Upon receipt of the product and prior to initial operation, read this manual thoroughly, and retain for future reference.
<table>
<thead>
<tr>
<th>MANDATORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 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.</td>
</tr>
<tr>
<td>• 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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 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.</td>
</tr>
<tr>
<td>• The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.</td>
</tr>
<tr>
<td>• 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.</td>
</tr>
<tr>
<td>• 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.</td>
</tr>
<tr>
<td>• YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.</td>
</tr>
<tr>
<td>• 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.</td>
</tr>
</tbody>
</table>
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.

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

---

3/297
Notation for Menus and Buttons

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menu</td>
<td>The menus displayed on screen are denoted with { }. ex. {TOOL}.</td>
</tr>
<tr>
<td>Button</td>
<td>The buttons, check boxes, radio buttons displayed on screen are denoted with [ ]. ex. [Close]; [Sync] check box; [Fast] radio button.</td>
</tr>
</tbody>
</table>

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.)

Registered Trademark

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or bland names for each company or corporation. The indications of (R) and TM are omitted.
1 Introduction

1.1 Overview of MotoSim EG ........................................... 14
1.2 Environment Required for MotoSim EG ........................ 14
1.3 Hardware Key .......................................................... 14
   1.3.1 Connecting USB Type Key ................................... 15
   1.3.2 Connecting D-Sub Type Key ................................. 15
1.4 Installing MotoSim EG ............................................. 16
1.5 Definition of Terms ................................................ 16
1.6 Folder Configuration .............................................. 17

2 MotoSim EG Quick Tour

2.1 Overview .............................................................. 18
2.2 Cell Construction .................................................. 19
2.3 Creation of Models ............................................... 23
   2.3.1 Creating a Workpiece and a Workpiece Stand ............. 23
   2.3.2 Editing Tool Data ............................................. 30
   2.3.3 Adding a Tool Model ....................................... 31
     ■ Creating and Adding a Tool Model with the CAD Function . 31
     ■ Reading the HSF Format Model ............................ 35
2.4 Setting of Target Points (AXIS6 Model) ....................... 37
2.5 Teaching .............................................................. 40
   2.5.1 Selecting a Job ............................................... 41
   2.5.2 Teaching the Standby Position ............................ 41
   2.5.3 Determining the Welding Approach Posture .............. 43
   2.5.4 Teaching the Welding Start Position ..................... 44
   2.5.5 Teaching the Welding End Position ....................... 45
   2.5.6 Teaching the Torch Retraction ............................ 46
   2.5.7 Returning to the Standby Position ....................... 47
   2.5.8 Verifying Each Step ....................................... 48
   2.5.9 Editing a JOB. ............................................... 49
     ■ Modifying Steps ............................................... 49
     ■ Modifying or Adding Instructions .......................... 49
     ■ Deleting Instructions ....................................... 49
2.6 Playback ............................................................. 50

3 Offline Teaching Procedure

3.1 Operation Flow ................................................... 51
4 Creating and Editing a Cell

4.1 Creating a New Cell ............................................. 52
4.2 Opening a Cell ..................................................... 53
4.3 Storing a Cell ....................................................... 54
4.4 Exiting a Cell and MotoSim EG ................................. 54
4.5 Creating a Cell with Actual Robot Data ..................... 55
4.6 Designating Relative Path of a Cell File .................... 55
4.7 Exporting a File .................................................... 56
   4.7.1 Playback animation file export ........................... 56A
   4.7.2 Exported HTML file display operations ................ 56A

5 Display Operations

5.1 MotoSim EG Display ............................................. 57
5.2 Toolbar .............................................................. 58
5.3 Viewpoint Operation Tools ..................................... 60
   5.3.1 Viewpoint Operation with the Mouse ................. 61
      ■ Right Mouse Button Operation .......................... 61
      ■ Scroll Wheel Operation .................................. 62
   5.3.2 Viewpoint Operation with the View Manager .......... 62
      ■ Using Shortcuts ................................................. 62A
   5.3.3 Light Manager Operation .................................. 62A
      ■ Adding and Modifying Lights ....................... 62C
      ■ Deleting Lights .............................................. 62E
      ■ Light Sources .................................................. 62E
   5.4 Other Display Operations ..................................... 63
      5.4.1 Changing Frame Width ................................. 63
      5.4.2 Picking Settings ........................................... 63
         ■ Pick Mode Setting ........................................ 63
         ■ Pick Object Setting ..................................... 63
         ■ Pick method and screen display ...................... 63A
      5.4.3 Displaying Shadows ....................................... 63A
      5.4.4 Copying the Image ........................................ 64
      5.4.5 Dividing a Cell Window .................................. 64
      5.4.6 Printing the Image ........................................ 64

6 Display Tool Functions

6.1 Display Tools ..................................................... 65
6.2 Markup .......................................................... 66
   6.2.1 Freehand .................................................... 66
   6.2.2 Circle ......................................................... 67
6.2.3 Rectangle .................................................. 68
6.2.4 Notes .................................................. 69
- Adding a Note ............................................. 69
- Deleting a Note .......................................... 70
- Relocating a Note ....................................... 70
6.3 Memo .................................................... 71
- Creating a Memo ........................................ 71
- Deleting a Memo ........................................ 72
- Relocating a Memo ..................................... 72

6.4 Cutting Planes ............................................ 73
6.4.1 X-Cutting Planes .................................... 73
- Displaying the X-Cutting Plane ..................... 73
- Deleting the X-Cutting Plane ....................... 73
- Changing Display of the X-Cutting Plane ....... 73
6.4.2 Y-Cutting Planes .................................... 74
- Displaying the Y-Cutting Plane ..................... 74
- Deleting the Y-Cutting Plane ....................... 74
- Changing Display of the Y-Cutting Plane ....... 74
6.4.3 Z-Cutting Planes .................................... 75
- Displaying the Z-Cutting Plane ..................... 75
- Deleting the Z-Cutting Plane ....................... 75
- Changing the Z-Cutting Plane ..................... 75

6.5 Measure Distance ........................................ 75A
6.6 Measure Angle ........................................... 75B
6.7 Measure Line ............................................. 76
- Creating a Dimension Line ......................... 76
- Deleting a Dimension Line ......................... 76
- Relocating a Dimension Line ....................... 76

6.8 Changing the Rendering Mode ....................... 77
- Smooth Transition ...................................... 78

7 Robot Settings

7.1 Adding/Deleting a Robot ............................... 79
- Adding a Robot .......................................... 79
- Deleting a Robot ........................................ 80

7.2 Controller ................................................ 81

7.2.1 Job Management ...................................... 81
- Selecting a Job .......................................... 81
- Importing a Job ........................................ 81
- Copying a Job .......................................... 82
- Deleting a Job .......................................... 82

7.2.2 Master Job Management ............................ 83
7.2.3 Robot Selection ....................................... 84

7.2.4 Heart Beat ............................................. 85
9 Model Editings

9.1 Cad Tree ............................................. 156
  9.1.1 Outline of the Cad Tree ..................... 156
  9.1.2 Tree Structure .................................. 157
  9.1.3 Opacity Settings .............................. 157
  9.1.4 Teacher ........................................ 158
  9.1.5 Mouse-Driven Model Editing ................. 158
    • Right Mouse Button Operation ............... 158

9.2 Creating a New Model .............................. 159
  • Creating a Model from an Existing Model .... 160
  • Creating a Dummy Model ....................... 160

9.3 Editing a Part ...................................... 162
  9.3.1 Displaying the File Data Editing Dialog Box 162
  9.3.2 Registering a Part ............................ 163
  9.3.3 Part Types ..................................... 164
    • BOX .............................................. 164
    • CYLINDER ...................................... 165
    • CONE2 .......................................... 165
    • PIPE2 .......................................... 166
    • AXIS6 .......................................... 166
    • CUBE ........................................... 167
    • FLOOR .......................................... 167
    • FACE ............................................ 168
    • "Teacher" Section of the Parts Editing Dialog Box 169

9.4 Editing a Model .................................... 170
  • Cut ................................................. 170
  • Copy .............................................. 170
  • Paste .............................................. 170
  • Delete ............................................. 170
  • Add ................................................ 170
  • Rename ........................................... 170
  • Property ......................................... 171

9.5 Positioning a Model .............................. 172

9.6 Editing Multiple Models (Model List) ........... 173

9.7 Searching a Model .................................. 174

9.8 Saving and Reading a Model Group ............. 175
  • Saving a Model Group ............................ 175
  • Reading a Model Group ......................... 176
  • Syntax of the ModelInfo.dat ........................... 176

9.9 Changing and Moving the Parent Model ........ 177
  9.9.1 Changing the Parent Model .................. 177
  9.9.2 Moving the Parent Model .................... 177

9.10 Changing a Model File .......................... 178

9.11 Reading a Model .................................. 179
10 Peripheral Equipment

10.1 Conveyor .................................................. 181
  ■ Conveyor Operation Panel .............................. 181
  ■ Registering a Conveyor ............................... 182
  ■ Editing a Conveyor .................................... 183
  ■ Setting the Conveyor Synchronization .............. 184
  ■ Setting the Soft Limit ................................ 186

10.2 Press Machine ............................................. 187
  ■ Registering a Press Machine ......................... 187
  ■ Deleting a Press Machine ............................ 188
  ■ Moving a Press Machine with a Jog Operation .... 188
  ■ Current Values of a Press Machine .................. 188
  ■ Modifying the Soft Limit of a Press Machine ...... 188

10.3 Gantry Robot .................................................. 189
  ■ Registering a Gantry Robot .......................... 189
  ■ Deleting a Gantry Robot ............................... 190
  ■ Moving a Gantry Robot with Jog Operation ....... 190
  ■ Current Values of a Gantry Robot .................... 190
  ■ Modifying the Soft Limit of a Gantry Robot ...... 190

11 Configuration Settings

11.1 Graphical Settings .......................................... 192
  11.1.1 Background Color .................................. 193
  11.1.2 Smooth Transition .................................. 193
  11.1.3 Display .................................................. 193
  11.1.4 Shadow .................................................. 194
  11.1.5 Frame &AXIS6 ......................................... 194

11.2 Markup Settings ............................................. 195

11.3 Robot Option Settings .......................... 197

11.4 Language and Unit Settings ......................... 199
  11.4.1 Setting the Units .................................... 200
   ■ Length ..................................................... 200
   ■ Position .................................................. 201
   ■ Angle ...................................................... 201
   ■ Weight .................................................... 202

12 Applied Operation

12.1 Teaching Using OLP Function ......................... 203
  12.1.1 What is OLP Function? .............................. 203
  12.1.2 Teaching Operation ................................ 204
   ■ Position Designation in Free Mode ................. 205
   ■ Position Designation in Vertex Mode ............... 206
Position Designation in Center Mode ........................................... 207
Position Designation in Edge Mode ........................................... 208
Designation with Orientation Mode .......................................... 209
Designation with Z-Axis Mode ................................................. 211
Pick Object Filter .................................................................... 213
Changing of Operation Object ................................................. 215
Move to External Reference Point .............................................. 217
Synchronous Base Axis Move to Target Point ......................... 219

12.2 User Frame Setting .......................................................... 220
Moving with a User Frame ....................................................... 225

12.3 Trace Function ............................................................... 226
12.3.1 Changing Trace Object .................................................. 226
12.3.2 Changing Trace Parent ................................................... 227

12.4 Simulation of Multiple Robots ........................................... 232
12.4.1 Simultaneous Playback of Multiple Robot Jobs ............... 232
12.4.2 Selection of Simulation Robots ...................................... 235
12.4.3 Synchronization between Robots .................................. 236

12.5 External Axes Setting ...................................................... 242
12.5.1 External Rotating Axis ................................................... 242
12.5.2 External Servotrack ...................................................... 243

12.6 Simulation of Non-Robot Models ....................................... 244
12.6.1 Simulation of Non-Robot Models .................................. 244
12.6.2 Translational Motion Setting for External Rotating Axis ... 246

12.7 Station Coordination Function ........................................ 248
12.7.1 Operational Flow .......................................................... 248
12.7.2 System Construction ..................................................... 248
12.7.3 Job Creation ............................................................... 249
12.7.4 Teaching ................................................................. 249
MOVE Instruction ............................................................. 249
12.7.5 Synchronized Jog Operation ......................................... 250
12.7.6 Playback ................................................................. 250
12.7.7 Twin Drive Function .................................................... 251

12.8 Conveyor Synchronization Function ................................ 252
12.8.1 Operation Flow .......................................................... 252
12.8.2 System Construction ..................................................... 253
Registration of Robot ............................................................. 253
Registration of Conveyor ......................................................... 253
Settings for Conveyor Characteristics .................................... 253
Settings for Conveyor Synchronization Conditions .................. 253
Layout of Conveyor ............................................................. 254
Creation of Workpiece Model and Position of Workpiece .......... 255
12.8.3 Teaching ................................................................. 256
Operation of Conveyor ............................................................ 256
Teaching of Conveyor Synchronization MOVE Instruction
(SYMOVJ, SYMOL, SYMOVC) ............................................... 257
Editing of Conveyor Synchronization START and END
Instructions ................................................................. 257
12.8.4 Playback .......................................................... 259
  • Playback of Conveyor Synchronization Job ........... 259
  • Confirmation of Path Using Pulse Record ............ 259
  • Settings for Spray Model .................................. 259
12.8.5 Conveyor Soft Limit Setting Function ............. 259

12.9 Handling .......................................................... 260

12.10 Data Format ..................................................... 268
  • Model File (*.mdl) ........................................... 268
  • Cell File ...................................................... 272

12.11 Remote Monitor Function ................................. 277A
12.11.1 Preparation ................................................. 277A
  • Robot and External Axis Handling ...................... 277C
12.11.2 Operation Procedure ................................. 277D
  • Cases of Bad Connection ................................. 277D

13 Appendix

13.1 List of Instructions Supported by MotoSim EG
(NX100, XRC, MRC, MRC II) ................................. 278

13.2 List of Manipulator Models and Offset Values
Supported by MotoSim EG ................................. 284
  • NX100 ...................................................... 284
  • NX100 ...................................................... 285B
  • YASNAC XRC ........................................... 286
  • YASNAC MRC ........................................... 291
  • YASNAC MRC II ....................................... 293
  • YASNAC ERC ........................................... 293

13.3 Reading the CAD Data with MotoSim EG .......... 295

13.4 Frequently-Asked Questions ............................. 296
  • How to perform a simulation with MotoSim EG using
data of actual robots ...................................... 296
  • When the driver has been installed with USB type key
connected to a personal computer .................... 296
  • When the previous version key driver (Ver.PD-5.39.2)
has been installed after installing the key driver
Ver.PD-5.41.1 ............................................. 296
  • When the software program does not start properly
with D-SUB type key ....................................... 296
  • Compatibility Concerns for MotoSim EG ver. 2.0 or later:
Cell Compatibility ........................................ 296
  • Compatibility Concerns for MotoSim EG ver. 2.0 or later:
File Export Compatibility ................................ 296B
  • Graphic Driver Concerns ................................. 296B

13.5 TransJob Function .......................................... 296E
Main Dialog Operation .......................... 296E
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:

<table>
<thead>
<tr>
<th>Hardware/Software</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>Microsoft Windows 2000/XP *(1)</td>
</tr>
<tr>
<td>Memory</td>
<td>128 MB or more</td>
</tr>
<tr>
<td>Hardware Disk</td>
<td>200 MB or more</td>
</tr>
<tr>
<td>Monitor</td>
<td>Supported by MS-Windows (256 colors or more)</td>
</tr>
<tr>
<td>Hardware Key</td>
<td>Used under single user environment. For details, refer to &quot;1.3 Hardware Key&quot; in the following section.</td>
</tr>
</tbody>
</table>

*(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.

Two types of hardware keys are available:
- USB type.
- D-sub type.
Refer to the following connecting methods for each key type:

### 1.3.1 Connecting USB Type Key

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.

Execute "\SentinelDriver\SSD5411-32bit.EXE" of the installation CD-ROM. Refer to "\SentinelDriver\Manual\usl\Readme.pdf" for the installation procedure.

- When installing the driver under Windows 2000/XP 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.

### 1.3.2 Connecting D-Sub Type Key

Connect the key to the printer port ( ).

<Installation of driver>
Execute "\SentinelDriver\SSD5411-32bit.EXE" of the installation CD-ROM. Refer to "\SentinelDriver\Manual\usl\Readme.pdf" for the installation procedure.

- Be sure to install the driver under Windows 2000/XP environment.
- When installing the driver under Windows 2000/XP environment, be sure to login in administrator mode in order to add files to system folder and input information in registry.

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.

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

<table>
<thead>
<tr>
<th>Term</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cell (*.cel)</td>
<td>A file in which MotoSim EG simulation environmental data are recorded.</td>
</tr>
<tr>
<td></td>
<td>Folder information to store the operation contents, model file information</td>
</tr>
<tr>
<td></td>
<td>such as robots, workpieces or tools, data of operational environment layout,</td>
</tr>
<tr>
<td></td>
<td>etc. is recorded.</td>
</tr>
<tr>
<td>Model file (*.mdl)</td>
<td>A file in which geometric data of robots, workpieces or tools are recorded.</td>
</tr>
</tbody>
</table>
| 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.                                            |
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 "TEST\MODELS".
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...}.

![Robot registration interface]

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.

![Open file dialog]

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.

![Install Robot dialog]

Select the robot model file if it is not selected automatically.
2.2 Cell Construction

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, "CelTest\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.

NOTE: 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 (Distance) in the {DisplayTool} menu. Refer to " 5.3 Viewpoint Operation Tools " 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.
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.
2.3 Creation of Models

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

   ![Workpiece Stand Model](diagram1.png)
   ![Workpiece Model](diagram2.png)

2. Click on the 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.

   ![Cad Tree](diagram3.png)

   **NOTE** 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.
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.

![BOX Edit dialog box](image)

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 $\downarrow$ 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.

![Position DAL](image)
9. 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.

10. 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].

11. 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.

<table>
<thead>
<tr>
<th>Width (W)</th>
<th>200</th>
<th>Depth (D)</th>
<th>500</th>
<th>Height (H)</th>
<th>30</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (mm)</td>
<td>0</td>
<td>Y (mm)</td>
<td>0</td>
<td>Z (mm)</td>
<td>0</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>0</td>
<td>Ry (degree)</td>
<td>0</td>
<td>Rz (degree)</td>
<td>0</td>
</tr>
</tbody>
</table>
2.3 Creation of Models

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.

<table>
<thead>
<tr>
<th>Width (W)</th>
<th>25</th>
<th>Depth (D)</th>
<th>500</th>
<th>Height (H)</th>
<th>200</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (mm)</td>
<td>0</td>
<td>Y (mm)</td>
<td>0</td>
<td>Z (mm)</td>
<td>115</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>0</td>
<td>Ry (degree)</td>
<td>0</td>
<td>Rz (degree)</td>
<td>0</td>
</tr>
</tbody>
</table>
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 Creation of Models

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.

Start

Create a tool model file in Cad Tree.

Add parts in the file data editing dialog box.

Set parts size and layout in BOX Edit dialog box.

Click on [Close] button in the file data editing dialog box after verification.

End
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)**

<table>
<thead>
<tr>
<th>Width (W)</th>
<th>Depth (D)</th>
<th>Height (H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>70</td>
<td>70</td>
<td>80</td>
</tr>
<tr>
<td>X (mm)</td>
<td>Y (mm)</td>
<td>Z (mm)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>40</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>Ry (degree)</td>
<td>Rz (degree)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- **Part B (BOX)**

<table>
<thead>
<tr>
<th>Width (W)</th>
<th>Depth (D)</th>
<th>Height (H)</th>
</tr>
</thead>
<tbody>
<tr>
<td>150</td>
<td>70</td>
<td>20</td>
</tr>
<tr>
<td>X (mm)</td>
<td>Y (mm)</td>
<td>Z (mm)</td>
</tr>
<tr>
<td>40</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>Ry (degree)</td>
<td>Rz (degree)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
2.3 Creation of Models

- Part C (CYLINDER)

<table>
<thead>
<tr>
<th>Lower Dia.</th>
<th>Height (mm)</th>
<th>Division</th>
<th>Upper Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>170</td>
<td>16</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X (mm)</th>
<th>Y (mm)</th>
<th>Z (mm)</th>
<th>Rx (degree)</th>
<th>Ry (degree)</th>
<th>Rz (degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

- Part D (CYLINDER)

<table>
<thead>
<tr>
<th>Lower Dia.</th>
<th>Height (mm)</th>
<th>Division</th>
<th>Upper Dia.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>145</td>
<td>16</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>X (mm)</th>
<th>Y (mm)</th>
<th>Z (mm)</th>
<th>Rx (degree)</th>
<th>Ry (degree)</th>
<th>Rz (degree)</th>
</tr>
</thead>
<tbody>
<tr>
<td>80</td>
<td>0</td>
<td>270</td>
<td>0</td>
<td>-35</td>
<td>0</td>
</tr>
</tbody>
</table>

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.
2. 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.
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 |

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
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].

![Frame Edit dialog box]

8. When AXIS6 is set, click on [OK] to complete the setting.
Follow the flowchart below to create an actual job for arc-welding.

- **Start**
- Select a job.
- Step 1: Set in the standby position.
- Step 2: Determine the welding approach posture.
- Step 3: Move to welding start position.
- Step 4: Determine welding end position.
- Step 5: Move to the position where the robot does not interfere with workpiece.
- Step 6: Return to the standby position.
- Verify each step.
- **End**
2.5 Teaching

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].

![Enter a new job name]

2.5.2 Teaching the Standby Position

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

![Programming Pendant Dialog Box]
2.5 Teaching

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).

![Image](image.png)

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 Teaching

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 Obectj: 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 Teaching

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. Clear the check box for the step synchronization [Sync], and point the cursor to Step 5.

3. Click the [Move...] button to display Interpolation dialog box. Set MOVJ (link) for the motion type and 100% for the speed.
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.
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.

![Dialog box showing robot cycle time and job details]
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:

1. Start
2. Work cell construction
   - Construct MotoSim EG operational environment (cell) on the personal computer.
3. Registration and arrangement of a robot
   - Select a robot to be used and determine its position.
4. Creation of work model and teaching target points
   - Create models by using MotoSim EG. Set target points to simplify teaching.
5. Model arrangement
   - Examine the layout.
6. Teaching of robot motion
   - Perform teaching and playback by using MotoSim EG to examine the motion.
7. Review of robot motion, time, and interference
   - Correct the layout error between MotoSim EG and actual manipulator.
8. Correction (work calibration)
9. JOB data transfer to controller
   - Send/receive data and transfer job data through CompactFlash or a separate transmission software.
10. Verification/correction of motion using actual robot
    - Reduce the error between MotoSim EG data and actual robot using the calibration software, and verify and correct the motion.
11. End

Solid lines indicate operation by MotoSim EG and dotted lines indicate operations by other software.
4.1 Creating a New 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

Store a cell file with either of the following procedures.

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. (See the figure below.)

To store a file by overwriting it, click button in the tool bar or select {File} - {Save}.

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.
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.

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.
This section explains on how to output the current display of the models on the cell window to the HSF, HMF, HTML files. The output file enables alteration of viewpoint, etc.

Procedure

1. Determine the display state of the models on the cell window.

2. Select {File} - {Export File}; select the file type and save the file with the desired file name. (In the example here, the HTML type is selected: note that if the cell is output in HTML file, an HSF file will be also saved simultaneously.)

- 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 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 and HSF file format.

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.

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 "5.3 Viewpoint Operation Tools ".

- 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

<table>
<thead>
<tr>
<th>Icon</th>
<th>Description</th>
</tr>
</thead>
</table>
| ![New Cell](image) | Creates a new cell.  
  • Menu bar: {File} - {New Cel Project...}. |
| ![Open](image) | Reads an existing cell.  
  • Menu bar: {File} - {Open}. |
| ![Save](image) | Saves the edited cell information of a cell file.  
  • Menu bar: {File} - {Save}. |
| ![Undo](image) | Undoes the last operation.  
  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.  
  • Menu bar: {Edit} - {Undo}. |
| ![Redo](image) | Redoes the last undone operation.  
  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.  
  • Menu bar: {Edit} - {Redo}. |
| ![Reset Job](image) | 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.  
  • Menu bar: {Robot} - {PlayBack} - {Reset Job}. |
| ![Start](image) | Executes the job currently selected.  
  Use button to select the job to be executed.  
  • Menu bar: {Robot} - {PlayBack} - {Start}. |
| ![Pause](image) | Halts temporarily the job under execution.  
  Use button to execute the rest of the job.  
  • Menu bar: {Robot} - {PlayBack} - {Pause}. |
| ![Hold](image) | Interrupts the job under execution.  
  To execute the job again from the beginning, use button to move to the top of the job, then execute the job with button.  
  • Menu bar: {Robot} - {PlayBack} - {Hold}. |
| ![Step Back](image) | Enables a job to skip backward step by step.  
  • Menu bar: {Robot} - {PlayBack} - {Step Back}. |
|   | Enables a job to skip forward step by step.  
|   | • Menu bar: {Robot} - {Playback} - {Step Next}. |
|   | 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.  
|   | • Menu bar: {Robot} - {Controller} - {Select Job}. |
|   | 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.)  
|   | • Menu bar: {Robot} - {Controller} - {Select Master Job}. |
|   | Displays the programming pendant dialog box.  
|   | Enables job editing and teaching.  
|   | • Menu bar: {Tool} - {Pendant} - {Pendant View}. |
|   | 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.  
|   | • Menu bar: {Tool} - {Pendant} - {Job Panel...}.  
|   | : {Tool} - {Monitor} - {Position Panel...}. |
|   | Displays a menu box to select various panels and dialog boxes to be displayed.  
|   | • Menu bar: {Tool} - {Monitor} - {Panel View}. |
|   | Displays the model selection box “Cad Tree” (models in tree structure), indicating connection of models or relation between parent and child in a tree.  
|   | • Menu bar: {Tool} - {CAD Tree}. |
|   | Displays a window which enables monitoring I/O signals.  
|   | Links to the job execution to display the I/O signals.  
|   | • Menu bar: {Tool} - {Monitor} - {I/O} - {I/O Monitor}. |
|   | Displays OLP dialog box and enables OLP function. Moves the end of the robot tool to a target point with one-click operation.  
|   | • Menu bar: {Tool} - {Teaching} - {OLP...}. |
|   | Displays Collision detection dialog box to check the interference between models.  
|   | • Menu bar: {Tool} - {Collision Detection}. |
|   | Displays Auto Place dialog box to automatically search for optimum robot placement to execute an arbitrary job.  
|   | • Menu bar: {Tool} - {Teaching} - {Auto Place...}. |
5.2 Toolbar

- 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 MotoSimEG is running may prevent undoing some operations. Normal termination of the MotoSimEG application will automatically remove all temporary files in this folder.
## 5.3 Viewpoint Operation Tools

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

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
<th>Menu Bar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zooms and rotates the image</td>
<td>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 &quot;world&quot; coordinates by dragging the mouse from side to side.</td>
<td>{Screen} \rightarrow {Camera Scope} \rightarrow {Scroll &amp; Zoom}.</td>
</tr>
<tr>
<td>Enlarges the specified range</td>
<td>drag the mouse over the desired range to be enlarged.</td>
<td>{Screen} \rightarrow {Camera Scope} \rightarrow {Free Zoom}.</td>
</tr>
<tr>
<td>Rotates the image</td>
<td>for vertical rotation, drag the mouse up and down; for horizontal rotation, drag the mouse from side to side.</td>
<td>{Screen} \rightarrow {Camera Scope} \rightarrow {Rotate}.</td>
</tr>
<tr>
<td>Moves the viewpoint in parallel</td>
<td>drag the mouse from side to side and up and down to synchronize the viewpoint with the mouse motion.</td>
<td>{Screen} \rightarrow {Camera Scope} \rightarrow {Shift}.</td>
</tr>
<tr>
<td>Changes the viewpoint</td>
<td>click any desirable point so that the image is displayed with the clicked point located in the center of the screen.</td>
<td>{Screen} \rightarrow {Camera Scope} \rightarrow {Center}.</td>
</tr>
<tr>
<td>Zooms and rotates the image</td>
<td>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.</td>
<td>{Screen} \rightarrow {Camera Scope} \rightarrow {Z-Scroll &amp; Zoom}.</td>
</tr>
<tr>
<td>Zooms the image</td>
<td>zoom in and out the image by dragging the mouse upward (to zoom in) or downward (to zoom out) over the screen.</td>
<td>{Screen} \rightarrow {Camera Scope} \rightarrow {Zoom}.</td>
</tr>
<tr>
<td>Displays all the models in the cell to fit in the view.</td>
<td></td>
<td>{Screen} \rightarrow {Camera Scope} \rightarrow {Zoom To Extents}.</td>
</tr>
<tr>
<td>Toggles display of the AXIS6 in frame indicators in the view.</td>
<td></td>
<td>{Screen} \rightarrow {Model} \rightarrow {Frame}.</td>
</tr>
<tr>
<td>Selects a model</td>
<td>click any desirable point for model selection.</td>
<td>{Screen} \rightarrow {Model} \rightarrow {Select Model}.</td>
</tr>
<tr>
<td>Changes the viewpoint to display the default top view.</td>
<td></td>
<td>{Screen} \rightarrow {Camera Scope} \rightarrow {Direction} \rightarrow {Top}.</td>
</tr>
</tbody>
</table>
5.3 Viewpoint Operation Tools

<table>
<thead>
<tr>
<th></th>
<th>Changes the viewpoint to display the default front view.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Menu bar: {Screen} - {Camera Scope} - {Direction} - {Front}.</td>
</tr>
<tr>
<td></td>
<td>Change the viewpoint to display the default side view.</td>
</tr>
<tr>
<td></td>
<td>• Menu bar: {Screen} - {Camera Scope} - {Direction} - {Side}.</td>
</tr>
<tr>
<td></td>
<td>Change the viewpoint to display the default isometric view.</td>
</tr>
<tr>
<td></td>
<td>• Menu bar: {Screen} - {Camera Scope} - {Direction} - {View}.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>• Menu bar: {Screen} - {Camera Scope} - {View Manager}</td>
</tr>
<tr>
<td></td>
<td>Displays the Light Manager panel, which allows to add or remove lights, and to modify each light's properties.</td>
</tr>
<tr>
<td></td>
<td>• Menu bar: {Display} - {Light Manager}</td>
</tr>
</tbody>
</table>

5.3.1 Viewpoint Operation with the Mouse

- 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.
5.3 Viewpoint Operation Tools

- **Scroll Wheel Operation**

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

<table>
<thead>
<tr>
<th>Operation</th>
<th>Effect on Viewpoint</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scroll backwards</td>
<td>Viewpoint zoomed in.</td>
</tr>
<tr>
<td>Scroll forwards</td>
<td>Viewpoint zoomed out.</td>
</tr>
<tr>
<td>Click</td>
<td>Clicked point displayed at the center of the window.</td>
</tr>
</tbody>
</table>

5.3.2 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}.
5.3 Viewpoint Operation Tools

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.g. "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.

5.3.3 Light Manager Operation

The Light Manager panel allows to add or remove lights and to modify the settings or 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.
### 5.3 Viewpoint Operation Tools

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intensity</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Light No.</strong></td>
<td>Selects a light for operations. The properties of the currently selected light are displayed in the Light Property section.</td>
</tr>
<tr>
<td><strong>Add</strong></td>
<td>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 &quot;Adding and Modifying Lights&quot; and &quot;Light Sources&quot; sections.</td>
</tr>
<tr>
<td><strong>Remove</strong></td>
<td>Deletes the currently selected light. Note that the &quot;Default&quot; light cannot be deleted.</td>
</tr>
<tr>
<td><strong>Pick Light Position with Mouse</strong></td>
<td>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 viewpoint change operation.) Pressing the [Shift] key toggles the Pick Light Position with Mouse check mark.</td>
</tr>
</tbody>
</table>
5.3 Viewpoint Operation Tools

## 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.)

### Light Property

<table>
<thead>
<tr>
<th>[On / Off]</th>
<th>[Off]: The selected light is turned off. But, the light is not erased, the settings remains valid. [On]: The selected light is turned on.</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Type]</td>
<td>Distant Light: Light rays are all parallel (coming from an infinite distance)</td>
</tr>
<tr>
<td></td>
<td>Local Light: Omni directional rays coming from the light source point (light marker).</td>
</tr>
<tr>
<td></td>
<td>Spot Light: Cone shaped directional rays coming from the light source point (light marker).</td>
</tr>
<tr>
<td></td>
<td>For more detail, please refer to the &quot;Light Sources&quot; section.</td>
</tr>
<tr>
<td>[Color]</td>
<td>The color of the light is displayed in the rectangle.</td>
</tr>
<tr>
<td>[Change]</td>
<td>Displays the Color Dialog to change the color of the light.</td>
</tr>
</tbody>
</table>

### OK

Closes the Light Manager panel. The lights information will be save to the cell file when the cell is saved. 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.

### Cancel

Cancels the light setting modifications and closes the Light Manager panel. The light markers in the main view will be deleted.

---

**NOTE**

- 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.

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.

**NOTE** 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.
5.3 Viewpoint Operation Tools

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

<table>
<thead>
<tr>
<th>Intensity</th>
<th>100</th>
<th>75</th>
<th>50</th>
</tr>
</thead>
</table>

The FLOOR model is not affected by light change and will always display the same way.
Distant Light

Light is emitted from an 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.

Local Light

Light is emitted in all directions from the light position. Useful for generating light from a given point.
5.3 Viewpoint Operation Tools

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.

Spot Light Marker
(Located at the clicked position)
5.4 Other Display Operations

5.4.1 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}.

5.4.2 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.

NOTE: 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.
5.4 Other Display Operations

- Frames: Model frame or AXIS6 models. (Note: The model frame needs to be visible to be selected.)
- Lines: Lines such as LINE part, WORK line and wireframe model. (Note: Frame or AXIS6 individual axis can be picked if "Frames" selection is off).
- 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.)

NOTE: 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.

Pick method and screen display

5.4.3 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 ".

Picked point
5.4.4 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.

5.4.5 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.

5.4.6 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.
6 Display Tool Functions

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 Display Tools

- Draws a free-form line.
  - Menu bar: {DisplayTool} - {Markup} - {Freehand}.

- Draws a circle.
  - Menu bar: {DisplayTool} - {Markup} - {Circle}.

- Draws a rectangle.
  - Menu bar: {DisplayTool} - {Markup} - {Rectangle}.

- Adds a note (text).
  - Menu bar: {DisplayTool} - {Markup} - {Notes}.

- Creates a memo (text).
  - Menu bar: {DisplayTool} - {Memo}.

- Displays cross-section X.
  - Menu bar: {DisplayTool} - {Cutting Planes} - {X-Cutting Planes}.

- Displays cross-section Y.
  - Menu bar: {DisplayTool} - {Cutting Planes} - {Y-Cutting Planes}.

- Displays cross-section Z.
  - Menu bar: {DisplayTool} - {Cutting Planes} - {Z-Cutting Planes}.

- Measures the distance between two clicked points.
  - Menu bar: {DisplayTool} - {Distance}.

- Measures the angle between three clicked points.
  - Menu bar: {DisplayTool} - {Angle}.

- Creates a dimension line.
  - Menu bar: {DisplayTool} - {Measure Line}. 
6.2 Markup

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

6.2.1 Freehand

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

---

**NOTE**

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 \[\text{button}\] or select \{DisplayTool\} - \{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.
6.2.2 Circle

This section explains on how to draw a circle.

NOTE 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 \( \oplus \) button or select {DisplayTool} - {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.
6.2.3 Rectangle

This section explains on how to draw a rectangle.

NOTE 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 {DisplayTool} - {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.
6.2.4 Notes

This section explains on how to add a note.

![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 the button or select {DisplayTool} - {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 button pressed or {Notes} in the menu selected. {Notes} can be selected by: {DisplayTool} - {Markup} - {Notes}.
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.

   **NOTE**

   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 \(\text{\(\mathbb{A}\)}\) button or select {DisplayTool} - {Memo}. Right-click "Memo" to open a pop-up menu, and select {Edit} to enter texts.

   ![Edit dialog box]

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.

   **NOTE**

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

- 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 \cancel{Aa} button pressed or {Memo} in {DisplayTool} selected. Note that the arrow remains at the same point.
6.4 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.

6.4.1 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 {DisplayTool} - {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 {DisplayTool} - {Cutting Planes} - {X - Cutting Planes}.

- **Changing Display of the X-Cutting Plane**
  Drag the tools \(c\) to \(e\) 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.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shift the X-cutting planes in a direction parallel to the X-axis.</td>
</tr>
<tr>
<td>2</td>
<td>Rotate the X-cutting planes centering on the Y-axis.</td>
</tr>
<tr>
<td>3</td>
<td>Rotate the X-cutting planes centering on the Z-axis.</td>
</tr>
</tbody>
</table>
6.4 Cutting Planes

6.4.2 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](image)

- **Displaying the Y-Cutting Plane**
  Perform either of the following operations when the Y-cutting plane is not displayed:
  
  - Click on .
  - Select {DisplayTool} - {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 {DisplayTool} - {Cutting Planes} - {Y - Cutting Planes}.

- **Changing Display of the Y-Cutting Plane**
  Drag the tools ① to ③ 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.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Shift the Y-cutting plane in a direction parallel to the Y-axis.</td>
</tr>
<tr>
<td>②</td>
<td>Rotate the Y-cutting plane centering on the X-axis.</td>
</tr>
<tr>
<td>③</td>
<td>Rotate the Y-cutting plane centering on the Z-axis.</td>
</tr>
</tbody>
</table>
6.4.3 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 {DisplayTool} - {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 {DisplayTool} - {Cutting Planes} - {Z - Cutting Planes}.

Changing the Z-Cutting Plane
Drag the tools ① to ③ 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.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>Shift the Z-cutting plane in a direction parallel to the Z-axis.</td>
</tr>
<tr>
<td>②</td>
<td>Rotate the Z-cutting plane centering on the X-axis.</td>
</tr>
<tr>
<td>③</td>
<td>Rotate the Z-cutting plane centering on the Y-axis.</td>
</tr>
</tbody>
</table>
6.5 Measure Distance

Click 2 points to measure the distance between them.

![Measure Distance dialog]

**Procedure**

1. Click the button in the toolbar, or select {Display Tool} - {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.

**NOTE** When clicking in an area the selected point depends on the current "Pick Mode" and "Pick Object" settings. Please refer to "5.4.2 Pick Settings" for details.
6.6 Measure Angle

Click 3 points to measure the angle between them.

**Procedure**

1. Click the \[ \text{button in the toolbar, or select \{Display Tool\} - \{Angle\} from the application menu.} \]
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.

**NOTE** When clicking in an area the selected point depends on the current "Pick Mode" and "Pick Object" settings. Please refer to "5.4.2 Pick Settings" for details.
6.7 Measure Line

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

![Creating a Dimension Line](image)

### Creating a Dimension Line

**Procedure**

1. Click 🔄 or select {DisplayTool} - {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.

**NOTE**

- 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 "5.4.2 Mouse Picking Mode " 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 {DisplayTool} selected. Note that both arrows remain at the same point.
6.8 Changing the Rendering Mode

The display mode can be changed by selecting {DisplayTool} - {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:

![Flat Shading Image]

Gourand Shading

The image displayed in Gourand shaded rendering mode:

![Gourand Shading Image]

Wire Frame

The image displayed in wire frame:

![Wire Frame Image]
6.7 Changing the Rendering Mode

■ 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.
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].

![Open dialog box](image)
3. The Install Robot dialog box appears. Enter the robot name in the Robot Name edit box, and click on [OK].

![Install Robot dialog box]

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**

1. Select {Robot} - {Delete Robot...}.
2. 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.)

![Select Robot 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 \( \text{Robot} \) - \{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.

![Job Copy Dialog Box]

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}.

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
</table>
| [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 tool bar of the main window (see lower left figure), or the Robot combo box on the programming pendant panel (see lower right figure).

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**

<table>
<thead>
<tr>
<th>Item</th>
<th>Corresponding Dialog Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Offset Of Robot Frame] button</td>
<td>AXIS6 Dlg dialog box appears: set the robot offset value for each axis.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="AXIS6 Dlg" /></td>
</tr>
<tr>
<td>[Warm Up Time] button</td>
<td>Warm Up Time dialog box appears: set the robot warm-up time.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Warm Up Time" /></td>
</tr>
</tbody>
</table>
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".

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".

<table>
<thead>
<tr>
<th>Button</th>
<th>Command from Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Play Start]</td>
<td>{Robot} - {PlayBack} - {Start}</td>
</tr>
<tr>
<td>![Play Pause]</td>
<td>{Robot} - {PlayBack} - {Pause}</td>
</tr>
<tr>
<td>![Play Hold]</td>
<td>{Robot} - {PlayBack} - {Hold}</td>
</tr>
<tr>
<td>![Play Step Next]</td>
<td>{Robot} - {PlayBack} - {Step Next}</td>
</tr>
<tr>
<td>![Play Step Back]</td>
<td>{Robot} - {PlayBack} - {Step Back}</td>
</tr>
<tr>
<td>![Play Reset Job]</td>
<td>{Robot} - {PlayBack} - {Reset Job}</td>
</tr>
</tbody>
</table>

Displays the maximum value of the play time.

Copies the displayed data to the clipboard.
7.4 Data Setting

Settings of tool data, user frame, and robot calibration 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.

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[OK] button</td>
<td>Closes the dialog box after modifying the tool data.</td>
</tr>
<tr>
<td>[Apply] button</td>
<td>Modifies the tool data; does not close the dialog box.</td>
</tr>
<tr>
<td>[Cancel] button</td>
<td>Closes the dialog box without modifying the data to the new values.</td>
</tr>
<tr>
<td>[Exp. &gt;&gt;] button</td>
<td>Displays tool load information, enabling data setting.</td>
</tr>
</tbody>
</table>

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 Data Setting

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}.

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[OK] button</td>
<td>Confirms saving of the modified tool data (&quot;Tool.cnd&quot;), and closes the dialog box.</td>
</tr>
<tr>
<td>[Update File] button</td>
<td>Confirms saving of the modified tool data (&quot;Tool.cnd&quot;); does not close the dialog box.</td>
</tr>
<tr>
<td>[Cancel] button</td>
<td>Closes the dialog box without modifying the data to the new values.</td>
</tr>
</tbody>
</table>
7.4 Data Setting

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**

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Active] check box</td>
<td>Enables mouse picking operation. When clicking in an area the selected point depends on the current &quot;Pick Mode&quot; and &quot;Pick Object&quot; settings. Please refer to &quot;5.4.2 Pick Settings&quot; for details. Pressing the [Shift] key enables or disables the [Active] checkbox.</td>
</tr>
<tr>
<td>[Close] button</td>
<td>Closes the dialog box.</td>
</tr>
</tbody>
</table>

**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](image)

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Clear User Frame] button</td>
<td>Deletes the user frame selected from the combo box for UFRAME.</td>
</tr>
<tr>
<td>[Close] button</td>
<td>Closes Calculate User Frame dialog box.</td>
</tr>
</tbody>
</table>
7.4 Data Setting

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).

![The external axis will be positioned according to the file data.](image)

A robot calibration file "rbcalib.dat" will be created according to the position of the external axis.

### Robot Calibration Setting Dialog Box

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Close] button</td>
<td>Closes Robot Calibration Setting dialog box.</td>
</tr>
</tbody>
</table>

## Creating an Environment using Actual Robot Calibration Files

### Procedure

1. 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.

<table>
<thead>
<tr>
<th>Parameter Item</th>
<th>Setting Value</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD7</td>
<td>1</td>
<td>Coordinated functional option</td>
</tr>
</tbody>
</table>

2. Copy the "ALL.prm", "tool.end" and "rbcalib.dat" from the actual controller to the robot folder.

3. Open the cell.

4. 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].

![Robot Calibration Setting dialog box]

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.

![Figure: Example 1 - 2-axis station]

**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.

![Figure: Example 2 - 1-axis stations]

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.
7.4 Data Setting

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.

<table>
<thead>
<tr>
<th>Parameter Item</th>
<th>Setting Value</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD7</td>
<td>1</td>
<td>Coordinated functional option</td>
</tr>
</tbody>
</table>

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".
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

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[File] button</td>
<td>Stores the displayed trace data in a text file.</td>
</tr>
<tr>
<td>[Copy] button</td>
<td>Stores the displayed trace data in the clipboard.</td>
</tr>
<tr>
<td>[Close] button</td>
<td>Closes the Trace Copy dialog box.</td>
</tr>
</tbody>
</table>

### 7.5.2 Deleting Trace Data

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

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](image)

Trace Configuration Dialog Box

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Default] button</td>
<td>Sets all the trace properties back to their default values.</td>
</tr>
<tr>
<td>[Ok] button</td>
<td>Modifies the settings, and closes the dialog box.</td>
</tr>
<tr>
<td>[Cancel] button</td>
<td>Closes the dialog box without modifying the settings.</td>
</tr>
</tbody>
</table>

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.

![Select Object](image)

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-
7.5 Trace

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]

Reach Area Dialog Box

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Mode” section</td>
<td>Selects P-point or tool end as a base point of range of motion.</td>
</tr>
</tbody>
</table>
| “Disp” section| Specifies display style for range of motion. (For some robot models, 3D display is not available.)
• [2D] radio button: displays range of motion in 2D style.
• [3D] radio button: displays range of motion in 3D style. |
| “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. |

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.

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.

**NOTE**

Be sure to use parameters with "Cube Area View" setting to enable this function. Since the coordinate system to be the parent of the model (base frame, robot frame, user frame) is determined by parameters, a model will not be created if the parameters have no "Cube Area View" setting.

7.7.1 Displaying the Cube Interference Area

The cube interference area (indicated by a cubic model) appears in the cell after setting the Cube Area dialog box which is displayed by selecting {Robot} - {Cube Area View} - {Cube Area View}.

**Procedure**
Specify opacity and color in Cube Area dialog box, and click [Draw Area] to display the cube interference area in a cubic model.

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}.

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Color] button</td>
<td>Displays Color dialog box to specify colors.</td>
</tr>
<tr>
<td>[OK] button</td>
<td>Executes the modification on setting, and closes Cube Area dialog box.</td>
</tr>
<tr>
<td>[Cancel] button</td>
<td>Closes Cube Area dialog box without executing the modification on setting.</td>
</tr>
</tbody>
</table>

Cube Area Dialog Box
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}. 

Selects operating coordinate system when the robot is moved by manual operation.

Selects user frame No. in operation.

Changes coordinate system to use external axis for manual operation.

Moves the cursor to the step of the current robot position.

Displays selected motion type and speed to be added or modified.

Selects a robot to be operated.

Axis operation keys: Operates each axis of robot.

Selects [ENTER] button processing mode.

Sets manipulator motion speed during the manual operation.

Synchronizes the robot with the selected step in the Job display box.

Check this check box to enable translational motion of the station axis.

Select mode of passing over a singular point.

Changes coordinate system to use external axis for manual operation.

Selects [ENTER] button processing mode.

Adds, deletes or modifies instructions or data.

Enables coordinated motion with selected axis.

Closes the Programming Pendant box.

This function is available for CSL10 and CSL15 only.
### Programming Pendant Box

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Title bar</strong></td>
<td>Displays the name of the job currently selected. (DEFAULT.JBI is selected in the figure.)</td>
</tr>
<tr>
<td><strong>Job display box</strong></td>
<td>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 job. (For the teaching of position variables, refer to &quot;Teaching with Position Variables&quot; in &quot;8.2.5 Variable Monitor&quot;). JOB Edit Dialog Box: Modify the instruction in the edit box. Select either the [Add Line] or [Replace Line] button.</td>
</tr>
<tr>
<td><strong>[Move...] button</strong></td>
<td>Displays the Interpolation dialog box. Specify motion type, speed and position level for the playback operation, and click [OK].</td>
</tr>
<tr>
<td><strong>[OLP] button</strong></td>
<td>Displays the OLP dialog box. (Refer to &quot;8.3.1 OLP&quot; for details.)</td>
</tr>
<tr>
<td><strong>[Position] button</strong></td>
<td>Displays the position data panel. (Refer to &quot;8.2.2 Position Data Panel&quot; for details.)</td>
</tr>
<tr>
<td><strong>[Long] button</strong></td>
<td>Extends the size of the job display panel: click [Short] to undo the size change.</td>
</tr>
<tr>
<td><strong>Axis operation keys</strong></td>
<td>Operates the robot: the display varies as shown below, depending on the selected operating coordinate system for manual operation.</td>
</tr>
</tbody>
</table>

**NOTE**: To enable the modification of the motion type and speed when a teaching position is modified, select the [Allow Modif.] check box.
8.1 Programming Pendant

8.1.2 Job Panel

The Job Panel displays the job and allows teaching: click on then select {Job Panel}, or select {Tool} - {P.Pendant} - {Job Panel...} to display the Job Panel.

Job Panel

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job display box</td>
<td>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 &quot;Teaching with Position Variables&quot; in &quot;8.2.5 Variable Monitor&quot;).</td>
</tr>
<tr>
<td>[Enter] button</td>
<td>Executes the command selected among [Del], [Add], [Mod] radio buttons.</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Pulse] radio button</td>
<td>Coordinate values are entered in pulse value.</td>
</tr>
<tr>
<td>[Rectangle] radio button</td>
<td>Coordinate values are entered in rectangle value.</td>
</tr>
<tr>
<td>[CSV File Load] button</td>
<td>Loads the coordinate values from a CSV file, and inserts the coordinate values right after the selected line in the list.</td>
</tr>
</tbody>
</table>
8.1 Programming Pendant

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

### Axis Input Dialog Box

<table>
<thead>
<tr>
<th>Coordinate</th>
<th>Radio Button selected in the Axis Data Input Dialog Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse/Rectangle</td>
<td>Pulse</td>
</tr>
<tr>
<td>S/X</td>
<td>S-axis</td>
</tr>
<tr>
<td>L/Y</td>
<td>L-axis</td>
</tr>
<tr>
<td>U/Z</td>
<td>U-axis</td>
</tr>
<tr>
<td>R/Rx</td>
<td>R-axis</td>
</tr>
<tr>
<td>B/Ry</td>
<td>B-axis</td>
</tr>
<tr>
<td>T/RZ</td>
<td>T-axis</td>
</tr>
</tbody>
</table>

**[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.

**NOTE**

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.

---

**8.1.3 Jog Panel**

Robot can be operated by clicking the axis operation buttons on the jog panel, which can be displayed by clicking [ ] and selecting the [Jog Panel] check box, or by selecting {Tool} - {P.Pendant} - {Jog Panel...}.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Jog...] button</td>
<td>Displays Job Operation Mode dialog box to specify frame type and jog speed.</td>
</tr>
</tbody>
</table>

![Jog Panel diagram]

Axis operation buttons

Amount moved when axis operation key is pressed once.

Sets direct acting function of station axes.

Selects operating coordinate system when the robot is moved by manual operation.

Lnk: link coordinates
Rct: rectangular coordinates
Ext: external axes

Jog 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, and enables robot operation by numerical value input of pulses or coordinate values. To display the position panel, select “Position Panel” from Panel selection dialog box, or select {Tool} - {Monitor} - {Position Panel...}.

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
### 8.2 Monitor

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.
8.2 Monitor

- **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 as 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 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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Auto Search&quot; section</td>
<td>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.</td>
</tr>
<tr>
<td>[Screen Pick Active] check box</td>
<td>Enables the mouse picking operation. Pressing the [Shift] key enables or disables the &quot;Screen Pick Active&quot; mode.</td>
</tr>
<tr>
<td>[Close] button</td>
<td>Closes the dialog box.</td>
</tr>
<tr>
<td>[More] or [Less] button</td>
<td>Displays or hides the pick mode setting section.</td>
</tr>
<tr>
<td>&quot;Set Value For:&quot; section</td>
<td>Determine which values of the Work Frame will be changed when the screen is clicked.</td>
</tr>
</tbody>
</table>
| "Use Face:" section  | Determines which information for a click surface is used to set the Travel Direction or the Work Surface.  
                          | [Normal] radio button:  
                          | The normal of the face is used.  
                          | [Edge] radio button:  
                          | The edge direction closest 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.  
                          | [Point] radio button:  
                          | The direction defined by the Work frame origin and the picked face point is used.  
                          | The [Reverse Direction] checkbox can be used to select the opposite direction. |
| "Pick Object" section | Sets the type of objects that can be selected when clicking on the screen. Please refer to "Fig. 5.4.2 Pick Settings".                          |
| "Pick Mode" section   | Sets conditions determining the selected point in the clicked area. Please refer to "Fig. 5.4.2 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.

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 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.</td>
</tr>
<tr>
<td>• 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.</td>
</tr>
<tr>
<td>• If no surface can be found, the position is set as the tool position and the previously found normal (Z-axis) is reused.</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Close] button</td>
<td>Closes the angle data panel.</td>
</tr>
<tr>
<td>[Add] button (in the extension)</td>
<td>Adds the items selected from the “Log option” section to the list box.</td>
</tr>
<tr>
<td>[Clear] button (in the extension)</td>
<td>Clear the list.</td>
</tr>
<tr>
<td>[Copy] button (in the extension)</td>
<td>Stores the listed data in the clipboard.</td>
</tr>
</tbody>
</table>
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:

- **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 \[
\text{\textcolor{#666666}{\text{•}}} \]
or select {Tool} - {Monitor} - {I/O} - {I/O Monitor}.

---

### I/O Monitor Dialog Box

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Set all IN-Signal] check box</td>
<td>Turns ON all the IN signals of all registered robots. Uncheck the box to turn OFF all the IN signals.</td>
</tr>
<tr>
<td>[Set all OT-Signal] check box</td>
<td>Turns ON all the OUT signals of all registered robots. Uncheck the box to turn OFF all the OUT signals.</td>
</tr>
<tr>
<td>[Clear I/O] button</td>
<td>Clears all the signals of all registered robots.</td>
</tr>
<tr>
<td>[Close] button</td>
<td>Closes I/O Monitor dialog box.</td>
</tr>
</tbody>
</table>
### 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.

#### 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].

![Connection Editor dialog box](image)

**Example**
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.

**NOTE**
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**

i) Click on [Exp.>>] to display the "Logical Equation" section.

ii) 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.

iii) Enter the logical arithmetic expression in the edit box (c): the supported operators are listed as follows:

<table>
<thead>
<tr>
<th>Operator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>+</td>
<td>Represents OR (U).</td>
</tr>
<tr>
<td>*</td>
<td>Represents AND ( ( \land ) ).</td>
</tr>
<tr>
<td>!</td>
<td>Represents NOT: applied in case of using the contact point B (STR-NOT).</td>
</tr>
<tr>
<td>(</td>
<td>Represents parenthesis.</td>
</tr>
<tr>
<td>T</td>
<td>Represents terminal.</td>
</tr>
</tbody>
</table>

+ Represents OR (U).

* Represents AND ( \( \land \) ).

! 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.

**NOTE** 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: \( T_1 = T_2 + T_3 \)
Explanation: Terminal 1 turns ON when either terminal 2 or 3 is ON.

Logical expression: \( T_1 = T_2 \times T_3 \)
Explanation: Terminal 1 turns ON when both terminal 2 and 3 are ON.

Logical expression: \( T_1 = \neg T_2 \times T_3 \)
Explanation: Terminal 1 turns ON when terminal 2 is OFF and terminal 3 is ON.

**Note**
- 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...}.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
</table>
| [Add(A)] button | Displays the Variable Property dialog box to set the variables to be displayed and edited. When setting a position variable (such as P, BP, EX variables), be sure to specify the frame (coordinate) in the FRAME combo box. Setting of FRAME:  
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 | Displays the Variable Property dialog box to modify the variables. 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. |
| [Del(D)] button | Deletes the selected variables. |
| [Clear(L)] button | Deletes all the variables displayed in the Variable Monitor window. |
| [Close(C)] button | Closes the Variable Monitor window. |
8.2  Monitor

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.

NOTE 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}....
8.2 Monitor

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 dia-
   log box.

4. Play back the job.

   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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Play] button</td>
<td>Moves the robot with the selected job, and displays the playback time in a text box.</td>
</tr>
<tr>
<td>[Next] button</td>
<td>Skips forward to the next line of the job.</td>
</tr>
<tr>
<td>[Back] button</td>
<td>Skips backward to the previous line of the job.</td>
</tr>
<tr>
<td>[Reset] button</td>
<td>Jumps to the top of the job, and clears the data in the edit box.</td>
</tr>
</tbody>
</table>

**“Refresh Time” section**

Sets the speed for refresh time.

This function is available only when the play panel dialog box is displayed.

Sets the play mode.

Displays the numbers of lines and steps of a played job.

Displays the moving time and play time.
### 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...).
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 robot position in pulse units is displayed in the dialog box at every refresh screen. In addition, by selecting a line of the displayed data, the robot can be moved to that specific pulse position.

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Back] button</td>
<td>Moves the robot to the previous position by moving the cursor in the text box backward line by line.</td>
</tr>
<tr>
<td>[Next] button</td>
<td>Moves the robot to the next position by moving the cursor in the text box forward line by line.</td>
</tr>
<tr>
<td>[Delete] button</td>
<td>Deletes the line where the cursor is located in the text box.</td>
</tr>
<tr>
<td>[Reset] button</td>
<td>Clears the data in the text box.</td>
</tr>
<tr>
<td>[Save] button</td>
<td>Stores the data in the text box to a text file (.txt).</td>
</tr>
<tr>
<td>[Copy] button</td>
<td>Stores the data in the text box to the clipboard.</td>
</tr>
</tbody>
</table>
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}.
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.

Select the robot

Select operation to add, modify or delete a Work entry.

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Work List</strong></td>
<td>Displays the defined work commands for every robot.</td>
</tr>
<tr>
<td><strong>Robot</strong>:</td>
<td>Name of the robot model.</td>
</tr>
<tr>
<td><strong>Work Command</strong>:</td>
<td>Command that will trigger the work.</td>
</tr>
<tr>
<td><strong>Display</strong>:</td>
<td>Indicates if the work path will be generated.</td>
</tr>
<tr>
<td><strong>Line</strong>:</td>
<td>Size of line to be displayed on the screen.</td>
</tr>
<tr>
<td><strong>Count</strong>:</td>
<td>Number of time the work has been activated.</td>
</tr>
<tr>
<td><strong>Work Time</strong>:</td>
<td>Total time that the work was ON.</td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

- **[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** Selects the instruction that will activate the work.
  - Instruction: ARCON / DOUT ON / SPOT / SPYON / TOOLON / HAND / Always
  - **NOTE**: Selecting "Always" will generate a line from the beginning to the end of the playback.

- **Radio buttons** 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.
  - ASF# / OUT# / GUN# / GUN / TOOL / HAND
- **[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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Parent] button</td>
<td>Displays the Model Selection dialog to select the parent model of the work path model.</td>
</tr>
<tr>
<td>[Max Points] box</td>
<td>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.</td>
</tr>
<tr>
<td>[Add] button</td>
<td>Adds a new work definition with the current settings in the property edition section.</td>
</tr>
<tr>
<td>[Modify] button</td>
<td>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.</td>
</tr>
<tr>
<td>[Delete] button</td>
<td>Deletes the currently selected work definitions.</td>
</tr>
<tr>
<td>[Close] button</td>
<td>Closes the Tool Work Panel.</td>
</tr>
</tbody>
</table>

**NOTE**

- 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".

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[OLP Pick] check box</td>
<td>To be selected whenever OLP is used. The check box is automatically cleared when another function is selected to operate the robot.</td>
</tr>
</tbody>
</table>
### OLP dialog box

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Move Mode</strong> section</td>
<td>Determines the method to move to the target point.</td>
</tr>
<tr>
<td>[Position] check box:</td>
<td>The Operation Object is moved to the position (XYZ) of the target point.</td>
</tr>
<tr>
<td>[Orientation] check box:</td>
<td>The Operation Object is turned to match the orientation (Rx, Ry, Rz) of the target point frame.</td>
</tr>
<tr>
<td>[Z-Axis] check box:</td>
<td>The Operation Object is turned so that its Z-axis matches the Z-axis of the target point frame.</td>
</tr>
<tr>
<td>[Use Face] section:</td>
<td>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.</td>
</tr>
<tr>
<td>[Normal] radio button:</td>
<td>The Z-axis is in the same direction as the face normal.</td>
</tr>
<tr>
<td>[Reverse] radio button:</td>
<td>The Z-axis is in the opposite direction of the face normal.</td>
</tr>
<tr>
<td></td>
<td>If only the orientation is to be changed without changing the position, uncheck the [Position] checkbox before clicking any point.</td>
</tr>
<tr>
<td><strong>Pick Mode</strong> section</td>
<td>Sets conditions determining the selected point in the clicked area.</td>
</tr>
<tr>
<td>[Free] check box:</td>
<td>Point of the model at the clicked position.</td>
</tr>
<tr>
<td>[Vertex] check box:</td>
<td>Nearest vertex from the clicked position.</td>
</tr>
<tr>
<td>[Center] check box:</td>
<td>Center of the nearest face or edge from the clicked position.</td>
</tr>
<tr>
<td>[Edge] check box:</td>
<td>Nearest edge point from the clicked position.</td>
</tr>
<tr>
<td><strong>Pick Object</strong> section</td>
<td>Sets the type of the object to be selected when clicking on the cell view. (Multiple items can be selected)</td>
</tr>
<tr>
<td>[Model] check box:</td>
<td>Solid models.</td>
</tr>
<tr>
<td>[Frame] check box:</td>
<td>Model frame or AXIS6 models.</td>
</tr>
<tr>
<td>[Line] check box:</td>
<td>Lines such as LINE part, WORK line and wireframe model.</td>
</tr>
<tr>
<td>[Point] check box:</td>
<td>Points such as TRACE points.</td>
</tr>
<tr>
<td>[Floor] check box:</td>
<td>FLOOR parts.</td>
</tr>
</tbody>
</table>
### 8.3 Teaching

#### “Operation Obj” section

Selects an object to be moved to the target point.

- **[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".

- **[Teacher] radio button:**
  - Sets the “Teacher” coordinate axis as the object to move.

- **[Model] radio button:**
  - Sets the selected model as the object to move.

  Model can be selected with \[\text{Screen} - \{\text{Model}\} - \{\text{Select-Model}\}\] or the [CADTree].

- **[XYZ] button:**
  - Displays the position data panel as shown below to manually modify the position or orientation of the operation object.

#### OLP dialog box

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Position Data Panel</td>
<td>Displays the position data panel as shown below to manually modify the position or orientation of the operation object.</td>
</tr>
<tr>
<td>Teacher dialog box</td>
<td>Refer to the dialog title bar to confirm the operation object name.</td>
</tr>
</tbody>
</table>

![Position Data Panel](image)

![Teacher dialog box](image)
8.3 Teaching

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.

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

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

Position Displays a point.
8.3 Teaching

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

The robot moves so that the robot TCP overlaps 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.
8.3 Teaching

- 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 workpiece:
- 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:
4. 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.

5. 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.

6. 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).
3. 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.

4. 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.

5. Click one of the position frames with the mouse to move the robot to the clicked position.
8.3 Teaching

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.

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

<table>
<thead>
<tr>
<th>Type of Selected Robot</th>
<th>Applicable Job Editing Application Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robot operated with NX100</td>
<td>Job EditorNX</td>
</tr>
<tr>
<td>Robot operated with XRC</td>
<td>Job Editor</td>
</tr>
<tr>
<td>Robot operated with MRC, MRC II, or ERC</td>
<td>N/A</td>
</tr>
</tbody>
</table>

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, MOVS 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...}.

**NOTE**
- 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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;FRAME&quot; section</td>
<td>Performs the Parallel Shift operation in the selected coordinate system. When the User frame is selected, select the user frame number.</td>
</tr>
</tbody>
</table>
| "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:
  a) 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.
  b) 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...}.

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;FRAME&quot; section</td>
<td>Performs the Rotation Shift operation in the selected coordinate system. When the User frame is selected, select the user frame number.</td>
</tr>
</tbody>
</table>
| "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](image)

### Paint Panel Dialog Box

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Gun No.] spin box (1 to 3)</td>
<td>Paint gun number.</td>
</tr>
<tr>
<td>[Tool No.] spin box</td>
<td>Specifies the tool number to set the paint gun number.</td>
</tr>
<tr>
<td>&quot;(a)TCP distance&quot; edit box</td>
<td>Distance from the paint spray outlet (nozzle).</td>
</tr>
<tr>
<td>&quot;(b)Valid distance&quot; edit box</td>
<td>Effective range to apply paint from the nozzle.</td>
</tr>
<tr>
<td>&quot;(c)Max Diameter&quot; edit box</td>
<td>Maximum width of the paint spray face.</td>
</tr>
<tr>
<td>&quot;(d)Mini Diameter&quot; edit box</td>
<td>Minimum width of the paint spray face.</td>
</tr>
<tr>
<td>&quot;(e)Nozzle Position&quot; edit boxes</td>
<td>Nozzle position viewed from the flange.</td>
</tr>
<tr>
<td>&quot;(e)Nozzle Posture&quot; edit boxes</td>
<td>Nozzle posture viewed from the flange.</td>
</tr>
</tbody>
</table>
### PAINT Panel Dialog Box

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[TCP calculation] check box</td>
<td>Automatically calculates tool dimensions according to the input information.</td>
</tr>
<tr>
<td>[Transparent] check box</td>
<td>Displays paint model in translucent color.</td>
</tr>
<tr>
<td>&quot;Model division&quot; combo box</td>
<td>Number of divided paint spray faces.</td>
</tr>
<tr>
<td>[TCP distance] button</td>
<td>Paint color from nozzle to TCP.</td>
</tr>
<tr>
<td>[Valid distance] button</td>
<td>Paint color from nozzle to the end of the valid painting distance.</td>
</tr>
<tr>
<td>[Display model] check box</td>
<td>Displays the created spray model.</td>
</tr>
</tbody>
</table>

### 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.
8.3 Teaching

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.
   Confirm each point of the generated jobs.

**NOTE**
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...}.

![Tool Renew dialog box]

**Procedure**

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.

![NOTE]

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

**Auto Place Dialog Box**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Add] button</td>
<td>Adds the taught points selected with the OLP function to the Select Teach list box.</td>
</tr>
<tr>
<td>[Check] button</td>
<td>Verifies the range of motion of each taught point in the Select Teach list box. Indicates &quot;NG&quot; if the taught point is out of the range of motion.</td>
</tr>
<tr>
<td>[Job...] button</td>
<td>Displays the “Making JOB” dialog box. For details, refer to the step 4 of the Procedure below.</td>
</tr>
<tr>
<td>[Search] button</td>
<td>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.</td>
</tr>
<tr>
<td>[Del] button</td>
<td>Deletes the item selected in the “Search Location” list box. (Multiple selection is not allowed.)</td>
</tr>
</tbody>
</table>
# Commands in the Menu

## {File} Pull-Down Menu

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>{Open}</td>
<td>Selects “Auto Place File” (.txt), and lists the Axis6 model data read from the file.</td>
</tr>
<tr>
<td>{Save}</td>
<td>Stores the listed Axis6 model data in the Auto Place File (.txt).</td>
</tr>
<tr>
<td>{Edit File}</td>
<td>Opens and edits the Auto Place File in Notepad.</td>
</tr>
<tr>
<td>{Exit}</td>
<td>Ends the Auto Place function.</td>
</tr>
</tbody>
</table>

## {Edit} Pull-Down Menu

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>{Copy Search Location}</td>
<td>Stores the search results in the list box of the “Search Location” section in the clipboard.</td>
</tr>
</tbody>
</table>

## {Teach} Pull-Down Menu

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>{Add}</td>
<td>Adds the taught points selected with the OLP function to the “Select Teach” list box. For the details of the OLP function, refer to &quot;8.3.1 OLP &quot;.</td>
</tr>
<tr>
<td>{Delete a Point}</td>
<td>Deletes the item selected in the “Select Teach” list box. (Multiple selection is not allowed.)</td>
</tr>
<tr>
<td>{Delete all Points}</td>
<td>Deletes all the items in the “Select Teach” list box.</td>
</tr>
<tr>
<td>{Load from JOB}</td>
<td>Reads the taught points from the selected job, and displays them on the “Select Teach” list box.</td>
</tr>
<tr>
<td>{Check Reach}</td>
<td>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.</td>
</tr>
<tr>
<td>{Making Job}</td>
<td>Displays the Making JOB dialog box. For details, refer to the step 4 of the Procedure below.</td>
</tr>
</tbody>
</table>
### 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.)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>{Search Start}</td>
<td>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.</td>
</tr>
<tr>
<td>(Search Area Def)</td>
<td>Specifies the search range in the Search Area Def dialog box.</td>
</tr>
<tr>
<td>{Load from Mode File}</td>
<td>Reads the location points from the auto place model file, and displays them on the “Search Location” list box.</td>
</tr>
<tr>
<td>(Delete a Location)</td>
<td>Deletes the item selected in the “Search Location” list box. (Multiple selection is not allowed.)</td>
</tr>
<tr>
<td>(Delete all Locations)</td>
<td>Deletes all the items in the “Search Location” list box.</td>
</tr>
<tr>
<td>{Quick Cycle Time}</td>
<td>{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.</td>
</tr>
</tbody>
</table>
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}.

Specify whether to create a new job or select an existing job.

Enter the job name.

Proceeds to the next dialog box.

Converts the INF file into the JBI file.

Press here to edit the INF file in Notepad.

Press here to edit the converted JBI file in Notepad.
### 8.3.10 Step Motion

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

![Step Motion Function](image)

**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.
The {Create Job Model} allows the creation of a taught point model (AXIS6 model) for a specified job.

**Procedure**

Display the Job Point Model dialog box by selecting {Tool} - {Create Job Model}. Select each item in the box, and then press the [OK] button. The job point models are created and added to the Cad Tree.

**NOTE**

The model name of the job point model will be "robot name_job name_JBI.mdl".
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].
8.6 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.
8.6 Collision Detection

### 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.

---

**NOTE** Register one master for one interference pair.

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

**NOTE:** Only one robot can be stopped or signaled per pair.
## 8.7 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](image)

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>[Add] button</strong></td>
<td>Select [Add] to register the software to run; the Launcher Setting dialog box appears. 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.)</td>
</tr>
<tr>
<td>[Edit] button</td>
<td>Edits the settings of the registered software.</td>
</tr>
<tr>
<td>[Delete] button</td>
<td>Deletes the registered software.</td>
</tr>
<tr>
<td>“Keyword” column</td>
<td>Double-click the desired software in the “Keyword” column to run the external software.</td>
</tr>
</tbody>
</table>

![Launcher Setting](image)
8.8 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.
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}.
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.

![Tree Structure Diagram]

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.

![Opacity Settings Figure]
### 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.

![Teacher interface](image)

1. Select "Teacher".
2. Select [Pos].

Set the incremental value of the spin button.

### 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.

![Menu for model editing](image)
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.
9.2 Creating a New Model

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].

   For RWX or 3DS model file format, the following message box appears. Select [OK] to automatically convert the file to an HMF format.

   ![Message Box]

   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.
9.2 Creating a New 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].
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]

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Add] button</td>
<td>Displays a dialog box to edit the part selected in [Add Parts] combo box. Also displays the added part on the cell window.</td>
</tr>
<tr>
<td>[Edit] button</td>
<td>Displays a dialog box to edit the part selected in the parts list. (Multiple selection is not possible.)</td>
</tr>
<tr>
<td>[Delete] button</td>
<td>Deletes the part selected in the parts list. (Multiple selection is not possible.)</td>
</tr>
<tr>
<td>[Move Org] button</td>
<td>Changes the parent of the part selected in the parts list. Refer to &quot; 9.9.1 Changing the Parent Model &quot; for details.</td>
</tr>
</tbody>
</table>
9.3 Editing a Part

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.

[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.

File data editing dialog box

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ClipBoard...] button</td>
<td>Stores/Retrieves the data of the part selected in the parts list on the clipboard.</td>
</tr>
<tr>
<td>[Close] button</td>
<td>Closes the file data editing dialog box.</td>
</tr>
</tbody>
</table>

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.

File data editing dialog box

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ClipBoard...] button</td>
<td>Stores/Retrieves the data of the part selected in the parts list on the clipboard.</td>
</tr>
<tr>
<td>[Close] button</td>
<td>Closes the file data editing dialog box.</td>
</tr>
</tbody>
</table>

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.

File data editing dialog box

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ClipBoard...] button</td>
<td>Stores/Retrieves the data of the part selected in the parts list on the clipboard.</td>
</tr>
<tr>
<td>[Close] button</td>
<td>Closes the file data editing dialog box.</td>
</tr>
</tbody>
</table>
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 keystrokes. (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.
9.3 Editing a Part

- **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.
9.3 Editing a Part

**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 frame part with only position and orientation data. It can be used as a target point or for external axis setting. It can be edited in the Frame Edit dialog box.

- Add frames by pressing [Insert]: the frames are added to the Index list box.
- To delete an AXIS6 model, select the frame number in the Index, and click on [Delete].
9.3 Editing a Part

■ 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.
9.3 Editing a Part

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 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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Goto] button</td>
<td>Moves the part to the Teacher position.</td>
</tr>
<tr>
<td>[POSE] check box</td>
<td>Moves the part including the posture to the Teacher position.</td>
</tr>
</tbody>
</table>
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.
9.4 Editing a Model

- Property

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

![Property dialog box]

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Opacity&quot; edit box</td>
<td>Specifies the opacity of the model.</td>
</tr>
<tr>
<td>&quot;Scale&quot; edit box</td>
<td>Specifies the scale of the model.</td>
</tr>
<tr>
<td>&quot;Model Type&quot; edit box</td>
<td>Specifies a character string in the model.</td>
</tr>
<tr>
<td>[OK] button</td>
<td>Applies the modifications, and closes the Property dialog box.</td>
</tr>
<tr>
<td>[Cancel] button</td>
<td>Closes the Property dialog box without applying the modifications.</td>
</tr>
</tbody>
</table>
Position a model by specifying the values in the Position dialog box. To display the Position dialog box, click on [Pos] or select {Attribute} - {Set Position} of the Cad Tree.

### Position dialog box

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
</table>
| "Operation" combo box       | **"Absolute"**<br>Displays the position with reference to the parent model, and moves the model.  
|                             | **"Relative"**<br>Displays the position with reference to the selected model, and moves the model.  
|                             | **"SelModel"**<br>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. |
| [matrix] button             | Allows to store or retrieve the data of the Position dialog box in the clipboard. |
| [OK] button                 | Applies the modifications, and closes the Position dialog box.               |
| [Cancel] button             | Closes the Position dialog box without applying the modifications.            |
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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model selection list box</td>
<td>Displays the models registered in the cell. The selected models are highlighted. (Multiple selection is possible.)</td>
</tr>
<tr>
<td>[Delete] button</td>
<td>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.</td>
</tr>
<tr>
<td>[Change Parent] button</td>
<td>Changes the parents of the models selected in the model selection list box. Refer to &quot;9.9.1 Changing the Parent Model&quot; for details.</td>
</tr>
<tr>
<td>[Move Parent] button</td>
<td>Moves the parents of the models selected in the model selection list box. Refer to &quot;9.9.2 Moving the Parent Model&quot; for details.</td>
</tr>
<tr>
<td>[Close] button</td>
<td>Closes the Model List dialog box.</td>
</tr>
</tbody>
</table>
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 "ModellInfo.dat" file to read the saved model including its child models.

NOTE
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 ModellInfo.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.

NOTE: 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; a confirmation dialog box (as shown below) appears. Select [Yes] to specify the parent model. If [No] is selected, the parent model is automatically set to "WORLD".
2. A dialog box appears to confirm whether to copy the model. Select [Yes] to copy the file to the "models" folder of the cell. Select [No] to display the file in the cell without copying it: in this case, the only file path is described in the cell file.

![Dialog box for copying model]

In the case that the model is in the RWX or 3DS format, the following message box appears; click on [OK] to automatically convert the model into the HMF format.

![Message box for converting model]

**NOTE**

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.)
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**

![Conveyor Operation Panel](image)

Specify the conveyor number.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
</table>
| "Position(mm)" spin box | 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.  

**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.

| [Conveyor Power On] check box | Enables verification of conveyor in halt status when clearing the check box during the playback. |
10.1 Conveyor

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.

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.

**Conveyor Install dialog box**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;No&quot; section</td>
<td>Specifies the conveyor number.</td>
</tr>
<tr>
<td>&quot;Joint Num&quot; section</td>
<td>Specifies the number of axis by selecting one of the radio buttons.</td>
</tr>
<tr>
<td>[OK] button</td>
<td>Displays the Edit Conveyor Information dialog box. Refer to &quot;Editing a Conveyor&quot; for details.</td>
</tr>
</tbody>
</table>
## 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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;No&quot; section</td>
<td>Specifies the conveyor number to set the condition.</td>
</tr>
<tr>
<td>&quot;Model info&quot; section</td>
<td>Specifies the dimensions of the conveyor to be registered.</td>
</tr>
<tr>
<td>&quot;L(mm)&quot; edit box</td>
<td>Entire length of the conveyor.</td>
</tr>
<tr>
<td>&quot;D(mm)&quot; edit box</td>
<td>Width of the conveyor.</td>
</tr>
<tr>
<td>&quot;H(mm)&quot; edit box</td>
<td>Thickness of the conveyor. (Distance from the floor to the conveyor top.)</td>
</tr>
<tr>
<td>&quot;Org(mm)&quot; edit box</td>
<td>Limit switch position for the conveyor home position. (Distance from the conveyor end.)</td>
</tr>
</tbody>
</table>
10.1 Conveyor

Edit Conveyor Information dialog box

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Motion info&quot; section</td>
<td>Specifies the dimensions of the conveyor to be registered.</td>
</tr>
<tr>
<td>&quot;Speed(mm/s)&quot; edit box</td>
<td>Operation speed of the conveyor.</td>
</tr>
<tr>
<td>&quot;Start(mm)&quot; edit box</td>
<td>Start position of the conveyor operation. (Specify the distance from the home position of the conveyor.)</td>
</tr>
<tr>
<td>&quot;End(mm)&quot; edit box</td>
<td>End position of the conveyor operation. (Specify the distance from the home position of the conveyor.)</td>
</tr>
<tr>
<td>[make model] check box</td>
<td>Creates a default conveyor model.</td>
</tr>
</tbody>
</table>

NOTE
- 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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Robot&quot; combo box</td>
<td>Lists the robots available for conveyor synchronization operation. Select a robot for the operation.</td>
</tr>
<tr>
<td>&quot;Conveyor No&quot; section</td>
<td>Specifies a conveyor to synchronize with the robot selected in the Robot combo box.</td>
</tr>
<tr>
<td>&quot;Conveyor info&quot; section</td>
<td>Displays the name and speed of the conveyor specified in the &quot;Conveyor No&quot; section.</td>
</tr>
</tbody>
</table>

#### "Condition" section

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Tracking&quot; combo box</td>
<td>Select an axis subject to track the conveyor (robot axis or base axis (servo track)).</td>
</tr>
<tr>
<td>&quot;Base Axis&quot; 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>
<tr>
<td>&quot;Direction Rev&quot; 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>
<tr>
<td>&quot;Ave Time(msec)&quot; edit box</td>
<td>Specify the average time for the conveyor to change speed.</td>
</tr>
<tr>
<td>&quot;User Coord No&quot; 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>
<tr>
<td>&quot;LS offset(mm)&quot; 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>
</tbody>
</table>
### 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}.

**NOTE** 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.)

     ![Press dialog box](image1)

  2. Enter the name of the press machine as shown in the figure below:

     ![Install Robot dialog box](image2)

  3. A press machine model is automatically generated.

     ![Press machine model](image3)
### 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.

![Current values of the rectangular motion]

### Modifying the Soft Limit of a Press Machine

**Procedure**

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.
10.3 Gantry Robot

■ 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.

**NOTE**

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Reset] button</td>
<td>Restores all the values to the default setting.</td>
</tr>
<tr>
<td>[OK] button</td>
<td>Applies the modifications, and closes the dialog box.</td>
</tr>
<tr>
<td>[Cancel] button</td>
<td>Closes the dialog box without applying the modifications.</td>
</tr>
</tbody>
</table>
11.1 Graphical Settings

11.1.1 Background Color

Specify the background color of the cell window in the “Background Color” section.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Top” color indication box</td>
<td>Displays the current color of the upper part of the background. Press [color] to display the Color dialog box, and select the desired color.</td>
</tr>
<tr>
<td>“Bottom” color indication box</td>
<td>Displays the current color of the bottom part of the background. Press [color] to display the Color dialog box, and select the desired color.</td>
</tr>
<tr>
<td>[Same Color] check box</td>
<td>Check this check box to set the “Bottom” background color to the same color as the “Top” background.</td>
</tr>
</tbody>
</table>

11.1.2 Smooth Transition

Specify if a smooth transition is executed when changing viewpoint in the “Smooth Transition” section.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Execute] check box</td>
<td>Select to execute the smooth transition function when changing the viewpoint.</td>
</tr>
<tr>
<td>“Duration” edit box</td>
<td>Specify the duration of the smooth transition. (Editable when the [Execute] check box is selected.)</td>
</tr>
</tbody>
</table>

11.1.3 Display

Configure the graphic driver in the "Display" section.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Driver&quot; combo box</td>
<td>Select a graphic driver from the list: “OpenGL” is selected by default. The graphic drivers currently available are “OpenGL” and “WinGDI”.</td>
</tr>
<tr>
<td>NOTE</td>
<td>To apply the change of graphic driver, reload the cell.</td>
</tr>
<tr>
<td>[Axis Triad On] check box</td>
<td>Displays the coordinate axis below on the lower left of the cell window.</td>
</tr>
<tr>
<td>[Perspective] check box</td>
<td>Check this check box to display the cell in perspective.</td>
</tr>
</tbody>
</table>
11.1.4 Shadow

Set the following items for shadow display in the “Shadow” section.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Show] check box</td>
<td>Select to display shadows on the cell window.</td>
</tr>
<tr>
<td>“Color” indication box</td>
<td>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.)</td>
</tr>
<tr>
<td>“Resolution” edit box</td>
<td>Enter the resolution value. (Editable when the [Show] check box is selected.)</td>
</tr>
<tr>
<td>“Blurring” edit box</td>
<td>Enter the value for the gradation effect. (Editable when the [Show] check box is selected.)</td>
</tr>
</tbody>
</table>

11.1.5 Frame & AXIS6

Specify the Frame and Axis6 display property.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Frame Length” spin box</td>
<td>Enter the value of the frame and Axis6 length with the spin button.</td>
</tr>
<tr>
<td>&quot;Always Display Axis6 in Front&quot; checkbox</td>
<td>When checked, the Axis6 are displayed in front of all the other parts.</td>
</tr>
</tbody>
</table>
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.

![Option Setting dialog box](image)

**Mark Up tab**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
</table>
| "Mark up" section        | "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.  

| "Thickness" spin box     | Directly enter the value or specify the value with the spin button to specify the thickness of the markup line. |
### 11.2 Markup Settings

#### Mark Up tab

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Font Name&quot; combo box</td>
<td>Select a desired font for the text. When using two-byte characters for the text, make sure to select a font which can be displayed properly.</td>
</tr>
<tr>
<td>&quot;Size (pts.)&quot; edit box</td>
<td>Specify the size of the font.</td>
</tr>
<tr>
<td>&quot;Back Color&quot; indication box</td>
<td>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.</td>
</tr>
<tr>
<td>[Reset] button</td>
<td>Restores all the values to the default setting.</td>
</tr>
<tr>
<td>[OK] button</td>
<td>Applies the modifications, and closes the dialog box.</td>
</tr>
<tr>
<td>[Cancel] button</td>
<td>Closes the dialog box without applying the modifications.</td>
</tr>
</tbody>
</table>
11.3 Robot Option Settings

When a robot axis reaches its limit position, the color of the axis changes.

![Robot Option Settings](image)

### Robot Option tab

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>&quot;Pulse limit warning&quot; section</strong></td>
<td></td>
</tr>
<tr>
<td>[Execute in Teach] check box</td>
<td>Select to display the axis reaching its limit in a reverse color or a limit color in a teaching operation.</td>
</tr>
<tr>
<td>[Execute in Play] check box</td>
<td>Select to display the axis reaching its limit in a reverse color or a limit color in a playback operation.</td>
</tr>
<tr>
<td>&quot;Limit Value (%)&quot; edit box</td>
<td>Directly enter the value to specify the limit value for the limit axis check.</td>
</tr>
<tr>
<td>[Reverse Color] check box</td>
<td>Select to reverse the color of the axis reaching its limit in its opposing color.</td>
</tr>
<tr>
<td>&quot;Color at Limit&quot; indication box</td>
<td>Displays the current limit color. Press [color] to display the Color dialog box, and select the desired color.</td>
</tr>
</tbody>
</table>

**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%.)
### 11.3 Robot Option Settings

**Robot Option tab**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>&quot;Playback Animation&quot; section</strong></td>
<td>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.</td>
</tr>
<tr>
<td>[Reset] button</td>
<td>Restores all the values to the default setting.</td>
</tr>
<tr>
<td>[OK] button</td>
<td>Applies the modifications, and closes the dialog box.</td>
</tr>
<tr>
<td>[Cancel] button</td>
<td>Closes the dialog box without applying the modifications.</td>
</tr>
</tbody>
</table>

**NOTE**

- The playback animation file does not support any model color change that 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.
11.4 Language and Unit Settings

To configure the language and unit, select the "Lang / Unit" tab of the Option Setting dialog box.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Language&quot; section</td>
<td>Select the [Japanese] or [English] radio button to configure the language.</td>
</tr>
<tr>
<td></td>
<td>To set from the main menu, select {View} - {English} or {Japanese}.</td>
</tr>
<tr>
<td>&quot;Unit Settings&quot; section</td>
<td>For unit configuration, press [Show Unit Setting Dialog]. Refer to &quot;11.4.1 Setting the Units&quot; for details.</td>
</tr>
<tr>
<td>&quot;Length&quot; edit box</td>
<td>Indicates the unit of the length.</td>
</tr>
<tr>
<td>&quot;Position&quot; edit box</td>
<td>Indicates the unit of the position</td>
</tr>
<tr>
<td>&quot;Angle&quot; edit box</td>
<td>Indicates the unit of the angle.</td>
</tr>
<tr>
<td>&quot;Weight&quot; edit box</td>
<td>Indicates the unit of the weight.</td>
</tr>
<tr>
<td>[Reset] button</td>
<td>Restores all the values to the default setting.</td>
</tr>
<tr>
<td>[OK] button</td>
<td>Applies the modifications, and closes the dialog box.</td>
</tr>
<tr>
<td>[Cancel] button</td>
<td>Closes the dialog box without applying the modifications.</td>
</tr>
</tbody>
</table>
11.4.1 Setting the Units

Specify the length, position, angle, and weight in the Setting Unit dialog box which can be displayed by pressing [Show Unit Setting Dialog] on the "Lang / Unit" tab.

**NOTE**
The settings other than the "Unit String" section are discarded.

- **Length**
  Select the “Length” tab, and specify the unit for length.

![Setting Unit dialog box]

Select the unit.

Select this check box to set the position unit in conjunction with the length unit.
11.4 Language and Unit Settings

- **Position**
  Select the “Position” tab, and specify the unit for positions.

- **Angle**
  Select the “Angle” tab, and specify the unit for angles.
11.4 Language and Unit Settings

- **Weight**

Select the "Weight" tab, and specify the unit for weight.
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 Teaching Using OLP Function

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.
12.1 Teaching Using OLP Function

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-
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
12.1 Teaching Using OLP Function

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.
12.1 Teaching Using OLP Function

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 check, the tool end will also move 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 lies target point; 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 axis.

- 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

<table>
<thead>
<tr>
<th>Width (W)</th>
<th>500</th>
<th>Depth (D)</th>
<th>500</th>
<th>Height (H)</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (mm)</td>
<td>0</td>
<td>Y (mm)</td>
<td>0</td>
<td>Z (mm)</td>
<td>0</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>0</td>
<td>Ry (degree)</td>
<td>0</td>
<td>Rz (degree)</td>
<td>0</td>
</tr>
</tbody>
</table>
12.1 Teaching Using OLP Function

3. Click on the [Pos] button in the Cad Tree to set the position as shown in the table below.

<table>
<thead>
<tr>
<th>X (mm)</th>
<th>800</th>
<th>Y (mm)</th>
<th>0</th>
<th>Z (mm)</th>
<th>560</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rx (degree)</td>
<td>150</td>
<td>Ry (degree)</td>
<td>-20</td>
<td>Rz (degree)</td>
<td>0</td>
</tr>
</tbody>
</table>

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.
6. Click on the position of the “WORK2” as shown below.

7. 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 check, the tool end will also move 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 arrows. For a solid, the Z-axis corresponds to the normal (or reversed normal) of the face where lies target point. 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. 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.
   
<table>
<thead>
<tr>
<th>Model: DAI (AXIS6)</th>
<th>Frame No.: 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (mm)</td>
<td>0</td>
</tr>
<tr>
<td>Y (mm)</td>
<td>0</td>
</tr>
<tr>
<td>Z (mm)</td>
<td>-100</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>0</td>
</tr>
<tr>
<td>Ry (degree)</td>
<td>0</td>
</tr>
<tr>
<td>Rz (degree)</td>
<td>0</td>
</tr>
</tbody>
</table>

   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.
12.1 Teaching Using OLP Function

**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 [OLP Pick] 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.
12.1 Teaching Using OLP Function

7. The robot will move the work piece target point to the external reference point.

---

**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 servotacks.

**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”.

---

**NOTE**

To use the "Move to External Reference Point" mode, the "Operation Object" needs to be set to robot.
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.
12.1 Teaching Using OLP Function

**Procedure**

1. Select the [Front movement] radio button in the “Synchronous base axis movement” dialog box.

   ![Synchronous base axis movement dialog box](image)

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.

![Approach little by little](image)

**Procedure**

1. Select the [Approach little by little] 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.

**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 Servotacks
For the robot with multiple servotacks, 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.
Procedure

1. Select the [Active] check box in the “Synchronous base axis move”. For the multiple servotacks, 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 servotracks move to the soft limit.
   - If the tool end (TCP) does not reach the target point, a message is displayed but the servotacks 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)

<table>
<thead>
<tr>
<th>Width (W)</th>
<th>500</th>
<th>Depth (D)</th>
<th>500</th>
<th>Height (H)</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (mm)</td>
<td>0</td>
<td>Y (mm)</td>
<td>0</td>
<td>Z (mm)</td>
<td>0</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>0</td>
<td>Ry (degree)</td>
<td>0</td>
<td>Rz (degree)</td>
<td>0</td>
</tr>
</tbody>
</table>

[Layout]

<table>
<thead>
<tr>
<th>X (mm)</th>
<th>780</th>
<th>Y (mm)</th>
<th>0</th>
<th>Z (mm)</th>
<th>800</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rx (degree)</td>
<td>-20</td>
<td>Ry (degree)</td>
<td>-20</td>
<td>Rz (degree)</td>
<td>0</td>
</tr>
</tbody>
</table>
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.
4. Set the [UFRAME] to “1” and select the [OO] radio button in the “PULSE” section.

5. Click on the vertex of the workpiece displayed in the cell window to move the robot tool to the vertex.

6. With the tool end in position, click on the [Register Pulse] button in the Calculate User Frame dialog box.
12.2 User Frame Setting

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.

![Select here. Select "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 describes 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 on the [Frame] button of the position data panel. Select the [User Frame] radio button and click on the [OK] button.

![Programming Pendant Dialog Box](image)

![Position Data Panel](image)

2. Set each value in the User#1 dialog box. In this example, set the values: \(X=300,\ Y=300,\ Z=0\).

![User#1 Dialog Box](image)

3. In the cell window, the tool moves to the coordinates: \((X, Y) = (300, 300)\) on the slant workpiece.

![The position: X=300, Y=300](image)

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 \( \Rightarrow \) to jump to the top of the job, and click on \( \rightarrow \).
12.3 Trace Function

The following figure shows when the tracing point is a tool.

![Tool end tracing](image)

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”.
7. To change the parent, set the [Parent Name] edit box to “WORK3”.

8. 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.)

9. The [Color...] edit box sets the tracing color. Set any desired color.

10. Click on the [Register] button to save the setting.

11. To create a new job, click on or select {Robot} - {Controller} - {Select Job}.

12. 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 MOVIL instructions.
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.

   ![Robot Diagram]

   - 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 upper left part of the screen to set the active robot to “HP6-A”.

3. Click on or select {Robot} - {Controller} - {Select Job} to create a new job “HP6-A”.

   ![Job Creation Dialog]
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”. Select “HP6-B” in the [Robot] combo box of the Programming Pendant dialog box.

6. Click on or select (Robot) - (Controller) - (Job Select) to create a job “HP6-B”.

7. Create any desired job in the same manner as “HP6-A”.
8. Click on \[\text{Start\Robot}^\text{1}\] then \[\text{Run\Robot}^\text{2}\] 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 Simulation of Multiple Robots

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
12.4 Simulation of Multiple Robots

5. Select “HP6-B” in the [Robot] combo box to add the following two lines.

DOUT OT#(1) OFF
WAIT IN#(1)=ON

DOUT OT#(1) OFF
WAIT IN#(1)=ON
MOVJ C0000 VJ=25.00
MOVJ C0001 VJ=25.00
MOVJ C0002 VJ=25.00
MOVJ C0003 VJ=25.00
END

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.
9. Add two connections in the sequencer as follows.

10. Click on the [OK] button.

11. Reset the cell and execute the jobs. Displaying both the I/O Monitor dialog box and the Programming Pendant dialog box may help you to read the sequence more easily. The I/O Monitor dialog box can display I/O information for each robot by changing the selected robot on the Programming Pendant dialog box.
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.

   ![Add Model Dialog](image)

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 servotacks, 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.
12.6 Simulation of Non-Robot Models

◆ 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.

NOTE  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=LINEAR32.DLL ROBOT=ES165N LINK=6 FUNCA1=1.0 FUNCA2=100.0 FUNCACB=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: \(Y=(A1/A) \times X+B\))
- **MODEL**: Name of the model to be moved
- **AXIS6 NO**: Direction to move (0: X, 1:Y, 2:Z)
2. 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.

3. Move the robot and spot gun cylinder portion to teach the target position, then create a job.

**NOTE**

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.
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.

NOTE
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 SMOVJ, SMOVL and SMOVC are added to the regular type of MOVE instructions that can be selected in the interpolation dialog box.

<table>
<thead>
<tr>
<th>Control Group</th>
<th>Display of MOVE Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>MOVJ C0000 VJ=50.00</td>
</tr>
<tr>
<td>S1</td>
<td>MOVJ EC0000 VJ=50.00</td>
</tr>
<tr>
<td>R1+S1</td>
<td>MOVJ C0000 VJ=50.0 +MOVJ EC000 VJ=50.0*</td>
</tr>
<tr>
<td>S1</td>
<td>MOVJ C0000 VJ=50.0 +MOVJ EC000 VJ=50.0*</td>
</tr>
<tr>
<td>NONE</td>
<td>SMOVL C000 V=500.0 +MOVJ EC000</td>
</tr>
</tbody>
</table>

*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 Station Coordination Function

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.

![Setting of the station](image)

**NOTE**

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.

![Trace Configuration](image)
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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Set Value</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>FD35</td>
<td>1</td>
<td>Twin drive function option</td>
</tr>
</tbody>
</table>

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.
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.)

<table>
<thead>
<tr>
<th>Item</th>
<th>Set Value</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>NX100 XRC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FD20 FD20</td>
<td>1</td>
<td>Conveyor synchronization function option</td>
</tr>
<tr>
<td>S3D111 S1D240</td>
<td>16</td>
<td>SL function selection</td>
</tr>
<tr>
<td>S3D115 S1D244</td>
<td>1</td>
<td>Robot 1 SL selection</td>
</tr>
<tr>
<td>S3D119 S1D247</td>
<td>4</td>
<td>Robot 1 application selection (painting)</td>
</tr>
</tbody>
</table>

*NOTE*

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.
12.8 Conveyor Synchronization Function

### 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 \( \downarrow \) along the line as shown in the following figure. The mark \( \downarrow \) 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 Conveyor Synchronization Function

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]

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Conveyor Power On] check box</td>
<td>Enables verification of conveyor in halt status when clearing the check box during the playback.</td>
</tr>
</tbody>
</table>

**NOTE**

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, SYMOVC)

Procedure

1. Select a robot from the robot selection combo box located in the upper left of the window.

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, SYMOVL, or SYMOVC) 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=-500.00
   (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.
12.8 Conveyor Synchronization Function

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”.

![Max Cycle Time=90.030s](image)

- 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.

![Pulse recorder](image)

- 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.

   ![Robot in Cell](image.png)

   - 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:

<table>
<thead>
<tr>
<th>CYLINDER</th>
<th>CYLINDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Dia.</td>
<td>Lower Dia.</td>
</tr>
<tr>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>X (mm)</td>
<td>Y (mm)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>Ry (degree)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BOX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Dia.</td>
</tr>
<tr>
<td>80</td>
</tr>
<tr>
<td>X (mm)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>Rx (degree)</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BOX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Dia.</td>
</tr>
<tr>
<td>100</td>
</tr>
<tr>
<td>X (mm)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>Rx (degree)</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BOX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Dia.</td>
</tr>
<tr>
<td>200</td>
</tr>
<tr>
<td>X (mm)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>Rx (degree)</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BOX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Dia.</td>
</tr>
<tr>
<td>160</td>
</tr>
<tr>
<td>X (mm)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>Rx (degree)</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BOX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Dia.</td>
</tr>
<tr>
<td>160</td>
</tr>
<tr>
<td>X (mm)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>Rx (degree)</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>
6) Create three workpieces to be gripped by the tool. Add "WORK1", "WORK2" and "WORK3" models below the "world" in the model tree.

![](image)

7) Add a BOX model to each workpiece. Setting AXIS6 may also be helpful.

**work1: BOX**

<table>
<thead>
<tr>
<th>Width</th>
<th>Length</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>170</td>
<td>200</td>
</tr>
<tr>
<td>X (mm)</td>
<td>Y (mm)</td>
<td>Z (mm)</td>
</tr>
<tr>
<td>300</td>
<td>900</td>
<td>100</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>Ry (degree)</td>
<td>Rz (degree)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**work2: BOX**

<table>
<thead>
<tr>
<th>Width</th>
<th>Length</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>170</td>
<td>200</td>
</tr>
<tr>
<td>X (mm)</td>
<td>Y (mm)</td>
<td>Z (mm)</td>
</tr>
<tr>
<td>0</td>
<td>900</td>
<td>100</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>Ry (degree)</td>
<td>Rz (degree)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**work3: BOX**

<table>
<thead>
<tr>
<th>Width</th>
<th>Length</th>
<th>Height</th>
</tr>
</thead>
<tbody>
<tr>
<td>160</td>
<td>170</td>
<td>200</td>
</tr>
<tr>
<td>X (mm)</td>
<td>Y (mm)</td>
<td>Z (mm)</td>
</tr>
<tr>
<td>-300</td>
<td>900</td>
<td>100</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>Ry (degree)</td>
<td>Rz (degree)</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**work1: AXIS6**

<table>
<thead>
<tr>
<th>X (mm)</th>
<th>Y (mm)</th>
<th>Z (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>900</td>
<td>200</td>
</tr>
<tr>
<td>Rx (degree)</td>
<td>Ry (degree)</td>
<td>Rz (degree)</td>
</tr>
<tr>
<td>180</td>
<td>0</td>
<td>90</td>
</tr>
</tbody>
</table>
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”.

<table>
<thead>
<tr>
<th>DAI: BOX</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width</td>
</tr>
<tr>
<td>500</td>
</tr>
<tr>
<td>X (mm)</td>
</tr>
<tr>
<td>900</td>
</tr>
<tr>
<td>Rx (degree)</td>
</tr>
<tr>
<td>0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DAI: AXIS6(0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (mm)</td>
</tr>
<tr>
<td>900</td>
</tr>
<tr>
<td>Rx (degree)</td>
</tr>
<tr>
<td>180</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DAI: AXIS6(1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>X (mm)</td>
</tr>
<tr>
<td>900</td>
</tr>
<tr>
<td>Rx (degree)</td>
</tr>
<tr>
<td>180</td>
</tr>
</tbody>
</table>
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.

**NOTE**
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 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".

"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".
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”.

![JOB Edit dialog box](image1.png)

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”.

![JOB Edit dialog box](image2.png)

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
MOVJ C0002 V=93.0
'MDL:MOV work1 hand
MOVJ C0003 V=93.0
MOVJ C0004 VJ=100.00
MOVJ C0005 V=93.0

'MDL:MOV work1 DAI
MOVJ C0006 V=93.0
MOVJ C0007 VJ=100.00
MOVJ C0008 VJ=50.00
MOVJ C0009 V=93.0

'MDL:MOV work2 hand
MOVJ C0010 V=93.0
MOVJ C0011 VJ=100.00
MOVJ C0012 V=93.0

'MDL:MOV work2 DAI
MOVJ C0013 V=93.0
MOVJ C0014 VJ=100.00
12.9 Handling

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.

\[
\text{RGB} (0, 0, 0)
\]

Sets the proportion of blue.

Sets the proportion of green.

Sets the proportion of red.

<\text{E.g.}> \quad \text{RGB}(0,0,0) \quad \text{Color: White}

\text{RGB}(255,0,0) \quad \text{Color: Red}

\text{RGB}(0,255,0) \quad \text{Color: Green}

\text{RGB}(0,0,255) \quad \text{Color: Blue}

\text{RGB}(255,255,255) \quad \text{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.

<table>
<thead>
<tr>
<th>Number</th>
<th>Color</th>
<th>Number</th>
<th>Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Black</td>
<td>8</td>
<td>Gray</td>
</tr>
<tr>
<td>1</td>
<td>Blue</td>
<td>9</td>
<td>Light blue</td>
</tr>
<tr>
<td>2</td>
<td>Green</td>
<td>10</td>
<td>Light green</td>
</tr>
<tr>
<td>3</td>
<td>Cyan</td>
<td>11</td>
<td>Light cyan</td>
</tr>
<tr>
<td>4</td>
<td>Red</td>
<td>12</td>
<td>Light red</td>
</tr>
<tr>
<td>5</td>
<td>Magenta</td>
<td>13</td>
<td>Light magenta</td>
</tr>
<tr>
<td>6</td>
<td>Yellow</td>
<td>14</td>
<td>Light yellow</td>
</tr>
<tr>
<td>7</td>
<td>White</td>
<td>15</td>
<td>Light white</td>
</tr>
</tbody>
</table>
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(RGB(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(RGB(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
    }
  }
• 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,
      000 upper face dia., upper plate thickness,
      0.000,0.000,0.000,0.000,0.000,0.000,0.000 height, No. of divided faces
    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)
  }
  }

• 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(RGB(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(RGB(255,0,0),3)
    {  
    6.000,6.000,0.000  
    -1500.000,-3000.000,0.000  
    1500.000,3000.000,0.000
    }
  }

  BLOCK
  {  
    FACE(RGB(255,128,0),4)
    {  
    0.000,0.000,0.000,0.000,0.000,0.000  
    200.000,300.000,300.000,3,0,0  
    -200.000,300.000,300.000,0,0,0  
    -200.000,300.000,-300.000,0,0,0
    }
  }

  • 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(RGB(255,128,0),4)
    {  
    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=%CELSPATH%\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) etc.

• 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 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 "NX100 Option: Instruction for Data Transmission Function".
3. Open the "RemoteMonitor.ini" file located in the MotoSim EG folder (default: \ProgramFiles\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:
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.
12.11 Remote Monitor Function

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)jCommunication
  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.)

```
<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>B1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```
```
<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R2</td>
<td>B2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```
```
<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R3</td>
<td>B3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```
```
<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R4</td>
<td>B4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

- 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.

   ![Remote Monitoring Dialog](image)

   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.

  ![Connection Failure Dialog](image)

  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.
12.11 Remote Monitor Function

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..."

![Remote Monitoring Dialog]

After the several seconds, the "Connection Failure" message will display and the Remote Monitor Link is not made.

**NOTE** While the "Connecting..." message is displayed, MotoSim EG operation cannot be process. Please be careful to set the proper IP address.
## 13.1 List of Instructions Supported by MotoSim EG (NX100, XRC, MRC, MRC II)

MotoSim EG ignores the instructions not on the following list.

O: editable and executable; ●: executable

<table>
<thead>
<tr>
<th>Type</th>
<th>Instruction</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O</td>
<td>DOUT</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>DIN</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>NWAIT</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>WAIT</td>
<td>O</td>
</tr>
<tr>
<td>Control</td>
<td>NOP</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>*(Comment)</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>*(Label)</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>JUMP</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>CALL</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>RET</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>TIMER</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>IF</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>CWAIT</td>
<td>O</td>
</tr>
<tr>
<td>Move</td>
<td>MOVJ</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>MOVL</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>MOVC</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>IMOV</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>EIMOV</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>EIMOV</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>REFP</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>SPEED</td>
<td>O</td>
</tr>
<tr>
<td>Calculation</td>
<td>ADD</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>SUB</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>MUL</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>DIV</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>INC</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>DEC</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>AND</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>OR</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>NOT</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>XOR</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>SQRT</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>SIN</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>COS</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>ATAN</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>SET</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>SETE</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>GETE</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>CLEAR</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>CNVRT</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>GETS</td>
<td>O</td>
</tr>
<tr>
<td>Shift</td>
<td>SFTON</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>SFTOF</td>
<td>●</td>
</tr>
<tr>
<td>Instruction</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td></td>
</tr>
</tbody>
</table>
| **DOUT**    | DOUT OT#(1) ON  
 Numeric value  
 OT#  
 OG# |
| **DIN**     | DIN B000 IN#(1)  
 Numeric value  
 OT#  
 OG#  
 B*** |
| **NWAIT**   | NWAIT |
| **WAIT**    | WAIT IN#(1)=ON T=0.5  
 Numeric value  
 IN#  
 IG# |
| **NOP**     | NOP |
| **'(Comment)'** | *(Label) |
| ***(Label)* |  |
| **JUMP**    | JUMP JOB:MRC IF IN#(1)=ON  
 Refer to description of "IF"  
 JOB: |
| **CALL**    | CALL JOB:MRC IF IN#(1)=ON  
 Refer to description of "IF"  
 JOB: |
| **RET**     | RET |
| **TIMER**   | TIMER T=0.50  
 Numeric value |
### 13.1 List of Instructions Supported by MotoSim EG (NX100, XRC, MRC, MRC II)

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IF</strong></td>
<td></td>
</tr>
<tr>
<td>IF IN#(1)=ON</td>
<td>ON/OFF Byte variable → B000, Numeric value → 000</td>
</tr>
<tr>
<td>IF IG#(1)=B000</td>
<td>Byte variable → B000, Constant → 000</td>
</tr>
<tr>
<td>IF B000=100</td>
<td>Byte variable → B000, Integer variable → I000, Double precision variable → D000, Real variable → R000, Constant → 000</td>
</tr>
<tr>
<td><strong>CWAIT</strong></td>
<td></td>
</tr>
<tr>
<td>MOVJ</td>
<td>MOVJ C000 VJ=50.00 PL=0 NWAIT</td>
</tr>
<tr>
<td>MOVL</td>
<td>MOVL C000 VJ=50.00 PL=0 NWAIT</td>
</tr>
<tr>
<td>MOVC</td>
<td>MOVC C000 VJ=50.00 PL=0 NWAIT</td>
</tr>
</tbody>
</table>

PL=0, PL=1, PL=2, PL=3, PL=4
## List of Instructions Supported by MotoSim EG (NX100, XRC, MRC, MRC II)

### REF-P

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>REFP 1 C000 PL=1</td>
<td>REFP 1 C000 PL=1</td>
</tr>
<tr>
<td></td>
<td>→ PL=0</td>
</tr>
<tr>
<td></td>
<td>→ PL=1</td>
</tr>
<tr>
<td></td>
<td>→ PL=2</td>
</tr>
<tr>
<td></td>
<td>→ PL=3</td>
</tr>
<tr>
<td></td>
<td>→ PL=4</td>
</tr>
</tbody>
</table>

### SPEED

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEED VJ=50.00 V=138 VR=138.0 VE=50.00</td>
<td>SPEED VJ=50.00 V=138 VR=138.0 VE=50.00</td>
</tr>
<tr>
<td></td>
<td>→ Numeric value</td>
</tr>
<tr>
<td></td>
<td>→ Ignored</td>
</tr>
<tr>
<td></td>
<td>→ VJ</td>
</tr>
<tr>
<td></td>
<td>→ VR</td>
</tr>
<tr>
<td></td>
<td>→ VE</td>
</tr>
<tr>
<td></td>
<td>→ V</td>
</tr>
</tbody>
</table>

### ADD SUB

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADD B000 0</td>
<td>ADD B000 0</td>
</tr>
<tr>
<td>SUB B000 0</td>
<td>SUB B000 0</td>
</tr>
<tr>
<td></td>
<td>→ Byte variable → B000</td>
</tr>
<tr>
<td></td>
<td>→ Integer variable → 1000</td>
</tr>
<tr>
<td></td>
<td>→ Double precision variable → D000</td>
</tr>
<tr>
<td></td>
<td>→ Real variable → R000</td>
</tr>
<tr>
<td></td>
<td>→ Constant → 000</td>
</tr>
<tr>
<td></td>
<td>→ Byte variable → B000</td>
</tr>
<tr>
<td></td>
<td>→ Integer variable → 1000</td>
</tr>
<tr>
<td></td>
<td>→ Double precision variable → D000</td>
</tr>
<tr>
<td></td>
<td>→ Real variable → R000</td>
</tr>
<tr>
<td></td>
<td>→ Robot position variable → P000</td>
</tr>
<tr>
<td></td>
<td>→ Base axis variable → BP000</td>
</tr>
<tr>
<td></td>
<td>→ Station axis variable → EX000</td>
</tr>
<tr>
<td></td>
<td>Array cannot be specified</td>
</tr>
<tr>
<td></td>
<td>Array cannot be specified</td>
</tr>
</tbody>
</table>
### 13.1 List of Instructions Supported by MotoSim EG (NX100, XRC, MRC, MRC II)

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MUL</strong></td>
<td>( \text{MUL } \text{D000 } \text{D000} ) &lt;br&gt; ( \text{MUL } \text{D000 } \text{D000} ) &lt;br&gt; Byte variable ( \rightarrow ) B000 &lt;br&gt; Integer variable ( \rightarrow ) I000 &lt;br&gt; Double precision variable ( \rightarrow ) D000 &lt;br&gt; Real variable ( \rightarrow ) R000 &lt;br&gt; Constant &lt;br&gt; ( \rightarrow ) Byte variable ( \rightarrow ) B000 &lt;br&gt; Integer variable ( \rightarrow ) I000 &lt;br&gt; Double precision variable ( \rightarrow ) D000 &lt;br&gt; Real variable ( \rightarrow ) R000 &lt;br&gt; Constant &lt;br&gt; Array cannot be specified</td>
</tr>
<tr>
<td><strong>DIV</strong></td>
<td>( \text{DIV } \text{D000 } \text{D000} ) &lt;br&gt; ( \text{DIV } \text{D000 } \text{D000} ) &lt;br&gt; Byte variable ( \rightarrow ) B000 &lt;br&gt; Integer variable ( \rightarrow ) I000 &lt;br&gt; Double precision variable ( \rightarrow ) D000 &lt;br&gt; Real variable ( \rightarrow ) R000 &lt;br&gt; Constant &lt;br&gt; Array cannot be specified</td>
</tr>
<tr>
<td><strong>INC</strong></td>
<td>( \text{INC } \text{B000} ) &lt;br&gt; Byte variable ( \rightarrow ) B000 &lt;br&gt; Integer variable ( \rightarrow ) I000 &lt;br&gt; Double precision variable ( \rightarrow ) D000 &lt;br&gt; Constant &lt;br&gt; Array cannot be specified</td>
</tr>
<tr>
<td><strong>DEC</strong></td>
<td>( \text{DEC } \text{B000} ) &lt;br&gt; Byte variable ( \rightarrow ) B000 &lt;br&gt; Integer variable ( \rightarrow ) I000 &lt;br&gt; Double precision variable ( \rightarrow ) D000 &lt;br&gt; Constant &lt;br&gt; Array cannot be specified</td>
</tr>
<tr>
<td><strong>AND</strong></td>
<td>( \text{AND } \text{B000 } \text{0} ) &lt;br&gt; Variable ( \rightarrow ) B000 &lt;br&gt; Constant ( \rightarrow ) 000 &lt;br&gt; Array cannot be specified</td>
</tr>
<tr>
<td><strong>OR</strong></td>
<td>( \text{OR } \text{B000 } \text{0} ) &lt;br&gt; Variable ( \rightarrow ) B000 &lt;br&gt; Constant ( \rightarrow ) 000 &lt;br&gt; Array cannot be specified</td>
</tr>
<tr>
<td><strong>NOT</strong></td>
<td>( \text{NOT } \text{B000 } \text{0} ) &lt;br&gt; Variable ( \rightarrow ) B000 &lt;br&gt; Constant ( \rightarrow ) 000 &lt;br&gt; Array cannot be specified</td>
</tr>
<tr>
<td><strong>XOR</strong></td>
<td>( \text{XOR } \text{B000 } \text{0} ) &lt;br&gt; Variable ( \rightarrow ) B000 &lt;br&gt; Constant ( \rightarrow ) 000 &lt;br&gt; Array cannot be specified</td>
</tr>
<tr>
<td><strong>SQRT</strong></td>
<td>( \text{SQRT } \text{B000 } \text{0} ) &lt;br&gt; Variable ( \rightarrow ) B000 &lt;br&gt; Constant ( \rightarrow ) 000 &lt;br&gt; Array cannot be specified</td>
</tr>
<tr>
<td><strong>SIN</strong></td>
<td>( \text{SIN } \text{B000 } \text{0} ) &lt;br&gt; Variable ( \rightarrow ) B000 &lt;br&gt; Constant ( \rightarrow ) 000 &lt;br&gt; Array cannot be specified</td>
</tr>
<tr>
<td><strong>COS</strong></td>
<td>( \text{COS } \text{B000 } \text{0} ) &lt;br&gt; Variable ( \rightarrow ) B000 &lt;br&gt; Constant ( \rightarrow ) 000 &lt;br&gt; Array cannot be specified</td>
</tr>
<tr>
<td><strong>ATAN</strong></td>
<td>( \text{ATAN } \text{B000 } \text{0} ) &lt;br&gt; Variable ( \rightarrow ) B000 &lt;br&gt; Constant ( \rightarrow ) 000 &lt;br&gt; Array cannot be specified</td>
</tr>
</tbody>
</table>
### 13.1 List of Instructions Supported by MotoSim EG (NX100, XRC, MRC, MRC II)

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GETE</strong></td>
<td>DIV D000 P000 (1)</td>
</tr>
<tr>
<td></td>
<td>🔄 Numeric value</td>
</tr>
<tr>
<td></td>
<td>🔄 Robot position variable → P000</td>
</tr>
<tr>
<td></td>
<td>🔄 Base axis variable → BP000</td>
</tr>
<tr>
<td></td>
<td>🔄 Station axis variable → EX000</td>
</tr>
<tr>
<td></td>
<td>🔄 D***</td>
</tr>
<tr>
<td></td>
<td>🔄 Array cannot be specified</td>
</tr>
<tr>
<td><strong>CLEAR</strong></td>
<td>CLEAR B000 0</td>
</tr>
<tr>
<td></td>
<td>🔄 Constant</td>
</tr>
<tr>
<td></td>
<td>🔄 Byte variable → B000</td>
</tr>
<tr>
<td></td>
<td>🔄 Integral variable → I000</td>
</tr>
<tr>
<td></td>
<td>🔄 Double precision variable → D000</td>
</tr>
<tr>
<td></td>
<td>🔄 Array cannot be specified</td>
</tr>
<tr>
<td><strong>CNVRT</strong></td>
<td>CNVRT PX000 PX000</td>
</tr>
<tr>
<td></td>
<td>🔄 Extended position variable → PX000</td>
</tr>
<tr>
<td></td>
<td>🔄 Extended position local variable → LPX000</td>
</tr>
<tr>
<td></td>
<td>🔄 Extended position variable → PX000</td>
</tr>
<tr>
<td></td>
<td>🔄 Extended position local variable → LPX000</td>
</tr>
<tr>
<td><strong>GETS</strong></td>
<td>GETS PX000 $PX001</td>
</tr>
<tr>
<td></td>
<td>🔄 Extended position status variable</td>
</tr>
<tr>
<td></td>
<td>🔄 $PX000</td>
</tr>
<tr>
<td></td>
<td>🔄 Array cannot be specified</td>
</tr>
<tr>
<td></td>
<td>🔄 Extended position variable → PX000</td>
</tr>
<tr>
<td></td>
<td>🔄 Array cannot be specified</td>
</tr>
</tbody>
</table>
## 13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

### NX100

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Robot Type (Model File Name)</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSA2000</td>
<td>SSA3-A00</td>
<td>450</td>
<td>Added at Ver2.30</td>
</tr>
<tr>
<td>EA1400N</td>
<td>EA1400N-A00</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>EA1400N Ceiling Mounted Type</td>
<td>EA1400N-A10</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>EA1900N</td>
<td>EA1900N-A00</td>
<td>505</td>
<td></td>
</tr>
<tr>
<td>HP3</td>
<td>HP3-A00</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>HP3J</td>
<td>HP3J-J00</td>
<td>290</td>
<td>Added at Ver2.20</td>
</tr>
<tr>
<td>HP3L</td>
<td>HP3L-A00</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>HP3XF</td>
<td>HP3XF-A00</td>
<td>300</td>
<td>Added at Ver1.30</td>
</tr>
<tr>
<td>HP3XF</td>
<td>HP3XF-B00</td>
<td>300</td>
<td>Added at Ver1.30</td>
</tr>
<tr>
<td>HP5</td>
<td>HP5-A00</td>
<td>300</td>
<td>Added at Ver1.30</td>
</tr>
<tr>
<td>HP6</td>
<td>HP6-A00</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>HP6R</td>
<td>HP6-R00</td>
<td>240</td>
<td>Added at Ver2.00</td>
</tr>
<tr>
<td>HP6R</td>
<td>HP6-R10</td>
<td>240</td>
<td>Added at Ver2.00</td>
</tr>
<tr>
<td>HP6S</td>
<td>HP6-A10</td>
<td>450</td>
<td>Added at Ver1.10</td>
</tr>
<tr>
<td>HP20</td>
<td>HP20-A00</td>
<td>505</td>
<td></td>
</tr>
<tr>
<td>HP20-6</td>
<td>HP20-A10</td>
<td>505</td>
<td></td>
</tr>
<tr>
<td>HP20 IP65</td>
<td>HP20-A20</td>
<td>505</td>
<td></td>
</tr>
<tr>
<td>HP165</td>
<td>HP165-A00</td>
<td>650</td>
<td></td>
</tr>
<tr>
<td>IA20</td>
<td>IA20-A00</td>
<td>450</td>
<td>Added at Ver2.00</td>
</tr>
<tr>
<td>EH80</td>
<td>EH80-A00</td>
<td>540</td>
<td>Added at Ver2.10</td>
</tr>
<tr>
<td>EH130</td>
<td>EH130-A00</td>
<td>650</td>
<td>Added at Ver2.30</td>
</tr>
<tr>
<td>EH130</td>
<td>EH130-A20</td>
<td>650</td>
<td>Added at Ver2.30</td>
</tr>
<tr>
<td>EH200-150</td>
<td>EH200-A10</td>
<td>730</td>
<td>Added at Ver2.30</td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-J00</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>Model Name</td>
<td>Robot Type (Model File Name)</td>
<td>Offset Value (mm)</td>
<td>Remarks</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-J10</td>
<td>740</td>
<td>Added at Ver1.20</td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-J30</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-J40</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-J50</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-J60</td>
<td>740</td>
<td>Added at Ver1.30</td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-K00</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-K10</td>
<td>740</td>
<td>Added at Ver1.20</td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-K30</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-K40</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-K50</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-K60</td>
<td>740</td>
<td>Added at Ver1.30</td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-L00</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-L10</td>
<td>740</td>
<td>Added at Ver1.20</td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-L30</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-L40</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-L50</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000N</td>
<td>EP4000N-L60</td>
<td>740</td>
<td>Added at Ver1.30</td>
</tr>
<tr>
<td>EPH130</td>
<td>EPH130-A00</td>
<td>730</td>
<td>Added at Ver2.00</td>
</tr>
<tr>
<td>EPH130R</td>
<td>EPH130R-A00</td>
<td>600</td>
<td>Added at Ver2.10</td>
</tr>
<tr>
<td>EPH130RL</td>
<td>EPH130RL-A00</td>
<td>600</td>
<td>Added at Ver2.10</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-J01</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-J11</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-J10</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-J41</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-J51</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-J60</td>
<td>758</td>
<td>Added at Ver1.20</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-JA0</td>
<td>758</td>
<td>Added at Ver1.30</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-K01</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-K11</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-K31</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
</tbody>
</table>
### List of Manipulator Models and Offset Values Supported by MotoSim EG

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Robot Type (Model File Name)</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPH4000</td>
<td>EPH4000-K41</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-K51</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-K60</td>
<td>758</td>
<td>Added at Ver1.20</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-KA0</td>
<td>758</td>
<td>Added at Ver1.30</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-L01</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-L11</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-L31</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-L41</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-L51</td>
<td>758</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-L60</td>
<td>758</td>
<td>Added at Ver1.20</td>
</tr>
<tr>
<td>EPH4000</td>
<td>EPH4000-LA0</td>
<td>758</td>
<td>Added at Ver1.30</td>
</tr>
<tr>
<td>EPL80</td>
<td>EPL80-A00</td>
<td>540</td>
<td>Added at Ver2.10</td>
</tr>
<tr>
<td>EPL160</td>
<td>EPL160-A00</td>
<td>880</td>
<td>Added at Ver1.10</td>
</tr>
<tr>
<td>EPL160</td>
<td>EPL160-A10</td>
<td>880</td>
<td>Added at Ver1.10</td>
</tr>
<tr>
<td>EPL300</td>
<td>EPL300-A00</td>
<td>880</td>
<td>Added at Ver1.10</td>
</tr>
<tr>
<td>EPL300</td>
<td>EPL300-A10</td>
<td>880</td>
<td>Added at Ver1.10</td>
</tr>
<tr>
<td>EPL500</td>
<td>EPL500-A00</td>
<td>880</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EPL500</td>
<td>EPL500-A10</td>
<td>880</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>ES165N</td>
<td>ES165N-A00</td>
<td>650</td>
<td></td>
</tr>
<tr>
<td>ES165N-100</td>
<td>ES165N-A10</td>
<td>650</td>
<td></td>
</tr>
<tr>
<td>ES165RN</td>
<td>ES165RN-A00</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>ES200N</td>
<td>ES200N-A00</td>
<td>650</td>
<td></td>
</tr>
<tr>
<td>ES200RN</td>
<td>ES200RN-A00</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>ES200TN</td>
<td>ES200TN-A00</td>
<td>650</td>
<td>Added at Ver2.30</td>
</tr>
<tr>
<td>ES200RN-120</td>
<td>ES200RN-A10</td>
<td>450</td>
<td>Added at Ver1.10</td>
</tr>
<tr>
<td>ES280N</td>
<td>ES280N-A00</td>
<td>650</td>
<td>Added at Ver2.00</td>
</tr>
<tr>
<td>DX1350N</td>
<td>DX1350N-A00</td>
<td>480</td>
<td>Added at Ver1.30</td>
</tr>
<tr>
<td>UP20MN</td>
<td>UP20MN-A00</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>UP50N</td>
<td>UP50N-A00</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>UP50N-80</td>
<td>UP50N-A10</td>
<td>540</td>
<td></td>
</tr>
</tbody>
</table>
### 13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Robot Type (Model File Name)</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP50SN</td>
<td>UP50N-A20</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>UP50N-35</td>
<td>UP50N-A30</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>UP50RN-35</td>
<td>UP50RN-A10</td>
<td>450</td>
<td>Added at Ver2.10</td>
</tr>
<tr>
<td>UP120EN-165</td>
<td>UP120EN-A10</td>
<td>525</td>
<td></td>
</tr>
<tr>
<td>UP130RLN</td>
<td>UP130RN-A2A</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>UP350N</td>
<td>UP350N-A00</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>UP350N-200</td>
<td>UP350N-A10</td>
<td>900</td>
<td>Added at Ver1.20</td>
</tr>
<tr>
<td>UP350N-500</td>
<td>UP350N-A20</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>UP350N-600</td>
<td>UP350N-A30</td>
<td>900</td>
<td>Added at Ver1.10</td>
</tr>
<tr>
<td>UP400RN</td>
<td>UP400RN-A00</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>SP800N</td>
<td>SP800N-A00</td>
<td>540</td>
<td></td>
</tr>
</tbody>
</table>

#### NXC100

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Robot Type (Model File Name)</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>HP3</td>
<td>HP3-A00</td>
<td>300</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>HP3L</td>
<td>HP3L-A00</td>
<td>300</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>HP3XF</td>
<td>HP3XF-A00</td>
<td>300</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>HP5</td>
<td>HP5-A00</td>
<td>300</td>
<td>Added at Ver1.50</td>
</tr>
</tbody>
</table>
### YASNAC XRC

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Robot Type (Model File Name)</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPJ^2)</td>
<td>UPJ3-A00</td>
<td>290</td>
<td></td>
</tr>
<tr>
<td>UPJ^2)</td>
<td>UPJ3-B00</td>
<td>290</td>
<td></td>
</tr>
<tr>
<td>UP6</td>
<td>UP6-A00</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>UP6</td>
<td>UP6-A20</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>UP6 Backward-Arm Model</td>
<td>UP6-A30</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>UP6R</td>
<td>UP6-R00</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>UP6RS</td>
<td>UP6-R10</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>UP20</td>
<td>UP20-A00</td>
<td>535</td>
<td></td>
</tr>
<tr>
<td>UP20-6</td>
<td>UP20-A10</td>
<td>535</td>
<td></td>
</tr>
<tr>
<td>UP20-10</td>
<td>UP20-A70</td>
<td>535</td>
<td></td>
</tr>
<tr>
<td>UP20M</td>
<td>UP20M-A00</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>UP50</td>
<td>UP50-A00</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>UP50S</td>
<td>UP50-A60</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>UP50-35</td>
<td>UP50-A20</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>UP50-80</td>
<td>UP50-A30</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>UP60E</td>
<td>UP60E-A00</td>
<td>270</td>
<td></td>
</tr>
<tr>
<td>UP60E</td>
<td>UP60E-A10</td>
<td>270</td>
<td></td>
</tr>
<tr>
<td>UP60E</td>
<td>UP60E-B00</td>
<td>270</td>
<td></td>
</tr>
<tr>
<td>UP60E</td>
<td>UP60E-B10</td>
<td>270</td>
<td></td>
</tr>
<tr>
<td>UP120E</td>
<td>UP120E-A00</td>
<td>525</td>
<td></td>
</tr>
<tr>
<td>UP120E-165</td>
<td>UP120E-A12</td>
<td>525</td>
<td></td>
</tr>
<tr>
<td>UP130</td>
<td>UP130-A00</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>UP130S</td>
<td>UP130-A10</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>UP130R</td>
<td>UP130R-A00</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>UP130RL</td>
<td>UP130R-A20</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>UP130T</td>
<td>UP130-T00</td>
<td>773</td>
<td></td>
</tr>
<tr>
<td>UP165</td>
<td>UP165-A00</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>UP165-100</td>
<td>UP165-A30</td>
<td>730</td>
<td></td>
</tr>
</tbody>
</table>
## List of Manipulator Models and Offset Values Supported by MotoSim EG

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Robot Type (Model File Name)</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>UP165-100</td>
<td>UP165-A40</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>UP165R</td>
<td>UP165R-A00</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>UP200</td>
<td>UP200-A00</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>UP200R</td>
<td>UP200-R00</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>UP350</td>
<td>UP350-A00</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>UP350-200</td>
<td>UP350-A10</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>UP350-500</td>
<td>UP350-A20</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>UP400R</td>
<td>UP400R-A00</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>UP400R</td>
<td>UP400R-A10</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>CSL10</td>
<td>CSL10-A00</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td>CSL10-460</td>
<td>CSL10-A10</td>
<td>840</td>
<td></td>
</tr>
<tr>
<td>CSL10-650</td>
<td>CSL10-A20</td>
<td>1030</td>
<td></td>
</tr>
<tr>
<td>CSL15</td>
<td>CSL15-A00</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>CSL15-1400</td>
<td>CSL15-A10</td>
<td>770</td>
<td></td>
</tr>
<tr>
<td>CSL15-1400</td>
<td>CSL15-A30</td>
<td>770</td>
<td></td>
</tr>
<tr>
<td>CSL15-1600</td>
<td>CSL15-A20</td>
<td>770</td>
<td></td>
</tr>
<tr>
<td>CSL15D</td>
<td>CSL15D-A00</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>CSL15D</td>
<td>CSL15D-B00</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>CSL15D-1400</td>
<td>CSL15D-A10</td>
<td>770</td>
<td></td>
</tr>
<tr>
<td>CSL15D-1400</td>
<td>CSL15D-B10</td>
<td>770</td>
<td></td>
</tr>
<tr>
<td>CSL15D-1400</td>
<td>CSL15D-B30</td>
<td>770</td>
<td></td>
</tr>
<tr>
<td>CSL15D-1600</td>
<td>CSL15D-B20</td>
<td>770</td>
<td></td>
</tr>
<tr>
<td>CSL600</td>
<td>CSL600-A00</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>CSL600D</td>
<td>CSL600D-A00</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>CSL600D-1400</td>
<td>CSL600D-A10</td>
<td>840</td>
<td></td>
</tr>
<tr>
<td>CSL1200</td>
<td>CSL20-A00</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200-1600</td>
<td>CSL20-A10</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200-1800</td>
<td>CSL20-A20</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200D</td>
<td>CSL20D-A00</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200D</td>
<td>CSL20D-B00</td>
<td>790</td>
<td></td>
</tr>
</tbody>
</table>
### 13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Robot Type (Model File Name)</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSL1200D</td>
<td>CSL20D-B30</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200D-L</td>
<td>CSL20D-A10</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200D-L</td>
<td>CSL20D-B10</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200D-1800</td>
<td>CSL20D-B20</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200D-1600</td>
<td>CSL20D-B40</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200D-875</td>
<td>CSL20D-B55</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200D-875</td>
<td>CSL20D-B61</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200D-1200</td>
<td>CSL20D-B80</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1200D-2400</td>
<td>CSL20D-B90</td>
<td>790</td>
<td></td>
</tr>
<tr>
<td>CSL1300D-2440</td>
<td>CSL30D-A00</td>
<td>870</td>
<td>Added at Ver2.00</td>
</tr>
<tr>
<td>CSL1300SC-1800</td>
<td>CSL30SC-A10</td>
<td>900</td>
<td>Added at Ver2.00</td>
</tr>
<tr>
<td>CSL2200D-1800</td>
<td>CSL50D-A00</td>
<td>824</td>
<td></td>
</tr>
<tr>
<td>CSL2200D-2400</td>
<td>CSL50D-A10</td>
<td>824</td>
<td></td>
</tr>
<tr>
<td>CSL2200D-2650</td>
<td>CSL50D-A20</td>
<td>824</td>
<td></td>
</tr>
<tr>
<td>CSL2400D-1800</td>
<td>CSL80D-A00</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td>CSL2400D-2400</td>
<td>CSL80D-A10</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td>CSL2400D-1800</td>
<td>CSL80D-C00</td>
<td>950</td>
<td>Added at Ver1.20</td>
</tr>
<tr>
<td>CSL2400D-2400</td>
<td>CSL80D-C10</td>
<td>950</td>
<td>Added at Ver1.20</td>
</tr>
<tr>
<td>CSL2400S-1800</td>
<td>CSL80S-A00</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td>CSL2400S-2400</td>
<td>CSL80S-A10</td>
<td>950</td>
<td></td>
</tr>
<tr>
<td>CSL2400S-2400</td>
<td>CSL80S-C10</td>
<td>950</td>
<td>Added at Ver1.30</td>
</tr>
<tr>
<td>CSL2500D-1800</td>
<td>CSL120D-A00</td>
<td>1059</td>
<td>Added at Ver2.10</td>
</tr>
<tr>
<td>CSL2500D-2400</td>
<td>CSL120D-A10</td>
<td>1050</td>
<td>Added at Ver2.10</td>
</tr>
<tr>
<td>CSL2500S-1800</td>
<td>CSL120S-A00</td>
<td>1059</td>
<td>Added at Ver2.10</td>
</tr>
<tr>
<td>CHL2400D-4700</td>
<td>CHL50D-A00</td>
<td>718</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>CHL2400D-3700</td>
<td>CHL50D-A10</td>
<td>718</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>CHL2400D-2700</td>
<td>CHL50D-A20</td>
<td>718</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>CSP1500</td>
<td>CSP50-A00</td>
<td>804.5</td>
<td></td>
</tr>
<tr>
<td>CSP1500</td>
<td>CSP50-B00</td>
<td>804.5</td>
<td></td>
</tr>
<tr>
<td>CSP1500W</td>
<td>CSP50-C00</td>
<td>822</td>
<td></td>
</tr>
<tr>
<td>Model Name</td>
<td>Robot Type (Model File Name)</td>
<td>Offset Value (mm)</td>
<td>Remarks</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------</td>
<td>-------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>CR20</td>
<td>CR20-A00</td>
<td>535</td>
<td></td>
</tr>
<tr>
<td>CR50</td>
<td>CR50-A00</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>CR165-100</td>
<td>CR165-A10</td>
<td>730</td>
<td>Added at Ver2.00</td>
</tr>
<tr>
<td>CR165-200</td>
<td>CR165-A30</td>
<td>730</td>
<td>Added at Ver1.50</td>
</tr>
<tr>
<td>EA1400</td>
<td>EA1400-A00</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>EA1900</td>
<td>EA1900-A00</td>
<td>535</td>
<td></td>
</tr>
<tr>
<td>EP3000</td>
<td>EP3000-A0A</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>EP4000</td>
<td>EP4000-A01</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000</td>
<td>EP4000-A11</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000</td>
<td>EP4000-A21</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000</td>
<td>EP4000-B01</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000</td>
<td>EP4000-B11</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000</td>
<td>EP4000-B21</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000</td>
<td>EP4000-C01</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000</td>
<td>EP4000-C11</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>EP4000</td>
<td>EP4000-C21</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>ES165</td>
<td>ES165-J02</td>
<td>650</td>
<td></td>
</tr>
<tr>
<td>ES165</td>
<td>ES165-J12</td>
<td>650</td>
<td></td>
</tr>
<tr>
<td>ES165R</td>
<td>ES165R-J02</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>ES200</td>
<td>ES200-J02</td>
<td>650</td>
<td></td>
</tr>
<tr>
<td>ES200R</td>
<td>ES200R-J02</td>
<td>450</td>
<td></td>
</tr>
<tr>
<td>DX1350</td>
<td>DX1350-A00</td>
<td>480</td>
<td></td>
</tr>
<tr>
<td>PX800</td>
<td>PX800-A02</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>PX800</td>
<td>PX800-Floor</td>
<td>310</td>
<td></td>
</tr>
<tr>
<td>PX1450</td>
<td>PX1450-A20</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>PX1450</td>
<td>PX1450-A30</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>PX1750</td>
<td>PX1750-A50</td>
<td>600</td>
<td>Added at Ver2.00</td>
</tr>
<tr>
<td>PX1850</td>
<td>PX1850-A20</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>PX1850</td>
<td>PX1850-A30</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>PX2050</td>
<td>PX2050-A20</td>
<td>600</td>
<td></td>
</tr>
</tbody>
</table>
### 13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Robot Type (Model File Name)</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>PX2050</td>
<td>PX2050-A30</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>PX2050</td>
<td>PX2050-A50</td>
<td>600</td>
<td>Added at Ver1.10</td>
</tr>
<tr>
<td>PX2750</td>
<td>PX2750-A30</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>PX2850</td>
<td>PX2850-A00</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>PX2850</td>
<td>PX2850-A10</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>PX2850</td>
<td>PX2850-A20</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>PX2850</td>
<td>PX2850-A50</td>
<td>600</td>
<td>Added at Ver1.10</td>
</tr>
<tr>
<td>PX2850</td>
<td>PX2850-A60</td>
<td>600</td>
<td>Added at Ver1.10</td>
</tr>
<tr>
<td>PX2850</td>
<td>PX2850-AA0</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>PX2900</td>
<td>PX2900-A00</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>PX2900</td>
<td>PX2900-A10</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>RS65-250</td>
<td>RS65-250</td>
<td>765</td>
<td></td>
</tr>
<tr>
<td>SK16X</td>
<td>SK16-J00</td>
<td>585</td>
<td></td>
</tr>
<tr>
<td>SK16X-6</td>
<td>SK16-J10</td>
<td>585</td>
<td></td>
</tr>
<tr>
<td>SK16MX</td>
<td>SK16M-J00</td>
<td>760</td>
<td></td>
</tr>
<tr>
<td>SK45X</td>
<td>SK45-J00</td>
<td>760</td>
<td></td>
</tr>
<tr>
<td>SK45X-30</td>
<td>SK45-J10</td>
<td>760</td>
<td></td>
</tr>
<tr>
<td>SK300X</td>
<td>SK300-J00</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>SK506X</td>
<td>SK506-J00</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>SV3X</td>
<td>SV3-J00</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>SV3X</td>
<td>SV3-J20</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>SV035</td>
<td>SV035-J00</td>
<td>380</td>
<td></td>
</tr>
<tr>
<td>SP70X</td>
<td>SP70-J00</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>SP100X</td>
<td>SP100-J00</td>
<td>880</td>
<td></td>
</tr>
<tr>
<td>SP100X-160</td>
<td>SP100-J10</td>
<td>880</td>
<td></td>
</tr>
<tr>
<td>SP100X-250</td>
<td>SP100-J20</td>
<td>880</td>
<td></td>
</tr>
<tr>
<td>SP100X-130</td>
<td>SP100-J30</td>
<td>880</td>
<td></td>
</tr>
<tr>
<td>SP400X</td>
<td>SP400-A00</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>SP400X-500</td>
<td>SP400-A20</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>SP800</td>
<td>SP800-A00</td>
<td>540</td>
<td></td>
</tr>
<tr>
<td>Model Name</td>
<td>Robot Type (Model File Name)</td>
<td>Offset Value (mm)</td>
<td>Remarks</td>
</tr>
<tr>
<td>------------</td>
<td>-----------------------------</td>
<td>-------------------</td>
<td>---------</td>
</tr>
<tr>
<td>SR200X-150</td>
<td>SR200-J20</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>SR200X-150</td>
<td>SR200-J40</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Model Name</td>
<td>Robot Type</td>
<td>Model File Name</td>
<td>Offset Value (mm)</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
<td>-----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>SK6</td>
<td>SK6-C000</td>
<td>SK6-C00</td>
<td>530</td>
</tr>
<tr>
<td>SK6</td>
<td>SK6-C020</td>
<td>SK6-C02</td>
<td>530</td>
</tr>
<tr>
<td>SK6R</td>
<td>SK6R-C001</td>
<td>SK6R-C00</td>
<td>240</td>
</tr>
<tr>
<td>SK6R</td>
<td>SK6R-C011</td>
<td>SK6R-C01</td>
<td>240</td>
</tr>
<tr>
<td>SK16</td>
<td>SK16-C000</td>
<td>SK16-C00</td>
<td>585</td>
</tr>
<tr>
<td>SK16-6</td>
<td>SK16-C010</td>
<td>SK16-C01</td>
<td>585</td>
</tr>
<tr>
<td>SK16M</td>
<td>SK16M-C000</td>
<td>SK16M-C00</td>
<td>760</td>
</tr>
<tr>
<td>SK45</td>
<td>SK45-C000</td>
<td>SK45-C00</td>
<td>760</td>
</tr>
<tr>
<td>SK45-30</td>
<td>SK45-C010</td>
<td>SK45-C01</td>
<td>760</td>
</tr>
<tr>
<td>SK45-80</td>
<td>SK45-D000</td>
<td>SK45-D00</td>
<td>760</td>
</tr>
<tr>
<td>SK120</td>
<td>SK120-C000</td>
<td>SK120-C00</td>
<td>850</td>
</tr>
<tr>
<td>SK120</td>
<td>SK120-C053</td>
<td>SK120-C05</td>
<td>850</td>
</tr>
<tr>
<td>SK120-75</td>
<td>SK120-C030</td>
<td>SK120-C03</td>
<td>850</td>
</tr>
<tr>
<td>SK120-80</td>
<td>SK120-E000</td>
<td>SK120-E00</td>
<td>850</td>
</tr>
<tr>
<td>SK120-150</td>
<td>SK120-D000</td>
<td>SK120-D00</td>
<td>850</td>
</tr>
<tr>
<td>SK506</td>
<td>SK506-C000</td>
<td>SK506-C00</td>
<td>0</td>
</tr>
<tr>
<td>SK506</td>
<td>SK506-C010</td>
<td>SK506-C01</td>
<td>0</td>
</tr>
<tr>
<td>SK604*7)</td>
<td>SK604-C000</td>
<td>SK604-C00</td>
<td>750</td>
</tr>
<tr>
<td>SV16</td>
<td>SV16-A000</td>
<td>SV16-A00</td>
<td>620</td>
</tr>
<tr>
<td>SV035</td>
<td>SV035-C000</td>
<td>SV035-C00</td>
<td>350</td>
</tr>
<tr>
<td>SP70</td>
<td>SP70-D000</td>
<td>SP70-D00</td>
<td>0</td>
</tr>
<tr>
<td>SP100</td>
<td>SP100-C000</td>
<td>SP100-C00</td>
<td>880</td>
</tr>
<tr>
<td>SP100-160</td>
<td>SP100-D000</td>
<td>SP100-D00</td>
<td>880</td>
</tr>
<tr>
<td>SR100</td>
<td>SR100-C000</td>
<td>SR100-C00</td>
<td>550</td>
</tr>
<tr>
<td>SR200-150</td>
<td>SR200-C110</td>
<td>SR200-C11</td>
<td>600</td>
</tr>
<tr>
<td>NY170L2</td>
<td>K300-C010</td>
<td>K300-C01</td>
<td>900</td>
</tr>
<tr>
<td>NY3002</td>
<td>K300-C000</td>
<td>K300-C00</td>
<td>900</td>
</tr>
<tr>
<td>NY400S2</td>
<td>K300-C020</td>
<td>K300-C02</td>
<td>900</td>
</tr>
<tr>
<td>CR45</td>
<td>CR45-C000</td>
<td>CR45-C00</td>
<td>760</td>
</tr>
</tbody>
</table>
## 13.2 List of Manipulator Models and Offset Values Supported by MotoSim EG

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Robot Type</th>
<th>Model File Name</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>K3</td>
<td>K3-C000</td>
<td>K3-C00</td>
<td>384</td>
<td></td>
</tr>
<tr>
<td>K5WG</td>
<td>K5G-A01</td>
<td>K5WG</td>
<td>685</td>
<td></td>
</tr>
<tr>
<td>K5WG</td>
<td>K5G-A01-B</td>
<td>K5WG</td>
<td>685</td>
<td></td>
</tr>
<tr>
<td>K6</td>
<td>K6-A301</td>
<td>K6-A30</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td>K6</td>
<td>K6-C000</td>
<td>K6-C00</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td>K10</td>
<td>K10-C000</td>
<td>K10-C00</td>
<td>585</td>
<td></td>
</tr>
<tr>
<td>K10-6</td>
<td>K10-C010</td>
<td>K10-C10</td>
<td>585</td>
<td></td>
</tr>
<tr>
<td>K10M</td>
<td>K10M-C000</td>
<td>K10M-C00</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>K30</td>
<td>K30-C000</td>
<td>K30-C00</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>K30</td>
<td>K30-C010</td>
<td>K30-C01</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>K60</td>
<td>K60-C000</td>
<td>K60-C00</td>
<td>720</td>
<td></td>
</tr>
<tr>
<td>K604*1)</td>
<td>K604-C000</td>
<td>K604-C00</td>
<td>750</td>
<td></td>
</tr>
<tr>
<td>K60C</td>
<td>K60C-A100</td>
<td>K60C-A10</td>
<td>720</td>
<td></td>
</tr>
<tr>
<td>K60T</td>
<td>K60T-C100</td>
<td>K60T-C10</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>K100</td>
<td>K100-C000</td>
<td>K100-C00</td>
<td>830</td>
<td></td>
</tr>
<tr>
<td>K100-120</td>
<td>K100-D000</td>
<td>K100-D00</td>
<td>830</td>
<td></td>
</tr>
<tr>
<td>K1004</td>
<td>K1004-C000</td>
<td>K1004-C00</td>
<td>1050</td>
<td></td>
</tr>
<tr>
<td>K100C</td>
<td>K100C-C100</td>
<td>K100C-C10</td>
<td>830</td>
<td></td>
</tr>
<tr>
<td>K100R</td>
<td>K100R-C000</td>
<td>K100R-C00</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td>K205*1)</td>
<td>K205-C000</td>
<td>K205-C00</td>
<td>900</td>
<td></td>
</tr>
<tr>
<td>K506</td>
<td>K506-C000</td>
<td>K506-C00</td>
<td>570</td>
<td></td>
</tr>
<tr>
<td>K506</td>
<td>K506-C010</td>
<td>K506-C01</td>
<td>570</td>
<td></td>
</tr>
<tr>
<td>S604</td>
<td>S604-C000</td>
<td>S604-C00</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>S604</td>
<td>S604-D000</td>
<td>S604-D00</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>S604-30</td>
<td>S604-C010</td>
<td>S604-C01</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>S604-30</td>
<td>S604-D010</td>
<td>S604-D01</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>
### YASNAC MRC II

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Robot Type</th>
<th>Model File Name</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>SK6</td>
<td>SK6-C000</td>
<td>SK6-C00</td>
<td>530</td>
<td></td>
</tr>
<tr>
<td>SK6</td>
<td>SK6-C020</td>
<td>SK6-C02</td>
<td>530</td>
<td></td>
</tr>
<tr>
<td>SK6R</td>
<td>SK6R-C001</td>
<td>SK6R-C001</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>SK6R</td>
<td>SK6R-C011</td>
<td>SK6R-C011</td>
<td>240</td>
<td></td>
</tr>
<tr>
<td>SK16</td>
<td>SK16-C000</td>
<td>SK16-C000</td>
<td>585</td>
<td></td>
</tr>
<tr>
<td>SK16-6</td>
<td>SK16-C010</td>
<td>SK16-C010</td>
<td>585</td>
<td></td>
</tr>
<tr>
<td>SK45</td>
<td>SK45-C000</td>
<td>SK45-C000</td>
<td>760</td>
<td></td>
</tr>
<tr>
<td>SK45-30</td>
<td>SK45-C010</td>
<td>SK45-C010</td>
<td>760</td>
<td></td>
</tr>
<tr>
<td>SV3</td>
<td>SV3-C000</td>
<td>SV3-C000</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>SV035</td>
<td>SV035-C000</td>
<td>SV035-C000</td>
<td>350</td>
<td></td>
</tr>
<tr>
<td>SP70</td>
<td>SP70-D000</td>
<td>SP70-D000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>CR3</td>
<td>CR3-C000</td>
<td>CR3-C000</td>
<td>300</td>
<td></td>
</tr>
<tr>
<td>CR45</td>
<td>CR45-C000</td>
<td>CR45-C000</td>
<td>760</td>
<td></td>
</tr>
</tbody>
</table>

### YASNAC ERC

<table>
<thead>
<tr>
<th>Robot Type  (Model File Name)</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>K3S1</td>
<td>384</td>
<td></td>
</tr>
<tr>
<td>K5G</td>
<td>685</td>
<td></td>
</tr>
<tr>
<td>K5NG</td>
<td>685</td>
<td></td>
</tr>
<tr>
<td>K5WG</td>
<td>685</td>
<td></td>
</tr>
<tr>
<td>K6S</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td>K10SH</td>
<td>585</td>
<td></td>
</tr>
<tr>
<td>K10MSB</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>K30SH</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>K30WSH</td>
<td>730</td>
<td></td>
</tr>
<tr>
<td>K60SH</td>
<td>720</td>
<td></td>
</tr>
<tr>
<td>K60COSH</td>
<td>720</td>
<td></td>
</tr>
</tbody>
</table>
### List of Manipulator Models and Offset Values Supported by MotoSim EG

<table>
<thead>
<tr>
<th>Robot Type (Model File Name)</th>
<th>Offset Value (mm)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>K60CSH</td>
<td>720</td>
<td></td>
</tr>
<tr>
<td>K60TCS1</td>
<td>740</td>
<td></td>
</tr>
<tr>
<td>K100CSH</td>
<td>830</td>
<td></td>
</tr>
<tr>
<td>K100RSH</td>
<td>550</td>
<td></td>
</tr>
<tr>
<td>K100SN</td>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>K120SH</td>
<td>830</td>
<td></td>
</tr>
<tr>
<td>K506NSH1*1)</td>
<td>570</td>
<td></td>
</tr>
<tr>
<td>S304SC</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>S304WSC</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>S604SC</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>S604WSC</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*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.

**NOTE**

The CAD converters "PolyTrans" and "Inovate" are not included with MotoSim EG. Prepare such application software before the operation.

Inovate: IRONCAD (http://www.ironcad.com)
13.4 Frequently-Asked Questions

- 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.

- 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.

- 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.
13.4 Frequently-Asked Questions

- 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.

- 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" tab.
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.)
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 needs 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).