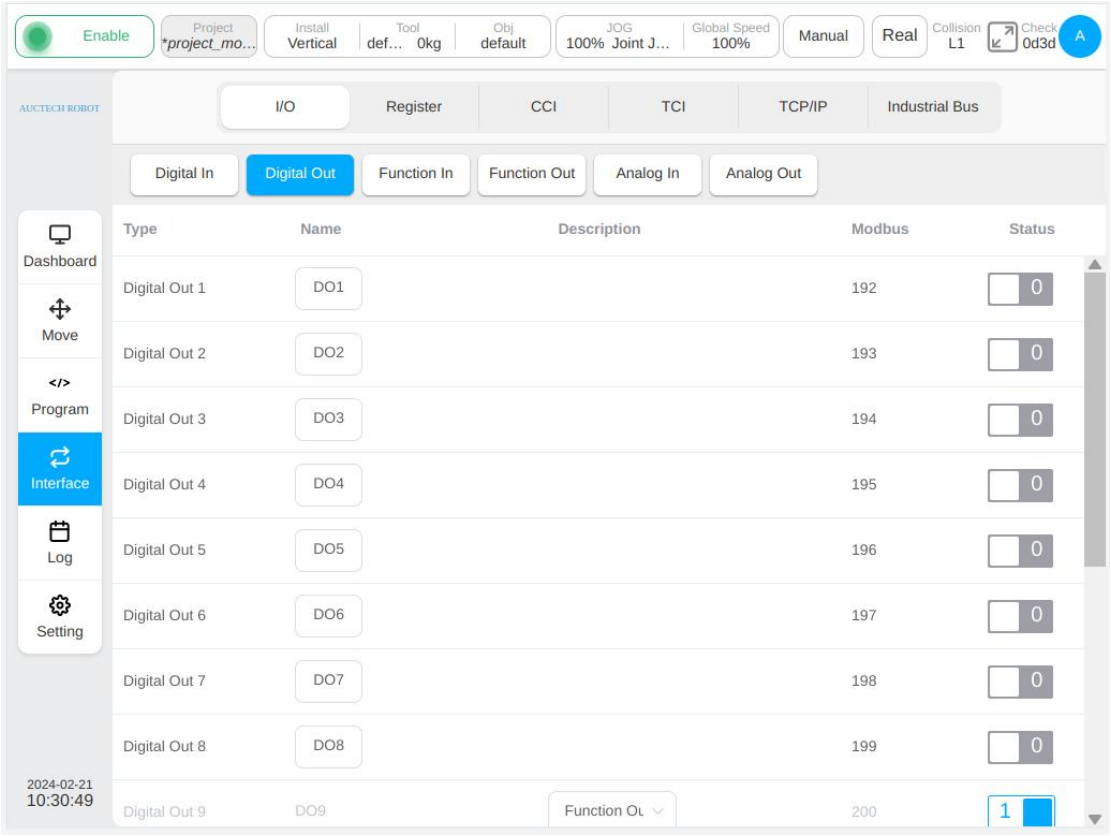


The general input interface can monitor the general 16-channel digital input status and basic information in the control cabinet, as shown in the figure. Different from the function input and

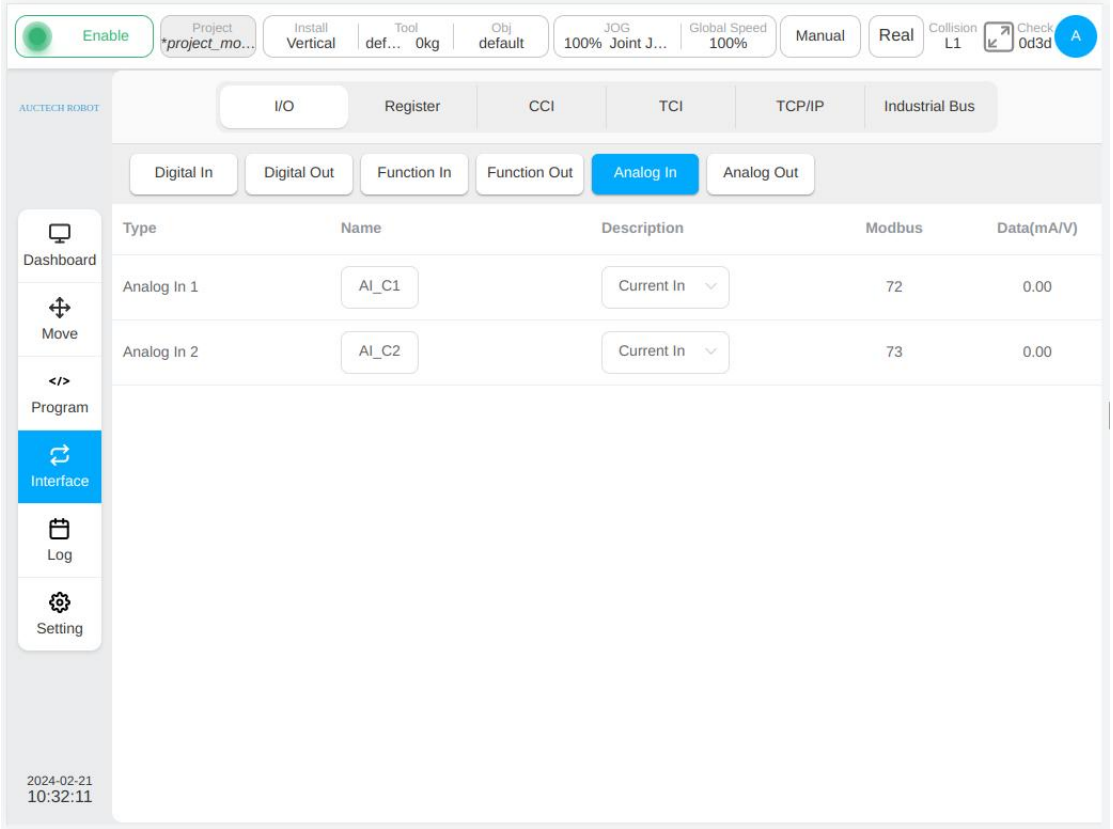
function output interface, only the corresponding name modification and restoration of the input signal can be carried out, and no specific function can be set.



The general output interface can monitor the state and basic information of ordinary 16-channel digital output in the control cabinet, as shown in the figure. The interface can only modify the corresponding name of the output signal and restore it after modification, and no specific function can be set.

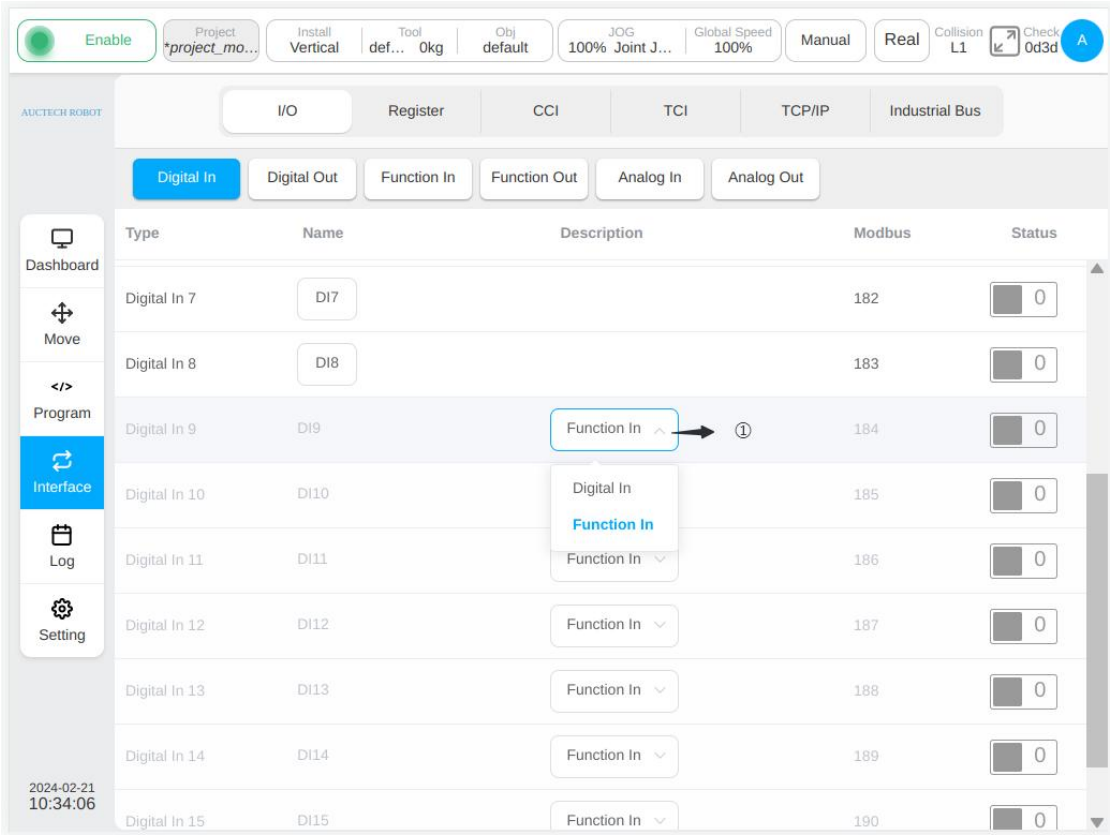


The analog interface can monitor the 4-channel analog current input signal and 4-channel analog voltage input signal, as shown in the figure. Similarly, click the analog input signal name display box to modify the signal name. The operation is similar to the functional I/O and general I/O described above.

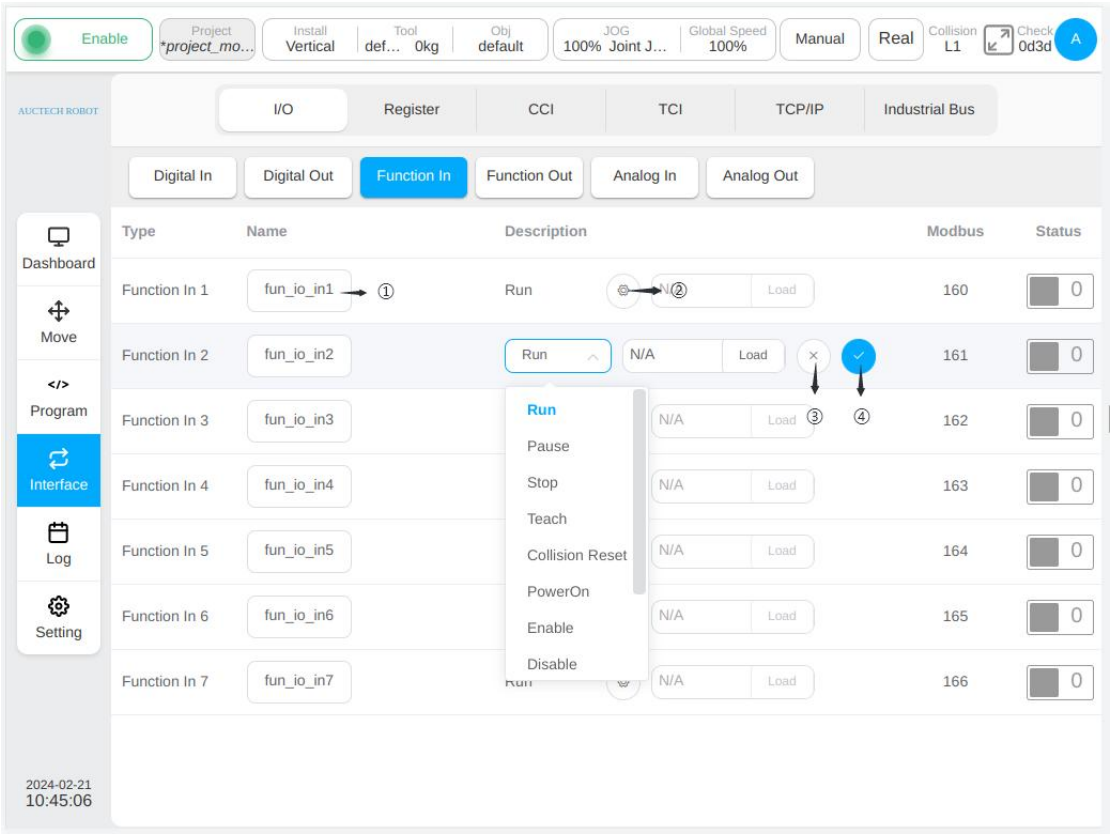


For DC00 / DC15S-J9E3 / DC30D-J9E3 control cabinets, there are six types of general input, general output, function input, function output, analog input, and analog output in the I/O subpage. Click different label bars to switch and display six types of input or output status information.

The general input interface can monitor the status and basic information of the ordinary 16-way digital input in the control cabinet, as shown in the figure. The eight digital input types from DI9 to DI16 can be configured as function input or general input in the description column ① of the page.



If you select each digit input as function input, the digit input status is disabled on the I/O general input page, and the digit status configured as function input is displayed on the function input subpage. For example, if DI9 and DI10 are configured as function input, the function input TAB page under the I/O subpage is shown in the following figure.

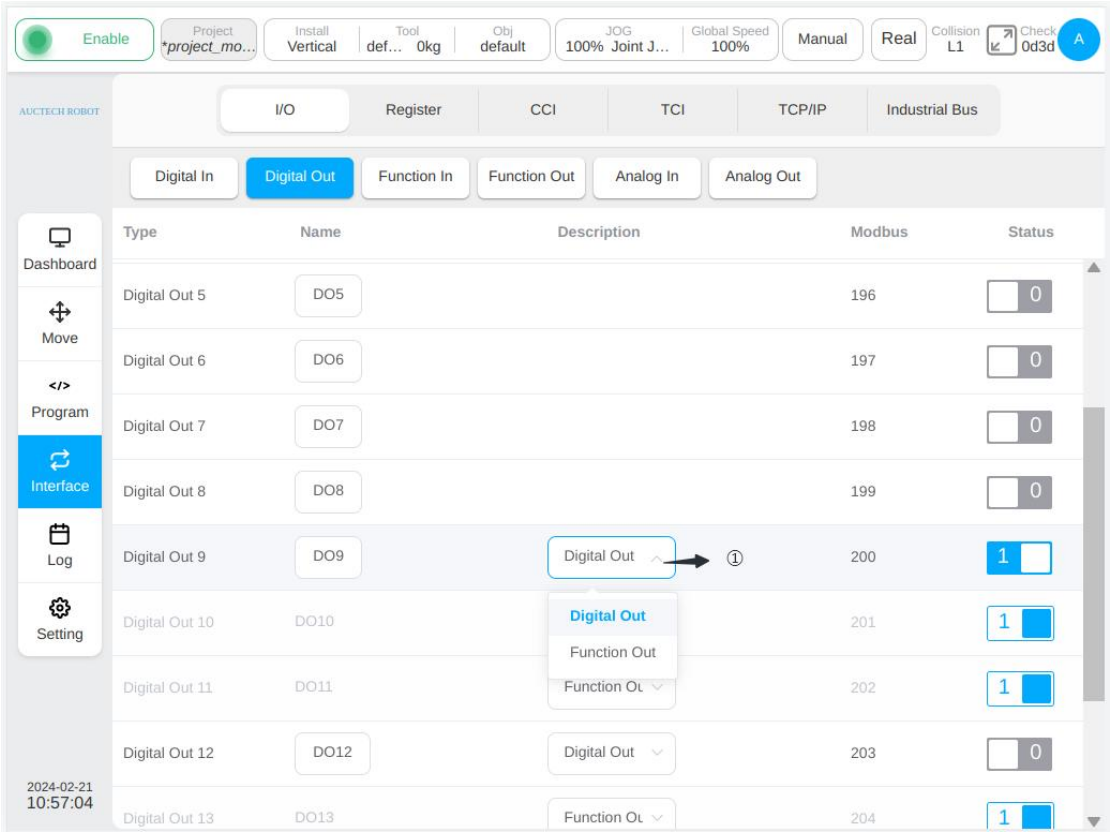


Similarly, clicking a function input name will bring up an ordinary virtual keyboard, and you can modify the default name of the function input. After you enter the default name for the modified function, the icon ① in the above figure is displayed on the right of the name display box. Click the icon to restore the function input name to the corresponding default name.

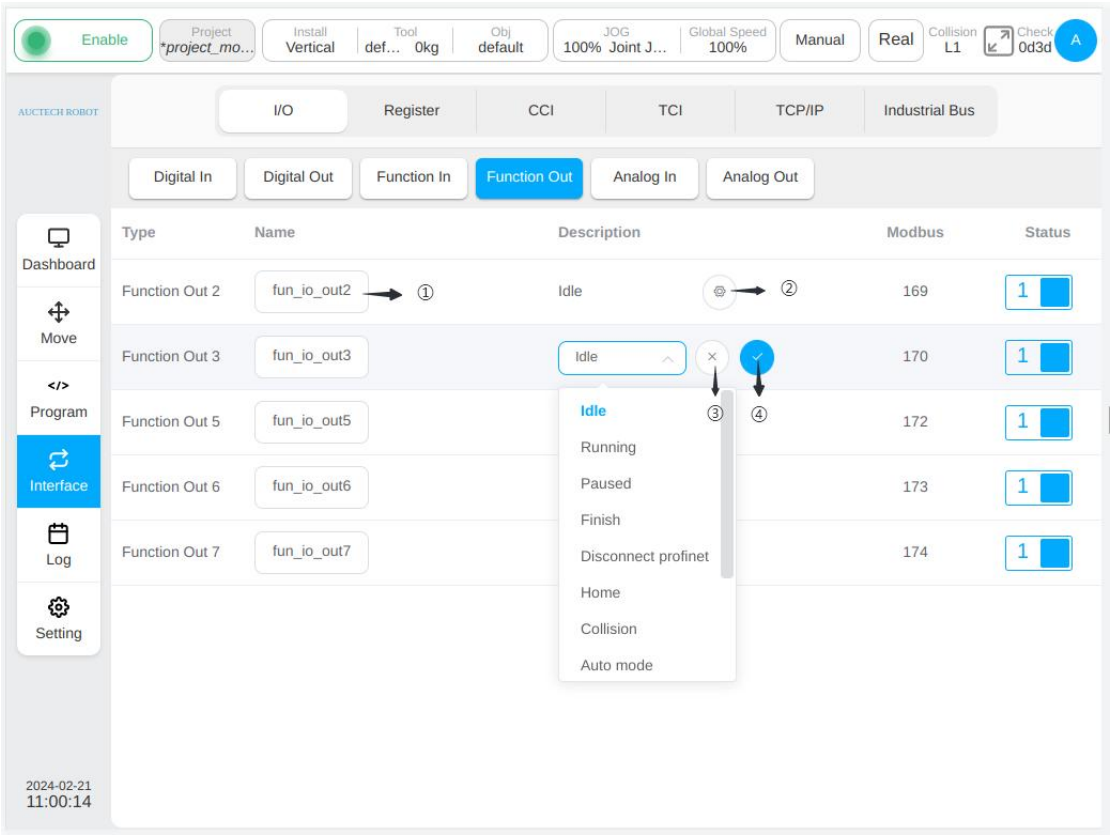
Click the corresponding function input icon ② in the figure, the function Settings selector, icon ③ and icon ④ will be displayed, and you can select the function settings of the function input. Select the function in the display function selector drop-down box and enter the function item you want to set. Click the icon ④ to determine the selected function item. You can also deselect the selected feature by clicking icon ③. When the function input signal is triggered, the set function is activated. The current function input supports the following functions: running program, suspending program, stopping program, traction teaching, collision detection reset, powered on, enabled on, enabled off, and powered off.

Care	● **Running program, suspending program, stopping program is triggered by rising edge trigger signals.**

The general output interface can monitor the status and basic information of the ordinary 16-channel digital output in the control cabinet, as shown in the figure. The DO9-DO16 digital input types can be configured as function input or general input in the description column ① of the page.



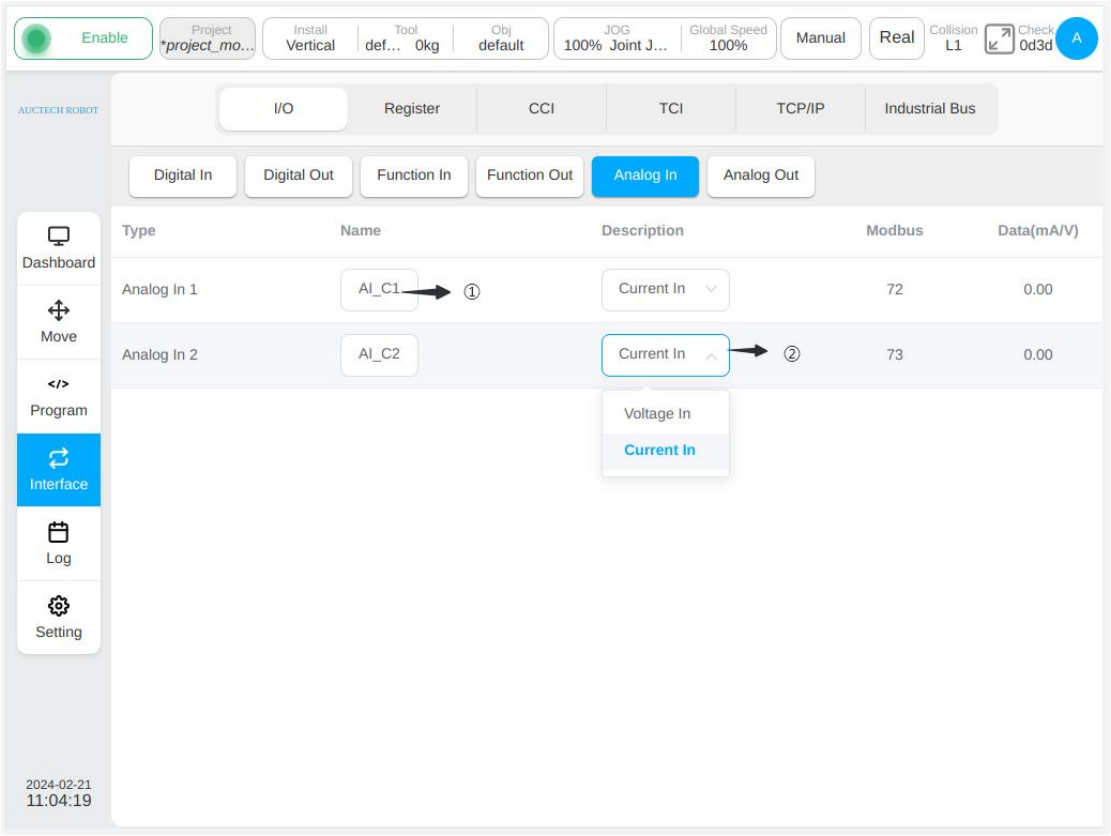
Similarly, if each general digital output is selected as function output, the digital output of this path is displayed as disabled on the I/O general output page, and the digital status of each path configured as function output is displayed on the function output sub-tab page. For example, DO9, DO10, DO11, and DO12 are configured as function output. The following figure shows the function output TAB page of the I/O subpage.



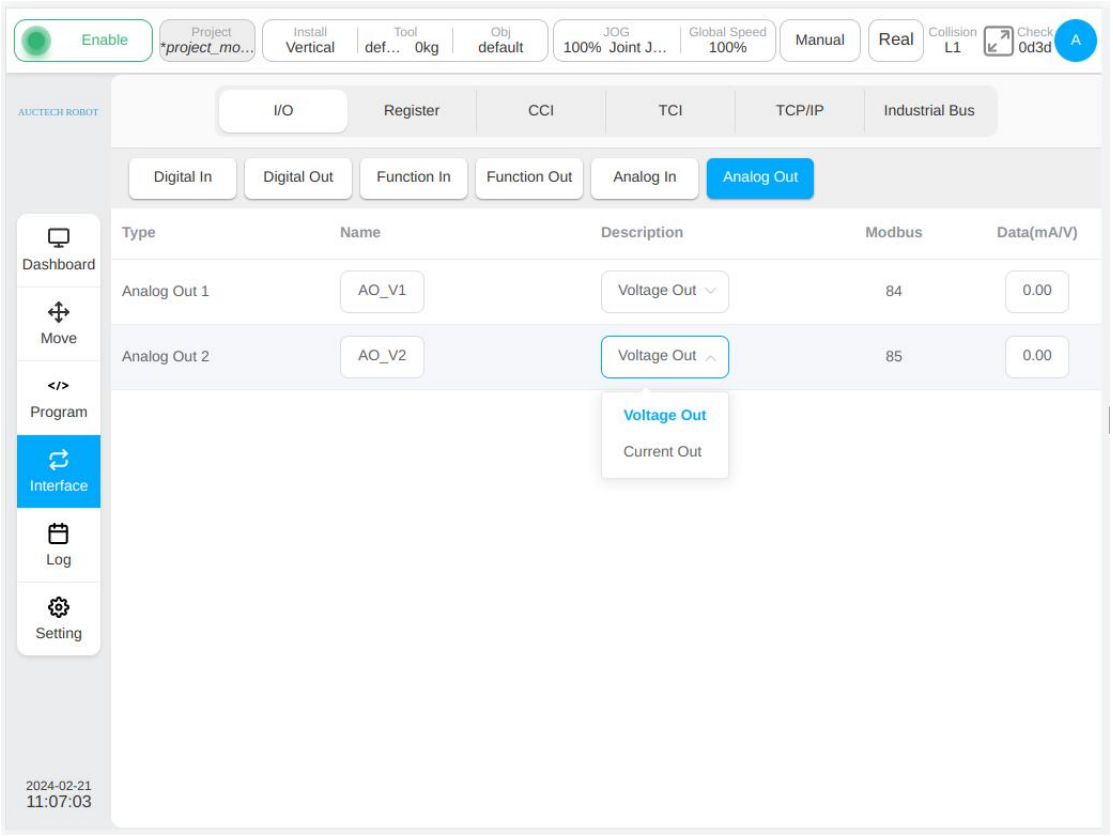
In the same way as the function input TAB, click the function output name, and an ordinary virtual keyboard is displayed. You can modify the default name of the function output. After the default function output name is changed, icon ① in the above figure is displayed on the right of the name display box. Click the icon to restore the function output name to its default name.

Click the corresponding function output icon ② in the figure, the function Settings selector, icon ③and icon ④ will be displayed, and the function settings of the function output can be selected. In the display function selector drop-down box, select the function item that the function output wants to set. Click the icon ④ to determine the selected function item. You can also deselect the selected feature by clicking icon ③. When the function output signal is triggered, the set function is started. Currently, the function output supports the following functions: idle state, program running state, pause state and program ending state, profinet disconnect, Home position, collision, automatic mode, not powered on, not enabled, robot arm moving, ethernet/ip disconnect.

The analog input interface can monitor 2 analog input signals, as shown in the figure. Similarly, click the analog input signal name display box to modify the signal name. After modifying the analog input default name, icon ① in the figure will be displayed on the right side of the name display box. Click the icon to restore the analog input name to the corresponding default name. And the analog input signal can be explained in the description column icon ② to select the voltage input or current input.



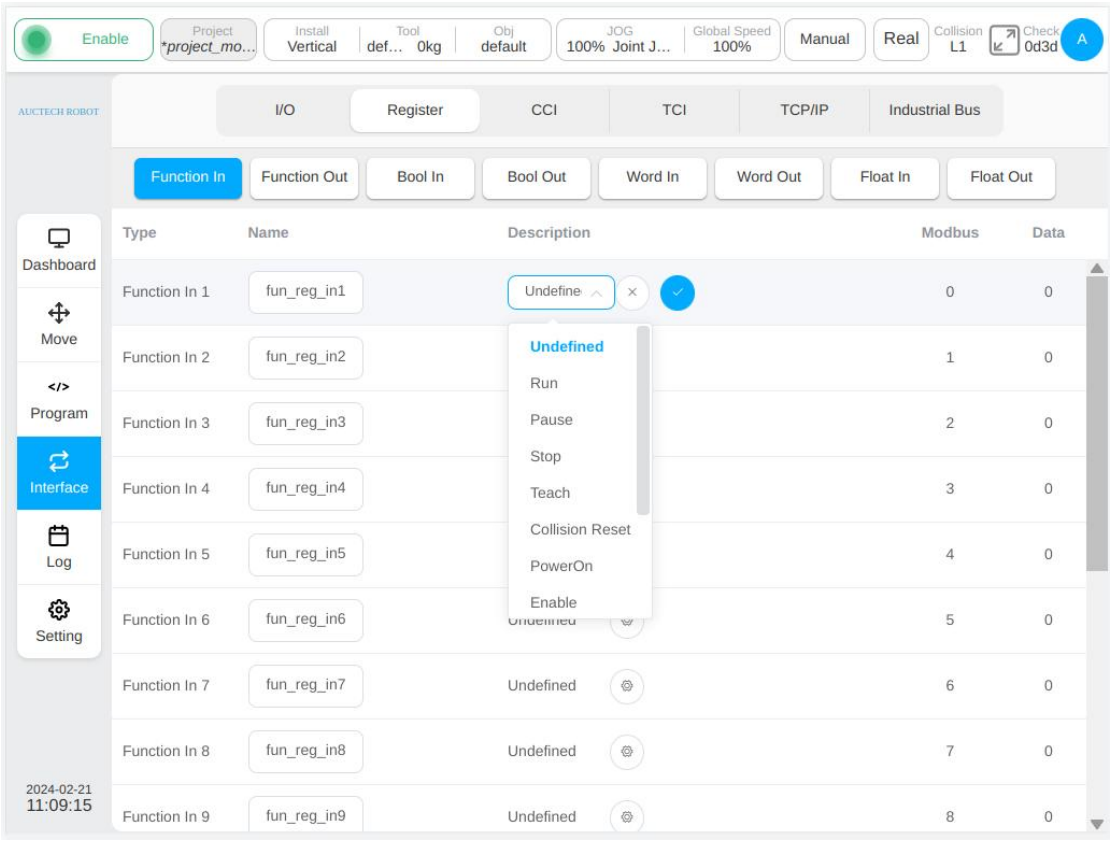
The analog output interface can monitor 2 analog output signals, as shown in the figure. Similarly, click the analog input signal name display box to modify the signal name. The operation is similar to the analog input described above and is not repeated here. And the analog output signal can be explained in the description column configuration selection, you can choose the voltage output or current output.


Enable
Project
*project_mo...
Install
Vertical
Tool
def... 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
I/O
Register
CCI
TCI
TCP/IP
Industrial Bus
Digital In
Digital Out
Function In
Function Out
Analog In
Analog Out
Dashboard
Move
Program
Interface
Log
Setting
Type
Name
Description
Modbus
Data(mA/V)
Analog Out 1
AO_V1
Voltage Out
84
0.00
Analog Out 2
AO_V2
Voltage Out
85
0.00
Voltage Out
Current Out
2024-02-21
11:07:03

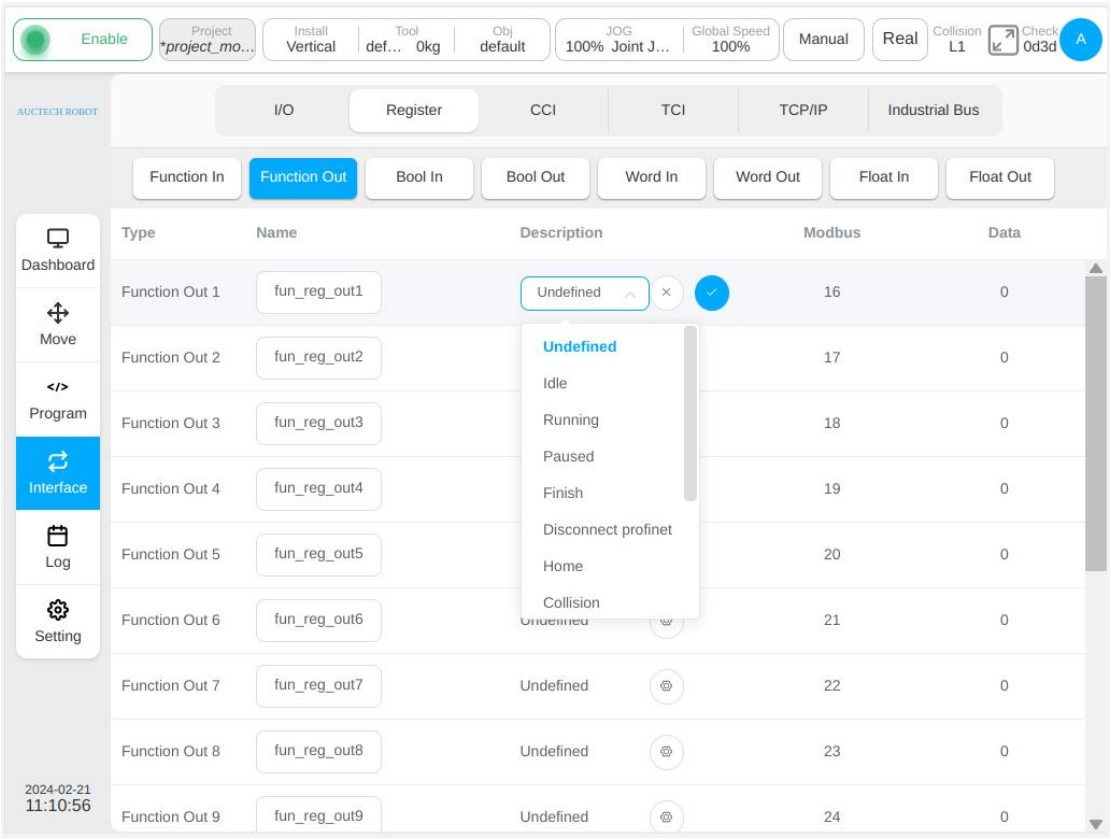
12.2. Register

The register subpage is similar to the I/O subpage. At the top of the page are labels for different types of input and output. There are eight types of input: functional input, functional output, Bool input, Bool output, Word input, Word output, Float input and Float output. Clicking different tabs toggle displays 8 types of input or output data information.

The register functional input interface can monitor the state information of the robot's internal 16-channel functional input registers, as shown in the figure. As with the function input of the I/O subpage, the function input name can be modified and restored after modification, and the register signal can be set to a specific function. The current register function input support is the same as the function input support in the above I/O subpage.



The register function output interface can monitor the state information of the 16-channel function output registers inside the robot, as shown in the figure. As with the function output of the I/O subpage, the function output name can be modified and restored after modification, and the register signal can be bound to a system-specific predefined state quantity. At present, the number of binding states supported by the output of register function are: idle state, program running state, pause state and program ending state, profinet disconnect, Home position, collision, automatic mode, not powered on, not enabled, robot arm moving.

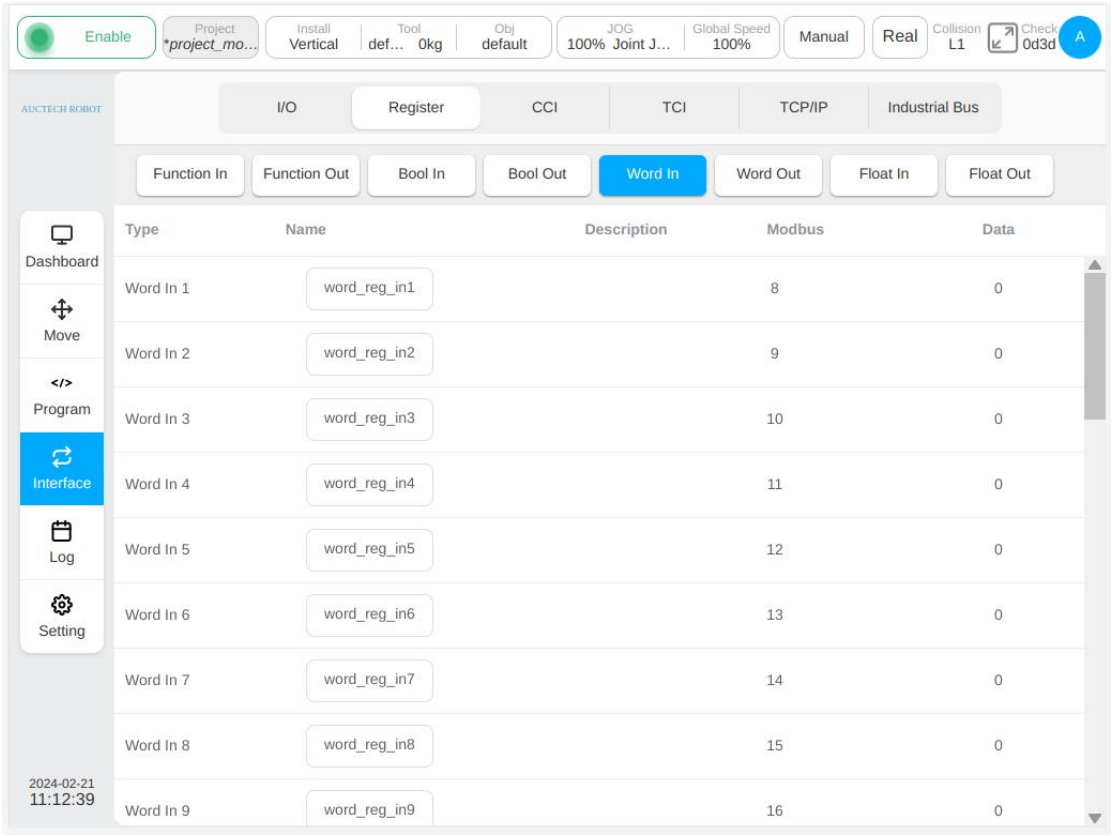


The Register BOOL input screen displays state information for 64-channel Boolean input registers, as shown in the figure. This interface can modify the register name and restore after modification, and cannot set specific function items.

The Register BOOL output screen displays the state information of 64-channel Boolean output registers. Similarly, this interface can only modify the register name and restore it after modification, and no specific function can be set.

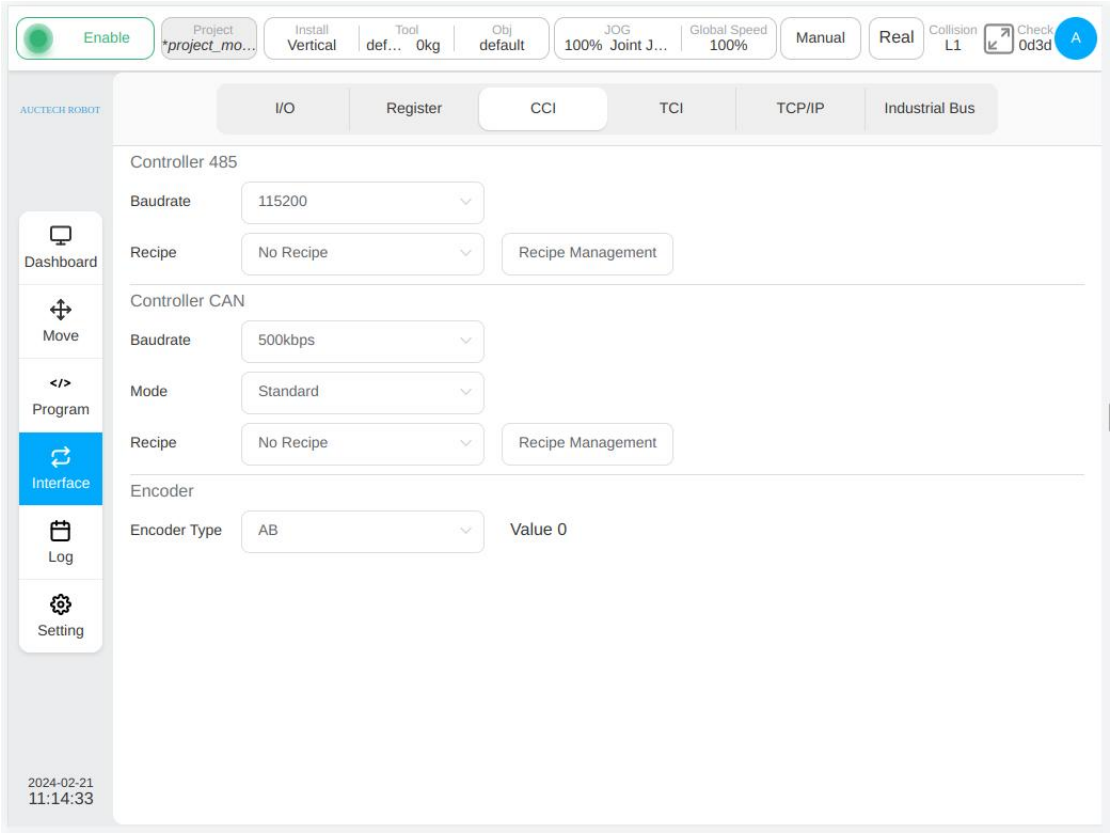
Register Word input and Float input interface display the state information of 32-way byte type input register and 32-way floating point type input register, respectively. They can only modify the register name and restore after modification, do not have the specific function of setting, nor can perform operations to the data column data display box.

Register Word output and Float output interface display the state information of 32-way byte type output register and 32-way floating point type output register respectively. Similar to the register Bool output interface, they can modify and restore the register name, as well as perform operations to the data column data display box.

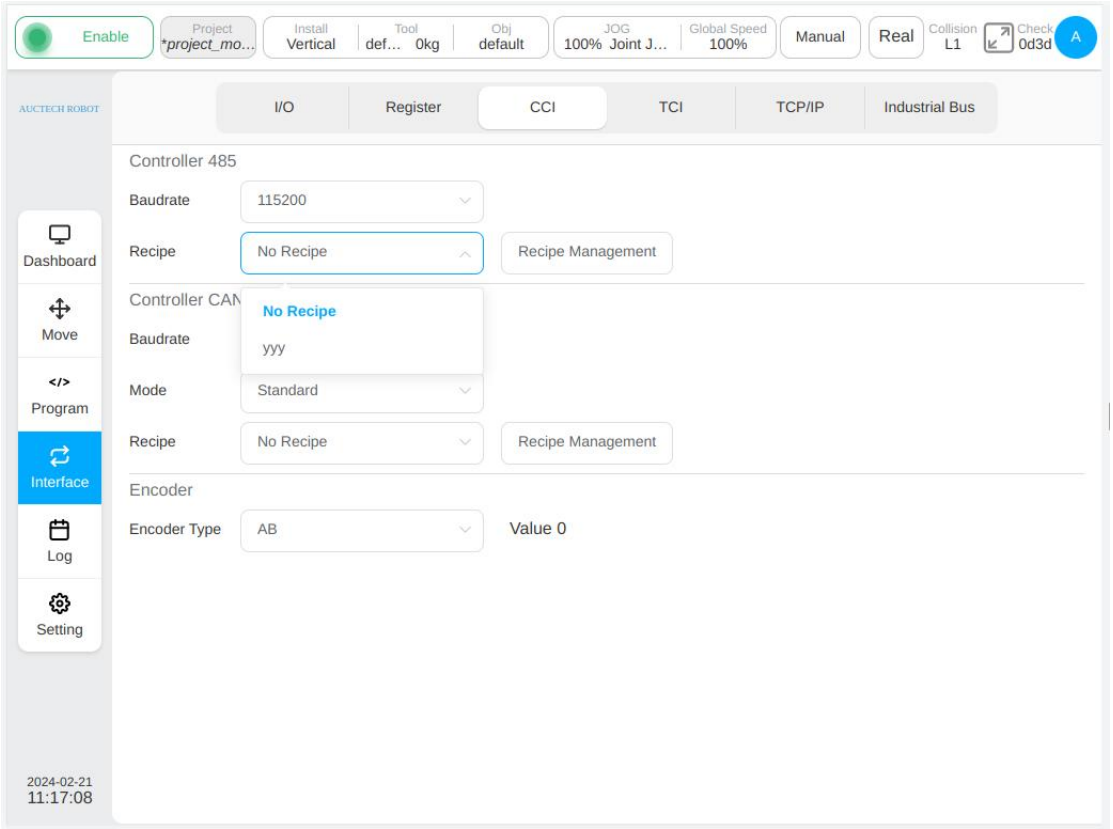

Enable
Project
*project_mo…
Install
Vertical
Tool
def… 0kg
Obj
default
JOG
100% Joint J…
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
I/O
Register
CCI
TCI
TCP/IP
Industrial Bus
Function In
Function Out
Bool In
Bool Out
Word In
Word Out
Float In
Float Out
Dashboard
Move
Program
Interface
Log
Setting
2024-02-21
11:12:39
Type
Name
Description
Modbus
Data
Word In 1
word_reg_in1
8
0
Word In 2
word_reg_in2
9
0
Word In 3
word_reg_in3
10
0
Word In 4
word_reg_in4
11
0
Word In 5
word_reg_in5
12
0
Word In 6
word_reg_in6
13
0
Word In 7
word_reg_in7
14
0
Word In 8
word_reg_in8
15
0
Word In 9
word_reg_in9
16
0

12.3. CCI

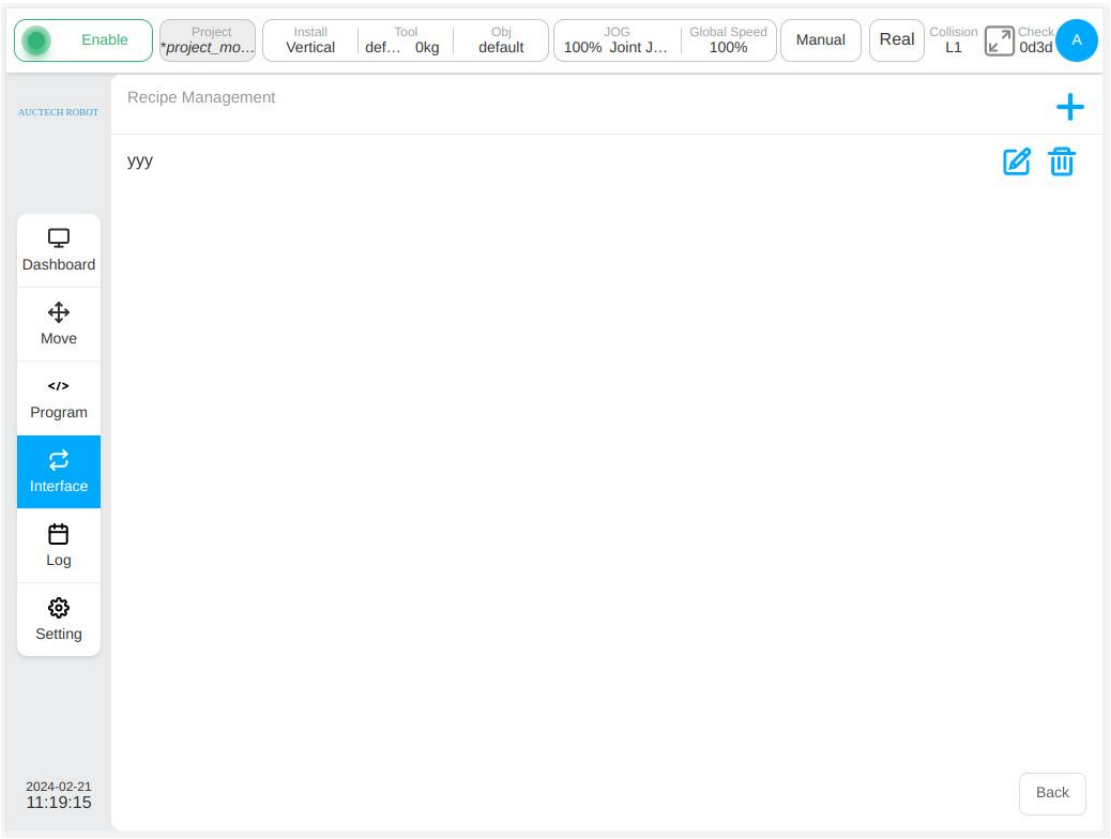
The CCI subpage is to configure the control cabinet 485 port, CAN port and encoder interface, mainly to set the baud rate and formula of the control cabinet 485 port and CAN port, and to set the encoder type. As is shown in the figure.



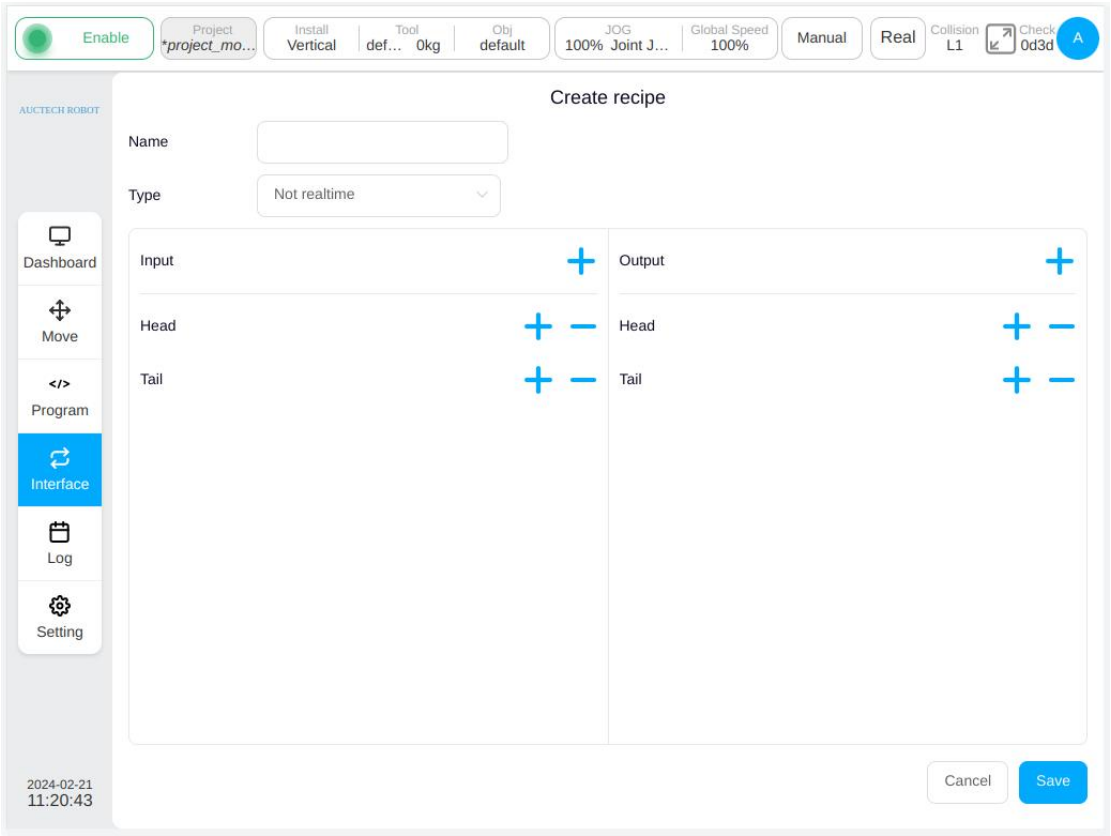
The baud rate of port 485 of control cabinet can be selected in the baud rate selector drop-down box. 485 ports support configuration baud rates are: 9600, 19200, 38400, 57600 and 115200. Select the formula file for the port in the formula selector drop-down box.

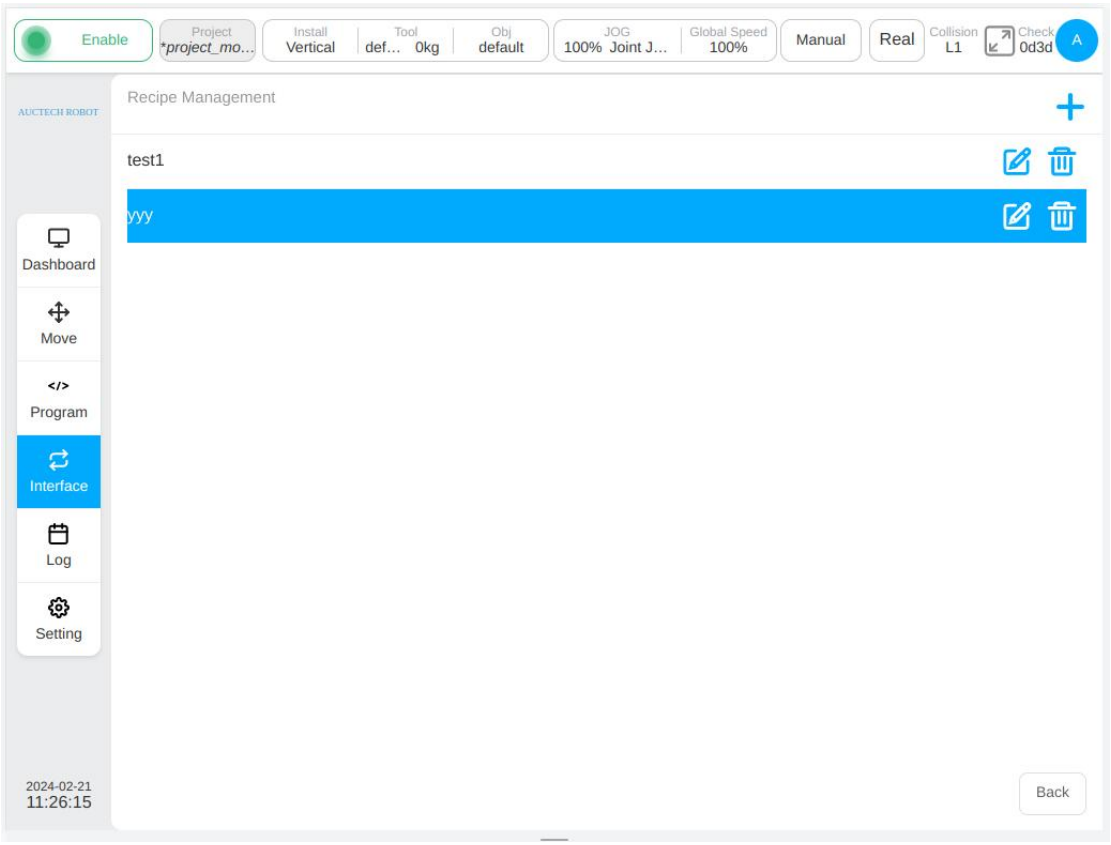


As shown in the figure above, the drop-down box displays the name of the formula file, which is user-defined. Click the "formula management" button to pop up the formula management list box. The interface displays the existing formula files in the current project, and the user can add, delete and edit the formula.



Click any formula file in the formula list, and a pop-up box with "Edit" and "Delete" buttons will appear on the right side. Users can modify or delete the existing formula file.

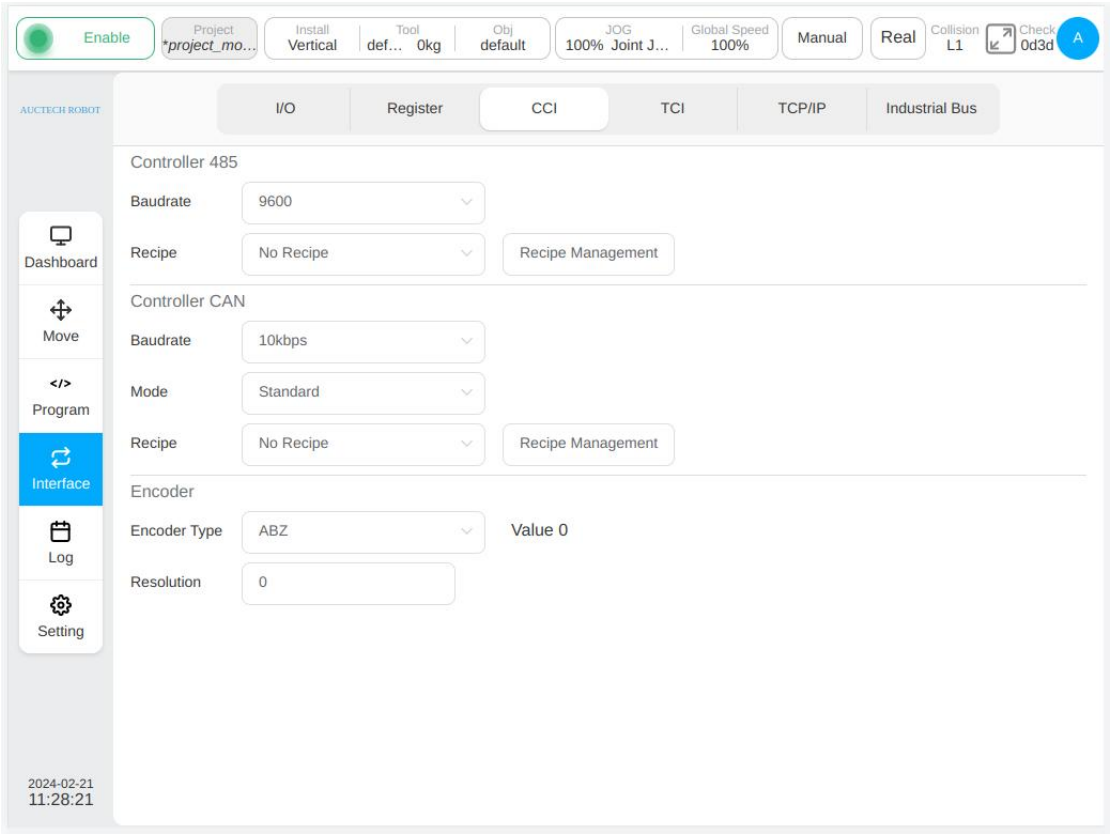




The baud rate and formula Settings of CAN port of the control cabinet are similar to those of 485

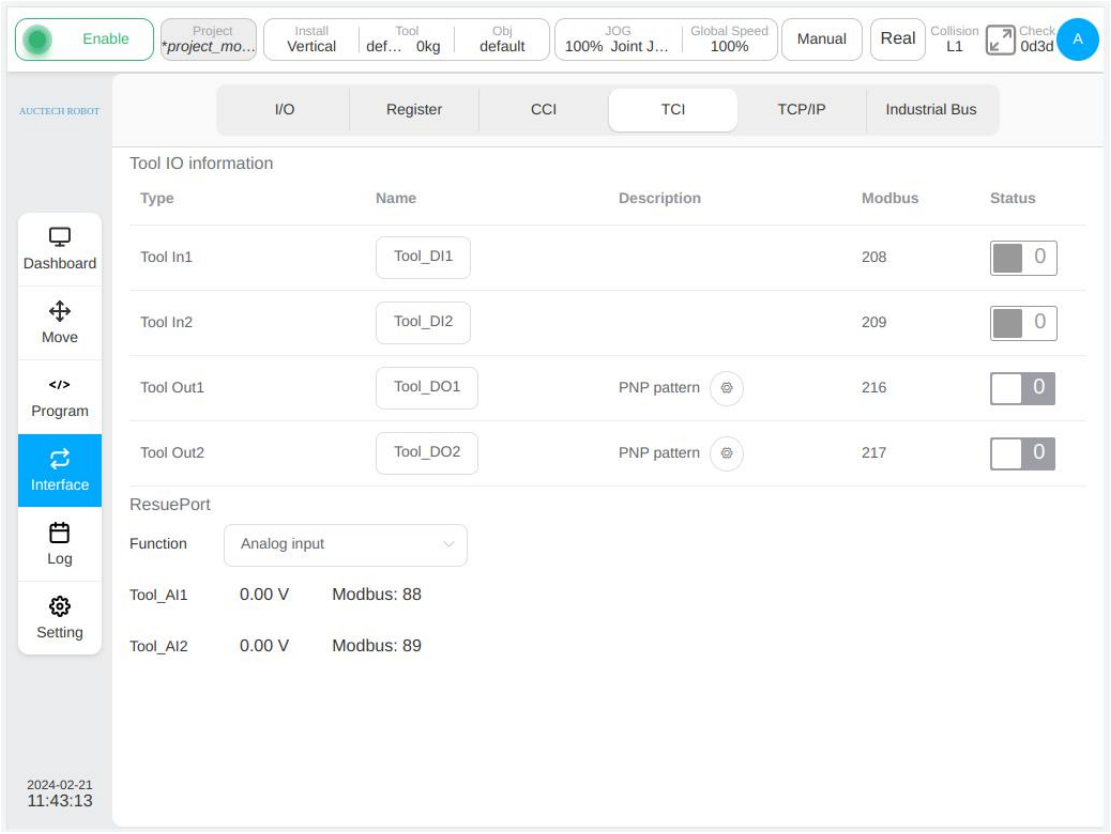
port, which are not described here. CAN ports are configured at 10kbps, 20kbps, 50kbps, 100kbps, 125kbps, 250kbps, 500kbps and 1000kbps. There are two modes of CAN configuration: standard frame and extended frame.

There are two types of control cabinet encoder configuration, namely AB and ABZ. The number of encoder pulses recorded by the current system is displayed on the right side of the encoder. When the encoder type is selected as ABZ, the number of encoder lines should be set, which is 0 by default.

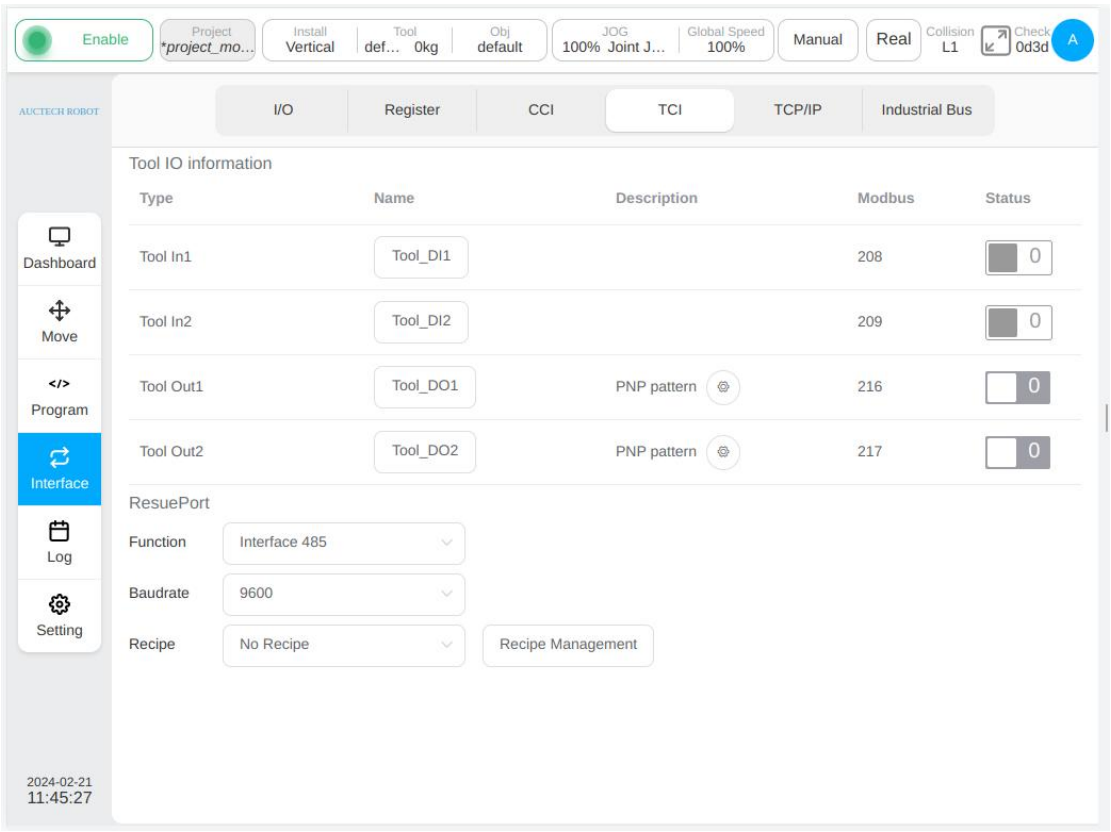


12.4. TCI

The TCI subpage displays the IO information of the end board and the related information of the end reusable interface. The end board has 2 tool inputs and 2 tool outputs. Like the general input/output signals in the I/O subpage, the interface can modify the name of the tool input and output and restore the default name after modification. You can also set the output state of the tool, 0 for low level, 1 for high level, as shown in the figure.



Before use, the user can configure the end interface to function as an analog input or 485 interface, and obtain the corresponding signal according to the configuration. As shown in the figure above, when the terminal interface function is set as analog input, the data of the 2 analog voltage inputs and the corresponding Modbus addresses will be displayed in real time. If the end port is set to 485, the interface displays the baud rate and configuration information related to the formula, as shown in the following figure.



The end 485 interface can set baud rate and formula. The specific operation is similar to the setting of port 485 of the control cabinet in the CCI sub-page, which is not described here.

12.5. TCP/IP

The TCP/IP sub-page mainly displays the external TCP/IP connection information of the robot. It can be divided into two parts: server and client.

Server: The robot acts as a server to monitor ports 2000, 2001, and 2011. The page will display the system IP, the connection status of the 2000 and 2001 ports, and the number of connections.

Care	The IP address displayed on the server corresponds to the IP address of the LAN1 network port. For LAN1's address settings, refer to Section 15.2, "Network Settings".

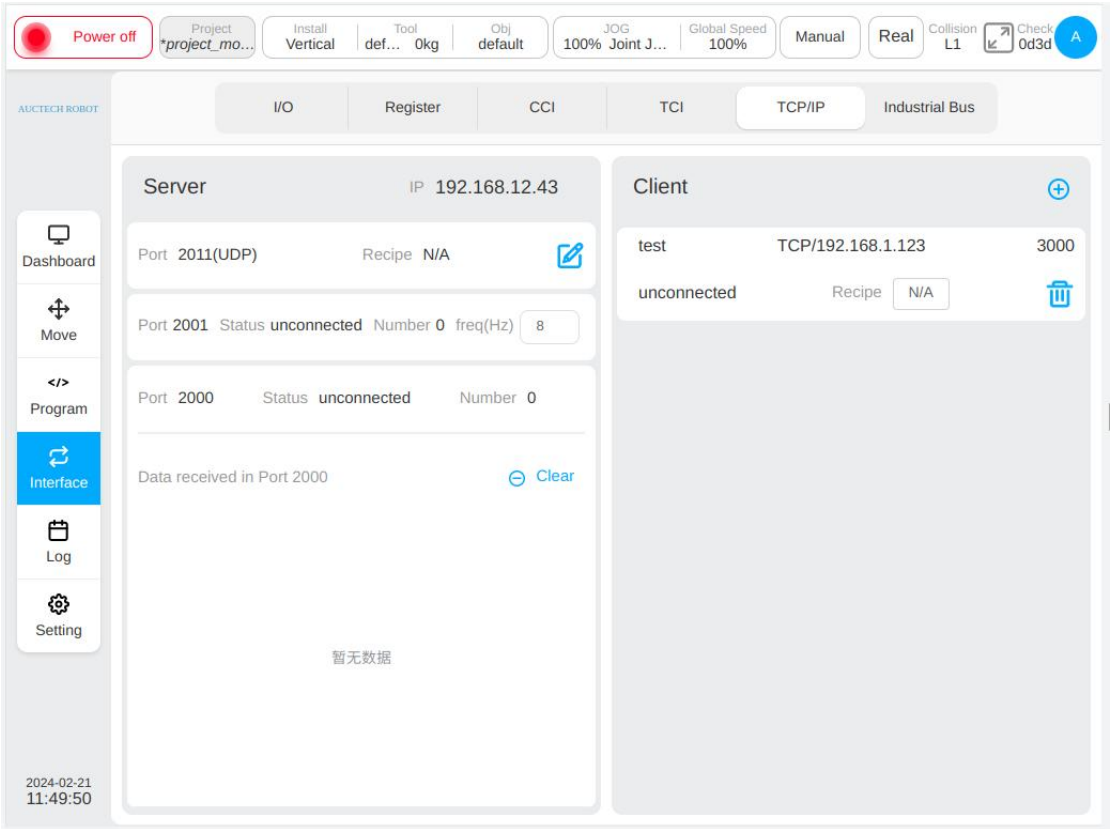
The 2000 port can receive the control commands of the robot. The area at the bottom of the page will display the information received on port 2000.

The 2001 port will send out the current status information of the robot at a frequency of 10Hz. The frequency can be set, and the range is 1hz-100hz.

The 2011 port is a UDP port, and the robot can be controlled through the data items configured in the formula.

For detailed usage of the 2000 and 2001 ports, please refer to the external communication interface description of the collaborative robot.

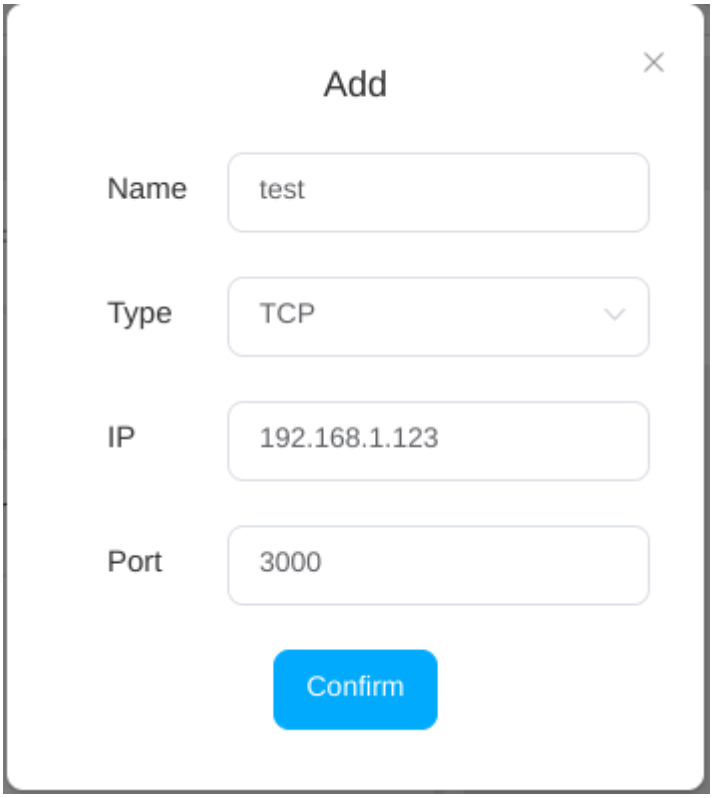
Please refer to the formula instructions for the use of the 2011 port.



Client: The robot acts as a client to connect to external devices. The page will display all the

connection information of the current robot as a client. The connection information includes: name, type (TCP/UDP), port number, and recipe. Click the formula button to set the formula, click the icon below the port number to delete the added client. The connection can be established in the program through the script or by clicking the icon above the port number.

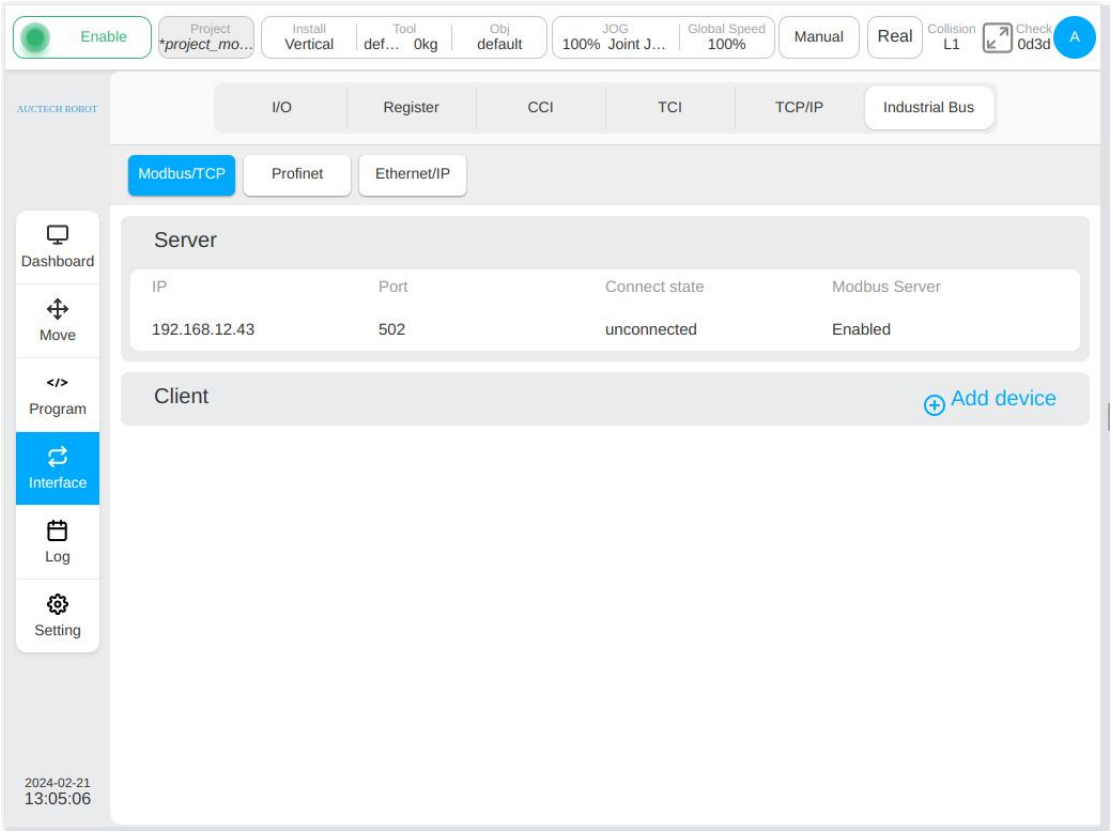
Click to pop up the following dialog box, enter the connection information and click "OK" to create a connection.



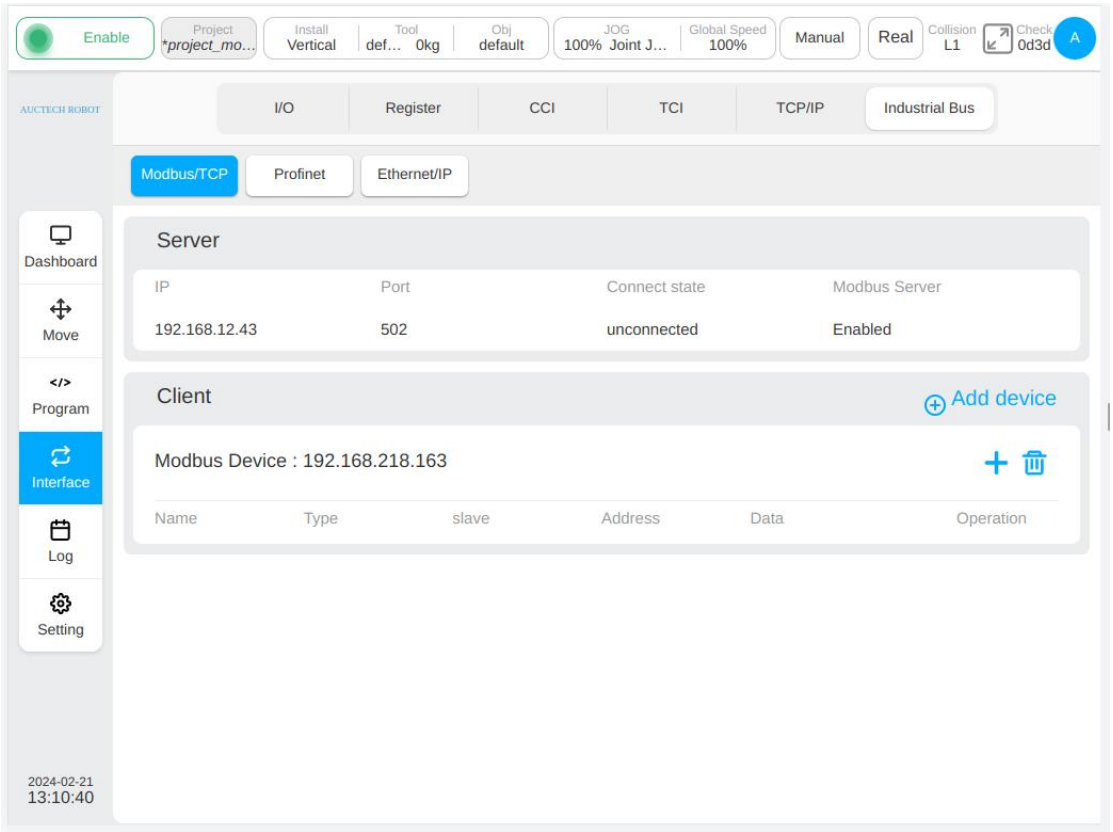
12.6. Industrial Bus

The industrial bus subpage mainly contains three subtabs: Modbus/TCP, Profinet, Ethernet/IP.

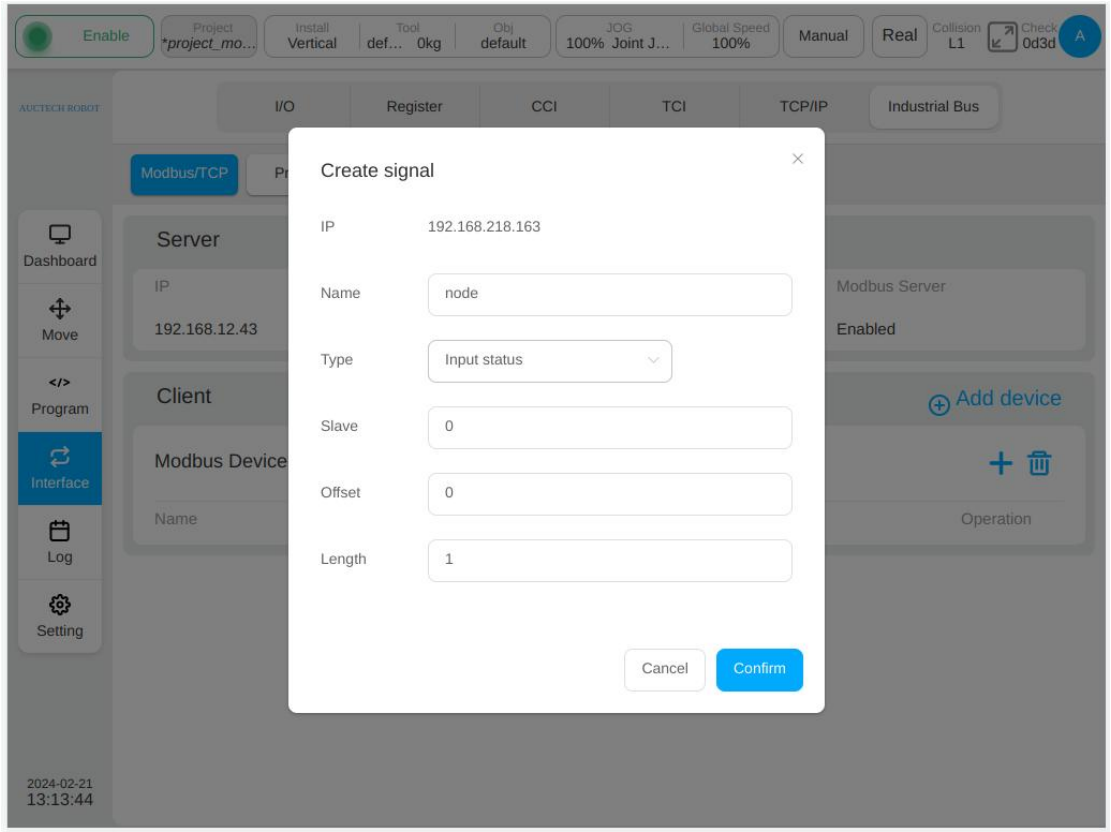
The robot can monitor the connection status of external Modbus clients as a Modbus server in the power-on state. The Modbus/TCP sub-page displays information and operations related to the external Modbus/TCP communication interface of the robot, as shown in the figure.



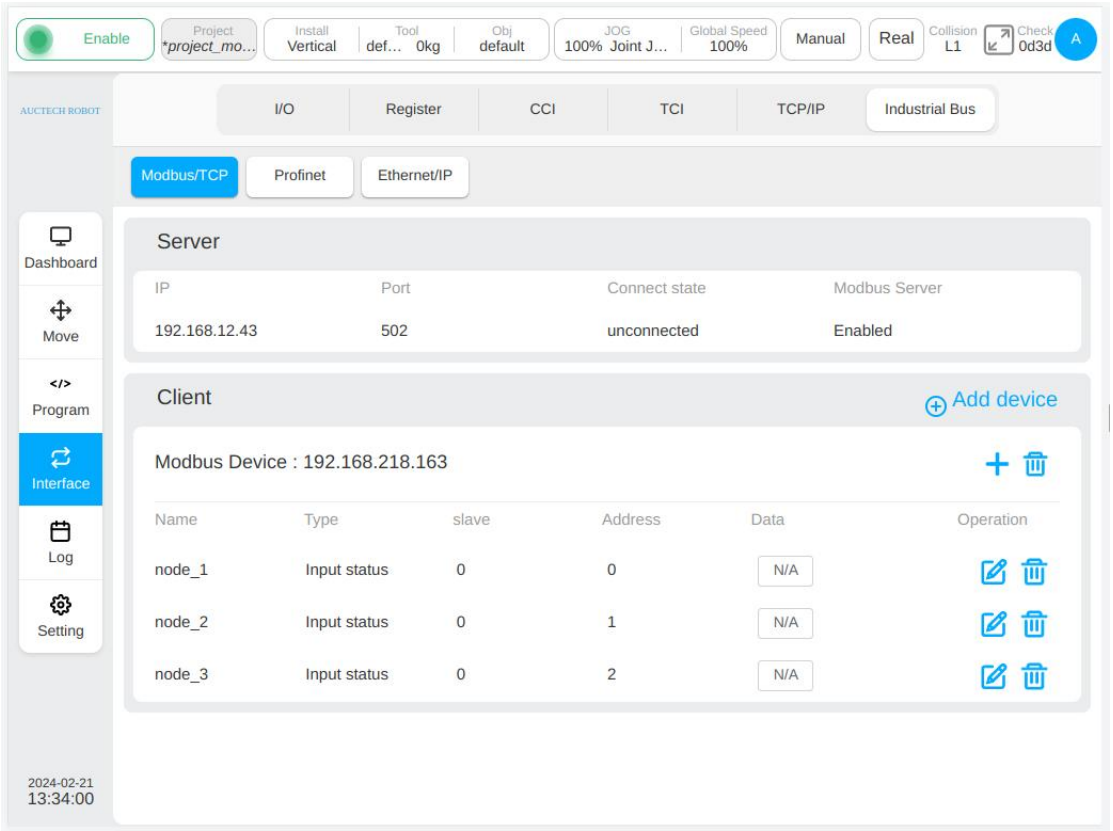
The IP, port, connection status and other information of Modbus server system are displayed at the top of the interface. Click the "Add Device" button, and a virtual ordinary keyboard will pop up. Enter the IP address of the external Modbus client device, such as 127.0.0.1, and the interface will display the IP address of the Modbus device and relevant operation buttons.



Click the icon +, and a new Modbus node window pops up, as shown in the figure. Enter the node name, node type, slave number, offset address, length, and click "OK" button to create successfully. Among them, there are four types of nodes: read-only coil, read-write coil, read-only register and read-write register.

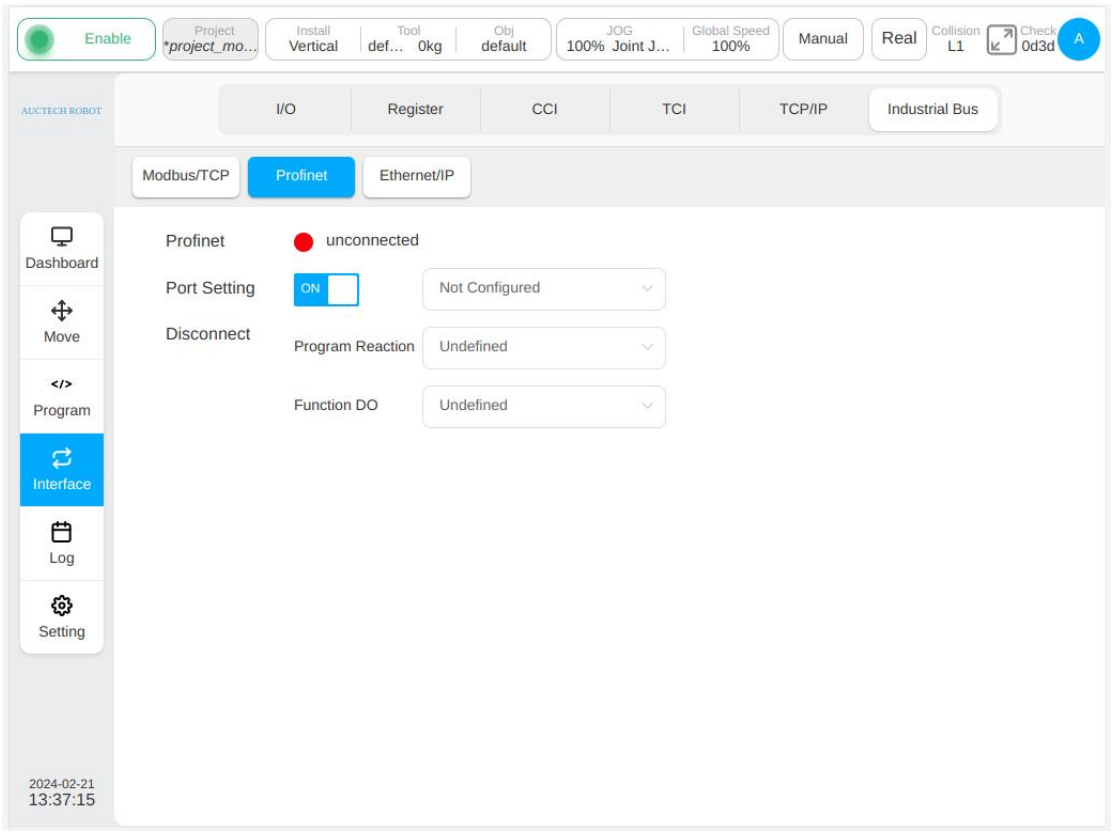


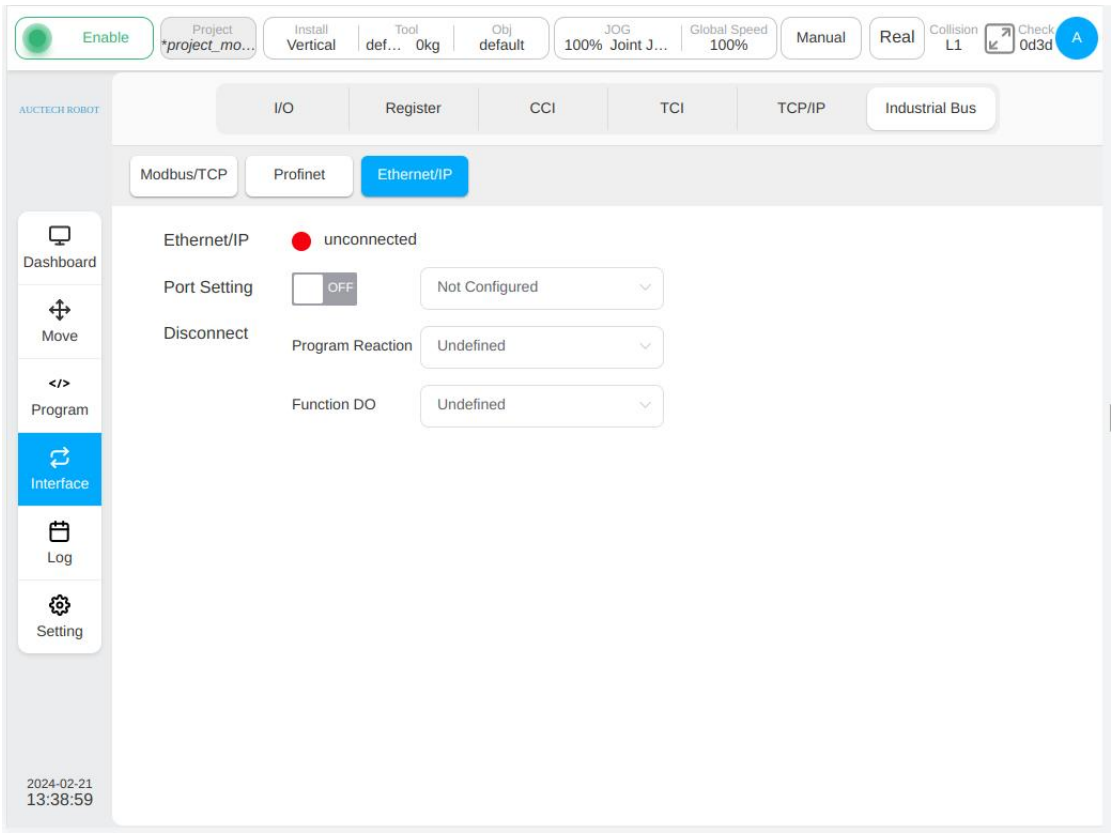
When creating a node, the length is 1 by default. When the length value is 1, a single node is created. If the length is greater than 1, multiple nodes are created in batches. If the length is set to 3, add underscores to node names according to the length, that is, node_1, node _2, and node _3, and the addresses are 0, 1, and 2 in sequence, as shown in the figure.



After the new node is created, the interface will display the corresponding information of the newly defined node. When the data column has no corresponding data, "N/A" is displayed. Users can modify and delete each node. Click the button  of the corresponding node row, and the pop-up window is similar to that when a new node is created, except that the node name cannot be changed, the length is not displayed, and the node type, slave number, and offset address can be changed.

The Profinet and Ethernet/IP subtabs are mainly used to display the connection status, port settings and disconnection processing configuration, including the program response action and the corresponding configuration of the function output IO. Port settings include whether to enable and configure the corresponding port name. Program response selector options are: undefined, paused program, stop program; The function DO output selector drop-down options include: undefined and undefined output signal names in the function output signal in the I/O subpage. The DO function configured for Profinet and Ethernet/IP disconnect on each sub-label page is synchronized with the function output configuration on the I/O sub-page.

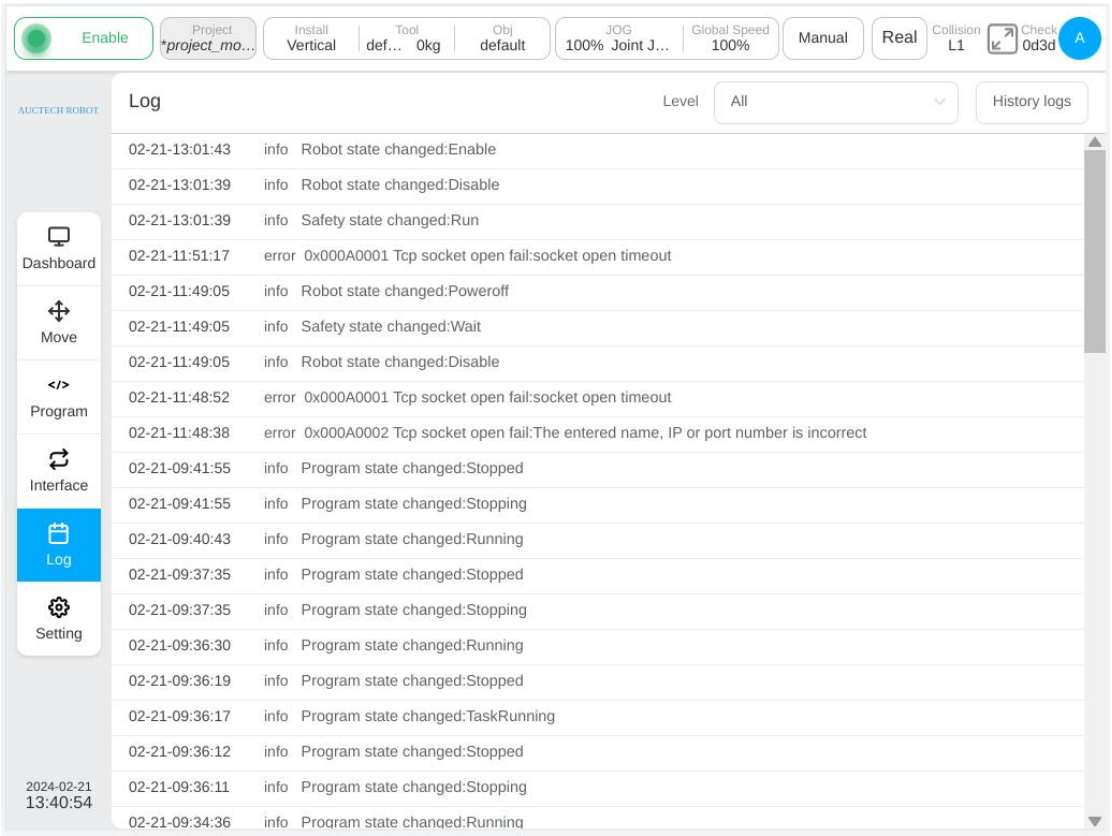

Enable
Project
*project_mo...
Install
Vertical
Tool
def... 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
I/O
Register
CCI
TCI
TCP/IP
Industrial Bus
Modbus/TCP
Profinet
Ethernet/IP
Dashboard
Move
Program
Interface
Log
Setting
Profinet
unconnected
Port Setting
ON
Not Configured
Disconnect
Program Reaction
Undefined
Function DO
Undefined
2024-02-21
13:37:15


Enable
Project
*project_mo...
Install
Vertical
Tool
def... 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
I/O
Register
CCI
TCI
TCP/IP
Industrial Bus
Modbus/TCP
Profinet
Ethernet/IP
Dashboard
Move
Program
Interface
Log
Setting
Ethernet/IP
unconnected
Port Setting
OFF
Not Configured
Disconnect
Program Reaction
Undefined
Function DO
Undefined
2024-02-21
13:38:59

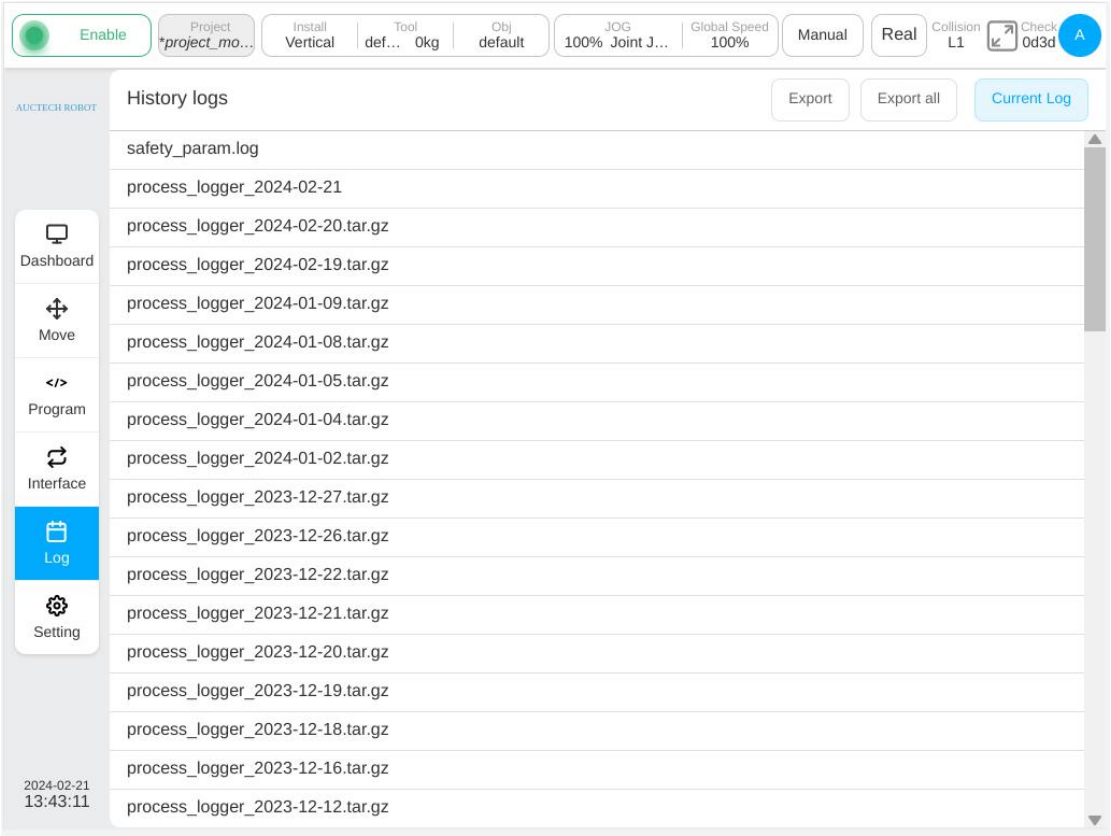
13. Log Page

Click "Log" in the navigation bar, it will enter the log page. The log page is to record relevant information triggered during the operation of the robot, which can be divided into fatal, error, warning and information. The log information in this page is the same as the log information in the overview page.

Log information can be an important source of tracking for diagnosing problems and processing historical data. When the relevant error alarm information occurs during the operation of the robot, the error alarm reason can be inquired in the log page for inspection. When the problem cannot be solved, please contact the relevant technical support personnel in time and inform the log information so that the problem can be solved quickly.

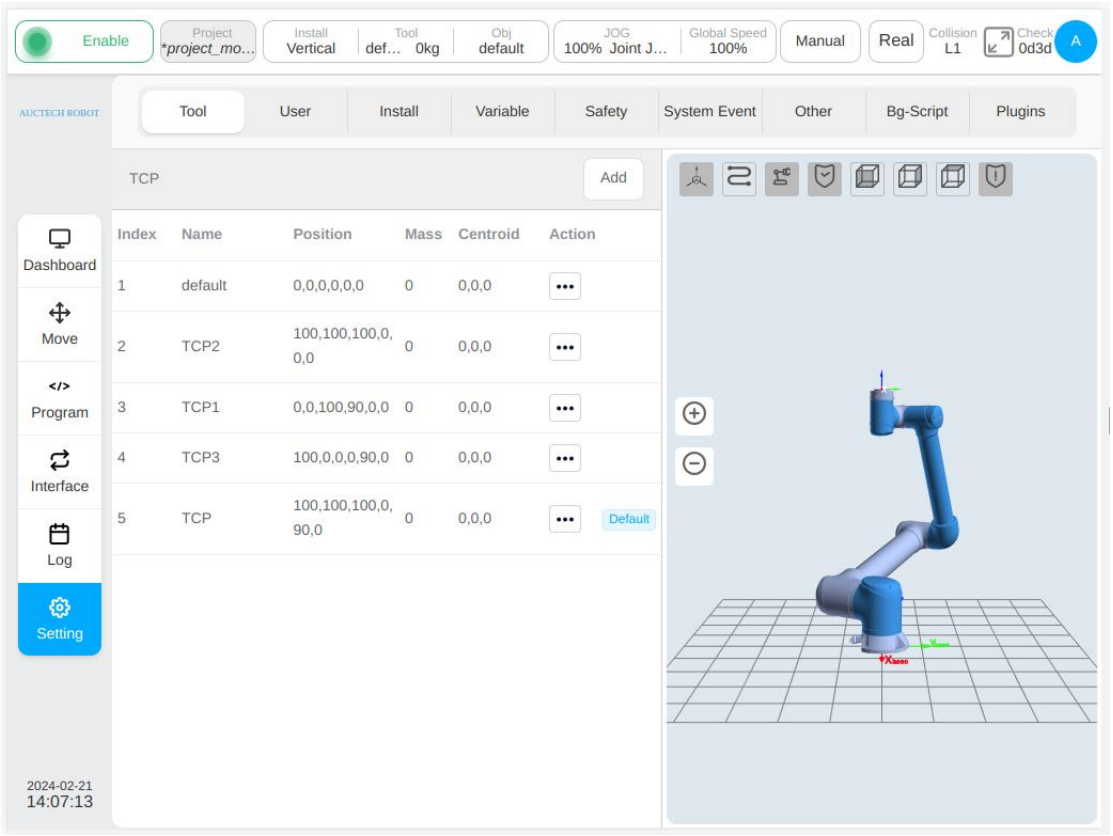


Clicking the “Export History Log” button, a list of all history log files will be displayed. You can export one of these log files or all of them. Clicking the “View Current Log” button will take you back to the current log page.


Enable
Project
*project_mo...
Install
Vertical
Tool
def... 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
History logs
Export
Export all
Current Log
safety_param.log
process_logger_2024-02-21
process_logger_2024-02-20.tar.gz
process_logger_2024-02-19.tar.gz
process_logger_2024-01-09.tar.gz
process_logger_2024-01-08.tar.gz
process_logger_2024-01-05.tar.gz
process_logger_2024-01-04.tar.gz
process_logger_2024-01-02.tar.gz
process_logger_2023-12-27.tar.gz
process_logger_2023-12-26.tar.gz
process_logger_2023-12-22.tar.gz
process_logger_2023-12-21.tar.gz
process_logger_2023-12-20.tar.gz
process_logger_2023-12-19.tar.gz
process_logger_2023-12-18.tar.gz
process_logger_2023-12-16.tar.gz
process_logger_2023-12-12.tar.gz
Dashboard
Move
Program
Interface
Log
Setting
2024-02-21
13:43:11

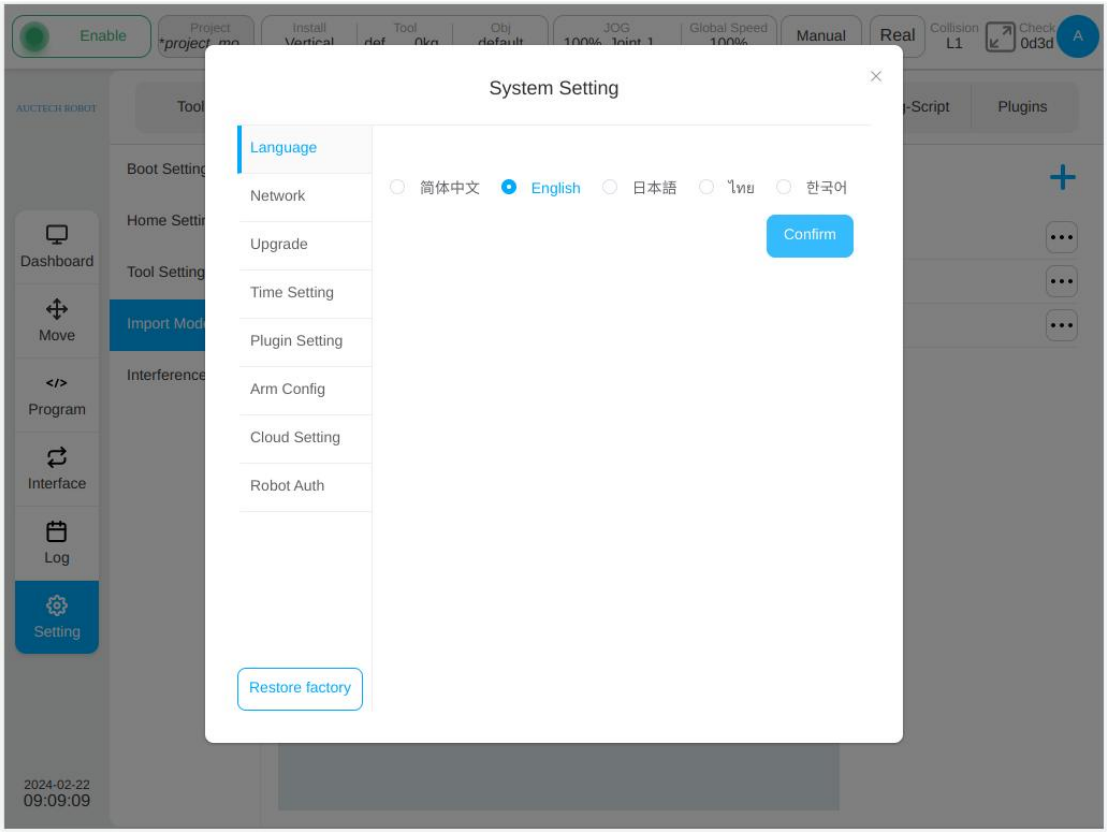
14. Settings Page

Click "Settings" in the navigation bar to enter the Tools Settings subpage under the Settings page by default. There are seven subpages on the Settings page: Tool Settings, Workpiece Coordinate System, Installation Settings, Variable Settings, Safety Settings (read Chapter 5), Other Settings, and Plugins.



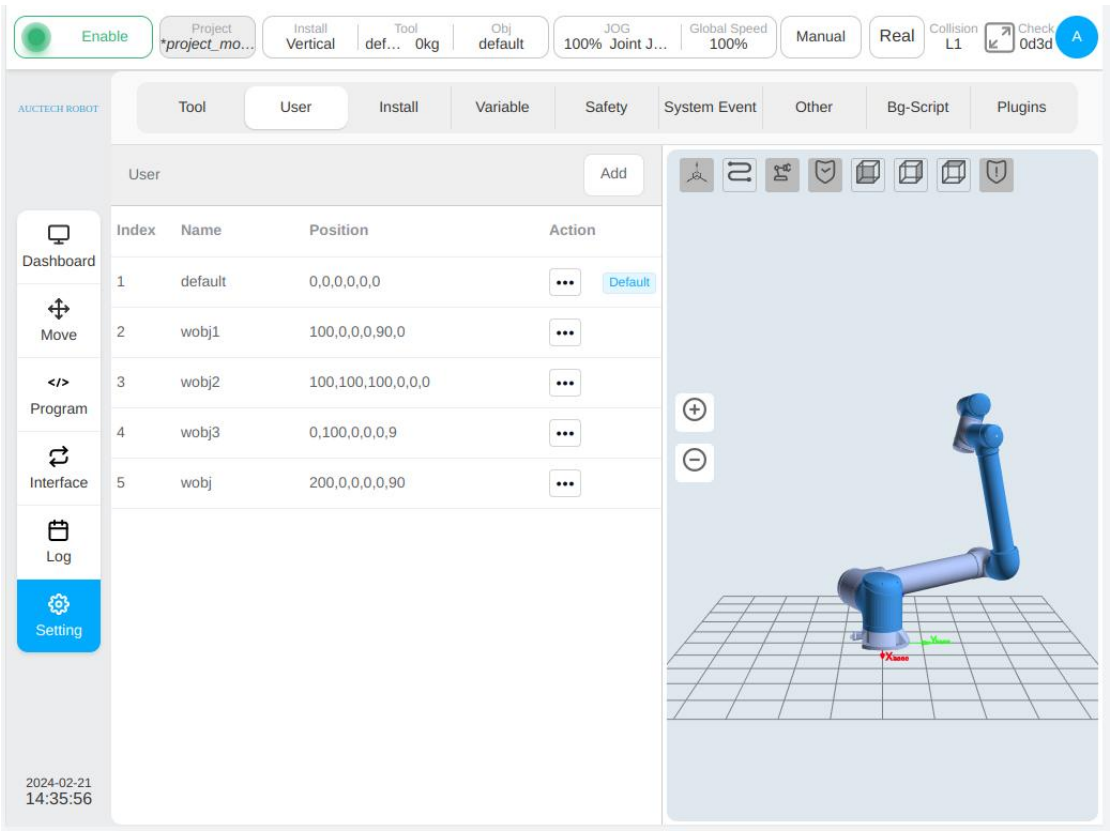
15.1. Language Settings

In the language setting, you can switch the language, select the language you need to set, click "OK", and the language setting is successful.

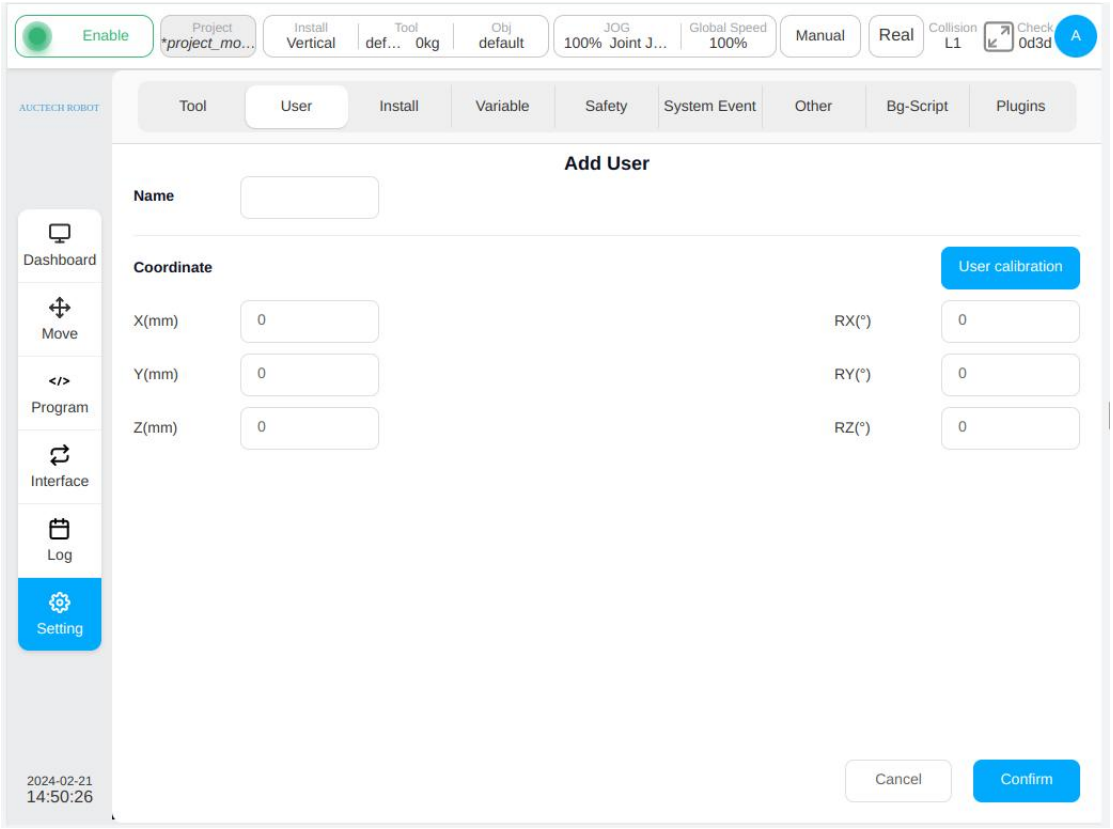


14.1. Workpiece Settings

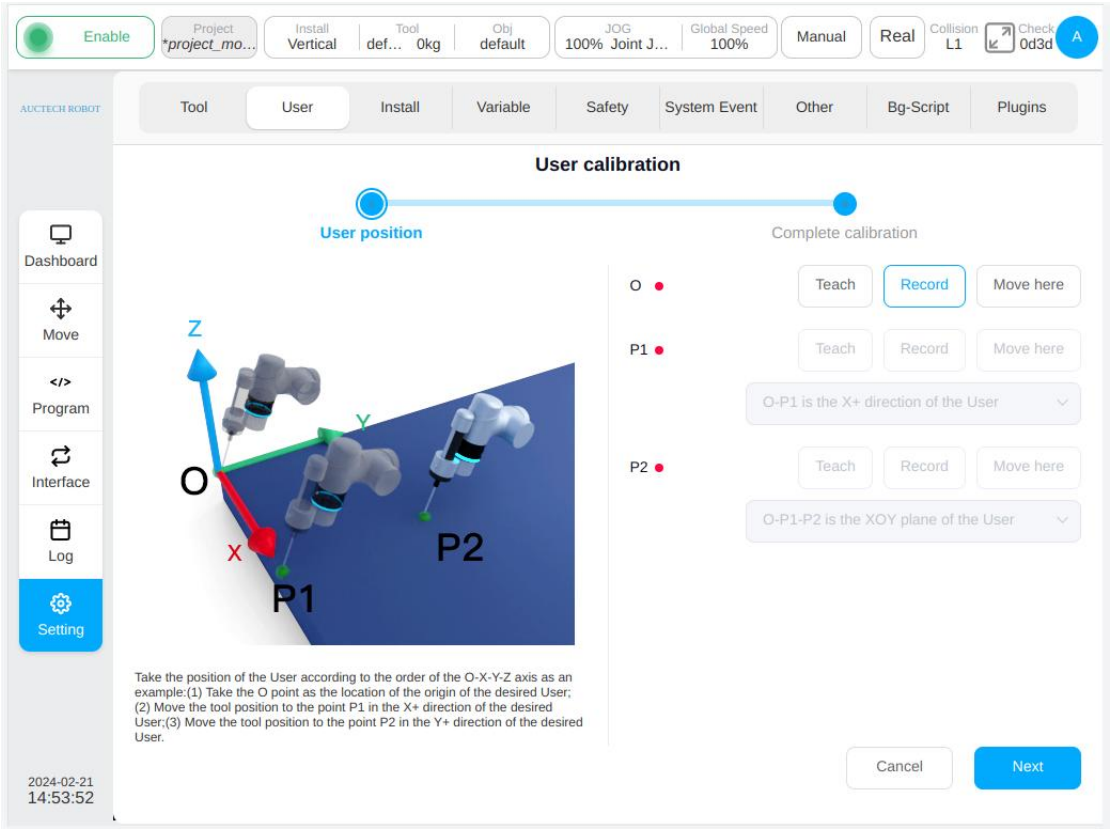
In the workpiece coordinate system setting, the offset of the workpiece coordinate from the world coordinate system can be set, which is similar to the tool setting page. On the left side of the page is the information about the set workpiece coordinate system, in which the workpiece coordinate system named Default is the system's default workpiece coordinate system. On the right is a 3D model of the robot.



Click the “Add” button, and a new workpiece coordinate system window will pop up. The name of the workpiece coordinate system can be set. The position of the workpiece coordinate system related to the world coordinate system X, Y, Z and the corresponding positive direction of X, Y, Z axis (RX, RY, RZ) can be set. After setting the workpiece coordinate system, the workpiece setting page will display the corresponding coordinate system for the workpiece. You can save multiple workpiece coordinate system Settings.

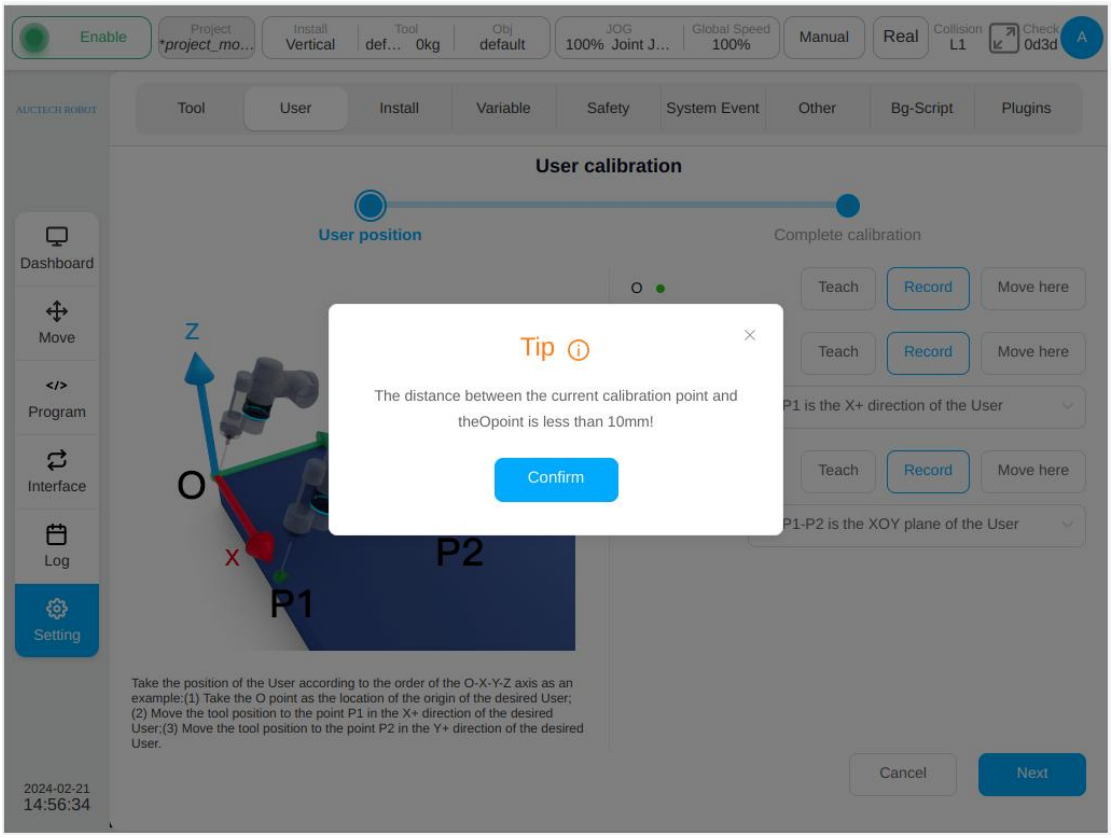


Similarly, in addition to manually setting the workpiece coordinate system, the workpiece coordinate can also be calibrated. Click the "Workpiece coordinate system calibration" button to enter the workpiece coordinate system position calibration phase of the workpiece coordinate system calibration process, which is displayed as follows:

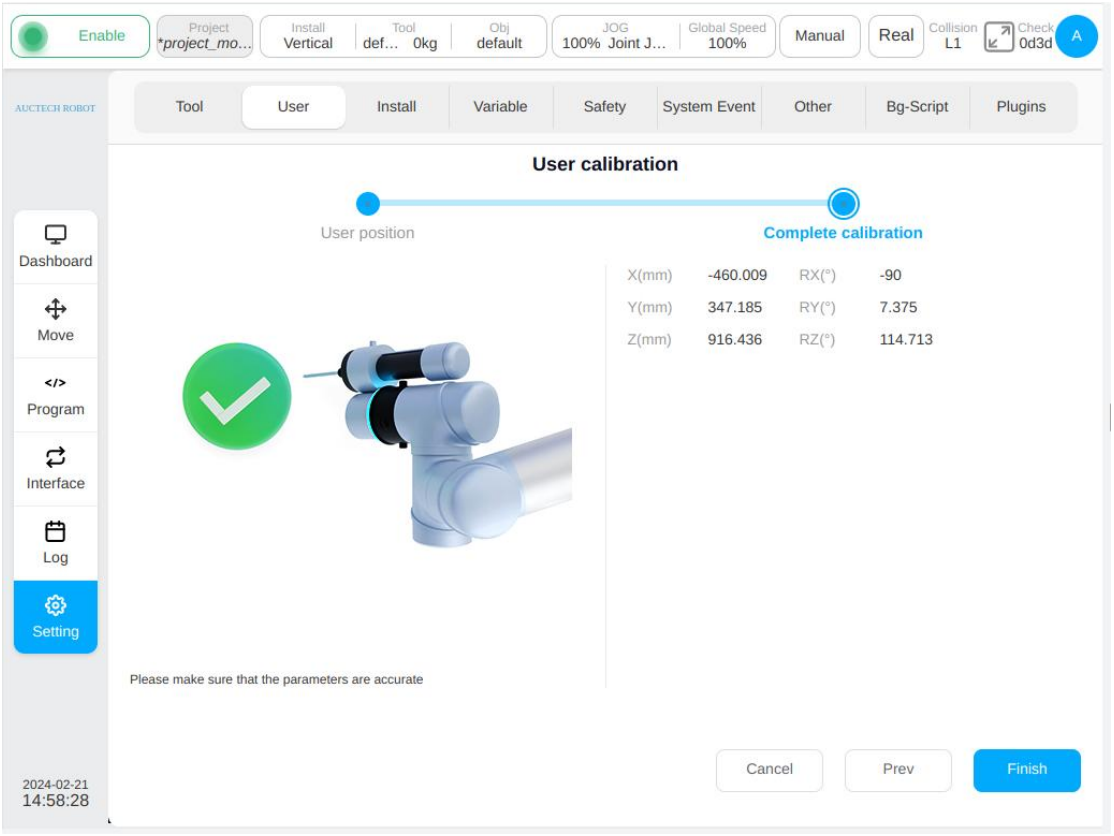


Set O point as the origin of the workpiece coordinate system, and P1 point can be selected as the tool coordinate system X+ direction/Y+ direction/Z+ direction. The options corresponding to point P2 are O-P1-P2 as the tool coordinate system XOY plane /XOZ plane, O-P1-P2 as the tool coordinate system XOY plane /YOZ plane, and O-P1-P2 as the tool coordinate system XOZ plane /YOZ plane. For example, to determine the posture of the tool coordinate system according to the O-X-Y-Z axis: Point O is the position of the current tool position, first move the tool position in the direction of the desired workpiece coordinate system X+ to point P1, and then move the tool position in the direction of the desired workpiece coordinate system Y+ to point P2.

Take P1 as an example, click the "Teach" button after P1, and the interface will jump to the mobile page. After the mobile robot reaches the target point, click "Record current position", and the interface will jump back to the interface of the current teaching marker point. After teaching a marker point, the red dot behind the corresponding marker point will turn green. You can also move the robot directly to the target point by pressing the physical button of teach pendant and click "Record current point" directly. During the teaching process, if the current teaching point does not meet the restrictions, the following message will be displayed:

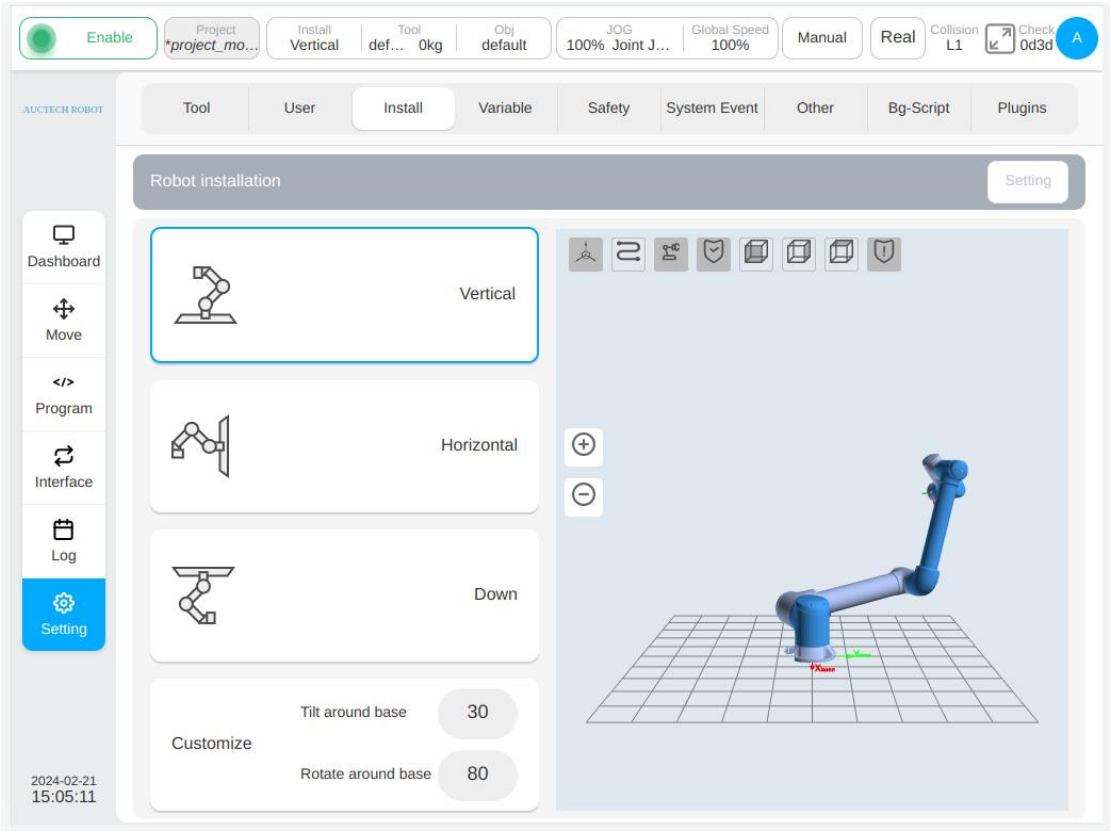


After setting the instruction O, P1 and P2, click the "Next" button to enter the calibration completion stage as shown below, and the calibration result will be displayed. The user can judge the quality of the calibration through the error information, so as to decide whether the coordinate system needs to be loaded. If you need to load this coordinate system, click "Confirm" button, otherwise click "Cancel" button, or click "Previous" to return to the teaching point again.


Enable
Project
*project_mo...
Install
Vertical
Tool
def... 0kg
Obj
default
JOG
100% Joint J...
Global Speed
100%
Manual
Real
Collision
L1
Check
0d3d
A
AUCTECH ROBOT
Tool
User
Install
Variable
Safety
System Event
Other
Bg-Script
Plugins
Dashboard
Move
Program
Interface
Log
Setting
User calibration
User position
Complete calibration
X(mm) -460.009
RX(°) -90
Y(mm) 347.185
RY(°) 7.375
Z(mm) 916.436
RZ(°) 114.713
Please make sure that the parameters are accurate
Cancel
Prev
Finish
2024-02-21
14:58:28

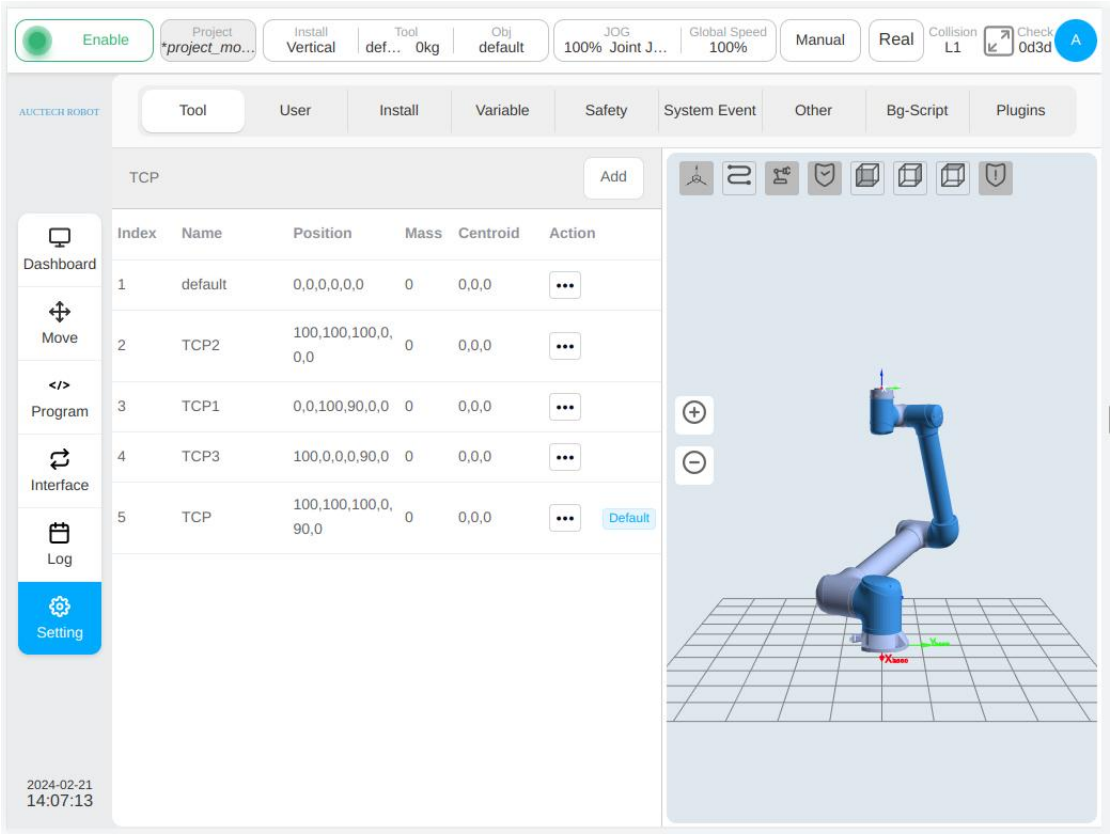
14.3. Installation Settings

The installation and setting sub-page is mainly to set the installation direction of the robot, which can be set as vertical installation, horizontal installation, flip installation and any one of the customization. The customization method is that the user sets the robot tilt Angle around the base and the robot rotation angle around the base, and the setting range is -180° to 180°. The 3D model will also change the direction of the installation when changing the installation mode. After setting the installation direction of the robot, click the "Set" button on the upper right of the interface, and the installation method is displayed in the installation box in the status bar.

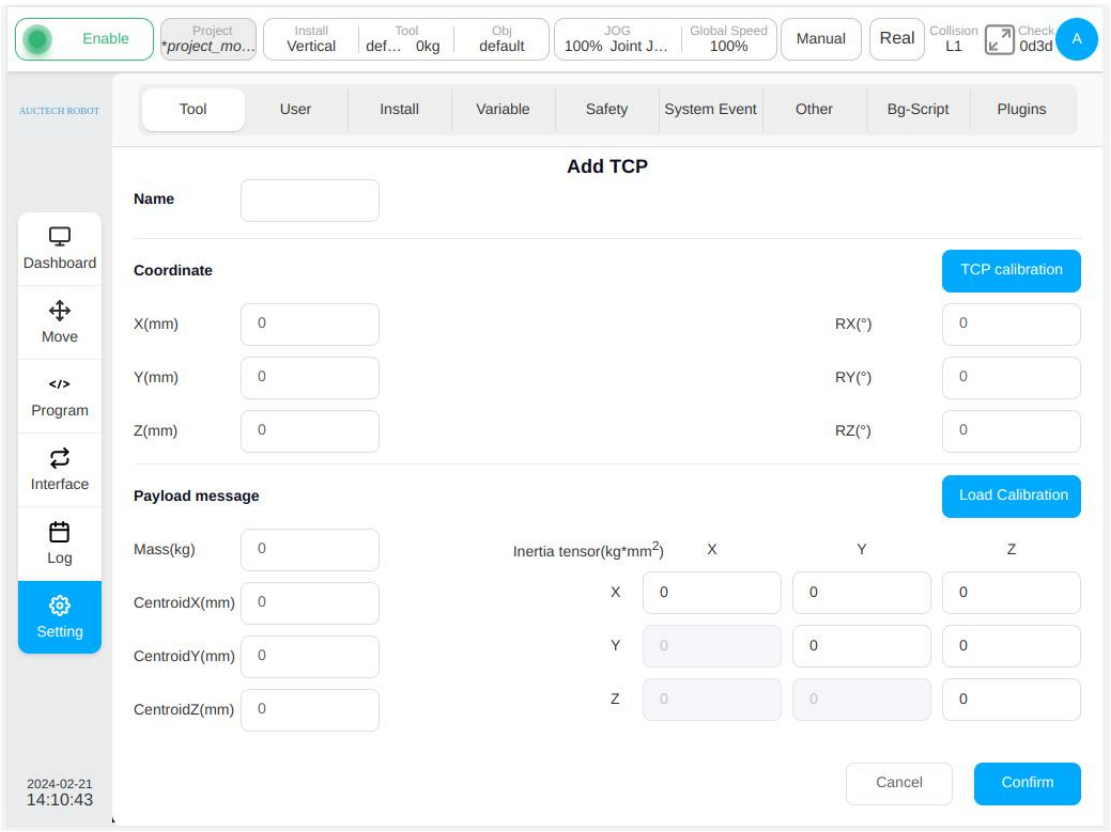


14.2. Tool Settings

On the left side of the tool setting sub-page is the information about the set tool coordinate system. The tool coordinate system named Default is the system's default tool coordinate system. On the right is a 3D model of the robot.



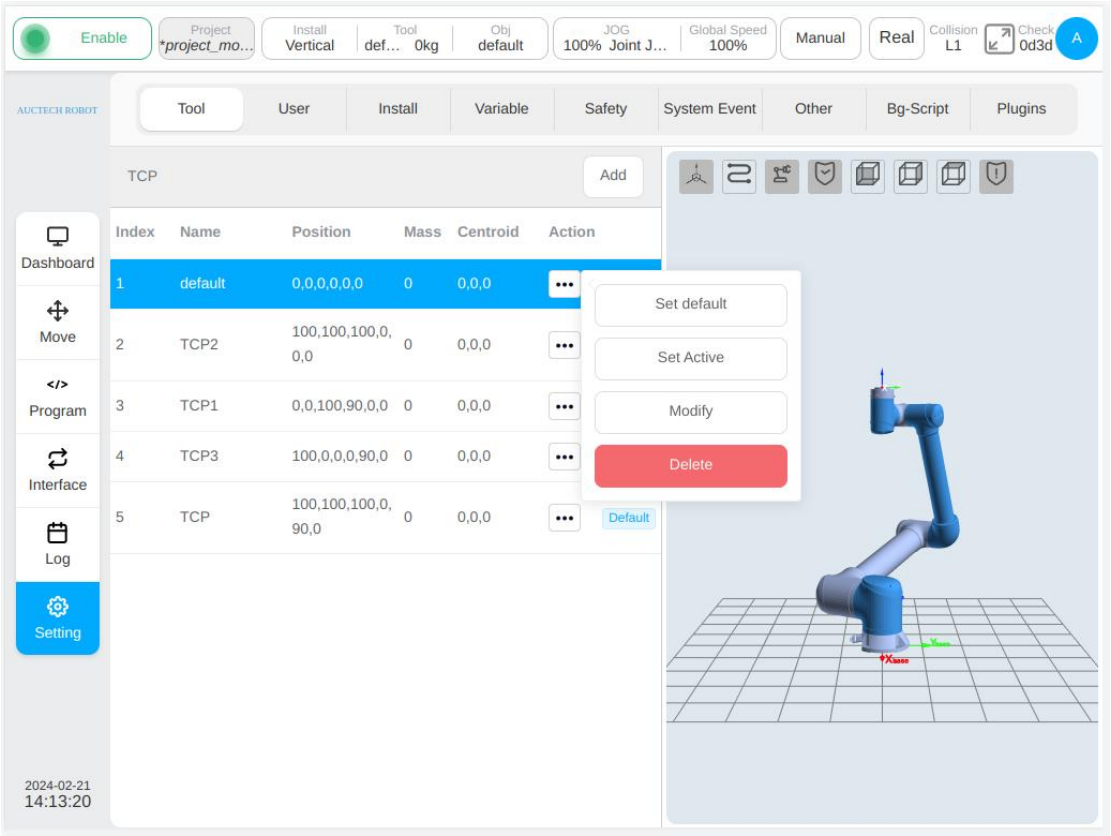
Click the “Add” button, and the new tool coordinate system window pops up. The tool coordinate system name can be set, the position of the tool coordinate system X, Y, Z at the end of the robot and the corresponding positive direction of X, Y, Z axis (RX, RY, RZ) can be set, and the mass and centroid position of the tool can be set at the same time, or the mass and center of mass can be identified through the load identification function. For more information on load identification, please refer to the AUCTECH CORE Terminal Force Control Function Operation Manual. You can set the inertia parameters of the tool and set the corresponding xx, xy, xz, yy, yz, zz elements of the inertia matrix.



After setting the tool coordinate system, the tool setting page will display the corresponding tool coordinate system, as tool coordinate system tcp1 shown in the figure. You can save multiple tool coordinate system Settings.

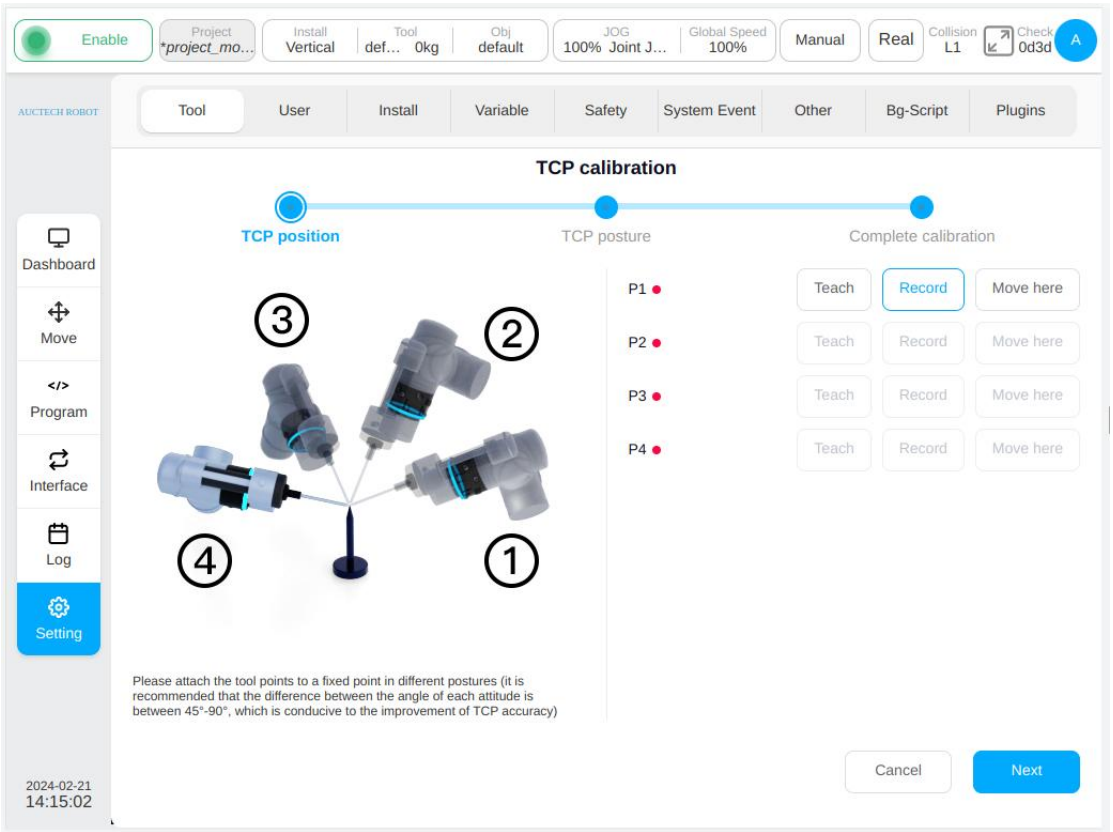
Click the operation column icon ••• for each row of tool coordinate system to display the coordinate system box. When the corresponding tool coordinate system is set to the default coordinate system, the word "Default" will be displayed after icon ••• .

When the corresponding tool coordinate system is set to the current coordinate system, the name of the coordinate system and the quality of the tool are displayed in the tool box of the status bar. Click Modify to modify the parameters related to the tool coordinate system, or click Delete to delete the tool coordinate system. Note: The default or current tool coordinate system cannot be deleted!

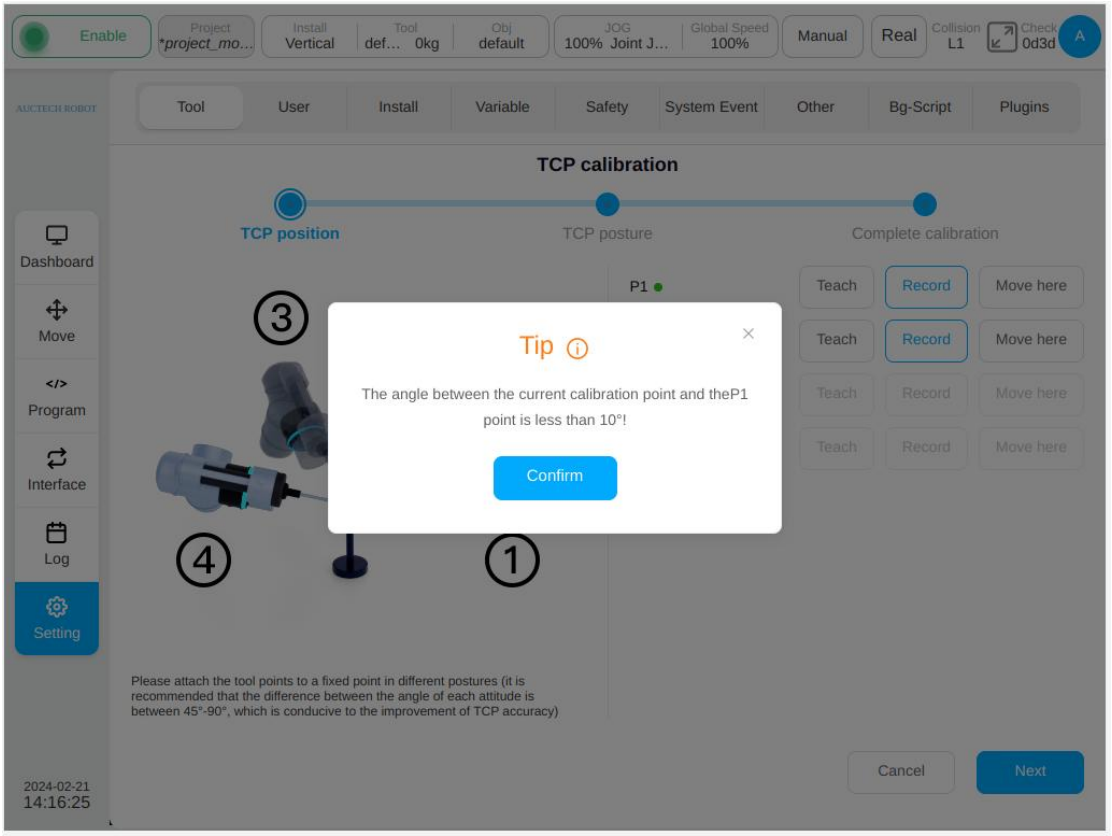


After selecting different tool coordinate systems, the 3D model area will display the position of the coordinate system accordingly. Red represents the X-axis, green represents the Y-axis, and blue represents the z-axis.

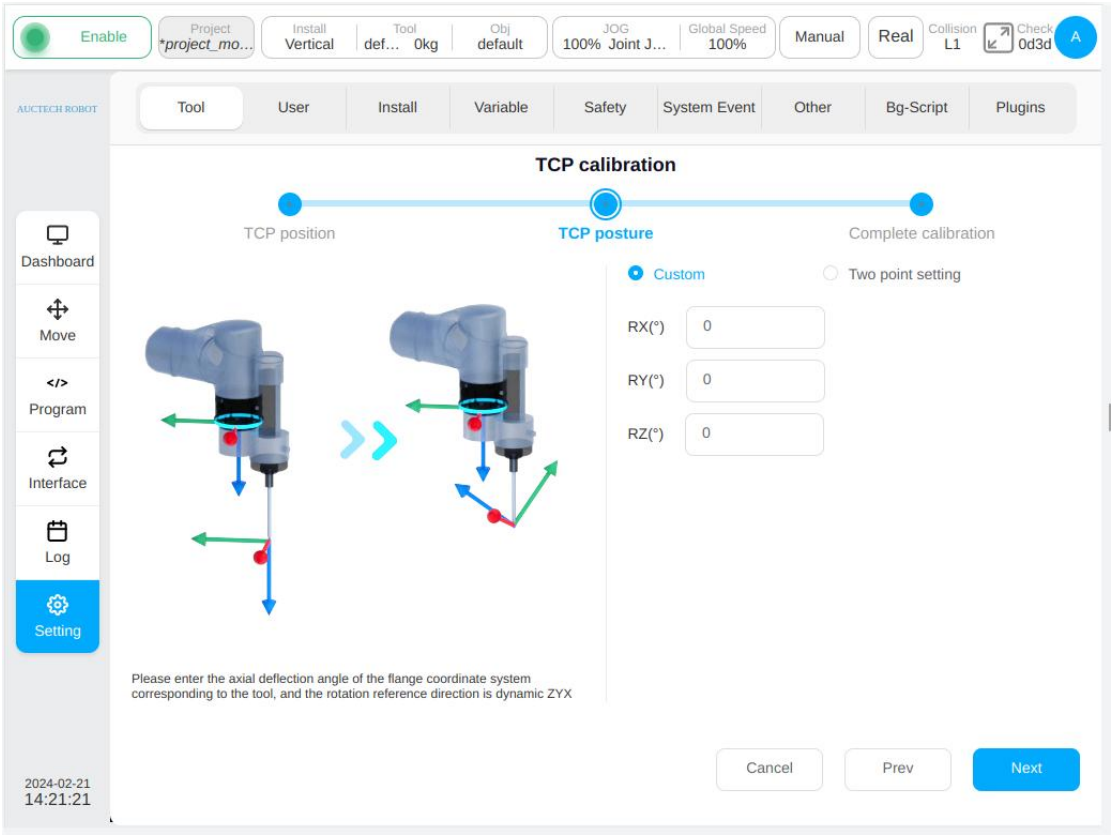
Besides setting the tool coordinate system manually, it can also calibrate the tool coordinate system. There are two ways to calibrate the tool coordinate system: 4-point calibration and 6-point calibration.



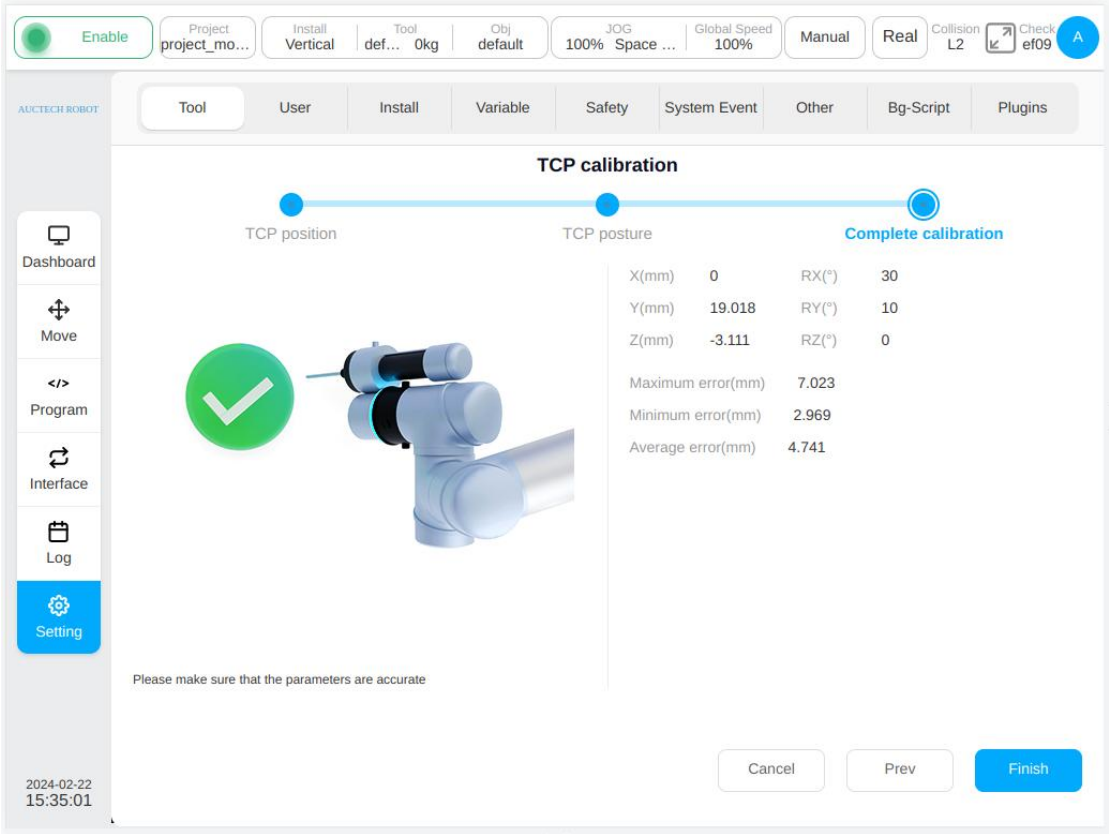
First of all, it is necessary to attach the tool point to the fixed point of the calibration needle in different posture, that is, to teach the P1-P4 points well, and it is recommended that the posture Angle change between the points should be between 45° and 90°, which is conducive to improving the accuracy of TCP calibration. Take point P1 as an example, click the "Teach" button at point P1, and the interface will jump to the mobile page. After the mobile robot reaches the target point, click "Record current position", and the interface will jump back to the interface of the current teaching mark point. After teaching a mark point, the red dot behind the corresponding mark point will turn green. You can also move the robot directly to the target point through the physical button of teach pendant and click "Record current point" directly. During the teaching process, if the current teaching point does not meet the restrictions, the following message will be displayed:



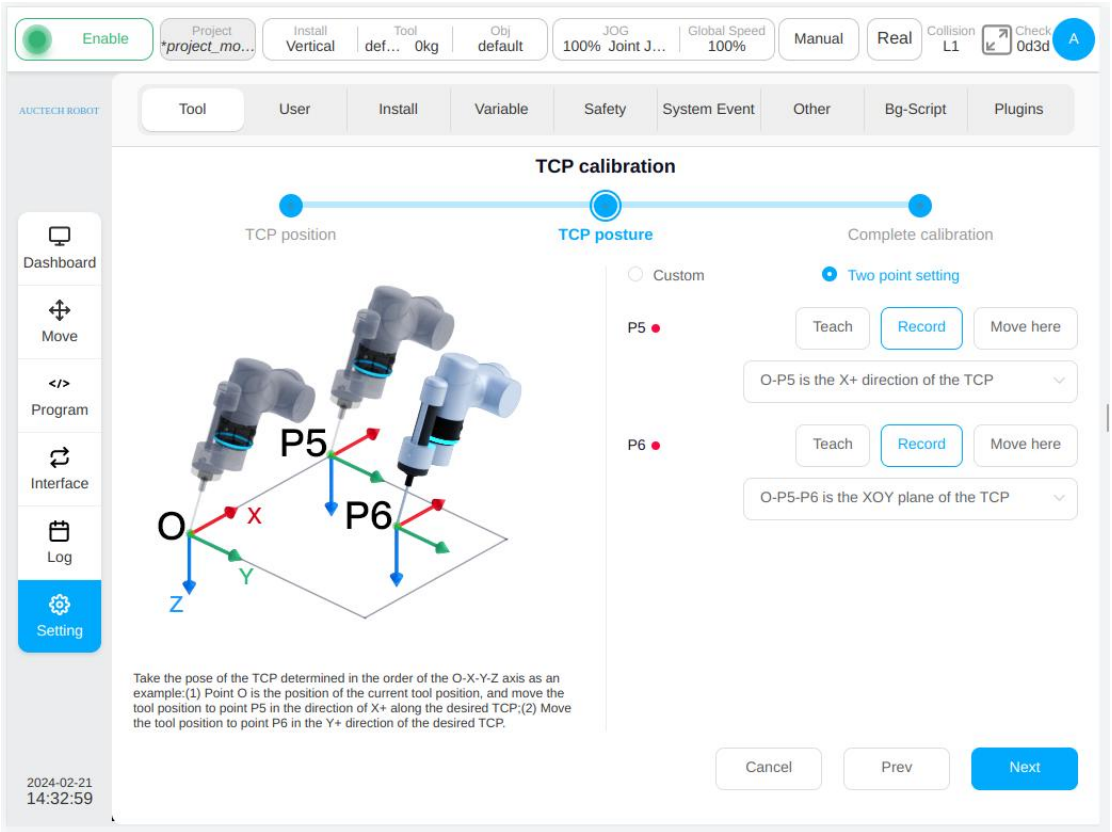
After teaching all P1-P4 points in turn, click the "Next" button at the lower right corner of the page to enter the TCP posture calibration stage. TCP posture calibration has two forms: custom and two-point Settings, the default is custom, as shown below:



After setting the axial deflection Angle of the tool corresponding to the flange coordinate system, click the "Next" button to enter the calibration completion stage, and the calibration results and error information will be displayed as shown below. The user can judge the quality of the calibration through the error information, so as to decide whether the coordinate system needs to be loaded. If you need to load this coordinate system, click "Confirm" button, otherwise click "Cancel" button, or click "Previous" to return to the teaching point again.



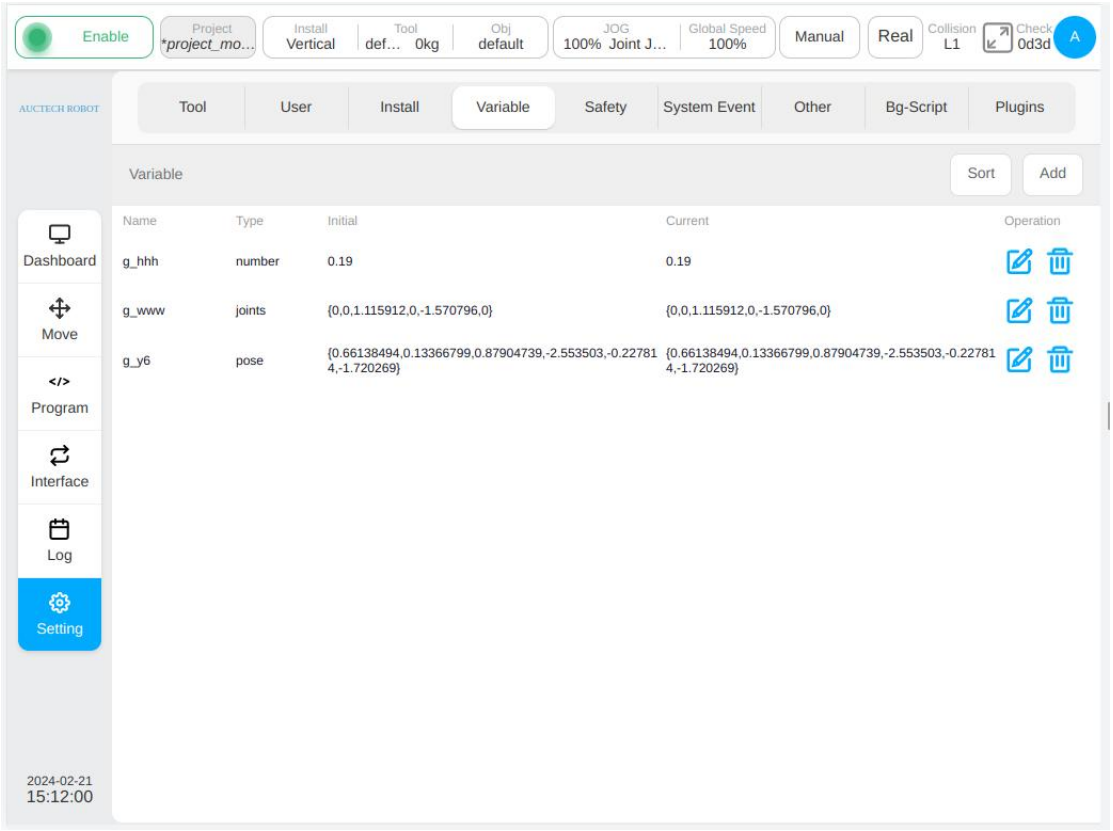
When "Two-point setting" is selected in the TCP posture calibration phase, the following figure is displayed: The options of the P5 point are O-P5 as the tool coordinate X+ direction /Y + direction/Z+ direction, the corresponding options of the P6 point are O-P5-P6 as the tool coordinate XOY plane /XOZ plane, O-P5-P6 as the tool coordinate XOY plane /YOZ plane, and O-P5-P6 as the tool coordinate XOZ plane /YOZ plane. For example, to determine the posture of the tool coordinate system according to the O-X-Y-Z axis: Point O is the position of the current tool position, first move the tool position in the direction of the desired tool coordinate system X+ to point P5, and then move the tool position in the direction of the desired tool coordinate system Y+ to point P6.



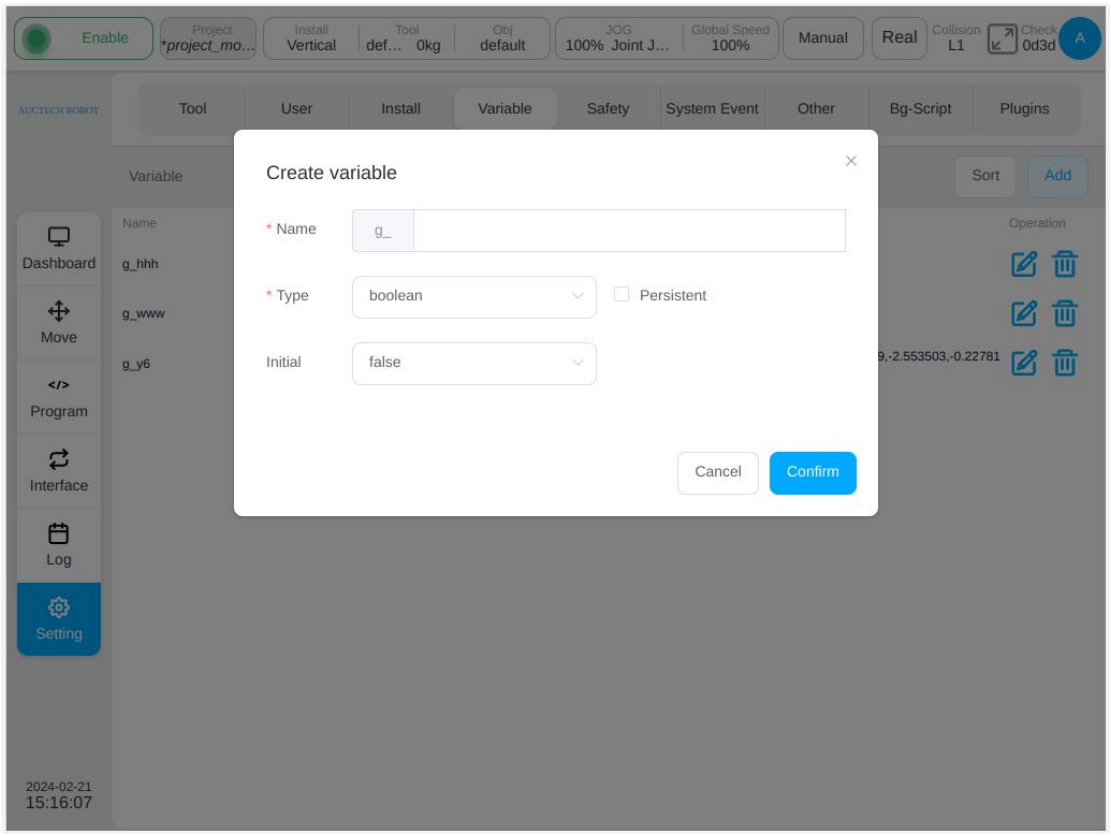
After setting the instruction P5 and P6, click the "Next" button to enter the calibration completion stage, and the calibration result and error information will be displayed. The user can judge the quality of the calibration through the error information, so as to decide whether the coordinate system needs to be loaded. If you need to load this coordinate system, click "Confirm" button, otherwise click "Cancel" button, or click "Previous" to return to the teaching point again.

14.4. Variable Settings

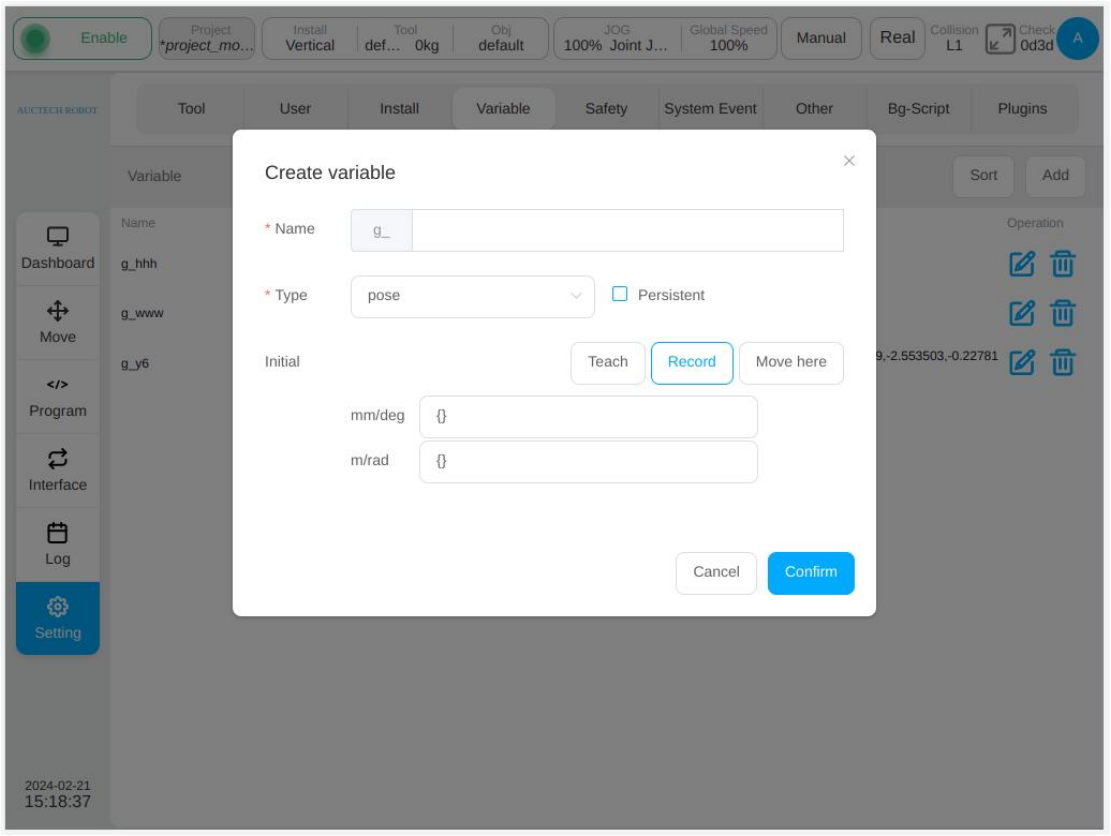
The variable setting sub-page mainly creates and displays information about system variables. Information to display system variables is: name, type, initial value, current value, and a button to modify or delete each variable. There are 13 types of variables, which are boolean, number, string, num_list, pose, joints, pose_list, joints_list, timer, pose_speed, pose_asc, joint_speed and joint_acc. The initial value and the current value represent the initial value when the variable is defined and the process value during the application of the program, respectively.



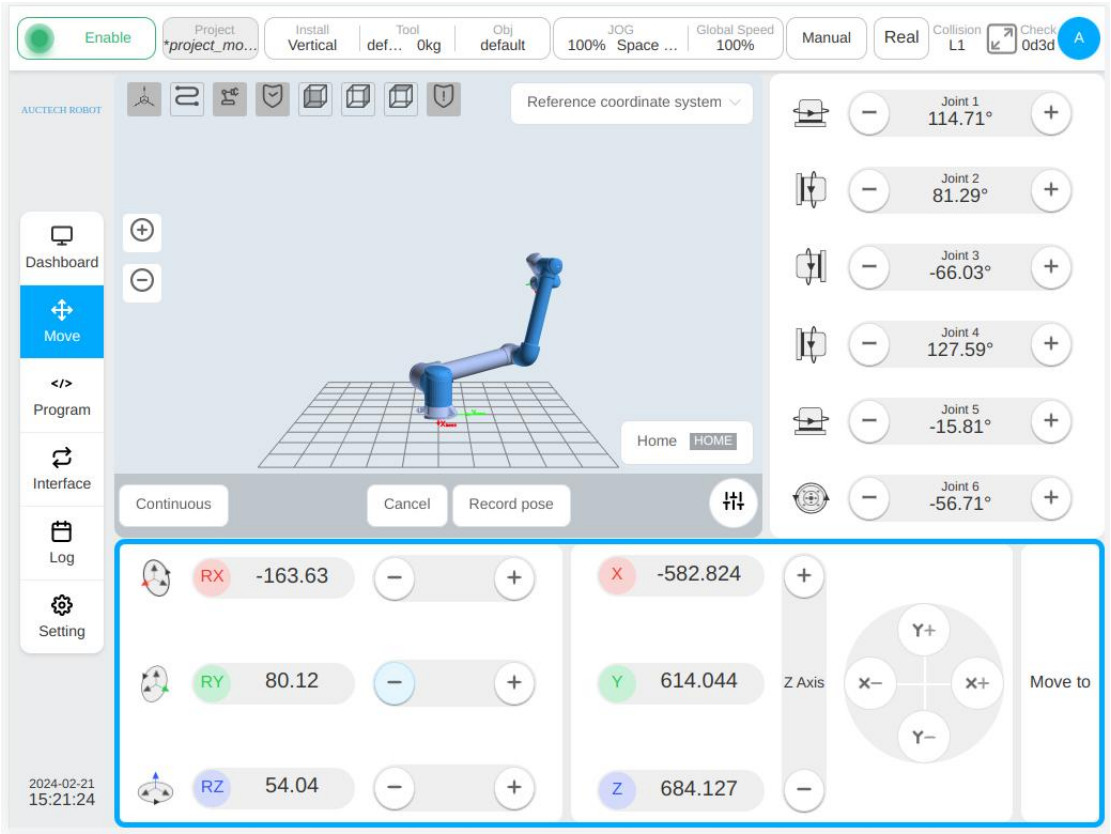
Click the "Add Variable" button at the upper left of the interface, and a window to create a new variable will pop up. Enter a variable name, type, and initial value, and click OK. Each variable type marked with a g_, indicating that it is a global variable, and each variable type can be selected as a “persistent variable”. When the “persistent variable” check box is checked after the variable type is selected for the new variable, the word “Ⓟ” will appear before the variable name on the page. For example, the added variable aa of type number is a persistent variable. When set to a persistent variable, the system will save the last value each time; Otherwise, the variable is initialized with its initial value.



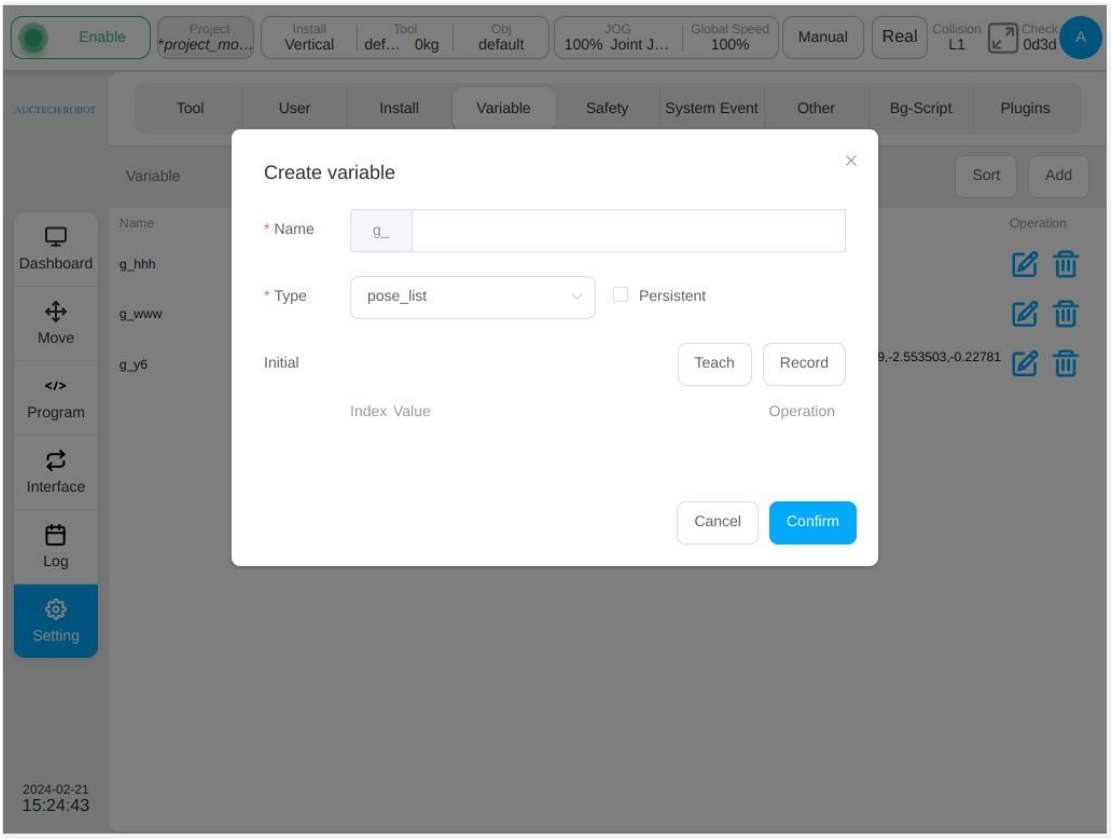
The initial Boolean value can be false or true; The initial value of the numeric type number is 0, and the variable value can be integer or decimal. The initial value of string is null. The array type num_list is an integer or floating-point array wrapped in curly braces. The pose type is a floating-point array of length 6 wrapped in curly braces. The joints type is a floating-point array of length 7; The pose_list type is a two-dimensional array of floating-point arrays of length 6 wrapped in curly braces; The joints_list type is a two-dimensional array of 7-length floating point arrays wrapped in curly braces. The timing type timer is an integer array or floating-point array wrapped in curly braces. The variables of end speed pose_speed type, end acceleration pose_acc type, joint angular velocity joint_speed type and joint angular acceleration joint_acc type are also number types in essence, supporting integers and decimals, and each variable type has two unit displays. Each can input a unit variable value after the automatic filling of another unit conversion value. All variable types can be assigned manually, and two types of variables, pose and joint_list, can be initialized and edited by teaching. The pose_list and joints_list variables can be directly added and joints_list variables can be added by teaching.



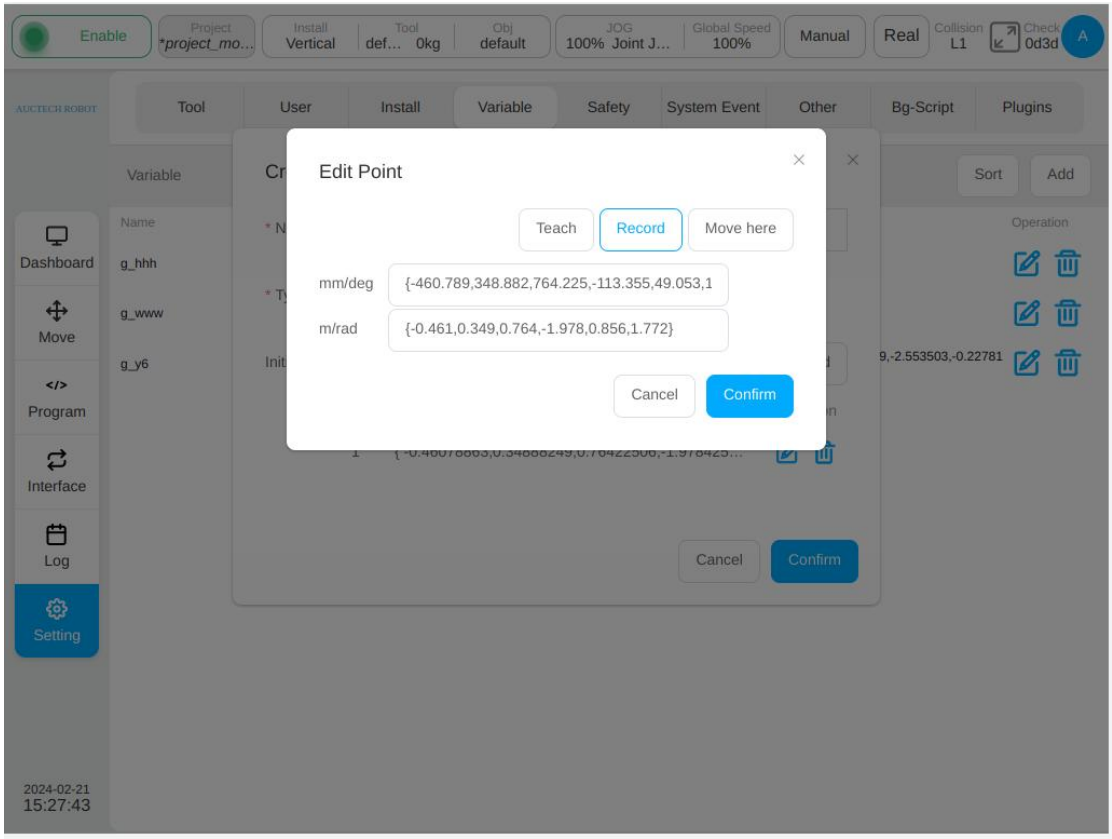
Click "Select Position" button, and the interface will jump to the mobile interface. After teaching the required pose, click "Record Current Position", and the interface will return to the new variable window, and record the pose value to the corresponding initial value position. For the display value in mm/deg and m/rad, the display value should be in two units.



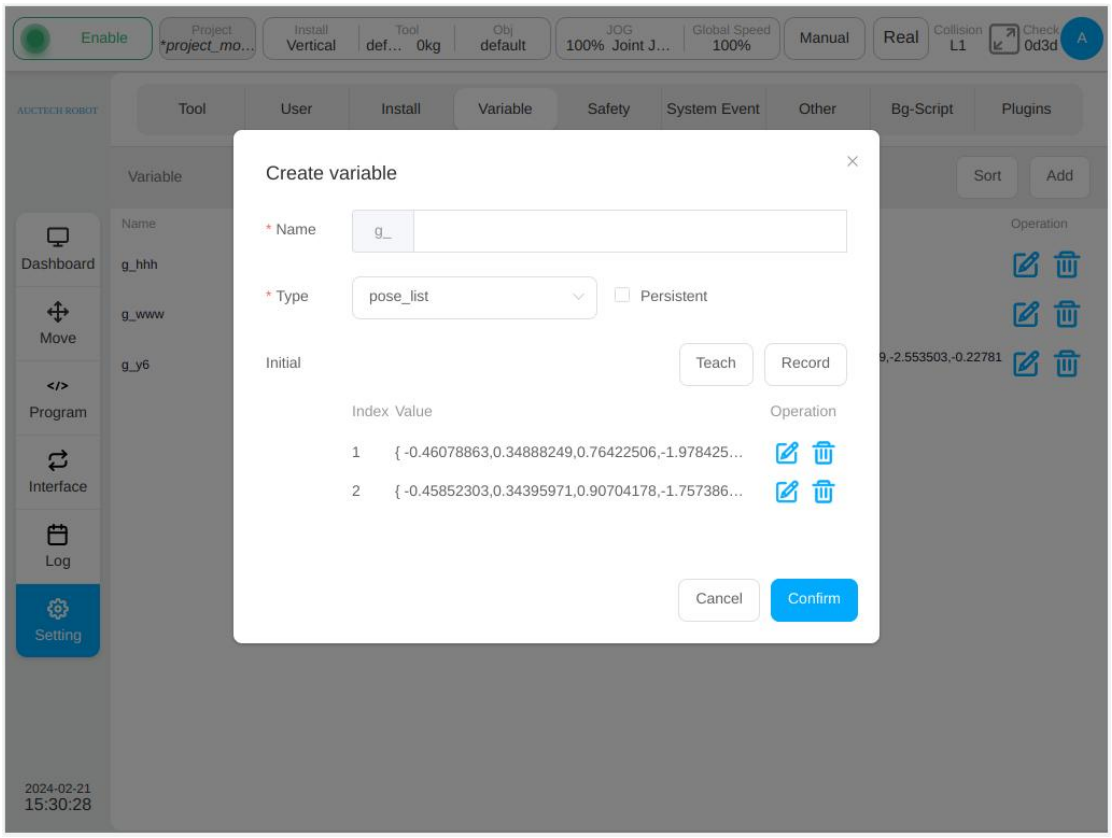
In addition to teaching initialization, the user can also click the initialization input box to manually initialize the assignment. The joints type variable creation is similar to the pose type and is not described here.



When creating pose_list variables, the initial value can be added in any way through "Direct addition" or "Teaching addition". By clicking the "Direct addition" button, the serial number, value and operation of the corresponding variables will be displayed at the bottom of the interface. By clicking the icon in the operation column, a window for editing points will pop up, which is not to be repeated here.

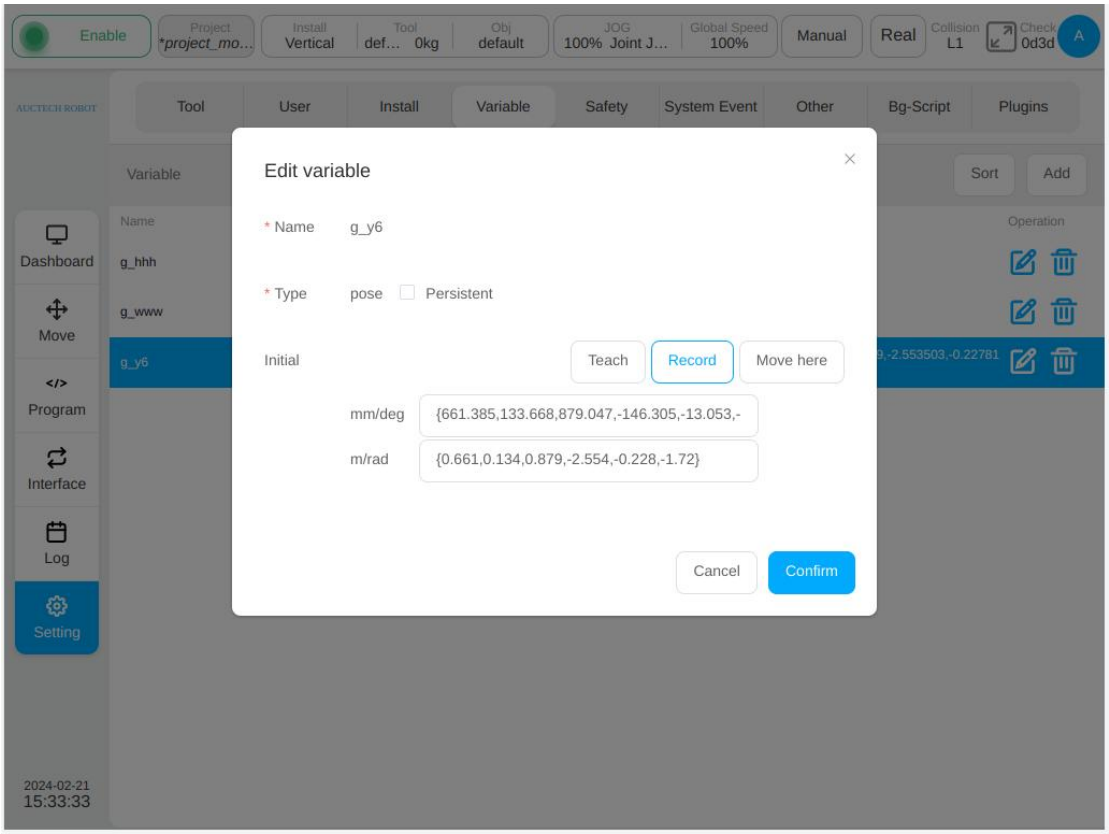


After selecting the pose position, the interface is as follows:



The joints_list variable creation process is similar to the pose_list type and is not described here.

When modifying a variable, click the icon corresponding to the variable row. A window for editing variables pops up. The variable type is not modifiable, only the initial value and whether it is a persistent variable can be modified. To delete a variable, click the icon corresponding to the variable row.

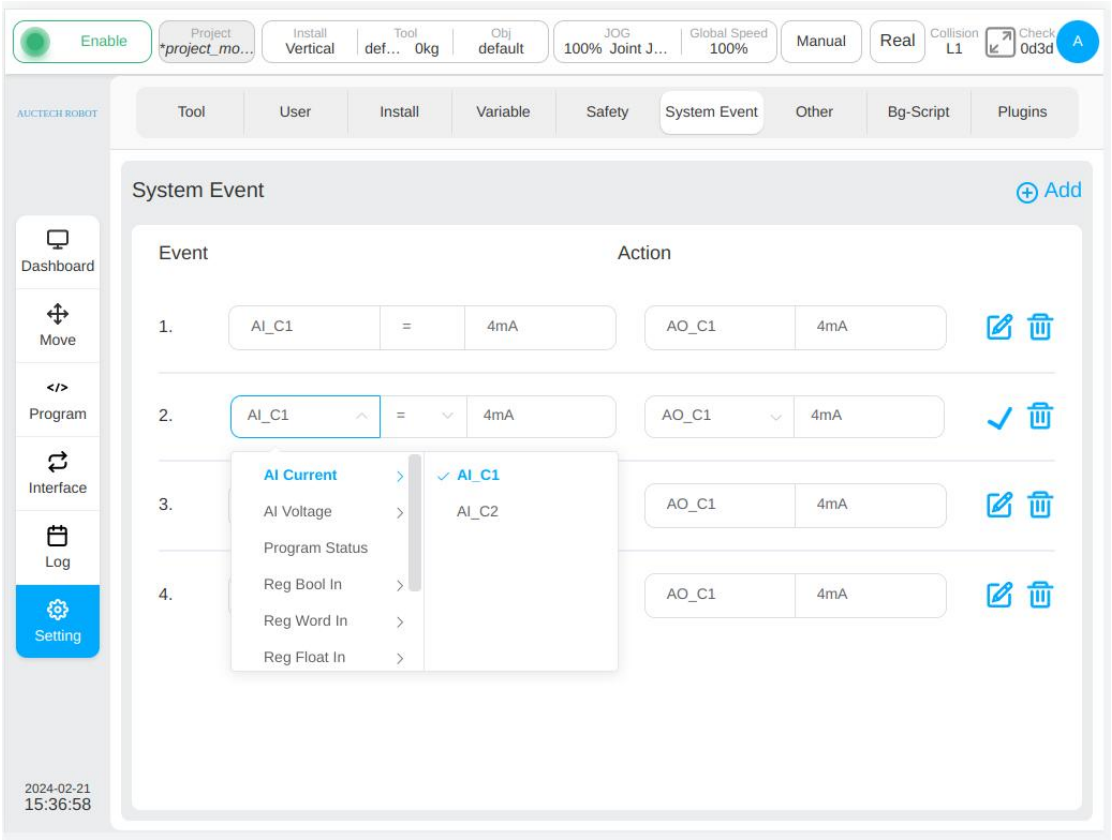


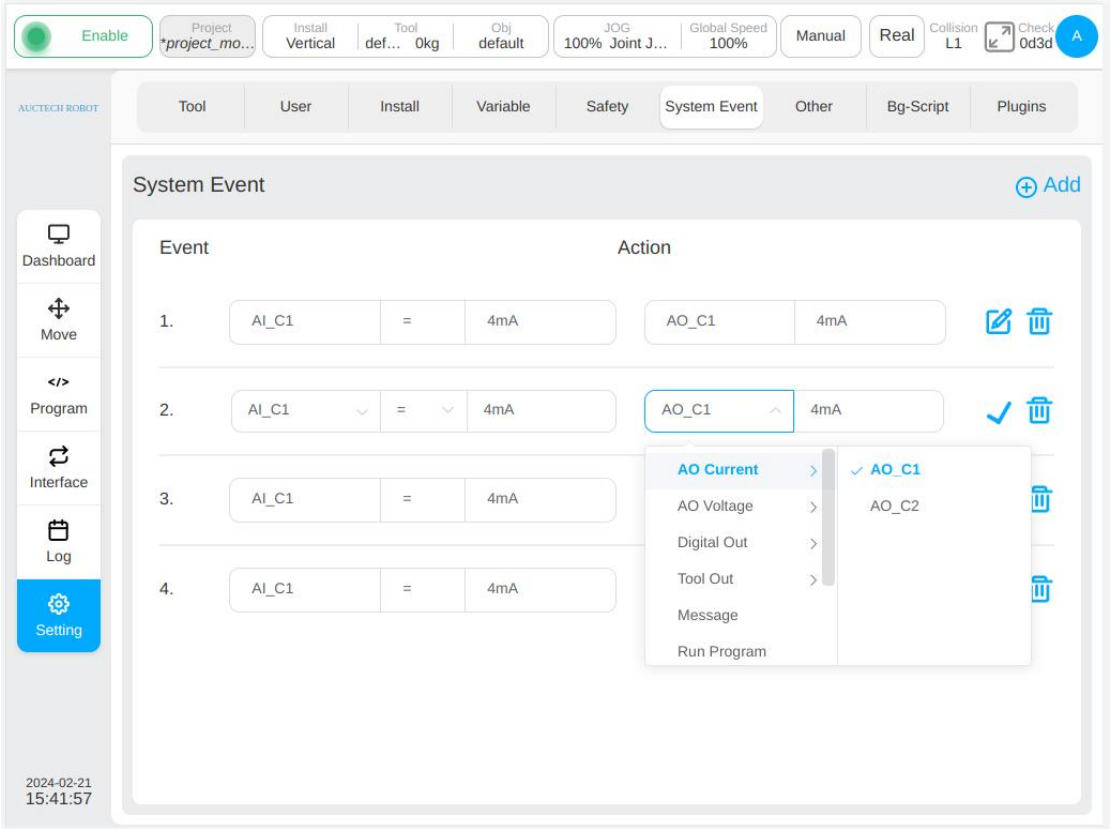
14.5. System Events

The System Events subpage is designed to add additional general event function to the system, allowing users to customize the response to certain events when they occur. At present, there are 9 types of events: analog current input, analog voltage input, program status, register Bool input, register Word input, register Float input, end speed, joint torque and custom event. There are 9 types of response: analog current output, analog voltage output, general output, tool output, pop-up box, running program, register Bool output, register Word output and register Float output.

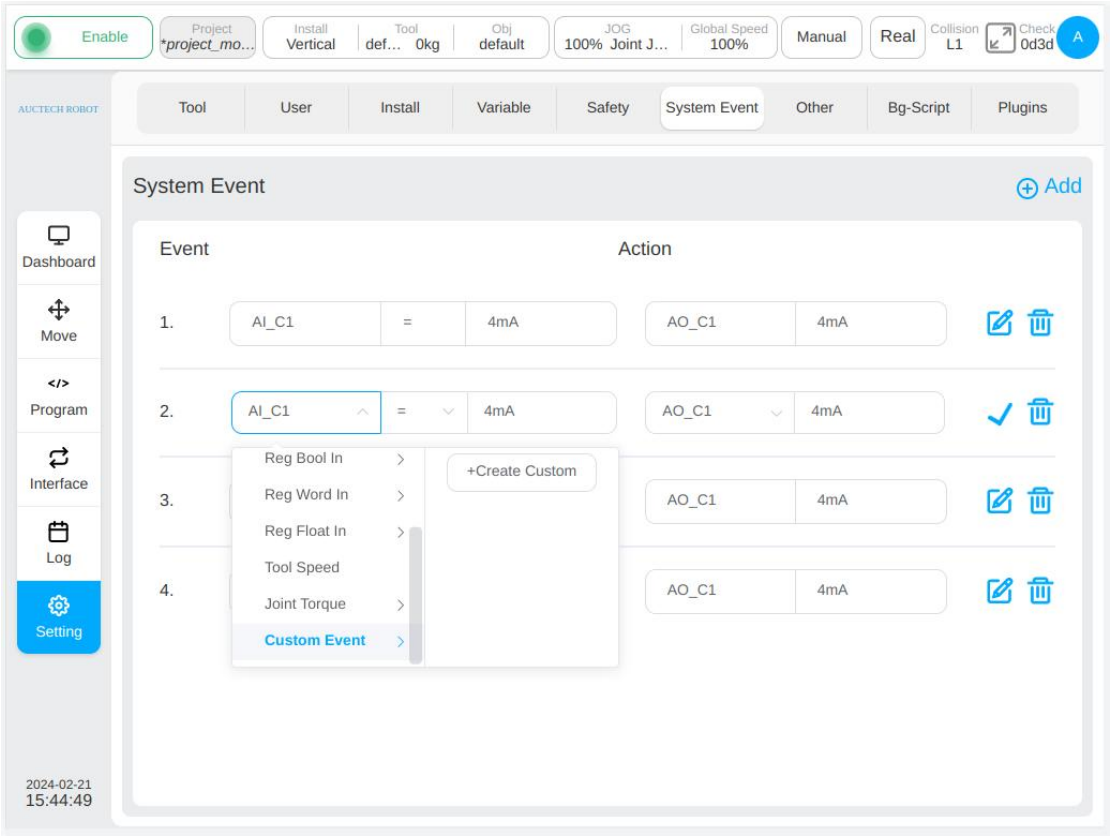
Care

- The event is always triggered by the side.
- If the event triggering conditions are met, the event will not trigger immediately after the setting. The event will be triggered next time.



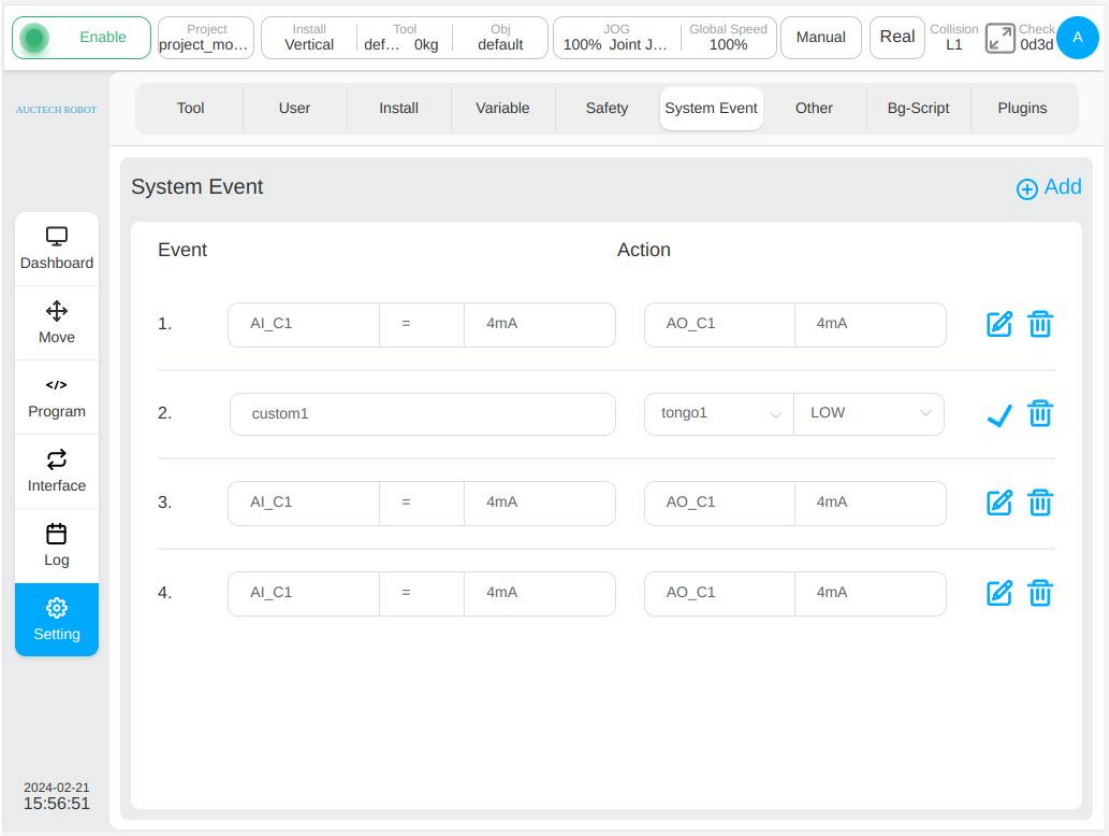


Click “Add Event” in the upper right corner of the page to add an event response. The default event type is analog current input, the event condition is “=”, and the value is 4mA. The default response type is Analog current output, and the value is 4mA. Click the icon next to each event response to enter the editing state. You can edit each event response. After editing, click the icon . Click the icon to delete the added event response.



For a custom event, if no option is available in the list on the right of the custom event option, you can click “New Custom Event” in the list on the right of the custom event option to create a custom event. Click the “New Custom Event button”. The virtual keyboard is displayed, prompting you to enter a custom event name.

After the user enters the customized event name (such as custom1), an event response is added, as shown in the following figure:



The newly created custom event is displayed in the custom event options list, and one custom event can correspond to multiple responses. In addition, if all event responses containing the same custom event are deleted, the custom event is also deleted. That is, the custom event is not available in the custom event option list.

14.6. Other Settings

The other settings subpages are startup settings, editing HOME points, collision settings (which are moved to safety settings for Safety2), force sensor settings, end settings, and model import settings. The left side of the interface is the navigation tab, and the right side is the corresponding tab display content area. The page displays the startup settings by default.

- **Boot settings**

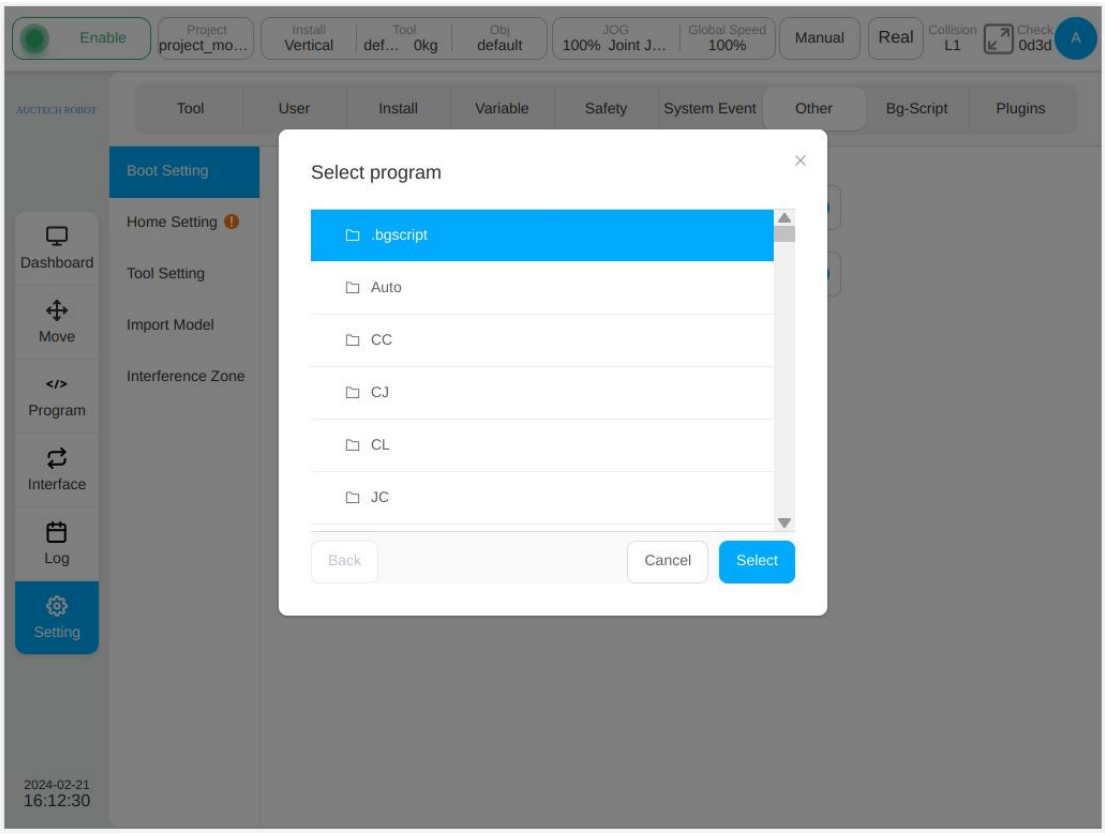
Click the “Boot Settings” TAB to set the default global speed, default jog speed, whether to log in automatically, and set the default program.

Adjust the default global speed slider on the right to set the default global speed of the robot;

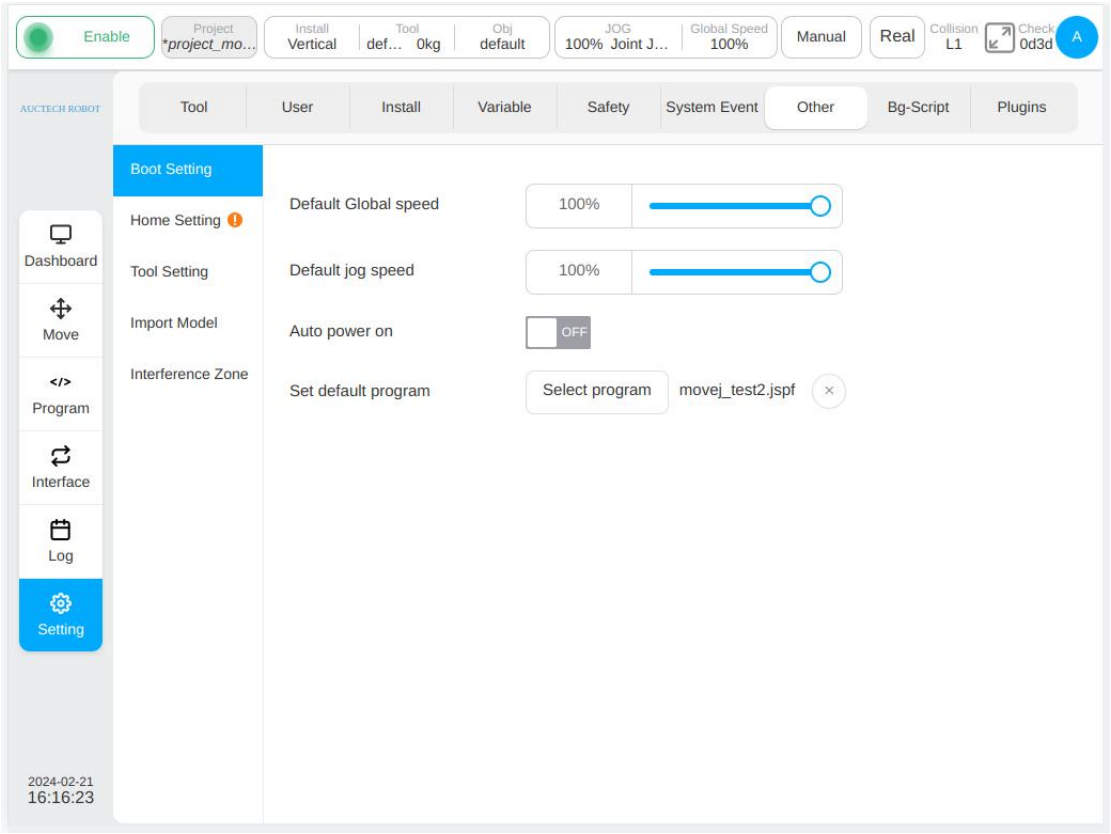
By adjusting the default jog speed, the right slider can set the default jog speed of the robot;

The switch on the right of “Robot power on automatically” can be used to switch whether the robot is automatically powered on.

Click the "Select Program" button and a program list window will pop up.



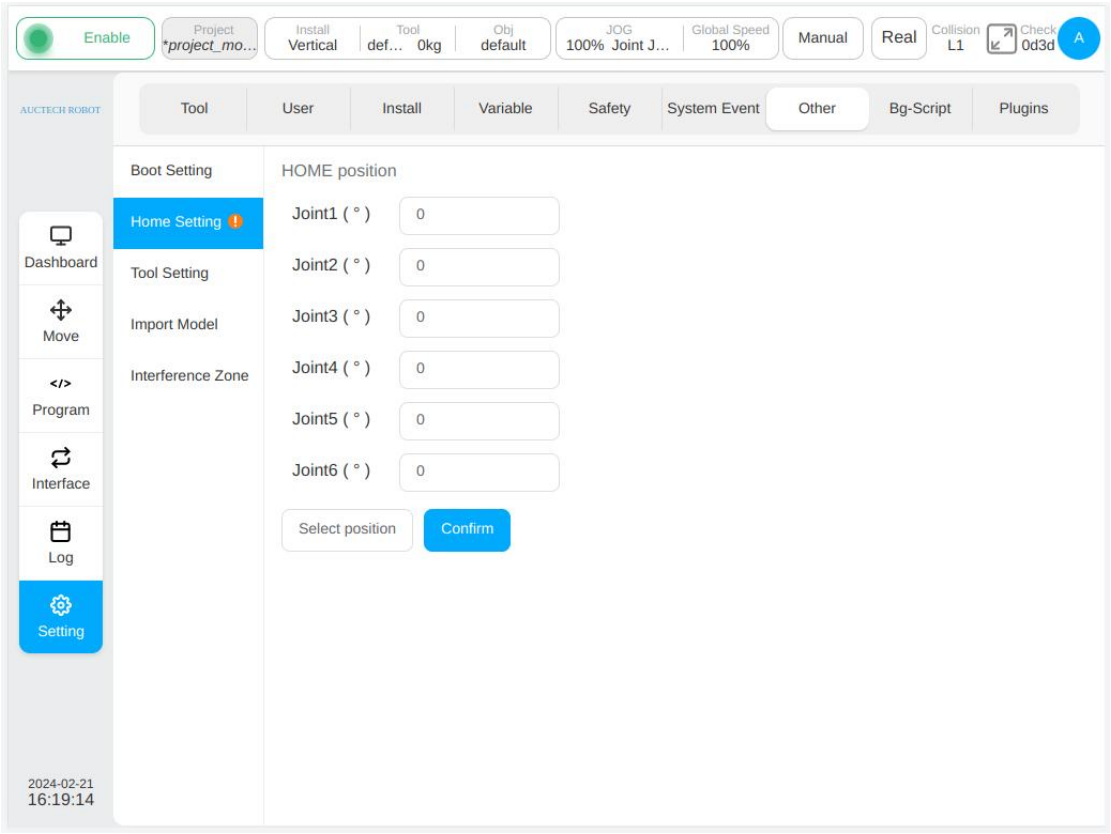
After selecting the program, click the "Select" button. After setting the default program, the "Select Program" button will display the default program name and a cross icon to cancel the default program.



- **Home settings**

The HOME position at the top of the interface displays the angle values of each joint at the current HOME position. The user can manually enter the joint angle by clicking each joint input box, or by clicking the "Select HOME position" button to jump to the mobile interface for teaching settings, which is similar to the process of creating a pose type variable above, after teaching the position Jump back to the current interface and click the "OK" button to make the settings take effect.

Care	**For DC00 / DC15S/DC30D control cabinets, after selecting the "HOME" position, synchronize it to the safety controller. For details, read Section 6.2.3.7.**

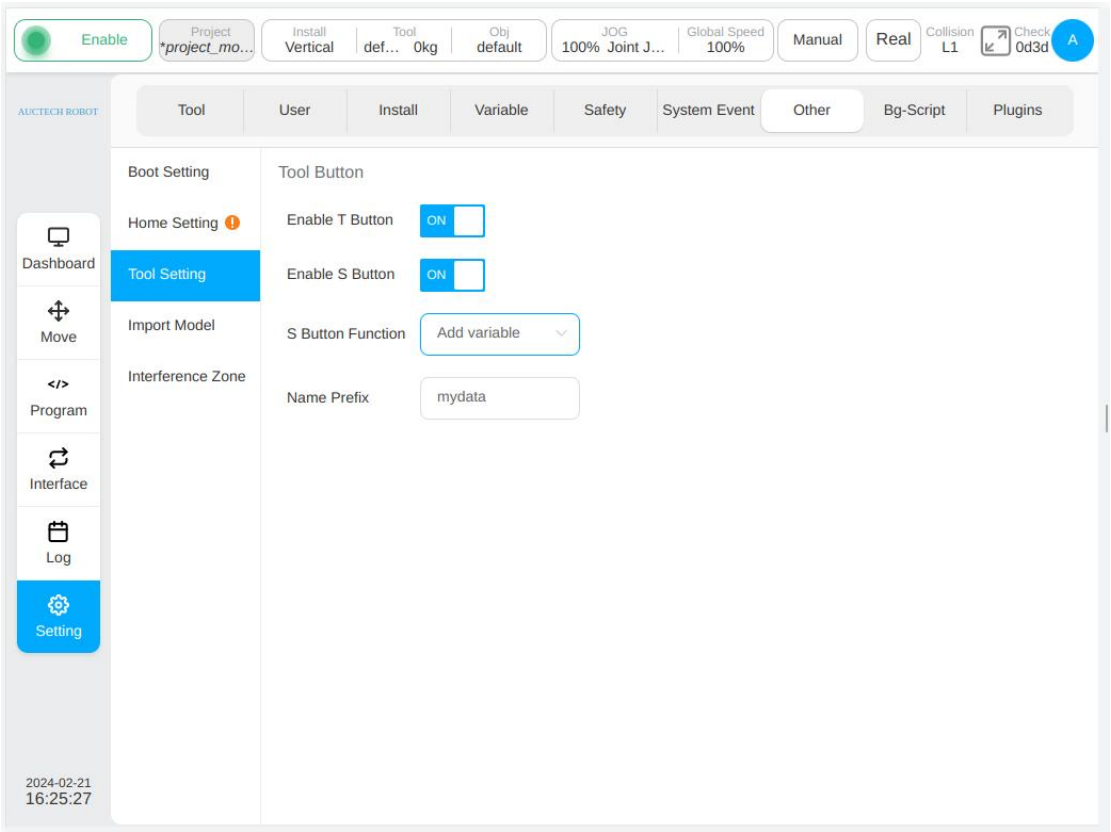


- **Collision Detection Settings**

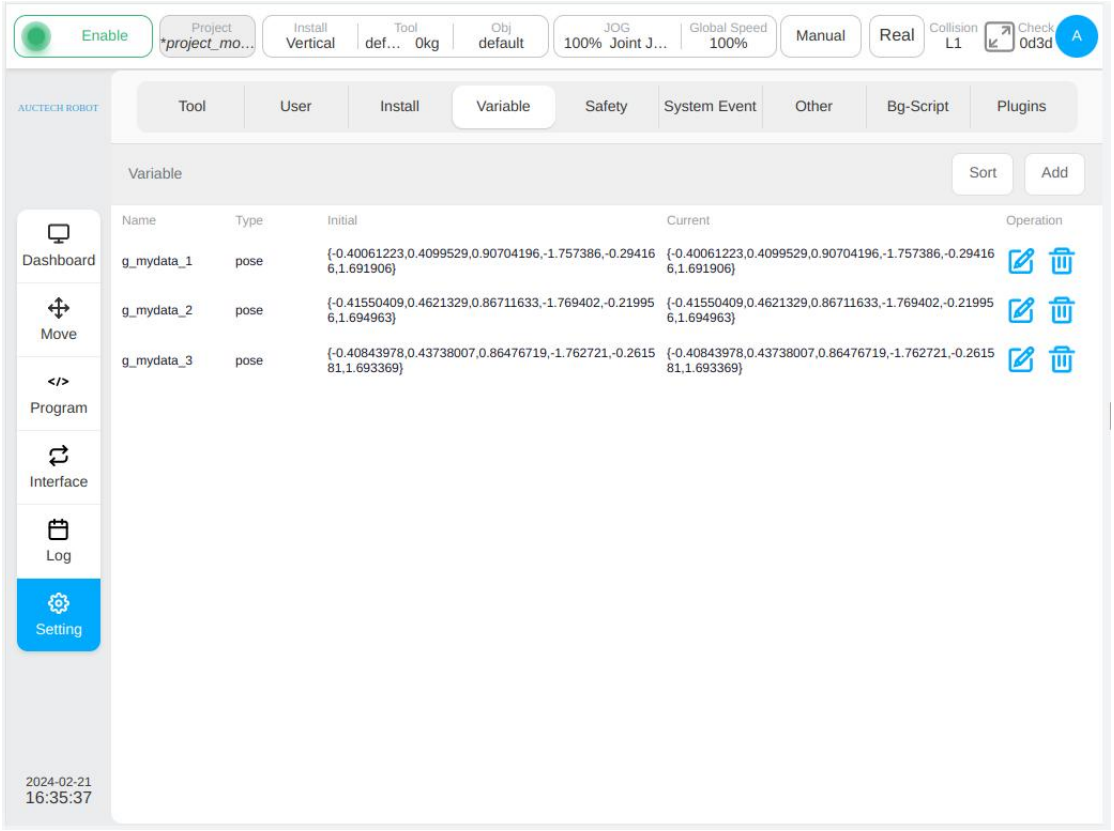
Collision detection Settings for DC30 control cabinet is configured in other Settings; For DC00 / DC15S/DC30D control cabinets, configure in Safety Settings (read Section 6.2 for details). The collision detection area can be set for collision detection level and reset mode. The collision detection levels are divided into: off, level 1, level 2, level 3, level 4, and level 5. The higher the level is set, the more sensitive the collision detection is. The collision detection reset mode is divided into manual reset and automatic reset. After the user configures the collision detection level and reset mode, click the "OK" button.

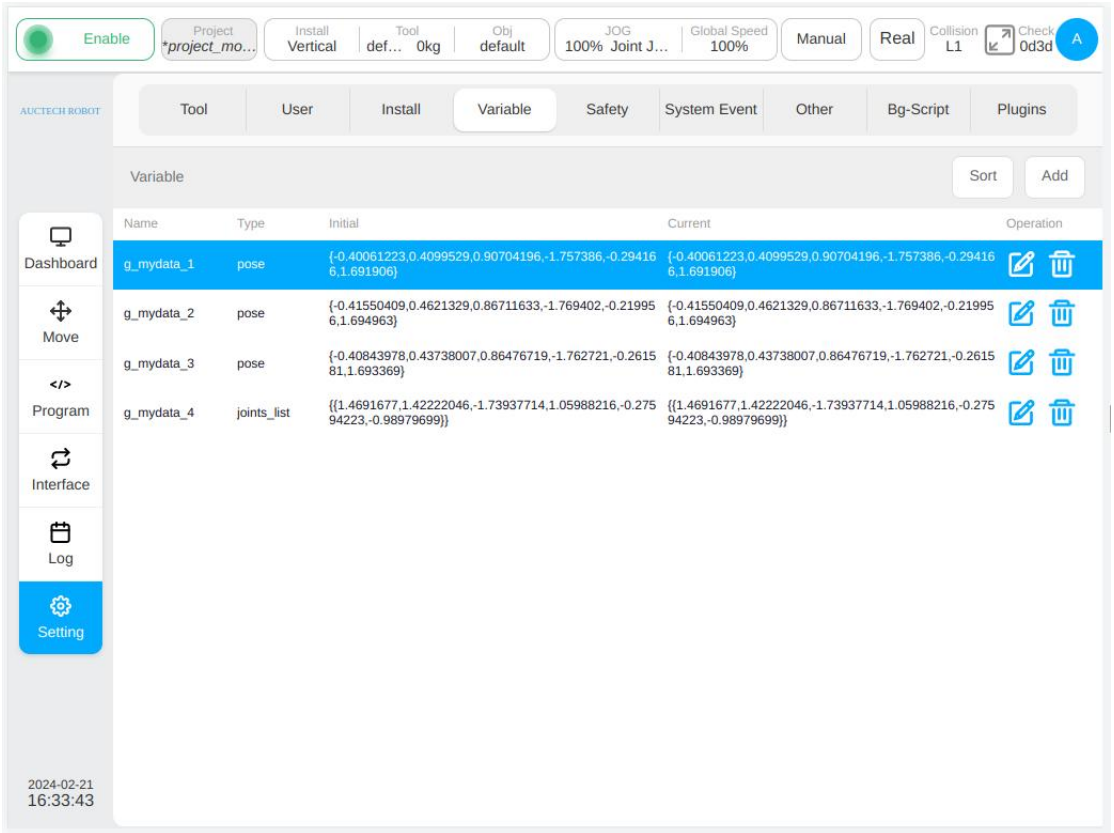
- **End Button Settings**

Set the end T and S buttons. You can choose whether to enable the T and S buttons at the end. Select to enable T button, which has the function of pressing and pulling the robot arm. The S button is enabled to set the S button function. The S button has three functions: add variables, add motion instruction, add variable and motion instructions. When you select the S button to add variables or add variables and motion commands, you also need to configure variable name prefixes. The default value is mydata. After global variables are recorded, their official names become g_mydata_1 and g_mydata_2. Each time a variable is added, the maximum value of the variable name suffix is checked, and the count is added on this basis.



With the S button enabled, when the S button function is configured to add variables, the variable name prefix is the default value mydata. Click to trigger S button, and a new pose global variable will be added to the variable setting page. If the S button is triggered 3 times a single time, three pose variables will be added to the variable setting page. The variable names are g_mydata_1, g_mydata_2, and g_mydata_3 in sequence, as shown in the figure below:





Long press the trigger S button, and a new global variable of joints will be added to the variable setting page. For example, long press the S button once, and another variable of joints will be added to the variable setting page, as shown in the figure.

When the function of S button is configured to add motion instructions, click to trigger S button, and a new MoveL instruction will be added to the program page under the conditions of adding instructions (e.g., it must be in the program editing state). When the S button is triggered, the Cartesian pose of the robot corresponds to the X/Y/Z/RX/RY/RZ input box recorded in the MoveL instruction parameter page. When long press the trigger S button, a new MoveJ instruction will be added to the program page, the robot joints angle is correspondingly recorded in the parameters page Joint1/ Joint2 / Joint3 Joint4 Joint5 / Joint6 input box on the MoveJ instruction parameters page when triggering the S button.

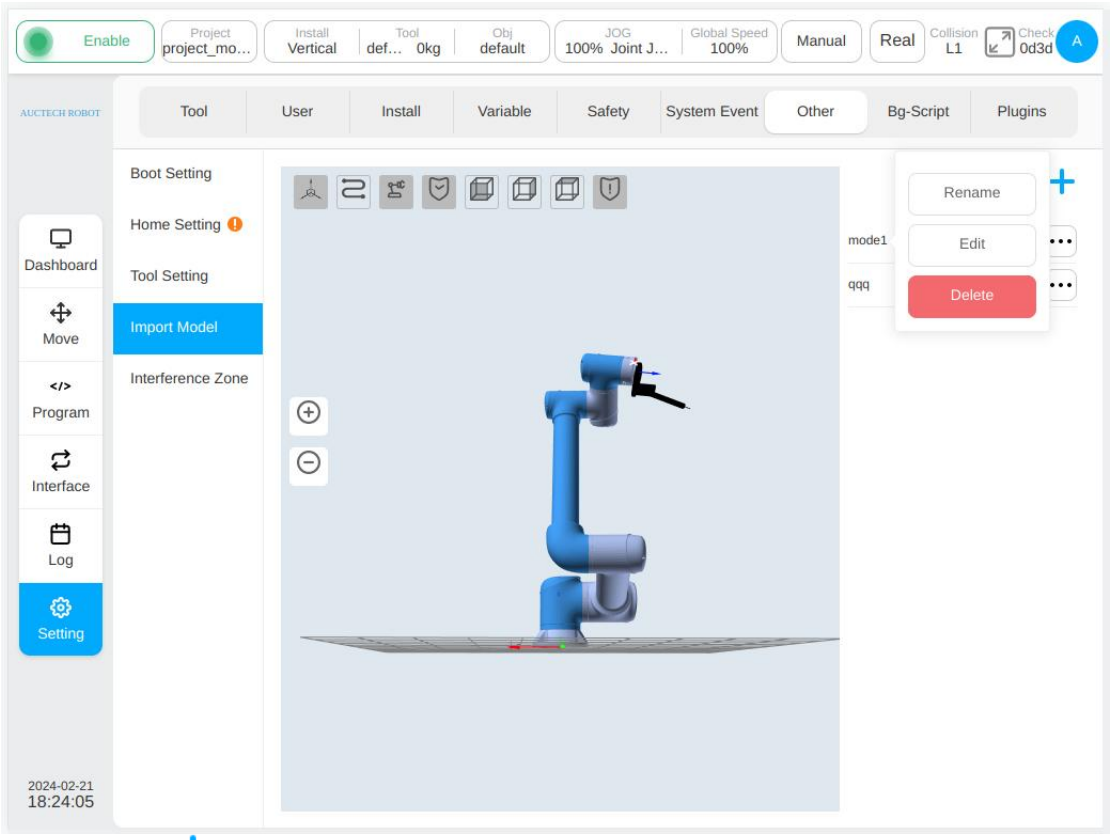
When the function of S button is configured to add variables and motion instructions, click to trigger S button. In addition to adding a new global variable of pose type to the variable setting page, the variable records the Cartesian pose of the robot when S button is triggered, and a new MoveL instruction is added to the program page when the conditions of adding instructions are met. The newly added MoveL instruction is set to a variable form, and the variable has been selected by default as the newly added pose global variable; After long pressing to trigger S button, a new global variable of joints is added to the variable setting page, which records the angle of each joint of the robot when S button was triggered. A new MoveJ instruction was added to the program page when the conditions of adding instructions were met, and the newly added MoveJ instruction was set as a variable. The variables have been selected by default as global variables of the newly added joints type.

The above addition of motion instructions is valid only when the program page instruction node is under the Move node, and the newly added MoveL instruction coordinate system calls the coordinate system which is in use when the S button is triggered, and the parent node coordinate system option is not checked by default.

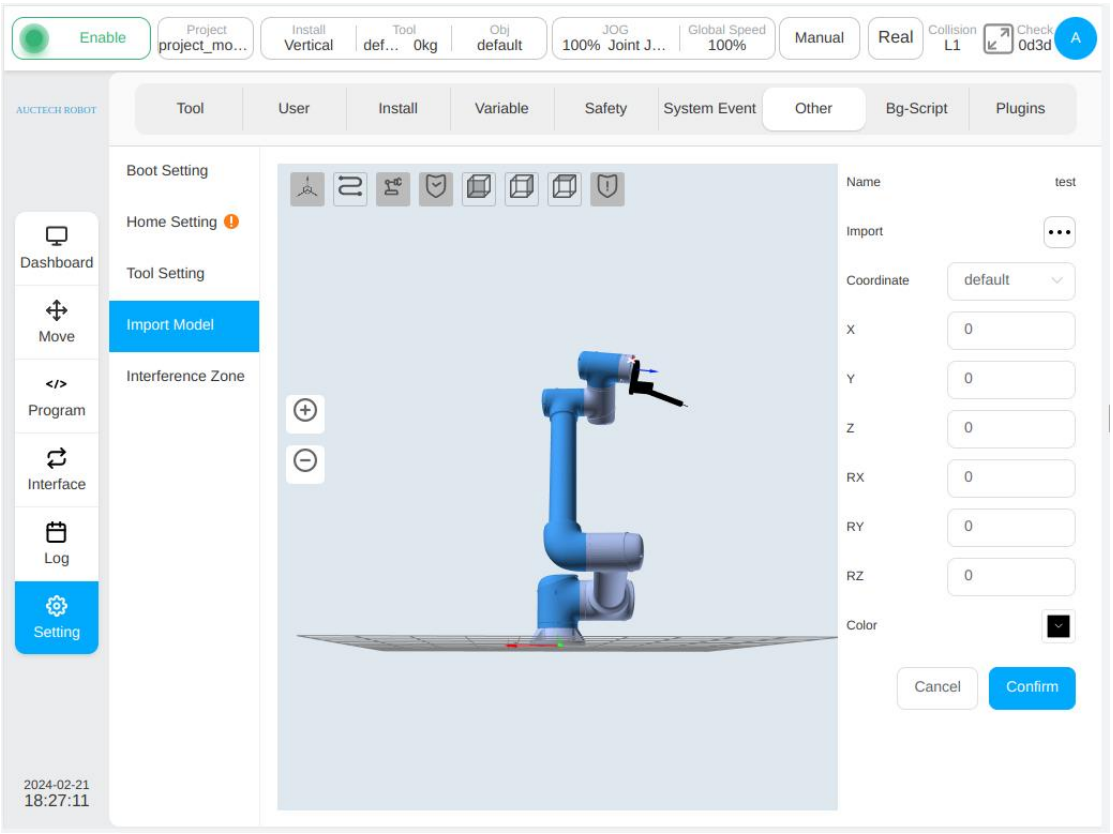
When the program page instruction node is in Spline, the S button adds motion instructions in a way that adds waypoints to Spline.

- **Model Import Settings**

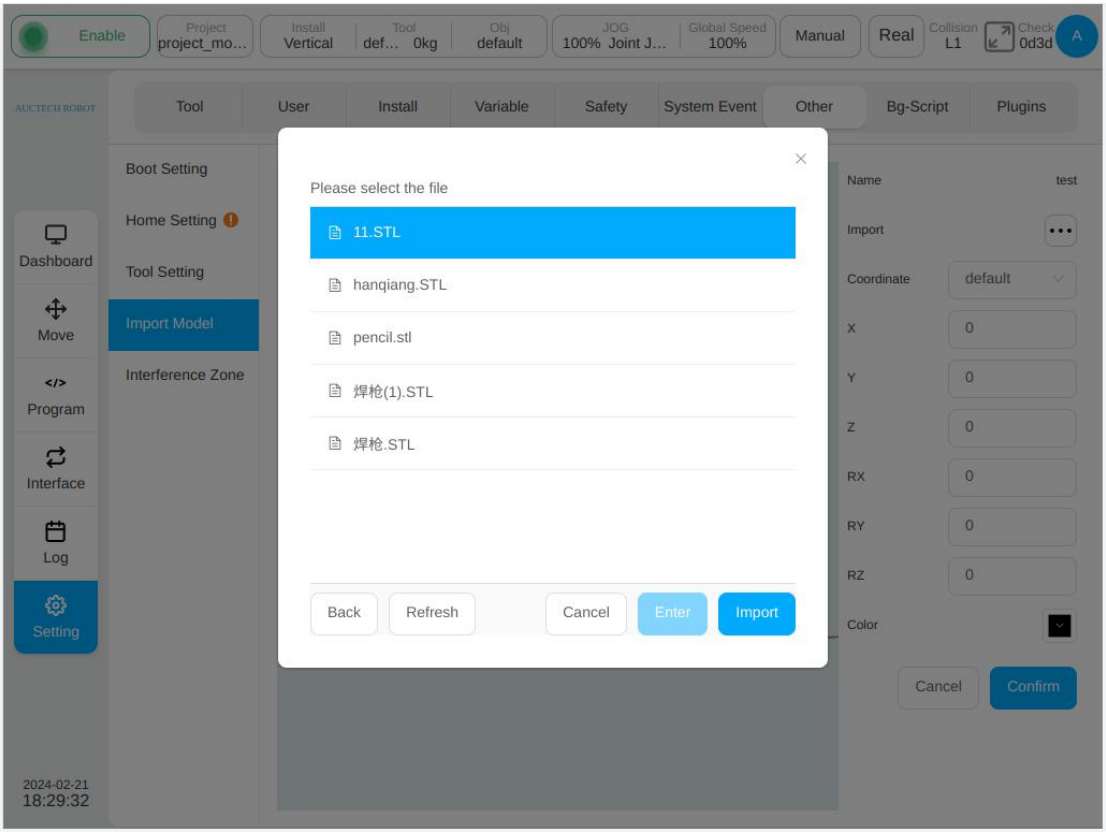
This page allows you to import tool or workpiece models and display them, the 3D simulation model is displayed on the left side of the page, and the list of imported tool/workpiece models is displayed on the right side. Click the icon to the right of each row in the model list to display a pop-up box for renaming, editing, and deleting the model.



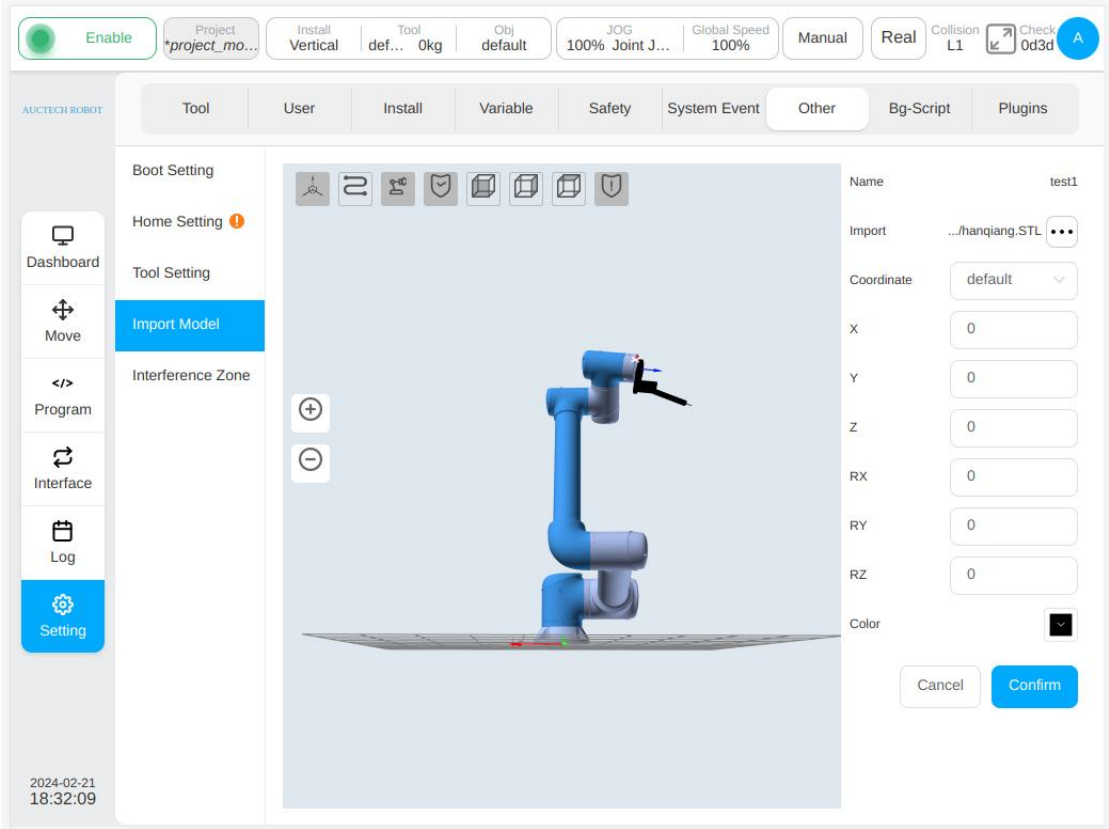
Click the icon + on the upper right to display the virtual keyboard, enter the model's name (such as test), enter the parameter editing page of the newly added model test, as shown in the figure.



Click next to “Import Model”, the model import mode selecting box is displayed. There are two import modes: external import and internal import. If external import is selected, the required model file is imported from an external U disk, and the size of the model file must not exceed 3M. When internal import is selected, the required model files are imported from the system internal model folder. Model files can only be in .stl or .STL format.

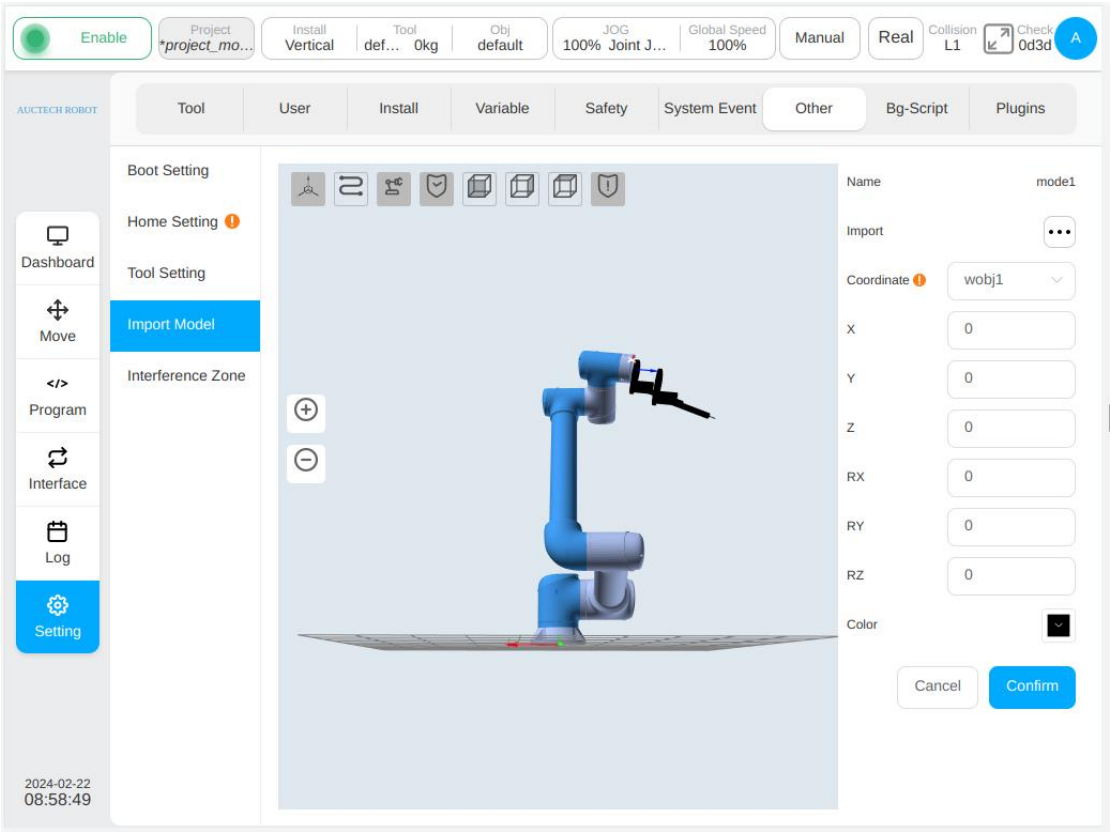


After the model file is selected, the default reference coordinate system displayed by the model is the default tool coordinate system, the values of X, Y, Z, Rx, Ry, and Rz are all 0 by default, and the model color is black by default. Users can set the values of reference coordinate system, X, Y, Z, Rx, Ry, Rz, and model color according to their own needs.

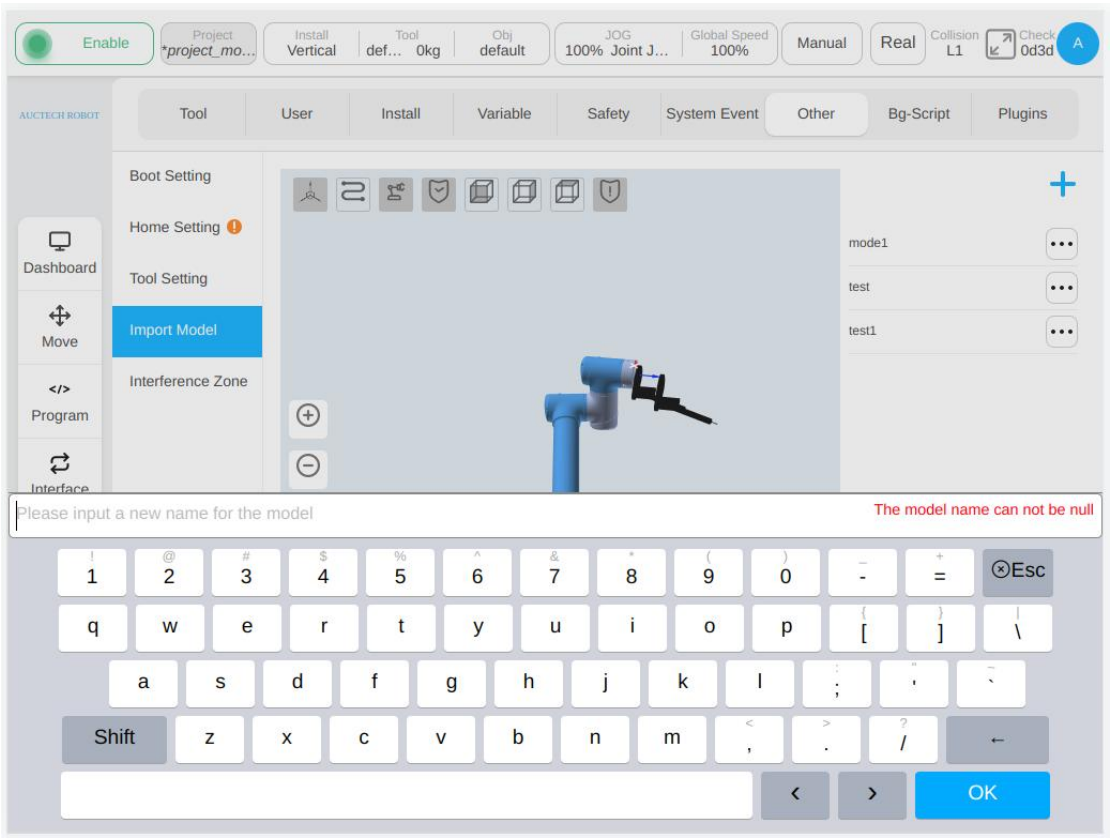


You can choose the world coordinate system, the base coordinate system, the tool coordinate system and the workpiece coordinate system as the reference coordinate system. Among them, the tool coordinate system and the workpiece coordinate system are the established coordinate systems in the tool setup and workpiece coordinate system pages respectively. Adjusting the model's reference coordinate system and its offset and color parameters will transform the model's pose and color in real time.

When editing an existing model (e.g., mode1), enter the model parameter editing page. If the selected tool/workpiece coordinate system parameter value is modified, it is inconsistent with the coordinate system parameter value used in the model import setting, a prompt icon will be displayed at the reference coordinate system.

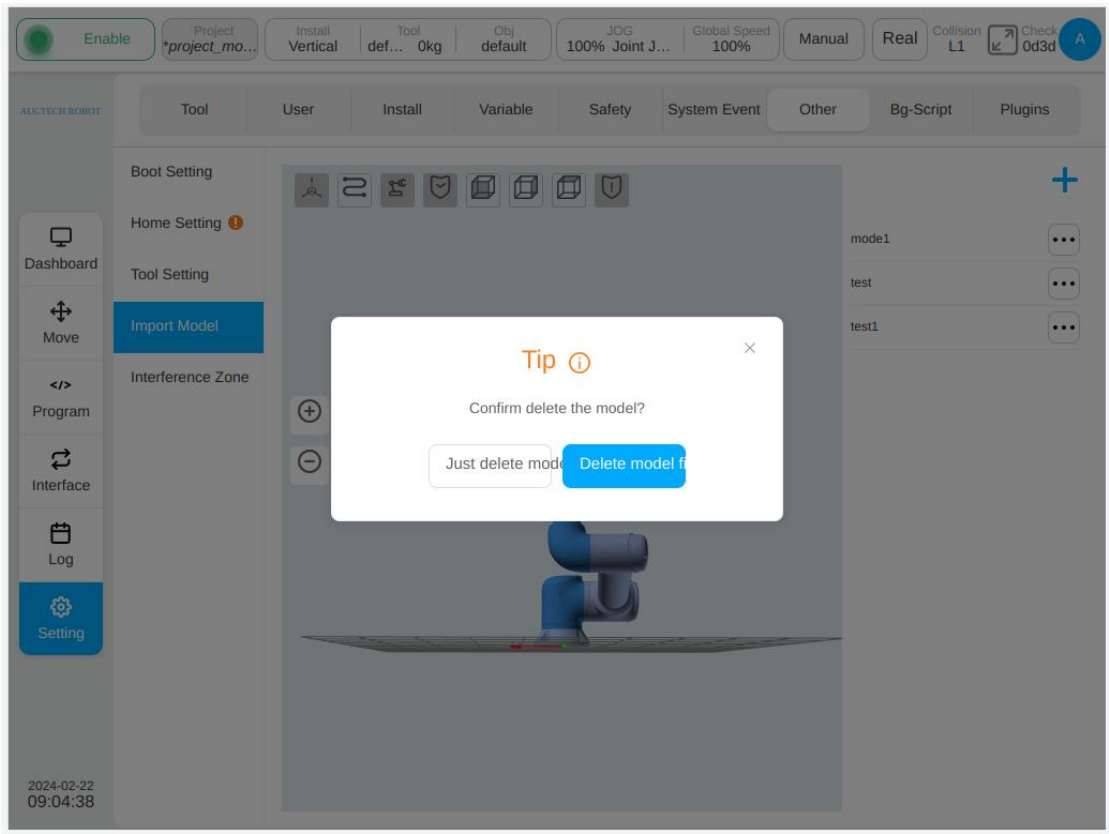


When renaming the model, click the icon ••• on the right of the model to click the “Rename” button in the operation box, and a virtual keyboard will pop up, prompting you to enter a new name for the model, as shown in the figure.



When editing an existing model, click the "Edit" button in the operation pop-up box of the icon ••• on the right of the model, and the parameter editing page of the model will be entered, as shown in the figure when creating a new model. It's not described in detail here.

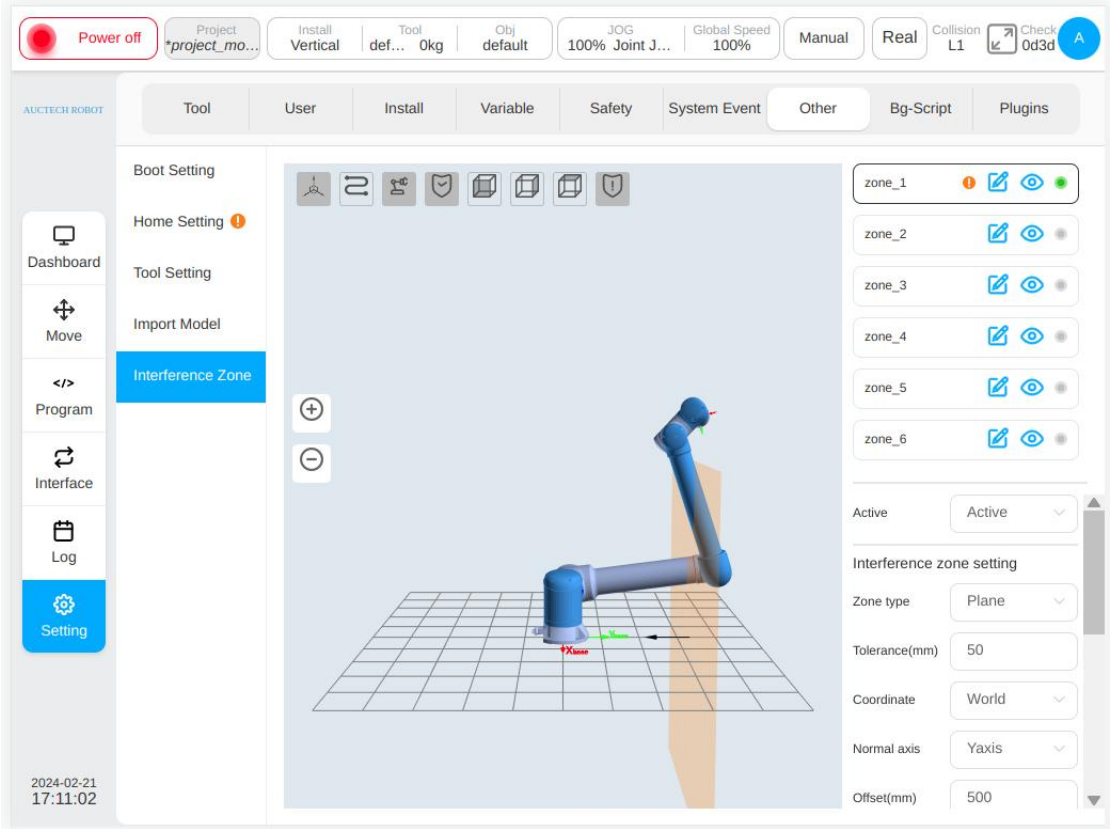
When deleting an existing model, click the "Delete" button in the operation pop-up box of the icon ••• on the right of the model, and the prompt box will appear as shown in the figure. Click the "Delete model only" button on the right side of the pop-up box to just delete the displayed model; Clicking the "Delete Model file" button will not only delete the displayed model but also delete the model file selected for the corresponding model. Click the cross in the upper right corner of the prompt box to cancel the deletion of the model.



- **Interference Area Setting**

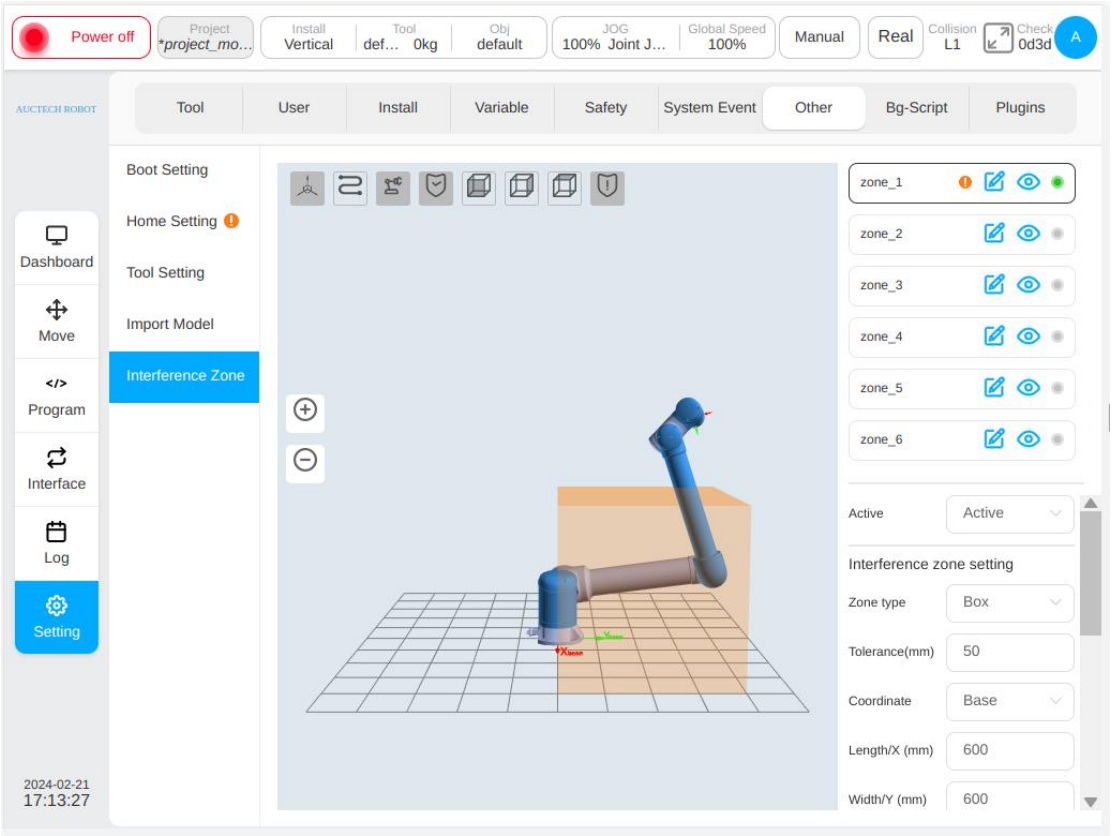
The definition types of interference region include plane, cuboid, cylinder, joint region and external axis region. Users can set up to 6 independent interference zones. After the interference area name, click icon can switch between display and hide in the 3D display area for the interference area whose type of interference area is plane, cuboid or cylinder, and click icon after the area name (for example, the default name zone_1) changes the name of a safety zone. are displayed for the nterference areas that are not disabled. Otherwise, will be displayed. For each interference zone, after modifying any parameter, the icon will be displayed if interference zone before clicking the "Confirm" button

The activation configuration of the interference zone can be disabled or activated. Interference area action configuration activation input and response output. When the activation input signal is high power level and the TCP at the end of robot enters the interference zone, the robot will suspend the program operation. When this activation input signal disappears, the program will automatically reset and the robot will continue to run the program. Activation input Configurable general input, register BOOL input; Response output configurable general output, register BOOL output. After the robot enters the interference area, the output of the interference area is triggered. When the robot is operating in the interference area, the activation input signal of the interference area is also monitored. When the activation input signal is high power level, the operation is immediately suspended. You can configure a maximum of two intervention actions.

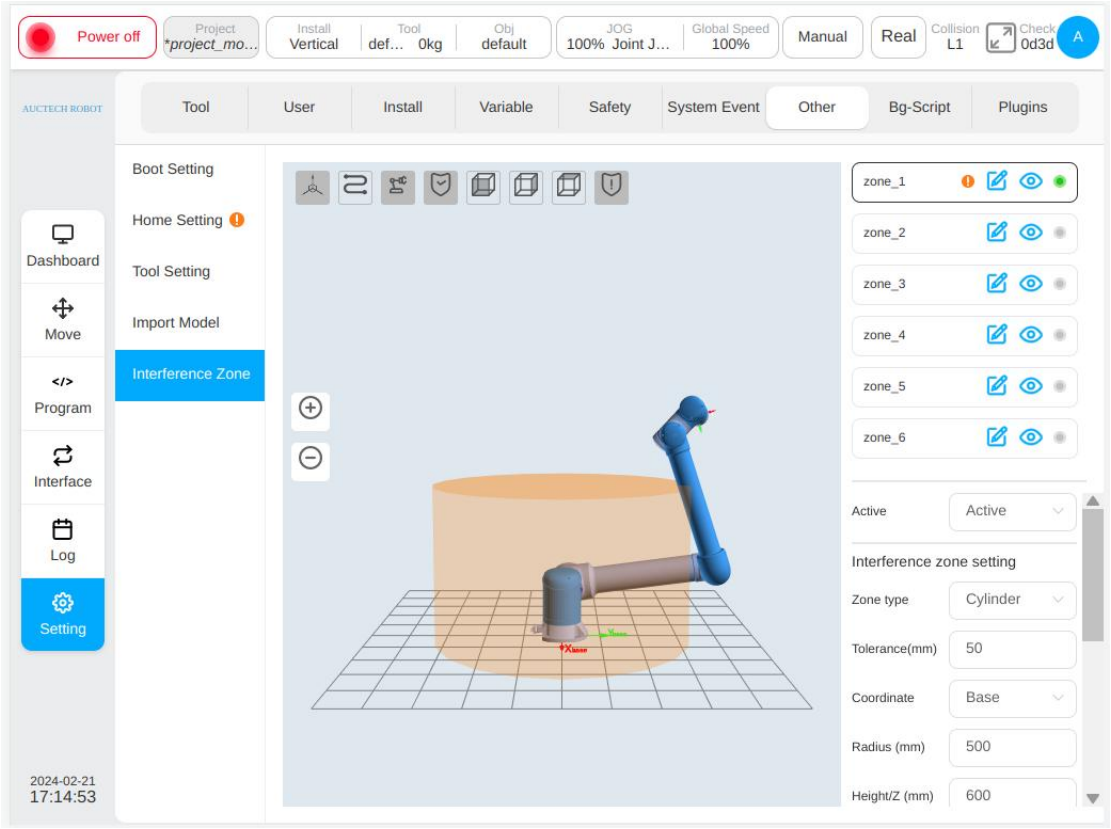


When the configuration area type is plane, the reference of the plane area is based on the world coordinate system/base/custom workpiece coordinate system, and the plane is determined by setting the plane normal axis and normal offset distance. The setting of a plane can take effect in the Select Area area, and the corresponding direction is displayed in the 3D area through the black arrow.

When the configuration area type is cuboid, the setting basis of the cuboid area is based on the world coordinate system/base/custom workpiece coordinate system. The workpiece coordinate system is taken as a corner point of the cuboid, and the three coordinate axis directions correspond to the length (X), width (Y) and height (Z) respectively. The length, width and height ranges from -3000mm to 3000mm.

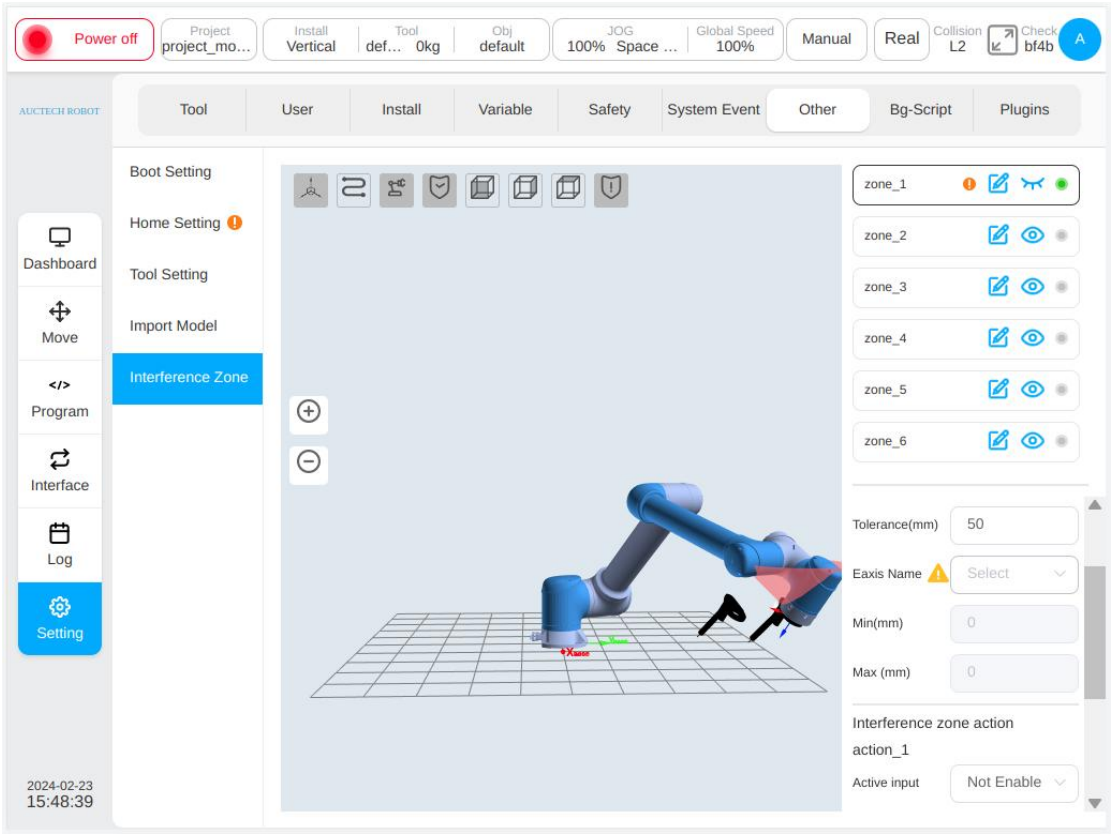


When the configuration area type is a cylinder, its setting is based on the world coordinate system/base/custom workpiece coordinate system. With the workpiece coordinate system as the center of the bottom surface of the cylinder, the Z direction points to the height direction, and the radius and height can be set. The radius ranges from 0 to 3000mm, and the height ranges from -3000mm to 3000mm.



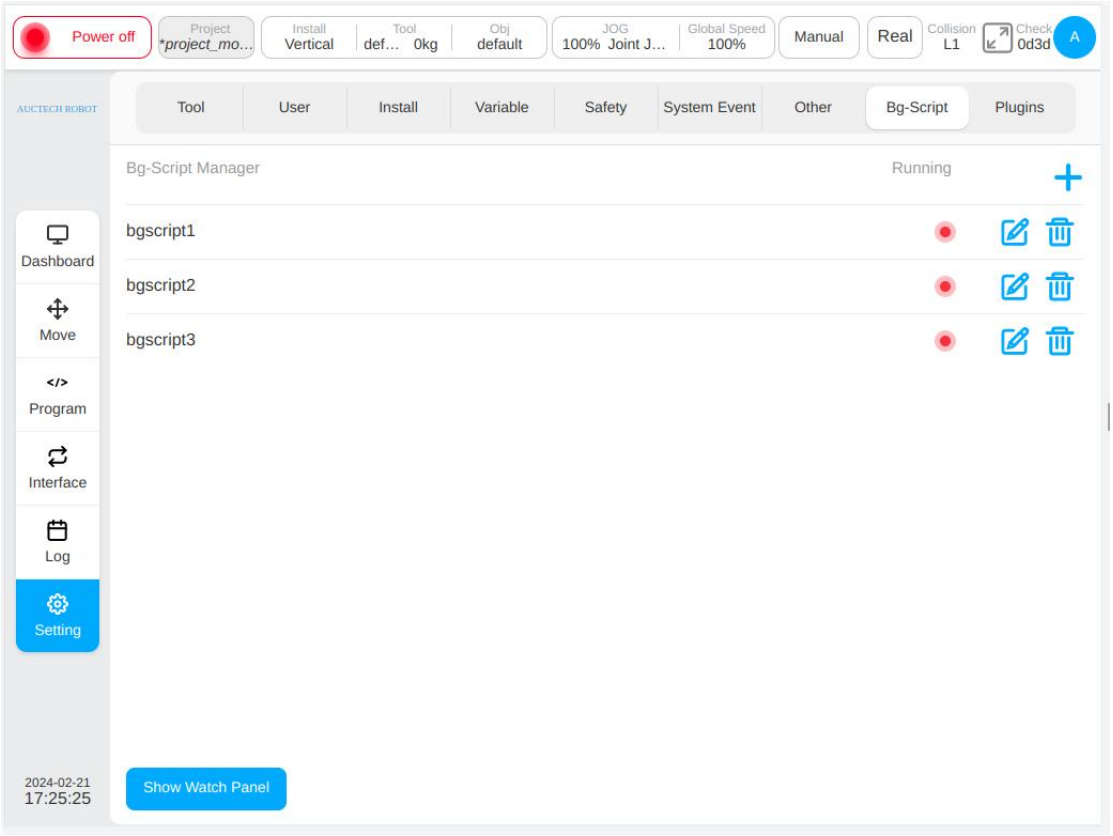
If the configuration area type is joint area, you can select either joint 1 or joint 6 to set the maximum value and minimum value. The maximum and minimum values range from -360° to 360°.

If the configuration area type is an external axis area, you can set the axis name of an external axis, and the maximum value (upper limit) and minimum value (lower limit) of an external axis. If no external axis is added, icon ⚠ will be displayed after the axis name. The maximum and minimum input boxes are disabled, and the "OK" button at the bottom of the area configuration is disabled and cannot be clicked.

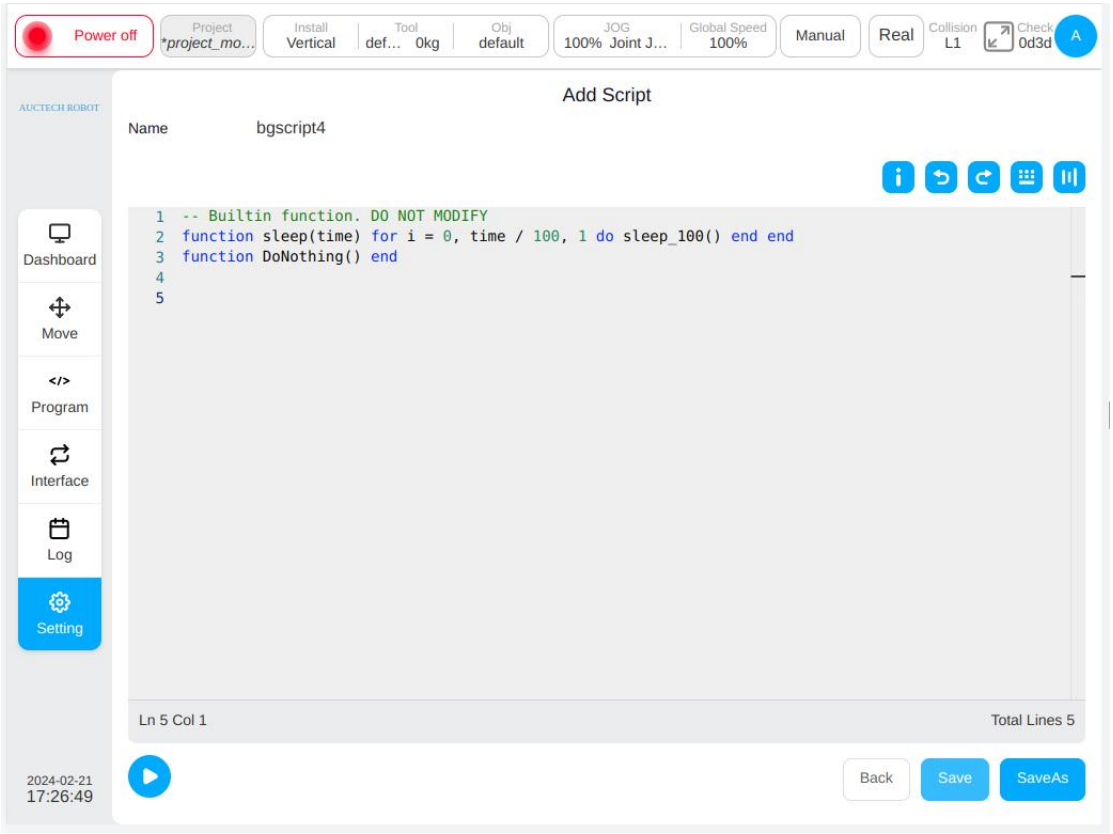

Power off
Project
project_mo...
Install
Vertical
Tool
def... 0kg
Obj
default
JOG
100% Space ...
Global Speed
100%
Manual
Real
Collision
L2
Check
bf4b
A
AUCTECH ROBOT
Tool
User
Install
Variable
Safety
System Event
Other
Bg-Script
Plugins
Dashboard
Move
Program
Interface
Log
Setting
2024-02-23
15:48:39
Boot Setting
Home Setting
Tool Setting
Import Model
Interference Zone
zone_1
zone_2
zone_3
zone_4
zone_5
zone_6
Tolerance(mm)
50
Eaxis Name
Select
Min(mm)
0
Max (mm)
0
Interference zone action
action_1
Active input
Not Enable

14.7. Background Script

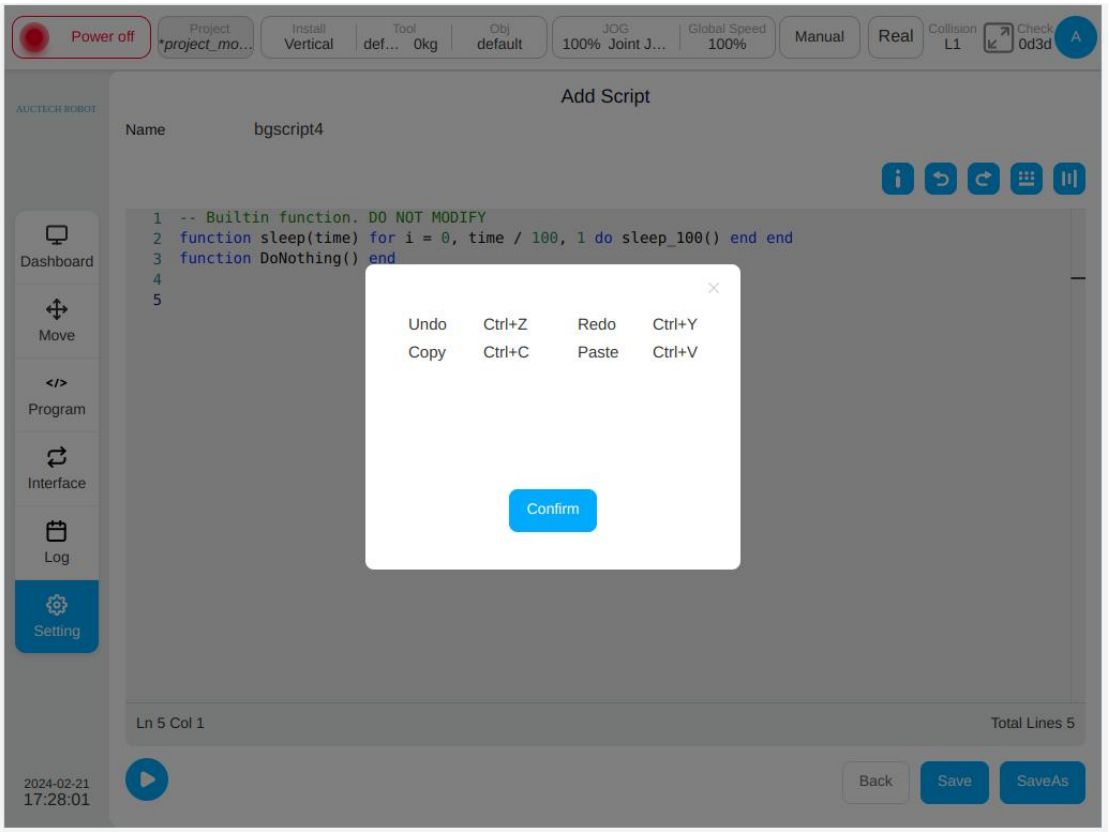
Background script is the independent script which running in the background of robot control system. Differ from general program, background scripts start running once robot control system starting before robot actually power on and enable. All background script related operation and state, including establish operation, running state, edit, delete and other operation button can be found in the background srcipt page.



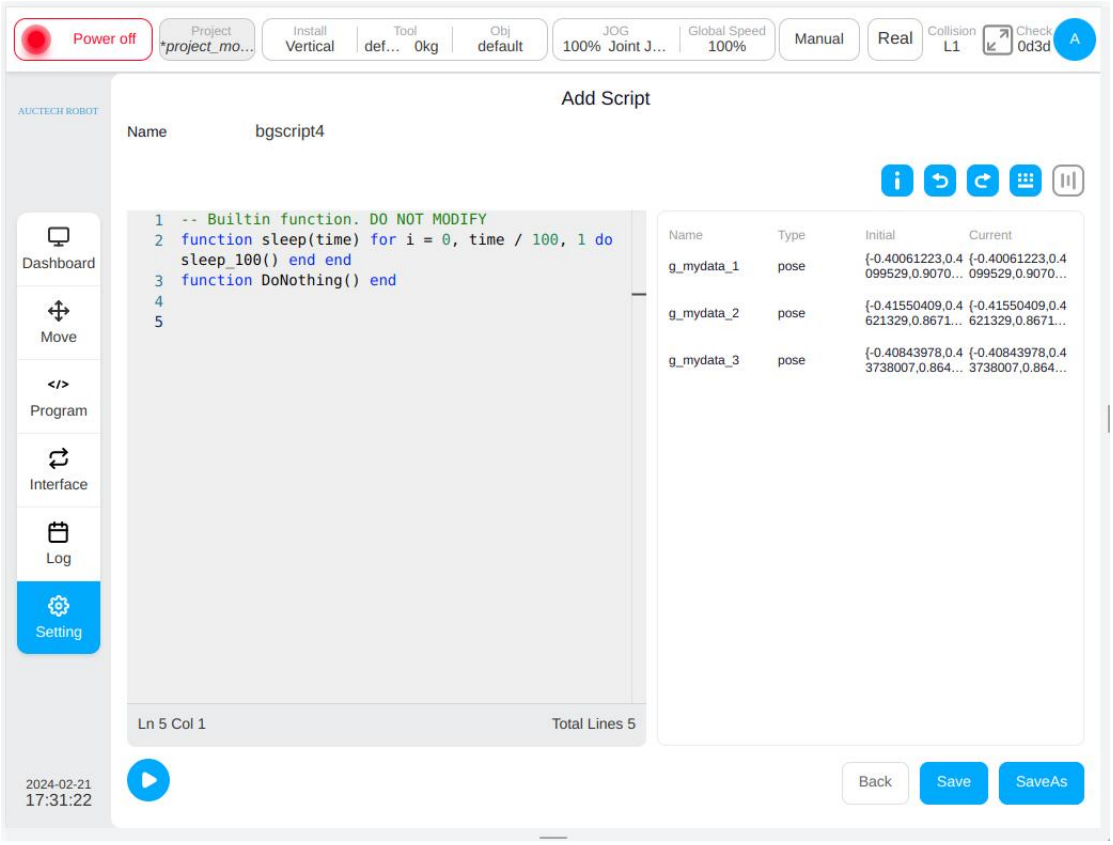
Click icon + on the right top corner will arouse the virtual keyboard. The default name of background script is "bgscript" with index number. After creating background script, the edit page will display as shown in the following figure.



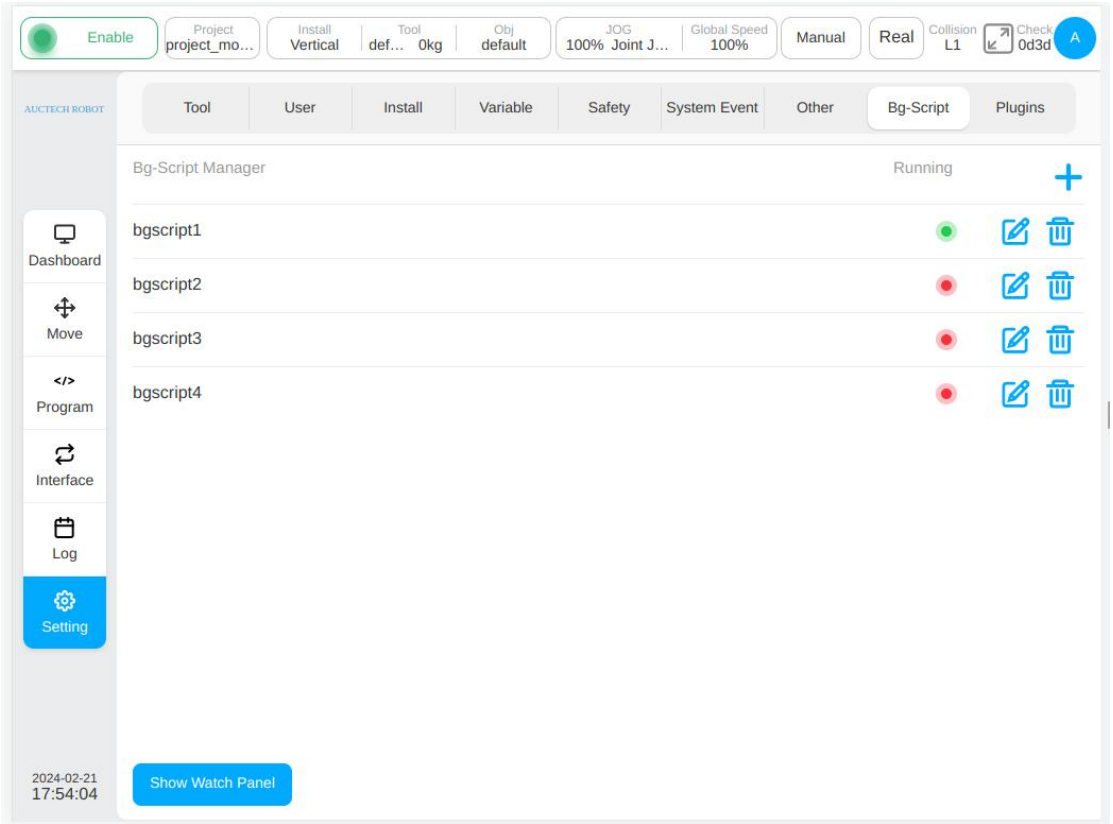
The main part of edit page is the script edition area, click icon  will pop up the prompt diaglog of shortcut key, as shown in the following figure. Icon  is the undo button, icon  is the recover button. Click icon  will pop up the floating shortcut keyboard window, which can be dragged and located.



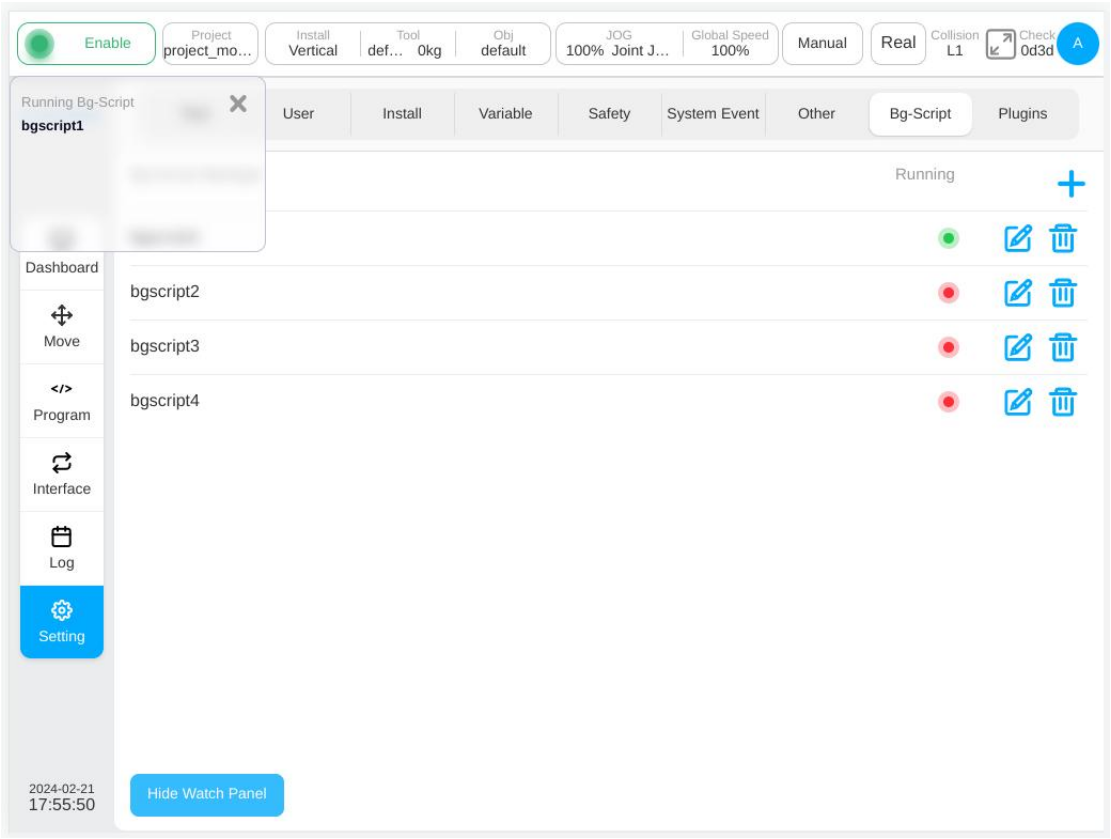
As shown in the following figure, click icon  will display the system variables. Click icon  to hide the system variable.



After editing the designed background script, click the "Save" icon at the right below corner ti save the current background script. Returning to the background script management page, all the created background scripts will display. It is also feasible to save the background script as a copy by clicking "Save As" button. Tap the "Run" button with icon , all created background scripts will start to run and the running state of background scripts will display with .



The floating window, which displays all the background scripts in running state, can be aroused by clicking the "Display Running Window" window at the buttom left corner. Such as:



To edit the existing background scripts, click the icon and then enter the edit interface again.

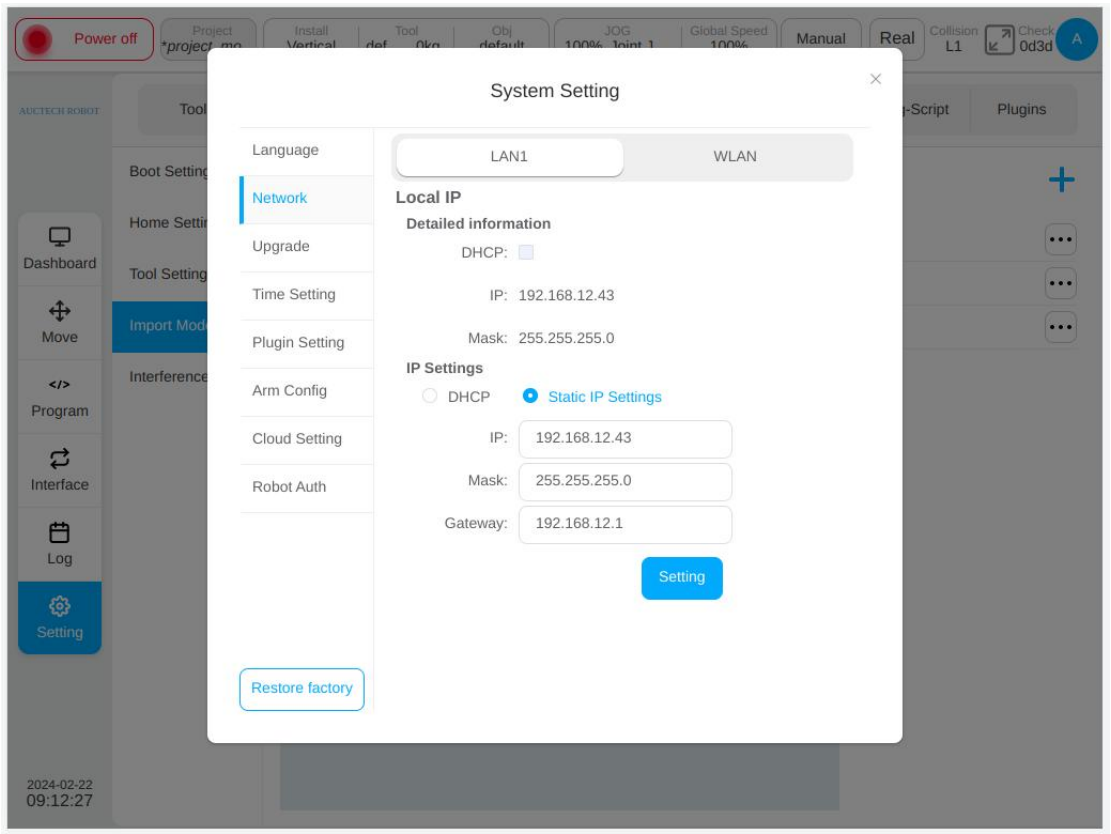
Click icon on the right of background script name will delete the corresponding background script.

15 System Settings

System Settings mainly include network and language settings, as well as version updates to the system, safety controller firmware, time settings, plug-in management, robot parameters (import/export of configuration files), cloud platform settings, and factory settings restoration. Click the user profile picture on the right of the status bar and select the “System Settings” to display the System Settings page. The navigation TAB is on the left of the page, and the content area of the corresponding TAB is on the right.

15.2. Network Settings

Click the "Network Settings" TAB, and the content related to network Settings will be displayed. You can set IP and WLAN. The number of network port configurations varies according to the hardware platform, so that you can change the IP addresses of different ports. The IP details displayed include whether DHCP is enabled, IP address, and subnet mask; IP Settings can be selected from DHCP or static IP Settings.

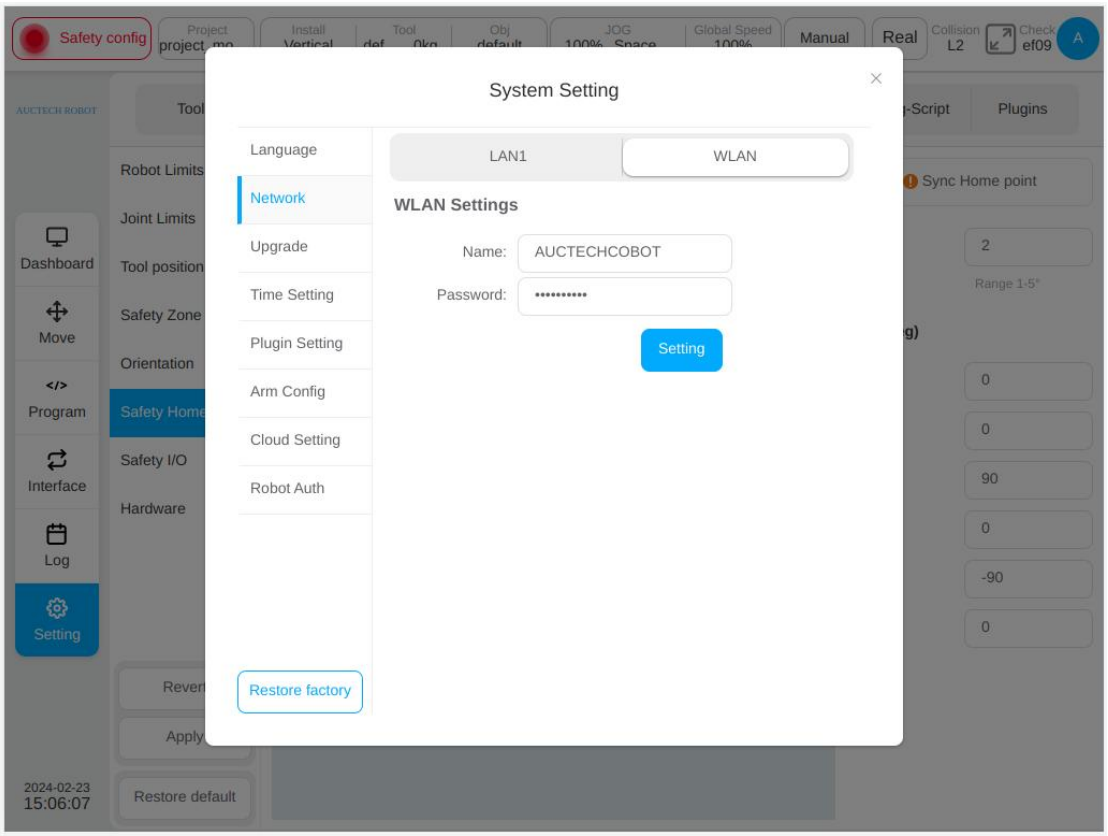


When selecting DHCP, the IP address, subnet mask and default gateway are automatically

assigned by the DHCP server. Users cannot enter the IP address manually. After selecting, click the "Settings" button. When selecting static IP Settings, the user manually enters the IP address, subnet mask, and default gateway, and then clicks the "Settings" button.

Care	If the control cabinet has multiple physical network ports, the IP address of the TCP/IP server specified in the port settings is the IP address of LAN1. For server IP address settings, refer to Section 12.5 “TCP/IP”.

When setting the WLAN, enter the network name and password, click the "Set" button and restart it.

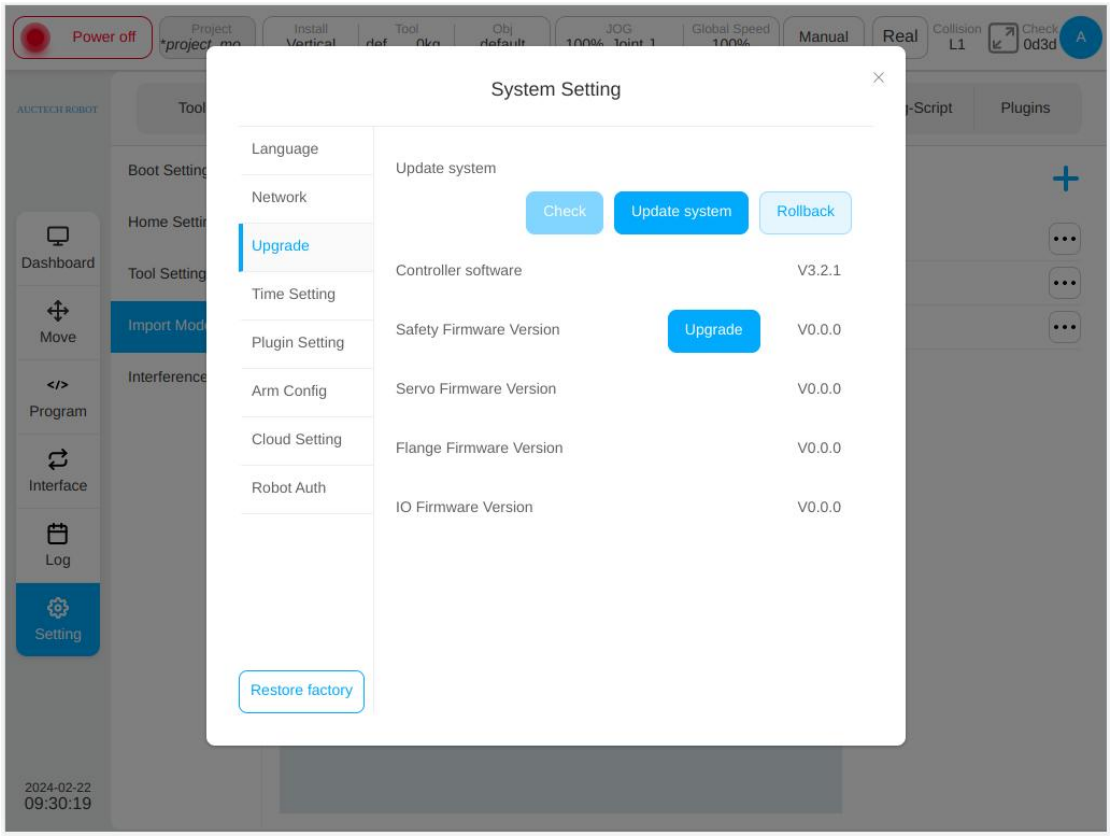


15.3. Update

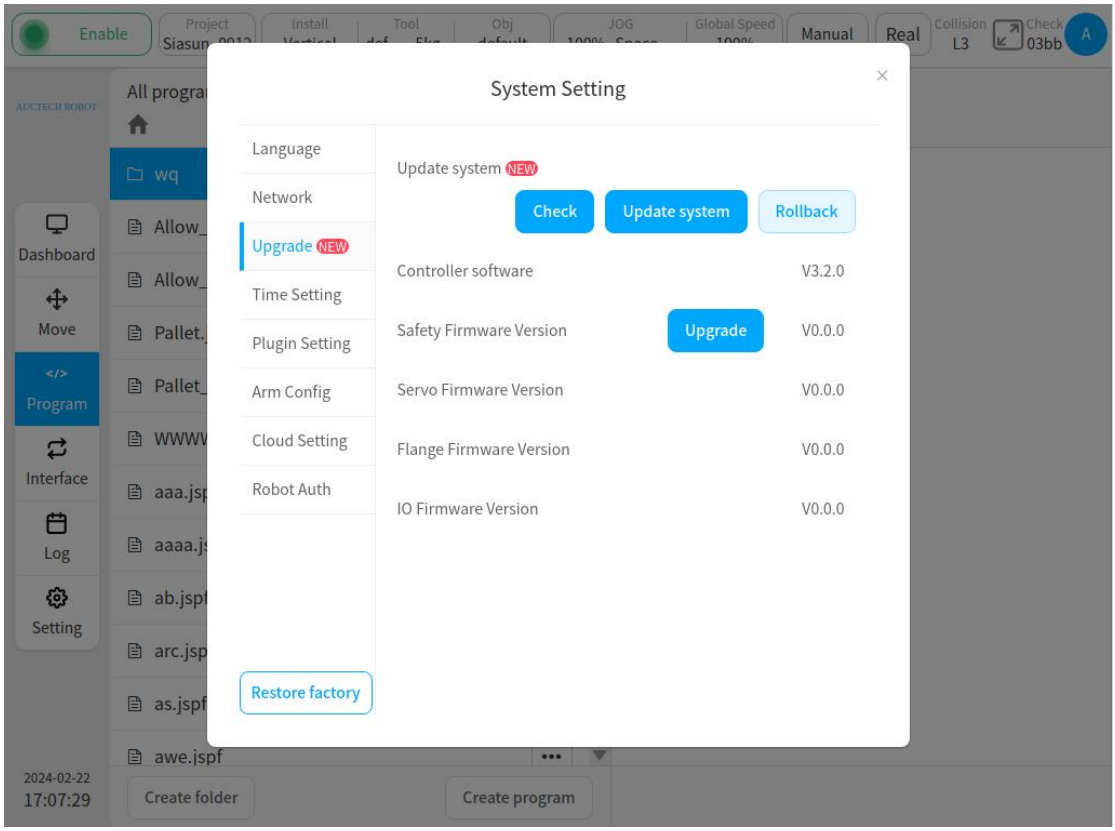
Click the “Update” TAB to display the operation buttons related to system update, which are “Check new version”, “System Update”, “Back” buttons, and the controller software version, safety controller firmware version, servo controller firmware version, end board firmware version, and control cabinet I/O board firmware version. The safety controller firmware version has a separate "Update" button to update the version. The system update can check the system version actively or update the local system to a certain version with one click, or return to a previous version.

When the robot is undergoing system updates and safety controller firmware versions, ensure that

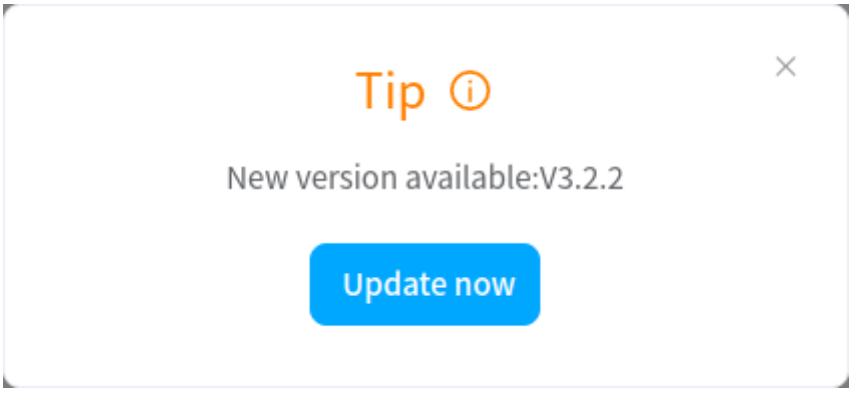
the robot is powered off.



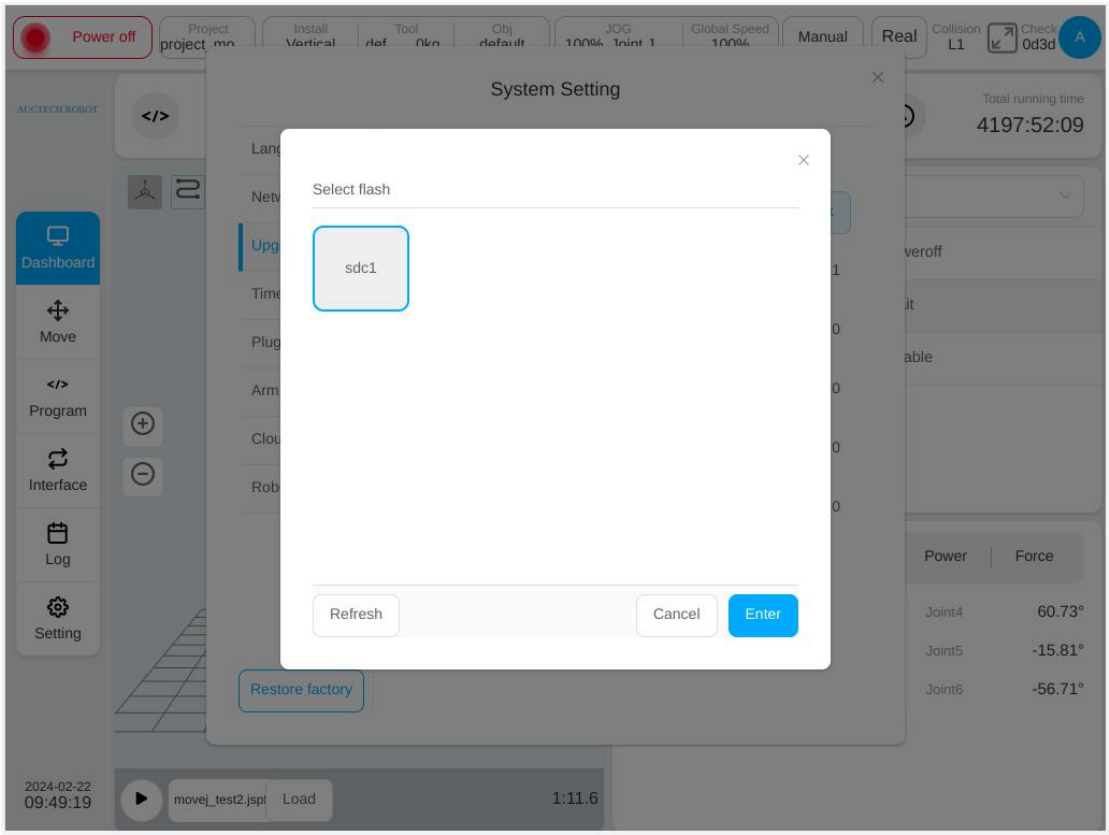
After clicking the “Check the new version” button, the pop-up box of the prompt “Getting the latest version information...” will be displayed at the top of the page.



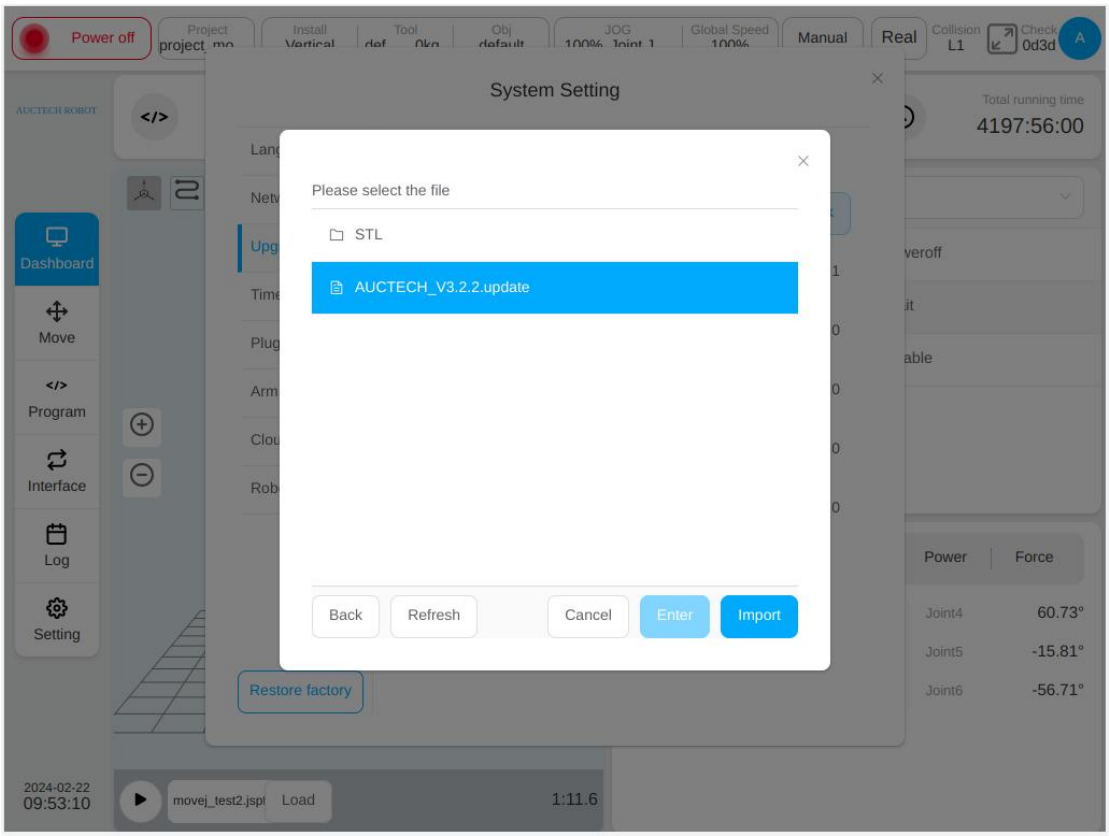
When there is no new version of the software, a pop-up box indicating that the current software version is the latest version will be displayed on the interface. When checking for a new version, a prompt box for the latest version will be displayed. To update to a new version, click “Update Now”.



Click the "System Update" button, the prompt box of “The robot will be automatically powered on and off during the update process, do not operate the robot!” will pop up. After the user clicks the "OK" button in the prompt box, the pop-up window of the U disk selection will be displayed.



After you select the U disk and click the “Select” button, all update packages of the corresponding type under the U disk are displayed. For example, the system update package ends the suffix with “.updatePro”, including the software update package (ending with “.update”), server firmware update package, end firmware update package, and I/O board communication package (.firmware). Software update packages end with the suffix “.update”. The safety controller update package ends with the suffix “.firmware”.

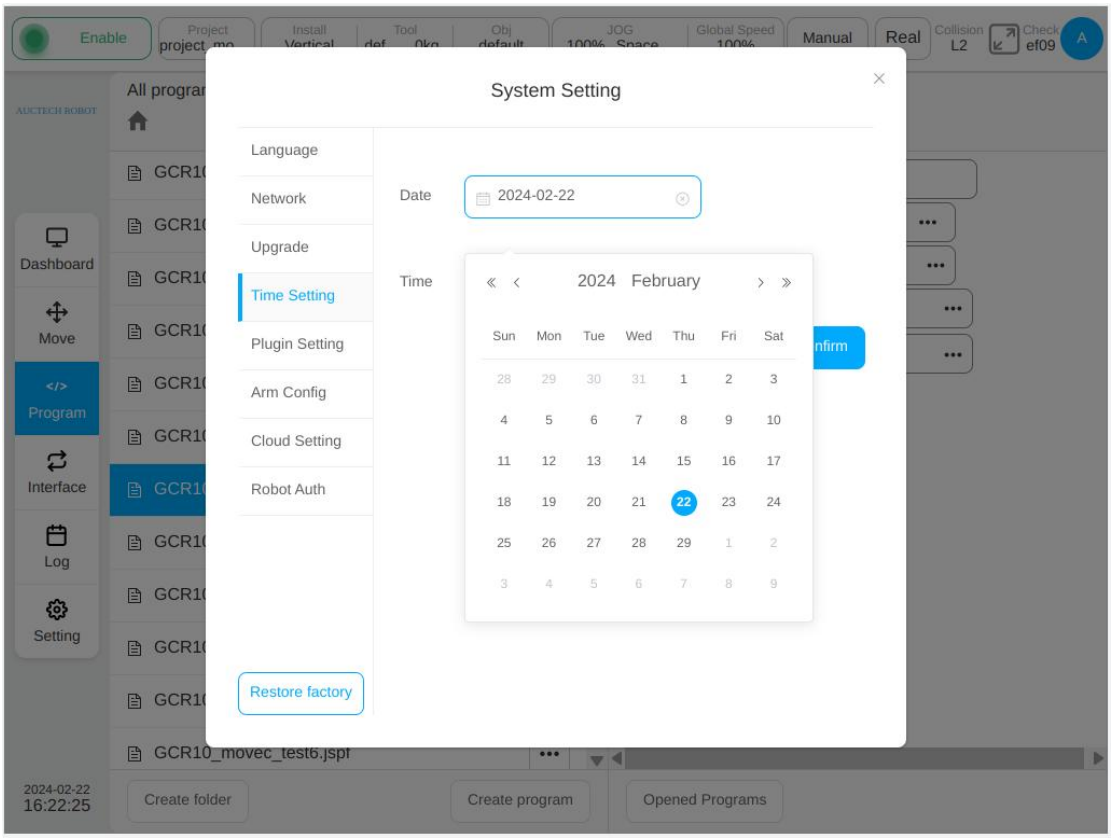


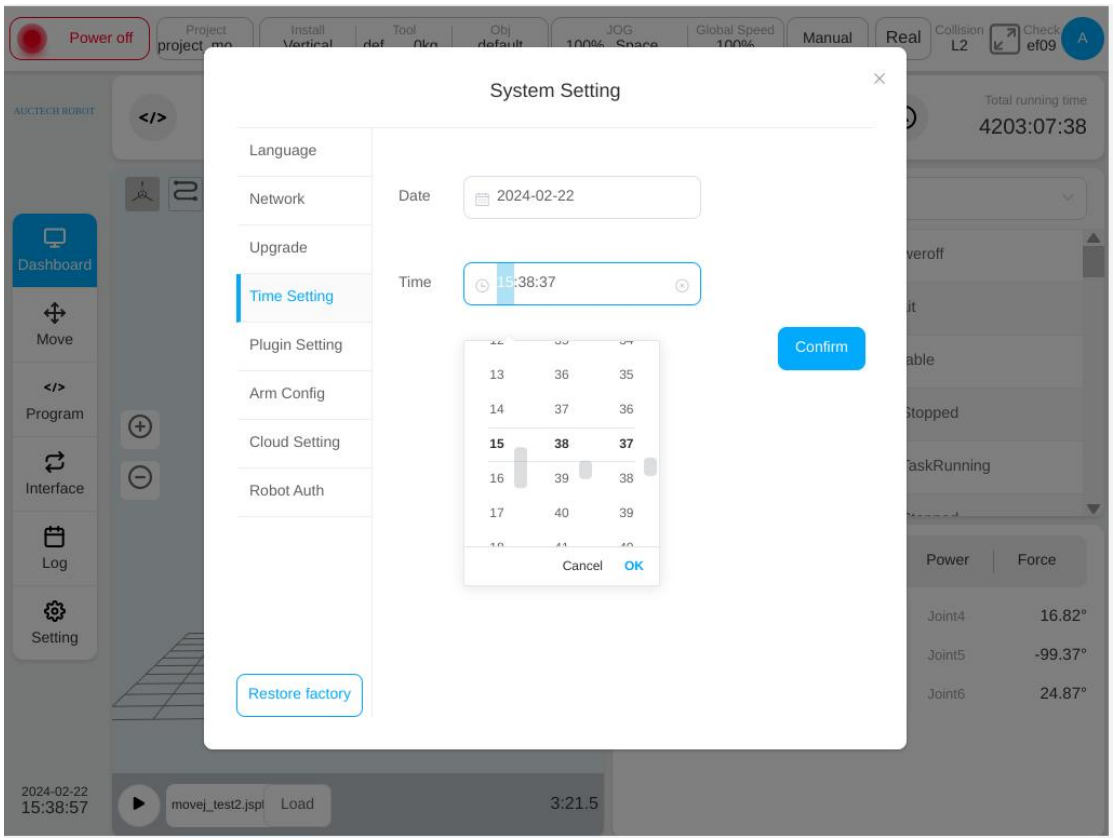
Click the “Back” button to roll back the robot system version. The system rollback file list screen is displayed. The system version rollback file ends with the suffix “.updatePro”. If you only want to roll back the software version, select the software rollback file which ends with the suffix “.update”. Select the required file and click the "Back" button, which will take effect after prompting to restart. When the robot is performing the roll back of the system version, ensure that the robot is powered off.

Besides the software version can be queried by the user actively, the cloud can push the new version to the device. If the cloud pushes a new version, click the “System Settings” button in the pop-up box next to the user profile picture and a red mark “New” will be displayed nearby.

15.4. Time Settings

Click the “Time Settings” tab, the current system date and time will be displayed. Click the selection box of the date picker or time picker to select the date and time respectively, as shown in the figure below:

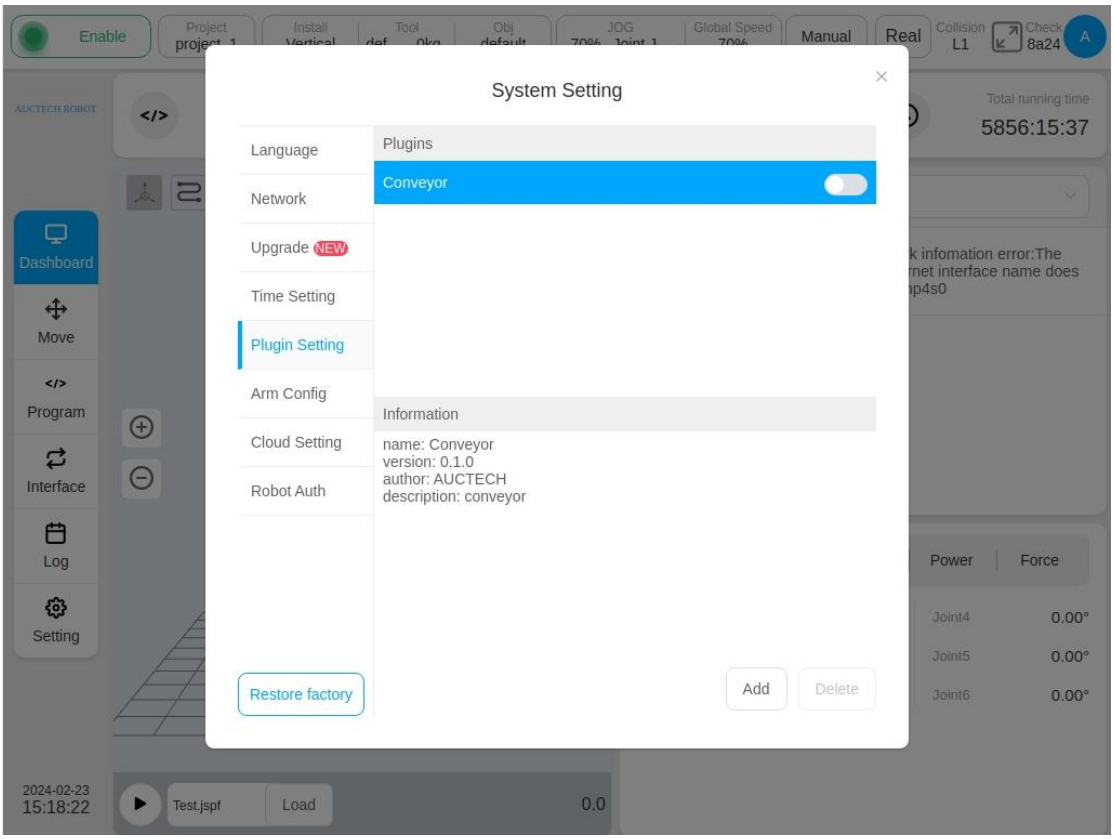




After setting the date and time, click the “OK” button to set successfully.

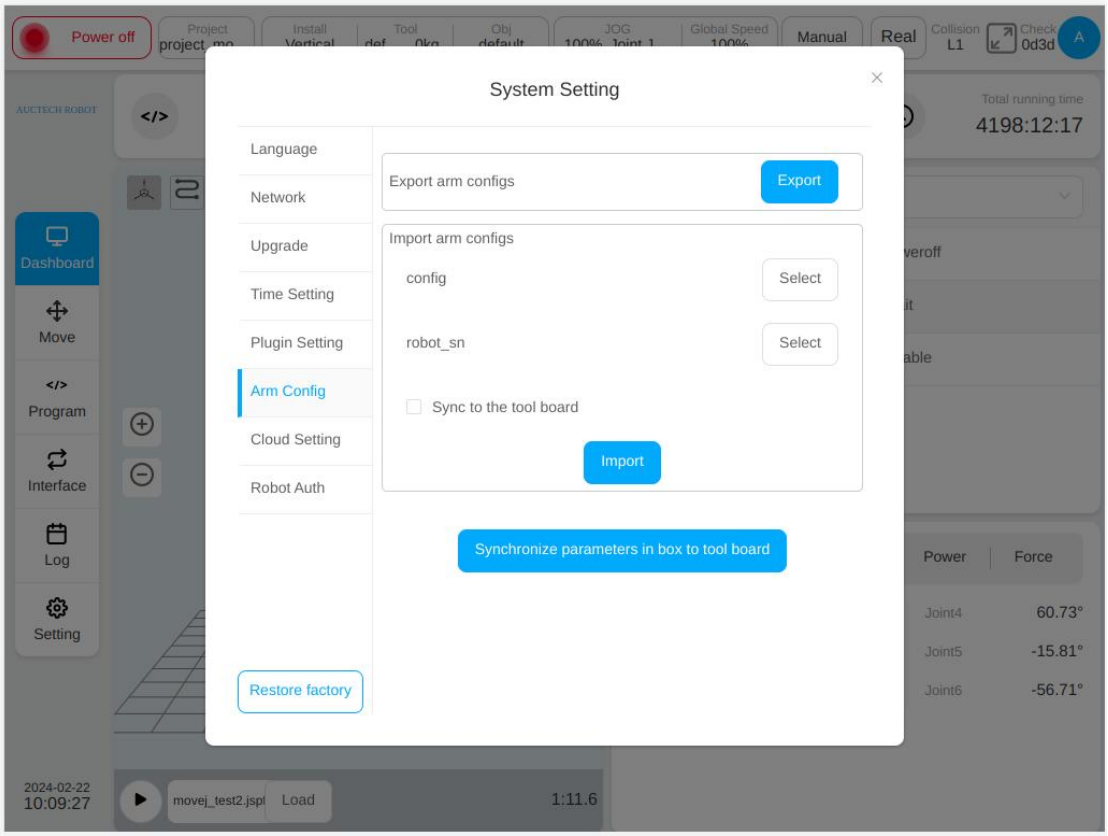
15.5. Plugin management

Click the “Plugin Management” tab, the detailed information of the installed plug-ins and the corresponding plugins will be displayed. As shown below:

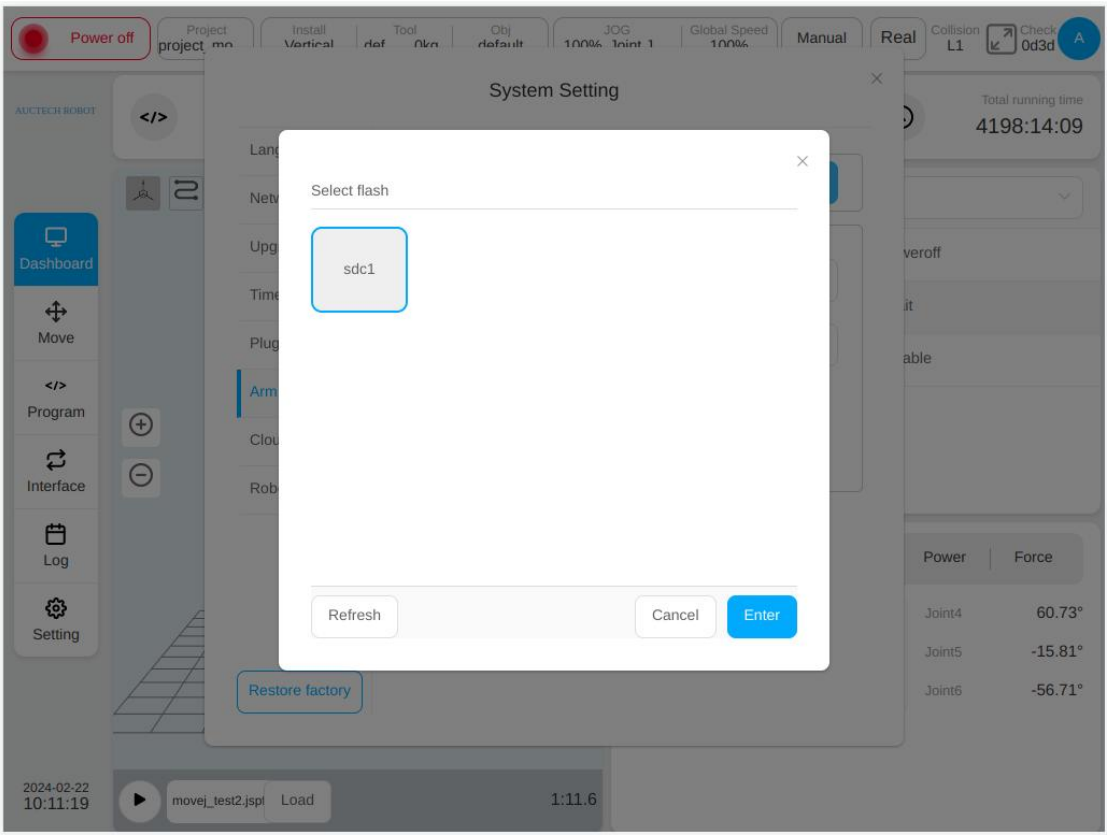


15.6. Robot parameters

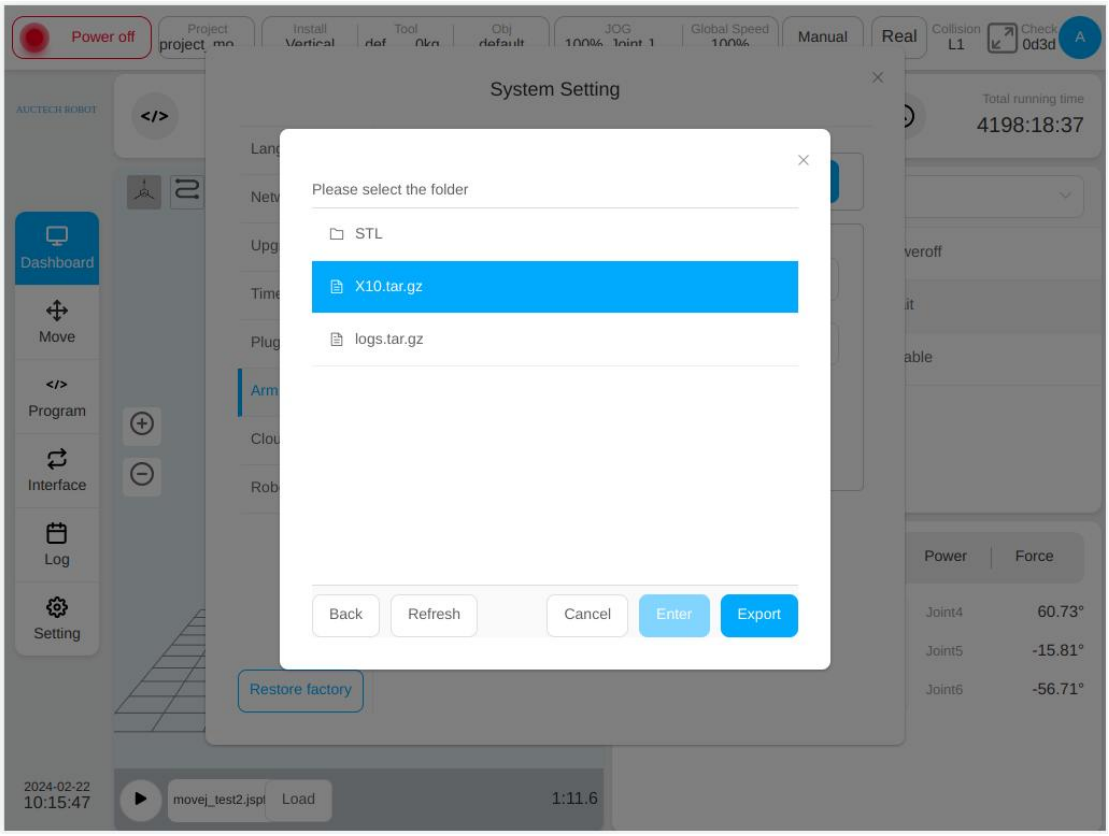
Click the "Robot Parameters" tab to import and export the configuration file of the robot arm and synchronize the parameters of the control cabinet to the end board, as shown below:



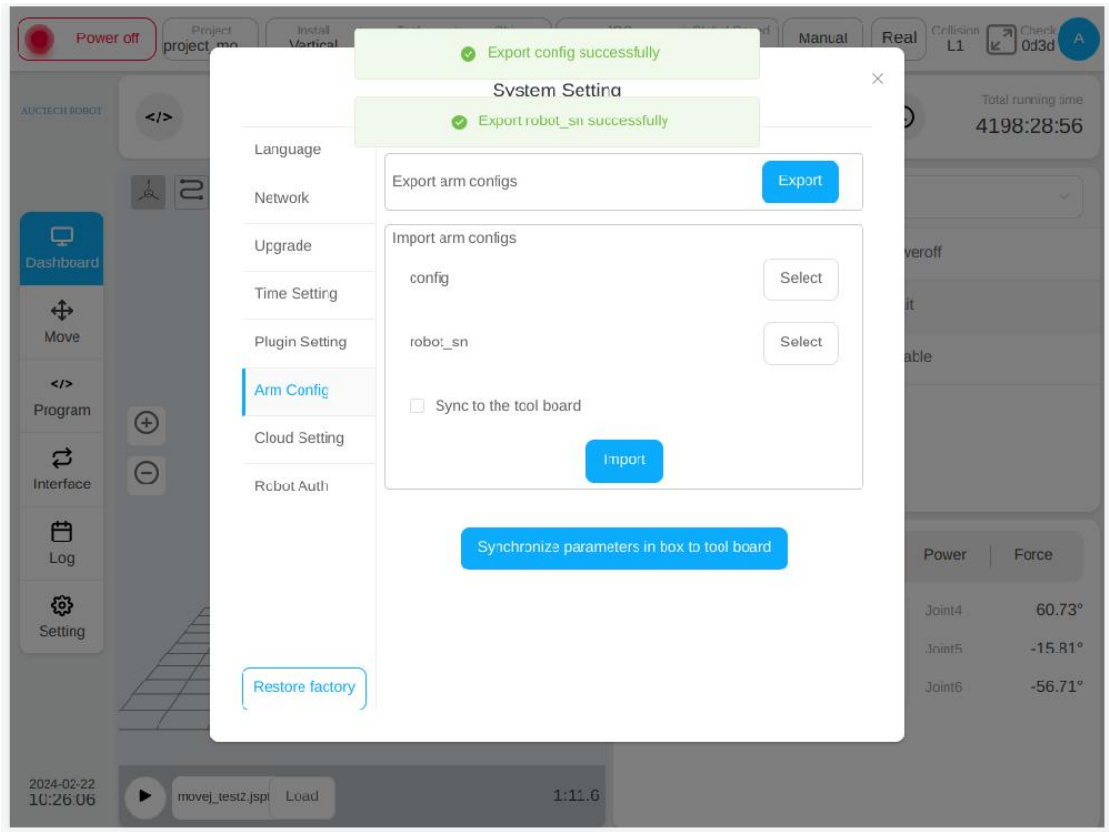
Click the “Export” button to display the dialog box for exporting files from external U disk, as shown below:



Select the U disk (e.g., select the U disk USB 1) and the corresponding U disk file storage position (e.g., select the U disk disk11 folder), click the "Select" button at the bottom right corner of the dialog box.

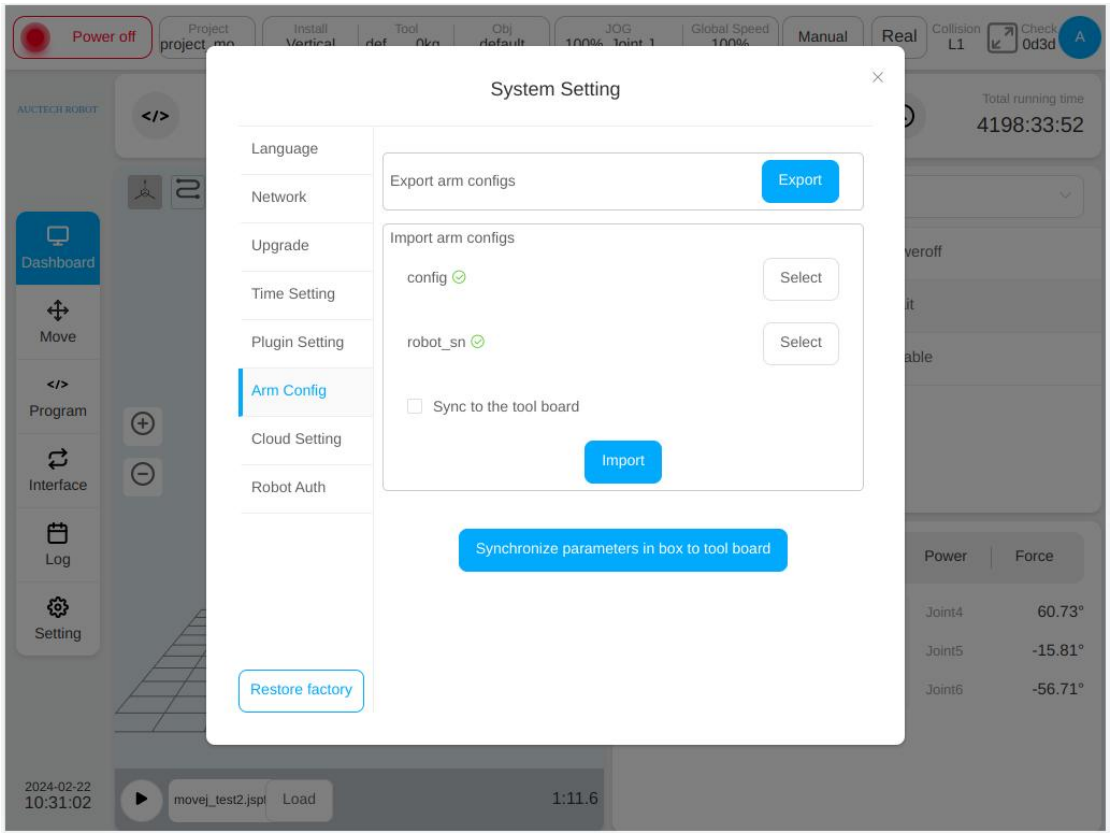


After the export is successful, the prompt words “config is exported successfully” and “robot_sn is exported successfully” is displayed on the upper part of the page.

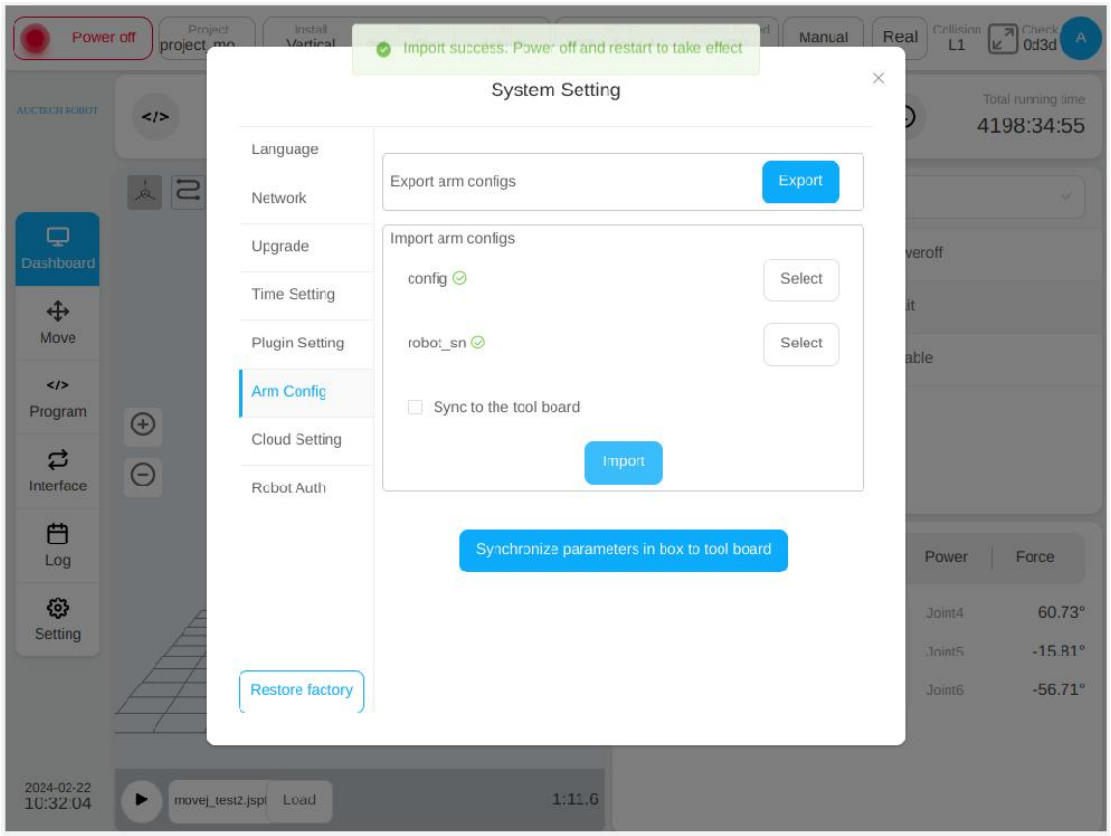


At this time, check the folder path corresponding to the selected U disk. The file with the suffix ".tar.gz" named after the type of the robot arm (e.g., gcr5.tar.gz) and the robot_sn.json file are displayed.

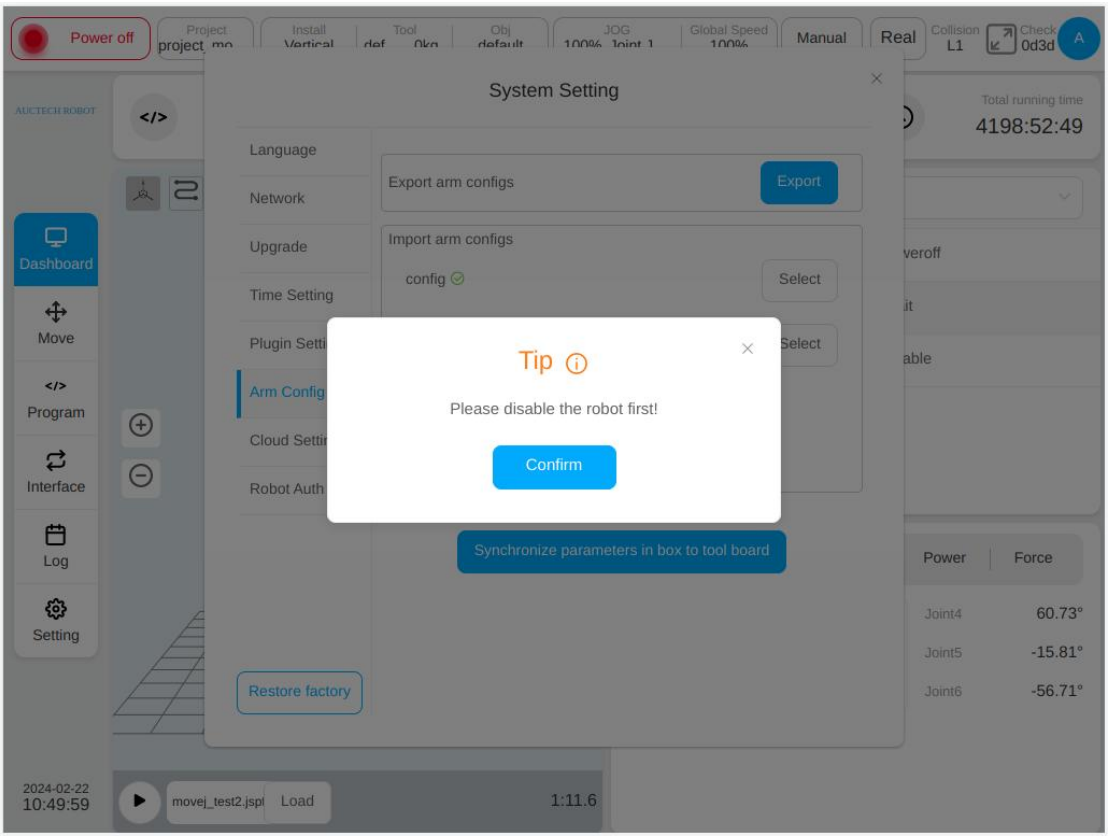
Click the "Select" button next to the config and robot_sn in the import robot arm configuration respectively. Select the required config file and robot_sn file respectively in the pop-up dialog box imported form the external U disk, and the green check icon will be displayed correspondingly next to the config and robot_sn. As shown in the figure below:



After selecting the imported robot arm configuration file, click “Import” on the page. After the import is successful, the prompt words “The import is successful. It will take effect after powered off and restarted.” is displayed, as shown in the following figure:



Click the "Synchronize control cabinet parameters to the end board" button to synchronize the robot parameters in the control cabinet to the end board of the robot.

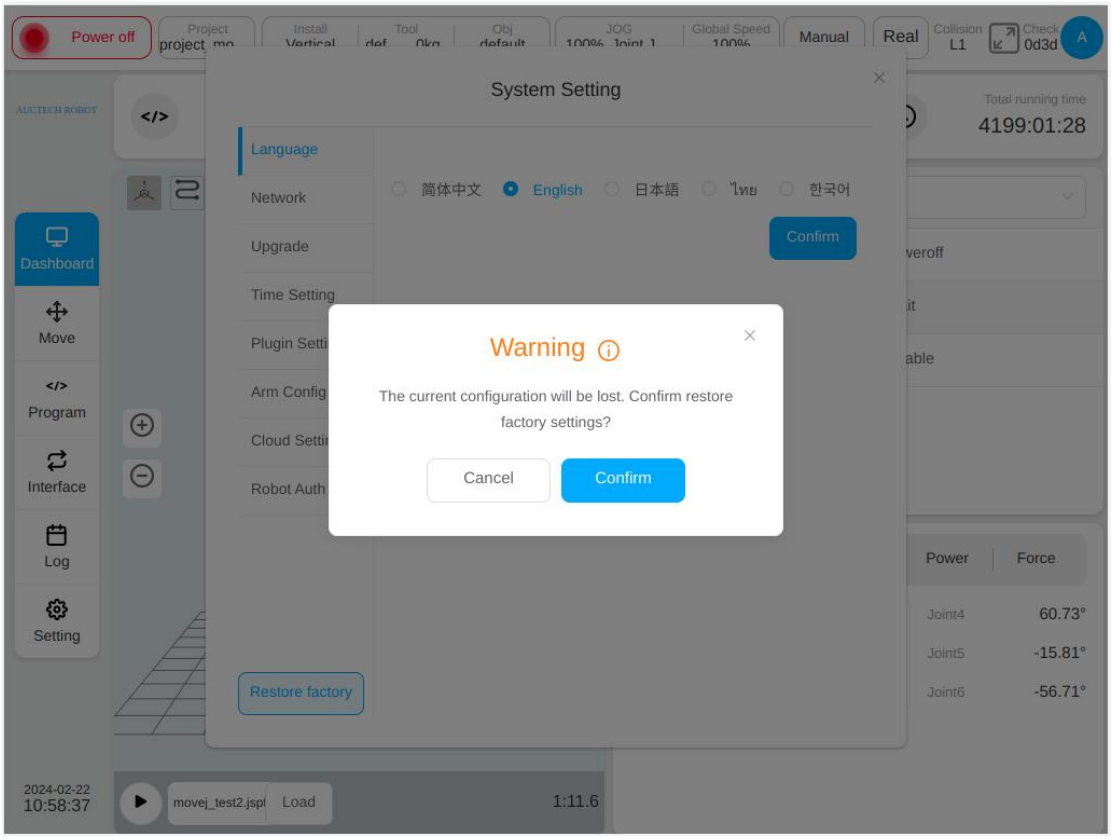


Care

- **In the whole robot system, there are two places to store the parameter files of the robot arm. The first place is in the robot control cabinet, which is the parameter file of the robot arm currently in effect. Another place is in the end board of the robot arm as a backup of the parameter of the robot arm.**
- **When the robot system is powered on, the two parameters are checked for consistency. The robot arm can be enabled normally only when the two parameters are consistent. If they are different, the parameters need to be synchronized.**
- **It is generally considered that the parameters in the end board of the robot arm are absolutely correct. If the parameter file needs to be modified for some reasons, import the modified parameter files "config" and "robot_sn" into the control cabinet by following the preceding steps, and then synchronize the parameters to the end board of the robot arm through the function of "Synchronize Control Cabinet Parameters to end Board".**

15.7. Restore factory Settings

Click the "Restore Factory Settings" button under the navigation tab on the left of the system settings page (only for admin users), and a warning box will pop up as shown below:

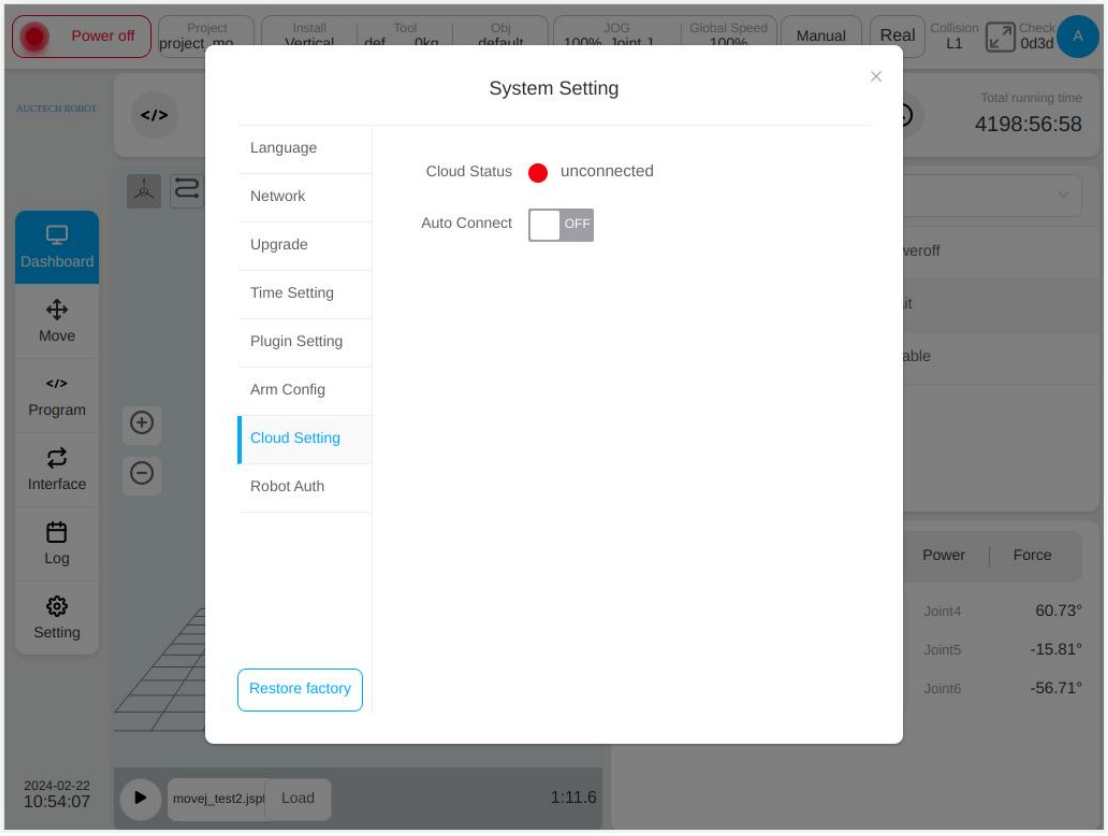


Click the “Cancel” button to cancel the restoration of factory settings; after clicking the “OK” button, the top of the page will display the “Restore factory settings successfully, need to restart to take effect!” pop-up box. After restoring the factory settings, the following contents will be cleared: all non-template projects in the project, all logs, robot_sn files, the project and default IP addresses under system files.

Care	• **When using this function, be careful to avoid the loss of important data!**

15.8. Cloud platform Settings

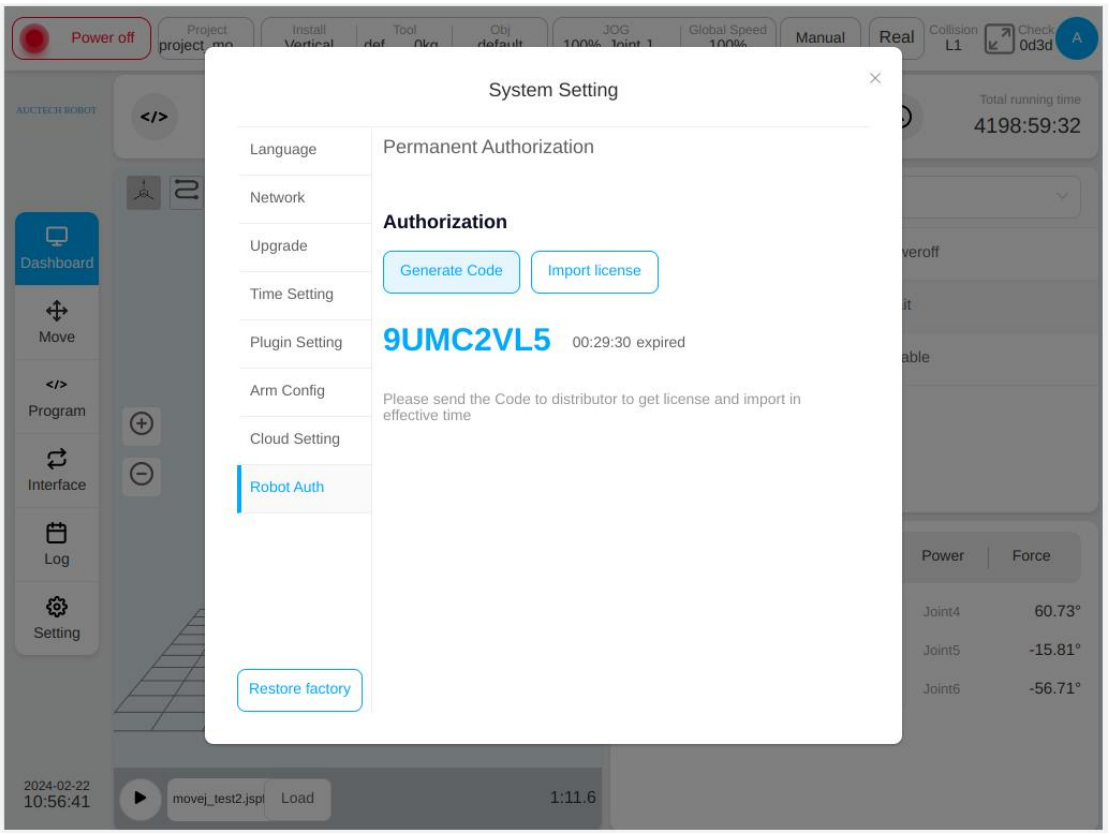
Click the “Cloud Platform Settings” tab to display the connection status between the robot and the cloud platform, enter the IP address of the cloud platform, and set whether to connect to the cloud platform. As shown below:



After manually entering the IP address of the cloud platform server and switching the “Whether to connect” switch, the user can actively connect to or disconnect with the cloud platform server, and the connection status changes accordingly.

15.9. Robot Authorization

Click the "Robot authorization" TAB, information about robot authorization and operation button will be displayed. Click the "Generate dynamic code" button, a dynamic code will be generated, and prompt the user to "please send the dynamic code to the dealer, obtain the authorization file, and activate it within the valid time" will be displayed as follows:



After obtaining the license file from the distributor through dynamic code, click the "Import License file" button to import and activate it.

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