H Series Robot Welding Process System

User Manual

V2.0

Guangzhou Auctech Automation Technology Ltd

Foreword

This series of instructions introduces the characteristics, system composition, system commands of each part and its use, operation steps, user programming methods and examples, etc., which is the basic instruction manual for users to quickly learn and use the teaching pendant. The update and upgrade of the manual are authorized and implemented by Guangzhou Auctech Automation Technology Ltd. Without the company's authorization or written permission, any unit or individual has no right to modify or correct the content of this manual, and the company is not responsible for this. Customer loss.

In the instruction manual of the programming of the teaching device (Hspad), we will try our best to describe various events related to the operation of the teaching device. Due to space limitations and product development positioning, it is impossible and impossible for all of the teaching device not to do or Events that cannot be done are described in detail. Therefore, events that are not specifically described in this specification can be considered as" impossible"or" not allowed"events.

We have checked the content of the printed matter for consistency with the described hardware and software content, and we do not rule out inconsistencies, but we regularly proofread the printed matter and make necessary changes in later editions. The copyright of this manual belongs to Guangzhou Auctech Automation Technology Ltd., any unit or individual publishing or copying is illegal, and our company will pursue its legal responsibility.

content

1 Introduction

AUCTECH type III control system is a new control system independently developed by Guangzhou Auctech Automation Technology Ltd..

1.1Target Group

This manual is mainly aimed at users who use AUCTECH industrial robots, and requires users to have basic knowledge of industrial robots.

1.2 Icon Description

	Information: provide more information for operation.
	Warning: warn about potential loss that may occur.
	Danger: inform the potential danger.

1.3 Terms

TCP: Tool Center Point

2 Upgrade procedure of welding process system

2.1 Upgrade though Teaching Device

1. Copy the files for upgrade to a USB flash disk, and plug it into the teaching device. Enter the ES explorer, select U-disk after clicking the quick navigation button in upper-left corner to enter the US flash disk, and then click to install the software named HSPad 3-1.6.3XXXXXX-WELD.APK in the upgrade folder"Teaching Device"(as illustrated in Figure 2-1).

Figure 2-1 Install HSPad software

2.Open the HSPad software after its successful installation; enter into the interface of Process package management through finding in sequence Configuration- Teach Pendant Configuration- Process package management in the navigator, and click Install Craft package in the lower corner (as illustrated in Figure 2-2), that is when a dialog box pops up from which enter into the folder"Teaching Device", select HS3_VX.X.X.XXXXXX_HJ.apk (as illustrated in Figure 2-3), click"Sure"and wait for completion of installation. Restarting as notified after installation is completed means successful installation of HSPad.

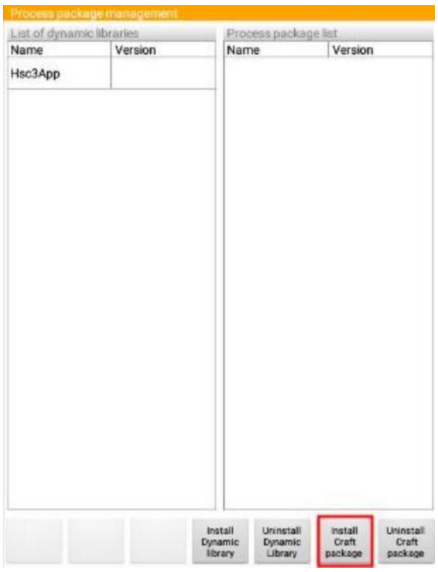


Figure 2-2 Install craft package

Figuare 2-3 Install craft package

3.On the premise of successful installation of HSPad, enter the software and click buttons in sequence"Menu"-"System"-"Cleaning system"(as illustrated in Figure 2-4), and then click Sure when a dialog box that says"Are you sure about cleaning the system?"arises. Cleaning the system will release controller's storage space from pre-occupied junks (including remaining upgrade package files, system backup files, etc. Hence it is necessary to clean the system).

Figuare 2-4 Clean the system

4.This step shall only be executed when the system is to upgrade from the versions of 2.0.2, 2.0.3 or 2. 1.0 to version 2.2.0, while step 5 shall be executed if it is the first time for the system to be upgraded or to upgrade directly from version 2.0. 1 to 2.2.0.

After plugging the USB flash disk into the teaching device, find and decompress the compressed file named ver_HSC3-V2.2.0.XXXXXX under"System Folder"of the upgrade package, and then copy the file Hsc3Upgrade.tar.gz into a folder without a Chinese folder name.

After that, start HSPad app and straight-forwardly click buttons"Menu"-"System"-"System upgrade". With the directory of USB disk displayed, select to enter the ungrade package list and send the upgrade file named Hsc3Upgrade.tar.gz (with a suffix. tar.gz) by clicking"Send update package"(as illustrated in Figuare 2-5). After successfully sending the upgrade file,

click"Sure"and restart the controller after powering off (check whether the zero point is correct or not). Then the system upgrade is completed.

Note: There shall be no file under a Chinese name in the upgrade path, or the upgrading fails.

5.This step shall only be executed when it is the first time for the system to be upgraded or to upgrade directly from version 2.0.1 to 2.2.0, and if the system is to upgrade from the versions of 2.0.2, 2.0.3 or 2.1.0 to version 2.2.0, step 4 shall be executed.

With USB flash disk plugged into the teaching device, decompress ver_HSC3-lib4plugin under folder"System"and copy the file Hsc3Upgrade.tar.gz in the decompressed folder of Hsc3Upgrade_out to anther folder without a Chinese name. Decompress the package ver_HSC3-V2.2.0.XXXXXX under"System Folder"and then copy the Hsc3Upgrade.tar.gz in it also to a folder named in language other than Chinese.

Then start HSPad, directly click buttons of"Menu"-"System"-"System upgrade". Displaying the directory of USB flash disk and select to enter the ungrade package list and send the upgrade file named Hsc3Upgrade.tar.gz (with a suffix. tar.gz) under Hsc3Upgrade_out by clicking"Send update package". After successfully sending the upgrade file, click"Sure" and restart the controller after powering off.

Repeat the procedure of clicking"Menu"-"System"-"System upgrade"after a successful restart. Displaying the directory of USB flash disk, select to enter the ungrade package list and send the file named Hsc3Upgrade.tar.gz (with a suffix . tar.gz) under folder ver_HSC3-V2.2.0.XXXXXX by clicking"Send update package"(as illustrated in Figuare 2-5). After successfully sending the upgrade file, click"Sure"and restart the controller after powering off (check whether the zero point is correct or not). Then the system upgrading is completed.

Note: There shall be no file under a Chinese name in the upgrade path, or the upgrading fails

Figure 2-5 Select upgrade file

6.If it is the first time to upgrade the system and directly to Version 2.2.0, there is n o need to execute this step. If it is to upgrade from versions of 2.0.1, 2.0.2, 2.0.3 and 2. 1.0 to version 2.2.0, file config under ftp://10.10.56.214/usr/codesys/hsc3_app/plugins/WeldP ackage-1.0-SNAPSHOT/ of the controller shall be transferred to its parent directory, and th en transfer configAUTHCODE_9 and configTOTALTIME_9 to the folder where config was copied. The concrete steps are as follows.

When executing this step, please take photos of the data of welding channel and pendulum channel interfaces in the process parameters of the craft package in case ofloss of process data.

Steps of entering ftp though teaching device are as follows:

(1) Click ES file explorer from the main application interface of the teaching device and select FTP (as illustrated in Figure 2-6) under Network provided in the Fast Access.

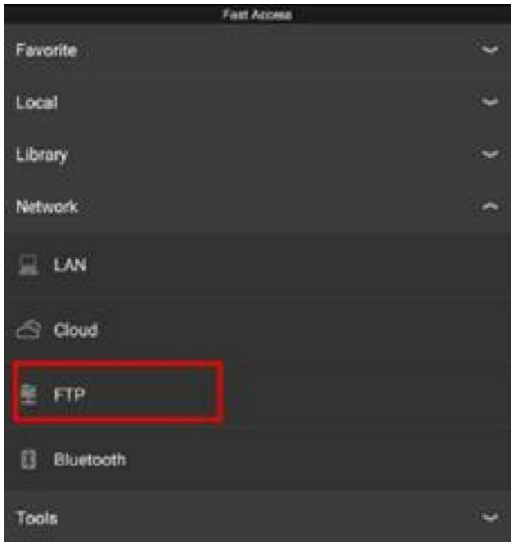


Figure 2-5 Select FTP server

(2) After entering the interface of FTP, click to establish a new FTP server where 10.10.56.214 shall be filled in following Server, root after Username and 111111 after Password, and thereafter click"OK", as illustrated in Figure 2-7.

Figure 2-7 Establish a new FTP server

(3) If you upgrade from 2.0.1, 2.0.2, 2.0.3 and 2.1.0 to 2.3.0, click 10.10.56.214/usr/c odesys/hsc3_ In the app / plugins / weldpackage-1.0-snapshot / directory, set config and a uthcode_ 9.configTOTALTIME_ 9. Select the file and click the copy button (as shown in Figure 2-8). After

copying, return to the upper level directory (i.e. 10.10.56.214 / usr / C oDeSys / hsc3)_ Click the paste button under app / plugins / (as shown in Figure 2-9). A fter copying, long press wavechannel.xml and weldchannel.xml in config and click the del ete button (as shown in Figure 2-10). After deletion, restart the controller to complete the upgrade.

Note: please take photos to back up the channel data before deleting

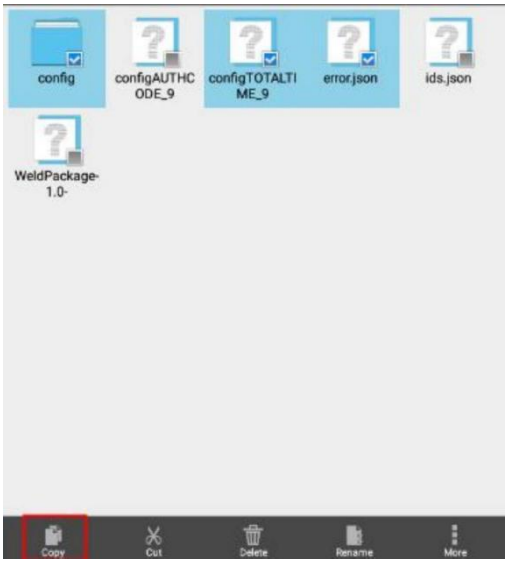


Figure 2-8 Copy the files

Figure 2-9 Paste the files

Figure 2-10 Delete the files

(4) When upgrading from version 2.2.0 to version 2.3.0, you need to delete the modfconfig.xml file in the config folder, and restart the controller after deletion (as shown in Figure 2-11).

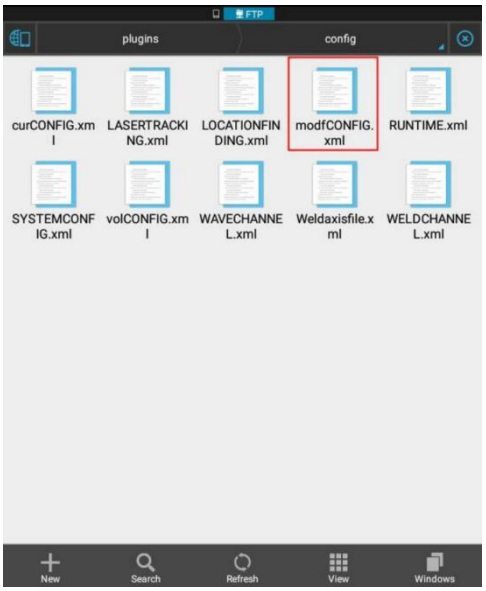


Figure 2-11 files to be deleted when upgrading from version 2.2.0 to version 2.3.0

(5) When upgrading from version 2.3.0 to version 2.4.0, you need to delete the wavechannel.xml file in the config folder, and restart the controller after deletion (as shown in Figure 2-12).

Note: please take photos to back up the channel data before deleting.

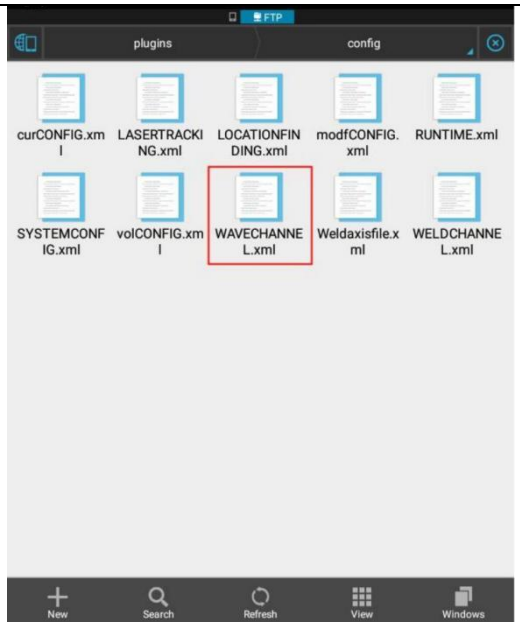


Figure 2-12 files to be deleted when upgrading from version 2.3.0 to version 2.4.0

（6）When upgrading from version 2.4.0 to version 2.4.1, you need to change the weldchannel in the config folder Delete the XML file (as shown in Figure 2-13) and change systemconfig The < item5 arcchannelnumber < / item5 > parameter in the XML file is changed to 30 (as shown in Figure 2-14). Restart the controller after operation.

Note: please take photos to back up the welding channel data before deleting.

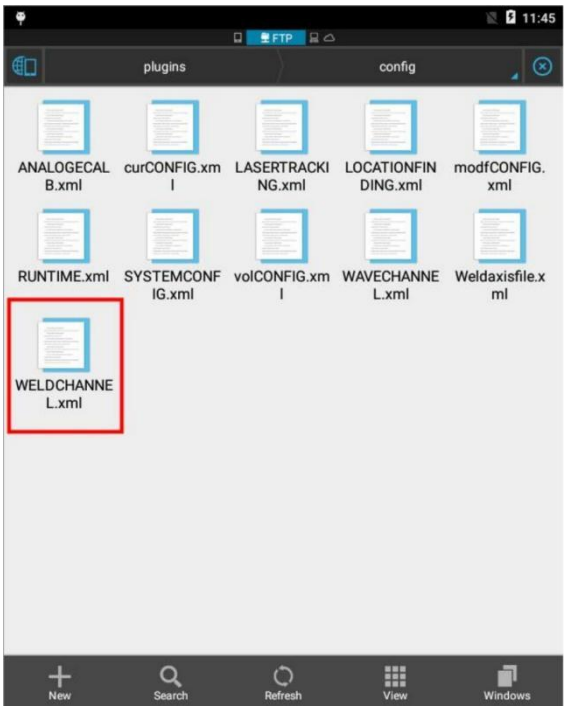


Figure 2-13 files to be deleted when upgrading from version 2.4.0 to version 2.4. 1

Figure 2-14 files to be changed when upgrading from version 2.4.0 to version 2.4.1

(7) Upgrade from version 2.4. 1 to version 2.4.2 normally.

Note: Before upgrading from version 2.4.2 to version 2.4. 1, you need to back up the calibration data in System - Import export Calibration Parameters before upgrading. After upgrading, you need to re select the model, and then import the previously backed up calibration data.

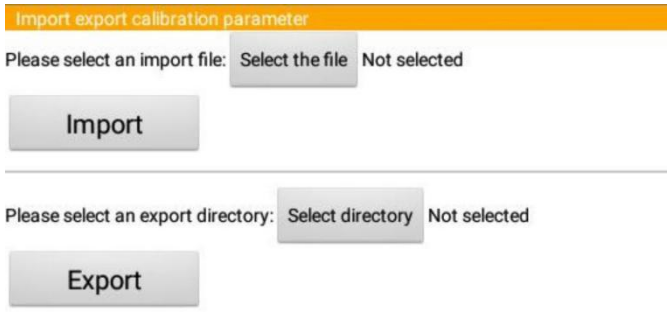


Fig. 2-15 Import and export calibration parameters

（8）Upgrading from any previous version to version 2.4.3 requires switching the model once.

（9) 1.6.9 Upgrading 1.6.11 The system can start normally only after the driver firmware is upgraded

2.2 Upgrading through CA

1.Copy the upgrade file to the USB flash drive, insert the USB flash drive into the teacher, enter the ES browser, select udisk from the shortcut navigation on the upper left corner to enter the USB flash drive, and click the HSPad3-1.6.6XXXXXX-W ELD.APK software installed in the upgrade folder (as shown in Figure 2-16).

Figure 2-16 Installing an HSPad

2. After HSPad is installed, open the HSPad software, find Configuration-Demon strator Configuration-Process package management in the navigation to enter the p rocess package management interface, click the Install process package button in th e lower right corner (as shown in Figure 2-17), and find the"Demonstrator"folder in the pop-up dialog box. Select HS3_VX.X.X.XXXXXX_HJ.apk (as shown in Figure 2-1 8), click OK, and wait until the installation is complete. After the installation is com plete, restart HSPad as prompted.

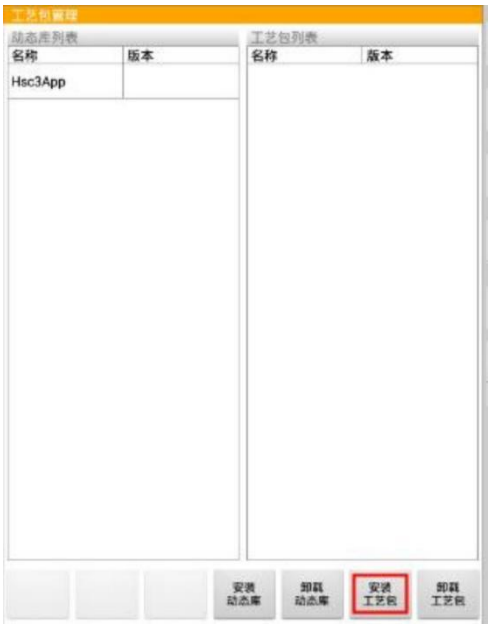


Figure 2-17 Installing a process package

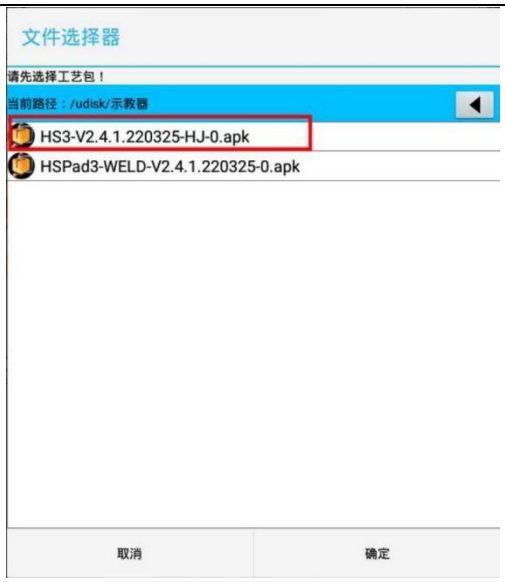


Figure 2-18 Installing a process package

3. Connect the controller network cable to the PC, open ControlAssistant_win.exe software, click Add in the lower left corner, and enter IP address 10.10.56.214 and port number 23234 in the displayed Configure Controller dialog box, and click OK (as shown in Figure 2-19).

Figure 2-19 Connecting a controller

4. Select the newly created controller and click Connect (as shown in Figure 2-20). If the status is displayed as Ready, the controller is successfully connected.

Figure 2-20 Connecting the controller

5. After the connection is successful, switch to the command screen, enter lib.clearDisk(), and press Enter to clear the system, as shown in Figure 2-21.

Figure 2-21 Cleaning system instructions

6.Perform this step if the system is upgraded from 2.0.2, 2.0.3, 2.1.0, or 2.2.0 to 2.3.0. Do not perform this step if the system is upgraded from 2.3.0 for the first time or from 2.0.1 to 2.3.0.

Decompress the ver_HSC3-V2.3.0.XXXXXX file in the System folder, right-click the newly created controller on the controller monitoring page, and select Upgrade from the displayed list (as shown in Figure 2-21). The upgrade dialog box is displayed. gz (the extension of the upgrade package is.tar.gz) in the upgrade package (as shown in Figure 2-21), click the upgrade button, and restart the controller after the restart is complete.

Note: The upgrade path cannot contain a Chinese file name. If a Chinese file name is included, the upgrade will fail.

7. Perform this step if the system is upgraded to version 2.3.0 for the first time or from version 2.0.1 to version 2.3.0. Perform Step 6 if the system is upgraded from version 2.0.2, 2.0.3, 2.1.0, or 2.2.0 to version 2.3.0.

Decompress the ver_HSC3-V2.2.0.XXXXXX file and the ver_HSC3-lib4plugin file in the System folder, and copy the decompressed file to a directory without a Chinese file name.

Right-click the newly created controller on the controller monitoring screen. In the displayed list, select Upgrade (as shown in Figure 2-21). The upgrade dialog box is displayed. Select the hSC3Upplant.tar. gz upgrade file in the ver_HSC3-lib4plugin folder. Then click the Upgrade button, wait for the restart controller time to complete, restart the controller.

After the controller is restarted, right-click the newly created controller on the controller monitoring page, and select Upgrade from the displayed list, as shown in Figure 2-21. The upgrade dialog box is displayed. Select the upgrade file Hsc3Upgrade.tar.gz (the extension of the upgrade package is.tar.gz) in the ver_HSC3-v2.0. XXXXXX folder (as shown in Figure 2-22), and click the upgrade button. After the controller is restarted, restart the controller.

Note: The upgrade path cannot contain a Chinese file name. If a Chinese file name is included, the upgrade will

Figure 2-22 Upgrading the system

Figure 2-23 Selecting the upgrade system file

8.If the system is upgraded to version 2.3.0 for the first time, you do not need to perform this step. If from 2.0.1, 2.0.2, 2.0.3, 2.1.0 version 2.2.0 version upgrade to 2.3.0 word, still need to the controller in the ftp://10.10.56.214/usr/codesys/hsc3_app/plugins/ directory for file operations, specific steps are as follows:

Before performing this step, you need to take pictures of the welding channel, swing welding channel, and curve configuration interface data of the welding machine in the process parameters of the process package to avoid process data loss.

The steps to enter ftp are as follows:

(1) In the Computer text box, enter ftp://10.10.56.214, and press Enter to connect to the controller directory, as shown in Figure 2-24.

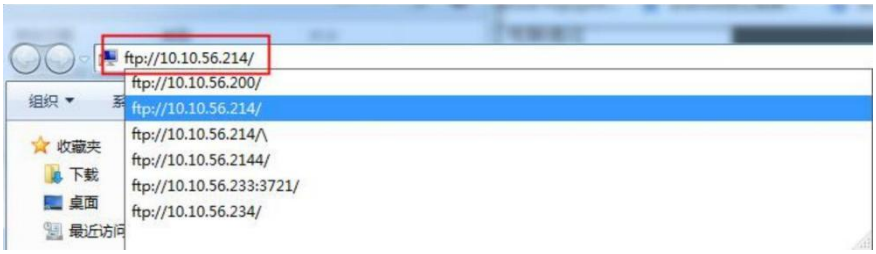
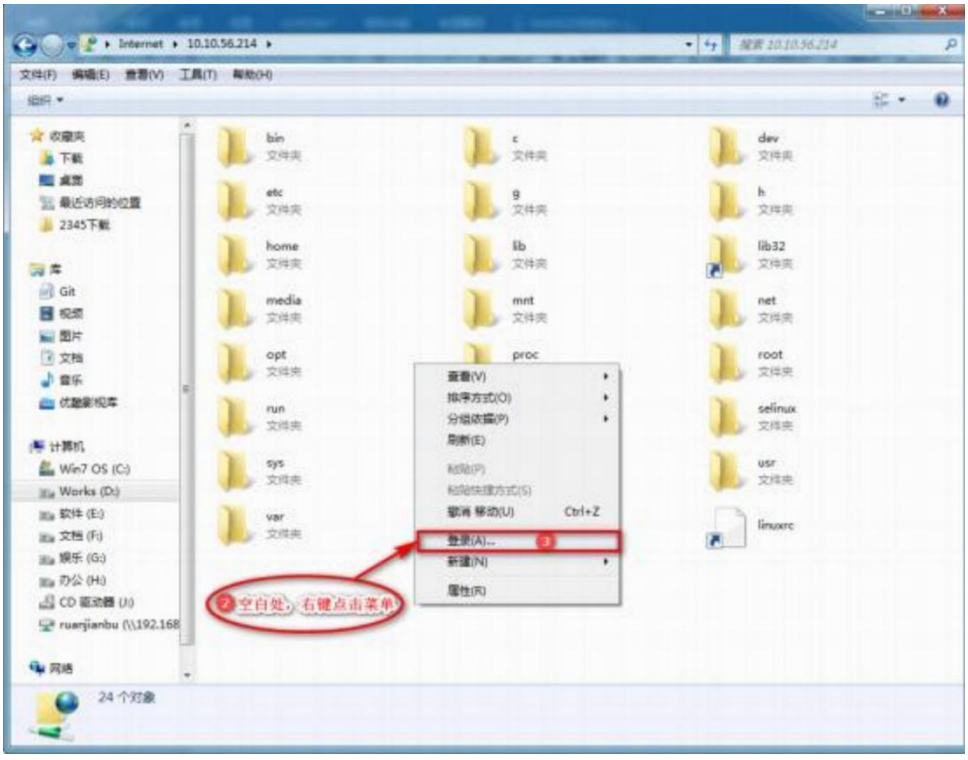


Figure 2-24 Connecting to the FTP server

(2) After obtaining the access permission, go to the controller file directory, right-click the blank area, choose Log In, and enter the user name and password to log in to the controller directory, as shown in Figure 2-25.



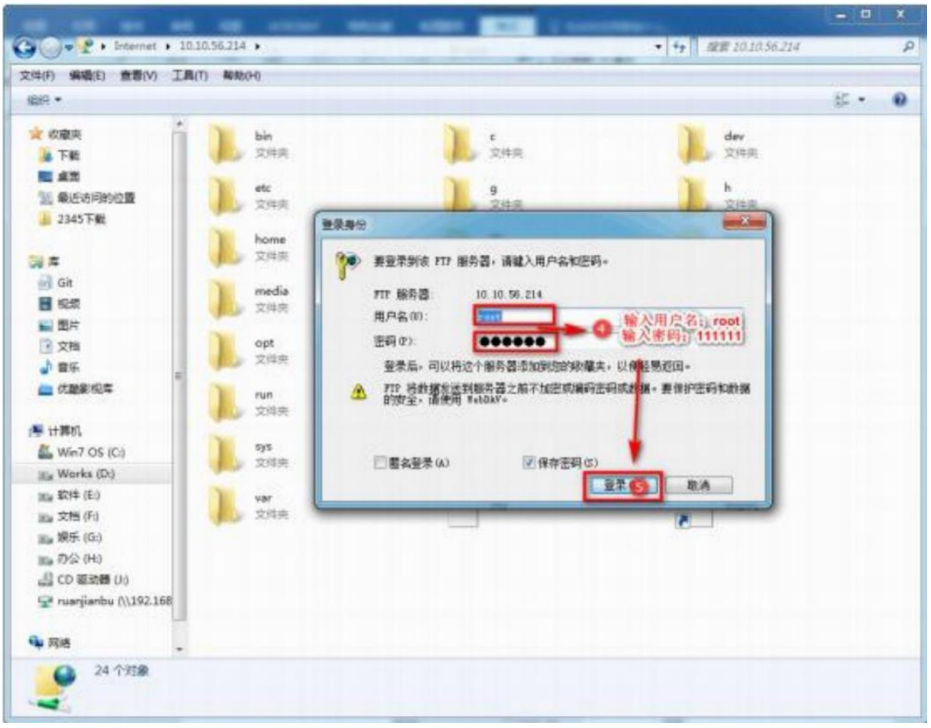
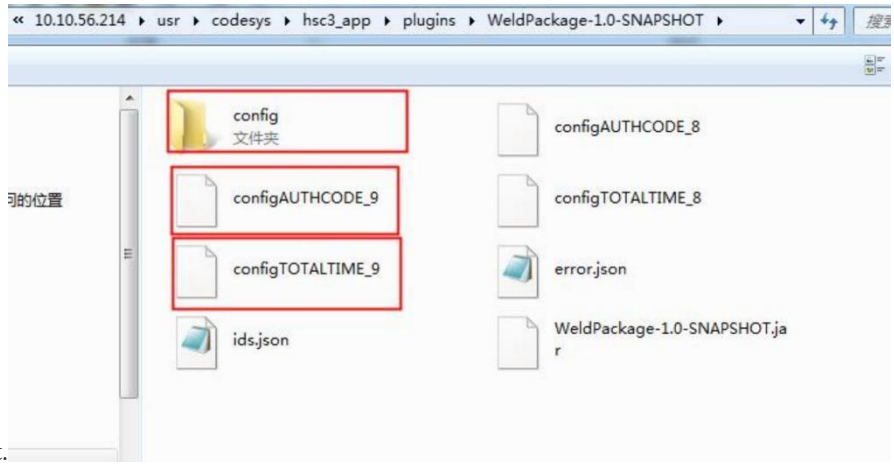


Figure 2-25 Logging in to the FTP server

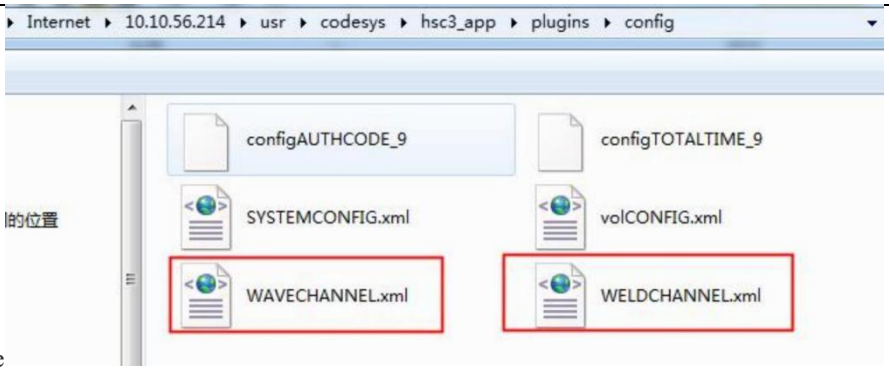
(3) ftp://10.10.56.214/usr/codesys/hsc3_app/plugins/WeldPackage-1.0-SNAPSHOT/ will config, configAUTHCODE_9, configTOTALTIME_9 in the directory File (as shown in figu re 2-26) is copied to the directory at the next higher level (i.e. 10.10.56.214 / usr/codesys hsc3_app/plugins /), xml and WELDCHANNEL.xml files (as shown in Figure 2-27) in th e config folder are deleted. After the files are deleted, restart the controller to complete th e upgrade.

Note: Take a photo to back up channel data before deleting



it.

Figure 2-26 Copying a



file

Figure 2-27 Deleting files

(4) When upgrading from 2.2.0 to 2.3.0, delete the modfCONFIG.xml file in the config folder, and then restart the controller, as shown in Figure 2-28.

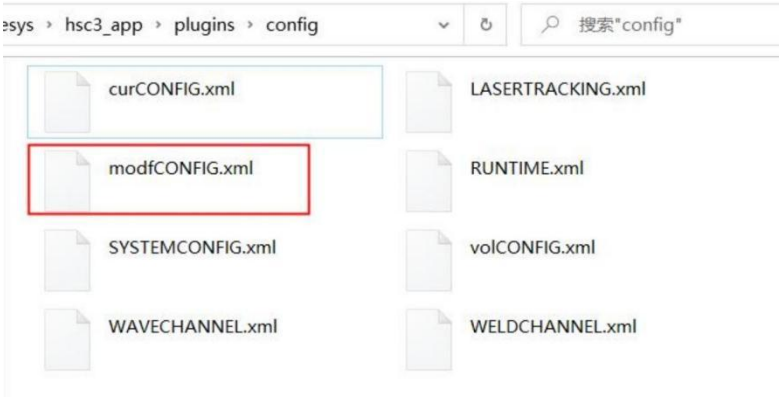


Figure 2-28 Deleting files before upgrading from 2.2.0 to 2.3.0

（5）When upgrading from 2.3.0 to 2.4.0, delete the WAVECHANNE.xml file in the config folder and restart the controller, as shown in Figure 2-29.

Note: Take a photo to back up channel data before deleting

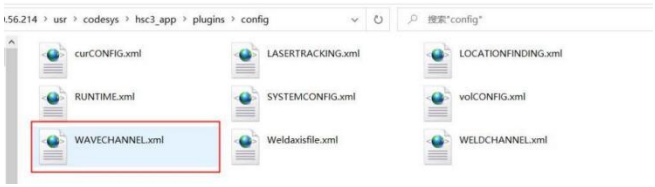


Figure 2-29 Files to be deleted when 2.3.0 is upgraded to 2.4.0

（6） When upgrading from 2.4.0 to 2.4.1, delete the WELDCHANNE.xml file in the config folder, as shown in Figure 2-30. Change the <item5 arcChannelNumber </item5 > parameter in the SYSTEMCONFIG.xml file to 30, as shown in Figure 2-31. Restart the controller after the operation.

Note: Take a photo to back up the welding channel data before deleting it.

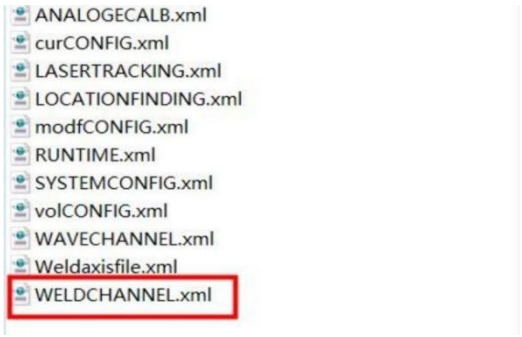
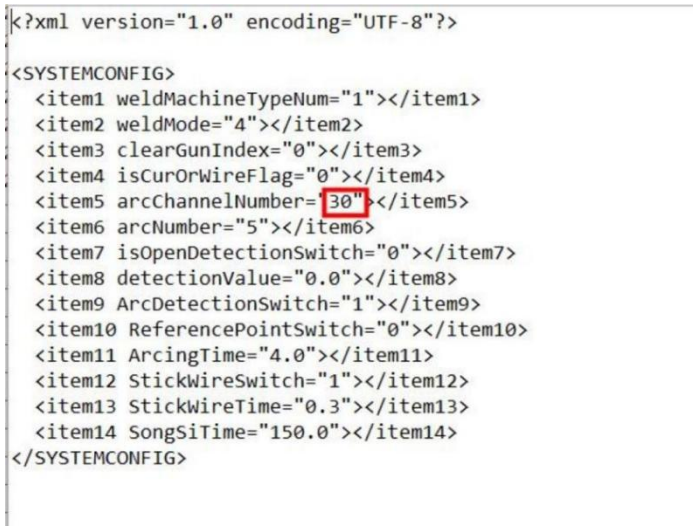


Figure 2-30 Deleting files before upgrading from 2.4.0 to 2.4.1



```
<?xml version="1.0" encoding="UTF-8"?>

<SYSTEMCONFIG>
  <item1 weldMachineTypeNum="1"></item1>
  <item2 weldMode="4"></item2>
  <item3 clearGunIndex="0"></item3>
  <item4 isCurOrWireFlag="0"></item4>
  <item5 arcChannelNumber="30"></item5>
  <item6 arcNumber="5"></item6>
  <item7 isOpenDetectionSwitch="0"></item7>
  <item8 detectionValue="0.0"></item8>
  <item9 ArcDetectionSwitch="1"></item9>
  <item10 ReferencePointSwitch="0"></item10>
  <item11 ArcingTime="4.0"></item11>
  <item12 StickWireSwitch="1"></item12>
  <item13 StickWireTime="0.3"></item13>
  <item14 SongSiTime="150.0"></item14>
</SYSTEMCONFIG>
```

Figure 2-31 Files required for upgrading from 2.4.0 to 2.4.1

(7) Upgrade from 2.4.1 to 2.4.2.

Note: Before upgrading from 2.4.2 to 2.4.1, you need to back up calibration data in System -Import/Export calibration parameters. After upgrading, you need to re-select the model and then import the previously backed up calibration data

Figure 2-32 Importing and exporting calibration parameters

（8）When upgrading from any previous version to version 2.4.3, you need to switch models once.

3 Brief introduction of AUCTECH III control system

AUCTECH III industrial robot control system is a control system independently developed by AUCTECH Robotics Co., Ltd. It has the characteristics of high speed and high precision, and its programming language is simple and easy to understand. Adjustment to meet the vast majority of industrial needs.

3.1 System composition

The composition of the AUCTECH industrial robot system mainly includes the following four parts:

- Mechanical arm
- connecting cable
- Electronic control system
- HPad teach pendant

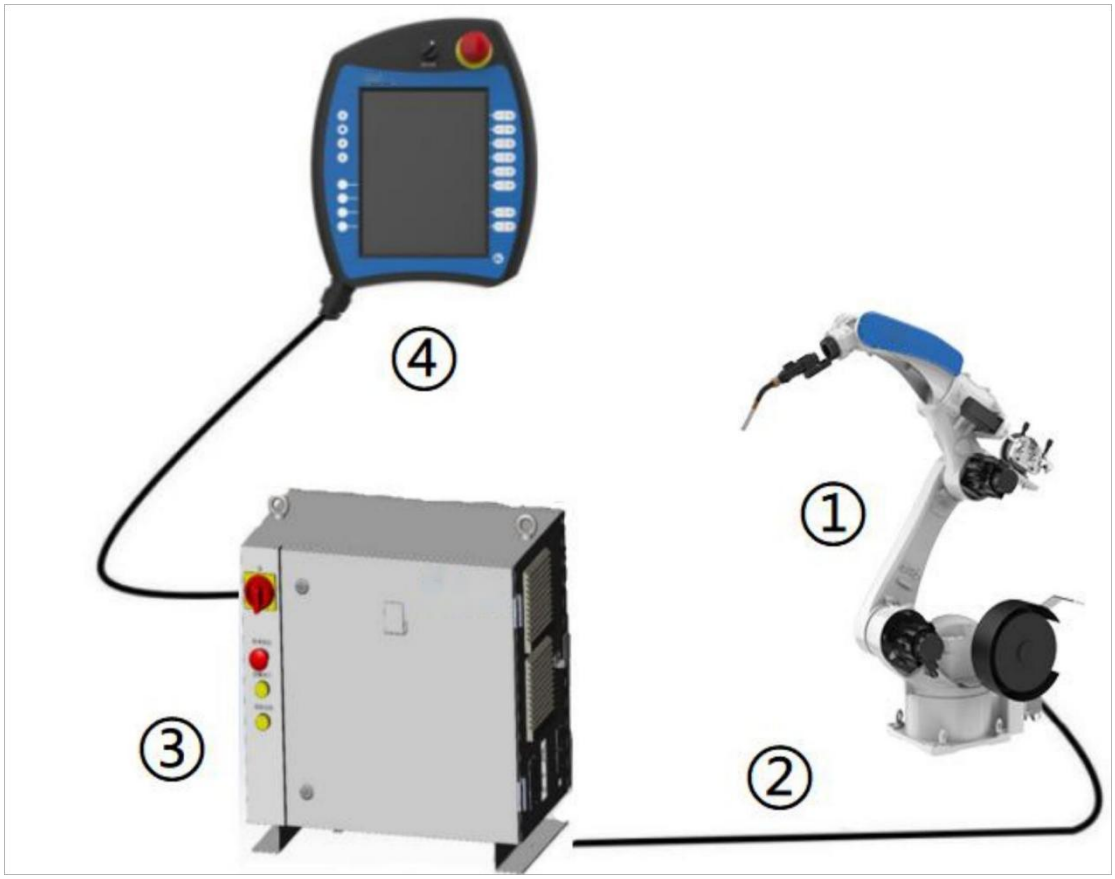


Figure 3-1 Connection diagram of HPad and AUCTECH robot

3.2 AUCTECH III Teaching Pendant Software

AUCTECH III control system mainly includes

- AUCTECH Robot Teaching Pendant Software HSC3- HSPad

4 Safety

4.1 Notes

1. AUCTECH robot users must operate the robot under the condition of ensuring their own safety.

2. Ensure that the state of the robot is stable and the base is stable.

3. Users of AUCTECH Robot must operate the robot in accordance with the regulations, and illegal operations are strictly prohibited.

4. Before using the AUCTECH robot, make sure that the surrounding environment will not affect the robot.

5. Guangzhou Auctech Automation Technology Ltd. is not responsible for the safety of the robot.

6. Guangzhou Auctech Automation Technology Ltd. reminds users that safety equipment must be used when using AUCTECH industrial robots, and safety provisions must be followed.

7. The AUCTECH robot can move a large distance at a high speed.

	the AUCTECH robot is powered off, it needs to wait for the discharge to complete before powering on again.

8. Never turn your back to a robot.

4.2 When the robot cannot be used

1. Combustion environment.

2. A potentially explosive environment.

3. An environment with radio interference.

4. In water or other liquids.

5. Moving people or other animals.

6. Not clinging.

7. Other occasions that cannot be used.

4.3 Safe operating procedures

4.3.1 Teaching and teaching the robot

1. Try to use a lower speed override when jogging the robot.

2. Consider the movement trend of the robot before pressing the jog button on the software.

3. Consider the movement trajectory of the avoidance robot in advance, and confirm that the route is not disturbed.

4. The area around the robot must be clean, free of oil, water and impurities.

4.3.2 Production Movement

1. Before starting the operation, you must know all the tasks that the robot will perform according to the programmed program.

2. The position and status of all switches, sensors and control signals that affect the movement of the robot must be known.

3. The location of the emergency stop buttons on the robot controller and peripheral control equipment must be known and prepared to use these buttons in an emergency.

4. Always keep a safe distance from the robot.

5 AUCTECH III Teaching Pendant

5.1 Front

Figure 5- 1 Front of Hspad

label item	illustrate
1	Key switch for recalling the connected controller. The state can only be transitioned after the key is inserted. The operating mode (Teach /Auto/External) can be switched by connecting the controller.
2	Emergency stop button (emergency stop). Used to stop the robot in dangerous situations.
3	Jog the run key. Used to teach mobile robots.
4	Button for setting the program adjustment amount. Automatic, external operation override adjustment.
5	Button for setting the teaching adjustment amount. Automatic run rate adjustment.
6	menu button. Switching between menu and file navigator is possible.
7	Pause button. When running the program, pause the operation.

8	stop key. Use the stop key to stop and uninstall running programs.
9	Back button. Use the back button to back out the program.
10	Start running key. When the program is loaded successfully, click this button to start the program.
11	Alternate button.

5.2 Back

Figure 5- 2 Hspad back

label item	illustrate
1	Three-stage safety switch. The safety switch has 3 positions: ①Not pressed ② Middle position ③ Press down fullyteaching mode of the running mode, the confirmation switch must be kept in the middle position so that the robot can move, and the other positions are turned off. In automatic operation mode, the safety switch has no effect.
2	The HSPad label model is pasted.
3	Debug interface.
4	USB flash drive. The USB interface is used for operations such as archive/restore.

5.3 HSPad operation interface

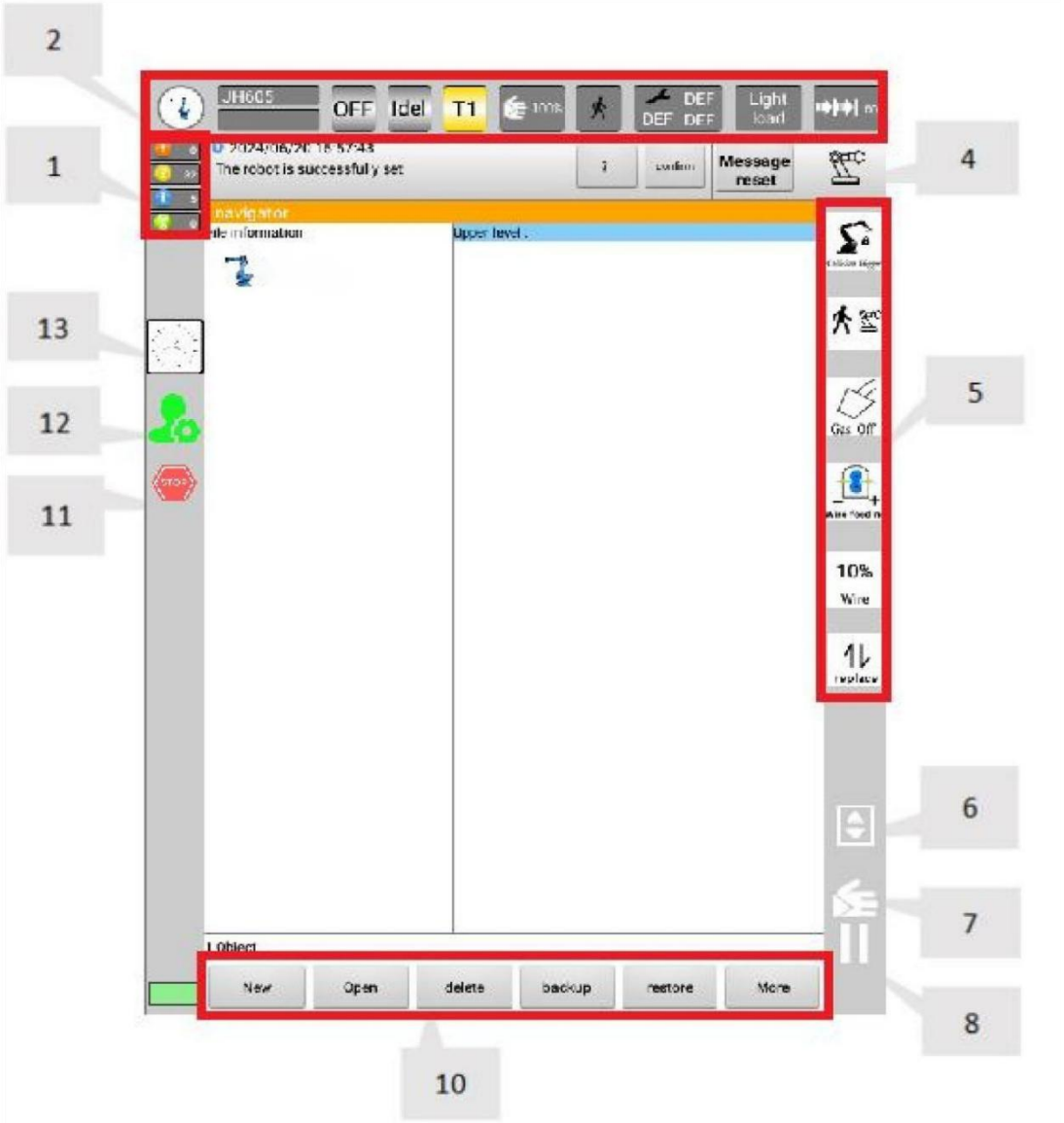


Figure 5- 3 Operation interface

label item	illustrate
1	Information prompt counter. The message prompt counter shows how many messages of each message type are waiting to be processed. Touch the information tip counter to enlarge the display.

2	Status Bar. the current model, load level, loaded program, enable status, program status, running mode, override, program running mode, tool workpiece number, and incremental mode.
3	Information window. By default only the last information tip will be displayed. Touch the info window to display a list of info. All pending messages are displayed in the list. The information that can be confirmed can be confirmed with the【Confirm】key. 【Message Confirmation】key to confirm all information except error information. 【Alarm Confirmation】key to confirm all error messages. The"?"key can display the details of the current message.
4	Coordinate system state. Touch this icon to display all coordinate systems, and select and switch.
5	Welding function and jog running instruction. If it is not enabled, it is the welding function icon. The welding function can be turned on and off, and the icon will turn green after it is turned on. If the axis-related operation is selected after enabling, the axis number (A1, A2, etc.) will be displayed here. If Cartesian run is selected, the orientation of the coordinate system (X, Y, Z, A, B, C) will be displayed here. Touching the icon displays the kinematics group selection window. When a group is selected, it will be displayed as the corresponding name in the corresponding group.
6	Flip the program line up and down, and use it after loading the program.
7	Zoom adjustment icon.
8	External pause point function icon.
9	Action menu bar. For program file related operations.
10	network status.

	Red is the network connection error, check the network line problem. Yellow means that the network connection is successful, but the initialization of the controller is not completed, and the robot cannot be controlled. Green indicates that the network is initialized successfully, and the HSPad is normally connected to the controller, which can control the movement of the robot.
11	Robot stop and motion indication icon.
12	The current user icon, click to enter the user login interface.
1 3	clock. The clock displays the system time. Clicking on the clock icon will digitally display the system time and the current operating time of the system.

5.3.1 Status bar

The status bar shows the status of the industrial robot settings. In most cases clicking on the icon will open a window where you can change the settings.

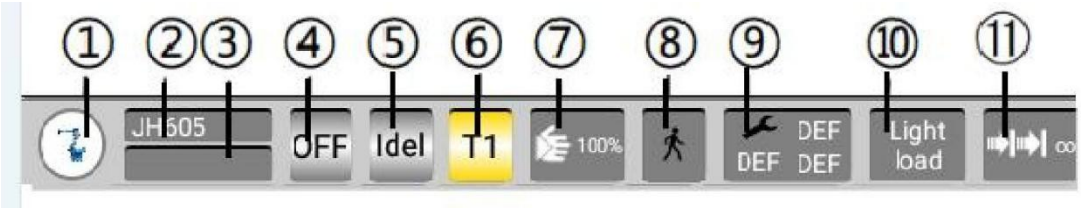


Figure 5- 4 Status Bar

label item	illustrate
1	menu. The function is the same as that of the menu button.
2	Robot name. Displays the current robot model and load level.
3	Loader name. After loading the program, the path and name of the currently loaded program will be displayed
4	enable state. Green and displays"On", indicating that the current enable is on. Red and displays"off", indicating that the current enable is off. Click to open the enable setting window. In automatic mode, you can only set the enable switch state by clicking on/off on the interface. The pressed state of the safety switch can be displayed in the window.

	teach mode, it can only be turned on or off by the safety switch
5	Program running status. When running automatically, the running status of the current program is displayed.
6	Mode status display. The mode can be set by the key switch, and the mode can be set to teach mode, automatic mode, external mode.
7	The magnification adjustment is displayed. When switching modes, the override value of the current mode will be displayed. Touching will open the setting window, you can use the plus/minus (+ /-) keys to add or subtract in units of 1%, or drag the scroll bar to the left or right.
8	Program run mode status. In automatic operation mode, it can only be continuous operation, and in teaching mode, it can be set to single-step or continuous operation. Touching will open the setting window, and in teaching mode, you can click the continuous/single step button to switch the operation mode.
9	Activate base coordinates/tool display. Touch will open the window, click the tool and base coordinate to select the corresponding tool and workpiece to set, the available tool workpiece number is 0 ~ 15.
10	Load display Touch to open the dynamic plug in the number selection, click the corresponding load number to switch.
11	Incremental mode display. in teach mode, click the corresponding option to set incremental mode. Sustainability : Sustained movement Non-continuous: move according to the set incremental distance (joint °or space mm inching)

5.3.2 Main menu

Steps

Click the"main menu icon"or key to open the main menu of the window.

Click the"Main Menu Icon"or button again to close the main menu.

Describe

the main menu window properties:

The main menu is displayed in the left column.

Clicking on a menu item will display the sub-menu to which it belongs (eg: Configuration).

When you click to open a large number of sub-menu layers, you may not see the main menu bar, but only the menu. At this time, the latest three-level menu display will be displayed.

The upper left"Home icon"key closes all open sub-menus and displays only the main menu.

In the [lower area], the last selected menu item (up to 6) will be displayed, which is equivalent to a shortcut menu. This allows the menu items to be selected again directly without first closing the open submenus.

The red cross ("X") on the left closes the window.

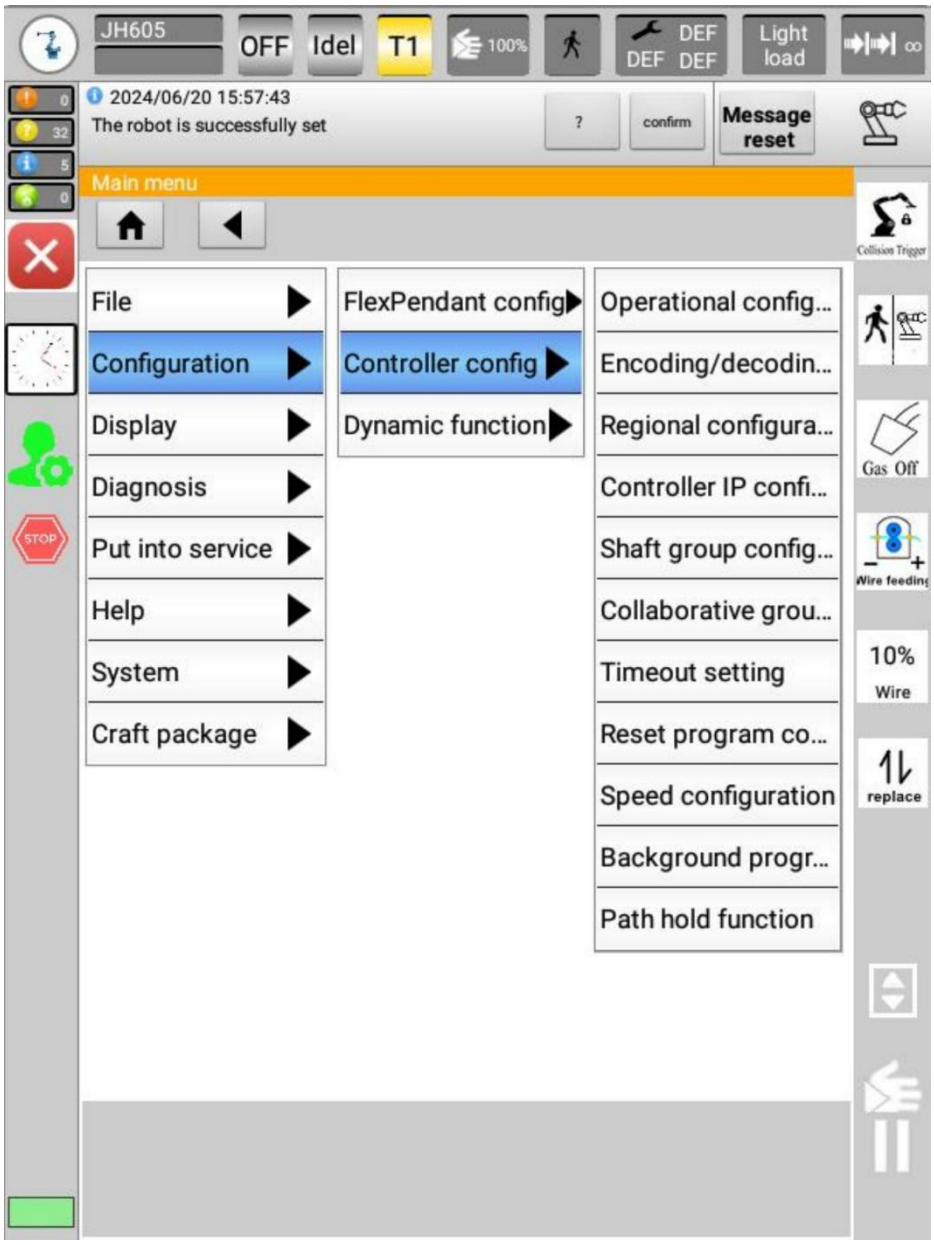


Figure 5- 5 Main menu interface

6 User permission function

illustrate

There are 3 user groups in the current version, namely production staff, engineers, and manufacturer staff. The specific user permissions are as follows. (Note:"×"does not have permission to display this interface, viewing means that you can only enter this page but cannot use this function,"√"means editable/useable), in the HSpad system software, different users have different permissions.

There are the following user groups:

Producer User :

Production personnel user group, this user group is the default user group, which can only produce and simple trajectory motion.

Engineer users :

Engineer user group, this user group has more rights to use system functions than the default ordinary user. Can change welding parameters, edit and change programs, etc. After the user logs in, select"Keep Engineer User"to restart as an engineer user. After selecting this, log in to the producer and manufacturer personnel and restart to restore the default as the producer user. This user is protected by a password.

Manufacturers and users :

user group with the highest authority, after logging in to this user, the next restart will be the production user user. This user has all the right to use the H spad system. This user is protected by a password.

[Remarks] The default password of the engineer user is"hspad".

A menu	Secondary menu	Tertiary menu	User group permissions		
			Producer	Engineer	Manufacturer personnel
file Management	Backup restore settings	——	You can only choose to set it as the root directory of the U disk/default	You can only choose to set it as the root directory of the U disk/default	√

			path, and you cannot edit the custom path	path, and you cannot edit the custom path	
	Lock password settings	____	×	×	√
	get register file	____	Can only get but not send	√	√
	log file management	____	√	√	√
PRG program file operation	new	____	×	√	√
	Open	____	√	√	√
	Program starts editing	____	×	√	√
	delete	____	×	√	√
	backup	____	√	√	√
	recover	____	×	√	√
	Multiple choice	____	×	√	√
	Rename	____	×	√	√
	locking	____	×	√	√
	On/Off Instructions	____	×	√	√
	On/Off state	____	×	√	√
	release waiting	____	×	√	√
configure	Teach Pendant Configuration	user group	√	√	√
		Alternate button	Check	√	√

		configuration			
		Process package management	Check	Check	√
	Controller Configuration	Robot Communic-ation Configuration	Check	Check	√
		Axes group Configuration	Check	Check	√
		Collaborati-on group Configuration	Check	Check	√
		Robot parameters	Check	Check	√
		external run Configuration	Check	√	√
		Encode/De-code Configuration	Check	Check	√
		Regional Configuration	Check	Check	√
		Modbus Configuratio-n	×	×	√
		Modbus	×	×	√

		mapping			
		timeout setting	Check	Check	√
		Authorize	Check	Check	√
show	input/output	digital input/output	Check	√	√
		Analog input/output	Check	√	√
	actual location	____	Check	Check	Check
	Variable list JR, LR, R	____	Check	√	√
	Variable List Tool Artifact	____	Check	Check	√
	Modbus display	____	×	×	√
diagnosis	run log	show	√	√	√
		configure	Check	√	√
put into service	Measureme-nt	User tool calibration	Check	√	√
		User workpiece calibration	×	×	√
		Collaborati-ve group calibration	×	×	√
		External shaft reduction ratio calibration	×	×	√

		20 point calibration	×	×	
	Adjustment	calibration	Check	Check	√
	Software limit switch	____	Check	Check	√
help	Version Information	____	√	√	√
system	Revelation Teaching Tool	____	√	√	√
	clean up the system	____	√	√	√
	shut down the system	____	×	√	√
	reboot the system	____	×	√	√
	System Upgrade	____	×	×	√
	Import and export user PLC	____	×	×	√
	Import and export calibration parameters	____	×	×	√
interface button	Start/Pause /Uninstall buttons	____	√	√	√
	Mode switch	____	√	√	√
	Teaching mode enabled	____	√	√	√
	Auto/Exter	____	√	√	√

	nal Mode Enable				
	Tool workpiece switching	____	×	√	√
	Program step/continuous	____	√	√	√
	Teach continuous/inch	____	×	√	√
	Override	____	√	√	√
	Teaching coordinate system replacement	____	√	√	√
	Program line page button	____	√	√	√
	auxiliary button	____	√	√	√
	Collision trigger button	____	√	√	√
	Synergy switch	____	√	√	√
	welding switch	____	√	√	√
	gas detection switch	____	√	√	√
	Wire feed control	____	√	√	√
	Wire feed	____	√	√	√

	rate				
	movement to the point	____	√	√	√
	jump	____	√	√	√
	point record	____	×	√	√
	Back to Pause button	____	√	√	√
craft kit	Welding process package	System Configuration	Check	√	√
		System Configuration - Positioner Configuration	×	×	√
		Welder curve parameter Configuration	Check	√	√
		Process parameters	Check	√	√
		Production Statistics	√	√	√
		Running time statistics	Check	√	√
		Authorize	Check	Check	√
		Analog correction	×	×	√

Steps

1. Select" User Login" in the main menu or click" User Icon"on the main interface. The current user group will be displayed.

2. If you want to switch to the"producer"user, select the user group as"producer"and press login.

3. Engineer users and manufacturer personnel users need to enter the password to log in, and enter the password to log in to confirm.

4. The user icon on the main interface is green to represent the current production user, yellow represents the current engineer user, and red represents the current manufacturer user.

5. Modify password: If you need to modify a user's password, select the user and click the"Modify Password"button.

6. After entering the original password and the new password in the password modification interface, click the"OK"button to complete the password modification.

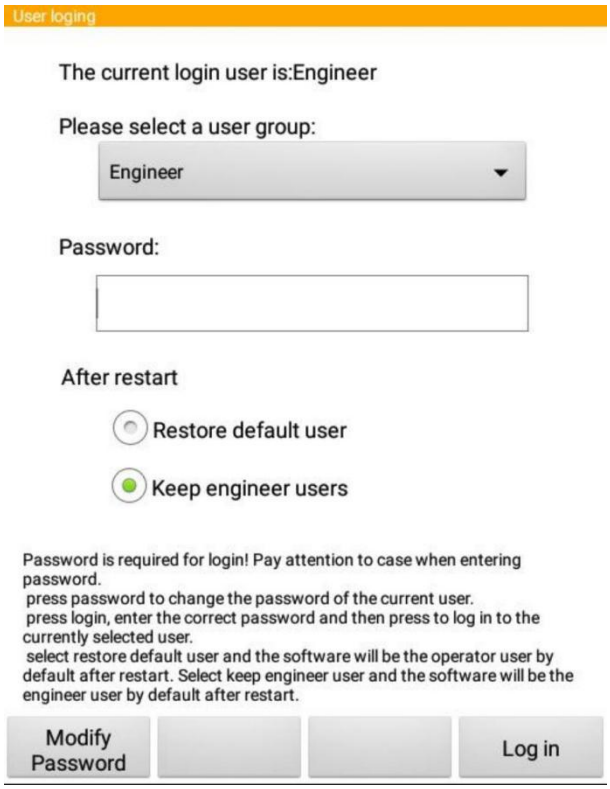


Figure 6-1 User login interface

7 File functions

7.1 System parameter file management

	This function sets the modification permission to the vendor user

Steps

Select Menu Bar → File → System Parameter File Management

Select Import File → Click the"Import"button to confirm the operation

Select the export directory → Click the"Export"button to confirm the operation

Figure 7-1 System parameter file management

7.2 Program data file management

	This function sets the modification permission to the vendor user

State

The program data file management function is divided into two parts: obtaining register file and sending register file (variable list register file, IO description file), obtaining controller register file through U disk, and sending storage file to controller.

operating steps

1. Choose > File > Program Data File Management from the menu bar.
2. Click the check box and select the file you want to import or export.
3. Click the Import File/Export File button.
4. Click"Confirm"to confirm the operation.

	l Export the program data file to the selected path in the upper folder regfile. l Import program data files also need to be sent to the selected path above the regfile folder. (The sending program data file takes effect after the system restarts.) l before delivery, the value of the corresponding program data file is 0, and obtaining it fails.

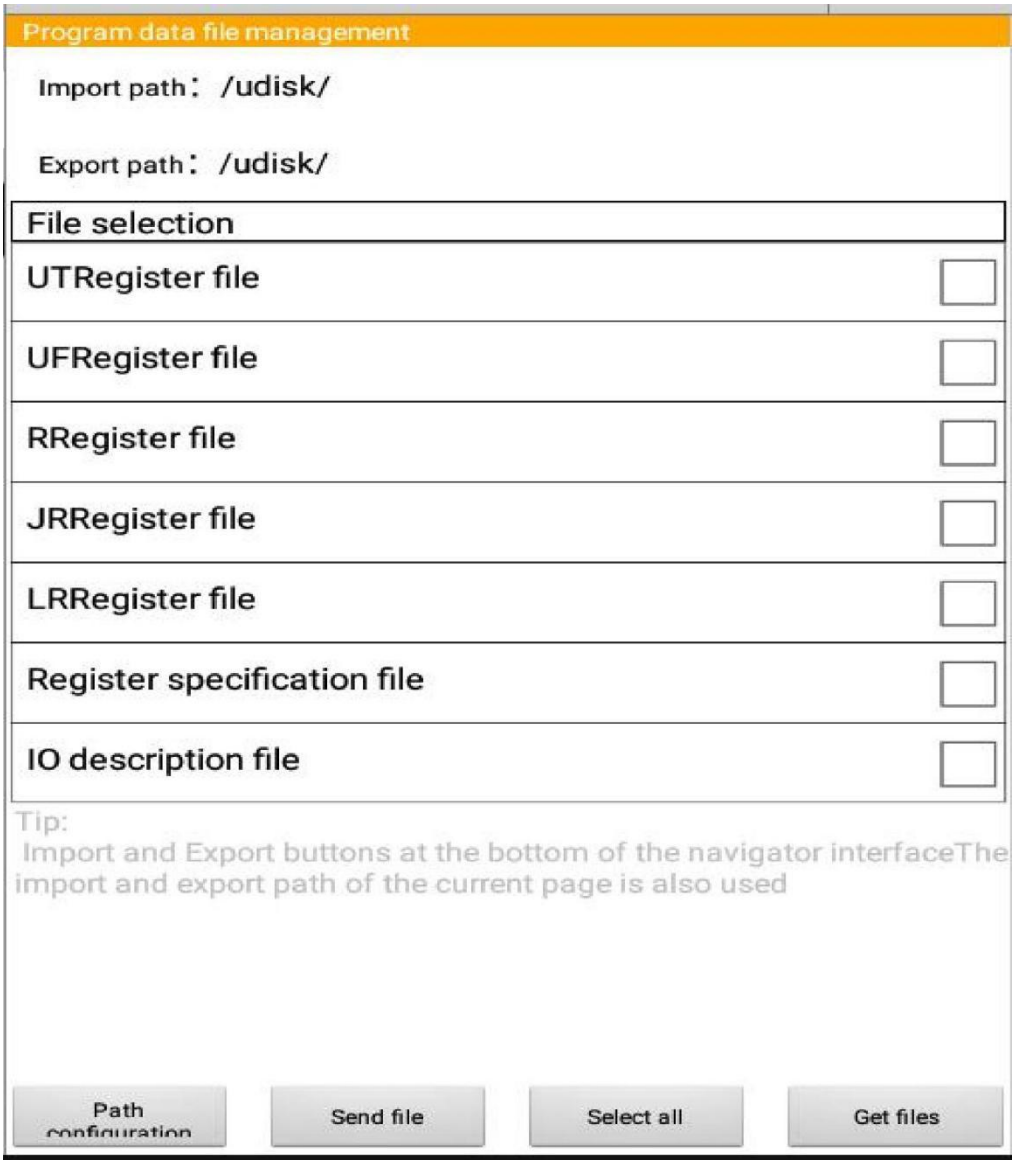


Figure 7-2 Gets the send register file

7.3 Import or export a user PLC

	This function sets the modification permission to the vendor user

State

Import and export the user PLC function, you can back up the user PLC in the existing controller system through the U disk, you can also import a new user PLC to update/restore the system environment.

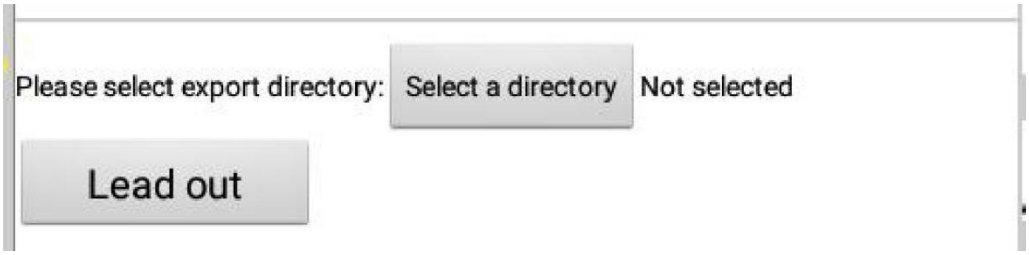
Export the user PLC procedure

1. Insert the USB flash drive. After the USB flash drive is successfully identified

2. Open the menu and click"System → Import and export user PLC"

3. Click the [Select Directory] button of the export module to determine the export path

4. Click the [Export] button. After the export is successful, the corresponding file will be found in the selected export path.



picture 7 - 3 Import or export user PLC-1

Import the user PLC procedure

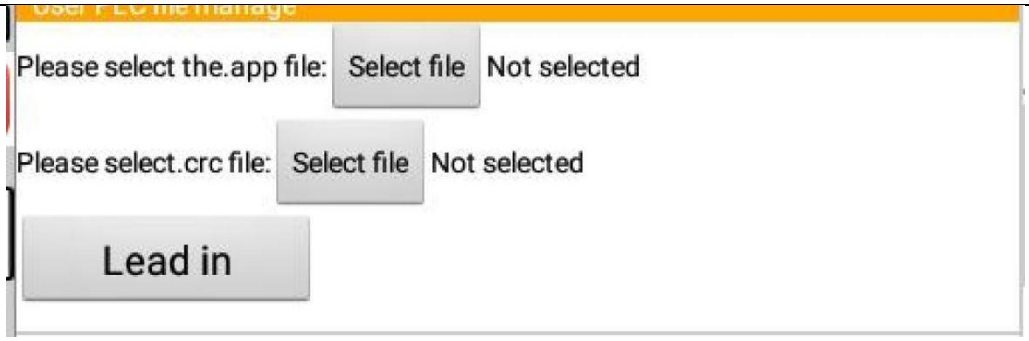
1, insert the U disk, U disk identification success

2, open the menu, click"System → Import and export user PLC"

3. Click the"Select File"button of the import module (select app file) to confirm the file to be imported

4. Click the"Select File"button of the import module (select crc file) to confirm the file to be imported

5, click [Import] button, prompt" Import file successfully, please power off and restart the controller!"After power failure and restart, the poured user PLC takes effect.



picture 7 - 4 Import or export user PLC-2

	The PLC cannot be imported or exported when the network connection fails

8 Configuration function

8.1 Teach Pendant configuration

8.1.1 Alternate key configuration

	Auxiliary keys can only be used in teaching and automatic modes, and cannot be used in external mode. The modification authority of this function setting is the engineer user and above.

Backup

button configuration Click menu - Configuration - Teach Pendant Configuration - Backup button configuration, as shown in Figure 8-1 Backup button configuration:

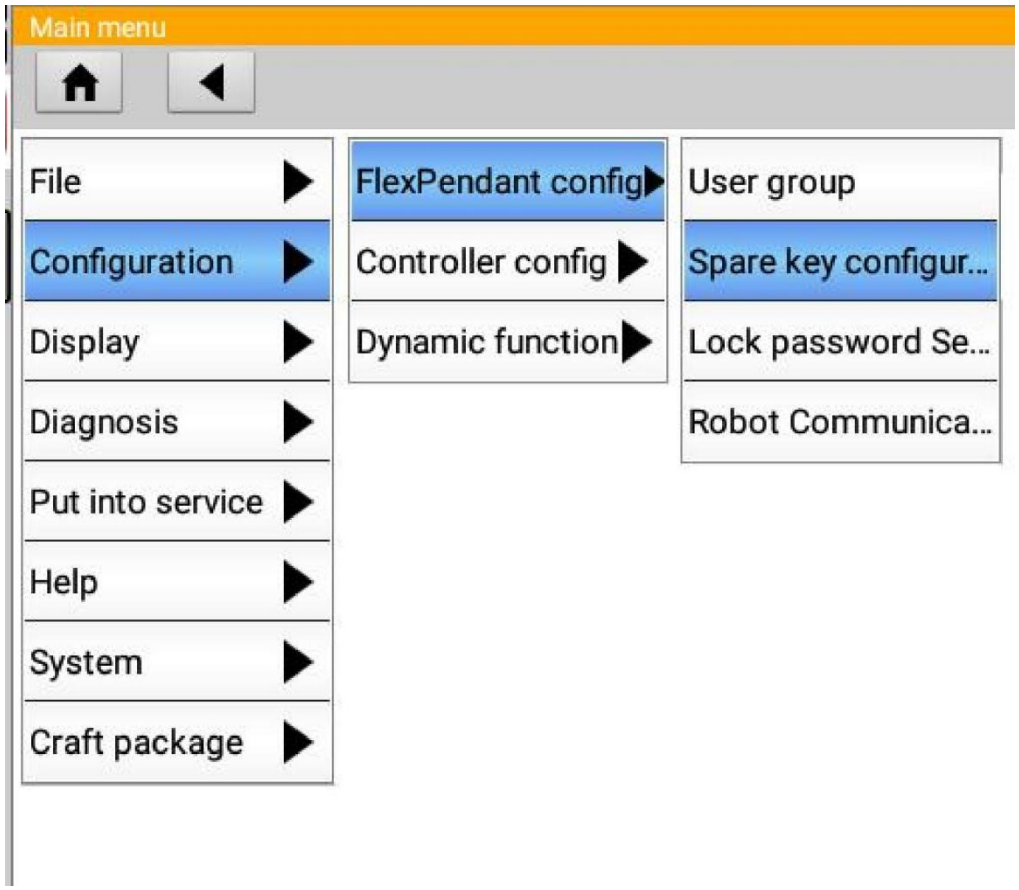


Figure 8-1 Alternate button configuration

After selecting, enter the interface shown in Figure 8-2.

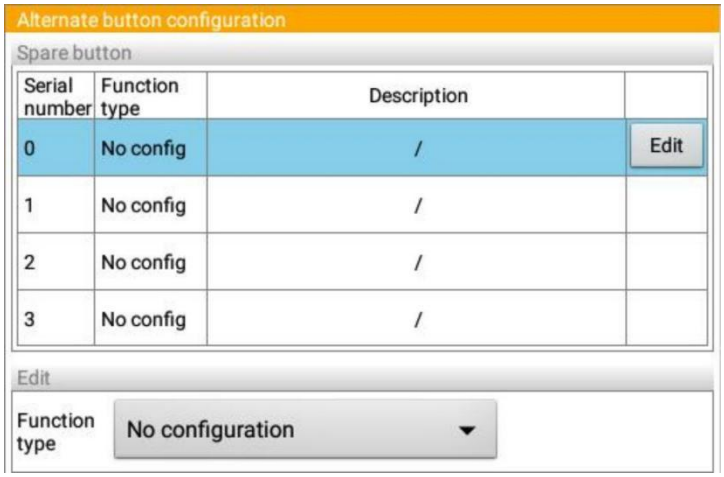


Figure 8-2 Button function selection

As shown in the figure, a total of four spare buttons can be configured, 0-3 correspond to the four buttons from top to bottom in the lower left corner of the teach pendant. Button configuration process :

（1） Select the corresponding row of the button to be configured, for example, to configure the first button, select the row with serial number 0. After selection, as shown in Figure 8-3.

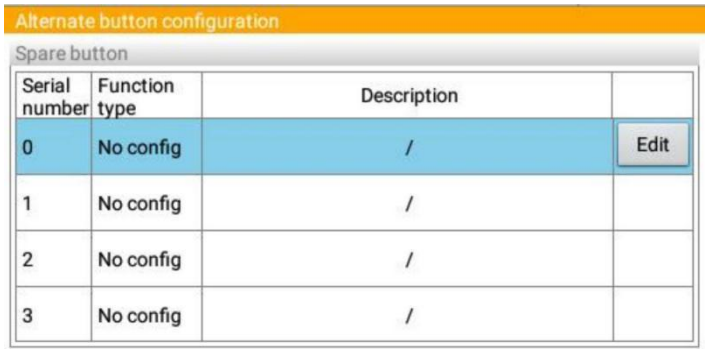


Figure 8-3 Key list

（2） Click Modify, and the function configuration button below becomes an optional option. After clicking, select the process package, and the screen shown in Figure 8-4 will appear.

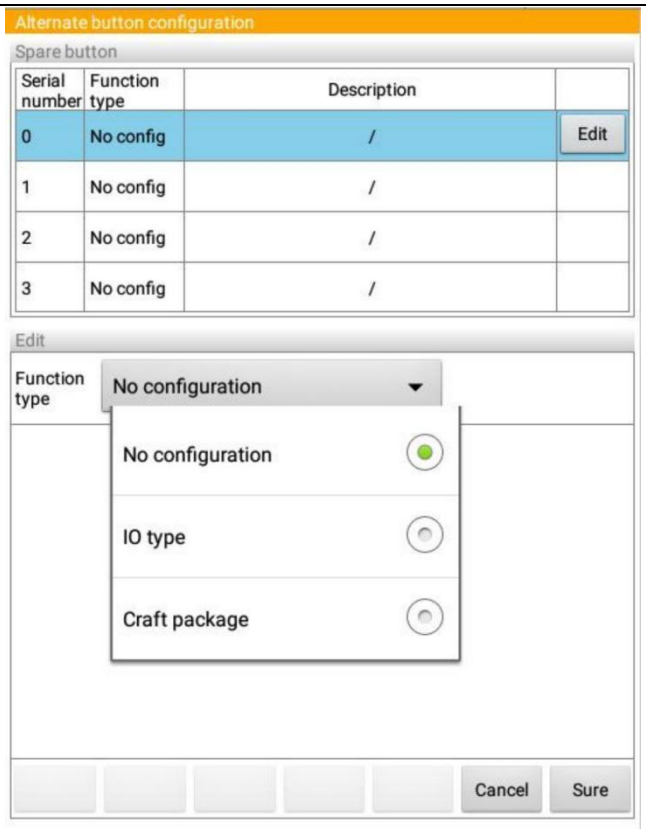


Figure 8-4 Function List

As shown in the figure, you can select the configuration bit alternate key function in the content displayed below.

(3) Select the desired function and click OK, and a prompt box will pop up as shown in Figure 8-5, completing the configuration of the function button.

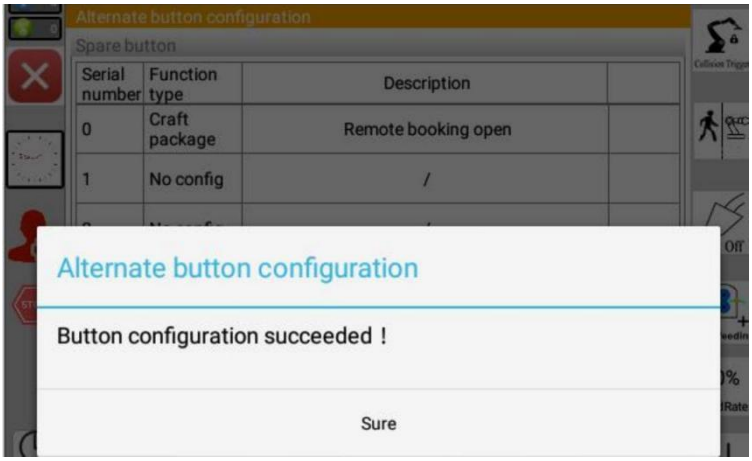


Figure 8-5 Prompt for successful configuration

8.1.2 User group

Figure 8-6 User group page

State

To display the current login user, you can customize user registration or switch login users.

The Final user can register a custom user (permission setting, logout, and registration buttons are used by custom users).

operating steps

1. Choose Configuration > Instructor Configuration > User Group from the main menu.

2. Tap Standard to switch to the Normal user automatically.

3. Click Login. You can choose to switch the login user.

8.1.2.1 Users login

State

There are three user levels set by the system, which are production personnel, debugging personnel and administrators. In addition, users can also register custom users in the system. Different users have different permissions.

lProduction personnel: operator user group. This user group is the default user group.

lDebugger: The debugger user group that has access to most system features. This user is protected by a password.

ladministrator: user group with the ultimate permission. This user has all the rights to use the system.

lUser-defined users: Users are allowed to use the functions of the user group. The default user level is production member. To change the user level, perform the following steps.

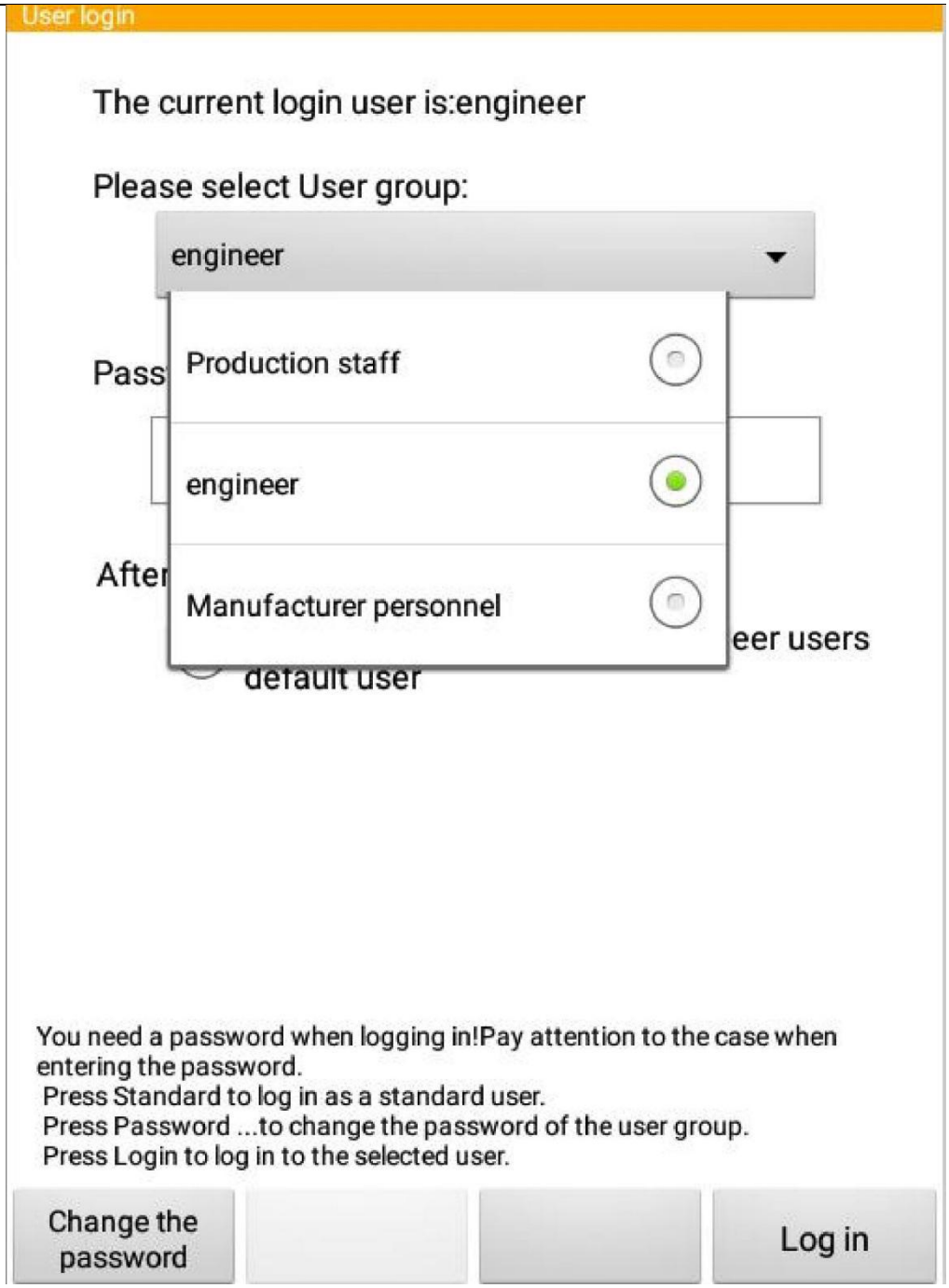


Figure 8-7 User login interface

operating steps

1. Choose → Configuration → Instructor Configuration → User Group from the main menu. The current user group is displayed.

2. 2. To switch to the default user group, click the [Standard] button. (If you are already in the default user group, you cannot use standards.) To switch to another user group, select the desired user group and click Login.

3. 3. The debugger and administrator need to enter the password to log in, enter the password to log in and confirm.

4. 4. Change the password: If you want to change the password of a user, select the user and press [Password...] Button.

5. 5. On the password change screen, enter the old password and new password and click OK

	Click the"User Quick Login"icon on the operation interface to quickly enter the user login interface.

Figure 8-8 【 User Shortcut login 】 icon

8.1.2.2 User rights configuration

State

The user rights configuration function allows a user to perform different operations based on requirements. By configuring the operations, you can reduce the possibility of system instability caused by misoperations.

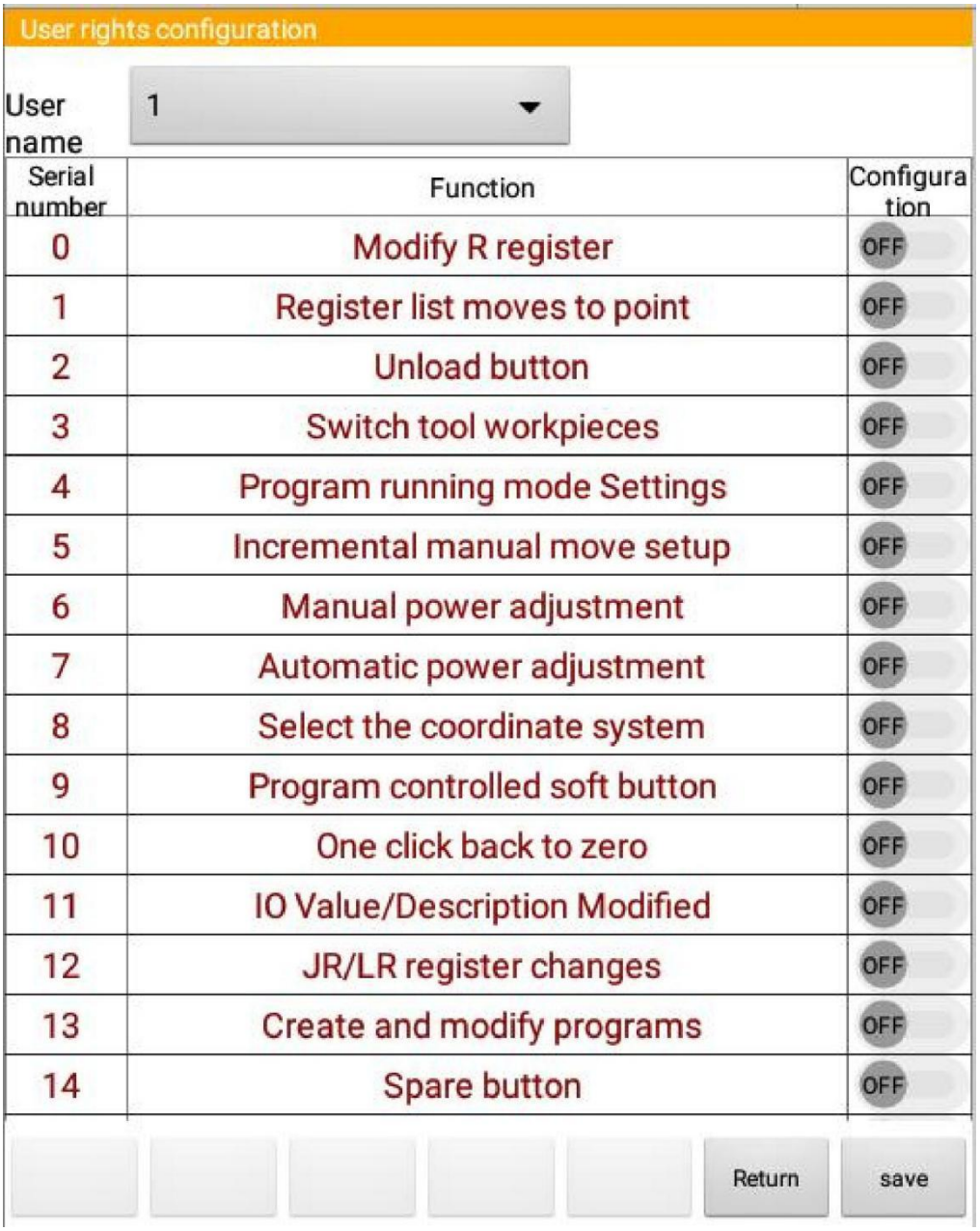


Figure 8-9 User rights configuration

configuration flow

1. Register and log in:

Log in to the Instructor Configuration → User Group and click the"Register"button to complete the process of registering a new user in sequence.

After the registration is complete, you can select the registered user to log in on the login screen.

2. Customize user function permission Settings:

Log in to administrator rights

Click [Permission Configuration]. On the permission configuration screen, you can customize the operation permissions of a user.

8.1.3 Lock password

	This function sets the modification permission to the vendor user.

State

This function changes the program lock password.

operating steps

1. Choose Configuration > Instructor Configuration > Lock Password from the main menu.

2. Enter the old password and new password and click OK to save the new password, as shown in Figure 8-10.

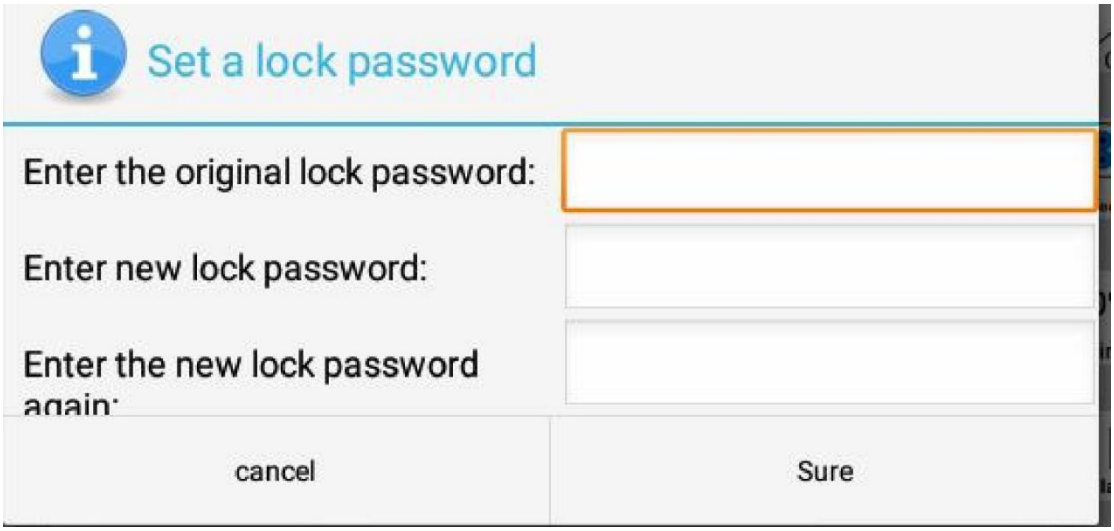


Figure 8-10 Change lock password

8.1.4 Robot communication setup

	This function sets the modification permission to the vendor user.

State

Establish a communication connection with the controller.

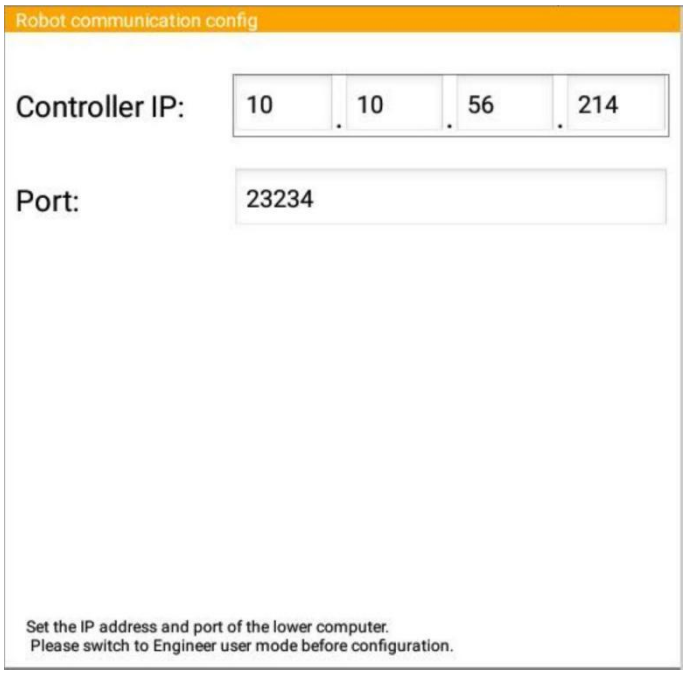
operating steps

1. In the menu"Configuration - Educator Configuration", select"User Group"and log in to the"Manufacturer Personnel"user (switch to super user or higher rights).

2. 2. In the menu bar" Configuration - Instructor Configuration", select" Robot Communication Configuration"in the submenu.

3. 3. Enter the IP address and port number of the controller and click Save

4. 4. Rerevelation Instructor (click"System - Rerevelation Instructor"in the menu bar or slide to close the app and then open the"HSC3-HSpad"app)



picture 8 - 11 Robot Communication Configuration

8.2 Controller configuration

8.2.1 Shaft configuration

	The axis group configuration should not be arbitrarily set by non-debuggers. When configuring, ensure that the models match. After the setting is completed, check whether the zero point and limit are correct . The setting authority is the manufacturer's personnel . (**Re-switching the model will lose the zero point, limit and other parameters, do not operate arbitrarily, you need to back up the system parameters**) Load classification : light load, medium load, full load. The nameplate information generally does not need to be changed, and can be set once at the factory. The set information can be viewed in the Help Information section.

Explain the use of axis group configuration, model switching, and load setting

Steps

1. Under the authority of the manufacturer, select the menu bar → Configuration → Controller Configuration → Axis Group Configuration to enter the axis group configuration interface.

2. Click the"Modify"button.

3. Select the"Model"drop-down box option and select the robot model.

4. Click the"Confirm"button. (Note: When switching models, the load will also be switched at the same time, and the load will be switched according to the load option below)

5. Click the Modify button. (The load can be switched to the robot separately, and the speed of the robot with different loads is different)

6. Select the"Load"drop-down box option and select the load level;

7. Click the"OK"button

8. Complete the setup after restarting the system.

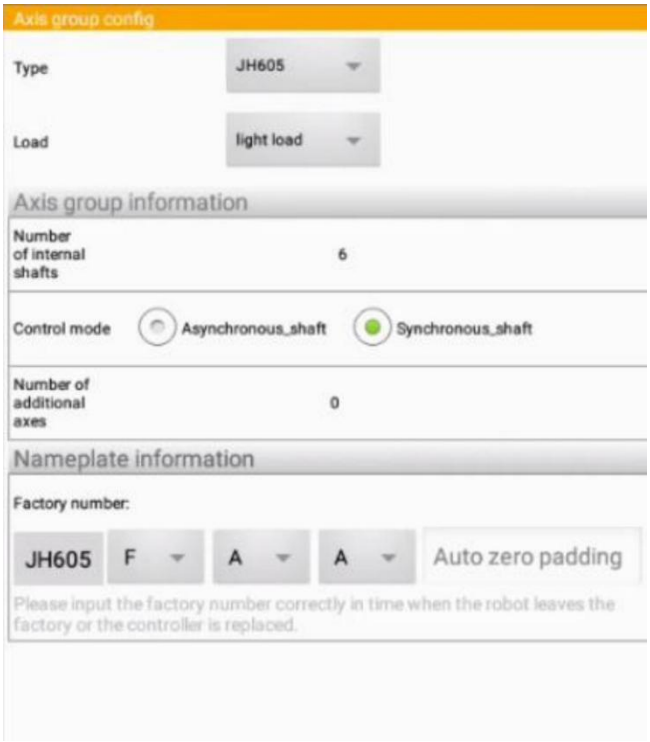


Figure 8 - 12 Axes group configuration

	Note : When changing the load level, it is not necessary to switch the model again, just follow steps 1, 6~ 8. setting the number of additional axes is reserved.

8.2.2 External Run Configuration

	The modification permission of this function is set to engineer user and above.

illustrate Configuring external signals is the process of establishing a mapping relationship between system signals and IO input and output indexes (that is, binding the function to IO). After the mapping relationship is established, the program can be run through the IO signal, and the robot status can be obtained. All system signals must be configured before they can be mapped to the corresponding IO points. In a system without external signal configuration, there is no mapping connection between system signals and IO by default.

	Note: External configuration can only be operated in teach mode Input configuration : By binding the specified input signal, by triggering the input signal, the normal operation of the external program is completed, such as: enable, load, pause, run the program, clear the alarm, etc. Output configuration : Display some states of the robot through output signals, such as: program state, enable state, current mode, area output, etc.

Steps

External input and output configuration :

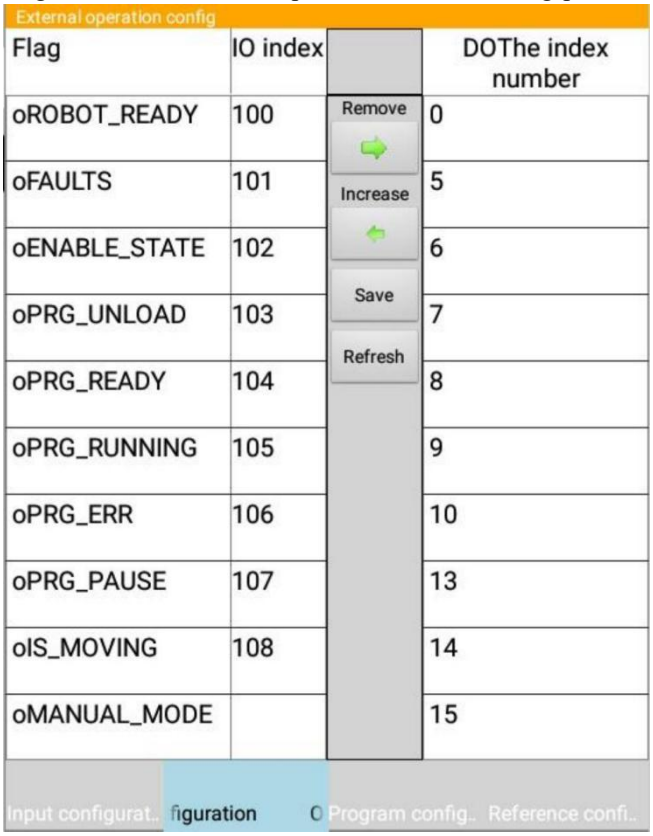
1. Select" Configuration → Controller Configuration → Run Configuration" from the main menu to enter the external operation configuration interface.

2. Click" Input Configuration", select the [Sign] on the left side of the screen, select the DIN index number on the right, and then click to add" <—"to establish a mapping relationship, and click to remove"—>" to cancel the mapping relationship.

3. Click" Save"to save the operation.

4. Click" Output Configuration", similar to the above operation, you can set the mapping relationship of the output.

picture 8-13 Input configuration for external operation of the welding process



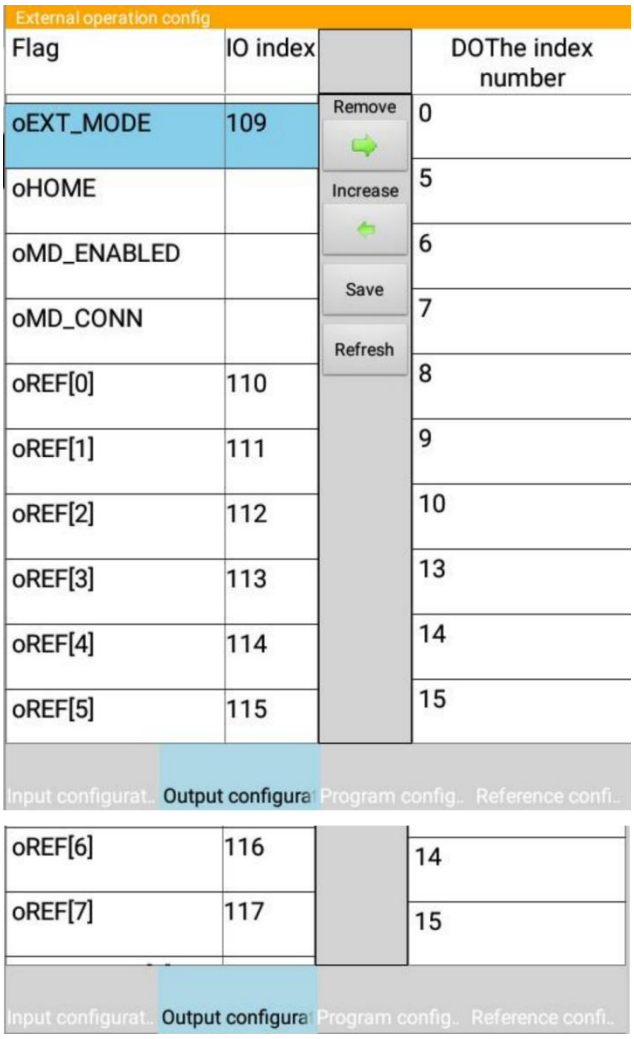


Figure 8-14 Output configuration for external operation of the welding process

	Note: External configuration can only be operated in teach mode. Note : When the external program is ready, it can be uninstalled through the uninstall signal. When running a program, you need to suspend the program first, and then uninstall the program through the stop program signal

Welding process input signal table

Signal name	illustrate	Effective way
iPRG_START	Start program signal. Start the loaded user program to run.	Falling edge takes effect
iPRG_PAUSE	Pause program signal. Suspend user program execution.	Falling edge takes effect
iPRG_STOP _	Stop program signal. Stop the user program from running and uninstall the program.	Falling edge takes effect
iPRG_LOAD	Loader signal. Load the specified user program.	Rising edge takes effect

iPRG_UNLOAD	Uninstaller signal. Uninstall the program in the ready state.	Falling edge takes effect
iENABLE	System enable signal.	Rising edge enable, set 0 to turn off enable
iCLEAR_FAULTS _	Clear the error signal.	Rising edge takes effect

Welding process output signal table

Signal name	illustrate	Remark
oROBOT_READY	Robot ready signal. This signal is output when the system initialization is completed and the user program is in the loaded state and enabled.	This signal will not be output during program operation
oDRV_FAULTS	error.	
oENABLE_STATE	enable state.	
oPRG_UNLOAD	User program is not loaded.	At the same time , these signals have one and only one signal output
oPRG_READY	User program loaded status.	
oPRG_RUNNING	User program running status.	
oPRG_ERR	User program alarm status.	
oPRG_PAUSE	User program pause state.	
o LS_MOVING _	The robot is in motion.	
oEXT_MODE	The system is in external mode.	
oREF [0]	Reference point 1	
oREF [1]	Reference point 2	
oREF [2]	Reference point 3	
oREF [3]	Reference point 4	
oREF [4]	Reference point 5	
oREF [5]	Reference point 6	
oREF [6]	Reference point 7	
oREF [7]	Reference point 8	

External runner configuration :

	After the external program is configured, if it is modified or loaded for the first time, it needs to be loaded in teaching or automatic mode, and the program will be updated to the controller.

1.Click the cursor to select any station number, and click the" Configure"button. (There are 10 station numbers in total, and 10 external programs can be configured at the same time)

2.pops up, click to select an externally running program.

3.Click the"OK"button to complete the external program configuration.

4.Click "Save" on the operation bar to complete the external program configuration.

	After the input and output and programs are configured, the main program MAIN.PRG will automatically run when switching to external mode. When the program is not running, it will be displayed as the program of station 1. After starting the operation, the current running program will be displayed. The robot is not at the reference point, please switch to teach mode to move the robot to the reference point!"error, you need to configure the reference point in"**Reference Configuration"** and move the robot to the reference point. Note: The program file named MAIN.PRG cannot be configured when configuring the station program.

picture 8-15 External Operation - Program Configuration

Reference configuration :

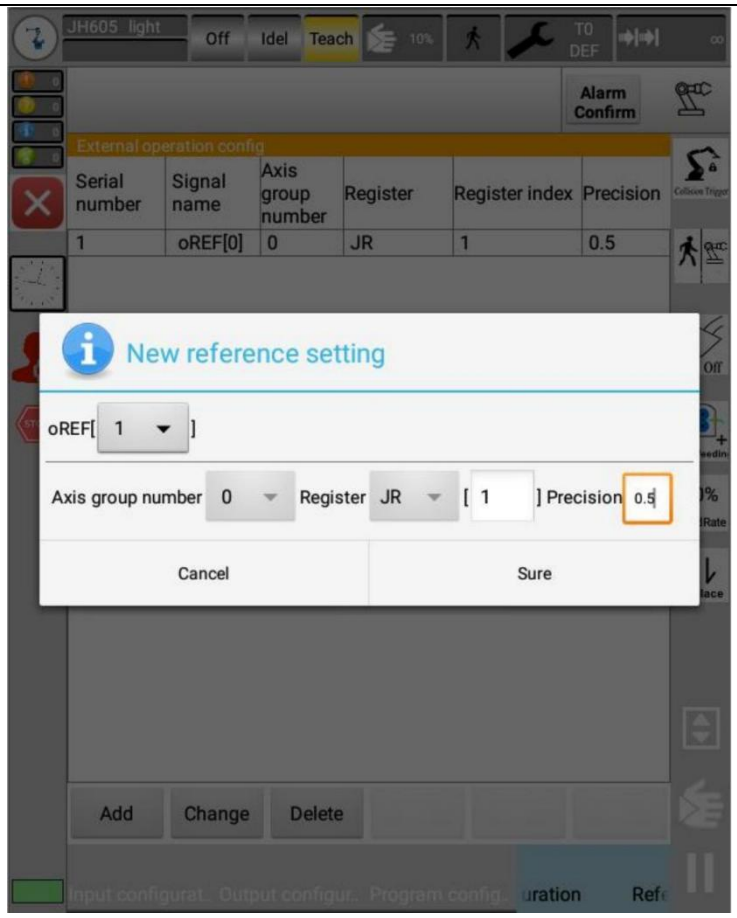
1. Click the"Reference Configuration"button to enter the reference configuration interface.

	Reference configuration function: The specified JR register can be configured as the reference point. When the actual position of the robot is at the position of the specified JR register (eg : JR[0]={0, -90, 180, 0, 90, 0 }), then The output has been bound to the position signal, and the precision range can be set. The maximum number of bound JR registers is 8.

2. Click the" Add"button to set the" Reference Number" ," Register" index number, and"Precision".

3. Click the"OK"button to complete the setting.

mode, it is necessary to add a reference point in the reference configuration., the robot is not at the reference point, please switch to the teaching mode to move the robot to the reference point!"error, switch the mode to the teaching mode at this time, and add the reference point in the running configuration - reference configuration (as shown in Figure 8-13), the back to reference point command needs to be added to the station program, one station can correspond to one reference point, up to 8 reference points.



picture 8-16 External run- reference configuration

8.2.2.1 One-key return to welding pause point function

In order to avoid the collision caused by the start of the pause during the welding process, the pause point detection function has been added. After the pause in the welding process, you need to return to the pause point to run the program, otherwise the running program will report"[Resumable] The robot did not return to pause. point, please teach back to the pause point"error message, the quick way to return to the pause point is as follows:

1. Click the pause icon""in the lower right corner of the teach pendant screen , and the"Return to Pause Point"button will pop up Press and hold the"Return to Pause Point"button and the robot will move to the pause point. After opening, stop the robot, and the running speed can be adjusted by the teaching override.

Note: This function can only be used after the external mode is paused.

2.The pause point data during the welding process is stored in LR[0], click Display-Variable List-LR in the main menu, select LR[0] (as shown in Figure 8-15), click the"Modify"button, in the pop-up box Click the"Line to point"button in the middle of the box, the robot will move to the pause point, click the"Stop Motion"button to stop the robot, and the running speed can be adjusted by the teaching magnification.

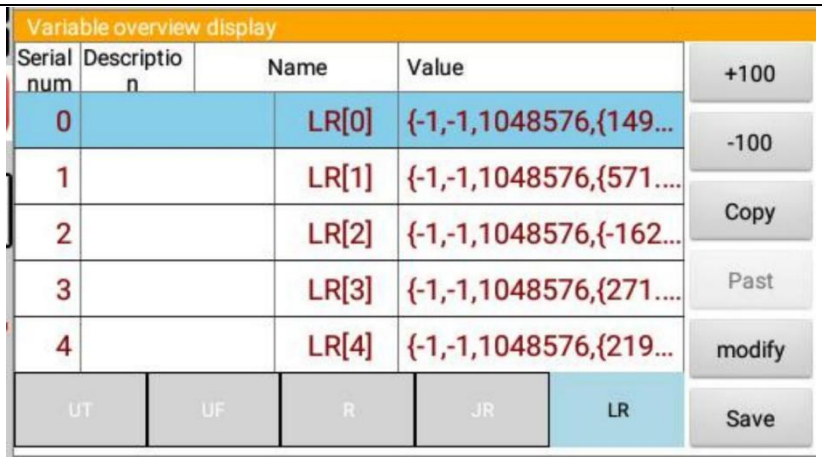


Figure 8-17 Pause point LR[0]

8.2.3 Encoding/Decoding configuration

	This function sets the modification authority to the manufacturer's personnel user.

illustrate

The encoding function is to map the R register to the output of IO, and set the IO sequence according to the value of R. This process is binary encoding, and the value of R is used to encode the corresponding IO sequence value, such as DO[1]-DO[4] and R[1] is associated, where R[1]=3 (binary 0011b), then DO[1]=1, DO[2]=1, and the rest of DO are 0; the decoding function is to map the input of IO to R Register, external input corresponding signal, the controller will decode this signal to R register, for example DI[1]-DI[4] is mapped to R[2], external input DI[2]=1, then the corresponding R[2] = 2 (binary 0010b).

Operation steps

1. Select the Configuration → Controller Configuration → Encoding/Decoding Configuration button in the main menu.
2. Click to select encoding settings or decoding settings
3. Click the"Add"button to enter the setting interface
4. After the setting is completed, click the"OK"button to complete the setting

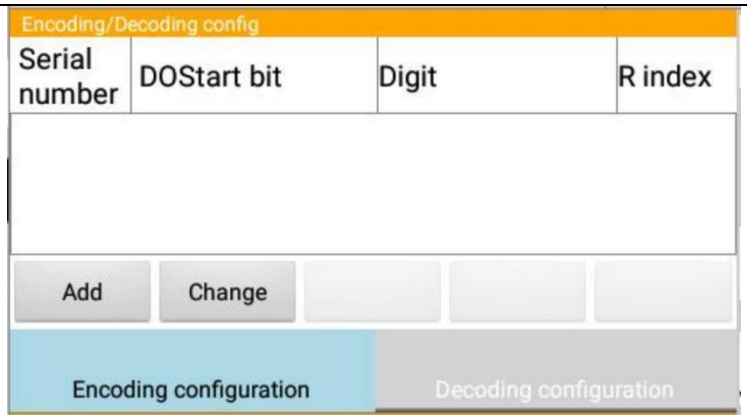
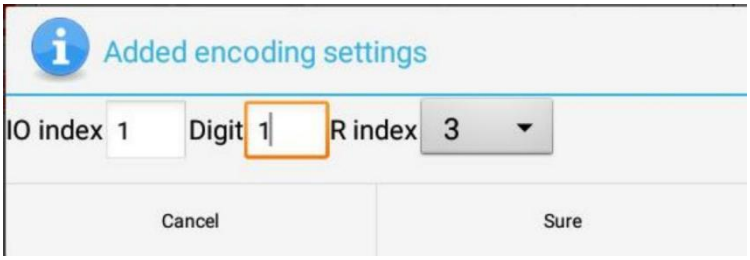


Figure 8-18 Encode/Decode Configuration



picture 8 - 19 Encode/Decode Change Configuration

	Example: Code R[0]=42, which is associated with DO[0~6], the decimal 42 to binary is 01010100, and the corresponding value of DO[0~6] is also 010101, if the output above DO[6] is associated Signals, such as DO[7~ 10] are also 0 Decoding is the opposite, convert the associated binary DI signal to decimal to get a value to the specified R register, such as: associated with DI[0~6] = 010101, bound with R[1], after decoding, R[1] =42

8.2.4 Zone configuration

	This function sets the modification authority to the manufacturer's personnel user.

Indicates that the area type includes interference area, safe area, shared area, and invalid area.

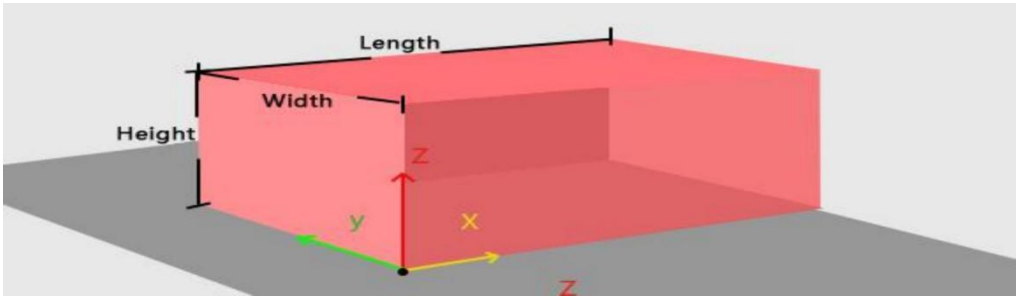
【Area configuration includes the following parameters 】

Area refers to a spatial extent. Has the following characteristics:

(1) Origin. A reference point for the region relative to some user coordinate system.

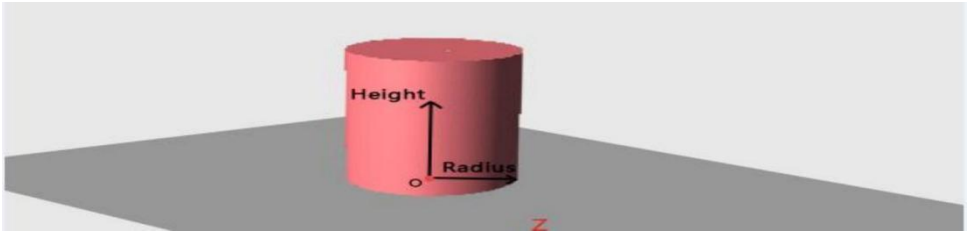
(2) Shape (Shape). A region is usually a solid based on the origin, and its shape can be box or column.

A. Box, with length, width and height.



box

B. Cylinder, with base radius and height.



cylindrical

(3) Offset value, the allowable error when judging the inside/outside of the area. **(The current system version cannot accurately stop at the edge of the telescopic value, and the stopping distance varies according to the movement position and speed)**

	Note : The expansion value can also be understood as the regional wall thickness. The safe area is equivalent to increasing the wall thickness inward, and the interference /sharing area is equivalent to increasing the outer wall. In practical applications, the expansion value should be larger than the theoretical value to increase security.

(4) Each area is equipped with an external output signal (digital signal, see external operation configuration for area signal configuration), which is used to indicate whether the robot position is inside/outside the area, and whether the external output signal is reversed can be configured.

When the zone parameters are configured successfully, the external output signal will have corresponding output according to the signal inversion, regardless of zone type.

Signal inversion = true (open state), output = ON outside the area, and vice versa in the area;

Signal inversion = false (off state), enter the zone, zone output = ON, and vice versa outside the zone ;

(5) The processing mode can be processed according to the relationship between the robot position and the area (inside/outside) (different types of areas have specific definitions).

Processing modes include:

A. Ignore it.

B. Error Stop.

C. Warning Stop.

(6) Workpiece selection, which can be selected according to the workpiece calibration to determine the XYZ direction of the area

Interference area (Block Area): refers to the area where the robot cannot enter or stay.

Features : It is normal for the robot to be outside the area, and it will alarm and stop when it is inside the area.

Features: In teaching mode (jog, jog, space motion) / automatic mode (teaching, automatic, external), it will report an error and stop in the area. If the robot alarms in the area, you need to switch the area type to the invalid area, and then move the robot out of the area before the robot can perform subsequent movements.

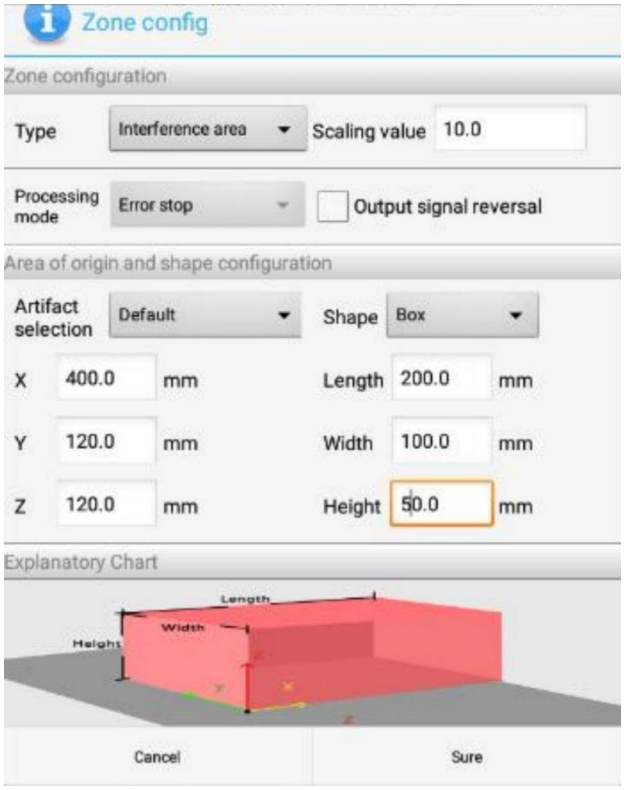
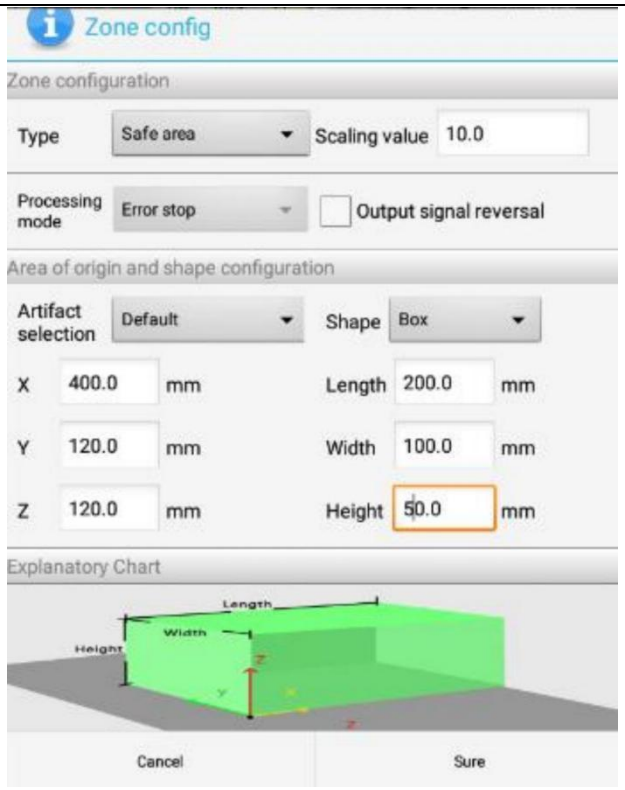


Figure 8-20 Locale Configuration Settings - 1

Area : refers to the area where the robot is not allowed to leave

Features: In teaching mode (jogging, jogging, space motion) / automatic mode (teac hing, automatic, external), the robot is normal when it is in the area, and it will stop when it is outside the area. If the robot alarms outside the area, you need to switch the area type to the invalid area, and then move the robot to the area before the robot can perform subsequent movements.



picture 8-21 Locale Configuration Settings - 2

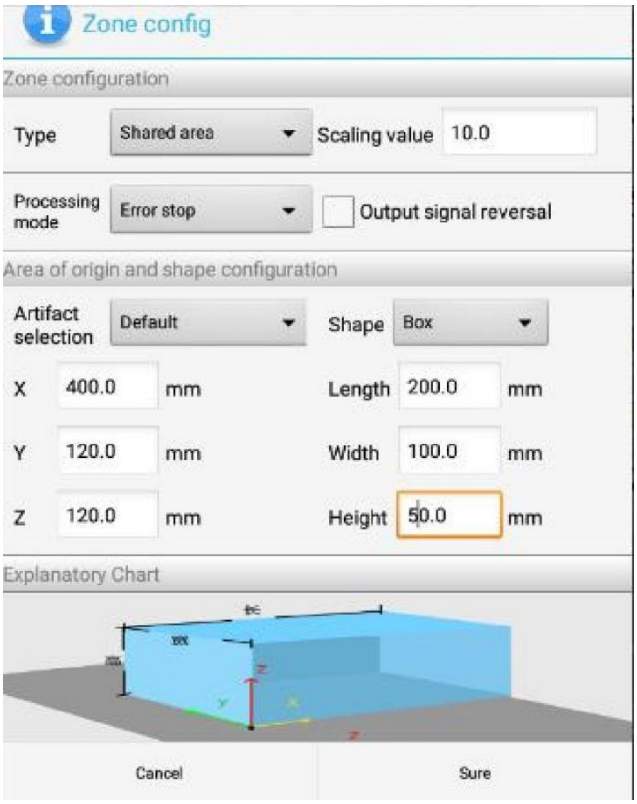
Share Area: refers to an area that can control whether it has the characteristics of an interference area, and you can choose to enter the processing mode of this area.

Each shared area is configured with an external input signal (digital signal) to enable the shared area.

A. In the enabled state, it is normal for the robot position to be outside the area; it responds according to the configured processing mode when entering the area.

B. In the non-enabled state, the shared area has no effect.

Features: In teaching mode (jogging, jogging, space motion) / automatic mode (teac hing, automatic, external), the robot is normal when it is outside the area, and it will report an error and stop when it is in the area. If the robot alarms in the area, you need to switch the area type to the invalid area or select the no-processing mode, and then move the robot out of the area before the robot can perform subsequent movements.



picture 8-22 Locale Configuration Settings - 3

Invalid area : **refers to the area where the current setting is invalid. Only the output signal detection is performed in this area, and no error reporting or shutdown is performed in this area.**

	Example : Suppose the robot is at a certain position, and an area is to be generated at this position, the actual position of XYZ coordinates is {600,-100, 100} to generate an interference area at the current position of the robot, set the length to 200, the width to 100, and the height to 50, the expansion value is 5, the range of a box-shaped area generated at this position is (by default, it is generated in the positive direction, if the workpiece coordinate is called, the direction of XYZ is determined) X=[59 5,805] Y=[-105,50]] Z=[95, 155] Remarks : The interference area/shared area is the super area when XYZ enters the XYZ area, and the safe area is the super area when any axis of XYZ exits the area.

8.2.5 Timeout setting

	This function sets the modification authority to the manufacturer's personnel user.

Description The timeout setting is to avoid unlimited waiting for the robot program. By

setting a time and using it with the WAIT timeout instruction, during the execution of the program, when the WAIT instruction is executed (except for the WAIT TIME= value, WAIT TIME does not have a timeout function), due to the condition When it is not satisfied that it is in a blocked state, after the waiting time exceeds the set time, it will jump to the corresponding program line to continue execution. The time unit is milliseconds (ms). If not set, the default timeout is 10s.

Operation steps

1. Open the menu and click"Configuration → Controller Configuration → Timeout Settings"

2. Check the time edit box and edit the time

3. After setting, click the [Settings] button, and the settings will take effect immediately.

picture 8 - 23 timeout setting

	In addition to the timeout setting, when the WAIT command is executed and the waiting state is blocked, the waiting can also be released by clicking"More → Release Waiting" in the lower menu. After clicking the"Release Waiting"button, the pointer will move to the next line, but the robot does not The program of the next line is executed, and the corresponding IO output of the robot is adjusted accordingly (equivalent to being in a paused state at this time), and the"Start"button needs to be clicked again to run the program. If there is no instruction in the next line, return to the first line of the program.

8.2.6 Controller IP configuration

picture 8 - 24 Controller IP configuration -1

State

You can configure or change the IP addresses of multiple controllers.

operating steps

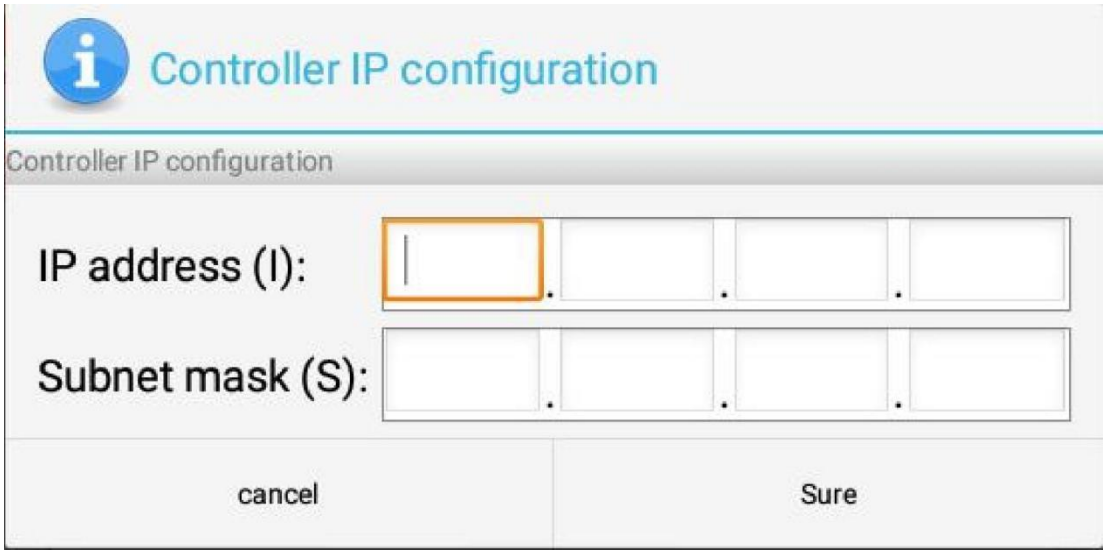
1. Log in to the Debugger user (switch to Super user or higher rights).

2. On the menu bar, choose > Configuration > Controller Configuration > Controller IP Configuration.

3. Click Enable to configure IP Address and Subnet Mask. You can configure a maximum of three controller IP addresses.

4. After the configuration is complete, click Save to make the configuration take effect.

5, by clicking the" Enable"and" Disable"button, you can adjust its network status.



picture 8 - 25 Controller IP configuration -2

Hint

The IP address cannot be the same as the controller IP address. For example, 10.10.56.213 is set to 10.10.56.214 or conflicts with the new ip address in the old n file. Otherwise, the system module may fail.

Avoid using the segment ID whose IP address is 192.168.2.

8.2.6.1 IP Describes and configures applications

Standard electrical cabinet control Device IP specification

object	Default IP
LAN0	IP：10.10.56.214 Port：23234 IP：90.0.0.1 Port：23234
LAN1/ECAT	IP：192.168.2.214 Port：23234

Drive and control integrated electric cabinet Controller IP address

object	Default IP
Demonstrator connector	IP：10.10.56.214 Port：23234
MLAN	IP：10.10.57.213 Port：23234
LAN1	IP：10.10.58.212 Port：23234
LAN2	IP：10.10.59.211 Port：23234

Educator IP The educator IP can be viewed and set using the"Ethernet"application on the educator

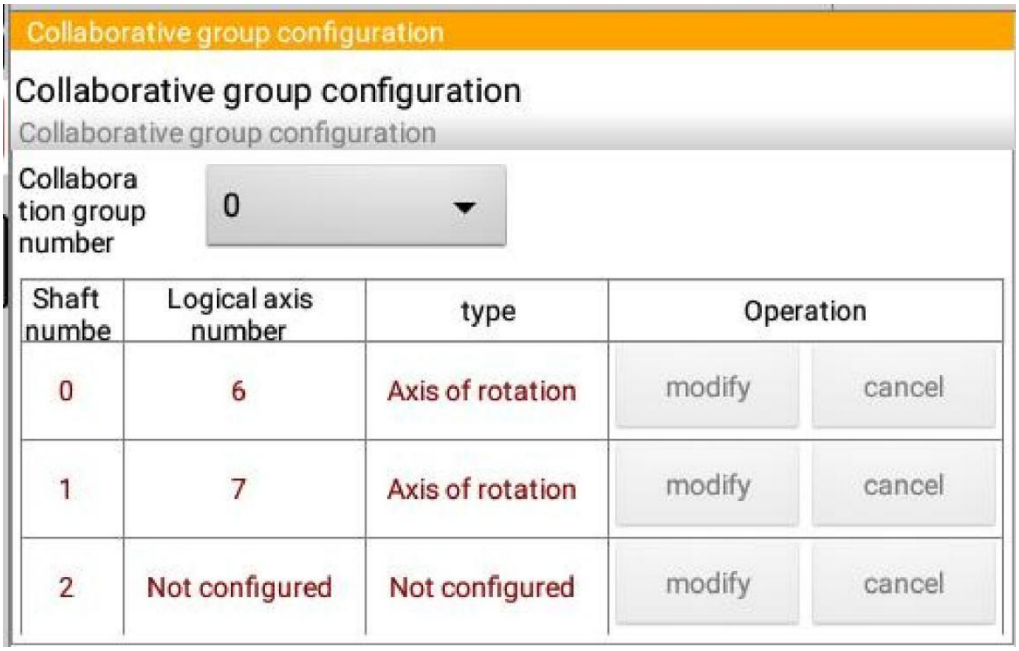
object	
IP address	10.10.56.123
Netmask	255.255.255.0
Gateway address	10.10.56.1

Note: The IP address and Gateway address must be on the same network segment.

8.2.7 Cooperative group configuration

State

Cooperative group refers to the whole after the combination of the robot shaft group and the external shaft positioner. The cooperative configuration of the positioner is the process of specifying the cooperative group number and configuring the external shaft that moves cooperatively with the robot. The synergetic group number is called by the synergetic instruction COORD_NUM in PRG, and the system will carry out the synergetic movement after the synergetic instruction is called.



picture 8 - 26 Cooperative group configuration

tag	state
【 Logical axis number 】	Logical axis number indicates the index number of all axes in the system (the system supports the point information of 9 axes). The logical axis number of the 6-axis robot arm is 0 to 5, and the logical axis number of the external axis is arranged in the sequential order, which is 6,7,8.
【type】	That is, the type of external shaft positioner, the shaft type has a rotating shaft and a linear shaft.

1. On the menu bar, go to → Configuration → Controller Configuration → Collaborative Group Configuration.

2. Click the Synergy Group Number drop-down box and select the synergy group number.

3. Click the"Modify"button, select the" Logical axis number"drop-down box, and select the corresponding external axis index number.

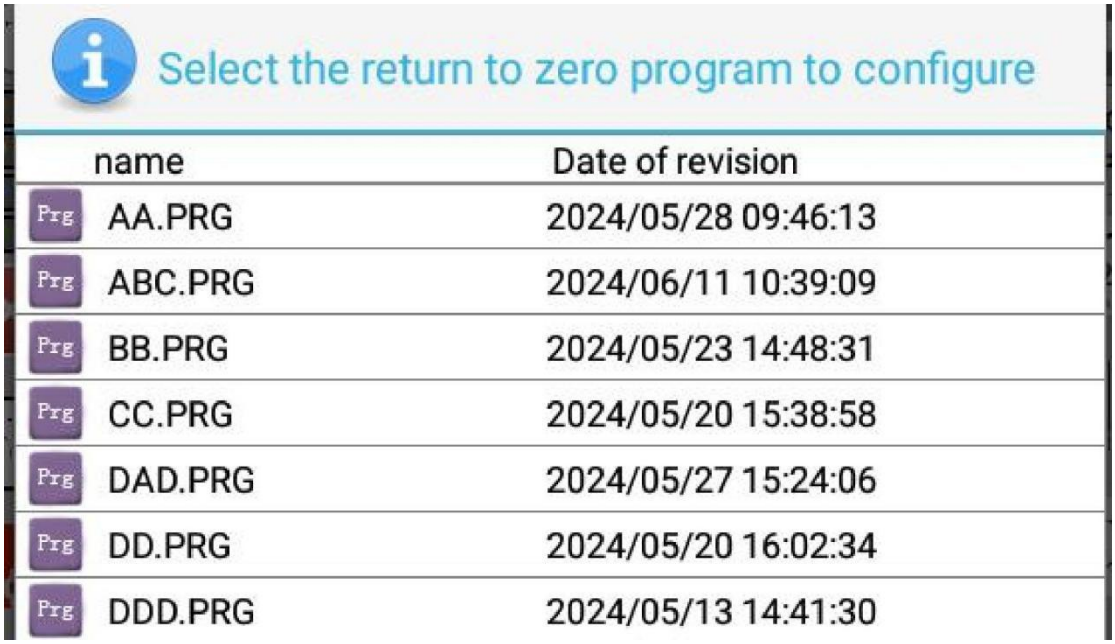
4. Click the"Type"drop-down box option and select the axis type (X~C, currently supports the rotation axis type, select X).

5. Click the" Save"button to bind the coordination group number to the logical axis number of the external axis.

When configuring a cooperative group, if two external axis positioner are required to cooperate, configure two logical axes.

8.2.8 Back to zero program configuration

picture 8 - 27 Back to zero program configuration



picture 8 - 28 configuration program

State

One key back to zero function is divided into two parts: one key back to zero program configuration and one key back to zero operation.

Return-zero program configuration is a PRG program that configures the return-zero motion to execute.

One-click return to zero operation means that the system executes the return to zero motion program. When the return to zero signal is triggered, the system will automatically execute the program, thus simplifying the operation steps for the manipulator to return to the set zero point.

Return to zero program example:

```
LBL [X]
```

```
WAIT DI[10]=ON    'Protection: Wait for the signal to meet the execution,
                                otherwise it has been blocked in this line
LR[1]=LPOS        'Gets the current position: Assign to the LR[1] register
IF LR[1][0]<200,GOTO LBL[1]
IF LR[1][0]>=200,GOTO LBL[2]
LBL [1]
L P[0]        'Back to zero transition point 0
LBL [2]
L P[1]        'Back to zero transition point 1
L JR[0]       'return zero
```

Back to zero program configuration

Controls

1. Choose > Configuration > Controller Configuration > Back to Zero program Configuration from the menu bar.

2. Click the"Configuration Program"button and select the"back to zero program".

3. Click [Save] button to complete the setting.

One click back to zero operation

1. In manual mode, enable the function when the main program is idle.

2. Click the"one-click back to zero"icon on the right to execute the zero back program.

Tip:

The prerequisite for executing the return to zero program is enable.

The return to zero program must be executed when the main program is not loaded (idle).

The return-zero program can be executed only in manual mode and automatic mode. AUCTECH robot operation and programming instructions

Return to zero immediately in manual mode or confirm twice in automatic mode.

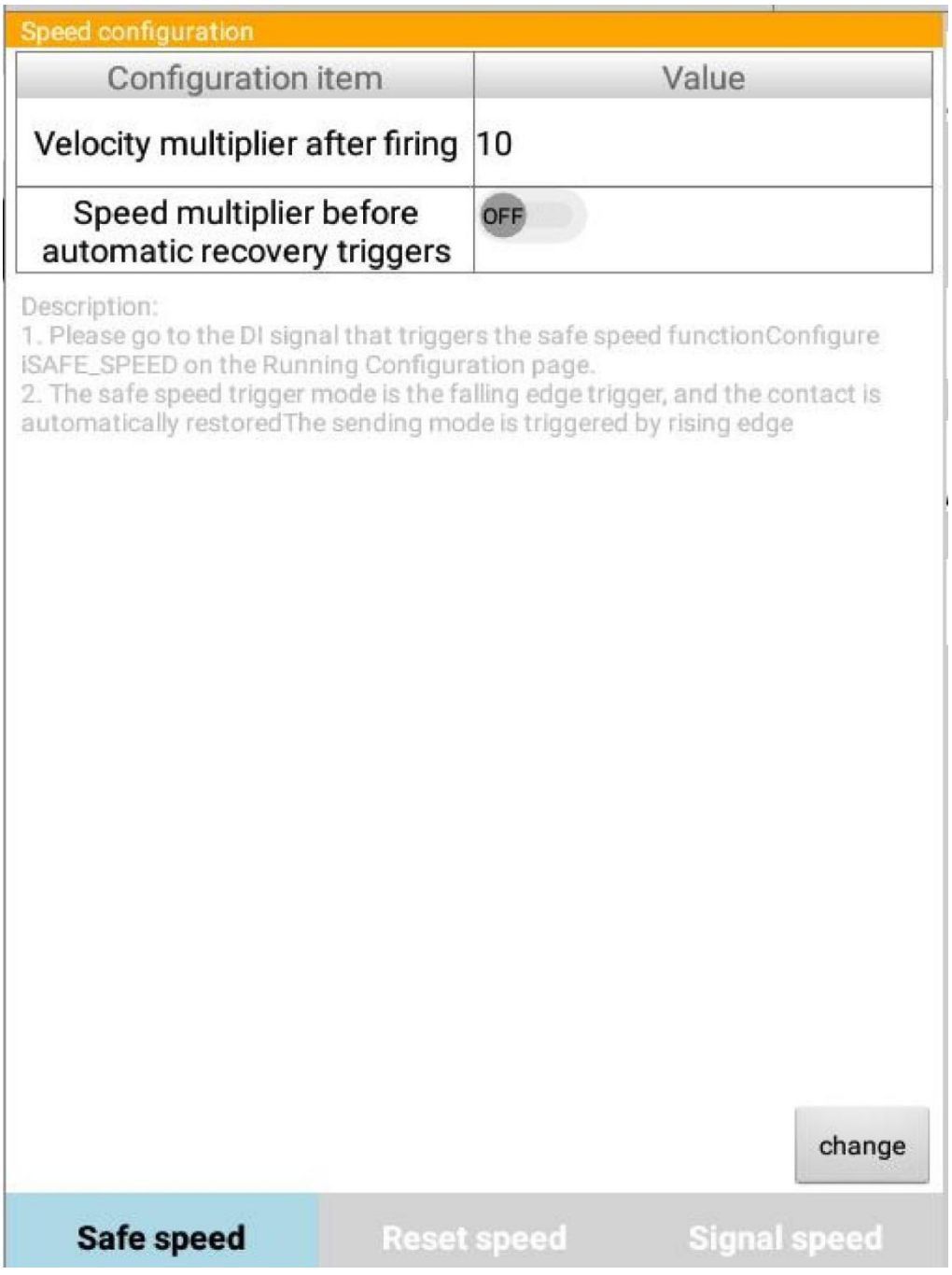
Back to zero After the program is written or modified, the latest program must be loaded before being updated to the controller.

8.2.9 Speed configuration

8.2.9.1 Safe speed trigger and recovery

State

In practical applications, the robot runs automatically and quickly in the safety bar. When the safety gate is opened and entered into the fence, the running speed of the robot arm needs to be reduced to prevent accidents in order to ensure safe production. When the gate is closed, the robot arm can be automatically restored to the original running speed for production, or the running speed can not be automatically restored. Instead, the speed magnification is modified by manually operating the indicator magnification button.



picture 8 - 29 Speed configuration

Speed multiplier after triggering, that is, after the corresponding IO signal is configured, the input value range of safe speed is [1, 100]. If the corresponding IO signal is configured to take effect, or if the robot movement speed is larger than the set safe speed value, it will automatically switch to the set safe speed.

automatically restore the original speed multiplier switch. When the corresponding IO signal is turned off, the robot will restore the original motion multiplier for movement. When the robot is turned off, the velocity ratio of the robot after maintaining the trigger signal is simulated.

Automatic recovery of the original speed multiplier function is enabled：

Prerequisites: Set the triggered speed multiplier V1 to 10%, enable the auto-recovery function, set the security signal DI[200],
set V to the current speed.

Case one：

DI[200]=ON,V_2=100%

DI[200]=OFF ‘Safety speed trigger takes effect V=V_1=10%

DI[200]=ON ‘V=V_2=100% (Speed recovery)

Case two：

DI[200]=ON, ‘V_2=100%

DI[200]=OFF ‘V=V_1=10%

‘Modified magnification，V_3=50%

DI[200]=ON ‘Speed recovery V=V_2=100%

picture 8 - 30

Configure the input I/O index of the iSAFE_SPEED flag bit in Running configuration.

	Tip: IO trigger signals can be virtual signals. The system default magnification value for safe speed is 10. The Safe Speed trigger and recovery function takes effect only in automatic, external mode. If iSAFE_SPEED is not configured, the safe speed

	triggeringand recovery functions do not take effect and iSAFE_SPEEDtakes effect at a falling edge. IO Trigger change speed magnification is not mutually exclusive with other change Speed magnification Vord operations, the user can still change the speed magnification using the instructor change magnification or the VORD command. For the multi-axis group scenario, only the velocity multiplier of the robot group is currently supported, and the external axis group is not considered. The speed multiplier set when running the program should be lower than the actual running rate, if the speed set higher than the running speed, no response.

Operation procedure

1, in the debugger above the user group.

2. Choose Configuration > Controller Configuration > Speed Configuration from the menu to enter the configuration page.

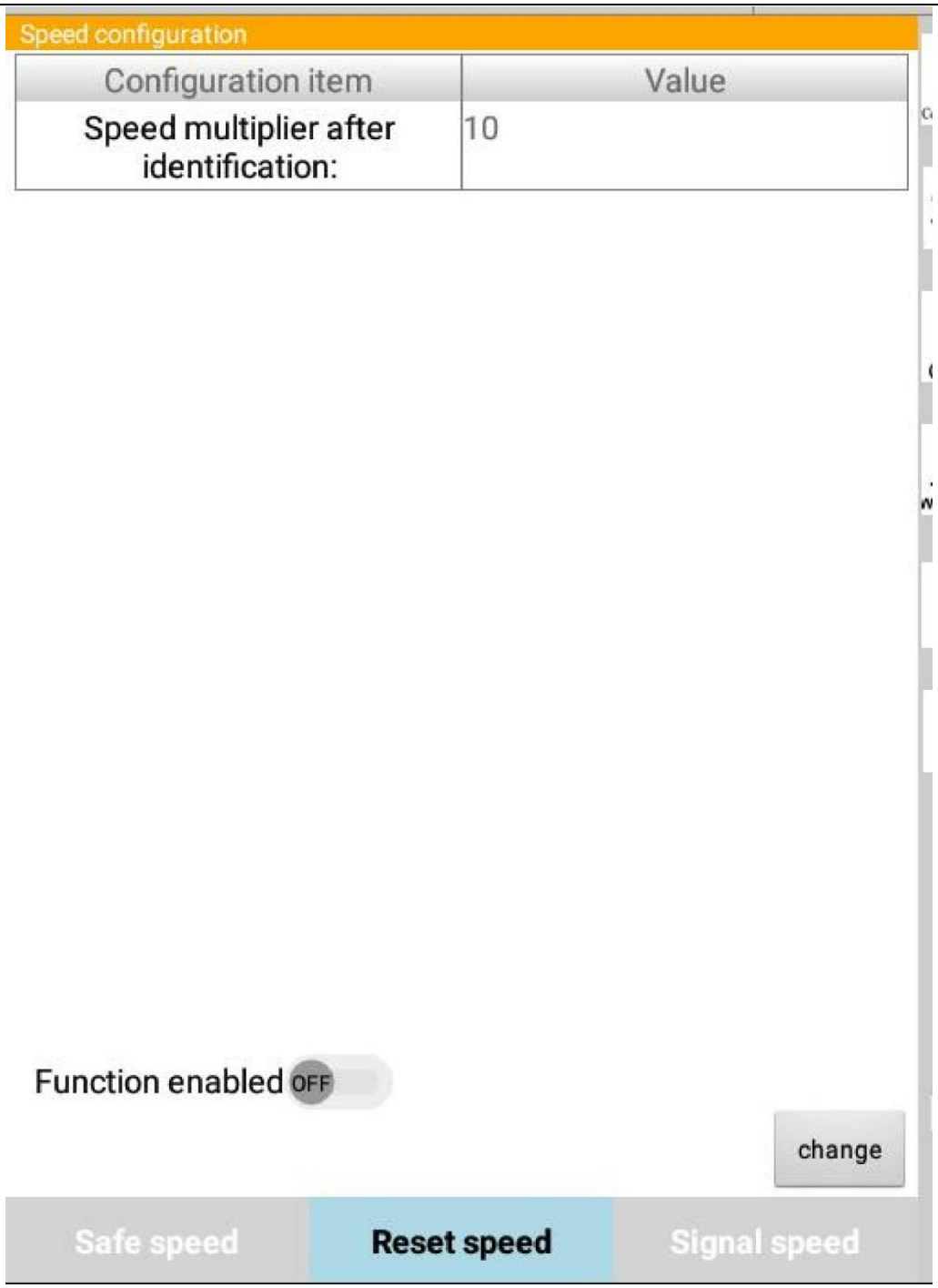
3. Set the triggered Speed multiplier and Automatically Restore the original speed multiplier parameters and save them.

4. Choose Configure Controller Configuration and Run Configuration from the menu bar. In the input configuration text box, select the DI index to match the iSAFE_SPEED signal.

8.2.9.2 Triggering and Recovering the Reset Speed

State

Reset speed function: After the system alarms, click [confirm alarm] to reset the robot arm, the system will automatically adjust the current magnification to the set value.



picture 8 - 31 reset speed

When the function is configured, the function takes effect only after the system throws an alarm and then clicks the"alarm confirmation"button. If the system has no alarm thrown directly click the" alarm confirmation"button, the function will not take effect.

This function needs to configure the speed ratio of the system after the alarm is confirmed, and the configuration information is stored in the system in a file.

Tip:

The system default multiplier value for the reset speed is 10.

Reset speed trigger function takes effect only in automatic, external mode.

Reset Speed Trigger Change Speed multiplier is not mutually exclusive with other speed multiplier change Vord operations. Users can still change the speed multiplier from the instructor or through VORD instructions.

When the speed is triggered, the indicator displays the message Reset Speed has triggered.

Before triggering the reset speed, it is necessary to judge the current speed ratio of the robot:

If the current speed multiplier is greater than the configured reset speed multiplier, the function touch takes effect after the function is configured, that is, the reset speed can be triggered.

Otherwise, the function cannot take effect, that is, the reset speed cannot be triggered, and no error message is displayed.

For the multi-axis group scenario, only the velocity multiplier of the robot group is currently supported, and the external axis group is not considered.

Operation procedure

1, in the debugger above the user group.

2, select the menu → Configuration → controller configuration → speed configuration,"Reset speed"TAB below to enter the configuration page.

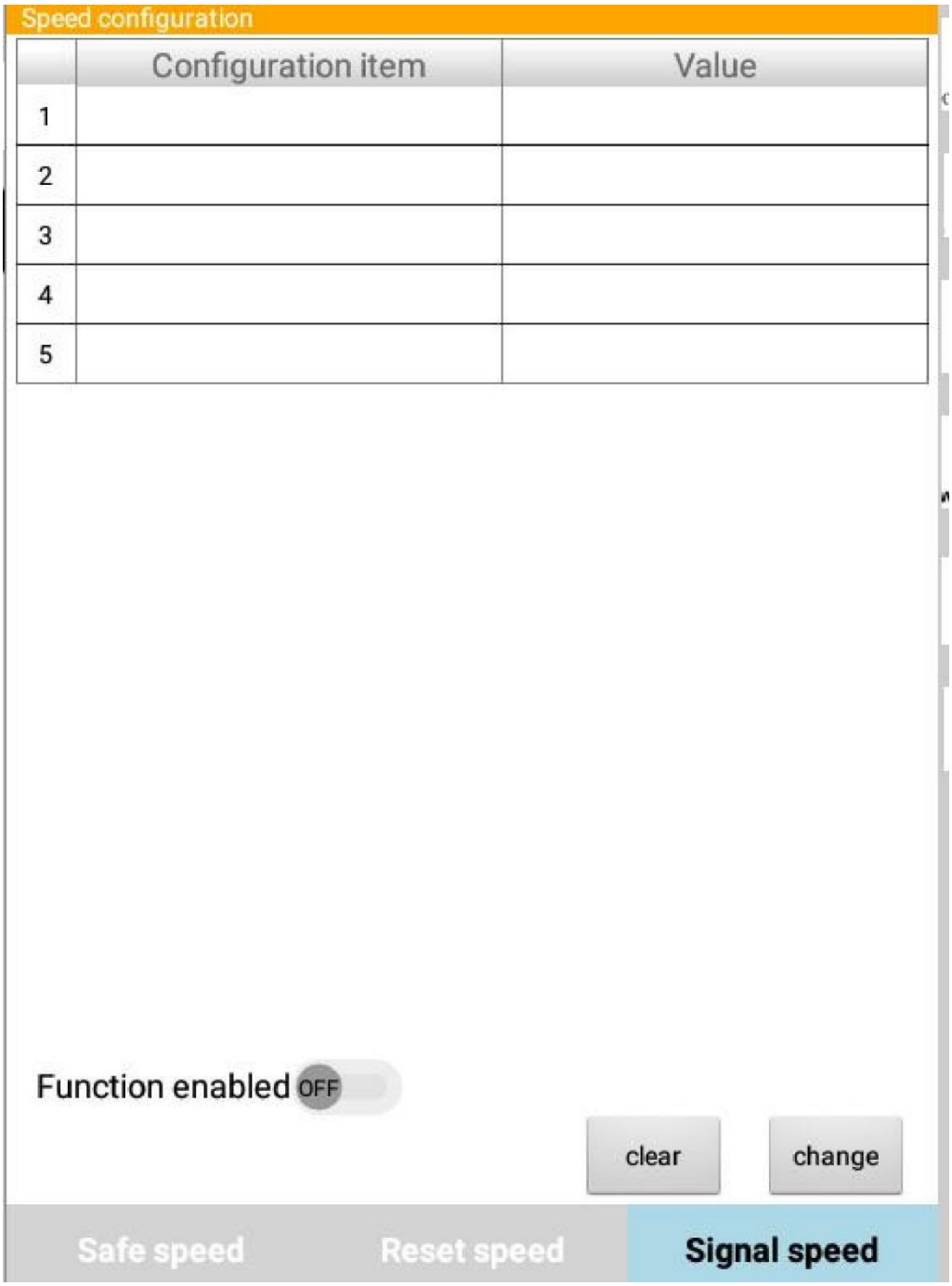
3, set the" speed ratio after alarm confirmation"parameter and save

4. Select Enable to enable the function.

8.2.9.3 Setting Signal Speed

State

In practical applications, the robot arm will enable different operation magnification according to different application scenarios, and the function supports user-defined configuration of signal speed.



picture 8 - 32 signal speed

After the function is configured, enable the function. Otherwise, the signal speed triggering function does not take effect.

This feature also requires the following configuration options:

Trigger signal and trigger mode (ON/OFF)

The speed multiplier of the system after the signal is triggered

Function enabled

Function trigger Using the signal edge mechanism, the configured IO signal

edge triggers the robot arm to adjust the running speed multiplier to the set value.

The configuration information is saved in a file.

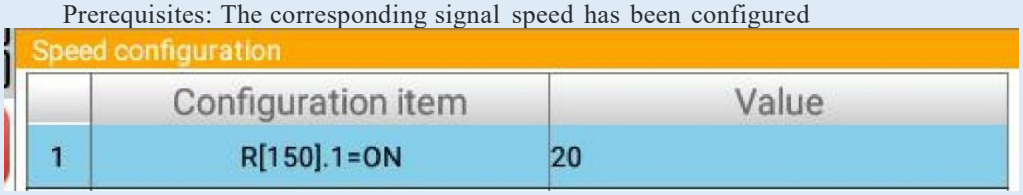
	Configuration description: R[N].X=OFF/ON, the value is V N is the R register number;

●X is the number of bits, also refers to the number of bits in binary. The user can set the value of the R[N] register, the corresponding value data from decimal to binary control signal speed output;

OFF/ON is the signal switch;

●V is the multiplier;

Prerequisites: The corresponding signal speed has been configured



Case 1: Modify the signal configuration according to the instruction

'Suppose the current multiplier is 50

R[150].1=OFF 'The current speed multiplier is unchanged

R[150].1=ON 'The current speed multiplier is set to 20

Case two: Modify the value of the R register and respond to the signal speed

'Suppose the current multiplier is 50

R[150]=60 'Current speed multiplier unchanged (register data is 60, decimal to binary is

0011 1100, the first digit is 0, which is OFF)

R[150]=70 'The current speed multiplier is set to 20 (register data is 70, decimal is converted to binary

The system is 0100 0110, the first digit of which is 1, which is ON)

	Tip: IO trigger signals can be virtual signals. Signal speed trigger function only works in automatic, external mode. IO Trigger change speed magnification is not mutually exclusive with other change Speed magnification Vord operations, the user can still change the magnification from the instructor, or change the speed magnification using VORD commands. When the speed is triggered, the instructor will issue the message" Signal speed has been triggered". For the multi-axis group scenario, only the velocity multiplier of the robot group is currently supported, and the external axis group

	is not considered.

Operation procedure

1, in the debugger above the user group.

2, select the menu → Configuration → controller configuration → speed configuration, the" signal speed"TAB below to enter the configuration page.

3. Set" Signal speed configuration item list". Click the corresponding list and select" Change"button to enter the pop-up window of signal configuration.

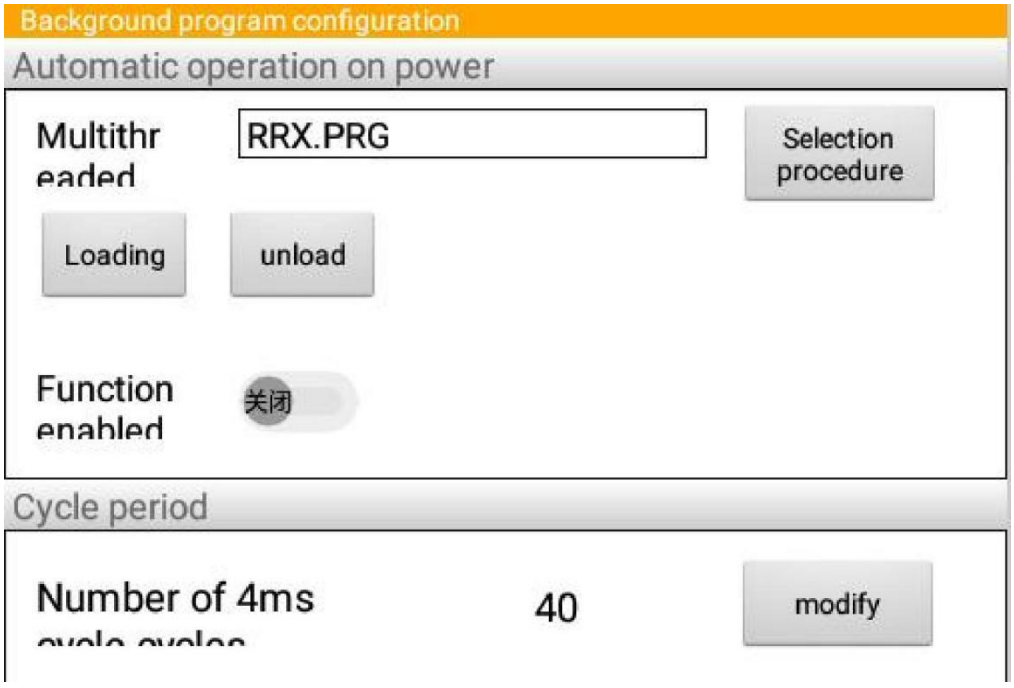
4, the signal configuration register can be input [0,999], the second input box can be input [0,7], the multiplier speed value can be input [1,100]

5. Select Enable to enable the function

8.2.10 Background program configuration

Instructions

Background program configuration, the user can configure the function of automatically allowing the background program to power on, the background program can configure the controller to run the main program at the same time, can run the logic PRG program in the background at the same time, to achieve multithreading function. The main program group mask is 0, and the multithreaded logic program group mask is *. You can also RUN the run daemon command in the main program to invoke the background program.



picture 8 - 33 Background program configuration

Operation procedure

1. Choose → Configuration → Controller Configuration → Background program configuration from the main menu to enter the background program configuration interface.

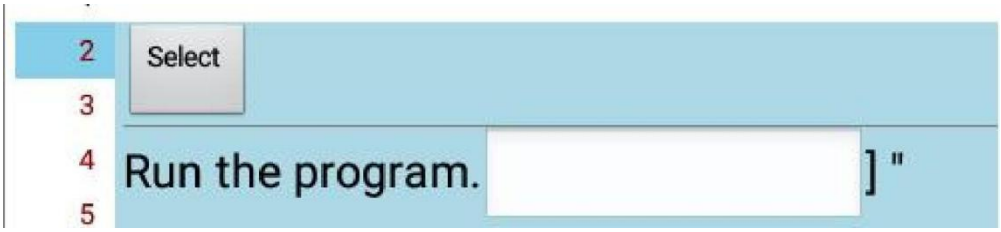
2. Click Select Program to select the program that will run automatically on power-on.

3. Click Enable to enable the function.

4, set the number of 4ms program cycles, the default is 1.

5. The function takes effect after the cabinet is restarted. If the program group mask is 0, the setting fails!

Command to add an operation step



1. Select the line above the instruction line that you want to insert.

2, select instructions → other instructions → Run the program.

3. Click the"Select Subroutine"button and select the logic program.

4. Click the"OK"button.

5. Click the OK button in the operation bar to add the RUN command.

Constraint condition

The background program runs subject to the following conditions:

Enable condition. When the program is running, disable the enable, and the main program ends running. After this function is enabled, the system can resume running. The background RUN program does not end.

servo alarm. When the program is running, the servo alarm, the main program will end the operation. When the alarm is lifted, the operation can continue to resume. The background RUN program does not end.

Indicates the error status of the main program, which affects the running of background programs

External signal output according to the main program status output.

external signal input: load the main program, but the background program will be loaded when the main program is loaded; PAUSE is only valid for the main program; Start, uninstall, and stop are valid for both programs.

When switching to the background program interface, not controlled by the instructor keys (pause, uninstall, back, Start).

The background program is only controlled by the program control softkey, and the main program is also controlled by the program control softkey.

resumed after being suspended. Run midway pause, the main program and background program can be separately controlled temporarily, can be separately controlled continue to resume operation.

Tip:

RUN If you modify or edit the logical program, the system automatically delivers the latest program to the system. The ABORT, END and PAUSE commands in multithreading control only the current program and do not affect the main program.

Only one set of logical PRG (background) programs and one set of robot motion control (main) programs are allowed to run simultaneously.

After the automatic running program is configured and powered on, loading the command that contains the RUN background program in the main program fails.

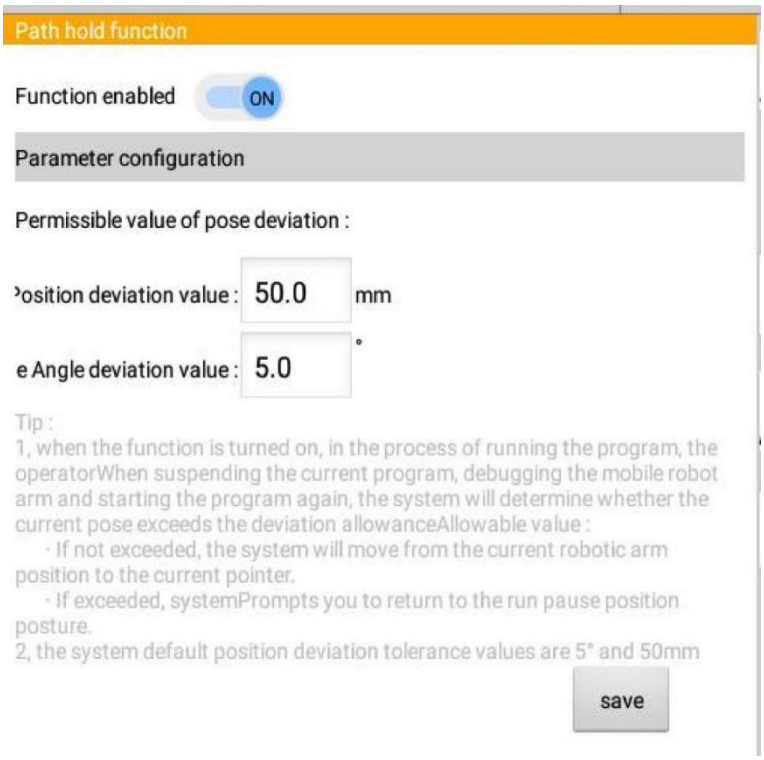
When the RUN background program is executed, the robot stops running and reports an error if a motion command is found in the program whose group mask is"*".

The program after RUN must be in the non-running state. A running program cannot be RUN by using the run command. Otherwise, an alarm is generated when the RUN command is executed. RUN program alarm description: When the program is executed, the main program or RUN program appears alarm information, which is displayed on the demonstrator. For the alarm priority, there is no main program and RUN program, and the same priority displays the last alarm message.

8.2.11 Path holding function

State

The path hold function means that the robot arm is moved after the program is paused, and the robot arm will return first when the program is started The function to pause the position and then move again. When this function is enabled, the current execution pointer can be moved after the program is suspended. When the startup program is run, the robot arm will move from the current position to the target point specified by the new pointer line, and the trajectory changes greatly at this time. In order to prevent collision, the user needs to be prompted to confirm whether to start the program execution.



picture 8 - 34 Path holding function

Operation procedure

1. Choose > Configuration > Controller Configuration > Path Hold from the menu to enter the configuration page.

2. After setting the allowable value of input position deviation, click Save to save the data to the controller. The position deviation value is assumed to be 50mm and the attitude deviation Angle is set to 5° by default.

3. Select Enable to enable the function

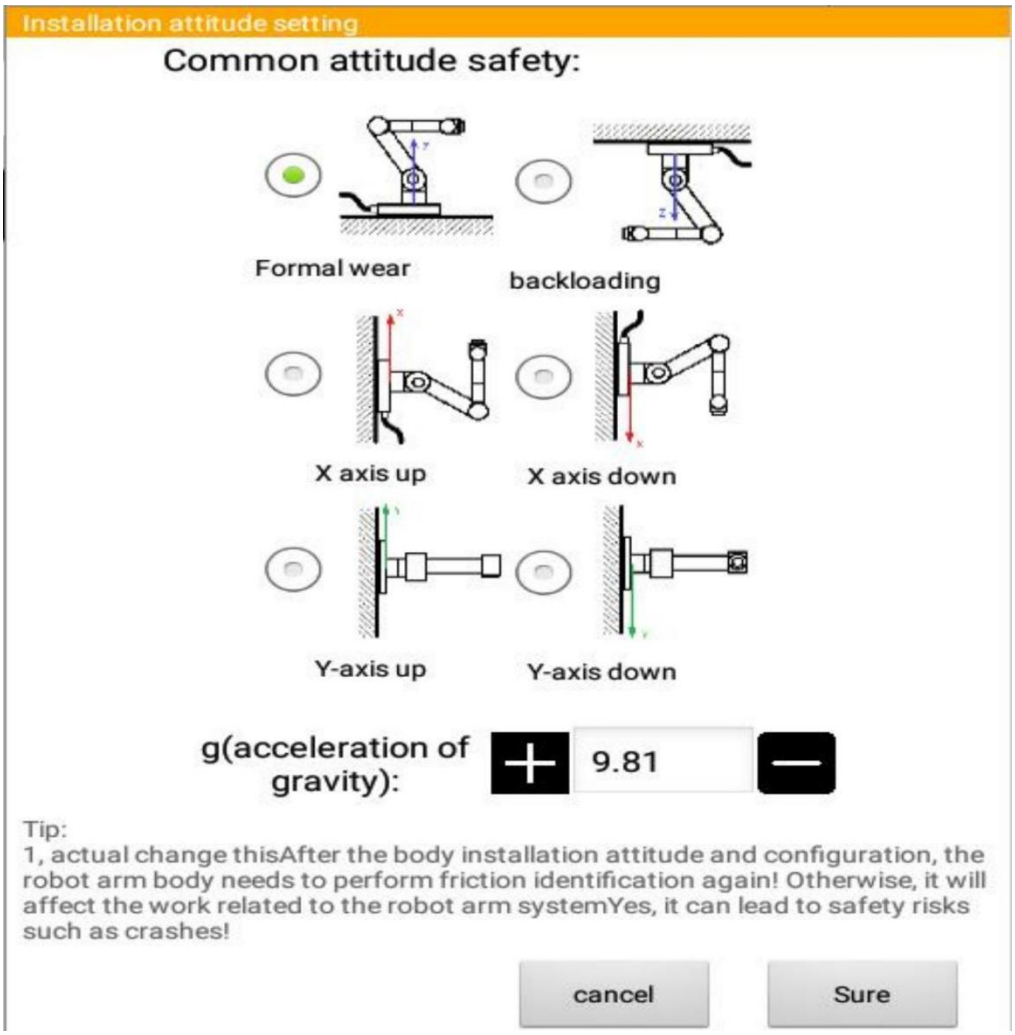
	Tip: During path backtracking, users need to pay attention to the environment around the robot arm to avoid potential safety risks such as collisions.

8.3 Dynamic function

8.3.1 Installation attitude setting

State

Under normal circumstances, the robot arm is installed on a smooth table or ground, and no operation is required in this case. If the robot arm is mounted in reverse, wall-mounted and side-mounted, the current installation attitude needs to be set when the dynamic related functions are used. The configuration page is displayed.



picture 8 - 35 Installation attitude setting

Operation procedure

1. Choose from the menu → Configuration → Dynamics function → Installation posture setting to enter the setting page.

2. Select the installation posture according to the actual robot installation posture

3.g is the local acceleration of gravity

4. Click the" OK"button to save the data to the system and restart the controller to take effect

	Tip: 1. Setting the installation attitude is to improve the accuracy of the dynamic model and ensure the precision of the dynamic model. If you need to flip to use, you should first set the installation posture during the flip, and then identify. The safety posture should also be set correctly before using the dynamics feature. 2. After changing the installation attitude, the robot arm body needs to perform friction identification again! Otherwise, it will affect the related functions of the robot arm system, which will lead to safety risks such as crashes!

8.3.2 Body friction identification function

State

Robot dynamics parameters are crucial to the accuracy and reliability of the robot, and each parameter is required before the factory Configured in the control system, no external identification process is provided.

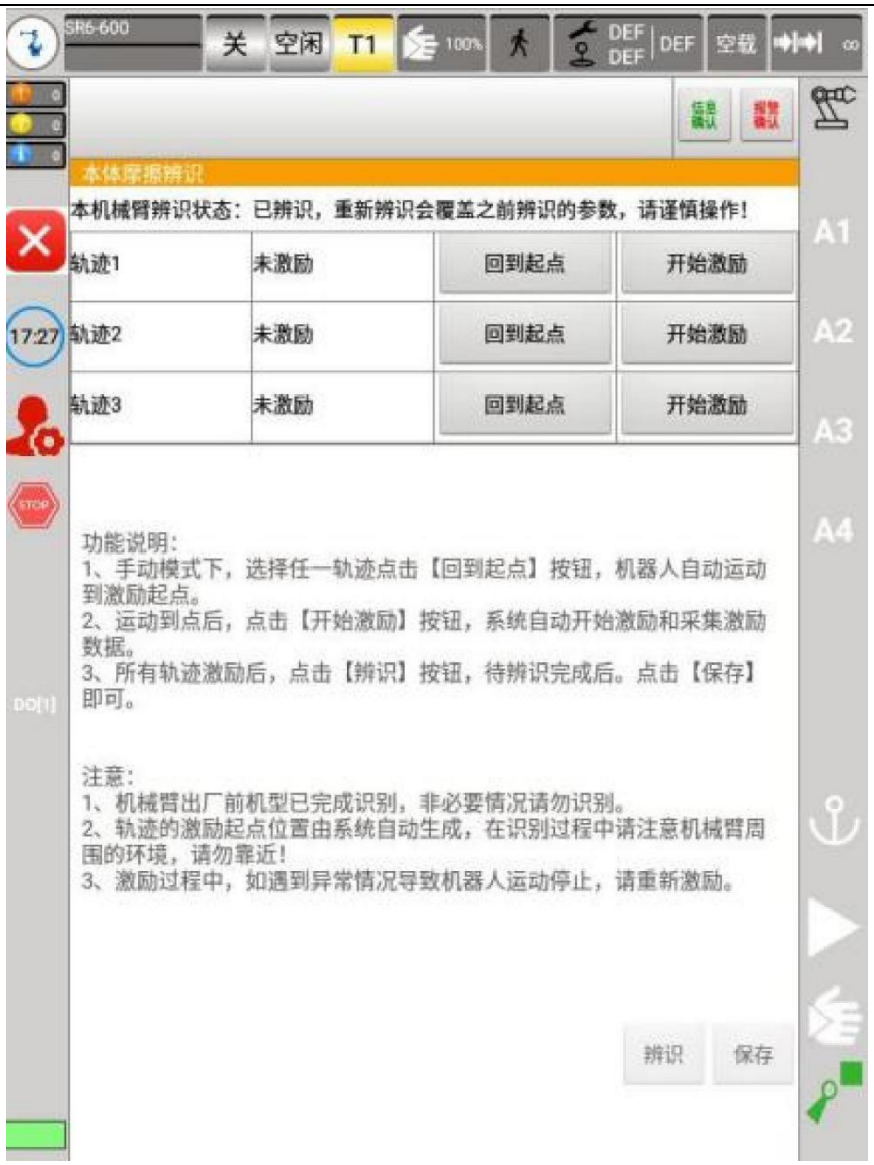


Figure 8-36 Body friction identification

Operation procedure

1. Choose > Configuration > Dynamics Function > Body friction Identification from the menu bar. The body friction identification page is displayed.

2. In manual mode, select any trajectory and click [Return to starting point] button, and the robot will automatically move to the starting point

3. After the movement reaches the point, click the" Start incentive"button, and the system will automatically start incentive and collect incentive data

4. Repeat the above steps to complete the stimulation of the remaining tracks.

5. After all trajectories are energized, click the" Identification"button to start the system's dynamic parameter identification operation.

6. Click [Save] button to save the relevant identification data into the controller.

Attention:

The model of the mechanical arm has been identified before delivery. Do not identify it unless necessary.

The excitation starting point of the trajectory is automatically generated by the system. During the recognition process, please pay attention to the environment around the robot arm and keep away from it.

The excitation starting point of the trajectory is automatically generated by the system.

Move to the start of the track in manual mode only, track excitation in automatic/manual mode.

During the excitation process, if abnormal circumstances (such as disable, emergency stop, error occurs, click"Stop excitation"button, etc.) occur, the robot movement will stop, the excitation fails, and the current trajectory incentive data will be cleared.

If ontology identification is not implemented on the model, collaboration related features cannot be used

Supported models

Not all models are compatible with the dynamics, please ask the relevant technician for details.

8.3.3 Load configuration function

Function description

Load configuration is a function to let the system know the current load of the robot by modifying the dynamic parameters, which can be obtained by self-input or load identification. The correct setting of load and load parameters can improve the robot action performance and effectively play the robot dynamics related functions, including collision detection and drag teaching functions. To avoid errors or adverse effects caused by relevant functions, the robot should identify the load before use, and select the load number.

8.3.3.1 Dynamic load switching

state

Dynamic load switching is a function that allows the robot to re-obtain the relevant load parameters under the current load number by switching the load number, so as to know the current load of the robot. There are 16 groups of load number data in the system. Load switching can be done in two ways, directly switching through the demonstrator button and switching through the command.

Operation procedure

Method 1:

Click the robot speed level or load status display box in the status bar of the instructor. If the current parameter is dynamic load, click the load number selection drop-down box to select the corresponding load number.

图 8-37 负载切换

Method 2: Set this parameter in the program using the PAYLOAD assignment command.

1. Select the line above the instruction line that you want to insert.
2. Select instructions → Dynamics instructions.
3. slide down the drop-down box to find the"PLAYLOAD"option and click Select.
4. Move the cursor to the right input box and enter the value.
5. Click the"OK"button to add instructions

Program example：

PAYLOAD=1 The value ranges from -1 to 15. The default value is -1 no load

Attention:

When the load of the robot changes, it should be switched to the corresponding load number in time; otherwise, the motion accuracy may be decreased, the collision detection may be false positive, or the dragging power may be adversely affected.

The load number switching policy of the loader and unloader is the same as that of the tool job switching. The current load after the program is uninstalled is the same as that used before the program is loaded.

8.3.3.2 Load parameter configuration

Instructions

Load parameter configuration is to set the load mass, centroid position, inertia tensor and other parameters. You can perform the following operations to configure load parameters:

1. Manually edit load parameters: If the load parameter information is known, you can directly modify the load parameter value. After saving, the load parameter configuration is complete.

2. Load parameter information is automatically generated based on load identification. If the load information is unknown, you can configure load parameters in this way.

This section describes the procedure for Mode 1

Method 1: Manually edit load parameters.

Figure 8-38 Setting load parameters -1

1. On the menu bar, select → Configuration → Dynamic Function → Load Configuration.

2. Click the Load Number drop-down list box and select the corresponding load number to go to the parameter page The information displayed on the interface is the load parameter information of the load number, which is not being used by the robot The load number used).

3. Click the"Description"input box to make remarks about the load number.

4. Select the corresponding row in the list and click the input box of Value to manually modify the load parameter value of the corresponding serial number.

5. Click Save to save the modification result and complete the load parameter configuration.

Warning:

Since BR robot is a model with internal rotation structure, users should pay attention to the following two situations when manually modifying load identification parameters:

1. Avoid the position of the joint axis of the robot's third axis approaching 270°

2. The fourth joint axis of the robot should be in the range of 0~ 180°

If the machine is loaded, the first solution is recommended.

And pay attention to avoid three-axis close to 270° resulting in load interference with the body.

Procedure For Mode 2

Method 2: Automatically generate load parameter information based on load identification.

Figure 8-39 Load Parameter Settings -2

1. On the menu bar, choose > Configuration > Dynamics Function > Load Configuration.

2. Click the Load Number drop-down list box and select a load number based on the load number.

3. Click the"Load Identification"button to enter the load identification setting interface.

4. Click the"negative direction range"or"positive direction range"input box to reset the relative motion range of A3 to A6 axis based on the current position (the

default motion range of positive and negative direction is automatically set according to the positive and negative soft limit range).

5. Click the"trial run"button to start the slow trial run track and test whether the operating environment is safe.

6. Click the"Start identification"button to start the identification track at high speed (this process belongs to the load identification data acquisition process, and the same track is repeated for ten times).

7. After identification, click"Save"button to complete the load parameter configuration.

	Attention: Track trial run can only be carried out in manual mode, high-speed run identification track can be carried out in manual or automatic mode. Before load identification, corresponding load should be attached to the end of the robot and the robot system is idle. High-speed operation identification trajectory During the trajectory, the collision detection function is automatically turned off.

8.3.4 Collision detection function

Function description

Collision detection is a function that quickly detects and stops the robot when it is impacted by external forces, which effectively enhances the safety of the robot. This function is automatically turned on from the moment the system is powered on, and takes effect in manual, automatic and external modes, which is the guarantee for maintaining the safe operation of the robot.

8.3.4.1 Collision detection switch

Instructions

Collision detection is automatically turned on when the system is powered on after friction identification. The function can be turned off briefly by the program instruction COL_DETECT. This directive has the same scope as global variables.

Program example:

```
COL_DETECT = OFF          'Collision detection is turned off while the program is running
```

Operation procedure

1. Select the line above the instruction line that you want to insert.

2. Select instructions → Dynamics instructions.

3. Slide the drop-down option to find the"COL_DETECT"option and click Select.

4. Click the cursor to locate the input box on the right.

5, click the"Other"drop-down box option, find the"OFF"or"ON"option and click.

6. Click the"OK"button to add instructions.

	Attention: After this function is temporarily disabled by program command, it will automatically switch to the enabled state when the program is not running, such as uninstallation, error, suspension, completion of the program, or online editing. When the program resumes running, it automatically switches to the closed state. dynamically-supported models and after ontology identification of the robot, the collision detection system will be automatically turned on after power on. The current version of the collision detection response mode is to slow down and stop.

8.3.4.2 Collision detection sensitivity

Instructions

The larger the collision detection sensitivity value, the higher the detection sensitivity. The collision detection sensitivity can be modified on the "Collision Detection Configuration"interface of the instructor, or by the COL_GUARD_ADJUST instruction in the program.

This section describes the procedure for Mode

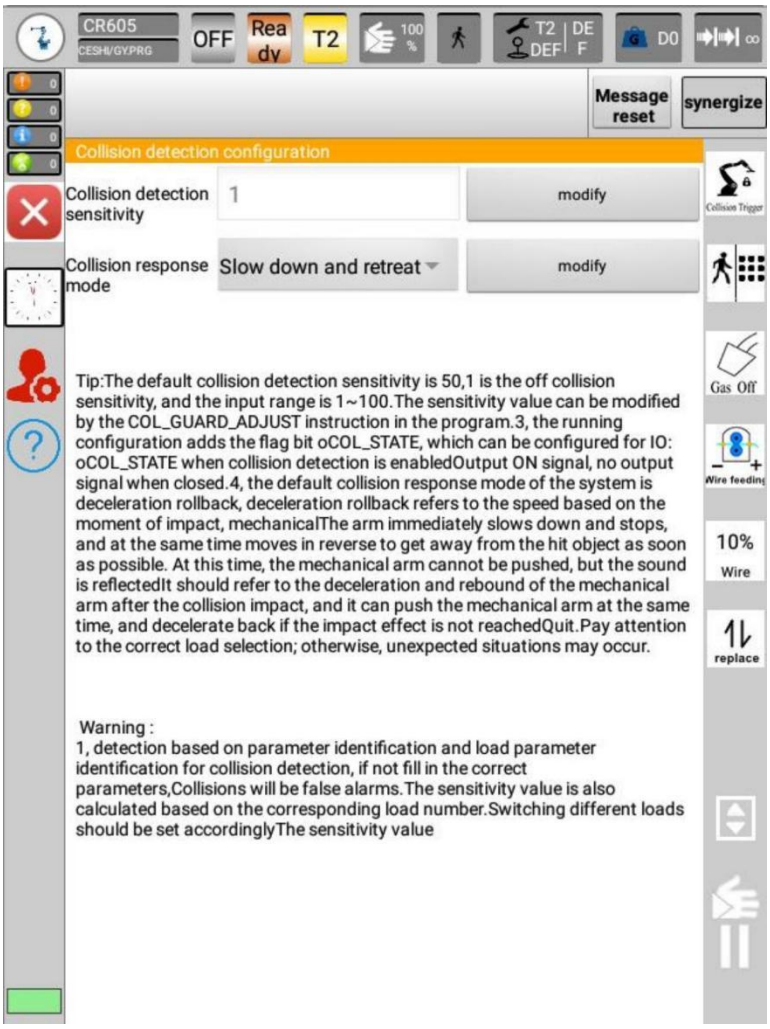


Figure 8-40 collision detection sensitivity

1. On the menu bar, choose → Configuration → Dynamics Function → Collision Detection Configuration.

2. Click the"Modify"button and enter a value in the"Collision Detection Sensitivity"field. The value ranges from 1 to 100.

3. Click the"OK"button to save the modified sensitivity value.

Procedure For Mode 2

Modified by the COL_GUARD_ADJUST command.

1. Select the line above the instruction line that you want to insert.

2. Select instructions → Dynamics instructions.

3, slide down the drop-down box to find the"COL_GUARD_ADJUST"option and click Select.

4, click the cursor to locate the right input box, you can enter 1-100 range of values; Or click the"Register"drop-down box option, find the"R[]"option and click,

and enter the R register serial number in the R[] index box.

5. Click the"OK"button to add instructions.

Program example 1：

```
COL_GUARD_ADJUST = 50 Program example 2：
COL_GUARD_ADJUST = R[1]
```

‘Set the collision detection sensitivity to 50

‘Set the collision detection sensitivity value to the value in the R[1] register

	Attention: Configure the Collision Detection page only after you have identified the body friction. Running configuration Adds the oCOL_STATE flag for I/O configuration. When collision detection is enabled, oCOL_STATE outputs the ON signal. When collision detection is disabled, OCOL_STATE does not output the signal. Sensitivity values are also calculated based on the corresponding load number. To switch different loads, the corresponding sensitivity value should be set. detection Collision detection is based on body friction identification and load parameters. If the correct parameters are not filled in, the collision will be false positive. When collision detection sensitivity is set to 1, this function is disabled by default.

8.3.5 Drag the teaching function

Instructions

The operator directly drags the robot body to teach, and adjusting the drag compliance coefficient can improve the drag effect to a certain extent.

Operation procedure

1. Press the drag button at the end of the robot's six axes.

2. After the robot is enabled, the robot can move in any direction applied by the hand.

	Attention: Drag is only allowed in manual mode. It is necessary to identify the load of the robot and use this function after calling the corresponding load number; otherwise,

	the robot should identify inaccurate data, which will cause dangerous situations such as arm drop.

8.3.5.1 Drag the teach Settings

Instructions

Drag teaching Settings You can select joint drag mode or Cartesian drag mode, and set the drag compliance according to the drag mode. The greater the drag compliance coefficient, the smoother the drag.

Operation procedure

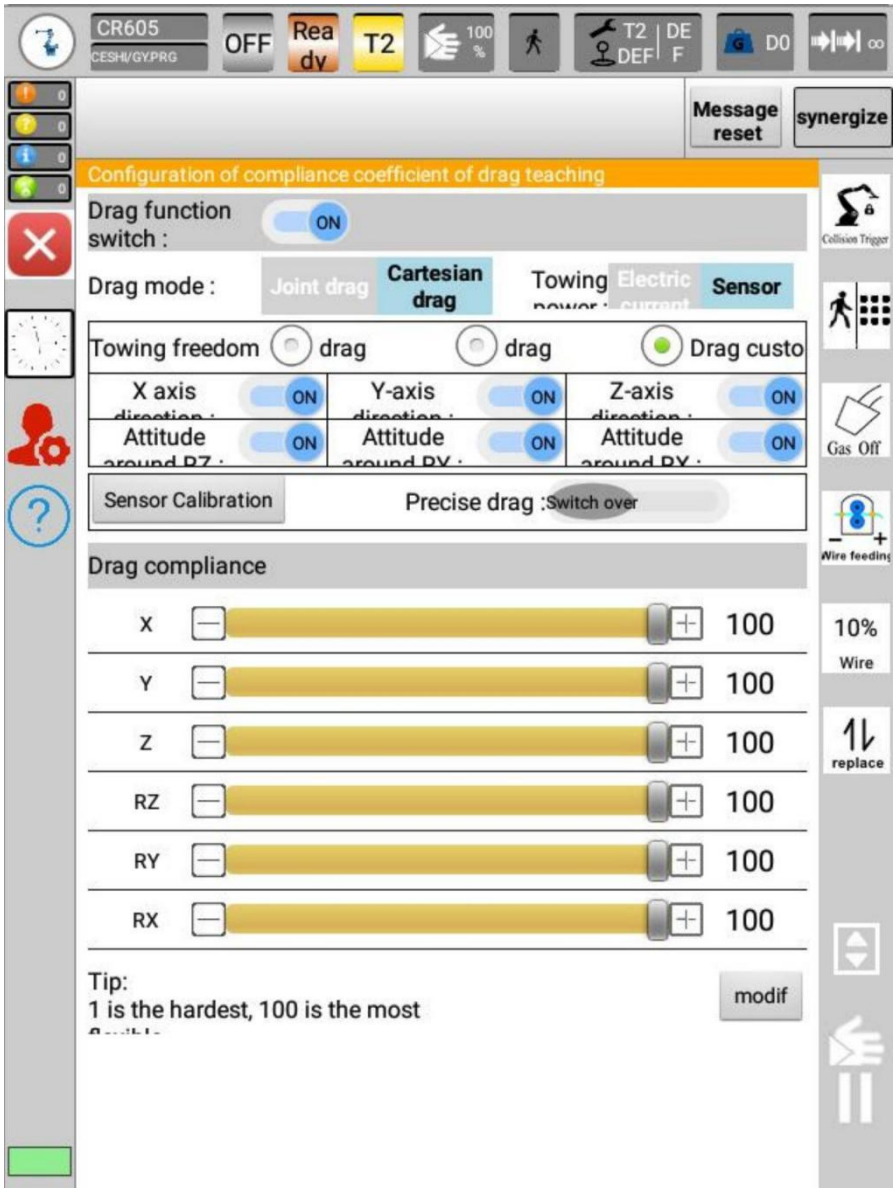


Figure 8-41 Dragging the display Settings

1. On the menu bar, select → Configuration → Dynamics Function → Drag the teaching Settings.

2. Click the"Modify"button to set the desired value in the compliance drag bar of the corresponding axis. The value range is 1-100.

3. Click"OK"to save the modified drag compliance coefficient value. The parameter setting takes effect immediately.

	Tip: You can enter the Drag Settings page for configuration only after you have identified the body friction.

8.3.5.2 Drag track recording

Instructions

The user uses the drag function of the cooperative robot to drag the robot to teach the trajectory. The software will record the movement trajectory of the robot shown by the user, and then generate the corresponding robot program, which saves the point position of the teaching trajectory shown. The execution of the program can complete the repetition of the teaching trajectory shown.

Operation procedure

1. New track:

Figure 8-42 Track recording

1. On the menu bar, choose → Configuration → Dynamics Function → Drag track recording.

2. Click the"New"button to create a new track. The content box in the middle will display the newly created track accordingly

Eight more tracks can be displayed, that is, a maximum of eight new tracks can be created.

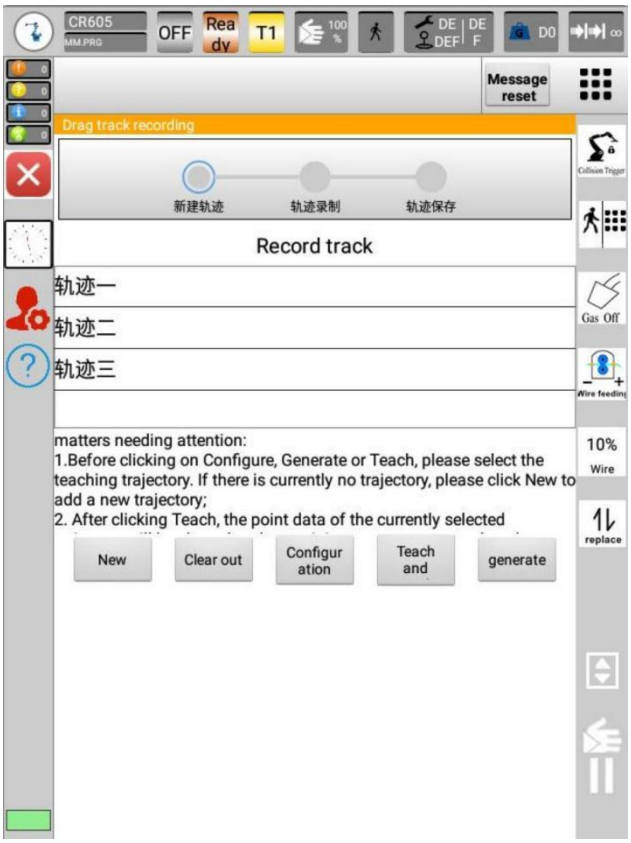


Figure 8-43 New trajectory

Select a track in the middle content box and click the"Configure"button to pop up the following interface (Figure 8-44）

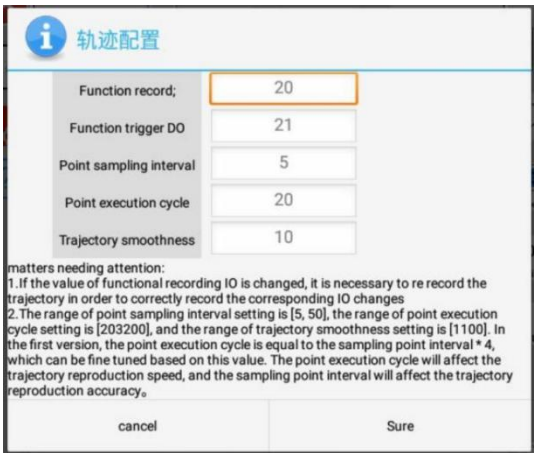


Figure 8-44

Function record DI: I/O (input IO) that is recorded simultaneously during track recording, that is, drag recording

The change of the IO is recorded at the same time. The current version only supports recording one IO.

Function trigger DO: replicates the IO (output IO) that changes the recorded I/O signal. It should be noted that function record IO and function trigger IO cannot be

set to the same IO.

point sampling interval: a point is selected at intervals of several points during the generation of the trajectory. The default value is 5, which is also the minimum value, that is, a point is selected at intervals of 5 points on the basis of the original trajectory to generate the trajectory. The greater the value, the lower the accuracy of the recorded and reproduced trajectory.

point execution cycle: That is, the movement time from one point of the robot's total trajectory to the next point, in ms, with a minimum value of 20 and a maximum value of 3200. It should be noted that this value should be used reasonably with the point sampling interval. If the point sampling interval is set to 10, the point execution period should be set to 10*4=40. Then, on this basis, fine-tuning is carried out. The smaller the value, the faster the robot will be when the trajectory is reproduced, and the slower it will be when the trajectory is reproduced. If the setting is improper, the robot may have super-acceleration when the trajectory is reproduced
Such alarm (corresponding to the program SEC instruction).

trajectory smoothness: The setting range of this configuration item is 1-100. The larger the value, the higher the trajectory smoothness (corresponding to the program CNT instruction). After the trajectory is created and configured for the first time, the trajectory teaching has not been performed at this time, so the"Generate"button cannot be clicked to generate the trajectory. At this time, you need to click the"Teach"button to start the track recording.

2.Drag the teaching track:

Figure 8-45

The teaching status is displayed on the track teaching interface. The image above shows"wait for drag to teach signal"which means soft at this time The device is waiting for the user to give a trigger signal. When the user presses the input drag teaching button at the end of the flange,The interface will change to"Wait until the dragging is complete", as shown in the following figure (Figure 8-46)

Figure 8-46

recording, and the software will record the robot movement trajectory of the user's teaching in real time. The recording duration is at most one minute, and the parts of the track after one minute are not recorded.

If the user wants to cancel the admission, he can click the"Cancel"button, and the software will return to the previous interface for creating a new track, and the user can perform Step 1 again to enter the interface for recording the track.

3.Generate and save tracks：

Figure 8-47

After the recording is finished and the robot is given the end teaching signal according to the robot's operation, the software will automatically enter the save page. As above, the status display above the software will be changed to the following, which means that all the tracks have been recorded, and then you only need to configure before generating the track file.

On the save page, you only need to set"track name", that is, the name of the last generated track file. Users can fill in it at will. Finally, after clicking the"Generate" button, the software will generate the track file, and the generated result will be displayed in a pop-up window. The effect picture is as follows.

Figure 8-48

When the system displays"Generated successfully! The latter indicates that the software has successfully generated and saved the corresponding trajectory file. The execution of the corresponding file can make the robot repeat the trajectory of the dragged teaching. If you want to re-record this track or a new track or a new track, click the"Back to Home"button to return to the initial interface, and perform the above operations again to teach the new track.

Tip:

You need to create tracks before dragging them. A maximum of eight tracks can be managed online at the same time.

The drag signal for the collaborator is the drag track button at the end of the flange.

In general, a track can be generated repeatedly after being recorded once. If you change the last three items of the above configuration items, click Generate again. In this case, the track file will be generated again according to the configured parameters.
After clicking the"Clear"button, all the current track data will be cleared, and you need to create a new track after clearing.

9 Display functions

9.1 Displaying digital inputs/outputs

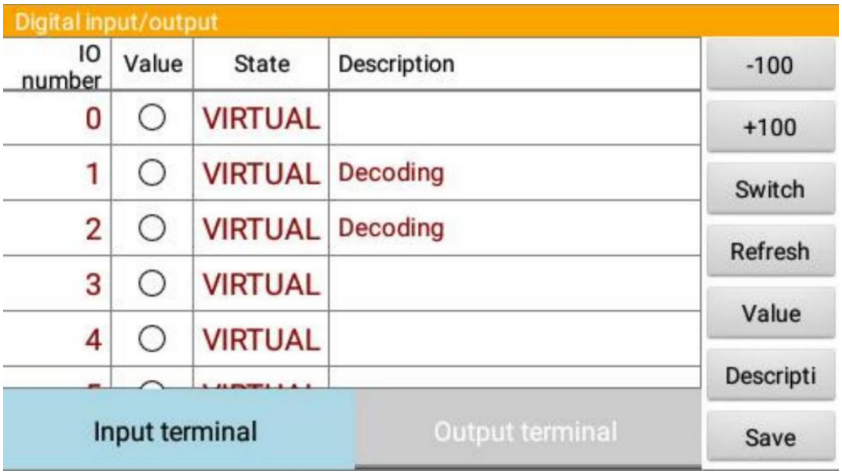
	The modification permission of this function is set to engineer user and above.

	input terminal REAL can only give signals through real external pulses, and VIRTUAL can give pulse signals through the teach pendant.

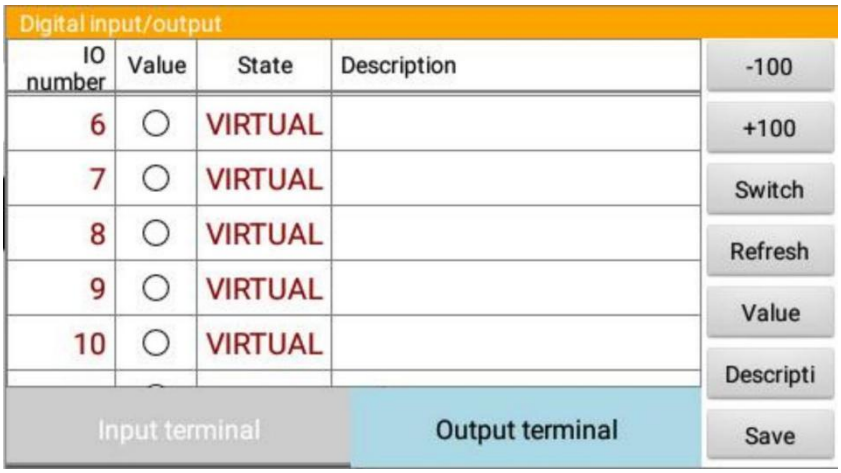
Steps

1. Select Display→Inputs/Outputs→Digital Inputs/Outputs in the main menu.

2. Click to select a specific input/output, and operate the IO through the buttons on the right side of the interface.



picture 9 - 1 digital input



picture 9 - 2 digital outputs

serial number	illustrate
serial number	Digital input/output serial number
io number	Digital input/output IO number
value	Input/output terminal value. If an input or output is TRUE, it is marked red. Click the value to toggle the value to TRUE or FALSE.
condition	Indicates that the digital input/output terminal is real IO or virtual IO, the real IO is displayed as REAL, and the virtual IO is displayed as VIRTUAL.
illustrate	Add a description to this digital input/output.
-100	Switches to the previous 100 inputs or outputs in the display.
100	Switches to the next 100 inputs or outputs in the display.
toggle	Switchable between virtual and real input/output.
value	The selected IO can be set to TRUE or FALSE.
illustrate	Add an explanation to the digital input/output of the selected row, and click to change it after selecting it.
save	save IO description

9.2 Display the actual position

	All users of this function can view the actual position of the robot.

Operation steps

Select Main Menu Display →Actual Position. The axis angle, Cartesian actual position, and encoder value will be displayed.

State

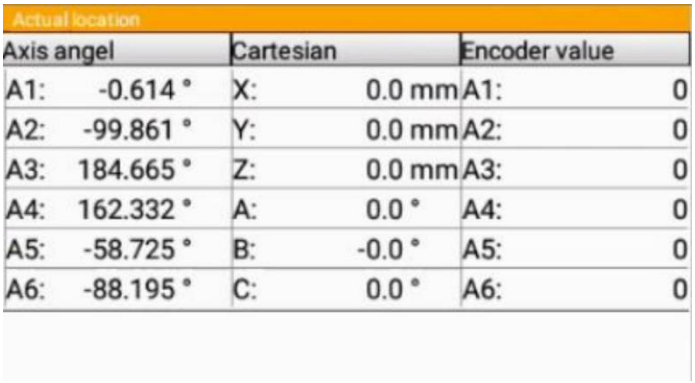
Cartesian actual position:

Displays the current position (X, Y, Z) and orientation (A, B, C) of the TCP.

Axis-related actual position:

The current positions of axes A1 to A6 are displayed. If there are additional axes, the positions of the additional axes are also displayed.

While the robot is running, the actual position of each axis is updated in real time.



picture 9 - 3 Actual position of the robot

9.3 Variable List

	The workpiece coordinates of this function tool can only be modified by manufacturer personnel, and can be modified by R, JR, LR register engineer users and above, and can only be viewed by production users.

Steps

1. Select Main Menu Display → Variable List. A list of related variables will be

displayed.

2. Click on the list of different variables, the related variables will be displayed.

3. The function buttons on the right can be used to turn pages, modify and save registers.

4. All modified operations must be saved to the file after clicking Save.

	setting the register, you need to click [Save] to save it. If it is not saved, it will be lost after power off and restart.

Description：

Variable lists are used to store different types of register data

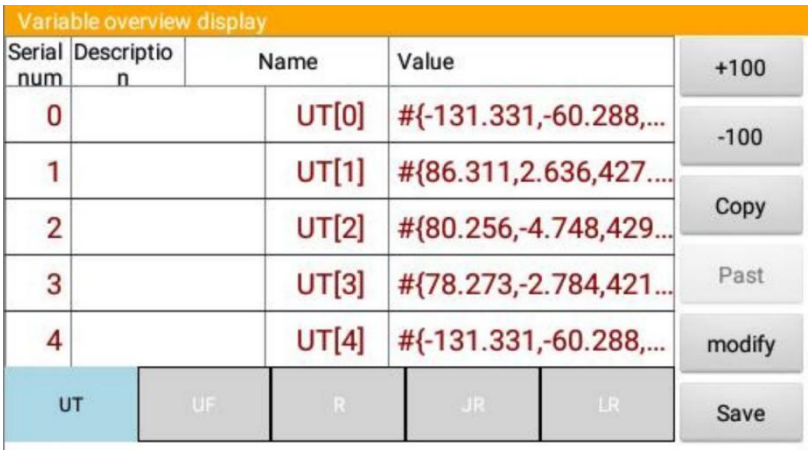
UT: Tool coordinate system variable

UF: base coordinate system variable

R：Numeric register

JR: Joint type coordinate register

L R：Cartesian coordinate register



picture 9 - 4 variable list

9.4 Functions associated with register description and IO description and program line

	modification permission of this function is set to engineer user and above.

State

After enabling the function of register description and IO description associated with the program line, you can see the description content of the register list and the user record on the IO list on the program interface of the

teach pendant.

Steps

1. Open the program, and click"More → Start Instructions"in turn.

After opening, you can see the corresponding instructions in the program. After opening the instructions, the procedure is as follows:

```
J JR[1:HOME]          //JR[1] is described as HOME in the register list
R[2]=R[1: Number of times ]-1      //R[2] has no description in the register list, and the description of R[1] in the register list is"number of times"
DO[0  : Grab ]=ON       //DO[0] in the IO list is described as"grab"
```

2. Open the program, click"More → Close Instructions"in turn, you cannot see the instructions after closing.

After closing the description, the program is as follows:

```
J JR
R[2]=R[1]-1
DO[0]=ON
```

	The description content cannot be changed in the program line. If the register index/IO index / description content is changed, the corresponding description content will also be changed in real time.

9.5 IO status correlation display

	modification permission of this function is set to engineer user and above.

Explain that after the IO status correlation display function is turned on, the corresponding IO status can be seen on the program interface of the teach pendant. When the function is turned off, it will not be displayed. It is similar to the register description and IO description and the program line correlation function.

Operation steps

1. Open the program, and click"More → Open Status"in turn. After opening,

you can see the corresponding IO status in the program. After the state is turned on, the procedure is as follows:

```
DO[1:ON]=OFF    //DO[1] is currently ON, running this command will adjust it to OFF
DO[2:OFF]=DI[1:ON]    //The current state of DI[1] is ON, and the current state of DO[2] is OFF. Running this command will adjust the state of DO[2] to OFF
```

2. Open the program, click"More → Close Status"in turn, you cannot see the IO status after closing.

After closing the description, the program is as follows:

```
DO[1]=OFF
DO[2]=DI[1]
```

	①When one of the programs is opened and closed, when the next program is opened, the program status display is consistent with the previous program, that is to say, the button operation of the previous program will affect all programs. The default is off (including restart after power failure). when loading the program. ②When it exists at the same time as IO description, it is performed in the order of displaying the status first, and then displaying the description. ③ When the IO state changes, it needs to be updated synchronously.

10 Diagnostic function

10.1 Operation log

	This function can be operated by all users.

Note that the teach pendant provides a log function to view the generated running log.

Steps

1. Select Diagnosis→Run Log from the main menu to display the Run Log window.

Key Description

serial number	illustrate
log header	Jump to the head of the log
log tail	jump to the end of the log
-100	up 100 entries in the log.
100	down 100 entries in the log.
output	Output the currently displayed log to a file
refresh	refresh current log
filter _	Set log filter display conditions

picture 10 - 1 Run log

10.1.1 Filters

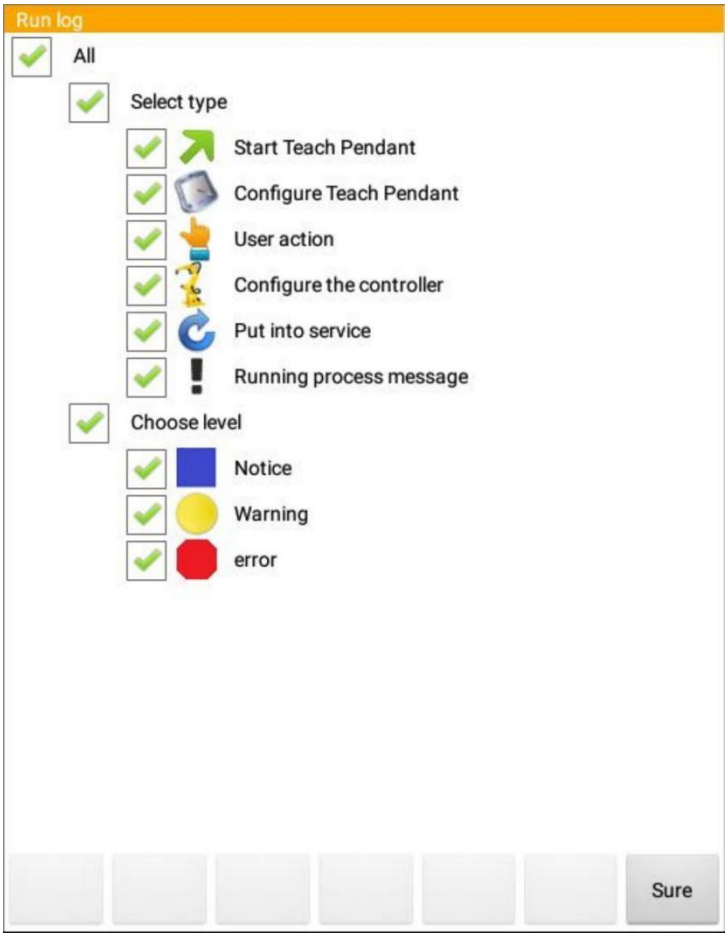
Description The specified content can be filtered and filtered.

Steps

1. Click the Filter button on the Run Log screen.

2. Set the log content to be displayed.

3. After clicking OK, it will return to the running log interface and display the filtered log content.



picture 10 - 2 Run Log - Filter

10.2 Diagnostic data export

	The modification permission of this function is set to engineer user and above.

Steps

1. Plug in the USB flash drive
2. Click on the main menu and select Diagnosis→Diagnostic data export
3. selection path
4. Click the"One-click derivation"button.

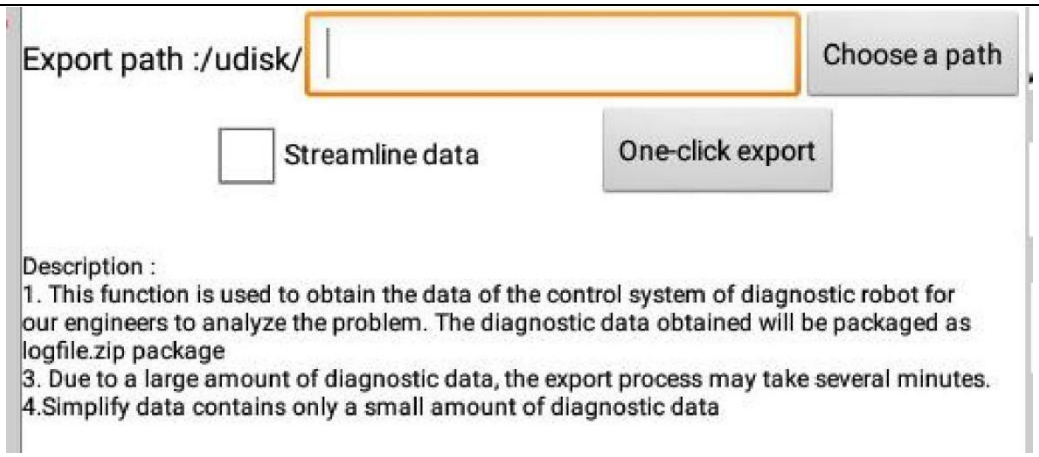


Figure 1 0 - 3 Diagnostic data export

11 Put into operation

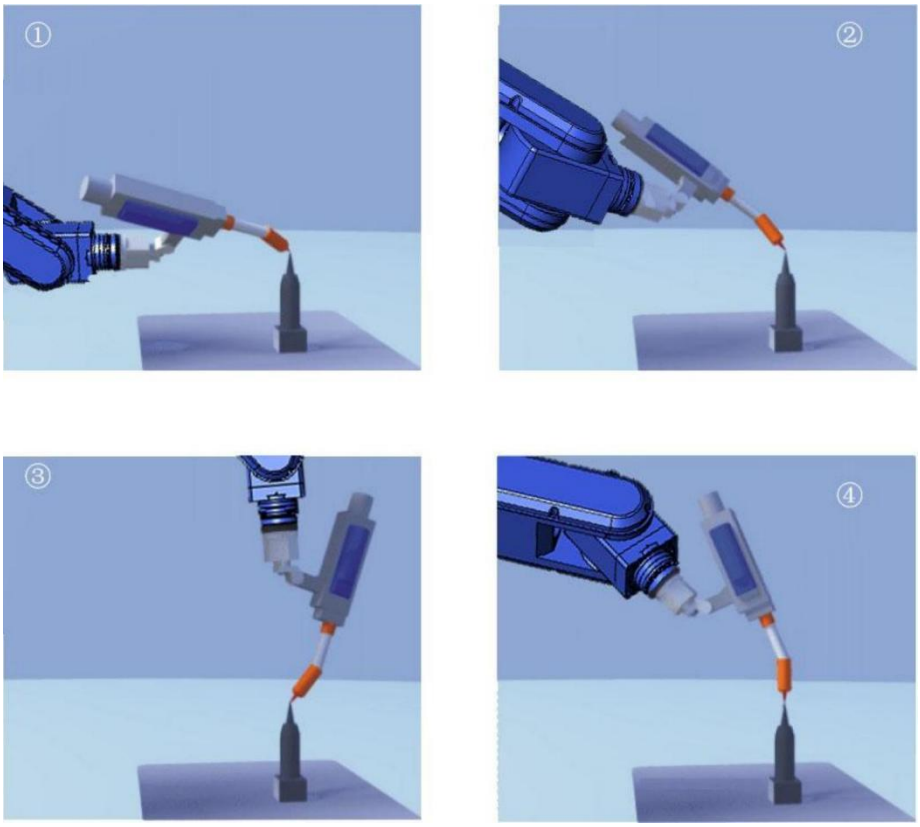
11.1 User tool calibration

	The modification permission of this function is set to engineer user and above.

11.1.1 Four-point calibration of tool coordinates

illustrate

Move the TCP of the tool to be measured from 4 different directions to a reference point. The reference point can be chosen arbitrarily. The robot controller calculates the TCP from the different flange position values. The 4 flange positions used for the movement to the reference point must be separated by a sufficient distance.



Steps

1. In the menu, select Put into Operation→Measure→User Tool Calibration tool number to be calibrated to set the user tool name.

3. Click the [Start Calibration] button.

4. Move to the origin of the base coordinate and click [Origin] to obtain the origin coordinates of the coordinate record.

5. Move to a point of the calibrated reference point 1, and click [Reference point 1] to obtain the coordinate record coordinates.

6. Move to a point of the calibrated reference point 2, and click [Reference point 2] to obtain the coordinate record coordinates.

7. Move to a point of the calibrated reference point 3, click [reference point 3] to obtain the coordinate record coordinates.

8. Move to a point of the calibrated reference point 4, click [reference point 4] to obtain the coordinate record coordinates.

9. Click the [Calibration] button to confirm that the program calculates the calibration coordinates

10. Click the [Save] button to store the calibration value of the tool coordinates

11. Switch to the tool coordinate system, select the calibrated tool number, and move in the ABC direction, the robot tool TCP will rotate around the workpiece.

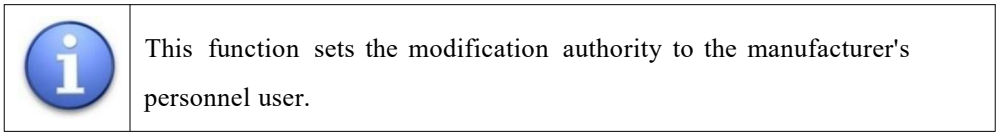
picture 11 - 1 Tool Coordinate Calibration

11.1.1.2 Calibration of tool coordinates by 6-point method

illustrate

Similar to the 4-point method, the 6-point method can calibrate the attitude of the tool. When recording the point position, the first 4-point method and the 4-point method mark the same top. When calibrating the 5th point, it is necessary to translate a distance up along the Z axis on the basis of the 4th point, and record the point. Finally, move another distance along the X-axis, record the sixth point, and complete the calibration of the 6-point method.

11.2 User workpiece calibration



This function sets the modification authority to the manufacturer's personnel user.

11.2.1 Workpiece coordinate three-point calibration

Operation steps

1. In the menu, select Start → Measure → User Workpiece Calibration.
2. workpiece number to be calibrated to set the user workpiece name.
3. Click the [Start Calibration] button.
4. Move to the origin of the base coordinate and click [Origin] to obtain the origin coordinates of the coordinate record.
5. Move to a point in the X direction of the calibration base coordinate, and click [X direction] to obtain the coordinate record coordinates.
6. Move to a point in the Y direction of the calibration base coordinate, and click [Y direction] to obtain the coordinate record coordinates.
7. Click the [Calibration] button to confirm that the program calculates the calibration coordinate value
8. Click the [Save] button to store the calibration value of the base coordinates
9. Switch to the user coordinate system, select the calibrated workpiece number, and move in the XYZ direction, it will move in the calibrated direction.

picture 11 - 2 Base coordinate calibration

11.3 Adjustment function

	This function sets the modification authority to the manufacturer's personnel user.

means that

the axis zero calibration must be performed before the robot runs. The robot can only make Cartesian movements after zero calibration and move the robot to a safe position. The mechanical position of the robot and the encoder position are coordinated during the zero calibration process. To do this, the robot must be placed in a defined mechanical position, the zero calibration position. Then, the encoder return value for each axis is stored. The calibration positions for all robots are similar, but not identical. The exact position will also vary between

robots of the same robot model.

Among them, the calibration function is updated to two types: internal and external axis calibration and absolute zero point saving. The difference between the two calibration methods is that, after calibrating the zero point through the internal and external axis calibration, when a non-zero position is accidentally calibrated to the zero point during debugging (the zero point position is the calibrated position after calculating the compensation amount through the latch and professional equipment), it will cause Need to re-zero calibration; and save the zero point through the absolute zero point without re-zero calibration, just click to restore the zero point.

Before the robot is put into operation, it must be calibrated first, otherwise it will not operate normally.

The robot must be calibrated in the following situations

condition	Remark
When the robot is put into operation	Must be calibrated, otherwise it will not function properly
robot sends a collision, after the encoder value is lost	Must be calibrated, otherwise it will not function properly
When replacing the motor or encoder	Must be calibrated, otherwise it will not function properly

Internal Shaft Calibration Procedure

Steps

1. Click"Menu → Put into Operation → Adjustment → Calibration".
2. Move the robot to the mechanical origin.
3. After each axis moves to the mechanical origin, click each option in the list, an input box will pop up, enter the correct data and click OK.
4. After the data input of each axis is completed, click to save the calibration data, save the data, and it will take effect immediately. Whether the save is successful can be checked by the current actual position data.

External axis calibration steps

1. Click"Menu → Put into Operation → Adjustment → Calibration".

2. Move the external axis of the robot to the mechanical origin.

3. Click the Send button of [Additional Axis].

4. After the external axis moves to the mechanical origin, click each option in the list, an input box will pop up, enter the correct data and click OK.

5. After the data input of each axis is completed, click the [Save] button to save the data, which will take effect immediately. Whether the saving is successful can be checked by the current position data.

	If it shows that the calibration is not successful, please check whether the network connection is successful; It can also support single-axis calibration (after calibration, the current actual position will become the set calibration value, generally a fixed position fixed calibration value)

Absolute zero point save operation steps

1. Click" Menu → Put into Operation → Adjustment → Calibration".

2. Move the robot to the mechanical origin.

3. After each axis moves to the mechanical origin, click each option in the list, an input box will pop up, enter the correct data and click OK.

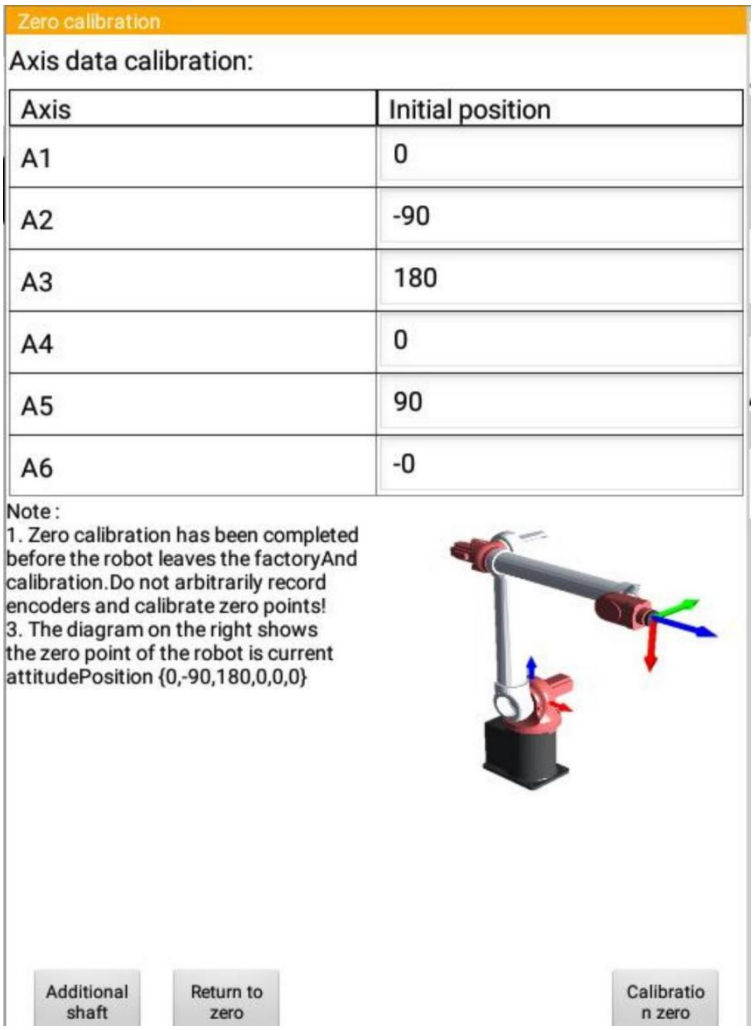
4. After inputting the data of each axis, click the [Calibration] button to save the data, which will take effect immediately. Whether the saving is successful can be checked by the current position data and encoder value data.

Restoring zero point save operation steps

1. Click" Menu → Put into Operation → Adjustment → Calibration"

2. Click each option in the list, the input box will pop up, enter the correct data (the same data as the calibration) and click OK

3. After the data input of each axis is completed, click the [Restore] button, it will take effect immediately, and whether the recovery is successful can be checked by the movement back to the zero point.



picture 11-3 Zero calibration

	Note : 1. The mechanical zero position of different models is not the same, and the calibration value is not the same. You can consult the relevant technical personnel, and the calibration value is also different at the non-zero position. 2. After the zero point calibration is completed, the system needs to be restarted to prevent the zero point loss caused by the system upgrade without restarting after the calibration.

11.4 Software limit switches

	This function sets the modification authority to the manufacturer's personnel user.

Description By setting the software limit switch, the axis range of all robots and positioning

axes can be limited.

software limit switch is used for robot protection, and after setting, it can ensure that the robot runs within the setting range.

software limit switches are set while the industrial robot is running. According to the site environment, set the corresponding limit for each axis in turn, and the unit of axis data is radian.

Note : When setting the limit information, the value of the negative limit must be less than the value of the positive limit.

⚠	robot is put into operation, the limit switch must be enabled and the corresponding axis data must be set, otherwise losses may be caused. The limits are based on the range of motion derived from the robot's calibrated zero point, which is a precondition.

Operation steps

1. Click the menu option, then click "put into operation → software limit switch" in turn

2. Select an axis, edit the limit data in the table, and click Limit Enable [On/Off] to enable or disable the enable limit.

3. After setting the software limit information of all axes, click the [Save] button, and the settings will take effect immediately.

Software limit switch

Axis	Eg	Current location	A surname	enable
A1[°]	-145.0	0	145.0	ON
A2[°]	-145.0	-90	60.0	ON
A3[°]	30.0	180.001	270.0	ON
A4[°]	-140.0	0	145.0	ON
A5[°]	-110.0	90	140.0	ON
A6[°]	-360.0	0	360.0	ON

Additional shaft

picture 11-4 Software limit setting

11.5 Coordination group calibration

Instructions

When the robot shaft group and the external shaft displacement unit perform cooperative actions, the mutual position relationship between them must be determined in advance. The process of determining the mutual position relationship is the calibration between the robot axis group and the external axis group.

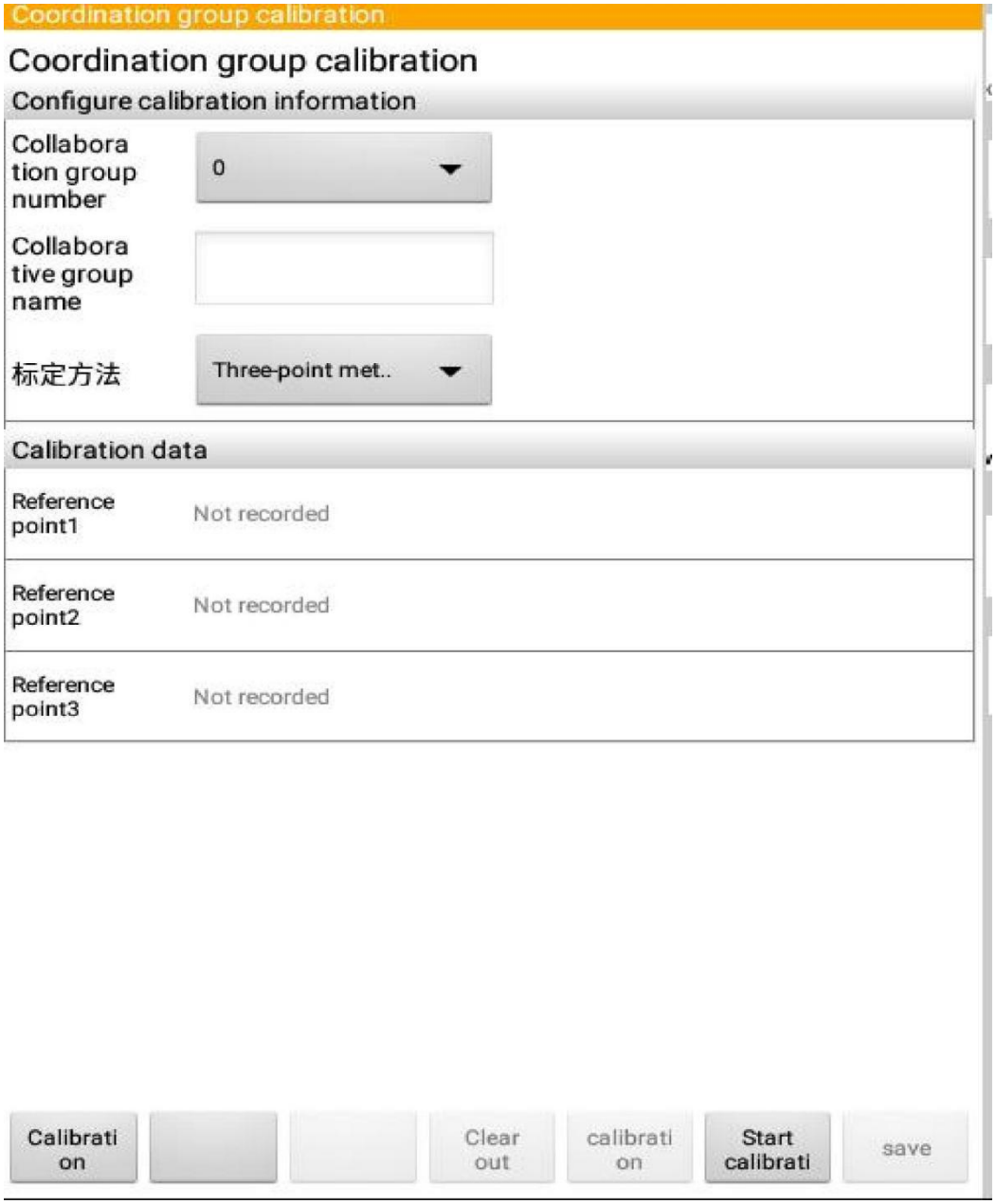


Figure 11-5 Collaboration group calibration

Operation procedure

1. Select Put into Operation → Coordinate group calibration from the menu.

2. Click the Synergy Group Number drop-down box and select the synergy group number. (This parameter cannot be set arbitrarily. Select the collaborative configuration group number you just set.)

3. Click the "Collaborative Group Name" input box and enter the annotation of the collaborative group number.

4, select the "calibration method" drop-down box option, select the 5 point method (2 external axis coordination use 5 point method calibration, 1 external axis use 3 point method calibration).

5. Click the "Start calibration" button, obtain the moving robot arm and external axis in turn, and record the coordinate points (see below for calibration formula).

6, after the record is completed, click the "calibration" button, the calibration result will pop up.

7. Click [Save] button to complete the collaborative group calibration.

	When conducting collaborative calibration, the following conditions must be met: The external axis has been zero-calibrated. sets the external shaft limit. Calibrates the tool. Click the [Calibration Result] button to check whether the current collaboration group number is in use. must be calibrated in the positive direction of the robot

The calibration steps are as follows:

(1) Determine an arbitrary point (P point) on the turntable of the positioner (the position as far as possible from the turntable rotation)

Merge the control point of the robot with point P, log in to C1, and record the first point

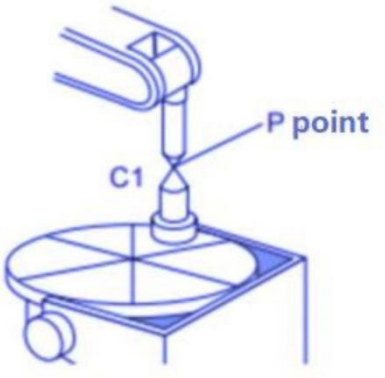


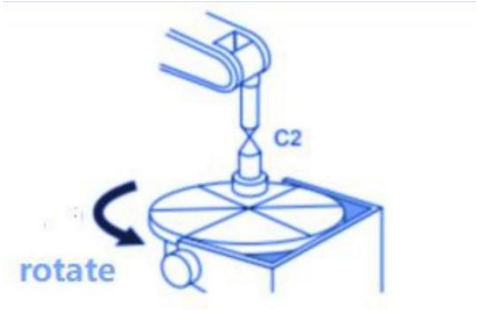
Figure 11-6 Coordinated 3 - point calibration

(2) Rotate the positioner shaft by any amount.

There is no limit to the amount of rotation, but please choose more than 30 .°

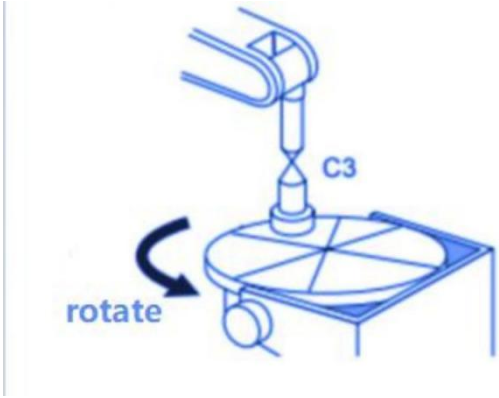
You can choose direction +-.

Merge the controller point of the robot with the selected P point, log in to C2, and record the second point



picture 11-7 Coordinated 3 - point calibration

(3) Rotate the positioner axis in the direction of rotation in step 2, merge the control point of the robot with the rotated point P, and log in to C3.

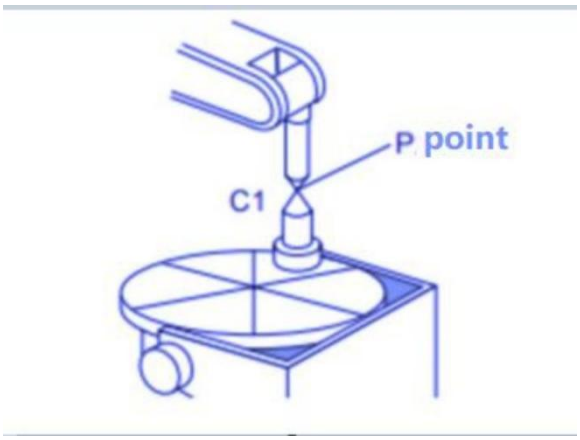


picture 11-8 Coordinated 3-point calibration

If the positioner has two rotation axes, the five-point method is required for calibration:

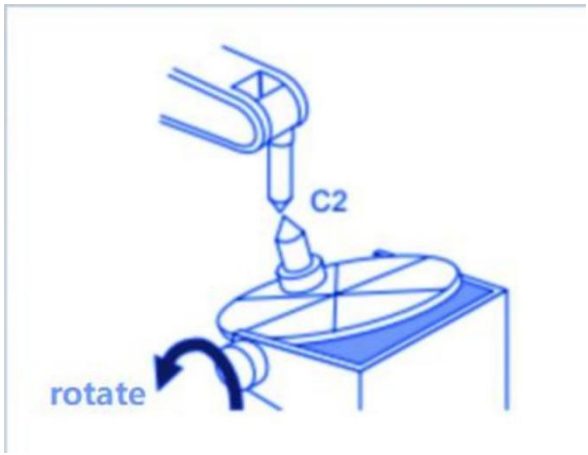
(1) Determine an arbitrary point (P point) on the turntable (the position as far as possible from the rotation center of the turntable).

Make the first axis of the positioner axis in a horizontal state with the ground, merge the controller point of the robot with the P point, log in C1, and record the first point.



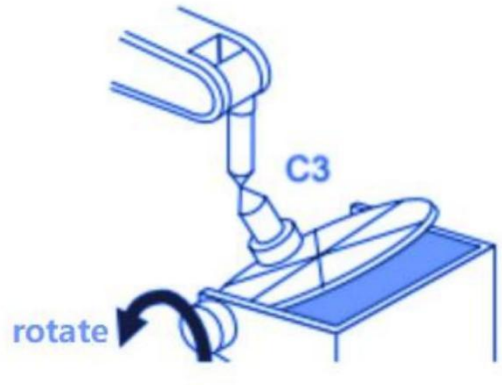
picture 11-9 Coordinated 5-point calibration

(2) Rotate the first axis that becomes the machine axis by about 30°, merge the controller point of the robot with the P point, register C2, and record the second point.



picture 11-10 Coordinated 5-point calibration

(3) Rotate the first axis of the positioner axis by about 30°, merge the control point of the robot with the P point, register C3, and record the third point.



picture 11-11 Coordinated 5-point calibration

(4) Return to point C1 and rotate the second axis of the positioner axis by about 30°. Merge the control point of the robot with point P, log in to C4, and record the 4th point.

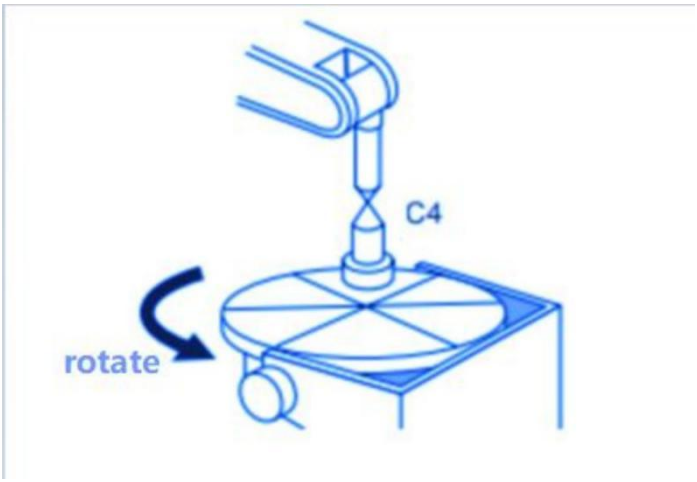
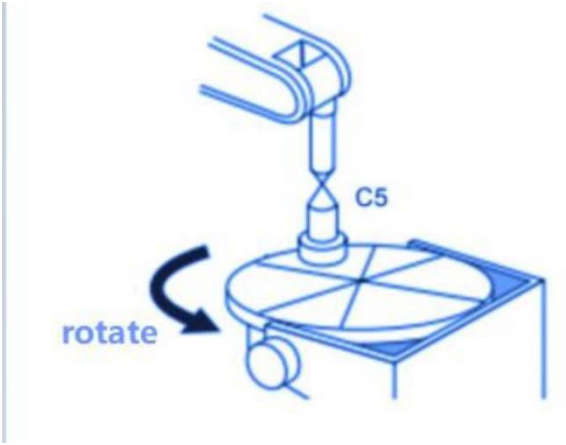


Figure 11-12 Coordinated 5-point calibration

(5) Rotate the second axis of the positioner shaft by about 30°. Merge the control point of the robot with point P, log in to C5, and record the 5th point.



picture 11 -13 Coordinated 5-point calibration

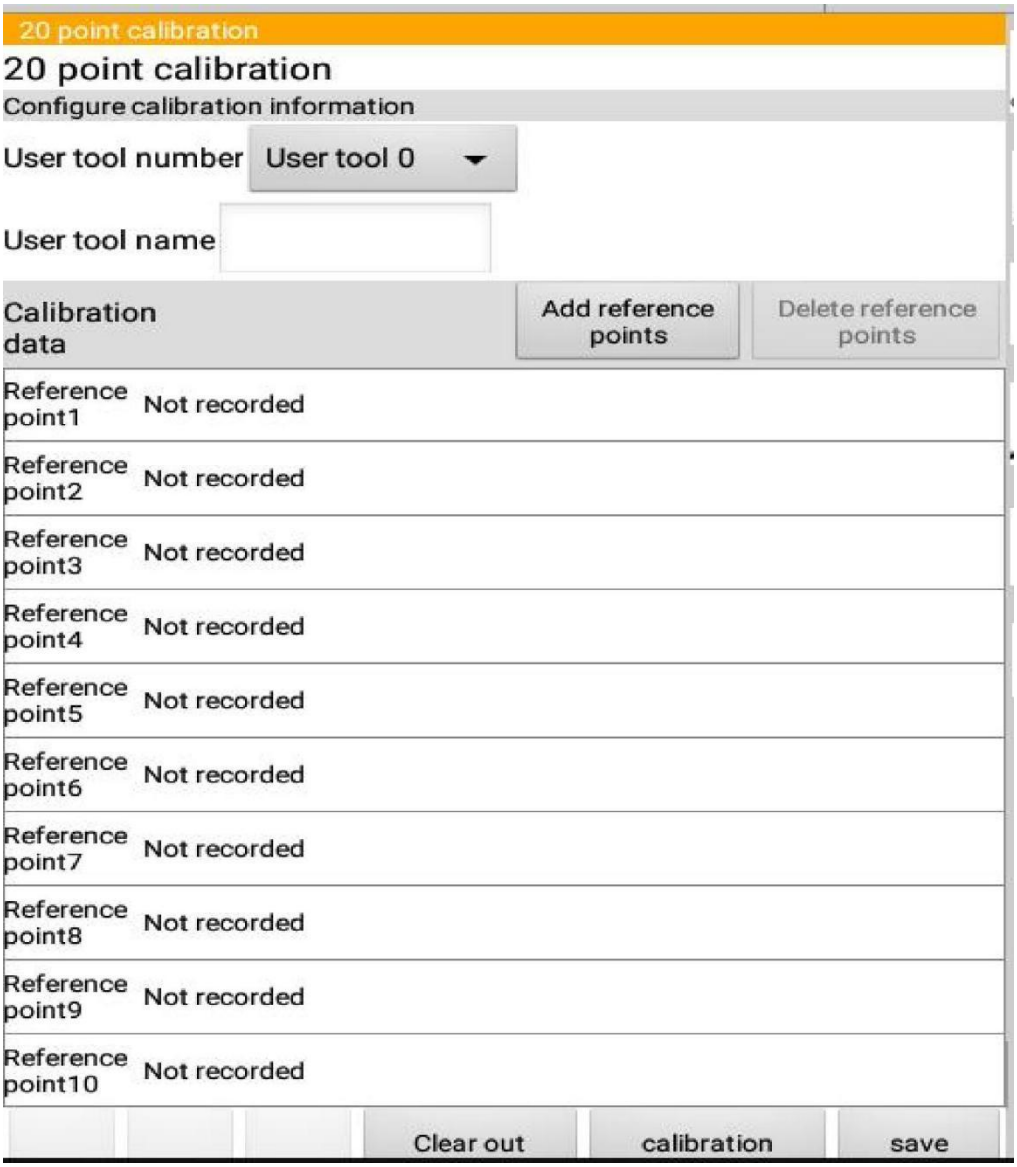
11.6 20-point calibration

Function description

In the case that the accuracy of the tool TCP is high, it can be achieved by using 20-point calibration. The 20-point calibration will mark a high precision tool coordinate system, but because of the need to maintain high TCP accuracy values, the calibration will also modify the zero values of each existing joint.

	Warning: The zero point will change irreversibly after calibration. You are advised to select File Calibration File Parameter Management from the menu to export calibration parameters. Do not operate this function in other circumstances.

The 20-point calibration is often used when a collision causes a change in zero point, which in turn degrades the TCP accuracy of the tool. The 20-point calibration can be used to calibrate the high precision tool TCP and at the same time correct and restore the original joint zero value



picture 11 -14 20-point calibration

Operation procedure

1. Select → Put into operation → 20-point calibration from the menu.
2. Select the tool number you want to calibrate.
3. Through the mobile robot, approach the reference point with different gestures (the difference between the gestures is as large as possible) and obtain the point position information.

4. After obtaining more than 10 points, click [Calibration] button, the system will calculate the offset of zero and the value of the tool coordinate system.

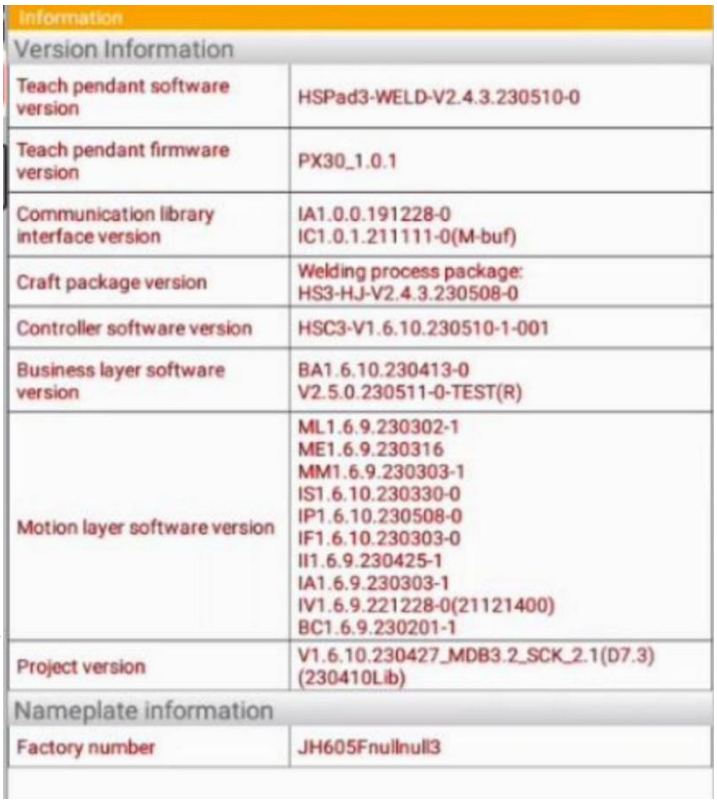
5. Click the [Save] button to save the relevant information.

	Tip: 20 points calibration, where 20 points is only an estimate. Usually only 10 points are needed to complete the calibration, but the more points are obtained, the more accurate the calibration results are. 20 point calibration is performed to shift the zero points of each joint, which may cause changes in the actual position of the points already in the program. 20 point calibration indicates a tool coordinate system with high accuracy. To ensure high accuracy, it modifies the zero values of each axis of the system.

12 Help

12.1 Information

Select Help ->Information from the main menu to view the version information of the current teaching pendant, controller, and robot nameplate in the opened window.



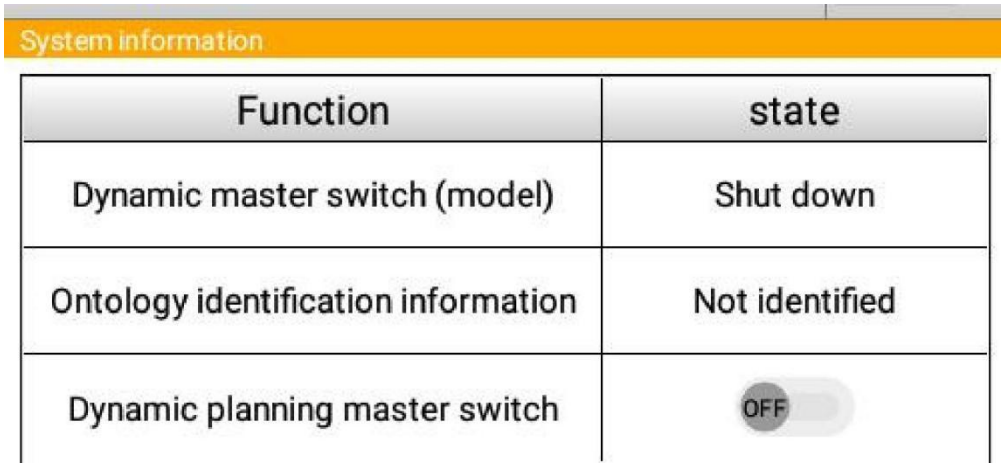
picture 12-1 Information Display Window

12.2 System information

Under the authority of engineers or manufacturer personnel

Operation steps:

1. Choose Menu Bar → Help → System Info. The system Info page is displayed.



picture 12 - 2 system information

12.3 Robot Parameters

This feature is available to all users.

Instructions

Robot parameters Used to view system parameters in detail

Operation steps:

1. Choose Menu Bar → Help → Robot Parameters. The robot parameters page is displayed.
2. Click the option drop-down box to display the details of the selected axis parameters.

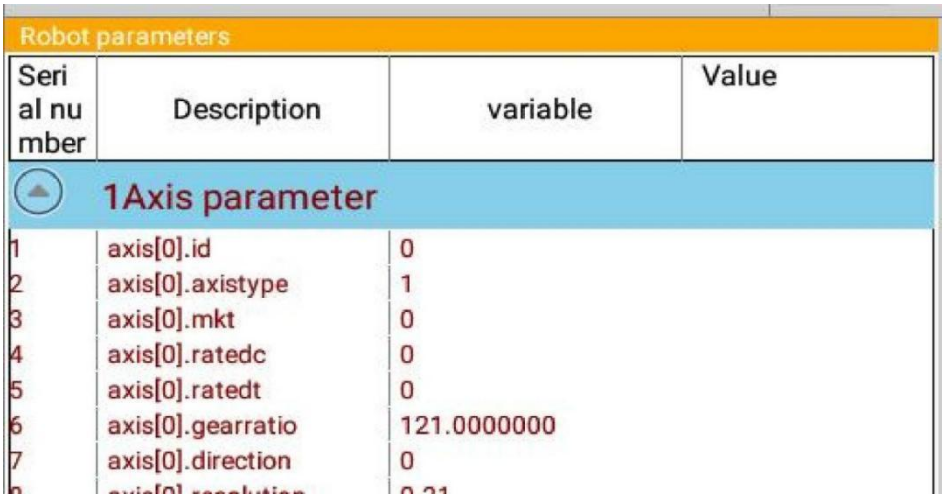


Figure 12-3 Robot parameters

13 Systems

13.1 Revelation Teaching Tool

	This function can be operated by all users.

Steps

1. In the main menu, select System → Reboot the Tutor, and select"OK"in the pop-up dialog box to reset the Tutor.

13.2 Clean up the system

	This function can be operated by all users.

Explain that this function is used to release the storage space of the controller and clean up the remaining upgrade package files. When upgrading the system version, you need to clean up the system first.

Operation steps

1.System in the main menu, and select"OK"in the pop-up dialog box to complete the cleanup work

13.3 Shut down the system

	The modification permission of this function is set to engineer user and above.

Operation steps

2.1. Open the menu, click"System → Shutdown System"in turn, and select"OK" in the pop-up dialog box to shut down the controller system.

13.4 Restart the system

	The modification permission of this function is set to engineer user and above.

Note that this function is used to restart the Type III controller system, which is different from power-off restart (in some scenarios, power-off and restart mode is required to restart the system).

Steps

1. In the main menu, select System→Restart the system, and select"OK"in the pop-up dialog box to restart the controller.

controller

	Some settings take effect after restarting the system, such as: load, send register file, etc.

13.5 System Upgrade

	This function sets the modification authority to the manufacturer's personnel user.

Note In the teach pendant, an upgrade function is provided, which is convenient for users to upgrade directly on the teach pendant. The suffix of the upgrade file is. tar.gz.

Steps

1. Select System →Upgrade System from the main menu to display the upgrade window.
2. Select the upgraded file.
3. Click Send Update Package.
4. Power off and restart the control system

	Before upgrading the system, you need to [Clean up the system] to free up space

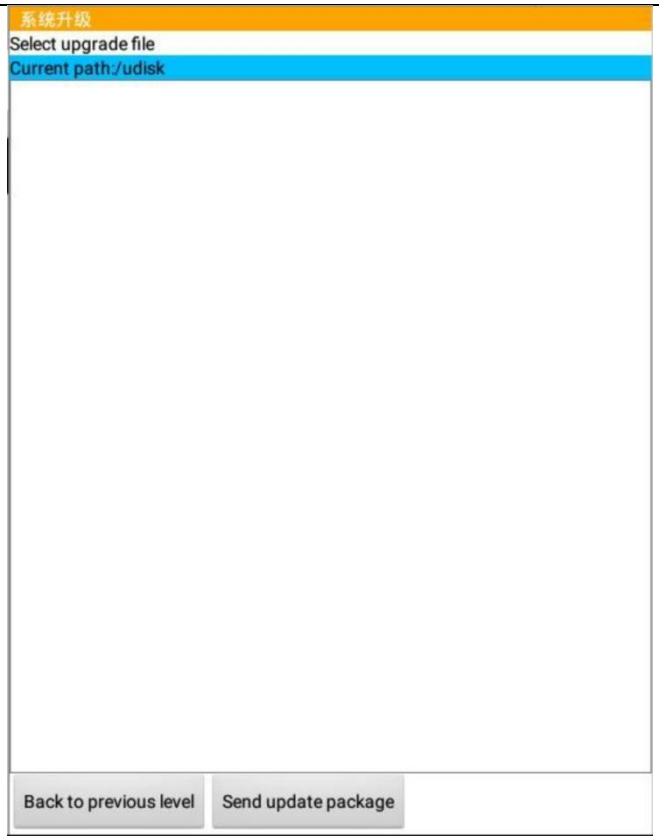


Figure 13-1 System upgrade

13.6 Authorization

	If a controller is used, authorization is required. This function sets the modification permission to the vendor user.

Instructions

In the new version of the controller software, the licensing function has been added and the trial time limit has been increased

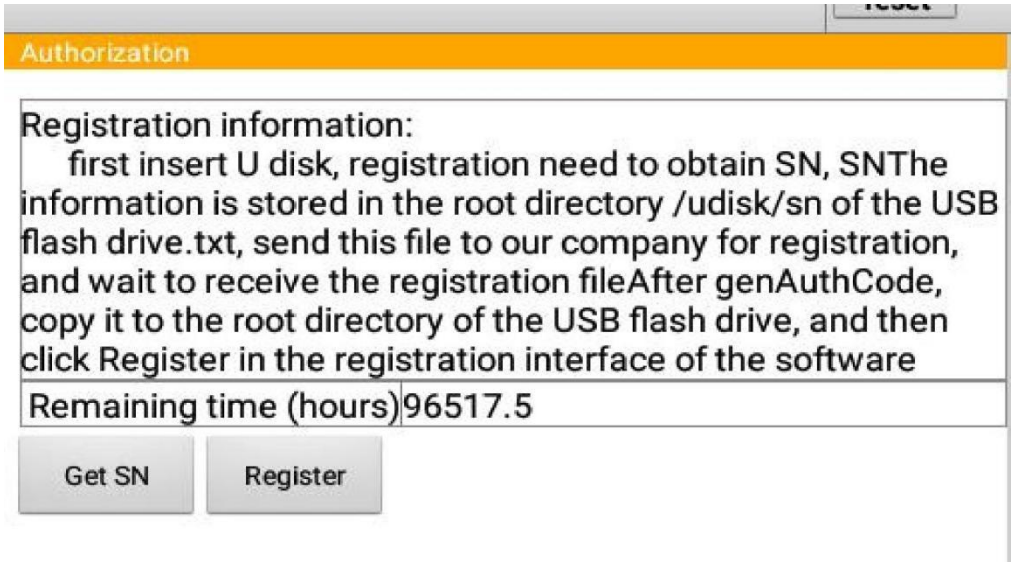


Figure 13-2 Entitlement

Operation procedure

1. Choose System > Authorization from the main menu.

2. Insert the USB flash drive and click SN to obtain the sn. A file named sn.txt is generated on the USB flash drive, which needs to be sent to the company for registration.

3. Put the registration file genAuthCode into the USB flash drive, insert the USB flash drive, and click Register to complete the registration.

13.7 Language settings

Steps

1. Select System →language settings
2. Tap the language you want to switch
3. Click“sure"button

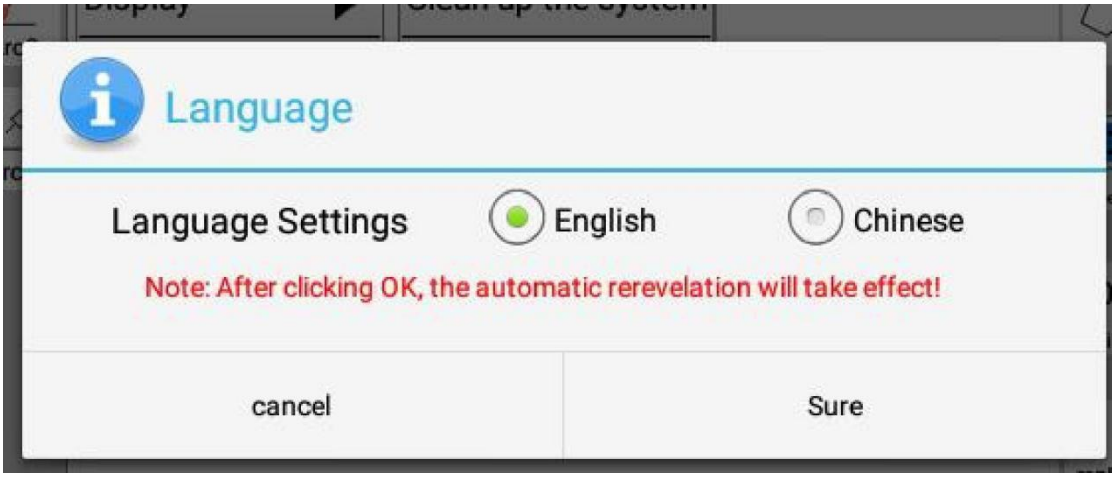


Figure 13-3 language settings

14 Welding process package

14.1 Process package management

	This function sets the modification authority to the manufacturer's personnel user.

Explain that the process package management is divided into two parts, one is the installation

and uninstallation of the process package, and the other is the installation and uninstallation of the dynamic library.

Steps to install the technology package

1. Open the menu and click "Configuration→Teach Pendant Configuration → Process Package Management"

2. Click the [Install Process Package] button, and the U disk file selector will pop up

3. Select the corresponding file, click OK, and wait for the installation process package to be successfully prompted that the installation is successful.

Steps to uninstall the technology package:

1. Open the menu and click "Configuration→Teach Pendant Configuration → Process Package Management"

2. Select the process package to be uninstalled in the process package list. After selecting it, click the [Uninstall process package] button and follow the prompts. After the process package is uninstalled successfully, the process package information in this row in the process package list will be deleted.

Steps to install dynamic library

1. Open the menu and click "Configuration→Teach Pendant Configuration → Process Package Management"

2. Click the [Install Dynamic Library] button to pop up the U disk file selector

3. Select the corresponding file, click OK, and wait for the successful installation of the dynamic library to indicate that the installation is successful.

uninstall the dynamic library :

1. Open the menu and click "Configuration→Teach Pendant Configuration →Process Package Management"

2. Select the dynamic library to be uninstalled in the dynamic library list. After selecting, click the [Uninstall dynamic library] button and follow the prompts. After the successful uninstallation, the dynamic library information in this row in the dynamic library list will be deleted.

picture 14-4 Process package management

	After the process package is installed, you can enter the related process package configuration interface in the first-level menu "process package", which requires a tool U disk.

Explain that the

welding process package is the welding parameter setting module of the welding system, which can set parameters such as welding machine brand, welding machine working mode, welding current and voltage.

Steps

Click "Process Package - Welding Process Package" in the first-level menu bar to enter the welding process package interface.

14.2 Welding package

Instructions:

The welding process package is the welding parameter setting module of the welding system, which can set the welding machine brand, welding machine working mode, welding current and voltage and other parameters.

Operation procedure:

Click" Process Package - Welding Process Package"in the first-level menu bar to enter the welding process package interface

14.2.1 Main interface of welding process system

Open the teach pendant menu: process package -> welding process package, you can enter the main interface of the welding process system, as shown in Figure 14-1 below:

Figure 14-1 Welding process system interface

System configuration: The system configuration mainly sets the welding machine brand, the number of welding channels, the brand of the gun cleaning station, the number of arc strikes, and the working mode of the welding machine.

Welder curve configuration: Set the mapping curve of current and voltage.

Process parameters: Set the process parameters of the welding channel (a total of 10 groups

of process parameters can be set), including welding machine working mode, arc starting/end arc voltage/current, welding voltage/current, welding speed, etc.

Output statistics: Count the number of times the specified program runs, that is, the specified product production quantity.

Authorization: The process package authorization interface, the welding process package needs to be authorized before it can be used.

Analog correction: The analog correction function is to measure, compare and calibrate the actual output value and the set value of analog channel 2, so that the actual output value and the input value tend to be consistent, so as to ensure that the current parameters fed back to the welding machine are more accurate. precise. This function is only displayed under the manufacturer personnel user.

14.2.2 Welding system configuration

	modification authority of this function is set to engineer users and above, and production users can only view it.

Open the teach pendant selection menu: Process Package—> Welding Process Package —>System Configuration; as shown in Figure 14-2 below :

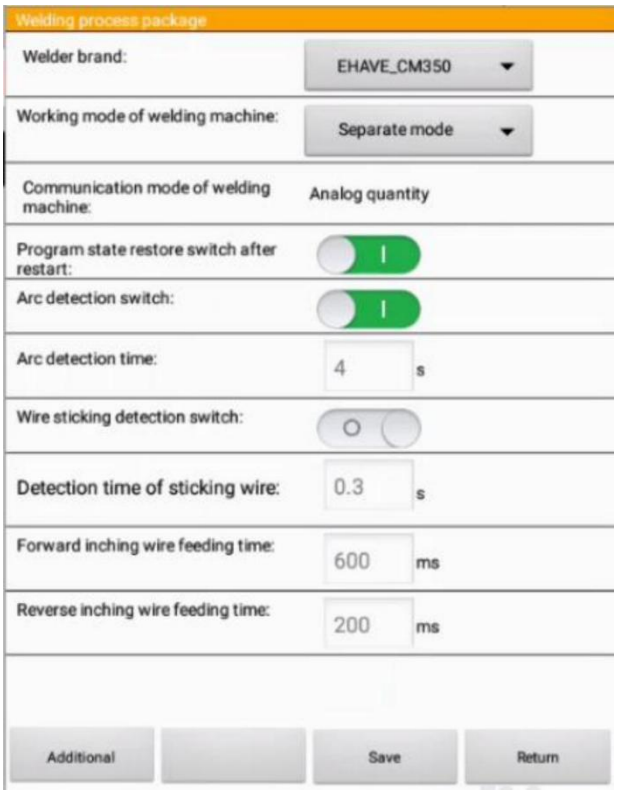


Figure 14-2 Welding system configuration

It can be seen from the interface that the welding system configuration has 7 configuration items (as shown in Figure 14-2) :

(1) Welding machine brand : At present, O TC, Aotai, Megmeet and Fornis and other welding machines have been configured.

(2) Welding machine working mode : There are 3 working modes in total, and the common working modes of analog welding machine are: unification and separate mode.

(3) Welding communication mode: display the current welding machine communication mode.

(4) Program state restoration after restart: whether to restore the program state after restart after opening, closing and restarting, and whether to restore the program state after opening, the programs loaded before restart will be automatically loaded after restart and automatically jump to the running line before restart, the program state will not be restored after restart after closing, and the programs loaded before restart will not be automatically loaded after restart. This function is off by default.

(5) Arc detection switch: The arc detection function can be turned on or off, and the function is turned on by default.

(6) Arc detection time: Set the arc detection time, the range is 0~10S, the default is 4S.

(7) Sticky wire detection switch: You can turn on or off the sticky wire detection function, which is enabled by default.

(8) Sticky wire detection time: Set the arc detection time, the range is 0~1S, the default is 0.3S.

(9) Forward jog wire feeding time：Set the forward jog wire feeding time, with a range of 70-800ms.

(10) Reverse jog wire feeding time：Set the reverse jog wire feeding time, with a range of 100-1000ms.

Note: The welding machine brand, welding work mode, arc detection switch and wire sticking detection switch in the system configuration will take effect immediately after

modification. After restarting the system without clicking the"Save Configuration"button, the previous settings will be restored. After modification, click"Save Configuration"to restart the system and the last configuration shall prevail.

Click the"Additional function configuration"button to enter the additional function configuration interface, which can configure the three-color light control switch, LED control switch, reference point switch, gas flow detection threshold data settings and switches (as shown in Figure 14-3).

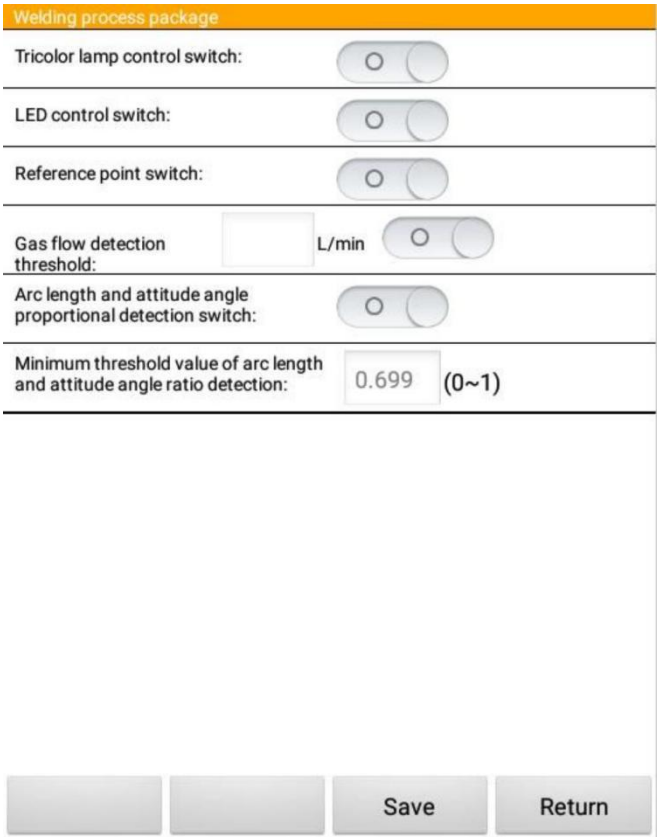


Figure 14-3 Additional function configuration

(1) Tri-color light control switch: It can be turned on and off the tri-color light, the default is off.

(2) LED control switch: can turn on and off the LED display, the default is off.

(3) Reference point switch: You can turn on or off the reference point judgment function when the external mode is started. After the operation is changed, you need to click the save button in the configuration-controller configuration-running configuration-program configuration according to the prompt to take effect. This function is enabled by default.

(4) Gas flow detection threshold: Set the size of gas flow, next to it is a switch, after it is turned on, it will judge whether there is still gas in the actual arc during the actual welding process, if there is no gas, the arc will fail and stop welding. The setting range is 0. 1~30L/min.

(5) Arc length and attitude angle proportion detection switch: it can turn on and off the arc length and attitude angle proportion detection function. When the arc length between the two adjacent points of the taught arc is smaller than other segments, the attitude change of these two points should also be smaller than other arc segments. If the attitude change does not match the arc length, the attitude change speed will be uneven (the terminal speed will not be affected), and there will be serious jitter, When the program executes to this arc segment, it will alarm. When off, the length between two points of the arc is not detected. This function helps to improve arc jitter.

(6) Ratio detection threshold of arc length and attitude angle: set the ratio detection threshold of arc length and attitude angle. The threshold can be adjusted according to the arc demand of teaching welding section. The greater the threshold, the more stable the arc running of successful teaching. The setting range is 0~ 1.

14.2.3 Welder curve configuration

	modification authority of this function is set to engineer users and above, and production users can only view it.

14.2.3.1 Welding voltage curve configuration

The curves corresponding to different welding machine brands are different. Enter the welding curve configuration page and click" Welding Voltage"below to configure the input and output curves ofthe welding machine voltage, as shown in Figure 14-4 :

The specific operations are:

1) If you know the minimum and maximum voltage of the welding machine, you can directly fill in the voltage range value into the input box, otherwise follow steps 2 to 5 to test to obtain the output voltage curve of the welding machine

2) Enter the voltage value in the input box on the right side of the analog A O1 (range: 0~ 10, it is recommended to start from 0, gradually increase and test), click"Enable",

3) Observe the display value of the welding machine voltage, whether it is the minimum value, if so, change the value of A O1, repeat the operation of step 2, until the minimum voltage value of the welding machine panel changes, remember the value of A O1 at this time and fill in In the output voltage input box,

4) Enter a voltage value in the input box on the right side of the analog A O1 (range: 0~ 10, it is recommended to start from 10, gradually reduce and test), click"Enable",

5) Repeat steps 3 and 4 until the maximum voltage value of the welding machine changes, remember the value of A 01 at this time and fill in the output voltage box

6) Verify whether the output voltage curve is correct. In the welding machine value test input box, enter the welding machine voltage value to be tested, and observe whether the deviation between the voltage value displayed on the welding machine panel and the input value (theoretical value) is within the allowable range (The maximum deviation of voltage and voltage is 1% of full scale), if the deviation is too large, reconfigure according to steps 1~ 5.

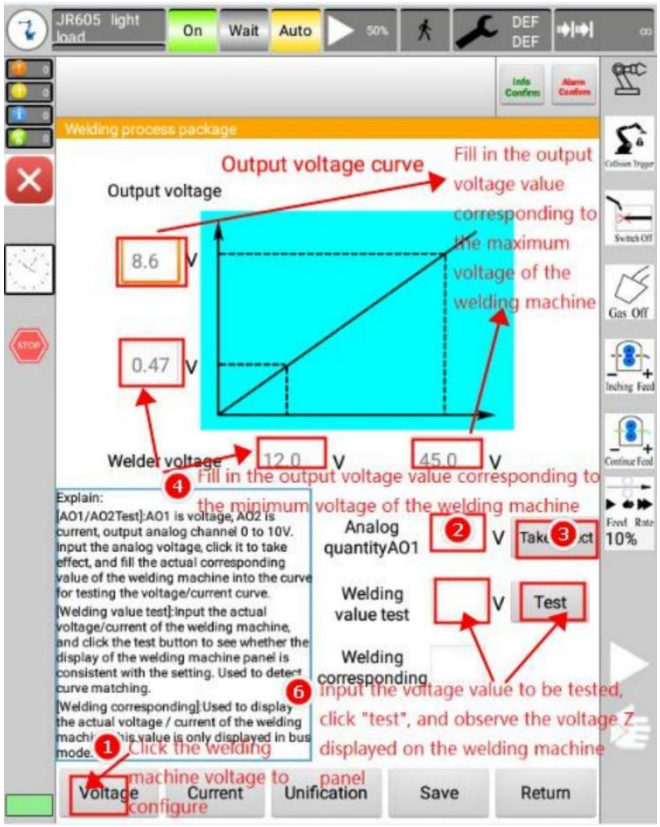


Figure 14-4 Welder Curve Configuration

14.2.3.2 Welding current curve configuration

Refer to 14.2.3.1 Welding voltage curve configuration process to configure

14.2.3.3 Unary curve configuration

The analog communication welding machine needs to switch to the unary mode on the welding machine panel first, and then configure it according to 14.2.3.1 welding voltage curve configuration process.

14.2.4 Process parameters

	modification authority of this function is set to engineer users and above, and production users can only view it.

Enter the welding process package process parameter setting interface as shown in Figure 14-5, which is mainly divided into message prompt area, menu selection area, content display, and button operation area.

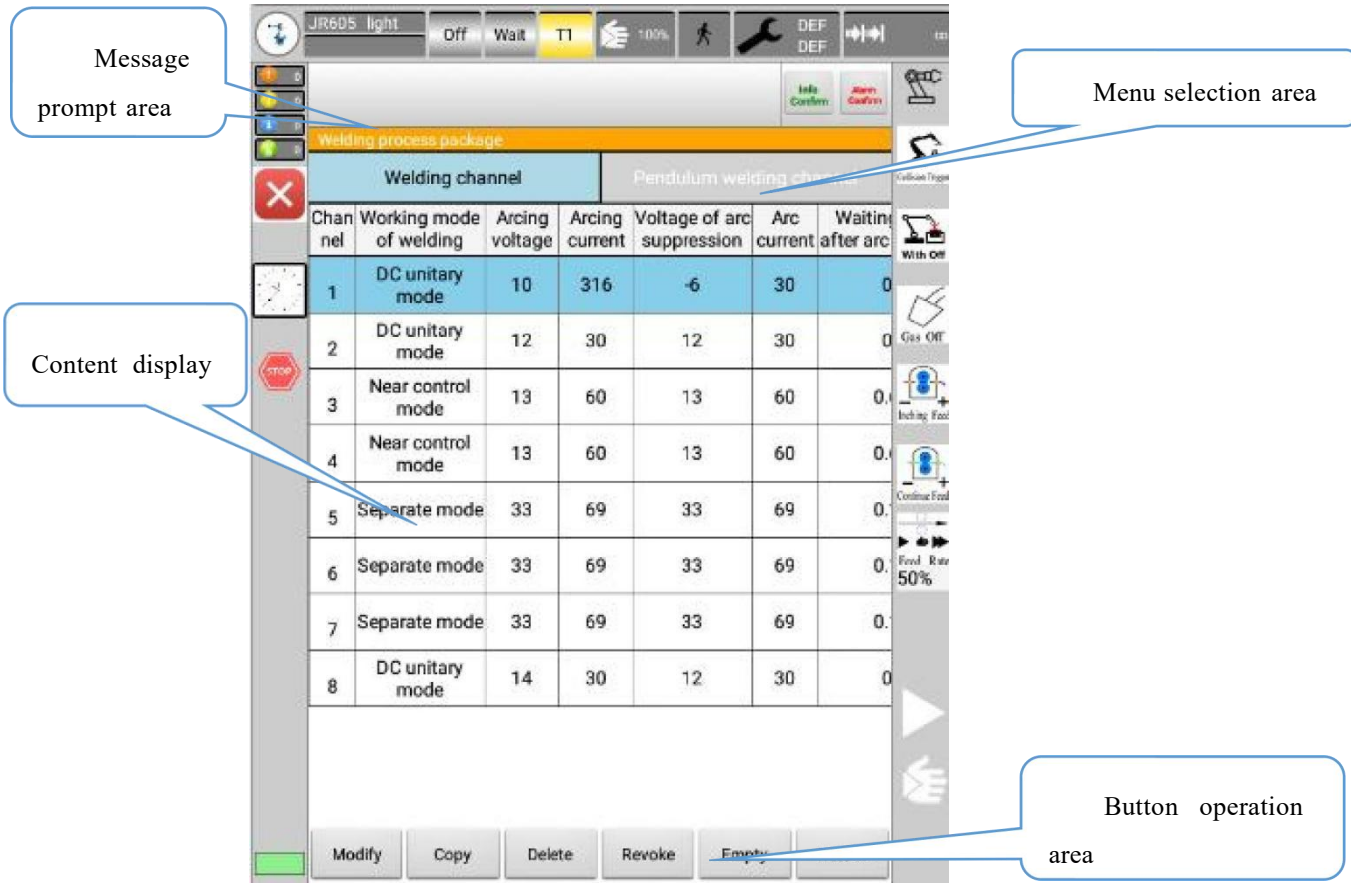


Figure 14-5 Process parameter setting interface

（1） The message prompt area is to display the feedback of the setting information, such as whether the setting is successful after setting the parameters, whether the deletion is successful after the channel is deleted, and so on.

（2） The menu selection area is to choose to enter different setting interfaces. The menu selection area includes welding channel and weaving welding channel. Back-arc waiting time,

terminal welding time, welding voltage, welding current, robot magnification, welding speed and other process parameters.

(3) The display area is the main area for displaying welding information.

(4) button operation area includes the modify, copy, delete, undo and clear buttons of the welding channel and the weaving channel setting interface.

14.2.4.1 Welding channel

Welding channel is a group of data saved after setting welding parameters, the number of channels can be configured, up to 30. After the welding channel is set, it can be called by the program.Open the teach pendant selection menu: process package -> welding process package -> process parameters -> welding channel ; the parameters that can be set in the welding channel mainly include: welding machine working mode, arc starting voltage, arc starting current, arc ending parameters, closing arc parameters Arc current, waiting time after arc strike, terminal welding time, welding voltage, welding current, robot speed, retraction time, etc. 11 items, as shown in Figure 14-6 below ;

Welding process package

Welding channel						
Channel	Working mode of welding	Arcing voltage	Arcing current	Voltage of arc suppression	Arc current	Waiting after arc
1	DC unitary mode	10	316	-6	30	0
2	DC unitary mode	12	30	12	30	0
3	Near control mode	13	60	13	60	0.

Figure 14-6 Welding channel process parameters

Channel number: the number of a group of process parameters (1～ 10)

Welder working mode: Generally, there are 8 working modes of welding machine, and there are 2 working modes available for analog welding machine: separate and unified

Arc start voltage: the voltage of the welding machine in the arc start stage

Arc starting current: the current of the welding machine in the arc starting stage

Crater voltage: the voltage of the welding machine in the crater stage

Crater current: the current of the welding machine in the crater stage

Waiting time after arc striking: the time the robot stays at the arc striking point after the arc striking is successful

Terminal welding time: the time the robot stays at the welding end point

Welding voltage: the voltage of the welding machine in the welding stage

Welding current: the current of the welding machine in the welding stage

Welding speed: The welding speed of the robot during the welding phase

Retraction time: the time for wire retraction

14.2.4.2Modification

Steps for welding pass modification:

（1） Select the row to be modified;

（2） Click the" Modify"button below the channel list, and the channel modification dialog box shown in Figure 14-7 will pop up;

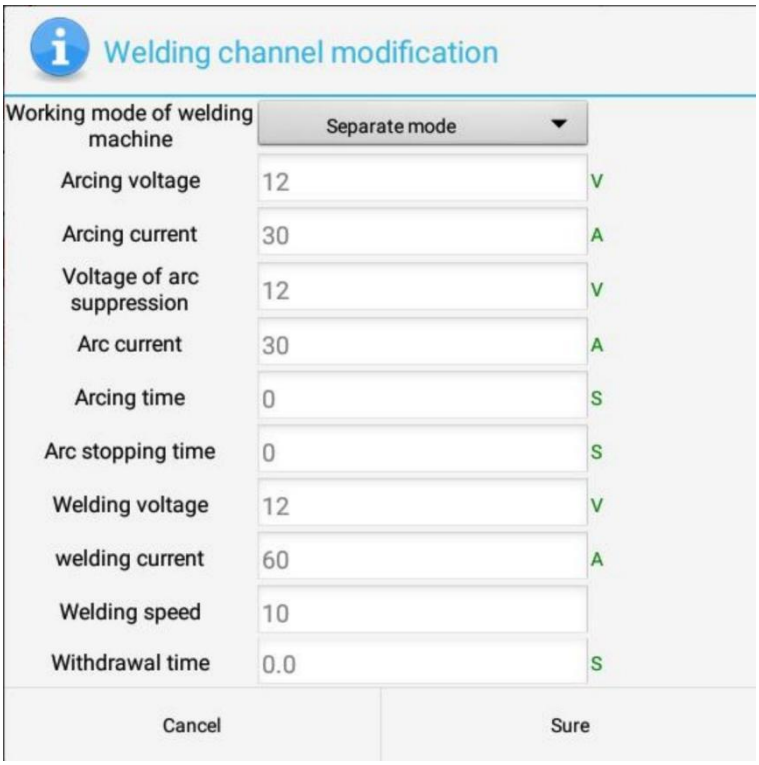


Figure 14-7 Weld channel modification dialog box

In the modification dialog box, the current parameter value is displayed by default. The welding machine working mode is an optional item, and the others are input values. Enter a certain value to be modified.

(3) Click"OK"to complete the modification.

14.2.4.3 Replication

Steps for channel duplication:

（1） Click the" Copy"button below the channel list, and the channel copy dialog box shown in Figure 14-8 will appear;

Figure 14-8 Channel copy function

（2） The channel copy dialog box includes the source channel number and the target channel number. Enter the line number to be copied in the edit box after the source channel number, and enter the line number of the line copied to the target channel number;

(3) Click the"OK"button to execute the channel copy operation;

14.2.4.4 Delete

（1） Select the row to delete;

（2） Click the"Delete"button below the channel list;

(3) Figure 14-9 pops up the prompt box of whether to delete the channel, click the"OK"button to execute the delete operation;

Figure 14-9 Delete channel prompt box

14.2.4.5 Revocation

The function of the undo operation is to undo the last modification, copy or delete operation, and the undo operation is only valid for the latest operation. After clicking cancel, it will take effect immediately.

14.2.4.6 Clear

Empty is to delete the data of all channels.

Steps to clear the channel:

（1） Click the"Clear"button under the channel list, and the following dialog box will pop up

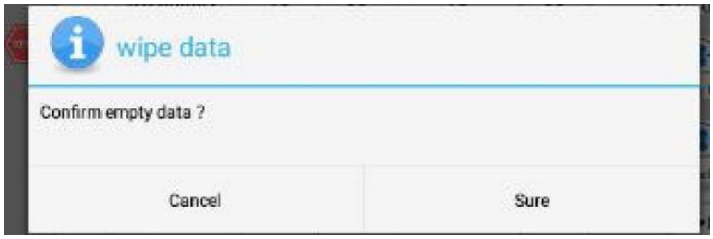


Figure 1 4-10 Whether to clear the channel prompt box

（2） Click the"OK"button to clear the channel;

14.2.4.7 Weaving channel

Weaving welding channel is a set of data saved after setting welding parameters. The number of channels can be configured, up to 10. After the weaving welding channel is set, it can be called by the program.

Open the teach pendant selection menu: Process Package—> Welding Process Package—> Process Parameters—> Weaving Weaving Channel ; the parameters that can be set in the weaving welding channel mainly include: swing track type, swing shape, swing frequency, swing amplitude, swing plane, Whether to stay, left stay time, right stay time and other 8 items, as shown in Figure 14-11 below ;

Welding process package							
Welding channel				Pendulum welding channel			
Channe	Type of	Swing	Swing	Amplitud	Swing	Stay or	Le
1	straight line	Z font	3	3	YZ Plane	No	
2	arc	Z font	4	3	90	No	
3	straight line	Z font	3	3	YZ Plane	No	
4	arc	Z font	4	3	90	No	

Figure 14-11 Weaving welding channel

For the related operations of the weaving welding channel, refer to the welding channel.

Note: The speed of weaving welding divided by the frequency needs to be greater than or equal to 2.5. 2.5 is the best. Before using weaving welding, you must use the 6-point method to

calibrate the tool coordinates. For detailed steps, refer to the calibration of tool/workpiece coordinates.

Weaving welding channel parameter reference table

serial number	Whether there is any attitude change at the starting point and end point of weaving welding	Weaving welding speed (mm/s)	Weaving welding maximum acceleration	Weaving welding maximum deceleration DEC	C NT
1	have	6 0	6 00	6 00	1 00
2		4 0	1 500	1 500	1 00
3		3 0	3 000	3 000	1 00
4	without	6 0	6 00	6 00	1 00
5		3 0	1 500	1 500	1 00
6		20	3 000	3 000	1 00

Description of table content:

No. 1, when there is no attitude change at the starting point and end point of the weaving welding, the maximum speed of the weaving welding is within 60mm/s, and the acceleration and deceleration can be set to a maximum of 600 ;

No. 2, when there is no attitude change at the starting point and end point of the weaving welding, the maximum speed of the weaving welding is within 40mm/s, and the acceleration and deceleration can be set to a maximum of 1500 ;

No. 3, when there is no attitude change at the starting point and end point of the weaving welding, the maximum speed of the weaving welding is within 30mm/s, and the acceleration and deceleration can be set to a maximum of 3000 ;

No. 4, when the starting point and end point of weaving welding have attitude changes, the maximum speed of weaving welding is within 60mm/s, and the acceleration and deceleration can be set to a maximum of 600 ;

No. 5, when there is a change in the attitude of the starting point and the end point of the weaving welding, the maximum speed of the weaving welding is within 30mm/s, and the acceleration and deceleration can be set to a maximum of 1500 ;

No. 6, when there is a change in the attitude of the starting point and the end point of the weaving welding, the maximum speed of the weaving welding is within 20mm/s, and the acceleration and deceleration can be set to a maximum of 3000 ;

14.2.5 Production statistics

	This function can be operated by all users.

Open the teach pendant selection menu: Process Package—> Welding Process Package— > Production Statistics ; as shown in Figure 14-12 below :

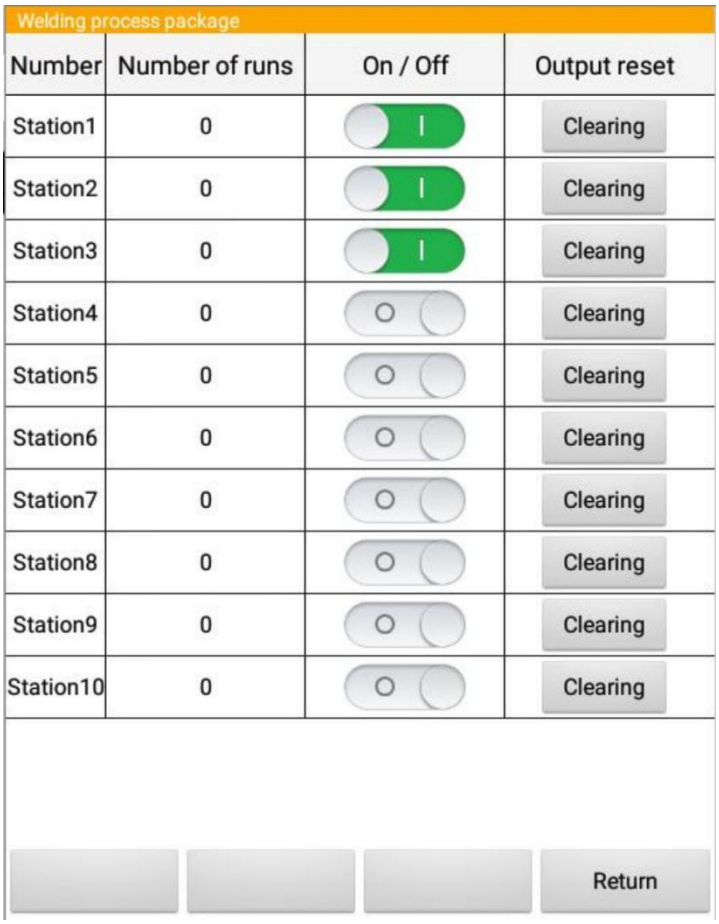


Figure 14-12 Yield statistics function

1. After adding the output statistics command in the program, turn on the switch of the current station (green is on, gray is off), and the number of times the current station is running will be counted, that is, the number of production.

2. Click the clear button, a prompt dialog box will pop up, asking whether to clear the output of the current station, click the OK button to clear the output of the current station.

14.2.6 Runtime statistics

	modification authority of this function is set to engineer users and above, and production users can only view it.

Open the teach pendant selection menu: Process Package—> Welding Process Package— > Running Time Statistics ; as shown in Figure 14-13 below :

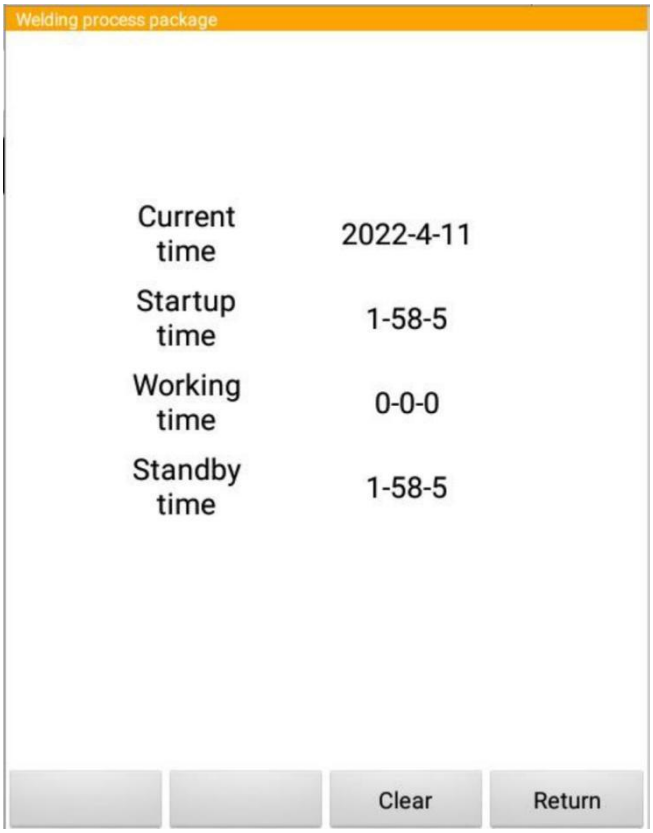


Figure 14-13 Running time statistics function

1. Click the reset button, a prompt dialog box will pop up, asking to confirm the reset time, click the OK button to reset the current time.

14.2.7 Process system license

	modification authority of this function is set to the manufacturer personnel user, and the production personnel and engineer users can only view it.

Note: Welding process system requires separate authorization

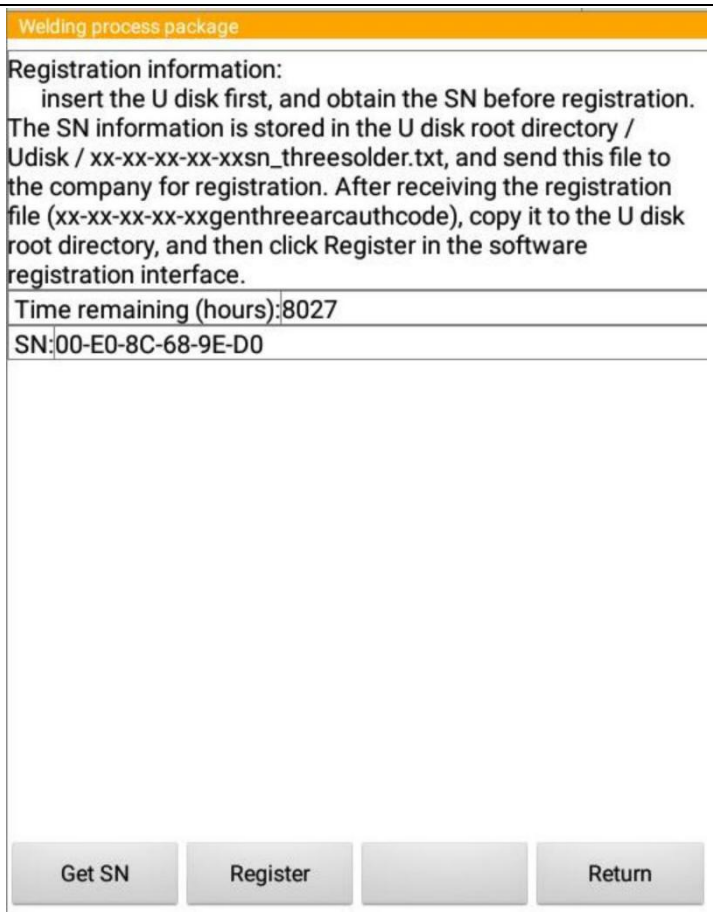


Figure 14-14 Authorization function

Steps:

(1) In the main menu, select Configuration -> Process Package -> Welding Process Package -> Authorization.

(2) Insert the U disk and click to get the SN. At this time, a file named XX-XX-XX

-XX-XX-XXsn_threesolder is generated in the U disk. This file needs to be sent to the co mpany for registration, where X X is the system S N. _

(3) Put the registration file XX-XX-XX-XX-XX-XXgenThreeArcAuthcode into the U disk, insert the U disk, and click Register to complete the registration.

14.2.8 Analog correction

	modification authority of this function is set to the manufacturer's personnel user, and it is only displayed under the manufacturer's personnel user.

Explain that the analog correction function is to measure, compare and calibrate the actual output value and the set value of the analog channel 2, so that the actual output value and the input

value tend to be consistent, so as to ensure that the final current parameter fed back to the welding machine is more accurate;

Steps:

1. After logging in to the manufacturer's user, the main interface of the process package will display the" Analog Correction"function button, click this button to enter the analog correction interface.

2. Select the serial number 1 in the correction interface, then click the delete button on the right to clear all parameters, and then click the" Save"and" Download"buttons to initialize the data;

3.After there is no data, select the correction switch to open the correction function (as shown in Figure 14-

2. .

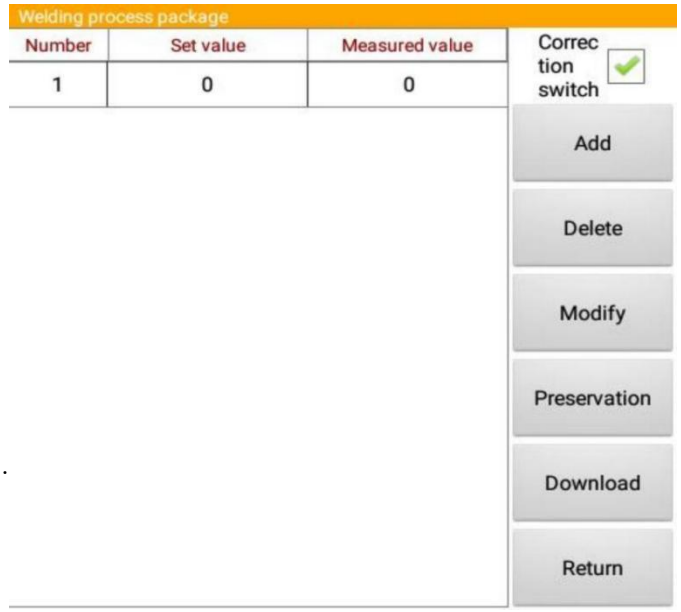


Figure 14-15 Analog correction switch

4. Click the" Add"button on the right, enter the setting value in the pop-up input box and click to take effect, measure the actual output value of the current channel with a multimeter, fill in the actual value, and click OK. Because the range of analog quantity is 0.00V-10.00V, it is required to take about 100 points (0.05, 0.15, 0.25....9.85, 9.95) evenly for calibration to ensure accuracy and retain two decimal places after the decimal point. The set value and the measured value cannot exceed 10.00V. After the correction value is added, click the" Save"and" Download"buttons.

14.2.9 Welding status

	This function can be operated by all users.

Display the current welding function parameter status and process parameter data under bus communication.

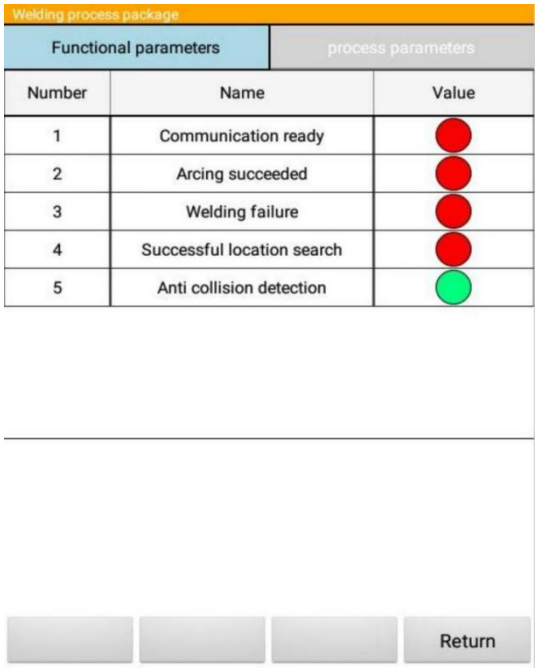


Figure 14-17 Function Parameter Status

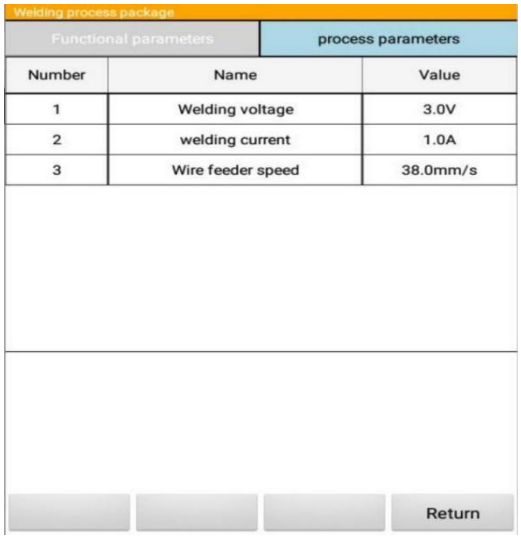


Figure 14-18 Process parameter data

14.3 Torque sensor calibration process package

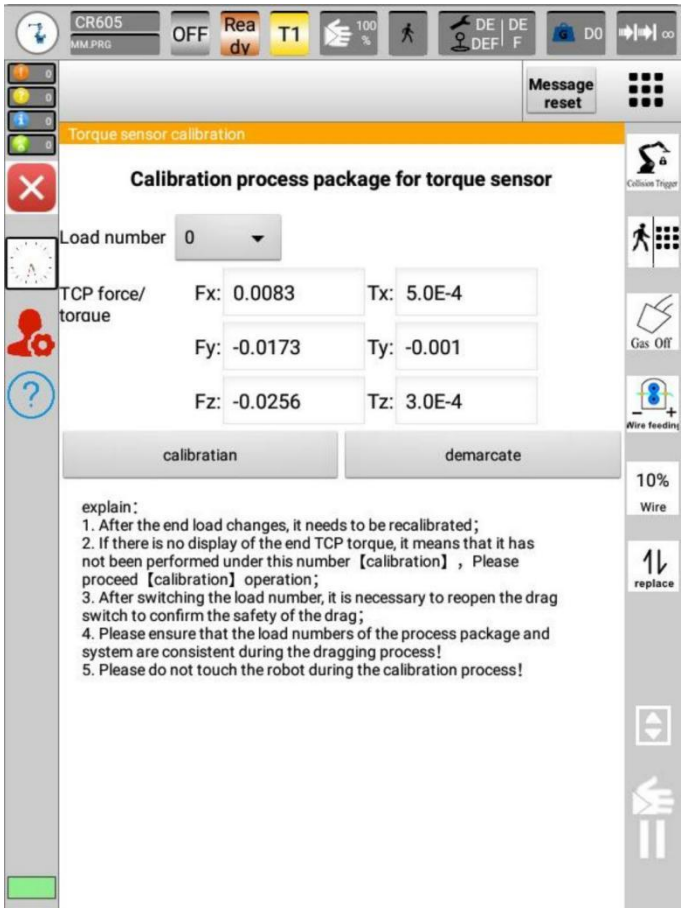


Figure 14-19 Torque sensor process package main interface

The process package is only applicable to version V1.6.11 and the robot has been dynamically identified.

Calibrate the new adaptive sensor, change the sensor installation mode, and change the end load. After the calibration, calibrate the sensor each time.

14.3.1 Sensor calibration

Sensor calibration process:

1 Switch the tool job number in the upper right corner of the demonstrator to default;

② Switch the load number in the upper right corner of the demonstrator to no-load, and select the load number of the process package that needs to be calibrated;

③ Make sure that the load number of the calibration interface is consistent with the selected load number;

④ Set the motion range of each axis;

⑤ Click on trial run;

⑥ Click to start identification, the robot runs the program at this time, and needs to wait for the program to finish;

7 Click to return;

⑧ Click to calibrate;

9 Sensor calibration and calibration completed;

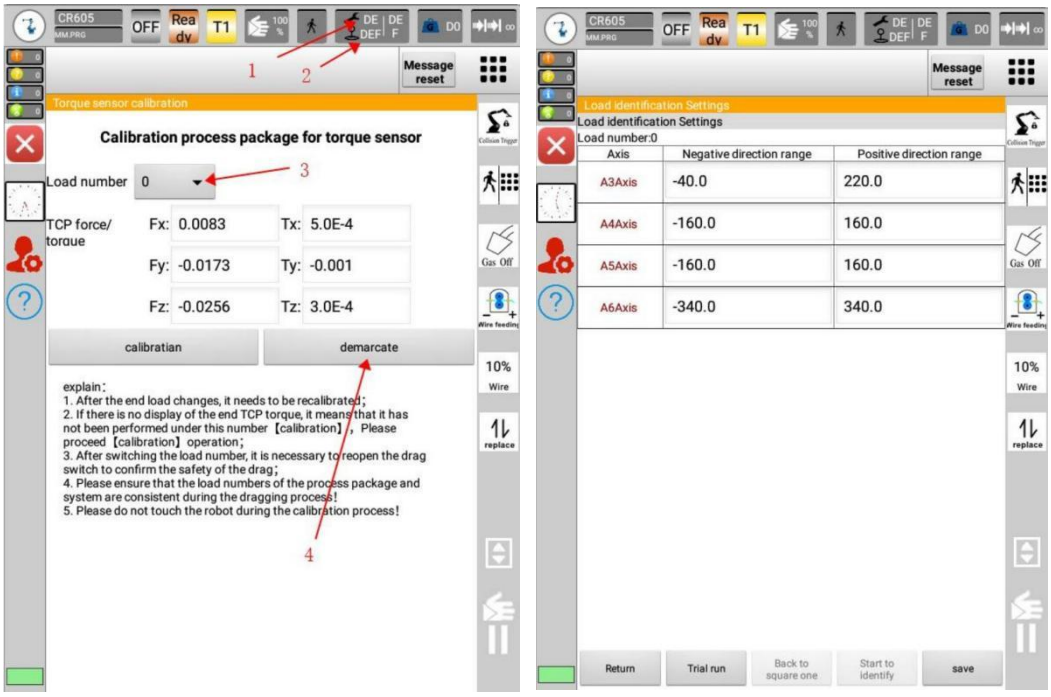


Figure 14-20 Sensor calibration

The front page of the process package displays the current load number, sensor external force value based on the current calibration parameters, calibration and calibration buttons. The calibration button is used when the sensor has been calibrated, and the calibrated sensor is used with zero drift (note: each time the machine is powered on and restarted, the sensor needs to be calibrated); The calibration button is used when the sensor is not calibrated, the sensor installation mode or the end load changes. In these cases, the sensor needs to be re-calibrated. The calibration parameters are bound to the load number and are automatically saved.

14.3.2 Sensor calibration

Select Process Package → Torque Sensor Calibration → Calibration from the main menu

Instructions：

1. Re-calibration is required after the end load changes.

2. If there is no display of TCP torque at the end, it indicates that [calibration] has not been performed under this number, please perform [calibration] operation;;

3. After switching the load number, turn on the drag switch again to confirm that the drag is safe.

4. Do not touch the robot during calibration.

Operation procedure：

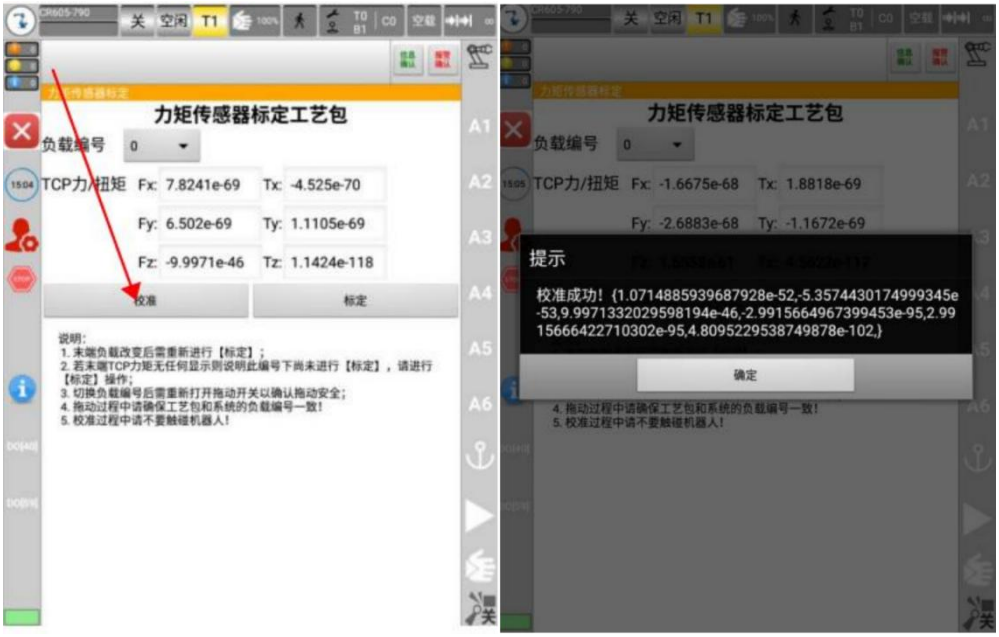


Figure 14-21 Operation procedure

14.3.3 Drag the teach Settings

From the main menu, select Configuration → Dynamics → Drag to teach Settings

Operation procedure: as shown in the figure

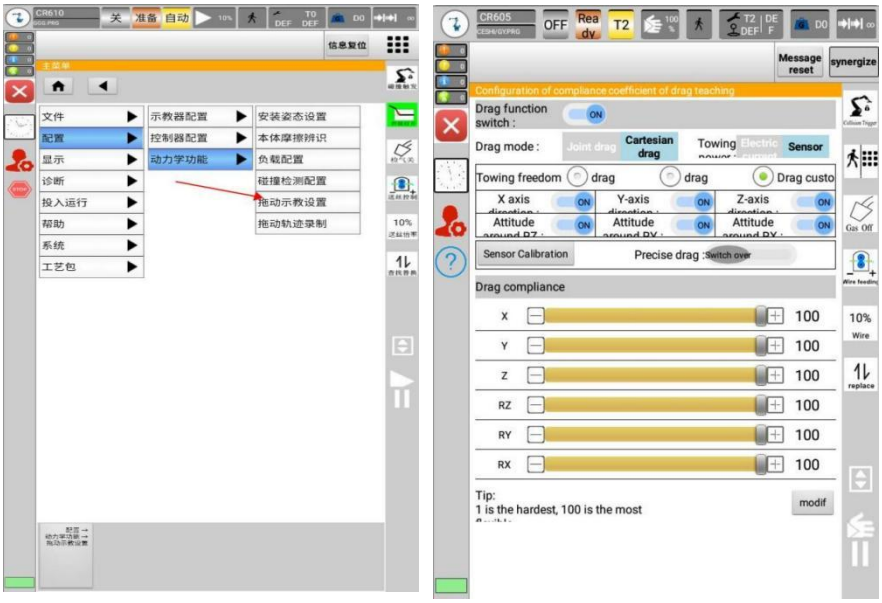


Figure 14-22 Drag the teach Settings

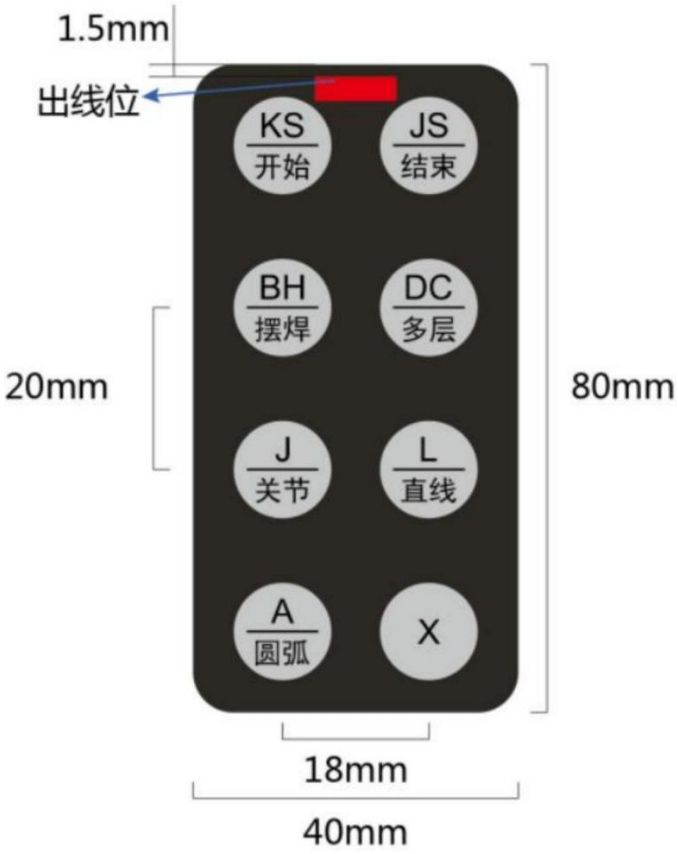
14.4 Drag button

Drag two modes:

Quick drag: Long press the flexible drag button without releasing, and the robot can be dragged.

Precision drag: Long press the flexible drag button without releasing, press the precision drag button once, you can switch to precision drag.

14.4.1 Quick programming key



There are eight keys in total. The mapping between DI and DI is lower：

Function description	Corresponding DI signal
KS	DI12
JS	DI13
BH	DI14
DC	DI15
J	DI16
L	DI17
A	DI18
X	DI19

When the instructor switches to manual mode, that is, T1 or T2 mode, open the program editing interface.

1. Press the"KS"button, the DI13 signal is connected, if the DI13 rising edge is detected, the"Arcing"command will be inserted.

2. Press the"JS"button, the DI13 signal is connected, if the DI13 rising edge is detected, the" Arc Off"command will be inserted.

3. Press the" B H "button, DI14 signal is connected, then press the"KS/"button,"swing

welding start"command and"Arcing"command will be inserted at the same time.

4. "DC"button, DI15 Considering the problem of template application, need to supplement the explanation, reserved. (Currently not in effect)

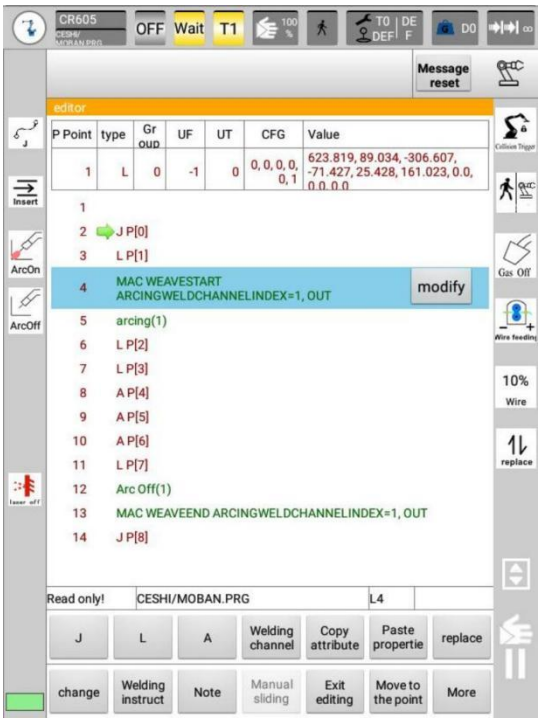
5. Press the"J"button, DI16 signal is switched on, if the DI16 rising edge is detected, insert the"joint"command and record the current robot point position.

6. Press the"L"button, DI17 signal is connected, if the DI17 rising edge is detected, insert the"straight line"command and record the current robot point position.

7. Press the" A"button, DI18 signal is connected, if the DI18 rising edge is detected, insert the"arc"command and record the current robot point position.

8. X：Reserve.

Program example：



15 Program files

15.1 Program file management navigator

Explains that

the user can manage programs and all system-related files in the navigator.

header row

Left area: Displays the selected folder.

Right area: Displays the files under the selected directory in the directory structure. ([Open] button can open the corresponding folder)

Directory Structure

Catalog overview. Which directory is displayed, click to display the directory list.

File List

Displays the contents of directories marked in the directory structure.

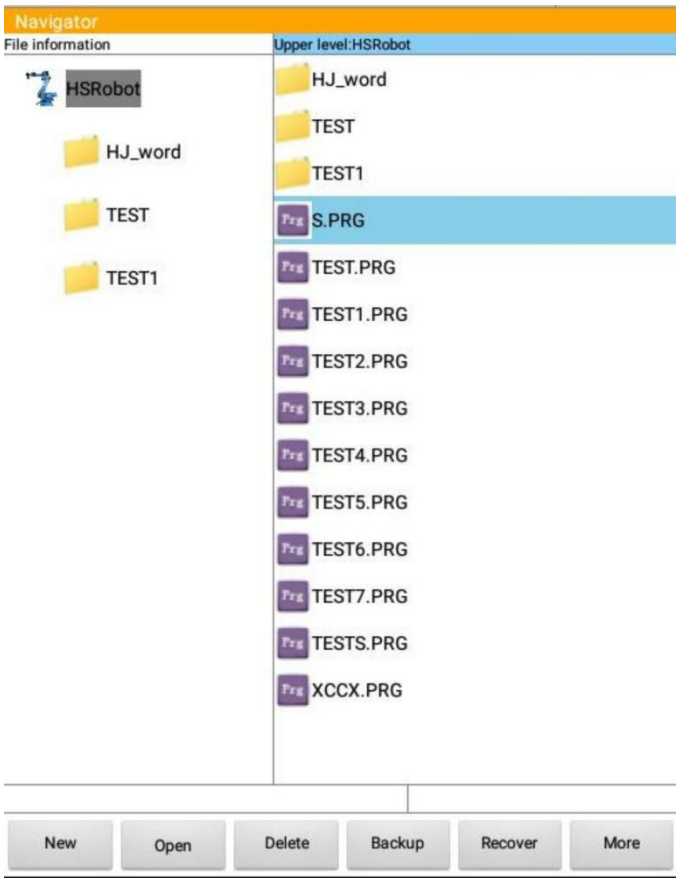


Figure 1 5-1 Navigator interface

15.2 New

	The modification permission of this function is set to engineer user and above.

Steps

1. Select the folder in the directory structure where you want to create the file
2. Click New

3. Select a program or folder

4. Give a name for the new file (name cannot contain spaces) and press the"OK"button.

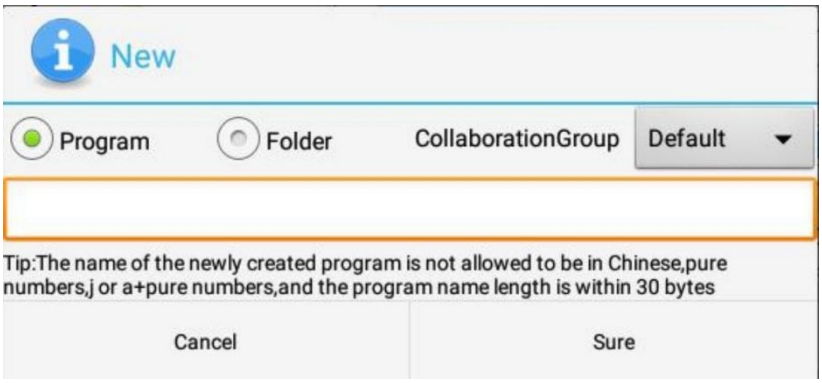


Figure 1 5-2 New program or folder

15.3 File / folder deletion

	The modification permission of this function is set to engineer user and above.

Actions Mark files or folders in a directory structure.

Choose Edit→Delete. (file is not locked)

Click the Confirm button in the dialog box, and the marked file or folder will be removed.

15.4 Selecting a program

	This function can be operated by all users.

Overview A program can be selected or opened. A program editor will then be displayed instead of the navigator. You can switch back and forth between the program display and the navigator.

15.5 Open and close programs

	This function can be operated by all users.

Steps

1. Select the program in the Navigator and click the"Open"button.

2. The program will appear in the editor. The selected program will open to the editor. The corresponding open file is always displayed in the editor. At the same time, the run cursor is displayed.

3. Close the program: select"More → Close Program"or directly press the"Close" button. If a program is running, it must be stopped before canceling the program selection.

15.6 Locking and Unlocking of Files

	The modification permission of this function is set to engineer user and above.

Operation steps **File lock:**

5.Mark files in a directory structure.

6.Select Edit→Lock, and click the"Lock"button in the prompt box.

7.Once locked, the selected file icon will display a lock style.

Unlock:

1.Select the locked file in the file directory.

2. Select Edit→Lock, and click the"Unlock"button in the prompt box.

3. Enter the unlock password and click OK to unlock the currently selected file.

The initial password for unlocking is"hspad".

Change the unlock password:

1. Select File→Lock Password Settings from the main menu.

2. After entering the original password and new password, click the"OK"button to save the new password.

	Locking can only be performed on files, not on folders. Rename, delete, and open operations cannot be performed on locked files.

Figure 1 5-3 Setting the lock password

16 Teach run

16.1 Action mode

teach mode：incremental and continuous.

16.1.1 Continuous

	This function can be operated by all users.

Operation steps

1. Select the coordinate system of"run key"in teaching mode
2. Set the teaching override.

The following names appear next to the run key:

A1 -A6 ：corresponding to the axis number marked on the robot;

X, Y, Z: used for linear motion along the axis of the selected coordinate system;

A, B, C: For rotary motion along the axis of the selected coordinate system.

3. Press and hold the safety switch with the enable on.
4. Press the plus or minus run key to move the robot in the plus or minus direction.

	The position of the robot during motion can be displayed by the following methods: Select Main Menu→Display→Actual Position. For the first time, the Cartesian coordinate position is displayed by default. If the axis coordinate is displayed, you can click the Cartesian button on the right to switch.

16.1.2 Incremental

	modification permission of this function is set to engineer user and above.

illustrate

Incremental teach mode allows the robot to move a defined distance, eg 10 mm or 3 。.Then the robot stops by itself, or 0～10°/0～100mm custom inching distance.

Application range:

1. Position the points at the same distance
2. Move a defined distance from a position

3. Use the measuring table to adjust

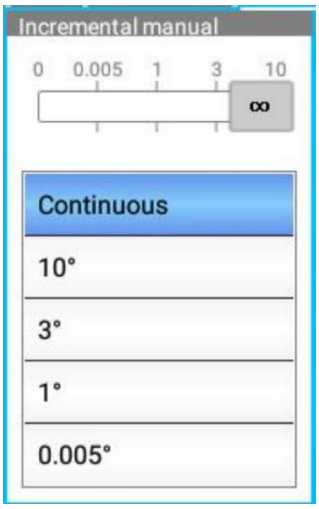
The following options are available

set up	illustrate
continuous	Incremental teach movement is turned off.
100mm/10°	1 increment = 100 mm or 10°
10mm/3°	1 increment = 10 mm or 3°
1mm/1°	1 increment = 1 mm or 1°
0.1mm/0.005°	1 increment = 0.1mm or 0.005°

mm : for Cartesian motion

Spend : for axis-related motions

	If the movement of the robot is interrupted, eg by releasing the safety switch, in the next action The interrupted increment is not continued, but a new increment is started from the current position.



picture 16 - 1 Incremental teach move

16.2 Teaching magnification

	This function can be operated by all users.

Note that the magnification is the speed of the robot at runtime. It is expressed as a percentage.

Steps

1. Touch the magnification adjustment status icon to open the magnification adjustment amount window, and the magnification will be adjusted after pressing the corresponding button or dragging.

2. The desired teaching magnification can be set by the positive and negative keys or by the screen adjuster

negative keys : can be set in 100%, 75%, 50%, 30%, 10%, 3%, 1% steps

Adjuster : It can be set in 1% steps.

【Remarks】Only the teaching magnification can be adjusted in the teaching mode; only the automatic magnification can be adjusted in the automatic mode.

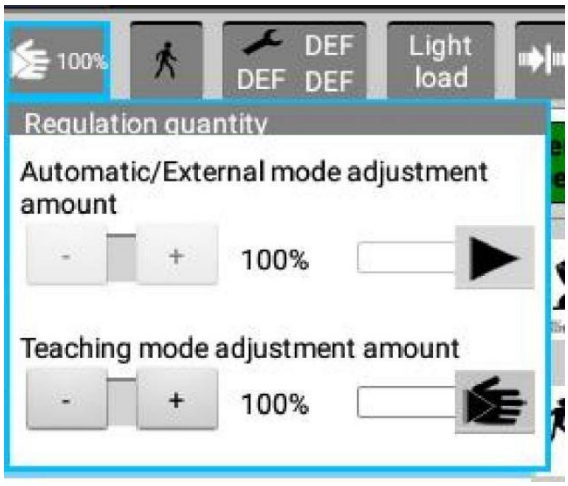
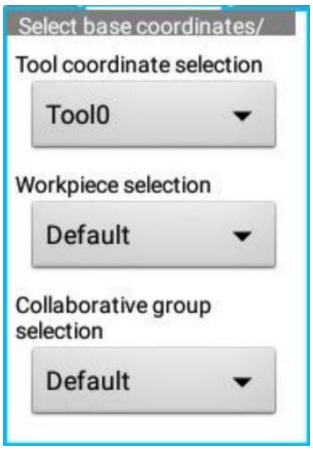


Figure 16-2 Teaching magnification display and adjustment

16.3 Tool selection and workpiece selection

	modification permission of this function is set to engineer user and above.

Description Up to 16 tool coordinate systems and 16 workpiece coordinate systems can be stored in the robot control system.



picture 16 - 3 Tool Workpiece Coordinate System

Steps

1. Touch the Tool and Workpiece Coordinates status icon to open the Active Tool/Workpiece Coordinates window.

2. Select the desired tool and desired workpiece coordinates.

Remarks :

Before loading the program, the current actual position is displayed based on the tool workpiece selected by the user. After the program is loaded (not running) successfully, the display of the tool workpiece coordinate system is the default, regardless of the non-default tool workpiece coordinate system selected before loading. After running the program, the tool workpiece coordinate system will be displayed according to the tool

workpiece coordinate system called in the program. If it is not called, the default tool workpiece coordinate system will be used and displayed. When the program is unloaded, it will be restored to the tool workpiece number called before loading.

	Taking the currently used tool workpiece coordinate system shown above as the standard, the current actual position is displayed.

16.4 Movement to the point

	This function can be operated by all users.

AUCTECH III control system provides the function of moving to the point, select the JR/LR variable in the main menu display → variable list, click"Change", enter the target coordinates,

press the safety switch, and click"Joint to point"or"Linear"To the point", you can run the robot to the target point. If it is the program editing interface, select the motion command line, press the safety switch, and click"joint to point"or"line to point"to achieve this function.

【Remark】

The arc command does not support the movement to point function.

	Note: Cartesian coordinate LR, because there are different shape positions, is not teaching"acquisition coordinates". The input coordinates need to be confirmed after teaching, and then the shape position can be generated before moving to the point correctly.

17 Autorun

	This function can be operated by all users.

Steps

1. Select the mode to be run：teach /automatic mode

2. Select the program to be run in the navigator interface and click"Load"

3. In teaching mode, press the safety switch, and do not release it during the program running; in automatic mode, click the enable button on the upper left of the screen to turn on the enable.

4. Adjust the speed magnification to an appropriate value.

5. After the program is displayed on the teach pendant as"ready", click the physical run button on the left side of the teach pendant to start the program (for the function of the left physical button, please refer to Section 4.1 AUCTECH Type III Teach Pendant - Front View)

6. When the program is running, click the corresponding physical button to pause and stop the program.

【Remark】

1. It is not allowed to switch modes while the program is running

2. Program editing is not allowed during program loading /running

18 Emergency stop

	This function can be operated by all users.

The emergency stop switch is used in an emergency to stop the robot movement in an emergency. Located on the top right of the teach pendant (red button).

Steps

1. In the event of an emergency, take a photo of the emergency stop button on the upper right of the teach pendant
2. Turn the emergency stop button clockwise to release the emergency stop switch
3. In the status display window of the teach pendant, click"Alarm Confirmation"to clear the emergency stop error

19 Jump function

	This function can be operated by all users.

Note In the teaching mode, the program supports jump running. If the program pointer is jumped to the selected row and then run, it will be executed sequentially from the selected row.

Steps

1. In teaching mode, load a program and enable teaching

2. Select any line of instructions in the program, click the"Run"button, the running pointer of the program running interface jumps to the selected line

3. Click the"Run"button again, and the program will execute the current command. If the current running mode is single-step running, after executing this line of instructions, the running pointer will point to the next line of instructions; if the current running mode is continuous running, the running will be completed. After the current instruction, the program will continue to execute downward until the program is completed.

	The jump function can be used in conjunction with the back function. When backing up, only the motion command is executed, and other commands are ignored and not executed.

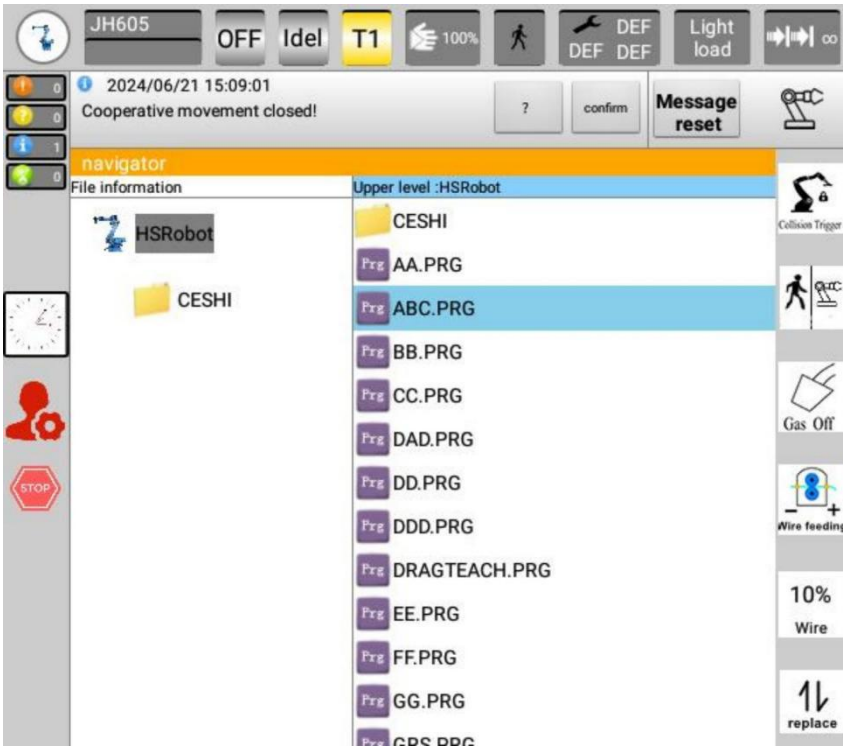
20 Button functions

20.1 Use of welding function keys

	This function can be operated by all users.

20.1.1 Welding button introduction

In the upper right part of the teach pendant, there are 12 buttons to control the movement of the robot. In the welding system, these 12 buttons are reused when not enabled. From top to bottom, each row of buttons corresponds to 7 functions of program operation mode switching and coordinate system switching button, welding switch, collision cancellation, gas detection, wire feeding control, wire feeding magnification, and search and replacement. The second row of buttons is in In the teaching mode, it is the program operation mode switching and coordinate system switching buttons, and in the automatic and external modes, it is the welding switch. The specific distribution is shown in Figure 20-1 :



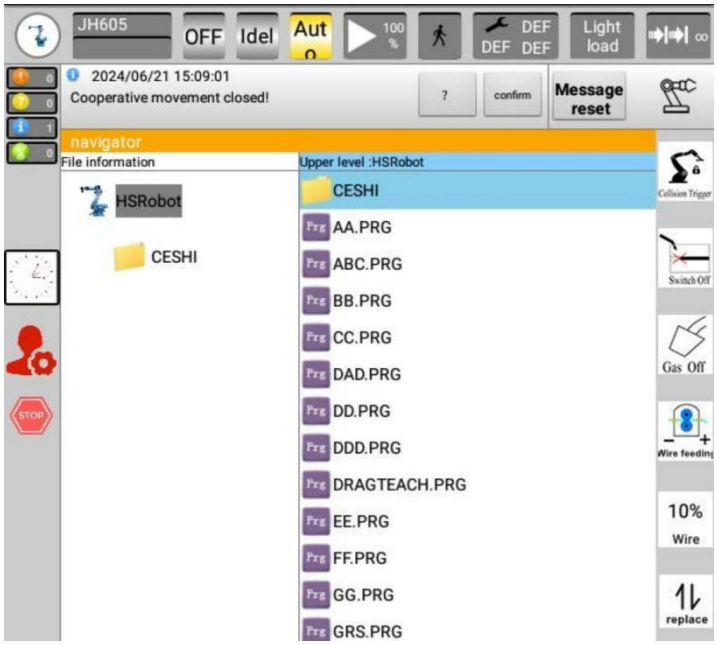


Figure 20-1 Function keys

20.1.2 Welding button function introduction

（1） Collision release: When the robot collides, press the corresponding"+"key, the switch is turned on, the collision signal is released, and there is 15 time to move the robot away from the collision point. After the timeout, the collision release switch is automatically turned off, if you need to remove the robot, you need to turn this switch on again. If the operation is completed within the time range, press the corresponding"-"key to close the collision cancellation.

（2） Welding switch: The welding switch is the main switch for controlling welding. This switch will only be displayed in the automatic mode, and will be automatically turned off in the teaching mode. When this switch is turned off, welding-related functions cannot be used. The corresponding operation is: press the"+"key to open, and press the"-"key to close.

(3) Gas detection: Press the"+"key to open the gas valve. Press the"-"key to close the air valve.

(4) Wire feed control :

A. Press the"+"key under the physical button to feed the wire forward, press and release it within a certain period of time for forward jog wire feeding, and release it after a certain period of time for forward continuous wire feeding. will stop feeding. Press the"-"key to reverse the wire feeding, press and release it within a certain period of time for reverse jog wire feeding, press and release it after a certain period of time for reverse continuous wire feeding, and the wire feeding will stop after releasing. The time can be set in the technology package system configuration.

B. In the teaching mode, turn on the enable and display the jog wire feed button below the axis, click the"wire feed +"button to realize the forward jog wire feeding, and click the "wire feed -"button to realize the reverse pull jog wire feeding (such as Figure 20-2). The wire feeding length is controlled by the wire feeding ratio.

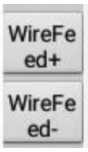


Figure 20-2 Enable lower wire feed button

（5） Wire feed rate: 10%-100% when the wire feed rate is adjusted. Press the"+"key to increase the wire feed rate by 10%. Press the"-"key to reduce the wire feed rate by 10%. The speed takes effect immediately.

（6） Find and replace: The command line attribute can be replaced when editing the program. This function is only used when replacing the command attribute.

(7) Program running mode switching and coordinate system switching keys: Press the"+"key to switch the coordinate system, switch between the axis coordinate system and the user coordinate system. Press the"-"key to switch the program running mode, switch between continuous and single step.

20.2 Debug button for program single-step continuous running

	This function can be operated by all users.

20.2.1 Single-step program key

After switching to the single step mode and enabling, the first row of keys of the axis keys are for the program to step backward and the program to step forward. Press the"-"key to step backward and execute one step program. After release, the program stops running. Press the"+"key to step forward and execute one step program. After release, the program stops running.

Figure 20-3 Button single-step running program

20.2.2 Continuous running program key

After switching to the single-step mode, the second row of keys ofthe axis keys has the functions of continuous backward running program and continuous forward running program. Keep pressing the"-"button and the program will continue to execute backward. After releasing, the program will stop running. Hold down the"+"key and the program will continue to execute, and the program will pause immediately after releasing it.

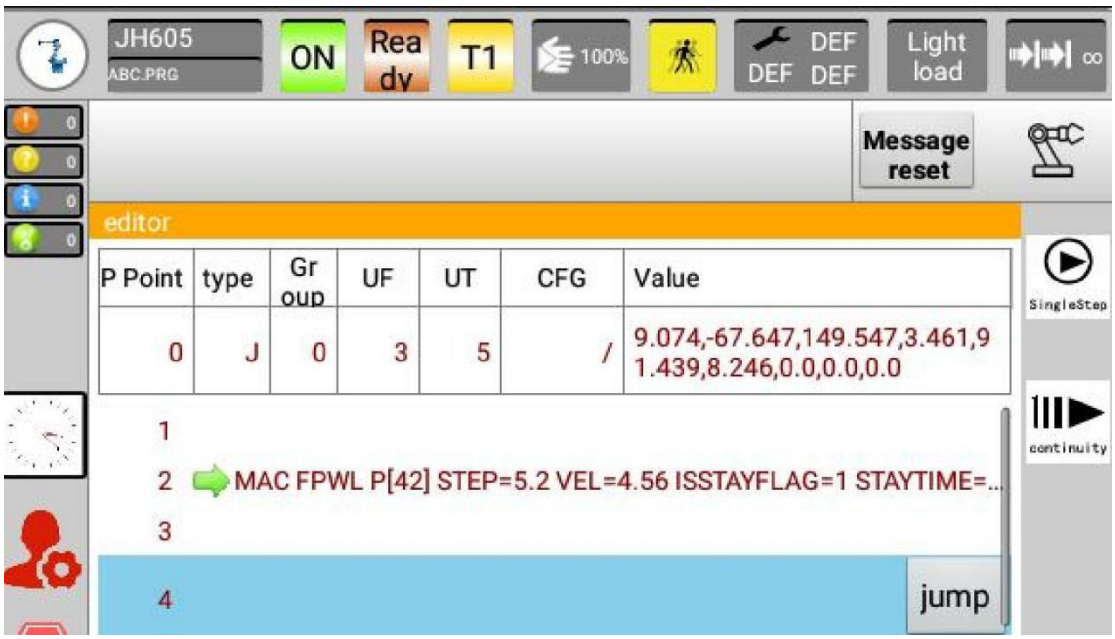


Figure 20-4 Press the button to run the program continuously

20.3 Instruction shortcut insert button

	The modification permission of this function is set to engineer user and above.

Instruction shortcut insertion can use the button to insert instructions. This function can only be operated after the teaching mode starts to edit. After clicking the" Start Editing"button in the program editing interface, the upper left button of the teach pendant becomes the shortcut insertion instruction button (as shown in Figure 20- 5).

The first button is to switch the type of motion command inserted, and there are three kinds of motion command switching: joint, straight line, and arc.

The second key is the insert motion command key, which inserts the command type selected by the previous key.

The third button is the button for inserting the arc starting command. Click the button to insert the arc starting command, and click the icon to select the inserted arc starting channel number.

The fourth button is the insert arc crater command button. After pressing, the arc crater command is inserted, and the arc crater command channel number is consistent with the selected arc starting channel number.

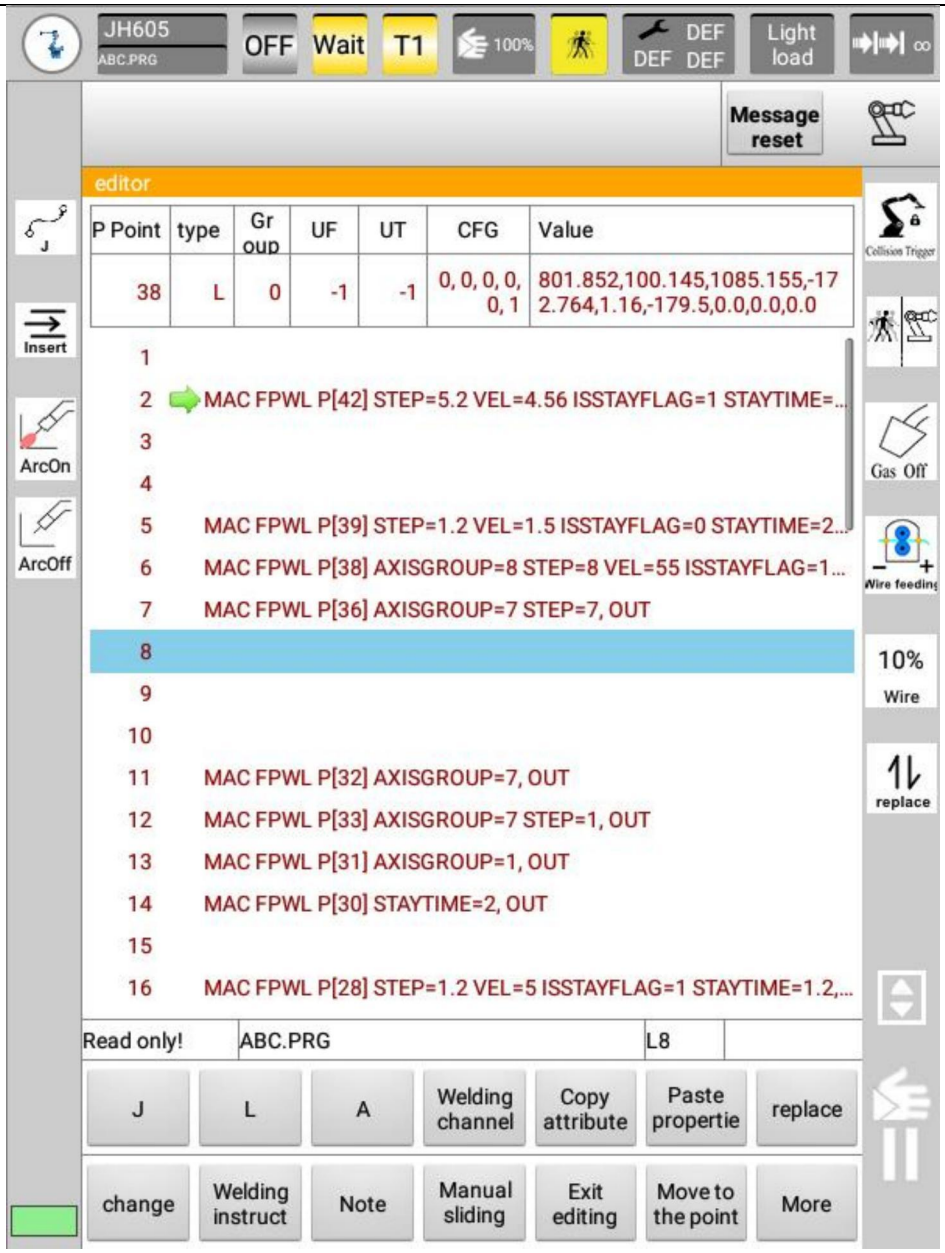
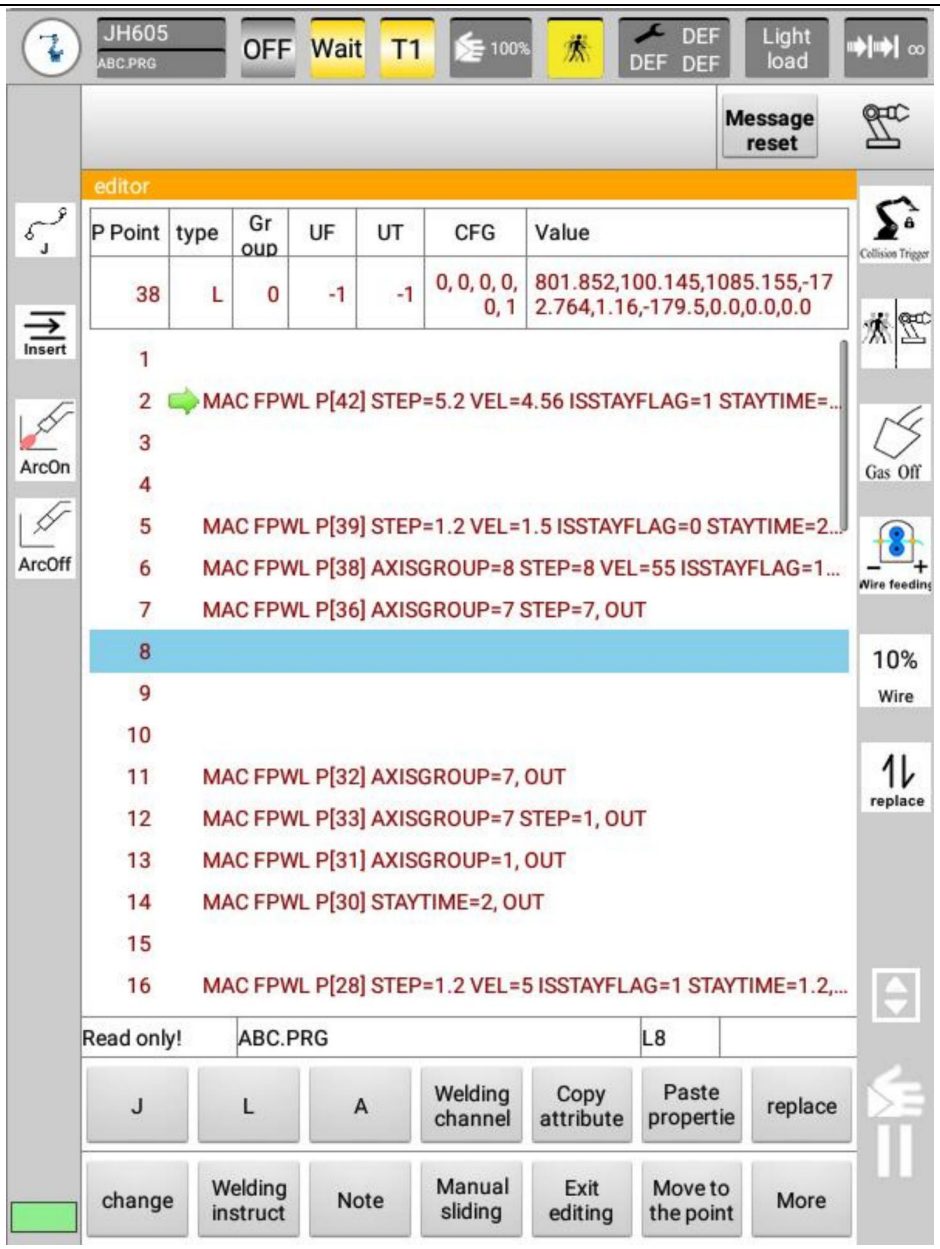


Figure 20-5 Shortcut key insertion command

After selecting any line of the program, press the shortcut key, and the corresponding command will be generated in this line as shown in the figure.

20.4 Program shortcut sliding button

After loading the program, you can use the program shortcut sliding button to slide the program line. The program shortcut sliding button is on the seventh row of buttons on the right side of the teach pendant. Press the"-"button to slide the program up, release it to stop sliding, and press"+". Press the key to slide down the program, release it to stop sliding, this function can improve the debugging efficiency when debugging the program.



20-6 Program sliding key

20.5 Remote reservation function

	This function can be operated by all users.

20.5.1 Functional Description

The remote reservation function is a function added based on the external mode for

single-machine multi-station production. The function of this function is to record the status of the station's production preparation, and directly go to the next station after completing the production of the previous station. The worker does not need to wait for the previous station to finish production before pressing the next station. bit start button. This function currently supports appointments for up to eight workstations.

20.5.2 Usage process

（1） Configure the reservation switch on the standby button, as shown in Figure 20-7 ：

Figure 20-7 Reservation switch

（2） Turn on the appointment switch, switch the mode to external mode, and configure the external startup program. (For external program configuration, please refer to the instruction manual of AUCTECH III teach pendant)

(3) Press and hold the start position for two seconds at the station where the workpiece is installed to complete the station reservation operation.

(4) Press the reservation switch again to cancel all reservations.

21 Welding system coordination function

21.1 Configure the collaboration group number

	This function sets the modification authority to the manufacturer's personnel user.

HSPad software menu, select the configuration-controller configuration-cooperative configuration page as shown in Figure 21-1:

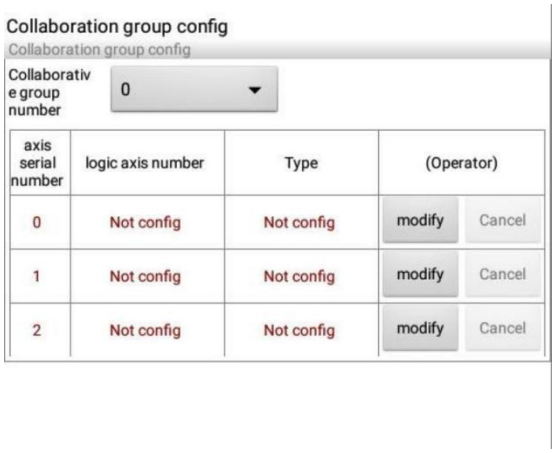


Figure 21-1 Collaboration configuration page

It can be seen from the figure that the configurable parameters are the coordination group number, the logical axis number, and the axis type.

The cooperative group number is stored in the way of external axis configuration.

The logical axis number refers to which axis the external axis is in the robot axis group.

The axis type refers to how the axis moves, currently only rotation is supported.

Here we select the collaboration group number as 0, and click the Modify button in the row of axis number 0, as shown in Figure 21-2 :

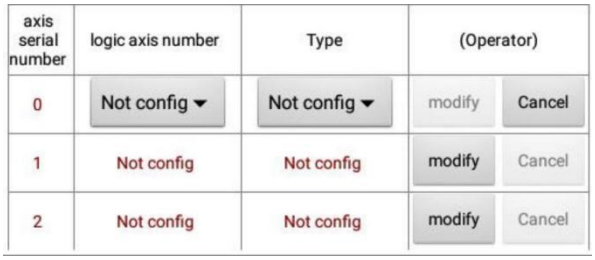


Figure 21-2 _

At this time, click Unconfigured to select the axis number and axis type. Here we choose 7

axes, and the rotation type is shown in Figure 21-3 :

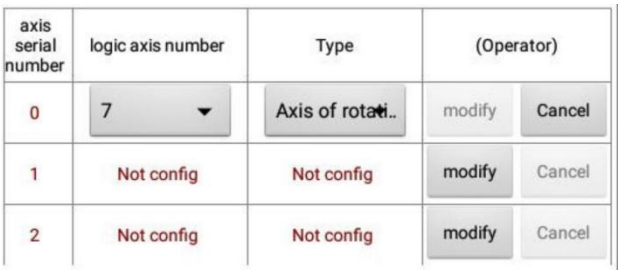


Figure 21-3 _

After completion, click Save in the lower right corner to complete the configuration of the first synergy axis. For multi-axis collaboration, the method is the same.

Note: When there is flip and rotation, you need to configure the flip axis first, and then configure the rotation axis.

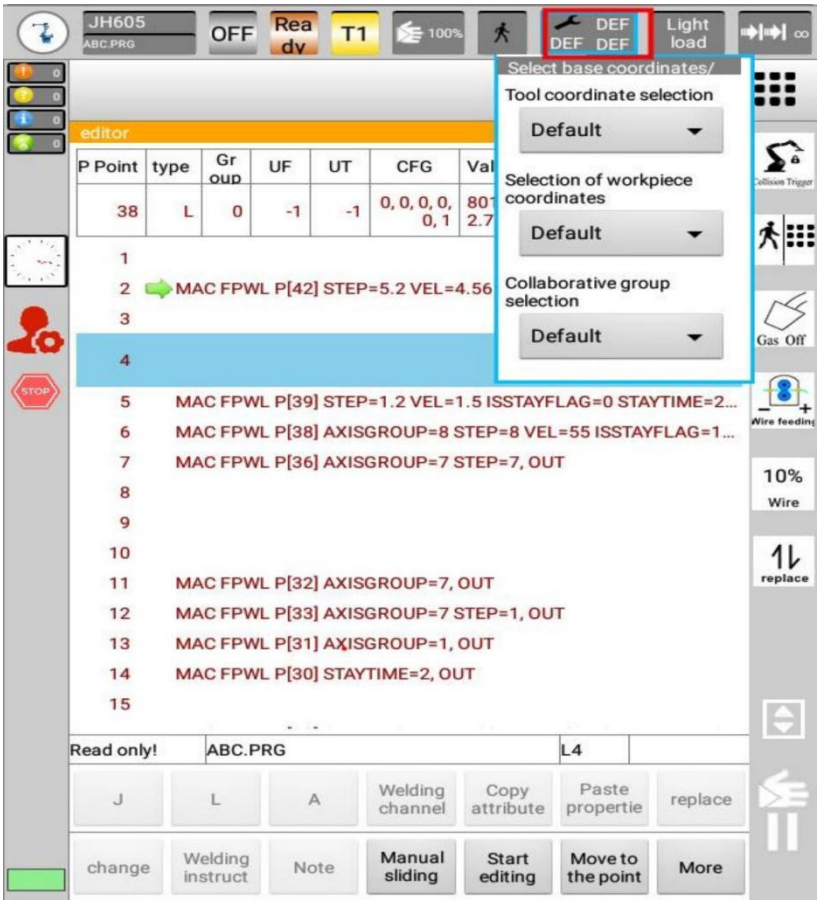
21.2Collaborative teaching

	The modification permission of this function is set to engineer user and above.

Note After the collaborative calibration is completed, you can select the base label/tool pop-up box in the teaching mode to select the calibrated collaboration group, and then click the"Collaboration"button. After the collaboration button turns green, enable it and select the additional axis. Afterwards, coordinated movements can be performed. Collaborative teaching can also be performed by creating a new collaborative group program file.

Teaching steps when the program is not open :

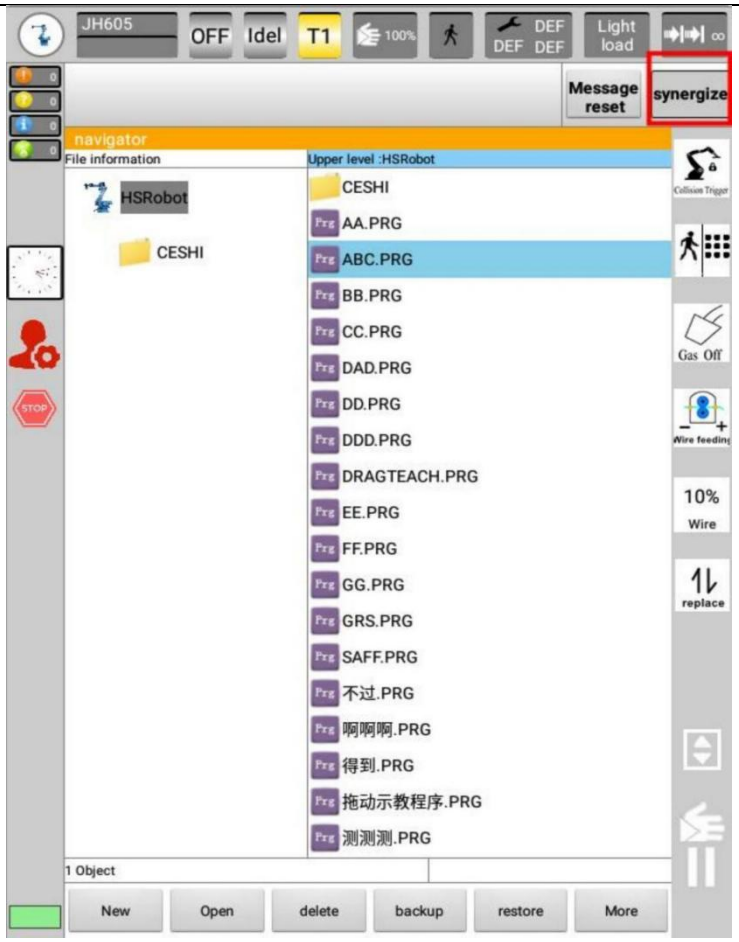
（1）Click the" Select Base Icon/ Tool" icon at the top of the software, and the" Select Base Icon/Tool"pop-up box will appear after clicking.



picture 21 -1 3 Collaborative group selection

（2）In the pop-up box, click and click the collaboration group selection drop-down box, and then select the collaboration group that needs to be coordinated.

(3) After the selection is completed, the"Collaboration"button will be displayed. Click the"Collaboration"button. The effective collaboration group at this time is the selected collaboration group. The button turns green to enable collaboration, and gray to close collaboration.



picture 21 -1 4 Collaboration button

(4) After enabling it, select the additional axis motion, and the external axis configured by the coordination group will be displayed at this time. Press the corresponding axis button on the right to perform the coordinated motion.

Teaching steps for creating and opening coroutines:

（1）When creating a new program, select the calibrated coordination group coordinate system, and click OK（as shown in the figure below).

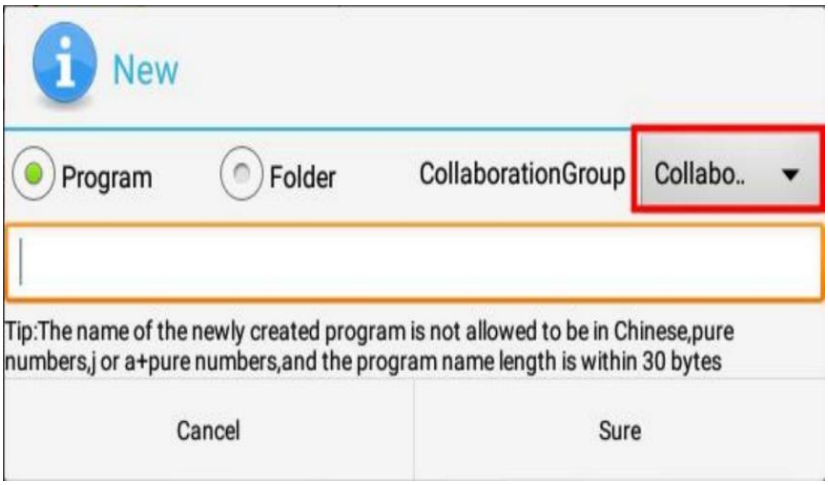


Figure 21-13 Create a new coroutine

(2) After creating a new program, open the program, and when inserting a point that needs to be coordinated, click the"Coordinate"button to insert the motion commands of line, arc, linear weaving, circular arc weaving, linear fish scale welding, and arc fish scale welding. The point is automatically defaulted to be the coordinated motion point (as shown in the figure below).

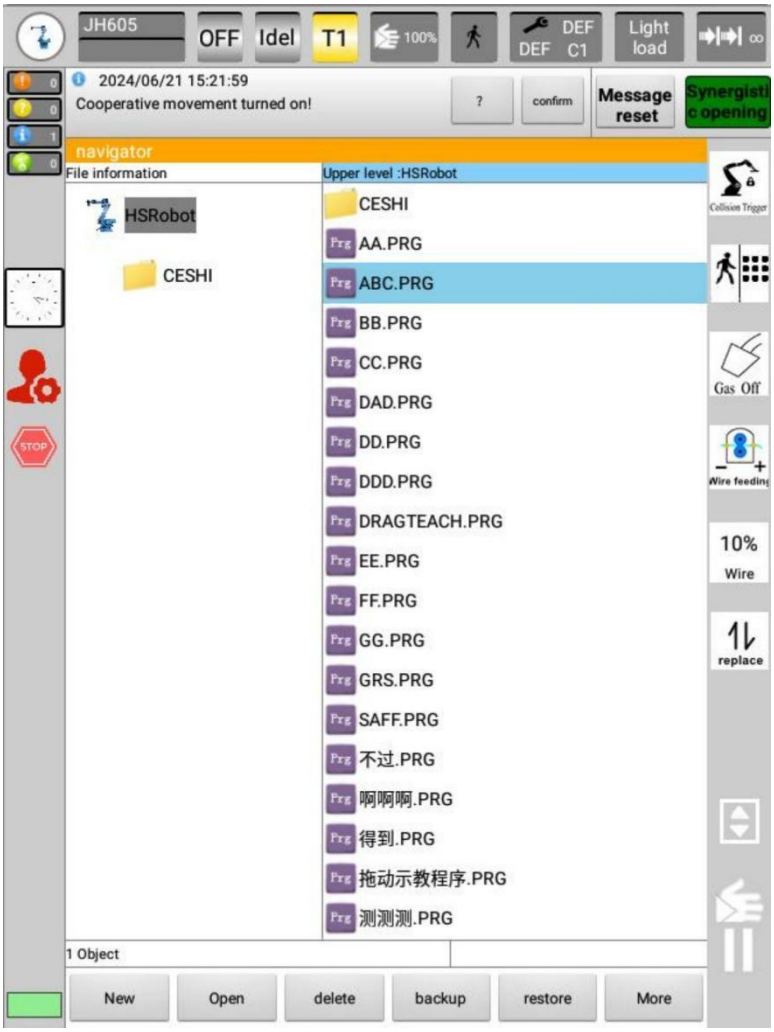


Figure 21-15 Collaboration properties

(3) After opening the collaborative program, the"Collaboration"button will be displayed, click the"Collaboration"button, the effective collaborative group at this time is the collaborative group bound by the program, the button turns green to open the collaboration, and the gray state means to close the collaboration.

(4) After opening the collaborative program and clicking the"Start Editing"button, the first button of the auxiliary button is changed to the collaborative attribute button (as shown in Figure

8). Line, arc, linear weaving, arc weaving motion, linear fish scale welding, arc fish scale welding motion commands without synergy attribute will automatically increase the synergy attribute, if there is synergy attribute, cancel the synergy attribute of the current command. Reverts to user-configured key functions when exiting editing.

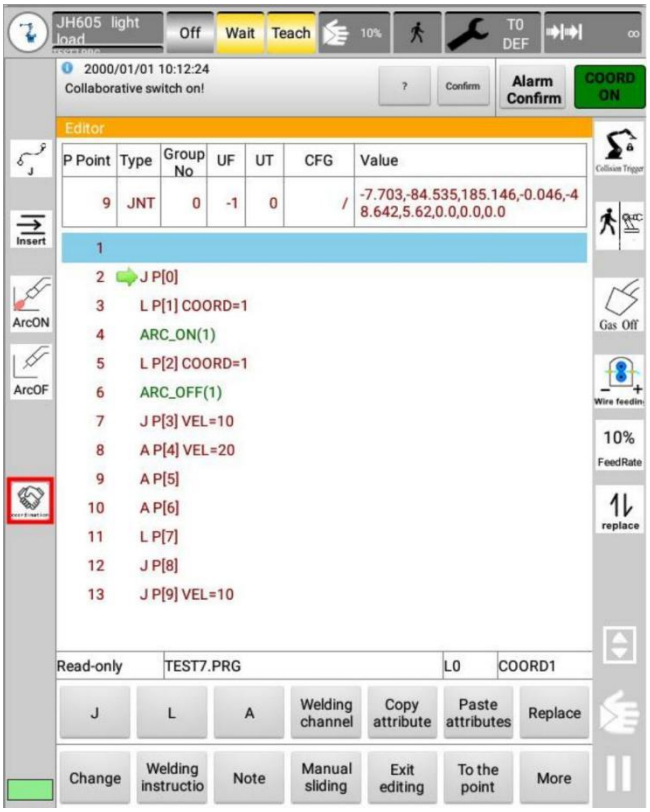


Figure 21-16 Collaboration attribute button

22 Asynchronous axis function

22.1 Asynchronous axis control mode configuration

	This function sets the modification authority to the manufacturer's personnel user.

In the HSPad software menu, select Configuration - Controller Configuration - Axis Group Configuration, click the Modify button in the control mode, select the asynchronous axis mode, click Modify in the number of additional axes, and enter the number of additional axes (as shown in Figure 22-1).), and then power off and restart the controller according to the prompts.

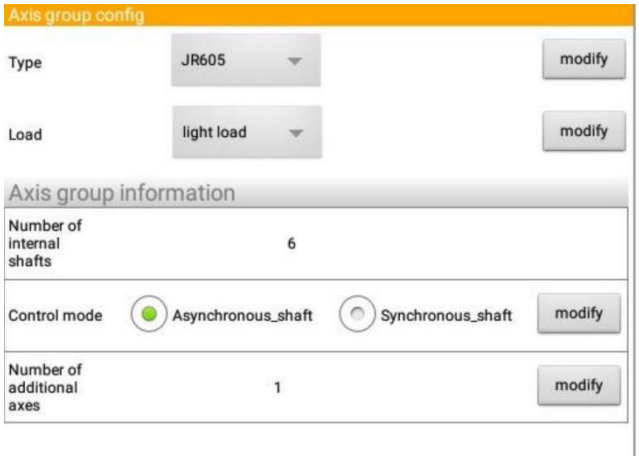


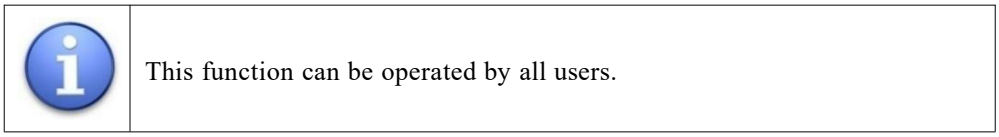
Figure 22-1 Asynchronous axis control mode configuration

22.2 Asynchronous axis parameter configuration

	This function sets the modification authority to the manufacturer's personnel user.

In the Hspad software menu, select Configuration-Teach Pendant Configuration-User Group, select the parameter person user login in the login interface, and log in to enter the welding process package system configuration. Click the positioner configuration button to enter the parameter configuration interface, and you can configure the deceleration of additional axes. ratio, acceleration time, deceleration time, running speed, and maximum running speed. Click to save the parameters after the input is complete.

22.3 Unsynchronized axis motion

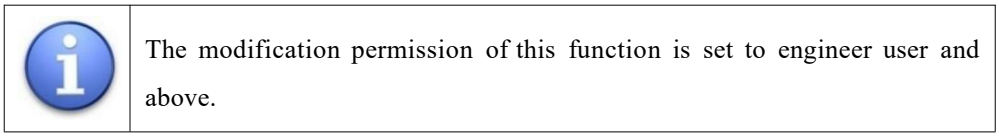


This function can be operated by all users.

After the parameter configuration is completed, it is necessary to select Operation - Adjustment - Calibration in the Hspad software menu, click the additional axis button on the axis calibration interface to enter the additional axis calibration interface, and click to save the calibration.

After calibration, click the axis icon on the right side of the teach pendant, and select the additional axis in the pop-up list box. At this time, the icon on the right button is the icon of the additional axis. First turn on an additional axis switch, and then press the corresponding additional axis. Press the motion button to move the additional axis. You can select Display - Actual Position in the Hspad software menu to see the actual position of the additional axis at this time.

22.4 Asynchronous axis motion command



The modification permission of this function is set to engineer user and above.

Calling the additional axis command in the program will record the current position of the additional axis to make the additional axis move, open a program, click the system command - motion command - additional axis running command to add an additional axis motion command, only after the additional axis switch is turned on. The position of the additional axis that is turned on will be recorded, and the current position of the additional axis that is turned off will not be recorded.

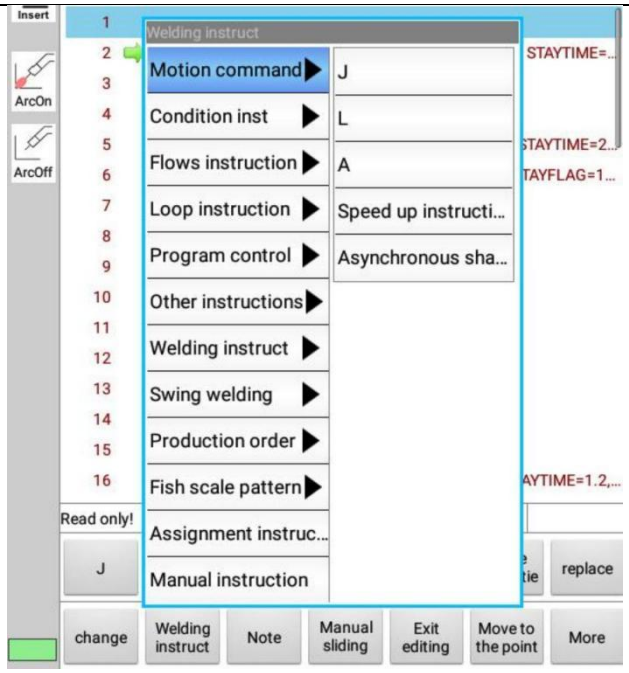


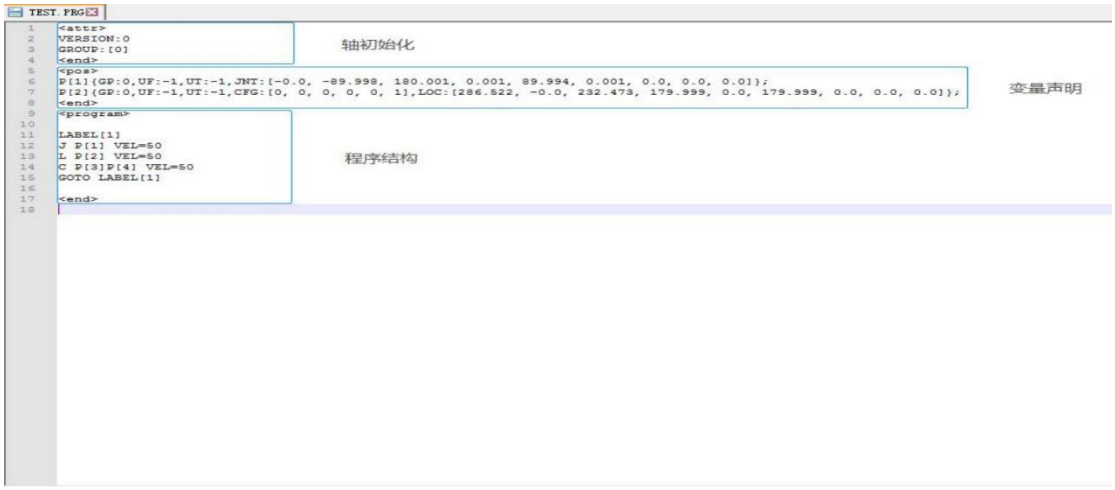
Figure 22-4 Additional axis motion command

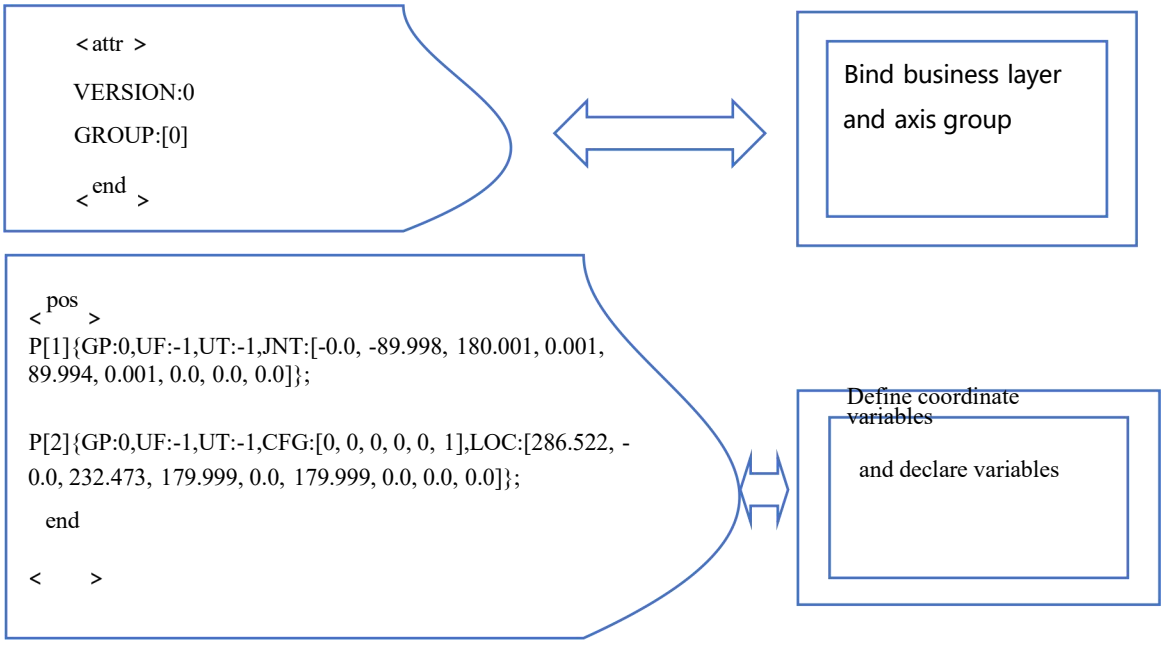
23 PRG program structure and program editing

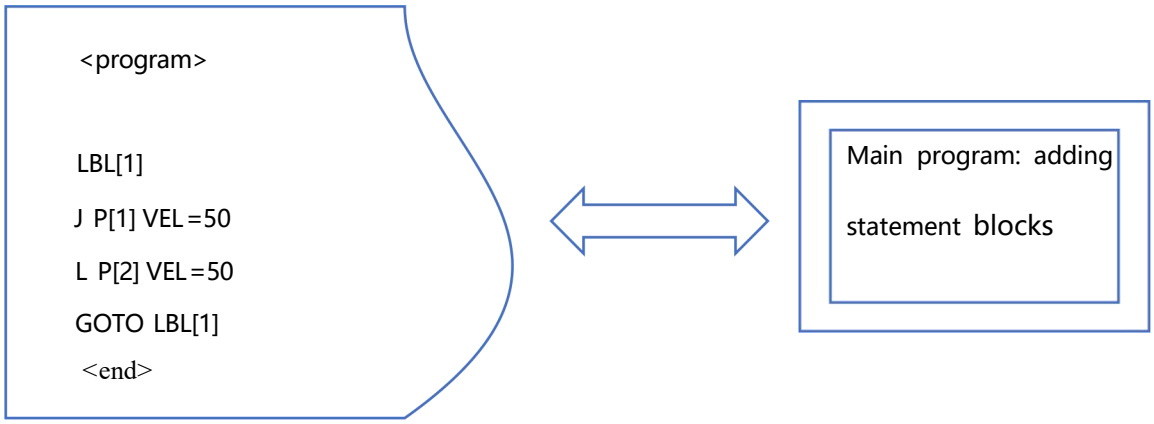
AUCTECH III control system has only one program for users: PRG file, which supports PRG program to call other PRG programs, that is, the caller is [main program], and the callee is [subroutine].

23.1 Program structure

The program is divided into three modules: axis initialization, variable declaration and main program, the structure is as follows.



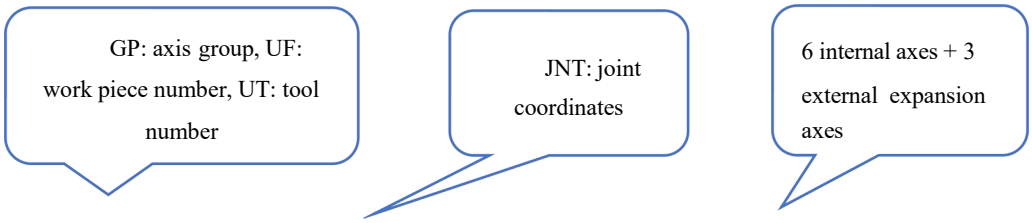




The above coordinate variable has a custom coordinate type P point, and the joint coordinate JR of the register, and the Cartesian coordinate LR;

23.1.1 Coordinate types

Define a variable P[1] point, joint coordinate, the meaning is as follows:



P[1]{GP:0,UF:-1,UT:-1,JNT:[-0.0, -90.0, 180.0, 0.001, 90.0, 0.0, 0.0, 0.0, 0.0]};

23.1.2 The main program calls other programs

The main program calls other programs, the syntax is: call the program"program name", the program executes here, call the subprogram, execute the program content of the subprogram, after the execution, return to the main program to continue execution (flow control, details See 2.3 Flow Control Instructions). 【The interface program of the teaching pendant is as follows】

picture 2 1 - 1 Program editing interface

23.2 Program editing

23.2.1 Start editing and exit editing program

	The permission to use this function is for engineer users and above.

Note that when editing a program, you need to click the" Start Editing"button before editing the program. After editing, you need to click the" Exit Editing"button to continue running the program. Program editing is only possible in teach mode.

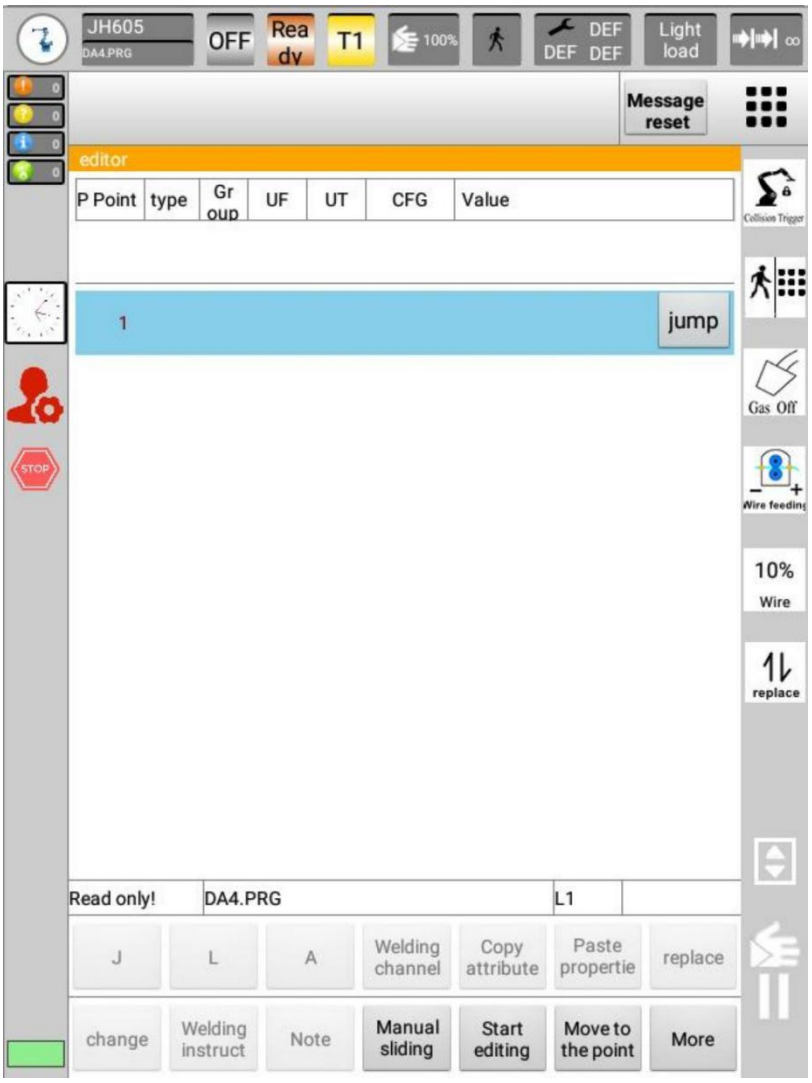
Operation steps:

1.Engineers and above users load a program in teach mode.

2.After loading, enter the program interface. At this time, buttons such as inserting and changing instructions are gray and inoperable. Click the"Start Editing"button. After clicking, the buttons such as inserting and changing instructions will become operable, and the program line can be operated.

3.After the operation is completed, click the"Exit Edit"button, and after clicking, the buttons such as inserting and changing instructions will turn gray and cannot be operated. You can directly run the program.

Note: Start editing state cannot uninstall programs and switch modes.



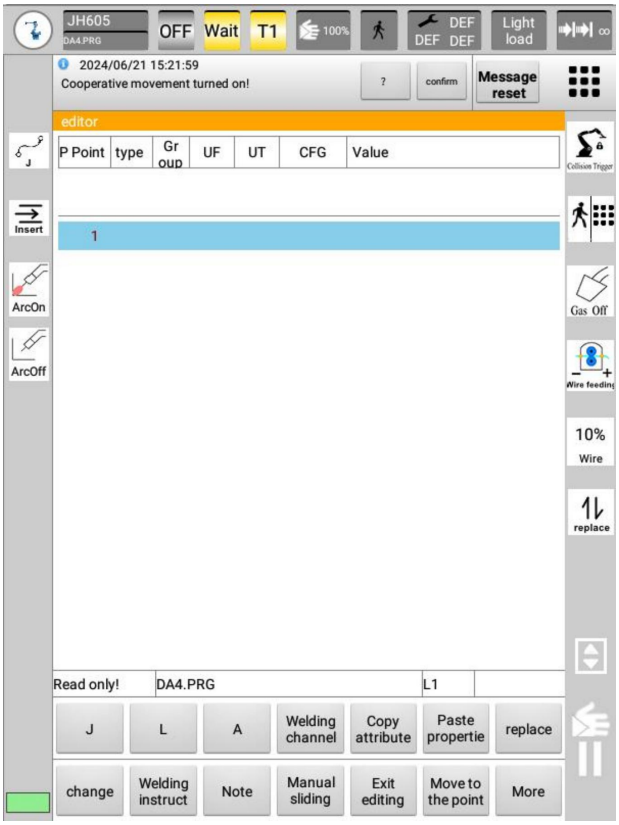


Figure 23-1 Program editing interface

23.2.2 Insert instructions

	The permission to use this function is for engineer users and above.

Explain that inserting instructions can insert welding instructions, motion instructions, process instructions, etc. into the program. After inserting and exiting editing, the program runs according to the inserted instructions.

Operation steps:

1. After editing, the buttons of"Joint","Line","Arc","Welding Channel"and"Welding Command"become operable.

2. Click the"Joint"button to insert a joint motion command in the next row of the selected row.

3. Click the"Linear"button to insert a linear motion command in the next line of the selected line.

4. Click the"Arc"button to insert an arc motion command in the next row of the selected row.

5. Click the"Welding Channel"button to insert a welding channel command in the next row of the selected row.

6. Click the" Welding Instruction"button to pop up the first-level instruction selection box, including motion instructions, process instructions, program control instructions, etc. (as shown in Figure 23-2). After selecting the first-level menu, the second-level menu of the instruction will pop up. Click the instruction in the second-level menu to insert the instruction.

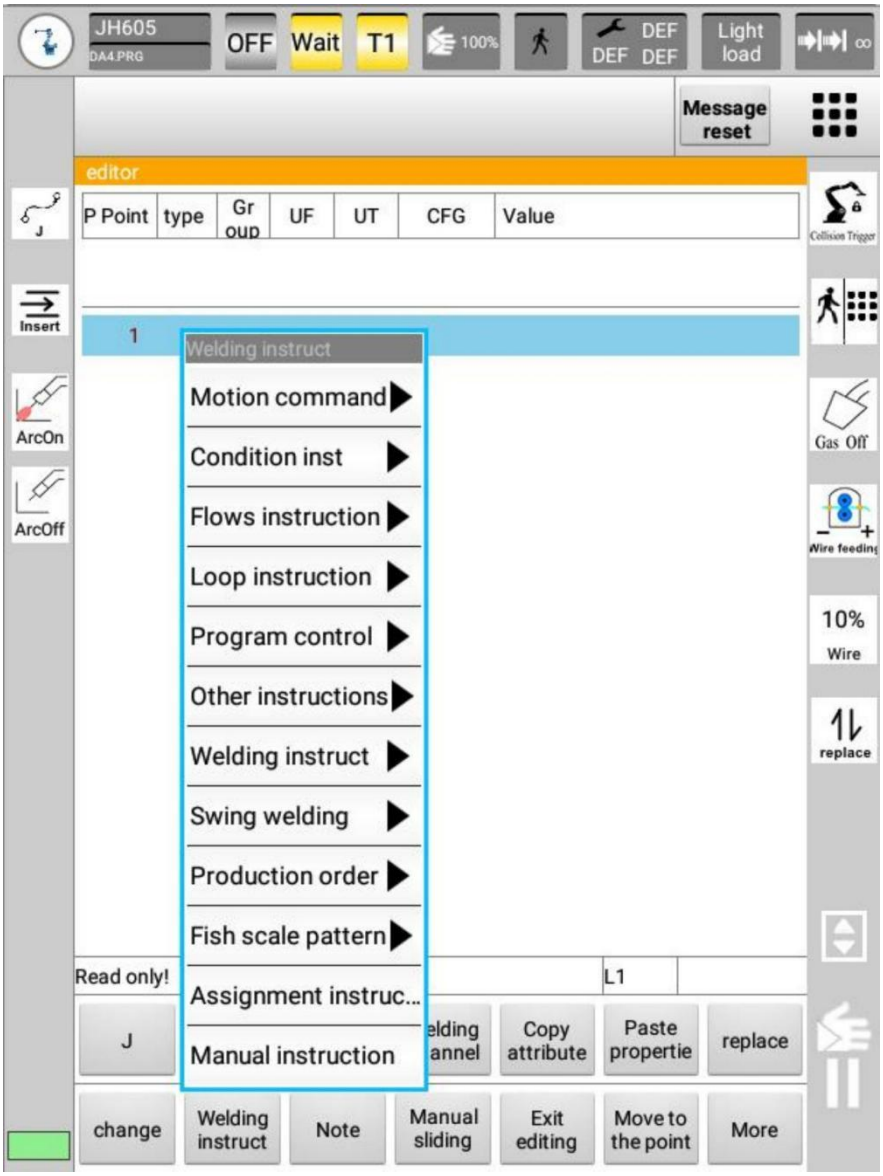


Figure 23-2 Welding command

23.2.3 Change instructions

	The permission to use this function is for engineer users and above.

Explain that changing the command can change the inserted command in the program. After

changing and exiting the editing, the program will run according to the changed command.

Operation steps:

1. After editing, the"Change"button becomes operable. Select the command line that needs to be changed and click the" Change"button to pop up the command to change the properties (as shown in Figure 23-3).

2. After the change is completed, click the"OK"button to make the change successful.

3. Click the"Cancel"button to cancel this change.

Figure 23-3 Change command

23.2.4 Remark command

	The permission to use this function is for engineer users and above.

The remark command can remark the inserted command in the program. After the remark

exits editing, the program will not execute the remarked command.

Operation steps:

1. After editing, the" Remark"button becomes operable. Select the command line that needs to be remarked and click the"Remark"button to remark the instruction. After the instruction is remarked, it will turn into a gray state (as shown in Figure 23-4).

2. Clicking the"Remark"button again will restore to the unremarked state of the command after the remark, and the command will become normal.

Figure 23-4 Remark command

23.2.5 Copy and paste instruction properties

	The permission to use this function is for engineer users and above.

Explanation Copying and pasting instruction attributes can paste other motion instruction attributes to the instruction that needs to change the same attributes.

Operation steps:

1. After editing, the "Copy Attributes" and "Paste Attributes" buttons become operational, select the command line whose attributes need to be copied, click the"Copy Attributes"button, and select the attributes to be copied in the pop-up dialog box and click"OK"button (as shown in Figure 23-5), including speed, smooth transition, attitude speed, acceleration, and deceleration.

2. After copying the attributes, select the command line that needs to change the same attribute and click the"Paste Attribute"button to change the currently selected attribute value.

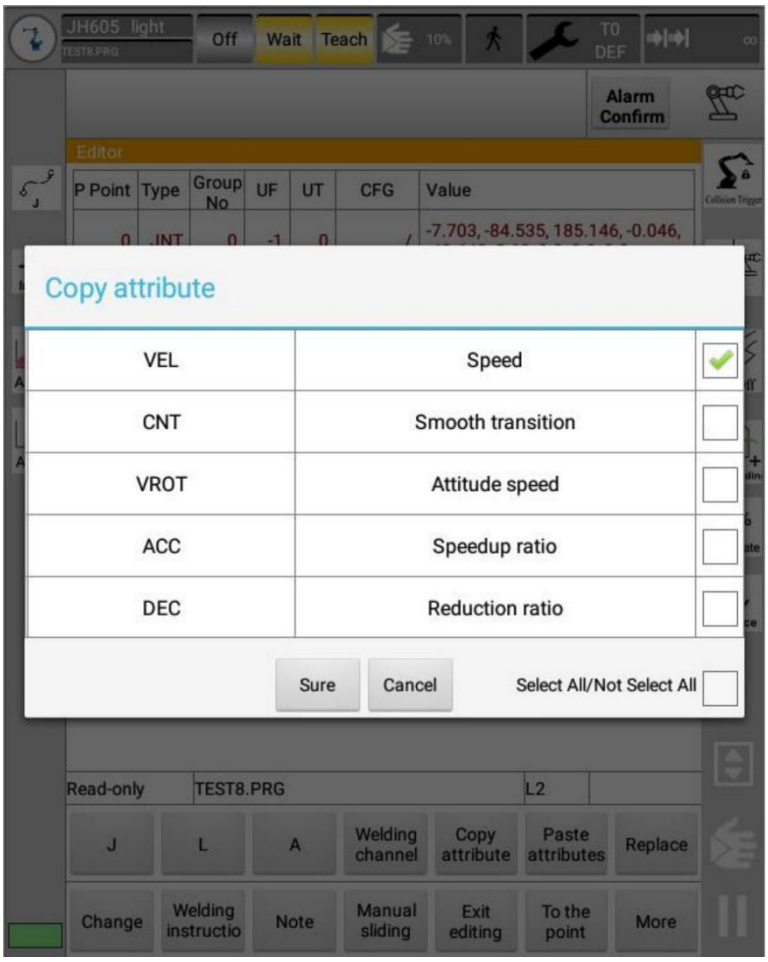


Figure 23-5 Copy and paste properties

23.2.6 Replacing directive attributes

	The permission to use this function is for engineer users and above.

Description Replacing an instruction attribute can replace the current motion instruction attribute of the same attribute.

Operation steps:

1. After starting editing, the"Replace"button becomes operable. After clicking the"Replace"button, a selection input box for replacing attribute selection and replacing a value with a certain value will pop up. After selecting the attribute, enter the replaced value and replace Then click the"Up"and"Down"buttons to start replacing the command line attributes of the currently selected line starting up and down (as shown in Figure 23-6).

2. After clicking the" Replace"button, you can also use the keys to perform attribute replacement up and down.

3. Click the"Cancel"button to cancel the replacement function.

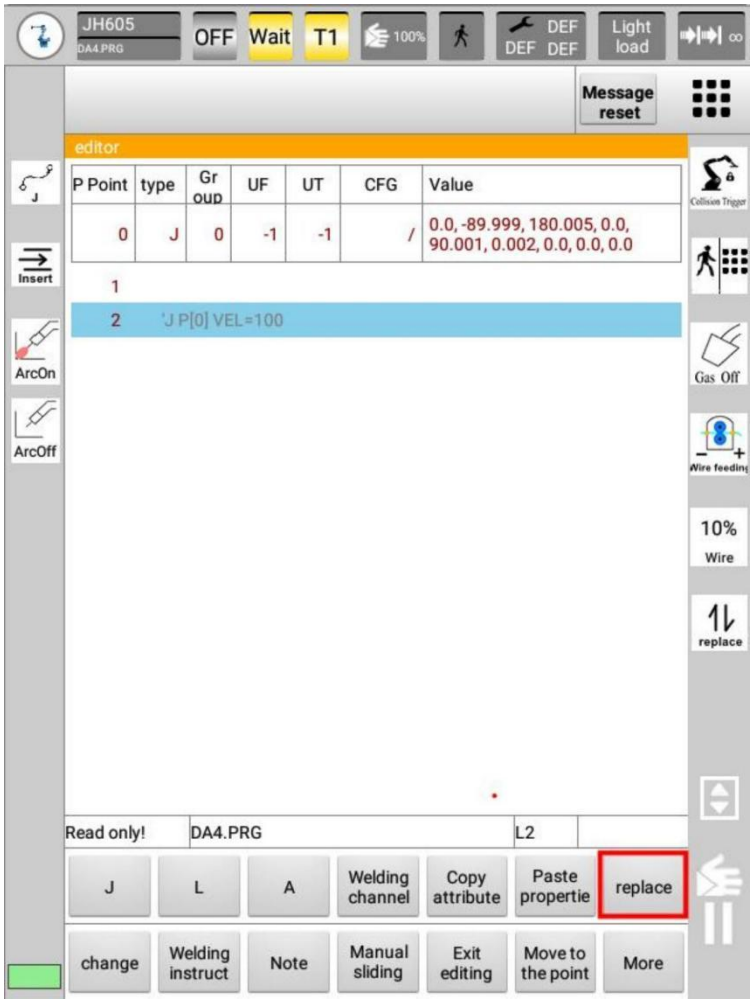


Figure 23-6 Replacing properties

23.2.7 Delete instruction

	The permission to use this function is for engineer users and above.

Description The delete command can delete any command in the current command line.

Operation steps:

1. After starting to edit, the "More"button becomes operable. After clicking the"More"button, a more command operation box will pop up. Select the command line to be deleted, and click" Delete"in the more box to delete the current command. line (as shown in Figure 23-7).

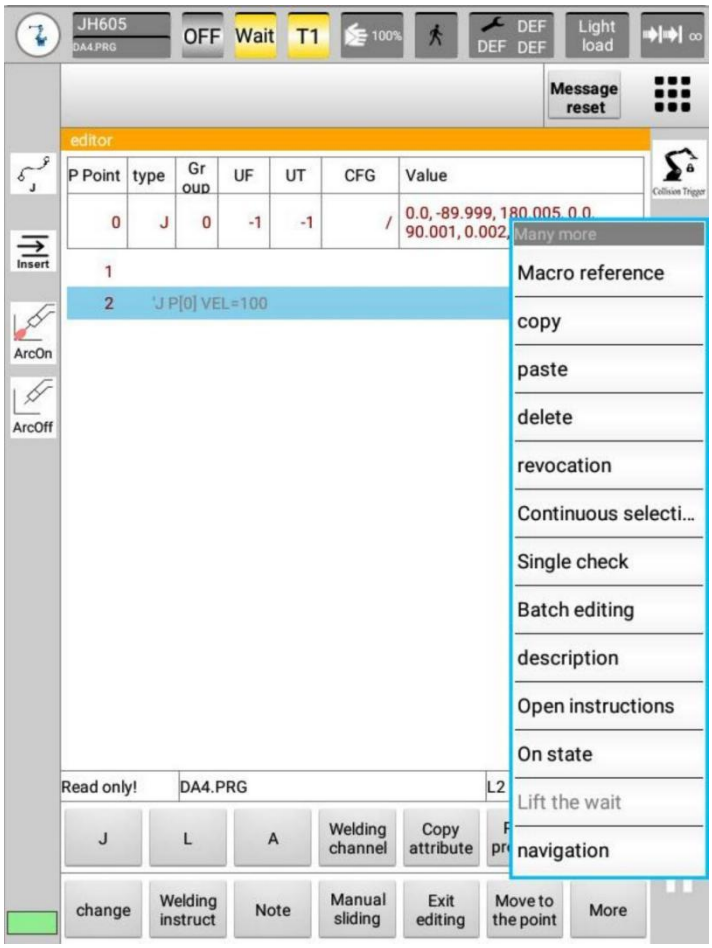


Figure 23-6 Delete instruction

23.2.8 Copy and paste instructions

	The permission to use this function is for engineer users and above.

Description Copy and paste instructions can select existing instructions and copy them to

other lines.

Operation steps:

1. After starting to edit, the "More"button becomes operable. After clicking the"More"button, a more command operation box will pop up. Select the command line to be copied, and click" Copy"in the more box to copy the current command line. After copying, select the program line to be pasted, and click" Paste"in the more box to insert the copied command (as shown in Figure 23-8).

Figure 23-8 Copy and paste instructions

23.2.9 Cancelling an order

	The permission to use this function is for engineer users and above.

Explain that the undo command can undo a previous operation of inserting, deleting, copying and pasting, remarking, and changing the attribute of the command line.

Operation steps:

1. After you start editing, the"More"button becomes operable. After clicking the"More"button, a more command operation box will pop up. Clicking" Undo"in the more box will undo the previous insertion, deletion, copy and paste., remarks, and change command line attribute operations (as shown in Figure 23-9).

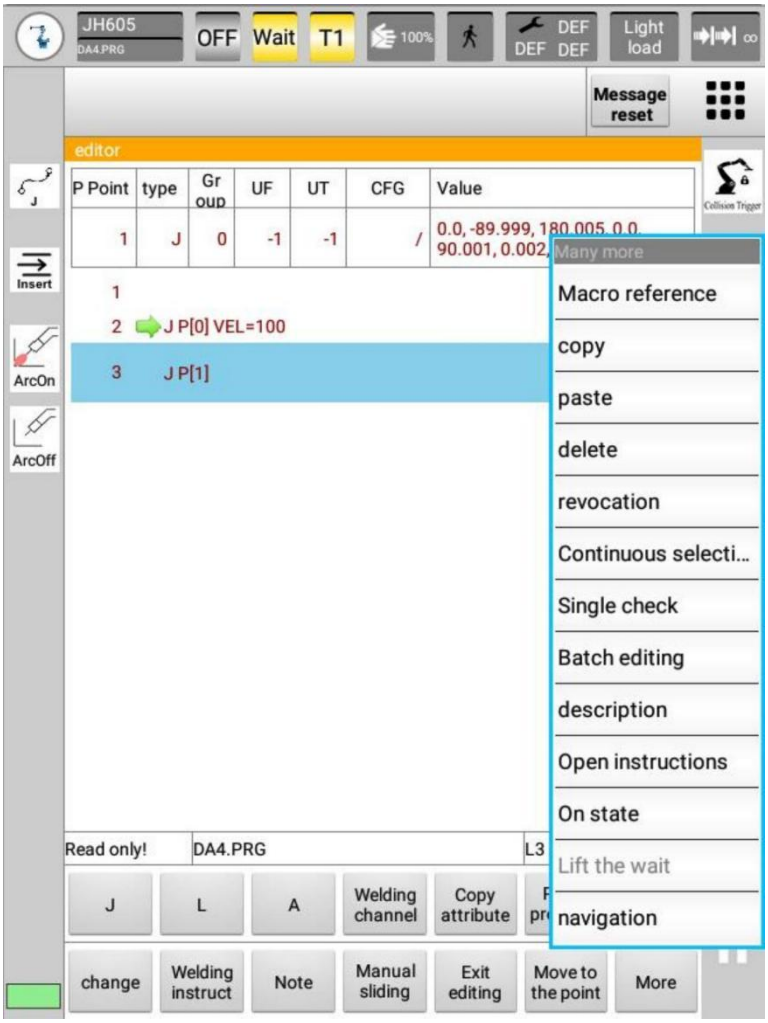


Figure 23-9 Undo command

23.2.10 Continuous selection and single selection instructions

	The permission to use this function is for engineer users and above.

Note" Continuous selection"and" Single selection"can select multiple command lines and operate commands in batches.

Operation steps:

1. After starting to edit, the "More"button becomes operable. After clicking the"More"button, a more command operation box will pop up. In the more box, click

"Continuous selection"and" Single selection"to select multiple commands. After multiple selections, you can change the properties of multiple selections, copy and paste them (as shown in Figure 23-10).

Figure 23-10 Continuous selection and single selection commands

23.2.11 Instruction description

	The permission to use this function is for engineer users and above.

Description An instruction description can describe the purpose or program logic of the current instruction.

Operation steps:

1. After starting to edit, the "More"button becomes operable. After clicking the"More"button, a more function operation box will pop up. After selecting an instruction, click" Description"in the more box to pop up a description dialog box. Enter the description of the command in the box and click the" OK"button to add the description of the command (as shown in Figure 23-11).

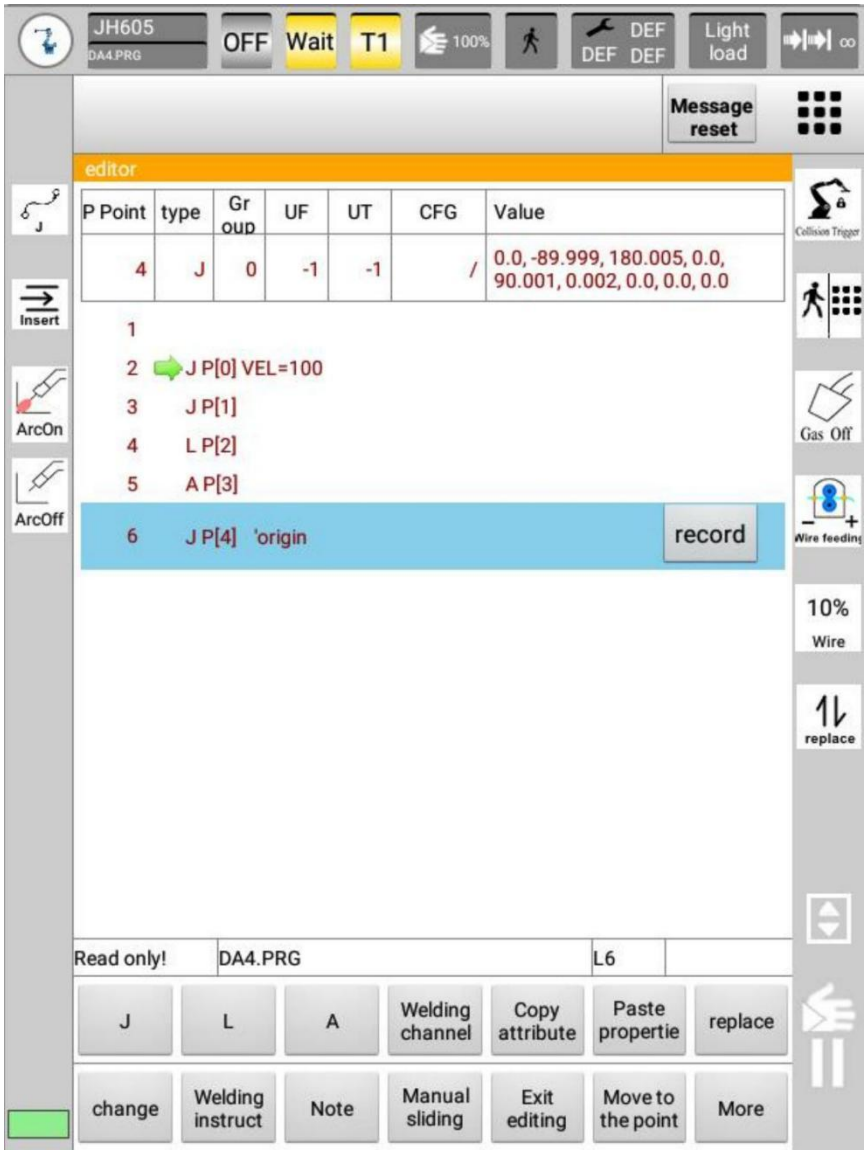


Figure 23-11 Instruction Description

23.2.12 Motion to point function

	This function can be operated by all users.

Explain that the move to point function can move the robot to the previously recorded point.

Operation steps:

1.After opening the program, select the motion instruction, and then press the" Move to point"button, the robot will start to move towards the target, and release the" Move to point"button and the robot will stop moving (as shown in Figure 23-12).

Note: The motion to point function can only be used in teach mode. Press the enable switch before exercising.

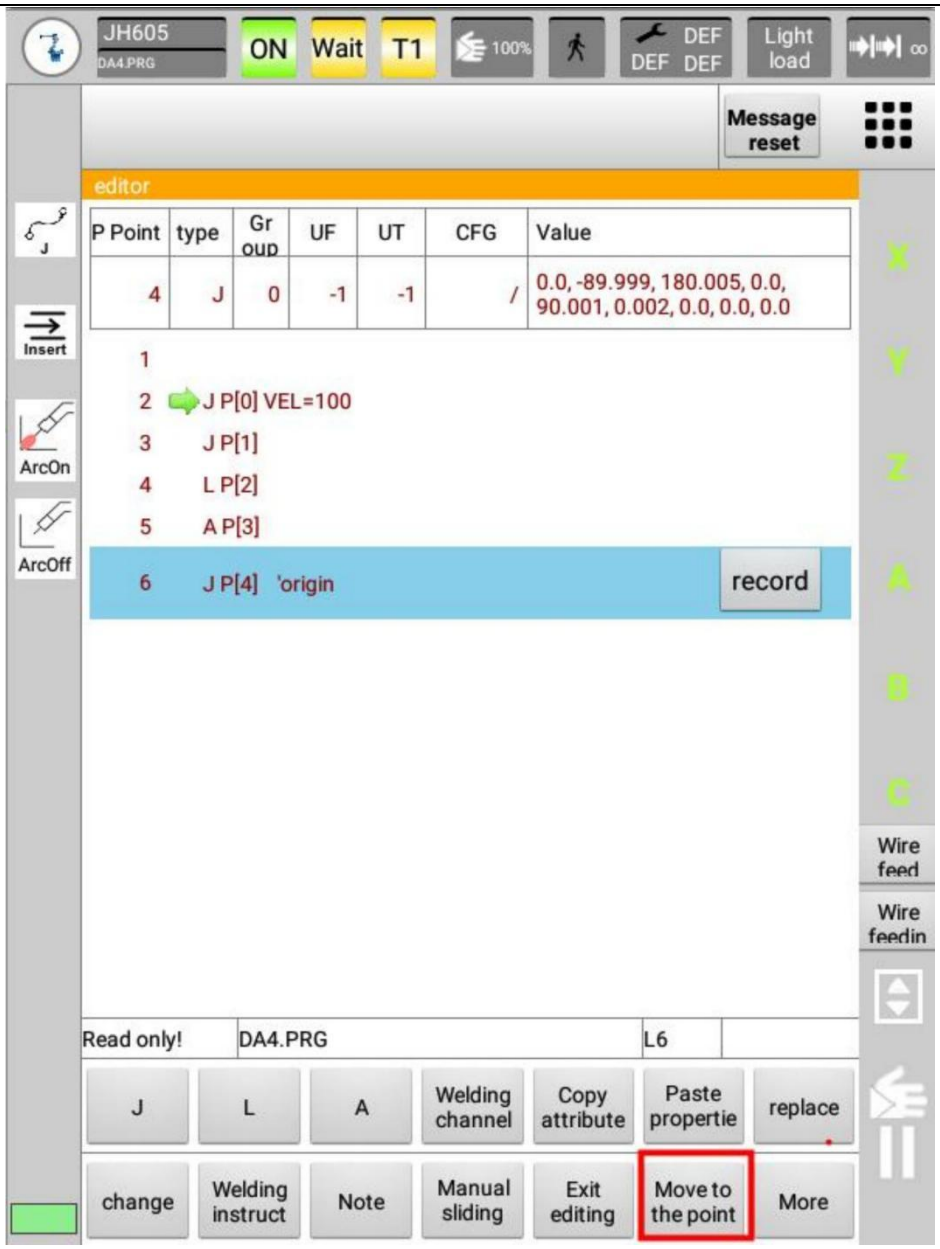


Figure 23-12 Movement to point

24 Welding programming instructions

24.1 Overview of welding programming instructions

Welding instructions include motion instructions, process instructions, program control instructions, welding instructions, weaving instructions, etc. Click the"Welding Instruction"button in the program editing interface to pop up the instruction selection box, as shown in Figure 24-1 below.

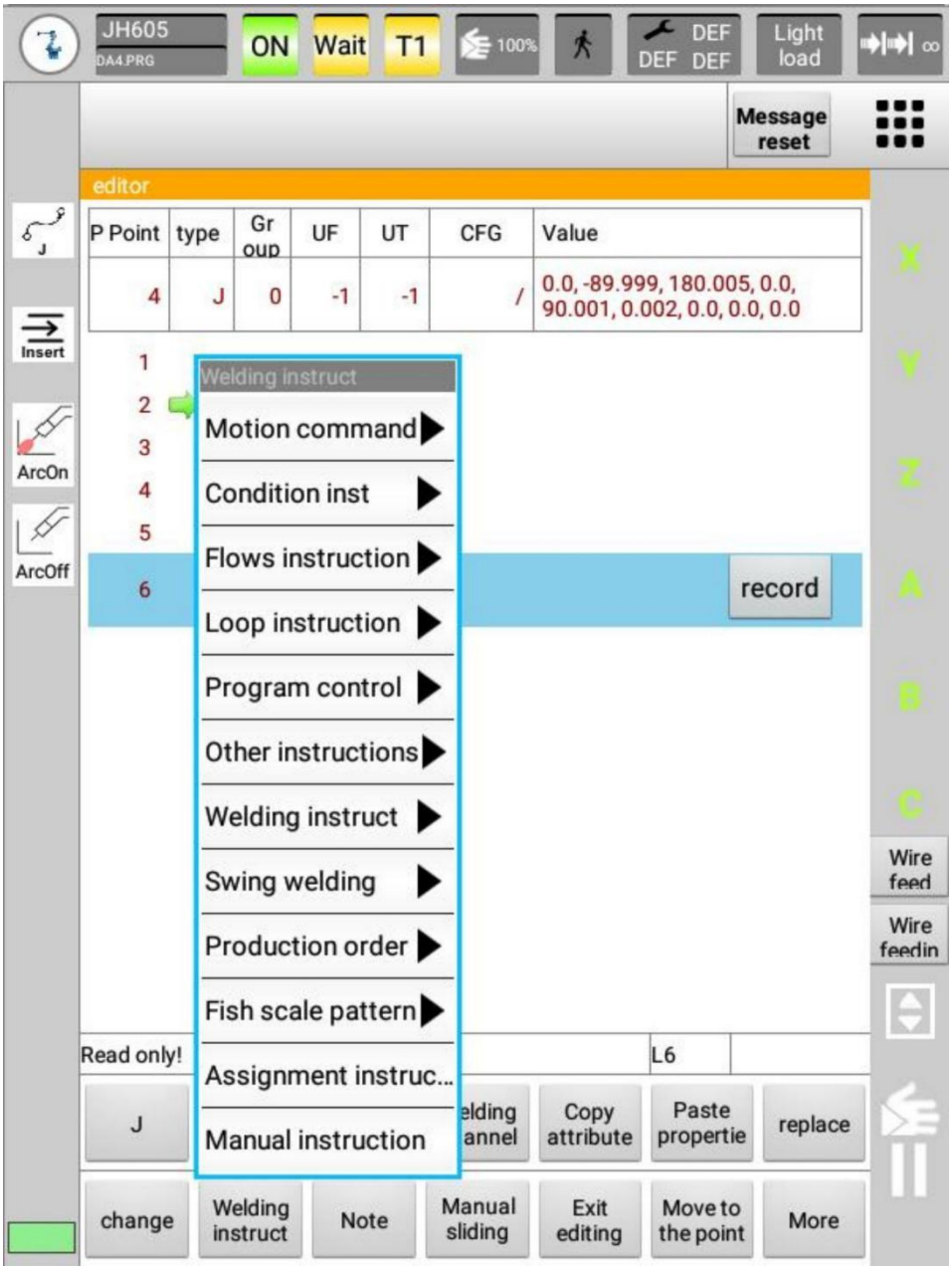


Figure 24-1 Welding instructions

Instruction type and the instruction table included in the type

Instruction type	instruction
motion instruction	J L A ACCSPEED
conditional instruction	ELSE SELECT CASE

	ELSE, GOTO LBL
Process instruction	CALL GOTO LBL IF

recurssion instruction	FOR
	END FOR
	WHILE
	END WHILE
	BREAK

Program control instructions	DO WAIT STOP End THROW SET_TOOL SET_FRAME
Other instructions	SET_TR run program PRINT F
Welding instructions	ARC_CHANNEL ARC_ON ARC_OFF Flifht arcing parameter Welding process gradient instruction
Weaving instructions	WAVE_ARC WL WC MOVE_WC
Production order	ARC_PRODUCTNUM ARC_CLEARPRODUCTNUM
Fish-scale pattern	INTERAITENT_WELD WM MOVE_WM
Assignment instruction	UFRAME_NUM UTOOL_NUM CNT J_VEL J_ACC J_DEC L_VEL

	L_ACC L_DEC L_VROT C_VEL C_ACC C_DEC C_VROT PLATLOAD COL_DETECT COL_GUARD_ADJUST SMOOTH TURN TALARN CR
Manual command	Enter instructions manuallys

24.2 Motion commands

Explain that the motion command includes joint motion, linear motion and arc motion.

Motion command edit box:

serial number	illustrate
1	Select instructions, J, L, C three instructions can be selected. Whenthe C command is selected, two points will pop up in the conversation box for recording the position.
2	The name of the newly recorded point. With the cursor at this point, you can click on the record joint or record Cartesian coordinates.
3	Set running speed
4	For parameter setting, you can add the attribute corresponding to the deletion point in the parameter setting dialog box. After editing the parameter, click OK to correspond the parameter to that point.
5	The new recorded point is assigned a joint coordinate value.

6	Assign this newly recorded point a Cartesian coordinate.
7	Click to open a Modify Coordinates dialog box, and you can manually modify the coordinate values (you need to record the point information first, and the modified coordinates correspond to the coordinate type of the record).
8	The value of the newly added point can be saved by creating a new JR register or LR register, and the relevant value can be found in the variable list, which facilitates the use of the point value through the register in the future.

24.2.1 J commands

Instruction description : The J instruction takes the current position of a single axis or a certain group of axes (robot group) as the starting point, and moves an axis or a certain group of axes (robot group) to the target point position. The movement process does not perform trajectory and attitude control, that is, joint motion.

Command example :

```
J P[1] VEL=50 ACC=100 DEC=100
J P[2]
```

Command parameters (optional):

The J command contains a series of optional motion parameters, such as speed, smooth transition, acceleration ratio,, deceleration ratio, etc. After the property is set, it is only valid for the current motion. After the end of the motion command line, it will return to the default value. If no parameter is set, the default value of each parameter is used for motion, such as: the default parameter used by the above joint P[2].

24.2.2 L command

Instruction description : The L instruction takes the current position of the robot as the starting point, and controls it to perform [linear motion] in the Cartesian space. It is often used in occasions that require trajectory control. The control object of this instruction can only be [robot group].

Command example :

```
L P[1] VEL=50 ACC=100 DEC=100 VROT=50
L P[2]
```

Command parameters (optional):

The L command contains a series of optional motion parameters, translation speed, smooth transition, acceleration ratio, deceleration ratio, attitude speed, etc. After the property is set, it is only valid for the current motion. After the end of the motion command line, it will return to the default value. If no parameter is set, the default value of each parameter is used for motion.

24.2.3 A command

Instruction description : The three points of the A position of the arc command robot together form two arcs of the same radius, so that the first two points are an arc of one radius, the last two points are an arc of another radius, and the two arcs are between the two arcs. Points can be added and deleted, and the motion attributes of the two arcs can be set to different attributes

Command example :

```
J P[1] VEL= 100
AP[2] VEL=500
AP[3] VEL=500
A P[4]
A P[5]
L P[6]
```

The above shows that when the first circular motion a command (line 2) is executed, the robot runs

The moving mode is linear motion, that is, from the current position P [1] of the robot to the target point P [2], from P [2] circular arc to p [3], from P [3] circular arc to p

Command parameters (optional):

The A command contains a series of optional motion parameters, such as speed, smooth transition, acceleration ratio, deceleration ratio, attitude speed, etc. After the property is set, it is only valid for the current motion. After the end of the motion command line, it will return to the default value. If no parameter is set, the default value of each parameter is used for motion.

	①The points on the arc can be added and deleted. ②You can set different motion attributes (speed, acceleration, smoothness, tool offset, etc.) for the middle point and end point of the arc. ③ Each arc track has a different radius.

Notes on using this command:

1.Since the package acceleration of the welding arc start command is 600 by default, if the attitude of the welding circle with a small diameter of φ15mm or below changes too much, it will cause an abnormal deviation of the running track. At this time, changing the acceleration of the A command to 100 can avoid this phenomenon.

2.When running a full-circle trajectory with attitude changes, after running a circle, the Z-axis is lifted up and a Cartesian point is recorded, and then the movement mode of the point is switched from a straight line to a joint, and the operation is started to the command. It will appear that the J6 axis rotates from +358 degrees to -358 degrees (720 degrees in total). This phenomenon can be avoided by re-recording the point as joint coordinates after moving to the point.

24.2.4 ACCSPEEDSPEEDLEVEL command

Instruction description : The speed-up instruction is the instruction to increase the running speed of the robot.

Command example :

```
MAC ACCSPEEDSPEEDLEVEL=0,OUT
J P[1]
L P[1]
```

Command parameters :

Speed-up commands include standard and high-speed options.

24.2.5 Additional axis motion commands

Instruction Description： Additional axis motion commands are asynchronous axis motion commands.

Command example：

Refer to 22.4 How to Use Asynchronous Axis Motion Commands.

24.3 Conditional instruction

The SELECT statement compares the value stored in the register selected by the SELECT with the value after the CASE. If the value is equal, the post-case flow instruction is executed, and the SELECT statement block is jumped out. The following CASE instruction and ELSE instruction are no longer executed. If they are not equal, the corresponding CASE of the row is not executed, and subsequent CASE selection judgments continue until the entire statement block is completed.

Syntax format:

SELECT <num expression>

CASE<num expression>, (GOTO LBL"["<unsigned int num>"]")|(CALL <string name>)

[{CASE<num expression>, (GOTO LBL"["<unsigned int num>"]")|(CALL <string name>)}

ELSE, (GOTO LBL"["<unsigned int num>"]")|(CALL <string name>)]

示例：

```
SELECT R[0]
CASE 1, GOTO LBL[1]
CASE 2, GOTO LBL[2]
CASE 1, CALL"RT.PRG"          'This is a repeated CASE, if R[0]=1, then only
                                Row once before LBL[1]
ELSE, CALL"HS.PRG"            'The ELSE command is optional and can be
                                written or not
GOTO LBL[4]
LBL[1]
J P[1]
GOTO LBL[4]
LBL[2]
J P[2]
GOTO LBL[4]
LBL[3]
```

J P[3]

LBL[4]

Execution logic description:

The above procedures are executed successively from the top down, matching R[0]. When R[0]=1, the program moves to P[1] When R[0]=2, the program moves to point P2. When R[0] is not equal to 1 or 2, the program executes ELSE

The contents of the instruction part of the subroutine HS.PRG are then sequentially executed.

24.4 Process instructions

24.4.1 CALL program instruction

Instruction description: The calling program instruction is used to call the subprogram and execute the program content of the subprogram.

Command example :

Example: here are two programs, the main program MAIN.PRG, subroutine SON.PRG.

'MAIN.PRG(main program)

J JR[1] VEL=50

J JR[2] VEL=50

CALL SON.PRG 'Call subroutine

wait time=500

Digital output [1]= off

The above execution process, joint movement to JR[1], JR[2], the execution of digital output [1]= on, forced to wait 500 milliseconds, digital output [1]= off, turn off the pulse signal, complete the program execution.

The above means that if DI[1]ON, the program content of the TEST.PRG subroutine is called, otherwise it is held

Remarks: Program calls support multiple levels of nesting, 10 levels and above.

Operation steps :

1.Select the line above the command line to be inserted.

2.Select Instruction → Process Instruction → Call Program.

3.Click the Select Subroutine button.

4.Select subroutine, OK.

5.Click the OK button in the operation bar to add the calling program instruction to complete.

picture 2 4 - 1 call program instruction

24.4.2 LBL[ ] and GOTOLBL [ ] instructions

Instruction description: The jump to process instruction is mainly used to jump the program to the specified label position (process). To use the jump to flow instruction, the flow label must be defined in the program, and the jump to flow instruction and the flow instruction must be in the same program block. The jump to flow instruction is used in combination with the flow instruction to complete the jump of the program, and it will jump to the line specified by the flow.

Command example :

```
LBL[1]
GOTO LBL[1]

LBL[1]
J P[1] VEL=50
J P[2] VEL=50                    ‘Circular motion between two
points
GOTO LBL[1]
```

Remarks: The program can realize circular motion through the GOTO statement

Operation steps :

1. Select the previous line of the command line to be inserted.
2. Select Command→Process Command→ Process, and enter the label number.

picture 2 4 - 2 Process Instructions - 1

3. Click the"OK"button in the operation bar to insert the process instruction successfully.

4. Select the command line to jump to.

5. Select instruction→process instruction→ jump to the process, and enter the label number in the input box

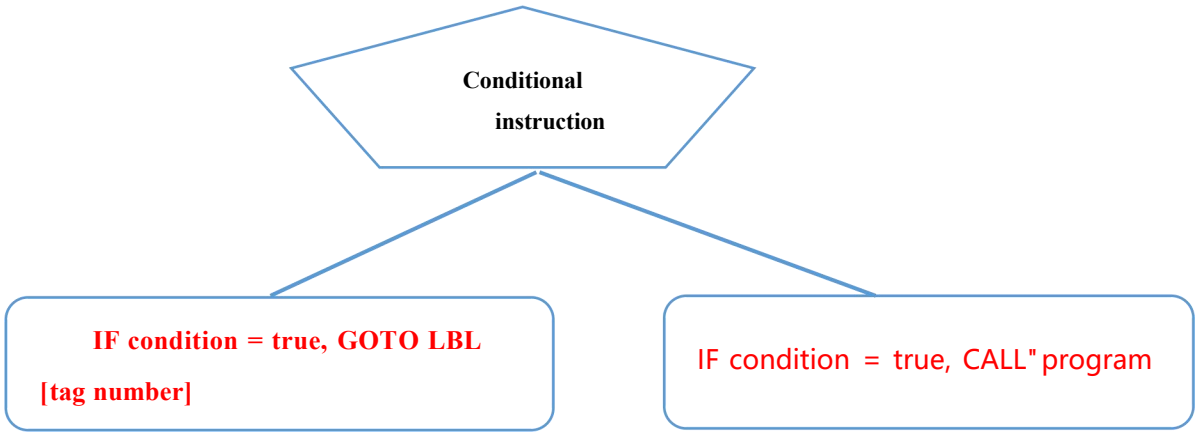
picture 2 4 - 3 Process Instructions - 2

6. Click the"OK"button in the operation bar to add the jump to the process instruction successfully.

	Use jump to process [], process [] to realize program loop running

24.4.3 if command

If the instruction is used for program condition judgment and logic processing, there are the following two types.



24.4.3.1 IF ….,GOTO LBL[]

Instruction description: The instruction syntax is if.…, jump to the flow [], when the

condition is met, execute the GOTO part of the code block; when the condition is not met, execute the program block starting from the IF descending sequence in sequence.

Command example :

Application exampe ①: It is realized by IF GOTO statement. movement to point P1, R [2] = 2, movement to point P2, R [3] = 3, movement to point P3

```
IF R[1] = 1, GOTO LBL[1]
IF R[1] =2, GOTO LBL[2]
IF R[1] =3, GOTO LBL[3]
GOTO LBL[4]
LBL[1]
J P[1]
GOTO LBL[4]
LBL[2]
J P[2]
GOTO LBL[4]
LBL[3]
J P[3]
LBL[4]
```

Application example ②: It is realized by IF GOTO statement. After 3 times of loop program, exit the loop.

```
R[1] =0
LBL[1]
IF R[1]>3 GOTO LBL[2]
J P[1]
J P[2]
R[1]=R[1]+1
GOTO LBL[1]
LBL[2]
```

24.4.3.2 IF…., CALL

Instruction description: The instruction syntax is if.… , call the program, when the condition is satisfied, execute the subprogram. PRG code content and then execute it in sequence; when the condition is not true, execute the program content starting from the downline, ignore the called subprogram program.

Command example :

IF <condition>, CALL Program name.PRG

Example:

IF DI[1] =ON,CALL TEST.PRG

J JR[1] VEL =50

DO[1] =OFF

.....

The above indicates that if the di [1] on condition is met, it will be called first TEST.PRG The program content of subroutine, after execution, execute J Jr [1] vel = 50, do [1] = off and the following instructions,

Operation steps :

1. Select the line above the command line that needs to be added
2. Select Instruction → Conditional Instruction → If
3. Click the symbol button above the modification box to quickly add conditions ; click options, you can add conditions, delete conditions, and modify conditions. When recording the statement, the list of conditions will be connected in the order of addition.

picture 2 4 - 4 if command

4.Click the up or down button in the action bar to move the position of the condition up or down.

5.Click to add a group, a check box will pop up, and you can check the conditional combination to complete the parentheses.

6.Check the check boxes for the conditions in columns 1 to 3, and then click to complete the grouping.

7.As shown in the figure below, select the first row, and if you click Ungroup again, you can restore to the state shown in the figure above.

8.Click the OK button in the operation bar to complete the addition of the IF instruction.

24.5 Loop instructions

24.5.1 FOR... END FOR instruction

The FOR statement needs to define the initial value of a variable, the final value, and the step value (the BY expression is optional, and the default increment is 1 each time it is not written). The system will determine whether the value of the loop variable is less than or equal to the final value, and if it is less than or equal to the loop, the loop will be

executed, otherwise the loop will exit. FOR and END FOR form a loop block.

Syntax format:

FOR<num expression1> TO<num expression2> [BY <num expression3>] [<lo
op statements>]

END

FOR

Example:

```
R[2]=0
FOR R[1]=0 TO 2 BY 1
R[2]=R[2]+1
END FOR
```

Execution logic description:

The loop body variable R[1] has an initial value of 0, a final value of 3, and a step value of 1, then each loop is increased by 1. In the first judgment, R[1]=0, not greater than the final value, the first cycle, R[2]=1; In the second judgment, R[1]=1, not greater than the final value, the second cycle, R[2]=2; In the third judgment, R[1]=2, not greater than the final value, the third cycle, R[2]=3; In the fourth judgment, R[1]=3, greater than the final value,

Exit the loop.

So we judged it four times and cycled it three times. After the program finishes running, R[1]=3, R[2]=3.

Tip:

If you need to use"loop"logic in the application process, it is recommended to add WAIT in the loop statement

TIME=50/100 delay instruction to avoid logical processing exceptions that may occur because the program is executing too fast Question.

24.5.2 WHILE... END WHILE instruction

The WHILE statement determines whether the loop ends based on the conditional expression. When the condition is true, the loop continues; When the condition is false, exit the loop. The WHILIE statement and END WHILE form a loop block.

Syntax format:

WHILE <bool expression>

[<loop statements>]

END WHILE

Example:

```
R[1]=0
WHILE R[1]<3
R[1]=R[1]+1
END WHILE
```

Execution logic description:

For the first judgment, R[1] =0, less than 3, the first loop is performed; In the second judgment, R[1] = 1, less than 3, the second cycle is performed; For the third judgment, R[1] =2, less than 3, the third cycle is performed; At the fourth judgment, R[1] =3, not less than 3, exit the loop. It went through the loop three times.

Tip:

If you need to use"dead-loop"logic in the process of application, it is recommended to add WAIT TIME=50/100 delay instruction in the loop statement to avoid possible logic processing exceptions due to fast execution of the program.

24.5.3 The BREAK command

The BREAK statement is used to exit the FOR or WHILE loop.

Syntax format:

```
<BREAK
>
Example:
WHILE R[1]=0
....        'Program content
BREAK       'jump out of the loop
END WHILE
FOR R[1]=0 TO 2 BY 1
....        'Program content
BREAK       'jump out of the loop
END FOR
```

24.6 Program control instructions

24.6.1 DO

Instruction description: The digital output instruction is used for the operation of the output signal and the mapping between IO.

Command example :

```
DO [1] = ON ‘Output [1] is set to ON
DO [1] = OFF ‘Output [1] is set to OFF
DO [1] = DO [2] ‘output [2] is assigned to output [1]
DO [1] = DI [2] ‘input [1] is assigned to output [1]
```

Operation steps :

1. Select the previous line where the digital output command line needs to be added
2. Select Command→IO Command→ Digital Output
3. Enter the IO serial number in the first input box
4. Select the corresponding value or IO in the second selection box. If IO is selected, you need to enter the corresponding IO serial number in the corresponding input box.
5. Click the"OK"button in the operation bar to complete the addition of the IO instruction.

24.6.2 WAIT TIME command

Instruction description: The usage scenarios of delay instructions can be divided into two situations. The first one is used to wait for a certain input state (digital input), output state (digital output) or whether the value of the R value is equal to the set value. If the condition If it is not satisfied, the program will block in this line until the condition is satisfied and continue to execute the following program content; the second is to force the wait for how many milliseconds before continuing to execute the following program content. The timeout command is the command that acts on the first case and is used in conjunction with the timeout setting.

```
J P [1]
WAIT TIME 1000 ‘After moving to P1, wait for 1 second after sleep, DI [1] will output the signal number
DI [1] = ON
J P [2]
J P [3]
```

Command example :

Remarks: When editing a delay instruction, after editing the delay condition, if the process to be jumped after editing timeout is selected as None, the timeout setting has no effect on the instruction. If it is blocked in this row, it can only be released by clicking"More → Release Waiting"in the lower menu bar.

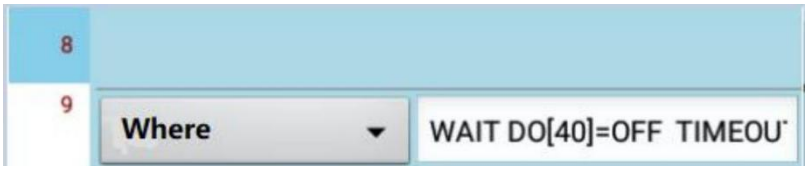


Figure 24-6 Delay Condition Instruction

24.6.3 PAUSE instruction

Instruction description: The suspend instruction is used to suspend program execution.

Command example :

```
J P [1]
J P [2]
PAUSE ‘the program is executed to this line, the program status is changed to
pause
```

Remarks: As in the example program above, the program moves to point P1, and then to point P2. When the program executes the pause command, the program state changes from running to pause state, and the current actual position is still at point P2.

Operation steps :

1.Select the line above the command line to be inserted.

2.Select Command→ Program Control Command→ Pause.

3.Click the OK button in the operation bar to add the PAUSE instruction to complete.

picture 2 4 - 7 Pause instruction

24.6.4 END command

Instruction description: This instruction is used to end the program running.

Command example :

```
J P [1]
J P [2]
END ‘the program is executed to this line, the program ends, and the
program pointer returns to the first line
```

Remarks: As in the above program, the program moves to point P1, and then to point P2. When the program executes to the end command, the program state changes from running to ready state, the pointer returns to the first line, and the current actual position is at point P2. Press the run button, the program moves to point P1, and then to point P2, the program state changes from running to ready state, and the pointer returns to the first line.

	Note: When the subprogram is called in the main program, and the subprogram contains the end, then the end subprogram continues to execute the main program program content

Steps

1.Select the line above the command line to be inserted.

2.Select Command→ Program Control Command→ End.

3. Click the OK button in the operation bar to complete the addition of the end command.

picture 2 4 - 8 end command

24.6.5 THROW command

Instruction description: This instruction is used for user-defined part of the alarm and prompt, the alarm prompts the user or stops the robot program running.

Command example :

```
J P[1]
J P[2]
THROW： “Logical error"LEVEL=ERROR J
P[3]
```

Command parameters:

Unrecoverable: Unrecoverable serious errors, the robot stops motion, the motion buffer is emptied, the program enters an error state and the cache is emptied, and cannot be recovered (the program cannot be resumed).

Alarm recoverable: recoverable error, the robot stops motion, the program enters an error state, but the motion buffer is not emptied, and the operation can be resumed.

Warning: The system is in a critical state or the user's operation may lead to adverse consequences and other prompts, which will not cause the program or motion to stop.

Hint: A general hint message for user guidance.

Information: General system status information or user operation records that are not prompted by the user.

Operation steps :

1. Select the previous line of the command line to be inserted.
2. Select Command→ Program Control Command→ THROW .
3. Enter custom alarm information in the"Alarm Information Input Box".
4. Click the"Alarm Type"drop-down box option and select it.
5. Click the OK button in the operation bar to complete the adding alarm information instruction.

24.6.6 SET_TOOL command

Instruction description: This instruction can assign and modify the value of the tool coordinate system through the program.

Command example :

```
LR[0]= UT[0]    'Assign the coordinate value of tool No. 0 to LR [0]
UTOOL_NUM = 0
SET_TOOL 0 LR[0]
```

Operation steps :

1. Select the previous line of the command line to be inserted.
2. Select command→ program control command → SET_TOOL.
3. Enter the tool number in the"Set tool number input box".
4. Click the"LR"input box again and enter the LR index number.
5. Click the OK button in the operation bar to complete the command to add the setting tool number.

24.6.7 SET_FRAME command

Instruction description: This instruction can assign and modify the workpiece coordinate system value through the program.

```
LR[1]= UF0    ‘Assigns the coordinate value of the job number 0
toLR[1]
FRAME_NUM = 0
```

Command example :

Operation steps :

1. Select the previous line of the command line to be inserted.
2. Select command→ program control command → SET_FRAME.
3. Enter the workpiece number in the"Set workpiece number input box".
4. Click the"LR"input box again and enter the LR index number.
5. Click the OK button in the operation bar to complete the instruction of adding and setting the workpiece number.

24.7 Other commands

24.7.1 The SET_TR command

The process of the robot arm to complete a motion track is: static (starting point) - acceleration - uniform speed - deceleration - stop (target point), and the speed is not uniform in the acceleration and deceleration section. If the manipulator reaches the starting point or target point and then outputs the signal or turns off the signal, it will introduce a track segment with uneven speed, which will cause uneven gluing in gluing or welding applications and reduce the processing quality of the product. Use SET_TR and BIND_TR

Signal trigger, which can turn the signal on or off in a specified track segment position.

Syntax format:

SET_TR[num], DS|DE|DC=<num>, <signal expression>

<Motion Type><Target Point>, BIND_TR[num1,num2…]

Parameter description:

Starting point: Normally the target point of the previous motion instruction. When the motion terminates, the current position of the robot should be used as the starting point for re-calculation after restarting the motion.

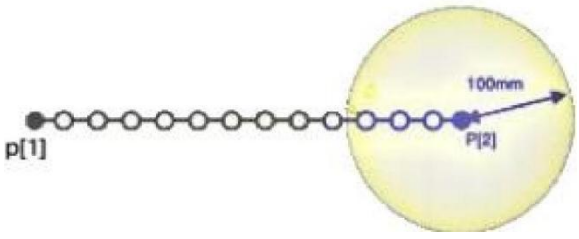
DS: Short for DISTANCE START, the distance from the starting point of the robot motion.

DE: Short for DISTANCE END, the distance from the moving target point.

DC: Short for DISTANCE COMPLETE, referring to the percentage of distance

completed

triggering condition	DS=xx	DE=xx	DC=xx
meaning	Robot TCP outputs signals when the distance from the starting point of robot operation exceeds xx mm	When the distance between the robot TCP and the target point of the robot operation is within xx mm, the signal is output	Robot TCP has run this line of motion instruction robot TCP needs to move the whole distance length xx%, the output signal
triggering condition	The robot leaves the starting point, and the distance (instruction) between the robot and the starting point is greater than xx mm	The robot is moving towards the target point, and the distance (instruction) between the robot and the target point is less than xx mm	The robot moves towards the target point, and the percentage of the TCP distance traveled by the robot in the length of the whole path is greater than xx
output signal	When the robot meets the trigger conditions, the signal is output or turned off		



example:

SET_TR[0], DS=50, DO[4]=ON

SET_TR[1], DE=100, DO[4]=OFF 'Set the trigger number to 1 and specify the end point target 100mm distance output DO[4]=OFF

J P[0]

L P[1], BIND_TR[0]

L P[2], BIND_TR[1] 'P2 Point set trigger 0 or 1, can be set single or multiple devices, with Comma separated

Execution logic description:

In the example program, the first 2 lines of the program set trigger 0 and 1, that is, DO[5] output ON at the end point 100mm (note: when there is the same trigger number, execute with the latest trigger number condition) binds trigger 0 at point P1 and trigger 1 at point P2; The robotic arm moves in a straight line to P[1], and then from P[1] to P[2]. The system will periodically detect the position of the robot TCP distance points P1 and P2. When the distance P[1] is greater than 50mm, DO[4] =ON signal output; When the distance P[2] is less than 100mm, DO[4]=OFF.

Tip:

(1) When the robot starts to move and has met the trigger conditions, the corresponding signal will be output when the robot starts to move.

(2) When there is CNT smoothing, the smooth transition does not pass the target point, and the distance from the target point may not meet the trigger conditions, so no signal output is performed.

(3) When the program line is paused midway and then resumed, the trigger condition will be judged again from the current robot position.

(4) The specified distance signal output J joint command is invalid.

(5) In the actual operation process, the specified distance signal output is related to the running speed of the robot arm, and the signal output point will have a slight error, which can be adjusted by lowering the output point speed or adjusting the specified distance value.

24.7.2 PRINTF instructions

This command can print display information directly in the information display bar of the instructor. Use semicolons to separate multiple printed messages.

Syntax format:

PRINTF <string> <string|double> {;<string> [string|double]}

example:

```
SR[1]="tom"
SR[2]="jerry"
R[1]=10
R[2]=20
PRINTF"Height:"R[1];"Thickness:"R[2]          'Height :10; Thickness :20
```

```
PRINTF SR[1]
PRINTF SR[1] SR[2]          ' Syntax error, missing data item
```

24.8 Welding instructions

24.8.1 Welding Instruction

Instruction description: Set the welding channel data, which is generally used to call multiple sets of process parameters for one welding seam.

Command example :

```
J P[0]
L P[1]
ARC_ON(1)
L P[2]
ARC_CHANNEL(1)
L P[3]
ARC_OFF(1)
```

Operation steps :

1. Select the previous line of the command line to be inserted.
2. Select command→ welding command → Welding Instruction.
3. Select the channel number for calling welding data in the drop-down box.
4. Click the OK button in the operation bar to complete the adding welding channel command.

Remarks: Inserting welding channel command can also directly click the"Welding Channel"button in the program editing interface.

24.8.2 ARC_ON command

Instruction description: Set welding data and start welding.

Command example :

```
J P[0]
L P[1]
ARC_ON(1)
L P[2]
ARC_OFF(1)
```

Operation steps :

1. Select the previous line of the command line to be inserted.

2. Select command→ welding command → ARC_ON.

3. Select the channel number for calling welding data in the drop-down box.

4. Click the OK button in the operation bar to complete the addition of the arc start command.

Remarks: The arc start command and the arc end command should be used in pairs and placed before the arc end command.

24.8.3 ARC_OFFcommand

Instruction description: End welding.

Command example :

```
J P[0]
L P[1]
ARC_ON(1)
L P[2]
ARC_OFF(1)
```

Operation steps :

1. Select the previous line of the command line to be inserted.

2. Select Command→ Welding Command → ARC_OFF.

3. Select the same channel number as the most recent arc strike command in the drop-down box.

4. Click the OK button in the operation bar to complete the addition of the arc ending command.

Remark: The arc ending command and the arc starting command should be used in pairs and placed after the arc starting command.

24.8.4 FLIGHT command

Instruction description: Start arcing ahead of time after the distance set from the arcing point. Flying arcing can increase the production takt by increasing the time used for arcing.

Command example :

```
MAC FLIGHT DISTANCE =0,OUT
J P[0]
L P[1] BIND_TR[1]
ARC_ON(1)
L P[2]
RAC_OFF(1)
```

Operation steps :

1. Select the previous line of the command line to be inserted.

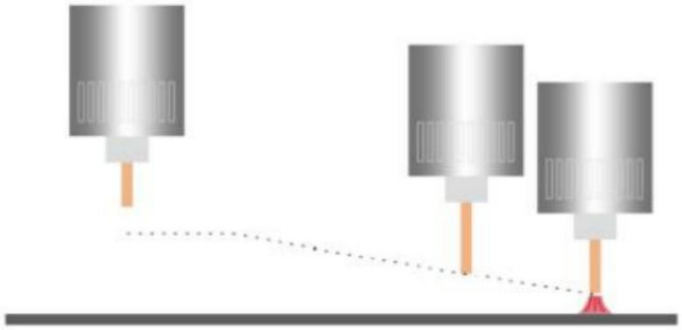
2. Select command→ welding command →FLIGHT.

3. In the input box, enter the distance from the arc starting point that needs to be started in advance.

4. Click the OK button in the operation bar to add the flight arc start parameter setting command to complete.

5. After adding the flight arcing parameter setting command, at the point where the flight arcing is required, click to change the properties, check the flight arcing check box, and click the OK button, the point becomes the flight arcing point.

Example of flight arc execution :



Take a common welding machine as an example: if the default slow wire feeding speed is 50mm/s for arc starting, the distance from the end of the welding wire to the workpiece after arc ending is about 10 mm, and normally there is no flying arc starting function, and the welding wire needs 200ms in the arc starting stage to When the robot touches the workpiece for ignition welding, since the robot is a deceleration process when it reaches the welding arc starting point, there is no fixed running speed, so the actual distance of the robot running 200ms before the arc starting point cannot be accurately calculated. Adjust after the situation is preset. Generally, the test distance is set as the distance from the tip of the contact tip to the workpiece. As shown in the

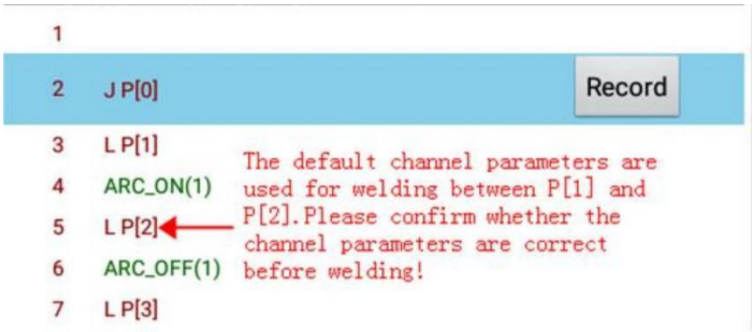
figure above, first set 10mm in the flight arc starting parameter setting command, then perform welding, and then adjust the parameters according to the actual production situation.

Remarks: Since the flying arc starting function is to execute the arc starting action before the robot reaches the actual arc starting point, in actual use, it is necessary to avoid the arc blasting and arc drawing affecting the rhythm caused by the robot arcing and feeding too long.

24.8.5 Welding instruction sample program

24.8.5.1 Application method for one weld joint with only one group of process parameters

```
J P[0]
JP [0]
L P[1]                  'Arching point
ARC_ON(1)               'Directive for arc striking which will invoke welding
                        channel (1) by default
L P[2]                  'End weld (extinguish point)
ARC_OFF(1)              'Directive for arc withdrawal
L P[3]                  'Transition point
```



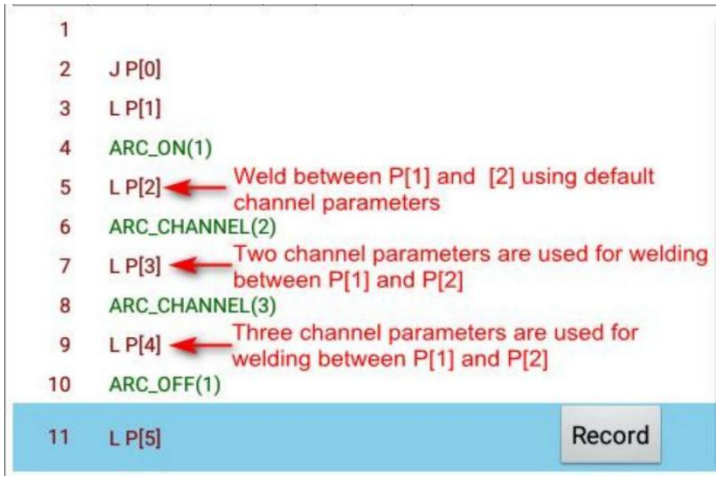
Remark: ARC_ON will invoke parameters of a welding channel to perform welding. Please confirm the accuracy of the parameters of the welding channel before operation!

24.8.5.2 Application method of one weld joint with multiple groups of process parameters

```
L P[1]                  'Arching point
ARC_ON(1)               'Directive for arc striking which will invoke welding
                        channel (1) by default
L P[2]                  'End weld of the first section
ARC_CHANNEL(2)          'Invoke a channel
L P[3]                  'End weld of the second section
ARC_CHANNEL(3)          'Invoke a channel
L P[4]                  'End weld of the third section, extinguish point
```

ARC_OFF(1) ‘Directive for arc withdrawal

L P[5] ‘Transition point



ARC_CHANNEL and ARC_OFF may be modified after insertion as Figure 12. 16 displays.

After selecting the directive line to be modified, a button says modify will show up. Click modify, there will come a dialog box as illustrated in Figure 24-10.

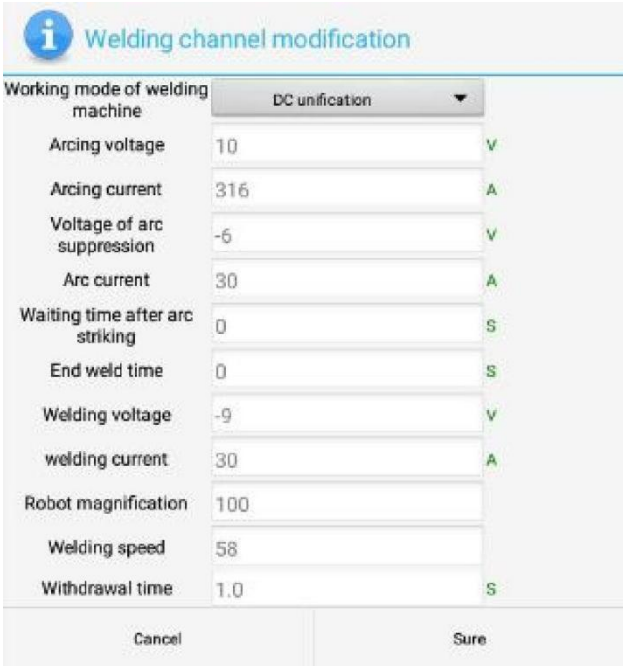


Figure 24-10 Modify the channel

Figure 24-10 As shown, you can select the channel number to be modified, select the process parameters, and the current, voltage, welding speed modification box will pop up. After setting the voltage, current, and welding speed, the welding voltage, welding current, and welding speed are subject to the current

settings. The voltage, current and welding speed in the welding channel shall prevail. After selecting, click OK to complete the modification of the channel number, voltage, current and welding speed. The arc detection function is added to the arc starting command for fish scale welding.

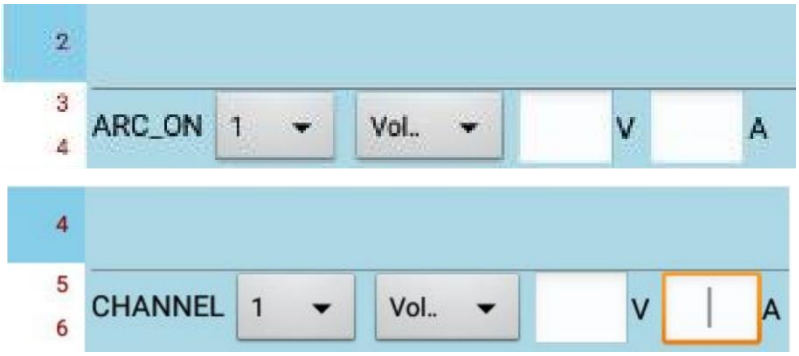


Figure 24-11 Modify the channel number that is voltage and current

Figure 24-11, you can select the channel number to be modified, and select the voltage and current to pop up the voltage and current modification boxes. When the voltage and current are set, the welding voltage and welding current are subject to the current settings. The voltage and current in the list shall prevail. After selecting, click OK to complete the modification of the channel number, voltage and current.

24.9 Swing command

The swing welding function means that when the robot arm executes a straight line or arc trajectory, it moves in the specified direction and superimposes a motion to realize that the motion trajectory of the final end TCP is the trajectory of the specified shape. Swing welding motion is commonly used in welding and grinding applications, the common swing trajectory are sine Z-shaped pendulum, circular pendulum, crescent pendulum, 8-shaped pendulum, L-shaped pendulum.

24.9.1 Call pendulum welding channel parameter setting description

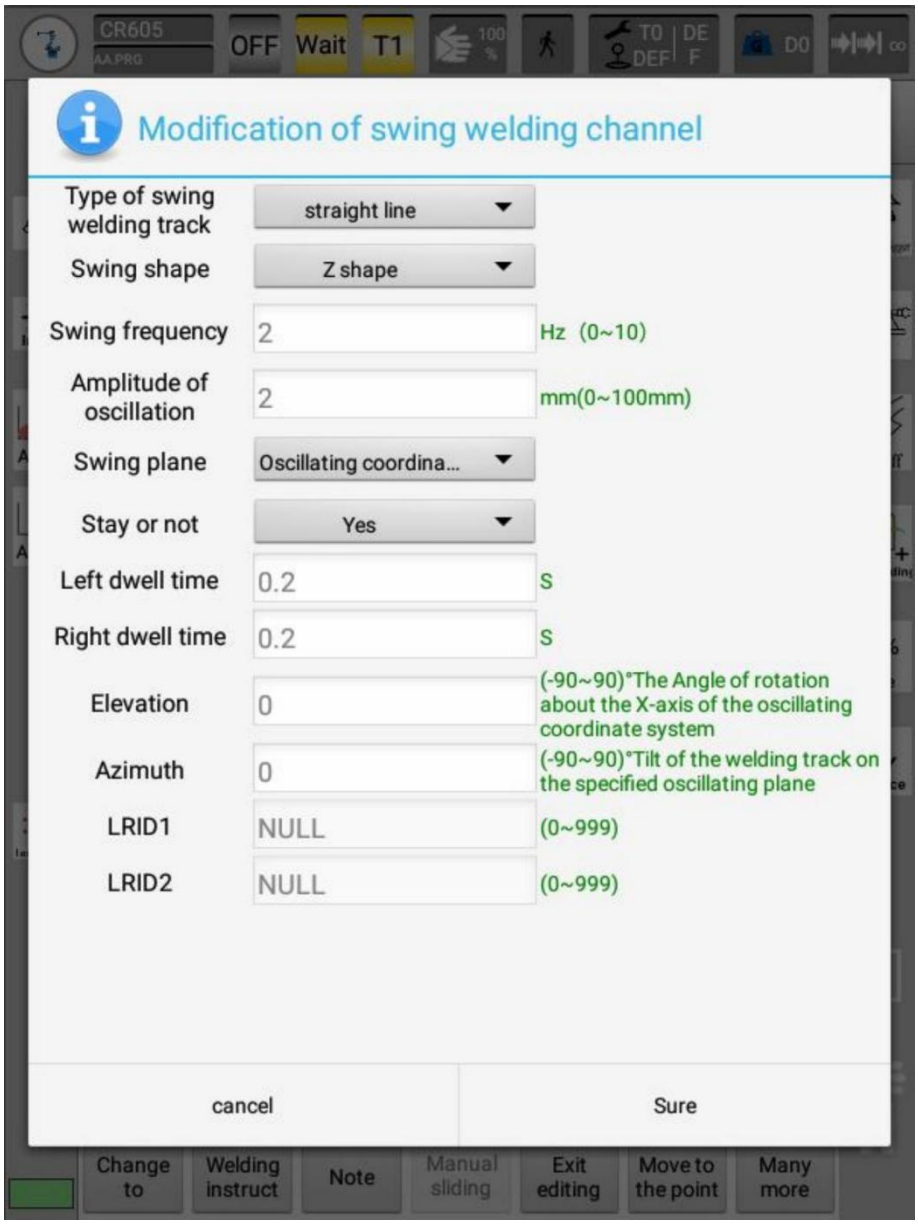


图24-12 Swing welding channel modification

The parameters are defined as follows：

Wobble trajectory type ： Determine the type of trajectory, if the linear pendulum welding, directly select the straight line can be; If there is a circular pendulum welding, choose arc; If it is a straight line + arc, directly select"Straight line"。

Oscillating shape ： Optional Z-shape, circle, L shape, positive crescent, reverse crescent, figure 8。

Amplitude of swing ： That is, the distance between the wave crest and the central axis, in millimeters。

Swingfrequency： That is, how many swing tracks are taken in 1 second, unit: Hz。

Oscillating plane：The plane in which the swing is located, that is, the direction of the swing motion. Taking the line between the starting point and the target point as the X-axis, the first plane is established on the z-axis of the tool coordinate system, and then the Y-axis of the oscillating plane is obtained by the cross product of the normal vector of the first plane and the X-axis, and then the Z axis of the oscillating plane is obtained by the cross product of the X and y-axes. The XYZ axis establishes the oscillating coordinate system. 0: along the oscillating coordinate system Y axis; 1: Along the Z axis of the oscillating coordinate system; 2: Along the X-axis of the oscillating coordinate system.

Stay or not：The options are Yes and No.

Left residence time：Left endpoint residence time. In seconds, rounded by 4ms if not an integral multiple of the interpolation period. The rounding principle.

Right residence time：Right endpoint residence time. In seconds, rounded by 4ms if not an integral multiple of the interpolation period. The rounding principle.

Elevation：That is, the Angle of rotation about the X-axis of the oscillating coordinate system, in degrees, with a value range of +-90 degrees. When the value is positive, it rotates counterclockwise, and when the value is negative, it rotates clockwise.

Azimuth Angle：Tilt of the welding track on the specified swing plane, the value is positive, and the left end point is inclined to the X+ axis; When the value is negative, the right endpoint tilts towards the X+ axis. The unit is degree. The value ranges from + to 90 degrees. When the value of ORI is equal to +-90 degrees, the direction of swing is parallel to the X-axis.

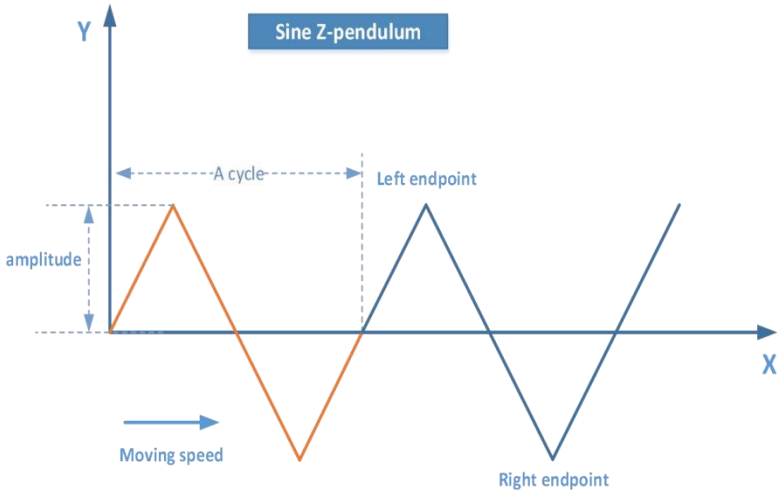
Reference point one：LR index value of the register, 0 to 999. The point on the first face of the L-swing is saved in the LR register.

Reference point two：LR index value of the register, 0 to 999. The point on the second face of the L-swing is saved in the LR register.

24.9.2 Pendulum welding type description

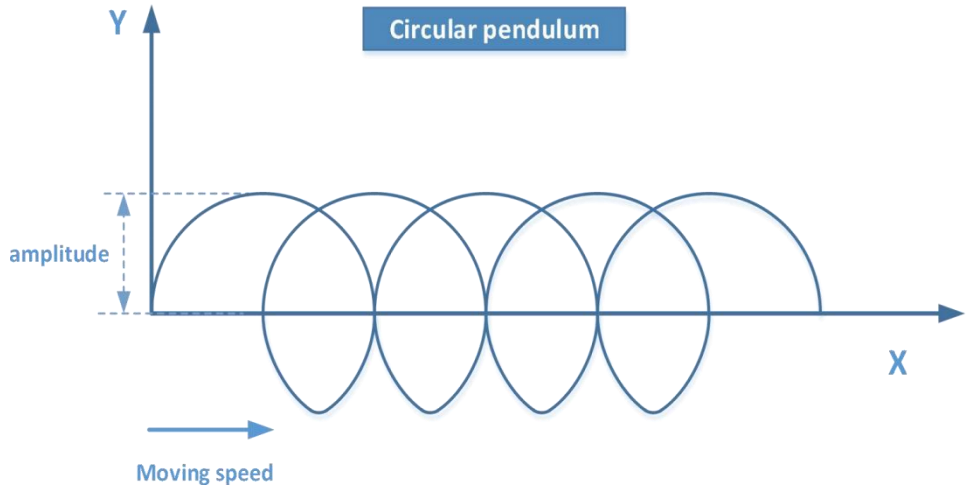
24.9.2.1 z-swing

The trajectory of the sine Z-wave swing is as follows. The manipulator can swing up and down on the specified swing plane when executing a straight line or arc trajectory.



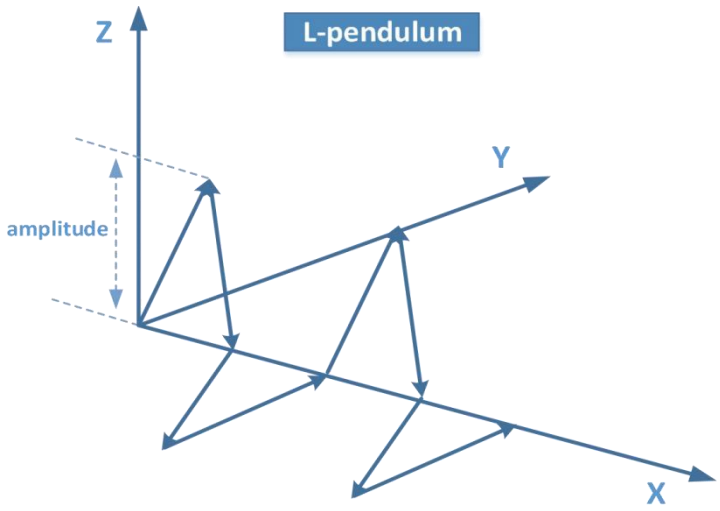
24.9.2.2 Circular swing

The circular swing trajectory is as follows: When the robot arm performs a straight line or arc trajectory, it can draw a circle and move forward on the specified swing plane.



24.9.2.3 L-swing

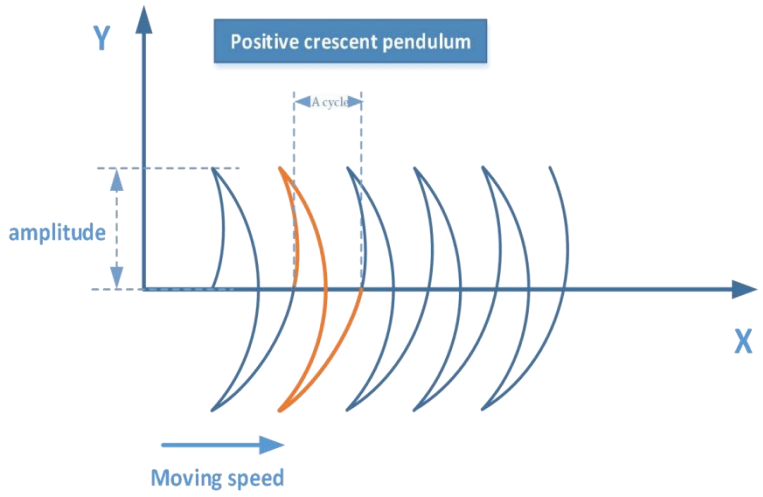
There is an Angle between the two plates, and the robot arm alternates swinging action on the two plates while performing the main motion. The L-shaped swing trajectory is as follows.



Note: When using L-swing, in addition to teaching the straight track, it is also necessary to teach the"reference point one"and"reference point two"on the surface of the two plates. In the index of the LR register specified by the swing welding channel number parameter, the two points shown are used to determine the Angle between the plate and the weld track. L-pendulum cannot be used for arc trajectories.

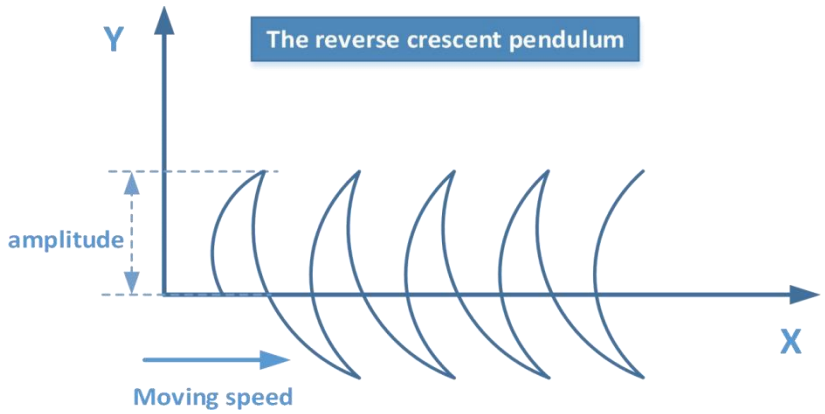
24.9.2.4 Positive crescent swing

The orbit of the positive crescent is as follows:



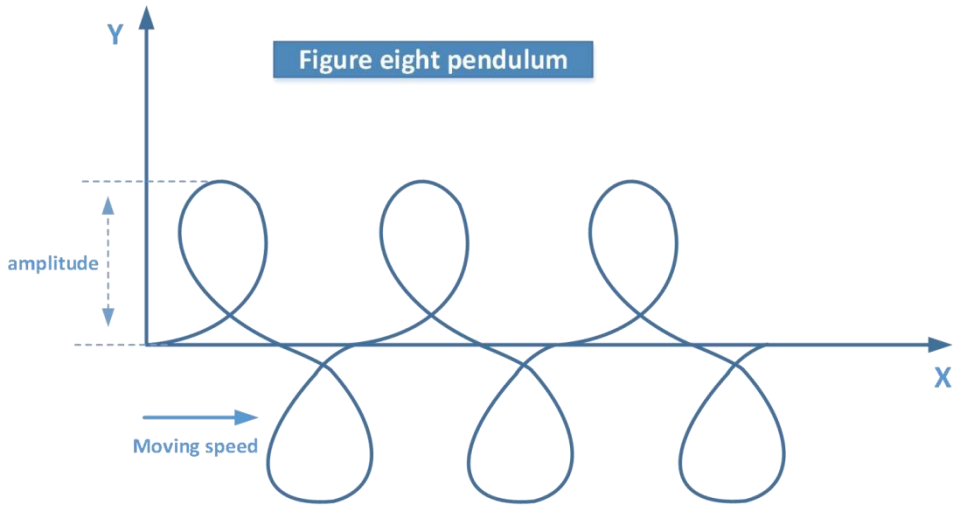
24.9.2.5 Countercrescent swing

The inverse crescent wobble trajectory is as follows:



24.9.2.6 Figure of eight swing

The 8-figure swing trajectory is as follows: When the robot arm executes the straight line or arc command, it can move forward while depicting the 8-figure on the specified swing plane. As shown below:



24.9.3 Example call swing welding channel instruction

Instruction specification：

Set the swing welding parameters for the swing welding procedure.

***Example instruction*:**

```
J P[0]
LP[1]                                ‘起弧点
MAC WEAVESTART
ARCINGWELDCHANNELINDEX= 1,OUT        ‘摆动开始指令
arcing(1)
L P[2]
L P[3]
A P[4]
A P[5]
A P[6]
LP[7]                    ‘收狐点
Arc Off(1)
MAC WEAVEEND
ARCINGWELDCHANNELINDEX= 1,OUT        ‘摆动结束指令
J P[8]
```

Operation procedure：

1. Open the welding process package → process parameters → swing welding channel, select channel 1, click"Modify"button, and set the required swing welding parameters.
2. Create a new program, click the"Open"button, click the"Program Edit"button.
3. Move the robot to the specified position and select insert joint, line, arc command.
4. Select instruction → Swing welding instruction → Call swing welding channel instruction.
5. Click the OK button in the operation bar to add and call the swing welding channel instruction.

Program example：

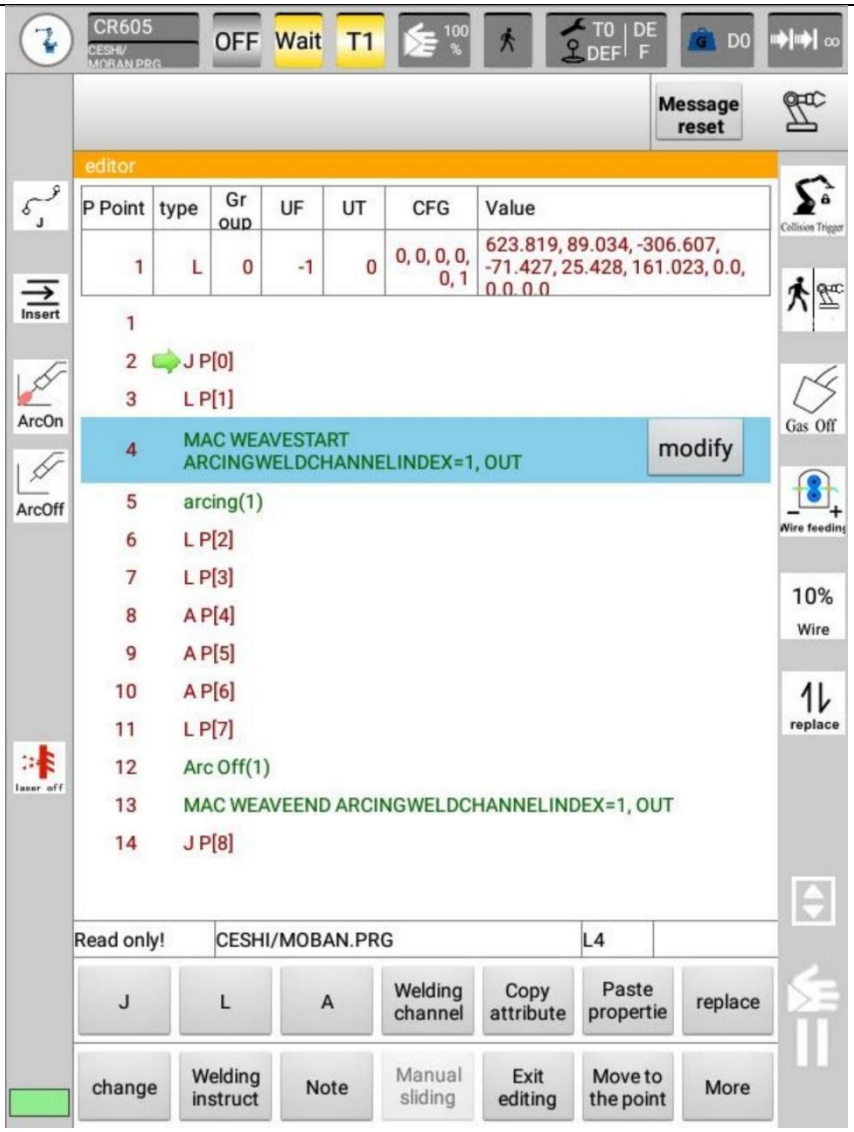


图 24-13 Example of standard procedure for pendulum welding

24.10 Production statistics instruction

24.10.1 ARC_PRODUCTNUM Instructions

Instruction description: This instruction is a statistical output command, which counts the output of welding workpieces.

Command example :

```
J P[0]
L P[1]
MAC ARC_PRODUCTNUM(1),OUT
```

Operation steps :

1. Select the previous line of the command line to be inserted.

2. Select Command→ Production Command → ARC_PRODUCTNUM.

3. Select the output statistics channel number to be used in the drop-down box.

4. Click the OK button in the operation bar to complete the addition of the output statistics command.

Note: After the output statistics command is executed, you can view it in Process Package → Production Statistics.

24.10.2 ARC_CLEARPRODUCTNUM command

Instruction description: This instruction clears the output of the corresponding channel.

Command example :

```
J P[0]
L P[1]
MAC ARC_CLEARPRODUCTNUM(1),OUT
```

Operation steps :

1. Select the previous line of the command line to be inserted.

2. Select command → output command → ARC_CLEARPRODUCTNUM.

3. Select the channel number to be cleared in the drop-down box.

4. Click the OK button in the operation bar to add the output reset command to complete.

24.11 Fish scale command

24.11.1 NTERMITTENT_WELD command

Instruction description: This instruction is a motion instruction, and the welding effect is fish scale after execution.

Command example :

```
J P[0]
ARC_ON（1）
MAC INTERMITTENT_WELD P[1] VEL=8mm/s Time=80ms Interval distance=1mm
ARC_OFF（1）
```

Operation steps :

1. Select the previous line of the command line to be inserted.

2. Select Command→ Fishscale Welding Command → NTERMITTENT_WELD.

3. In the input box, you can input the translation speed, time and interval distance.

4. After the input is completed, click the OK button in the operation bar to complete the addition of the linear fish scale welding instruction.

24.11.2 SA command

Instruction description: This instruction is the record of arc fish scale welding point, which records the arc position of arc fish scale welding.

Command example :

```
J P[0]
ARC_ON(1)
MAC SAP[1],OUT
MAC SAP[1],OUT
MAC SAP[1],OUT
MAC MOVE_SA,OUT
ARC_OFF（1）
```

Operation steps :

1. Select the previous line of the command line to be inserted.

2. Select Command → Fish Scale Welding Command → SA.

3. Click the OK button in the operation bar to add the arc fish scale welding point recording command to complete.

Remarks: More than 3 arc fish scale welding point recording instructions need to be inserted together, otherwise the arc path cannot be planned.

24.11.3 MOVE_SA command

Instruction description: This instruction is the motion instruction of arc fish scale welding, which is generally placed under the arc fish scale welding point recording instruction.

Command example :

```
J P[0]
ARC_ON(1)
MAC SAP[1],OUT
MAC SAP[1],OUT
MAC SAP[1],OUT
MAC MOVE_SA,OUT
ARC_OFF（1）
```

Operation steps :

1. Select the previous line of the command line to be inserted.

2. Select the command → fish scale welding command → MOVE_SA.

3. In the input box, you can input the translation speed, time and interval distance of the movement.

4. Click the OK button in the operation bar to add the arc fish scale welding motion command to complete.

24.11.4 Example program of fish scale instruction

24.11.4.1 Use of linear fish scale welding instructions

J P[0] ‘Normal editing program

MAC ARC_ON（1）

MAC INTERMITTENT_WELD P[1] VEL=8mm/s Time=100ms Interval distance=1 mm

MACINTERMITTENT_WELD P[1] VEL=8mm/s Time=150ms Interval distance=1mm

MAC INTERMITTENT_WELD P[1] VEL=8mm/s Time=80ms Interval distance=1mm

MAC ARC_OFF（1）

J P[4]

```
2  J P[0]
3    MAC ARC_ON R[500], OUT
4    L P[1]
5    MAC INTERMITTENT_WELD P[2] TIME_FLAG=0 SPACE_TIME_DIST...
6    MAC INTERMITTENT_WELD P[3] TIME_FLAG=0, OUT
7    MAC INTERMITTENT_WELD P[4] TIME_FLAG=0, OUT
8    MAC ARC_OFF R[500], OUT
9    J P[5]
```

Figure 24-14, when there is a fish scale welding instruction in the program, the weld effect is similar to"fish scale".

24.11.4.2 Use of arc fish scale welding instruction

J P[0] ‘Transition point

MAC ARC_ON(1) ‘Arc striking command, calling a set of welding

channel data

MAC SA P[1] ‘Record high-precision arc point instruction

MAC SA P[2] ‘Record high-precision arc point instruction

MAC SA P[3] ‘Record high-precision arc point instruction

MAC MOVE_SA ‘Execute high-precision circular motion command

MAC ARC_OFF（1） ‘Arc stop command

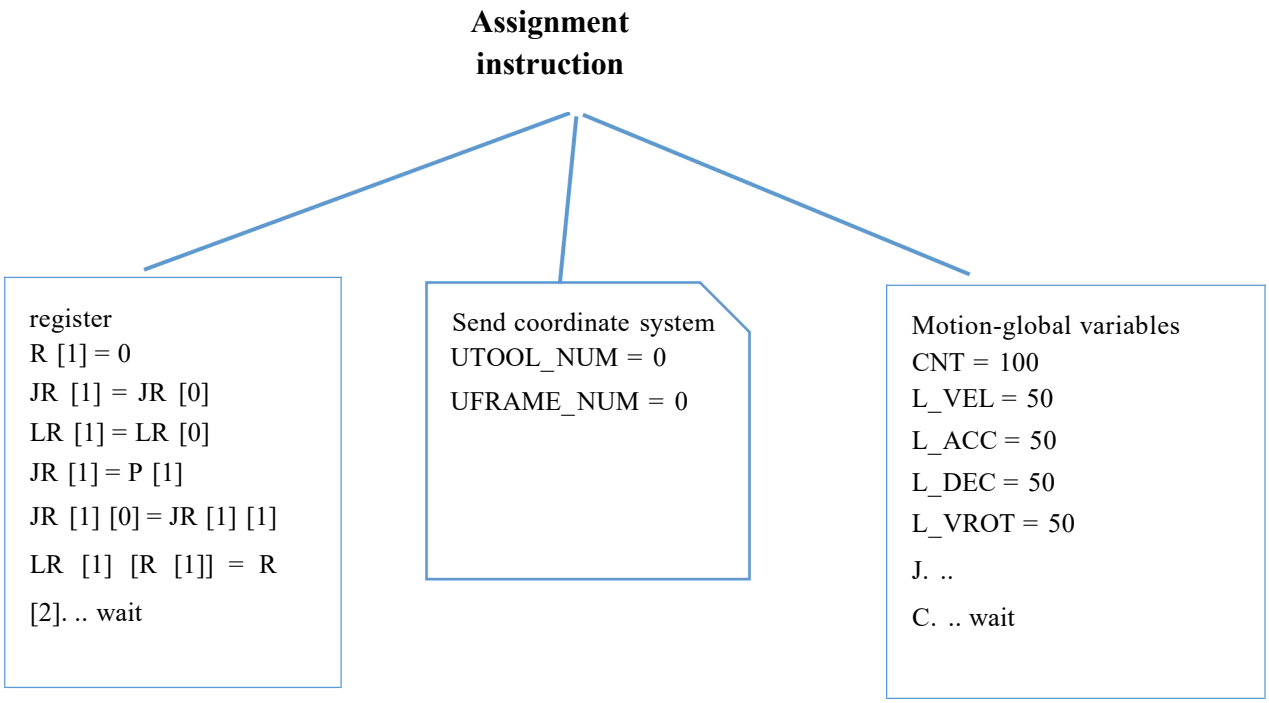
J P[4] ‘Transition point

```
2  J P[0]
3    MAC ARC_ON R[500], OUT
4    MAC SA P[1], OUT
5    MAC SA P[2], OUT
6    MAC SA P[3], OUT
7    MAC MOVE_SA , OUT
8    MAC ARC_OFF R[500], OUT
```

shown in Figure 24-15, the use of arc fish scale welding instruction.

24.12 Assignment Instructions

Instruction description: The assignment instruction is divided into three parts : register operation, coordinate system call, and global parameters.



24.12.1 Register Instructions

Instruction description: AUCTECH III system pre-defined several groups of different types of registers for users to use. It includes floating - point R registers, joint coordinate type JR registers, and Cartesian type LR registers. There are 300 R registers available for users to use, and 300 JR and LR registers . In general, the user assigns the preset value to the register corresponding to the index number, such as: R[0] = 1, JR[0] =JR[1], LR[0] =LR[1], the register can be directly used in the program. Register instructions include R[], JR[], LR[], JR[][], LR[][], P[], P[][].

Command example :

Operation steps :

1.Select the line above the line where the register instruction line needs to be added.

2.select instruction → assignment instruction

3.In the first input box, the"Register"drop -down box selects the register type

R[1] = 1

R[1] = R[2]

R[1] =R[1]+1

R[1] = DI[1]

R[1] =DO[1]

R[1] = JR[0][0]+LR[0][1]*R[2]-(R[3]/2+R[4])

JR[1]=JR[2]

JR[1]=JR[2]+JR[3]

JR[1]=(JR[2]*JR[3])+(JR[4]/JR[5]-JR[6])

JR[R[1]]=P[1]

JR[1][0]=JR[3][0]

JR[1][8]=R[1]

JR[1][0]=P[1][0]

JR[1][1]=JR[1][R[1]]*2

JR[1][1]= JR[1][1]*R[2]

JR[R[1]][R[2]]=JR[1][0]-R[1]

JR[(R[23]+JR[1][1])-(JR[1][8]/P[1][0])*2-21]=(JR[1]-JR[2])+JR[R[1]]*P[R[1]]/(R[1]+1)

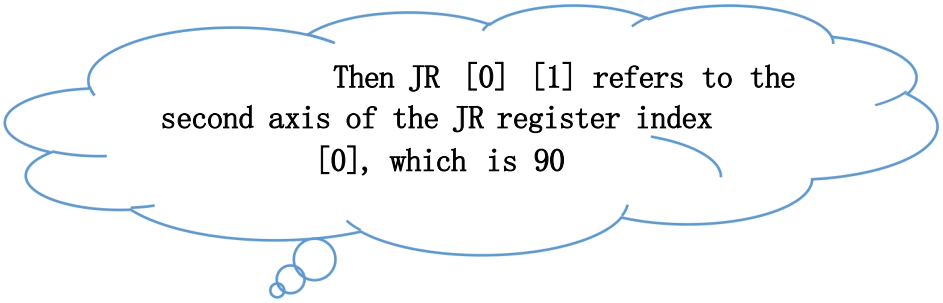
As mentioned above, it is used for register compound operation. Same for LR and P

Note: LR [1] = LR [2] + LR [3]. At this time, LR [1] takes the shape bit of LR [2].

4.Enter the register index number in the input box

5.Repeat steps 3 ~4 in the second input box.

6.Click the"OK"button in the operation bar to complete the addition of the assignment-register instruction.



假设JR[0]={0,-90,180,0,90,0}

Remarks : The JR\LR register supports obtaining the current robot position to the position register and modifying the value of the current position register during the program editing process. The specific operation method is as follows (take the motion instruction J JR[0] as an example), select the motion instruction J JR [0], click"record joint"to open the JR[0] register editing interface. After modifying the coordinate value, click"OK"to save the currently modified coordinate value to the JR[0] register. It should be noted that when the JR register is used in the motion instruction, only the joint position can be recorded, and when the LR register is used in the motion instruction, only the Cartesian position can be recorded.

24.12.2 Coordinate system command

Instruction description: This instruction is used to call the tool and the workpiece number in the program (Note: the point is recorded in the program, if the tool workpiece is used, the tool workpiece coordinate system needs to be added to the program) The coordinate system command is divided into the base coordinate system workpiece coordinate and Tool coordinate system, the defined coordinate system number can be selected in the program, and the coordinate system can be switched in the program. The tool and workpiece numbers are 0~15, and the default coordinate system is -1.

Command example :

Remarks: The callable tool workpiece number is 0~15, -1 is the default coordinate system

Note: If the point recorded by the tool or workpiece is called, the corresponding coordinate system must be added to the program to instruct the trajectory movement to be correct.

24.12.3 Global variable directive

Instruction description: The global variable instruction is used to define the global parameters of the program, and it takes effect in the entire program, except for those with parameters.

The difference between global parameters and local parameters is as follows:

```
LBL [888]
J  P[1]
J  P[2]  'Is the default motion parameter
J  P[3]
J  P[4]
GOTO LBL[888]
```

```
LBL[888]
CNT =1
J_VEL = 100
J_ACC = 100
J_DEC = 100  'Global motion parameters, function downwards,
P [1 ~ 4] use the above motion parameters
J  P[1]
J  P[2]
J  P[3]
J  P[4]
GOTO LBL[888]
```

```
LBL[888]
CNT =1
J_VEL = 100
J_ACC = 100
J_DEC = 100  'Global motion parameters, function downwards, P [1, 3] use the above motion parameters J P [1]
J P [2] VEL = 50 ACC = 50 DEC = 50 CNT = 0  'P [2] uses its own motion parameters
J P [3] VEL = 50  'P [3] uses its own VEL parameter. Since other parameters are not set, it still uses the global ACC and DEC above.
GOTO LBL [888]
```

Operation steps :

1. Select the previous line of the register instruction line to be added.
2. Select instruction→assign instruction
3. In the first input box, select the type from the"Global variable"drop -down box
4. Enter a value in the second input box
5. Click the"OK"button in the operation bar to complete the assignment-adding of the global variable instruction.

The motion parameters are as follows:

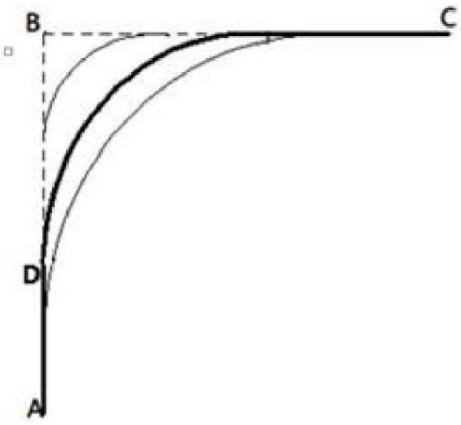
The global parameter instruction is used to define the global parameters of the program, which takes effect in the whole program, except for the parameters with its own.

For usage, please refer to the [Motion Parameters] section.

CNT = 0 ~ 100 ‘Smooth transition to 0, default is not smooth
CNT_TYPE = 0/ 1/2/ 17 ‘Smooth Type
J_VEL = 1 ~ 100 ‘joint speed
J_ACC = 1 ~ 100 ‘joint acceleration ratio
J_DEC = 1 ~ 100 ‘joint reduction ratio
L_VEL = 1 ~ 1000 ‘Linear speed
L_ACC = 1 ~ 100 ‘Linear acceleration ratio
L_DEC = 1 ~ 100 ‘Linear reduction ratio
L_VROT = 1 ~ 100 ‘Linear attitude speed
C_VEL = 1 ~ 1000 ‘arc speed
C_DEC = 1 ~ 100 ‘arc reduction ratio
C_ACC = 1 ~ 100 ‘arc acceleration ratio
C_VROT = 1 ~ 00 ‘arc attitude speed

24.12.4 Arc transition smoothness

Instruction description : The smoothness mode can be used in the mixed motion of joint interpolation and Cartesian interpolation. This parameter defines the starting position of the arc transition, and its value is a percentage.

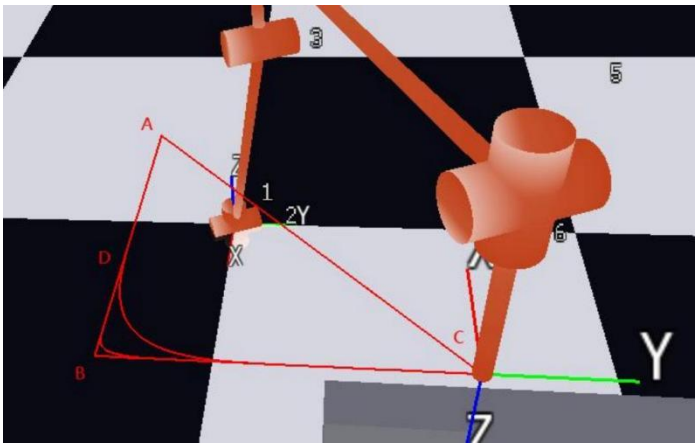


path is A->B->C, and the arc transition function is used at point B, then the blending coefficient value defines the position of the starting point D of the arc transition : AD= blending coefficient * AB/100

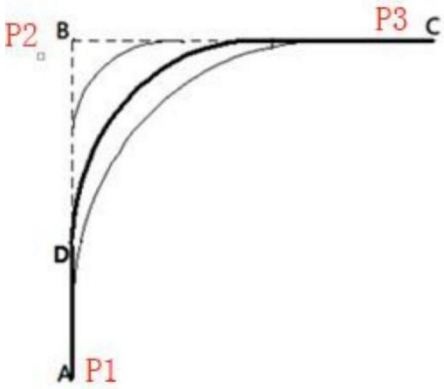
When this parameter is set to 100, it means that the arc transition starts from point A and ends at point C, and the whole new path is completely different from the original path. but the parameter is set to 0, it means that the arc transition function is not used.

Sample program :

```
L P[1]                    A point
L P[2]   CNT=40    Point B starts from 40% of line AB and smoothly transits to
point C (i.e. point D, BD = 40 / AB)
L P[3]                    C point
```



Special instructions: as shown in the figure



【Signal output and smooth transition point 】 [WAIT waiting condition and smooth transition]

```
L P[1]
L P[2] CNT=50
DO[1] = ON   'At this point, the signal is output
                    at the transition point D
J P[3]
```

```
L P[1]
L P[2] CNT=50
WAIT DO[1] = ON   'At this point, the signal is
output at the transition point DJ P [3]  'Note: If the
WAIT condition is not met, it will stop at The P [2]
point wait condition is satisfied, and there is no
smooth action at this time.
```

2

tr…racteristics, requiring t…turning point can be specified, in this case, the user can use the CR attribute function, CR attribute specifies the distance between the turning point and the target point during the smooth transition, the value is positive, the unit is millimeter (mm). The larger the value, the larger the radius of

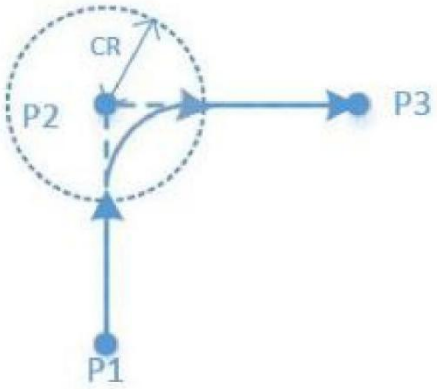
the corner, and the farther the turning point of the smooth trajectory is from the target point.

Syntax format:

<Motion Type><Tatget Point>[CR=<num expression>]

example:

```
L P[1]
L P[2] CR=20
L P[3]
```



Tip:

(1) CR is a positive number, that is, the value is greater than 0, and the input is incorrect.

(2) When the CR value is less than half of the short side, the radius value of the actual corner path is the arc of CR.

(3) When the value of CR is greater than half of the short side, the actual corner radius is equal to half of the short side, but because it is speed smooth, in the case of long line segment to short line segment, the actual turning point may change according to the different speed values, so that the smooth trajectory also has a corresponding change.

(4) The CR attribute supports the L instruction, does not support the JUMP instruction, and does not alarm when written, but will have no effect.

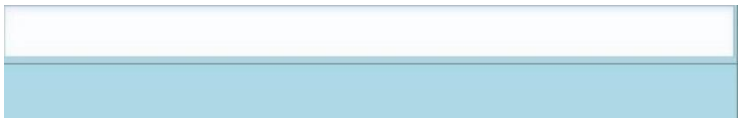
(5) In the case of two-point reentry motion, or three-point collinear, the trajectory characteristics will cause the value of CR to have no effect, and the motion will be accurate to the point.

(6) CR and CNT attributes can be used when velocity smoothing CNT_TYPE=1, or trajectory smoothing CNT_TYPE=2.

	CNT_TPYE specifies the smoothness type, while CR and CNT specify the smoothness value.

24.13 Teaching Instructions

Instruction description: used to teach the input command line.



picture 21 - 13 Teaching Instructions

Operation steps :

1. Select the previous line where the teaching instruction needs to be inserted.
2. Enter the command.
3. Click the OK button in the operation bar to complete the addition of the command.

Guangzhou Auctech Automation Technology Ltd

Add: Room 903, Building E1, Design City, No. 7, Hexian North Street, Helong Street, Baiyun District, Guangzhou City, CHINA
Tel: +86 20 84898493
E-mail: info@auctech.com.cn
Web: www.auctech.com.cn