

MotoSim EG Ver3.60

OPERATION MANUAL

FOR WINDOWS

Upon receipt of the product and prior to initial operation, read this manual thoroughly, and retain for future reference.



MANDATORY

- **This manual explains teaching, playback, editing operations of jobs and files, operation management of MotoSim EG. Read this manual carefully and be sure to understand its contents before operation.**
- **General items related to safety are listed in instruction manuals supplied with the manipulator. To ensure correct and safe operation, carefully read the instructions on safety before reading this manual.**



CAUTION

- **Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.**
- **The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.**
- **YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.**
- **If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.**
- **YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.**
- **Software described in this manual is supplied against licensee only, with permission to use or copy under the conditions stated in the license. No part of this manual may be copied or reproduced in any form without written consent of YASKAWA.**

Notes for Safe Operation

Before using this product, read this manual and all the other related documents carefully to ensure knowledge about the product and safety, including all the cautions.

In this manual, the Notes for Safe Operation are classified as “WARNING”, “CAUTION”, “MANDATORY”, or “PROHIBITED”.



WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.



CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.



MANDATORY

Always be sure to follow explicitly the items listed under this heading.



PROHIBITED

Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations. At any rate, be sure to follow these important items.



To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “CAUTION” and “WARNING”.

Notation for Menus and Buttons

Descriptions of the programming pendant, buttons, and displays are shown as follows:

Item	Manual Designation
Menu	The menus displayed on screen are denoted with { }. ex. {TOOL}.
Button	The buttons, check boxes, radio buttons displayed on screen are denoted with []. ex. [Close]; [Sync] check box; [Fast] radio button.

Description of the Operation Procedure

In the explanation of the operation procedure, the expression "Select •••" means the following operations:

- To move the cursor to the object item and left-click on it with the mouse.
- To pick out the object item by the tab key and press the Enter key.
(In case of selecting a menu, use arrow keys instead of the tab key to pick out the object item, then press the Enter key.)

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1 Introduction

1.1 Overview of MotoSim EG

MotoSim EG is a software which has been developed as an offline teaching system for YASKAWA industrial robot MOTOMAN series.

MotoSim EG reduces teaching time requiring an actual robot, supports improvement of productivity and insures operator's safety by enabling robot teaching on a personal computer. MotoSim EG is an application software for MS-Windows having excellent operability and many advantages such as running multiple applications at once.

1.2 Environment Required for MotoSim EG

To run MotoSim EG, the following hardware and software are required:

OS	Microsoft Windows 2000 Service Pack 4 or later Windows XP Service Pack 2 or later ^{*1}
Memory	128 MB or more
Hardware Disk	500 MB or more
Monitor	Supported by MS-Windows (256 colors or more)
Hardware Key	Used under single user environment. For details, refer to " 1.3 Hardware Key " in the following section.

^{*1} MS-Windows 2000 or MS-WindowsXP are registered trademarks of Microsoft Corporation, USA.

1.3 Hardware Key

For proper operation, install the provided hardware key to the personal computer before using this software.

Perform <Checking the computing environment> and <Installing the driver> explained below before connecting the key to the personal computer. Connect the key to the USB port after completing those procedures.

<Checking the computing environment>

Multi-connection of USB type key is not available for one USB port because of hardware structure. Therefore, only one key can be connected to one USB port. When installing multiple software with USB keys into one personal computer, use a personal computer which provides at least the same numbers of USB ports as the number of software to be installed.

<Installing the driver>



Be sure to install the driver with the key detached from the personal computer.

For Windows 2000/XP/Vista environment:

- Execute "\SentinelDriver\Sentinel System Driver Installer 7.4.0.EXE" of the installation CD-ROM.
- Refer to "\SentinelDriver\Manual\us\ReadMe.pdf" for the installation procedure.

For Windows NT4.0 environment:

- Execute "\SentinelDriver\SSD5411\SSD5411-32bit.exe" of the installation CD-ROM.
- Refer to "\SentinelDriver\SSD5411\Manual\us\ReadMe.pdf" for the installation procedure.



- The necessary drivers must be install for Windows NT4.0/2000/XP/Vista environment.
- When installing the driver under Windows NT4.0/2000/XP/Vista environment, be sure to login in administrator mode in order to add files to system folder and input information in registry.
- If a key is connected to the personal computer before installing the driver, Windows wizard ([Add New Hardware] Wizard) starts up. In this case, press [cancel], and remove the key from the personal computer and then install the driver.

Refer to " 13.4 Frequently-Asked Questions " for other countermeasures concerning hardware key.

1.4 Installing MotoSim EG

1. Turn ON the power of the computer and monitor to start up Windows.



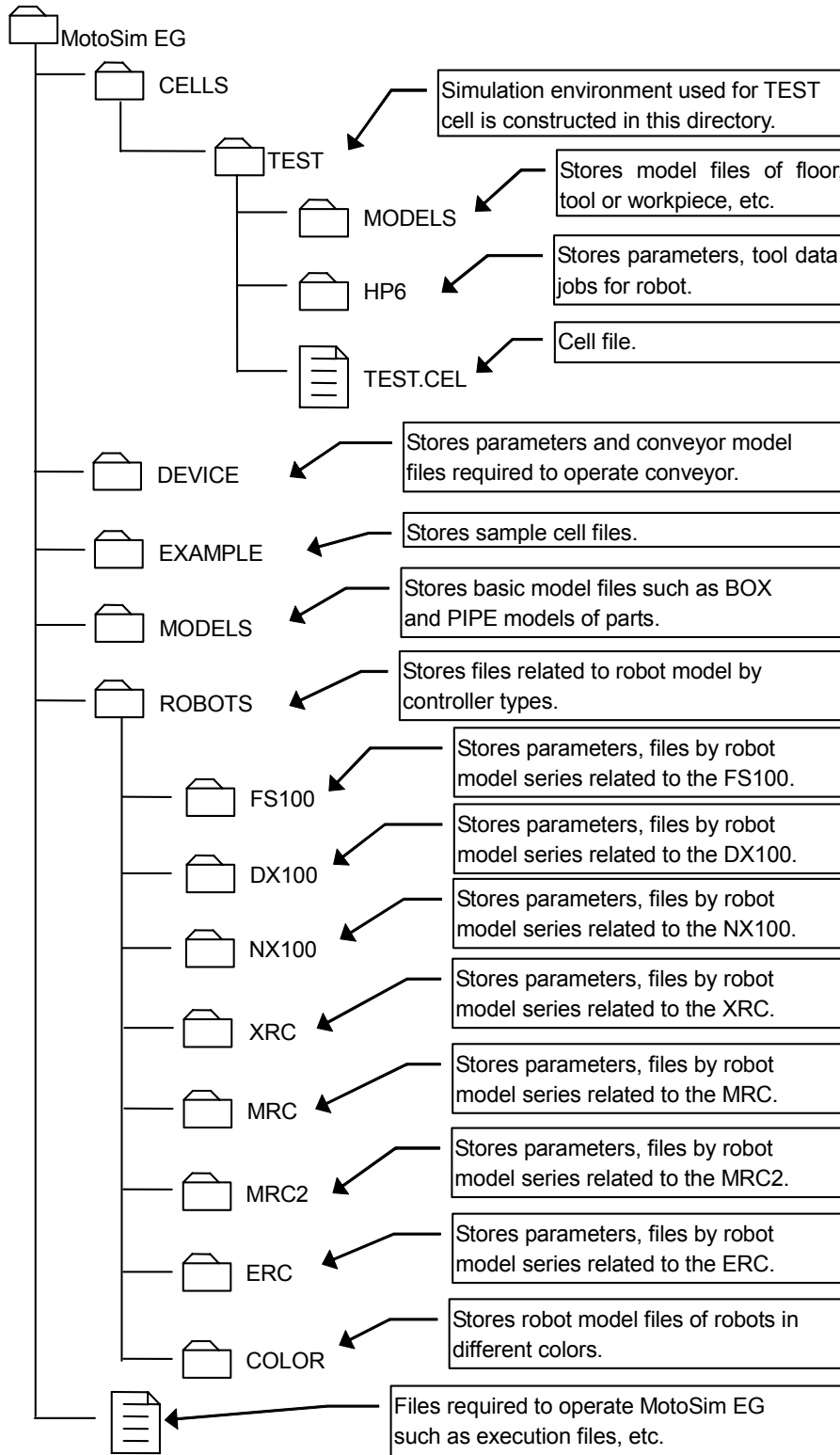
- Be sure to login in administrator mode when installing the MotoSim EG in Windows 2000/XP, or else the system related DLL files in Windows might not be updated.
- It is necessary to install Windows 2000 Service Pack 4 and Windows Installer 3.1 for Microsoft Windows 2000.

2. Insert the installation CD-ROM into the CD-ROM drive.
3. Click the [Start] button in the task bar and point to {Settings}. Click {Control Panel}, and select the {Add/Remove Programs}.
4. Click the [Install] button. Follow the on-screen instructions to run "MotoSimEG\setup.exe" from the CD-ROM drive.
5. The installation program starts running. Follow the on-screen instructions.
6. When the setup is completed, {MotoSim EG} is registered under the {MotoSim EG} folder that appears by clicking the [Start] button in the task bar and selecting {Program} and then {Motoman}.
7. Connect the hardware key to the printer port.
For details, refer to " 1.3 Hardware Key " in this chapter.

1.5 Definition of Terms

Cell (*.cel)	A file in which MotoSim EG simulation environmental data are recorded. Folder information to store the operation contents, model file information such as robots, workpieces or tools, data of operational environment layout, etc. is recorded.
Model file (*.mdl)	A file in which geometric data of robots, workpieces or tools are recorded.
Parameter data, tool data	Information necessary to run a simulation. It is preferable to use the actual robot data. However, if unavailable, the default data provided by MotoSim EG may be used.
Parent model	Each model requires a coordinate that refers to something in the layout. Model to which the coordinate of a model refers to is called "parent model". The most basic reference model in the MotoSim EG is "world". Normally, world becomes parent for workpiece models or robot models. However, since tool models or positioners move along with external axis or robot axes, they refer to different parent models than fixed model. Since tool models must move with the robot, the robot model flange is normally set as the parent model of the tool model.

1.6 Folder Configuration



The above diagram is based on the assumption that the cell "TEST" is the file in which the simulation environmental data is stored, and that there is a robot named "HP6". The model files other than the robot model files are stored in the folder "TESTMODELS".

2 MotoSim EG Quick Tour

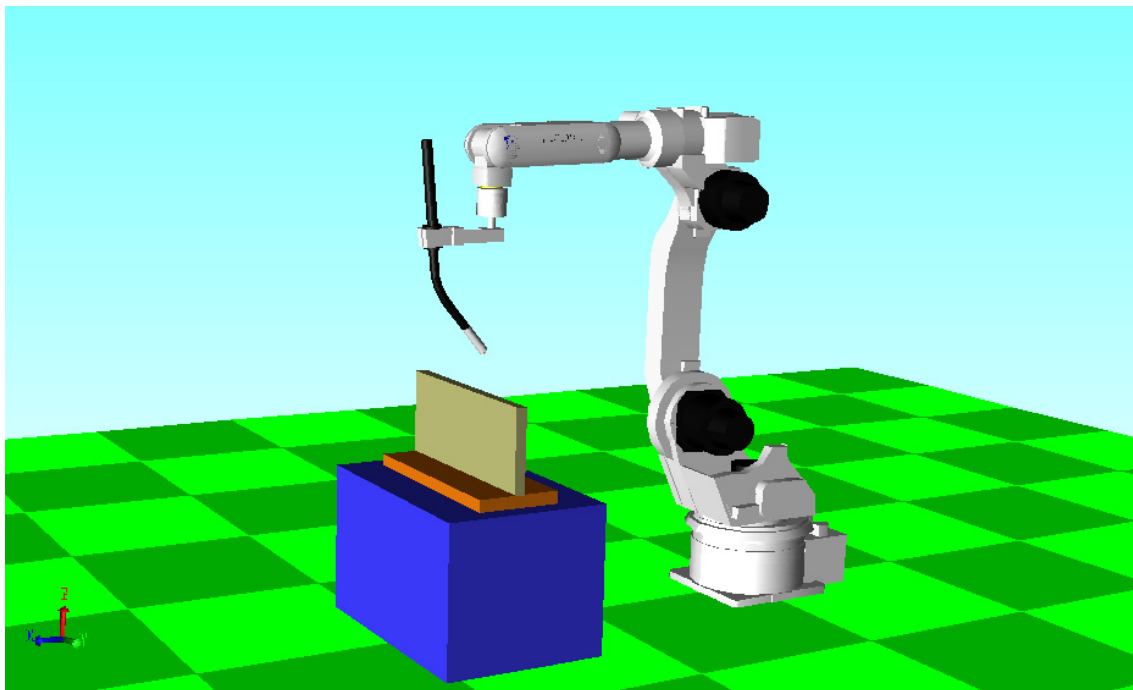
This chapter describes the basic operation of MotoSim EG by giving practical examples to first time users of this system.

Read this chapter thoroughly in order to quickly take advantage of the excellent operability and various functions of MotoSim EG.

2.1 Overview

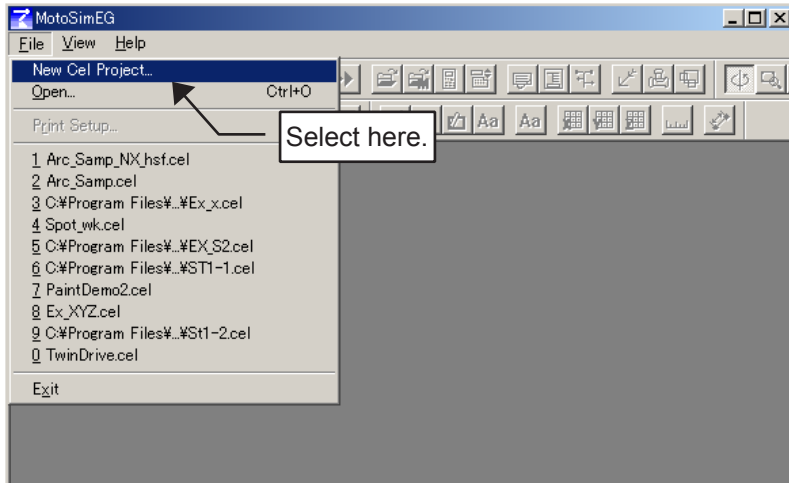
This chapter describes the procedures from cell construction to job creation. An arc welding application is used as an example to illustrate the creation of workpieces for fillet-welding and a welding torch for tool, and then to teach a welding path.

The following sections aim to create a robot, a workpiece and a stand like the ones prepared in "Arc_samp_NX" sample cell shown in the figure below.

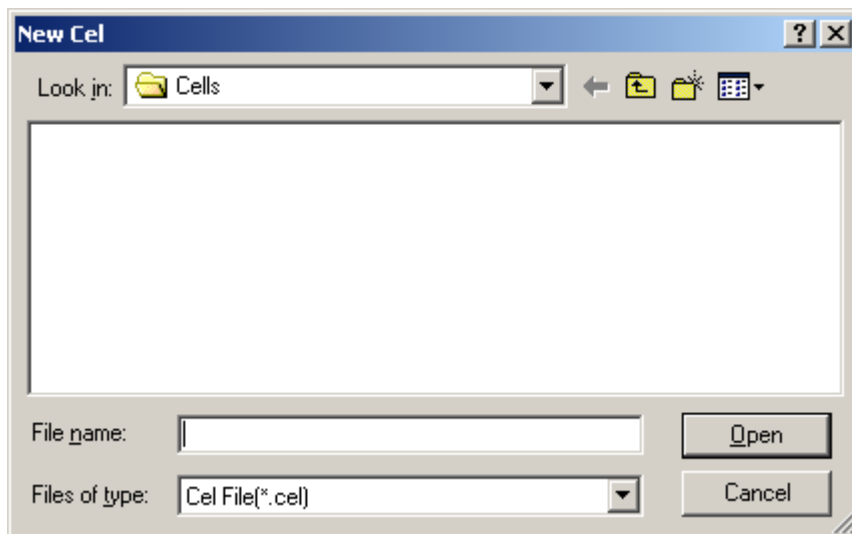


2.2 Cell Construction

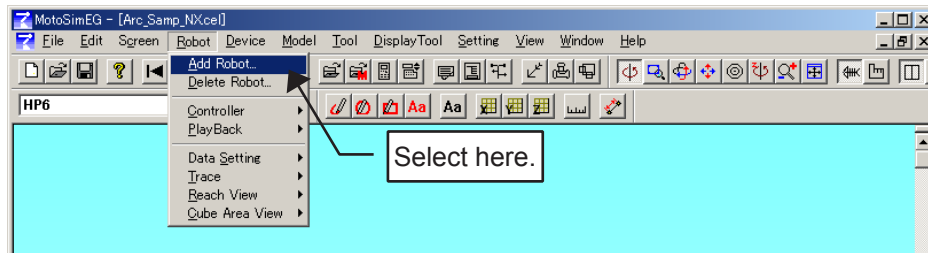
1. Click on [START] in the task bar menu, then click {PROGRAM} - {Motoman} - {MotoSim EG} - {MotoSim EG} to run MotoSim EG.
2. When the main window appears, select {New Cel Project...} in the {File} menu.



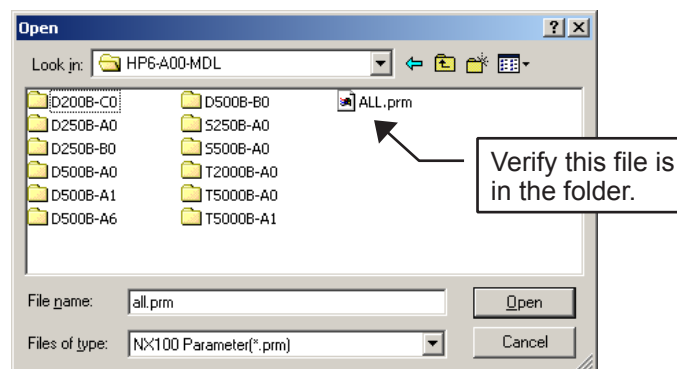
3. When the New Cel dialog box appears, enter any cell name: a folder where cells, parameter data, model data, job data, etc. are stored can also be set. (The new folder name is the same as the cell name.) In this example, the "CelTest" cell is created in the "CELLS" folder in the "MotoSimEg\Cells" folder. Enter "CelTest" in the File name edit box and click the [OK] button.



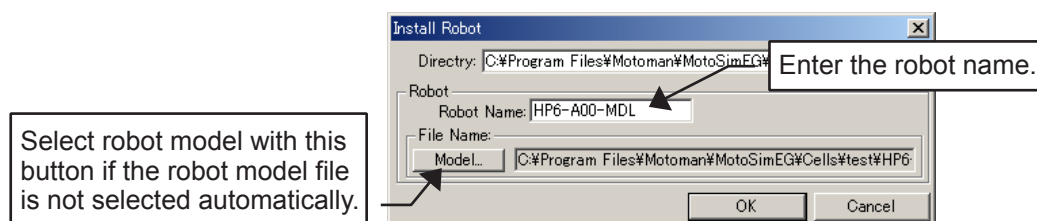
4. The new cell with only a floor model appears.
Register a robot in the cell by selecting {Robot} then {Add Robot...}.



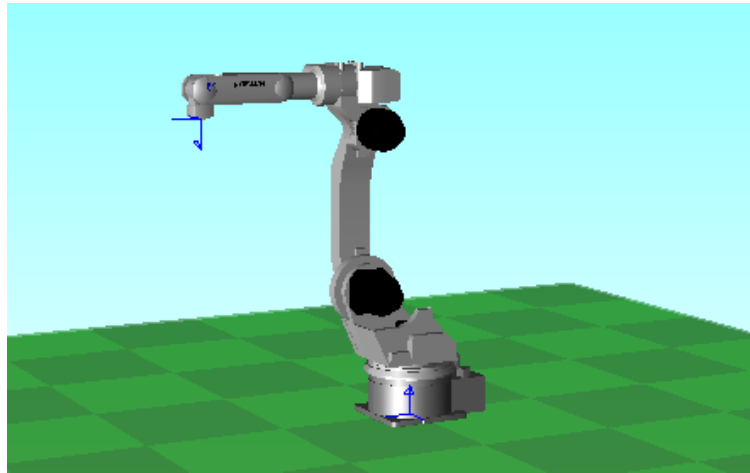
5. In file selection screen, select the folder where the robot parameter data, tool data, etc. are stored: select "Hp6-a00-MDL" folder from "\ROBOTS\NX100\HP-Family" folders. Verify that "All.prm" is listed in the file name list box of the "Hp6-a00-MDL" folder; select the "All.prm" parameter file and click the [Open] button.



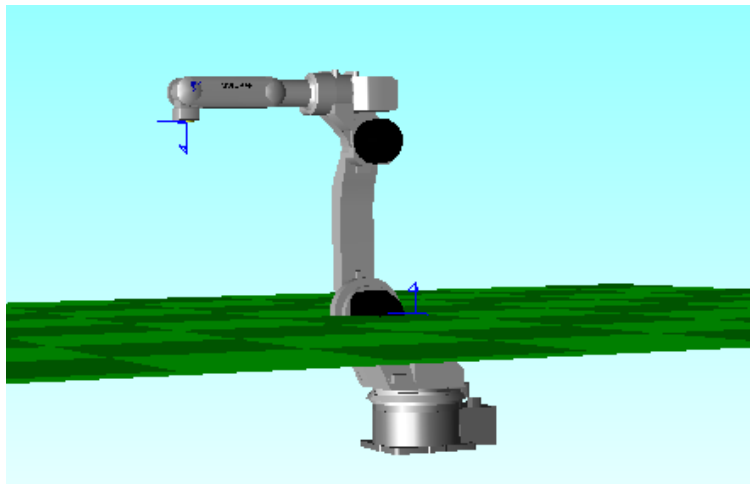
6. Specifying the parameter file displays the "Install Robot" dialog box as shown below. Enter any robot name in the Robot Name input box. (Here in this example, "HP6" is entered.)
Since the robot model is usually in the same folder where its corresponding parameter file is stored, the robot model selection is automatically made with its name displayed in the Robot Name input box when the parameter file is specified. However, if the MotoSim EG folder composition has been changed or the robot model file has been deleted, the robot model file is not selected automatically. In this case, click the [Model] button to open the File Selecting Screen, then select the robot model: in this example here, "HP6-a00-MDL.mdl" file is selected. Verify that data for all the items is entered and click the [OK] button to complete robot registration.




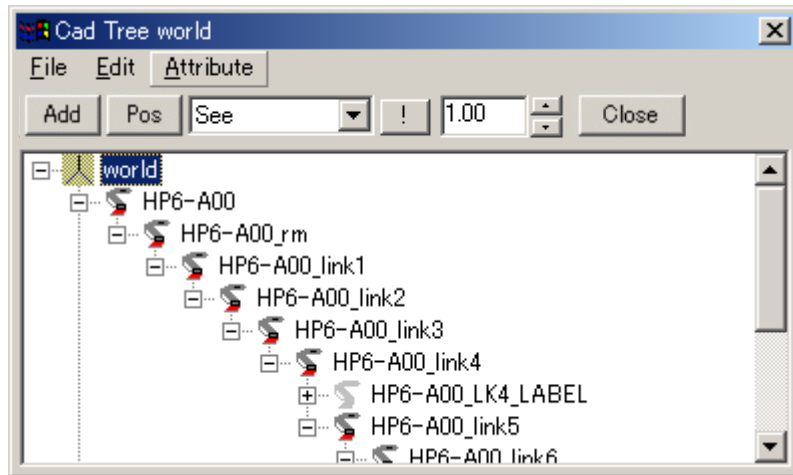
7. When the robot registration has been completed normally, the robot model appears in the cell screen as shown in the figure below.



However, as shown in the following figure, the robot may be displayed as if it is sank in the floor. This is because the offset value of the robot operational origin and the floor center coordinate has been set to 0 (initial value). In this case, correct the robot position by following steps 8 and 9, or copy the actual robot parameter with correct offset values to the robot model storing folder (for example here, "CellTest\Hp6" folder).




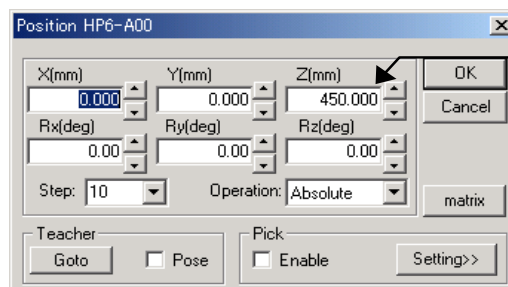
8. Click the  button in the tool bar to display the Cad Tree selection box. Select "HP6" and click on [Pos] button.



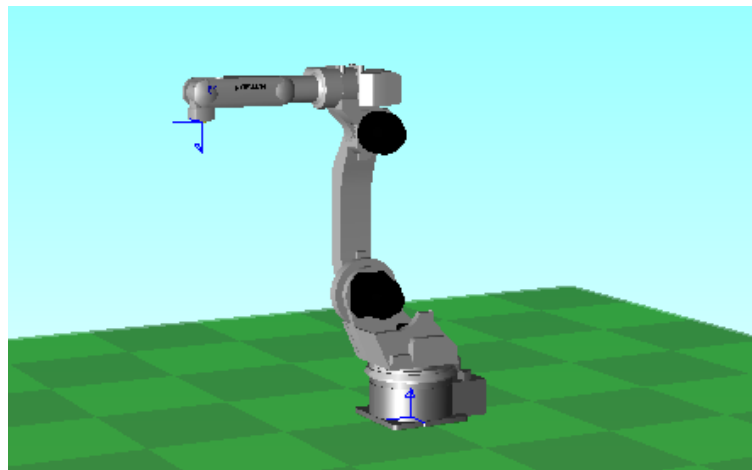
9. In the Position dialog box below, the robot model can be moved to any arbitrary place. In the case of HP6, the height from the floor to the robot operational origin is 450 mm, enter "450" for "Z" and click the [OK] button.



The height from the floor to the robot operational origin (here the height is 450 mm) can be obtained by measuring the distance between the floor and the robot bottom by clicking the  button or selecting {Screen} - {Measure} - {Distance}. Refer to " 5.2 Toolbar " for the details of measuring tools, and " 13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG " for each robot offset values.



Distance between floor and robot bottom face.

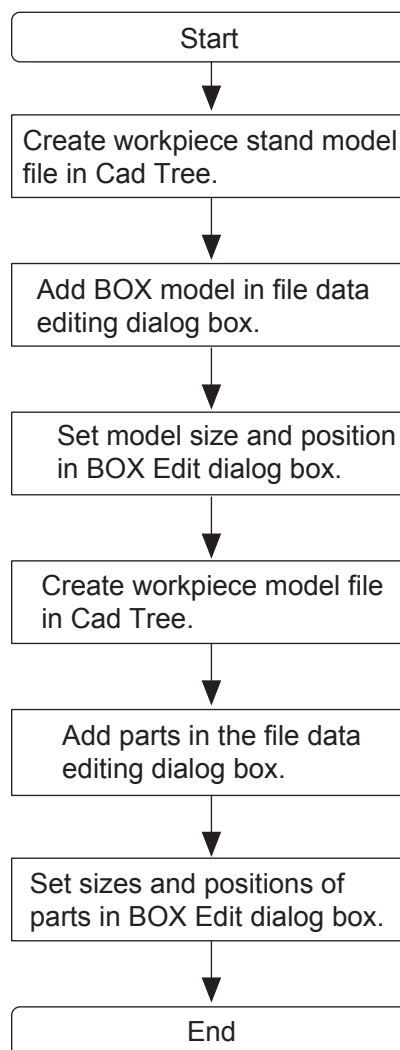


2.3 Creation of Models

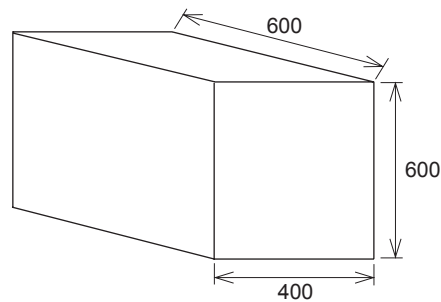
This section explains how to create workpiece models and tool models using the CAD functions.

2.3.1 Creating a Workpiece and a Workpiece Stand

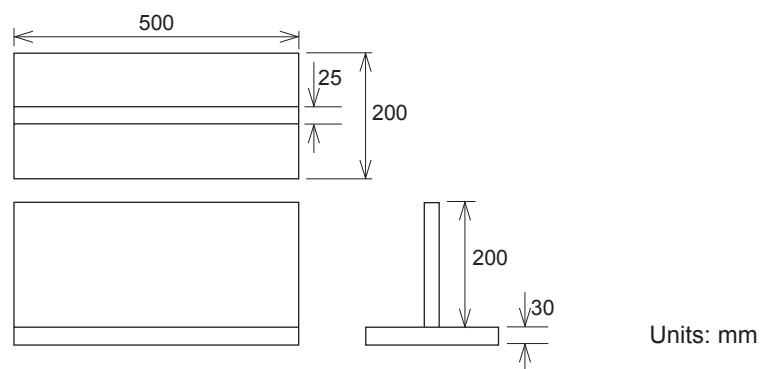
Follow the flowchart below to create a workpiece and its stand.



1. The dimensions of the workpiece model and workpiece stand model are shown in the following figure:




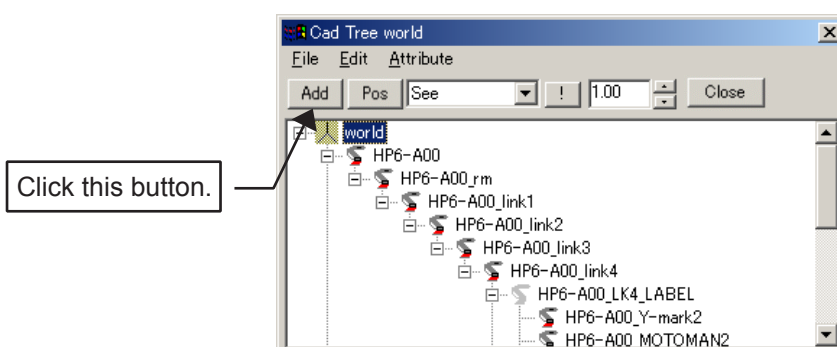
Workpiece Stand Model



Workpiece Model

Units: mm

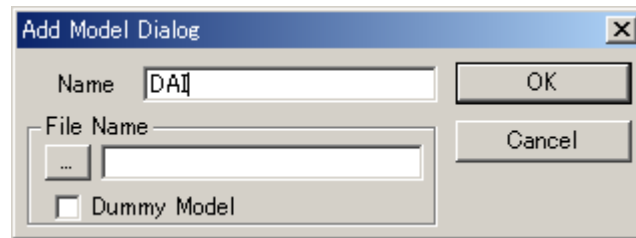
2. Click on  button or select {CAD Tree} in the {Tool} menu to display the Cad Tree.
3. When the Cad Tree appears, select "world" from the model tree; select {New Model} in the {File} menu, or click the [Add] button.



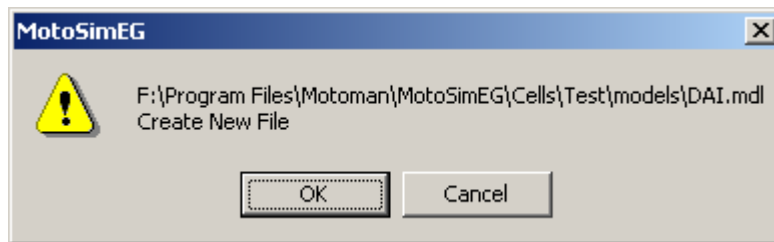
To create a new model in the model selection screen, verify that the cursor is pointed to "world" so that it will be the parent model.

2.3 Creation of Models

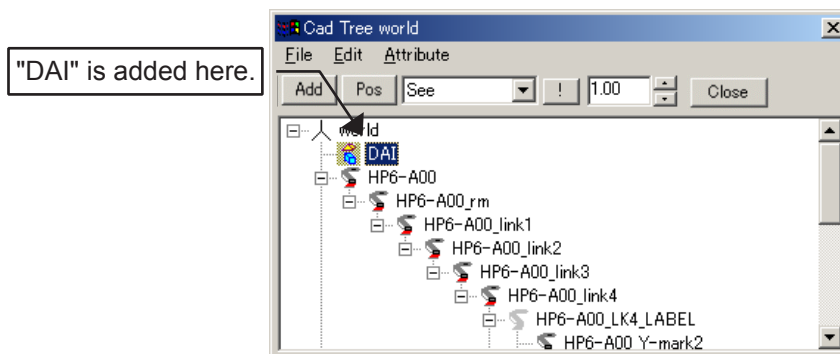
4. Enter "DAI" (a word for "stand" in Japanese) in the Add Model Dialog box and click the [OK] button.



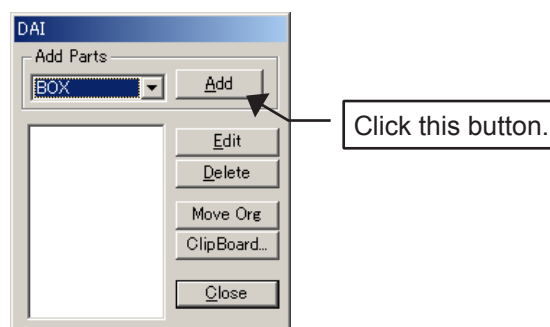
A confirmation dialog box appears, to create the new model: click on [OK].



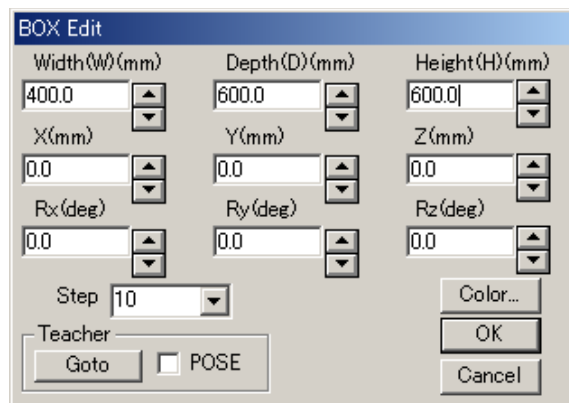
5. The "DAI" model appears in the Cad Tree: point the cursor to "DAI" and double-click it.




6. The file data editing dialog box appears: select "BOX" from the "Add Parts" combo box, and click [Add].



7. The BOX Edit dialog box appears: input the dimensions of the workpiece stand.

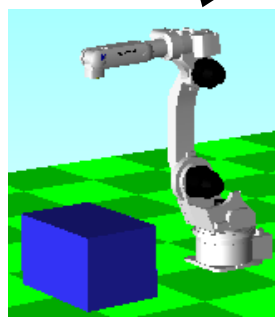
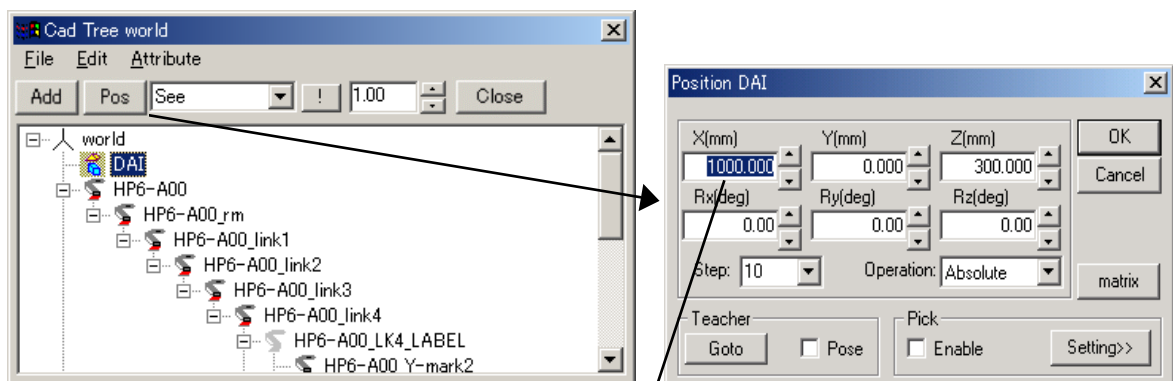


When a part is added with the [Add] button, the parts editing dialog box appears automatically. However, to reedit a part that has already been added, use the [Edit] button to display the part editing dialog box after selecting the subject part name.

Select 400 for width, 600 for depth and 600 for height by using the spin button  at the side of the edit box or by entering the values directly. The incremental values of the spin box can be changed from 0.1 to 100 in the incremental value list box. Select desired colors, and check if the stand is displayed properly.

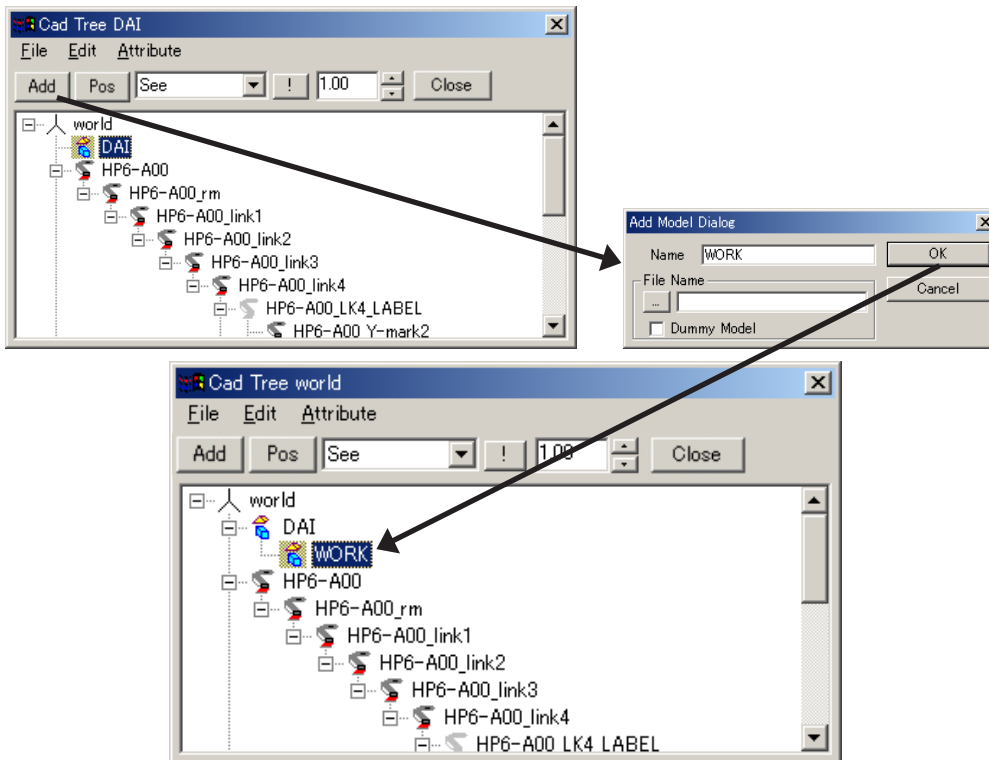
When satisfied, click the [OK] button to return to the file data editing box. Click the [Close] button in the file data editing dialog box to complete the creation of workpiece stand model.

8. The workpiece stand model is located at the center of the floor under the current conditions: therefore, click the [Pos] button in the Cad Tree to display the position dialog box, and input 1000 for X, 0 for Y and 300 for Z to modify the model location.

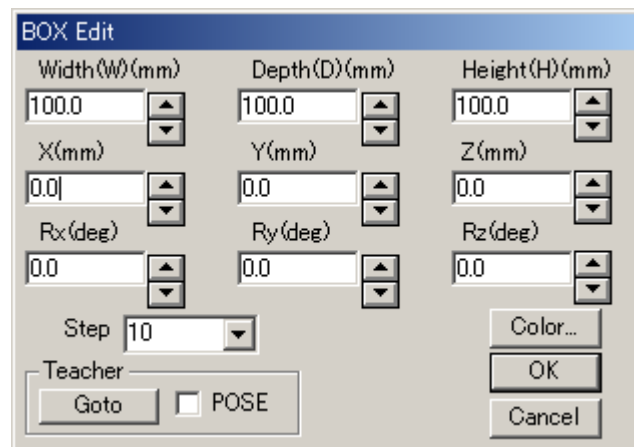


2.3 Creation of Models

- To create a workpiece, set "DAI" as the parent model by pointing the cursor to "DAI" in the Cad Tree. Create a new model named "WORK" as shown in the figures below.



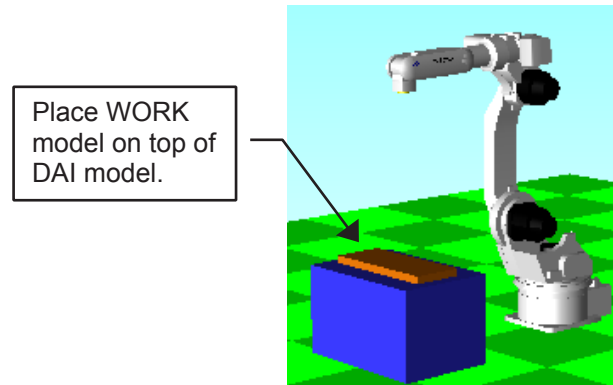
- Display the BOX Edit dialog box by selecting "BOX" from the "Add Parts" combo box in the file data editing dialog box, then click [Add].



- Set the workpiece size and position as shown in the table below in the BOX Edit dialog box: this model will be the bottom part of the fillet-welding workpiece.

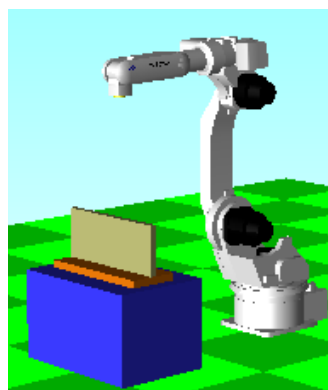
Width (W)	200	Depth (D)	500	Height (H)	30
X (mm)	0	Y (mm)	0	Z (mm)	0
Rx (degree)	0	Ry (degree)	0	Rz (degree)	0

12. The model is currently displayed in the center of DAI model: to modify its position, first close the BOX Edit dialog box by clicking [OK] and the file data editing dialog box by clicking [Close]; after closing those dialog boxes, click the [Pos] button in Cad Tree to display the Position dialog box, and enter 0 for X, 0 for Y, and 315 for Z to display WORK model on top of DAI model.



13. Create the upper part of the workpiece: the upper workpiece is composed of a second BOX part. Double-click "WORK" in Cad Tree to call up the file data editing dialog box, and add another BOX model (note that this operation should not be done by clicking the [Add] button in the Cad Tree).
14. Set the workpiece size and position as shown in the table below in the BOX Edit dialog box.

Width (W)	25	Depth (D)	500	Height (H)	200
X (mm)	0	Y (mm)	0	Z (mm)	115
Rx (degree)	0	Ry (degree)	0	Rz (degree)	0

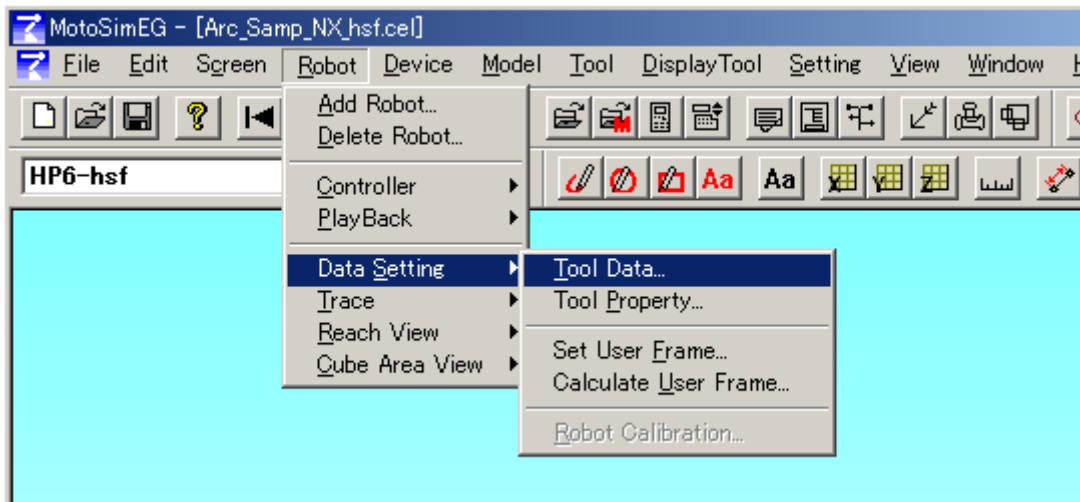


15. Check if the workpiece model has been created according to the dimensions specified in the step 1.
If the model has different dimensions or to change the color of the model, proceed to the step 16 and 17 to make modifications.
16. Display the BOX Edit dialog box by pointing the cursor to BOX model to be edited among the models added to the Cad Tree, then double-click it.
17. Reedit the workpiece size, etc. in the BOX Edit dialog box. To modify the color of the model, click on the [Color...] button.

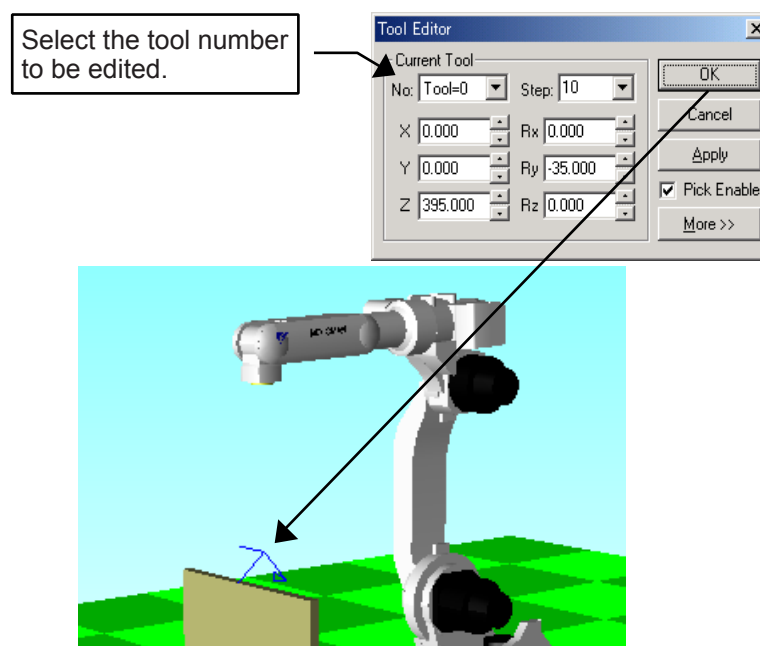
2.3.2 Editing Tool Data

This section explains on how to edit the tool data. The tool to be created is a torch for arc-welding. The tool dimensions are: 0 mm for X, 0 mm for Y, and 395 mm for Z.

1. Select {Robot} - {Data Setting} - {Tool data...}.



2. The TOOL Editor dialog box appears: select the tool number to be edited from the combo box, and set each coordinate value. In this example, the values should be set as follows since the tool end curves by "Ry = -35" relative to the flange axis.



2.3.3 Adding a Tool Model

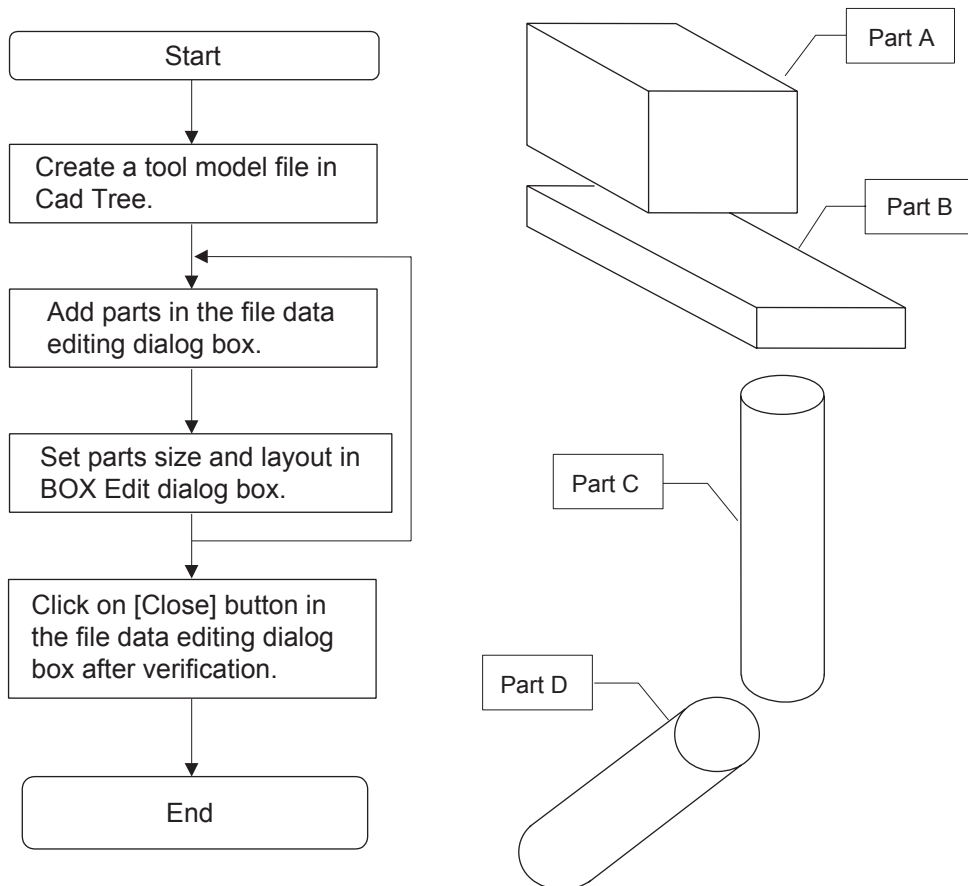
There are two ways to add a tool model:

- (1) Read a tool model in the HSF format (*.hsf).
- (2) Create a tool model with the CAD function of MotoSim EG.

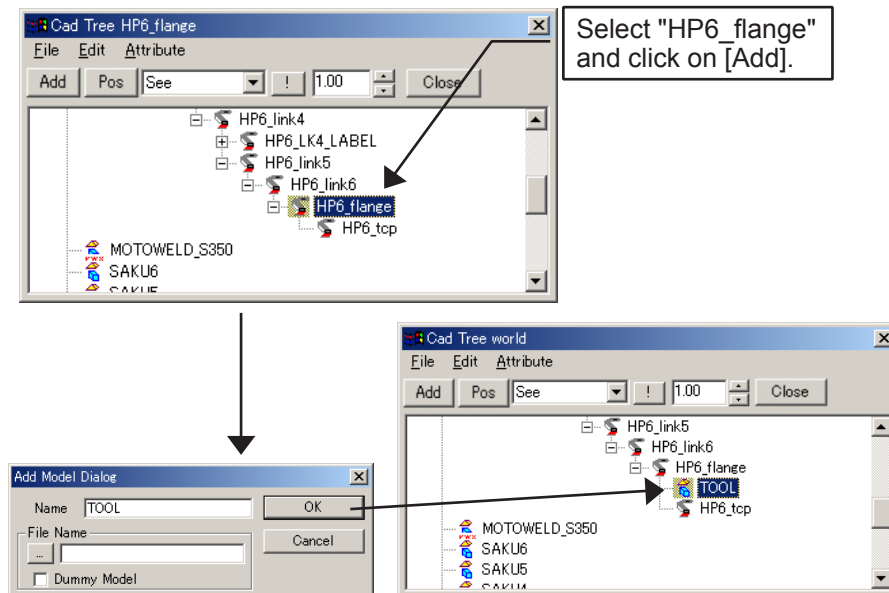
In method (1), an HSF format model is used; this is explained in " Reading the HSF Format Model " later on. First, as a reference, method (2) explains the creation of a tool model with the MotoSim EG CAD function.

■ Creating and Adding a Tool Model with the CAD Function

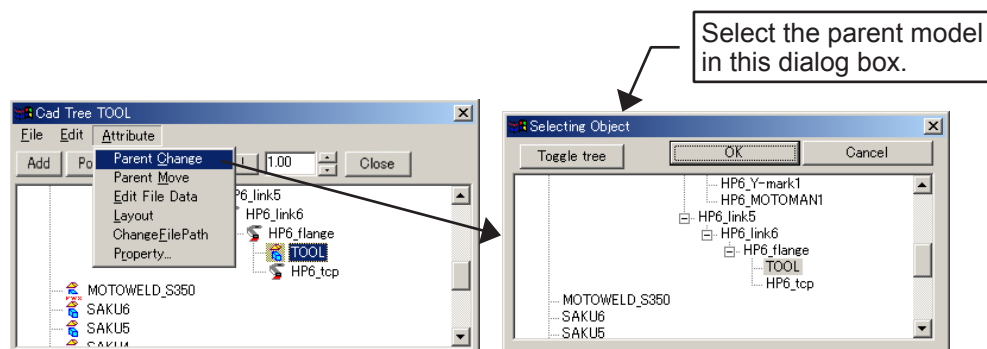
Follow the flowchart below to create a tool model.



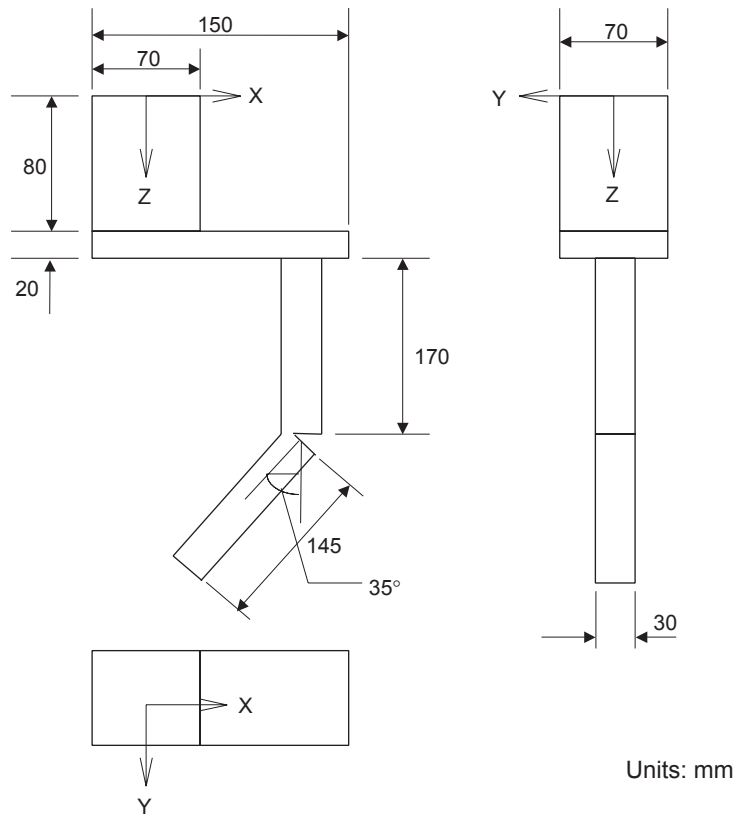
1. Display the Cad Tree to create a new model names "TOOL". In this case, point the cursor to "HP6_flange" and create a new model so that the parent model of the tool model is the flange of the robot.



If the parent model is not set correctly, change the parent model by selecting {Attribute} - {Parent Change} as shown in the following figure.



2. The dimensions of the tool model are shown in the following figure:



3. Double-click "TOOL" in the Cad Tree to display the file data editing dialog box, and add parts in the file data editing dialog box.

The tool model is composed of two BOX models and two CYLINDER models. Assume these four parts as parts A, B, C and D, respectively: edit parts A and B in the BOX edit dialog box and parts C and D in the CYLINDER Edit dialog box.

The following tables show the size and layout of each parts A, B, C and D.

• Part A (BOX)

Width (W)	70	Depth (D)	70	Height (H)	80
X (mm)	0	Y (mm)	0	Z (mm)	40
Rx (degree)	0	Ry (degree)	0	Rz (degree)	0

• Part B (BOX)

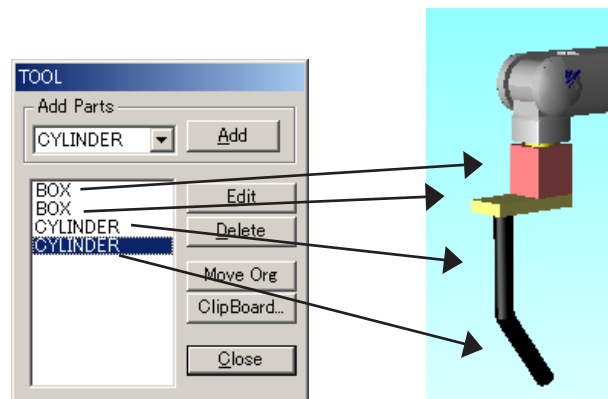
Width (W)	150	Depth (D)	70	Height (H)	20
X (mm)	40	Y (mm)	0	Z (mm)	90
Rx (degree)	0	Ry (degree)	0	Rz (degree)	0

- Part C (CYLINDER)

Lower Dia.	30	Height (mm)	170	Division	16	Upper Dia.	30
X (mm)	80	Y (mm)	0	Z (mm)	100		
Rx (degree)	0	Ry (degree)	0	Rz (degree)	0		

- Part D (CYLINDER)

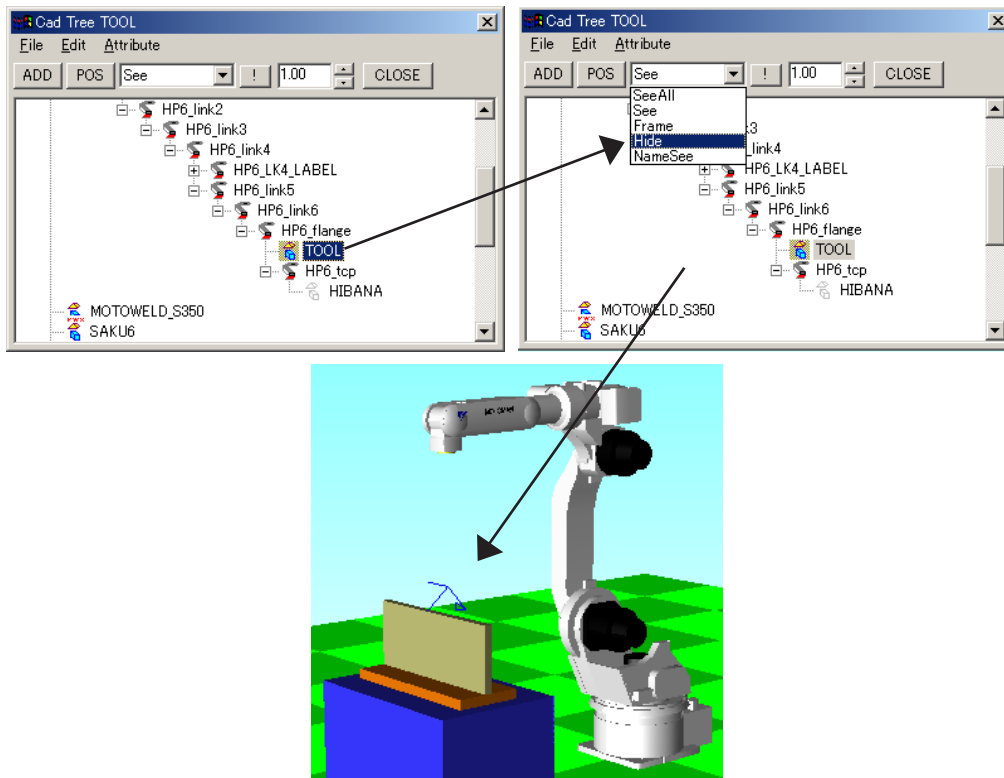
Lower Dia.	30	Height (mm)	145	Division	16	Upper Dia.	30
X (mm)	80	Y (mm)	0	Z (mm)	270		
Rx (degree)	0	Ry (degree)	-35	Rz (degree)	0		



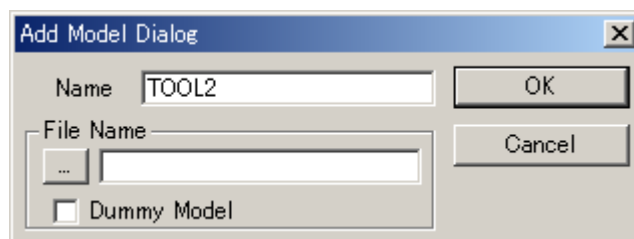
4. When the parts are all added, check the tool model on the screen, then click on the [Close] button to exit the file data editing dialog box.
5. Verify that the size and layout of the tool model, DAI model and WORK model are properly set, and click the [Close] button in the Cad Tree to complete creation of the models.

■ Reading the HSF Format Model

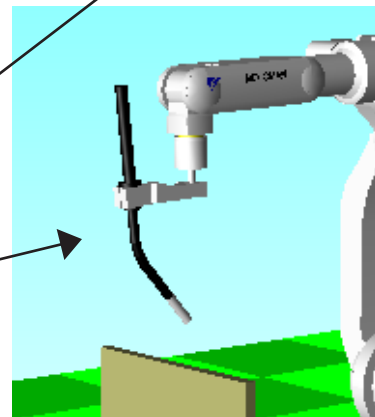
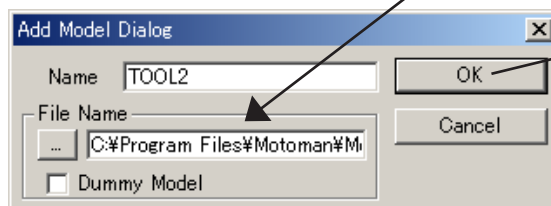
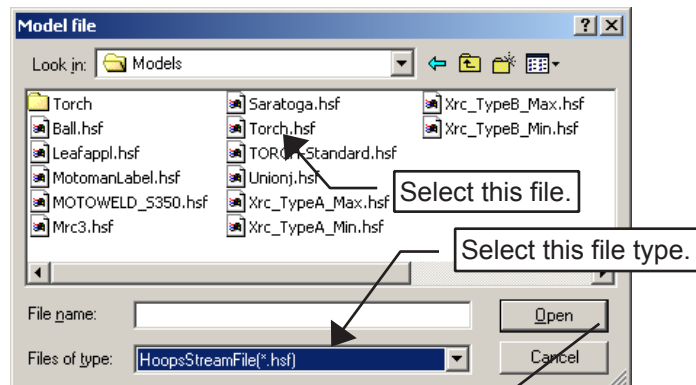
This section describes how to add a tool model which is provided as an HSF format (*.hsf). If the tool model has been already added in the previous section "Creating and Adding a Tool Model with the CAD Function", select "TOOL" from the Cad Tree and select "Hide" to hide it.



1. Select "HP6_tcp" in Cad Tree and click [Add] to display the Add Model Dialog dialog box, then enter "TOOL2" in the Name edit box.



- Click the [...] button of the file name and select "Torch.hsf" file in the folder "MODELS"; click the [OK] button.




The HSF model files can be added by drag and drop from the Explorer. (Refer to "9.11 Reading a Model" for details.) In this case, answer "Yes" when prompt "Select the parent model?" and then select "HP6_tcp" as the parent.

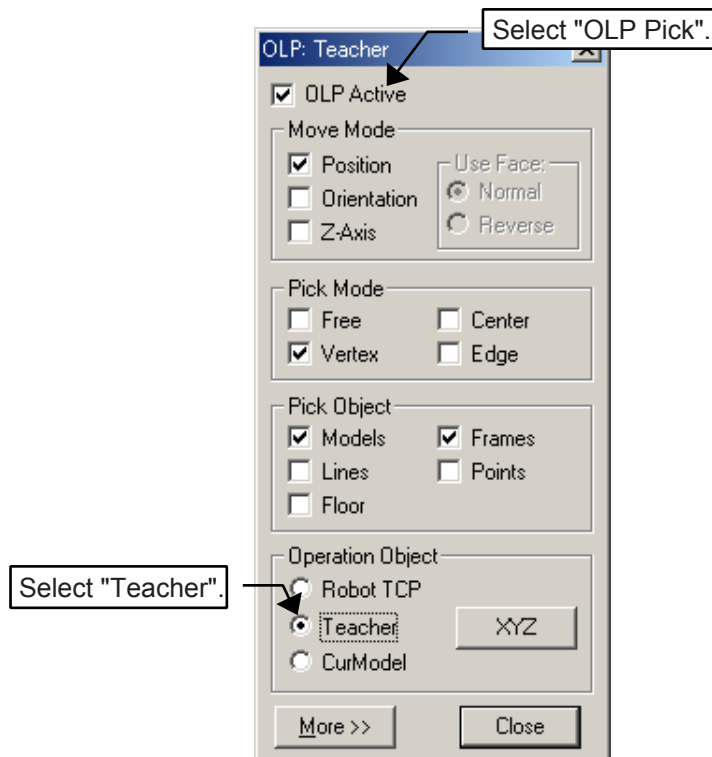
2.4 Setting of Target Points (AXIS6 Model)

This section explains on how to add an AXIS6 model before starting to teach. This procedure is not necessarily required, however, it makes future teaching easier.

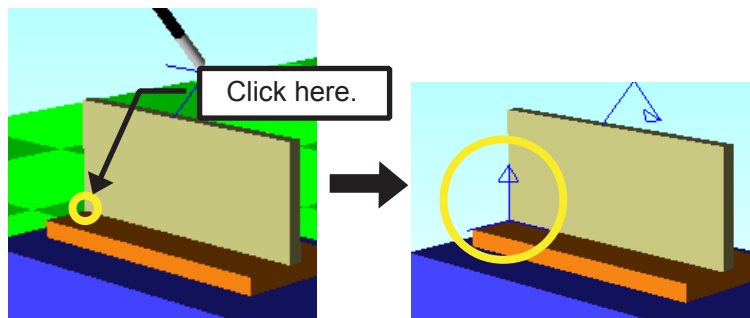
AXIS6 is a model composed of only X, Y and Z-axis frames. Set AXIS6 as target points for the following two steps which will be teach later.

- Step 3: welding start position
- Step 4: welding end position

1. Click the OLP display button  to display OLP dialog box as shown below. Select the [Teacher] radio button in the "Operation Obj" section, check the [OLP Pick] check box.



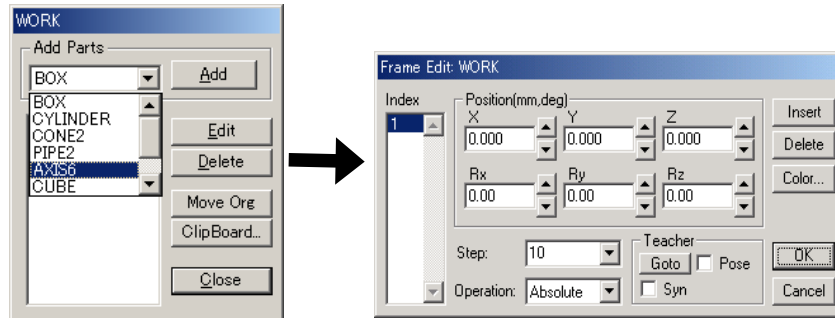
2. Set the Teacher to the welding start position of Step 3: click the welding start position with [OLP Pick] checked.



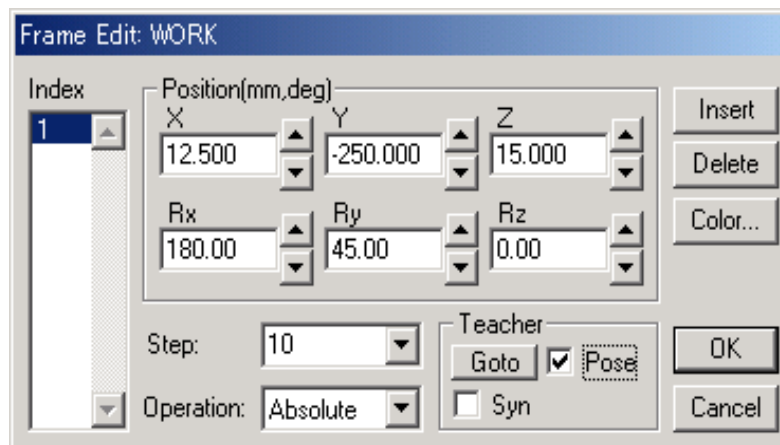
3. Set the Teacher to optimum angle for the tool welding position: in the following example, welding is performed at an angle of 45° to the welding position. Select "Teacher" from the Cad Tree and set Rx, Ry and Rz as shown below using the [Pos] button.

Rx (degree)	180	Ry (degree)	45	Rz (degree)	0
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4. Double-click the "WORK" model in the Cad Tree and add AXIS6 in the file editing dialog box.



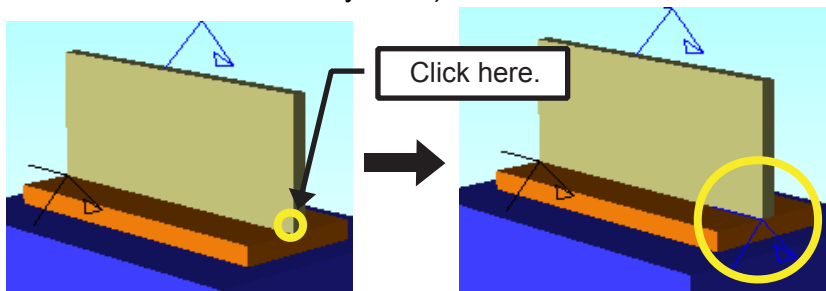
5. Click on [Add] and verify that the number "1" has been added to the Index list box. Then, check the [Pose] check box in the Teacher group and click the [Goto] button. With this operation, the teacher frame color in the cell window changes, which means that AXIS6 has been set to the teacher coordinate and orientation and now overlaps it.



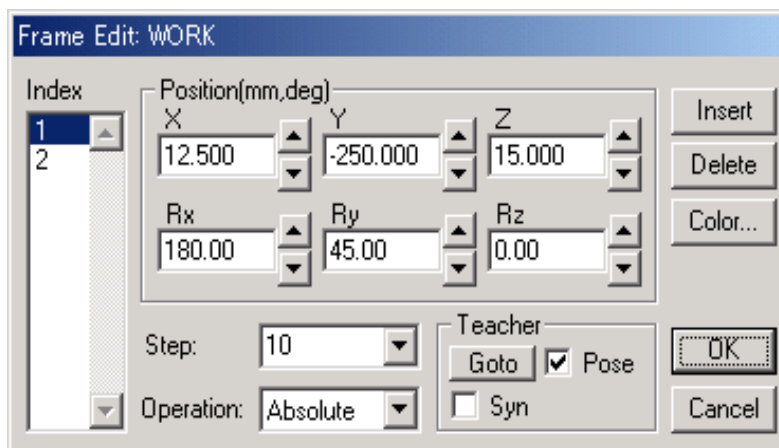
6. Set AXIS6 to the welding end point by performing steps 1 and 2 again, however, since the welding end point is to be set this time, be sure to click the part shown below in the OLP function. (Since the teacher angle has already been modified in the 3rd step, the

2.4 Setting of Target Points (AXIS6 Model)

angle modification is not necessary here.)



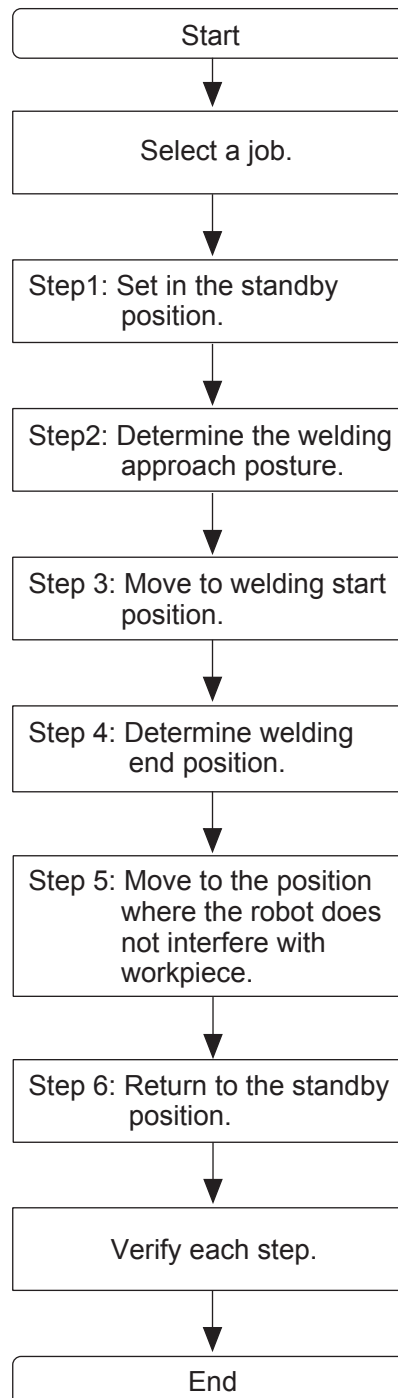
7. Add frame number 2 by clicking the [Insert] button in Frame Edit dialog box for AXIS6 which has been previously set; verify that the [Pose] check box is checked and click on [Goto].



8. When AXIS6 is set, click on [OK] to complete the setting.

2.5 Teaching

Follow the flowchart below to create an actual job for arc-welding.




2.5.1 Selecting a Job

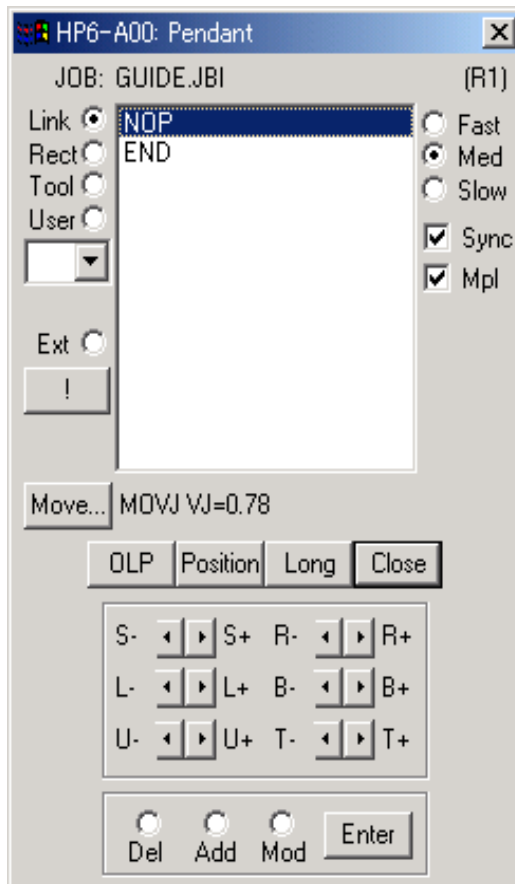
Select a job before teaching: select {Robot} on the menu bar of the main window, then select {Controller} - {Select Job} to call up a job selection dialog box.


In this example, create a new job "guide.jbi": enter "Guide" in the edit box and click on [OK].

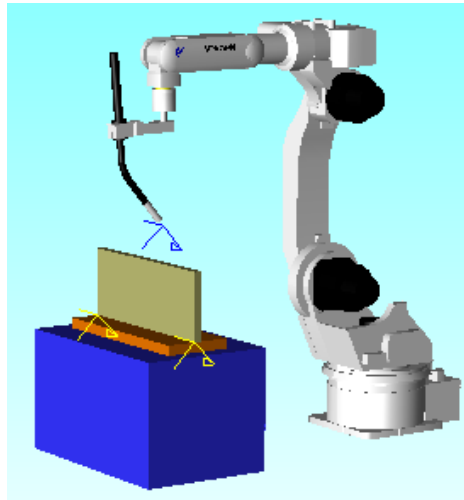


2.5.2 Teaching the Standby Position

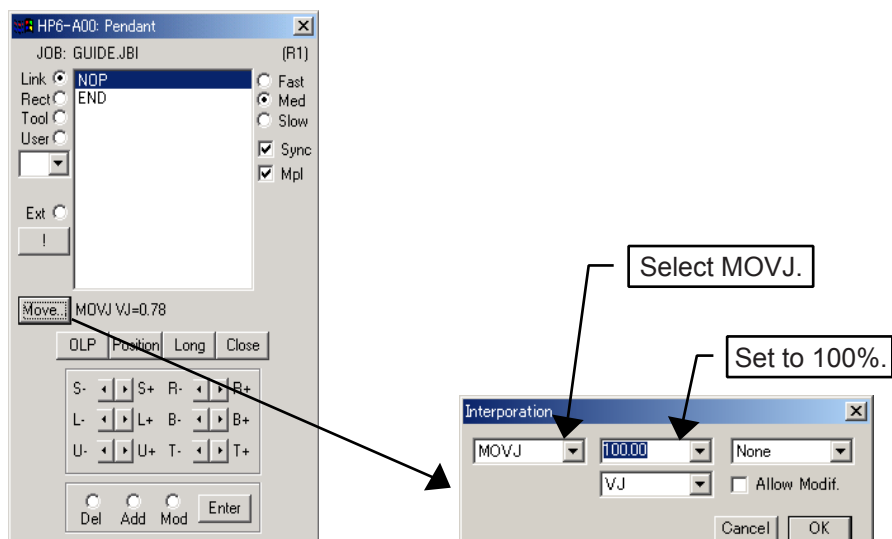
1. Click on the button  to display the programming pendant dialog box.



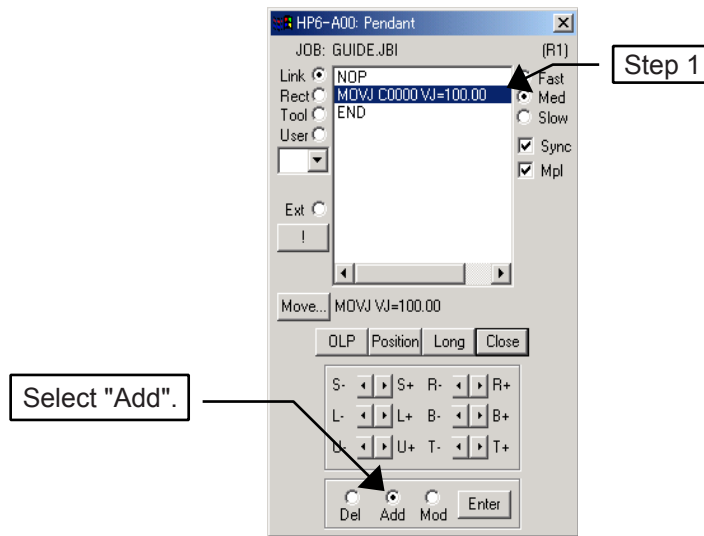
2. Teach the standby position: move the robot to the standby position using the spin button  .




3. Click the [Move...] button to display the Interpolation dialog box. Select the motion type, speed and position level from combo boxes and click on [OK] to determine the settings. Here, the motion type and speed are set to MOVJ (link) and 100%, respectively.

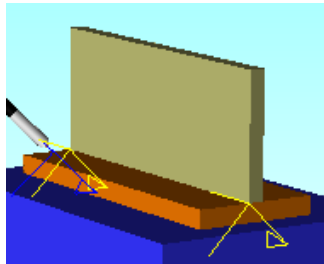


4. Select [Add] among the radio buttons [Del], [Add] and [Modify], and click on [Enter] as shown in the following figure to complete the teaching of standby position (Step 1).




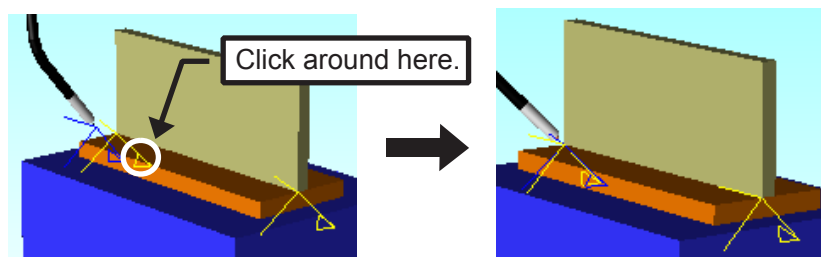
2.5.3 Determining the Welding Approach Posture

Use the spin button  to posture the robot so that it can perform welding. Click the [Enter] button to register this step (Step 2).

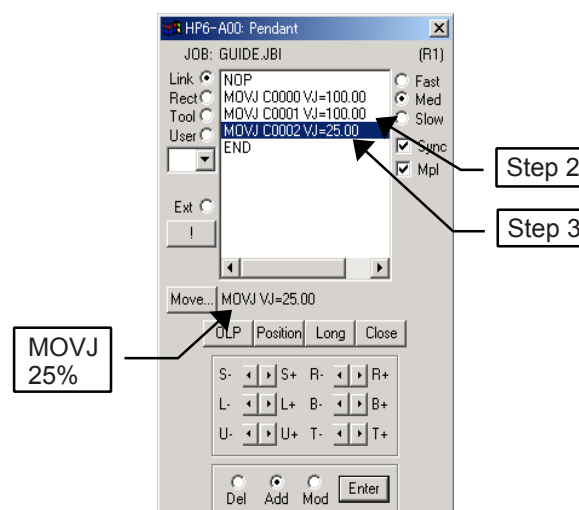


2.5.4 Teaching the Welding Start Position

1. Click the [OLP] button in the programming pendant dialog box or click the OLP display button  to display the OLP dialog box.
2. Select the [OLP Pick] check box and [Vertex] check box in the "Pick type" section, and click an arbitrary point; the TCP moves to overlap the vertex near the clicked point. To make the most of the AXIS6 which has been set to the welding start point in the previous section, the OLP settings should be made as follows:
 - OLP Active: Checked
 - Move Mode: Position, Orientation
 - Pick Mode: Vertex
 - Pick Object: Frames
 - Operation Object: Robot TCP
3. Click on AXIS6 displayed on the screen with the mouse as shown in the figure below: the tool angle is adjusted to the angle of the AXIS6. If the tool collides with the workpiece due to an improper tool angle, avoid the collision by manually repositioning the robot with the programming pendant dialog box.

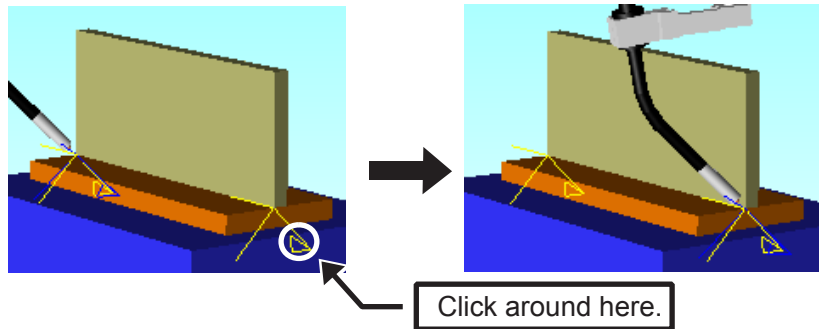


4. Click the [Move...] button to display the Interpolation dialog box. Set MOVJ (link) for the motion type and 25% for the speed.
5. Click the [Enter] button to register this step (Step 3).

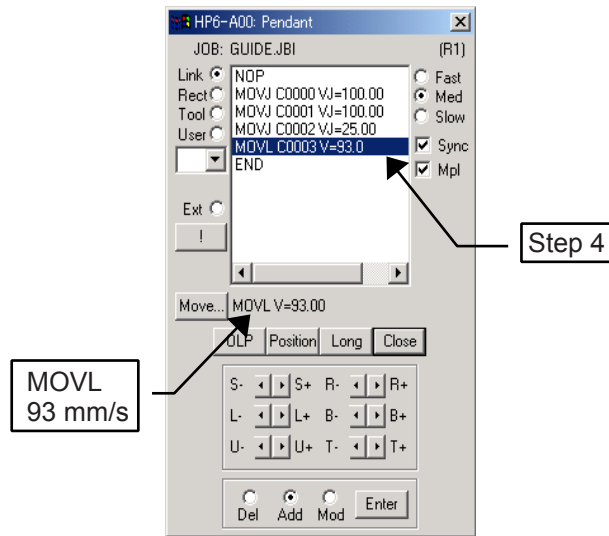


2.5.5 Teaching the Welding End Position


1. Enable the OLP function and click on AXIS6 which has been set to the welding end point to move the tool to the welding end point.

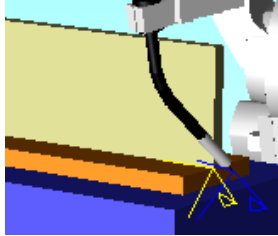


2. Click the [Move...] button to display Interpolation dialog box. Set MOVL (linear interpolation) for the motion type and 93 mm/s for the speed.
3. Click the [Enter] button to register this step (Step 4).

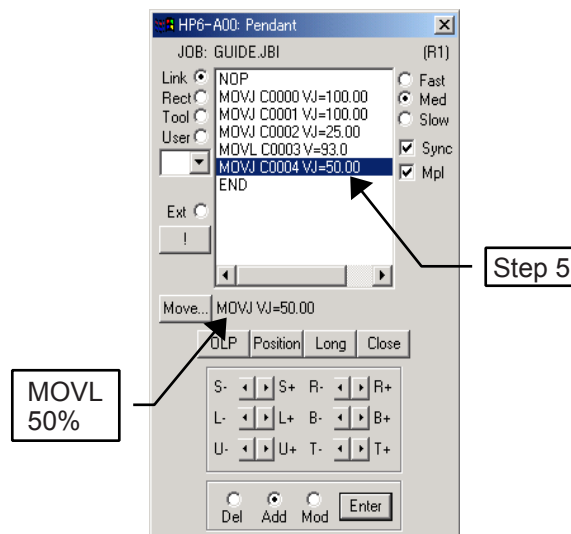


2.5.6 Teaching the Torch Retraction

1. Use the spin button  of the programming pendant dialog box to move the robot where it does not interfere with the workpiece.

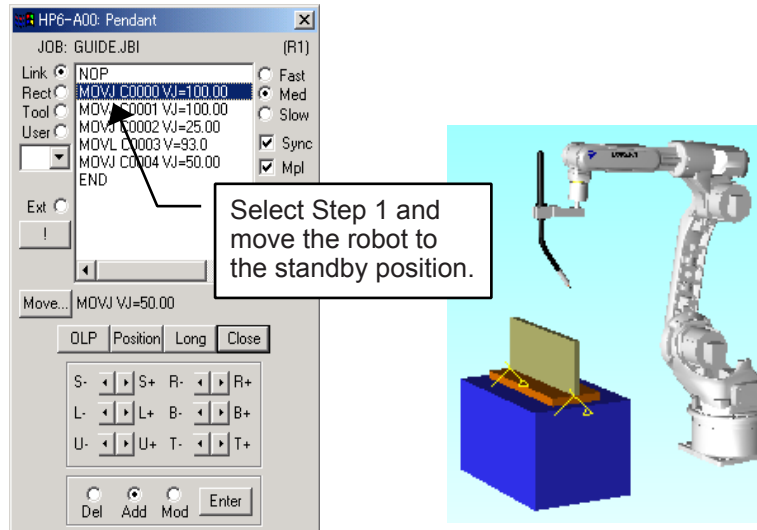


2. Click the [Move...] button to display the Interpolation dialog box. Set MOVJ (link) for the motion type and 50% for the speed.
3. Click the [Enter] button to register this step (Step 5).

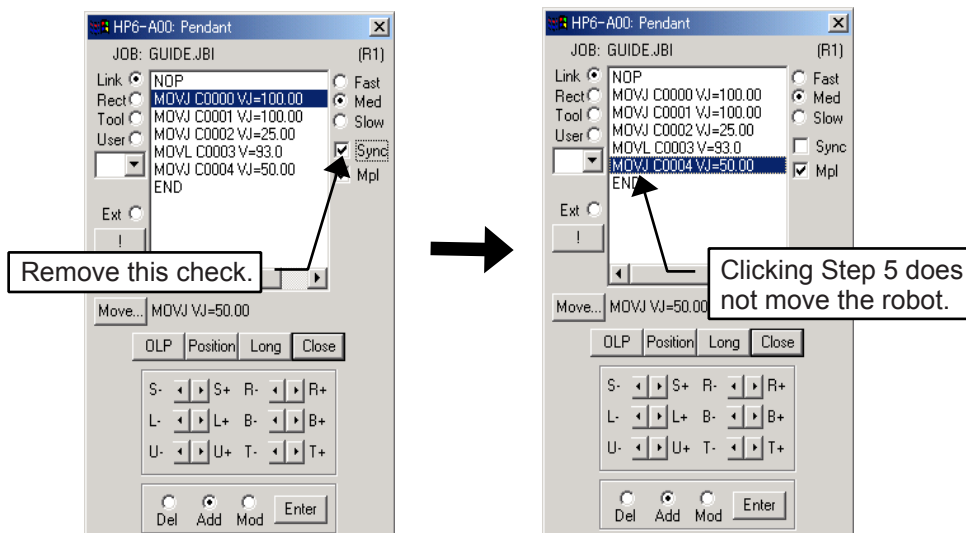


2.5.7 Returning to the Standby Position

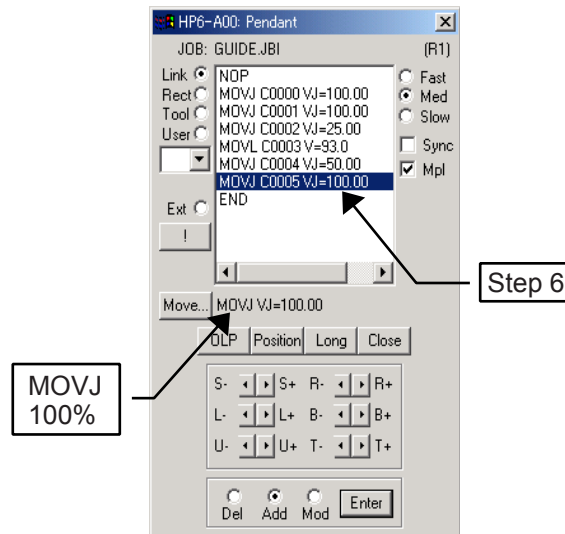
1. To move the robot to the same position as Step 1, check the step synchronization [Sync] check box in the programming pendant dialog box, then point the cursor to the instruction of Step 1 in the job display section.



2. Click the [Move...] button to display Interpolation dialog box. Set MOVJ (link) for the motion type and 100% for the speed.
3. Clear the check box for the step synchronization [Sync], and point the cursor to Step 5.

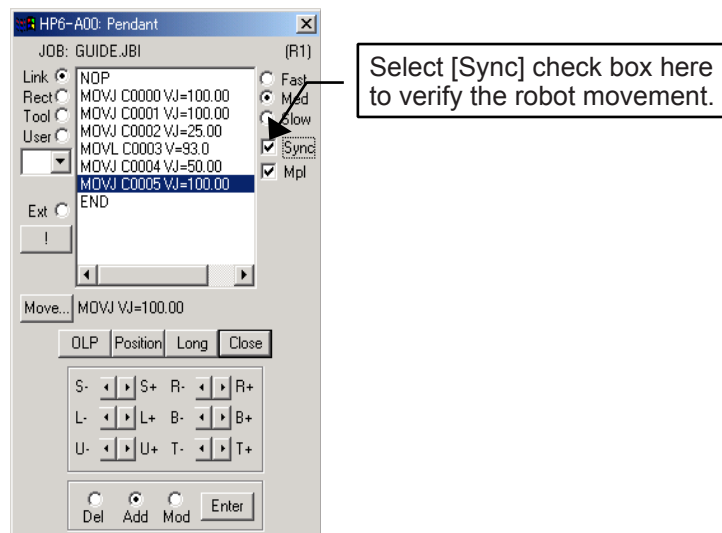


4. Click the [Enter] button to register this step (Step 6).



2.5.8 Verifying Each Step

Check the step synchronization [Sync] check box in the programming pendant dialog box, and point the cursor to each Step in the edit box instruction display section to verify the movement of the robot Step by Step.



2.5.9 Editing a JOB

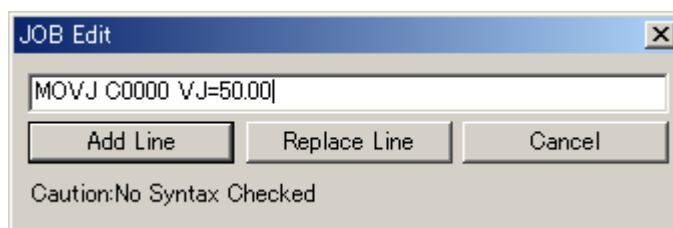
A JOB can be edited with the following procedure.

■ Modifying Steps

- 1) Click [Move...] button to modify the interpolation settings, and check the [Allow Modif.] check box.
- 2) Point the cursor to the step to be changed. Select the [Modify] radio button, then click the [Enter] button.

■ Modifying or Adding Instructions



- 1) Point the cursor to the step to be modified or added in the job display section of the programming pendant dialog box, and double-click the step.
- 2) The JOB Edit dialog box appears; enter the instruction in the edit box and select either the [Replace Line] or [Add Line] button.

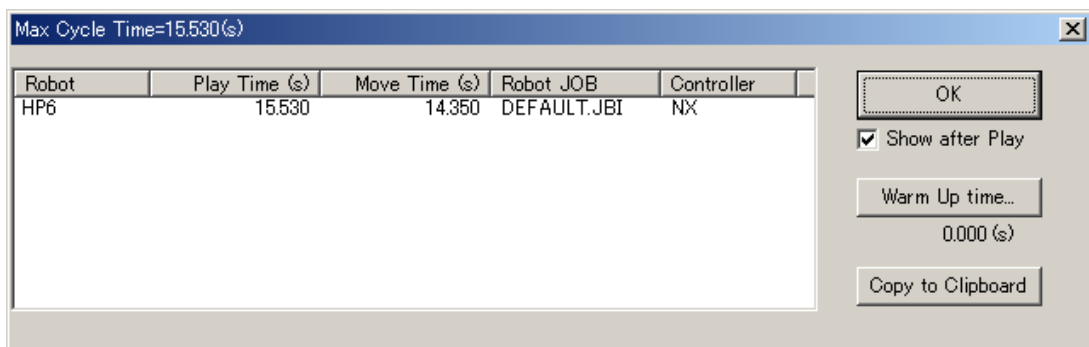


■ Deleting Instructions

Point the cursor to the step to be deleted; select the [Del] radio button and click the [Enter] button.

2.6 Playback

1. Click the button  in the tool bar of the main window to move to the top of the job.
2. Click the job execution button  to perform playback and check the movement.
3. When the playback is completed, the moving time and play time are displayed in the following dialog box. Click the [OK] button to close it.

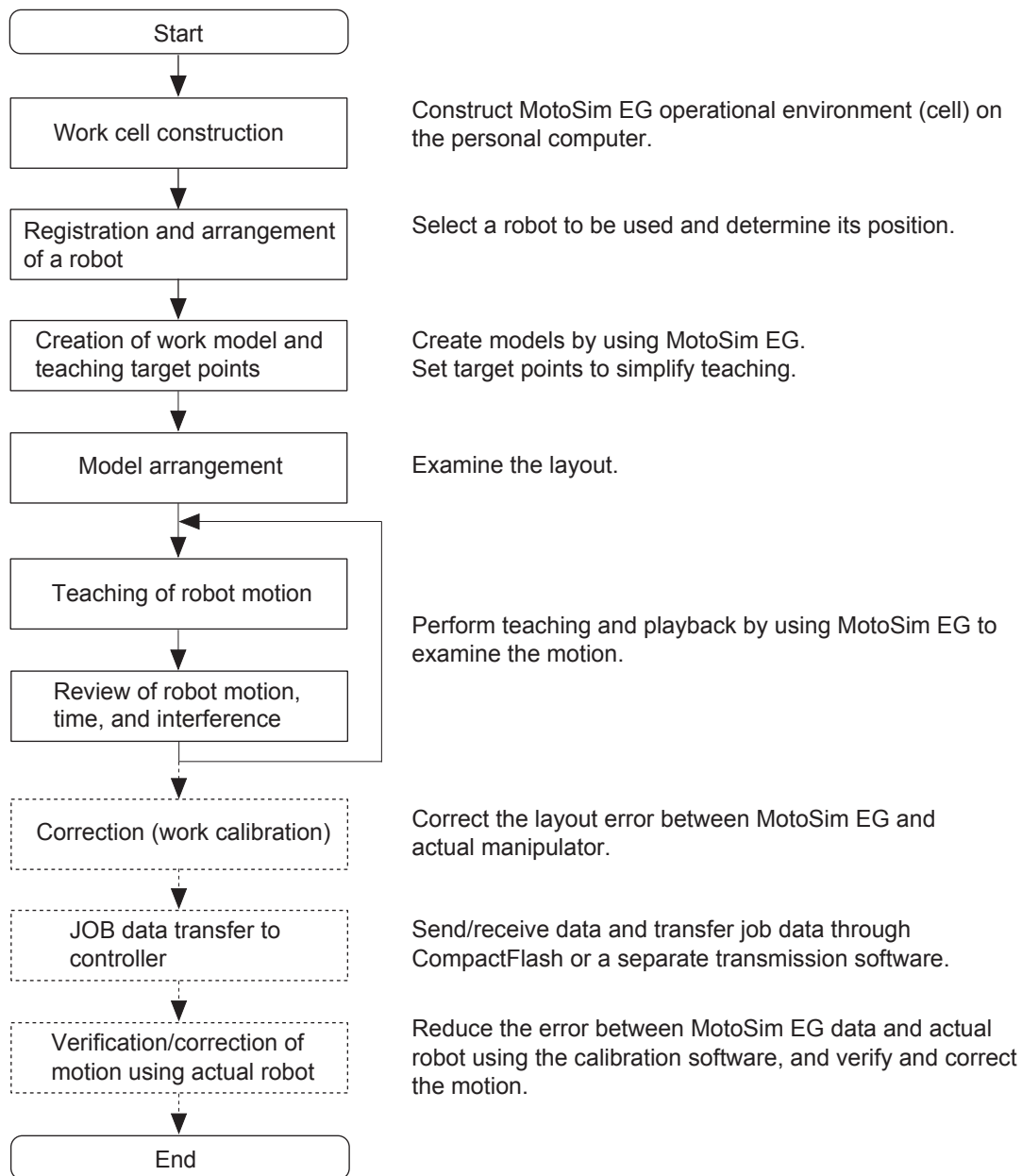


3 Offline Teaching Procedure

This chapter describes the procedure for offline teaching and examination of robot application with MotoSim EG, and other related software.

3.1 Operation Flow

The following flowchart shows the general flow of the offline teaching using MotoSim EG.



Solid lines indicate operation by MotoSim EG and dotted lines indicate operations by other software.

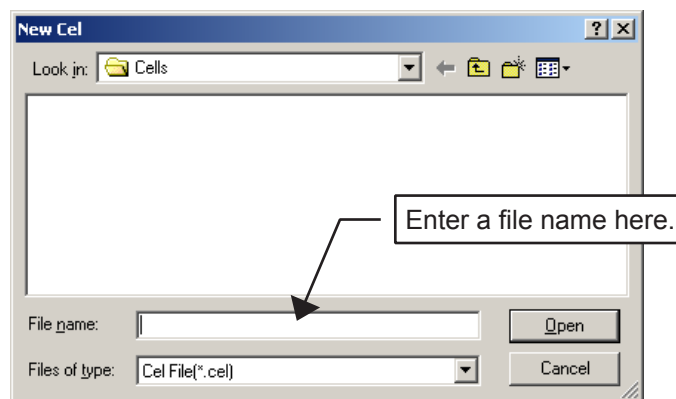
4 Creating and Editing a Cell

This chapter explains on how to create and edit a cell: before performing an operation with MotoSim EG, create a cell and set the type and number of the robot to be used. For robot registration, refer to " 7.1 Adding/Deleting a Robot ".

4.1 Creating a New Cell

Procedure

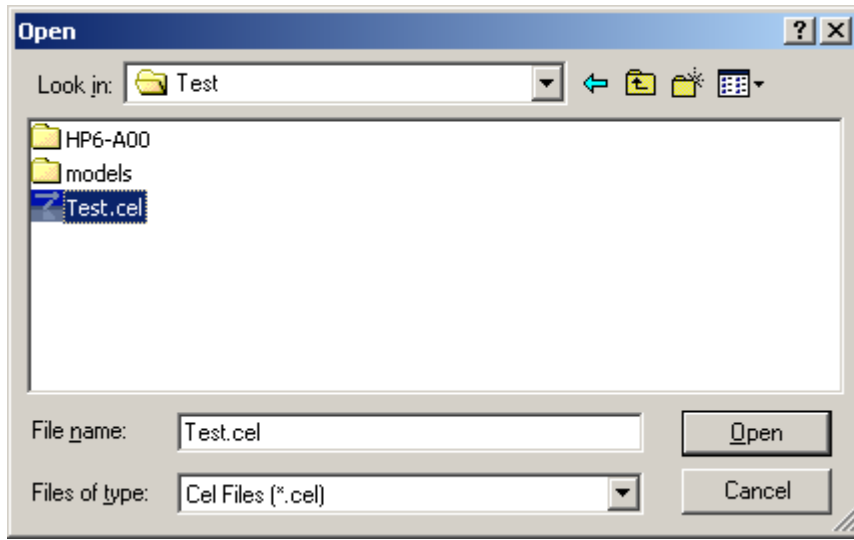
1. Select {File} - {New Cel Project...} of the MotoSim EG main window.
2. Enter a file name in the File name edit box, and click on [Open] to create a basic cell.



4.2 Opening a Cell

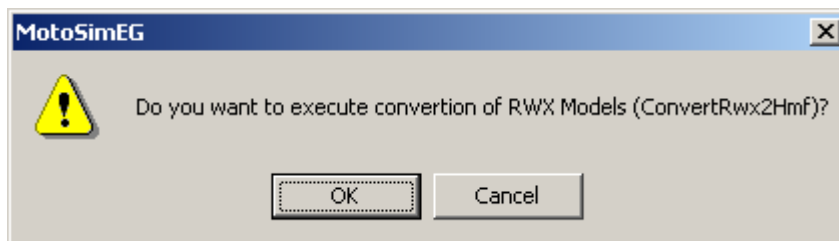
Procedure

1. Select {File} - {Open} of the MotoSim EG main window.
2. Select a cell file, and click on [Open]: the cell appears.



When opening a cell with LINE data (wire frame), it is recommended to use LINE data in the HMF format: opening a cell with LINE data in other format may take some time. If the LINE data is in the format other than HMF, convert the LINE data with "MDL2HMF.EXE" (located in a folder where MotoSim EG has been installed).

If there is a model in the RWX format in the cell, the following dialog box appears. Click on [OK] to open the cell: the cell opens after the model in RWX format is automatically converted to HMF format.



- When the model is converted, a cell with corresponding HMF format will automatically be created as well: the RWX format cell will be saved under the name "*.cel.BCL".
- If the cell created upon the model conversion is not saved, the model will be converted again the next time the cell is open.


4.3 Storing a Cell

A cell file can be stored either under its current name "Save" or under a new name "Save As".

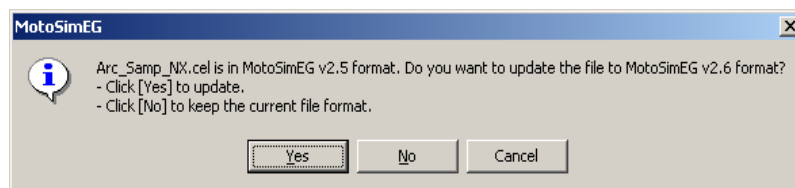


Newer cell files containing HSF files may not display properly on older MotoSimEG versions. In a cell file that needs to be used with an older MotoSimEG version, it is recommended to save it in the corresponding version with the "Save As" dialog box.

4.3.1 Save

To store a file under its current name, click the  button in the tool bar or select {File} - {Save}.

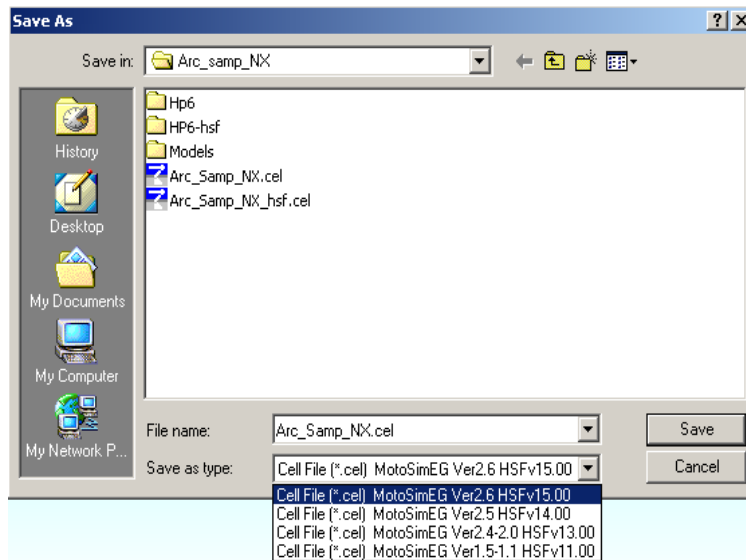
If the cell file was loaded from an older MotoSimEG version, the following message will display to confirm if the cell should be saved in cell original format or in the MotoSimEG current version.



Click [Yes] to save the file in MotoSimEG current version. Click [No] to save the file in its original version. Click [Cancel] to abort saving the cell file.

4.3.2 Save As

To store a file under a new name, select {File} - {Save As} to display the "Save As" dialog box, then store the file with the desired cell name. By changing the "Save as type" selection, the cell file may also be saved in a previous MotoSimEG format.



4.4 Exiting a Cell and MotoSim EG

To close the active cell, select {File} - {Close}.

To exit MotoSim EG, select {File} - {Exit}.

They can also be terminated by clicking  button in the control menu box on each window.

4.5 Creating a Cell with Actual Robot Data

Perform the following operations in order to run a simulation using the jobs taught by an actual robot and/or parameters of an actual robot with external axis.

Procedure

1. Create a new cell and register the same model robot as the actual robot.
2. Save the cell and close the file.
3. Download the following files from the actual robot, and copy them in the robot folder under the folder "CELLS":
 - Parameter file (File name: ALL.PRM)
 - Tool data file (File name: TOOL.COND)
 - Job data file (File name: **.JBI)
 - Other data files including user frame data, condition files for other robots, etc.
4. Open the cell file and operate the robot.

4.6 Designating Relative Path of a Cell File

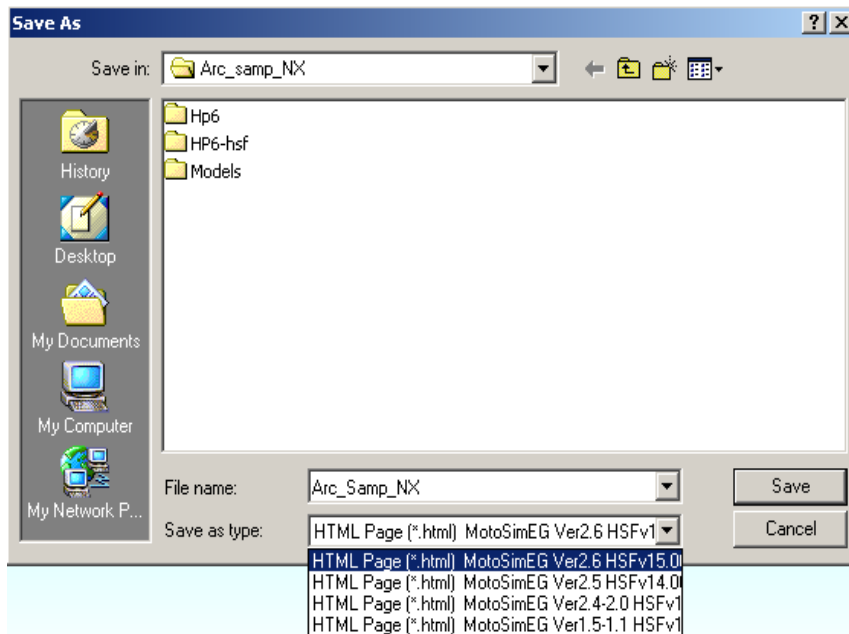
To use a cell file relatively, select {File} - {Relative Path} to specify the path and store the file (refer to " 4.3 Storing a Cell "). A cell saved in this manner makes it easier to transfer the file on another other personal computer.

4.7 Exporting a File

This section explains on how to output the current display of the models in the cell window to the HTML files. The output file is in 3 dimensions and enables changing of viewpoint, zoom, etc.

Procedure

1. Determine the display state of the models on the cell window.
2. Select {File} - {Export File}. Select the export file format in the "Save as type" box and save the file with the desired file name.



- When exporting to HTML format, a HTML file and a HSF file are saved. Both files are required to display the HTML data properly.
- When exporting HSF file format, only the HSF file is saved. A separate application supporting HSF format display will be required to view the HSF file by itself.
- When storing the cell as an HTML file, be sure that the folder name consists of one-byte characters only; a file with two-byte characters may not be successfully opened.
- To open the cell saved in HTML file, use a personal computer which has access to the Internet.
- To view the cell saved in HTML file, use a personal computer which has access to the Internet. When viewing the HTML files of the simulation, an Internet connection is required to install any necessary ActiveX controls. Allow any ActiveX controls blocked by Windows security settings.

4.7.1 Playback animation file export

Job playback animation of the cell display can be exported to HTML file format.



The color change of models occurring during playback (such as collision check) will not be included in the animation file.

Procedure

1. Set the display status of the models in the cell.
2. From the menu select [Setting] - [Options] to display the "Option Setting" dialog. Under the "Robot Options" tab, in the "Animation Playback" section, check the "Export HSF file" box.
3. Select the job for which you want to create an animation. Playback the entire job.
4. From the menu select {File} - {Export File} to display the "Save As" dialog box. In the "Save as type" box select "HTML Page (*.html)". Save the file under the desired file name. (This will also save an HSF file.)

4.7.2 Exported HTML file display operations

Once the exported HTML file is open, the view can be manipulated with the mouse.

- The view can be change by clicking, holding and dragging with the left mouse button. To set camera manipulation mode, right mouse click on the view and select one of the following mode: Orbit (Rotate), Pan (Shift), Zoom (Zoom), Zoom to Window (Zoom to Extents). For detail on the camera mode, please refer to section " 5.2 Toolbar ".
- In the case of HTML animation file, to playback the animation right mouse click and select Animation - Play. The playback can be paused/resumed by right clicking and selecting Animation - Pause. The animation can be reset to the beginning by right clicking and selecting Animation - Rewind.

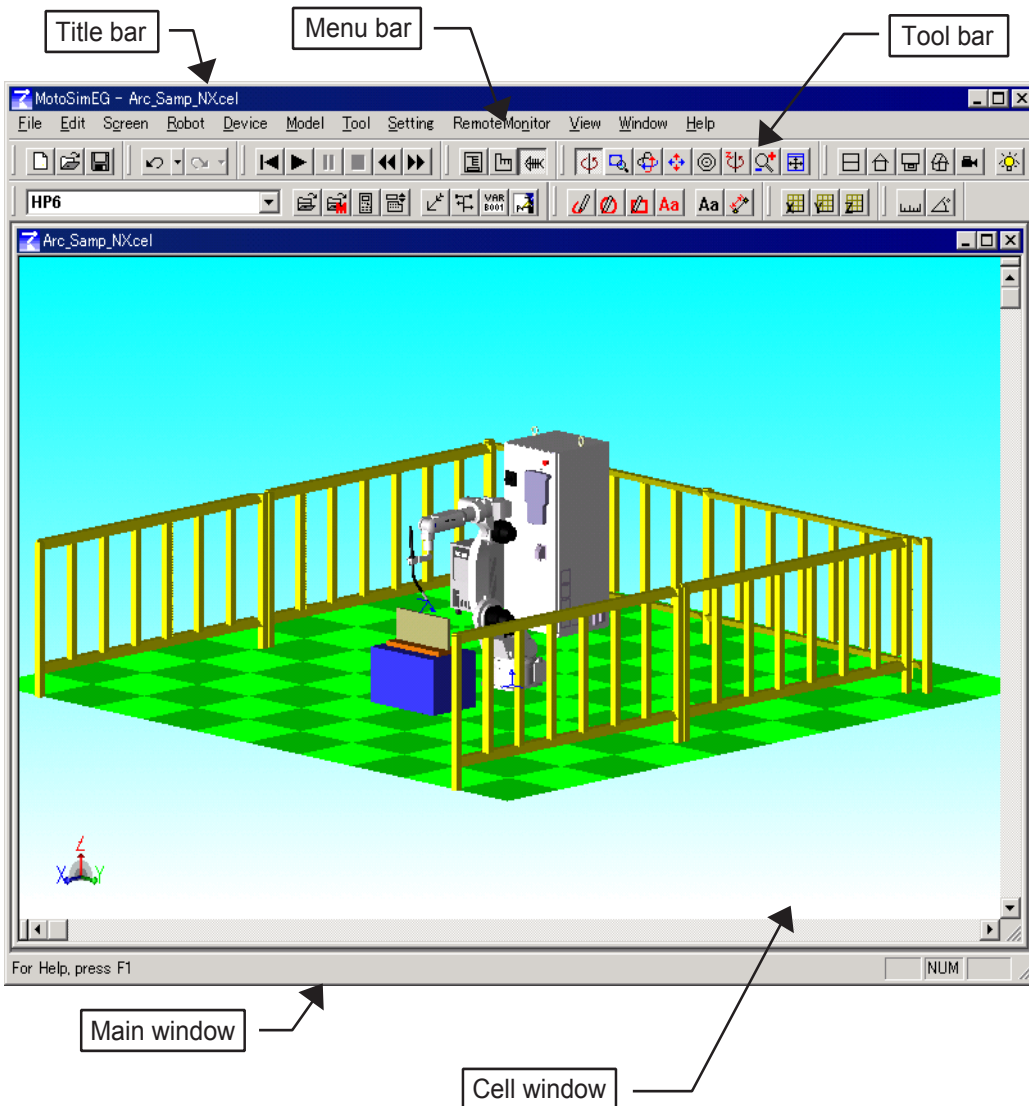
5 Display Operations

MotoSim EG has various display control functions such as expansion, reduction, simultaneous displays from various directions, etc. In addition, by using 3D (three-dimensional) surface model display, the motion can be easily verified.

5.1 MotoSim EG Display

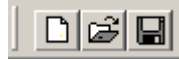
For improvement of operability, the basic operations of MotoSim EG are common with those of other Windows applications.




The following figure shows the MotoSim EG main window.



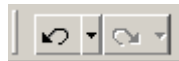
5.2 Toolbar



■ File toolbar



	<p>Creates a new cell.</p> <ul style="list-style-type: none"> • Menu bar: {File} - {New Cel Project...}.
	<p>Reads an existing cell.</p> <ul style="list-style-type: none"> • Menu bar: {File} - {Open}.
	<p>Saves the edited cell information of a cell file.</p> <ul style="list-style-type: none"> • Menu bar: {File} - {Save}.

■ Edit toolbar













	<p>Undoes the last operation.</p> <p>Click the down arrows beside the icon to display the last 9 operations. Selecting an operation from the list will undo this operation and all the operations performed after.</p> <ul style="list-style-type: none"> • Menu bar: {Edit} - {Undo}.
	<p>Redoes the last undone operation.</p> <p>Click the down arrows beside the icon to display the last 9 undone operations. Selecting an operation from the list will redo this operation and all the undone operations performed before.</p> <ul style="list-style-type: none"> • Menu bar: {Edit} - {Redo}.



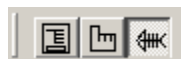
- Undo and Redo function supports the robot position change, job edition, model edition, Cad Tree operations and camera viewpoint operations. Any operation generated by the playback of a JOB is not supported by the Undo and Redo function.
- Undo and Redo function may generate temporary files (mseg????.tmp) located in the Temp folder under the MotoSimEG installation folder. Deleting these files while Moto-SimEG is running may prevent undoing some operations. Normal termination of the MotoSimEG application will automatically remove all temporary files in this folder.




■ Playback toolbar



	<p>Jumps to the top of the job execution line. Use this button to execute (or reset) a job from the beginning when job execution is interrupted.</p> <ul style="list-style-type: none"> • Menu bar: {Robot} - {PlayBack} - {Reset Job}.
	<p>Executes the job currently selected.</p> <p>Use  button to select the job to be executed.</p> <ul style="list-style-type: none"> • Menu bar: {Robot} - {PlayBack} - {Start}.
	<p>Halts temporarily the job under execution.</p> <p>Use  button to execute the rest of the job.</p> <ul style="list-style-type: none"> • Menu bar: {Robot} - {PlayBack} - {Pause}.
	<p>Interrupts the job under execution.</p> <p>To execute the job again from the beginning, use  button to move to the top of the job, then execute the job with  button.</p> <ul style="list-style-type: none"> • Menu bar: {Robot} - {PlayBack} - {Hold}.
	<p>Enables a job to skip backward step by step.</p> <ul style="list-style-type: none"> • Menu bar: {Robot} - {PlayBack} - {Step Back}.
	<p>Enables a job to skip forward step by step.</p> <ul style="list-style-type: none"> • Menu bar: {Robot} - {PlayBack} - {Step Next}.

■ CAD toolbar



	<p>Displays the model selection box “Cad Tree” (models in tree structure), indicating connection of models or relation between parent and child in a tree.</p> <ul style="list-style-type: none"> • Menu bar: {Tool} - {CAD Tree}.
	<p>Selects a model: click any desirable point for model selection.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Select Model}.
	<p>Toggles display of the AXIS6 in frame indicators in the view.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Frame Display}.








■ Robot toolbar



	<p>Selects a job to be executed or edited. Display a list of jobs registered in the current robot, and select the job to be executed or edited. The selected job is displayed on the screen of the programming pendant.</p> <ul style="list-style-type: none"> • Menu bar: {Robot} - {Controller} - {Select Job}.
	<p>Displays the Master Job dialog box to call, register, or cancel a master job. (The master job is a job which is selected during start-up.)</p> <ul style="list-style-type: none"> • Menu bar: {Robot} - {Controller} - {Select Master Job}.
	<p>Displays the programming pendant dialog box. Enables job editing and teaching.</p> <ul style="list-style-type: none"> • Menu bar: {Tool} - {P.Pendant} - {P.Pendant View}.
	<p>Displays the dialog boxes Position Panel and Job Panel. Position Panel displays the robot position, pulse data, etc., while Job Panel enables display or editing of a job. To display each dialog box separately, use the commands in the menu bar.</p> <ul style="list-style-type: none"> • Menu bar: {Tool} - {P.Pendant} - {Job Panel...} : {Tool} - {Monitor} - {Position Panel...}.
	<p>Displays OLP dialog box and enables OLP function. Moves the end of the robot tool to a target point with one-click operation.</p> <ul style="list-style-type: none"> • Menu bar: {Tool} - {Teaching} - {OLP...}.
	<p>Displays a window which enables monitoring I/O signals. Links to the job execution to display the I/O signals.</p> <ul style="list-style-type: none"> • Menu bar: {Tool} - {Monitor} - {I/O} - {I/O Monitor}.
	<p>Displaying and editing the robots are enabled by setting the Variable Monitor.</p> <ul style="list-style-type: none"> • Menu bar: {Tool} - {Monitor} - {Variable Monitor}.
	<p>Job Editor is available depending on the type of the selected robot: it is an optional application that enables instruction-editing operation as accurately as the actual controller.</p> <div style="border: 1px solid blue; padding: 5px;"> <p>NOTE To use this function, it is necessary to install the separate applications Job EditorDX (for DX100) , Job EditorNX (for NX100) or Job Editor (for XRC). (Refer to the list below.)</p> </div>







■ Camera toolbar



	<p>Zooms and rotates the image: zoom in and out the image by dragging the mouse upward (to zoom in) or downward (to zoom out) over the screen; rotate the image centering on the Z-axis of "world" coordinates by dragging the mouse from side to side.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Scroll & Zoom}.
	<p>Enlarges the specified range: drag the mouse over the desired range to be enlarged.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Free Zoom}.
	<p>Rotates the image: for vertical rotation, drag the mouse up and down; for horizontal rotation, drag the mouse from side to side.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Rotate}.
	<p>Moves the viewpoint in parallel: drag the mouse from side to side and up and down to synchronize the viewpoint with the mouse motion.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Shift}.
	<p>Changes the viewpoint: click any desirable point so that the image is displayed with the clicked point located in the center of the screen.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Center}.
	<p>Zooms and rotates the image: zoom in and out the image by dragging the mouse upward (to zoom in) or downward (to zoom out) over the screen; rotate the image horizontally by dragging the mouse from side to side.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Z-Scroll & Zoom}.
	<p>Zooms the image: zoom in and out the image by dragging the mouse upward (to zoom in) or downward (to zoom out) over the screen.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Zoom}.
	<p>Displays all the models in the cell to fit in the view.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Zoom To Extents}.







■ View toolbar



	<p>Changes the viewpoint to display the default top view.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Direction} - {Top}.
	<p>Changes the viewpoint to display the default front view.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Direction} - {Front}.
	<p>Change the viewpoint to display the default side view.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Direction} - {Side}.
	<p>Change the viewpoint to display the default isometric view.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {Direction} - {View}.
	<p>Displays the View Manager panel, which offers a wider selection of standard view and allows to save and load up to 10 user defined views.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Camera Scope} - {View Manager}
	<p>Displays the Light Manager panel, which allows to add or remove lights, and to modify each light's properties.</p> <ul style="list-style-type: none"> • Menu bar: {Display} - {Light Manager}




■ Memo toolbar



	<p>Draws a free-form line.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Markup} - {Freehand}.
	<p>Draws a circle.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Markup} - {Circle}.
	<p>Draws a rectangle.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Markup} - {Rectangle}.
	<p>Adds a note (text).</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Markup} - {Notes}.
	<p>Creates a memo (text).</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Memo}.
	<p>Creates a dimension line.</p> <ul style="list-style-type: none"> • Menu bar: {Screen} - {Measure Line}.



■ Cutting toolbar



	Displays cross-section X. • Menu bar: {Screen} - {Cutting Planes} - {X-Cutting Planes}.
	Displays cross-section Y. • Menu bar: {Screen} - {Cutting Planes} - {Y-Cutting Planes}.
	Displays cross-section Z. • Menu bar: {Screen} - {Cutting Planes} - {Z-Cutting Planes}.

■ Measure toolbar:



	Measures the distance between two clicked points. • Menu bar: {Screen} - {Measure} - {Distance}.
	Measures the angle between three clicked points. • Menu bar: {Screen} - {Measure} - {Angle}.

6 Display Operation

The display tool functions help to achieve better visualization enabling text input on the cell window, sectional display of models, display mode change, etc.

6.1 Viewpoint Operation Tools

MotoSim EG can control the display with the viewpoint operation tool as follows

6.1.1 Viewpoint Operation with the Mouse

Viewpoint operation depend on the selected camera scope mode.

Select the mode by clicking on one of the button of the .Camera. toolbar or by making the selection from the {Screen} - {Camera Scope} menu.

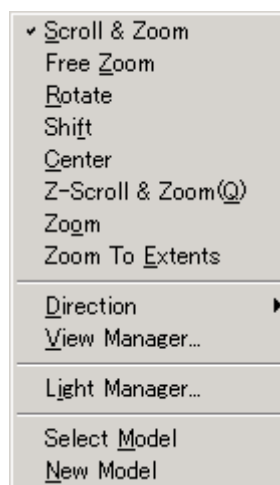
The viewpoint is change according to the selected operation when the mouse left button is press down on the main screen and dragged up and down or left and right.

For detail on the various viewpoint operation modes please refer to section " 5.2 Toolbar ".

■ Right Mouse Button Operation

A pop-up menu for viewpoint operation appears by clicking the right mouse button on the cell window.

However, note that a menu of the Cad Tree appears if the right mouse button is clicked when the Cad Tree is on the screen.



■ Scroll Wheel Operation

The viewpoint operation is also available with the scroll wheel of the mouse. Perform the following operations on the cell window.

Operation	Effect on Viewpoint
Scroll backwards	Viewpoint zoomed in.
Scroll forwards	Viewpoint zoomed out.
Click	Clicked point displayed at the center of the window.

■ [ALT] key and [CTRL] key operation

The viewpoint can be change by pressing the [ALT] key or the [CTRL] key on the keyboard and clicking the mouse left button.

The following operation can be done when the mouse pointer is over the cell window.

Operation	Effect on Viewpoint
Press [ALT] key + left mouse button and drag the mouse side to side and up and down.	The viewpoint moves parallel to the view screen.
Press [CTRL] key + left mouse button and drag the mouse up and down.	The viewpoint zooms in (up) and out (down) the scene.

6.1.2 Preset Viewpoint Operation

The camera viewpoint can also be changed to a preset viewpoint.


The most comunly used viewpoint are available by clicking on the .View. toolbar button or by selecting a view from the {Screen} - {Camera Scope} - {Direction} menu.

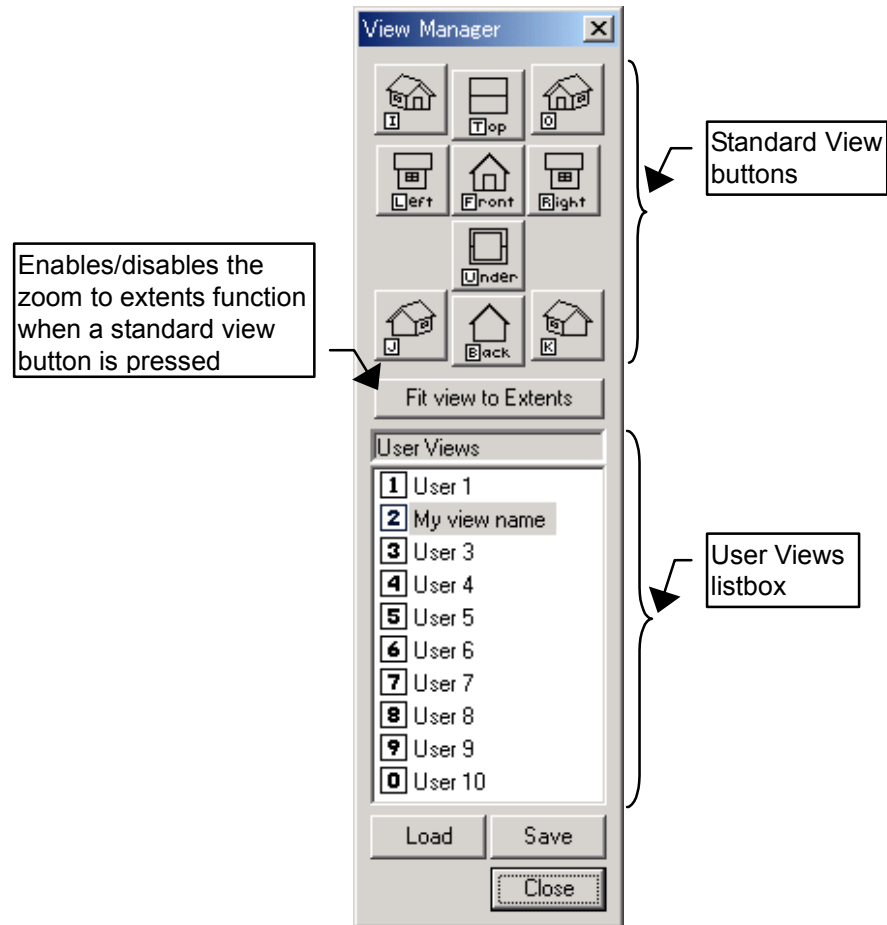
For detail on the preset viewpoint choices please refer to section " 5.2 Toolbar ".

Further preset viewpoint choices are available with the View Manager.

■ Viewpoint Operation with the View Manager

The View Manager panel allows to quickly change the view point of the scene by selecting one of the standard views or user views.

The View Manager panel can be displayed by clicking the , or by selecting {Screen} - {Camera Scope} - {View to Extents}.



View Manager

Item	Description
[Standard View] buttons	Changes the viewpoint to display associated the standard view.
[Fit view to extents] button	Displays all the models in the cell to fit in the view.
[User View] listbox	Double clicking one of the views will display the associated user defined view. Clicking the selected view name will enable the edition mode to allow renaming the selected view.
[Load] button	Changes the viewpoint displayed on the screen to the user view selected in the "User View" listbox.
[Save] button	Saves the current viewpoint displayed on the screen to the user view selected in the "User View" listbox.
[Close] button	Closes the View Manager panel.



User views definitions are only saved to the file when the cell is saved.

■ Using Shortcuts

Each view has an associated shortcut key that can be used to recall one of the defined views when the input focus is on either the cell display or on the View Manager panel. Pressing one of the numeric keys (1... 9, 0) will load the corresponding user view; the "0" key is used for the 10th user view. The first letter of the standard view name is used (.e.i. "T" for the Top view, "F" for the Front view...), the letters are indicated on the buttons of the View Manager panel. The keys "I", "O", "J" and "K" are used for the four isometric views.

■ Smooth Transition

The viewpoint can be changed with or without smooth transition function by setting the display as follows:

Smooth transition ON (smooth transition checked in the menu):


- The viewpoint changes as the image continuously moves.
- For the duration setting, select {Setting} - {Options}, then set the duration.

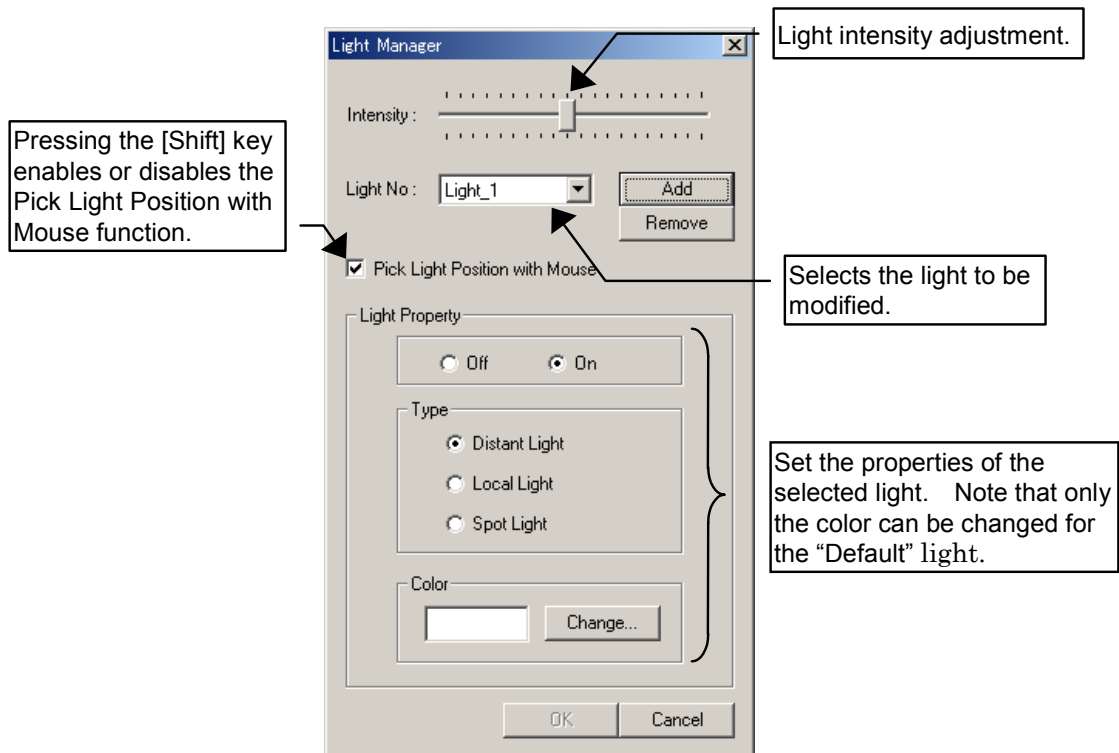
Smooth transition OFF (smooth transition unchecked in the menu):

- The viewpoint changes instantaneously.

6.2 Light Manager Operation

The Light Manager panel allows to add or remove lights and to modify the settings of each light. In addition to the default light, up to 4 additional lights can be added.

The Light Manager panel can be displayed by clicking the  button in the toolbar, or by selecting {Display} - {Light Manager} from the application menu.



Light Manager

Intensity	Adjusts the intensity of the lights. Sliding the control toward the left will reduce the general lighting of the scene. Sliding the control toward the right will increase it. (The standard intensity is 100) All the lights are affected by this control.
Light No.	Selects a light for operations. The properties of the currently selected light are displayed in the Light Property section.
Add	Adds a new light. To complete the operation, click on the main view to position the light. A light object will be displayed to indicate the location of the light. Up to 4 lights can be added. For more details please refer to the " Adding and Modifying Lights " and " Light Sources " sections.
Remove	Deletes the currently selected light. Note that the "Default" light cannot be deleted.

6.2 Light Manager Operation

Light Manager

Pick Light Position with Mouse	<p>When checked, clicking on the main view will move the position of the light to the clicked position. (When unchecked, clicking the main view doesn't change the light position and allows view point change operation.)</p> <p>Pressing the [Shift] key toggles the Pick Light Position with Mouse check mark.</p>
Light Property	<p>[On / Off]</p> <p>[Off] : The selected light is turned off. But, the light is not erased, the settings remains valid.</p> <p>[On] : The selected light is turned on.</p> <p>[Type]</p> <p>Distant Light : Light rays are all parallel (coming from an infinite distance)</p> <p>Local Light : Omni directional rays coming from the light source point (light marker).</p> <p>Spot Light : Cone shaped directional rays coming from the light source point (light marker).</p> <p>For more detail, please refer to the " Light Sources " section.</p> <p>[Color]</p> <p>The color of the light is displayed in the rectangle.</p> <p>[Change]</p> <p>Displays the Color Dialog to change the color of the light.</p>
OK	<p>Closes the Light Manager panel. The lights information will be save to the cell file when the cell is saved.</p> <p>The light markers in the main view will disappear when Light Manager is closed. To display the light markers again, reopen the Light Manager panel.</p>
Cancel	<p>Cancel the light setting modifications and closes the Light Manager panel.</p> <p>The light markers in the main view will be deleted.</p>

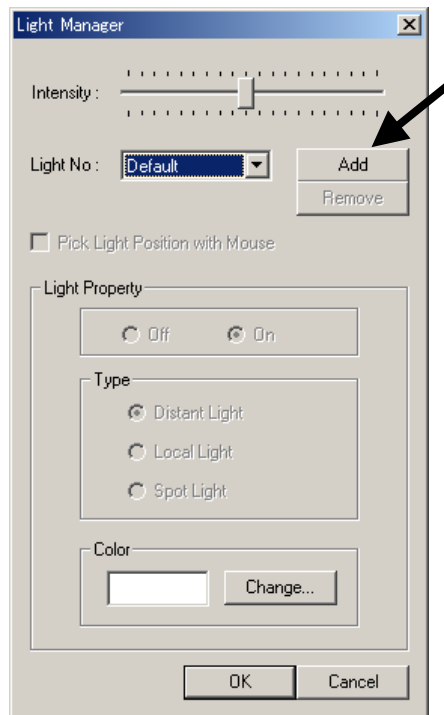


- To preserve the light settings for next time the cell is opened, the cell needs to be saved after the light settings are changed.
- When exporting files (i.e. html format), changing the light settings don't affect the resulting exported file.

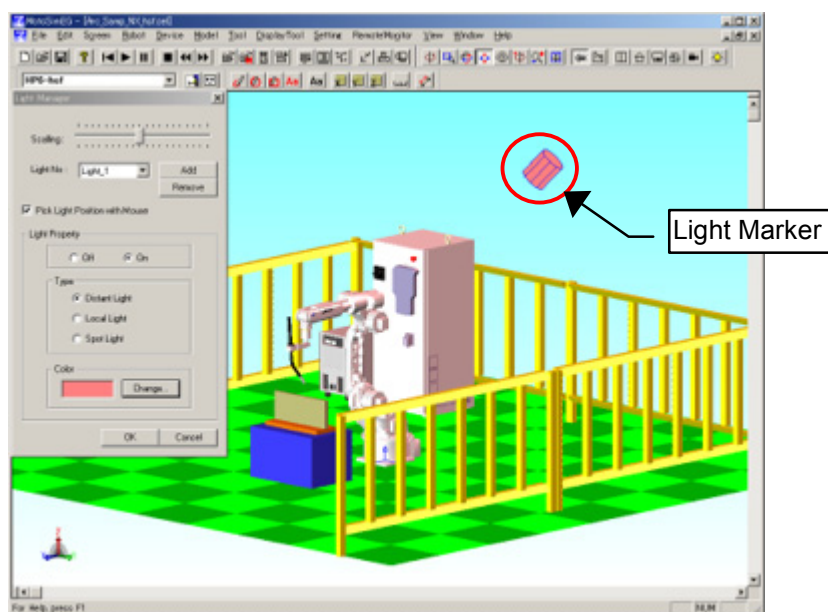
■ Adding and Modifying Lights

Operation Procedure

1. Press the [Add] button. The properties of the newly added light will display in the Light Property section. (At this stage, the light source still isn't created.)



2. Click on the main view to position the light. The light will be created and a light marker will be displayed to indicate the location of the light.
The light location and type can be confirmed by looking at the light marker in the main view.



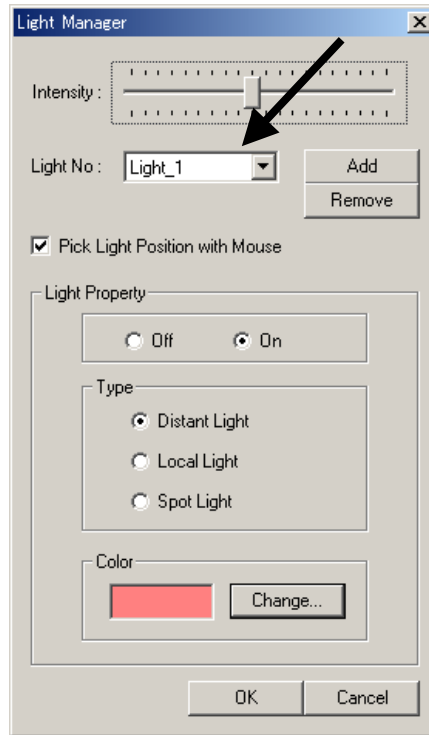
6.2 Light Manager Operation

The lighting of the cell will change to reflect the new light influence.

As long as the [Pick Light Position with Mouse] is checked, clicking on the main view will move the light to the clicked position. Other items can be changed in the Light Property section.

Note that a maximum of 4 lights can be added to the cell.

3. To modify existing light, first select the "Light No." and then change the settings in the "Light Property" section.



4. Press [OK] or [Cancel] to close the Light Manager panel.

When the Light Manager is closed the light markers in the main view will disappear. To display the light markers again, reopen the Light Manager panel.



To preserve the light settings for next time the cell is opened, the cell needs to be saved after the light settings are changed.

■ Deleting Lights

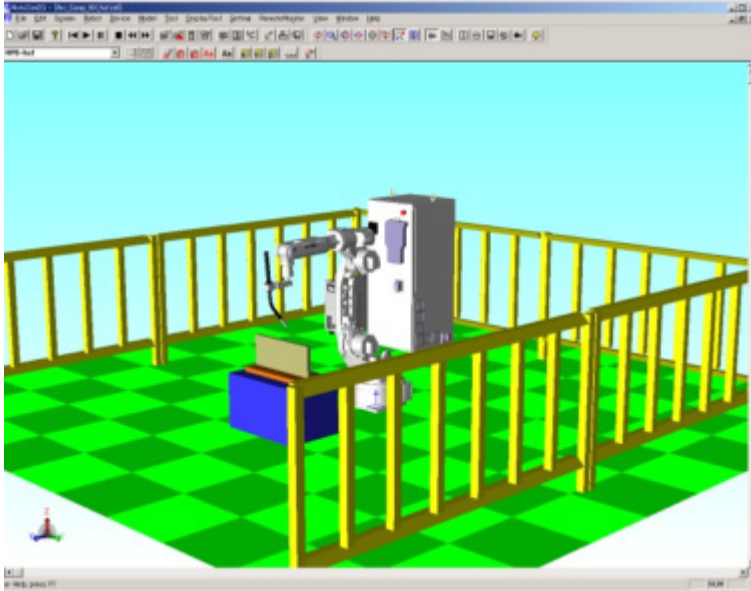
Select the light number. Press the [Remove] button to remove the light.

Note that the "Default" light cannot be deleted.

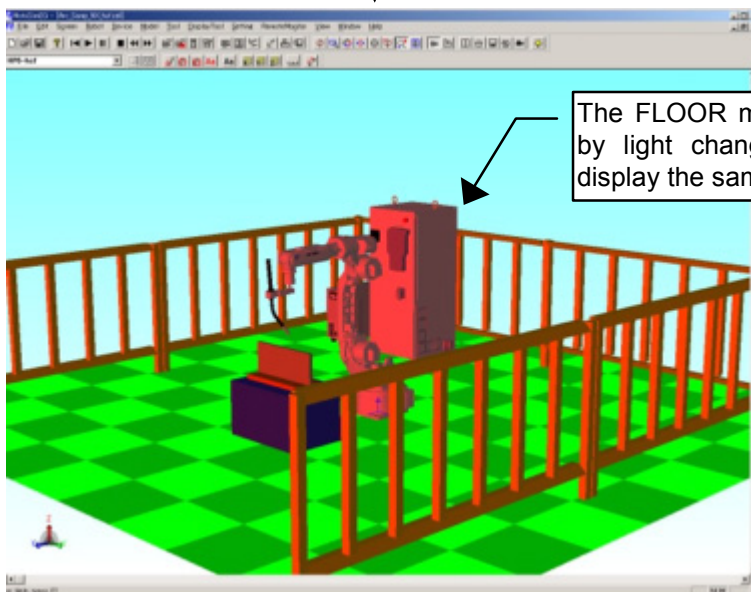
■ Light Sources

Default

Directional light constantly attached to the viewpoint. The initial light color is white.



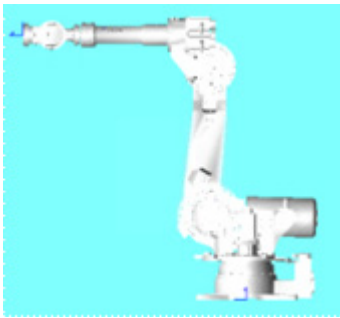
Result after changing the light color



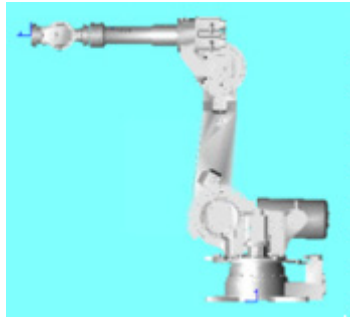
6.2 Light Manager Operation

The light reflection and intensity of the whole scene can be modified by adjusting the "Intensity" value.

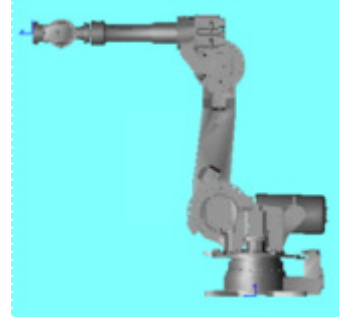
Intensity: 100



75



50

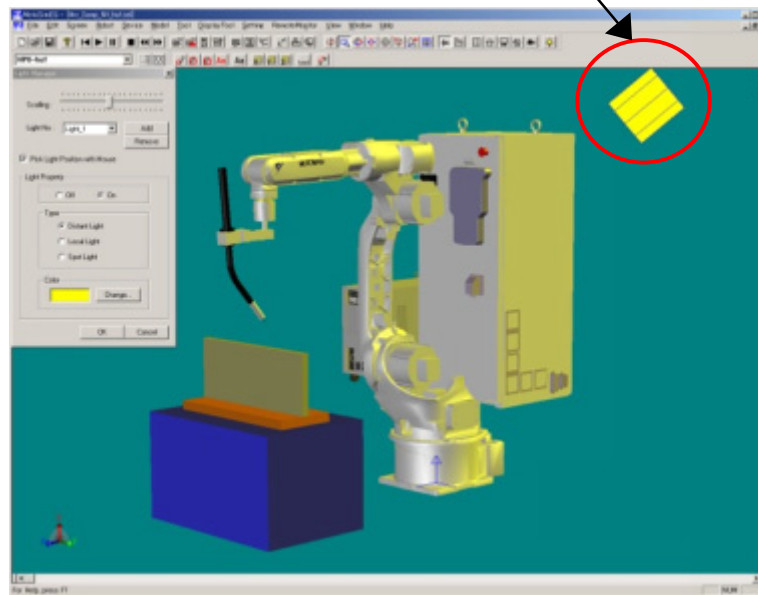


Distant Light

Light is emitted from a infinite distance so that all the rays are parallel. Light type for general use. The light direction is from the clicked position toward the viewpoint center.

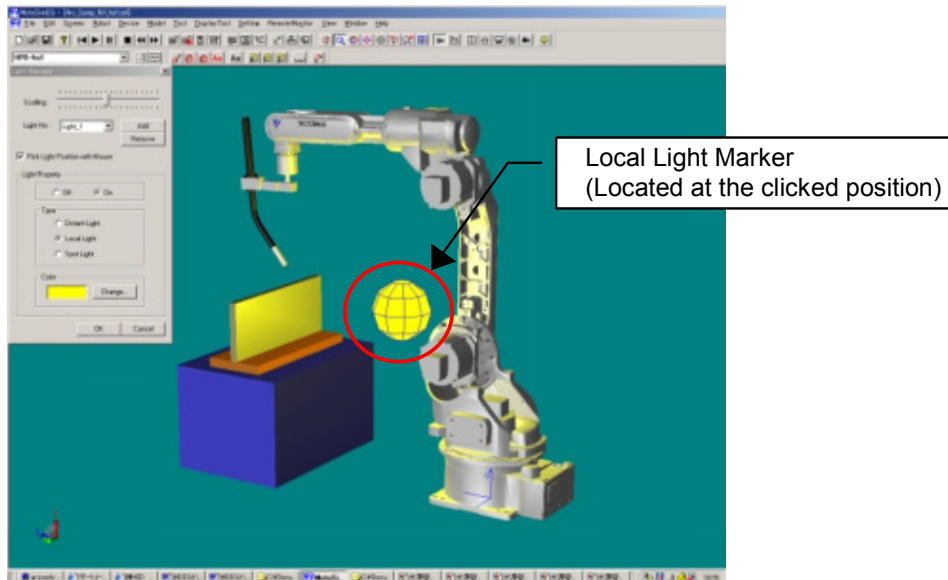
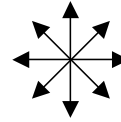


Distant Light Marker
(Located at the clicked position)



Local Light


Light is emitted in all direction from the light position.
Useful for generating light from a given point.

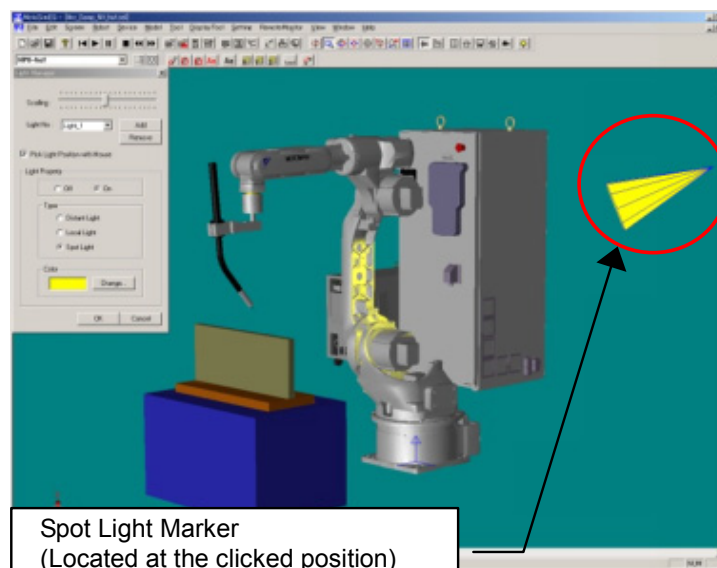


Spot Light

Light is emitted in a specific direction forming a cone from the light position in a cone shape. Useful to illuminate a specific face of a part.

The light direction is from the clicked position toward the viewpoint center. For proper illumination of a model or a face, it may be necessary to relocate the viewpoint center on the intended target before setting the light position.

Viewpoint center can be moved with the  icon or the {Center} item from the {Screen} - {Camera Scope} menu.

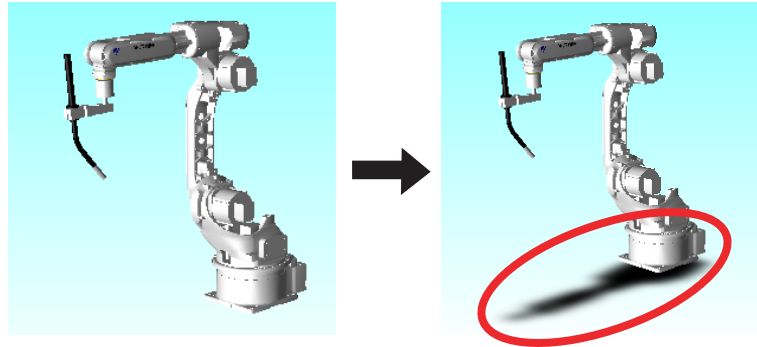


6.3 Displaying Shadows

Shadows can be displayed for the models on the screen.

Since the shadows are not easily visible when the floor is displayed, use the shadow with the opacity of floor image decreased (approx. to 0.5 or less), or hide the floor image.

For the detailed setting of shadow, refer to " 11.1.4 Shadow ".



6.4 Pick Settings

The Pick settings influence the selection of objects when picking object in the cell view with the mouse.

■ Pick Mode Setting

The Pick Mode sets conditions determining the selected point in the clicked area.

Procedure

Select {Screen} - {Mouse Picking}, and select one of the following items.

- Free: Selects the point of the model corresponding to the clicked position.
- Vertex: Selects the model vertex nearest to the clicked position.
- Center: Selects the face or edge center nearest to the clicked position. Note that in order to select the center of the cylindrical model, select the model using [Vertex] instead of [Center].
- Edge: Selects the edge point nearest to the clicked position.



That these settings are also linked to the same settings available in the OLP dialog.

■ Pick Object Setting

Pick object set filters on the type of objects that can be selected by the mouse pick.

Procedure

Select {Screen} - {Pick Object}, and toggle the check mark for one or more of the following items. A check mark indicates that the items can be selected.

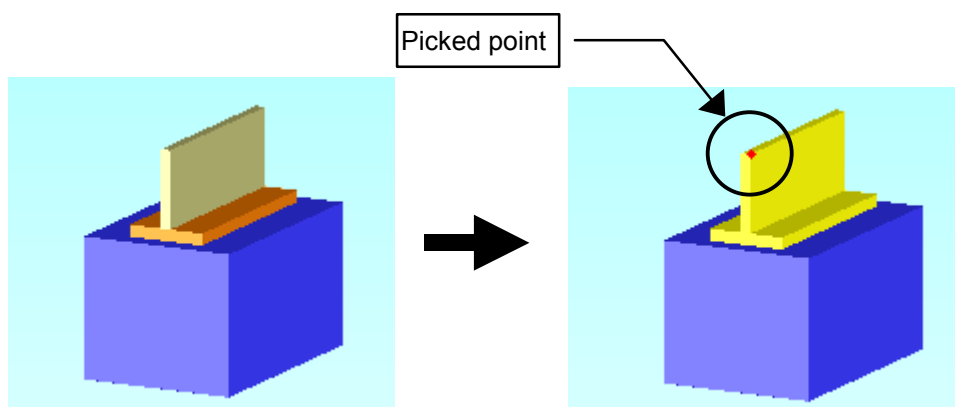
- Models: Solid models.
- Frames: Model frame or AXIS6 models. (Note: The model frame needs to be visible to be selected.)
- Lines & Inters: Lines such as LINE part, WORK line and wireframe model, and intersection lines generated by the intersection of parts or models. (Note the intersection lines are displayed during the pick operation when the left mouse button is pressed down. In cells with many detailed models, the intersection generation may slow down the pick function response. In such case, you may uncheck this item to improve performance.)
- Points: Points such as TRACE points.
- Floor: FLOOR parts. (Note: FLOOR parts tend to interfere selection depending on the viewpoint, therefore their selection is managed independently from other models.)



That these settings are also linked to the same settings available in the OLP dialog.

■ Pick method and screen display

When the mouse pointer is over the cell view, press down the left mouse button. The model considered for selection will display in yellow with a red dot to indicate the specific point location. The display will update to represent change of selection as the mouse pointer is moved over different models. The actual selection is made only when the mouse button is released.



6.5 Markup

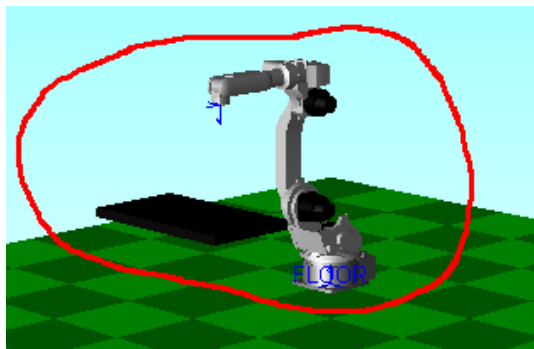
Graphic forms (such as circles, rectangles) and text can be temporarily drawn on the cell window.

6.5.1 Freehand


This section explains on how to draw a free-form line.



The line drawn on the cell is deleted by changing the viewpoint of the window.



Procedure

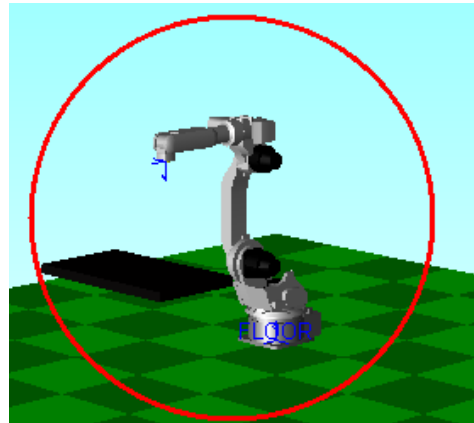
1. Set the viewpoint of the window. (This step must be done first since the line will be deleted when the viewpoint is changed.)
2. Click  button or select {Screen} - {Markup} - {Freehand}. Position the mouse pointer at a desired point, and drag the mouse freely so that the mouse pointer on screen draws a line with the mouse movement. Select {Setting} - {Options} to set the color and thickness of the line. Refer to " 11.2 Markup Settings " for details.

6.5.2 Circle


This section explains on how to draw a circle.



The circle drawn on the cell is deleted by changing the viewpoint of the window.



Procedure

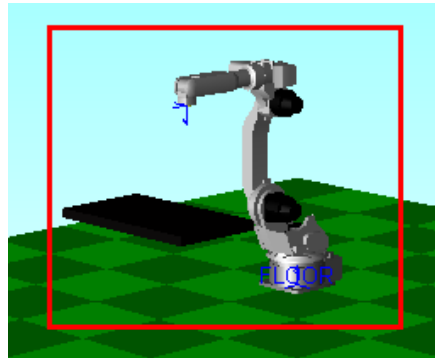
1. Set the viewpoint of the window. (This step must be done first since the circle will be deleted when the viewpoint is changed.)
2. Click  button or select {Screen} - {Markup} - {Circle}.
Position the mouse pointer at a desired point, and drag the mouse: a circle is drawn centering around the point where the mouse started dragging.
Select {Setting} - {Options} to set the color and line thickness of the circle. Refer to " 11.2 Markup Settings " for details.

6.5.3 Rectangle


This section explains on how to draw a rectangle.



The rectangle drawn on the cell is deleted by changing the viewpoint of the window.



Procedure

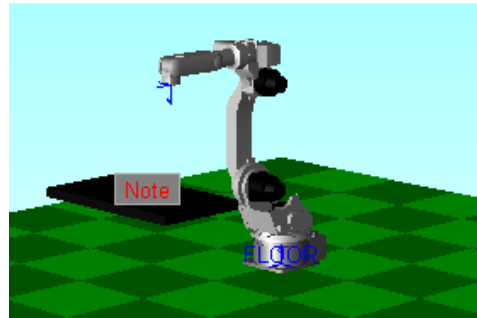
1. Set the viewpoint of the window. (This step must be done first since the rectangle will be deleted when the viewpoint is changed.)
2. Click  button or select {Screen} - {Markup} - {Rectangle}.
Position the mouse pointer at a desired point, and drag the mouse: a rectangle is drawn from the point where the mouse started dragging.
Select {Setting} - {Options} to set the color and line thickness of the rectangle. Refer to " 11.2 Markup Settings " for details.

6.5.4 Notes

This section explains on how to add a note.




The note added on the cell is deleted by changing the viewpoint of the window.



■ Adding a Note

Procedure

1. Set the viewpoint of the window. (This step must be done first since the note will be deleted when the viewpoint is changed.)
2. Click  button or select {Screen} - {Markup} - {Notes}.
Click any point on the window where to add notes; a "Note" indication appears at the clicked point. Right-click the "Note" to open a pop-up menu, and select {Edit} to enter texts.



3. Click on [OK] after entering the texts.
Select {Setting} - {Options} to set the font and color of the text. Refer to " 11.2 Markup Settings " for details.



- The note added on the cell is deleted by changing the viewpoint of the window.
- When adding two-byte characters, use a font that properly displays two-byte characters.

■ Deleting a Note

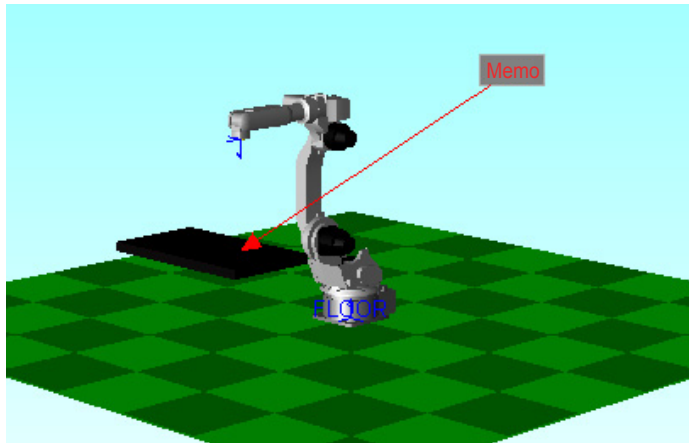
Select the note to be deleted, and right-click it. Select {Delete} from the pop-up menu to delete the text.

■ Relocating a Note

Drag a note to a different location with **Aa** button pressed or {Notes} in the menu selected ({Notes} can be selected by: {Screen} - {Markup} - {Notes}).

6.6 Memo

This section explains on how to create a memo (text).



■ Creating a Memo

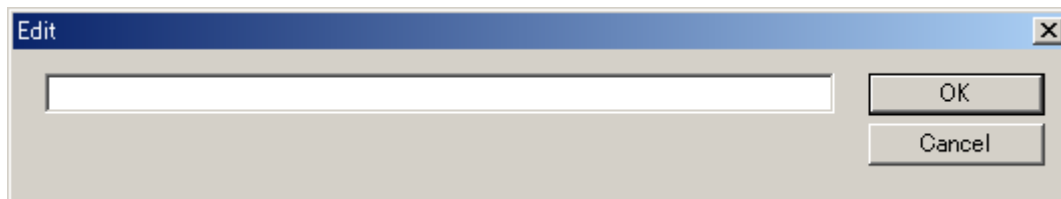
Procedure

1. Click the desired model and drag the mouse to the desired memo location; a "Memo" indication with an arrowed line appears at the position where the mouse button is released after dragging.



Non-displayed model or the point where there is no model cannot be selected as a subject for the memo indication whereas any point of the model displayed on the window can be selected for the memo indication.

2. Click **Aa** button or select {Screen} - {Memo}.
Right-click "Memo" to open a pop-up menu, and select {Edit} to enter texts.



3. Enter texts, and click on [OK].
Select {Setting} - {Options} to set the font and color of the texts. Refer to " 11.2 Markup Settings " for details.



When adding two-byte characters, use a font that properly displays two-byte characters.

■ Deleting a Memo

Select a memo to be deleted, and right-click it. Select {Delete} from the pop-up menu to delete the memo with the arrowed line.

■ Relocating a Memo

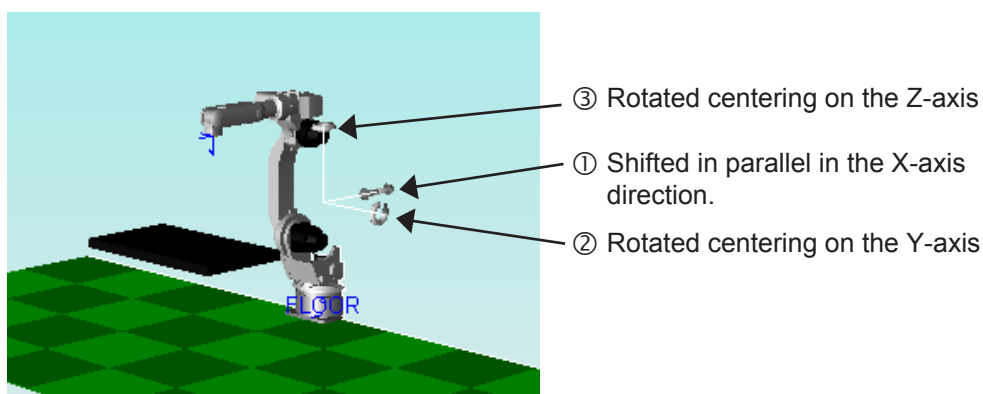
Drag a memo to a different location with **Aa** button pressed or {Memo} in {Screen} selected. Note that the arrow remains at the same point.

6.7 Cutting Planes

This section explains on how to display cross sections that are perpendicular to the X-, Y-, Z-axes directions in the cell window.

6.7.1 X-Cutting Planes

With this command, the X-cutting plane (a cutting plane which is perpendicular to the X-axis direction in the window) can be displayed as shown in the following figure:



■ Displaying the X-Cutting Plane

Perform either of the following operations when the X-cutting plane is not displayed:


- Click on .
- Select {Screen} - {Cutting Planes} - {X - Cutting Planes}.



■ Deleting the X-Cutting Plane

Perform either of the following operations when the X-cutting plane is displayed:

- Click on .
- Select {Screen} - {Cutting Planes} - {X - Cutting Planes}.

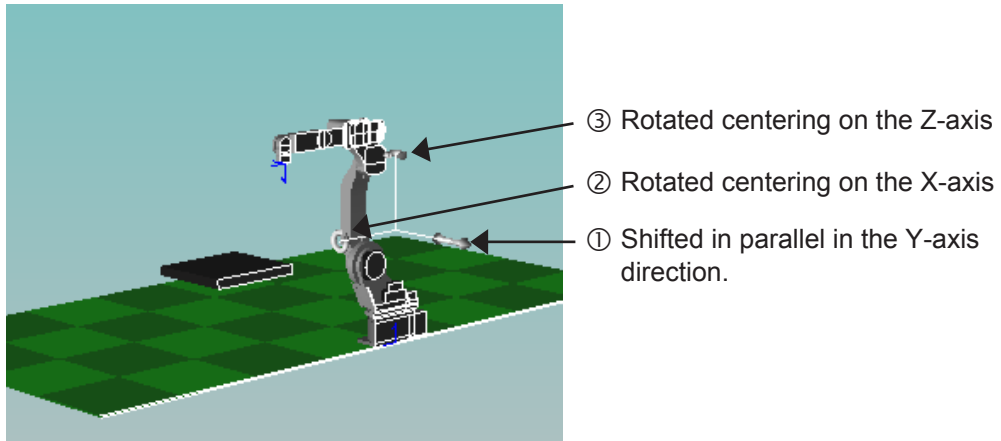
■ Changing Display of the X-Cutting Plane

Drag the tools ① to  on the figure above to rotate the X-cutting plane centering on the Y- or Z-axis, or shift it in a direction parallel to the X-axis.

①	Shift the X-cutting planes in a direction parallel to the X-axis.
	Rotate the X-cutting planes centering on the Y-axis.
	Rotate the X-cutting planes centering on the Z-axis.

6.7.2 Y-Cutting Planes

With this command, the Y-cutting plane (a cutting plane which is perpendicular to the Y-axis direction in the window) can be displayed as shown in the following figure:



■ Displaying the Y-Cutting Plane

Perform either of the following operations when the Y-cutting plane is not displayed:


- Click on .
- Select {Screen} - {Cutting Planes} - {Y - Cutting Planes}.



■ Deleting the Y-Cutting Plane

Perform either of the following operations when the Y-cutting plane is displayed:

- Click on .
- Select {Screen} - {Cutting Planes} - {Y - Cutting Planes}.

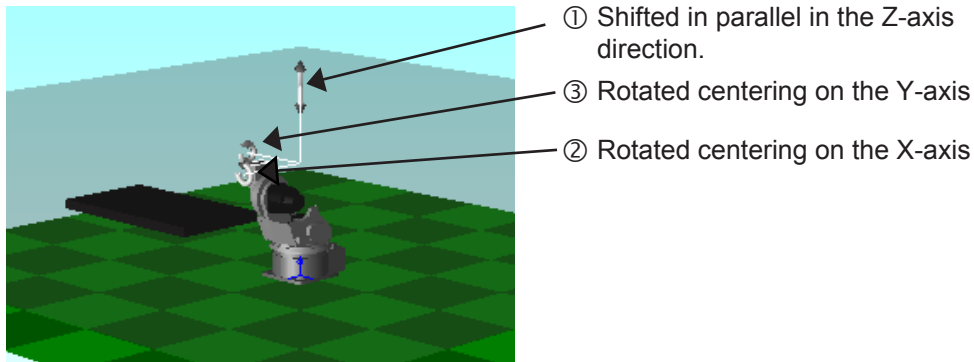
■ Changing Display of the Y-Cutting Plane

Drag the tools ① to  on the figure above to rotate the Y-cutting plane centering on the X- or Z-axis, or shift it in a direction parallel to the Y-axis.

①	Shift the Y-cutting plane in a direction parallel to the Y-axis.
	Rotate the Y-cutting plane centering on the X-axis.
	Rotate the Y-cutting plane centering on the Z-axis.

6.7.3 Z-Cutting Planes

With this command, the Y-cutting plane (a cutting plane which is perpendicular to the Z-axis direction in the window) can be displayed as shown in the following figure:



■ Displaying the Z-Cutting Plane

Perform either of the following operations when the Z-cutting plane is not displayed:


- Click on .
- Select {Screen} - {Cutting Planes} - {Z - Cutting Planes}.



■ Deleting the Z-Cutting Plane

Perform either of the following operations when the Z-cutting plane is displayed:

- Click on .
- Select {Screen} - {Cutting Planes} - {Z - Cutting Planes}.

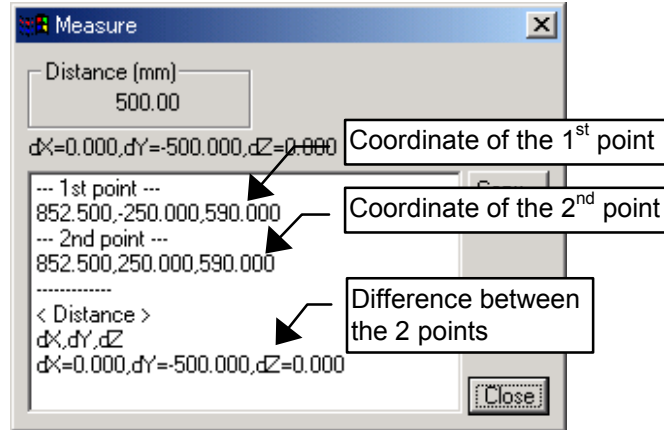
■ Changing the Z-Cutting Plane

Drag the tools ① to  on the figure above to rotate the Z-cutting plane centering on the X- or Y-axis, or shift it in a direction parallel to the Z-axis.

①	Shift the Z-cutting plane in a direction parallel to the Z-axis.
	Rotate the Z-cutting plane centering on the X-axis.
	Rotate the Z-cutting plane centering on the Y-axis.

6.8 Measure Distance


Click 2 points to measure the distance between them.



Measure Distance dialog

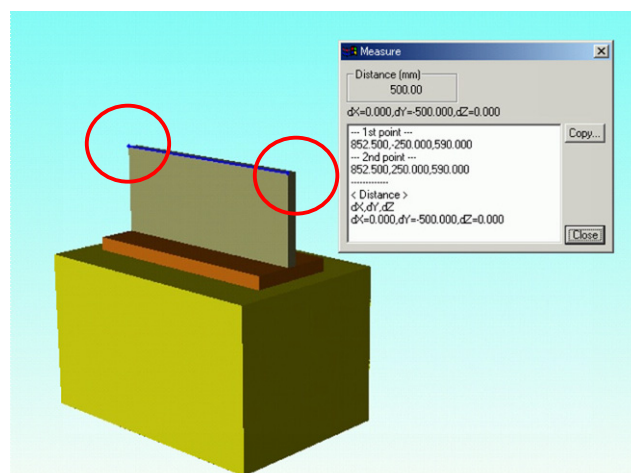
Copy	Copies the measurement result to the clipboard.
Close	Closes the Measure Distance dialog.

Procedure

1. Click the  button in the toolbar, or select {Screen} - {Measure} - {Distance} from the application menu.
2. Click with the mouse any 2 points on models. (Blue dots on the clicked positions and a blue line joining the points will appear.) The Measure Distance dialog will display with the measurement results.

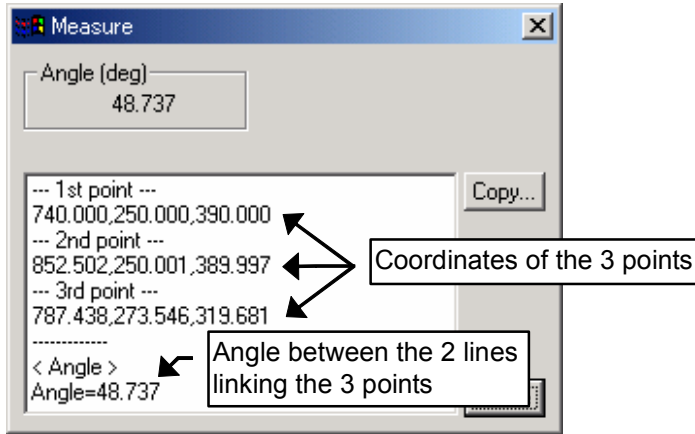


When clicking in an area the selected point depends on the current "Pick Mode" and "Pick Object" settings. Please refer to " 6.4 Pick Settings " for details.



6.9 Measure Angle


Click 3 points to measure the angle between them.



Measure Distance dialog

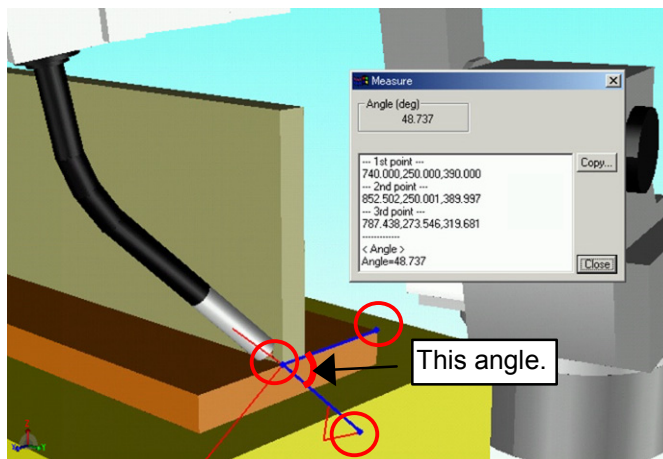
Copy	Copies the measurement result to the clipboard.
Close	Closes the Measure Angle dialog.

Procedure

1. Click the  button in the toolbar, or select {Screen} - {Measure} - {Angle} from the application menu.
2. Click with the mouse any 3 points on models. (Blue dots on the clicked positions and blue lines joining the points will appear.) The Measure Angle dialog will display with the measurement results.

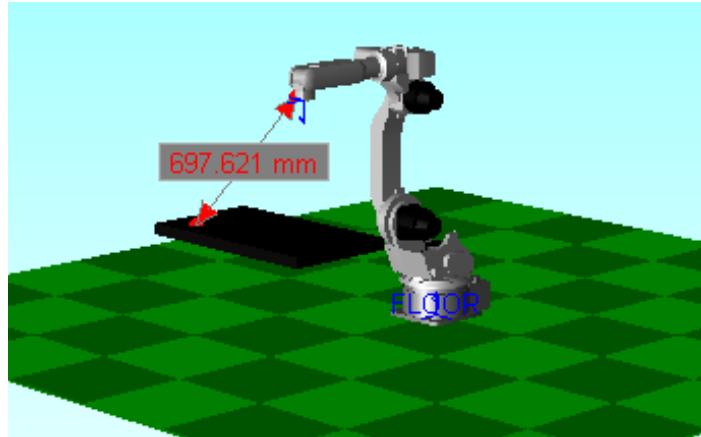


When clicking in an area the selected point depends on the current "Pick Mode" and "Pick Object" settings. Please refer to " 6.4 Pick Settings " for details.




6.10 Measure Line

With this command, a dimension line can be created as shown in the figure below.



■ Creating a Dimension Line

Procedure

1. Click  or select {Screen} - {Measure Line}.
2. Click a model and drag; a dimension line with two-headed arrow appears where the mouse is dragged across, displaying the dimension between the both ends.




- Non-displayed model or the point where there is no model cannot be selected as a subject for the dimension line indication whereas any point of the model displayed on the window can be selected for the dimension indication.
- When clicking in an area the selected point depends on the current "Pick Mode" and "Pick Object" settings. Please refer to " 6.4 Pick Settings " for details.

■ Deleting a Dimension Line

Select a dimension to be deleted, and right-click it. Select {Delete} from the pop-up menu to delete the dimension with the dimension line.

■ Relocating a Dimension Line

Drag a dimension to a different location with  button pressed or {Measure Line} in the {Screen} selected. Note that both arrows remain at the same point.

6.11 Changing the Rendering Mode

The display mode can be change by selecting {Screen} - {Rendering Mode}.



- The cell is displayed in "GourandShading" mode when it is opened.
- For edition, select desired mode from "FlatShading", "GourandShading", or "Wireframe".

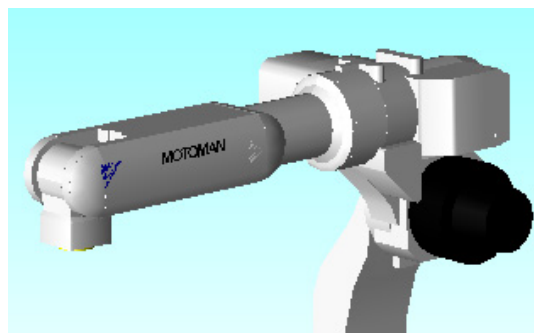
Flat Shading

The image displayed in flat shaded rendering mode:



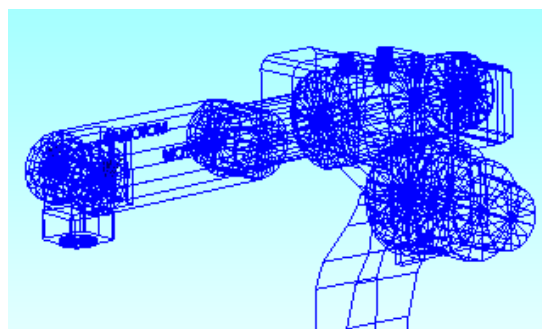
Gourand Shading

The image displayed in Gourand shaded rendering mode:



Wire Frame

The image displayed in wire frame:



6.12 Other Display Operations

6.12.1 Changing Frame Width

Modify the frame line width for better visualization on the display.
Refer to " 11.1.5 Frame & AXIS6 " to set the frame length.

Procedure

Select {Screen} - {Line Style}, and select the frame width from {Small}, {Medium}, or {Large}.

6.12.2 Copying the Image

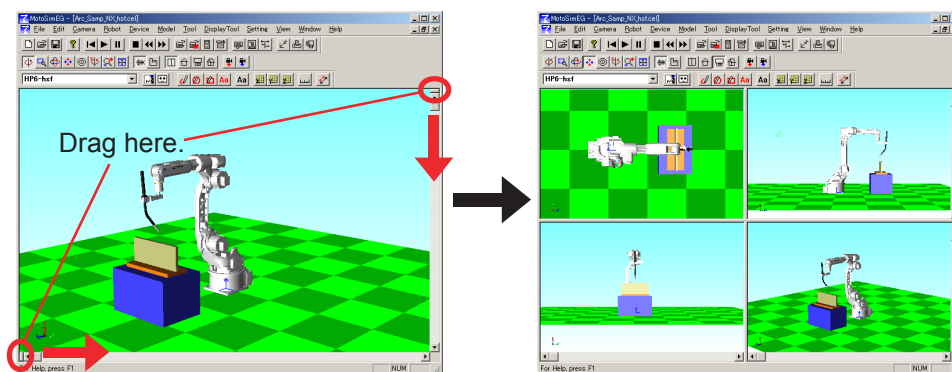
Copy the static image of the cell window: the copied data can be used in other application software by pasting it.

Procedure

Display the cell to be copied. Select {Edit} - {Copy}, or hold down the Ctrl key and press the C key.

6.12.3 Dividing a Cell Window

A cell window can be divided up to four views by dragging a separator of the vertical or horizontal scroll bar in the cell window. This function provides users with different viewpoint angles, enabling teaching or playback operations viewed from several directions.



6.12.4 Printing the Image

MotoSim EG does not have any printing function. To print the data with MotoSim EG, select {Edit} - {Copy} or hard-copy the screen (Alt + Print Screen), and paste it to another application.

7 Robot Settings

MotoSim EG allows many robot operations, such as adding, deleting, etc. This chapter describes operation related to robot, jobs, data setting for tools, user coordinates and so forth.

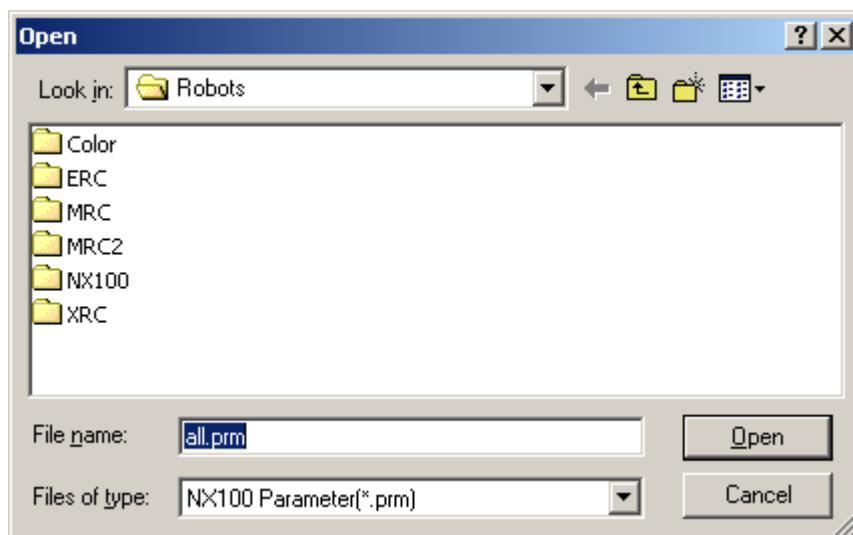
7.1 Adding/Deleting a Robot

■ Adding a Robot

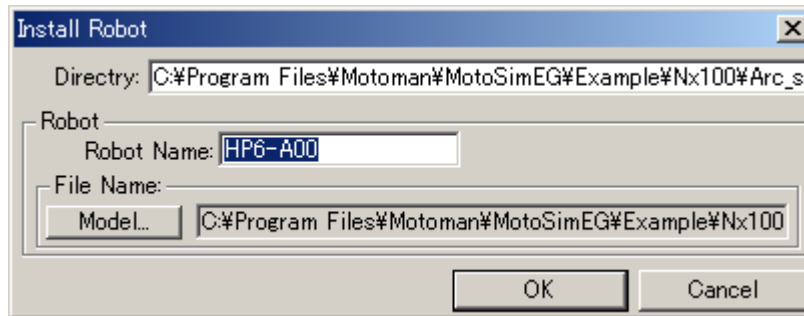
The parameter file "All.prm" is required to add a robot. (In the case of an ERC robot, the parameter file "Param.dat" and a tool file "Tool.dat" are required.) The parameter is basically prepared by saving the parameter data stored in the controller. Note, however, that it is also possible to use sample data from MotoSim EG.

Procedure

1. Select {Robot} - {Add Robot}.
2. A dialog box (Open) appears. Select the parameter for the subject robot, and click [Open].



- The Install Robot dialog box appears.
Enter the robot name in the Robot Name edit box, and click on [OK].



Robot model file is selected automatically when the parameter file is specified. However, if the MotoSim EG folder configuration is changed, or if the robot model file has been erased, the model file may not be selected automatically. In this case, click on [Model] to select the robot model file.

Changing the Robot Position

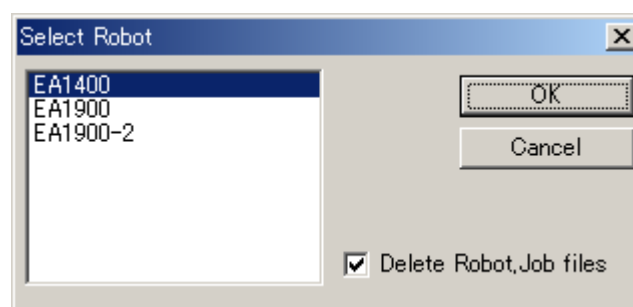
The position of the robot registered in a cell can be changed by the same procedure to change model positions. Refer to " 9.5 Positioning a Model " for details.

■ Deleting a Robot

Delete the robot registered in a cell in the following procedure.

Procedure

- Select {Robot} - {Delete Robot...}.
- A dialog box (Select Robot) appears. Select the robot to be deleted, then click on [OK]. (Note that multiple selection is not possible in this dialog box.)



The cell folder and the file of the robot model folder in the lower layer, and the sub-folders lower than the 2nd layer are deleted upon the delete operation executed when the [Delete Robot, Job files] check box is ON. However, the files in the MODELS folder will not be deleted.


When keeping the job files, execute the delete operation after clearing the [Delete Robot, Job files] check box.

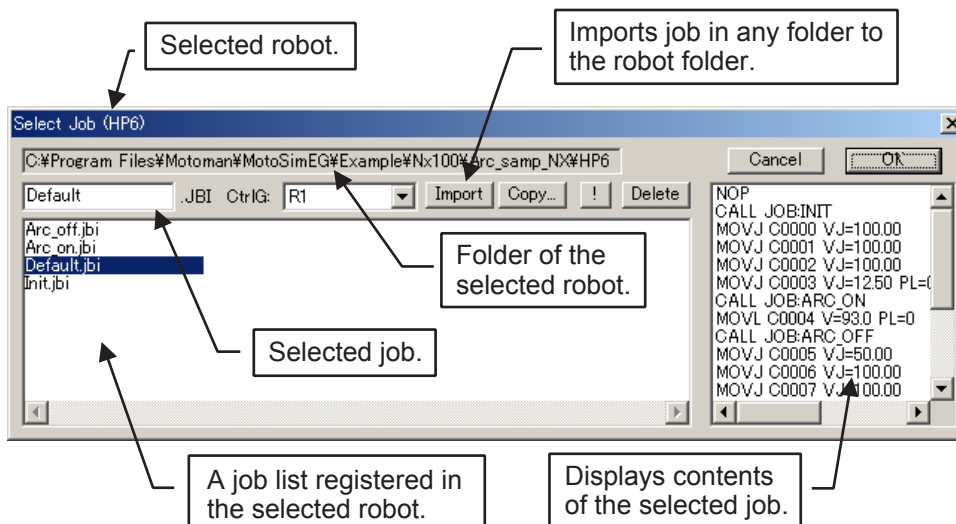
7.2 Controller

The {Controller} command from the {Robot} menu in the MotoSim EG main window enables robot/job selection, heart beat settings, etc.

7.2.1 Job Management

The Select Job dialog box (see the figure below) allows to select, copy, delete the jobs. It can also import jobs registered in other cells.

To display the Select dialog box, click on , or select {Robot} - {Controller} - {Select JOB}.



■ Selecting a Job

Select a job from the job list, then click on [OK].

■ Importing a Job

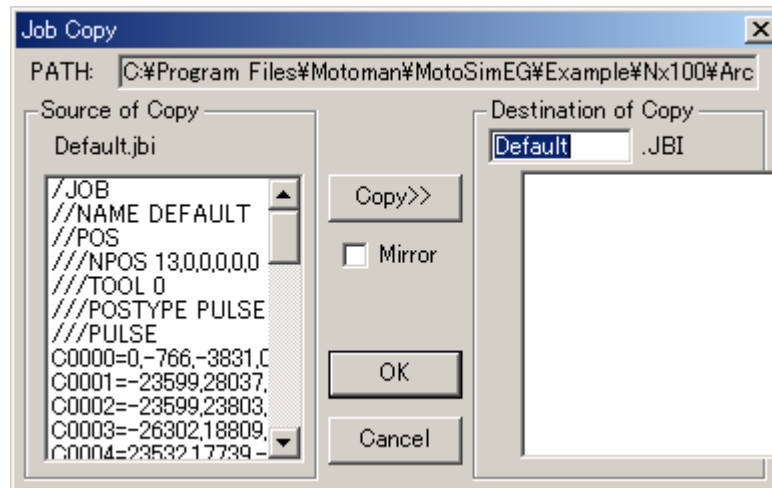
Procedure

- 1) Click on [Import].
- 2) Select a job, and click [Open].
- 3) Click [OK] to import the job.

■ Copying a Job

Procedure

- 1) Select a job to be copied, and click on [Copy...]: the Job Copy dialog box as shown below appears.




- 2) Enter a job name in the Destination of Copy edit box, and click on [Copy>>].
- 3) The job to be copied is displayed on the right; check the item, then click on [OK] to copy the job.

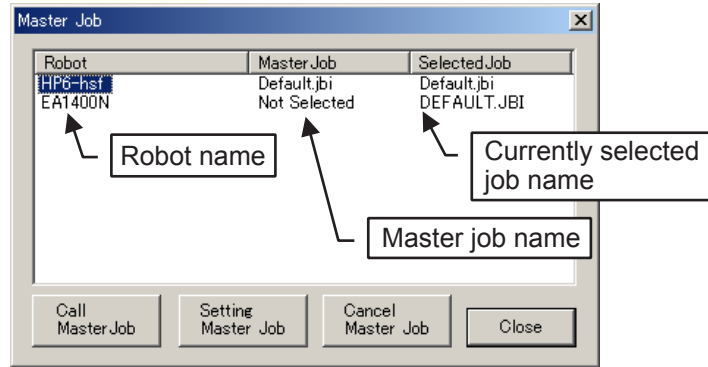
■ Deleting a Job

Select a job to be deleted from the job list in the Select dialog box, then click on [Delete].

7.2.2 Master Job Management

The Master Job dialog box (see the figure below) allows to call, set, and cancel the master job.

The Master Job dialog box appears by clicking the button , or by selecting {Robot} - {Controller} - {Select Master Job}.



Master Job Dialog Box

Item	Function
[Call Master Job] button	Sets the master job as a selected job. (Enabled if a master job is registered.)
[Setting Master Job] button	Registers a job selected in the job selection dialog box as a master job. The master job is automatically selected when the cell is opened. (Select {Robot} - {Controller} - {Select Job} to call up the job selection dialog box.)
[Cancel Master Job] button	Cancels the registered master job.

7.2.3 Robot Selection

Select a robot to be operated.

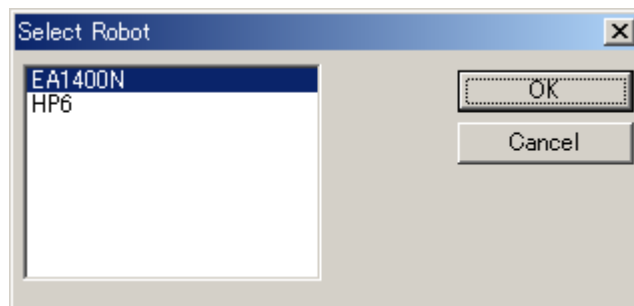
The robot can be selected in the Select Robot dialog box which can be opened by selecting {Robot} - {Controller} - {Change Robot}.

It is also possible to set the robot with the combo box on the left of the [Robot] tool bar of the main window. (See figure below)



Procedure

Select the robot to be operated, and click on [OK].

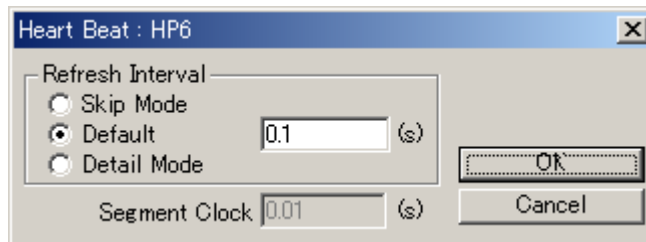


7.2.4 Heart Beat

The drawing time interval can be set in the Heart Beat dialog box, which appears by selecting {Robot} - {Controller} - {Heart Beat}.

To change the drawing time interval, select one of the radio buttons [Default], [Skip Mode], [Detail Mode], or directly enter a value in the edit box. However, note that a value smaller than the "Segment Clock" (at the bottom of the Heart Beat dialog box) is invalid.

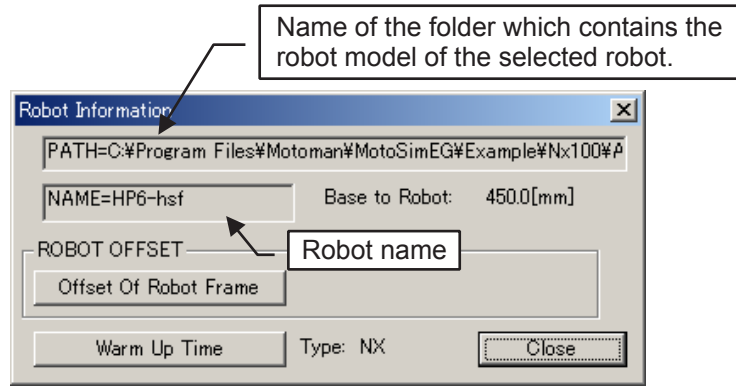
The segment clock value is set in the robot parameters, and is indicated as a reference.



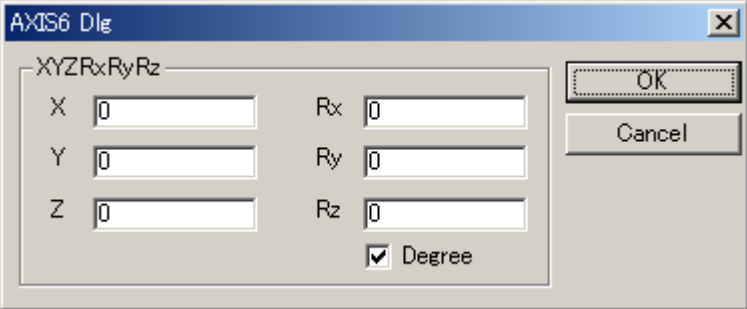
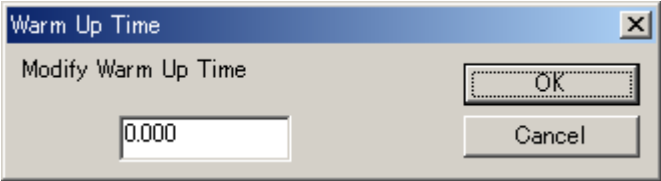
7.2.5 Robot Information

Set the offset value of the subject robot frame and the warm up time in the Robot Information dialog box shown below.

To open the Robot Information dialog box, select {Robot} - {Controller} - {Information}.



Robot Information Dialog Box

Item	Corresponding Dialog Box
<p>[Offset Of Robot Frame] button</p>	<p>AXIS6 Dlg dialog box appears: set the robot offset value for each axis.</p> 
<p>[Warm Up Time] button</p>	<p>Warm Up Time dialog box appears: set the robot warm-up time.</p> 

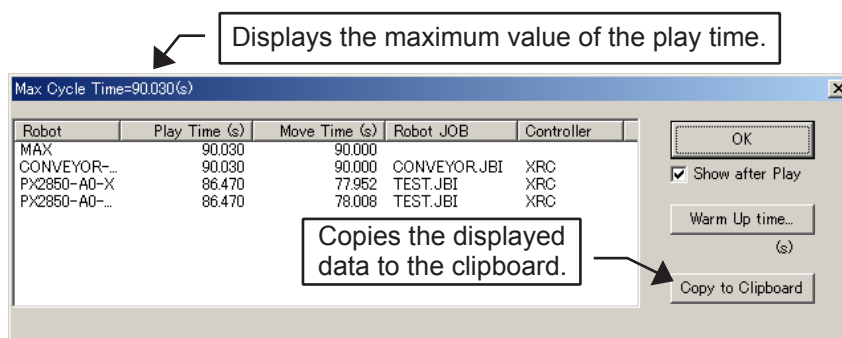
7.3 Playback

Operation of job, display of playback speed and cycle time, etc. are enabled by the {PlayBack} command in the {Robot} menu.

7.3.1 Cycle Time

The result of the latest playback cycle time is displayed by selecting {Robot} - {PlayBack} - {Cycle Time}.

For the details of the button [Warm Up time], refer to " 7.2.5 Robot Information ".





- If robot job contain the position level "PL=0" in move command or application specific instruction, the resulting cycle time of the simulation may not provide sufficient accuracy compared to the actual robot.
- MotoSim EG does not support the "High-speed picking" function. If the conveyor synchronization job uses the "High-speed picking" function, the resulting cycle time of the simulation may not provide sufficient accuracy.

7.3.2 Job Operations

The job operations are available by selecting the following buttons or selecting the functions from the {PlayBack} command in the {Robot} menu.

For the details of each function, refer to " 5.2 Toolbar ".

Button	Command from Menu
	{Robot} - {PlayBack} - {Start}
	{Robot} - {PlayBack} - {Hold}
	{Robot} - {PlayBack} - {Pause}
	{Robot} - {PlayBack} - {Step Next}


Button	Command from Menu
	{Robot} - {PlayBack} - {Step Back}
	{Robot} - {PlayBack} - {Reset Job}

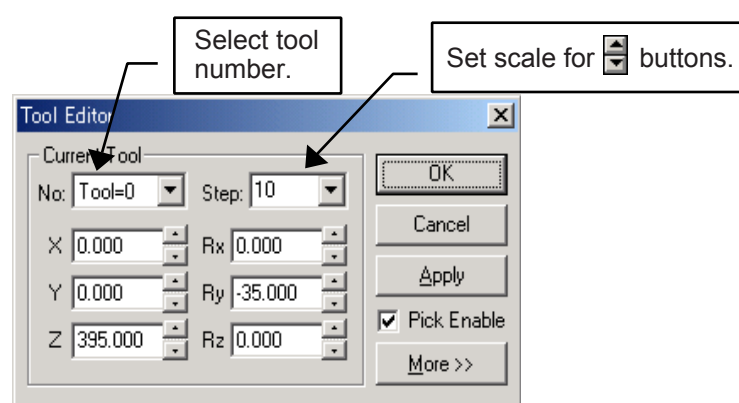
7.4 Data Setting

Settings of tool data, user frame, and robot calibration and soft limits are enabled by the {Data Setting} command in the {Robot} menu.

7.4.1 Modifying the Tool Data

To modify the tool data, display the TOOL Editor dialog box first by selecting {Robot} - {Data Setting} - {Tool data}.

Select the tool number, then modify the tool data by using the spin button  at the side of each edit box or entering the value directly.



TOOL Editor Dialog Box

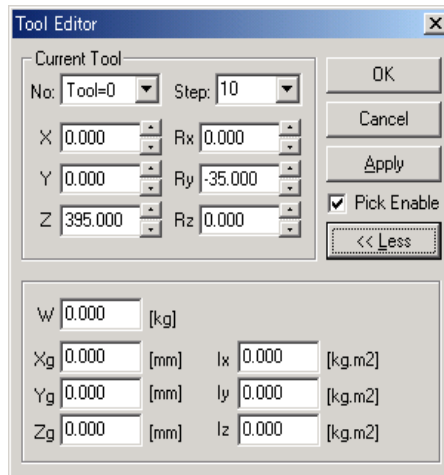
Item	Function
[OK] button	Closes the dialog box after modifying the tool data.
[Cancel] button	Closes the dialog box without modifying the data to the new values.
[Apply] button	Modifies the tool data; does not close the dialog box.
[Pick Enable] check box	Enables mouse picking operation. When clicking in an area the selected point depends on the current "Pick Mode" and "Pick Object" settings. Please refer to " 6.4 Pick Settings " for details. Pressing the [Shift] key enables or disables the [Active] checkbox.
[Exp. >>] button	Displays tool load information, enabling data setting.

■ Setting the Tool Load Information

TOOL Editor dialog box extends to show the tool load information as follows when [Exp. >>] button is selected.

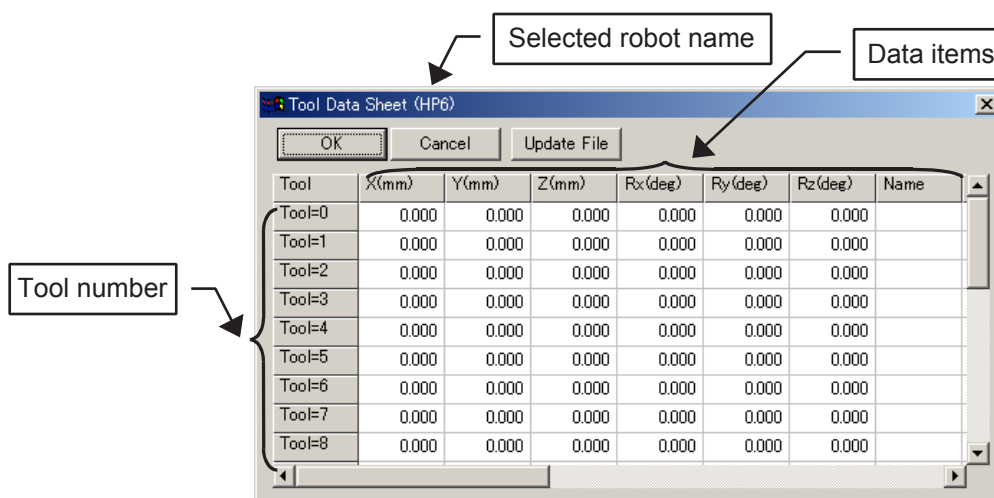


The tool load information setting is not available for YASNAC MRC, MRC II, ERC robots.



7.4.2 Modifying the Tool Data Collectively

The tool data can be modified collectively: to start the operation, open the following dialog box for collective modification by selecting {Robot} - {Data Setting} - {Tool Data Sheet}.

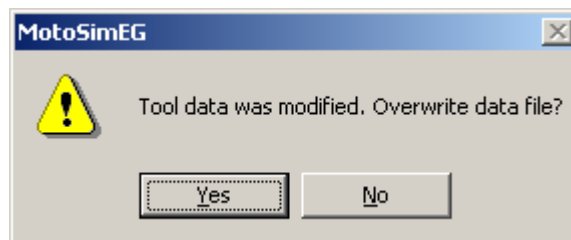


Tool Data Sheet Dialog Box

Item	Function
[OK] button	Confirms saving of the modified tool data ("Tool.cnd"), and closes the dialog box.
[Update File] button	Confirms saving of the modified tool data ("Tool.cnd"); does not close the dialog box.
[Cancel] button	Closes the dialog box without modifying the data to the new values.

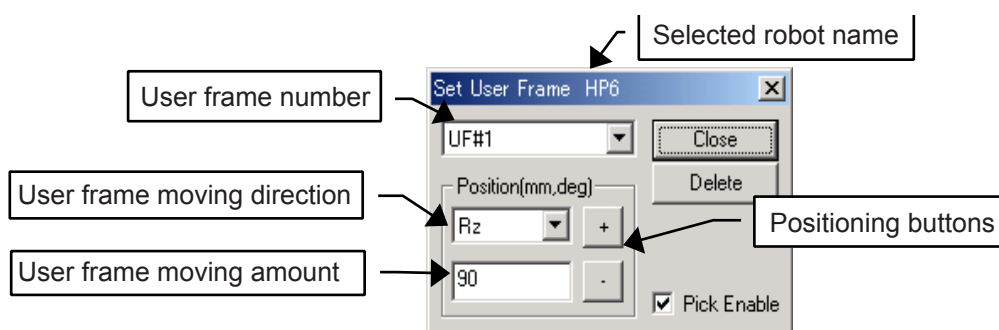
Procedure

1. Enter and modify the value of data item to be modified in the dialog box sheet, and press [OK] or [Update File].
2. A confirmation dialog box appears.
Click [Yes] to save the modified data; click [No] if the modified data is not to be saved.



7.4.3 Setting the User Frame with the Mouse Picking Mode

The user frame can be plotted simply with mouse picking operation. Start by opening the following dialog box for user frame setting by selecting {Robot} - {Data Setting} - {Set User Frame}.



Set User Frame Dialog Box

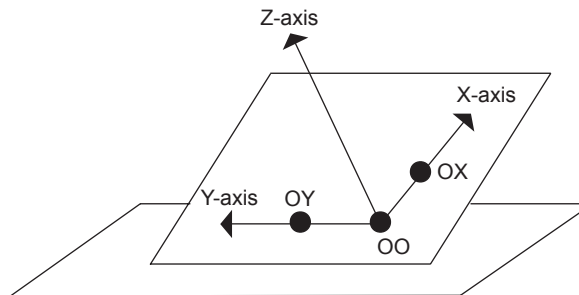
Item	Function
[Pick Enable] check box	Enables mouse picking operation. When clicking in an area the selected point depends on the current "Pick Mode" and "Pick Object" settings. Please refer to " 6.4 Pick Settings " for details. Pressing the [Shift] key enables or disables the [Active] checkbox.
[Close] button	Closes the dialog box.

Procedure

1. Check the [Active] check box in the dialog box.
Click the point where the user frame is to be plotted on the cell window: the user frame appears.
2. Move the user frame as necessary: to move the user frame, set its moving direction and moving distance, and move it with buttons [+] / [-].
3. Click on [Close] to complete creation of the user frame.

7.4.4 Setting the User Frame

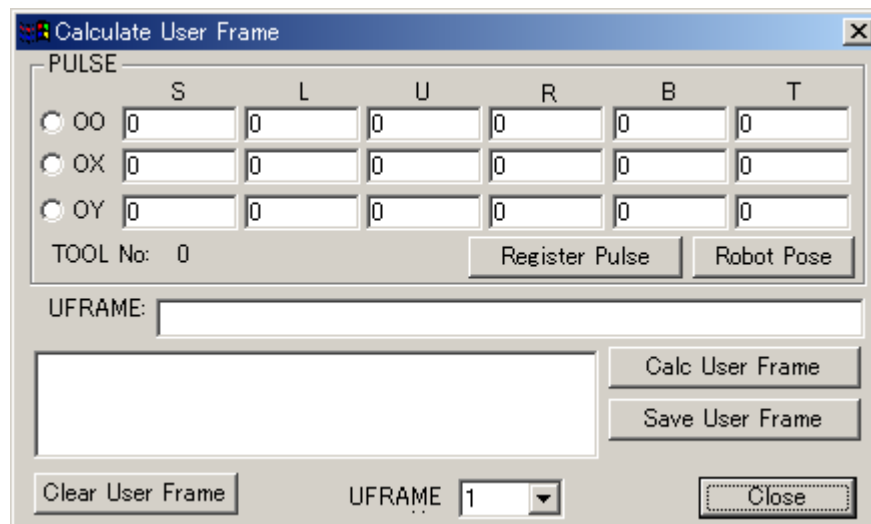
The user frame is defined by three points which are taught by axis key operation. The three defined points are OO, OX, and OY as shown in the following figure.



User frame defining points

- OO: Origin of user frame
- OX: Point on user frame X-axis
- OY: Point on user frame Y-axis

Select {Robot} - {Data Setting} - {Calculate User Frame...} to open the Calculate User Frame dialog box. Refer to " 12.2 User Frame Setting " for detailed use of the user frame setting.



Calculate User Frame Dialog Box

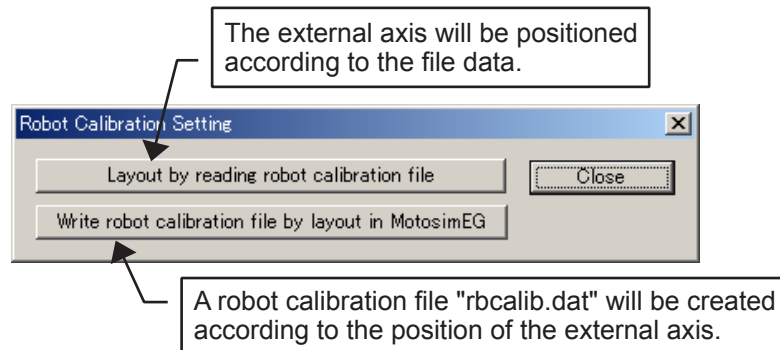
Item	Function
[Clear User Frame] button	Deletes the user frame selected from the combo box for UFRAME.
[Close] button	Closes Calculate User Frame dialog box.

Procedure

1. Select the user frame number from the combo box for UFRAME.
2. Select the [OO] radio button.
3. Move the robot to the point that will be the origin of the user frame, then click on [Register Pulse]: the current pulses of each axis (S, L, U, R, B, T) are displayed.
4. Register "OX" and "OY" in the same way as "OO" following the steps 2 to 3.
5. Select any of [OO], [OX], [OY] radio buttons, and move the robot to each registered point using [Robot Pose] to verify the posture.
6. Click on [Calc User Frame] to calculate the user frame.
7. Click on [Save User Frame] to register the user frame.

7.4.5 Setting the Robot Calibration

An external axis for a station can be automatically build using the file information for robot calibration (rbcalib.dat).



Robot Calibration Setting Dialog Box

Item	Function
[Close] button	Closes Robot Calibration Setting dialog box.

■ Creating an Environment using Actual Robot Calibration Files

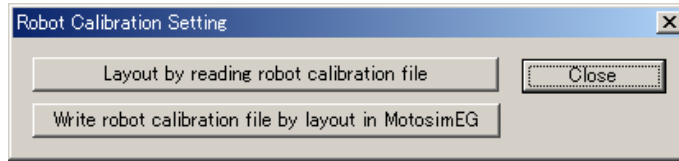
Procedure

- To register a robot, follow the procedures described in "7.1 Adding/Deleting a Robot". Close the cell file after saving it.
Make sure that the robot to be registered has a parameter file (All.prm) with the following optional parameter enabled: if this option is not enabled, the station coordination function does not operate properly.

Parameter Item	Setting Value	Function
FD7	1	Coordinated functional option

- Copy the "ALL.prm", "tool.end" and "rbcalib.dat" from the actual controller to the robot folder.
- Open the cell.
- Select {Robot} - {Data Setting} - {Robot Calibration}.
Note that the menu selection is disabled if the station coordination function is not enabled in the parameter file. In this case, set the parameter FD07 to "1", then open the cell once again.

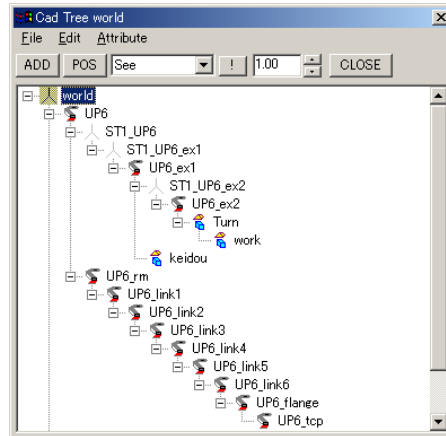
5. The Robot Calibration Setting dialog box appears: click on [Layout by reading robot calibration file].



6. The external axis of the station is located according to the file information.

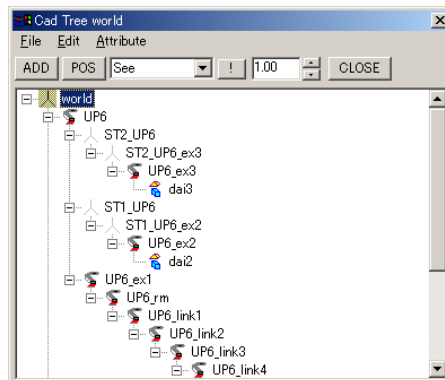
Example 1: For one 2-axis station

As shown in the following figure, ST1_UP6_ex1 and ST1_UP6_ex2 are automatically created as parents of UP6_ex1 and UP6_ex2, respectively. Since ST_UP6_ex1 and 2 are to be the bases of the external axes, these models contain information on the axis postures. The information on the position (X, Y and Z) of the station is described in ST1_UP6.



Example 2: For two 1-axis stations

The following figure is an example in which a servotrack and two single-axis stations are used. ST1_UP6_ex2 and ST2_UP6_ex3 are created in the same way as explained in Example 1.



7. Finally, add models of the station base, tilting axis, turn table, and other necessary models: models are added with ST1_UP6, UP6_ex1, and UP6_ex2 as parents for the station base, tilting axis, turn table, respectively.


■ Constructing an Environment with MotoSim EG

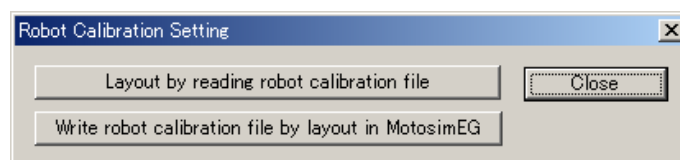
Procedure

1. To register a robot with axes, follow the procedures described in " 7.1 Adding/Deleting a Robot ": close the cell file after saving it.

Make sure that the robot to be registered has a parameter file (All.prm) with the following optional parameter enabled: if this option is not enabled, the station coordination function does not operate properly.

Parameter Item	Setting Value	Function
FD7	1	Coordinated functional option

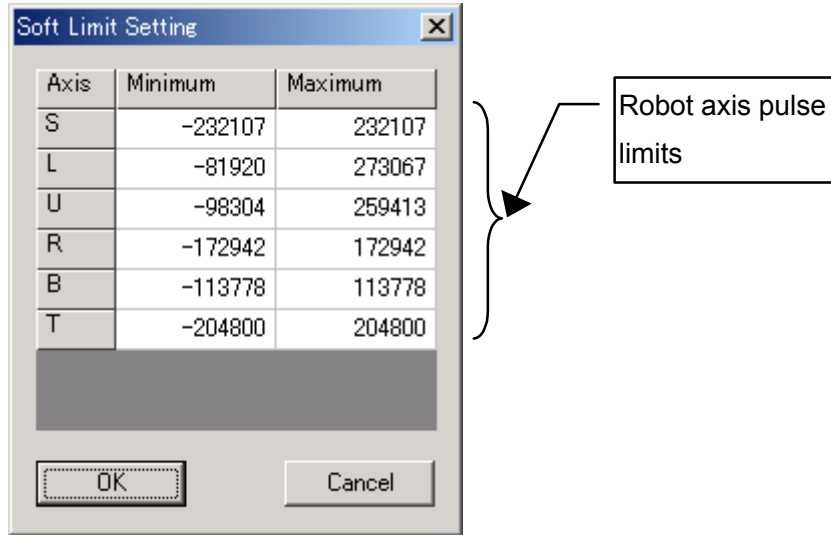
2. Use the Position Panel dialog box to move the external axis to 0-pulse position, the home position. (The Position Panel dialog box appears by clicking on , or select {Tool} - {Monitor} - {Position Panel...}.)
3. Move the top axis of each station to the desired position using the POS function on the Cad Tree: for example, move UP6_ex2 if a two-axis station is used, and move UP6_ex3 if a base axis is provided.
For the axis posture, the Z-axis must be in the rotating direction of the rotary axis (turn table), and the Y-axis must be in the rotating direction of the tilting axis.
4. On the main menu, select {Robot} - {Data Setting} - {Robot Calibration}.
Note that the menu selection is disabled if the station coordination function is not enabled in the parameter file. In this case, set the parameter FD07 to "1" then restart the system.
5. The Robot Calibration Setting dialog box appears: click on [Write robot calibration file by layout on MotoSim].



6. A robot calibration file "rbcalib.dat" is created according to the position of the external axis.
7. Create a model referring to the step 7 of " Creating an Environment using Actual Robot Calibration Files ".

7.4.6 Soft Limit Setting

The robot soft limits define the pulse range within which the robot axes can move. To modify the soft limits, display the "Soft Limit Setting" dialog by selecting {Robot} - {Data Setting} - {Soft Limit Setting}.



Soft Limit Setting

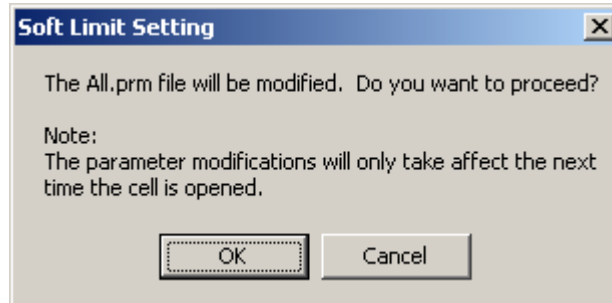
Item	Function
[OK] button	Updates the robot parameters (All.prm) with the values entered in the Soft Limit Setting dialog.
[Cancel] button	Discards the soft limit modifications and closes the dialog.



- Because this function will overwrite the parameter, it is recommended to make a backup of the parameter file (All.prm) before doing any modifications.
- For setting soft limits to devices (i.e. Conveyor), please refer to section 10 Peripheral Equipment.

Procedure

1. Modify the soft limit values and then press the [OK] button.
2. A confirmation message will display.



Press [OK] to update the parameters and close the setting dialog. Or, press [Cancel] to return to the "Soft Limit Setting" dialog without updating the parameters.

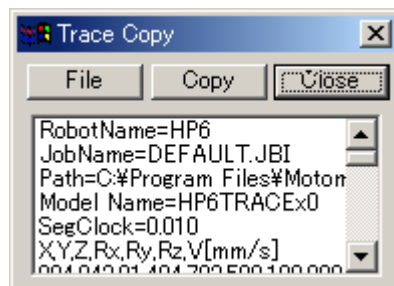
3. In order for the parameter change to take affect, close cell (save the cell first if necessary) and reopen it.

7.5 Trace

Trace is a function to display update points of the robot position when the robot playback is performed. This section explains the operations for the trace function.

7.5.1 Storing Trace Data

The trace data can be saved in the Trace Copy dialog box: select {Robot} - {Trace} - {Clipboard...} to open the Trace Copy dialog box, then select [File] or [Copy] to save the data. The trace data in the dialog box includes the names of selected robot, job, path, trace model, and data such as segment clock, position and speed in the world coordinates at every trace point.



Trace Copy Dialog Box

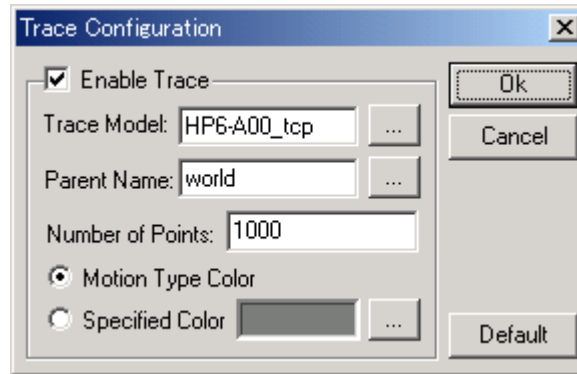
Item	Function
[File] button	Stores the displayed trace data in a text file.
[Copy] button	Stores the displayed trace data in the clipboard.
[Close] button	Closes the Trace Copy dialog box.

7.5.2 Deleting Trace Data

The trace points displayed on the screen are deleted by selecting {Robot} - {Trace} - {Clear}.

7.5.3 Setting Trace Points

Set the model to plot trace, the number of trace points, and the trace color in the Trace Configuration dialog box which is displayed by selecting {Robot} - {Trace} - {Configuration...}.

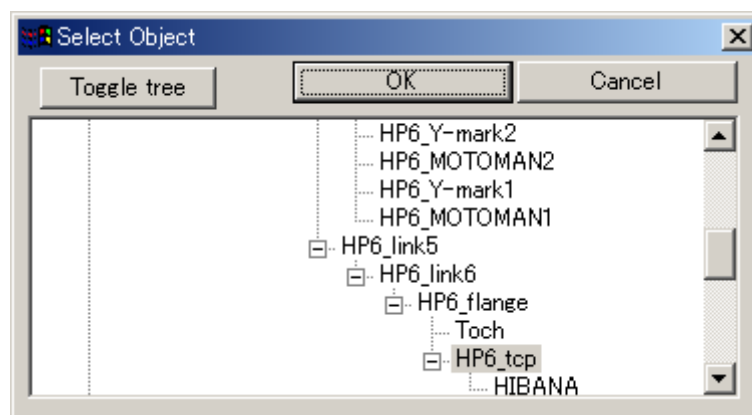


Trace Configuration Dialog Box

Item	Function
[Default] button	Sets all the trace properties back to their default values.
[OK] button	Modifies the settings, and closes the dialog box.
[Cancel] button	Closes the dialog box without modifying the settings.

Procedure

1. Check the Enable Trace checkbox to generate a trace. When this checkbox is unchecked, the trace function is turn off and the trace will not display during playback.



2. Click [...] button at the side of the Trace Model edit box to display the Select Object dialog box as follows; select a model to be traced, and click on [OK]. ("TCP" is selected in default configuration.)
3. Select a model as the parent. Specify the Parent Name edit box in the same manner as the trace model is selected. ("World" is selected in default configuration.)
4. In "Number of Points" edit box, specify the maximum number of trace points to be displayed. If the specified number is "100", 100 trace points will be displayed on the win-

dow, and when the number of trace points exceeds 100, trace points disappear in the order of appearance.

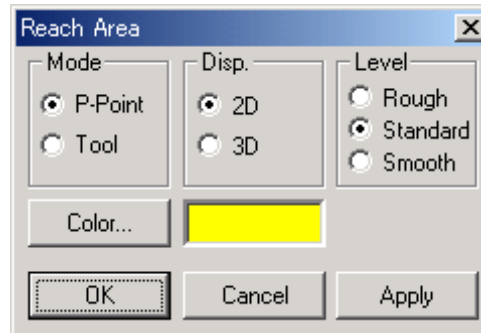
5. Select between "Motion Type Color" and "Specified Color". When "Motion Type Color" is selected, the trace color changes according to the type of motion used for each step. When "Specified Color" is selected, the trace color is of the color displayed in the box next to this option. The specified color can be changed by pressing the [...] button to display the Color dialog box.

7.6 Reach View

7.6.1 Displaying the Range of Motion

The range of motion of the robot can be displayed in 2D or 3D.

For setting, display the Reach Area dialog box by selecting {Robot} - {Reach View} - {Reach View}.



Reach Area Dialog Box

Item	Function
"Mode" section	Selects P-point or tool end as a base point of range of motion.
"Disp" section	Specifies display style for range of motion. (For some robot models, 3D display is not available.) <ul style="list-style-type: none"> • [2D] radio button: displays range of motion in 2D style. • [3D] radio button: displays range of motion in 3D style. <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>NOTE Range of motion can be displayed in both 2D and 3D style simultaneously: Select 2D and press the [Apply] button; then select 3D, change color (optional) and press apply again.</p> </div>
"Level" section	Selects display level (rough/standard/fine) of range of motion.
[Color] button	Displays Color dialog box to specify colors.
[Apply] button	Displays range of motion for the specified style.
[OK] button	Displays range of motion for the specified style (if not already displayed), and closes the Reach Area dialog box.
[Cancel] button	Closes Reach Area dialog box after deleting the range of motion displayed on the screen.

7.6.2 Deleting the Range of Motion

Select {Robot} - {Reach View} - {Delete Reach View} to delete the displayed range of motion.

7.7 Cube Area View

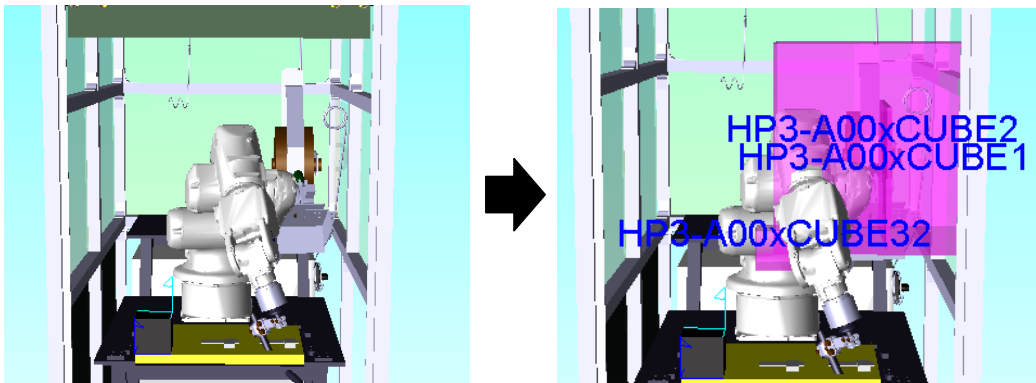
The "Cube Area View (cube interference area)" which is set in the actual controller can be displayed as cubic models and modified.



Cube interference area is not available for YASNAC MRC, MRCáU and ERC type robots.

7.7.1 Displaying the Cube Interference Area

The cube interference areas defined for a robot can be displayed as cubic model in the cell by selecting {Robot} - {Cube Area View} - {Cube Area View}.



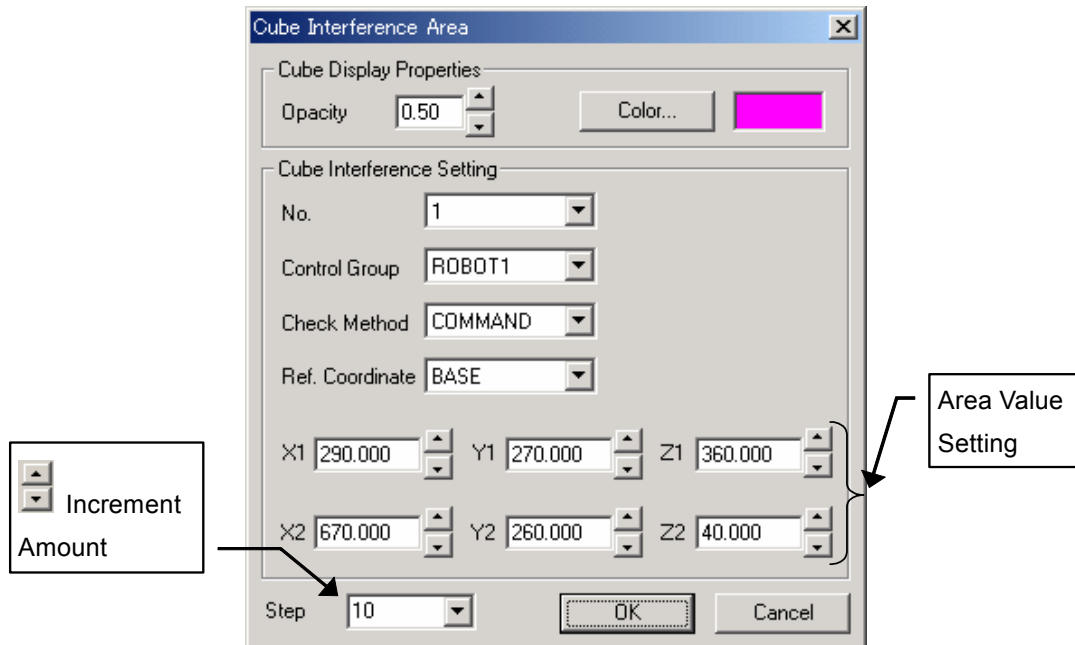
If cubic interference areas are not defined in the robot parameters (All.prm), cubic models will not display. Cubic interference area can be defined or modify by MotoSimEG, please refer to section " 7.7.3 Setting the Cube Interference Area " for details.

7.7.2 Deleting the Cube Interference Area

Delete the cube interference area displayed on the cell window by selecting {Robot} - {Cube Area View} - {Delete Cube Area}.

7.7.3 Setting the Cube Interference Area


Define or edit the cube interference areas of a robot by selecting {Robot} - {Cube Area View} - {Cube Area Setting}.



Cube Interference Area Dialog Box

Item	Function
"Cube Display Properties" section	<p>[Opacity] Specifies the opacity of the model. The value can be set between 1.00 and 0.00, which corresponds respectively to fully opaque and completely transparent.</p> <p>[Color] Displays "Color" dialog box to specify colors.</p>
"Cube Interference Setting" section	<p>[No.] Select the cube number for which the settings will be displayed. A maximum of 32 cubes can be defined.</p> <p>[Control Group] Select the control group for which the cube is defined. If the value is set to NONE the cube is considered undefined. To define a cube this value is normally be set to ROBOT1.</p> <p>[Check Method] Selects if the checked position is the COMMAND position or the FEEDBACK position.</p> <p>[Ref. Coordinate] Defines the coordinate system in which the area values are defined. In the case of the "USER" coordinate system, the user frame number also needs to be defined.</p>

Cube Interference Area Dialog Box

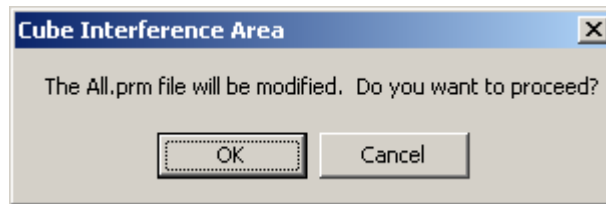
Item	Function
[OK] button	Updates the robot parameters (All.prm) with the values entered in the "Cube Interference Area" dialog and closes the dialog.  The data for all the cubes will be saved, not only the one currently displayed.
[Cancel] button	Discards the cube interference modifications and closes the dialog.



Because this function will overwrite the parameter, it is recommended to make a backup of the parameter file (All.prm) before doing any modifications.

Procedure

1. Modify the cube interference definition and then press the [OK] button.
2. A confirmation message will display.



Press [OK] to update the parameters and close the setting dialog. Or, press [Cancel] to return to the "Cube Interference Area" dialog without updating the parameters.

8 Tool Functions


MotoSim EG has tools to operate and teach a robot, including functions to display the current position and pulses of the robot; it also has functions that simplifies teaching operations such as OLP (on-screen teaching function to teach target point) and interference check function. This chapter explains each function and its application.

8.1 Programming Pendant

8.1.1 Programming Pendant

The Programming Pendant dialog box is a tool to move a robot in MotoSim EG and perform teaching.

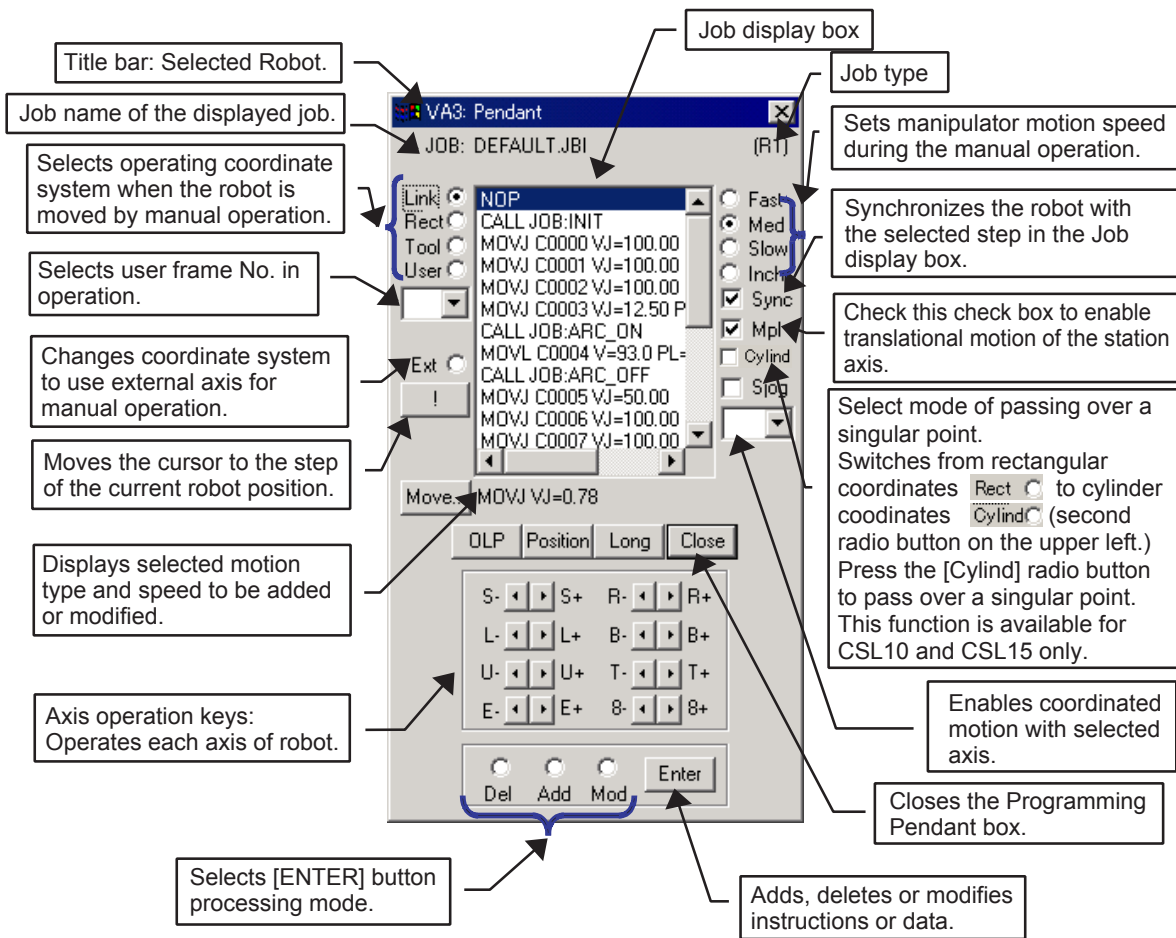
Since this tool can be used in the same way as an actual programming pendant, it allows users to simulate the actual operations.

Programming Pendant dialog box can be displayed by clicking on  , or by selecting {Tool} - {P.Pendant} - {P.Pendant View}.

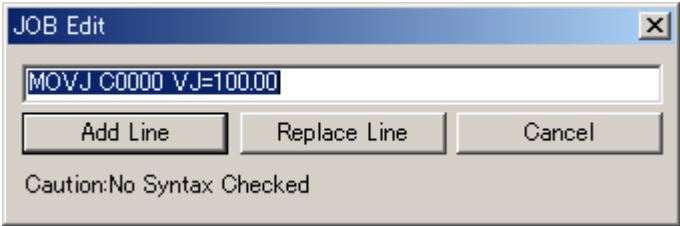


If the cell contains multiple robots and the "Multiple Robot Dialog" mode is enable, a separate Programming Pendant can be displayed for each robot in the cell. Select the robot to be displayed in the robot combobox of the toolbar before displaying the Programming Pendant.

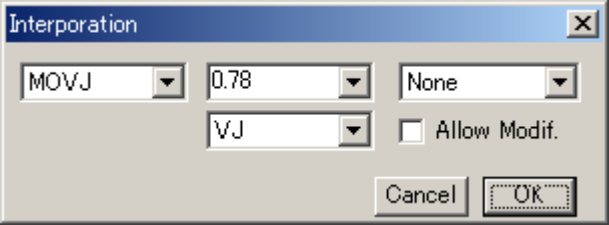

8.1 Programming Pendant




Programming Pendant Box

Item	Description
Title bar	Displays the name of the robot selected for the programming pendant operation. If the "Multiple Robot Dialog" mode is disabled, the robot name changes when the cell robot selection is changed.
Job display box	<p>The robot moves to the step selected in the job display panel if the [Sync] step synchronization check box is selected.</p> <p>JOB Edit dialog box for job editing appears by double-clicking the selected job.</p> <p>(For the teaching of position variables, refer to "Teaching with Position Variables" in "8.2.5 Variable Monitor".)</p> <p>JOB Edit Dialog Box: Modify the instruction in the edit box. Select either the [Add Line] or [Replace Line] button.</p>  <p>Caution: No Syntax Checked</p>

Programming Pendant Box

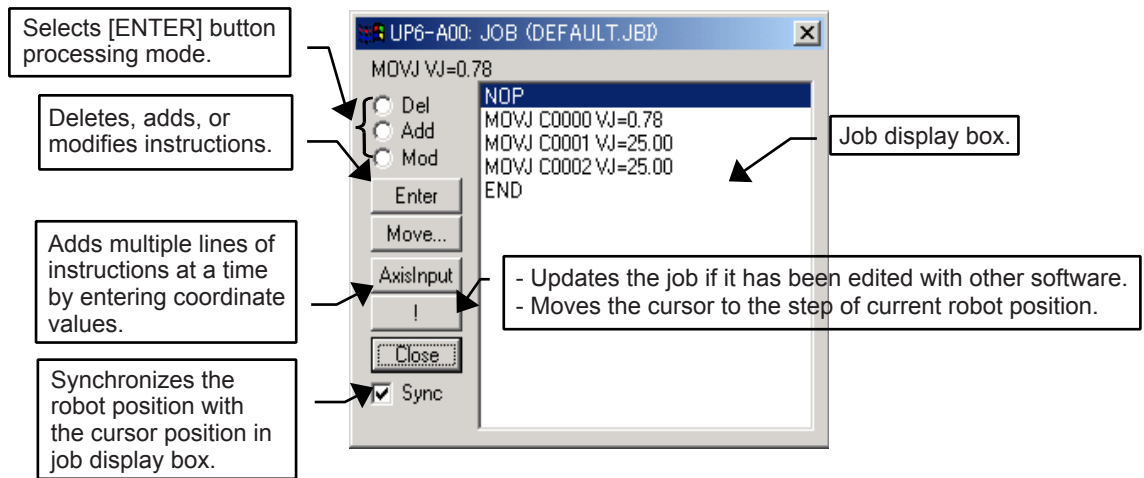
Item	Description
[Move...] button	<p>Displays the Interpolation dialog box. Specify motion type, speed and position level for the playback operation, and click [OK].</p>  <p>NOTE To enable the modification of the motion type and speed when a teaching position is modified, select the [Allow Modif.] check box.</p>
[OLP] button	Displays the OLP dialog box. (Refer to " 8.3.1 OLP " for details.)
[Position] button	Displays the position data panel. (Refer to " 8.2.2 Position Panel " for details.)
[Long] button	Extends the size of the job display panel: click [Short] to undo the size change.
Axis operation keys	<p>Operates the robot: the display varies as shown below, depending on the selected operating coordinate system for manual operation.</p>  <p style="text-align: center;">Link Rectangular, Tool, User External Axes</p>

8.1.2 Job Panel

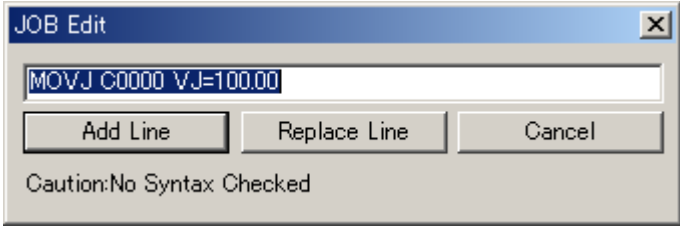
The Job panel displays the robot job and allows teaching. To display the Job panel, click the "Position and Job View" icon  in the toolbar, or select {Tool} - {P.Pendant} - {Job Panel...}



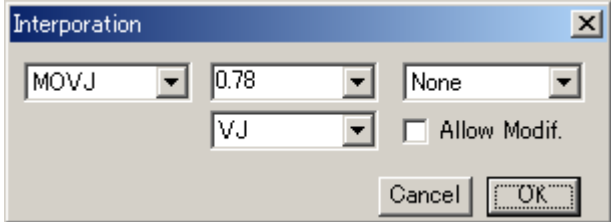
If the cell contains multiple robots and the "Multiple Robot Dialog" mode is enable, a separate Job panel can be displayed for each robot in the cell. Select the robot to be displayed in the robot combobox of the toolbar before displaying the Job panel.



Job Panel

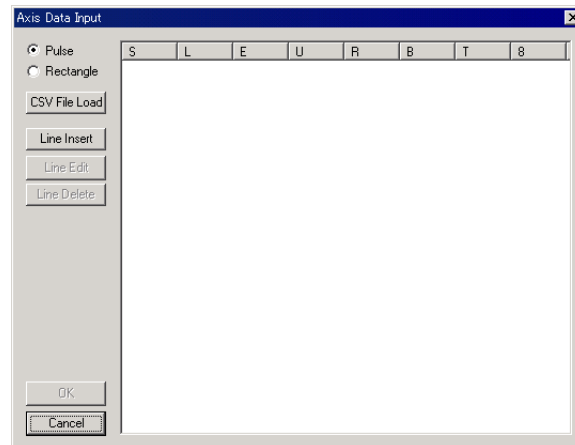
Item	Description
Job display box	<p>The robot moves to the step selected in the job display panel if the [Sync] step synchronization check box is selected. JOB Edit dialog box for job editing appears by double-clicking the selected line. (For the teaching of position variables, refer to " Teaching with Position Variables " in " 8.2.5 Variable Monitor ".)</p> <p>JOB Edit Dialog Box: Modify the instruction in the edit box. Select either the [Add Line] or [Replace Line] button.</p> 
[Enter] button	Executes the command selected among [Del], [Add], [Mod] radio buttons.

Job Panel

Item	Description
[MOVE...] button	<p>Displays the Interpolation dialog box. Specify motion type, speed and position level for the playback operation, and click [OK].</p>  <p>NOTE To enable the modification of the motion type and speed when a teaching position is modified, select the [Allow Modif.] check box.</p>
[Close] button	Closes the Job Panel

■ Input of Coordinates (AxisInput)

Press [AxisInput] in the Job Panel to display Axis Data Input dialog box shown below, and create a list by entering coordinate values (either pulse or rectangle). Instructions are added to the job for each point of the list.



Axis Data Input Dialog Box

Item	Description
[Pulse] radio button	Coordinate values are entered in pulse value.
[Rectangle] radio button	Coordinate values are entered in rectangle value.
[CSV File Load] button	Loads the coordinate values from a CSV file, and inserts the coordinate values right after the selected line in the list.

8.1 Programming Pendant

Axis Data Input Dialog Box

Item	Description
[Line Insert] button	Inserts the coordinate entered in the Axis Input dialog box right after the selected line in the list.
[Line Edit] button	Edits the selected line in the Axis Input dialog box.
[Line Delete] button	Deletes the selected line from the list. (Multiple selection is allowed.)
[OK] button	Closes the Axis Data Input dialog box; the list is added as instructions.
[Cancel] button	Closes the Axis Data Input dialog box without modifying the job.

The screenshot shows the 'Axis Input' dialog box with the 'Pulse' mode selected. It contains input fields for S, L, E, T, U, R, and B, each with a value of 0. There are also 'OK' and 'Cancel' buttons at the bottom.

The screenshot shows the 'Axis Input' dialog box with the 'Rectangle' mode selected. It contains input fields for X, Y, Z, Re, Rx, Ry, and Rz, each with a value of 0.000. There are also 'OK' and 'Cancel' buttons at the bottom.

Axis Input Dialog Box

Item	Description		
Pulse/Rectangle	Radio Button selected in the Axis Data Input Dialog Box		
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">Pulse</td> <td style="width: 50%; text-align: center;">Rectangle</td> </tr> </table>	Pulse	Rectangle
	Pulse	Rectangle	
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">S-axis</td> <td style="width: 50%; text-align: center;">X-axis</td> </tr> </table>	S-axis	X-axis
	S-axis	X-axis	
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">L-axis</td> <td style="width: 50%; text-align: center;">Y-axis</td> </tr> </table>	L-axis	Y-axis
	L-axis	Y-axis	
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">U-axis</td> <td style="width: 50%; text-align: center;">Z-axis</td> </tr> </table>	U-axis	Z-axis
	U-axis	Z-axis	
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">R-axis</td> <td style="width: 50%; text-align: center;">Rx-axis</td> </tr> </table>	R-axis	Rx-axis
R-axis	Rx-axis		
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">B-axis</td> <td style="width: 50%; text-align: center;">Ry-axis</td> </tr> </table>	B-axis	Ry-axis	
B-axis	Ry-axis		
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">T-axis</td> <td style="width: 50%; text-align: center;">Rz-axis</td> </tr> </table>	T-axis	Rz-axis	
T-axis	Rz-axis		
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">E-axis</td> <td style="width: 50%; text-align: center;">Re-axis</td> </tr> </table>	E-axis	Re-axis	
E-axis	Re-axis		
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">8-axis</td> <td style="width: 50%;"></td> </tr> </table>	8-axis		
8-axis			
[OK] button	Applies the modification, and closes the Axis Input dialog box.		
[Cancel] button	Closes the Axis Input dialog box without executing the modification.		

Procedure

1. Select either the [Pulse] or [Rectangle] radio button in Axis Data Input dialog box.
2. Edit coordinate values with [Line Insert], [Line Edit], or [Line Delete], and create a list. If a CSV file already exists, load coordinate values by selecting [CSV File Load].
3. When the list is completed, press [OK] to add the created list as instructions after the selected line in the job.



The motion type and speed of MOVE instructions which have been added with the input of coordinates are the set values specified in Interpolation dialog box displayed by clicking [MOVE...] in the Job Panel.

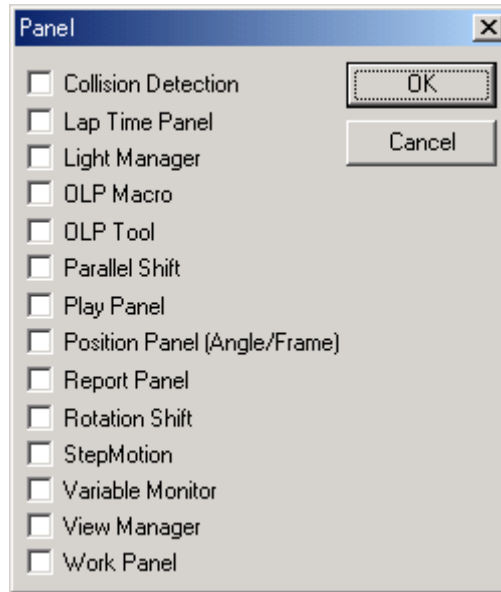
8.2 Monitor

8.2.1 Displaying the Panel Selection Box

Panel selection dialog box can display various panels (dialog boxes) for teaching operations.

To display it, click on , or select {Tool} - {Monitor} - {Panel View}.


To display the panels listed in the Panel selection box, check the check boxes for the desired panels then click [OK].



Refer to the following sections for the details on the other panels under the {Monitor} menu.

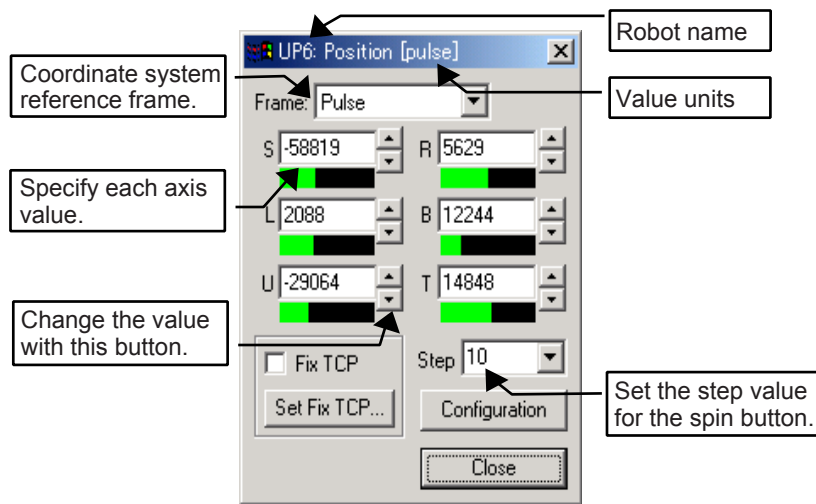
8.2.2 Position Panel

The Position panel displays position data of a robot, and enables robot operation by entering numerical values in pulses or coordinate units.

To display the Position panel, click the "Position and Job View" icon  in the toolbar, or select {Tool} - {Monitor} - {Position Panel...}



If the cell contains multiple robots and the "Multiple Robot Dialog" mode is enable, a separate Position panel can be displayed for each robot in the cell. Select the robot to be displayed in the robot combobox of the toolbar before displaying the Position panel.



Position Data Panel

Item	Description
[Frame] combobox	The coordinate system reference frame can be selected with the "Frame" combobox. The choice of frame available in the list may change depending on the robot configuration.
[Fix TCP] checkbox	When checked, the [Fix TCP] function is enabled. The robot TCP position remains fixed relative to another model in the cell. Refer to section " 12.12 Fix TCP " for details.
[Set Fix TCP...] button	Displays the "Select Model" dialog to change the model reference used by the Fix TCP function.
[Configuration] button	Displays the robot "Configuration" dialog to select a different robot configuration to reach the current position. (Refer to section " 8.3.12 Robot Position Configuration " for details)
[Close] button	Closes the position data panel.



The Fix TCP section is not available when the Frame is set to "Work Angle".

Keyboard entry

The value of an axis can be entered directly with the numeric keys. Select the desired axis edit box, enter the new value, and then press the [Enter] key to update the robot position or the [Tab] key to move to the next axis.

■ Pulse

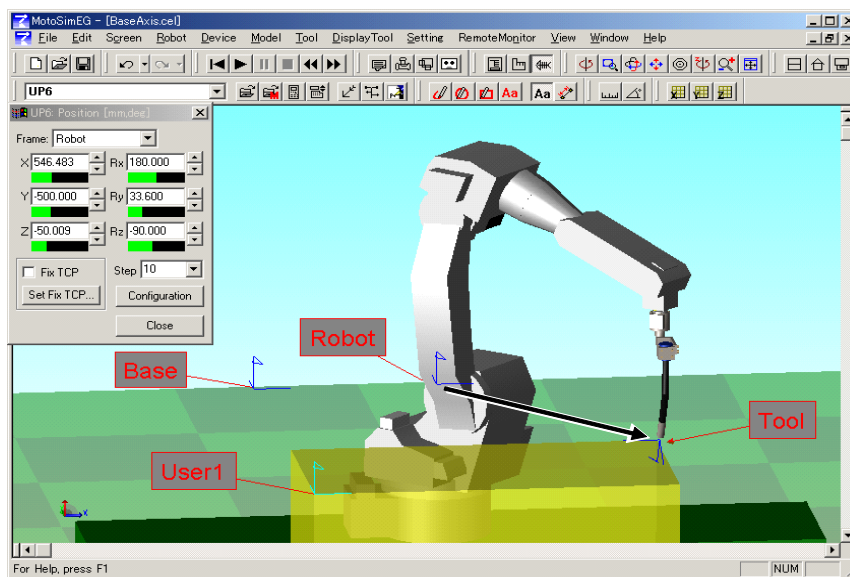
Displays the pulse values of the S, L, U, R, B, T axis of the robot.

■ Joint

Displays the angular values of the S, L, U, R, B, T axis in angular units (degrees or radians).

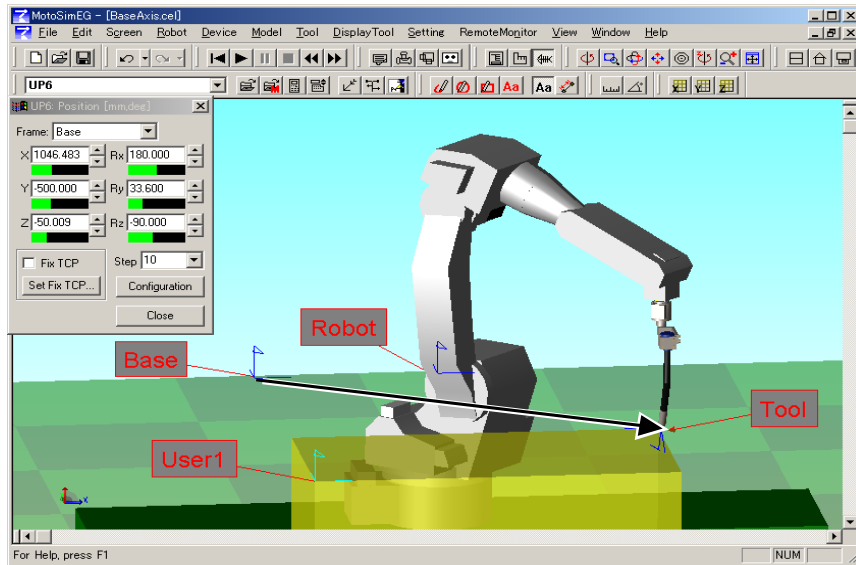
■ Robot

Displays the position (X, Y, Z, Rx, Ry, Rz) of the robot current Tool frame (TCP) relative to the Robot frame.



■ Base

Displays the position (X, Y, Z, Rx, Ry, Rz) of the robot current Tool frame (TCP) relative to the Base frame. If the robot doesn't have any base axis, the Base frame and Robot frame overlaps each other.

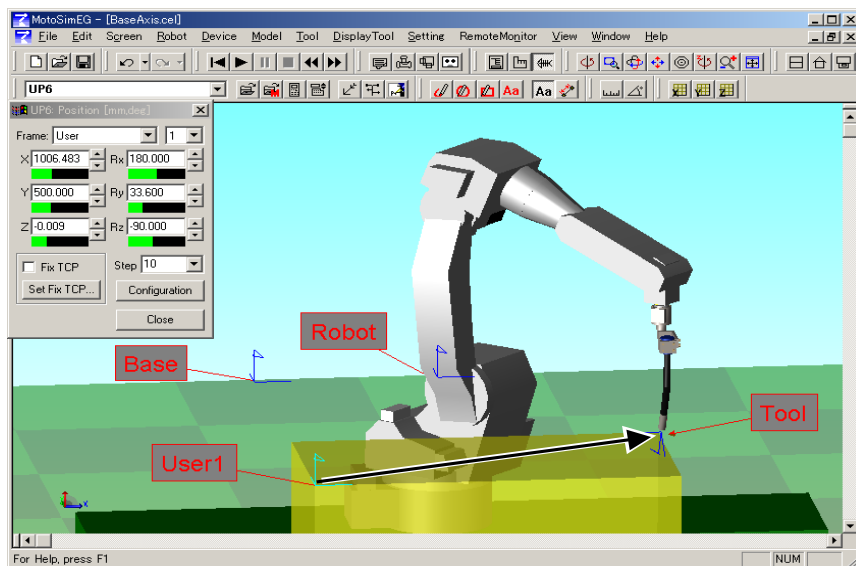


■ Tool

This frame is useful to move the robot in the Tool coordinate system (X, Y, Z, Rx, Ry, Rz) but the displayed values are always "0" even though the robot moves since the reference system and the Tool coordinate frame are the same.

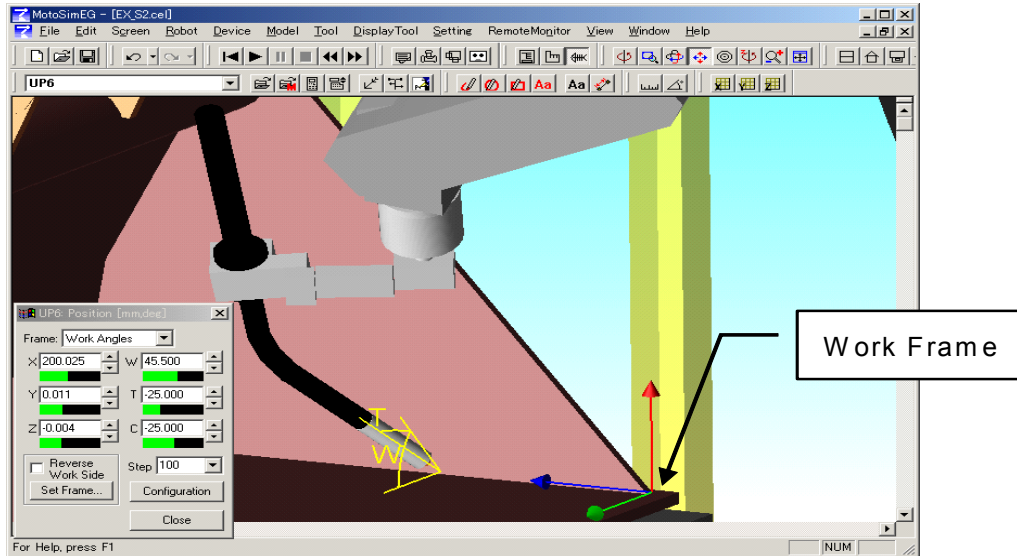
■ User

Displays the position (X, Y, Z, Rx, Ry, Rz) of the robot current Tool frame (TCP) relative to the selected user frame. When selected, a 2nd combobox will appear next to the "Frame" combobox to allow the selection of the user frame number. Only the defined user frame will appear in the list. At least one user frame need to be define in order to select the User Frame reference system.



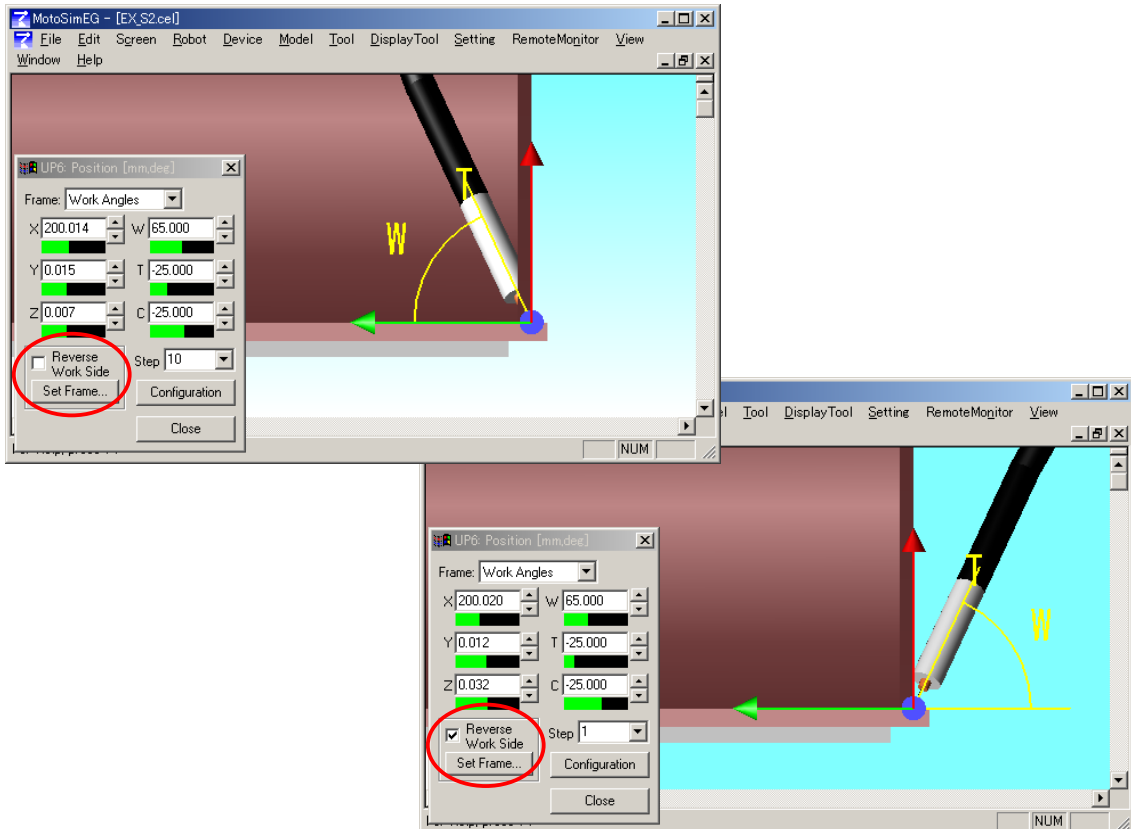
■ Work

Displays the position (X, Y, Z, W, T, C) of the robot current Tool frame (TCP) relative to the set Work frame. When this coordinate system is selected, the "Set Frame..." button and the "Reverse Work Side" checkbox will appear under the axis values.



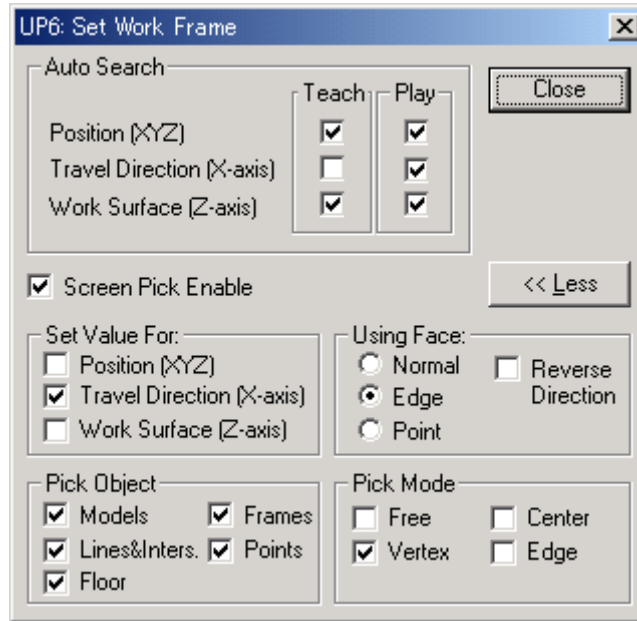
The Work frame is defined by three components: the frame position (or origin), the travel direction, and the work surface. The normal of the work surface is set as the Z-axis (red arrow) and the tool travel direction is set as the X-axis (blue arrow). The Y-axis (green arrow) will be set perpendicular to the other two axes.

The Work angle (W) is defined by the angle between the tool and the work surface in the YZ plane. Changing the value of "W" will rotate the tool around the Work frame X-axis. The "W" angle is defined between -90.0 and 90.0 degrees. The Reverse Work Side checkbox indicates if the Work Angle is on the same side then the Y-axis (unchecked) or on the opposite side (checked). If a work angle is moved over the 90.0 degree limit, the work angle side will change and the work angle will be set back within its allowable limit.



The Travel angle (T), also called the Push/Pull angle, is defined as the angle between the torch and the YZ plane. When set to 0 degree, the tool is in perpendicular to the travel direction. If "T" is positive, the tool is pushing; and if it is negative, the tool is pulling. The "C" angle is the rotation angle around the Tool Z axis.

The Work frame can be set manually or automatically. Press the "Set Frame..." button to display the Work Frame Set dialog and set your preferences.



Set Work Frame

Item	Description
"Auto Search" section	Determine which components of the Work frame are to be automatically updated as the robot moves. Settings during teaching [Teach] and during playback [Play] are independently set.
[Screen Pick Active] check box	Enables the mouse picking operation. Pressing the [Shift] key enables or disables the "Screen Pick Active" mode.
[Close] button	Closes the dialog box.
[More] or [Less] button	Displays or hides the pick mode setting section.
"Set Value For:" section	Determine which values of the Work Frame will be changed when the screen is clicked.
"Use Face:" section	<p>Determines which information for a click surface is used to set the Travel Direction or the Work Surface.</p> <p>[Normal] radio button: The normal of the face is used.</p> <p>[Edge] radio button: The edge direction closes to the picked point is used. Note if both the X-axis and the Z-axis are checked, the Z-axis is set in the Edge direction.</p> <p>[Point] radio button: The direction defined by the Work frame origin and the picked face point is used.</p> <p>The [Reverse Direction] checkbox can be used to select the opposite direction.</p>
"Pick Object" section	Sets the type of objects that can be selected when clicking on the screen. Please refer to " 6.4 Pick Settings ".
"Pick Mode" section	Sets conditions determining the selected point in the clicked area. Please refer to " 6.4 Pick Settings ".

Auto Search

MotoSimEG can automatically set the Work frame by searching from the work surface. The tool Z-axis positive direction is searched to find the first intersecting face. The found face intersection point and normal can be used to calculate the frame position and Z-axis. The travel direction (or Work frame X-axis) can automatically be determined by using the robot previous position and new position.

Each component of the Work frame can be set to automatically updated as the robot moves or not. The settings are independently set for "Teach" and "Play" mode. By default the "Auto Search" is active (checked) for all the components except for the "Travel Direction" in "Teach" which tends make jogging operation of the robot difficult because the Work frame changes after each position change.



- The Work surface search and calculation can become fairly intensive in cells with large models made of thousand of faces and will slow down the playback animation. For such cases, it may necessary to turn off (uncheck) the Work Surface auto search and manually set the Z-direction.
- When the tool is close to an edge formed by multiple faces, the face with the normal pointing upward will be selected over the other ones.
- If no surface can be found, the position is set as the tool position and the previously found normal (Z-axis) is reused.

Manually setting the Work Frame

The Work frame components can be set manually by clicking on the screen. To control the pick result, press the "More" button to display the Pick Setting section of the dialog. Select the value to be set and click on the screen to change those values to those of the clicked geometry.

Note that the "Auto Search" - "Teach" check boxes and the "Pick" - "Set Value for" check boxes are exclusive of one another. By default, only the "Travel Direction" is checked to be manually set by using the face point information ("Use Face: point"). Therefore, clicking on the screen will cause travel direction (X-axis) to turn in the work surface plane to point toward the clicked point.

■ External Axis

Displays the pulse values of the external axis (base and station) 1, 2, 3... axis of the robot.

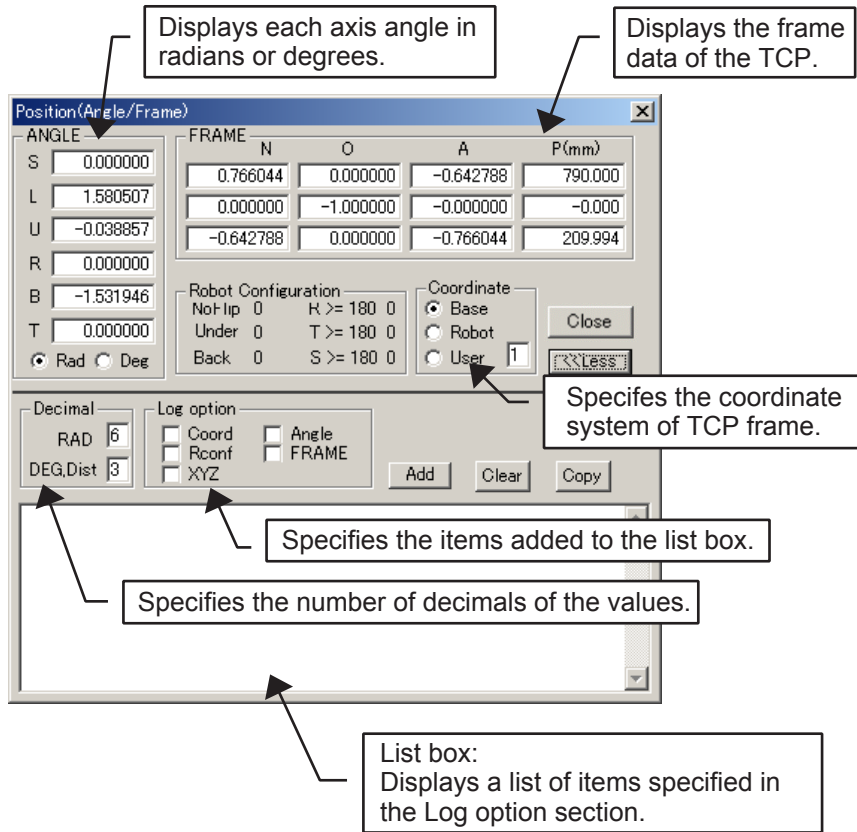
■ External Axis [units]

Displays the values of the external axis (base and station) 1, 2, 3... axis of the robot in the corresponding units. For linear axis, position units are used (mm, cm, inch...). For rotation axis, angular units are used (degrees or radians).

8.2.3 Angle Data Panel

The angle data panel (or the Position(Angle/Frame) dialog box) displays the angles of each robot axis and the TCP frame.

To display the angle data panel, select “Position Panel (Angle/Frame)” from the Panel selection box, or select {Tool} - {Monitor} - {Angle/Frame Panel...}.



Angle Data Panel (Position(Angle/Frame) Dialog Box)

Item	Description
[Close] button	Closes the angle data panel.
[More>>] and [<<Less] button	[More>>] displays extended dialog box, and [<<Less] closes the extended dialog box.
[Add] button (in the extension)	Adds the items selected from the “Log option” section to the list box.
[Clear] button (in the extension)	Clear the list.
[Copy] button (in the extension)	Stores the listed data in the clipboard

8.2.4 I/O

I/O setting and monitoring are enabled by commands under {I/O} command: select {Tool} - {Monitor} - {I/O} for the following operations:



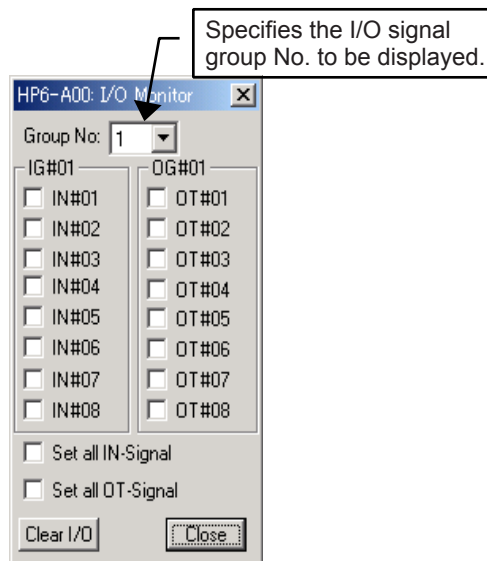
If the cell contains multiple robots and the "Multiple Robot Dialog" mode is enable, a separate I/O Monitor can be displayed for each robot in the cell. Select the robot to be displayed in the robot combobox of the toolbar before displaying the I/O Monitor.

■ I/O Monitor

I/O Monitor can display signals from an instruction and also give signals to the robot by selecting an IN signal before or during playback.

The I/O data specified in I/O Monitor can be saved as well. Refer to " Saving and Loading the I/O Data " for details.

To display the I/O Monitor dialog box, click on  or select {Tool} - {Monitor} - {I/O} - {I/O Monitor}.



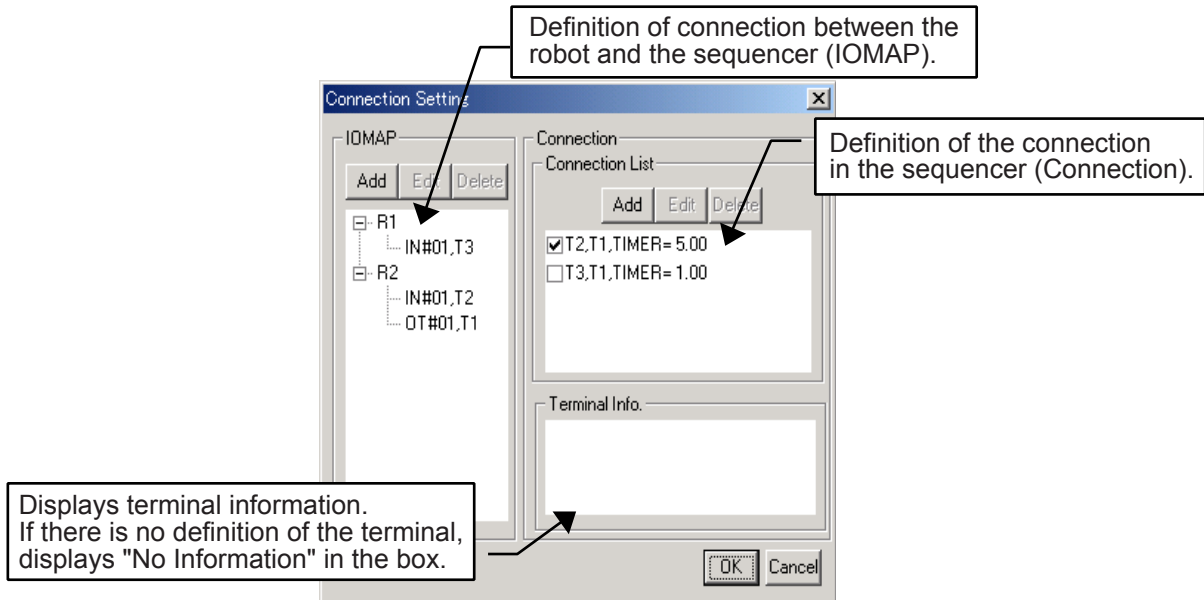
I/O Monitor Dialog Box

Item	Description
[Set all IN-Signal] check box	Turns ON all the IN signals of all registered robots. Uncheck the box to turn OFF all the IN signals.
[Set all OT-Signal] check box	Turns ON all the OUT signals of all registered robots. Uncheck the box to turn OFF all the OUT signals.
[Clear I/O] button	Clears all the signals of the selected robot.
[Close] button	Closes I/O Monitor dialog box.

■ Sequencer Connection Setting

MotoSim EG uses a STAGE object as sequencer function to exchange I/O signals between robots: the I/O check between robots is enabled with this function.

Select {Tool} - {Monitor} - {I/O} - {Connection Setting} to display the Connection Setting dialog box.

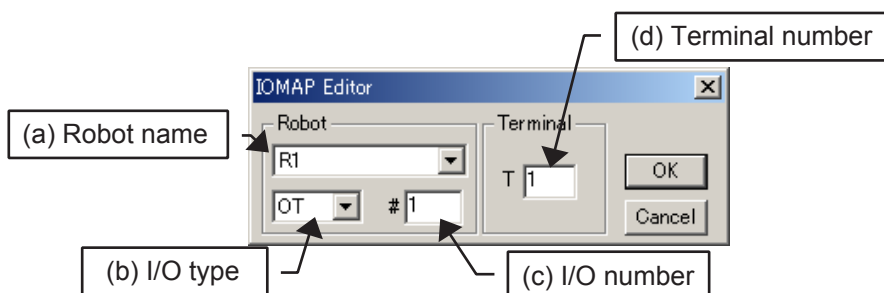


Connection Setting Dialog Box

Item	Description
[OK] button	Applies the modifications on the connection setting, and closes the dialog box.
[Cancel] button	Closes the dialog box without applying the modifications.

Procedure

1. Select [Add] in the "IOMAP" section to display the IOMAP Editor dialog box, and define the connection between the robot and the sequencer entering the robot name, I/O type, and the I/O number and terminal number for the sequencer. Press [OK].



To connect the OUT-1 of the robot R1 to the terminal 1, set:

(a) R1; (b) OT; (c) 1; (d) 1.

To connect the IN-1 of the robot R1 to the terminal 21, set:

(a) R1; (b) IN; (c) 1; (d) 21.

It is also possible to connect in group unit.

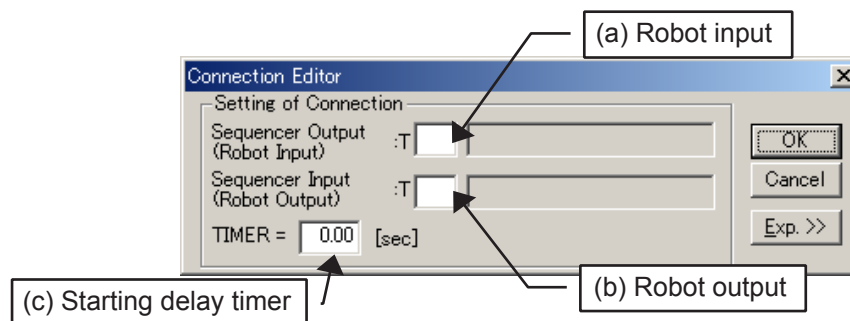
To connect the OUT1-8 to terminal 1-8, set:

(a) R1; (b) OG; (c) 1; (d) 1.

2. Select [Add] in the "Connection List" section to display Connection Editor dialog box, and define the connection in the sequencer.

Setting without Logical Expression

Enter the terminal numbers for the Robot Input and the Robot Output. Specify the starting delay timer, then press [OK].



e.g.

To delay the T9 sequencer output signal (to the robot input) for 2 seconds after receiving the T17 sequencer input signal (from a robot output), set:

(a) 9; (b) 17; (c) 2.00.



In this case, the result terminal (sequencer output) must be connected to the IN signal of the robot.

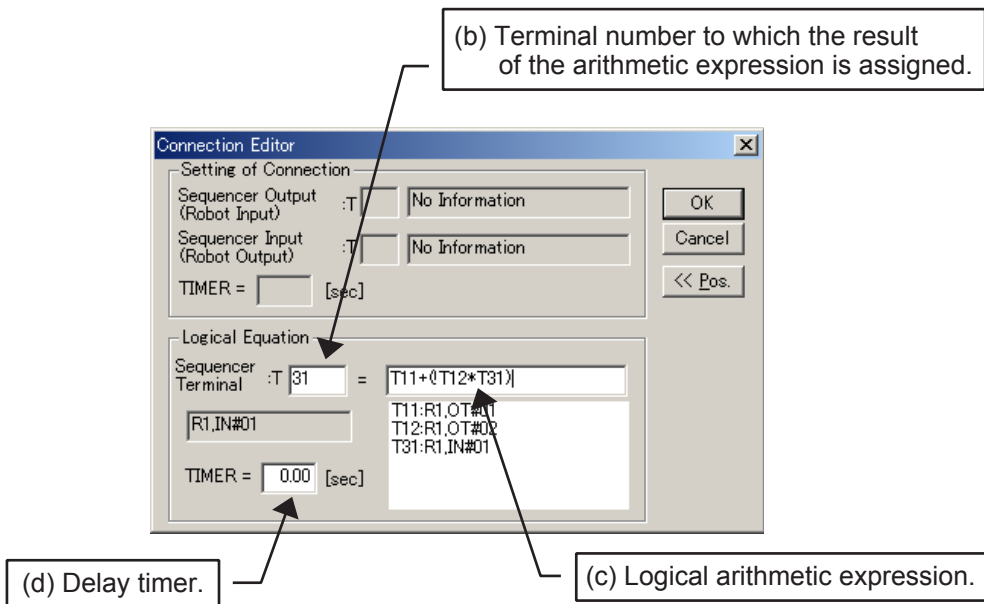
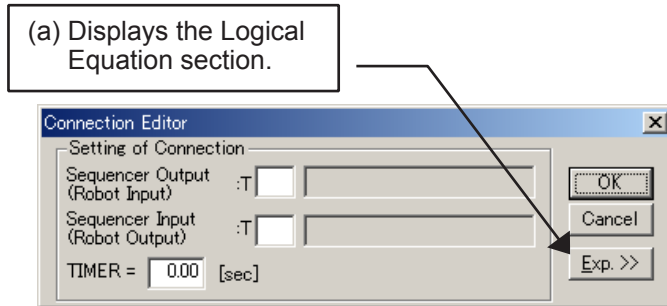
Be aware that the connection of the result terminal to the OUT signal of the robot may cause damage to the logic, resulting in an I/O simulation failure.

Setting with Logical Expression

- Click on [Exp.>>] to display the "Logical Equation" section.
- Enter in the "Sequencer Terminal: T" edit box the terminal number to which the result of the logical arithmetic expression is to be assigned, the item (b) in the figure below.
- Enter the logical arithmetic expression in the edit box (c): the supported operators are listed as follows:

+	Represents OR (\cup).
*	Represents AND (\cap).
!	Represents NOT: applied in case of using the contact point B (STR-NOT).
()	Represents parenthesis.
T	Represents terminal.

- iv) Set the delay time in TIMER edit box (d) if the result of (c) is to be assigned to (b) with a certain time delay.

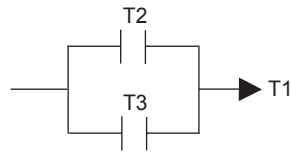


- 3. Press [OK] on the Connection Setting dialog box when the setting is completed.

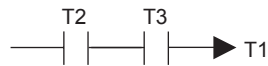


In the "Connection List" section, the checkbox on the left of each connection can be unchecked to disable the connection.

Example of Logical Expression



Logical expression: $T1 = T2 + T3$
 Explanation: Terminal 1 turns ON when either terminal 2 or 3 is ON.



Logical expression: $T1 = T2 * T3$
 Explanation: Terminal 1 turns ON when both terminal 2 and 3 are ON.



Logical expression: $T1 = !T2 * T3$
 Explanation: Terminal 1 turns ON when terminal 2 is OFF and terminal 3 is ON.



- This function does not check for duplication when defining IOMAP.
- The instructions currently supported are as follows:


```
DOUT OT#(1)=1
DOUT OG#(1)=3
WAIT IN#(1)=1
WAIT IN#(1)=1 T=20.0
```

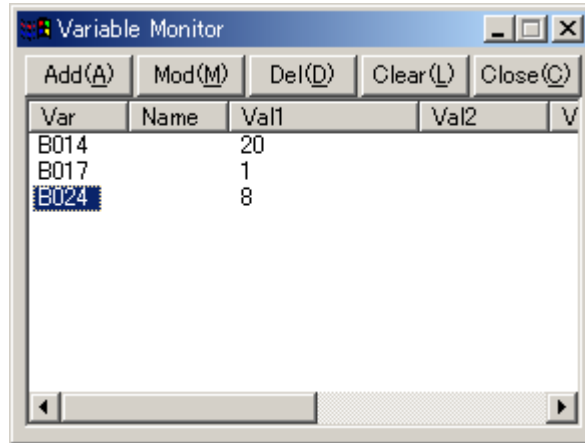
■ Saving and Loading the I/O Data

The data set in the I/O Monitor dialog box can be saved and loaded.

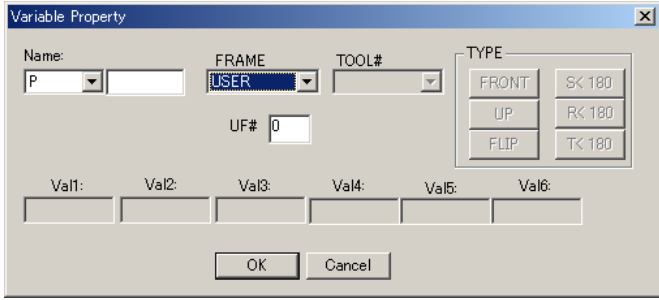
To save the I/O data, set the I/O status to the desired state, then select {Tool} - {Monitor} - {I/O} - {I/O Save}. To display the saved I/O status, select [I/O Load] to load the saved I/O data.

8.2.5 Variable Monitor

Displaying and editing the robots are enabled by setting the Variable Monitor, which appears by clicking  and selecting the [Variable Monitor] check box, or by selecting {Tool} - {Monitor} - {Variable Monitor...}.



Variable Monitor

Item	Description
[Add(A)] button	<p>Displays the Variable Property dialog box to set the variables to be displayed and edited.</p> <p>When setting a position variable (such as P, BP, EX variables), be sure to specify the frame (coordinate) in the FRAME combo box.</p> <p>Setting of FRAME:</p> <ul style="list-style-type: none"> Variable P: When "USER" has been selected, set the user coordinate number in the [UF#] box. Variable BP: Enabled only when "PULSE" or "BASE" is selected. Variable EX: Enabled only when "PULSE" is selected. 
[Mod(M)] button	<p>Displays the Variable Property dialog box to modify the variables.</p> <p>If "PULSE" is selected in the FRAME combo box when a position variable (such as P, BP, EX variables) is selected in the Name combo box, no selection can be made in the "TYPE" section.</p>
[Del(D)] button	<p>Deletes the selected variables.</p>
[Clear(L)] button	<p>Deletes all the variables displayed in the Variable Monitor window.</p>
[Close(C)] button	<p>Closes the Variable Monitor window.</p>

■ Teaching with Position Variables

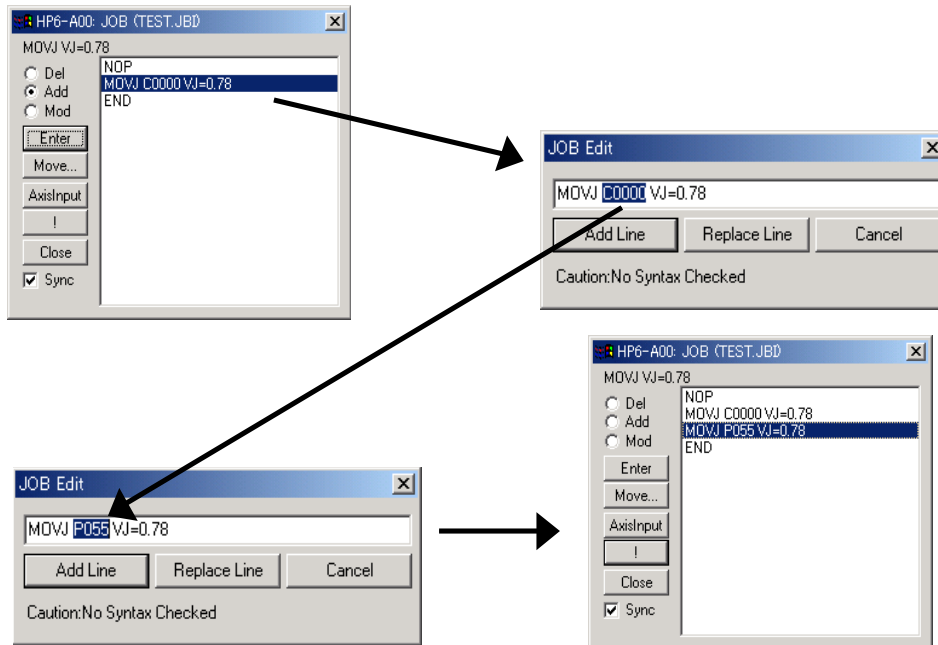
Use the JOB Edit dialog box to perform teaching with position variables. The JOB Edit dialog box is displayed via the Job Panel or the Programming Pendant dialog box.

Procedure

1. To display the JOB Edit dialog box, select a MOVE instruction which is already taught and double-click it.
2. Enter the position variable to be taught in the JOB Edit dialog box, and add the line as an instruction.



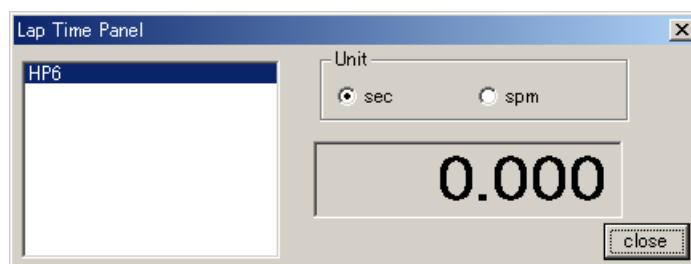
Teaching with position variables is available only in the JOB Edit dialog box.



8.2.6 Lap Time Panel

The Lap Time Panel dialog box shows playback time of a specified section or the number of stroke per minute (spm).

It can be displayed by clicking and selecting the [Lap Time Panel] check box, or by selecting {Tool} - {Monitor} - {Lap Time Panel...}.



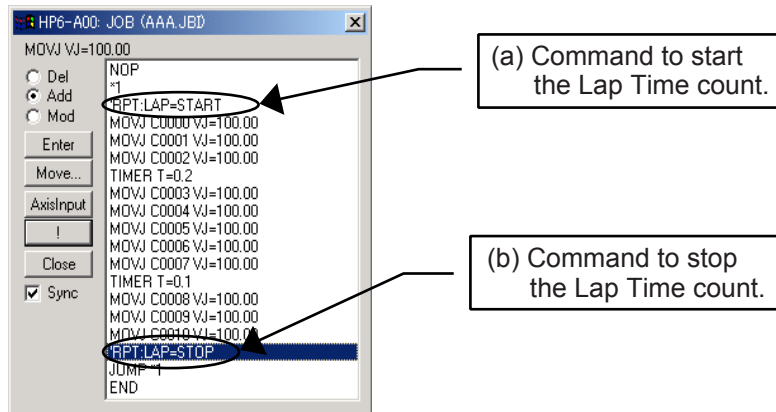
Procedure

1. Enter the following command at the point where the lap time count is to be started.
(Note that the command has to be entered before the start point as shown in the figure below at “(a)”.)

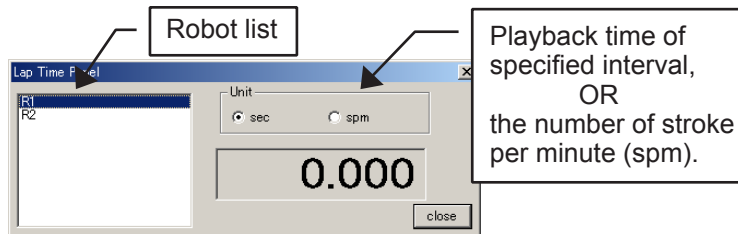
‘RPT:LAP=START

2. Enter the following command at the point where the lap time count is to be stopped.
(Note that the command has to be entered after the end point as shown in the figure below at “(b)”.)

‘RPT:LAP=STOP




3. Select "Lap Time Panel" in the Panel selection box to display the Lap Time Panel dialog box.



4. Play back the job.


NOTE Robots cannot be selected during the playback.

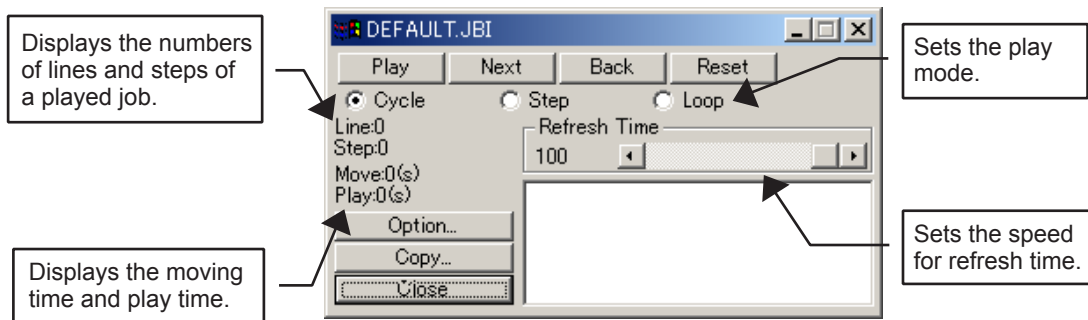
5. After the playback, the Lap Time Panel dialog box shows the playback time between two points specified in steps 1 and 2 above, or the number of stroke per minute (spm) of the currently selected robot.
To display the lap time of each robot, change the robot selection in the robot list.

6. Press  to reset the value to zero in the Lap Time Panel dialog box.

8.2.7 Play Panel

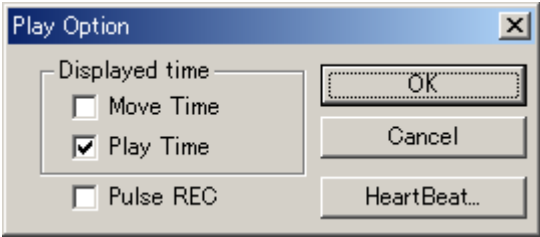
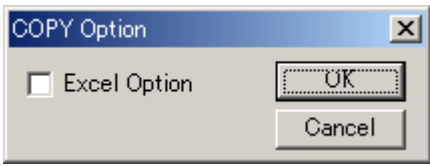
The Play Panel enables the review of the cycle time for each step, the adjustment of the display refresh time, the data storage, etc.

To display the Play Panel, click on  and select the [PLAY Panel] check box in the Panel selection box, or select {Tool} - {Monitor} - {Play Panel...}.




Play Panel

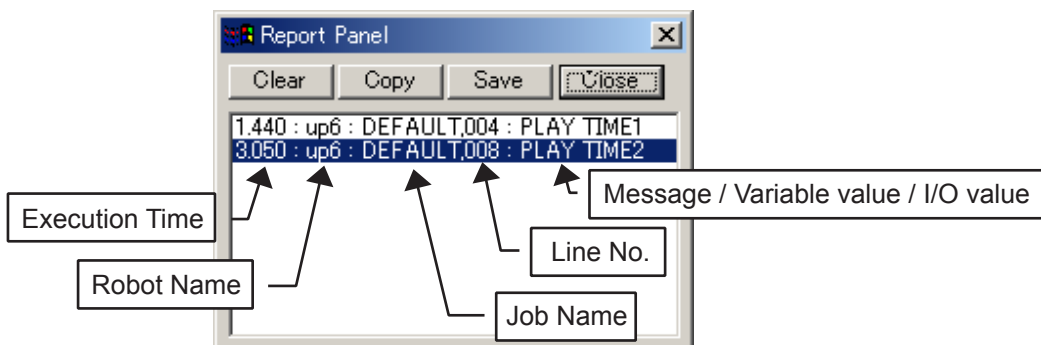
Item	Description
[Play] button	Moves the robot with the selected job, and displays the playback time in a text box.
[Next] button	Skips forward to the next line of the job.
[Back] button	Skips backward to the previous line of the job.
[Reset] button	Jumps to the top of the job, and clears the data in the edit box.
"Refresh Time" section	<p>Slows the drawing speed. Reduce the value toward 0 by moving the scroll bar in the "Refresh Time" section: the speed is set at 100 by default. To make the refresh time even slower, select {Robot} - {Controller} - {HeartBeat}, then set the mode to [Detail Mode].</p> <div style="border: 1px solid blue; padding: 5px; margin-top: 10px;"> <p>NOTE This function is available only when the play panel dialog box is displayed.</p> </div>

Play Panel	
Item	Description
[Option...] button	<p>Displays the Play Option dialog box to select the type of time displayed in the play panel and to display the Heart Beat dialog box. (For the details of Heart Beat, refer to " 7.2.4 Heart Beat ".)</p> <p>Select the [Pulse REC] check box to display the Pulse Record dialog box.</p> 
[Copy...] button	<p>Stores the content of the text box on the clipboard.</p> <p>Selects whether to paste data into the text document or Excel spread sheet in COPY Option dialog box.</p> 
[Close] button	Closes the Play Panel.

8.2.8 Report Panel

Special command can be inserted in a job to display the execution time of the specified line and other information on the Report Panel.

To display the Report Panel, click on  and select the [Report Panel] check box, or select {Tool} - {Monitor} - {Report Panel...}.



Report Panel

Item	Description
[Clear] button	Deletes all reports displayed in the Report Panel.
[Copy] button	Copies all reports shown in the Report Panel to the clipboard.
[Save] button	Saves all reports shown in the Report Panel to a text file.
[Close] button	Closes the Report Panel.

Procedure

Open the Report Panel. A report entry is generated when a report command in the job is encountered during playback.

■ Report Command Description

Add the following report command ('RPT:') within the job so that the Report Panel displays a message, a variable value, or an IO value when that line is executed during playback.

To Display a Message

Example of command in a JOB ⇒ Display in the Report Panel

'RPT:MSG=Character string to display ⇒ 12.34:UP6-1: TEST, 002: Character string to display



Enclose the whole string in double quotes if delimiters (such as space, etc.) are included in the string.

To Display a Variable

Example of Command in a JOB ⇒ Display in the Report Pane

'RPT:VAL=B001 ⇒ 12.34:UP6-1: TEST, 002: B001=3

'RPT:VAL=D002 ⇒ 13.34:UP6-1: TEST, 003: D002=10

'RPT:VAL=I003 ⇒ 14.34:UP6-1: TEST, 004: I003=3

'RPT:VAL=P004 ⇒ 15.34:UP6-1: TEST, 005: P004=1.0,2.0,3.0,4.0,5.0,6.0


To Display an I/O

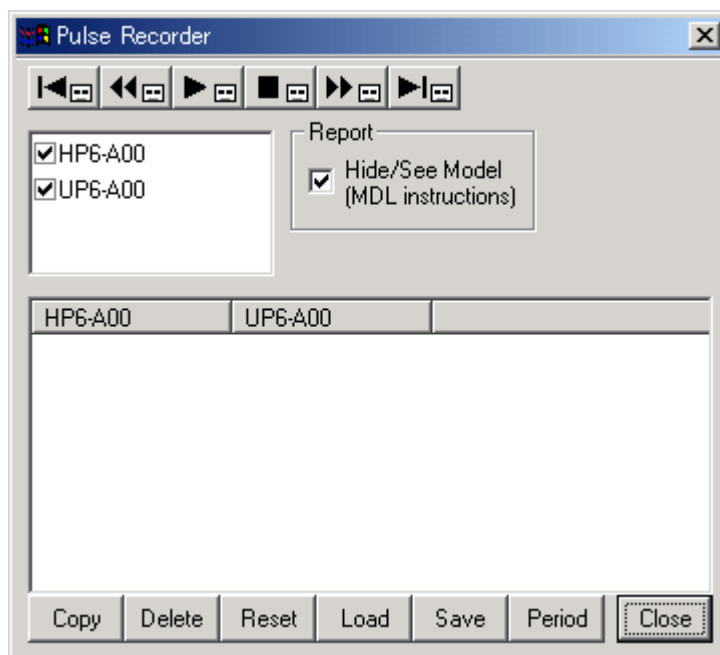
Example of command in a JOB	⇒	Display in the Report Panel
'RPT:IO=IN#(1)	⇒	1.00:UP6-1: TEST, 002: IN#(1)=1
'RPT:IO=IG#(1)	⇒	2.00:UP6-1: TEST, 003: IG#!)=127
'RPT:IO=IGH#(1)	⇒	3.00:UP6-1: TEST, 004: IGH#(1)=15
'RPT:IO=OT#(1)	⇒	4.00:UP6-1: TEST, 005: OT#(1)=1
'RPT:IO=OG#(1)	⇒	5.00:UP6-1: TEST, 006: OG#(1)=127
'RPT:IO=OGH#(1)	⇒	6.00:UP6-1: TEST, 007: OGH#(1)=15

8.2.9 Pulse Recorder








When playback is performed with the Pulse Recorder dialog box displayed on the screen, the pulse positions of the specified robot is displayed in the dialog box at every screen refresh. Model operation instruction can also be recorded by checking the "Hide See Model (MDL instructions) checkbox.

When moving the cursor in the displayed list of data, if the selected data line contains pulse information, the robots are moved to the specified pulse positions; if it contains a model instruction, the specified model operation is executed.

The Pulse Recorder dialog box appears by clicking on , or by selecting {Tool} - {Monitor} - {Pulse Record}.



Pulse Recorder Dialog Box

Item	Description
	Moves the cursor to the first data line and executes it.
	Move the cursor to the previous data line and executes the line.
	Continuously executes the data line in the pulse record from the cursor current position to the end of the list or until stopped.
	Stops the continuous execution of the data lines started by pressing the  button.
	Moves the cursor to the next data line and executes the line.
	Moves the cursor to the last data line and executes it.
[Copy] button	Copies all the data lines to the clipboard.
[Delete] button	Deletes the data line where the cursor is located.
[Reset] button	Deletes the all the data lines.
[Load] button	Retrieves the previously saved data lines from a text file (.txt).
[Save]button	Stores all the data lines in a text file (.txt).
[Period]button	Displays the Heart Beat dialog box to specify the refresh time interval. (For details on Heart Beat, refer to " 7.2.4 Heart Beat ".)
[Close]button	Closes the Pulse Recorder.



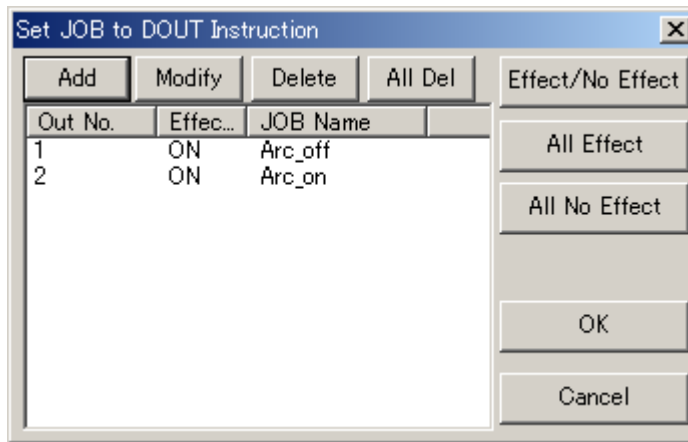
NOTE Same buttons in the Pulse Recorder dialog box can only be used after the job has been played back.

8.2.10 DOUT Command Job Call

When the external output signal is turned ON by a DOUT instruction, the job related to the output number is executed.

MotoSim EG can execute a job containing MDL instructions to simulate such action as hand ON/OFF, however, the sections that call those jobs or MDL instructions should be deleted when downloading jobs to the actual controller. This function can simplify these procedures by linking a job to DOUT instructions.

The function can be set in the "Set Job to DOUT instruction" dialog box, which can be displayed by selecting {Tool} - {Monitor} - {Set Dout Job}.



“Set Job to DOUT instructions” Dialog Box

Item	Description
[Add] button	Adds an output number and a job name to be called. If the output number is already defined, select whether the data is to be overwritten.
[Modify] button	Modifies the contents of the selected definition.
[Delete] button	Deletes the contents of the selected definition.
[All Del] button	Deletes all definitions.
[Effect/No Effect] button	Enables or disables the selected definition.
[All Effect] button	Enables all definitions.
[All No Effect] button	Disables all definitions.
[OK] button	Stores all the modifications in the memory and closes the dialog box.
[CANCEL] button	Cancels all the modifications and closes the dialog box.

Procedure

1. Click [Add] or [Modify] to display the Add/Modify Call Job dialog box where the output

number and job name can be set. Note that only a job in the Job Name combo box can be selected.




2. When the setting is complete, click on [OK] to store the modifications. The information defined in the dialog box are written to the cell file when the cell file is stored.

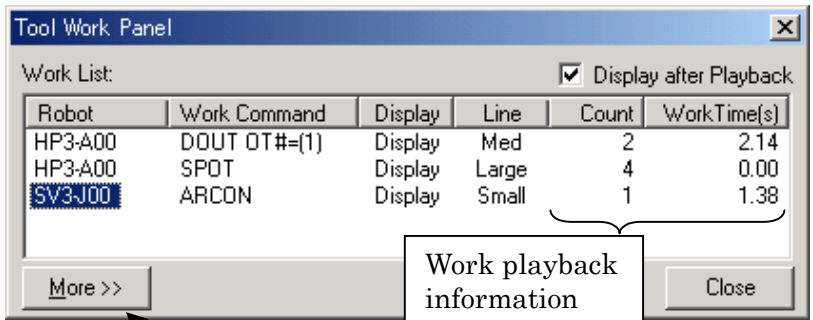


When using this function, it requires as much cycle time as it for a call instruction to execute. Therefore, disable the related definition when an accurate cycle time is required.

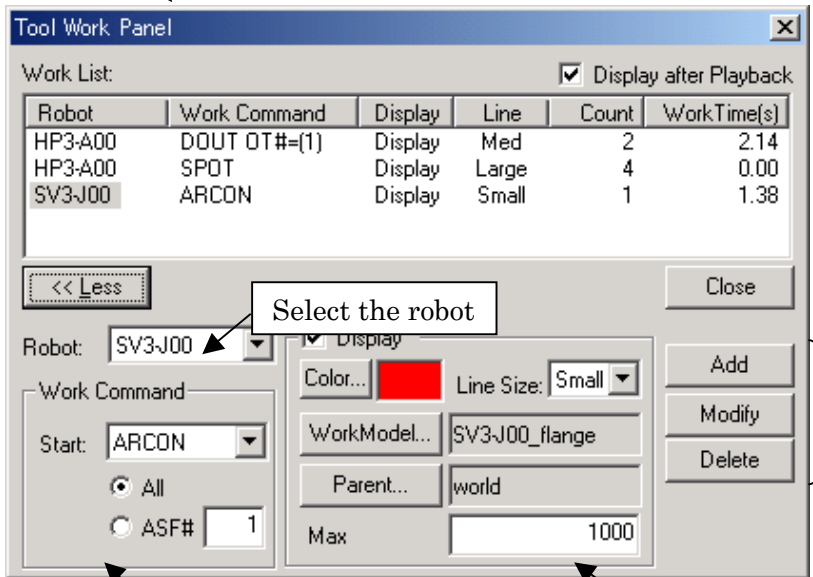
8.2.11 Tool Work Panel

The Tool Work Panel allows defining commands that activates/deactivates the tool work operation and monitors the work operation during playback. When the tool is turned ON, its path can be displayed on the screen. After playback, tool activation count and the work operation time are reported in the Tool Work Panel. Work path models are automatically erased when the playback is reset.

The Tool Work Panel can be displayed by clicking the Panel Display Button  and selecting the [Work Panel] checkbox, or by selecting {Tool} - {Monitor} - {Tool Work Panel} from the menu.



Displays the work properties edition section.



Define the Work command that will activate the robot tool.

Define the properties to display the Work on the screen.

"Tool Work Panel" Dialog Box

Item	Description
Work List	<p>Displays the defined work commands for every robot.</p> <p>Robot: Name of the robot model.</p> <p>Work Command: Command that will trigger the work.</p> <p>Display: Indicates if the work path will be generated.</p> <p>Line: Size of line to be displayed on the screen.</p> <p>Count: Number of time the work has been activated.</p> <p>Work Time: Total time that the work was ON.</p> <p>Clicking on a work item will select it for edition. When the work selection is changed the properties are updated with the setting of the newly selected item. Double clicking on a work item will automatically display the edition section and restore the item original properties.</p>
[Display After Playback] checkbox	When checked the Tool Work Panel is automatically displayed after playback.
[More>>] and [<<Less] button	[More>>] expands the dialog box to display the property edition section, and [<<Less] collapses it to hide the properties.
[Robot] combobox	Selects the robot to which the work command applies.
[Start] combobox	<p>Selects the instruction that will activate the work.</p> <p>Instruction : ARCON / DOUT ON / SPOT / SPYON / TOOLON / HAND/ Always</p> <div style="border: 1px solid black; padding: 5px;"> <p>NOTE Selecting "Always" will generate a line from the beginning to the end of the playback.</p> </div>
Radio buttons	<p>If the [All] radio button is selected, all the occurrences of the work instruction will be detected. Otherwise, only the instructions with the specified parameter are detected.</p> <p>ASF# / OUT# / GUN# / GUN / TOOL / HAND</p>
[Display] checkbox	Indicates that the work path will be generated during playback when checked.
[Color] button	Displays the Model Selection dialog to select the color used to display the work path.
[Line Size] combobox	Selects the line thickness used to display the work path.
[WorkModel] button	Displays the Model Selection dialog to select the model from which the work path is generated.

"Tool Work Panel" Dialog Box

Item	Description
[Parent] button	Displays the Model Selection dialog to select the parent model of the work path model.
[Max Points] box	Defines the maximum number of data points that are generated in the work path model. The value may be increased up to 20 000 points. When the maximum value is reached, the oldest points are erased as new points are generated.
[Add] button	Adds a new work definition with the current settings in the property edition section.
[Modify] button	Modifies the currently selected work definitions with the new settings in the property edition section. Note that the work entry may change position in the Work List.
[Delete] button	Deletes the currently selected work definitions.
[Close] button	Closes the Tool Work Panel.




- When the DOUT command is selected, turning the output with output groups (OG# or OGH#) will also be detected. It is the change of the state of the output by the instruction that is detected; therefore, if the output was already on, its activation will not be detected. PULSE instructions are not detected.
- When the SPOT command is selected, the SVSPOT instruction will also be detected. Work time is not calculated and will always display 0.00 seconds. The spots are displayed as dots on the screen.

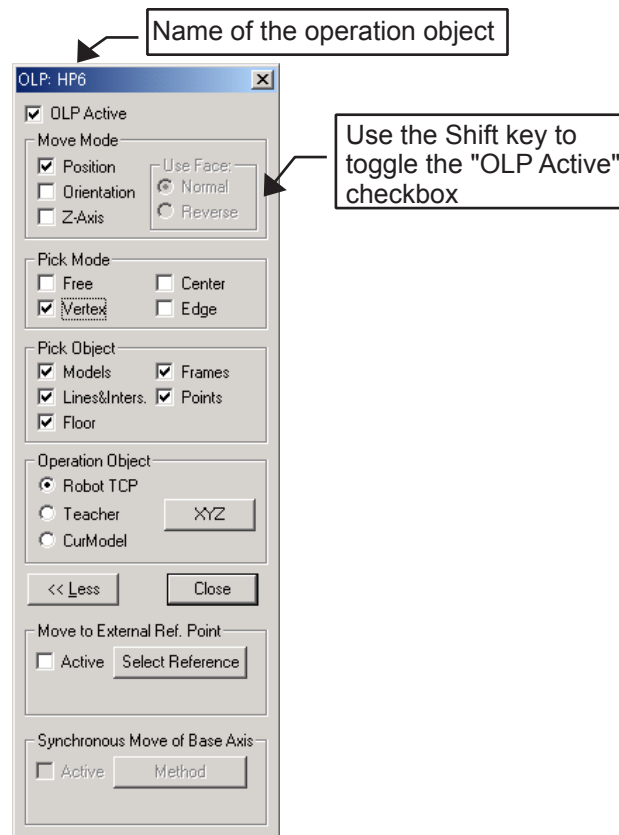
8.3 Teaching

8.3.1 OLP

OLP is a teaching tool that simplifies the robot teaching by moving the robot to a target position.

The OLP dialog box can be displayed by clicking on , or by selecting {Tool} - {Teaching} - {OLP...}.

For the details on how to use OLP, refer to " 12.1 Teaching Using OLP Function ".




OLP dialog box

Item	Description
[OLP Pick] check box	To be selected whenever OLP is used. The check box is automatically cleared when another function is selected to operate the robot.

OLP dialog box

Item	Description
"Move Mode" section	<p>Determines the method to move to the target point.</p> <p>[Position] check box: The Operation Object is moved to the position (XYZ) of the target point.</p> <p>[Orientation] check box: The Operation Object is turned to match the orientation (Rx, Ry, Rz) of the target point frame.</p> <p>[Z-Axis] check box: The Operation Object is turned so that its Z-axis matches the Z-axis of the target point frame.</p> <p>[Use Face] section: This setting is enable with [Orientation] or [Z-Axis] mode. It can be use to change the direction of the Z-Axis when selecting a face.</p> <p>[Normal] radio button: The Z-axis is in the same direction as the face normal.</p> <p>[Reverse] radio button: The Z-axis is in the opposite direction of the face normal.</p> <div style="border: 1px solid black; padding: 5px;"> <p>NOTE If only the orientation is to be changed without changing the position, uncheck the [Position] checkbox before clicking any point.</p> </div>
"Pick Mode" section	<p>Sets conditions determining the selected point in the clicked area.</p> <p>[Free] check box: Point of the model at the clicked position.</p> <p>[Vertex] check box: Nearest vertex from the clicked position.</p> <p>[Center] check box: Center of the nearest face or edge from the clicked position.</p> <p>[Edge] check box: Nearest edge point from the clicked position.</p>
"Pick Object" section	<p>Sets the type of the object to be selected when clicking on the cell view. (Multiple items can be selected)</p> <p>[Model] check box: Solid models.</p> <p>[Frame] check box: Model frame or AXIS6 models.</p> <p>[Lines & Inters] check box: Lines such as LINE part, WORK line and wireframe model, and intersection lines generated by the intersection of parts or models.</p> <p>[Point] check box: Points such as TRACE points.</p> <p>[Floor] check box: FLOOR parts.</p>

OLP dialog box

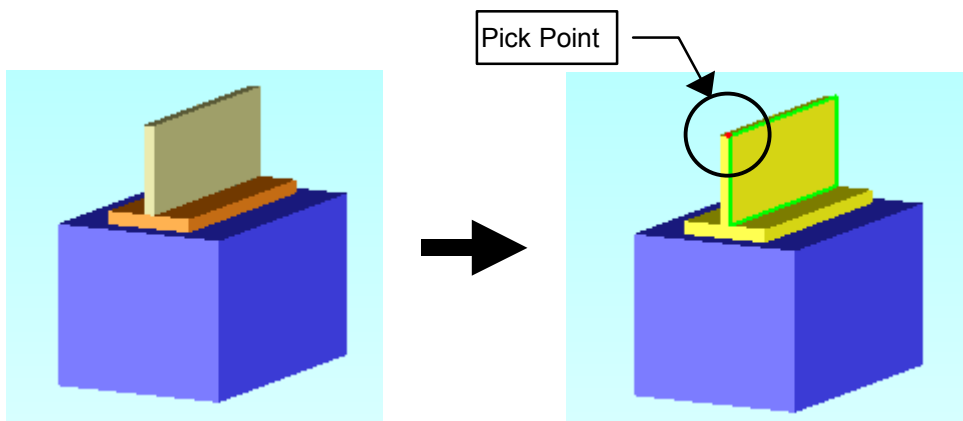
Item	Description
<p>“Operation Obj” section</p>	<p>Selects an object to be moved to the target point.</p> <p>[Robot TCP] radio button: -Sets the robot TCP as the object to move. To select the robot, please refer to section " 7.2.3 Robot Selection ".</p> <p>[Teacher] radio button: -Sets the “Teacher” coordinate axis as the object to move.</p> <p>[Model] radio button: -Sets the selected model as the object to move.</p> <p>Model can be selected with  or {Screen} - {SelectModel} or the [CADTree].</p> <p>[XYZ] button: -Displays the position data panel as shown below to manually modify the position or orientation of the operation object.</p> <div> </div> <p style="text-align: center;">Position Data Panel</p> <div> </div> <p style="text-align: center;">Teacher dialog box</p> <div style="border: 1px solid blue; padding: 10px;"> <p>NOTE Refer to the dialog title bar to confirm the operation object name.</p> </div>

OLP dialog box

Item	Description
"Move to External Ref. Point" section	TUse to move the part held by the robot to a specific point (External Reference Point). [Active] check box: - When check the robot will move the point clicked on the model it is holding to the defined external reference. [Select Reference] button: Displays the Select Model dialog to select a model (frame) as the external reference point.
"Synchronous Move of Base Axis" section	Use to move the base axis (servotrack) at the same time as the robot when moving to a target point. [Active] check box: - When check the base axis will move according the set method to enable the robot to reach the target point. [Method...] button -Specifies the method to move the base axis.

■ OLP Function Pick Method and Display

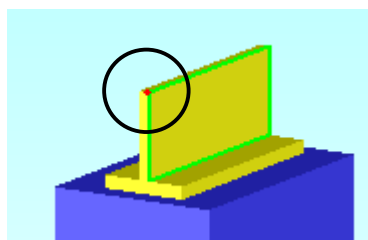
When the mouse pointer is over the cell view, press down the left mouse button. The model considered for selection will display in yellow with a red dot to indicate the specific point location. In the case of a solid model, the border (edges) of the pick face will be highlighted in green. The display will update to represent change of selection as the mouse pointer is moved over different models. The actual selection is made only when the mouse button is released.



The pick point display will change depending on the selected move mode.

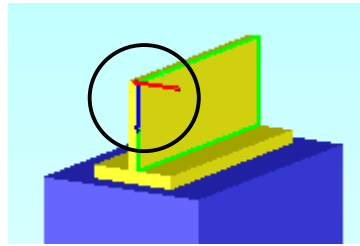
Position

Displays a point.



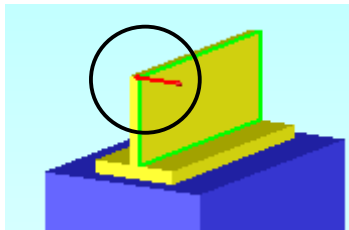
Orientation

Displays a frame (Z-axis is in red).



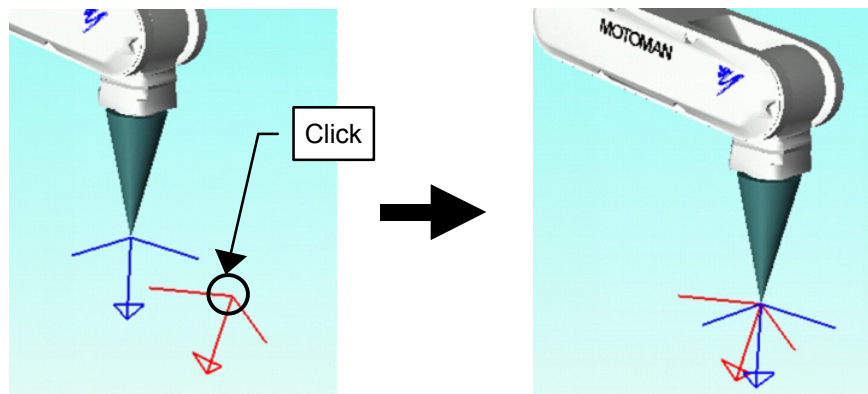
Z-axis

Display an arrow (Z-Axis).



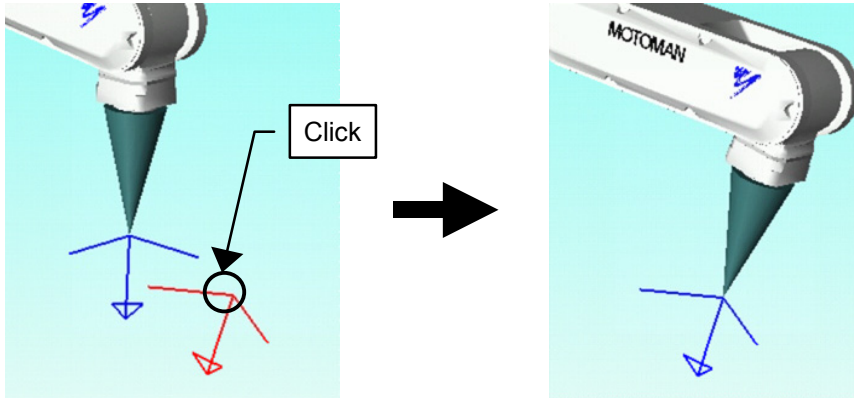
- Selecting [Position] in the "Move Mode" section: (Other items set at default)

The robot moves so that the robot TCP overlaps with any clicked point.
Note that this motion does not involve any change in the wrist posture.



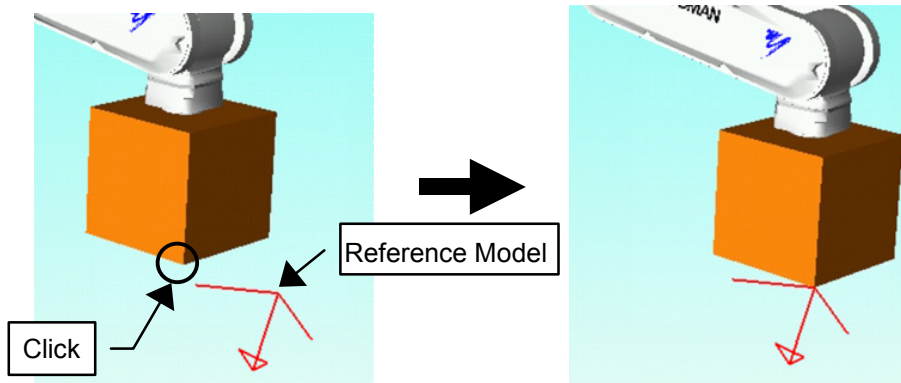
- Selecting [Position] and [Orientation] in the "Move Mode" section: (Other items set at default)

The robot moves changing its wrist's posture so that the frame of the robot TCP overlaps the frame of the clicked point.



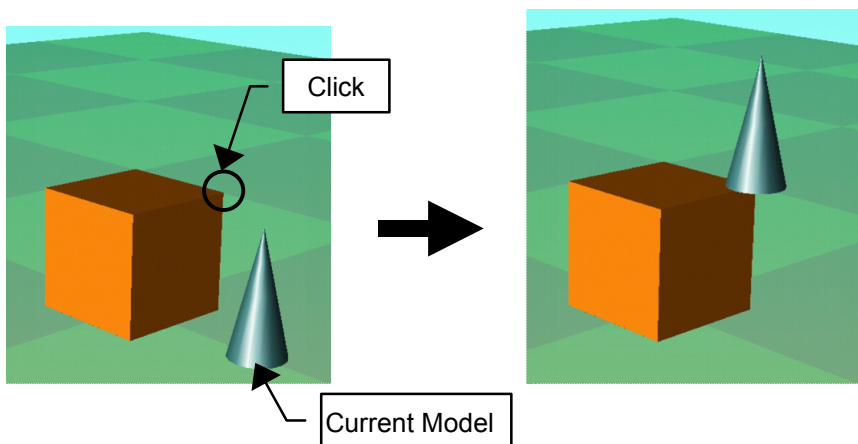
■ Selecting "Move to External Reference Point"

Click a point on a model carried by the robot and the robot will move to bring that point to the reference point. (The reference point needs to have been set before this operation can be used.)



■ Selecting [CurModel] in the "Operation Object" section

Click a point and the currently selected model will be move to the click location. The name of the current model is displayed in the OLP dialog title bar.



For more details on the OLP operation, please refer to section " 12.1 Teaching Using OLP Function "

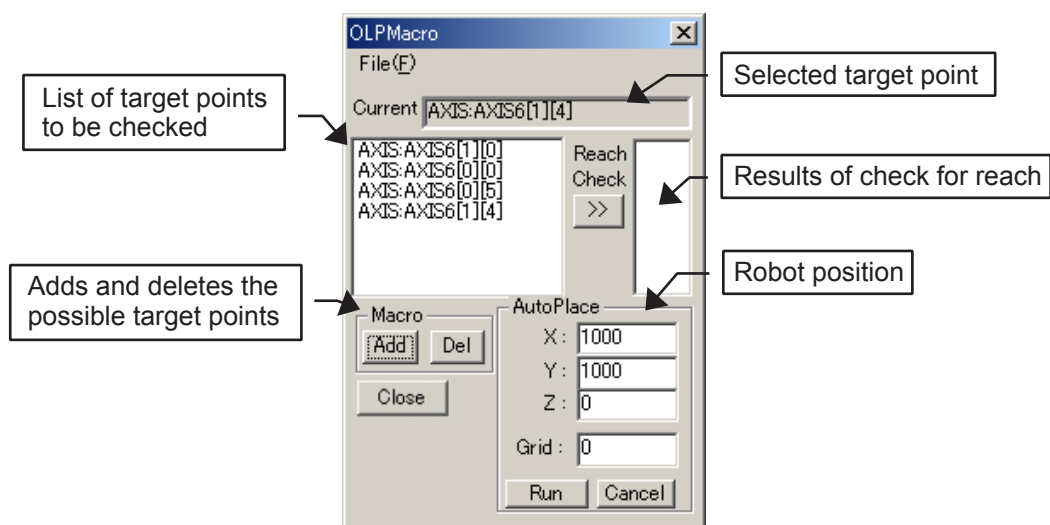
8.3.2 OLP Macro

MotoSim EG has the following OLP macro function related to the target point set in a work-piece:

- A function to Judge whether the robot can reach the target points.
- A function to Judge and display the installation position from which the robot can reach the target points.

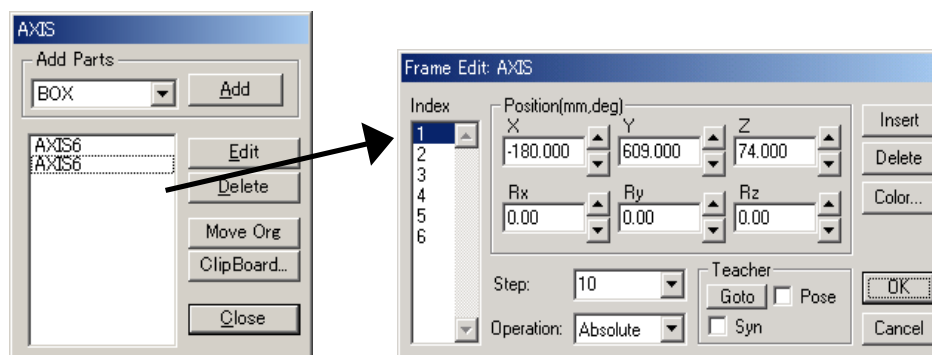
With the OLP macro function, only AXIS6 can be identified as target points. Therefore, it is required to set AXIS6 for the desired target points prior to using this function.

The OLP macro can be set in the OLP Macro dialog box, which is displayed by selecting {Tool} - {Teaching} - {OLP Macro...}.



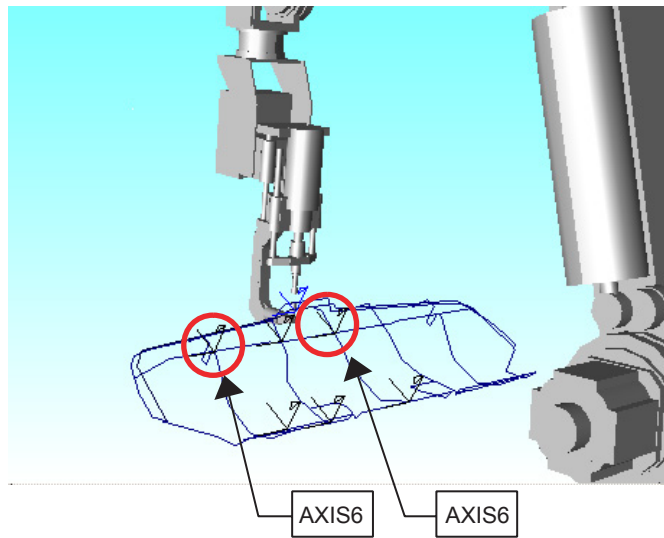
Procedure


1. Set AXIS6 for all the target points. (There are six target points set in the example below.)

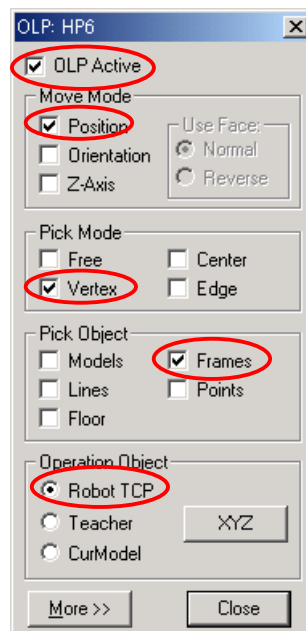


Use [Goto] button in the "Teacher" section to make the setting of AXIS6 coordinate for the target point coordinate easier. Refer to "9.1.4 Teacher" for details.

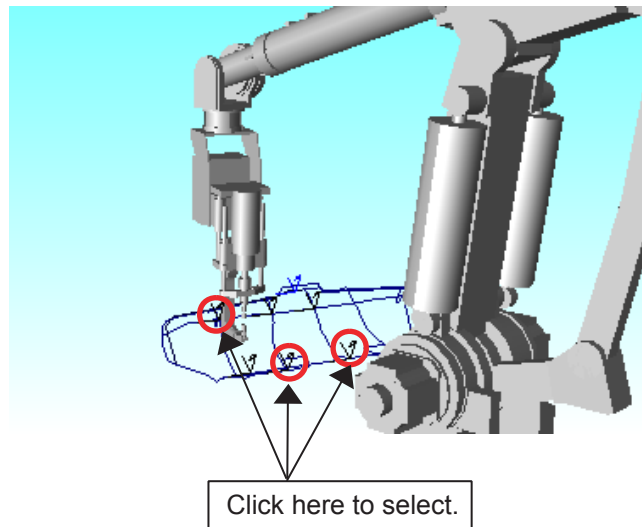
2. Once the setting of AXIS6 for the target points is completed, the AXIS6 frames are displayed on the model as shown in the following figure.



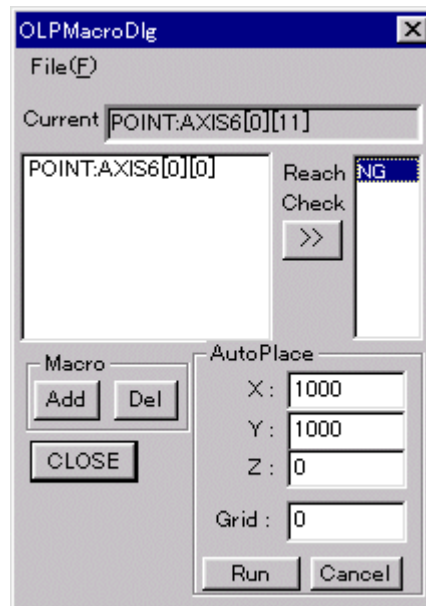
3. Click on , or select {Tool} - {Teaching} - {OLP...} to display the OLP dialog box, and configure the setting as follows:



- Select the AXIS6 using the OLP function. Note that inappropriate order of object selection may cause an improper movement of the robot, resulting in a reach check failure.



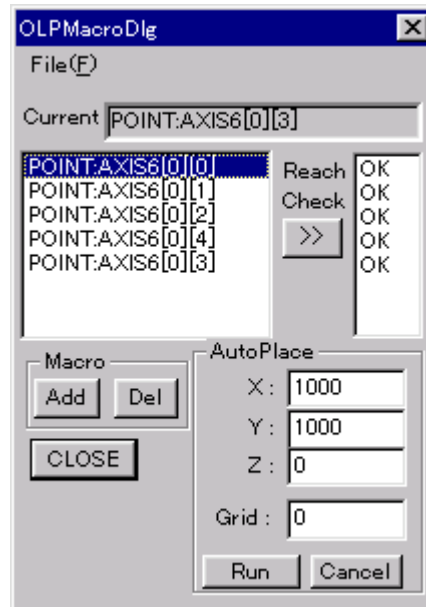
- After selecting one target point, verify that AXIS6 is displayed in "Current" bar in the OLP Macro dialog box, and then click the [Add] button. Repeat the same procedure for all the other target points.



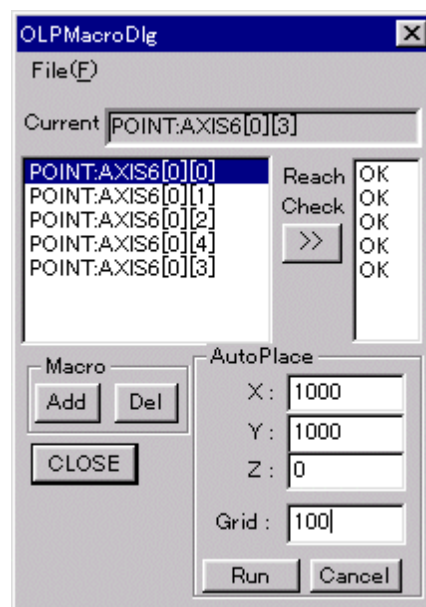
- After adding all the target points, click the Reach Check button [>>] to find out whether "OK" or "NG" is displayed on the right box. Make sure that the robot can reach all those target points.

■ Auto Positioning of the Robot

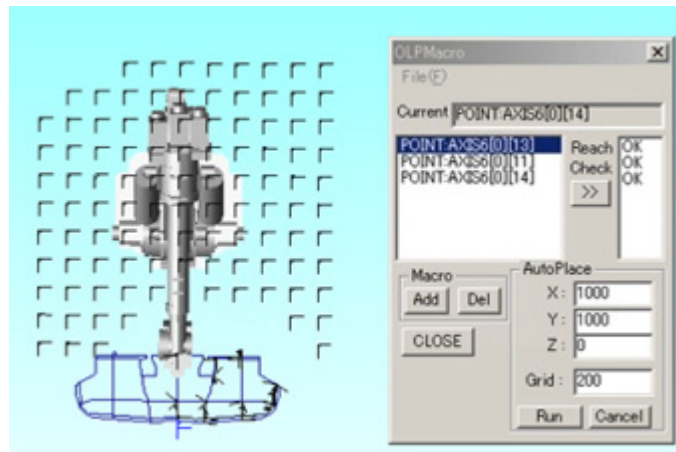
1. To set all the target points, perform the same procedure as the reach check, referring to steps 1 to 5 in " 8.3.2 OLP Macro ".



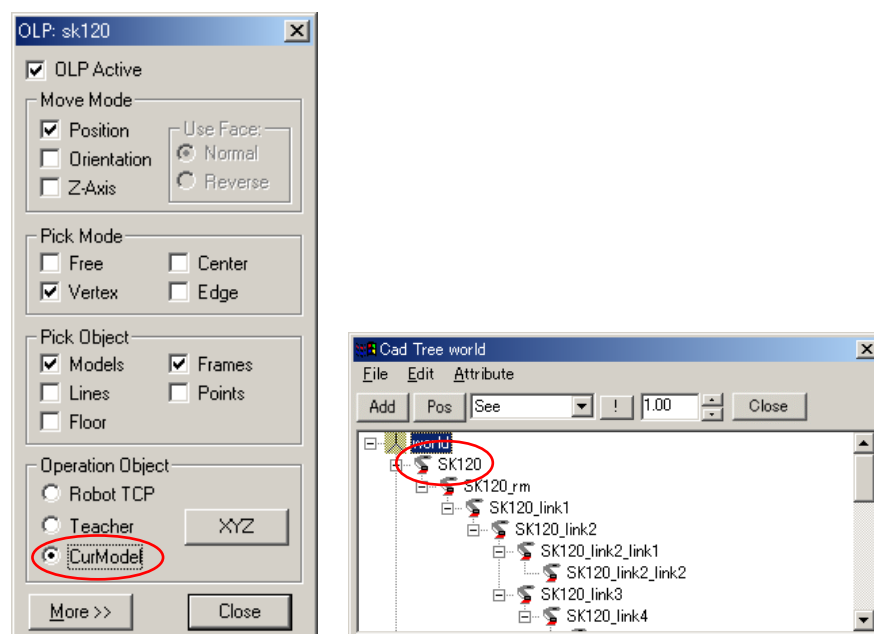
2. Enter the searching range (+/-) and grid width to X, Y and Z in the "Auto Place" section, and click the [Run] button (for placement calculation).



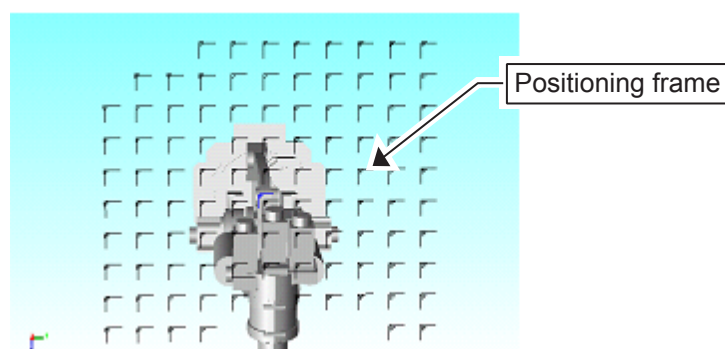
- The places from which the robot can reach all the target points previously set are automatically calculated. The usable coordinates are displayed with the AXIS 6 frames.



- Move the robot to the calculated coordinates where the robot can be placed: select the [CurModel] radio button in the “Operation Obj” section in the OLP dialog box, and select the robot model from the tree in the Cad Tree.




- Click one of the position frames with the mouse to move the robot to the clicked position.



8.3.3 Job Editing Function

Job Editor (or Job EditorNX) is available depending on the type of the selected robot: it is an optional application that enables instruction-editing operation as accurately as the actual controller.

To use the Job Editor functions, click on , or select {Tool} - {Teaching} - {Execute Job Editor...} to start the application.

The contents of the Programming Pendant dialog box (in paragraph 8.1.1) and the Job Panel (in paragraph 8.1.2) are updated when Job Editor is terminated after editing the jobs.




To use this function, it is necessary to install the separate applications Job EditorDX (for DX100) , Job EditorNX (for NX100) or Job Editor (for XRC). (Refer to the list below.)

Type of Selected Robot	Applicable Job Editing Application Name
Robot operated with DX100	Job EditorDX
Robot operated with NX100	Job EditorNX
Robot operated with XRC	Job Editor
Robot operated with MRC, MRC II, or ERC	N/A

8.3.4 Parallel Shift

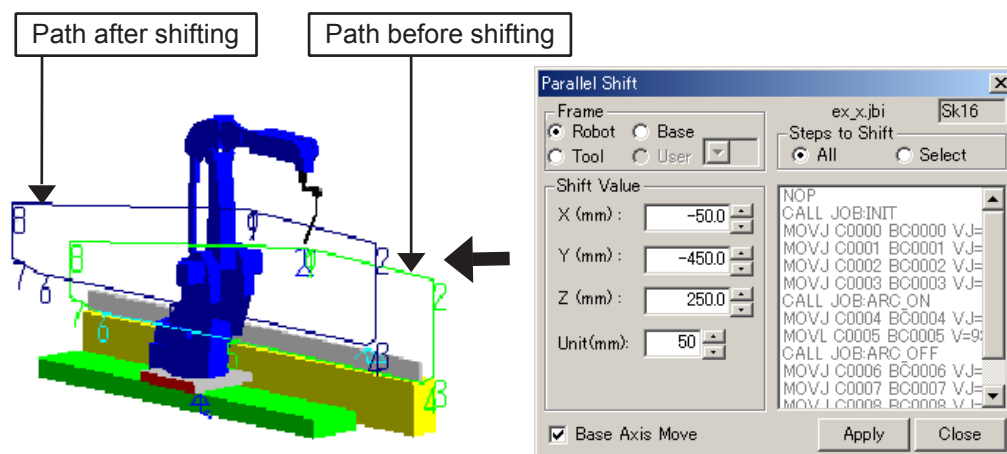
Parallel Shift is a function which enables multiple taught positions of a job to be shifted at the same time. The commands subject to this function are MOVJ, MOVL, MOVC, MOV S and REFP.

The teaching positions and motion paths of all the MOV commands are displayed in the Parallel Shift dialog box, and only the teaching position is displayed for REFP (reference point) commands. The dialog box displays the motion paths before shifting in green color and the motion paths after shifting in dark blue color.



The Parallel Shift function is enabled by displaying the Parallel Shift dialog box, which appears by clicking on  and selecting the [Parallel Shift] check box, or by selecting {Tool} - {Teaching} - {Parallel Shift...}.



- The commands after the shift remain the same, and only the positions are changed; there will be no change in interpolation, speed, etc.
- The assumed image after the shift will be re-drawn each time the shift amount is updated.



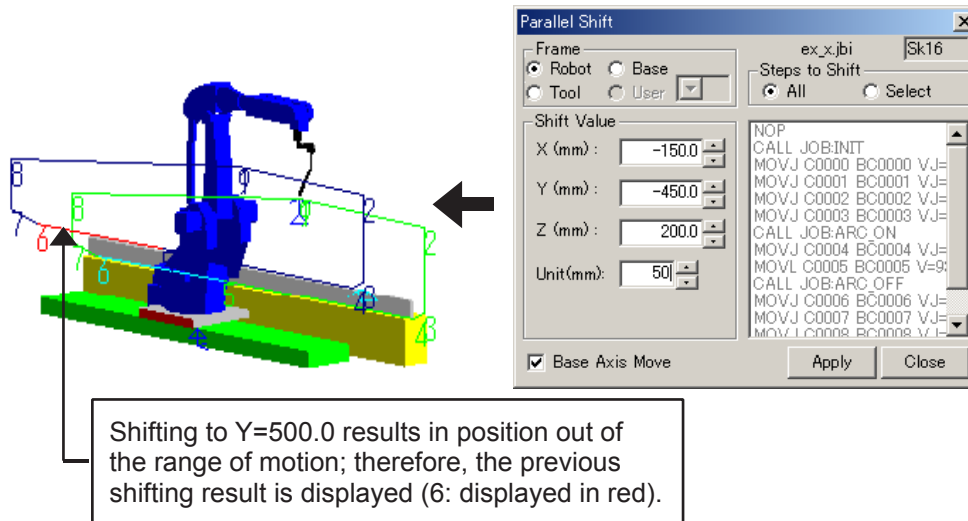
Parallel Shift Dialog Box

Item	Description
"FRAME" section	Performs the Parallel Shift operation in the selected coordinate system. When the User frame is selected, select the user frame number.
"Shift Value" section	"X", "Y", "Z" spin boxes Sets the shifting amount of each axis direction in millimeter. Directly enter the value or specify the value with each spin button  . Unit(mm) spin box Sets the shift unit for the spin button. Directly enter the value or specify the value with spin button  . The value can be set between 1 to 1000 mm.
[Base Axis Move] check box	Calculates the shift amount using the robot axis after moving the robot with a servotrack. Enabled only for a robot with a servotrack.
"Steps to Shift" section	[All] radio button Selects all the steps to which a shift may be applied in the job. [Select] radio button Selects the steps to which a shift may be applied in the selected range.
[Apply] button	Writes the shift result to the job. After applying the shift, the shift value in the Parallel Shift dialog box is reset to zero.
[Close] button	Closes the Parallel Shift dialog box. The shift value is discarded if [Apply] is not clicked.

■ Limitation of Parallel Shift

- Shifting out of the range of motion:

If the position after the shift operation is out of the range of motion, the position out of the range of motion will be displayed in red.



- If any of the following are performed during the Parallel Shift operation, the shift value in the Parallel Shift dialog box is reset to zero:

- Operations of the dialog box during the Parallel Shift.
 - Modifying the setting in the "FRAME" section.
 - Modifying the setting in the "Steps to Shift" section.
 - Modifying the setting of the [Base Axis Move] check box.
- Job operations during the Parallel Shift
 - Modifying the job contents with another function
 - Modifying the current job
 - Executing a job that calls other jobs

- Teaching Sheet function disabled during Parallel Shift:


The Parallel Shift uses the Teaching Sheet function. Therefore, the Teaching Sheet function in the {Robot} menu is unavailable while the Parallel Shift function is being used.

- Soft limit when servotrack moves:

When the [Base Axis Move] check box is selected for a robot operating with a servotrack, the servotrack motion cannot exceed its soft limit settings.

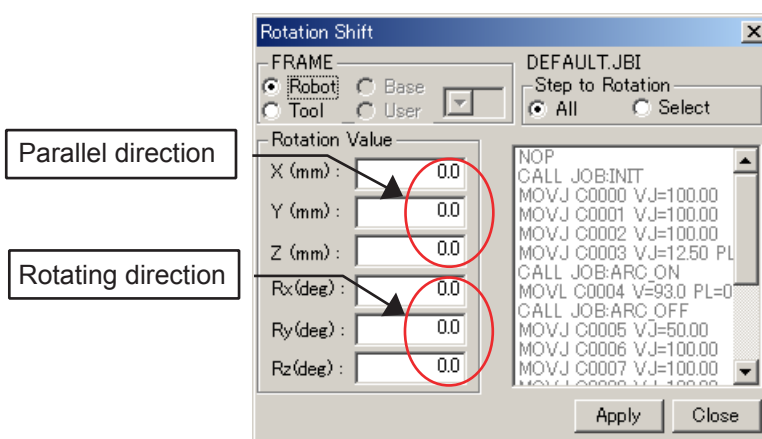
8.3.5 Rotation Shift

Rotation Shift is a function which enables multiple teaching positions in a job to be shifted in parallel or rotated at the same time. The commands subject to this function are MOVJ, MOVL, MOVC, and MOVS.

The Rotation Shift is enabled by setting the Rotation Shift dialog box, which appears by clicking on  and selecting the [Rotation Shift] check box, or by selecting {Tool} - {Teaching} - {Rotation Shift...}.



The commands after the shift/rotation remain the same, and only the positions are changed; there will be no change in interpolation, speed, etc.

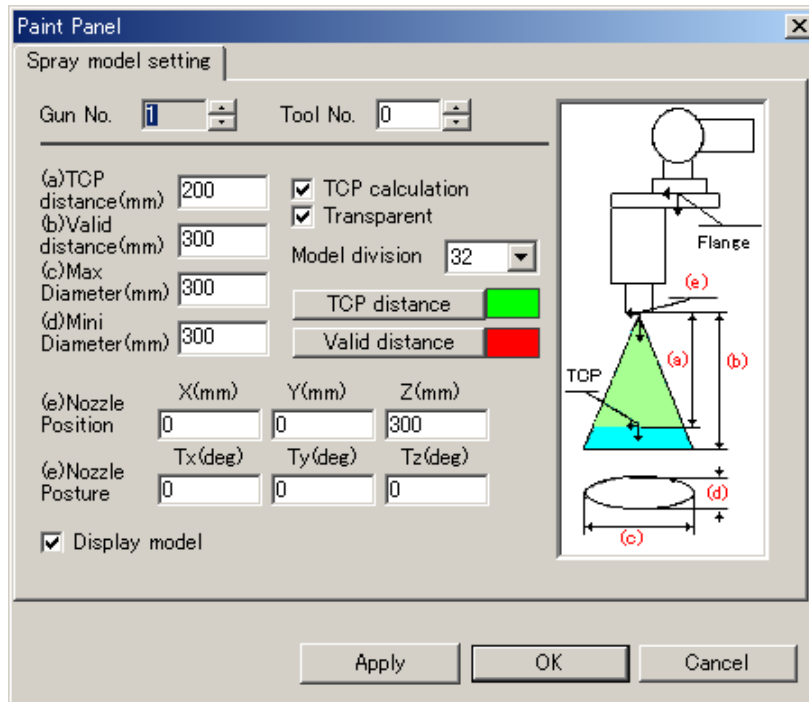


Rotation Shift Dialog Box

Item	Description
"FRAME" section	Performs the Rotation Shift operation in the selected coordinate system. When the User frame is selected, select the user frame number.
"Rotation Value" section	"X", "Y", "Z" edit boxes Sets the shifting amount of each axis direction in millimeters by directly entering the value. "Rx", "Ry", "Rz" edit boxes Sets the shifting amount of each axis direction in degrees by directly entering the value.
"Steps to Rotation" section	[All] radio button Selects all the steps to which a shift may be applied in the job. [Select] radio button Selects the steps to which a shift may be applied in the selected range.
[Apply] button	Writes the shift result to the job. After applying the shift, the shift value in the Rotation Shift dialog box is reset to zero.
[Close] button	Closes the Rotation Shift dialog box. The shift value is discarded if [Apply] is not clicked.

8.3.6 Paint Setting

The Paint Setting function allows to display the spray model when the SPYON or SPYOF instruction is executed in playback operation. With this function, the painting section and the valid painting range can be confirmed.



PAINT Panel Dialog Box

Item	Description
[Gun No.] spin box (1 to 3)	Paint gun number.
[Tool No.] spin box	Specifies the tool number to set the paint gun number.
"(a)TCP distance" edit box	Distance from the paint spray outlet (nozzle).
"(b)Valid distance" edit box	Effective range to apply paint from the nozzle.
"(c)Max Diameter" edit box	Maximum width of the paint spray face.
"(d)Mini Diameter" edit box	Minimum width of the paint spray face.
"(e)Nozzle Position" edit boxes	Nozzle position viewed from the flange.
"(e)Nozzle Posture" edit boxes	Nozzle posture viewed from the flange.

PAINT Panel Dialog Box

Item	Description
[TCP calculation] check box	Automatically calculates tool dimensions according to the input information.
[Transparent] check box	Displays paint model in translucent color.
"Model division" combo box	Number of divided paint spray faces.
[TCP distance] button	Paint color from nozzle to TCP.
[Valid distance] button	Paint color from nozzle to the end of the valid painting distance.
[Display model] check box	Displays the created spray model.

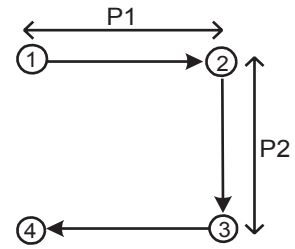
Procedure

1. Select a robot for the spray model setting.
2. Select {Tool} - {Teaching} - {Paint Setting...} to specify each item in the Paint Panel dialog box.

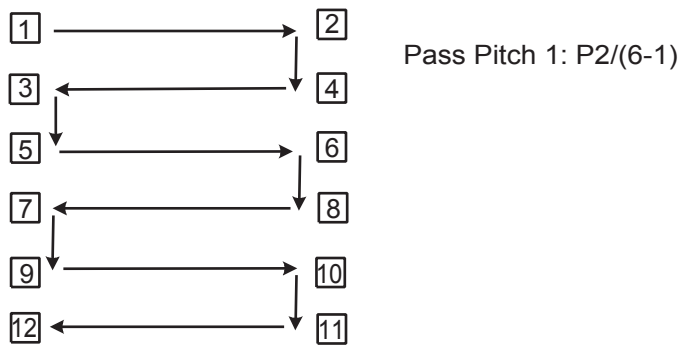
8.3.7 Four Point Teaching

The Four Point Teaching function automatically generates rectangular tracks from four taught points previously selected. Passes in the interim of the rectangular track are generated by specifying the first point, paint count, and pass count.

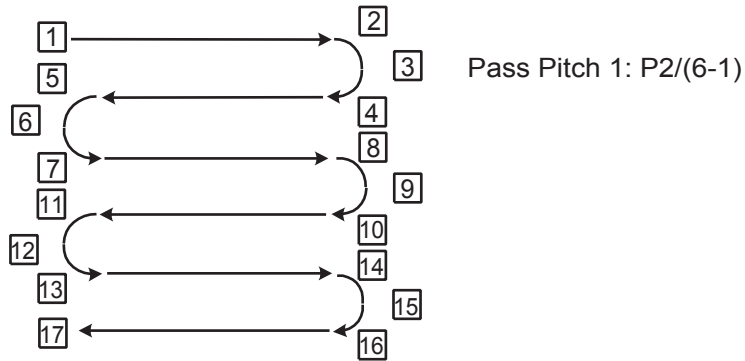
To use this function, display the Four Point Teaching dialog box by selecting {Tool} - {Teaching} - {Four Point Teaching...}.



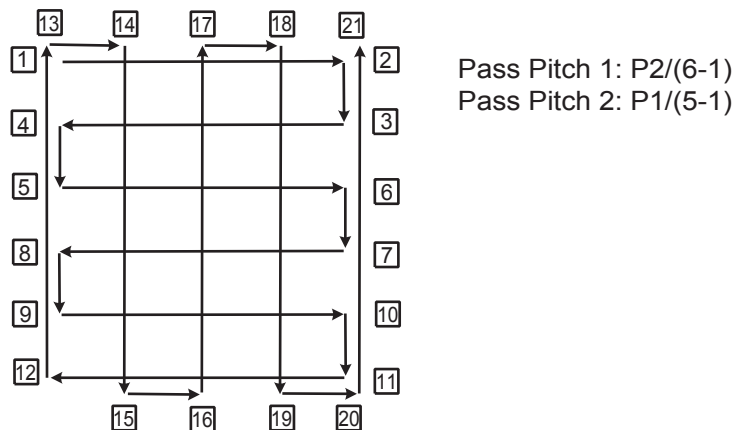
Example 1) Paint Count = 1; Pass Count 1 = 6; Circular = OFF.

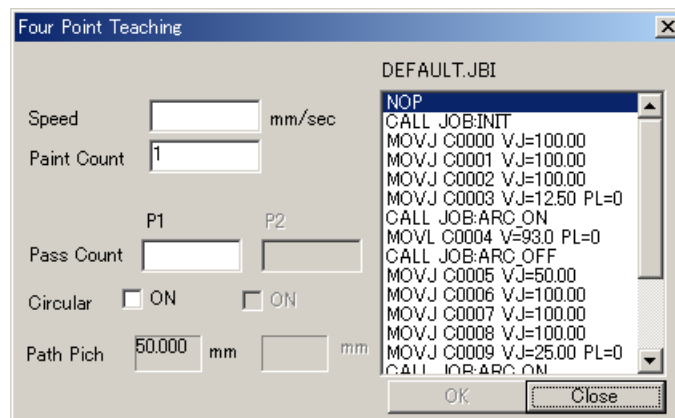


Example 2) Paint Count = 1; Pass Count 1 = 6; Circular = ON.



Example 3) Paint Count = 2; Pass Count 1 = 6; Pass Count 2 = 5; Circular = OFF.





Procedure

1. Select the first point of four consecutive points in the displayed job.

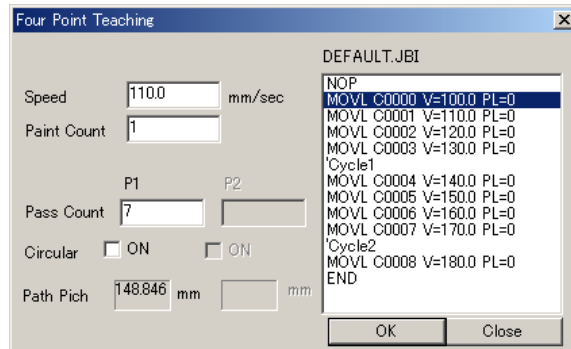


- The lines other than MOVE instructions are not allowed between the four points.
- In the above example, the lines C0007 to C0009 cannot be specified as the first point.

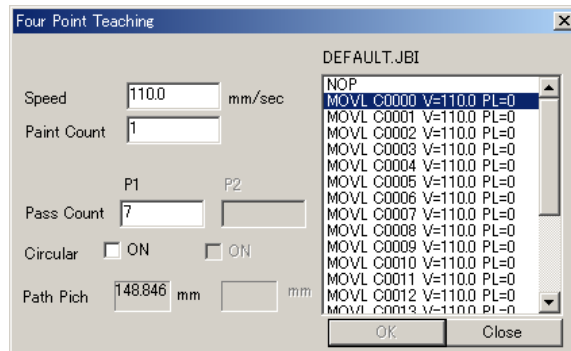
2. Enter the speed for the four point teaching.
(The speed of the second point of the original values is displayed as the initial value.)
3. Specify the Paint Count edit box.
Setting range of the value is 1 to 99; the initial value is 1. (If 5 or above is set, the same area is to be painted again.)
4. Set the Pass Count edit boxes as follows:
Setting range: 1 to 99.
If the Paint Count is 1, "P2" cannot be set.
The initial value is calculated from the selected four points and the value of the initial Pass Pitch.
When the Paint Count is odd, the value set in "P1" is used.
When the Paint Count is even, the value set in "P2" is used.
5. Set the circular interpolation as follows:
When the Paint Count is odd, circular interpolation is used if the [ON] check box on the "P1" side is checked.
When the Paint Count is even, circular interpolation is used if the [ON] check box on the "P2" side is checked.
6. Press the [OK] button.
A confirmation dialog box appears; select [Yes] to generate the MOVE instructions according to the information set in the steps 2 to 6 above.



- Be aware that once the [Yes] button is selected, the job after the Four Point development cannot easily be restored (e.g. deletion of instructions, etc.) to its initial state.



The Four Point Teaching dialog box before the Four Point development (C0000 is selected, and 7 is entered in the Pass Count.)



The Four Point Teaching dialog box after the Four Point development (The generated instruction lines C0000 to C0013 are developed.)

7. Press [Close] button.
Confirm each point of the generated jobs.

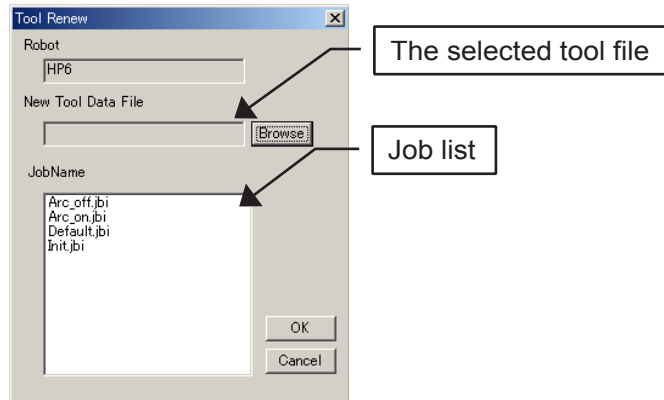


The Pass Pitch cannot be specified directly: the Pass Pitch box shows the value calculated from the selected four points and the Pass Count.

8.3.8 Tool Renew

The Tool Renew function allows the taught job to be converted to the same control point even if different tool files (TOOL.CND) are used.

To use this function, select {Tool} - {Teaching} - {Tool Renew...}.



This function overwrites tool files and job files. Make sure to backup the tool files and job files before performing this operation.

Procedure

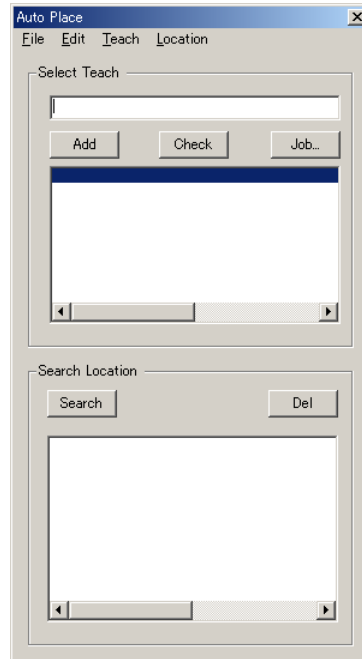
1. Press [Browse] button and select the tool file.
2. From the JOB List, select the job to be converted. (Multiple jobs can be selected.)
3. Click on [OK].
4. Confirm the job.

The conversion will not be executed if the robot posture is changed significantly or the position is out of the range of motion due to the tool change. If the conversion cannot be executed normally, the message " 'Next Cannot be Converted!! " appears in the line before the MOVE instruction.

8.3.9 Auto Place

The Auto Place function automatically searches a point to position the robot from a job or "Auto Place File" (.txt). It also allows to create a job with minimum cycle time from the search result.

For the operation, select {Tool} - {Teaching} - {Auto Place...} to display the Auto Place dialog box.



Auto Place Dialog Box

Item	Description
[Add] button	Adds the taught points selected with the OLP function to the Select Teach list box.
[Check] button	Verifies the range of motion of each taught point in the Select Teach list box. Indicates "NG" if the taught point is out of the range of motion.
[Job...] button	Displays the "Making JOB" dialog box. For details, refer to the step 4 of the Procedure below.
[Search] button	Searches for all the available points within the search range; displays the results on the list box of the "Search Location" section, creating auto place model files.
[Del] button	Deletes the item selected in the "Search Location" list box. (Multiple selection is not allowed.)

Commands in the Menu

{File}

{File} Pull-Down Menu

Item	Description
{Open}	Selects "Auto Place File" (.txt), and lists the Axis6 model data read from the file.
{Save}	Stores the listed Axis6 model data in the Auto Place File (.txt).
{Edit File}	Opens and edits the Auto Place File in Notepad.
{Exit}	Ends the Auto Place function.

{Edit}

{Edit} Pull-Down Menu

Item	Description
{Copy Search Location}	Stores the search results in the list box of the "Search Location" section in the clipboard.

{Teach}

{Teach} Pull-Down Menu

Item	Description
{Add}	Adds the taught points selected with the OLP function to the "Select Teach" list box. For the details of the OLP function, refer to " 8.3.1 OLP ".
{Delete a Point}	Deletes the item selected in the "Select Teach" list box. (Multiple selection is not allowed.)
{Delete all Points}	Deletes all the items in the "Select Teach" list box.
{Load from JOB}	Reads the taught points from the selected job, and displays them on the "Select Teach" list box.
{Check Reach}	Verifies the range of motion of the selected taught point in the "Select Teach" list box. Indicates "NG" if the taught point is out of the range of motion.
{Making Job}	Displays the Making JOB dialog box. For details, refer to the step 4 of the Procedure below.

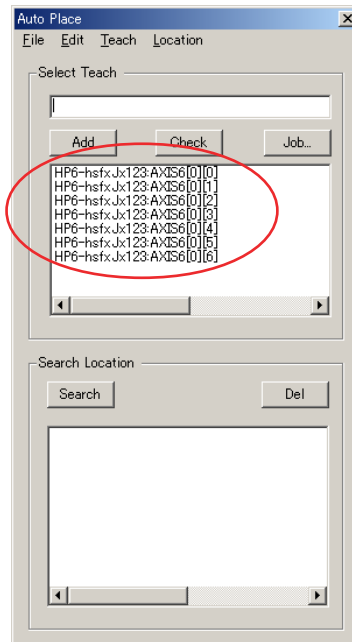
{Location}

{Location} Pull-Down Menu

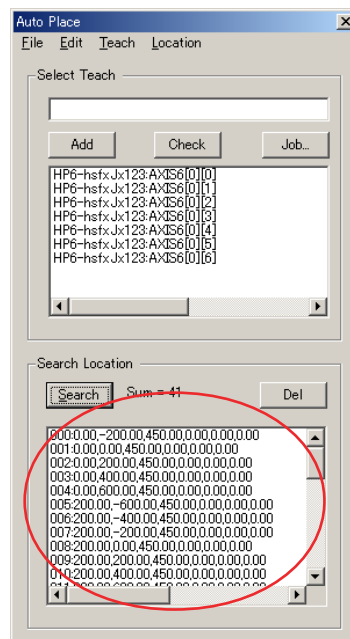
Item	Description
{Search Start}	Searches for all the available points within the search range; displays the results on the list box of the “Search Location” section, and creates an auto place model file.
{Search Area Def}	Specifies the search range in the Search Area Def dialog box. <div style="text-align: center;"> </div>
{Load from Mode File}	Reads the location points from the auto place model file, and displays them on the “Search Location” list box.
{Delete a Location}	Deletes the item selected in the “Search Location” list box. (Multiple selection is not allowed.)
{Delete all Locations}	Deletes all the items in the “Search Location” list box.
{Quick Cycle Time}	{Start} Starts the quick cycle time operation. {Stop} Ends the quick cycle time operation. {Define INF File} Selects an INF file to perform the quick cycle time operation.

Procedure

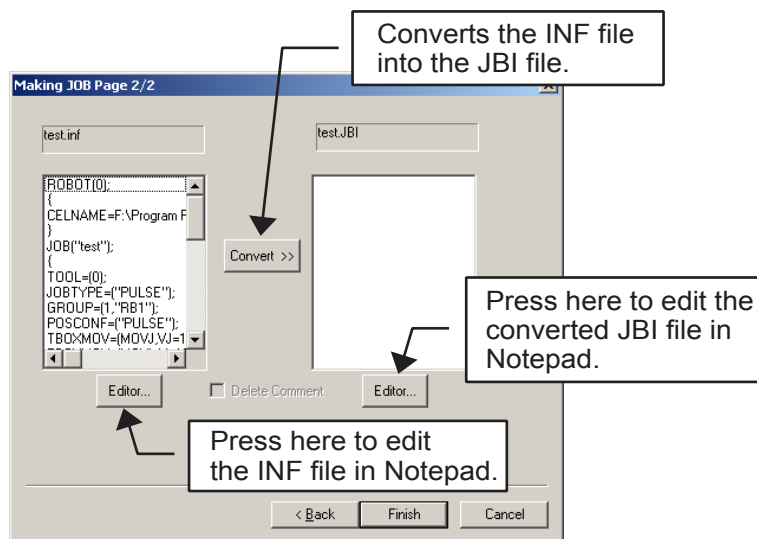
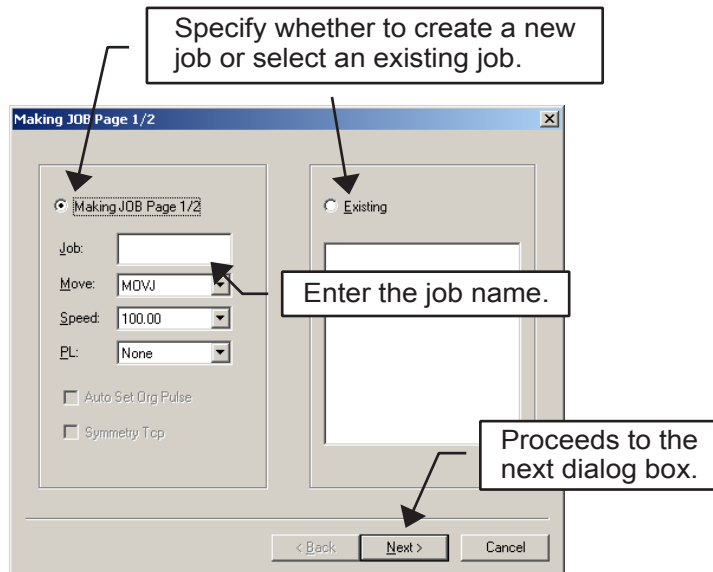
1. Select {Teach} - {Load from JOB} to select a job, and display the list of Axis6 models of the selected job on the Select Teach list box as shown in the following figure. (At this point, select a simple job such as the one with MOVL and MOVJ instructions. The one with CALL, JUMP, or WAIT instruction should not be selected.)



2. Specifies the search range in the Search Area Def dialog box.
3. Press [Search] to start searching the location points.
The location points Axis6 models are listed as follows.

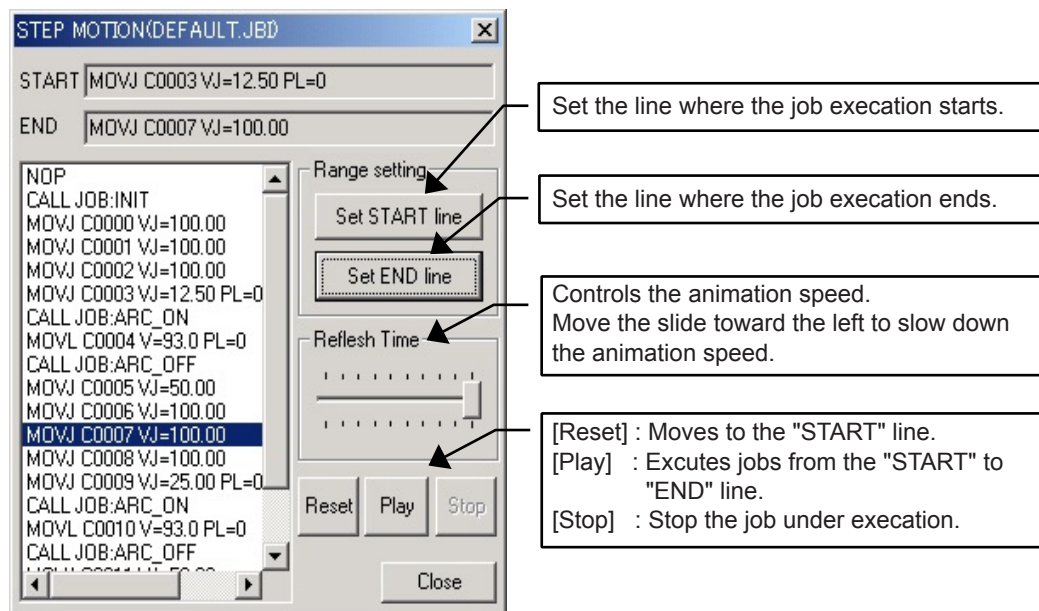


4. Select an arbitrary point from the Search Location list box, and display the following dialog box to create a job by selecting {Teach} - {Making Job}.




8.3.10 Step Motion

The Step Motion function enables to check a robot motion moving between the specified steps.

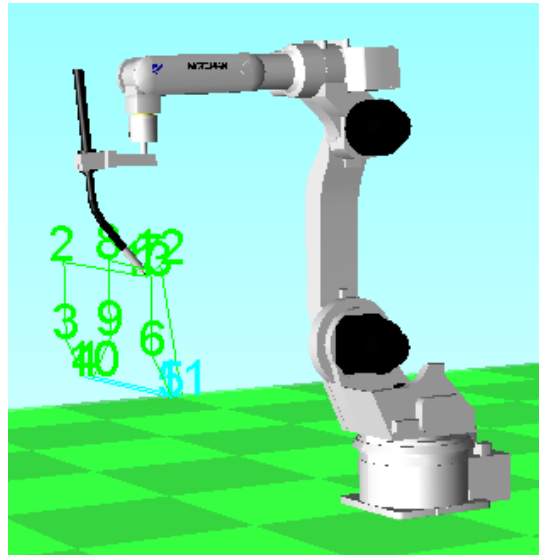


Procedure

1. Select {Robot} - {Controller} - {Select Job}, or click on  to select a job for the Step Motion operation.
2. Set the range by selecting a line in the job display area and pressing either "Set START line" or "Set END line" button.
3. Press [Play] button to execute the job and confirm the robot motion.

8.3.11 Teaching Sheet

Teaching Sheet is a function to number every teaching point and display a figure drawn by connecting each point with straight lines on the cell window.



■ Create, Delete, and Break

Select {Tool} - {Teaching} - {Teaching Sheet}, then select {Create}, {Delete}, or {Stop} to create, delete or cancel the teaching sheet.

■ Color Setting

Select {Tool} - {Teaching} - {Teaching Sheet} - {Color} with a teaching sheet displayed on the cell window to enable {Move Dependent} and {User Defined} color settings.

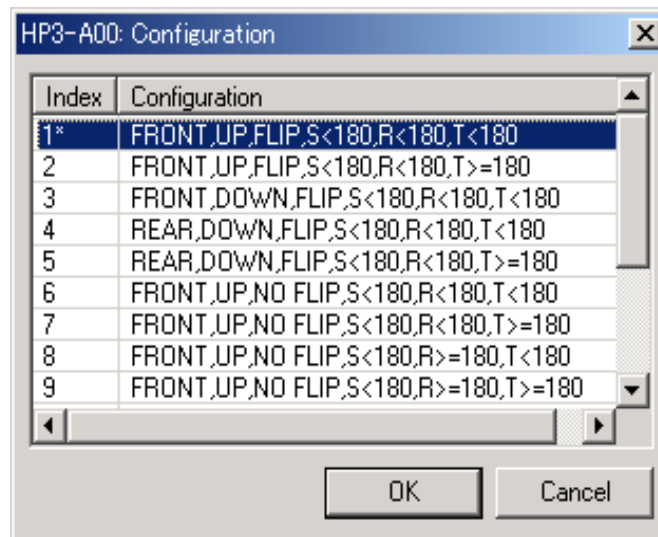
The {Move Dependent} command displays a teaching sheet where the color changes depending on the type of MOVE instruction; the {User Defined} command allows to set the color of the teaching sheet.

■ With Motion

Select {Tool} - {Teaching} - {Teaching Sheet} - {With Motion} to move the robot as the teaching sheet is being drawn.

8.3.12 Robot Position Configuration

The robot position "Configuration" dialog displays a list of different ways the robot can reach its current position. To display the "Configuration" dialog, select {Tool} - {Teaching} - {Robot Configuration} or from the robot "Position" panel click the "Configuration" button.



Configuration Dialog Box

Item	Description
Configuration List	Displays the list of all available robot configurations in which the robot can reach the current position. Changing the selected configuration will move the robot into the specified configuration. The asterisk next to the index number indicates the initial configuration of the robot.
[OK] button	Closes the Configuration dialog and changes the robot configuration to the select one.
[Cancel] button	Closes the Configuration dialog and returns the robot to its initial configuration.

A robot can often reach the same position in different ways. The robot resulting pulse position will be different but the tool will be at same position (XYZ position). The robot configuration is used to differentiate between those possibilities.

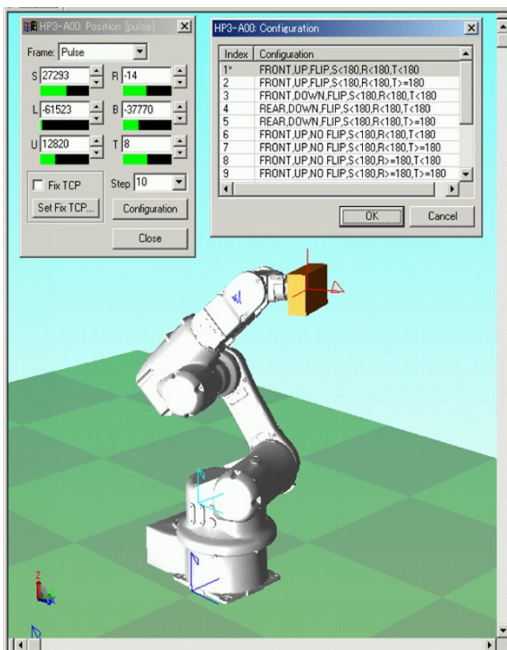
The configuration is define by six parameters:

FRONT or REAR	Specifies if the B-axis rotation center is in the FRONT or the REAR of the S-axis rotation center.
UP or DOWN	Specifies if the elbow of the robot (angle between the lower and upper arm) is UP or DOWN.

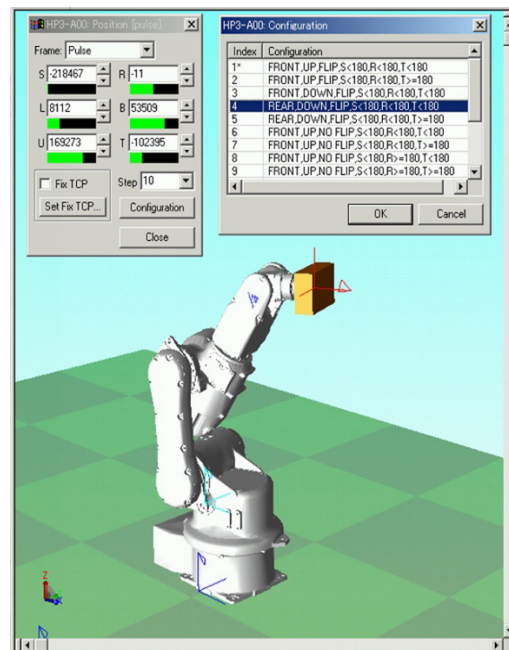
8.3 Teaching

FLIP or NO FLIP	Specifies if the R axis is FLIP or NOFLIP. FLIP position indicates an angle from -90° to 90° , 270° to 360° , or -360° to -270° .
$S < 180$ or $S \geq 180$	Specifies if the S-axis absolute angle is smaller than 180° (within one turn) or greater (over one turn).
$R < 180$ or $R \geq 180$	Specifies if the R-axis absolute angle is smaller than 180° (within one turn range) or greater (over one turn range).
$T < 180$ or $T \geq 180$	Specifies if the S-axis absolute angle is smaller than 180° (within one turn range) or greater (over one turn range).

Example:



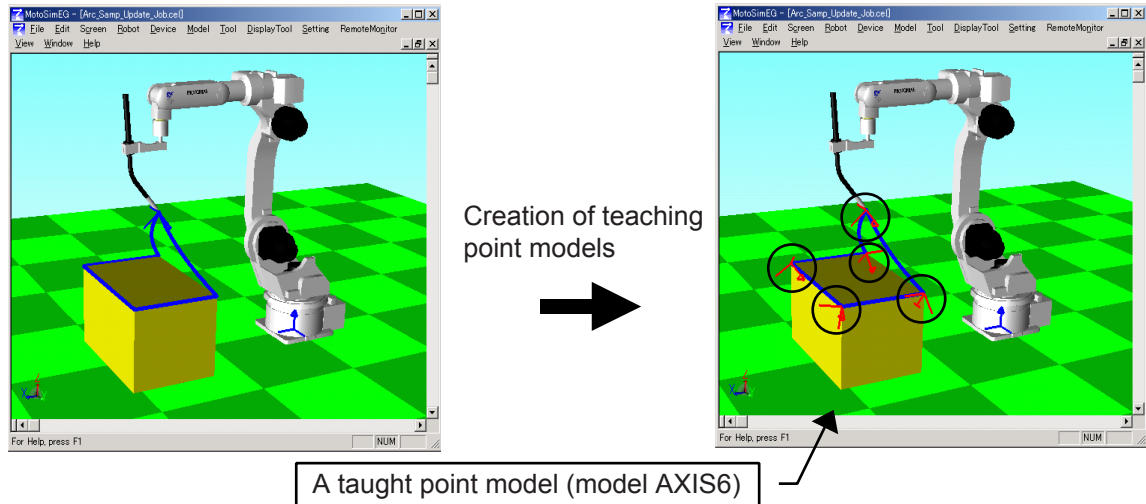
FRONT,UP,FLIP,S<180,R<180,T<180



REAR,DOWN,FLIP,S<180,R<180,T<180

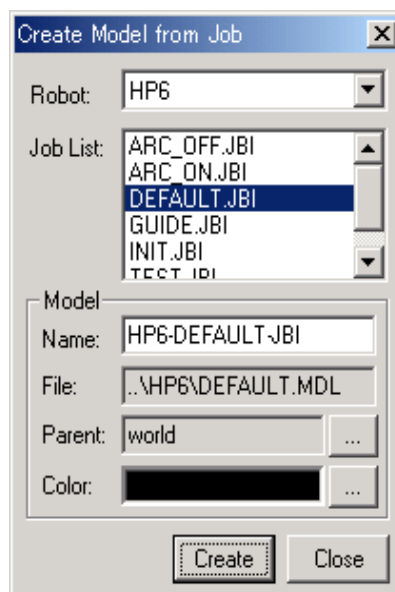
8.4 Create Model from Job

The "Create Model from Job" allows the creation of a taught point model (AXIS6 model) for a specified job.



Procedure

1. Display the "Create Model from Job" dialog box by selecting {Tool} - {Create Model from Job}.
2. Select a robot and then a job from the job list of that robot.
Change the model properties in the model section as required.
3. Press the [Create] button to generate a model for the selected job.
If models for other jobs need to be created, repeat the previous steps.
4. When done, press the [Close] button to close the dialog.



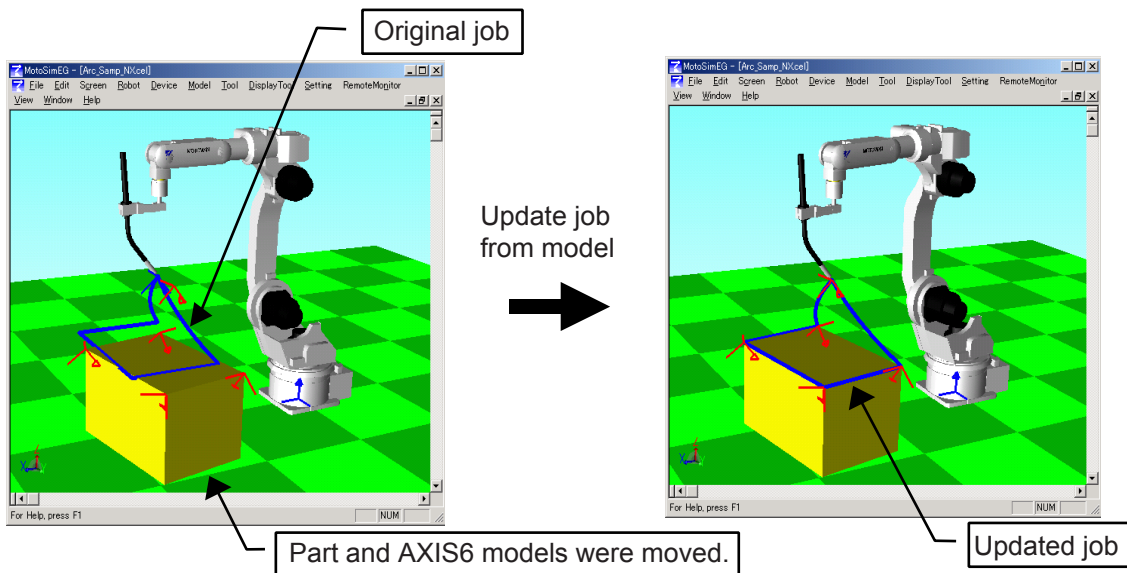
8.4 Create Model from Job

Create Model from Job Dialog Box

Item	Description
[Robot] combobox	Selects a robot in the cell.
Job List	Displays the list of job available for the selected robot. Select the job for which a model will be created.
"Model" section	<p>[Name] Displays the name of the model that will appear in the Cad Tree. The default name will be: <robotname>-<jobname>-JB. The model name can be change by typing a new name in the model name box.</p> <p>[File] Displays the model file name. The model file is created in the robot folder with the name of the job and the extension ".MDL"</p> <p>[Parent] Displays the model parent name. The default parent is the "world" model. The parent can be changed by pressing the [...] button and selecting a different parent from the "Select Parent Model" dialog.</p> <p>[Color] Displays the model color. The default color is black. The color can be changed by pressing the [...] button and selecting a different color from the Color dialog box.</p>
[Create] button	Creates a point model for the selected job.
[Close] button	Closes the dialog box.

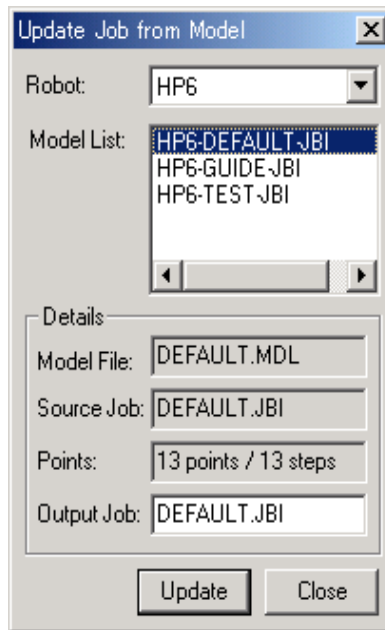
8.5 Update Job from Model

The "Update Job from Model" allows updating the taught positions of a job with the points of a model (AXIS6).



Procedure

1. Display the "Update Job from Model" dialog box by selecting {Tool} - {Update Job from Model}.
2. Select a robot and then a model from the model list of that robot. The associated files information will display in the "Details" section. The "Output Job" name can be modified as required.
3. Press the [Update] button to update the Output Job with the selected model point (AXIS6) data. If other jobs need to be updated select the associated model for that other job, repeat the previous steps.
4. When done, press the [Close] button to close the dialog.



Update Job from Model Dialog Box

Item	Description
[Robot] combobox	Selects a robot in the cell.
Model List	<p>Displays the models with associated job files for the specified robot. Select the model from which the job should be updated.</p> <div style="border: 1px solid black; padding: 5px;"> <p>NOTE To be able to update a job a corresponding model file (.MDL) with the job name must be located in the robot folder. A model in the CADtree must then make reference to that job model file in order to be displayed in the model list.</p> </div>
"Details" section	<p>[Model File] Name of the model file located in the selected robot folder.</p> <p>[Source Job] Name of the job file that will be used as a template for the updated job.</p> <p>[Points] Displays the number of points in the model and the number of steps in the job. For best result, both amount should be equal.</p> <p>[Output Job] Name of the job the resulting job updated with the model point (AXIS6) data. By default, this Output Job has the same name as the Source Job. Inputted name it must be a valid job name.</p>
[Update] button	Updates the Output Job with the model point (AXIS6) data.
[Close] button	Closes the dialog box.

■ Copying Jobs Between Robots

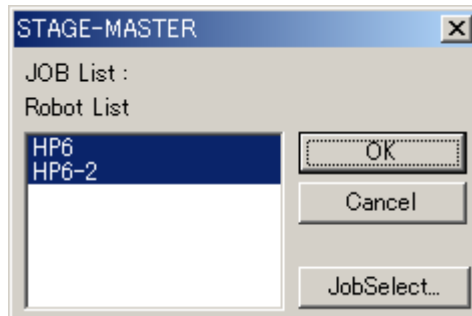
Job can also be copied to another robot and then updated.

- 1.** Create a model for the job with the "Create Model from Job" dialog. (See section " 8.4 Create Model from Job " for details).
- 2.** Copy the job (.JBI) and model (.MDL) files from source robot folder to another destination robot folder (using Windows Explorer or similar tools).
- 3.** Add a new model in the CADTree making reference to the copied model file in the destination robot folder.
- 4.** Update the destination robot job with the "Update Job from Model" dialog.

8.6 Stage Master

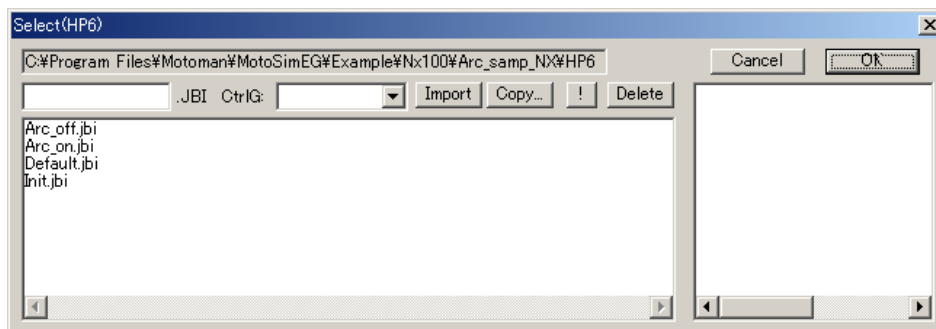
Stage Master enables a simultaneous playback of more than one robot.

To use this function, the job names of all the subject robots for playback should be the same.



Procedure

1. Display the STAGE-MASTER dialog box by selecting {Tool} - {StageMaster}. The dialog box displays the robots registered in the cell.
Select the robots to be simultaneously played back.
2. Click on [JobSelect...] to display the Select dialog box.
Note that only the jobs of which names are common with all the selected robots are listed in the dialog box.




3. Verify that the selected jobs are displayed in the JOB List of the STAGE-MASTER dialog box; click on [OK].

8.7 Collision Detection

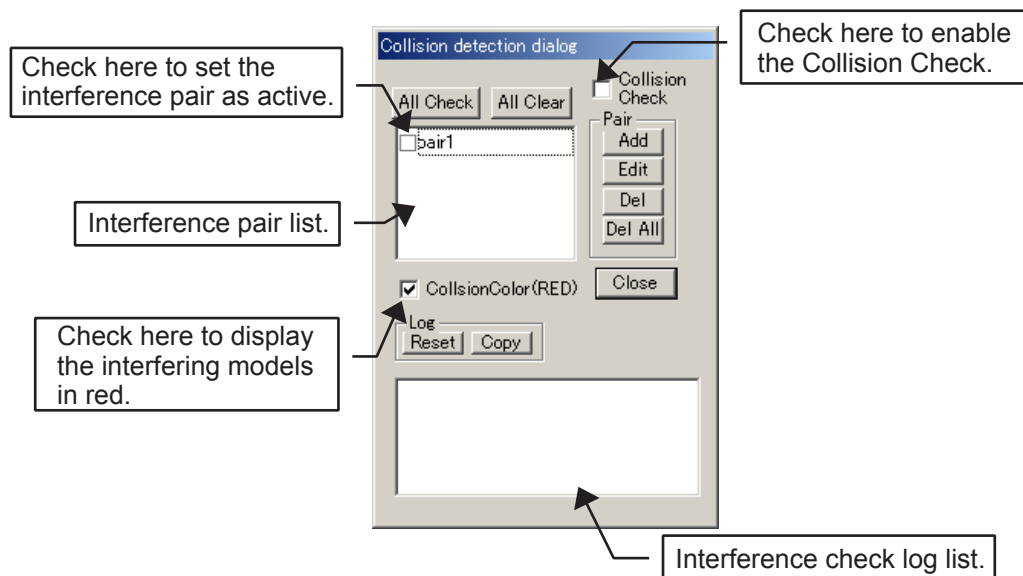
The Collision Detection function displays interferences between models on the screen.

To carry out the interference check, register the models to be checked as an interference pair so that they will be checked in pairs. When there is interference, the colors of the interfering models are reversed (in opposing colors) and the interferential status is indicated on the log list. The function is enabled during teaching and playback. It can also be used to check the multiple models by registering several interference pairs.

To display the Collision detection dialog box shown below, click on , or select {Tool} - {Collision Detection}.



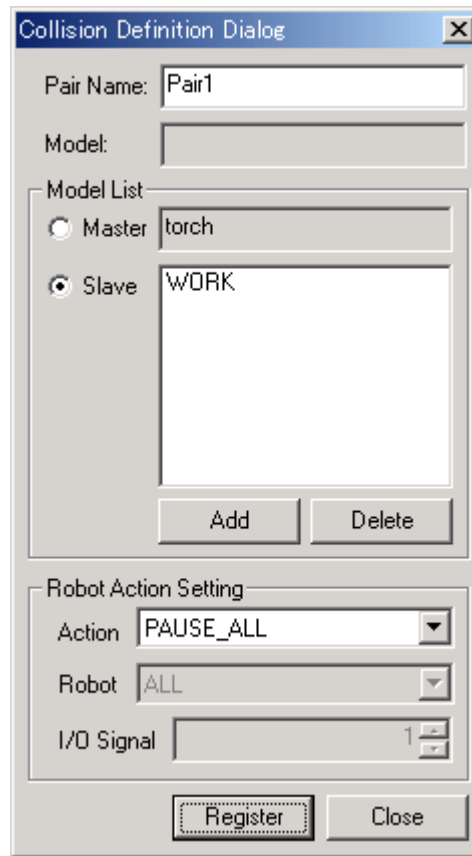
- The function is not available for hidden model.
- Register one master per interference pair.
When two or more masters are necessary, register the same number of interference pairs as the number of masters. However, more than one slave can be registered for one interference pair.




■ Setting the Collision Detection

Procedure

1. Press the [Add] button to display the Collision definition dialog box.



2. Click on  in viewpoint operation tool bar to select a master model. Select the [Master] radio button; click the model to be the master by using the mouse so that the name of the model is displayed in "Model" box. Confirm the name of the model and press the [Add] button to register the master.
3. Select a [Slave]. Select the [Slave] radio button; click the model to be the slave by using the mouse so that the name of the model is displayed in "Model" box. Confirm the name of the model and press the [Add] button to register the slave.
4. Enter a name for the interference pair in the Pair edit box. Click on [Register] to register the data in the "Collision detection dialog".
5. To register several pairs, repeat the steps 2 to 5; press [Close] when the registrations are completed.



Register one master for one interference pair.

6. Select the interference pair to be checked from the interference pair list in the "Collision

detection dialog", and tick the [Collision Check] check box to activate the collision detection during teaching or playback of the job.

When the models interfere, the interfering model will be displayed in red. (If the [CollisionColor(RED)] check box is not selected, the colors of the interfering models will be changed to the opposing color of each model.)

■ Setting the Robot Action in Collision

In the default action setting is "PAUSE ALL", under this condition the playback pauses once the models interfere. However, this function can be set independently for each interference check pair. Note that depending on the action setting, some of the controls may be disabled. To stop the robot motion when the interference occurs, select "STOP_ROBOT" and choose the name of the robot to stop.

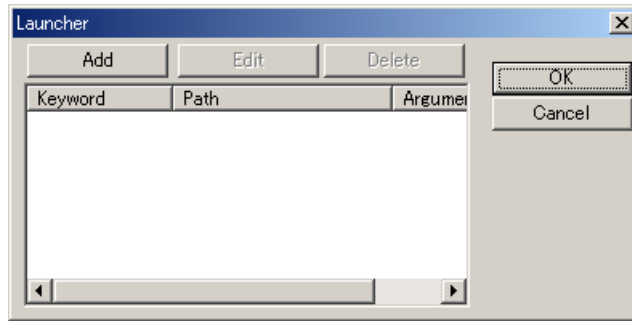
To turn on an input or output signal when the interference occurs, select "TURN_ON_INPUT" or "TURN_ON_OUTPUT". Choose the name of the robot that owns the I/O signal and select the I/O signal number. Note that under this condition the robot will not stop when a collision occurs. This function is useful to simulate sensor response during playback and send proper I/O signals to control the flow of the JOB.



Only one robot can be stopped or signaled per pair.

8.8 Running an External Software

To run an external software with MotoSim EG, display the Launcher dialog box by selecting {Tool} - {Execute Soft}, and perform the settings explained in the list below.



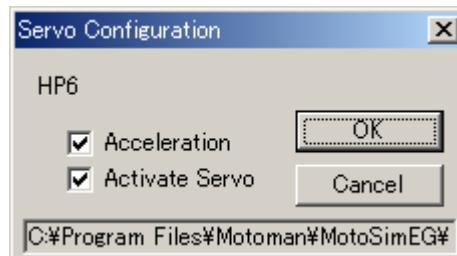
Launcher Dialog Box

Item	Description
[Add] button	<p>Select [Add] to register the software to run; the Launcher Setting dialog box appears.</p> <p>Press the [Browse] button on the right of the Path edit box. Select the desired program (executable file), and press [OK]. (The file name will be automatically entered in the Name edit box.)</p>
[Edit] button	Edits the settings of the registered software.
[Delete] button	Deletes the registered software.
"Keyword" column	<p>Double-click the desired software in the "Keyword" column to run the external software.</p>

8.9 Servo Settings

To set the servo function, display the Servo Configuration dialog box by selecting {Tool} - {Servo} - {Configuration...}.

If the [Activate Servo] check box is cleared, playback will be performed without taking the servo delays in consideration.



8.10 Export CAD File from Job

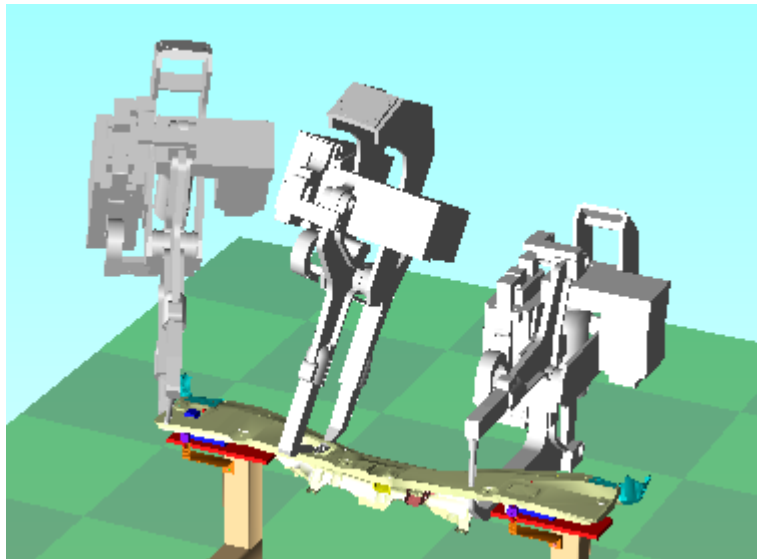


When IGES or SAT data are exported (CadPack option), the MotoSim EG-CadPack is required. (The MotoSim EG-CadPack is separate product from MotoSim EG.)

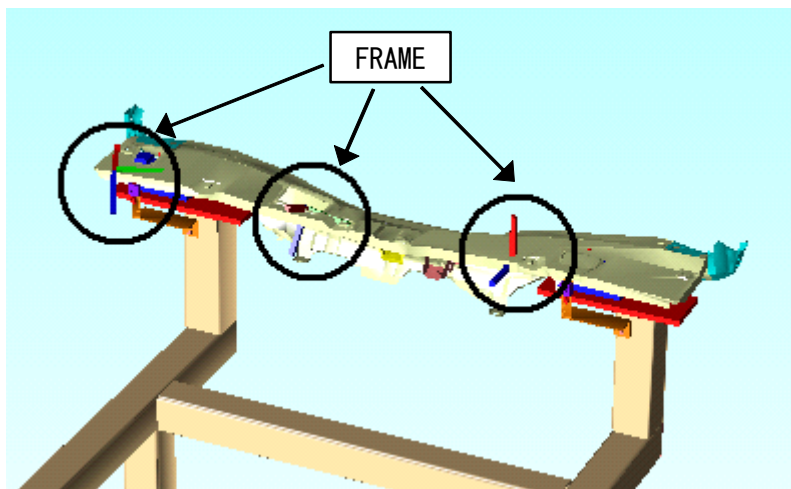
Exports, in IGES,SAT or HSF format, the selected models for each control points of a job.

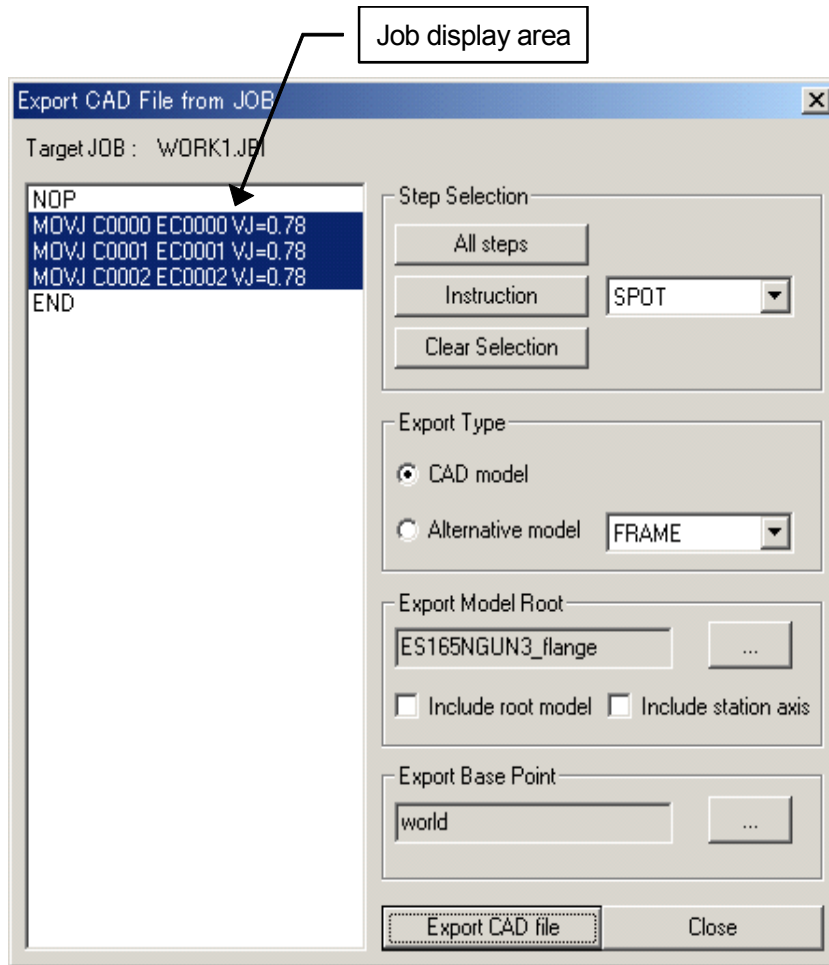
The exported CAD data can be of two types:

CAD model data referring to imported CAD data in IGES or SAT format or to Moto-SimEG models (.mdl) composed of BOX, BOX2, CYLINDER, CONE2, SPHERE, PIPE2, AXIS6, LINE, LINE2



A specified model [FRAME]

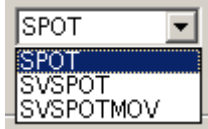






Export CAD File from JOB

Job display area	<p>Displays the content of the current job.</p> <p>The highlighted lines are the selected lines to be exported. On initial display, all the lines are selected.</p> <p>Multiple lines can be selected by holding the [Ctrl] or [Shift] key while left clicking lines with the mouse</p> <p>The [Ctrl] key, allows adding or removing the clicked line from the selection.</p> <p>The [Shift] key, allows range selection of all the lines between the last selected line and the clicked line.</p>
------------------	--


Export CAD File from JOB

<p>“Step Selection” section</p>	<p>Selects the job steps for which the "Export Model" will be exported. For each selected step, a copy of the "Export Model" is exported in the position corresponding to that step.</p> <p>[All steps] button Selects all the lines in the Job display area.</p> <p>[Instruction] button Selects all the lines corresponding to the instruction specified in the combobox list.</p>  <p>[Clear Selection] button All the lines are unselected.</p>
<p>“Export Type” section</p>	<p>Select the type of data that will be exported for every selected job step.</p> <p>[CAD model] The CAD model data of the Export Model will be exported.</p> <div style="border: 1px solid blue; padding: 5px; margin: 10px 0;"> <p>NOTE Only model data referring to imported CAD data in IGES, SAT or HSF format or to MotoSimEG models (.mdl) composed of BOX, BOX2, CYLINDER, CONE2, SPHERE, PIPE2, AXIS6, LINE, LINE2 is supported.</p> </div> <p>[Alternative model] The alternative model "FRAME" will be exported at the location of the "Export Model".</p>
<p>“Export Model Root” section</p>	<p>Indicates the name of the root of the models to be exported at the control point of each selected line. All child models under this root model will be exported. The default setting depends on the "Export Type":</p> <ul style="list-style-type: none"> • When [CAD model] is selected, the default [Export Model Root] will become the robot "flange" model. • When [Alternative model] is selected, the default [Export Model Root] will become the robot "tcp" model. <p>To change the root model, click the  button to display the "Select Object" dialog and select the desired root model.</p> <p>[Include root model] check box When checked, the root model data will also be exported.</p> <p>[Include station axis] check box When checked, if the job contains station position information, this station axis model and its child models are also exported to the CAD file.</p>
<p>“Export Base Point” section</p>	<p>Indicates the name of the model that will be used to set the origin of the exported model data. (The default base point is the origin of the "world" model.)</p> <p>To change the root model, click the  button to display the "Select Object" dialog and select the model to be used as base point and press [OK].</p>

Export CAD File from JOB

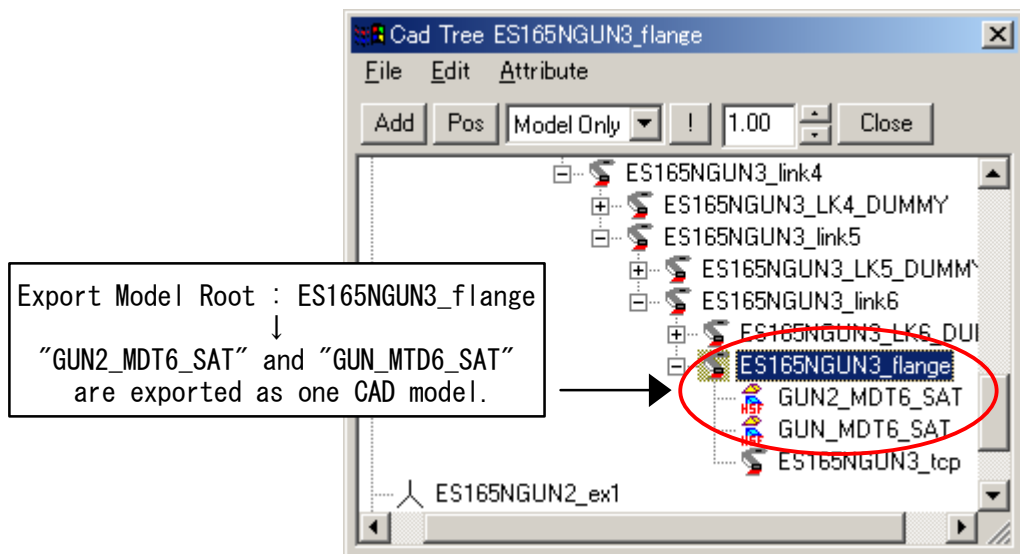
[Export CAD file] button	Exports the CAD data (IGES,SAT or HSF data) at the control point of each selected step of the job.
[Close] button	Closes the "Export CAD file from JOB" dialog (without exporting the CAD file).

Procedure

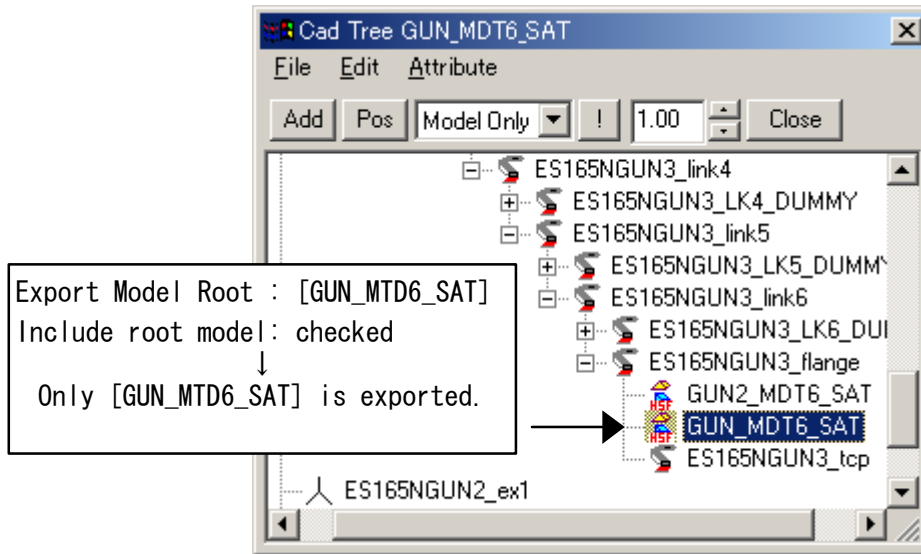
1. Select the Job for which the CAD data is to be exported by clicking the  icon or by selecting from the main menu: {Robot} - {Controller} - {Select Job...}.
2. From the main menu, select {Tool} - {Export CAD File from JOB} to display the "Export CAD File from JOB" dialog.
3. Select the steps of the job for which the "Export Model" is to be exported at the corresponding control point. Selection can be made with the "Step Selection" buttons or directly in the job display area.
4. Select the type of CAD data to export in the [Export Type] section.
5. Select the models to export in the "Export Model Root" section.

Example 1: Multiple models are exported as one CAD data.

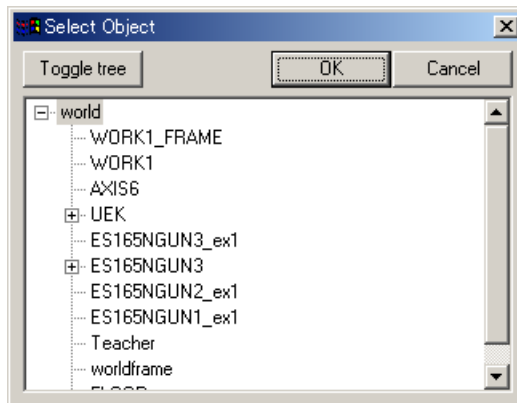
([Export Type]: CAD model)



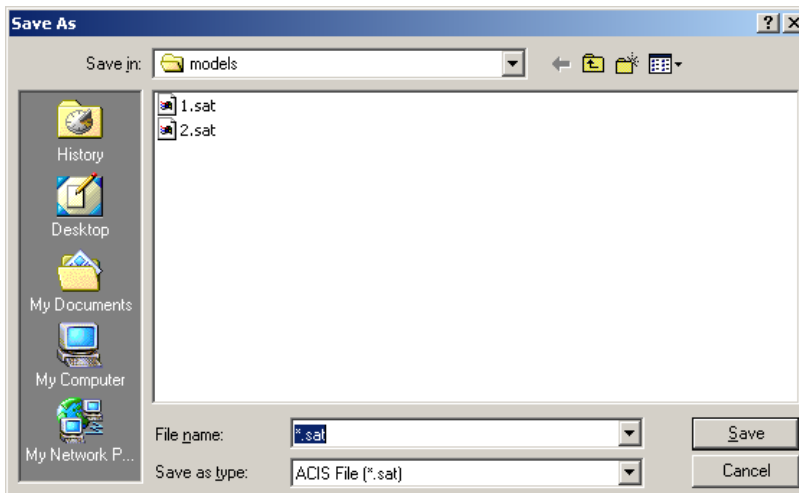
Example 2: One gun model out of multiple models is exported.
([Export Type]: CAD model)



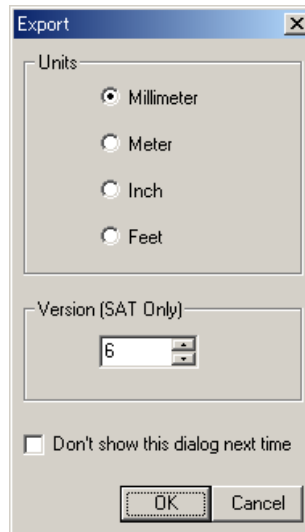
6. Select the model to use as the CAD file point of origin, in the [Export Base Point] section.



7. In the "Save As" dialog, select the file type (IGES,SAT or HSF). Enter a filename and press the [Save] button.



8. If the "Export" dialog is set to display, the "Export" dialog will display to confirm the IGES/SAT export settings. Change the settings as required, and then press [OK]. For more details please refer to the " Export " section above.



9. When the export is completed the following message will display.



9 Model Editings


This chapter explains the operations for creating and editing the workpiece and tool models using the CAD functions.

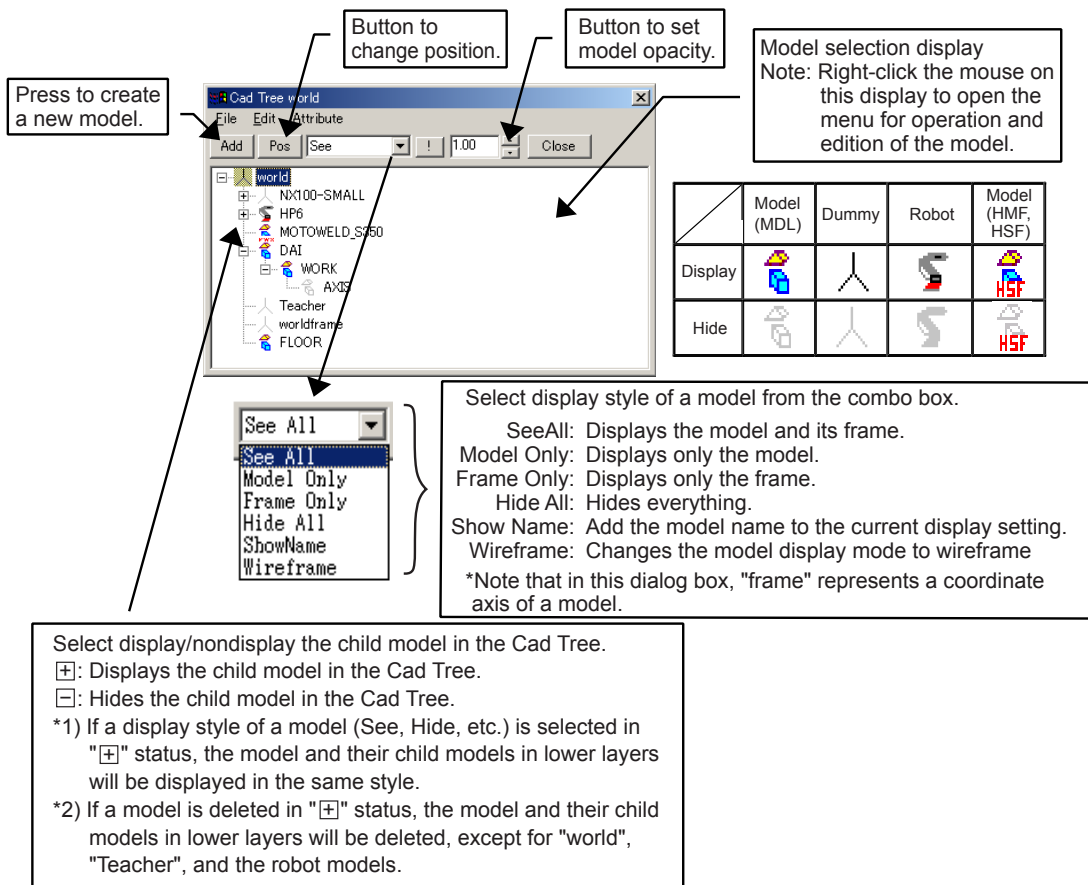
A model is generally created by combining basic figures, such as cubes and cylinders; in addition to the general method, MotoSim EG supports the model creation by reading HSF and HMF data.

The operations explained in this chapter focus on using the Cad Tree operations, however, note that the commands under {Model} in the main menu have the same functions.

9.1 Cad Tree

9.1.1 Outline of the Cad Tree

The Cad Tree is accessible in the "Cad Tree" dialog box which is displayed by clicking on , or selecting {Tool} - {CAD Tree}.



The screenshot shows the 'Cad Tree world' dialog box with a tree view of models and a display style selection table. Annotations include:

- Press to create a new model.** (points to the 'Add' button)
- Button to change position.** (points to the 'Pos' button)
- Button to set model opacity.** (points to the 'See' dropdown menu)
- Model selection display**
Note: Right-click the mouse on this display to open the menu for operation and edition of the model.
- Select display style of a model from the combo box.** (points to the 'See All' dropdown menu)
- Select display/nondisplay the child model in the Cad Tree.** (points to the tree view)

Display Style Selection Table:

	Model (MDL)	Dummy	Robot	Model (HMF, HSF)
Display				
Hide				

Display Style Legend:

- SeeAll: Displays the model and its frame.
- Model Only: Displays only the model.
- Frame Only: Displays only the frame.
- Hide All: Hides everything.
- Show Name: Add the model name to the current display setting.
- Wireframe: Changes the model display mode to wireframe

Child Model Legend:

- : Displays the child model in the Cad Tree.
- : Hides the child model in the Cad Tree.

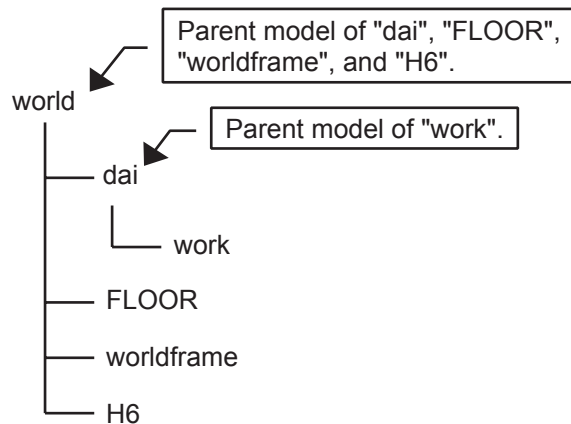
Notes:

- *1) If a display style of a model (See, Hide, etc.) is selected in "☑" status, the model and their child models in lower layers will be displayed in the same style.
- *2) If a model is deleted in "☑" status, the model and their child models in lower layers will be deleted, except for "world", "Teacher", and the robot models.

9.1.2 Tree Structure

The Cad Tree displays a column of models in a tree structure.

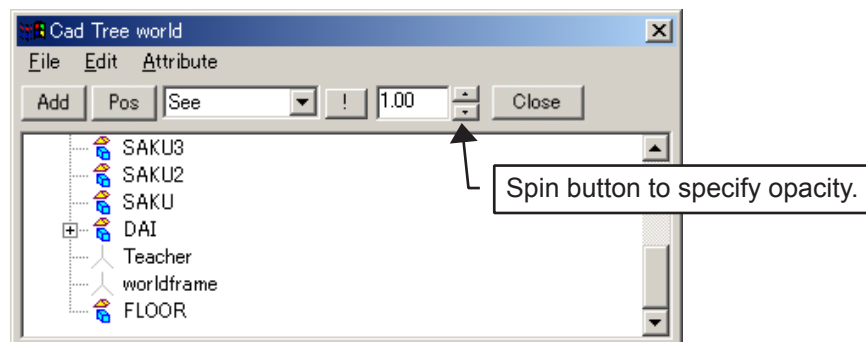
As shown in the following diagram, a model in the level immediately above the subject model is the parent model of the subject model.



9.1.3 Opacity Settings

To set the model opacity, select the model in the Cad Tree and set the value using the spin button indicated in the following figure.

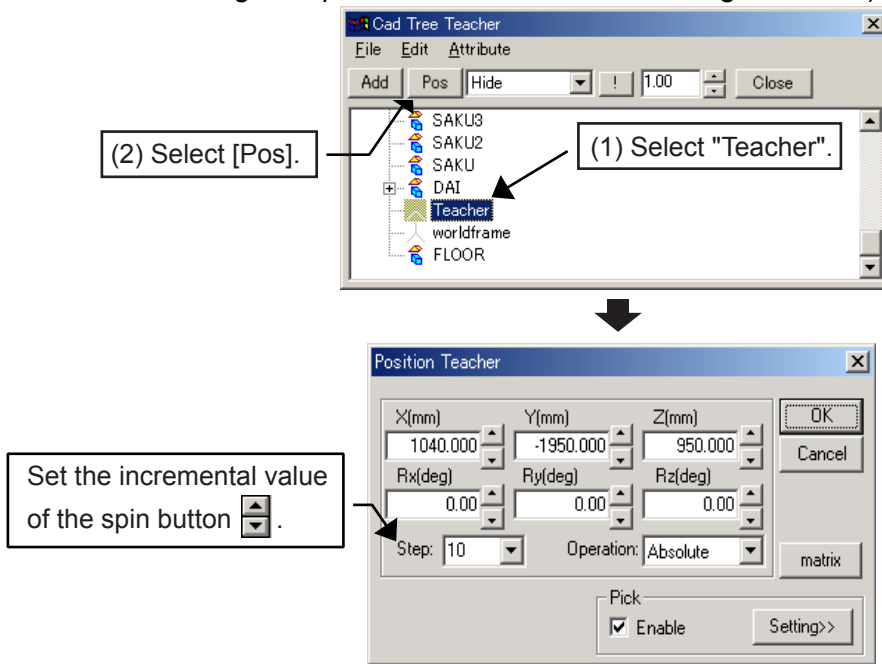
The maximum value of opacity is “1.00”. Decreasing the value below the maximum value reduces the opacity, the model becomes translucent enabling to see other models through it. If the value is set to “0”, the model becomes completely transparent and can no longer be seen.



9.1.4 Teacher

"Teacher" is a tool to create a target point (coordinate) at an arbitrary position, and is displayed as an AXIS6 frame on the screen. It simplifies the use of OLP-related function and the relocation of parts.

To enable the Teacher, point the cursor to "Teacher" in the Cad Tree, and click on [Pos] to display the "Position Teacher" dialog box. Specify the values in this dialog box. (For further detail on the "Position" dialog box, please refer to " 9.5 Positioning a Model ").

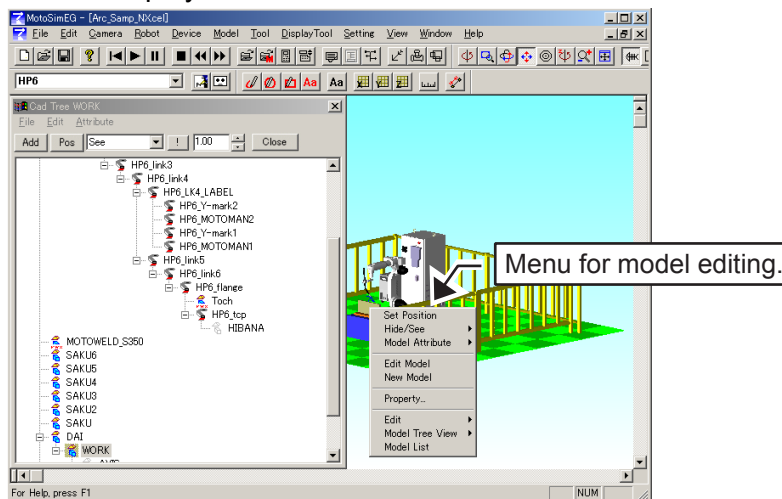


9.1.5 Mouse-Driven Model Editing

Right Mouse Button Operation

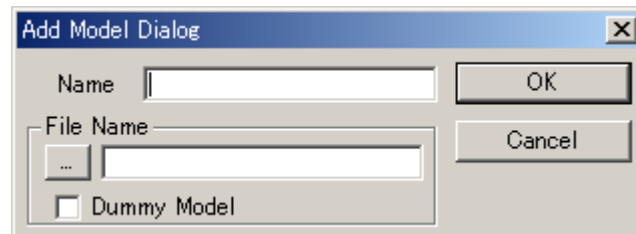
A pop-up menu for model editing operation appears by clicking the right mouse button at a location where a model is displayed.

However, note that the viewpoint operation menu appears when clicking the right mouse button where there is no model displayed or when the Cad Tree is not on the screen.



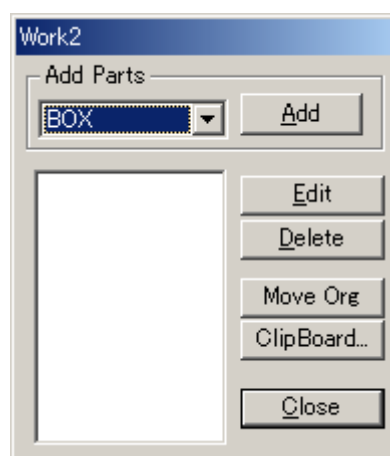
9.2 Creating a New Model

To start creating a new model, click on [Add], or select {File} - {New Model} of the Cad Tree menu to display the Add Model dialog box.



Procedure

1. Enter a name of the new model to be created in the Name edit box of the Add Model dialog box.
(By default, the model name and the model file name are the same: the model file is created with the model name.)
2. Click [OK] in the Add Model dialog box.
A newly created model is displayed in the Cad Tree. (Note that new model file does not contain any data at this point.)
3. Double-click the new model name in the Cad Tree, or select {Attribute} - {Edit File Data} to edit the model.
The file data editing dialog box (as shown below) appears; refer to " 9.3 Editing a Part " to edit the file data.



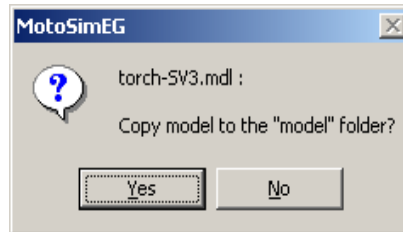
4. When the creation of the model is completed, click [Close] to complete the file data editing.

■ Creating a Model from an Existing Model

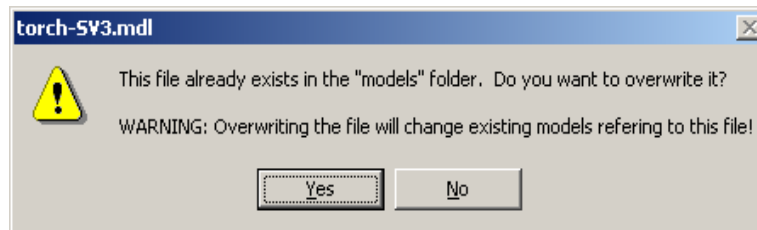
A new model creation can be achieved not only by creating parts with the CAD function, but also with an existing model file. In addition to those methods, a new model can also be added with the method explained in " 9.11 Reading a Model ".

Procedure

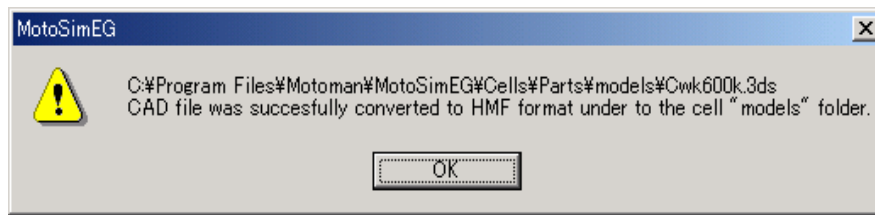
1. Click [Add] of the Cad Tree, or select {File} - {New Model} from the main menu of the Cad Tree.
2. The Add Model dialog box appears. Press the [...] button on the left of the File Name edit box to select a file.
3. Enter a new model name in the Name edit box of the Add Model dialog box.
4. Click [OK].
5. If the model file path doesn't correspond to the "models" folder under the cell folder, the following dialog box will display and offer to copied model file to the "models" folder of the cell.



If the "Yes" button is clicked and a file with the same name already exists in the cell "models" folder. The following dialog will display to ask for overwrite confirmation.



For RWX or 3DS model format, the files will automatically be converted to HMF format. The created HMF file will be located in the "models" folder of the cell. After the conversion is successfully completed, the following message will display.



When adding LINE data (wire frame), it is recommended to use LINE data in the HMF format: adding LINE data in other format may take some time. If the LINE data is in a format other than HMF, convert the LINE data with "MDL2HMF.EXE" before adding the model. (The MDL2HMF.EXE is located in a folder where MotoSim EG was installed).

■ Creating a Dummy Model

Dummy model is a model with only the position and direction data and no modeling data (model file). Normally, external servo track or rotation axis have a reference position that is fixed and unchangeable (even if it is changed, it returns to the original position when opening the cell next time).

To avoid such problem, use a dummy model: create a dummy model, then register the external axis as a child model of the dummy model. This way, the reference position of the external axis or rotating axis can be moved by changing the reference position of the dummy model.

Procedure

1. Click [Add] on the Cad Tree dialog box, or select {File} - {New Model} from the main menu of the Cad Tree.
2. The Add Model dialog box appears; enter a new model name in the Name edit box.
3. Check the [Dummy Model] check box.
4. Click [OK].

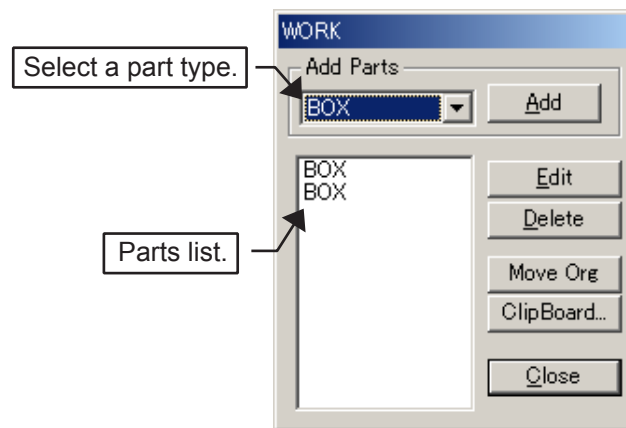
9.3 Editing a Part

MotoSim creates a model data file by combining basic figures such as cubes and cylinders: such figures are called "parts" in this manual.

The following sections explain on how to edit the parts using the file data editing dialog box of the Cad Tree.

9.3.1 Displaying the File Data Editing Dialog Box

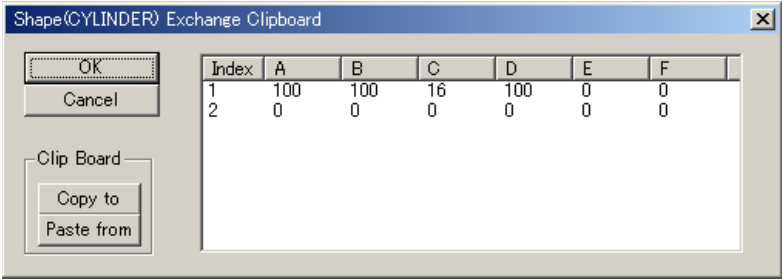
In the Cad Tree, double-click the model to be edited, or select {Attribute} - {Edit File Data} to display the file data editing dialog box as follows:



File data editing dialog box

Item	Description
[Add] button	Displays a dialog box to edit the part selected in [Add Parts] combo box. Also displays the added part on the cell window.
[Edit] button	Displays a dialog box to edit the part selected in the parts list. (Multiple selection is not possible.)
[Delete] button	Deletes the part selected in the parts list. (Multiple selection is not possible.)
[Move Org] button	Changes the parent of the part selected in the parts list. Refer to " 9.9.1 Changing the Parent Model " for details.

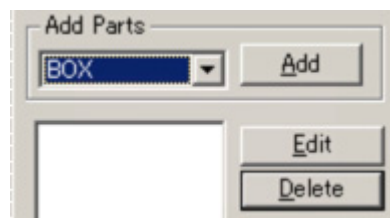
File data editing dialog box

Item	Description
[ClipBoard...] button	Stores/Retrieves the data of the part selected in the parts list on the clipboard. 
[Close] button	Closes the file data editing dialog box.

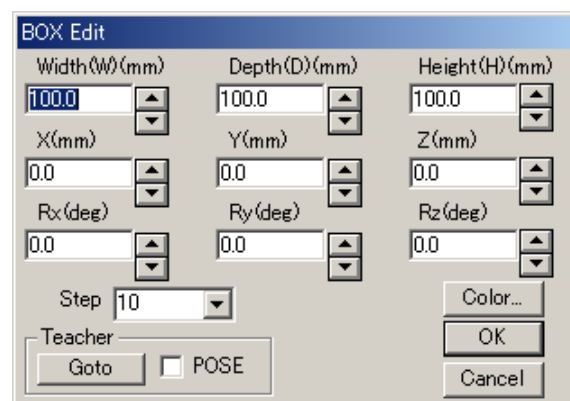
9.3.2 Registering a Part

Procedure


1. Select a type of parts to be added in [Add Parts] combo box in the file data editing dialog box.



2. Click [Add] to display the part on the cell window; the parts editing dialog box appears.



3. See descriptions below to edit the part in the parts editing dialog box:

- Enter the values for model size, position, etc. with the spin buttons  or key-strokes. (The incremental value of the spin buttons is specified in the Step combo box.)
- Click [Color...] to display the Color dialog box, and specify the color.
- To move the part to an arbitrary point with the Teacher, set the Teacher to the target position; click [Goto] in the "Teacher" section to move the part to the teacher coordinate. To move the part including the posture to the teacher, check the [POSE] check box and then click [Goto]. (For the details of the Teacher, refer to " 9.1.4 Teacher ".)

4. When all the settings for the model are completed in the parts editing dialog box, click [OK] to add the part to the model data file.

5. Create a model by repeating the steps 1 to 4 to register additional parts.

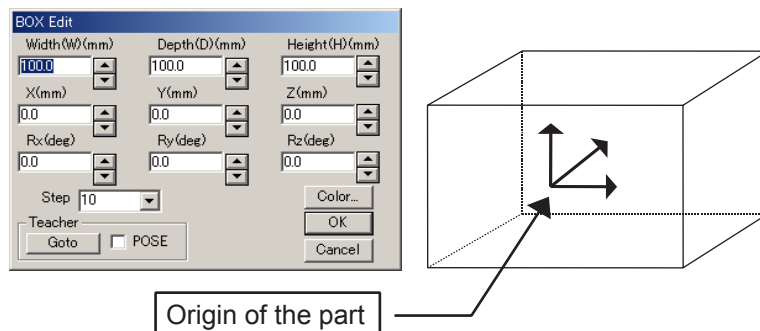
9.3.3 Part Types

This section explains on how to edit the parts according to the part type.

■ BOX

The BOX is a rectangular parallelepiped part, which can be edited in the BOX Edit dialog box.

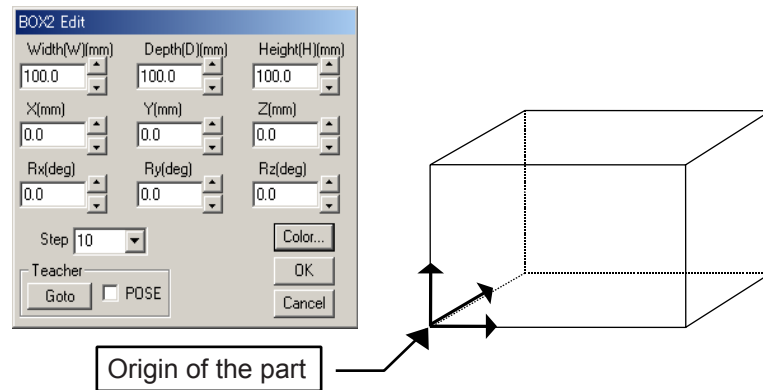
- The origin of the part is the center of the BOX part model.



■ BOX2

The BOX2 is a rectangular parallelepiped part, which can be edited in the BOX2 Edit dialog box.

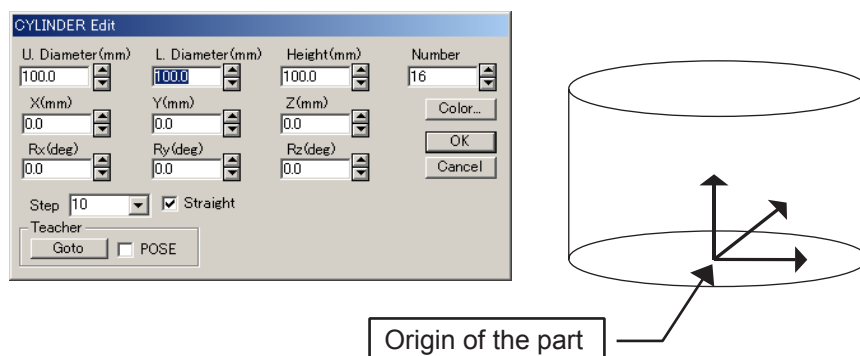
- The origin of the part is the vertex of the BOX2 part model.



■ CYLINDER

The CYLINDER is a cylindrical part, which can be edited in the CYLINDER Edit dialog box.

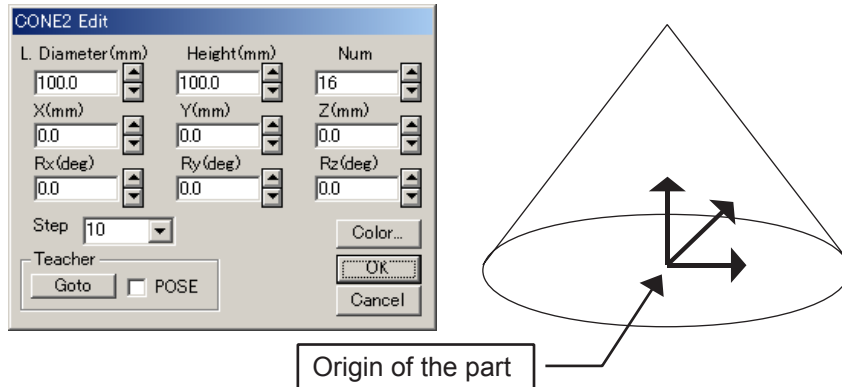
- Selecting the [Straight] check box links the values of the upper and lower diameters ("U. Diameter" and "L. Diameter", respectively).
- The value in "Number" edit box represents the number of sides to form a cylinder: the larger the number becomes, the more perfect the cylinder becomes. Therefore, when "3" is input, the number of side faces becomes three, forming a triangular cylinder.
- The origin of the part is the center of the CYLINDER bottom.



■ CONE2

The CONE2 is a conic part, which can be edited in the CONE2 Edit dialog box.

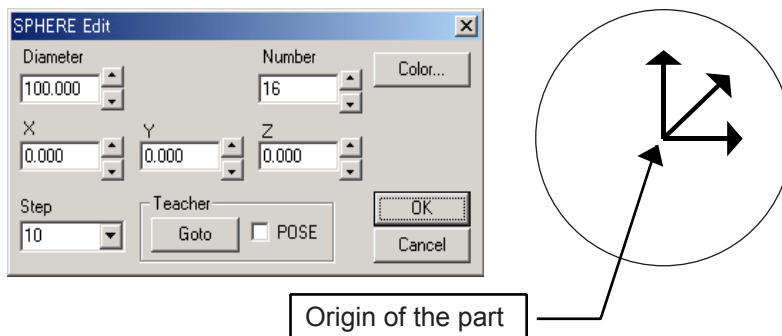
- The origin of the part is the center of the CONE2 bottom.



■ SPHERE

The SPHERE is a spherical part, which can be edited with the "SPHERE Edit" dialog box.

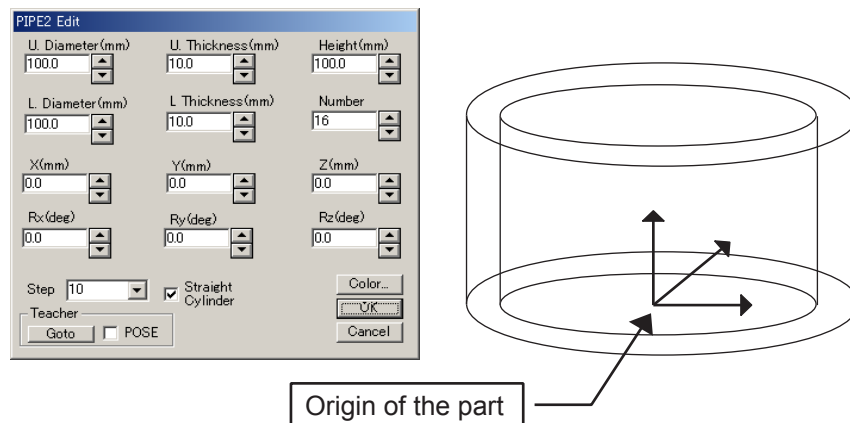
- The origin of the part is the center of the sphere.



PIPE2

The PIPE2 is a pipe part, which can be edited in the PIPE2 Edit dialog box.

- The values in "U. Thickness" and "L. Thickness" edit boxes respectively represent the thickness of upper and bottom faces of the pipe.
- Selecting the [Straight Cylinder] check box links the upper and lower diameters ("U. Diameter" and "L. Diameter", respectively), and the upper and bottom face thickness.
- The origin of the part is the center of the PIPE2 bottom.



■ AXIS6

The AXIS6 is a part that may contain multiple frames (position and orientation data). The frames can be used as a target point or for external axis setting. It can be edited in the Frame Edit dialog box.

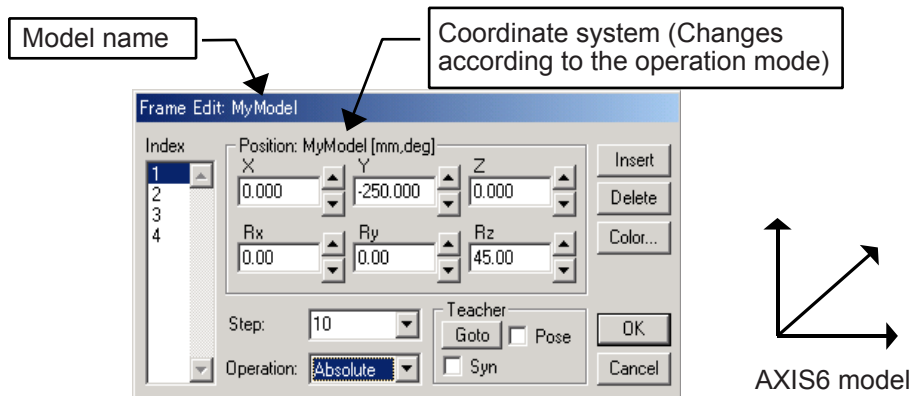
- To add a frames, press [Insert]. The frames are added to the "Index" list box.
- To delete a frame, select the frame number in the "Index" list box, and press [Delete].
- To edit a frame, select the frame number in the "Index" list box and modify the values in the "Position" section. The position can be displayed and modified relative to various coordinated system depending on the "Operation" mode.

"Operation" combo box settings

- "Absolute" Displays the position with reference to the model frame.
- "Relative" Displays the position with reference to the frame original position when initially selected in the "Index" list box.
- "SelModel" Displays the position with reference to a selected model. When this mode is first selected the "Select Model" dialog will display to allow selection of the reference model.

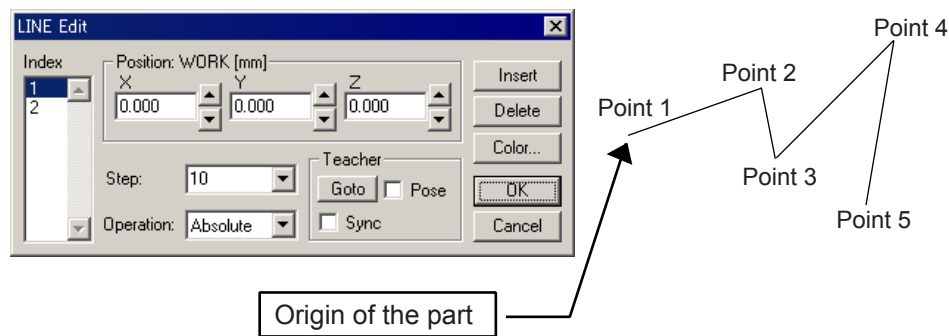


The frame corresponding to the selected "Index" of the list box is highlighted in red in the main view.



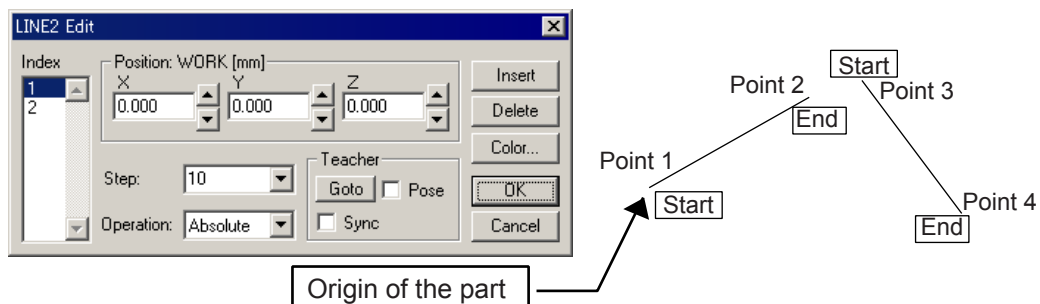
■ LINE

The LINE is a part that contains multiple points. The points are links together by straight-line segments to form a continuous line. It can be edited with the "LINE Edit" dialog box. A minimum of 2 points must be defined for the line to display. Points can be inserted, edited or deleted in the same manner as the "FRAME Edit" dialog box. (Please refer to the "AXIS6" section for details).



■ LINE2

The LINE2 is a part that may contains multiple lines each made of 2 points. It can be edited with the "LINE2 Edit" dialog box. The points with an odd index number are the starting points and those with an even index number are the end points. The total number of defined points must be even to display all the segments. Points can be inserted, edited or deleted in the same manner as the "FRAME Edit" dialog box. (Please refer to the "AXIS6" section for details).



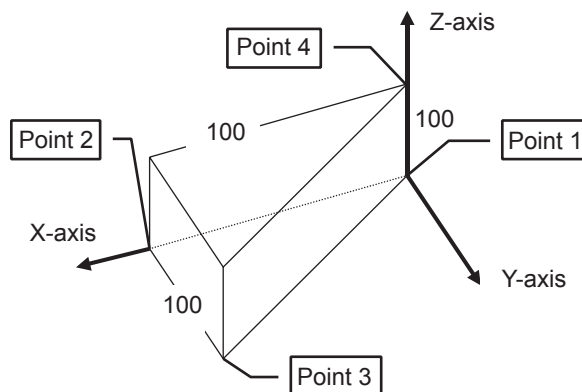
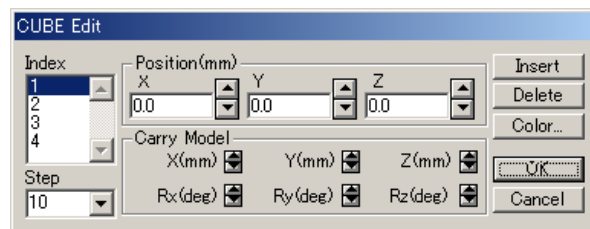
■ CUBE

The CUBE is a polyhedron part, which can be edited in the CUBE Edit dialog box.

- When a CUBE model is added, a model with four points appears on the screen, with the four points already registered in the CUBE Edit dialog box as shown below.
- The apex of the figure at the bottom is registered as a point from No. 1, the point in the height direction is the last registered point in the model file form.

The points at the apex of the bottom figure are arranged as follows:

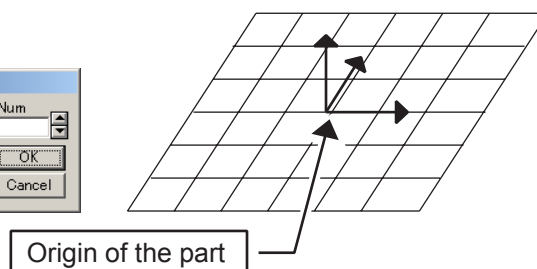
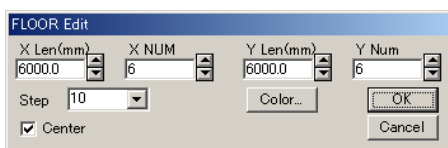
- When the height is set to Z-axis positive (+) direction: counterclockwise to Z-axis positive (+) direction.
- When the height is set to Z-axis negative (-) direction: clockwise to Z-axis positive (+) direction.



■ FLOOR

The FLOOR is a floor part, which can be edited in the FLOOR Edit dialog box.

- The values "X Num" and "Y Num" edit boxes respectively represent the numbers of dividing lines that divide the face in the X-direction and Y-direction.
- The origin of the part is the center of the FLOOR model.

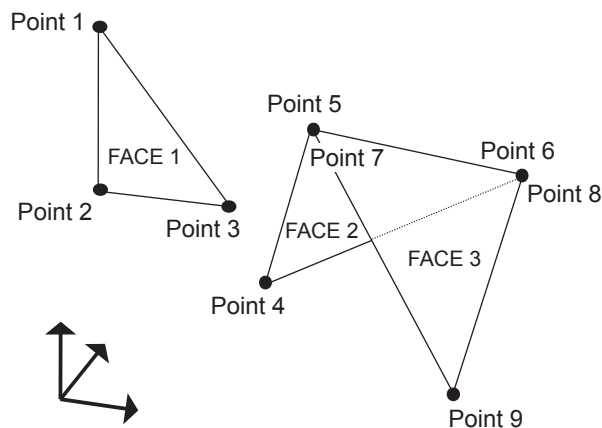
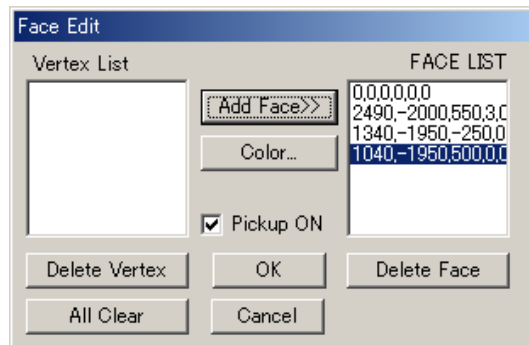


■ FACE

The FACE is a face part, which can be edited in the Face Edit dialog box.

- Register apexes to create faces.

Several faces can be created in one FACE part, however, there must be three or more points to create each face. If the points are not in the same plane, the face will be divided into some triangles. Therefore, unless these points are clearly on the same plane, create the FACE with units of three points.



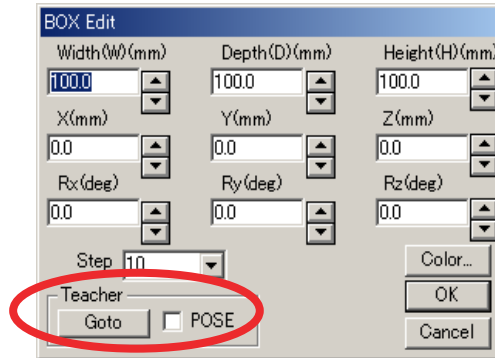
Procedure

1. Select the [Pickup ON] check box.
(Clear the check box to change the viewpoint on the screen.)
2. Click the points 1, 2 and 3 as shown in the above figure.
The frame of the clicked point is displayed in "Vertex List" box. Click [Add Face>>] to create the FACE 1 defined by three points.
3. Click the points 4 to 6, and click [Add FACE>>] to create FACE 2.
4. Click the points 7 to 9, and click [Add FACE>>] to create FACE 3.

■ “Teacher” Section of the Parts Editing Dialog Box

The parts BOX, CYLINDER, CONE2, PIPE2, AXIS6, SPHERE, LINE, LINE2 can be relocated by using the "Teacher" section of each editing dialog box.

When using the Teacher, it has to be previously set: refer to " 9.1.4 Teacher " for details.



“Teacher” section of the parts editing dialog box

Item	Description
[Goto] button	Moves the part to the Teacher position.
[POSE] check box	Moves the part including the posture to the Teacher position.

9.4 Editing a Model

A model can be cut, copied, pasted, etc. with commands under {Edit} of the Cad Tree. Select a model from the Cad Tree, and edit the model with the commands described below:

■ Cut

Cuts the selected model.

■ Copy

Copies the selected model.

■ Paste

Pastes the cut or copied model in an arbitrary place.

When selecting {Copy} - {Paste} within the same cell, enter the model name to be copied.

■ Delete

Deletes the selected model. However, the model file will not be deleted though the model is deleted from the Cad Tree and the cell window.

When deleting the currently selected model including its child models are to be deleted, set the display/nondisplay status (or) on the left of the model name to in the Cad Tree, then select [Delete]. Note, however, that the "world", "Teacher", and robot model will not be deleted even if they are in the status.

■ Add

Creates a new model.

Refer to " 9.2 Creating a New Model " for details.

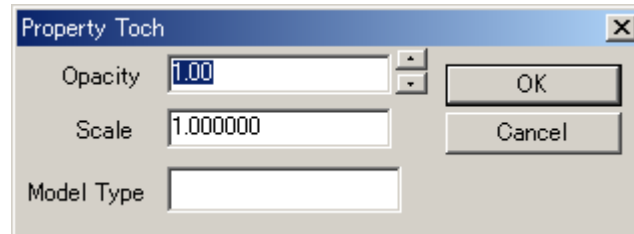
■ Rename

Changes the model name.

Note, however, that the names of "world", "Teacher", and the robot model names cannot be changed.

■ Property

Specifies opacity, scale, and model type. (The command {Property} is located under {Attribute}.)



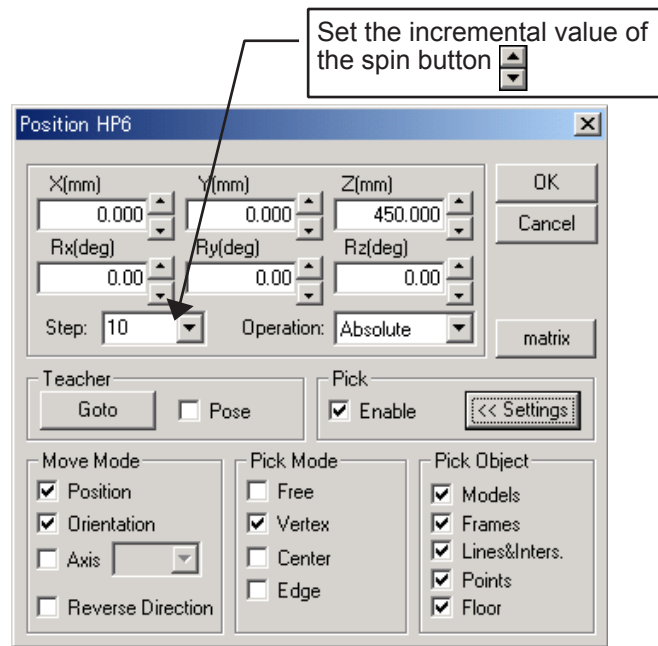
Property dialog box

Item	Description
"Opacity" edit box	Specifies the opacity of the model.
"Scale" edit box	Specifies the scale of the model.
"Model Type" edit box	Specifies a character string in the model.
[OK] button	Applies the modifications, and closes the Property dialog box.
[Cancel] button	Closes the Property dialog box without applying the modifications.

9.5 Positioning a Model

Position a model by specifying the values in the Position dialog box.

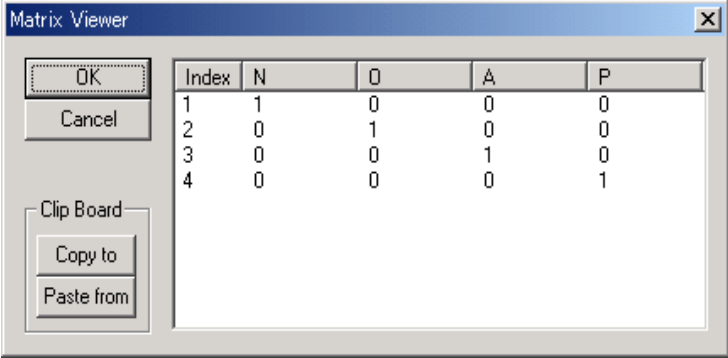
To display the Position dialog box, click on [Pos] button or select {Attribute} - {Set Position} menu item of the Cad Tree.



Position dialog box

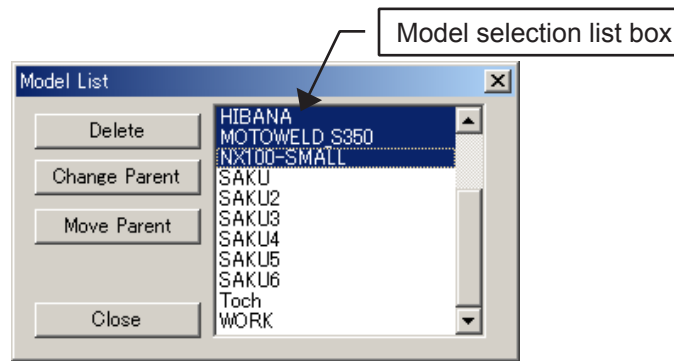
Item	Description
"Operation" combo box	<p>"Absolute" Displays the position with reference to the parent model, and moves the model.</p> <p>"Relative" Displays the position with reference to the selected model, and moves the model.</p> <p>"SelModel" Displays the Select Object dialog box; displays the position with reference to the model specified in the Select Object dialog box, and moves the model.</p>

Position dialog box

Item	Description																									
[matrix] button	<p>Allows to store or retrieve the data of the Position dialog box in the clip-board.</p>  <table border="1"> <thead> <tr> <th>Index</th> <th>N</th> <th>O</th> <th>A</th> <th>P</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>1</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>2</td> <td>0</td> <td>1</td> <td>0</td> <td>0</td> </tr> <tr> <td>3</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> </tr> <tr> <td>4</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> </tr> </tbody> </table>	Index	N	O	A	P	1	1	0	0	0	2	0	1	0	0	3	0	0	1	0	4	0	0	0	1
Index	N	O	A	P																						
1	1	0	0	0																						
2	0	1	0	0																						
3	0	0	1	0																						
4	0	0	0	1																						
"Teacher" section	<p>Move the model to the Teacher current position. [Goto] button Moves the model to the Teacher position. [POSE] check box When checked and the [Goto] button is used, the model also moves to match the Teacher orientation. When using the Teacher, it has to be previously set: refer to " 9.1.4 Teacher " for details.</p>																									
"Pick" section	<p>[Enable] check box Enables the mouse picking operation. Pressing the [Shift] key enables or disables the "Pick Enable" mode. [Settings >>] or [<< Settings] buttons Displays or hides the pick setting section.</p>																									
"Move Mode" section	<p>Determines the method to move to the picked point. [Position] check box The model is moved to the position (XYZ) of the picked point. [Orientation] check box The model is turned to match the orientation (Rx, Ry, Rz) of the picked point frame. [Axis] check box The model axis specified in the combobox is turned so that it matches the picked face normal. [Reverse] check box This setting is enable with [Orientation] or [Axis] mode. It can be use to change the direction of the picked face normal.</p>																									
"Pick Mode" section	<p>Sets conditions determining the selected point in the clicked area. Please refer to " Pick Mode Setting " for details.</p>																									
"Pick Object" section	<p>Sets the type of the object to be selected when clicking on the cell view. (Multiple items can be selected) Please refer to " Pick Object Setting " for details.</p>																									
[OK] button	<p>Applies the modifications, and closes the Position dialog box.</p>																									
[Cancel] button	<p>Closes the Position dialog box without applying the modifications.</p>																									

9.6 Editing Multiple Models (Model List)

Multiple models can be edited in the Model List dialog box. To open the dialog box, select {Edit} - {Models List} of the Cad Tree menu.



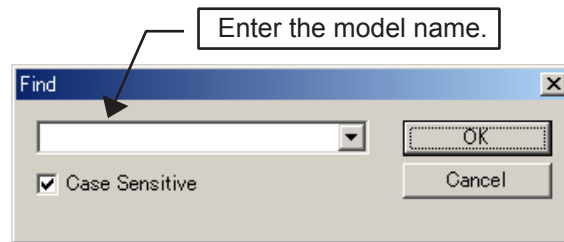
Model List dialog box

Item	Description
Model selection list box	Displays the models registered in the cell. The selected models are highlighted. (Multiple selection is possible.)
[Delete] button	Deletes the models selected in the model selection list box. The models on the cell window are also deleted, however, their model files still exist.
[Change Parent] button	Changes the parents of the models selected in the model selection list box. Refer to " 9.9.1 Changing the Parent Model " for details.
[Move Parent] button	Moves the parents of the models selected in the model selection list box. Refer to " 9.9.2 Moving the Parent Model " for details.
[Close] button	Closes the Model List dialog box.

9.7 Searching a Model

Search for a desired model with the Find dialog box. To open the dialog box, select {Edit} - {Find} from the Cad Tree menu.

If the entered name exists, the model is selected in the Cad Tree.



9.8 Saving and Reading a Model Group


A model and its parent-child relevant information can be saved as a set.

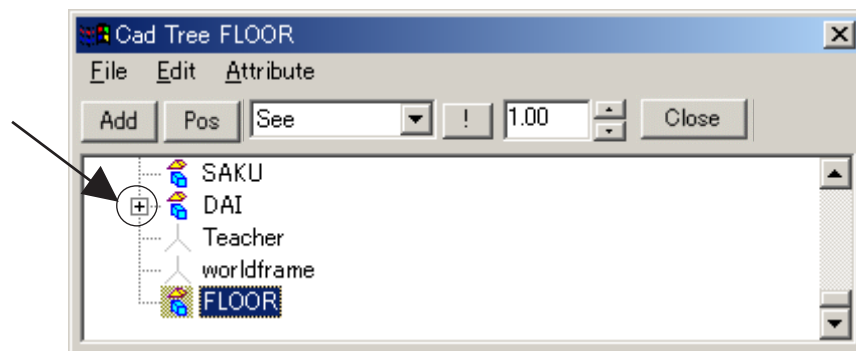
This can be done by creating a folder under [cell folder name\models] and naming it with the same name as the subject model, then by saving the following files in the new folder:

- The parent-child relevant information of the model (ModelInfo.dat).
- Subject model and its all the child models (*.mdl, *.hsf).

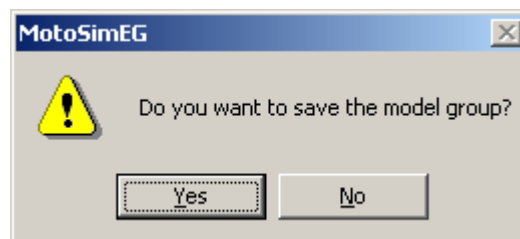
■ Saving a Model Group

Procedure

1. Select a model with the status symbol (on the left of the selected model name) in the Cad Tree set to .



2. Select {Edit} - {Save Model Group} from the Cad Tree menu.
Select [Yes] to create a folder with the same name as the model selected in the step 1. The files of the model (selected in the step 1) and its child models are copied to the folder, and a parent-child relevant information file "ModelInfo.dat" is generated.



■ Reading a Model Group

Select {Edit} - {Load Model Group} from the Cad Tree menu. Select a "ModelInfo.dat" file to read the saved model including its child models.



If there is a model with the same name in the current cell, the second one will automatically be numbered. (The number will be added after the name.)

■ Syntax of the ModelInfo.dat

MODEL

```
{  
  NAME=Camera_Dummy //Logical name of the model  
  PARENT=world //Parent model name  
  FILENAME=dummy //File name  
  COLOR=RGB (0,0,255) //Color of the model  
  HIDESEE=1 //Display/nondisplay information  
  OPACITY=0.25 //Opacity  
  AXIS6=4000.000,5500.000,2000.000,-1.57,0.00,-0.35 // Position of the model  
}
```

9.9 Changing and Moving the Parent Model

9.9.1 Changing the Parent Model

The parent model of an arbitrary model can be changed with {Parent Change} under {Attribute} of the Cad Tree menu.

With this function, the relation (coordinate) between the selected model and its parent model is automatically changed, and the model position does not change. Use this function in case of changing the parent model while keeping the model in the same position.

To use this function, select the desired model in the Cad Tree, then select {Attribute} - {Parent Change} from the Cad Tree menu.

9.9.2 Moving the Parent Model

The parent model of an arbitrary model can be moved with {Parent Move} under {Attribute} of the Cad Tree menu.

Since the relation (coordinate) between the selected model and its parent model does not change with this function, the selected model position changes when it is moved to its new parent model with {Parent Move}.

To use this function, select the desired model in the Cad Tree, then select {Attribute} - {Parent Move} from the Cad Tree menu.

9.10 Changing a Model File

The model file of an existing model can be changed with {ChangeFilePath} under {Attribute} of the Cad Tree menu.

To use this function, select a model to be changed in the Cad Tree, then select {Attribute} - {ChangeFilePath} from the Cad Tree menu. Select the desired model file in a file selection dialog box to change the model file.

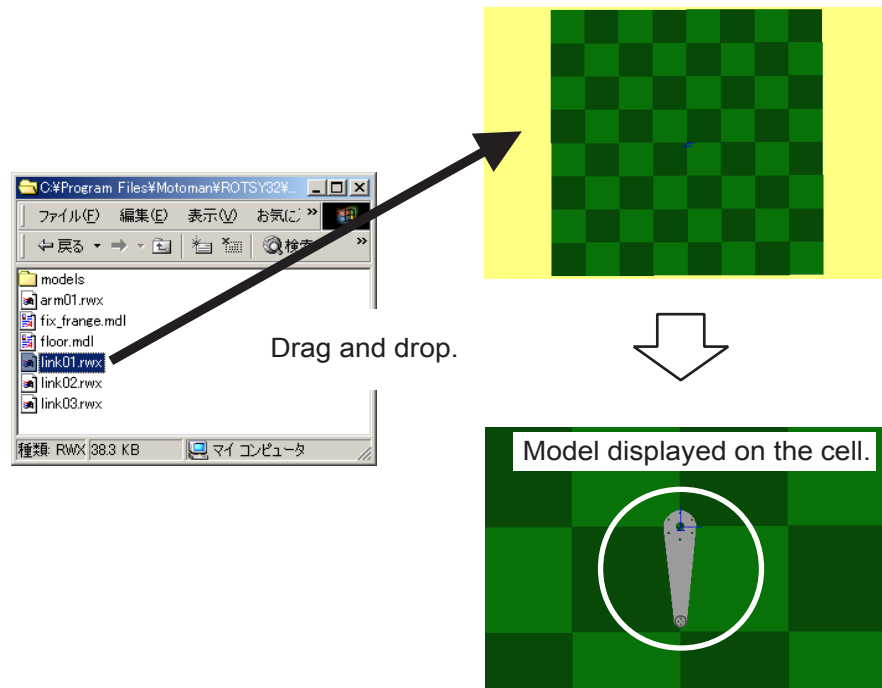
Note that the change will only take effect the next time the cell is open.



The model files for "world", "Teacher", and robot models cannot be changed.

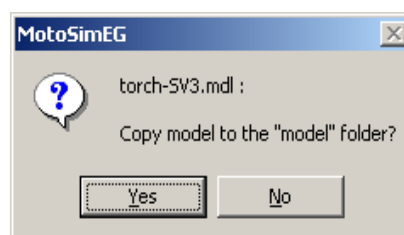
9.11 Reading a Model

A model appears on the cell by dragging and dropping its model file (in the HSF, HMF, MDL, 3DS, or RWX format) to the cell window, and the model file is copied to the "models" folder. In this operation, a parent model can also be selected.

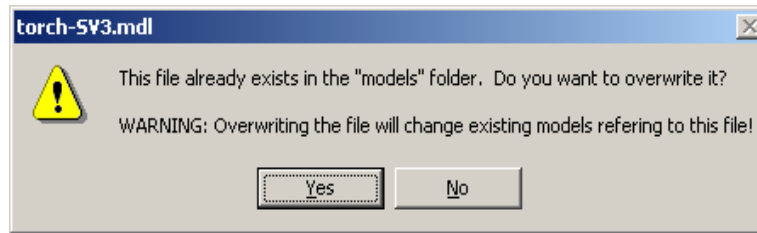


Procedure

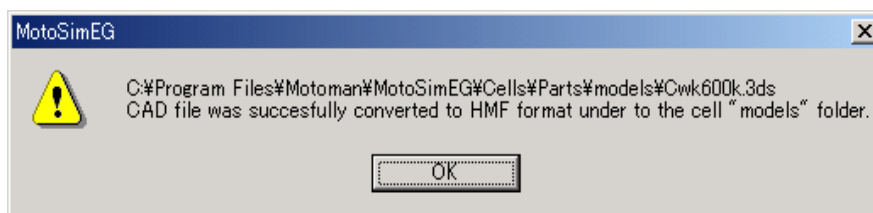
1. Drag and drop an arbitrary model to the cell window; If the model file path doesn't correspond to the "models" folder under the cell folder, the following dialog box will display and offer to copied model file to the "models" folder of the cell.



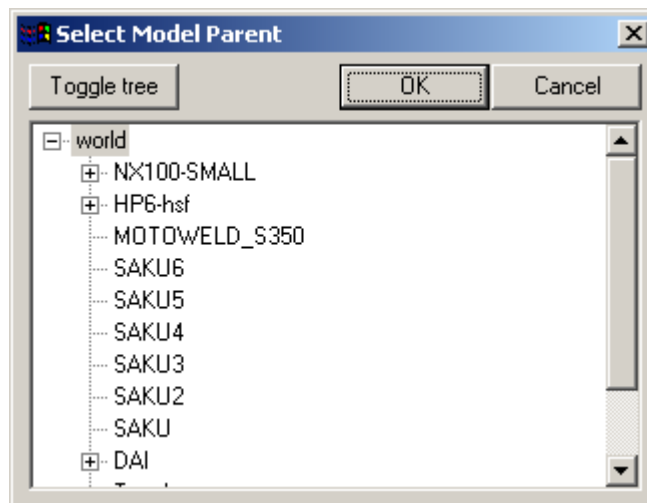
If the "Yes" button is clicked and a file with the same name already exists in the cell "models" folder. The following dialog will display to ask for overwrite confirmation.



For RWX or 3DS model format, the files will automatically be converted to HMF format. The created HMF file will be located in the "models" folder of the cell. After the conversion is successfully completed, the following message will display.



2. The Select Model Parent dialog will display. Select the model that will become the parent of the new model and press the [OK] button. (By default the "world" model is selected.)



When adding LINE data (wire frame), it is recommended to use LINE data in the HMF format: adding LINE data in other format may take some time. If the LINE data is in a format other than HMF, convert the LINE data with "MDL2HMF.EXE" before adding the model. (The MDL2HMF.EXE is located in a folder where MotoSim EG was installed).

9.12 CAD Data Import <CadPack Option>



To use this function (CadPack option), the MotoSim EG-CadPack is required. (The Moto-Sim EG-CadPack is separate product from MotoSim EG.)

Loads directly to the cell the CAD data in IGES or SAT format.

This function is accessible by:

- a) The Add Model dialog of the [Cad Tree]
(For details, please refer to section " Creating a Model from an Existing Model ".)
- b) Dragging and dropping the file over the cell display area.
(For details, please refer to section " 9.11 Reading a Model ".)



When adding a model with method a) Add Model dialog, it is necessary to select "All (*.*)" in the "File Type" section, in order to display all the file types and be able to select the IGES or SAT files.

■ IGES Data Import

When importing an IGES file, the "IGES Import" dialog will display to confirm the IGES import settings before importing the file. The healing settings in the dialog can be changed if required. (This dialog doesn't display when importing SAT file.)

To change the default settings related to the IGES Import, please refer to section " 11.5 CAD Import/Export <CadPack Option> ".

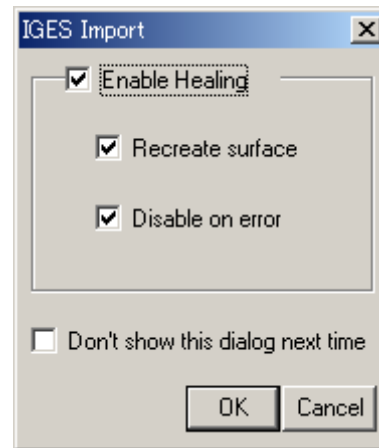


The healings setting selected in the "IGES Import" dialog will not change the settings in the "Option Setting" dialog under the "CAD Import/Export" tab.

The figure below shows, the "IGES Import" dialog when the IGES data healing is disabled.
This is the default setting.



The "IGES Import" dialog with the IGES data healing enabled.



IGES Import

"Enable Healing" section	<p>When enabled, a healing algorithm is applied to the imported IGES data.</p> <p>[Recreate surface] check box The [Recreate surface] option is normally selected. The [Recreate surface] is part of the normal healing process. If it is unselected, this step will be skipped in the healing process. If the surface regeneration doesn't give the intended results, unselect the "Recreate Surface" may improve the healing results.</p> <p>[Disable on error] check box The [Disable on error] option is normally selected. When the [Disable on error] is selected, the healing will be disabled if an error occurs during the healing process.</p>
[Don't show this dialog next time] check box	<p>If checked, the "IGES Import" dialog will no longer be displayed when an IGES file is imported. The "IGES Import" dialog display can be re-enabled in the "Option Setting" dialog under the "CAD Import/Export" tab. Please refer to section " 11.5 CAD Import/Export <CadPack Option> ".</p>
[OK]button	<p>The IGES file import will proceed with the options set in the dialog.</p>
[Cancel]button	<p>Cancel the IGES file import</p>



The healing process attempts to repair any corrupted data of the imported IGES files. However, the processing time to import a file may increase significantly when healing is used. The performance may also vary depending on the extent and nature of the errors in the original IGES file. In some cases, result with healing may be worst than reading the file without healing.

9.13 CAD Data Export

NOTE When IGES or SAT data are exported (CadPack option), the MotoSim EG-CadPack is required. (The MotoSim EG-CadPack is separate product from MotoSim EG.)

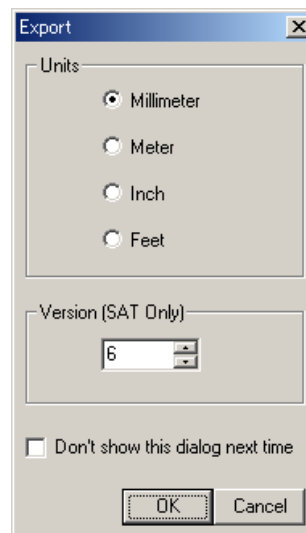
Exports in IGES, SAT or HSF format the data of multiple models with their relative position from a selected base point.

■ Export

Before the CAD data of IGES or SAT format is exported, the "Export" dialog is displayed. The export settings in the dialog can be changed if required.

To change the default settings related to the export, please refer to section " 11.5 CAD Import/Export <CadPack Option> ".

NOTE The settings selected in the "Export" dialog will not change the settings in the "Option Setting" dialog under the "CAD Import/Export" tab.



Export

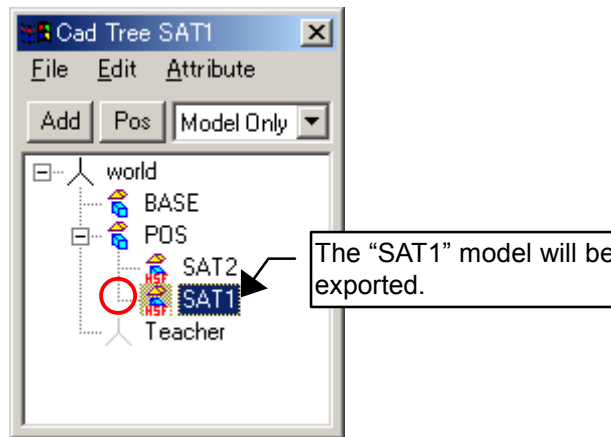
[Units] radio button	Sets the measuring units of the exported SAT or IGES files.
"Version (SAT Only)" section	Sets the SAT file version used in the exported file. Recommended value: 6 (Setting range: 4 to 16)

Export

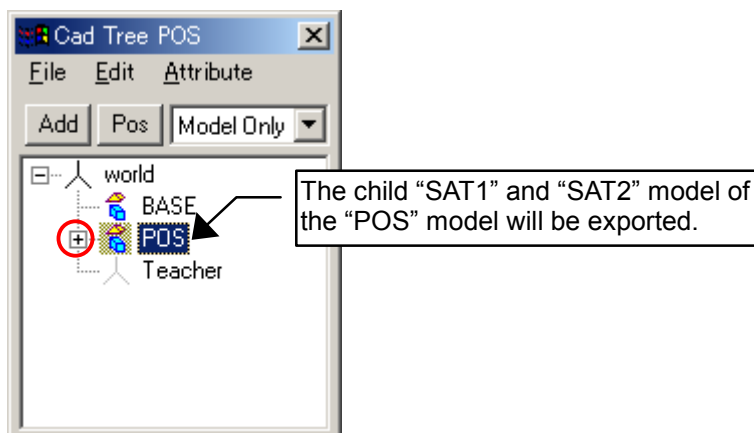
[Don't show this dialog next time] check box	If checked, the "IGES Import" dialog will no longer be displayed when an IGES file is imported. The "IGES Import" dialog display can be re-enable in the "Option Setting" dialog under the "CAD Import/Export" tab. Please refer to section " 11.5 CAD Import/Export <CadPack Option> ".
[OK]button	The CAD export will proceed with the options set in the dialog.
[Cancel]button	Cancel the CAD export.

Procedure

1. Select in the Cad Tree the models to export.
 - To select a single model:
Expand the model node so that there is no "+" icon on the left of the model name and select the model.



- To select multiple models
Collapse the node containing the desired models so that there is a "+" icon on the left of the model name. All the child models in the collapsed branch will also be exported.



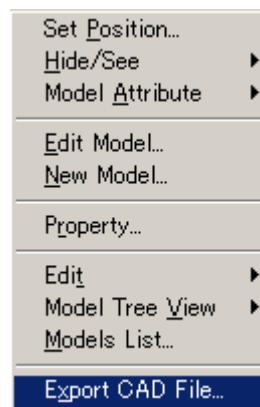


Only the model referring to

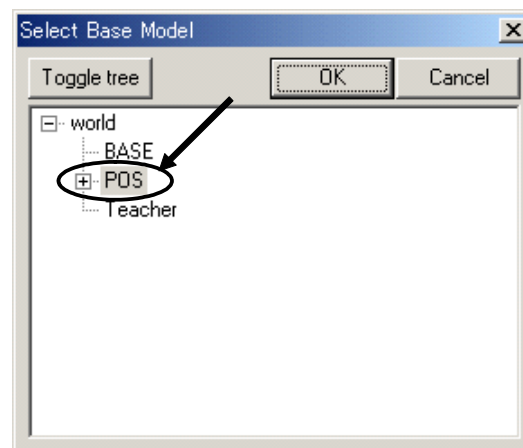
- IGES, SAT or HSF format files;
- .mdl files composed of BOX, BOX2, CYLINDER, CONE2, SPHERE, PIPE2, AXIS6, LINE, LINE2 parts;

can be exported. When selecting multiple models, at least one of the selected models must make reference to such CAD file.

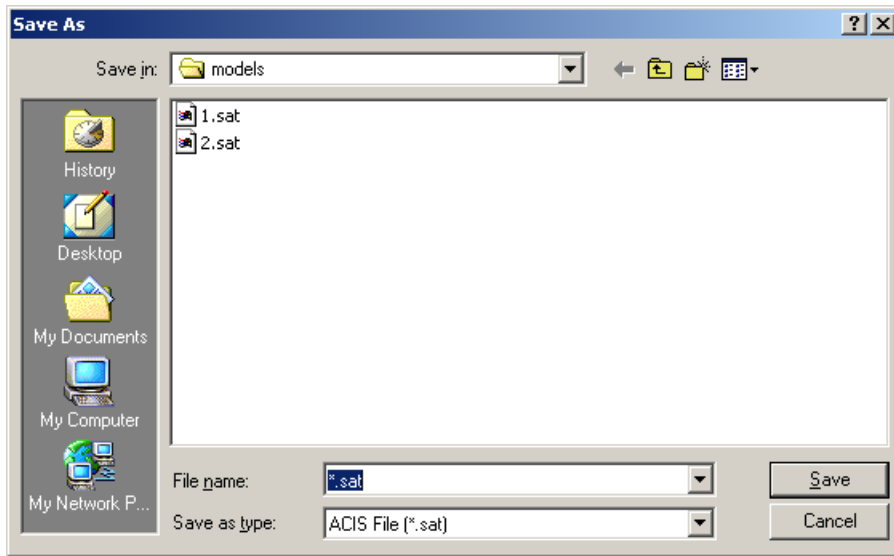
2. Right click on the CadTree to display the popup menu. Then select "Export CAD File..."



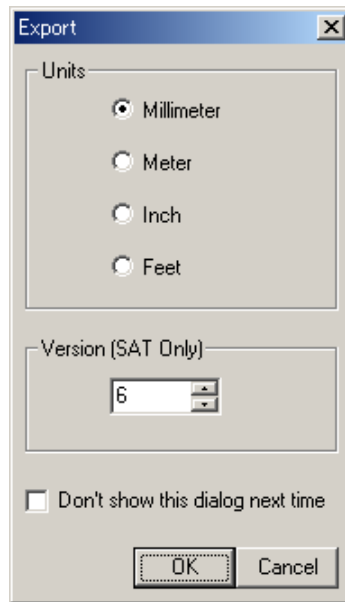
3. In "Select Base Model" dialog, select the model to be used as the base point (origin) of the exported model and press the [OK] button.



4. In the "Save As" dialog, select the file type (IGES, SAT or HSF). Enter a filename and press the [Save] button.



5. If the "Export" dialog is set to display, the "Export" dialog will display to confirm the IGES/SAT export settings. Change the settings as required, and then press [OK]. For more details please refer to the " Export " section above.



6. When the export is completed the following message will display.



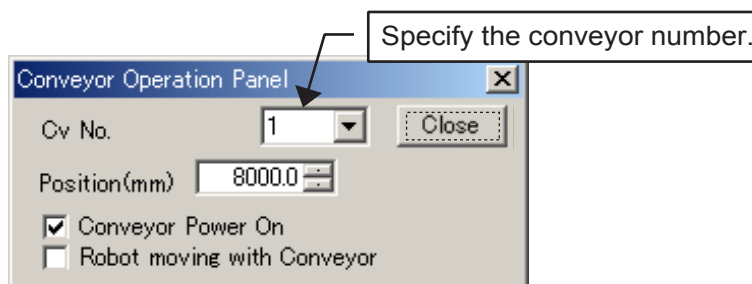
10 Peripheral Equipment

10.1 Conveyor


This section describes the procedure to create a conveyor model.

■ Conveyor Operation Panel

The Conveyor Operation Panel is a dialog box to operate a conveyor with one axis. When operating a conveyor with two or more axes, refer to "Operating a Multi-Axis Conveyor" in "12.8.3 Teaching".



Conveyor Operation Panel

Item	Description
"Position(mm)" spin box	<p>With the spin button  or keystrokes, enter the value in the spin box to move the conveyor to the position where teaching can be performed easily.</p> <div style="border: 1px solid blue; padding: 5px;"> <p>NOTE The value in the "Position" spin box is the conveyor position which represents the offset value of the limit switch set in each robot. Therefore, if the current robot is changed, the "Position" may change even though the conveyor on the cell window does not move at all.</p> </div>
[Conveyor Power On] check box	Enables verification of conveyor in halt status when clearing the check box during the playback.

■ Registering a Conveyor

Register a new conveyor in the Conveyor Install dialog box.

To open the dialog box, select {Device} - {Conveyor} - {Add}.



The conveyor is registered as a robot with the name displayed in the "Name" edit box of the Conveyor Install dialog box. This allows the user to operate the conveyor in a same way as a robot.

To ensure correct operation, do not modify the tool dimensions.

Automatically specifies the conveyor name when the conveyor number is selected.



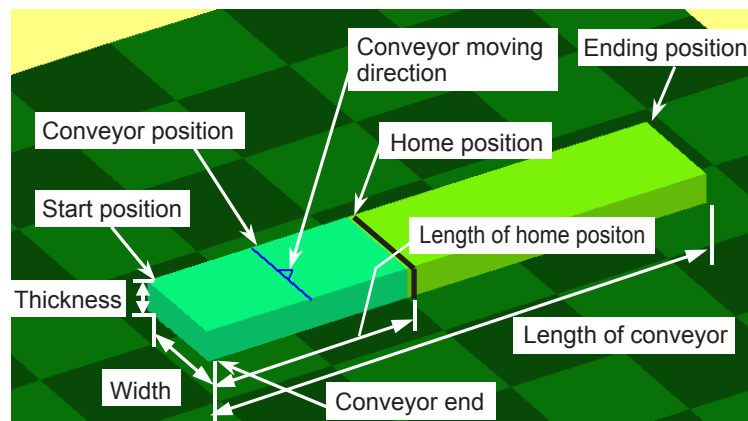
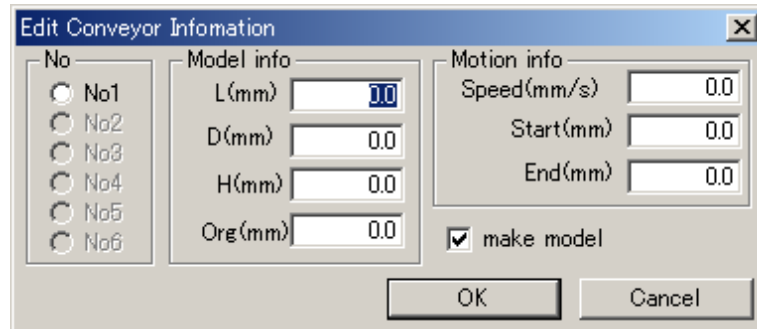
Conveyor Install dialog box

Item	Description
"No" section	Specifies the conveyor number.
"Joint Num" section	Specifies the number of axis by selecting one of the radio buttons. <div style="border: 1px solid blue; padding: 5px; margin-top: 10px;"> <p>NOTE When using the conveyor synchronization function, be sure to select "1". If "2" or "3" is selected, the conveyor synchronization function cannot be used. "2" and "3" are to be selected for the simulation of an L-type conveyor or a vertical conveyor.</p> </div>
[OK] button	Displays the Edit Conveyor Information dialog box. Refer to "Editing a Conveyor" for details.

■ Editing a Conveyor

Specify the dimensions, speed, and operating range of the conveyor to be registered in the Edit Conveyor Information dialog box.

To open the dialog box, select {Device} - {Conveyor} - {Edit}.



Edit Conveyor Information dialog box

Item	Description	
"No" section	Specifies the conveyor number to set the condition.	
"Model info" section	Specifies the dimensions of the conveyor to be registered.	
	"L(mm)" edit box	Entire length of the conveyor.
	"D(mm)" edit box	Width of the conveyor.
	"H(mm)" edit box	Thickness of the conveyor. (Distance from the floor to the conveyor top.)
	"Org(mm)" edit box	Limit switch position for the conveyor home position. (Distance from the conveyor end.)

Edit Conveyor Information dialog box

Item	Description	
"Motion info" section	Specifies the dimensions of the conveyor to be registered.	
	"Speed(mm/s)" edit box	Operation speed of the conveyor.
	"Start(mm)" edit box	Start position of the conveyor operation. (Specify the distance from the home position of the conveyor.)
	"End(mm)" edit box	End position of the conveyor operation. (Specify the distance from the home position of the conveyor.)
[make model] check box	Creates a default conveyor model.	

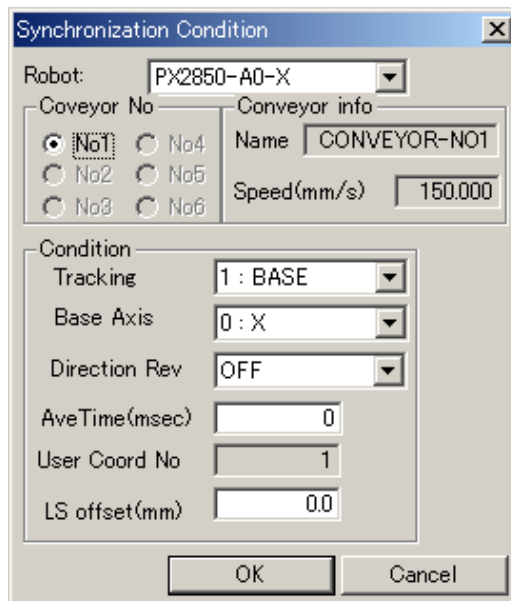


- Even after the conveyor registration, the settings in the Edit Conveyor Information dialog box can be changed by selecting {Device} - {Conveyor} - {Edit}.
- When the default conveyor model is modified, clear the [make model] check box unless the default conveyor model is to be used. If the [make model] check box is not cleared, the modification for the model becomes invalid, and the model is restored to the default model.

■ Setting the Conveyor Synchronization

Set the synchronization conditions of the robot and conveyor in the Synchronization Condition dialog box.

To open the dialog box, select {Device} - {Conveyor} - {Set Conveyor Condition File}. The data will be stored in the conveyor condition file (CV.DAT) of each robot.



Synchronization Condition dialog box

Item	Description		
"Robot" combo box	Lists the robots available for conveyor synchronization operation. Select a robot for the operation.		
"Conveyor No" section	Specifies a conveyor to synchronize with the robot selected in the Robot combo box.		
"Conveyor info" section	Displays the name and speed of the conveyor specified in the "Conveyor No" section.		
"Condition" section	<table border="1"> <tr> <td>"Tracking" combo box</td> <td>Select an axis subject to track the conveyor (robot axis or base axis (servo track)).</td> </tr> </table>	"Tracking" combo box	Select an axis subject to track the conveyor (robot axis or base axis (servo track)).
	"Tracking" combo box	Select an axis subject to track the conveyor (robot axis or base axis (servo track)).	
	<table border="1"> <tr> <td>"Base Axis" combo box</td> <td>Select the axis (X-, Y-, or Z-axis) to be selected. Applies only if the base axis is selected in the Tracking combo box.</td> </tr> </table>	"Base Axis" combo box	Select the axis (X-, Y-, or Z-axis) to be selected. Applies only if the base axis is selected in the Tracking combo box.
	"Base Axis" combo box	Select the axis (X-, Y-, or Z-axis) to be selected. Applies only if the base axis is selected in the Tracking combo box.	
	<table border="1"> <tr> <td>"Direction Rev" combo box</td> <td>Select ON/OFF to reverse or not the direction of the motion. Applies only if the base axis is selected in the Tracking combo box.</td> </tr> </table>	"Direction Rev" combo box	Select ON/OFF to reverse or not the direction of the motion. Applies only if the base axis is selected in the Tracking combo box.
	"Direction Rev" combo box	Select ON/OFF to reverse or not the direction of the motion. Applies only if the base axis is selected in the Tracking combo box.	
<table border="1"> <tr> <td>"Ave Time(msec)" edit box</td> <td>Specify the average time for the conveyor to change speed.</td> </tr> </table>	"Ave Time(msec)" edit box	Specify the average time for the conveyor to change speed.	
"Ave Time(msec)" edit box	Specify the average time for the conveyor to change speed.		
<table border="1"> <tr> <td>"User Coord No" edit box</td> <td>Specify the user frame number that specifies the conveyor direction. The user frame number that corresponds to the conveyor number is set automatically and cannot be changed.</td> </tr> </table>	"User Coord No" edit box	Specify the user frame number that specifies the conveyor direction. The user frame number that corresponds to the conveyor number is set automatically and cannot be changed.	
"User Coord No" edit box	Specify the user frame number that specifies the conveyor direction. The user frame number that corresponds to the conveyor number is set automatically and cannot be changed.		
<table border="1"> <tr> <td>"LS offset(mm)" edit box</td> <td>Specify the distance of the conveyor home position. For example, if the distance is 1000 mm, the conveyor home position for the selected robot is 1000 mm ahead of the home position on the screen.</td> </tr> </table>	"LS offset(mm)" edit box	Specify the distance of the conveyor home position. For example, if the distance is 1000 mm, the conveyor home position for the selected robot is 1000 mm ahead of the home position on the screen.	
"LS offset(mm)" edit box	Specify the distance of the conveyor home position. For example, if the distance is 1000 mm, the conveyor home position for the selected robot is 1000 mm ahead of the home position on the screen.		

■ Setting the Soft Limit

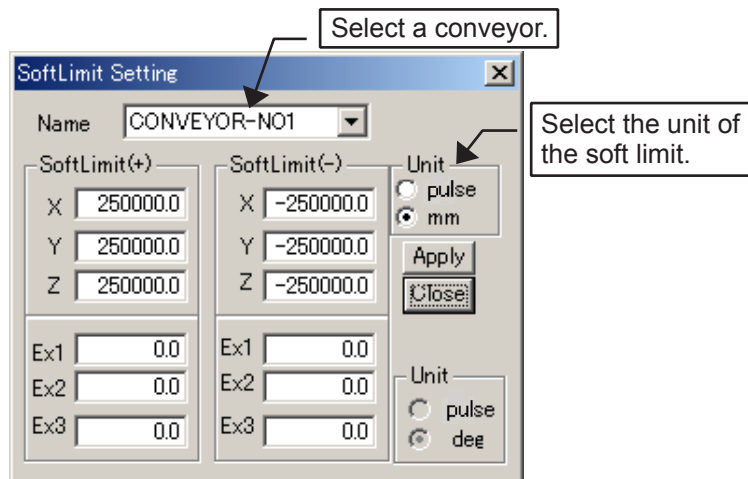
Read the soft limit from the parameter file (All.prm).

To modify the soft limit, set the soft limit (in pulse unit) for the conveyors in each axis. The modifications are only effective the next time the cell is opened.

To set the soft limit, display the SoftLimit Setting dialog box by selecting {Device} - {Conveyor} - {SoftLimit Setting}.



This function is available only when using a parameter file (All.prm) set up with a conveyor.



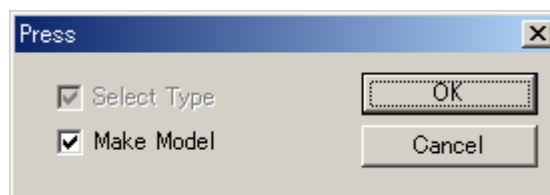
10.2 Press Machine

This section describes the procedure to create a press machine model.

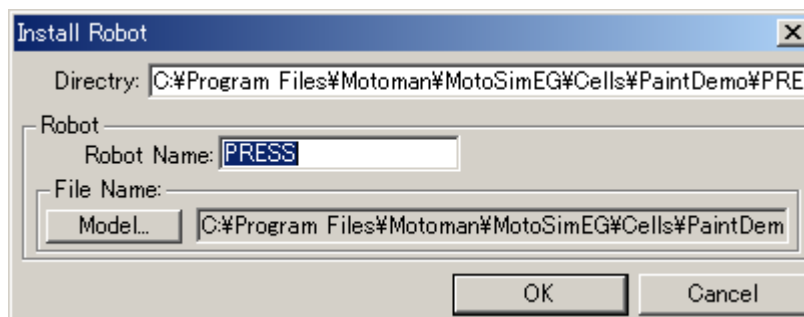
■ Registering a Press Machine

Procedure

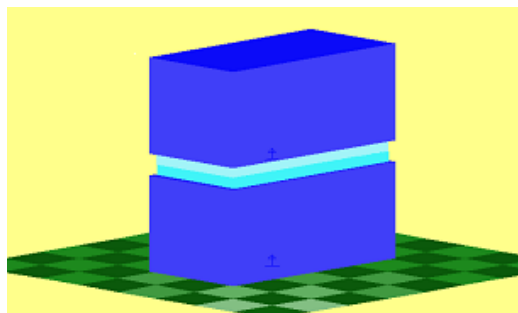
1. Select {Device} - {Press} - {Add} to display the Press dialog box. (The [Make Model] check box is selected by default.)



2. Enter the name of the press machine as shown in the figure below:



3. A press machine model is automatically generated.



■ Deleting a Press Machine

The press machine model can be deleted by using the same procedure as for other robot models, by selecting {Robot} - {Delete Robot...}.

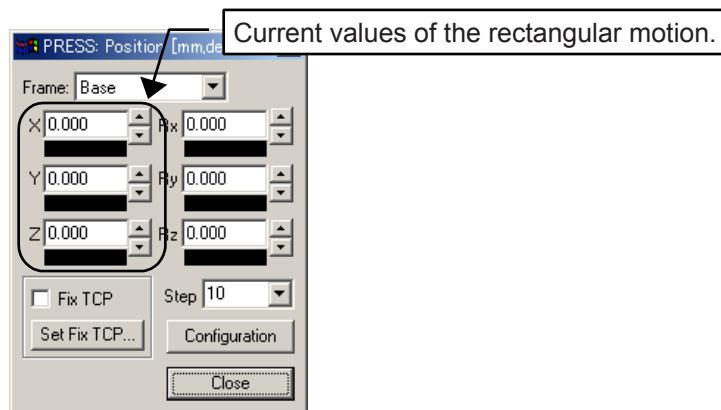
■ Moving a Press Machine with a Jog Operation

Jog operation can be performed with the Programming Pendant dialog box, using the rectangular coordinate system (coordinate X, Y, Z in millimeters).

■ Current Values of a Press Machine

Procedure

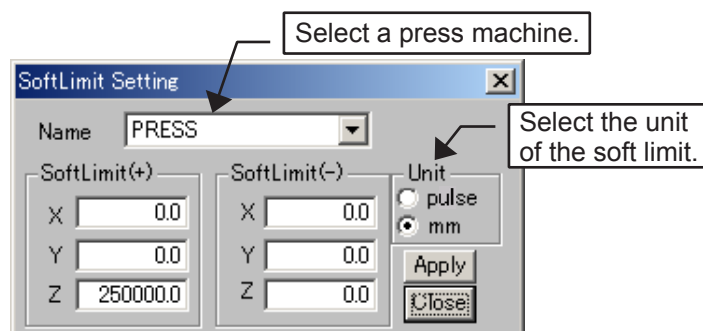
1. Open the Position Data Panel with a press machine selected on the main screen.
2. Check the current value with the rectangular motion (X-, Y-, Z-axes) of the robot coordinates.



■ Modifying the Soft Limit of a Press Machine

Procedure

1. Select {Device} - {Press} - {SoftLimit Setting} to open the Position Panel dialog box with a press machine selected on the screen.



2. Close the cell file, then open it again.



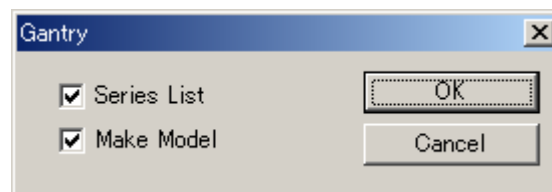
To enable the modifications, reload the cell.

10.3 Gantry Robot

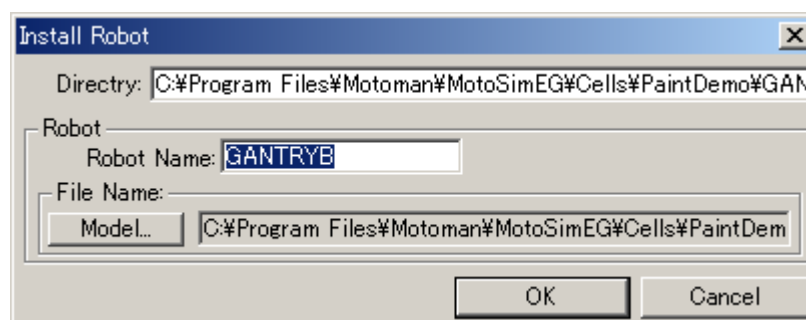
A gantry robot is a robot model which is composed of a conveyor model with three linear axes for the base and three external rotation axis for the head. The control point is thoroughly determined by the three rectangular linear axes, and is not dependent on the external axes.

■ Registering a Gantry Robot

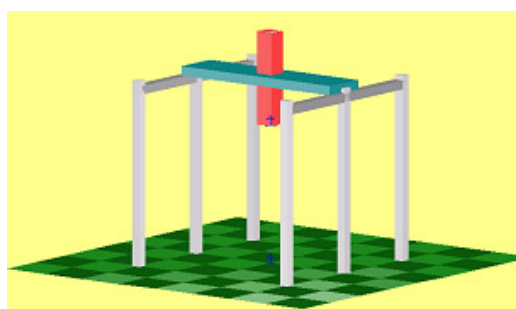
1. Select {Device} - {Gantry} - {Add} to display the Gantry dialog box. Select the check box to specify if the following items in [Gantry] dialog box are required.
 [Series List] check box: Configuration of external rotation axis.
 (Checked: serial configuration; cleared: parallel configuration.)
 [Make Model] check box: Creation of a model. (Check the box if model creation is desired.)
 Note that both check boxes are selected by default.



2. Enter the name of the gantry robot in the "Robot Name" edit box in the Install Robot dialog box.



3. A gantry robot is automatically generated.



■ Deleting a Gantry Robot

The gantry robot model can be deleted by using the same procedure as for deleting other robot models, by selecting {Robot} - {Delete Robot...}.

■ Moving a Gantry Robot with Jog Operation

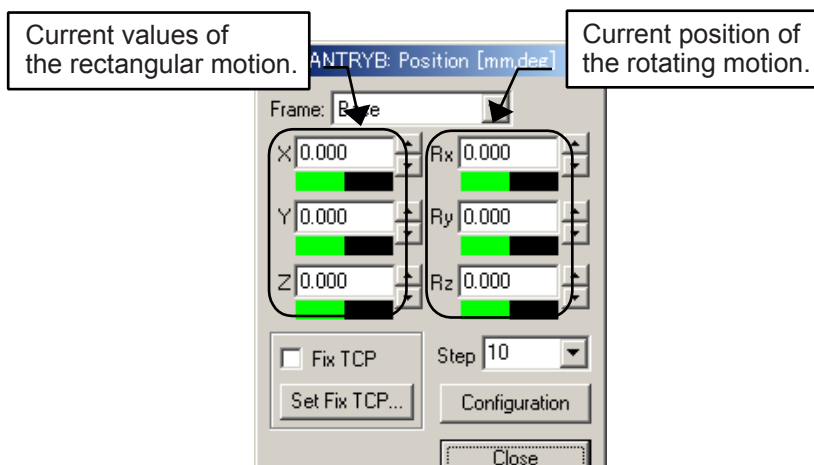
Jog operation can be performed with the Programming Pendant dialog box or the Position Data Panel.

- Operation with the Programming Pendant dialog box
 - Rectangular motion: rectangular coordinates X, Y, Z (units in millimeters).
 - Rotating motion: external axes E1, E2, E3 (units in pulses).
- Operation with the Position Data Panel.
 - Rotating motion: robot coordinates Rx, Ry, Rz (units in degrees).

■ Current Values of a Gantry Robot

Procedure

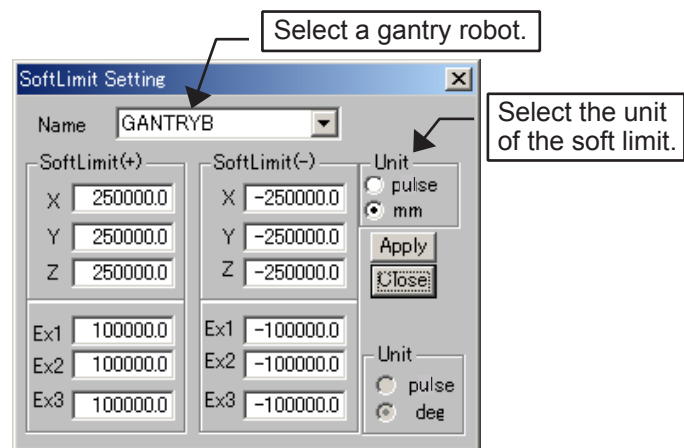
1. Open the Position Data Panel with a gantry robot selected on the main screen.
2. Check the current value with the rectangular motion (X-, Y-, Z-axes) and rotating motion (Rx, Ry, Rz-axes) of the robot coordinates.



■ Modifying the Soft Limit of a Gantry Robot

Procedure

1. Select {Device} - {Press} - {SoftLimit Setting} to open the Position Panel dialog box with a gantry robot selected on the screen.



2. Close the cell file, then open it again.



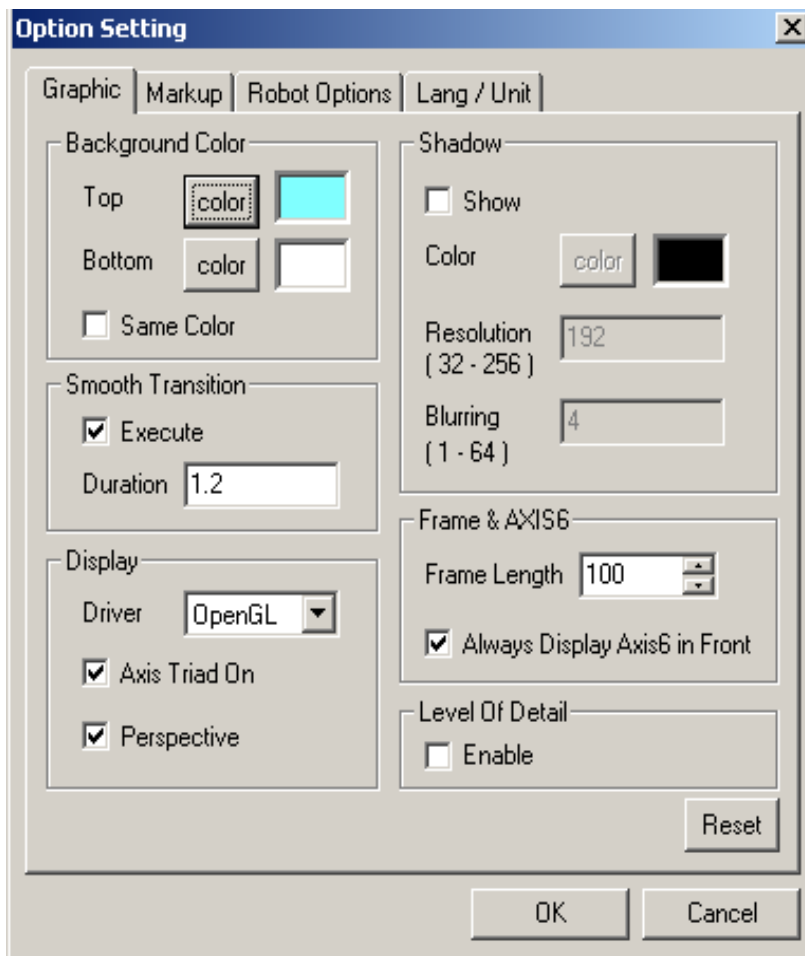
To enable the modifications, reload the cell.

11 Configuration Settings

Various configuration settings can be made in the Option Setting dialog box. To display the Option Setting dialog box, select {Setting} - {Options} .

11.1 Graphical Settings

For the graphical settings, select the “Graphic” tab of the Option Setting dialog box.



Graphic tab

Item	Description
[Reset] button	Restores all the values to the default setting.
[OK] button	Applies the modifications, and closes the dialog box.
[Cancel] button	Closes the dialog box without applying the modifications.

11.1.1 Background Color

Specify the background color of the cell window in the "Background Color" section.

Item	Description
"Top" color indication box	Displays the current color of the upper part of the background. Press [color] to display the Color dialog box, and select the desired color.
"Bottom" color indication box	Displays the current color of the bottom part of the background. Press [color] to display the Color dialog box, and select the desired color.
[Same Color] check box	Check this check box to set the "Bottom" background color to the same color as the "Top" background.


11.1.2 Smooth Transition

Specify if a smooth transition is executed when changing viewpoint in the "Smooth Transition" section.

Item	Description
[Execute] check box	Select to execute the smooth transition function when changing the viewpoint.
"Duration" edit box	Specify the duration of the smooth transition. (Editable when the [Execute] check box is selected.)

11.1.3 Display

Configure the graphic driver in the "Display" section.

Item	Description
"Driver" combo box	<p>Select a graphic driver from the list: "OpenGL" is selected by default. The graphic drivers currently available are "OpenGL" and "WinGDI".</p> <div style="border: 1px solid blue; padding: 5px; margin-top: 10px;"> <p>NOTE To apply the change of graphic driver, reload the cell.</p> </div>
[Axis Triad On] check box	<p>Displays the coordinate axis below on the lower left of the cell window.</p> 

11.1 Graphical Settings

Item	Description
[Perspective] check box	Check this check box to display the cell in perspective.

11.1.4 Shadow

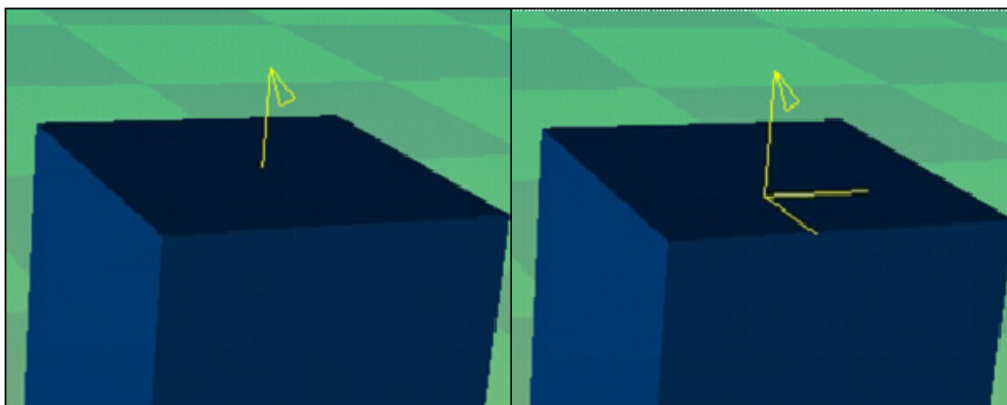
Set the following items for shadow display in the "Shadow" section.

Item	Description
[Show] check box	Select to display shadows on the cell window.
"Color" indication box	Displays the current color of the shadows. Press [color] to display the Color dialog box, and select a desired color. (The [color] button is enabled when the [Show] check box is selected.)
"Resolution" edit box	Enter the resolution value. (Editable when the [Show] check box is selected.)
"Blurring" edit box	Enter the value for the gradation effect. (Editable when the [Show] check box is selected.)

11.1.5 Frame & AXIS6

Specify the Frame and Axis6 display property.

Item	Description
"Frame Length" spin box	Enter the value of the frame and Axis6 length with the spin button.
"Always Display Axis6 in Front" checkbox	When checked, the Axis6 are displayed in front of all the other parts.



Regular Display

Axis6 Displayed in Front

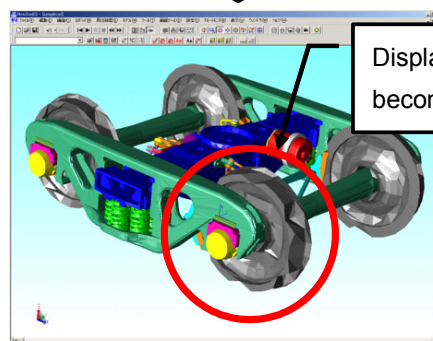
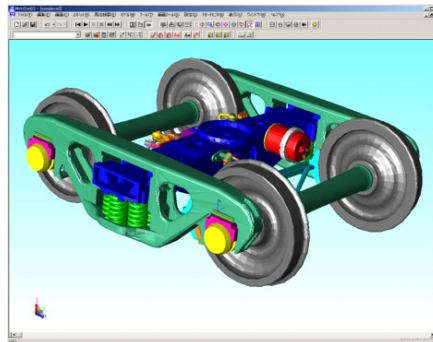
11.1.6 Level of Detail

When changing the scene viewpoint or during playback the level of detail can be decrease in order to obtain a smoother animation. This function is useful to improve display performance of cell containing a large amount of data such as very detailed HSF model.

Item	Description
Enable	<p>When this item is checked, the level of detail will be reduced during viewpoint change and playback. The level of detail data will also be generated for the HSF models when required.</p> <div style="border: 1px solid black; padding: 5px;"> <p>NOTE</p> <ul style="list-style-type: none"> • When the function is enabled, a message offers to generate the level of detail data for the currently opened cell. If the data was previously generated for this cell, it is not necessary to regenerate the data and you may press "Cancel". • The generation of the level of detail data may take some time depending on the size of the model file. </div>



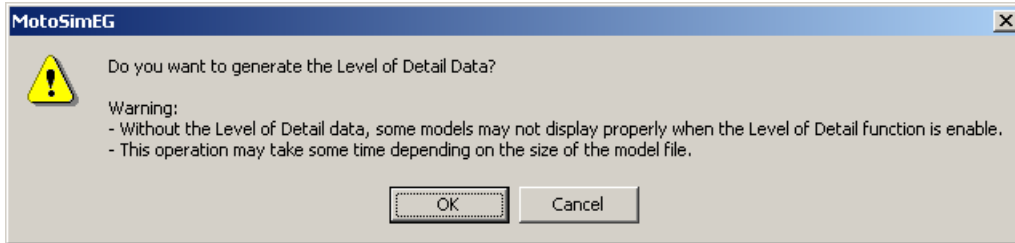
- When the displayed surface becomes rougher during viewpoint change or playback, depending on the data some model elements may not display.
- It is easier to distinguish the discrepancies between levels of detail when displaying the cell in "Flat Shading" (refer to section " 6.11 Changing the Rendering Mode ").



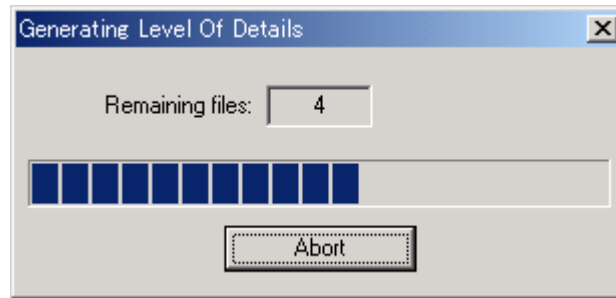
Displayed surface become rough

■ Generating the Level of Detail Data

When the Level of Detail function is enabled, the level of detail data need to be generate for the function to work properly. If an opened cell doesn't contain the level of detail data, a message will prompt the user to confirm that the data should be generated at this time.



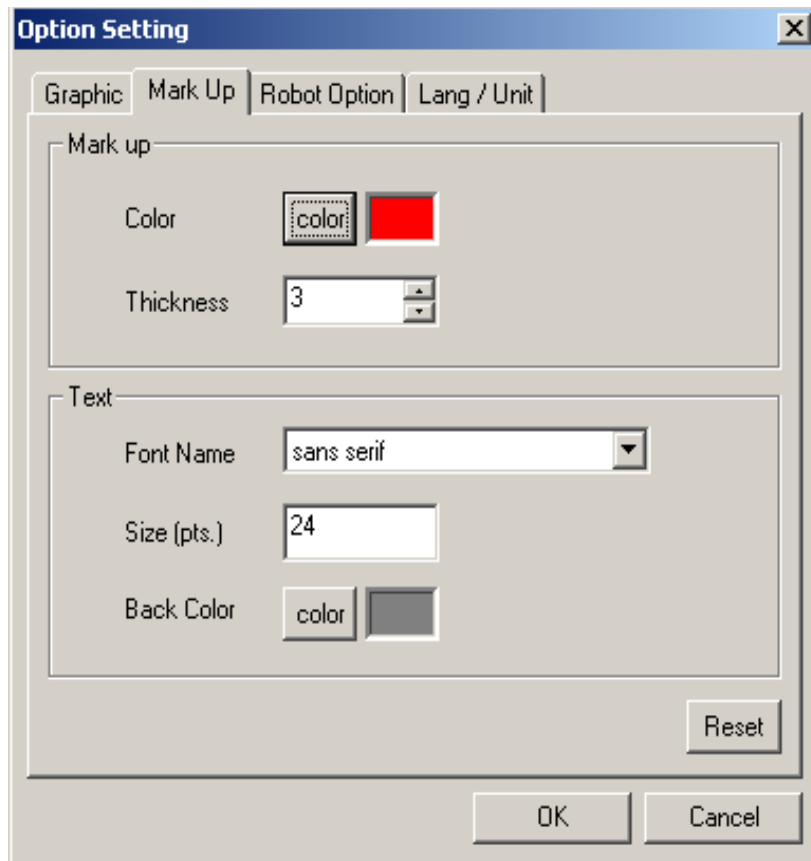
While generating the level of detail data, the "Generating Level of Detail" dialog will display the generation progress. To stop the data generation, click on the "Abort" button. Note that when aborting the generation, the current file processing will continue until completed, and then the generation will stop and data for the remaining file will not be created




When adding HSF model and the Level of Detail is enable, the level of detail data will automatically be generated for the new model. The "Generating Level of Detail" progress dialog will display but the process cannot be aborted.

11.2 Markup Settings

To configure the lines and texts on the cell window, select the "Mark Up" tab of the Option Setting dialog box.




Mark Up tab

Item	Description
"Mark up" section	<p>"Color" indication box Displays the current color of the markup object (line and text). Press [color] to display the Color dialog box, and select the desired color.</p> <p>"Thickness" spin box Directly enter the value or specify the value with the spin button  to specify the thickness of the markup line.</p>

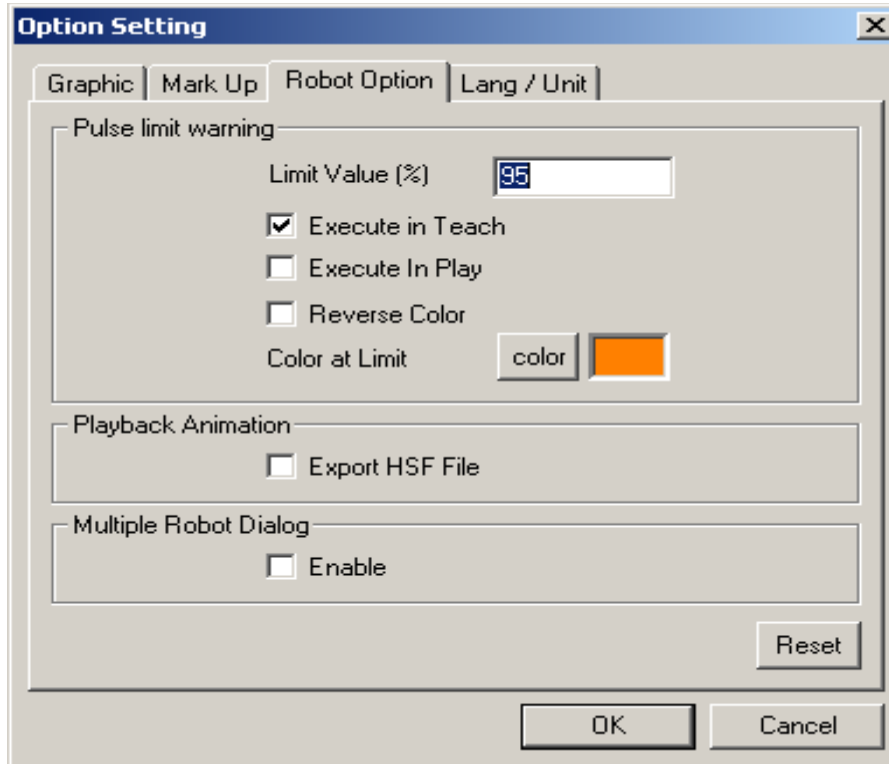
11.2 Markup Settings

Mark Up tab

Item	Description
"Text" section	<p>"Font Name" combo box Select a desired font for the text.</p> <div style="border: 1px solid #add8e6; padding: 5px;"> NOTE When using two-byte characters for the text, make sure to select a font which can be displayed properly.</div> <p>"Size (pts.)" edit box Specify the size of the font.</p> <p>"Back Color" indication box The color indication box displays the current markup text background color. Press [color] to display the Color dialog box. And select the desired background color.</p>
[Reset] button	Restores all the values to the default setting.
[OK] button	Applies the modifications, and closes the dialog box.
[Cancel] button	Closes the dialog box without applying the modifications.

11.3 Robot Option Settings

When a robot axis reaches its limit position, the color of the axis changes.



Robot Option tab

Item	Description
"Pulse limit warning" section	<p>[Execute in Teach] check box Select to display the axis reaching its limit in a reverse color or a limit color in a teaching operation.</p> <p>[Execute in Play] check box Select to display the axis reaching its limit in a reverse color or a limit color in a playback operation.</p> <p>"Limit Value (%)" edit box Directly enter the value to specify the limit value for the limit axis check.</p> <div style="border: 1px solid blue; padding: 5px; margin: 10px 0;"> <p>NOTE For example, the limit range is plus or minus 5% if the limit value is set at "90". (If the limit value is set at "80", the limit range is plus or minus 10%.)</p> </div> <p>[Reverse Color] check box Select to reverse the color of the axis reaching its limit in its opposing color.</p> <p>"Color at Limit" indication box Displays the current limit color. Press [color] to display the Color dialog box, and select the desired color.</p>

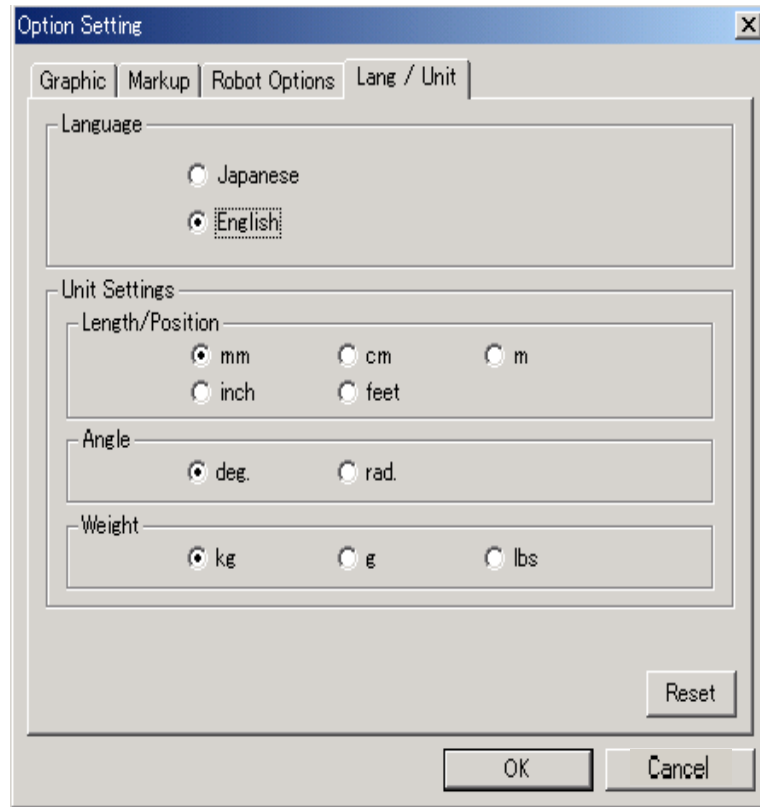
11.3 Robot Option Settings

Robot Option tab

Item	Description
"Playback Animation" section	<p>When this item is checked, the job playback animation is stored in memory. After the playback, the animation can then be exported in HSF file format.</p> <div style="border: 1px solid #add8e6; padding: 10px;"> <p>NOTE</p> <ul style="list-style-type: none"> The playback animation file does not support any model color change the may occur during playback (such as collision detection, limit warning...). For the file export operation, please refer to the " 4.7.1 Playback animation file export "section. </div>
"Multiple Robot Dialog" section	<p>When enabled MotoSimEG will display a separate copy of robot related dialog or panel for each robot in the cell. When a dialog is initially displayed, it is set to the currently selected robot. Once displayed the dialog will always display the information for the same robot, even if the current robot is changed. To display multiple copy of a same dialog, display a first copy of the dialog, then change the current robot and display the dialog again.</p>
[Reset] button	Restores all the values to the default setting.
[OK] button	Applies the modifications, and closes the dialog box.
[Cancel] button	Closes the dialog box without applying the modifications.

11.4 Language and Unit Settings

To configure the language and unit, select the "Lang / Unit" tab of the Option Setting dialog box.



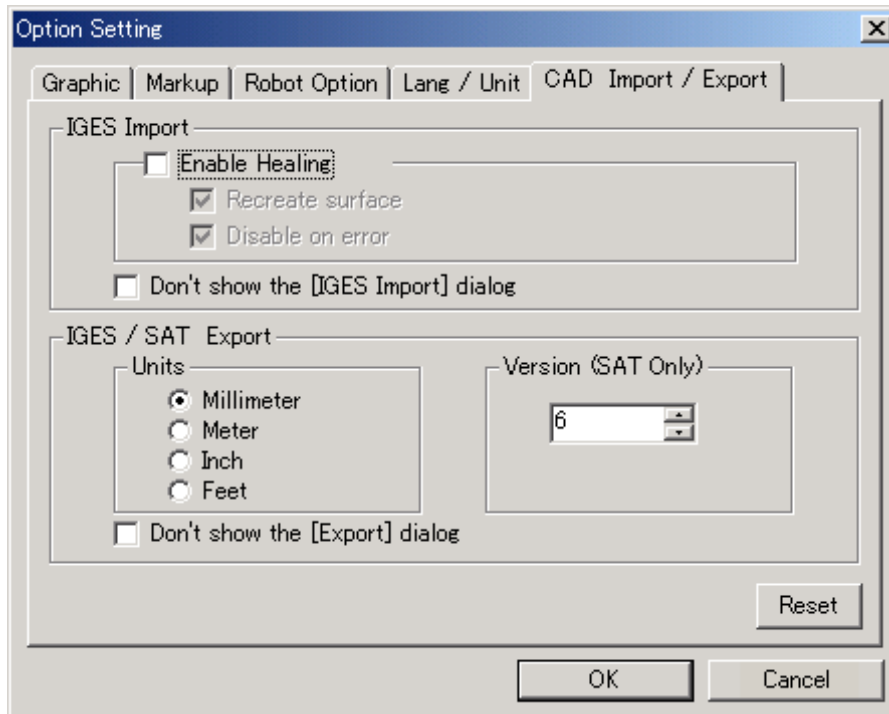
Lang / Unit tab

Item	Description
"Language" section	Select the [Japanese] or [English] radio button to configure the language. To set from the main menu, select {View} - {English} or {Japanese}.
"Unit Settings" section	Select the units for each type of values. "Length/Position" edit box Indicates the unit of the length. "Angle" edit box Indicates the unit of the angle. "Weight" edit box Indicates the unit of the weight.
[Reset] button	Restores all the values to the default setting.
[OK] button	Applies the modifications, and closes the dialog box.
[Cancel] button	Closes the dialog box without applying the modifications.

11.5 CAD Import/Export <CadPack Option>



To use this function (CadPack option), the MotoSim EG-CadPack is required. (The MotoSim EG-CadPack is separate product from MotoSim EG.)



11.5.1 IGES Import

Option settings related to reading IGES format files.

<p>“Enable Healing” section</p>	<p>When enabled, a healing algorithm is applied to the imported IGES data.</p> <p>[Recreate surface] check box The [Recreate surface] option is normally selected. The [Recreate surface] is part of the normal healing process. If it is unselected, this step will be skipped in the healing process. If the surface regeneration doesn't give the intended results, unselect the "Recreate Surface" may improve the healing results.</p> <p>[Disable on error] check box The [Disable on error] option is normally selected. When the [Disable on error] is selected, the healing will be disabled if an error occurs during the healing process.</p>
---------------------------------	---

[Don't show the [IGES Import] dialog] check box	<p>When this option is selected, the "IGES Import" dialog will not display when an IGES file is read.</p> <div style="border: 1px solid black; padding: 5px;"> <p>NOTE For details on the IGES data import, please refer to section " 9.12 CAD Data Import <CadPack Option> ".</p> </div>
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The healing process attempts to repair any corrupted data of the imported IGES files. However, the processing time to import a file may increase significantly when healing is used. The performance may also vary depending on the extent and nature of the errors in the original IGES file. In some cases, result with healing may be worst than reading the file without healing.

11.5.2 IGES/SAT Export

Units	Sets the measuring units of the exported SAT or IGES files.
Version (SAT Only)	Sets the SAT file version used in the exported file. Recommended value: 6 (Setting range: 4 to 16)
[Don't show the [Export] dialog] check box	<p>When this option is selected, the "Export" dialog will not display when the "Export CAD file" function is used.</p> <div style="border: 1px solid black; padding: 5px;"> <p>NOTE For details on the IGES, SAT data export, please refer to section " 9.13 CAD Data Export ".</p> </div>

12 Applied Operation

12.1 Teaching Using OLP Function

12.1.1 What is OLP Function?

Normally, teaching operation uses the programming pendant to move the robot model to the target position. The OLP function is a quick and efficient way to move the robot to a target position. When the desired destination is located on a model, by using the OLP panel, the end of the tool (TCP) can conveniently be moved to the target position by simply clicking on the screen (for example, any point of a workpiece, etc.).



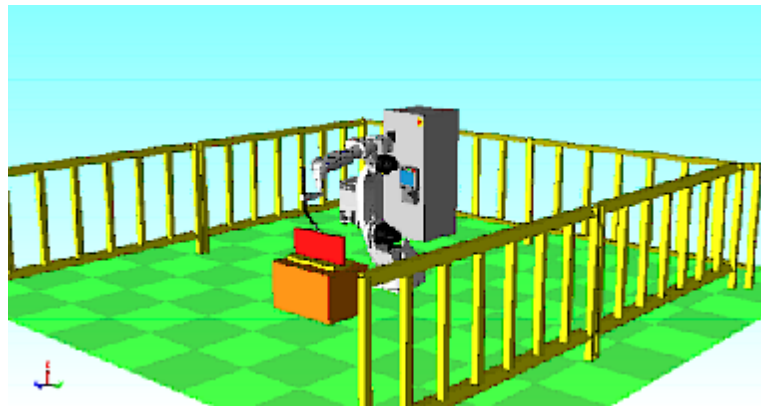
- When moving the robot tool end with the OLP function, the message "Cannot reach this point" may appear even if the robot is not too far from the target point. This may happen when the tool end cannot be moved to the target point due to the shape or current posture of the robot.
- A point other than the target point may be selected depending on the point clicked and the view position. When this occurs, use the programming pendant to move the robot or change the camera scope of the screen to click on the proper model.

12.1.2 Teaching Operation

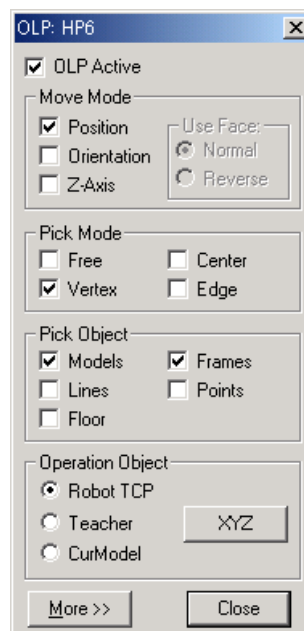
The teaching operation is explained by using “Arc_Samp_Nx.cel” as an example.

Procedure

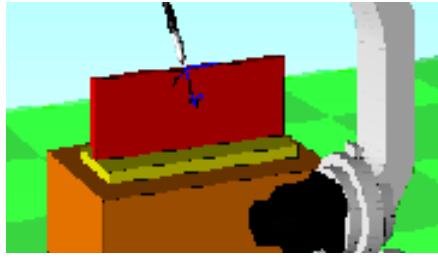
1. Open “Arc_Samp_Nx.cel”.
(If it is difficult to perform the teaching operation, hide the displayed models such as fence, controller, etc. by selecting “Hide” from the combo box on the Cad Tree dialog box.)



2. Click on  on the tool bar or select {Tool} - {Teaching} - {OLP...} to display the OLP dialog box.



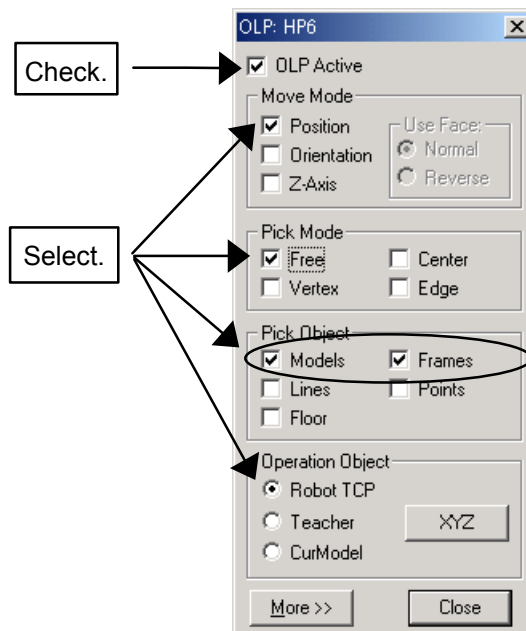
3. Display the cell window so that the workpiece is visible as shown in the figure below.



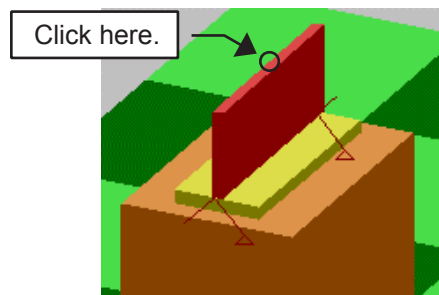
■ Position Designation in Free Mode

In "Free" mode, the tool end (TCP) moves to the point of the model corresponding to the clicked position.

1. Set each item in the OLP dialog box as shown in the following figure.

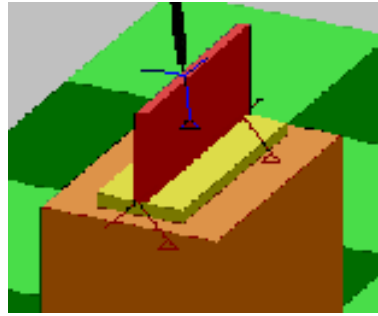


2. Click on the following position of the workpiece model displayed in the cell window.



3. The tool end moves to the clicked position.

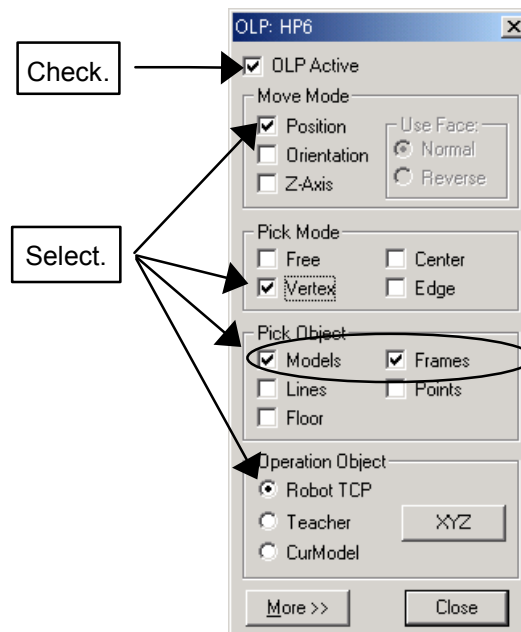
Click on another point, and the tool end moves to the clicked position.



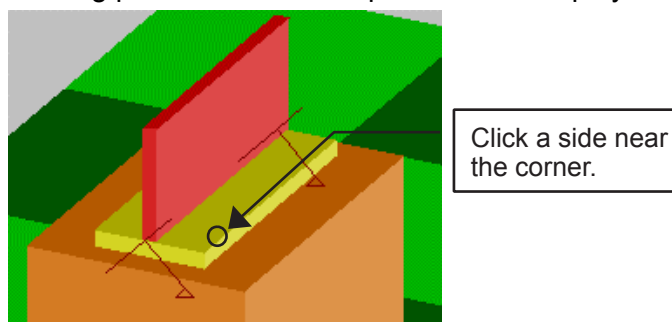
■ Position Designation in Vertex Mode

In "Vertex" mode, the tool end (TCP) moves to the model vertex nearest to the clicked position.

1. Set each item in the OLP dialog box as shown in the following figure.

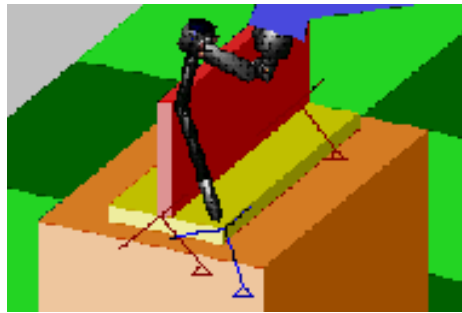


2. Click on the following position of the workpiece model displayed in the cell window.



3. The tool end moves to the nearest vertex.
Click on a point near another vertex to check if the tool end moves to the nearest ver-

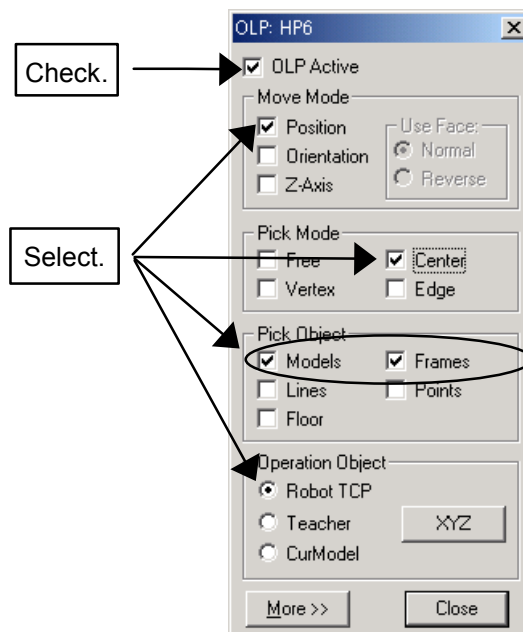
tex.



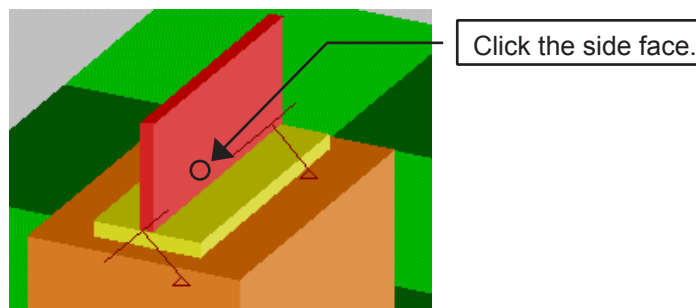
■ Position Designation in Center Mode

In "Center" mode, the tool end (TCP) moves to the face or edge center nearest to the clicked position.

1. Set each item in the OLP dialog box as shown in the following figure.

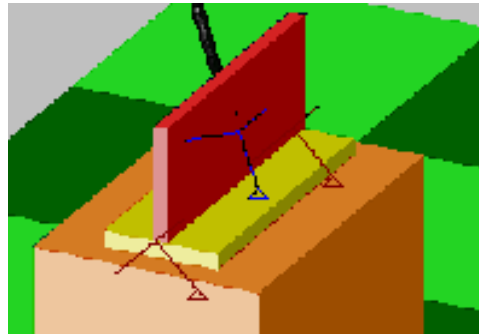


2. Click on the following position of the workpiece model displayed in the cell window.



3. The tool end moves to the center point of the designated model face or edge. If the tool overlaps on the model, the tool direction is improper. Use the programming pendant to correct the position afterward. Click on another face to check if the tool end moves to the center of the designated

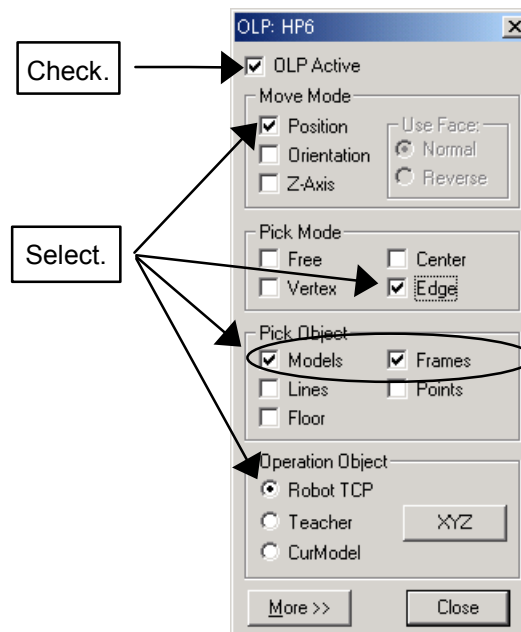
model face.



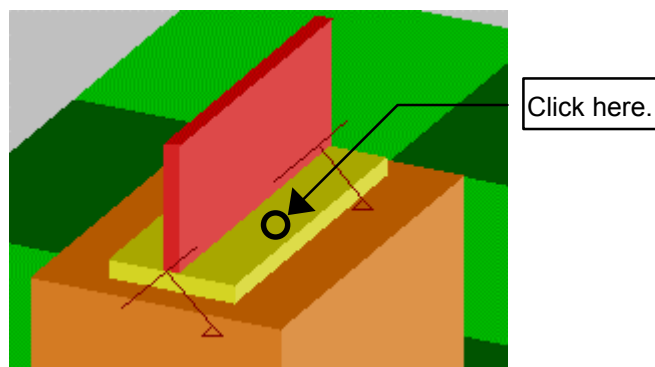
■ Position Designation in Edge Mode

In "Edge" mode, the tool end (TCP) moves to the edge point nearest to the clicked position.

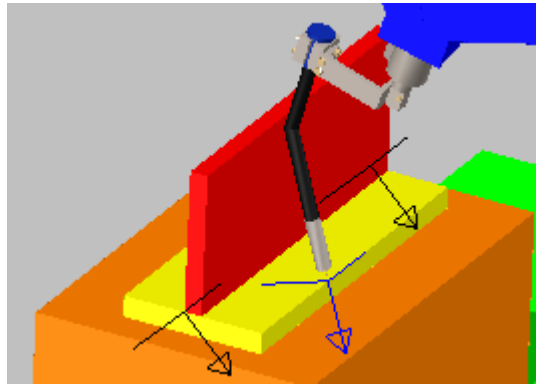
1. Set each item in the OLP dialog box as shown in the following figure.



2. Click on the following position of the workpiece model displayed in the cell window.



3. The tool end moves to the edge point nearest to the clicked position. Click on another face point to check if the tool end moves to the closest edge.



■ Designation with Orientation Mode

Orientation Move Mode can be used by itself or in combination with the Position Mode. Checking the [Orientation] checkbox rotates the tool end frame to align it with the target point frame. If the [Position] mode is also checked, the tool end will also move to overlap the target frame. Therefore, if you only want to change the orientation of the tool without moving it, make sure to uncheck the [Position] checkbox.


The target point frame appears when the left mouse button is pressed down on a model and is represented by 3 colored arrows. The red arrow is the Z-axis and corresponds to the normal (or reversed normal) of the face where the target point lies; the blue arrow is the X-axis and is defined by the face edge closest to the point; and the green arrow is the Y-axis and is orthogonal to the two other axes.



- That some geometries, such as lines or points, do not have sufficient information to generate a frame information. In such cases, the tool end will maintain its original orientation.
- The direction of the Z-axis can be changed by selecting [Normal] or [Reverse] mode in the "Use Face:" section.

Procedure

1. Hide the T-shape workpiece and the stand to make it easier to create a new workpiece.

Click on  or select {Tool} - {CAD Tree} to hide the lower hierarchy of the "DAI" tree. Confirm that the cursor points to "DAI", then select "Hide" to hide the model.

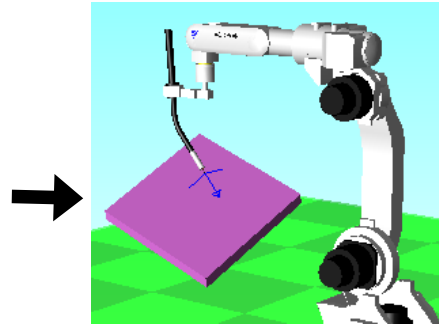
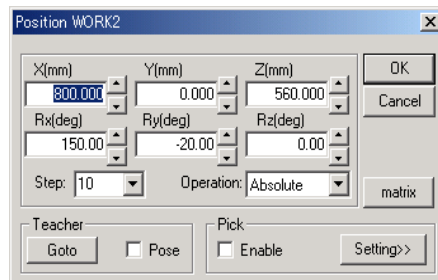
2. Select "World" in the Cad Tree and click on the [Add] button to add the BOX of the following specifications.

Model: WORK2

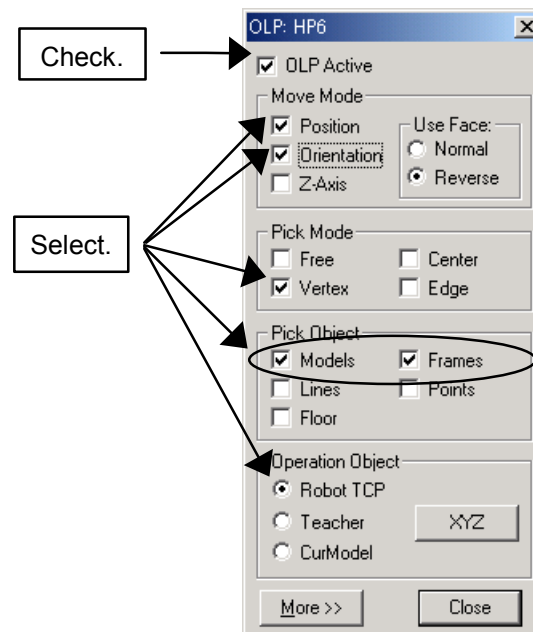
Width (W)	500	Depth (D)	500	Height (H)	50
X (mm)	0	Y (mm)	0	Z (mm)	0
Rx (degree)	0	Ry (degree)	0	Rz (degree)	0

3. Click on the [Pos] button in the Cad Tree to set the position as shown in the table below.

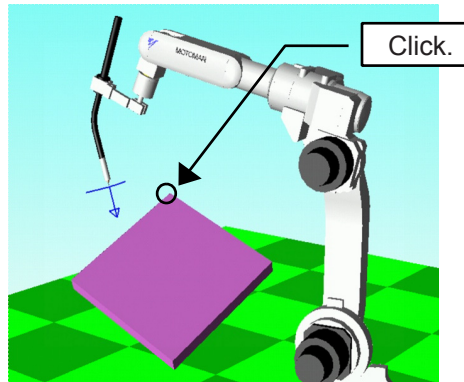
X (mm)	800	Y (mm)	0	Z (mm)	560
Rx (degree)	150	Ry (degree)	-20	Rz (degree)	0



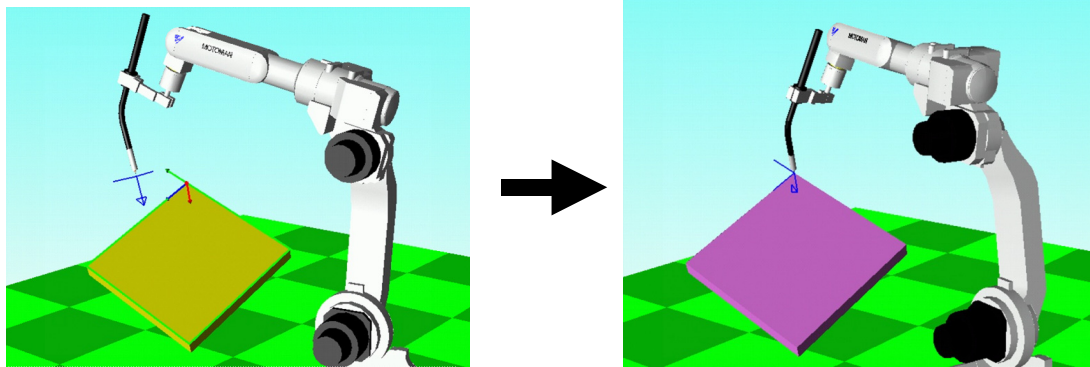
4. To see and understand the coordinate axis of "WORK2", select "WORK2" in the Cad Tree, then select "SeeAll" to display the Frame of the coordinate axis on the "WORK2".
5. Set each item in the OLP dialog box as shown in the following figure.



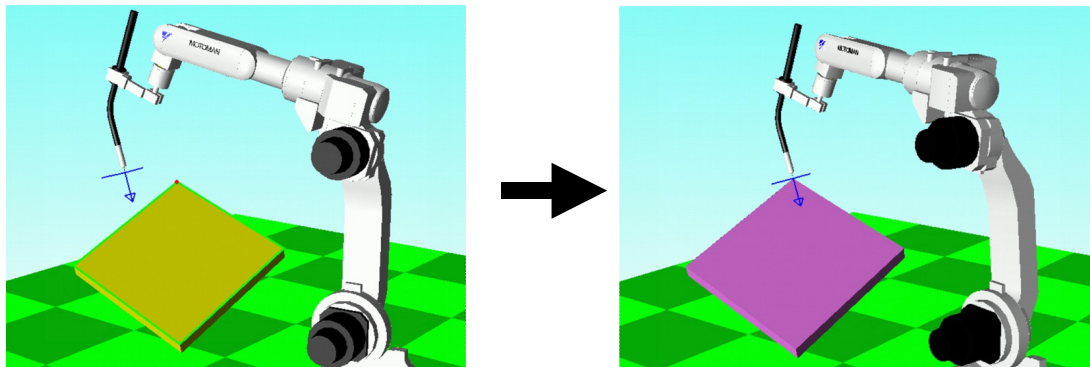
- Click on the position of the "WORK2" as shown below.



- The tool end moves to the model vertex and the tool coordinate axis is aligned in the same direction as the target point frame that was displayed when the point was clicked.



If the [Orientation] checkbox is not checked, the direction of the tool coordinate axis will not be changed as shown below.



■ Designation with Z-Axis Mode

Z-Axis Move Mode can be used by itself or in combination with the Position Mode. Checking the [Z-Axis] checkbox rotates the tool end frame to align its Z-axis with the target point Z-axis. If the [Position] mode is also checked, the tool end will also move to overlap the target frame. Therefore, if you only want to change the orientation of the tool without moving it, make sure to uncheck the [Position] checkbox.

The target point Z-Axis appears when the left mouse button is pressed down on a model and is represented by a red arrow. For a solid, the Z-axis corresponds to the normal (or reversed normal) of the face where the target point lies. For a line, it corresponds to the line direction to the

next closest point.

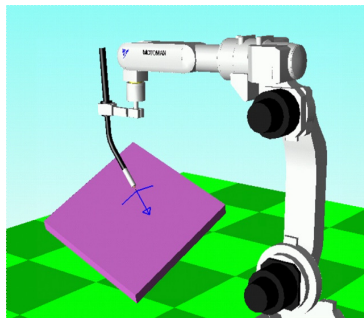


- Tat points do not have sufficient information to generate Z-axis information. In such cases, the tool end will maintain its original orientation. .
- The direction of the Z-axis can be changed by selecting [Normal] or [Reverse] mode in the "Use Face:" section.

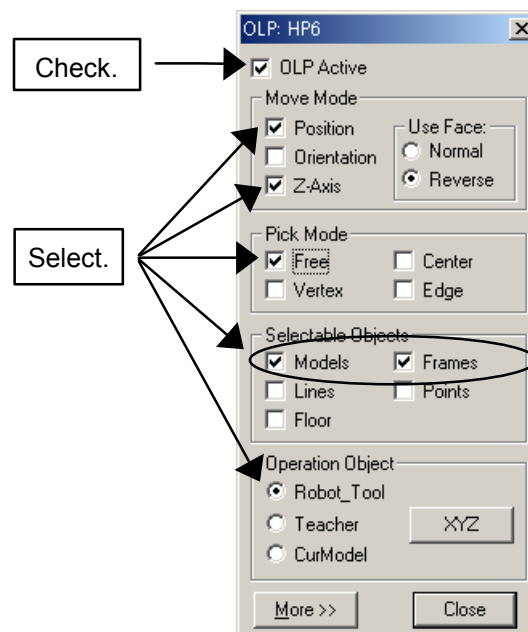
Procedure

The procedure is explained by using "WORK2", which has been used in "Designation with Orientation Mode", as an example.

1. Move the robot to its home position.

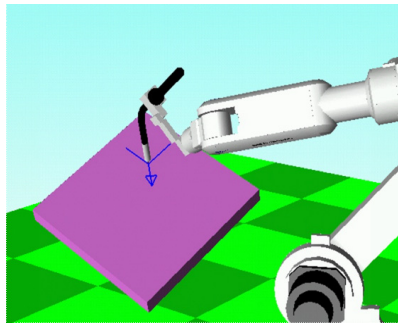


2. Set each item in the OLP dialog box as shown in the following figure.



3. 3.Click on the face of the "Work2", and the tool Z-axis will turn so that the tool end is

perpendicular to the clicked face of the model.



■ Pick Object Filter

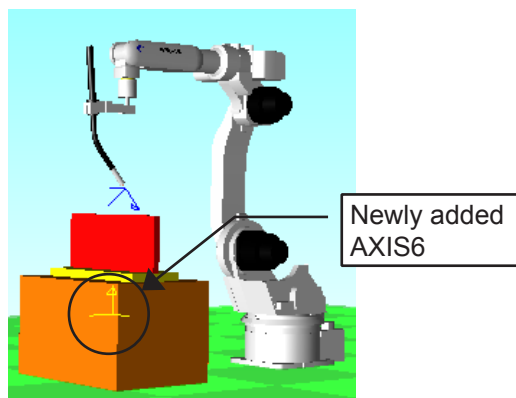
The "Pick Object" section allows setting the type of model that can be selected with mouse. Use this section when pick operation cannot be executed properly because the objects overlap each other. This setting filters which object types can be selected and enables proper pick operation.

Procedure

The procedure is explained by using "WORK2", which has been used in "Designation with Orientation Mode", as an example.

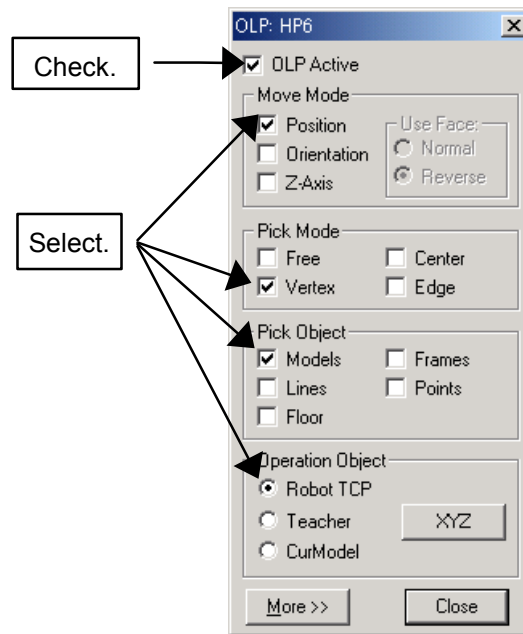
1. Display the Cad Tree; hide the "WORK2" and display the "DAI".
2. Select "DAI" in the Cad Tree to add the AXIS6 of the following specifications.
Model: DAI (AXIS6) Frame No.: 0

X (mm)	0	Y (mm)	0	Z (mm)	-100
Rx (degree)	0	Ry (degree)	0	Rz (degree)	0

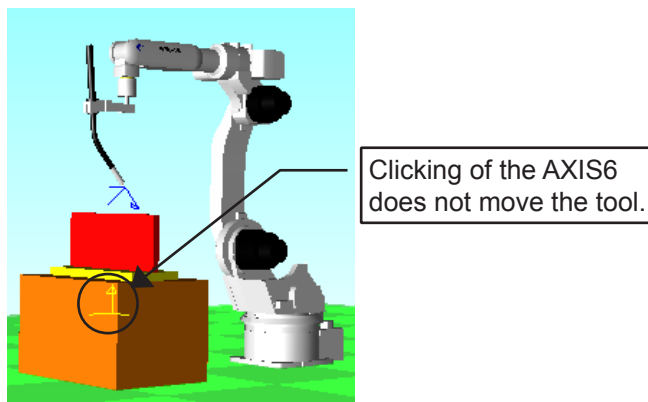


The AXIS6 is inside the BOX. (To see AXIS6 make sure that the Axis6 are always displayed in front in the "Options" dialog. Please refer to section " 11.1.5 Frame & AXIS6 "

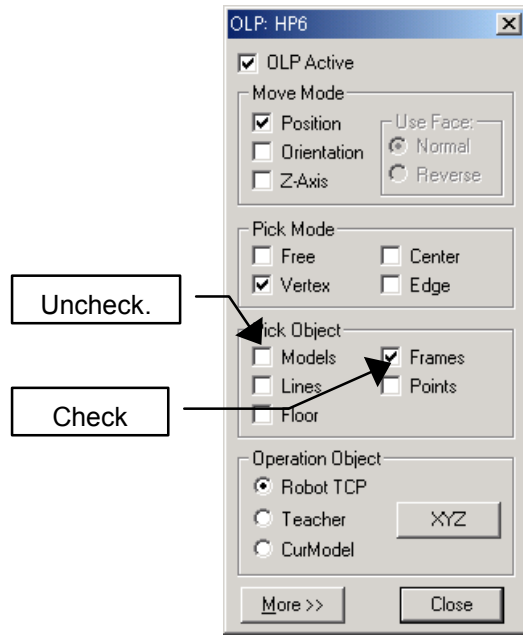
3. Set each item in the OLP dialog box as shown in the following figure.



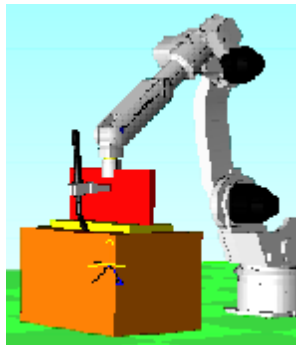
4. The tool does not move even though the “AXIS6” on the cell window is clicked. If you click around the vertex of the BOX, however, the tool moves to the vertex. This is because the [Frame] check box in the OLP dialog box has been cleared and only models are considered for selection.



5. Check the [Frame] check box for the “Pick Object” and clear the [Model] check box.



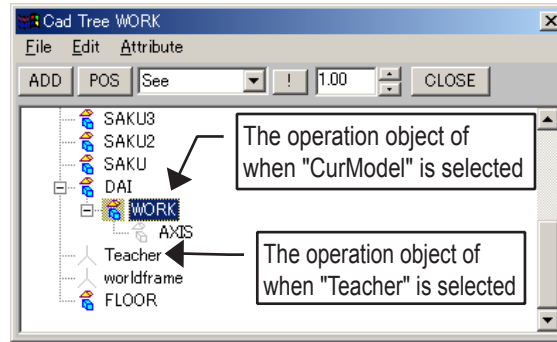
6. Click on the AXIS6, and the tool moves to the vertex of the AXIS6.



It is recommended to use this function with both [Frame] and [Parts] checked for normal operation.

■ Changing of Operation Object

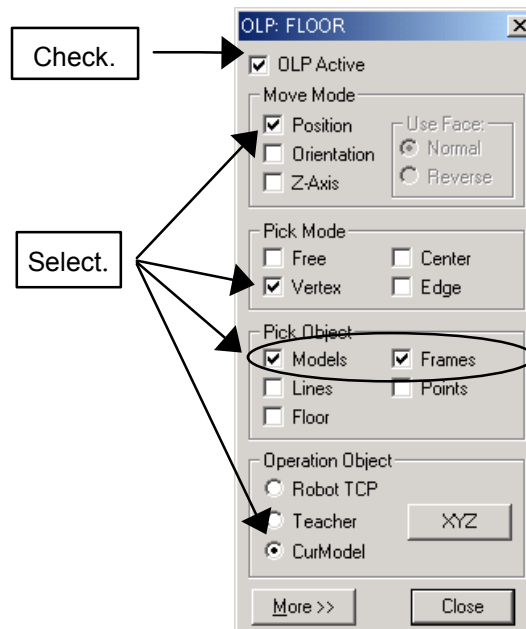
Setting the "Operation Object" section in the OLP dialog box allows changing the object moved by the pick operation. The "Operation Object" can be changed among.




Procedure


The procedure is explained by taking “CurModel” as an example.

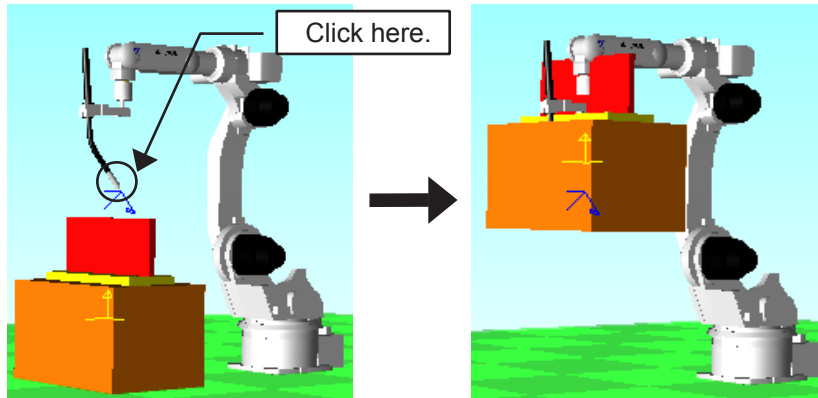
1. Set each item in the OLP dialog box as shown in the following figure.



2. Display the Cad Tree to select “DAI”, or click on the  button to select the “DAI” model in the cell window.

3. Select a model for the operation object.

- When the current model was selected with the Cad Tree
Click on the tool end in the cell window with the mouse, and the “DAI” moves to the tool end.
- When the current mode was selected with the  button
Check the [OLP Pick] check box, then click on the tool end on the cell window, and the “DAI” moves to the tool end.



Perform the same operation when the [Teacher] radio button is selected for the “Operation Obj” section.

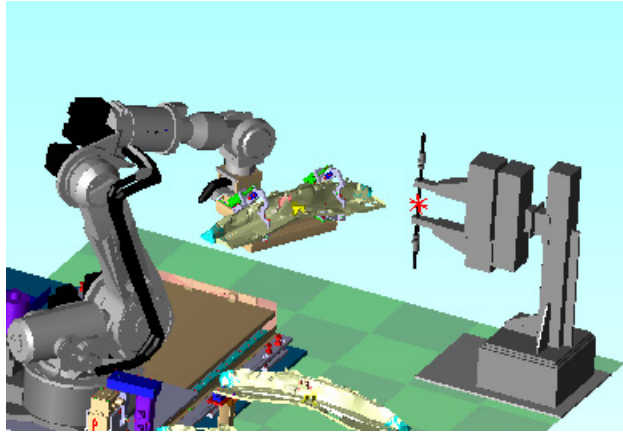
■ Move to External Reference Point


When the Move to External Reference Point function is active, the robot will move so that the point clicked on a model (carried by the robot) is brought to the external reference point. This is useful for applications like sealing and spot welding where the parts are handled by the robot and brought to a fix point (distribution nozzle, spot gun) for processing.

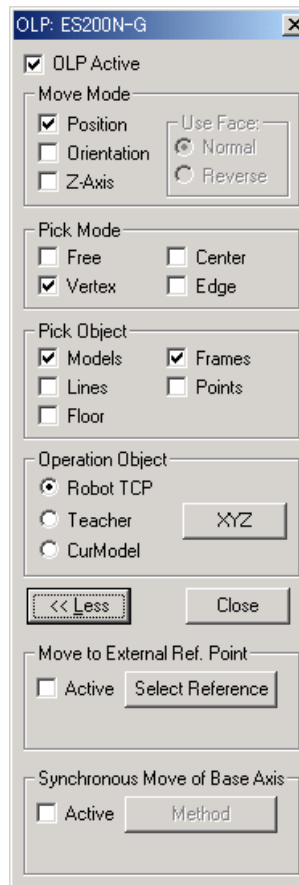
Procedure


The procedure is explained by using the "SpotWeld.cel" as an example.

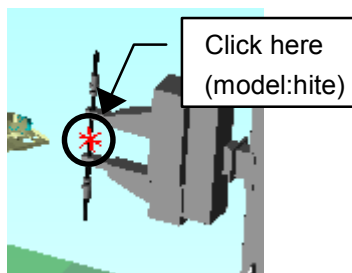
1. Open the "SpotWeld.cel" located in the "Example/NX100" folder.
 - (1) Display the "CadTree" and expand the "base200" node.
 - (2) Select the "200w" model and set the display mode to "Model Only" so that the model is visible.
 - (3) Then select the active robot as the "ES200N-G".
2. The cell display should now look like the one shown below.



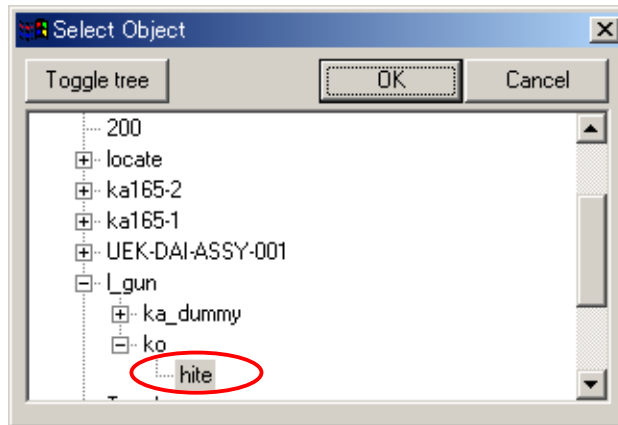
3. With the  icon or the menu {Tool} - {Teaching} - {OLP}, display the OLP dialog box and click on the [More >>] button.



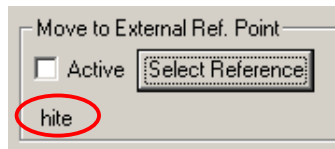
4. Set the external reference point.
With the "Select Model" mode , select the "hite" model by clicking on it.



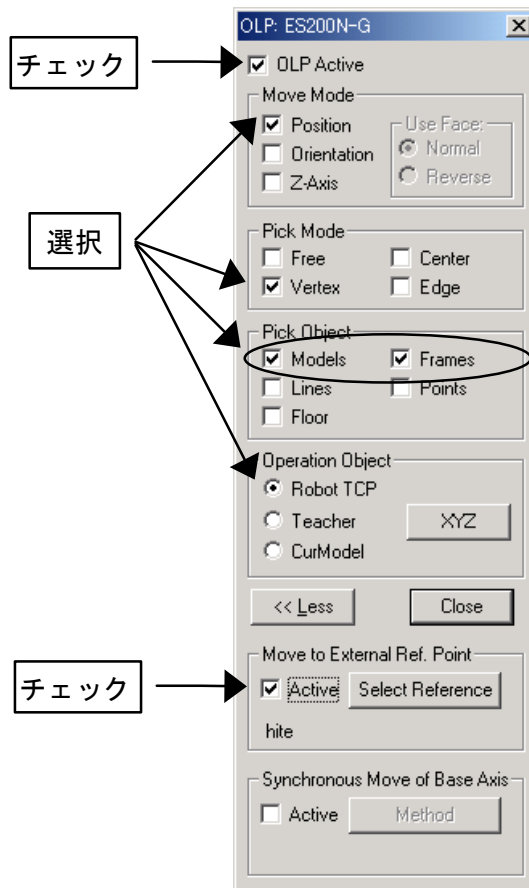
To set the external reference point, click on the [Select Reference] button, the [Select Model] dialog will display, select the "hite" model and press [OK].



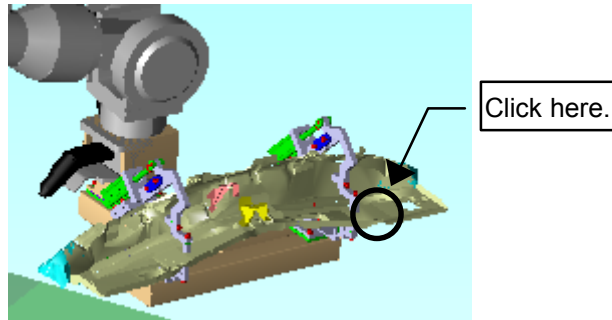
The name of the selected reference model is displayed in the "Move to External Ref. Point" section. Confirm that the "hite" model is selected.



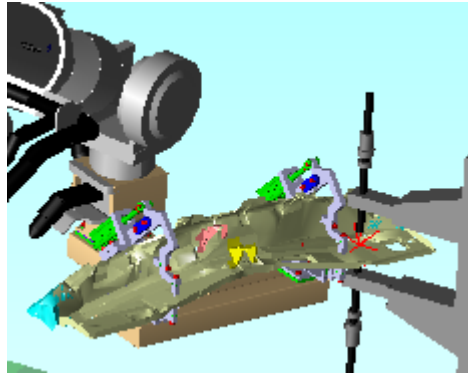
5. Set each item in the OLP dialog box as shown in the following figure.



6. Click on the work piece at the shown position.



7. The robot will move the work piece target point to the external reference point.



NOTE To use the "Move to External Reference Point" mode, the "Operation Object" needs to be set to robot.

■ Synchronous Base Axis Move to Target Point

When a robot with servotrack/servotracks is moved with the OLP, the synchronous base axis move function allows the tool end (TCP) to move to the target point with the servotrack motion.

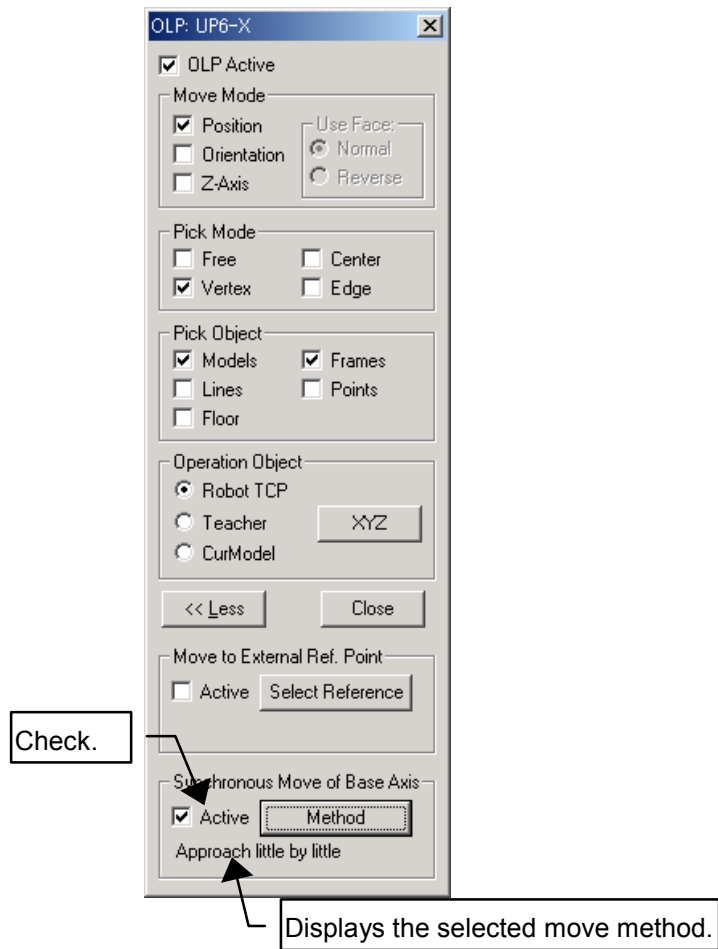
This operation function procedure is explained separately for robots with a single servotrack and robots with multiple servotracks.

Robot with Single Servotrack

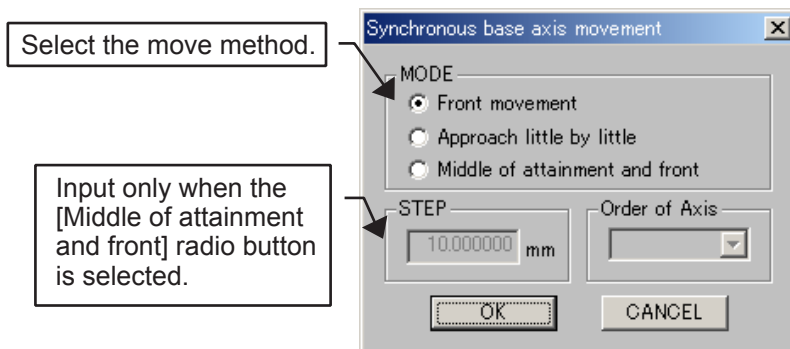
Procedure

1. For the robot with a single servotrack, the move method can be selected among:
 - Front movement;
 - Approach little by little; and
 - Middle of attainment and front.

2. Select the [Active] check box in the "Synchronous base axis move" .

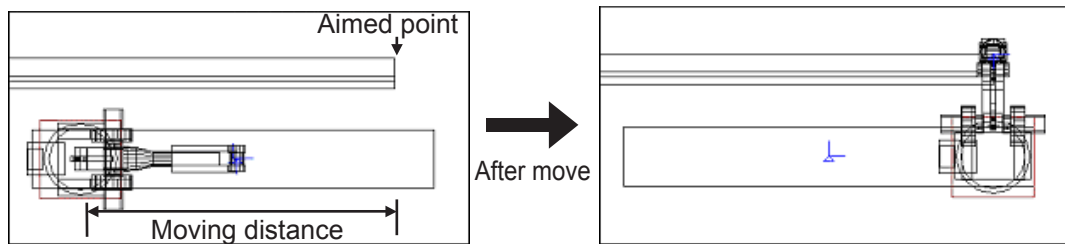


3. Click on the [Method] in the OLP dialog box to display the “Synchronous base axis movement” dialog box, and set the move method.



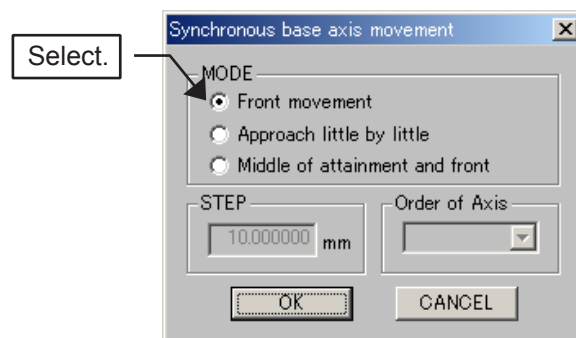
Front Movement

The function enabled with the [Front movement] radio button allows the tool end to move to the target point after the servotrack moves in front of the target point.



Procedure

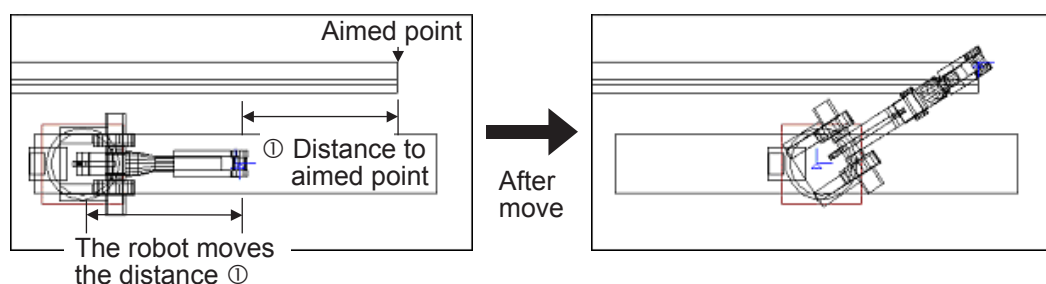
1. Select the [Front movement] radio button in the “Synchronous base axis movement” dialog box.



2. Click on the target point.
 - If the target point exceeds the servotrack soft limit, a message is displayed and the servotrack moves to the soft limit.
 - If the tool end (TCP) does not reach the target point, an error message is displayed but the servotrack moves in front of the target point.

Approach Little by Little

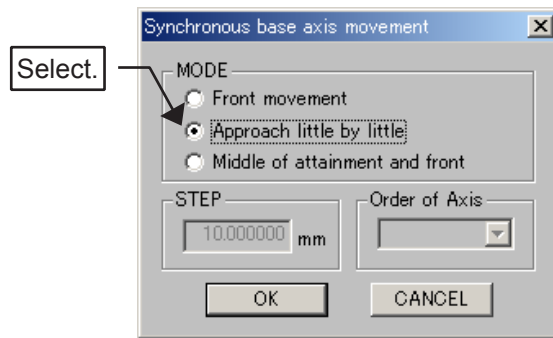
The function enabled with the [Approach little by little] radio button allows the servotrack to move only the distance between the target point and the position of the current tool end (TCP), then the tool end (TCP) moves to the target point. In short, the servotrack and the tool end (TCP) move so that the current robot posture is maintained as much as possible.



Procedure

1. Select the [Approach little by little] radio button in the “Synchronous base axis move-

ment” dialog box.

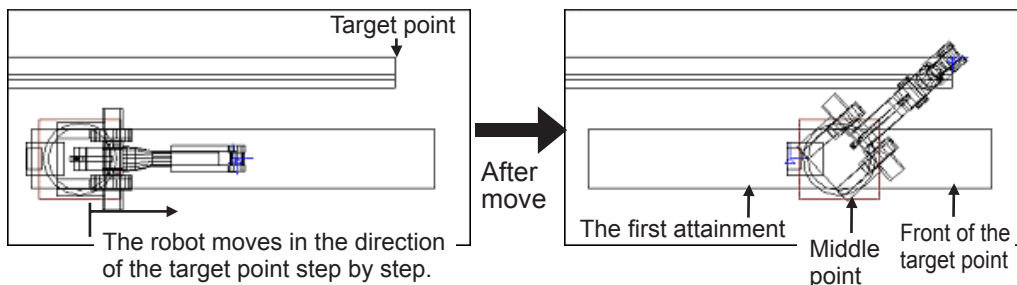


2. Click on the target point.

- If the target point exceeds the servotrack soft limit, a message is displayed and the servotrack moves to the soft limit.
- If the tool end (TCP) does not reach the target point, an error message is displayed but the servotrack moves in front of the target point.

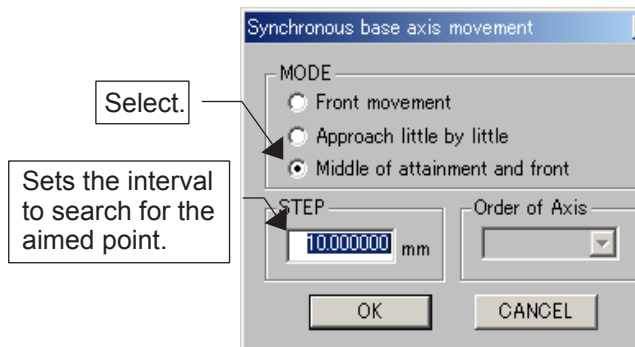
Middle of Attainment and Front

The function enabled with the [Middle of attainment and front] radio button allows the servotrack to move toward the target point step by step to search for the first position where the tool end (TCP) can attain the target point. The servotrack then moves to the middle point between the first attainment and the front of the target point, and the tool end (TCP) moves to the target point.



Procedure

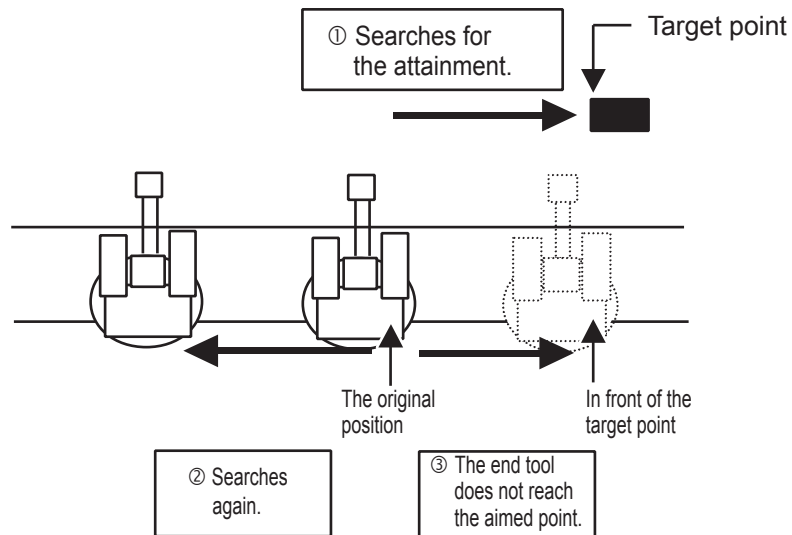
1. Select the [Middle of attainment and front] radio button in the “Synchronous base axis movement” dialog box. In the “STEP” edit box, set the moving amount for each step taken toward the target point.



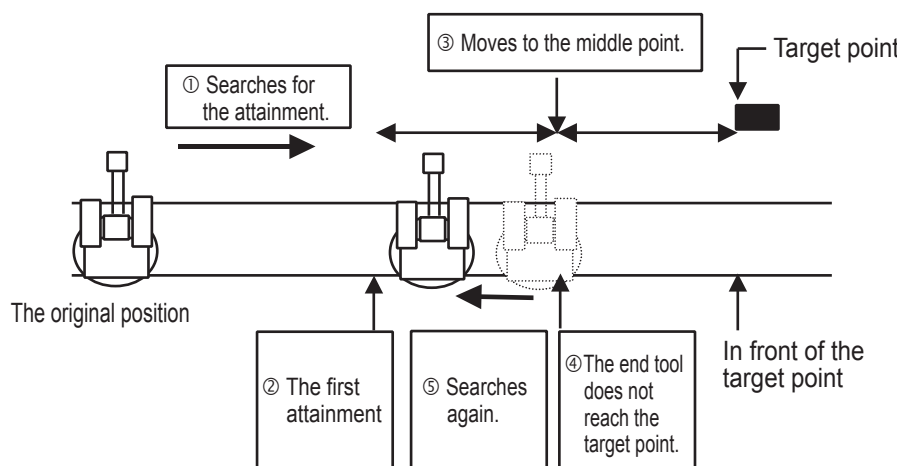
2. Click on the target point.

- If the tool end (TCP) does not reach the target point even though the servotrack

moves in front of the target point, the attainment is searched with the servotrack moving in such a direction that the target point will be further (up to the maximum soft limit) than the servotrack position before moving.



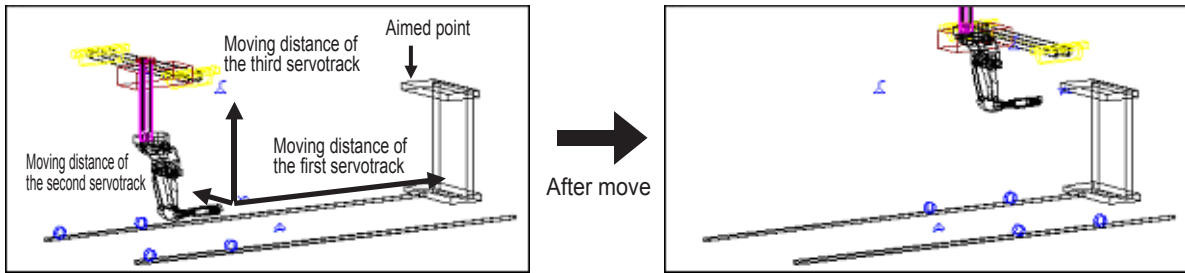
- If the tool end (TCP) does not reach the target point, an error message is displayed and the servotrack returns to the original position before moving.
- If the tool end (TCP) does not reach the target point because the servotrack moves to the middle point between the first attainment and the front of the target point, the attainment is searched again with the servotrack moving in such a direction that the target point will be further than the middle point.



Robot with Multiple Servotracks

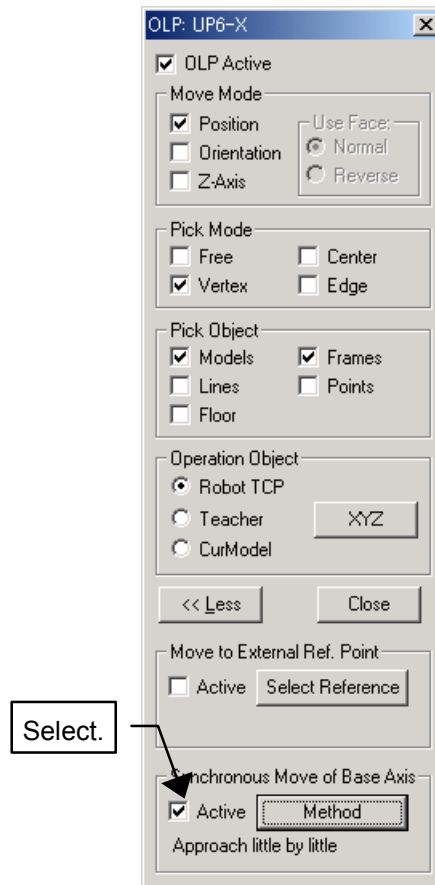
For the robot with multiple servotracks, each servotrack moves the distance between the current tool end (TCP) position and the target point, and the tool end (TCP) moves to the target point.

12.1 Teaching Using OLP Function



Procedure

1. Select the [Active] check box in the “Synchronous base axis move”. For the multiple servotracks, the servotrack move methods cannot be selected since only one method is available.



2. Click on the target point.
 - If the target point exceeds the servotrack soft limit, a message is displayed and the servotrack moves to the soft limit.
 - If the tool end (TCP) does not reach the target point, a message is displayed but the servotracks move the distance to the target point.

12.2 User Frame Setting

MotoSim EG can set user frames that allows users to teach on workpiece slant face easily.

On a horizontally placed workpiece, teaching a position such as (X, Y)=(300, 300) along the face from a certain vertex can easily be performed by using the Programming Pendant dialog box and other functions. But how about teaching a slant face? With the robot frame axis, it is difficult to calculate (or teach) a frame along the slant face from a vertex. In such a case, use a user frame to teach the frame easily along the slant face.

This section describes the simplified teaching of the workpiece slant face by using a user frame.

Procedure

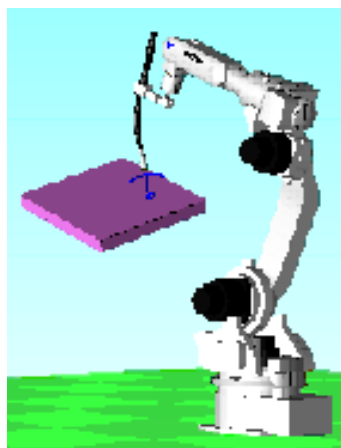
1. Create a workpiece (BOX) located at a slant by using the Cad Tree.

Model: WORK_UF (Parent model: world)

Width (W)	500	Depth (D)	500	Height (H)	50
X (mm)	0	Y (mm)	0	Z (mm)	0
Rx (degree)	0	Ry (degree)	0	Rz (degree)	0

[Layout]

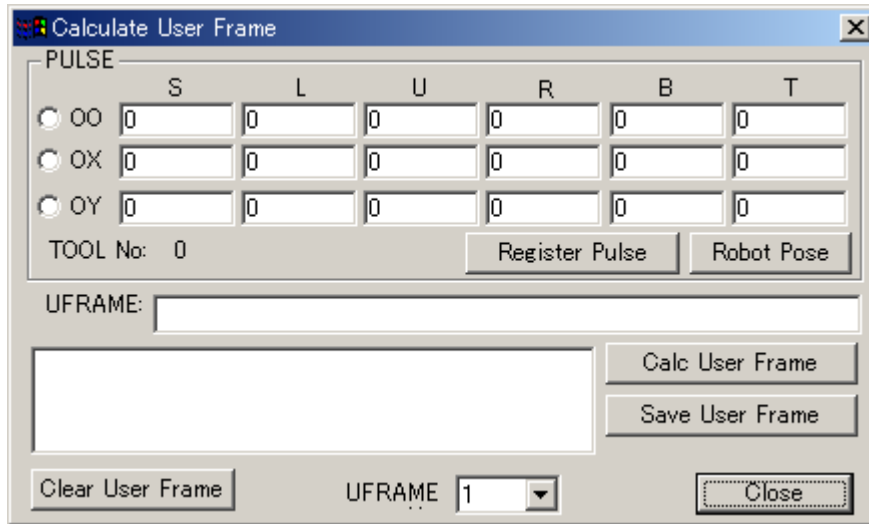
X (mm)	780	Y (mm)	0	Z (mm)	800
Rx (degree)	-20	Ry (degree)	-20	Rz (degree)	0



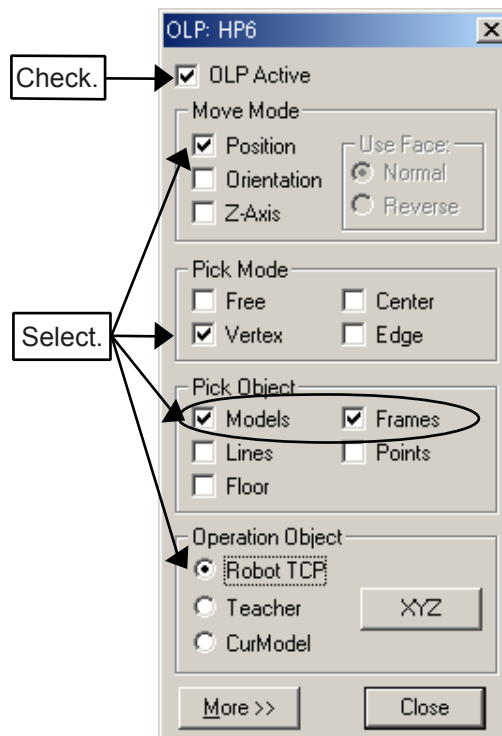
2. Select {Robot} - {Data Setting} - {Set User Frame...}.

In this example, the OLP function is used to describe the operation although you may manually input the frame-axis data of the user frame.

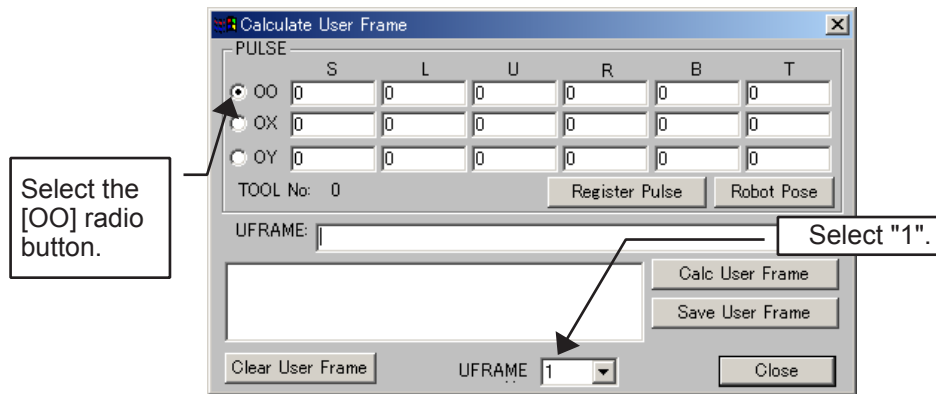
Click on , or select {Tool} - {Teaching} - {OLP...}.



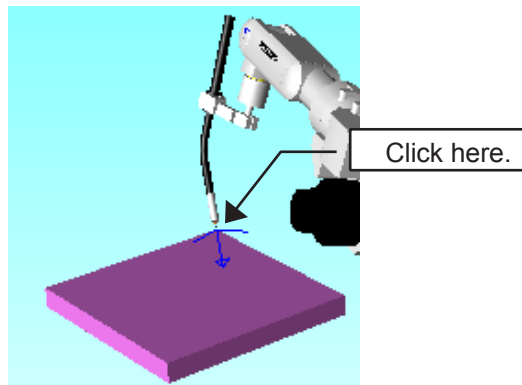
3. Set each item in the OLP dialog box as shown in the following figure.



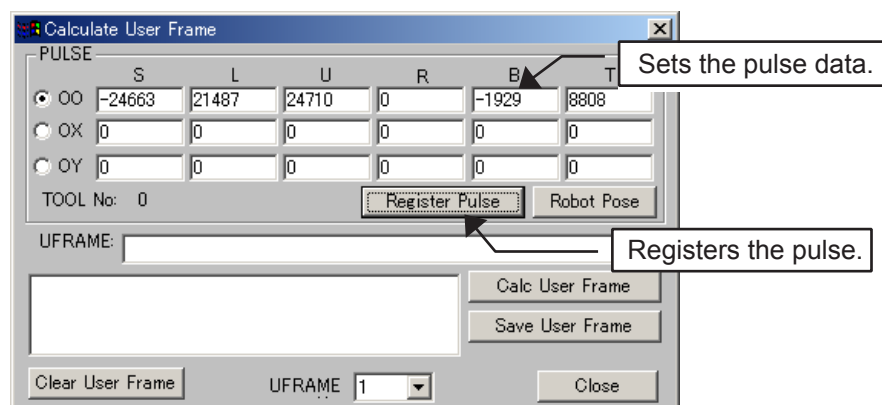
- Set the [UFRAME] to "1" and select the [OO] radio button in the "PULSE" section.



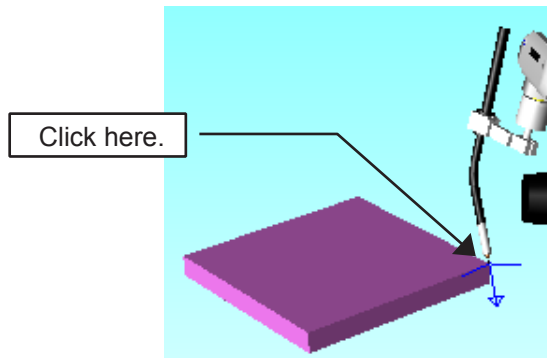
- Click on the vertex of the workpiece displayed in the cell window to move the robot tool to the vertex.



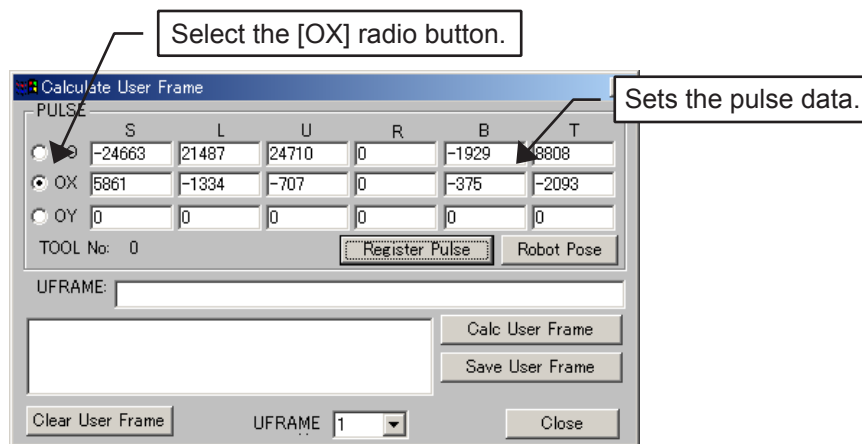
- With the tool end in position, click on the [Register Pulse] button in the Calculate User Frame dialog box.



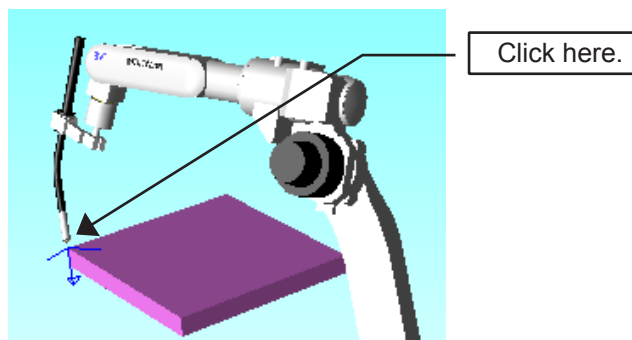
7. Click on the position of the workpiece in the cell window as shown in the figure below.



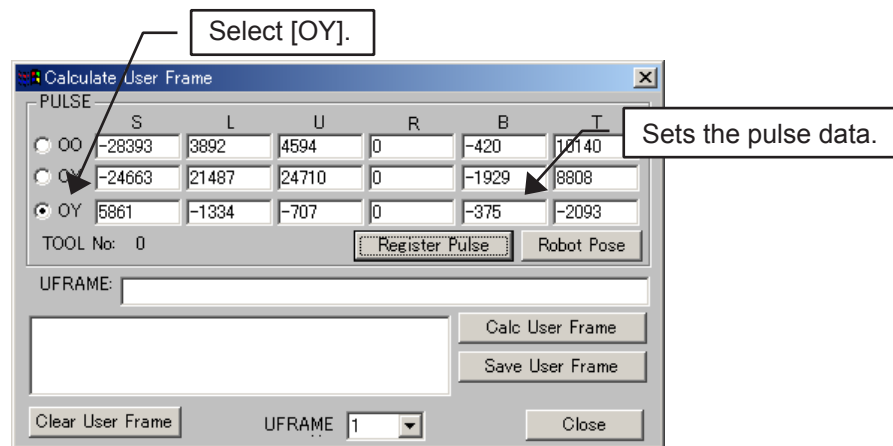
8. Select the [OX] radio button in the Calculate User Frame dialog box, and click on the [Register Pulse] button.



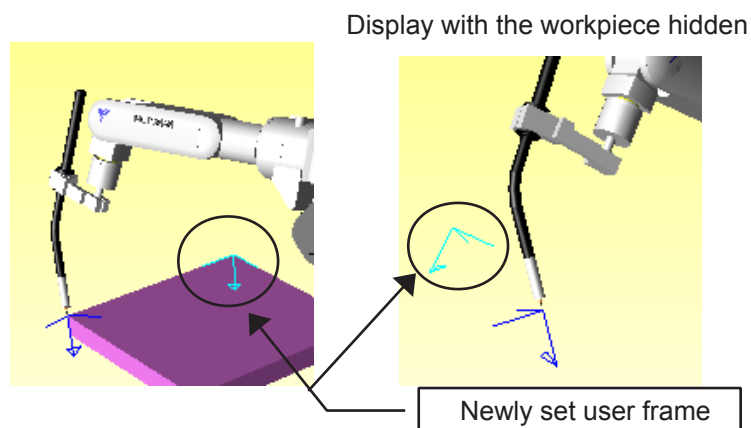
9. Click on the position of the workpiece in the cell window as shown in the following figure.




10. Select the [OY] radio button in the Calculate User Frame dialog box, and click on the [Register Pulse] button.

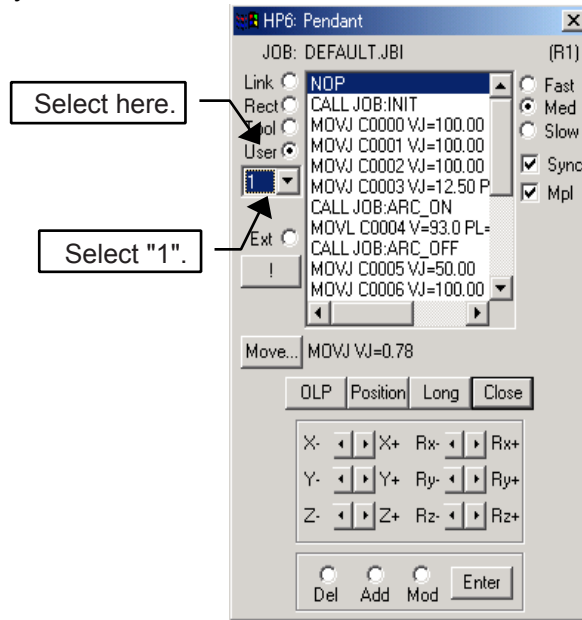


11. Verify that values are entered in the edit boxes [OO], [OX], and [OY], and click on the [Calc User Frame] button. The frame as shown in the figure below is displayed on the workpiece.

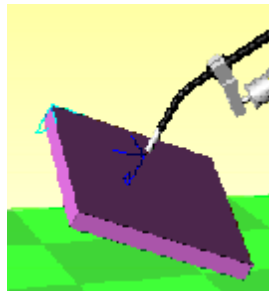


12. Click on  or select {Tool} - {P.Pendant} - {P.Pendant View} to display the Programming Pendant dialog box.

Select the [User] radio button and set the combo box located below the [User] radio button to "1" for the user frame No. With this setting, the coordinate system to move to robot with the X, Y and Z keys of the Programming Pendant dialog box becomes the coordinate system of the user frame 1.



13. Use the Programming Pendant diagram box to move along the X and Y axes, and the tool moves along the slant.

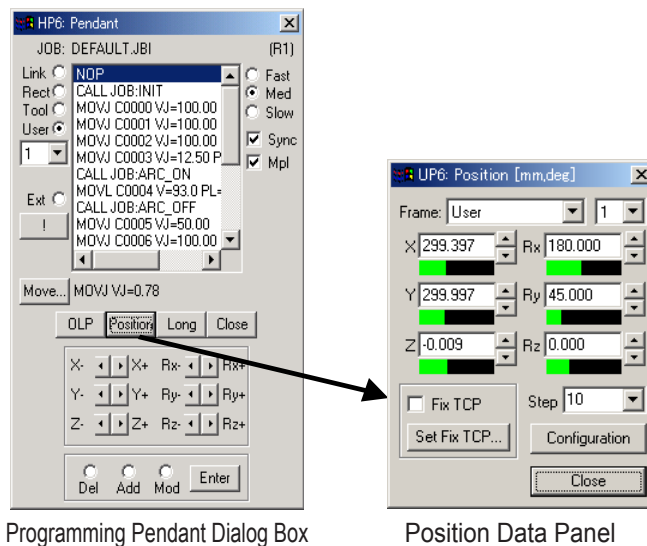


■ Moving with a User Frame

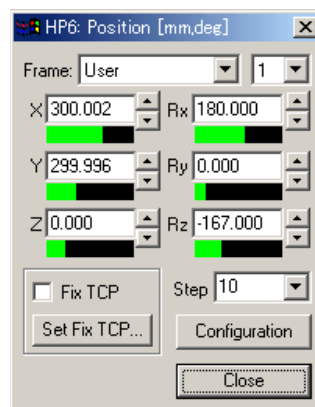
The following describe how to move the tool to the position: $(X, Y) = (300, 300)$ from the vertex of the user frame.

Procedure

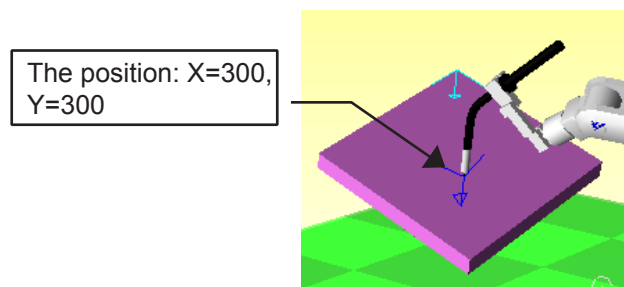
1. Click on the [Position] button of the Programming Pendant dialog box and then in the [Frame] combobox select "User". Select the desired user frame number in the combobox that appears next to the [Frame] combobox.



2. Set each value in the User#1 dialog box. In this example, set the values: $X=300$, $Y=300$, $Z=0$.



3. In the cell window, the tool moves to the coordinates: $(X, Y) = (300, 300)$ on the slant workpiece.



As described above, teaching can easily be performed with user frame, in situation otherwise difficult.

12.3 Trace Function

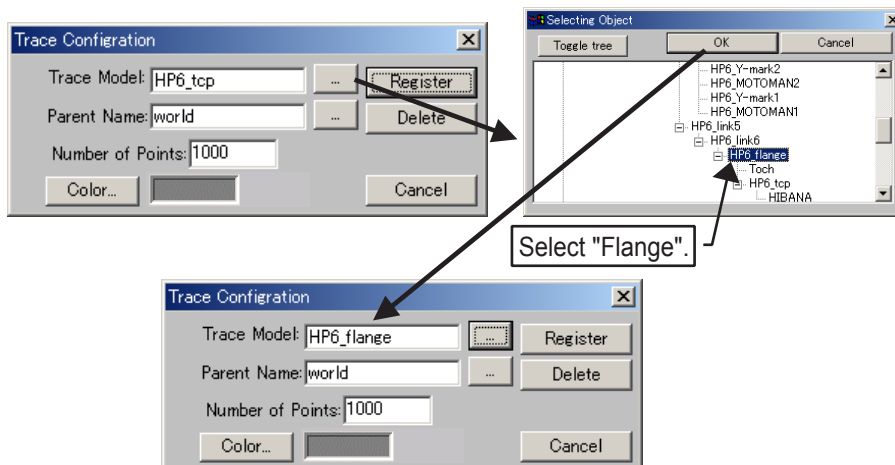
12.3.1 Changing Trace Object

The object normally traced is the tool end, however, the trace object can be changed. The trace object is changed to the flange in the following explanation.

Procedure

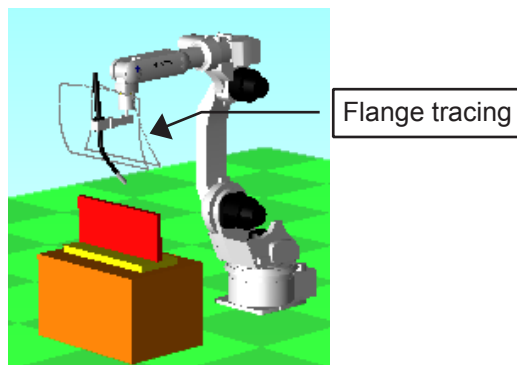
The procedure is explained with the "Arc_Samp_Nx.cel" example.

1. Select {Robot} - {Trace} - {Configuration...}.
Enter the model name to be traced in the [Trace Model] edit box. It can be entered either manually or by selecting it in the model tree. To display the model tree, click on the [...] button of the Trace Configuration dialog box, and select the desired model. Then click on the [OK] button. Make sure that the [Trace Model] edit box shows the selected model name and click on the [Register] button.

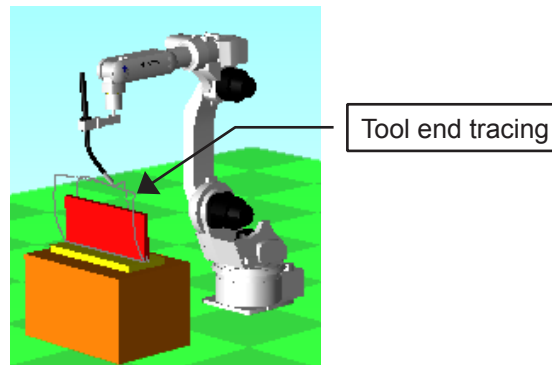


2. Execute an job.

Click on  to jump to the top of the job, and click on .



The following figure shows when the tracing point is a tool.




12.3.2 Changing Trace Parent

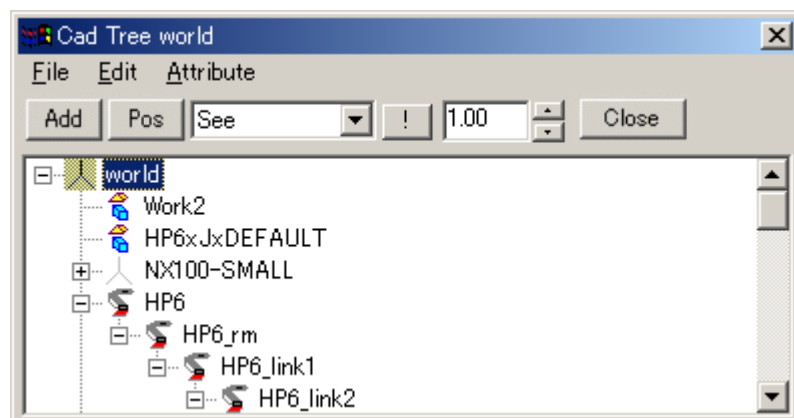
The tracking drawn by the trace function is normally created and drawn as a model having "world" as the parent. Therefore, changing the name of the "Parent" in the Trace Configuration dialog box will change the parent of the tracking. This parent changing function is useful in the following cases:

- Tracing welding point positions when the robot holds and moves a workpiece to a fixed welding points.
- Points to be traced are set to welding points.

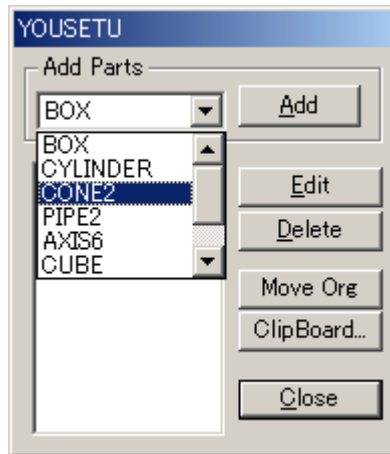
Procedure

The procedure is explained with the "Arc_Samp_Nx.cel" example.

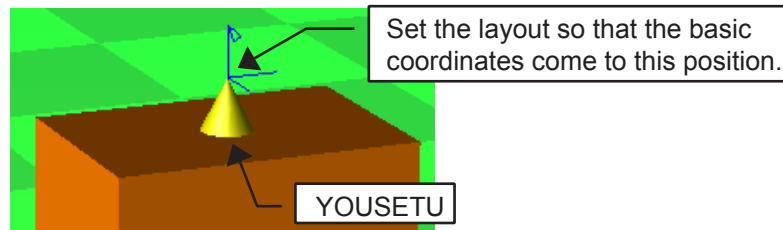
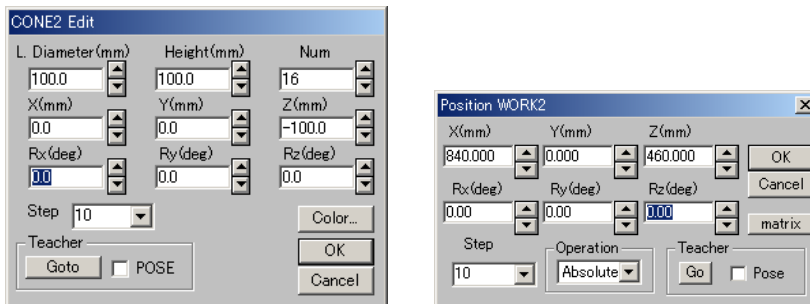
1. Display the Cad Tree by clicking on , or by selecting {Tool} - {CAD Tree}. To hide the "WORK" which is located on "DAI", select "WORK" to set it to "Hide".
2. Select "world" from the Cad Tree and click on the [Add] button to create the "YOUSETU" model.



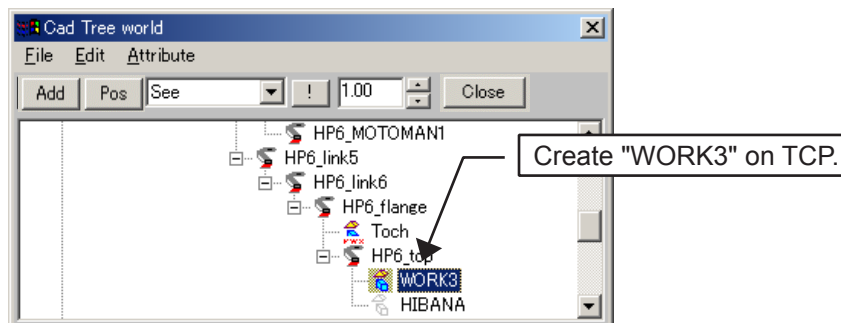
3. Add the "CONE2" model to "YOUSETU".



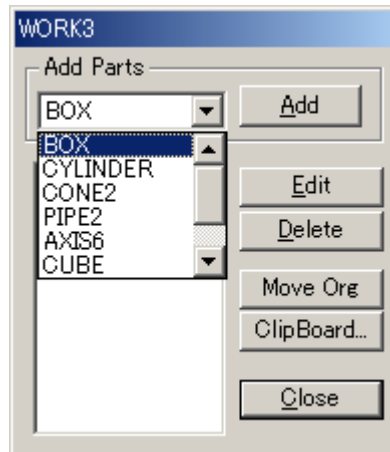
The following figures show "CONE2" and the layout setting.



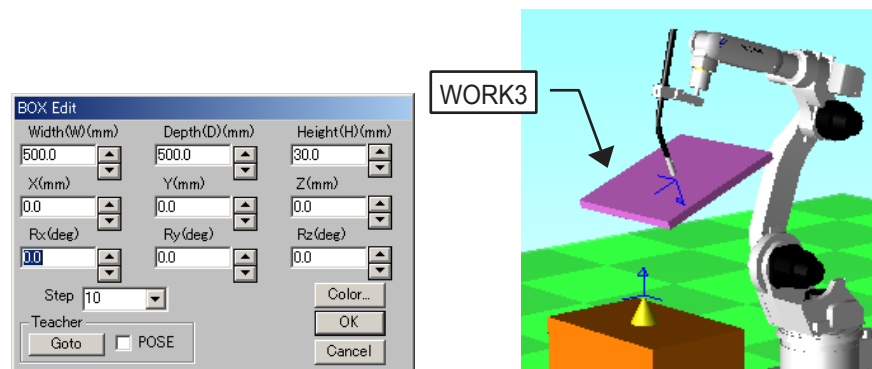
4. Create the "WORK3" model that has "TCP" as the parent.
Select "HP6_tcp" from the Cad Tree, then click on the [Add] button.



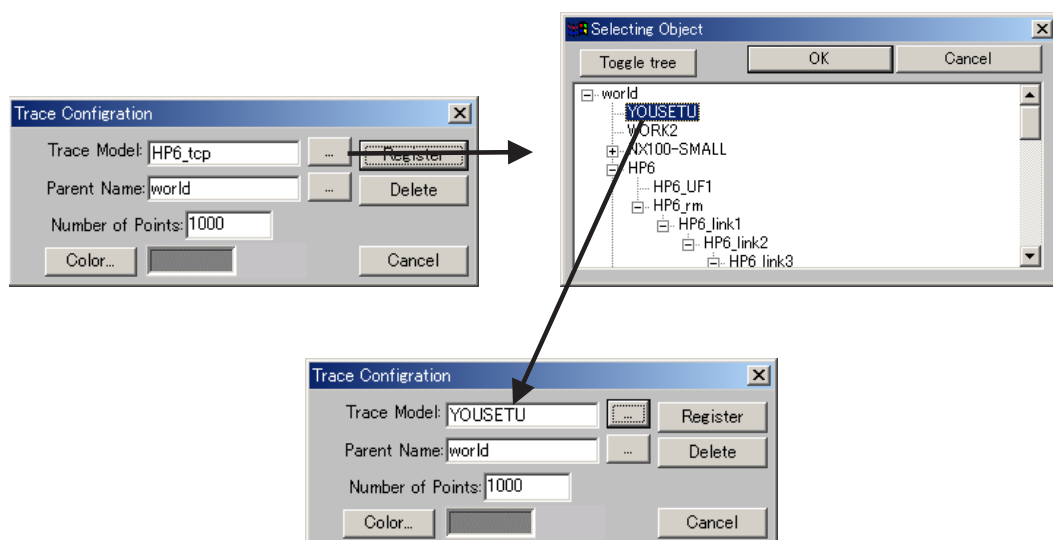
5. Add the "BOX" model to "WORK3".



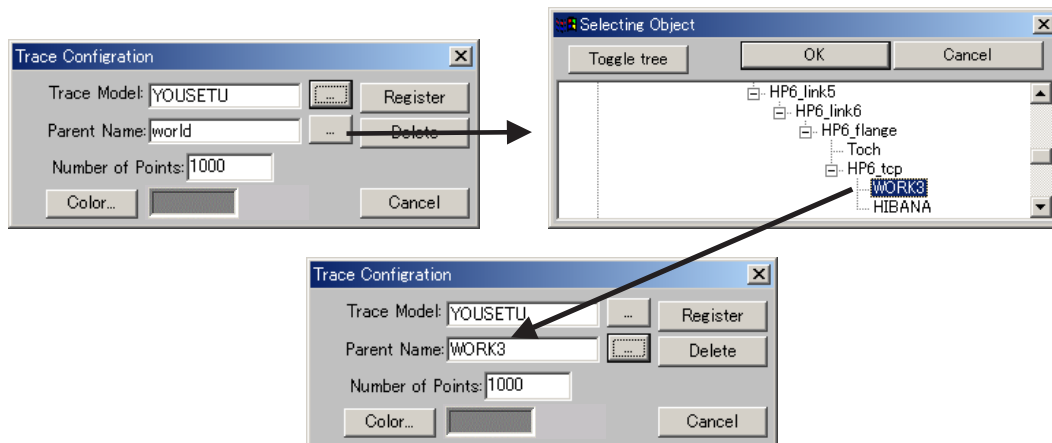
Set the BOX as follows.



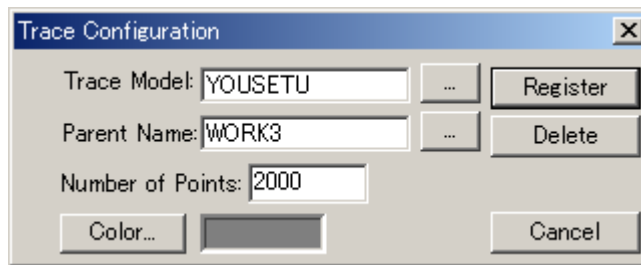
6. Select {Robot} - {Trace} - {Configuration...} to set the [Trace Model] edit box to "YOUSETU".




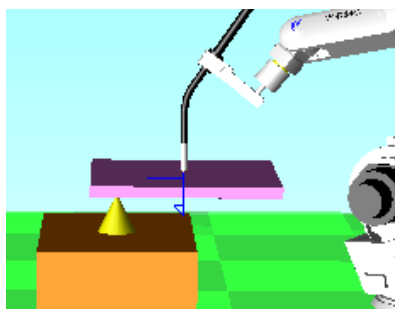
- To change the parent, set the [Parent Name] edit box to "WORK3".



- If nothing is entered in the [Number of Points] edit box, set a value. In this example, 2000 is set. (If the number of tracing points at execution exceeds the set value, tracing points are deleted in order from the oldest.)



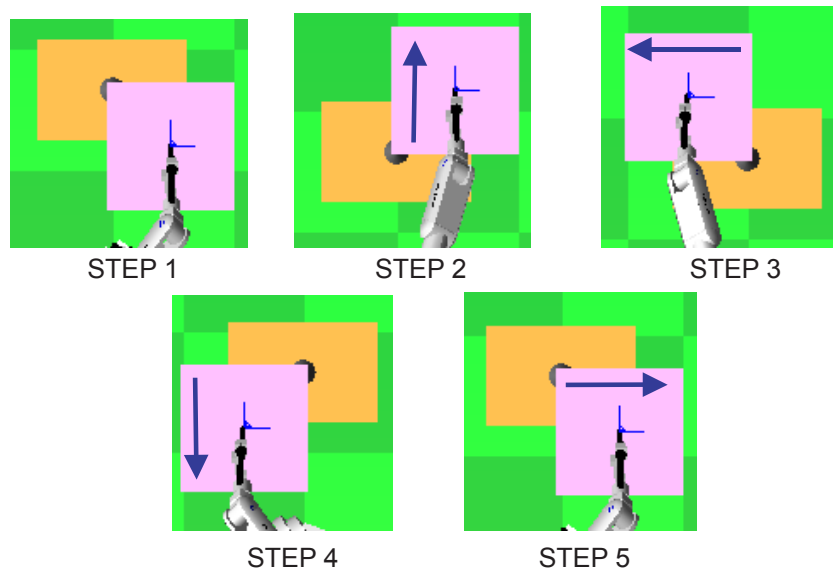
- The [Color...] edit box sets the tracing color. Set any desired color.
- Click on the [Register] button to save the setting.
- To create a new job, click on  or select {Robot} - {Controller} - {Select Job}.
- Display the Programming Pendant dialog box to create a job which welds four corners of a workpiece as shown in the following figure. Teach the positions of each STEP with MOVL instructions.



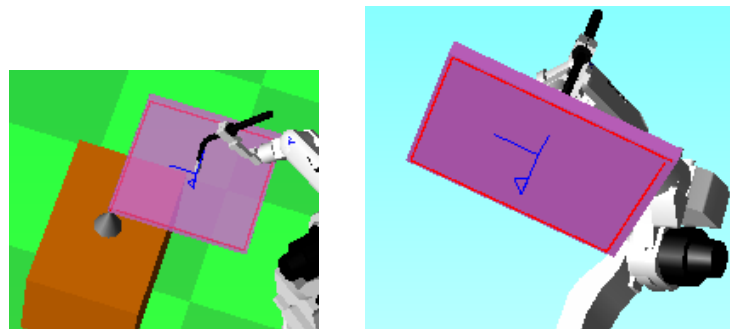
Initial State Viewed from Side



Initial State Viewed from Front



13. Execute the job and the tracing track attached to “WORK3” will be displayed. This helps to see which positions on the workpiece are to be welded.



As described above, changing the trace object and the parent with the Trace Configuration dialog box can leave the moving track of the target point that can be easily read.

12.4 Simulation of Multiple Robots

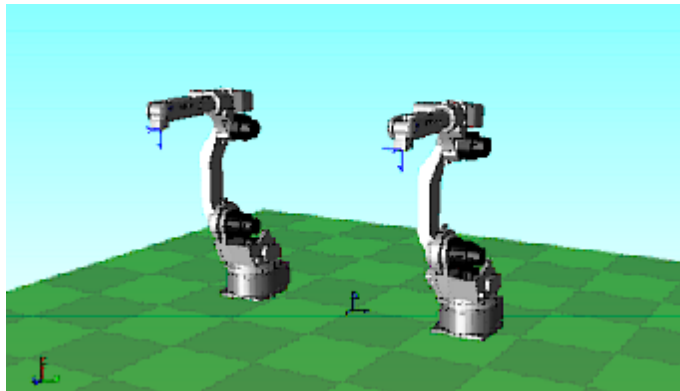
This section describes how to simulate a cell when multiple robots are registered.

12.4.1 Simultaneous Playback of Multiple Robot Jobs

Procedure


The procedure is explained by taking two robots as an example.

1. Create a new cell and place the robots as shown below.

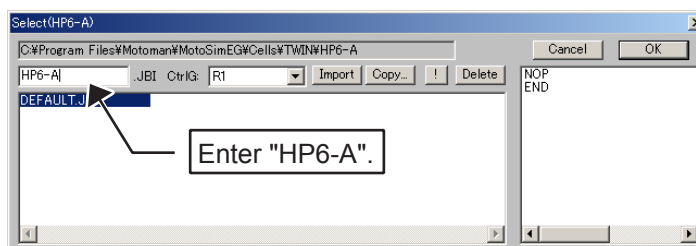



- Cell name : TWIN
- Robot model (common in both) : HP6-A00
- The 1st robot name : HP6-A
- The 1st robot position : X = 0, Y = 700, Z = 450
- The 2nd robot name : HP6-B
- The 2nd robot position : X = 0, Y = -700, Z = 450

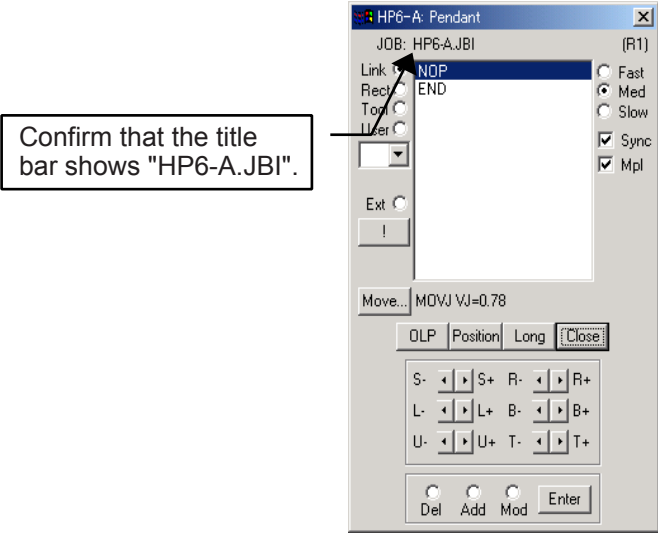
2. Create a job for "HP6-A".

Use the robot selection combo box  located in the "Robot" toolbar to set the active robot to "HP6-A".


3. Click on  or select {Robot} - {Controller} - {Select Job} to create a new job "HP6-A".



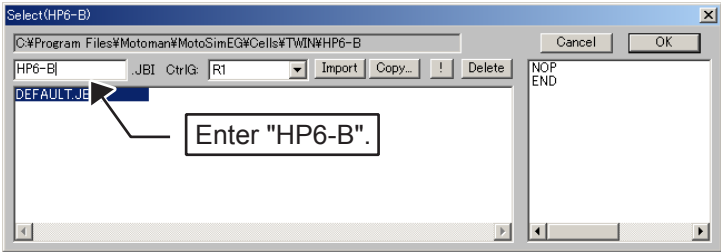
- 4. Click on  to display the Programming Pendant dialog box. Confirm that the title bar of Programming Pendant dialog box shows "HP6-A.JBI", then create any desired job.






- 5. Create a job for "HP6-B".

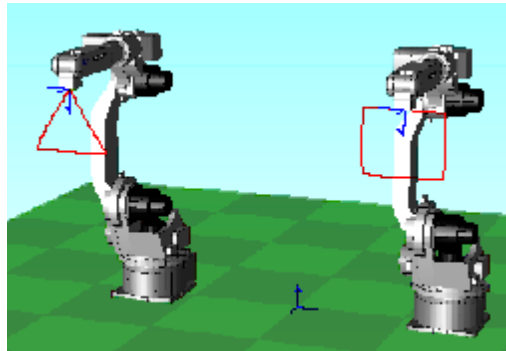
Use the robot selection combo box  located in the "Robot" toolbar to set the active robot to "HP6-B".

- 6. Click  on or select {Robot} - {Controller} - {Job Select} to create a job "HP6-B".



- 7. Create any desired job for the robot "HP6-B" in the same manner as "HP6-A". If the "Multiple Robot Display" mode is enable, click on  to display the Programming Pendant dialog box for the "HP6-B" robot.

8. Click on  then  to execute jobs.
Two robots start executing each job at the same time.

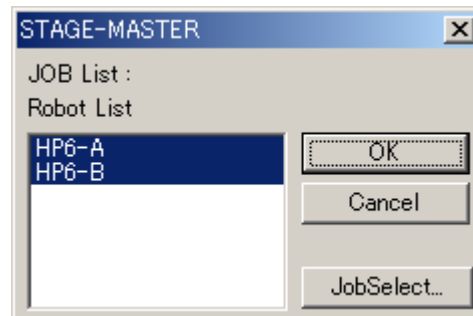


12.4.2 Selection of Simulation Robots

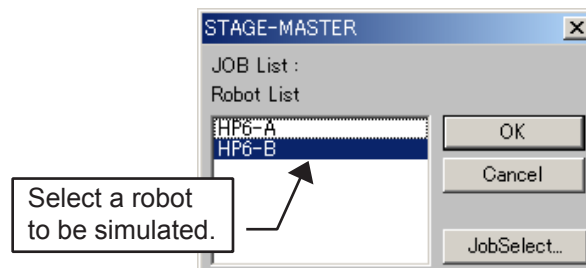
In the case that more than one robot is provided, the robots active for simulation can be selected with the “Stage-Master” function.



Procedure

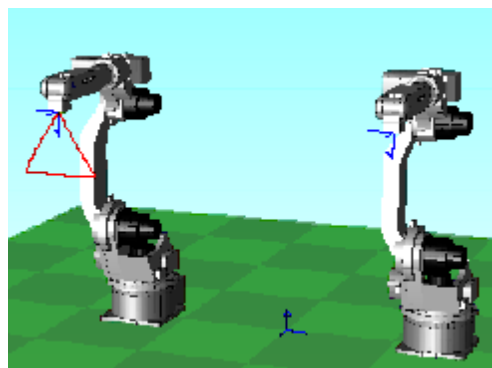
1. Select {Tool} - {StageMaster}.



2. Select a robot to be simulated.
Click on the robot name to highlight it.



3. Click on the [OK] button to close the Stage-Master function. Click on  then  to execute a job. Only the robot selected in the Stage Master will execute its job.

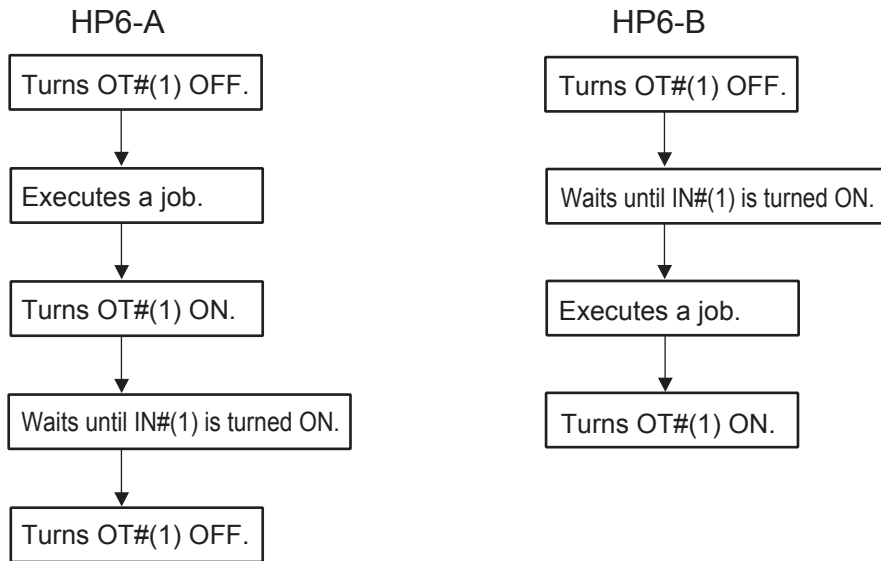


12.4.3 Synchronization between Robots

When a series of operation is performed by multiple robots, the robot actions may be synchronized.

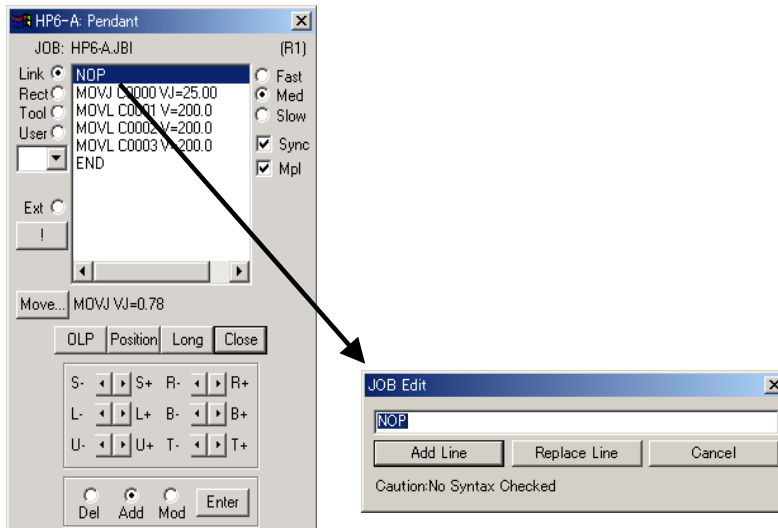
Synchronization between robots is achieved by monitoring I/O signals. In the following example, "HP6-B" is set to start moving once "HP6-A" finishes its operation.

The following shows the job flow charts.

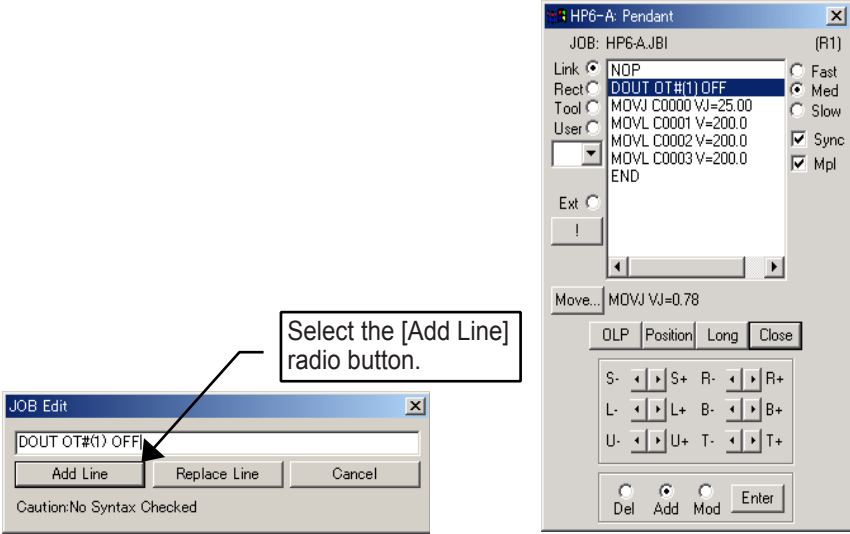


Procedure

1. Click on to display the Programming Pendant dialog box. Select "HP6-A" in the [Robot] combo box.
2. Double-click at "NOP" to display the JOB Edit dialog box.

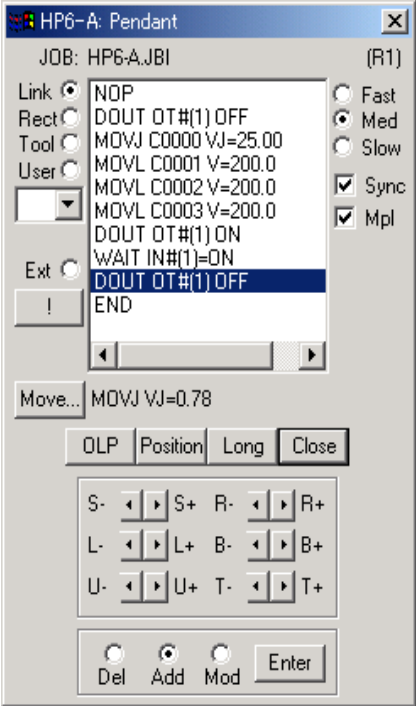


- 3. Enter "DOUT OT#(1) OFF" in the edit box of the JOB Edit dialog box. Click on the [Add Line] button.



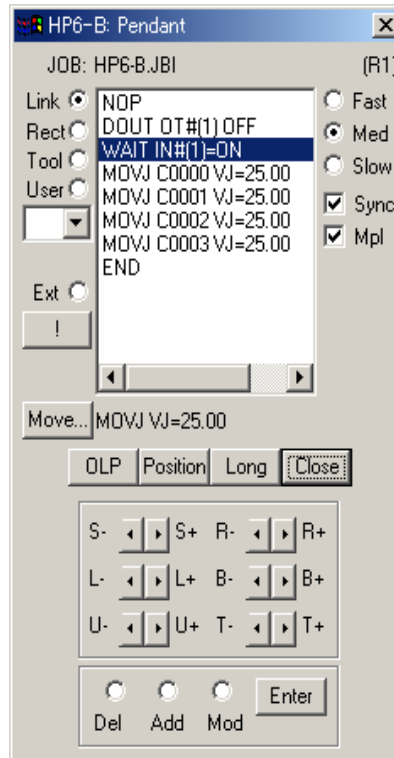
- 4. Add the following three lines after the last instruction "MOVJ".

DOUT OT#(1) ON
WAIT IN#(1)=ON
DOUT OT#(1) OFF



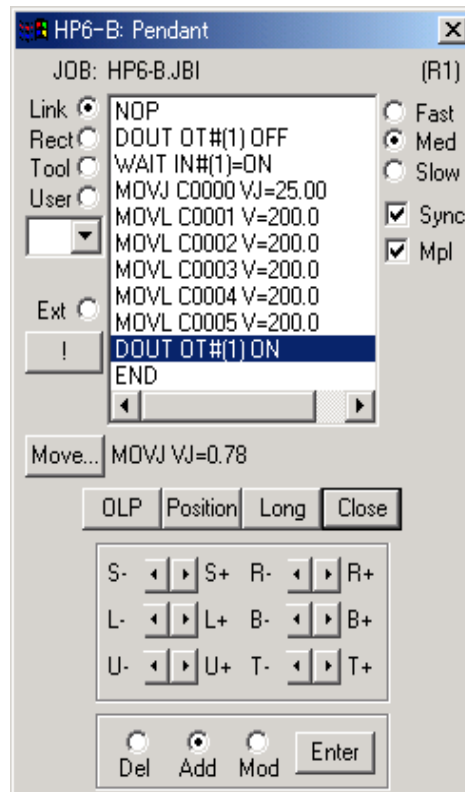
5. Select "HP6-B" in the [Robot] combo box to add the following two lines.

DOUT OT#(1) OFF
WAIT IN#(1)=ON



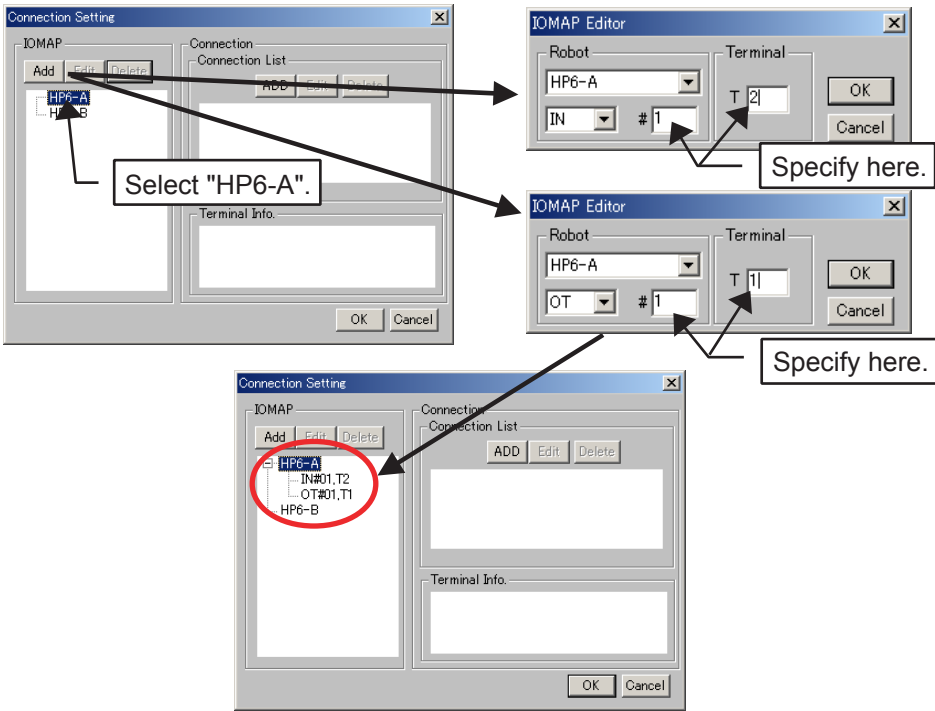
6. Add the following line after the last instruction "MOVJ".

DOUT OT#(1) ON

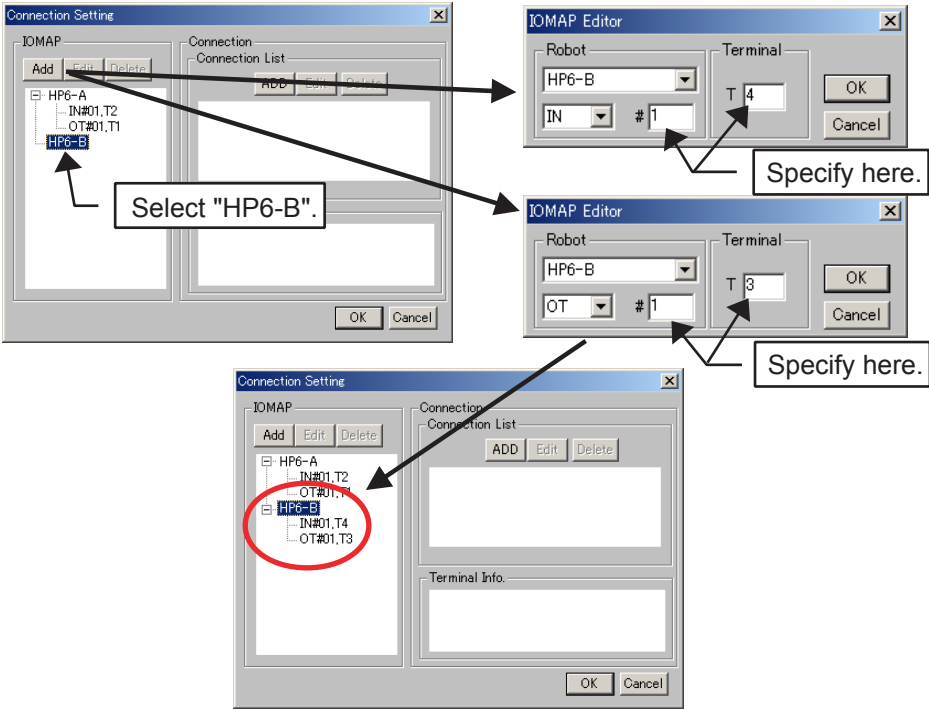


7. Set I/O signals.

Select {Tool} - {Monitor} - {I/O} - {Connection Setting} to open the Connection Setting dialog box, then select "HP6-A". Click on the [Add] button of the Connection Setting dialog box to add two connections between the robot and the sequencer.

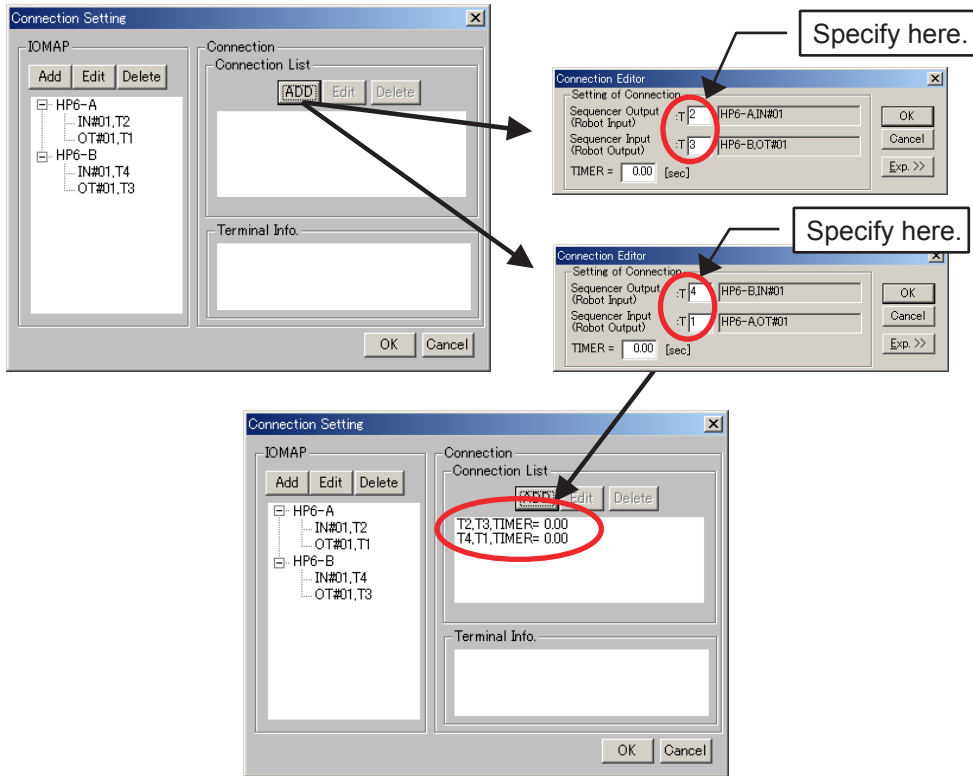


8. Select "HP6-B" in the Connection Setting dialog box. Click on the [Add] button to add two connections between the robot and the sequencer.



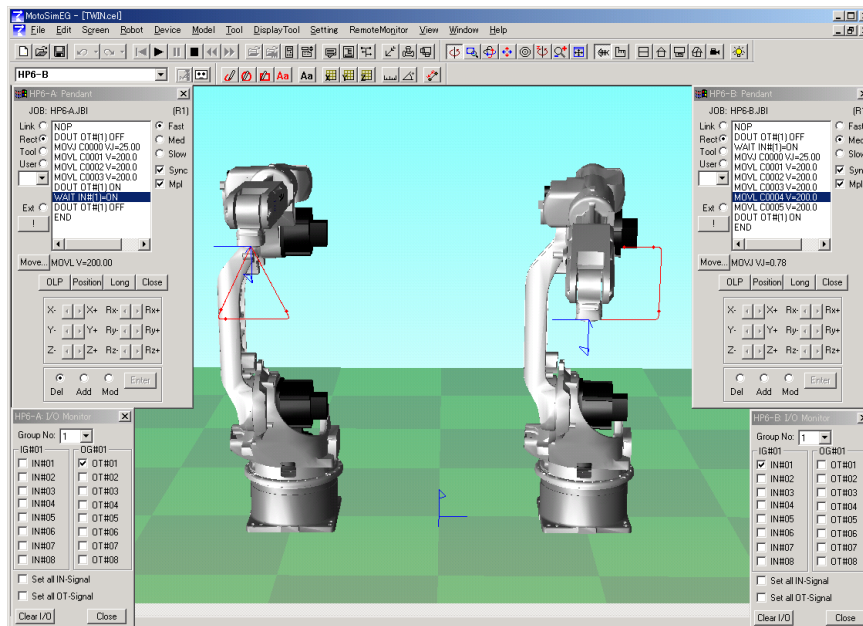
12.4 Simulation of Multiple Robots

9. Add two connections in the sequencer as follows.

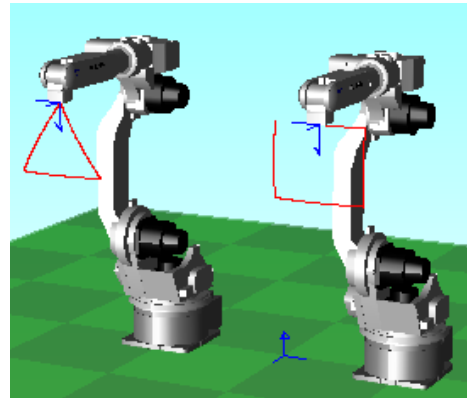
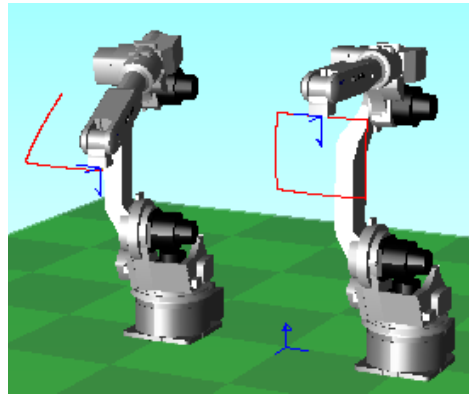
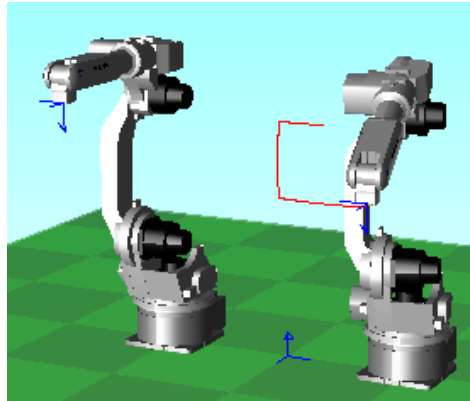


10. Click on the [OK] button.

11. Reset the cell and execute the jobs. Enabling the "Multiple Robot Dialog" option allows displaying an I/O Monitor and a Programming Pendant for each robot. This may help you to read the sequence more easily.



12. Execute a job and "HP6-A" starts moving first. "HP6-A" turns OT#(1) ON. When "HP6-A" comes to the waiting status, IN#(1) is turned ON and "HP6-B" starts moving.



12.5 External Axes Setting

When a parameter file defines a robot with external axes, MotoSim EG internally creates the required external servotrack and external rotating axis in accordance with the parameter setting when the cell is opened.

12.5.1 External Rotating Axis

If parameters are set as a robot with external rotating axis, MotoSim EG internally creates a rotating axis frame model under the name of “*robot name_ex1* (for the first axis on the external turntable)” once the cell is opened.

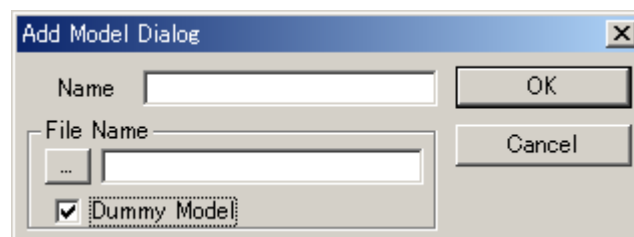
For the second and third axes, the frame models are created under the name of “*robot name_ex2*” and “*robot name_ex3*” respectively; all the axes that follow are provided with names in the same way.

If any model rotates together with rotation of the rotating axis, register the model with the following procedure.

Procedure

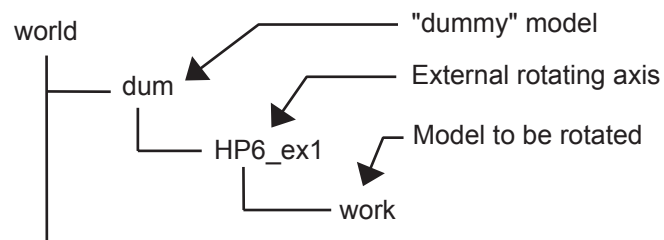
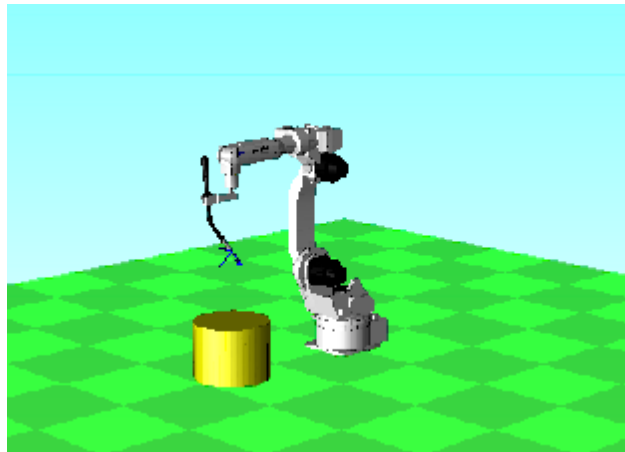
1. The parent model of rotating axes is set to “world” by default. First, register a dummy model to facilitate positioning, then place this model in any position on the world frames.

When creating a new model, check the [Dummy Model] check box of the Add Model dialog box to create the dummy model.



2. Change the parent model of the rotating axis (rotating axis base model) which is set to “world” to the dummy model (e.g. Dummy) to facilitate positioning. Select {Attribute} - {Parent Move} to change the parent model.

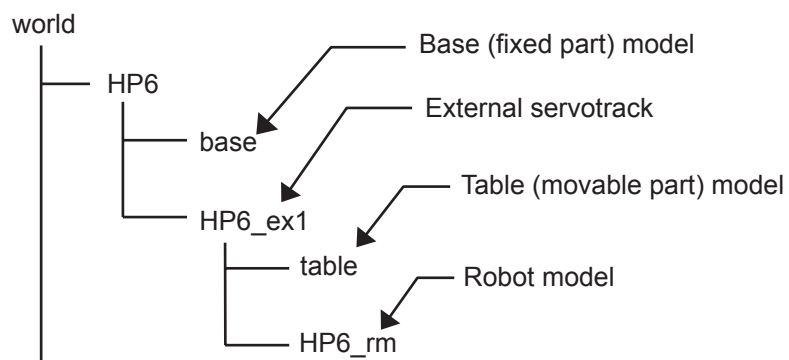
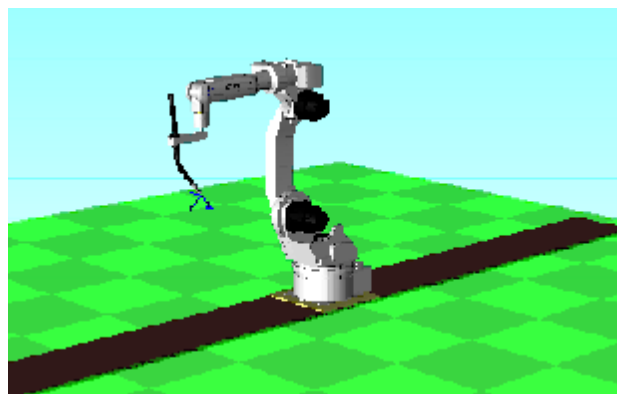
3. Create a model to be rotated and register the parent model as a rotating axis.



12.5.2 External Servotrack

If parameters are set as a robot with external servotracks, the MotoSim EG internally creates a servotrack frame model under the name of “*robot name_ex1* (for the first servotrack)” once the cell is opened.

If any model moves together with the servotrack, register its parent model as an external servotrack.



12.6 Simulation of Non-Robot Models

12.6.1 Simulation of Non-Robot Models

MotoSim EG can also perform operation simulation of models other than robot models by using the following keywords in INFORM (robot language) comments. These simulations are useful for handling, palletizing, etc.

For model names which are used in the following comments, models can be designated not only by the usual model names but also by specifying variable values. The variable names to be used as part of the model names are indicated in [] to distinguish them from the usual model names.

Example) WORK_[I000] : If I000 is 1, it is recognized as "WORK_001".

◆ Model Copy 1

Notation 'MDL:DUP M1 M2

Meaning Copies (duplicates) the model M1 to create M2.

Note If MotoSim EG is closed without deleting the copied model, the description (information on arrangement, etc.) is written in to the cell.
The copied model will reference the same model data file (.mdl) as the original model.

◆ Model Copy 2

Notation 'MDL:REF M1 M2

Meaning Copies (references) the model M1 to create M2.

Note If MotoSim EG is closed without deleting the copied model, the description (information on arrangement, etc.) is not written in to the cell.

◆ Model Move 1

Notation 'MDL:MOV M1 M2

Meaning Moves the model M1 in the Cad Tree to change its parent to M2 without changing the model location on the display. The model position from its new parent is adjusted so that its location does not change in regards to the world.

◆ Model Move 2

Notation 'MDL:ADDX6 M1=10,20,30,0,0,0

Meaning Moves the model M1. The position from the parent is changed by adding (10,20,30,0,0,0) to the current position.

◆ Model Move 3

Notation 'MDL:AXIS6 M1=10,20,30,0,0,0

Meaning Moves the model M1. The position from the parent is changed to (10,20,30,0,0,0).

◆ Model Deletion

Notation 'MDL:DEL M1

Meaning Deletes the model M1.

◆ Model Display

Notation 'MDL:SEE M1

Meaning Displays the model M1.

◆ Model Non-display

Notation 'MDL:HID M1

Meaning Hides the model M1.



These simulations are valid only in the playback mode.

12.6.2 Translational Motion Setting for External Rotating Axis

The MotoSim EG allows you to set an external rotating axis of a robot so that the external rotating axis moves in a translational motion like for a servo gun, etc.

The following procedure describes an example to set the external rotating axis as the cylinder of a spot gun. (In this example, the setting for the spot gun cylinder is assumed to be completed.)

Refer to " 12.5.1 External Rotating Axis " for the external axis settings.

Procedure

1. Open a cell file with Notepad (or similar text editor) to define the robot settings in a block of "CELL_INIT" command. The following shows an example.

```
Manipulator
{
TASK=LINER32.DLL ROBOT=ES165N LINK=6 FUNCA1=1.0 FUNCA2=100.0 FUNCB=0.0 MODEL=YASKAWA AXIS6NO=2
}
```

- TASK : LINER32.LL
- ROBOT : Name of the robot with external rotating axes
- LINK : Axis No. for the robot with external rotating axes (begins with 0.)
E.g. The LINK is "6" in the case that the first external rotating axis is set to operate as the cylinder of a spot gun under the robot name "ES165N".
- FUNCA1 : Moving amount (mm) to the standard pulse amount
- FUNCA2 : Standard pulse amount (pulse)

How to calculate values of FUNCA1 and FUNCA2


[For a ball-screw driven axis]

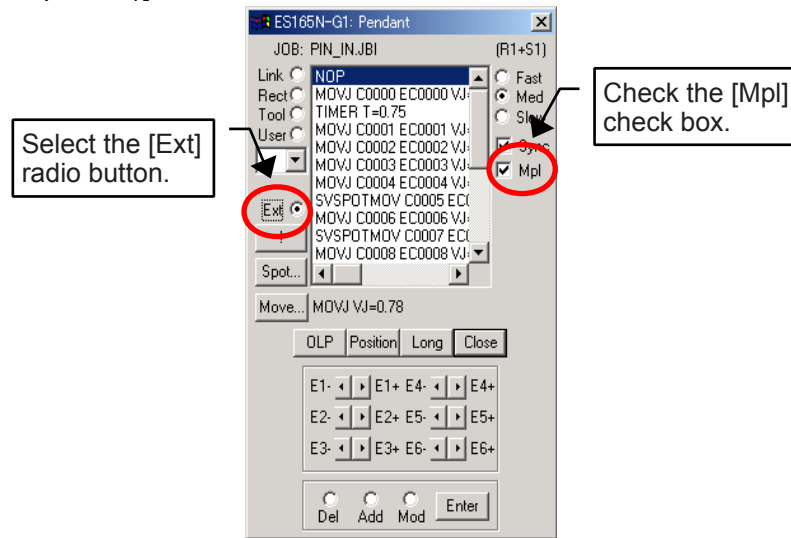
$$\text{Ball screw pitch} \times \frac{1}{\text{Feedback PPR}} \times \frac{\text{Speed reduction ratio (numerator)}}{\text{Speed reduction ratio (denominator)}} = \frac{\text{FUNCA1}}{\text{FUNCA2}}$$

[For a rack & pinion driven axis]

$$\pi \times \text{Pinion diameter} \times \frac{1}{\text{Feedback PPR}} \times \frac{\text{Speed reduction ratio (numerator)}}{\text{Speed reduction ratio (denominator)}} = \frac{\text{FUNCA1}}{\text{FUNCA2}}$$

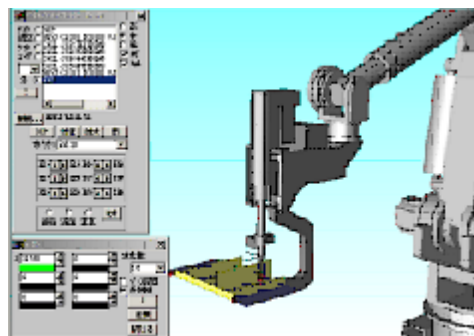
- FUNCB : Initial moving amount (mm) (Note: Y=(A1/A) * X+B)
- MODEL : Name of the model to be moved
- AXIS6 NO : Direction to move (0: X, 1:Y, 2:Z)

- Click on  or select {Tool} - {P.Pendant} - {P.Pendant View} to display the Programming Pendant dialog box. Select the [Ext (external axis)] radio button and check the [Mpl (Manipulator)] check box.



The spot gun cylinder always moves during the playback of a simulation. However, it does not move when the robot is operated with the Programming Pendant dialog box if the [Mpl] check box is not checked. Make sure to check the [Mpl (manipulator)] check box to move the cylinder.

- Move the robot and spot gun cylinder portion to teach the target position, then create a job.



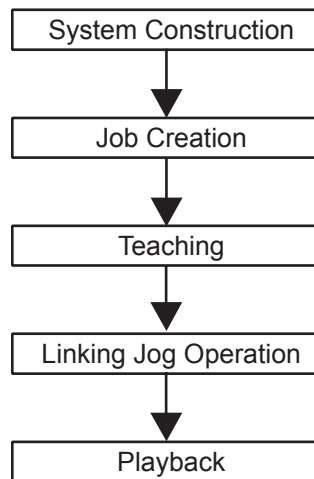
12.7 Station Coordination Function

The Station Coordination function consists of job teaching and playback for station coordination job, an automatic environment construction function using a calibration file, a synchronized jog function, and a twin drive function.

This function can be used to construct and verify off-line teaching environment for arc welding or similar application using external axis servo station.

12.7.1 Operational Flow

The following flowchart shows necessary steps to construct an environment for the station synchronous motion.




12.7.2 System Construction

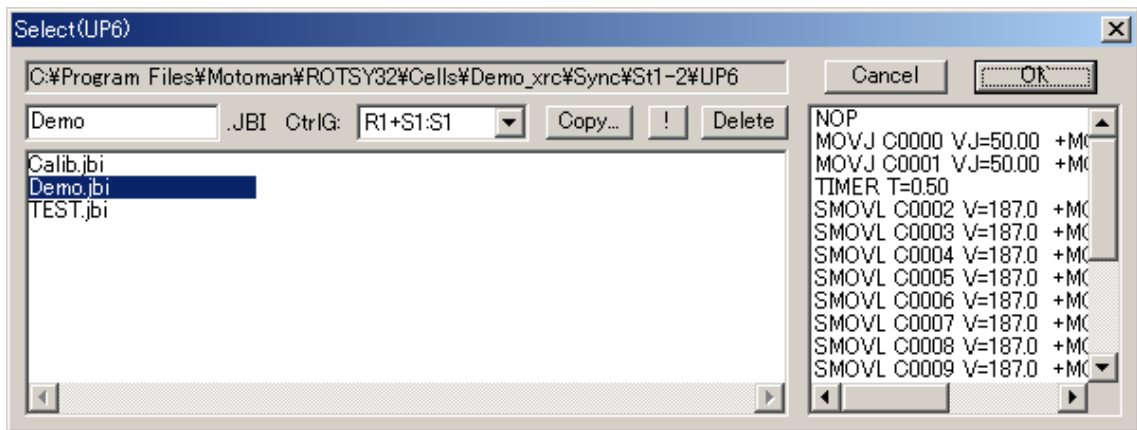
After creating a new cell and registering a robot, build an external axis as a station. Refer to " 7.4.5 Setting the Robot Calibration " for detailed procedure.

12.7.3 Job Creation

Procedure

Click on  or select {Robot} - {Controller} - {Select Job}.

Enter a new job name in the edit box and select a control group from the [CtrlG] combo box. Then click on the [OK] button.



A control group of existing jobs cannot be modified. Create a new job.

12.7.4 Teaching

■ MOVE Instruction

MOVE instructions are taught in the same way as ordinary teaching except that SMOVL and SMOVC are added to the regular type of MOVE instructions that can be selected in the interpolation dialog box.

Control Group	Display of MOVE Instructions
R1	MOVJ C0000 VJ=50.00
S1	MOVJ EC0000 VJ=50.00
R1+S1	MOVJ C000 VJ=50.0 +MOVJ EC000 VJ=50.0 ^{*1}
R1+S1:S1 (means S1 master.)	MOVJ C000 VJ=50.0 +MOVJ EC000 VJ=50.0 ^{*1} SMOVL C000 V=500.0 +MOVJ EC000 ^{*2}
NONE	Any MOVE instruction cannot be taught by a job.

^{*1} If MOVJ+MOVJ is used to set the speed for the robot and the station individually, double-click the MOVE instruction to change the desired speed.

MOVJ C000 VJ=50.0 +MOVJ EC000 VJ=80.0

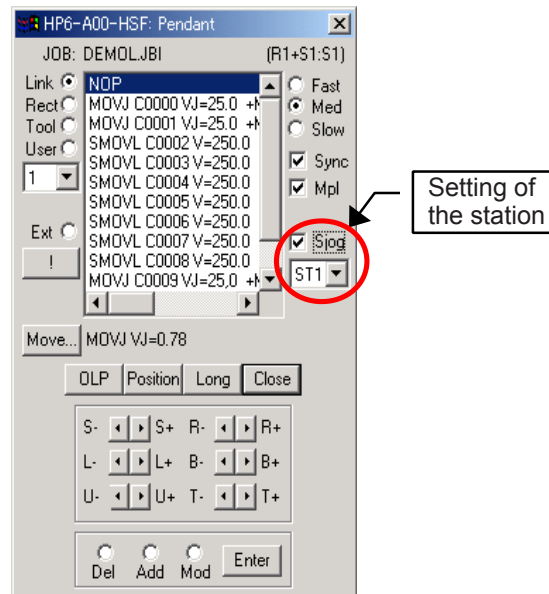
^{*2} The station speed for the SMOVL and SMOVC instructions cannot be specified.

12.7.5 Synchronized Jog Operation

A synchronized Jog operation is a motion where the robot (slave) is moved by following the station (master) when the master is moved. This function is used to hold the relative position of the robot with the station. However, if the slave side is moved, the master side does not move.

Procedure

1. Display the Programming Pendant dialog box.
 2. Check the [Sjog] check box then select the station to be linked with the robot.
 3. Select the [Ext (external axis)] radio button to operate the external axis.
- The robot starts moving in conjunction with the station.

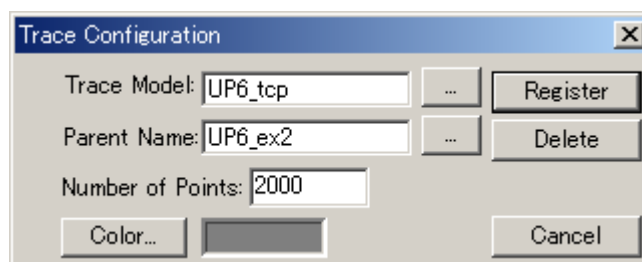


Perform the following operations to automatically update the relative position of the master and the slave.

- Click on the MOVE instruction of a job.
- Move to the target position.
- Perform a JOG operation with any axis other than external axes.

12.7.6 Playback

Playback can be done in the same way as any standard procedure except that to make the motion path easier to see, the motion path can be drawn on the station by using the trace configuration function to specify the top axis of the station as the parent model.

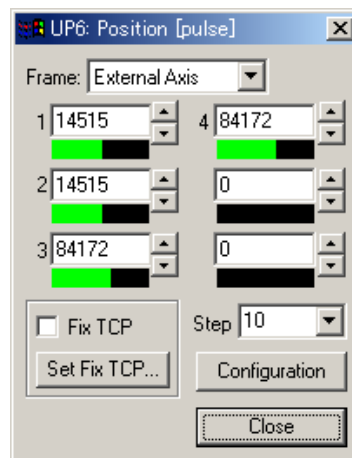


12.7.7 Twin Drive Function

MotoSim EG supports the twin drive option. If this option enables the parameter file (All.prm), the external axes of each station move in the same pulse count.

Item	Set Value	Function
FD35	1	Twin drive function option

The following “Extern” dialog box shows an example of a twin drive having two 2-axis stations. The first external axis is linked to the second axis, and the third external axis is linked to the fourth axis.



12.8 Conveyor Synchronization Function

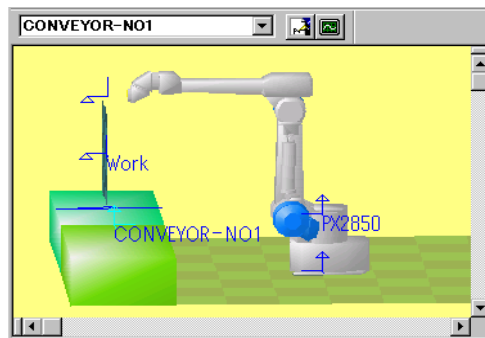
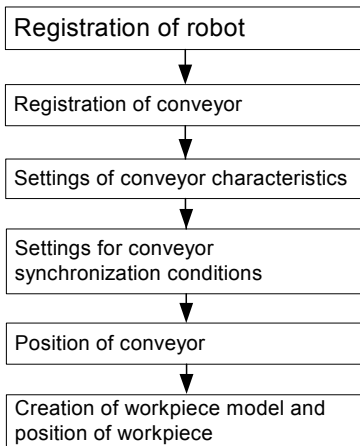
The conveyor synchronization function consists of a conveyor simulation function, teaching and playback function for conveyor synchronization jobs, a painting instruction editing function, and a spray model display function.

This function is used to construct and review offline teaching environment for painting applications.

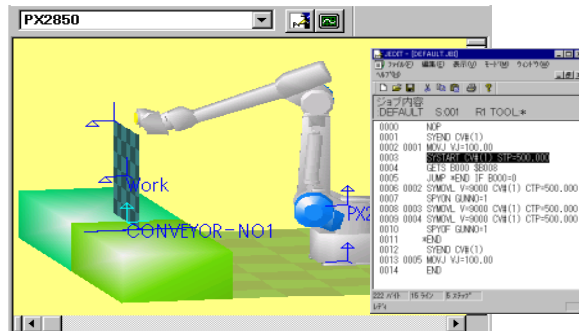
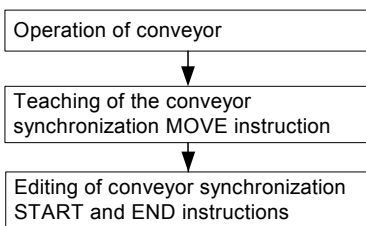
12.8.1 Operation Flow

The following flowcharts briefly describe how the environment is constructed. The figure on the right is an image of the process.

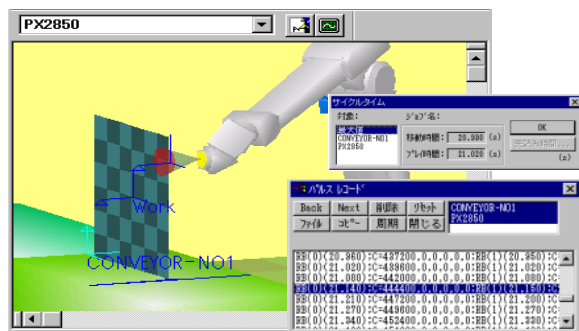
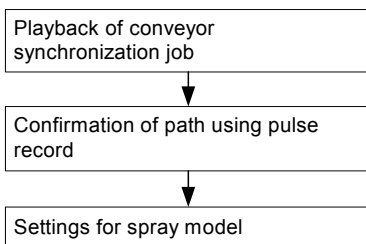
System Construction



Teaching



Playback



12.8.2 System Construction

This section describes how to construct an environment where a conveyor synchronization job can be created after a new cell is created.

■ Registration of Robot

Register the robot according to the procedure described in " 7.1 Adding/Deleting a Robot ". The robot to be registered must have the following option parameter settings (All.prm). If these options are set properly, the painting function will operate correctly. (The PX series parameters that are supplied with MotoSim EG are already set properly.)

Item				Set Value	Function
FS100	DX100	NX100	XRC		
FS20	FD20	FD20	FD20	1	Conveyor synchronization function option
S3D249	S3D249	S3D111	S1D240	16	SL function selection
S3D257	S3D257	S3D115	S1D244	1	Robot 1 SL selection
-	S3D227	S3D119	S1D247	4	Robot 1 application selection (painting)



When the robot's location is changed, the user-frame's position is also changed automatically. Update the conveyor's location to return the user-frame's position to the original position.

Follow the procedure below to update the conveyor's position:

1. Display the Cad Tree to select a conveyor.
2. Click on the [Pos] button to display the Position dialog box. Then, click on the [OK] button and the user frame returns to its original position.

■ Registration of Conveyor

Refer to in " Registering a Conveyor " in " 10.1 Conveyor " to register a conveyor.

■ Settings for Conveyor Characteristics


Refer to " Editing a Conveyor " in " 10.1 Conveyor " to set the conveyor characteristics.

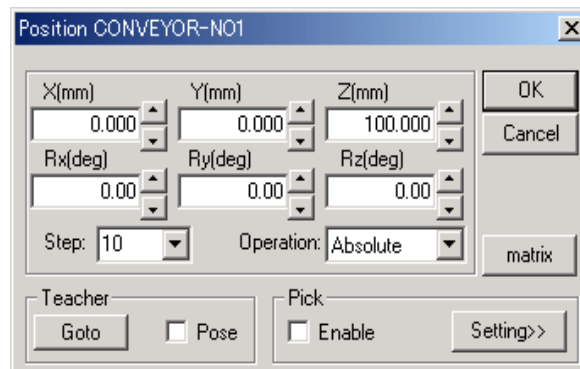
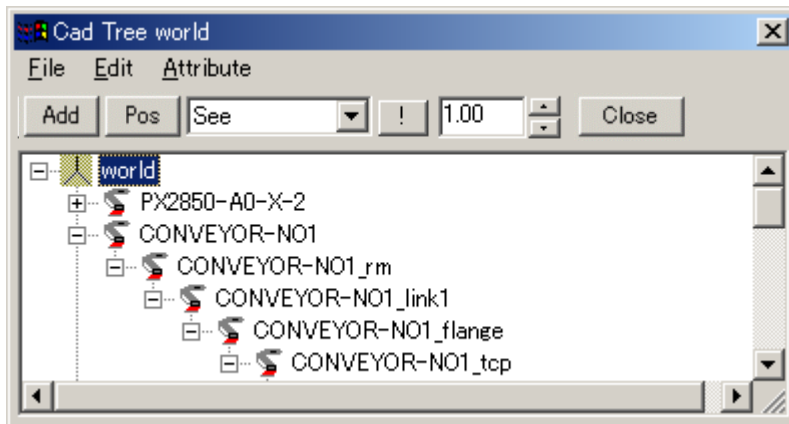
■ Settings for Conveyor Synchronization Conditions

Refer to " Setting the Conveyor Synchronization " in " 10.1 Conveyor " to set the conveyor synchronization conditions.

Layout of Conveyor

Procedure

1. Click on , or select {Tool} - {CAD Tree} to display the Cad Tree. Then select the conveyor model: "CONVEYOR-NO (CONVEYOR-NO1 in the following example)."
2. Click on the [Pos] button to display the Layout dialog box. Then enter any desired position for the conveyor.



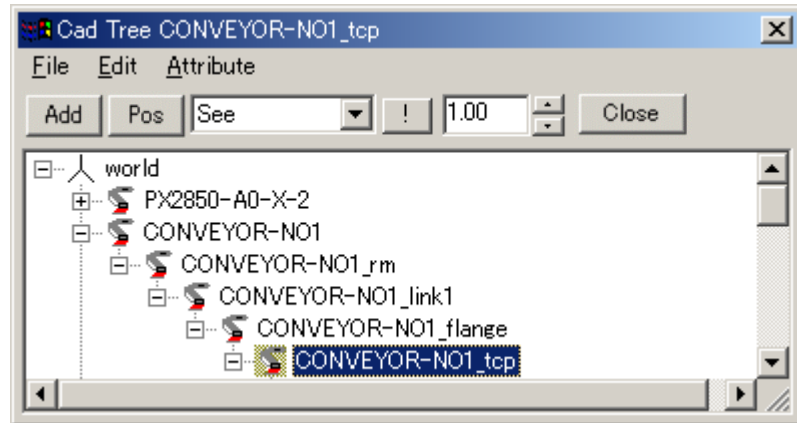
3. When the conveyor is in the desired position, click on the [OK] button. Then, the robot with the conveyor synchronization function automatically creates a user frame in the new position of the conveyor with the user frame number corresponding to the conveyor number.

■ Creation of Workpiece Model and Position of Workpiece

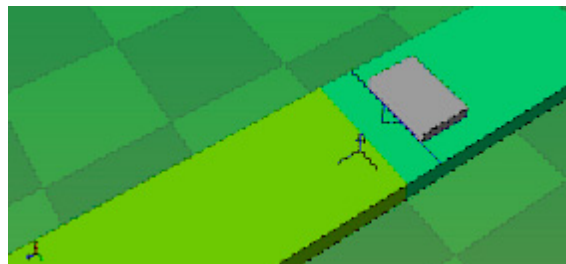
Place a workpiece on the conveyor

Procedure

1. Create a workpiece model with “conveyor name_TCP” as the parent.



2. Place the workpiece on the side opposite to the mark ∇ along the line as shown in the following figure. The mark ∇ indicates the direction in which the conveyor advances. When this line passes the conveyor's home position (or if SYSTART instruction specifies STP, when this line passes the position specified by the STP), synchronization of the conveyor starts.



12.8.3 Teaching

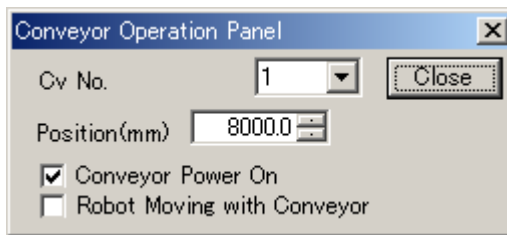
■ Operation of Conveyor

Two methods to operate the conveyor are available:

- To operate a conveyor with a single axis.
- To operate a conveyor with any number of axes.

Operating a Single-Axis Conveyor

1. Select {Device} - {Conveyor} - {Operation Panel} to display the Conveyor Operation Panel dialog box. Then select/enter any numerical value in the “Position(mm)” combo box to move the conveyor position, and adjust the workpiece position so that the robot can easily be taught.



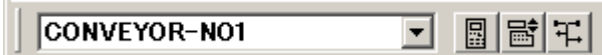
Conveyor Operation Panel

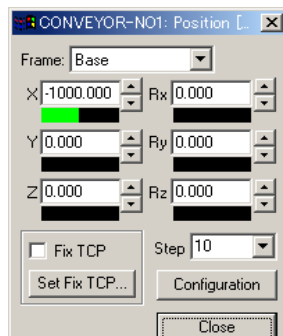
Item	Description
[Conveyor Power On] check box	Enables verification of conveyor in halt status when clearing the check box during the playback.



The “Position(mm)” of the “Conveyor Operation Panel” dialog box shows the conveyor’s position where the LS offset value, which is set to each robot is reflected. Therefore, if the current robot is changed, the settings in the “Position(mm)” combo box may also be changed, although the conveyor on the display does not move.

Operating a Multi-Axis Conveyor

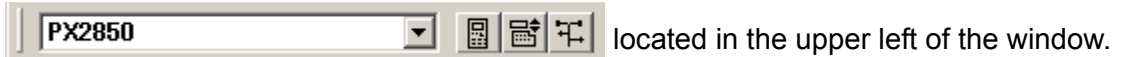
1. Select a conveyor from the combo box  located in the upper left of the window.
2. Move the conveyor with the position data panel, and adjust the workpiece position so that the robot can be easily taught.



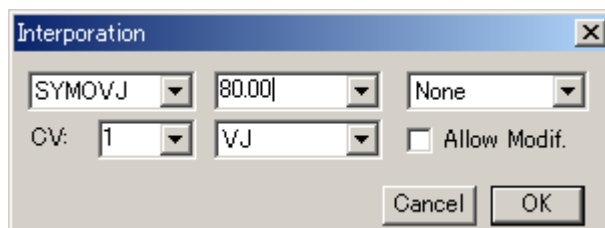
■ Teaching of Conveyor Synchronization MOVE Instruction (SYMOVJ, SYMOL, SYMOVJ)

Procedure

1. Select a robot from the robot selection combo box



2. Display the Job Panel or Programming Pendant dialog box.
3. Click on the [Move...] button to display the Interpolation dialog box. Select the synchronization MOVE instruction (SYMOVJ, SYMOVJ, or SYMOVJ) and the number of the conveyor to be synchronized.



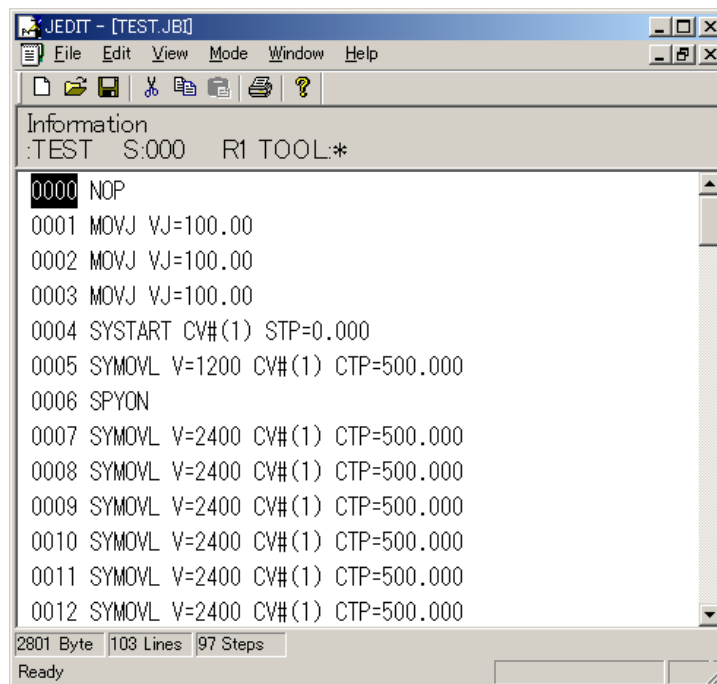
4. Move the robot to the taught position. Select the [Add] radio button and click on the [Enter] button, and the following instructions are added.
 SYMOVJ C0002 BC0002 VJ=80.00 CV#(1) CTP=-500.000
 (CTP is the conveyor position at teaching (mm).)
5. Check the [Sync] check box and move the cursor to each step, and the position of conveyor to be synchronized also moves to the registered position. To teach the job while frequently changing the conveyor position, it is recommended to clear the [Sync] check box.

■ Editing of Conveyor Synchronization START and END Instructions

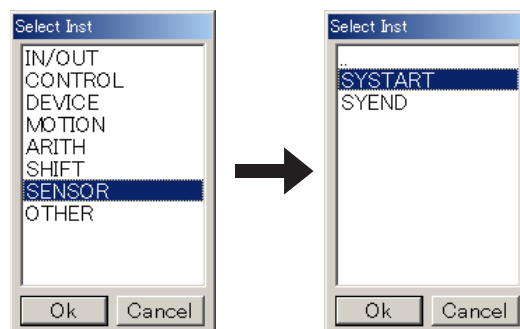
1. Move the cursor to the position where synchronization starts, and click on the [JOB Editor] button on the tool bar.



2. The Job Editor starts.



3. Move the cursor to the position where synchronization starts. Double-click a line number to display the Select Inst dialog box to add instructions. Then select SENSOR instruction group and add an SYSTART instruction.



4. Move the cursor to the position where synchronization ends, and add an SYEND instruction.
5. Save the job.
6. Exit the Job Editor. The MotoSim EG operation cannot be performed unless exiting the Job Editor.

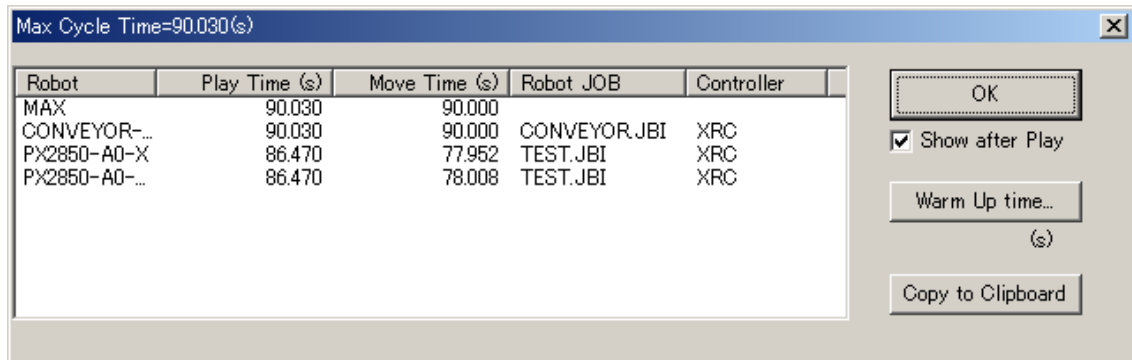


- If the Job Editor is not installed, this function cannot be used. If so, use MotoSim EG to add START/END instructions.
- If a TIMER or WAIT instruction is used during conveyor synchronization, the robot's TCP moves as if it were fixed on a single point on the conveyor.

12.8.4 Playback

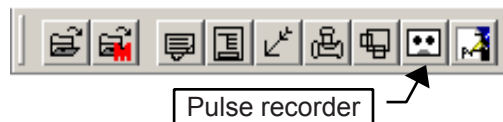
■ Playback of Conveyor Synchronization Job

The following dialog box appears after a job is carried out. The play time of the whole line is displayed on "MAX".



■ Confirmation of Path Using Pulse Record

When carrying out a job, click on the [Pulse Recorder] button on the tool bar to display the Pulse Record dialog box. Even after the playback, the path of robot motion on a workpiece can be examined in detail. Furthermore, click on the [Save] button to record the pulse record in a text file. To read the saved pulse record again, click on the [Load] button.



■ Settings for Spray Model

Refer to " 8.3.6 Paint Setting " for settings for spray model.

12.8.5 Conveyor Soft Limit Setting Function

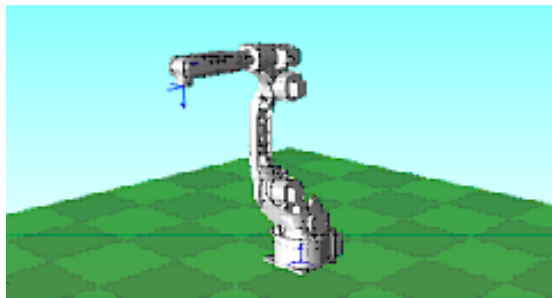
Refer to " Setting the Soft Limit " in " 10.1 Conveyor " for conveyor soft limit settings.

12.9 Handling

As a handling example, a robot grips three boxes from the floor one by one using the tool, and pile them up in a different location. One of the important operation of this procedure is to change the model parent.

Procedure

1. Create a new cell to place a robot as shown below.



- Cell name : Hand_smp
- Parameter : HP6-A00
- Robot name : HP6-A00
- Robot model file : HP6-A00.mdl

2. Mount a tool on the robot.

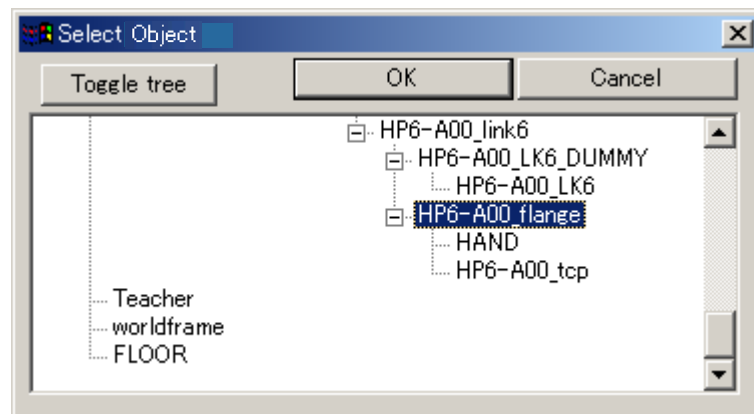
If a hand model (sample model) is already supplied, use this model or create a new model based on the following data.

<When Using the Sample Model>

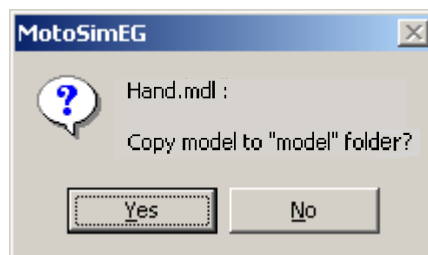
- 1) Select the sample model in the Explorer. Drag and drop the sample model on the cell window. Click on the [Yes] button when the MotoSimEG dialog box appears.



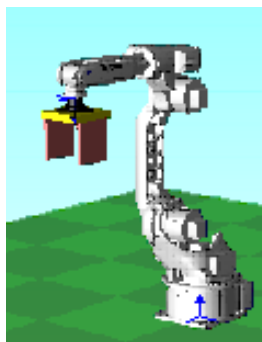
- 2) The Select Object dialog box appears. Select "HP6-A00_flange", then click on the [OK] button.



- 3) Click on the [Yes] button when the MotoSimEG dialog box appears.



- 4) The tool is mounted on the robot.



- 5) Set the Z-axis of the tool data adjusting it to the tool position.

<When Creating a Tool Model>

Select "HP6_flange" in the model tree dialog box and click on the [Add] button to set the model name and the model file name. Then create a model according to the parts data as follows.

- Model name: hand
- File name: hand

• Parts data:

CYLINDER

Upper Dia.	Lower Dia.	Height
60	60	30
X (mm)	Y (mm)	Z (mm)
0	0	0
Rx (degree)	Ry (degree)	Rz (degree)
0	0	0

CYLINDER

Upper Dia.	Lower Dia.	Height
80	80	30
X (mm)	Y (mm)	Z (mm)
0	0	30
Rx (degree)	Ry (degree)	Rz (degree)
0	0	0

BOX

Upper Dia.	Lower Dia.	Height
100	100	20
X (mm)	Y (mm)	Z (mm)
0	0	64
Rx (degree)	Ry (degree)	Rz (degree)
0	0	0

BOX

Upper Dia.	Lower Dia.	Height
200	200	30
X (mm)	Y (mm)	Z (mm)
0	0	64
Rx (degree)	Ry (degree)	Rz (degree)
0	0	0

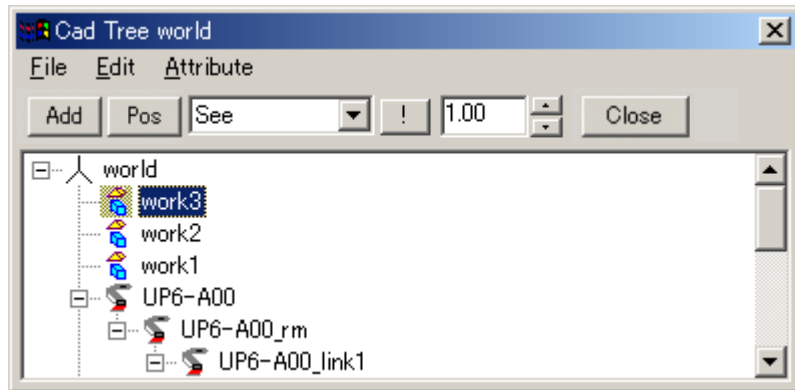
BOX

Upper Dia.	Lower Dia.	Height
160	10	200
X (mm)	Y (mm)	Z (mm)
0	90	150
Rx (degree)	Ry (degree)	Rz (degree)
0	0	0

BOX

Upper Dia.	Lower Dia.	Height
160	10	200
X (mm)	Y (mm)	Z (mm)
0	-90	150
Rx (degree)	Ry (degree)	Rz (degree)
0	0	0

- 6) Create three workpieces to be gripped by the tool. Add "WORK1", "WORK2" and "WORK3" models below the "world" in the model tree.



- 7) Add a BOX model to each workpiece. Setting AXIS6 may also be helpful.

work1: BOX

Width	Length	Height
160	170	200
X (mm)	Y (mm)	Z (mm)
300	900	100
Rx (degree)	Ry (degree)	Rz (degree)
0	0	0

work2: BOX

Width	Length	Height
160	170	200
X (mm)	Y (mm)	Z (mm)
0	900	100
Rx (degree)	Ry (degree)	Rz (degree)
0	0	0

work3: BOX

Width	Length	Height
160	170	200
X (mm)	Y (mm)	Z (mm)
-300	900	100
Rx (degree)	Ry (degree)	Rz (degree)
0	0	0

work1: AXIS6

X (mm)	Y (mm)	Z (mm)
300	900	200
Rx (degree)	Ry (degree)	Rz (degree)
180	0	90

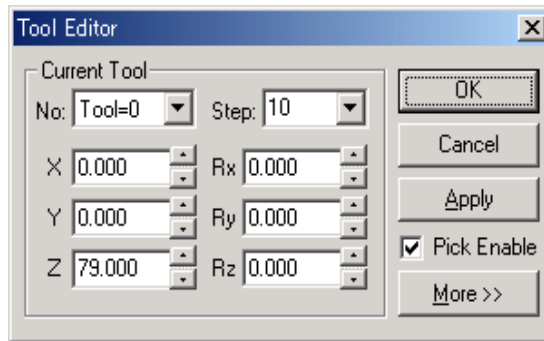
work2: AXIS6

X (mm)	Y (mm)	Z (mm)
0	900	200
Rx (degree)	Ry (degree)	Rz (degree)
180	0	90

work3: AXIS6

X (mm)	Y (mm)	Z (mm)
-300	900	200
Rx (degree)	Ry (degree)	Rz (degree)
180	0	90

8) Set the tool data as follows.



9) Prepare a stand where workpieces are to be piled up. Add "DAI" model with "world" as parent. Also set an AXIS6 for the position where workpieces are to be piled up. The AXIS6 should be set to the upper surface of the piled workpieces of when the workpieces are put on the "DAI".

DAI: BOX

Width	Length	Height
500	500	100
X (mm)	Y (mm)	Z (mm)
900	0	50
Rx (degree)	Ry (degree)	Rz (degree)
0	0	0

DAI: AXIS6(0)

X (mm)	Y (mm)	Z (mm)
900	0	300
Rx (degree)	Ry (degree)	Rz (degree)
180	0	90

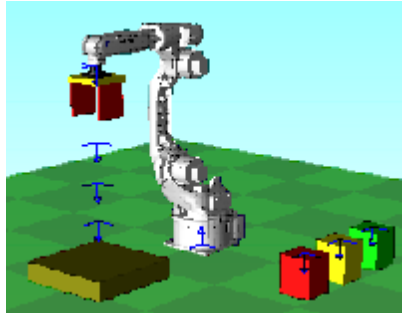
DAI: AXIS6(1)

X (mm)	Y (mm)	Z (mm)
900	0	500
Rx (degree)	Ry (degree)	Rz (degree)
180	0	90

DAI: AXIS6(2)

X (mm)	Y (mm)	Z (mm)
900	0	700
Rx (degree)	Ry (degree)	Rz (degree)
180	0	90

10) At this stage, the cell should look like the one shown below.



11) Create a new job to pile up three workpieces under the name of "Hand.jbi."

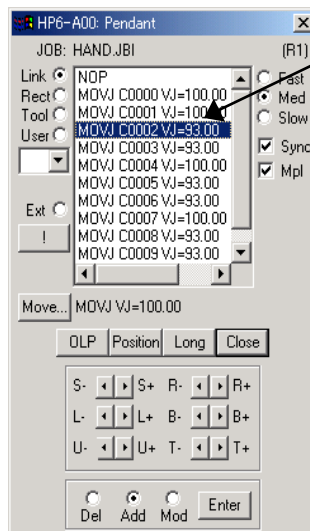
12) Create a job that performs "workpiece gripping" and "workpiece dropping" three times with the OLP panel using AXIS6 as the target point.



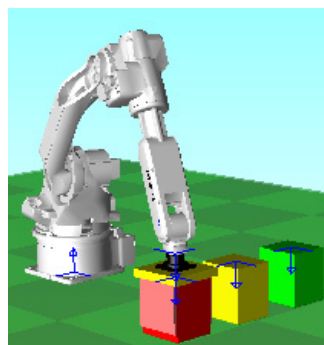
Do not set the actual workpiece gripping operation, but only register each step to pile up the workpieces (settings of operating).

13) Move the actual workpiece model by adding instructions ^{*1} that makes the tool seems to grip and pile the workpieces. For this operation, use the job display panel of the Programming Pendant dialog box and double-click the step where the robot moves to the position to grip "work1".

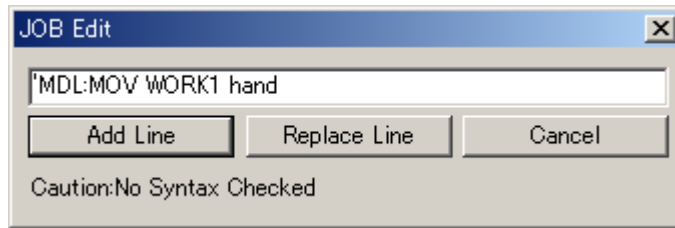
^{*1} "Instruction that makes the tool seem to grip and pile the workpieces" means: each model has a parent model without exception. MotoSim EG is provided with instructions that describe Macros to change the parent model or hide the model. The annotated process, using this function, describes the process to make the tool grip "work1".



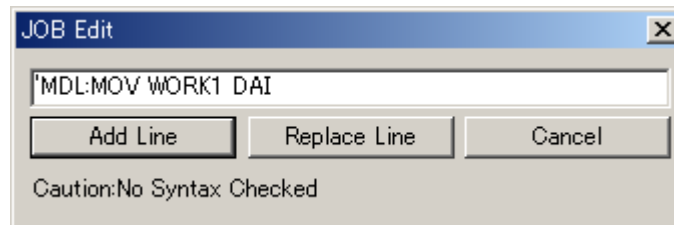
Double-click the step at position where "work1" is gripped.



- 14) Use the JOB Edit dialog box to enter the code as shown in the figure below. Select the [Add Line] radio button and click on the [OK] button. This code changes the parent of “WORK1” to “hand”.



- 15) Enter the processing to put the "WORK1" is put on the "DAI". Double-click the step where the job “WORK1” is put on “DAI” in the Programming Pendant dialog box, then enter the code as shown below. This code changes the parent of “WORK1” to “DAI”.



- 16) Add description: “MDL:MOV WORK???” after each step of “workpiece gripping” and “workpiece putting” for the other two workpieces in the same manner as the first one. Follow the same procedures as 14) and 15).

```

NOP
MOVJ C0000 VJ=100.00
MOVJ C0001 VJ=100.00
MOVL C0002 V=93.0
'MDL:MOV work1 hand
MOVL C0003 V=93.0
MOVJ C0004 VJ=100.00
MOVL C0005 V=93.0
'MDL:MOV work1 DAI
MOVL C0006 V=93.0
MOVJ C0007 VJ=100.00
MOVJ C0008 VJ=50.00
MOVL C0009 V=93.0
'MDL:MOV work2 hand
MOVL C0010 V=93.0
MOVJ C0011 VJ=100.00
MOVL C0012 V=93.0
'MDL:MOV work2 DAI
MOVL C0013 V=93.0
MOVJ C0014 VJ=100.00

```

```

MOVJ C0015 VJ=50.00
MOVL C0016 V=93.0
'MDL:MOV work3 hand
MOVL C0017 V=93.0
MOVJ C0018 VJ=100.00
MOVL C0019 V=93.0
'MDL:MOV work3 DAI
MOVL C0020 V=93.0
MOVJ C0021 VJ=100.00
END

```

- 17) If this job is executed, the operation completes with the workpiece-model parent being changed to "DAI", which will not be displayed properly when the job is performed again. To avoid this, create "init.jbi" for initialization and add the processing to return the parent of each workpiece model to "world" and call this job from the main display "hand.jbi".

```

"init.jbi"
NOP
'MDL:MOV work1 world
'MDL:AXIS6 work1=0,0,0,0,0,0
'MDL:MOV work2 world
'MDL:AXIS6 work2=0,0,0,0,0,0
'MDL:MOV work3 world
'MDL:AXIS6 work3=0,0,0,0,0,0
END

```

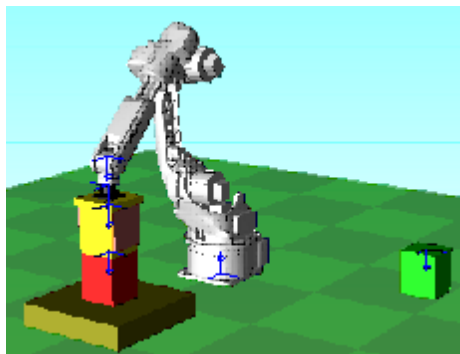
Absolute position from the parent is the position displayed by clicking the [Pos] button in the model tree dialog box where the workpiece is set for the first time.

```

"hand.jbi"
NOP
CALL JOB:INIT
MOVJ C0000 VJ=100.00
:
:
END

```

- 18) Perform the job of "hand.jbi" from the top. Tool grips the workpieces and piles them up on the "DAI."



12.10 Data Format

This section describes the formats of model data files and cell data files.

■ Model File (*.mdl)

There are eight parts available for MotoSim EG as described later in " Each Part Format " of this section.

Data unit system is in millimeters (mm) and real numbers are available. Use decimal point as required.

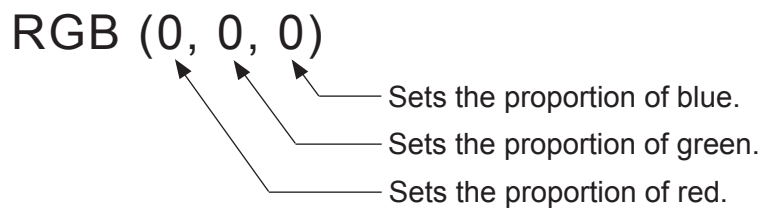
Model Color Settings

The color of each model can be set by using the basic color code function or using RGB. The following describe each setting.

- RGB

RGB is created with the format RGB (0, 0, 0).

Each color proportion can be set by a number from 0 to 255.



<E.g.> RGB(255,255,255) Color: White
 RGB(255,0,0) Color: Red
 RGB(0,255,0) Color: Green
 RGB(0,0,255) Color: Blue
 RGB(0,0,0) Color: Black

- Basic Color Code (QB Color) Function

Setting a number from 0 to 15 displays its corresponding color.

For example, setting BOX (4, 2) creates a red BOX model.

Number	Color	Number	Color
0	Black	8	Gray
1	Blue	9	Light blue
2	Green	10	Light green
3	Cyan	11	Light cyan
4	Red	12	Light red
5	Magenta	13	Light magenta
6	Yellow	14	Light yellow
7	White	15	Light white

Each Part Format

- BOX (color, num): Box form model

Described with data of width, length, height, X, Y, Z, Rx, Ry and Rz.

<Sample>

```

BLOCK
{
BOX(255,0,0,2)           Description
{
100.000,100.000,100.000,0.000,0.000,0.000  Width, length, height, 0, 0, 0
0.000,0.000,0.000,0.000,0.000,0.000      X, Y, Z, Rx, Ry, Rz
}
}

```

- BOX2 (color, num): Box form model

Described with data of width, length, height, X, Y, Z, Rx, Ry and Rz.

<Sample>

```

BLOCK
{
BOX2(255,0,0,2)         Description
{
100.000,100.000,100.000,0.000,0.000,0.000  Width, length, height, 0, 0, 0
0.000,0.000,0.000,0.000,0.000,0.000      X, Y, Z, Rx, Ry, Rz
}
}

```

- CYLINDER (color, num): Cylinder form model

Described with data of lower face diameter, upper face diameter, height, number of divided faces, X, Y, Z, Rx, Ry and Rz.

<Sample>

```

BLOCK
{
CYLINDER(255,0,0,2)    Description
{
200.000,100.000,16.000,100.000,0.000,0.000  Lower face dia. height, No. of divided
faces, upper face dia., 0, 0
0.000,0.000,0.000,0.000,0.000,0.000      X, Y, Z, Rx, Ry, Rz
}
}

```

- CONE2 (color, num): Cone form model

Described with data of bottom diameter, height, number of divided faces, X, Y, Z, Rx, Ry and Rz.

<Sample>

```

BLOCK
{
CONE2(RGB(255,0,0),2)           Description
{
200.000,100.000,16.000,0.000,0.000,0.000  Bottom dia., height, No. of divided faces,
0, 0, 0
0.000,0.000,0.000,0.000,0.000,0.000  X, Y, Z, Rx, Ry, Rz
}
}
    
```

- SPHERE(color,num): Spherical model

Described with data of diameter, number of divided faces, X, Y and Z.

<Sample>

```

BLOCK
{
SPHERE(RGB(255,0,0),2)         Description
{
100.000,30.000,0,0,0,0         Diameter, No.of devided face, 0, 0, 0, 0
0.000,0.000,0.000,0,0,0       X, Y, Z, 0, 0, 0
}
}
    
```

- PIPE2 (color, num): Pipe form model

Described with data of lower face diameter, bottom plate thickness, upper face diameter, upper plate thickness, height, number of divided faces, X, Y, Z, Rx, Ry and Rz.

<Sample>

```

BLOCK
{
PIPE2(RGB(255,0,0),2)          Description
{
100.000,100.000,100.000,10.000,100.000,16.000  Lower face dia., bottom plate thickness,
upper face dia., upper plate thickness,
height, No. of divided faces
0.000,0.000,0.000,0.000,0.000,0.000  X, Y, Z, Rx, Ry, Rz
}
}
    
```

- **AXIS6** (color, num): Model having information only of position and posture
Described with data of X, Y, Z, Rx, Ry and Rz.

"num" sets the number of target points.

<Sample>

BLOCK	
{	
AXIS6(RGB(255,0,0),3)	Description
{	
0.000,0.000,0.000,0.000,0.000,0.000	Point1 (X, Y, Z, Rx, Ry, Rz)
100.000,0.000,0.000,0.000,0.000,0.000	Point2 (X, Y, Z, Rx, Ry, Rz)
200.000,0.000,0.000,0.000,0.000,0.000	Point3 (X, Y, Z, Rx, Ry, Rz)
}	
}	

- **LINE**(color,num): Continuous line model
Described with data of X, Y and Z.

"num" sets the number of points.

<Sample>

BLOCK	
{	
LINE(RGB(255,0,0),3)	Description
{	
0.000,0.000,0.000	Point1 (X, Y, Z)
100.000,200.000,300.000	Point2 (X, Y, Z)
500.000,235.000,111.000	Point3 (X, Y, Z)
}	
}	

- **LINE2**(color,num): Segmented line model
Described with data of X, Y and Z.

"num" sets the number of points.

<Sample>

BLOCK	
{	
LINE2(RGB(255,0,0),4)	Description
{	
253.000,353.000,686.000	Segment 1 Start (X, Y, Z)
89.000,254.000,79.000	Segment 1 End (X, Y, Z)
413.000,3.000,99.000	Segment 2 Start (X, Y, Z)
917.000,524.000,-48.000	Segment 2 End (X, Y, Z)
}	
}	

- CUBE (color, num): Polygonal cube model

Data of polygonal cube are described with data of bottom and height.

A rectangular parallelepiped is composed of four points and one height, therefore, num is 5 in this case.

<Sample>

BLOCK	
{	
CUBE(255,0,0),5)	Description
{	
0.000,0.000,0.000	Start point1 (X, Y, Z)(= End point 4)
100.000,0.000,0.000	End point1 (X, Y, Z)(= Start point 2)
100.000,100.000,0.000	End point2 (X, Y, Z)(= Start point 3)
0.000,100.000,0.000	End point3 (X, Y, Z)(= Start point 4)
0.000,0.000,100.000	Offset value (X, Y, Z)
}	
}	

- FLOOR (color, num): Floor form model

Describes a plane meshed data string.

Described with data of number of divided faces (vertical and horizontal) and frame data of floor end point.

<Sample>

BLOCK	
{	
FLOOR(255,0,0),3)	Description
{	
6.000,6.000,0.000	No. of divided faces (X division No., Y division No., 0)
-1500.000,-3000.000,0.000	Floor end point1 (X, Y, Z)
1500.000,3000.000,0.000	Floor end point2 (X, Y, Z)
}	
}	

- FACE (color, num): Face model

Describes a face with the frame data of X, Y, and Z of each point.

In this case the face model is composed of three points on the face and the data for X, Y, Z, Rx, Ry and Rx, num is 4.

<Sample>

BLOCK

{

FACE(255,128,0),4)

Description

{

0.000,0.000,0.000,0.000,0.000,0.000

X, Y, Z, Rx, Ry, Rz

Face is created with the following three points.

200.000,300.000,300.000,3,0,0

Point1 (X, Y, Z)

-200.000,300.000,300.000,0,0,0

Point2 (X, Y, Z)

-200.000,300.000,-300.000,0,0,0

Point3 (X, Y, Z)

}

}

■ Cell File

When constructing a cell, a cell file is created. The following describe an example of a cell file.

```

CELL_INIT
{
VERSION=1, 0, 0, 0
ROBOT(0)
{
PATH=%CELPATH%\HP6-A00;
NAME=HP6-A00;
JOBNAME=DEFAULT.JBI;
TOOL=0;
CPULSE=0,0,0,0,0,0;
EPULSE=0,0,0,0,0,0ÅG
TCPFRAME4=1;
FLANGEFRAME4=0;
SAKIYOMIDELAY=0.000;
DRIVER=SEQDRV;
DRIVER=MODELDRV;
DRIVER=MOV;
DRIVER=TRACE(PARENT=world)(POINTS=1000);
DRIVER=HADRV;
DRIVER=RRS;
DRIVER=REPORTDRV;
}

STAGE
{
}

NSIMVIEW
{
BACKCOLORTOP=RGB(128,255,255);
BACKCOLORBOTTOM=RGB(255,255,255);
CAMERAPOSITION=8.167229,8.167229,2.792158;
CAMERATARGET=0.000000,0.000000,0.045000;
CAMERAUPVECTOR=-0.163618,-0.163618,0.972865;
USERVIEW
    {
    NO=0
    CAMERAPOSITION=0.000000,0.000000,0.000000;
    CAMERATARGET=0.000000,0.000000,0.000000;
    CAMERAUPVECTOR=0.000000,0.000000,0.000000;
    }
}

RTSVIEW
{
NO=0;
PARTITION=0;
FRAMELENGTH=100;
REFMODEL=world;
UnitOfLength=MILLIMETER;
LightAXIS6=0.000,0.000,0.000,-144.737,-45.000,180.000;
LightBrightness=0.699;
VIEW(0)
    {
    VSCALE=0.15;
    ASPECT=1;
    PANORAMA=0;
    AXIS6=0,0,5000,180,0,0;
    ORGAXIS6=0,0,5000,180,0,0;
    DIRNO=0;
    }
}

```

```

    BACKCOLOR=RGB(255,255,128);
    }
VIEW(1)
    {
    VSCALE=0.15;
    ASPECT=0.721925;
    PANORAMA=0;
    AXIS6=5000,0,0,-90,0,90;
    ORGAXIS6=5000,0,0,-90,0,90;
    DIRNO=1;
    BACKCOLOR=RGB(255,255,128);
    }
VIEW(2)
    {
    VSCALE=0.15;
    ASPECT=0.721925;
    PANORAMA=0;
    AXIS6=0,-5000,0,-90,0,0;
    ORGAXIS6=0,-5000,0,-90,0,0;
    DIRNO=2;
    BACKCOLOR=RGB(255,255,128);
    }
VIEW(3)
    {
    VSCALE=0.15;
    ASPECT=0.721925;
    PANORAMA=0;
    AXIS6=2500,2500,1000,-100,0,135;
    ORGAXIS6=2500,2500,1000,-100,0,135;
    DIRNO=3;
    BACKCOLOR=RGB(255,255,128);
    }
}
UNIT
{
Length
    {
    VALUE=0.000,10000.000;
    DIV=0,1000;
    RATE=1.000000000,1.000000000;
    STR=mm;
    }
Position
    {
    VALUE=-10000.000,10000.000;
    DIV=0,2000;
    RATE=1.000000000,1.000000000;
    STR=mm;
    }
Angle
    {
    VALUE=-3600.000,3600.000;
    DIV=0,720;
    RATE=1.000000000,1.000000000;
    STR=deg;
    }
Weight
    {
    VALUE=0.000,10000.000;
    DIV=0,1000;
    RATE=1.000000000,1.000000000;
    STR=kg;
    }
}

```

```
}
MODEL_INIT
{
MODEL
    {
        NAME=FLOOR;
        PARENT=world;
        FILENAME=%CELPATH%\models\floor.mdl;
        COLOR=RGB(0,0,255);
        HIDESEE=1;
        OPACITY=0.50;
        SCALE=1.000000;
        AXIS6=0,0,0,0,0,0;
    }
MODEL
    {
        NAME=worldframe;
        PARENT=world;
        FILENAME=dummy;
        COLOR=RGB(0,0,255);
        HIDESEE=256;
        OPACITY=1.00;
        SCALE=1.000000;
        AXIS6=0,0,0,0,0,0;
    }
MODEL
    {
        NAME=Teacher;
        PARENT=world;
        FILENAME=dummy;
        COLOR=RGB(0,0,255);
        HIDESEE=256;
        OPACITY=1.00;
        SCALE=1.000000;
        AXIS6=0,0,0,0,0,0;
    }
MODEL
    {
        NAME=HP6-A00;
        PARENT=world;
        FILENAME=%CELPATH%\HP6-A00\HP6-A00-MDL.mdl;
        COLOR=RGB(0,0,255);
        HIDESEE=1;
        OPACITY=1.00;
        SCALE=1.000000;
        AXIS6=0,0,450,0,0,0;
    }
MODEL_RB
    {
        NAME=HP6-A00_rm;
        HIDESEE=1;
        OPACITY=1.00;
    }
MODEL_RB
    {
        NAME=HP6-A00_link1;
        HIDESEE=1;
        OPACITY=1.00;
    }
MODEL_RB
    {
        NAME=HP6-A00_link2;
        HIDESEE=1;
    }
}
```

```
        OPACITY=1.00;
    }
MODEL_RB
    {
    NAME=HP6-A00_link3;
    HIDESEE=1;
    OPACITY=1.00;
    }
MODEL_RB
    {
    NAME=HP6-A00_link4;
    HIDESEE=1;
    OPACITY=1.00;
    }
MODEL_RB
    {
    NAME=HP6-A00_link5;
    HIDESEE=1;
    OPACITY=1.00;
    }
MODEL_RB
    {
    NAME=HP6-A00_link6;
    HIDESEE=1;
    OPACITY=1.00;
    }
MODEL_RB
    {
    NAME=HP6-A00_flange;
    HIDESEE=1;
    OPACITY=1.00;
    }
MODEL_RB
    {
    NAME=HP6-A00_tcp;
    HIDESEE=257;
    OPACITY=1.00;
    }
}
PAIR_INIT
{
}
```

1) ROBOT Command

The ROBOT command describes data concerning robots.

- VERSION=1, 0, 0, 0
Describes the MotoSim EG version.
- ROBOT(0)
Describes the ROBOT No. 0.
When more than one robot is used, the robots are provided with numbers ROBOT(0), ROBOT(1), ROBOT(2) ~~ⓧ~~ ~~ⓧ~~ ~~ⓧ~~.
- PATH=%CELPATH%\HP6-A00;
Describes the directory path to which the ROBOT refers.
This directory needs a "All.prm" file. All jobs to be referred to must be stored here.
- NAME=HP6-A00;
Describes the name of the ROBOT.
- JOBNAME=DEFAULT.JBI;
Describes the job name to which the ROBOT of the cell refers.
- TOOL=0;
Describes the tool number to which the ROBOT of the cell refers.
- CPULSE=-0,0,0,0,0,0;
Describes the current value pulses of internal six axes to which are referred by the ROBOT of the cell.
- EPULSE=0,0,0,0,0,0;
Describes the current value pulses of external six axes to which are referred by the ROBOT of the cell.
- TCPFRAME4=1;
Describes that TCP (tool center point) is to be displayed.
- DRIVER=TRACE(PARENT=world)(POINTS=1000);
Describes that trace points are displayed at review (playback). Description of "(PARENT=world)" indicates that the PARENT is world. Since a trace point is considered as one of MODELS, PARENT needs to be described. "(POINTS=1000)" indicates that the maximum number of trace points is 1000.

2) STAGE Command

The STAGE command describes the internal connection of the STAGE object that works as a sequencer for I/O simulation.

3) NSIMVIEW Command

The NSIMVIEW command describes data related to drawing.

4) RTSVIEW Command

The RTSVIEW command describes data related to drawing.

5) UNIT Command

The UNIT command describes data related to drawing.

6) MODEL_INIT Command

The MODEL_INIT command describes data concerning models.

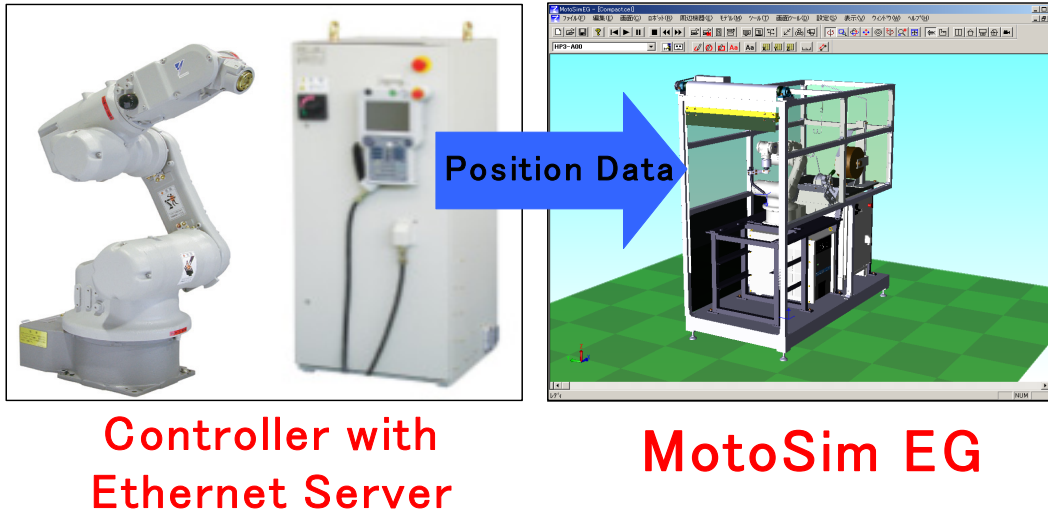
- MODEL
Describes a MODEL.
- NAME=HP6-A00;
Describes the name of the MODEL.
- PARENT=world;
Describes the PARENT model of the MODEL.
- FILENAME=%CELPATH%\HP6-A00\HP6-A00-MDL.mdl;
Describes the directory path and MODEL file name to which the MODEL refers.
If no MODEL file exists, "dummy" is described.
- COLOR=RGB(0,0,255);
Describes the color of the MODEL.
- HIDESEE=1;
Describes the display bit of the MODEL.
- OPACITY=1.00;
Describes the opacity of the MODEL.
- SCALE=1.000000;
Describes the scale factor of the MODEL.
- AXIS6=0,0,450,0,0,0;
Describes the relative coordinates to the MODEL PARENT.

7) Default Model

- world
Starting point for all models. It does not appear.
- worldframe
Displays the world position with a frame.
- Teacher
Displays a frame to create a target coordinate on any point.
- FLOOR
Displays world XY plane.

12.11 Remote Monitor Function

Validation of the robot running process with MotoSim EG by acquiring the robot current position from the real machine (only FS100, DX100, NX100 controller).



Requirements to use the Remote Monitor Function with MotoSim EG.

- MOTOCOM32 (Hardware Lock Key)
The hardware lock key is necessary to execute the "Data Transmission" between the computer and the robot controller. Without the key, the message "Hardware Key is missing" will display and the communication will not be established.
If you do not have a copy of MOTOCOM32, it is available separately.
- Controller Ethernet Server (Controller Option)
The "Ethernet Server Option" and the "Ethernet Option" are both required. If the controller doesn't have those options activated, they can be added separately.
- Communication Equipment (LAN cable and others)
The necessary equipment to build a physically LAN connection (Ethernet) between the controller and the computer.

12.11.1 Preparation

1. In MotoSimEG, build a cell identical to the real system.
(Use the same data file as the real controller (ALL.PRM, TOOL.CND...))
2. Connect the computer to the controller with a LAN cable. For connection procedure, please refer to the robot controller "Options Instructions For Data Transmission Function".
3. Open the "RemoteMonitor.ini" file located in the MotoSim EG folder (default: \Program-Files\MOTOMAN\MotoSimEG\).
4. Edit the "RemoteMonitor.ini" file so that the values correspond to the value set on the controller.

The following is an example of the "RemoteMonitor.ini" with explanation:


```

//NX NS3.30 or more for EServer
//MOTOCOM FILEVERSION:4.30 DATE:2006/01/27
NEWSIMULATOR ;
{
    ControllerNumber = 1 ;
    Controller(0) ;
    {
        Info="TEST" ;           //Comment Information
        R1 = 6 ;
        B1 = 0 ;
        S1 = 0 ;
        Timer = 150 ;           //ms
        ConnectType = 2 ;       //0:Com 1:Ether 2:Eserver
        ComSettings = 1,9600,2,8,0 ;
                                // Port,Baudrate,Parity,DataLen,StopBit
        IpAddress = 192.168.255.1 ;
        EserverMode = 1 ;       //1:Normal -1:KeepAlive
    }
}

```

Note: Disregard the comments after the //

- ControllerNumber=1
Indicates the number of controller used.
Note: At the present time, only one controller can be used. This value shouldn't be modified.
- Controller(0)
Definition of the controller 0 (1st controller).
Note: This value shouldn't be modified.
- Info="TEST"
Comment string to identify the controller information.
Note: Does not affect the Remote Monitor operation.
- R1=6
Defines the number of axis used by robot 1.
Values for R2, R3, R4 can also be set. (The default value is 0 axis)
Note: Refer to the "Robot and External Axis Handling"
- B1=0
Defines the number of base axis used by robot 1.
Values for B2, B3, B4 can also be set. (The default value is 0 axis)
Note: Refer to the "Robot and External Axis Handling"
- S1=0

Defines the number of station axis used by robot 1.

Values for S2, S3, S4 can also be set. (The default value is 0 axis)

Note: Refer to the "Robot and External Axis Handling"

- Timer=150

Defines acquisition interval (units: milliseconds) of the position values.

Note: If a small value then 150 is set, the interval is insufficient to acquire position values.

If this value is increased the refresh time in MotoSimEG becomes longer.

- ConnectType=2

Define the MOTOCOM32 communication type.

0 : FCom(Serial)Communication

1 : FEthernet Communication

2 : FEthernetServer Communication

Note: Normally does not need to be modify.

Note: If LAN cable connection is not possible, set this value to 0.

- ComSettings=1,9600,2,8,0

Serial Port Communication Settings (Port No, Baud Rate, Parity, Data Bits, Stop Bits).

Note: Normally does not need to be modify.

Note: Define the serial settings when the "ConnectType=0"

- IpAddress=192.168.255.1

Indicates the IP address of the controller.

Note: Indicate the exact IP address defined in the LAN network for the controller.

If an incorrect address is entered, the Remote Monitor will be unable to communicate with the controller.

- EServerMode=1

Indicates the Ethernet Server Mode

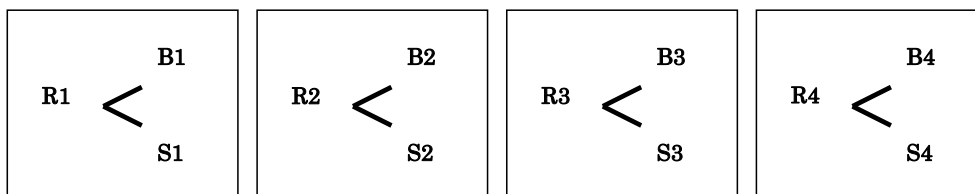
1 : Normal Mode

-1 : Exclusive Mode

Note: This value shouldn't be modified.

■ Robot and External Axis Handling

- The following combination of the control group for the robot and the external axis are fixed. (For robot system with only one robot, R2, R3 and R4 equal 0.)



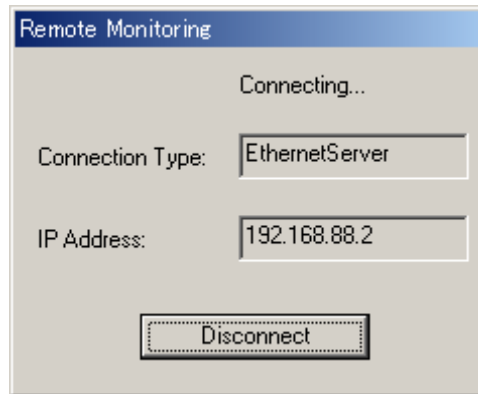
- Robot axis (Rx) should be set to 6 axis.

- The total external axis number (Bx+Sx) cannot exceed 6 axis.

12.11.2 Operation Procedure

1. Linking to the Controller and Acquiring the Current Position Data (Remote Monitor Link)

From the MotoSimEG "Remote Monitor" menu select "Connect". After the connection is properly established with the controller, the robot in the cell will move based on the current position of the real robot and the following dialog will display.



While the remote monitor is connected, please do not turn off the controller. While the remote monitor is connected, except for viewpoint operations, MotoSim EG other functions like Collision Check and Pulse Recorder functions cannot be used. While Viewpoint operations (change of view) are being carried out, the normal motion will be interrupted.

2. Disconnection from the controller

Press the "Disconnect" button from the "Remote Monitoring" dialog. Or from the MotoSim EG "Remote Monitor", select "Connect".

■ Cases of Bad Connection

Losing the connection after establishing the Remote Monitor link

After the connection was properly established, if the cable is disconnected or communication is lost for more than 5 seconds, the "Connection Failure" message is displayed and the Remote Monitor link is terminated.



Depending on the MOTOCOM32 specifications and cause of lost of communication, MOTOCOM32 may take some time to report the lost of communication, which will significantly increase the normal 5 seconds period before the failure message is displayed.

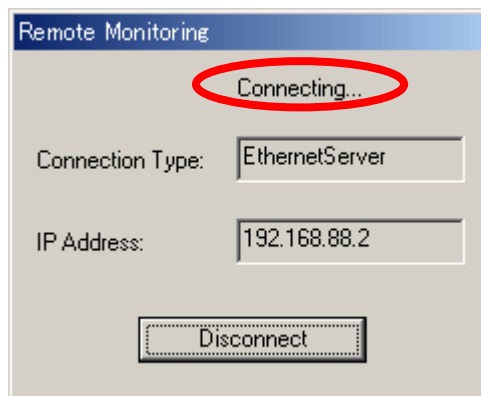


Bad connection when establishing connection: case 1

When starting the Remote Monitor link (menu: "Remote Monitor" - "Connect"), if the connection cannot be properly established, the message "Connection Failure" is displayed and the Remote Monitor Link is not made.

Bad connection when establishing connection: case 2

If the cable is properly connected but the IP address is incorrect when starting the Remote Monitor Link (menu: "Remote Monitor" - "Connect"), the "Remote Monitoring" dialog will display with the message "Connecting..."



After the several seconds, the "Connection Failure" message will display and the Remote Monitor Link is not made.



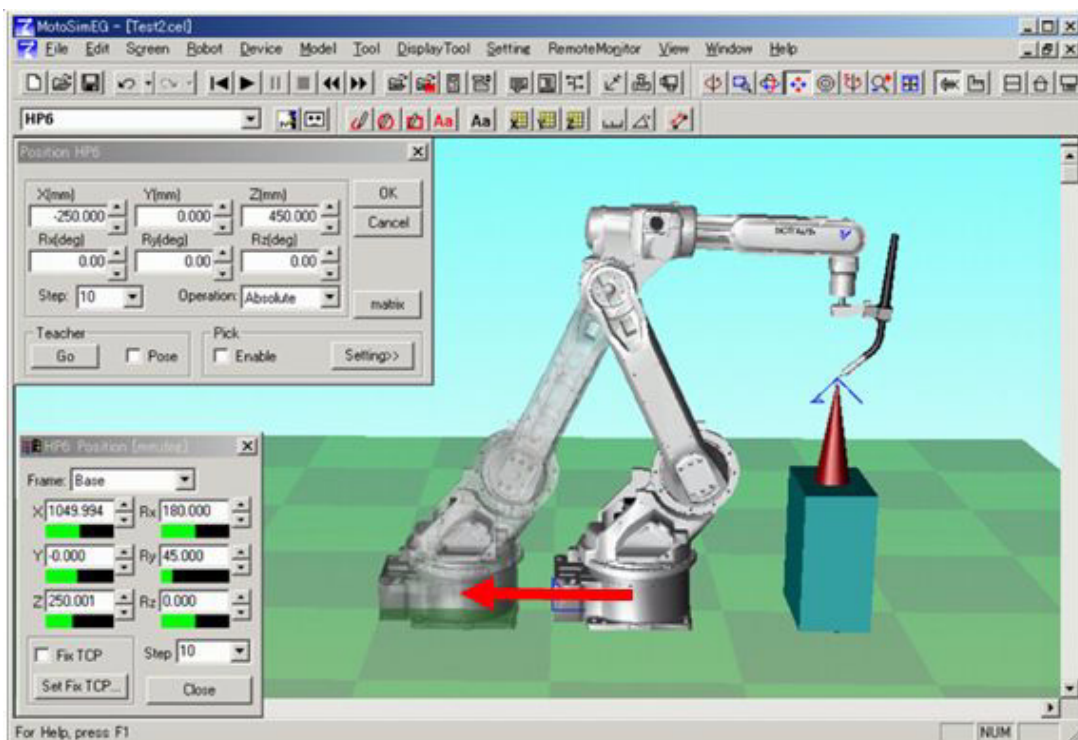
While the "Connecting..." message is displayed, MotoSim EG operation cannot be process. Please be careful to set the proper IP address.

12.12 Fix TCP

The Fix TCP function allows fixing (or attaching) the robot TCP position relative to another model in the cell. If the robot base or the attached model is moved, the robot changes position so that its TCP remains in the same position relative to the specified model.

The Fix TCP function is enabled by the robot Position panel. Check the "Fix TCP" check box to enable the function. The default model to which the TCP is attached is the world. To change the model, press the "Set Fix TCP..." button to display the "Select Model" dialog.

This function is useful to determine the layout of a cell. For example, the robot TCP can be attached to a work piece. As the robot base or work piece are moved around during the layout procedure, the robot automatically adjusts itself to keep its TCP in the same position on the work piece. It then becomes obvious if the work piece becomes out of reach, because the robot will no longer maintain its position on the work piece.



It can also be used when teaching a robot with an external axis. After the tool has been set in position, if the robot external axis needs to be changed, with the Fix TCP function enabled, the robot tool will remain in position. This avoids having to adjust the robot tool after moving the external axis.



The function is automatically disabled if the Position panel is closed or if a job is played back. The Fix TCP section is not available when the Frame is set to "Work Angle".

13 Appendix

13.1 List of Instructions Supported by MotoSim EG (FS100, DX100, NX100, XRC, MRC, MRC II)

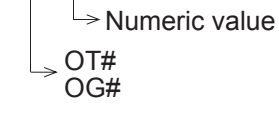
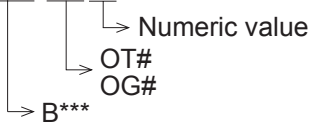
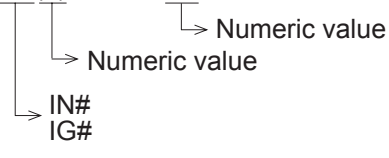
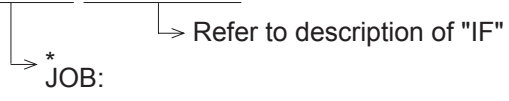
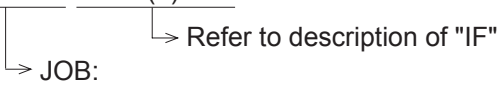

MotoSim EG ignores the instructions not on the following list.

○: editable and executable; ●: executable

Type	Instruction	Availability
I/O	DOUT	○
	DIN	○
	NWAIT	○
	WAIT	○
Control	NOP	○
	'(Comment)	○
	*(Label)	○
	JUMP	○
	CALL	○
	RET	○
	TIMER	○
	IF	○
	CWAIT	○
Move	MOVJ ^{*1}	○
	MOVL	○
	MOVC	○
	IMOV	●
	EIMOVL	●
	EIMOVC	●
	REFP	○
	SPEED	○

Type	Instruction	Availability
Calculation	ADD	○
	SUB	○
	MUL	○
	DIV	○
	INC	○
	DEC	○
	AND	○
	OR	○
	NOT	○
	XOR	○
	SQRT	○
	SIN	○
	COS	○
	ATAN	○
	SET	○
	SETE	●
GETE	○	
Shift	CLEAR	○
	CNVRT	○
	GETS	○
	SFTON	●
	SFTOF	●

^{*1} "MOVJ" instruction cannot be used by some robot models.

Instruction	Description
DOUT	DOUT <u>OT#(1)</u> ON 
DIN	DIN <u>B000</u> <u>IN#(1)</u> 
NWAIT	NWAIT
WAIT	WAIT <u>IN#(1)=ON</u> T= <u>0.5</u> 
NOP	NOP
'(Comment)	'(Comment)
*(Label)	*(Label)
JUMP	JUMP <u>JOB:MRC</u> IF <u>IN#(1)=ON</u> 
CALL	CALL <u>JOB:MRC</u> IF <u>IN#(1)=ON</u> 
RET	RET
TIMER	TIMER T= <u>0.50</u> 

13.1 List of Instructions Supported by MotoSim EG (FS100, DX100, NX100, XRC, MRC, MRC II)

Instruction	Description
IF	<p>IF IN#(1)=ON</p> <ul style="list-style-type: none"> ON/OFF Byte variable → B000 → = Numeric value 000 Array cannot be specified <p>IF IG#(1)=B000</p> <ul style="list-style-type: none"> Byte variable → B000 Constant → = < > Numeric value 000 Array cannot be specified <p>IF B000=100</p> <ul style="list-style-type: none"> Byte variable → B000 Integer variable → I000 Double precision variable → D000 Real variable → R000 Constant → = < > > >= < <= Byte variable → B000 Integer variable → I000 Double precision variable → D000 Real variable → R000 000 Array cannot be specified
CWAIT	CWAIT
MOVJ ^{*1} MOVL MOVC	<p>MOVJ C000 VJ=50.00 PL=0 NWAIT</p> <p>MOVL C000 VJ=50.00 PL=0 NWAIT</p> <p>MOVC C000 VJ=50.00 PL=0 NWAIT</p> <ul style="list-style-type: none"> PL=0 PL=1 PL=2 PL=3 PL=4 Numeric value VJ ... Only MOVJ VR } MOVL, MOVC VE } V } C*** <p>*1 "MOVJ" instruction cannot be used by some robot models.</p>

13.1 List of Instructions Supported by MotoSim EG (FS100, DX100, NX100, XRC, MRC, MRC II)

Instruction	Description
REFP	<p>REFP 1 C000 PL=1</p> <p>→ C***</p> <p>→ PL=0 PL=1 PL=2 PL=3 PL=4</p>
SPEED	<p>SPEED VJ=50.00 V=138 VR=138.0 VE=50.00</p> <p>→ VJ VR VE V</p> <p>→ Numeric value</p> <p>→ Ignored</p>
ADD SUB	<p>ADD B000 0</p> <p>SUB B000 0</p> <p>→ Byte variable → B000</p> <p>→ Integer variable → I000</p> <p>→ Double precision variable → D000</p> <p>→ Real variable → R000</p> <p>→ Constant → 000</p> <p>→ Array cannot be specified</p> <p>→ Byte variable → B000□</p> <p>→ Integer variable → I000□</p> <p>→ Double precision variable → D000□</p> <p>→ Real variable → R000□</p> <p>→ Robot position variable → P000□</p> <p>→ Base axis variable → BP000□</p> <p>→ Station axis variable → EX000</p> <p>→ 000</p> <p>→ Array cannot be specified</p>

13.1 List of Instructions Supported by MotoSim EG (FS100, DX100, NX100, XRC, MRC, MRC II)

Instruction	Description
<p>MUL DIV</p>	<p>MUL <u>D000</u> <u>D000</u> DIV <u>D000</u> <u>D000</u></p> <ul style="list-style-type: none"> → Byte variable → <u>B000</u> → Integer variable → <u>I000</u> → Double precision variable → <u>D000</u> → Real variable → <u>R000</u> → Constant → <u>000</u> Array cannot be specified <p>→ Byte variable → <u>B000</u></p> <ul style="list-style-type: none"> → Integer variable → <u>I000</u> → Double precision variable → <u>D000</u> → Real variable → <u>R000</u> → <u>000</u> Array cannot be specified <p>MUL <u>EX000</u> (1) <u>D000</u> DIV <u>EX000</u> (1) <u>D000</u></p> <ul style="list-style-type: none"> → Real variable → <u>R000</u> → Constant → <u>000</u> Array cannot be specified → Numeric value <p>→ Robot position variable → <u>P 000</u>□</p> <ul style="list-style-type: none"> → Base axis variable → <u>BP 000</u>□ → Station axis variable → <u>EX000</u> → <u>000</u> Array cannot be specified
<p>INC DEC</p>	<p>INC <u>B000</u> DEC <u>B000</u></p> <ul style="list-style-type: none"> → Byte variable → <u>B000</u> → Integer variable → <u>I000</u> → Double precision variable → <u>D000</u> → <u>000</u> Array cannot be specified
<p>AND OR NOT XOR SQRT SIN COS ATAN</p>	<p>AND <u>B000</u> <u>0</u> OR <u>B000</u> <u>0</u> NOT <u>B000</u> <u>0</u> XOR <u>B000</u> <u>0</u> SQRT <u>B000</u> <u>0</u> SIN <u>B000</u> <u>0</u> COS <u>B000</u> <u>0</u> ATAN <u>B000</u> <u>0</u></p> <ul style="list-style-type: none"> → Variable → <u>B 000</u> → Constant → <u>000</u> Array cannot be specified → <u>B***</u>

Instruction	Description
GETE	<p>DIV <u>D000</u> <u>P000</u> (1)</p> <ul style="list-style-type: none"> ↳ Numeric value ↳ Robot position variable → P000□ ↳ Base axis variable → BP000□ ↳ Station axis variable → EX000 ↳ D*** ↳ 000 ↳ Array cannot be specified
CLEAR	<p>CLEAR <u>B000</u> 0</p> <ul style="list-style-type: none"> ↳ Constant ↳ Byte variable → B000 ↳ Integral variable → I000 ↳ Double precision variable → D000 ↳ 000 ↳ Array cannot be specified
CNVRT	<p>CNVRT <u>PX000</u> <u>PX000</u></p> <ul style="list-style-type: none"> ↳ Extended position variable → PX000 ↳ Extended position local variable → LPX000 ↳ 000 ↳ Extended position variable → PX000 ↳ Extended position local variable → LPX000 ↳ 000
GETS	<p>GETS <u>PX000</u> <u>\$PX001</u></p> <ul style="list-style-type: none"> ↳ Extended position status variable → \$PX000 ↳ 000 ↳ Array cannot be specified ↳ Extended position variable → PX000 ↳ 000 ↳ Array cannot be specified

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

■ FS100

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
MPP3	MPP0003-A00	0	Added at Ver3.60

■ DX100

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
ES165D	ES0165D-A00	650	Added at Ver3.02
ES165RD	ES165RD-A00	450	Added at Ver3.40
ES200D	ES0200D-A00	650	Added at Ver3.02
ES280D-230	ES0280D-A10	650	Added at Ver3.50
HP20D	HP0020D-A00	505	Added at Ver3.02
HP20RD	HP020RD-A00	305	Added at Ver3.50
MA1400	MA01400-A00	450	Added at Ver3.01
MA1800	MA01800-A00	555	Added at Ver3.30
MA1900	MA01900-A00	505	Added at Ver3.02
MH5	MH00005-C00	330	Added at Ver3.44
MH5	MH00005-E00	330	Added at Ver3.51
MH5	MH00005-E10	330	Added at Ver3.51
MH5L	MH0005L-C00	330	Added at Ver3.44
MH6	MH00006-A00	450	Added at Ver3.01
MH6-10	MH00006-A30	450	Added at Ver3.44
MH6S	MH0006S-A00	450	Added at Ver3.30
MH50	MH00050-A00	540	Added at Ver3.02
MH50-20	MH00050-A10	540	Added at Ver3.30
MH50-35	MH00050-A20	540	Added at Ver3.44
MH80	MH00080-A00	540	Added at Ver3.51

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

MH165	MH00165-A00	650	Added at Ver3.51
MH165	MH00165-B00	650	Added at Ver3.51
MH215	MH00215-A00	650	Added at Ver3.50
MH250	MH00250-A00	650	Added at Ver3.60
MH250	MH00250-B00	650	Added at Ver3.60
MPK2	MPK0002-A00	500	Added at Ver3.41
MPK2	MPK0002-B01	420	Added at Ver3.51
MPL80	MPL0080-A00	540	Added at Ver3.44
MPL100	MPL0100-A00	880	Added at Ver3.40
MPL160	MPL0160-A00	880	Added at Ver3.10
MPL300	MPL0300-A00	880	Added at Ver3.40
MPL500	MPL0500-A00	880	Added at Ver3.50
MPL800	MPL0800-A00	880	Added at Ver3.40
MS80	MS00080-A00	540	Added at Ver3.01
MS80W	MS0080W-A00	540	Added at Ver3.60
MS80W	MS0080W-B00	540	Added at Ver3.60
MS120	MS00120-A00	680	Added at Ver3.51
SIA10D	SIA010D-A00	360	Added at Ver3.10
SIA20D	SIA020D-A00	410	Added at Ver3.10
SIA50D	SIA050D-A00	540	Added at Ver3.02
UP120ED-165	UP120ED-A10	525	Added at Ver3.50
UP350D	UP0350D-A00	900	Added at Ver3.20
UP350D-600	UP0350D-B30	900	Added at Ver3.51
VA1400	VA01400-A00	450	Added at Ver3.00
VS50	VS00050-A00	540	Added at Ver3.02

■ NX100

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
DX1350N	DX1350N-A00	480	Added at Ver1.30
EA1400N	EA1400N-A00	450	
EA1400N Ceiling Mounted Type	EA1400N-A10	450	
EA1800N	EA1800N-A00	555	Added at Ver2.60
EA1900N	EA1900N-A00	505	
EA1900N Ceiling Mounted Type	EA1900N-A10	505	Added at Ver2.50
ECH2401D-4700	ECH50D-D00	716	Added at Ver3.30
ECH2501D-4700	ECH80D-D00	716	Added at Ver3.20
ECR3J	ECR3J-A00	290	Added at Ver3.40
ECR200	ECR200-A00	735	Added at Ver2.50
ECR400R-200	ECR400R-A10	1005	Added at Ver3.40
ECR400R-400	ECR400R-B00	1005	Added at Ver3.40
ECS600N	ECS600N-A01	730	Added at Ver3.50
EH80	EH80-A00	540	Added at Ver2.10
EH130	EH130-A00	650	Added at Ver2.30
EH130	EH130-A20	650	Added at Ver2.30
EH200	EH200-A00	730	Added at Ver2.50
EH200-150	EH200-A10	730	Added at Ver2.30
EP4000N	EP4000N-J00	740	
EP4000N	EP4000N-J10	740	Added at Ver1.20
EP4000N	EP4000N-J30	740	
EP4000N	EP4000N-J40	740	
EP4000N	EP4000N-J50	740	
EP4000N	EP4000N-J60	740	Added at Ver1.30
EP4000N	EP4000N-K00	740	
EP4000N	EP4000N-K10	740	Added at Ver1.20
EP4000N	EP4000N-K30	740	
EP4000N	EP4000N-K40	740	

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
EP4000N	EP4000N-K50	740	
EP4000N	EP4000N-K60	740	Added at Ver1.30
EP4000N	EP4000N-L00	740	
EP4000N	EP4000N-L10	740	Added at Ver1.20
EP4000N	EP4000N-L30	740	
EP4000N	EP4000N-L40	740	
EP4000N	EP4000N-L50	740	
EP4000N	EP4000N-L60	740	Added at Ver1.30
EPH130	EPH130-A00	730	Added at Ver2.00
EPH130	EPH130-C24	730	Added at Ver2.60
EPH130R	EPH130R-A00	600	Added at Ver2.10
EPH130RL	EPH130RL-A00	600	Added at Ver2.10
EPH130RL	EPH130RL-A54	600	Added at Ver2.60
EPH130RL-85	EPH130RL-A34	600	Added at Ver2.60
EPH130RL-85	EPH130RL-A60	600	Added at Ver3.00
EPH4000	EPH4000-J01	758	Added at Ver1.50
EPH4000	EPH4000-J11	758	Added at Ver1.50
EPH4000	EPH4000-J31	758	Added at Ver1.50
EPH4000	EPH4000-J41	758	Added at Ver1.50
EPH4000	EPH4000-J51	758	Added at Ver1.50
EPH4000	EPH4000-J60	758	Added at Ver1.20
EPH4000	EPH4000-J71	758	Added at Ver3.00
EPH4000	EPH4000-J81	758	Added at Ver2.80
EPH4000	EPH4000-JA0	758	Added at Ver1.30
EPH4000	EPH4000-K01	758	Added at Ver1.50
EPH4000	EPH4000-K11	758	Added at Ver1.50
EPH4000	EPH4000-K31	758	Added at Ver1.50
EPH4000	EPH4000-K41	758	Added at Ver1.50
EPH4000	EPH4000-K51	758	Added at Ver1.50
EPH4000	EPH4000-K60	758	Added at Ver1.20

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
EPH4000	EPH4000-KA0	758	Added at Ver1.30
EPH4000	EPH4000-L01	758	Added at Ver1.50
EPH4000	EPH4000-L11	758	Added at Ver1.50
EPH4000	EPH4000-L31	758	Added at Ver1.50
EPH4000	EPH4000-L41	758	Added at Ver1.50
EPH4000	EPH4000-L51	758	Added at Ver1.50
EPH4000	EPH4000-L60	758	Added at Ver1.20
EPH4000	EPH4000-LA0	758	Added at Ver1.30
EPL80	EPL80-A00	540	Added at Ver2.10
EPL160	EPL160-A00	880	Added at Ver1.10
EPL160	EPL160-A10	880	Added at Ver1.10
EPL300	EPL300-A00	880	Added at Ver1.10
EPL300	EPL300-A10	880	Added at Ver1.10
EPL500	EPL500-A00	880	Added at Ver1.50
EPL500	EPL500-A10	880	Added at Ver1.50
EPX1250	EPX1250-A000	310	Added at Ver3.51
EPX2050	EPX2050-A500	600	Added at Ver3.50
EPX2050	EPX2050-B500	600	Added at Ver3.50
EPX2700	EPX2700-A000	0	Added at Ver3.50
EPX2700	EPX2700-A010	0	Added at Ver3.50
EPX2700	EPX2700-A100	0	Added at Ver3.50
EPX2700	EPX2700-A110	0	Added at Ver3.50
EPX2800	EPX2800-A000	795.5	Added at Ver3.50
EPX2800R	EPX2800R-Z000	817.5	Added at Ver2.60
EPX2800R	EPX2800R-C000	817.5	Added at Ver3.60
EPX2900	EPX2900-Z000	750	Added at Ver2.60
EPX2900	EPX2900-A000	750	Added at Ver2.70
EPX2900	EPX2900-B000	750	Added at Ver2.70
ES120N	ES120N-A00	650	Added at Ver3.02
ES120N	ES120N-A20	680	Added at Ver3.02

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
ES165N	ES165N-A00	650	
ES165N-100	ES165N-A10	650	
ES165RN	ES165RN-A00	450	
ES200N	ES200N-A00	650	
ES200RN	ES200RN-A00	450	
ES200RN-120	ES200RN-A10	450	Added at Ver1.10
ES200TN	ES200TN-A00	650	Added at Ver2.30
ES280N	ES280N-A00	650	Added at Ver2.00
HP3	HP3-A00	300	
HP3J	HP3J-J00	290	Added at Ver2.20
HP3L	HP3L-A00	300	
HP3XF	HP3XF-A00	300	Added at Ver1.30
HP3XF	HP3XF-B00	300	Added at Ver1.30
HP5	HP5-A00	300	Added at Ver1.30
HP6	HP6-A00	450	
HP6R	HP6-R00	240	Added at Ver2.00
HP6R	HP6-R10	240	Added at Ver2.00
HP6S	HP6-A10	450	Added at Ver1.10
HP20	HP20-A00	505	
HP20-6	HP20-A10	505	
HP20 IP65	HP20-A20	505	
HP20R	HP20R-B2C	305	Added at Ver3.02
HP165	HP165-A00	650	
IA20	IA20-A00	450	Added at Ver2.00
SIA2	SIA2-A00	314.5	Added at Ver3.60
SIA10	SIA10-A00	360	Added at Ver2.80
SIA20	SIA20-A00	410	Added at Ver2.80
SP800N	SP800N-A00	540	
SSA2000	SSA3-A00	450	Added at Ver2.30

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
SSA2000 Ceiling Mounted Type	SSA3-A10	450	Added at Ver2.70
SSF2000	SSF6-A00	450	Added at Ver2.60
SSF2000R	SSF6R-A20	240	Added at Ver3.02
UP20MN	UP20MN-A00	540	
UP50N	UP50N-A00	540	
UP50N	UP50N-A51	540	Added at Ver2.70
UP50N	UP50N-AA1	540	Added at Ver2.80
UP50N-80	UP50N-A10	540	
UP50SN	UP50N-A20	540	
UP50SN	UP50N-A71	540	Added at Ver2.70
UP50N-35	UP50N-A30	540	
UP50RN-35	UP50RN-A10	450	Added at Ver2.10
UP120EN-165	UP120EN-A10	525	
UP130RN	UP130RN-B00	600	Added at Ver3.00
UP130RLN	UP130RN-A2A	600	
UP130RLN	UP130RN-A2B	600	Added at Ver2.60
UP130RLN-85	UP130RN-A4A	600	Added at Ver2.60
UP350N	UP350N-A00	900	
UP350N-200	UP350N-A10	900	Added at Ver1.20
UP350N-500	UP350N-A20	900	
UP350N-600	UP350N-A30	900	Added at Ver1.10
UP400RN	UP400RN-A00	1000	

■ NXC100

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
HP3	HP3-A00	300	Added at Ver1.50
HP3L	HP3L-A00	300	Added at Ver1.50
HP3XF	HP3XF-A00	300	Added at Ver1.50
HP5	HP5-A00	300	Added at Ver1.50
MHJN	MHJN-A00	240	Added at Ver3.60

■ YASNAC XRC

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
CHL2400D-4700	CHL50D-A00	718	Added at Ver1.50
CHL2400D-3700	CHL50D-A10	718	Added at Ver1.50
CHL2400D-2700	CHL50D-A20	718	Added at Ver1.50
CR3X	CR3-J00	300	Added at Ver2.60
CR20	CR20-A00	535	
CR50	CR50-A00	540	
CR130	CR130-A10	730	Added at Ver3.40
CR165	CR165-A20	730	Added at Ver3.40
CR165-100	CR165-A10	730	Added at Ver2.00
CR165-200	CR165-A30	730	Added at Ver1.50
CSL10	CSL10-A00	950	
CSL10-460	CSL10-A10	840	
CSL10-650	CSL10-A20	1030	
CSL15	CSL15-A00	750	
CSL15-1400	CSL15-A10	770	
CSL15-1400	CSL15-A30	770	
CSL15-1600	CSL15-A20	770	
CSL15D	CSL15D-A00	750	
CSL15D	CSL15D-B00	750	
CSL15D-1400	CSL15D-A10	770	
CSL15D-1400	CSL15D-B10	770	
CSL15D-1400	CSL15D-B30	770	
CSL15D-1600	CSL15D-B20	770	
CSL600	CSL600-A00	730	
CSL600D	CSL600D-A00	730	
CSL600D-1400	CSL600D-A10	840	
CSL1200	CSL20-A00	790	
CSL1200-1600	CSL20-A10	790	
CSL1200-1800	CSL20-A20	790	

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
CSL1200-2400	CSL20-A70	790	Added at Ver2.50
CSL1200D	CSL20D-A00	790	
CSL1200D	CSL20D-B00	790	
CSL1200D	CSL20D-B30	790	
CSL1200D-L	CSL20D-A10	790	
CSL1200D-L	CSL20D-B10	790	
CSL1200D-1800	CSL20D-B20	790	
CSL1200D-1600	CSL20D-B40	790	
CSL1200D-875	CSL20D-B55	790	
CSL1200D-875	CSL20D-B61	790	
CSL1200D-1200	CSL20D-B80	790	
CSL1200D-2400	CSL20D-B90	790	
CSL1300D-2440	CSL30D-A00	870	Added at Ver2.00
CSL1300SC-1800	CSL30SC-A10	900	Added at Ver2.00
CSL2200D-1800	CSL50D-A00	824	
CSL2200D-2400	CSL50D-A10	824	
CSL2200D-2650	CSL50D-A20	824	
CSL2400D-1800	CSL80D-A00	950	
CSL2400D-2400	CSL80D-A10	950	
CSL2400D-1800	CSL80D-C00	950	Added at Ver1.20
CSL2400D-2400	CSL80D-C10	950	Added at Ver1.20
CSL2400S-1800	CSL80S-A00	950	
CSL2400S-2400	CSL80S-A10	950	
CSL2400S-2400	CSL80S-C10	950	Added at Ver1.30
CSL2500D-1800	CSL120D-A00	1059	Added at Ver2.10
CSL2500D-2400	CSL120D-A10	1050	Added at Ver1.20
CSL2500S-1800	CSL120S-A00	1059	Added at Ver2.10
CSP1500	CSP50-A00	804.5	
CSP1500	CSP50-B00	804.5	
CSP1500W	CSP50-C00	822	

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
DX1350	DX1350-A00	480	
EA1400	EA1400-A00	450	
EA1900	EA1900-A00	535	
EP3000	EP3000-A0A	600	
EP4000	EP4000-A01	740	
EP4000	EP4000-A11	740	
EP4000	EP4000-A21	740	
EP4000	EP4000-B01	740	
EP4000	EP4000-B11	740	
EP4000	EP4000-B21	740	
EP4000	EP4000-C01	740	
EP4000	EP4000-C11	740	
EP4000	EP4000-C21	740	
ES165	ES165-J02	650	
ES165	ES165-J12	650	
ES165R	ES165R-J02	450	
ES200	ES200-J02	650	
ES200R	ES200R-J02	450	
PX800	PX800-A02	0	
PX800	PX800-Floor	310	
PX1450	PX1450-A20	600	
PX1450	PX1450-A30	600	
PX1750	PX1750-A50	600	Added at Ver2.00
PX1850	PX1850-A20	600	
PX1850	PX1850-A30	600	
PX2050	PX2050-A20	600	
PX2050	PX2050-A30	600	
PX2050	PX2050-A50	600	Added at Ver1.10
PX2750	PX2750-A30	600	
PX2850	PX2850-A00	600	

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
PX2850	PX2850-A10	600	
PX2850	PX2850-A20	600	
PX2850	PX2850-A50	600	Added at Ver1.10
PX2850	PX2850-A60	600	Added at Ver1.10
PX2850	PX2850-AA0	600	
PX2900	PX2900-A00	750	
PX2900	PX2900-A10	750	
RS65-250	RS65-250	765	
SK16X	SK16-J00	585	
SK16X-6	SK16-J10	585	
SK16MX	SK16M-J00	760	
SK45X	SK45-J00	760	
SK45X-30	SK45-J10	760	
SK300X	SK300-J00	900	
SK506X	SK506-J00	0	
SP70X	SP70-J00	0	
SP100X	SP100-J00	880	
SP100X-160	SP100-J10	880	
SP100X-250	SP100-J20	880	
SP100X-130	SP100-J30	880	
SP400X	SP400-A00	800	
SP400X-500	SP400-A20	800	
SP800	SP800-A00	540	
SR200X-150	SR200-J20	600	
SR200X-150	SR200-J40	600	
SV3X	SV3-J00	300	
SV3X	SV3-J20	300	
SV035	SV035-J00	380	
UP6	UP6-A00	450	
UP6	UP6-A20	450	

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
UP6 Backward-Arm Model	UP6-A30	450	
UP6R	UP6-R00	240	
UP6RS	UP6-R10	240	
UP20	UP20-A00	535	
UP20-6	UP20-A10	535	
UP20-10	UP20-A70	535	
UP20M	UP20M-A00	540	
UP50	UP50-A00	540	
UP50S	UP50-A60	540	
UP50-35	UP50-A20	540	
UP50-80	UP50-A30	540	
UP120E	UP120E-A00	525	
UP120E-165	UP120E-A12	525	
UP130	UP130-A00	730	
UP130R	UP130R-A00	600	
UP130RL	UP130R-A20	600	
UP130S	UP130-A10	730	
UP130T	UP130-T00	773	
UP165	UP165-A00	730	
UP165-100	UP165-A30	730	
UP165-100	UP165-A40	730	
UP165R	UP165R-A00	600	
UP200	UP200-A00	730	
UP200R	UP200-R00	600	
UP350	UP350-A00	900	
UP350-200	UP350-A10	900	
UP350-500	UP350-A20	900	
UP400R	UP400R-A00	1000	
UP400R	UP400R-A10	1000	

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

Model Name	Robot Type (Model File Name)	Offset Value (mm)	Remarks
UPJ*2)	UPJ3-A00	290	
UPJ*2)	UPJ3-B00	290	

■ YASNAC MRC

Model Name	Robot Type	Model File Name	Offset Value (mm)	Remarks
CR45	CR45-C000	CR45-C00	760	
K3	K3-C000	K3-C00	384	
K5WG	K5G-A01	K5WG	685	
K5WG	K5G-A01-B	K5WG	685	
K6	K6-A301	K6-A30	550	
K6	K6-C000	K6-C00	550	
K10	K10-C000	K10-C00	585	
K10-6	K10-C010	K10-C10	585	
K10M	K10M-C000	K10M-C00	730	
K30	K30-C000	K30-C00	730	
K30	K30-C010	K30-C01	730	
K60	K60-C000	K60-C00	720	
K604 ^{*1)}	K604-C000	K604-C00	750	
K60C	K60C-A100	K60C-A10	720	
K60T	K60T-C100	K60T-C10	740	
K100	K100-C000	K100-C00	830	
K100-120	K100-D000	K100-D00	830	
K1004	K1004-C000	K1004-C00	1050	
K100C	K100C-C100	K100C-C10	830	
K100R	K100R-C000	K100R-C00	550	
K205 ^{*1)}	K205-C000	K205-C00	900	
K506	K506-C000	K506-C00	570	
K506	K506-C010	K506-C01	570	
NY170L2	K300-C010	K300-C01	900	
NY3002	K300-C000	K300-C00	900	
NY400S2	K300-C020	K300-C02	900	
S604	S604-C000	S604-C00	0	
S604	S604-D000	S604-D00	0	
S604-30	S604-C010	S604-C01	0	

13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

Model Name	Robot Type	Model File Name	Offset Value (mm)	Remarks
S604-30	S604-D010	S604-D01	0	
SK6	SK6-C000	SK6-C00	530	
SK6	SK6-C020	SK6-C02	530	
SK6R	SK6R-C001	SK6R-C00	240	
SK6R	SK6R-C011	SK6R-C01	240	
SK16	SK16-C000	SK16-C00	585	
SK16-6	SK16-C010	SK16-C01	585	
SK16M	SK16M-C000	SK16M-C00	760	
SK45	SK45-C000	SK45-C00	760	
SK45-30	SK45-C010	SK45-C01	760	
SK45-80	SK45-D000	SK45-D00	760	
SK120	SK120-C000	SK120-C00	850	
SK120	SK120-C053	SK120-C05	850	
SK120-75	SK120-C030	SK120-C03	850	
SK120-80	SK120-E000	SK120-E00	850	
SK120-150	SK120-D000	SK120-D00	850	
SK506	SK506-C000	SK506-C00	0	
SK506	SK506-C010	SK506-C01	0	
SK604 ^{*1)}	SK604-C000	SK604-C00	750	
SP70	SP70-D000	SP70-D00	0	
SP100	SP100-C000	SP100-C00	880	
SP100-160	SP100-D000	SP100-D00	880	
SR100	SR100-C000	SR100-C00	550	
SR200-150	SR200-C110	SR200-C11	600	
SV16	SV16-A000	SV16-A00	620	
SV035	SV035-C000	SV035-C00	350	

■ YASNAC MRC II

Model Name	Robot Type	Model File Name	Offset Value (mm)	Remarks
CR3	CR3-C000	CR3-C00	300	
CR45	CR45-C000	CR45-C00	760	
SK6	SK6-C000	SK6-C00	530	
SK6	SK6-C020	SK6-C02	530	
SK6R	SK6R-C001	SK6R-C00	240	
SK6R	SK6R-C011	SK6R-C01	240	
SK16	SK16-C000	SK16-C00	585	
SK16-6	SK16-C010	SK16-C01	585	
SK45	SK45-C000	SK45-C00	760	
SK45-30	SK45-C010	SK45-C01	760	
SP70	SP70-D000	SP70-D00	0	
SV3	SV3-C000	SV3-C00	300	
SV035	SV035-C000	SV035-C00	350	

■ YASNAC ERC

Robot Type (Model File Name)	Offset Value (mm)	Remarks
K3S1	384	
K5G	685	
K5NG	685	
K5WG	685	
K6S	550	
K10SH	585	
K10MSB	730	
K30SH	730	
K30WSH	730	
K60SH	720	
K60COSH	720	

Robot Type (Model File Name)	Offset Value (mm)	Remarks
K60CSH	720	
K60TCS1	740	
K100CSH	830	
K100RSH	550	
K100SN	1000	
K120SH	830	
K506NSH1 ^{*1)}	570	
S304SC	0	
S304WSC	0	
S604SC	0	
S604WSC	0	

***1** The robot will be displayed in a simplified image (e.g. displayed without the parallel link, etc.) compared to the actual robot. However, there will be no problem in operating the robot including teaching with MotoSim EG.

***2** The models which are operated primarily with JRC can be simulated with XRC under the following conditions:

-P-point maximum envelope.

The same P-point maximum envelope specified in the external dimension diagram is applied. It can be used to examine the layout.

-Cycle time.

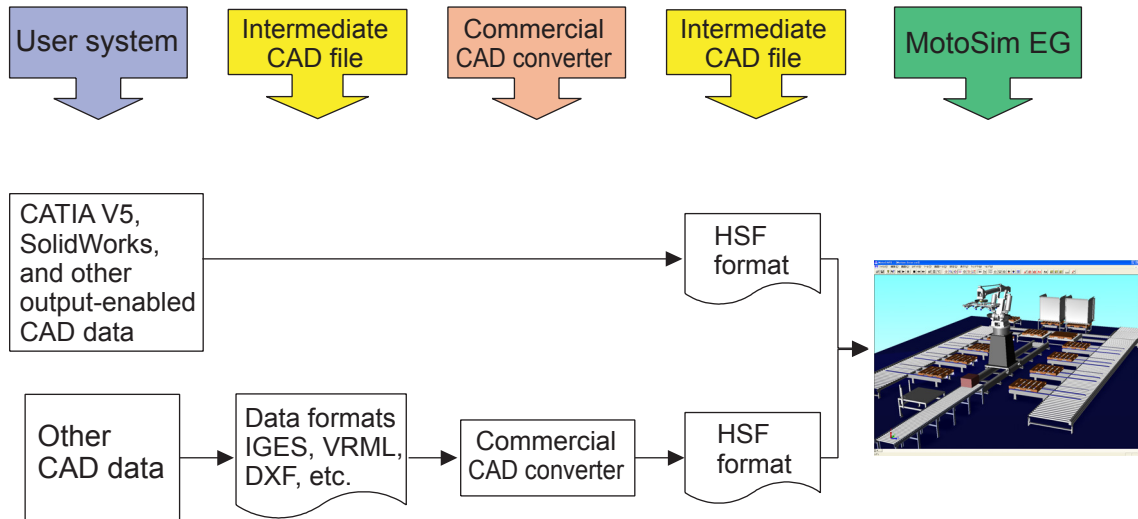
Accuracy of any calculated cycle time is not assured.

-Jobs.

Created jobs can be used exclusively for XRC; they cannot be used for JRC.

13.3 Reading the CAD Data with MotoSim EG

The CAD data must be converted into a form readable for MotoSim EG before starting the reading operation. The following flowchart shows the data conversion operations required for MotoSim EG.



The CAD converters "PolyTrans" and "Inovate" are not included with MotoSim EG. Prepare such application software before the operation.

PolyTrans: Okino Computer Graphics (<http://www.okino.com>)

Inovate: IRONCAD (<http://www.ironcad.com>)

13.4 Frequently-Asked Questions

- When the driver has been installed with USB type key connected to a personal computer
 1. With the USB type key attached to a personal computer, delete the item registered as "USB Token" in Device Manager.
 2. Uninstall the driver (Sentinel System Driver 5.41.1(32-bit)) with "Add/Remove Programs".
 3. Install the driver with key detached from personal computer.

- When the previous version key driver (Ver.PD-5.39.2) has been installed after installing the key driver Ver.PD-5.41.1

Although it is rare, there may be some trouble in this case.

Uninstall the driver Ver.PD-5.39.2 (Sentinel System Driver) with "Add / Remove Programs".

- When the software program does not start properly with D-SUB type key

The driver of the hardware lock may be too old or does not exist.

Execute "\SentinelDriver\SSD5411-32bit.EXE" in the installation CD-ROM. For the installation procedure, refer to "\SentinelDriver\Manual\us\Readme.pdf".



- Be sure to install the driver under Windows 2000/XP environment.
- When installing the driver under Windows 2000/XP environment, make sure to login in administrator mode in order to add files to system folder and input information in registry.

- How to perform a simulation with MotoSim EG using data of actual robots

Refer to the " 4.5 Creating a Cell with Actual Robot Data " for details.

- Cell file containing HSF files don't display properly

When cell file containing HSF model files, if the HSF format version is higher than the one currently supported by MotoSimEG, the HSF file may not display properly. In the case that a newer MotoSimEG version displays the cell properly, the newer MotoSimEG can save the cell file in a previous MotoSimEG format. This will also save the HSF file into the corresponding format version (Refer to section " 4.3.2 Save As " for details.) If the HSF file was generated by a 3rd party software, look in the that software HSF export options to export the file in an HSF format version corresponding to you current version of MotoSimEG.

■ MotoSimEG - CadPack Cell file compatibility

Cell file created with MotoSimEG can be used by MotoSimEG-CadPack. Cell file created with MotoSimEG-CadPack can also be used by MotoSimEG even if CAD data (IGES,SAT) was imported into the cell. When saving the cell, the MotoSimEG-CadPack converts imported CAD data into HSF files. Once that conversion is done, the regular MotoSimEG can open the file without problems.

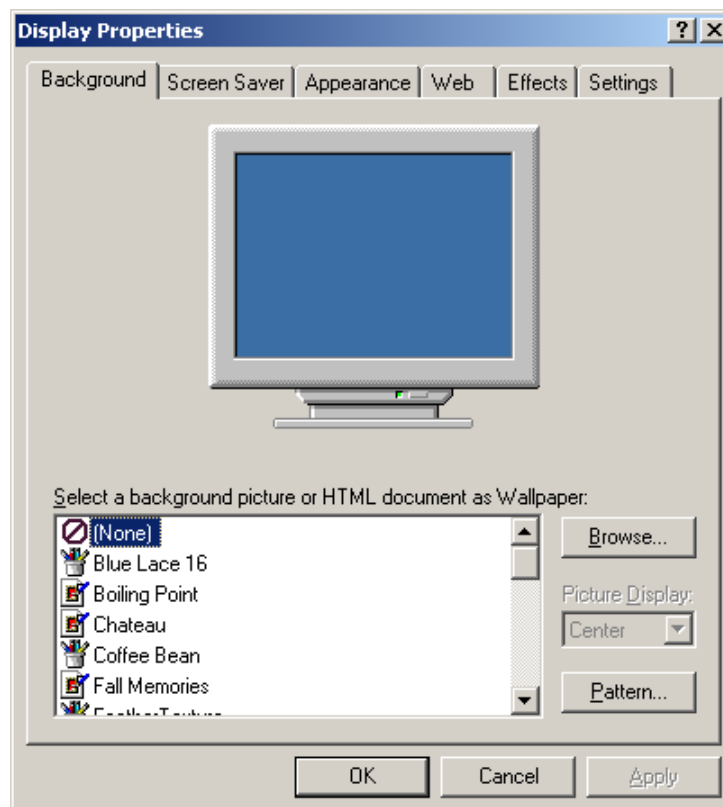
■ Graphic Driver Concerns

With MotoSim EG ver. 2.0 or later, some old version display adapters (graphic drivers) may not properly generate memos and dimension lines. In those cases, it is necessary to upgrade the version of the display driver. For Intel type adapter, verify that the version number is 6.14.10.4020 or later, otherwise please upgrade the display driver.

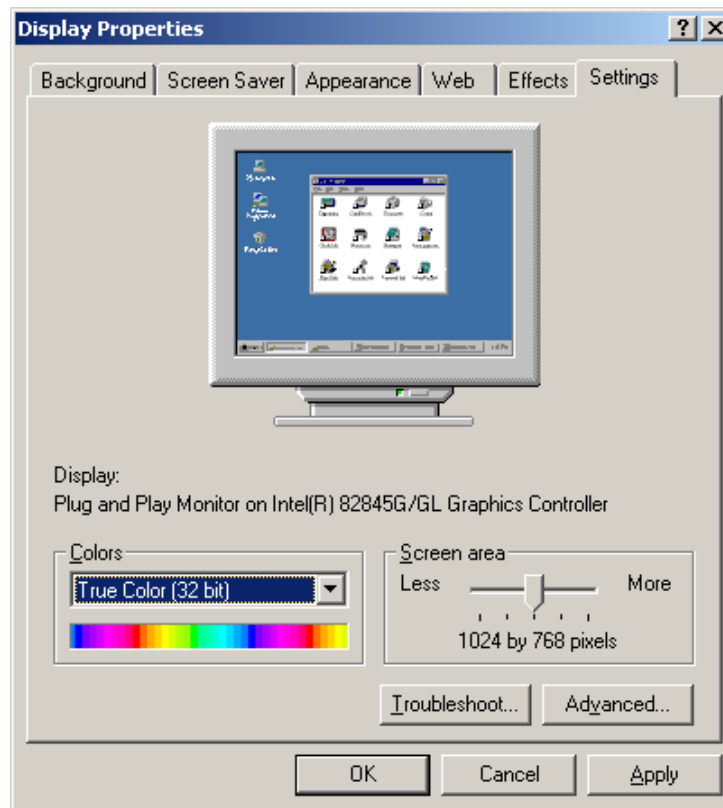
Version Verification Procedure

The following example is for a IntelR Graphics Controller on a Windows 2000 operating systems.

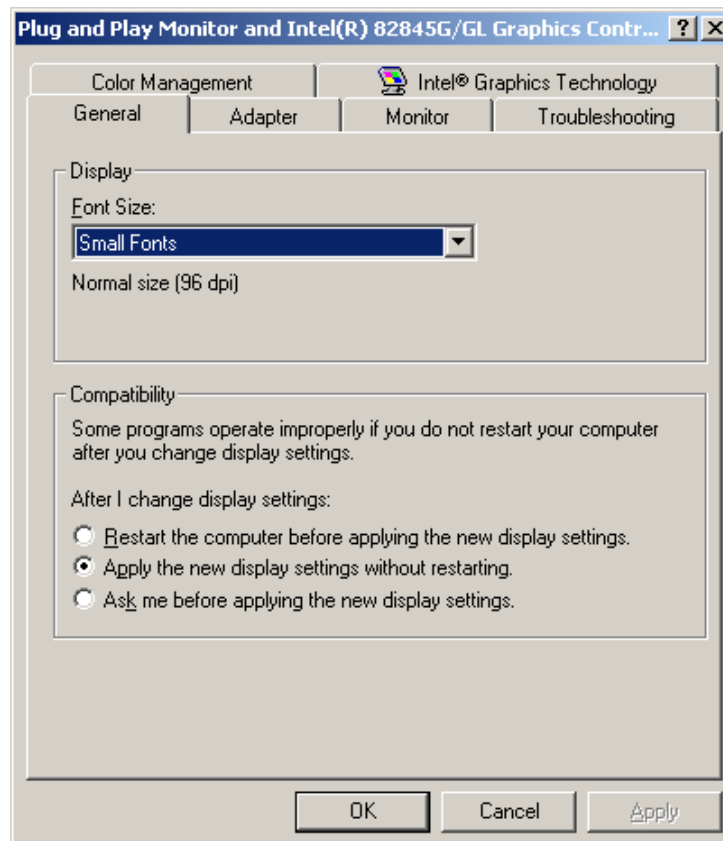
1. With the mouse right click on the desktop and select "Properties" from the popup menu to display the Desktop Properties dialog.



2. Select the "Display" tab.



3. Click on the "Advanced" button to display the graphic driver property dialog.



4. Select the "IntelR Graphics Technology"ntab.



5. Verify the version. (The version is 6.13.01.3084. An upgrade is necessary.)

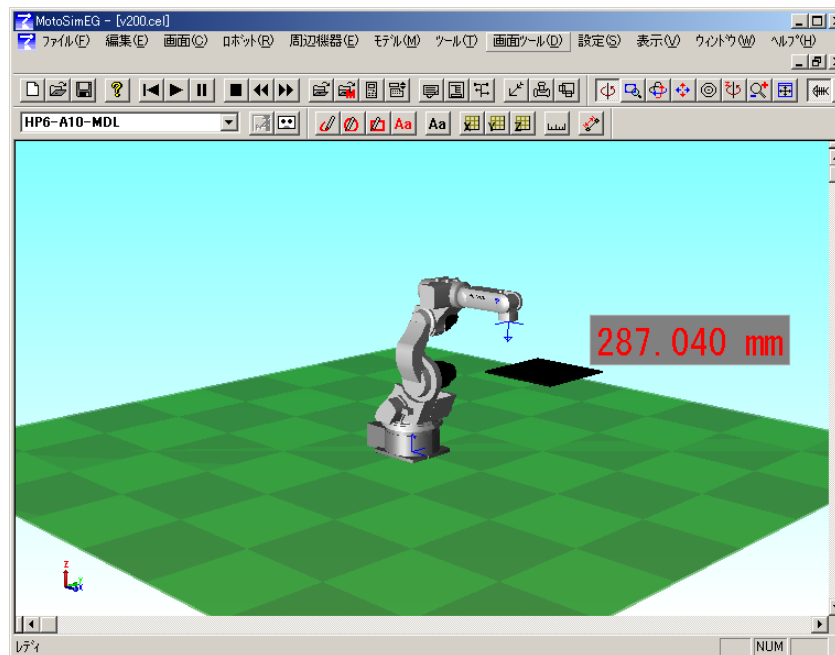
Version Upgrade Procedure

Download the necessary file (i.e. Win2K_XP1410.exe) from the download site and execute it. (In this example, the <http://support.intel.com/support/go/downloads> site was used.)

■ Compatibility Concerns for MotoSim EG ver. 2.0 or later: Cell Compatibility

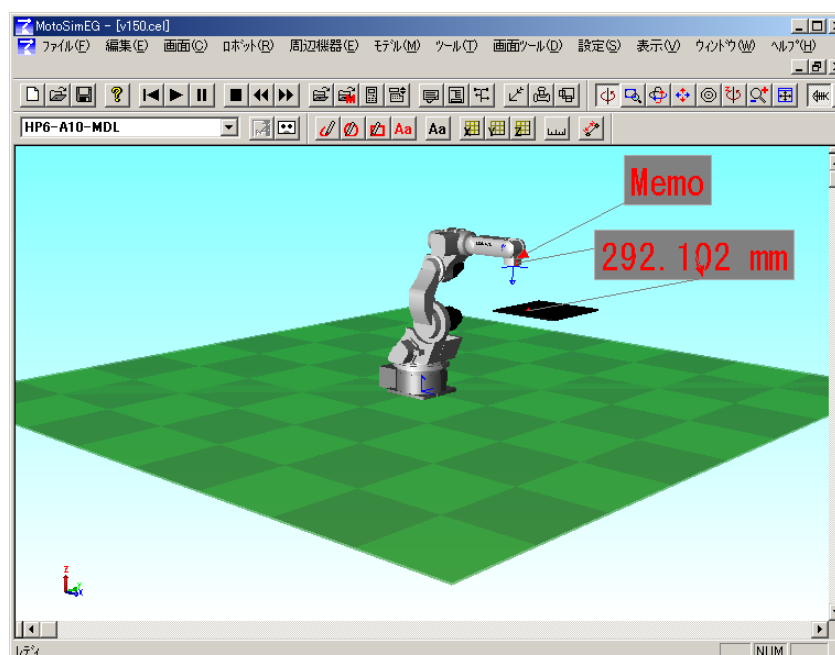
When opening a cell saved in MotoSim EG ver. 2.0 or later with MotoSim EG ver. 1.X, memos and dimension lines will not display properly. (Except for memos and dimension lines, other entities are displayed normally).

Example of a cell created in MotoSim EG ver. 2.0 and opened in ver. 1.5



A cell saved with MotoSim EG ver. 1.X and then opened with MotoSim EG ver. 2.0 or later will display the memo and dimensions arrows properly.

Example of a cell created in MotoSim EG ver. 1.5 and opened in ver. 2.0





Depending on the type of display adapter used, the arrow may not display in red.

■ Compatibility Concerns for MotoSim EG ver. 2.0 or later: File Export Compatibility

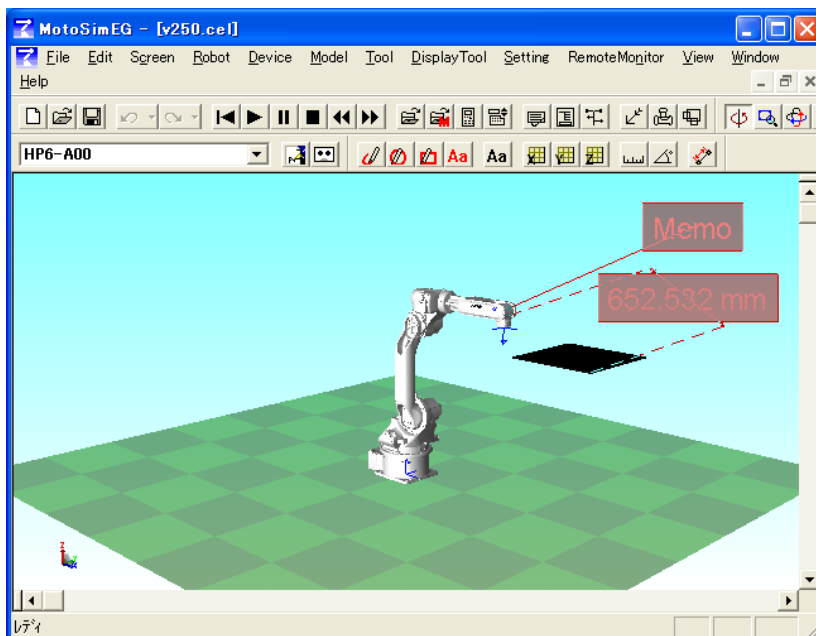
The "hsf" and "hmf" files generated with the "File Output (hsf, hmf, html)" by MotoSim EG ver. 1.X are in version v11.00. The "hsf" and "hmf" files generated by MotoSim EG ver. 2.0 or later are in version v13.00.

In the case that the resulting exported "html" doesn't display normally, establish an internet connection and open the "html" file again.

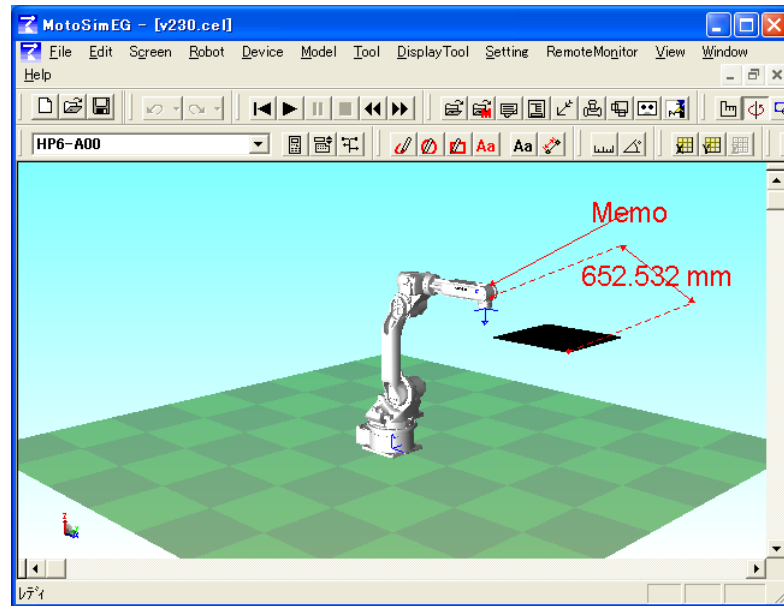
■ Compatibility Concerns for MotoSim EG ver. 2.5 or later: Cell Compatibility

When opening a cell saved in MotoSim EG ver. 2.5 or later with MotoSim EG ver. 2.3 or earlier, memos and dimension lines will not display properly. (Except for memos and dimension lines, other entities are displayed normally).

Example of a cell created in MotoSim EG ver. 2.5 and opened in ver. 2.3



A cell saved with MotoSim EG ver. 2.3 or earlier and then opened with MotoSim EG ver. 2.5 or later can not display the background parts of the memo and dimensions arrows. But the memo and dimensions arrows can be modified by right mouse button operation (delete / edit).

Example of a cell created in MotoSim EG ver. 2.3 and opened in ver. 2.5**Compatibility Concerns for MotoSim EG ver. 2.5 or later: File Export Compatibility**

The ".hsf" and ".hmf" files generated with the "File Output (.hsf, .hmf, .html)" by MotoSim EG ver. 2.3 or earlier are in Hoops version v13.00 or v11.00. The ".hsf" and ".hmf" files generated by MotoSim EG ver. 2.5 or later are in Hoops version v15.00.

If the resulting exported ".html" doesn't display properly, establish an internet connection and open the ".html" file again (the latest driver should automatically be downloaded).

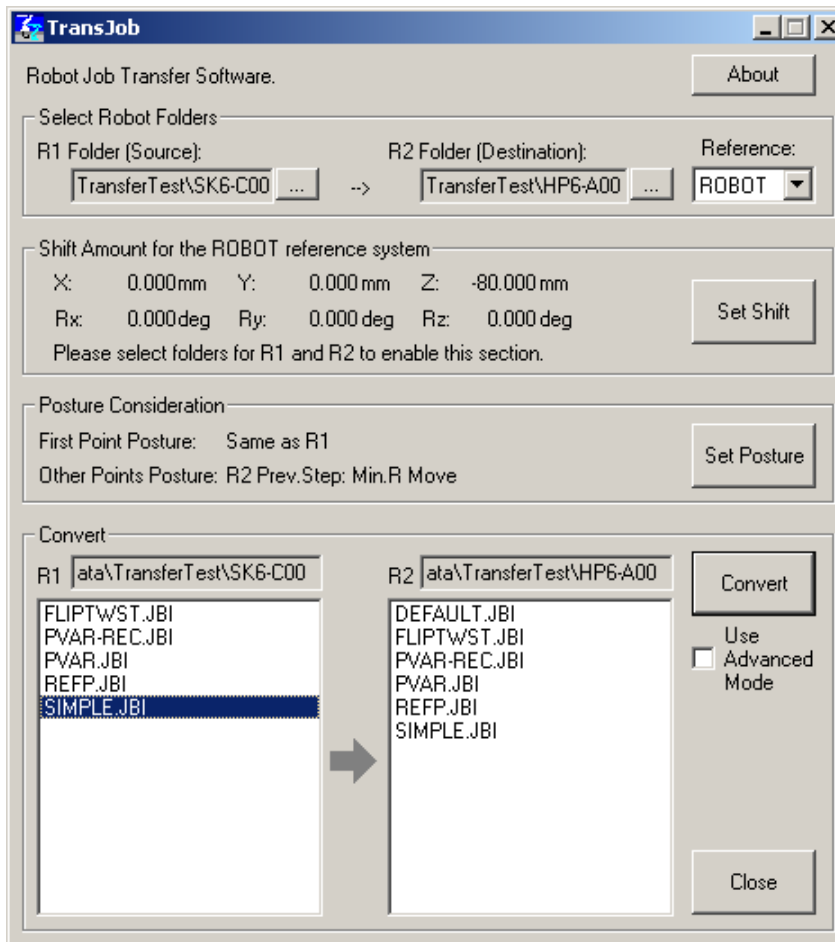
13.5 TransJob Function

TransJob is a software utility to transfer Motoman's robot JOB between manipulators.

For example this software can be used to transfer JOBS when an old manipulator is replaced by a newer model or when production need to be transferred from one manipulator to another.

The JOB format normally defines the manipulator position by registering the position of each motor in encoder pulses. Motors and geometry being different between manipulators, the JOBS cannot be transferred directly between them. Even when robots are identical, if the location of the work piece relative to the robot is different, the use of TransJob can help compensate for the difference.

■ Main Dialog Operation



TransJob function, refer to "TransJob Operation Manual_US.pdf" of the folder that installs MotoSim EG (default: \ProgramFiles\MOTOMAN\MotoSimEG\).

MotoSim EG

OPERATION MANUAL

FOR WINDOWS

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Specifications are subject to change without notice
for ongoing product modifications and improvements.

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