# SCARA Teach Pendant Manual

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Smarter. Greener. Together.

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# Robot language

# 1. Human machine interface

## 1.1 Hardware interface

The hardware interface for the teach pendant is mainly divided into touch screen and physical buttons, as shown in Figure 1-1 , Figure 1-2, and Figure 1-3.

- Touch-screen functions include: operating status of the robot, connecting status, robot language editing, display/teaching of coordinates information, system-related parameter settings, display of system information, etc.
- Functions of the physical buttons include: JOG operation, auto run, pause/resume, running stop, page-switching button, select/adjustment button, emergency stop (e-stop), and power indicator light for teach pendant.

| Physical buttons | Description | Executable page |
|---|---|---|
| RUN | Press and hold down this button and the stage two of the three-stage for operation button simultaneously for 2 seconds to automatically run the opened project. | Edit/Run |
| PAUSE<br>RESUME | Press and hold down this button and the stage two of the three-stage operation button simultaneously to pause or resume the currently-running project. | Edit/Run |
| STOP | Press and hold down this button and the stage two of the three-stage operation button simultaneously to stop the currently-running project. | Edit/Run |

| | | |
|---|---|---|
| + | Press and hold down this button and the stage two of the three-stage operation button simultaneously to shift the axis toward the positive direction. | All pages |
| – | Press and hold down this button and the stage two of the three-stage operation button simultaneously to shift the axis toward the negative direction. | All pages |
| ⬆ | Press this button to return to the previous page. It is used on the points page, project directory page, and RL editing page. | Edit/Run, Points |
| ⬇ | Press this button to return to the next page. It is used on the points page, project directory page, and RL editing page. | Edit/Run, Points |

- Three-stage operation button: Located on the back of the teach pendant (Figure 1-2), it is a safety switch for operating the robot.
- SD Card slot: Located at the bottom of the teach pendant (Figure 1-3), it is used for updating firmware on the teach pendant.

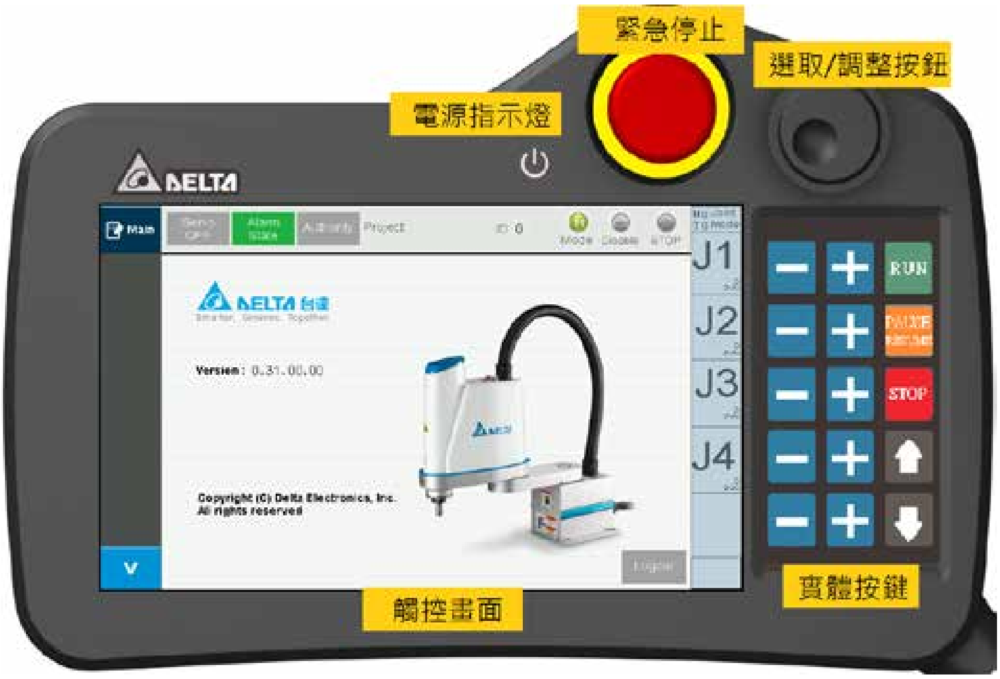

**Figure 1-1 Startup screen**

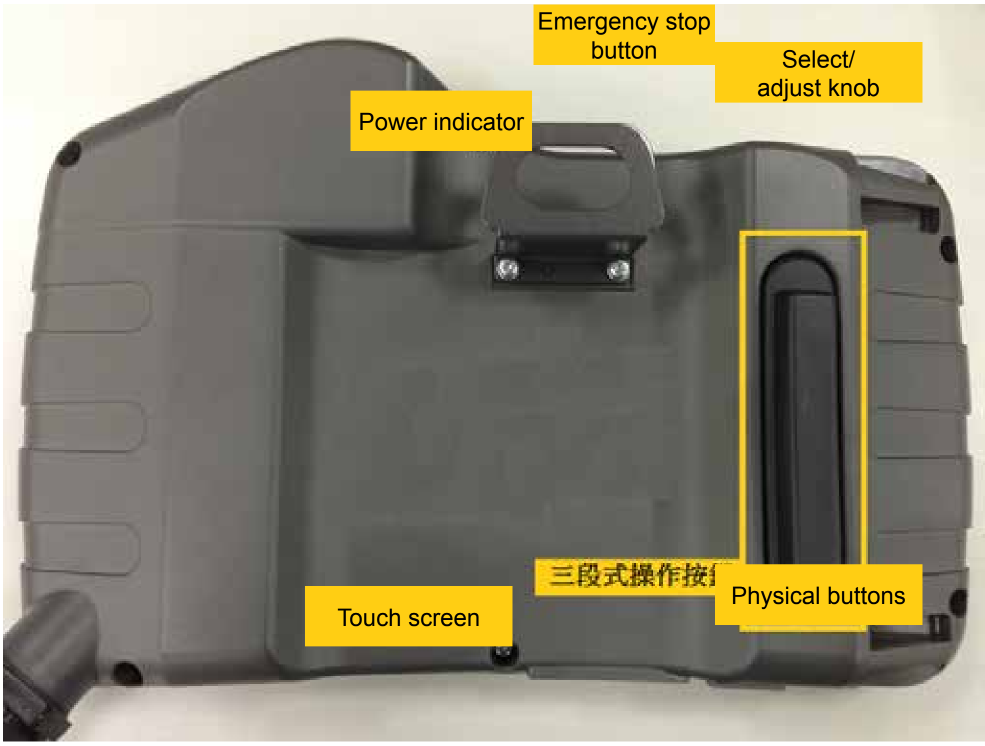

Figure 1-2 Back of the teach pendant

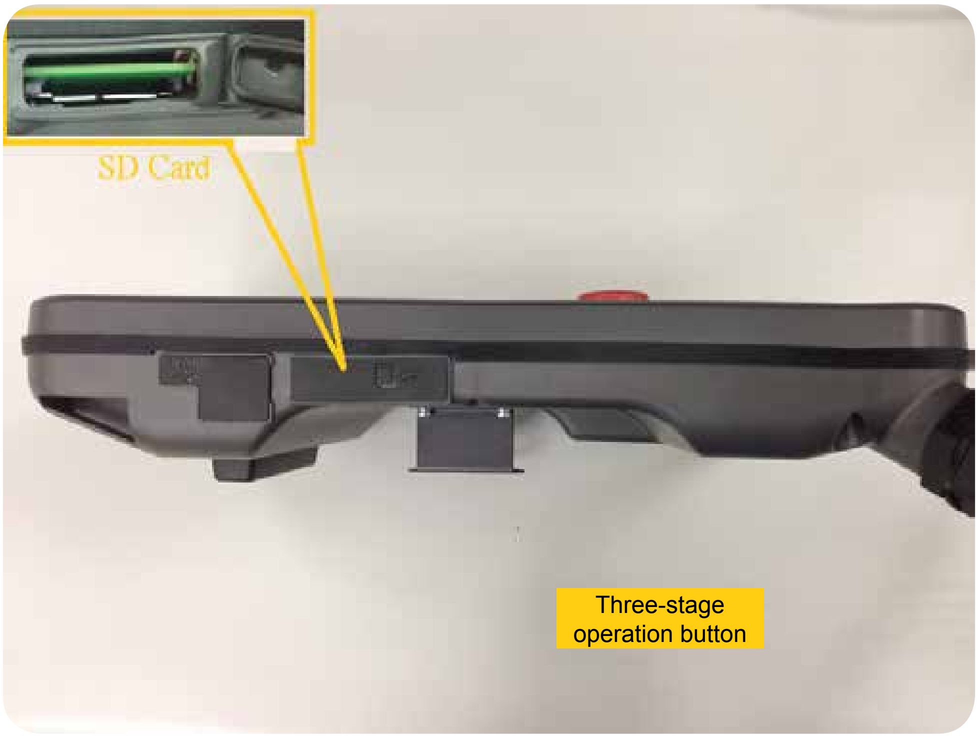

Figure 1-3 SD Card slot for the teach pendant

# 1.2 Touch screen

The touch screen (Figure 1-4) is divided into a Menu Bar on the left, a bar on the top to monitor status of the robotic arm, a bar on the right to monitor Jog information, and a tab screen. Functions of each part are described as follows:

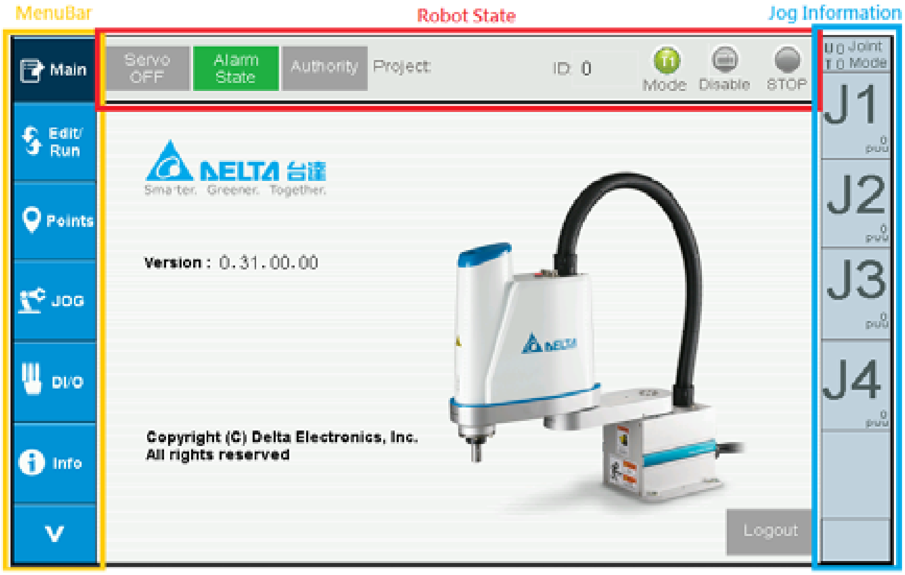

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**Figure 1-4 Layout of touch screen**

- Menu Bar：
  Displays tab-switching buttons, including Edit/Run program for the robot, point information (Points), Jog settings (Jog), IO monitoring (DI/O), information display (Info), and Setting

| Appearance of UI buttons | Description |
|---|---|
| Main | Press this button to return to the main screen and return to the first page on the Menu Bar. Once done successfully, the button will be highlighted in black. |
| V | Press this button to turn to the next page on the Menu Bar. |
| Λ | Press this button to return to the previous page on the Menu Bar. |
| Edit/ Run | Press this button to switch to the screen to Edit/Run program for the robot. Once done successfully, the button will be highlighted in black. |
| Points | Press this button to switch to the point information screen. Once done successfully, the button will be highlighted in black. |
| JOG | Press this button to switch to the Jog setting screen. Once done successfully, the button will be highlighted in black. |
| DI/O | Press this button to switch to the IO monitoring screen. Once done successfully, the button will be highlighted in black. |

| | |
|---|---|
| ℹ Info | Press this button to switch to the information display screen. Once done successfully, the button will be highlighted in black. |
| ⚙ Setting | Press this button to switch to the system settings screen. Once done successfully, the button will be highlighted in black. |
| Servo | Press this button to switch the screen to the Servo ON/OFF screen. Once Done successfully, the button will be highlighted in black. |

- Status monitoring bar for the robot:
  - ServoOn/Off: Monitors ServoOn/Off status. Or press this button to switch between ServoOn or Off.

| Appearance of UI buttons | Description |
|---|---|
| Servo OFF | Displays the current robot motor as Servo Off. Press this button to switch the motor to Servo On. |
| Servo ON | Displays the current robot motor as Servo On. Press this button to switch the motor to Servo Off. |

  - Alarm State: Monitors the current Alarm status for the system.

| Appearance of UI buttons | Description |
|---|---|
| Alarm State | It shows that no alarm has occurred on the current system. Press this button to switch to the Alarm Info page. |
| Alarm State | It shows that there is an alarm occurred on the system. This button will flash in red. Press this button to switch to the Alarm Info page. |

  - Authority login: Pressing this button allows logging in with permission password. Logout permission: Press the Logout button on the Main page to enable only monitoring functions on the teach pendant.

| Appearance of UI buttons | Description |
|---|---|
| Authority | Pressing this button allows logging in with permission password. |
| Logout | Press this button to logout the permission password and enable only monitoring functions on the teach pendant. |

  - Name/ID of the project opened: Displays the name and ID of the project opened.
  - Robot operating status: Displays status of the current program run by the robot.

| Appearance of UI buttons | Description |
|---|---|
| ● STOP | Shows that no program is currently run on the robot. |
| ● RUNNING | Shows that a program is currently run on the robot. |
| ● PAUSE | Shows that a program is currently pause on the robot. |
| ● Break Point | Shows that the program operation of the current robot will pause after single-line execution. |

- Mode display: Displays whether it is currently in T1, T2 or Auto mode

| Appearance of UI buttons | Description |
|---|---|
| T1 | T1 mode: Jog synthesis rate cannot exceed 250mm/s.<br>TP/DROE can be operated and program cannot be run with IO execution under this mode.<br>TP/DROE can be operated and program cannot be run with IO execution under this mode. |
| T2 | T2 mode: Jog synthesis rate cannot exceed 2000mm/s.<br>TP/DROE can be operated and program cannot be run with IO execution under this mode. |
| Auto | Auto mode: TP cannot be operated, DROE can be operated and program can be run with IO execution under this mode. |

- TP Operation Mode: Can be set to Enable or Disable

| Appearance of UI buttons | Description |
|---|---|
| Disable | Disable TP mode: Robot cannot be operated by TP but can be operated by DROE under this mode. Press this icon to switch to Enable TP mode. |
| Enable | Enable TP mode: Robot can be operated by TP but cannot be operated by DROE under this mode. Press this icon to switch to Disable TP mode. |

- Jog information bar: Shows current position of the robot, User Frame ID, Tool Frame ID, Cart. Space, or Joint Space. Click the bar to switch between different Jog modes.

| 按鈕外觀 | Description |
|---|---|
| U 0<br>T 0 | Displays User Frame ID and Tool Frame ID. U 0 means that the current User Frame ID is 0; T 0 means that the current Tool Frame ID is 0. |

| | |
|---|---|
| Joint Mode | Displays the current Jog mode for the robot as Joint Space. |
| Cart. Mode | Displays the current Jog mode for the robot as Joint Space. |
| User Mode | Displays the current Jog mode for the robot as User Space. |
| X 0.000 mm | Current position of X-axis for the robot, unit mm. |
| Y 0.000 mm | Current position of X-axis for the robot, unit mm. |
| Z 0.000 mm | Current position of Z-axis for the robot, unit mm. |
| RZ 0.000 deg | Current position of RZ-axis for the robot, unit degree. |

# 2.Tab Operation and instructions

## 2.1 Main screen (Main)

When the teach pendant finishes starting up, the main screen will first be displayed, as shown in Figure 2-1. This page displays information on the TP version and logs out user permissions to switch the teach pendant into monitoring mode.

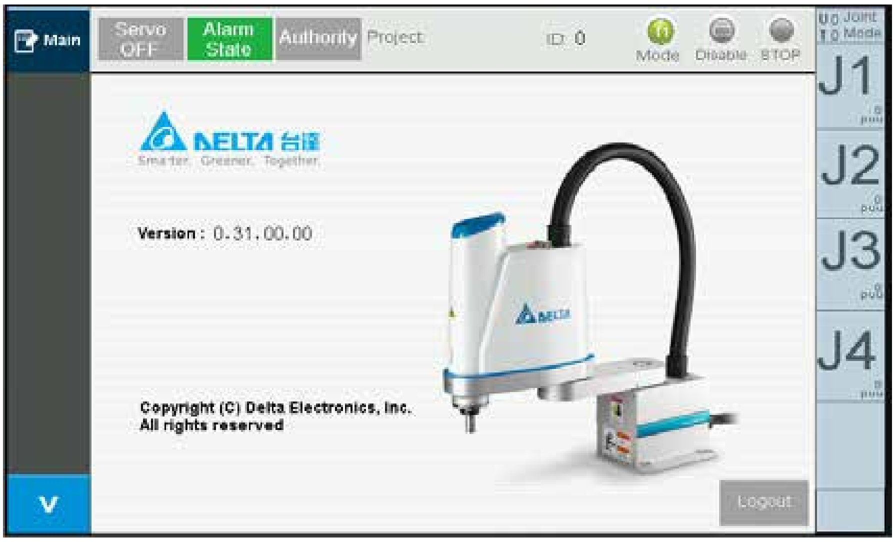

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**Figure 2-1 Main screen - Not logged in**

| Appearance of UI buttons | Description |
|---|---|
| Version : 0.0.0.0 | Displays information on TP version. |

| | |
|---|---|
| Logout | Press this button to logout user permissions and switch teach pendant into monitoring mode. |

Click the login button ( Authority ) and enter the authorization password (Figure 2-2) and the operation screen for that authorization will appear. The Robot operation mode will also be switched to T1( T1 ) or T2( T2 ) and TP operation mode will be switched to Enable( Enable ), as shown in Figure 2-3. The user can then operate on various functions.

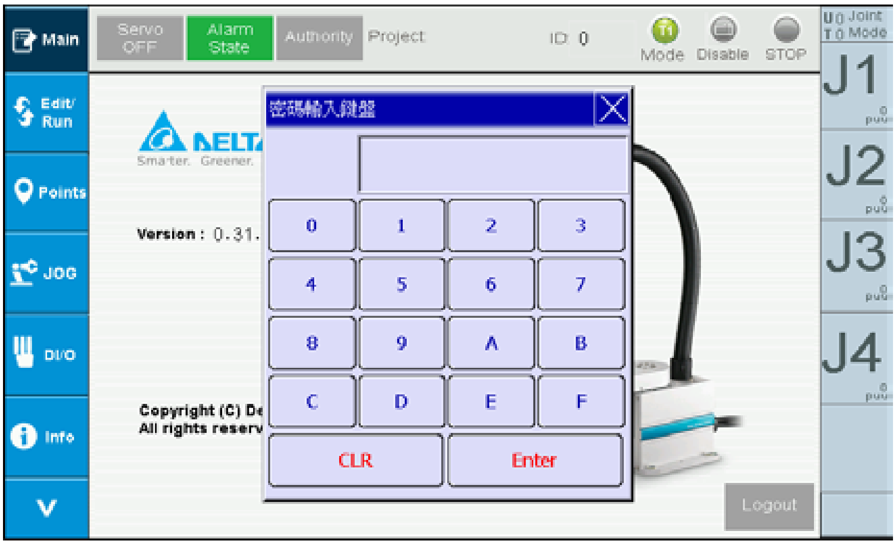

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Figure 2-2 Main screen - Enter permission password

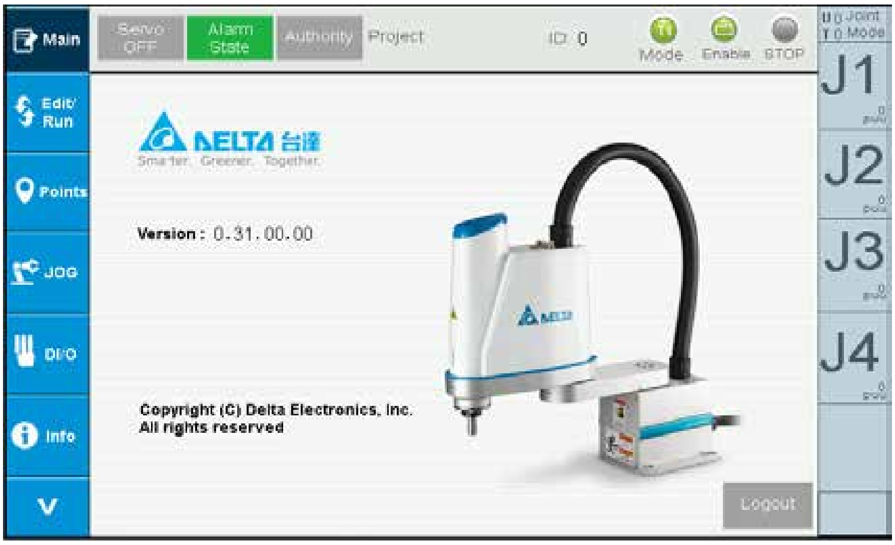

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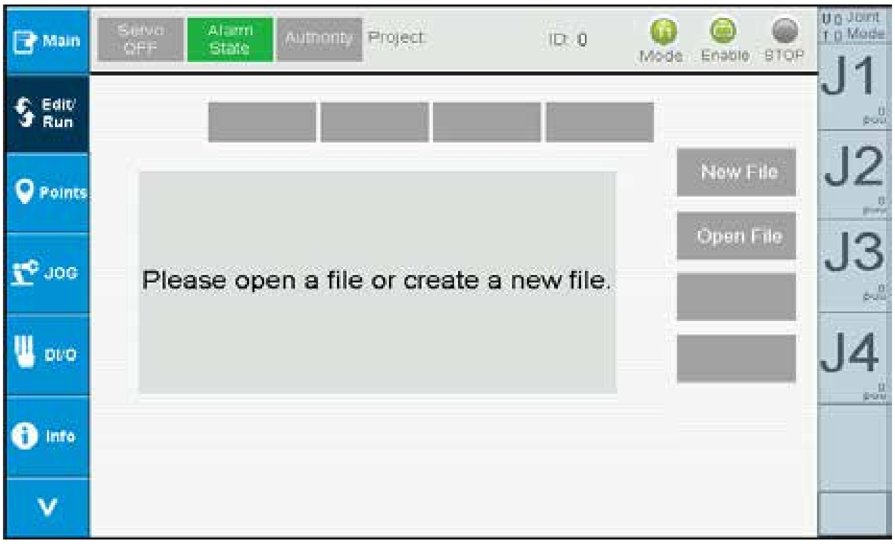
Figure 2-3 Main screen - Logged in

## 2.2 Edit/run program for robot (Edit/Run)

On this screen, projects can be added, opened, and saved. Programs for the robot can be edited and executed. The screen before a project is opened is as shown in Figure 2-4. To edit or execute program for the robot at this time, be sure to create a new project or open an old project. The operation procedures are shown as follows.



Please open a file or create a new file.

**Figure 2-4 Edit/run program for the robot - No project opened**

| 實體按鍵 | Description | 可執行頁面 |
|---|---|---|
| RUN | Once a project is opened or added, press and hold this button and stage two of the three-stage operation button simultaneously for 2 seconds to automatically run the opened project; once it is successfully run the Robot running status will display as ● RUNNING | Edit/Run |
| PAUSE<br>RESUME | 同 Press and hold this button and the stage two of the three-stage operation button simultaneously to pause to resume the project currently running. Once it has successfully paused, the Robot running status will display as ● PAUSE Once it has successfully resumed, the Robot running status will display as ● RUNNING | Edit/Run |
| STOP | Press and hold this button and the stage two of the three-stage operation button simultaneously to stop the project currently running. Once it has successfully stopped, the Robot running status will display as ● STOP | Edit/Run |
| Step | ress and hold this button and the stage two of the three-stage operation button simultaneously will run a single line of machine process. Every time it is pressed it will execute one line of machine process. Step can be executed when paused or when the project is not running. When Step is executed the Robot running status will display as ● | Edit/Run |

### 2.2.1. Create a new project

The process for creating a new project is shown as follows:

1. Press the New File button
2. Enter the name for the new project.
3. Press OK to create the new project. The screen for completion of project creation will show as Figure 2-5, with the project name and ID displayed on top of the information bar.
4. When the project created, programs can be edited and the Local points for the project can be taught.
5. Once program editing is completed, press Save File, as shown in Figure 2-6. This will save the current project, and the contents saved include the programs and the Local point information.

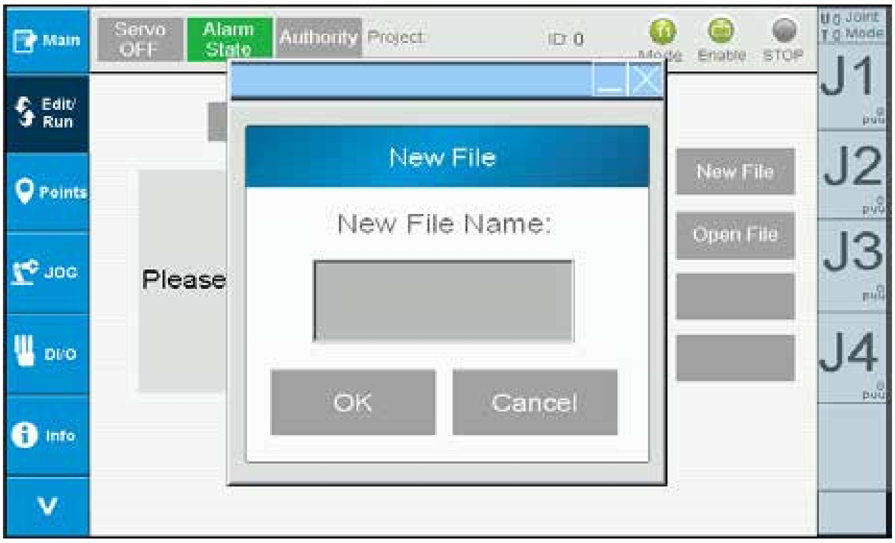


**Figure 2-5 Edit/run program for the robot - Enter project name**

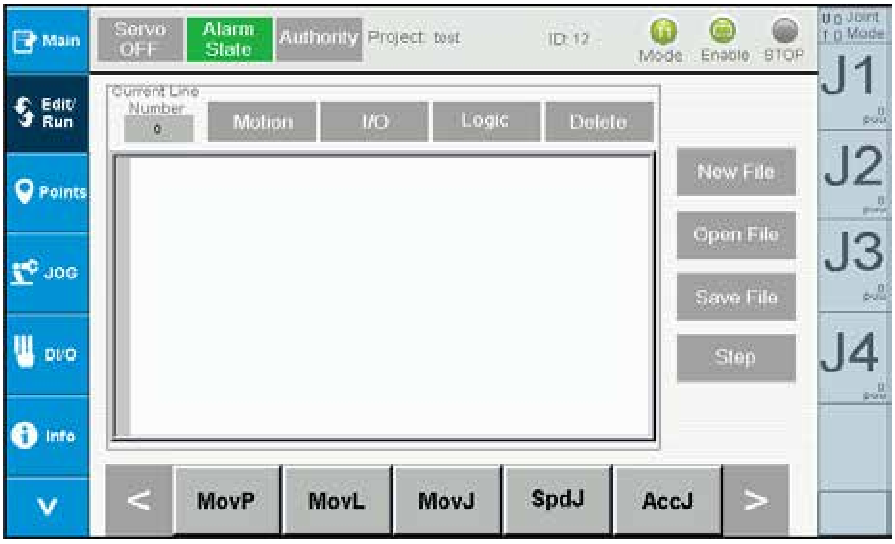
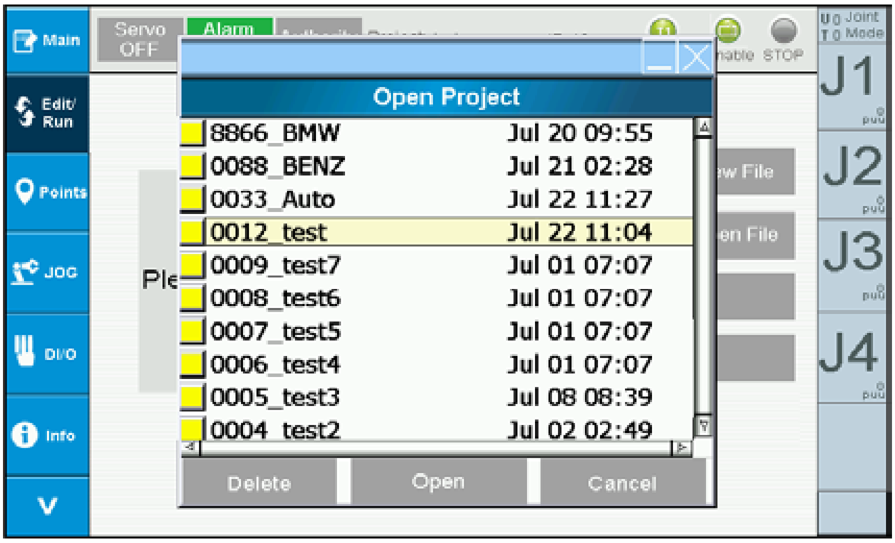


**Figure 2-6 Edit/run program for the robot - Creation of new project completed**

## 2.2.2 Open old projects

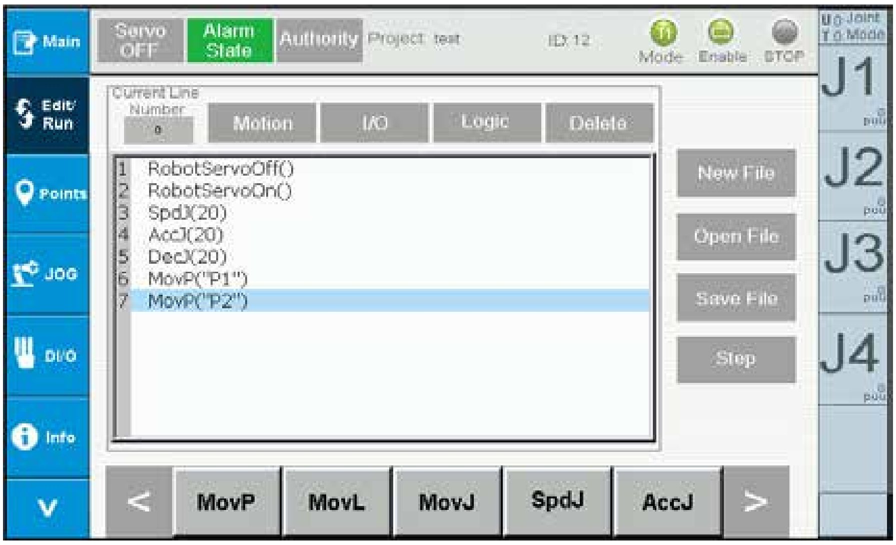
The process for opening an old project is shown as follows:

1. Press the Open File button.
2. Press the name of the project file to open, Figure 2-7.
3. Press Open to open the project. The screen for the project opened is as shown in Figure 2-8, with the project name and ID displayed on top of the information bar.
4. Once the project is opened, users can perform program editing.
5. Once program editing is completed, press Save File, as shown in Figure 2-8. This will save the current project, and the saved contents include the programs and the Local point information.



| | |
|---|---|
| 8866_BMW | Jul 20 09:55 |
| 0088_BENZ | Jul 21 02:28 |
| 0033_Auto | Jul 22 11:27 |
| 0012_test | Jul 22 11:04 |
| 0009_test7 | Jul 01 07:07 |
| 0008_test6 | Jul 01 07:07 |
| 0007_test5 | Jul 01 07:07 |
| 0006_test4 | Jul 01 07:07 |
| 0005_test3 | Jul 08 08:39 |
| 0004_test2 | Jul 02 02:49 |

**Figure 2-7 Edit/run program for the robot - Opening a project**



```
RobotServoOff()
RobotServoOn()
SpdJ(20)
AccJ(20)
DecJ(20)
MovP("P1")
MovP("P2")
```

**Figure 2-8 Edit/run program for the robot - Project opening completed**

## 2.2.3 Program editing

Once a project is created or opened, users can start editing the program. Teach pendant provides buttons for convenient editing. The operation procedures are shown as follows.

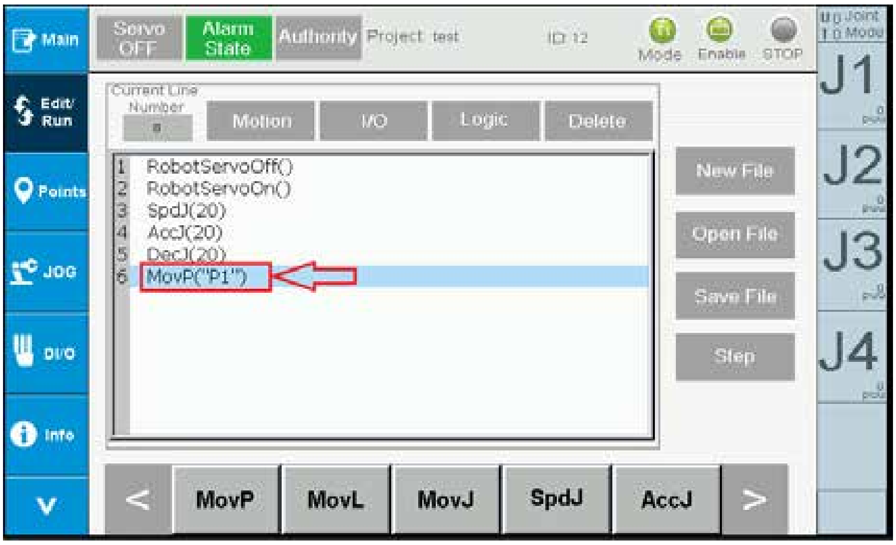
1. Click above the row number you want to enter on the RL editor, shown as Figure 2-9.
2. Select the command type (Motion, I/O, Logic) on the top of the RL display, shown as Figure 2-10.
3. Select the RL command (MovP, MovL, etc.) at the bottom, shown as Figure 2-11. Press < or > to switch to commands on the next page.
4. Enter RL command related information, shown as Figure 2-12,

   A. Press Name to switch the input point name or point index.

   B. Press Type2 to switch between different types; for example, the maximum speed can be entered.

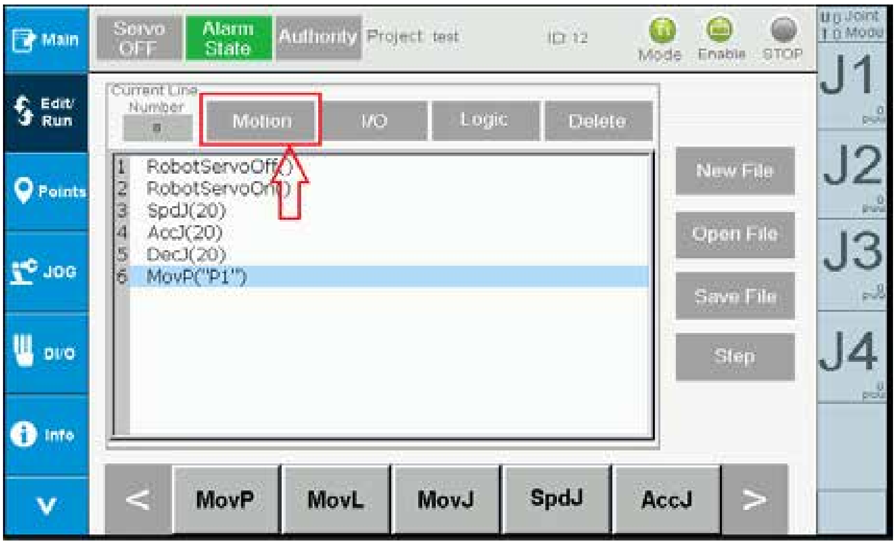
   C. Enter RL command information such as point name.

4. Press Insert or Replace to add a command or replace the command of that row, shown as Figure 2-13.
5. To delete the command, first press the command on its row, and then press Delete to delete the command.



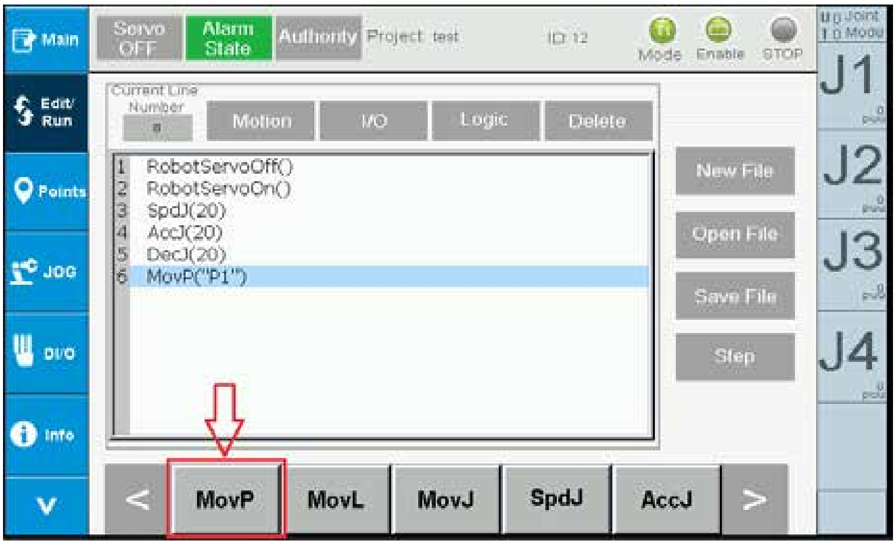
```
RobotServoOff()
RobotServoOn()
SpdJ(20)
AccJ(20)
DecJ(20)
MovP("P1")
```

**Figure 2-9 Edit/run program for the robot - Select input position**



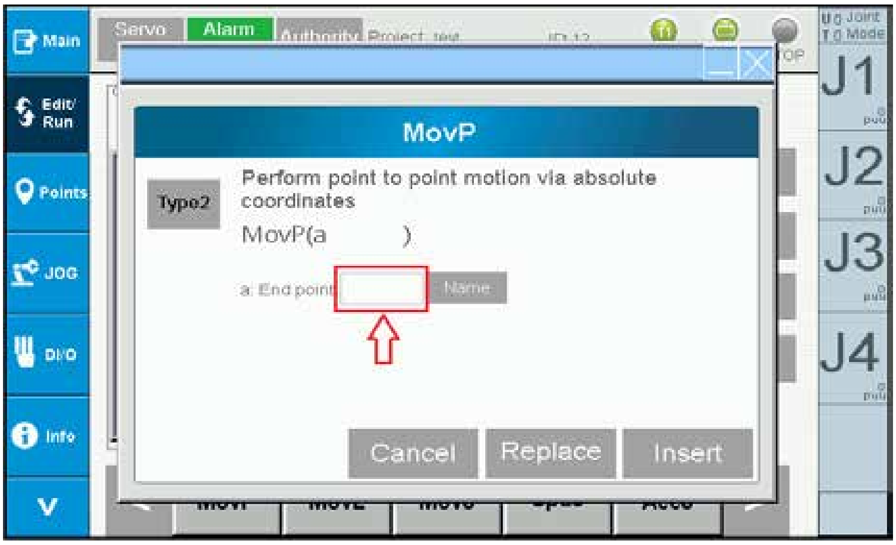
```
RobotServoOff()
RobotServoOn()
SpdJ(20)
AccJ(20)
DecJ(20)
MovP("P1")
```

**Figure 2-10 Edit/run program for robot - Select command type**



```
RobotServoOff()
RobotServoOn()
SpdJ(20)
AccJ(20)
DecJ(20)
MovP("P1")
```

**Figure 2-11 Edit/run program for robot - Select command**

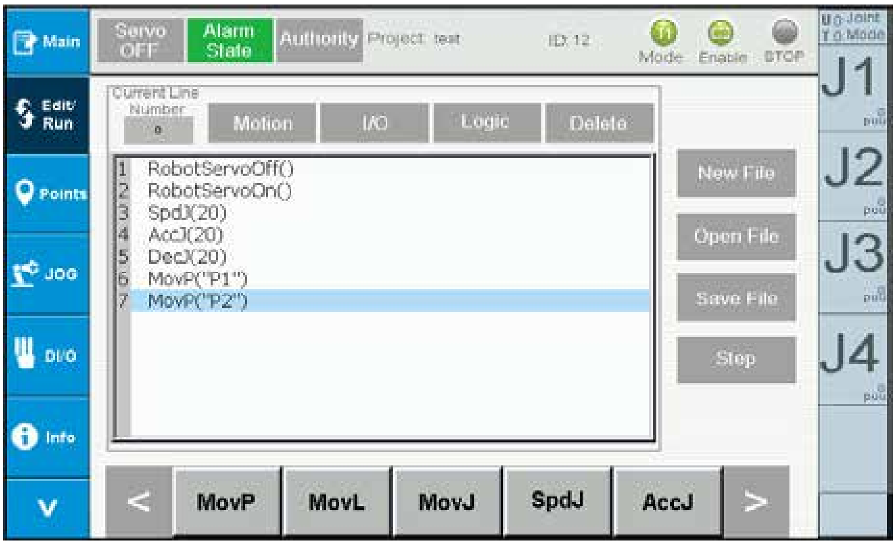


MovP

Perform point to point motion via absolute coordinates

MovP(a )

Figure 2-12 Edit/run program for robot - Enter command name and other information



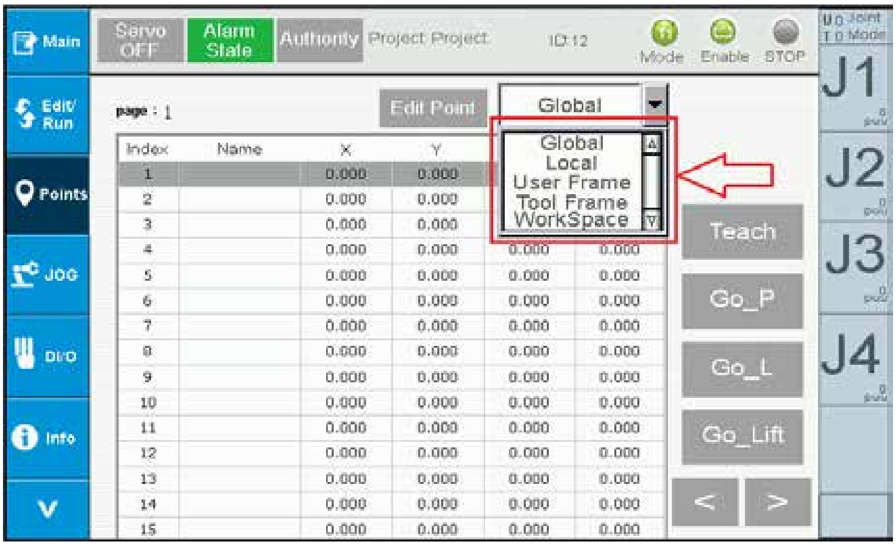
```
RobotServoOff()
RobotServoOn()
SpdJ(20)
AccJ(20)
DecJ(20)
MovP("P1")
MovP("P2")
```

Figure 2-13 Edit/run program for robot - Input completed

## 2.3 Point information (Points)

The Points page provides three functions, which are: Global point operation, Local point operation, UserFrame, ToolFrame and WorkSpace settings. Clicking the corresponding functions from the pull-down menu allows switching to corresponding operation screens. Figure 2-14 provides the descriptions as follows.

| Appearance of UI buttons | Description |
|---|---|
| Global ▼ | Currently is the Global point operation screen |
| Local ▼ | Currently is the Local point operation screen |
| User Frame ▼ | Currently is the User Frame setting operation screen |
| Tool Frame ▼ | Currently is the Tool Frame setting operation screen |
| WorkSpace ▼ | Currently is the WorkSpace setting operation screen |



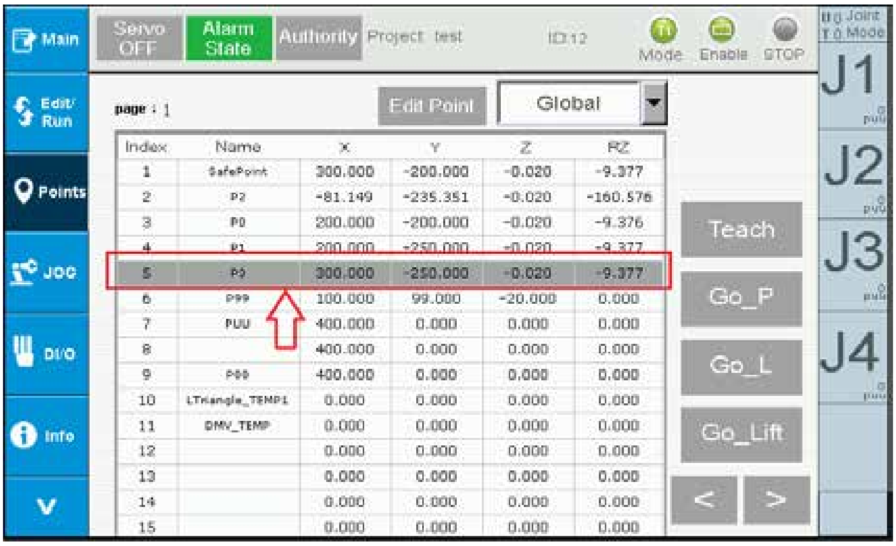
| Index | Name | X | Y | | |
|---|---|---|---|---|---|
| 1 | | 0.000 | 0.000 | | |
| 2 | | 0.000 | 0.000 | | |
| 3 | | 0.000 | 0.000 | | |
| 4 | | 0.000 | 0.000 | 0.000 | 0.000 |
| 5 | | 0.000 | 0.000 | 0.000 | 0.000 |
| 6 | | 0.000 | 0.000 | 0.000 | 0.000 |
| 7 | | 0.000 | 0.000 | 0.000 | 0.000 |
| 8 | | 0.000 | 0.000 | 0.000 | 0.000 |
| 9 | | 0.000 | 0.000 | 0.000 | 0.000 |
| 10 | | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 | | 0.000 | 0.000 | 0.000 | 0.000 |
| 13 | | 0.000 | 0.000 | 0.000 | 0.000 |
| 14 | | 0.000 | 0.000 | 0.000 | 0.000 |
| 15 | | 0.000 | 0.000 | 0.000 | 0.000 |

**Figure 2-14 Point information - Global point operation**

## 2.3.1 Global point

Use the pull-down menu to switch to the Global point operation. The point table will display Global points for the controller, as shown in Figure 2-14. This is when teach point can be performed. Use MovP to move to the specified point (Go_P), use MovL to move to the specified point (Go_L), and use Lift to move to the specified point (Go_Lift). Instructions for the operation are shown as follows:

| Appearance of UI buttons | Instructions for operations |
|---|---|
| Teach | 1. First select the target point information, shown as Figure 2-15.<br>2. Press this button to record the current position of the robot to a selected point, and save it to a memory location corresponding to the MS controller. |
| Go_P | 1. First select the target point information, shown as Figure 2-15.<br>2. Press and hold down this button and the stage two of the three-stage operation button simultaneously. The robot will move to the target position via MovP. Release the button or the three-stage button to stop this motion. |
| Go_L | 1. First select the target point information, shown as Figure 2-15.<br>2. Press and hold down this button and the stage two of the three-stage operation button simultaneously. The robot will move to the target position via MovL. Release the button or the three-stage button to stop this motion. |
| Go_Lift | 1. First select the target point information, shown as Figure 2-15.<br>2. Press and hold down this button and the stage two of the three-stage operation button simultaneously. The robot will move to the target position via MovL. Release the button or the three-stage button to stop this motion. |
| Edit Point | 1. First select the target point information, shown as Figure 2-15.<br>2. Press and hold this button to manually change information on the point. |
| < | Switches information displayed for the point and displays information on X, Y, Z, and RZ. |
| > | Switches information displayed for the point and displays information on the hand (H), Tool Frame ID (TF), and User Frame ID (UF). |
| ⬆ | Physical button. Press this button to return to the previous page for the point table. |
| ⬇ | Physical button. Press this button to return to the next page for the point table. |



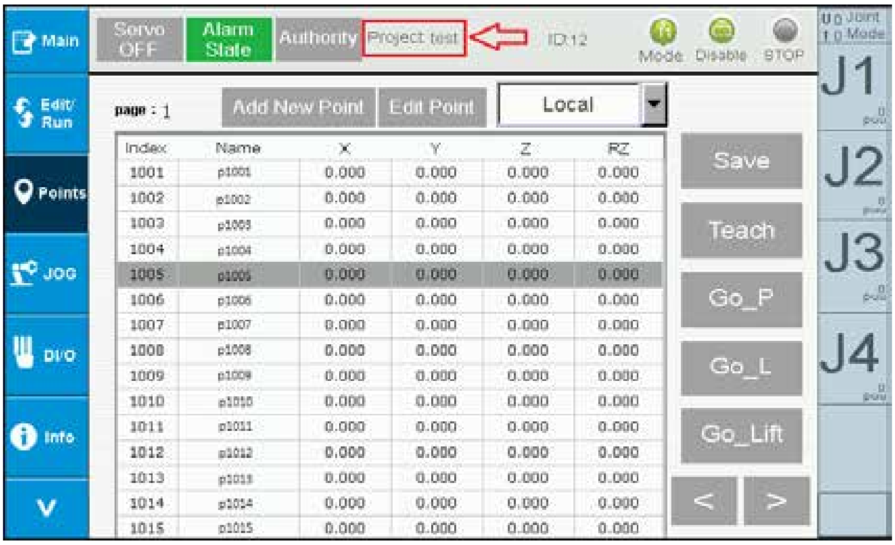
| Index | Name | X | Y | Z | RZ |
|---|---|---|---|---|---|
| 1 | SafePoint | 300.000 | -200.000 | -0.020 | -9.377 |
| 2 | P2 | -81.149 | -235.351 | -0.020 | -160.576 |
| 3 | P0 | 200.000 | -200.000 | -0.020 | -9.376 |
| 4 | P1 | 200.000 | -250.000 | -0.020 | -9.377 |
| 5 | P3 | 300.000 | -250.000 | -0.020 | -9.377 |
| 6 | P99 | 100.000 | 99.000 | -20.000 | 0.000 |
| 7 | PUU | 400.000 | 0.000 | 0.000 | 0.000 |
| 8 |  | 400.000 | 0.000 | 0.000 | 0.000 |
| 9 | P88 | 400.000 | 0.000 | 0.000 | 0.000 |
| 10 | LTriangle_TEMP1 | 0.000 | 0.000 | 0.000 | 0.000 |
| 11 | DMV_TEMP | 0.000 | 0.000 | 0.000 | 0.000 |
| 12 |  | 0.000 | 0.000 | 0.000 | 0.000 |
| 13 |  | 0.000 | 0.000 | 0.000 | 0.000 |
| 14 |  | 0.000 | 0.000 | 0.000 | 0.000 |
| 15 |  | 0.000 | 0.000 | 0.000 | 0.000 |

**Figure 2-15 Point information - Specifying Global point operation**

## 2.3.2 Local point

Only when an old project is opened or a new project is created can the Local point operation be performed for the project. Use the pull-down menu and press Update Local to switch to the Local point operation. The point table will display the Local points for the current project.

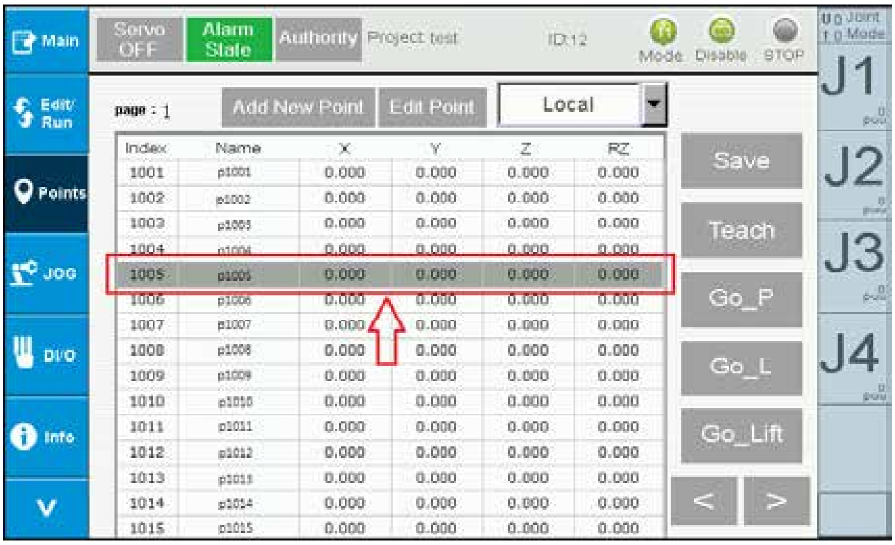
Figure 2-16 as an example, operations are being performed on the Local points for the test project. The teach point can be performed. Use MovP to move to the specified point (Go_P), use MovL to move to the specified point (Go_L), use Lift to move to the specified point (Go_Lift), and save information on the Local point to the MS controller (Save). Instructions for the operation are shown as follows:



| Index | Name | X | Y | Z | RZ |
|---|---|---|---|---|---|
| 1001 | p1001 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1002 | p1002 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1003 | p1003 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1004 | p1004 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1005 | p1005 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1006 | p1006 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1007 | p1007 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1008 | p1008 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1009 | p1009 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1010 | p1010 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1011 | p1011 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1012 | p1012 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1013 | p1013 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1014 | p1014 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1015 | p1015 | 0.000 | 0.000 | 0.000 | 0.000 |

**Figure 2-16 Point information - Local point operation for the test project**

| Appearance of UI buttons | Instructions for operations |
|---|---|
| Save | Press this button to save all the Local points for the current project to the MS controller. |
| Teach | 1. First select the target point information, shown as Figure 2-17.<br>2. Press this button to record the current position of the robot to a selected point. |
| Go_P | 1. First select the target point information, shown as Figure 2-17.<br>2. Press and hold down this button and the stage two of the three-stage operation button simultaneously. The robot will move to the target position via MovP. Release the button or the three-stage button to stop this motion. |
| Go_L | 1. First select the target point information, shown as Figure 2-17.<br>2. Press and hold down this button and the stage two of the three-stage operation button simultaneously. The robot will move to the target position via MovL. Release the button or the three-stage button to stop this motion. |
| Go_Lift | 1. First select the target point information, shown as Figure 2-17.<br>2. Press and hold down this button and the stage two of the three-stage operation button simultaneously. The robot will move to the target position via MovL. Release the button or the three-stage button to stop this motion. |
| Edit Point | 1. First select the target point information, shown as Figure 2-17.<br>2. Press and hold this button to manually change information on the point. |
| Add New Point | Press this button to add an entry for the Local point on the last row of the Local point table. |
| < | Switches information displayed for the point and displays information on X, Y, Z, and RZ. |
| > | Switches information displayed for the point and displays information on the hand (H), Tool Frame ID (TF), and User Frame ID (UF). |
| ⬆ | Physical button. Press this button to return to the previous page for the point table. |
| ⬇ | Physical button. Press this button to return to the next page for the point table. |



| Index | Name | X | Y | Z | RZ |
|---|---|---|---|---|---|
| 1001 | p1001 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1002 | p1002 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1003 | p1003 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1004 | p1004 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1005 | p1005 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1006 | p1006 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1007 | p1007 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1008 | p1008 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1009 | p1009 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1010 | p1010 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1011 | p1011 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1012 | p1012 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1013 | p1013 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1014 | p1014 | 0.000 | 0.000 | 0.000 | 0.000 |
| 1015 | p1015 | 0.000 | 0.000 | 0.000 | 0.000 |

**Figure 2-17 Point information - Specifying Local point operation**

## 2.3.3 User Frame setting

User coordinates are unfixed coordinates defined by the user. Therefore, this coordinate can be defined at any position, e.g. on the workpiece or workbench.

Three Point Method is the method used to teach user coordinates. It calculates the conversion relationship between the user coordinates and earth coordinates by entering the coordinate values of the original point (Original), the X point along the positive X-axis (+Xaxis), and the Y point along the positive Y-axis (+Yaxis) on the earth coordinates.

【The procedures for setting up user coordinates are provided as follows】

1. Enter User Frame ID. Users can set up 9 sets of user coordinates (1~9). The ID 0 is the earth coordinate for the system and cannot be changed.
2. Set User Frame as Orthogonal/Non-Orthogonal and Inclined/Non-Inclined. Orthogonal/Non-Orthogonal: Sets whether the X-direction and Y-direction of the coordinates is orthogonal.Inclined/Non-Inclined: Sets whether the coordinate plane XY is inclined.
3. Setting up original point (Original) for the user coordinates.
   i. Move the robot to the original point of the user coordinates.
   ii. Select Original on the screen (Figure 2-18).
   iii. Press Teach to record position of the original point.
4. Setting up the X point for the user coordinates along the positive X-axis.
   iv. Move the robot to the X point for the user coordinates along the positive X-axis.
   v. Select +Xaxis on the screen (Figure 2-19).

vi. Press Teach to record position of the original point.

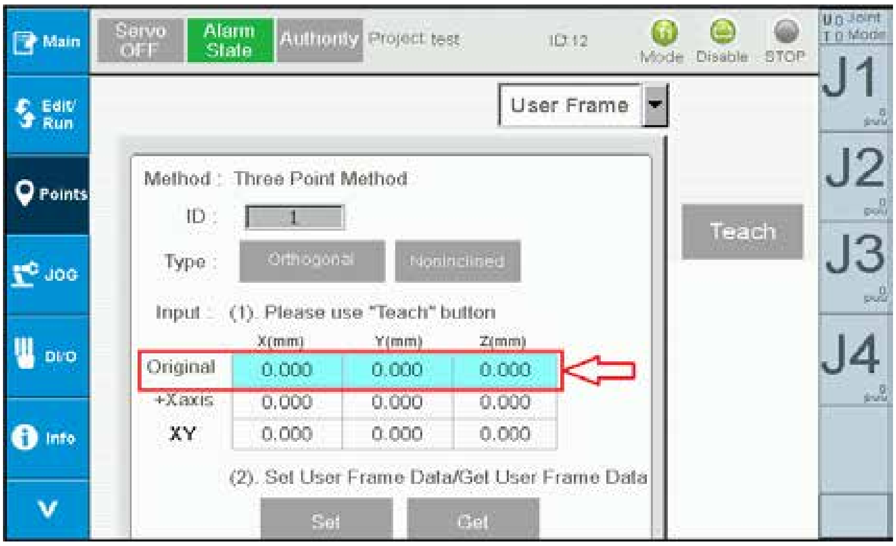
5. Setting up the Y point for the user coordinates along the positive Y-axis

vii. Move the robot to the Y point for the user coordinates along the positive Y-axis.

viii. Select XY or +Yaxis on the screen (Figure 2-19).

ix. Press Teach to record position of the original point.

6. Press Set to store to the MS controller user coordinates that have been set.



Method : Three Point Method

ID : 1

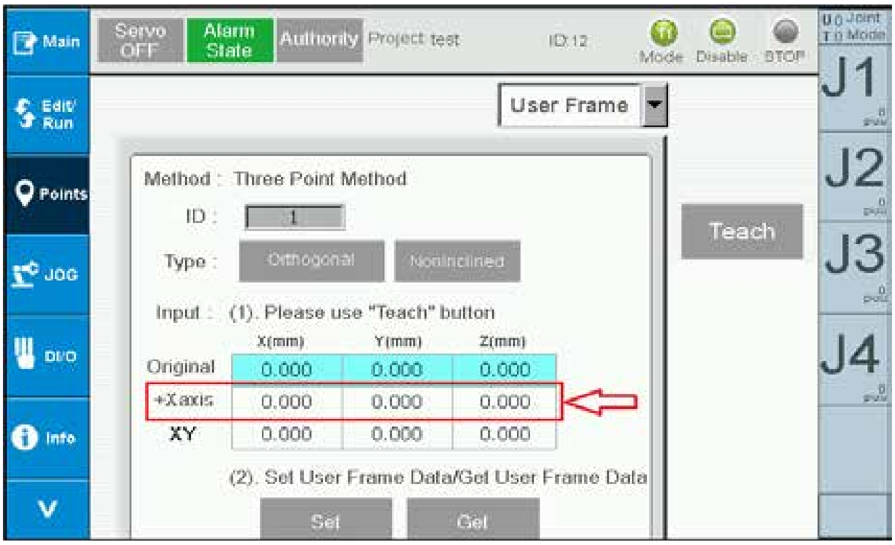
Type : Orthogonal Noninclined

Input : (1). Please use "Teach" button

| | X(mm) | Y(mm) | Z(mm) |
|---|---|---|---|
| Original | 0.000 | 0.000 | 0.000 |
| +Xaxis | 0.000 | 0.000 | 0.000 |
| XY | 0.000 | 0.000 | 0.000 |

(2). Set User Frame Data/Get User Frame Data

Figure 2-18 Point information - Setting up original point of user coordinates



Method : Three Point Method

ID : 1

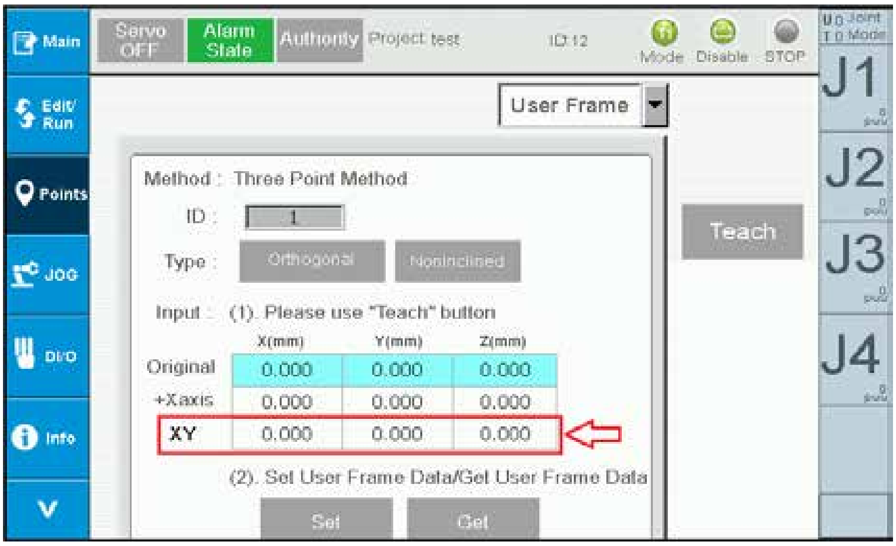
Type : Orthogonal Noninclined

Input : (1). Please use "Teach" button

| | X(mm) | Y(mm) | Z(mm) |
|---|---|---|---|
| Original | 0.000 | 0.000 | 0.000 |
| +Xaxis | 0.000 | 0.000 | 0.000 |
| XY | 0.000 | 0.000 | 0.000 |

(2). Set User Frame Data/Get User Frame Data

Figure 2-19 Point information - Setting up X point for the user coordinates (+Xaxis direction)



Method : Three Point Method

ID : 1

Type :

Input : (1). Please use "Teach" button

| | X(mm) | Y(mm) | Z(mm) |
|---|---|---|---|
| Original | 0.000 | 0.000 | 0.000 |
| +Xaxis | 0.000 | 0.000 | 0.000 |
| XY | 0.000 | 0.000 | 0.000 |

(2). Set User Frame Data/Get User Frame Data

**Figure 2-20 Point information - Setting up XY or +Y point for the user coordinates (+Yaxis direction)**

【Procedures to read settings of user coordinates are shown as follows:】

1. Enter User Frame ID.
2. Press Get to display the values set for the user coordinates.

## 2.3.4 ToolFrame Setting

This page is used to perform ToolFrame related settings (Figure 2-22), including Tool Size and Tool Orientation settings. Instructions are as follows:

1. Entering the ToolFrame ID; users can set 9 sets of tool coordinates (1~9). The one with ID 0 is the earth coordinates of the system and cannot be changed.
2. Set Tool Size
   A. Direct Input

      Enter the Tool Size Height, Width and Angle in the Tool Size field, as shown in Figure 2-21; press Set (Direct Input) when input is complete to save the coordinate data of this tool to the MS controller. Press Get to acquire the Tool Size information of the current ID.

   B. Calibration

i. Press Set (Calibration) to switch to the calibration screen as shown in Figure 2-23.

ii. Teach points 2~8, shown as Figure 2-24, press P1~P8 and then press Teach to record this point.

iii. Press Calculate to calculate the Width and Angle of the Tool Size. If the error is too big, press Select to cancel the point change and then press Calculate again to calculate the new Width and Angle of the Tool Size. Repeat this action until the error is within an acceptable range.

iv. Enter the Height; it must be a positive value. This height is the value of teach point (P1~P8) Z.

v. Press Set to set the Height, Width and Angle of the Tool Size. Press Get to acquire the Tool Size information of this ID.

vi. When finished teaching, switch the Jog mode to Tool and set the Tool ID as this ID. When the Z-axis is rotated it can be discovered that it is rotating with the end point of the teach tool.

vii. Press Back to return to the main Tool Setting page, shown as Figure 2-22

3. Set Tool Orientation

A. Press in the Tool Orientation field to enter Tool Orientation Settings (Figure 2-25).

B. Set the Original point, X-axis and Y-axis directions of the Tool, as shown and defined in Figure 2-26.

i. Move the Robot to the Original point and press Teach.

ii. Move the Robot to the pivot point on the +X-axis direction and press Teach.

iii. Move the Robot to the pivot point on the +Y-axis direction and press Teach.

C. Press to calculate the related values (Pitch, Roll, Yaw) of Tool Orientation and write the results into the controller. Press to acquire the Tool Orientation information (Pitch, Roll, Yaw) of the current ID.

D. When finished teaching, switch the Jog mode to Tool and set the Tool ID as this ID. The moving direction of XYZ while Jogging will change to the directions taught.

E. Press to return to the main Tool Settings screen, shown as Figure 2-22.

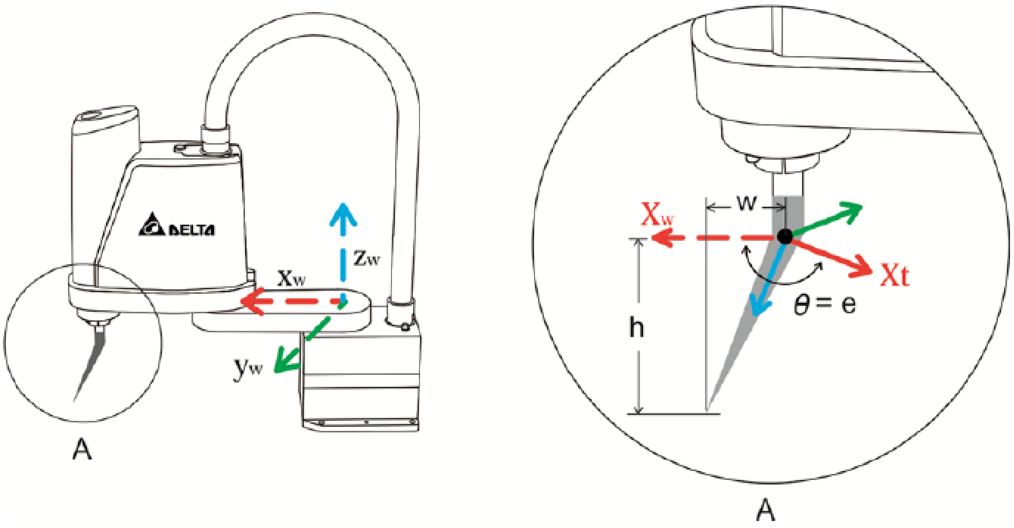
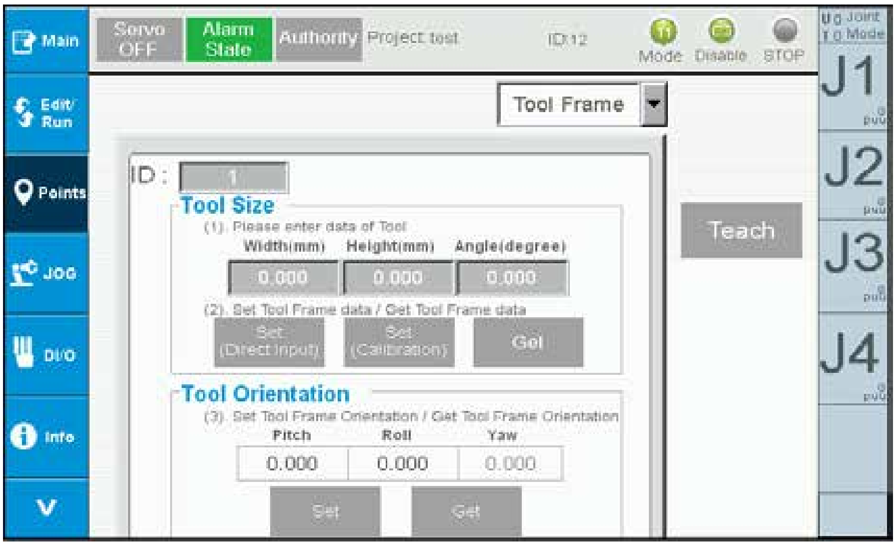


Figure 2-21 Tool size Height, Width and Degree



Project test

ID:12

ID : 1

Tool Size

(1). Please enter data of Tool

| Width(mm) | Height(mm) | Angle(degree) |
|---|---|---|
| 0.000 | 0.000 | 0.000 |

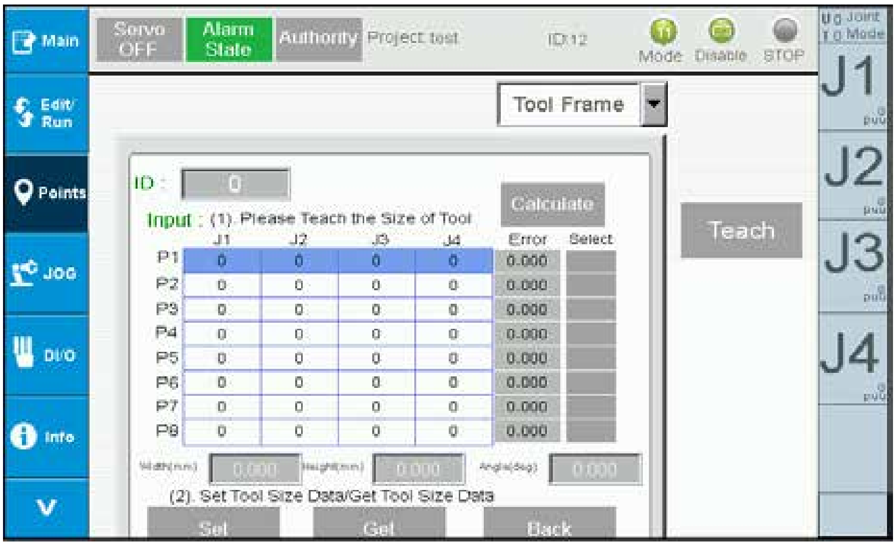
(2). Set Tool Frame data / Get Tool Frame data

Tool Orientation

(3). Set Tool Frame Orientation / Get Tool Frame Orientation

| Pitch | Roll | Yaw |
|---|---|---|
| 0.000 | 0.000 | 0.000 |

Figure 2-22 Point information- Tool coordinates setting



ID : 0

Input : (1). Please Teach the Size of Tool

| | J1 | J2 | J3 | J4 | Error | Select |
|---|---|---|---|---|---|---|
| P1 | 0 | 0 | 0 | 0 | 0.000 | |
| P2 | 0 | 0 | 0 | 0 | 0.000 | |
| P3 | 0 | 0 | 0 | 0 | 0.000 | |
| P4 | 0 | 0 | 0 | 0 | 0.000 | |
| P5 | 0 | 0 | 0 | 0 | 0.000 | |
| P6 | 0 | 0 | 0 | 0 | 0.000 | |
| P7 | 0 | 0 | 0 | 0 | 0.000 | |
| P8 | 0 | 0 | 0 | 0 | 0.000 | |

Width(mm) 0.000 Height(mm) 0.000 Angle(deg) 0.000

(2). Set Tool Size Data/Get Tool Size Data

**Figure 2-23 Point Data – Tool Size Calibration**

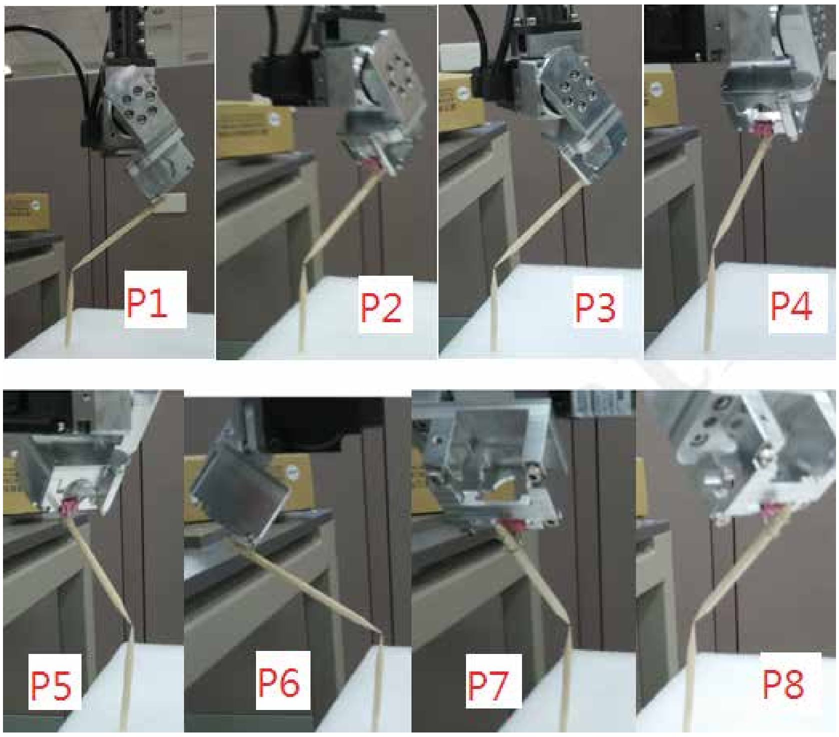
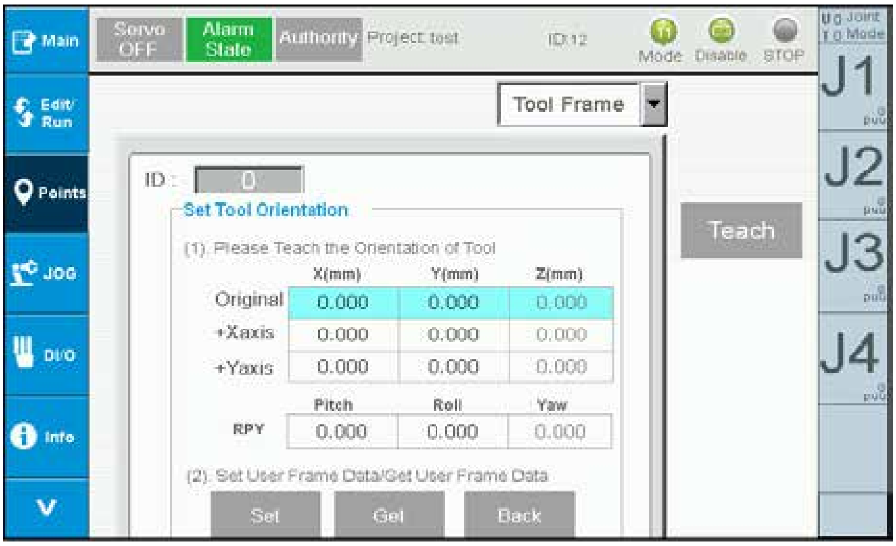


**Figure 2-24 Point Data – Tool Size Calibration (Points P1~P8)**



ID : 0

Set Tool Orientation

(1). Please Teach the Orientation of Tool

|  | X(mm) | Y(mm) | Z(mm) |
|---|---|---|---|
| Original | 0.000 | 0.000 | 0.000 |
| +Xaxis | 0.000 | 0.000 | 0.000 |
| +Yaxis | 0.000 | 0.000 | 0.000 |

|  | Pitch | Roll | Yaw |
|---|---|---|---|
| RPY | 0.000 | 0.000 | 0.000 |

(2). Set User Frame Data/Get User Frame Data

**Figure 2-25 Point Data – Tool Orientation Calibration**

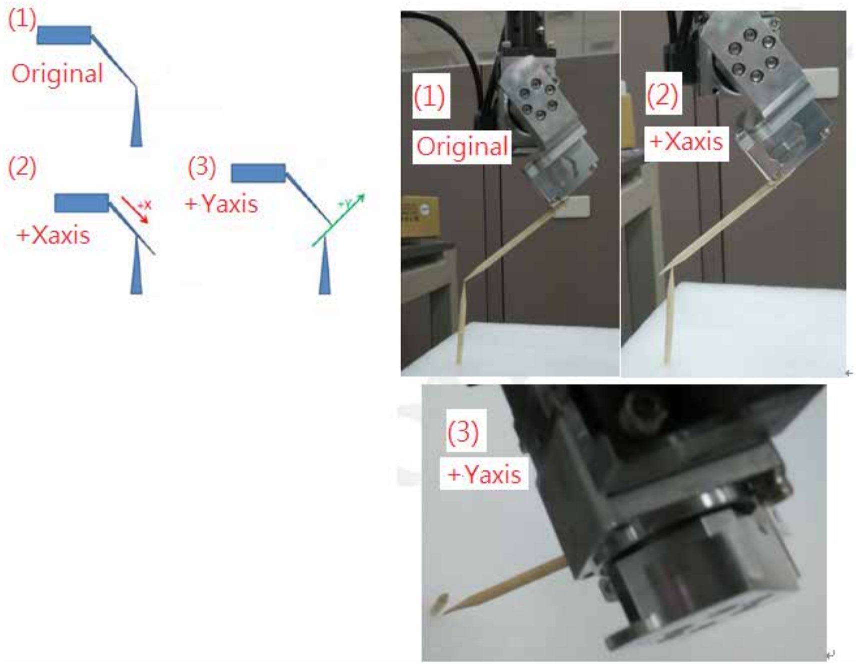


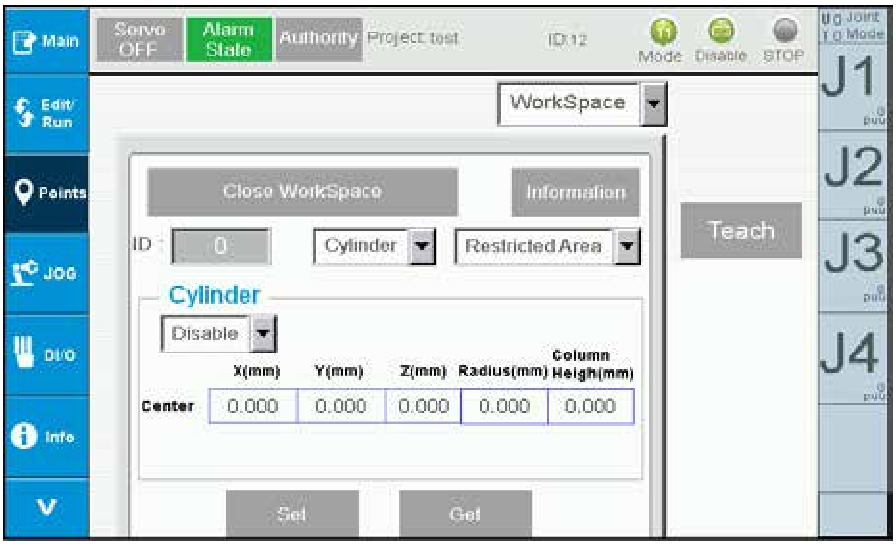
**Figure 2-26 Point Data – Tool Orientation Calibration Setting**

## 2.3.5 Work Space Setting

This page is used to perform WorkSpace related settings, including setting work spaces or non-work spaces. The order of setting Work Space operations is as follows:

1. Enter WorkSpace ID. 10 Sets (1~10) can be set.
2. Select Cylinder or Rectangle as the work space area.
3. Select whether the work space is Restricted Area or Working Area.
4. Enter Cylinder and Rectangle space information
   A. Cylinder space teaching method
      i. Move the position of the Robot to the top surface center of the cylinder.
      ii. Press to teach the center position.
      iii. Manually enter the cylinder radius (Radius) and cylinder height (Column Height)
   B. Rectangle space teaching method
      i. Move the robot to the P0 position, press the P0 field on the screen and then press to teach the position
      ii. Move the robot to the PX position, press the PX field on the screen and then press to teach the position
      iii. Move the robot to the PY position, press the PY field on the screen and then press to teach the position. The rectangle height must also be set when setting the PY position; the PY point can be higher or lower than the P0 point
5. Press the pull-down menu and set as Enable to enable the work space of this ID; setting it as Disable will disable the work space of this ID.
6. Press to set the work space information of this ID to the MS controller. Press to acquire the work space information of this ID.
7. Enabling work space check function: Press to enable the work space check function; it will switch to when enabled successfully.
8. Disabling work space check function: Press to enable the work space check function; it will switch to when enabled successfully.
9. Press to check the usage status of WorkSpace ID 1~10.

Once the work space check function is enabled, an Alarm (AL82D) will appear when continuous movements exceed the work space; disable the work space check function first and then press AlarmReset to remove the Alarm. To continue using the work space check function, first move the Robot into the work space. An Alarm (AL82D) will appear when Jog use exceeds the work space. Press AlarmReset to remove the Alarm.



|  | X(mm) | Y(mm) | Z(mm) | Radius(mm) | Column Heigh(mm) |
|---|---|---|---|---|---|
| Center | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**Figure 2-27 Point information-WorkSpace Setting**

## 2.4 Jog setting (JOG)

Jog-related settings can be performed on this page, including speed (Speed), distance (Distance), and mode switch (Mode), as shown in Figure 2-28 . Descriptions are provided below:

1. Speed setting (Speed):
   There is low speed (Low), medium speed (Medium), and high speed (High). Or it can be entered directly. The unit is percentage.

2. Mode setting (Mode):
   It is possible to switch between joint mode (Joint), Cartesian mode (Cartesian), and user mode (User).

3. Distance setting (Distance):
   Moving distance that can be set includes short (Low), medium (Medium), long (Long), and continuous movement (Continuous). The unit for joint mode (Joint) is PUU, the unit for Cartesian mode (Cartesian) is mm, and the unit for user mode (User) is mm.

4. HandWheel setting
   Allows setting HandWheel Jog related parameters; descriptions are as follows:
   State:
   Switch Hand Wheel operation status (Disable/Enable). When the Hand Wheel operation status is Disable, the Robot cannot be moved with the Hand Wheel. When set as Enable, the Robot can be operated with the Hand Wheel. The switching of Hand Wheel Jog coordinates can be done by switching the Mode between Joint Mode, Cartesian Mode, User Mode and Tool Mode

Amp:

Switches the amplification of the HandWheel (x1 means the robot will move 1um or 1PUU when the HandWheel is rotated by 1 grid)

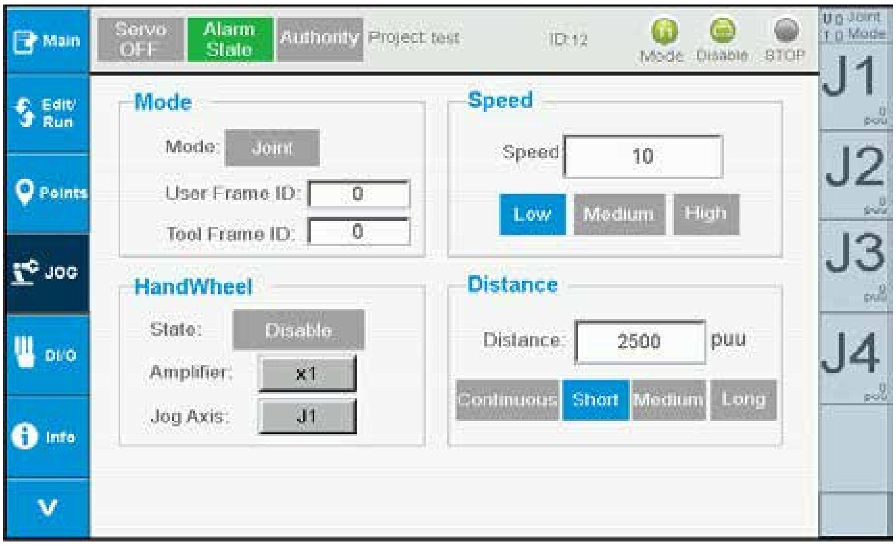
Amplification that can be set for JointSpace is x1~x1000, and x1~x100 for Cart.Space

Jog Axis:

Switches the HandWheel Jog target axis (J1~J4 or X,Y,Z,RZ)

To perform Jog operation on the robot, press and hold down the physical Job button ( + or − )and the stage two of the three-stage operation button (Figure 1-2) to move the arm. Moving the robot through Jog is available on any page.

Performing HandWheel Jog operations to the robot means rotating the HandWheel (Figure 1-1) and performing the stage two of the three-stage operation (Figure 1-2) simultaneously to move the robot. When the status of HandWheel is Enable, it can move the robot through Jog function on any page.



Mode: Joint

User Frame ID: 0

Tool Frame ID: 0

Speed: 10

State: Disable

Amplifier: x1

Jog Axis: J1

Distance: 2500 puu

Figure 2-28 Jog setting

## 2.5 I/O monitoring (DI/O)

This page monitors the User IO, with the yellow light representing ON and the gray light representing OFF, as shown in Figure 2-29. Press the DO component ① buttons to perform DO control.

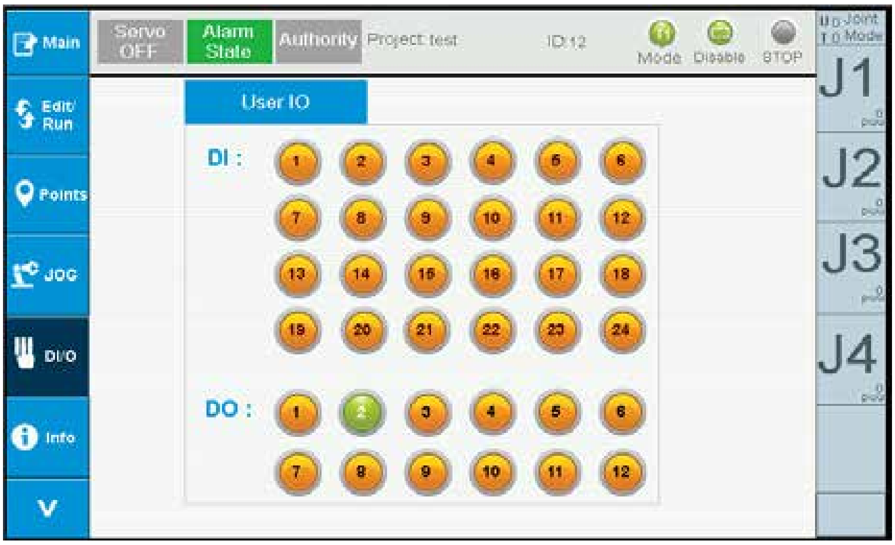


Figure2-29 IO monitoring

## 2.6 System information (Info)

System alarms can be viewed or reset (Alarm Reset), and information on the version of the control system can be viewed on this page, as shown in Figure 2-30. Press Alarm Info to switch to the information page for system alarm (Alarm Info); press Controller Info to switch to the information page for version of the control system (Controller Info).

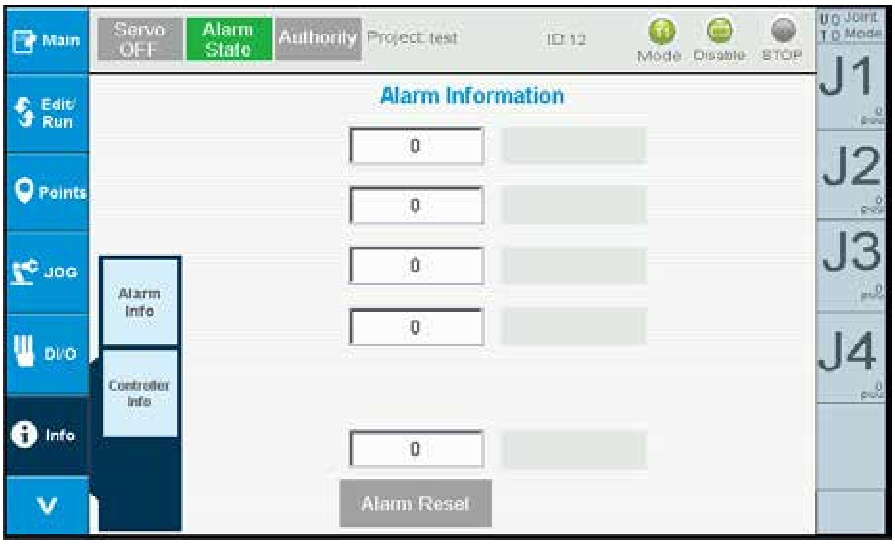
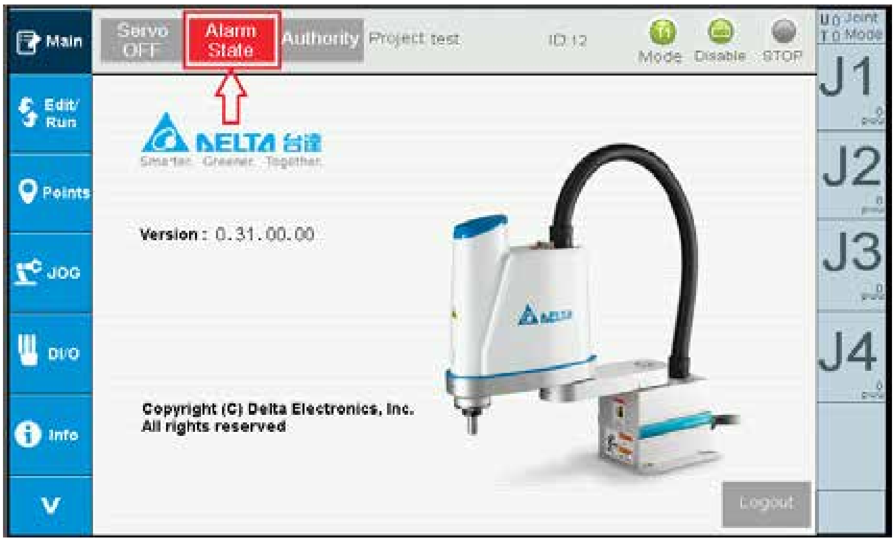


Figure 2-30 System information

## 2.7 System alarm information (Alarm Info)

When an error has occurred on MS, the Alarm status on top of the screen will have a red icon flash to notify the user. The user can press Alarm status directly (Figure 2-31) or switch to the Alarm Info page to find out more about the error message (Figure 2-32). Once the error is fixed, press Alarm Reset Alarm Reset to reset the Alarm. Once done successfully, the Alarm message will be cleared and the Alarm status will change from flashing red to green, as shown in Figure 2-30.



Version : 0.31.00.00

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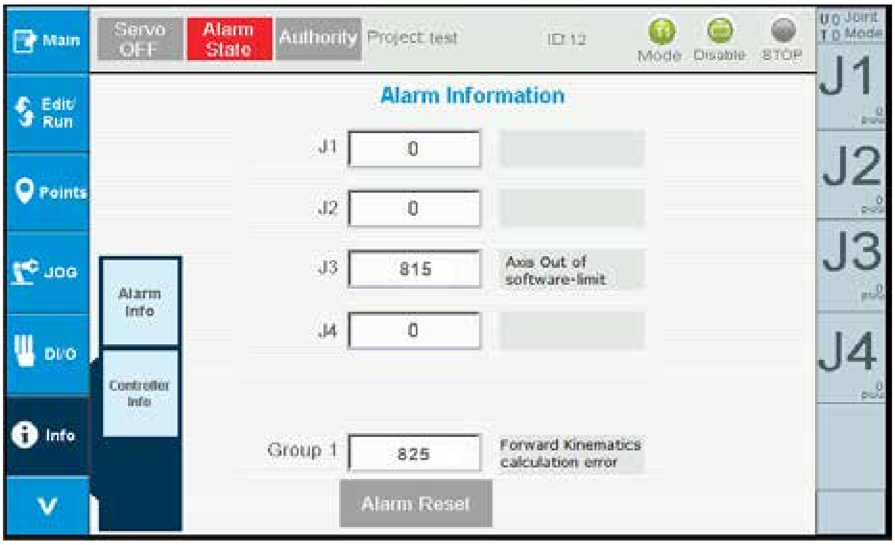
Figure 2-31 System alarm information



Alarm Information

J1 0

J2 0

J3 815 Axis Out of software-limit

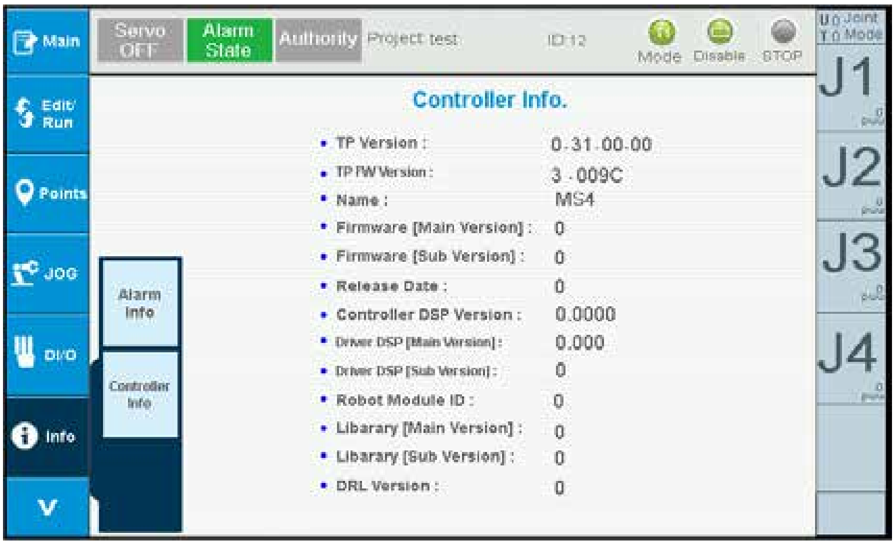
J4 0

Group 1 825 Forward Kinematics calculation error

Figure 2-32 System alarm information - Alarm information

## 2.8 Controller information (Controller Info)

This page will display information related to version for the controller, shown as Figure 2-33



Controller Info.

| | |
|---|---|
| TP Version : | 0.31.00.00 |
| TP FW Version : | 3 . 009C |
| Name : | MS4 |
| Firmware [Main Version] : | 0 |
| Firmware [Sub Version] : | 0 |
| Release Date : | 0 |
| Controller DSP Version : | 0.0000 |
| Driver DSP [Main Version] : | 0.000 |
| Driver DSP [Sub Version] : | 0 |
| Robot Module ID : | 0 |
| Libarary [Main Version] : | 0 |
| Libarary [Sub Version] : | 0 |
| DRL Version : | 0 |

**Figure 2-33 Controller information**

## 2.9 System setting (Setting)

Original point operations (Home), display of information on controller IP, and settings (Controller IP) can be performed on this page, as shown in Figure 2-34

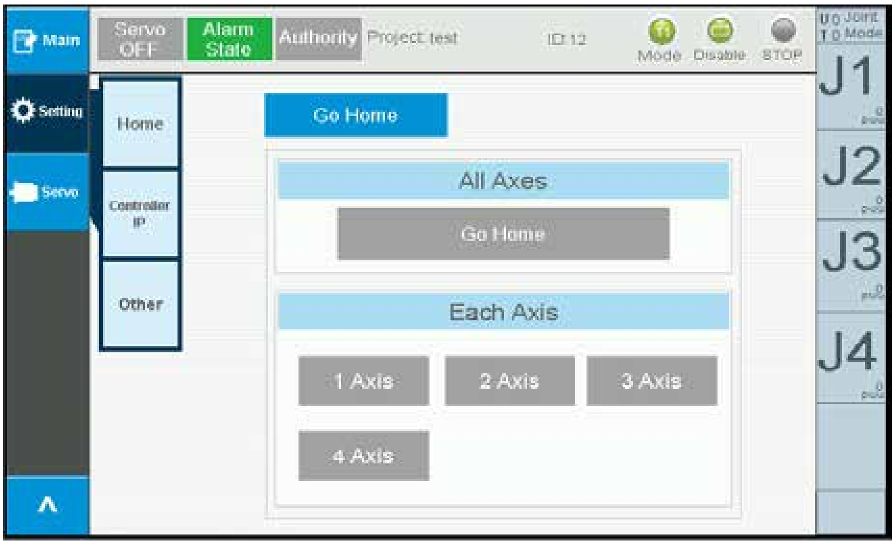


**Figure 2-34 System setting - Returning to original point**

## 2.9.1 Original point operations (Home)

Press Home to switch to the screen for original point operation (Home). This page allows return to the original point (GoHome), as shown in Figure 2-34.

Returning to original point (GoHome)

1. All Axes: All axes will return to their original point. Press and hold stage two of the three-stage operation button to execute this command. Once returned to the original point, the button will be restored to its original status.
2. Each Axis: Only returns a single axis to its original point. Press and hold stage two of the three-stage operation button to execute this command. Once returned to the original point, the button will be restored to its original status.

## 2.9.2 Controller IP (Controller IP)

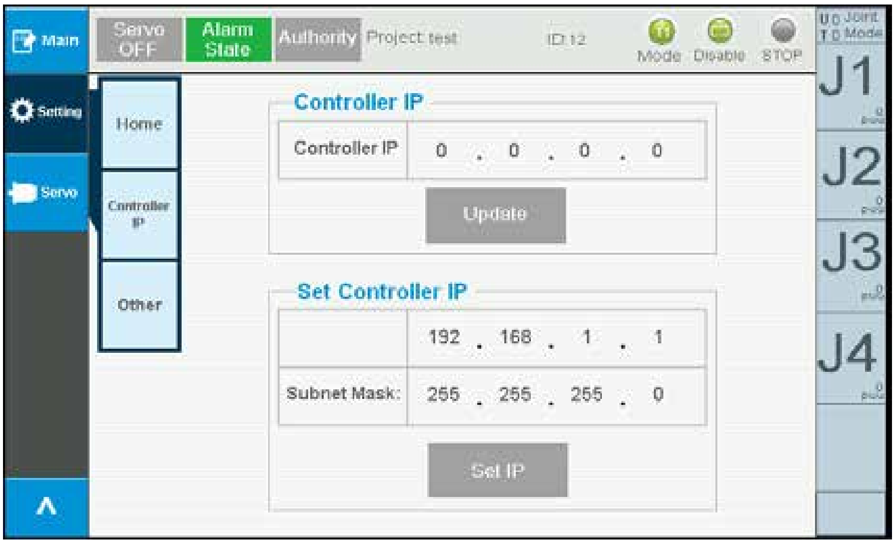
Press Controller IP to switch to the controller IP (Controller) screen. This page allows acquiring the IP address of the current controller and setting of the controller IP, shown as Figure 2-35.

【Steps to acquire the current controller IP are as follows:】

1. Press Update to acquire the current controller IP.
2. The acquired IP will be displayed in the Controller IP field, shown as Figure 2-36.

【Steps to set the controller IP are as follows:】

1. Enter the IP and SubnetMask in the Set Controller IP field, shown as Figure 2-37.
2. Press Set IP to perform the setup and the button will display as processing... , . Once done setting, the buttons will be restored to Set IP
3. Acquire the current controller IP to check whether the settings are correct.



Controller IP

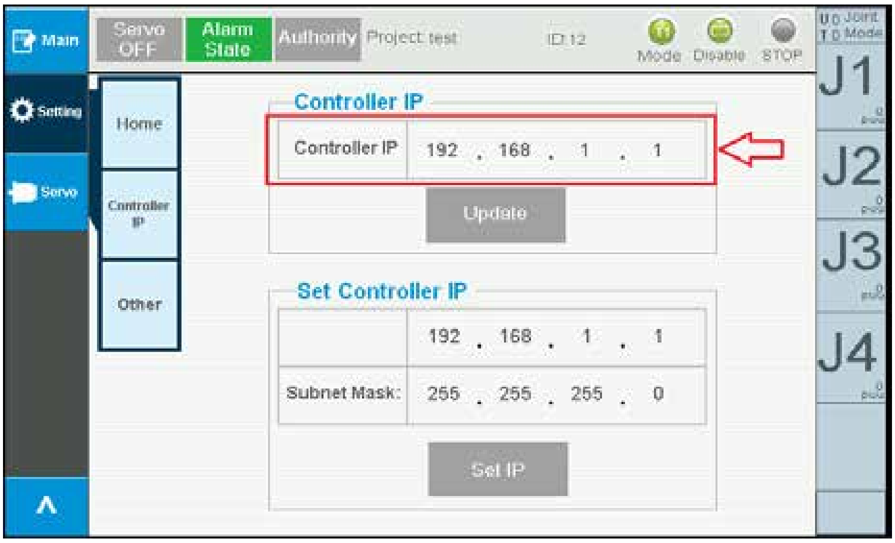
Controller IP: 0 . 0 . 0 . 0

Set Controller IP

192 . 168 . 1 . 1

Subnet Mask: 255 . 255 . 255 . 0

Figure 2-35 System setting - Controller IP



Controller IP

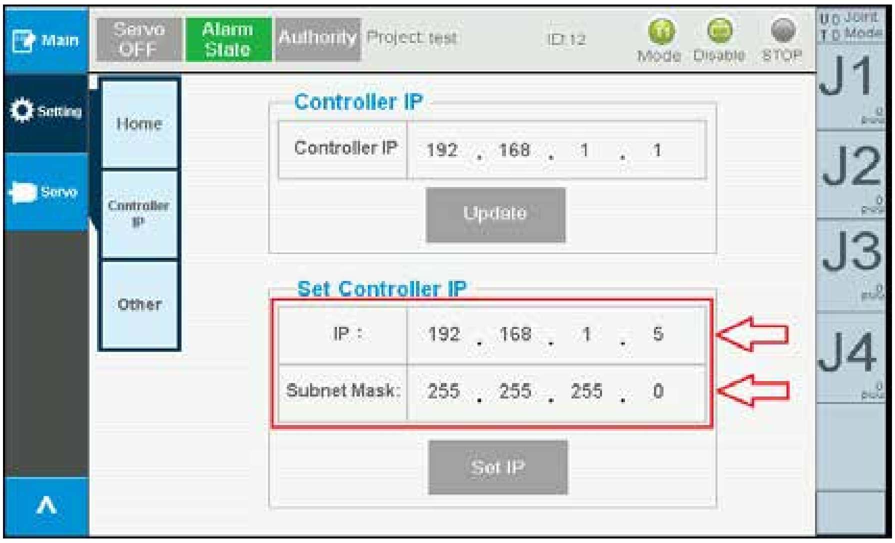
Controller IP: 192 . 168 . 1 . 1

Set Controller IP

192 . 168 . 1 . 1

Subnet Mask: 255 . 255 . 255 . 0

Figure 2-35 System setting - Controller IP



Controller IP

Controller IP: 192 . 168 . 1 . 1

Set Controller IP

IP : 192 . 168 . 1 . 5

Subnet Mask: 255 . 255 . 255 . 0

Figure 2-37 System setting - Setting controller IP

# 2.10 System setting - Setting controller IP

This page can be used to Start/Stop the Servo motor, including all-axes Servo On/Off, individual-axis Servo On/Off, shown as Figure 2-38.

1. All-axes Servo On/Off

   A. Press Servo OFF to execute all-axes Servo On. When Servo On is successful it will change to Servo On

   B. Press Servo On to execute all-axes Servo Off. When Servo Off is successful it will change to Servo OFF

2. Individual-axis ServoOn/Off, using the J1-axis as example:

   A. Press 1 Axis to execute J1-axis Servo On. When Servo On is successful it will change to 1 Axis

   B. Press 1 Axis to execute J1-axis Servo Off. When Servo Off is successful it will change to 1 Axis

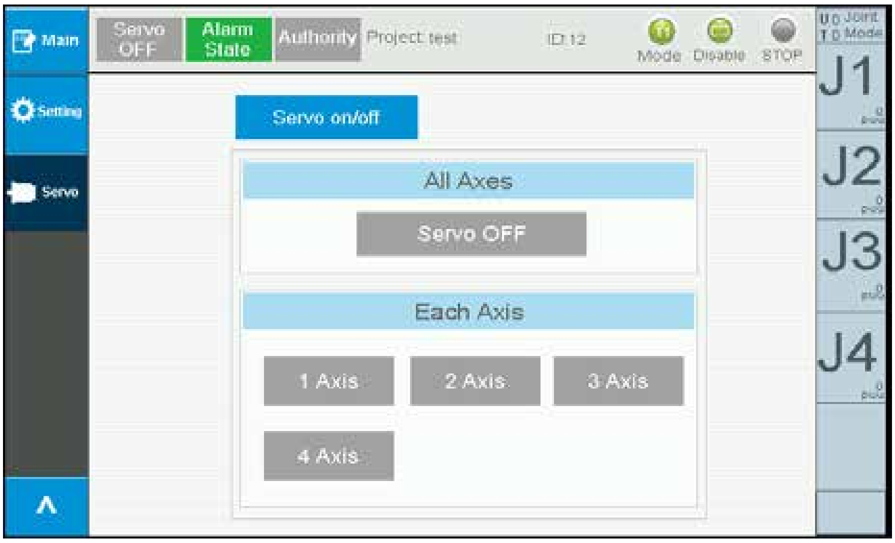


**Figure 2-38 Servo Setting Servo On/Off**

# 3. Alarm

## 3.1 Definitions of alarms

There are 4 major categories of abnormal alarms, namely the control type, customized type, group type, and axis type, the meanings of which are described as follows:

- Control type: alarms sent out by the controller.
- Customized type: alarms customized by the users through the PLC program written.
- Group type: alarms sent out by a group which is combined randomly from an axis group.
- Axis type: alar ms sent out by individual axis.

The 7-segment display shows the abnormal alarm code in the following way.

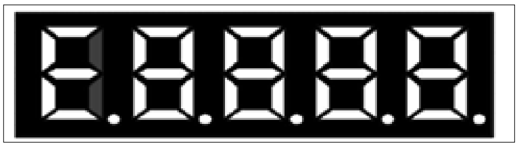
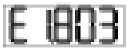
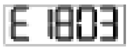
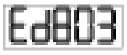
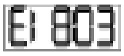


**Fig 49 Seven-segment display of MS error code**

**1. Fixed display for abnormal alarm E**

**2.**

| | |
|---|---|
| Control type (Controller): | C This type of abnormal alarm is currently reserved. |
| Customized type (User): | U |
| Group type (Group): | 1-2<br>* "?" is used to represent numbers in the List of Abnormal Alarms. |
| Axial type (Axis): | 1-6 axis: number 1-6.<br>7-12 axis: reserved.<br>13-18 axis: English letter D-I<br>* "?" is used to represent numbers and English letters in the List of Abnormal Alarms. |
| For example: |  Abnormal alarm code E1.803 is the alarm of Group 1 in the group type.<br> Abnormal alarm code E1803 is the alarm of Axis 1 in the axial type.<br> Abnormal alarm code ED803 is the alarm of Axis 13 in the axial type.<br> Abnormal alarm code EI803 is the alarm of Axis 18 in the axial type. |

**3. Codes for Abnormal Alarms**

# 3.2 Index of alarm

## 3.2.1 Group type

| Abnormal Alarm Display | Abnormal Alarm Name | Abnormal Alarm Type | | Servo Status | |
|---|---|---|---|---|---|
| | | ALM | WARN | ON | OFF |
| E?801 | Axis did not return to the origin | ○ | | | ○ |
| E?803 | Incompatible motion command | ○ | | | ○ |
| E?80A | Motion command is not ready | ○ | | | ○ |
| E?80B | Unknown motion command | ○ | | | ○ |
| E?80C | Error of the motion command in buffer region | ○ | | | ○ |
| E?813 | Axis error during interpretation of commands | ○ | | | ○ |
| E?814 | Axis error during implementation of the motion commands | ○ | | | ○ |
| E?815 | Mono-axis exceeds the software limit | ○ | | | ○ |

| Abnormal Alarm Display | Abnormal Alarm Name | Abnormal Alarm Type | | Servo Status | |
|---|---|---|---|---|---|
| | | ALM | WARN | ON | OFF |
| E?821 | Arm gesture is inconsistent | ○ | | | ○ |
| E?822 | Target position for P2P motion command is out of Robot’s operating range | ○ | | | ○ |
| E?823 | Target position of command for continuous path is out of Robot’s operating range | ○ | | | ○ |
| E?824 | Spatial movement exceeds the operating range of Robot | ○ | | | ○ |
| E?825 | P2P movement path exceeds the operating range of Robot | ○ | | | ○ |
| E?827 | Group does not exist | ○ | | | ○ |
| E?829 | Error in switching the coordinates | ○ | | | ○ |
| E?82A | Error in switching user coordinates | ○ | | | ○ |
| E?82B | Error in switching tool coordinates | ○ | | | ○ |
| E?832 | Loss of internal communication packet | ○ | | | ○ |
| E?833 | Error in check code for internal communication | ○ | | | ◯ |
| E?841 | The arc command is out of boundary | ○ | | | ◯ |
| E?842 | The arc cannot be formed | ○ | | | ◯ |
| E?843 | Arc mode error | ◯ | | | ◯ |
| E?851 | Time out error in transmission of vision parameters followed by conveyor belt | ◯ | | | ◯ |
| E?852 | The following speed for conveyor belt exceeds limits | ◯ | | | ◯ |
| E?853 | Overtime error in transmission of vision parameters followed by conveyor belt | ◯ | | | ◯ |
| E?861 | The jogging speed of the TP hand wheel is too fast. | ◯ | | | ◯ |
| E?862 | The TP hand wheel is jogging. | ◯ | | | ◯ |

Note :
If there’s other alarm code appearing, please contact the technique team or agent directly for further support.
"?"represents the number of "1. ~ 2." in the alarm of group type.

## 3.2.2 Axis type

| Abnormal Alarm Display | Abnormal Alarm Name | Abnormal Alarm Type | | Servo State | |
|---|---|---|---|---|---|
| | | ALM | WARN | ON | OFF |
| E?001 | Overcurrent | ○ | | | ○ |
| E?002 | Overvoltage | ○ | | | ○ |
| E?003 | Low voltage | | ○ | | ○ |
| E?004 | Motor matching error | ○ | | | ○ |
| E?005 | Retrogradation error | ○ | | | ○ |
| E?006 | Overload | ○ | | | ○ |
| E?007 | Over speed | ○ | | | ○ |
| E?009 | Error in position control is too large | ○ | | | ○ |
| E?011 | Encoder abnormal | ○ | | | ○ |
| E?012 | Calibration abnormal | ○ | | | ○ |
| E?013 | Emergency stop | | ○ | | ○ |
| E?014 | Reverse limit abnormal | | ○ | | ○ |
| E?015 | Direct limit abnormal | | ○ | ○ | |
| E?016 | IGBT overheated | ○ | | | ○ |
| E?017 | Memory abnormal | ○ | | | ○ |
| E?018 | Detector output abnormal | ○ | | | ○ |
| E?019 | Serial communication abnormal between controller and drive | ○ | | | ○ |
| E?020 | Overtime in sSerial communication between controller and drive | | ○ | ○ | |
| E?022 | Power abnormal on the main loop | | ◯ | | ◯ |
| E?023 | Advanced overload warning | | ◯ | ◯ | |
| E?024 | Error in Initial magnetic field for the internal encoder | ◯ | | | ◯ |
| E?025 | Internal error on the encoder | ◯ | | | ◯ |
| E?026 | Error in reliability of internal data for the encoder | ◯ | | | ◯ |
| E?027 | Error in internal reset for the encoder | ◯ | | | ◯ |
| E?028 | High voltage on the encoder or internal error on the encoder | ◯ | | | ◯ |
| E?029 | Gray code error | ◯ | | | ◯ |
| E?030 | Motor collision error | ◯ | | | ◯ |
| E?031 | Detection on disconnection of the motor power cable | ◯ | | | ◯ |
| E?034 | Error in internal communication for the encoder | ◯ | | | ◯ |
| E?035 | Encoder temperature exceeded protection limit. | ○ | | | ◯ |
| E?044 | Warning on usage of the drive functions | | ◯ | | |

| Abnormal Alarm Display | Abnormal Alarm Name | Abnormal Alarm Type | | Servo State | |
|---|---|---|---|---|---|
| | | ALM | WARN | ON | OFF |
| E?060 | Loss of absolute position | | ○ | | ○ |
| E?061 | Low voltage error on the encoder | | ○ | ○ | |
| E?062 | Absolute position laps overflow | | ○ | ○ | |
| E?067 | Encoder temperature alarm | | ○ | ○ | |
| E?069 | Motor type error | ○ | | | ○ |
| E?06A | Loss of absolute position | | | | |
| E?070 | Incomplete encoder processing | | ○ | | ○ |
| E?099 | EEPROM needs updating | ○ | | | ○ |
| E?111 | DMCNET packet receiver overflows | ○ | | | ○ |
| E?185 | DMCNET Bus hardware abnormal | ○ | | | ○ |
| E?201 | Initial error of DMCNET data | ○ | | | ○ |
| E?235 | Position command overflows | ○ | | | ○ |
| E?245 | Positioning overtime | ○ | | | ○ |
| E?283 | Drive direct limit | | ○ | ○ | |
| E?285 | Drive reverse limit | | ○ | ○ | |
| E?289 | Position counter overflows | ○ | | | ○ |
| E?301 | DMCNET synchronizing signal failed | ○ | | | ○ |
| E?302 | DMCNET synchronizing signal is too fast | ○ | | | ○ |
| E?303 | DMCNET synchronizing signal overtime | ○ | | | ○ |
| E?304 | DMCNET IP command invalid | ○ | | | ○ |
| E?500 | STO function is activated | ○ | | | ○ |
| E?501 | STO_A lost | ○ | | | ○ |
| E?502 | STO_B lost | ○ | | | ○ |
| E?503 | STO_error | ○ | | | ○ |
| E?555 | Drive failure | ○ | | | ○ |

Note:
"?"represents the number of "1~6"and alphabet"D ~ I" in the alarm of axis type

## 3.2.3 Control type

| Abnormal Alarm Display | Abnormal Alarm Name | Abnormal Alarm Type | | Servo State | |
|---|---|---|---|---|---|
| | | ALM | WARN | ON | OFF |
| EC001 | PLC timeout | ○ | | | ○ |
| EC002 | PLC Image load failed | ○ | | | ○ |
| EC003 | PLC Exception | ○ | | | ○ |
| EC004 | Motion module failed | ○ | | | ○ |
| EC005 | Controller failed | ○ | | | ○ |

| Abnormal Alarm Display | Abnormal Alarm Name | Abnormal Alarm Type | | Servo State | |
|---|---|---|---|---|---|
| | | ALM | WARN | ON | OFF |
| EC006 | Continuous 30 second write in alarm | ○ | | | ○ |
| EC007 | DMCNET device setting mismatch | ○ | | | ○ |
| EC008 | Mechanism parameter file load failed | ○ | | | ○ |
| EC009 | Robot Type inconsistent | ○ | | | ○ |
| E1998 | Operation mode not started | ○ | | | ○ |

- **Group type:**

| E?801 Axis did not return to the origin | |
|---|---|
| Cause | Axis did not return to the origin |
| Check and Correction | If the axis fails to return to the origin before the coordinates moved, please return the axis to the origin. |
| Solution | Reset alarm |

| E?803 Incompatible motion command | |
|---|---|
| Cause | The motion command does not support over-lapping mode |
| Check and Correction | Whether commands such as mono-axial P2P(MovJ), multi-axial P2P(MovP, MovPR, MArchP)and spatial commands(MovL, MovLR, MArc, MCircle, MArchL)are blended at the same time since these three types of motion commands cannot overlap. Please use other motion commands to replace or avoid command overlapping. |
| Solution | Reset alarm |

| E?80A Motion command is not ready | |
|---|---|
| Cause | The motion command is not ready and cannot be interpreted. |
| Check and Correction | Return to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?80B Unknown motion command | |
|---|---|
| Cause | The motion command cannot be identified. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?80C Error of the motion command in buffer region |
|---|

| | |
|---|---|
| Cause | Error in Interpretation of the motion command for cache region. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?813 Axis error during interpretation of commands | |
|---|---|
| Cause | Axis error during interpretation of commands. |
| Check and Correction | Please use the original software (DROE) to check whether any abnormality of axis is found and eliminate any abnormality in accordance with the troubleshooting of alarms. |
| Solution | Reset alarm |

| E?814 Axis error during implementation of motion commands | |
|---|---|
| Cause | Axis error during implementation of the motion commands. |
| Check and Correction | Please use the original software (DROE) to check whether any abnormality of axis is found and eliminate any abnormality in accordance with the troubleshooting of alarms. |
| Solution | Reset alarm |

| E?815 Mono-axis exceeds the software limit | |
|---|---|
| Cause | Target position of the mono-axis exceeds the software limit. |
| Check and Correction | Whether target position of the command for each axis is within configured limits of software. If not, please move the arm (manual or Jog) back into the limits of software. |
| Solution | Reset alarm |

| E?821 Arm gesture is inconsistent | |
|---|---|
| Cause | Current arm gesture is inconsistent with gesture at target position. |
| Check and Correction | 1. Continuous path command (MovL, MArc, MCircle, MArchL) does not support movements under hand changes. Check whether the gesture at current position is consistent with that at the target position. If not, please change the gesture at target position or use another motion command.<br>2. Please check whether this motion path can be ignored. If not, then determine the arm gesture with the controller. |
| Solution | Reset alarm |

| E?822 Target position for P2P motion command is out of Robot’s operating range |
|---|

| | |
|---|---|
| Cause | The target position for issued mono-axial P2P(MovJ), multi-axial P2P(MovP, MovPR, MArchP) is out of the operating range. |
| Check and Correction | Whether the target position of the motion command for each axis is within the software limits configured by the drive. |
| Solution | Reset alarm |

| E?823 Target position of command for continuous path is out of Robot's operating range | |
|---|---|
| Cause | The target position of spatial command issued(MovL, MovLR, MArc, MCircle, MArchL) is out of the operating range. |
| Check and Correction | Whether the target position of the motion command for each axis is within the software limits configured by the drive. |
| Solution | Reset alarm |

| E?824 Spatial movement exceeds the operating range of Robot | |
|---|---|
| Cause | Spatial command movement exceeds the operating range of Robot. |
| Check and Correction | Whether the target position of the motion command for each axis is within the configured limits of software. |
| Solution | Reset alarm |

| E?825 P2P movement path exceeds the operating range of Robot | |
|---|---|
| Cause | Error of computation for forward kinematics. Path of movements for mono-axial/multi-axial P2P commands exceeds the operating range. |
| Check and Correction | 1. Whether the setting of software limits is normal. Whether the target position of the motion command for each axis is within the software limits configured by the drive.<br>2. Whether path is within the operating range defined by the user.<br>3. Whether the machine dimension is correct.(Please contact original manufacturer) |
| Solution | Reset alarm |

| E?827 Group does not exist | |
|---|---|
| Cause | The designated group does not exist. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?829 Error in switching the coordinates | |
|---|---|
| Cause | The coordinates to be switched to do not exist. |
| Check and Correction | Whether the designated coordinate number is between 0 and 9. If not, please fill in or select the correct coordinate number. Currently, only four coordinates systems of "world", "tool", "user" and "axis" are supported. |

| | |
|---|---|
| Solution | Reset alarm |

| E?82A Error in switching user coordinates | |
|---|---|
| Cause | Switching error of the user coordinates |
| Check and Correction | 1. Whether the designated number of user coordinates system has been established or is between 0 and 9. If not, please fill in or select the correct coordinate number.<br>2. Please use the original software tool to check the coordinates instruction. |
| Solution | Reset alarm |

| E?82B Error in switching tool coordinates | |
|---|---|
| Cause | Switching error of the tool coordinates |
| Check and Correction | 1. Whether the designated number of tool coordinates system has been established or is between 0 and 9. If not, please fill in or select the correct coordinate number.<br>2. Please use the original software tool to check the coordinates instruction. |
| Solution | Reset alarm |

| E?832 Loss of internal communication packet | |
|---|---|
| Cause | Between the controller and the drive, three continuous losses of the communication packet. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?833 Error in check code for internal communication | |
|---|---|
| Cause | Between the controller and the drive, three continuous errors of the communication check code(CRC). |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?841 The arc command is out of boundary | |
|---|---|
| Cause | The target position of the command issued is out of the operating range. |
| Check and Correction | Whether the target position of the motion command for each axis is within the configured limits of software. |
| Solution | Reset alarm |

| E?842 The arc cannot be formed | |
|---|---|
| Cause | The input conditions cannot form an arc. |

| | |
|---|---|
| Check and Correction | Whether the input conditions for forming an arc is correct, conditions like 3 points are collinear, the radius is 0, or the centre falls on the circumference cannot form a circle.  Please reissue command positions according to conditions that can form a circle. |
| Solution | Reset alarm |

| E?843 Arc mode error | |
|---|---|
| Cause | Setting error of arc parameter mode. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?851  Time out error in transmission of vision parameters followed by conveyor belt | |
|---|---|
| Cause | 1. Data transmission error<br>2. Vision system has not been triggered. |
| Check and Correction | 1. Ensure the vision system has been triggered before the robot starts.<br>2. Check if the configuration and settings for the vision system are correct. |
| Solution | Reset alarm |

| E?852 The following speed for conveyor belt exceeds limits | |
|---|---|
| Cause | The speed of conveyor belt is too fast. |
| Check and Correction | Reduce the speed of conveyor belt. |
| Solution | Reset alarm |

| E?853 Overtime error in transmission of vision parameters followed by conveyor belt | |
|---|---|
| Cause | Error in setting of number for the user coordinates used in the conveyor belt following application. |
| Check and Correction | Whether the setting of number for  the user coordinates used in the conveyor belt following meets the application specification（it cannot be 0 or larger than 9）. |
| Solution | Reset alarm |

| E?861 TP handwheel Jog speed too fast | |
|---|---|
| Cause | TP handwheel Jog speed too fast. |
| Check and Correction | Please decrease TP handwheel jog speed. |
| Solution | Alarm reset. |

| E?862 TP handwheel performing jog | |
|---|---|
| Cause | TP handwheel performing jog. |
| Check and Correction | Stop TP handwheel jog first and then perform original movement. |
| Solution | Alarm reset. |

- **Axis type:**

| E?001 Overcurrent | |
|---|---|
| Cause | 1. Short circuit of the drive output<br>2. Abnormal motor wiring<br>3. Abnormal IGBT |
| Check and Correction | 1.Whether wiring between the motor and drive has short-circuited, and if circuited, eliminate the short-circuit condition and prevent exposed wiring.<br>2.Please refer to the wiring sequence in the instruction Manual and check whether the wiring sequence from the motor to the drive is correct and rewire. If the alarm continues, return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?002 Overvoltage | |
|---|---|
| Cause | 1. Input voltage for the main loop is too high<br>2. Hardware failure on the drive |
| Check and Correction | 1. Whether the input voltage of the main loop is within the rated voltage value; if not, use the correct voltage components or tandem voltage stabilizer to transform the voltage within the rated voltage value.<br>2. Whether the input voltage of the main loop is within the rated voltage value; if this error continues, please return the drive back to the dealer or original manufacturer for overhauling. |
| Solution | Reset alarm |

| E?003 Low voltage | |
|---|---|
| Cause | 1. Input voltage for the main loop is too low<br>2. The main loop has no source of input voltage<br>3. Power input error |
| Check and Correction | 1. Use the electric meter to check whether the voltage of the main loop is normal.<br>2. Please refer to the wiring sequence in the Instruction Manual to check whether the wiring for input voltage on the main loop is normal, if not, please rewire.<br>3. Whether the power system agrees with the definition of the specification, use the correct voltage elements or tandem voltage stabilizer to transform the voltage within the rated voltage value. |
| Solution | Clear alarm when voltage restores |

| E?004 Motor matching error | |
|---|---|
| Cause | 1. Position encoder is loose<br>2. Motor matching error |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?005 Retrogradation error | |
|---|---|
| Cause | 1. Wrong retrogradation resistance is chosen or no external retrogradation resistance is connected.<br>2. Parameter setting error |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?006 Overload | |
|---|---|
| Cause | 1. Continuously exceeding the rated load of the drive<br>2. Error in wiring for the motor and the encoder<br>3. Motor drive abnormal |
| Check and Correction | 1. Whether the wiring of U, V, W and the encoder is correct; if not, please rewire correctly.<br>2. Return the motor to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?007 Over speed | |
|---|---|
| Cause | Improper setting for parameter P2-34 (warning conditions for over speed) |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?009 Error in position control is too large | |
|---|---|
| Cause | 1. External load is too large |
| Check and Correction | Please use within the maximum Payload value or adjust the Payload value. |
| Solution | Reset alarm |

| E?011 Encoder abnormal | |
|---|---|
| Cause | 1. Wiring error for the encoder<br>2. Encoder is loose or the wiring is poor.<br>3. Encoder is damaged. |

| | |
|---|---|
| Check and Correction | 1. Whether the wiring follows the suggested path in the Instruction Manual.<br>2. Whether the connection of MotorENC. in the drive and the encoder in the motor position is loose; if loose, reconnect MotorENC. of the drive with a position detector. |
| Solution | Reconnect power and clear alarm. |

| E?012 Calibration abnormal | |
|---|---|
| Cause | Current calibration is abnormal |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?013 Emergency stop | |
|---|---|
| Cause | Emergency stop switch is pressed. |
| Check and Correction | Whether the emergency switch is activated. The emergency stop switch is normally off; if activated unintentionally, please turn it off. |
| Solution | Reset alarm |

| E?014 Reverse limit abnormal | |
|---|---|
| Cause | 1. The reverse limit switch is activated<br>2. The servo system is unstable |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?015 Direct limit abnormal | |
|---|---|
| Cause | 1. The direct limit switch is activated<br>2. The servo system is unstable |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

| E?016 IGBT overheated | |
|---|---|
| Cause | 1. Continuous overloading on the drive<br>2. Short circuit upon output from the drive |
| Check and Correction | 1. Check whether the load is too large, and use within the maximum Payload value or adjust the Payload value.<br>2. Check the drive output wiring to ensure the wiring is correct. |
| Solution | Reset alarm |

| E?017 Memory abnormal |
|---|

| | |
|---|---|
| Cause | 1. Reference data write-in error or parameter error, which occurs at factory reset for parameters due to error in setting of drive types.<br>2. Drive memory abnormal<br>3. ROM data is damaged, if error occurs during power transmission, it is usually due to damage on ROM data or no data available in the ROM. Please return it to the dealer or original manufacturer for repairing. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

### E?018 Detector output abnormal

| | |
|---|---|
| Cause | 1. Encoder error<br>2. The output pulse exceeds a permissible range for the hardware. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

### E?019 Serial communication abnormal between controller and drive

| | |
|---|---|
| Cause | 1. Improper settings for communication parameters<br>2. Incorrect communication address<br>3. Incorrect communication value |
| Check and Correction | 1. Reset to the factory setting<br>2. Or return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

### E?020 Overtime in serial communication between controller and drive

| | |
|---|---|
| Cause | The drive has not received communication command for a long time. |
| Check and Correction | Check whether the communication cable is loose or broken to ensure correct wiring. |
| Solution | Reset alarm |

### E?022 Power abnormal on the main loop

| | |
|---|---|
| Cause | Power abnormal on the main loop |
| Check and Correction | 1. Whether RS power cable is loose or non-conductive.<br>2. Connect the power correctly. If power supply is normal but alarm remains, return the drive to the dealer or manufacturer for repairing. |
| Solution | Reset alarm |

### E?023 Advanced overload warning

| | |
|---|---|
| Cause | Advanced overload warning |
| Check and Correction | 1. Whether the use of overloading. Please refer to the Corrective Action for E?006 |
| Solution | Reset alarm |

| E?024 Error in Initial magnetic field for the internal encoder | |
|---|---|
| Cause | Error in initial magnetic field for the encoder<br>(error in the magnetic field positions U, V and W) |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?025 Internal error on the encoder | |
|---|---|
| Cause | 1. Internal error on the encoder (internal memory error and error in internal counting).<br>2. The motor rotates due to mechanical inertia or other reasons when it is connected to the power. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?026 Error in reliability of internal data for the encoder | |
|---|---|
| Cause | Encoder error (three continuous errors in internal data) |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?027 Error in internal reset for the encoder | |
|---|---|
| Cause | Encoder chip reset |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?028 High voltage on the encoder or internal error on the encoder | |
|---|---|
| Cause | 1. Over- voltage on battery<br>2. Internal error of the encoder |
| Check and Correction | 1. Whether the drive has a charging circuit and whether battery installation (voltage >3.8 V) is abnormal. Please use an electric meter to check whether the voltage is higher than 3.8V. |
| Solution | Reconnect power and clear alarm. |

| E?029 Gray code error | |
|---|---|
| Cause | Error in absolute position of one-loop |
| Check and Correction | Reconnect the power supply and run the motor to see if alarm reappears, if it remains, return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?030 Motor collision error | |
|---|---|
| Cause | 1. Whether anti-collision function for the motor is activated.<br>2. Return it to the dealer or original manufacturer for repairing. |
| Check and Correction | Reconnect the power supply and run the motor to see if alarm reappears, if it remains, replace the encoder. |
| Solution | Reconnect power and clear alarm. |

| E?031 Detection on disconnection of the motor power cable | |
|---|---|
| Cause | Disconnection of the motor power cable |
| Check and Correction | Whether the motor power cables(U, V, W, GND)are disconnected, please connect the cables correctly according to the Instruction Manual and ground them correctly. |
| Solution | Reconnect power and clear alarm. |

| E?034 Error in internal communication for the encoder | |
|---|---|
| Cause | Error in internal communication for the encoder |
| Check and Correction | Whether the battery wiring is loose; if loose, reconnect the battery correctly and turn on the power again |
| Solution | Reconnect power and clear alarm. |

| E?044 Warning on usage of the drive functions | |
|---|---|
| Cause | Warning on usage of the drive functions |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?060 Loss of absolute position | |
|---|---|
| Cause | 1. Battery voltage is too low<br>2. Replace the battery when power of the drive control is turned off<br>3. The initialization on coordinates for the absolute position has not been completed after activating the absolute function.<br>4. Poor contact or disconnection on the circuit for supply of battery power.<br>5. Change of the ratio on the electronic gear. |

| | |
|---|---|
| Check and Correction | 1. Whether the battery voltage is lower than 2.8V.<br>2. Do not change or remove the battery when the drive control power is turned off.<br>3. Reset the coordinates for the absolute position after completing the initialization on the coordinates for the absolute position and the zero return procedure.<br>4. (1) Whether the battery installation and wiring is correct. (2) Check the encoder wiring (3) Check the wiring between the external battery holder and the drive<br>Corrective action: Repeat the zero return procedure |
| Solution | Reconnect power and clear alarm. |

| E?061 Low voltage on the encoder | |
|---|---|
| Cause | Battery voltage is too low. |
| Check and Correction | 1. Whether the voltage on panel battery is lower than 3.1V (provisional specification).<br>2. Whether the battery voltage is lower than 3.1V (provisional specification); if lower, please replace the battery with power ON for the drive control. |
| Solution | Auto-clear |

| E?062  Absolute position laps overflow | |
|---|---|
| Cause | The stroke is out of range. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?067 Encoder temperature alarm | |
|---|---|
| Cause | Temperature of the encoder is too high (85~100 ℃ ) |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?069 Motor type error | |
|---|---|
| Cause | Activation of absolute function by the incremental motor is not allowed. |
| Check and Correction | Whether the motor is of incremental motor or absolute encoder. |
| Solution | Reconnect power and clear alarm. |

| E?06A Loss of absolute position | |
|---|---|
| Cause | The initialization on coordinates for the absolute position has not been completed after activating the absolute function. |

| | |
|---|---|
| Check and Correction | 1. Reset the coordinates for the absolute position after completing the initialization on the coordinates for the absolute position and the zero return procedure.<br>2. Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?070 Incomplete encoder processing | |
|---|---|
| Cause | Related commands are not completed when the encoder conducts Barcode write-in or relevant actions. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?099 EEPROM needs updating | |
|---|---|
| Cause | EEPROM needs updating |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?111 DMCNET packet receiver overflows | |
|---|---|
| Cause | More than 2 packets are received within 1ms. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?185 DMCNET Bus hardware abnormal | |
|---|---|
| Cause | DMCNET Bus hardware abnormal or loss of communication packet |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?201 Initial error of DMCNET data | |
|---|---|
| Cause | Initial error of DMCNET data |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reconnect power and clear alarm. |

| E?235 Position command overflows |
|---|

| | |
|---|---|
| Cause | 1. When temporary register for the feedback position overflows;<br>2. When the zero return is triggered, but the zero return procedure is not completed;<br>3. When E?060 and E?062 occur. |
| Check and Correction | Implement the zero return procedure. |
| Solution | Reconnect power and clear alarm. |

| E?245 Positioning overtime | |
|---|---|
| Cause | Positioning overtime for the position mode . |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | None. |

| E?283 Drive direct limit | |
|---|---|
| Cause | Exceeding software direct limit. |
| Check and Correction | Whether the position exceeds the value of P5-09. Please set the limit according to actual conditions; if the position doesn't exceed the limit, please set the maximum:2147483648. |
| Solution | Reset alarm. |

| E?285 Drive reverse limit | |
|---|---|
| Cause | Exceeding software reverse limit. |
| Check and Correction | Whether the position exceeds the value of P5-09. Please set the limit according to actual conditions; if the position doesn't exceed the limit, please set the maximum:-2147483648. |
| Solution | Reset alarm. |

Note: Direct and reverse limits for the software are determined according to the position commands and not the actual feedback positions, because the commands always arrive before the feedback. When the limits play a protective role, the actual position may not have exceeded the limit; therefore, desired effect can be achieved by setting appropriate deceleration time. Please refer to the description of Parameter P5-03

| E?289 Position counter overflows | |
|---|---|
| Cause | Position counter overflows. |
| Check and Correction | Do not make any modification on the original machine if this alarm occurs; return it back to the original manufacturer directly. |
| Solution | None. |

| E?301 DMCNET synchronizing signal failed | |
|---|---|

| | |
|---|---|
| Cause | Failure on transmission of synchronizing signal. |
| Check and Correction | 1. Whether the quality of communication line is poor.<br>2. Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

### E?302 DMCNET synchronizing signal is too fast

| | |
|---|---|
| Cause | Synchronizing signal is too fast. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm |

### E?303 DMCNET synchronizing signal overtime

| | |
|---|---|
| Cause | Synchronizing signal overtime |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm. |

### E?304 DMCNET IP command invalid

| | |
|---|---|
| Cause | The IP mode operation time is too long. |
| Check and Correction | Return it to the dealer or original manufacturer for repairing. |
| Solution | Reset alarm. |

### E?500 STO function is activated

| | |
|---|---|
| Cause | Safety function STO is activated. |
| Check and Correction | Safety function STO is manually activated; please check the activating cause. |
| Solution | Reset alarm. |

### E?501 STO_A lost

| | |
|---|---|
| Cause | STO_A loses enabling signal or STO_A and STO_B have not been synchronized for more than 1 second. |
| Check and Correction | Whether the STO_A wiring is correct. |
| Solution | Reset alarm. |

### E?502 STO_B lost

| | |
|---|---|
| Cause | STO_B loses enabling signal or STO_A and STO_B have not been synchronized for more than 1 second. |
| Check and Correction | Whether the STO_B wiring is correct. |
| Solution | Reset alarm. |

| **E?503 STO_error** | |
|---|---|
| Cause | STO self-diagnosis error. |
| Check and Correction | Whether STO_A and STO_B correctly connected. |
| Solution | Reset alarm. |

| **E?555 Drive failure** | |
|---|---|
| Cause | Drive processor abnormal. |
| Check and Correction | Do not make any modification on the original machine if this alarm occurs; return it to the original manufacturer directly. |
| Solution | None. |

Note: If abnormal alarm code that isn't listed above, please notify the original manufacturer.

- **Control type:**

| **EC001 PLC timeout** | |
|---|---|

| | |
|---|---|
| Cause | 1. PLC program too big, execution time too long.<br>2. Debug operation. |
| Check and Correction | 1. Confirm PLC Debug is closed. |
| Solution | Alarm reset. |

| EC002 PLC Image load failed | |
|---|---|
| Cause | The library version in the PLC Image does not match with the system. |
| Check and Correction | Check whether the controller parameter P1-01 is 1; if so, version mismatch is caused by firmware update. Please update to the same version of PLC Image. |
| Solution | Alarm reset. |

| EC003 PLC Exception | |
|---|---|
| Cause | PLC execution error. |
| Check and Correction | Please refer to the following error message for troubleshooting. |
| Solution | Alarm reset. |

| Error Message | Exception Code |
|---|---|
| PlcExcNon | 0 |
| ExcOutOfMemory | 1 |
| ExcDivisionByZero | 2 |
| ExcIndexOutOfRange | 3 |
| ExcIllegalCast | 4 |
| ExcStackOverflow | 5 |
| ExcNullReference | 6 |
| ExcMissingMethod | 7 |
| ExcThreadCreation | 8 |
| ExcThreadAbort | 9 |
| ExcSynchronizationLockException | 10 |
| ExcBreakpointIllegal | 11 |
| ExcBreakpoint | 12 |
| ExcExecutionEngine | 13 |
| ExcExternal | 16 |
| PlcExcString | 32 |
| PlcExcWatchDogExceeded | 33 |
| PlcExcMaximumCpuLoadExceeded | 34 |
| PlcExcSystem | 35 |
| PlcExcEnd | 36 |

| EC004 Motion module failed | |
|---|---|
| Cause | Abnormal movement module function. |
| Check and Correction | If this alarm occurred, do not make any modifications to the original machine and send it back to the manufacturer directly. |
| Solution | None. |

| EC005 Controller failed | |
|---|---|
| Cause | Abnormal controller function. |
| Check and Correction | If this alarm occurred, do not make any modifications to the original machine and send it back to the manufacturer directly. |
| Solution | None. |

| EC004 Motion module failed | |
|---|---|
| Cause | Abnormal movement module function. |
| Check and Correction | If this alarm occurred, do not make any modifications to the original machine and send it back to the manufacturer directly. |
| Solution | None. |

| EC006 Continuous 30 second write in alarm | |
|---|---|
| Cause | Write in operation executed for 30 seconds continually without interruptions. |
| Check and Correction | Check whether the logic of the PLC and RL program or Modbus operation has errors that caused continuous write in. If it occurs repeatedly, it is recommended to remove all external devices and restore original PLC settings and debug step by step. |
| Solution | Alarm reset. |

| EC007  DMCNET device setting mismatch | |
|---|---|
| Cause | DMCNET power on scan results does not match with the maintain power parameter settings. |
| Check and Correction | Please check the connection status of the DMCNET device and confirm whether the controller parameter P3-31~P3-42 settings matches the current DMCNET external device. |
| Solution | Alarm reset, to change settings please scan again and save the power maintain parameter. |

| EC009 Robot Type mismatch | |
|---|---|
| Cause | The Robot Type set in the parameter does not match the one loaded by the current movement module. |

| | |
|---|---|
| Check and Correction | 1. Confirm the firmware version; is it an updated firmware (downgraded or failed) that caused parameters P1-00 and P0-03 to be inconsistent.<br>2. Reset parameter P1-00, confirm that the current firmware version supports this type, disconnect the power and restart. |
| Solution | Reconnect the power and clear. |

| E1998 Operation mode not started | |
|---|---|
| Cause | Operation mode not started, please confirm the reason or System DI4 and DI5 contact are not connected. |
| Check and Correction | Please conform the System DI4 and DI5 contacts of the operation mode, and restart the controller. |
| Solution | Alarm reset. |

Note: If abnormal alarm code that isn't listed above, please notify the original manufacturer.

# 4. Robot Language

## 4.1 Basic Instructions

### 4.1.1 Robot Language Index

| Function | Symbol | Description |
|---|---|---|

| | | |
|---|---|---|
| Operation Symbols | + | Plus |
| | - | Minus |
| | * | Times |
| | / | Divided |
| | ^ | Power |
| | AND | Logical operation : conjunction operation |
| | OR | Logical operation : or operation |
| | XOR | Logical operation : nonequivalence operation |
| | > | Greater than |
| | >= | Greater than or equal |
| | < | Less than |
| | <= | Less than or equal |
| | = | equal |
| | ~= | Not equal |

| Function | Symbol | Description |
|---|---|---|
| Operation Commands | ABS (x) | Absolute value |
| | ACOS (x) | Arc cosine (in degree) |
| | ASIN (x) | Arc sine (in degree) |
| | ATAN (x) | Arc tangent (in degree) |
| | ATAN2 (y, x) | Arc tangent of y / x (in degree) |
| | CEIL (x) | Smallest integer larger than or equal to input value |
| | COS (x) | Consine (in degree) |
| | COSH (x) | Hyperbolic consine |
| | DEG (x) | Angle radians to degrees |
| | EXP (x) | Calculate the x-th power based on e |
| | FLOOR (x) | Largest integer smaller than or equal to input value |
| | FMOD (x, y) | Remainder of the division of x by y |
| | LOG10 (x) | Logarithm of x in the base 10 |
| | LOG (x[,base]) | Logarithm of x in the base, default base is natural |
| | MAX (x, …) | Maximum value among its arguments |
| | MIN (x, …) | Minimum value among its arguments |
| | MODF (x) | Return integer part of x and fractional part of x |
| | POW (x, y) | Return x^y |
| | RAD (x) | Angle degrees to radians |
| | SIN (x) | Sine (in degree) |
| | SINH (x) | Hyperbolic sine |
| | SQRT (x) | Square root |
| | TAN (x) | Tangent (in degree) |
| | TANH (x) | Hyperbolic tangent |

| | | |
|---|---|---|
| Basic Command | DELAY | Delay for a period of time |
| Point Management Commands | SetGlobalPoint | Save Global point |
| | CopyPoint | Copy point information |
| | ReadPoint | Read point information |
| | WritePoint | Write temporary storage value in the point data |
| | RobotX | The X-directional coordinate of current Cartesian coordinate |
| | RobotY | The Y-directional coordinate of current Cartesian coordinate |
| | RobotZ | The Z-directional coordinate of current Cartesian coordinate |
| | RobotC | The C-directional coordinate of current Cartesian coordinate |
| | Robothand | The L/R hand status of current robot |

| Function | Symbol | Description |
|---|---|---|
| Motion Parameters | AccJ | Acceleration, affecting the motion command of MovP, MovJ |
| | DecJ | Deceleration, affecting the motion command of MovP, MovJ |
| | SpdJ | Maximum speed, affecting the motion command of MovP, MovJ |
| | AccL | Acceleration, affecting the motion command of MovL, MArchL, Marc, MCircle |
| | DecL | Deceleration, affecting the motion command of MovL, MArchL, Marc, MCircle |
| | SpdL | Maximum speed, affecting the motion command of MovL, MArchL, Marc, MCircle |
| | Accur | Accuracy of points passed through |
| Motion Control Commands | RobotServoOn | Activate the robot’s servo motor |
| | RobotServoOff | Stop the robot’s servo motor |
| | MovJ | Control motor axis to rotate to the target position |
| | MovP | Perform point to point motion via absolute coordinates |
| | MovPR | Perform point to point motion in relative term |
| | MovL | Perform rectilinear motion via absolute coordinates |
| | MovLR | Perform rectilinear motion in relative term |
| | MArc | Make arc motion via absolute coordinates |
| | Lift | Use the absolute coordinate to move to the location of the relative point of reference. |
| | MArc | Make arc motion via absolute coordinates |
| | MCircle | Make circle motion via absolute coordinates |
| Coordinate System Commands | SetUF | Set the user coordinate system |
| | ChangeUF | Switch the user coordinate system |
| | SetTF | Set the tool coordinate system. |
| | ChangeTF | Switch the tool coordinate system |

| | | |
|---|---|---|
| Process Control Commands | if…end | If conditional statement (predicate) |
| | if…elseif…end | If conditional statement (predicate) |
| | while…do..end | while loop |
| | for(type1) | for loop |
| | for(type2) | for loop |
| | repeat…until | repeat loop |
| | function…end | User-defined sub-function |
| IO Operation Commands | DI | Read digital input |
| | DO | Read or write in digital output |
| | ReadModbus | Read the value of the memory location |
| | WriteModbus | Write the value of the memory location |
| Program Executing Commands | QUIT | Stop executing program |
| | PAUSE | Suspend the current action |
| Application function Commands | SafetyMode | This is used for the raster pause function. |
| | SafetyStatus | This is used for the raster trigger status. |

## 4.1.2 Syntax definition:

**Table VI -1 Syntax Precautions**

| Precautions | Instructions |
|---|---|
| Case-sensitive | The robot language is case-sensitive, a and A are different |
| Delimiter statement | Robot language statements can be separated with either semicolon " ; " , or blank, e.g.<br>a1=0 a2=1 a3=2 equivalent to a1, a2, a3 = 0, 1, 2 |
| Number of variables > number of values | Make up nil based on the number of variables, e.g.<br>a1, a2, a3 = 0, 1, then the value of a3 equals to nil |
| Number of variables < number of values | Expletory value will be ignored, e.g.<br>a1, a2 = 0, 1, 2, then 2 will be ignored |

## 4.1.3 Variable declaration

- In robot language, no variable becomes Local Variables by particularly having local added, and all of them are Global Variables. Examples of Global Variables and Local Variables are shown as follows.

**Example**

```
a=1
if a==1 then
 Local b=2
end
if b==2 then -- the value of b here is nil
 c=1
end
```

### 4.1.4 Reserved Keywords:

- The following keywords should not be used as variables naming declaration. Therefore, special attention should be paid at time of variables naming.
- Robot Languages are case-sensitive, “and” and “AND” are different.
- Users should not use the following names for naming the variables in the form: and, break, do, else, elseif, end, false, for, function, if, in, local, global, nil, not, or, repeat, return, then, true, until, while, P, p, table, boolean, number, string, thread, goto, in, pi, PI, Pi, pI,ON,OFF,On,Off,oN,oFF,on,off.

### 4.1.5 Point definition P：

- Two methods for indicating points in the form
- The first method: Inside the double quotation marks is the point name
- The second method: point number indication. n: point number

**Example**

```
MovP ("FirstPoint") – the first indication method, inside the double quotation marks is the point name
MovP (1) –the second indication method, point number
```

## 4.2 Operation symbols

**Table VI-2 Operation Symbols**

| Symbol | Description |
|---|---|
| + | Plus |
| - | Minus |
| * | Times |
| / | Divided |
| ^ | Power |
| AND | Logical operation : conjunction operation |
| OR | Logical operation : or operation |
| XOR | Logical operation : nonequivalence operation |

| | |
|---|---|
| > | Greater than |
| >= | Greater than or equal |
| < | Less than |
| <= | Less than or equal |
| = | equal |
| ~= | Not equal |

# 4.3 Operation commands

**Table VI-3 Operation Commands**

| Command | Description |
|---|---|
| ABS (x) | Absolute value |
| ACOS (x) | Arc cosine (in degree) |
| ASIN (x) | Arc sine (in degree) |
| ATAN (x) | Arc tangent (in degree) |
| ATAN2 (y, x) | Arc tangent of y / x (in degree) |
| CEIL (x) | Smallest integer larger than or equal to input value |
| COS (x) | Consine (in degree) |
| COSH (x) | Hyperbolic consine |
| DEG (x) | Angle radians to degrees |
| EXP (x) | Calculate the x-th power based on e |
| FLOOR (x) | Largest integer smaller than or equal to input value |
| FMOD (x, y) | Remainder of the division of x by y |
| LOG10 (x) | Logarithm of x in the base 10 |
| LOG (x[,base]) | Logarithm of x in the base, default base is natural |
| MAX (x, …) | Maximum value among its arguments |
| MIN (x, …) | Minimum value among its arguments |
| MODF (x) | Return integer part of x and fractional part of x |
| POW (x, y) | Return x^y |
| RAD (x) | Angle degrees to radians |
| SIN (x) | Sine (in degree) |
| SINH (x) | Hyperbolic sine |
| SQRT (x) | Square root |
| TAN (x) | Tangent (in degree) |
| TANH (x) | Hyperbolic tangent |

# 4.4 Basic Commands

## DELAY

### Instruction

Delay for a period of time

### Syntax

DELAY (a)

### Parameter

a: Time, unit 0.01s, period of time delay from 0.05~60s

### Example

1. DELAY (0.5) --- delay for 0.5s
2. Time=5 – variable time setting is 5
3. DELAY (Time)

# 4.5 Point Management Commands

## SetGlobalPoint

### Instruction

Save Global point

### Syntax

SetGlobalPoint (a,b,c,d,e,f,g,h)

### Parameter

This is the command for setting a point

**Table VI-4: Point variable parameter form**

| Parameter | Name | Description |
|---|---|---|
| a | Number | Point number, range 1~1000 |
| b | Name | Point name |
| c | X | Space coordinate X, floating-point number (unit: mm) can be entered, range 0.001 to 999 |
| d | Y | Space coordinate Y, floating-point number (unit: mm) can be entered, range 0.001 to 999 |
| e | Z | Space coordinate Z, floating-point number (unit: mm) can be entered, range 0.001 to 999 |
| f | C | Space coordinate C, floating-point number (unit: degree) can be entered, range 0.001 to 999 |
| g | HAND | SCARA: 0 or "R" (right hand)<br>1 or "L" (left hand) |
| h | UF | User coordinate system, up to 5 sets of coordinate can be entered, 0 is the geodetic coordinate |
| PT_TF | TF | Tool coordinate system, up to 5 sets of coordinate can be entered, 0 is the geodetic coordinate |

## CopyPoint

### Instruction

Copy point information

### Syntax

CopyPoint (a,b)

### Parameter

This is the command for setting a point

**Table VI-5: CopyPoint parameter form**

| Parameter | Name | Description |
|---|---|---|
| a | Point copied | The point, point number or point name being copied |
| b | Point copying | The point, point number or point name copying |

### Example

1. CopyPoint (1,2) – Take the point location of Point 1 as the temporary storage point location and copy the point location information of Point 2 to the point location of Point 1
2. CopyPoint ("P1","P2") – Take the point named P1 as the temporary storage point location and copy the point location information of the point named P2 to the point named P1.

## ReadPoint

### Instruction

Read point information

### Syntax

ReadPoint (a,b)

### Parameter

Table VI-6: ReadPoint parameter form

| Parameter | Name | Description |
|---|---|---|
| a | Point read | |
| b | Item to be read | "X" : X-directional coordinate (Unit:mm)<br>"Y" : Y-directional coordinate (Unit:mm)<br>"Z" : Z-directional coordinate (Unit:mm)<br>"RZ" : RZ-directional coordinate (Unit: 0.001 degree)<br>"H" : L/R hand information (0: right hand; 1: left hand) |

### Example

1. PostionX=ReadPoint (1001,"X") --Read the X coordinate of point Index 1001
2. PostionY=ReadPoint (1001,"Y") --Read the Y coordinate of point Index 1001
3. PostionZ=ReadPoint (1001,"Z") --Read the Z coordinate of point Index 1001
4. PostionRZ=ReadPoint (1001,"RZ") --Read the RZ coordinate of point Index 1001
5. PostionH=ReadPoint (1001,"H") --ead the L/R hand informaton of point Index 1001
6. PostionX1=ReadPoint ("P1","X") --Read the X coordinate of point P1
7. PostionY1=ReadPoint ("P1","Y") --Read the Y coordinate of point P1
8. PostionZ1=ReadPoint ("P1","Z") --Read the Z coordinate of point P1
9. PostionRZ1=ReadPoint ("P1","RZ") --Read the RZ coordinate of point P1
10. PostionH1=ReadPoint ("P1","H") --Read the L/R hand information of point P1

## WritePoint

### Instruction

Write temporary storage value in the point data

### Syntax

WritePoint (a,b,c)

### Parameter

Table VI-7: WritePoint parameter form

| Parameter | Name | Description |
|---|---|---|
| a | Point being written | |
| b | Parameters intended to be written in | "X" : X-directional coordinate (Unit: mm)<br>"Y" : Y-directional coordinate (Unit: mm)<br>"Z" : Z-directional coordinate (Unit: mm)<br>"RZ" : RZ-directional coordinate (Unit:0.001 degree)<br>"H" : L/R hand information (0 or "R": right hand; 1 or "L": left hand) |
| c | Input value | "X" : X-directional coordinate (Unit: mm); floating-point number can be entered, range 0.001 to 999<br>"Y" : Y-directional coordinate (Unit: mm); floating-point number can be entered, range 0.001 to 999<br>"Z" : Z-directional coordinate (Unit: mm); floating-point number can be entered, range 0.001 to 999<br>"RZ" : RZ-directional coordinate (Unit:0.001 degree); floating-point number can be entered, range 0.001 to 999<br>"H" : L/R hand information (0 or "R": right hand; 1 or "L": left hand) |

### Example

1. WritePoint(1001,"X",300)--Input 300mm for the X coordinate of point Index 1001
2. WritePoint(1001,"Y",50)--Input 50mm for the Y coordirnate of point Index 1001
3. WritePoint(1001,"Z",-50)--Input -50mm for the Z coordirnate of point Index 1001
4. WritePoint(1001,"RZ",30)--Input 30° for the RZ coordirnate of point Index 1001
5. WritePoint(1001,"H",0)--Input 0 for the L/R hand information of point Index 1001
6. WritePoint("P1","X",250)--Input 250mm for the X coordirnate of point P1
7. WritePoint("P1","Y",50)--Input 50mm for the Y coordirnate of point P1
8. WritePoint("P1","Z",-100)--Input -100mm for the Z coordirnate of point P1
9. WritePoint("P1","RZ",30)--Input 30° for the RZ coordirnate of point P1
10. WritePoint("P1","H",1)--Input 1 for the L/R hand information of point P1
11. WritePoint(1002,"X",300.223)--Input 300.223mm for the X coordirnate of point Index 1002

12. WritePoint (1002,"Y",50.671)--Input 50.671mm for the Y coordirnate of point Index 1002
13. WritePoint (1002,"Z",-50.111)--Input -50.111mm for the Z coordirnate of point Index 1002
14. WritePoint (1002,"RZ",30.456)--Input 30.456° for the RZ coordirnate of point Index 1002
15. WritePoint (1002,"H",0)--Input 0 for the L/R hand information of point Index 1002
16. WritePoint ("P2","X",250.232)--Input 250.232mm for the X coordirnate of point P2
17. WritePoint ("P2","Y",50.761)--Input 50.761mm for the Y coordirnate of point P2
18. WritePoint ("P2","Z",-100.105)--Input -100.105mm for the Z coordirnate of point P2
19. WritePoint ("P2","RZ",30.222)--Input 30.222° for the RZ coordirnate of point P2
20. WritePoint ("P2","H",1)--Input 1 for the L/R hand information of point P2

## RobotX

### Instruction

The X-directional coordinate of current Cartesian coordinate, unit: mm

### Syntax

RobotX ()

### Parameter

This is the command for reading the current position of X coorindate

### Example

NowPosition_X=RobotX ()

## RobotY

### Instruction

The Y-directional coordinate of current Cartesian coordinate, unit: mm

### Syntax

RobotY ()

### Parameter

This is the command for reading the current position of Y coorindate

### Example

NowPosition_Y=RobotY ()

## RobotZ

### Instruction

The Z-directional coordinate of current Cartesian coordinate, unit: mm

### Syntax

RobotZ ()

### Parameter

This is the command for reading the current position of Z coorindate

### Example

NowPosition_Z=RobotZ ()

### RobotRZ

**Instruction**

RZ-direction coordinate value of the current cassette coordinate; when the tool coordinate or the RZ-direction coordinate value of the user coordinate needs to be read, it must switch to the corresponding coordinate status in order for the corresponding coordinate information to be read.

**Syntax**

RobotRZ ()

**Parameter**

This is the command for reading the current position of RZ coorindate

**Example**

NowPosition_RZ=RobotRZ ()

### Robothand

**Instruction**

The L / R hand status of current robot; value 0 = right hand, value 1 = left hand

**Syntax**

Robothand ()

**Parameter**

This is the command for reading the L / R hand information of the current position

**Example**

NowPosition_hand=Robothand()

## 4.6 Motion Parameters

### AccJ

**Instruction**

Acceleration, affecting the motion command of MovP, MovJ

**Syntax**

AccJ (a)

**Parameter**

a: Percentage, range 1~100, cannot enter floating-point number

**Example**

AccJ (50)

## DecJ

**Instruction**

Deceleration, affecting the motion command of MovP, MovJ

**Syntax**

AccJ (a)

**Parameter**

a: Percentage, range 1~100, cannot enter floating-point number

**Example**

DecJ (50)

## SpdJ

**Instruction**

Maximum speed, affecting the motion command of MovP, MovJ

**Syntax**

SpdJ (a)

**Parameter**

a: Percentage, range 1~100, cannot enter floating-point number

**Example**

SpdJ (100)

## AccL

**Instruction**

Acceleration, affecting the motion command of MovL, MArchL, Marc, MCircle

**Syntax**

AccL (a)

**Parameter**

a: Actual speed mm / sec$^2$, range 1~25000, cannot enter floating-point number

**Example**

AccL (5)

## DecL

**Instruction**

Deceleration, affecting the motion command of MovL, MArchL, Marc, MCircle

**Syntax**

DecL (a)

**Parameter**

a: Actual speed mm / sec$^2$, range 1~25000, cannot enter floating-point number

**Example**

DecL (5)

### SpdL

**Instruction**

Maximum speed, affecting the motion command of MovL, MArchL, Marc, MCircle

**Syntax**

SpdL (a)

**Parameter**

a: Actual speed mm / sec, range 1~2000, cannot enter floating-point number

**Example**

SpdL (10) –Line speed is 10 mm / sec

### Accur

**Instruction**

Accuracy of points passed through
Valid for the motion command without PASS Parameter set

**Syntax**

Accur (a)

**Parameter**

a: "STANDARD" (0.1mm)
"HIGH" (0.01mm)

**Example**

1. Accur ("HIGH")
2. MovL ("P1")
3. MovL ("P2")
4. Accur ("STANDARD")
5. MovL ("P3")

## 4.7 Motion Control Commands

### RobotServoOn

**Instruction**

Activate the robot’s servo motor

**Syntax**

RobotServoOn ()

**Example**

RobotServoOn ()

## RobotServoOff

### Instruction

Stop the robot's servo motor

### Syntax

RobotServoOff ()

### Example

RobotServoOff ()

## MovJ

### Instruction

Control motor axis to rotate to the target position

### Syntax

MovJ (a,b)
MovJ (a,b,c)
MovJ (a,b,c,d,e)

### Parameter

a: Motor shaft number, 1~4
b: In case of input for shaft 1, 2 or 4, this is the angle of absolute position, unit: degree
In case of input for shaft 3, this is the absolute position, unit: mm
In case of input for shaft 5 to 10 (external shafts), this is the absolute position, unit: PUU (Plus User Unit)
c: Maximum speed % (optional), input range 1~100
d: Acceleration % (optional), input range 1~100
e: Deceleration % (optional), input range 1~100

### Example

1. MovJ (4,180)
2. MovJ (4,180,50) --shaft 4 moves to the 180-degree position with speed set as 50%
3. MovJ (4,-180,100,10,10) --shaft 4 moves to the minus 180-degree position with speed set as 100% and acceleration / deceleration set as 10%

## MovP

### Instruction

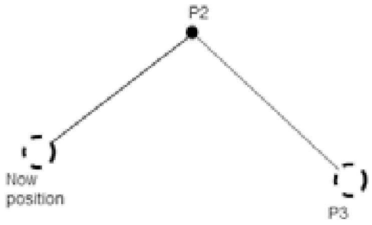
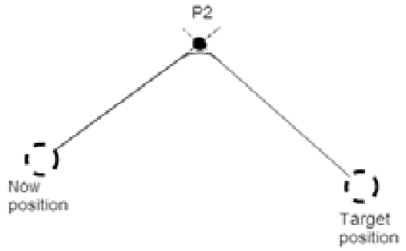
Perform point to point motion via absolute coordinates

### Syntax

MovP (a,b,c,d,e)
MovP (a,c,d,e)
MovP (a,c)
MovP (a,b)
MovP(a)

### Parameter

a: End point, point variable
b: PASS (optional), pass the end point

| No PASS | PASS |
|---|---|
| When no PASS command is added, the robot will only move towards P3 after fully reaching P2 | When a PASS command is added, the robot will move towards P3 without reaching P2. This function can help the robot to skip over unimportant point locations |
|  |  |

c: Maximum speed % (optional), input range 1~100

d: Acceleration % (optional), input range 1~100

e: Deceleration % (optional), input range 1~100

**Example**

1. MovP(1)---move to the first point via PtP
2. MovP(2,"PASS")--- move to the second point via PtP continuous movement
3. MovP(3,100,50,50)--- move to the third point via PtP, with speed set as 100% and acceleration/deceleration set as 50%
4. MovP("P0",100,50,50)-- move to P0 with speed set as 100% and acceleration/deceleration set as 50%
5. MovP("P1", "PASS",1000,500,500)---move to point 1 via PtP continuous movement, with speed set as 1000mm/s and acceleration/deceleration set as 500mm/s$^2$

## MovPR

**Instruction**

Perform point to point motion in relative term

**Syntax**

MovPR(a,b)
MovPR(a,b,c)

**Parameter**

a: Moving distance

Positive value: moving in positive direction
Negative value: moving in negative direction
When moving the direction of X, Y, Z coordinates, unit: mm
When moving the direction of C coordinate, unit: degree

b: Moving direction

"X": direction of X-coordinate
"Y": direction of Y-coordinate
"Z": direction of Z-coordinate
"C": direction of C-coordinate

c: moving speed % (optional), input range 1~100

**Example**

1. MovPR (10,"X") ---Move 10mm relatively towards positive X direction via PtP
2. MovPR (-10,"X") ---Move 10mm relatively towards negative X direction via PtP
3. MovPR (10,"Y") ---Move 10mm relatively towards positive Y direction via PtP
4. MovPR (10,"Z") ---Move 10mm relatively towards positive Z direction via PtP
5. MovPR (-10,"Z") ---Move 10mm relatively towards negative Z direction via PtP
6. MovPR (10,"C") ---Move 10 ° degrees relatively towards positive C direction via PtP
7. MovPR (-10,"C") ---Move 10 ° relatively towards negative C direction via PtP

## MovL

### Instruction

Perform rectilinear motion via absolute coordinates

### Syntax

MovL (a,b,c,d,e)
MovL (a,c,d,e)
MovL (a,c)
MovL (a,b)
MovL(a)

### Parameter

a: End point, point variable
b: PASS (optional), pass the end point
c: Maximum speed mm / sec (optional), input range 1~2000
d: Acceleration mm / sec$^2$ (optional), input range 1~25000
e: Deceleration mm / sec$^2$ (optional), input range 1~25000

### Example

1. MovL ("P1") ---move to the first point via Line movement
2. MovL (1, "PASS") ---move to the first point via Line continuous movement
3. MovL (1,1000,500,500) --- move to point 1 via Line movement, with speed set as 1000mm / s and acceleration / deceleration set as 500mm / s$^2$
4. MovL ("P1", "PASS",1000,500,500) --- move to point 1 via Line continuous movement, with speed set as 1000mm / s and acceleration / deceleration set as 500mm / s$^2$

## MovLR

### Instruction

Perform rectilinear motion in relative term

### Syntax

MovLR (a,b)
MovLR (a,b,c)

### Parameter

a: Moving distance
Positive value: moving in positive direction
Negative value: moving in negative direction
When moving the direction of X, Y, Z coordinates, unit: mm
When moving the direction of C coordinate, unit: degree
b: Moving direction

"X": direction of X-coordinate
"Y": direction of Y-coordinate
"Z": direction of Z-coordinate
"C": direction of C-coordinate

c: moving speed % (optional)

**Example**

1. MovLR (10,"X") ---Move 10mm relatively towards positive X direction via Line movement
2. MovLR (-10,"X") ---Move 10mm relatively towards negative X direction via Line movement
3. MovLR (10,"Y") ---Move 10mm relatively towards positive Y direction via Line movement
4. MovLR (10,"Z") ---Move 10mm relatively towards positive Z direction via Line movement
5. MovLR (-10,"Z") ---Move 10mm relatively towards negative Z direction via Line movement
6. MovLR (10,"C") ---Move 10 ° relatively towards positive C direction via Line movement
7. MovLR (-10,"C") ---Move 10 ° relatively towards negative C direction via Line movement

## MArc

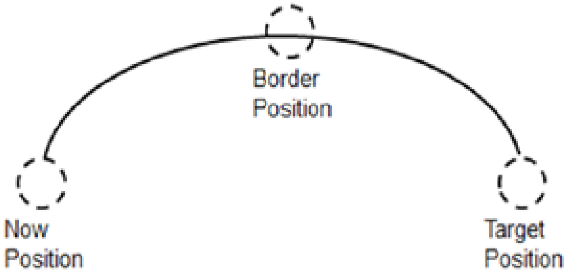
**Instruction**

Make arc motion via absolute coordinates

**Syntax**

MArc (a,b)
MArc (a,b,c)
MArc (a,b,c,d)
MArc (a,b,c,d,e,f)

**Parameter**



a: Passing point, point variable
b: End point, point variable
c: Circle mode, there is BORDER mode
d: Maximum speed mm / sec (optional), input range 1~2000
e: Acceleration mm / sec$^2$ (optional), input range 1~25000
f: Deceleration mm / sec$^2$ (optional), input range 1~25000

**Example**

1. MArc ("P1","P2","BORDER") --P1 as the passing point and P2 as the target point, move via continuous mode
2. MArc ("P1","P2","BORDER",100) -- P1 as the passing point and P2 as the target point, move via continuous mode with speed of 100mm / s
3. MArc ("P1","P2",BORDER,100,100,100) -- P1 as the passing point and P2 as the target point, move via continuous mode with speed of 100mm / s, acceleration 100mm / s$^2$ and deceleration 100mm / s$^2$

## MCircle

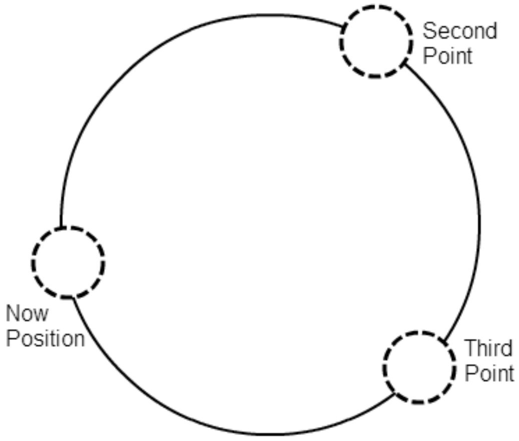
### Instruction

Make circle motion via absolute coordinates, with 3 points forming a circle

### Syntax

MCircle (a,b)
MCircle (a,b,c)
MCircle (a,b,c,d)
MCircle (a,b,c,d,e,f)

### Parameter



a: Point 2, point variable
b: Point 3, point variable
c: Circle mode, there is BORDER mode
d: Maximum speed mm / sec (optional), input range 1~2000
e: Acceleration mm / sec$^2$ (optional), input range 1~25000
f: Deceleration mm / sec$^2$ (optional), input range 1~25000

### Example

1. MCircle ("P1","P2","BORDER") -- P1 as the passing point and P2 as the target point, move via continuous mode
2. MCircle ("P1","P2","BORDER",100) -- P1 as the passing point and P2 as the target point, move via continuous mode with speed of 100mm / s
3. MCircle ("P1","P2","BORDER",100,100,100) -- P1 as the passing point and P2 as the target point, move via continuous mode with speed of 100mm / s, acceleration 100mm / s$^2$ and deceleration 100mm / s$^2$

## Lift

### Instruction

Use the absolute coordinate to move to the location of the relative point of reference. The parameters entered are the upper-body  angle, ascending angle, ascending level and ascending direction.

### Syntax

Lift (a,b,c,d)

### Parameter

a: Location of the Reference point and point location variable
b: Ascending angle (unit: degree) (1~90)
c: Ascending level (unit: mm)
d: Ascending direction (unit: degree) (-360~360)

### Example

Lift ("P0",45,10,90) – The P0 point is used as the reference point. A point is moved to the location with 45-degree ascending angle referring to the specified reference point, 10 mm ascending level and 90-degree ascending direction.

# 4.8 Coordinate System Commands

## SetUF

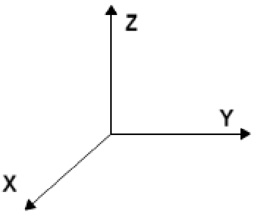
### Instruction

Set the user coordinate system

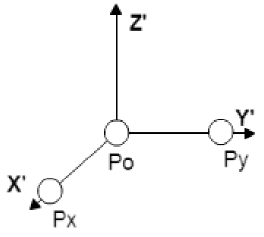
### Syntax

SetUF (a,b,c,d)

### Parameter



World Coordinate



User Coordinate

a: Index of the coordinate system; nine sets of user coordinate are provided for use, input range 1~9
b: The original point of the user coordinate system (Po in diagram)
c: Set the position point in the X-axis direction of the user coordinate system (Px in diagram)
d: Set the position point in the Y-axis direction of the user coordinate system (Py in diagram)

### Example

1. SetUF (1,"P0","P1","P2") --Set P0 as the original point of the user coordinate system 1
--Set P1 as the position point in the X-axis direction of the user coordinate system 1
-- Set P2 as the position point in the Y-axis direction of the user coordinate system 1

## ChangeUF

### Instruction

Switch the user coordinate system

### Syntax

ChangeUF (a)

### Parameter

a: Index of the coordinate system; five sets of user coordinate are provided for use, input range 1~5. 0 will switch back to the geodetic coordinate system.

### Example

1. ChangeUF (1) --- Switch to user coordinate system 1
2. ChangeUF (0) --- Switch to geodetic coordinate system

## SetTF

### Instruction

Set the tool coordinate system

### Syntax

SetTF (a,b,c,d)

### Parameter

a: The coordinate system index provides 9 sets of the tool coordinate system. (1~9)
b: Set the width of the tool
c: Set the height of the tool
d: Set the angle of the tool

### Example

```
SetTF (1,10,20,30)    -- Set the width of the tool coordinate system 1 to 10 mm
                      -- Set the length of the tool coordinate system 1 to 20 mm
                      -- Set the height of the tool coordinate system 1 to 30 mm
```

## ChangeTF

### Instruction

Switch the tool coordinate system

### Syntax

ChangeTF (a)

### Parameter

a: Coordinate system number (1~9) provides 9 sets of the tool coordinate system. Enter 0 to return to the world coordinate system.

### Example

1. ChangeTF (1) --- Switch to the tool coordinate system 1
2. ChangeTF (0) --- Switch to the world coordinate system

# 4.9 Process Control Commands

## if…end

### Instruction

If conditional statement (predicate) : The program imports different program blocks based on the different conditions assumed.

### Syntax

```
if a then
execute program 1
end
```

### Parameter

a: The condition

### Example

```
1. if DI (1) == "ON" then
2.      MovP ("P1")
3. end
```

---

## if…elseif…end

### Instruction

if assertion: The program introduces different program code segments via different assumed situations.

### Syntax

```
if a then
execute program 1
elseif b then
execute program 2
end
```

### Parameter

a: Condition 1

b: Condition 2

### Example

```
1. if DI (1)  == "ON"  then
2. MovP ("P1")
3.     elseif DI(2) == “ON” then
4. MovL(“P2”)
5. end
```

---

## while…do..end

### Instruction

while loop: the program will continuously repeat an execution. To break the loop, use the "break" command.

### Syntax

```
while a do
loop executing program
end
```

### Parameter

a: Execute if signal is "true"

### Example

Calculate accumulation of i until 100, then exit the while loop

```
i = 1
while true do
 i = i + 1
 if i==100 then
  break
 end
end
```

## for (type1)

### Instruction

for loop: use the loop command to make the program continuously repeat an execution.

### Syntax

```
for a=b,c do
loop executing program
end
```

### Parameter

a: Loop variable

b: Set the initial value of loop variable

c: Set the final value of the loop variable.
The default updated value is 1.

### Example

Calculate the sum of array a

```
a = {5, 4, 3, 2, 1}
i = 1
sum = 0
for i = 1, 5 do
    sum = sum + a[i]
end
```

## for (type2)

### Instruction

for loop: use the loop command to make the program continuously repeat an execution.

### Syntax

```
for a=b,c do
```

loop executing program end

### Parameter

a: Loop variable
b: Set the initial value of loop variable
c: Set the final value of the loop variable
d: Updated value

### Example

Calculate the sum of array a

```
a = {5, 4, 3, 2, 1}
i = 1
sum = 0
for i = 1, 5 do
     sum = sum + a[i]
end
```

## repeat…until

### Instruction

repeat loop: the program will continuously repeat an execution. Remember to add the predicates where "until" appears.

### Syntax

```
repeat
loop executing program
until a
```

### Parameter

a: The condition

### Example

Calculate the sum of array a

```
a = {5, 4, 3, 2, 1}
i = 1
sum = 0
repeat
   sum = sum + a[i] -- sum = 15
    i = i + 1
until i > #a -- #a: get size of array a
```

## function…end

### Instruction

User-defined sub-function. Before using the sub-function, the sub-function must be declared first.

### Syntax

```
function a ()
execute program
```

end

**Parameter**

a: Sub-function name; this must be in English alphabets or numbers, and must not be in word string or other languages.

**Example**

```
1.function MyFunc1 ()
2.    MovP (1)
3.    MovP ("P2")
4. end
5. MovL (3)
6. MyFunc1 ()
```

---

# 4.10 IO Operation Commands

## DI

**Instruction**

Read the status of digital input

**Syntax**

DI (n)

**Parameter**

n: Digital input pin number, input range 1~24

**Example**

```
1.if DI (1) == "ON" then
2. MovL ("P1")
3.end
```

---

## DO

**Instruction**

Read or write in digital output

**Syntax**

DO (n,s)

DO (n,s,t)

**Parameter**

n: Digital output pin number, input range 1~12

s: ON / OFF

t: Delay time

**Example**

```
1. if DO (1) == "ON" then
2. DO (1,"OFF") --Let first DO Off
3. end
4. if DO (1) == "OFF" then
5. DO (1,"ON") --Let first DO On
```

6. end
7. DO (1,"ON",1) --Let first DO On for one second

## ReadModbus

### Instruction

It is the command for external communication to read the value of the memory location. The readable memory location is 0x1000 to 0x1FFF. A total of 4096 words can be used. When data is read in length of double word, the memory location to be read must be even numbers for the reading action to be performed.

### Syntax

ReadModbus (a,b)

### Parameter

a: Input the Modbus address to be read, input range 0x1000~0x1FFF
b: Input the length of data to be read, input value "W" or "DW"

### Example

```
1. WriteModbus (0x1000,"W",1)
2. readModbus_0x1000=ReadModbus (0x1000,"W")
3. if readModbus_0x1000 == 1 then
4. WriteModbus (0x1F00,"DW",2)
5. DELAY (0.1)
6. end
7. readModbus_0x1F00=ReadModbus (0x1F00,"DW")
```

## WriteModbus

### Instruction

It is the command for external communication to write the value of the memory location. The writable memory location is 0x1000 to 0x1FFF. A total of 4096 words can be used. When data is written in length of double word, the memory location to be written in must be even numbers for the writing action to be performed.

### Syntax

WriteModbus (a,b,c)

### Parameter

a: Input the Modbus address to be written in, range 0x1000~0x1FFF
b: Input the length of data to be written in, input value  "W" or "DW"
c: Input the value of Modbus address to be written in

### Example

```
1.WriteModbus (0x1000,"W",1)
2.readModbus_0x1000=ReadModbus (0x1000,"W")
3.if readModbus_0x1000 == 1 then
4. WriteModbus (0x1F00,"DW",2)
5. DELAY (0.1)
6.end
7.readModbus_0x1F00=WriteModbus (0x1F00,"DW")
```

# 4.11 Program Executing Commands

## QUIT

### Instruction

Stop executing program

### Syntax

QUIT ()

### Parameter

None

### Example

```
1.IOStatus=DI (1)
2.DELAY (1)
3.if IOStatus~=“ON” then
4. QUIT ()
5.end
```

## PAUSE

### Instruction

Suspend the current action. To continue with the execution, a start action must be externally triggered (method for starting: write 2 in the memory location 0x0228 by an external program)

### Syntax

PAUSE ()

### Parameter

None

### Example

```
1.IOStatus=DI (1)
2.DELAY (1)
3.if IOStatus~="ON" then
4. PAUSE ()
5.end
```

# 4.12 Application Function Commands

## SafetyMode

### Instruction

This function is used to pause functions

### Syntax

SafetyMode(a)

### Parameter

a: There are five modes ranging from 1~5; the default status is set as mode 1.

1: Action completed when grating touches; IO stays in current status;

2: Action completed when grating touches; IO returns to OFF status;

3: Disable default function and user manually edits the function at RL;

4: Action slows down and stops when grating touches; IO stays in current status and triggers reset system DI (which is system DI 3),and it continues operating;

5: Action slows down and stops when grating touches; IO returns to OFF status and triggers reset system DI (which is system DI 3),and it continues operating;

### Example

1. SafetyMode (4) – Set grating mode as mode 4; action slows down and stops when grating touches; IO stays in current status and triggers reset system DI (which is system DI 3), and it continues operating.
2. MovP (1)
3. SafetyMode (1) – Set grating mode as mode 1; action completed when grating touches; IO stays in current status.
4. MovP (2)

## SafetyStatus

### Instruction

This is the status used to trigger the grating

### Syntax

SafetyStatus()

### Parameter

Status read includes 0, 2 and 3

0: Means the grating was not triggered, which is the normal operating status.

2: Means the grating was triggered when the program was not operating; during this time the motor servo status if OFF.

3: Means the grating was triggered while the program was operating.

### Example

```
1. if SafetyStatus()== 3 then
2.  PAUSE()
3.  end
```

Smarter. Greener. Together.

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