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

MOTOMAN INSTRUCTIONS
- MOTOMAN-□□□ INSTRUCTIONS
- FS100 INSTRUCTIONS
- FS100 OPERATOR’S MANUAL
- FS100 MAINTENANCE MANUAL

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Revision: 0
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1 System Configuration

The dual-arm system in the FS100 system, the rotation axis, which is commonly used to R1 (left arm) and R2 (right arm), is registered as the base axis (B1 and B2). Following fig. 1-1 “Configuration of Dual-Arm System in the FS100 System” shows the control group configuration of the dual-arm system in which the shared base axis is used.

Fig. 1-1: Configuration of Dual-Arm System in the FS100 System

NOTE

The job created by the former DX100 system configuration whose rotation axis is registered as S1 cannot be used in the FS100 system in which the shared base axis is employed.

NOTE

In the FS100 system, up to “4” axes can be controlled, therefore, to the shared axis used dual-arm operation FS100 system, the external axes cannot be added.
2 Axis Operation

2.1 Control Point Fixed Motion During Base Axis Operation

Since the rotation axis is registered as the base axis, by operating the rotation base axis in the cartesian coordinate, the rotation axis can be kept moving with each manipulator’s control point at fixed point.

Following figures fig. 2-1, fig. 2-2 and fig. 2-3 show the manipulator’s control point fixed operation during the base axis operation.

Fig. 2-1: Control Point Fixed Rotation Base Axis Operation: Single Arm (R1)

Fig. 2-2: Control Point Fixed Rotation Base Axis Operation: Single Arm (R2)
2 Axis Operation
2.1 Control Point Fixed Motion During Base Axis Operation

Fig. 2-3: Control Point Fixed Rotation Base Axis Operation: Dual-Arm (R1 and R2)
2.1.1 Control Point Fixed Base Axis Operation for Single Arm

1. Select [SETUP] in the Main Menu.

2. Select [JOG CONDITION SETTING].
   - JOG CONDITION SETTING window appears.
2. Axis Operation
2.1 Control Point Fixed Motion During Base Axis Operation

3. Select {CONTROL POINT OPERATION (BASE)}.
   – Selection dialog box appears.
   (1) Select “VALID”.

4. Select B1 (or B2) as its control group. For the control group selecting method, please refer to “2.2.0.3 Select Control Group” in “FS100 OPERATOR’S MANUAL (RE-CSO-A043)”. Also, select “cartesian coordinates” for the operating coordinate system. For its selecting method, please refer to “2.2.0.4 Select Coordinate System” in “FS100 OPERATOR’S MANUAL (RE-CSO-A043)”. 

5. Turn the servo ON, press [X-] or [X+] and then, operate B1 (or B2) axis. At this time, the rotation base axis moves while the control point of R1 (or R2) is fixed.
2 Axis Operation

2.1 Control Point Fixed Motion During Base Axis Operation

2.1.2 Control Point Fixed Base Axis Operation for Dual-Arm

1. Select {SETUP} in the Main Menu.

2. Select {JOG CONDITION SETTING}.
   - JOG CONDITION SETTING window appears.
3. Select \{CONTROL POINT OPERATION (BASE)\}.

   – Selection dialog box appears.

   (1) Select “VALID ALL”.

4. Select B1 (or B2) as its control group. For the control group selecting method, please refer to “2.2.0.3 Select Control Group” in “FS100 OPERATOR’S MANUAL (RE-CSO-A043)”. Also, select “cartesian coordinates” for the operating coordinate system. For its selecting method, please refer to “2.2.0.4 Select Coordinate System” in “FS100 OPERATOR’S MANUAL (RE-CSO-A043)”.

5. Turn the servo ON, press [X-] or [X+] and then, operate B1 (or B2) axis. At this time, the rotation base axis moves while the control point of R1 and R2 are fixed.
2.2 Axis Operation in Cartesian Coordinate System

At the dual-arm system in the FS100 system, the rotation axis is registered as the base axis. Therefore, the base coordinate (the world coordinate) is fixed to the ground even if the rotation axis is operated.

On the other hand, the manipulator moves on the basis of the base coordinate when it is operated in the cartesian coordinate system. In this consequence, when the manipulator is operated in the cartesian coordinate system while the rotation axis is moved from the home position as shown in fig. 2-4 “Base Coordinate-Based Axis Operation Direction”, the manipulator will move in accordance with the ground fixed base coordinate system.

In this case, it might be difficult for the operator to confirm the manipulator’s moving direction.

To clear this problem, setting of the robot coordinate to the reference coordinate when the manipulator is operated in the cartesian coordinate is made possible.

As described above, when the robot coordinate is set to the reference coordinate and the manipulator is operated in the cartesian coordinate system, as shown in fig. 2-5 “Robot Coordinate-Based Axis Operation Direction”, regardless of the rotation axis position, the manipulator’s front facing direction is recognized as X-axis direction.

Fig. 2-4: Base Coordinate-Based Axis Operation Direction

Fig. 2-5: Robot Coordinate-Based Axis Operation Direction
2.2.1 Setting Method

1. Select {SETUP} in the Main Menu.

2. Select {JOG CONDITION SETTING}.
   - JOG CONDITION SETTING window appears.
3. Select {RECTANGULAR JOG COORDINATE}.
   - [BASE] and [ROBOT] alternate each time [SELECT] is pressed.

4. Select B1 (or B2) as its control group. For the control group selecting method, please refer to “2.2.0.3 Select Control Group” in “FS100 OPERATOR’S MANUAL (RE-CSO-A043)”. Also, select “cartesian coordinates” for the operating coordinate system. For its selecting method, please refer to “2.2.0.4 Select Coordinate System” in “FS100 OPERATOR’S MANUAL (RE-CSO-A043)

5. Turn the servo ON. At this time, R1 (or R2) moves in accordance with the coordinate set at RECTANGULAR JOG COORDINATE.
The dual-arm system in the FS100 system, creation of jobs specified by the control groups shown below are possible. Movements shown in the table 3-1 “Job Configuration” at page 3-1 can be created by the combination of the groups. For the registration method of the group combination, please refer to “5.2 Group Combination” in “FS100 OPTIONS INSTRUCTION FOR INDEPENDENT/COORDINATED CONTROL FUNCTION (RE-CKI-A461)”.

<table>
<thead>
<tr>
<th>No.</th>
<th>Combination of control groups</th>
<th>Movements</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>R1 (B1)</td>
<td>Interpolation at R1 control point including B1 movement</td>
</tr>
<tr>
<td>2</td>
<td>R2 (B2)</td>
<td>Interpolation at R2 control point including B2 movement</td>
</tr>
</tbody>
</table>
| 3   | R1 (B1) + R2 (B2) : R1 master | -Interpolation at R1 control point including B1 movement  
    |                               | -Interpolation at R2 control point including B2 movement  
    |                               | -R2 coordinated interpolation movement on R1 tool coordinate |
| 4   | R1 (B1) + R2 (B2) : R2 master | -Interpolation at R1 control point including B1 movement  
    |                               | -Interpolation at R2 control point including B2 movement  
    |                               | -R1 coordinated interpolation movement on R2 tool coordinate |

The dual-arm system in the FS100 system, the rotation axis motor is commonly used to B1 and B2. When respective jobs are executed by R1 and R2 parallel to each other, the base axis (rotation axis) moves on the basis of a job’s taught position data previously started by “PSTART” instruction. On the other hand, when R1 (left arm) and R2 (right arm) are to be simultaneously moved while the base axis (rotation axis) is rotating, do not move the respective jobs of R1 and R2 in parallel by validating the independent control function but use the coordinated job (shown in No. 3 or No. 4 in table 3-1 “Job Configuration”).
(1) Creation of a job only for the base axis is impossible. If the rotation axis is to be rotated, create a job for “R1” or “R2”.

(2) When operating the both arm (R1 and R2) simultaneously with the base axis in motion, create a job for “R1 + R2”.

(3) During the job of “R1 + R2”, the taught points for B1 and B2 in the step should be the same position. Use text editor, etc. to edit the job’s base axis position. If the taught positions of B1 and B2 differ even in the same step, following alarm occurs at the time the moving instruction of this step is executed.

“AL4523: SHARED BASE AXIS CONTROL ERROR [1]”

(4) In the dual-arm system in which the shared base axis is used, the station twin synchronous function cannot be validated. The following alarm occurs at the time “PSTART SYNC” instruction to start the station twin synchronous operation is executed.

“AL4529: TWIN COORDINATED ERROR [9]”
Specifications are subject to change without notice for ongoing product modifications and improvements.