

# STEP Robot Operating Software Instruction Manual

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## Foreword

### Abstract

This manual provides complete and comprehensive description about STEP robot software function. This manual can be used as the guidance for welding function of STEP robot.

In order to ensure proper use of STEP robot, be sure to read this manual carefully before using the robot.

### Target Readers

Operator

Robot programmer

Engineering maintenance personnel

Technical support personnel for users

### Contents

Contents in this manual may be supplemented and modified, please visit our website to update your manual. Our website: [www.steprobots.com](http://www.steprobots.com).

### Main features

The screen of STEP robot teach pendant adopts hierarchical and classified management type, the users could control the robot with the physical buttons on the teach pendant and the virtual hotkeys on the touchscreen. The operation screen is concise, and the using method conforms to human senses, it's easy to understand.

### Descriptions of safety-related marks

In this operation manual, the contents relating to safety will apply the following marks. Descriptions and contents with safety mark are important, please be sure to observe them.



## Danger

It may cause hazardous conditions or personal death if it is used improperly.



## Caution

It may cause danger, minor or serious personal injury and equipment damage if it is used improperly.



# Important

The part that the user needs to observe and pay attention.

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# Chapter I Description

## 1.1 Purpose

This document is aimed to describe the function, operation method and notice for use of the teach pendant. The document can help users quickly learn how to use the robot.

## 1.2 Target groups

The audience of the document is: robot operator, programmer, maintenance personnel, robot integrator. The following is other skills required by target groups.

**Table 1.1 Target Group and Skill Requirement**

Target group	Required skills
Operator	Participate in the robot training and get qualified certificate, be familiar with robot operation.
Programmer	Have robot programming basis, be familiar with robot function.
Maintenance personnel	Be familiar with robot function and electrical schematic.
Integration personnel	Be familiar with robot function and application.

## 1.3 Other relevant documents

"SRC4 Technical Reference Manual for Robot Control System"

## 1.4 Precautions

This manual mainly introduces the basic robot operation, for the details of each robot module, please refer to the relevant document.

# Chapter II Safety

## 2.1 Safety protective device of the robot

### 2.1.1 Overview

The following safety protective devices are provided on robot system:

- Emergency switch-off key
- Selection switch of operation mode
- Jogging operation
- Mechanical end stop
- Software limit switch

Note: when the safety protective device is dismantled or stopped, the robot system is forbidden to run.

### 2.1.2 Emergency switch-off key

The emergency stop button is located on the control panel of the teach pendant. When the button is pressed, the robot's drive is shut down immediately.



**Danger** The emergency stop button shall be pressed immediately if any accident

occurs that will endanger personnel or equipment. To resume the operation, turn the emergency stop button to unlock it and acknowledge the shut-down information.

### 2.1.3 Selection switch of operation mode

There are 3 operation modes for the robot: fast manual operation (T2), automatic operation (AUT), automatic external operation (AUT EXT)

The operation mode is selected using the key switch on the panel. If the operation mode is changed during the movement of the robot, the drive is disrupted immediately.

**Table 2.1 Robot Operation Mode**

Operation mode	Application	Speed
T2	For testing operation.	Programming running: without speed limit requirement; Jogging operation: max. speed is 250mm/s
AUT	For the robot system without higher level control system	Programming running: without speed limit requirement; Jogging operation: unable to run
AUT EXT	For the robot system with higher level control system (such as PLC)	Programming running: without speed limit requirement; Jogging operation: unable to run

## 2.1.4 Jogging operation

### Important

When a program is developed, the program teaching and debugging shall be done in manual mode and no error occurs before it can be run in automatic mode. It is called jogging operation when the program is run in manual mode.

Difference between automatic operation program and jogging operation program:

- In automatic running mode, press “Start” button to run the program. In manual mode, press and hold “Start” button to run the program. The robot stops running when the “Start” button is released.
- It is safer to run the program in manual mode as there is stricter limit on the running speed.

## 2.1.5 Mechanical end stop

The basic axes A1, A2, A3, A5 and A6 are provided with mechanical end stop with buffer.

## 2.1.6 Software limit switch

### Caution

The movement range of all the axes of the robot can be limited by the defined software limit switch. The software limit switch only serves as mechanical safety device and is so defined that the robot will not collide with the mechanical end stop.

## 2.2 Relevant personnel

### Important

All the working personnel related to the robot control system shall read and be familiar with the documents on the safety of the robot system.

Before the work, the working method, range and potential hazard shall be introduced to the working personnel. Describe them again after accident or technical update.

The relevant personnel include the system integrator that integrates the robot system into the equipment, user, operator or the programmer of the robot system.

## 2.3 Training

The user that uses the robot and the robot system shall ensure that its programmer, operator and maintenance personnel have participated in the safety training, and acquired corresponding capabilities to undertake the work. For the training, it's better to combine classroom courses with practical operation.

### Objective:

The goal of the training is to help the trainees understand the following information:

- 1) Usage and function of safety components;
- 2) Procedures concerning health and safety;
- 3) All danger caused by the operation of robot or robot system;
- 4) Task and purpose related with specific robot;

5) Basic safety concept.

**Requirement:**

- 1) Learn applicable safety procedures and safety suggestions provided by the robot manufacturer and the robot system designer;
- 2) Understand the clear meaning of the task assigned;
- 3) Master the identification and description of all control units and their functions that are used to complete the assigned task, such as slow speed control, teach box operation, emergency stop procedure, switch-off procedure, single point control and etc.;
- 4) Identify the danger related to the task, including the danger caused by the auxiliary equipment;
- 5) Identify the safety protective devices, including the type, capability or selection scheme of the safety protective devices, function of the components selected, functional test method of the components, limit of the components selected and the safety operation procedures since identifying danger, personnel protection equipment and etc.;
- 6) Master the test method to ensure the normal function of safety protective devices and interlocking units;

**Re-training requirement:**

In case system change, personnel change or accident occurs, in order to ensure safe operation, relevant personnel should participate in training again.

## 2.4 Safety measures



### Caution

The robot system can only be operated with the equipment functioning properly and with proper safety awareness. Improper application may lead to personal injury and equipment damage.

Even if the robot control system is shut off with safety protection, there still could be movement of the robot system. Improper installation (such as overload) or mechanic damage (such brake failure) could cause settlement of the robot or auxiliary axis. If the work is performed on the robot system that has been shut off, the robot and the auxiliary axes shall move to a state where they will not move on their own with or without load. If the above conditions cannot be met, proper protection shall be provided for the robot and auxiliary axis.

Execute the following when the robot system has any fault:

- Shut off the robot control system and protect it well, to prevent unauthorized restart.
- Indicate the fault by the nameplate with corresponding prompts.
- Record the fault.
- Troubleshoot and have functional check

.

## Chapter III Installation and Configuration

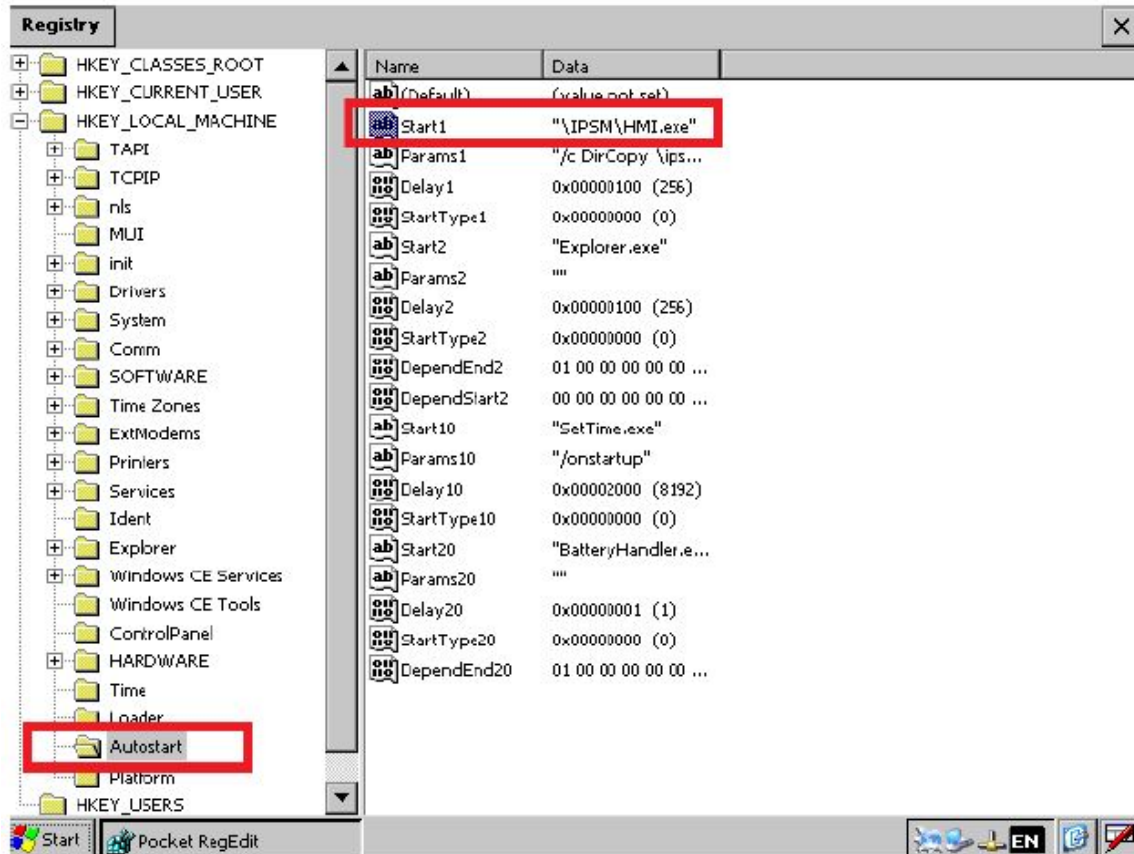
### 3.1 Installation

The robot software is divided into HMI program, non-real-time program, real time program and configuration program. The HMI program is installed in the teaching pendant. The non-real-time program is installed in Windows Xpe system of the controller. The installation program is downloaded to the autonomous controller via CODESYS. The configuration program directly runs on PC.

#### Installation procedure:

##### HMI program:

- **Copy installation files:** if the teach pendant is T50, copy the installation program \svn\sharedoc\V1.0 and all the files and folders under the readme folder \HMI\T50 to IPSM directory of the teach pendant; If the teach pendant is T55, copy the installation program \svn\sharedoc\V1.0 and all the files and folders under the readme folder \HMI\T55 to psm directory of the teach pendant
- **Set HMI program to self-start:** open the registry (click Start->Run and enter “regedit”), add “\IPSM\HMI.exe” following the following screenshot; click Start->Program->KeTop->Registry Backup and then click OK to complete the power-off protection setting in the registry.



### Non-real-time program:

Update the non-real-time program through putty software link.

**Configuration program:** it can be configured directly on the user's PC. When it is done, save it using the default filename and copy the generated \*.xml file to C:\SRSystemFile\ConfigFiles.

**Real-time program:** Packaged as \*.zip project and it can directly run when it is decompressed, compiled and downloaded to the autonomous controller.

In the first run, it is necessary to install the program, configure the robot and download codesys project.

After first use, you can directly power up and start the robot control software.

## 3.2 Robot configuration

Two configurations need to be done for the robot: robot information configuration and physical information configuration. The configuration software provided in the software suite is used for the robot information configuration. The robot axis configuration need to be done in AS software.

### 3.2.1 Robot information configuration

The configuration software is the same as that of keba. The limit interface is also integrated in the configuration software and its use is the same as corresponding interface of keba.

There is large difference in the interface of additional axis. See “SRS0\_RobotSoftware\_1-0-9 Configuration Interface User Manual” for the robot configuration.

## 3.2.2 Axis configuration

### 3.2.2.1 Introduction to robot software CoDeSys project

As a part of the robot software V1.3, the robot software CoDeSys project is provided to the user as a template. The user can use it after modification to a few configurations according to actual conditions.

### 3.2.2.2 Configuration guideline for robot CoDeSys template project

#### 1. Open the project

The template project is released as project archive package. You can directly open the project compressed as project archive package in CoDeSys. All you need to do is select a decompression path.

#### 2. Modify real axis mapping

The servo corresponding to real axis variables gAxis01 - 06 has been provided under EtherCAT Master. As default, gAxis01 ~ 06 correspond to the first to the sixth axis of the robot. But it can be changed. See establish robot project section for details. Here, the user only needs to allocate the servos of the first and the sixth axis to gAxis01 – 06 respectively.

The same goes for the configuration of the auxiliary axis.

#### 3. Real axis configuration modification

##### Configuration of translation from motor's number of turns to path unit

As the V1.3 software does not come with individual reduction ratio setting function, the translation function in CoDeSys is used to directly correlate the motor's number of turns to the path unit.

You need to modify the Scaling option in gAxis01~gAxis06 equipment. Where, in the first row of parameters, the “increments” stands for the number of pulse in a single turn of the motor encoder. The “motor turns” stands for the motor's number of turns. The two parameters mean when the motor rotates “motor turns”, the number of the pulse of the encoder is “increments”. In the second row, the “motor turns” and the “gear output turns” stand for the number of input turn and the number of output turn of the reduction drive, namely the reciprocal of the reduction ratio. Note that the two values shall be rounded. In the third row, the “gear output turns” stands for the number of output turn of the reduction drive and the “unit in application” stands for the path unit in the robot program. Here, the path unit is 1 degree.

For linear axes, the unit is 1 mm. The other calculations are the same.

##### Encoder direction configuration

The individual axis debug function provided by the servo drive's manufacturer is used to test if the current direction of the motor is the same as the direction required by the robot joint. If not the same, modify the "Invert direction" setting to different value.

### **Zero point configuration**

The user shall use the individual axis debug function provided by the servo drive's manufacturer to configure the zero point.

First, move the robot to zero point using the individual axis debug function. Considering the coupling, it is best to move the axis to zero point one by one.

Then, in the individual axis debug software provided by the servo drive's manufacturer, enter the current encoder value as the zero returning offset and perform return-to-zero operation.

### **Individual axis limit configuration**

The individual axis limit value is in the "Software limits" under gAxis01~gAxis06.

The position, speed, acceleration and jerk of each joint of the robot are limited in the robot configuration software (described in another section). So the algorithm can ensure the defined limit value of the robot joint is not overridden.

In addition, another level of protection is provided in CoDeSys. When the algorithm fails, CoDeSys ensures that the axis will not override the defined value. So the setting in CoDeSys is recommended between hard limit and joint limit. Note that the coupling shall be considered.

The unit of all the setting value is "unit", namely 1 degree / 1 mm.

## **4. IO mapping modification**

Some relays in the electrical circuit are associated with IO module and the electrical system can only function normally when the relays are configured correctly; The number of IO that can be processed by the internal software is limited to 32 and only digital IO can be processed for the time being.

Note: to ensure the IO module can be processed correctly by the robot software, the name of the global variables MainPower, RobotDI and RobotDO shall not be changed.

### **Electrical circuit connected with IO module**

The V1.3 software is intended for the cabinet with only one STO relay bound to IO module. There is variable named "MainPower" among the global variables of the CoDeSys project. You only need to bind this variable to the IO module connected with STO in the cabinet. Normally, it is DO3 or DO4 (counting from 1, it is DO4 in most cases).

### **Bind IO with internal software IO**

The internal software can only process the IO variables mapped to RobotDI and RobotDO arrays. Therefore, you only need to map the members of the RobotDI and RobotDO to the required IO ends.

# Chapter IV Handheld Programmer

## 4.1 Front panel description

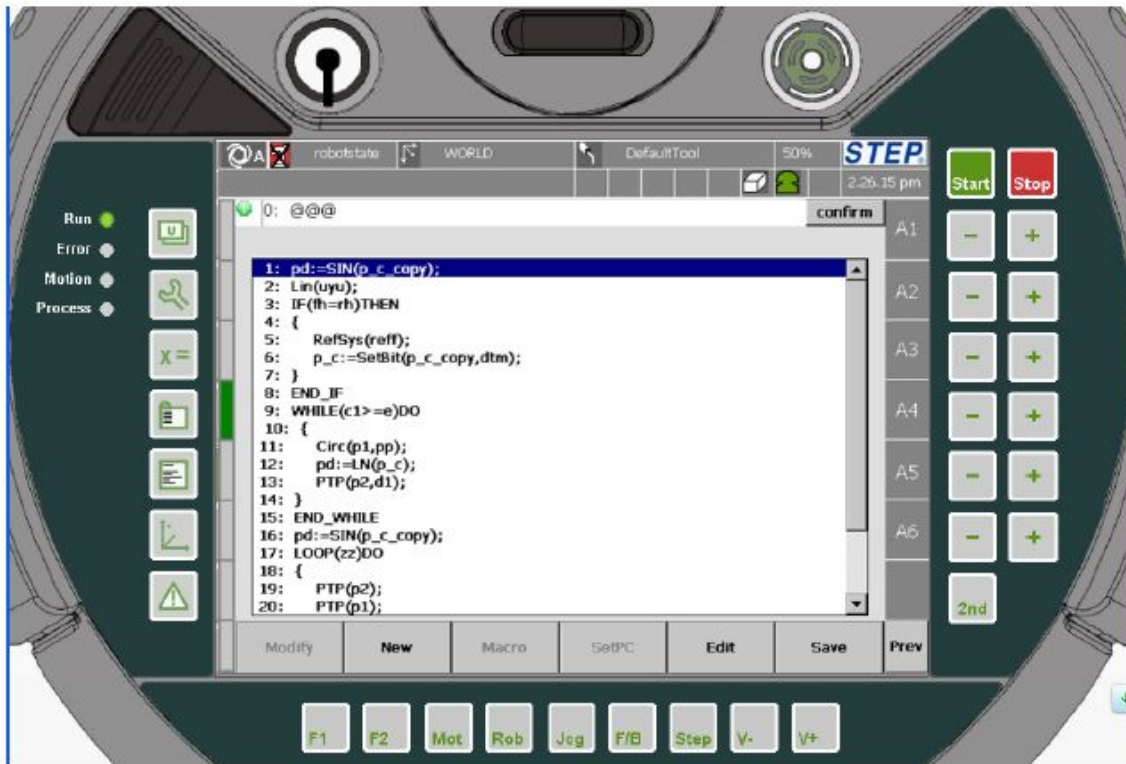



Figure 1 Description of Front Panel of Teach Pendant

- The button  on the left is used for interface switching.
- The “Run” indicator on the left indicates if there is program running. Light on means the robot is moving and light off means the robot stops moving; the “Error” indicator indicates if there is any error alarm message. Light on means there is error message and light off means there is no error message; the “Motion” indicator indicates if the robot is enabled. Light on means the robot is enabled and light off means the robot is not enabled.
- The “F1” key is used for the operation mode switching.
- The “Mot” key is used to enable the robot in auto mode.
- The “Step” key is used for the program running mode switching.
- The “V+” and “V-” keys are used for the Override adjustment.
- The “Start” key is used to run the program.
- The “Stop” key is used to stop the program.

- The “+” and “-” keys are used for jog.
- The “2nd” key is used for the jog of the additional axis.



- is emergency stop button.

## 4.2 Rear panel description

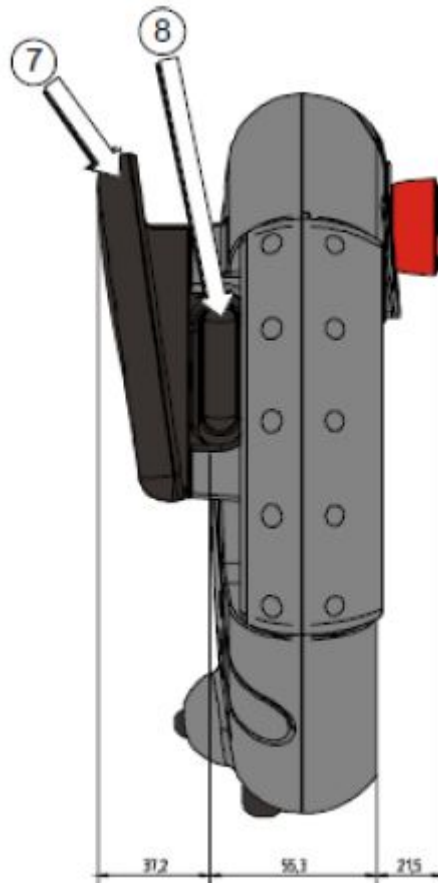


Figure 2 Teach Pendant

- The part marked with 7 is the handle.
- The part marked with 8 is three-position switch, mainly used to enable the robot in manual mode.

# Chapter V HMI Operation Interface

## 5.1 Status bar

The status bar is used to display a number of internal status of the robot in an intuitive way.



Figure 3 Status Bar

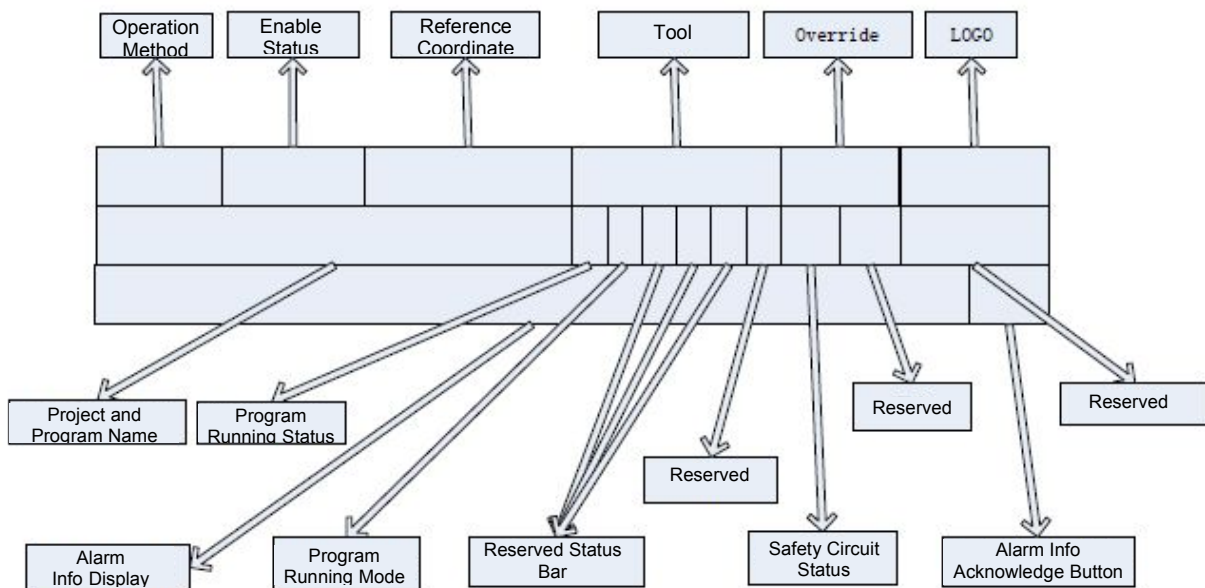











Figure 3-1 Layout of Status Bar


- Operation mode: 4 in total (low speed manual, high speed manual, automatic, external automatic), the icon means low speed manual; the icon means high speed manual; the icon means automatic; the icon means external automatic. The switching of the running mode is performed through “F1” on the panel.
- Enable status: indicates if the robot is enabled. The icon means the robot is enabled and the icon the robot is not enabled. The robot enable status is switched through the “Mot” key on the panel.
- Reference coordinate: indicates the internal reference coordinate of the robot system. The switching of the reference coordinate need to be defined in the program.
- Tool: indicates the internal tools of current robot system. The robot system tools can be set in two ways: One is setting in the robot program and the other is through the tool setting drop-down box from the robot position interface.

- **Override:** Override indicates the operation speed parameter of the current robot. Override can be set in 3 ways: from the program; from the “v\_jog” setting in the robot position interface; using the “V+”“V-” keys on the panel.
- **Logo:** Logo of the robot.
- **Project and program name:** shows the path of currently loaded program. For example, “proj1\program1” means the name of currently loaded program is “program1” and the project of the program is “proj1”.
- **Program running status:** there are 4 status (running, stop, pause, return). The icon  indicates the robot is running; the icon  indicates the robot is at pause; the icon  indicates the robot is stopped; the icon  means the robot is in path-returning status.
- **The program running mode:** there are 3 modes (continuous, single step, movement single step). The icon  means the robot running mode is continuous; the icon  means the mode is single step; the icon  means the mode is movement single step. The running mode switching is done through the “Step” key on the panel.
- **Emergency stop key status:** The icon  means the safety circuit is connected. The icon  means the safety circuit is disconnected.
- **Alarm message display:** displays current internal alarm message of the robot system (3 types: error, alarm, info).
- **Alarm message acknowledge key:** used to acknowledge the internal alarm message. The robot can be enabled again only when all the internal alarm messages are acknowledged.

## 5.2 User management interface

### 5.2.1 Opening method



First, press  on the left of the teach pendant and click Service option in the popup tab.

### 5.2.2 Function description

Used for user management (user logon, access privilege grant and release), user edit (user edit, create and delete).

## 5.2.3 Interface description

### 5.2.3.1 User logon

Click Setting button to enter the user logon interface, as shown in the following figure:

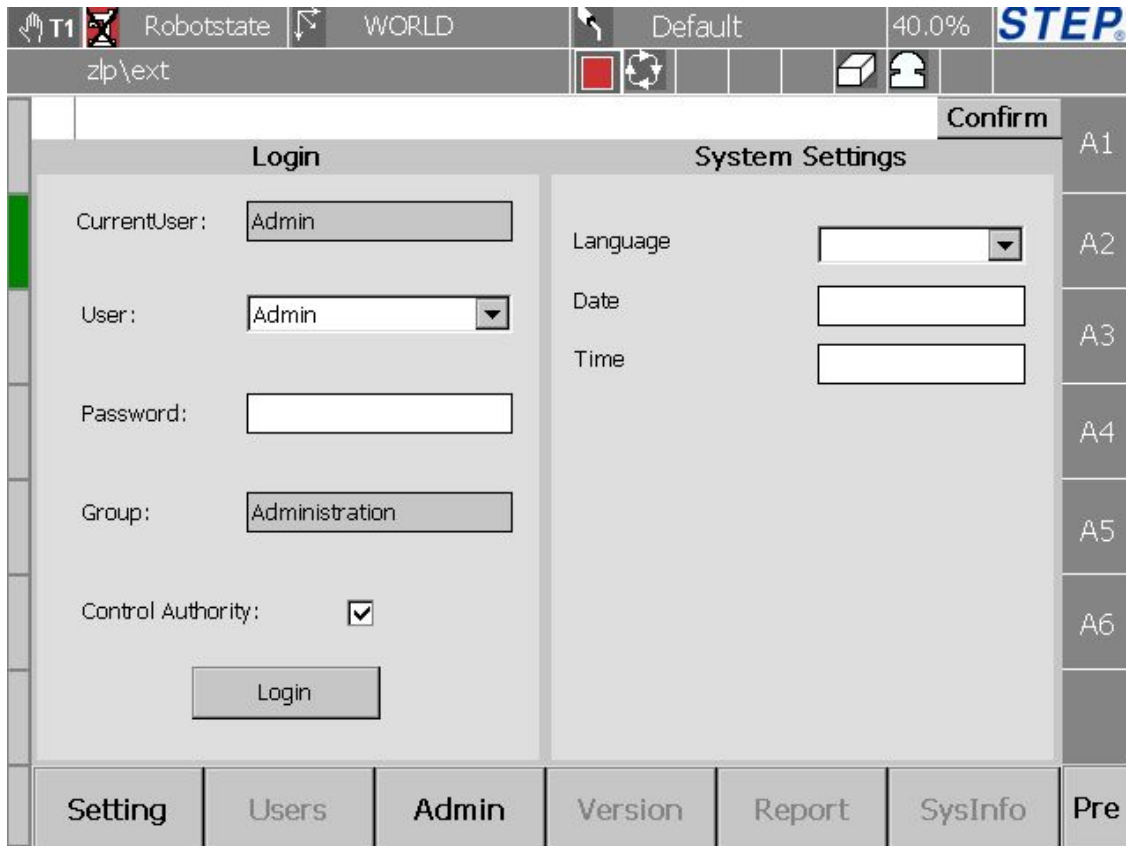


Figure 4 User Logon Interface

The Login column is used for user logon and control privilege grant and release.

- **CurrentUser:** shows the name of the currently logged user. As default, no user is logged when the teach pendant program starts. But the pendant can be used to view the internal status now.
- **User:** for user selection.
- **Password:** for entering the user password.
- **Group:** shows the group of the currently selected user.
- **Control Authority:** for the grant and release of the control privilege. When checked, it means the control privilege is granted. When unchecked, it means the control privilege is released. If the control privilege of the controller has been granted to the other teach pendant, “Control Authority” cannot be checked.
- **Login:** click Login to complete the logon.

The System Settings column is used for some system settings: language, date and time. It is not supported in V1.0.1.

### 5.2.3.2 User management interface

Click User\_Admin button to enter user management interface, as shown in the following figure:

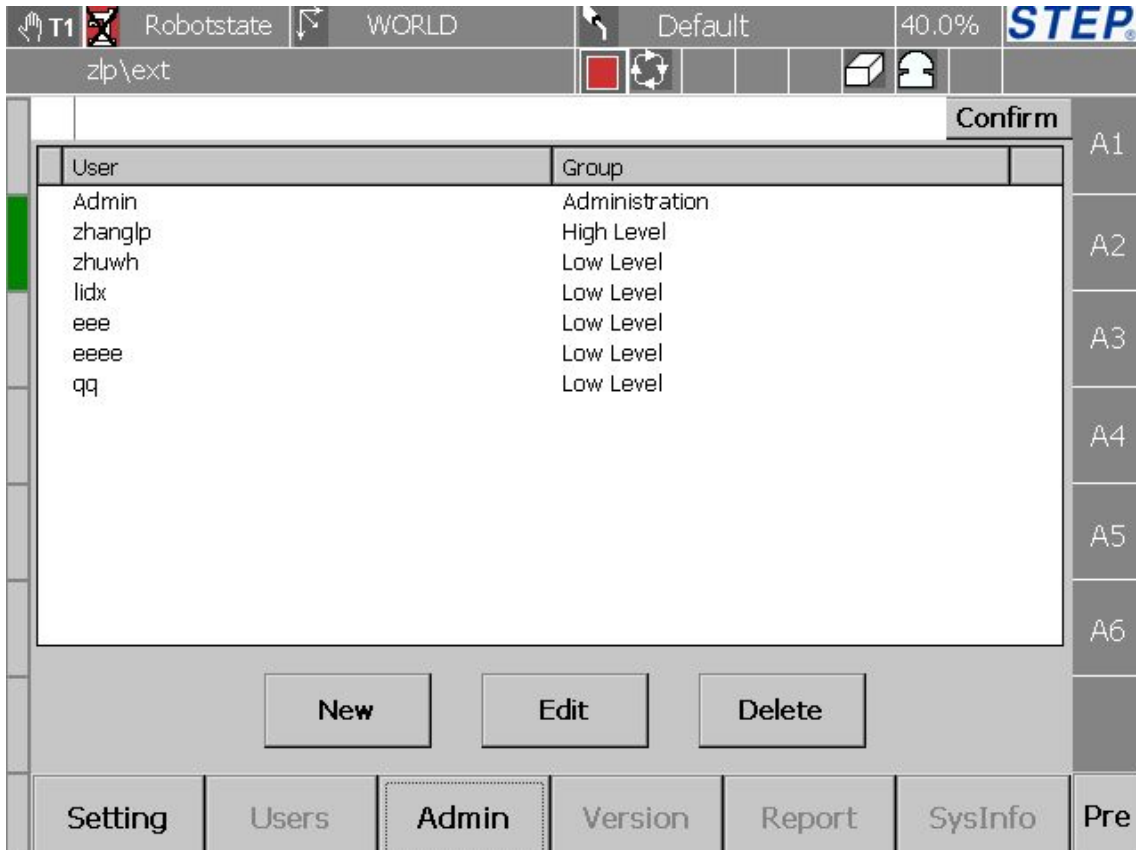


Figure 5 User Management Interface

The user column is used to display the user names that exist in the teach pendant (the user Admin is always there). The Group column is used to display the group of the user. The user group is classified into 4 levels: Administration, High Level, Middle Level, Low Level.

Click “New” button to enter the user creation interface, as shown in the following figure:

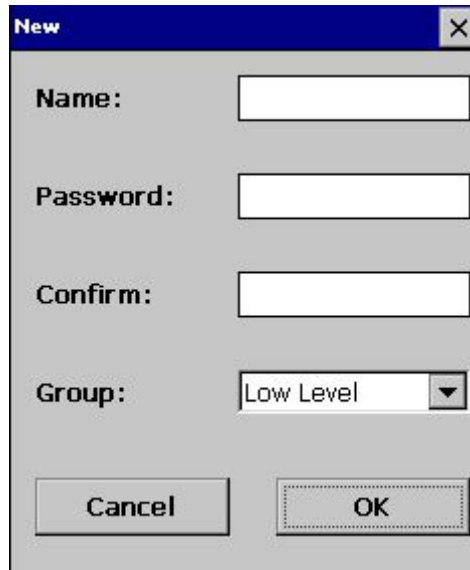
A dialog box titled "New" with a close button (X) in the top right corner. It contains four input fields: "Name:" (text box), "Password:" (text box), "Confirm:" (text box), and "Group:" (dropdown menu with "Low Level" selected). At the bottom are "Cancel" and "OK" buttons.

Figure 6 User Creation Interface

The Name field is used to enter the user name (only English letters accepted). The Password field is used to enter the password. The Confirm field is used to re-enter the user password. The Group field is used to select the group of the user (High Level, Middle Level, Low Level). Click "OK" to complete the user creation. Click "Cancel" to cancel the user creation. Note that the password entered in Password and Confirm fields must be the same.

Click "Edit" button to enter the user edit interface, as shown in the following figure:

A dialog box titled "Edit" with a close button (X) in the top right corner. It contains four input fields: "Name:" (text box with "zhangrf" entered), "Password:" (text box), "Confirm:" (text box), and "Group:" (dropdown menu with "Low Level" selected). At the bottom are "Cancel" and "OK" buttons.

Figure 7 User Edit Interface

In user edit interface, you can change the password and the group of the user. Click "OK" button to complete the user edit and click "Cancel" button to cancel the user edit.

Select a user and click "Delete" button, the following dialog box appears:

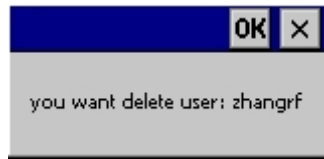



Figure 8 User Delete Interface

Click “OK” to complete user delete and click “Cancel” to cancel user delete. Note that the user “Admin” cannot be deleted.

## 5.3 Robot position interface

### 5.3.1 Opening method

Press the  button on the left of the teach pendant and select Position option in the popup tab.

### 5.3.2 Function description

Used to display current real-time position of TCP point, set robot’s override, reference coordinate for jog and tools.

### 5.3.3 Interface description

#### 5.3.3.1 Display of TCP position

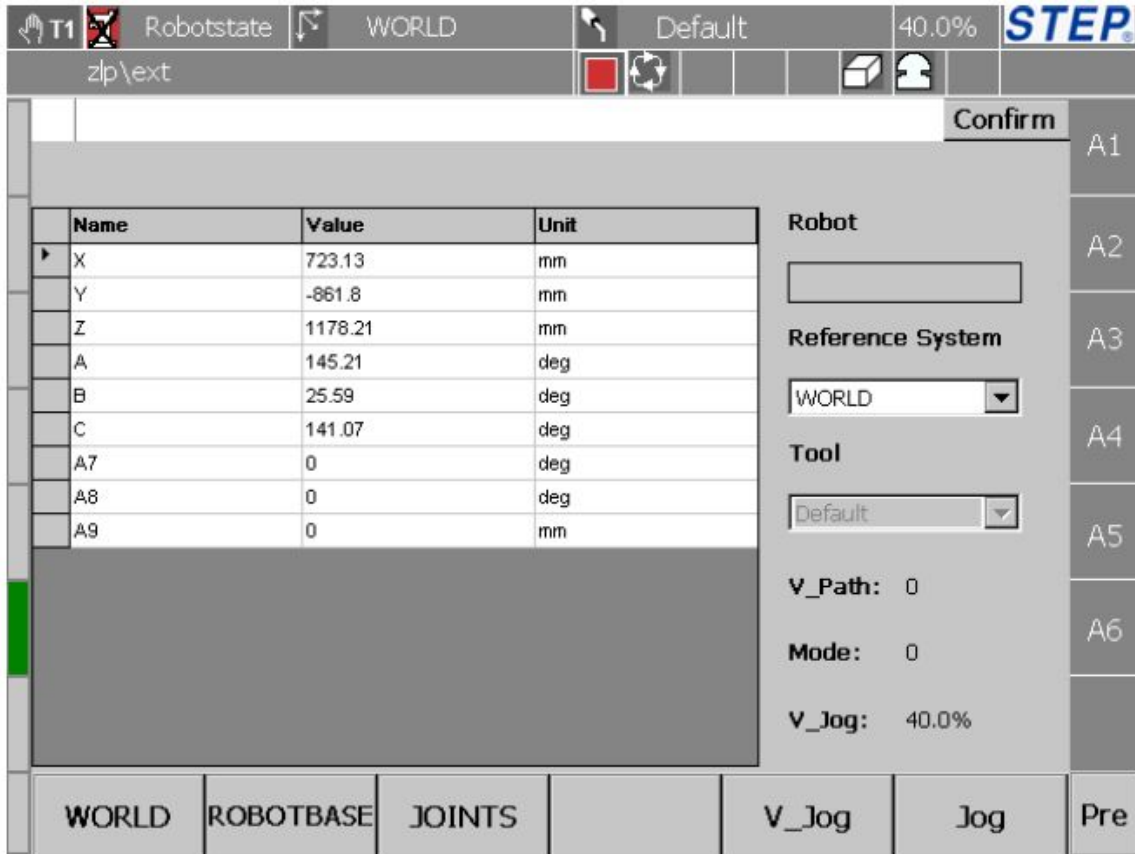


Figure 9 Robot's Cartesian Position Interface

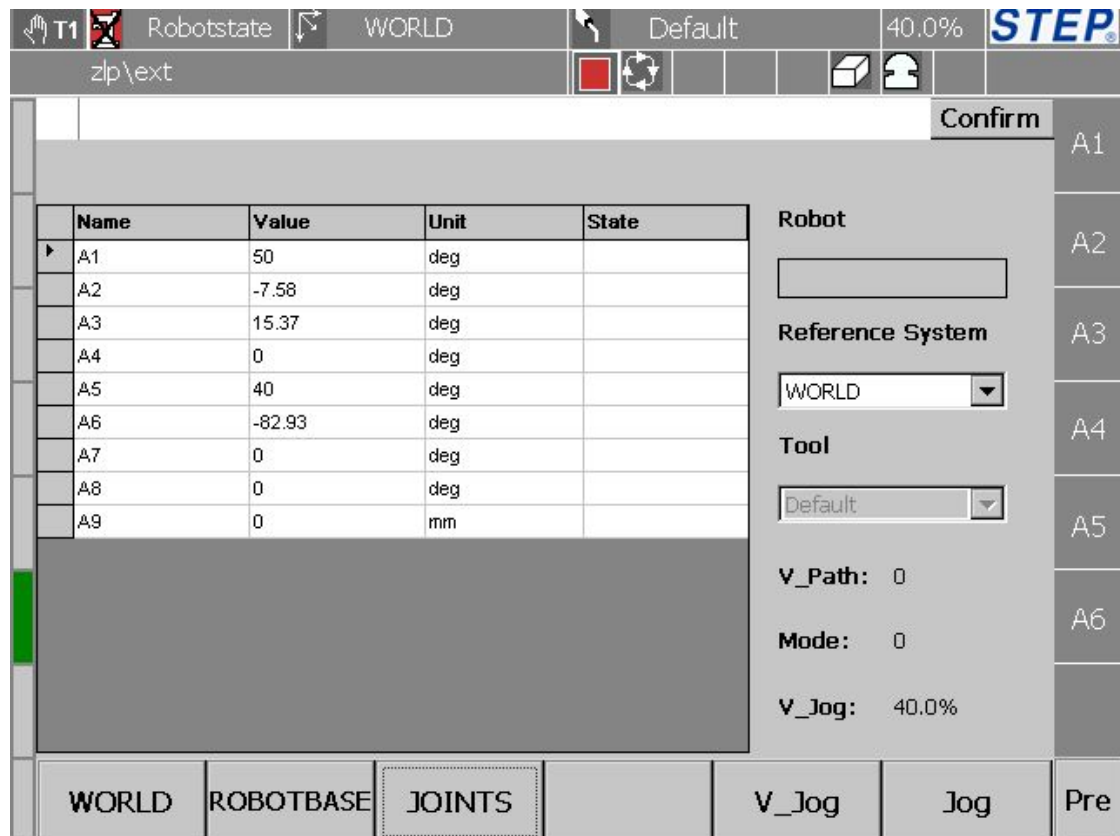


Figure 10 Robot's Joint Position Display

- The TCP position display can be switched between two spaces: joint space and Cartesian space. The position of the Cartesian space is shown in figure 10 and the position of the joint space is shown in figure 11.
- The switching of TCP position display reference coordinate: There are four buttons at the bottom of the interface: "WORLD", "ROBOTBASE", "Joints", "reff" (as shown in figure 10). The buttons respectively respond to world coordinate system, base coordinate system, joint space, user-defined reference coordinate system.
- It is switched to joint space position display only when the Joints button is pressed. The "Reference System" drop-down box on the right is used to select the user-defined reference coordinate system (for example, in figure 10, when "reff" coordinate system is selected from the box, the button corresponding to the user-defined reference coordinate system at the bottom shows "reff", which means if additional axis is configured, the additional axis coordinate system option appears here).
- TCP is divided into three columns in Cartesian space position: Name, Value and Unit; The Name is X, Y, Z, A, B, C in turn; the Value is correct to two decimal places; there are two units: mm (for X, Y, Z), deg (degree, for A, B, C).
- The TCP is divided into four columns in joint space position: Name, Value, Unit, State; The Name is A1, A2, A3, A4, A5, A6 in turn; the Value is correct to two decimal places; The unit is deg (degree); There are four status: state (for joint position simulation), E+ (joint reaching positive limit), E- (joint reaching negative limit), NRef (no return-to-zero, parameter finding).

- In the above figure, A7, A8, A9 are additional axes of the robot. If there are no additional axes, A7, A8, A9 are not available. The robot can be equipped with 6 additional axes at most.

### 5.3.3.2 OVERRIDE setting

Click V\_Jog button and OVERRIDE setting dialog box pops up, as shown in the following figure:

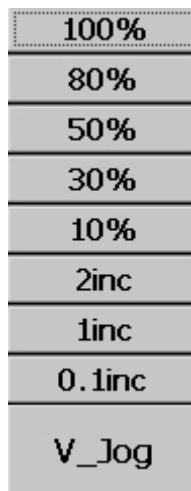


Figure 11 OVERRIDE Setting

Here, there are 8 values for Override setting: 100%, 80%, 50%, 30%, 10%, 2inc, 1inc, 0.1inc. If any override value is selected in the box (such as 30%), the override field in the status bar shows corresponding change.

Description:

- The Override can be set via V+ and V- buttons on the panel.
- The jog type for override value ending with “inc” is incremental jog. The other override values are continuous jog.

### 5.3.3.3 Jog reference coordinate system setting

Click Jog button and jog reference coordinate system setting dialog box pops, as shown in the following figure:



Figure 12 Jog Reference Coordinate System Setting

- In figure 13, “TOOL”、 “JOINTS”、 “ROBOTBASE”、 “WORLD” correspond to

tool coordinate system, joint coordinate system, base coordinate system, world coordinate system; Note that “ROBOTBASE” is a multi-use button. When a user-defined coordinate system, such as “reff”, is selected from the “Reference System” drop-down box on the right, the button changes to “reff”, as shown in the following figure:



Figure 13 Jog Reference Coordinate System Set as User-defined Coordinate System


- When the jog reference coordinate system is set to “TOOL”, the status bar on the right will show TX, TY, TZ, TA, TB, TC; when the jog reference coordinate system is set to “ROBOTBASE” or user-defined coordinate system, the status bar on the right will show RX, RY, RZ, RA, RB, RC; when the jog reference coordinate system is set to “WORLD” or user-defined coordinate system, the status bar on the right will show X, Y, Z, A, B, C; when the jog reference coordinate system is set to “JOINTS” or user-defined coordinate system, the status bar on the right will show A1, A2, A3, A4, A5, A6; if the robot is equipped with additional axes, click 2<sup>nd</sup> and the status bar on the right will show the information of the additional axis, such as A7, A8, A9.... The number shown is related to the number of the additional axis.

#### 5.3.3.4 Other functions

- Display of current robot running speed
- Mode display
- Override display

## 5.4 Variable maintenance interface

### 5.4.1 Opening method

Press  on the left of teach pendant and click Variable option on the popup tab.

### 5.4.2 Function description

Used to maintain the variable data of the teach pendant program. The functions mainly are: variable display, variable data modification, creation, copy, cut, paste, delete, rename, teaching of robot position type variable.

## 5.4.3 Interface description

5.4.3.1 The following is a main variable maintenance interface:

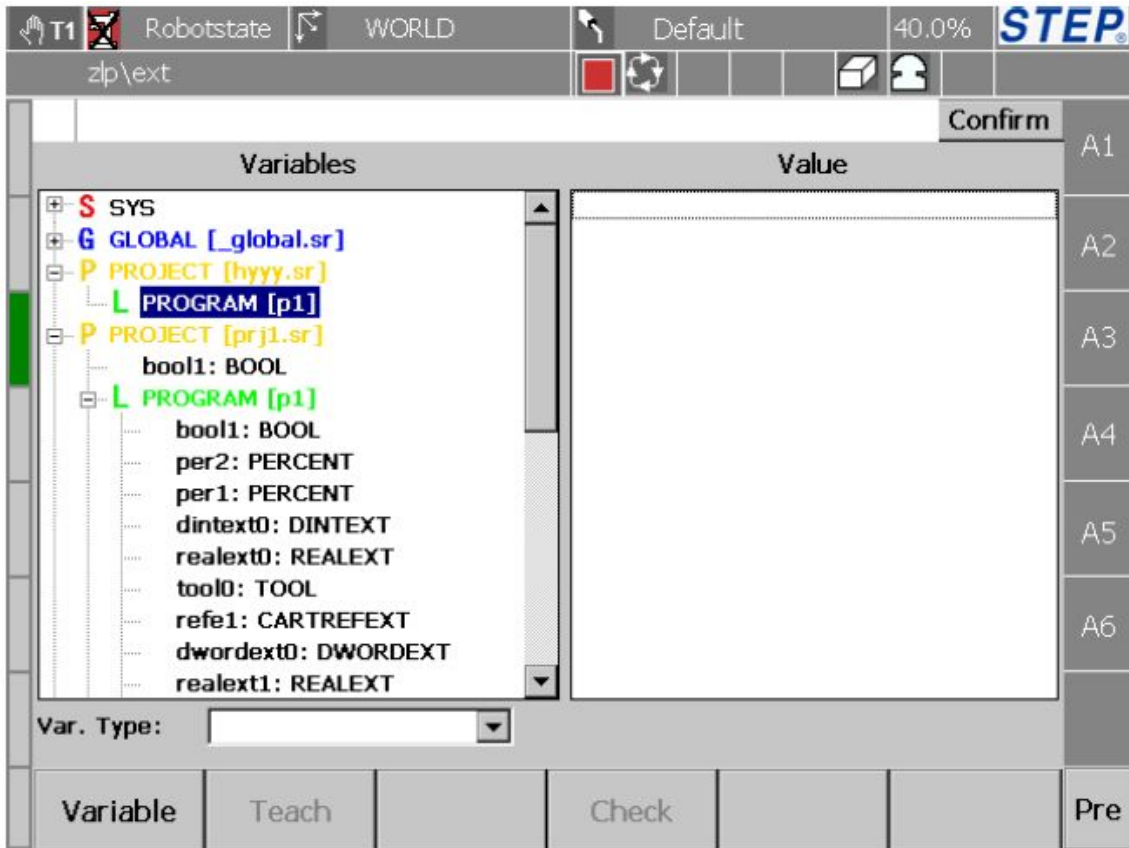


Figure 14 Variable Interface

### 5.4.3.2 Variable classification and notes

There are 4 types of robot variables: system variable, global variable, project variable and program variable.

Note:

- The program variables of different programs can have the same name.
- The program variable under a project cannot be the same as the project variable of the project.
- Any variable cannot have the same name as the global variable.
- The name of the system variable is fixed, such as “WORLD”, “ROBOTBASE”, “EASYS”.

### 5.4.3.3 Variable operation

- Variable display: the left column in figure 15 shows the directory structure of the variable. The right column shows the specific data of the selected variable. Different types of variable have different display formats. The floating type variable is correct to two decimal places.
- Variable data modification: click the data at right side in fig.15 and the variable modification dialog box pops up, as shown in the following figure:

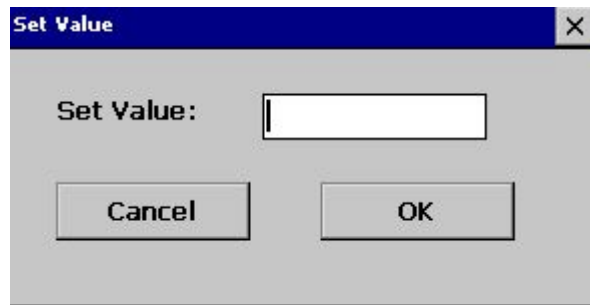


Figure 15 Variable Data Modification

Enter the value and click Ok to complete the modification. Click Cancel to cancel the modification. Note: the type and size of the each type of variable entered are limited. If the entered value is not valid, the system will show input error.

- Variable creation: click New button and the variable creation interface appears, as shown in the following figure:

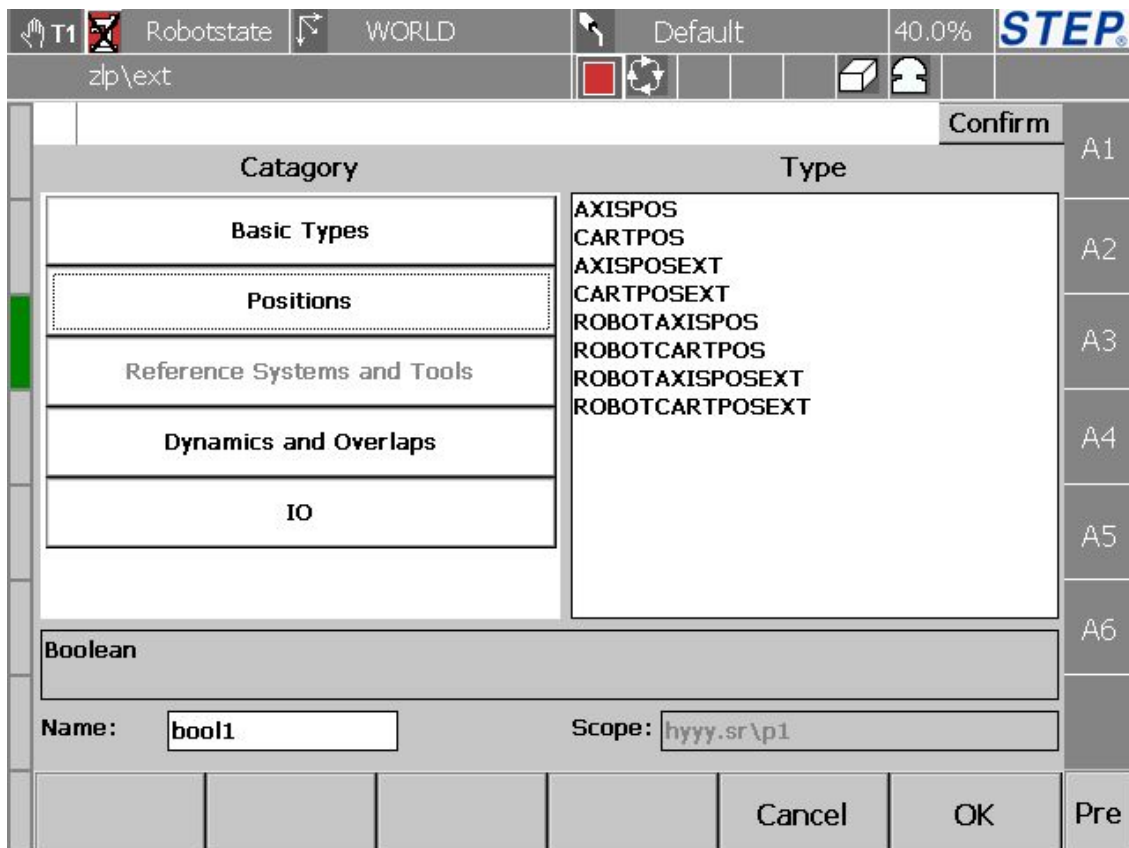


Figure 16 Variable Creation Interface

The left button in fig.17 is used to select major type of the variable. The list on the right shows the specific variable type under this major type. In fig.17, it shows the variable type under the major type of Positions. Enter the variable name (the initial letter must be in capital) and click OK to complete the variable creation. Click Cancel to cancel the creation and exit the creation interface.

- Variable copy: select a variable and click Copy button, the variable is copied to the clipboard.
- Variable cut: If the selected variable is not used in the program, it can be cut; the variable used in the program can be cut (click Cut). But for paste, it will be judged if it is valid. If not, the Paste operation is forbidden; The rules for cut operation are: the program variable can only be cut under the project or global; the project variable can be cut to global.
- Variable paste: select a project or project name and the content in the clipboard can be pasted to the project or program.
- Variable delete: the variable used in the program cannot be deleted. If you attempt to delete a variable used in the program, the following dialog box will appear:
- Variable rename: you can rename a selected variable. Note: the variable used in the program cannot be renamed. If you attempt to rename a variable used in the program, the following dialog box will appear:
- Position variable teach: select a position variable (such as ROBOTAXISPOS) and click Teach button to complete teach.
- Variable display filter: you can show only a type of variable by clicking the variable filter drop-down box, as shown in the following figure:

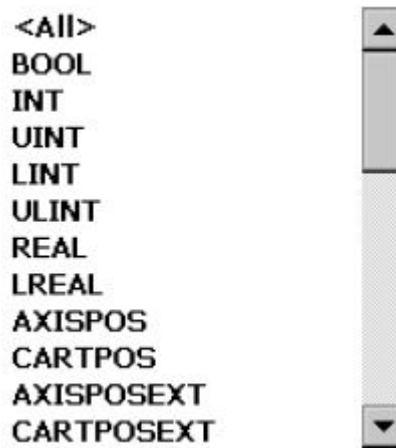


Figure 17 Variable Filter Drop-down Box

Note: you cannot edit or delete the project variable, program variable and global variable under the project of the program during the automatic operation of the program. But the variable create can be performed. Only variable display function is provided for the system variable.

## 5.5 Project interface

### 5.5.1 Opening method

Press the  on the left of the teach pendant and select Project option in the popup tab.

### 5.5.2 Function description

Used to edit (create, delete, copy) the project; manage (load, close, open) and edit (create, delete, copy) the program; display currently loaded or opened program.

### 5.5.3 Interface description

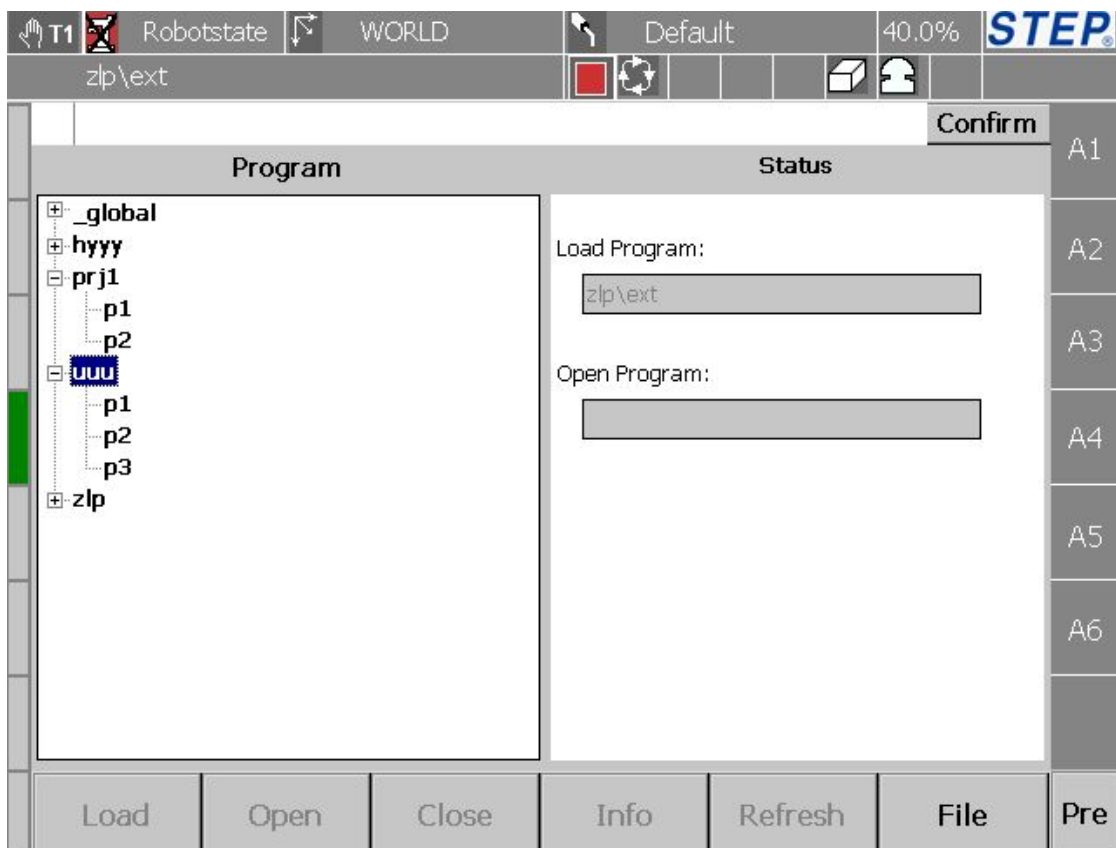


Figure 18 Project Interface

#### 5.5.3.1 Project directory display

- A tree structure is used on the left of the view to display the program directory structure. “\_global” means global project, which exists at any time and the user cannot delete and rename the project.

- Loaded program display: the “Load Program” plugin on the right of the view is used to display the directory of currently loaded program.

If no program is loaded, the plugin view is empty; if any program is loaded, it displays the complete directory of the loaded program, such as “prj1\loop”, which means the name of the loaded program is “loop” and it is in “prj1” directory.

- Open program display: the “Open Program” plugin on the right is used to display the directory of currently opened program. If not program is opened, the plugin view is empty; If any program is opened, it displays the complete directory of the opened program, such as “prj1\loop”, which means the name of the loaded program is “loop” and it is in “prj1” directory.

### 5.5.3.2 Project edit

Click “File” button and the project / program edit dialog box pops up:

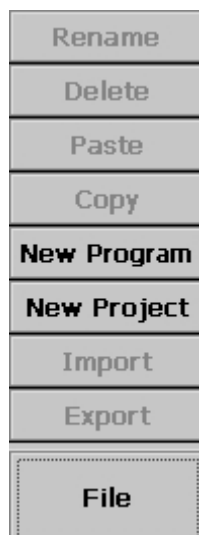


Figure 19 Project / Program Edit Dialog Box

- Project create: click “New Project” button and the project create dialog box pops up:

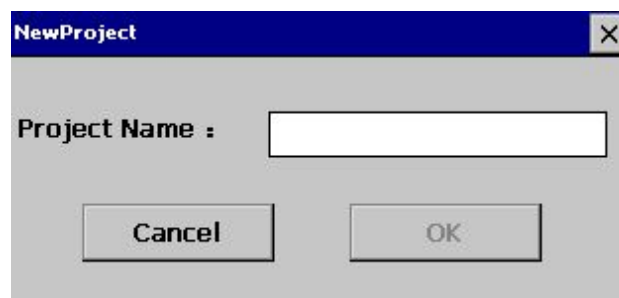


Figure 20 Project Create Dialog Box

Enter the name of the project (the initial letter must be in capital) and click OK to complete the project create. Click Cancel to cancel the project create.

- Project rename: select a project (except for \_global) and click “Rename”. The project rename box pops up:



Figure 21 Project Rename Box

The “Current” field shows the name of the current project. Enter the name in “New Name” field (the initial letter must be in capital) and click OK to complete rename. Click Cancel to cancel rename.

- Project delete: select a project (except for \_global) and click “Delete”. The project delete box pops up:

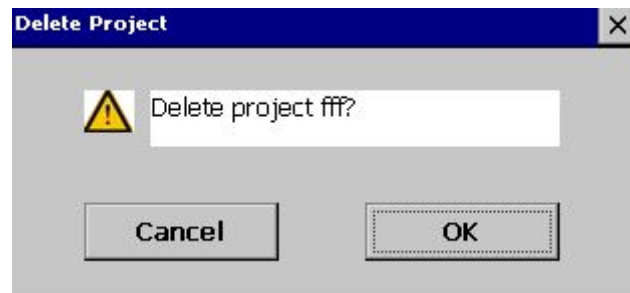


Figure 22 Delete Box

Click OK to complete delete and click Cancel to cancel the delete.

- Project copy: select a project (except for \_global) and click “Copy” to cut the project to clipboard.
- Project paste: select a project or program and click “Paste”. The paste setting box is shown below:

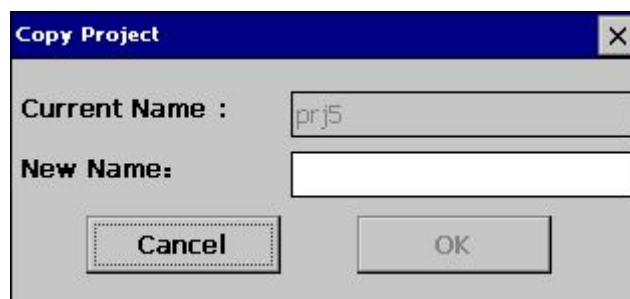


Figure 23 Project Paste Box

The “Current” field shows the name of the copied project. Enter the name (the initial letter must be in capital) of the copied project and click OK to complete paste. Click Cancel to cancel paste.

### 5.5.3.3 Program file operation

- Program create: select a project or program node from the left of the view and click “New Program” button. The new program box pops up:



Figure 24 Program Create Box

The “Project Name” field shows the name of the project of the program to be created. Enter the program’s name (the initial letter must be in capital) and click OK button to complete the create. Click Cancel to cancel the create.

- Program rename: select a program and click “Rename” button. The program rename box pops up:

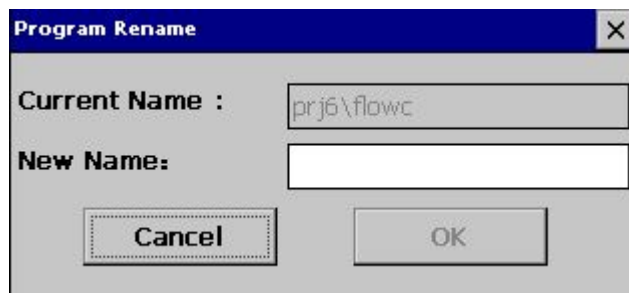


Figure 25 Program Rename Box

The “Current” field shows the name of current project program. Enter new name (the initial letter must be in capital) into the “New Name” field and click OK button to complete rename. Click Cancel to cancel rename.

- Program delete: select a program and click “Delete” button. The program delete box pops up:

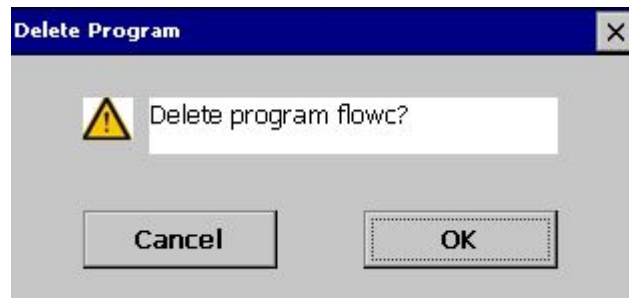


Figure 26 Program Delete Box

Click Ok button to complete program delete and click Cancel to cancel delete.

- Program copy: select a program and click “Copy” button to cut the selected program to clipboard.
- Program paste: select a project or program and click “Paste”. The program paste box pops up:

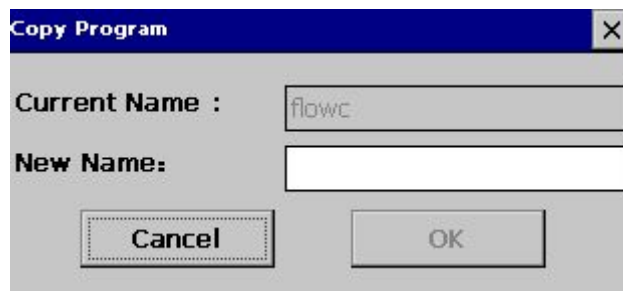


Figure 27 Program Paste Box

The “Current” field shows the name of the program to be copied. Enter the name (the initial letter must be in capital) of the program after copy in “New Name” field. Click OK to complete paste. Click Cancel to cancel the paste.

#### 5.5.3.4 Program management operation

- Load program: Click “Load” button to complete the program load. Now you can see if the program is successfully loaded through the status bar or the loaded program display plugin on the right. When the program is successfully loaded, the view is as follows: Note: Only a program can be loaded at a time. If program A has been loaded, it has to be closed before you can load program B; If there is any syntax error in the loaded program, a dialog box will pop up to indicate the line with the error and the program open status view appears.
- Close loaded program: Select the loaded program in the project directory tree and click “Close” button to complete the operation. If the program is modified, save confirmation box pops up.
- Open program: select the program (unloaded) in the project directory tree and click “Open” to complete the operation.


- Close opened program: select the opened program in the project directory tree and click “Close” to complete the operation. If the program is modified, save confirmation box pops up.

#### 6.5.3.5 Other operations

- Program information display.
- Program directory refresh.
- Project program import.
- Project program export.

## 5.6 Program view

### 5.6.1 Opening method

You can have quick access to a recently opened or loaded program view through ; You can also open and close the program view via the “Load” and “Close” buttons in the project view.

### 5.6.2 Function description

To perform program display, edit and other operations.

### 5.6.3 Interface description

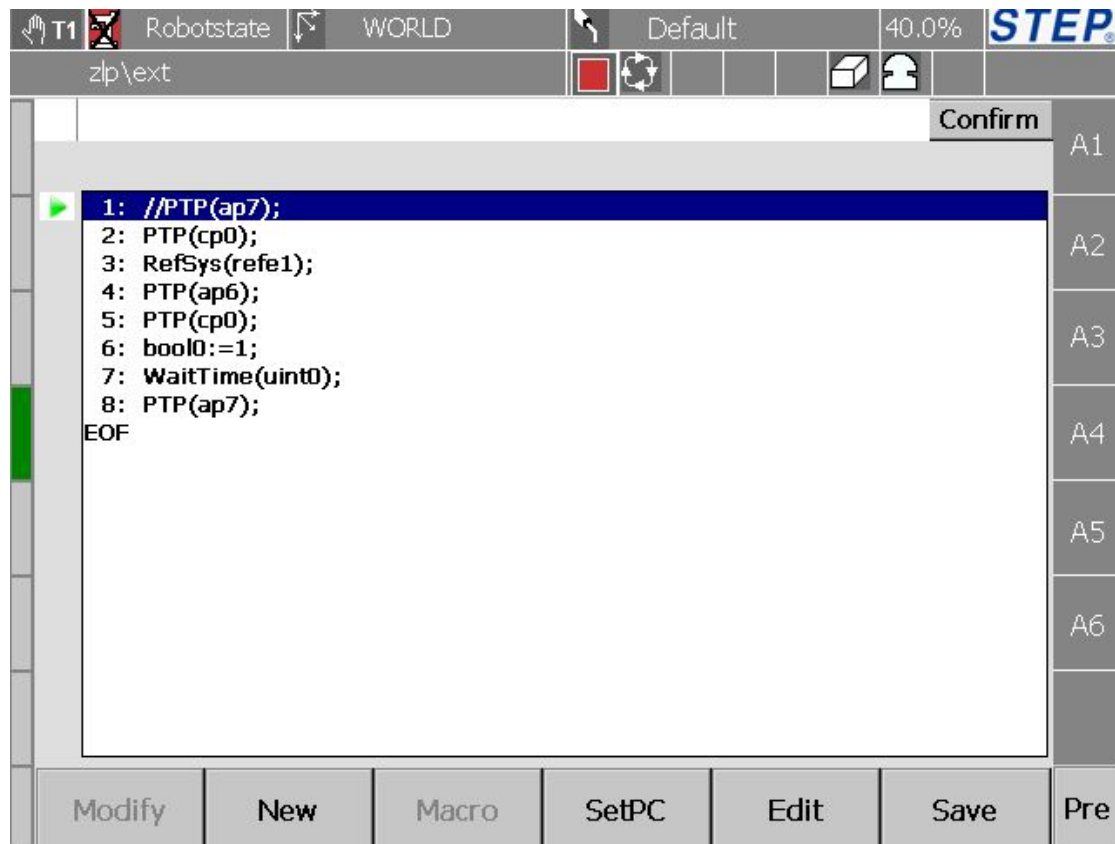


Figure 28 Program in Load Status

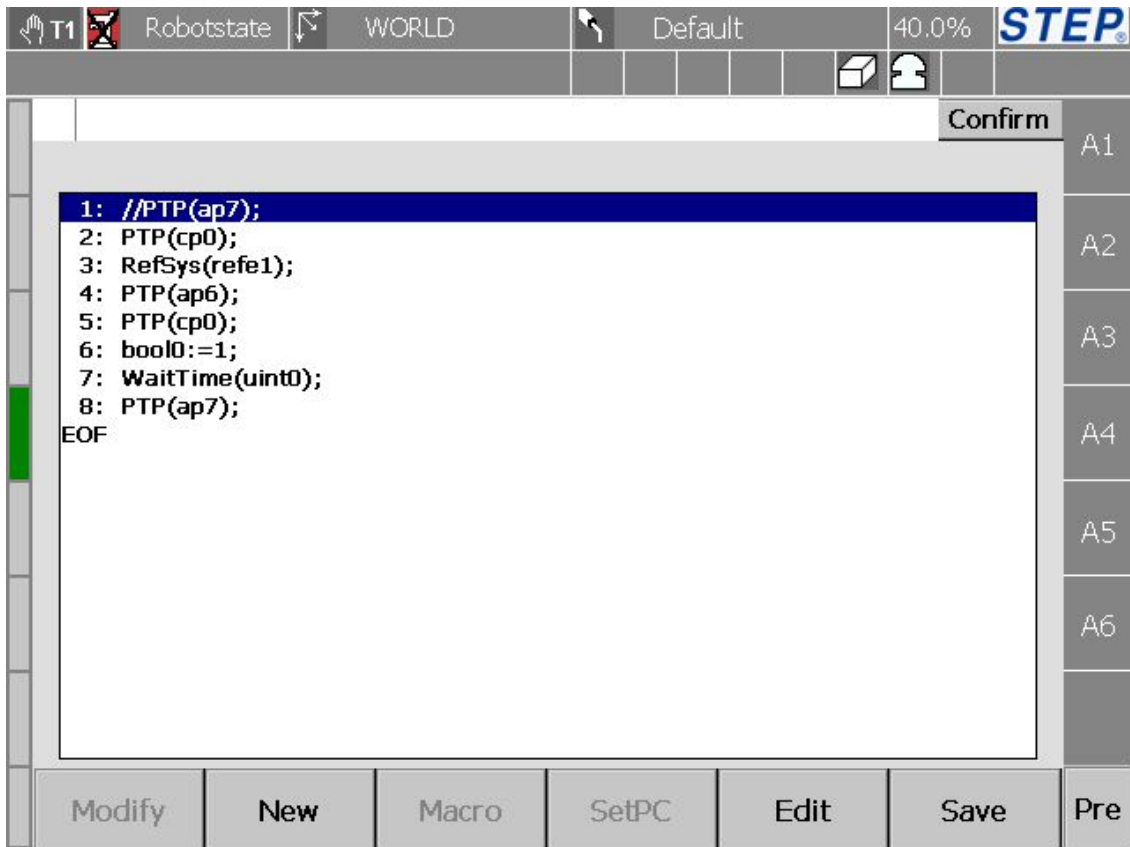



Figure 29 Program in Open Status

#### 5.6.4 Program display

Compare fig.28 and fig.29 and you can see that the program view in Open status is a subset of the program view in Load status. So, the program view in Load status is described here.

- Program statement display: the number before the statement is the line number. When the program is too long, you can use the scroll bar at right side to scroll the view.
- The display of the line number that the program runs to (not viewed in program view in Open status), you can view the number of lines current program runs to through  on the left.

5.6.4.1 Program edit operation



Figure 30 Part of Program Edit Buttons

- Program statement create: click create button and the program statement create box pops up:

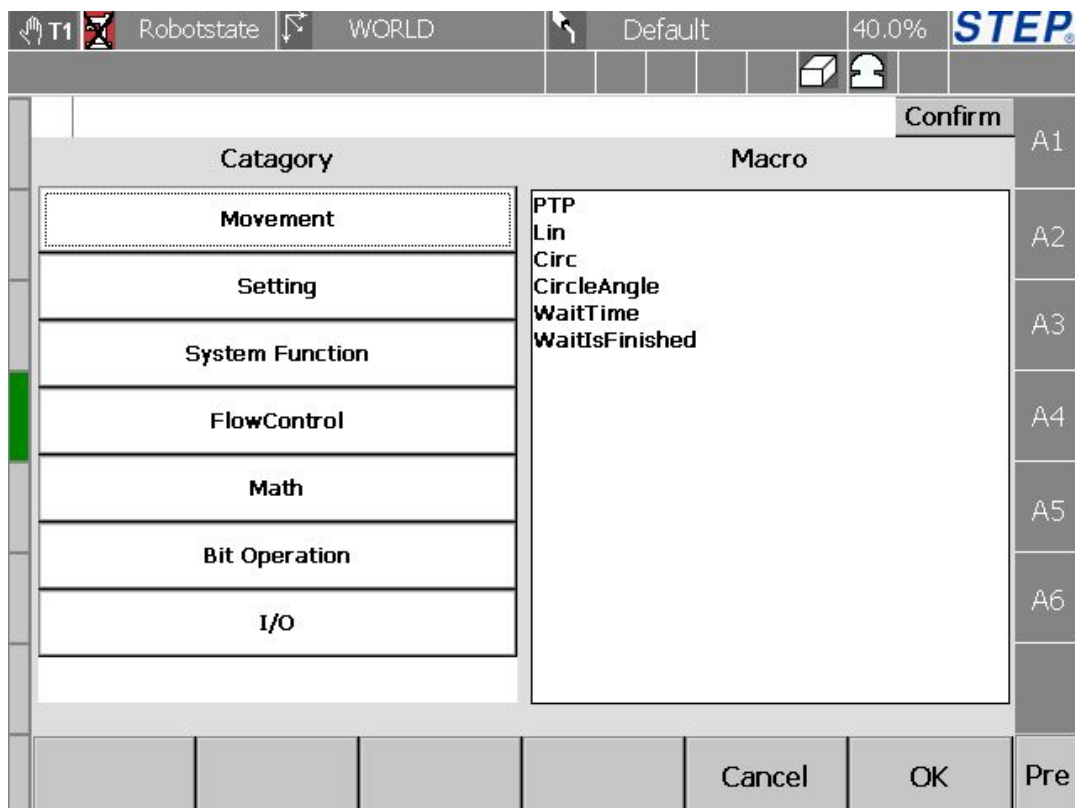


Figure 31 Program Statement Create Interface

The left buttons in fig.31 respond to the major type of the statement. The right list shows the specific type. The major types of the right buttons respond to are:


- Movement: movement-related statement, such as PTP, LIN.

- Setting: some setting statements, such as Dyn, Ovl.
- System Function: system functions, only assignment statement available now.
- Flow Control: process project statements, such as LOOP、WHILE.
- Math: math function statement, such as SIN, COS.
- Bit Operation: bit operation statement, such as SHR, SHL
- I/O: I/O operation statement, such as DIRRead, DIWAIT.

If you want to insert a “PTP”, you can click the “Movement” button on the left and select “PTP” on the right. Then click OK to enter “PTP” statement setting interface.


- Program statement modification: select the statement you wish to modify and click “Modify” button to enter statement modify interface.
- Program statement delete: select the statement you want to delete and click “Remove” button. A dialog box appears with the prompt message for your confirmation. Click OK to delete or click Cancel to cancel delete.
- Program statement cut: select the statement you want to cut and click “Cut” button to cut the statement to clipboard.
- Program statement copy: select the statement you want to copy and click “Copy” button to copy the statement to the clipboard.
- Program statement paste: select the position you want to paste to and click “Paste” button to paste.
- Comment and uncomment: select the position you want to paste to and click “Comment” button to comment; select the statement with comment and click “Uncomment” button.
- Program save: click “Save” button to synchronize the modified program to the controller.

#### 5.6.4.2 Other control operations

- Program statement SetPC function: with SetPC function, the user can choose the line where the program start to run. Select the line number where the program start to run and click “SetPC” button. You can check if the SetPC is successful via the button  on the right.

## 5.7 Error alarm interface

### 5.7.1 Opening method

Press  on the left side of the teach pendant and click Messages option in the popup tab.

### 5.7.2 Function description

Used to display the error alarm message about the current fault of the robot.

### 5.7.3 Interface description

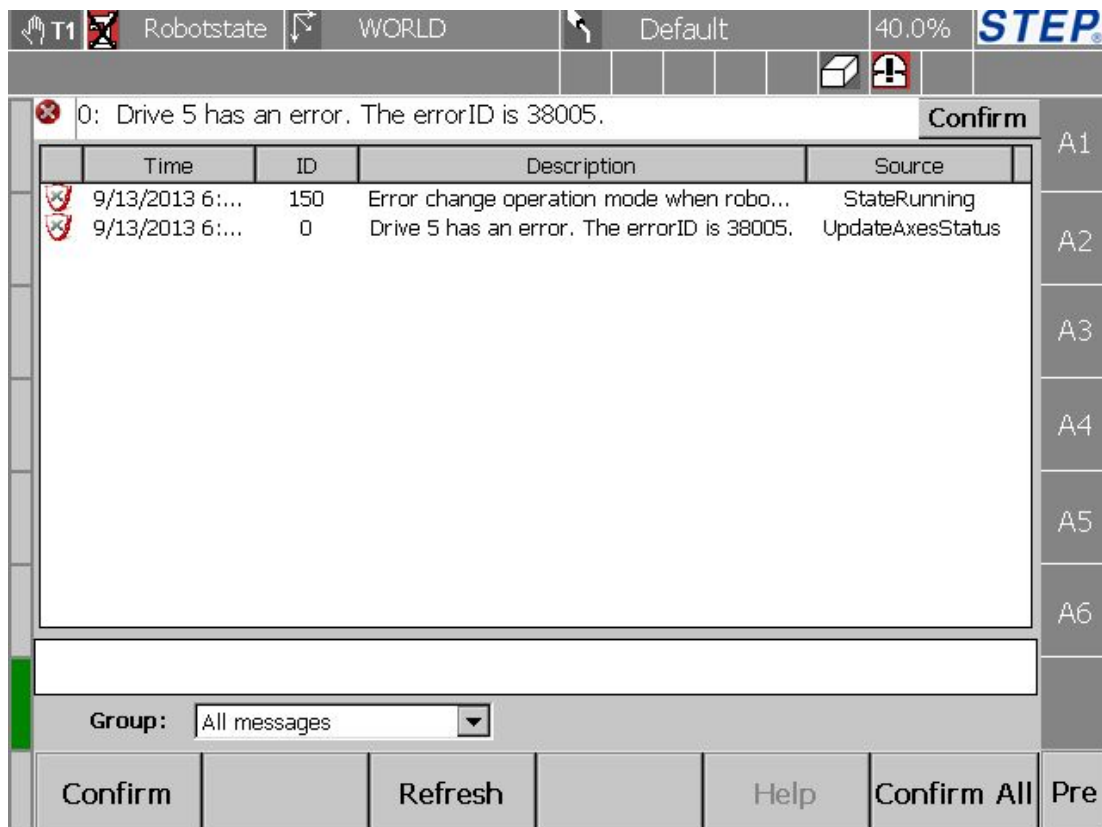


Figure 32 Error Alarm Message Display

#### 5.7.3.1 Message display

- Message data display: in the plugin, Time, ID, Description, Source means the time, ID, description, source of the message.
- Complete message display: select a message and the complete description of the message is displayed in the plugin at the lower side of the view.


- Message filter view: you can select the type of message you wish to display through the Group dropdown box from the lower side of the view, where All messages, Errors, Warnings, Info mean respectively all messages, error message, alarm message, normal message.

#### 5.7.3.2 Message acknowledgement

- Single acknowledgement: select a message you wish to acknowledge and click “Confirm” to acknowledge a single message. The message will disappear from the view.
- All acknowledgement: click “Confirm All” to acknowledge all the messages. All the messages will disappear from the view.

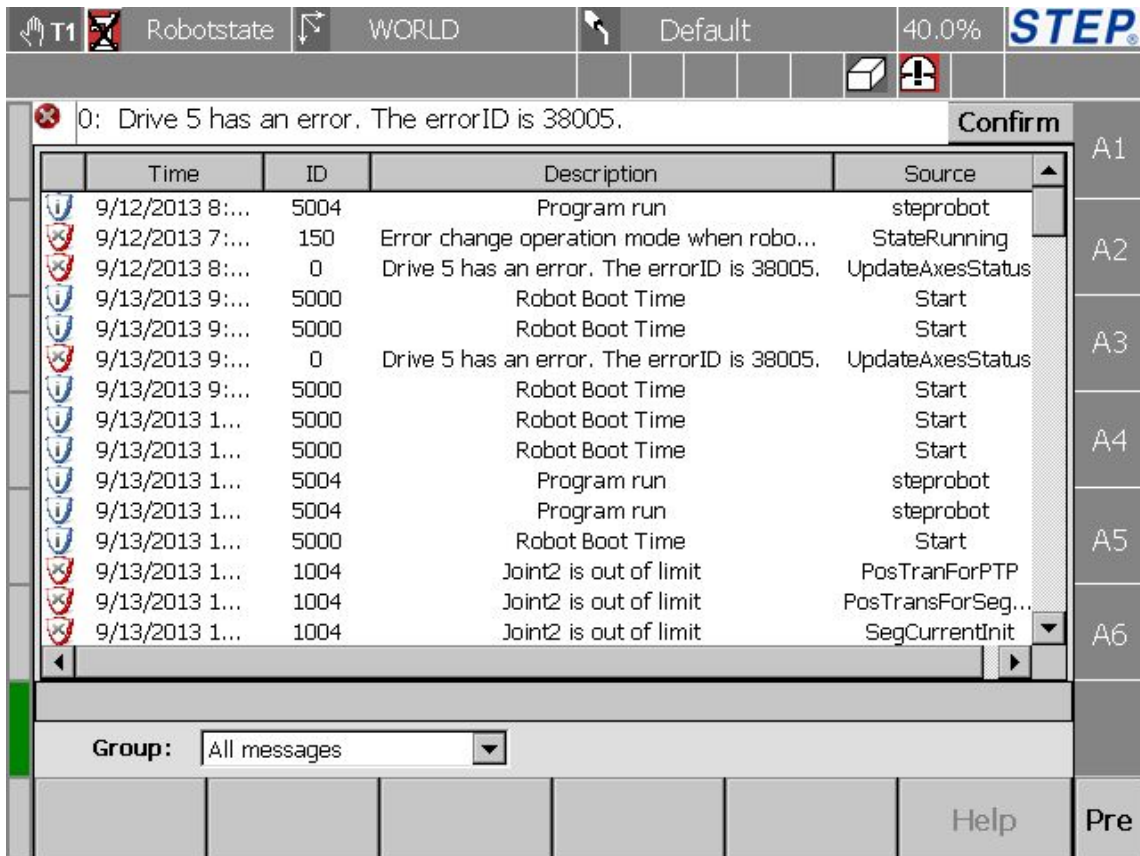
## 5.8 Report view

### 5.8.1 Opening method

Press  on the left side of the teach pendant and click Reports option in the popup tab.

### 5.8.2 Function description

Mainly used to display the error alarm messages of the recent faults of the robot.




### 5.8.3 Interface description

Message display

- Message data display: in the plugin, Time, ID, Description, Source means the time, ID, description, source of the message.
- Complete message display: select a message and the complete description of the message is displayed in the plugin at the lower side of the view.
- Message filter view: you can select the type of message you wish to display through the Group dropdown box from the lower side of the view, where All messages, Errors, Warnings, Info mean respectively all messages, error message, alarm message, normal message.

## 5.9 IO management interface

### 5.9.1 Opening method

Press  on the left side of the teach pendant and click IO Monitor in popup tab.

## 5.9.2 Function description

Used to monitor the IO status: force digital and analog output; simulate the digital and analog input.

## 5.9.3 Interface description

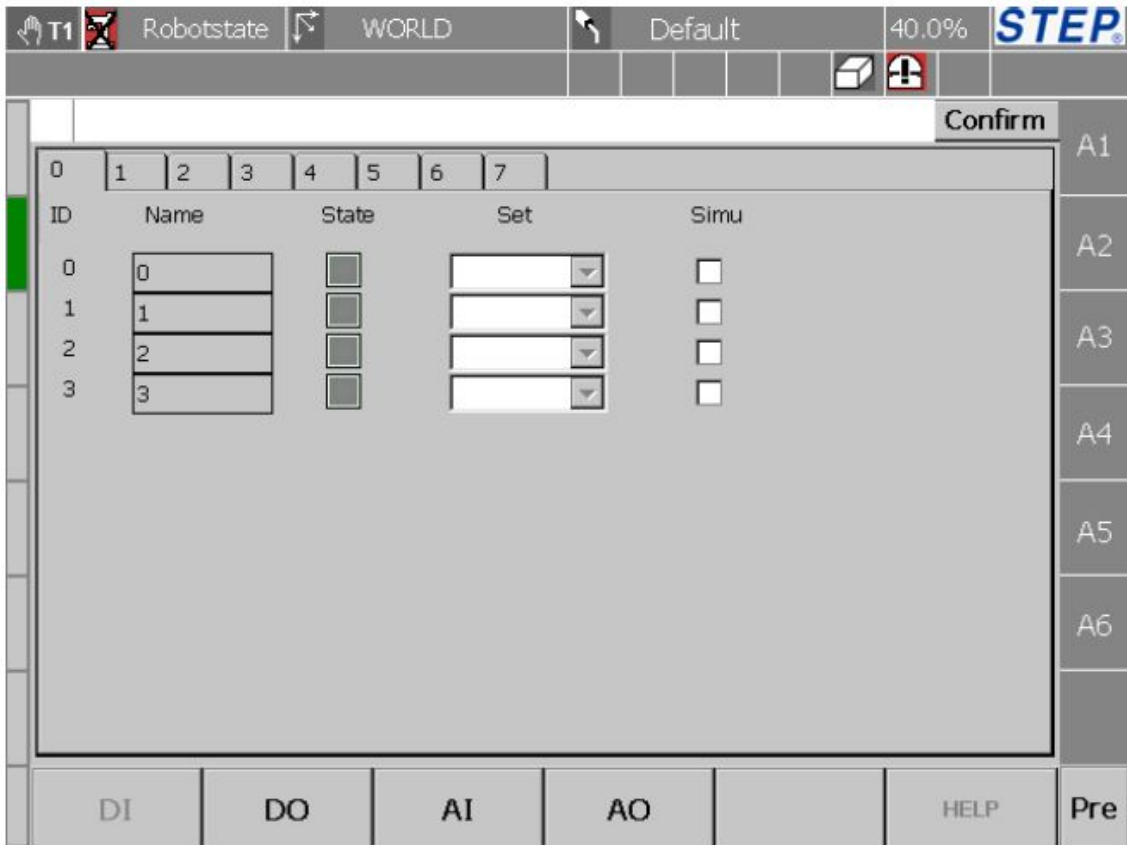


Figure 33 IO Schematics (DI Point: 0, 1, 2, 3)

### 5.9.3.1 IO interface switchover

The DI, DO, AI, AO buttons at the lower part of the interface means digital input, digital output, analog input, analog output. Click the button to enter corresponding IO interface.

click the     label on the upper part to enter different IO point interface. Click button 2 to enter the following interface:

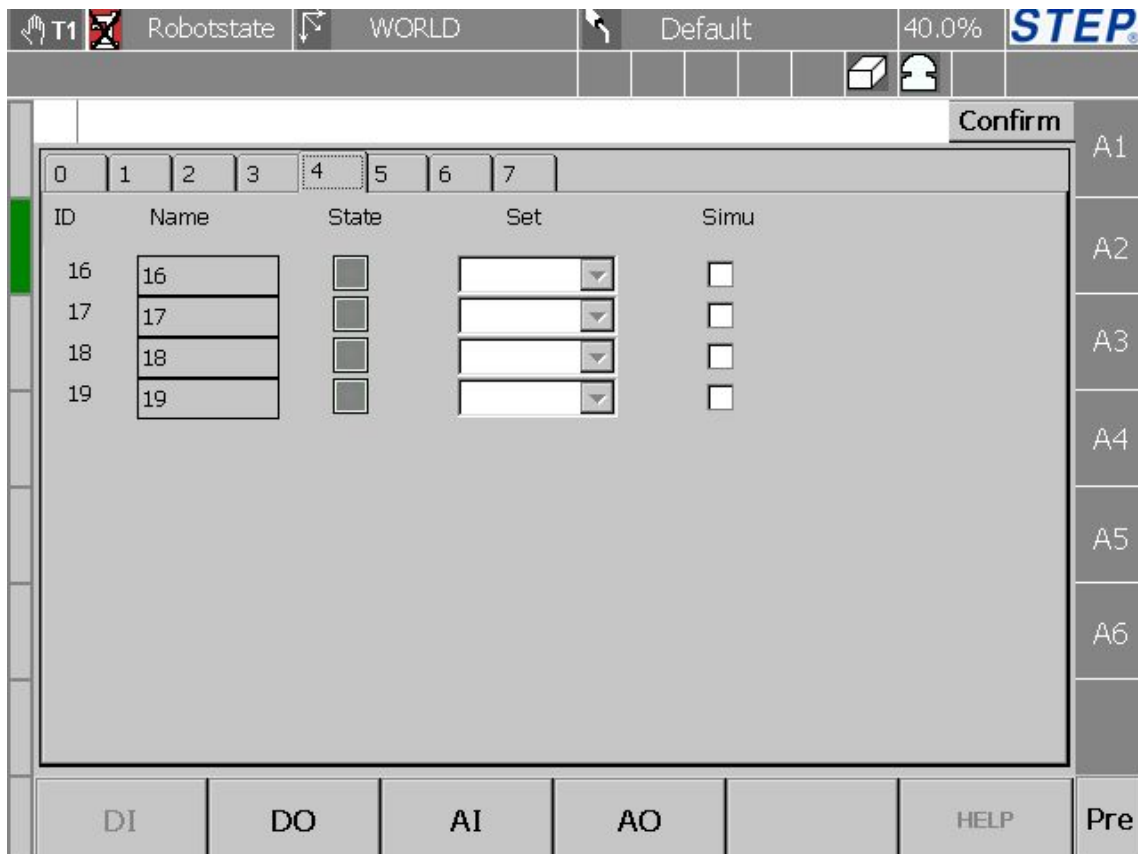


Figure 34 IO Interface (DI point: 16, 17, 18, 19)

### 5.9.3.2 Digital input

In digital input interface (fig.34), ID, Name, State, Set, Simu respectively means the ID, name, status, input simulation setting, input simulation enabled or not of the digital input port.

- The range of digital input port is 0 – 31, which can be expanded when necessary.
- You can assign a name to the digital input port based on actual requirement.
- Display current DI status,  means DI is 1 and  means DI is 0.
- Click Set dropdown box and “ON”/ “OFF” options pop up. The two options correspond to “1” and “0”. For example, click “ON” and it means the analog input status is set to “1”.
- Simu field is used to control whether the digital input simulation is enabled. When checked, it is enabled. When unchecked, it is disabled.

## 5.9.3.3 Digital output

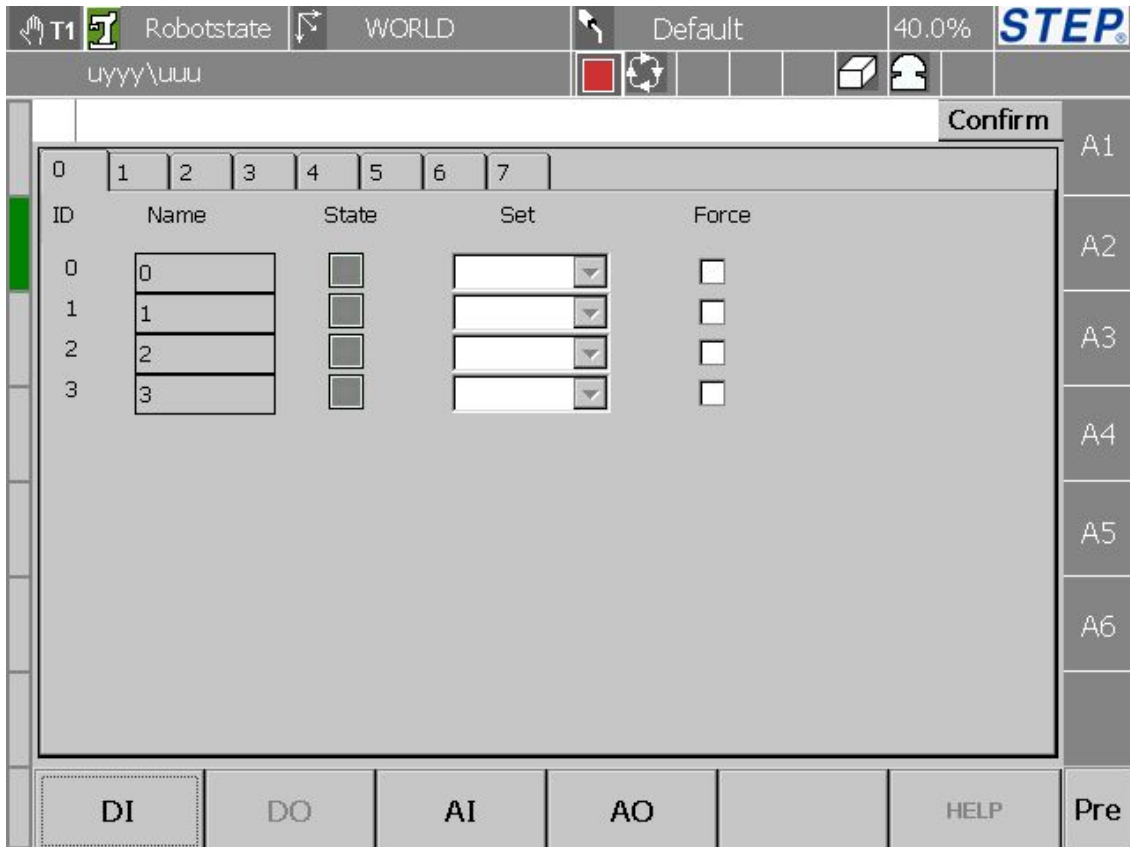


Figure 35 Digital Output

In digital output interface (fig.35), ID, Name, State, Set, Simu respectively means the ID, name, status, output force setting, output force enabled or not of the digital output port.

- The range of digital output port is 0 – 31, which can be expanded when necessary.
- You can assign a name to the digital output port based on actual requirement.
- Display current DO status,  means DO is 1 and  means DO is 0.
- Click Set dropdown box and “ON”/ “OFF” options pop up. The two options correspond to “1” and “0”.For example: click ON and it means the output force status is set to “1”.
- Force field is used to control whether the digital output simulation is enabled. When checked, it is enabled. When unchecked, it is disabled.

## 5.9.3.4 Analog input

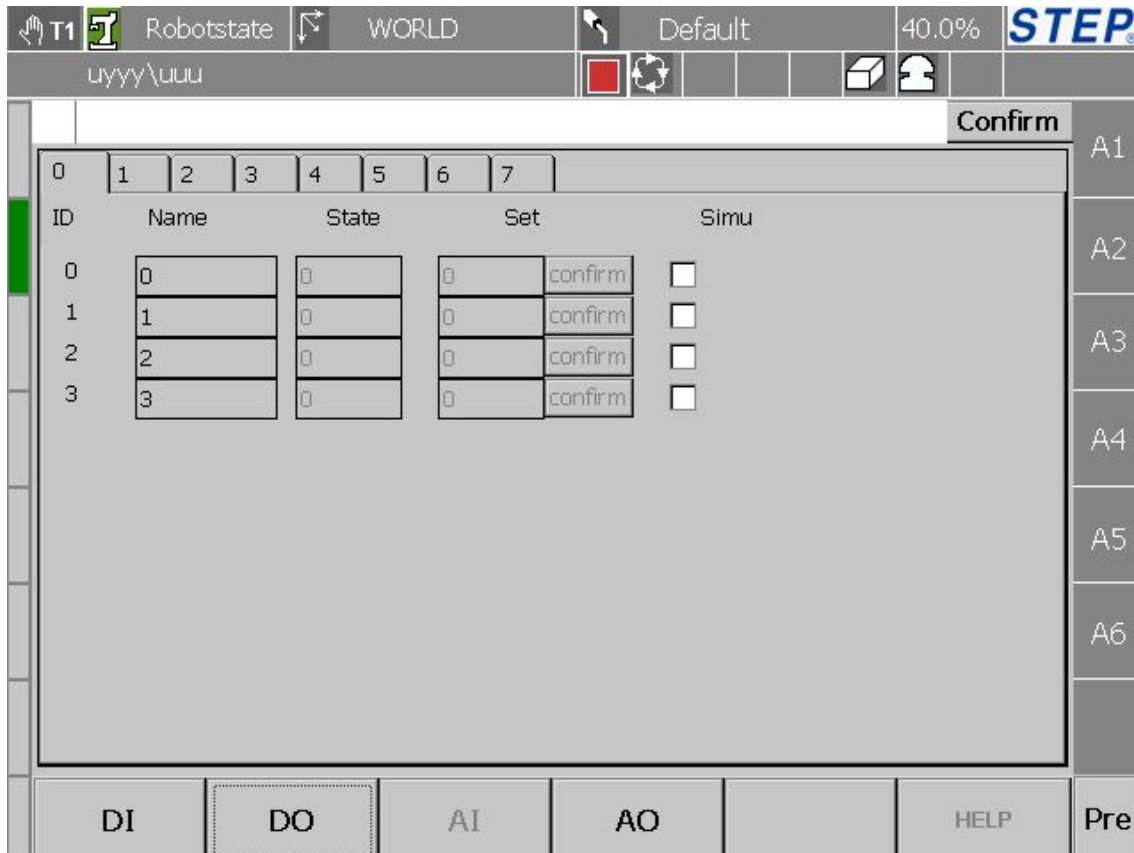


Figure 36 Analog Input

In analog input interface (fig.36), ID, Name, State, Set, Simu respectively means the ID, name, status, input simulation setting, analog input simulation enabled or not of the analog input port.

- The range of analog input port is 0 – 31, which can be expanded when necessary.
- You can assign a name to the analog input port based on actual requirement.
- Display current AI status.
- Enter the value in the text box and click “confirm” button to complete the operation.
- Simu field is used to control whether the analog input simulation is enabled. When checked, it is enabled. When unchecked, it is disabled.

## 5.9.3.5 Analog output

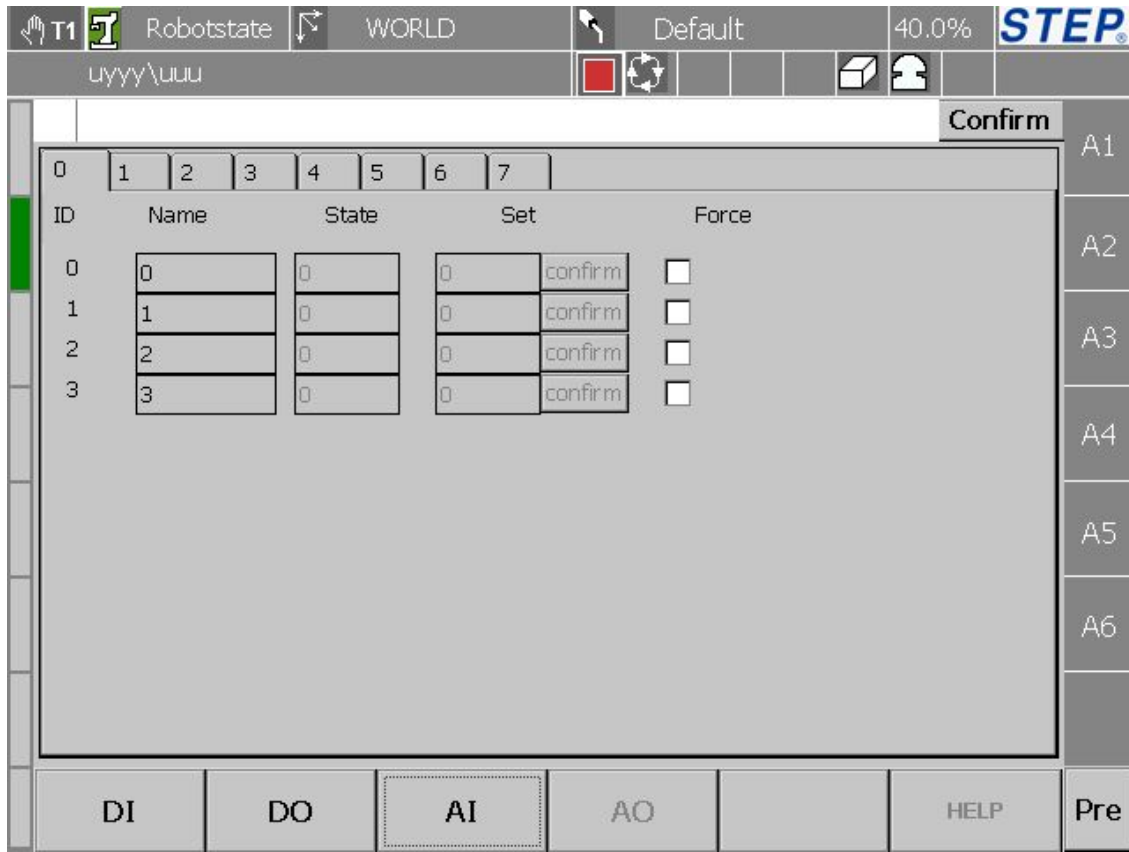



Figure 37 Analog Output

In analog output interface (fig.37), ID, Name, State, Set, Force respectively means the ID, name, status, output force setting, output force enabled or not of the analog output port.

- The range of analog output port is 0 – 31, which can be expanded when necessary.
- You can assign a name to the analog output port based on actual requirement.
- Display current data of AO port.
- Enter the value in the text box and click “confirm” button to complete the operation.
- Force field is used to control whether the analog output simulation is enabled. When checked, it is enabled. When unchecked, it is disabled.

## 5.10 Coordinate system teach interface

### 5.10.1 Opening method

Press  on the left of the teach pendant and click Reference option in the popup tab.

### 5.10.2 Function description

Teach user-defined coordinate system.

### 5.10.3 Interface description

#### 5.10.3.1 Initial interface description

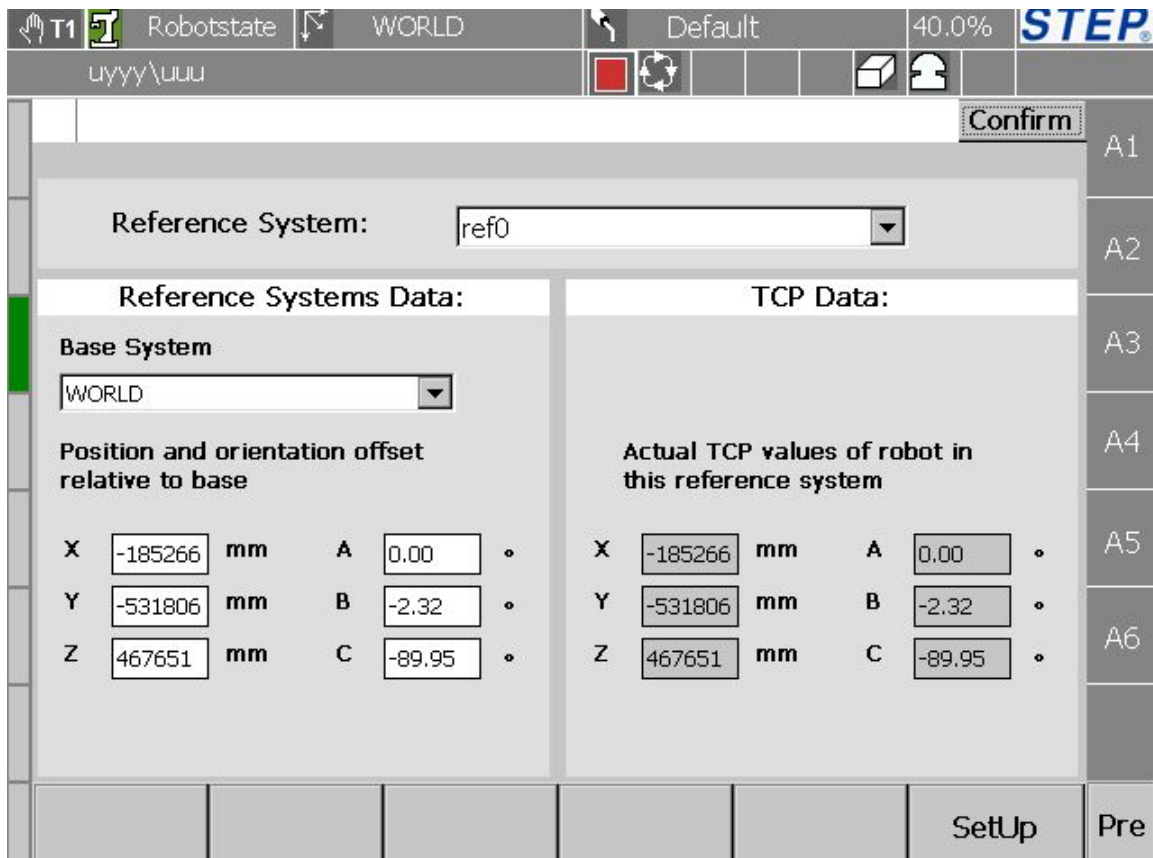


Figure 38 Initial Coordinate System Teach Interface

- User coordinate system selection: select the coordinate system to teach
- Reference coordinate system selection: select the reference coordinate system. Other than normal user coordinate system, there are “WORLD”, “ROBOTBASE” coordinate system in here.

- Display of TCP point in user-defined coordinate system.
- Display of TCP point in user-defined coordinate system.

Click “SetUp” to enter the teach method selection interface:

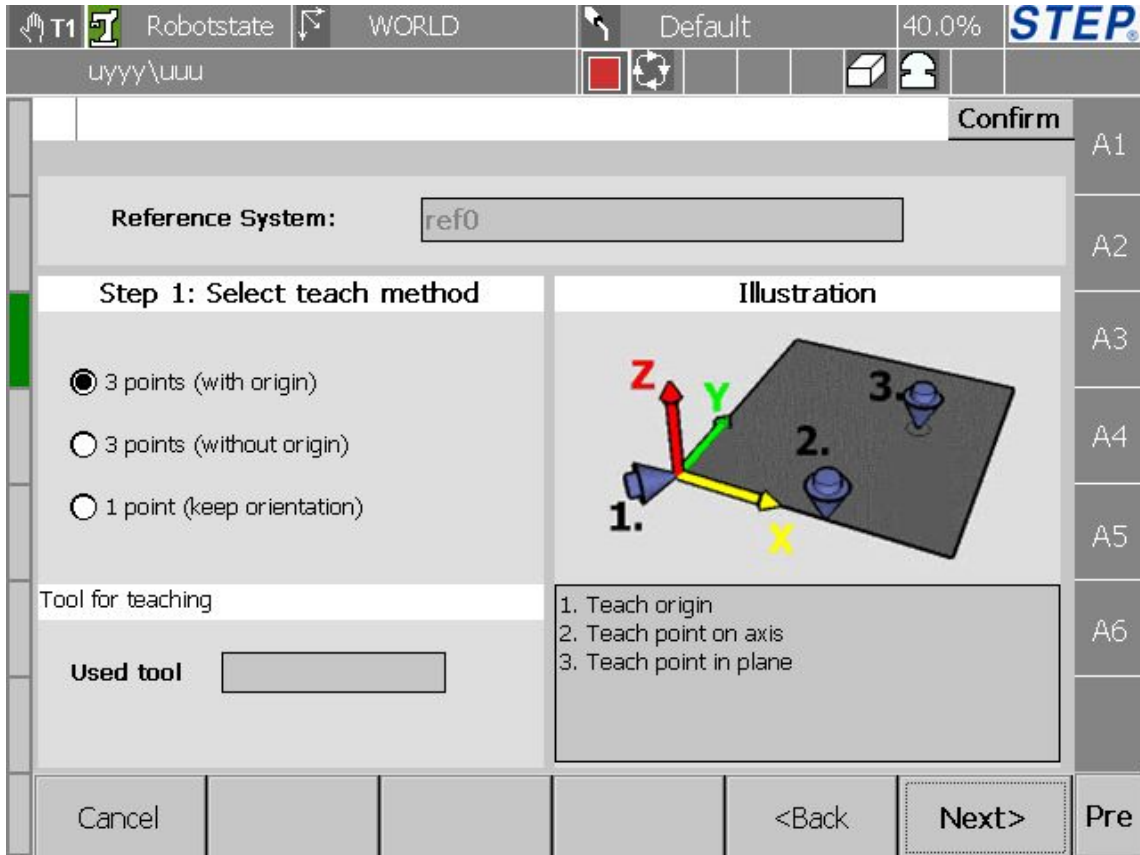


Figure 39 Teach Method Selection

In fig.39, the “Reference System” on the uppermost part shows the reference CS (coordinate system) responding to user-defined CS; the “Select teach method” on the left is used to select teach method; the “Tool for teaching” for selecting current teach tool; the “Illustration” field on the right is used for the description of the selected method; Click “Cancel” or “Back” buttons to go back to initial teach interface; click “Next” to enter specific teach interface.

### 5.10.3.2 Three point method with origin

Select CS teach method (“3 points(with origin)”) in fig.39 and click “Next” to enter the following interface:

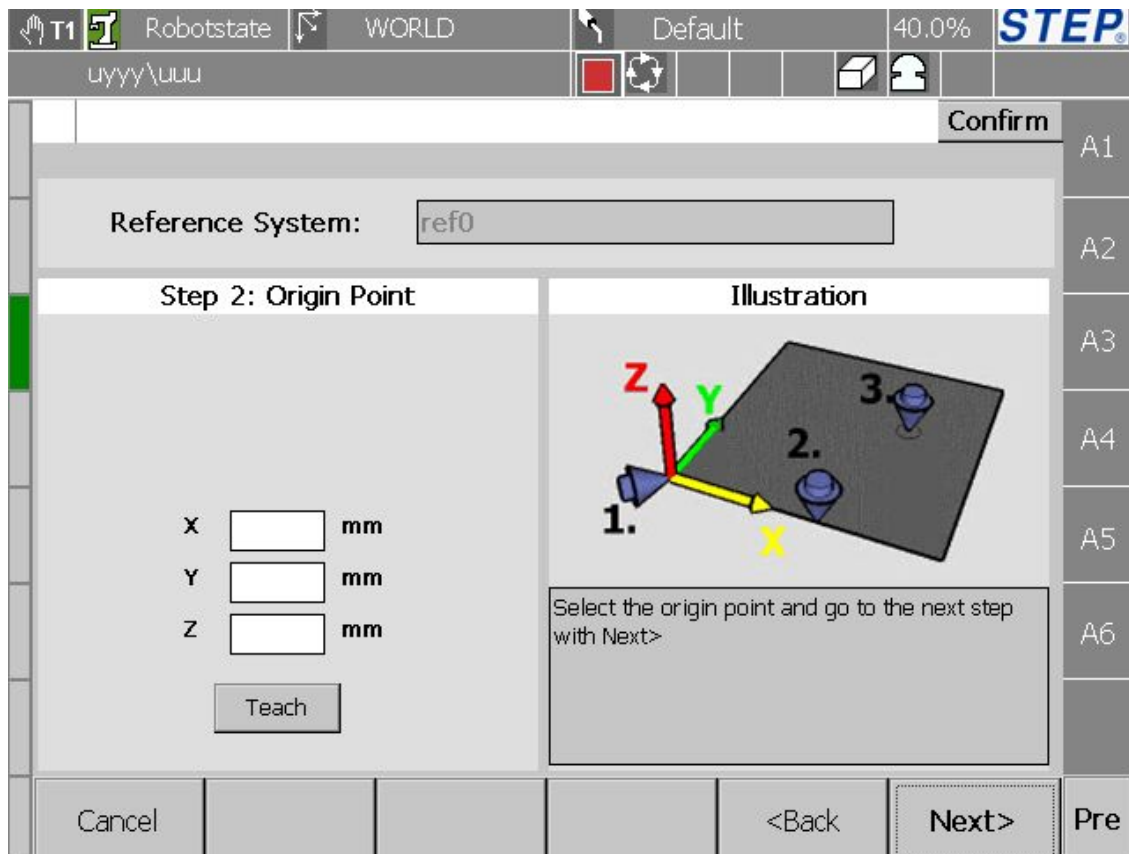


Figure 40 First Step of Three-Point Method with Origin

Click “Teach” button to complete teach; Click “Cancel” to go back to initial CS teach interface; Click “Back” to return to the previous interface (CS teach method selection interface); Click Next to enter the next teach interface:

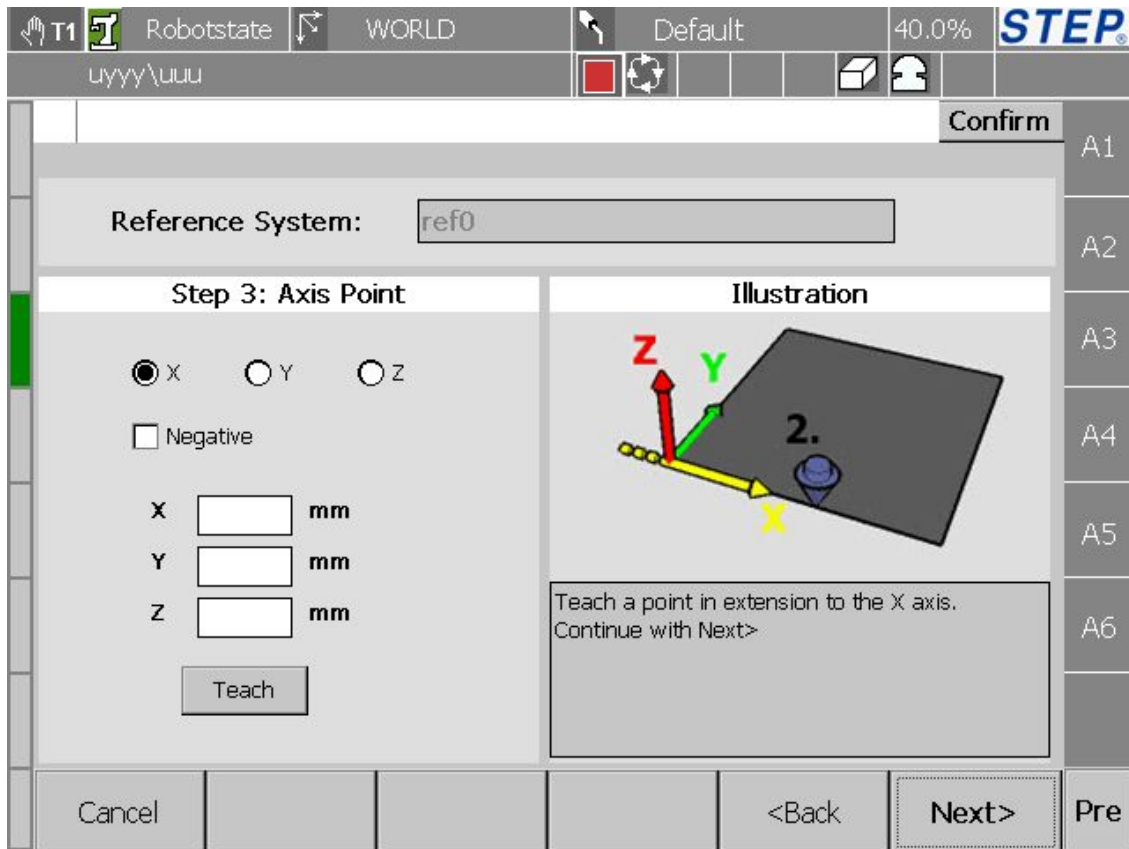


Figure 41 Second Step of Three-Point Method with Origin

First, select the axis (X, Y, Z) with the point to teach. Then, select the direction of the axis (forward, reverse) and run the robot to desired position. Click “Teach” to complete the second step. Click “Cancel” to return to initial CS teach interface; Click “Back” return to the first step; Click “Next” to go to the next step:

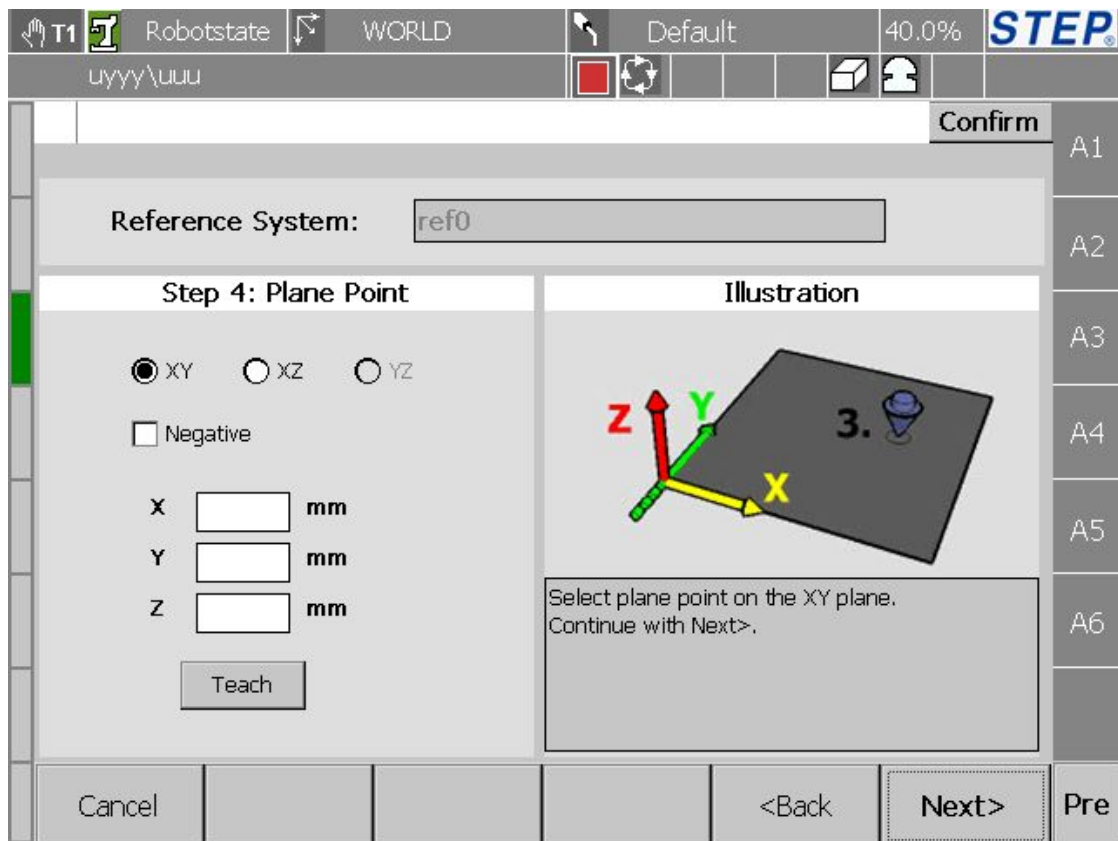


Figure 42 Third Step of Three-Point Method with Origin

Select the plane (XY, XZ, YZ) with the point to teach and then select the direction of the point on the plane (forward, reverse). Run the robot to the desired position and click “Teach” to complete the third step. Click “Cancel” to go back to the initial CS teach interface; click “Back” to go back to the second step; Click “Next” to go to the next step:

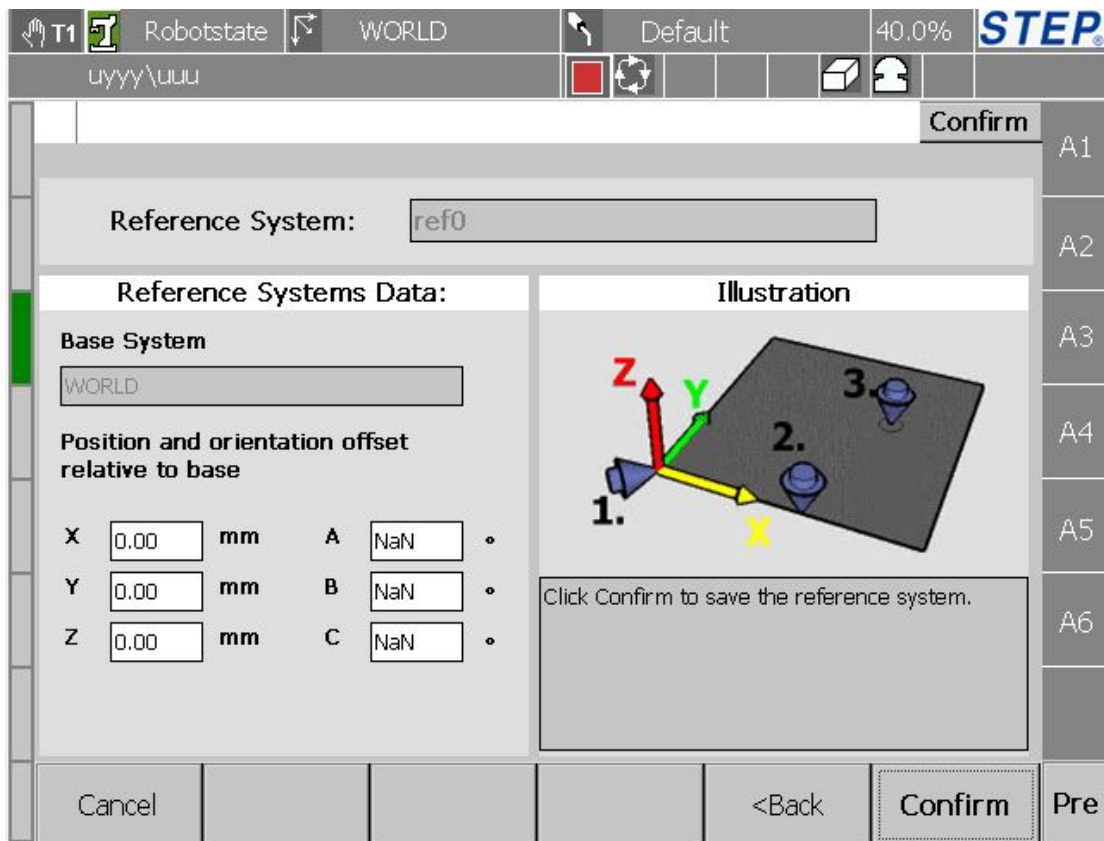


Figure 43 Fourth Step of Three-Point Method with Origin

The left side shows the CS data after the teach; Click “Cancel” to go back to the initial CS teach interface; click “Back” to go back to the second step; click “Confirm” to complete CS teach.

### 5.10.3.3 Three-point method without origin

Select CS teach method (“3 points (without origin)”) in fig.39 and click “Next” to enter the following interface:

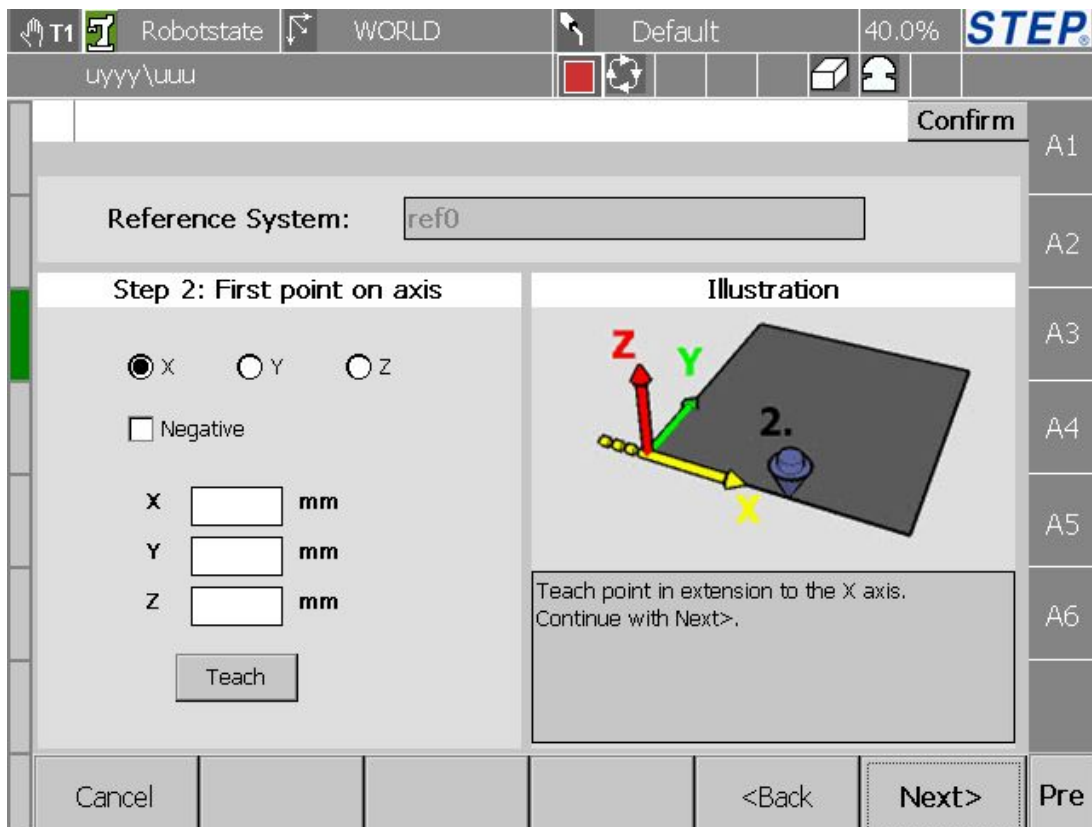


Figure 44 First Step of Three-Point Method without Origin

Select the first axis (X, Y, Z) to teach and direction (forward, reverse). Run the robot to the desired position. Then click “Teach” button to complete teach; Click “Cancel” to return to initial CS teach interface; Click “Back” return to the previous interface (CS teach method selection interface); Click “Next” to go to the next step:

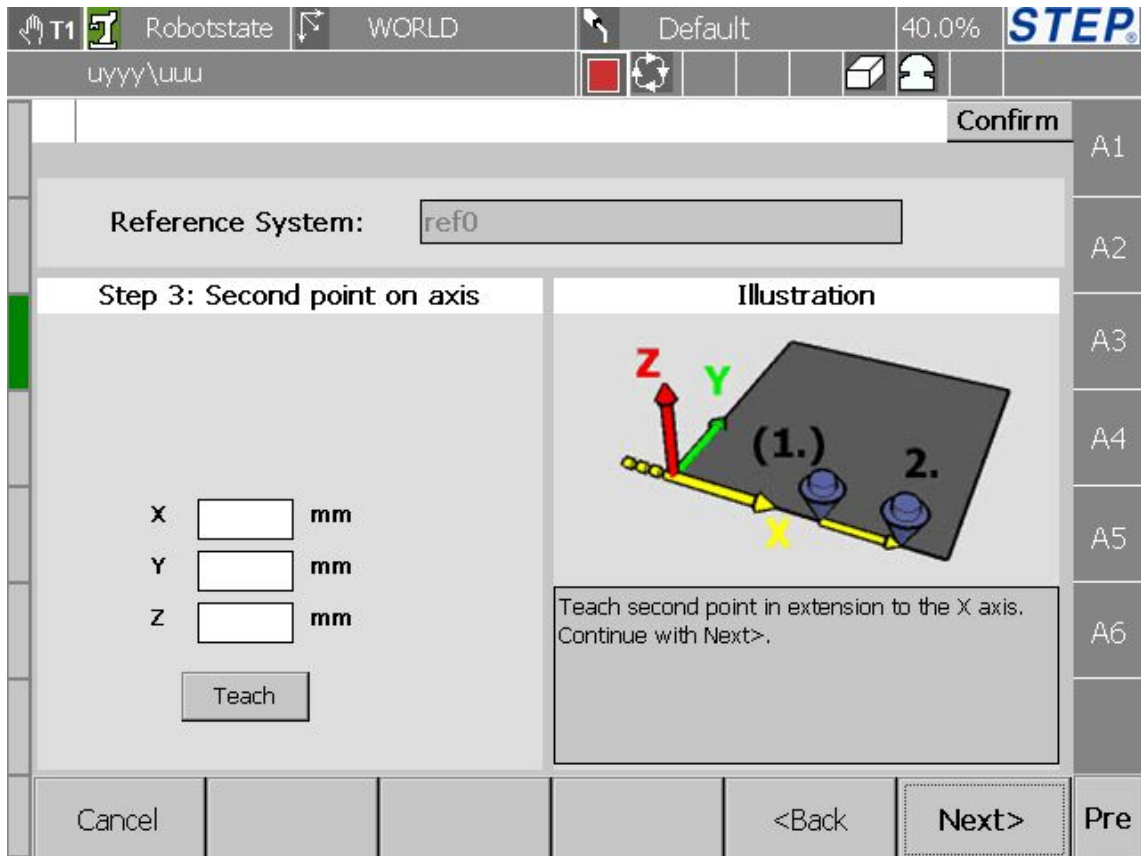


Figure 45 Second Step of Three-Point Method without Origin

Run the robot to the desired position and click “Teach” to complete the second step. With the points determined from this and previous step, an axis can be determined. Click “Cancel” to return to initial CS teach interface; Click “Back” return to the first step; Click “Next” to go to the next step:

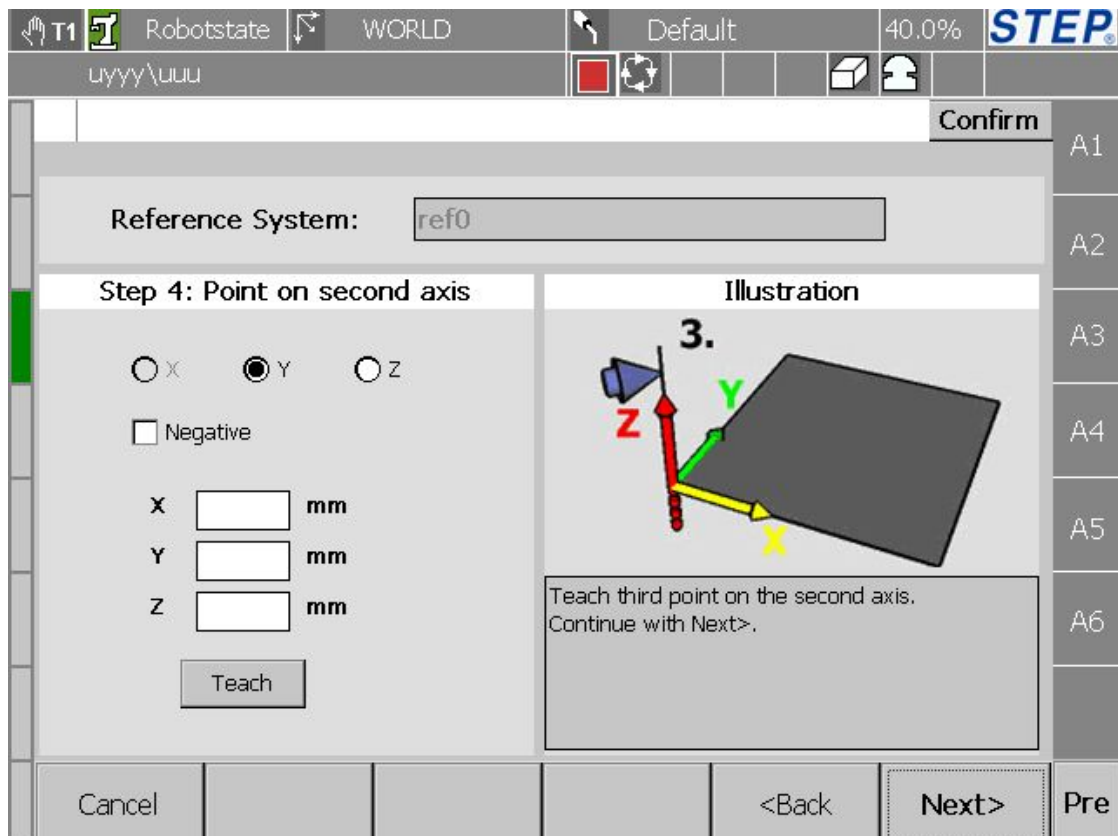


Figure 46 Third Step of Three-Point Method without Origin

Select the axis (X, Y, Z) with the point to teach and then select the direction (forward, reverse) of the axis. Run the robot to the desired position. Then click “Teach” button to complete the third step; Click “Cancel” to return to initial CS teach interface; Click “Back” return to the first step; Click “Next” to go to the next step:

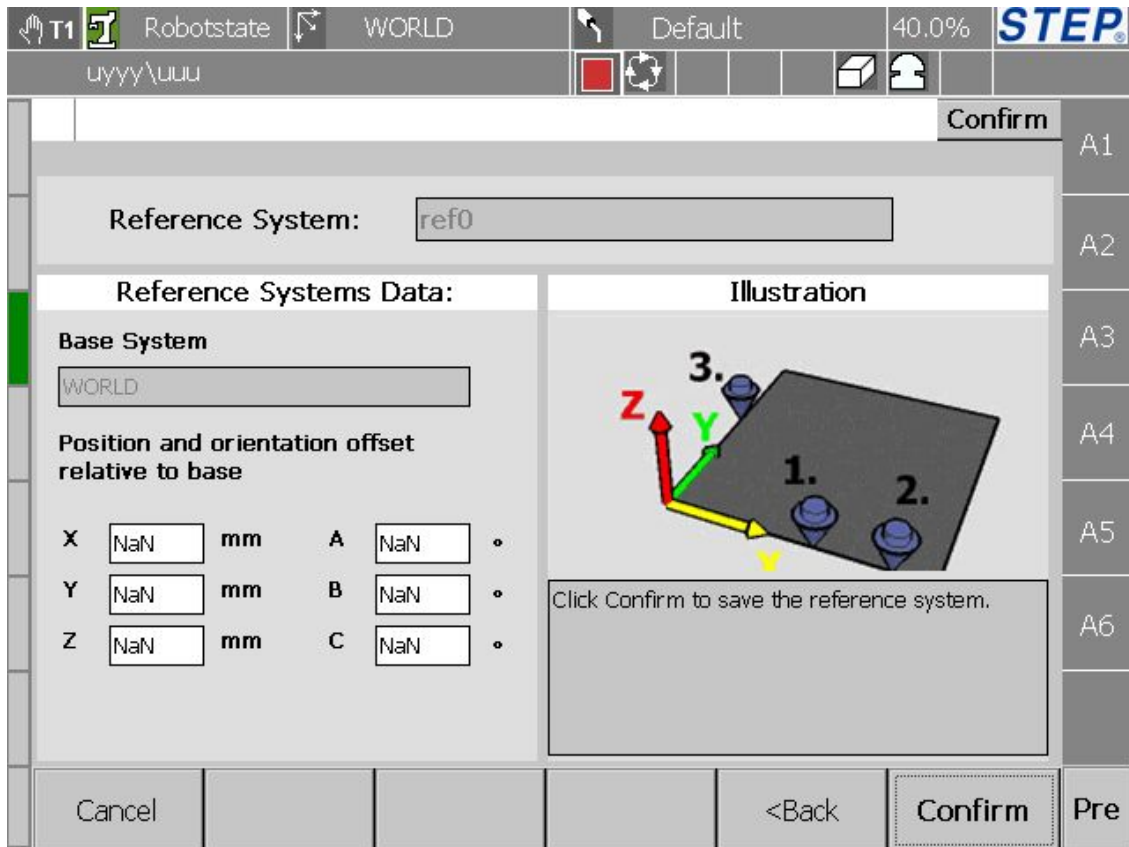


Figure 47 Fourth Step of Three-Point Method without Origin

The left side shows the CS data after the teach; Click “Cancel” to go back to the initial CS teach interface; click “Back” to go back to the second step; click “Confirm” to complete CS teach.

#### 5.10.3.4 One-point method (keep orientation)

The principle of the single-point method is only coordinate translation occurs with no orientation change of user-defined CS with relation to reference CS.

Select CS teach method (“1 points(keep orientation)”) in fig.39 and click “Next” to enter the following interface:

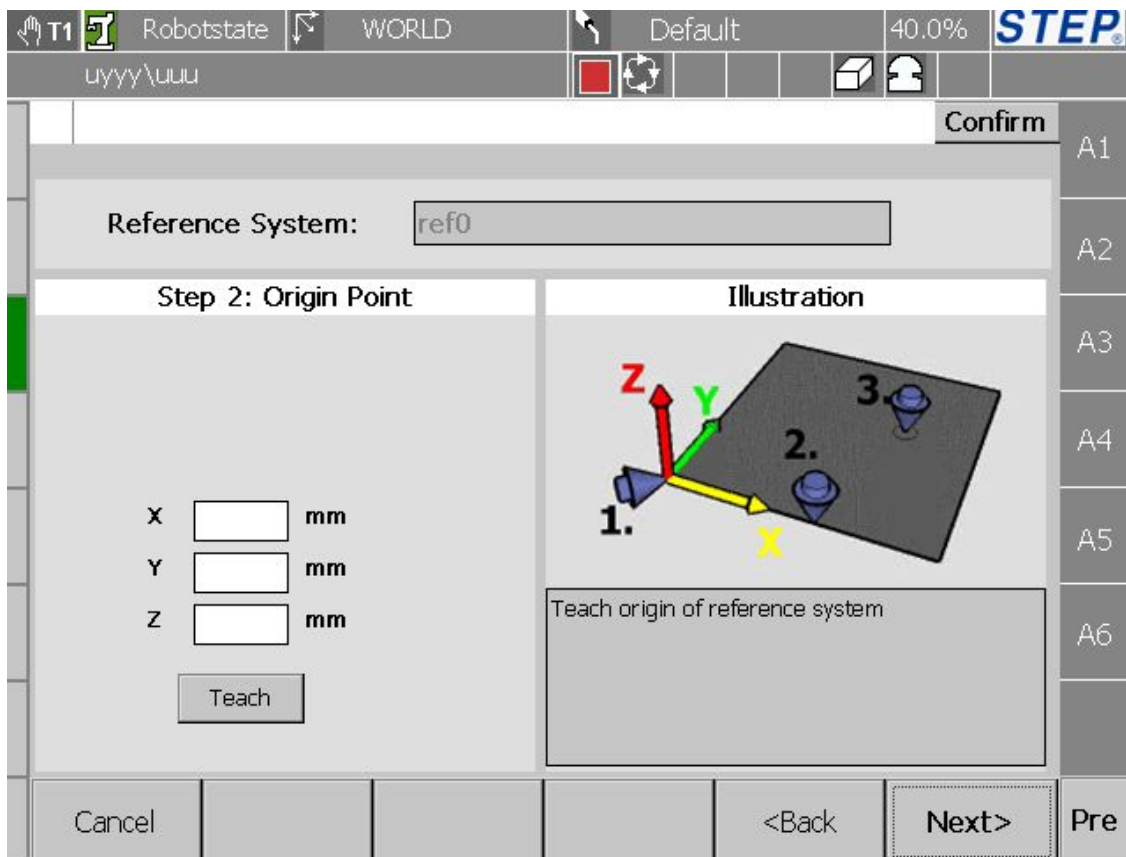


Figure 48 First Step of One-point Method

Run the robot to the desired position and click “Teach” button to complete the teach of the origin; Click “Cancel” to go back to initial CS teach interface; Click “Back” to return to the previous interface (CS teach method selection interface); Click Next to enter the next teach interface:

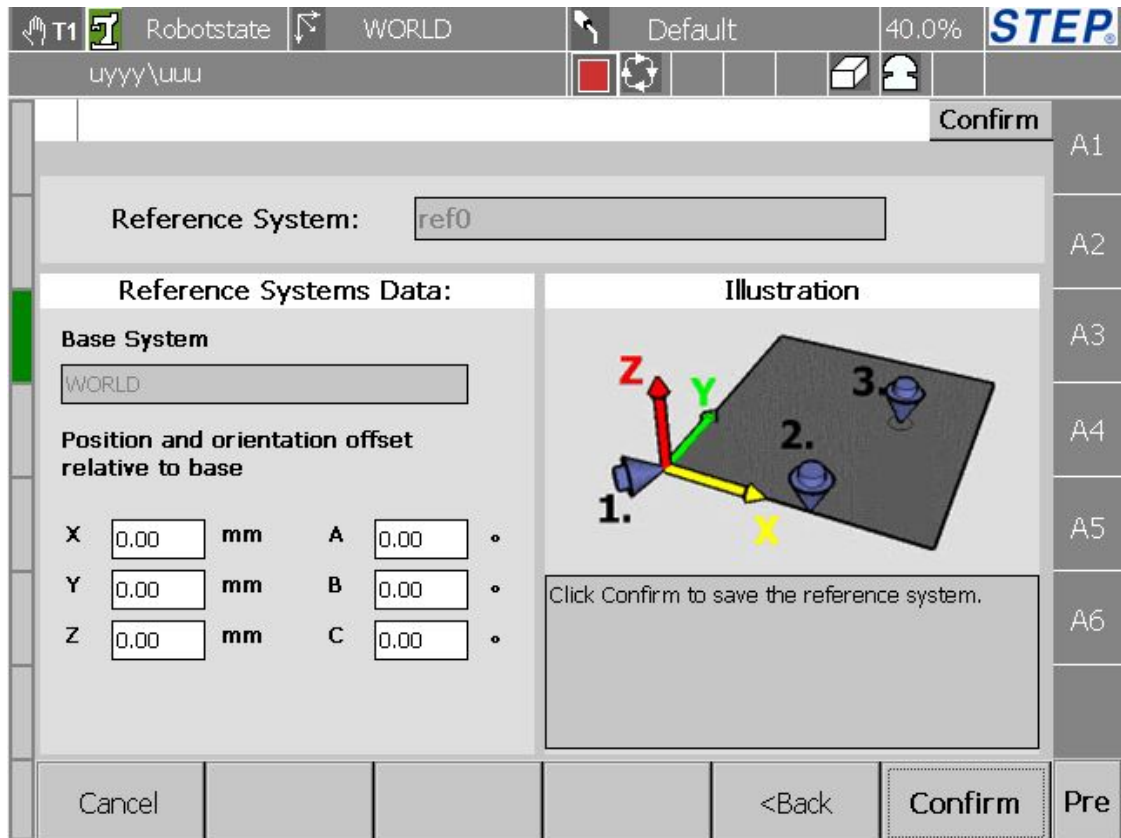



Figure 49 Second Step of One-point Method

The left side shows the CS data after the teach; Click “Cancel” to go back to the initial CS teach interface; click “Back” to go back to the second step; click “Confirm” to complete CS teach.

## 5.11 Tool teach interface

### 5.11.1 Opening method

Press  on the left the teach pendant and click Tool option in the popup tab.

### 5.11.2 Function description

Teach specified tool.

## 5.11.3 Interface description

### 5.11.3.1 Initial interface description

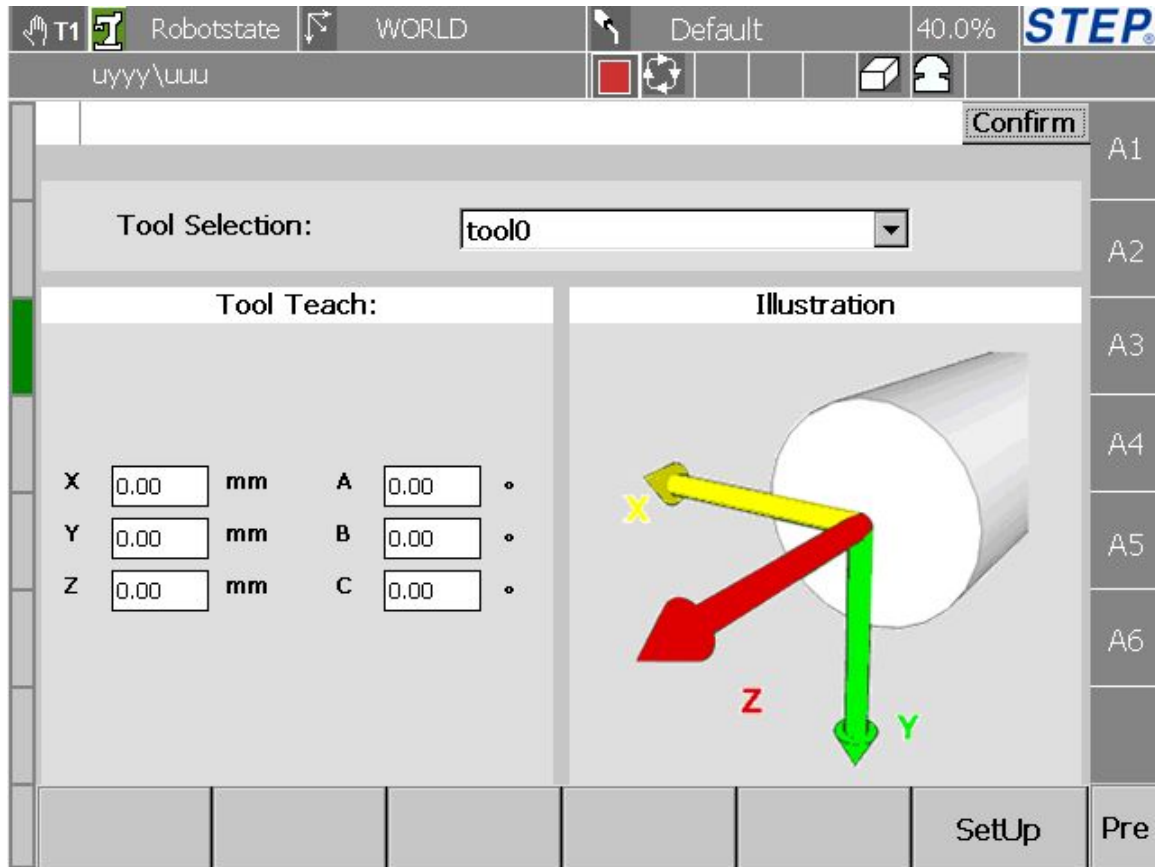


Figure 50 Initial Tool Teach Interface

Select the tool variable to teach in the “Tool Selection” dropdown box. The value of the tool will be displayed on the left side. Click “SetUp” button to go to tool teach method selection interface:

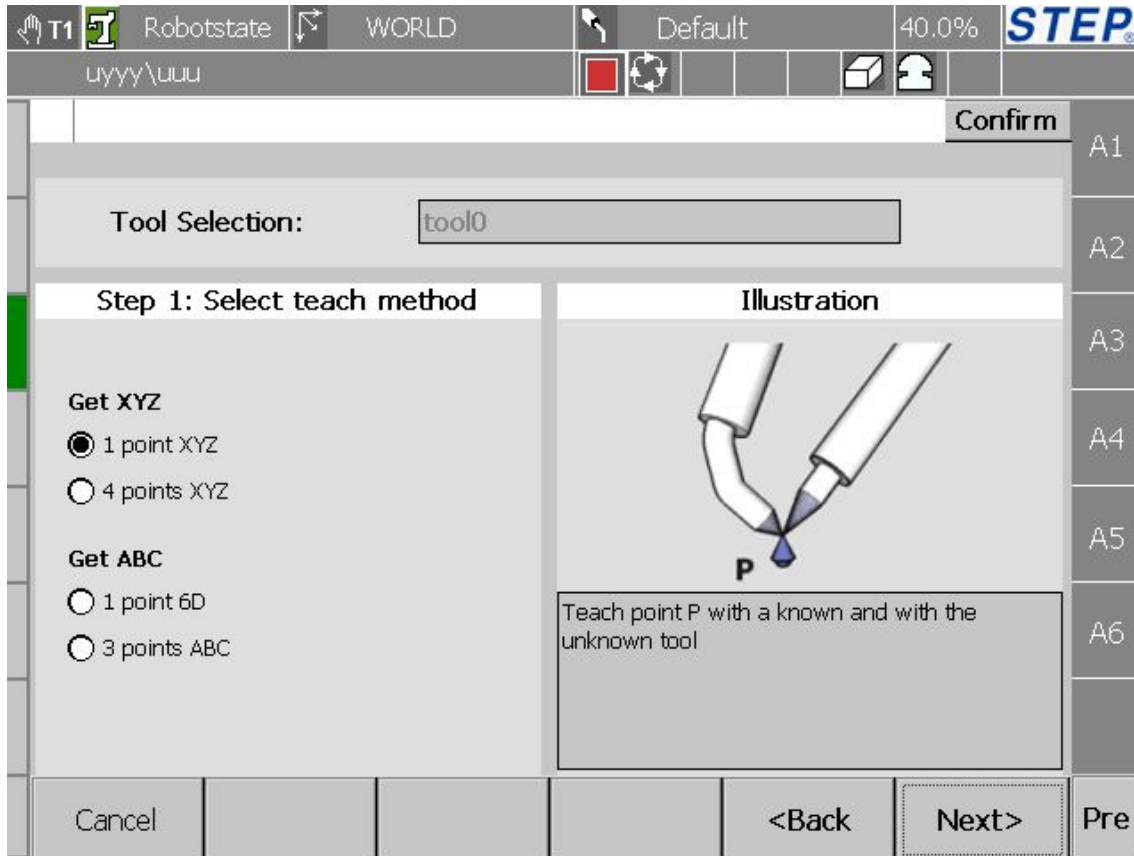


Figure 51 Tool Teach Method Selection

The teach of tool variable is divided into two parts: teach tool position X, Y, Z; teach tool orientation A, B, C. There are two methods for tool position teach: one-point and four-point. There are two methods for tool orientation teach: one-point and three-point. Click “Cancel” or “Back” buttons to go back to initial teach interface; click “Next” to enter specific teach interface.

Note: the three-point method in orientation teach is related to the position data of the selected tool. So it is necessary to teach tool position before teaching tool orientation using three-point method.

### 5.11.3.2 Teach tool’s coordinate XYZ (one-point method)

Select teach method (“1 point XYZ”) in fig.51 and click “Next” to go to the following interface:

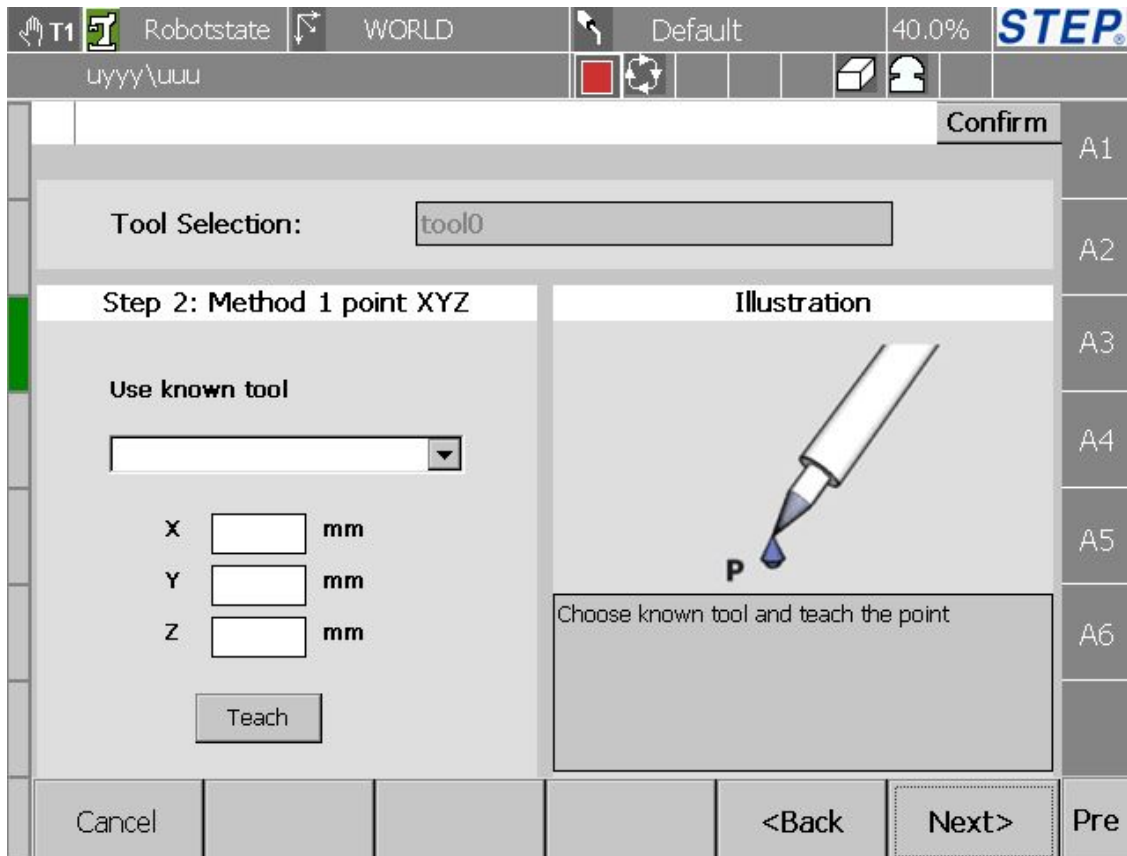


Figure 52 First Step of XYZ (One-point method)

Select a known tool and run the robot to the desired position. Click “Teach” to complete teach; Click “Cancel” to return to initial CS teach interface; Click “Back” to return to tool teach method selection interface; Click “Next” to go to the next teach interface:

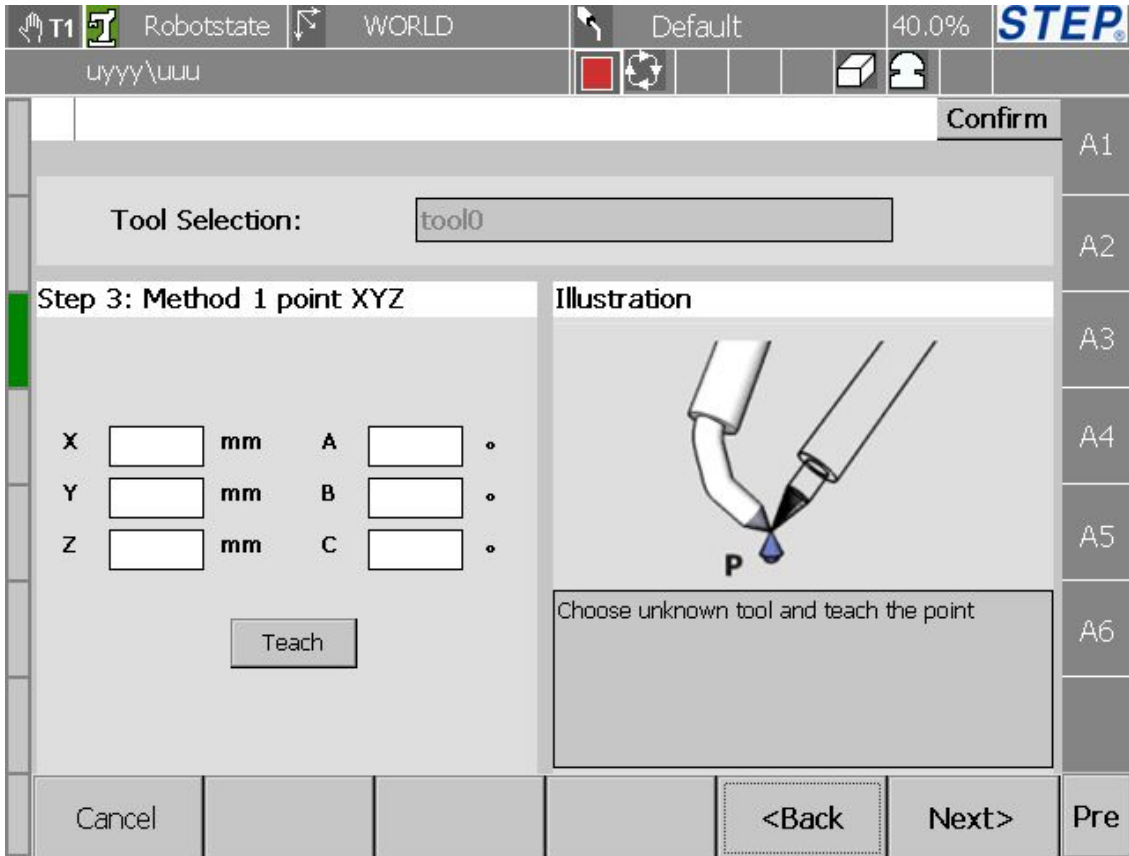


Figure 53 Second Step of XYZ (One-point method)

Remove the known tool and replace the desired teach tool. Run the robot to the teach position in the first step and click “Teach” to complete teach; Click “Cancel” to return to initial CS teach interface; Click “Back” to return to tool teach method selection interface; Click “Next” to go to the next teach interface:

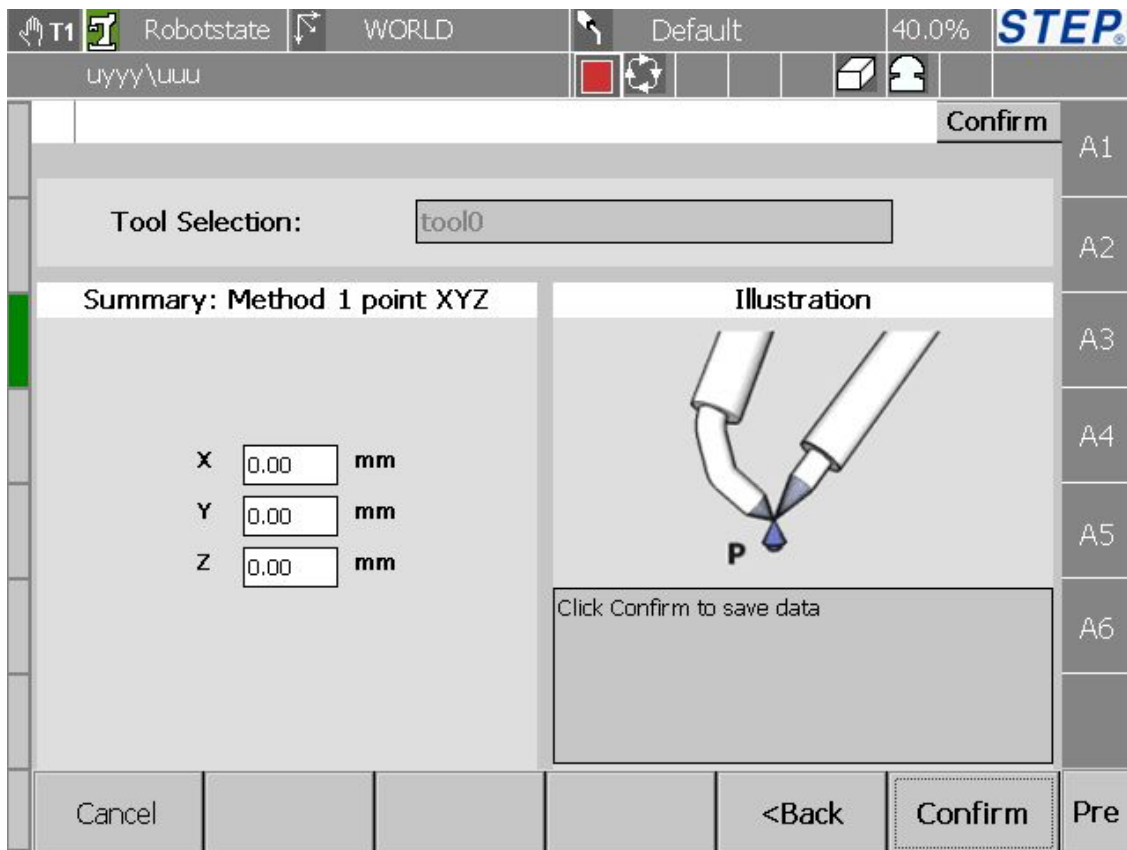


Figure 54 Third Step of XYZ (One-point method)

The left side shows the CS data after the teach; Click “Cancel” to go back to the initial CS teach interface; click “Back” to go back to the second step; click “Confirm” to complete tool teach.

### 5.11.3.3 Teach tool’s coordinate XYZ (four-point method)

Principle: move the robot to a point in different orientation for four times and teach.

Select teach method (“4 points XYZ”) in fig.51 and click “Next” to go to the next interface:

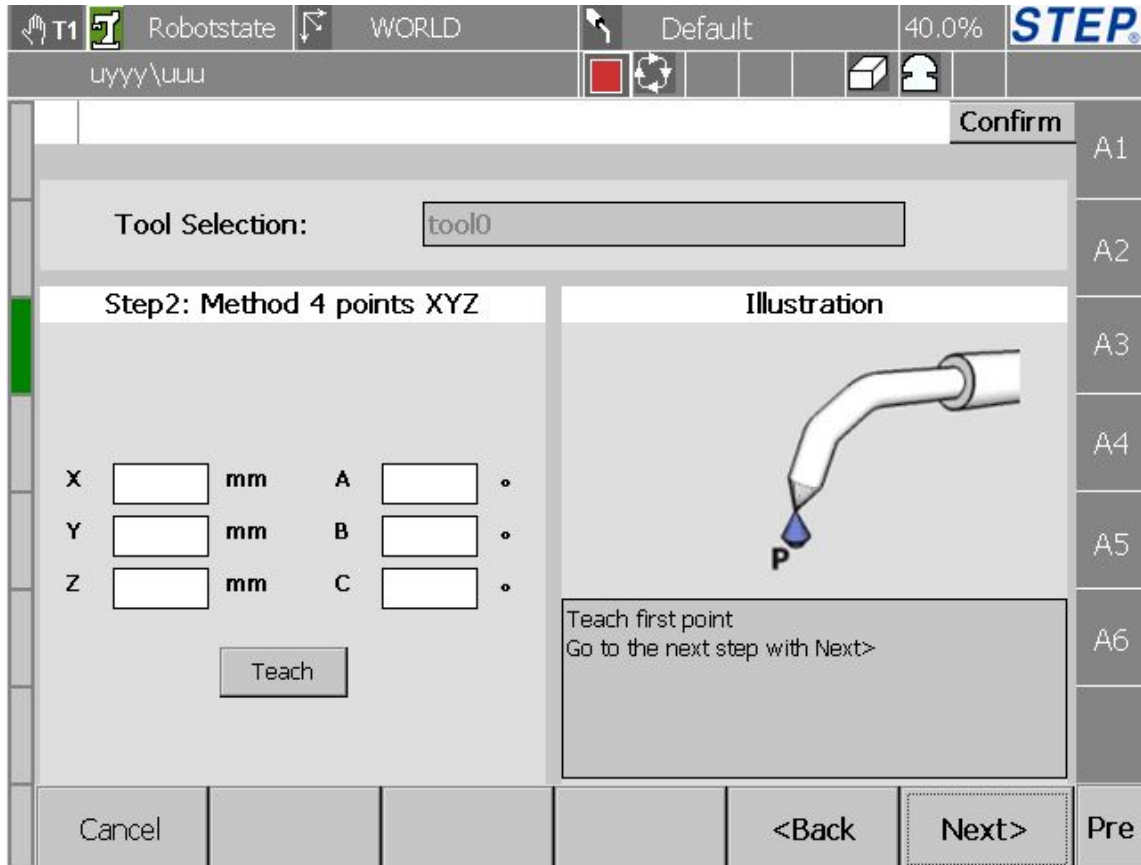


Figure 55 First Step of XYZ (Four-point method)

Run the robot to the desired position P and click “Teach” to complete teach; Click “Cancel” to return to initial CS teach interface; Click “Back” to return to tool teach method selection interface; Click “Next” to go to the next teach interface:

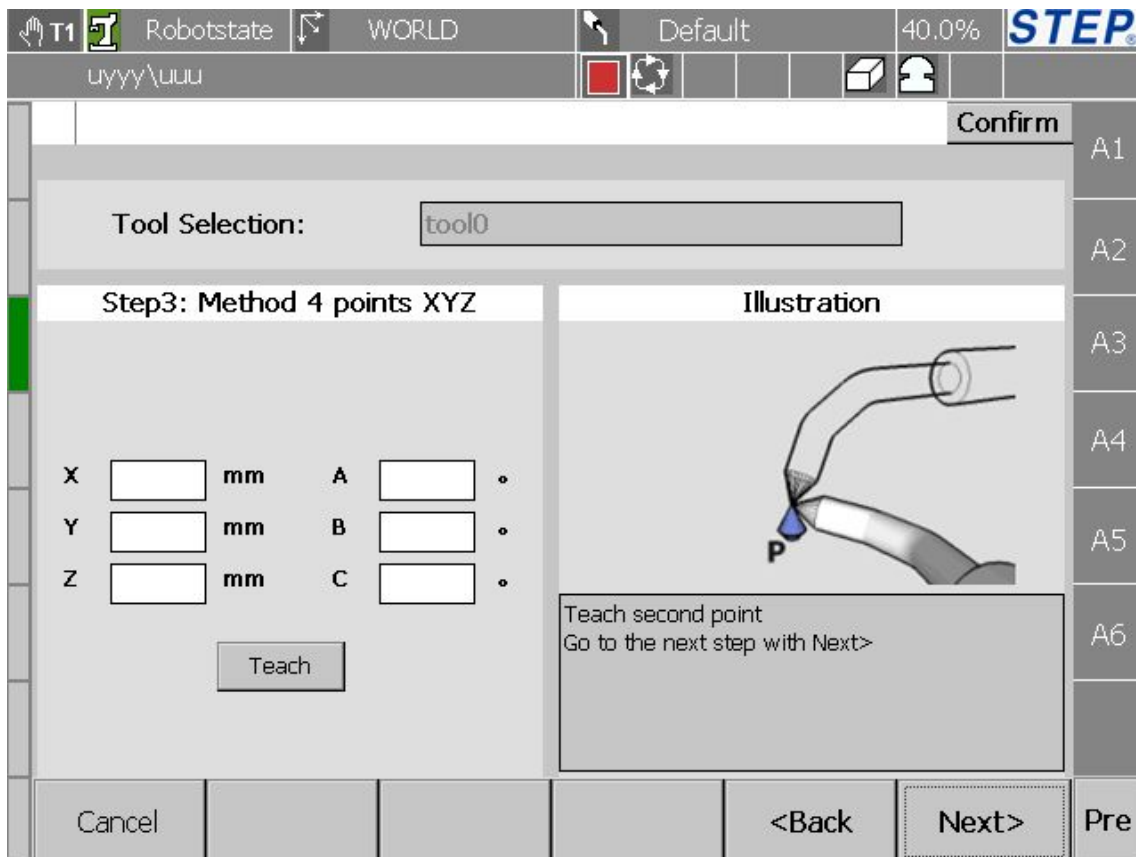
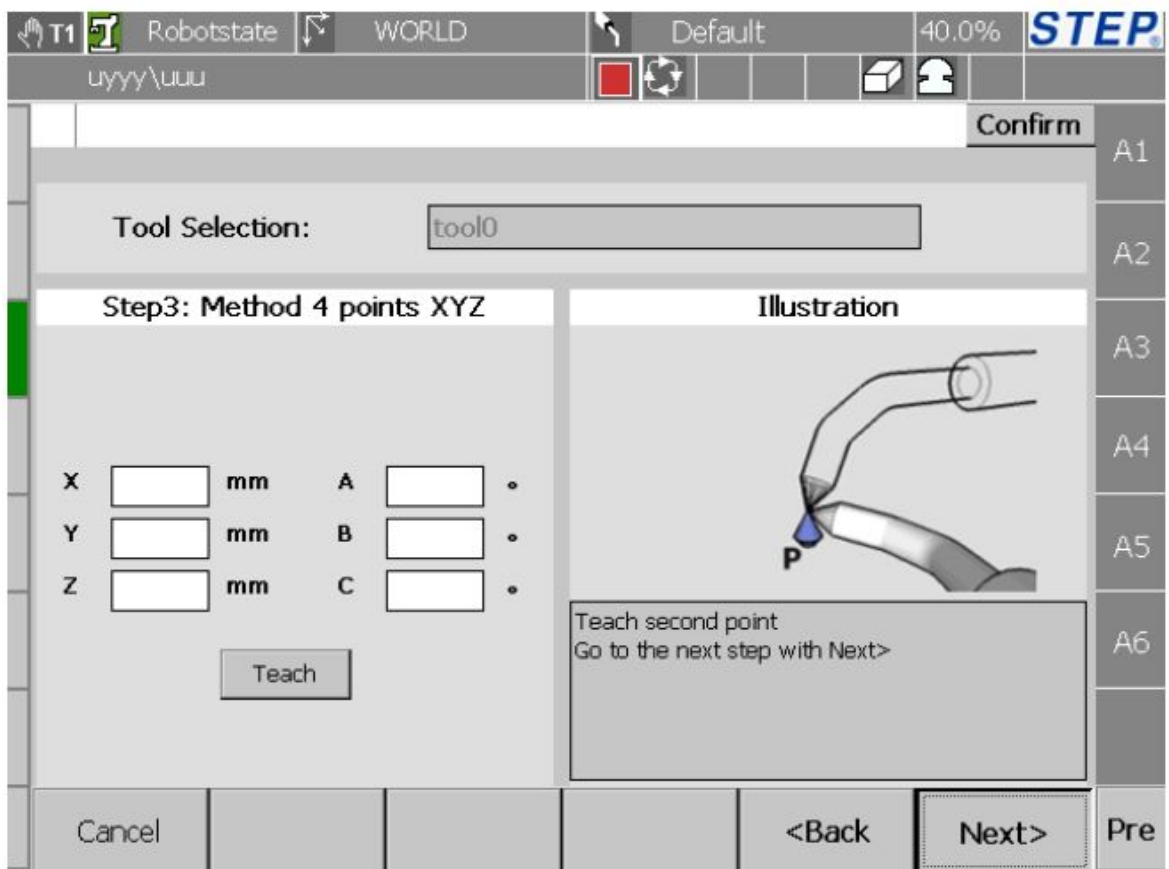
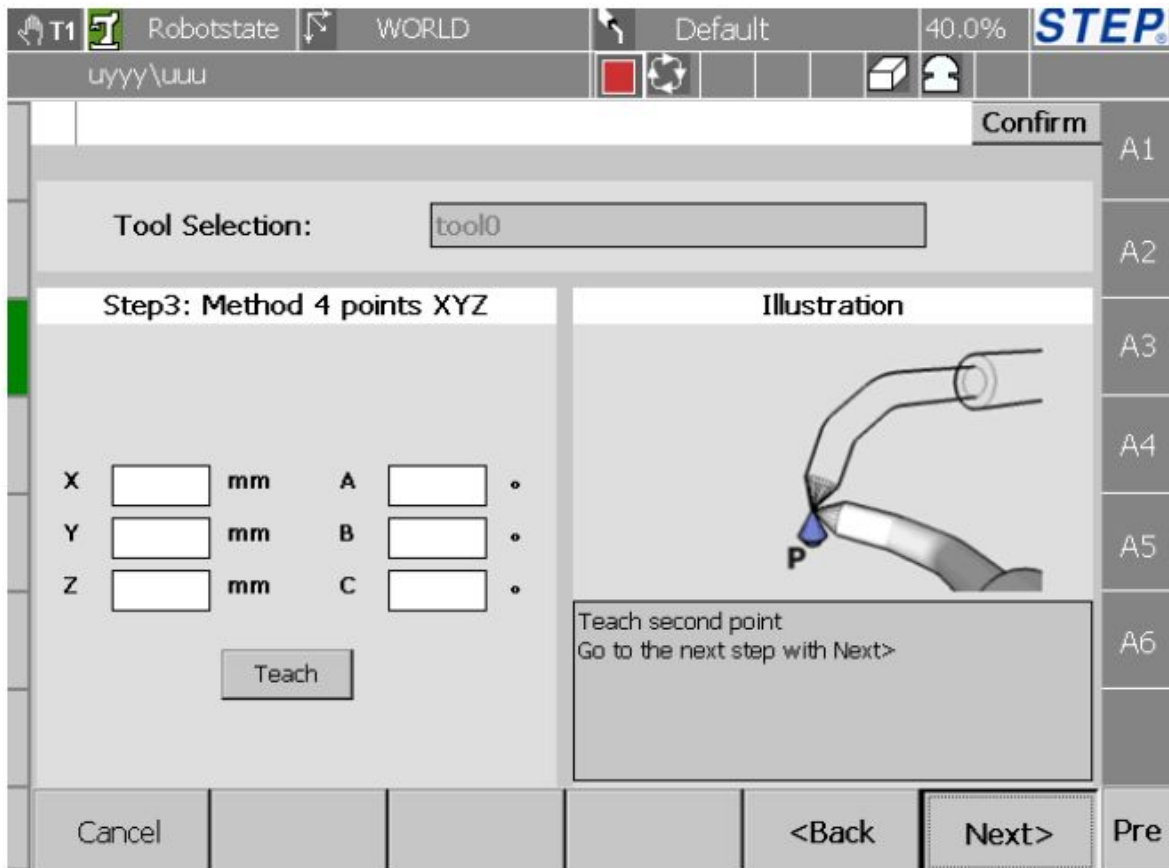


Figure 56 Second Step of XYZ (Four-point method)

Move the robot near point P in different orientation and click “Teach” to complete teach; Click “Cancel” to return to initial CS teach interface; Click “Back” to return to tool teach method selection interface; Click “Next” to go to the next teach interface:



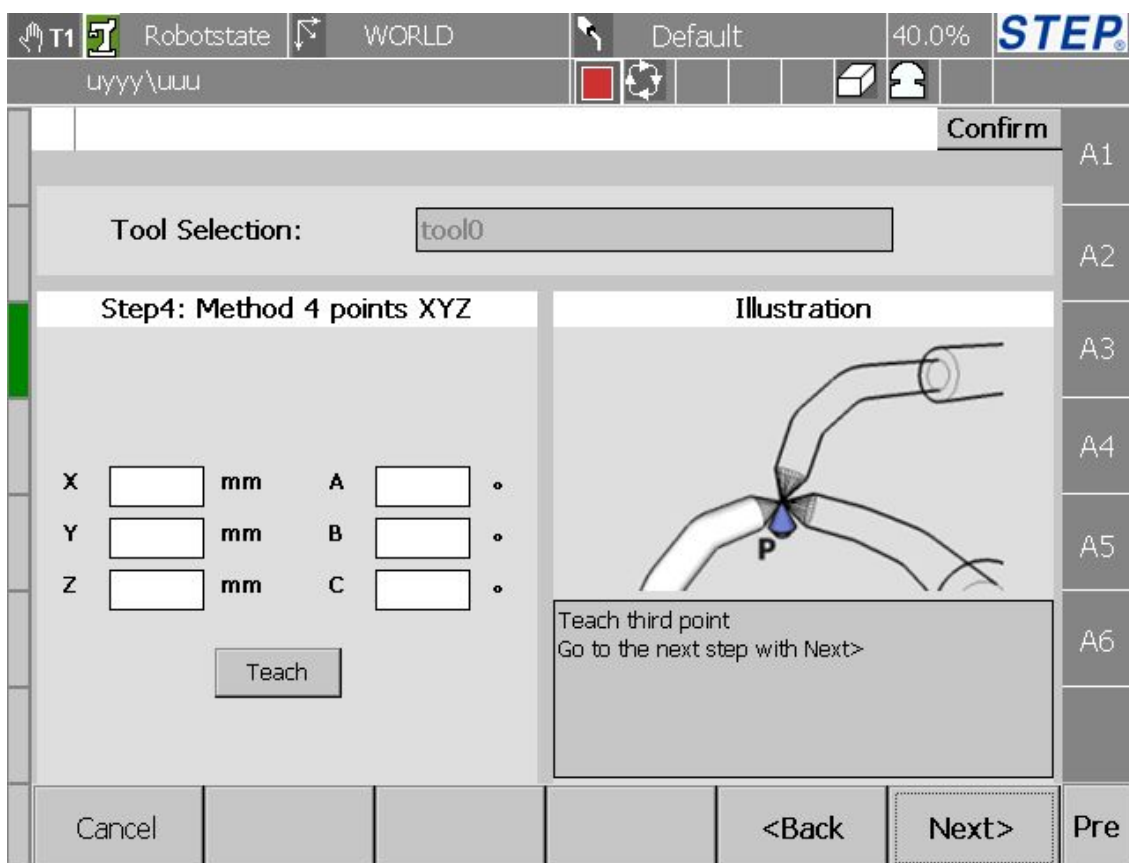


Figure 57 Third Step of XYZ (Four-point method)

The same as step 2, click "Next" to go to the next interface.

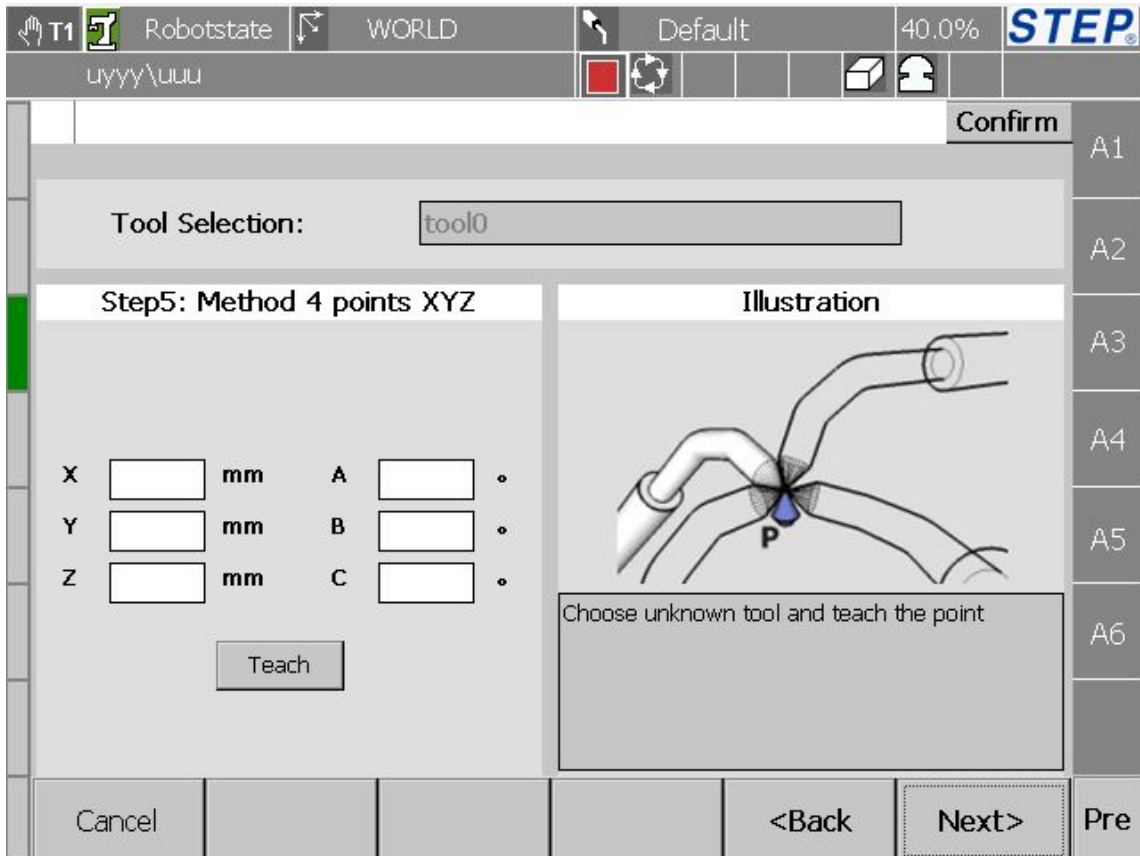


Figure 58 Fourth Step of XYZ (Four-point method)

The same as step 2. Click “Next” to go to the next interface.

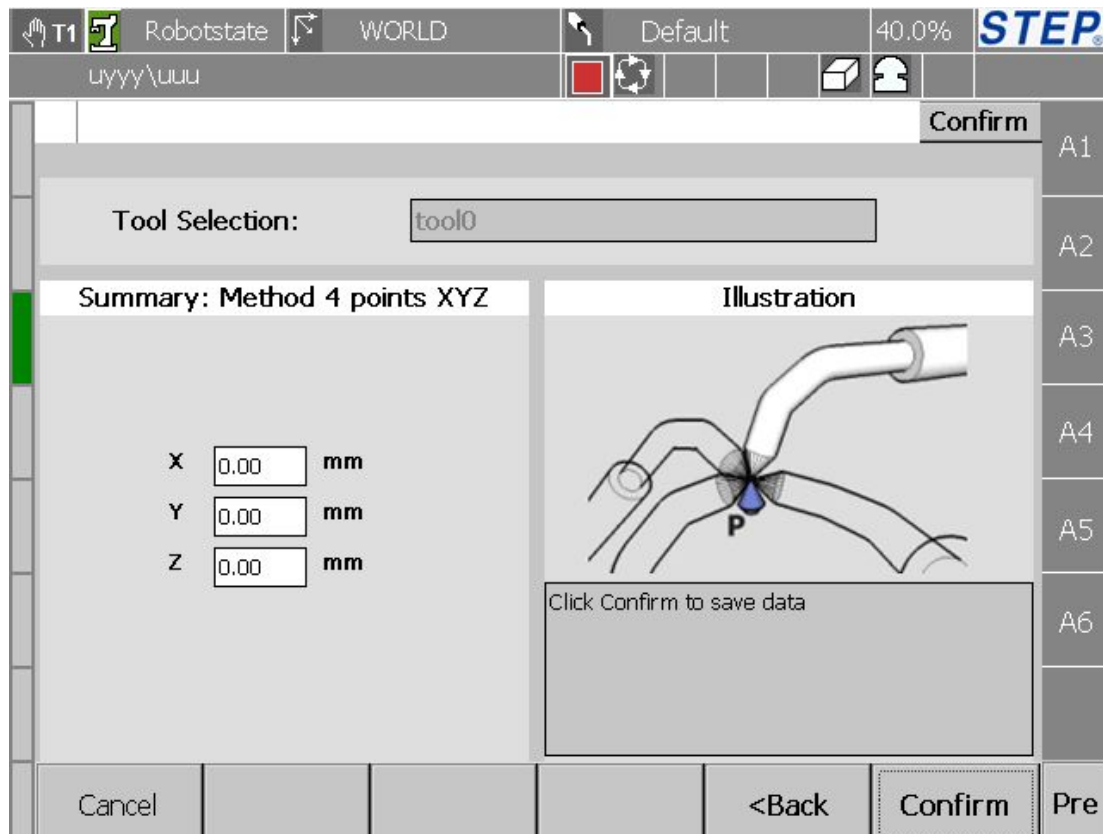


Figure 59 Fifth Step of XYZ (Four-point method)

The left side shows the CS data after the teach; Click “Cancel” to go back to the initial CS teach interface; click “Back” to go back to the fourth step; click “Confirm” to complete tool teach.

#### 5.11.3.4 Teach tool’s orientation ABC (one-point method)

Select teach method (“1 point 6D”) in fig.51 and click “Next” to go to the next interface:

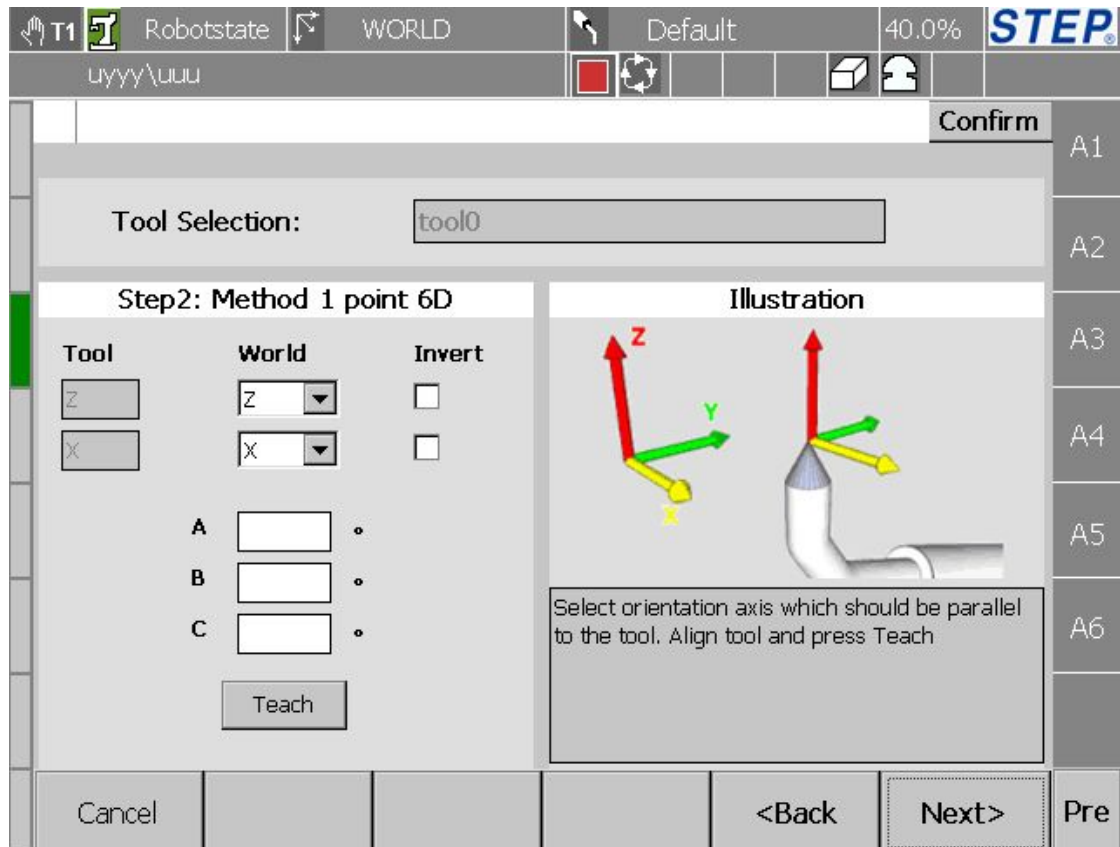


Figure 60 First Step of Obtaining ACB (One-point Method)

- The tool field indicates the tool axis to be aligned.
- The World field is used to confirm the alignment between tool axis and World axis.
- The Invert field is used to confirm forward and reverse direction alignment.

According to the setting of tool axis and World axis alignment, run the robot to the alignment orientation and click “Teach” to complete teach; click “Cancel” to go back to initial tool teach interface; Click “Back” to go back to teach method selection interface; Click “Next” to go to the next teach interface:

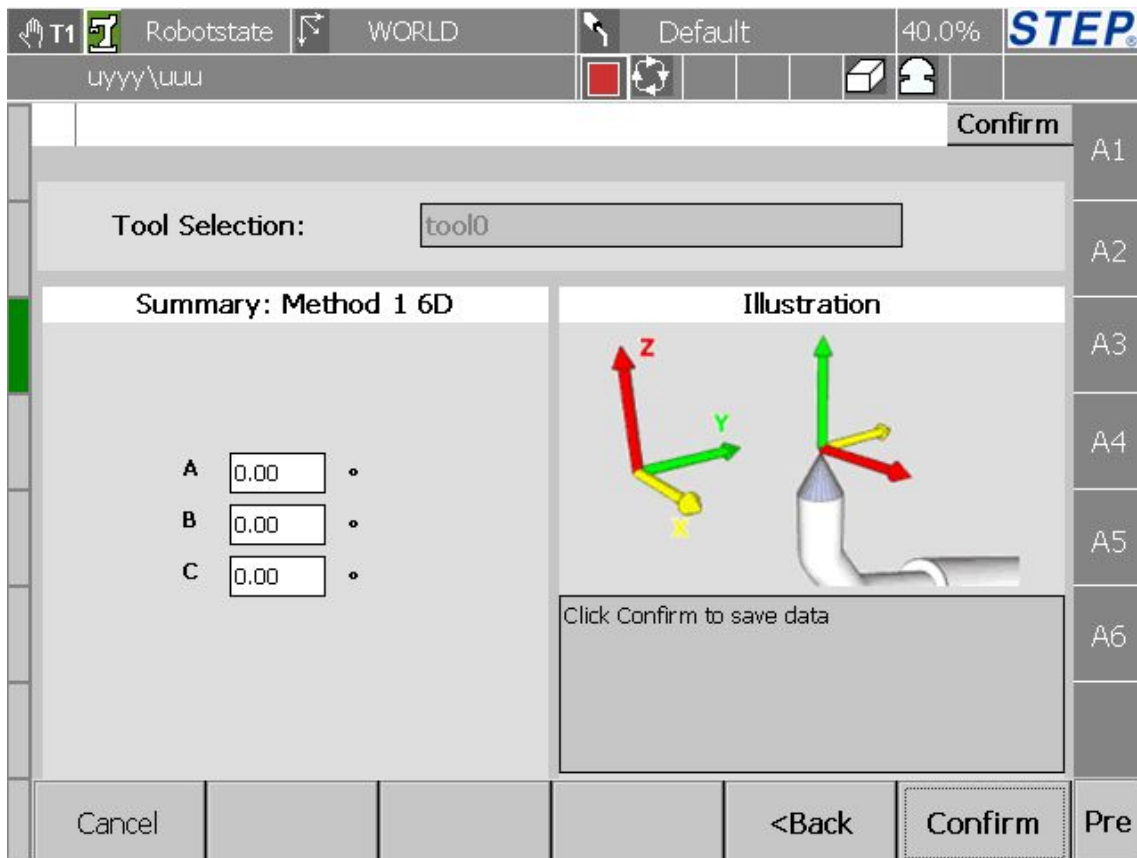


Figure 61 Second Step of Obtaining ACB (One-point Method)

The left side shows the CS data after the teach; Click “Cancel” to go back to the initial CS teach interface; click “Back” to go back to the first step; click “Confirm” to complete tool teach.

#### 5.11.3.5 Teach tool’s orientation ABC (three-point method)

Select CS teach method (“3pointsABC”) in fig.51 and click “Next” to go to the next interface:

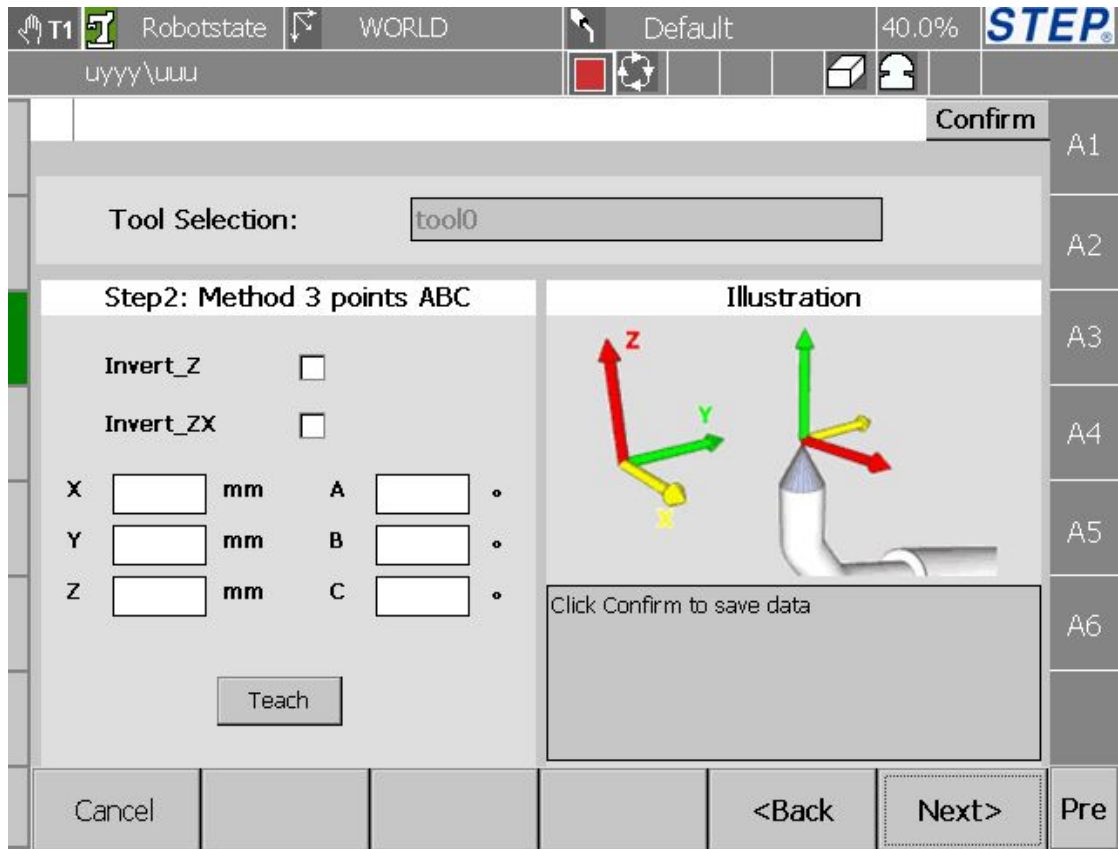


Figure 62 First Step of ABC (Three-point method)

Select teach direction first: forward or reverse direction of Z axis and forward or reverse direction of ZX. Run the robot to a reference point and click “Teach” to complete the teach of the first point; Click “Cancel” to go back to the initial tool teach interface; click “Back” to go back to teach method selection interface; Click “Next” to go to the next teach interface:

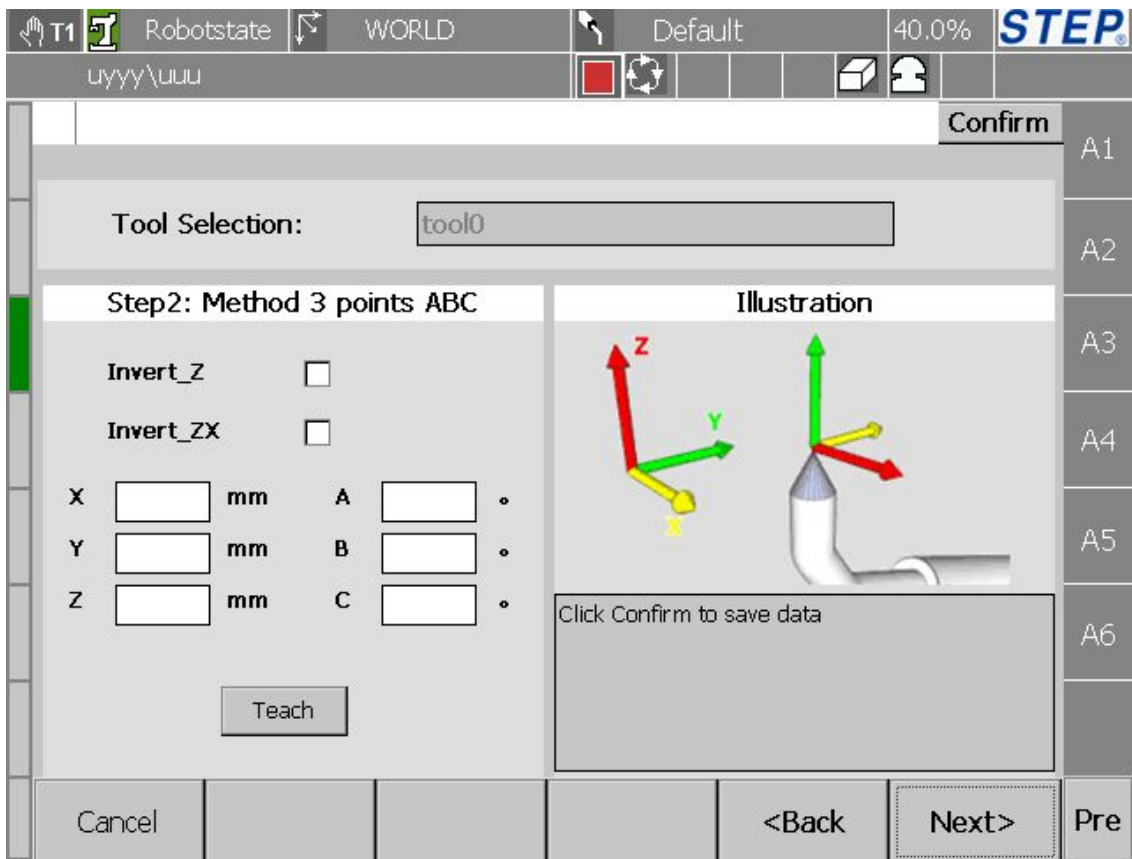


Figure 63 Second Step of ABC (Three-point method)

Run the robot to a reference point and click “Teach” to complete the teach of the second point; Click “Cancel” to go back to the initial tool teach interface; click “Back” to go back to teach method selection interface; Click “Next” to go to the next teach interface:

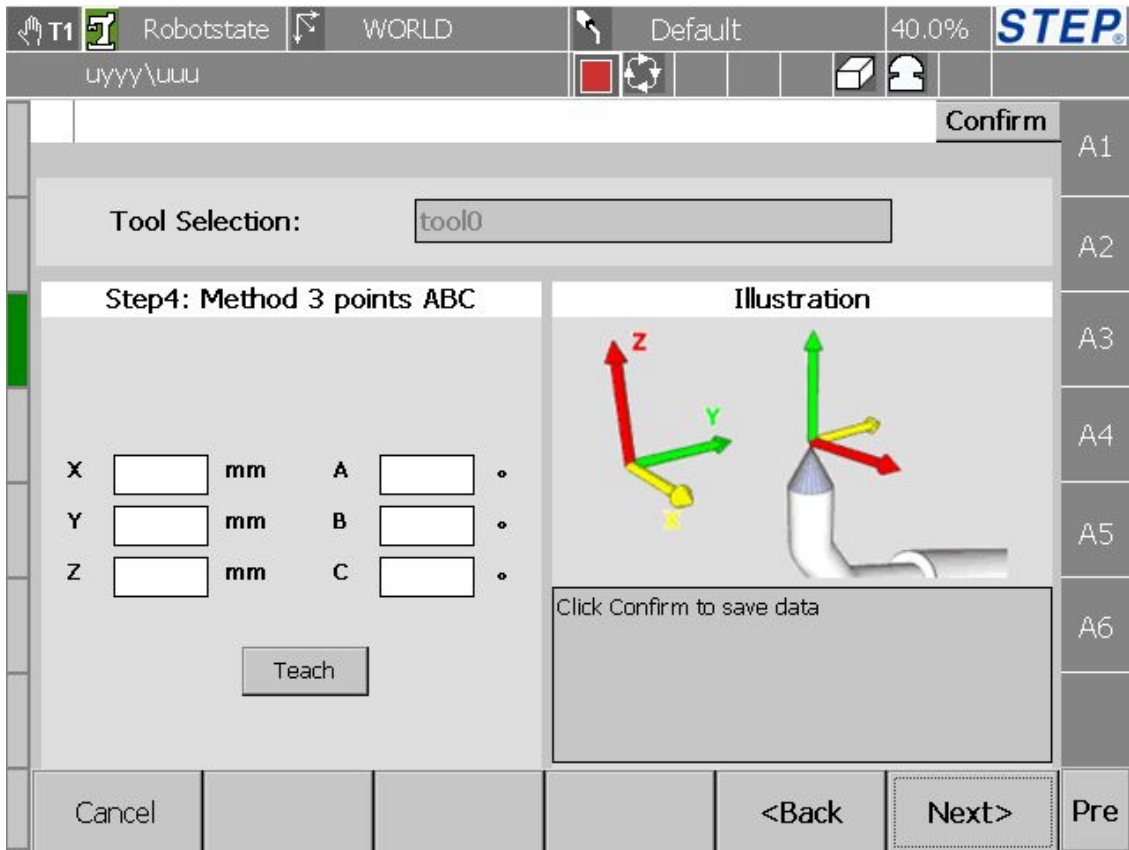


Figure 64 Third Step of ABC (Three-point method)

Run the robot to a reference point and click “Teach” to complete the teach of the third point; Click “Cancel” to go back to the initial tool teach interface; click “Back” to go back to teach method selection interface; Click “Next” to go to the next teach interface:

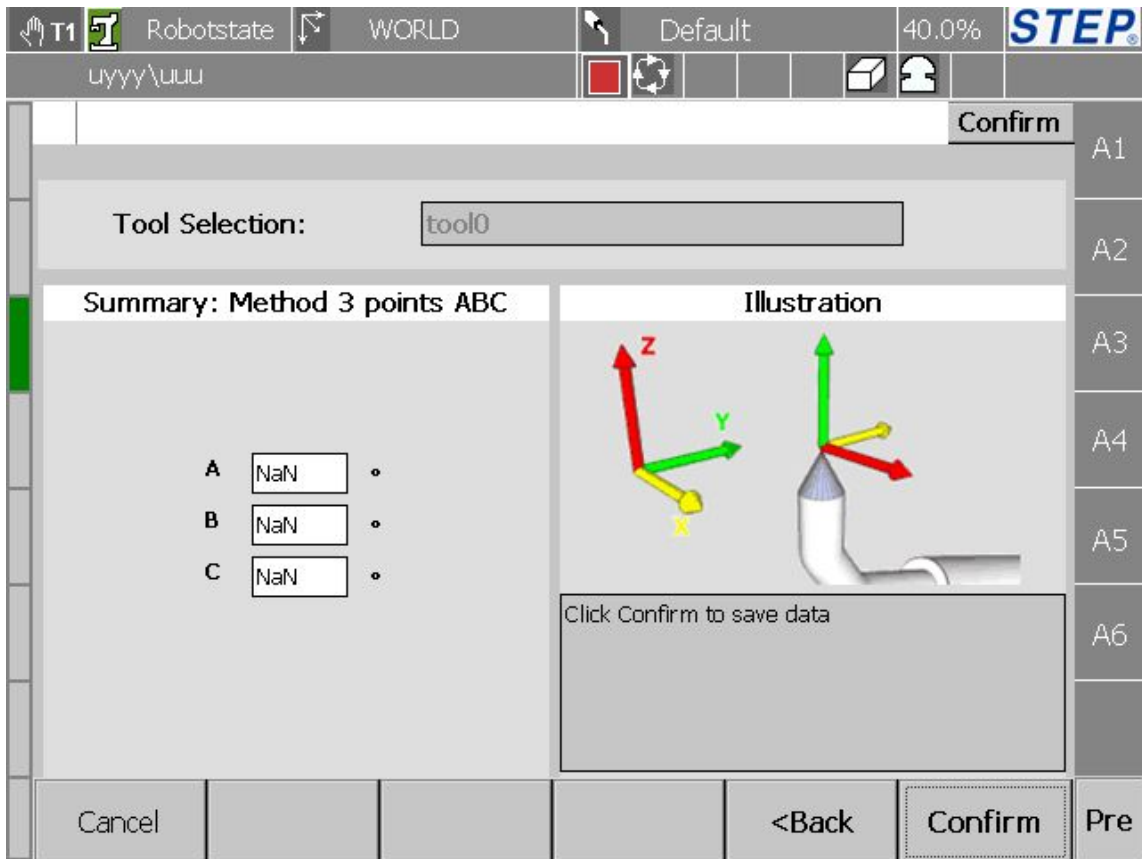


Figure 65 Fourth Step of ABC (Three-point method)

The left side shows the CS data after the teach; Click “Cancel” to go back to the initial tool teach interface; click “Back” to go back to the third step; click “Confirm” to complete tool teach.

# Chapter VI Instructions for User Program Development

Click “Modify” or “New” button in the program interface to go to program edit interface. This section only provides instructions for the programming of the statement in the interface. See relevant documents for the function and use of each statement.

## 6.1 Movement statement

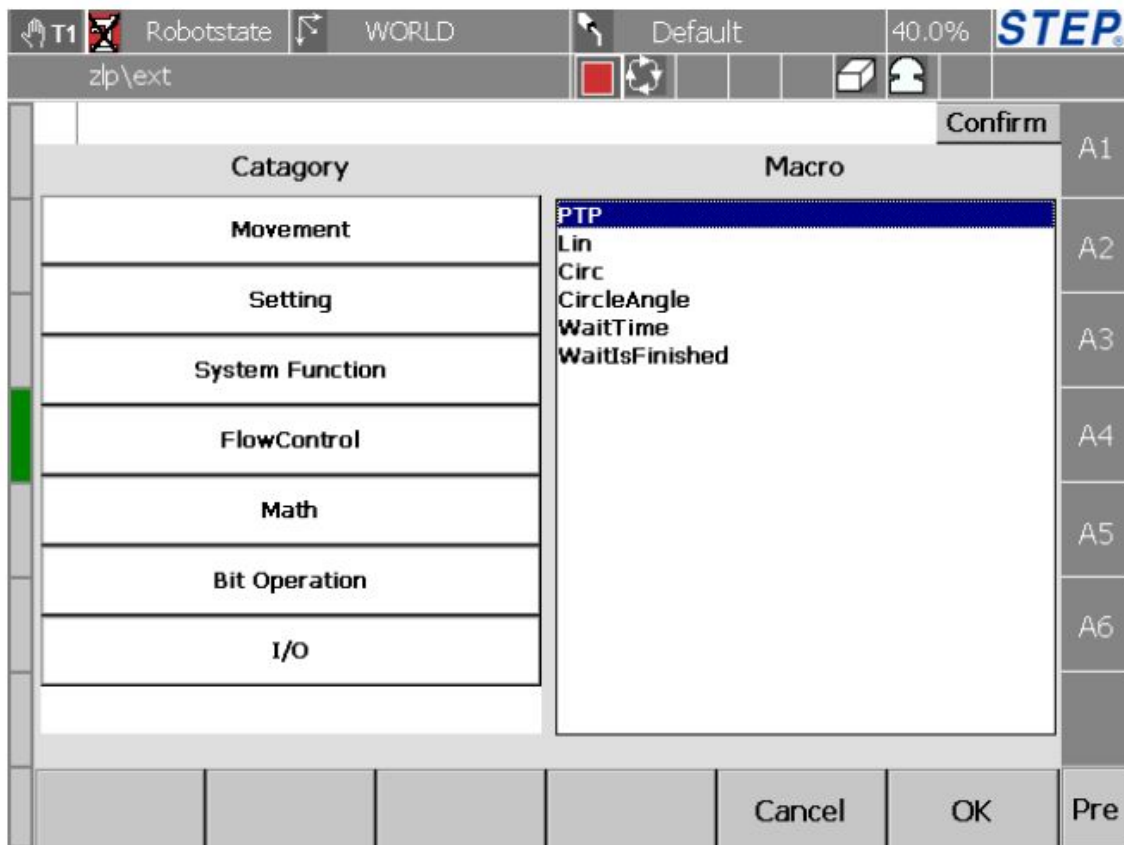


Figure 66 Movement Statement Selection Interface

Click “Movement” button in the statement selection interface and the statements appear in the right side to be selected. Select a statement you want to insert and click “OK” button to go to the setting interface of the statement (click “Cancel” to go back to program display interface). The following screenshot shows the statement setting interface.

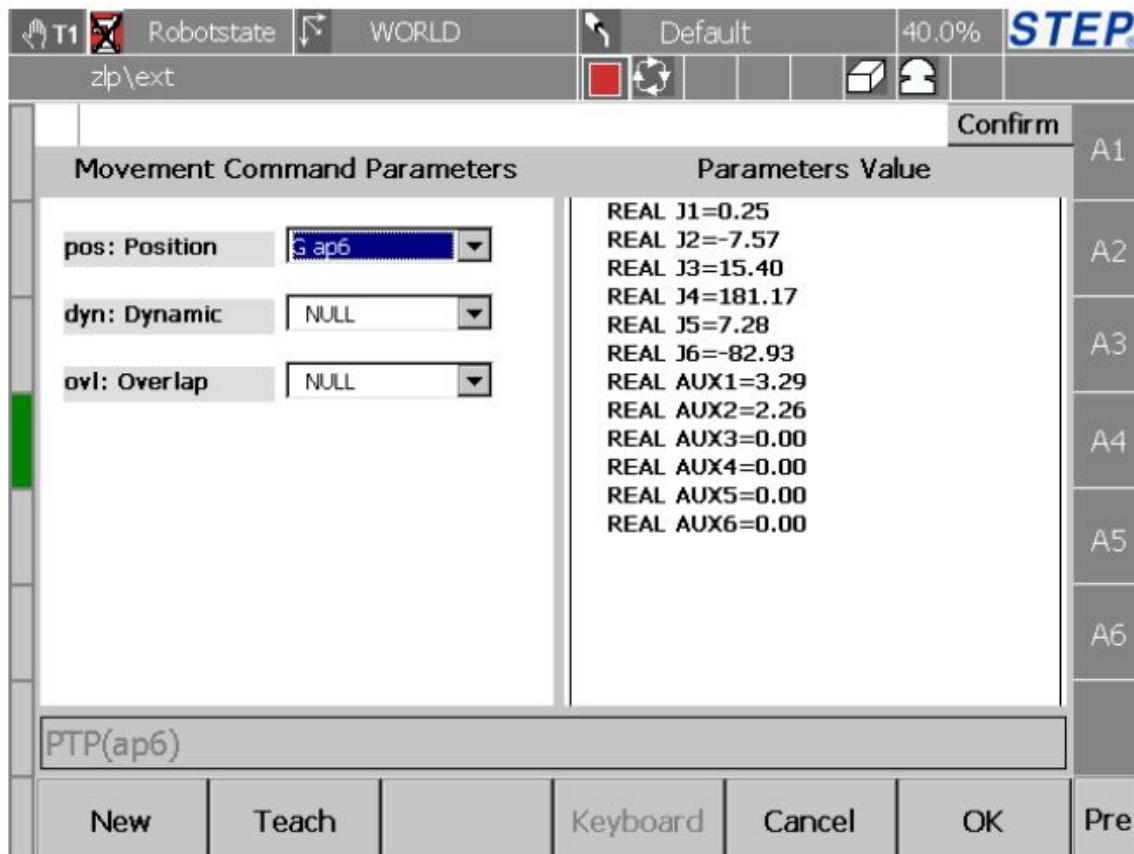


Figure 67 PTP Statement Setting

You can modify the parameters used by PTP statement from the left side of the interface. The right side shows the value of the selected variable. Click the value to modify it. The lower box shows the text value of the statement to be inserted. The text value changes with statement modification. Click “Cancel” button to cancel the insert and go back to the statement selection interface. Click “OK” button to complete the insert.

If the type of the selected parameter is robot position type, you can click “Teach” to perform the teach (the teach function only available in manual mode).

Click “New” button to go to the parameter variable create interface. Note that this interface is related to the entered parameter type. If the selected variable is robot position type, the variable create interface is as follows:

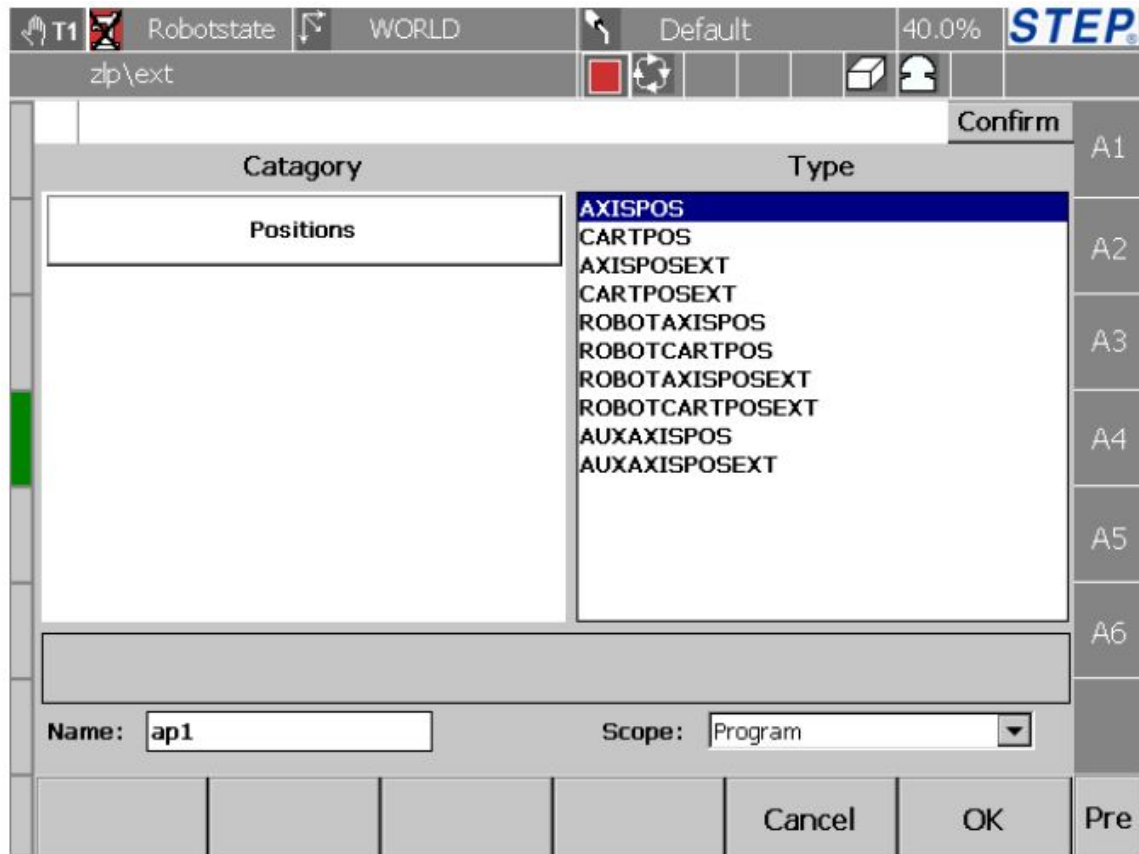


Figure 68 Position Variable Create Interface

Select the type of the variable you want to create and enter the name for the variable (the initial character must be English letter). Then, select the position of the variable: Global, Project, Program.

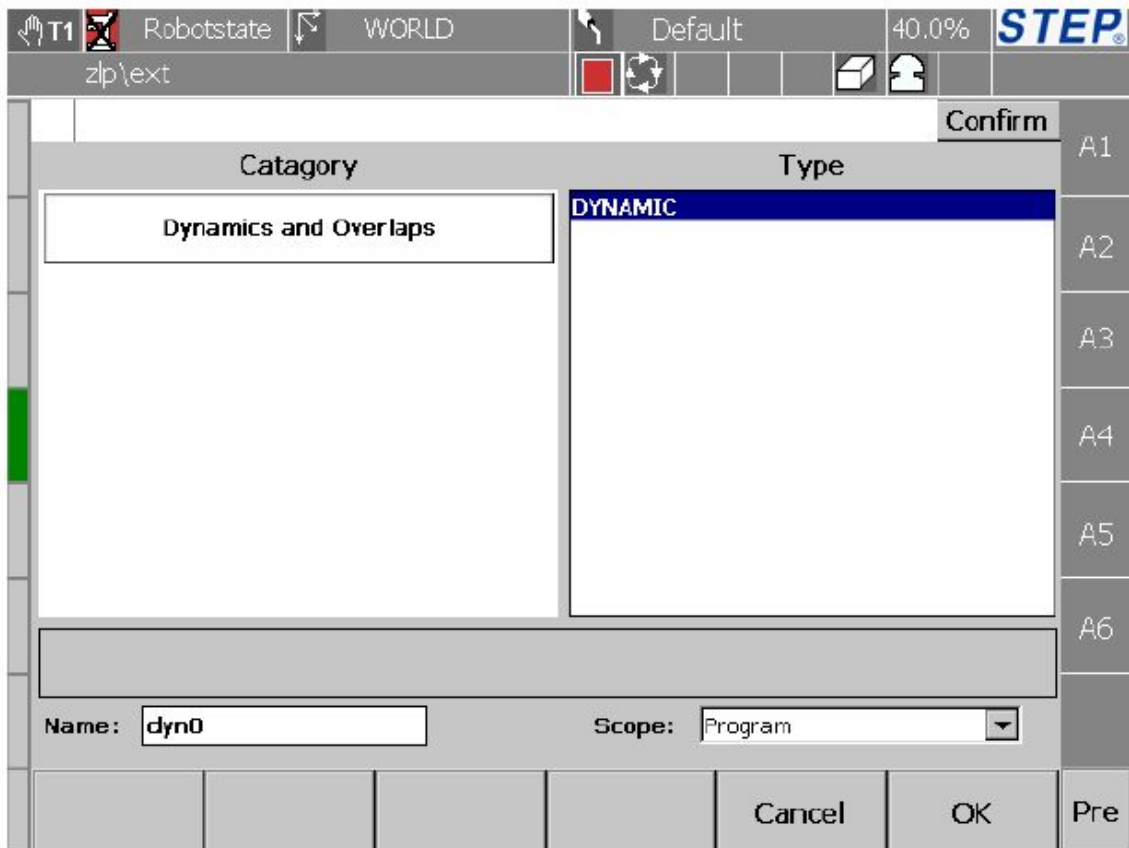


Figure 69 DYNAMIC Variable Create

The notes for the movement statements:

- PTP
- Lin
- Circ
- CircAngle
- PTPRel
- LinRel
- WaitTime
- WaitIsFinished
- WaitJustInTime
- WaitRefFinished
- RefRobotAxis
- RefRobotAxisAsync
- OnParameter
- OnPlane

- OnDistance
- OnPosition

## 6.2 Set statement

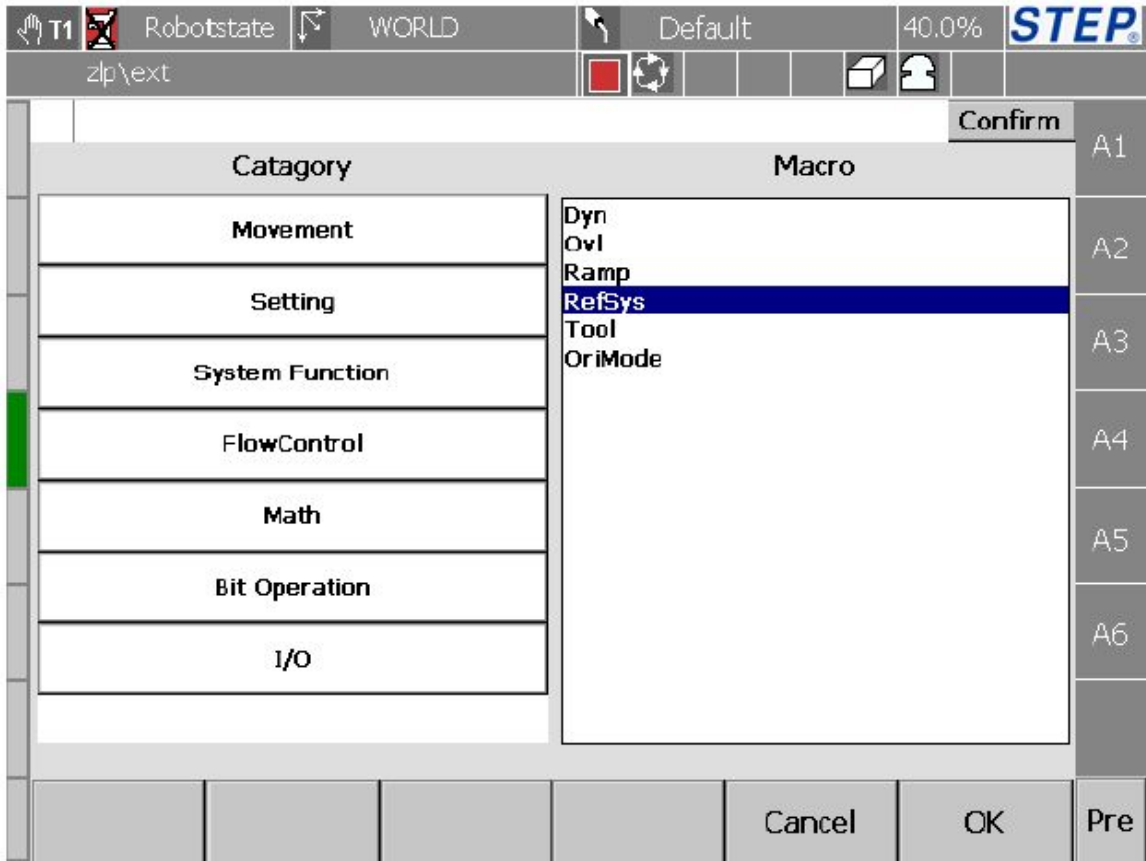


Figure 70 Set statement selection interface

Click “Setting” button in the statement selection interface and the set statements appear on the right side. Select a statement you want to insert and click “OK” button to go to the setting interface of the statement (click “Cancel” to go back to the program display interface). The setting interface for “RefSys” statement is shown below.

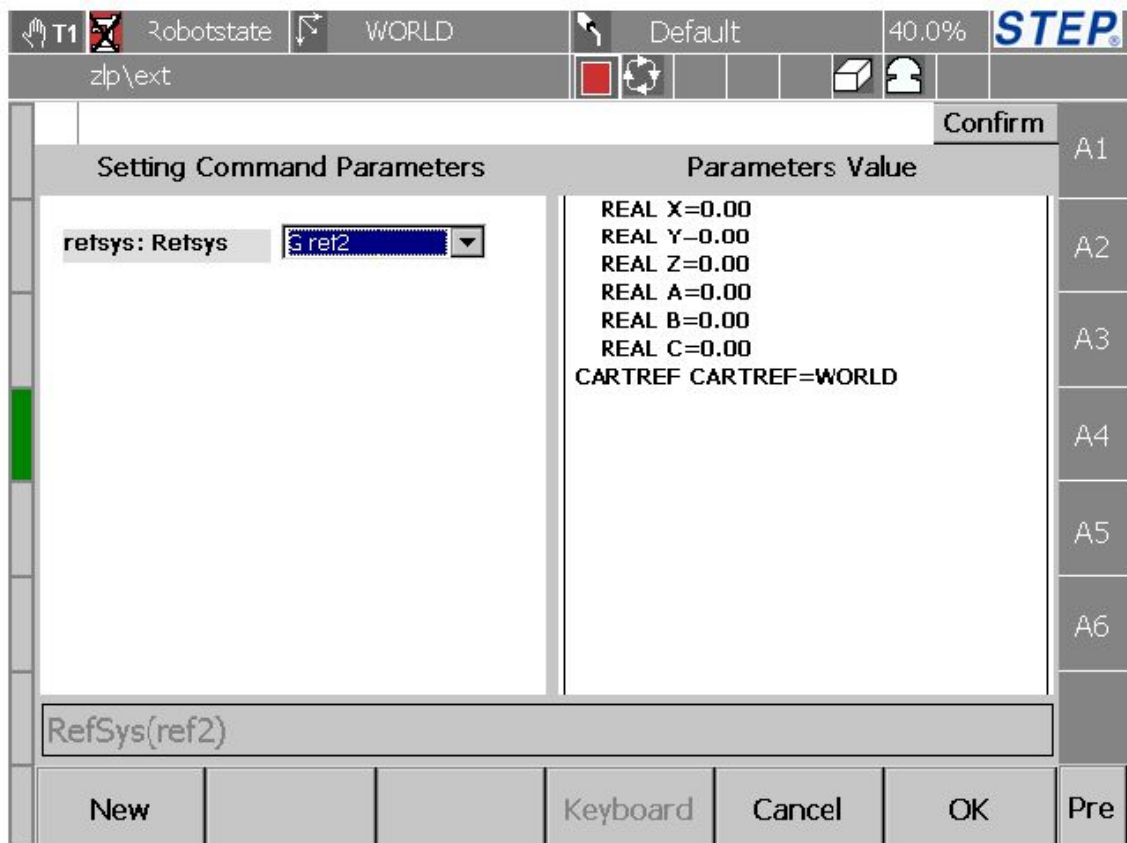


Figure 71 RefSys Statement Setting Interface

Notes for set statement:

- Dyn
- Ovl
- Ramp
- RefSys
- Tool
- OriMode

## 6.3 System function statement

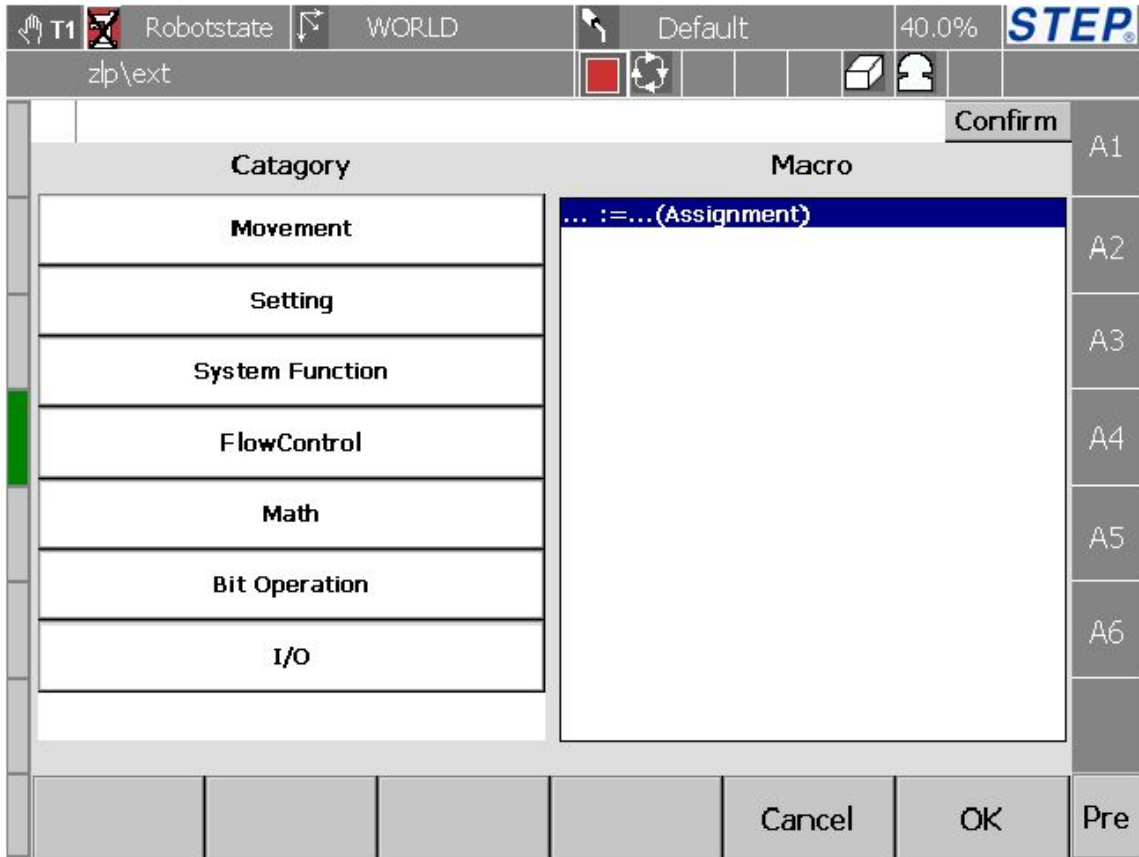


Figure 72 System Function Statement Selection

Click “System Function” button in the statement selection interface and the system function statements appear in the right side of the interface. Select a statement you want to insert and click “OK” button to go to the setting interface of the statement (click “Cancel” to go back to the program display interface). The setting interface for “Assignment” statement is shown below.

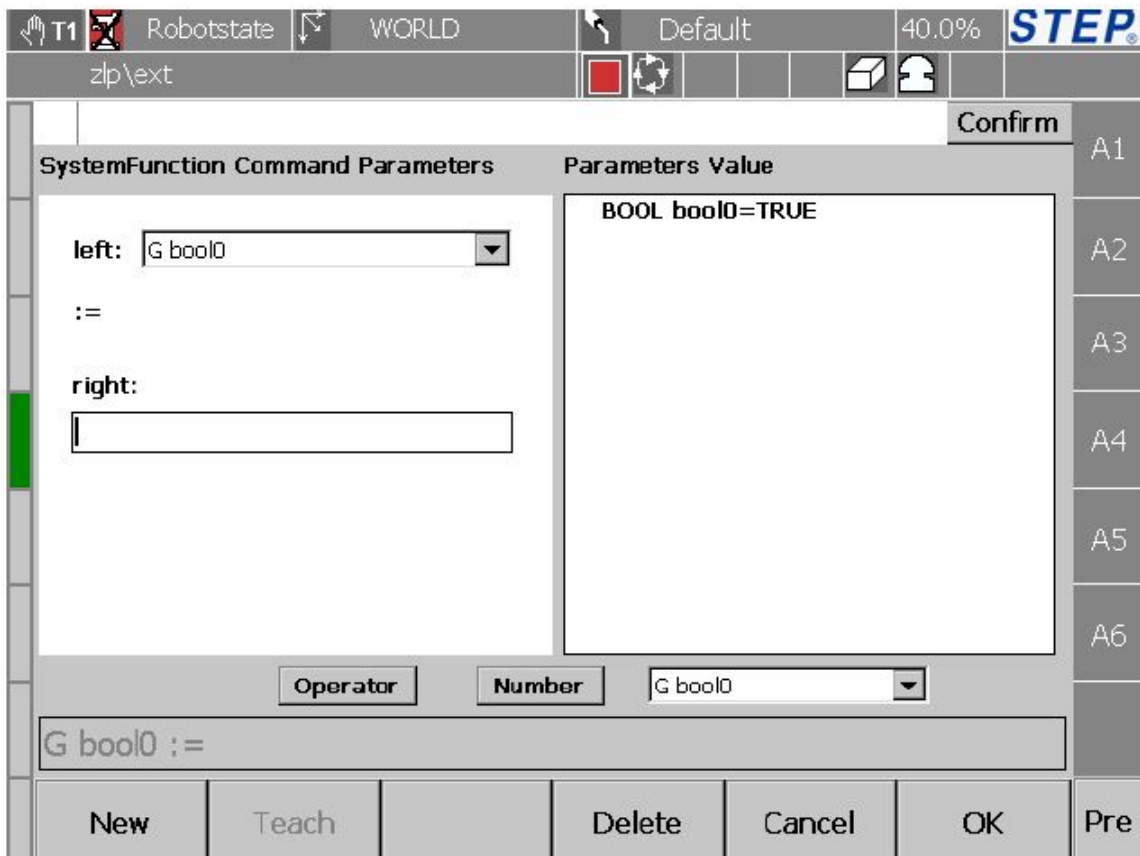


Figure 73 Assignment Statement Setting

The “Assignment left” dropdown box is used to select left operand; the right operand can be entered via the three plugins at the lower part (two buttons and one dropdown box); the “Delete” button is used to delete the entered characters of the right operand.

Click “Operator” to go to the operator selection interface:

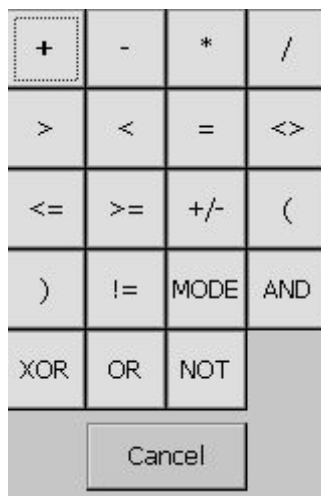


Figure 74 Operator Input Interface

Click “Number” to go to digit input interface:



Figure 75 Operator Input Interface

Click “Cancel” to cancel the input and click “OK” to complete the input.

## 6.4 Process control statement

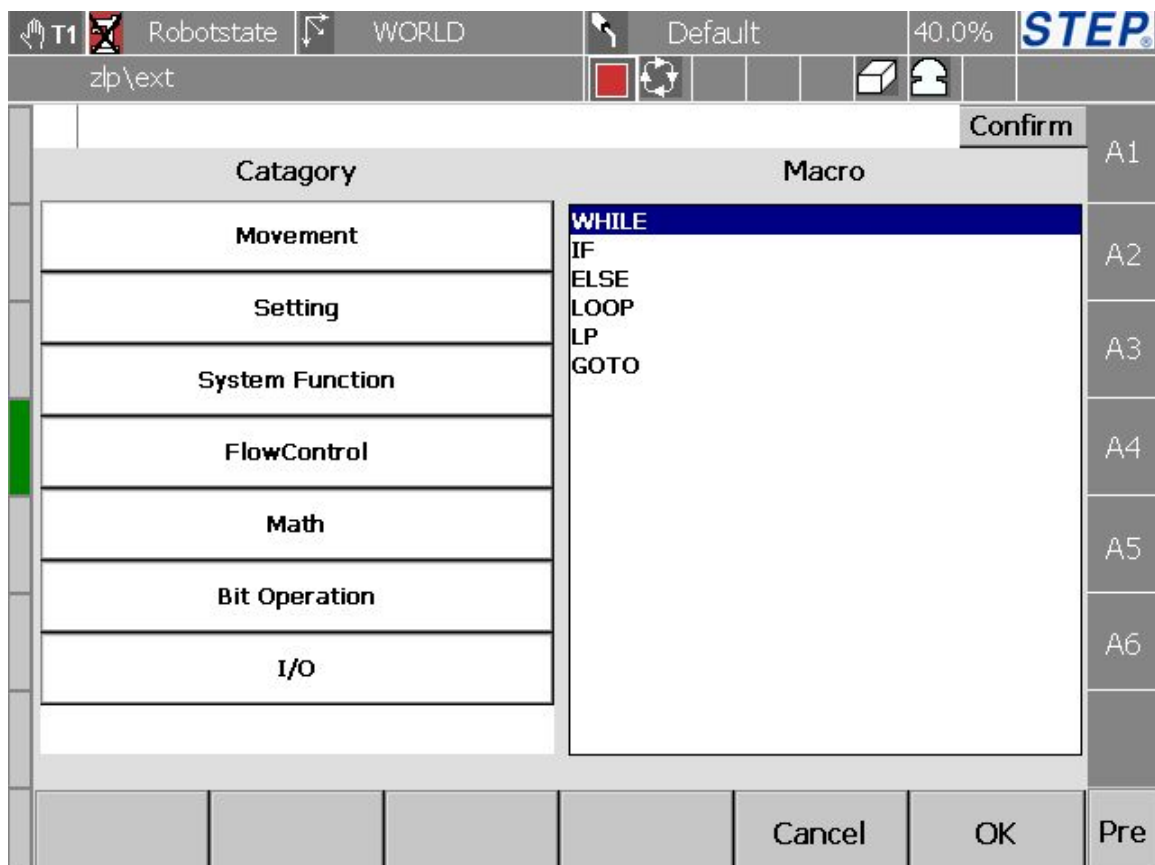


Figure 76 Process Control Statement Selection Interface

Click “FlowControl” button in the statement selection interface and the process control statements appear in the right side of the interface. Select a statement you want to insert and click “OK” button to go to the setting interface of the statement (click “Cancel” to go

back to the program display interface). The setting interface for “While” statement is shown below.

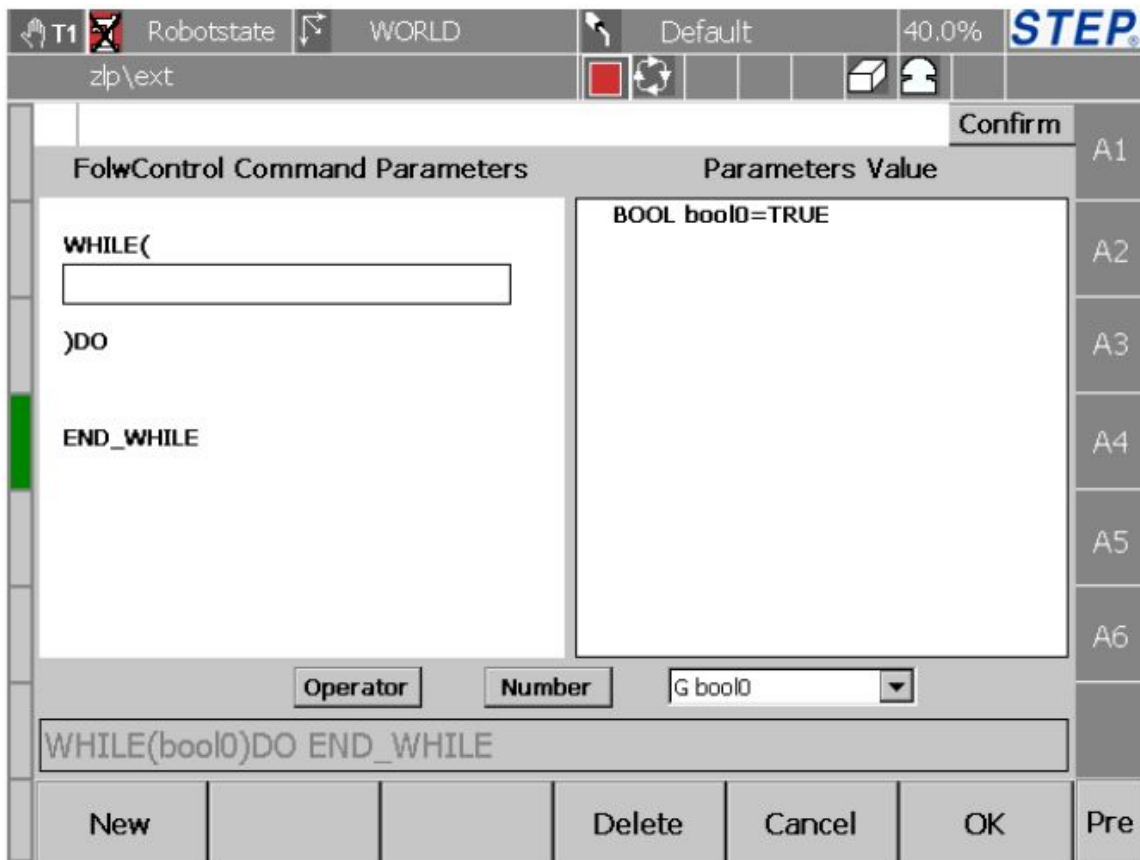


Figure 77 Whiles Statement Setting

The input method for conditional statement is similar to system function statement. Notes for process control statement:

- WHILE
- IF
- ELSE
- LOOP
- LP
- GOTO

## 6.5 Math function statement

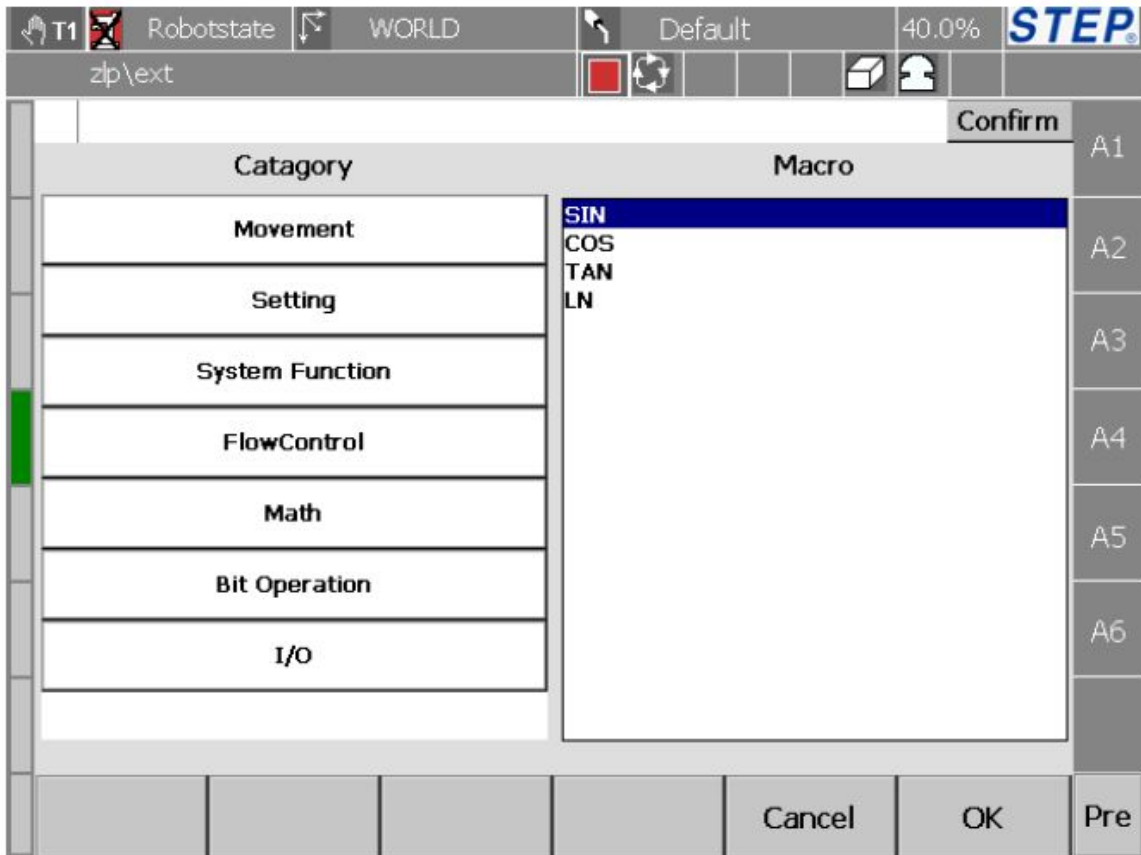


Figure 78 Math Function Statement Selection

Click “Math” button in the statement selection interface and the math function statements appear in the right side of the interface. Select a statement you want to insert and click “OK” button to go to the setting interface of the statement (click “Cancel” to go back to the program display interface). The setting interface for “SIN” statement is shown below.

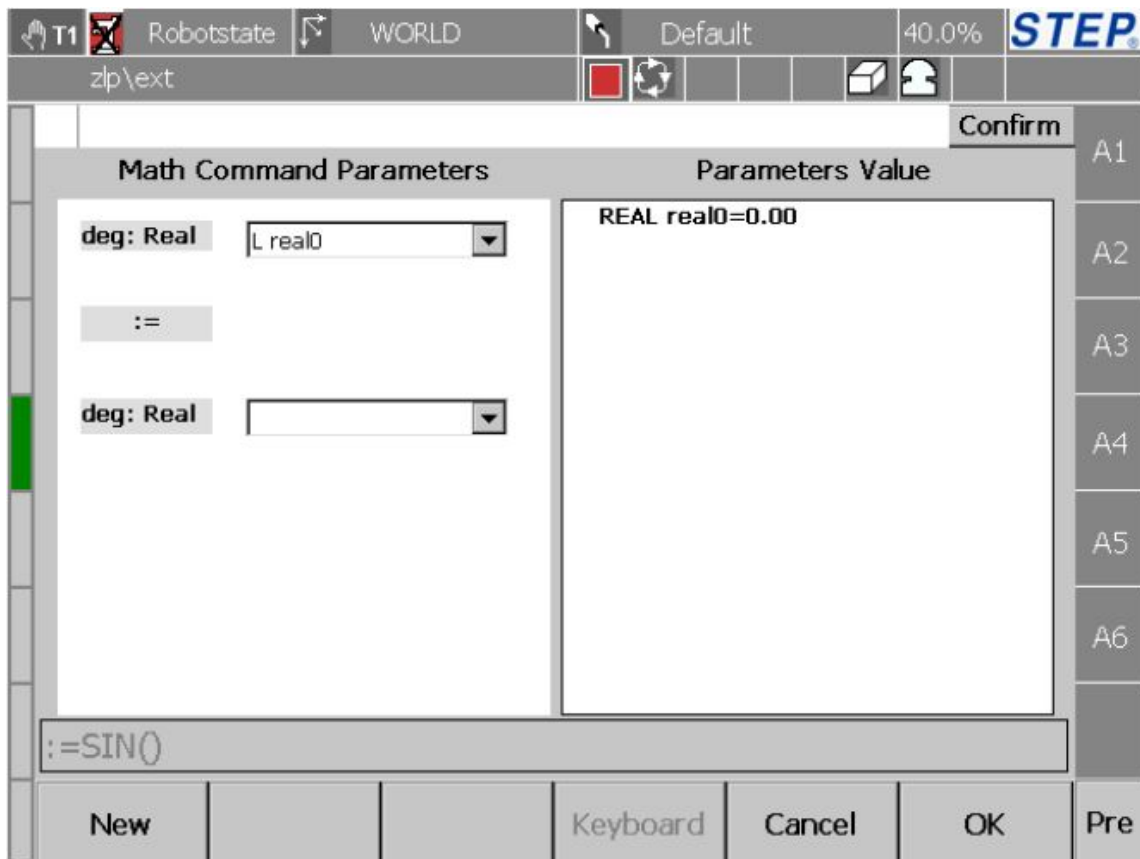


Figure 79 SIN Statement Setting

Notes for math function statement:

- SIN
- COS
- TAN
- LN

## 6.6 Bit operation statement

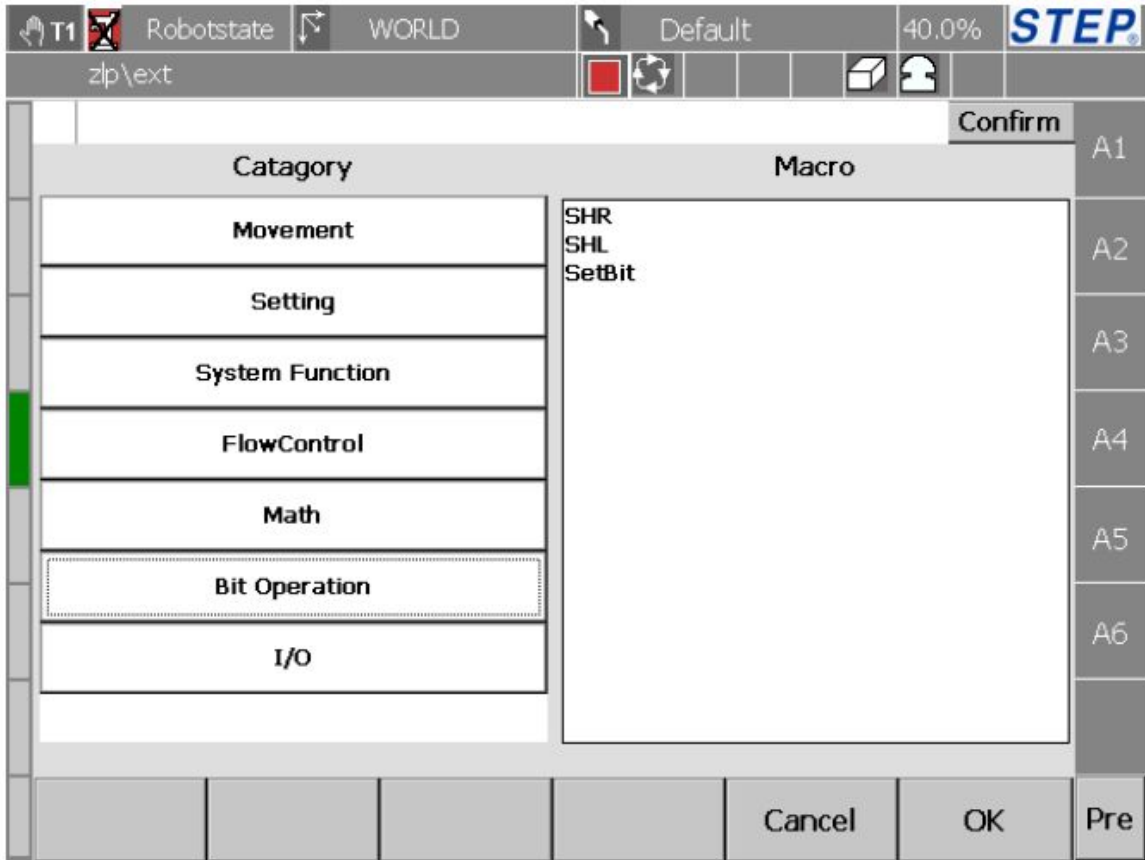


Figure 80 Math Function Statement Selection

Click “Bit Operation” button in the statement selection interface and the bit operation statements appear in the right side of the interface. Select a statement you want to insert and click “OK” button to go to the setting interface of the statement (click “Cancel” to go back to the program display interface). The setting interface for “SHR” statement is shown below.

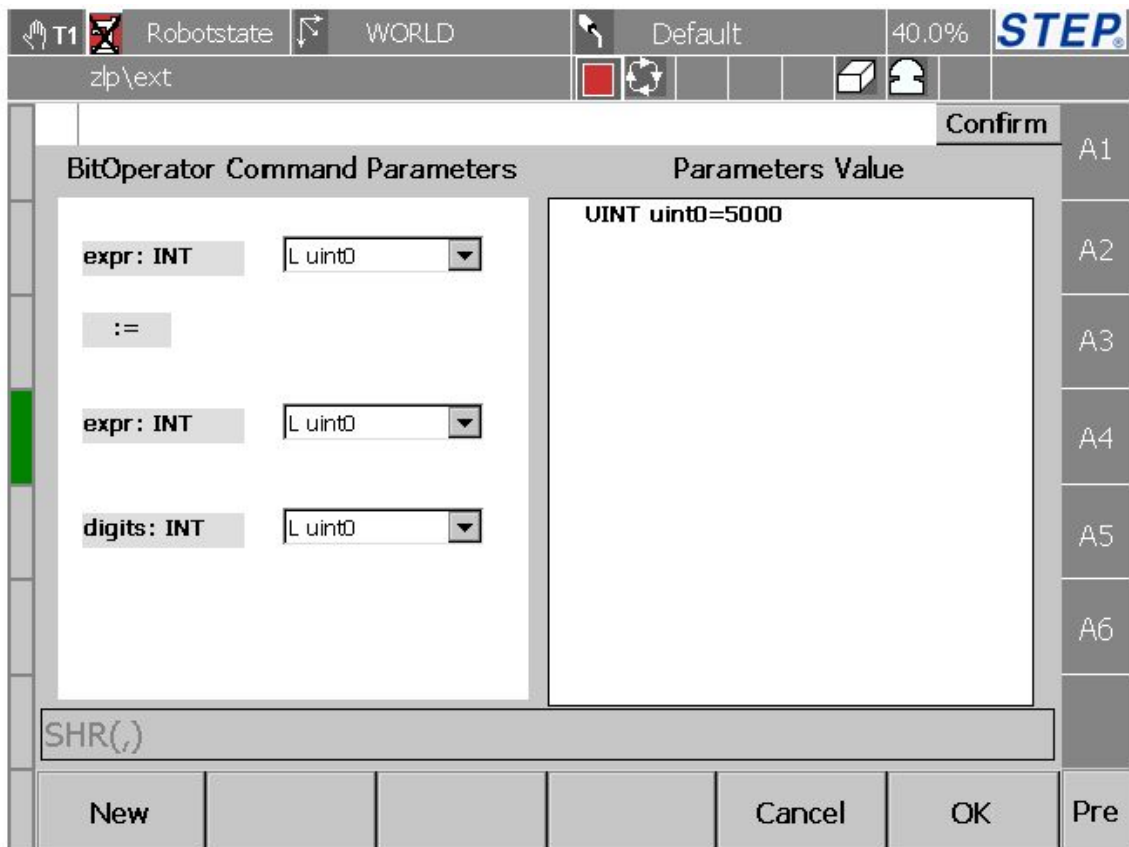


Figure 81 SHR Statement Setting Interface

Notes for bit operation statement:

- SHR
- SHL
- SetBit

## 6.7 I/O statement

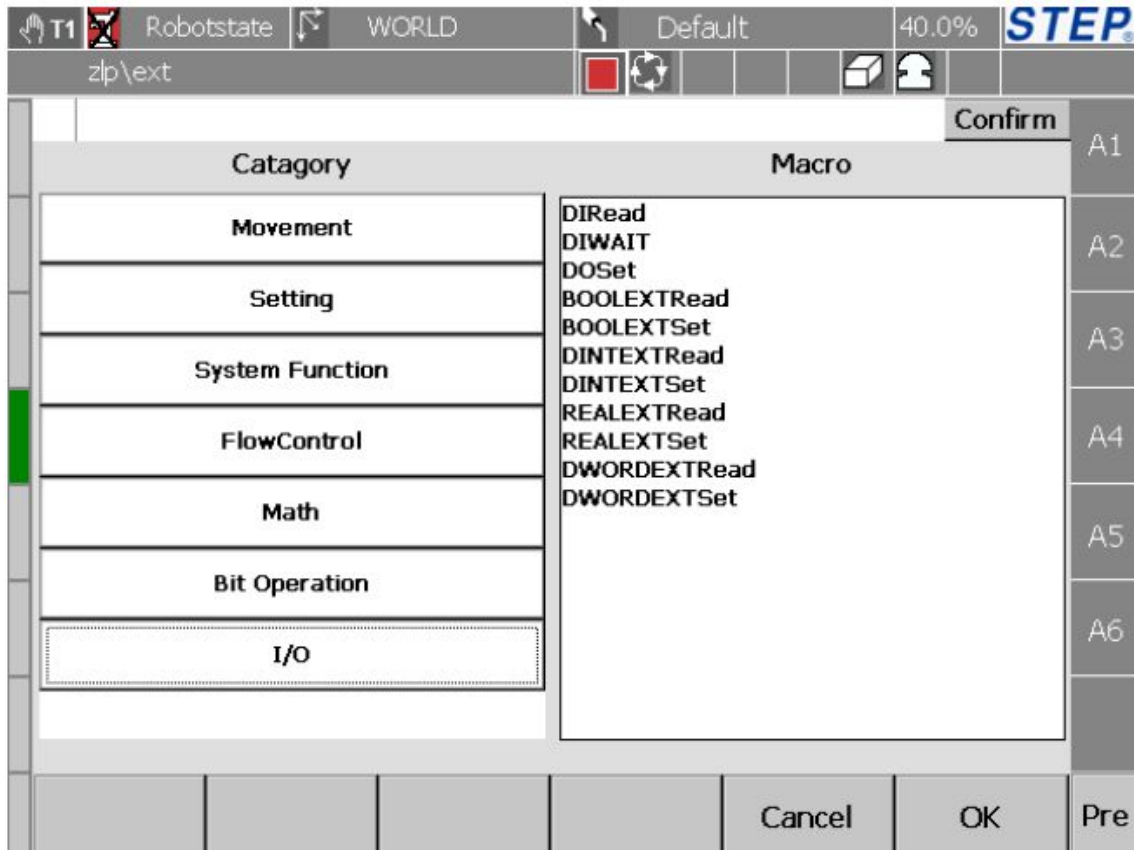


Figure 82 Math Function Statement Selection Interface

Click “I/O” button in the statement selection interface and the I/O statements appear in the right side of the interface. Select a statement you want to insert and click “OK” button to go to the setting interface of the statement (click “Cancel” to go back to the program display interface). The setting interface for “DIRead” statement is shown below.

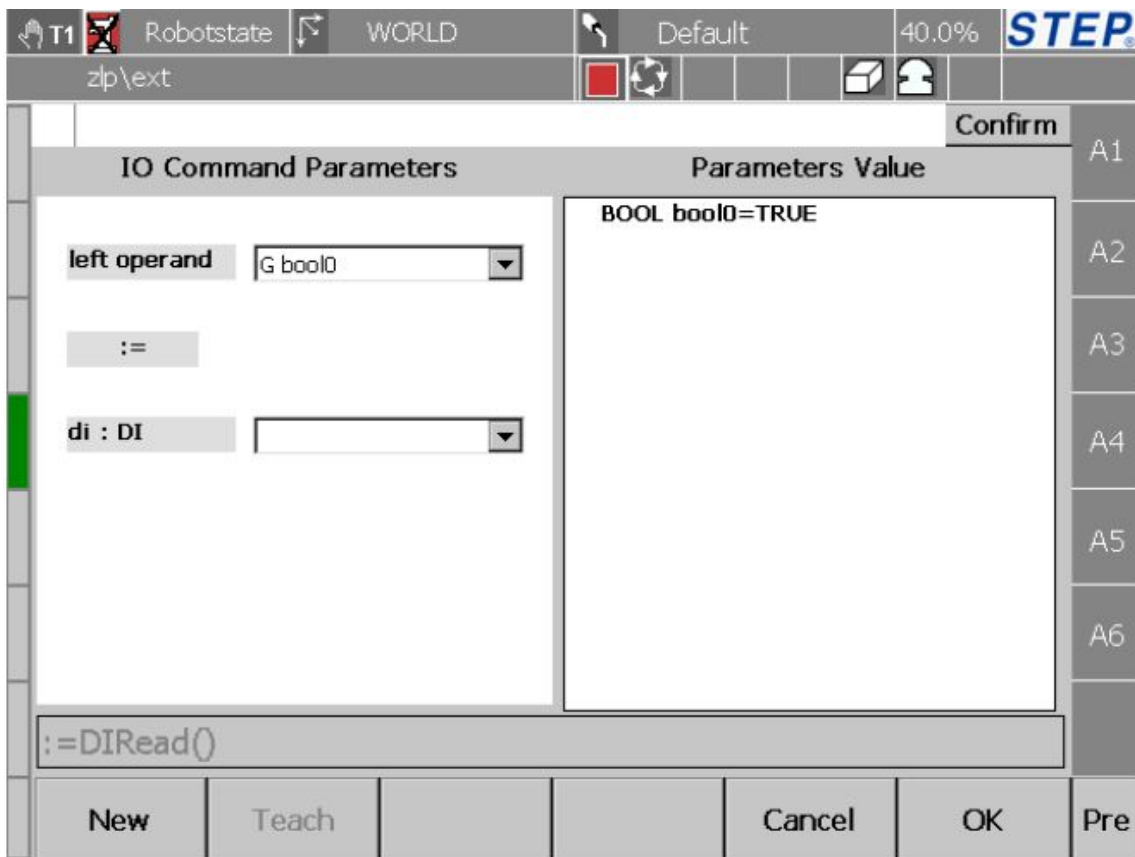


Figure 83 DIRead Statement Setting Interface

Notes for I/O statement:

- DIRead
- DIWAIT
- AIRead
- AIWaitgreater
- AIWaitLess
- DOSet
- AOSet

## 6.8 External Variable Operation statement

The statement creation operation is the same as IO statement. The notes for external statement are shown below:

- BOOLEXTRead(): external BOOL type variable read statement
- BOOLEXTSet(): external BOOL type variable set statement
- DINTEXTRead(): external DINT type variable read statement


- DINTEXTSet(): external DINT type variable set statement
- REALEXTRead(): external REAL type variable read statement
- REALEXTSet(): external REAL type variable set statement
- DWORDEXTRead(): external DWORD type variable read statement
- DWORDEXTSet(): external DWORD type variable set statement

# Chapter VII Robot Movement

## 7.1 Jog operation

### 7.1.1 Continuous jog


Continuous jog means when the job buttons “+” and “-” are pressed, the robot moves continuously. When the buttons are released, the robot stops moving.

For continuous jog, it is necessary to set Override first (Override cannot end with “inc” after the setting). Then, confirm the right status bar shows joint jog or Cartesian jog, instead of absolute position jog icon .

There are two reference CS for continuous jog: joint reference CS, Cartesian reference CS (“WORLD”, “ROBOTBASE”, user-defined reference CS). The reference CS for continuous jog is set via the Jog popup box in the robot position interface; There are three setting methods for Override: in program; through “v\_jog” setting in the position interface; using “V+” and “V-” buttons on the teach pendant.

### 7.1.2 Incremental jog


Incremental jog means the length of the robot movement path is not related to the duration for which the “+” and “-” buttons are pressed, but related to the press times.

For incremental jog, it is necessary to set Override first (Override cannot end with “inc” after the setting). Then, confirm the right status bar shows joint jog or Cartesian jog, instead of absolute position jog icon .



Similar to continuous jog, there are two reference CS for incremental jog: joint reference CS, Cartesian reference CS (“WORLD”, “ROBOTBASE”, user-defined reference CS). The reference CS for incremental jog is set via the Jog popup box in the robot position interface; There are three setting methods for Override: in program; through “v\_jog” setting in the position interface; using “V+” and “V-” buttons on the teach pendant.


### 7.1.3 Absolute position jog

Absolute position jog means the robot is made run to a point in the space with certain method (“PTP” or “Lin”).

First, it is necessary to switch the robot into absolute position jog mode via the “Activate” button in the absolute position jog interface. The  icon now appears in the right status bar. See interface description for other settings.

### 7.1.4 Position jog operation procedure

First, set the robot to low speed manual  or high speed manual  via the “F1” key button on the panel. The jog operation can be performed only when the robot is in manual mode (low speed, high speed).

Second, turn on the enable of the robot using “Mot” button. When the enable icon in the status bar turns into , it means the enable is turned on.

Third: perform jog operation setting (continuous jog, incremental jog, absolute position jog). See corresponding document for the setting of each jog mode.

Fourth: run the robot jog.

### 7.1.5 Program jog operation procedure

First: select operation mode. Switch the operation mode to manual mode using the “F1” button on the panel (F1 or F2).

Second: select a finished program in the project interface and click “Load” button to load the program. If the loaded program appears in the status bar, the program is loaded successfully.

Third: press and hold the “Start” button to run the program. When the button is released, the program stops running.

## 7.2 Automatic running

First: select running mode. Switch the operation mode of the robot to automatic running mode (AUT) using the “F1” button on the panel.

Second: select a finished program in the project interface and click “Load” button to load the program. If the loaded program appears in the status bar, the program is loaded successfully.

Third: Press “Start” button the run the program. Press “Stop” button the stop running.

**Notes: the program cannot run when the robot is in overrun condition. The robot must be moved to a non-overrun position before the program can run.**

## Technical support

### ◆ Technical service

ADTECH (SHENZHEN) TECHNOLOGY CO., LTD. is pleased to provide information about robot running and operation, and assist in your troubleshooting and offer detailed consult. If any fault occurs in the operation of your robot, you can contact our technical service immediately and provide the following information, if possible.

- ◇ Type and serial number of the robot
- ◇ Type and serial number of the control system
- ◇ Version number of the control system
- ◇ Additional software package (optional)
- ◇ Current application program
- ◇ Additional accessories (such as positioner and rail, optional)
- ◇ Problem description, fault duration and frequency etc.

### ◆ Contact

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