This user manual describes all proceedings concerning the operations of in detail as much as possible. However, it is impractical to give particular descriptions for all unnecessary or unallowable system operations due to the manual text limit, product specific applications and other causes. Therefore, the proceedings not indicated herein should be considered impractical or unallowable.

It is necessary to ensure that this operation manual reaches to the ultimate user of this product.

PREFACE

Your Excellency,

It’s our pleasure for your patronage and purchase of this Robot product made by GSK CNC Equipment Co., Ltd.

This manual is introduced the operation, teaching and programming proceedings of the robot in detail.

In order to guarantee the product is operated with a safe, normal and effective situation, it is necessary to carefully read this manual before installing and using this product.

SECURITY PRECAUTION

Accident may occur by improper connection and operation!

This system only can be operated by authorized and qualified personnel. Please carefully read this manual before using!

SECURITY RESPONSIBILITY

Security responsibility of the manufacturer

——Manufacturer should take responsibility for the design and structure danger of the product and the accessories which have been eliminated and/or controlled.

——Manufacturer should take responsibility for the security of the product and accessories.

——Manufacturer should take responsibility for the offered information and suggestions for the user.

Security responsibility of the users

——User should know and understand about the contents of security operations by learning and training the security operations of the product.

——User should take responsibility for the security and danger because of increasing, changing or modifying the original product or accessory by themselves.

——User should take responsibility for the danger without following the operations, maintenances, installations and storages described in the manual.

Chinese version of all technical documents in Chinese and English languages is regarded as final.

Sincere thanks for your friendly supporting of GSK's products!

CONTENTS

CHAPTER ONE SAFETY

1.1 Warning

The precondition of composing this operation user manual is that the overall operators of the industry robot (Abbreviated as robot) should perform the corresponding trainings which are the base requirement for the related rule and standard. It is very essential to note the following safety prompts which are emphasized the safety defenses and operations.

The listed warning, caution, enforcement movement and prohibition in this operation manual should be performed. Carelessly, if the robot's movement direction is wrong, the operator and others may be hurt, as well the equipment may be damaged.

It is very important to confirm the normal operation of the equipment at any time.

The robot is designed and manufactured based upon meeting that the user abides by the operation manual. Carefully read and comprehend the overall contents of this operation manual before using other manuals.

1.2 Danger

Do not observe the following operations, the hazard may occur.

- Press the front-door of GR-C controllable cabinet and the ESP button on the TP, and confirm the motor power in OFF state before operating the robot. The indicator of servo ON on the TP lights off after the servo power is turned off.
- The motor power should be switched on after the ESP accident is released. It is better to turn on the motor's power after releasing the ESP.
- Observe the following items when teaching within the robot movement range:
  —— View the robot from front side
  —— Observe the operation steps
  —— Consider the strain project when the robot suddenly moves to your position
  —— Ensure the setting dodging place against emergencies.
- The personnel injury may occur by the robot operation due to the malfunction.

- Confirm nobody within the robot's motion range when the following operations are performed, and the operator on the safety position operation.
  —— Robot ON
  —— Operate the robot by TP
  —— Dry run
  —— Automatic play
- Carelessly enter the robot motion range or touch the robot, the personnel injury accident may occur. Additional, immediately press the ESP button when abnormality occurs (The ESP button is on the front door of the GR-C controllable cabinet and at the right side of the TP).

1.3 Notice

- The illustration in the manual, some are drawn after taking down the cover or safety closure for describing the detail. When operating this component, it can be operated based upon the user manual after the cover and safety enclosure is recovered.
- The figures and photos in this manual are the special examples which are different from your purchased products.
- The user manual may be adequately modified because of the product improvement, specification alteration etc. The modified manual will replace the data number at the lower right corner of the cover and publish with the revised edition.
- If the customer reforms the product without authorization, it is not within the maintenance range for our company so I am afraid that we can not take this responsibility.
- Check the following items before performing the robot teaching; it is necessary to immediately repair or adopt other measures if the abnormality occurs.
  —— Check whether the robot operation is abnormal
  —— Check whether the external cable cover and external package are damage.
- TP should be placed at the original position after using.
- If the TP places at the robot, fixture or ground which may impact with the

robot or fixture when the robot operates, so that the personnel injury or equipment damage accident may occur.

- Use the robot after comprehending the “Warning Mark” of GR-C robot control system operation manual.

CHAPTER TWO GR-C CONTROL SYSTEM INTRODUCTION

2.1 Structure

GR-C series industry robot control system (This operation manual is mainly described to the control equipment) which connects the robot body, controllable cabinet and TP with cables (Refer to the Fig. 2-1).

Fig. 2-1

2.2 Controllable cabinet

The left side on the front of the controllable cabinet (Refer to Fig. 2-2) is installed main power switch and lock, as well there is the power OFF/ON and ESP buttons at the upper right corner. The hook under the power OFF button is used to hang the TP.

Fig. 2-2

It is important to note that the ESP buttons both on the controllable cabinet and TP are different. The servo power is turned off when pressing the ESP button on the controllable cabinet; but the one on the TP is temporarily stopping the robot's motion, not for cutting the servo's power.

2.3 TP

TP provides a friendly and reliably man-machine interface, which can be performed the teaching operation to the robot, as well, the program file editing, administration, teaching inspection and playing, coordinate value monitoring, variable and input/output; and therefore, the settings such as the system, parameter and machine can be performed. The AIARM HISTORY and necessary operation prompts can be immediately displayed.

2.3.1 TP Appearance

TP is divided into button and display screen. Button includes the overall keys for programming and teaching the robot. Refer to the Fig. 2-3 for the TP appearance.

Fig. 2-3

2.3.2 Button Operation

(1) Button Description

In this manual, the overall buttons on the TP are indicated by [ ], and the menu display in the TP screen expresses by { }.

For example: 

expresses [SELECT];

Menu button means {Menu}.

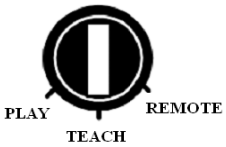
(2) Common button name

Emergency Stop key, it means by [ESP].

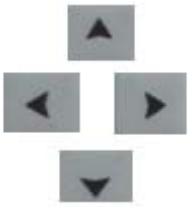
(Green) Start key, it means by [START].

(Red) Dwell key, it means by [DWELL].

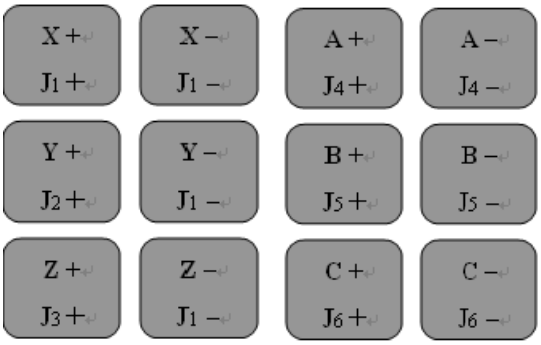
Enabling switch, it means by [ENABLING SWITCH].



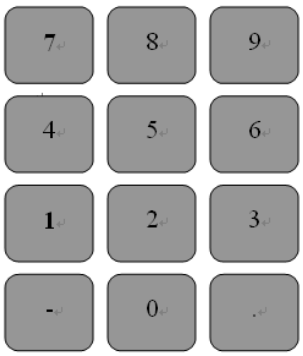
Mode SELECT key, it means by [MODE SELECT].



Direction keys: [LEFT], [RIGHT], [UP] and [DOWN]



Axis operation buttons



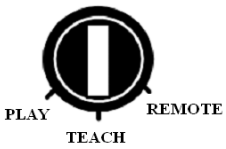
Numerical buttons

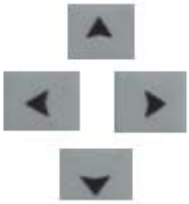
(3) Simultaneous button expression

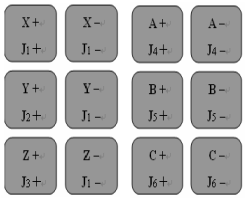
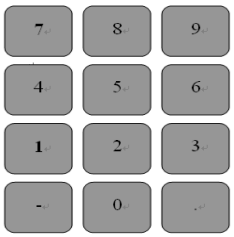
Simultaneously press two buttons, for example, when press the [SHIFT] and [PAGE] buttons; it can be expressed by [SHIFT] + [PAGE].

2.3.3 Button Functions

The functions of the buttons are shown below:

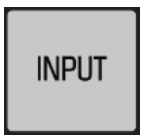
[ESP] button 	**Robot stops after pressing this button and the ESP prompt information displays on screen.** Robot stops operation after pressing the ESP button on the controllable cabinet, and the motor power is cut off. The robot stops operation pressing the ESP on the TP, and the motor's power does not cut off. The power recovers by releasing the ESP on the controllable cabinet; clear the ESP prompt information by [CLEAR] manually, then the system recovers the normal state. Clear the ESP prompt information by [CLEAR] manually, then the system recovers the normal state, after releasing the ESP on the TP.
[HOLD] button 	**Robot holds the operation procedure by pressing this button when Play Mode is performed.**
[START] button 	**In the Play mode, the program starts after servo ready is performed.**
[MODE SELECT] button 	**Select the Teach mode, Play mode and Remote mode** TEACH: Teaching mode, it can be performed the axis and program operations by TP PLAY: Play mode, it can be performed the play mode for the taught file. REMOTER: Remote mode, it can be performed remote control operation for the taught main program file. Enabling OFF in the mode shift and the system is on the stop state.
[ENABLING SWITCH] button	**Enabling switch is mainly used for switching on/off enabling** Slightly press the enabling switch before teaching the robot, then control the axis operation button or forward/ backward button, and therefore the robot can be moved.

	The robot may immediately stop after cutting the enabling once releasing or hard pressing.
[F1] button 	**{Main Page} interface shortcut key** In the {Open}, {Edit}, {Status}, {Tool} interfaces, system can be shifted to the {Main Page} interface by pressing the [F1].
[F2] button 	**{Open} interface shortcut key** In the {Main Page}, {Edit}, {Status}, {Tool} interfaces, system opens the current program and then shifts to the {Open} interface by pressing the [F2], and then the program can be previewed or played.
[F3] button 	**{Edit} interface shortcut key** In the {Main Page}, {Open},{Status},{Tool} interfaces, system opens the current program and then shifts to the {Edit} interface by pressing the [F3], and then the program can be previewed or reappeared. It only can be shifted to the Edit interface in the teaching mode.
[F4] button 	**{Status} interface shortcut key** In the {Main Page}, {Open}, {Edit}, {Tool} interfaces, system shifts to the {Status} interface by pressing the [F4].
[F5] button 	**{Tool} interface shortcut key** In the {Main Page}, {Open}, {Edit}, {Status} interfaces, system shifts to the {Tool} interface by pressing the [F5].
Direction button 	**The direction buttons are used for changing the cursor focus to carry out the ergodic menu, button etc. functions which matches with the [SELECT] button to select the menu or button, as well change the size of the numerical value.** The cursor dimension, movable range and area may

	differ depending on the different screens. In the {Open} and {Edit} interfaces, cursor moves to the 1st line of the program by [SHIFT] + [UP]; and the cursor moves to the end line of the program by [SHIFT]+[DOWN] When the cursor is at the file list or the 1st line of the program, cursor moves to the end line by [UP]; when the cursor is at the file list or the last line of the program, the cursor moves to the 1st line by [DOWN].
Axis operation button 	**Slightly press the enabling switch in the teaching mode, and then press the axis operation key; each axis of the robot can be operated according to some method based upon the current coordinate system.** Regardless of this button in the play mode.
Numerical button 	**It is mainly used for inputting the number characters.** Totally, 12 buttons, 0~9 are number buttons; decimal point ".", minus "-"
[SELECT] button 	**This button can be activated or selected the interface object, for example, button, menu, file list etc.** **SELECT a** button in interface, it performs the corresponding function of its buttons. **SELECT a** menu in interface, it enters the corresponding window of its menu. When the file list [**SELECT**] in the main interface, open the file of the cursor place. Also, this button can be activated the soft keyboard for inputting the characters.

[SERVO READY] key 	Press this key in the play mode if you want to perform the play, and then it is performed by pressing the start button (it is better to keep the robot at the beginning position); otherwise, the play operation may not operate. The indicator on the [SERVO READY] may turn into yellow after pressing this button.
[CANCEL] button 	**[CANCEL] button for closing or quitting this page** This button is used for closing or quitting the current page, and return to the previous page or main interface.
[COORDINATE SETTING] button 	**Shift the robot's motion coordinate system by this button.** The coordinate system is changed based upon the following sequence by pressing the key once: "Joint" → "Base" → "Tool" → "User" → "Joint". The selected coordinate systems are displayed at the state area.
[POSITION] button 	**Gain the teaching point (Robot current position) pressing the [POSITION] button in the movement command editing widow;** Gain the robot's current position by the [**POSITION**] when setting the tool coordinate 3-point, tool coordinate 5-point and user coordinate 3-point methods.
[PAGE UP/DOWN] button 	**Perform the page up/down function pressing this button** Carry out the page downward function by the [**PAGE UP/DOWN**] button Carry out the page upward function by [SHIFT] + [**PAGE UP/DOWN**] buttons Page function can be used in the file list, file command content browsing, interface display, variable, input/output, servo parameter, welding machine setting and ALARM HISTORY etc.

[SHIFT] button 	**In a special window, it is used matching with other buttons.** Carry out the page upward function matching with the [PAGE UP/DOWN] button, [SHIFT] + [PAGE UP/DOWN]. When previewing the program, carry out the function of skipping to initial line with [SHIFT] + [UP] When previewing the program, carry out the function of skipping to end line with [SHIFT] + [DOWN] In the soft keyboard interface, this button can be used for shifting the capital letters, lower-case letters and mark characters. In the command edit, this button is used for shifting some command parameters, for example ON->OFF.
[MANUAL SPEED] button 	**The setting button of the robot operation speed is used for the teaching and play speed regulation.** There are 5 levels for the manual speed (Inching, low, medium, high, super-speed) The speed changes with the following sequence pressing high speed key each time: “Inching” -> “Low” -> “Medium” -> “High” -> “Super-speed” The speed changes with the following sequence pressing low speed key each time: “Super-speed” -> “High” -> “Medium” -> “Low” -> “Inching” The set speed is displayed at the state area.
[SINGLE CONTINUOUS] button 	**In the teaching mode, the “SINGLE” and “CONTINUOUS” motion cycle modes can be shifted each other.** “**SINGLE**” mode is that the system stops after operating one command when it performs the forward or backward teaching; and the system can be performed the next command only when user presses the [FORWARD] or [BACKWARD] again. “**CONTINUOUS**” mode is that the system continues to operate the program command till it stops after the command ends when the forward or backward teaching is performed.

[TAB] button 	**Shift the cursor in the current interface display area by pressing this button.** The interface, usually, can be divided by several rectangular frames of which these rectangles are equivalent to an area; the cursor can be shifted to this area only when one area contains of figure element (for example, button, menu, file list and text display frame). Usually, the [TAB] and four direction buttons are used together to move the cursor and select the figure element so that the system function can be employed.
[CLEAR] button 	**ALARM HISTORY clear (other than the servo alarm); Clear the prompt information of the man-machine interface display area etc.**
[EXTERNAL AXIS SWITCHOVER] button 	**Shift the motion system between robot and external axis by pressing this button** The system changes according to the following sequence by pressing once: “External axis” → “The robot coordinate system before shifting” The selected coordinate system displays in the system state area.
[INPUT] button 	**Confirm the current input content from user** In the soft keyboard interface, the [INPUT] is used for confirming the content of the current soft keyboard; in the modification command, the [INPUT] is used for confirming the content of current command modification; in the welding machine setting; the [INPUT] is used for confirming the input value of the current attribution. Similar as the other interfaces.

[DELET] button 	**This button is used for deleting the program file or command etc.** In the {JOB LIST} interface, delete the file placed at the current cursor Delete the command of current cursor selected area in the editing command.
[ADD] button 	The system enters Add mode of the program editing by this button in the program editing page.
[ALTER] button 	The system enters **Modify** mode of the program editing by this button in the program editing page.
[COPY] button 	**In the editing Normal mode, this button can be copied the command.** Press this button at the first time, select the block to be copied; press this button again, select the paste location; system performs copy motion pressing this button again; the copy function is then completed.
[CUT] button 	**In the editing Normal mode, this button can be cut the command.** Press this button at the first time, select the block to be cut; press this button again, select the paste location; system performs cut motion pressing this button again; the cut function is then completed.
[FORWARD] button 	**The robot operates based upon the teaching programming point path by [ENABLING SWITCH] and this button. Non-movement command statement directly performs.**

[BACKWARD] button 	**The robot is operated reversely based upon the program point path by pressing [ENABLING SWITCH] and this key.**
[Backspace] button 	**Press this button to clear the character in the editing /digit frame.**
[APPLICATION] button 	**This button is an external application switch** When [SHIFT] + [APPLICATION] are used for welding or painting, it starts or closes the signal.

2.4 Screen Display of TP

Totally, there are 7 display areas in the TP main page: shortcut menu, system state display, navigation bar, main menu, time display, file list and man-machine dialogue display areas, wherein, only the shortcut menu, main menu and file list areas can be accepted the cursor focus shift. Shift the cursor each other on the display screen by [TAB], and then shift the cursor focus by direction buttons within the area.

The main page of the display screen, refer to the Fig. 2-4.

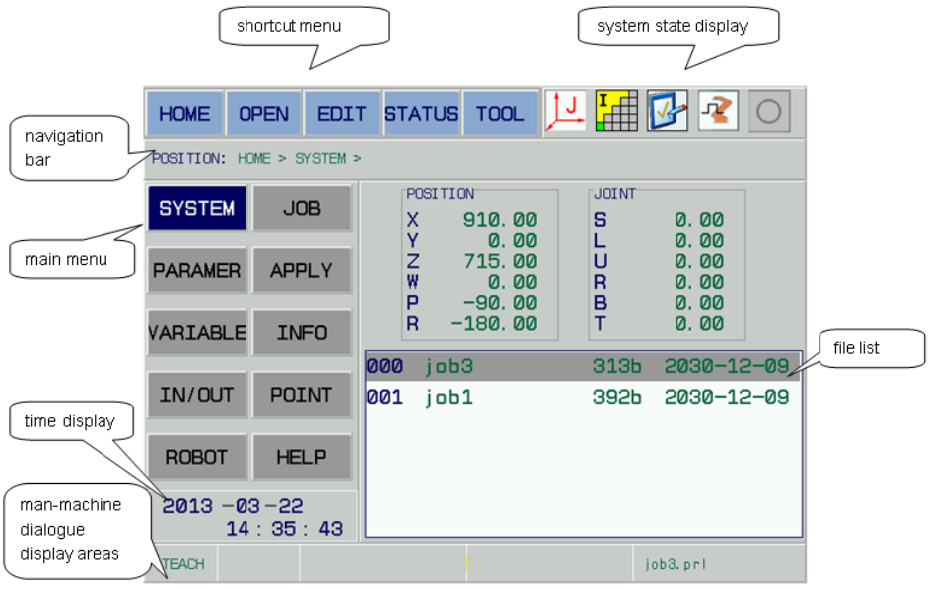


Fig. 2-4

2.4.1 Shortcut Menu Area

The home, open, edit, status and tool in the shortcut menu area are separately used to return the main page, open the current program, edit the current program, display the operation state and figure display tool. Refer to the Fig. 2-5.

Fig. 2-5

The menu items in the shortcut menu area are separately indicated by {HOME}, {OPEN}, {EDIT}, {STATUS} and {TOOL}. When the cursor in the shortcut menu area, circularly shift the cursor in turn by left/right key, and then enter the corresponding interface by [SELECT]. Rapidly shift the 5 interfaces by these short-cut keys from F1 to F5. Wherein, enter {HOME} interface by [F1]; enter {OPEN} interface by [F2]; enter the {EDIT} interface by [F3]; enter the {STATUS} interface by [F4]; enter the {TOOL} interface by [F5].

(1) {OPEN} menu interface

{OPEN} is used for opening the current program display (the current program name displays at the most right of the man-machine dialogue area). The current program can be opened based upon the following 3-kind operations.

- Move the cursor to the {OPEN}, open the current program by [SELECT]
- In the {HOME} interface, the {EDIT} interface, the {STATUS} interface and the {TOOL} interface, press F2 shortcut key to open the current program.
- In the main page, move the cursor to the file list area by the [TAB] and direction buttons; and then select the desired program to open it by [SELECT]; the opened program is set to current program.

Cursor stops at the menu {OPEN} after opening the program. Refer to the Fig. 2-6

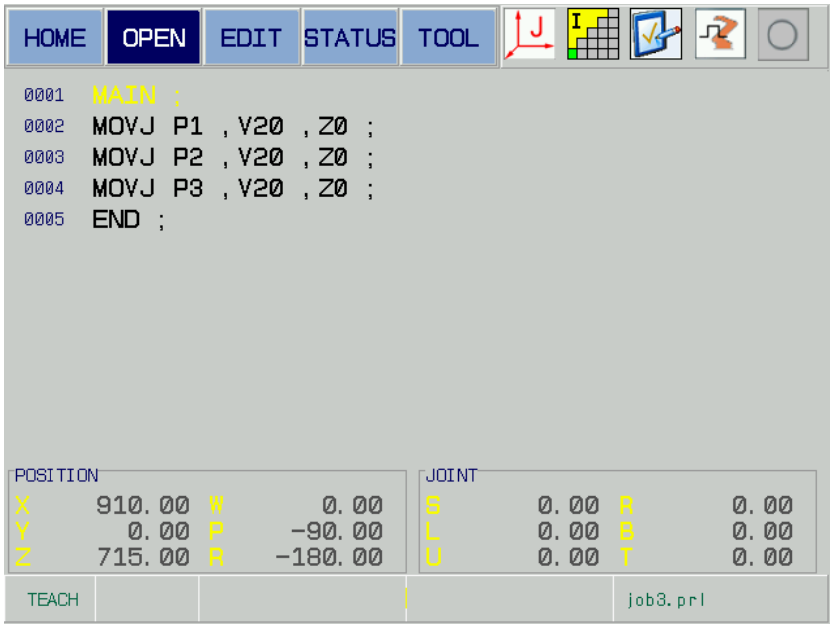


Fig. 2-6

In the {OPEN} interface, the single, consecutive teaching and play operation program can be previewed. The cursor can be moved to the previous line or next line by [UP] or [DOWN]; page down can be performed by [PAGE]; page up can be performed by [SHIFT] + [PAGE]; move the cursor to the initial line of program by [SHIFT] + [UP]; move the cursor to the end line of program by [SHIFT] + [DOWN]. In this case, the button combination also can be used in the {Edit} menu interface.

(2) {EDIT} menu interface

The {EDIT} interface is only used for compiling the current program. In the teaching mode, enter the {EDIT} interface according to the following 3 operations.

- Move the cursor to the {EDIT}, open the current program and edit it by [SELECT]
- In the main page, the {OPEN} interface, the {STATUS} interface and the {TOOL} interface, press F3 shortcut key to open the current program and edit it.
- Cursor stops at the { EDIT} menu after entering the {EDIT} interface, refer to Fig. 2-7

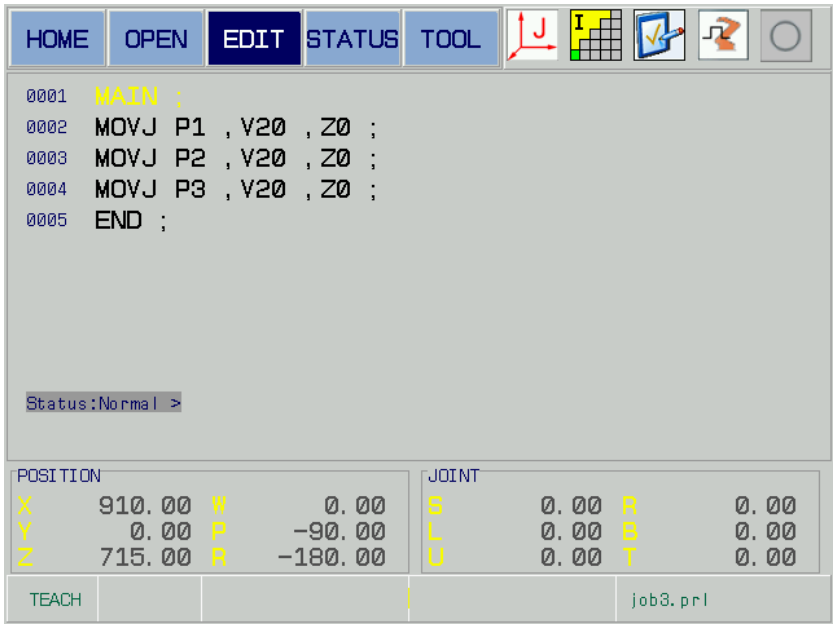


Fig. 2-7

In the { EDIT } interface, the program can be operated with addition command, DELET command, copy/paste command, cut/paste command, modification command parameter and search command etc. The cursor movement method is same to the {OPEN} menu interface.

(3) {STATUS} menu interface

This interface is used for checking the operation state related with the system.

Enter the {STATUS} interface based upon the following 3 operations:

- Move the cursor to the {STATUS}, enter the {STATUS} interface by [SELECT]
- In the {HOME} interface, the {OPEN} interface, the {EDIT} interface and the {TOOL} interface, press F2 to complete it.
- Cursor stops at the {STATUS} menu after entering the {STATUS} interface, refer to Fig. 2-8.

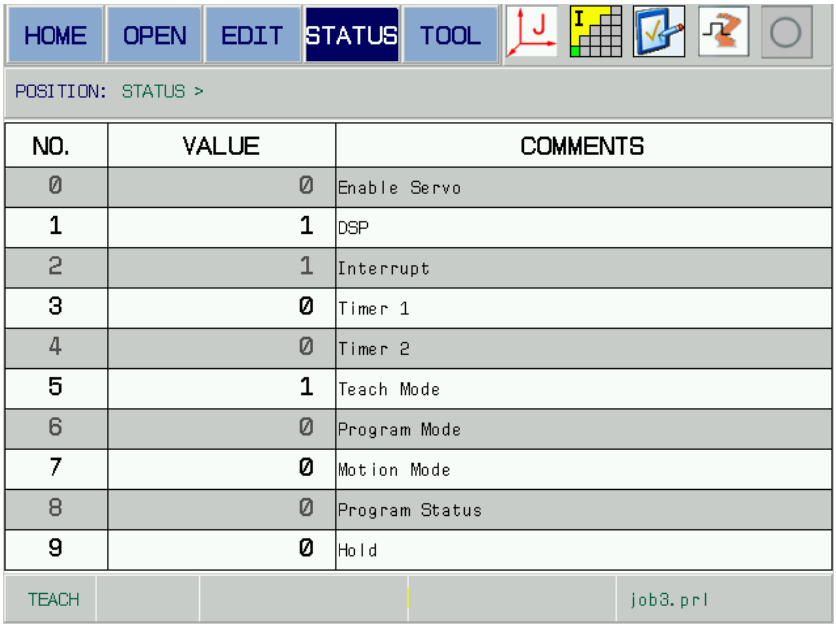


Fig. 2-8

The variable information, such as the machine operation state, bus state, can be viewed in the {STATUS} interface. In this interface, input variable series number by the numerical value buttons, for example 130 (in this case, the system does not display the input number “130” from user), then press the [INPUT], the interface rapidly shifts to the page of variable series No.130. Moreover, the system state variable value can be observed page by page by using the up/down, page, shift buttons.

(4) {Tool} menu interface

This interface display the operation state of the system based upon the curve consecutive change method.

Enter the {TOOL} interface according to the following 2 operations:

- Move the cursor to the {TOOL}, enter the {STATUS} interface by [SELECT].
- In the {HOME} interface, the {OPEN} interface, the {EDIT} interface and the {STATUS} interface, press F5 to complete it.

Cursor stops at the {TOOL} menu after entering the {TOOL} interface, refer to the Fig. 2-9.

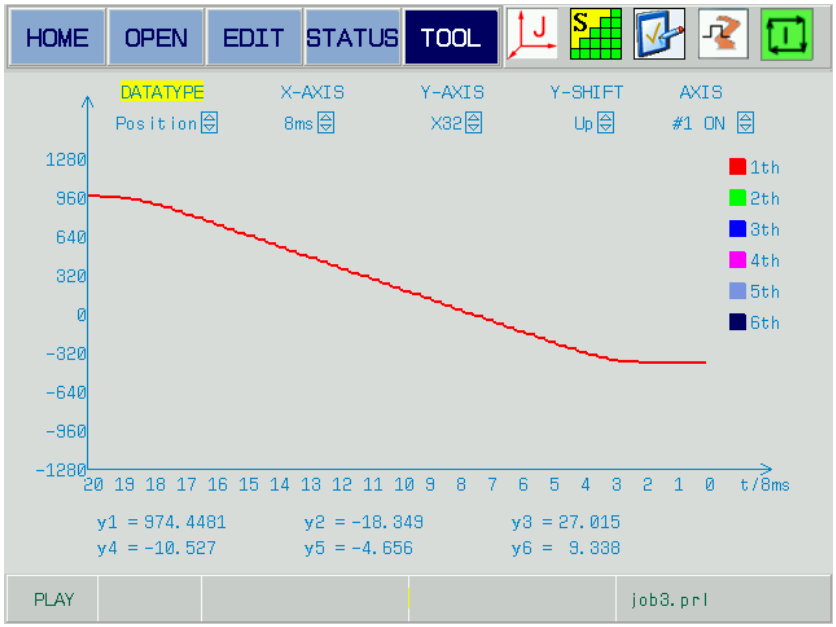


Fig. 2-9

In this interface, the options such as the “DATATYPE”, the “X-AXIS”, the “Y-AXIS”, the “Y-SHIFT”, and the “AXIS” etc. can be selected by left/right button. Each option can be set by up/down direction button; the displayed curve can be changed along with the setting. When setting the “AXIS”, select the desired axis by up/down button, for example, #6OFF means that there is no curve correspondence with the 6th axis. In this case, press [SELECT], the #6OFF can be set to #6ON, and then the interface displays the corresponding curve.

2.4.2 State Display Area

The state display area shows the state of the robot, the displayed information varies with the current state of the robot. Refer to the Fig. 2-10.

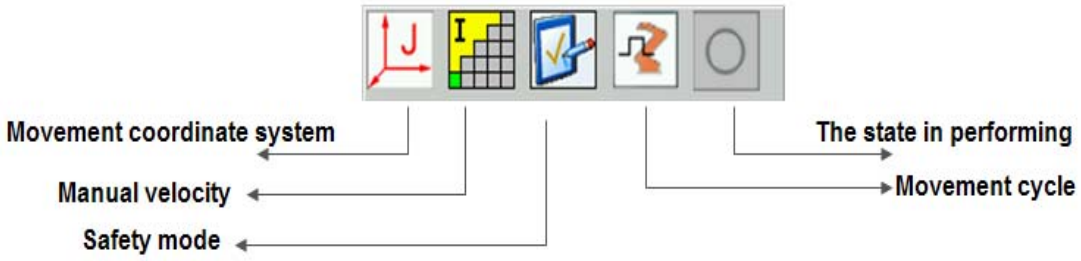


Fig. 2-10

(1) Movement coordinate system

Display the selected coordinate system. There are 5-kind coordinate systems, for example, joint, base, tool, user and external axis coordinate system, which can be shifted by the [COORDINATE SETTING] and [EXTERANL AXIS SWITCHOVER] buttons on the TP in turn.

The robot coordinate system differs depending on pressing the [COORDINATE SETTING] once: Joint coordinate system -> Base coordinate system -> Tool coordinate system -> User coordinate system. Coordinate system shifts between external axis coordinate system and joint, Base, tool and user coordinate systems when controlling the [EXTERANL AXIS SWITCHOVER]. When the system that sets the external axis number is 0, it is disabled by [EXTERANL AXIS SWITCHOVER].

: Joint coordinate system

: Base coordinate system

: Tool coordinate system

: User coordinate system

: External axis coordinate system

(2) Manual velocity

The selected manual speed is displayed. There are 5 levels: Inching, low, medium, high and super-high. The acceleration or deceleration can be performed by the [MANUAL SPEED] on the TP.

The velocity varies according to the following sequence after pressing high-speed once: “Inching” →”Low” →”Medium” →”High” → “Super-high”

The velocity varies according to the following sequence after pressing low speed key once: “Super-high” →“High” →”Medium” →”Low” →”Inching”

：Inching (5%)

：Low velocity (25%)

：Medium velocity (50%)

：High velocity (75%)

：Super-high (100%)

The default speed in system start is slight level. If you want to modify the system start speed level, perform the {System speed} interface in the {System} menu. Refer to the Fig. 3.1.8.

(3) Safety mode

Display the selected safety mode:


：Operation mode

The operation mode is a kind of operator mode for robot monitoring in the product line, which can be performed the robot start, stop, monitoring etc. as well the recovery operation during the abnormality of the product line.


：Edit mode

The edit mode is a kind of operator mode for teaching, which is increased some movements compared with the operation mode, for example, the slow movement, programming edit and the compilation of various programming files of the robot.


：Administration mode

The administration mode is a kind of operator mode for system setting and maintenance, which is increased some movements compared with the editing mode, for example, the parameter setting, user password modification etc.

(4) Movement cycle

Display the current movement cycle


： Single step


： Continuation

(5) The state in performing

Display the current state (stop, dwell, ESP, alarm or operation), the corresponding states may display during performing.

 ： Stopping

 ： Holding

 ： In ESP

 ： Operating

2.4.3 Main Menu Area

In total, there are 10 submenus in the main menu, refer to the Fig. 2-11.

Fig. 2-11

In the {HOME} interface, move the cursor to the main menu by [TAB], enter the menu corresponding interface matching with the direction buttons and [SELECT], then complete the corresponding operation. When cursor enters this area, the cursor position is at the one last leaving time.

2.4.4 File List Area

File list area will display the overall program information of the system, which are included the program name, program size, program creation date. Refer to the Fig. 2-12.

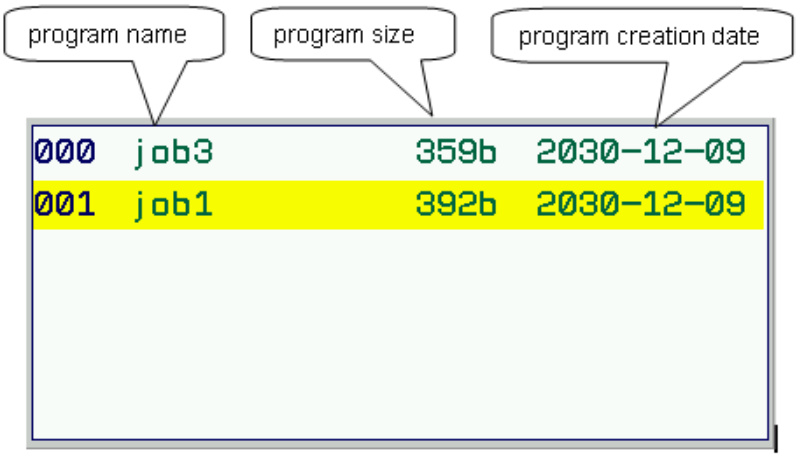


Fig. 2-12

In the {HOME} interface, move the cursor to the file list area by [TAB], open the selected program matching with the direction buttons, [PAGE UP/DOWN], [SHIFT] and [SELECT].

2.4.5 Man-machine Interface Display Area

Display each operation prompt and ALARM HISTORY etc. Refer to the Fig. 2-13.

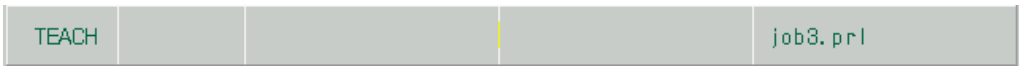


Fig. 2-13

CHAPTER THREE MAIN MENU EXPLANATION

3.1 {SYSTEM} Menu

The {System} menu consists of 11-submenu, select the {System} menu by [SELECT], the submenu may appear; refer to the Fig. 3-1.

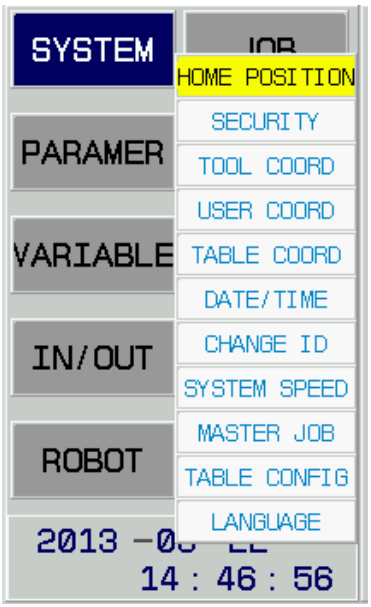


Fig. 3-1

After sub-menu appears, the cursor position is at the sub-menu of the last leaving one. Select the sub-menu by the up/down direction button; close and leave this sub-menu interface by left/right and [CANCEL] buttons.

3.1.1 {HOME POSITION} Menu Interface

The {HOME POSITION} menu interface is used to calibrate the home position, refer to the Fig. 3-2.

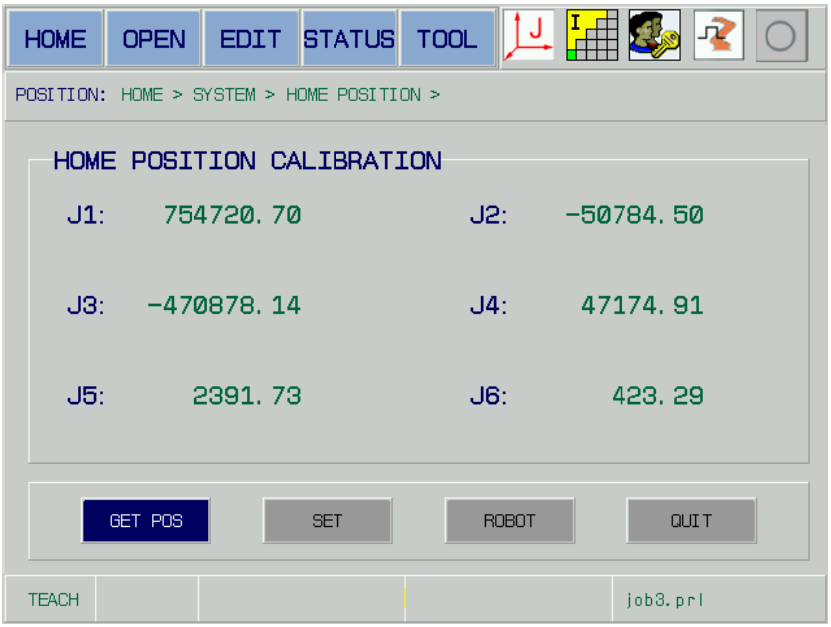


Fig. 3-2

This interface composes of 2 areas.

Area 1 displays the current home position of the robot or the Table.

Area 2 contains of 4 buttons:

[GET POS] button: Read the actual corner value of current axis, and then display at the area 1.

[SET] button: The displayed value at the area 1 is set to absolute zero position value.

[ROBOT/TABLE] button: When the button displays [ROBOT], set the home position value of the robot machine itself; when it displays [TABLE], set the home position value to the table. [ROBOT] and [TABLE] can be shifted each other by [SELECT].

[QUIT] button: Retreat from this interface, and then return to the main page. Same to the [CANCEL] button.

The [TAB] can be shifted the cursor between 2 areas, which can be passed through each button and the value along with each axis matching with the direction buttons.

Additional, the value of J1~J6 can be gained not only by [GET POS] button, but also inputting numerical key directly. Move the cursor to the area 1, and then the input operation can be performed by pressing the numerical value key.

3.1.2 {SECURITY} Menu Interface

This interface is used for shifting the current safety mode; refer to the Fig. 3-3.

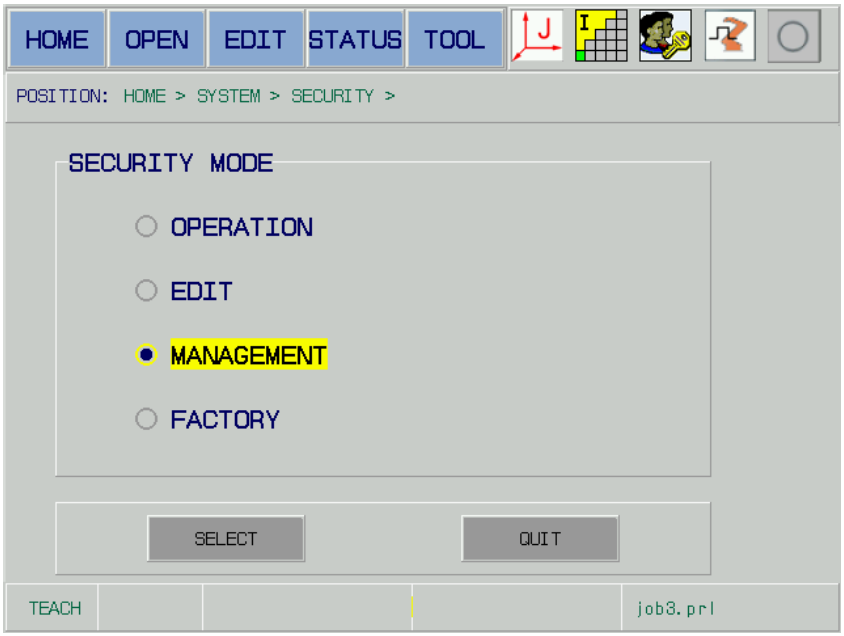


Fig. 3-3

This interface composes of 2 areas. Cursor can be shifted between 2 areas by [TAB].

Area 1 can be selected the shifting mode by direction buttons, for example, Operation, Edit, Administration or Factory modes.

Area 2 contains of 2 buttons:

[SELECT] button: Shift to the current safety mode according to the selected mode in the area 1, if the current safety mode is lower than the area 1, the corresponding password should be input. If the cursor is in the area 1, it can be performed by pressing [SELECT]. The edit mode factory password is 888888, administration factory password is 666666. The password can be modified in Section 3.1.7 {Change ID} interface.

[QUIT] button: Retreat from this interface, return to the main page; or the [CANCEL].

3.1.3 {TOOL COORD} Menu Interface

{Tool coord} menu interface is used for setting tool coordinate; refer to Fig. 3-4.

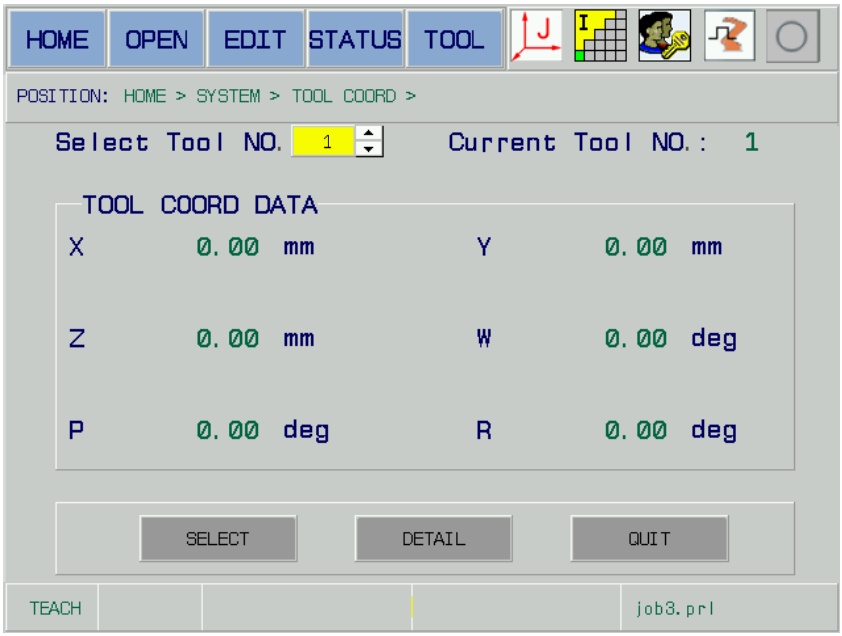


Fig. 3-4

This interface composes of 3 areas. The cursor can be shifted between area 1 and area 3 by [TAB].

Area 1 can be selected the tool coordinate number 0~9 to be set by up/down direction button (Coordinate number can be input the numerical value by its buttons).

Area 2 displays that the selected tool coordinate number correspondence with the coordinate value in the area 1.

Area 3 contains 3 buttons:

[SELECT] button: Set the selected tool coordinate number as the current one in the area 1.

[DETAIL] button: The tool coordinate number displayed in the area 1 is amply set. Its setting methods are: direct input, 3-point and 5-point.

[QUIT] button: Retreat from this interface, and then return to the main page; or the [CANCEL].

3.1.3.1 “Tool Coord System Detailed Setting” Interface

If the area 3 of the {Tool coord} menu interface selects the [DETAIL] button, enter to the tool coordinate system setting method interface by [SELECT]. Refer to the Fig. 3-5.

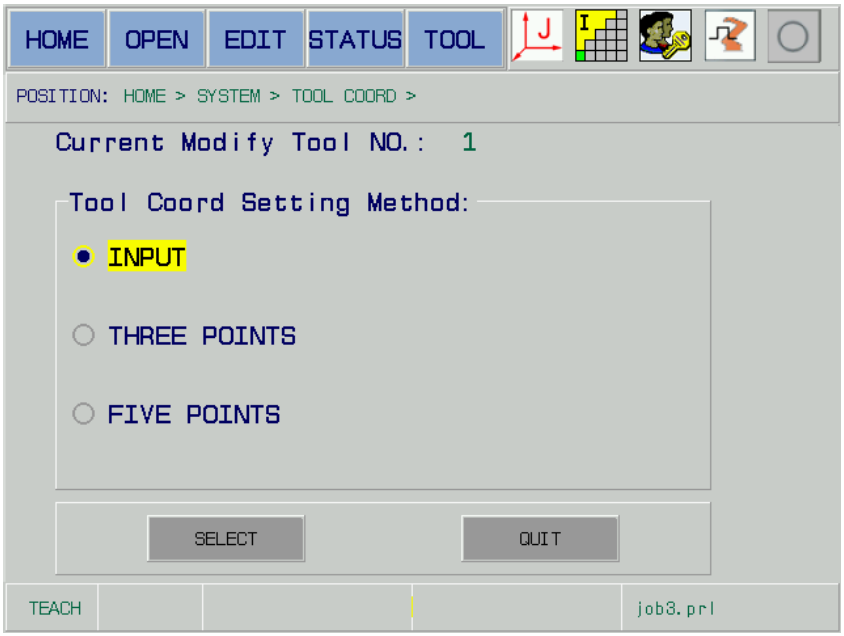


Fig. 3-5

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 can be selected the tool coordinate method to be set by up/down direction button. Setting methods: direction input, 3-point and 5-point.

Area 2 contains 2 buttons:

[SELECT] button: Enter to the corresponding interface setting tool coordinate based upon the tool coordinate system setting information from the area 1. When the cursor is in the area 1, press [SELECT] to complete it.

[QUIT] button: Retreat from this interface, and then return to the {Tool coord} menu interface; or the [CANCEL] to return.

3.1.3.2 “Direct Input Method Setting Tool Coordinate” Interface

If the area 1 of the {Tool coordinate detail setting} selects the direct input method, then enter the direction input method to set the interface of the tool coordinate after pressing the [SELECT] button. Refer to the Fig. 3-6.

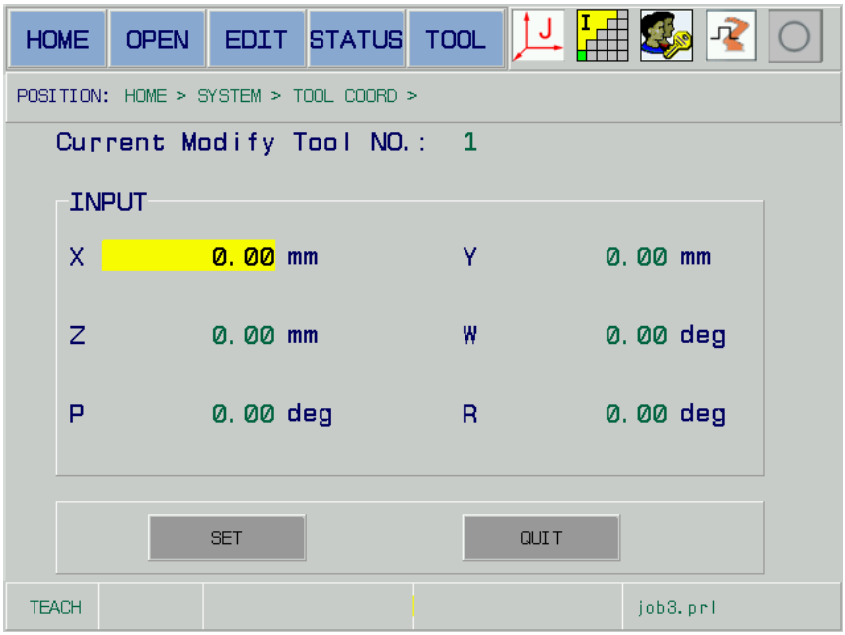


Fig. 3-6

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 displays X, Y, Z, W, P and R values, which can be directly input its numerical values by keyboard.

Area 2 contains 2 buttons:

[SET] button: Set the corresponding coordinate of the current selected tool coordinate number based upon the value in the area 1.

[QUIT] button: Retreat from this interface, and then return to the {Tool coord} menu interface; or the [CANCEL] to return.

3.1.3.3 “3-Point Setting Tool Coordinate” Interface

If the area 1 of the {Tool coordinate detail setting} menu interface selects the 3-point method; enter the 3-point method to set interface of the tool coordinate after pressing the [SELECT] button. Refer to the Fig. 3-7.

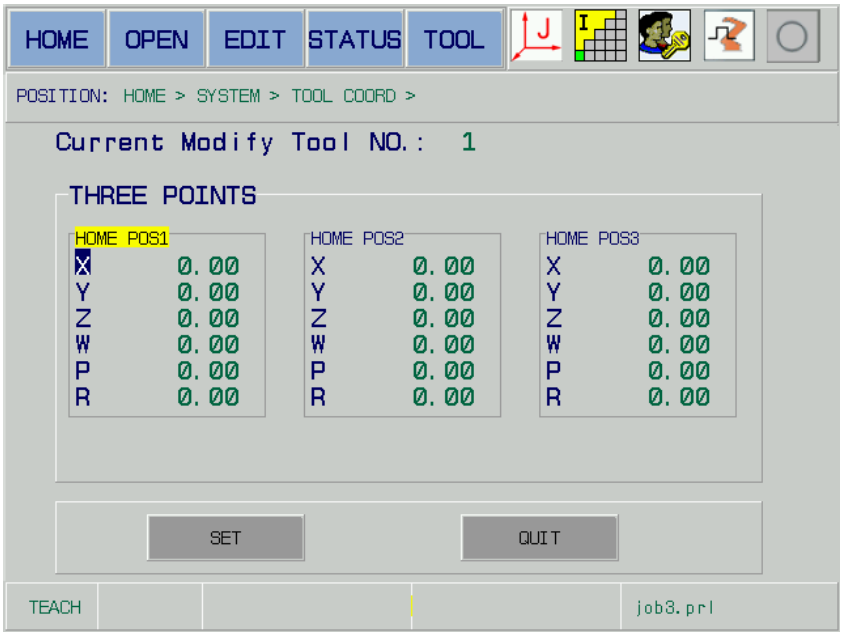


Fig. 3-7

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 displays the 3 points values, origin 1, origin 2 and origin 3. Gain the current position value to assign this point and display by the [POSITION] after the cursor moves to one of the point. The numerical value of the point also can be directly input by up/down direction and numerical value buttons.

Area 2 contains 2 buttons:

[SET] button: Gain the value of 3 points based upon the area 1. Set the corresponding coordinate of the current selected tool coordinate number

[QUIT] button: Retreat from this interface, and then return to the {Tool coord} menu interface, or the [CANCEL] to return.

3.1.3.4 “5-Point Method Setting Tool Coordinate” Interface

If the area 1 of the {Tool coordinate detail setting} menu interface selects the 5-point method; enter the 5-point method to set interface of the tool coordinate after pressing the [SELECT] button. Refer to the Fig. 3-8.

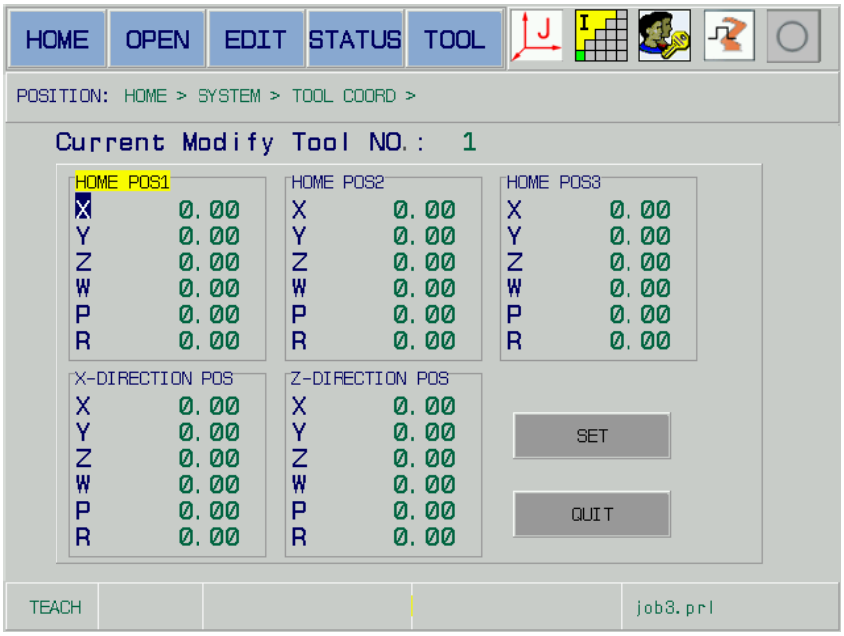


Fig. 3-8

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 displays the 5 points values, origin 1, origin 2 and origin 3, X direction point and Z direction point. Gain the current position value to assign this point and display by the [POSITION] after the cursor moves to one of the point. The numerical value of the point also can be directly input by up/down direction and numerical value buttons.

Area 2 contains 2 buttons:

[SET] button: Gain the value of 5 points based upon the area 1. Set the corresponding coordinate of the current selected tool coordinate number

[QUIT] button: Retreat from this interface, and then return to the tool coordinate menu interface, or the [CANCEL] to return.

3.1.4 {USER COORD} Menu Interface

{User Coord} menu interface is used for setting the user coordinate; refer to the Fig. 3-9.

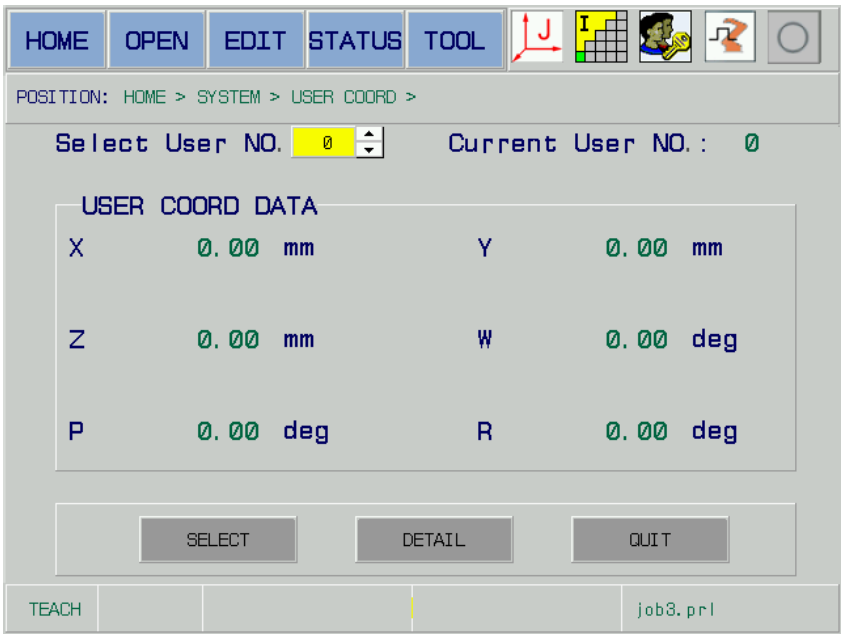


Fig. 3-9

This interface composes of 3 areas. The cursor can be shifted between the area 1 and area 2 by [TAB].

Area 1 can be selected the desired user coordinate number 0~9 (The coordinate number can be directly input the number value by its buttons) by the up/down direction button.

Area 2 displays the corresponding coordinate value of the selected tool coordinate number in area 1.

Area 3 contains 3 buttons:

[SELECT] button: The selected user coordinate number in the setting area 1 is regarded as the current user coordinate number.

[DETAIL] button means that the tool coordinate number can be performed the detailed setting in the area 1. The setting method has direct input and 3-point methods.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to return.

3.1.4.1 “User Coordinate Detailed Setting” Interface

If the area 3 of the {User coord} menu interface selects the [DETAIL] button, enter the user coordinate setting method interface after pressing the [SELECT]; refer to the Fig. 3-10.

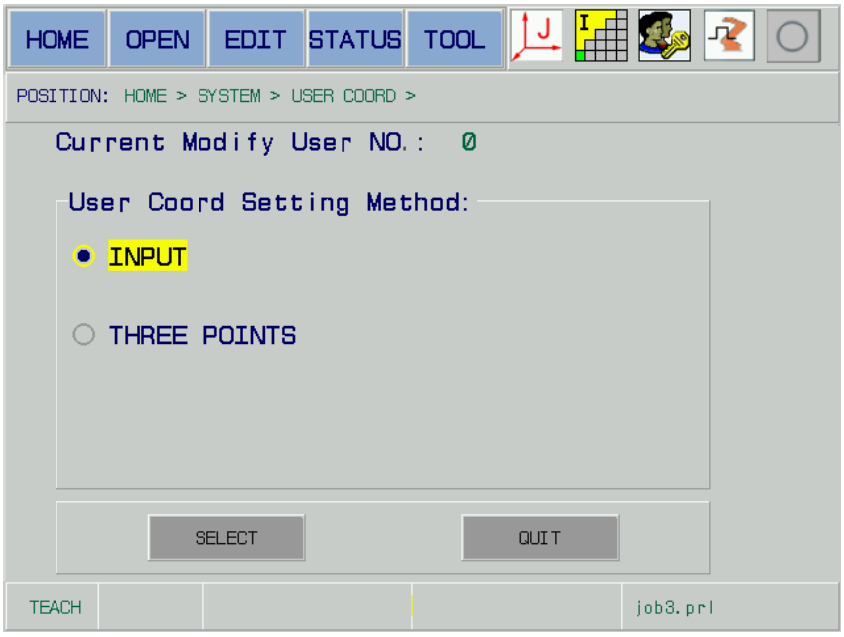


Fig. 3-10

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 can be selected the desired user coordinate methods by up/down direction button: direct input and 3-point methods.

Area 2 contains 2 buttons:

[SELECT] button: Enter the corresponding interface to set the user coordinate based upon the selected user coordinate setting information in the area 1. When the cursor is in the area 1, press [SELECT] to perform it.

[QUIT] button: Retreat from this interface, and then return to the {User coord} menu interface, or the [CANCEL] to return.

3.1.4.2 “User Coordinate Setting by Direct Input” Interface

If the area 2 of the {User Coordinate detailed setting} menu interface selects the direct input method, and then enter the direct input method to set the interface of the user coordinate after pressing [SELECT]. Refer to the Fig. 3-11.

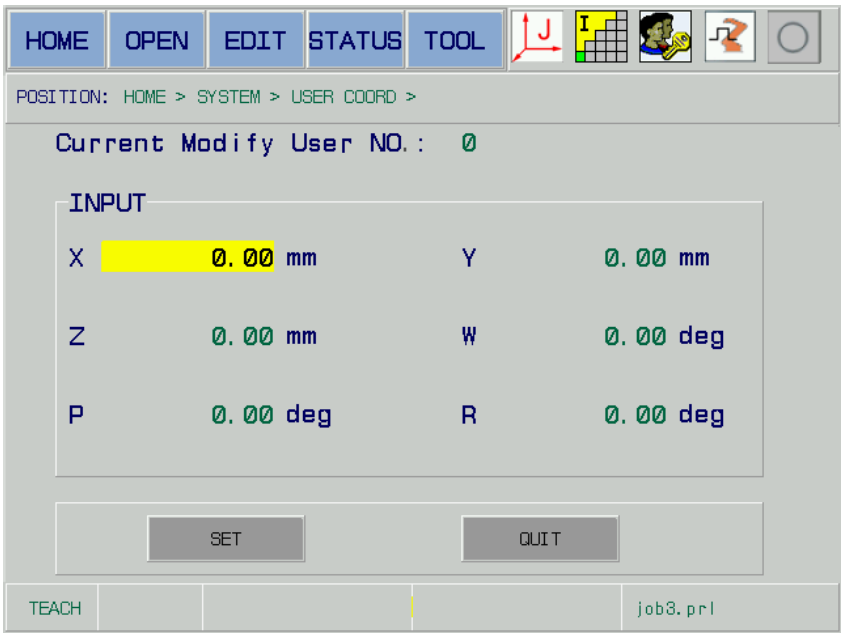


Fig. 3-11

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 displays X, Y, Z, W, P and R values, which can be directly input its numerical values by keyboard.

Area 2 contains 2 buttons:

[SET] button: Set the corresponding coordinate of the current selected tool coordinate number based upon the value in the area 1.

[QUIT button: Retreat from this interface, and then return to the {User coord} menu interface; or the [CANCEL] to return.

3.1.4.3 “Three-point Setting User Coordinate” Interface

If the area 2 of the {User coord} menu interface selects the 3-point method, and then enter the 3-point method to set interface of the user coordinate after pressing the [SELECT]. Refer to the Fig. 3-12.

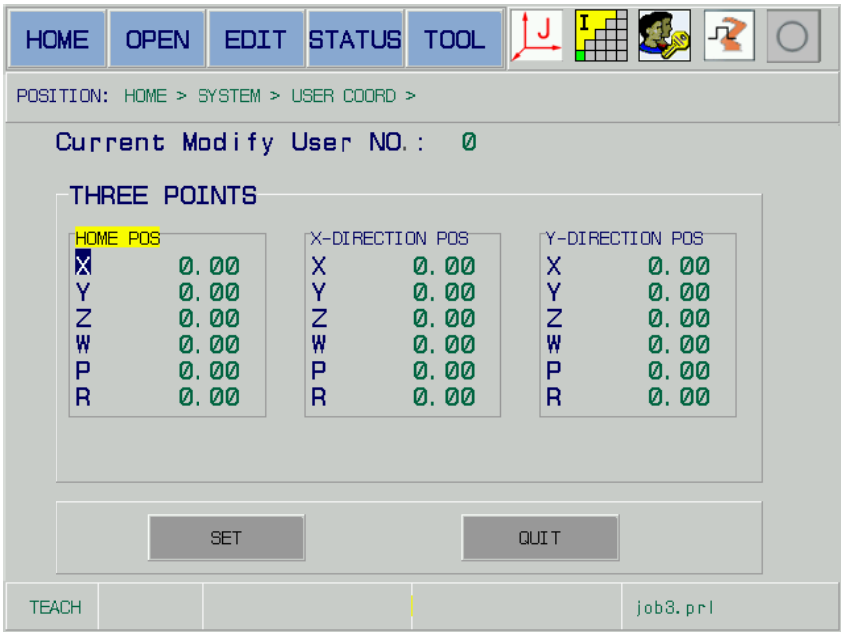


Fig. 3-12

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 displays the 3 points values, origin 1, X and Y direction points. Gain the current position value to assign this point and display by the [POSITION] after the cursor moves to one of the point. The numerical value of the point also can be directly input by up/down direction and numerical value buttons.

Area 2 contains 2 buttons:

[SET] button: Gain the value of 3 points based upon the area 1. Set the corresponding coordinate of the current selected tool coordinate number.

[QUIT] button: Retreat from this interface, and then return to the {User coord} menu interface, or the [CANCEL] to return.

3.1.5 {TABLE COORD} Menu Interface

The {Table Coord} menu interface is used for setting the Table coord. The table axis number should be set in the {table config} before entering this interface. Refer to the Fig.3-13 for details.

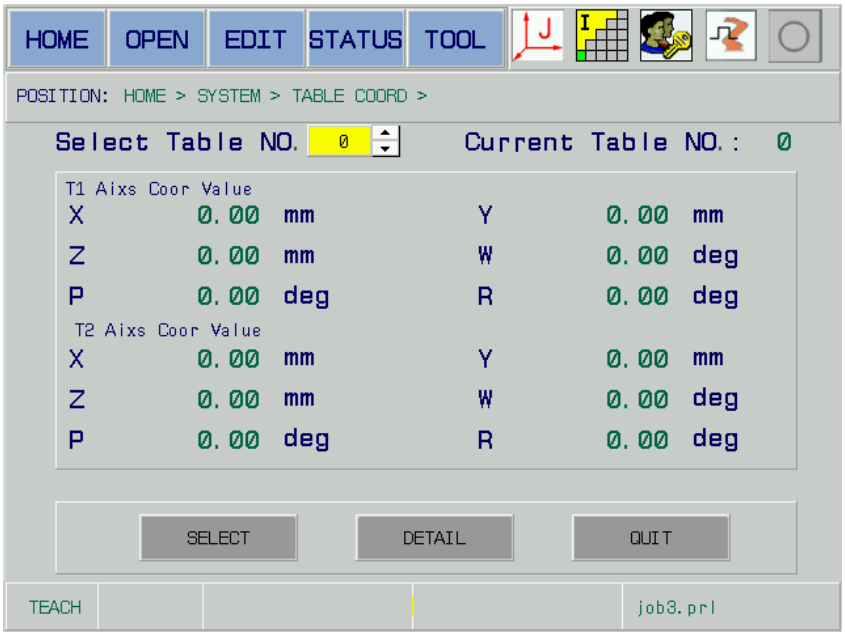


Fig. 3-13

This interface composes of 3 areas. The cursor can be shifted between the area 1 and area 2 by [TAB].

Area 1 can be selected the desired Table coord number 0~9 (The coordinate number can be directly input the number value by its buttons) by the up/down direction button.

Area 2 displays the corresponding coordinate value of the selected Table coord number in area 1. If the current table axis number configuration is 1 axis, and then this area is only displayed the value of the T1 axis.

Area 3 contains 3 buttons:

[SELECT] button: The selected Table coord number in the setting area 1 is regarded as the current Table coord number.

[DETAIL] button: The Table coord number displayed in the area 1 is performed the Table coord system setting. The direct input method (The 1st axis and the 2nd one can be used universally), 3-point method (It should be selected the 1st axis table in advance in the table configuration; otherwise, this area cannot be displayed the 3-point method setting), 5-point method (It should be selected the 2nd axis table in advance in the table configuration; otherwise, this area cannot be displayed the 5-point method setting).

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to return.

3.1.5.1 “Table coord Detailed Setting” Interface

If the area 3 in the {Table coord} menu interface selects the [DETAIL] button, and then enter the Table coord system setting method interface after pressing [SELECT]. Refer to the Fig. 3-14.

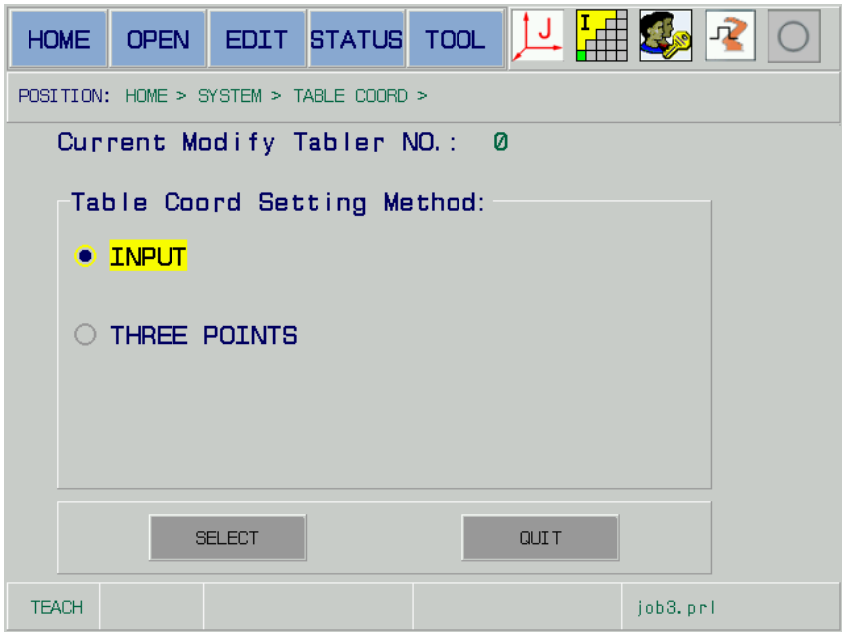


Fig. 3-14

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 can be selected the desired tool coordinate method by up/down direction button: Direct input method, 3-point method or 5-point method.

Area 2 contains 2 buttons:

[SELECT] button: Enter to the corresponding interface setting Table coord based upon the selected Table coord system setting information from area 1.

[QUIT] button: Retreat from this interface, and then return to the {Table coord} menu interface, or the [CANCEL] to return.

3.1.5.2 “Table coord Setting by Direct Input Method” Interface

If the area 1 in the {Table coord detailed setting} menu interface selects the direct input method, and then enter the direct input method to set Table coord interface after pressing [SELECT]. Refer to the Fig. 3-15.

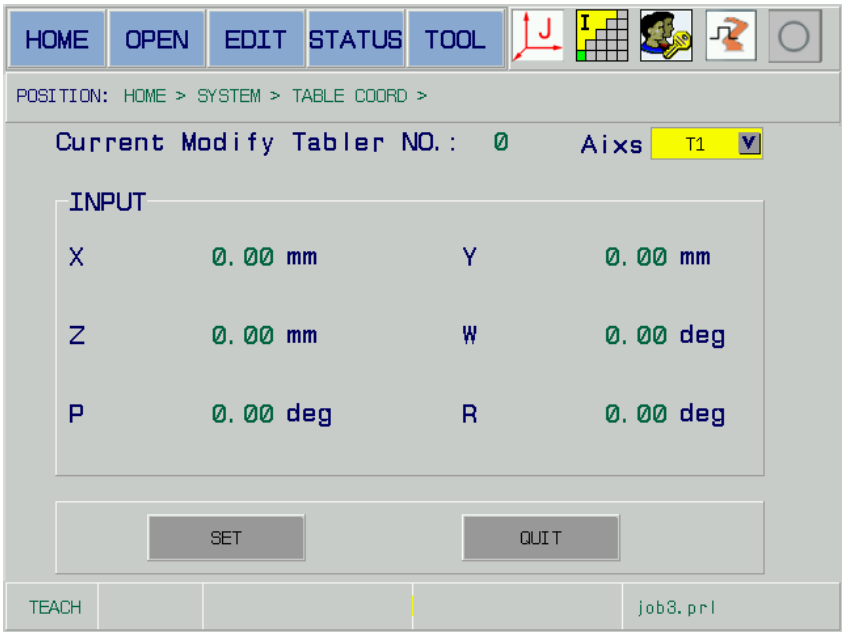


Fig. 3-15

This interface composes of 3 areas. The cursor can be shifted among the 3 areas by [TAB].

The left side of the area 1 is regarded as table number for displaying the current setting; the right can be shown the pull-down frame by [SELECT]; select the desired table axis T1, T2 (The table axis T1 and T2 should be checked the table configuration; Only set the T1 parameter if the configuration is the 1st axis table; however, the T1 and T2 parameters should be input by the 2nd axis one) to be set by up/down direction button.

Area 2 displays X, Y, Z, W, P and R values, which can be directly input its numerical values by keyboard.

Area 3 contains 3 buttons:

[SET] button: Set the coordinate correspondence with the selected Table coord number.

[QUIT] button: Retreat from this interface, and then return to the {Table coord} menu interface; or the [CANCEL] to return

3.1.5.3 “Table coord Setting by 3-point Method” Interface

If the area 1 in the {Table coord detailed setting} menu interface selects the 3-point method, and then enter the 3-point method to set Table coord interface after

pressing [SELECT]. Refer to the Fig. 3-16.

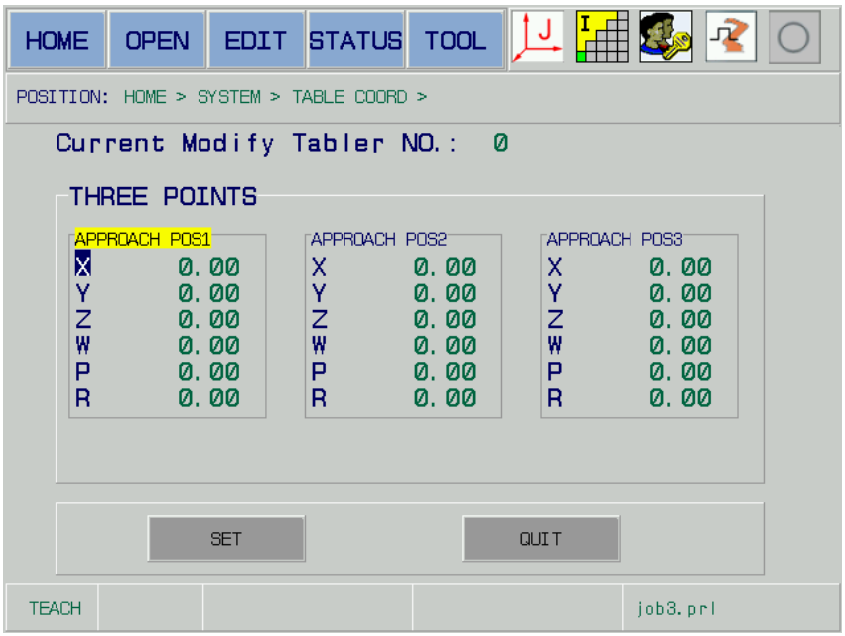


Fig. 3-16

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 displays the values of 3 points: Approach point 1, Approach point 2 and Approach point 3. Gain the current position value to assign this point and display by the [POSITION] after the cursor moves to one of the point. It also can be directly input by the up/down direction and numerical value buttons.

Area 2 contains 2 buttons:

[SET] button: Gain the value of 3 points based upon the area 1. Set the coordinate correspondence with the current selected tool coordinate number.

[QUIT] button: Retreat from this interface, and then return to the {Table coord} menu interface, or the [CANCEL] to return.

3.1.5.4 “Table coord Setting by 5-point Method” Interface

If the area 1 in the {Table coord detailed setting} menu interface selects the 5-point method, and then enter the 5-point method to set Table coord interface after pressing [SELECT]. Refer to the Fig. 3-17.

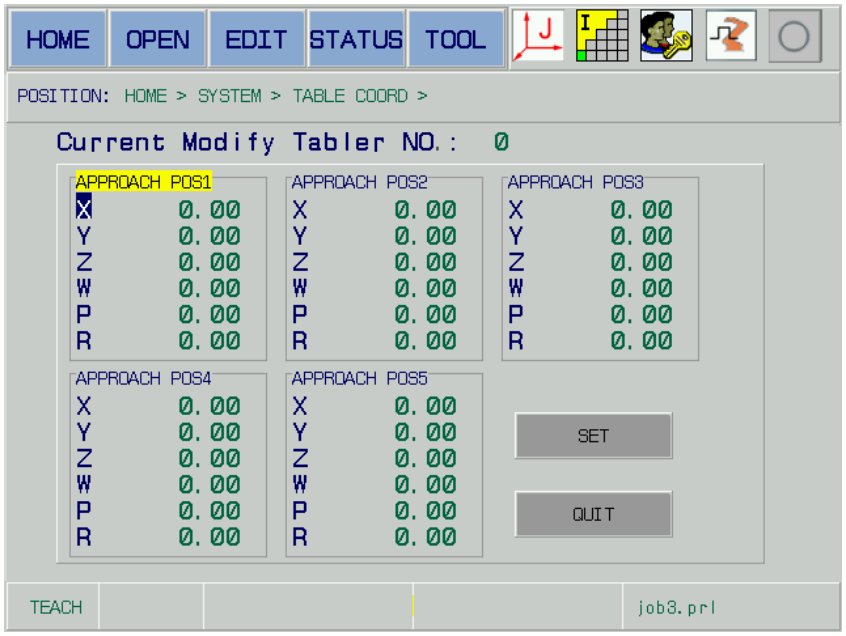


Fig. 3-17

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 displays the values of 5 points: Approach point 1, Approach point 2, Approach point 3, Approach point 4 and Approach point 5. Gain the current position value to assign this point and display by the [POSITION] after the cursor moves to one of the point. It also can be directly input by the up/down direction and numerical value buttons.

Area 2 contains 2 buttons:

[SET] button: Gain the value of 5 points based upon the area 1. Set the coordinate correspondence with the current selected tool coordinate number.

[QUIT] button: Retreat from this interface, and then return to the {Table coord} menu interface, or the [CANCEL] to retract.

3.1.6 {DATE/TIME} Menu Interface

This interface is used for setting the system time. Refer to the Fig. 3-18.

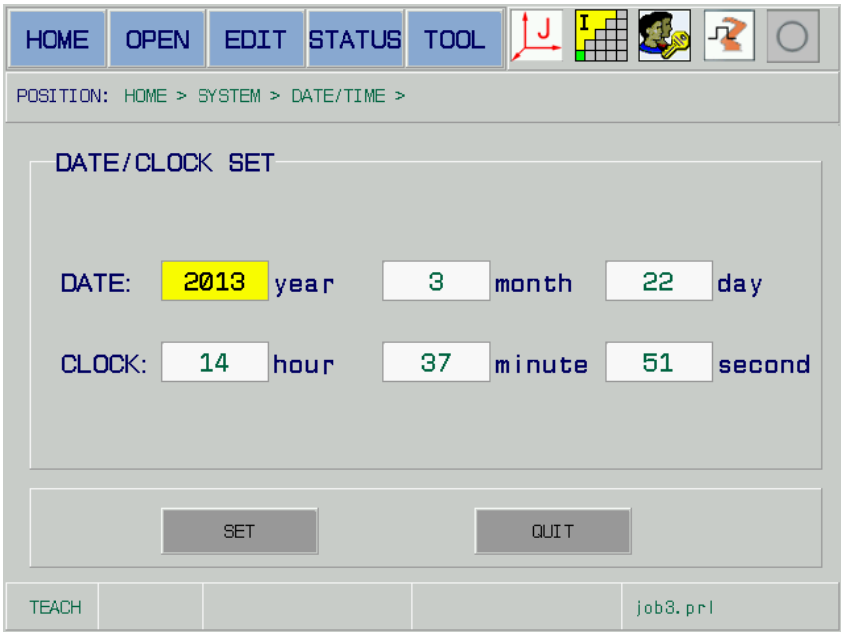


Fig. 3-18

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 sets the date and clock. Direction buttons can be moved the cursor to select the desired Year, Month, Day, Hour, Minute and Second. The system time value to be altered can be input by the numerical button. The year input range is 2000~2099; the month is 1~12; the day is 1~31; the hour is 0~23; the minute is 0~59 and the second is 0~59.

Area 2 contains 2 buttons:

[SET] button: Set the current system date and time based upon the input value in area 1.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.1.7 {CHANGE ID} Menu Interface

This interface is used for modifying the password setting of the Edit mode or Administration mode. The factory default password of the Edit mode is 888888; the default one of the Administration mode is 666666. If enters this interface in the Edit mode, only the password setting of the Edit mode can be altered; If enters this interface in the Administration mode, only the password setting of the administration

mode can be modified; and the factory mode can not modify the factory password in this interface. Refer to the Fig. 3-19 for the administration mode password setting.

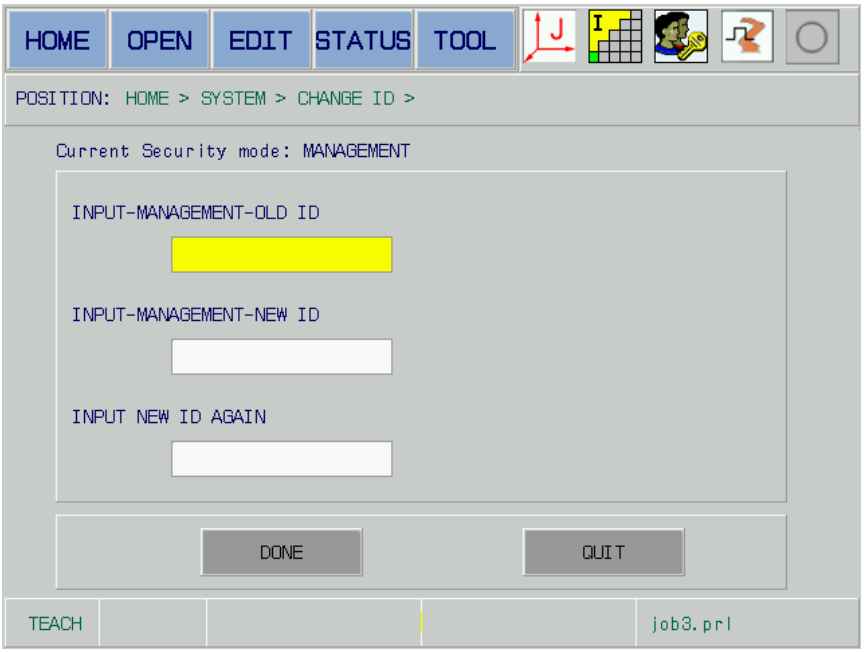


Fig. 3-19

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

There are 3 input frames in the area 1, which should be separately input the original password, new password and new password affirmation. Up to 6-digit for the password, 0 is the least.

Area 2 contains 2 buttons:

[DONE] button: Modify and set the corresponding mode password based upon the input in area 1. The password alteration setting is disabled if the original password or the new one and the new affirmation password are not match.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.1.8 {SYSTEM SPEED} Menu Interface

This interface is used for setting speed proportional value of current each velocity level and the starting-up default level, refer to the Fig. 3-20.

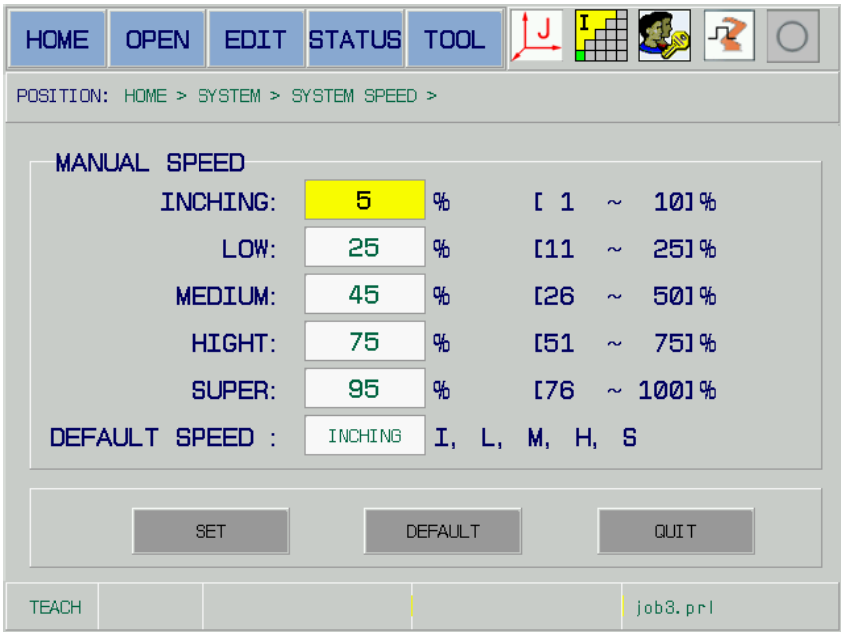


Fig. 3-20

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1: The velocity proportional value of each speed level and the starting-up default speed can be input by direction and numerical value buttons

Modify the percentage size of each speed level by numerical buttons. Alter the starting-up default speed by the [SELECT].

Area 2 contains 3 buttons:

[SET] button: Set the input value in the area to the system speed value.

[DEFAULT] button: Read the default proportional value of each speed level and the starting-up default speed value and display to the area 1.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.1.9 {MASTER JOB} Menu Interface

This interface is used for setting main program call in the remote mode; refer to the Fig. 3-21.

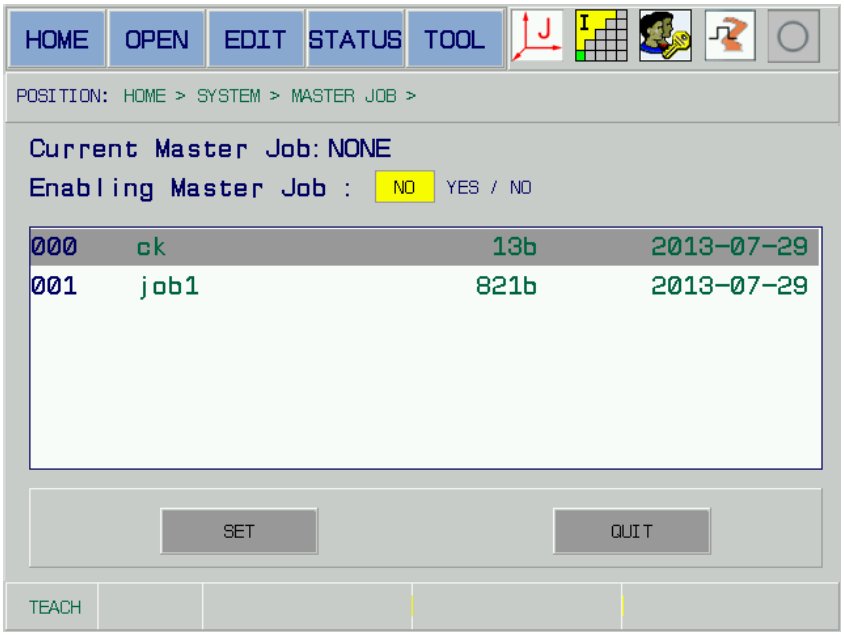


Fig. 3-21

This interface composes of 3 areas.

Area 1: Select shifting “YES” or “NO” by [SELECT].

Area 2: Display a file list; select the main program by direction buttons or page buttons.

Area 3 contains 2 buttons:

[SET] button: Set the SELECT of area 1 and area 2 to the system.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.1.10 {TABLE CONFIG} Menu Interface

The {Table config} menu interface is used for setting the required table axis number for current application; refer to the Fig. 3-22.

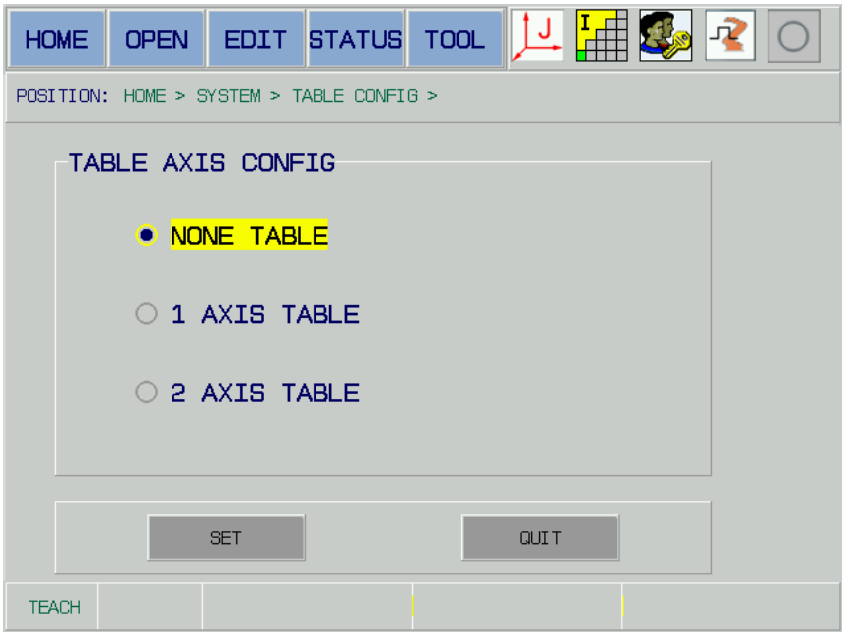


Fig. 3-22

This interface composes of 2 areas. The cursor can be shifted between the 2 areas by [TAB].

Area 1 can be selected the table axis number to be set by up/down direction button. When the cursor locates on this area, press the [SELECT], and then the cursor will automatically skip to the [SET] button of the area 2.

Area 2 contains 2 buttons:

[SET] button: Set the current table configuration based upon the selected one in area 1. It can be enabled by restarting the system after setting.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.2 {JOB} Menu

The {JOB} menu composes of 3 submenu; select the {JOB} menu by [SELECT], the submenu may appear; refer to the Fig. 3-24.

Fig. 3-24

After display the submenu, the cursor is at the last leaving position of this submenu. Select the submenu by up/down direction button; close or retract this submenu by the left/right or [CANCEL] button.

3.2.1 {New Job} Menu Interface

The {New Job} menu interface is used for creating a new program file; refer to the Fig. 3-25:

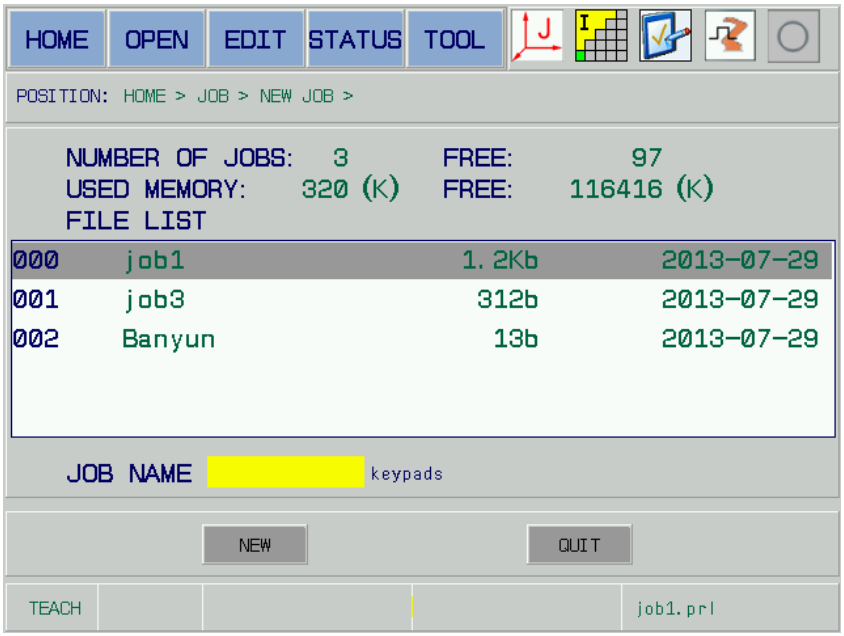


Fig. 3-25

This interface composes of 3 areas.

Area 1: Display the current system overall program files by the file list; browse the program file information by the up/down, [PAGE UP/DOWN] and [SHIFT] buttons.

Area 2: Display the new job name; enable the soft keyboard by [SELECT]; input the desired program name by soft keyboard or directly input the number as the program name by numerical value button.

Area 3 contains 2 buttons:

[NEW] button: Create a program file based upon the inputted new job name in the area 2, and then open this file; compile this file after entering the edit interface.

[QUIT] button: Quit the new program operation, retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.2.2 {JOB List} Menu Interface

{Job list} menu interface is used for performing the copy, delete, rename of the program file; refer to the Fig. 3-26:

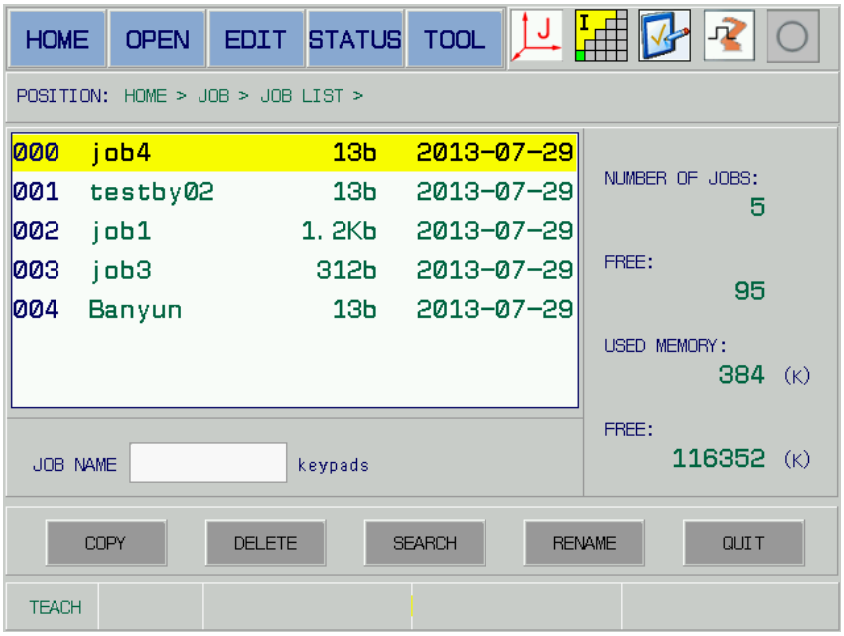


Fig. 3-26

This interface composes of 4 areas.

Area 1: Display the overall program files of current system by the file list; browse the program file information by the up/down, [PAGE UP/DOWN] and [SHIFT] buttons.

Area 2: Input the program file name; enable the soft keyboard by [SELECT]; input the program name by soft keyboard or directly input the number as the program name

by numerical value button.

Area 3 contains 5 buttons:

[COPY] button: The cursor pointed program file based upon area 1 is regarded as the source file; the program file name in the area 2 is treated as the object file; copy the source one to the object one.

[DELETE] button: The cursor pointed program file in area 1 can be deleted. The system may appear the “DELET file affirmation” dialogue frame before deleting, confirm whether deleting this operation. When the cursor locates on the area 1, the file can be deleted by [DELET], too.

[SEARCH] button: The inputted program file name based upon the area 2 is regarded as object name, search the object file, and then shift the cursor to the information record of this object file.

[RENAME] button: Rename the current cursor pointed program file in the area 1 based upon the inputted program file in the area 2.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

Area 4 displays the file information of the current system, which includes the memorized program number, the remained program number, the used storage value and the remaining storage value etc.

3.2.3 {SD CARD} Menu Interface

The {SD CARD} menu interface is used for program copy each other between the system and external U disk; refer to the Fig. 3-27:

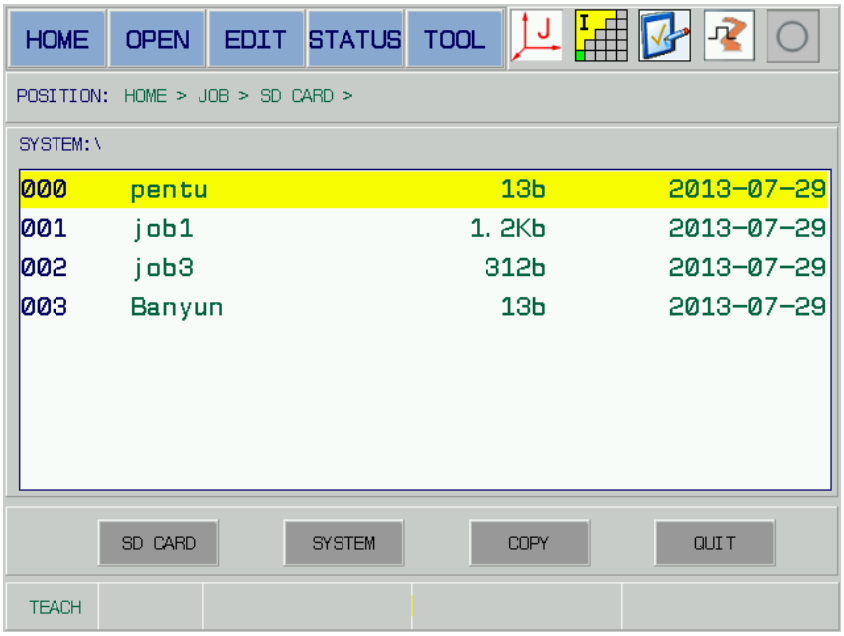


Fig. 3-27

The interface composes of 2 areas.

There is current path name above the area 1, “System:\” means the displayed file in the list is regarded as the robot’s system file. If the path name is “U” disk: \PIC\” means the displayed file in the list is the one in the fold PIC of the U disk Root. Select the program to be copied by the up/down direction button, copy the program by [SELECT]. In this case, if the cursor is in the robot system file, the copy operation: copy the robot system file to the U disk path; if the cursor in the U disk file, the copy operation: copy the U disk file to the robot system.

Area 2 contains 4 buttons:

[SD CARD] button: Shift the cursor to the U disk file, read the current path program from the user U disk. Up to 400 files.

[SYSTEM] button: Shift the cursor to the system file, read the overall information from the system.

[COPY] button: Copy the current selected robot system file (U disk file) by the cursor to the U disk (Robot system).

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.3 {PARAMETER} Menu

The overall parameters setting in this menu should be performed by the factory authorized. Refer to the “Maintenance Manual” offered from factory for detailed operations.

3.4 {VARIABLE} Menu

{Variable} menu composes of 5 submenus, its submenu may appear selecting {Variable} menu by [SELECT]; refer to the Fig. 3-28.

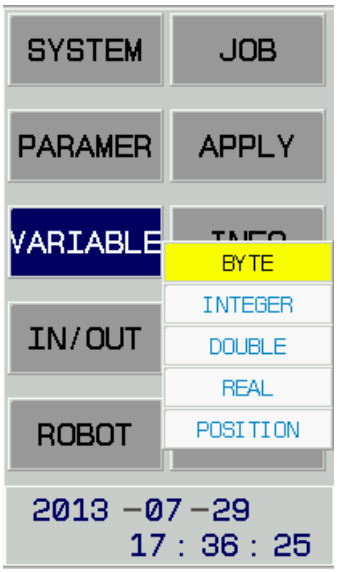


Fig. 3-28

The cursor is at the last leaving position after the submenu appears. Select the submenu by up/down direction button; close or retract the submenu interface by left/right or [CANCLE] button.

The allowance value range of the byte variable is 0~255, the allowance value range of integer variable is -32768~32767, the allowance value range of the double variable is -2147483648~2147483647, the allowance value range of the real variable is -3.4E+38 ~ 3.4E38.

The byte, integer, double and real variable interfaces are shared with the same operation method, and therefore, only the real and the position variable interface are shown below.

3.4.1 {REAL} Menu Interface

{Real} menu interface is used for checking and modifying the real variable information; refer to the Fig. 3-29.

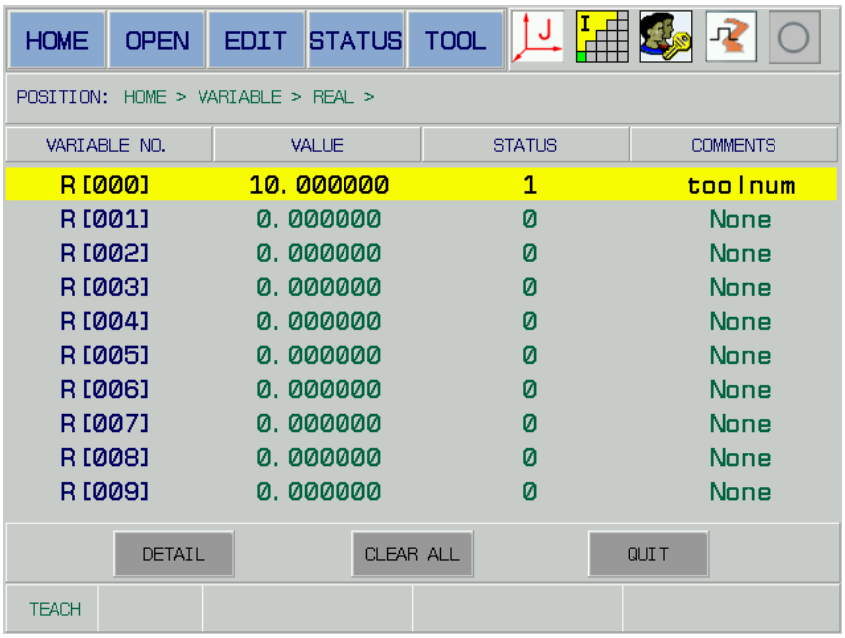


Fig. 3-29

This interface composes of 2 areas.

Area 1 displays 100 REAL variable information, which includes variable name, variable value, variable state and variable note. When program reappears, this area may display the variable value alteration in the program by real-time. Move the cursor to check variable information by up/down, [PAGE UP/DOWN], [SHIFT] buttons. Input the variable series number by numerical value button, for example, 45 (In this case, the system does not display the inputted “45” from user), and then the cursor may be moved to the variable R[045] by [INPUT] at the rapid rate. Enter the variable detailed modification interface of the cursor positioned by [SELECT].

Area 2 contains 2 buttons:

[DETAIL] button: Select this button entering the variable modification interface based upon the cursor’s variable in area 1.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.4.1.1 “Real Variable Detail” Interface

Enter this interface by the [SELECT] or the [DETAIL] in area 1 of the {REAL} menu interface, and then the variable information alteration can be performed. Refer to the Fig. 3-30.

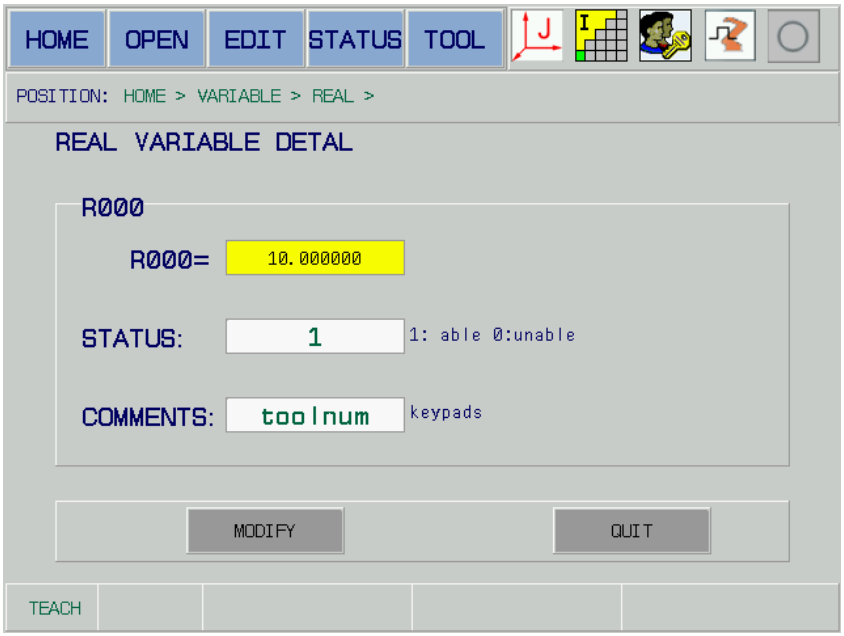


Fig. 3-30

This interface composes of 2 areas.

Area 1 displays the INTEGER variable information. Move the cursor to the corresponding edit frame and input the value to be modified. The variable explanation can be directly input by the number button, also, it can be enabled the soft keyboard by [SELECT].

Area 2 contains 2 buttons

[MODIFY] button: Save the inputted value from the area to this variable, and the complete the modification operation; lastly shift to the {REAL} menu interface.

[QUIT] button: Retreat from this interface, and then return to the {REAL} menu interface, or the [CANCEL] to retract.

3.4.2 {POSITION} Menu Interface

{Position} menu interface is used for checking or modifying the variable information of the Cartesian posture. Refer to the Fig. 3-31.

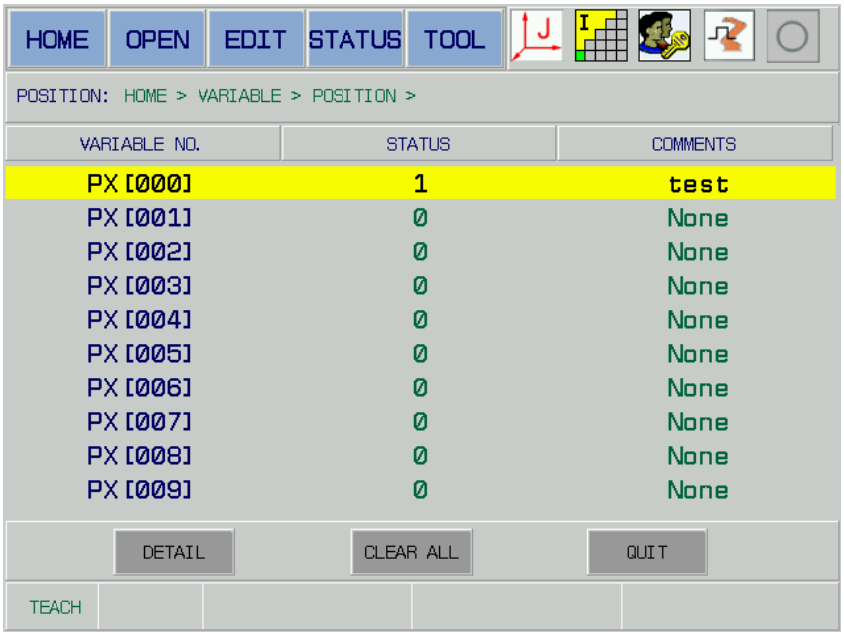


Fig. 3-31

This interface composes of 2 areas.

Area 1 displays 100 Position variable information, which includes variable name, variable value, variable state and variable note. The variable value displays at the "Position **Variable** Detail" interface. Move the cursor to check variable information by up/down, [PAGE], [SHIFT] buttons. Input the variable series number by numerical value button, for example, 78 (In this case, the system does not display the inputted "78" from user), and then the cursor may be moved to the variable PX[078] by [INPUT] at the rapid traverse rate. Enter the variable detailed modification interface of the cursor positioned by [SELECT].

Area 2 contains 2 buttons:

[DETAIL] button: Select this button entering the variable modification interface based upon the cursor's variable in area 1.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.4.2.1 "Position Variable Detail" Interface

If the area 1 presses the [SELECT] or selects the [Detail] button in the {Position} menu interface, and then enter this interface; the Position variable information can be modified. Refer to the Fig. 3-32.

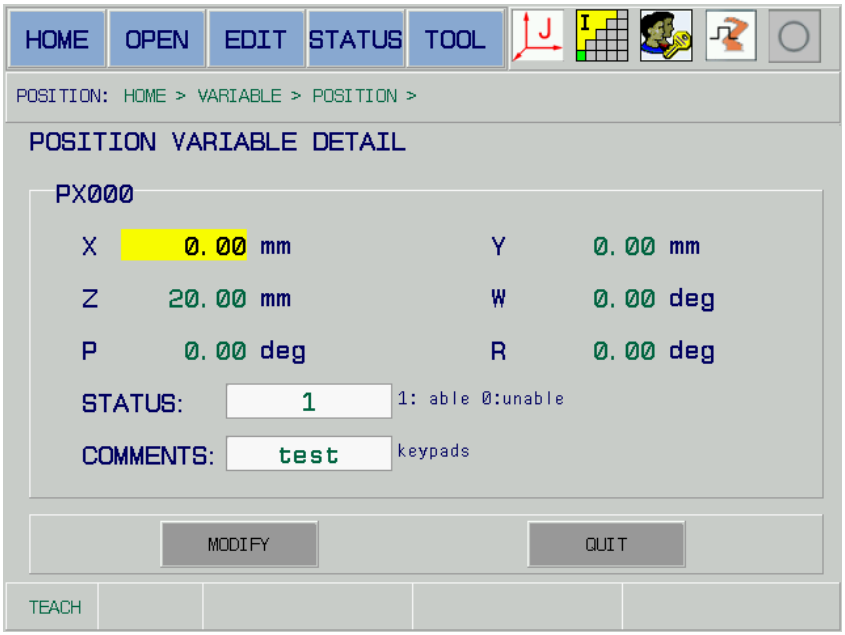


Fig. 3-32

This interface composes of 2 areas.

Area 1 displays the position type variable information, move the cursor to the corresponding edit frame and then input the desired value. X, Y, Z, W, P, R value can be gained the current posture value by [POSITION]. The variable explanation can be not only directly input by number buttons, but also enabled the soft keyboard by [SELECT].

Area 2 contains 2 buttons.

[MODIFY] button: Save the inputted value from the area to this variable, and the complete the modification operation; lastly shift to the {Position} menu interface.

[QUIT] button: Retreat from this interface, and then return to the {Position} menu interface, or the [CANCEL] to retract.

3.5 {System Information} Menu

The {System information} menu composes of 3 submenus. Select the {System information} menu by [SELECT], the submenu may issue; refer to the Fig. 3-33.

Fig. 3-33

The cursor is at the last leaving position after the submenu appears. Select the submenu by up/down direction button; close or retract the submenu interface by left/right or [CANCLE] button.

3.5.1 {ALARM HISTORY} Menu Interface

{ALARM HISTORY} menu interface is used for browsing about 20 pieces alarm history; refer to the Fig. 3-34.

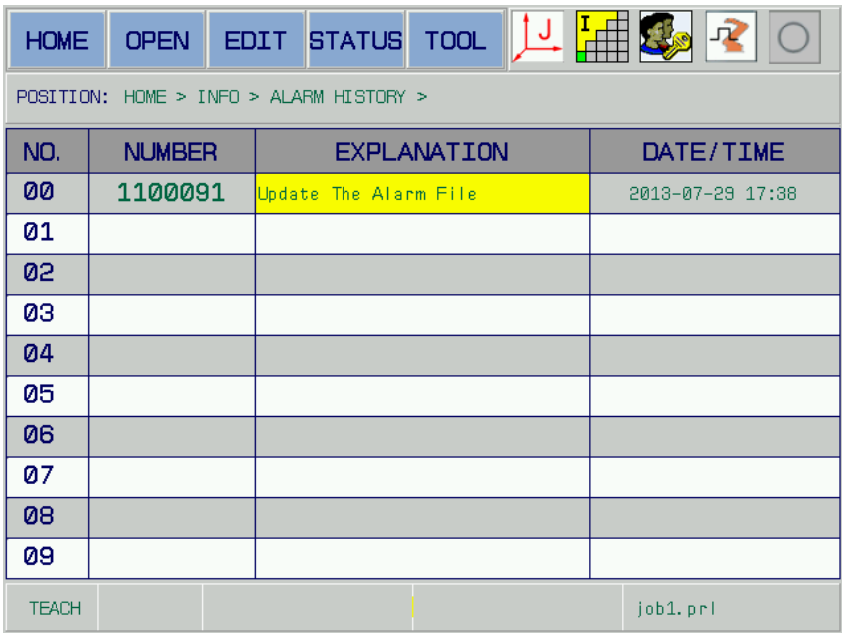


Fig. 3-34

This interface displays some information, such as the alarm number, alarm explanation, alarm time etc. which can be browsed by up/down or [PAGE] button.

Retreat from this interface by [CANCEL], and then return to the main page.

3.5.2 {VERSION} Menu Interface

{Version} menu interface is used for displaying the version information of current system. Refer to the Fig. 3-35.

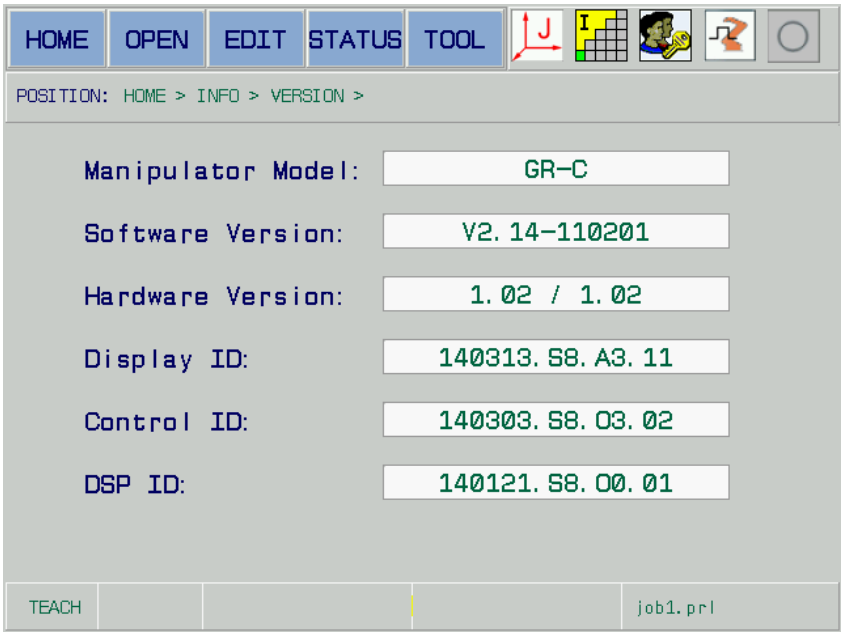


Fig. 3-35

This interface displays the version information, which includes Manipulator Mode, Software Version, Hardware Version, Display ID, Control ID and DSP ID etc.

Retreat from this interface by [CANCEL].

3.5.3 {KEY DIAGNOSIS} Menu Interface

{KEY diagnosis} menu interface is used for diagnosing whether each key is normal; refer to Fig. 3-36.

Fig. 3-36

In this interface, press one button on the keyboard, the corresponding button on the interface may gain the cursor focus, which means the button is enabled; otherwise, it is disabled.

Retreat from this interface by [CANCEL], and then return to main page.

3.6 {IN/OUT} Menu

There is no submenu item in the {In/Out} menu, enter the {In/Out} menu interface by [SELECT]. This interface is used for controlling, checking 32-digit signal output ports, and 32-digit signal input ports. Refer to the Fig. 3-37:

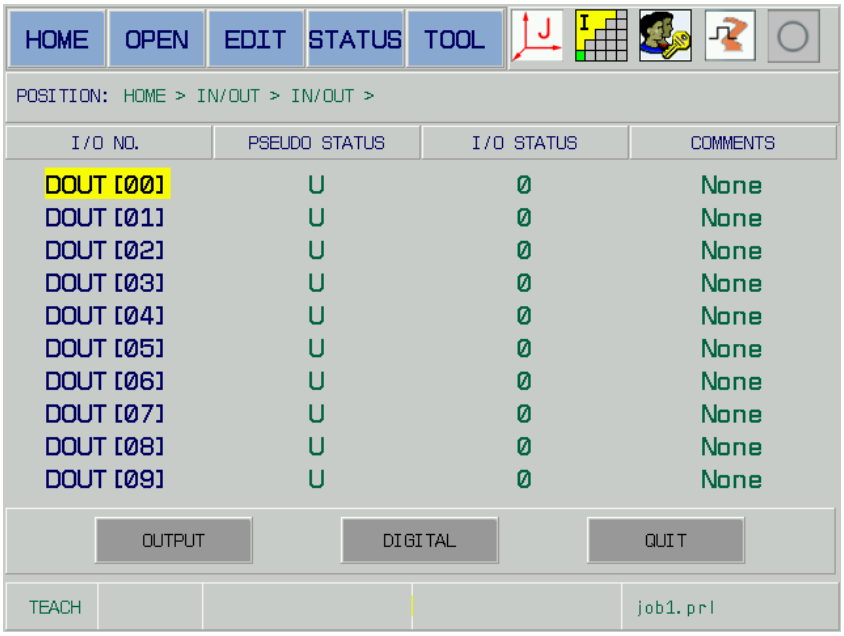


Fig. 3-37

This interface composes of 2 areas.

Area 1 displays port information, which includes “I/O NO.”, “Pseudo state”, “I/O state” and “Comments” etc. The “Pseudo state” is temporarily disabled. Move the cursor to the “I/O state”, the digit signal output can be controlled by the numerical value 0 and 1; 0 means OFF, 1 means ON. The digit signal input can not be controlled instead of inputting from outside. Move the cursor to the “Note”, active the soft keyboard by [SELECT] to modify the corresponding notes. Browse the port information by the up/down, [PAGE], [SHIFT] button. When the cursor locates on the “I/O NO.”, input the port number by the numerical value button, for example 13 (In this case, the system does not display the input “13” where from the user); the cursor then can be rapidly moved to the DOUT[13] or DIN[13] by [INPUT] again.

Area 2 contains 3 buttons:

[OUTPUT/INPUT] button: The button changes between the [INPUT] and [OUTPUT] after select this button by [SELECT].

[DIGITAL/ANALOG] button: The button changes between the [DIGITAL] and [ANALOG] after select this button by [SELECT]. At present, this function does not work.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.7 {POINT} Menu

There is no submenu item in the {Point} menu, enter the {Point} menu interface by [SELECT]. This interface is used for checking the teaching point information of the program file. Refer to the Fig. 3-38:

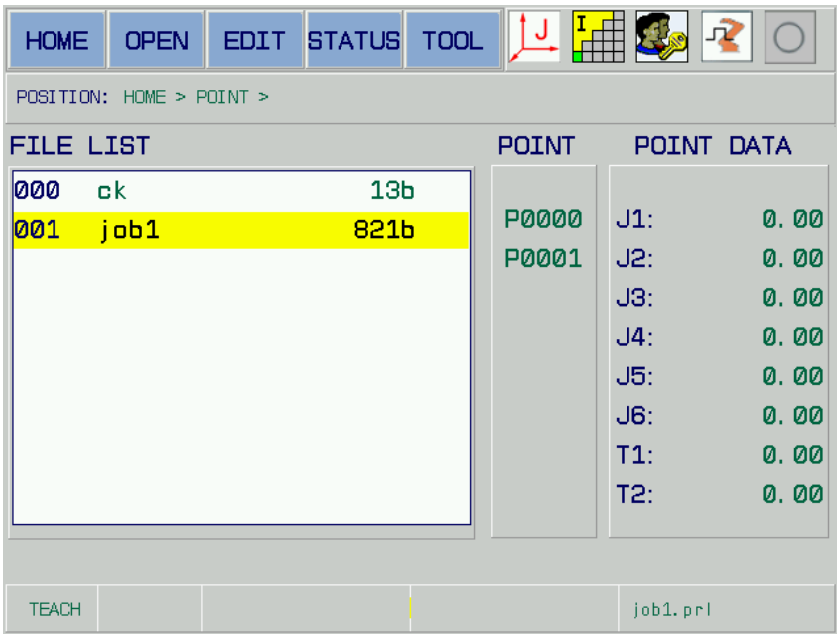


Fig. 3-38

This interface composes of 3 areas.

Area 1: Display the overall program file information by the file list; move the cursor by the up/down, [PAGE], [SHIFT] button; browse the program file to select the file of the teaching point.

Area 2: Display the overall teaching point of the cursor specified program file in the area 1. Move the cursor by the up/down, [PAGE], [SHIFT] button. Check the overall teaching points information from this file.

Area 3: Display the selected program file in the area 1 and the each axis information along with the teaching point in the area 2. If the system allocates the external axis, and the external axis value correspondence with the teaching point will be displayed in this area.

The cursor only can be shifted between the area 1 and 2.

Retreat from this interface by [CANCEL], and then return to the main page.

3.8 {ROBOT} Menu

{ROBOT} menu composes of 3 submenus, select the {ROBOT} menu by [SELECT], its submenu may occur; refer to the Fig. 3-39.

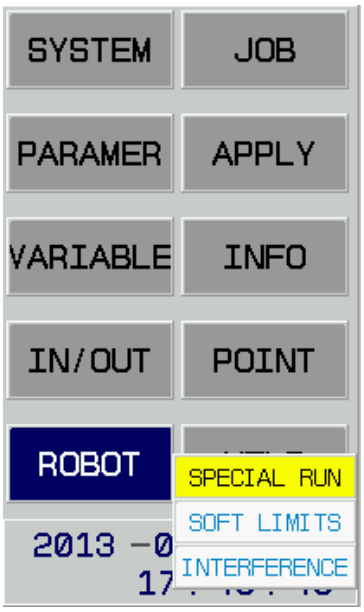


Fig. 3-39

The cursor is at the last leaving position after the submenu appears. Select the submenu by up/down direction button; close or retract the submenu interface by left/right or [CANCLE] button.

3.8.1 {SPECIAL RUN} Menu Interface

This menu interface is used for setting the play mode. Refer to the Fig. 3-40.

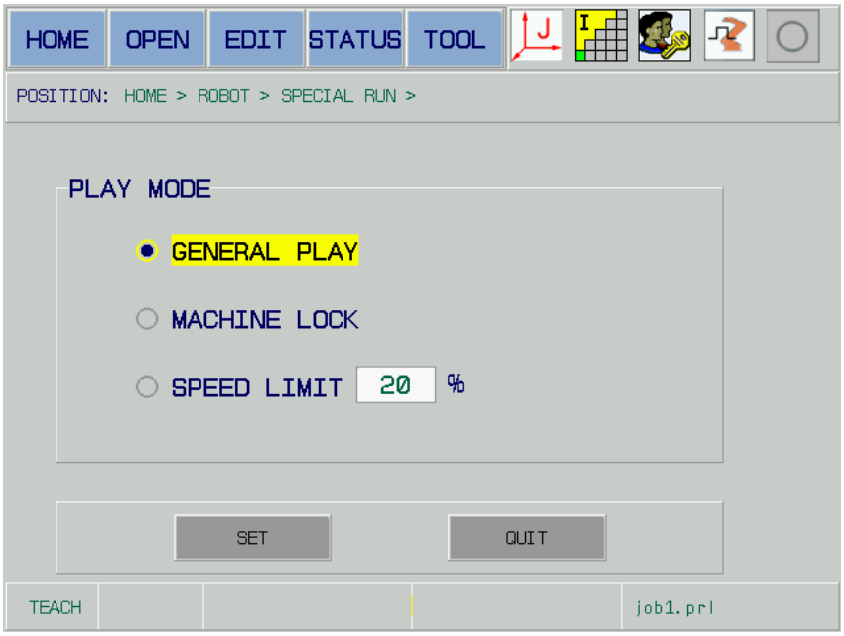


Fig. 3-40

Area 1: Display 3 play operation modes, one of can be selected by the direction buttons.

Area 2, it contains 2 buttons:

[SET] button: Set the selected method from the area 1 as the current play operation method.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.8.2 {Soft Limit} Menu Interface

This menu is used for setting the soft limit; refer to the Fig. 3-41.

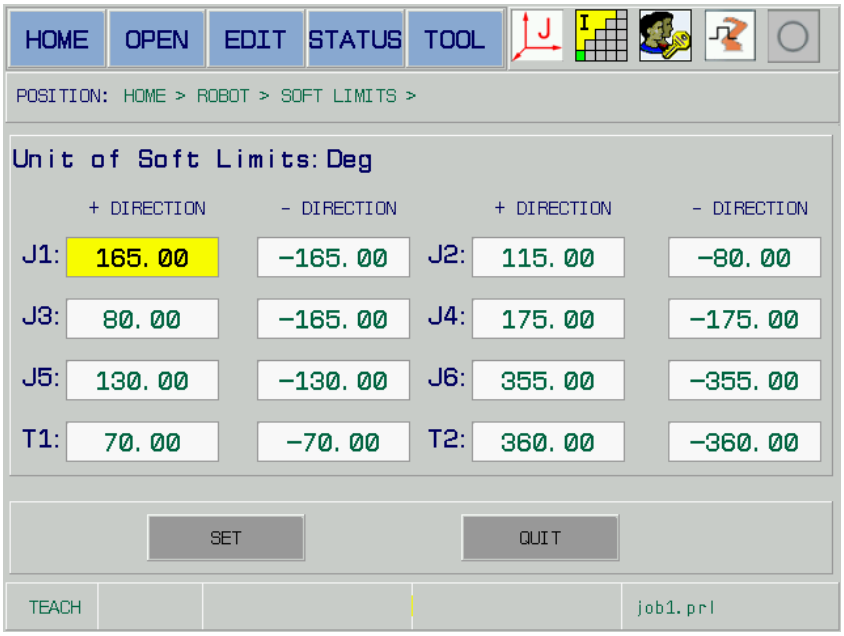


Fig. 3-41

This interface composes of 2 areas.

Area 1: Display the positive/negative soft limit value of the current system. Move the cursor by direction buttons; input the limit value by numerical value button. Wherein, T1 and T2 are the value of the external axis; the interface will not display the value of T1 and T2 if the external axis configuration number is regarded as 0.

Area 2, it contains 2 buttons:

[SET] button: Set the inputted limit value from the area 1 as the current limit value.

[QUIT] button: Retreat from this interface, and then return to the main page, or the [CANCEL] to retract.

3.8.3 {Interference} Menu Interface

This menu interface is used for setting the interference area. Refer to the Fig. 3-42.

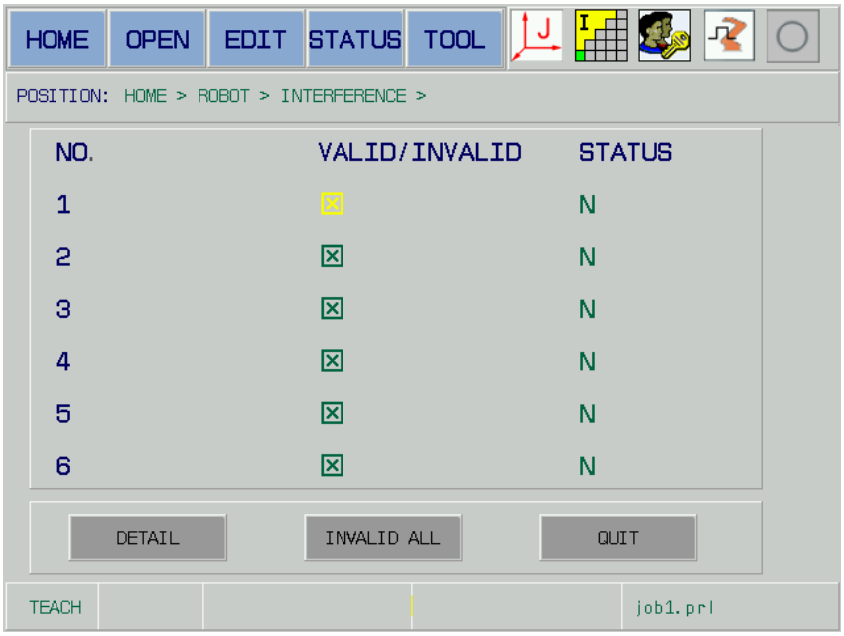


Fig. 3-42

This interface composes of 2 areas.

Area 1: Display the set interference area information of current system, which includes interference area number, effectiveness of the current area, whether the system enters the current interference area. Move the cursor by up/down direction button in the enabled/disabled list. The corresponding interference area number of the cursor can be set whether it is enabled by [SELECT], "×" means invalid, "√" means valid.

Area 2: it contains 3 buttons.

[DETAIL] button: Enter the interface of the detailed setting interference area.

[INVALID ALL] button: Set the overall interference areas as disabled.

[QUIT] button: Retreat from this interface, and then return to the main page.

3.8.3.1 "Interference Area Detailed Setting" Interface

In the {Interference} menu interface, enter this interface by [DETAIL] button. This interface is used for detailed setting of the interference area. Refer to the Fig. 3-43.

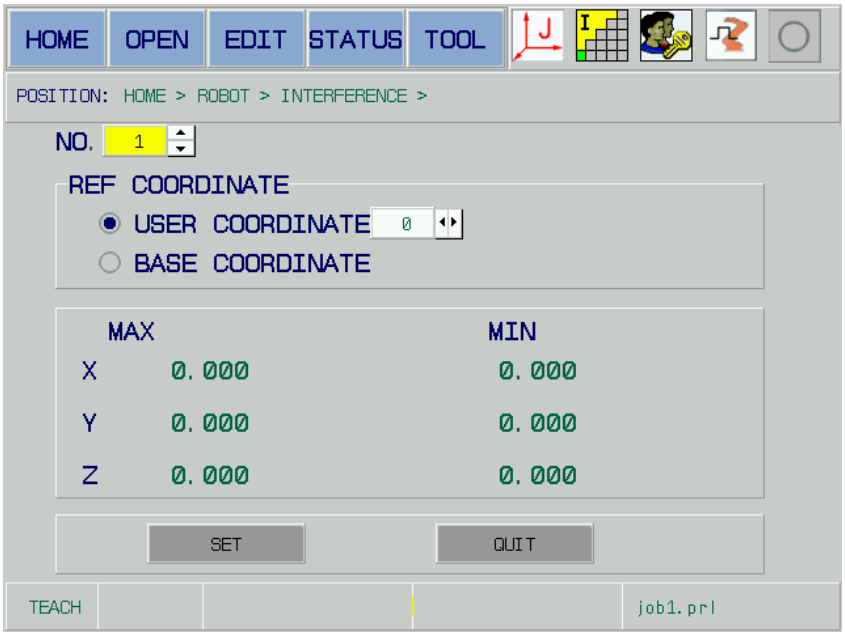


Fig. 3-43

This interface composes of 4 areas.

Area 1: Select the desired interference area number 1~6 by up/down direction button.

Area 2: Select the reference coordinate system in the interference area by up/down direction button. If the user coordinate system is selected, the user coordinate system number is then can be selected by left/right button.

Area 3: Display the Max. value and the Min. value in the interference area. The values of the 2 points can be input by numerical value buttons, as well gain it by the [POSITION].

Area 4, it contains 2 buttons:

[SET] button: Set the corresponding interference area information based upon the inputted content from previous 3 areas. If it sets, the interface shifts to the {Interference area} menu interface; simultaneously, the settled interference area just now turns into valid.

[QUIT] button: Retreat from this interface, and then return to the {Interference} menu interface.

3.9 {HELP} Menu

There are 2 submenus in the {Help} menu. When the {Help} menu is selected by [SELECT], its submenu may occur. Refer to the Fig. 3-44.

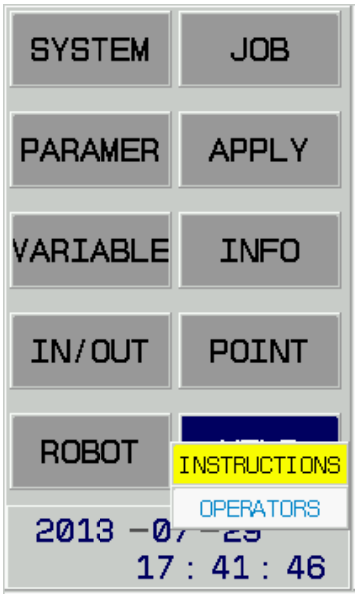


Fig. 3-44

The cursor is at the last leaving position after the submenu appears. Select the submenu by up/down direction button; close or retract the submenu interface by left/right or [CANCLE] button.

3.9.1 {INSTRUCTIONS} Menu Interface

This menu interface is used for browsing the brief explanation of each command. Refer to the Fig. 3-45.

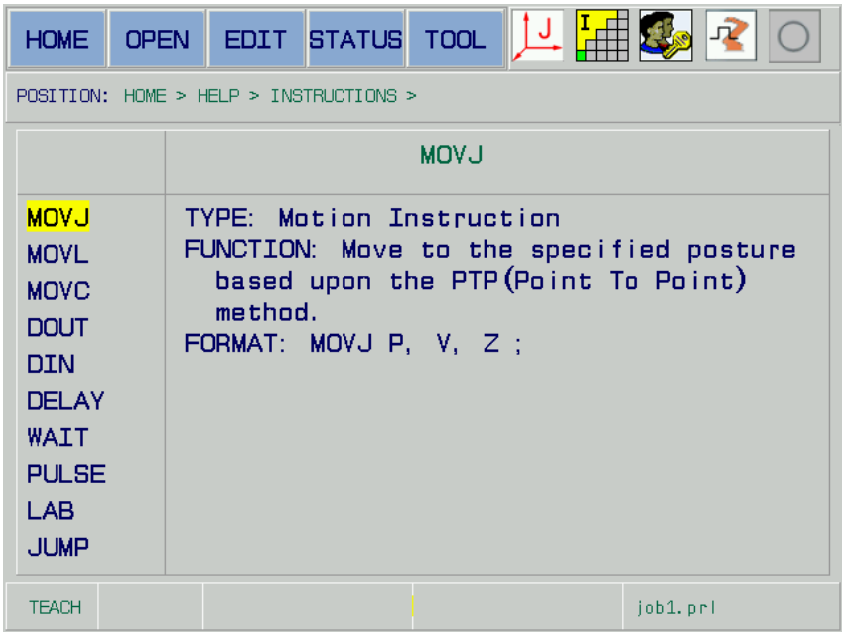


Fig. 3-45

This interface composes of 2 areas.

Area 1: Display the command list. Move the cursor by the [PAGE], [SHIFT] and up/down direction button, and then browse other commands.

Area 2: Display the brief explanation of the command based upon the cursor specified command from area 1.

Retreat from this interface and then return to the main page by [CANCEL].

3.9.2 {OPERATORS} Menu Interface

This menu interface is used for browsing the operation explanation file; refer to the Fig. 3-46.

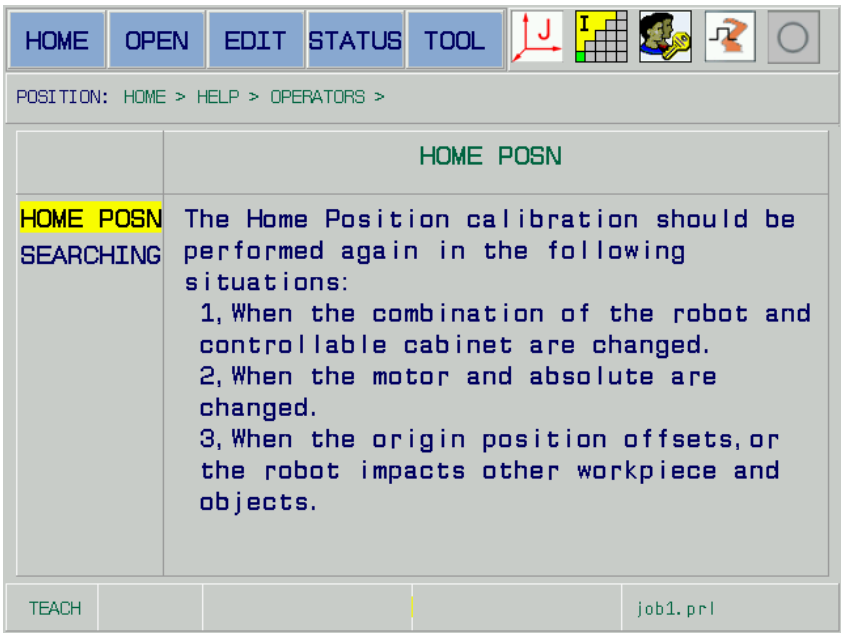


Fig. 3-46

This interface composes of 2 areas.

Area 1: Display the operation list. Move the cursor by the [PAGE], [SHIFT] and up/down direction button, and then browse other operation themes. Currently, only one operation theme, that is setting zero.

Area 2: Display the brief explanation of this operation theme based upon the specified theme from the area 1.

Retreat from this interface and then return to the main page by [CANCEL].

CHAPTER FOUR ROBOT PROGRAMMING

4.1 The Basic Programming Concept

4.1.1 Position, Posture and Teaching Point

- **Position**

The position means the position coordinate of robot TCP in the Cartesian space, which is indicated by (X, Y and Z).

- **Posture**

Posture is the orientation of the robot tool in the space, which shows by (W, P, and R) and indicates the tool rotation angle along with each axis of the fixed coordinate system.

- **Point**

A teaching point expresses by the zero point angle for the corresponding 6 joints. One teaching point confirms one robot tool position and posture in the robot basis coordinate system. This point indicates by P0~P999 or P*. If the teaching point does not used in the next program (for example: translation), it can be indicated by P* regardless of the series number of this point. If the system matches with the table, the teaching point is included angle value along with each joint of the table.

4.1.2 Robot Motion Mode

There are 3 modes of robot motion: Teach, Play and Remote modes.

4.1.2.1 Teach Mode

In the Teach mode, you can move the robot or teach, compile, alter the operation program or perform the parameter setting and file operation. However, the corresponding authorities should be executed here. Refer to the System authority in “Chapter nine Safety Mode”.

Teaching inspection: It is performed the debugging operation for the compiled program: single or continuous mode.

4.1.2.2 Play Mode

The Play mode is a procedure that robot performs the user program and completes predetermine operation and task. In the play mode, you can select the operation program and check the monitoring information instead of performing any operations about the program editor system parameter setting.

4.1.2.3 Remote Mode

In the remote mode, the following operations can be specified by external signal input: Switch on the servo power, start, call the main program and operate the related operations.

4.2 Robot Coordinate System

4.2.1 Brief

The coordinate system of robot contains of joint, base, wrist, tool and user coordinate systems; each definition and relationships of each coordinate system shows as the Fig. 4-1.

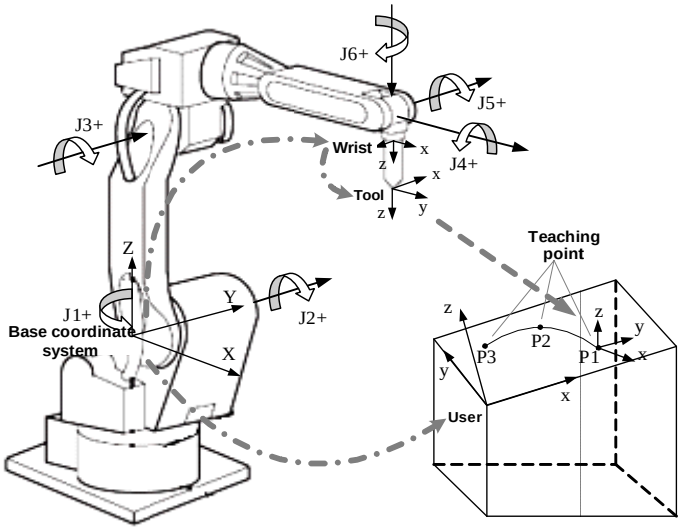


Fig. 4-1 Robot coordinate system

The base coordinate system is regarded as the foundation coordinate system of the robot system; other Cartesian coordinates are directly or indirectly based on this coordinate system. Wherein, the wrist coordinate system is the implication one, which

is based upon the base coordinate system definition, and fixes on the flange of the robot wrist; its pose in the base coordinate system can be affirmed by robot's kinesiology.

Tool coordinate system is based on the definition of the wrist coordinate system, and its concrete pose can be determined by the tool coordinate system standard function or by inputting the related parameter directly. (Refer to the Section "8.1.2 Tool Coordinate System Setting")

The user coordinate system is based on the definition of the base coordinate, which can be described the workpiece position.

The teaching point is the point in the joint space. During the operation, the tool coordinate system of robot can be performed the corresponding operation destinations based upon the specified each position point in turn during the teaching.

4.2.2 Joint Coordinate System

Each axis along with the robot performs single motion, which is called joint coordinate system; the axial of each joint is specified as Fig. 4-2.

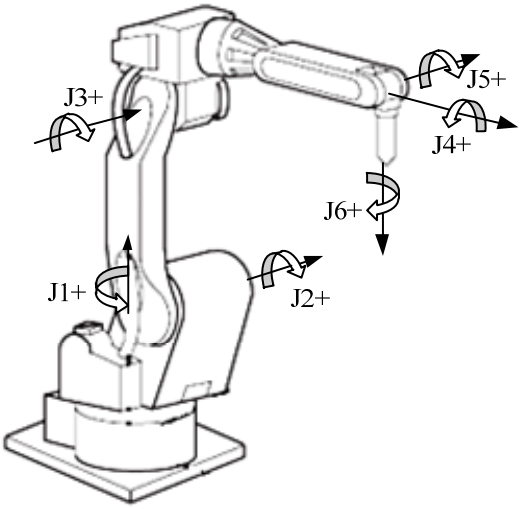


Fig. 4-2 Joint coordinate system

4.2.3 Base Coordinate System

The base coordinate system is default one of the robot. The robot can be moved along with the X, Y and Z axes (Fig. 4-3) in parallel or revolved around with the corresponding axis. The posture of tool coordinate system in the base coordinate

system can be observed in main page or program operation page.

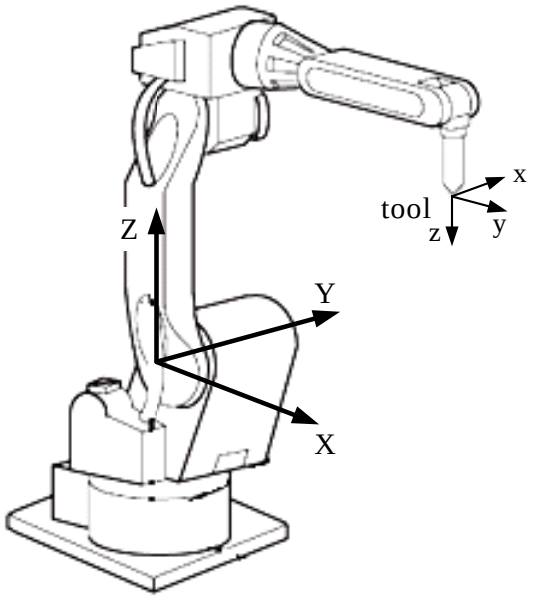


Fig. 4-3 Base coordinate system

4.2.4 Tool Coordinate System

The tool coordinate system is regarded the valid direction of holding tool by robot wrist flange as the Z axis, and the coordinate system origin (TCP) is defined at the top of the tool. The system automatically adopts the default tool when the tool coordinate system does not define. In this case, the tool coordinate system is overlapped with the one of the wrist flange. When robot traces some path of Cartesian space, the coordinate system should be defined correctly. If the selected coordinate system is the tool one during the robot teaching, the robot will then move along with the axis of the tool coordinate system or rotate around with the coordinate system. The tool coordinate system origin (TCP) holds when rotates around with the coordinate axis, which is called invariable control point operation. Similarly, the motions in the base and user coordinate system also can be performed. This method can be used for inspecting the tool coordinate system, if the tool coordinate system origin (TCP) moves during the rotation, which means the parameter wrong or big error of the tool coordinate system; it should be redefined or set the tool coordinate system.

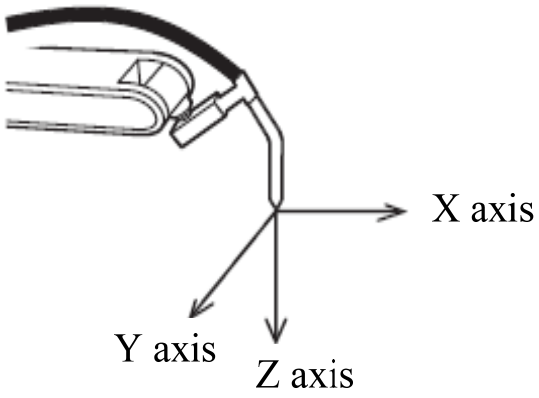


Fig. 4-4 Tool coordinate system

4.2.5 User Coordinate System

In this coordinate system, robot moves in parallel or rotates along with each axis based upon the specified user coordinate system. In some application situation, the teaching can be simplified in the user coordinate system.

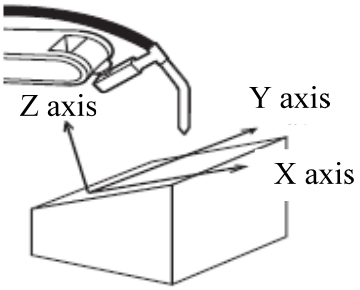


Fig. 4-5 User coordinate system

4.3 Interpolation Method

The interpolation method indicates the movement path of the robot at the end of the tool between the known points. GR-C series industry robot control system consists of three interpolation methods: Joint, Linear and Circular arc.

4.3.1 Joint Interpolation

The joint interpolation is used when the robot does not use the specified movement path, it is specified as MOVJ. For the safety sake, the first operation point

of the programming should be used the joint interpolation. Refer to the details in the “Section 6.2.1 MOVJ” for the joint interpolation command.

The schematic of the command and path is shown below:

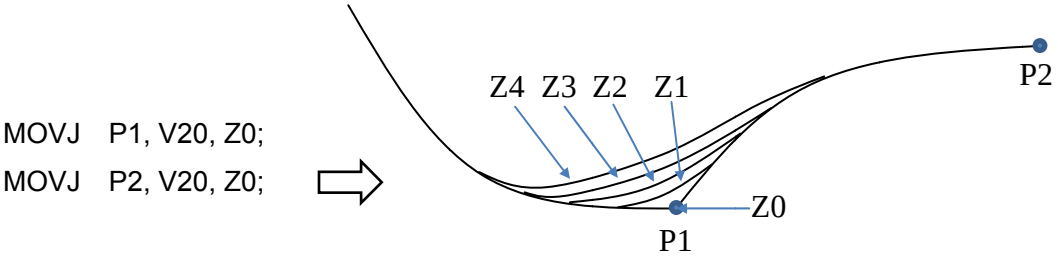


Fig. 4-6 Joint movement path

P* is teaching point, V* means motion speed, which is indicated by percentage. Z* means precision level, and its resolution range is from 0 to 4. Z0 means accuracy arrival destination point. The bigger the Z axis is, the bigger the transition radius is, and the higher the robot’s operation efficiency is.

4.3.2 Linear Interpolation

The linear interpolation indicates that the end TCP tracks the specified linear path and it specifies to MOVL. The robot automatically changes its posture of his wrist. Refer to the “Section 6.2.2 MOVL” for the linear interpolation command.

The schematic of the command and path is shown below:

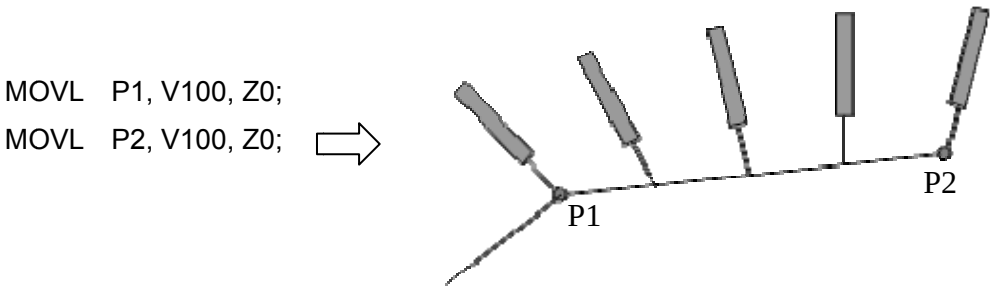


Fig. 4-7 Linear movement path

P* is movement destination point, V* means operation speed, its unit is mm/s. Z* means precision level. The meaning and resolution value is same as the Z* in the joint

interpolation.

Refer to the Fig. 4-8 (left), when the 2nd command accuracy level is changed, refer to the same figure (right) for the actual movement path.

MOVL P1，V100，Z0；
MOVL P2，V100，Z0；
MOVL P3，V100，Z0；

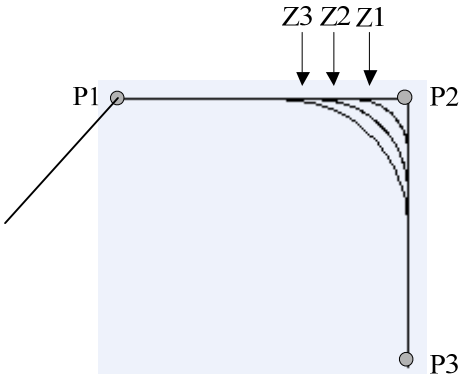


Fig. 4-8 Actual linear movement path

Z0 means precision in-position, Z1~Z4 expresses MOVL transition; the higher the accuracy level is, the lower the in-position accuracy is.

4.3.3 Circular Interpolation

The circular arc interpolation indicates that it approaches along with point group of the linear between two points, its command is MOVC. The robot automatically changes its position of his wrist. Refer to the “Section 6.2.3 MOVC” for details.

The schematic of the command and path is shown as Fig. 4-9:

MOVC P1, V100, Z0;
MOVC P2, V100, Z0;
MOVC P3, V100, Z0;

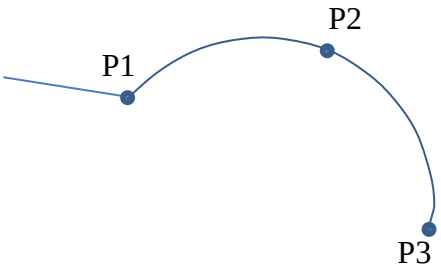


Fig. 4-9 Circular arc path

The command format as follows:

MOVC P001，V20，Z0；

MOVC P002，V20，Z0；

MOVC P003，V20，Z0；

There is no alternative other than select 3 points to confirm an arc; it may alarm less than 3 points. The robot regards the 1st MOVC as the start during operation. V20 means that it moves based upon 20mm/s speed; Z0 means the accuracy level 0.

The abovementioned movement path is shown in the Fig. 4-10.

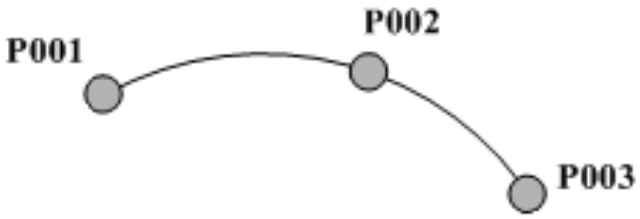


Fig. 4-10 Arc movement path

Precautions:

1. When selecting the teaching point in the arc command, it is necessary to keep away from two adjacent points; otherwise, the path accuracy of the arc will descend (Refer to the Fig. 4-11).

2. When arc start is not overlapped with the destination point of last movement command, the system will move to the arc start form the destination point by linear method (Refer to Fig. 4-11).

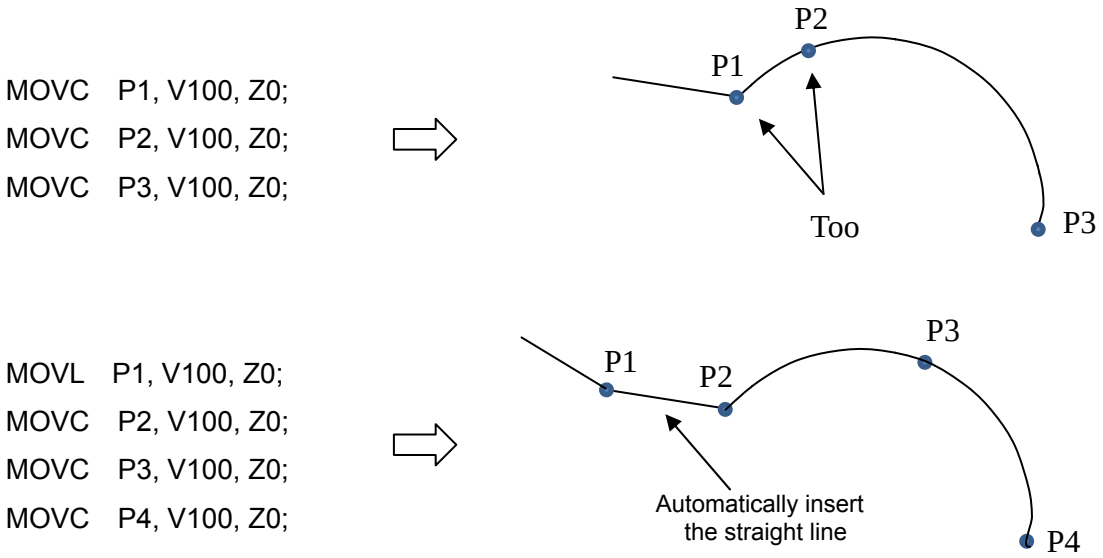


Fig. 4-11 Arc path

3. The arc interpolation can be combined with the movement path by any 3 or more than 3 MOVC commands; refer to the following example:

(1) There are 5 points on plane. Refer to the Fig. 4-12:

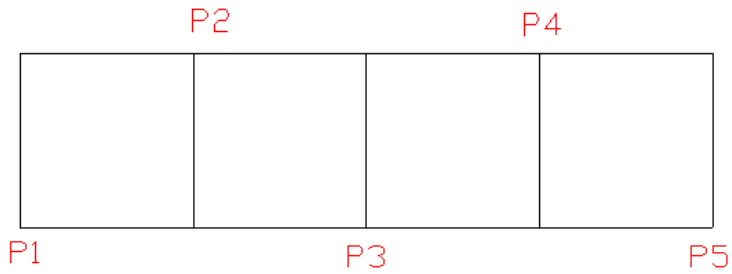


Fig. 4-12

(2) Example

Example 1: Compile 3 MOVC commands.

```
MAIN;
MOVC P1,V100,Z1;
MOVC P2,V100,Z1;
MOVC P3,V100,Z1;
END;
```

TCP path as follows:

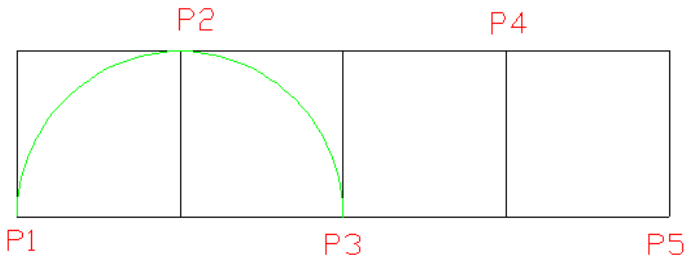


Fig. 4-13

P1→P2→P3

Example 2: Compile 4 MOVC commands

```
MAIN;
MOVC P1,V100,Z1;
MOVC P2,V100,Z1;
MOVC P3,V100,Z1;
MOVC P4,V100,Z1;
END;
```

TCP path as follows:

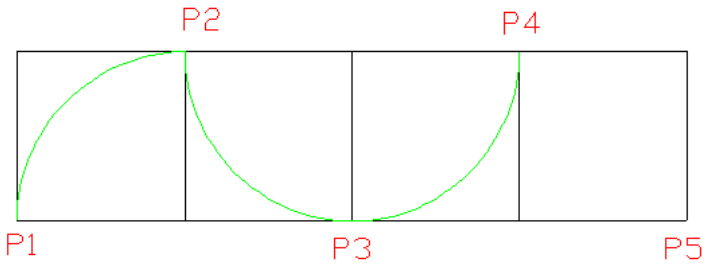


Fig. 4-14

P1→P2→P3→P4

Example 2: Compile 5 MOVC commands.

MAIN;

MOVC P1,V100,Z1;

MOVC P2,V100,Z1;

MOVC P3,V100,Z1;

MOVC P4,V100,Z1;

MOVC P5,V100,Z1;

END;

TCP path as follows:

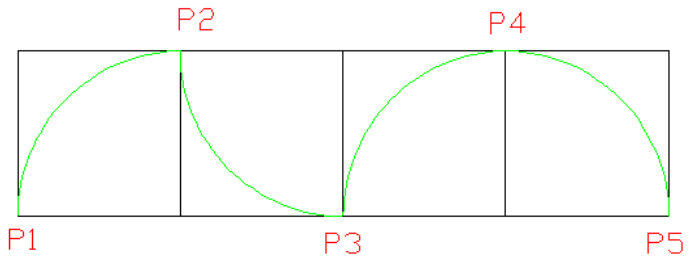


Fig. 4-15

P1→P2→P3→P4→P5

4.4 Robot Variable

Robot variable divided into 5 types: byte, integer, double, real and position. Only real and position variable are described over here.

1. Real (R): Variable name range is R0-R99, solution range is -99999.0~99999.0, which can be used for workpiece counting, quantity increase/decrease. It is used with INC, DEC and JUMP IF together.

For example:

```
MAIN；                                  Program heading
SET  R0 , 0；                           Assign 0 value to R0 variable
LAB0：                                  Label 0
INC   R0；                              R0 adds 1
MOVJ   P*   V20，Z0；                   Teaching point position
MOVJ   P*   V20，Z0；                   Teaching point position
JUMP   LAB0 ，IF  R0 < 10；             Shift to LAB0 when R0 is less than 10
END；                                   End of program
```

2. Position (PX): Variable name range is PX0-PX99, which is used for translation command; it used with SHIFTON, MSHIF together.

For example:

```
MAIN；                                  Program heading
SET  R0, 0；                            Assign 0 value to R0 variable
PX1 = PX1 – PX1；                       Clear the translation value PX1
LAB0：                                  Label 0
INC   R0；                              R0 adds 1
SHIFTON  PX1；                 Translation starts, and specify the translation value
MOVJ   P*   V20，Z0；                   The teaching point after translating
SHIFTOFF；                              End of translation
PX1 = PX1 + PX0；                       Add translation value PX1 based upon the
                                        original PX0=10（…）
JUMP   LAB0   IF   R0 < 10；            Shift to LAB0 when R0 is less than 10
END；                                   End of program
```

4.5 Teaching

The operations, such as the teaching programming and inspection can be performed using the TP when the teaching mode is selected by mode shift switch.

The edit, administration and system setting etc. of program only can be operated

in teaching mode.

4.5.1 Preparation Before Teaching

4.5.1.1 Safety Power-on

1. For the safety sake, ensure that there is no person or material within the robot operation range.

2. The robot controllable system should be turned on when the electric apparatus is normal.

The power-on steps are shown below:

- ✓ Before the power is turned on, check whether the working area (robot, controller etc.) and the overall safety equipments are normal.
- ✓ The switch on the controllable cabinet panel is set to ON;
- ✓ Press the green power key on the controllable cabinet.

4.5.1.2 Setting Inspection

Check the following settings before teaching:

1. Current selected coordinate system

Select the coordinate system based upon the desired inspection destination; different coordinate systems show big different teaching effect.

2. Check whether the tool coordinate system and zero are correct.

3. Current selected speed override.

It is note that the speed override should be lower before teaching operation, usually, debug to the low speed 

.

4.5.2 Teaching Operation

Firstly, Set the movement mode to the teaching one, and then select the coordinate system. Secondly, confirm whether the movement direction and path of each axis is correct by [ENABLING SWITHC] + [AXIS OPERATION]; otherwise, it may affect the normal operation of the system.

4.5.2.1 Teaching Programming

There are 2 teaching programs, one is new program, and the other is the modification of the registered program.

- The new program performs based upon the following steps:

1. Create a program
2. Add or modify program line
3. Teaching inspection program

- The registered program modification performs based upon the following steps:

1. Open a saved or registered program
2. Modify or add program line
3. Teaching inspection program

Refer to the Section “4.8 Program Example” for details.

4.5.2.2 Teaching Inspection

The teaching inspection should be performed in the teaching mode, which can be divided into single or continuous, and shift by [Single/Continuous]; it can be separated into forward teaching and back teaching. The combination of the teaching inspection: single forward, consecutive forward, single backward and consecutive backward.

Note: During the teaching inspection operation, if it stops to edit or move the original position manually, and then perform the forward/backward teaching; it may not operate according to original path; refer to the “Trace movement after editing”.

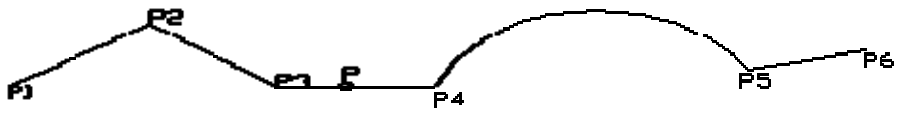


Fig. 4-16

For example: As the above Fig. 4-16, program moves to P2 from P1 straightly, then to P3, and then to P4; moves to P5 with circular arc; lastly to the P6 with straight line.

1. Single forward

When single forward performs, the program may stop after moves to P2, P3, P4, P5, and P6.

Additional, when program operates to the some position (for example, point P) between two points; in this case, the program may stop after releasing [Forward], but the subsequent teaching inspection will normally operate.

2. Consecutive forward

When the consecutive forward operates, it may not stop at P2, P3, P4, P5, and P6 after program moves here if keeps holding this button.

The program will stop if releasing the [Forward] or [Enabling] button, but the subsequent teaching inspection may normally operate till to the end of the program.

3. Single backward

Program moves from P6 to P1 in the single backward movement; program may stop after operating to the P5, P4, P3, and P2.

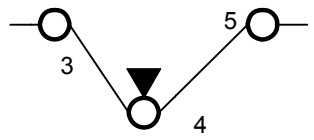
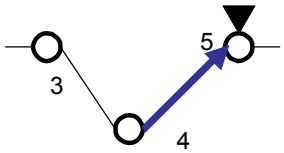
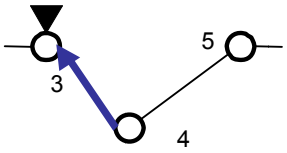
4. Consecutive backward

Program moves from P6 to P1 in the consecutive backward movement; program may stop after operating to the P5, P4, P3, and P2.

4.5.2.3 The Trace Movement After Editing

During the inspection operation, it stops to edit or move the original position manually, then perform the teaching inspection; it may not perform the original path.

The following illustrations show that the robot motion performs the forward/backward in the trace operation after compiling.

Manual edit	Forward trace	Backward trace
Robot original movement 		

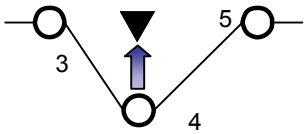
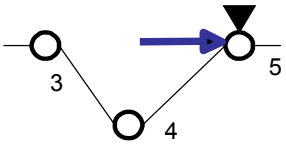
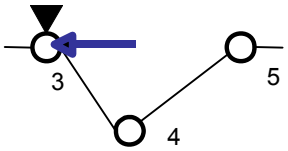
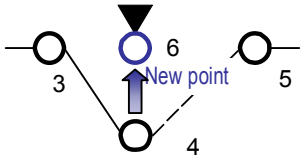
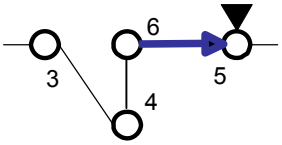
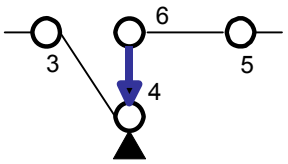
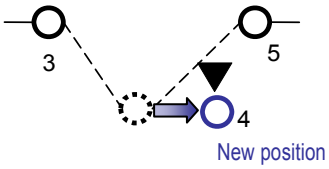
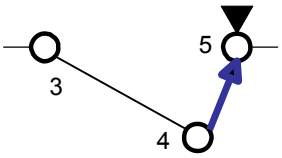
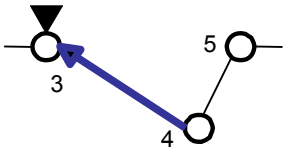
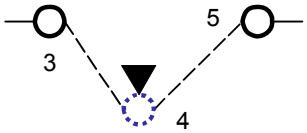
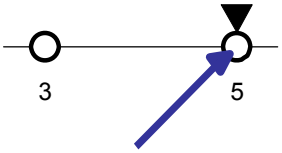
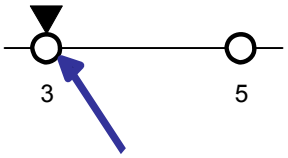
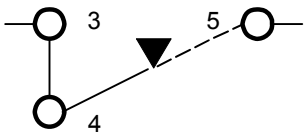
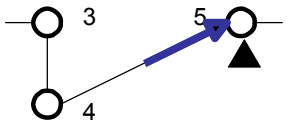
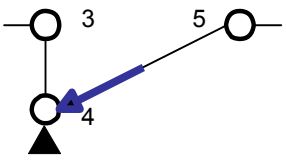
Move robot by hand  (Move robot by hand)	 	
Addition point  (Add the teaching point 6)	 	
Change the position of one point  (Change the teaching point 4)	 	
DELET point  (Delete the teaching point 4)	 	

Fig. 4-17

Stop the robot between the teaching points (4 and 5), then edit it.

Manual edit	Forward trace	Backward trace
Robot original movement  	 	

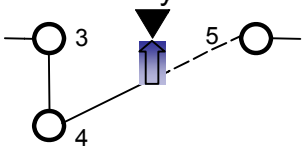
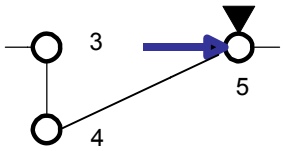
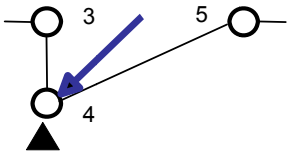
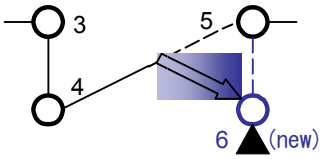
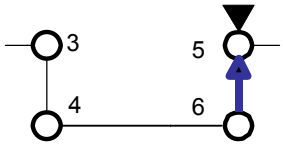
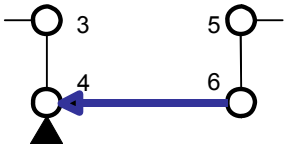
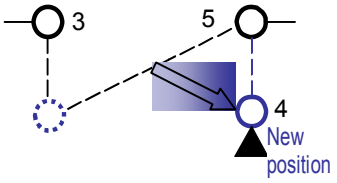
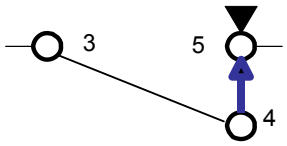
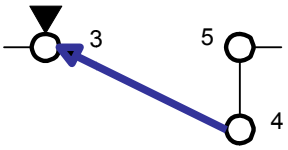
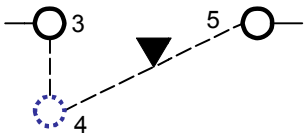
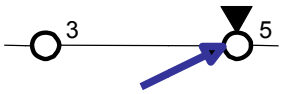
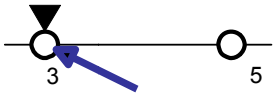
Move robot by hand  (Move robot by hand)	 	
Addition point  (Add teaching point (6) between 4 and 5)	 	
Change the position of one point  (Change the teaching point)	 	
DELET point  (Delete teaching point (4))	 	

Fig. 4-18

4.6 Play

Play means that making the robot performs the automatic operation teaching procedure, after the programming command editing is performed and the path is confirmed, the play teaching programming can be performed. The robot can be automatically operated according to the taught path beforehand.

4.6.1 The Preparation Before Play

1. Confirm the robot's movement is safe: nobody nearby the machine and depart

from the wall and other objects;

2. Open the program to be operated, and perform it to the start position.

3. Debug the mode button on the TP to the “PLAY”;

4. Open the servo power;

Open the servo power by [Servo ready] button

5. Start the program

The start program operates by the [START] on the TP.

Fail to operate the program, check whether the mode switch is on “PLAY” and the servo power is ON and the machine itself is at the 1st point of the program; if the above-mentioned are specified, try to press the [START].

If the system does not operate

Fail to operate the system, it is better to comprehend the program find out its reason; in this case, do not close the machine itself/robot machine too fast.

4.6.2 Special Run of the Play

The following special run can be performed in play mode:

- General play: send a pulse to servo during the system operation; the motor is then operated and the robot performs accordingly.
- Machine lock: Do not send a pulse to servo during the system operation; the robot does not operate and the robot immovable.

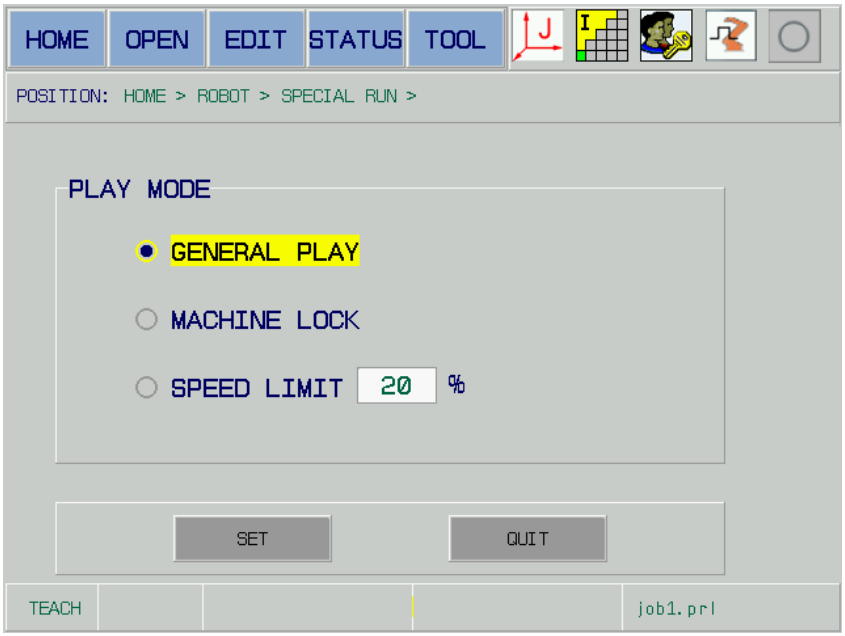


Fig. 4-19

4.6.3 Stop and Restart

The robot stops or automatically stops during enabling; refer to the following reasons:

- Hold
- ESP
- The stopping from alarm
- Other stops
- The stop caused from each operation

4.6.3.1 Hold Operation

At present, if the robot is on the operation state while pressing the [HOLD] on the TP, the robot may hold; otherwise, without response. It will be consecutively operated followed the last position by the [START] again after dwells.

4.6.3.2 ESP Operation

The motor's power is cut off but servo holds, after the ESP operation is performed, and the robot is then immediately stopped. The ESP can be performed at the following operations:

- The ESP button on the controllable cabinet
- The ESP button on the TP

ESP

Series No.	Operation step	Explanation
1	Press the ESP button on the controllable cabinet	The motor power is cut off, the robot is then immediately stopped.
2	Press the ESP button on the controllable cabinet	The motor power is not cut off, but the robot is immediately stopped.

Release the ESP

Series No.	Operation step	Explanation
1	Rotate the ESP button on TP CW	It is necessary to open the enabling when operating again.

2	Rotate the ESP on the cabinet CCW	It is necessary to open the enabling when operating again.

4.6.3.3 Restart After ESP

The position may alter after ESP; hence, it is necessary to confirm the position by forward operation and no workpiece and the interference of fixture.

1. Stopping caused by alarm

The robot may immediately stop after the alarm occurs during the operation.

The alarm displays on the TP, which notices the user that it is stopped caused from alarm.

When alarm occurs, clear the alarm prompts, and record the ALARM HISTORY by the [CLEAR].

Check the ALARM HISTORY and reason on the ALARM HISTORY page; refer to the Fig. 4-20.

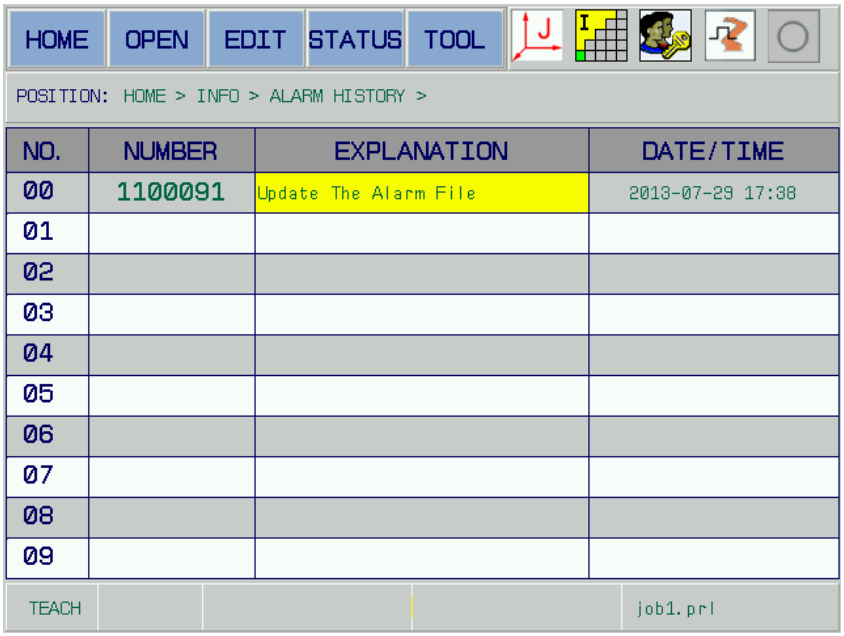


Fig. 4-20

2. Other stops

Enabling closes by shifting the operation mode; the system then stops.

4.6.4 Modify the Play Velocity

1. The modification can be regulated by the high/low override.

It can be modified in the play process. The velocity of the play can be regulated by [MANUAL SPEED] button during the operation.

2. The Max. velocity of the system can be altered by setting the system.

Adjust the operation speed of the system by modifying the maximum allowance velocity in the {Parameter Setting} page.

3. The play velocity can be altered by the V value in the program command.

In the {Edit} page, modify the speed by the numerical value followed with the V. wherein, the V followed with MOVJ is percentage; the V followed with the MOVL and MOVC are the actual speed.

4.7 Remote Operation

The operations such as the station appointment, main program operation and remote continued point operation etc. can be performed in the remote operation mode. The remote operation helps the user to operate the robot from long distance, which can be control the robot start, dwell, servo enabling etc. by I/O signal, so that it is convenient for user to perform the robot. At present, station appointment and continued point operation are being established.

4.7.1 Remote I/O Port

IN0 ---- External ESP signal input: The control system may immediately stop when hazard occurs for the remote mode.

IN8 ---- External dwell signal input: It equals to the dwell key function of the operation handle.

IN9 ---- External servo enabling signal input: It equals to the servo enabling key function of the operation handle

IN10---- External start operation signal input: It equals to the start key function of the operation handle.

IN13---- Remote mode enabling (IN13 is High Level)

OUT0 ---- System ESP signal output: It controls the ESP of the peripheral equipment.

OUT1 ---- System dwell signal output: It indicates the system working in the dwell state.

OUT2 ---- System operation signal output: It indicates the system working in the

operation state.

OUT3 ---- System enabling signal output: It indicates the system enabling state.

Note: Other I/O ports can be regarded as the common one in the non-remote mode other than the defined ESP I/O port of the system.

4.7.2 Remote Operation Step

1. If there is no main program or needs to be changed the main program, set the main program in the {MASTER JOB} menu interface.
2. Perform the robot teaching to the 1st teaching point of the main program.
3. Shift the handle mode to the remote one, system enters the remote mode; the operation button on the handle is disabled.
4. The remote mode setting is enabled by external input port IN13.
5. The servo enabling is performed by external input port IN9.
6. The main program operation is started by external input port IN10.
7. The port IN0 can be input during the main program is performed in remote mode, and then the robot ESP; the robot dwells by inputting the port IN8.

4.7.3 Main Programming Setting

Refer to the Section 3.1.9 {MASTER JOB} menu interface for the main program setting method.

Notice:

1. When the main program is set, select “YES” of the “Enabling Master Job”, the remote main program operation is then can be performed.

2. If the program A is set to main program, user can delete or rename it in the {Job list} interface, then the main program is regarded as null; the system will not automatically set the main program by default.

4.8 Main Program Example

The program is integrated the command described from the robot language based upon the operation content of the robot. The program content composes of the robot command; refer to the “Chapter Six Robot Command” for details.

At present, we input the program of workpiece transportation as the Fig. 4-21; this program contains of 8 teaching points.

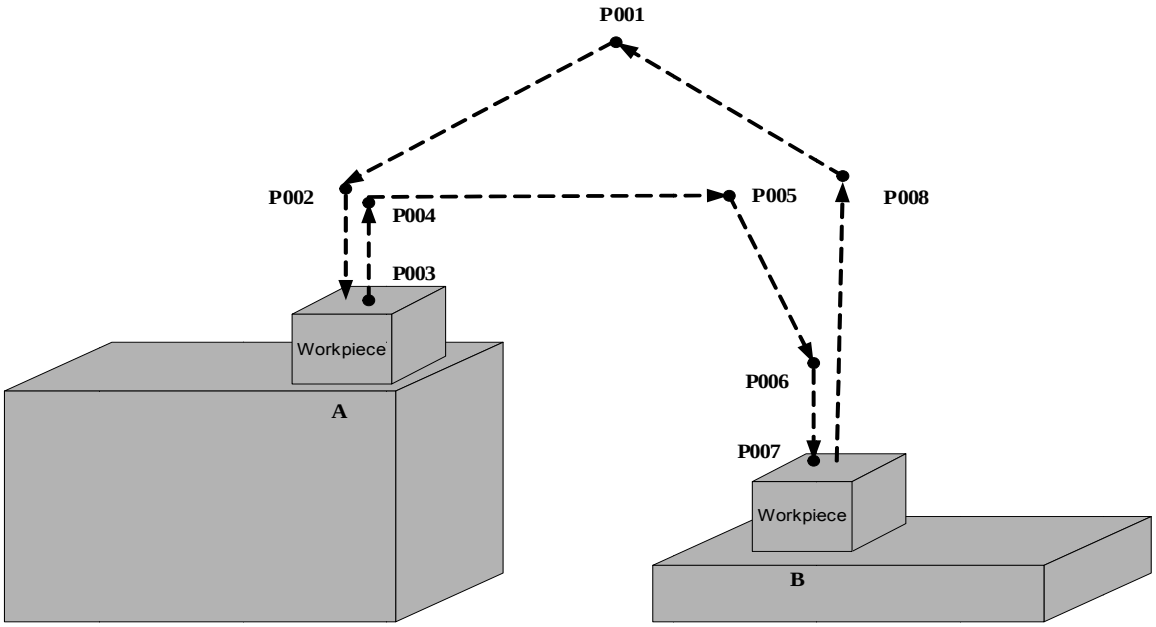


Fig. 4-21

4.8.1 New Program

Create a program Banyun.prl, refer to the “Chapter Fine Job And Edit” for details.

4.8.2 Program Open

Open a program Banyun.prl, refer to the “Chapter Fine Job And Edit” for details.

4.8.3 Command Addition

1. Open the ESP switch, open the mode SELECT switch to the teaching position, so that the robot can be entered the moveable state.

2. Select the joint coordinate system  by [Coordinate setting] button, and then the [Manual speed] button, regular the speed to the low one  .

3. Move the robot to the beginning position by [Enabling switch] + axis operation button, the beginning position should be set at the safety and suitable operation preparation place.

4. Open the new created teaching file, enter the Edit state by [F3], display the command list by [ADD] button.

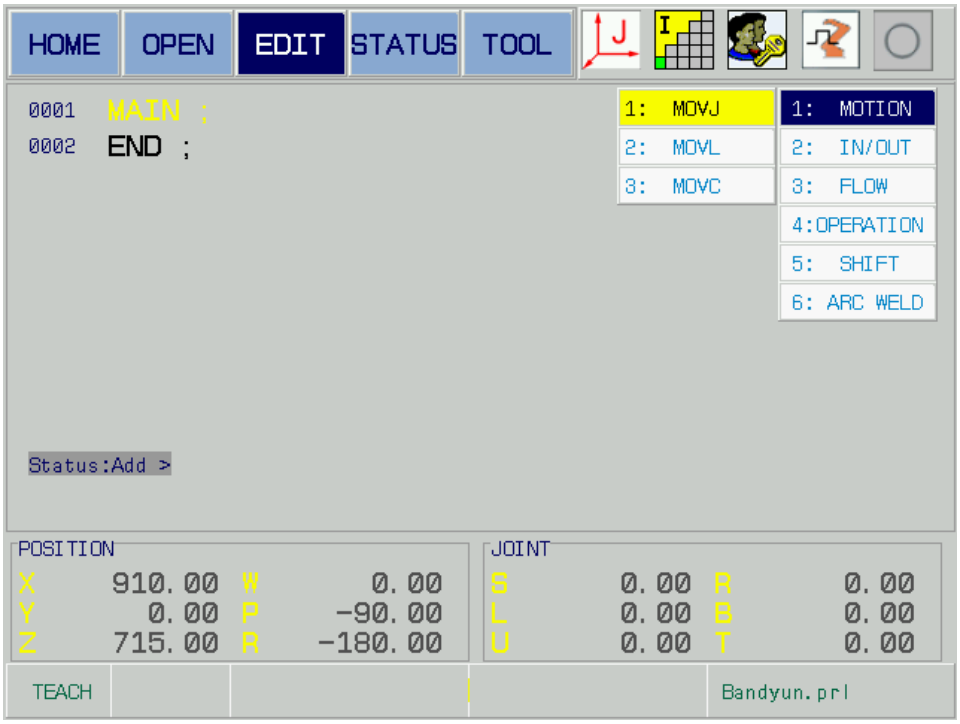


Fig. 4-22

5. Move the cursor to the MOVJ command, add this command to the program by [SELECT];

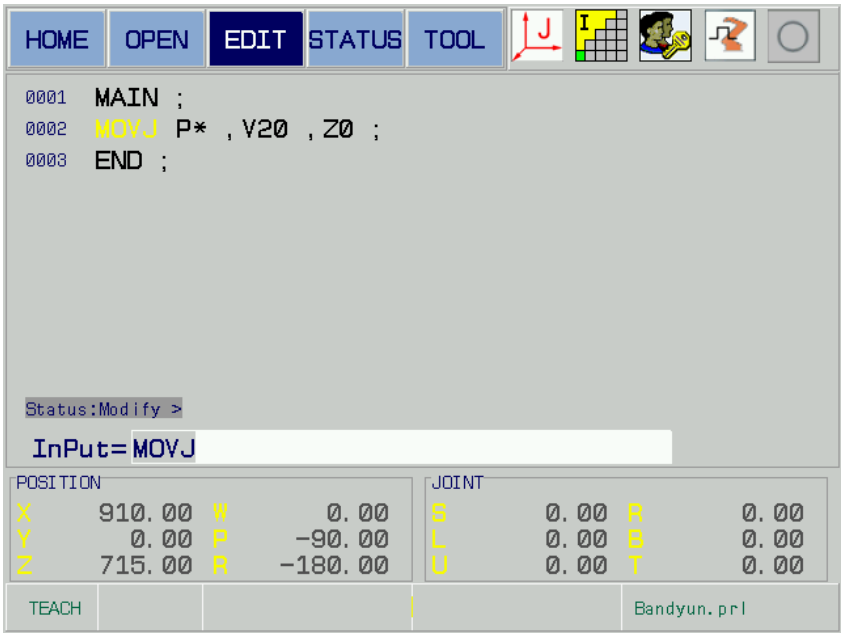


Fig. 4-23

6. The related filed in the command line can be edited by left/right direction button.

7. Move the cursor by left/right direction button, when the cursor moves to the position filed P*; in this case, the P* value is the position by the robot TCP controlled, and then press the number key 1. The position modification can be complete by input key. At this moment, the P1 value is the one of the P*.

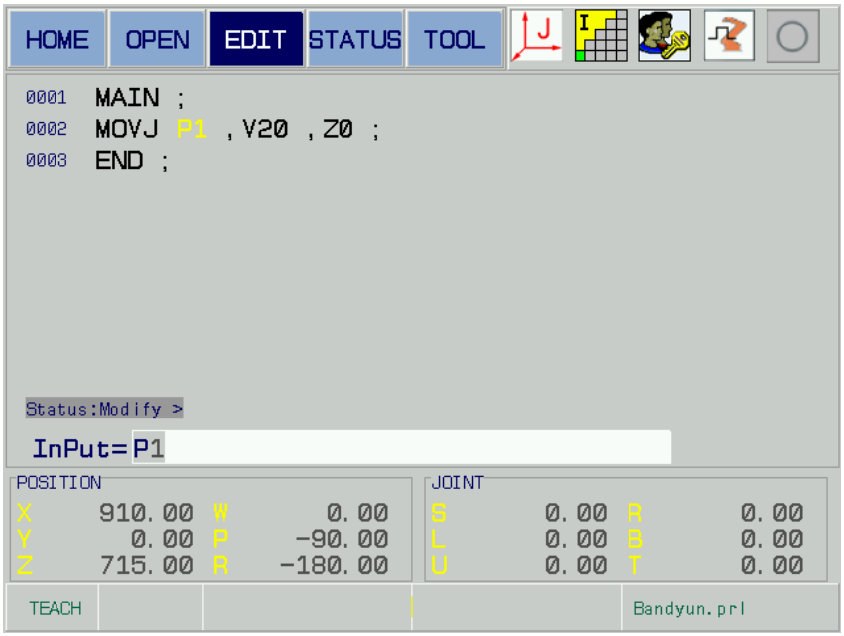


Fig. 4-24

8. Move it to the speed filed by left/right direction button; directly input the number 30 by its numerical value buttons, and then complete the speed alteration by [INPUT].

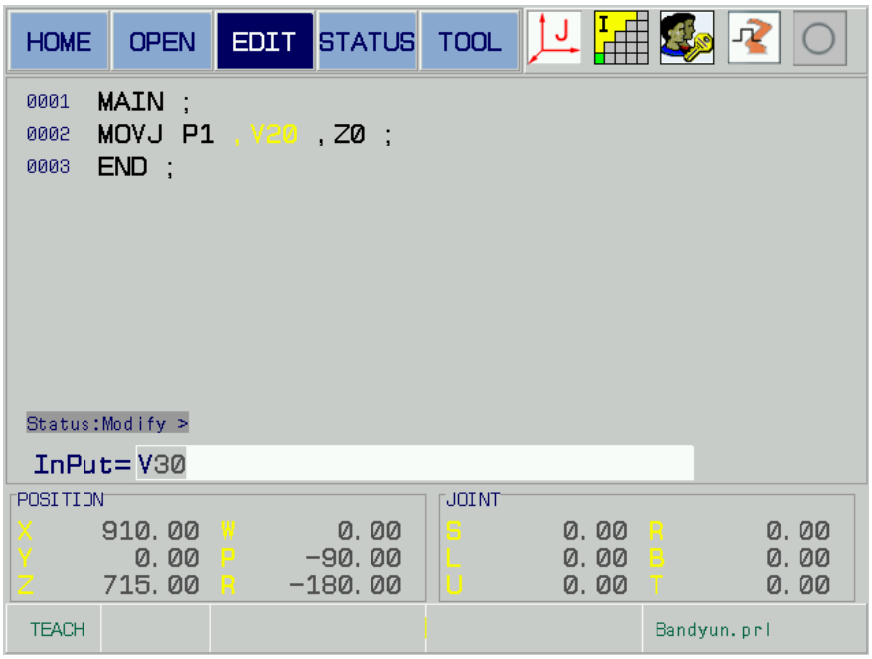


Fig. 4-25

In this way, a teaching point is then performed. Subsequently, add other commands similarly, the edited programs are shown below. The program can be

tested after confirming it is without error.

Program	Content explanation
MAIN	
MOVJ P1, V30, Z0;	Move to the start
MOVJ P2, V20, Z0;	Move to the capture point proximity
DOUT OT1, OFF;	Open the capture
MOVL P3, V10, Z0;	Move to the capture point
DOUT OT1, ON;	Close the capture, hold the workpiece
MOVL P4, V10, Z0;	Move to the capture point proximity (after capture)
MOVJ P5, V20, Z0;	Move above the B
MOVJ P6, V20, Z0;	Move to the placement point proximity (before place)
MOVL P7, V010, Z0;	Move to the placement position
DOUT OT0, OFF;	Open the capture, place the workpiece
MOVL P8, V10, Z0;	Move to the placement point proximity (after place)
MOVJ P1, V030, Z0;	Move to the start
END	

4.8.4 Path Confirmation

After a motion program input of the robot is completed, and then perform this program; so that confirm whether each teaching position is normal.

There are two ways of the teaching detection can be selected, one is single-step mode  , the other is consecutive mode  . Press [Single Continuous], there are two mode shifting may be viewed on the state display area

In the single-step, only one line programming can be performed when pressing the [Forward] or [Backward] button each time. In the consecutive mode, the overall programming can be continuously detected by pressing the [Forward] or [Backward].

- Set the velocity to low by high/low key of the [Manual speed]
- Select the teaching inspection mode by [Single continuation] button.

Generally, perform the teaching inspection at the low speed step by the single mode; after that, check the overall program using the continuation mode.

- Confirm the motion while the robot moves to each teaching point by [Enabling

switch] + [Forward].

Others can not enter the robot's motion range other than the operators during the robot is being performed.

4.8.5 Play Operation

The play can be operated after the teaching inspection is regarded the program operation path as correct.

- Teach the robot to the 1st motion point of the program;
- Shift the mode switch to the PLAY mode;
- Open the enabling by [Servo ready] button.
- Start the program by [Start] button.

CHAPTER FIVE JOB AND EDIT

The operation described in this chapter is that the robot performs in the stillness state, which includes JOB and edit. The operations, such as the new program, program copy, program DELET and program rename only can be performed in the edit and administration modes.

The program naming rule is used the 8.3 format, that is, up to 8 characters and 1 character least of the program name, and the suffix name is 3 characters. The suffix name of the program file is defaulted as prl, and regardless of the user input. The system may automatically add when creating a new program file. At present, the program file name is only constituted with Capital/lower case or numbers.

5.1 JOB

5.1.1 Program Creation

1. Shift the cursor to the {JOB} menu by [TAB] and left/right direction button; the new job, Job list and SD CARD menu can be displayed by [SELECT]; refer to the Fig. 5-1.

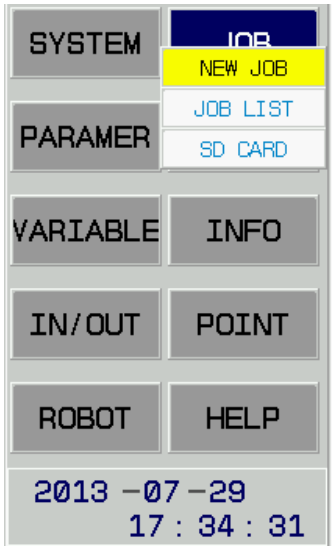


Fig. 5-1

2. Select the {New job} by the up/down direction button, and then enter the new program interface by [SELECT]; refer to the Fig. 5-2.

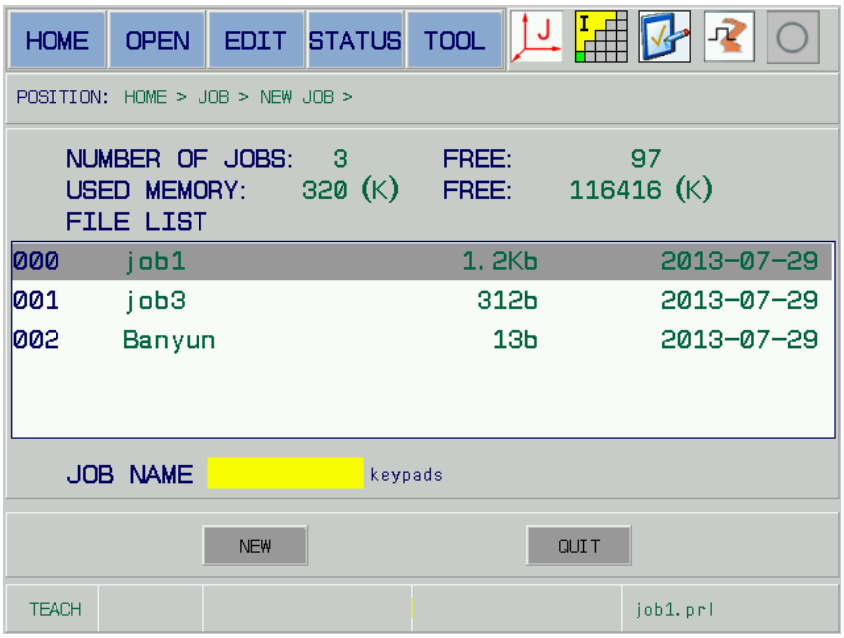


Fig. 5-2

3. After entering the new job interface, shift the cursor to the program name input frame by [TAB], then [SELECT], and then the interface shows the soft keyboard dialogue frame. In this case, the lower case, capital letter and symbols can be shifted by [SHIFT]. Move the cursor to the letter position to be inputted by using the direction buttons. The letter input at the cursor's position can be completed by [SELECT], or directly input numbers on the panel; repeat this input procedure till the input completes. You can clear one character by [Backspace] when the incorrect letter or numbers are input. For example, inputting the program name is testby01.prl; refer to the Fig. 5-3.

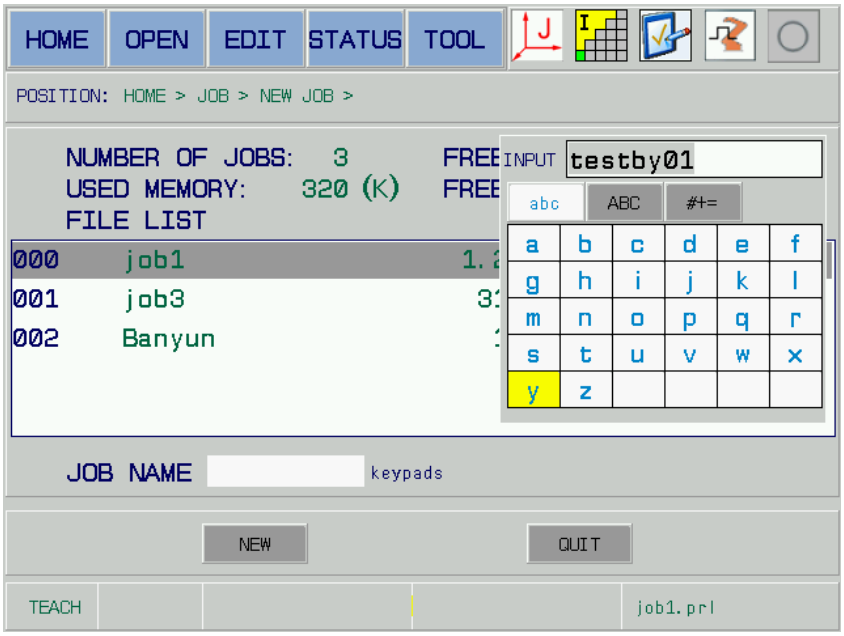


Fig. 5-3

4. After file name is input, retreat from {Soft keyboard} interface by [INPUT]. The [] can be eliminated the current input program name. In the Fig. 5-4, shift the cursor to the button [New] by [TAB], complete the new file name by [SELECT], simultaneously, enter the program edit page; refer to the Fig. 5-5.

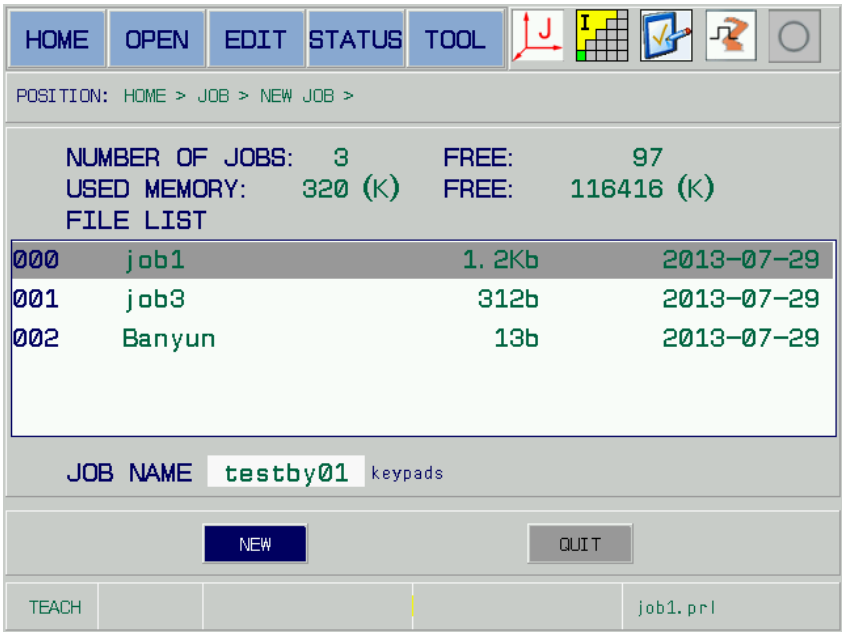


Fig. 5-4

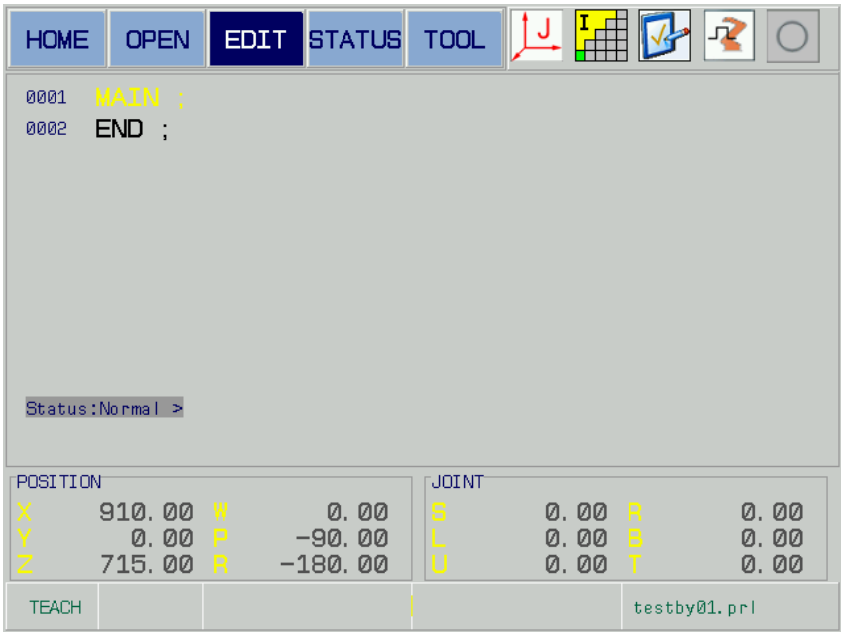


Fig. 5-5

5.1.2 Program Copy

Program file copy is copied the file. The copied file is same to the original one, which includes teaching point and program command.

When an important program file should be backup, which can be copied this file to save; so that the important file can not recover after disoperation (for example, DELET, etc).

1. Press the [TAB] and direction buttons in the {Main page} menu, shift the cursor to the {JOB} menu, and then open the {JOB} submenu by [SELECT]; refer to the Fig. 5-6.

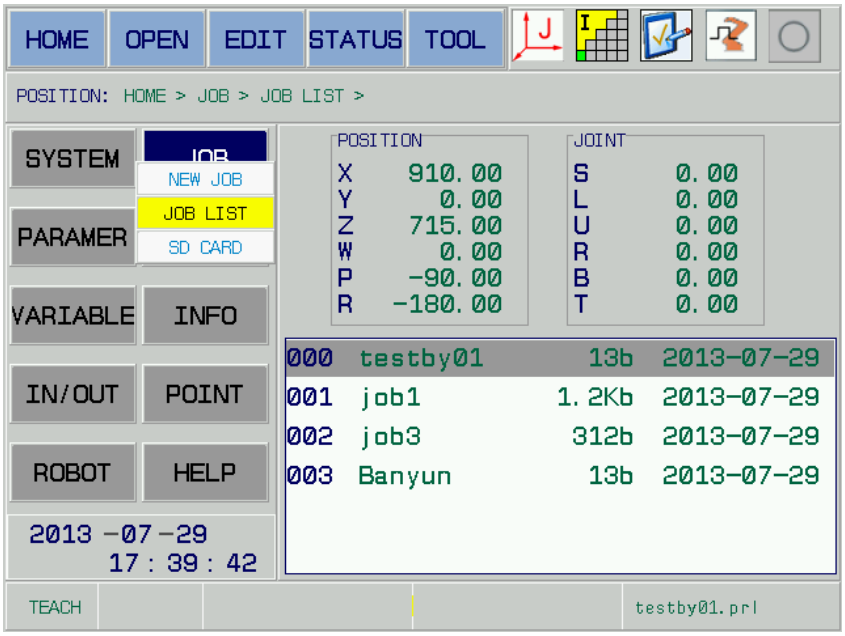


Fig. 5-6

2. Open the {Job list} page by [SELECT]; refer to Fig. 5-7.

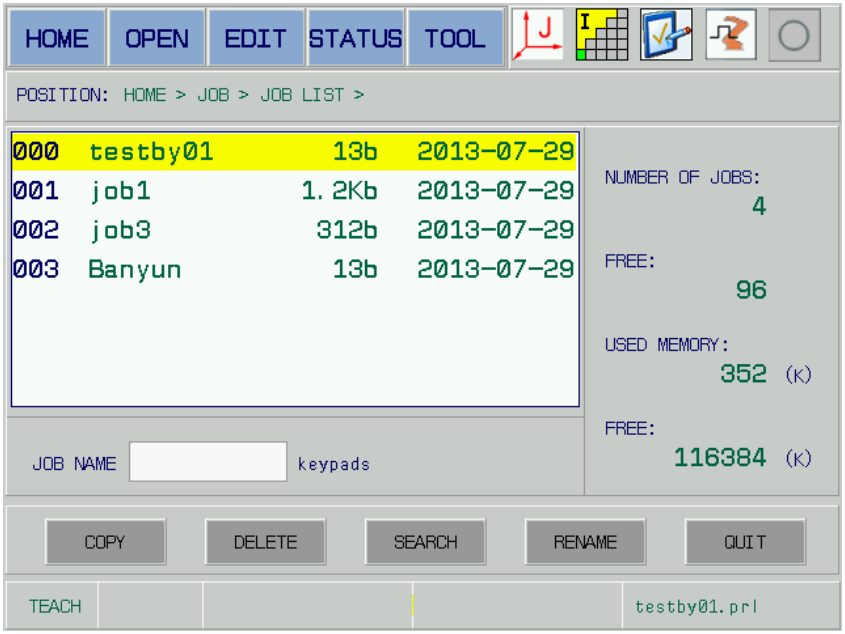


Fig. 5-7

3. Select the program to be copied by direction buttons in the {Job list} page, for example: copy “testby01.prl” to “testby02.prl”. Shift the cursor to the input frame by [TAB], then enter the soft keyboard input page by [SELECT], and then complete the file name input “testby02.prl” based upon the steps of the file name input in the “Section 5.1.1 New Program”; refer to the Fig. 5-8.

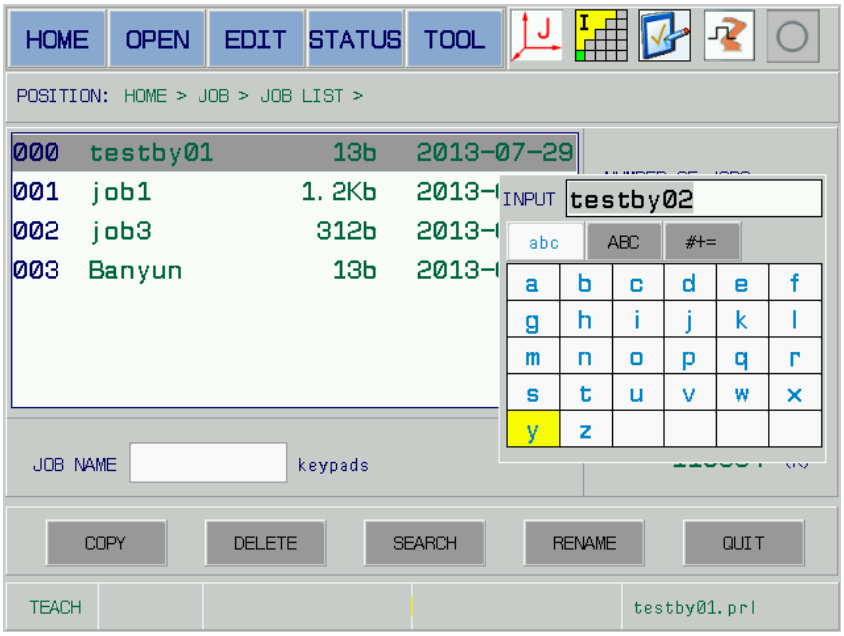


Fig. 5-8

4. Shift the cursor to the operation button area by [TAB], then move the cursor to the [COPY] button with the left/right direction button, and then complete the program copy by [SELECT], refer to the Fig. 5-9.

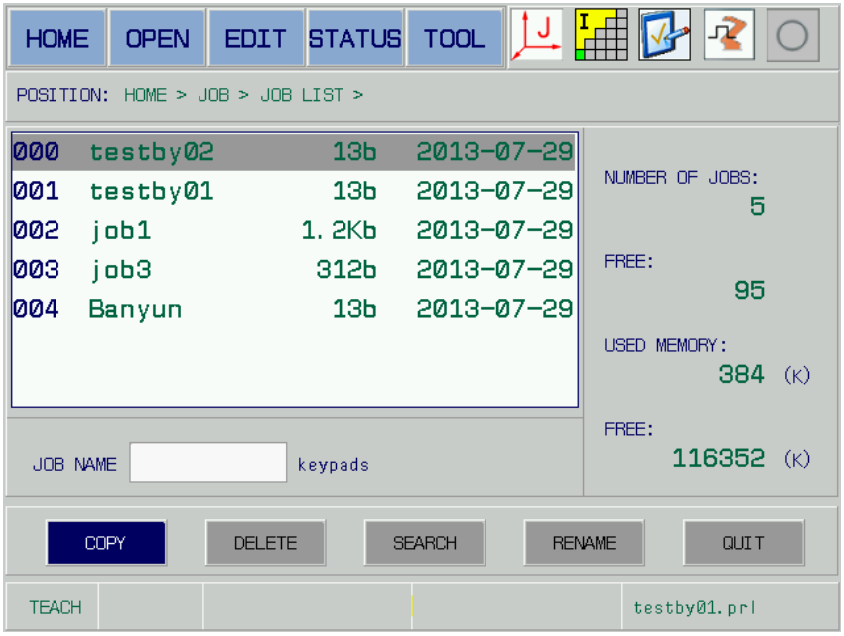


Fig. 5-9

5.1.3 Program DELET

Program file DELET means clear the program file.

It is important to note that the program file can not be recovered after it is deleted,

and therefore, be careful DELET the file. The teaching point in this file is following deleted after removing the file.

For example, the operation steps of the DELET program “testby01.prl” are shown below:

1. Shift cursor to the {JOB} menu by [TAB] and left/right direction button, then open the {Job list} submenu by [SELECT]; refer to Fig. 5-10.

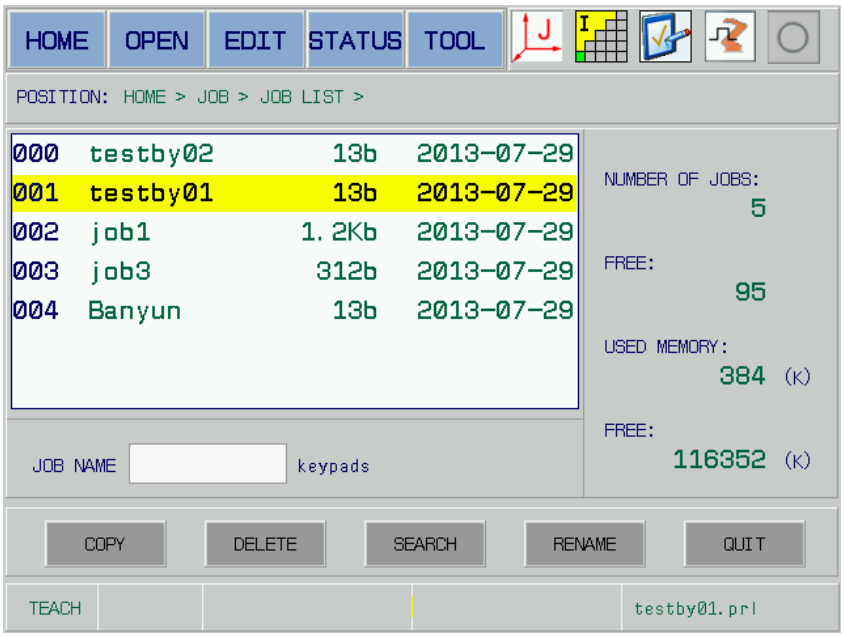


Fig. 5-10

2. Move the cursor to the program to be deleted by up/down direction button, for example, delete the “testby01.prl” program; refer to the Fig. 5-11.

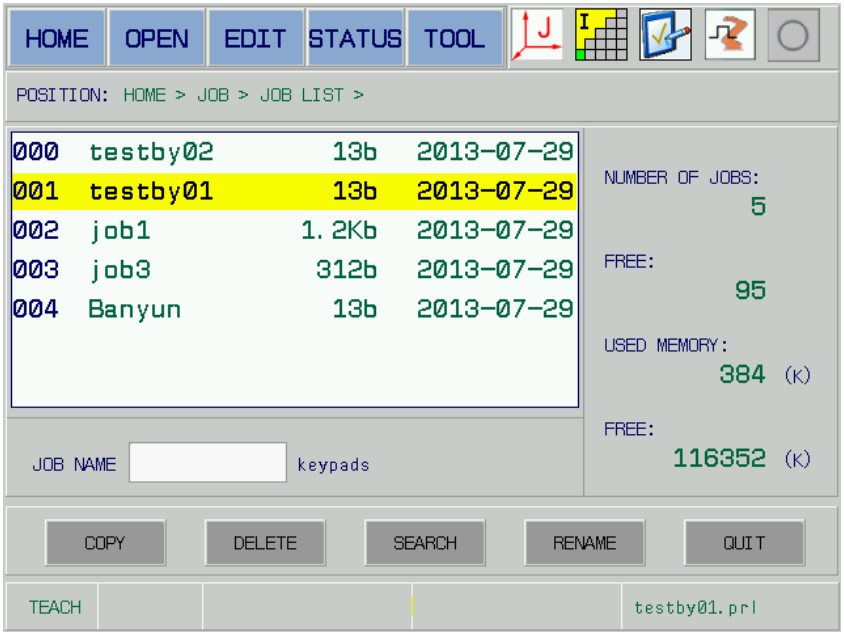


Fig. 5-11

3. Shift the cursor to the [DELETE] button by [TAB], then the [SELECT]; in this case, the file confirmation frame (DELET or not) appears; refer to the Fig. 5-12.

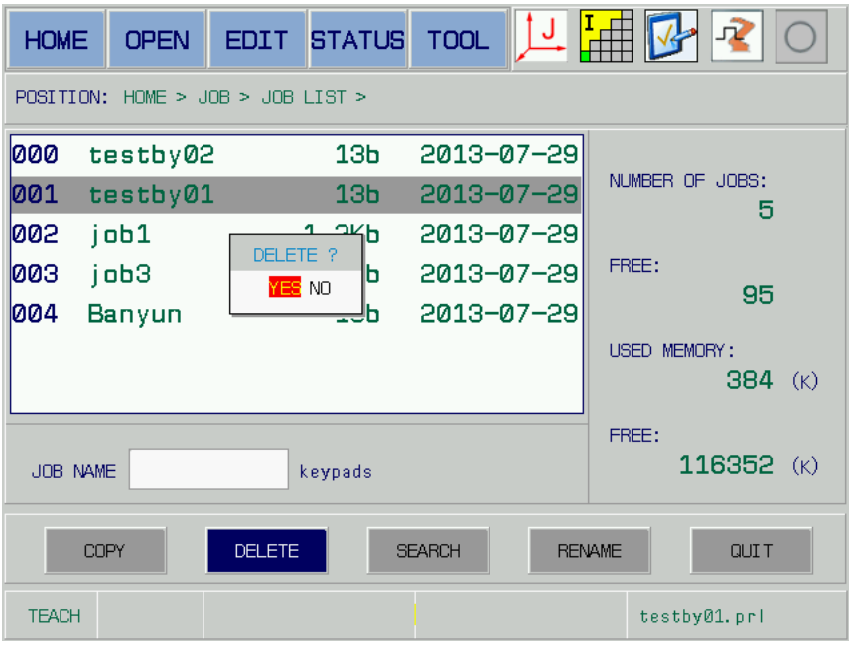


Fig. 5-12

4. Move the cursor by left/right direction button, select [YES], and then delete the program line of the current cursor placed, the file list will refresh; if [NO], retreat from the DELET program interface; refer to the Fig. 5-13.

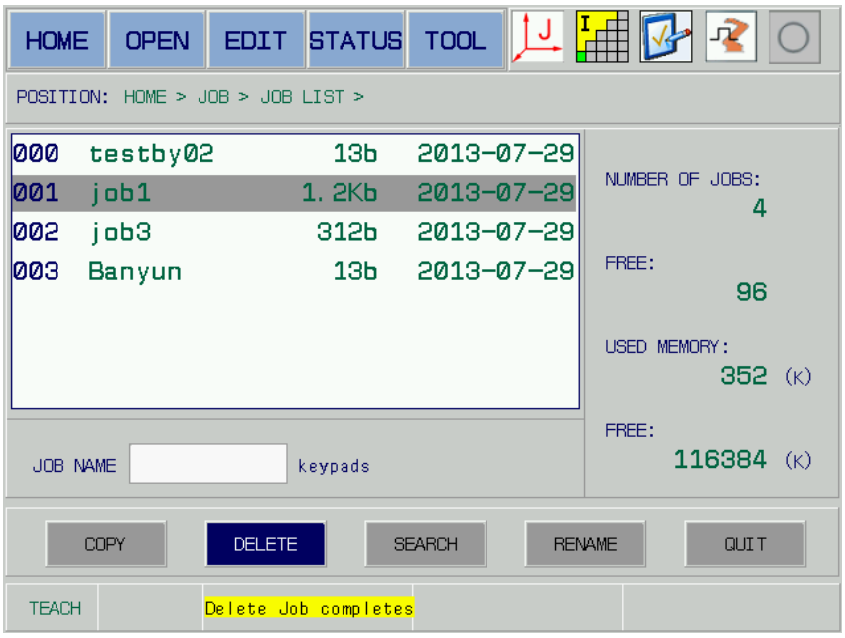


Fig. 5-13

5.1.4 Program Search

Program file search can be rapidly found the required program file for searching the program file names.

For example, the operation steps of the search program “testby02.prl” are shown below:

1. Shift cursor to the {JOB} menu by [TAB] and left/right direction button, then open the {Job list} submenu matching with the [SELECT] and move the cursor to the {Job list} menu by up/down direction button, lastly open the {Job list} page by [SELECT]; refer to the Fig. 5-14.

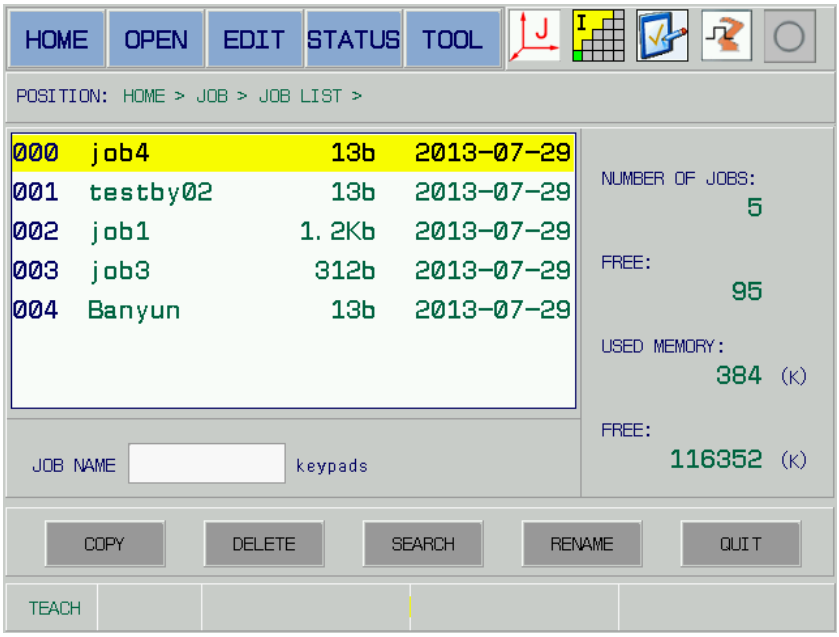


Fig. 5-14

2. In the {Job list} page, shift the cursor to the input frame by [TAB], then enter the soft keyboard input page matching with the [SELECT], input the program name “testby02”; refer to the Fig. 5-15.

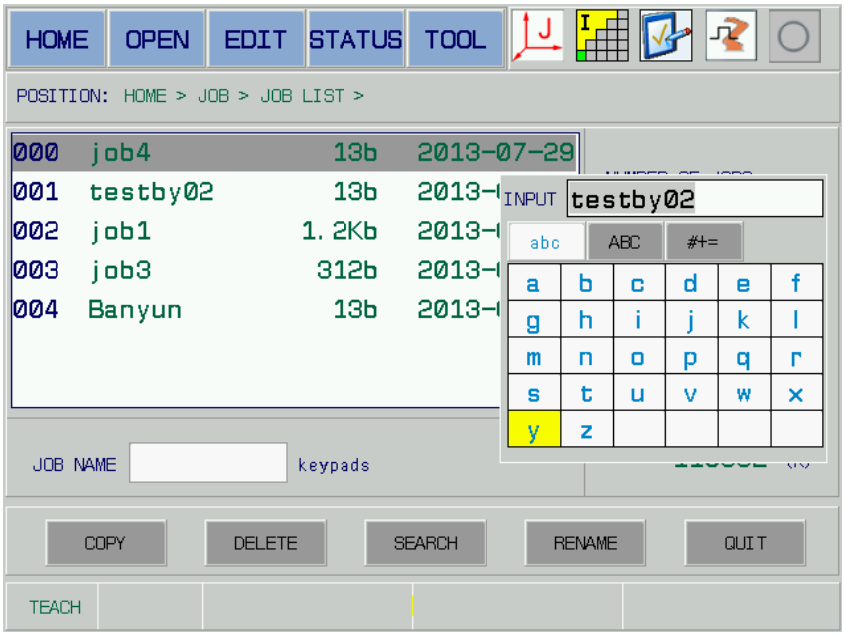


Fig. 5-15

3. Shift cursor to the button area by [TAB], then move the cursor to the [Search] button matching with the left/right direction button; refer to the Fig. 5-16.

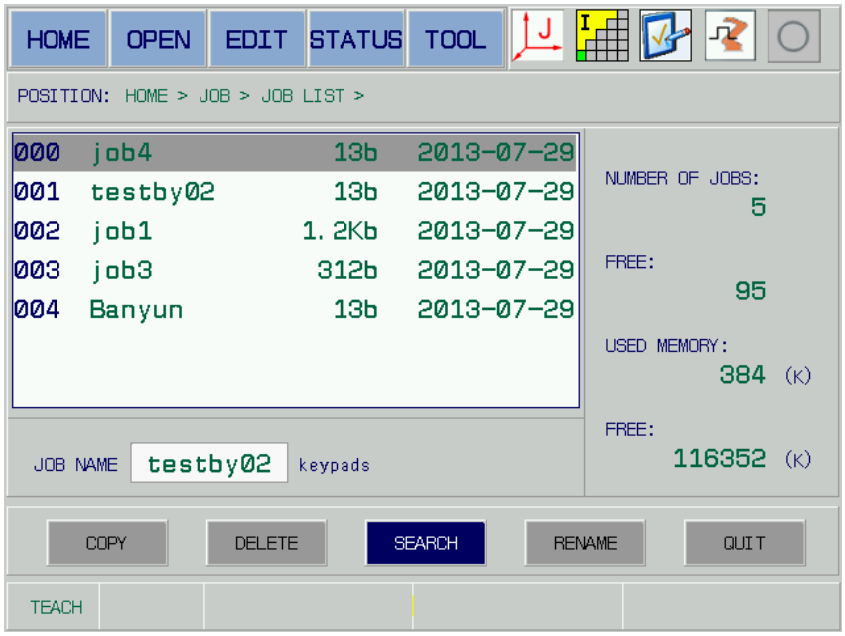


Fig. 5-16

4. Press [SELECT] to input search command; if it is correct, the cursor will stop at the found file name; otherwise, the system prompts “fail to find”; refer to the Fig. 5-17.

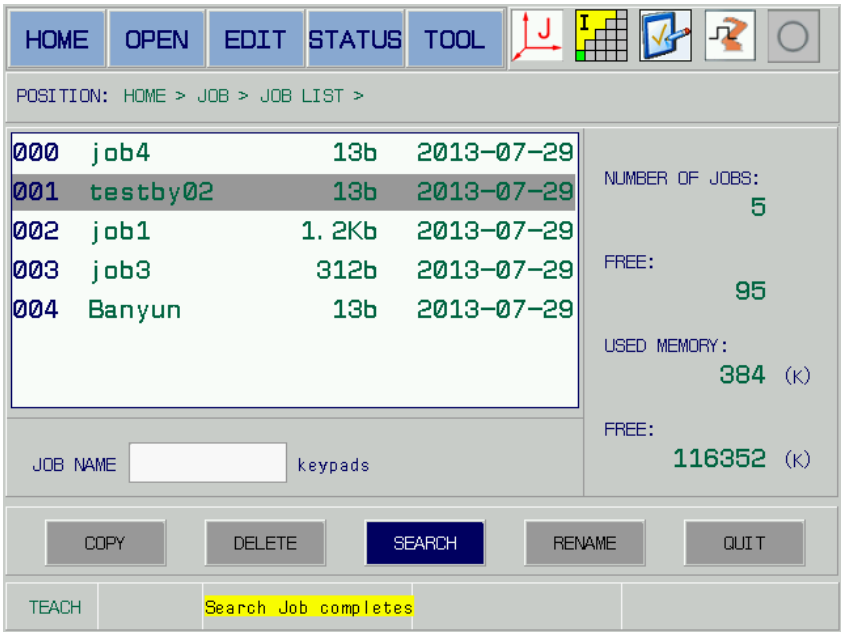


Fig. 5-17

5.1.5 Rename File

The renaming program file is modified to the program file. The modified program file should be identical with the original one, but its name should be changed.

For example: Rename the program name “testby01.prl” into “testby02.prl”, as the steps below:

1. Shift cursor to the {JOB} menu by [TAB] and left/right direction button, then open the {JOB} submenu matching with the [SELECT] and move the cursor to the {Job list} menu by up/down direction button, lastly open the {Job list} page by [SELECT]; refer to the Fig. 5-18.

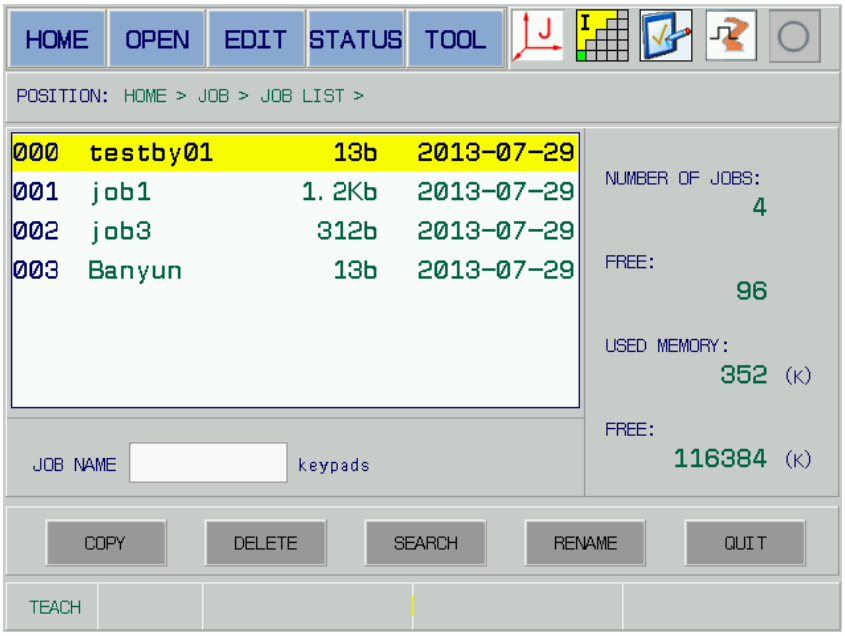


Fig. 5-18

2. Select the program to be renamed by up/down direction button, shift the cursor to the input frame area by [TAB], then enter the soft keyboard input page matching with the [SELECT], lastly input the new program name. Rename the program name “testby01” into “testby02”; refer to the Fig. 5-19.

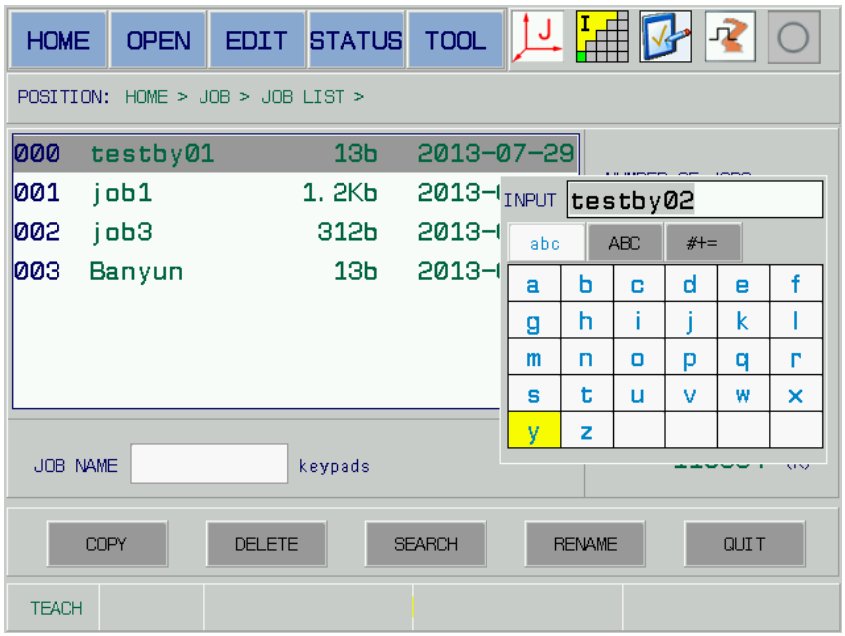


Fig. 5-19

3. Shift the cursor to the button by [TAB], then move the cursor to the [Rename] button by left/right direction button refer to the Fig. 5-20.

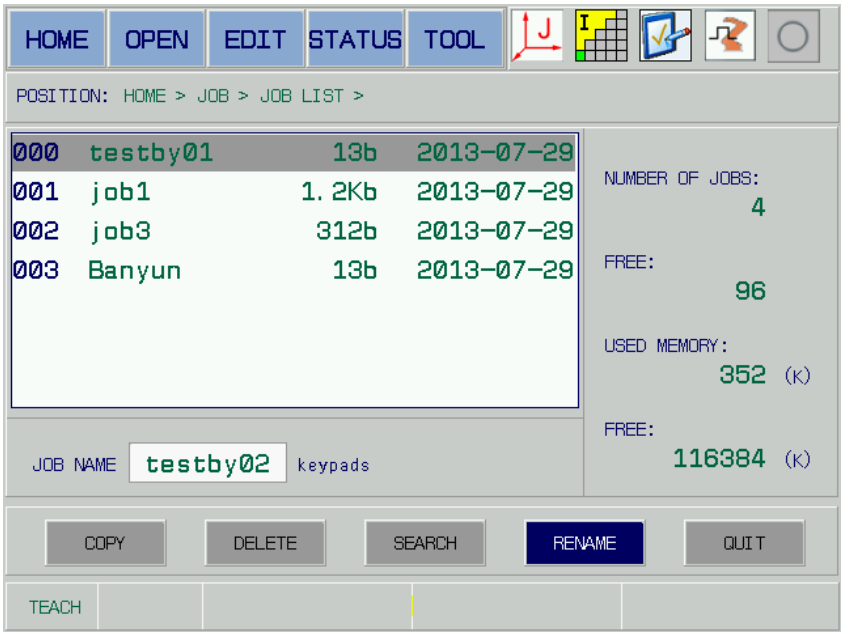


Fig. 5-20

4. Press the [SELECT], the program name “testby01” in the Job list is renamed into “testby02”; refer to the Fig. 5-21.

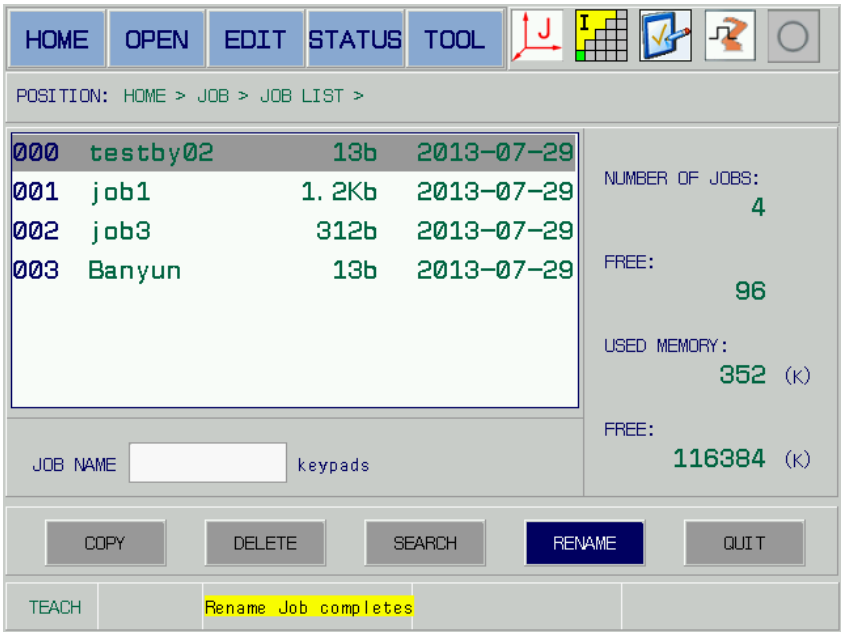


Fig. 5-21

5.1.6 Copy the System File to U Disk

The SD CARD function is that the program file of the robot system is copied to the U disk, vice versa.

For example: Copy the program name “job2.prl” to the SD CARD U disk; the

steps are shown below:

1. Insert the U disk.

2. Firstly, shift the cursor to the {JOB} menu by the [TAB] and left/right direction button, then open the {JOB} submenu by [SELECT], and then move the cursor to the {SD CARD} menu by up/down direction button, lastly open the {SD CARD} page by [SELECT]; refer to the Fig. 5-22.

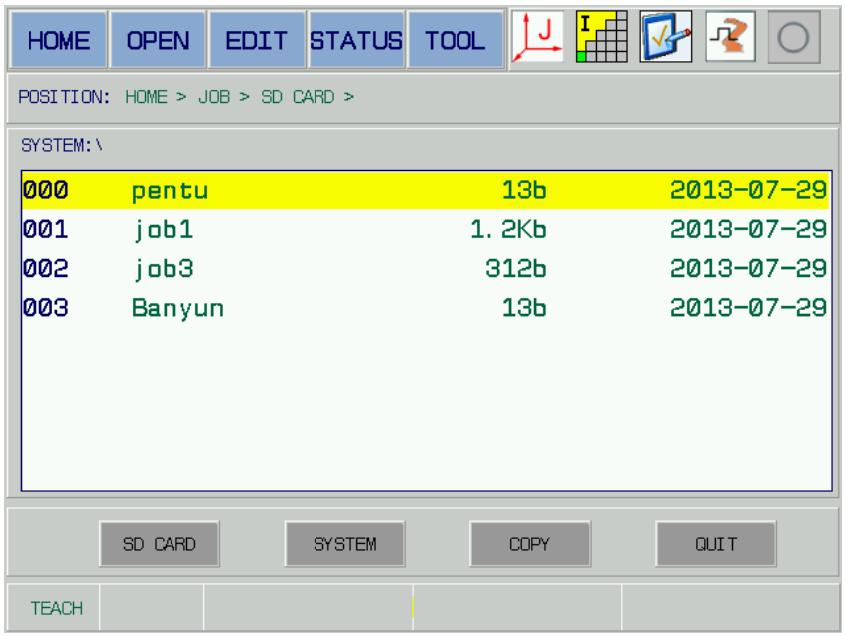


Fig. 5-22

The path name above the file list is “System\”, which means that the displayed file on the file list is the one of the system; if does not, select the [System] button by [TAB] and direction buttons; shift to the system path, then display the file information of the system.

3. Move the cursor on the program “job2.prl” to be copied by [TAB] and up/down direction buttons; the system may prompt “Confirm the copied file to U disk?” by [SELECT] (or shift the cursor to the [Copy] button in the area 2, and then press the [SELECT]); refer to the Fig. 5-23.

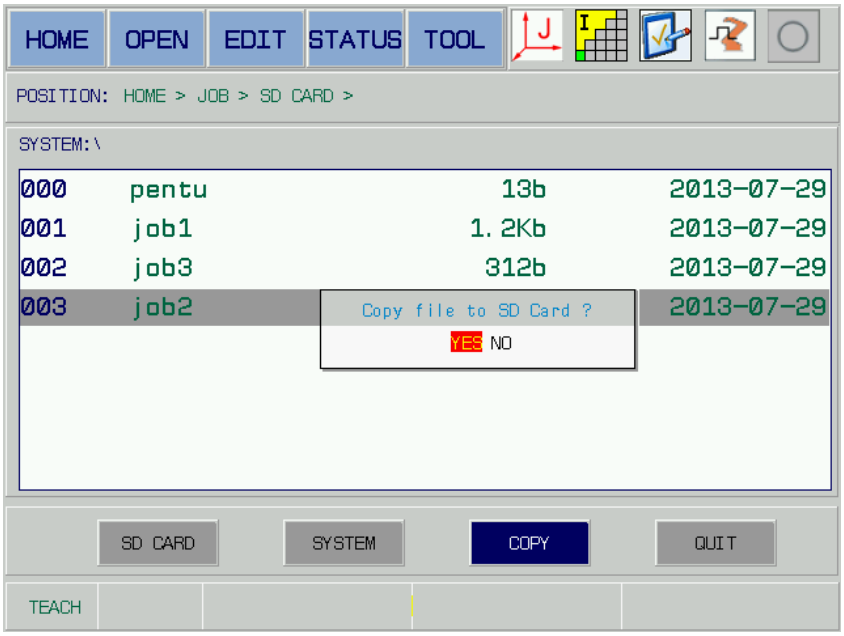


Fig. 5-23

4. Move the cursor to the “YES” by left/right direction button, and then complete the program copy by [SELECT]; refer to the Fig. 5-24.

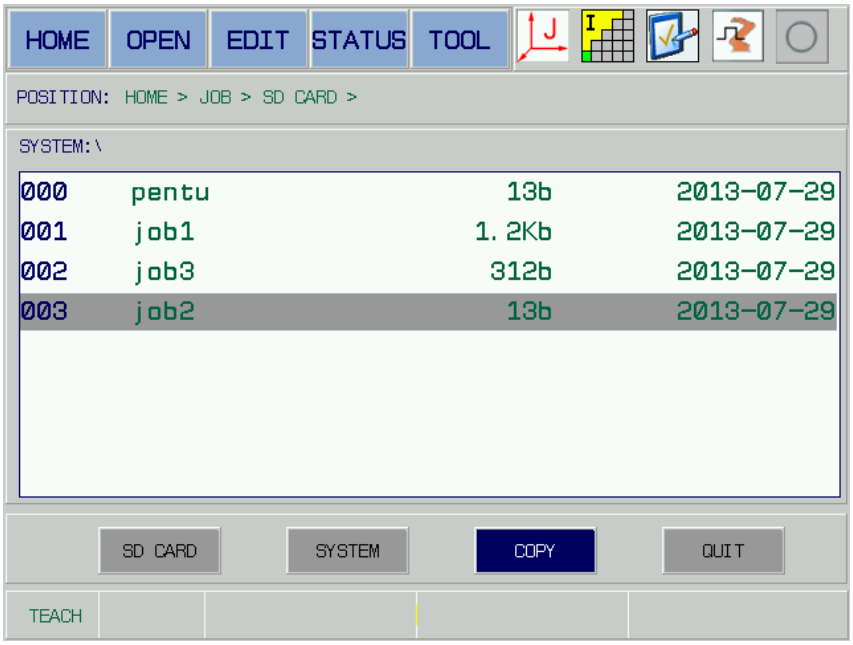


Fig. 5-24

5.1.7 Copy the U disk File to System

Copy the program name “TJIAO.prl” in the U disk to the robot TP, refer to the following steps:

1. Insert U disk.

2. Move the cursor to the {JOB} menu by [TAB] and left/right direction buttons, then open the {JOB} submenu matching with the [SELECT], and then move the cursor to {SD CARD} menu by up/down direction button, lastly open the {SD CARD} page by [SELECT].

3. Move the cursor to [U disk] button by [TAB] and left/right buttons, then open the U disk by [SELECT]; refer to Fig. 5-25.

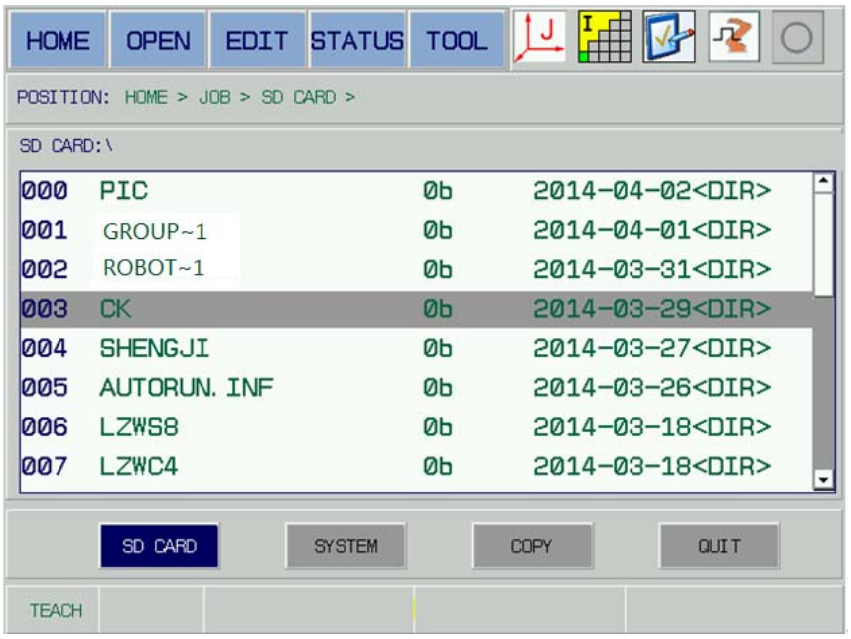


Fig. 5-25

4. Move cursor by [TAB] and up/down direction buttons, then enter the catalogue by [SELECT], return to the last layer by “Previous..”, and then move the cursor to the program ‘TJIAO.prl’ to be copied, press [SELECT] (or shift cursor to the [Copy] button, by [SELECT] of the area 2); the system may prompt “Confirm the copied file to system?”; refer to Fig. 5-26.

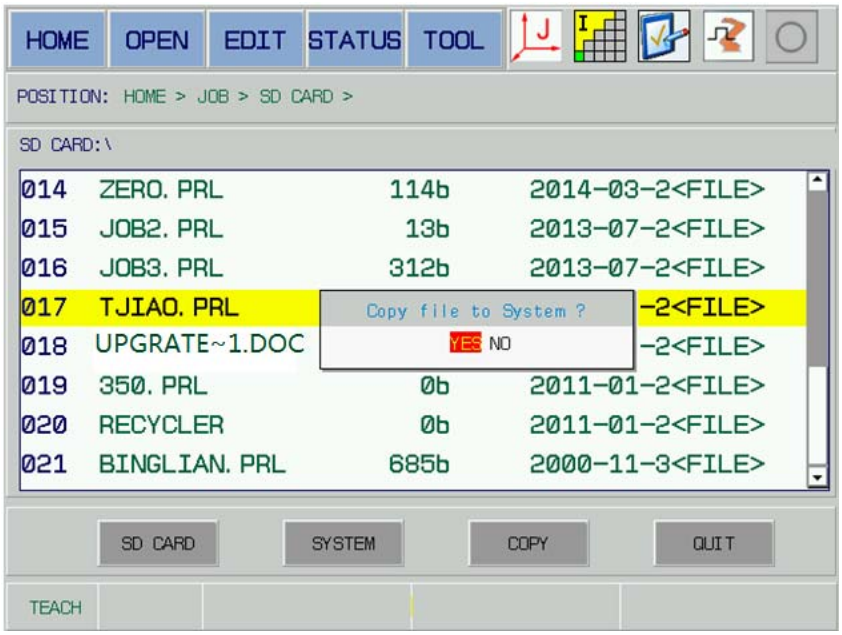


Fig. 5-26

5. Move the cursor to “YES” by left/right direction button, and then complete the program copy by [SELECT]; refer to Fig. 5-27.

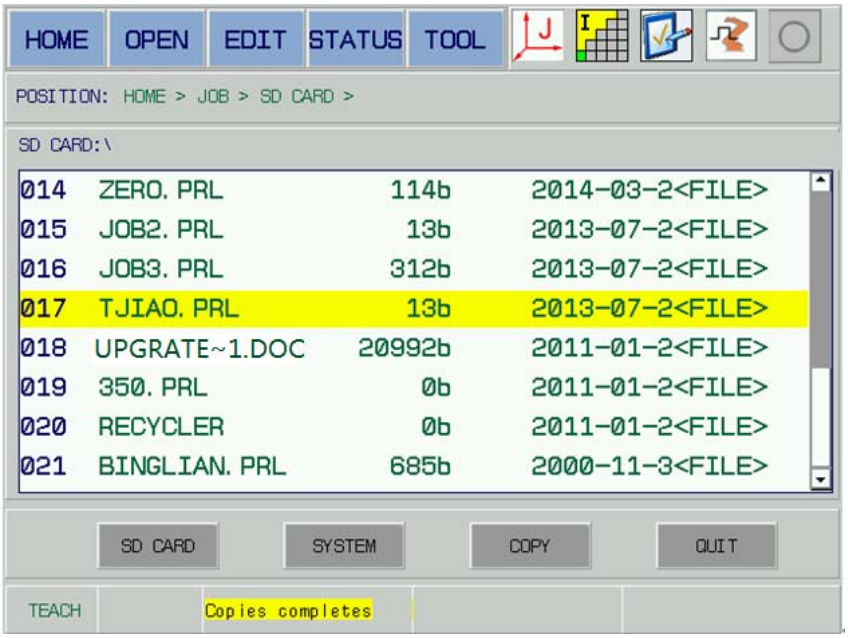


Fig. 5-27

5.2 Programming Command Editing

After the programming is input and the teaching has been inspected the operation path, if some unexpected programming commands occur, the programming command

can be edited by the corresponding functions, such as, addition command, modification command, DELET command, cutting command and copy command etc.

5.2.1 Command Addition

Command addition is that the command in the command list can be inputted to the next line of the cursor placed of the program.

It is supposed that we want to have one second dwell when the robot clamps the workpiece after moving to the clamping point, the following operations can be performed, and refer to the Fig. 5-28:

1. Open the program “testby02.prl”, enter the program display page; shift to edit method by [F3]; move the cursor to the 6th line program position by up/down direction button, in this case, the edit mode is Normal mode; refer to Fig. 5-28.

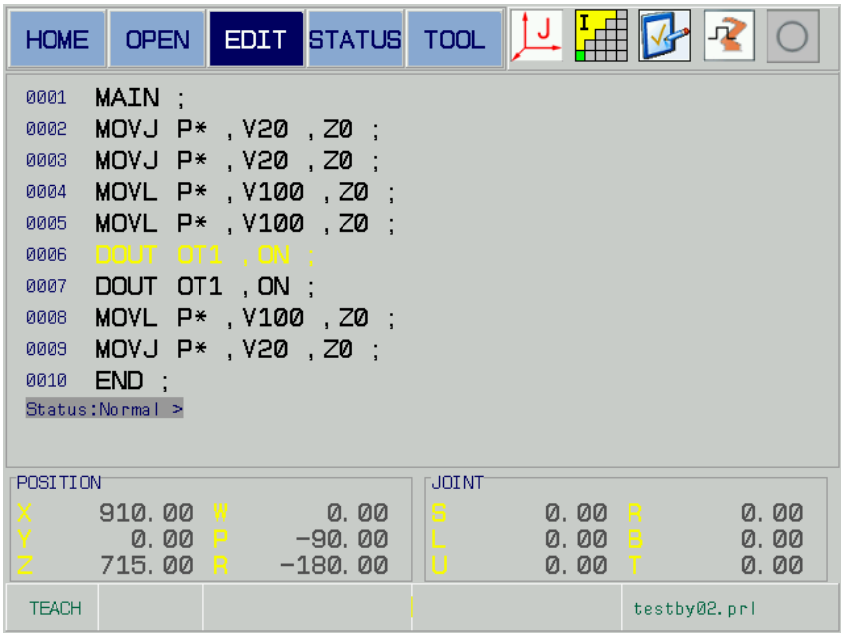


Fig. 5-28

2. Enter the Add mode by [ADD]. Move the cursor matching with the number key 2 or up/down direction button, select the type of the command specified —— {2: IN/OUT}. Move the cursor to the subcommand by left/right or [SELECT] button, then select the subcommand ——{3:DELAY} by up/down direction button or number key 3; in this case, the system may insert the delay command DELAY by [SELECT]; refer to the Fig. 5-29.

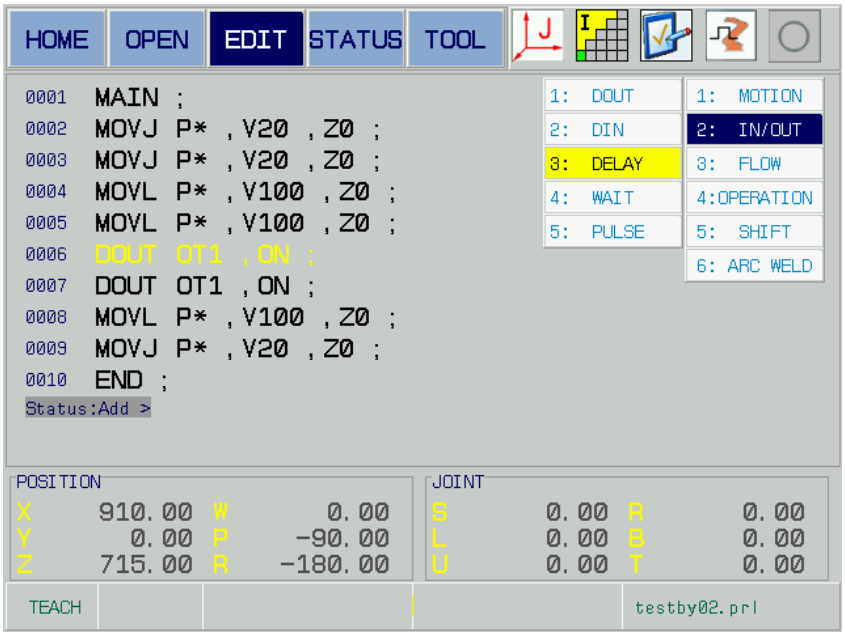


Fig. 5-29

3. The edit mode is the Modify mode after adding the DELAY command; move the cursor to the time setting T by right direction button, then input the 1 second, and then complete the time setting by [INPUT]; refer to Fig. 5-30.

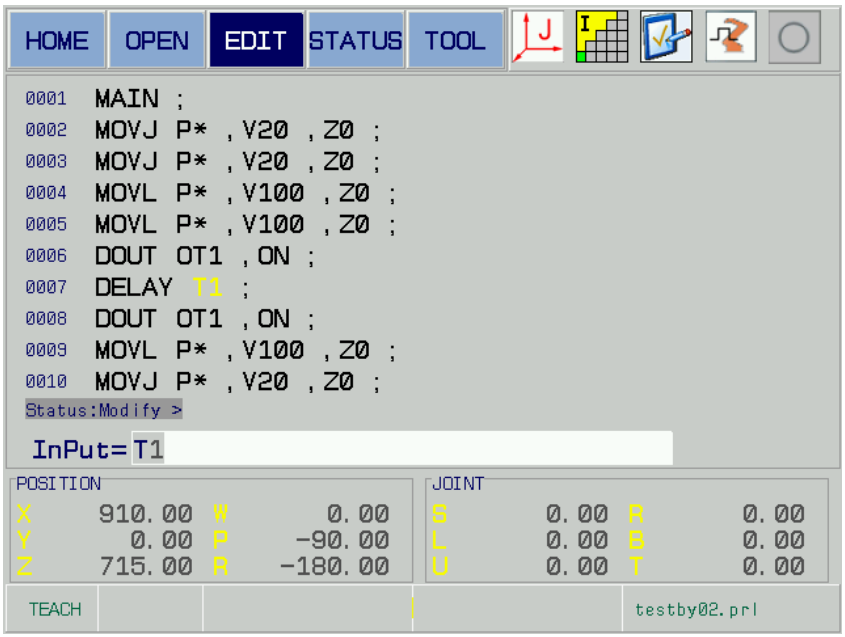


Fig. 5-30

4. Complete the command addition by [CANCEL] after time setting is performed, and then retreated from the Normal mode; refer to Fig. 5-31.

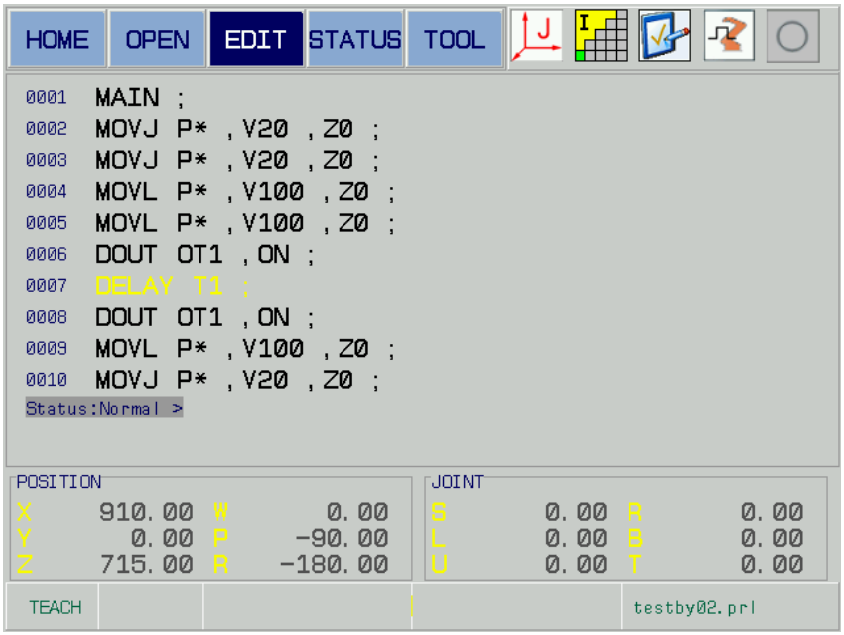


Fig. 5-31

5.2.2 Command Modification

Modification command is altered the program command where in the cursor line

The Fig. 5-32 regards as an example, it is supposed that the movement command MOVL speed at the 5th line is changed to 25; refer to the following steps:

1. Open the “testby02.prl”, enter the program display page; shift to the edit method by [F3], and then move the cursor to the 5th program position by up/down button; refer to the Fig. 5-32.

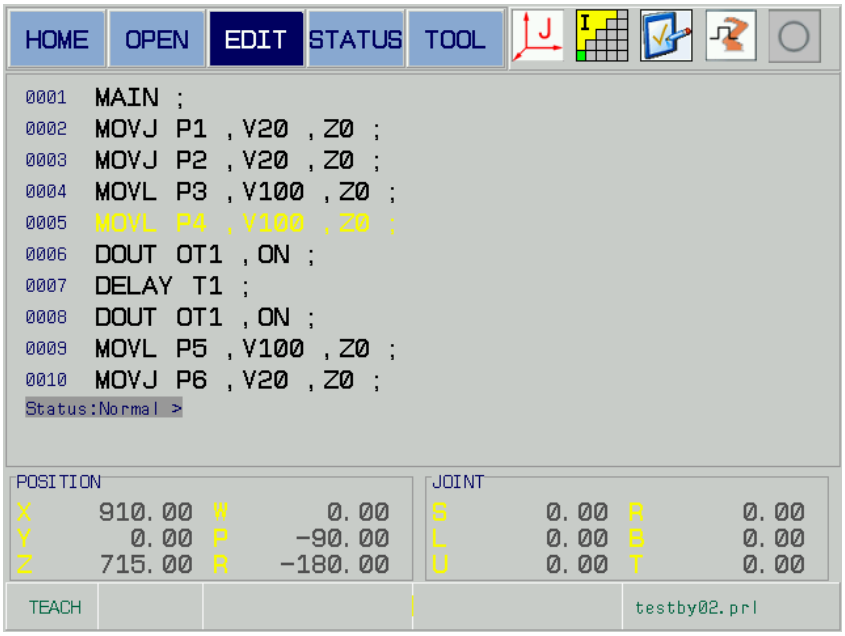


Fig. 5-32

2. Enter the Modify mode by [ALTER], move the cursor to the speed position V by left/right direction button; input 25 by number key, and then complete the modification speed by [INPUT]; refer to the Fig. 5-33.

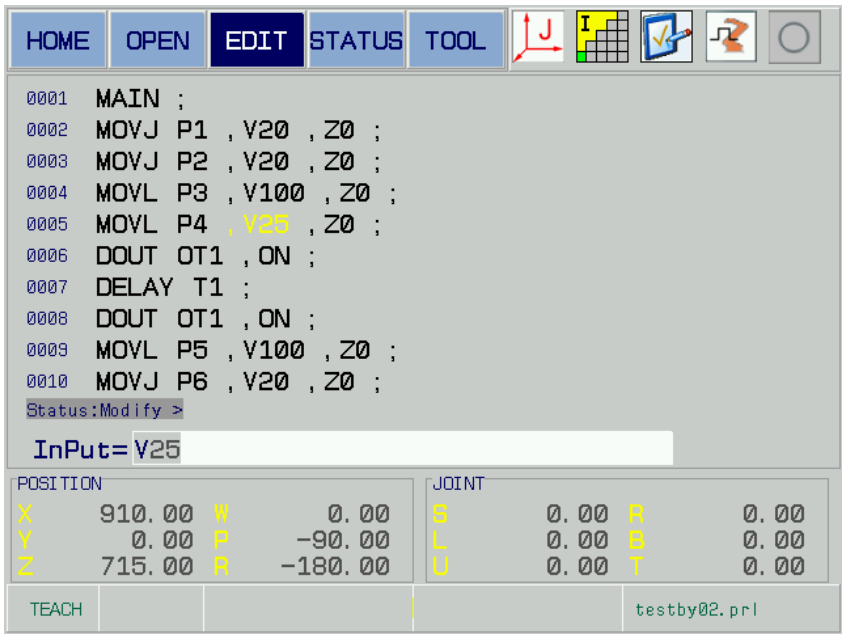


Fig. 5-33

3. Complete the command modification by [CANCEL] after the setting is performed, and back to the Normal mode; refer to the Fig. 5-34.

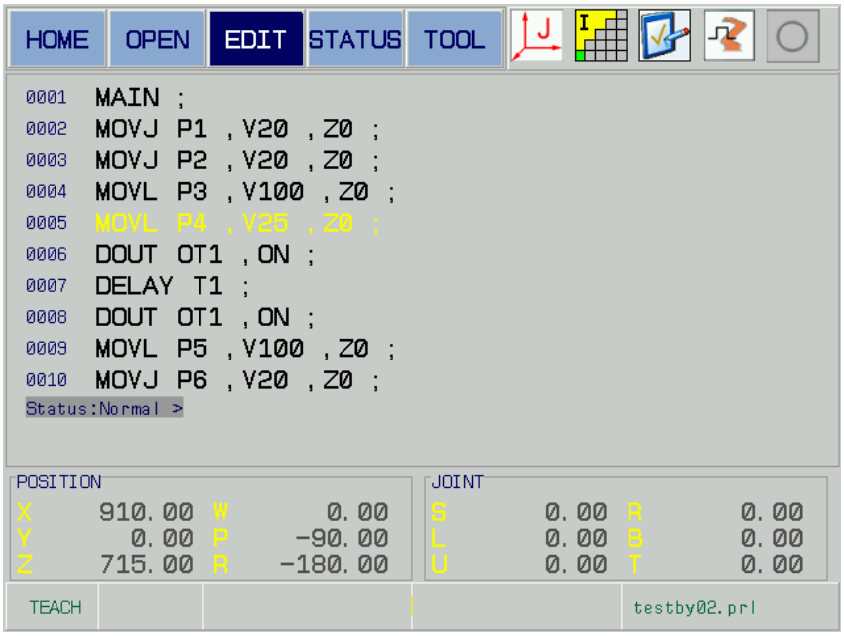


Fig. 5-34

Note: Change the teaching point variable Pm to Pn (m,n are the teaching point series No. 0~999 or *); if the Pn point does not exist, the system may create the Pn point, and its value is the one of the Pm; if the Pn is already existed, the value of the Pn point does not change. The Pn point is always existed including the deleted command line, as long as the current program is quoted the Pn.

The system may assign the current position to the Pn point when the teaching point operation gain is performed to Pn, the old value of the Pn point will be abandoned.

5.2.3 Command DELET

Command DELET is deleted the program command where at the cursor line

The Fig. 5-35 is regarded as an example; it is supposed that if the MOVJ movement command at the 2nd line will be deleted, the operation steps are shown below:

1. Open the program “testby02.prl, then enter the program display page, shift to the edit method by [F3], and then move the cursor to the 2nd line program position by up/down direction button; refer to Fig. 5-35.

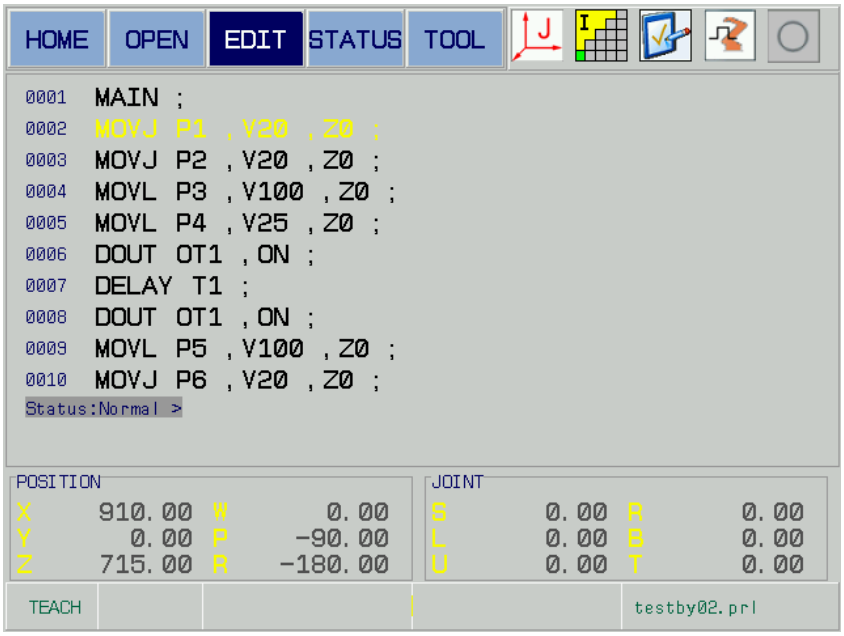


Fig. 5-35

2. Press [DELET], the page prompts “Select Block. Select the desired command area by up/down button. Here, we just delete the current line, regardless of the SELECT area.

3. Press [DELET] button before selecting the area, in this case, the page shows deleting the current line confirmation frame, and then select whether delete it by left/right direction button; refer to Fig. 5-36.

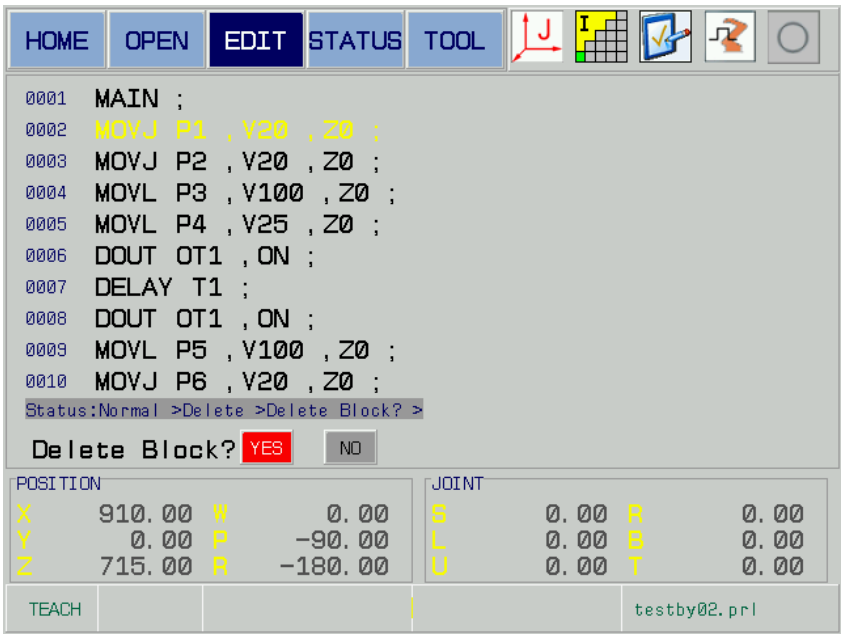


Fig. 5-36

4. If select [YES], the press the [SELECT], and then delete the current line; if select [NO], then cancel the DELET operation; refer to the Fig. 5-37.

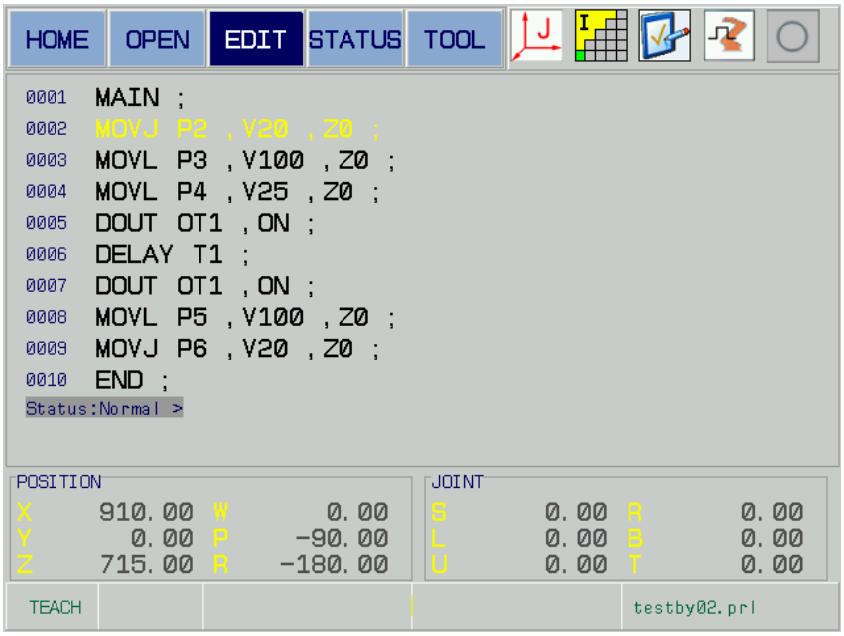


Fig. 5-37

5.2.4 Cutting Command

The Fig. 5.38 is regarded as an example, cut the 2nd, 3rd and 4th line program to the back of the 5th line; refer to the operation steps:

1. Open the program “testby02.prl”, then enter the program display page; shift to the edit method by [F3]; select the program start line (the 2nd line) to be cut by up/down direction button; refer to the Fig. 5-38.

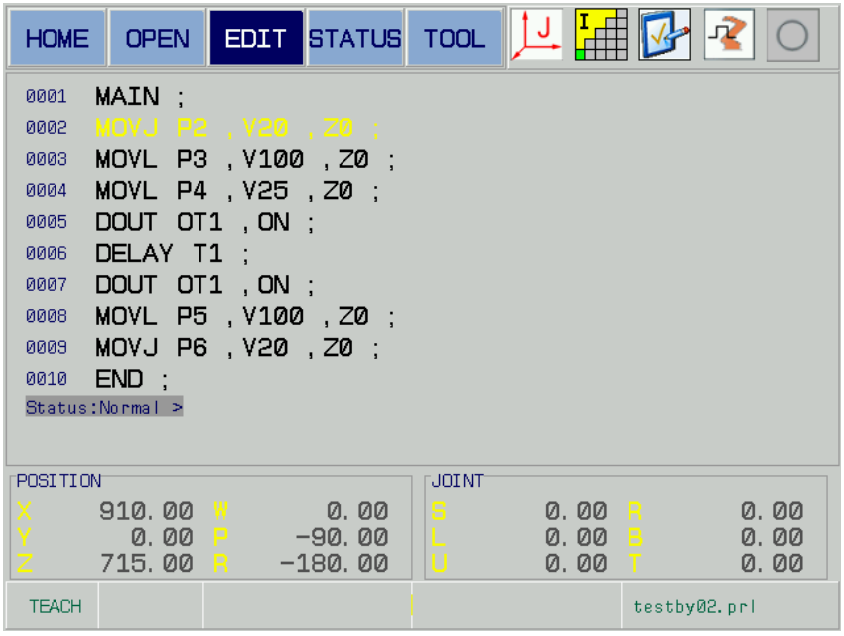


Fig. 5-38

2. Press [CUT], in this case, the cutting area SELECT may prompt at the bottom of the interface; select the desired cutting area (from the 2nd line to the 4th) by up/down direction button; refer to Fig. 5-39.

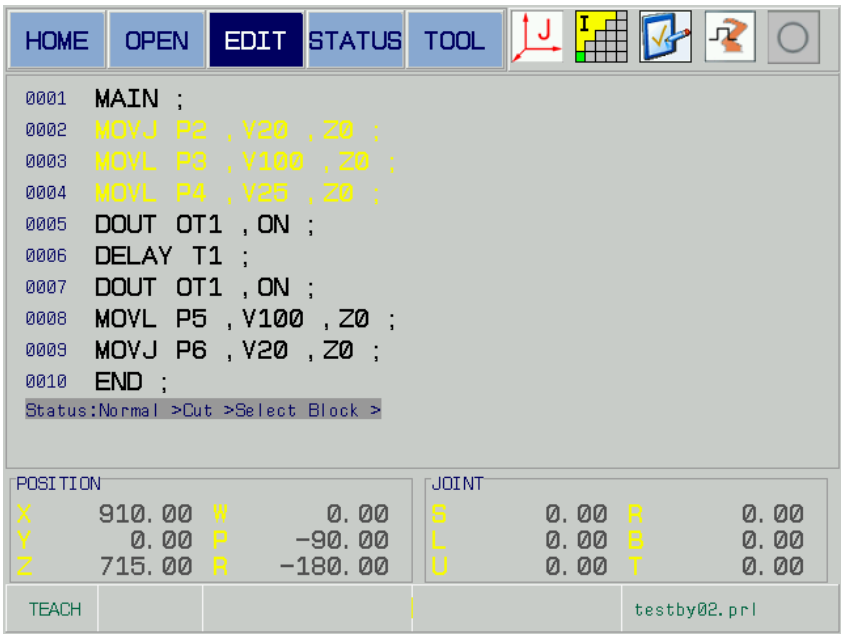


Fig. 5-39

3. Press the [CUT] before selecting the cutting area, in this case, the “Select Paste Location” prompts at the bottom of the page; move the cursor to the previous line of the eventual position to be pasted, for example, cut the 2nd, 3rd, and the 4th line program and place to the back of the 5th line; refer to the Fig. 5-40

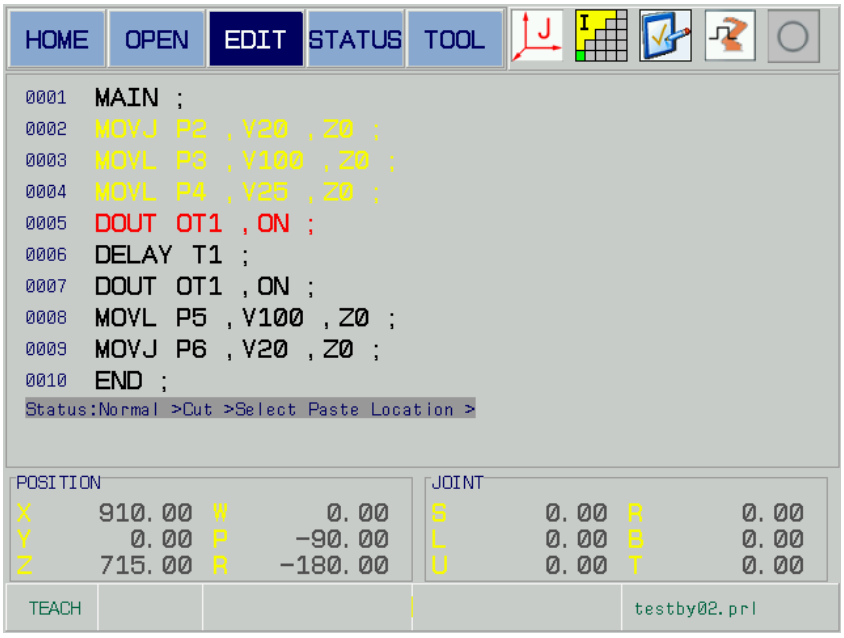


Fig. 5-40

4. Lastly, complete the cutting operation by [CUT]; refer to the Fig. 5-41.

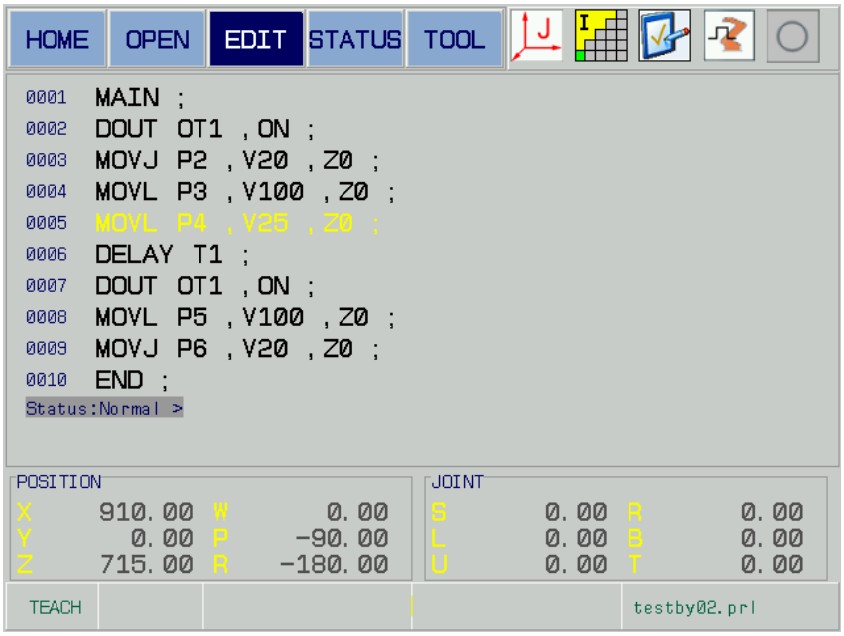


Fig. 5-41

5.2.5 Copy Command

The Fig. 5-42 is regarded as an example, copy the 2nd, 3rd, 4th and 5th line program to the back of the 8th line; refer to the following operation steps:

1. Open the program “testby02.prl”, then enter the program display page; shift to the edit method by [F3]; select the desired copy program start line (the 2nd line) by up/down direction button; refer to the Fig. 5-42

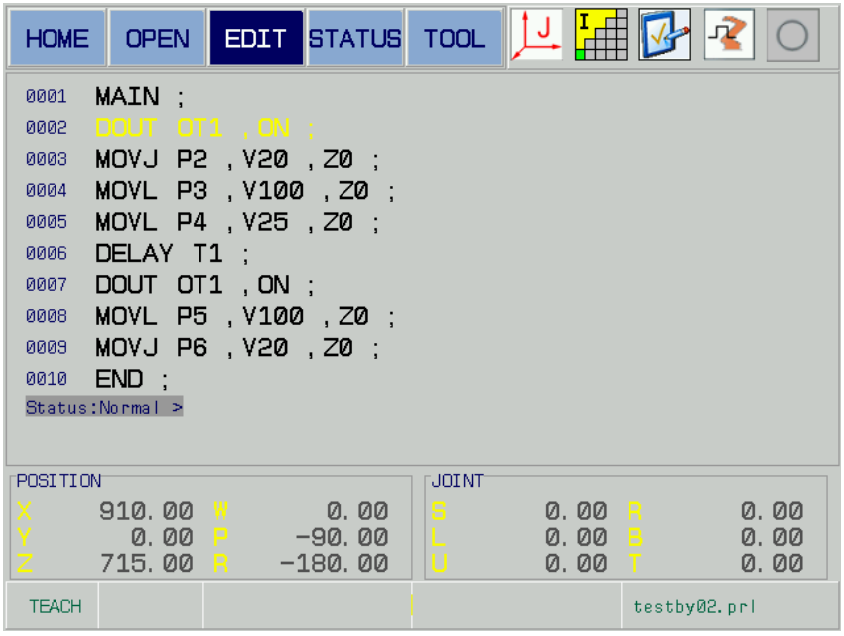


Fig. 5-42

2. Press the [COPY] button, in this case, the “Select Block” may prompt at the bottom of the interface; Select the desired copy area (from the 2nd line to the 5th) by up/down direction button; refer to Fig. 5-43.

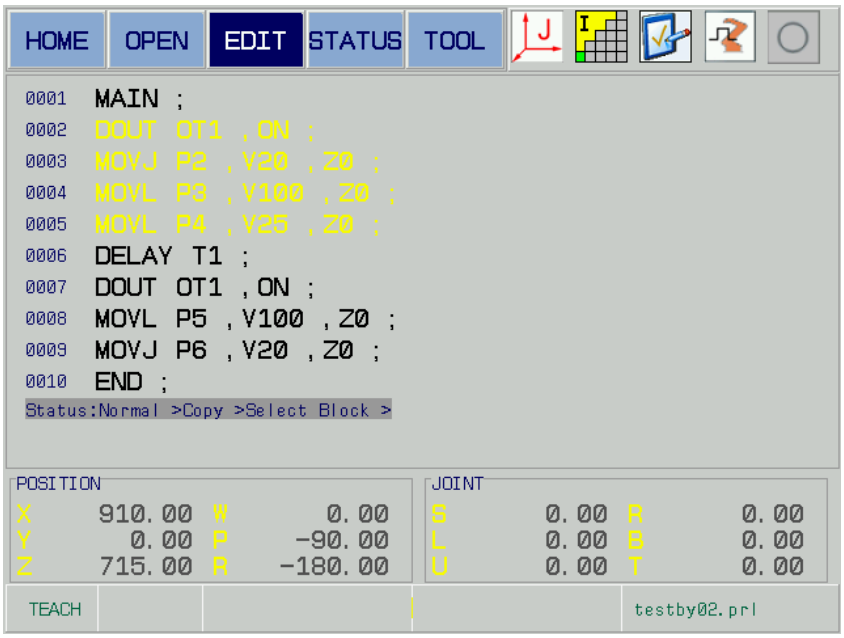


Fig. 5-43

3. Press the [COPY] before selecting the copy area, in this case, the "Select Paste Location" prompts at the bottom of the page; move the cursor to the previous line of the eventual position to be pasted, for example, copy the 2nd, 3rd, 4th and 5th line program to the back of the 8th line; refer to the Fig. 5-44.

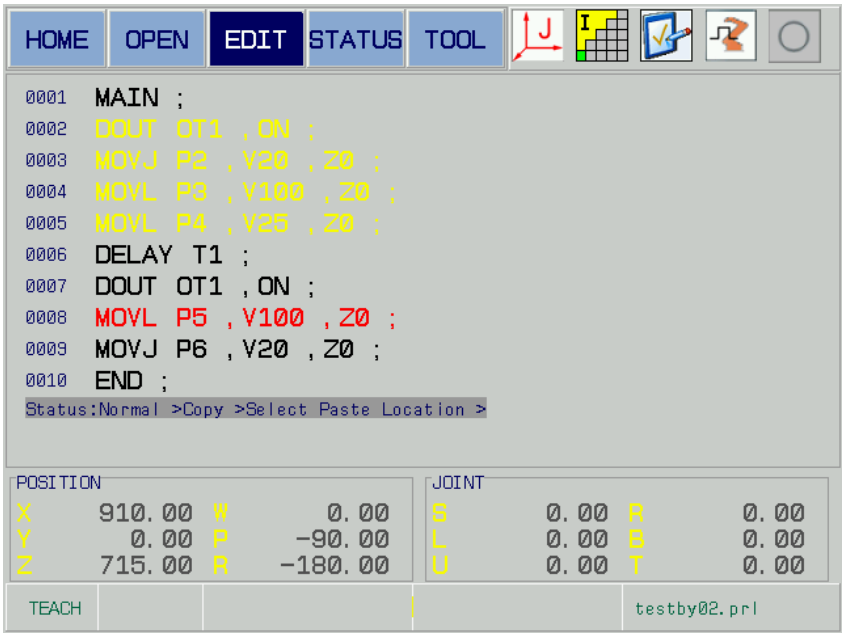


Fig. 5-44

4. Lastly, press the [COPY] to complete the copy operation; refer to the Fig. 5-45.

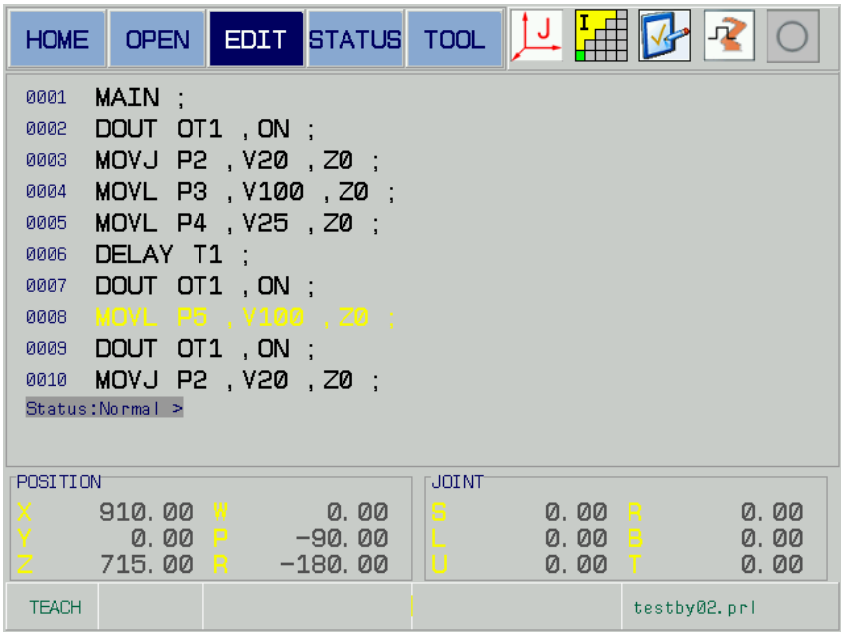


Fig. 5-45

5.2.6 Integral Replacement

The integral replacement function is that the speed or transition parameter of the overall same movement command (MOVJ or MOVL or MOVC) in the program file is replaced. Speed parameter has two methods to perform the integral replacement: one is replaced to a same speed value entirely, which is called **Integral Same Replacement Method**, for example, replace the overall MOVJ command speed into V80; the other is replaced based upon one proportion, which is treated as the **Integral Proportion Replacement Method**, for example, alter the speed of each MOVJ command to V*0.5. Only the Integral Same Replacement Method is performed for the transition parameter.

A. Integral Same Replacement Method

"job1.prl" is regarded as an example, replace the speed V of the movement command MOVJ and the accuracy value Z with the Integral Same Replacement Method; refer to the following operation steps:

1. Open the program "job1.prl", then enter the program display page; shift to the edit method by [F3], and then select the speed parameter V20 (the 1st line) of MOVJ by [ALTER] and the up/down direction button; refer to the Fig. 5-46.

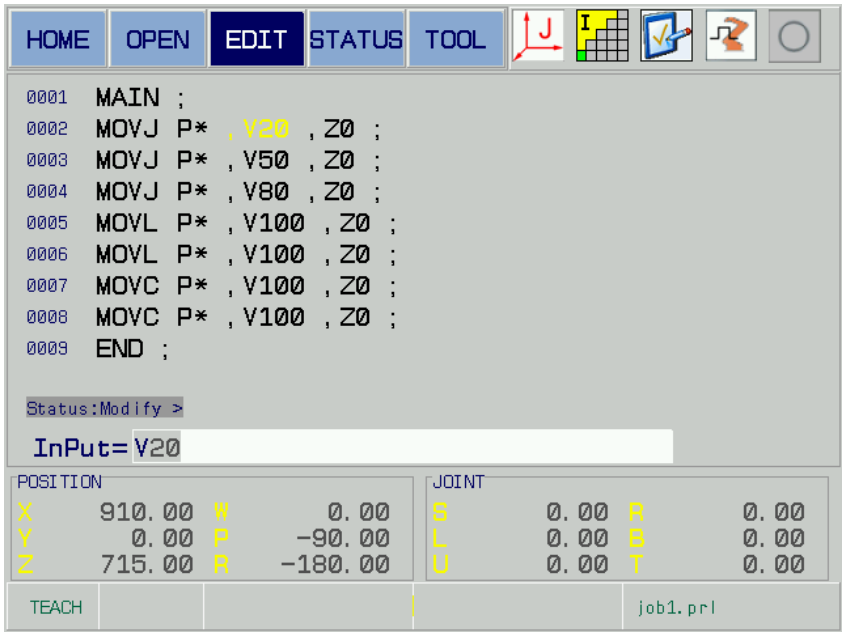


Fig. 5-46

2. Input the desired speed value of MOVJ command movement by the numerical value buttons; for example, V60, input 60 by these buttons.

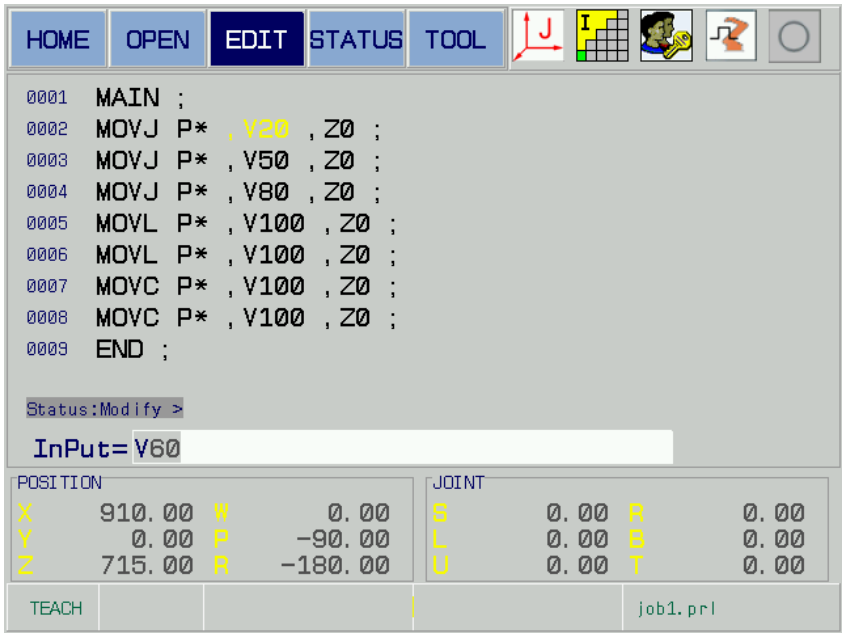


Fig. 5-47

3. The speed parameter of the overall MOVJ movement commands will be all replaced into V60 by [SHIFT] + [INPUT]; refer to the Fig. 5-48.

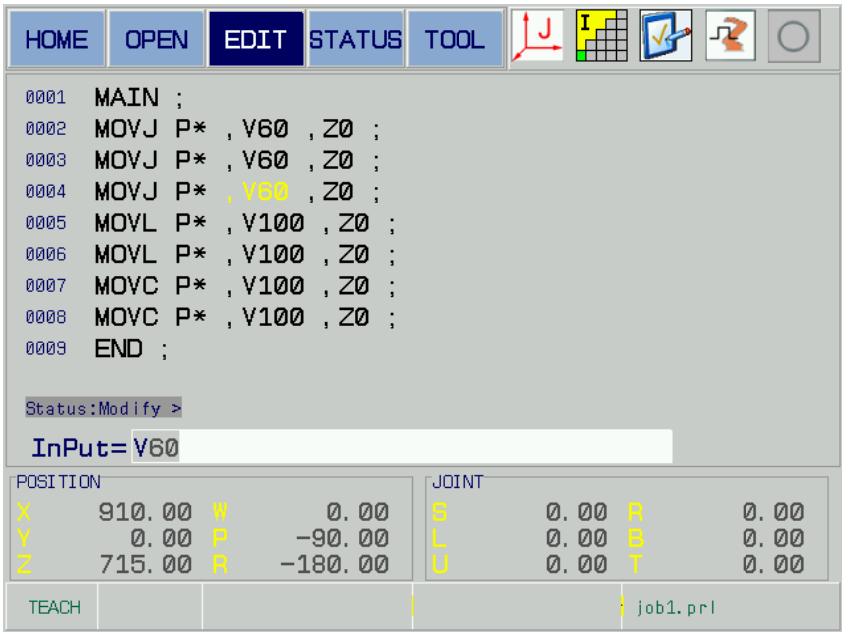


Fig. 5-48

4. Select the speed parameter Z0 (the 1st line) of the MOVJ by the four direction buttons; refer to Fig. 5-49.

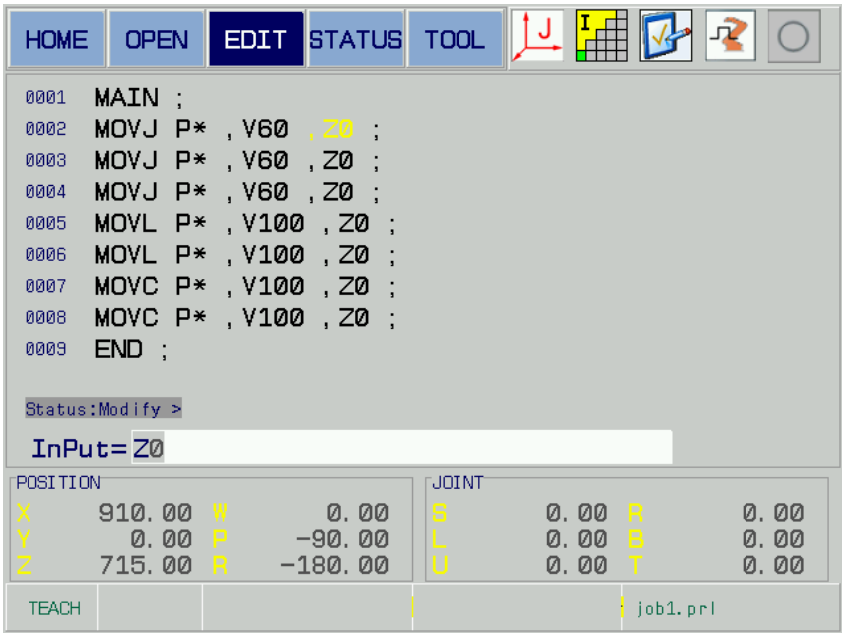


Fig. 5-49

5. Input the desired accuracy value of the MOVJ command movement by the numerical value buttons; for example, Z1, input the 4 by these buttons; refer to the Fig. 5-50.

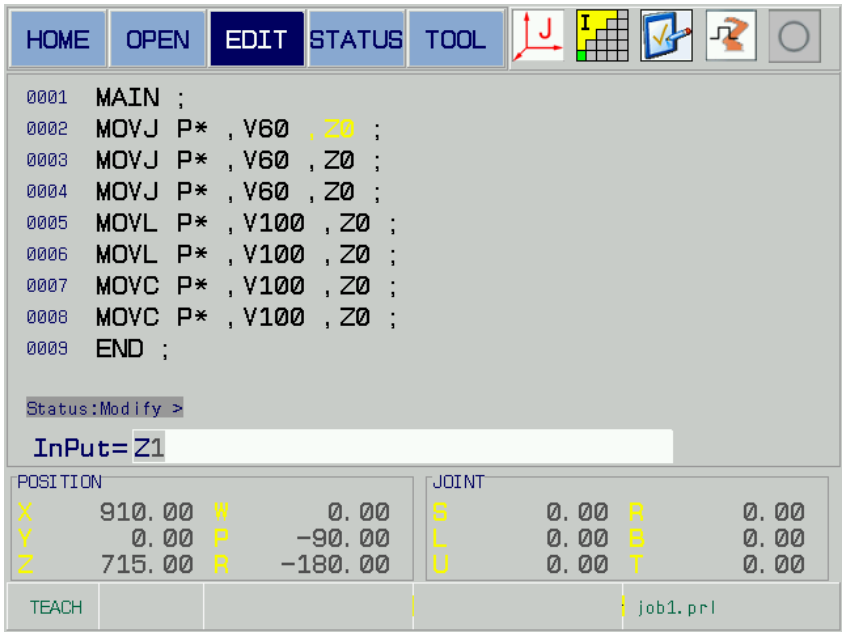


Fig. 5-50

6. The accuracy parameter Z0 of the MOVJ movement command will be replaced into Z1 by [SHIFT] + [INPUT]; refer to the Fig. 5-51.

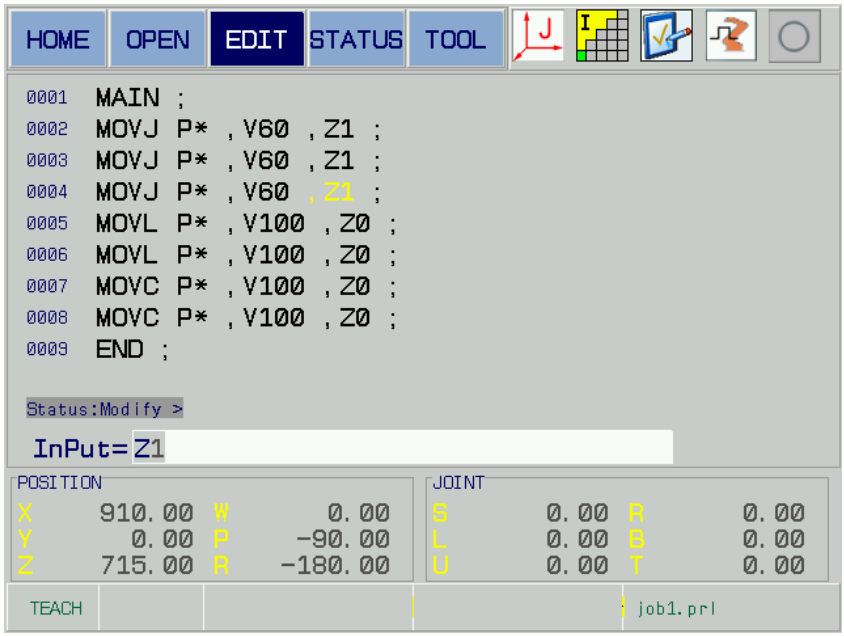


Fig. 5-51

7. This function is also can be used in the MOVL and MOVC movement commands, same as the operations.

B. Integral Proportion Replacement Method

"job2.prl" is regarded as an example, replace the speed of the movement command MOVJ by the Integral Proportion Replacement Method; refer to the

operation steps:

1. Open the program “job2.prl”, then enter the program display page; shift to the edit method by [F3], and then select the speed parameter V20 (the 1st line) of the MOVJ by [ALTER] or up/down direction button; refer to the Fig. 5-52.

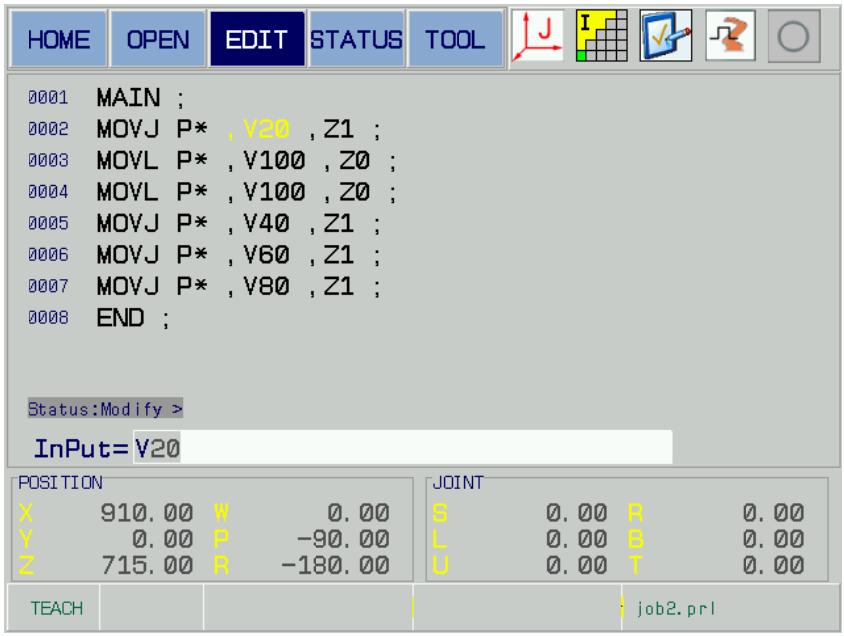


Fig. 5-52

2. Input the desired proportion value (0.1~1.9) of the MOVJ command movement by numerical value buttons; for example, input 0.5 by these buttons; refer to the Fig. 5-53.

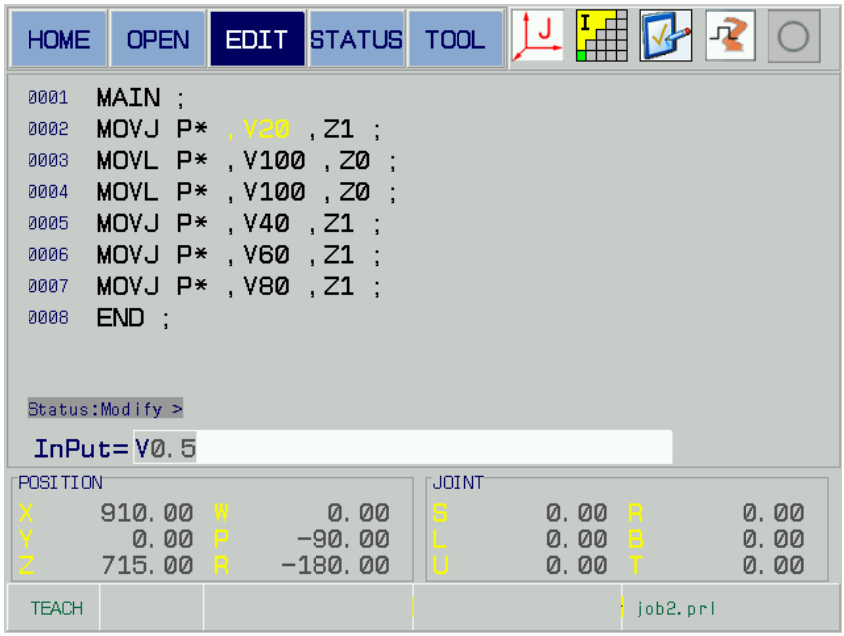


Fig. 5-53

3. The speed parameters of the overall MOVJ movement commands will be all

replaced into V*0.5 by [SHIFT] + [INPUT]; refer to the Fig. 5-54.

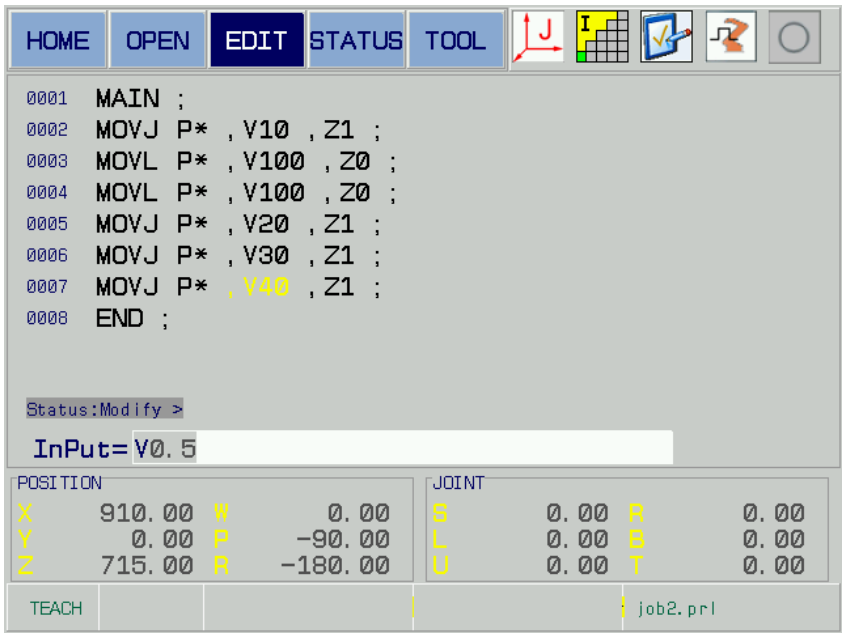


Fig. 5-54

4. This function is also can be used in the MOVL and MOVC movement commands, same as the operations.

Note: When the V* proportion value is more than the max. value of the speed parameter, the max. value is regarded as the last result; if the V* proportion value is less than the min. value of the speed parameter; the min. value is then treated as the last result.

5.2.7 Search Command

Search command is found the command position by the key word; simultaneously, position the cursor to the command suitable for this key word. If there are several commands are accorded with the key word, circularly view each command suitable for the key word by the up/down button.

The search methods are included: Line search, Position search, Label search, Instruction search, Regular Expression search etc.

A. Enter the search mode

It is Normal mode in {Edit} interface mode, enter the search mode by [SELECT], then search method menu appears; refer to the Fig. 5-55.

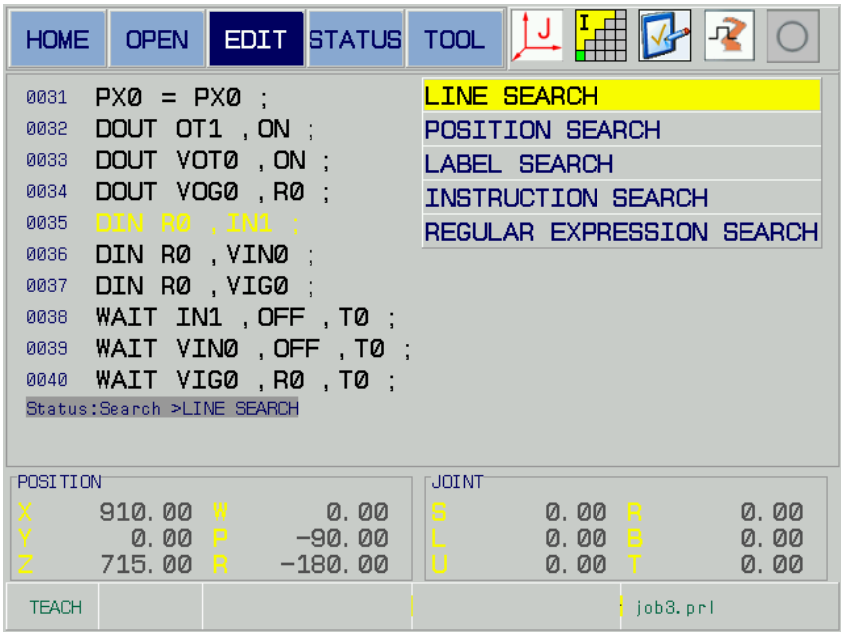


Fig. 5-55

Retreat from the search mode by [CANCEL], and then return to the Normal mode.

B. Line search

In the search method menu, move the cursor to the {LINE SEARCH} by the direction buttons, then enter the program line search interface by [SELECT], input the desired search program line, and then complete the search operation by [INPUT] Key , lastly, position the cursor to the specified program line; refer to Fig. 5-56.

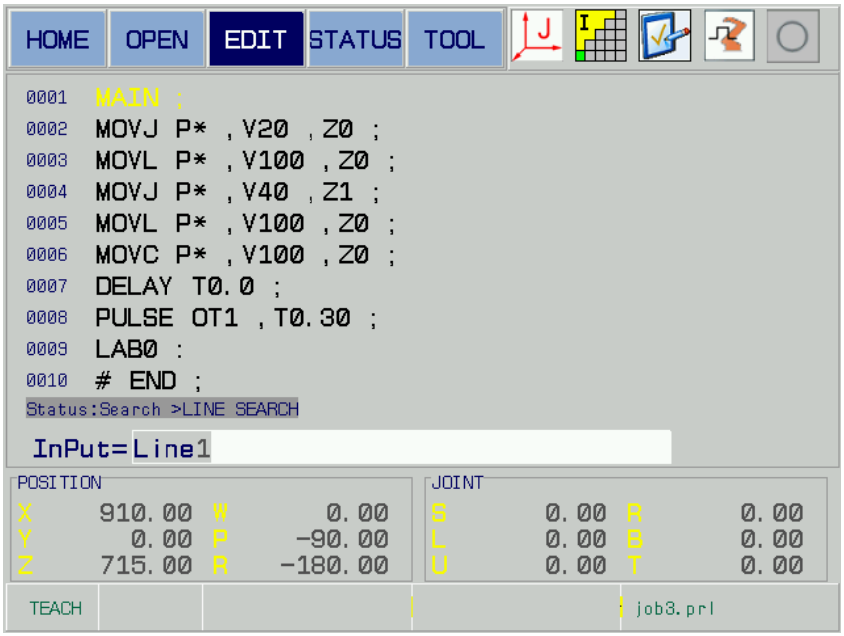


Fig. 5-56

C. Position search

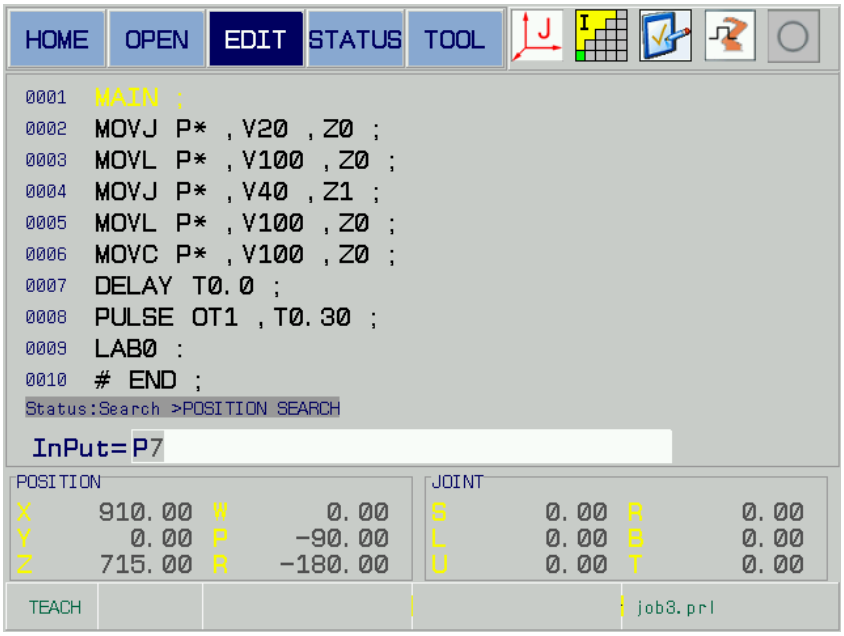


Fig. 5-57

D. Label search

Move the cursor to the {LABEL SEARCH} in search method menu, enter the mark search interface by [SELECT], input the desired search mark, and then complete the search operation by [INPUT] key. The cursor is positioned to the program line which appears the key word at the first time. View and browse the operation by up/down direction button; refer to the Fig. 5-58.

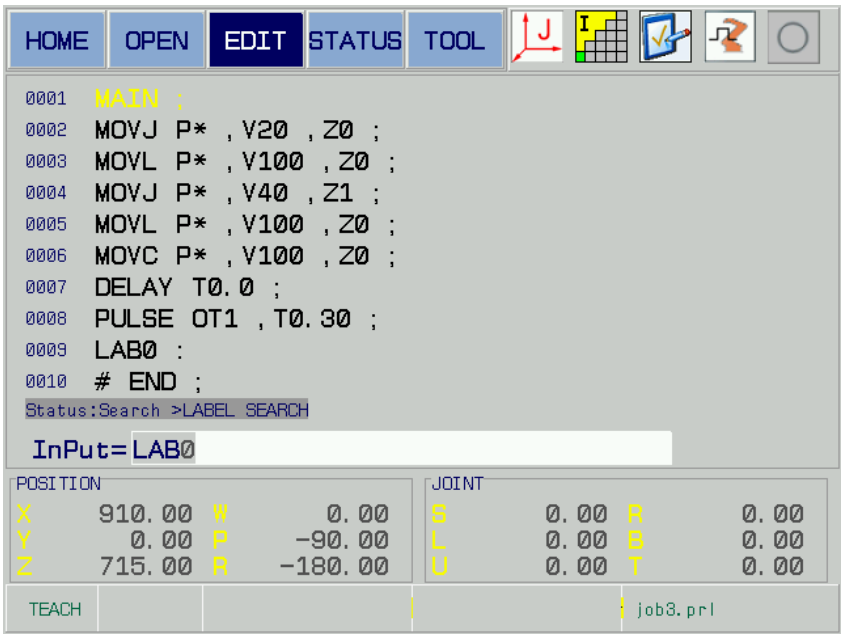


Fig. 5-58

E. Instruction search

Move the cursor to the {INSTRUCTION SEARCH} in search method menu, enter

the instruction search interface by [SELECT], input the desired instruction (such as MOVJ, WAIT, OFF), and then complete the search operation by [INPUT] key. The cursor is positioned to the program line which appears the key word at the first time. View and browse the operation by up/down direction button; refer to the Fig. 5-59.

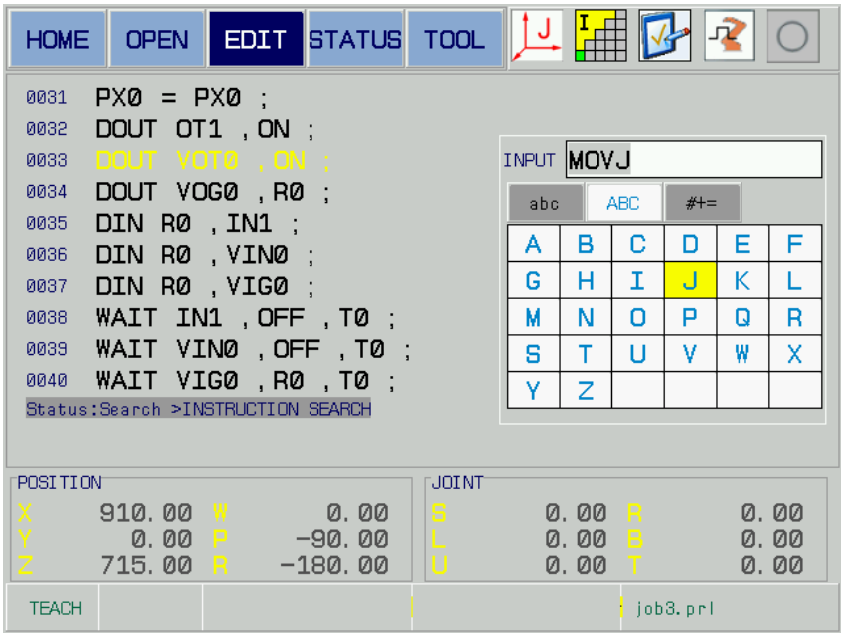


Fig. 5-59

F. Regular Expression Search

Regular expression search is the search that the regular expression is regarded as the search key word.

The regular expression has many complicated functions, here we just use a fraction of them; refer to the following rules.

1) The regular expression composes of letter, number and symbol.

2) Symbol with some specified meaning

a) The symbol means quantity:

'.' point symbol: It means any single character.

'*' start symbol: It means that the left character can be appeared freely, zero included.

For example: BA* can be matched with B, BA, BAA, BAAA...

b) The symbol means position:

'^': It means that the upmost left character must be appeared at the beginning of the command.

'$': It means that the upmost left character must be appeared at the end of the command.

'\<': If one character string is at the right followed with its left {Blank or punctuation}, this character will be matched with the one of "\<character string".

For example: "\<MOVJ" will match with the character string "MOVJ" in the MOVJ P1, V100, Z1

However, the MOVJ in the # MOVJ P1, V100, Z1; can not be matched.

'\>': It is opposite to the "\<": "P\>" only match with the P in JUMP, instead of the P in the P*.

For example: If the overall MOVJ,MOVL,MOVC commands should be searched, and the transition values are all regarded as Z1, and therefore, the regular expression search can be performed: ^MOV.*Z1.

In the search method menu, move cursor to the {REGULAR EXPRESSION SEARCH} by direction button; enter the regular expression search interface by [SELECT]; and then input the regular expression (For example, \<O search the overall commands, which only the letter O is at the left of the space or the punctuation character) by soft keyboard; and then complete the search operation by [INPUT] key. The cursor is positioned to the program line which appears the key word at the first time. View and browse the operation by up/down direction button; refer to the Fig. 5-60.

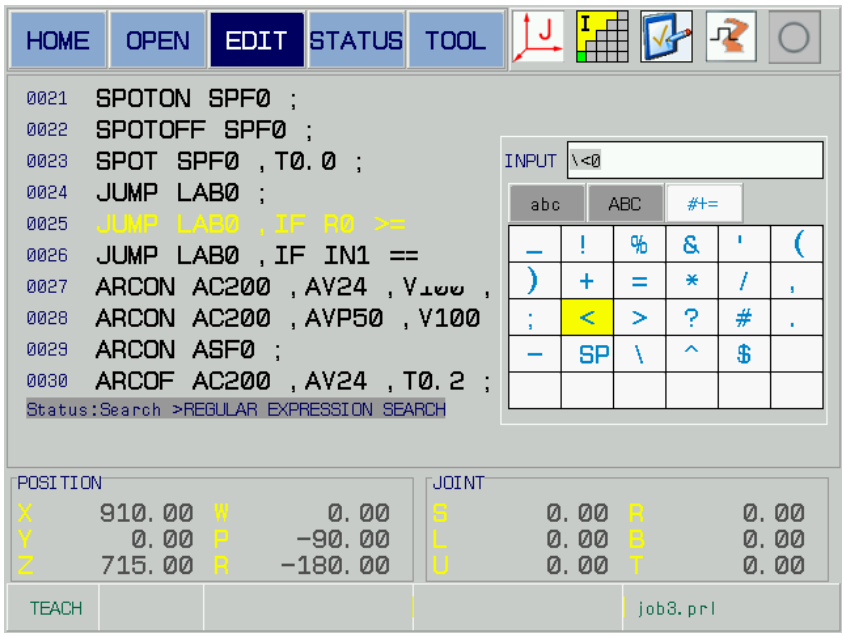


Fig. 5-60

CHAPTER SIX ROBOT COMMAND

6.1 Program Command

The robot commands are composed of the movement command, signal treatment command, flow control command, calculation command and translation command.

6.2 Movement Command

The movement command consists of MOVJ, MOVL and MOVC commands.

6.2.1 MOVJ

Function:

Move to the specified posture based upon the PTP (Point To Point) method.

Format:

MOVJ posture variable name, V <Velocity>, Z <Precision>;

Parameter:

1. Posture variable name Specify a destination posture of the robot, which is regarded as teaching point number; the system that adds this command is regarded as default “P*”, which can be compiled the P Teaching point, and its range is P**0**~P999.

2. V<Velocity> Specify the movement velocity of the robot, which is treated as maximum velocity percentage, and its solution range is 1-100(%).

3. Z <Precision> Specify a precise in-position situation of the robot, wherein, the precision means accuracy grade. At present, there are only four levels from 0 and 4.

Explanations:

1. When the MOVJ command is performed, the robot moves based upon the joint interpolation mode.

2. During movement, the whole processing that the robot is performed from the start posture to the end one, the movement stroke proportion of each joint is equal related with the overall stroke.

3. MOVJ command accuracy level Z0 means precision in-position, Z1~4 means

joint transition

4. When the MOVJ and MOVJ are transited, and the transition level Z1~Z4 are same; when the MOVJ is transited between the MOVJ (MOVJ, MOVC), its level is Z1~Z4.

For example:

```
MAIN；
MOVJ  P*, V30, Z0;
MOVJ  P*, V60, Z1;
MOVJ  P*, V60, Z1;
END；
```

6.2.2 MOVL

Function:

Move to the specified posture based upon the linear interpolation method.

Format:

MOVL posture variable name V <Velocity>, Z<Precision>

Parameter:

1. Posture variable name Specify a destination posture of the robot, which is regarded as teaching point number; the system that adds this command is regarded as default “P*”, which can be compiled the P Teaching point, and its range is P**0**~P999.

2. V<Velocity> Specify the movement velocity of the robot, and its resolution range 0-9999mm/s is the integer.

3. Z <Precision> Specify a precise in-position situation of the robot, wherein, the precision means accuracy grade. At present, there are four levels (from 0 to 4), Z0 means precision in-position, Z1~Z4 means straight line transition; the higher the precision level is, the lower the in-position accuracy is.

Explanation:

When the MOVL command is performed, the robot moves based upon the linear interpolation method.

For example:

```
MAIN；
MOVJ  P*, V30, Z0;
```

```
MOVL  P*, V30, Z0;
MOVL  P*, V30, Z1;
END;
```

6.2.3 MOVC

Function:

Move to the specify pose based upon the circular arc interpolation method.

Format:

MOVC Posture variable name, V<Velocity>, Z<Accuracy>;

Format:

1. Posture variable name Specify a destination posture of the robot, which is regarded as teaching point number; the system that adds this command is regarded as default “P*”, which can be compiled the P Teaching point, and its range is P**0**~P999.

2. V<Velocity> Specify the movement velocity of the robot, and its resolution range 0-9999mm/s is the integer.

3. Z <Precision> Specify a precise in-position situation of the robot, wherein, the precision means accuracy grade, and its range is 0-4.

Explanation:

1. When the MOVC command is performed, the robot moves based upon the circular arc interpolation method.

2. Three or more points can be confirmed an arc, the system may alarm if it is less than three points.

3. The transition can be performed between straight line and arc and circular arcs, the accuracy level Z is 0-4.

For example:

```
MAIN；
MOVJ   P*，V30，Z0；
MOVL   P*，V60，Z1；
MOVC  P*，V50，Z1；
MOVC  P*，V50，Z1；
MOVC  P*，V60，Z1；
MOVC  P*，V30，Z1；
```

END;

6.3 Signal Treatment Command

The signal treatment command consists of DOUT, DIN, WAIT, DELAY and PULSE.

6.3.1 DOUT

Function:

Digit signal outputs the I/O setting command.

Format:

DOUT OT<Output port>，ON/OFF；

DOUT VOT<Virtual output port number >， ON/OFF；

DOUT VOG<Virtual output group number>, <Variable/constant>；

Parameter:

1. <Output port> Specify the I/O port to be set, it range is 1-31, which depends on the I/O extension card numbers.

2. ON/OFF Set to ON, the corresponding I/O sets to 1, its HIGH LEVEL; Set to OFF, the corresponding I/O sets to 1, its LOW LEVEL.

3. <Virtual output port number> depends on the concrete application agreement.

4. <Virtual output group number> depends on the concrete application agreement.

5. <Variable/constant> can be a constant, B<Variable number>, I<Variable number>, D<Variable number>, R<Variable number>, LB<Variable number>, LI<Variable number>, LD<Variable number> and LR<Variable number>. The resolute range of the variable number is 0~99.

For example:

MAIN；

MOVJ P1，V30，Z0；

DOUT OT1，OFF；

DOUT OT18，OFF；

MOVL P2，V30，Z0；

```
DOUT  OT16，ON；
MOVL  P3，V30，Z0；
DOUT  OT17，ON；
DOUT  OT18，ON；
MOVL  P4，V30，Z0；
MOVJ  P1，V30，Z0；
END;
```

6.3.2 WAIT

Function:

Wait until that the state of the external input signal accords with the specified value.

Format:

WAIT IN<Input port number>, ON/OFF，T<Time(sec)>;

WAIT VIN<Virtual input port number>, ON/OFF，T<Time(sec)>；

WAIT VIG< Virtual input group number>, <Variable/Constant>, T<Time(sec)>；

Parameter:

1. IN <Input port number> Specify the corresponding input port, its range: 0-31.

2. VIN<Virtual input port number> Specify the corresponding virtual input port number based upon the concrete application agreement.

3. VIG<Virtual input group number> Specify the corresponding virtual input port number based upon the concrete application agreement.

4. <Variable/Constant> It may variable, B<Variable number>, I< Variable number >，D< Variable number >, R< Variable number >, LB< Variable number >, LI< Variable number >, LD< Variable number > and LR< Variable number >. Its range of the variable number: 0~99.

5. T<Time(sec)> Specify the waiting time, its range is 0.0-900.0 (Unit: Second).

Explanation:

When edit the WAIT command, if the waiting time T=0 (s), the WAIT command is then performed; it may wait for limitless till the signal input state is met the condition. If T>0 (s), when the WAIT command is performed, the state signal input while waiting for the corresponding time T does not pleased with the condition, the program may continuously performed in sequence.

For example:

```
MAIN；
MOVJ  P1，V30，Z0；
WAIT  IN16，ON，T3；
MOVL  P2，V30，Z0；
WAIT  IN16，ON，T0；
MOVL  P3，V30，Z0；
MOVJ  P1，V30，Z0；
END;
```

6.3.3 DELAY

Function:

The robot delays the movement specified time

Format:

DELAY T<Time (sec)>;

Parameter:

1. T<Time (sec)> Specify the delay time, its unit is second, and its solution range is 0.0-900.0 (s).

For example:

```
MAIN；
MOVJ  P1，V60，Z0；
DELAY  T5.6；
MOVL  P2，V30，Z0；
DELAY  T0.5；
MOVL  P3，V30，Z0；
MOVJ  P1，V30，Z0；
END；
```

6.3.4 DIN

Function:

Read the input signal to the variable.

Format:

DIN <Variable>, IN<Input port number>；

DIN <Variable>, VIN<Virtual input port number>；

DIN <Variable>, VIG< Virtual input group number>；

Parameter:

1. <Variable> It can be B<Variable number>, I<Variable number>, D<Variable number>, R<Variable number>, LB<Variable number>, LI<Variable number>, LD<Variable number>, LR<Variable number>. The resolution range of the variable number is: 0~99.

2. IN<Input port number> its range is 0-31.

3. VIN<Virtual input port number> Its range depends on the concrete application agreement.

4. VIG<Virtual input group number> Its range depends on the concrete application agreement.

For example:

```
MAIN；
LAB0
DELAY  T2；
DIN R1 ,IN0；
JUMP  LAB0，IF R1 == 1；
DELAY  T1；
JUMP  LAB0，IF R1 == 0；
MOVJ  P1，V30，Z0；
END；
```

6.3.5 PULSE

Function:

Output the pulse signal with a certain width, which is treated as the external output signal.

Format:

PULSE OT<Output port>, T<Time(sec)>；

Parameter:

1. OT<Output port>, it range is 1-31.

2. T<Time(sec)> Specify the pulse time width, its range is 0.0-900.0 (unit: s).

6.4 Schedule Control Command

The schedule control command consists of LAB, JUMP, # NOTE, END and MAIN.

6.4.1 LAB

Function:

Mark the statement to be skipped.

Format:

LAB<Mark>：

Parameter:

1. <Mark> Specify the label name, its range is 0-999.

Explanation:

It is used matching with the JUMP command, the label number can not be repeated.

For example:

```
MAIN；
LAB1：
MOVJ  P*，V60，Z0；
MOVL  P2，V60，Z0；
MOVC  P3，V50，Z0；
MOVC  P4，V50，Z0；
MOVL  P5，V60，Z0；
JUMP  LAB1；
END；
```

6.4.2 JUMP

Function:

Skip to the specified label.

Format:

JUMP LAB<Label number>;

JUMP LAB <Label number>, IF <Variable/Constant> <Comparison operators> <Variable/Constant >;

JUMP LAB <Label number>, IF IN<Input port> <Comparison operators>

<ON/OFF>;

Parameter:

1. LAB<Label number> Specify the label number, its resolution range is 0-999.

2. <Variable/Constant> It can be set to constant, B<Variable number>，I<Variable number>, D<Variable number>, R<Variable number>, LB<Variable number>, LI<Variable number>, LD<Variable number>, LR<Variable number>.

The range of the variable number is 0~99.

3. Comparison operator Specify the comparison method, including the ==, >=, <=, >, < and <>.

4. IN<Input port> Specify the input port to be compared, its resolution range is 0-31.

Explanation:

1. JUMP command should be used matching with the LAB; otherwise, the program error “Matching error: Fail to find the corresponding label”;

2. When performing the JUMP statement, if the condition is not specified, it may directly skip to the specified label; if does, it will skip to the specified label after according with the corresponding condition; and it may perform the next statement directly if it does not suitable.

3. The “<>” in the comparison operators means “unequal”

For example:

```
MAIN；
LAB1：
SET  B1，0；
LAB2：
MOVJ  P1，V30，Z0；
MOVL  P2，V30，Z0；
INC  B1；
JUMP  LAB2，IF B1 <=5；
MOVL  P3，V30，Z0；
MOVC  P4，V30，Z0；
MOVC  P5，V30，Z0；
JUMP  LAB2，IF IN1 ==ON；
MOVJ  P6，V30，Z0；
```

```
JUMP  LAB1；
END；
```

6.4.3

Function:

Note statement

Format:

#<Note character>

For example:

```
MAIN；
# MOVJ   P1，V10，Z0；
MOVL   P2，V30，Z0；
MOVL   P3，V30，Z0；
END；
```

Explanation:

1. “#” adds in front of the command, which does not perform this program line.

2. The command that has been noted already is performed the note again, the note state will be cancelled, that is called “Uncomment”

6.4.4 END

Function

End-of-program

Format:

```
END；
```

For example:

```
MAIN；
MOVJ   P1，V10，Z0；
MOVL   P2，V30，Z0；
END；
MOVL   P3，V30，Z0；
END；
```

Explanation:

Program stops the teaching or play operation state when it performs to the block END, the following program will not be performed.

6.4.5 MAIN

Function:

Beginning of program (System default line)

Format

MAIN

For example:

MAIN；

MOVJ P1，V10，Z0；

MOVL P2，V30，Z0；

MOVL P3，V30，Z0；

END；

Explanation:

MAIN program default line number, do not edit it, and it shows the beginning of the program.

6.5 Calculation Command

Calculation command consists of ARITHMETIC and LOGIC operation commands.

The calculation command is mainly performed the arithmetic and logic operations for the system variable. The system variable divides into global and local variables. The former includes global byte variable (B), global integer variable (I), global double variable (D), global real variable (R) and global position variable (PX), and overall files are shared with these variables. The local variable consists of the local byte variable (LB), local integer variable (LI), local double variable (LD) and local real variable (LR); the local variable of each program file is independent each other. The {Variable} menu in the main menu displays the information of the global variable; if you want to check the local one, firstly assign the local variable value to the corresponding global one, lastly view it by {Variable} menu.

It is necessary to initialize the variable before using the system global variable, and then set the "STATUS" to 1.

Refer to the Section 3.4.1.1 for details.

6.5.1 Arithmetic Operation Command

Arithmetic operation command composes of INC, DEC, ADD, SUB, MUL, DIV, SET, SETE and GETE.

6.5.1.1 INC

Function:

Add 1 in the value of the specified number.

Format:

INC <Operation number>;

Parameter:

<Operation number> It can be set to B<Variable number>, I<Variable number>, D<Variable number>, R<Variable number>, LB<Variable number>, LI<Variable number>, LD<Variable number>, LR<Variable number>. The range of the variable number is 0~99.

For example:

```
MAIN;
LAB1:
SET R1，0;
LAB2:
MOVJ P*，V60，Z0;
INC R1;
JUMP LAB2，IF R1<=6;
JUMP LAB1 ;
END;
```

6.5.1.2 DEC

Function:

Deduct 1 from the value of the specified number.

Format:

DEC <Operation number>;

Parameter:

1. <Operation number> It can be set to B<Variable number>, I<Variable number>, D<Variable number>, R<Variable number>, LB<Variable number>, LI<Variable number>, LD<Variable number>, LR<Variable number>. The range of the variable number is 0~99.

For example:

```
MAIN;
SET R1，8;
LAB1：
MOVJ P*, V30，Z0;
DEC R1;
JUMP LAB1，IF R1>=0;
END;
```

6.5.1.3 ADD

Function:

Add the operation number 1 and 2, and then register to the operation number 1.

Format

ADD <Operation number 1>, < Operation number 2>;

Parameter:

1. <Operation number 1> It can be set to B<Variable number>, I<Variable number>, D<Variable number>, R<Variable number>, LB<Variable number>, LI<Variable number>, LD<Variable number>, LR<Variable number>.

The range of the variable number is 0~99.

2. <Operation number 2> It can be set to constant B<Variable number>, I<Variable number>, D<Variable number>, R<Variable number>, LB<Variable number>, LI<Variable number>, LD<Variable number>, LR<Variable number>.

The range of the variable number is 0~99.

For example:

```
SET B0 ， 5;
SET B1 ， 2;
```

ADD B0，B1;

In this case, the value of the B0 is regarded as 7.

6.5.1.4 SUB

Function:

Subtract the operation number 1 to 2, and then register to the operation number 1.

Format:

SUB <Operation number 1> ， < Operation number 2>；

Parameter:

<Operation number 1> and <Operation number 2> are absolutely same as the ADD command.

For example:

SET B0 ，5；

SET B1 ，2；

SUB B0，B1；

In this case, the value of the B0 is set to 3.

6.5.1.5 MUL

Function:

The operation number 1 is multiplied with the operation number 2 of which its result registers to the operation number 1.

Format:

MUL <Operation number 1>, <Operation number 2>；

Parameter:

<Operation number 1> and <Operation number 2> are absolutely same with the ADD command.

For example:

SET B0 ，5；

MUL B0，2；

In this case, the value of the B0 is set to 10.

6.5.1.6 DIV

Function:

The operation number 1 is divided the operation number 2 of which its result is registered to the operation 1.

Format:

DIV < Operation number 1>, < Operation number 2>；

Parameter:

< Operation number 1> and < Operation number 2>are absolutely same with the ADD command.

For example:

SET B0 ，6；

DIV B0，2；

In this case, the value of the B0 is set to 3.

6.5.1.7 SET

Function:

Assign the operation number 1 to the value of the operation number 2.

Format:

SET <Operation number 1>, <Operation number 2>；

Parameter:

<Operation number 1>, <Operation number 2> are absolutely same with the ADD command.

For example:

SET B0，5；

SET B1， B0；

SET R1，2.3；

SET R2，R1；

6.5.1.8 SETE

Function:

Assign the variable value of the operation number 2 to the element in the Cartesian posture variable.

Format:

SETE PX<Variable number> (Element number) , Operation number 2;

Parameter

1. <Variable number> Its range is 0~99.

2. <Element number> Its range is 0~6. 0 means that assign the same value to the overall elements of the P variables.

3. <Operation number 2> It can be set to D<Variable number>, or the dual-accuracy integer constant.

For example:

SET D0 ， 6；

SETE PX1 (0) ，D0；//In this case, X=6，Y=6，Z=6，W=6，P=6，R=6 of PX1 variable.

SETE PX1 (6) ，3；//In this case, X=6，Y=6，Z=6，W=6，P=6，R=3 of PX1 variable.

6.5.1.9 GETE

Function:

The element value in the Cartesian posture variable is assigned to the operation number 1.

Format:

GETE <Operation number 1>, PX<Variable number > (Element number);

Parameter:

1, <Variable number> its range: 0~99。

2. <Element number> its range: 1~6。

3. <Operation number 1> is the D<Variable number>.

For example:

SET D0，6；

SETE PX1 (0) , D0；//By this time, X=6, Y=6, Z=6, W=6, P=6 and R=6 for the PX1.

SETE PX1 (6) , 3；//By this time, X=6, Y=6, Z=6, W=6, P=6 and R=3 for the PX1.

GETE D0 ， PX1 (6)；//By this time, D0=3.

6.5.2 Logic Operation Command

The logic operation command consist of AND, OR, NOT and XOR.

6.5.2.1 AND

Function:

Operation number 1 and operation number 2 are performed the logic AND of which its result is registered to the operation number 1.

Format:

AND <Operation number 1> , <Operation number 2>;

Parameter:

1.<Operation number 1> It is B<Variable number>, the range of the variable number is 0~99.

2. <Operation number 2> It can be set to both the constant and the B<Variable number>, the range of the variable number is 0~99.

For example:

SET B0 , 5; // $(0000\ 0101)_2$

AND B0, 6; // $(0000\ 0101)_2 \& (0000\ 0110)_2 = (0000\ 0100)_2 = (4)_{10}$

In this case, the value of the B0 is 4.

6.5.2.2 OR

Function:

Operation number 1 and operation number 2 are performed the logic OR of which its result is registered to the operation number 1.

Format:

OR <Operation number 1>, <Operation number 2>;

Parameter:

<Operation number 1>, < Operation number 2> are absolutely same with the AND command.

For example:

SET B0 , 5; // $(0000\ 0101)_2$

OR B0, 6; // $(0000\ 0101)_2 | (0000\ 0110)_2 = (0000\ 0111)_2 = (7)_{10}$

In this case, the value of the B0 is 7.

6.5.2.3 NOT

Function:

Take the logic NOT of the operation number 2, and its result is registered to the operation number 1.

Format:

NOT <Operation number 1>, <Operation number 2>；

Parameter:

<Operation number 1>, <Operation number 2> are absolutely same with the AND command.

For example:

SET B0 ，5；// $(0000\ 0101)_2$

NOT B0，B0；// ~$(0000\ 0101)_2$ = $(1111\ 1010)_2$= $(250)_{10}$

In this case, the value of the B0 is 250.

6.5.2.4 XOR

Function

Operation number 1 and operation number 2 are performed the logic XOR of which its result is registered to the operation number 1.

Format:

XOR< Operation number 1>, < Operation number 2>；

Parameter:

<Operation number 1>, <Operation number 2> are absolutely same with the AND command。

For example:

SET B0 ，5；// $(0000\ 0101)_2$

XOR B0，6；// $(0000\ 0101)_2$ ^ $(0000\ 0110)_2$ = $(0000\ 0011)_2$= $(3)_{10}$

In this case, the value of the B0 is regarded to 3.

6.6 Translational Command

The translational command composes of PX, SHIFTON, SHIFTOFF AND MSHIFT.

6.6.1 PX

Function:

To assign the PX variable (Cartesian posture variable) is used for the translation function.

Format:

PX<Variable name> = PX<Variable name>；

PX<Variable name> = PX<Variable name> + PX<Variable name>；

PX<Variable name> = PX<Variable name> – PX<Variable name>；

Parameter:

1. PX< Variable name > Specify the position variable number to be calculated, its range is 0-99。

Explanation:

The Cartesian posture variable is mainly used in translation function; refer to the “Section 7.3 Translation Function” for details.

For example:

```
MAIN；
LAB1：
SET  R1，0；
PX1 = PX1 – PX1；//Clear the PX1 to 0
LAB2：
MOVJ  P1，V30，Z0；
SHIFTON  PX1；
MOVL  P*，V10，Z0；
SHIFTOFF；
PX1 = PX1 + PX0；
JUMP  LAB2，IF R1< 4；
JUMP  LAB1；
END；
```

6.6.2 SHIFTON

Function:

Specify the translation beginning and value.

Format:

SHIFTON PX<Variable name>;

Parameter:

1. PX <Variable name> Specify the translational value, and its solution range is 0-99.

Explanation:

1. PX variable can be set in the {Cartesian posture} menu interface.

2. The teaching points in the MOVL and MOVC commands can be translated; it is disabled to the MOVJ command.

For example:

```
MAIN；
SHIFTON PX1；
MOVL P1，V20，Z0；
MOVL P2，V50，Z0；
MOVC P3，V50，Z0；
MOVC P4，V50，Z0；
SHIFTOFF；
END；
```

6.6.3 SHIFTOFF

Function:

End the translational mark.

Format:

SHIFTOFF；

Explanation:

1. It should be matched with the SHIFON command, otherwise, the incorrect prompt “there is the repeated translational end command” occurs.

2. The movement command followed with the SHIFTOFF statement does not own

the translational function.

For example:

```
MAIN；
SHIFTON  PX1；
 MOVC  P2，V50，Z1；
 MOVC  P3，V50，Z1；
 MOVC  P4，V50，Z1；
 MOVC  P5，V50，Z1；
 MOVC  P6，V50，Z1；
 MOVC  P7，V50，Z1；
 SHIFTOFF；
 END；
```

6.6.4 MSHIFT

Function:

Gain the translational value by the command. The translational value is the different that the 1st teaching point position subtracts the 2nd one.

Format:

MSHIFT PX< Variable name>, P< Variable name 1>, P< Variable name 2>

Parameter:

1. **PX<Variable name>** Specify a translational value, and its solution range is 0-99.

2. **P<Variable name 1>** Gain that the 1st teaching point is treated as the teaching point number, and its solution range is P0- P999.

3. **P< Variable name 2>** Gain that the 2nd teaching point is treated as the teaching point number, and its solution range is P0- P999.

Explanation:

The translational value can be precisely calculated by the subtracting between two teaching points; it can avoid the error from the manual setting.

For example:

```
MAIN；
```

```
LAB1：
R1=0；
MSHIFT PX0，P001，P002；
PX1=PX1 – PX1；
LAB2：
MOVJ P1，V30，Z0；
SHIFTON PX1；
MOVL P2，V10，Z0；
SHIFTOFF；
MOVL P3，V30，Z0；
PX1=PX1 + PX0；
INC R1；
JUMP LAB2，IF R1< 4；
JUMP LAB1；
END；
```

6.7 Operational Character

The operational characters to be used in the command input are composed of: relation operational characters, calculation operational characters and other special characters.

6.7.1 Relation Operational Character

== Equivalence compare character, it is TRUE when the character is equal, and otherwise, it is FALSE.

> More than compare character, it is TRUE when the character is greater, and otherwise, it is FALSE.

< Less than compare character, it is TRUE when the character is less, and otherwise, it is FALSE.

>= More than or equal compare character, it is TRUE when the character is more than or less than, otherwise, it is FALSE.

<= Less than or equal compare character, it is TRUE when the character is less than or equal, otherwise, it is FALSE.

<> Unequal character, it is TRUE when the character is unequal, otherwise, it is FALSE.

6.7.2 Calculation Operational Character

= Variable assignment

+ Two numbers are added

- Two numbers are subtracted

CHAPTER SEVEN CONVENIENT FUNCTION

7.1 Information Monitoring of the Robot

The current information on the robot can be gained by monitoring function, for example, current posture information, joint actual position and variable information, input/output state etc.

7.1.1 Status Information

Display the system operation state and view the program procedure by the variable value 0 or 1; refer to the Fig. 7-1.

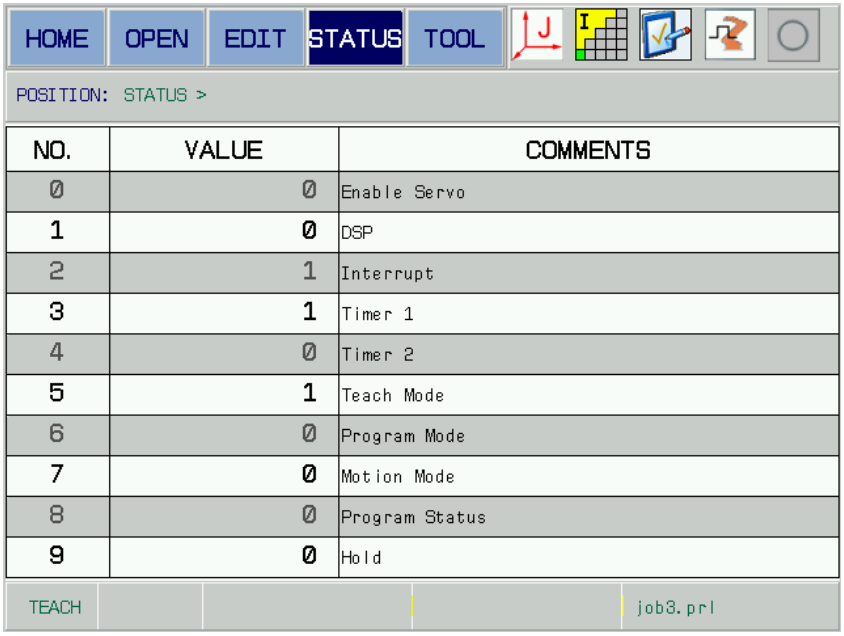


Fig. 7-1

Move the cursor to the {STATUS} by [F4] and left/right direction button if the current is main page; directly enter the state information page by [SELECT]; view more variable content by up/down or [PAGE] button.

7.1.2 Path Curve

Analyze the continuity and stability problems of the current system; refer to the Fig. 7-2.

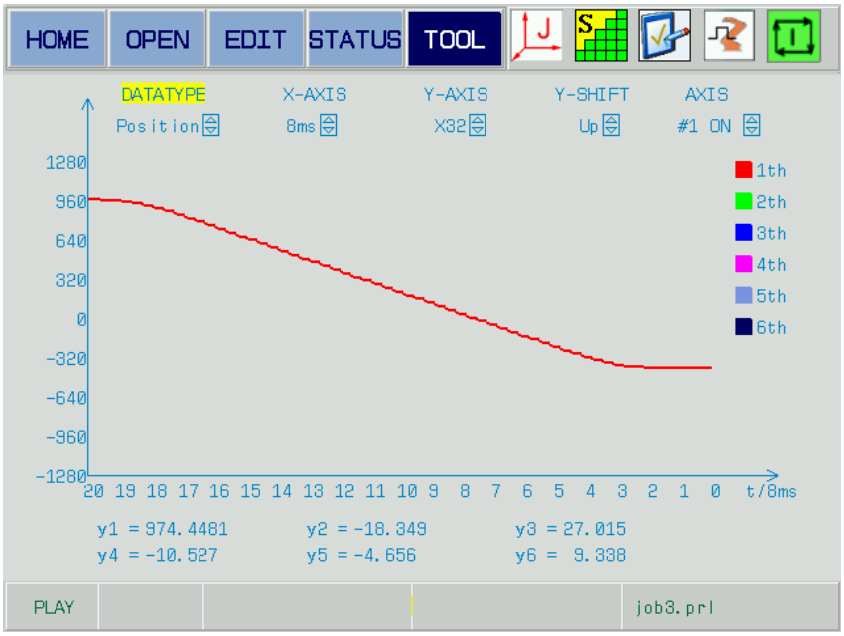


Fig. 7-2

Move the cursor to the {Tool} by [F5] and left/right direction button if the current is main page; directly enter the path curve display page by [SELECT].

7.1.3 Variable Monitoring

Shift the focus to the main menu area by [TAB]; move the cursor the {Variable} by up/down direction button. Spring out the {Variable} submenu by [SELECT], select the variable type to be viewed by up/down direction button, and then enter the variable monitoring interface by [SELECT].

There are five variable types: byte, integer, double, real and position. Wherein, four of them are identical with the variable interface operation. Here, we just introduce the real variable interface.

7.1.3.1 Real Type

Move the cursor to {Variable} on the {Main page}, spring out the submenu by [SELECT]; refer to the Fig. 7-3.

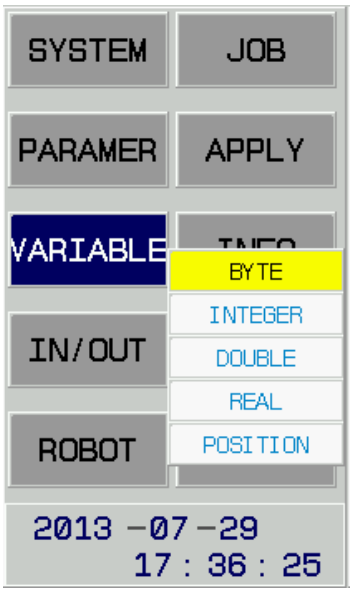


Fig. 7-3

Move the cursor to the {REAL} submenu, and then open the real type variable list by [SELECT]; refer to the Fig. 7-4.

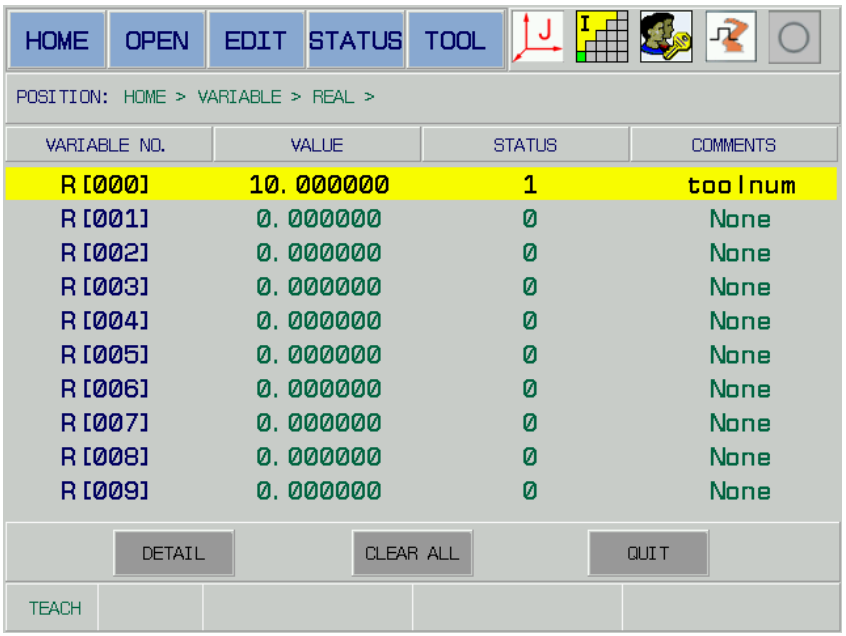


Fig. 7-4

Note 1: In the R variable monitoring interface, if the state of the R variable displays “1”, it means that the R variable is already employed; if it displays “0”, it means that the R variable does not use. If the program content uses the REAL variable in the program operation, the corresponding state of the variable then displays “1”; otherwise, the system alarm occurs.

Note 2: When the program used the variable is performed, the variable numerical value can be renovated in real-time. In the variable monitoring interface, enter the corresponding variable detailed interface by [Detail] button or press the [SELECT] in

area 1, and then inspect the variable details and modify the note; refer to the following explanations:

- Check the variable details and modify it.

In the detail interface, the variable value can be modified and whether to use this variable value and its explanation etc.; refer to the Fig. 7-5 for the R0 variable detailed interface.

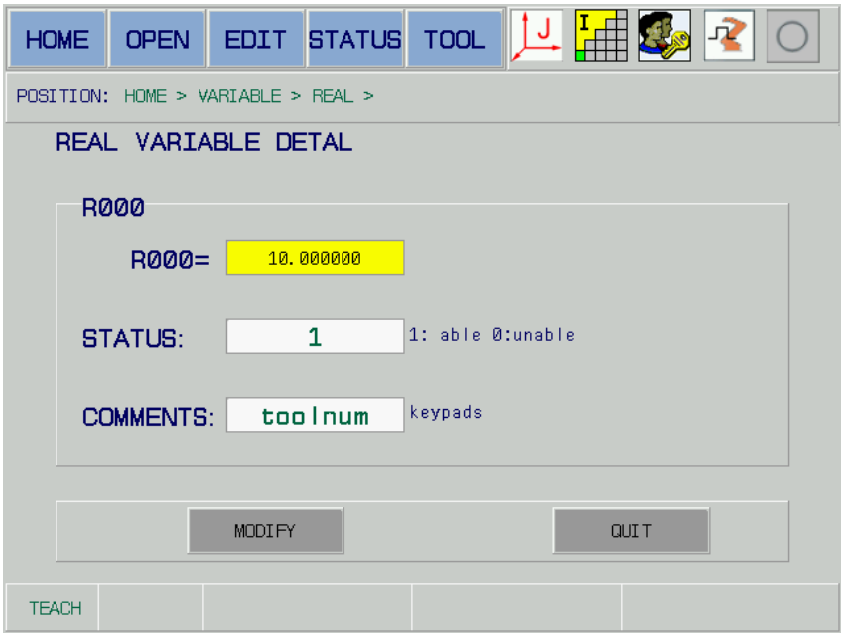


Fig. 7-5

- Modify the variable value

1. Move the cursor to the “R000” numerical value input frame.

2. Input new variable value by numerical value buttons.

3. Shift the cursor to the [MODIFY] button by [TAB] after altering, save the altered content by [SELECT]; if the cursor shifts to the [QUIT] button, return to the previous page by [SELECT] or [CANCEL].

- Whether the modification uses the symbol.

1. Move the cursor to “STATUS” numerical input frame.

2. Input 0 or 1 by numerical value buttons.

3. Shift the cursor to the [MODIFY] button by [TAB] after altering, save the altered content by [SELECT]; if the cursor shifts to the [QUIT] button, return to the previous page by [SELECT] or [CANCEL].

- Modify the variable explanation

1. Move the cursor to the "COMMENTS" input frame.

2. Enter the {Soft keyboard} input page by [SELECT].

3. Retreat from the {Soft keyboard} page by selecting the [INPUT], after the input is performed.

4. Shift the cursor to the [MODIFY] button by [TAB] after altering, save the altered content by [SELECT]; if the cursor shifts to the [QUIT] button, return to the previous page by [SELECT] or [CANCEL].

7.1.3.2 Cartesian Posture

Shift the cursor to the {Variable} on the {Main page}, spring out the variable submenu by [SELECT]; move the cursor to the {POSITION} by up/down direction button; refer to the Fig. 7-6:

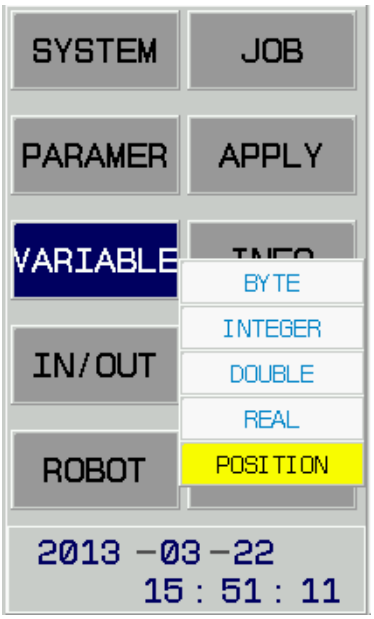


Fig. 7-6

Press the [SELECT] button to open the Cartesian posture list; refer to the Fig. 7-7.

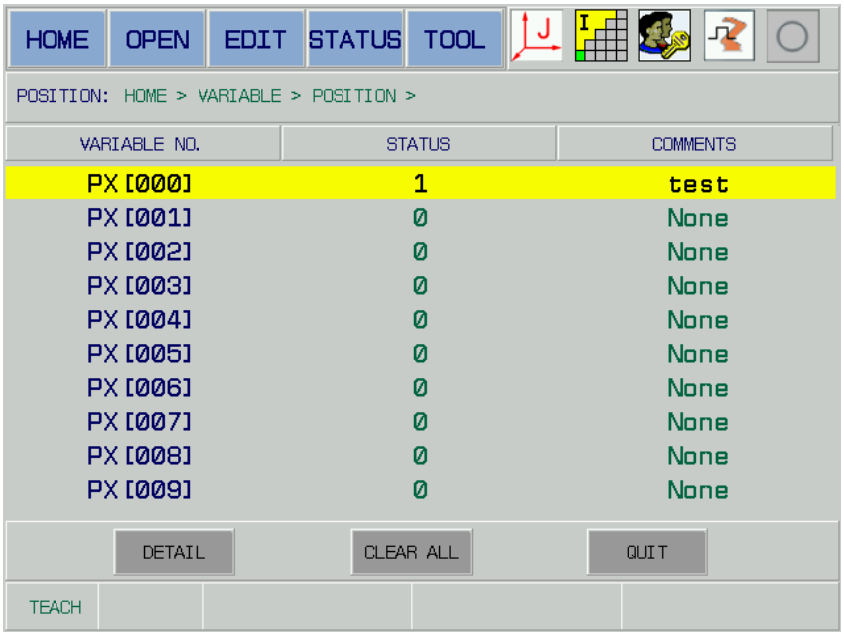


Fig. 7-7

Note 1: In the PX variable monitoring interface, if the state of the PX variable displays “1”, it means that the Cartesian posture is already employed; if it displays “0”, it means that the Cartesian posture does not use. If the program content uses the variable number variable in the program operation, the corresponding state of the variable then displays “1”; otherwise, the system alarm occurs.

Note 2: In the variable monitoring interface, enter the corresponding variable detailed interface by [Detail] button or press the [SELECT] in area one, and then inspect the variable details and modify the note; refer to the following explanations:

- Check the variable details and modify it.

In the detail interface, the variable value can be modified and whether to use this variable value and its explanation etc.; refer to the Fig. 7-8 for the RX000 variable detailed interface.

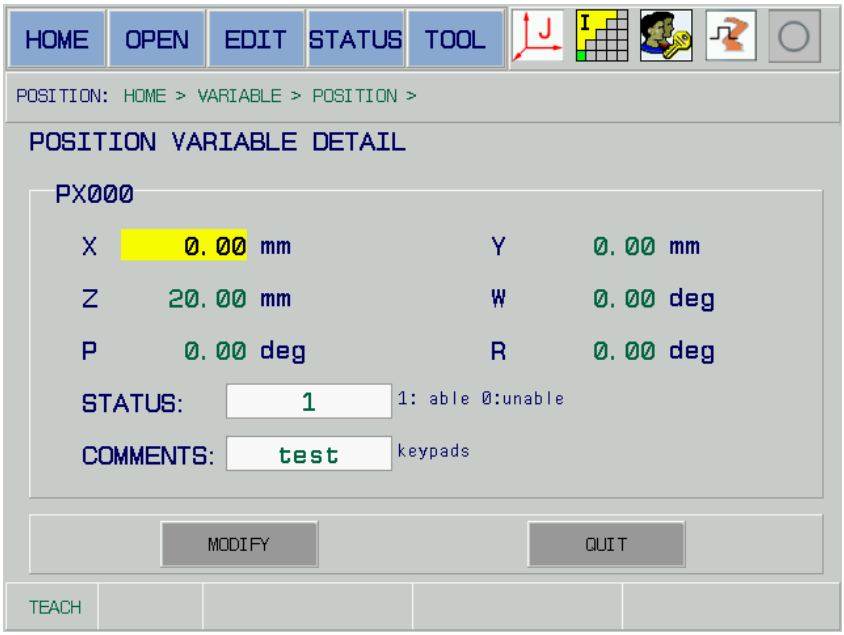


Fig. 7-8

- Modify the variable value

1. Move the cursor to “PX000” numerical input frame.

2. Input new variable value by numerical value button.

3. Shift the cursor to the [MODIFY] button by [TAB] after altering, save the altered content by [SELECT]; if the cursor shifts to the [QUIT] button, return to the previous page by [SELECT] or [CANCEL].

- Whether the modification uses the symbol.

1. Move the cursor to "STATUS" numerical input frame.

2. Input 0 or 1 by numerical value buttons.

3. Shift the cursor to the [MODIFY] button by [TAB] after altering, save the altered content by [SELECT]; if the cursor shifts to the [QUIT] button, return to the previous page by [SELECT] or [CANCEL].

- Modify the variable explanation

1. Move the cursor to the "COMMENTS" input frame.

2. Enter the {Soft keyboard} input page by [SELECT].

3. Retreat from the {Soft keyboard} page by selecting the [INPUT], after the input is performed.

4. Shift the cursor to the [Modification] button by [TAB] after altering, save the altered content by [SELECT]; if the cursor shifts to the [QUIT] button, return to the previous page by [SELECT] or [CANCEL].

The PX000 variable note item is modified into “test”; refer to the Fig. 7-9:

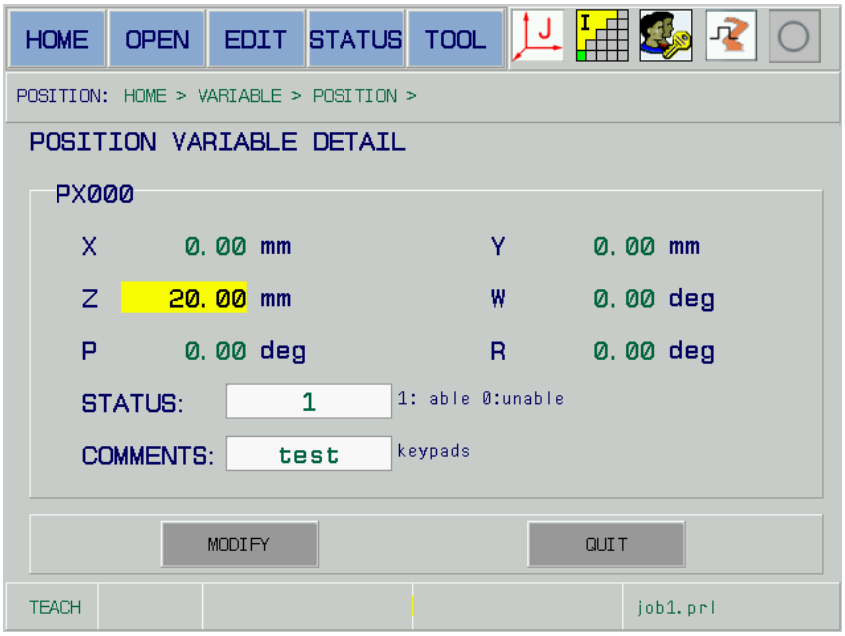


Fig. 7-9

Explanation: The variable note should be less than 10 characters.

7.1.4 Input/Output Monitoring

Shift the focus to the main menu area by [TAB], then select the {IN/OUT} by [SELECT] to shift the I/O monitoring interface; refer to the Fig. 7-10.

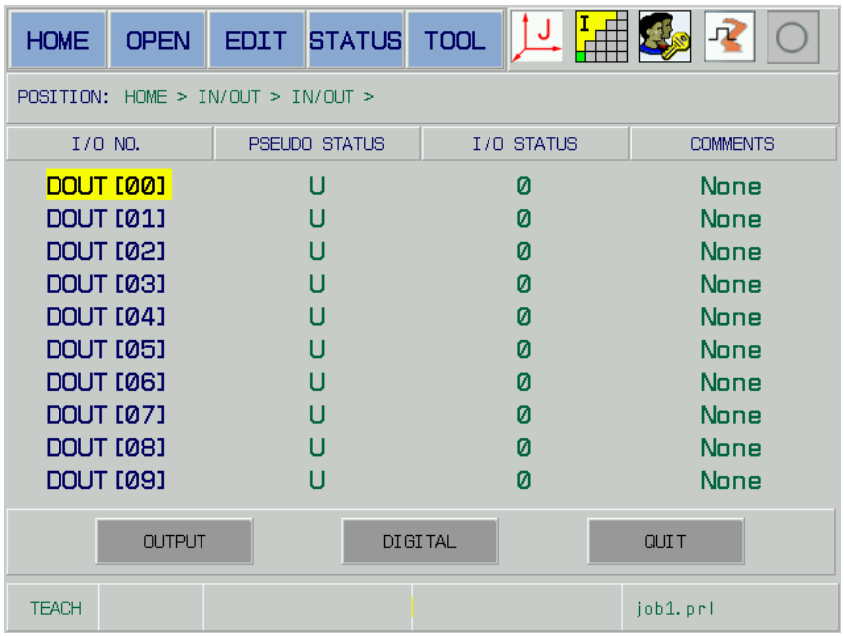


Fig. 7-10

Note: The focus can be shifted in this interface by [TAB]; Different I/O point can be selected by up/down direction button; the modification attribution can be

modified by left/right direction button; the I/O SELECT, input/output SELECT and modification note etc. can be operated matching with the [SELECT] button. At present, neither use the pseudo state, nor modify it. The detailed explanations are shown below:

- **I/O type SELECT**
  - Shift the cursor to the [OUTPUT] by [TAB]. The original [OUTPUT] turns into [INPUT] button by [SELECT], the current page shifts to the content displaying the input port; otherwise, it may be the content of the output port.
- **I/O state modification**
  - Output signal: Cursor moves to the “I/O STATUS” area to be altered by the numerical value button 1 or 0, the system will output the corresponding HIGH LEVEL or LOW LEVEL.
  - Input signal: Monitor the external signal input to the system and check the corresponding I/O state, display 0 or 1 in real-time. The input signal is only used for inspecting the external signal instead of modifying.
- Note modification
  - Press the [SELECT] when the cursor locates on the "COMMENTS", spring out the soft keyboard, input the corresponding content, complete the note modification by [INPUT].

7.2 Teaching Point View

The teaching point data in the programming file can be viewed but can not be deleted by the {POINT} in the main menu; refer to the Fig. 7-11:

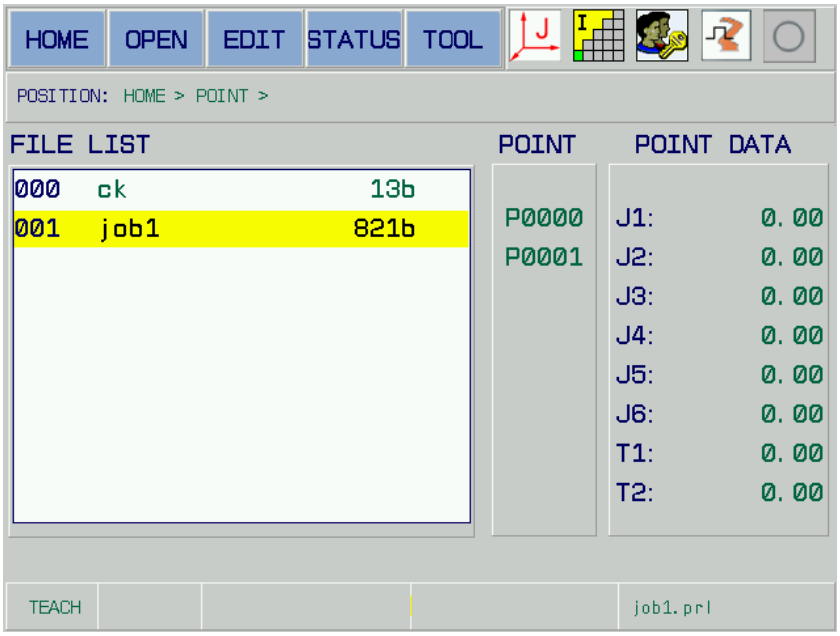


Fig. 7-11

- Check the teaching point of file

1. Select the file by the up/down direction button, when the teaching point of the file program content is treated as P* by default. The teaching point and position data will not displayed. If compiling the teaching point to the file content, for example, change P* to P1, and then check the teaching point information and position data entering the {POINT}; refer to the Fig. 7-12.

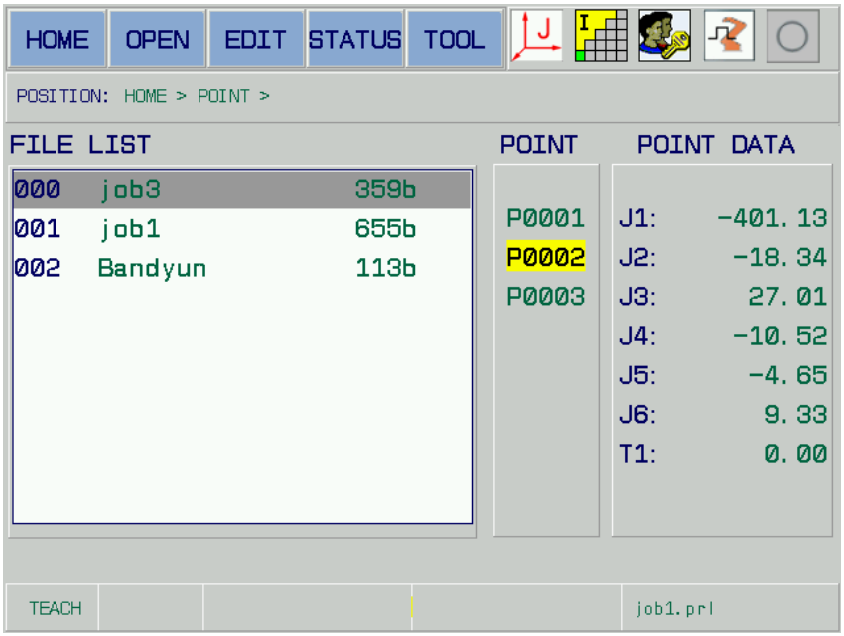


Fig. 7-12

- Check the numerical value of the teaching point

1. Shift the cursor to the area 2 “POINT” by [TAB]; the numerical value of this teaching point may automatically display under the “POINT DATA”.

2. Select the different “Teaching point” by up/down direction button; the numerical value of this teaching point may automatically display under the “POINT DATA”.

7.3 Translational Function

7.3.1 Translation Function Introduction

The translational is that each point on the object material keeps moving with equidistance when the destination object moves from the specified position, refer to the Fig. 7-13:

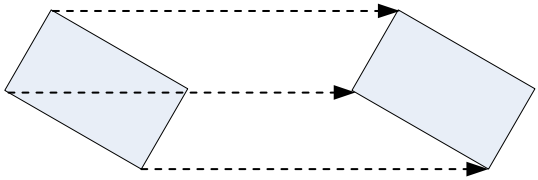


Fig. 7-13

Reduce the working by translational function when the robot teaching is performed. Especially, the translational function is suitable for a group of regular movement, for example, the workpiece stacking etc.

The main commands for the translation function: PX, SHIFTON, SHIFTOFF and MSHIFT.

7.3.2 Create a Translational Value

Firstly, we should set up a translation value before using the translation. There are two methods to establish a translation value, one is that manually compile after entering the Cartesian posture variable interface; the other is that gain offset value by MSHIFT command. The former one will be used accordingly.

Shift to the main menu area by [TAB], select the {Variable}, enter the position variable interface, and then enter the Cartesian posture variable editing interface after selecting the PX000 throughout the details. It is supposed that the workpiece thickness is 20mm, whether the Z is set to 1 by variable after it is set to 20, and then

save it by select [MODIFY] button. In this case, the PX000 variable can be used in the program.

Also, the translational value can be gained by the MSHIFT command in the translational command. MSHIFT command can be regarded the distance between two teaching points as the translational value, input the MSHIFT command, after select two teaching points, that is, the translational value can be generated by using MSHIT command; refer to the Fig. 7-14.

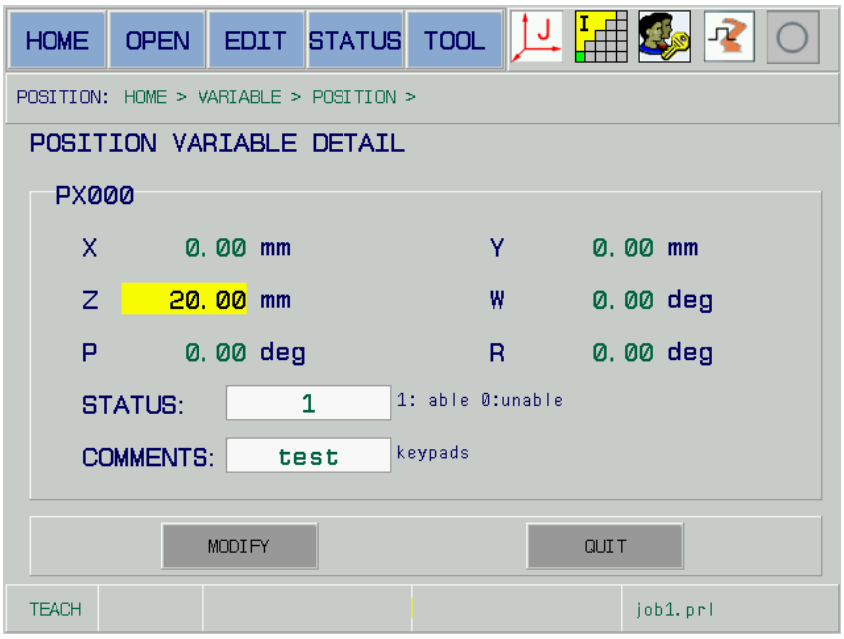


Fig. 7-14

7.3.3 Translational Programming Illustration

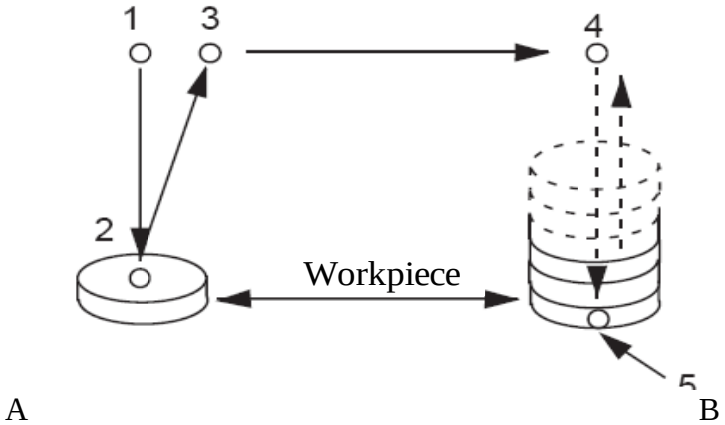


Fig. 7-15

Refer to the abovementioned Fig. 7-15; it is supposed that the workpiece at the A is the one transferred by the conveyor belt. It is should be caught to the B. The translational function is used here. The teaching point 5 at the B only needs to be gained, and other teaching points can be gained by adding the translational value. Refer to the following table for details:

Program command	Content explanation
MAIN;	**Program head (System default line)**
LAB1：	**Label 1**
SET R1, 0；	**Workpiece number statistic variable clear**
PX1 = PX1 – PX1；	**Translational value PX1 clear**
LAB 2：	**Label 2**
MOVJ P1，V20，Z0；	**Move to the teaching point 1**
MOVL P2，V100，Z0；	**Move to the capture workpiece point**
MOVL P3，V100，Z0；	**Move to the teaching point 3**
MOVL P4，V100，Z0；	**Move to the teaching point 4**
SHIFTON PX1；	**Translational beginning, specify a translational value**
MOVL P5，V100，Z0；	**The teaching point after translating**
SHIFTOFF；	**Translation end**
PX1 = PX1 + PX0；	**PX0 is translational value (Workpiece thickness)**
MOVL P4，V100，Z0；	**Move to the teaching point 4**
MOVJ P1，V100，Z0；	**Move to the teaching point 1**
INC R1；	**Workpiece adds 1**
JUMP LAB2 IF R1 < 4；	**Clamping continues if the workpiece number is less than 4**
JUMP LAB1 ；	**Clamping again**
END;	**End**

PX0 indicates the translational value in the programming, that is, the thickness of

the workpiece, which is manually set by the PX variable detail window, and therefore, the thickness dimension should be affirmed beforehand.

The translation can be carried out by calculating its value based upon the POSITION with MSHIFT command.

For example, the workpiece at A is transported to B, and place them one by one; refer to the Fig. 7-16.

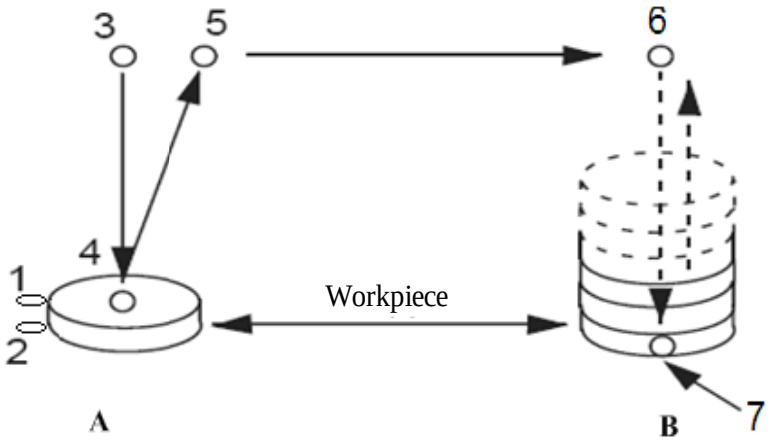


Fig. 7-16

It is supposed that the workpiece at the A is the one from the conveyor belt, the overall process and the related explanations are shown below:

Program command	Content explanation
MAIN;	**Program head (System default line)**
LAB1：	**Label 1**
SET R1 , 0；	**Workpiece number statistic variable clear**
PX1 = PX1 – PX1；	**Translation value PX1 clear**
MSHIFT PX0, P1, P2；	**Gain translational value PX0 (Workpiece thickness)**
LAB 2：	**Label 2**
MOVJ P3，V20，Z0；	**Move to the teaching point 3**
MOVL P4，V100，Z0；	**Move the clamping workpiece point**
MOVL P5，V100，Z0；	**Move to the teaching point 5**
MOVL P6，V100，Z0；	**Move to the teaching point 6**
SHIFTON PX1；	**Translation beginning**
MOVL P7，V100，Z0；	**The teaching point after translation**
SHIFTOFF；	**Translation end**

PX1 = PX1 + PX0；	**Translation value PX1 adds translation value PX0 (workpiece thickness) based upon the original value**
MOVL P6，V100，Z0；	**Move to the teaching point 6**
MOVJ P3，V100，Z0；	**Move to the teaching point 3**
INC R1；	**Workpiece number adds 1**
JUMP LAB2 IF R1 < 4；	**Clamping continues if the workpiece number is less than 4**
JUMP LAB1 ；	**Clamping beginning again**
END;	**End**

Arc translation is shown below:

For example: If you want to perform the same size and interval repeated arc operation, as the Fig. 7-17, you can simply finish the teaching programming by the translation command.

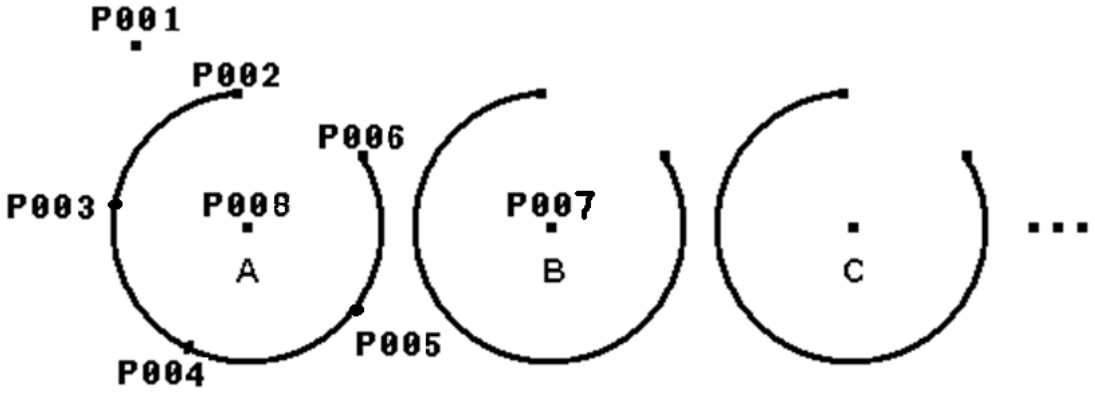


Fig. 7-17

Suppose that the teaching is performed from point A, B->C->…translation is executed in turn; the overall contents and related explanations are shown below:

Program command	Content explanation
MAIN;	**Program head (System default line)**
LAB1：	**Label 1**
SET R1,0；	**Translation number statistic variable clear**
PX1 = PX1 – PX1；	**Translation value PX1 clear**
MSHIFT PX0, P7, P8；	**Gain translational value PX0（…）**
LAB2：	**Label 2**
MOVJ P1，V20，Z0；	**Move to the teaching point 1**

SHIFTON PX1；	**Translation beginning**
MOVL P2，V100，Z0；	**Move to the teaching point 2**
MOVC P3，V030，Z1；	**Move to the teaching point 3**
MOVC P4，V100，Z1；	**Move to the teaching point 4**
MOVC P5，V100，Z1；	**Move to the teaching point 5**
MOVC P6，V100，Z1；	**Move to the teaching point 6**
SHIFTOFF；	**Translation end**
PX1 = PX1 + PX0；	**Translational value PX1 adds PX0 (workpiece thickness) based upon the original value（…）**
INC R1；	**Variable R1 adds 1**
JUMP LAB2 IF R1 < 4；	**Translation continues if the workpiece number is less than 4**
JUMP LAB1 ；	**Translation beginning again**
END;	**End**

7.4 On-Line Help

The related help information can be viewed by selecting the on-line help on the main menu.

The {HELP} divides into Command (Fig. 7-18) and Operation (Fig. 7-19) submenus. Open the command help menu to confirm the unclear command.

The command help submenu introduces the usage of each command.

The operation help submenu introduces some common operations, for example the zero setting.

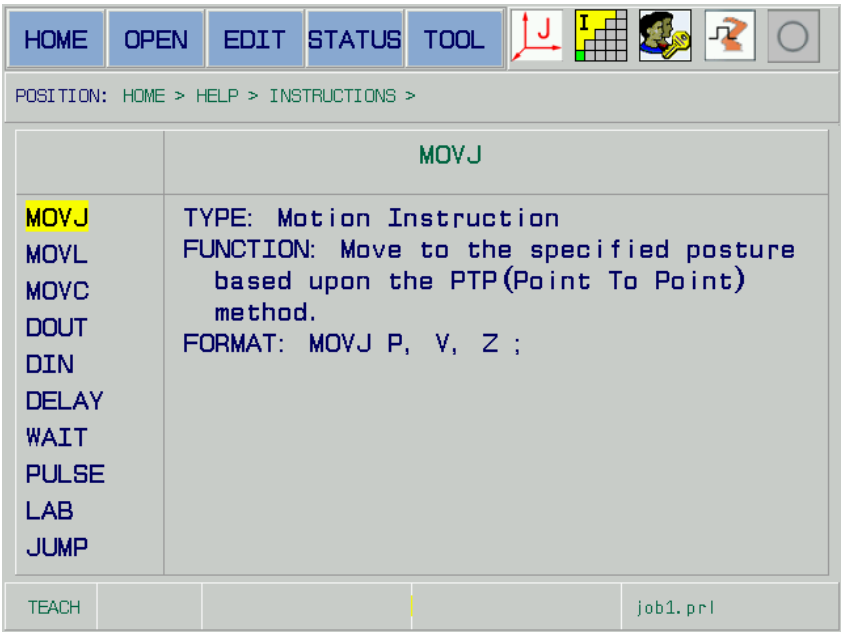


Fig. 7-18

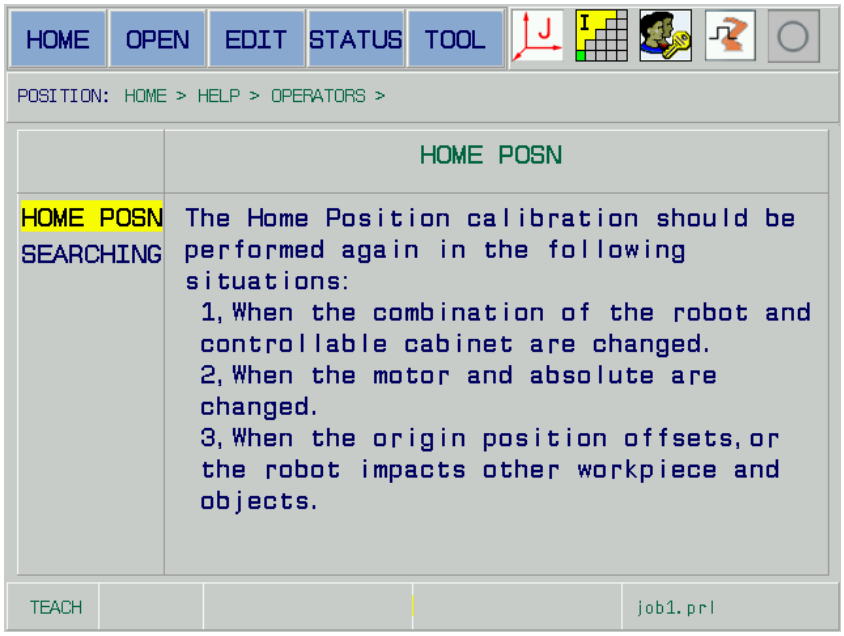


Fig. 7-19

Note: Refer to the following command information steps:

1. Shift to the main menu area by [TAB], select the {HELP}, then select the {INSTRUCTIONS} or {OPERATORS}, and then separately open the command help display interface and operation prompt one.

2. The command and operation cursor at the left side list can be switched by up/down direction button; but the cursor correspondence with the related help information will display at the right display area.

7.5 Version Information

The version information displays the robot type, software version, hardware version, display mark, main controller mark and the motion controller mark.

User can comprehend the corresponding information and the configuration by the version information.

The steps for observing the version information:

1. Shift to main menu area by the [TAB], then {INFO} → {VERSION}.

2. Open version information display window by the [SELECT]; refer to the Fig. 7-20.

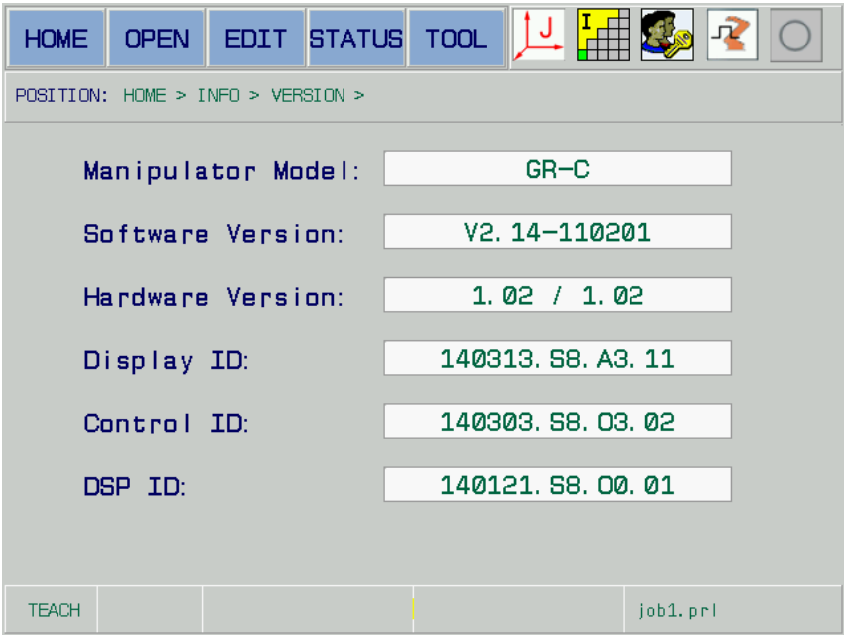


Fig. 7-20

3. The version information display interface can be closed by [CANCEL], and then return to the main page interface.

Note: The above solution range is only for reference, it is subject on the actual parameters.

CHAPTER EIGHT SYSTEM SETTING

The system setting includes the **system setting**, **parameter setting** and **machine setting**, refer to the following explanations.

8.1 System Setting

8.1.1 Home Position Setting

The home position setting is that the mechanical origin of the robot is calibrated for position, ensure the operation safety and movement accuracy of the robot etc. the absolute zero position setting is performed based upon the concrete dimension of the robot before delivery. The teaching and play operations can not be performed if the origin position calibration does not execute so that the unexpected hazard occurs.

1. Home Position Calibration

The home position calibration is a kind of operation that comparing the mechanical origin position of the robot with the absolute value of the absolute encoder, which are corresponding one by one after the origin position calibration is performed, that is, only one group absolute value of encoder corresponds the robot origin position.

The origin position calibration should be performed again in the following situations.

- When the combination of the robot and controllable cabinet are changed.
- When the motor and absolute are changed.
- When the origin position offsets, or the robot impacts other workpiece and objects.

2. The posture of robot home position

The posture of robot’s home position is shown in the Fig. 8-1:

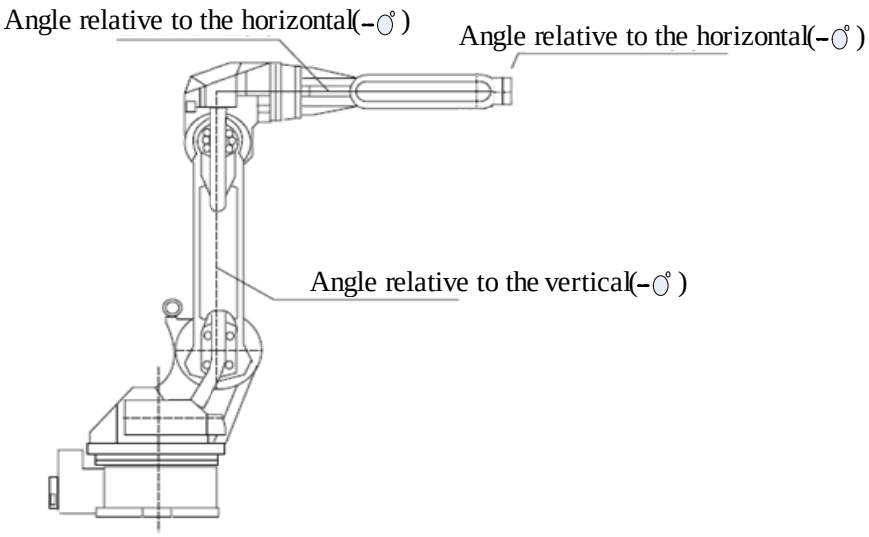


Fig. 8-1

3. Home Position Setting

The home position calibration should be performed in the administration mode. Press [TAB], shift to main menu area, select {SYSTEM}, then open the {HOME POSITION}; refer to Fig. 8-2.

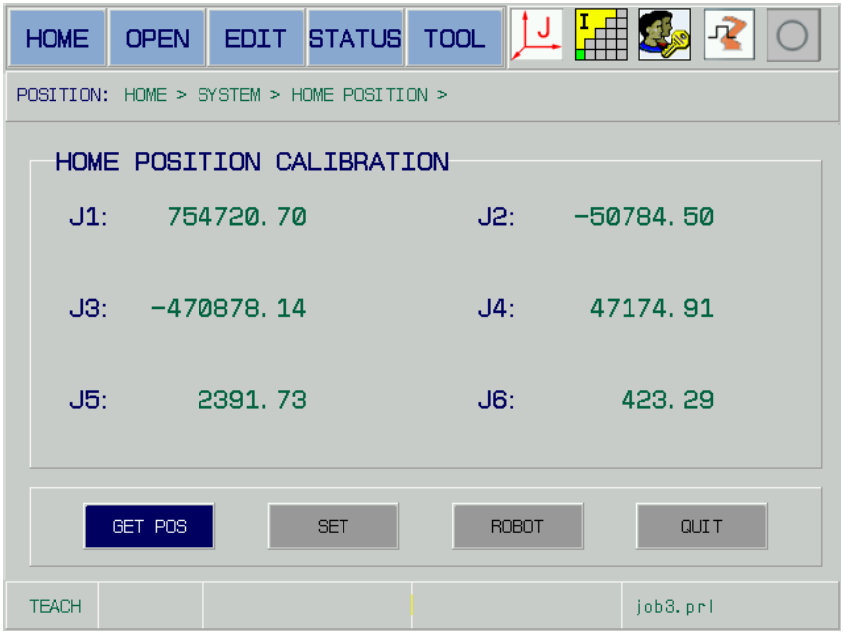


Fig. 8-2

In this page, J1-J6 are displayed the zero value of the last time. Complete the home position setting by the following steps:

Step one: Select the joint coordinate system  by [Coordinate setting].

Step two: Move the robot to the mechanical home position (absolute zero position). The home position is that the one is aimed with the triangle flag of each axis

positive/negative on the robot machine itself.

Step three: Shift the cursor to the [GET POS] button by [TAB], then the [SELECT], and then the actual position value at the current state of each joint will be read.

Step four: Move the cursor to the [SET] button by left/right direction button, then the [SELECT], and then complete the home position setting.

8.1.2 Workpiece Coordinate System Setting

The corresponding tool coordinate system should be set only when the tool is installed on the 6th axis of the robot; the robot's movement control point then can be moved to the tool center from the flange center of J6 axis. The setting method of the tool coordinate system consists of direct input, three-point and five-point methods. The tool coordinate system setting can be selected based upon the tool shape and dimension.

1. What is the tool coordinate system?

The origin of the coordinate system set with default is located on the Flange plate of the robot J6 axis. The origin of the tool coordinate system moves to the position and direction of the work, this position is called center point (TCP) which is formed the tool coordinate system.

2. The direction input method for tool coordinate system setting.

When the detailed parameter, such as the tool dimension, is displayed, of which the direction input method can be used. The tool coordinate system setting can be performed by inputting the corresponding value, and the numerical length of each item can not more than 10-digit. The operation steps of the direction input are shown below:

Step one: Enter the direct input setting interface of the tool coordinate; refer to the Section 3.1.3 for details.

Step two: View the current setting after entering the setting interface. The value along with each axis can be selected by up/down direction button; the corresponding numerical value is then can be set. Here, XYZ indicates the position distance from the flange center. Select the [SET] button after the coordinate numerical value input is performed. In this moment, the corresponding tool parameter has been enabled. Refer to the Fig. 8-3.

Fig. 8-3

3 Three-point method of tool coordinate system setting

The three-point method can be performed to set the tool parameters when the tool parameters are not displayed; the operation methods are shown below:

Step one: Enter the three-point setting interface of the tool coordinate; refer to the Section 3.3.3 for details.

Step two: The tool center is separately closed to the reference point with three directions, record to the 3 points by [POSITION] to calculate the tool center position. The corresponding interface may display the current coordinate value after pressing [POSITION]. In order to get the better calculation results, it is better to differ 90 degree among the three directions and can not at the same plane.

Step three: If the wrong point-capture occurs during its operation procedure, try it again; refer to the Fig. 8-4:

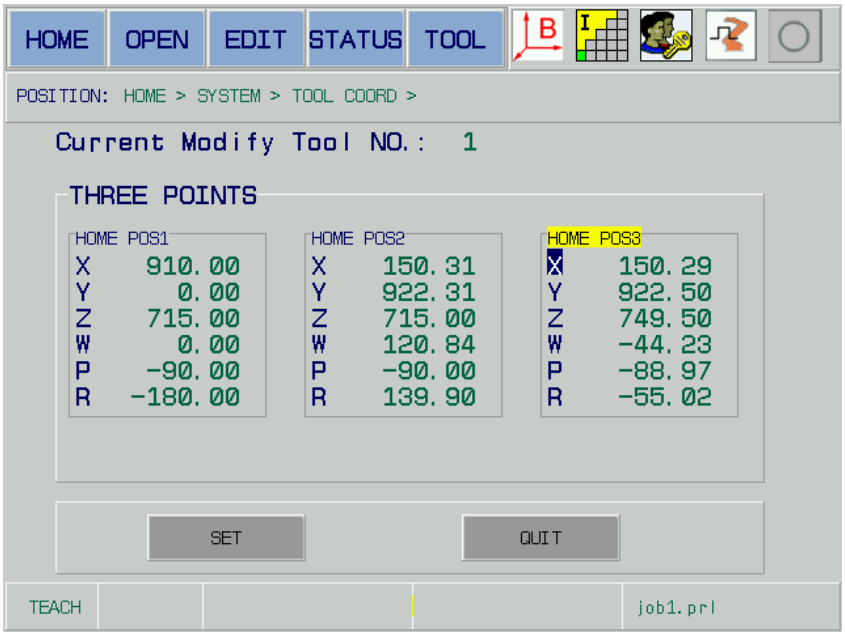


Fig. 8-4

4. Five-point method of tool coordinate system setting

The tool coordinate system setting can be used by five-point method if the tool parameters are not performed. There are three points and two approximate direction points should be gained during the five-point method.

Step one: Enter the five-point setting interface of the tool coordinate; refer to the Section 3.1.3 for details.

Step two: It is necessary to gain 3 original points and 2 direction points in the five-point method. Firstly, move the robot to the 3 original points, press the [POSITION], then the teaching robot moves 250mm at least along with the setting +X; press the [POSITION], then the teaching robot moves 250mm at least along with the setting +Z; lastly, press the [POSITION], and therefore the record issues.

Step three: If the wrong point-capture occurs during its operation procedure, try it again; refer to the Fig. 8-5:

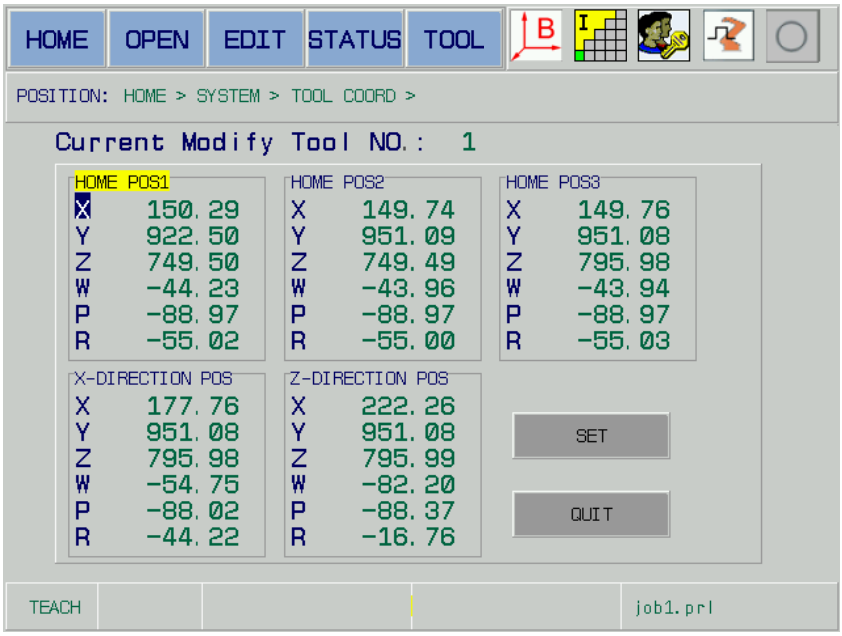


Fig. 8-5

8.1.3 The Inspection of the Tool Coordinate System

The tool coordinate system is immediately enabled when it is set. We can inspect it, refer to the following steps:

1. 1. Inspect the X Y Z directions

a) Shift the coordinate system to the tool coordinate system  by [Coordinate setting].

b) The teaching robot is separately moved along with the X, Y and Z; check whether the direction setting of the tool coordinate system is consistent with the requirements.

2. Inspect the position of the tool center

a) Shift the coordinate system to the rectangular coordinate system  or tool coordinate system  by [Coordinate setting].

b) Move the robot to the reference position; teaching robot rotates with the X, Y and Z axes; check whether the position of the TCP point is consistent with the requirements.

The abovementioned setting steps should be repeated to set if the inspection (for

example, error) is not consistent with the requirements.

8.1.4 User Coordinate System Setting

1. What is the user coordinate?

User coordinate system is convenient to the user to perform the teaching on the worktable in any position and direction. After the user coordinate system is set, the robot can be operated along with the set user coordinate systems X, Y and Z directions. XYZ indicates the user coordinate origin is at the rectangular coordinate system. WPR means that the user coordinate system rotates around the rectangular coordinate system.

The setting of the user coordinate system should be performed in the editing/administration mode.

2. The direction input method for the setting of the user coordinate system

The direction input of the user coordinate system setting is shown below:

Step one: Step one: Enter the direction input setting interface of the user coordinate system; refer to the Section 3.1.4 for details.

Step two: View the current setting after entering the setting interface. The value along with each axis can be selected by up/down direction button; the corresponding numerical value is then can be set. The numerical value input range is -9999.99~9999.99. Here, XYZ indicates the position of the user coordinate system origin under the rectangular coordinate system; WPR means the rotation angle that user coordinate system revolves the rectangular coordinate system.

Step three: Select the completion after the settings are performed. In this case, the user coordinate system setting is enabled. Refer to the Fig. 8-6.

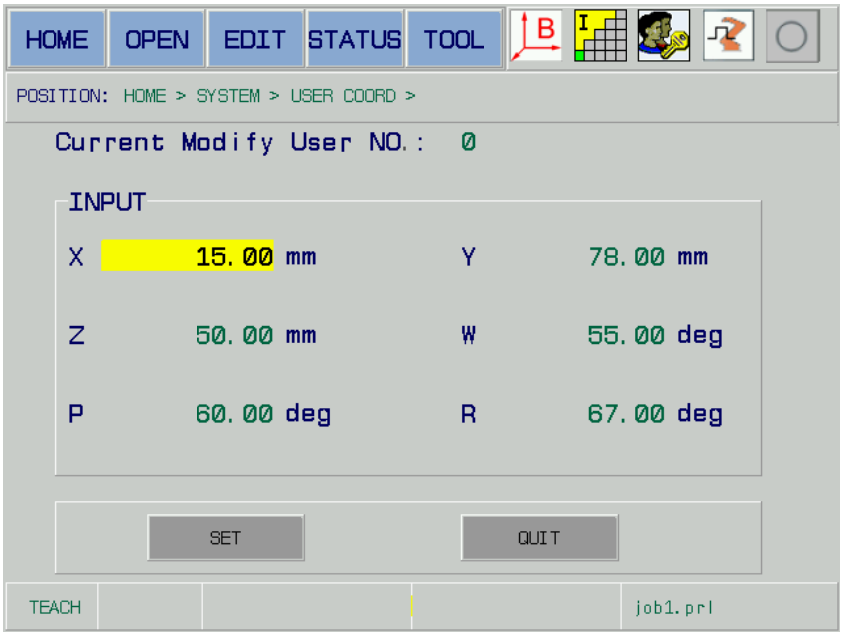


Fig. 8-6

3. Three-point of the user coordinate system

Step one: Enter the three-point setting interface of the user coordinate; refer to the Section 3.1.4 for details.

Step two: Firstly, move the robot to the user coordinate system origin, press the [POSITION], record the origin of the user coordinate system. Secondly, the teaching robot moves 250mm at least along with its desired +X, press the [POSITION], record the X direction point. Lastly, the teaching robot moves 250mm at least along with its desired +Y, press the [POSITION], record the Y direction point. To guarantee the correction of the calculation, when gaining the 3rd point (the point of along with the Y direction), it is better to perform it vertically with the +X direction as much as possible, and then gain it on the worktable for the user desired.

Step three: If the wrong point-capture occurs during its operation procedure, try it again; refer to the Fig. 8-7:

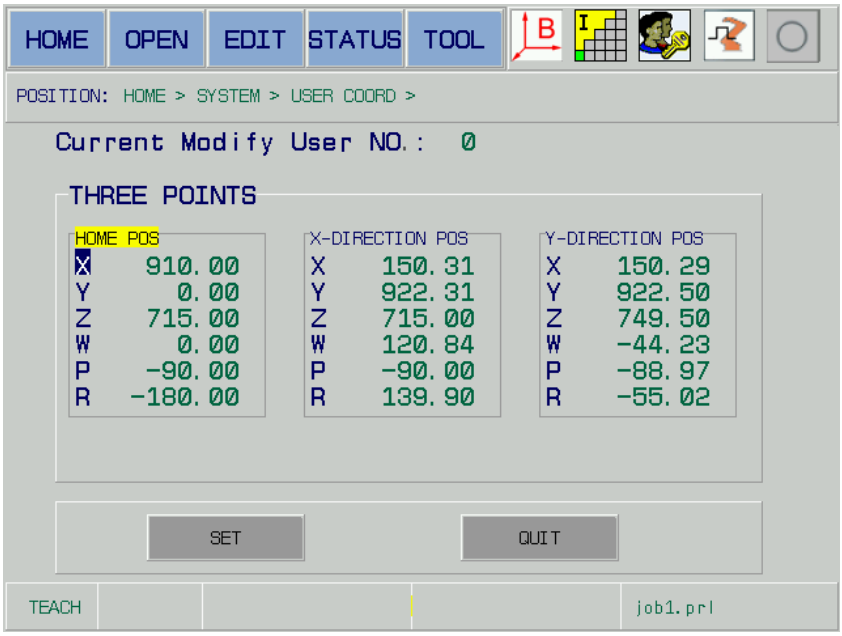


Fig. 8-7

8.1.5 The Inspection of the User Coordinate System

The user coordinate system should be inspected after it is set, refer to the following steps:

1. Shift the teaching coordinate system by [Coordinate setting] of the robot to the user coordinate system  ;

2. The teaching robot moves separately along with the X, Y and Z directions, check whether the setting of the user coordinate system direction exists deviation; if the deviation does not consistent with the requirements, the steps should be set repeatedly.

8.1.6 The Setting of the Table Coordinate System

1. What is the Table coordinate system

The Table coordinate system is mainly convenient for the user teaching after placing the table at any position and orientation. The robot will operate based upon the center of the Table coordinate system setting. The Table coordinate system owns the “Direct input method”, “Three-point method” and the “Five-point method”.

The setting of the Table coordinate system should be performed in the Edit/Administration mode; the configuration of the table should be firstly set before setting the Table coordinate system. Fail to set the table if it is without configuration. If the 1st axis table is allocated, the Table coordinate setting is only can be performed by direct and three-point methods. If the 2nd axis table is allocated, the Table coordinate setting is only can be performed by direct and five-point methods.

2. Direct input method setting of the Table coordinate system

When the detailed parameters for the relative position of the table and robot are recognized, input the value of the corresponding item by direct input method to complete the setting of the Table coordinate system;

The direct input method of the Table coordinate system setting; refer to the following detailed explanations:

Step one: Enter the direct input method setting interface of the table; refer to the Section 3.1.5 for details.

Step two: View the current setting after entering the setting interface. The value of each axis can be selected by [TAB] and direction buttons, and then the corresponding numerical values can be set. The numerical value input range is -9999.99~9999.99. Here, XYZ means the position both the Table coordinate system origin and robot base; WPR expresses the table rotation angle.

Step three: Select the [SET] button after setting; at this moment, the Table coordinate system setting is enabled.

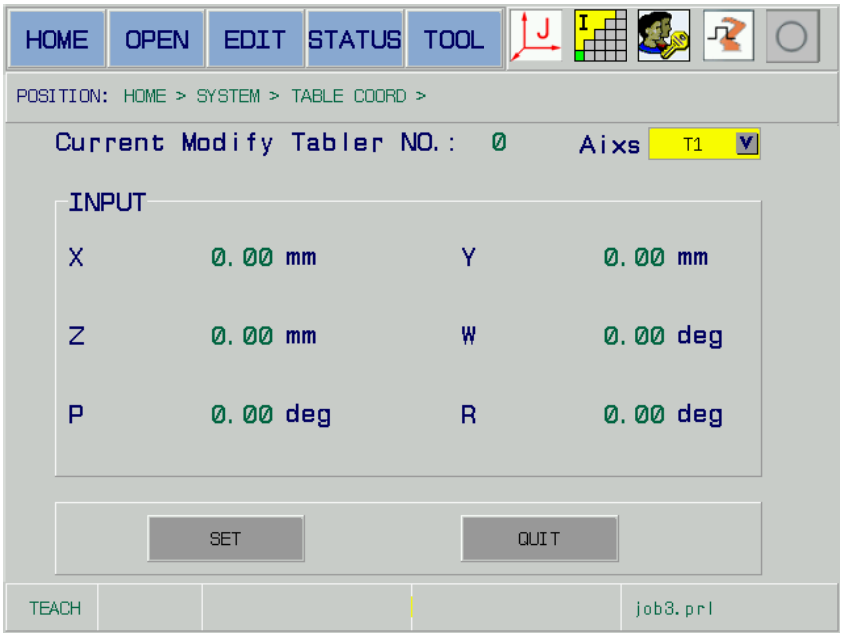


Fig. 8-8

Explanation: If the table is the 2nd axis, the T1 and T2 values should be separately input. The dialogue frame appears in area 1 by [SELECT], shift it by T1 or T2; and then input the corresponding numerical input and save it by the [SET] button.

3. Three-point setting of Table coordinate system

Step one: Enter the table three-point setting interface;

Step two: Firstly, mark a point P at the table worktable after the related position of the robot and table is fixed, lastly perform the teaching;

(1) Place the table at the zero; teaching robot moves to the point P, and record the position coordinate value P1{X, Y and Z} of this point by [POSITION], that is the approximation point 1.

(2) Controlling the table rotates an angle “a” (more than 30°), teaching robot moves to point P, record the position coordinate value P2{X, Y and Z} of this point by [POSITION], that is the approximation point 2; it is similar as the P3, as well the approximation point 3.

Step three: Select the [SET] button by TAB and direction buttons, and then complete the setting of the Table coordinate system. If the point-capture error, it can be marked the point again.

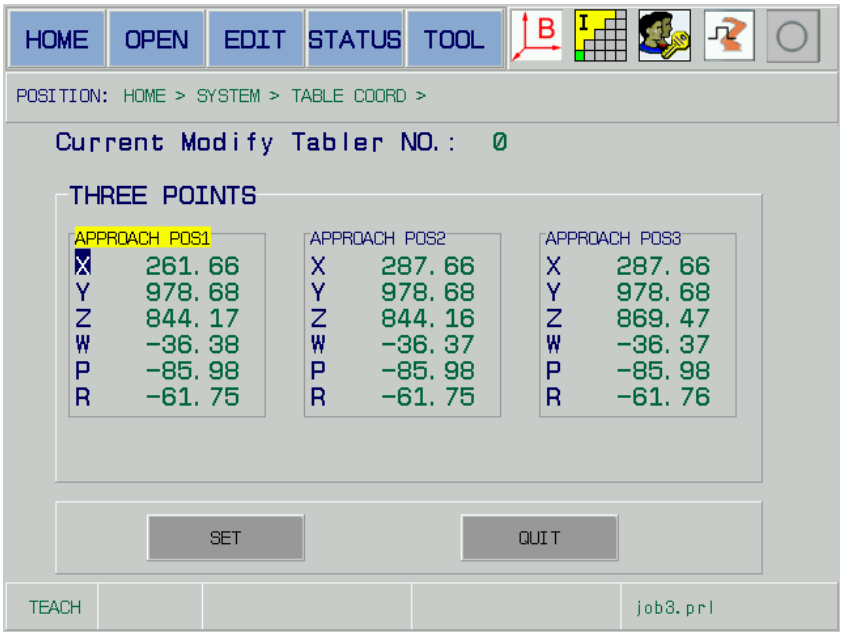


Fig. 8-9

4. Five-point method setting of the Table coordinate system

Step one: Enter the table five-point setting interface;

Step two: After the relative position of the robot and table are fixed, firstly, mark a point P at the table worktable, and then perform the teaching:

(1) Place the table at the zero; teaching robot moves to the point P, and record the position coordinate value P1{X, Y and Z} of this point by [POSITION], which is the approximation point 1.

(2) Controlling the table Y axis rotates an angle “a” (more than 30°), teaching robot moves to point P, record the position coordinate value P2{X, Y and Z} of this point by [POSITION], that is the approximation point 2; P3 value rotates an angle “a” (more than 30°) by controlling the table Y axis based upon the P2 point table state; teaching robot is then moves to the point P, and record the position coordinate value P3{X, Y and Z} of this point by [POSITION], that is the approximation point 3.

(3) Controlling the table X axis rotates an angle “β” (more than 30°) based upon the table state of the P3, the teaching robot moves to the P, and record the position coordinate value P4 {X, Y and Z} of this point by [POSITION], that is the approximation point 4. P5 value rotates an angle “a” (more than 30°) by controlling the table X axis based upon the P4 table state; teaching robot is then moves to the P, and record the position coordinate value P5 {X, Y and Z} of this point by [POSITION], that is the approximation point 5.

Step three: Select the [SET] button by TAB and direction buttons after the point is captured, and then complete the setting of the Table coordinate system. If the point-capture error, it can be marked the point again.

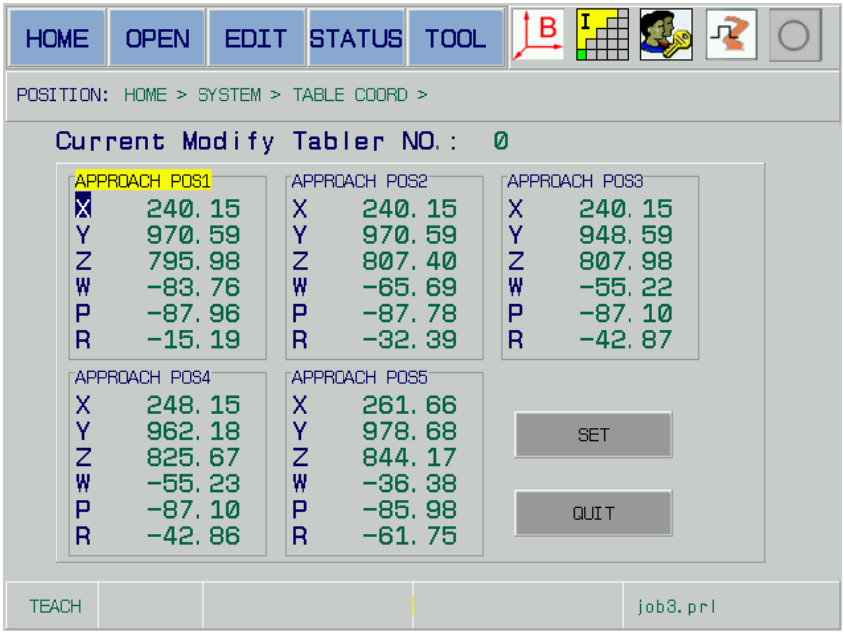


Fig. 8-10

8.2 Parameter Setting

The system parameter setting should be performed in the factory mode.

8.2.1 Axis Velocity and Acceleration/Deceleration Setting

Shift the cursor to the main menu area by [TAB] and direction buttons, select the {PARAMER} → {JOINT PARA}; the setting of the Max. allowance speed, the Max. acceleration and the error stop deceleration of each axis can be performed. Shift the cursor by direction button, the corresponding parameter can be set. The Max. allowance velocity is 1~999; the Max. acceleration of each axis is 1~999; and the error stop deceleration of each axis is 1~999.

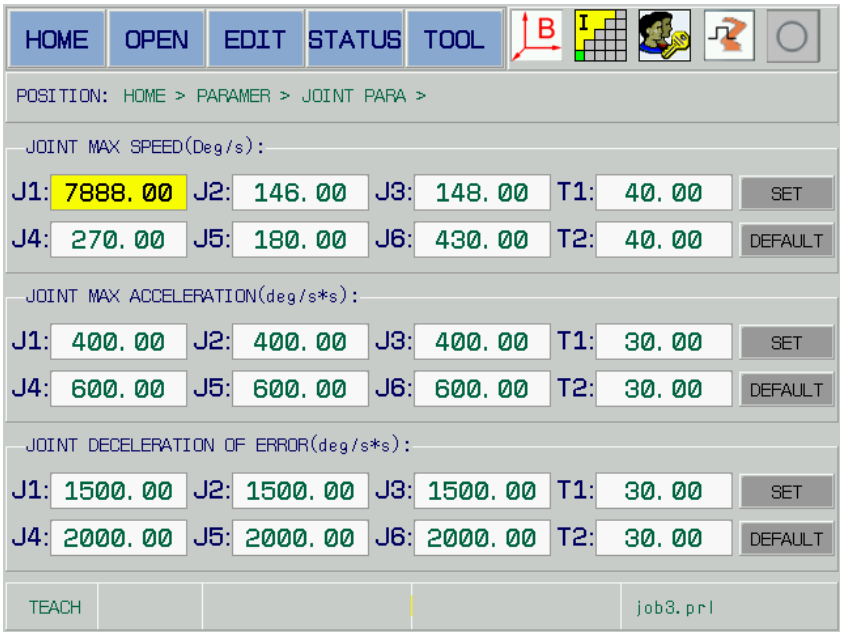


Fig. 8-11

8.2.2 Axis Parameter Setting

Shift to the main menu area by [TAB]; the axis parameter setting can be performed by selecting the {PARAMER} → {AXIS PARA}, which includes axis accuracy, axis deceleration ratio, mechanical compensation and axis direction, which can be set in this page all of them.

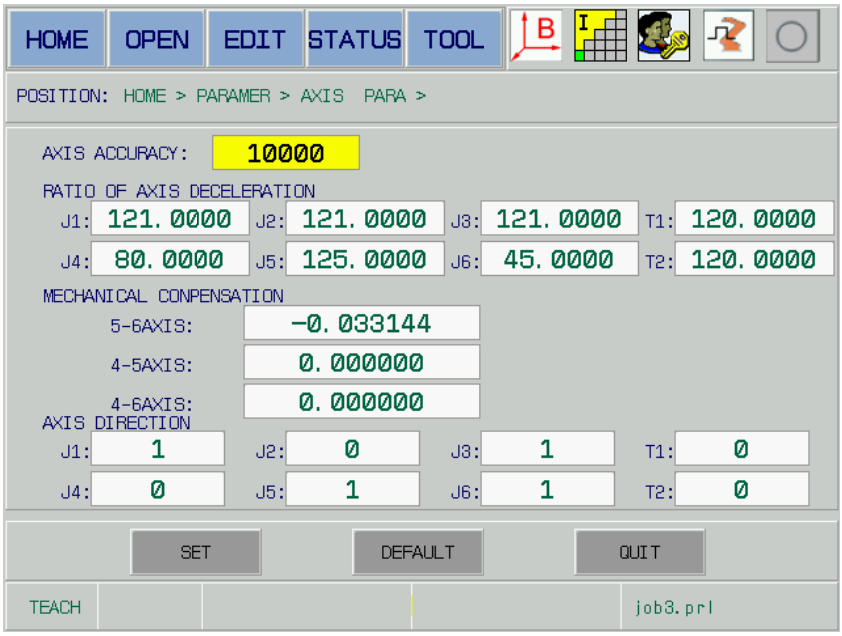


Fig. 8-12

8.2.3 Movement Parameter Setting

Shift to the main menu area by [TAB]; the robot motion acceleration time, the Max. allowance position speed, the Max. allowance posture speed, the Max. position acceleration, the Max. posture acceleration, the Max. position stop deceleration and the Max. posture stop deceleration can be performed by selecting the {PARAMER} → {MOTION PARA}.

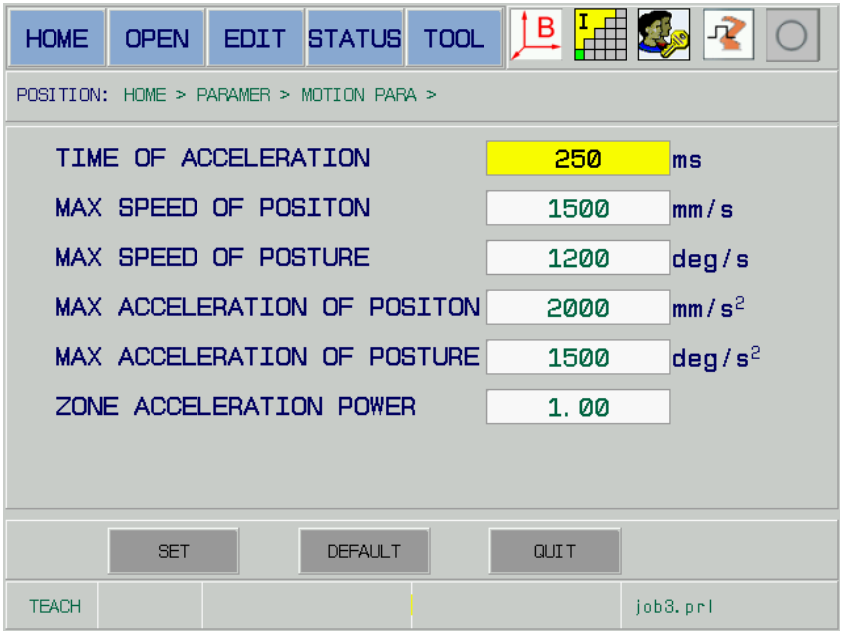


Fig. 8-13

8.2.4 Servo Parameter Setting

Shift to main menu area by [TAB], and then select the {PARAMER} → {SERVO PARA} by setting the servo parameter.

Fig. 8-14

8.3 Machine Setting

The structure parameter, deceleration ratio and soft limit etc. can be set in the robot setting, which only can be performed in the management security mode instead of the operation security mode. The {INTERFERENCE} needs the edit security mode, and the {SPECIAL RUN} only needs the operation security mode.

8.3.1 Robot Structure Parameter Setting

The robot structure parameter means the length parameter of the robot's rear-arm and the forearm components, which only can be set by factory. The setting range of the robot structure parameter is -1~2000 (Decimal, -1 and 2000 are not included), up to 6-digit can be limit.

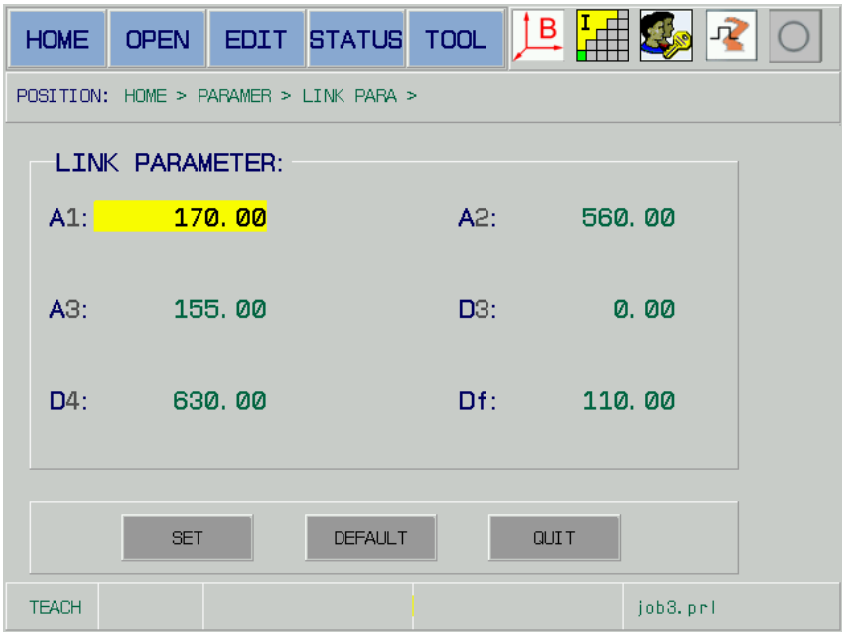


Fig. 8-15

8.3.2 The Setting of the Play Mode.

The following special operations can be performed when playing:

- **General Play**

The general play is the normal method, it is delivered pulse to servo when the system operates, and then the robot moves.

- **Machine lock**

The mechanical lock is mainly used for testing each condition of program operation is suitable or not. Fail to deliver the pulse to servo when the system operates. Although the robot position value changes, the robot is actually stationary.

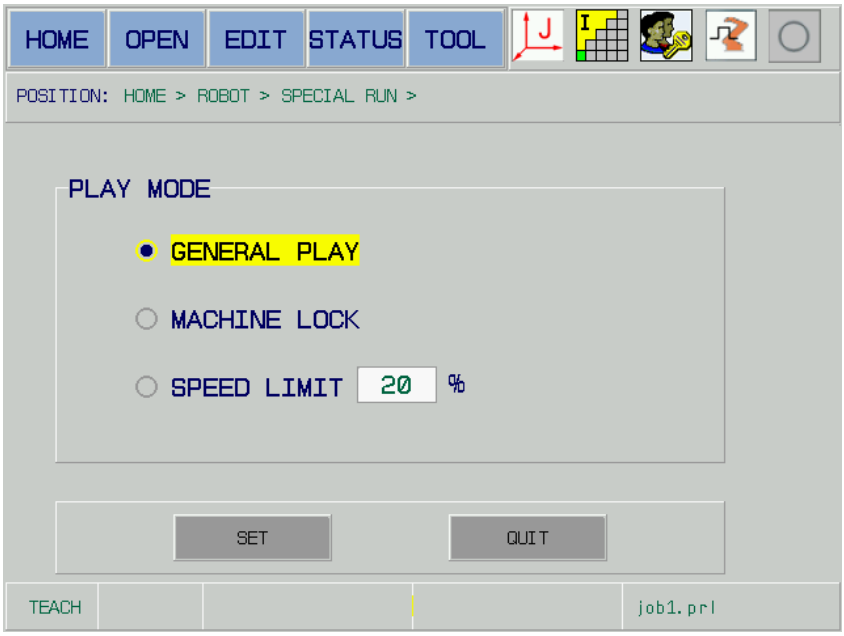


Fig. 8-16

8.3.3 Deceleration Ratio Setting

The deceleration ratio setting is the one of decelerator along with each axis. Current setting information can be set in the deceleration ratio setting interface. This parameter only can be set by factory.

The parameter setting range of the deceleration ratio is 0~1000 (decimal), up to 6-digit can be input.

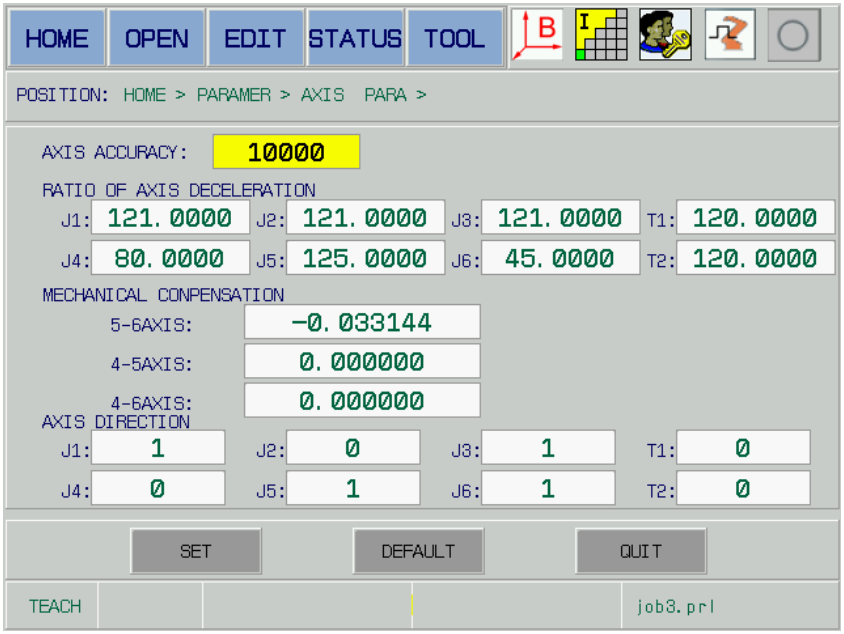


Fig. 8-17

8.3.4 Soft-limit Setting

The soft-limit setting is that the user defines the angle range of each movement axis. If one axis moves to out of the angle range of the soft-limit setting during teaching, the alarm may occur.

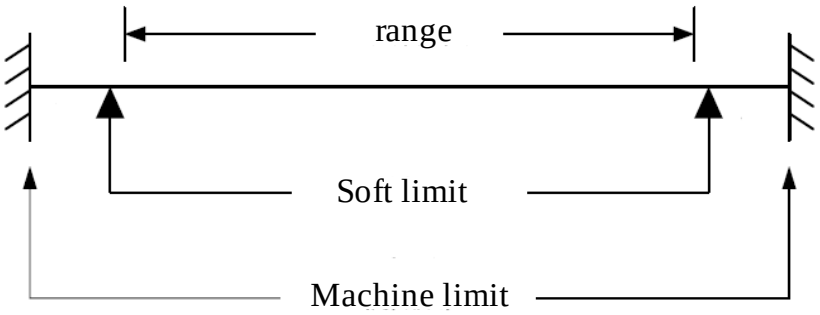


Fig. 8-18

The system alarm may occur when user operates the robot approaching to the soft-limiting. In this case, the overall axis operation keys may not move the robot. The alarm state of the {State display area} is cleared pressing the [Clear] key. Shift to the joint coordinate system, the press [Enabling switch] slightly; the soft limit area can be retracted by pressing the axis movement key reversed to the soft limit direction. The soft limit parameter setting range is -9999.99~9999.99; and the limit can be input up to 4 digits.

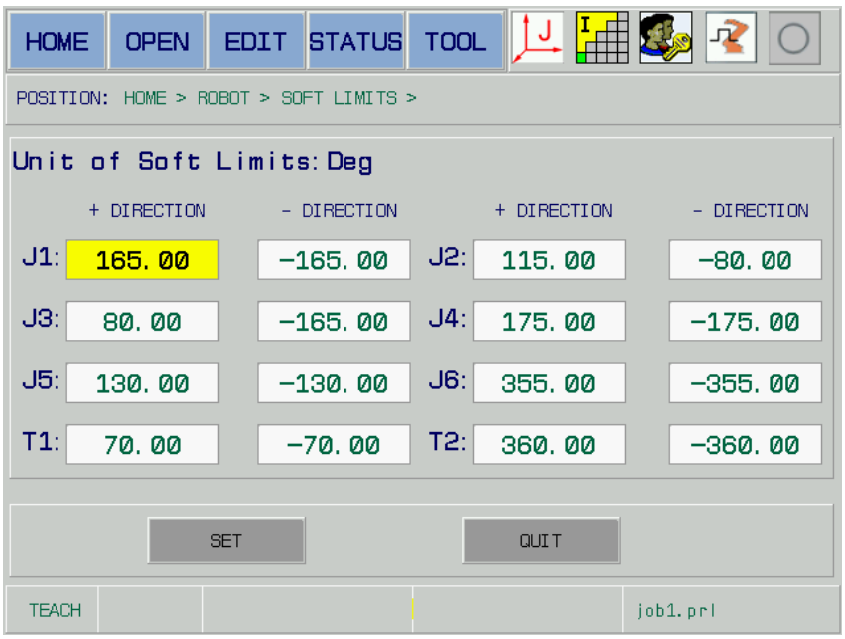


Fig. 8-19

8.3.5 The Setting of the Interference Area

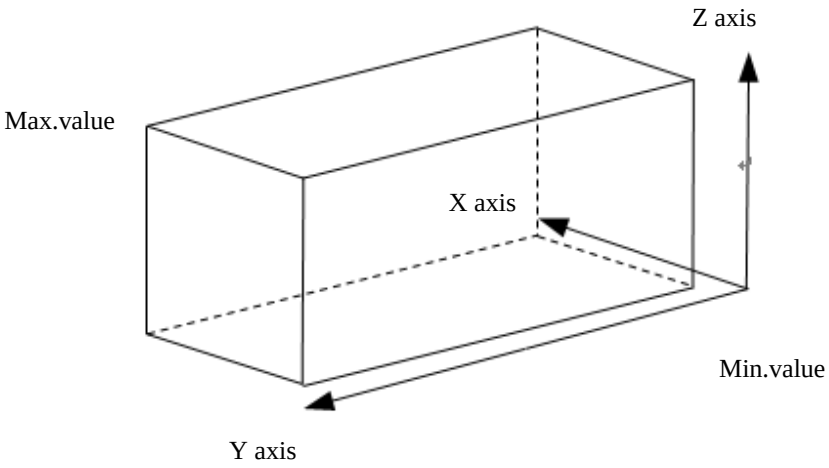


Fig. 8-20

Cube interference area is set a cube area based upon the corresponding coordinate system. At present, the interference area can be set in the base and user coordinate systems. If the interference area should be set in the user coordinate system, it only can be performed after establishing the corresponding user coordinate system.

Enter the interference area setting interface by selecting the main menu area → {ROBOT} → {INTERFERENCE}.

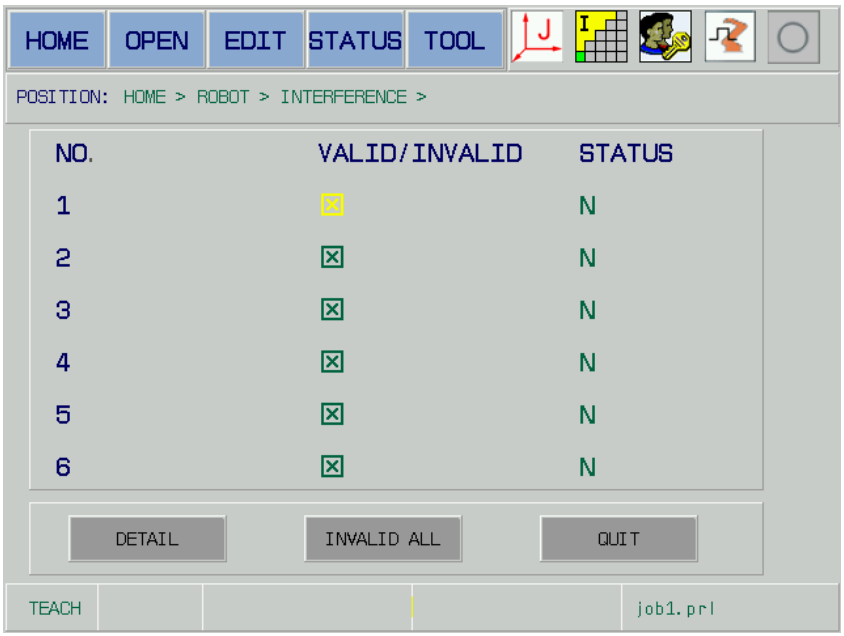


Fig. 8-21

Presently, there are 6 interference areas can be set. “VALID/INVALID” means the corresponding interference area is invalid or not. User enables the corresponding interference area by [SELECT]. “STATUS” is monitored to the robot.

The system alarm may occur after entering the interference area. In this case, release the enabled setting of the corresponding interference area, then move the robot at the back of the interference area, and therefore the corresponding area is then set as enabled.

The interference area can be set by selecting the [DETAIL]. At present, there are two setting methods: Manual input method and Two-point teaching method; refer to the following detailed introductions:

- **Manual input method**

A cube interference area can be confirmed by inputting the Max. and Min. values of the cube coordinate manually.

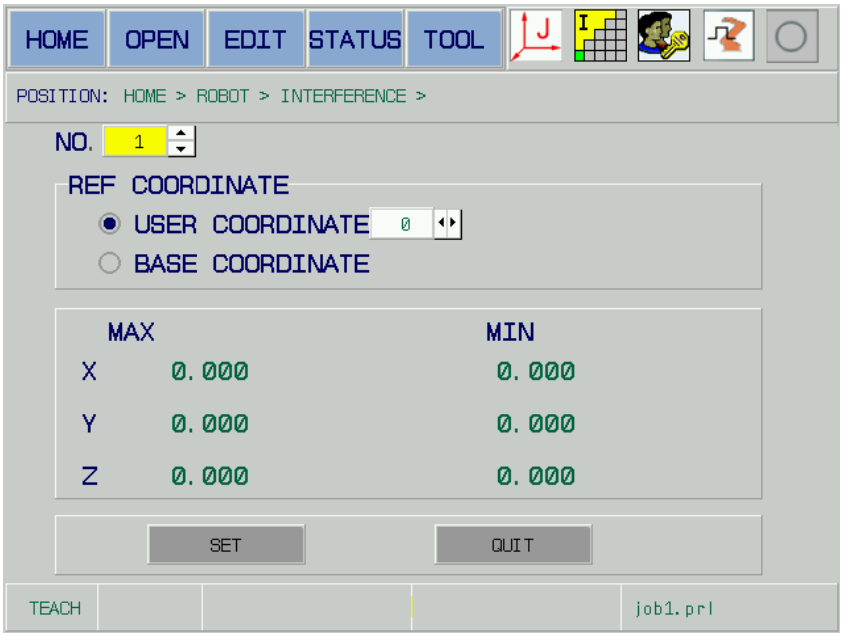


Fig. 8-22

In the interference interface, after the user coordinate system number is selected, input the coordinate values of two summits. Select the [SET] after the input is executed, the setting of the interference then can be performed.

- **Teaching method**

It is convenient to set the cube interference area by the method of two summits of the teaching cube.

Firstly, move the cursor to the Max. value X, Y or Z, then move the robot to the top of the interference area cube, and then press the {POSITION} button. Secondly, move

the cursor to the Mix. X, Y or Z, then teach the robot to the Min. point of the interference cub, and then press the {POSITION} button. In this case, the coordinate value of two top points is already recorded; the set cube interference area is then enabled after selecting the [SET].

CHAPTER NINE SAFETY MODE

There are three types for safety mode: Operation mode, Edit mode and Administration mode. Safety mode limits the application range of the robot function. The function range of the Operation mode is less than the Edit one of which the Edit one is less than the administration one. In total, their function range can be regarded as: Operation mode < Edit mode < Administration mode.

User only can operate the robot, teaching inspection and reappearance play programming operation etc. in the operational mode. He who can edit the program file and set partial parameter of the robot; for example, tool coordinate system, user coordinate system and interference area etc. The factory default password of the Edit mode is 888888. In the Administration mode, user can perform any system setting and operation other than the parameter setting in the {Parameter settingPARAMER} menu; the factory password of the Administration mode is 666666.

The safety and operation modes of robot operation are shown in the table 9-1:

Table 9-1

Operation content of robot	**SecuritySafety mode**			**Operation mode**	
	Operation	**Editing**	**AdministraManagementtion**	**TeachTeaching**	**PlayReappearance**
Command editing (input, addition, modification, DELET, cutting, copy)	NO	YES	YES	YES	NO
Program file editing (new, rename, search, copy and DELET)	NO	YES	YES	YES	NO
Program file open/close	YES	YES	YES	YES	YES
Absolute zero position	NO	NO	YES	YES	NO
Tool coordinate system	NO	YES	YES	YES	NO
User coordinate system	NO	YES	YES	YES	NO
Table coord	NO	YES	YES	YES	NO
System time	YES	YES	YES	YES	NO
Password setting	NO	YES	YES	YES	NO

Mode shifting	YES	YES	YES	YES	NO
System velocity	NO	NO	YES	YES	NO
Main program setting	NO	YES	YES	YES	NO
Table configuration	NO	YES	YES	YES	NO
Self-defined alarm	NO	YES	YES	YES	NO
Joint parameter	NO	NO	NO	YES	NO
Axis parameter	NO	NO	NO	YES	NO
Movement parameter	NO	NO	NO	YES	NO
Servo parameter	NO	NO	NO	YES	NO
Connecting rod parameter	NO	NO	NO	YES	NO
Application configuration	NO	NO	NO	YES	NO
Variable	YES	YES	YES	YES	YES
ALARM HISTORY	YES	YES	YES	YES	YES
Version information	YES	YES	YES	YES	NO
Input/output	YES	YES	YES	YES	YES
Teaching point	YES	YES	YES	YES	NO
Special Run	NO	NO	YES	YES	NO
Soft-limit	NO	NO	YES	YES	NO
Interference	NO	YES	YES	YES	NO
On-line help command	YES	YES	YES	YES	NO
On-line help operation	YES	YES	YES	YES	NO
Teaching inspection (forward/backward)	YES	YES	YES	YES	NO
Play (Start/hold)	YES	YES	YES	NO	YES

CHAPTER TEN INPUT/OUTPUT

1. Input/Output Monitoring

Move the cursor to the {IN/PUT} on the main page menu area, then enter the input/output monitoring interface by [SELECT]; refer to the Fig. 10-1:

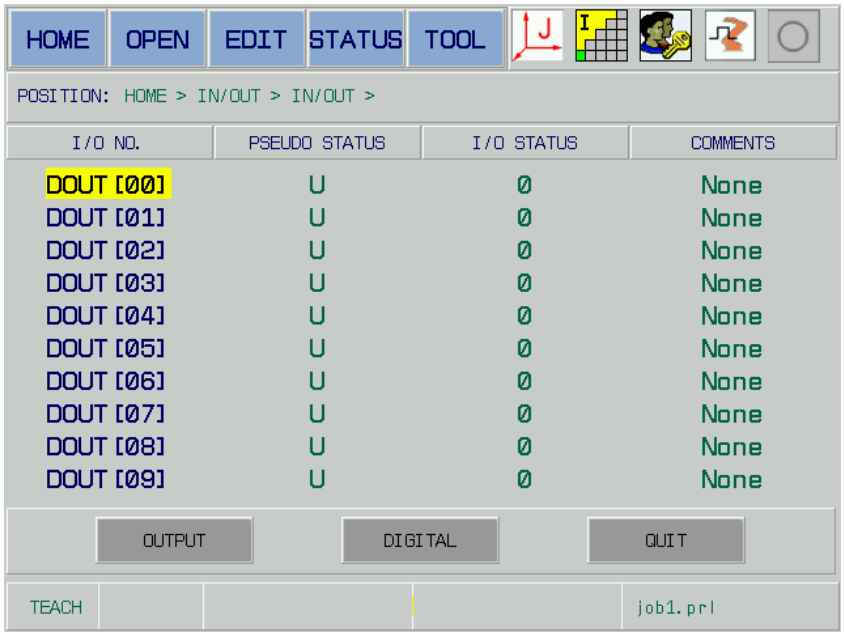


Fig. 10-1

In this interface, shift the cursor by [TAB], then enter the operations, such as the input or output signal SELECT, the modification I/O state and the note modification etc. matching with the [SELECT].

2. Input/output signal SELECT

Shift the cursor to the [OUTPUT] button by [TAB] and direction buttons; shift the input/output type by [SELECT]; refer to the Fig. 10-2.

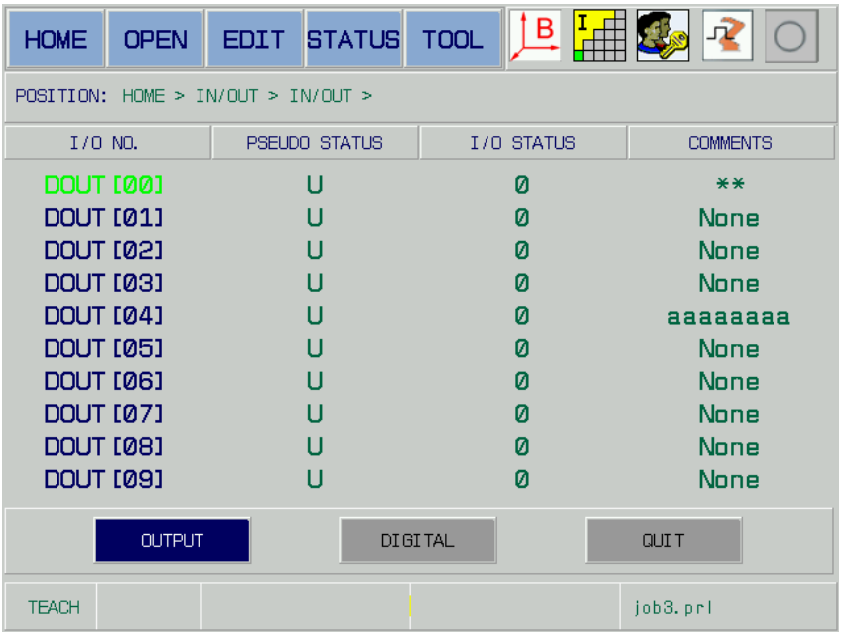


Fig. 10-2

3. Enforcement output state

Shift the cursor to the “I/O STATUS” column by [TAB] and direction buttons in the digit output signal state. The output state of I/O can be enforced treating as the ON or OFF by the numerical value 1 or 0. The signal output port DOUT[01] is enforced at the “ON” state which shows at the Fig. 10-3.

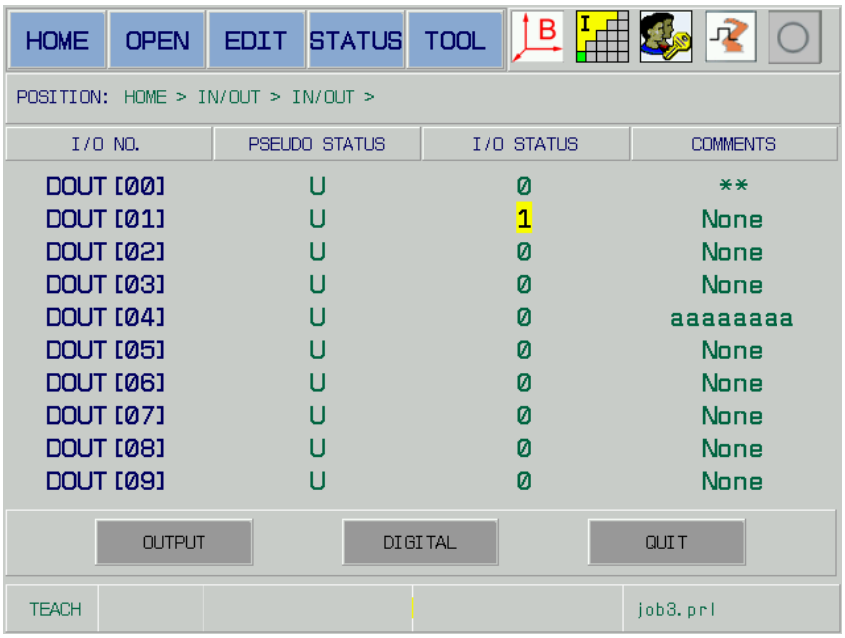


Fig. 10-3

4. Note modification

Shift the cursor to the “COMMENTS” by [TAB], then enable the soft keyboard by [SELECT], and then input the input port note; the signal input port DIN [00] alters to “job” which shows at the Fig. 10-4.

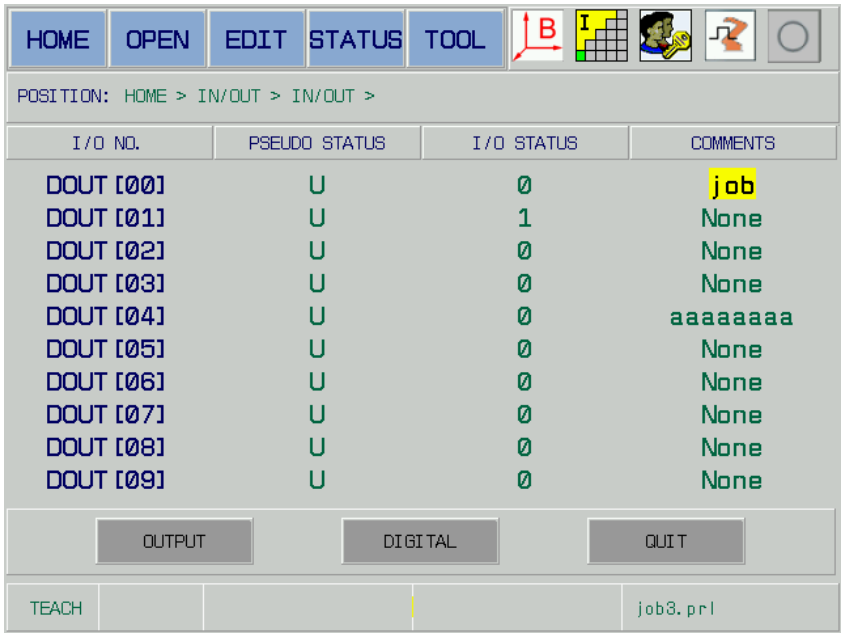


Fig. 10-4

Note: The I/O note should be less than 8 characters, the interface will not display if it exceeds.

APPENDIX ALARM HISTORY

Alarm No.		Content
4000001	:	Motor speed over set value
4000002	:	Main circuit over voltage
4000003	:	Main circuit low voltage
4000004	:	Pos value over set one
4000005	:	Motor excess temperature
4000006	:	Speed amplifier saturation fault
4000007	:	Driver forbid abnormal
4000008	:	Pos deviation counter flow
4000009	:	Encoder signal error
4000010	:	Control power undervoltage
4000011	:	IPM intelligent module fault
4000012	:	Motor excess current
4000013	:	Overload
4000014	:	Brake circuit fault
4000015	:	Encoder count abnormal
4000017	:	Brake time too long
4000018	:	Absolute encoder overspeed
4000019	:	Brake feedback before voltage to be threshold value
4000020	:	EEPROM wrong
4000021	:	Power source phase loss
4000022	:	AV too high
4000023	:	A/D chip wrong
4000024	:	Multi loop data wrong
4000025	:	External cell under 2.5V
4000026	:	External cell under 3.1V
4000027	:	Motor type mismatching
4000028	:	Encoder CRC checking error
4000029	:	Encoder data abnormal
4000030	:	Encoder Z pulse miss

4000031 : Encoder UVW signal error
4000032 : Encoder UVW signal illegal code
4000033 : Bus comm. abnormal
4000034 : Radiator high temperature alarm
4000035 : Radiator low temperature alarm
4000036 : Main power supply power down
4000037 : read/write absolute coder EEPROM over time
3000001 : Link comm. wrong
3000002 : No MDT data
3000003 : Comm. error
2000004 : no enabled
3000005 : Linkage initialization error
3000006 : Serial comm. error
3002009 : Path buffer null
2000007 : User coordinate sys set abnormal
3000008 : Comm data abnormal
3000009 : Servo alarm
3000010 : Pos over soft limit
2001000 : Inptu motion para error
2001001 : CR circular arc transition failed
2001002 : Input point in limit
2001003 : Input point in singularity pos
2001004 : Get the point not by principle of proximity
2001005 : Circular arc three points collinear
2001006 : Circular arc three points too near
2001007 : Intermediate point of circular arc error
3002000 : Buffer error
2002001 : No ending line
2002002 : Pos limit
2002003 : No inverse solution
2002004 : ACC/DEC program error
2002005 : Program speed over limit
3002006 : Buffer null
2003000 : Emergency stop

2003001 : Motion module change emergency stop
2003002 : J3 Singularity status
2003003 : J5 Singularity status
1003004 : J3 Approach singularity pos
1003005 : J5 Approach singularity pos
2003006 : Beyond work space
2003007 : Data hole pos mutation
2003008 : Interpolation mode error
2003009 : Robot is about to enter interference region
2004000 : J1 axis speed over limit
2004001 : J2 axis speed over limit
2004002 : J3 axis speed over limit
2004003 : J4 axis speed over limit
2004004 : J5 axis speed over limit
2004005 : J6 axis speed over limit
2004006 : T1 axis speed over limit
2004007 : T2 axis speed over limit
2005000 : J1 axis servo alarm
2005001 : J2 axis servo alarm
2005002 : J3 axis servo alarm
2005003 : J4 axis servo alarm
2005004 : J5 axis servo alarm
2005005 : J6 axis servo alarm
2005006 : Zero point miss
2005007 : disable
2006001 : J1+soft limit
2006002 : J2+soft limit
2006003 : J3+soft limit
2006004 : J4+soft limit
2006005 : J5+soft limit
2006006 : J6+soft limit
2006007 : T1+soft limit
2006008 : T2+soft limit
2006021 : J1-soft limit

2006022 : J2-soft limit
2006023 : J3-soft limit
2006024 : J4-soft limit
2006025 : J5-soft limit
2006026 : J6-soft limit
2006027 : T1-soft limit
2006028 : T2- soft limit
1006001 : S+approach soft limit
1006002 : L+approach soft limit
1006003 : U+approach soft limit
1006004 : R+approach soft limit
1006005 : B+approach soft limit
1006006 : T+approach soft limit
1006007 : T1+approach soft limit
1006008 : T2+approach soft limit
1006021 : S-approach soft limit
1006022 : L-approach soft limit
1006023 : U-approach soft limit
1006024 : R-approach soft limit
1006025 : B-approach soft limit
1006026 : T-approach soft limit
1006027 : T1-approach soft limit
1006028 : T2-approach soft limit
2007000 : Teaching coordinate sys error
2007001 : Teaching coordinate sys error
2008000 : Robot enter interference region
2008001 : Interference region set data abnormal
3009000 : ARM initialization error
3009001 : Robot zero abnormal
2010001 : I/O output value error
2010002 : I/O input value error
2010003 : I/O point type error
2010004 : I/O number type error
2003010 : Motor angle and joint value tolerance

1100001 : Open file failed
1100002 : Open control file failed
1100004 : File pointer null
1100005 : File read/write pos set failed
1100006 : syntax error
1100007 : Command combined error
1100008 : Addr string too long
1100009 : Addr identifier more than 18
1100010 : No addr identifier inline
1100015 : External axis number error
1100016 : Lable (LAB*) repeated
1100017 : Lable(LAB*) format error
1100018 : Lable(LAB*) text more than 20 CH
1100019 : No found Lable (LAB*) addr
1100020 : JUMP command incomplete
1100021 : Unrecognized command string
1100022 : Unrecognized string
1100023 : Calling file not exist
1100029 : MOVE command incomplete
1100030 : MOVE Value error
1100031 : MOVE point data error
1100032 : Z addr string repeated
1100033 : V addr string repeated
1100034 : Variable value over range
1100038 : I/O input/output format error
1100039 : Arithmetical operation format error
1100040 : Robot linkage speed inconformity
1100041 : Translation invalid as external axis move
1100042 : Arithmetical operation statement has wrong value
1100043 : WAIT Command format error
1100044 : DELAY Command format error
1100045 : DOUT output format error
1100046 : DIN Input format error
1100047 : Constant error

1100048 : Translation invalid as external axis move
1100050 : Code error
1100051 : Data is invalid as analyzing
1100052 : No found corresponding point data
1100053 : Value set error
1100054 : MOVE command process error
1100055 : JUMP command process error
1100056 : coord. point data format error
1100058 : No end SHIFT as CALL
1100059 : SHIFTON reappear
1100060 : Translation instr. mismatching
1100061 : No return to main PRG as calling
1100062 : Calling level beyond the range
1100063 : DOUT command process error
1100065 : WAIT command process error
1100066 : Invalid code data
1100067 : Judge error debug point
1100070 : Command (ARCON ARCOFF) mismatching
1100071 : Command (WVON WVOFF) mismatching
1100072 : Command (SHIFTON SHIFTOFF) mismatching
1100073 : Swing welding no end
1100074 : Welder no close
1100075 : PRG no end translation
1100076 : Sub-PRG call main PRG
1100077 : Rigid loop (JUMP Lab)
1100078 : non-existent command
1100079 : Compare error operate
1100080 : Addr error
1100081 : Read para error
1100082 : Set para error
1100083 : Input para specified by SHIFTON isn't PX
1100084 : Input para specified by MSHIFT isn't PX
1100085 : No close welder as CALL
1100086 : No end swing weld as CALL

1100087 : This I/O is in used
1100088 : Point data too large
1100089 : Repeat point data
1100090 : Data pointer error
1100091 : Arc no three points
1100092 : Welding format error
1100093 : repeated WVON
1100094 : Command (WVON WVOFF mismatching)
1100095 : Arc three points collinear (DSP function ret.)
1100096 : Swing type error (function ret.)
1100098 : Undefined error (function ret.)
1100099 : Swing welding frequency is 0
1100100 : Restart welder
1100101 : Welder no start but to execute close command
1100102 : Variable operation (+/-) beyond range(0-9999)
1100103 : illegal welding/swing
1100104 : Variable No.over range
1100105 : Current variable not used
1100106 : Point connect file No. over range(1-10)
1100107 : Point connect file No. mismatching
1100108 : Robot not in 1st teaching point
1100109 : No.0 output terminal is for alarm I/O
1100110 : Undefined variable type
1100111 : nonexistent variable operator
1100112 : Para type error (logical operate)
1100113 : Sub-prg call sub-prg
1100114 : Lab repeat
2200100 : DSP para file no exist
2200101 : Save DSP para file failed
2200102 : Save motion para file failed
2200103 : Save integer para file failed
2200104 : Open DSP para file failed
2200105 : Open interference region file failed
2200106 : Save interference region file failed

2200107 : Open user coord.sys file failed
2200108 : Save user coord.sys file failed
2200109 : Open tool coord.sys file failed
2200110 : Save tool coord.sys file failed
2200111 : File length over default one
2200112 : Save tool machining PRG file failed
2200113 : Open tool process PRG file failed
2200114 : Copy source file null
2200115 : File format error
2200215 : Flow times lose as power down
2200216 : Motor actual pos lose as power down
2200217 : Robot absolute zero lose as power down
2200218 : Turntable absolute zero lose as power down
2200219 : Tool coord. sys recover default
2200220 : User coord. sys recover default
2200222 : Read swing welding process file failed
2200223 : Save swing welding process file failed
2200224 : Read arc strike process file failed
2200225 : Read arc blowout process file failed
3000034 : Checking para file lose
3000035 : Checking para file format error
3000036 : Axis precision default
3000037 : Axis reduction ratio default
3000038 : Soft limit default
3000039 : Each axis Max.speed default
3000040 : Each axis Max.ACC default
3000041 : Each axis actual DEC default
3000042 : Motion ACC/DEC time default
3000043 : Max. permissible speed default
3000044 : Max. permissible pose speed default
3000045 : Max. permissible ACC speed default
3000046 : Max. permissible pose speed default
3000047 : Max. permissible DEC speed default
3000048 : User coord.sys No. data abnormal

3000049 : Tool coord.sys No. data abnormal
3000050 : Connecting rod coefficient default
3000051 : Axis offset para default
3000052 : Turntable Max. permissible acc default
3000053 : Turntable Max. speed default
3000054 : Turntable stop DEC default
3000055 : Turntable + limit default
3000056 : Turntable - limit default
3000057 : Turntable axis reduction ratio default
3000058 : Turntable axis number default
3000059 : Turntable 1st axis precision default
3000060 : Turntable 2nd axis precision default
3000061 : Path control priority default
3000062 : Transition threshold factor of pos use ratio default
3000063 : Fixed threshold factor of pos use transition default
3000064 : PL transition grade of CR transition equivalent default
3000065 : Pose transition speed multiply factor default
3000066 : Pose transition speed multiply factor of external axis default
3000067 : Pose transition speed threshold factor default
3000068 : Transition speed threshold factor of external axis default
3000069 : Joint ACC/DEC time constant default
3000070 : Max.jerk factor default
3000071 : 1-8 area of pos grade default
3000072 : Version checking not initialized ferroelectric
3000073 : Byte variable default
3000074 : Integer variable default
3000075 : Dou-precision variable default
3000076 : Real variable default
3000077 : Cartesian pos type variable default
3200001 : Comm. data length abnormal
3200002 : Servo driver number mismatching
3200003 : MDT bus link overtime
3200004 : Bus link unknown error
3200005 : DSP load failed

3200006 : DSP pulse abnormal
3200007 : Servo slave over max. number
3200008 : Servo para checking error
3200009 : Gain servo para overtime
3200010 : Servo para save failed
3200011 : Invalid MDT data alarm
3200012 : Zero lose alarm
3200013 : Station booking status error
3201001 : Not enough space for add current line
3201002 : Cut PRG lines more than file end lines
3201003 : Copy PRG lines more than file ending lines
3201004 : String format length less than 1
3201005 : Files over 100pcs
3201006 : Create PRG file failed
3201007 : Save file failed
3201008 : Deleting file name is null
3201009 : Obtaining file name is null
3201010 : Create PRG File null
3201011 : Distribution handle failed
3201012 : Distribution handle failed
3201013 : Station booking status error
3201014 : Code open failed
3201015 : Interference region set failed
3300001 : Comm.with welder failed
3300002 : Robot and welder explicit comm.overtime
3300003 : Robot and welder I/O comm.overtime
3300004 : Robot and welder had UCMM comm.
3300005 : Robot and welder had explicit comm. error
3300006 : Robot and welder had I/O comm.
3300007 : Robot and welder UCMM comm. error
3300008 : Robot and welder non-explicit comm. error
3300009 : Robot and welder explicit comm. error
3300010 : Robot and welder I/O comm. error
3300011 : Robot and welder MAC ID conflict

3300012 : Welder equipment mismatching with Robot set

3300013 : Welder I/O length mismatching with Robot set

3300014 : Welder set command invalid in on-line state

3300015 : Welder data command invalid in off-line state

3300016 : Welder no input I/O data

3300017 : Welder no output I/O data

3300018 : DEVICENET Master para beyond range

3300019 : DEVICENET Slave para beyond range

3300111 : Welder fault

3300112 : Welder para beyond range

3300113 : Welder arc strike failed

3300114 : Welder ropiness alarm

3300116 : Welder type error

3300117 : Welder operate logic error

3300118 : Drive power source off alarm

3000030 : Sys key para axis reduction ratio lose

3000031 : Sys key para axis precision lose