Yaskawa Customer Support

- 24-hour Telephone Number: (937) 847-3200
  Use for urgent or emergency needs for technical support, service
  and/or replacement parts
- Routine Technical Inquiries: techsupport@motoman.com
  Allow up to 36 hours for response

Yaskawa

YRC1000
GENERAL OPERATOR’S MANUAL

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

MOTOMAN INSTRUCTIONS

MOTOMAN-□□□ INSTRUCTIONS
YRC1000 INSTRUCTIONS
YRC1000 OPERATOR’S MANUAL (GENERAL) (SUBJECT SPECIFIC)
YRC1000 MAINTENANCE MANUAL
YRC1000 ALARM CODES (MAJOR ALARMS) (MINOR ALARMS)

Please have the following information available when contacting Yaskawa Customer Support:
- System
- Primary Application
- Software Version (Located on Programming Pendant by selecting:
  {Main Menu} - {System Info} - {Version})
- Robot Serial Number (Located on robot data plate)
- Robot Sales Order Number (Located on controller data plate)

Part Number: 178645-1CD
Revision: 5
DANGER

• This manual describes the various components of the YRC1000 system and general operations. Read this manual carefully and be sure to understand its contents before handling the YRC1000. Any matter, including operation, usage, measures, and an item to use, not described in this manual must be regarded as “prohibited” or “improper”.

• General information related to safety are described in “Chapter 1. Safety” of the YRC1000 INSTRUCTIONS. To ensure correct and safe operation, carefully read “Chapter 1. Safety” of the YRC1000 INSTRUCTIONS.

CAUTION

• In some drawings in this manual, protective covers or shields are removed to show details. Make sure that all the covers or shields are installed in place before operating this product.

• YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids the product warranty.

NOTICE

• The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.

• YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

• If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the YRC1000.

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

**DANGER**
Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Safety Signs identified by the signal word DANGER should be used sparingly and only for those situations presenting the most serious hazards.

**WARNING**
Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury. Hazards identified by the signal word WARNING present a lesser degree of risk of injury or death than those identified by the signal word DANGER.

**CAUTION**
Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury. It may also be used without the safety alert symbol as an alternative to “NOTICE”.

**NOTICE**
NOTICE is the preferred signal word to address practices not related to personal injury. The safety alert symbol should not be used with this signal word. As an alternative to “NOTICE”, the word “CAUTION” without the safety alert symbol may be used to indicate a message not related to personal injury.

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 “DANGER”, “WARNING” and “CAUTION”.
• Before operating the manipulator, make sure the servo power is turned OFF by performing the following operations. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.
   – Press the emergency stop buttons on the front door of the YRC1000, on the programming pendant, on the external control device, etc.
   – Disconnect the safety plug of the safety fence.
     (when in the play mode or in the remote mode)
If operation of the manipulator cannot be stopped in an emergency, personal injury and/or equipment damage may result.

Fig. : Emergency Stop Button

• Before releasing the emergency stop, make sure to remove the obstacle or error caused the emergency stop, if any, and then turn the servo power ON.
Failure to observe this instruction may cause unintended movement of the manipulator, which may result in personal injury.

Fig. : Release of Emergency Stop

• Observe the following precautions when performing a teaching operation within the manipulator's operating range:
   – Be sure to perform lockout by putting a lockout device on the safety fence when going into the area enclosed by the safety fence. In addition, the operator of the teaching operation must display the sign that the operation is being performed so that no other person closes the safety fence.
   – View the manipulator from the front whenever possible.
   – Always follow the predetermined operating procedure.
   – Always keep in mind emergency response measures against the manipulator’s unexpected movement toward a person.
   – Ensure a safe place to retreat in case of emergency.
Failure to observe this instruction may cause improper or unintended movement of the manipulator, which may result in personal injury.

• Confirm that no person is present in the manipulator's operating range and that the operator is in a safe location before:
   – Turning ON the YRC1000 power
   – Moving the manipulator by using the programming pendant
   – Running the system in the check mode
   – Performing automatic operations
Personal injury may result if a person enters the manipulator's operating range during operation. Immediately press an emergency stop button whenever there is a problem. The emergency stop buttons are located on the front panel of the YRC1000 and on the right of the programming pendant.

• Read and understand the Explanation of the Warning Labels before operating the manipulator.
Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and manipulator cables.

In this manual, the equipment is designated as follows.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>YRC1000 controller</td>
<td>YRC1000</td>
</tr>
<tr>
<td>YRC1000 programming pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and the controller</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>

**WARNING**

- Perform the following inspection procedures prior to conducting manipulator teaching. If there is any problem, immediately take necessary steps to solve it, such as maintenance and repair.
  - Check for a problem in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.
- Always return the programming pendant to the hook on the YRC1000 cabinet after use.

If the programming pendant is left unattended on the manipulator, on a fixture, or on the floor, etc., the Enable Switch may be activated due to surface irregularities of where it is left, and the servo power may be turned ON. In addition, in case the operation of the manipulator starts, the manipulator or the tool may hit the programming pendant left unattended, which may result in personal injury and/or equipment damage.
Descriptions of the programming pendant keys, buttons, and displays are shown as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Pendant</td>
<td></td>
</tr>
<tr>
<td>Character Keys /Symbol Keys</td>
<td>The keys which have characters or symbols printed on them are denoted with [ ]. e.g. [ENTER]</td>
</tr>
<tr>
<td>Axis Keys /Numeric Keys</td>
<td>[Axis Key] and [Numeric Key] are generic names for the keys for axis operation and number input.</td>
</tr>
<tr>
<td>Keys pressed simultaneously</td>
<td>When two keys are to be pressed simultaneously, the keys are shown with a &quot;+&quot; sign between them, e.g. [SHIFT]+[COORD].</td>
</tr>
<tr>
<td>Mode Switch</td>
<td>Mode Switch can select three kinds of modes that are denoted as follows: REMOTE, PLAY or TEACH. (The switch names are denoted as symbols)</td>
</tr>
<tr>
<td>Button</td>
<td>The three buttons on the upper side of the programming pendant are denoted as follows: START, HOLD, or EMERGENCY STOP. (The button names are denoted as symbols)</td>
</tr>
<tr>
<td>Displays</td>
<td>The menu displayed in the programming pendant is denoted with { }. e.g. {JOB}</td>
</tr>
</tbody>
</table>

![Diagram of the programming pendant](image)

*The button/switch names are denoted as symbols.*
Description of the Operation Procedure

In the explanation of the operation procedure, the expression “Select • • • ” means that the cursor is moved to the object item and [SELECT] is pressed, or that the item is directly selected by touching the screen.

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1 Introduction

1.1 YRC1000 Overview

The main power switch and the door lock are located in the upper left on the front panel of the YRC1000.

The emergency stop button is installed in the upper right on the front panel of the YRC1000, and the programming pendant can be hung from a hook below the button.

For information on setup, installation, and connection of the YRC1000 system, refer to the “YRC1000 INSTRUCTIONS (RE-CTO-A221)”. 

Fig. 1-1: YRC1000 Front View
1.2 Programming Pendant

1.2.1 Programming Pendant Overview

The programming pendant is equipped with the keys and buttons used to perform manipulator teaching, job editing and playback, etc.

*Fig. 1-2: Programming Pendant Overview*

- **Start button**
- **Hold button**
- **Mode Switch**
- **Emergency stop button**
- **SD card slot**
- **Page key**
- **USB connector**
- **Select key**
- **Cursor key**
- **Axis keys**
- **Manual speed keys**
- **Enable Switch**
  - Located on the back of the programming pendant. Lightly squeeze this switch to turn the power ON. Firmly squeeze this switch to turn the power OFF.
- **Numeric keys / Function keys**
  - Press these keys to enter numbers. These keys are also used as function keys. When inputting instructions, etc., these keys are automatically switched from numeric keys to function keys.
- **Enter key**
- **Motion type key**
1.2.2 Key Description

1.2.2.1 Character Keys and Symbol Keys

The keys with characters or symbols printed on them are denoted with [ ]. For example, [ ] is denoted as [ENTER].

To each numeric key, functions other than numerical entry are allocated. In the description of our instruction manuals, only the function explained there is denoted as the key.

For example, [ ] is denoted as [1] when the key is used to enter the numerical value 1, and denoted as [TIMER] when used to register the timer instruction.

1.2.2.2 Axis Keys and Numeric Keys

The keys shown below are collectively referred to as [Axis Keys] and [Numeric Keys].

![Axis Keys and Numeric Keys Diagram]

1.2.2.3 Keys Pressed Simultaneously

When two keys must be pressed simultaneously, the keys are shown with a "+" sign between them, such as [SHIFT] + [COORD].
### 1.2.3 Programming Pendant Keys

<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>[START]</strong></td>
<td>Starts the manipulator motion in playback operation.</td>
</tr>
<tr>
<td><img src="image" alt="Start Button" /></td>
<td>• The lamp on this button lights up during the play operation.</td>
</tr>
<tr>
<td></td>
<td>• The lamp also lights up when the playback operation is started by the START signal of system input.</td>
</tr>
<tr>
<td></td>
<td>• The lamp turns OFF when the playback operation is stopped by alarm occurrence, HOLD signal, or mode change.</td>
</tr>
<tr>
<td><strong>[HOLD]</strong></td>
<td>Temporarily stops the manipulator motion.</td>
</tr>
<tr>
<td><img src="image" alt="Hold Button" /></td>
<td>• This button is enabled in any mode.</td>
</tr>
<tr>
<td></td>
<td>• The lamp on this button lights up only while the button is being pressed.</td>
</tr>
<tr>
<td></td>
<td>Although the lamp turns OFF when the button is released, the manipulator stays stopped until a next START command is input.</td>
</tr>
<tr>
<td></td>
<td>• The HOLD lamp automatically lights up in the following cases to indicate that the system is in HOLD status.</td>
</tr>
<tr>
<td></td>
<td>The start and axis operations are disabled while the lamp lights up.</td>
</tr>
<tr>
<td></td>
<td>1. The HOLD signal of system input is ON.</td>
</tr>
<tr>
<td></td>
<td>2. The HOLD request is being sent from an external device in remote mode.</td>
</tr>
<tr>
<td></td>
<td>3. In the HOLD status caused by an error occurred in working process such as wire sticking at arc welding.</td>
</tr>
<tr>
<td></td>
<td>• While communication between the YRC1000 and the programming pendant is disconnected, the manipulator does not stop its operation even if [HOLD] is pressed.</td>
</tr>
<tr>
<td><strong>[EMERGENCY STOP]</strong></td>
<td>Turns OFF the servo power.</td>
</tr>
<tr>
<td><img src="image" alt="Emergency Stop Button" /></td>
<td>• When the servo power is turned OFF, the &quot;SERVO ON&quot; LED on the programming pendant turns OFF.</td>
</tr>
<tr>
<td></td>
<td>• An emergency stop message is shown on the display.</td>
</tr>
<tr>
<td><strong>Mode Switch</strong></td>
<td>Selects the Play mode, Teach mode, or Remote mode.</td>
</tr>
<tr>
<td><img src="image" alt="Mode Switch" /></td>
<td>PLAY: Play Mode</td>
</tr>
<tr>
<td></td>
<td>The playback of a taught job can be performed.</td>
</tr>
<tr>
<td></td>
<td>The START signal from an external device is disabled.</td>
</tr>
<tr>
<td></td>
<td>TEACH: Teach Mode</td>
</tr>
<tr>
<td></td>
<td>Axis can be operated and operation can be edited by using the programming pendant.</td>
</tr>
<tr>
<td></td>
<td>The START signal from an external device is disabled.</td>
</tr>
<tr>
<td></td>
<td>REMOTE: Remote Mode</td>
</tr>
<tr>
<td></td>
<td>Operation by an external signal is enabled.</td>
</tr>
<tr>
<td></td>
<td>During the remote mode, [START] of the programming pendant is disabled.</td>
</tr>
<tr>
<td></td>
<td>• While communication between the YRC1000 and the programming pendant is disconnected, the mode of the YRC1000 cannot be changed.</td>
</tr>
</tbody>
</table>
Enable Switch

Turns ON the servo power.
- When the Enable Switch is lightly squeezed while the “SERVO ON” LED is blinking and the Mode Switch is set to TEACH, the power turns ON.
- When this switch is released or firmly squeezed while the power is turned ON, the power turns OFF.

[SELECT]

Works as described below.
- Selects a menu item in the main menu area and the menu area.
- Makes the selected item ready to be set in the general-purpose display area.
- Shows two or more messages in the human interface display area.

Cursor Key

Moves the cursor in the direction of the arrow.
- The size of the cursor and the range/place where the cursor can move vary depending on the window.
- In the JOB CONTENT window, if the UP cursor is pressed when the cursor is on the first line, the cursor moves to the last line of the job. Conversely, if the cursor is on the last line of the job and the DOWN cursor is pressed, the cursor will jump to the first line of the job.

[SHIFT] + [↑] (UP)
Scrolls the screen upward.
[SHIFT] + [↓] (DOWN)
Scrolls the screen downward.
[SHIFT] + [→] (RIGHT)
Scrolls the screen to the right.
[SHIFT] + [←] (LEFT)
Scrolls the screen to the left.

[MAIN MENU]

Displays the main menu.
- When the main menu is shown, press this key to hide the main menu.

[MAIN MENU] + UP
Increases the brightness of the screen.
[MAIN MENU] + DOWN
Decreases the brightness of the screen.

[SIMPLE MENU]

Displays the simple menu.
- When the simple menu is shown, press this key to hide the simple menu.

[SHIFT] + [SIMPLE MENU]
Registers the layout displayed in the general-purpose area to the user defined menu.

Press [SIMPLE MENU] for three seconds to display the pop-up menu window.
1 Introduction
1.2 Programming Pendant

**[SERVO ON READY]** Enables the servo power supply to be turned ON.
- If the servo power supply is shut OFF by the emergency stop or overrun signal, press this key to enable the servo power supply to be turned ON.
- When this key is pressed,
  1. in the play mode, the servo power supply turns ON if the safeguarding is securely closed;
  2. in the teach mode, the “SERVO ON” LED blinks, and the servo power supply turns ON with the Enable Switch turned ON;
  3. while the servo power is ON, the “SERVO ON” LED lights up.

**[CANCEL]** Cancels the current status.
- Hides the sub menu in the main menu area and the menu area.
- Cancels the current input data or input status in the general-purpose display area.
- Cancels the list of messages in the human interface display area.
- Cancels the current error.

**[SHIFT] + [CANCEL]**
When the job content is shown and the undo function is enabled, the assist menu is shown.

**[MULTI]** Works for the multi mode.
- If this button is pressed when the multi mode is ON, the active window switches.

**[SHIFT] + [MULTI]**
Switches between the multi-window display and the single-window display when the multi mode is ON.

**[COORD]** Selects the operation coordinate system when the manipulator is operated manually.
- The coordinate system can be selected from the six coordinate systems, i.e., joint, Cartesian, cylindrical, tool, user, and teaching line.
  Each time this key is pressed, the coordinate system is switched in the following order: JOINT → CAR/CYL → TOOL → USER → TEACHING LINE (only for arc welding purpose)
- The selected coordinate system is shown in the status display area.

**[SHIFT] + [COORD]**
The number of the coordinate system can be changed when the “TOOL” or “USER” coordinate system is selected.
### 1.2 Programming Pendant

<table>
<thead>
<tr>
<th>Key</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[DIRECT OPEN]</td>
<td>Displays the content related to the current line.</td>
</tr>
<tr>
<td></td>
<td>• When the job content is displayed, move the cursor to an instruction and press this key to show its related content.</td>
</tr>
<tr>
<td></td>
<td>Example:</td>
</tr>
<tr>
<td></td>
<td>For a CALL instruction, the content of the called job is shown.</td>
</tr>
<tr>
<td></td>
<td>For a work instruction, the content of the current condition file is shown.</td>
</tr>
<tr>
<td></td>
<td>For an input/output instruction, the input/output status is shown.</td>
</tr>
<tr>
<td></td>
<td>• The lamp on this button lights up while the direct open is ON.</td>
</tr>
<tr>
<td></td>
<td>While the lamp lights up, press this button to return to the previous window.</td>
</tr>
<tr>
<td>[PAGE]</td>
<td>Displays the next page.</td>
</tr>
<tr>
<td></td>
<td>• The page can be switched only when the lamp on this button lights up.</td>
</tr>
<tr>
<td></td>
<td>[SHIFT] + [PAGE]</td>
</tr>
<tr>
<td></td>
<td>Switches to the previous page.</td>
</tr>
<tr>
<td>[AREA]</td>
<td>Moves the cursor in the display in the following order: Menu Area → General-Purpose Display Area → Human Interface Display Area → Main Menu Area. If no item is displayed, the cursor does not move.</td>
</tr>
<tr>
<td></td>
<td>[SHIFT] + [AREA]</td>
</tr>
<tr>
<td></td>
<td>Switches the language when the bilingual function is valid. (Bilingual function is optional.)</td>
</tr>
<tr>
<td>[AREA]</td>
<td>[AREA] + DOWN</td>
</tr>
<tr>
<td></td>
<td>Moves the cursor from the general-purpose display area to the operation button when the operation button is displayed.</td>
</tr>
<tr>
<td>[AREA]</td>
<td>[AREA] + UP</td>
</tr>
<tr>
<td></td>
<td>Moves the cursor to the general-purpose display area when the cursor is on the operation button.</td>
</tr>
<tr>
<td>[SHIFT]</td>
<td>Changes the functions of other keys by pressing together.</td>
</tr>
<tr>
<td></td>
<td>Can be used with [SIMPLE MENU], [PAGE], [DIRECT OPEN], [MULTI], [COORD], [AREA], [MOTION TYPE], the cursor, [Numeric Key], [ROBOT], [EX. AXIS], or [AUX] to access alternate functions. Refer to the description of each key for the alternate functions with [SHIFT].</td>
</tr>
<tr>
<td>[INTERLOCK]</td>
<td>Changes the functions of other keys by pressing together.</td>
</tr>
<tr>
<td></td>
<td>Can be used with [TEST START], [FWD], [Numeric Key] (Numeric key customize function), [ROBOT], [EX. AXIS], or [AUX].</td>
</tr>
<tr>
<td></td>
<td>Refer to the description of each key for the alternate functions with [INTERLOCK].</td>
</tr>
<tr>
<td>[INFORM LIST]</td>
<td>Displays the list of instructions available for editing the job.</td>
</tr>
</tbody>
</table>
1 Introduction
1.2 Programming Pendant

[ROBOT] Switches the robot axis to be operated.
• Press this key to enable the robot axis operation.
• [ROBOT] is enabled for the system with one YRC1000 and multiple manipulators or the system with one or more external axes.

[SHIFT] + [ROBOT]
The robot axis to be operated is switched to a robot axis which is not registered in the currently selected job.

[INTERLOCK] + [ROBOT]
Switches the application when multiple applications are set to one robot.

[EX. AXIS] Switches the external axis to be operated.
• Press this key to enable the external axis (base axis or station axis) operation.
• [EX.AXIS] is enabled for the system with one or more external axes.

[SHIFT] + [EX. AXIS]
The external axis to be operated is switched to an external axis which is not registered in the currently selected job.

[MOTION TYPE] Selects the interpolation type for playback operation.
• The selected interpolation type is shown in the input buffer line in the display.
• Each time this key is pressed, the interpolation type changes in the following order:
  MOVJ → MOVL → MOVC → MOVS

[SHIFT] + [MOTION TYPE]
The interpolation mode changes in the following order:
STANDARD → EXTERNAL REFERENCE POINT* → CONVEYOR*
In each interpolation mode, by pressing only [MOTION TYPE], the usable interpolation method is switched as in the above STANDARD mode.

*: These modes are options.

[AUX] Calls a function.

[INTERLOCK] + [AUX]
Shows the confirmation dialog for enabling/disabling the touch panel.

[SHIFT] + [AUX]
When the job content is shown the welding line control list function is called. (Only for the arc welding application)
### 1.2 Programming Pendant

| **[TEST START]** | Press [TEST START] and [INTERLOCK] simultaneously to move the manipulator through the taught steps in a continuous motion for checking the path.  
|                  | • The manipulator moves in the currently selected operation cycle: AUTO, 1 CYCLE, or STEP.  
|                  | • The manipulator moves at the taught speed.  
|                  | If the taught speed exceeds the maximum teaching speed, the operation proceeds at the maximum teaching speed.  
|                  | [INTERLOCK] + [TEST START]  
|                  | The manipulator moves through the taught steps in a continuous motion.  
|                  | Operation immediately stops when this key is released during the continuous motion. |

| **[FWD]** | Moves the manipulator through the taught steps only while this key is pressed.  
|           | • Only the move instruction is executed.  
|           | • The manipulator moves at the selected manual speed.  
|           | Before operating the manipulator, make sure that the selected manual speed is set as intended.  
|           | [INTERLOCK] + [FWD]  
|           | All instructions including the move instruction are executed.  
|           | [REFP] + [FWD]  
|           | The manipulator moves to the reference point indicated by the line with the cursor. |

| **[BWD]** | Moves the manipulator through the taught steps in the reverse direction only while this key is pressed.  
|           | • Only the move instruction is executed.  
|           | • The manipulator moves at the selected manual speed.  
|           | Before operating the manipulator, make sure that the selected manual speed is set as intended. |

| **[DELETE]** | Deletes the registered instruction.  
|             | • Deletion completes when [ENTER] is pressed while the lamp on this key lights up. |

| **[INSERT]** | Inserts a new instruction.  
|             | • Insertion completes when [ENTER] is pressed while the lamp on this key lights up. |

| **[MODIFY]** | Modifies the taught position data or instruction.  
|             | • Modification completes when [ENTER] is pressed while the lamp on this key lights up. |
1 Introduction
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[ENTER]
Completes the execution of each process for registration and edition of instructions, data, current position of the manipulator, etc.
• When [ENTER] is pressed, the instruction or data shown in the input buffer line moves to the cursor position to complete a registration, insertion, modification, etc.

[MANUAL SPEED]
Sets the speed for manual operation. This speed is also valid for operations with [FWD] and [BWD].
• There are four speed levels (slow, medium, fast, and inching). The speed changes as described below. The selected speed is displayed on the status area.

* Each time [FAST] is pressed, manual speed changes in the following order:
  INCH \(\rightarrow\) SLOW \(\rightarrow\) MED \(\rightarrow\) FST.
* Each time [SLOW] is pressed, manual speed changes in the following order:
  FST \(\rightarrow\) MED \(\rightarrow\) SLOW \(\rightarrow\) INCH

[HIGH SPEED]
Makes the manipulator move at high speed while this key and one of the axis keys are pressed simultaneously during manual operation. No need to change the setting of speed.
• The speed for [HIGH SPEED] is specified in advance.

[Axis Key]
Moves a specific axis of the manipulator.
• The manipulator operates only while the key is pressed.
• By pressing two or more keys simultaneously, multiple axes can be operated at the same time.
• The manipulator operates in the selected coordinate system at the selected manual speed.
Before operating the axis, make sure that the selected coordinate system and the manual speed are set as intended.
• A user-selected external axis can be allocated to [E-], [E+], [B-], or [B+]. For details, refer to chapter 6.9 "Jog Key Allocation".

[Numeric Key]
Enters the number or symbol on the key when the prompt “>” appears on the input line.
• “.” is the decimal point. “-” is a minus sign or hyphen.
• [Numeric Keys] are also used as function keys.
Refer to the explanation of each function for details.
1.2.4 Programming Pendant Display

The programming pendant display is a 5.7 inch color display. Alphanumeric characters can be used.

1.2.4.1 Five Display Areas

The general-purpose display area, menu area, human interface display area, and main menu area among the following five areas can be moved by pressing [AREA], or can be selected by directly touching the screen.

Each window displayed during operations is provided with its name on the upper left of the general-purpose display area.
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1.2.4.2 General-Purpose Display Area

On the general-purpose display area, various settings and contents such as jobs and characteristics files can be displayed and edited.

Displays also can be switched by scrolling the window, moving the cursor and switching pages.

Character strings can be copied or the window can be zoomed in/out by touch operation.

**Scrolling the window**

If the display content is oversized in the general-purpose display area, the display area can be resized by scrolling the window.

Follow the procedure below to scroll the window.

- Scrolling the window using the cursor:
  Refer to chapter 1.2.3 “Programming Pendant Keys”.

- Scrolling the window by touch operation:
  While touching the general-purpose display area, move it up and down or sideways, and release the touch.

To enable or disable scrolling the window by touch operation, select {DISPLAY SETUP} - {TOUCH OPE. SETTING} and make the setting.

<Example>
Touch the job window and slide it upwards. (The window scrolls towards the lower part.)
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- **Moving the cursor**
  The cursor are displayed on some windows. Follow the procedure below to move the cursor position.

  - Moving the cursor using the cursor:
    Refer to *chapter 1.2.3 “Programming Pendant Keys”.*

  - Moving the cursor by touch operation:
    Touch the position available for cursor moving in the general-purpose display area, and release the touch.
    To enable or disable moving the cursor by touch operation, select {DISPLAY SETUP} - {TOUCH OPE. SETTING} and specify the setting.

  To move the cursor by touch operation in the job window, select one of the following methods:

  A. Pressing [INTERLOCK] + touch operation
  B. Touch operation + confirmation dialog
  C. Not use touch operation to move the cursor

A. Method of “pressing [INTERLOCK] + touch operation”

1. Set pressing [INTERLOCK] as the method for moving the cursor by touch operation in the job window.
2. While pressing [INTERLOCK], touch a position in the job window where the cursor can move.
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B. Method of “touch operation + confirmation dialog”

1. Set confirming by the dialog as the method for moving the cursor by touch operation in the job window.
2. Touch a position in the job window where the cursor can move.
3. Select “YES” in the confirmation dialog box “Move the cursor position?”.

### Page switching

When the [PAGE] lamp lights up, the pages can be switched.

Select one of the following methods to switch the pages.

- **Page switching by [PAGE]:**
  Refer to chapter 1.2.3 “Programming Pendant Keys”.

- **Displaying the next page by touch operation:**
  While touching the general-purpose display area, move it to the left side and release it.

- **Displaying the previous page by touch operation:**
  While touching the general-purpose display area, move it to the right side and release it.

- **To enable or disable page switching by touch operation, select (DISPLAY SETUP) - {TOUCH OPE. SETTING} and specify the setting.**
Copy and paste of a character string

Character strings in the general-purpose display area can be copied by touch operation. The copied character string can be pasted on the "Result" of the character input keypad.

Copy a character string by the following procedure:

1. Touch and hold a character string in the general-purpose display area.
   - Selection menu appears.

2. To change the length of the character string to be copied, touch and slide the copy cursor.

   - The character string is copied.
Paste a character string by the following procedure:

1. Touch and hold the “Result” of the character input keypad.
   - Selection menu appears.

2. Select “Paste” in the selection menu.
   - The copied character string is pasted.

By using the character input keypad, cut or paste of the character string can be undone by “Undo”, and a character string within 8 characters can be registered by “Regist”.

To enable or disable copy and paste of a character string, select (DISPLAY SETUP) - (TOUCH OPE. SETTING) and specify the setting.
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### Zooming in/out of the window

To zoom in or out the general-purpose display area, touch and hold the title or unused space.

1. Touch and hold the title of the general-purpose display area.
   - Zoom in/out bar appears.

![Zoom in/out bar appears](image)

2. Touch and slide the cursor of the zoom in/out bar.
   - Only the main area of the general-purpose display area is zoomed in/out.

![Only the main area is zoomed in/out](image)

3. Touch anywhere outside the zoom in/out bar.
   - The zoom in/out bar is closed, and the entire general-purpose display area is zoomed in/out.

![The entire area is zoomed in/out](image)

To enable or disable zooming in/out of the window, select {DISPLAY SETUP} - {TOUCH OPE. SETTING} and specify the setting.
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- **Operation buttons**

On some windows, an operation button appears.

To perform the operation allocated to the operation button, press [SELECT] or touch the operation button.

To move the cursor from the general-purpose display area to the operation button, press [AREA] + [↓].

To move the cursor from the operation button to the general-purpose display area, press [AREA] + [↑] or press [CANCEL].

In the operation button area, press [←] or [→] to move the cursor and press [SELECT] to perform the operation where the cursor is located.

**EXECUTE** : Continues operation of the contents displayed in the general-purpose display area.

**CANCEL** : Cancels the contents displayed in the general-purpose display area, and returns to the previous window.

**COMPLETE** : Completes the setting operation displayed in the general-purpose display area.

**STOP** : Stops loading, saving, or verifying in the external memory device.

**RELEASE** : Releases the overrun and shock sensor function.

**RESET** : Resets an alarm. (Cannot reset major alarms.)

**PAGE** : On a switchable page, press (PAGE) and directly enter a desired page number, and then press [ENTER] to switch to the desired page.

On a window where a list appears, press [↓] or [↑] to select a desired item on the list, and press [ENTER] to show the desired item.
1.2.4.3 Main Menu Area

Menus and submenus are displayed in the main menu area. Press [MAIN MENU] or touch {Main Menu} on the bottom left of the window to display the main menu.

![Main Menu Area Diagram]
1.2.4.4 Status Display

The status display area shows controller status. The displayed information will vary depending on the controller mode (Play/Teach).

A. Control Group
Displays the active control group when the robot system includes a station axis, two or more robot axes, etc.

- to : Robot Axes
- to : Base Axes
- to : Station Axes

B. Operation Coordinate System
Displays the selected coordinate system. Switched by pressing [COORD].

- : Joint Coordinates
- : Cartesian Coordinates
- : Cylindrical Coordinates
- : Tool Coordinates
- : User Coordinates
- : Teaching Line Coordinates (arc welding purpose)
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C. Manual Speed
Displays the selected speed for axis operation. For details, refer to chapter 2.2.0.5 “Select Manual Speed”.

- : Inching
- : Low Speed
- : Medium Speed
- : High Speed

D. Security Mode

- : Operation Mode
- : Edit Mode
- : Management Mode
- : Safety Mode
- : One Time Manage Mode

E. Operation Cycle
Displays the present operation cycle.

- : Step
- : Cycle
- : Continuous

F. Current Status
Displays the current status of the system (STOP, HOLD, ESTOP, ALARM, or RUN).

- : Stop Status
- : Hold Status
- : Emergency Stop Status
- : Alarm Status
- : Operating Status
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G. Mode
- : Teach mode
- : Play mode

H. Tool Number
- From to : Displays the tool No. selected by the robot when the tool No. switching function is enabled. (S2C431=1)

I. Page
- : Displayed when the page can be switched.

J. Multi Mode
- : Displayed when the multi window mode is set.

K. Weak Battery of Memory
- : Displayed when the battery of memory is weak.

L. Touch Operation Disabled
- : Displayed the touch panel operation is disabled.
- : Displayed when the battery of memory is weak and the touch operation is disabled.

M. Saving Data
- : Displayed while saving the data.
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1.2.4.5 Human Interface Display Area

A message(s) is displayed in the human interface display area.

When there are two or more messages, appears in the message display area.

Activate the message display area and press [SELECT] to view the list of current errors.

To close the error list, select {CLOSE} or press [CANCEL].

1.2.4.6 Menu Area

The menu area is used for edit or management of jobs and for execution of various utilities.

1.2.4.7 Error Dialog Box

If an error occurs, an error dialog box appears in the middle of the display.

While the error dialog box is on the display, no operation can be performed.

Press [CANCEL] or select (CANCEL) by manually touching the window in the error dialog box to continue operation.

To show the description of an error in the human interface display area, select (DISPLAY SETUP) - (TOUCH OPE. SETTING) and disable the error dialog box.
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1.2.5 Screen Descriptions

- The menu displayed in the programming pendant is denoted with { }.

The above menu items are denoted as {DATA}, {EDIT}, {DISPLAY}, and {UTILITY}.

- The window is shown in full view or in partial view as necessary.

**Full Window View**

![Full Window View]

**Upper Window View**

![Upper Window View]

**Middle Window View**

![Middle Window View]

**Lower Window View**

![Lower Window View]
1.2.6 Character Input Operation

Move the cursor to the data for which characters are to be input, and press [SELECT] to display the software keypad.

1.2.6.1 Character Input

To input characters, the software keypad is shown on the programming pendant display.

There are three types of software keypads: the alphanumeric keypads each for upper-case and lower-case characters and the symbol keypad. To switch between the alphanumeric keypads and the symbol keypad, touch the button tab on the screen or press [PAGE]. To switch the alphanumeric keypads between upper-case and lower-case characters, touch “CapsLock OFF” or “CapsLock ON”.

1.2.6.2 Operation

<table>
<thead>
<tr>
<th>Keypad</th>
<th>Key on the programming pendant</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cursor</td>
<td><img src="image" alt="Cursor Key" /></td>
<td>Moves the cursor (focus).</td>
</tr>
<tr>
<td>[SELECT]</td>
<td><img src="image" alt="Select Key" /></td>
<td>Selects a character.</td>
</tr>
<tr>
<td>[CANCEL]</td>
<td><img src="image" alt="Cancel Key" /></td>
<td>Clears all the characters being typed. Press this key two times to close the software keypad.</td>
</tr>
<tr>
<td>[ENTER]</td>
<td><img src="image" alt="Enter Key" /></td>
<td>Enters the input characters.</td>
</tr>
<tr>
<td>Button Tab</td>
<td><img src="image" alt="Button Tab Key" /></td>
<td>Switches the keypads displayed on the programming pendant.</td>
</tr>
<tr>
<td>-</td>
<td><img src="image" alt="Minus Key" /></td>
<td>Closes the software keypad.</td>
</tr>
<tr>
<td>Numeric Key</td>
<td><img src="image" alt="Numeric Key" /></td>
<td>Enters numbers.</td>
</tr>
</tbody>
</table>
1.2.6.3 Alphanumeric Input

Number input is performed with the [Numeric Key] or on the following alphanumeric input window. Numbers include 0 to 9, the decimal point (.), and the minus sign/hyphen (-).

Depending on the contents to be input, some characters may be restricted. If a registered word includes a restricted character, the word cannot be used.

For Numbers and Upper-Case Characters

For Numbers and Lower-Case Characters

Press [PAGE] to display the alphanumeric input window.

Move the cursor to a desired character and press [SELECT] to enter the character.
1.2.6.4 Symbol Input

Press [PAGE] to display the symbol input window.

Move the cursor to a desired symbol and press [SELECT] to enter the symbol.

Note that only some symbols are available for naming jobs.

For Symbols

When the focus is in a text field of [Result], the cursor position can be moved by pressing [Shift]+[→] or [Shift]+[←].
1.2.6.5 Word Register Function

A word (character string) can be registered and used for character input. Each character string must be within 8 characters, and up to 32 character strings can be registered.

- Depending on the contents to be input, some characters may be restricted. If a registered word includes a restricted character, the word cannot be used.
  - e.g., No lower-case character or decimal point can be used for a job name.

From the main menu, select {SETUP}, and then select {SET WORD}.

- Word register window appears.
- The registered words are displayed in the word area.
- When no word is registered, {Name order}, {Delete}, and {Delete All} in the button area cannot be selected.
Word Registration
A word can be registered by selecting (Regist) in the word register window or in the keypad when the word registration function is enabled (S2C410=1).

Up to 32 words (each word within 8 characters) can be registered.

Example> Registration of the word “TEST”
1. Select (KEYBORD).
2. Enter “TEST” by using the keyboard, and select “Regist”.
   – The dialog box appears.
3. Select {REGISTER WORD}.
   - The word area appears.
   - Confirm that “TEST” is in the word area.

   ![Word Register Window]

- **Back Space**
  Deletes the character located immediately before the cursor from the input character string.
  1. Select {Back space} in the word register window.
     - The character immediately before the cursor is deleted from the character string.

- **Cancel**
  Cancels the input character string.
  1. Select {Cancel} in the word register window.
     - When a character string is input, the input character string is canceled.
     - When no character string is input in the word register window, the window is closed.
Use of Registered Words

Example>

1. Select the (REGISTER WORD) tab where the word "TEST" is registered.
   - The word area is displayed.

   Depending on the contents to be input, some characters may be restricted. If a registered word includes a restricted character, the word cannot be used.

2. Select {TEST} in the word area.
   - The registered word "TEST" appears in the “Result” field.
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3. Select [KEYBOARD].

4. Move the focus to “1” by the programming pendant, and press [Select].
   - The “1” is entered after “TEST” in the “Result” field.

5. While “TEST1” is displayed in the “Result” field, select [Regist].
   - The dialog box “TEST1 Word registration succeeded.” appears, and the registration is completed.
### Changing Order of Registered Words

The order of registered words can be changed.

1. **Listing the words in the order of name**
   
   (1) Select {Name order} in the button area.
   
   - The words in the word area is shown in alphabetical order.
   
   - {Name Order} button changes to {Register order} button.

2. **Listing the words in the order of registration**
   
   (1) Select {Register order} in the button area.
   
   - Displayed by the register order of the words.
   
   - {Register order} button changes to {Name Order} button.
Deleting a Registered Word
A registered word can be deleted.

A registered word can be deleted in the word register window, or by using the keypad when word editing is enabled (S2C410=1).

e.g. Deleting a registered word “TEST”.

1. Select {REGISTER WORD} tab.
   - The word area appears.

2. Select {TEST} in the word area, and select {Delete} in the button area.
   - The dialog box “TEST Do you delete a word?” appears.

3. Select “Yes”.
   - “TEST” in the word area is deleted.
Deleting All Registered Words
All of the registered words can be deleted.

All of the registered words can be deleted in the word register window, or by using the keypad when word editing is enabled (S2C410=1).

• Deleting all registered words
1. Select (Delete All) in the button area.
   – The dialog box “Do you delete all words?” appears.
2. Select “Yes”.
   – All of the registered words are deleted.
1.2.7 Numeric Value Input Operation

Move the cursor to the input data and press [SELECT]. The numeric value input area and the numeric value keypad are shown. To enable or disable the numeric value keypad, select {DISPLAY SETUP}-{TOUCH OPE.SETTING} and specify the setting.

### 1.2.7.1 Operation for Numeric Value Input Area

<table>
<thead>
<tr>
<th>Name of key</th>
<th>Key on the programming pendant</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cursor</td>
<td><img src="image" alt="Cursor" /></td>
<td>Moves the cursor (focus). The down cursor can delete one number.</td>
</tr>
<tr>
<td>[CANCEL]</td>
<td><img src="image" alt="CANCEL" /></td>
<td>Clears all the characters being typed. Press this key two times to close the numeric value input area.</td>
</tr>
<tr>
<td>[ENTER]</td>
<td><img src="image" alt="ENTER" /></td>
<td>Enters the input numeric values.</td>
</tr>
<tr>
<td>Numeric keys</td>
<td><img src="image" alt="0 to 9" /></td>
<td>Inputs numbers. To input E as the real number, press [SHIFT] and [-(minus)] together.</td>
</tr>
</tbody>
</table>
1.2.7.2 Operation for Numeric Value Input Keypad

<table>
<thead>
<tr>
<th>Keypad</th>
<th>Key on the programming pendant</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear</td>
<td>Clear</td>
<td>Clears all the characters being typed.</td>
</tr>
<tr>
<td>Back space</td>
<td>Back space</td>
<td>Deletes one number at the cursor position.</td>
</tr>
<tr>
<td>Cancel</td>
<td>Cancel</td>
<td>Clears all the characters being typed. Press this key two times to close the numeric value input area.</td>
</tr>
<tr>
<td>Enter</td>
<td>Enter</td>
<td>Enters the input numeric values.</td>
</tr>
<tr>
<td>Change of base number</td>
<td>Dec or Dec</td>
<td>Select the base number (Binary, decimal, hexadecimal). Modify the numeric value which is being input in the input area in accordance with the selected base number.</td>
</tr>
<tr>
<td>Numeric keys</td>
<td>0 to 9</td>
<td>Inputs numbers.</td>
</tr>
<tr>
<td>Numeric keys of hexadecimal</td>
<td>A to F</td>
<td>Inputs numbers for the hexadecimal input.</td>
</tr>
</tbody>
</table>

Numeric values to be input are limited depending on the contents. For the numeric values which cannot be input, the color of numeric key becomes grey and the numbers cannot be selected.
1.2.8  Bilingual Function (Optional)

When the bilingual function (optional) is enabled, two languages can be displayed alternately by ONE-TOUCH operation.

1. Press [SHIFT] + [AREA]

- English and Japanese are switched each time the [AREA] and the [SHIFT] are pressed simultaneously.

The two languages cannot be displayed alternately in the following conditions:

- During character or number input operation, or when a confirmation dialog is on the window
- During axis operation, FWD/BWD operation, or test operation in the teach mode

Use alphanumeric characters (single byte) for items registered by users, such as job names and comments. Non-alphanumeric characters cannot be displayed correctly in languages other than Japanese and English.
1.3 Mode

The following three modes are available for YRC1000.

- Teach Mode
- Play Mode
- Remote Mode

1.3.1 Teach Mode

In the teach mode, the following can be done.

- Preparation and teaching of a job
- Modification of a registered job
- Setting of various characteristic files and parameters

1.3.2 Play Mode

In the play mode, the following can be done.

- Playback of a taught job

1.3.3 Remote Mode

In the remote mode, the operations such as Servo ON Ready, Start, Cycle Change, Call Master Job can be commanded by external input signals.

The operations by external input signals become enabled in the remote mode, while [START] on the programming pendant becomes disabled.

The data transmission function (optional function) is also available in the remote mode.

The following table shows how each operation is input in each mode.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Mode</th>
<th>Teach Mode</th>
<th>Play Mode</th>
<th>Remote Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servo ON Ready</td>
<td>PP</td>
<td>PP</td>
<td>External input signal</td>
<td></td>
</tr>
<tr>
<td>Start</td>
<td>Invalid</td>
<td>PP</td>
<td>External input signal</td>
<td></td>
</tr>
<tr>
<td>Cycle Change</td>
<td>PP</td>
<td>PP</td>
<td>External input signal</td>
<td></td>
</tr>
<tr>
<td>Call Master Job</td>
<td>PP</td>
<td>PP</td>
<td>External input signal</td>
<td></td>
</tr>
</tbody>
</table>

Note: “PP” indicates the programming pendant.

1.3.4 Teach Mode Priority

In the teach mode, the following operations are disabled.

- Playback using [START]
- Playback from external input signals
1.4 Security Mode

1.4.1 Types of Security Modes

The following five types of security modes are available for YRC1000.

- **Operation Mode**
  
The operator can monitor the line operation and start and stop the manipulator. Repairs, etc. can be performed if any abnormalities are detected.

- **Edit Mode**
  
  Teaching, robot jog operations, and editing of jobs and various condition files can be performed in addition to the operations enabled in the operation mode.

- **Management Mode**
  
  The operator who performs setup and maintenance for the system can set the machine control parameter, set the time, change the password, etc. in addition to the operations enabled in the edit mode.

- **Safety Mode**
  
  The operator who performs the safety management of the system can edit the files related to the safety function in addition to the operations enabled in the management mode. When the functional safety function (optional) is enabled, the security is changed to the safety mode in which files such as tool files can be edited. For the details of the safety mode, refer to “YRC1000 OPTIONS INSTURC-

- **One Time Manage Mode**
  
  Maintenance operations in a higher security mode than the management mode can be performed. The one time security code provided by YASKAWA is required.

  Restriction of the loading of the batch data (CMOS.BIN)/parameter batch (ALL.PRM)/function definition parameter (FD.PRM) is released in addition to the operations enabled in the safety mode.

Any operation in the edit mode, the management mode, and the security mode requires a password.

In the edit mode and the management mode, the password must consist of 4 to 16 numbers or symbols.

In the safety mode, the password must consist of 9 to 16 numbers or symbols.
### Table 1-1: Menu & Security Mode (Sheet 1 of 5)

<table>
<thead>
<tr>
<th>Main Menu</th>
<th>Sub Menu</th>
<th>Allowed Security Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOB</td>
<td>JOB</td>
<td>Operation Edit</td>
</tr>
<tr>
<td></td>
<td>SELECT JOB</td>
<td>Operation Operation</td>
</tr>
<tr>
<td></td>
<td>CREATE NEW JOB(^1)</td>
<td>Edit Edit</td>
</tr>
<tr>
<td></td>
<td>MASTER JOB</td>
<td>Operation Edit</td>
</tr>
<tr>
<td></td>
<td>JOB CAPACITY</td>
<td>Operation -</td>
</tr>
<tr>
<td></td>
<td>RES. START (JOB)(^1)</td>
<td>Edit Edit</td>
</tr>
<tr>
<td></td>
<td>RES. STATUS(^2)</td>
<td>Operation -</td>
</tr>
<tr>
<td></td>
<td>CYCLE</td>
<td>Operation Operation</td>
</tr>
<tr>
<td></td>
<td>TRASH JOB LIST(^3)</td>
<td>Edit Edit</td>
</tr>
<tr>
<td></td>
<td>JOB EDIT (PLAY)</td>
<td>Edit Edit</td>
</tr>
<tr>
<td></td>
<td>PLAY EDIT JOB LIST</td>
<td>Edit Edit</td>
</tr>
<tr>
<td>VARIABLE</td>
<td>BYTE</td>
<td>Operation Edit</td>
</tr>
<tr>
<td></td>
<td>INTEGER</td>
<td>Operation Edit</td>
</tr>
<tr>
<td></td>
<td>DOUBLE</td>
<td>Operation Edit</td>
</tr>
<tr>
<td></td>
<td>REAL</td>
<td>Operation Edit</td>
</tr>
<tr>
<td></td>
<td>STRING</td>
<td>Operation Edit</td>
</tr>
<tr>
<td></td>
<td>POSITION (ROBOT)</td>
<td>Operation Edit</td>
</tr>
<tr>
<td></td>
<td>POSITION (BASE)</td>
<td>Operation Edit</td>
</tr>
<tr>
<td></td>
<td>POSITION (ST)</td>
<td>Operation Edit</td>
</tr>
<tr>
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\(^1\) Depending on the system model
\(^2\) In the offline operation
\(^3\) In the online operation
## 1.4 Security Mode

### Table 1-1: Menu & Security Mode (Sheet 2 of 5)

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### Table 1-1: Menu & Security Mode  (Sheet 4 of 5)

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1 Introduction
1.4 Security Mode

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1 Displayed in the teach mode only.
2 Displayed in the play mode only.
3 Displayed when the job reconstruction function is valid.

*As for the menu and the security mode when the functional safety is valid, refer to “YRC1000 OPTIONS INSTRUCTIONS FOR FUNCTIONAL SAFETY FUNCTION (HW1483576)” for more details.

Table 1-1: Menu & Security Mode (Sheet 5 of 5)
1.4 Security Mode

1.4.2 Selecting Security Mode

1. Select {SYSTEM INFO} under {Main Menu}.
   – The sub menu appears.

   ![Image of Main Menu]

2. Select {SECURITY}.
   – The SECURITY window appears.

   ![Image of SECURITY window]

   – The security mode can be selected from operation mode, edit mode, management mode, or safety mode.
3. Select the desired security mode.
   - When the selected security mode is higher than the currently set mode, the Password input status window appears.

4. Input the password as required.
   - At the factory, the password number is preset as follows:
     Edit Mode : [0000000000000000]
     Management Mode : [9999999999999999]
     Safety Mode : [5555555555555555]

5. Press [ENTER].
   - The security mode is changed when the input password is correct.
Follow the procedures below when changing the security mode to the one-time manage mode.

1. Change the security mode to the management mode.
   - Selection of the mode is available among "OPERATION MODE", "EDITING MODE", "MANAGEMENT MODE", "SAFETY MODE", and "ONE TIME MANAGE MODE" when the mode is changed to the management mode.

2. Select "ONE TIME MANAGE MODE".
   - A key pad for character input is displayed. Input the one time security code provided by YASKAWA.
   - The security mode is changed to the one time manage mode when the input security code is correct.
2 Manipulator Coordinate Systems and Operations

2.1 Control Groups and Coordinate Systems

2.1.1 Control Group

For the YRC1000, a group of axes to be controlled at a time is called “Control Group”, and the group is classified into three units: “ROBOT” as a manipulator itself, “BASE” that moves the manipulator in parallel, and “STATION” as jigs or tools other than “ROBOT” and “BASE”. BASE and STATION are also called external axes.

- **Robot**: This is the axis for the manipulator itself.
- **Base**: This is the axis that moves the entire manipulator. It corresponds to the servo track. It controls the path of traveling manipulators.
- **Station**: This is any axis other than the robot and base. It indicates the tilt or rotating axis of the fixture.
2.1.2 Types of Coordinate Systems

The following coordinate systems can be used to operate the manipulator:

- **Joint Coordinates**
  Each axis of the manipulator moves independently.

- **Cartesian Coordinates**
  The tool tip of the manipulator moves parallel to any of the X-, Y-, and Z-axes.

- **Cylindrical Coordinates**
  The $\theta$ axis moves around the S-axis. The r-axis moves parallel to the L-axis arm.
  For vertical motion, the tool tip of the manipulator moves parallel to the Z-axis.

- **Tool Coordinates**
  The effective direction of the tool mounted in the wrist flange of the manipulator is defined as the Z-axis.
  This axis controls the coordinates of the end point of the tool.

- **User Coordinates**
  The XYZ-Cartesian coordinates are defined at any point and angle.
  The tool tip of the manipulator moves parallel to the axes of them.

- **Teaching Line Coordinates**
  The XYZ-Cartesian coordinates will be set from two steps and the Z-axis direction of the robot coordinates.
  The tool tip of the manipulator moves parallel to the coordinates. They can be used only for an arc welding purpose.
2.2 General Operations

2.2.0.1 Check Safety

Before any operation of the YRC1000, read Section 1 “Safety” of “YRC1000 INSTRUCTIONS” again and keep safe around the robot system or peripherals.

2.2.0.2 Select Teach Mode

Set the mode switch on the programming pendant to “teach”.

2.2.0.3 Select Control Group

If the YRC1000 has several Control Groups or Coordinate Control Systems (optional function), select control group first.

If two or more ROBOT, BASE, STATION are registered, switch control group by pressing [SHIFT] + [ROBOT] or [SHIFT] + [EX. AXIS].

After selecting a job, the control group registered in the selected job is enabled. The control group registered in the edit job can be switched by pressing [ROBOT] or [EX. AXIS].

Check the selected control group at the status display area on the programming pendant.

2.2.0.4 Select Coordinate System

Select a coordinate system by pressing [COORD].

Each time [COORD] is pressed, the coordinate system switches in the following order:

- Joint → Cartesian (Cylindrical) → Tool → User → Teaching Line (only for arc welding purpose).

Check the selected coordinate on the status display area on the programming pendant.
2.2.0.5 Select Manual Speed

Select manual speed of operation by pressing [FAST] or [SLOW]. The selected speed is effective not only for axis operation but [FWD] or [BWD] operation.

- Each time [FAST] is pressed, the speed switches in the order of “INCH”→“SLOW”→“MED”→“FAST”.

  ![FAST](image)

- Each time [SLOW] is pressed, the speed switches in the order of “FAST”→“MED”→“SLOW”→“INCH”.

  ![SLOW](image)

2.2.0.6 Servo ON

Press [SERVO ON READY], and then SERVO ON LED starts blinking. Squeeze the Enable Switch, and then SERVO ON LED starts lighting.

2.2.0.7 Axis Operation

Make sure of safety around the manipulator.

Press [Axis Key] then axis moves according to the selected control group, coordinates, and manual speed. See chapter 2.3 “Coordinate Systems and Axis Operation”.

2.2.0.8 HIGH SPEED

Press [HIGH SPEED] while pressing [Axis Key] to make the manipulator move faster than the usual speed.

The [HIGH SPEED] is disabled when “INCH” is selected for the manual speed.
2.3 Coordinate Systems and Axis Operation

2.3.1 Joint Coordinates

When the manipulator is operating in the joint coordinates, each axis of the manipulator can be moved independently.

If the [Axis Key] of an axis not included in the manipulator is pressed, no axis operates.

The motion of each axis is described in the table below.

Table 2-1: Axis Motion in Joint Coordinates

<table>
<thead>
<tr>
<th>Axis Name</th>
<th>Axis Operation Key</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Major Axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-axis</td>
<td>![S-axis Key]</td>
<td>Main unit rotates right and left.</td>
</tr>
<tr>
<td>L-axis</td>
<td>![L-axis Key]</td>
<td>Lower arm moves forward and backward.</td>
</tr>
<tr>
<td>U-axis</td>
<td>![U-axis Key]</td>
<td>Upper arm moves up and down.</td>
</tr>
<tr>
<td>Wrist Axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-axis</td>
<td>![R-axis Key]</td>
<td>Wrist rolls right and left.</td>
</tr>
<tr>
<td>B-axis</td>
<td>![B-axis Key]</td>
<td>Wrist moves up and down.</td>
</tr>
<tr>
<td>T-axis</td>
<td>![T-axis Key]</td>
<td>Wrist turns right and left.</td>
</tr>
<tr>
<td>E-axis</td>
<td>![E-axis Key]</td>
<td>Lower arm turns right and left.</td>
</tr>
</tbody>
</table>

**Axis Operation in the Joint Coordinates**

- When two or more [Axis Keys] are pressed at the same time, the manipulator performs a combined movement. However, if two different directional keys (such as [S -] + [S +]) for the same axis are pressed at the same time, the axis will not operate. (When [S -] + [S +] + [L +] are pressed, only the axis corresponding to [L +] will operate.)
2.3 Coordinate Systems and Axis Operation

7-Axis Manipulator

6-Axis Manipulator
2.3.2 Cartesian Coordinates

In the Cartesian coordinates, the manipulator moves parallel to the X-, Y-, or Z-axes.

The motion of each axis is described in the table below.

*Table 2-2: Axis Motion in Cartesian Coordinates*

<table>
<thead>
<tr>
<th>Axis Name</th>
<th>Axis Operation Key</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-axis</td>
<td>![X-axis symbol]</td>
<td>Moves parallel to X-axis.</td>
</tr>
<tr>
<td>Wrist Axes</td>
<td>Motion about TCP is executed.</td>
<td>See chapter 2.3.7 &quot;Motion about TCP&quot;.</td>
</tr>
</tbody>
</table>

**Axis Operation in the Cartesian Coordinates**

- When two or more [Axis Keys] are pressed at the same time, the manipulator performs a combined movement. However, if two different directional keys (such as [X -] + [X +]) for the same axis are pressed at the same time, the axis will not operate. (When [X -] + [X +] + [Y +] are pressed, only the axis corresponding to [Y +] will operate.)

![Diagram of manipulator showing X, Y, and Z-axes and their motion](image)
2.3.3 Cylindrical Coordinates

In the cylindrical coordinates, the manipulator operates in a rotational movement, a perpendicular movement, or a parallel movement with respect to the Z-axis.

The motion of each axis is described in the table below.

Table 2-3: Axis Motion in Cylindrical Coordinates

<table>
<thead>
<tr>
<th>Axis Name</th>
<th>Axis Operation Key</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>θ-axis</td>
<td>X-</td>
<td>Main unit rotates with respect to Z-axis.</td>
</tr>
<tr>
<td>r-axis</td>
<td>Y-</td>
<td>Moves perpendicular to Z-axis.</td>
</tr>
<tr>
<td>Z-axis</td>
<td>Z-</td>
<td>Moves parallel to Z-axis.</td>
</tr>
<tr>
<td>Wrist Axes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
|             | Motion about TCP is executed. See chapter 2.3.7 “Motion about TCP”.

Axis Operation in the Cylindrical Coordinates

• When two or more [Axis Keys] are pressed at the same time, the manipulator performs a combined movement. However, if two different directional keys (such as [Z -] + [Z +]) for the same axis are pressed at the same time, the axis will not operate. (When [Z -] + [Z +] + [Y +] are pressed, only the axis corresponding to [Y +] will operate.)

Fig. 2-3: Moves parallel to θ-axis     Fig. 2-4: Moves parallel to r-axis
2.3.4 Tool Coordinates

In the tool coordinates, the manipulator moves parallel to the X-, Y-, and Z-axes defined with respect to the tip of the tool.

The motion of each axis is described in the table below.

*Table 2-4: Axis Motion in Tool Coordinates*

<table>
<thead>
<tr>
<th>Axis Name</th>
<th>Axis Operation Key</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Axes</td>
<td>X-axis</td>
<td>Moves parallel to X-axis.</td>
</tr>
<tr>
<td></td>
<td>Y-axis</td>
<td>Moves parallel to Y-axis.</td>
</tr>
<tr>
<td></td>
<td>Z-axis</td>
<td>Moves parallel to Z-axis.</td>
</tr>
<tr>
<td>Wrist Axes</td>
<td>Motion about TCP is executed.</td>
<td>See chapter 2.3.7 &quot;Motion about TCP&quot;.</td>
</tr>
</tbody>
</table>

**Axis Operation in the Tool Coordinates**

- When two or more [Axis Keys] are pressed at the same time, the manipulator performs a combined movement. However, if two different directional keys (such as [X -] + [X +]) for the same axis are pressed at the same time, the axis will not operate. (When [X -] + [X +] + [Y +] are pressed, only the axis corresponding to [Y +] will operate.)

The tool coordinates are defined at the tip of the tool, assuming that the effective direction of the tool mounted on the manipulator wrist flange is the Z-axis. Therefore, the tool coordinates axis direction moves with the wrist.

In the tool coordinates motion, the manipulator can be moved using the effective tool direction as a reference regardless of the manipulator position or orientation. These motions are best suited when the manipulator is required to move parallel while maintaining the tool orientation with the workpieces.
2.3.4.1 Selecting Tool

Tool numbers are allocated to tools when two or more tools are used in the system. Select the desired tool number to switch the tool.

To use the tool coordinates, the tool file must be registered in advance. For further details, refer to “YRC1000 INSTRUCTIONS (RE-CTO-A221) 8.3 Tool Data Setting”.

1. Press [COORD] and select the tool coordinates.

   – Each time [COORD] is pressed, the coordinate system switches in the following order:
     Joint → Cartesian (Cylindrical) → Tool → User → Teaching Line (only for arc welding purpose).
     Confirm the selected coordinate system in the status display area.

2. Press [SHIFT] + [COORD].

   – The TOOL NO. SELECT window appears.

3. Move the cursor to the tool to use.

   – As an example, the TOOL NO. SELECT window above indicates that the tool number 0 (torch MT-3501) is selected.

4. Press [SHIFT] + [COORD].

   – The window goes back to the previous window.
2.3.5 User Coordinates

In the user coordinates, the manipulator moves parallel to each axis of the coordinates predetermined by the user. The user must preset the X-, Y-, and Z-axes with desired slopes at a desired position within the manipulator’s motion range. Up to 63 types of the user coordinates can be registered, and each has a user coordinates number and is called a user coordinates file.

The motion of each axis is described in the table below.

*Table 2-5: Axis Motion in User Coordinates*

<table>
<thead>
<tr>
<th>Axis Name</th>
<th>Axis Operation Key</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-axis</td>
<td><img src="image" alt="X-axis Keys" /></td>
<td>Moves parallel to X-axis.</td>
</tr>
<tr>
<td>Y-axis</td>
<td><img src="image" alt="Y-axis Keys" /></td>
<td>Moves parallel to Y-axis.</td>
</tr>
<tr>
<td>Z-axis</td>
<td><img src="image" alt="Z-axis Keys" /></td>
<td>Moves parallel to Z-axis.</td>
</tr>
<tr>
<td>Wrist Axes</td>
<td></td>
<td>Motion about TCP is executed.</td>
</tr>
</tbody>
</table>

*Axis Operation in the User Coordinates*

- When two or more [Axis Keys] are pressed at the same time, the manipulator performs a combined movement. However, if two different directional keys (such as [X -] + [X +]) for the same axis are pressed at the same time, the axis will not operate. (When [X -] + [X +] + [Y +] are pressed, only the axis corresponding to [Y +] will operate.)

*Fig. 2-5: Moves parallel to X or Y-axis*

*Fig. 2-6: Moves parallel to Z-axis*
2.3.5.1 Selecting User Coordinates

In the system using two or more user coordinates, select the desired user coordinates for the task from the registered user coordinates.

1. Press [COORD], and select the user coordinates.
   
   – Each time [COORD] is pressed, the coordinate system switches in the following order:
     Joint \(\rightarrow\) Cartesian (Cylindrical) \(\rightarrow\) Tool \(\rightarrow\) User
     Confirm the selected coordinate system in the status display area.

2. Press [SHIFT] + [COORD].
   
   – The USER COORDINATE window appears.

3. Select the number of the desired user coordinates.

For more information on registration of the user coordinates, refer to “YRC1000 INSTRUCTIONS (RE-CTO-A221) 8.8 User Coordinate Setting”.

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2.3.5.2 Usage of User Coordinates

The user coordinates make teaching operations easier.

<Examples>

• When two or more fixtures are used, manual operation is simplified by setting the user coordinates for each fixture.

• When performing arranging or stacking operations, the incremental value for parallel shift is easily set by setting the user coordinates on a pallet.

• When performing conveyor tracking operations, the moving direction of the conveyor is specified.
2.3.6 External Axis

The external axis can be operated by selecting “BASE” or “STATION” for the control group.

The motion of each axis is described in the table below.

<table>
<thead>
<tr>
<th>Axis Name</th>
<th>Axis Operation Key</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE or STATION</td>
<td>1st axis</td>
<td>1st axis moves.</td>
</tr>
<tr>
<td></td>
<td>2nd axis</td>
<td>2nd axis moves.</td>
</tr>
<tr>
<td></td>
<td>3rd axis</td>
<td>3rd axis moves.</td>
</tr>
</tbody>
</table>

2.3.7 Motion about TCP

In the motion about TCP (Tool Center Point), the manipulator’s posture can be changed without changing the position of the tool’s tip (TCP).

The motion about TCP is available in the coordinates except the joint coordinates.

The motion of each axis is described in the table below.

Table 2-6: Axis Motion in Motion about TCP

<table>
<thead>
<tr>
<th>Axis Name</th>
<th>Axis Operation Key</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wrist Axes</td>
<td><img src="image" alt="Wrist Axes Operated" /></td>
<td>Only the tool’s posture changes with the TCP fixed. The tool’s posture changes around the axes of the specified coordinates.</td>
</tr>
<tr>
<td>E-axis</td>
<td><img src="image" alt="E-axis Operated" /></td>
<td>* Available only for the manipulator with seven axes. The posture of arm changes while the position and posture of the tool remain fixed. (The Re degree changes.)</td>
</tr>
</tbody>
</table>

Axis Operation in the Motion about TCP

* When two or more [Axis Keys] are pressed at the same time, the manipulator performs a combined movement. However, if two different directional keys (such as [X -] + [X +]) for the same axis are pressed at the same time, the axis will not operate. (When [X -] + [X +] + [Y +] are pressed, only the axis corresponding to [Y +] will operate.)
Re is an element to indicate the posture of the manipulator with seven axes and does not change by the specified coordinates.

The definition of Re is shown below.

Fig. 2-7: Torch Welding

Fig. 2-8: Gun Spot Welding
Turning of each wrist axis differs in each coordinate system.

- In the Cartesian or cylindrical coordinates, wrist axis rotations are based on the X-, Y-, and Z-axes of the manipulator.

- In the tool coordinates, wrist axis rotations are based on the X-, Y-, and Z-axes of the tool coordinates.

- In the user coordinates, wrist axis rotations are based on the X-, Y-, and Z-axes of the user coordinates.
2.3.7.1 Modification of TCP

The tool tip position (TCP) is the target point of axis operations and is registered in a tool file as the distance from the flange face.

Modification of TCP is performed as an axis operation that involves selecting a tool from the list of registered tools (Refer to chapter 2.3.4.1 “Selecting Tool”), and then manipulating the axes while changing the TCP.

Modification of TCP is available in the coordinates except the joint coordinates.

The axis operation after the modification of TCP is the same as that of the motion about TCP.

<Example 1> TCP Modification with Two or More Tools

1. Set the TCPs for Tool 1 and Tool 2 as P1 and P2, respectively.
2. When Tool 1 is selected to perform an axis operation, P1 (Tool 1’s TCP) is the target point of the operation. Tool 2 only follows Tool 1 and is not controlled by the axis operation.
3. When Tool 2 is selected to perform an axis operation, P2 (Tool 2’s TCP) is the target point of the axis operation. Tool 1 only follows Tool 2.

Fig. 2-9: Selecting Tool 1 and operating axes with respect to P1 as TCP
Fig. 2-10: Selecting Tool 2 and operating axes with respect to P2 as TCP
<Example 2> TCP Modification with One Tool

1. Set the two corners of the workpiece which the tool is holding as TCP P1 and P2.

2. By selecting two TCPs alternately, the workpiece moves as shown below.

For registration of the tool file, refer to “YRC1000 INSTRUCTIONS (RE-CTO-A221) 8.3 Tool Data Setting”
2.3.8 Teaching Line Coordinates

The teaching line coordinates is the coordinates that are set from the two successive steps and the Z-axis direction of the robot coordinates.

The teaching line coordinates can be used only for the arc welding.

### X-, Y-, and Z- axes of the teaching line coordinates

<table>
<thead>
<tr>
<th>Axis Name</th>
<th>Motion</th>
<th>Axis Operation Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-axis</td>
<td>Direction of travel &lt;br&gt;Tangential direction in a circular arc path</td>
<td></td>
</tr>
<tr>
<td>Y-axis</td>
<td>Perpendicular direction with respect to the welding line (direction of travel) and the Z-axis of base coordinates &lt;br&gt;(G_y) is outer product direction of the Z-axis of base coordinates and the X-axis of teaching line coordinates. &lt;br&gt;(\theta_R) is the angle of (G_y) and the Z-axis of tool coordinates. &lt;br&gt;(\theta_L) is the angle of (-G_y) and the Z-axis of tool coordinates. &lt;br&gt;When (\theta_R) is smaller than (\theta_L), the Y-axis of teaching line coordinates is (G_y). &lt;br&gt;When (\theta_L) is smaller than (\theta_R), the Y-axis of teaching line coordinates is (-G_y).</td>
<td></td>
</tr>
<tr>
<td>Z-axis</td>
<td>Perpendicular direction with respect to the welding line (direction of travel) and the Y-axis of teaching line coordinates &lt;br&gt;The Z-axis of teaching line coordinates is the outer product direction of the X-axis of base coordinates and (G_y).</td>
<td></td>
</tr>
</tbody>
</table>

**Fig. 2-13: Teaching Line Coordinates**
**Torch Angle and Travel Angle**

Torch angle and travel angle of the teaching line coordinates

<table>
<thead>
<tr>
<th>Name</th>
<th>Motion</th>
<th>Axis Operation Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Torch angle</td>
<td>The angle made between the Z-axis of tool coordinates projected on the YZ-plane of teaching line coordinates and the Y-axis of teaching line coordinates.</td>
<td><img src="image" alt="X-" /> <img src="image" alt="X+" /></td>
</tr>
<tr>
<td>Travel angle</td>
<td>The angle subtracted 90 degrees from the angle made between the X-axis of teaching line coordinates and the Z-axis of tool coordinates.</td>
<td><img src="image" alt="Y-" /> <img src="image" alt="Y+" /></td>
</tr>
</tbody>
</table>

*Fig. 2-14: Torch Angle and Travel Angle*
At the steps in circular interpolation or spline interpolation, if axis operation is performed in the teaching line coordinates without previously performing FWD, BWD, or test operation, the following message appears and the axis operation cannot be completed.

"Execute Test run or FWD operation before perform jog operation."
Perform test operation, FWD operation, etc., and then perform axis operation.

---

### Fig. 2-15: Linear Interpolation and the Teaching Line Coordinates

<table>
<thead>
<tr>
<th>Step</th>
<th>Instructions</th>
<th>Teaching line coordinate system instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MOVL</td>
<td>🔄 ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️</td>
</tr>
<tr>
<td>2</td>
<td>MOVL</td>
<td>🔄 ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️</td>
</tr>
<tr>
<td>3</td>
<td>MOVL</td>
<td>🔄 ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️</td>
</tr>
</tbody>
</table>

---

### Fig. 2-16: Circular Interpolation and the Teaching Line Coordinates

<table>
<thead>
<tr>
<th>Step</th>
<th>Instructions</th>
<th>Teaching line coordinate system instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>MOVC</td>
<td>None</td>
</tr>
<tr>
<td>2</td>
<td>MOVC</td>
<td>🔄 ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️</td>
</tr>
<tr>
<td>3</td>
<td>MOVC</td>
<td>🔄 ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️ ➔ 🅱️</td>
</tr>
</tbody>
</table>

---

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The ranges near +90 degrees and -90 degrees of the torch angle and the travel angle are movement-prohibited areas. If entry into one of these areas is attempted, the following message appears:

“Jog operation is limited in the area that torch or travel angle is near 90 degree.”

Fig. 2-17: Operation for the Torch Angle and Travel Angle

At the steps in circular interpolation or spline interpolation, perform FWD, BWD, or test operation, and then perform manual operation.
2.3.8.1 Operations for Teaching Line Coordinates

In the teaching line coordinates, manual operation can be performed as follows.

Table 2-7: Axis Motion in Teaching Line Coordinates

<table>
<thead>
<tr>
<th>Axis Name</th>
<th>Axis Operation Key</th>
<th>Motion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-axis</td>
<td>X- [ ] X+ [ ]</td>
<td>Moves parallel to the X-axis.</td>
</tr>
<tr>
<td>Y-axis</td>
<td>Y- [ ] Y+ [ ]</td>
<td>Moves parallel to the Y-axis.</td>
</tr>
<tr>
<td></td>
<td>[SHIFT]+[Y-], [SHIFT]+[Y+]</td>
<td>Moves parallel to the Gy-axis.</td>
</tr>
<tr>
<td>Z-axis</td>
<td>Z- [ ] Z+ [ ]</td>
<td>Moves parallel to Z-axis.</td>
</tr>
<tr>
<td></td>
<td>[INTERLOCK]+[Z-], [INTERLOCK]+[Z+]</td>
<td>Moves parallel to the Z-axis of tool coordinates.</td>
</tr>
<tr>
<td>Wrist Axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>X-axis</td>
<td>X- [ ] X+ [ ]</td>
<td>The position of TCP is fixed, and the torch angle changes.</td>
</tr>
<tr>
<td></td>
<td>[SHIFT]+[x-], [SHIFT]+[x+]</td>
<td>The position of TCP is fixed, and the tool posture changes around the X-axis.</td>
</tr>
<tr>
<td>Y-axis</td>
<td>Y- [ ] Y+ [ ]</td>
<td>The position of TCP is fixed, and the travel angle changes.</td>
</tr>
<tr>
<td></td>
<td>[SHIFT]+[y-], [SHIFT]+[y+]</td>
<td>The position of TCP is fixed, and the tool posture changes around the Gy-axis.</td>
</tr>
<tr>
<td>Z-axis</td>
<td>Z- [ ] Z+ [ ]</td>
<td>The position of TCP is fixed, and the tool posture changes around the Z-axis of tool coordinates.</td>
</tr>
<tr>
<td></td>
<td>[SHIFT]+[z-], [SHIFT]+[z+]</td>
<td>The position of TCP is fixed, and the tool posture changes around the Z-axis.</td>
</tr>
</tbody>
</table>

**Axis Operation in the Teaching Line Coordinates**

- When two or more [Axis Keys] are pressed at the same time, the manipulator performs a combined movement. However, if two different directional keys (such as [X -] + [X +]) for the same axis are pressed at the same time, the axis will not operate.  (When [X -] + [X +] + [Y +] are pressed, only the axis corresponding to [Y +] will operate.)
In the following operations and cases, manual operation in the teaching line coordinates is limited.

Table 2-8: Limited Manual Operation in Teaching Line Coordinates

<table>
<thead>
<tr>
<th>Condition</th>
<th>Restrictions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job is not selected.</td>
<td>The following message appears, and axis operation cannot be performed:</td>
</tr>
<tr>
<td>The number of steps in the JOB is less than 2.</td>
<td>“Teach line JOG move not allowed for invalid teach line.”</td>
</tr>
<tr>
<td>The cursor is at the 1st step.</td>
<td></td>
</tr>
<tr>
<td>The current step and the previous step are the same position, or the</td>
<td></td>
</tr>
<tr>
<td>distance between these steps are short.</td>
<td></td>
</tr>
<tr>
<td>Direction of travel is the same as the Z-axis direction of the base</td>
<td></td>
</tr>
<tr>
<td>coordinates.</td>
<td></td>
</tr>
<tr>
<td>Move instruction of the current step is MOVJ.</td>
<td></td>
</tr>
<tr>
<td>Move instruction of the current step is IMOV.</td>
<td></td>
</tr>
<tr>
<td>The torch angle is about ± 90°.</td>
<td>The following message appears, and the following axis operations cannot be</td>
</tr>
<tr>
<td></td>
<td>performed:</td>
</tr>
<tr>
<td></td>
<td>· Y-axis of the teaching line coordinates</td>
</tr>
<tr>
<td></td>
<td>· Torch angle</td>
</tr>
<tr>
<td></td>
<td>· Jog operation is limited in the area that torch or travel angle is near 90</td>
</tr>
<tr>
<td></td>
<td>degree.”</td>
</tr>
<tr>
<td>The travel angle is about ± 90°.</td>
<td>The following message appears, and the following axis operations cannot be</td>
</tr>
<tr>
<td></td>
<td>performed:</td>
</tr>
<tr>
<td></td>
<td>· Y-axis of the teaching line coordinates</td>
</tr>
<tr>
<td></td>
<td>· Torch angle</td>
</tr>
<tr>
<td></td>
<td>· Travel angle</td>
</tr>
<tr>
<td></td>
<td>· Jog operation is limited in the area that torch or travel angle is near 90</td>
</tr>
<tr>
<td></td>
<td>degree.”</td>
</tr>
</tbody>
</table>
2.3.8.2 Welding-Related Information Display

Degrees of the angles in the teaching line coordinates are shown in the JOB CONTENT window.

Regarding the movement to the target position (“COMMAND” in the following window), refer to chapter 2.3.8.3 “Operation of Moving to Torch Angle/Travel Angle”.

1. **Torch angle (-90.000 ~ 90.000)**
   
   CURRENT: Degrees of the torch angle of the current teaching line coordinates

2. **Travel angle (-90.000 ~ 90.000)**

   CURRENT: Degrees of the travel angle of the current teaching line coordinates

3. **Downward angle (-90.000 ~ 90.000)**

   CURRENT: Current downward angle
   
   The slope of the direction of travel of the welding line with respect to the plane horizontal to the ground. (Defined by subtracting 90 degrees from the angle made between the Z-axis of the base coordinates and the X-axis of the teaching line coordinates)

In the following operations and cases, ARC INFORMATION for the teaching line coordinates is not displayed:

- Selecting a job
- Editing a job
- Moving the cursor
- The cursor is at the 1st step.
- The current step and the previous step are the same position, or the distance between these steps are short.
- Move instruction of the current step is MOVJ.
- Move instruction of the current step is IMOV.
- Direction of travel is the same as the Z-axis of the base coordinates.
Switching Welding-Related Information Display

ARC INFORMATION can be hidden or shown as follows:

1. Select (JOB) under the main menu.
2. Select (JOB CONTENT).
   - The JOB CONTENT window appears.
3. Select (DISPLAY) in the menu area.
   - A pull-down menu appears.
4. Select (ARC INFORMATION).
   - Welding-related information is shown.
2.3.8.3 Operation of Moving to Torch Angle/Travel Angle

The manipulator can be moved to the torch angle/travel angle specified as the COMMAND (target position) in ARC INFORMATION.

1. Display ARC INFORMATION.
2. Touch ARC INFORMATION.
   – ARC INFORMATION is activated.
3. Select a data input area of the torch angle or travel angle.
4. Input a numeric value by [Numeric Key].
5. Press [ENTER].
   – The COMMAND is set.
6. Press [NEXT].
   – The confirmation dialog box appears to confirm to move the manipulator to the torch angle/travel angle.
7. Press “YES”.
   – The confirmation dialog box disappears.
   – While ARC INFORMATION is activated, the confirmation dialog does not appear again.

8. By pressing [NEXT] again, the manipulator moves to the target position.
   – The manipulator stops when the manipulator arrives at the target position.
   – The manipulator stops when [NEXT] is released.

**NOTE**

In the multi-window mode, operation of moving to the torch angle/travel angle is unavailable. If [NEXT] is pressed when the cursor is on a move instruction, the next motion of the move instruction is operated.
3 Teaching

3.1 Preparation for Teaching

To ensure safety, the following operations should always be performed before teaching:

• Check the emergency stop buttons to be sure they function properly.
• Set the mode switch to “TEACH”.

Then,
• Register a job.

3.1.1 Checking Emergency Stop Buttons

The Servo ON button on the programming pendant should be lit while the power is ON for the servo system. Perform the following operation to ensure that the emergency stop buttons on both the YRC1000 and the programming pendant are functioning correctly before operating the manipulator.

1. Press [EMERGENCY STOP].
   – Press the emergency stop button on the YRC1000 or the programming pendant.
2. Confirm the servo power is turned OFF.
   – The SERVO ON button on the programming pendant lights while servo supply is turned ON.
   – When the emergency stop button is pressed and the servo power is turned OFF, the SERVO ON lamp will turn OFF.
   – After confirming correct operation, press [SERVO ON READY]. The servo power will be ready to turn ON.
   – The servo power can be turned ON while the SERVO ON button lamp blinks.

3.1.2 Setting the Teach Lock

For safety purposes, always set the mode switch to “TEACH” before beginning to teach.

While the teach lock is set, the mode of operation is tied to the teach mode and the machines cannot be played back using either [START] or external input.
3 Teaching
3.1 Preparation for Teaching

3.1.3 Registering a Job

Specify the name, comments (as required), and control group to register a job.

3.1.3.1 Registering Job Names

Job names can use up to 32 alphanumeric and symbol characters. These different types of characters can coexist within the same job name.

The following rules apply to the designation of job names:

- A maximum of 32 characters can be used for a job name.
- If the job name is already used, an input error is caused.

<Example>

0 0 1 JOB - 1 WORK - A

3.1.3.2 Registering Jobs

1. Select {JOB} under {Main Menu}.
   – The sub-menu appears.

2. Select {CREATE NEW JOB}.
   – The NEW JOB CREATE window appears.
3. Input job name.
   – Move the cursor to JOB NAME, and press [SELECT]. Input job names using the character input operation. For information on character input operation, refer to chapter 1.2.6 “Character Input Operation”.

4. Press [ENTER].

3.1.3.3 Registering Comments

Register a comment using up to 32 alphanumeric and symbol characters as required.

1. Enter a comment.
   – In the NEW JOB CREATE window, move the cursor to the comment and press [SELECT]. For information on character input operation, refer to chapter 1.2.6 “Character Input Operation”.

2. Press [ENTER].

3.1.3.4 Registering Control Groups

Select the control group that has been registered in advance. If external axes (BASE or STATION) or multiple robot systems are not used, the registration of control groups is not required.
3.1.3.5 Switching to the Teaching Window

After the name, comments (can be omitted), and the control groups have been registered, switch the window to the teaching window as follows.

1. In the NEW JOB CREATE window, press [ENTER] or select “EXECUTE”.
   - Job name, comments, and control groups are all registered. Then, the JOB CONTENT window appears. NOP and END instructions are automatically registered.

   ![Image of teaching window]

   Up to 10000 instructions can be registered per JOB. (Including NOP and END, line 0 to 9999)

   Note that the number of registrable instructions is restricted if the JOB capacity is not sufficient, or if the structured program language function, the ARCON instruction (for arc welding), or the SVSPOTMOV instruction (for spot welding using motor gun) is used.
3 Teaching

3.2 Teaching Operation

3.2.1 Teaching Window

Teaching is conducted in the JOB CONTENT window. The JOB CONTENT window contains the following items:

A. Line Numbers

The number of the job line is automatically displayed. Line numbers are automatically updated if lines are inserted or deleted.

B. Cursor

The cursor for manipulator control. For the FWD, BWD, and test operation, the manipulator motion starts from the line this cursor points.

C. Instructions, Additional Items, Comments, Etc.

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Additional Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOVJ</td>
<td>VJ = 50.00</td>
</tr>
</tbody>
</table>

Instructions: These are instructions needed to process or perform an operation. In the case of MOVE instructions, the instruction corresponding to the interpolation type is automatically displayed at the time position is taught.

Additional items: Speed and time are set depending on the type of instruction. When needed, numerical or character data is added to the condition-setting tags.
3.2 Teaching Operation

3.2.2 Interpolation Type and Play Speed

Interpolation type determines the path along which the manipulator moves between playback steps. Play speed is the rate at which the manipulator moves.

Normally, the position data, interpolation type, and play speed are registered together for a robot axis step. If the interpolation type or play speed settings are omitted during teaching, the data used from the previously taught step is automatically used.

3.2.2.1 Joint Interpolation

The joint interpolation is used when the manipulator does not need to move in a specific path toward the next step position. When the joint interpolation is used for teaching a robot axis, the move instruction is MOVJ. For safety purposes, use the joint interpolation to teach the first step.

When [MOTION TYPE] is pressed, the move instruction on the input buffer line changes.

<Play Speed Setting Window>

- Speeds are indicated as percentages of the maximum rate.
- Setting "0: Speed Omit" sets the same speed as the previous determination.

1. Move the cursor to the play speed.
2. Set the play speed by pressing [SHIFT] + the cursor.
   - The joint speed value increases or decreases.

<table>
<thead>
<tr>
<th>Speed Level</th>
<th>Value (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fast</td>
<td>100.00</td>
</tr>
<tr>
<td></td>
<td>50.00</td>
</tr>
<tr>
<td></td>
<td>25.00</td>
</tr>
<tr>
<td></td>
<td>12.50</td>
</tr>
<tr>
<td></td>
<td>6.25</td>
</tr>
<tr>
<td></td>
<td>3.12</td>
</tr>
<tr>
<td></td>
<td>1.56</td>
</tr>
<tr>
<td>Slow</td>
<td>0.78</td>
</tr>
</tbody>
</table>

3-6
3 Teaching
3.2 Teaching Operation

3.2.2 Linear Interpolation

The manipulator moves in a linear path from one taught step to the next. When the linear interpolation is used to teach a robot axis, the move instruction is MOVL. Linear interpolation is used for work such as welding. The manipulator moves automatically changing the wrist position as shown in the figure below.

<Play Speed Setting Window (same for circular and spline interpolation)>

- There are two types of displays, and they can be switched depending on the application.

1. Move the cursor to the play speed.
2. Set the play speed by pressing [SHIFT] + the cursor.
   - The play speed value increases or decreases.

VMAX speed

This is the play speed which is specified as the rate with respect to the maximum speed of each axes. This tag can be added to MOVL (linear interpolation). For example, if VMAX=100 is set, the linear interpolation motion is performed at the TCP speed without exceeding the maximum speed of each axes. If VMAX=50 is set, the motion is performed at the half speed of TCP speed when VMAX=100 is set.

<table>
<thead>
<tr>
<th>Fast</th>
<th>1500.0</th>
<th>750.0</th>
<th>375.0</th>
<th>187.0</th>
<th>93.0</th>
<th>46.0</th>
<th>23.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slow</td>
<td>11 (mm/s)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fast  1500.0
750.0
375.0
187.0
93.0
46.0
23.0
Slow  11 (mm/s)

Fast  9000
4500
2250
1122
558
276
138
Slow  66 (cm/min)

Notes for VMAX speed

If VMAX speed is specified, TCP speed may not be stable since the speed of each axes is controlled not to exceed the maximum speed during operation. Thus, VMAX speed must be used in the case where the motion with the stable speed is not required for the operation. Also, VMAX speed is not changed by operation for speed modification, TRT and PAM function.
3.2 Teaching Operation

3.2.2.3 Circular Interpolation

The manipulator moves in an arc that passes through three points. When circular interpolation is used for teaching a robot axis, the move instruction is MOVC.

- **Single Circular Arc**
  When a single circular movement is required, teach the circular interpolation for three points, P1 to P3, as shown in the following figure.

  If joint or linear interpolation is taught at P0, the point before starting the circular operation, the manipulator moves from P0 to P1 in a straight line.

  Table 3-1: Interpolation Type for Single Circular Arc

```
<table>
<thead>
<tr>
<th>Point</th>
<th>Interpolation Type</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0</td>
<td>Joint or Linear</td>
<td>MOVJ, MOVL</td>
</tr>
<tr>
<td>P1</td>
<td>Circular</td>
<td>MOVC</td>
</tr>
<tr>
<td>P4</td>
<td>Joint or Linear</td>
<td>MOVJ, MOVL</td>
</tr>
</tbody>
</table>
```

- **Continuous Circular Arcs**
  When two or more successive circular movements with different curvatures are required, the movements can be continuously performed by adding an “FPT” tag to the step whose curvature is needed to be changed.

  Fig. 3-1: Interpolation Type for Continuous Circular Arcs

```
<table>
<thead>
<tr>
<th>Point</th>
<th>Interpolation Type</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0</td>
<td>Joint or Linear</td>
<td>MOVJ, MOVL</td>
</tr>
<tr>
<td>P1</td>
<td>Circular</td>
<td>MOVC</td>
</tr>
<tr>
<td>P3</td>
<td>Circular</td>
<td>MOVC, FPT</td>
</tr>
<tr>
<td>P4</td>
<td>Circular</td>
<td>MOVC</td>
</tr>
<tr>
<td>P6</td>
<td>Joint or Linear</td>
<td>MOVJ, MOVL</td>
</tr>
</tbody>
</table>
```
If not adding an "FPT" tag, the successive circular movements must be separated from each other, thus add a joint or linear interpolation step (P4) at a connecting point of the preceding movement and the following movement. However, when the steps at the same connecting point are taught, the movements cannot be continuously performed.

<table>
<thead>
<tr>
<th>Point</th>
<th>Interpolation Type</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>P0</td>
<td>Joint or Linear</td>
<td>MOVJ, MOVL</td>
</tr>
<tr>
<td>P1</td>
<td>Circular</td>
<td>MOVC</td>
</tr>
<tr>
<td>P2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P4</td>
<td>Joint or Linear</td>
<td>MOVJ, MOVL</td>
</tr>
<tr>
<td>P5</td>
<td>Circular</td>
<td>MOVC</td>
</tr>
<tr>
<td>P6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>P8</td>
<td>Joint or Linear</td>
<td>MOVJ, MOVL</td>
</tr>
</tbody>
</table>

<Play Speed>

- The play speed set display is identical to that for the linear interpolation.
- The speed taught at P2 is applied from P1 to P2. The speed taught at P3 is applied from P2 to P3.
- If a circular operation is taught at high speed, the actual arc path has a shorter radius than that taught.
3.2 Teaching Operation

3.2.4 Spline Interpolation

When performing operations such as welding, cutting, and applying primer, using the spline interpolation makes teaching for workpieces with irregular shapes easier. The path of motion is a parabola passing through three points. When spline interpolation is used for teaching a robot axis, the move instruction is MOV.S.

**Single Spline Curve**

When a single spline curve movement is required, teach the spline interpolation for three points, P1 to P3, as shown in the figure below. If joint or linear interpolation is taught at point P0, the point before starting the spline interpolation, the manipulator moves from P0 to P1 in a straight line.

*Table 3-2: Interpolation Type for Single Spline Curve*

<table>
<thead>
<tr>
<th>Point</th>
<th>Interpolation Type</th>
<th>Instruction</th>
</tr>
</thead>
</table>
| P0     | Joint or Linear   | MOVJ
         |                   | MOVL       |
| P1     | Spline            | MOV.S       |
| P2     |                   |             |
| P3     |                   |             |
| P4     | Joint or Linear   | MOVJ
         |                   | MOVL       |

**Continuous Spline Curves**

The manipulator moves through a path created by combining parabolic curves. This differs from the circular interpolation in that steps at an identical point or an FPT tag is not required at the connecting point between two spline curves.

*Table 3-3: Interpolation Type for Continuous Spline Curves*

<table>
<thead>
<tr>
<th>Point</th>
<th>Interpolation Type</th>
<th>Instruction</th>
</tr>
</thead>
</table>
| P0     | Joint or Linear   | MOVJ
         |                   | MOVL       |
| P1 to  | Spline            | MOV.S       |
| P5     |                   |             |
| P6     | Joint or Linear   | MOVJ
         |                   | MOVL       |

When the parabolas overlap, a composite motion path is created.
3.2 Teaching Operation

<P>Play Speed>

• The play speed setting window is identical to that for the linear interpolation.

• As with the circular interpolation, the speed taught at P2 is applied from P1 to P2, and the speed taught at P3 is applied from P2 to P3.

Teach points so that the distances between the three points are roughly equal. If there is any significant difference, an error will occur on playback and the manipulator may operate in an unexpected, dangerous manner. Ensure that the ratio of distances between steps m:n is within the range of 0.25 to 0.75.
### 3.2.3 Teaching Steps

#### 3.2.3.1 Registering Move Instructions

Whenever one step is taught, one move instruction is registered. There are two ways to teach a step. Steps can be taught in sequence as shown in the following left figure **Fig. 3-2 “Registering Move Instructions”** or they can be done by inserting steps between already registered steps, as shown in the right figure **Fig. 3-3 “Inserting Move Instructions”**.

This paragraph explains the teaching of **Fig. 3-2 “Registering Move Instructions”**, the operations involved in registering new steps.

**Fig. 3-2: Registering Move Instructions**

Teaching of **Fig. 3-3 “Inserting Move Instructions”** is called “Inserting move instruction”, to distinguish it from the method shown in **Fig. 3-2 “Registering Move Instructions”**. For more details on this operation, see chapter 3.4.2 “Inserting Move Instructions”. The basic operations for registration and insertion are the same. The only difference is pressing [INSERT] in the case of insertion. For registration (**Fig. 3-2 “Registering Move Instructions”**), the instruction is always registered before the END instruction. Therefore, it is not necessary to press [INSERT]. For insertion (**Fig. 3-3 “Inserting Move Instructions”**), [INSERT] must be pressed.
3.2 Teaching Operation

- Setting the Position Data
  1. Select {JOB} under {Main Menu}.
     - The sub-menu appears.

  2. Select {JOB}.
     - The contents of the currently-selected job is displayed.

  3. Move the cursor on the line immediately before the position where a move instruction to be registered.

  4. Grip the Enable switch.
     - Grip the Enable switch to turn the servo power ON.

  5. Move the manipulator to the desired position using [Axis Key].
     - Use [Axis Key] to move the manipulator to the desired position.
3. Teaching

3.2 Teaching Operation

**Selecting the Tool Number**

1. Press [SHIFT] + [COORD].
   - When selecting the “JOINT”, “XYZ/CYLINDRICAL”, or “TOOL” coordinates, press [SHIFT] + [COORD] and the TOOL NO. SELECT window will be shown.
   
   ![TOOL NO. SELECT Window]

   2. Move the cursor to the desired tool number.
      - The currently-selected tool number by the cursor is displayed.
   3. Press [SHIFT] + [COORD].
      - The JOB CONTENT window appears.

   ![Using Multiple Tools with One Manipulator]
   - When multiple tools are to be used with one manipulator, set parameter S2C431 to 1.
   - See chapter 2.3.4 “Tool Coordinates” for details on this operation.

   **Setting the Interpolation Type**

   1. Press [MOTION TYPE].
   2. Select the desired interpolation type.
      - When [MOTION TYPE] is pressed, MOVJ → MOVL → MOVC → MOV5 are displayed in order in the input buffer line.

   **Setting the Play Speed**

   1. Move the cursor to the instruction.
   2. Press [SELECT].
      - The cursor moves to the input buffer line.

   ![Play Speed Setting]
   3. Move the cursor to the play speed to be set.
3. Teaching

3.2 Teaching Operation

4. Press [SHIFT] + the cursor [↑] or [↓] simultaneously.
   - The joint speed moves up and down.

```
MOV J2 50.00
```

5. Press [ENTER].
   - The MOV instruction is registered.

```
0000 NOP
0001 MOV J2 50.00
0002 END
```

Follow the above instructions when conducting teaching. (Tool number, interpolation type, or play speed does not need to be set if it is same as the previous step.)

To make the setting so that the play speed tag is not displayed as a default, select {EDIT} from the menu and then select "ENABLE SPEED TAG" to delete "*".

- The position level can be set at the same time that the move instruction is registered.
- To display the position level tag as a default, select {EDIT} from the menu and then select "ENABLE POS LVL TAG".

**Position Level:** The position level is the degree of approximation of the manipulator to a taught position.

The position level can be added to move instructions MOVJ (joint interpolation) and MOVL (linear interpolation).

If the position level is not set, the precision depends on the operation speed. Setting an appropriate level moves the manipulator in a path suitable to circumferential conditions and the workpiece.

The relationship between path and accuracy for position levels is as follows.

<table>
<thead>
<tr>
<th>Position Levels</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Teaching position</td>
</tr>
<tr>
<td>1 to 8</td>
<td>Fine Rough</td>
</tr>
</tbody>
</table>
### Setting the Position Level

1. Select move instruction.
   - The DETAIL EDIT window appears.

   ![DETAIL EDIT window](image)

   - The DETAIL EDIT window appears.

2. Select the position level "UNUSED".
   - The selection dialog box appears.

   ![Selection dialog box](image)

   - The selection dialog box appears.

3. Select "PL".
   - The position level is displayed. The position initial value is 1.

   ![Selected position level](image)
4. Press [ENTER].

- To change the position level, select the level in the input buffer line, type the value using [Numeric Key], and press [ENTER]. The position level’s move instruction is registered.

5. Press [ENTER].

For example, to perform the movement steps shown below, set as follows:

Steps P2, P4, and P5 are simple passing points, and do not require accurate positioning. Adding PL=1 to 8 to the move instructions of these steps moves the manipulator around the inner corners, thereby reducing the cycle time.

If complete positioning is necessary as P3 or P6, add PL=0.

<EXAMPLE>

Passing points P2, P4, and P5:

```
MOVL V=138   PL=3
```

Positioning point P3 and P6:

```
MOVL V=138   PL=0
```
Position Distance (PD): The position distance can be added to the instruction MOVL (linear interpolation). When the position distance is specified, the manipulator (at the feedback position) starts inward-turning operation from the specified point. By adding this tag, a specific distance can be used to adjust how close the manipulator moves to the taught position.

The relation among the position distance, the operation-command path, and the manipulator’s motion path (feedback position) is shown in the following figure. The manipulator can perform inward-turning operation from the specified point.

The relation between the manipulator’s path and the teaching position when the position distance is specified is shown below.
3 Teaching
3.2 Teaching Operation

### Setting the Position Distance

1. Select the MOVL instruction.
   - The DETAIL EDIT window appears.

```
MOVL X-750.0
```

2. Select the position level “UNUSED”.
   - The selection dialog box appears.

```
MOVL X-750.0
```

3. Select “PD”.
3.2 Teaching Operation

– The position distance is displayed. The position initial value is 0.1 mm.

4. Press [ENTER].

– To change the position distance, select the distance in the input buffer line, type the value using [Numeric Key], and press [ENTER]. The position distance’s move instruction is registered.

5. Press [ENTER].

NOTE
If a large value is specified for the position distance in a short-distance step, the accuracy of the position distance may be deteriorated. The manipulator starts its inward-turning operation in the latter half of the step’s distance.
3.2.3.2 Registering Reference Point Instructions

Reference point instructions (REFP) set an auxiliary point such as a wall point for weaving. Reference point Nos. 1 to 8 are assigned for each application. Follow these procedures to register reference point instructions.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
3. Move the cursor.
   - Move the cursor to the line immediately before the position where the reference point to be registered.

4. Grip the Enable switch.
   - The servo power is turned ON.
5. Press [Axis Key].
   - Move the manipulator to the position to be registered as the reference point.
6. Press [REFP] or select “REFP” from the inform list.
   - The reference point instruction is displayed in the input buffer line.
7. Change the reference point number in one of the following ways.
   - Move the cursor to the reference point number, and press [SHIFT] + the cursor to change the reference point number; or
   - Press [SELECT] when the cursor is on the reference point number. Then, the data input buffer line appears. Input the number and press [ENTER].
8. Press [INSERT].
   - The [INSERT] lamp lights.
   - When registering before the END instruction, pressing [INSERT] is not needed.
9. Press [ENTER].
   - The REFP instruction is registered.

The programming pendant does not have the [REFP] for the application of spot welding, motor gun, and of material handling, assembling, and cutting.
3.2.3.3 Registering Timer Instructions

The timer instruction stops the manipulator for a specified time. Follow these procedures to register timer instructions.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
3. Move the cursor.
   – Move the cursor to one line before the position where the timer instruction is to be registered.

4. Press [TIMER].
   – The TIMER instruction is displayed on the input buffer line.

5. Change the timer value.
   – Move the cursor to the timer value and change it by pressing [SHIFT] + the cursor. The timer unit of adjustment is 0.01 seconds.
   – If [Numeric Keys] are used for inputting the timer value, press [SELECT] when the cursor is on the timer value. The data input line appears. Input the value and press [ENTER].

6. Press [INSERT].
   – The [INSERT] lamp lights.
   – When registering before the END instruction, pressing [INSERT] is not needed.
7. Press [ENTER].
   – The TIMER instruction is registered.
### Changing Timer Value

1. Press [TIMER].
2. Press [SELECT].
   - The DETAIL EDIT window for the TIMER instruction appears.

3. Input the timer value on the instruction DETAIL EDIT window.
   (1) When ☑ is selected, the items available to be changed are displayed in the dialog box.

   ![Detail Edit Window](image)

   - When a number is to be changed, move the cursor to the number and press [SELECT]. Input the desired value using the [Numeric Keys], and press [ENTER].

   ![Detail Edit Window](image)
4. Press [ENTER].
   – The DETAIL EDIT window is closed and the JOB CONTENT window
     appears again. Modified content is displayed in the input buffer line.

5. Press [INSERT].
   – The [INSERT] lamp lights.
   – When registering before the END instruction, pressing [INSERT] is
     not needed.

6. Press [ENTER].
   – The TIMER instruction is registered.
3.2.4 Overlapping the First and Last Steps

Why is overlapping the first and last step necessary?

Assume that the job shown below is to be repeated. The manipulator moves from the last step (Step 6) to the first step (Step 1). If Step 6 and Step 1 are the same position, the manipulator moves directly Step 5 to Step 1, thereby improving work efficiency.

1. Move the cursor to the first step line.
2. Press [FWD].
   – The manipulator moves to the first step position.
3. Move the cursor to the last step line.
   – The cursor starts blinking.
   – When the cursor line position and the manipulator position are different in the JOB CONTENT window, the cursor blinks.
4. Press [MODIFY].
   – The key lamp lights.
5. Press [ENTER].
   – The position data for the first step is registered on the line of the last step.
   – At this time, only the position data can be changed in the last step. Interpolation type and play speed do not change.
3.3 Checking Steps

3.3.1 FWD/BWD Operations

Check whether the position of the taught steps is appropriate using [FWD] or [BWD] on the programming pendant. Each time [FWD] or [BWD] is pressed, the manipulator moves by a single step.

[FWD]: Moves the manipulator ahead in step number sequence. Only the move instruction is executed when [FWD] is pressed.

[INTERLOCK] + [FWD]: All instructions are executed alternately.

[BWD]: Moves the manipulator backward a step at a time in reverse step number sequence. Only the move instruction is executed.

1. Move the cursor to the step to be checked.
2. Press [FWD] or [BWD].
   – The manipulator reaches the following / previous step and stops.

For safety, set manual speed at or below.

With using parameters, the movement at [FWD] operation can be set.

Refer to chapter 8.3.0.4 “S2C198: EXECUTION UNITS AT “FORWARD” OPERATION” and chapter 8.3.0.5 “S2C199: INSTRUCTION (EXCEPT FOR MOVE) EXECUTION AT “FORWARD” OPERATION”.
3.3 Checking Steps

3.3.1 Precautions When Using FWD/BWD Operations

- **FWD Movements**
  - The manipulator moves in step number sequence. Only move instructions are executed when [FWD] is pressed. To execute all instructions, press [INTERLOCK] + [FWD].
  - The manipulator stops after playing a single cycle. It does not move after the END instruction is reached, even if [FWD] is pressed. However, at the end of a called job, the manipulator moves the instruction next to the CALL instruction.

- **BWD Movements**
  - The manipulator moves in reverse step number sequence. Only move instructions are executed.
  - The manipulator does not move after the first step is reached, even if [BWD] is pressed. However, at the beginning of a called job, the manipulator moves to the instruction immediately before the CALL instruction.

- **Circular Movements with [FWD/BWD] Operations**
  - The manipulator moves in a straight line to the first step of the circular interpolation.
  - There must be three circular interpolation steps in a row to move the manipulator in an arc.
  - If [FWD] or [BWD] operation is restarted after being stopped to move the cursor or to perform search, the manipulator moves in a straight line to the next step.
  - If [FWD] or [BWD] operation is restarted after being stopped to move the axis as shown below, the manipulator moves in a straight line to P2, the next circular interpolation. Circular motion is restored from P2 to P3.
Spline Curve Movements with FWD/BWD Operations

- The manipulator moves in a straight line to the first step of spline interpolation.

- There must be three spline curve motion steps in a row to perform a spline curve operation.

- Depending on the position where the [FWD] / [BWD] operation is performed, the alarm "IRREGULAR DISTANCES BETWEEN TEACHING POINTS" may occur.

- Note that FWD/BWD inching operations change the path of the manipulator and caution is therefore required. Performing these operations also increases the likelihood that the "IRREGULAR DISTANCES BETWEEN TEACHING POINTS" will occur.

- If the [FWD] or [BWD] operation is restarted after being stopped to move the cursor or perform a search, the manipulator moves in a straight line to the next step.

- If the [FWD] or [BWD] operation is restarted after being stopped to move the axis as shown below, the manipulator moves in a straight line to P2, the next spline curve motion step. Spline curve motion is restored from P2 onward. However, the path followed between P2 and P3 is somewhat different from the path followed at playback.

- If the manipulator is moved to P3 with [FWD], stopped, and then returned to P2 with [BWD], the path followed between P2 and P3 is different for each of the following: the first FWD operation, the BWD operation, and the consequent FWD operation.
3.3.1.2 Selecting Manual Speed

When [FWD] or [BWD] is pressed, the manipulator moves at the manual speed selected at that time. Selected manual speed can be checked by the manual speed indication on the programming pendant.

INCH  SLW  MED  FST

• Each time [FAST] is pressed, the speed switches in the order of “INCH”→“SLOW”→“MED”→“FAST”.

FST  MED  SLW  INCH

• Each time [SLOW] is pressed, the speed switches in the order of “FAST”→“MED”→“SLOW”→“INCH”.

NOTE

• FWD/BWD operation is performed with SLW speed even if INCH is selected.
• [HIGH SPEED] is available only for the FWD operation but not for BWD operation.
3.3 Checking Steps

3.3.1.3 Moving to Reference Point
To check the position of a taught reference point, follow these procedures to move the manipulator to the reference point.

1. Move the cursor to the reference point instruction line to be checked.
2. Press [REFP] + [FWD].
   – The manipulator moves to the reference point of the cursor line.

3.3.1.4 Test Operations
Playback operations can be simulated in the teach mode with test operations. This function is convenient for checking continuous paths and operation instructions.

Test operation differs in the following ways from actual playback in the play mode.

- Note that the motion path for the playback operation is replayed during the test operation. Therefore, make sure that there is no obstacle around the manipulator and great caution should be exercised when the test operation is performed.

- Operation speeds greater than the maximum teaching speed are reduced to the maximum teaching speed.
- Work instruction output, such as arc output, is not executed.

There may be a slight difference between the motion path for the test operation and the motion path for the playback operation due to a mechanical error or control delay, etc.
3 Teaching
3.3 Checking Steps

Test operation is performed by pressing [INTERLOCK] and [TEST START]. For safety purposes, these keys will only function while the keys are held down.

1. Select {JOB} under {Main Menu}.
2. Press {JOB}.
   – The test operation JOB CONTENT window appears.
3. Press [INTERLOCK] + [TEST START].
   – The manipulator starts the test cycle operation.
   – However, after the operation starts, the motion continues even if [INTERLOCK] is released.
   – The manipulator moves only while these keys are held down.
   – The manipulator stops immediately when [TEST START] is released.

NOTE Always check safety conditions before pressing [INTERLOCK] + [TEST START] to start the manipulator in motion.
3.3.1.5 Machine Lock Operation

When "MACHINE LOCK" is enabled, the [FWD] / [BWD] operation or the test operation can be performed to check the status of input and output without moving the manipulator.

1. Press [AREA].
2. Select {UTILITY}.
3. Select {SETUP SPECIAL RUN}.
   – The SPECIAL TEACH window appears.
4. Select “MACHINE LOCK”.
   – Press [SELECT] to switch “VALID” and “INVALID”.

   **NOTE**

   • The setting of “MACHINE LOCK” is maintained even after the mode is switched: If the machine lock is set to “VALID” in the teach mode, it is still “VALID” after switching to the play mode. The same applies when the mode is switched from the play mode to the teach mode.

   • Note that the machine lock becomes “INVALID” if the following operation is performed.
      • Execution of “CANCEL ALL SELECT” in the SPECIAL PLAY window.
      • Turning off the main power.
3.4 Modifying Steps

Begin move instruction insertion.

Move step cursor to location where you want to insert the instruction.

Perform axis operations.

Set interpolation type.

Set play speed.

Set position level when necessary.

Press [INSERT].

Press [ENTER].

Insertion completed.

Begin move instruction deletion.

Move cursor to location of instruction to be deleted.

Press [DELETE].

Press [ENTER].

Deletion completed.
Move step cursor to step to be modified.

Note

It is not possible to change a move instruction to a reference point instruction and vice versa.
3.4 Modifying Steps

Begin REFP instruction modification.

- **Deletions**
  - Move step cursor to the REFP instruction to be deleted, and move the manipulator to the position.
  - Press [DELETE].
  - Press [ENTER].
  - Deletion completed.

- **Modifications**
  - Move step cursor to the REFP instruction to be modified.
  - Perform axis operations.
  - Press [REFP].
  - Press [MODIFY].
  - Press [ENTER].
  - Modification completed.
Begin TIMER Instruction Modification.

Deletions

Move edit cursor to the TIMER instruction to be deleted.

Press [DELETE].

Press [ENTER].

Deletion completed.

Modifications

Move edit cursor to the TIMER instruction to be modified.

Press [TIMER].

Enter timer value.

Press [MODIFY].

Press [ENTER].

Modification completed.
3.4 Modifying Steps

3.4.1 Displaying the JOB CONTENT Window for Editing

3.4.1.1 Job Currently Called-Up

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
   – The JOB CONTENT window appears.

3.4.1.2 Calling Up Other Jobs

NOTE In any other than the teach mode, set the mode switch to "TEACH".

1. Select {JOB} under {Main Menu}.
2. Select {SELECT JOB}.
   – The JOB LIST window appears.

3. Select the job name to be called.
### 3.4.2 Inserting Move Instructions

1. Move the cursor to the line immediately before the insert position.
   - The line immediately before where the move instruction is to be added.

   ```
   0006  MOVL V=276
   0007  TIMER T=1.00
   0008  DOUT OT#(1) ON
   0009  MOVJ VJ=100.0
   ```

2. Press [Axis Key].
   - Turn ON the servo power and press [Axis Key] to move the manipulator to the position to be inserted.

   ```
   NOTE
   Confirm the move instruction on the input buffer line and set desired interpolation type and play speed.
   ```

3. Press [INSERT].
   - The key lamp will light.

   ```
   NOTE
   When the inserting position is immediately before the END instruction, pressing [INSERT] is not needed.
   ```

4. Press [ENTER].
   - The move instruction is inserted after the cursor line.

   ```
   0006  MOVL V=558
   0010  MOVJ VJ=100.0
   ```

**NOTE**
Move instructions cannot be inserted when the servo power is OFF.
3 Teaching
3.4 Modifying Steps

5. Press [ENTER].
   – <Examples of Inserting a Move Instruction>
     • When a move instruction is inserted in the following job, it is placed on different lines according to the setting in the TEACHING CONDITION window.

<table>
<thead>
<tr>
<th>Before inserting the move instruction</th>
<th>After the insertion: when inserting before the next step</th>
<th>After the insertion: when inserting after the cursor line</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOVL V=276</td>
<td>MOVL V=276</td>
<td>MOVL V=276</td>
</tr>
<tr>
<td>TIMER T=1.00</td>
<td>DOUT OT#(1) ON</td>
<td>TIMER T=1.00</td>
</tr>
<tr>
<td>DOUT OT#(1) ON</td>
<td>MOVL V=558</td>
<td>DOUT OT#(1) ON</td>
</tr>
<tr>
<td>MOVL V=558</td>
<td>MOVJ VJ=100.0</td>
<td>MOVL VJ=100.0</td>
</tr>
<tr>
<td>cursor line</td>
<td>Added instruction</td>
<td>Added instruction</td>
</tr>
</tbody>
</table>

   Positions where the move instructions are inserted.

   The default location for insertions is "before the next step", but it is also possible to insert “after the cursor line”. This setting is made in the “Move Instruction Register Method” in the TEACHING CONDITION window.
3.4.3 Deleting Move Instructions

1. Move the cursor to the move instruction to be deleted.

   If the manipulator position differs from the cursor position on the window, the cursor blinks. Stop the blinking by either of the following procedures.

   1. Press [FWD] and move the manipulator to the position where the move instruction is to be deleted.
   2. Press [MODIFY] → [ENTER] to change the position data of the blinking cursor position to the current manipulator position.

2. Press [DELETE].
   - The key lamp will blink.

3. Press [ENTER].
   - The step indicated by cursor line is deleted.
3.4 Modifying Steps

3.4.4 Modifying Move Instructions

3.4.4.1 Modifying Position Data

1. Move the cursor to the MOV instruction to be modified.
   – Display the JOB CONTENT window and move the cursor to the
     move instruction to be changed.

2. Press [Axis Key].
   – Turn ON the servo power and press [Axis Key] to move the
     manipulator to the desired position.

3. Press [MODIFY].
   – The key lamp will blink.

4. Press [ENTER].
   – The position data in the present position is registered.

   For MOV instructions for which position variables have been
   set, the position variables will not be changed.

3.4.4.2 Modifying Interpolation Type

1. Move the cursor to the move instruction to be modified.
   – Display the JOB CONTENT window, and move the cursor to the
     move instruction for which interpolation type is to be changed.

2. Press [FWD].
   – Turn ON the servo power and press [FWD] to move the manipulator
     to the position of the move instruction.

3. Press [DELETE].
   – The key lamp will blink.

4. Press [ENTER].
   – The cursor line step is deleted.

5. Press [MOTION TYPE].
   – Press [MOTION TYPE] to change the interpolation type.
   – Each time [MOTION TYPE] is pressed, the input buffer line
     instruction alternates.

6. Press [INSERT].

7. Press [ENTER].
   – The interpolation type and position data are changed at the same
     time.

NOTE: Modifying only interpolation type is impossible. The interpolation type can be modified as a choice for modifying the position data.
3.4.5 Undo Operation

After inserting, deleting, or modifying an instruction, the operation can be undone.

The UNDO operation becomes enabled by selecting {EDIT} → {ENABLE UNDO}, and becomes disabled by selecting {EDIT} → {ENABLE UNDO} while editing a job.

- The undo operation can be performed even after the manipulator is moved by the FWD or BWD operation or test operation after inserting, deleting, or modifying a move instruction. However, the undo operation cannot be performed if other instructions are edited after editing the move instruction.

- The undo operation works only for the last five edited instructions only.

1. Press [SHIFT] + [CANCEL].
   - The assist menu appears.

2. Select {UNDO}.
   - The last operation is undone.

3. Select {REDO}.
   - The last UNDO operation is undone.

UNDONE and REDO can be performed also by selecting the pull-down menu {EDIT} → {UNDO}, and {EDIT} → {REDO}.
3.4.6 Modifying Reference Point Instructions

3.4.6.1 Deleting Reference Point Instructions

1. Move the cursor to the reference point instruction to be deleted.
2. Press [DELETE].
   - The key lamp will blink.
3. Press [ENTER].
   - The reference point instruction at the cursor line is deleted.

**NOTE**

If the manipulator position differs from the cursor position, an error message is displayed. If this occurs, follow either of the procedures below.

- Press [REFP] + [FWD] to move the manipulator to the position to be deleted.
- Press [MODIFY] then [ENTER] to change the reference point position data to the current position of the manipulator.

3.4.6.2 Modifying Reference Point Instructions

1. Move the cursor to the reference point instruction to be modified.
2. Move the manipulator with [Axis Keys].
   - Turn ON the servo power and use [Axis Keys] to move the manipulator to the desired position.
3. Press [REFP].
4. Press [MODIFY].
   - The key lamp will light.
5. Press [ENTER].
   - The reference point instruction at the cursor line is changed.
3.4 Modifying Steps

3.4.7 Modifying Timer Instructions

3.4.7.1 Deleting Timer Instructions

1. Move the cursor to the timer instruction to be deleted.

2. Press [DELETE].
   – The key lamp will light.

3. Press [ENTER].
   – The timer instruction at the cursor line is deleted.

```
0003      MOVJ VJ=50.00
0004      TIMER T=1.00
0005      MOVL V=138
```

3.4.7.2 Modifying Timer Instructions

1. Move the cursor to the timer instruction to be modified.

```
0003      MOVJ VJ=50.00
0004      TIMER T=1.00
0005      MOVL V=138
```

2. Press [SELECT].

3. Move the cursor to the input buffer line timer value.

   – Move the cursor to the input buffer line timer value and press [SHIFT] + the cursor to set the data.

   – To use [Numeric Keys] to input data, move the cursor to the input buffer line timer value and press [SELECT].

4. Change the timer value.

5. Press [MODIFY].

6. Press [ENTER].
   – This key lamp will light.
3.5 Modifying Jobs

3.5.1 Calling Up a Job

1. Select {JOB} under {Main Menu}.
2. Select {SELECT JOB}.
   - The JOB LIST window appears.
3. Select the desired job.

3.5.2 Windows Related to Job

There are five types of job windows. Jobs can be checked and edited in these windows.

- JOB HEADER Window
  Comments, data and time of registration, edit prohibit status, and so on are displayed and edited.
- JOB CONTENT Window
  The content of the registered job can be displayed and edited.
- COMMAND POSITION Window
  The taught data is displayed.
- JOB LIST Window
  The registered job is sorted alphabetically, then displayed, and the job is selected.
- JOB CAPACITY Window
  The number of registered jobs, amount of memory, number of steps used, etc. is shown.
3.5 Modifying Jobs

3.5.3 JOB HEADER Window

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
3. Select {DISPLAY} under the menu.
4. Select {JOB HEADER}.

- The JOB HEADER window appears. Scroll the window using the cursor.

1. **JOB NAME**
   Displays the name of the current job.

2. **COMMENT**
   Displays the comments attached to the current job. This can be edited in this window.

3. **JOB FOLDER**
   The JOB name which is set to this job is displayed.
   This can be edited in this window.

4. **DATE**
   Displays the date and time of the last editing of the job.

5. **CAPACITY**
   Displays the amount of memory that is being used to register this job.

6. **LINES**
   Displays the total number of instructions registered in this job.

7. **STEPS**
   Displays the total number of move instructions registered in this job.

8. **EDIT LOCK**
   Displays whether the Edit Lock setting for this job is “ON” or “OFF”. When the security mode is set to the management mode or higher, this can be edited in this window.

9. **CONTENTS DISPLAY**
   Setting status whether displaying of the contents of a job is displayed with “PERMIT” or “PROHIBIT”.
   Set “PROHIBIT” to display "Invisible" for the instructions of the JOB CONTENT window to prohibit them from being displayed.
   When the security mode is set to the management mode or higher, this can be edited in this window.
10. SAVE JOB
Setting status whether saving of this job data to an external memory device is displayed with “PERMIT” or “PROHIBIT”. Set “PROHIBIT” to prohibit the data from being saved to an external memory device. When the security mode is set to the management mode or higher, this can be edited in this window.

11. TO SAVE TO FD
Displays “DONE” if the contents of the job have already been saved to an external memory after the date and time of the last editing operation, and displays “NOT DONE” if they have not been saved. The job is marked as “DONE” only if it is saved as an independent job or as a related job.

12. GROUP SET
Displays the control group that this job controls. If the master axis is specified, the master axis is highlighted.

13. JOB KIND
Displays the kind of this job.

---

3.5.4 JOB CONTENT Window
1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
   - The JOB CONTENT window appears.
   - (Left) : The cursor is moved to the address area.
   - (Right): The cursor is moved to the instruction area.

A. Address Area
Displays the line numbers, the step numbers and the tool numbers which are registered in the each step.

B. Instruction Area
Displays instructions, additional items, and comments. Line editing is possible.
3.5 Modifying Jobs

3.5.4.1 Switching the Address Area

Able to switch a state of the display (to hide or show) of the following numbers in the address area:

- Step numbers
- Tool numbers in the each step

1. Select the {JOB} under {Main Menu}.
2. Select {JOB CONTENT}.
   - Job content appears.
3. Select {DISPLAY} in the menu area.
   - A pull down menu appears.
4. Select {ENABLE STEP NO}.
   - Step numbers appear in the address area.
   - In the pull down menu, {ENABLE STEP NO} changes to {✶ ENABLE STEP NO}.

---

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3.5 Modifying Jobs

5. Select \{\ast\ \text{ENABLE STEP NO}\}.
   - Step numbers in the address area disappear.
   - In the pull down menu, \{\ast\ \text{ENABLE STEP NO}\} changes to \{\text{ENABLE STEP NO}\}.

6. Select \{\text{ENABLE TOOL NO}\}.
   - Tool numbers appear in the address area.
   - In the pull down menu, \{\text{ENABLE TOOL NO}\} changes to \{\ast\ \text{ENABLE TOOL NO}\}.
   Tool numbers only appear in the line during the move instruction and also appear under the teach mode.
3 Teaching

3.5 Modifying Jobs

7. Select {** ENABLE TOOL NO**}.
   - Step numbers in the address area disappear.
   - In the pull down menu, {** ENABLE TOOL NO**} changes to {ENABLE TOOL NO}.

8. Select both {ENABLE STEP NO} and {ENABLE TOOL NO}.
   - The both step numbers and tool numbers appear in the address area.
   - In the pull down menu, {ENABLE STEP NO} changes to {** ENABLE STEP NO**}.
   - In the pull down menu, {ENABLE TOOL NO} changes to {** ENABLE TOOL NO**}.

Tool numbers only appear in the line during the move instruction and also appear under the teach mode.
9. Select both {＊ENABLE STEP NO} and {＊ENABLE TOOL NO}.
   - The both step numbers and tool numbers disappear in the address area.
   - In the pull down menu, {＊ENABLE STEP NO} changes to {ENABLE STEP NO}.
   - In the pull down menu, {＊ENABLE TOOL NO} changes to {ENABLE TOOL NO}.
3.5 Modifying Jobs

3.5.5 COMMAND POSITION Window

1. Select {ROBOT} under {Main Menu}.
2. Select {COMMAND POSITION}.

– Edit operations cannot be conducted on this window, but the taught play speed and position data can be viewed on this window.

A. Interpolation
   Displays the interpolation type.

B. Speed
   Displays the play speed.

C. Command Position
   Displays the tool file number and position data that has been taught for this job. Steps which have no position data, such as move instructions which use position variables, are marked with an asterisk (*).

D. Current Data
   Displays the current tool file number and position of the manipulator.
3.5.6 JOB CAPACITY Window

1. Select {JOB} under {Main Menu}.
2. Select {JOB CAPACITY}.

A. NUMBER OF JOBS
   Displays the total number of jobs currently registered in the memory of YRC1000.

B. USED MEMORY
   Displays the total amount of memory used in the YRC1000.

C. STEPS
   Displays the total number of used steps.

D. EDITING BUFFER
   Displays editing buffer use.
3.6 Editing Instructions

The editable content differs depending on whether the cursor is in the address area or instruction area.

A. When the cursor is in the address area
   Instructions can be inserted, deleted, or modified.

B. When the cursor is in the instruction area
   The data of additional items of already-registered instructions can be modified, inserted, or deleted.
   Editing only additional items is called "line editing".

When inserting or modifying instructions, input the instruction with the function keys such as [TIMER], etc. or by using the instruction list dialog box.

The selected instruction is displayed on the input buffer line with the same additional items as registered previously.

If the addition, deletion or modification of additional item is needed, edit on the instruction DETAIL EDIT window. If it is not needed, continue the registration process.
3 Teaching
3.6 Editing Instructions

3.6.1 Instruction Group

The instructions are divided into eight groups by processing or each work.

<table>
<thead>
<tr>
<th>Display</th>
<th>Instruction Group</th>
<th>Content</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN/OUT</td>
<td>I/O Instruction</td>
<td>Controls input and output</td>
<td>DOUT, WAIT</td>
</tr>
<tr>
<td>CONTROL</td>
<td>Control Instruction</td>
<td>Controls processing and each work</td>
<td>JUMP, TIMER</td>
</tr>
<tr>
<td>MOTION</td>
<td>Move Instructions</td>
<td>Moves the manipulator</td>
<td>MOVJ, REFP</td>
</tr>
<tr>
<td>DEVICE</td>
<td>Work Instructions</td>
<td>Operates arc welding, spot welding, handling, painting, etc.</td>
<td>ARCON, WVON, SVSPOT, SPYON</td>
</tr>
<tr>
<td>ARITH</td>
<td>Operating Instructions</td>
<td>Performs arithmetic calculation</td>
<td>ADD, SET</td>
</tr>
<tr>
<td>SHIFT</td>
<td>Shift Instructions</td>
<td>Shifts the teaching point</td>
<td>SFTON, SFTOF</td>
</tr>
<tr>
<td>SENS (Option)</td>
<td>Sensor Instructions (Option)</td>
<td>Instructions related to the sensor</td>
<td>COMARCON</td>
</tr>
<tr>
<td>OTHER</td>
<td>Other Instructions</td>
<td>Instructions for functions other than above</td>
<td>SHCKSET</td>
</tr>
<tr>
<td>SAME</td>
<td>-</td>
<td>Specifies the instruction where the cursor is.</td>
<td></td>
</tr>
<tr>
<td>PRIOR</td>
<td>-</td>
<td>Specifies the previously-registered instruction.</td>
<td></td>
</tr>
</tbody>
</table>

- Instruction List
  
By pressing [INFORM LIST], the instruction group list dialog box appears.

By selecting a group, the instruction list dialog box of the selected group appears.
3.6.2 Inserting Instructions

1. Move the cursor to the address area in the JOB CONTENT window.
   – Move the cursor to the line immediately before where the instruction
     is to be inserted, in the teach mode.

   ![Instruction List Example]

2. Press [INFORM LIST].
   – The INFORM command list appears, and an underline is displayed
     beneath the line number in the address area.

3. Select the instruction group.
   – The instruction list dialog box appears. The selected instruction is
     displayed on the input buffer line with the same additional items as
     registered previously.

4. Select the instruction.
5. Change the data of additional items or variables as required.

<When Nothing is to be Changed>

(1) Proceed to Step 6.

<When Additional Items are to be edited>

(1) Changing numeric data

I) Move the cursor to the desired item and press [SHIFT] + the cursor to increase or decrease the value.

II) To directly input the value using [Numeric Keys], press [SELECT] to display the input buffer line.

III) Type the value and press [ENTER]. The value on the input buffer line is changed.

(2) Adding, modifying, or deleting an additional item

I) To add, modify, or delete an additional item, move the cursor to the instruction on the input buffer line and press [SELECT]. The DETAIL EDIT window appears.

To add an item, move the cursor to "UNUSED" and press [SELECT]. The selection dialog box appears.

II) Move the cursor to the desired item and press [SELECT]. To delete an item, move the cursor to the item to be deleted and select "UNUSED".
3 Teaching
3.6 Editing Instructions

(3) Changing the data type

I) To change the data type of an additional item, move the cursor to ✔️ of the item and press [SELECT]. The data type list appears. Select the desired data type.

II) After additional items have been added, modified or deleted as required, press [ENTER]. The DETAIL EDIT window closes and the JOB CONTENT window appears.

6. Press [INSERT] and [ENTER].
– The instruction displayed in the input buffer line is inserted.
3.6 Editing Instructions

3.6.3 Deleting Instructions

1. Move the cursor to the address area in the JOB CONTENT window.
   – Move the cursor to the instruction line to be deleted, in the teach mode.

   ![The line to be deleted]

2. Move the cursor to the deleting line in the address area.
3. Press [DELETE] and [ENTER].
   – The instruction is deleted and the following lines move up.

   ![The following lines move up.]

3.6.4 Modifying Instructions

1. Move the cursor to the address area in the JOB CONTENT window.
   – Move the cursor to the instruction line to be modified, in the teach mode.

   ![Instruction line to be changed]

2. Press [INFORM LIST].
   – The INFORM command list appears and the cursor moves to the INFORM command list.

   ![INFORM command list]
3. Select the instruction group.

- The instruction list dialog box appears. The selected instruction is displayed on the input buffer line with the same additional items as registered previously.

4. Move the cursor to the instruction to be modified and press [SELECT].

5. Change the data of additional items or variables as required.

<Editing Additional Items>

(1) Changing numeric data

I) Move the cursor to the desired item and press [SHIFT] + the cursor to increase or decrease the value.

To directly input the value using [Numeric Keys], press [SELECT] to display the input buffer line for the numeric values.

II) Type the value and press [ENTER]. The value on the input buffer line is changed.

(2) Adding, modifying, or deleting an item

I) To add, modify or delete an additional item, move the cursor to the instruction on the input buffer line and press [SELECT]. The DETAIL EDIT window appears.
II) To add an item, move the cursor to "UNUSED" and press [SELECT]. The selection dialog box appears.

III) Move the cursor to the desired item and press [SELECT]. To delete an item, move the cursor to the item to be deleted and select "UNUSED".

(3) Changing the data type

I) To change the data type of an additional item, move the cursor to [ ] of the item and press [SELECT]. The data type list appears. Select the desired data type.

II) After additional items have been added, modified or deleted as required, press [ENTER]. The DETAIL EDIT window closes and the JOB CONTENT window appears.
6. Press [MODIFY] and [ENTER].

- The instruction is modified to the instruction displayed in the input buffer line.
3.6.5 Modifying Additional Numeric Data

1. Move the cursor to the instruction area in the JOB CONTENT window.
   – Move the cursor to the instruction area if it is in the address area.
   – Press [SELECT] to change the mode to line editing mode.

2. Select the line where the number data is to be modified.
   – The selected line can now be edited.

   
   Number data to be modified

   0004 MODU X=00.00
   0005 DESCRTX
   0006 IDNXX 1-3,40

3. Move the cursor to the numeric data to be modified.

4. Input the desired number.
   – Press [SHIFT] + the cursor to increase or decrease the value. To
directly input the number, press [SELECT]. The input buffer line
appears. Type the number and press [ENTER].

   
   Number data to be modified

   0004 MODU X=00.00
   0005 DESCRTX
   0006 IDNXX 1-3,40

5. Press [ENTER].
   – The numeric data is modified.

   
   Instruction line for which
   numeric data was changed

   0004 MODU X=00.00
   0005 DESCRTX
   0006 IDNXX 1-3,40
3.6 Editing Instructions

3.6.6 Modifying Additional Items

1. Move the cursor to the instruction area in the JOB CONTENT window.

2. Select the instruction line for which the additional item is to be modified.
   – Move the cursor to the instruction area if it is in the address area
   – Press [SELECT] to change the mode to line editing mode.

3. Select the instruction.
   – Move the cursor to a instruction, the press [SELECT] to display DETAIL EDIT window.

4. Select the additional item to be modified.
   – The selection dialog box appears.

5. Select the desired additional item.
   – The modified additional item is displayed on the DETAIL EDIT window.

6. Press [ENTER].
   – The DETAIL EDIT window closes, and the JOB CONTENT window appears.

7. Press [ENTER].
   – Contents of the input buffer line are registered on the cursor line of the instruction area.
3.6 Editing Instructions

3.6.7 Inserting Additional Items

1. Move the cursor to the instruction area in the JOB CONTENT window.

2. Select the instruction line for which the additional item is to be inserted.
   - The selected line can now be edited.

3. Select the instruction.
   - Move the cursor to [SELECT] and press, then DETAIL EDIT window appears.

4. Select the additional item to be inserted on DETAIL EDIT window.
   - The selection dialog box appears.

5. Select inserting additional item.
   - The item to be added appears.
   - When the additional item needs the numeric data, move the cursor to the number and press [SELECT]. The input buffer line appears. Type the number and press [ENTER].

6. Press [ENTER].
   - DETAIL EDIT window closes and JOB CONTENT window appears.

7. Press [ENTER].
   - Contents of the input buffer line are registered on the cursor line of the instruction area.
3.6.8 Deleting Additional Items

1. Move the cursor to the instruction area in the JOB CONTENT window.

2. Select the line where the additional item is to be deleted.
   – Move the cursor to the instruction area when it is in the address area.
   – Press [SELECT] to change the mode to line editing mode.

3. Select the instruction.
   – Move the cursor to the instruction and press [SELECT], then DETAIL EDIT window appears.

4. Select the additional item to be deleted.
   – The selection dialog box appears.

5. Select “UNUSED”.
   – “UNUSED” is displayed on the DETAIL EDIT window.

6. Press [ENTER].
   – The DETAIL EDIT window closes, and the JOB CONTENT window appears.

7. Press [ENTER].
   – Contents of the input buffer line are registered on the cursor line of the instruction area.

NOTE: This operation cannot be used for the additional item which is locked.
3.7 Editing Jobs

The following five operations are to edit jobs.

Copy : Copies a specified range to the buffer.
Cut : Deletes a specified range from a job, and copies it to a buffer.
Paste : Inserts a content of the buffer into a job.
Reverse Paste : Reverses the order of the contents of the buffer, and inserts them into a job.
Base Reverse Paste : Reverses the order of the contents of the buffer and adjusts the to-and-from speeds same, and inserts them into a job.

Execute Base Reverse Paste

Execute Reverse Paste

The speed and interpolation are different going and returning.

The speed and interpolation are the same going and returning.
3.7 Editing Jobs

3.7.1 Selecting the Range

After setting the range, copying and deleting can be performed.

1. Move the cursor to the instruction area in the JOB CONTENT window.

![Image showing the instruction area with a cursor.

2. Move the cursor to the start line and press [SHIFT] + [SELECT].
   - The range specification begins, and the address is displayed in reverse.

![Image showing the start line with a cursor.

3. Move the cursor to the end line.
   - The range is varied by moving the cursor. Up to the line specified by the cursor is the range.
3 Teaching
3.7 Editing Jobs

3.7.2 Copying

Before copying, the range to be copied has to be specified.

1. Select {EDIT} under the menu.
   – The pull-down menu appears.

2. Select {COPY}.
   – The specified range is copied to the buffer.

3.7.3 Cutting

Before cutting, the range to be cut has to be specified.

1. Select {EDIT} under the menu.
   – The pull-down menu appears.

2. Select {CUT}.
   – The confirmation dialog box appears. When “YES” is selected, the specified range is deleted and copied to the buffer.
   – When “NO” is selected, the cutting operation is canceled.
3.7 Editing Jobs

3.7.4 Pasting

Before pasting, the range to be pasted has to be stored in the buffer.

1. Move the cursor to the line immediately before the desired position in the JOB CONTENT window.
   – The pull-down menu appears.

2. Select {EDIT} under the menu.

3. Select {PASTE}.
   – The confirmation dialog box appears.
   – When “YES” is selected, the contents of the buffer are inserted to the job.
   – When “NO” is selected, the pasting operation is canceled.
3.7 Editing Jobs

### 3.7.5 Reverse Pasting

Before pasting, the range to be pasted has to be stored in the buffer.

1. Move the cursor to the line immediately before the desired position in the JOB CONTENT window.

2. Select (EDIT) under the menu.
   - The pull-down menu appears.
   - The CONFIRMATION dialog box appears.
   - When “YES” is selected, the contents of the buffer are reverse pasted to the job.
   - When “NO” is selected, the reverse-pasting operation is canceled.

3. Select (REVERSE PASTE).
   - The CONFIRMATION dialog box appears.
   - When “YES” is selected, the contents of the buffer are reverse pasted to the job.
   - When “NO” is selected, the reverse-pasting operation is canceled.
3.7.6 Commenting Out a Line

The lines in a job can be commented out by specifying line-by-line or multiple lines.

By commenting out a line, the line can be exempted from a target when executing a job.

When modifying or selecting the commented-out line, “ERROR 1012: This line is defined as a comment.” appears.

When performing the conversion operation, such as the parallel shift job conversion, for a job that includes the commented-out line, the conversion operation cannot be performed to the commented-out line.

Followings are the settings for the commented-out line:

- Treated equivalent as a comment instruction.
- Cannot be edited.
- Displayed as a line or a step.
- The set position can be confirmed by using direct open function.
- Exempted from a target for the conversion operation.

NOP and END cannot be commented out.

When NOP and END are tried to be commented out, “ERROR 2371: EDIT LOCK/COMMENT functions cannot be applied to NOP and END.” appears.

3.7.6.1 Commenting Out One Line

1. Display the (JOB CONTENT) window.
2. Move the cursor to the targeted line.
   - Place the cursor on the line to be commented out.
   - Move the cursor to the right (INST).
3. Press [SHIFT] + [SELECT].
   - The line is selected.

4. Select (EDIT) → (COMMENT OUT) under the pull-down menu.
   - The selected line is commented out.
   - “/” is displayed at the head of the selected line.
### 3.7.6.2 Commenting Out Multiple Lines

1. Display the \{JOB CONTENT\} window.
2. Move the cursor to the targeted line.
   - Place the cursor at the head of the line to be commented out.
   - Move the cursor to the right (INST).
   
   ![Image of the job content window](image1)

3. Press \[SHIFT\] + \[SELECT\].
   - The line is selected.
   
   ![Image of the job content window with selected line](image2)

4. Press \[↑\] or \[↓\] to select multiple lines to be commented out.
   
   ![Image of the job content window with multiple lines selected](image3)
5. Select \{EDIT\} → \{COMMENT OUT\} under the pull-down menu.

- The selected lines are commented out.
- “//” is displayed at the head of the selected line.
3.7.6.3 Canceling the Comment Out of One Line

1. Display the {JOB CONTENT OUT} window.
2. Move the cursor to the targeted line.
   - Place the cursor on the line whose comment out is to be canceled.
   - Move the cursor to the right (INST).
3. Press [SHIFT] + [SELECT].
   - The line is selected.
4. Select (EDIT) → {*COMMENT OUT} under the pull-down menu.

- The comment out of the selected line is canceled.
- "//" at the head of the line disappears.
3.7.6.4 Canceling the Comment Out of Multiple Lines

1. Display the \{JOB CONTENT OUT\} window.

2. Move the cursor to the targeted line.
   – Place the cursor at the head of the line whose comment out is to be canceled.
   – Move the cursor to the right \(\text{INST}\).

3. Press \([\text{SHIFT}] + [\text{SELECT}]\).  
   – The line is selected.

4. Press \([\uparrow]\) or \([\downarrow]\) to select multiple lines whose comment out is to be canceled.
5. Select \( \text{EDIT} \rightarrow \{\text{COMMENT OUT}\} \) under the pull-down menu.

- The comment out of the selected lines is canceled.
- "//" at the head of the line disappears.

When the lines which are not commented out are included in the selected lines, \( \{\text{COMMENT OUT}\} \) (without ***) is displayed in the pull-down menu.

In this case, when \( \{\text{COMMENT OUT}\} \) is selected, all the selected lines will be commented out.
3.7 Editing Jobs

3.7.6.5 Canceling All the Comment Out of Lines

1. Display the {JOB CONTENT} window.
2. Move the cursor to the right (INST).
3. Select {EDIT} → {COMMENT OUT CLR (ALL)} under the pull-down menu.

– The comment out of all the lines of the displayed jobs are canceled.
– “//” at the head of the line disappears.

SUPPLEMENT

For the following sets of instructions, only one of the instructions cannot be commented out independently. When commenting out, select both of the instructions.

When only one of the instructions are tried to be commented out, “Error 2372: This line cannot be defined as a comment.” appears, and the comment out is not executed.

• IFTHEN,ENDIF
• SWITCH,ENDSWITCH

For the following sets of instructions, when one of the instructions is commented out, another instruction will automatically be commented out.

• FOR,NEXT
• WHILE, ENDWHILE
### 3.7.7 Prohibiting Editing Line-by-Line

The Edit Lock setting can be performed to the jobs line-by-line.

By setting the Edit Lock to a job line, the line will be prohibited from being edited.

When the editing operation, such as changing, deletion, selection, or cutting, is performed to the line to which the Edit Lock is set, “Error 1011: EDIT LOCK is set for this line.” appears.

Also, when the conversion operation such as the parallel shift job conversion is performed to the job including the lines to which the Edit Lock is set, the lines will not be converted.

#### 3.7.7.1 Prohibiting Editing One Line

For the Edit Lock operation of one line, follow the procedures below.

1. Display the {JOB CONTENT} window.
2. Move the cursor to the targeted line.
   - Place the cursor on the line to which the Edit Lock operation is to be performed.
   - Move the cursor to the right (INST).

The Edit Lock cannot be set to NOP and END.

When Edit Lock is tried to be set to NOP and END, “ERROR 2371: EDIT LOCK/COMMENT functions cannot be applied to NOP and END.” appears.
3. Press [SHIFT] + [SELECT].
   – The line is selected.

4. Select {EDIT} → {LINE EDIT LOCK} under the pull-down menu.
   – The selected line will be prohibited from being edited, and “X” is displayed at the head of the line.
3.7 Editing Jobs

3.7.7.2 Prohibiting Editing Multiple Lines

For the Edit Lock operation of multiple lines, follow the procedures below.

1. Display the {JOB CONTENT} window.

2. Move the cursor to the targeted line.
   - Place the cursor at the head of the line to which the Edit Lock operation is to be performed.
   - Move the cursor to the right (INST).

3. Press [SHIFT] + [SELECT].
   - The line is selected.
4. Press [↑] or [↓] to select multiple lines to which the Edit Lock operation is to be performed.

5. Select {EDIT} → {LINE EDIT LOCK} under the pull-down menu.

– The selected line will be prohibited from being edited, and “X” is displayed at the head of the line.
3.7.7.3 Canceling the Edit Lock of One Line

For canceling the Edit Lock of one line, follow the procedures below.

1. Display the {JOB CONTENT} window.
2. Move the cursor to the targeted line.
   - Place the cursor on the line whose Edit Lock is to be canceled.
   - Move the cursor to the right (INST).
3. Press [SHIFT] + [SELECT].
   - The line is selected.
4. Select {EDIT} → {"LINE EDIT LOCK"} under the pull-down menu.

- The Edit Lock of the selected line is canceled.
- "X" at the head of the line disappears.
3.7.4 Canceling the Edit Lock of Multiple Lines

1. Display the (JOB CONTENT) window.

2. Move the cursor to the targeted line.
   - Place the cursor at the head of the line whose Edit Lock is to be canceled.
   - Move the cursor to the right (INST).

3. Press [SHIFT] + [SELECT].
   - The line is selected.

4. Press [↑] or [↓] to select multiple lines whose Edit Lock is to be canceled.
5. Select (EDIT) → (*LINE EDIT LOCK) under the pull-down menu.

- The Edit Lock of the selected lines is canceled.
- "X" at the head of the line disappears.
### 3.7.7.5 Canceling All the Edit Lock of Lines

1. Display the {JOB CONTENT} window.
2. Move the cursor to the right (INST).
3. Select {EDIT} → {EDITLOCK CLR (ALL)} under the pull-down menu.

   - The Edit Lock of all the lines is canceled, and the displayed "X" disappears.
3.8 Test Operations

Playback operations can be simulated in the teach mode with test operations. This function is convenient for checking continuous paths and operation instructions.

Test operation differs in the following ways from actual playback in the play mode.

- Operation speeds greater than the maximum teaching speed are reduced to the maximum teaching speed.
- Only machine lock is available among special operations for playback in the play mode.
- Work instruction output, such as arc output, is not executed.

3.8.1 Test Operation Procedures

Test operation is performed by pressing [INTERLOCK] and [TEST START]. For safety purposes, these keys will only function while the keys are held down.

1. Select {JOB} under {Main Menu}.
2. Press {JOB}.
   - The test operation JOB CONTENT window appears.
3. Press [INTERLOCK] + [TEST START].
   - The manipulator starts the test cycle operation.
   - The manipulator moves only while these keys are held down. However, after the operation starts, the motion continues even if [INTERLOCK] is released.
   - The manipulator stops immediately when [TEST START] is released.

NOTE Always check safety conditions before starting the manipulator in motion.
3.8.2 Test Operation (High Accuracy)

3.8.2.1 Test Operation (High Accuracy)

In test operation (high accuracy), the motion path of the manipulator’s control point for playback operation in the taught speed (speed override: 100%) is simulated by executing “test operation”.

The repetitive accuracy of the motion path in test operation (high accuracy) had been greatly improved in comparison with the conventional test operation (normal).

For the “test operation”, refer to chapter 3.8.1 “Test Operation Procedures”.

### NOTICE

Following functions cannot be simulated in the test operation (high accuracy).

- Weaving function
- COMARC function
- Sensor function
- Twin/triple coordinated control function
- Conveyor synchronized function
- Weld line coordinate shift function

When the functions above are tried to be executed in test operation (high accuracy), the alarm “4909 TEST RUN(HIGH ACCURACY) ERROR” occurs. As for the functions above, operate in the test operation (normal).
### 3.8 Test Operations

#### 3.8.2.2 Setting Method

1. Select {SETUP} under main menu → {TEACHING CONDITION SETTING}.

2. Move the cursor to the “TEST RUN CONTROL” and select “HIGH ACCURACY”. (“NORMAL” and “HIGH ACCURACY” are displayed alternately.)

“HIGH ACCURACY” is for test operation (high accuracy) and “NORMAL” is for the conventional test operation.

![Teaching Condition Setting](image)

By executing “test operation” after the setting above, test operation (high accuracy) is started.

**NOTE**

The switching position of the cursor is different in test operation (high accuracy) and in test operation (normal).

Before performing the job editing (add or modify teaching position) or back operation after the test operation (high accuracy) is interrupted, make sure to check the cursor position.
3 Teaching
3.9 Other Job-editing Functions

3.9 Other Job-editing Functions

3.9.1 Editing Play Speed

There are two ways to modify play speed:

- Modification of Speed Type
- Relative Modification

3.9.1.1 Modification of Speed Type

This method is used to modify the speed type (such as VJ, V, VR, etc.)

<table>
<thead>
<tr>
<th>Type of Play Speed</th>
<th>Explanation</th>
<th>Normal robot axes</th>
</tr>
</thead>
<tbody>
<tr>
<td>VJ</td>
<td>Joint Speed</td>
<td>Normal robot axes</td>
</tr>
<tr>
<td>V</td>
<td>TCP Speed</td>
<td></td>
</tr>
<tr>
<td>VR</td>
<td>Posture Angle Speed</td>
<td></td>
</tr>
<tr>
<td>VE</td>
<td>Base Axis Speed</td>
<td></td>
</tr>
</tbody>
</table>

0005 MOVJ VJ=25.00  
0006 MOVL V=138  
0007 MOVJ VJ=50.00  

Only VJ is changed to 100.

0005 MOVJ VJ=100.00  
0006 MOVL V=138  
0007 MOVJ VJ=100.00  

3.9.1.2 Relative Modification

All steps are selected for the play speed VJ, V,VR, VE. This method is used to change all steps by a specified percentage (1% to 200%). This is called relative modification.

0005 MOVJ VJ=25.00  
0006 MOVL V=253  
0007 MOVJ VJ=50.00  

Speed is doubled.

0005 MOVJ VJ=50.00  
0006 MOVL V=506  
0007 MOVJ VJ=100.00  

0005 MOVJ VJ=100.00  
0006 MOVL V=506  
0007 MOVJ VJ=200.00  

0005 MOVJ VJ=200.00  
0006 MOVL V=1012  
0007 MOVJ VJ=400.00  

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3 Teaching
3.9 Other Job-editing Functions

The speed of the entire job or specified section can be changed.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
   - The JOB CONTENT window appears.
3. Move the cursor to the instruction area.
4. Press [SHIFT] + [SELECT] in the speed modify start line.
   - If the section is not specified, the speed of the entire job will be changed.
   - Move the cursor to the end line. The line numbers of the selected lines are highlighted.
5. Select {EDIT} under the menu.
6. Select {CHANGE SPEED}.
   - The SPEED MODIFICATION window appears.

7. Set desired items.

   **A. START LINE NO.**
   Displays the first line number of the section to be modified.

   **B. END LINE NO.**
   Displays the last line number of the section to be modified.

   **C. MODIFICATION TYPE**
   Selects the confirmation before changing: “CONFIRM” or “NO CONFIRM”.
   Each time [SELECT] is pressed when the cursor is on this item, the setting alternates between “CONFIRM” and “NO CONFIRM”.

   **D. SPEED KIND**
   Selects the speed type.
   When [SELECT] is pressed when the cursor is on this item, the selection dialog box appears. Select the speed type to be changed.
   To perform the relative modification of the play speed, select “RELATIVE”.

   **E. SPEED**
   Specifies the speed value.
   When [SELECT] is pressed when the cursor is on this item, the mode changes to the number input mode. Input the speed value and press [ENTER].
3.9 Other Job-editing Functions

8. Select “EXECUTE”.
   – The speed begins to change.
   – If “MODIFICATION TYPE” is set to “CONFIRM”, the confirmation dialog box “Modifying speed” is displayed. Press [ENTER] to change the speed on the first line and search for the next speed. Press the UP/DOWN cursor button to keep the speed on the first line and search for the next speed. To cancel the speed modification, press [CANCEL].
   – If “MODIFICATION TYPE” is set to “NOT CONFIRM”, all the speeds of the specified section are changed.

3.9.1.3 Modification by TRT (Traverse Time)

Modifications made by TRT have the following characteristics:

• By setting the time required to execute a move instruction (moving time) to a desired value, the speeds can be modified.
• It is possible to measure the moving time without actually moving the manipulator.

For example, when the movement from lines 5 through 20 currently requires 34 seconds, and you want to reduce it to 15 seconds or extend it to 50 seconds, this function is used.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
   – The JOB CONTENT window appears.
3. Move the cursor to the instruction area.
4. Press [SHIFT] + [SELECT] in the weaving time measure start line.
   – Move the cursor to the end line. The line numbers of the selected lines are highlighted.
5. Select {EDIT} under the menu.
6. Select {TRT}.

– The TRT window appears.

![TRT Window]

7. Set the desired items.

A. START LINE NO.
Displays the first line number of the section to be measured and modified.

B. END LINE NO.
Displays the last line number of the section to be measured and modified.

C. MOVING TIME
The weaving time needed to move from the first number to last number is measured and displayed.

D. SETTING TIME
Set the desired weaving time. When [SELECT] is pressed when the cursor is on this item, the input buffer line appears. Input the desired weaving time and press [ENTER].

8. Select “EXECUTE”.

– The speed is changed according to the setting.

- If instructions that include specific speed data such as SPEED or ARCON instructions (including speed data of the welding condition file) exist in the specified section, the speed data for those steps are not changed. Also, the speed which is set to the play speed VMAX is not changed. Therefore, in such cases, the set time and the actual time required are not same.

- If the speed data is limited by the maximum value, the following message is displayed.

![Limited to maximum speed]

- The line to which the Edit Lock function is set or the comment out is performed cannot be changed.
(For details, refer to chapter 3.7.6 “Commenting Out a Line” and chapter 3.7.7 “Prohibiting Editing Line-by-Line”.)
3.9 Other Job-editing Functions

3.9.2 Editing Interpolation Type

To modify the interpolation type of an already registered instruction, use the interpolation modification function.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
   – The JOB CONTENT window appears.
3. Move the cursor to the instruction area.
4. Select the line to be modified.
   – The instruction on the cursor is displayed in the input buffer line.

5. Press [SHIFT] + the cursor simultaneously.
   – The interpolation type in the input buffer line changes.
   – The modification of the speed according to the modification of the interpolation type is calculated by the ratio to maximum speed at each speed.

   – Joint Speed: MAX=100.0%  
   Linear Speed: MAX=9000cm/min  
(e.g.)
Joint Speed: 50% = Linear Speed: 4500cm/min  
Linear Speed: 10% = Linear Speed: 900cm/min
6. Press [ENTER].

- The instruction on the cursor line is replaced with one on the input buffer line.

**3.9.3 Editing Condition Files**

Condition files are prepared in order to set the conditions for the manipulator to execute instructions.

Multiple condition files are provided for each application. More than one pattern can be set up in each condition file. The patterns are listed by "condition numbers". This number is specified by the work instruction in a job.

Regarding the contents and editing methods of the condition file, refer to YRC1000 Operator’s Manual (subject specific) for each application.
3.9 Other Job-editing Functions

3.9.4 User Variables

User variables are used to temporarily store counters, calculation results, or input signals in the job. The user variables can be freely defined in the job. Since the same user variables can be used in multiple jobs, save the numerical values as common references for the jobs. The user variables are maintained even when the power is turned OFF.

User variables have the following applications:

- Controlling of the number of workpieces
- Controlling of the number of jobs
- Sending/receiving of information between jobs

The data formats for user variables are described in the following table.

Table 3-4: User Variables

<table>
<thead>
<tr>
<th>Data Format</th>
<th>Variable No. (pcs.)</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte type</td>
<td>B000 to B099 (100)</td>
<td>Range of storable values is from 0 to 255. Can store I/O status.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can perform logical operations (AND, OR, etc.)</td>
</tr>
<tr>
<td>Integer type</td>
<td>1000 to 1099 (100)</td>
<td>Range of storable values is from -32768 to 32767.</td>
</tr>
<tr>
<td>Double-precision</td>
<td>D000 to D099 (100)</td>
<td>Range of storable values is from -2147483648 to 2147483647.</td>
</tr>
<tr>
<td>Integer type</td>
<td>D000 to D099 (100)</td>
<td>Range of storable values is from -2147483648 to 2147483647.</td>
</tr>
<tr>
<td>Real type</td>
<td>R000 to R099 (100)</td>
<td>Range of storable values is from -3.4E+38 to 3.4E38. Accuracy: 1.18E-38 &lt; x ≤ 3.4E38</td>
</tr>
<tr>
<td>Character type</td>
<td>S000 to S099 (100)</td>
<td>Maximum storable number of characters is 16.</td>
</tr>
<tr>
<td>Boolean type</td>
<td>FL000 to FL1023 (1024)</td>
<td>Storable values are ON and OFF.</td>
</tr>
<tr>
<td>Position type</td>
<td>P000 to P127 (128)</td>
<td>Can store position data in pulse form or in XYZ form. XYZ type variable can be used as target position data for move instructions, and as incremental values for parallel shift instructions. Teaching line coordinates system cannot be used.</td>
</tr>
<tr>
<td></td>
<td>BP000 to BP127 (128)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>EX000 to EX127 (128)</td>
<td></td>
</tr>
<tr>
<td>Timer variable</td>
<td>TM000 to TM059 (60)</td>
<td>Range of storable values is from -2147483648 to 2147483647.</td>
</tr>
</tbody>
</table>

* For the timer variable, refer to chapter 6.18.2 “Timer Variable”.
3.9.4.1 Setting Byte, Integer, Double Precision Integer, and Real Type Variables

1. Select {VARIABLE} under {Main Menu}.
   - {BYTE}, {INTEGER}, {DOUBLE}, and {REAL} are displayed for the sub menu.

2. Select desired variable type.
   - The BYTE VARIABLE window appears. (Following is a case that {BYTE} is selected.)

   - **Play Speed V:**
     MOV L V=I000
     The variable I000 is used for speed V with this move instruction.
     *The unit for V is 0.1 mm per second.*
     For example, if I000 were set as 1000, the following would be true:
     I000=1000 → unit for V is 0.1 mm/s → V=100.0 mm/s
     Note that, depending on the unit being used, the value of the variable and the value of the actual speed on occasion might not match.

   - **Play Speed VJ:**
     MOV L VJ=I000
     The unit for VJ is 0.01%.
     For example, if I000 were set as 1000, the following would be true:
     I000=1000 → unit for VJ is 0.01% → VJ=10.00%.

   - **Timer T:**
     TIMER T=I000
     The unit for T is 0.01 seconds.
     For example, if I000 were set as 1000, the following would be true:
     I000=1000 → unit for T is 0.01 seconds → T=10.00 seconds.
3. Move the cursor to the desired variable No.
   - When the desired variable number is not displayed, move the cursor with either of the following operations.
     • Move the cursor on the variable No. and press [SELECT]. Then input the variable No. using the [Numeric Keys] and press [ENTER].
     • Move the cursor to the menu area and select {EDIT} → {SEARCH}. Then input the variable No. with the [Numeric Keys] and press [ENTER].

4. Move the cursor to the data of the variable.
   - The number can be directly typed.

5. Input the desired number.

6. Press [ENTER].
   - Input value is set to the variable on the cursor position.
3.9.4.2 Setting Character Type Variables

1. Select {VARIABLE} under {Main Menu}.
2. Select {STRING}.
   – The STRING VARIABLE window appears.

3. Move the cursor to the desired variable No.
   – When the desired variable number is not displayed, move the cursor with either of the following operations.
     • Move the cursor on the variable No. and press [SELECT]. Then input the variable No. using the [Numeric Keys] and press [ENTER].
     • Move the cursor to the menu area and select {EDIT} → {SEARCH}. Then input the variable No. with the [Numeric Keys] and press [ENTER]

4. Move the cursor to the data of the variable.
   – The characters can be directly typed.
5. Input the desired characters.
   – For information on character input operation, refer to chapter 1.2.6 “Character Input Operation”.

6. Press [ENTER].
   – The input characters are set to the variable on the cursor position.

3.9.4.3 Setting Boolean Type (Flag) Variables

1. Select (VARIABLE) under (Main Menu).
2. Select (FLAG).
   – The FLAG VARIABLE window appears.

3. Move the cursor to the desired variable No. to change.
   – Move the cursor to the STATUS (“ ” or “ ● ”) of the variable to change.
4. Press [INTERLOCK] + [SELECT].
   – The STATUS is changed.
     ( ● : ON, ○ : OFF)

### S2C1253: FLAG STATUS WHEN CONTROL POWER IS ON

Follow the procedure below to change the status of the flags.

- 0: Reset to the power OFF state (Default)
- 1:Initialized (all flags OFF)
3.9.4.4 Registering Variable Name

1. Select \{VARIABLE\} under \{Main Menu\}.
2. Select desired variable.
   - Select any variable type from among byte type, integer type, double precision integer type, real type, robot position type, base position type, and station position type.
3. Move the cursor to desired variable number.
   - If desired variable number is not displayed, move the cursor by either of following operations.
     • Select the variable number, input desired variable number and press [ENTER]. The cursor moves to the variable number to be input.
     • Move the cursor to the menu area and select \{EDIT\} \rightarrow \{SEARCH\}. Input desired variable number and press [ENTER]. The cursor moves to the variable number to be input.
4. Select “NAME”.
   - The input buffer line appears.

   Refer to chapter 1.2.6 “Character Input Operation” for the character input operation.

5. Input name.
6. Press [ENTER].
   - The variable name is registered.
3.9.4.5 Displaying Position Variables

1. Select \{VARIABLE\} under \{Main Menu\}.

2. Select desired position variable type.

   – The POSITION VARIABLE window of desired type among robot type, base type, and station type appears.

3. Move to a page with the objective variable number.

   – When the desired variable number is not displayed, move the cursor with either of the following operations.
     
     • Press [PAGE] or [SHIFT] + [PAGE].
     
     • Press page button, then input the variable No. using the [Numeric Keys] and press [ENTER].
     
     • Move the cursor to the menu area and select \{EDIT\} \(\rightarrow\) \{SEARCH\}. Then input the variable No. with the [Numeric Keys] and press [ENTER].
### 3.9.4.6 Setting Position Variables

The following table shows the types of position variables and setting methods.

- The setting of position variables is done in the teach mode.
- Turn the servo power ON when setting the variables with the [Axis Keys].

**NOTE**

<table>
<thead>
<tr>
<th>Type</th>
<th>Pxxx (Robot)</th>
<th>BPxxx (Base)</th>
<th>EXxxx (Station)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse Type</td>
<td>XYZ Type</td>
<td>Pulse Type</td>
<td>XYZ Type</td>
</tr>
<tr>
<td>Setting Method</td>
<td>Select coordinates from base, robot, user, etc.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 3-5: Types of Position Variables and Setting Method**

- Using the numeric keys
- Using the axis keys
3.9.4.7 Setting Position Variables Using the Numeric Keys

- **Pulse Type**

1. Select `{VARIABLE}` under {Main Menu}.
2. Select desired position variable type.
   - The desired variable window appears (robot, base, or station). (The POSITION VARIABLE window is used for this example.)

3. Select the variable data type.
   - The selection dialog box appears.

4. Select (PULSE).
5. Move the cursor to desired data to be input and press [SELECT].
6. Input the value.
7. Press [ENTER].
   - The value is set in the cursor position.
3.9 Other Job-editing Functions

XYZ Type

1. Select \{VARIABLE\} under \{Main Menu\}.
2. Select desired position variable type.
3. Select the variable data type.
   – The selection dialog box appears.
4. Select desired coordinates except PULSE.
5. Move the cursor to desired data to be input and press [SELECT].
6. Input the value.
7. Press [ENTER].
   – The value is set in the cursor position.

(1) Setting of “<TYPE>”
– Each time [SELECT] is pressed when the cursor is on the setting data in the input buffer line, the settings alternate.

About “<TYPE>”
• It is not necessary to set a type if the position variable is to be used for parallel shift operations.
• When the position variable is used with a move instruction such as “MOVJ P001”, it is necessary to set a type. For details on types, refer to chapter 3.9.4.11 “Manipulator Types”.

Current Position Window (XYZ) shows the current setting of a type.
3.9.4.8 Setting Position Variables Using the Axis Keys

### Pulse Type

1. Select {VARIABLE} under {Main Menu}.
2. Select desired position variable type.
   - The desired variable window appears (robot, base, or station).
3. Press [SHIFT] + [ROBOT]. When you need an external axis position, press [SHIFT]+[EX.AXIS].
   1. When there are two or more robot, base, or a station, specify the axis with following operation.
      - **Robot**
      Each time [SHIFT] + [ROBOT] is pressed, the axis displayed on the status line changes:
        R1 → R2 → ... → R8.
      - **Base or Station**
      Each time [SHIFT]+[EX.AXIS] is pressed, the axis displayed on the status line changes:
        B1 → B2 → ... → B8 → S1 → S2 → ... → S24.
   2. Check the selected axis on the status line.
4. Move the manipulator with the [Axis Keys].
   - Move the manipulator or the external axis to the desired position to be set to position variable.
5. Press [MODIFY].
6. Press [ENTER].

### XYZ Type

1. Select {VARIABLE} under {Main Menu}.
2. Select desired position variable type.
   1. When there are two or more robot, base, or a station, specify the axis with following operation.
      - **Robot**
      Each time [SHIFT] + [ROBOT] is pressed, the axis displayed on the status line changes:
        R1 → R2 → ... → R8.
      - **Base or Station**
      Each time [SHIFT]+[EX.AXIS] is pressed, the axis displayed on the status line changes:
        B1 → B2 → ... → B8 → S1 → S2 → ... → S24.
   2. Check the selected axis on the status line.
3. Move the manipulator with the [Axis Keys].
   - Move the manipulator or the external axis to the desired position to be set to position variable.
4. Press [MODIFY].
5. Press [ENTER].
3.9 Other Job-editing Functions

3.9.4.9 Deleting Data Set of Position Variables

1. Select {VARIABLE} under {Main Menu}.
2. Select desired position variable type.
3. Select {DATA} under the menu.
   – The pull-down menu appears.
4. Select {CLEAR DATA}.
   – The position variable data on the displayed page are deleted.

3.9.4.10 Checking Positions by Position Variables

1. Select {VARIABLE} under {Main Menu}.
2. Select desired position variable type.
   (1) When there are two or more robot, base, or a station, specify the axis with following operation.
   • Robot
     Each time [SHIFT] + [ROBOT] is pressed, the axis displayed on the status line changes:
     R1 → R2 → ... → R8.
   • Base or Station
     Each time [SHIFT] + [EX.AXIS] is pressed, the axis displayed on the status line changes:
     B1 → B2 → ... → B8 → S1 → S2 → ...... → S24.
   (2) Check the selected axis on the status line.
3. Press [FWD].
   – Selected axis moves to the position specified by the variable.

   The selected axis (manipulator, base, or station) moves directly to the set variable position.
   Before pressing [FWD], check that the surrounding area is safe.
3.9.4.11 Manipulator Types

When the position data of the job data are described using the XYZ format, several postures may be taken according to the manipulator’s structure when moving it to the described position.

Although these postures have the same coordinates for TCP, they vary in pulse for each axis.

Thus, the manipulator’s posture cannot be uniquely defined only by the coordinate value, and it is necessary to specify the data other than the coordinate value to define the manipulator’s posture.

This is called “Type”.

Type varies according to the manipulator model.

For the manipulator with seven axes, X, Y, Z, Rx, Ry, Rz, Re and Type are used.

Re is an element to indicate the posture of the manipulator with seven axes and does not change by the specified coordinates.

The definition of Re is shown below.
3.9.4.12 Flip/No Flip

When the angle of B-axis is within (+) range ($\theta_B \geq 0^\circ$), it is called “Flip”, and when within (-) range ($\theta_B < 0^\circ$), “No Flip”.

3.9.4.13 R-Axis Angle

This specifies whether the R-axis angle is less than ±180° or greater than ±180°.

<table>
<thead>
<tr>
<th>$R &lt; 180^\circ$</th>
<th>$R \geq 180^\circ$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-180^\circ &lt; \theta_R \leq 180^\circ$</td>
<td>$180^\circ &lt; \theta_R$ or $\theta_R \leq -180^\circ$</td>
</tr>
</tbody>
</table>

Note that $\theta_R$ is the angle when the R-axis home position is 0°.
3.9.4.14 T-Axis Angle

This specifies positions of the R-, B-, and T-axis. For manipulators with wrist axes (three axes), this specifies whether the T-axis angle is less than ±180° or greater than ±180°.

<table>
<thead>
<tr>
<th>T &lt;180°</th>
<th>T ≥ 180°</th>
</tr>
</thead>
<tbody>
<tr>
<td>0°</td>
<td>0°</td>
</tr>
<tr>
<td>-180° &lt; θT ≤ 180°</td>
<td>180° &lt; θT or θT ≤ -180°</td>
</tr>
</tbody>
</table>

Note that θT is the angle when the T-axis home position is 0°.

3.9.4.15 Front/Back

This specifies where in the S-axis rotation center the B-axis rotation center locates when viewing the L-axis and U-axis from the right-hand side. When viewed from the right-hand side, the right of the S-axis rotation center is called the front, and the left is called the back.
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3.9 Other Job-editing Functions

The diagram below shows the S-axis at $0^\circ$ and at $180^\circ$. This is the configuration when the L-axis and the U-axis are viewed from the right-hand side.

<table>
<thead>
<tr>
<th>S-axis $0^\circ$</th>
<th>S-axis $180^\circ$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Back</td>
<td>Front</td>
</tr>
<tr>
<td>Front</td>
<td>Back</td>
</tr>
</tbody>
</table>

For the manipulator with seven axes, this specifies where in the S-axis rotation center the U-axis rotation center locates when viewing the L-axis and U-axis from the right-hand side.

When viewed from the right-hand side, the right of the S-axis rotation center is called the front, and the left is called the back.
3.9.4.16 Upper Arm/Lower Arm

This specifies a type comprised of L-axis and U-axis when the L-axis and U-axis are viewed from the right-hand side.

<table>
<thead>
<tr>
<th>Upper Arm</th>
<th>Lower Arm</th>
</tr>
</thead>
</table>

3.9.4.17 S-Axis Angle

This designation is required for the manipulators which have working envelopes greater than ±180°. This specifies whether the S-axis angle is less than ±180° or greater than ±180°.

<table>
<thead>
<tr>
<th>S&lt;180°</th>
<th>S ≥ 180°</th>
</tr>
</thead>
</table>

Note that θS is the angle when the S-axis home position is 0°.
3.9.5 Editing Local Variables

As well as user variables, local variables can be used for the storage of counters, calculations, and input signals. The data format is the same as that of user variables. As shown in the following table, the letter L is affixed to the variable number to indicate a local variable.

**Table 3-6: Local Variables**

<table>
<thead>
<tr>
<th>Data Format</th>
<th>Variable No.</th>
<th>Functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Byte type</td>
<td>LB000 to LB☐☐</td>
<td>Range of storable values is from 0 to 255.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can store I/O status.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Can perform logical operations (AND, OR, etc.)</td>
</tr>
<tr>
<td>Integer type</td>
<td>Li000 to Li☐☐</td>
<td>Range of storable values is from -32768 to 32767.</td>
</tr>
<tr>
<td>Double-precision integer type</td>
<td>LD000 to LD☐☐</td>
<td>Range of storable values is from -2147483648 to 2147483647.</td>
</tr>
<tr>
<td>Real type</td>
<td>LR000 to LR☐☐</td>
<td>Range of storable values is from -3.4E+38 to 3.4E+38.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Accuracy: 1.18E-38 &lt; x ≤ 3.4E+38</td>
</tr>
<tr>
<td>Character type</td>
<td>LS000 to LS☐☐</td>
<td>Maximum storable number of characters is 16.</td>
</tr>
<tr>
<td>Position type</td>
<td>Robot axes</td>
<td>Can store position data in pulse form or in XYZ form.</td>
</tr>
<tr>
<td></td>
<td>LP000 to LP☐☐</td>
<td>XYZ type variables can be used as target position data for move instructions, and as incremental values for parallel shift instructions.</td>
</tr>
<tr>
<td></td>
<td>Base axes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LBP000 to LBP☐☐</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Station axes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LEX000 to LEX☐☐</td>
<td></td>
</tr>
</tbody>
</table>

Local variables differ from user variables in the following four ways:

- **Used in One Job Only**
  With user variables it is possible to define and use one variable in multiple jobs, but local variables are used only in the job in which they are defined, and cannot be read from other jobs. Accordingly, local variables do not affect other jobs, so it is possible to define a variable number (such as LB001) separately in different jobs, and use it in different ways in each of these jobs.

- **Able to Use Any Number of Variables**
  The number is set in the JOB HEADER window. When the number is set, the area for the value is saved in memory.

- **Not Able to Display the Variable Contents**
  To display the local variable contents, user variables are needed. For example, to view the contents of local variable LP000, save it temporarily as user variable P001. Then execute the instruction SET P001 LP000, and view the POSITION VARIABLE window for P001.
• Enabled Only During the Execution of the Defined Job
The contents of the local variables are enabled only during the execution of the defined job.
The local variable field is assured when the defined job is called (when the job is executed by a CALL or JUMP instruction, or the job is selected by the menu). Once the job is completed by the execution of a RET, END, or JUMP instruction, the local variable data that was set is disabled. However, if a job which uses local variables itself calls a separate job, then is returned by use of a RET instruction, the data that was present prior to the CALL instruction remains in effect and can be used.

Precautions for Variables and Units
As was the case with user variables, note that, depending on the value of the unit being used, the value of the variable and the value of the actual speed or time an occasion might not match. Refer to chapter 3.9.4 “User Variables”.

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3.9 Other Job-editing Functions

3.9.5.1 Setting the Number of Local Variables

The number of local variables used in a job is set in the JOB HEADER window. When the number of local variables is set, memory is allocated for those variables.

Only when expanding the “INSTRUCTION LEVEL”, it is possible to use local variables. However, when “PROHIBIT” is set to (COB TENT DISPLAY), the number of local variables cannot be confirmed or changed.

Refer to “8.12 Instruction Level Setting” of “YRC1000 INSTRUCTIONS” (RE-CTO-A221) for details on setting the language level. Refer to chapter 5.8 “Prohibit Displaying the Contents of a Job” for setting the displaying of a job contents.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
3. Select {DISPLAY} under the menu.
4. Select {JOB HEADER}.
   – The JOB HEADER window appears. Scroll the window using the cursor.
5. Select the number of local variables to be set.
   – The input buffer line appears.

NOTE

Only when expanding the “INSTRUCTION LEVEL”, it is possible to use local variables. However, when “PROHIBIT” is set to (COB TENT DISPLAY), the number of local variables cannot be confirmed or changed.

Refer to “8.12 Instruction Level Setting” of “YRC1000 INSTRUCTIONS” (RE-CTO-A221) for details on setting the language level. Refer to chapter 5.8 “Prohibit Displaying the Contents of a Job” for setting the displaying of a job contents.
6. Input the number of variables.
7. Press [ENTER].
   – The number of local variables are set.
3.9 Other Job-editing Functions

3.9.6 Search

When editing or checking, jobs and steps can be searched for. Search can be done when the cursor is in either the address or instruction area on the JOB CONTENT window.

1. Select {JOB} under (Main Menu).
2. Select {JOB}.
   – The JOB CONTENT window appears.
3. Select {EDIT} under the menu.
   – The pull-down menu appears.
4. Select {SEARCH}.
   – The selection dialog box appears.
5. Select the search type.

Search is an operation by which the cursor is moved to a specific step or instruction in the edit job. The desired item can be instantly searched for without using the cursor.
3.9 Other Job-editing Functions

3.9.6.1 Line Search

This function moves the cursor to the desired line number.

1. Select (EDIT), (SEARCH) and “LINE SEARCH”.
   – The number can be entered.

2. Input desired line number.

3. Press [ENTER].
   – The cursor is moved to the line number and the window appears.
3.9.6.2 Step Search

This function moves the cursor to the desired step number (move instruction).

1. Select {EDIT], {SEARCH} and “STEP SEARCH”.
   – The number can be entered.

2. Input desired step number.

3. Press [ENTER].
   – The cursor is moved to the input step and the window appears.
3. Teaching

3.9 Other Job-editing Functions

3.9.6.3 Label Search

This function searches for the desired label and the instruction using that label.

1. Select {EDIT}, {SEARCH} and “LABEL SEARCH”.
   – The characters can be entered.

2. Input desired label name.
   – For information on character input operation, refer to chapter 1.2.6 “Character Input Operation”.
   – At this time, search can be conducted by entering any one character of the label. For example, to search for the “START” label, enter only “S”, and the search can be done.

3. Press [ENTER].
   – The cursor is moved to the desired label and the window appears.
4. Use the cursor to continue search.

- While searching, forward search and backward search are possible by pressing the cursor.
- To end search, select (EDIT) → {END SEARCH} on the menu and press [SELECT].
This function moves the cursor to a desired instruction.

1. Select {EDIT}, {SEARCH} and "INSTRUCTION SEARCH".
   – The INFORM command list appears.
2. Select desired instruction group.
3. Select desired instruction.
   – The cursor is moved to the selected instruction and the window appears.
4. Use the cursor to continue search.
   
   – While searching, forward search and backward search are possible by pressing the cursor.
   
   – To end search, select (EDIT) → (END SEARCH) on the menu and press [SELECT], or press [CANCEL].
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3.9 Other Job-editing Functions

3.9.6.5 Tag Search

This function moves the cursor to the desired tag.

1. Select {EDIT}, {SEARCH} and "TAG SEARCH".
   – The instruction list dialog box appears.

2. Select desired instruction group.

3. Select desired instruction for which the tag is to be searched.

   – The tag list dialog box for selected instruction appears.
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3.9 Other Job-editing Functions

4. Select the desired tag.
   - The cursor is moved to the selected tag and the window appears.

5. Use the cursor to continue search.
   - While searching, forward search and backward search are possible by pressing the cursor.
   - To end search, select {EDIT} → (END SEARCH) on the menu and press [SELECT], or press [CANCEL].
### 3.9.6.6 Current-Position Neighbor Search

This function searches for a teaching point adjacent to the current position of the manipulator.

1. **Select** {EDIT}, {SEARCH} and “CURRENT-POS NEIGHBOR SEARCH”.
   - The number can be entered.

2. Enter the numerical value of the pulse range where the teaching point is searched.
   - Specify the pulse range so that the teaching point is present in the range from the value: the current position of the manipulator minus the pulse range, to the value: the current position of the manipulator plus the pulse range.
3. Press [ENTER].

- The cursor moves to the step where all axes of the control group included in the job are present in the range from the value: the current feedback pulse minus the pulse range, to the value: the current feedback pulse plus the pulse range.

4. Use the cursor to continue search.

- While searching, forward search and backward search are possible by pressing the cursor [↑] [↓].

- To end search, select {EDIT} → {END SEARCH} on the menu and press [SELECT], or press [CANCEL].
4 Playback

4.1 Preparation for Playback

4.1.1 Selecting a Job

Playback is the act of executing a taught job. Before playback operation, first call the job to be executed.

4.1.1.1 Calling a Job

1. Select (JOB) under (Main Menu).

2. Select (SELECT JOB).
   - The JOB LIST window appears.

3. Select the desired job.
4.1.2 Registering the Master Job

If a particular job is played back frequently, it is convenient to register that job as a master job (master registration). A job registered as the master job can be called more easily than the method described on the preceding page.

**NOTE**

Only one job can be registered as the master job. Registering a master job automatically cancels the previously registered master job.

Be sure to register a master job in the teach mode.

1. Select {JOB} under {Main Menu}.
2. Select {MASTER JOB}.
   - The MASTER JOB window appears.
3. Press [SELECT].
   - The selection dialog box appears.
4. Preparation for Playback

4.1 Preparation for Playback

4. Select (CALL MASTER JOB).
   – The JOB LIST window appears.

5. Select a job to be registered as a master job.
   – The selected job is registered as the master job.
4.1.3 Calling the Master Job

This operation is to call a master job. The job can be called in the JOB CONTENT window, PLAYBACK window, JOB SELECT window, or the MASTER JOB window.

- ** Calling from the JOB CONTENT, PLAYBACK, JOB SELECT Window

  1. Select {JOB} under the menu.

  2. Select {MASTER JOB}.

     - The master job is called, and the JOB CONTENT window appears.

- **Calling from the MASTER JOB Window

  1. Select {JOB} under {Main Menu}.


4. Playback
4.1 Preparation for Playback

2. Select (MASTER JOB).
   – The MASTER JOB window appears.

3. Press [SELECT].
   – The selection dialog box appears.

4. Select (CALL MASTER JOB).
   – The master job is called, and the JOB CONTENT window (during the teach mode), or the PLAYBACK window (during the play mode) appears.
4.1.2 The PLAYBACK Window

When the mode switch on the programming pendant is switched to “PLAY” while displaying the JOB CONTENT window, the PLAYBACK window appears.

A. Job Content

The cursor moves according to the playback operation. The contents are automatically scrolled as needed.

B. Speed Adjustment Settings

Displayed when the speed override is set.

C. Cycle Time

Displays the operating time of the manipulator. Each time the manipulator is started, the previous cycle time is reset, and a new measurement begins. Either showing or hiding the cycle time display is selectable.

D. Measure Start

First step in the measurement. Measurement starts when the lamp of [START] lights up and the playback starts.

E. Playback Time

Displays the time from the beginning to the end of the measurement. Measurement ends when the manipulator stops and the lamp of [START] turns off.
4.1 Preparation for Playback

4.1.2.1 Display of Cycle Time

Follow the procedure below to set whether or not to display the cycle time on the PLAYBACK window.

1. Select {DISPLAY} under the menu.
2. Select {CYCLE TIME}.
   - The cycle time is displayed.
   - Repeat the same operation to hide the cycle time display.

4.1.2.2 Operation Cycle

There are three types of manipulator operation cycles:

- **AUTO** : Repeats a job continuously.
- **1 CYCLE** : Executes a job once. If there is a called job during execution, it is performed, after which the execution processing returns to the original job.
- **1 STEP** : Executes one step (instruction) at a time.

The operation cycle can be changed as follows:

1. Select {JOB} under {Main Menu}, and then select {CYCLE}.
2. Select the operation cycle to be changed.
   - The operation cycle is changed.
4  Playback
4.1  Preparation for Playback

Automatic Setting for Operation Cycle
Automatic setting of the operation cycle can be changed by the following operation.

This can be done in the management mode only.

1. Select {SETUP} under {Main Menu}.
2. Select {OPERATE COND}.
   – The OPERATING CONDITION window appears. Use the cursor to scroll the screen.

3. Select the desired operation.
   – The selection dialog box appears.

“NONE” setting
The operation cycle is not changed when “NONE” is set. For example, if the setting is “CYCLE SWITCH IN PLAY MODE = NONE”, the operation cycle is maintained even after switching to the play mode.
4. Select a cycle.

– The operation cycle when switching modes is set.
4.2 Playback

4.2.1 Playback Operation

After checking to be sure there is no one near the manipulator, start the playback operation by following the procedures below.

Playback is the operation by which the taught job is played back. Follow the procedures below to start the playback operation.

<table>
<thead>
<tr>
<th>Mode Switch on the programming pendant</th>
<th>Job is started up by</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLAY</td>
<td>[START] on the programming pendant</td>
</tr>
<tr>
<td>REMOTE</td>
<td>Peripheral device (external start input)</td>
</tr>
</tbody>
</table>

To perform playback by using the programming pendant, follow the procedures below.

4.2.1.1 Selecting the Start Device

1. Set the Mode Switch on the programming pendant to "PLAY".
   – The play mode is enabled so that the job is started up by the programming pendant.

4.2.1.2 Servo On

1. Press [SERVO ON READY].
   – The YRC1000 servo power turns ON and the “SERVO ON” lamp on the programming pendant lights up.

4.2.1.3 Start Operation

1. Press [START].
   – The lamp of [START] lights up and the manipulator starts operation.
4.2 Special Playback Operations

The following special operations can be performed during playback:

- Low speed operation
- Limited speed operation
- Dry-run speed operation
- Machine lock operation
- Check mode operation
- Weaving prohibited operation

Two or more special operations can be performed at the same time. If multiple operations are selected, the speed during playback is limited to the speed of the slowest operation. Settings for special operations are done in the SPECIAL PLAY window.

When the PLAYBACK window is displayed, move the cursor to the menu area and select (UTILITY) → (SPECIAL PLAY). The SPECIAL PLAY window appears.

4.2.2.1 Low Speed Operation

The manipulator moves at low speed during the first step after starting.

After the operation of this step, the manipulator stops regardless of the selection of the operation cycle and then low speed operation is canceled.

During/After one step operation, pressing [START] allows the manipulator to move at the taught speed from the next step.

1. Select “LOW SPEED START” on the SPECIAL PLAY window.
   - The setting alternates between "VALID" and "INVALID".
2. Select “COMPLETE”.
   - The window returns to the PLAYBACK window.
4.2.2.2 Limited Speed Operation

The manipulator operates within the limited speed for the teach mode. Usually, the limited speed is set to 250 mm/s at the TCP and the flange. For the step in which the speed at the TCP is 250 mm/s or less, operation is performed at the taught playback speed.

1. Select “SPEED LIMIT” under the SPECIAL PLAY window.
   – The setting alternates between “VALID” and “INVALID”.
2. Select “COMPLETE”.
   – The window returns to the PLAYBACK window.

4.2.2.3 Dry-Run Speed Operation

The dry-run speed is a constant speed that is independent of the speed used for teaching, and the dry-run speed is usually 10% of the maximum speed. The manipulator executes all the steps at the constant speed, which is convenient for quick check of a job consisting of slow operations.

Be careful of steps programmed at lower speeds than the dry-run speed, because they are executed at greater speeds than programmed.

1. Select the “DRY-RUN SPEED” under the SPECIAL PLAY window.
   – The setting alternates between “VALID” and “INVALID”.
2. Select “COMPLETE”.
   – The window returns to the PLAYBACK window.

Fig. 4-1: Safety Speed and Dry-Run Speed
4.2 Playback

4.2.2.4 Machine Lock Operation

A job is played back without moving the manipulator to check the status of input and output.

1. Select “MACHINE LOCK” under the SPECIAL PLAY window.
   − The setting alternates between “VALID” and “INVALID”.
2. Select “COMPLETE”.
   − The window returns to the PLAYBACK window.

- The setting of “MACHINE LOCK” is maintained even after the mode is switched: If the machine lock is set to “VALID” in the teach mode, it is still “VALID” after switching to the play mode. The same applies when the mode is switched from the play mode to the teach mode.
- Note that the machine lock becomes “INVALID” if the following operation is performed.
  • Execution of “CANCEL ALL SELECT” in the SPECIAL PLAY window.
  • Turning OFF the main power supply.
  • When executing “MACHINE LOCK”, select {SETUP} → {PLAYBACK COND.}. And set “CHECK/MACHINE LOCK” to “PERMIT”.

4.2.5 Check Mode Operation

The machine runs without issuing work instructions, such as the ARCON instruction. It is used primarily to check the path of the program.

1. Select “CHECK-RUN” under the SPECIAL PLAY window.
   − The setting alternates between “VALID” and “INVALID”.
2. Select “COMPLETE”.
   − The window returns to the PLAYBACK window.

- When executing “CHECK-RUN”, select {SETUP} → {PLAYBACK COND.}. And set “CHECK/MACHINE LOCK” to “PERMIT”.

4.2.6 Weaving Prohibited Operation

The weaving operation is not executed in the weaving section of the job.

1. Select “WEAV PROHIBIT” under the SPECIAL PLAY window.
   − The setting alternates between “VALID” and “INVALID”.
2. Select “COMPLETE”.
   − The window returns to the PLAYBACK window.
4.2.7 Cancel All Special Operations

All special operations are disabled by the following operation:

1. Select {EDIT} from the menu.
2. Select “CANCEL ALL SELECT”.
   – The message “All special functions canceled” appears.

```
NOTE
Special operations are also automatically canceled if the main power supply is shut OFF.
```


4.3 Stop and Restart

The manipulator or JOB in operations stops in the following conditions:

- Hold
- Emergency stop
- Stop by alarm
- Stop by other causes

4.3.1 Hold

By the hold operation, the JOB stops temporarily.

4.3.1.1 Using the Programming Pendant

- **Hold**
  1. Press [HOLD] on the programming pendant.
  2. The manipulator stops temporarily. The lamp on [HOLD] lights up while [HOLD] is held down.

4.3.1.2 Using an External Input Signal (System Input)

- **Hold**
  1. Turn ON the hold signal from an external input (system input).
     - The manipulator stops temporarily.
     - The output signal "HOLD" turns ON.
     - The programming pendant [HOLD] lamp lights up.

- **Release**
  1. Turn off the hold signal from an external input (system input).
     - Hold is released.
     - To restart the operation, press [START] or turn ON the external input signal (system input). The manipulator restarts its operation from the position where it was stopped.

SUPPLEMENT

During the hold operation, the lamp on [START] turns OFF.
4.3 Stop and Restart

4.3.2 Emergency Stop

At an emergency stop, the servo power supply that drives the manipulator is turned OFF and the manipulator stops immediately. An emergency stop can be performed by using either of the following:

- Button on the Front Door of the YRC1000
- Programming pendant
- External input signal (system input)

**Emergency Stop**

1. Press the emergency stop button.  
   - The servo power turns OFF and the manipulator stops immediately.
   - On the front door of the YRC1000:
   - On the programming pendant:

Using the Emergency Stop Button on the Programming Pendant

Using the External Input Signal (System Input)

**Release**

1. Turn the emergency stop button in the direction of the arrows.

   - On the front door of the YRC1000:
   - On the programming pendant:
   - To turn ON the servo power supply again, press [SERVO ON READY] and then grip the Enable Switch of the programming pendant.
4.3.2.1 Restart After Emergency Stop

**CAUTION**

- Prior to restarting the manipulator's operation after an emergency stop, confirm the position of the manipulator by using FWD, etc., and make sure that there is no interference between the manipulator and the workpiece or fixture.
- When an emergency stop is performed during a high-speed operation of consecutive steps, the manipulator may stop two or three steps before the displayed step. If the manipulator's operation is restarted under such conditions, the manipulator may interfere with the workpiece or fixture.

4.3.3 Stop by Alarm

If an alarm occurs during operation, the manipulator stops immediately and the ALARM window appears on the programming pendant indicating that the machine was stopped by an alarm.

- If more than one alarm occurs simultaneously, all alarms can be viewed on the window. Scroll down the viewing area of the window when necessary.

The following operations are available in the alarm status: window change, mode change, alarm reset, and emergency stop. To display the ALARM window again when the window is changed during alarm occurrence, select {SYSTEM INFO} and then {ALARM HISTORY} under {Main Menu}.
Releasing Alarms

<MInor Alarms>
1. Press [SELECT].
   - Select “RESET” under the ALARM window to release the alarm status.
   - When using an external input signal (system input), turn ON the “ALARM RESET” setting.

<Major Alarms>
1. Turn OFF the main power supply and remove the cause of the alarm.
   - If a severe alarm such as hardware failure alarm occurs, the servo power is automatically shut off and the manipulator stops. If releasing does not work, turn OFF the main power and correct the cause of the alarm.

4.3.4 Others

4.3.4.1 Temporary Stop by Mode Change
When the play mode is switched to the teach mode during playback, the manipulator stops immediately.

To restart the operation, return to the play mode and perform a start operation.

4.3.4.2 Temporary Stop by the PAUSE Instruction
When the PAUSE instruction is executed, the manipulator stops operating.

To restart the operation, perform a start operation. The manipulator restarts from the next instruction.
4.4 Modifying Play Speed

4.4.1 Speed Override

Speed modifications using the speed override have the following features:

- Speed can be modified during playback. The job can be played back at various speeds until the play speed is properly adjusted.
- Speed can be increased or decreased by a ratio of the current play speed. The ratio settings range from 10% to 150% in increments of 1%. Therefore, it is convenient when, for example, all play speed settings are to be increased by 150% at the same time.

The operation flow is shown below.

Start speed override

Call job to perform speed override

Set speed override (Speed data modify: OFF, specify the ratio)

Start playback

Adjust the ratio during playback if needed

YES

Reset and playback?

NO

Modify?

YES

Call job to perform speed override

Set speed override (Speed data modify: ON, specify the ratio)

Start playback

Modify play speed simultaneously

(1cycle completed)

End

Changes experimentally, without modifying registered speed

Modifies play speed

(NO)

YES

Modify?
4.4 Modifying Play Speed

4.4.1 Setting Speed Overrides

1. Select {UTILITY} under the menu in the PLAYBACK window.

2. Select {SPEED OVERRIDE}.
   - The PLAYBACK window shows the speed override status.

3. Select “ON” or “OFF”.
   - Each time [SELECT] is pressed, “ON” and “OFF” alternate.
   - Select “ON” to modify the registered play speed during playback.
   - When “OFF” is selected, the registered play speed is not modified. To change the play speed temporarily (for example, to experiment with various speeds), select “OFF”.

4. Line up the cursor with the override ratio and move the cursor up and down to change the ratio.
   - If you want to input the ratio number directly, move the cursor to the override ratio and press [SELECT].
   - The number input line appears. Input the override ratio using the [Numeric Keys].
4.4 Modifying Play Speed

4.4.1.2 Modifying Play Speed

1. Set speed override.
2. Playback the manipulator.
   - The play speed is increased or decreased in the set ratio.
   - When setting “MODIFY” to “ON”, the step's play speed is modified when each step is reached.
   - When one cycle is completed by the END instruction, the speed override setting is canceled.

```
- Assuming that the manipulator moves from step 1 to step 2, the play speed of step 2 is not modified if the speed override is canceled before reaching step 2.
- The play speed after the modification by the speed override is limited by the maximum and the minimum speed of manipulator.
- When the safety speed operation is commanded with the setting of “MODIFY: ON”, the manipulator operates at the safety speed. However, the play speed in memory is modified as set by the speed override.
- Play speed set by the SPEED instruction is not modified.
```

4.4.1.3 Canceling Speed Override Settings

1. Select {UTILITY} under the menu in the PLAYBACK window.
2. Select {SPEED OVERRIDE}.
   - The setting of the speed override ratio is canceled.
   - If canceled, the speed ratio setting is not displayed on the PLAYBACK window.

The speed override settings are automatically canceled in the following cases:

```
- When dry-run speed operation is set.
- When the mode is changed to any mode other than the play mode.
- When an alarm occurs.
- When one cycle operation is completed with the END instruction.
- When the power supply is turned OFF.
```
4.4.2 Specification for Speed Override in AUTO Cycle Operation

4.4.2.1 Functional Overview

This specification allows the manipulator to temporarily change its operation speed during playback.

The operation speed is specified by setting the Speed Override percentage (1 to 100% in increments of 1%) for the operation speed (play speed) specified in the current job.

This function also enables an automatic setting of the Speed Override function when changing modes from TEACH to PLAY.

Speed Override function can be performed with this specification by setting the parameter S2C701.

4.4.2.2 Setting the Speed Override Function

NOTE

Set the mode selection switch to PLAY.

1. Select {JOB} under {Main Menu}, and press {JOB}.

   – The PLAYBACK screen appears.

   - Select {JOB} under {Main Menu}, and press {JOB}.

   - The PLAYBACK screen appears.

   - Select {JOB} under {Main Menu}, and press {JOB}.

   - The PLAYBACK screen appears.
4 Playback

4.4 Modifying Play Speed

2. Select {UTILITY} in the Menu Area.

![Menu Area Image]

3. Select {SPEED OVERRIDE}.

![Menu Area Image]

- The Speed Override setting is enabled. (As shown below, an asterisk "*" appears beside {SPEED OVERRIDE}, and "SPEED ADJUSTMENT" appears in the input buffer line.)

![Menu Area Image]
4. Set the override ratio.

(1) Move the cursor to highlight the RATIO edit box.
(2) Hold [SHIFT] and press the cursor (up or down) to modify the percentage.

- To directly enter the value, perform the following:
  (1) Move the cursor to highlight the RATIO edit box, and press [SELECT].
  (2) Enter the desired percentage using [Numeric Key] pad.
  (3) Press [ENTER].

5. Setting completed.

4.4.2.3 Performing the Speed Override Function

Set the mode selection switch to PLAY.

1. Start the job.
   - Press [START]

2. Speed Override is executed.
   - The manipulator moves in the specified speed percentage.
4.4.2.4 Modifying the Speed Override Percentage

1. Modify the override ratio.
   - Highlight the RATIO edit box, and hold [SHIFT] and press the cursor (up or down) when SPEED ADJUSTMENT is displayed in the input buffer line.
   - Note: The value is increased or decreased by 1% increments.

2. Modification completed.
   - The manipulator moves in the specified speed percentage.

• Set the mode selection switch to PLAY.
• This operation can be performed during playback.
4.4.2.5 Disabling the Speed Override Function

1. Select {UTILITY} in the Menu Area.

2. Select {"SPEED OVERRIDE"}.

– The Speed Override function is disabled. (As shown below, the asterisk beside {SPEED OVERRIDE} and the "SPEED ADJUSTMENT" input buffer line disappears)
4.4 Modifying Play Speed

3. Operation completed.
   – Additionally, the Speed Override function is automatically disabled when:
     • Setting the Dry-Run Speed mode.
     • Changing the mode to any mode other than PLAY.
     • Alarm or error occurs.
     • Power is turned OFF.

4.4.2.6 Enabling an Automatic Setting of Speed Override

The function is enabled by setting the parameter S2C702.

This function allows Speed Override to be automatically set when the operation mode is changed from TEACH to PLAY. The percentage corresponds to the manual speed selected during the TEACH mode.

<table>
<thead>
<tr>
<th>Manual Speed</th>
<th>Applicable Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inching</td>
<td>Maximum jog operation link speed × S1CxG045</td>
</tr>
<tr>
<td>Low</td>
<td>Maximum jog operation link speed × S1CxG045</td>
</tr>
<tr>
<td>Medium</td>
<td>Maximum jog operation link speed × S1CxG046</td>
</tr>
<tr>
<td>High</td>
<td>Maximum jog operation link speed × S1CxG047</td>
</tr>
</tbody>
</table>

4.4.2.7 Manual Speed in the TEACH Mode

The function is enabled by setting the parameter S2C699.

The manual speed (inching, low, medium, and high) in the TEACH mode is changed by using [MANUAL SPEED] on the programming pendant.

The manual speed is automatically set at LOW when:
   • Changing modes from PLAY to TEACH.
   • Changing coordinate system in the TEACH mode.
   • Turning OFF the SERVO power in the TEACH mode.
### 4.4.2.8 Parameter

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Details</th>
<th>Setting Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2C699</td>
<td>Automatic change of manual speed to LOW</td>
<td>Automatically sets the manual speed to LOW.</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td></td>
<td><img src="" alt="Diagram" /></td>
<td></td>
</tr>
<tr>
<td>S2C701</td>
<td>Speed Override setting</td>
<td>Specifies the usage of Speed Override. 0: Disables continuous cycle operation; Enables speed modification (standard specification). 1: Enables the Continuous Cycle operation; Disables speed modification.</td>
<td>0</td>
</tr>
<tr>
<td>S2C702</td>
<td>Automatic Speed Override Setting 1 in mode change (When S2C701 = 1)</td>
<td>Specifies whether to automatically set Speed Override when the mode is changed to PLAY. 0: Disables Speed Override. 1: Sets the percentage corresponding to the manual speed.</td>
<td>0 to 1</td>
</tr>
<tr>
<td>S2C709</td>
<td>Automatic Speed Override Setting 2 in mode change (When S2C701 = 1)</td>
<td>Specifies whether to automatically set Speed Override when the mode is changed to PLAY. 0: Disables Speed Override. 1: Sets the percentage applied last time.</td>
<td>0 to 1</td>
</tr>
</tbody>
</table>
4.4.3 Specification for Speed Override with Input Signals

4.4.3.1 Functional Overview

This specification allows the manipulator to temporarily change its operation speed during playback using the external input signals. The operation speed is specified by setting the speed override percentage (1 to 255% in increments of 1%) for the operation speed (play speed) specified in the current job.

Fig. 4-2: Play Speed and Override Speed

- The speed override function can be continued in the auto cycle operation.
- The play speed data of the job will not be modified.
- The maximum and minimum manipulator speeds limit the play speed modified by speed override.
4.4.3.2 Performing the Speed Override Function

1. Playback a job.
2. Input the external signals for Speed Override.
   - The message “Over-riding speed” and the Speed Override percentage appears on the screen.
3. Speed Override is executed.
   - The manipulator moves in the specified speed percentage.

4.4.3.3 Disabling the Speed Override Function

Speed Override is disabled when:

- External signals are OFF.
- Changing modes from PLAY to TEACH.
4.4 Modifying Play Speed

4.4.3.4 Parameters

The Override Speed percentage can be specified with the parameters (S4C288 to S4C295) in two ways as follows:

Setting a Speed Percentage with Respect to Each Signal

- Specify the speed percentage 1 to 255 in the parameters (S4C288 to S4C295). As to the speed percentage for unused signals, set "0": Speed Override will not take effect even when the external signals are input.
- The signal priority is: "Signal 1 > Signal 8". For example, when the signals 1 to 3 are input simultaneously, Speed Override will be performed applying the speed percentage of signal 1.

Using Eight Points of External Signals as the Speed Percentage Data

- Set "0" for all the parameters (S4C288 to S4C295).
- Speed Override will be performed applying the input status of signals 1 to 255 as the speed percentage. For example, when the signals 5 and 7 are input simultaneously, Speed Override will be performed applying 80% of the speed percentage.

The Override Speed percentage can be specified with the parameters (S4C288 to S4C295) in two ways as follows:

Setting a Speed Percentage with Respect to Each Signal

- Specify the speed percentage 1 to 255 in the parameters (S4C288 to S4C295). As to the speed percentage for unused signals, set "0": Speed Override will not take effect even when the external signals are input.
- The signal priority is: "Signal 1 > Signal 8". For example, when the signals 1 to 3 are input simultaneously, Speed Override will be performed applying the speed percentage of signal 1.

Using Eight Points of External Signals as the Speed Percentage Data

- Set "0" for all the parameters (S4C288 to S4C295).
- Speed Override will be performed applying the input status of signals 1 to 255 as the speed percentage. For example, when the signals 5 and 7 are input simultaneously, Speed Override will be performed applying 80% of the speed percentage.

When this function is enabled, Speed Override cannot be operated with a programming pendant.
4.5 Playback with Reserved Start

4.5.1 Preparation for Reserved Start

In the reserved start function, jobs registered at different stations are played back in the reserved order using the start buttons on the stations.

For example, in the case where three stations handle three different workpieces, as shown in the illustration above, the jobs would be registered as follows:

- Job 1 is registered to process workpiece 1 at Station 1
- Job 2 is registered to process workpiece 2 at Station 2
- Job 3 is registered to process workpiece 3 at Station 3

To play back the jobs, prepare workpiece 1 and press the start button on Station 1. The manipulator executes Job 1. Prepare workpieces 2 and 3 while Job 1 is being executed, and press the start buttons on Stations 2 and 3. Even if Job 1 is being executed at that time, jobs on different stations are reserved in the order that the start buttons have been pressed, and will be executed in that order.

During playback, the status of the reservation can be checked on the start reservation window.
4.5 Playback with Reserved Start

4.5.1.1 Enabling Reserved Start

The start button on the station is operative when the reserved start function is enabled, and the following start operations are disabled.

- [START] on the programming pendant
- Start operation from external input signal (system input)

The FUNCTION ENABLE SETTING window is shown only when the security mode is set to the management mode.

1. Select (SETUP) under (Main Menu).
2. Select (OPERATE COND).
   - The OPERATING CONDITION window appears.
   - The screen is scrolled up/down by the cursor when it locates at the top/bottom of the items.
3. Select “RESERVED START”.
   - Each time [SELECT] is pressed, “PERMIT” and “PROHIBIT” alternate. Select “PERMIT”.

When the reserved start is enabled, the external start and the programming pendant start are prohibited even if setting is “PERMIT” in the OPERATE ENABLE SETTING window. Regardless of the operation cycle selected, it is automatically set to “1 CYCLE”.

NOTE
4.5 Playback with Reserved Start

4.5.1.2 Registering Reserved Start I/O Signal

Register the start I/O signal as a preparation to perform the start operation from the station.

**NOTE**

This operation can be done only when the operation mode is set to the teach mode and the security mode is set to the management mode, and only when the setting of "RESERVED START JOB CHANGE" is "PERMIT" in the FUNCTION ENABLE SETTING window.

1. Select {SETUP} under {Main Menu}.
2. Select {RES. START(CNCT)}.
   – The RESERVED START (CNCT) window appears.

3. Select “START IN” or “START OUT” for each station.
   – The number can now be entered.
4.5 Playback with Reserved Start

4. Input signal number and press [ENTER].
   – The input/output signal number is registered.

4.5.1.3 Registering Jobs to Stations

Register the starting job of each station.

**NOTE**
This operation can be done only when the operation mode is set to the teach mode and the setting of "RESERVED START JOB CHANGE" is "PERMIT" in the FUNCTION ENABLE SETTING window.

1. Select (JOB) under (Main Menu).
2. Select (RES. START(JOB)).
   – The RESERVED START (JOB) window appears.
   – ● indicates that the input/output number is registered.
   – ○ indicates that the input/output number is not registered.
3. Select the job name for each station.
   – The selection dialog box appears.

4. Select “SETTING START JOB”.
   – The JOB LIST window appears.

5. Select a job.
   – The starting job is registered.
4.5 Playback with Reserved Start

4.5.1.4 Deleting Registered Jobs from Stations

Delete the registered job of each station.

This operation can be done only when the operation mode is set to the teach mode and the setting of “RESERVED START JOB CHANGE” is “PERMIT” in the FUNCTION ENABLE SETTING window.

1. Select (JOB) under (Main Menu).
2. Select (RES. START(JOB)).
   – The RESERVED START (JOB) window appears.
3. Select the “JOB NAME” of the station to be deleted.
   – The selection dialog box appears.
4. Select “CANCEL START JOB”.
   – The registered job is deleted.
4.5 Playback with Reserved Start

4.5.2 Playback from Reserved Start

- While the job is being executed, the start button lamp on the station lamps.
- If the workpiece must be prepared at the station, prepare it before pressing the start button.
- During the execution of a job for one station, if the start button of another station is pressed, the job of the latter station is reserved and prepared to start. Jobs are reserved and executed in the order that the start buttons have been pressed.
- When a job is reserved, the start button lamp on the station blinks.
- No station job is reserved when it is being executed even if its start button is pressed.
- To suspend a job being executed, perform the Hold operation.

NOTE

4.5.2.1 Start Operation

1. Set the Mode Switch of the programming pendant to "PLAY".
   - The play mode is set.
2. Press start button on the station.
   - The job registered for the station starts up and the manipulator performs one cycle operation.

RESERVATION

Reservations are canceled when the start button is pressed again during the job reservation operation.
4.5.2.2 Checking Job Reservation Status

The job reservation status during playback can be checked.

1. Select {JOB} under {Main Menu}.
2. Select {RES. STATUS}.

→ The RESERVATION STATUS window appears.

**A. STATUS**
Reservation status is displayed.
STARTING: Indicates the station currently working.
STOP: Indicates any station where work has been temporarily stopped by a hold operation.
RESERVE1, RESERVE2, ...: Indicates the order in which jobs have been reserved for start.

**B. START IN**
Input signal status is displayed.
“●”: Input signal ON
“○”: Input signal OFF
4.5.2.3 Resetting Job Reservation

**NOTE**
If “STARTING” is displayed, the job cannot be reset.

1. Select {JOB} on the RESERVATION STATUS window.

2. Select {RESET RESERVATION} or {RESET ALL}.
   - When {RESET RESERVATION} is selected, job reservation stated to “RESERVE” is reset.
   - When {RESET ALL} is selected, job reservation stated to “STOP” and “RESERVE” is reset.

   ![Image of the RESERVATION STATUS window](image_url)

   – The confirmation dialog box appears.

   ![Image of the confirmation dialog box](image_url)

   3. Select “YES”.

   All job reservations are reset automatically in the following conditions:

   **NOTE**
   - When the reserved start sets to “PROHIBIT”. (When “RESERVED START” is set to “PROHIBIT” on the FUNCTION ENABLE SETTING window.)
   - When another job is called or an edit operation is performed.
4.5.3 Hold Operation

Hold operation causes the manipulator to stop all motion. It can be performed by the following buttons or signal.

- [HOLD] on the programming pendant
- External Input Signal (system input)
- Hold button for the station axis

During the hold operation, the lamp on [START] turns OFF.

4.5.3.1 [HOLD] on the Programming Pendant

- **Hold**
  1. Press [HOLD] on the programming pendant.
  - The manipulator stops temporarily.
  - The [HOLD] lamp lights while the [HOLD] button is held down.

- **Release**
  1. Press the start button on the suspended station.
  - The manipulator restarts its operation from the position where it was stopped.

4.5.3.2 Hold by External Input Signal (System Input)

- **Hold**
  1. Input ON signal to the external input (system input) specified for the hold operation.
  - The manipulator stops temporarily.
  - The hold lamp for the external output signal lights.
  - The [HOLD] lamp on the programming pendant lights and the [START] lamp turns OFF.

- **Release**
  1. Input OFF signal to the external input (system input) specified for the hold operation.
  - Hold is released.
  2. To continue the operation, press the start button on the suspended station.
  - The manipulator restarts its operation from the position where it was stopped.
4.5.3.3 Hold at the Station

- **Hold**
  1. Press the hold button on the station.
     - The manipulator stops temporarily.

- **Release**
  1. Press the hold button on the suspended station.
     - Hold is released.
     - Press the start button on the station, then the manipulator restarts its operation from the position where it was stopped.

Pressing the start button on a station that is not in the Hold status does not start manipulator operation. The job registered for the station is reserved or the reservation, if it has been made, is canceled.
4.6 Displaying Job Stack

During the execution of the series of jobs that combined with CALL or JUMP instructions, the job stack can be displayed to check where the current job is and how many jobs are left.

1. Select \{DISPLAY\} under the menu on the PLAYBACK window.
2. Select {JOB STACK}.

- The job stack status dialog box appears.
- To close the job stack status dialog box, select {DISPLAY} and then {JOB STACK} under the menu again.

- For above example, the playback of “Job C” is being executed and “Job C” is called from “Job B”. Also, “Job B” is called from “Job A”.

If any of the following operations are performed, the job stack is canceled.

- Creating a new job
- Calling the master job
- Selecting jobs
- Copying and renaming jobs
- Job conversion
  (relative job conversion, parallel shift job conversion, mirror shift job conversion)
- Editing the job header window
  (change of axis operation control group, change the coordinate display)
- Displaying jobs by operating the direct open function
- The operation of UNDO and REDO
- Four point teaching
- Executing TRT
5 Editing Jobs

This section explains how to manage the jobs without moving the manipulator. Copying, deleting, and modifying of the jobs can be done only in the teach mode. Other operations can be done in any mode.

NOTE
Edit operations are restricted when the edit lock is applied.

Editing Move Instructions
See chapter 3 “Teaching” for basic information on editing move instructions.

• It is not possible to add, delete, or modify move instructions which have position data. See chapter 3.4 “Modifying Steps” for details.

• The following MOV instruction edit operations are explained in this section:

For move instructions:
• Insertion, deletion, or modification of additional items
• Modification of interpolation type or play speed for move instructions
• Setting, modification, or deletion of UNTIL statements (interruption conditions based on input signals)
• Setting and deletion of NWAIT instructions

For move instructions using position variables:
• Insertion and deletion of move instruction.

NOTE

Refer to chapter 1.2.6 “Character Input Operation” for the character input operation.
5 Editing Jobs
5.1 Copying Jobs

This operation is used to copy registered jobs and use them to create new jobs. It can be done using either the JOB CONTENT window or the JOB LIST window.

5.1.0.1 Copying Jobs on the JOB CONTENT Window

On the JOB CONTENT window, the current edit job becomes the copy source job.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
   – The JOB CONTENT window appears.
3. Select {JOB} → {COPY JOB} under the pull-down menu.
4. Input the job name.
   – Input the new job name.
   – The name of the copy source job is displayed on the input area. It is possible to partially change this name to enter a new name.
5. Press [ENTER].

- The confirmation dialog box appears.
- If “YES” is selected, the job is copied and the new job appears.
- If “NO” is selected, the job copy is not executed, and the process is canceled.
5.1.0.2 Copying Jobs on the JOB LIST Window

On the JOB LIST window, select the copy source job from the registered jobs and specify the copy destination directory.

1. Select {JOB} → {SELECT JOB} under {Main Menu}.
   – The JOB LIST window appears.

2. Move the cursor to the copy source job.

3. Select {JOB} → {COPY JOB} under the pull-down menu.

4. Input the job name.
   – Input the new job name.
   – The name of the copy source job is displayed on the input area. It is possible to partially change this name to enter a new name.
5. Press [ENTER].

- The confirmation dialog box appears.
- If “YES” is selected, the job is copied and the new job appears.
- If “NO” is selected, the job copy is not executed, and the process is canceled.
5.2 Deleting Jobs

This operation is used to delete jobs that are registered on the YRC1000. It can be performed in either the JOB CONTENT window or the JOB LIST window.

5.2.0.1 Deleting Jobs on the JOB CONTENT Window

On the JOB CONTENT window, the current edit job is deleted.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
   
   – The JOB CONTENT window appears.
3. Select {JOB} → {DELETE JOB} under the pull-down menu.
4. Press “YES”.
   
   – The confirmation dialog box appears.
   
   – When “YES” is selected, the edit job is deleted. When deletion is completed, the {JOB LIST} window appears.
   
   – When “NO” is selected, the job deletion is canceled.
5.2.0.2 Deleting Jobs on the JOB LIST Window

On the JOB LIST window, select the job to be deleted from the list of the registered jobs.

1. Select {JOB} → {SELECT JOB} under {Main Menu}.
   - The JOB LIST window appears.

2. Move the cursor to the job to be deleted.

3. Select {JOB} → {DELETE JOB} under the pull-down menu.

4. Press “YES”.
   - The confirmation dialog box appears.
   - When “YES” is selected, the selected job is deleted. When deletion is completed, the JOB LIST window appears.
   - If “NO” or [CANCEL] is selected, the job deletion is canceled and the JOB LIST window appears.

To select all the registered jobs at a time, select (EDIT) from the menu and then select “SELECT ALL”.

5-7
5 Editing Jobs
5.3 Modifying Job Names

This operation is used to modify the name of a job that is registered. The operation can be performed in either the JOB CONTENT window or the JOB LIST window.

5.3.0.1 Modifying Job Names on the JOB CONTENT Window

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
   – The JOB CONTENT window appears.
3. Select {JOB} → {RENAME JOB} under the pull-down menu.

4. Input the job name.
   – Input the new job name.
   – The name of the source job is displayed on the input area. It is possible to partially change this name to enter a new name.
5. Press [ENTER].

- The confirmation dialog box appears.
- When “YES” is selected, the job name is changed and a new job name is displayed.
- When “NO” is selected, the job name is not changed, and the process is canceled.
5 Editing Jobs
5.3 Modifying Job Names

5.3.2 Modifying Job Names on the JOB LIST Window

On the JOB LIST window, select the job whose name is to be modified from the list of the registered jobs.

1. Select {JOB} → {SELECT JOB} under {Main Menu}.
   - The JOB LIST window appears.

2. Move the cursor to the name to be changed.

3. Select {JOB} → {RENAME JOB} under the pull-down menu.

4. Input the job name.
   - Input the new job name.
   - The name of the source job is displayed on the input area. It is possible to partially change this name to enter a new name.
5. Press [ENTER].

- The confirmation dialog box appears.
- When “YES” is selected, the job name is changed and a new job name is displayed.
- When “NO” is selected, the job name is not changed, and the process is canceled.
5.4 Editing Comments

Comments of up to 32 characters can be added to each job to identify each job more specifically. Comments are displayed and edited on the JOB HEADER window.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
3. Select {DISPLAY} under the pull-down menu.
4. Select {JOB HEADER}.
   – The JOB HEADER window appears.

5. Select “COMMENT”.
   – The window for character input appears.

6. Input comments.
   – Input comments.
   – For the jobs that are already registered, comments are displayed on the input area. It is possible to partially change comments to enter new comments.

7. Press [ENTER].
   – The comment on the input area is registered and is displayed on the “COMMENT” area in the JOB HEADER window.
5.5 Job Folder Function

This function enables to classify the jobs in each folder.

The jobs can be classified and displayed, so the visibility improves.

Up to 100 folders, including NONE (no folders), can be registered to this function.

For the folder name, up to 32 one-byte characters can be used.

However, the name of NONE (no folders) cannot be changed.

5.5.1 Displaying Jobs by Folders

5.5.1.1 Operation for Displaying Jobs by Folders

For displaying the jobs by folders, follow the procedures below.

1. Display the {JOB LIST} window.

2. Select {DISPLAY} → {FOLDER} under the pull-down menu.
5 Editing Jobs
5.5 Job Folder Function

- The folder name is displayed at the head of each job.

- Pressing [SELECT] at the folder name enables to hide the jobs registered in the folder.

- On the (JOB LIST) window in which the jobs are displayed by folders, the folders with no jobs are not displayed.

- When the cursor is moved to the folder name while the job details are displayed, all the information is displayed as asterisks **.*
5.5.1.2 Operation for Canceling Displaying Jobs by Folders

For canceling displaying the jobs by folders, follow the procedures below.

1. Display the {JOB LIST} window.

2. Select {DISPLAY} → (*FOLDER) under the pull-down menu.

- The folder name disappears, and only the JOB names are displayed.
5.5.2 Registering Jobs in Folders

This section explains how to set the jobs to the specified folders. A job can be set in the specified folder when creating a new job or by changing the folder after the job creation.

5.5.2.1 Registering Jobs in Folders (At a New Job Creation)

1. Display the NEW JOB CREATE window.

![NEW JOB CREATE window](image)

2. Move the cursor to the folder name field, and then press [SELECT].
   - The JOB FOLDER LIST is displayed.

![JOB FOLDER LIST](image)
3. Move the cursor to the folder name to select, and then press [SELECT].
   - The selected folder name is displayed in the folder name field.

4. Press [ENTER].
   - A JOB is created.

   The folder name is set as NONE or FOLDER001 to 099 before shipment.
5.5.2.2 Changing the Folder Registration of Jobs

The folder in which the created job is registered can be changed to the other folder.

When changing the folder of one job

1. Display the JOB LIST window.
2. Move the cursor to the job whose registered folder is to be changed.
3. Select {JOB} → {FOLDER CHANGE} under the pull-down menu.
   – The JOB FOLDER LIST window appears.
4. Move the cursor to the folder name to which the job is to be moved, and press [SELECT].
5.5 Job Folder Function

- The job is moved to the specified folder.

When changing the folder of multiple jobs
1. Display the JOB LIST window.
2. Move the cursor to the job whose registered folder is to be changed.
3. Press [SHIFT] + [SELECT] to select the job. — Select all jobs to be changed.
4. Select (JOB) → (FOLDER CHANGE) under the pull-down menu.

- The JOB FOLDER LIST is displayed.
5 Editing Jobs
5.5 Job Folder Function

5. Move the cursor to the folder name to which the job is to be moved, and press [SELECT].

- The jobs are moved to the specified folder.

When loading a job from an external memory device, if the loaded job has a folder name and the same name does not exist in the folder names registered in the controller, the folder name of the loaded job will automatically be registered. However, it is necessary to meet the following requirement:

Requirement: Among the 99 folder names except for NONE, there should be a folder with the default value name in which any jobs are not registered.

If there are no folders which meet this requirement, the folder name of the loaded job will be registered to NONE.
When the bilingual function is activated:

- Respective folder names can be registered to the first and second languages.

Example:
The following folder names can be set to FOLDER001:
First language: “FOLDER 1”
Second language: “FOLDER-1”

- When the name of the folder to which the jobs are loaded from an external device is automatically registered, the language of the folder name depends on the language used at loading.
5.5.3 Changing the Folder Name

5.5.3.1 Changing the Folder Name While Displaying Folder List Window

1. Display the JOB FOLDER LIST window.
2. Move the cursor to the folder name to be changed.
3. Select (DATA) → (RENAME(FOLDER)) in the sub-menu.

4. Input the new name of the folder.

– The folder name will be changed.
– The folder name of the job registered in the folder will also be changed.
5 Editing Jobs
5.5 Job Folder Function

5.5.3.2 Changing the Folder Name While Displaying Jobs by Folders in Job List Window

1. Display the jobs by folders in the JOB LIST window.
2. Move the cursor to the folder name to be changed.
3. Select {JOB} → {RENAME(FOLDER)} in the sub-menu.
4. Input the new name of the folder.

– The folder name will be changed.
– The folder name of the job registered in the folder will also be changed.
5.5.4 Changing the Display Order While Displaying Jobs by Folders

The order of the jobs can be changed while the jobs are displayed by folders.

- **Displaying by name**
  1. Select {DISPLAY} → {NAME} in the sub-menu.

- The jobs are displayed in name order for each folder.
5 Editing Jobs
5.5 Job Folder Function

- Displaying by date
  1. Select (DISPLAY) → (DATE) in the sub-menu.

- The jobs are displayed in date order for each folder.
5 Editing Jobs

5.6 Setting Edit Lock on Individual Job Units

In order to prevent inadvertent changes in the registered jobs or data, it is possible to set the edit lock to each job. When the edit lock is ON, the job cannot be edited or deleted.

The edit lock can be set and canceled on the JOB HEADER window.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
3. Select {DISPLAY} under the pull-down menu.
4. Select {JOB HEADER}.
   - The JOB HEADER window appears.

5. Select “EDIT LOCK” and set the edit prohibit.
   - Each time [SELECT] is pressed, the setting alternates between “ON” (edit disabled) and “OFF” (edit enabled).

Setting of the edit lock can be changed only when the security mode is set to the management mode or higher.
5.7 Enabling the Modification of Position Data Only

Even in the edit-locked job, the steps (position data) can be modified.

1. Select {SETUP} under {Main Menu}.
2. Select {TEACHING CONDITION SETTING}.
   - The TEACHING CONDITION SETTING window appears.

3. Select “STEP ONLY CHANGING” and press [SELECT].
   - Each time [SELECT] is pressed, the setting alternates between “PROHIBIT” and “PERMIT”.

The TEACHING CONDITION SETTING window is shown only when the security mode is set to the edit mode or higher.
5.8 Prohibit Displaying the Contents of a Job

Contents of a job can be nondisclosed on a job base. The job whose contents are set to be nondisclosed, “Invisible” is displayed instead of each job except NOP instruction, which comes to the first line of the job, and END instruction, which comes to the last line.

For the job whose contents are set to be displayed, only the name of the job and its control group are displayed on the JOB CONTENT: MASTER window.

Also, the following operations are limited.

- Job editing operation (adding, changing, deleting) cannot be operated.
- The job cannot be deleted, copied, or changed the names.
- Direct open cannot display the contents of the instructions.
- The command position does not appear on the COMMAND POSITION window.
- The job cannot be set as the target of the job conversion.
- The job cannot be edited during playback.

The contents display setting can be done on the JOB HEADER window to each job.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
3. Select {DISPLAY} under the pull-down menu.
4. Select (JOB HEADER).

– The JOB HEADER window appears.

5. Select “CONTENTS DISPLAY” and set to “PROHIBIT”.

The contents display of a job can be changed only when the security mode is set to the management mode or higher.

When “PROHIBIT” is set for “CONTENTS DISPLAY”, the contents of capacity, lines, steps and the number of local variables (Only when expanding the “INSTRUCTION LEVEL”) are not displayed on the JOB HEADER window.

Even if “PROHIBIT” is set for “CONTENTS DISPLAY”, comment, job folder, edit lock and save job can be changed when the edit lock is “ON”.

5-29
5 Editing Jobs

5.8 Prohibit Displaying the Contents of a Job

6. Select {DISPLAY} under the pull-down menu.

7. Select {JOB}.

- The JOB CONTENT window appears. “Invisible” is displayed instead of each job except NOP instruction, which comes to the first line of the job, and End instruction, which comes to the last line, and instructions are displayed in black regardless of the display color condition setting. (Refer to chapter 6.11 “Instruction Display Color Setting Function” for the display color condition setting.) The step No. and the tool No. are displayed on the general-purpose display area as asterisks “*”.

![Image of JOB CONTENT window]

**NOTE**

Edit operation cannot be conducted for the job whose contents are set to be nondisclosed.

Jobs whose contents can be modified during the playback operation, such as a job in the speed modification operation to a move instruction in the speed override function, are possible to be modified even if “CONTENTS DISPLAY” is set to “PROHIBIT”. (Refer to chapter 4.4 “Modifying Play Speed” for the speed override function.)

To prohibit modifying a job during playback, set “EDIT LOCK” to “ON”. (Refer to chapter 5.6 “Setting Edit Lock on Individual Job Units”.)

For a job whose “CONTENTS DISPLAY” is set to “PROHIBIT”, to prohibit saving the job’s data to an external memory device, set “TO SAVE TO FD” to “PROHIBIT”. (Refer to chapter 5.9 “Prohibit: Saving The Job Data”.)
5.9 Prohibit: Saving The Job Data

Data saving can be prohibited on a job base to prevent the job of the YRC1000 from being saved to the external memory device.

Setting "SAVE JOB" to "PROHIBIT" can be set on the JOB HEADER window of each job.

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
3. Select {DISPLAY} under the pull-down menu.
4. Select {JOB HEADER}.
   - The JOB HEADER window appears.

5. Select "SAVE JOB" and set "PROHIBIT".

6. For a job whose "SAVE JOB" is set to "PROHIBIT", the job cannot be saved to an external memory device. Refer to chapter 7.3.0.2 "Saving Data" for saving job data in an external memory device.

When saving a job whose "SAVE JOB" is set to "PROHIBIT" by using data transmission function, high-speed Ethernet server function, FTP function, or MotoPlus function, an error occurs and it cannot be saved. (ERROR 2110 "This data cannot be accessed".)

The save job setting can be changed only when the security mode is set to the management mode or higher.

To prohibit displaying of the contents of a job whose "SAVE JOB" is set to "PROHIBIT", set "CONTENTS DISPLAY" to "PROHIBIT". Refer to chapter 5.8 "Prohibit Displaying the Contents of a Job".
6 Convenient Functions

6.1 One-touch Operation “Direct Open”

6.1.1 Description of Direct Open Function

The direct open function immediately shows the JOB CONTENT window or condition file contents of a job called by the CALL instruction. Move the cursor to the desired job name or condition file name and simply press [DIRECT OPEN] to display the contents of the file. This function can be used for the following window:

- JOB CONTENT window for a job name directly specified by a CALL instruction
- CONDITION FILE window for a file name directly specified by a work instruction
- COMMAND POS window for a move instruction
- I/O window with an I/O instruction (when I/O numbers are specified)

<Example> Example Using Direct Open
6 Convenient Functions
6.1 One-touch Operation "Direct Open"

6.1.2 Direct Open of the JOB CONTENT Window

1. In the JOB CONTENT window, move the cursor to a job name or a condition file.

2. Press [DIRECT OPEN].

   (1) For a job name
   – The lamp on [DIRECT OPEN] blinks, and the JOB CONTENT window appears.
     Direct open can be repeatedly performed in the window opened by the direct-open operation.
   – Press [SHIFT] + [DIRECT OPEN] to return to the previous JOB CONTENT window.
     When the window is returned to the first JOB CONTENT window, the lamp turns OFF.

   (2) For a condition file, etc.
   – The lamp on [DIRECT OPEN] lights up, and the CONDITION FILE window, etc. appears.
   – Press [DIRECT OPEN] again to return to the former JOB CONTENT window. The lamp turns OFF.

NOTE
• If another window is selected while the direct open function is effective, the function is automatically canceled and the lamp on the direct open key goes out.

• Once another JOB CONTENT window is opened by the direct open function, the former job cannot be continuously operated. (Stopped until the opened JOB CONTENT window is closed.)

6.1.3 Direct Open of the JOB LIST Window

1. In the JOB LIST window, move the cursor to a job name.

2. Press [DIRECT OPEN].

   – The lamp on [DIRECT OPEN] lights up, and the JOB VIEW window appears.
   – Press [DIRECT OPEN] again to return to the JOB LIST window.
     The lamp turns OFF.

NOTE
In the JOB VIEW window, jobs cannot be edited.
6 Convenient Functions
6.2 Parallel Shift Function

6.2 Parallel Shift Function

6.2.1 Function Overview

Parallel shift refers to the shifting of an object from a fixed position in such a way that all points within the object move an equal distance. In the model for parallel shift shown in the following, the shift value can be defined as the distance L (three-dimensional coordinate displacement). The parallel shift function is relevant to the actual operation of the manipulator because it can be used to reduce the amount of work involved in teaching by shifting a taught path (or position).

In the example in the figure below, the taught position A is shifted in increments of the distance L (this is actually a three-dimensional XYZ displacement that can be recognized by the robot) in order to enable the operation that was taught at position A to also be performed at positions B through G.
6 Convenient Functions
6.2 Parallel Shift Function

6.2.1.1 Parallel Shift of Step

The block from the SFTON to the SFTOF instructions is subject to the shift operation.

<table>
<thead>
<tr>
<th>Line (Step)</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>NOP</td>
</tr>
<tr>
<td>0001(001)</td>
<td>MOV J V=50.00</td>
</tr>
<tr>
<td>0002(002)</td>
<td>MOV L V=138</td>
</tr>
<tr>
<td>0003</td>
<td>SFTON PUF# (1)</td>
</tr>
<tr>
<td>0004(003)</td>
<td>MOV L V=138</td>
</tr>
<tr>
<td>0005(004)</td>
<td>MOV L V=138</td>
</tr>
<tr>
<td>0006(005)</td>
<td>MOV L V=138</td>
</tr>
<tr>
<td>0007</td>
<td>SFTOF</td>
</tr>
<tr>
<td>0008(006)</td>
<td>MOV L V=138</td>
</tr>
</tbody>
</table>

6.2.1.2 Parallel Shift of Job

Parallel shift is performed for a job.

...
6.2.2 Setting the Shift Value

6.2.2.1 Coordinate Systems

The shift amount of parallel shift is denoted by the increments of X, Y, and Z in a coordinate system. Four types of coordinate systems are available: the base coordinates, the robot coordinates, the tool coordinates, and the user coordinates. In a robot system with no servo track, the base coordinates and the robot coordinates are the same. Note that the teaching line coordinates cannot be used.

6.2.2.2 Setting the Shift Value

When setting the shift value for the position variables, use the current position (coordinates) of the manipulator in the window.
The shift value is the X, Y, and Z difference between the shift position and teaching position and the difference in angular displacement RX, RY, and RZ (normally set at "0"). If shifting is executed at equal pitch intervals, for example for palletizing, find the difference between the teaching position and the final shift position, then divide by the number of pitch intervals (number of divisions) to calculate the shift value per pitch.

The posture of the wrist is defined by the angular displacement of the coordinates of the wrist axes. Consequently, if the shift value is specified with X, Y, and Z only (RX, RY, RZ=0), the wrist is shifted while maintaining the same posture as at the teaching point. Since shifting is normally performed without changing the posture, there is no need to specify an angular displacement for the wrist. The motion when a parallel shift is performed is shown in the following:

The shift value is calculated on the position data window for the coordinates in which the shift is performed. Since this is normally performed in the user coordinates, the position data window for the user coordinates is used.

The shift amount of posture displacement (Rx, Ry, Rz) in the Cartesian coordinates is not calculated by the difference of degrees between the components of posture at the shifted position and the components of posture at the taught position.

To calculate the shift amount with the posture displacement values (Rx, Ry, Rz), use the MSHIFT instruction described in chapter 6.2.3.3 “MSHIFT Instruction”.

---

Teaching position
Final shift position

Teaching posture
Shift without changing the wrist posture (RX,RY,RZ=0)
Shift with wrist posture change (RX,RY,RZ ≠ 0)

Shift value

L1= Number of pitches

L2

L1

L2
6 Convenient Functions
6.2 Parallel Shift Function

6.2.3 Registering Shift Instructions

To register the instruction, move the cursor to the address area in the JOB CONTENT window during teach mode as follows:

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
   – The JOB CONTENT window appears.
3. Move the cursor to the address area.

6.2.3.1 SFTON Instruction

This is the instruction that starts a parallel shift.

1. Move the cursor to the line immediately before where the SFTON instruction is to be registered.

   | Line immediately before where SFTON instruction is to be registered. |
   |--------------------------|--------------------------|
   | 0001 MOVJ VJ=50.00       |
   | 0002 MOVJ V=138          |
   | 0003 MOVL V=138          |

2. Press [INFORM LIST].
   – The instruction list dialog box appears.
3. Select {SHIFT}.
4. Select the SFTON instruction.
   – The SFTON instruction is displayed in the input buffer line.
5. Modify the additional items or number values as required.

<When Nothing is to be Changed>
Proceed to Step 6.

<When Editing Additional Items>

• Adding or modifying additional items

(1) To change the position variable number, move the cursor to the position variable number and press [SHIFT] + the cursor to increase or decrease the value.

⇒ SFTON P000

To directly input the value using the [Numeric Keys], press [SELECT] to display the input buffer line.

⇒ SFTON P =

(2) After the number is input, press [ENTER] to modify the number value in the input buffer line.

• Adding the coordinate system in which the shift is performed

(1) Move the cursor to the instruction in the input buffer line and press [SELECT]. The DETAIL EDIT window appears.

⇒ SFTON P001

Line up the cursor with “UNUSED” and press [SELECT]. The selection dialog box appears. Line up the cursor with the coordinate system to be added, and press [SELECT].

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6 Convenient Functions
6.2 Parallel Shift Function

(2) After the coordinate system addition is completed, press [ENTER]. The DETAIL EDIT window closes and the JOB CONTENT window appears.

6. Press [INSERT] and then [ENTER].
   – The instruction displayed in the input buffer line is registered.

   Line where SFTON instruction is registered.
   | 0002 | MOVL V=138 |
   | 0003 | SFTON P000 BF |
   | 0004 | MOVL V=138 |

6.2.3.2 SFTOF Instruction

This is the instruction that ends a parallel shift.

1. Move the cursor to the line immediately before where the SFTOF instruction is to be registered.

   Line immediately before where SFTOF instruction is to be registered.
   | 0006 | MOVL V=138 |
   | 0007 | DOUT OT#(1) ON |
   | 0008 | TIMER T=1.00 |

2. Press [INFORM LIST].
   – The instruction list dialog box appears.

3. Select {SHIFT}.

4. Select the SFTOF instruction.
   – The SFTOF instruction is displayed in the input buffer line.

   SFTOF

5. Press [INSERT] and then [ENTER].
   – The SFTOF instruction is registered.

| 0006 | MOVL V=138 |
| 0007 | SFTOF |
| 0008 | DOUT OT#(1) ON |
6 Convenient Functions

6.2 Parallel Shift Function

6.2.3.3 MSHIFT Instruction

The MSHIFT instruction is used to calculate the shift amount between the reference position and the target position (the shifted position) in the specified coordinates and set the calculated value to the position variable.

By using the MSHIFT instruction, the shift amount with the posture displacement values (Rx, Ry, Rz) in the Cartesian coordinates can be easily calculated.

1. Move the cursor to the line immediately before where the MSHIFT instruction is to be registered.

   Line immediately before where MSHIFT instruction is registered.
   
   0005  MOVJ V=138
   0006  GETS PX001 $PX000
   0007  DOUT OT#(1) ON

2. Press [INFORM LIST].

   – The instruction list dialog box appears.

3. Select (SHIFT).

4. Select the MSHIFT instruction.

   – The MSHIFT instruction is displayed in the input buffer line.

5. Change the number data or additional items as required.

   <When Nothing is to be Changed>
   Proceed to Step 6.

   <When Editing Additional Items>

   • Adding or modifying additional items

   (1) To change the position variable number, move the cursor to the position variable number and press [SHIFT] + the cursor to increase or decrease the value.

   \[
   \begin{array}{l}
   \text{MSHIFT PX001 BF PX001 PX002} \\
   \text{To directly input the value using the [Numeric Keys], press [SELECT] to display the input buffer line.}
   \end{array}
   \]

   (2) After the number is input, press [ENTER] to modify the number value in the input buffer line.
6 Convenient Functions
6.2 Parallel Shift Function

- Changing the coordinate system in which the shift is performed

(1) Move the cursor to the instruction in the input buffer line and press [SELECT]. The DETAIL EDIT window appears.

```
MSHIFT PX000 BF PX001 PX002
```

Line up the cursor with “BF” and press [SELECT]. The selection dialog box appears. Line up the cursor with the coordinate system to be changed, and press [SELECT].

(2) After the coordinate system modification is complete, press [ENTER]. The DETAIL EDIT window closes and the JOB CONTENT window appears.

6. Press [INSERT] and then [ENTER].

- The instruction displayed in the input buffer line is registered.

```
0006       GETS PX000 $PX000
0007       MSHIFT PX000 RF PX001 PX002
0008       DOUT OT#(1) ON
```

Line where MSHIFT is registered.
6.2.4 Continuation of the Parallel Shift Function

**CAUTION**

- If the parallel shift function is canceled because of job editing, etc. after the execution of a parallel shift instruction, start up the job again from the beginning.

Because no parallel shift is performed if the operation is restarted in the middle of the job, the manipulator may interfere with the workpiece or fixture.

If any of the following operations are performed after executing a parallel shift instruction, the shift function is canceled.

- Job editing operation (changing, deleting, adding)
- Job copy, job name change
- Registering a new job, deleting a job, or modifying a selected job

**NOTE**

With any operation other than those listed above, the parallel shift function remains in effect.
### 6.2.5 Examples of Use

#### 6.2.5.1 Example of Use of Shift Addition/Subtraction

**Table 6-1: Workpiece Stacking Operation**

<table>
<thead>
<tr>
<th>Line</th>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>NOP</td>
<td></td>
</tr>
<tr>
<td>0001</td>
<td>SET B000 0</td>
<td></td>
</tr>
<tr>
<td>0002</td>
<td>SUB P000 P000</td>
<td>Make the first shift value zero.</td>
</tr>
<tr>
<td>0003</td>
<td>*A</td>
<td></td>
</tr>
<tr>
<td>0004</td>
<td>MOVJ</td>
<td>Step 1</td>
</tr>
<tr>
<td>0005</td>
<td>MOVL</td>
<td>Step 2</td>
</tr>
<tr>
<td>0006</td>
<td>Gripping workpiece</td>
<td></td>
</tr>
<tr>
<td>0007</td>
<td>MOVL</td>
<td>Step 3</td>
</tr>
<tr>
<td>0008</td>
<td>MOVL</td>
<td>Step 4</td>
</tr>
<tr>
<td>0009</td>
<td>SFTON P000 UF#(1)</td>
<td>Shift start</td>
</tr>
<tr>
<td>0010</td>
<td>MOVL</td>
<td>Shift position Step 5</td>
</tr>
<tr>
<td>0011</td>
<td>Releasing workpiece</td>
<td></td>
</tr>
<tr>
<td>0012</td>
<td>SFTOF</td>
<td>Shift end</td>
</tr>
<tr>
<td>0013</td>
<td>ADD P000 P001</td>
<td>Add the shift value for the next operation.</td>
</tr>
<tr>
<td>0014</td>
<td>MOVL</td>
<td>Step 6</td>
</tr>
<tr>
<td>0015</td>
<td>MOVL</td>
<td>Step 7</td>
</tr>
<tr>
<td>0016</td>
<td>INC B000</td>
<td></td>
</tr>
<tr>
<td>0017</td>
<td>JUMP *A IF B00&lt;6</td>
<td></td>
</tr>
<tr>
<td>0018</td>
<td>SFTON P000 UF#(1)</td>
<td>Since the shift data is retained in memory, the same data can be used (with subtraction instead of addition) to perform a workpiece unloading operation.</td>
</tr>
</tbody>
</table>
6 Convenient Functions
6.2 Parallel Shift Function

6.2.5.2 Example of Use of MSHIFT Instruction

<table>
<thead>
<tr>
<th>Line</th>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>NOP</td>
<td></td>
</tr>
<tr>
<td>0001</td>
<td>MOVJ VJ=20.00</td>
<td>Move the manipulator to the reference position.</td>
</tr>
<tr>
<td>0002</td>
<td>GETS PX000 $PX000</td>
<td>Set the reference position as position variable P000.</td>
</tr>
<tr>
<td>0003</td>
<td>MOVJ VJ=20.00</td>
<td>Move the manipulator to the target position.</td>
</tr>
<tr>
<td>0004</td>
<td>GETS PX001 $PX000</td>
<td>Set the target position as position variable P001.</td>
</tr>
<tr>
<td>0005</td>
<td>MSHIFT PX010 BF PX000 PX001</td>
<td>Set shift value and set it as position variable P010.</td>
</tr>
<tr>
<td>0006</td>
<td>END</td>
<td></td>
</tr>
</tbody>
</table>
6 Convenient Functions
6.3 Parallel Shift Job Conversion Function

6.3 Parallel Shift Job Conversion Function

6.3.1 Function Overview

If the manipulator and base positions are moved after a job has been taught, the entire job has to be modified. The parallel shift conversion function shortens the modification time required in cases like this by shifting all steps of the job by the same value to create a new job.

When the parallel shift conversion is performed, all job steps are shifted by the same value.

Steps Outside the P-point Maximum Envelope

• "/OV" is added to the step when its position exceeds the P-point maximum envelope due to this conversion. At this time, if the pulse limit is exceeded, the position after conversion is taught; if the interpolation motion is impossible, the pulse before conversion is taught when the taught position is in pulses, and the Cartesian values after conversion is taught when the taught position is in the Cartesian values.

When the position is corrected, "/OV" display disappears.

Position Variable

• Position variables are not subject to the parallel shift job conversion.

Not Converted Job

• The following jobs cannot be converted. If conversion is attempted, no operation is performed.
  
  • Jobs without any group axes
  
  • Concurrent jobs (optional)

NOTICE

• If a job name after conversion is not specified when executing the parallel shift job conversion, the position data of the job is shifted and converted, then the data is overwritten with a new position data after the shift. Be sure to save the job in the external memory device or create the same job by copying before executing conversion.
6.3.2 Coordinate Systems for Conversion

When performing the parallel shift job conversion, it is necessary to specify the coordinate systems in which the conversion is to be performed. The coordinate system can be selected from the following:

- Base coordinates
- Robot coordinates
- Tool coordinates
- User coordinates (64 types)
- Master tool coordinates (R*+R* job)
- Pulse coordinates

In the case of an ordinary job for which group axes are registered, shift conversion is performed in accordance with the selected coordinate system. The relationship between group combinations and coordinates are shown in the following table.

1 to 4 in the table are followed by their explanations.

<table>
<thead>
<tr>
<th>Group Combination in Job</th>
<th>Explanation</th>
<th>Usable Coordinate System</th>
</tr>
</thead>
<tbody>
<tr>
<td>R</td>
<td>Shift is performed on the basis of selected coordinates.</td>
<td>Base coordinates, robot coordinates, tool coordinates, user coordinates, pulse coordinates</td>
</tr>
<tr>
<td>R(B)</td>
<td>Shift is performed on the basis of selected coordinates.</td>
<td></td>
</tr>
<tr>
<td>1. Base Coordinates</td>
<td>The base axis is shifted by the specified amount and the TCP of the manipulator is shifted by the specified amount in the base coordinates.</td>
<td></td>
</tr>
<tr>
<td>2. Robot Coordinates</td>
<td>The base axis is shifted by the specified amount. The TCP of the manipulator is shifted by the specified amount in the robot coordinates. These shifts are carried out independently.</td>
<td></td>
</tr>
<tr>
<td>3. Tool Coordinates</td>
<td>The base axis is shifted by the specified amount. The TCP of the manipulator is shifted by the specified amount in the tool coordinates. These shifts are carried out independently.</td>
<td></td>
</tr>
<tr>
<td>4. User Coordinates</td>
<td>The base axis is shifted by the specified amount and the TCP of the manipulator is shifted by the specified amount in the user coordinates.</td>
<td></td>
</tr>
<tr>
<td>5. Pulse Coordinates</td>
<td>The taught position of each axis is shifted by the specified amount on the basis of pulse values.</td>
<td></td>
</tr>
<tr>
<td>S</td>
<td>Shift is performed on the basis of pulse values regardless of the coordinates.</td>
<td></td>
</tr>
</tbody>
</table>
### 6 Convenient Functions

#### 6.3 Parallel Shift Job Conversion Function

<table>
<thead>
<tr>
<th>Group Combination in Job</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>R+S</strong></td>
<td>The manipulator is shifted in the selected coordinates. The station axis is shifted on the basis of pulse values regardless of the coordinates.</td>
</tr>
<tr>
<td><strong>R(B)+S</strong></td>
<td>The manipulator is shifted in the selected coordinates, as in 1 to 5 above. The station axis is shifted on the basis of pulse values regardless of the coordinates.</td>
</tr>
<tr>
<td><strong>R+R</strong></td>
<td>Two manipulators are shifted in the selected coordinates.</td>
</tr>
<tr>
<td><strong>R(B)+R(B)</strong></td>
<td>Two manipulators are shifted in the selected coordinate system, as in 1 to 5 above. Two base axes are also shifted.</td>
</tr>
</tbody>
</table>

1 In the master tool coordinates, conversion only occurs at the "slave" from the standpoint of the SMOV instruction.

## About 1 to 4 in the Table

### 1. Base Coordinates

The base axis is shifted by B and the TCP of the manipulator is shifted by A in the base coordinates.

![Base coordinates](image_url)
6 Convenient Functions
6.3 Parallel Shift Job Conversion Function

2. Robot Coordinates
The base axis is shifted by B. The TCP of the manipulator is shifted by A in the robot coordinates. These shifts are carried out independently.

3. Tool Coordinates
The base axis is shifted by B and the TCP of the manipulator is shifted by A in the tool coordinates. These shifts are carried out independently.

4. User Coordinates
The base axis is shifted by B and the TCP of the manipulator is shifted by A in the user coordinates. These shifts are carried out independently.
Converting \( R^*+R^* \) Jobs with Master Tool Coordinates

\( R^*+R^* \) coordinated jobs can be subjected to the parallel shift job conversion in the master tool coordinates. Only the steps taken at the “slave” from the standpoint of the SMOV instruction are subject to conversion (i.e., the steps of R2 in the figure below).
6.3.3 Executing the Parallel Shift Job Conversion

6.3.3.1 Window Display

A. SOURCE JOB
   Selects the job before conversion. The job which is shown in the JOB CONTENT window is set initially. To change the job, perform the following procedure.
   Move the cursor to the job name and press [SELECT]. The JOB LIST window appears. Select the desired job.

B. STEP SECTION (Start Step ➔ End Step)
   Specifies the step section of the source job. All the steps are set initially. If there is no step in the source job, "*****" is displayed. To change the section, perform the following procedure.
   Move the cursor to the step section indication and press [SELECT]. The input buffer line appears. Input the step number and press [ENTER].

C. DESTINATION JOB
   Specifies the converted job. If this is not specified ("********" is displayed), the source job is overwritten with a job after conversion. If the converted job is specified, the source job is copied and converted. To change the job, perform the following procedure.
   Move the cursor to the converted job name indication and press [SELECT]. The character input line appears. The source job name is displayed in the input line. To enter a job name without using the source job name, press [CANCEL] and then input a job name.

D. COORDINATES
   Selects the conversion coordinates. Move the cursor to the coordinates name and press [SELECT]. The selection dialog box appears. Select the desired coordinates.
   When the user coordinates are selected, the input buffer line appears. Input the desired user coordinate number and press [ENTER].

E. BASE POINT
   Calculates the difference by the two teaching points as a shift value.
6 Convenient Functions
6.3 Parallel Shift Job Conversion Function

F. SHIFT VALUE
The axis shown is varied according to the setting of “4. coordinates” above.
Move the cursor to the input box and press [SELECT] to directly input the shift value.
If the shift value is calculated by the two teaching points, the difference is shown as a shift value.

6.3.3.2 Parallel Shift Job Conversion Operation
There are two methods for specifying the shift value.
• Directly input the shift value by numerical value.
• Calculate the shift value by teaching the original base point and converted base point.

The following are the operation procedures by each setting of shift value for parallel shift job conversion.

- Numerical Value Input

1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
   – The JOB CONTENT window appears.
3. Select {UTILITY} under the pull-down menu.
4. Select {PARALLEL SHIFT JOB}.
   – The PARALLEL SHIFT JOB window appears.

The method using position variables by parameter setting is described in chapter 6.3.4 “Specifying the Shift Value by Position Variables” other than above two methods.
6 Convenient Functions
6.3 Parallel Shift Job Conversion Function

5. Specify the conversion items.
   – Specify each item.

6. Select the shift value to be set.
   – The number can be entered.

7. Type the shift value using [Numeric Keys].

8. Press [ENTER].
   – The shift value is set.
6 Convenient Functions
6.3 Parallel Shift Job Conversion Function

9. Display the PARALLEL SHIFT JOB window. Select “EXECUTE”.
   – The confirmation dialog box appears when the converted job is not specified. Select “YES” then the conversion is executed.
   – The JOB CONTENT window appears when the conversion is completed.
   – When “CANCEL” is selected, the display goes back to the JOB CONTENT window without executing conversion.

![Parallel Shift Job Window]

**NOTE** If an alarm occurs during conversion, conversion is suspended.

**Calculation by Teaching**

1. Select (JOB) under (Main Menu).
2. Select (JOB).
   – The JOB CONTENT window appears.
3. Select (UTILITY) under the pull-down menu.
4. Select (PARALLEL SHIFT JOB).
   – The PARALLEL SHIFT JOB window appears.
5. Specify the conversion items.
   – Specify each item.

6. Display the PARALLEL SHIFT JOB window. Select “TEACH SETTING” in the item of “BASE POINT”.
   – The BASE POINT window appears.

7. Select “BASE POINT(SRC)”.

8. Move the manipulator to the original base point by the [Axis Keys].

9. Press [MODIFY] and [ENTER].
   – The original base point is set.

10. Select “BASE POINT(DEST)”.  

11. Move the manipulator to the converted base point by the [Axis Keys].
12. Press [MODIFY] and [ENTER].
   – The conversion base point is set.

13. Touch “EXECUTE”.
   – The difference is calculated by the two teaching points and set as a shift value.
6 Conveninet Functions
6.3 Parallel Shift Job Conversion Function

14. Display the PARALLEL SHIFT JOB window. Select “EXECUTE”.
   - The confirmation dialog box appears when the converted job is not specified. Select “YES” then the conversion is executed.
   - The JOB CONTENT window appears when the conversion is completed.
   - When “CANCEL” is selected, the display goes back to the JOB CONTENT window without executing conversion.

NOTE
If an alarm occurs during conversion, conversion is suspended.
6.3.4 Specifying the Shift Value by Position Variables

The shift value can be specified using position variables by parameter settings.

Parameter S2C652: SHIFT VALUE FOR PARALLEL SHIFT JOB CONVERSION

0: Shift value by numeral/teaching (Initial setting)
1: Position variable shift value

6.3.4.1 Window Display

A. FILE NO.
Specifies position variables.

B. SHIFT JOB NAME
The job which was shown in the JOB CONTENT window is set initially. To change the job, perform the following procedure.
Move the cursor to the conversion job name and press [SELECT]. The JOB LIST window appears. Move the cursor to the desired job and press [SELECT]. The PARALLEL SHIFT JOB window reappears, and the job name which was selected is shown.

C. MODE
Specifies the conversion mode.
SINGLE (INDEPENDENT JOB CONVERSION)
Only the selected job is converted even if the selected job includes the jobs called by JUMP or CALL instructions. Related jobs are not converted.
RELATIVE (RELATIVE JOB CONVERSION)
Both the selected job and all the related jobs (the jobs called by JUMP or CALL instructions) are converted.
For details of each conversion mode, refer to chapter 6.3.4.2 “Jobs Targeted for Conversion”.

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6 Convenient Functions
6.3 Parallel Shift Job Conversion Function

D. COORDINATES
Selects the conversion coordinates.
Move the cursor to the coordinates name and press [SELECT]. The selection dialog box appears. Select the desired coordinates. When the user coordinates are selected, the input buffer line appears. Input the desired user coordinate number and press [ENTER].

E. CONV. METHOD
Specifies the conversion methods of related jobs such as a coordinated job with two manipulators or the system with multiple stations.
COMMON (COMMON SHIFT)
All the manipulators (or all the bases, or all the stations) are converted by the same shift value.
EACH (INDIVIDUAL SHIFT)
Each manipulator (or each base, or each station) is converted separately by different shift values.
For details of each conversion method, refer to chapter 6.3.4.3 “Conversion of Coordinated Jobs”.

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6.3.4.2 Jobs Targeted for Conversion

There are two ways to specify the job to be converted as described in the following:

- **Independent Job Conversion**
  Only the selected job is converted even if the selected job includes the jobs called by JUMP or CALL instructions. Related jobs are not converted.

- **Related Job Conversion**
  Both the selected job and all the related jobs (the jobs called by JUMP or CALL instructions) are converted.
6.3.4.3 Conversion of Coordinated Jobs

There are two ways to convert a related job such as a coordinated job with two manipulators or the system with multiple stations as described in the following:

- **Common Shift**
  All the manipulators (or all the bases, or all the stations) are converted by the same shift value.

Coordinated job with R1+R2
### Individual Shift
Each manipulator (or each base, or each station) is converted separately by different shift values.

Coordinated job with R1+R2

The system with multiple stations
Variables used in an individual shift

Example 1) When selecting P010 for a coordinated job with R1 + R2:
Use P010 for R1.
Use P011 for R2.

Example 2) When selecting EX005 for multiple jobs with four stations:
Use EX005 for S1.
Use EX006 for S2.
Use EX007 for S3.
Use EX008 for S4.

**NOTE**
Be sure to use the variables of which numbers are consecutive after the selected number. The variables of which numbers are not consecutive are unable to be selected.
6 Convenient Functions
6.3 Parallel Shift Job Conversion Function

- Relation between variables and jobs for conversion in an individual shift

- In the case of independent job conversion:
  - Coordinated job with R1 + R2
    Different shift values can be set for each manipulator and base.

- Job with R□ (+ S□)
  Use one variable for a job with one manipulator.

- In the case of related job conversion:
  - Different shift values can be set for each manipulator, base, and station.

In a system with R1, R2, and S1 to S12:
6 Convenient Functions
6.3 Parallel Shift Job Conversion Function

6.3.4.4 Operation Procedure

The following is the operation procedure for the parallel shift job conversion using position variables.

1. Set the parameter.
   - Set the parameter S2C652 (SHIFT VALUE FOR PARALLEL SHIFT JOB CONVERSION) to 1 (Position variable shift value).

2. Set the position variable.
   - Specify a position variable in advance when setting a shift value by position variables.
   - For the setting of position variables, refer to chapter 3.9.4 “User Variables”.

3. Select {JOB} under {Main Menu}.

4. Select {JOB}.
   - The JOB CONTENT window appears.

5. Select {UTILITY} under the pull-down menu.

6. Select {PARALLEL SHIFT JOB}.
   - The PARALLEL SHIFT JOB window appears.

7. Specify the conversion items.
   - Specify each item.

8. Select “EXECUTE”.
   - Select “EXECUTE” then the parallel shift job conversion is executed. The JOB CONTENT window appears when the conversion is completed.
   - When “CANCEL” is selected, the display goes back to the JOB CONTENT window without executing conversion.

   • If an alarm occurs during conversion, conversion is suspended.
   • Specify the position variable in advance when using the setting value as a shift value.
   • The line to which the Edit Lock function is set or the comment out is performed cannot be changed. (For details, refer to chapter 3.7.6 “Commenting Out a Line” and chapter 3.7.7 “Prohibiting Editing Line-by-Line”.)
6 Convenient Functions
6.4 PAM Function

6.4 PAM Function

6.4.1 Function Overview

The function for position adjustment during playback (PAM: Position Adjustment by Manual) allows position adjustment by simple operations while observing the motion of the manipulator and without stopping the manipulator. Positions can be adjusted in both teach mode and play mode.

The following data can be adjusted by key input from the programming pendant.

- Teaching Point (Position)
- Teaching Point (Posture angle)
- Operation Speed
- Position Level

6.4.1.1 Input Ranges for Adjustment Data

The input ranges for adjustment data are indicated in the following table.

<table>
<thead>
<tr>
<th>Data</th>
<th>Input Range</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Steps for Adjustment</td>
<td>Up to 10 steps can be adjusted at the same time.</td>
<td></td>
</tr>
<tr>
<td>Position Adjustment Range (X, Y, Z)</td>
<td>Unit: mm, valid to two decimal places, maximum ±10 mm</td>
<td></td>
</tr>
<tr>
<td>Posture Angle Adjustment Range (Rx, Ry, Rz)</td>
<td>Unit: deg, valid to two decimal places, maximum ±10 deg</td>
<td></td>
</tr>
<tr>
<td>Speed Adjustment Range (V)</td>
<td>Unit: %, valid to two decimal places, maximum ±50%</td>
<td>Play speed VMAX cannot be modified</td>
</tr>
<tr>
<td>PL Adjustment Range</td>
<td>0 to 8</td>
<td></td>
</tr>
<tr>
<td>Adjustment Coordinates</td>
<td>Robot coordinates, base coordinates, tool coordinates, user coordinates (Default coordinates: robot coordinates)</td>
<td></td>
</tr>
</tbody>
</table>

The input ranges for adjustment data can be changed by the following parameters:

- S3C1098: Position adjustment range (unit: 0.001 mm)
- S3C1099: Speed adjustment range (unit: 0.01%)
- S3C1100: Adjustment coordinate specification
- S3C1102: Posture angle adjustment range (unit: 0.01 deg)

For details, refer to chapter 8 “Parameter”.

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• Base axis and station axis data cannot be adjusted.

• Adjustment when a TCP instruction is executed is performed by adjusting the data of the selected tool.

• When the coordinates for adjustment are user coordinates, an error occurs if teaching has not been performed in the user coordinates.

• If an attempt is made to adjust “PL” when there is no “PL” in the step subject to the adjustment, an error occurs.

• Position variable and reference point steps cannot be adjusted. An error occurs if adjustment is attempted.

• An attempt to adjust the speed at the step where the speed tag VJ, V,VR,VE is not added or the play speed VMAX is specified cause an error.
6.4 PAM Function

6.4.2 Operating Methods

6.4.2.1 Setting Adjustment Data

1. Select {JOB} under {Main Menu}.

2. Select {JOB}.
   - The JOB CONTENT window (in the teach mode) or the PLAYBACK window (in the playback mode) appears.

3. Select {UTILITY} under the pull-down menu.

4. Select {PAM}.
   - The PAM window appears.

5. Set adjustment data.
   - Set adjustment data.
     - **A. Job**
       Set the job name to be adjusted.
       Line up the cursor and press [SELECT] to display the JOB LIST window.
       Move the cursor to the desired job and press [SELECT] to set the adjusted job.
     - **B. Status**
       Shows the status of adjustment in the PAM function.
       “NOT DONE” appears when adjustment is not executed. “DONE” appears when the execution of adjustment is completed.
     - **C. Input Coord**
       Set the desired coordinates.
       Line up the cursor and press [SELECT] to display the selection dialog box.
       Move the cursor to the desired coordinate system and press [SELECT] to set the input coordinates.
     - **D. Step Number**
       Set the step number to be adjusted.
       Line up the cursor and press [SELECT] to display the number input buffer line.
       Input the step number and press [ENTER] to set the value.
6 Convenient Functions
6.4 PAM Function

- **E. XYZ Coordinate Adjustment**
  Set the direction and amount of the X, Y, and Z coordinates.
  Line up the cursor with the data to be adjusted and press [SELECT] to display the number input buffer line.
  Input the number data and press [ENTER] to set the adjusted data.

- **F. Rx, Ry, Rz Coordinate Adjustment**
  Set the direction and amount of the Rx, Ry and Rz posture angles.
  Line up the cursor with the data to be adjusted and press [SELECT] to display the number input buffer line.
  Input the number data and press [ENTER] to set the adjusted data.

- **G. V Coordinate Adjustment**
  Set the speed.
  Line up the cursor and press [SELECT] to display the number input buffer line.
  Input the number data and press [ENTER] to set the adjusted data.

- **H. PL**
  The position level of the job to be adjusted for the step set in “4. Step Number” is displayed, and the data can be modified.
  When the position level is not decided, [-] is displayed, and cannot be set.
  To modify the position level, line up the cursor, press [SELECT], input the number value and press [ENTER].

<table>
<thead>
<tr>
<th>NOTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The line to which the Edit Lock function is set or the comment out is performed cannot be changed.</td>
</tr>
<tr>
<td>Following errors occur when performing the Edit Lock operation.</td>
</tr>
<tr>
<td>1011: EDIT LOCK is set for this line.</td>
</tr>
<tr>
<td>1012: This line is defined as a comment.</td>
</tr>
</tbody>
</table>

(For details, refer to chapter 3.7.6 “Commenting Out a Line” and chapter 3.7.7 “Prohibiting Editing Line-by-Line”.)
6.4.2.2 Executing the Adjustment

- **Executing the Adjustment**

1. Touch "COMPLETE" on the screen.
   - The confirmation dialog box appears.

2. Select "YES".
   - In the teach mode, the job adjustment can be immediately executed. In the play mode, the job can be adjusted just before execution (move operation).
   - When the job adjustment is completed, the set data shown in the PAM window is cleared. However, if a step which exceeds the software limit or a step for which interpolation is not applicable is found during the job adjustment, an error occurs and only the data of that step cannot be cleared on the window.
6 Convenient Functions
6.4 PAM Function

■ Canceling the Execution

In the play mode, during the adjustment wait status, “STOP” is displayed in the PAM window. To cancel the adjustment process, touch “STOP” on the screen. Also, if the following occurs before executing, the process is automatically canceled.

- If the mode is changed
- If an alarm occurs
- If the power is turned OFF

■ Clearing Data

If there is a mistake made when adjusting the data, or if the adjustment of the step becomes unnecessary, the data can be cleared.

1. Move the cursor to the step of the data to be cleared.
2. Select {EDIT} under the pull-down menu.
3. Select {LINE CLEAR}.
   - The line data is cleared.
6 Convenient Functions
6.4 PAM Function

■ Copying Data

To input the same data as those set previously, perform the following operation.

1. Move the cursor to the line to be copied.
2. Select {EDIT} under the menu.
   – The pull-down menu appears.
3. Select {LINE COPY}.
4. Move the cursor to the line where the item is to be copied.
5. Select {EDIT} under the menu.
6. Select {LINE PASTE}.
   – The desired data is copied to the line.
   – However, if the line where the data is to be copied does not have a speed value or PL value, it cannot be copied.
6 Convenient Functions
6.4 PAM Function

■ Canceling the Adjustment

After the position adjustment in the PAM function, the job can be returned to the status before adjustment only during teaching. In this case, follow the procedures below.

Note that the job cannot be undone during playback.

1. Check the status of adjustment.

   – After the position adjustment, the status shows “DONE”.

2. Select (EDIT) under the menu.

   – The pull-down menu appears.

3. Select (UNDO) under the pull-down menu.

   – The confirmation dialog box appears.

4. Select “YES”

   – The status turns “NOT DONE” and the job is undone when selecting “YES”. The status does not change and the job is not undone when selecting “NO”.

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6.5 Mirror Shift Function

6.5.1 Function Overview

With the mirror shift function, a job is converted to the job in which the path is symmetrical to that of the original job. This conversion can be performed for the specified coordinate among the X-Y, X-Z, or Y-Z coordinate of the robot coordinates and the user coordinates.

The mirror shift function is classified into the following three: the pulse mirror-shift function, the robot-coordinates mirror-shift function, and the user-coordinates mirror-shift function.
6.5.2 Pulse Mirror-Shift Function

With the pulse mirror-shift function, the mirror shift is performed by reversing the sign (+/-) for the axes which are specified with the parameter in advance.

6.5.2.1 Parameter Setting

Using the following parameter, specify the axes for which the sign is to be reversed.

S1CxG065: Mirror Shift Sign Reversing Axis Specification

```
1 2 3 4 5 6 7
The 1st axis (0:Not reversed, 1:Reversed)
: The 7th axis
```

6.5.2.2 Object Job

Jobs without group axes and relative jobs cannot be converted.

6.5.2.3 Group Axes Specification

When specifying the group axes for the converted job in a multiple group axes system, the group axes specified in the original and converted jobs must be the same.

- Robot Axis: Same model
- Base Axis: Same configuration
- Station Axis: Same configuration

6.5.2.4 Position Variables

Position variables are not converted by the mirror shift function.
6.5.3 Robot-Coordinates Mirror-Shift Function

With the robot-coordinates mirror-shift function, the mirror shift is performed on the X-Z coordinate of the robot coordinates.

6.5.3.1 Object Job

Jobs without group axes cannot be converted.

6.5.3.2 Group Axes Specification

When specifying the group axes for the converted job in a multiple group axes system, the group axes specified in the original and converted jobs must be the same.

- Robot Axis: Same model
- Base Axis: Same configuration
- Station Axis: Same configuration

6.5.3.3 Position Variables

Position variables are not converted by the mirror shift function.

- Mirror shift conversion for the base axis is not performed with the robot-coordinates mirror shift function.
- With the robot-coordinates mirror shift function, mirror shift conversion for the station axis is performed by reversing the sign for the axes specified with the parameter S1CxG065 “Mirror Shift Sign Reversing Axis Specification”.

NOTE
6.5.4 User-Coordinates Mirror-Shift Function

With the user-coordinates mirror-shift function, the mirror shift is performed on the X-Z, X-Y, or Y-Z coordinate of the specified user coordinates.

6.5.4.1 Object Job

Jobs without group axes cannot be converted.

6.5.4.2 Group Axes Specification

When specifying the group axes for the converted job in a multiple group axes system, the group axes specified in the original and converted jobs must be the same.

- Robot Axis: Same model
- Base Axis: Same configuration
- Station Axis: Same configuration

6.5.4.3 Position Variables

Position variables are not converted by the mirror shift function.

NOTE

With the user-coordinates mirror shift function, mirror shift conversion for the station axis is performed by reversing the sign for the axes specified with the parameter S1CxG065 "Mirror Shift Sign Reversing Axis Specification".
6 Convenient Functions
6.5 Mirror Shift Function

6.5.5 Notes on the Mirror Shift Function

For manipulators, such as a polishing wrist, whose center of S-axis rotation and T-axis rotation are offset in the X-coordinate direction, the mirror shift cannot correctly be performed by the pulse mirror-shift function. Be sure to use the robot-coordinates mirror-shift function or use the user-coordinates mirror-shift function with the user coordinates specified on the center of the T-axis rotation.

(1) Using the Robot-coordinates Mirror-shift Function
When the robot-coordinates mirror-shift function is performed, the mirror shift is performed on the X-Z coordinate of the robot coordinates. The path of the converted job is as follows:

Robot-coordinates Mirror-shift Conversion

(2) Using the User-coordinates Mirror-shift Function
To use the user-coordinates mirror-shift function, specify the user coordinates on the center of T-axis rotation in advance.

User-coordinates Mirror-shift Conversion

"/OV" is added to the step when its position exceeds the P-point maximum envelope due to the conversion. For the step to which "/OV" is added, if the pulse limit is exceeded, the position after conversion is taught; if the interpolation motion is impossible, the pulse before conversion is taught when the taught position is in pulses, and the Cartesian values after conversion is taught when the taught position is in the Cartesian values.
6.5.6 Operation Procedures

6.5.6.1 Calling Up the JOB CONTENT Window

Call up the JOB CONTENT window of the job to be converted as follows:

- **For Current Job**
  1. Select {JOB} under {Main Menu}.
  2. Select (JOB).

- **For Another Job**
  1. Select {JOB} under {Main Menu}.
  2. Select (SELECT JOB).
     - The JOB LIST window appears.
  3. Select the desired job.

6.5.6.2 Mirror Shift Conversion

1. Display the JOB CONTENT window.
2. Select {UTILITY} under the pull-down menu.
3. Select (MIRROR SHIFT).
   - The MIRROR SHIFT window appears.
6.5 Mirror Shift Function

6.5.6.3 Explanation of the Mirror Shift Window

A. SOURCE JOB
Selects the conversion source job. To select another job to be converted, move the cursor to the name and press [SELECT] to call up the list of jobs. Select the desired job and press [SELECT].

B. SOURCE CTRL GROUP
Displays the control group of the conversion source job.

C. STEP SELECTION
Specifies the steps to be converted. From the first step to the last step of the selected job are specified as initial value.

D. DESTINATION JOB
Specifies the converted job name. To enter the name, move the cursor to the name and press [SELECT]. The name of the conversion source job is displayed in the input line as initial value. When "***" is displayed, the name for the converted job is to be the same as that of the conversion source job.

E. DEST CTRL GROUP
Selects the control group for the converted job. When the destination job name is entered, the same control group as the conversion source job is automatically set. To change it, move the cursor to the control group and press [SELECT] to call up the selection dialog box.

F. COORDINATES
Specifies the coordinates used for conversion.
- PULSE: Executes the pulse mirror-shift conversion.
- ROBOT: Executes the mirror-shift conversion on the basis of the Cartesian coordinates.
- USER: Executes the mirror-shift conversion on the basis of the specified user coordinates.
6 Convenient Functions
6.5 Mirror Shift Function

G. USER COORD NO.
Specifies the user coordinates number when “USER” is selected in “F. COORDINATES”.
This item cannot be set when “PULSE” or “ROBOT” is selected in “F. COORDINATES”.

H. TARGET
Specifies the coordinate where conversion is to be done when “ROBOT” or “USER” is selected in “F. COORDINATES”. “XY”, “XZ”, or “YZ” can be selected. Always specify “XZ” for “ROBOT”.

I. EXECUTE
Mirror shift conversion is executed when pressing [EXECUTE] or [ENTER]. A job is created with the name of conversion source job when a job after conversion is not entered.
6.6 Multi Window Function

6.6.1 Function Overview

Multi window function divides the general-purpose display area up to 4 windows and shows them simultaneously.

There are seven dividing patterns to be optionally choose as necessary.

6.6.2 Setting the Dividing Pattern of the General-Purpose Display Area

The dividing pattern of the general purpose display area can be changed in the window exclusive for setting.

Table 6-3: Display the dividing Pattern  (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Number of the window</th>
<th>Dividing Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><img src="image1" alt="1 window" /></td>
</tr>
<tr>
<td>2</td>
<td><img src="image2" alt="2 windows" /></td>
</tr>
<tr>
<td>3</td>
<td><img src="image3" alt="2 windows" /></td>
</tr>
<tr>
<td>4</td>
<td><img src="image4" alt="3 windows" /></td>
</tr>
</tbody>
</table>
6.6 Multi Window Function

6.6.2.1 Calling Up and Operating Methods of the Display Dividing Pattern Setting Window

Call up the dividing pattern setting window.

1. Select {DISPLAY SETUP} - {CHANGE WINDOW PATTERN} under {Main Menu}.

2. Dividing pattern setting window appears in the center of the display.

Table 6-3: Display the dividing Pattern  (Sheet 2 of 2)

<table>
<thead>
<tr>
<th>Number of the window</th>
<th>Dividing Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3 windows</td>
</tr>
<tr>
<td></td>
<td>1 2 3</td>
</tr>
<tr>
<td>6</td>
<td>3 windows</td>
</tr>
<tr>
<td></td>
<td>1 2 3</td>
</tr>
<tr>
<td>7</td>
<td>4 windows</td>
</tr>
<tr>
<td></td>
<td>1 2 3 4</td>
</tr>
</tbody>
</table>
6 Convenient Functions
6.6 Multi Window Function

In the dividing pattern setting window, set the dividing pattern of the general-purpose display area.

1. Key operation 1:
   When “Window Pattern” is focused in the window, the option of the dividing pattern shifts as cursor moves upper or lower.
   – Choose the desired dividing pattern from the “Window Pattern”.

2. Key operation 2:
   Press [SELECT] when “Window Pattern” is focused. The list of the dividing patterns appears. The list closes and a pattern is set after choosing the desired pattern and press [SELECT].

3. Touching operation:
   The desired pattern can be chosen by touching a pattern in the window.
   – Choose a pattern from the dividing pattern buttons.
6 Convenient Functions
6.6 Multi Window Function

4. Touch [OK] button or move the cursor to it and press [SELECT].
   – The dividing pattern setting window closes and the chosen pattern
     (chosen with the procedure either 1, 2 or 3) appears.

Cancel the setting
1. Touch [CANCEL] button or move the cursor to it and press [SELECT].
   – Dividing pattern setting window closes. The dividing pattern in the
     general-purpose display area doesn’t change.

The cursor moves by pressing [AREA] in the dividing pattern
setting window.
6 Convenient Functions
6.6 Multi Window Function

6.6.3 Displaying the Multi Window

6.6.3.1 Multi Window Mode and Single Window Mode

Specifying more than two-window pattern in the dividing pattern setting window shows plural windows simultaneously in the general-purpose display area.

This is called multi window mode.

On the other hand, a single active window can be displayed with pressing [SHIFT] + [MULTI] operation.

This is called single window mode.

Pressing [SHIFT] + [MULTI] operation switches the display from single window mode to multi window mode. The mode can be changed as necessary.

6.6.3.2 Displaying the Status of Plural (More Than Two) Window Dividing Pattern Setting

When more than two windows are displayed as a desired pattern, appears on the upper part of the window whereas it doesn't appear when a single window is displayed.

6.6.3.3 Displaying of Active Window and Non-Active Window

When a display is in the multi window mode, one window should be active and the rest is (are) non-active. The title of the active window is displayed in deep blue and non-active window is in light blue.

The active window is the subject of key operation.

Also, the menu area or the operational buttons under the general-purpose displaying area are displayed for the operation of the active window.

6.6.3.4 Limited Matters in Multi Window Mode

The content of window when it is in multi window mode can be different from the same window when it is in single window mode because of its limited size. The content becomes normal when the window is displayed in the single window mode.

- The input buffer in the JOB window is displayed only when the window is active.
- No auxiliary window appears.
6 Convenient Functions
6.6 Multi Window Function

6.6.4 Operation of Multi Window

6.6.4.1 Switching of Multi Window Mode and Single Window Mode

When more than two windows are displayed as a dividing pattern of the multi window, it is possible to switch multi window mode to single window mode.

1. Set the mode of the general-purpose displaying area to multi window mode.

2. Press [SHIFT]+[MULTI].
   - Active window is displayed under single window mode in the general-purpose window displaying area.
6 Convenient Functions
6.6 Multi Window Function

3. Press [SHIFT]+[MULTI] under the condition of the step 2.
   – The general-purpose display area changes to already set pattern in multi window mode.
6 Convenient Functions
6.6 Multi Window Function

6.6.4.2 Switching of Active Window

Switch the active window in the multi window displaying mode.

1. Set the mode of the general-purpose displaying area to multi window mode.

2. Key Operation:
   Press [MULTI].
   - The window to be active shifts. The active window shifts in the order mentioned in chapter 6.6.2 “Setting the Dividing Pattern of the General-Purpose Display Area”. (1→2→3→4→1⋯⋯)

3. Touching Operation:
   Touch the window to be active.
   - The touched window becomes active.
Switch the active window in the single window mode.

1. Set the mode of the general-purpose displaying area to single window mode.

2. Press [MULTI].
   
   The following windows are displayed in the order mentioned in chapter 6.6.2 “Setting the Dividing Pattern of the General-Purpose Display Area” (1→2→3→4→1⋯).
6.6.5 Switching the Axis Operation Control Group

The appropriate control group for axis operation is automatically selected in accordance with the window status or its operation in the active window. Due to this function, when the general-purpose display area is in multi window mode, the control group for axis operation can vary depending on the window which is active at the time.

To avoid unexpected control group to function and for the better safeness, the change of the control group with the [MULTI] operation or touching operation when switching the active window is notified to the user.

6.6.5.1 S2C540 “Choosing Method of Notifying the Change of Axis Operation Control Group When Switching the Active Window”

The method to notify the change of control group for axis operation due to the switch of active window can be changed with parameter.

- Setting Value: 0
  - Keep displaying the message in the human interface display area for three seconds.
  - Message “Control group switched by switching the active window” is displayed.

SUPPLEMENT
The change of the control group for axis operation due to other than [MULTI] operation or touching operation; due to the switch of the window by selecting main menu, is not notified to the user.
6 Convenient Functions
6.6 Multi Window Function

- **Setting Value: 1**
  - Call up the confirmation dialog box to confirm the switch of the active window.
  - Message “Control group will be changed. Switch the active window?” is displayed
  - “Yes” ······ After switching the window to be active, a message appears in the human interface display area.
  - “No” ······ Cancel the window to be active.

![Multi Window Function Diagram](image)

- **Setting Value: 2**
  - Do not notify the control group change.
6.7 Simple Menu Function

6.7.1 Simple Menu

This function enables users to create "USER DEFINITION" menu by registering the layouts (screen dividing patterns and screen to be displayed) on the general-purpose display area.

Eight layout patterns can be registered to the user definition menu at maximum.
The registered layout patterns can be easily called up with the buttons of simple menu.
6 Convenient Functions
6.7 Simple Menu Function

6.7.2 Registering the Layout Patterns to User Definition Menu

6.7.2.1 Register with {REGIST} Button

Register the layout patterns by using {RESIST} button which is in “USER DEFINITION” menu.

1. Press [SIMPLE MENU] or select {Simple Menu} button on the display while the layout pattern to be registered is on the general-purpose display area.
   - “USER DEFINITION” menu appears.

2. Press {REGIST} button.
   - “USER DEFINITION” menu closes.
   - The message “Do you register a current layout?” appears in the confirmation dialog box.

3. Select “YES”.
   - The layout is registered and the dialog box closes.
   If “NO” is selected, the layout will not be registered.
6.7.2.2 Register by Key Operation

Use the programming pendant keys to register the layout patterns to “USER DEFINITION” menu.

1. Press [SHIFT] + [SIMPLE MENU] while the layout pattern to be registered is on the general-purpose display area.
   - The message “Do you register a current layout?” appears in the confirmation dialog box.

2. Select “YES”.
   - The layout is registered and the dialog box closes.
   - If “NO” is selected, the layout will not be registered.

6.7.2.3 Conditions to Register the Layout

There are some cases that the layout patterns cannot be registered to “USER DEFINITION” menu. Followings are the conditions and the messages that the layout is refused to register.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 when the layout is already registered.</td>
<td>This layout is already registered.</td>
</tr>
<tr>
<td>2 when eight layouts are already registered.</td>
<td>There is not an undefined domain.</td>
</tr>
<tr>
<td>3 When the registering layout includes the window which cannot be started up in the {Main Menu}.</td>
<td>The screen which I cannot register is included [W1W2W3W4] (The number W1 to W4 indicates the windows which are actually displayed on the general-purpose display area, however, the highlighted numbered window cannot be registered. *For the layout of 1 to 4, refer to table 6-3 “Display the dividing Pattern”.)</td>
</tr>
<tr>
<td>4 When a single window is displayed under the multi window mode.</td>
<td>Cannot register at current operation mode.</td>
</tr>
</tbody>
</table>
6.7.2.4 The Displayed Layout Name

After a layout pattern is registered to "USER DEFINITION" menu, it is named in accordance with the status of the general-purpose display area when the layout pattern is created. Refer to the followings for the details.

<table>
<thead>
<tr>
<th>Status of general-purpose display area</th>
<th>Name registered to “USER DEFINITION” Menu</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Single window mode</td>
<td>(Same as the sub menu in main menu)</td>
</tr>
<tr>
<td>2 Multi window mode</td>
<td>Layout -n (“n” should be a number from 0 to 7)</td>
</tr>
</tbody>
</table>

It is possible to change the name even after the name is registered. Refer to chapter 6.7.4.3 “Changing the Name of Registered Layout Name”.

6.7.3 Calling Up of the Registered Layout

6.7.3.1 Calling up

Call up the registered layout with the following procedures.

1. Press [SIMPLE MENU] or select (Simple Menu) button at the lower-left on the display.
   - “USER DEFINITION” menu appears.
6 Convenient Functions
6.7 Simple Menu Function

2. Select and press a button on “USER DEFINITION” menu to display a layout to be called up.
   – “USER DEFINITION” menu closes.
   – The selected layout appears on the general-purpose display area.

   Condition Message
   1 When all the registered layout windows cannot be displayed due to security mode or its purpose of use.
      There are no windows to display within the chosen layout.

When undisplayed screen is included in the layout to be called up due to above mentioned reasons, the message, “Please selected a Main Menu” appears to the said screen.

6.7.3.2 Conditions When Calling Up the Layout

There are some cases where the layout cannot be called up depending on the conditions when calling up. Followings are the conditions and the messages that the layout is refused to be called up.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>There are no windows to display within the chosen layout.</td>
</tr>
</tbody>
</table>

There is no screen which I can display in the layout that I chose.
6.7.4 Editing USER DEFINITION Menu

Editing procedures of “changing the registered name” and “deleting the registered item” are possible to the items registered to the USER DEFINITION MENU window.

Those editions are executed on the USER DEFINITION MENU window. Displaying of the USER DEFINITION MENU window is possible in the operation mode or more and editing of this menu is possible in the editing mode or more.

6.7.4.1 Displaying USER DEFINITION MENU Window by Using EDIT Button

Displays the USER DEFINITION MENU window by using (EDIT).

1. Press [SIMPLE MENU] or select (Simple Menu) button at the lower-left on the display.

   – The USER DEFINITION menu appears.

2. Press (EDIT).

   – The USER DEFINITION menu closes.

   – The USER DEFINITION MENU window appears on the active window in the general-purpose display area.
6.7.4.2 Displaying USER DEFINITION MENU Window under Main Menu

Displays the USER DEFINITION MENU window under the main menu.

1. Select {SYSTEM INFO} under {Main Menu}.
   - {SYSTEM INFO} sub menu appears.

2. Select {USER DEFINITION}.
   - The USER DEFINITION MENU window appears on the active window in the general-purpose display area.
6.7.4.3 Changing the Name of Registered Layout Name

The registered layout names can be changed.

1. Display the USER DEFINITION MENU window.

2. Move the cursor to the layout name to be changed and press [SELECT].
   - The software key pad for inputting letters appears.
3. Input the layout name, and then press [ENTER] or {ENTER}.
   – The software key pad closes.
   – The name changes.

Note that if the software key pad is completed by [CANCEL] or {CANCEL}, the name editing operation is also canceled.

When the bilingual function is valid, name in each language can be set.
6.7.4.4 Deleting the Layout

The layout registered to the USER DEFINITION menu can be deleted.

1. Display the USER DEFINITION MENU window.

![USER DEFINITION MENU window]

2. Move the cursor to the layout to be deleted and press [SHIFT] + [SELECT]. (multiple selection possible)
   - "●" mark is indicated at the head of the selected line.

![Selected layouts]

3. Select {DATA} in the menu.
   - A pull down menu appears.
6. Select (DELETE MENU).
   - The confirmation dialog box with a message "Delete? Layout -4 (layout name)" appears to the line marked with •.

5. Select "YES" in the dialog box.
   - The marked layout is deleted.
   * The layout will not be deleted if "NO" in the dialog box is selected.
6.7.4.5 Deleting All Layouts

All layouts registered to the USER DEFINITION menu can be deleted at a time.

1. Display the USER DEFINITION MENU window.
2. Select {EDIT} in the menu.
   – A pull down menu appears.
3. Select {SELECT ALL}.
   – "●" mark is indicated at the head of all the registered layouts.
4. Select (DATA) in the menu.
   – A pull down menu appears.

5. Select (DELETE MENU).
   – The confirmation dialog box with a message “Delete? Layout -0 (layout name)” appears to the lines marked with “●”.

6. Select “YES” in the dialog box.
   – The marked layouts are deleted.
   * The layout will not be deleted if “NO” in the dialog box is selected.

To hide “●” mark, move the cursor to the line with “●” mark, and press [SHIFT] + [SELECT].
To clear all the selected items and hide all “●” marks, select {EDIT} → {CANCEL SELECT} under the pull down menu.
6.7.5 Save/Load of the User Definition Menu Data (to External Memory Device)

The data registered to the USER DEFINITION menu (user menu data) can be saved to and loaded from the external memory device.

In this case, the name of the file is "USERMENU.DAT".

6.7.5.1 Saving the Data

User menu data can be saved at the security level of operation mode or more.

1. Select {EX. MEMORY} under {Main Menu}.
   - {EX. MEMORY} sub menu appears.

2. Select {SAVE}.
   - {SAVE} window of external memory device appears.

3. Select "FILE/GENERAL DATA".
   - The FILE/GENERAL DATA window of an external memory device appears.
6. Convenient Functions
6.7 Simple Menu Function

4. Select “USER MENU DATA”.
   - “★” mark is indicated at the head of “USER MENU DATA”.

5. Press [ENTER].
   - The confirmation dialog box with a message “SAVE” appears.

6. Select “YES” in the dialog box.
   - “USER MENU DATA” is saved.
   - “USER MENU DATA” will not be saved if “NO” in the dialog box is selected.
6 Convenient Functions
6.7 Simple Menu Function

6.7.5.2 Loading the Data

User menu data can be loaded at the security level of editing mode or more.

1. Select {EX. MEMORY} under {Main Menu}.
   – {EX. MEMORY} sub menu appears.

2. Select {LOAD}.
   – The LOAD window of an external memory device appears.

3. Select "FILE/GENERAL DATA".
   – The FILE/GENERAL DATA window of an external memory device appears.
4. Select “USER MENU DATA”.
   - “★” mark is indicated at the head of “USER MENU DATA”.

5. Press [ENTER].
   - The confirmation dialog box with a message “LOAD?” appears.

6. Select “YES” in the dialog box.
   - “USER MENU DATA” is loaded.
   “USER MENU DATA” will not be loaded if “NO” in the dialog box is selected.
6.8 Parameter Setting Function

6.8.1 Parameter Setting Function

Among the parameters explained in chapter 8 “Parameter”, frequently used parameters’ settings can be changed from the exclusive windows. Those windows are sorted out depending on the parameters’ function as shown below.

• TEACHING CONDITION SETTING
  Teaching-relevant parameters are displayed.

• OPERATE CONDITION SETTING
  Mode switching/power-relevant parameters are displayed.

• OPERATE ENABLE SETTING
  ON/OFF of the manipulator-relevant parameters are displayed.

• FUNCTION ENABLE SETTING
  Enable/unable of optional function-relevant parameters settings are displayed.

• JOG CONDITION SETTING
  Operation of the jog-relevant parameters are displayed.

• PLAYBACK CONDITION SETTING
  Playback operation-relevant parameters are displayed.

• FUNCTIONAL CONDITION SETTING
  Execution of each function-relevant parameters are displayed.

Select above mentioned menu from {SETUP} window under main menu.
6 Convenient Functions
6.8 Parameter Setting Function

Move the cursor to select a menu, then the settings of the desired parameters can be changed by one of the following three methods according to its content.

• When there are two options.  
The options alternate every time [SELECT] is pressed.

• When there are three or more options.  
A dialog box with the options appears. Select one to change the settings.

• When it requires to input a value.  
Input a value using [Numeric Keys] and press [ENTER] to change the settings.
6 Convenient Functions
6.8 Parameter Setting Function

6.8.2 Teaching Condition Setting

Select (SETUP) \rightarrow (TEACHING CONDITION SETTING) to display the following window.

- **LANGUAGE LEVEL (S2C211)**
  Refer to chapter 8.3.0.13 “S2C211: LANGUAGE LEVEL”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUBSET</td>
<td>0</td>
</tr>
<tr>
<td>STANDARD</td>
<td>1</td>
</tr>
<tr>
<td>EXPANDED</td>
<td>2</td>
</tr>
</tbody>
</table>

- **INSTRUCTION INPUT LEARNING (S2C214)**
  Refer to chapter 8.3.0.14 “S2C214: INSTRUCTION INPUT LEARNING FUNCTION”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VALID</td>
<td>0</td>
</tr>
<tr>
<td>INVALID</td>
<td>1</td>
</tr>
</tbody>
</table>

- **MOVE INSTRUCTION SET POSITION (S2C206)**
  Refer to chapter 8.3.0.8 “S2C206: ADDITIONAL STEP POSITION”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP</td>
<td>0</td>
</tr>
<tr>
<td>LINE</td>
<td>1</td>
</tr>
</tbody>
</table>

- **BUZZER WHEN POSITION TEACHING (S2C433)**
  Refer to chapter 8.3.0.43 “S2C433: POSITION TEACHING BUZZER”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONSIDER</td>
<td>0</td>
</tr>
<tr>
<td>NOT CONSIDER</td>
<td>1</td>
</tr>
</tbody>
</table>
- **STEP ONLY CHANGING (S2C203)**
  Refer to chapter 8.3.0.6 “S2C203: CHANGING STEP ONLY”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **RECT/CYL INDRICAL (S2C196)**
  Refer to chapter 8.3.0.2 “S2C196: SELECTION OF Cartesian/CYLINDRICAL”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYL.</td>
<td>0</td>
</tr>
<tr>
<td>RECT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **TOOL NO. SWITCH (S2C431)**
  Refer to chapter 8.3.0.42 “S2C431: TOOL NO. SWITCHING”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROHIBIT</td>
<td>0</td>
</tr>
<tr>
<td>PERMIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **TOOL NO. INTERLOCK FOR STEP ENTRY (S2C234 d0 bit)**
  Refer to chapter 8.3.0.29 “S2C234: STEP REGISTRATION AT TOOL NO. CHANGE”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Bit status</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **TOOL NO. MODIFICATION CHECK BY POSITION VARIABLE (S2C234 d1 bit)**
  Refer to chapter 8.3.0.29 “S2C234: STEP REGISTRATION AT TOOL NO. CHANGE”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Bit status</th>
</tr>
</thead>
<tbody>
<tr>
<td>VALID</td>
<td>0</td>
</tr>
<tr>
<td>INVALID</td>
<td>1</td>
</tr>
</tbody>
</table>

- **POS. TEACH ONLY JOG CONTROL GROUP (S2C320)**
  Refer to chapter 8.2.0.15 “S2C320: CONTROLLED GROUP JOB TEACHING POSITION CHANGE”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROHIBIT</td>
<td>0</td>
</tr>
<tr>
<td>PERMIT</td>
<td>1</td>
</tr>
</tbody>
</table>
6 Convenient Functions

6.8 Parameter Setting Function

• JOB UNDELETE FUNCTION (S2C413)
  Refer to chapter 8.3.0.40 “S2C413: JOB UNDELETE FUNCTION”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVALID</td>
<td>0</td>
</tr>
<tr>
<td>VALID</td>
<td>1</td>
</tr>
</tbody>
</table>

• INDEPENDENT: MOTION OF NEXT/TEST(S2C231)
  Refer to chapter 8.6.0.3 “S2C231: OPERATION METHOD AT FWD/BWD OPERATION OR TEST RUN BY INDEPENDENT CONTROL”.
  This appears only when the independent control is valid.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE</td>
<td>0</td>
</tr>
<tr>
<td>ALL</td>
<td>1</td>
</tr>
</tbody>
</table>

• BWD OPERATION NO GROUP AXIS (S2C688 d0 bit)

• BWD OPERATION CONCURRENT JOB (S2C688 d1 bit)
  Refer to chapter 8.6.0.10 “S2C688: EXECUTION OF “BWD” OPERATION”.
  This appears only when the independent control is valid.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Bit status</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

• STATION TWIN (S2C434)
  Refer to chapter 8.3.0.44 “S2C434: JOB LINKING DESIGNATION (When Twin Synchronous Function Used)”.
  This appears only when the STATION TWIN SYNCHRONOUS JOB is valid.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVALID</td>
<td>0</td>
</tr>
<tr>
<td>VALID</td>
<td>1</td>
</tr>
</tbody>
</table>

• CLEARANCE TEACHING METHOD (S2C612)
  This appears only when it is for motor gun use.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPPER TIP</td>
<td>0</td>
</tr>
<tr>
<td>LOWER TIP</td>
<td>1</td>
</tr>
<tr>
<td>GUN CLOSE</td>
<td>2</td>
</tr>
</tbody>
</table>

• TEST RUN OPERATION (S2C896)

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>NORMAL</td>
<td>0</td>
</tr>
<tr>
<td>HIGH-PRECISION</td>
<td>1</td>
</tr>
</tbody>
</table>
6.8.3 Operation Condition Setting

Select (SETUP) \(\rightarrow\) {OPERATE CONDITION SETTING} to display the following window.

- **SPEED DATA INPUT FORM (S2C221)**
  Refer to chapter 8.3.0.21 “S2C221: SPEED DATA INPUT FORM”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MM/SEC</td>
<td>0</td>
</tr>
<tr>
<td>CM/MIN</td>
<td>1</td>
</tr>
<tr>
<td>INCH/MIN</td>
<td>2</td>
</tr>
<tr>
<td>MM/MIN</td>
<td>3</td>
</tr>
</tbody>
</table>

- **CYCLE SWITCH IN TEACH MODE (S2C313)**
  Refer to chapter 8.3.0.33 “S2C313: TEACH MODE FIRST CYCLE MODE”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP</td>
<td>0</td>
</tr>
<tr>
<td>1 CYCLE</td>
<td>1</td>
</tr>
<tr>
<td>AUTO</td>
<td>2</td>
</tr>
<tr>
<td>NONE</td>
<td>3</td>
</tr>
</tbody>
</table>

- **CYCLE SWITCH IN PLAY MODE (S2C314)**
  Refer to chapter 8.3.0.34 “S2C314: PLAY MODE FIRST CYCLE MODE”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP</td>
<td>0</td>
</tr>
<tr>
<td>1 CYCLE</td>
<td>1</td>
</tr>
<tr>
<td>AUTO</td>
<td>2</td>
</tr>
<tr>
<td>NONE</td>
<td>3</td>
</tr>
</tbody>
</table>
6 Convenient Functions

6.8 Parameter Setting Function

• CYCLE SWITCH IN LOCAL MODE (S2C294)
  Refer to chapter 8.3.0.31 “S2C294: LOCAL FIRST CYCLE MODE”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP</td>
<td>0</td>
</tr>
<tr>
<td>1 CYCLE</td>
<td>1</td>
</tr>
<tr>
<td>AUTO</td>
<td>2</td>
</tr>
<tr>
<td>NONE</td>
<td>3</td>
</tr>
</tbody>
</table>

• CYCLE SWITCH IN REMOTE MODE (S2C293)
  Refer to chapter 8.3.0.30 “S2C293: REMOTE FIRST CYCLE MODE”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP</td>
<td>0</td>
</tr>
<tr>
<td>1 CYCLE</td>
<td>1</td>
</tr>
<tr>
<td>AUTO</td>
<td>2</td>
</tr>
<tr>
<td>NONE</td>
<td>3</td>
</tr>
</tbody>
</table>

• SET CYCLE ON POWER ON (S2C312)
  Refer to chapter 8.3.0.32 “S2C312: POWER ON FIRST CYCLE MODE”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEP</td>
<td>0</td>
</tr>
<tr>
<td>1 CYCLE</td>
<td>1</td>
</tr>
<tr>
<td>AUTO</td>
<td>2</td>
</tr>
<tr>
<td>NONE</td>
<td>3</td>
</tr>
</tbody>
</table>

• SECURITY MODE WHEN POWER ON (S2C195)
  Refer to chapter 8.3.0.1 “S2C195: SECURITY MODE WHEN CONTROL POWER SUPPLY IS TURNED ON”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OPERATION MODE</td>
<td>0</td>
</tr>
<tr>
<td>EDIT MODE</td>
<td>1</td>
</tr>
<tr>
<td>MANAGEMENT MODE</td>
<td>2</td>
</tr>
</tbody>
</table>

• JOB STEP WHEN POWER ON (S2C215)
  Refer to chapter 8.3.0.15 “S2C215: ADDRESS SETTING WHEN CONTROL POWER IS TURNED ON”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER OFF</td>
<td>0</td>
</tr>
<tr>
<td>INITIAL</td>
<td>1</td>
</tr>
</tbody>
</table>
6 Convenient Functions

6.8 Parameter Setting Function

• GENERAL-PURPOSE OUT KEEP WHEN POWER ON (S2C235)
  Refer to chapter 8.5.0.1 “S2C235: USER OUTPUT RELAY WHEN CONTROL POWER IS ON”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER OFF</td>
<td>0</td>
</tr>
<tr>
<td>INITIAL</td>
<td>1</td>
</tr>
</tbody>
</table>

• DISABLE MODE OPERATION (FUNCTIONAL SAFETY) (S2C1201)
  This appears only when the security mode is set to the safety mode under one of the following conditions:
  • Axis range limit function is enabled
  • Robot range limit function is enabled
  • Tool angle monitor function is enabled
  • Functional safety and tool change monitor function are enabled

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAFETY MODE</td>
<td>0</td>
</tr>
<tr>
<td>EDIT MODE</td>
<td>1</td>
</tr>
<tr>
<td>MANAGEMENT MODE</td>
<td>2</td>
</tr>
</tbody>
</table>

• TOOL (INTERFERENCE) FILE OPERATION (FUNCTIONAL SAFETY) (S2C1235)
  This appears only when the functional safety is enabled and the security mode is set to the safety mode.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAFETY MODE</td>
<td>0</td>
</tr>
<tr>
<td>EDIT MODE</td>
<td>1</td>
</tr>
<tr>
<td>MANAGEMENT MODE</td>
<td>2</td>
</tr>
</tbody>
</table>

• SINGULAR POINT PASS CHECK (S2C892 d1 bit)
  This appears only when the singular point pass check function is enabled.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Bit status</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVALID</td>
<td>0</td>
</tr>
<tr>
<td>VALID</td>
<td>1</td>
</tr>
</tbody>
</table>
### 6.8.4 Operate Enable Setting

Select (SETUP) → (OPERATE ENABLE SETTING) to display the following window.

![Operate Enable Setting Window]

- **EXTERNAL START (S2C219)**
  
  Refer to chapter 8.3.0.19 “S2C219: EXTERNAL START”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **PP START (S2C220)**
  
  Refer to chapter 8.3.0.20 “S2C220: PROGRAMMING PENDANT START”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **EXTERNAL MODE SWITCH (S2C225)**
  
  Refer to chapter 8.3.0.24 “S2C225: EXTERNAL MODE SWITCH”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **EXTERNAL CYCLE SWITCH (S2C227)**
  
  Refer to chapter 8.3.0.25 “S2C227: EXTERNAL CYCLE SWITCHING”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

6-87
### Parameter Setting Function

- **PP CYCLE SWITCH (S2C228)**
  Refer to chapter 8.3.0.26 “S2C228: PROGRAMMING PENDANT CYCLE SWITCHING”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **EXTERNAL SERVO ON (S2C229 d0 bit)**

- **PP SERVO ON (S2C229 d1 bit)**

- **DSW SERVO ON (S2C229 d2 bit)**
  Refer to chapter 8.3.0.27 “S2C229: SERVO ON FROM EXTERNAL PP PROHIBITION”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Bit Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>
6.8 Parameter Setting Function

6.8.5 Function Enable Setting

Select (SETUP) → (FUNCTION ENABLE SETTING) to display the following window.

- MASTER JOB CHANGE (S2C207)
  Refer to chapter 8.3.0.9 "S2C207: MASTER JOB CHANGING OPERATION".

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- RESERVED START (S2C222)
  Refer to chapter 8.3.0.22 "S2C222: RESERVED START".

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- RESERVED START JOB CHANGE (S2C209)
  Refer to chapter 8.3.0.11 "S2C209: RESERVED WORK JOB CHANGING OPERATION".

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- JOB SELECTION IN PLAY MODE (S2C552).

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>
6 Convenient Functions
6.8 Parameter Setting Function

- **JOB SELECTION IN PLAY MODE WITH REMOTE (S2C224)**
  Refer to *chapter 8.3.0.23 “S2C224: JOB SELECTION AT REMOTE FUNCTION (PLAY MODE)”*.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **I/O VARIABLE CUSTOMIZE FUNCTION (S2C397)**
  Refer to *chapter 8.3.0.38 “S2C397: I/O VARIABLE CUSTOMIZE FUNCTION”*.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVALID</td>
<td>0</td>
</tr>
<tr>
<td>VALID</td>
<td>1</td>
</tr>
</tbody>
</table>

- **GENERAL-PURPOSE I/O NAME DISP. ON JOB (S2C544)**
  Refer to *chapter 8.3.0.46 “S2C544: I/O NAME DISPLAY FUNCTION FOR JOB”*.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVALID</td>
<td>0</td>
</tr>
<tr>
<td>VALID</td>
<td>1</td>
</tr>
</tbody>
</table>

- **ANTICIPATION FUNCTION (S2C646)**
  Refer to *chapter 8.8.0.1 “S2C646: ANTICIPATOR FUNCTION”*.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVALID</td>
<td>0</td>
</tr>
<tr>
<td>VALID</td>
<td>1</td>
</tr>
</tbody>
</table>

- **ALL AXES ANGLE DISP FUNCTION (S2C684 d0 bit)**
  Refer to *chapter 8.3.0.47 “S2C684: ALL AXES ANGLE DISPLAY FUNCTION”*.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Bit status</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVALID</td>
<td>0</td>
</tr>
<tr>
<td>VALID</td>
<td>1</td>
</tr>
</tbody>
</table>

- **SAVE DATA CRC CONFIRM FUNCTION (FUNCTIONAL SAFETY) (S2C1202)**
  This appears only when the functional safety is enabled and the security mode is set to the safety mode.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>VALID</td>
<td>0</td>
</tr>
<tr>
<td>INVALID</td>
<td>1</td>
</tr>
</tbody>
</table>

6-90
### 6.8.6 Jog Condition Setting

Select {SETUP} → {JOG CONDITION SETTING} to display the following window.

#### • COORDS SWITCH WHEN JOG OPERATION (S2C197)
Refer to chapter 8.3.0.3 “S2C197: COORDINATE SWITCHING PROHIBITED”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOOL &amp; USER OK</td>
<td>0</td>
</tr>
<tr>
<td>TOOL NG</td>
<td>1</td>
</tr>
<tr>
<td>USER NG</td>
<td>2</td>
</tr>
<tr>
<td>TOOL &amp; USER NG</td>
<td>3</td>
</tr>
</tbody>
</table>

#### • MANUAL SPEED SAVE EVERY COORDS (S2C204)
Refer to chapter 8.3.0.7 “S2C204: MANUAL SPEED STORING FOR EACH COORDINATE”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVALID</td>
<td>0</td>
</tr>
<tr>
<td>VALID</td>
<td>1</td>
</tr>
</tbody>
</table>

#### • MOTION ABOUT TCP IN BASE COORDS (S2C713)
Refer to chapter 8.3.0.48 “S2C713: CONTROL POINT OPERATION SETTING ON THE SERVO TRACK”.
This appears only when the robot system includes a base axis.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>INVALID</td>
<td>0</td>
</tr>
<tr>
<td>VALID</td>
<td>1</td>
</tr>
</tbody>
</table>

#### • Cartesian JOG COORDS (S2C724)
This appears only when the robot system includes two or more manipulators.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE COORDS</td>
<td>0</td>
</tr>
<tr>
<td>ROBOT COORDS</td>
<td>1</td>
</tr>
</tbody>
</table>
6.8 Parameter Setting Function

6.8.7 Playback Condition Setting

Select {SETUP} → {PLAYBACK CONDITION SETTING} to display the following window.

- **CHECK/MACHINE LOCK (S2C208)**
  Refer to chapter 8.3.0.10 "S2C208: CHECK AND MACHINE-LOCK KEY OPERATION IN PLAY MODE".

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **MASTER CALLING UP (S2C210)**
  Refer to chapter 8.3.0.12 "S2C210: MASTER OR SUBMASTER CALL OPERATION IN PLAY MODE".

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERMIT</td>
<td>0</td>
</tr>
<tr>
<td>PROHIBIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **INITIAL MOVE SPEED OF ROBOT (S2C217)**
  Refer to chapter 8.3.0.17 "S2C217: INITIAL OPERATION OF MANIPULATOR".

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECIAL PLAY</td>
<td>0</td>
</tr>
<tr>
<td>LOW SPEED AFTER EDIT</td>
<td>1</td>
</tr>
</tbody>
</table>

- **START METHOD AFTER ABSO OVER (S2C316)**
  Refer to chapter 8.3.0.35 "S2C316: START CONDITION AFTER ALARM-4107 ("OUT OF RANGE (ABSO DATA)")".

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>POS. CHECK</td>
<td>0</td>
</tr>
<tr>
<td>LOW SPEED</td>
<td>1</td>
</tr>
</tbody>
</table>

- **SIGNAL NO. WHEN DROP VALUE OVER (S2C240)**
  Refer to chapter 8.5.0.7 "S4C240: USER OUTPUT NO. WHEN MANIPULATOR DROP ALLOWABLE RANGE ERROR OCCURS".
6 Convenience Functions
6.8 Parameter Setting Function

### 6.8.8 Functional Condition Setting

Select [SETUP] → [FUNCTIONAL CONDITION SETTING] to display the following window.

![Functional Condition Setting Window](image)

- **COORDINATE (PAM) (S2C1100)**
  - Refer to chapter 8.2.0.24 “S3C1098 to S3C1102: POSITION CORRECTING FUNCTION DURING PLAYBACK”.

<table>
<thead>
<tr>
<th>Setting</th>
<th>Parameter value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BASE</td>
<td>0</td>
</tr>
<tr>
<td>ROBOT</td>
<td>1</td>
</tr>
<tr>
<td>TOOL</td>
<td>2</td>
</tr>
<tr>
<td>USER #1</td>
<td>3</td>
</tr>
<tr>
<td>USER #63</td>
<td>65</td>
</tr>
</tbody>
</table>

- **POSITION ADJUST RANGE (PAM) (S2C1098)**
- **SPEED ADJUST RANGE (PAM) (S2C1099)**
- **POSTURE ANGLE ADJUST RANGE (PAM) (S2C1102)**
  - Refer to chapter 8.2.0.24 “S3C1098 to S3C1102: POSITION CORRECTING FUNCTION DURING PLAYBACK”.
6.9 Jog Key Allocation

6.9.1 Jog Key Allocation Function

This function enables to operate external axis without switching control groups by using operation keys of 7th-axis (E+, E-) and 8th-axis (8+,8-) on the programing pendant after setting any external axis to them.

**NOTICE**

- Operation of external axis by using the allocated operation keys of 7th axis and 8th axis are valid only when operating a robot. In the case where operating external axes, operate them by using keys from the key for 1st axis. Furthermore, when the robot is equipped with 7th and 8th axes, keys on the pendant are used to operate existing axes on a priority basis. For example, when the robot is equipped with 7 axes, E-axis will move even if the external axis operation is allocated to 7th axis (E+, E-) operational key.

**NOTE**

This function can operate other control group than displayed in the upper part of the programming pendant (Status display area or the LED of [ROBOT] or [EX.AXIS]). Also, the simultaneous operation of the robot and the external axes is possible by pressing several axis operational keys at a time. Please be careful to the axes movements when pressing them.
6 Convenient Functions
6.9 Jog Key Allocation

6.9.2 Jog Key Allocation Setting

6.9.2.1 Allocation of the Jog Key

**NOTICE**

- Allocation of the jog keys is valid only in the management mode while only confirmation of allocated axes is valid in the operation mode and edit mode.

The setup conditions are saved in the following parameters. Even if the same numbered external axes are allocated to a key (example: S1 for the 1st axis), the value of the parameter to be saved varies depending on the composition of the control group of the system. In this consequence, when loading the parameter file (ALL.PRM or AC.PRM), please make sure to confirm the allocating status before executing the function.

Parameters for saving the setup conditions of jog key allocation

S2C739  7th axis
S2C740  8th axis

1. Select {SETUP} under main menu.
2. Select {JOG KEY ALLOCATION}.
   - Jog key allocation window appears.

![Jog Key Allocation Window](image)
3. Move the cursor to “GROUP” and press down [SELECT].
   – The list of allocatable external axes appears.

4. Select an external axis to be allocated.
   – The selected external axis is indicated in “GROUP” and “1” is indicated in “AXIS NO”.

5. (In the cases where the external axis is composed of more than two axes and the axis from the 2nd-axis are operated)
   Move the cursor to “AXIS NO”. and press down [SELECT].
   – The list of selected external axes appears.

6. Select a desired axis number.
   – The selected axis is indicated in “AXIS NO”.

---

6 Convenient Functions

6.9 Jog Key Allocation

---

3. [Diagram of JOG KEY ALLOCATION screen]

4. Select an external axis to be allocated.

5. (In the cases where the external axis is composed of more than two axes and the axis from the 2nd-axis are operated)
   Move the cursor to “AXIS NO”. and press down [SELECT].

6. Select a desired axis number.

6 Convenient Functions
6.9 Jog Key Allocation

6.9.2.2 Cancellation of Jog Key Allocation

1. Select {SETUP} under main menu.
2. Select {JOG KEY ALLOCATION}.
   – Jog key allocation window appears.
3. Move the cursor to “GROUP” and press [SELECT].
   – The list of allocatable external axes appears.

4. Select “NONE”.
   – “******” is indicated in “GROUP” and “AXIS NO”.

---

---
6.9.2.3 Operating Method of Allocated External Axis

NOTICE

- When the same external axis (same group and axis number) is allocated to 7th and 8th [Axis Keys], it won’t move even both keys are pressed individually. In the case like this, the message “Check the setting of JOG KEY ALLOCATION (7th and 8th)” is indicated to alarm that the same external axis is allocated to two different keys. Please cancel the allocation setting or allocate another external axis to either of the key.

1. Press [ROBOT].
   - A mark of robot is indicated at the left side of the status area on the programming pendant, and this expresses that the robot is selected to be the object of operation.
   - Also, the LED of [ROBOT] lights.

2. Press 7th (E+,E-) axis or 8th (8+,8-) axis operation key.
   - The allocated external axes moves if there are no 7th and 8th axes and the allocation setting was done properly.
6 Convenient Functions
6.10 Energy Saving Function

6.10 Energy Saving Function

6.10.1 Energy Saving Function

Energy saving function is a function to save power by halting the power to the robot after applying brake to the motor when robot’s all axes won’t move for a designated period of time while servo is turned ON in play mode. The initial designated period of time is 10 minutes.

This energy saving function is valid when all the following condition met.

1. Energy saving function is valid.
2. The system input signal (the signal to prohibit on energy saving mode #40580) is turned OFF.

Followings are the status of the robot while this function is valid.

1. The message “On energy saving mode” is indicated on the programming pendant.
2. The servo is turned ON.
3. The jobs under execution are continuously executed.
4. The system output signal (ENERGY SAVING:SOUT#0576(#50727)) to indicate that it is in energy saving status is turned ON while other signals won’t change.

NOTICE

• This function is canceled in the following cases:
  – When the programming pendant mode is switched to teach mode.
  – When the system input signal of external servo OFF(1,2,3) is input.
  – When the axis, which belongs to the subject control group of the executing job, is about to move while energy saving function is valid.
  – In the cases where emergency stop or servo OFF is executed when alarming.

NOTE

This function will not be canceled if the system input signal (the signal to prohibit energy saving #40580) is turned ON. This signal merely prohibits to shift the status to energy saving status.
6.10 Energy Saving Function

6.10.2 Method of Setting Energy Saving Function

6.10.2.1 Enable/Disable Energy Saving Function

**NOTICE**

- The energy saving function can be enabled/disabled only in the management mode. In the operation mode or in the edit mode, only confirmation of this function is available.

1. Select (SETUP) under main menu.
2. Select (ENERGY SAVING FUNCTION).
   - The ENERGY SAVING FUNCTION window appears.
6 Convenient Functions
6.10 Energy Saving Function

3. Move the cursor to “ENERGY SAVING FUNCTION” and press [SELECT].
   – Valid and invalid alternates at each press of [SELECT].

4. Move the cursor to {SETTING TIME} and press [SELECT].
   – Input the time you want to start energy saving after the robot is stopped into {SETTING TIME} section (unit: min.). The initial value is set to 10 min. and the range of the inputting value is from 1 to 60.
6 Convenient Functions

6.10 Energy Saving Function

6.10.2.2 Accumulated Energy Saving Time Clearance

1. Select {SETUP} under main menu.
2. Select {ENERGY SAVING FUNCTION}.
   - Energy saving function window appears.
3. Move the cursor to {ACCUMULTED ENERGY-SAVING TIME}.
4. Move the cursor to {DATA} and press [SELECT].
   - {CLEAR ACCUMULTED} appears in the pull-down menu.
5. Select {CLEAR ACCUMULTED}.
   - The confirmation dialog box appears.
6. Select “YES” on the dialog box.
   - The accumulated energy-saving time is cleared.
6 Convenient Functions

6.10 Energy Saving Function

6.10.3 Energy Saving Status Confirmation Method

6.10.3.1 Confirmation by the Accumulated Energy-Saving Time

1. Select {SETUP} under main menu.
2. Select {ENERGY SAVING FUNCTION}.

– The ENERGY SAVING FUNCTION window appears.
The accumulated energy-saving time is being counted up while the status is in the energy saving mode.

6.10.3.2 Confirmation by System Signal Output

1. Select {IN/OUT} under main menu.
2. Select {SPECIFIC OUTPUT}.

– The SPECIFIED OUTPUT window appears.
3. Press the [PAGE] or [SELECT] to display SOUT#0576 (#50727).

– The system output status during the energy saving status is indicated.
This signal is turned ON while in the energy saving mode.

– This signal is turned OFF after the energy saving mode is released.
6 Convenient Functions

6.11 Instruction Display Color Setting Function

6.11.1 Setting the Instruction Display Color on the Job Window

By using this function, each instruction can be displayed in each different color on the job window.

Display colors can be specified for the following instructions:
- Move instruction
- Work instruction
- Comment instruction
- Label instruction
- Macro instruction (when the macro function is enabled)
- I/O instruction
- Instruction to which LINE EDIT LOCK is specified
- Instruction to which LINE COMMENT is specified
- All the instructions other than listed above

The color of each instruction in the job window can be set on the DISPLAY COLOR CONDITION SETTING window.

1. Select {SETUP} under {Main Menu}.

2. Select {DISPLAY COLOR COND.}.

   - The DISPLAY COLOR CONDITION SETTING window appears.
6 Convenient Functions
6.11 Instruction Display Color Setting Function

3. Move the cursor to an instruction and press [SELECT].
   – The list of available colors for the instruction is displayed.

4. Select a color.
   – The selected color is set for the instruction.

5. Select the JOB window.
   – The instruction is displayed in the selected color on the job window.
6. Convenient Functions
6.12 Present Manipulator Position Output Function

6.12 Present Manipulator Position Output Function

6.12.1 Function for Outputting Present Cartesian Position of Manipulator to Register

6.12.1.1 Outline

The present Cartesian position of the manipulator (values in the base coordinates) is output to the specified registers.

6.12.1.2 Parameters

The following parameters specify the details of the function and output register numbers.

<table>
<thead>
<tr>
<th>S1CxG</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>208</td>
<td>Enables/Disables the function for outputting the present Cartesian position (in the base coordinates) to registers. (command value)</td>
</tr>
<tr>
<td></td>
<td>0: disable</td>
</tr>
<tr>
<td></td>
<td>1: enable</td>
</tr>
<tr>
<td>209</td>
<td>Specifies the output size to the register.</td>
</tr>
<tr>
<td></td>
<td>0: output in 2 bytes</td>
</tr>
<tr>
<td></td>
<td>1: output in 4 bytes</td>
</tr>
<tr>
<td>210</td>
<td>Cartesian position (command value) X register number of output destination</td>
</tr>
<tr>
<td>211</td>
<td>Cartesian position (command value) Y register number of output destination</td>
</tr>
<tr>
<td>212</td>
<td>Cartesian position (command value) Z register number of output destination</td>
</tr>
<tr>
<td>213</td>
<td>Cartesian position (command value) Rx register number of output destination</td>
</tr>
<tr>
<td>214</td>
<td>Cartesian position (command value) Ry register number of output destination</td>
</tr>
<tr>
<td>215</td>
<td>Cartesian position (command value) Rz register number of output destination</td>
</tr>
<tr>
<td>216</td>
<td>Cartesian position (command value) Re register number of output destination</td>
</tr>
<tr>
<td>217</td>
<td>Enables/Disables the function for outputting the present Cartesian position (in the base coordinates) to registers. (FB value)</td>
</tr>
<tr>
<td></td>
<td>0: disable</td>
</tr>
<tr>
<td></td>
<td>1: enable</td>
</tr>
<tr>
<td>218</td>
<td>Specifies the output size to the register.</td>
</tr>
<tr>
<td></td>
<td>0: output in 2 bytes</td>
</tr>
<tr>
<td></td>
<td>1: output in 4 bytes</td>
</tr>
<tr>
<td>219</td>
<td>Cartesian position (FB value) X register number of output destination</td>
</tr>
<tr>
<td>220</td>
<td>Cartesian position (FB value) Y register number of output destination</td>
</tr>
<tr>
<td>221</td>
<td>Cartesian position (FB value) Z register number of output destination</td>
</tr>
<tr>
<td>222</td>
<td>Cartesian position (FB value) Rx register number of output destination</td>
</tr>
<tr>
<td>223</td>
<td>Cartesian position (FB value) Ry register number of output destination</td>
</tr>
<tr>
<td>224</td>
<td>Cartesian position (FB value) Rz register number of output destination</td>
</tr>
<tr>
<td></td>
<td>Cartesian position (FB value) Re register number of output destination</td>
</tr>
</tbody>
</table>
6 Convenient Functions
6.12 Present Manipulator Position Output Function

<Example 1>

<table>
<thead>
<tr>
<th>S1C1G</th>
<th>Setting value</th>
</tr>
</thead>
<tbody>
<tr>
<td>208</td>
<td>1</td>
</tr>
<tr>
<td>209</td>
<td>0</td>
</tr>
<tr>
<td>210</td>
<td>10</td>
</tr>
<tr>
<td>211</td>
<td>11</td>
</tr>
<tr>
<td>212</td>
<td>12</td>
</tr>
<tr>
<td>213</td>
<td>13</td>
</tr>
<tr>
<td>214</td>
<td>14</td>
</tr>
<tr>
<td>215</td>
<td>15</td>
</tr>
<tr>
<td>216</td>
<td>16</td>
</tr>
</tbody>
</table>

When the parameters are set as shown in the above table, the present position is output to the registers as follows:

M010 = Manipulator’s present Cartesian position (command value) X [unit: mm]
M011 = Manipulator’s present Cartesian position (command value) Y [unit: mm]
M012 = Manipulator’s present Cartesian position (command value) Z [unit: mm]
M013 = Manipulator’s present Cartesian position (command value) Rx [unit: deg]
M014 = Manipulator’s present Cartesian position (command value) Ry [unit: deg]
M015 = Manipulator’s present Cartesian position (command value) Rz [unit: deg]
M016 = Manipulator’s present Cartesian position (command value) Re [unit: deg]

<Example 2>

<table>
<thead>
<tr>
<th>S1C1G</th>
<th>Setting value</th>
</tr>
</thead>
<tbody>
<tr>
<td>217</td>
<td>1</td>
</tr>
<tr>
<td>218</td>
<td>1</td>
</tr>
<tr>
<td>219</td>
<td>10</td>
</tr>
<tr>
<td>220</td>
<td>12</td>
</tr>
<tr>
<td>221</td>
<td>14</td>
</tr>
<tr>
<td>222</td>
<td>16</td>
</tr>
<tr>
<td>223</td>
<td>18</td>
</tr>
<tr>
<td>224</td>
<td>20</td>
</tr>
<tr>
<td>225</td>
<td>22</td>
</tr>
</tbody>
</table>

When the parameters are set as shown in the above table, the present position is output to the registers as follows:

M010 = Lower 2 bytes of the manipulator’s present Cartesian position (FB value) X [unit: µm]
M011 = Upper 2 bytes of the manipulator’s present Cartesian position (FB value) X [unit: µm]
M012 = Lower 2 bytes of the manipulator’s present Cartesian position (FB value) Y [unit: µm]
M013 = Upper 2 bytes of the manipulator’s present Cartesian position (FB value) Y [unit: µm]
M014 = Lower 2 bytes of the manipulator’s present Cartesian position (FB value) Z [unit: µm]
M015 = Upper 2 bytes of the manipulator’s present Cartesian position (FB value) Z [unit: µm]
M016 = Lower 2 bytes of the manipulator’s present Cartesian position (FB value) Rx [unit: 0.001 deg]
M017 = Upper 2 bytes of the manipulator’s present Cartesian position (FB value) Rx [unit: 0.001 deg]
6 Convenient Functions

6.12 Present Manipulator Position Output Function

- M018 = Lower 2 bytes of the manipulator’s present Cartesian position (FB value) Ry [unit: 0.001 deg]
- M019 = Upper 2 bytes of the manipulator’s present Cartesian position (FB value) Ry [unit: 0.001 deg]
- M020 = Lower 2 bytes of the manipulator’s present Cartesian position (FB value) Rz [unit: 0.001 deg]
- M021 = Upper 2 bytes of the manipulator’s present Cartesian position (FB value) Rz [unit: 0.001 deg]
- M022 = Lower 2 bytes of the manipulator’s present Cartesian position (FB value) Re [unit: 0.001 deg]
- M023 = Upper 2 bytes of the manipulator’s present Cartesian position (FB value) Re [unit: 0.001 deg]

**NOTE**

- When this function for command values is enabled (S1CxG208=1), be sure to set the register number of output destination for each coordinate value (S1CxG210 to 216).
- When this function for FB values is enabled (S1CxG217=1), be sure to set the register number of output destination for each coordinate value (S1CxG219 to 225).
- When the output size to the register is set to 2 bytes (S1CxG209=0 or S1CxG218=0), the unit for X, Y, Z coordinate values is “mm”, and the unit for Rx, Ry, Rz, Re coordinate values is “deg”. If the coordinate value exceeds 2 bytes, only the lower 2 bytes will be output.
- When the output size to the register is set to 4 bytes (S1CxG209=1 or S1CxG218=1), the unit for X, Y, Z coordinate values is “µmm”, and the unit for Rx, Ry, Rz, Re coordinate values is “0.0001 deg”.
- When the output size to the register is set to 4 bytes (S1CxG209=1 or S1CxG218=1), the upper bytes of the coordinate value will be output to the next number of the specified register number. Before performing setting, check the usage status of the registers.
6 Convenient Functions
6.12 Present Manipulator Position Output Function

6.12.2 Function for Outputting Present Pulse Position to Register

6.12.2.1 Outline

The present position of the robot axis, the base axis, or the station axis in pulses is output to the specified registers.

6.12.2.2 Parameters

The following parameters specify the details of the function and output register numbers.

<table>
<thead>
<tr>
<th>S1CxG</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>202</td>
<td>Specifies the axis to apply the function 1 for outputting the present position in pulses to registers. (command value) The axis is specified in bits. Bit OFF: disable Bit ON: enable</td>
</tr>
<tr>
<td>203</td>
<td>Specifies the axis to apply the function 1 for outputting the present position in pulses to registers. (FB value) The axis is specified in bits. Bit OFF: disable Bit ON: enable</td>
</tr>
<tr>
<td>204</td>
<td>Specifies the output size to the register. Bit OFF: output in 2 bytes Bit ON: output in 4 bytes</td>
</tr>
<tr>
<td>205</td>
<td>Specifies the axis to apply the function 2 for outputting the present position in pulses to registers. (command value) The axis is specified in bits. Bit OFF: disable Bit ON: enable</td>
</tr>
<tr>
<td>206</td>
<td>Specifies the axis to apply the function 2 for outputting the present position in pulses to registers. (FB value) The axis is specified in bits. Bit OFF: disable Bit ON: enable</td>
</tr>
<tr>
<td>207</td>
<td>Specifies the output size to the register. Bit OFF: output in 2 bytes Bit ON: output in 4 bytes</td>
</tr>
<tr>
<td>1090  to 1097</td>
<td>Function 1 register number of output destination</td>
</tr>
<tr>
<td>1100  to 1107</td>
<td>Function 1 resolution setting</td>
</tr>
<tr>
<td>1110  to 1117</td>
<td>Function 1 offset value setting</td>
</tr>
<tr>
<td>1120  to 1127</td>
<td>Function 2 register number of output destination</td>
</tr>
<tr>
<td>1130  to 1137</td>
<td>Function 2 resolution setting</td>
</tr>
<tr>
<td>1140  to 1147</td>
<td>Function 2 offset value setting</td>
</tr>
</tbody>
</table>
6 Convenient Functions
6.12 Present Manipulator Position Output Function

2-byte output specification:
• \((\text{specified M register}) = \frac{(\text{pulse (command or FB)})}{(\text{resolution})} + (\text{offset value})\) [unit: pulse]

NOTE
When the output size to the register is set to 2 bytes (no axis specified in S1CxG204 or S1CxG207), the pulse value in the size of 2 bytes will be output to the specified register number. If the size exceeds 2 bytes, only the lower 2 bytes will be output.

4-byte output specification:
• \((\text{specified M register}) = \text{Lower 2 bytes of } \frac{(\text{pulse (command or FB)})}{(\text{resolution})} + (\text{offset value})\) [unit: pulse]
• \((\text{specified M register} + 1) = \text{Upper 2 bytes of } \frac{(\text{pulse (command or FB)})}{(\text{resolution})} + (\text{offset value})\) [unit: pulse]

NOTE
When the output size to the register is set to 4 bytes (an axis specified in S1CxG204 or S1CxG207), the lower 2 bytes will be output to the specified register number, and the upper 2 bytes will be output to the next number of the specified register number. Before performing setting, check the usage status of the registers.

<Example 1>

<table>
<thead>
<tr>
<th>S1C1G</th>
<th>Setting value</th>
</tr>
</thead>
<tbody>
<tr>
<td>202</td>
<td>63</td>
</tr>
<tr>
<td>203</td>
<td>0</td>
</tr>
<tr>
<td>204</td>
<td>0</td>
</tr>
<tr>
<td>1090</td>
<td>10</td>
</tr>
<tr>
<td>1091</td>
<td>11</td>
</tr>
<tr>
<td>1092</td>
<td>12</td>
</tr>
<tr>
<td>1093</td>
<td>13</td>
</tr>
<tr>
<td>1094</td>
<td>14</td>
</tr>
<tr>
<td>1095</td>
<td>15</td>
</tr>
</tbody>
</table>

When the parameters are set as shown in the above table, the present position is output to the registers as follows:

\[
\begin{align*}
M010 &= \text{Present pulse position (command value)} \quad \text{S (1st axis) [unit: pulse]} \\
M011 &= \text{Present pulse position (command value)} \quad \text{L (2nd axis) [unit: pulse]} \\
M012 &= \text{Present pulse position (command value)} \quad \text{U (3rd axis) [unit: pulse]} \\
M013 &= \text{Present pulse position (command value)} \quad \text{R (4th axis) [unit: pulse]} \\
M014 &= \text{Present pulse position (command value)} \quad \text{B (5th axis) [unit: pulse]} \\
M015 &= \text{Present pulse position (command value)} \quad \text{T (6th axis) [unit: pulse]}
\end{align*}
\]
6 Convenient Functions
6.12 Present Manipulator Position Output Function

<Example 2>

<table>
<thead>
<tr>
<th>S1C1G</th>
<th>Setting value</th>
</tr>
</thead>
<tbody>
<tr>
<td>202</td>
<td>0</td>
</tr>
<tr>
<td>203</td>
<td>63</td>
</tr>
<tr>
<td>204</td>
<td>63</td>
</tr>
<tr>
<td>1090</td>
<td>10</td>
</tr>
<tr>
<td>1091</td>
<td>12</td>
</tr>
<tr>
<td>1092</td>
<td>14</td>
</tr>
<tr>
<td>1093</td>
<td>16</td>
</tr>
<tr>
<td>1094</td>
<td>18</td>
</tr>
<tr>
<td>1095</td>
<td>20</td>
</tr>
</tbody>
</table>

When the parameters are set as shown in the above table, the present position is output to the registers as follows:

- M010 = Lower 2 bytes of the Present pulse position (FB value) S (1st axis) [unit: pulse]
- M011 = Upper 2 bytes of the Present pulse position (FB value) S (1st axis) [unit: pulse]
- M012 = Lower 2 bytes of the Present pulse position (FB value) L (2nd axis) [unit: pulse]
- M013 = Upper 2 bytes of the Present pulse position (FB value) L (2nd axis) [unit: pulse]
- M014 = Lower 2 bytes of the Present pulse position (FB value) U (3rd axis) [unit: pulse]
- M015 = Upper 2 bytes of the Present pulse position (FB value) U (3rd axis) [unit: pulse]
- M016 = Lower 2 bytes of the Present pulse position (FB value) R (4th axis) [unit: pulse]
- M017 = Upper 2 bytes of the Present pulse position (FB value) R (4th axis) [unit: pulse]
- M018 = Lower 2 bytes of the Present pulse position (FB value) B (5th axis) [unit: pulse]
- M019 = Upper 2 bytes of the Present pulse position (FB value) B (5th axis) [unit: pulse]
- M020 = Lower 2 bytes of the Present pulse position (FB value) T (6th axis) [unit: pulse]
- M021 = Upper 2 bytes of the Present pulse position (FB value) T (6th axis) [unit: pulse]

**NOTE**

- If the pulse is a negative value, the pulse will be output to the register in 2's complement notation.
- Even in one control group, “command value” or “FB value” can be specified differently for each axis. However, if “command value” and “FB value” are specified for the same axis, the value “0” will be output to the register.
- If “0” is set as the resolution setting parameter (S1C1G1110 to 1117, S1C1G1130 to 1137), it will be treated as “1” when output to the register is performed.
- If “0” is set as the register number of output destination (S1C1G1090 to 1097, S1C1G1120 to 1127), the present pulse position will not be output to the register. Thus, no value can be output to the register number M000. Also, if the same register number of output destination is used more than twice, the former data will be overwritten by the latter data.
6.12.3 Function for Outputting TCP Speed to Register

6.12.3.1 Outline

The TCP (tool center point) speed of the manipulator is output to the specified registers.

6.12.3.2 Parameters

The following parameters specify the details of the function and output register numbers.

<table>
<thead>
<tr>
<th>S1CxG</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>330</td>
<td>Enables/Disables the function for outputting the TCP speed to registers. (command value)</td>
</tr>
<tr>
<td>0: no output to register</td>
<td></td>
</tr>
<tr>
<td>1: output in 2 bytes [unit: mm/sec]</td>
<td></td>
</tr>
<tr>
<td>2: output in 4 bytes [unit: µm/sec]</td>
<td></td>
</tr>
<tr>
<td>331</td>
<td>TCP speed (command value) register number of output destination</td>
</tr>
<tr>
<td>332</td>
<td>Enables/Disables the function for outputting the TCP speed to registers. (FB value)</td>
</tr>
<tr>
<td>0: no output to register</td>
<td></td>
</tr>
<tr>
<td>1: output in 2 bytes [unit: mm/sec]</td>
<td></td>
</tr>
<tr>
<td>2: output in 4 bytes [unit: µm/sec]</td>
<td></td>
</tr>
<tr>
<td>333</td>
<td>TCP speed (FB value) register number of output destination</td>
</tr>
</tbody>
</table>

Example 1>

<table>
<thead>
<tr>
<th>S1CxG</th>
<th>Setting value</th>
</tr>
</thead>
<tbody>
<tr>
<td>330</td>
<td>1</td>
</tr>
<tr>
<td>331</td>
<td>10</td>
</tr>
<tr>
<td>332</td>
<td>2</td>
</tr>
<tr>
<td>333</td>
<td>11</td>
</tr>
</tbody>
</table>

When the parameters are set as shown in the above table, the speed is output to the registers as follows:

- M010 = TCP speed (command value) [unit: mm/sec]
- M011 = Lower 2 bytes of the TCP speed (FB value) [unit: µm/sec]
- M012 = Upper 2 bytes of the TCP speed (FB value) [unit: µm/sec]

**NOTE**

- When the output size to the register is set to 2 bytes ("1" is set in S1CxG330 or S1CxG332), the TCP speed in the size of 2 bytes will be output to the specified register number. If the size exceeds 2 bytes, only the lower 2 bytes will be output.
- When the output size to the register is set to 4 bytes ("2" is set in S1CxG330 or S1CxG332), the lower 2 bytes will be output to the specified register number, and the upper 2 bytes will be output to the next number of the specified register number. Before performing setting, check the usage status of the registers.
- If "0" is set as the register number of output destination (S1CxG331 or S1CxG333), the present TCP speed will not be output to the register. Thus, no value can be output to the register number M000. Also, if the same register number of output destination is used more than twice, the former data will be overwritten by the latter data.
6.12 Function for Outputting Each Axis Speed to Register

6.12.4 Outline

The speed of each axis of the robot axis, the base axis, and the station axis is output to the specified registers.

6.12.4.2 Parameters

The following parameters specify the details of the function and output register numbers.

<table>
<thead>
<tr>
<th>S1CxG</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>334</td>
<td>Enables/Disables the function for outputting each axis speed to registers. (command value)</td>
</tr>
<tr>
<td></td>
<td>0: no output to register</td>
</tr>
<tr>
<td></td>
<td>1: output in 2 bytes [unit: deg/sec (mm/sec for a linear motion axis)]</td>
</tr>
<tr>
<td></td>
<td>2: output in 4 bytes [unit: 0.0001 deg/sec (µm/sec for a linear motion axis)]</td>
</tr>
<tr>
<td>335</td>
<td>Enables/Disables the function for outputting each axis speed to registers. (FB value)</td>
</tr>
<tr>
<td></td>
<td>0: no output to register</td>
</tr>
<tr>
<td></td>
<td>1: output in 2 bytes [unit: deg/sec (mm/sec for a linear motion axis)]</td>
</tr>
<tr>
<td></td>
<td>2: output in 4 bytes [unit: 0.0001 deg/sec (µm/sec for a linear motion axis)]</td>
</tr>
</tbody>
</table>

| 1270 to 1277 | Each axis speed (command value) register number of output destination |
| 1280 to 1287 | Each axis speed (FB value) register number of output destination       |

<Example 1>

<table>
<thead>
<tr>
<th>S1C1G</th>
<th>Setting value</th>
</tr>
</thead>
<tbody>
<tr>
<td>334</td>
<td>1</td>
</tr>
<tr>
<td>335</td>
<td>0</td>
</tr>
<tr>
<td>1270</td>
<td>10</td>
</tr>
<tr>
<td>1271</td>
<td>11</td>
</tr>
<tr>
<td>1272</td>
<td>12</td>
</tr>
<tr>
<td>1273</td>
<td>13</td>
</tr>
<tr>
<td>1274</td>
<td>14</td>
</tr>
<tr>
<td>1275</td>
<td>15</td>
</tr>
</tbody>
</table>

When the parameters are set as shown in the above table, the speed is output to the registers as follows:

- M010 = Each axis speed (command value) S (1st axis) [unit: deg/sec]
- M011 = Each axis speed (command value) L (2nd axis) [unit: deg/sec]
- M012 = Each axis speed (command value) U (3rd axis) [unit: deg/sec]
- M013 = Each axis speed (command value) R (4th axis) [unit: deg/sec]
- M014 = Each axis speed (command value) B (5th axis) [unit: deg/sec]
- M015 = Each axis speed (command value) T (6th axis) [unit: deg/sec]
6 Convenient Functions
6.12 Present Manipulator Position Output Function

<Example 2>

<table>
<thead>
<tr>
<th>S1C1G</th>
<th>Setting value</th>
</tr>
</thead>
<tbody>
<tr>
<td>334</td>
<td>0</td>
</tr>
<tr>
<td>335</td>
<td>2</td>
</tr>
<tr>
<td>1280</td>
<td>10</td>
</tr>
<tr>
<td>1281</td>
<td>12</td>
</tr>
<tr>
<td>1282</td>
<td>14</td>
</tr>
<tr>
<td>1283</td>
<td>16</td>
</tr>
<tr>
<td>1284</td>
<td>18</td>
</tr>
<tr>
<td>1285</td>
<td>20</td>
</tr>
</tbody>
</table>

When the parameters are set as shown in the above table, the speed is output to the registers as follows:

- M010 = Lower 2 bytes of the Each axis speed (FB value) S (1st axis) [unit: 0.0001 deg/sec]
- M011 = Upper 2 bytes of the Each axis speed (FB value) S (1st axis) [unit: 0.0001 deg/sec]
- M012 = Lower 2 bytes of the Each axis speed (FB value) L (2nd axis) [unit: 0.0001 deg/sec]
- M013 = Upper 2 bytes of the Each axis speed (FB value) L (2nd axis) [unit: 0.0001 deg/sec]
- M014 = Lower 2 bytes of the Each axis speed (FB value) U (3rd axis) [unit: 0.0001 deg/sec]
- M015 = Upper 2 bytes of the Each axis speed (FB value) U (3rd axis) [unit: 0.0001 deg/sec]
- M016 = Lower 2 bytes of the Each axis speed (FB value) R (4th axis) [unit: 0.0001 deg/sec]
- M017 = Upper 2 bytes of the Each axis speed (FB value) R (4th axis) [unit: 0.0001 deg/sec]
- M018 = Lower 2 bytes of the Each axis speed (FB value) B (5th axis) [unit: 0.0001 deg/sec]
- M019 = Upper 2 bytes of the Each axis speed (FB value) B (5th axis) [unit: 0.0001 deg/sec]
- M020 = Lower 2 bytes of the Each axis speed (FB value) T (6th axis) [unit: 0.0001 deg/sec]
- M021 = Upper 2 bytes of the Each axis speed (FB value) T (6th axis) [unit: 0.0001 deg/sec]

**NOTE**

- When the output size to the register is set to 2 bytes (“1” is set in S1CxG334 or S1CxG335), the axis speed in the size of 2 bytes will be output to the specified register number. If the size exceeds 2 bytes, only the lower 2 bytes will be output.

- When the output size to the register is set to 4 bytes (“2” is set in S1CxG334 or S1CxG335), the lower 2 bytes will be output to the specified register number, and the upper 2 bytes will be output to the next number of the specified register number. Before performing setting, check the usage status of the registers.

- If “0” is set as the register number of output destination (S1CxG1270 to 1277, S1CxG1280 to 1287), the present axis speed will not be output to the register. Thus, no value can be output to the register number M000. Also, if the same register number of output destination is used more than twice, the former data will be overwritten by the latter data.
6 Convenient Functions
6.12 Present Manipulator Position Output Function

6.12.5 Function for Outputting Each Axis Position to Register

6.12.5.1 Outline

The position of each axis of the robot axis, the base axis, and the station axis is output to the specified registers.

6.12.5.2 Parameters

The following parameters specify the details of the function and output register numbers.

<table>
<thead>
<tr>
<th>S1CxG</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>336</td>
<td>Enables/Disables the function for outputting each axis position to registers. (command value) 0: no output to register 1: output in 2 bytes [unit: deg (mm for a linear motion axis)] 2: output in 4 bytes [unit: 0.0001 deg (µm for a linear motion axis)]</td>
</tr>
<tr>
<td>337</td>
<td>Enables/Disables the function for outputting each axis position to registers. (FB value) 0: no output to register 1: output in 2 bytes [unit: deg (mm for a linear motion axis)] 2: output in 4 bytes [unit: 0.0001 deg (µm for a linear motion axis)]</td>
</tr>
<tr>
<td>1290 to 1297</td>
<td>Each axis position (command value) register number of output destination</td>
</tr>
<tr>
<td>1300 to 1307</td>
<td>Each axis position (FB value) register number of output destination</td>
</tr>
</tbody>
</table>

<Example 1>

<table>
<thead>
<tr>
<th>S1C1G</th>
<th>Setting value</th>
</tr>
</thead>
<tbody>
<tr>
<td>336</td>
<td>1</td>
</tr>
<tr>
<td>337</td>
<td>0</td>
</tr>
<tr>
<td>1290</td>
<td>10</td>
</tr>
<tr>
<td>1291</td>
<td>11</td>
</tr>
<tr>
<td>1292</td>
<td>12</td>
</tr>
<tr>
<td>1293</td>
<td>13</td>
</tr>
<tr>
<td>1294</td>
<td>14</td>
</tr>
<tr>
<td>1295</td>
<td>15</td>
</tr>
</tbody>
</table>

When the parameters are set as shown in the above table, the position is output to the registers as follows:

M010 = Each axis position (command value) S (1st axis) [unit: deg]
M011 = Each axis position (command value) L (2nd axis) [unit: deg]
M012 = Each axis position (command value) U (3rd axis) [unit: deg]
M013 = Each axis position (command value) R (4th axis) [unit: deg]
M014 = Each axis position (command value) B (5th axis) [unit: deg]
M015 = Each axis position (command value) T (6th axis) [unit: deg]
### 6 Convenient Functions

#### 6.12 Present Manipulator Position Output Function

<Example 2>

<table>
<thead>
<tr>
<th>S1CG</th>
<th>Setting value</th>
</tr>
</thead>
<tbody>
<tr>
<td>336</td>
<td>0</td>
</tr>
<tr>
<td>337</td>
<td>2</td>
</tr>
<tr>
<td>1300</td>
<td>10</td>
</tr>
<tr>
<td>1301</td>
<td>12</td>
</tr>
<tr>
<td>1302</td>
<td>14</td>
</tr>
<tr>
<td>1303</td>
<td>16</td>
</tr>
<tr>
<td>1304</td>
<td>18</td>
</tr>
<tr>
<td>1305</td>
<td>20</td>
</tr>
</tbody>
</table>

When the parameters are set as shown in the above table, the position is output to the registers as follows:

- **M010** = Lower 2 bytes of the Each axis position (FB value) S (1st axis) [unit: 0.0001 deg]
- **M011** = Upper 2 bytes of the Each axis position (FB value) S (1st axis) [unit: 0.0001 deg]
- **M012** = Lower 2 bytes of the Each axis position (FB value) L (2nd axis) [unit: 0.0001 deg]
- **M013** = Upper 2 bytes of the Each axis position (FB value) L (2nd axis) [unit: 0.0001 deg]
- **M014** = Lower 2 bytes of the Each axis position (FB value) U (3rd axis) [unit: 0.0001 deg]
- **M015** = Upper 2 bytes of the Each axis position (FB value) U (3rd axis) [unit: 0.0001 deg]
- **M016** = Lower 2 bytes of the Each axis position (FB value) R (4th axis) [unit: 0.0001 deg]
- **M017** = Upper 2 bytes of the Each axis position (FB value) R (4th axis) [unit: 0.0001 deg]
- **M018** = Lower 2 bytes of the Each axis position (FB value) B (5th axis) [unit: 0.0001 deg]
- **M019** = Upper 2 bytes of the Each axis position (FB value) B (5th axis) [unit: 0.0001 deg]
- **M020** = Lower 2 bytes of the Each axis position (FB value) T (6th axis) [unit: 0.0001 deg]
- **M021** = Upper 2 bytes of the Each axis position (FB value) T (6th axis) [unit: 0.0001 deg]

### NOTE

- If the axis position is a negative value, the axis position will be output to the register in 2's complement notation.
- When the output size to the register is set to 2 bytes (“1” is set in S1CG336 or S1CG337), the axis position in the size of 2 bytes will be output to the specified register number. If the size exceeds 2 bytes, only the lower 2 bytes will be output.
- When the output size to the register is set to 4 bytes (“2” is set in S1CG336 or S1CG337), the lower 2 bytes will be output to the specified register number, and the upper 2 bytes will be output to the next number of the specified register number. Before performing setting, check the usage status of the registers.
- If “0” is set as the register number of output destination (S1CG1290 to 1297, S1CG1300 to 1307), the present axis position will not be output to the register. Thus, no value can be output to the register number M000. Also, if the same register number of output destination is used more than twice, the former data will be overwritten by the latter data.
6 Convenient Functions
6.13 Softlimit Setting Function

6.13.1 About the Softlimit Setting Function

The softlimit setting function is a function to set the softlimit to limit the range of the manipulator motion in software.

6.13.2 The Softlimit Setting Screen

The softlimit setting screen is displayed only at the teach mode and the management mode.

1. Select (ROBOT) in (Main Menu).

2. Select (SOFTLIMIT SETTING).

   - The softlimit setting screen is displayed.

3. Set the control group as desired.

   - Switch to the desired control group by [PAGE] or the selection dialog.
   - As for the selection dialog, select [PAGE] on the screen and move the cursor to desired control group. Press [SELECT].
6.13.3 Setting the Softlimit by Numerical Value Input

1. Move the cursor to the desired axis of the softlimit (+) or the softlimit (-), and press [SELECT].

2. Enter the values of the softlimit (+)/the softlimit (-), and press [ENTER].
   - The softlimit is set.

![Image of the interface showing softlimit setting](Image)
6 Convenient Functions
6.13 Softlimit Setting Function

6.13.4 Set the Current Value to the Softlimit

1. Move the manipulator by the [Axis Key].
   -- Move the manipulator to the position of which value is maximum number or minimum number of the softlimit by the [Axis Key].

2. Move the cursor to the desired axis of the softlimit (+) or the softlimit (-).
   -- When change the maximum number of the first softlimit, move the cursor to the first axis of the softlimit (+).
   -- When change the minimum number of the first softlimit, move the cursor to the first axis of the softlimit (-).

3. Press [MODIFY].
   -- The message “Update the data with <ENTER>,” appears.

   ![Image of softlimit setting interface]

   -- If perform the one of the following operations, the modify operation will be canceled.
   • Press [MODIFY].
   • Press [SELECT].
   • Press the one of [↑] [↓] [←] [→].
   • Press [PAGE].
   • Press [Numeric Key].
   • Select the reserved display.
   • Switch the screen.
   • Switch the mode.
6 Convenient Functions
6.13 Softlimit Setting Function

– The message "Update operation with <CHANGE> was canceled." appears.

4. Press [ENTER].

– The current position is set as the softlimit.
6. Convenient Functions
6.13 Softlimit Setting Function

6.13.5 Set the Softlimit (+) / the Softlimit (-) to the Initial Maker Value

1. Select {DATA} in the pull-down menu.
   – {Initial Maker Value} appears.

2. Select {Initial Maker Value}.
   – The confirmation dialog appears.

3. Select “YES”.
   – The initial maker value is set for all displayed axes.
   The operation is canceled when “NO” is selected.

The initial maker value limits the range of the mechanical motion of the manipulator, and it varies according to the model of the robot.
It is different from the motion range which was set to add the base station axis.
6.13.6 Change the Coordinate Display of the Softlimit (+) / the Softlimit (-)

1. Select {DISPLAY} in the pull-down menu.
   - {Coordinate Change} appears.

   ![Coordinate Change Menu]

   2. Select {Coordinate Change}.
      - When the displaying coordinate is a pulse, the robot axis is changed to the angle display; the base axis is changed to the distance display; and the station axes is changed for each axis by the value of the station axis display parameter (S2C265 to 288).

      When the first bit is OFF, the first axis is changed to the angle display.
      When the second bit is ON, the second axis is changed to the distance display.
      When the display coordinate is angle/distance, the all axes are changed to the pulse display.

      ![Coordinate Change Display]

      • When the display of the softlimit value is the angle display, the pulse display and the sign may be different.
      • Be sure to confirm the motion range by the jog operation after changing the softlimit value.
6 Convenient Functions
6.14 Job Edit Function During Playback

6.14 Job Edit Function During Playback

6.14.1 Function

Jobs can be edited during playback, including during the play mode.

- Editable : user job
- Not Editable : macro job and system job

6.14.2 Job Edit During Playback

6.14.2.1 Basic Operation

The job edit operation during playback is described below.

1. During playback, select (Main Menu) (JOB), then select the submenu (SELECT JOB).
   - JOB LIST display appears.

2. Select (EDITING) under the pull-down menu (JOB).
3. Select the job to be edited from JOB LIST.

   ![Image of Job List]

   - The selected job will be registered in the display of the submenu “PLAY EDIT JOB LIST”.

4. Edit the selected job.

   - Edit the job selected in the above step in the same manner as the teach mode.

   ![Image of Job Edit]

   - Regarding restrictions on editing, refer to chapter 6.14.2.2 “Editing”.

6 Convenient Functions
6.14 Job Edit Function During Playback
6 Convenient Functions
6.14 Job Edit Function During Playback

5. Select (WRITING) under the pull-down menu (JOB) to reflect the edited data.

- If the job to be written to is listed in "JOB LIST", a confirmation dialog "Overwrite?" appears. Select "YES" to reflect the edited data. Refer to the "SUPPLEMENT" on the next page.

- If the job with the same name is not listed in "JOB LIST", the job to be written to will be added to "JOB LIST". Refer to the following "SUPPLEMENT".

If data is reflected during playback, the message "Requesting playback edit JOB writing" appears, and the status becomes a write request. To write the job, execute the instruction "LATESTJOB" in the write request status or end playback. If data is reflected in the play mode but not during playback, the job will be written immediately.

However, if the job to be written to is being executed (including jobs in the call stack), "Error 5240: Cannot write in the JOB in execution." appears, and the edited data will not be reflected.

If a job in the call stack is written to in the play mode but not during playback, "Error 5241: Cannot write in the JOB in JOB STACK." appears, and the edited data will not be reflected.

If data is reflected during teaching, the job will be written immediately.
6.14.2.2 Editing

The data of the selected job (see the step 4 of chapter 6.14.2.1 “Basic Operation”) can be edited in the same manner as the normal teach mode. However, the functions that affect the manipulator motion are restricted as follows:

- Position teaching cannot be edited.
- The pull-down menu during editing is restricted as shown in fig. 6-1 “Pull-Down Menu (EDIT) * Cursor Is on Line No.” to fig. 6-4 “Pull-Down Menu (UTILITY)”.

Fig. 6-1: Pull-Down Menu (EDIT) * Cursor Is on Line No.

![Pull-Down Menu (EDIT) * Cursor Is on Line No.](image1)

Fig. 6-2: Pull-Down Menu (EDIT) * Cursor Is on Instruction

![Pull-Down Menu (EDIT) * Cursor Is on Instruction](image2)
6 Convenient Functions
6.14 Job Edit Function During Playback

In addition to the job edit operation described above, {CREATE NEW JOB}, {RENAME JOB}, {COPY JOB}, and {DELETE JOB} under the pull-down menu {JOB} are also available.

All of the above operations are performed for the jobs listed in "PLAY EDIT JOB LIST".

To reflect the edited data in the job listed in JOB LIST, {WRITING} must be done.

Regarding {DELETE JOB}, only the jobs listed in "PLAY EDIT JOB LIST" can be deleted. The jobs in "JOB LIST" will not be deleted.

The above {WRITING}, {DELETE JOB}, {RENAME JOB}, and {COPY JOB} can be done in the same manner on the "PLAY EDIT JOB LIST" display.
6 Convenient Functions

6.14 Job Edit Function During Playback

6.14.2.3 Editing Multiple Jobs

The procedure to delete or write multiple jobs at once on the PLAY EDIT JOB LIST display is described below.

- **Deleting Multiple Jobs**
  1. Select {Main Menu} {JOB}, then select the submenu {PLAY EDIT JOB LIST}.

  - ![Diagram of PLAY EDIT JOB LIST display]

  2. Select the job to be deleted by [SHIFT] + [SELECT].

    - "●" appears on the left of the selected job.

    ![Diagram of PLAY EDIT JOB LIST display with "●" marker]
6 Convenient Functions
6.14 Job Edit Function During Playback

3. Select (DELETE JOB) under the pull-down menu (JOB).
   – A confirmation dialog box appears for each selected job. Select “YES” to delete the job from the PLAY EDIT JOB LIST display.

Writing to Multiple Jobs
1. Select (Main Menu) {JOB}, then select the submenu {PLAY EDIT JOB LIST}.

2. Select the job to be written to by [SHIFT] + [SELECT].
   – “●” appears on the left of the selected job.
6 Convenient Functions
6.14 Job Edit Function During Playback

3. Select {WRITING} under the pull-down menu {JOB}.

- If the job to be written to is listed in JOB LIST, a confirmation dialog "Overwrite?" appears. Select "YES" to reflect the edited data. If "NO" is selected, the edited data will not be reflected. To cancel writing, press [CANCEL] while the confirmation dialog appears. If the job with the same name is not listed in "JOB LIST", the job to be written to will be added to "JOB LIST". Refer to the "SUPPLEMENT" below.

If data is reflected during playback, the message "Requesting playback edit JOB writing" appears, and the status becomes a write request. To write the job, execute the instruction "LATESTJOB" in the write request status or end playback. If data is reflected in the play mode but not during playback, the job will be written immediately.

However, if the job to be written to is being executed (including jobs in the call stack), "Error 5240: Cannot write in the JOB in execution." appears, and the edited data will not be reflected.

If a job in the call stack is written to in the play mode but not during playback, "Error 5241: Cannot write in the JOB in JOB STACK." appears, and the edited data will not be reflected.

If data is reflected during teaching, the job will be written immediately.
6.14.2.4 Canceling Write Request

The procedure to cancel a write request is described below.

**Canceling Write Request**

1. Select (Main Menu) {JOB}, then select the submenu {PLAY EDIT JOB LIST}, or select (Main Menu) {JOB}, then select the submenu {JOB EDIT (PLAY)}.

2. Select {WRITING CANCEL} under the pull-down menu {JOB}.
6 Convenient Functions
6.14 Job Edit Function During Playback

NOTICE

• When the mode switch is changed to the teach mode during job editing
  Even if the mode switch is changed to the teach mode without reflecting
  or canceling the edited data, the changed data will be saved. In this
  case, select {Main Menu} {JOB}, then select the submenu {SELECT
  JOB} or {PLAY EDIT JOB LIST} to edit data in the same manner as in
  the play mode. However, position teaching cannot be done.

  Regarding the job edited in the play mode, even after
  the mode is changed to the teach mode, the edited data
  will not be reflected if {WRITING} is not done.

• Writing a job
  {WRITING} operates differently depending on the status of the robot.
  Select {JOB}, then select {WRITING} to reflect the edited data in the
  job. The data is reflected as described below depending on whether
  the job is being executed or not.
  1. When the job is NOT being executed: The data is reflected
     immediately.
  2. When the job is being executed: The data is reflected when the
     instruction "LATESTJOB" is executed or when the job execution is
     completed.

  “Requesting playback edit JOB writing” appears while waiting for reflect
  operation (during a write request).

    • The executing job cannot be written to even by the
      instruction "LATESTJOB".
    • If a power failure occurs during a write request, the
      write request will be canceled upon restarting, and the
      job will not be reflected.

• During a file transfer
  {WRITING} cannot be done during file transfer (i.e. external memory
  operation or data transmission).
  In addition, a file cannot be transferred during a write request.
  • During a write request
    Editing is inhibited during a write request (while "Requesting playback
    edit JOB writing" appears).
    To edit data, wait for the writing to be completed or cancel the write
    request.
6 Convenient Functions
6.15 Logging Function

6.15 Logging Function

By using the logging function, the history (log) of the controller's operation, data editing, and job execution can be saved in chronological order and displayed on the screen.

The user can select operations to be logged and save the log data in an external device.

6.15.2 Data to be Logged

The following data can be saved by using this function:

• Operation log:
  • Mode switching (PLAY/TEACH/REMOTE)
  (Operations in the remote mode are also saved in logs.)
  • Safeguarding OPEN (PLAY)
  • Selecting a job (including direct open)
  • Calling the master job
  • Initializing a file or job
  • Loading and saving a file or job (normal termination/abnormal termination)
  (Loading and saving operations by the DCI function or the data transmission function are not saved in logs.)
  • Creating, deleting, renaming a job
  • Converting a job
  • Parallel shift job conversion, mirror shift job conversion, relative job conversion, user coordinates shift conversion, PAM (position correcting during playback), PMT (position correcting due to tool deformation), 4-point teaching
  • Changing the home position of the manipulator
  • Login/logoff (Only available when the password protection function (optional) is used.)
  • Turning ON/OFF the power supply

• Edit log:
  • Job
  • Adding an instruction
  • Changing conditions in an instruction
  • Deleting an instruction
  • Cut, paste, and reverse paste
  • UNDO and REDO
  • Editing a job header
  • Line edit lock and line commenting out
  • Canceling all line edit lock, canceling all line commenting out
  • Editing a condition file/general data
  • Editing a parameter
6 Convenient Functions
6.15 Logging Function

• Editing the CIO
  Editing on the ladder program window. When compiling is executed, the edit histories (addition/modification/deletion of lines) are output together. The recorded times are the actual times at which the lines were edited, so they may not be the same as the time at which compiling was executed.

• Editing a variable
  (Operations in the remote mode are not saved in logs.)

• Editing I/O
  Logs of switching ON and OFF of a general-purpose input signal or a general-purpose output signal are obtained.

NOTE
Only the editing operations performed by the user will be logged. If the status of a variable or I/O is modified by an instruction in the job, etc., such modification will not be logged.

• Job execution log:
  The job execution log can be saved when a job is started, completed, or stopped, and this log can be referred to later. For example, if the power supply is turned OFF for some reason and the job is stopped during execution, the job execution log can be used to make recovery operations easier.

  • Job name
  • Line number
  • Task (local task number)
  • Event (START, NEXT, BACK, TEST, STOP)
  • Cause of stop
    • Completion of execution (execution of the instruction of a given line number is completed), END (END of the job), PAUSE instruction, ABORT instruction, servo OFF, hold, key OFF (key is released during FWD, BWD, or test operation), turning OFF of the power supply
  • Date

NOTE
The job execution logs of JUMP, CALL, PSTART (independent control function), interrupt job, etc., in which jobs are switched during execution, are not saved.

6.15.3 Number of Stored Logs

The number of storable logs are as follows:

• Operation logs : 200
• Edit logs : 200
• Job execution logs : 200

If the number described above is exceeded, old data will be deleted and new data will be saved.
6.15.4 Operating Methods

6.15.4.1 Displaying List of Logs

The log list can be referred to with the following procedures:

1. Select (Main Menu) → (SYSTEM INFO) → (LOGDATA).

2. Select (LOGDATA).
   - The LOGDATA window appears.
6 Convenient Functions
6.15 Logging Function

The list of logs can be shown for each log type (operation/edit/job execution).

1. Select [DISPLAY] in the menu.
   - [ALL], [OPERATION], [EDITING], and [JOB EXECUTION] appear.

2. Select the desired log type.
   - The list of logs of the selected log type appears.
   - Select [ALL] to see the list of all logs of operation, edit, and job execution, select.

Alternatively,

1. Touch [PAGE] at the bottom of the window.
   - The dialog box for selecting the log type "all", "operation", "edit", or "job execution" appears.

2. Select the desired log type to see the list of logs.
   - Press [PAGE] to switch the list of logs in the order of "all", "operation", "edit", "job execution", and then "all".

Operation log list

![Operation log list image]

Edit log list

![Edit log list image]
6.15.4.2 Displaying Log Details

On the (LOGDATA) window, moving the cursor to the desired log and pressing the [SELECT] display the selected log's details.

When touching the [RETURN] button at the bottom of the window or pressing [CANCEL], the window returns to the (LOGDATA) window.

The items displayed in the (DETAIL) window are shown in the tables on the following pages. However, the following items are displayed regardless of whether the displayed log type is operation, edit, or job execution.

- INDEX
- DATE
- EVENT
- LOGIN NAME
### Table 6-4: Operation Log

<table>
<thead>
<tr>
<th>Log name</th>
<th>Remark</th>
<th>Items displayed in the detailed display section</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEACH MODE</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>PLAY MODE</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>REMOTE MODE</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>SELECT JOB</td>
<td>-</td>
<td>Task Job name</td>
</tr>
<tr>
<td>SAFETY FENCE OPEN</td>
<td>-</td>
<td>Task Job name Line number Current value</td>
</tr>
<tr>
<td>MASTER JOB CALL</td>
<td>-</td>
<td>Task Job name</td>
</tr>
<tr>
<td>FILE INIT</td>
<td>-</td>
<td>File name</td>
</tr>
<tr>
<td>FILE LOAD END</td>
<td>-</td>
<td>File name</td>
</tr>
<tr>
<td>FILE SAVE END</td>
<td>-</td>
<td>File name</td>
</tr>
<tr>
<td>FILE LOAD ERROR</td>
<td>-</td>
<td>File name</td>
</tr>
<tr>
<td>FILE SAVE ERROR</td>
<td>-</td>
<td>File name</td>
</tr>
<tr>
<td>JOB CREATE</td>
<td>-</td>
<td>Job name</td>
</tr>
<tr>
<td>JOB DELETE</td>
<td>-</td>
<td>Job name</td>
</tr>
<tr>
<td>JOB RENAME</td>
<td>-</td>
<td>Job name Destination job name</td>
</tr>
<tr>
<td>PARALLEL SHIFT</td>
<td>-</td>
<td>Job name Destination job name</td>
</tr>
<tr>
<td>MIRROR SHIFT</td>
<td>-</td>
<td>Job name Destination job name</td>
</tr>
<tr>
<td>JOB (PAM)</td>
<td>-</td>
<td>Job name</td>
</tr>
<tr>
<td>JOB (RELATIVE)</td>
<td>-</td>
<td>Job name Destination job name</td>
</tr>
<tr>
<td>JOB (USER COORD. SHIFT)</td>
<td>-</td>
<td>Job name Destination job name</td>
</tr>
<tr>
<td>JOB (4-POINT TEACH)</td>
<td>-</td>
<td>Job name</td>
</tr>
<tr>
<td>JOB (PMT)</td>
<td>-</td>
<td>Job name</td>
</tr>
<tr>
<td>ORG ABSO</td>
<td>-</td>
<td>Group number Axis number Setting Current value</td>
</tr>
<tr>
<td>LOGIN</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>LOGOUT</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>POWER ON</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>POWER OFF</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
### Table 6-5: Edit Log

<table>
<thead>
<tr>
<th>Log name</th>
<th>Remark</th>
<th>Items displayed in the detailed display section</th>
<th>Value after editing</th>
<th>Current value</th>
</tr>
</thead>
<tbody>
<tr>
<td>JOB EDIT(INS)</td>
<td>Task</td>
<td>File name, Line number</td>
<td>Value after editing</td>
<td></td>
</tr>
<tr>
<td>JOB EDIT(MOD)</td>
<td>Task</td>
<td>File name, Line number</td>
<td>Value after editing</td>
<td></td>
</tr>
<tr>
<td>JOB EDIT(DEL)</td>
<td>Task</td>
<td>File name, Line number</td>
<td>Deleted line</td>
<td></td>
</tr>
<tr>
<td>JOB EDIT(P. REG)</td>
<td>Task</td>
<td>Job name, Line number</td>
<td>Current value</td>
<td></td>
</tr>
<tr>
<td>JOB EDIT(P. MOD)</td>
<td>Task</td>
<td>File name, Line number</td>
<td>Current value</td>
<td></td>
</tr>
<tr>
<td>JOB EDIT(CUT)</td>
<td>Task</td>
<td>File name, Processing start position</td>
<td>Processing completion position</td>
<td></td>
</tr>
<tr>
<td>JOB EDIT(PASTE)</td>
<td>Task</td>
<td>File name, Processing start position</td>
<td>Processing completion position</td>
<td></td>
</tr>
<tr>
<td>JOB EDIT(R. PST)</td>
<td>Task</td>
<td>File name, Processing start position</td>
<td>Processing completion position</td>
<td></td>
</tr>
<tr>
<td>JOB EDIT(UNDO)</td>
<td>Task</td>
<td>Job name</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>JOB EDIT(REDO)</td>
<td>Task</td>
<td>Job name</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>JOB EDIT(HEADER)</td>
<td>Numeric value</td>
<td>Job name, Element number</td>
<td>Value before editing</td>
<td>Value after editing</td>
</tr>
<tr>
<td></td>
<td>Character string</td>
<td>Job name, Element number</td>
<td>Value after editing</td>
<td>-</td>
</tr>
<tr>
<td>OTHER FILE EDT</td>
<td>Numeric value</td>
<td>File name, Element number</td>
<td>Value before editing</td>
<td>Value after editing</td>
</tr>
<tr>
<td></td>
<td>Character string</td>
<td>File name, Element number</td>
<td>Value after editing</td>
<td>-</td>
</tr>
<tr>
<td>PARAMETER EDIT</td>
<td>-</td>
<td>Parameter type, Parameter number</td>
<td>Value before editing</td>
<td>Value after editing</td>
</tr>
<tr>
<td>LADDER EDIT(ADD)</td>
<td>-</td>
<td>Line number</td>
<td>Value after editing</td>
<td>System/User</td>
</tr>
<tr>
<td>LADDER EDIT(CHG)</td>
<td>-</td>
<td>Line number</td>
<td>Value after editing</td>
<td>System/User</td>
</tr>
<tr>
<td>LADDER EDIT(DEL)</td>
<td>-</td>
<td>Line number</td>
<td>Deleted line</td>
<td>System/User</td>
</tr>
<tr>
<td>COMPILE</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>VARIABLE EDIT</td>
<td>Numeric value</td>
<td>Variable type, Variable number</td>
<td>Value before editing</td>
<td>Value after editing</td>
</tr>
<tr>
<td></td>
<td>Character string</td>
<td>Variable type, Variable number</td>
<td>Value after editing</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Position variable</td>
<td>Variable type, Variable number</td>
<td>Value before editing</td>
<td>Value after editing</td>
</tr>
<tr>
<td>I/O EDIT</td>
<td>-</td>
<td>I/O number</td>
<td>Value after editing</td>
<td>-</td>
</tr>
</tbody>
</table>
6 Convenient Functions
6.15 Logging Function

6.15.4.3 Updating Log Information

When a new log is added while displaying the {LOGDATA} window, pressing [SELECT] displays a confirmation dialog “The log was added. Update the display?”. When selecting “YES”, a log data is obtained again and the window is updated. When selecting “NO”, the window display is not updated, but after that, when pressing [SELECT], the same dialog appears again.

When the log display type is set to “OPERATION”, “EDIT”, or “JOB EXECUTION”, the confirmation dialog described above appears only when a log of the currently displayed type is added and [SELECT] is pressed.

Table 6-6: Job Execution Log

<table>
<thead>
<tr>
<th>Log name</th>
<th>Remark</th>
<th>Items displayed in the detailed display section</th>
</tr>
</thead>
<tbody>
<tr>
<td>START</td>
<td>-</td>
<td>Task Job name Line number - -</td>
</tr>
<tr>
<td>NEXT</td>
<td>-</td>
<td>Task Job name Line number - -</td>
</tr>
<tr>
<td>BACK</td>
<td>-</td>
<td>Task Job name Line number - -</td>
</tr>
<tr>
<td>TEST</td>
<td>-</td>
<td>Task Job name Line number - -</td>
</tr>
<tr>
<td>STOP</td>
<td>-</td>
<td>Task Job name Line number Cause of stop -</td>
</tr>
</tbody>
</table>

When a new log is added while displaying the {LOGDATA} window, pressing [SELECT] displays a confirmation dialog “The log was added. Update the display?”. When selecting “YES”, a log data is obtained again and the window is updated. When selecting “NO”, the window display is not updated, but after that, when pressing [SELECT], the same dialog appears again.

When the log display type is set to “OPERATION”, “EDIT”, or “JOB EXECUTION”, the confirmation dialog described above appears only when a log of the currently displayed type is added and [SELECT] is pressed.
6.15.4.4 Deleting Log Information

Only when security is in management mode, selecting “DATA” in the pull-down menu on the LOGDATA window displays {INITIALIZE}. Selecting {INITIALIZE} displays the confirmation dialog “Initialize?”. When “YES” is selected, all the logs of the currently displayed type are deleted.
6.15.4.5 Selecting Operation to Be Logged

By selecting operations to be logged, unnecessary logging can be prevented.

1. Select {Main Menu} → {SETUP} → {LOGDATA COND.}.
   – The LOGDATA CONDITION SETTING window appears.

2. Move the cursor to the desired log, and press [SELECT].
   – “SAVE” and “NOT SAVE” alternate.
   – When “NOT SAVE” is selected, the log will not be saved even if the operation is performed.
The log names and the logged data are as follows.

<table>
<thead>
<tr>
<th>Log name</th>
<th>Logged data</th>
</tr>
</thead>
<tbody>
<tr>
<td>POWER ON/OFF LOG</td>
<td>POWER ON, POWER OFF</td>
</tr>
<tr>
<td>EXECUTE JOB LOG</td>
<td>START, NEXT, BACK, TEST, STOP</td>
</tr>
<tr>
<td>SAFETY FENCE LOG</td>
<td>SAFETY FENCE OPEN</td>
</tr>
<tr>
<td>MODE SWITCH LOG</td>
<td>• TEACH MODE</td>
</tr>
<tr>
<td></td>
<td>• PLAY MODE</td>
</tr>
<tr>
<td></td>
<td>• REMOTE MODE</td>
</tr>
<tr>
<td>JOB SELECTION LOG</td>
<td>SELECT JOB</td>
</tr>
<tr>
<td>MASTER JOB SELECTION LOG</td>
<td>MASTER JOB CALL</td>
</tr>
<tr>
<td>LOG ON/OFF LOG</td>
<td>• LOGIN</td>
</tr>
<tr>
<td></td>
<td>• LOGOUT</td>
</tr>
<tr>
<td>FILE INITIALIZE LOG</td>
<td>FILE INIT</td>
</tr>
<tr>
<td>FILE LOAD LOG</td>
<td>• FILE LOAD END</td>
</tr>
<tr>
<td></td>
<td>• FILE LOAD ERROR</td>
</tr>
<tr>
<td>FILE SAVE LOG</td>
<td>• FILE SAVE END</td>
</tr>
<tr>
<td></td>
<td>• FILE SAVE ERROR</td>
</tr>
<tr>
<td>JOB CREATE/DELETE LOG</td>
<td>• JOB CREATE</td>
</tr>
<tr>
<td></td>
<td>• JOB DELETE</td>
</tr>
<tr>
<td>JOB RENAME LOG</td>
<td>JOB RENAME</td>
</tr>
<tr>
<td>JOB SHIFT LOG</td>
<td>• PARALLEL SHIFT</td>
</tr>
<tr>
<td></td>
<td>• MIRROR SHIFT</td>
</tr>
<tr>
<td>JOB PAM LOG</td>
<td>PAM</td>
</tr>
<tr>
<td>ABSO SET LOG</td>
<td>ORG ABSO</td>
</tr>
<tr>
<td>JOB EDIT LOG</td>
<td>• JOB EDIT(INS)</td>
</tr>
<tr>
<td></td>
<td>• JOB EDIT(MOD)</td>
</tr>
<tr>
<td></td>
<td>• JOB EDIT(DEL)</td>
</tr>
<tr>
<td></td>
<td>• JOB EDIT(P. REG)</td>
</tr>
<tr>
<td></td>
<td>• JOB EDIT(P. MOD)</td>
</tr>
<tr>
<td>JOB CUT/PASTE LOG</td>
<td>• JOB EDIT(CUT)</td>
</tr>
<tr>
<td></td>
<td>• JOB EDIT(PASTE)</td>
</tr>
<tr>
<td></td>
<td>• JOB EDIT(R. PST)</td>
</tr>
<tr>
<td>JOB UNDO/REDO LOG</td>
<td>• JOB EDIT(UNDO)</td>
</tr>
<tr>
<td></td>
<td>• JOB EDIT(REDO)</td>
</tr>
<tr>
<td>JOB HEADER EDIT LOG</td>
<td>• JOB EDIT(HEADER)</td>
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<tr>
<td>FILE EDIT LOG</td>
<td>OTHER FILE EDT</td>
</tr>
<tr>
<td>PARAMETER EDIT LOG</td>
<td>PARAMETER EDIT</td>
</tr>
<tr>
<td>VARIABLE EDIT LOG</td>
<td>VARIABLE EDIT</td>
</tr>
<tr>
<td>SIGNAL EDIT LOG</td>
<td>I/O EDIT</td>
</tr>
<tr>
<td>LADDER EDIT LOG</td>
<td>• LADDER EDIT(ADD)</td>
</tr>
<tr>
<td></td>
<td>• LADDER EDIT(CHG)</td>
</tr>
<tr>
<td></td>
<td>• LADDER EDIT(DEL)</td>
</tr>
</tbody>
</table>
6.16 Function of Analog Output Corresponding to Speed

6.16.1 Overview

The function of analog output corresponding to speed changes the analog output value automatically according to the manipulator’s operating speed. This function does not need resetting of the analog output value according to the operating speed, so that the time required for job teaching can be reduced.

For example, in a sealing or painting operation where the thickness of sealant or paint must be constant, the feed amount of sealant or paint can be automatically controlled corresponding to the manipulator’s operating speed.

NOTE

The following circuit board is required for the function of analog output corresponding to speed:

- Analog output expansion board: JANC-D-AEW02-E
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6.16.2 Instructions

6.16.2.1 Instructions for the Function of Analog Output Corresponding to Speed

The instructions, ARATION and ARATIOF, are used for the function of analog output corresponding to speed.

**ARATION**

The function of analog output corresponding to speed is performed after executing ARATION instruction. This instruction is valid during circular interpolation, linear interpolation or spline interpolation. It is executed only at playback or [FWD] operation; it is not executed during axis operation.

This instruction is also used when each set value for the function of analog output corresponding to speed is to be changed.

<table>
<thead>
<tr>
<th>ARATION</th>
<th>AO#(1)</th>
<th>BV=10.00</th>
<th>V=200.0</th>
<th>OFV=2.00</th>
<th>FINE</th>
<th>DELAY=1.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
</tbody>
</table>

- **Output port number**
  General-purpose analog output port to execute the analog output corresponding to speed
  Setting range: 1 to 40

- **Base voltage**
  Voltage to be output at the speed set with the basic speed.
  Setting range: -14.00 to +14.00 V

- **Base speed**
  Operating speed which becomes the basis for when the set voltage is output.
  Setting range: 0.1 to 1500.0 mm/sec
  1 to 9000 cm/min

- **Offset voltage**
  Analog voltage when the operating speed is 0.
  Setting range: -14.00 to +14.00 V

- **Fine output**
  Analog output is performed corresponding to the feedback speed, not corresponding to the command speed (the speed defined by path calculation).
  When this tag is added, filtering will not be performed.

- **Delay time**
  Delay time for the analog output corresponding to the feedback speed.
  Setting range: 0.00 to 10.00 sec

According to the set value of the ARATION instruction, the output characteristics for the relation between the operating speed and the analog voltage are calculated. The function of analog output corresponding to speed is executed depending on these output characteristics.

The following graph shows the output characteristics.
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6.16 Function of Analog Output Corresponding to Speed

Fig. 6-5: Output Characteristics When the Function of Analog Output Corresponding to Speed is Used

- **ARATIOF**
  When the ARATIOF instruction is executed, the analog output corresponding to speed is completed, and the set offset voltage becomes the fixed output.

  \[
  \text{ARATIOF} \quad \text{AO#(1)}
  \]

- **Output port number**
  General-purpose analog output port to end the analog output corresponding to speed
  Setting range: 1 to 40

**NOTE**
When the analog output value exceeds ± 14.00 V because of the operating speed, the value is limited within ± 14.00 V.
6 Convenient Functions
6.16 Function of Analog Output Corresponding to Speed

6.16.2.2 Registration of Instructions

The instructions can be registered when the cursor is in the address area on the job content display in teach mode. Perform the following operations before registering an instruction.

1. Select (JOB) under (Main Menu).
2. Select (JOB CONTENT).
3. Move the cursor to the address area.

- **ARATION**
  1. Move the cursor to one line above the place to register the ARATION instruction.
  2. Press [INFORM LIST].
  3. Select (IN/OUT).
     - The instruction list dialog appears.
  4. Select (ARATION).
     - The ARATION instruction is indicated in the input buffer line.
5. Change additional items and numerical values.

- <Register without change>
  To register without any change, perform operation of the step 6.

- <Register with addition or change of items>
  • To change the output port number
    • When using [SHIFT] and the cursor
      (1) Move the cursor to the output port number.
      (2) Press [SHIFT] and the cursor simultaneously to change
          the output port number.

    • In case of using [Numeric Keys]
      (1) Move the cursor to the output port number, and press
          [SELECT]
          The input buffer line appears.
      (2) Enter the number, and then press [ENTER] to change the
          number displayed.

  • To change the base voltage, speed, offset voltage, fine output, or
    delay time
      (1) Move the cursor to the instruction in the input buffer line, and
          then press [SELECT].
      The DETAIL EDIT window appears.

      (2) Move the cursor to “UNUSED” of the additional item to be
          changed, and then press [SELECT].
      The selection dialog is displayed.
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6.16 Function of Analog Output Corresponding to Speed

(3) Move the cursor to the additional item to be changed, and then press [SELECT].

![Image of DETAIL EDIT window]

(4) When the additional item is changed, press [ENTER]. The DETAIL EDIT window closes, and the JOB CONTENT window appears.

6. Press [INSERT] and [ENTER].

- The instruction indicated in the input buffer line is registered.

![Image of instruction list dialog]

- **ARATIOF**

  1. Move the cursor to one line above the place to register ARATIOF instruction.

![Image of instruction list dialog]

  2. Press [INFORM LIST].

- The instruction list dialog appears.

  3. Select (IN/OUT).
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4. Select {ARATIOF}.
   - The ARATIOF instruction is indicated in the input buffer line.

5. Press [INSERT] and [ENTER].
   - The ARATIOF instruction is registered.

6.16.2.3 Analog Output Display

The current settings can be confirmed on the analog output window.

1. Select {IN/OUT} under the {Main Menu}.
2. Select {ANALOG OUTPUT}.
   - The analog output window appears.

The output terminal numbers which follow the AOUT4 can be switched and displayed by pressing [PAGE].
6.16.3 Examples

6.16.3.1 Example of Output Characteristics

The graph below shows the change in the output characteristics when the following job is done.

\[
\begin{array}{l}
\text{MOVJ } V_J=50.00 \\
\text{ARATION AO#(1) } BV=7.00 V=150.0 OFV=-10.00 \\
\text{MOVL } V=50.0 \\
\text{MOVC } V=100.0 \\
\text{MOVC } V=100.0 \\
\text{MOVC } V=100.0 \\
\text{MOVL } V=200.0 \\
\end{array}
\]

Output Voltage (V)

\[
\begin{array}{l}
\text{7.00} \\
\text{-4.33} \\
\text{1.33} \\
\text{1.33} \\
\text{12.67} \\
\end{array}
\]
6 Convenient Functions
6.16 Function of Analog Output Corresponding to Speed

6.16.3.2 Example of Variation of Operating Speed and Analog Output Value

The following graph shows the change of the analog output according to the speed variation.

MOVL V=200.0

ARATION AO#(1) BV=10.00 V=200.0 OFV=-2.00

MOVC V=150.0

MOVC VR=20.0 (When the TCP (tool center point) speed is 100 mm/s)

MOVC V=150.0

MOVL V=180.0

MOVL (When the TCP speed is 180 mm/s)

AOUT AO#(1) 10.00

Fig. 6-6: Analog Voltage according to Speed

<table>
<thead>
<tr>
<th>Analog voltage (V)</th>
<th>Operating speed (mm/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>8.8</td>
</tr>
<tr>
<td>8.8</td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>200</td>
</tr>
<tr>
<td>200</td>
<td>7</td>
</tr>
<tr>
<td>180</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>150</td>
</tr>
<tr>
<td>150</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
</tr>
</tbody>
</table>

NOTE

• Since the analog output corresponding to speed is made with respect to the calculated speed, there may be a little difference from the actual operating speed of the manipulator.

• When the posture angle is specified as the speed, the analog output corresponding to speed is made with respect to the operating speed at the TCP.
6.16.4 Filtering

In the function of analog output corresponding to speed, the output analog signal can be filtered by setting a filter constant at the parameters.

6.16.4.1 When Parameter is Set to "0"

The analog signal according to the speed reference (the speed determined by path calculation) is output.

6.16.4.2 When Parameter is Set to Values Other Than "0"

The analog signal according to the filtered speed reference is output. Filtering makes the output signal close to the manipulator's actual speed.
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6.16 Function of Analog Output Corresponding to Speed

### 6.16.4.3 Parameter Setting

Adjust the settings of parameters during actual operations.

**Table 6-7: Parameter (Sheet 1 of 2)**

<table>
<thead>
<tr>
<th>Parameter Number</th>
<th>Analog Output</th>
<th>Content</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3C1111</td>
<td>Analog output No.1</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1112</td>
<td>Analog output No.1</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1113</td>
<td>Analog output No.2</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1114</td>
<td>Analog output No.2</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1115</td>
<td>Analog output No.3</td>
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<td>[msec]</td>
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<tr>
<td>S3C1116</td>
<td>Analog output No.3</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1117</td>
<td>Analog output No.4</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1118</td>
<td>Analog output No.4</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
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<td>S3C1119</td>
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<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1120</td>
<td>Analog output No.5</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1121</td>
<td>Analog output No.6</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1122</td>
<td>Analog output No.6</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
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<td>Analog output No.7</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
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<td>Analog output No.7</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
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<td>Primary filter constant</td>
<td>[msec]</td>
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<td>Analog output No.8</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
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<td>S3C1127</td>
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<td>[msec]</td>
</tr>
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<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
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<td>S3C1129</td>
<td>Analog output No.10</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
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<td>S3C1130</td>
<td>Analog output No.10</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
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<td>S3C1131</td>
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<td>Primary filter constant</td>
<td>[msec]</td>
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<td>S3C1132</td>
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<td>Primary filter constant</td>
<td>[msec]</td>
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<td>[msec]</td>
</tr>
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<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
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<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1141</td>
<td>Analog output No.16</td>
<td>Primary filter constant</td>
<td>[msec]</td>
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<td>S3C1142</td>
<td>Analog output No.16</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
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<td>S3C1143</td>
<td>Analog output No.17</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1144</td>
<td>Analog output No.17</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1145</td>
<td>Analog output No.18</td>
<td>Primary filter constant</td>
<td>[msec]</td>
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<tr>
<td>S3C1146</td>
<td>Analog output No.18</td>
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<td>[msec]</td>
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<tr>
<td>S3C1147</td>
<td>Analog output No.19</td>
<td>Primary filter constant</td>
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<td>S3C1148</td>
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<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1149</td>
<td>Analog output No.20</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
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<td>S3C1150</td>
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<td>Secondary filter constant</td>
<td>[msec]</td>
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<td>Analog output No.21</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1152</td>
<td>Analog output No.21</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1153</td>
<td>Analog output No.22</td>
<td>Primary filter constant</td>
<td>[msec]</td>
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<tr>
<td>S3C1154</td>
<td>Analog output No.22</td>
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<td>[msec]</td>
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<td>[msec]</td>
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<tr>
<td>S3C1156</td>
<td>Analog output No.23</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1157</td>
<td>Analog output No.24</td>
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<td>[msec]</td>
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<tr>
<td>S3C1158</td>
<td>Analog output No.24</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
</tbody>
</table>

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### 6 Convenient Functions

#### 6.16 Function of Analog Output Corresponding to Speed

The standard parameter settings are as follows:

- **For small capacity manipulator (payload of 6 kg or 16 kg)**
  - Primary filter constant: 50 msec
  - Secondary filter constant: 50 msec

- **For large capacity manipulator (payload of 60 kg or 130 kg)**
  - Primary filter constant: 100 msec
  - Secondary filter constant: 100 msec

<table>
<thead>
<tr>
<th>Parameter Number</th>
<th>Analog Output</th>
<th>Content</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>S3C1159</td>
<td>Analog output No.25</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
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<td>[msec]</td>
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<td>[msec]</td>
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<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
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<td>Analog output No.28</td>
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<td>[msec]</td>
</tr>
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<td>S3C1166</td>
<td>Analog output No.28</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
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<td>S3C1167</td>
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<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
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<td>S3C1168</td>
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<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
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<td>Analog output No.30</td>
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<td>[msec]</td>
</tr>
<tr>
<td>S3C1170</td>
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<tr>
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<td>Secondary filter constant</td>
<td>[msec]</td>
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<td>[msec]</td>
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<td>Analog output No.32</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1175</td>
<td>Analog output No.33</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1176</td>
<td>Analog output No.33</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1177</td>
<td>Analog output No.34</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1178</td>
<td>Analog output No.34</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1179</td>
<td>Analog output No.35</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1180</td>
<td>Analog output No.35</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1181</td>
<td>Analog output No.36</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1182</td>
<td>Analog output No.36</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1183</td>
<td>Analog output No.37</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1184</td>
<td>Analog output No.37</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1185</td>
<td>Analog output No.38</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1186</td>
<td>Analog output No.38</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1187</td>
<td>Analog output No.39</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1188</td>
<td>Analog output No.39</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1189</td>
<td>Analog output No.40</td>
<td>Primary filter constant</td>
<td>[msec]</td>
</tr>
<tr>
<td>S3C1190</td>
<td>Analog output No.40</td>
<td>Secondary filter constant</td>
<td>[msec]</td>
</tr>
</tbody>
</table>
6 Convenient Functions
6.16 Function of Analog Output Corresponding to Speed

6.16.5 Notes

6.16.5.1 When Analog Output Corresponding to Speed Is Interrupted

If the manipulator is stopped for some reason and the editing operation is performed, the analog output corresponding to speed is interrupted. This interruption is performed in all output terminals, and the analog voltage immediately before the interruption is output to each output terminal.

The above-mentioned case is the only case where the analog output corresponding to speed is interrupted.

6.16.5.2 When Two or More Manipulators Are Used

The attribute of the job where the instruction is executed determines the manipulator for which the analog output corresponding to speed is performed.

In coordinated interpolation (SMOV□), the analog output corresponding to speed is performed with respect to the "relative speed" of the slave-side manipulator to the master-side manipulator.
6.17 QR Code Creation Function

6.17.1 Outline

By using this QR code creation function, the status of the YRC1000 (system configuration, alarm information, current position data, etc.) can be shown as a QR code on the programming pendant display. The user can use this function to send the current status of YRC1000 to YASKAWA representative rapidly and accurately when making inquiries or in case an abnormality occurs.

Also, by using an Android application called "MOTOMAN Touch!", the user can send both information (serial number, etc.) read from the QR code of the YRC1000 and information about the status of the YRC1000 read from the programming pendant to the YASKAWA representative. This application provides rapid and correct transmission of information, and thus helps the user to reduce down-time.

<QR Code Creation Function>

- While the QR Code Creation function is under function, only following keys and the exclusive keys used for this function are available. (for the key exclusively used for this function, refer to chapter 6.17.5 “Operation Method”.

- [START]
- [HOLD]
- [EMERGENCYSTOP]

Mode Switch
Enable Switch

Accordingly, operation of the manipulator in the teaching mode (jog operation) is not available. The manipulator stops its operation if the QR Code Creation function is executed.

Do not complete the QR Code Creation function while the axis operation key is being pressed because the operation triggered by the key immediately resumes when the function completes.

- Even if PLAYBACK OPERATION CONTINUATION FUNCTION (S2C437=1) is set valid, its window would not appear if the QR Code Creation Function is executed.

<MOTOMAN Touch!>

- Inquire of YASKAWA representative for downloading method of "MOTOMAN Touch!".
- "MOTOMAN Touch!" is not designed to avoid failures or reduce the recovery time.
6 Convenient Functions
6.17 QR Code Creation Function

### Main Function

By using the QR code, information of the YRC1000 in the following table can be displayed on the programming pendant.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>QR Code Data</td>
<td>• ALARM (the latest four alarms)</td>
</tr>
<tr>
<td></td>
<td>• ALARM HISTORY (the latest ten alarms for each)</td>
</tr>
<tr>
<td></td>
<td>- MAJOR FAILURE ALARM</td>
</tr>
<tr>
<td></td>
<td>- MINOR FAILURE ALARM</td>
</tr>
<tr>
<td></td>
<td>- USER ALARM (SYSTEM)</td>
</tr>
<tr>
<td></td>
<td>- USER ALARM (USER)</td>
</tr>
<tr>
<td></td>
<td>- OFF-LINE ALARM</td>
</tr>
<tr>
<td></td>
<td>• MONITORING TIME</td>
</tr>
<tr>
<td></td>
<td>- SYS MONITORING TIME</td>
</tr>
<tr>
<td></td>
<td>- SERVO POWER TIME</td>
</tr>
<tr>
<td></td>
<td>- PLAYBACK TIME</td>
</tr>
<tr>
<td></td>
<td>- MOVING TIME</td>
</tr>
<tr>
<td></td>
<td>• OPERATING TIME</td>
</tr>
<tr>
<td></td>
<td>- HOME POSITION</td>
</tr>
<tr>
<td></td>
<td>• CURRENT VALUE</td>
</tr>
<tr>
<td></td>
<td>• SERVO MONITOR</td>
</tr>
</tbody>
</table>
| Note:              | Only "ALARM" and "ALARM HISTORY" data are available in the maintenance mode.

| Function           | • Operations executed by a key                                           |
|--------------------| Display switch ([FWD] or [BWD])                                          |
|                    | Completion of the QR Code Creation Function                             |
|                    | • Operations executed by a button on the display                        |
|                    | Display switch ("Next", "Back", or "First").                           |
|                    | Completion of the QR Code Creation Function                             |

| QR Code Format     | • Format type                                                             |
|--------------------| 10 to 18 (automatically set according to the number of data)             |
|                    | • Data                                                                    |
|                    | 8-bit byte (binary)                                                      |
|                    | • Error correction level                                                  |
|                    | Level M                                                                  |
|                    | • Maximum number of data in a QR code                                    |
|                    | 560-byte at maximum (when the format type is 18)                         |
6 Convenient Functions
6.17 QR Code Creation Function

Usage of the QR code by “MOTOMAN Touch!” is as follows.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading/Displaying of the YRC1000 serial number, etc.</td>
<td>Read the QR code on the YRC1000 with the smartphone QR code reader, and then displays the serial number, etc.</td>
</tr>
<tr>
<td>Reading/Displaying of the status information of the YRC1000</td>
<td>Read the QR code on the programming with the smartphone QR code reader, and then displays the alarm history, etc.</td>
</tr>
<tr>
<td>Inquiry</td>
<td>Attach above mentioned QR code data and pictures to an e-mail and send it to the in charge call center. (use the mailer)</td>
</tr>
</tbody>
</table>

“MOTOMAN Touch!” is an application which operates in Android 4.2 or higher environment. However, depending on the manufacturers or type of the smart phone, it may not work.

QR code is a trademark of DENSO WAVE INCORPORATED.

Android is a trademark of Google Inc.
6 Convenient Functions
6.17 QR Code Creation Function

6.17.3 Method of Starting Up QR Code Creation Function

6.17.3.1 Starting Up the Function by Pressing {SYSTEM INFO} under the Main Menu → {QR CODE}

1. Select {SYSTEM INFO} under the main menu.
   - {QR CODE} appears in the sub menu.

2. Select {QR CODE} from the sub menu.
   - QR CODE Creation function starts up.
3. Select data to be codified into a QR code, and then press {Create} button.
   - A QR code appears.
6 Convenient Functions
6.17 QR Code Creation Function

6.17.3.2 Starting Up the Function by Selecting the Pull-Down Menu {UTILITY} → {QR CODE DISPLAY}

1. Select {UTILITY} under the pull down menu.
   - {QR CODE} appears in the sub menu when the window has a function to display QR code data.

2. Select {QR CODE DISPLAY} from the sub menu.
   - QR CODE Creation function starts up and a QR code of the data displayed on the window appears.
6. Convenient Functions
6.17 QR Code Creation Function

6.17.3.3 Starting Up the Function by Selecting the Pull-Down Menu (UTILITY) → (QR CODE ALL PAGE)

1. Select (UTILITY) under the pull down menu.
   - (QR CODE) appears in the sub menu when the window has a function to display a QR code data.

2. Select (QR CODE ALL PAGE) from the sub menu.
   - QR Code Creation function starts up and QR codes of the window on which page switching or display switching is available appear.
   (when ALARM HISTORY is selected, data for the latest ten alarms at each alarm are created)
6.17.4 Display Configuration

The window for the QR Code Creation Function consists of two areas.

- Data for QR code select area
- QR code display area

Displaying status of the button varies depending on the ON/OFF of the button function or the shift of the focusing point.

Example: {Next}

Normal display  Active display  No display

The QR code number and the total number of QR codes are displayed in the QR code display area.
6.17.5 Operation Method

6.17.5.1 Data for QR Code Select Area

Select data to be codified into a QR code and press {Create} button. A QR code appears.

Use the programming pendant keys or directly touch the display to perform the above-mentioned operation.

When using the programming pendant keys, following keys are usable:

- **Cursor key**
  - Shifts the area to be focused.

- **[SELECT]**
  - When the focus is in the list area of data to be codified into a QR code, selects a data to be codified into the QR code.
  - When the focus is on {Create}, creates a QR code.

- **[PAGE]**
  - Displays the next QR code (if two or more QR codes are created).
  - Displays the previous QR code by pressing [SHIFT] + [PAGE].

- **[AREA]**
  - Shifts the area to be focused.

- **[CANCEL]**
  - Exits the QR Code Creation Function.
6.17.5.2 QR Code Display Area

A QR code can be displayed, and the CR code to be displayed can be switched.

Use the programming pendant keys or directly touch the display to perform the above-mentioned operation.

When using the programming pendant keys, following keys are usable:

- **Cursor**
  - Shifts the area to be focused.

- **[SELECT]**
  - When the focus is on {Return}, displays the first QR code.
  - When the focus is on {Back}, displays the previous QR code.
  - When the focus is on {Next}, displays the next QR code.
  - When the focus is on {Close}, exits the QR Code Creation Function.

- **[PAGE]**
  - Displays the next QR (if two or more QR codes are created).
  - Displays the previous QR code by pressing [SHIFT] + [PAGE].

- **[AREA]**
  - Shifts the area to be focused.

- **[CANCEL]**
  - Exits the QR Code Creation Function.
6.17.6 QR Code Syntax

6.17.6.1 Basic Syntax

The basic syntax of a QR code is shown below.

- Data header
- System information
- Data 1
- Data 2
- Data 3

When the volume of the data is too large, this function divides the data into several sections before codifying into a QR code.

At this time, the data header and the system information is set to the first data.

*, (comma)“, ”(space)“, and ”(new line character)” are used to separate the data.

Data which is not selected in the “Data for QR code select area” will not be codified into the QR code.
6 Convenient Functions

6.17 QR Code Creation Function

6.17.6.2 Data Header

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Version</td>
<td>??x.xx</td>
</tr>
<tr>
<td>2</td>
<td>Year, month, date</td>
<td>YYMMDD</td>
</tr>
<tr>
<td>3</td>
<td>Time</td>
<td>HHTT</td>
</tr>
</tbody>
</table>

Note: "?": any one character, "*": any line, "X": any number

1. Version
   **Syntax**: "??x.xx"
   
   ?? : Version of the controller
   - If the controller is YRC1000, "Y1" is indicated.
   
   x.xx : Version of the QR Code Creation function (decimal number)

2. Year, Month, Date
   **Syntax**: "YYMMDD"
   
   YY : Year when the QR code is created (last two digits)
   MM : Month when the QR code is created
   DD : Date when the QR code is created

3. Time
   **Syntax**: "HHTT"
   
   HH : Hour when the QR code is created
   TT : Minute when the QR code is created

6.17.6.3 System Information

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>System version</td>
<td><em>.x.xx</em>(*)-xx</td>
</tr>
<tr>
<td>2</td>
<td>Parameter version</td>
<td>xx.xx</td>
</tr>
<tr>
<td>3</td>
<td>Purpose of system</td>
<td>*</td>
</tr>
</tbody>
</table>

Note: "?": any single character, "*": any line, "X": any number

1. System version
   **Syntax**: "*.x.xx*(*)-xx"
   - System version number displayed on the version window

2. Parameter version
   **Syntax**: "xx.xx"
   - Parameter version number displayed on the version window

3. Purpose of system
   **Syntax**: " * "
   - Purpose of system displayed on the version window
6 Convenient Functions
6.17 QR Code Creation Function

6.17.6.4 Alarm

Four alarms can be codified into the QR code at maximum in ascending order.

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alarm data code</td>
<td><code>&lt;ALARM&gt;</code></td>
</tr>
<tr>
<td>2</td>
<td>Alarm data</td>
<td>Refer to “Alarm Data”</td>
</tr>
</tbody>
</table>

1. Alarm data code

Syntax : `<ALARM>`

The first line of the alarm data

- **Alarm Data**

Following shows the syntax of alarm data (one line).

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alarm number</td>
<td><code>xxxx</code></td>
</tr>
<tr>
<td>2</td>
<td>Sub code</td>
<td><code>*</code></td>
</tr>
<tr>
<td>3</td>
<td>Information about options</td>
<td><code>*</code></td>
</tr>
<tr>
<td>4</td>
<td>Date of alarm occurrence</td>
<td><code>YYYY/MM/DD</code></td>
</tr>
<tr>
<td>5</td>
<td>Time of alarm occurrence</td>
<td><code>HH:TT:SS</code></td>
</tr>
</tbody>
</table>

Note: “?” : any single character, “*” : any line, “X” : any number

1. Alarm number

Syntax : `xxxx`

Alarm number

2. Sub code

Syntax : `*`

Sub code

Only the inverted characters are displayed, if any.

Example: Sub code

```
ALARM 4414   TASK#2
EXCESSIVE SEGMENT
[R1:HIGH SLUBI]
```

[ R1: HIGH: RT ]

3. Information about options

Syntax : `*`

Sub code

Information about options

4. Date of alarm occurrence

Syntax : `YYYY/MM/DD`

Date when the alarm occurred

5. Time of alarm occurrence

Syntax : `HH:TT:SS`

Time when the alarm occurred
The latest ten alarms, in the order of registration, for each alarm can be codified.

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alarm history data code</td>
<td>&lt;ALARM HISTORY&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Major failure alarm code</td>
<td>MAJOR</td>
</tr>
<tr>
<td>3</td>
<td>Major failure alarm data</td>
<td>Refer to &quot;Alarm Data&quot;.</td>
</tr>
<tr>
<td>4</td>
<td>Minor failure alarm code</td>
<td>MINOR</td>
</tr>
<tr>
<td>5</td>
<td>Minor failure alarm data</td>
<td>Refer to &quot;Alarm Data&quot;.</td>
</tr>
<tr>
<td>6</td>
<td>User alarm (system) code</td>
<td>IO_SYS</td>
</tr>
<tr>
<td>7</td>
<td>User alarm (system) data</td>
<td>Refer to &quot;Alarm Data&quot;.</td>
</tr>
<tr>
<td>8</td>
<td>User alarm (user) code</td>
<td>IO_USR</td>
</tr>
<tr>
<td>9</td>
<td>User alarm (user) data</td>
<td>Refer to &quot;Alarm Data&quot;.</td>
</tr>
<tr>
<td>10</td>
<td>OFF line alarm code</td>
<td>OFFLINE</td>
</tr>
<tr>
<td>11</td>
<td>OFF line alarm data</td>
<td>Refer to &quot;Alarm Data&quot;.</td>
</tr>
</tbody>
</table>

1. **Alarm history data code**
   - **Syntax**: "<ALARM HISTORY>"
   - The first line of the alarm history data

2. **Major failure alarm code**
   - **Syntax**: "<MAJOR>"
   - The first line of the major failure alarm data

4. **Minor failure alarm code**
   - **Syntax**: "<MINOR>"
   - The first line of the minor failure alarm data

6. **User alarm (system) code**
   - **Syntax**: "IO_SYS"
   - The first line of the user alarm (system) data

8. **User alarm (user) code**
   - **Syntax**: "IO_USR"
   - The first line of the user alarm (user) data

10. **OFF line alarm code**
    - **Syntax**: "OFFLINE"
    - The first line of the OFF line alarm data
### 6 Convenient Functions

#### 6.17 QR Code Creation Function

**Alarm History Data**

Following shows the syntax of the alarm history data (one line).

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alarm number</td>
<td>xxxx</td>
</tr>
<tr>
<td>2</td>
<td>Sub code</td>
<td>*</td>
</tr>
<tr>
<td>3</td>
<td>Mode</td>
<td>*</td>
</tr>
<tr>
<td>4</td>
<td>Information about options</td>
<td>*</td>
</tr>
<tr>
<td>5</td>
<td>Date of alarm occurrence</td>
<td>YYYY/MM/DD</td>
</tr>
<tr>
<td>6</td>
<td>Time of alarm occurrence</td>
<td>HH:TT:SS</td>
</tr>
</tbody>
</table>

**Note:** “?” : any single character, “*” : any line, “X” : any number

1. **Alarm number**
   - Syntax : “xxxx”
     - Alarm number

2. **Sub code**
   - Syntax : “*”
     - Sub code
     - Only the inverted characters are displayed, if any.

Example: Sub code

```
ALARM 4414   TASK#2
EXCESSIVE SEGMENT
[R1:HIGH:RT]
```

3. **Mode**
   - Structure : “*”
     - Mode

4. **Information about options**
   - Structure : “*”
     - Sub code
     - Information about options

5. **Date of alarm occurrence**
   - Structure : “YYYY/MM/DD”
     - Date when the alarm occurred

6. **Time of alarm occurrence**
   - Structure : “HH:TT:SS”
     - Time when the alarm occurred
### 6.17.6.6 Monitoring Time

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monitoring time code</td>
<td><code>&lt;MONITORING TIME&gt;</code></td>
</tr>
<tr>
<td>2</td>
<td>System monitoring time code</td>
<td><code>SYS MONITORING TIME</code></td>
</tr>
<tr>
<td>3</td>
<td>System monitoring time data</td>
<td>Refer to ■ “System Monitoring Time Data”</td>
</tr>
<tr>
<td>4</td>
<td>Servo power time code</td>
<td><code>SERVO POWER TIME</code></td>
</tr>
<tr>
<td>5</td>
<td>Servo power time data</td>
<td>Refer to ■ “Data for Servo Power Time, Play Back Time and Moving Time”</td>
</tr>
<tr>
<td>6</td>
<td>Play back time code</td>
<td><code>PLAYBACK TIME</code></td>
</tr>
<tr>
<td>7</td>
<td>Play back time data</td>
<td>Refer to ■ “Data for Servo Power Time, Play Back Time and Moving Time”</td>
</tr>
<tr>
<td>8</td>
<td>Moving time code</td>
<td><code>MOVING TIME</code></td>
</tr>
<tr>
<td>9</td>
<td>Moving time data</td>
<td>Refer to ■ “Data for Servo Power Time, Play Back Time and Moving Time”</td>
</tr>
<tr>
<td>10</td>
<td>Operating time code</td>
<td><code>OPERATING TIME</code></td>
</tr>
<tr>
<td>11</td>
<td>Operating time data</td>
<td>Refer to ■ “Data for Servo Power Time, Play Back Time and Moving Time”</td>
</tr>
</tbody>
</table>

1. **Monitoring time data code**
   
   Syntax : `<MONITORING TIME>`
   
   The first line of the monitoring time data

2. **System monitoring time code**
   
   Syntax : “SYSTEM MONITORING TIME”
   
   The first line of the system monitoring time data

4. **Servo power time code**
   
   Syntax : “SERVO POWER TIME”
   
   The first line of the servo power time data

6. **Play back time code**
   
   Syntax : “PLAYBACK TIME”
   
   The first line of the play back time data

8. **Moving time code**
   
   Syntax : “MOVING TIME”
   
   The first line of the moving time data

10. **Operating time code**
    
    Syntax : “OPERATING TIME”
    
    The first line of the operating time data
6 Convenient Functions
6.17 QR Code Creation Function

**System Monitoring Time Data**

Following shows the syntax of the system monitoring time data (one line).

<table>
<thead>
<tr>
<th>No.</th>
<th>Item code</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Item code</td>
<td>&quot; * &quot;</td>
</tr>
<tr>
<td>2</td>
<td>Starting date of measurement</td>
<td>YY/MM/DD</td>
</tr>
<tr>
<td>3</td>
<td>Starting time of measurement</td>
<td>HH:TT</td>
</tr>
<tr>
<td>4</td>
<td>Elapsed time</td>
<td>xxxxx:xx'xx</td>
</tr>
</tbody>
</table>

**Note:** "?": any single character, "*": any line, "X": any number

1. **Item code**
   - Syntax: " * "
   - CONTROL POWER
   - SERVO POWER
   - PLAYBACK TIME
   - MOVING TIME
   - OPERATING TIME
   - ENERGY TIME

2. **Starting date of measurement**
   - Syntax: "YY/MM/DD"
   - Date when the measurement is started

3. **Starting time of measurement**
   - Syntax: "HH:TT"
   - Time when the measurement is started

4. **Elapsed time**
   - Syntax: "xxxxx:xx'xx"
   - Elapsed time since the measurement is started (do not use "0".)
### Data for Servo Power Time, Play Back Time and Moving Time

Following shows the syntax of the servo power time data, play back time data and moving time data (one line).

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control group</td>
<td>*</td>
</tr>
<tr>
<td>2</td>
<td>Starting date of measurement</td>
<td>YY/MM/DD</td>
</tr>
<tr>
<td>3</td>
<td>Starting time of measurement</td>
<td>HH:TT</td>
</tr>
<tr>
<td>4</td>
<td>Elapsed time</td>
<td>xxxxx:xx'xx</td>
</tr>
</tbody>
</table>

Note: “?”: any single character, “***”: any line, “X”: any number

1. **Control group**
   - Syntax : “?xx”
   - Control group
     - Robot : R1 to R8
     - Base : B1 to B8
     - Station : S1 to S24
   (Setting is unnecessary if the control group does not exist in the system.

2. **Starting date of measurement**
   - Syntax : “YY/MM/DD”
   - Date when the measurement is started

3. **Starting time of measurement**
   - Syntax : “HH:TT”
   - Time when the measurement is started

4. **Elapsed time**
   - Syntax : “xxxx:xx’xx”
   - Elapsed time since the measurement is started
   (do not use “0”.)
### 6 Convenient Functions

#### 6.17 QR Code Creation Function

#### Operating Time Data

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Purpose of operation</td>
<td>*</td>
</tr>
<tr>
<td>2</td>
<td>Starting date of measurement</td>
<td>YY/MM/DD</td>
</tr>
<tr>
<td>3</td>
<td>Starting time of measurement</td>
<td>HH:TT</td>
</tr>
<tr>
<td>4</td>
<td>Elapsed time</td>
<td>xxxxx:xx'xx</td>
</tr>
</tbody>
</table>

Note: "?": any single character, "*": any line, "X": any number

1. **Purpose of operation**
   - **Syntax**: " * "
   - Purpose of this operation
   - (Setting is unnecessary if the control group does not exist in the system.

2. **Starting date of measurement**
   - **Syntax**: "YY/MM/DD"
   - Date when the measurement is started

3. **Starting time of measurement**
   - **Syntax**: "HH:TT"
   - Time when the measurement is started

4. **Elapsed time**
   - **Syntax**: "xxxxxx:xx'xx"
   - Elapsed time since the measurement is started
   - (do not use "0".)
6 Convenient Functions
6.17 QR Code Creation Function

6.17.6.7 Home Position

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Home position data code</td>
<td>&lt;HOME POSITION&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Home position data</td>
<td>Refer to &quot;Home Position Data&quot;.</td>
</tr>
</tbody>
</table>

1. Home position data code

Structure : "<HOME POSITION>"

The first line of the home position data

■ Home Position Data

Following shows the syntax of the home position data (one line).

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control group (robot/station)</td>
<td>?xx</td>
</tr>
<tr>
<td>2</td>
<td>Axis name 1 to 8: Absolute data 1 to 8</td>
<td>?:-xxxxx  •  •  •</td>
</tr>
<tr>
<td>3</td>
<td>Control group (base)</td>
<td>?xx</td>
</tr>
<tr>
<td>4</td>
<td>Axis name 1 to 8: Absolute data 1 to 8</td>
<td>?:-xxxxx  •  •  •</td>
</tr>
</tbody>
</table>

Note: "?": any single character, "*": any line, "X": any number

1. Control group (robot/station)

Syntax : "?xx"

Control group

Robot : R1 to R8
Station : S1 to S24

(Setting is unnecessary if the control group does not exist in the system.)

2. Axis name: Absolute data

Syntax : "?:-xxxxx  •  •  •"

? : S, L, U, R, B, T, E, 1, 2, 3, 4, 5, 6 (axis name)

(Setting is unnecessary if this control group does not exist in the system.)

- : - (minus sign)

(Setting is unnecessary if the data is not a negative data.)

xxxxx : Absolute data

(Display " ** ", if " ** " is used to display.)

3. Control group (base)

Syntax : "?xx"

Control group

Base : B1 to B8

(Setting is unnecessary if this control group does not exist in the system.)
6. Convenient Functions
6.17 QR Code Creation Function

4. Axis name: Absolute data

Syntax : “?-xxxxx  •  •  • ”

? : 1, 2, 3, 4, 5, 6 (axis name)

(Setting is unnecessary if this control group does not exist in the system.)

- : - (minus sign)

(Setting is unnecessary if the data is no a negative data.)

xxxxx : Absolute data

(Display " * ", if " * " is used to display.)

6.17.6.8 Current Position

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Current position data code</td>
<td>&lt;CURRENT POSITION&gt;</td>
</tr>
<tr>
<td>2</td>
<td>Current position data</td>
<td>Refer to ■ “Current Position Data (Pulse coordinate)” and chapter 6.8.2 “Teaching Condition Setting” .</td>
</tr>
</tbody>
</table>

1. Current position data code

Syntax : “<CURRENT POSITION>”

The first line of the current position data

2. Current position data

Setting of the current position requires a coordinate (pulse, robot, or user), which is selected in the current position window.

In case other than above mentioned coordinate is selected, set the current position with the pulse coordinate.

■ Current Position Data (Pulse coordinate)

Following shows the syntax of the current position data (one line).

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coordinate</td>
<td>*</td>
</tr>
<tr>
<td>2</td>
<td>Tool</td>
<td>TOOL:xx</td>
</tr>
<tr>
<td>3</td>
<td>Control group (robot/station)</td>
<td>?xx</td>
</tr>
<tr>
<td>4</td>
<td>Axis name 1 to 8:Absolute data 1 to 8</td>
<td>?:-xxxxx  •  •  •</td>
</tr>
<tr>
<td>5</td>
<td>Control group (base)</td>
<td>?xx</td>
</tr>
<tr>
<td>6</td>
<td>Axis name 1 to 8:Absolute data 1 to 8</td>
<td>?:-xxxxx  •  •  •</td>
</tr>
</tbody>
</table>

Note: “?” : any single character, “*” : any line, “X” : any number

1. Coordinate

Syntax : “* *”

* : PULSE (pulse coordinate)
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6.17 QR Code Creation Function

2. Tool
   Syntax : “TOOL:xx”
   xx : 00 to 63 (tool number)

3. Control group (robot/station)
   Syntax : “?xx”
   Control group
   Robot : R1 to R8
   Station : S1 to S24
   (Setting is unnecessary if this control group does not exist in the system.)

4. Axis name: Current position data
   Syntax : “?->xxxxx • • • ”
   ? : S, L, U, R, B, T, E, 1, 2, 3, 4, 5, 6 (axis name)
   (Setting is unnecessary if this control group does not exist in the system.)
   - : - (minus sign)
   (Setting is unnecessary if the data is not a negative data.)
   xxxxx• • • : Current position data

5. Control group (base)
   Syntax : “?xx”
   Base : B1 to B8
   (Setting is unnecessary if this control group does not exist in the system.)

6. Axis name: Current position data
   Syntax : “?->xxxxx • • • ”
   ? : 1, 2, 3, 4, 5, 6 (axis name)
   (Setting is unnecessary if this control group does not exist in the system.)
   - : - (minus sign)
   (Setting is unnecessary if the data is not a negative data.)
   xxxxx• • • : Current position data
# Convenient Functions

## 6.17 QR Code Creation Function

**Current Position Data (Base/user/robot coordinate)**

Following shows the syntax of the current position data (base / user / robot coordinate (one line)).

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Coordinate</td>
<td>*</td>
</tr>
<tr>
<td>2</td>
<td>Tool</td>
<td>TOOL:xx</td>
</tr>
<tr>
<td>3</td>
<td>Control group (robot)</td>
<td>?xx</td>
</tr>
<tr>
<td>4</td>
<td>X-axis coordinate</td>
<td>X:-xxx.xxxmm</td>
</tr>
<tr>
<td>5</td>
<td>Y-axis coordinate</td>
<td>Y:-xxx.xxxmm</td>
</tr>
<tr>
<td>6</td>
<td>Z-axis coordinate</td>
<td>Z:-xxx.xxxmm</td>
</tr>
<tr>
<td>7</td>
<td>Rx angle</td>
<td>Rx:-xxx.xxxdeg.</td>
</tr>
<tr>
<td>8</td>
<td>Ry angle</td>
<td>Ry:-xxx.xxxdeg.</td>
</tr>
<tr>
<td>9</td>
<td>Rz angle</td>
<td>Rz:-xxx.xxxdeg.</td>
</tr>
<tr>
<td>10</td>
<td>Re angle (7-axis robot)</td>
<td>Re:-xxx.xxxdeg.</td>
</tr>
<tr>
<td>11</td>
<td>Figure (front or back)</td>
<td><em>:</em></td>
</tr>
<tr>
<td>12</td>
<td>Figure (up or down)</td>
<td><em>:</em></td>
</tr>
<tr>
<td>13</td>
<td>Figure (flip or no flip)</td>
<td><em>:</em></td>
</tr>
<tr>
<td>14</td>
<td>X0-axis coordinate (base)</td>
<td>X0:-xxx.xxxmm</td>
</tr>
<tr>
<td>15</td>
<td>Y0-axis coordinate (base)</td>
<td>Y0:-xxx.xxxmm</td>
</tr>
<tr>
<td>16</td>
<td>Z0-axis coordinate (base)</td>
<td>Z0:-xxx.xxxmm</td>
</tr>
</tbody>
</table>

Note: "?": any single character, "***": any line, "X": any number

1. **Item code**
   - **Syntax**: "***
     - *: ROBOT (robot coordinate)
     - : BASE (base coordinate)
     - : USER#1 to USER#63 (user coordinate)

2. **Tool**
   - **Syntax**: "TOOL:xx"
     - xx: 00 to 63 (tool number)

3. **Control group**
   - **Syntax**: "?xx"

   **Control group**
   - Robot: R1 to R8
   (Setting is unnecessary if this control group does not exist in the system.)

4. **X-axis coordinate**
   - **Syntax**: "X:-xxx.xxxmm"
     - -: (minus sign)
   (Setting is unnecessary if the data is not a negative data.)
   - xxx.xxx••: Current position data (unit: mm)
6 Convenient Functions
6.17 QR Code Creation Function

5. Y-axis coordinate
Syntax : "Y:-xxx.xxxmm"
- : - (minus sign)
(Setting is unnecessary if the data is not a negative data.)
xxx.xxx• • • : Current position data (unit: mm)

6. Z-axis coordinate
Syntax : "Z:-xxx.xxxmm"
- : - (minus sign)
(Setting is unnecessary if the data is not a negative data.)
xxx.xxx• • • : Current position data (unit: mm)

7. Rx angle
Syntax : "Rx:-xxx.xxxxdeg."
- : - (minus sign)
(Setting is unnecessary if the data is not a negative data.)
xxx.xxx• • • : Current position data (unit: deg.)

8. Ry angle
Syntax : "Ry:-xxx.xxxxdeg."
- : - (minus sign)
(Setting is unnecessary if the data is not a negative data.)
xxx.xxx• • • : Current position data (unit: deg.)

9. Rz angle
Syntax : "Rz:-xxx.xxxxdeg."
- : - (minus sign)
(Setting is unnecessary if the data is not a negative data.)
xxx.xxx• • • : Current position data (unit: deg.)

10. Re angle
Syntax : "Re:-xxx.xxxxdeg."
- : - (minus sign)
(Setting is unnecessary if the data is not a negative data.)
xxx.xxx• • • : Current position data (unit: deg.)

11. Figure (front or back)
Syntax : "*:*"
*: FRONT
  REAR
*: S<180
  S>=180

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6. Convenient Functions

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12. Figure (up or down)
   Syntax: "*:*"
   * : UP
   DOWN
   * : R<180
   : R>=180

13. Figure (flip or no flip)
   Syntax: "*:*"
   * : FLIP
   NO FLIP
   * : T<180
   : T>=180

14. X0-axis coordinate
   Syntax: "X0:-xxx.xxxmm"
   - : - (minus sign)

   (Setting is unnecessary if the data is not a negative data.)
   xxx.xxx••• : Current position data (unit: mm)

15. Y0-axis coordinate
   Syntax: "Y0:-xxx.xxxmm"
   - : - (minus sign)

   (Setting is unnecessary if the data is not a negative data.)
   xxx.xxx••• : Current position data (unit: mm)

16. Z0-axis coordinate
   Syntax: "Z0:-xxx.xxxmm"
   - : - (minus sign)

   (Setting is unnecessary if the data is not a negative data.)
   xxx.xxx••• : Current position data (unit: mm)
<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Servo monitor data code</td>
<td><code>&lt;SERVO MONITOR&gt;</code></td>
</tr>
<tr>
<td>2</td>
<td>Feedback pulse code</td>
<td>FEEDBACK PULSE</td>
</tr>
<tr>
<td>3</td>
<td>Feedback pulse data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>4</td>
<td>Error pulse code</td>
<td>ERROR PULSE</td>
</tr>
<tr>
<td>5</td>
<td>Error pulse data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>6</td>
<td>Speed deviation code</td>
<td>SPEED DEVIATION</td>
</tr>
<tr>
<td>7</td>
<td>Speed deviation data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>8</td>
<td>Speed instruction code</td>
<td>SPEED INST</td>
</tr>
<tr>
<td>9</td>
<td>Speed instruction data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>10</td>
<td>Speed feedback code</td>
<td>FEEDBACK SPEED</td>
</tr>
<tr>
<td>11</td>
<td>Speed feedback data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>12</td>
<td>Torque instruction code</td>
<td>TORQUE SPEC</td>
</tr>
<tr>
<td>13</td>
<td>Torque instruction data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>14</td>
<td>Maximum torque code</td>
<td>MAX TORQUE</td>
</tr>
<tr>
<td>15</td>
<td>Maximum torque data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>16</td>
<td>Encoder accumulative rotation code</td>
<td>ENCODER ROTATE SUM</td>
</tr>
<tr>
<td>17</td>
<td>Encoder accumulative rotation data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>18</td>
<td>Position code in 1 turn</td>
<td>IN 1 TURN POSITION</td>
</tr>
<tr>
<td>19</td>
<td>Position data in 1 turn</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>20</td>
<td>Motor absolute value code</td>
<td>MOTOR ABSOLUTE</td>
</tr>
<tr>
<td>21</td>
<td>Motor absolute value data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>22</td>
<td>Encoder temperature code</td>
<td>ENCODER TEMP.</td>
</tr>
<tr>
<td>23</td>
<td>Encoder temperature data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>24</td>
<td>Maximum torque (constant speed) code</td>
<td>MAX TRQ (CONST)</td>
</tr>
<tr>
<td>25</td>
<td>Maximum torque (constant speed) data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>26</td>
<td>Minimum torque (constant speed) code</td>
<td>MIN TRQ (CONST)</td>
</tr>
<tr>
<td>27</td>
<td>Minimum torque (constant speed) data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>28</td>
<td>Motor torque load ratio code</td>
<td>MOTOR DUTY CYCLE</td>
</tr>
<tr>
<td>29</td>
<td>Motor torque load ratio data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
<tr>
<td>30</td>
<td>Load ratio measure time code</td>
<td>MEASURE TIME DUTY</td>
</tr>
<tr>
<td>31</td>
<td>Load ratio measure time data</td>
<td>Refer to ■ “Servo Monitor Data”.</td>
</tr>
</tbody>
</table>
6 Convenient Functions
6.17 QR Code Creation Function

1. Servo monitor data code
   Syntax : "<SERVO MONITOR>"
   The first line of the servo monitor data

2. Feedback pulse code
   Syntax : "FEEDBACK PULSE"
   The first line of the feedback pulse data

4. Error pulse code
   Syntax : "ERROR PULSE"
   The first line of the error pulse data

6. Speed deviation code
   Syntax : "SPEED DEVIATION"
   The first line of the speed deviation data

8. Speed instruction code
   Syntax : "SPEED INST"
   The first line of the speed instruction data

10. Speed feedback code
    Syntax : "FEEDBACK SPEED"
    The first line of the speed feedback data

12. Torque instruction code
    Syntax : "TORQUE SPEC"
    The first line of the torque instruction data

14. Maximum torque code
    Syntax : "MAX TORQUE"
    The first line of the maximum torque data

16. Encoder accumulative rotation code
    Syntax : "ENCODER ROTATION SUM"
    The first line of the encoder accumulative rotation data

18. Position code in 1 turn
    Syntax : "IN 1 TURN POSITION"
    The first line of the position data in 1 turn

20. Motor absolute value code
    Syntax : "MOTOR ABSOLUTE"
    The first line of the motor absolute value data

22. Encoder temperature code
    Syntax : "ENCODER TEMP."
    The first line of the encoder temperature data

24. Maximum torque (constant speed) code
    Syntax : "MAX TRQ(CONST)"
    The first line of the maximum torque (constant speed) data
6 Convenient Functions
6.17 QR Code Creation Function

26. Minimum torque (constant speed) code
Syntax : "MIN TRQ(CONST)"
The first line of the minimum torque (constant speed) data

28. Motor torque load ratio code
Syntax : "MOTOR DUTY CYCLE"
The first line of the motor torque load ratio data

30. Load ratio measure time code
Syntax : "MEASURE TIME DUTY"
The first line of the load ratio measure time data

Servo Monitor Data
Following shows the syntax of the servo monitor (one line).

<table>
<thead>
<tr>
<th>No.</th>
<th>Item</th>
<th>Syntax</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Control group (robot/station)</td>
<td>?xx</td>
</tr>
<tr>
<td>2</td>
<td>Axis name 1 to 8: Servo monitor data 1 to 8</td>
<td>:-xxxxx • • •</td>
</tr>
<tr>
<td>3</td>
<td>Control group (base)</td>
<td>?xx</td>
</tr>
<tr>
<td>4</td>
<td>Axis name 1 to 8: Servo monitor data 1 to 8</td>
<td>:-xxxxx • • •</td>
</tr>
</tbody>
</table>

Note: "?": any single character, "*": any line, "X": any number

1. Control group (robot/station)
Syntax : "?xx"
Control group
Robot : R1 to R8
Station : S1 to S24
(Setting is unnecessary if this control group does not exist in the system.)

2. Axis name: Servo monitor data
Syntax : "?:-xxxxx • • •"
? : S, L, U, R, B, T, E, 1, 2, 3, 4, 5, 6 (axis name)
(Setting is unnecessary if this control group does not exist in the system.)
- : - (minus sign)
(Setting is unnecessary if the data is not a negative data.)
xxxxx- • • : Current position data

3. Control group (base)
Syntax : "?xx"
Control group
Base : B1 to B8
(Setting is unnecessary if this control group does not exist in the system.)
6 Convenient Functions
6.17 QR Code Creation Function

4. Axis name: Servo monitor data

Syntax: “?::xxxxx • • •”

? : 1, 2, 3, 4, 5, 6 (axis name)

(Setting is unnecessary if this control group does not exist in the system.)

- : - (minus sign)

(Setting is unnecessary if the data is no a negative data.)

xxxxx• • • : Current position data
6.18 Time Measuring Function

6.18.1 Time Measuring Function

Time measuring function measures the execution time for the specified section in the job or the signal output time of the specified signal.

6.18.2 Timer Variable

The result measured by the time measuring function is stored in the timer variable. The contents of the timer variable can be checked in the timer variable window.

To display the timer variable window, select “VARIABLE” and then “TIMER VARIABLE”.

<table>
<thead>
<tr>
<th>No.</th>
<th>CONTENTS</th>
<th>NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM000</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TM001</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TM002</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TM003</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TM004</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TM005</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TM006</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TM007</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TM008</td>
<td>0</td>
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<tr>
<td>TM009</td>
<td>0</td>
<td></td>
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<tr>
<td>TM010</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TM011</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TM012</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>TM013</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

* The unit is 0.01 sec. (example: 1.00sec for 100)
* When setting a name to the timer variable which is set to be displayed in the job window, the set name and the time measurement result are displayed in the job window.

A. Move the cursor to a variable number

Move the cursor to any variable number and press [SELECT] to display the numerics input box. After inputting a variable number in the box, press [ENTER]. The cursor moves to the variable number.

B. Edit variable contents

The contents cannot be edited, but can be updated by executing the SETTM instruction.

C. Register a variable name

Move the cursor to the “NAME” of the variable number to be registered and press [SELECT]. The character input line appears. After inputting a variable name, press [ENTER] to register the input variable name.
6.18 Time Measuring Function

6.18.3 Time Measuring Method

To measure the time, use the SETTM instruction of INFORM instructions.

**SETTM**

<table>
<thead>
<tr>
<th>SUBSET</th>
<th>STANDARD</th>
<th>EXPANDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not Available</td>
<td>Available</td>
<td>Available</td>
</tr>
</tbody>
</table>

**Function**

Execute these functions, such as to start measuring, to end, to reset, and to set the time.

**Syntax**

```
SETTM ← TM → Variable number

2 TSTART

3 TSTOP

4 TRESET

5 D/LD[LD] [LD]

6 TM → Variable Number
```

**Explanation**

1. **TM variable number**

Add the following tag.

<table>
<thead>
<tr>
<th>No.</th>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>TM variable number</td>
<td>Specifies the TM variable number for the measurement time writing.</td>
<td>Number: 0 to 59</td>
</tr>
</tbody>
</table>
6 Convenient Functions
6.18 Time Measuring Function

2. TMSTART/TSTOP/TRESET/D Variable number/LD
   Variable number/D [Arrangement number]/LD
   [Arrangement number]/[Constant]/TM Variable number

Select one of them shown in the table below.

<table>
<thead>
<tr>
<th>No.</th>
<th>Tag</th>
<th>Explanation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>TSTART</td>
<td>Specifies to start the time measurement.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>TSTOP</td>
<td>Specifies to finish the time measurement.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>TRESET</td>
<td>Specifies to reset the time measurement.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>D Variable number/LD Variable number/D [Arrangement number]/LD [Arrangement number]/[Constant]</td>
<td>Specifies the time measurement by the integer type variable. Number: -2147483648 to 2147483647</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>TM variable number</td>
<td>Specifies the time measurement by timer variable. Number: 0 to 59</td>
<td></td>
</tr>
</tbody>
</table>

Example

The motion setting of SETTM is shown below.

(1) SETTM TM000 TSTART
   Starts measuring and sets the measuring time on TM000.

(2) SETTM TM000 TSTOP
   Finishes measuring and sets the measuring time on TM000.

(3) SETTM TM000 TRESET
   Sets 0 for the measuring time of TM000.

(4) SETTM TM000 1000
   Sets 1000 for the measuring time of TM000, and starts measuring at the same time.

(5) SETTM TM000 TM001
   Sets TM001 for measuring time of TM000, and starts measuring at the same time.
### 6.18.4 Setting for Time Measurement

For time measurement, set a measuring method for each timer variable. Perform the setting in the SETTM SETUP window.

Display the SETTM SETUP window as follows:

1. Set the management mode or higher to the security mode.
2. Select “SETUP” under the main menu. Then select “SETTM SETUP”.

#### Setup Menu

- **A. Displays a timer variable number whose time measuring method is to be set.**
  - To change the timer variable number, press the [PAGE] key or the PAGE button at the bottom of the window.

- **B. Sets whether to display the result in the job window.**
  - Select “OFF”, “ON(LINE1)”, “ON(LINE2)” or “ON(LINE3)”. When “ON(LINE1)”, “ON(LINE2)” or “ON(LINE3)” is selected, the time measuring result is displayed on the specified line in the auxiliary area of the job window. The same setting cannot be performed for two or more timer variables. For example, while “ON(LINE1)” is set for the timer variable 0, it is changed to “OFF” if “ON(LINE1)” is specified for the timer variable 1.

- **C. Sets a measuring target.**
  - Select “ELAPSED TIME”, “SIGNAL ON TIME” or “SIGNAL OFF TIME”. When “ELAPSED TIME” is selected, the time measuring target is the elapsed time in the specified section. When “SIGNAL ON TIME” or “SIGNAL OFF TIME” is selected, the time measuring target is ON or OFF time of the specified signal in the specified section.

- **D. When the measuring target is “SIGNAL ON TIME” or “SIGNAL OFF TIME”**
  - Sets a signal number whose time is to be measured when the measuring target is “SIGNAL ON TIME” or “SIGNAL OFF TIME”.

- **E. Selects the time measuring type from “LOCAL” and “GLOBAL”.**
  - If “LOCAL” is selected, only the time when the job is executed is measured. If “GLOBAL” is selected, the time when the job is stopped is also measured.
6 Convenient Functions
6.18 Time Measuring Function

F. Sets an additional output destination where the measuring time is to be output.
Select "NONE", "GENERAL-PURPOSE OUTPUT (2 GROUP)", "GENERAL-PURPOSE OUTPUT (4 GROUP)", "REGISTER (1)", or "REGISTER (2)". When "GENERAL-PURPOSE OUTPUT (2 GROUP)", "GENERAL-PURPOSE OUTPUT (4 GROUP)", "REGISTER (1)", or "REGISTER (2)", the measuring time is set to the specified output destination.

G. Sets a signal number to be output additionally when the additional output target is "GENERAL-PURPOSE OUTPUT 2 GROUP" or "GENERAL-PURPOSE OUTPUT 4 GROUP".
* Example: -32768 to 32767 is output for "GENERAL-PURPOSE OUTPUT 2 GROUP". Sets a register number to be output additionally when the additional output target is "REGISTER 1" or "REGISTER 2".
* Example: As for "REGISTER 1", 0 to 32767 is output when the measuring time is a positive value.
65535 to 32768 is output when the measuring time is a negative value.
* When the measuring time is out of the output range, the minimum value or the maximum value of the output range is output.

6.18.5 Displaying Time Measurement Result in Job Window
The time measuring result can be checked in the job window.
Display the time measuring result in the job window as follows:
1. Set the management mode or higher to the security mode.
2. Select "SETUP" under the main menu. Then select "SETTM SETUP".
3. Set "ON(LINE1)", "ON(LINE2)", or "ON(LINE3)" to DISPLAY ON JOB CONTENT in the SETTM SETUP window.
4. Select {JOB} under the main menu. Then select {JOB CONTENT}.
5. Select {DISPLAY} and {TIME MEASUREMENT} in the pull down menu.
6 Convenient Functions

6.18 Time Measuring Function

A. Displays the timer variable number.
B. Displays the timer variable name.
C. Displays the time measuring result.

* Up to three time measuring results can be displayed.
6.19 3D Graphic Display Function

6.19.1 3D Graphic Display Function

The 3D graphic display function (henceforth described as 3D display function) is that, a 3D model of the robot is displayed on the programming pendant window, and the current value of the robot can be confirmed. By using the multi-window function, the job's teaching position displayed in the job content can also be confirmed on the 3D display window. When the functional safety function is valid, the functional safety range can also be displayed.

**NOTE**

Only the robot is displayed. Displaying the peripheral devices are not available.
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6.19.2 Operation Method

The operations for the 3D display function are described below in this chapter.

The 3D display function operations are basically performed by touching the window.

6.19.2.1 How to Start the 3D Graphic Display Function

The procedures for starting the 3D display function are described below.

1. From the menu on the left of the window, select (ROBOT).
2. From the sub-menu, select (3D GRAPHICS).
6.19.3 Window Configuration

The window configuration is described below.

The 3D display function, when starting, is displayed on the general-purpose display area.

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>3D display area</td>
</tr>
<tr>
<td>②</td>
<td>Human interface display area</td>
</tr>
</tbody>
</table>

The area that displays the robot model in 3D.
Messages notifying the 3D display function mode are displayed.
6.19.4 Operating the Viewpoint

The procedure for changing the viewpoint is described below.
1. From the pull-down menu, select {UTILITY}.
2. Select a viewpoint operating method.
3. Touch the 3D display area with one finger, and then move the finger up, down, left and right.
   Touch operations using two fingers or multiple fingers are not supported.
   The types of the viewpoint operation are as follows.

The types of the viewpoint operation are as follows.

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ORBIT</td>
</tr>
<tr>
<td>2</td>
<td>PAN</td>
</tr>
<tr>
<td>3</td>
<td>ZOOM</td>
</tr>
</tbody>
</table>

The viewpoint operation can be also performed by the key operations. The operation method is as follows.

<table>
<thead>
<tr>
<th>Name</th>
<th>Key operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>[SHIFT] + [CURSOR]</td>
</tr>
<tr>
<td>2</td>
<td>[CURSOR]</td>
</tr>
<tr>
<td>3</td>
<td>[INTERLOCK] + [CURSOR]</td>
</tr>
</tbody>
</table>
6.19.5 Preset Viewpoint

The preset viewpoint, such as the viewpoint position when starting, the top surface and the side, can be called.

1. From the pull-down menu, select {UTILITY}.
2. Select the preset viewpoint.

The preset viewpoint and the direction of the viewpoint are as follows.

<table>
<thead>
<tr>
<th>Name</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1  DEFAULT</td>
<td>Changes to the viewpoint when starting.</td>
</tr>
<tr>
<td>2  TOP SURFACE</td>
<td>Changes to the viewpoint observed from above.</td>
</tr>
<tr>
<td>3  LOWER SURFACE</td>
<td>Changes to the viewpoint observed from below.</td>
</tr>
<tr>
<td>4  FRONT SURFACE</td>
<td>Changes to the viewpoint observed from front.</td>
</tr>
<tr>
<td>5  BACK SURFACE</td>
<td>Changes to the viewpoint observed from back.</td>
</tr>
<tr>
<td>6  LEFT SIDE</td>
<td>Changes to the viewpoint observed from the left side.</td>
</tr>
<tr>
<td>7  RIGHT SIDE</td>
<td>Changes to the viewpoint observed from the right side.</td>
</tr>
</tbody>
</table>
6.19.6 Current Position 3D Display

The current position 3D display mode is described below in this chapter. For changing to the current position 3D display mode, perform the operations in the procedure below.

1. From the pull-down menu, select {DISPLAY}.
2. Select {CURRENT POS 3D}.
3. In the human interface display area, the message “CURRENT POSITION 3D DISPLAY MODE.” is displayed.
6.19.6.1 Display Content

- **Display During TEACH MODE**
  In the teach mode, according to the jog operation or the FWD key operation of the robot, the posture of the robot in the 3D display area changes.

  When operating by using the cartesian coordinates system, the tool coordinates system, and the user coordinate system, an arrow that indicates the operation direction is displayed. The displayed position is the position (TCP position) considering the selected tool data. The directions of the arrow are the positive direction of the X-axis, the Y-axis, and the Z-axis. The each axis is displayed as follows; X-axis direction is blue, the Y-axis direction is green, and the Z-axis direction is red.

  ![Image of 3D graphic display]

  **NOTE** The robot cannot be operated by dragging the arrow.
6 Convenient Functions
6.19 3D Graphic Display Function

- **Display During PLAY MODE**

Even in the play mode, in accordance with the motion of the robot, the posture of the robot in the 3D display area changes.

And during playback, the motion path is displayed. The motion path, in the working section, is displayed in different color. When the IO instruction is executed, the icon is changed and displayed.

- The motion path display requires the processing for drawing the information, therefore, the path display is less delayed than the actual motion of the robot.

- Since the path is displayed on the basis of sampling data, depending on the speed, the angular position may not be displayed at the corner.
### 6.19.7 Teaching Position 3D Display

The teaching position 3D display mode is described below in this chapter. In teaching position 3D display mode, the job teaching position displayed in the job contents is displayed in 3D. When performing the jog operation, the operation will not be reflected to the robot, and the current position will not be displayed.

The teaching position 3D display mode is only valid in the teach mode. And when the mode is changed to the play mode, it is changed to the current position 3D display mode.

For changing to the teaching position 3D display mode, perform the operations in the procedure below.

1. From the pull-down menu, select (DISPLAY).
2. Select (TEACHING POS 3D).
3. In the human interface display area, the message “TEACHING POSITION 3D DISPLAY MODE.” is displayed.

**NOTE**

- When changing to the play mode, the (TEACHING POS 3D) menu will not display.
- The job content window must be displayed.
6.19.7.1 Display Content

On the job content window, when the cursor is moved to the move instruction position, the posture of the robot in the 3D display area changes to the posture of the teaching position.

The teaching positions of the previous five steps and the following five steps are displayed in broken lines. The position of each broken line indicates the TCP position with an icon. The teaching position currently displayed has a large icon. The step number is displayed next to the icon.

- The displayed step is only for the job displayed in the job content. Job calling is not displayed.
- The broken lines connect the teaching positions linearly, so it differs to the actual motion path of the robot.
6.19.8 Functional Safety Range Display

The functional safety range display is described below in this chapter.

For the system which functional safety is valid, the functional safety range is displayed on the 3D display window. The areas that can be displayed are the robot operation limit range and the tool interference. The robot model for the range monitoring is also displayed.
6 Convenient Functions
6.19 3D Graphic Display Function

6.19.8.1 Display Setting

For setting the display, perform the operations in the procedure below.

1. From the menu on the left of the window, select {SAFETY FUNC.}.
2. From the sub-menu, select {ROBOT RANGE DISPLAY}.
3. The ROBOT RANGE LIMIT DISPLAY window is displayed.
6 Convenient Functions

6.19 3D Graphic Display Function

4. Select the target robot model.

5. Select the model color.

6. The tool interference model is selected by the tool of the target robot. The color can be changed.
6 Convenient Functions
6.19 3D Graphic Display Function

7. When the robot model is selected, the target robot range limit display file is displayed. Set ON to “DISPLAY” of the file number to be concealed. And set OFF to it when hiding the file number.

8. Press {DISPLAY}.


The settings are reflected in the 3D display function. When {NO} is pressed, the settings will not be reflected in the 3D display function.
6.19.9 Concealing Setting

For concealing all functional safety range, perform the operations in the procedure below.

1. From the menu on the left of the window, select {SAFETY FUNC.}.
2. From the sub-menu, select {ROBOT RANGE DISPLAY}.
3. The ROBOT RANGE LIMIT DISPLAY window is displayed.
4. When {ALL RESET} is pressed, a message saying “Reset all display?” is displayed.
   When {YES} is pressed, the settings are reset.
   When {NO} is pressed, the settings will not be reset.
5. Press {DISPLAY}.
6. A message saying “Upload?” is displayed. Press {YES}. The settings are reflected in the 3D display function. When {NO} is pressed, the settings will not be reflected in the 3D display function.
6 Convenient Functions
6.19 3D Graphic Display Function

6.19.10 Other Settings

Other settings are described in this chapter.

6.19.10.1 How to Change the Robot Model Arrangement in a Multiple Robot System

For multiple robot systems, the robot arrangement displayed in the 3D display function can closely match the actual arrangement. When changing the arrangement, perform the operations in the procedure below.

1. From the menu on the left of the window, select {SETUP}.
2. From the sub-menu, select {ROBOT ARRANGEMENT SETUP}.
3. The ROBOT ARRANGEMENT SETUP window is displayed.
6 Convenient Functions
6.19 3D Graphic Display Function

4. Enter the arrangement.

5. For changing the robot to set, press (PAGE) and then select. Also [PAGE] can be changed.

6. The entered settings are reflected in the 3D graphic window.
6.20 Remote Pendant Operation Function

6.20.1 Overview of the Remote Pendant Operation Function

By using the remote pendant operation function, the display of the programming pendant can be viewed and controlled via a web browser. Thus, the display of the programming pendant can be shown and the status of the YRC1000 can be checked from a remote location. The administrator can set the login name and password of the user who performs the remote pendant operation, and also can set the access method for viewing or operating the programming pendant for each user. The administrator can register up to 100 user accounts. Only the administrator can modify the data of a registered user account. This function is available for YAS1.11-00 or later.

• While the programming pendant is being controlled by the remote pendant operation, the programming pendant cannot be controlled by using the programming pendant itself.

• In the remote pendant operation, the maintenance mode cannot be operated.

6.20.2 Recommended Environment

For security and convenience, we recommend the following web browsers with the latest versions when using the remote pendant operation function.

• Recommended web browsers:
  Microsoft Internet Explorer 10.0 or later
  Firefox 6 or later
  Chrome 4 or later
6 Convenient Functions
6.20 Remote Pendant Operation Function

6.20.3 Connection with the YRC1000

6.20.3.1 Ethernet Cable Connections

Connect the Ethernet cable (shielded cable: category 5 or higher) to the LAN connector, CN106 (LAN2) or CN107 (LAN3) which are located on the front panel of the ACP01 board inside the CPU rack.

**NOTE**
There are three LAN connectors (RJ45) in front of the ACP01 board, and CN106 (LAN2) or CN107 (LAN3) are the connectors for the Ethernet communication function. Do not connect the connector to or disconnect the connector from CN105 (LAN1) since it is exclusively used for the programming pendant.

**NOTE**
To the enabled interface (LAN2 or LAN3), the YRC1000 confirms the presence or the type of the connected cable when starting. To avoid performing an unnecessary check process, enable only the interface that is actually connected over an Ethernet cable. Note that LAN3 cannot be enabled by itself. To enable LAN3, make sure that LAN2 is also enabled.

![Fig. 6-7: Front View of CPU Rack](image-url)
6.20.3.2 LAN Interface Settings

- **Setting procedure**

For performing the data communication by using the Ethernet, first perform the LAN interface settings. These settings are required to use the data communication described in this manual.

- Make sure to perform the following settings in the management mode.
- In the operation mode or the edit mode, only reference to the settings is available.

1. Turn ON the power supply while pressing {Main Menu}.
   - The maintenance mode starts.

2. Set the security mode to the "MANAGEMENT MODE".
6 Convenient Functions

6.20 Remote Pendant Operation Function

3. Select {SYSTEM} under the Main Menu.
   – Sub menu appears.

4. Select {SETUP}.
   – The SETUP window appears.

5. Select “OPTION FUNCTION”.
   – The OPTION FUNCTION window appears.
6. Select "DETAIL" of the "LAN INTERFACE SETTING".
   – The LAN INTERFACE SETTING window appears.

7. Select "IP ADDRESS SETTING(LAN2)".
   – The pull-down menu appears.
   Select either "MANUAL SETTING" or "DHCP SETTING".
8. Select the communication parameter to be modified.
   – After "IP ADDRESS SETTING(LAN2)" is enabled, select other communication parameters which must be modified. Select the parameter by using the pull-down menu, or enter the parameter directly by using the virtual keyboard.

9. Press [ENTER].
   – The confirmation dialog box appears.
10. Select {YES}.

- Select {YES} to return to the OPTION FUNCTION window.

11. Turn the power OFF and then ON again.

- By turning the power OFF and then ON again, the normal operation mode will start.
6.20.3.3 LAN Interface Setting Items

In the LAN interface settings, perform the following settings.

- **Host Setting**
  Select the host name setting method of the YRC1000 from the pull-down menu.
  
  **MANUAL SETTING**: The character string set in the following item is used as the host name.
  
  **DCHP SETTING (LAN2)**: The host name is acquired from the LAN2 DCHP server.
  
  **DCHP SETTING (LAN3)**: The host name is acquired from the LAN3 DCHP server.
  
  - **HOST NAME**
    If "MANUAL SETTING" is set for host setting method, enter the host name by using the character string.
    Characters which can be used for the host name are half-width alphanumeric characters, hyphens (-) and underscores (_).
    Include one or more alphabetic character, and set the name within 32 characters.

- **Setting the Domain**
  Select the domain name of the YRC1000 setting method from the pull-down menu.
  
  **MANUAL SETTING**: The character string set in the following item is used as the domain name.
  
  **DCHP SETTING (LAN2)**: The domain name is acquired from the LAN2 DCHP server.
  
  **DCHP SETTING (LAN3)**: The domain name is acquired from the LAN3 DCHP server.
  
  - **DOMAIN NAME**
    If "MANUAL SETTING" is set for domain setting method, enter the domain name by using the character string.
    Characters which can be used for the domain name are half-width alphanumeric characters, hyphens (-) and underscores (_).
    Include one or more alphabetic character, and set the name within 32 characters.

- **IP Address (LAN2)**
  Select the LAN2 IP address setting method from the pull-down menu.
  
  **NOT USED**: LAN2 is not used. Thus, LAN3 cannot be used either.
  
  **MANUAL SETTING**: The value set in the following item is used as the LAN2 IP address/subnet mask.
  
  **DCHP SETTING**: The IP address (LAN2) is acquired from the DCHP server.
  
  - **IP ADDRESS**
    If "MANUAL SETTING" is set for IP address (LAN2) setting method, set the LAN2 IP address to this item.
    Use half-width numbers and periods (.) for the IP address, and set "xx.xx.xx.xx" using the following format: xx is decimal number from 0 to 255.
    (Example) 192.168.255.1
6 Convenient Functions
6.20 Remote Pendant Operation Function

• SUBNET MASK
  If “MANUAL SETTING” is set for IP address (LAN2) setting method, set the LAN2 subnet mask to this item. Use half-width numbers and periods (.) for the subnet mask, and set “xx.xx.xx.xx” using the following format: xx is decimal number from 0 to 255.
  (Example) 255.255.255.0

NOTE
YRC1000 supports only IPv4 and does not support IPv6. [10.0.0.xx] (xx: 0 to 255) cannot be used for the IP address of the LAN2.

IP Address (LAN3)
Select the LAN3 IP address setting method from the pull-down menu.
NOT USED: LAN3 is not used.
MANUAL SETTING: The value set in the following item is used as the LAN3 IP address/subnet mask.
DCHP SETTING: The IP address (LAN3) is acquired from the DCHP server.

NOTE
Enable LAN2 before using LAN3.
LAN3 cannot be used without using LAN2.

• IP ADDRESS
  If “MANUAL SETTING” is set for IP address (LAN3) setting method, set the LAN3 IP address to this item. Use half-width numbers and periods (.) for the IP address, and set “xx.xx.xx.xx” using the following format: xx is decimal number from 0 to 255.
  (Example) 172.16.0.1

NOTE
YRC1000 supports only IPv4, does not support IPv6. [10.0.0.xx] (xx: 0 to 255) and the address of the same network as LAN2 cannot be used for the IP address of LAN3.

• SUBNET MASK
  If “MANUAL SETTING” is set for IP address (LAN3) setting method, set the LAN3 subnet mask to this item. Use half-width numbers and periods (.) for the subnet mask, and set “xx.xx.xx.xx” using the following format: xx is decimal number from 0 to 255.
  (Example) 255.255.255.0
6 Convenient Functions
6.20 Remote Pendant Operation Function

- **Default Gateway**

Select the default gateway of the YRC1000 setting method from the pull-down menu.

NOT USED: The default gateway is not used.

MANUAL SETTING: The value set in the following item is used as the default gateway.

DCHP SETTING (LAN2): The default gateway is acquired from the LAN2 DCHP server.

DCHP SETTING (LAN3): The default gateway is acquired from the LAN3 DCHP server.

- **DEFAULT GATEWAY**

If "MANUAL SETTING" is set for default gateway setting method, set the default gateway to this item. Use half-width numbers and periods (.) for the default gateway, and set "xx.xx.xx.xx" using the following format: xx is decimal number from 0 to 255.

(Example) 192.168.255.200

- **Static Route (LAN2)**

Select whether to perform the static route control via LAN2 from the pull-down menu.

NOT USED: The static route control via LAN2 is not performed.

MANUAL SETTING: Perform the static route control using the value set in the following item.

- **NETWORK DESTINATION**

If "MANUAL SETTING" is set for static route (LAN2) setting method, set the network destination to perform static route control via LAN2 to this item. Use half-width numbers and periods (.) for the network destination, and set "xx.xx.xx.xx" using the following format: xx is decimal number from 0 to 255.

- **SUBNET MASK**

If "MANUAL SETTING" is set for static route (LAN2) setting method, set the subnet mask to perform static route control via LAN2 to this item. Use half-width numbers and periods (.) for the subnet mask, and set "xx.xx.xx.xx" using the following format: xx is decimal number from 0 to 255.

- **GATEWAY**

If "MANUAL SETTING" is set for static route (LAN2) setting method, set the gateway to perform static route control via LAN2 to this item. Use half-width numbers and periods (.) for the gateway, and set "xx.xx.xx.xx" using the following format: xx is decimal number from 0 to 255.
6 Convenient Functions
6.20 Remote Pendant Operation Function

Static Route (LAN3)
Select whether to perform the static route control via LAN3 from the pull-down menu.

NOT USED: The static route control via LAN3 is not performed.
MANUAL SETTING: Perform the static route control using the value set in the following item.

• NETWORK DESTINATION
  If "MANUAL SETTING" is set for static route (LAN3) setting method, set the network destination to perform static route control via LAN3 to this item. Use half-width numbers and periods (.) for the network destination, and set "xx.xx.xx.xx" using the following format: xx is decimal number from 0 to 255.

• SUBNET MASK
  If "MANUAL SETTING" is set for static route (LAN3) setting method, set the subnet mask to perform static route control via LAN3 to this item. Use half-width numbers and periods (.) for the subnet mask, and set "xx.xx.xx.xx" using the following format: xx is decimal number from 0 to 255.

• GATEWAY
  If "MANUAL SETTING" is set for static route (LAN3) setting method, set the gateway to perform static route control via LAN3 to this item. Use half-width numbers and periods (.) for the gateway, and set "xx.xx.xx.xx" using the following format: xx is decimal number from 0 to 255.

DNS Setting
For using the DNS (Domain Name System) client function, and for the setting method of DNS server when using the DNS client function, select from the pull-down menu.

NOT USED: The DNS is not used.
MANUAL SETTING: The value set in the following item is used as the DNS server.
DCHP SETTING (LAN2): The DNS Server is acquired from the LAN2 DCHP server.
DCHP SETTING (LAN3): The DNS Server is acquired from the LAN3 DCHP server.

• DNS SERVER
  If "MANUAL SETTING" is set for DNS setting method, set the IP address of the DNS server to this item. Use half-width numbers and periods (.) for the IP address of the DNS server, and set "xx.xx.xx.xx" using the following format: xx is decimal number from 0 to 255.
6 Convenient Functions
6.20 Remote Pendant Operation Function

- **SNTP Setting**
  For using the SNTP (Simple Network Time Protocol) client function, and for the setting method of SNTP server when using the SNTP client function, select from the pull-down menu.

  **NOT USED**: The SNTP is not used.

  **MANUAL SETTING**: The value set in the following item is used as the SNTP server.

  **DCHP SETTING (LAN2)**: The SNTP Server is acquired from the LAN2 DCHP server.

  **DCHP SETTING (LAN3)**: The SNTP Server is acquired from the LAN3 DCHP server.

- **SNTP SERVER**
  If "MANUAL SETTING" is set for SNTP setting method, set the SNTP setting to this item. Use half-width numbers and periods (.) for the SNTP server IP address, and set "xx.xx.xx.xx" using the following format: xx is decimal number from 0 to 255.
  Note that if the DNS client function is enabled, the FQDN (Fully Qualified Domain Name: "Hostname@domainname" name format) can also be set. Characters which can be used for the FQDN are half-width alphanumeric characters, hyphens (-), underscores (_) and the at-sign (@), which is the character boundary between the host name and the domain name. Set it within 128 characters.

- **TIME DIFFERENCE FROM UTC**
  The time that can be acquired by using SNTP is UTC (Coordinated Universal Time). To calculate the local time from UTC, enter the time difference between UTC and the local time.
  Every time a symbol is selected, "+" and "-" switches. Enter half-width numeric characters for each hour and minute. The settable range is from -12:00 to +14:00.

- **INQUIRY INTERVAL (H)**
  Enter a time interval for making an inquiry to the SNTP server. Enter the hour (H) using half-width numeric characters. The settable range is 10 to 99.
6.20.4 User Settings for the Remote Pendant Operation

6.20.4.1 Registration of a New User Account

To register a new user account, follow the procedure below.

1. Select {SYSTEM INFO} - {USER PASSWORD} under the Main Menu.

2. The USER PASSWORD LIST window appears. Move the cursor to "USER NAME", and press [SELECT].

3. The selection list appears. Move the cursor to "REGISTER", and press [SELECT].
6 Convenient Functions
6.20 Remote Pendant Operation Function

4. The USER PASSWORD EDIT (REGISTER/MODIFY) window appears. Make the settings for the user account as shown below.

- **USER NAME:**
  For the user name, 1 to 16 alphanumeric characters can be used.

- **PASSWORD:**
  For the password, 4 to 16 numeric characters can be used.

- **REMOTE PENDANT OPERATION:**
  Specify whether to use this user name or not in the remote pendant operation function. (USED/NOT USED)

- **OPERATION:**
  Select the access level of the user. (PROHIBIT/PERMIT)

5. Press [ENTER] or select {EXECUTE}.
6. The user account is registered.

**NOTE**

The above-mentioned procedure must be performed in the management mode or higher in the security mode (authorization).
6.20.4.2 Modification of a User Account

To modify the user account, follow the procedure below.

1. Select (SYSTEM INFO) - (USER PASSWORD) under the Main Menu.

2. Move the cursor to the user name to be modified, and press [SELECT].

3. The selection list appears.
   Move the cursor to "MODIFY", and press [SELECT].
4. The USER PASSWORD EDIT (REGISTER/MODIFY) window appears. Set the user account as shown below.

- **USER NAME:**
  For the user name, 1 to 16 alphanumeric characters can be used.

- **PASSWORD:**
  For the password, 4 to 16 numeric characters can be used.

- **REMOTE PENDANT OPERATION:**
  Specify whether to use this user name or not in the remote pendant operation function. (USED/NOT USED)

- **OPERATION:**
  Select the access level of the user. (PROHIBIT/PERMIT)

5. Press [ENTER] or select {EXECUTE}.
6. The user account is modified as specified.

**NOTE**

The above-mentioned procedure must be performed in the management mode or higher in the security mode (authorization).
6.20.4.3 Deletion of a User Account

To delete the user account, follow the procedure below.

1. Select {SYSTEM INFO} - {USER PASSWORD} under the Main Menu.

2. Move the cursor to the user name to be deleted, and press [SELECT].

3. The selection list appears.
   Move the cursor to "DELETE", and press [SELECT].
6 Convenient Functions
6.20 Remote Pendant Operation Function

4. The confirmation dialog "Delete?" appears. Select (YES).

![Confirmation Dialog]

5. The user account is deleted.

![User Account Deleted]

**NOTE**
The above-mentioned procedure must be performed in the management mode or higher in the security mode (authorization).
6.20.4.4 Deletion of All User Accounts

To delete all the user accounts, follow the procedure below.

1. Select {SYSTEM INFO} - {USER PASSWORD} under the Main Menu.

2. Move the cursor to "USER NAME", and press [SELECT].

3. The selection list appears.
   Move the cursor to "DELETE ALL", and press [SELECT].
6 Convenient Functions
6.20 Remote Pendant Operation Function

4. The confirmation dialog "Delete?" appears. Select (YES).

5. All the user accounts are deleted.

**NOTE**
The above-mentioned procedure must be performed in the management mode or higher in the security mode (authorization).
6.20.5 Start-Up of the Remote Pendant

6.20.5.1 Start-Up of the Remote Server

To start up the remote server, follow the procedure below.

1. Select {REMOTE PENDANT} - {REMOTE SERVER START} under the Main Menu.

2. The confirmation dialog “Do you want to start a remote server?” appears. Select {Yes}.
6.20.5.2 Settings for the Remote Server

To make the settings for the remote server, follow the procedure below.

1. Select {REMOTE PENDANT} - {REMOTE SERVER SETTING} under the Main Menu.

2. The settings window appears.
   Make the settings for the remote server as shown below.

- Jpeg compression level:
  The Jpeg compression level can be specified within the range between 1 (low compression) to 5 (high compression).

- Refresh Time:
  The refresh interval at which the image on the display of the programming pendant is distributed to the client.

NOTE
If the remote server is already started, the settings will not be reflected.
6 Convenient Functions
6.20 Remote Pendant Operation Function

6.20.5.3 End of the Remote Server

To end the remote server, follow the procedure below.

1. Select {REMOTE PENDANT} - {REMOTE SERVER END} under the Main Menu.

![Remote Server Interface]

2. The confirmation dialog “Do you want to exit the remote server?” appears.
   Select {Yes}.

![Confirmation Dialog]

6.20.5.4 Automatic Start-Up of the Remote Server

To activate automatic start-up of the remote server, set the parameter S2C1364 to 1.

After changing the parameter, turn the power OFF and ON again.
6.20.6 Operation of the Remote Pendant

6.20.6.1 Login

To log in, follow the procedure below.

1. Start up the web browser, and enter the following URL into the URL field.
   http://xxx.xxx.xxx.xxx:20080/
   – As “xxx.xxx.xxx.xxx”, enter the IP address specified according to chapter 6.20.3.1 “Ethernet Cable Connections”.

2. The Login window appears.
   Enter the user name assigned by the administrator into the “UserName” field.

3. Enter the password assigned by the administrator into the “Password” field.

4. Press “Login”.

   **NOTE**
   When starting monitoring or operating the programming pendant from the client, the following message appears on the programming pendant.

   – To access the programming pendant from the client, press {Yes} in the confirmation dialog box or leave the confirmation dialog as it is for a while.
   If {No} is pressed, the programming pendant cannot be accessed from the client.
6 Convenient Functions
6.20 Remote Pendant Operation Function

6.20.6.2 Monitoring

When the user without the authorization for the remote pendant operation logs in, the following window appears.

• “Logout” button
  Press the “Logout” button to end monitoring of the remote pendant and return to the Login window.

6.20.6.3 Operation

When the user with the authorization for the remote pendant operation logs in, the following window appears.

• {Press Key Simultaneous} button
  By pressing this {Press Key Simultaneous} button, 2 keys can be pressed simultaneously.

• Other buttons
  These buttons have the same functions as the keys on the programming pendant.
  Axis keys, TEST START, BWD, and FWD cannot be used.

• {Logout} button
  Press this {Logout} button to exit the remote pendant operation and return to the login window.

• Operation on the programming pendant display by using the mouse
  Touch-screen operation on the programming pendant can also be performed by using the mouse.
  The icon ○ blinks where the cursor is located.
6.21 High Accuracy Path Control Function

6.21.1 Description of High Accuracy Path Control Function

The high accuracy path control function allows the motion path of the manipulator to be with high accuracy by moving the motion path of the manipulator to the command path closer.

Using this function, the path difference during the linear interpolation or the inward-turning amount during the circular interpolation is reduced.

The operation command speed slows down automatically to reproduce the operation-command trajectory more faithfully during the circular interpolation. The operation command speed is adjusted automatically, therefore, the adjustment of the teaching speed does not have to be done while confirming the path and the teaching work can be reduced.

Fig. 6-8: Image of the operation-command trajectory and the motion path

Using this function, the operation of the manipulator may vibrate depending on the teaching position or the teaching speed. Correct the teaching position and the teaching speed when the operation of the manipulator vibrates. Or disable the high accuracy path control function.

NOTE

Using this function, the shock sensor may occur. When the shock sensor occurs, change the shock sensor level.

For details, refer to chapter 8.7 Shock Detection Function in YRC1000 INSTRUCTIONS (RE-CTO-A221).

6.21.2 Instruction of High Accuracy Path Control Function

The instructions, HTRAJON and HTRAJOF, are used for the function of the high accuracy path control.

The high accuracy path control will be valid in the operation of the area between the HTRAJON instruction and the HTRAJOF instruction.

The high accuracy path control function can be used for the manipulator.

NOTE

Use the high accuracy path control in the operating area where the highly accurate path is required.
6 Convenient Functions
6.21 High Accuracy Path Control Function

**HTRAJON Instruction**
This is the instruction to enable the high accuracy path control.

This instruction is applied during the playback or test operation, not during the axis operation.

The additional items of the HTRAJON instruction are shown below.

HTRAJON R1 RND=1

1. Select robot
   Select the robot to apply the high accuracy path control.
   If omitted, this instruction is enabled to the robot specified by the JOB control group.

2. Roundness Distance Specification
   When the circular interpolation operation (or the consecutive MOVC instruction) is in the high accuracy path control area, the amount of inward turning operation (=roundness distance) of the motion path for the manipulator to the circular interpolation operation can be specified.
   
   Unit: 0.001 mm

   This specification can be omitted. If omitted, the roundness distant specification will be operated in the default value, 0.5 mm.

*Fig. 6-9: Roundness Distance*
6 Convenient Functions
6.21 High Accuracy Path Control Function

- **HTRAJOF Instruction**
  This is the instruction to end the high accuracy path control.

  HTRAJOFO R1

  ① Select robot
  Select the robot to end the high accuracy path control.

In the high accuracy path control area which is between the HTRAJON instruction and the HTRAJOF instruction, the positioning zone (PL) can be used at the circular interpolation operation (the consecutive MOVC instruction) or the different kind of steps for the interpolation instruction.

* The consecutive circular interpolation (MOVC instruction) is corresponding to only when PL=0.

For details of the positioning zone, refer to chapter 8.2.0.8 “S1CxG033 to S1CxG040: POSITIONING ZONE”.

---

### 6.21.3 Instruction Registration of High Accuracy Path Control Function

When the cursor is in the address area, the instruction can be registered by using the JOB CONTENT window. Perform following operations before registering the instruction.

1. Select (JOB) under the main menu.
2. Select (JOB CONTENT).
3. Move the cursor to the address area.
6 Convenient Functions
6.21 High Accuracy Path Control Function

**HTRAJON Instruction**

1. Move the cursor to one line above the place to register HTRAJON.

   ```plaintext
   0000 NOP
   0001 MOVL Vj=10.00
   0002 MOVL V=100.0 PL=0
   0003 DOUT CT#1 ON
   0004 MOVC V=1200.0 PL=1
   ```

2. Press [INFORM LIST].

3. Select {OTHER}.
   - The instruction list dialog appears.

4. Select {HTRAJON}.
   - The HTRAJON instruction is indicated in the input buffer line.
5. Change the additional item or number values.

<When nothing to be changed>
Proceed to step 6.

When the robot or the roundness distance specification is changed.

1) Move the cursor to the instruction in the input buffer line and press [SELECT].
   The DETAIL EDIT window appears.

2) Move the cursor to "UNUSED" of the additional item to be changed, and then press [SELECT].
   The selection dialog is displayed.

3) Move the cursor to "UNUSED" of the additional item to be changed, and then press [SELECT].

4) When the additional item is changed, press [ENTER].
   The DETAIL EDIT window closes, and the JOB CONTENT window appears.
6 Convenient Functions
6.21 High Accuracy Path Control Function

6. Press [INSERT] and [ENTER].
   – The instruction indicated in the input buffer line is registered.

```
0001 MDVJ VJ=10.00
0002 MDVL V=100.0 PL=0
0003 HTRAJO
0004 DDUT OTM(1) ON
0005 MDVC V=1200.0 PL=1
```

### HTRAJOF Instruction

1. Move the cursor to one line above the place to register HTRAJOF.

2. Press [INFORM LIST].
   – The instruction list dialog appears.

3. Select {OTHER}.

4. Select {HTRAJOF}.
   – HTRAJOF instruction appears on the input buffer line.

5. Press [INSERT] and [ENTER].
   – HTRAJOF instruction is registered.

```
0006 MDVC V=1200.0 PL=1
0007 MDVL V=1200.0
0008 HTRAJCF
0009 MDVL V=1200.0
0010 END
```
6.21.4 Example of High Accuracy Path Control Function

JOB examples to use the high accuracy path control function are shown below.

```
0000 NOP
0001 MOVJ VJ=10.00
0002 MOVL V=100.0 PL=0
0003 HTRAJON
    DOUT The operation starts.
0004 MOVC V=1200.0 PL=1
0005 MOVC V=1200.0
0006 MOVC V=1200.0 PL=1
0007 MOVC V=1200.0
0008 MOVC V=1200.0 PL=1
0009 MOVC V=1200.0
0010 MOVC V=1200.0 PL=1
0011 MOVL V=1200.0
0012 MOVC V=1200.0 PL=1
0013 MOVC V=1200.0
0014 MOVC V=1200.0 PL=1
0015 MOVL V=1200.0 PL=0
0016 MOVL V=1200.0 PL=3
0017 MOVL V=1200.0 PL=8
0018 MOVL V=1200.0 PL=0
0019 MOVL V=1200.0
0020 HTRAJOF
0021 MOVJ VJ=10.00
0022 END
```

- 0004 MOVC V=1200.0 PL=1
- 0016 MOVL V=1200.0 PL=3
- 0017 MOVL V=1200.0 PL=8
- 0018 MOVL V=1200.0 PL=0

*Note:*
- Circular operation can be done by teaching the consecutive circular interpolation (or the consecutive MOVC instruction).
- The circular operation moves at the limited speed for the inward-turning only the specified roundness distance.
- Amount of inward-turning can be adjusted by using the specified the positioning (PL).
- For details of the positioning zone, refer to chapter 8.2.0.8 “S1CxG033 to S1CxG040: POSITIONING ZONE”.
- High Accuracy Path Control Function ends.

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6 Convenient Functions
6.22 Speed Priority Control Function

6.22.1 Speed Priority Control Function

Speed priority control function enables the manipulator to move at the specified speed even when the distance between teaching positions is short.

When the distance between teaching positions is short, the manipulator may move at the slower speed than the specified speed as shown in the figure due to the required distance is not enough to reach the specified speed.

By using the speed priority control function, the manipulator moves at the specified speed, as shown in the figure, even when the distance between teaching positions is short.

*Fig. 6-10: Operating Speed When the Distance Between Teaching Positions is Short*

*Fig. 6-11: Operating Speed When Using the Speed Priority Control Function*
6.22.2 Instruction of the Speed Priority Control Function

The instructions, HPVELON and HPVELOF are used for the function of the speed priority control.

- **HPVELON Instruction**
  This is the instruction to start the speed priority control.
  This instruction is executed only at the playback or the test operation, not executed during the axis operation.

  HPVELON

- **HPVELOF Instruction**
  This is the instruction to end the speed priority control.

  HPVELOF

---

**NOTE**

This function moves the manipulator at the speed priority, therefore, the manipulator may vibrate.

When the manipulator vibrates, set the move instruction to ACC (acceleration adjustment ratio) or DEC (deceleration adjustment ratio), or review the teaching speed.

This function may not make the teaching motion speed reach the specified speed.

When the motion speed does not reach the specified speed, review the posture or the motion speed of the manipulator.

This function makes the manipulator move at the forcibly specified speed.

When using this function, set only the required range to the speed priority control range.
Even in the speed priority instruction area, in case falling under any conditions of the following, the speed priority control function is not enabled.

- In case that the current step interpolation is except for the linear interpolation (MOVL instruction) and the circular interpolation (MOVC instruction).
- In case that the motion of the previous step and the current step is not continued.
- In case that the teaching position of the previous step and the current step is matched.
- In case that the distance between steps is long.
- In case that the positioning level is set to the current step.
- In case that the angle of the previous step and the current step is larger than the reference value of the speed priority instruction angle.

\[ \theta \]: Angle of the previous step and the current step

\[ \rightarrow \]: The previous step
\[ \rightarrow \]: The current step

The reference value of the speed priority instruction angle is set by the parameter. For details of this parameter, described in the following chapter 6.22.2.2 “Parameter of the Speed Priority Control Function”.

This function affects the step motion of the outer range, therefore, the speed priority control function is not enabled at the right after the step of the HPVELON instruction and the right before the step of the HPVELOF instruction.

### 6.22.2.2 Parameter of the Speed Priority Control Function

The reference value of the speed priority instruction angle is set by the following parameter.

<table>
<thead>
<tr>
<th>S3C</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1395</td>
<td>Reference value of the speed priority instruction angle (Unit: 0.1 degrees) 0 (initial setting value): 25.0 degrees</td>
</tr>
</tbody>
</table>
6 Convenient Functions
6.22 Speed Priority Control Function

6.22.2.3 Registration of the Instruction of the Speed Priority Control Function

When the cursor is in the address area, the instruction can be registered by using the JOB CONTENT window. Perform following operations before registering the instruction.

1. Select (JOB) under the main menu.
2. Select (JOB CONTENT).
3. Move the cursor to the address area.

- **HPVELON Instruction**
  1. Move the cursor to one line above the place to register HPVELON.
  2. Press [INFORM LIST].
  3. Select (OTHER).

    The instruction list dialog box appears.
6 Convenient Functions
6.22 Speed Priority Control Function

4. Select {HPVELON}.
   - The HPVELON instruction is indicated in the input buffer line.

5. Press [INSERT] and [ENTER].
   - HPVELON instruction is registered.

### HPVELOF Instruction

1. Move the cursor to one line above the place to register HPVELOF.

2. Press [INFORM LIST].

3. Select {OTHER}.
   - The instruction list dialog box appears.

4. Select {HPVELOF}.
   - The HPVELOF instruction is indicated in the input buffer line.

5. Press [INSERT] and [ENTER].
   - HPVELOF instruction is registered.
6 Convenient Functions

6.22 Speed Priority Control Function

6.22.3 Example

6.22.3.1 Motion Example of the Speed Priority Control

JOB examples to use the speed priority control function are shown below.

![Motion Diagram]

<table>
<thead>
<tr>
<th>Line</th>
<th>Instruction</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>NOP</td>
</tr>
<tr>
<td>0001</td>
<td>MOVJ VJ=10.00</td>
</tr>
<tr>
<td>0002</td>
<td>MOVL V=320.0</td>
</tr>
<tr>
<td>0003</td>
<td>HPVELON     : Speed priority control function starts.</td>
</tr>
<tr>
<td>0004</td>
<td>MOVL V=320.0 : ①</td>
</tr>
<tr>
<td>0005</td>
<td>MOVL V=320.0</td>
</tr>
<tr>
<td>0006</td>
<td>MOVL V=320.0</td>
</tr>
<tr>
<td>0007</td>
<td>MOVL V=320.0 : ②</td>
</tr>
<tr>
<td>0008</td>
<td>MOVL V=320.0</td>
</tr>
<tr>
<td>0009</td>
<td>MOVL V=320.0 : ③</td>
</tr>
<tr>
<td>0010</td>
<td>MOVL V=320.0 : ④</td>
</tr>
<tr>
<td>0011</td>
<td>MOVL V=320.0</td>
</tr>
<tr>
<td>0012</td>
<td>HPVELOF     : Speed priority control function ends.</td>
</tr>
<tr>
<td>0013</td>
<td>MOVJ VJ=10.00</td>
</tr>
<tr>
<td>0014</td>
<td>END</td>
</tr>
</tbody>
</table>

When the manipulator moves at the slower speed than the specified speed due to the distance to the teaching position such as the motion instruction ① to ④ is short, the motion can be executed at the specified constant speed.
## 7 External Memory Device

### 7.1 Memory Device

The following memory devices can be used in the YRC1000 to save and load data such as jobs and parameters.

<table>
<thead>
<tr>
<th>Device</th>
<th>Function</th>
<th>Media (destination of saved/loaded data)</th>
<th>Optional function requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>SD: Pendant</td>
<td>Standard</td>
<td>SD card</td>
<td>No requirement. Programming pendant is equipped with a slot.</td>
</tr>
<tr>
<td>USB: Pendant</td>
<td>Standard</td>
<td>USB memory stick</td>
<td>No requirement. Programming pendant is equipped with a connector.</td>
</tr>
<tr>
<td>FC1 (YRC)</td>
<td>Optional</td>
<td>Personal computer (FC1 emulator)</td>
<td>Personal computer with “FC1 emulator”</td>
</tr>
<tr>
<td>PC</td>
<td>Optional</td>
<td>Personal computer (MOTOCOM32 host)</td>
<td>Via RS-232C: “Data transmission function” and “MOTOCOM32” Via Ethernet: “Ethernet function” plus above two requirements</td>
</tr>
<tr>
<td>FTP</td>
<td>Optional</td>
<td>FTP server such as personal computer</td>
<td>“Data transmission function”, “MOTOCOM32”, and “FTP function”</td>
</tr>
<tr>
<td>USB1: Controller</td>
<td>Standard</td>
<td>USB memory stick</td>
<td>No requirement. CPU board (JANCD-ACP01) is equipped with a connector.</td>
</tr>
</tbody>
</table>

1 For the operation, refer to instruction manuals for each optional function.
7.1.1 SD Card

The programming pendant is equipped with the SD card slot. Use a FAT16 or FAT32 formatted SD card.

SD/SDHC/SDEX cards are usable.

7.1.1.1 Recommended SD Card

Refer to “YRC1000 INSTRUCTIONS (RE-CTO-A221) 9.1.2 Device” for the recommended products used for external memory of YRC1000. Model numbers are subject to be updated due to termination of product and new addition. Contact YASKAWA representative when necessary.

7.1.1.2 Notes on Handling SD Card

- Do not drop or bend exerting any shock or strong force to the SD card.
- Keep away from water, oil, organic solvent, dust, dirt, etc.
- Do not use or keep the SD card in places where strong static electricity or electronic noise may occur.
- Do not insert or remove the SD card or turn OFF the power when accessing the SD card (writing-in or reading-out the data).
- To protect the data, back up the data regularly on other media. Damages or loss of data due to operation errors or accidents can be minimized.

*An SD card has a limited life span.

The life span differs depending on products or status of use. However, normal use of SD card as an external memory device for the YRC1000 does not adversely affect the SD card. For details, refer to instruction manuals for each medium.
7.1.1.3 Inserting an SD Card

When inserting an SD card, take note of insertion direction. Keep the programming pendant with its back side up. Keep the SD card with its top surface up and with its connector downward, and insert it into the SD card slot on the back side of the programming pendant. Forcible insertion may result in damage to the SD card or the SD card slot. After inserting the card, be sure to close the cover of the slot before starting operation.

Fig. 7-1: Using an SD Card
7.1.2 USB Memory Stick

The programming pendant or the CPU board (JANCD-ACP01) is equipped with a USB connector. Use the FAT16 or FAT32 formatted USB memory stick.

7.1.2.1 Recommended USB Memory Stick

Refer to in "YRC1000 INSTRUCTIONS (RE-CTO-A221) 9.1.2 Device" for the recommended products used for external memory of the YRC1000. Model numbers are subject to be updated due to termination of product and new addition. Contact YASKAWA representative when necessary.

7.1.2.2 Notes on Handling USB Memory Stick

- Do not drop or bend exerting any shock or strong force to the USB memory stick.
- Keep away from water, oil, organic solvent, dust, dirt, etc.
- Do not use or keep the USB memory stick in places where strong static electricity or electronic noise may occur.
- Do not insert or remove the USB memory stick or turn OFF the power when accessing the USB memory stick (writing-in or reading-out the data).
- To protect the data, back up the data regularly on other media. Damages or loss of data due to operation errors or accidents can be minimized.

*USB memory stick has a limited life span.

The life span differs depending on products or status of use. However, normal use of USB memory stick as an external memory device for the YRC1000 does not adversely affect the USB memory stick. For details, refer to instruction manuals for each medium.
7.1.2.3 Rules for USB Connector and USB Memory Stick

Followings are the rules of the USB connector on the CPU board (JANCD-ACP01) and the USB memory stick to be installed.

1. **Prohibition of insertion/removal of the USB memory stick during control power ON**
   The device recognition process is executed when the USB memory stick is inserted. Do not insert or remove the USB memory stick while the control power supply is ON. Failure to observe this rule may affect the operation of the manipulator (cycle time).

2. **Prohibition of disconnection of the control power and insertion/removal of USB memory stick during file access**
   Do not disconnect the control power or insert/remove the USB memory stick during file access.
   Failure to observe this rule may breakdown the FAT.

3. **Operating temperature range of USB memory stick**
   Use a USB memory stick that is guaranteed to work in the range of temperature of the YRC1000.

4. **USB memory stick’s falling off by controller vibration**
   Prevent the USB memory stick from falling off by the vibration of the controller.
   (Countermeasure example)
   * Fix the USB memory stick with jigs not to fall off, etc.

5. **USB connector on the front surface of the CPU board (JANCD-ACP01)**
   The USB connector on the front surface of the CPU board (JANCD-ACP01) accepts only the USB memory stick.
   Do not connect a USB hub or other USB devices.

6. **Capacity of USB memory stick**
   The capacity of the memory stick must be 4 Gbyte or less.
7.1.2.4 Inserting a USB Memory Stick in Programming Pendant

When inserting a USB memory stick, take note of insertion direction. Keep the programming pendant with its back side up. Keep the USB memory card with its top surface up and with its connector downward, and insert it into the USB memory stick connector on the back side of the programming pendant.

Forcible insertion may result in damage to the USB memory stick or USB connector.

After inserting the stick, be sure to close the cover of the connector before starting operation.

Fig. 7-2: Using a USB Memory Stick

When a USB memory stick is used, the waterproof property of the programming pendant cannot be maintained.

If the USB memory stick is always set in the programming pendant, the stick may fall out of the pendant.

If it is impossible to maintain the waterproof property of the programming pendant or to prevent the USB memory stick from falling out of the programming pendant, use an SD card instead.
7.1.2.5 Inserting a USB Memory Stick in the CPU Board (JANCD-ACP01)

Make sure to insert the USB memory stick with its connector kept in the correct direction: Keep the USB memory stick with its top surface right, and insert it slowly into the connector on the CPU board.

Forcible insertion may result in damage to the USB memory stick or USB connector.

*Fig. 7-3: Using a USB Memory Stick on the CPU Board*
7.2 Handling Data

7.2.1 Data Classification

For the YRC1000, data that can be saved online are classified into six categories.

1. JOB
2. FILE/GENERAL DATA
3. PARAMETER*¹¹)
4. I/O DATA
5. SYSTEM DATA
6. SYSTEM BACKUP (CMOS.BIN)

Data saved on the external memory device can be loaded again into the YRC1000.

Each data in the six categories varies depending on applications or options.

When the device is set to “PC” or “FTP”, data cannot be handled other than “1. JOB” and “2. FILE/GENERAL DATA”.

Also, the “1. JOB” whose name consists of more than nine letters cannot be handled at “FC1”.

---

**NOTE**

PARAMETER, SYSTEM DATA, I/O DATA, and SYSTEM BACKUP (CMOS.BIN), which includes the data of the former three data, have inherent information of each controller.

If those data are loaded by other controllers, unintended data overwriting, unexpected operation, or abnormal system startup may occur.

Do not load those backup data into other controllers.

If two controllers are loaded with the same job, paths of the two manipulators are different due to the home positions or mechanical error of the component parts.

Be sure to check the operation instruction before operation.

---

¹ "PARAMETER BATCH" includes all "3. PARAMETER".
### Table 7-1: Data List (Sheet 1 of 3)

<table>
<thead>
<tr>
<th>Data Classification</th>
<th>File Name (Saved Data)</th>
<th>Save</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>OPN</td>
<td>EDT</td>
</tr>
<tr>
<td>6. SYSTEM BACKUP (CMOS.BIN)</td>
<td>CMOS.BIN</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>1. JOB</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single job</td>
<td>JOBNAME.JBI</td>
<td>○</td>
<td>○</td>
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<tr>
<td>Related job (Job+Condition)</td>
<td>JOBNAME.JBR</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2 FILE/GENERAL DATA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tool data</td>
<td>TOOL.CND</td>
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<td>○</td>
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<tr>
<td>Weaving data</td>
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<tr>
<td>User coordinate data</td>
<td>UFRAME.CND</td>
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<tr>
<td>Variable data</td>
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<td>Arc start condition data</td>
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</tr>
<tr>
<td>Arc end condition data</td>
<td>ARCEND.CND</td>
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<td>Welding condition auxiliary data</td>
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<td>Welder characteristic data</td>
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<td>Job registration data</td>
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<td>Interference area file</td>
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<td>Motor Gun Pressure Data</td>
<td>SGPRS.CND</td>
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<td>Motor Gun Dry Pressure Data</td>
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<td>Spot Gun Condition Data</td>
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<td>Spot Welder I/F Data</td>
<td>SGWELDIF.DAT</td>
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<td>Gun Open Position Data</td>
<td>STROKE.DAT</td>
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<td>○</td>
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<tr>
<td>Spot I/O Allocation Data</td>
<td>SGIO.DAT</td>
<td>○</td>
<td>○</td>
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<td>Spot Welding Condition Data</td>
<td>SPOTWELD.DAT</td>
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<td>Clearance Setting Data</td>
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* ○: Can be done, X: Cannot be done

OPN: Operation mode, EDT: Edit mode, MNG: Management mode, SFT: Safety mode
Table 7-1: Data List (Sheet 2 of 3)

<table>
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<td>SD.PRM</td>
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<td></td>
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<td>System matching parameter</td>
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<td>PSEUDOIN.DAT</td>
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<td>External I/O name data</td>
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<td>Register name data</td>
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<td></td>
<td>YSF logic file</td>
<td>YSFLOGIC.DAT</td>
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</tbody>
</table>

* O: Can be done, X: Cannot be done

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### Table 7-1: Data List  (Sheet 3 of 3)

<table>
<thead>
<tr>
<th>Data Classification</th>
<th>File Name (Saved Data)</th>
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<th>Load</th>
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</thead>
<tbody>
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<td></td>
<td></td>
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<td>6 5. SYSTEM DATA</td>
<td>Second home position</td>
<td>HOME2.DAT</td>
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<td></td>
<td>User word</td>
<td>UWORD.DAT</td>
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<td>SV monitor signal</td>
<td>SVMON.DAT</td>
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<td>Variable name</td>
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</tr>
<tr>
<td></td>
<td>Alarm history data</td>
<td>ALMHIST.DAT</td>
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</tr>
<tr>
<td></td>
<td>Home position calibrating data</td>
<td>ABSO.DAT</td>
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</tr>
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<td></td>
<td>System information</td>
<td>SYSTEM.SYS</td>
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<td>Controller information</td>
<td>PANELBOX.LOG</td>
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<td>Work home position data</td>
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<td>I/O message history data</td>
<td>IOMSGHST.DAT</td>
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<td>Function key allocation data</td>
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<td></td>
<td>Arc monitor data</td>
<td>ARCMON.DAT</td>
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<td>Wear detection base position data</td>
<td>SGWEARBP.DAT</td>
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<td>External I/O ALLOC data</td>
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<td></td>
<td>Max/ Min torque data</td>
<td>TRQDAT.DAT</td>
<td>○</td>
</tr>
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<td></td>
<td>Log data</td>
<td>LOGDATA.DAT</td>
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</tr>
<tr>
<td></td>
<td>PM (reducer) file</td>
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<tr>
<td></td>
<td>PM (reducer) condition</td>
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<tr>
<td></td>
<td>Encoder maintenance</td>
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<td></td>
<td>Inspection record file</td>
<td>PMLOG.DAT</td>
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<td>Robot stop FACTR file</td>
<td>RBSTPFCT.DAT</td>
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<td>SETTM setup file</td>
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<td></td>
<td>Timer variable name</td>
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<td>Paint system</td>
<td>PNTSYS.DAT</td>
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<td>Paint special</td>
<td>PNTSPCL.DAT</td>
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<tr>
<td></td>
<td>Paint time chart set</td>
<td>PNTTCSSET.DAT</td>
<td>○</td>
</tr>
</tbody>
</table>

* O: Can be done,  X: Cannot be done

OPN: Operation mode, EDT: Edit mode, MNG: Management mode, SFT: Safety mode
7.2.2 File Existence

The following data categories show whether the same file name as a file that is going to be saved is in the external memory device or not.

- **JOB**
  No mark appears when the selected folder has the file of the same name.
The asterisk (*) appears when the folder does not have the same name file.

- **FILE/GENERAL DATA, PARAMETER, SYSTEM DATA, I/O DATA**
  Black circle (●) appears when the selected folder has the file of the same name.
  White circle (○) appears when the folder does not have the same name file.

Whether the job after editing is saved or not can be judged by checking "TO SAVE TO FD" in the JOB HEADER window.

Fig. 7-4: Example of JOB

Fig. 7-5: Example of FILE/GENERAL DATA
7.2.2.1 Saving by Overwriting

"6. SYSTEM BACKUP (CMOS.BIN)" can be overwritten.

As for "1. JOB", "2. FILE/GENERAL DATA", "3. PARAMETER", "4. I/O DATA" and "5. SYSTEM DATA", those data cannot be overwritten. Delete the target file in the device before the saving operation.

If "SD: Programming pendant", "USB: Programming pendant" or "USB1: Controller" is used as the device, the file does not need to be deleted because another folder can be created to save the data.
7 External Memory Device
7.3 Operation Flow

The following description is the operation flow for external memory devices.

- **SELECT DEVICE**
  Select (EX. MEMORY) → (DEVICE), and the destination device for saving.
  The device selected is valid after turning the power supply ON again.

- **SELECT FOLDER**
  Select (EX. MEMORY) → (DEVICE), and the destination folder for saving.
  The folder selected is invalid after turning the power supply ON again.
  *1: (FOLDER) appears when using the "SD: Programming pendant", "USB: Programming pendant" or "USB1: Controller" as a device.
  *2 The settings of {CREATE NEW FOLDER}, {DELETE FOLDER}, and {ROOT FOLDER} can be set.

- **SELECT SUB MENU**
  Select an operation to be performed from {LOAD}, {SAVE}, {VERIFY}, and {DELETE}.

- **SELECT DATA CATEGORY**
  Select the target data category.

- **SELECT DATA**
  Select the target data.
  *6: SYSTEM BACKUP (CMOS.BIN)” does not require this operation.
  *3 Individual selection, batch selection, marker (*) selection, and canceling selection can be performed.

- **EXECUTE**
  Select [ENTER] or {EXECUTE}. 

Diagram:

```
Main Menu
(EX. MEMORY)

Sub Menu
(LOAD) (SAVE) (VERIFY) (DELETE) (DEVICE) (FOLDER)

Select Device

Select Folder

Select Data Category

Select Data

Select [ENTER] or {EXECUTE}
```
7.3.1 Folder Operation

Folders can be used in order to classify and sort out the data such as jobs and condition files when using the "SD: Programming pendant", "USB: Programming pendant" or "USB1: Controller". The folders can be created in hierarchical structure positioning a root folder at the top.

**Restrictions**

 Folder name: Up to 8 characters + 3 characters for extension
 *Long folder names cannot be used such as the name that exceeds the restricted number of characters mentioned above as created in PC, etc.

 Maximum path length: 48 characters
 **"ERROR 3360: INVALID FOLDER" appears when selecting the folder of which name exceeds the maximum path length.**

**Selecting a Folder**

1. Select {EX. MEMORY} under {Main Menu}.
2. Select {FOLDER}.
   - The FOLDER LIST window appears.
3. Move the cursor to a folder and press [SELECT].
   - A folder can be selected.
4. To move the hierarchy from a child folder to a parent folder, move the cursor to [..] and press [SELECT].

**Creating a Folder**

1. Set the security mode to the management mode or higher. Select {EX. MEMORY} under {Main Menu}.
2. Select {FOLDER}.
   - The FOLDER LIST window appears.
3. Move the cursor to a folder and press [SELECT].
   - Select the higher-level folder where a new folder to be created should be contained.
   - When creating a folder in top-level, this step is unnecessary.
4. Select {DATA} → {CREATE NEW FOLDER} under the pull-down menu. Enter the folder name by using the keyboard on the screen and press [ENTER].
   - A folder is created.
7 External Memory Device
7.3 Operation Flow

Deleting a Folder
1. Set the security mode to the management mode or higher. Select {EX. MEMORY} under {Main Menu}.
2. Select {FOLDER}.
   - The FOLDER LIST window appears.
3. Move the cursor to a folder and press [SELECT].
   - Select the higher-level folder where a folder to be deleted is contained.
   - When deleting a folder in top-level, this step is unnecessary.
4. Delete the files and subfolders beforehand inside the folder that is to be deleted.
   - A folder cannot be deleted if the folder contains files or subfolders inside.

Move the cursor to the folder to be deleted.
5. Select (DATA) → (DELETE FOLDER) under the pull-down menu.
7 External Memory Device
7.3 Operation Flow

**Initial Folder Setting**

The folder that is contained in a deep hierarchy can be selected in a shortened operation.

When selecting `{LOAD}`, `{SAVE}`, `{VERIFY}`, or `{DELETE}` from the sub menu of `{EX. MEMORY}`, the folder that has been set as an initial folder becomes a current folder.

1. Set the security mode to the management mode or higher. Select `{EX. MEMORY}` under `{Main Menu}`.
2. Select `{FOLDER}`.
   - The FOLDER LIST window appears.
   - Select a folder that is to be set as a root folder.
4. Select `{DISPLAY} → {ROOT FOLDER}` under the pull-down menu.
   - The INITIAL FOLDER SETTING window appears.

- A folder currently selected appears in "CURRENT FOLDER" and the initial folder appears in "ROOT FOLDER".
5. Select {EDIT} → {SETUP FOLDER} under the pull-down menu. Move the cursor to "AUTO CHANGE" and press [SELECT].

- The initial folder is set in "ROOT FOLDER".

- "AUTO CHANGE" shows "ON" and the initial folder setting becomes valid. Subsequently, every time {EX. MEMORY} → {FOLDER} is selected, the initial folder that has been set becomes a current folder.

When the initial folder is missing due to exchange of the SD card, etc., "ERROR 3360: INVALID FOLDER" appears when selecting (LOAD), (SAVE), (VERIFY), (DELETE) or (FOLDER) menu from (EX. MEMORY), and simultaneously the initial folder becomes invalid. Set "ON" in "AUTO CHANGE" when the initial folder setting needs to be valid.
7 External Memory Device
7.3 Operation Flow

7.3.0.2 Saving Data

To download data from the memory of the YRC1000 to the external memory device, perform the following procedure.

**NOTE**
After modifying data, save the data individually.

### Saving a Job

1. Select {EX. MEMORY} under {Main Menu}.
2. Select {SAVE}.
   - The following window appears.

![Image 1](image1.png)

3. Select "JOB".
   - The JOB LIST window appears.

![Image 2](image2.png)
4. Select a job to be saved.
   – The selected job is marked with "★".

5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select "YES".
   – The selected job is saved.
7 External Memory Device
7.3 Operation Flow

- Saving a Condition File or General Data

1. Select {EX. MEMORY} under {Main Menu}.
2. Select {SAVE}.
   - The following window appears.

3. Move the cursor to “FILE/GENERAL DATA” and select.
   - The selection window appears.
   - The content of the display varies in accordance with applications and options.
4. Select condition files or general data to be saved.
   – The selected files are marked with "★".

5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select "YES".
   – The selected files are saved.
Saving a Parameter

1. Select {EX. MEMORY} under {Main Menu}.

2. Select {SAVE}.
   - The following window appears.

3. Move the cursor to “PARAMETER” and select.
   - The selection window for parameters appears.

4. Select parameters to be saved.
   - The selected parameters are marked with “★”.

---

7 External Memory Device
7.3 Operation Flow
5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select “YES”.
   – The selected parameters are saved.
7 External Memory Device
7.3 Operation Flow

■ Saving I/O Data

1. Select {EX. MEMORY} under {Main Menu}.
2. Select {SAVE}.
   – The following window appears.
   ![Saving I/O Data Window]

3. Move the cursor to "I/O DATA" and select.
   – The selection window for I/O data appears.
   ![Selection Window]

4. Select I/O data to be saved.
   – The selected I/O data are marked with "★".
   ![Marked I/O Data]
5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select “YES”.
   – The selected I/O data are saved.
7 External Memory Device
7.3 Operation Flow

### Saving System Data

1. Select {EX. MEMORY} under {Main Menu}.
2. Select {SAVE}.
   - The following window appears.

![Selection Window]

3. Move the cursor to {SYSTEM DATA} and select.
   - The selection window for system data appears.

![Selection Window]

4. Select system data to be saved.
   - The selected system data are marked with "★".
5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select “YES”.
   – The selected system data are saved.

As for “JOB”, “FILE/GENERAL DATA”, “PARAMETER”, “SYSTEM DATA”, and “I/O DATA”, the data cannot be overwritten. In this case, delete the file of the same name in the folder beforehand or create a new folder so that the data can be stored inside.
7.3 Operation Flow

- **Saving SYSTEM BACKUP (CMOS.BIN)**

1. Select {EX. MEMORY} under {Main Menu}.
2. Select {SAVE}.
   - The following window appears.

3. Select "SYSTEM BACKUP(CMOS.BIN)".
   - The confirmation dialog box appears.

4. Select "YES".
   - Saving operation of SYSTEM BACKUP(CMOS.BIN) starts in case CMOS.BIN does not exist where this data is saved. Or proceed to the following step (step 5) when CMOS.BIN is already equipped.
5. The confirmation dialog box appears.

![Confirmation Dialog Box]

5. The confirmation dialog box appears.

6. Select “YES”.

   Saving of SYSTEM BACKUP (CMOS.BIN) starts.

   Saving of SYSTEM BACKUP (CMOS.BIN) cannot be performed while servo is turned ON, data is transmitted together with data modification, automatic backup, or when the media free space is less than 35 MB.

   For about 2 seconds right after SYSTEM BACKUP (CMOS.BIN) saving is started, the hourglass icon appears at the center of the window and all the operations become invalid. Operations become valid when the hourglass disappears.

   Do not turn OFF the power supply because SYSTEM BACKUP (CMOS.BIN) is being saved in the saving device while the hourglass is appeared in the status area.
7.3.0.3 Loading Data

To upload data from the external memory device to the memory of the YRC1000, follow the procedure in the following.

PARAMETER, SYSTEM DATA, I/O DATA, and SYSTEM BACKUP (CMOS.BIN), which includes the data of the former three data, have inherent information of each controller.

If those data are loaded by other controllers, unintended data overwriting, unexpected operation, or abnormal system startup may occur.

Do not load those backup data into other controllers.

If two controllers are loaded with the same job, paths of the two manipulators are different due to the home positions or mechanical error of the component parts.

Be sure to check the operation instruction before operation. Take extra care for the saved data.

NOTE

When the ladder program used in the DX200 is tried to be loaded, the confirmation dialog “DX200 CIOPRG DOWN-LOAD?” is displayed. Select “YES” to load the ladder program of the DX200. If [CANCEL] is pressed or “NO” is selected while this dialog is displayed, the ladder program will not be loaded.

When the ladder program used in the DX200 is loaded to the YRC1000, make sure to confirm that the APPLI of the program in the DX200 system and the YRC1000 system to which the program is loaded are the same. Do not load the ladder program which has a different APPLI. The “different APPLI” also means the case that the number of APPLIs are different (ex. "Arc" and "Arc + Arc").

The ladder program used in the DX100 can also be loaded to the YRC1000.

If the ladder program used in the DX100/DX200 for arc welding is loaded to the YRC1000, some new functions added in the DX200 cannot be used (only for arc welding). In order to use the new functions added in the DX200, reflect the content edited in the DX100/DX200 to the YRC1000 ladder program without loading the ladder program of the DX100/DX200.
## Loading a Job

1. Select **(EX. MEMORY)** under **(Main Menu)**.
2. Select **(LOAD)**.
   - The following window appears.

   ![Window](image1.png)

   ![Window](image2.png)

3. Select **(JOB)**.
   - The job selection window appears.

   ![Window](image3.png)

4. Select a job to be loaded.
   - The selected jobs are marked with “★”.

   ![Window](image4.png)
5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select “YES”.
   – The selected jobs are loaded.
Loading a Condition File/General Data

1. Select (EX. MEMORY) under (Main Menu).
2. Select (LOAD).
   - The following window appears.

3. Move the cursor to “FILE/GENERAL DATA” and select.
   - The selection window for condition file or general data appears.

4. Select a condition file or general data to be loaded.
   - The selected files are marked with "★".
5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select “YES”.
   – The selected files are loaded.
Loading a Parameter

1. Select (EX. MEMORY) under (Main Menu).

2. Select (LOAD).

   – The following window appears.

   ![Window](image1)

   3. Move the cursor to “PARAMETER” and select.

   – The selection window for parameters appears.

   ![Window](image2)

   4. Select parameters to be loaded.

   – The selected parameters are marked with "★".

   ![Window](image3)
5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select “YES”.
   – The selected parameters are loaded.
7 External Memory Device

7.3 Operation Flow

Loading I/O Data

1. Select {EX. MEMORY} under {Main Menu}.

2. Select {LOAD}.
   - The following window appears.

3. Move the cursor to “I/O DATA” and select.
   - The selection window for I/O data appears.

4. Select I/O data to be loaded.
   - The selected I/O data are marked with “★”.

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5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select “YES”.
   – The selected I/O data are loaded.
7 External Memory Device
7.3 Operation Flow

Loading System Data

1. Select {EX. MEMORY} under {Main Menu}.
2. Select {LOAD}.
   – The following window appears.
   ![Screen shot showing data selection window]

3. Move the cursor to “SYSTEM DATA” and select.
   – The selection window for system data appears.
   ![Screen shot showing system data selection window]

4. Select system data to be loaded.
   – The selected system data are marked with “★”.
   ![Screen shot showing marked system data]
5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select “YES”.
   – The selected system data are loaded.
7.3.0.4 Verifying Data

Follow the procedure below to verify data in the memory of the YRC1000 with data saved in the external memory device.

**NOTE**

“SYSTEM BACKUP (CMOS.BIN)” cannot be verified.

- **Verifying a Job**

1. Select (EX. MEMORY) under (Main Menu).
2. Select (VERIFY).
   
   - The following window appears.

3. Select “JOB”.
   
   - The job selection window appears.
4. Select a job to be verified.
   – The selected jobs are marked with "★".

5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select "YES".
   – The selected jobs are verified.
7 External Memory Device
7.3 Operation Flow

- Verifying a File (FILE/GENERAL DATA, PARAMETER, I/O DATA, SYSTEM DATA)

1. Select (EX. MEMORY) under (Main Menu).
2. Select (VERIFY).
   - The following window appears.

3. Select the group of the file to be verified.
4. Select a file to be verified.
   - The selected files are marked with "★".
5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select “YES”.
   – The selected files are verified.
7.3.0.5 Deleting Data

Follow the procedure below to delete a file or files on an external memory device.

- **Deleting a Job**

1. Select “EX. MEMORY” under {Main Menu}.
2. Select “DELETE”.
   - The following window appears.

   ![Delete Job Window]

3. Select “JOB”.
   - The job selection window appears.

   ![Job Selection Window]
4. Select a job to be deleted.
   – The selected jobs are marked with "★".

![Image of job selection process]

5. Press [ENTER].
   – The confirmation dialog box appears.

![Image of confirmation dialog box]

6. Select "YES".
   – The selected jobs are deleted.
Deleting a File (FILE/GENERAL DATA, PARAMETER, I/O DATA, SYSTEM DATA)

1. Select (EX. MEMORY) under (Main Menu).
2. Select (DELETE).
   - The following window appears.

3. Select the group of the file to be deleted.

4. Select a file to be deleted.
   - The selected files are marked with "★".
5. Press [ENTER].
   – The confirmation dialog box appears.

6. Select “YES”.
   – The selected files are deleted.
Deleting SYSTEM BACKUP (CMOS.BIN)

1. Select {EX. MEMORY} under {Main Menu}.
2. Select {DELETE}.
   - The following window appears.
3. Select “SYSTEM BACKUP (CMOS.BIN)”.
   - A confirmation dialog box appears when CMOS.BIN exists in the saving device. And it will not appear when CMOS.BIN does not exist.
4. Select “YES”.
   - Deleting of SYSTEM BACKUP (CMOS.BIN) starts.

**NOTE**
Deleting of SYSTEM BACKUP (CMOS.BIN) is not executed while a data is transmitted together with data modification.
7.3.6 Job Selection Mode

The method of selecting a job and various data files when loading, saving, verifying, and deleting are described in the following:

- **Individual Selection**
  Jobs and data files are selected individually one at a time.

- **Batch Selection**
  Jobs and data files are selected all at one time.

- **Marker (*) Selection**
  Loading: selects the files in the external memory device.
  Saving: selects the files in the memory of the YRC1000.
  Verifying: selects both the files in the external memory device and in the memory of the YRC1000.

- **Batch Selection (individual file)**
  Jobs and data files (FILE/GENERAL DATA, PARAMETER, I/O DATA, SYSTEM DATA) are selected all at one time.
  This operation can be performed on the window where the data type of the external memory device is selected. Only in the case of saving and verifying, operation of the external memory device can be performed.
Using Individual Selection

1. In either the external memory JOB LIST window or the file selection window, move the cursor to a job or a file to be selected.

   - The selected jobs are marked with "★".

2. Press [SELECT].

   Move the cursor to a file needed and press [SELECT] again.
   • To cancel the selected items, select (EDIT) and then (CANCEL SELECT).

   - The selected jobs are marked with "★".
Using Batch Selection

1. In either the external memory JOB LIST window or the file selection window, select {EDIT} under the menu.
   - The pull-down menu appears.
   - Select {SELECT ALL}.
     - All jobs are selected.
   - To cancel the selected items, select {EDIT} and then {CANCEL SELECT}.

2. Select {SELECT ALL}.
   - All jobs are selected.
   *To cancel the selected items, select {EDIT} and then {CANCEL SELECT}.

---

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Using Marker (*) Selection

1. In either the external memory JOB LIST window or the file selection window, select {EDIT} under the menu.
   – The pull-down menu appears.

   ![Diagram of external memory JOB LIST window]

   1. In either the external memory JOB LIST window or the file selection window, select {EDIT} under the menu.

2. Select {SELECT MARKER (*)}.
   *To cancel the selected items, select {EDIT} and then {CANCEL SELECT}.

   ![Diagram of file selection window]
Using Batch Selection (individual file)

For two or more types of data (JOB, FILE/GENERAL DATA, PARAMETER, I/O DATA, SYSTEM DATA), the data can be selected all at one time. This operation can be performed when saving or verifying the data in the external memory device.

1. On the window where the types of data in the external memory device are selected, select {SELECT ALL (INDIVIDUAL)} from the pull-down menu {EDIT}.

2. On the left of JOB, FILE/GENERAL DATA, PARAMETER, I/O DATA, and SYSTEM DATA, the signs “★” appear and indicate the items are selected.

3. Press [ENTER].
4. The confirmation dialog box appears.
When saving the data, “Do you save all individual files?” appears.
When verifying the data, “Do you verify all individual files?” appears.

5. Select “YES”.
– The data of the data type selected all at one time is saved or verified in the external memory device.

- Move the cursor to the data type (JOB, FILE/GENERAL DATA, PARAMETER, I/O DATA, SYSTEM DATA) and press [SHIFT] + [SELECT] to individually select/cancel the data type.
- To perform operation (save/verify) of the external memory device all at one time for one specific data type, press [SHIFT] + [SELECT], and while the specific data type is selected, perform the steps 3 to 5 above.

To cancel all the selection on the window where the data type is selected, select {CANCEL ALL (INDIVIDUAL)} from the pull-down menu {EDIT}. The selection of the data types is canceled all at one time, and the signs “★” on the left of JOB, FILE/GENERAL DATA, PARAMETER, I/O DATA, and SYSTEM DATA are hidden.
8 Parameter

8.1 Parameter Configuration

The parameters of YRC1000 can be classified into the following seven:

**Motion Speed Setting Parameter:**
Determines the manipulator motion speed for jog operation at teaching, test operation, or playback operation.

**Mode Operation Setting Parameter:**
Makes the setting for various operations in the teach mode or remote mode.

**Parameter according to Interference Area:**
Limits the P-point maximum envelope of the manipulator or sets the interference area for axis interference or cubic interference.

**Parameter according to Status I/O:**
Sets the parity check or I/O setting for user input/output signals.

**Parameter according to Coordinated or Synchronized Operation:**
Makes the settings for coordinated or synchronized operations between manipulators or between manipulators and stations.

**Parameter for Other Functions or Applications:**
Makes the settings for other functions or applications.

**Hardware Control Parameter:**
Makes the hardware settings for fan alarm or relay operation, etc.

---

**S1CxG Parameters**

The initial setting of S1CxG parameters depends on the manipulator model. For a system in which two manipulators are controlled, the following two types of parameters are used: S1C1G type and S1C2G type.
These parameters set the manipulator motion speed for jog operation at teaching, test operation, or playback operation.

8.2.0.1 S1CxG000: IN-GUARD SAFE OPERATION MAX. SPEED
Units: 0.01%
The upper speed limit is set for in-guard safe operation. While the in-guard safe operation command signal is being input, the TCP speed is limited to the in-guard safe operation maximum speed.

8.2.0.2 S1CxG001: DRY-RUN SPEED
Units: 0.01%
This is a dry-run operation speed setting value used when checking the path. Take safety into consideration when setting changes are unnecessary.

8.2.0.3 S1CxG002 to S1CxG009: JOINT SPEED FOR REGISTRATION
Units: 0.01%
The value set in these parameters is registered as the joint speed for each speed level when teaching the position data with the programming pendant. The percentage corresponding to the set value at each level is registered as 100% of the value set in the playback speed limit. Values greater than those set as speed limit values cannot be set.

S1CxG002: Level 1
S1CxG003: Level 2
·
·
S1CxG009: Level 8
8 Parameter
8.2 Motion Speed Setting Parameters

8.2.0.4 S1CxG010 to S1CxG017: LINEAR SPEED FOR REGISTRATION
Units: 0.1mm/s
The value set in these parameters is registered as the linear speed for each speed level when teaching the position data with the programming pendant. Values greater than those set as playback speed limit values cannot be set.

S1CxG010: Level 1
S1CxG011: Level 2
·
·
S1CxG017: Level 8

8.2.0.5 S1CxG018 to S1CxG025: POSITION ANGLE SPEED
Units: 0.1°/s
The value set in these parameters is registered as the position angle speed for each speed level when teaching the position data with the programming pendant. Values greater than those set as playback speed limit cannot be set.

S1CxG018: Level 1
S1CxG019: Level 2
·
·
S1CxG025: Level 8

8.2.0.6 S1CxG026 to S1CxG029: JOG OPERATION ABSOLUTE VALUE SPEED
Units: 0.1mm/s
These are setting values of jog operation speed set by the programming pendant. Values greater than those set as jog operation speed limit value cannot be set.

S1CxG026 Low level : Jog operation speed when “LOW” manual speed is specified.
S1CxG027 Medium level : Jog operation speed when “MEDIUM” manual speed is specified.
S1CxG028 High level : Jog operation speed when “HIGH” manual speed is specified.
S1CxG029 High-speed-level : Jog operation speed when [HIGH SPEED] is pressed.
8.2 Motion Speed Setting Parameters

8.2.0.7 S1CxG030 to S1CxG032: INCHING MOVE AMOUNT

These parameters specify the amount per move at inching operation by the programming pendant. The referenced parameter differs according to the operation mode at inching operation.

- S1CxG030: Joint Operation (Unit: 1 pulse)
- S1CxG031: Cartesian/cylindrical (Unit: 0.001 mm)
- S1CxG032: Motion about TCP (Unit: 0.0001 degree)

If the value set for S1CxG031 or S1CxG032 is too small, the inching operation does not proceed.

8.2.0.8 S1CxG033 to S1CxG040: POSITIONING ZONE

Units: μm

This parameter value will be referenced when positioning is specified with the “MOVE” instruction: MOVJ (joint movement) or MOVL (linear movement).

<Example> MOVL V=100.0 PL=1

The value set in this parameter specifies the range to enter in relation to the teaching point for that step positioning. After entering the specified positioning zone, the manipulator starts moving to the next step. The system is also set up so inward turning operation is carried out in the moving section when moving to the next path; speed changeover is smooth.
Since operation will be turning inward during playback, as shown in the following diagram, use setting values taking safety aspects into consideration.

- Position level 1: S1CxG33 (μm)
- Position level 2: S1CxG34 (μm)
- Position level 3: S1CxG35 (μm)
- Position level 4: S1CxG36 (μm)
- Position level 5: S1CxG37 (μm)
- Position level 6: S1CxG38 (μm)
- Position level 7: S1CxG39 (μm)
- Position level 8: S1CxG40 (μm)

**Position Level**

Position level (PL: Position Level)

Position levels are divided into nine levels (0 to 8) and can be specified by using the "MOV" instruction.

The functions at each level are as follows:

0: Complete positioning to the target point
1 to 8: Inward turning operation

Following are explanations of the respective processing details and their relations with the parameter.

- **Level 0**
  Determines positioning completion when the amount of deviation (number of pulses) to the target point of each axis comes within the position set zone specified by the parameter.
  After the positioning completes, the instruction system starts instruction to the next target point.

- **Level 1 to 8**
  Recognizes virtual positioning before the target point. The distance of the virtual target position from the target point is specified at the positioning level.
  Distance data corresponding to each level are set in the parameter. Determination of the virtual target position is carried out in the instruction system.
  Set zone: The zone of each positioning level set in the parameter. (μm)

Example:

MOVL V=500 PL=1
8 Parameter
8.2 Motion Speed Setting Parameters

8.2.0.9 S1CxG044: LOW-SPEED START
Units: 0.01%
This parameter specifies max. speed at low speed start. Specify the starting method for “initial operation speed of manipulator” (S2C217).

8.2.0.10 S1CxG045 to S1CxG048: JOG OPERATION LINK SPEED
Units: 0.01%
These parameters prescribe the link speed at jog operation by the programming pendant. Specify the percentage (%) for the jog operation speed limit, the joint max. speed.
S1CxG045: Jog operation link speed at level “LOW”
S1CxG046: Jog operation link speed at level “MEDIUM”
S1CxG047: Jog operation link speed at level “HIGH”
S1CxG048: Jog operation link speed at level “HIGH SPEED”

8.2.0.11 S1CxG056: WORK HOME POSITION RETURN SPEED
Units: 0.01%
This parameter specifies the speed for returning to work home position against the maximum speed.

8.2.0.12 S1CxG057: SEARCH MAX. SPEED
Units: 0.1mm/s
This parameter specifies the max. speed for searching.

8.2.0.13 S2C201: POSTURE CONTROL AT CARTESIAN OPERATION OF JOG
This parameter specifies whether or not posture control is performed at Cartesian operation of “JOG” by the programming pendant. Use posture control unless a special manipulator model is used.
  0 : With posture control
  1 : Without posture control
8.2.0.14 S2C202: OPERATION IN USER COORDINATE SYSTEM (WHEN EXTERNAL REFERENCE POINT CONTROL FUNCTION USED)

This parameter specifies the TCP or reference point of motion about TCP when the external reference point control function is used and the user coordinate system is selected by the programming pendant.

*Fig. 8-1: When manipulator TCP is selected*

*Fig. 8-2: When external reference point is selected*

8.2.0.15 S2C320: CONTROLLED GROUP JOB TEACHING POSITION CHANGE

This parameter is used to change only the job teaching position of controlled group axis.

0 : Not changed
1 : Changed

8.2.0.16 S2C422: OPERATION AFTER RESET FROM PATH DEVIATION

8.2.0.17 S2C423: OPERATION AFTER JOB

These parameters specify the method of restarting the manipulator that has deviated from the normal path such as an emergency stop or jog operation.

0 : Moves to the indicated step (initial setting).
1 : After moving back to the deviated position, moves to the indicated step.
2 : Moves back to the deviated position and stops.
### 8.2 Motion Speed Setting Parameters

#### Table 8-1: S2C422

<table>
<thead>
<tr>
<th>Parameter setting value</th>
<th>Movement when restarting</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Moves to next step.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Diagram for Parameter 0" /></td>
</tr>
<tr>
<td>1</td>
<td>After moving back to the deviated position, moves to the indicated step.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Diagram for Parameter 1" /></td>
</tr>
<tr>
<td>2</td>
<td>Emergency stop (Servo OFF) moves back to the deviated position and then moves to the indicated step.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Diagram for Parameter 2" /></td>
</tr>
</tbody>
</table>

#### Table 8-2: S2C423

<table>
<thead>
<tr>
<th>Parameter setting value</th>
<th>Movement when restarting</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Moves to the next step.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Diagram for Parameter 0" /></td>
</tr>
<tr>
<td>1</td>
<td>After moving back to the deviated position, moves to the indicated step.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Diagram for Parameter 1" /></td>
</tr>
<tr>
<td>2</td>
<td>Emergency stop (Servo OFF) moves back to the deviated position and then moves to the indicated step.</td>
</tr>
<tr>
<td></td>
<td><img src="image" alt="Diagram for Parameter 2" /></td>
</tr>
</tbody>
</table>

---

**NOTE**

- The manipulator moves to the path deviated position in a linear movement at the low speed of the low-speed start (S1CxG044). After resetting from deviation, the manipulator operates at the taught speed.
- The factory-set value is 0: The manipulator moves in a straight line from the present position to the indicated step.
8.2.0.18 S2C424: DEVIATED POSITION

This parameter specifies whether deviated position is to be robot current (reference) position or feedback position.

0 : Return to the feedback position.
1 : Return to the current value (reference) position.

When emergency stop is applied during high-speed motion, the deviated position differs from the robot current value (reference) position and feedback position as shown in the following.

---

8.2.0.19 S2C425: CIRCULAR INTERPOLATION TOOL POSITION CONTROL

This parameter selects tool position control methods at circular interpolation operation.

0 : Fixed angle position
   Interpolation is performed depending on the position change viewed from the base coordinate.
   As the figure below (left) shows, when tool position viewed from outside is not significantly changed and that position is mainly taught at teaching, this setting is required.

1 : Rotating position by circular arc path
   Interpolation is performed depending on the position change corresponding to circular arc path.
   As the figure below (right) shows, when tool position corresponding to circular arc path (tool position viewed from the center of the circular arc) is not significantly changed, and that position is mainly taught at teaching, this setting is required.

---
8. Parameter
8.2 Motion Speed Setting Parameters

8.2.0.20 S2C653: EMERGENCY STOP CURSOR ADVANCE CONTROL FUNCTION

This parameter specifies whether to use the cursor advance control function or not.
0: Not use
1: Use

8.2.0.21 S2C654: EMERGENCY STOP CURSOR ADVANCE CONTROL FUNCTION CONT PROCESS COMPLETION POSITION

Units: %

When the manipulator stops during moving inner corner by CONT process, this parameter specifies which position of the inner corner should be considered as the end of step.

8.2.0.22 S2C655: EMERGENCY STOP ADVANCE CONTROL FUNCTION WORK START INSTRUCTION STEP MOTION COMPLETION DELAY TIME

Units: ms

In order to recognize securely the completion of motion to the step of work start instruction (such as ARCON instruction), this parameter specifies the delay time for motion completion of the work start instruction step only.

8.2.0.23 S2C698: BASE AXIS OPERATION KEY ALLOCATION SETTING

Table 8-3: Parameter Setting and Jog Operation Key Allocation

<table>
<thead>
<tr>
<th>Coordinates/Parameter</th>
<th>S2C698= “0”</th>
<th>S2C698= “1”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joint</td>
<td>Axis number order</td>
<td>Specified</td>
</tr>
<tr>
<td>Cylindrical</td>
<td>Axis number order</td>
<td>Specified</td>
</tr>
<tr>
<td>Cartesian</td>
<td>Specified</td>
<td>Specified</td>
</tr>
<tr>
<td>Tool</td>
<td>Specified</td>
<td>Specified</td>
</tr>
<tr>
<td>User</td>
<td>Specified</td>
<td>Specified</td>
</tr>
</tbody>
</table>

Axis number order: X: First axis, Y: Second axis, Z: Third axis
8 Parameter
8.2 Motion Speed Setting Parameters

8.2.0.24 S3C1098 to S3C1102: POSITION CORRECTING FUNCTION DURING PLAYBACK

These parameters specify the necessary data for position correcting function (PAM) during playback operation.

S3C1098 Specifies the limit of position correcting range (Units: μm)
S3C1099 Specifies the limit of speed correcting range (Units: 0.01%)
S3C1100 Specifies the correcting coordinates
0: Base
1: Robot
2: Tool
3: User 1
to
65: User 63
S3C1102 Specifies the limit of posture angle adjustment range (Units: 0.01°)
8.3 Mode Operation Setting Parameters

These parameters set various operations in the teach mode or remote mode. Some parameters can be set through (SETUP) → (TEACHING COND) or (OPERATE COND).

8.3.0.1 S2C195: SECURITY MODE WHEN CONTROL POWER SUPPLY IS TurnED ON

The operation level when the control power supply is turned ON is set.

- 0: Operation Mode
- 1: Editing Mode
- 2: Management Mode

8.3.0.2 S2C196: SELECTION OF Cartesian/CYLINDRICAL

This parameter specifies whether the Cartesian mode or cylindrical mode is affected when Cartesian/cylindrical mode is selected by operation (coordinate) mode selection at axis operation of programming pendant. This specification can be done on the TEACHING CONDITION window.

- 0: Cylindrical mode
- 1: Cartesian mode

8.3.0.3 S2C197: COORDINATE SWITCHING PROHIBITED

This parameter prohibits switching coordinates during JOG operation by the programming pendant.

- 0: Switching permitted for tool coordinates and user coordinates
- 1: Switching prohibited for tool coordinates
- 2: Switching prohibited for user coordinates
- 3: Switching prohibited for tool coordinates and user coordinates

8.3.0.4 S2C198: EXECUTION UNITS AT “FORWARD” OPERATION

This parameter specifies the execution units at step mode of “FORWARD” operation by the programming pendant.

<table>
<thead>
<tr>
<th>Parameter Setting Value</th>
<th>Operation Units</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>MOVL DOUT TIMER DOUT MOVL</td>
<td>Stops at every instruction</td>
</tr>
<tr>
<td>1</td>
<td>MOVL DOUT TIMER DOUT MOVL</td>
<td>Stops at move instruction</td>
</tr>
</tbody>
</table>
8.3.0.5 S2C199: INSTRUCTION (EXCEPT FOR MOVE) EXECUTION AT “FORWARD” OPERATION

This parameter specifies the method of instruction (except for move) execution at “FORWARD” operation by the programming pendant.

0 : Executed by pressing [FWD] + [INTERLOCK]
1 : Executed by pressing [FWD] only
2 : Instruction not executed

8.3.0.6 S2C203: CHANGING STEP ONLY

This parameter specifies whether to permit only step changes in an editing-prohibited job. When permitted, only position data can be changed but additional data such as speed cannot be changed. This specification can be done on the TEACHING CONDITION window.

0 : Permitted
1 : Prohibited

8.3.0.7 S2C204: MANUAL SPEED STORING FOR EACH COORDINATE

This parameter specifies whether to assign different manual speeds for the joint coordinates and other coordinates. If “NOT STORED” is selected, manual speed is not affected by changing the coordinates. If “STORED” is selected, manual speeds can be selected separately for the joint coordinates and other coordinates.

0 : Not stored
1 : Stored

8.3.0.8 S2C206: ADDITIONAL STEP POSITION

This parameter designates either “before next step” or “after the cursor position (between instructions)” as additional step position. This specification can be done on the TEACHING CONDITION window.
8.3 Mode Operation Setting Parameters

8.3.0.9 S2C207: MASTER JOB CHANGING OPERATION

This parameter specifies whether to permit or prohibit master job changing operation. If "PROHIBIT" is specified, the master job cannot be changed (or registered) easily. The specification can be done on the OPERATING CONDITION window.

0 : Permitted  
1 : Prohibited

8.3.0.10 S2C208: CHECK AND MACHINE-LOCK KEY OPERATION IN PLAY MODE

This parameter specifies whether to permit or prohibit in play mode to change the operation that changes the operation condition. Even if an error occurs because of the operation with the keys, the manipulator does not stop. The specification can be done on the OPERATING CONDITION window.

0 : Permitted  
1 : Prohibited
8 Parameter
8.3 Mode Operation Setting Parameters

8.3.0.11 S2C209: RESERVED WORK JOB CHANGING OPERATION

This parameter specifies whether to permit reserved work job changing operation.

The designation can be done on the OPERATING CONDITION window.

0 : Permitted
1 : Prohibited

8.3.0.12 S2C210: MASTER OR SUBMASTER CALL OPERATION IN PLAY MODE

This parameter specifies whether the master or submaster call operation in play mode is permitted or not. When the independent control function is valid, the master job for sub-task is specified at the same time. The specification can be done on the OPERATING CONDITION window.

0 : Permitted
1 : Prohibited

8.3.0.13 S2C211: LANGUAGE LEVEL

This parameter specifies the level of the robot language (INFORM III). The levels simplify the instruction registering operation. With the YRC1000, all robot instructions can be executed regardless of specification of instruction sets. The specification can be done on the TEACHING CONDITION window. For details, refer to “YRC1000 INSTRUCTIONS (RE-CTO-A221) 8.12 Instruction Level Setting”.

0: Contracted Level
Only frequently used robot instructions are selected to reduce the number of instructions to be registered. Robot instructions displayed on the instruction dialog box are also reduced so that specification is simplified.

1: Standard Level
2: Expanded Level
All the robot instructions are available in standard and expanded levels. The two levels are distinguished by the number of additional information items (tags) that can be used with robot instructions. At the expanded level, the flowing functions are available.

- Local Variables and Array Variables
- Use of Variables for Tags (Example: MOVJ VJ=I000)
  The above functions are not available at the standard level, however, which reduces the number of data required to register instructions, thereby simplifying the operation.

8.3.0.14 S2C214: INSTRUCTION INPUT LEARNING FUNCTION

This parameter specifies whether to set a line of instructions that has been input on the input buffer line when pressing the first soft key for each instruction. If "PROVIDED" is selected, the instructions are set.

0 : Without learning function
1 : With learning function
8.3.0.15 S2C215: ADDRESS SETTING WHEN CONTROL POWER IS TURNED ON

This parameter specifies the processing of the job name, step No., and line No. that are set when the control power supply is turned ON.

0 : Reproduces the address when power supply is turned ON.
1 : Lead address (Line"0") of the master job.

8.3.0.16 S2C216: JOB LIST DISPLAY METHOD AT JOB SELECTION

These parameters specify the displaying method on the JOB LIST window at job selection.

0 : Order of Names
1 : Order of Date

8.3.0.17 S2C217: INITIAL OPERATION OF MANIPULATOR

This parameter specifies the operation speed level of the first section when starting. Specify the operation speed with the low-speed start (S1CxG044). When starting at low-speed, the manipulator stops after reaching the indicated step regardless of the cycle setting. Once the manipulator is paused during the low-speed operation, it moves at teaching speed when restarted.

0 : Specified on the SPECIAL PLAY window. Operates at low speed only when low speed start is set. Operates at taught speed when not instructed.
1 : Starts at low speed after editing regardless of soft key instructions.

8.3.0.18 S2C218: PLAYBACK EXECUTION AT CYCLE MODE "1- STEP"

<table>
<thead>
<tr>
<th>Parameter Setting Value</th>
<th>Operation Units</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>MOVL</td>
<td>Stops at every instruction</td>
</tr>
<tr>
<td></td>
<td>DOUT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TIMER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DOUT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MOVL</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>MOVL</td>
<td>Stops at move instruction</td>
</tr>
<tr>
<td></td>
<td>DOUT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TIMER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>DOUT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MOVL</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

When operating "FORWARD" by the programming pendant, the units for execution are set in another parameter (S2C198).
8 Parameter
8.3 Mode Operation Setting Parameters

8.3.0.19 S2C219: EXTERNAL START
This parameter specifies whether a start instruction from external input is accepted or not. The specification can be done on the OPERATING CONDITION window.
0 : Permitted
1 : Prohibited

8.3.0.20 S2C220: PROGRAMMING PENDANT START
This parameter specifies whether a start instruction from the programming pendant is accepted or not. The specification can be done on the OPERATE ENABLE SETTING window.
0 : Permitted
1 : Prohibited

8.3.0.21 S2C221: SPEED DATA INPUT FORM
This parameter specifies the units for speed data input and display.
mm/s : in units of 0.1 mm/s
cm/min : in units of 1 cm/min
inch/min : in units of 1 inch/min
mm/min : in units of 1 mm/min
The specification can be done on the OPERATE ENABLE SETTING window.
0 : mm/sec
1 : cm/min
2 : inch/min
3 : mm/min

8.3.0.22 S2C222: RESERVED START
This parameter specifies whether a reserved start instruction from the programming pendant is accepted or not. The specification can be done on the FUNCTION ENABLE SETTING window.
0 : Permitted
1 : Prohibited

8.3.0.23 S2C224: JOB SELECTION AT REMOTE FUNCTION (PLAY MODE)
This parameter specifies whether a job selection in play mode at remote function is prohibited or not. The specification can be done on the FUNCTION ENABLE SETTING window.
0 : Permitted
1 : Prohibited
8.3.0.24 S2C225: EXTERNAL MODE SWITCH
   This parameter specifies whether mode switching from the outside is accepted or not.
   The specification can be done on the OPERATE ENABLE SETTING window.
   
   0 : Permitted
   1 : Prohibited

8.3.0.25 S2C227: EXTERNAL CYCLE SWITCHING
   This parameter specifies whether cycle switching from the outside is accepted or not.
   The specification can be done on the OPERATE ENABLE SETTING window.
   
   0 : Permitted
   1 : Prohibited

8.3.0.26 S2C228: PROGRAMMING PENDANT CYCLE SWITCHING
   This parameter specifies whether cycle switching from the programming pendant is accepted or not.
   The specification can be done on the OPERATE ENABLE SETTING window.
   
   0 : Permitted
   1 : Prohibited

8.3.0.27 S2C229: SERVO ON FROM EXTERNAL PP PROHIBITION
   This parameter specifies whether a servo ON instruction is accepted or not. More than one instruction can be specified. For example, to permit the servo ON instruction from an external input only, set “2”. In this case, servo ON instruction from the programming pendant is not accepted.
   The specification can be done on the OPERATE ENABLE SETTING window.

   ![Diagram](attachment:diagram.png)
8.3.0.28 S2C230: PROGRAMMING PENDANT OPERATION WHEN "IO" IS SELECTED FOR REMOTE MODE

This parameter specifies whether each operation of the following is valid when "IO" is selected for remote function selection. "IO" and command are available for remote function selection: "IO" is set prior to shipping. "Command" is valid when transmission function (optional) is specified.

8.3.0.29 S2C234: STEP REGISTRATION AT TOOL NO. CHANGE

The registration of the step when the tool number is changed allows the setting to be made as prohibited.

If this parameter is set to "1" (prohibited), the following operations are prohibited.

0 : Permitted
1 : Prohibited

- Modification of a step
  When the tool number of the teaching step differs from the currently-selected tool number, the step cannot be modified.

- Deletion of a step
  Even if the teaching step position coincides with the current position, the step cannot be deleted when the tool number of the teaching step differs from the currently-selected tool number.

- Addition of a step
  When the tool number of the teaching step indicated by the cursor differs from the currently-selected tool number, the step cannot be added.

8.3.0.30 S2C293: REMOTE FIRST CYCLE MODE

This parameter sets the cycle that changes from the local mode to the remote mode.

The specification can be done on the OPERATE CONDITION SETTING window.

0 : Step
1 : 1 cycle
2 : Continuous
3 : Not specified
8.3.0.31 S2C294: LOCAL FIRST CYCLE MODE

This parameter sets the cycle that changes from the remote mode to the local mode.

The specification can be done on the OPERATE CONDITION SETTING window.

0 : Step
1 : 1 cycle
2 : Continuous
3 : Not specified

8.3.0.32 S2C312: POWER ON FIRST CYCLE MODE

This parameter sets the first cycle mode for when the power is turned ON.

The specification can be done on the OPERATE CONDITION SETTING window.

0 : Step
1 : 1 cycle
2 : Continuous
3 : Not specified

8.3.0.33 S2C313: TEACH MODE FIRST CYCLE MODE

This parameter sets the cycle that changes from the play mode to the teach mode.

The specification can be done on the OPERATE CONDITION SETTING window.

0 : Step
1 : 1 cycle
2 : Continuous
3 : Not specified

8.3.0.34 S2C314: PLAY MODE FIRST CYCLE MODE

This parameter sets the cycle that changes from the teach mode to the play mode.

The specification can be done on the OPERATE CONDITION SETTING window.

0 : Step
1 : 1 cycle
2 : Continuous
3 : Not specified
### 8.3.0.35 S2C316: START CONDITION AFTER ALARM-4107 ("OUT OF RANGE (ABSO DATA)")

This parameter specifies the activating method after the alarm 4107 ("OUT OF RANGE (ABSO DATA)") occurs.

The specification can be done on the PLAYBACK CONDITION SETTING window.

- **0**: Position check operation required
- **1**: Low-speed start up

### 8.3.0.36 S2C395: SIGNAL NAME ALIAS FUNCTION

On the JOB CONTENT window, the name registered to the user input/output signal number can be displayed as alias instead of the signal number itself.

**Table 8-4: S2C395**

<table>
<thead>
<tr>
<th>Parameter Setting Value</th>
<th>Valid/Invalid</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Function invalid</td>
</tr>
<tr>
<td>1</td>
<td>Function valid</td>
</tr>
</tbody>
</table>

1. With this function valid, the confirmation dialog box "Register by name (alias)?" is displayed when a signal (IN#, OT#, IG#, OG#, IGH#, OGH#) is selected on the DETAIL EDIT window.

2. Select "YES" and the signal select window appears. Then select the target signal of number and press [ENTER], and the registered name is displayed instead of the signal number. However, if the signal number’s name is not yet registered, it is displayed by number as usual.

**<Example>** Registration of the name of user output OUT#0001 as "OUTPUT 1"

In the case of DOUT instruction:

- S2C395=0 : DOUT OT#(1) ON
- S2C395=1 : DOUT OT#(OUTPUT 1) ON
Select (IN/OUT) → (UNIVERSAL INPUT/OUTPUT) to edit signal names on the window. Up to 16 characters can be entered as a signal name. However, when this function is valid, if the content below is entered, the error message shows and the name cannot be registered.

- The name already registered
- Letters beginning with a number
- Letters including the signs below: (, ), [ , ] , = , < , > , space, comma
- Letters beginning with “alphabets representing variables” + “number”

**<Example>** B0..., I0..., BP1..., LEX2...

When the name begins with “’”, it is regarded as a comment and the same comment can be registered for two or more signals. In this case, although this function is valid, the number is displayed on the JOB CONTENT window instead of the name.

**<Example>** Registration of the name of user output
OUT#0002 as “’OUTPUT 2”
S2C395=0 : DOUT OT#(2) ON
S2C395=1 : DOUT OT#(2) ON

A job including 513 or more aliases cannot be saved in or loaded from the external memory device, but the job can be executed.

Examples of cases where saving and loading can be performed:
- Registering “OT#(1)” 513 times
- Registering “OT#(OUTPUT 1)” for 513 signal numbers
- Registering each from “OT#(OUTPUT 1)” to “OT#(OUTPUT 512)”, and registering one B000 without using an alias

Examples of cases where saving and loading cannot be performed:
- Registering each from “OT#(OUTPUT 1)” to “OT#(OUTPUT 513)”
- Registering each from “OT#(OUTPUT 1)” to “OT#(OUTPUT 512)”, and registering one B000 with using an alias
8 Parameter
8.3 Mode Operation Setting Parameters

8.3.0.37 S2C396: VARIABLE NAME ALIAS FUNCTION

On the JOB CONTENT window, the name registered to the variable (including local variables) can be displayed as alias instead of the variable number.

Table 8-5: S2C396

<table>
<thead>
<tr>
<th>Parameter Setting Value</th>
<th>Valid/Invalid</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Function invalid</td>
</tr>
<tr>
<td>1</td>
<td>Function valid</td>
</tr>
</tbody>
</table>

1. With this function valid, the confirmation dialog box “Register by name (alias) ?” is displayed when you select the variable on the DETAIL EDIT window.

2. Select “YES” and the variable select window appears. Then select the target variable of number and press [ENTER], and the registered name is displayed instead of the variable number. However, if the variable number’s name is not yet registered, it is displayed by number as usual.

<Example> Registration of the byte type variable B000 as "WORK KIND"
In the case of SET instruction
S2C396=0 : SET B000 128
S2C396=1 : SET WORK KIND 128

Select {VARIABLE} from the menu to select each variable and edit the variable name. Up to 16 characters can be entered as a variable name. However, when this function is valid, if the content below is entered, the error message shows and the name cannot be registered.

- The name already registered
- Letters beginning with a number
- Letters including the signs below: ( , ) , [ , ] , = , < , > , space, comma
- Letters beginning with “alphabets representing variables” + “number”

<Example> B0..., I0..., BP1..., LEX2...

When the name begins with “ ’ ”, it is regarded as a comment and the same comment can be registered for two or more variables. In this case, although this function is valid, the number is displayed on the JOB CONTENT window instead of the name.

<Example> Registration of the byte type variable B001 as "WORKNUM"
S2C396=0 : SET B001 10
S2C396=1 : SET B001 10
A job including 513 or more aliases cannot be saved in or loaded from the external memory device, but the job can be executed.

Examples of cases where saving and loading can be performed:

- Registering "OT#(1)" 513 times
- Registering "OT#(OUTPUT 1)" for 513 signal numbers
- Registering each from "OT#(OUTPUT 1)" to "OT#(OUTPUT 512)", and registering one B000 without using an alias

Examples of cases where saving and loading cannot be performed:

- Registering each from "OT#(OUTPUT 1)" to "OT#(OUTPUT 513)"
- Registering each from "OT#(OUTPUT 1)" to "OT#(OUTPUT 512)", and registering one B000 with using an alias
8.3.0.38 S2C397: I/O VARIABLE CUSTOMIZE FUNCTION

This function enables registration of any particular input/output signal/variable. Reference and editing of signals/variables are possible on the same window.

Table 8-6: S2C397

<table>
<thead>
<tr>
<th>Parameter Setting Value</th>
<th>Valid/Invalid</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Function Invalid</td>
</tr>
<tr>
<td>1</td>
<td>Function Valid</td>
</tr>
</tbody>
</table>

With this function valid, the sub-menu {I/O-VARIABLE CUSTOMIZE} opens under {Main Menu} {ARC WELDING}, {SPOT WELDING}, {GENERAL}, {HANDLING} (differs by application). Select {I/O-VARIABLE CUSTOMIZE}, and the I/O-VARIABLE CUSTOMIZE window appears as follows.

Fig. 8-6: I/O VARIABLE CUSTOMIZE Window

On the I/O-VARIABLE CUSTOMIZE window, any of the input/output signals/variables can be selected and registered (up to 32 items). Registrable signals/variables are as follows:

Table 8-7: Registrable Items on the I/O-VARIABLE CUSTOMIZE Window

<table>
<thead>
<tr>
<th>Input/Output Signals</th>
<th>USER INPUT SIGNAL</th>
<th>USER OUTPUT SIGNAL</th>
<th>PSEUDO INPUT SIGNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variables</td>
<td>BYTE TYPE VARIABLE (B VARIABLE)</td>
<td>INTEGER TYPE VARIABLE (I VARIABLE)</td>
<td>DOUBLE-PRECISION INTEGER TYPE VARIABLE (D VARIABLE)</td>
</tr>
</tbody>
</table>

The contents and names of the registered signals/variables can be checked and edited on this window. In addition, the data list of registered signals/variables can be loaded, saved, verified or deleted with an external memory unit. Only when this function is valid, “I/O-VARIABLE CUSTOMIZE (file name: USRIOVAR.DAT)” is displayed and can be selected. To display the “I/O-VARIABLE CUSTOMIZE (file name: USRIOVAR.DAT)”, select {EX.MEMORY} \(\rightarrow\) {LOAD} {SAVE} {VERIFY} {DELETE} \(\rightarrow\) {SYSTEM DATA}.

8-25
8.3.0.39  S2C410: WORD REGISTRATION FUNCTION / WORD EDITING FUNCTION SPECIFICATION

Specifies the valid or invalid to edit the words while inputting the characters.

0 : Invalid
1 : Valid

Note: It is able to edit the words when the security mode is set to the edit mode or the management mode.

8.3.0.40  S2C413: JOB UNDELETE FUNCTION

This function doesn’t completely delete a job from its memory when deleting the job, but saves the data so that the job can be restored as needed.

This parameter can be set on (TEACHING CONDITION) window.

If a job is deleted while this function is valid, the job disappears from the JOB LIST window. In this case, (TRASH JOB LIST) is newly displayed to (JOB) on (Main Menu) and the deleted job is listed on it.

NOTE

The job will not be listed on the trash job list and will not be restored if it is deleted when this function is invalid.
On the trash job list, the deleted jobs are displayed.

On this window, the following operations are available with the same operations as job list window.

- Batch selection / canceling selection of the jobs
  (EDIT) → (SELECT ALL) → (CANCEL SELECT)
- Job search (EDIT) → (JOB SEARCH COND)
- Rearrange of the jobs in the order of date / order of name
  (DISPLAY) → (DATE) (NAME)
- Job detailed information display (DISPLAY) → (DETAIL)
- Displaying by job groups (DISPLAY) → (FOLDER)

**Restoring the Job**

Choose a job to be restored and select (UNDELETE JOB) from (JOB) on the pull down menu.

A dialog box to confirm restoring the selected job.

Select “YES” to restore the job. The restored job is deleted from the trash job list and newly listed to the job list.

“NO” to cancel restoring the job.
8 Parameter
8.3 Mode Operation Setting Parameters

- Deleting the Job Completely
  Delete a job from the memory. The job will not be restored after this operation.
  Choose a job to be completely deleted, then select {DELETE JOB} from {JOB} on the pull down menu.

  ![Delete Job Menu]

  A dialog box to confirm deleting the selected job.

  ![Delete Confirmation]

  Select
  "YES" to delete the job completely. The deleted job is deleted from the trash job list.
  "NO" to cancel deleting the job.

  **NOTE**
The job data remains until it is completely deleted and the capacity of the memory becomes less as long as this function is valid. Delete unnecessary data to keep enough job capacity.

8.3.0.41 S2C415 to S2C419: TIME RESET

These parameters specify whether resetting operation of the specified times is permitted or not.

- S2C415 : CONTROL POWER ON TIME
- S2C416 : SERVO POWER ON TIME
- S2C417 : PLAYBACK TIME
- S2C418 : WORK TIME
- S2C419 : WEAVING TIME

0 : Prohibit Resetting
1 : Permit Resetting

"PERMIT" is set as the initial value for the work time and motion time.
8.3 Mode Operation Setting Parameters

8.3.0.42 S2C431: TOOL NO. SWITCHING

This parameter specifies whether tool number switching is permitted or not.

- 0: Prohibited (Only number “0” can be used.)
- 1: Permitted (64 type of tools from number “0” to “63” can be used.)

8.3.0.43 S2C433: POSITION TEACHING BUZZER

This parameter specifies whether the buzzer sound at position teaching is used or not.

- 0: With buzzer
- 1: Without buzzer

8.3.0.44 S2C434: JOB LINKING DESIGNATION (When Twin Synchronous Function Used)

This parameter specifies whether the manipulator at the synchronizing side is to be linked when the manipulator and the station at the synchronized side are performing FWD/BWD or test run, by using the twin synchronous function.

- 0: Not operating
- 1: Linking

Fig. 8-7: 0: Does not operate the synchronizing side while teaching the synchronized side.

Fig. 8-8: 1: Links the synchronizing side while teaching the synchronized side.
8.3.0.45 S2C437: PLAYBACK OPERATION CONTINUATION FUNCTION

This function is used to decide where to resume the playback on the start operation after suspending the playback and moving the cursor or selecting other jobs.

- **0**: Starts operation where the cursor is located in the job displayed at the moment.
- **1**: The playback continuation window appears. Select “YES” and the playback resumes where the cursor has been located when the playback suspended. If “NO” is selected, the playback resumes where the cursor is located in the job displayed at the moment.

<table>
<thead>
<tr>
<th>Parameter setting value</th>
<th>Where the playback resumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Resumes where the cursor is located in the job displayed at the moment.</td>
</tr>
</tbody>
</table>
| 1                       | Resumes where the cursor has been located when the playback suspended OR where the cursor is located in the job displayed at the moment.  
**<Example>**
Suspended at step 0003 during the playback of job A  
Displays job B  
Starts operation  
On the playback operation continuation window  
• When “YES” selected, the playback resumes from step 0003 of job A  
• When “NO” selected, the playback resumes from the current position in job B |

**Note:** When this function is valid (S2C437=1), a light blue cursor is displayed at the instruction section of step where the playback has been stopped. When “YES” is selected, the playback resumes where this cursor is located.

**NOTE**
If a job has been edited or FWD/BWD/TEST RUN operation(s) have been executed, the playback cannot resume where it has suspended. Also this function is invalid if the reserved start function is set valid (S2C222=0).
8 Parameter
8.3 Mode Operation Setting Parameters

8.3.0.46 S2C544: I/O NAME DISPLAY FUNCTION FOR JOB

When a user input/output signal, whose name is already set, is used as a job, this function displays the signal name in the form of a comment.

![Job content example]

<table>
<thead>
<tr>
<th>JOB CONTENT: MASTER</th>
<th>J: SAMPLE01</th>
</tr>
</thead>
<tbody>
<tr>
<td>CONTROL GROUP: P1</td>
<td></td>
</tr>
<tr>
<td>CONTROL #</td>
<td></td>
</tr>
<tr>
<td>0001 DOUT OT#(1) ON //OUTPUT01</td>
<td></td>
</tr>
<tr>
<td>0002 MOTU VJ=0.78</td>
<td></td>
</tr>
<tr>
<td>0003 WAIT IN#(1)=ON //INPUT01</td>
<td></td>
</tr>
<tr>
<td>0004 MovJ VJ=0.78</td>
<td></td>
</tr>
<tr>
<td>0005 END</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE**

When the specification of the signal is group specification (IG#, IGH#, OG#, OGH#), the name will not be displayed. Also, the name will not be displayed when the job is saved at external memory devices.

This parameter can be set on {FUNCTION ENABLE}.window.

| 0 : Invalid |
| 1 : Valid   |

8.3.0.47 S2C684: ALL AXES ANGLE DISPLAY FUNCTION

This function enables to change the display of manipulator position from pulse-formed to angle-formed on the specific window.

This function is valid in the following windows.

- Current value (however, it is invalid if the present displayed coordinate systems are "base", "robot" or "user".)
- Command position
- Work home position
- Second work home position

![Diagram of angle display]

This function can be valid/invalid on {FUNCTION ENABLE}. window.

Select {DISPLAY} on the pull down menu while this function is valid, then {PULSE}, {ABSOLUTE ANGLE} and {GROUND ANGLE} appear. Select one so that the presently displayed data can be changed to the selected data type.
8.3 Mode Operation Setting Parameters

PULSE
Indicates the pulse data of each axis.

ABSOLUTE ANGLE
Indicates the independent angle at every axes on the basis that the absolute value is 0[deg] when the pulse is 0.

GROUND ANGLE
Indicates the L- and U-axes angle according to the manipulator installation direction. The value of unoperated axes may vary depending on the manipulator’s posture.

NOTE
As for the servo track, angle is not indicated but distance (unit [mm]).
8.3.0.48 S2C713: CONTROL POINT OPERATION SETTING ON THE SERVO TRACK

This parameter specifies a motion system by which the manipulator’s control point is fixed while the servo track is in operation. However, it is valid only when the selected control group is specified as a servo track and the servo track is operated by jog keys in the Cartesian coordinates.

0 : Normal operation
1 : Control point operation setting on the servo track

8.3.0.49 S2C1203: TOUCH OPERATION FUNCTION IN GENERAL-PURPOSE DISPLAY AREA

This parameter specifies whether window scrolling, page switching, and cursor movement by touch operation in the general-purpose display area are enabled or disabled. The specification is done through the bit specification.

```
<table>
<thead>
<tr>
<th>d7</th>
<th>d0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Window scrolling Valid/Invalid: 1: (Invalid)</td>
</tr>
<tr>
<td></td>
<td>Page switching Valid/Invalid: 2: (Invalid)</td>
</tr>
<tr>
<td></td>
<td>Cursor movement Valid/Invalid: 4: (Invalid)</td>
</tr>
</tbody>
</table>
```

8.3.0.50 S2C1204: CURSOR MOVEMENT FUNCTION BY TOUCH OPERATION ON JOB WINDOW

This parameter specifies the cursor movement operation by touch operation on the job window. The specification can be done on the {FUNCTION ENABLE SETTING} window.

0: Press [INTERLOCK] + touch operation
1: Touch operation + dialog confirmation
2: Cursor movement by touch operation is not available

Note: S2C1203: When d2 (the cursor movement by the touch operation in the general-purpose display area) is disabled, the cursor cannot be moved.
8.4 Parameters according to Interference Area

These parameters limit the P-point maximum envelope of the manipulator or set the interference area for axis interference or cubic interference.

8.4.0.1 S1CxG800 to S1CxG819: PULSE SOFT LIMIT

Soft limit is set independently for each axis by pulse value setting. Set current value (pulse value) of the axis at the soft limit set up position.

8.4.0.2 S2C001: CUBE SOFT LIMIT CHECK

This parameter specifies whether to check the cube soft limit. More than one soft limit can be specified.

If "WITH CHECK" is selected, set up the following parameters. Units: μm

Cube Soft Limit (Base Coordinates of Robot TCP)

- S3C000: Robot 1: + side: X
- S3C001: Robot 1: + side: Y
- S3C002: Robot 1: + side: Z
- S3C003: Robot 1: - side: X
- S3C004: Robot 1: - side: Y
- S3C005: Robot 1: - side: Z
- S3C006: Robot 2: + side: X
- S3C007: Robot 2: + side: Y
- S3C008: Robot 2: + side: Z
- S3C009: Robot 2: - side: X
- S3C010: Robot 2: - side: Y
- S3C011: Robot 2: - side: Z
- S3C042: Robot 8: + side: X
- S3C043: Robot 8: + side: Y
- S3C044: Robot 8: + side: Z
- S3C045: Robot 8: - side: X
- S3C046: Robot 8: - side: Y
- S3C047: Robot 8: - side: Z
Soft Limit

Soft limit is a software-type function to limit the range of movement of the manipulator.

If the TCP reaches the soft limit during operation, the manipulator automatically stops and no longer moves in that same direction. An alarm occurs if this soft limit is exceeded during playback. This soft limit is classified into two types.

- Cube Soft Limit
  Soft limit is set with the absolute value on the base coordinates.

- Pulse Soft Limit (Independent Axis Soft Limit)
  Refer to chapter 8.4.0.1 “S1CxG800 to S1CxG819: PULSE SOFT LIMIT”.

8.4.0.3 S2C002: S-AXIS INTERFERENCE CHECK

This parameter specifies whether to check for interference with each manipulator. If “WITH CHECK” is selected, set up the following parameters.

Units: Pulse

- S3C048: S-axis Interference Area Robot 1 (+)
- S3C049: S-axis Interference Area Robot 1 (-)
- S3C050: S-axis Interference Area Robot 2 (+)
- S3C051: S-axis Interference Area Robot 2 (-)
- ... 
- S3C063: S-axis Interference Area Robot 8 (-)
8.4 Parameters according to Interference Area

8.4.0.4 S2C003 to S2C066: CUBE/AXIS INTERFERENCE CHECK

1. Designation of checking
   These parameters specify the cube/axis interference to be used by bit.
   
   - 0 : Cube Interference/Axis Interference Not Used
   - 1 : Robot 1
   - 2 : Robot 2
   - ......
   - 8 : Robot 8
   - 9 : Base Axis 1
   - 10 : Base Axis 2
   - ......
   - 16 : Base Axis 8
   - 17 : Station Axis 1
   - 18 : Station Axis 2
   - ......
   - 40 : Station Axis 24

2. Checking method
   Designates whether checking is performed by command or feedback.

<table>
<thead>
<tr>
<th>Checking Method Designation (data setting)</th>
<th>Checking method (bit setting)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0: Not used</td>
<td>0: Command, 1: Feedback</td>
</tr>
<tr>
<td>1: Robot 1, ......, 40: Station axis 24</td>
<td></td>
</tr>
</tbody>
</table>

**Checking method**

The checking method differs according to ON/OFF status of servo power supply.

<table>
<thead>
<tr>
<th>Checking Method Designation</th>
<th>Servo Power Supply ON</th>
<th>Servo Power Supply OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Command</td>
<td>Feedback</td>
<td>Feedback</td>
</tr>
<tr>
<td>Feedback</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

During the servo float function operation, checking is performed by feedback regardless of the checking method designation.
8 Parameter
8.4 Parameters according to Interference Area

Interference Area

It is possible to output whether the TCP during operation is inside or outside as a status signal, and to set the area to control the position by parameters S2C003 to S2C194. When the manipulator attempts to enter this area, the corresponding input signal (e.g., an "entrance prohibit signal") is detected. The manipulator stops immediately if there is an input signal and goes into waiting status until this signal is cleared. This signal is processed in the I/O section. Three methods of interference area settings are prepared for manipulators and stations. For a system with one manipulator, use robot 1.

• S-axis Interference Area
  Position is controlled by the pulse value of the S-axis.

• Cubic Interference Area
  Up to 64 cubic areas can be set. The edges of the cubes are set parallel to the robot coordinates or the user coordinates.

• Axis Interference Area
  Up to 64 areas can be set. Each operation area maximum and minimum value are set for the robot, base axis, and station axis plus and minus side.
8.4 Parameters according to Interference Area

S2C067 to S2C194: CUBE INTERFERENCE/AXIS INTERFERENCE SIGNAL USING METHOD

For each interference signal, the reference coordinate system for the interference area can be specified by the type and number of the coordinate system.

- S2C067: Cube/axis interference signal 1 Type of the coordinate system
- S2C068: Cube/axis interference signal 1 Number of the coordinate system
- S2C069: Cube/axis interference signal 2 Type of the coordinate system
- S2C070: Cube/axis interference signal 2 Number of the coordinate system
- ... ...
- S2C194: Cube/axis interference signal 64 Number of the coordinate system

1. Type of the coordinate system
   Specify the reference coordinate system for the interference area.
   - 0 : Pulse (axis interference)
   - 1 : Base coordinates (cube interference)
   - 2 : Robot coordinates (cube interference)
   - 3 : User coordinates (cube interference)

2. Number of the coordinate system
   When “3: User coordinates” is specified for the type of the coordinate system, specify the number of the user coordinates here.

Precaution When Setting the Interference Area

The following must be considered in advance when setting the area for the cube/axis interference or the S-axis interference.

The manipulator is decelerated to stop from the point where it enters in the area, and the actual point where the manipulator stops is inside the area. Thus, set the area in consideration of the amount of the manipulator movement in the deceleration section shown in the figure below.

The above-mentioned amount depends on the moving speed of the manipulator at that time as shown below.

- \( V = 1500 \text{ mm/s}: \text{approx.} \ 300 \text{ mm (max.)} \)
- \( V = 1000 \text{ mm/s}: \text{approx.} \ 160 \text{ mm} \)
- \( V = 30 \text{ mm/s}: \text{approx.} \ 3 \text{ to} \ 4 \text{ mm} \)
- \( V = 20 \text{ mm/s}: \text{approx.} \ 2 \text{ mm} \)
Interference Prevention in Interference Area

Processing to prevent interference is executed in the I/O processing section. The relation between the YRC1000 I/O signal and manipulator operation is shown below.

If the status becomes the wait status by the entrance prohibit signal, the manipulator enters the area just a little bit because of the deceleration process, and then stops. The manipulator does not enter the interference area where the entrance prohibit signal is already valid.

Fig. 8-9: Connection Example Where Two Manipulators Are Operated in the Same Area
8.4.0.6  S3C000 to S3C047: CUBE SOFT LIMIT
   These parameters specify auxiliary functions of S2C001 parameter. For details, see chapter 8.4.0.2 “S2C001: CUBE SOFT LIMIT CHECK”.

8.4.0.7  S3C048 to S3C063: S-AXIS INTERFERENCE AREA
   These parameters specify auxiliary functions of S2C002 parameter. For details, see chapter 8.4.0.3 “S2C002: S-AXIS INTERFERENCE CHECK”.

8.4.0.8  S3C064 to S3C1087: CUBIC INTERFERENCE AREA
   These parameters specify auxiliary functions of S2C003 to S2C066 parameters. For details, see chapter 8.4.0.4 “S2C003 to S2C066: CUBE/AXIS INTERFERENCE CHECK”.

8.4.0.9  S3C1089 to S3C1096: ROBOT INTERFERENCE AREA
   These parameters specify auxiliary functions of S2C236 to S2C263 parameters. For details, see chapter 8.4.0.6 “S3C000 to S3C047: CUBE SOFT LIMIT”.

8.4.0.10 S3C1097: A SIDE LENGTH OF WORK-HOME-POSITION CUBE
   Units: 1μm
   This parameter specifies a side length of the cube for the work home position.
8.5 Parameters according to Status I/O

These parameters set the parity check or I/O setting for user input/output signals.

8.5.0.1 S2C235: USER OUTPUT RELAY WHEN CONTROL POWER IS ON

This parameter specifies the state of the user output relays when the control power is turned ON. Since the power OFF state, including peripheral devices, cannot be completely reproduced, take note when restarting.

0 : Reset to the power OFF state
1 : Initialized (all user relays OFF)

8.5.0.2 S4C000 to S4C015, S4C1100 to S4C1115: PARITY OF USER INPUT GROUPS

These parameters specify whether to execute parity checks with parameters when instructions covering the input group (1G#) are executed. The instructions covering the input groups are as shown below.

- IF Sentence (JUMP, CALL, RET, PAUSE)
- Pattern Jump, Pattern Job Call
- DIN
- WAIT

A parity check is performed against the input group where a bit-ON (1) was done by this parameter.

S4C000 to S4C015 : IG#(1) to IG#(256)
S4C1100 to S4C1115 : IG#(257) to IG#(512)

Parity bits are set as the highest level bits of each input group and are written in even parity. If an error is detected during parity check, an alarm occurs and the manipulator stops. Remains unchanged if no parity check is specified.
8.5.0.3 S4C016 to S4C031, S4C1116 to S4C1131: PARITY OF USER OUTPUT GROUPS

These parameters specify whether the output group instruction is executed with parity check (even parity).

A parity check is performed against the output group where a bit-ON (1) was done by this parameter.

S4C016 to S4C031 : OG#(1) to OG#(256)
S4C1116 to S4C1131 : OG#(257) to OG#(512)

Parity bits are set as the highest level bits of each output group. For example, if OG#01 is specified with parity and DOUT OG# (1) 2 is executed, the result will be 00000010 if 2 is binary converted. Since there will be only one bit (odd) ON at this time, the parity bit (highest level bit) will be set to ON and 10000010 (130) will be output to OG# (1).

As in the case of a variable such as DOUT OG# (1) B003 parity bits are added to the contents of the variable data. However, if the contents of the variable exceed 127, as in the case of DOUT OG# (1) 128, an alarm will occur. Remains unchanged if no parity check is specified.
8.5.0.4 S4C032 to S4C047, S4C1132 to S4C1147: DATA OF USER INPUT GROUPS

These parameters specify whether to handle the input group data as binary data or as BCD data when an instruction for the input group (1G#) is executed. The instructions covering the input groups are as shown below.

- IF Sentence (JUMP, CALL, RET, PAUSE)
- Pattern Jump, Pattern Job Call
- DIN
- WAIT

The input group where a bit-ON (1) was done by this parameter is treated as BCD data.

- S4C032 to S4C047: IG#(1) to IG#(256)
- S4C1100 to S4C1115: IG#(257) to IG#(512)
8.5.0.5 S4C048 to S4C063, S4C1148 to S4C1163: DATA OF USER OUTPUT GROUPS

These parameters specify whether the output group instruction is executed with binary data or BCD data.

The output group where a bit-ON (1) was done by this parameter is treated as BCD data.

S4C048 to S4C063 : OG#(1) to OG#(256)
S4C1148 to S4C1163 : OG#(257) to OG#(512)

---

Differences Between Binary Data and BCD Data

For the input group and output group, the result will depend on whether the binary or BCD formula is used.

**Example** When the input function is [01010101]

<table>
<thead>
<tr>
<th>State</th>
<th>Binary Case</th>
<th>BCD Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 (2^0)</td>
<td>1 (2^0)</td>
</tr>
<tr>
<td>0</td>
<td>2 (2^1)</td>
<td>2 (2^1)</td>
</tr>
<tr>
<td>1</td>
<td>4 (2^2)</td>
<td>4 (2^2)</td>
</tr>
<tr>
<td>0</td>
<td>8 (2^3)</td>
<td>8 (2^3)</td>
</tr>
<tr>
<td>1</td>
<td>16 (2^4)</td>
<td>16 (2^4)</td>
</tr>
<tr>
<td>0</td>
<td>32 (2^5)</td>
<td>32 (2^5)</td>
</tr>
<tr>
<td>1</td>
<td>64 (2^6)</td>
<td>64 (2^6)</td>
</tr>
<tr>
<td>0</td>
<td>128 (2^7)</td>
<td>128 (2^7)</td>
</tr>
<tr>
<td></td>
<td><strong>86</strong></td>
<td><strong>85</strong></td>
</tr>
</tbody>
</table>

However, in the case of BCD data, because the upper bound value is 99, it is not possible to use any value which exceeds nine in the one or ten digit place.
8.5.0.6 S4C064 to S4C079, S4C1164 to S4C1179: USER OUTPUT GROUP TO BE INITIALIZED AT SWITCHING MODE

Set the user output group with bit to be initialized at switching mode.

Use these parameters when using universal output signals as work instructions for peripheral devices.

The signal of the output group where the bit-on (1) is done by this parameter will be turned OFF at mode switching.

- S4C064 to S4C079 : OG#(1) to OG#(256)
- S4C1164 to S4C1179 : OG#(257) to OG#(512)

8.5.0.7 S4C240: USER OUTPUT NO. WHEN MANIPULATOR DROP ALLOWABLE RANGE ERROR OCCURS

This parameter specifies the user output number to output the manipulator drop allowable range error alarm occurrence externally.

When this function is not used, set "0".
8.6 Parameters according to Coordinated or Synchronized Operation

These parameters make the settings for coordinated or synchronized operations between manipulators or between manipulators and stations.

8.6.0.1 S2C212: +MOV or +SMOV INSTRUCTION SPEED INPUT

This parameter specifies whether the speed inputting for move instructions of the master robot in a coordinated job is permitted or not.

**Example**

0: Not Provided

<table>
<thead>
<tr>
<th>Instruction</th>
<th>V=100</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMOVL</td>
<td></td>
</tr>
<tr>
<td>+MOVL</td>
<td></td>
</tr>
</tbody>
</table>

← Master side
Speed specification not provided

**Example**

1: Provided

<table>
<thead>
<tr>
<th>Instruction</th>
<th>V=100</th>
</tr>
</thead>
<tbody>
<tr>
<td>SMOVL</td>
<td></td>
</tr>
<tr>
<td>+MOVL</td>
<td></td>
</tr>
</tbody>
</table>

← Master side
Speed specification provided

8.6.0.2 S2C213: +MOV INSTRUCTION INTERPOLATION INPUT

This parameter specifies which interpolation is permitted for move instructions for the master robot in a coordinated job. More than one instruction can be specified.

<table>
<thead>
<tr>
<th>d7</th>
<th>d0</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

+ MOVJ : 1(VALID)
+ MOVL : 2(VALID)
+ MOVC : 4(VALID)
+ MOVS : 8(VALID)
8.6 Parameters according to Coordinated or Synchronized Operation

8.6.0.3 S2C231: OPERATION METHOD AT FWD/BWD OPERATION OR TEST RUN BY INDEPENDENT CONTROL

This parameter specifies the operation method at FWD/BWD operation or test run by independent control.

0 : The job of the task that is currently displayed operates.
1 : Jobs of all the tasks operate.

0: One of the task jobs that are currently displayed operates.  1: All task jobs operate.

8.6.0.4 S2C232: JOB AT CALLING MASTER OF SUBTASK BY INDEPENDENT CONTROL

This parameter specifies the job which is called up when the master of the subtask is called up by independent control.

0 : Master job
1 : Root job

Master Job: Job registered in the master control window
Root Job: Job activated by PSTART instruction

8.6.0.5 S2C264: STATION AXIS CURRENT VALUE DISPLAY FUNCTION

This parameter specifies whether the function to display the current value of the station axis in the following units is valid/invalid.

0 : Invalid
1 : Valid

Rotary axis: Angle (deg)
Servo track: Distance (mm)

Regarding whether to specify the rotary axis or the servo track, refer to chapter 8.6.0.6 “S2C265 to S2C288: STATION AXIS DISPLAYED UNIT”.

---

8-47
8.6 Parameters according to Coordinated or Synchronized Operation

8.6.0.6 S2C265 to S2C288: STATION AXIS DISPLAYED UNIT

This parameter specifies the station axis displayed unit (bit specification).

0 : Display angle (deg)
1 : Display in distance (mm)

Setting Method

Set a numerical value (decimal) where the bit of the axis to be displayed in the units of distance becomes 1.

<Example> When 1st and 3rd axes of station 1 are displayed in the units of distance:

Set 1 to axis displayed in distance.

4 + 1 = 5

Therefore, set parameter S2C265 of station 1 to 5.

8.6.0.7 S2C420: POSTURE CONTROL OF SYNCHRONIZED MANIPULATOR (When Twin Synchronous Function Used)

This parameter specifies the posture control method for synchronized manipulator performing compensation during playback by using the twin synchronous function.

0 : Change posture according to station movement
1 : Fixed in relation to the ground

0: Change posture according to station movement
1: Fixed in relation to the ground
8.6.0.8 S2C421: POSTURE CONTROL OF MANIPULATOR IN MULTI-JOB (When Twin Synchronous Function Used)

This parameter specifies the posture control method for manipulator executing compensation at the linking side when job linking is performed during FWD/BWD operation by the twin synchronous function.

0  : Change posture according to station movement
1  : Fixed in relation to the ground

8.6.0.9 S2C687: OPERATION OF JOB WITHOUT CONTROL GROUP SPECIFICATION

When the servo power supply is individually turned OFF where jobs in multiple number of tasks are operated using the independent control function, the job execution of the control group whose servo power supply is turned OFF is interrupted. The jobs of other control groups continue their execution.

For the jobs without control group specification such as master job, the conditions for execution can be set by the parameter.

0  : Execution possible only when servo power supply to all the axes have been turned ON.
1  : Execution possible when servo power supply to any axis is turned ON.

8.6.0.10 S2C688: EXECUTION OF "BWD" OPERATION

This parameter prohibits step-back operation of a job without a step.

```
d7   d0
```

"BWD" operation for a job without a group axis. 0: Enabled 1: Disabled

"BWD" operation for concurrent job. 0: Enabled 1: Disabled
8.6.0.11 S3C1101: MAXIMUM DEVIATION ANGLE OF CURRENT STATION POSITION (When Twin Synchronous Function Used)

Used when the twin synchronous function is used. This parameter specifies the maximum deviation between the teaching position and the current station position.

0 : No deviation check
Other than 0 : Deviation angle (units: 0.1°)

In the above figure on the left, the follower R2 executes the job of subtask 2 in synchronization with the motion of the station axis which is moved by the R1 job. In this procedure, the job of subtask 2 controls only the R2 robot axis.

If the teaching position of the station in the subtask 2 differs from the station current position (controlled by the subtask 1 job), the difference is automatically offset so that R2 keeps the taught position in relation to the station.

Difference between the taught and the station current positions is always monitored. If the difference exceeds a set value of the parameter, the message “PULSE LIMIT (TWIN COORDINATED)” appears.
8.7 Parameters for Other Functions or Applications

These parameters make the settings for other functions or applications.

8.7.0.1 S1CxG049 to S1CxG051: SMALL CIRCLE CUTTING

These parameters prescribe cutting operation at small circle cutting.

- **S1CxG049** (Minimum diameter): Set the minimum diameter of a figure in the units of μm that can be processed by small-circle cutting machine.
- **S1CxG050** (Maximum diameter): Set the maximum diameter of a figure in the units of μm that can be processed by small-circle cutting machine.
- **S1CxG051** (Maximum speed): Set the maximum cutting speed at operation by CUT instruction in the units of 0.1mm/s.

8.7.0.2 S1CxG052 to S1CxG053: SMALL CIRCLE CUTTING DIRECTION LIMIT VALUE

These parameters set the cutting direction limits at small circle cutting.

- **S1CxG052** (+ direction): Set the limit value in the positive direction of cutting angle DIR set by CUT instruction, in the units of 0.01°.
- **S1CxG053** (- direction): Set the limit value in the negative direction of cutting angle DIR set by CUT instruction, in the units of 0.01°.

8.7.0.3 S1CxG054 to S1CxG055: SMALL CIRCLE CUTTING OVERLAP VALUE

These parameters set the overlapped value at small circle cutting.

- **S1CxG054** (Operation radius): Set the operation radius at inner rotation in the units of 1 μm after overlapping by CUT instruction.
- **S1CxG055** (Rotation angle): Set the rotation angle at inner rotation in the units of 0.1° after overlapping by CUT instruction.

8.7.0.4 S1CxG063, S1CxG064: PATTERN CUTTING DIMENSION

These parameters set the minimum diameter (S1CxG063) and the maximum diameter (S1CxG064) for the pattern cutting in units of μm.

8.7.0.5 S1CxG065: MIRROR SHIFT SIGN INVERSION

This parameter sets which axis to be shifted (mirror-shift: invert the sign).

1st axis (0: Not invert, 1: Invert)

7th axis
8 Parameter
8.7 Parameters for Other Functions or Applications

8.7.0.6 S2C430: RELATIVE JOB OPERATION METHOD

This parameter specifies how to operate a relative job. A method to convert a relative job into a standard job (pulse), and a conversion method to calculate the aimed position (pulse position) when a relative job is operated can be specified.

0 : Previous step with priority (B-axis moving distance minimized)
1 : Form with priority
2 : Previous step with priority (R-axis moving distance minimized)
4 : Previous step with priority (R-axis moving distance minimized, and pulse limit avoided)

8.7.0.7 S2C1135: PROHIBIT WELDING SECTION SPEED OVERRIDE

This parameter prohibits the speed override within the welding section. While the manipulator is in the welding section, it moves at the same speed as in the situation where the speed override is not specified.

0 : Invalid
1 : Valid

```
0000 NOP
0001 MOV L P000 V=50
0002 ARCON ASF#(1)
0003 MOV L P001 V=30
0004 MOV L P002 V=30
0005 MOV L P003 V=30
0006 ARCOF
0007 MOV L P004 V=50
0008 END
```

Speed override is prohibited

8.7.0.8 S2C1137: DISPLAY WELDING CONDITION FILE COMMENT ON THE JOB WINDOW FUNCTION

This parameter specifies a comment to the welding start condition file or the welding end condition file, and then displays the comment on the job window when teaching the file by ARCON, ARCOF or ARCSET instruction.

0 : Invalid
1 : Valid

```
0000 NOP
0001 MOV L P000 V=50
0002 ARCON ASF#(1) //Current200A Voltage10V
0003 MOV L P001 V=30
0004 MOV L P002 V=30
0005 MOV L P003 V=30
0006 ARCOF
0007 MOV L P004 V=50
0008 END
```
8.7.0.9 S3C1111 to S3C1190: ANALOG OUTPUT FILTER CONSTANT

(When analog output corresponding to speed function is used)
By setting a constant to filter, a filter processing can be performed for the output analog signal.

8.7.0.10 S3C1191: CUT WIDTH CORRECTION VALUE

(When form cutting function is used)
This parameter specifies the path correction value for pattern cutting operation. A value 1/2 of the cut width is set in units of μm.
8.8 Hardware Control Parameters

These parameters make the hardware settings for fan alarm or relay operation, etc.

8.8.0.1 S2C646: ANTICIPATOR FUNCTION

This parameter specifies anticipation output.

0 : Invalid
1 : Valid

The anticipator function is a function to quicken or slow the ON/OFF timing of four universal output signals and two user output groups. Using this function, signal output can be carried out before or after the step is reached. As a result, timing deviation due to delayed motion of peripheral devices and robot motion can be adjusted.

Setting the time to a negative value (-) advances the signal output.

This setting is effective when adjusting timing deviation due to delayed motion of peripheral devices.

Setting the time to a positive value (+) delays the signal output.

This setting is effective when adjusting timing deviation due to delayed robot motion.

<Advanced Signal Output>

Signal output is carried out before the step is reached.

<Delayed Signal Output>

Signal output is carried out after the step is reached.
8.8 Hardware Control Parameters

8.8.0.2 S4C327 to S4C390: SETTING OF OPERATING RELAY NO.

Up to 64 output signals can be turned ON/OFF with the programming pendant. The object relay No. is set in these parameters. Although it is possible to set optional values for output No. 1 to 4096 in the parameters, the following must be taken into consideration.

• Avoid setting duplicate numbers.
• The signal turned ON or OFF with the programming pendant is operated again or remains unchanged until the instruction is executed.

8.8.0.3 S4C391 to S4C454: OPERATING METHOD OF RELAYS

These parameters specify the operating method of output signals by the programming pendant. The operating method can be specified for each output signal.

<table>
<thead>
<tr>
<th>Parameter Setting Value</th>
<th>Operation of Output Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>[ON][OFF]</td>
</tr>
<tr>
<td>1</td>
<td>[ON] ON/OFF with the key ON while the key is pressed, OFF if the key is not pressed</td>
</tr>
</tbody>
</table>

0 : No detection
1 : Detected with message display
2 : Detected with message and alarm display

8.8.0.4 S2C786 to S2C788: COOLING FAN ALARM DETECTION

This parameter specifies a detection display for cooling fan 1 to 3 with alarm sensor, connected to power ON unit.

0 : No detection
1 : Detected with message display
2 : Detected with message and alarm display

8.8.0.5 S2C1170: COOLING FAN ALARM DETECTION

This parameter specifies a detection display for cooling fan 4 to 5 with alarm sensor, connected to power ON unit.

0 : No detection
1 : Detected with message display
2 : Detected with message and alarm display
8 Parameter
8.8 Hardware Control Parameters

8.8.0.6 S2C789 to S2C792: COOLING FAN ALARM 1 OPERATION

8.8.0.7 S2C793 to S2C796: COOLING FAN ALARM 2 OPERATION

8.8.0.8 S2C797 to S2C800: COOLING FAN ALARM 3 OPERATION

These parameters specify the operation of cooling fan 1 to 3 with alarm sensor, connected to power ON unit.

Each bit specifies the power ON unit to which the detecting sensor is connected.

8.8.0.9 S2C1174: COOLING FAN ALARM 4 OPERATION

These parameters specify the operation of the cooling fan 4 with an alarm sensor, connected to the power supply contactor unit.
8.8.0.10 S2C801 to S2C804: FAN ALARM 1 WELDER STATUS

8.8.0.11 S2C805 to S2C808: FAN ALARM 2 WELDER STATUS

8.8.0.12 S2C809 to S2C812: FAN ALARM 3 WELDER STATUS

These parameters specify the power status that detects a fan alarm.

- 0: Detect during control power ON
- 1: Detect during servo power ON

8.8.0.13 S2C1178: FAN ALARM 4 WELDER STATUS

This parameter specifies the power status that detects a fan alarm.

- 0: Detect during control power ON
- 1: Detect during servo power ON
8.9 Transmission Parameters

These parameters are used when the optional FC1, FC2, or data transmission function is used.

For details, refer to the optional manual "YRC1000 OPTIONS INSTRUCTIONS FOR DATA TRANSMISSION FUNCTION (HW1484044)."

8.10 Application Parameters

8.10.1 Arc Welding

8.10.1.1 AxP000: APPLICATION

This parameter specifies the application. Set "0" for arc welding.

8.10.1.2 AxP003: WELDING ASSIGNMENT OF WELDING START CONDITION FILE

This parameter specifies the beginning condition number in the welding start condition file to be assigned to the power source 2. Condition files of a lower number are automatically assigned to the power source 1. For a system with one power source, set "49" (maximum value).

8.10.1.3 AxP004: WELDING ASSIGNMENT OF WELDING END CONDITION FILES

This parameter specifies the beginning condition number in the welding END condition file to be assigned to the power source 2. Condition files of a lower number are automatically assigned to the power source 1. For a system with one power source, set "13" (maximum value).

8.10.1.4 AxP005: WELDING SPEED PRIORITY

This parameter specifies whether the welding speed is specified by the "ARCON" instruction, by the welding start condition file, or by the additional times of the "MOV" instruction.

8.10.1.5 AxP009: WORK CONTINUING

This parameter specifies whether to output an "ARCON" instruction to restart after the manipulator stopped while the "ARCON" instruction is being output.

8.10.1.6 AxP010: WELDING INSTRUCTION OUTPUT

This parameter specifies the beginning number (0 to 12) of the analog output channel to the power source. "0" indicates that no power source exists.
8.10 Application Parameters

8.10.1.7 AxP011, AxP012: MANUAL WIRE OPERATION SPEED
These parameters specify the manual wire operation speed as a percentage of the maximum instruction value. Instruction polarity is determined by the current instruction in the power source condition file. The setting range is from 0 to 100.

8.10.1.8 AxP013, AxP014: WELDING CONTROL TIME
These parameters specify the welding control time in units of minutes. The setting range is from 0 to 999.

8.10.1.9 AxP015 to AxP017: NUMBER OF WELDING CONTROL
These parameters specify the number of welding controls. The setting range is from 0 to 99.

8.10.1.10 AxP026 to AxP029: TOOL ON/OFF USER OUTPUT NO. (Jigless System)
These parameters specify the user output number for the tool open/close operation by specific keys.

8.10.2 Handling Application

8.10.2.1 AxP002, AxP004: f1 KEY FUNCTION
These parameters set the output signal to assign for f1 key.
0: Not specified
1 to 4: Specific outputs for HAND-1 to HAND4-1
5: User output (No. is specified by AxP004)

8.10.2.2 AxP003, AxP005: f2 KEY FUNCTION
These parameters set the output signal to assign for f2 key.
0: Not specified
1 to 4: Specific outputs for HAND-2 to HAND4-2
5: User output (No. is specified by AxP005)

8.10.3 Spot Welding

8.10.3.1 AxP003: MAXIMUM NUMBER OF CONNECTED WELDING POWER SOURCE
This parameter specify the maximum number of power sources to be used. The value is automatically set at start-up. No modification is needed.

8.10.3.2 AxP004: GUN FULL OPEN STROKE ON/OFF SIGNAL
This parameter specifies which stroke switching signal is output ON or OFF to make the gun fully-opened for each gun.
Bit specification (1 for 01) for 8 guns. The initial setting is “0”.
0 0 0 0 0 0 0 0
| | | | | | | |
8 7 6 5 4 3 2 1 Gun number
8.10 Application Parameters

8.10.3.3 AxP005: STROKE CHANGE ANSWER TIME LIMIT

When using the X2 gear mechanical stopper gun and switching gun stroke, this parameter sets the time from the stroke-switching-sequence start until the pressure instruction end.

The initial setting is “0”, with which the switching signal is output for the “stopper-type stroke switching time” set in the file, and then the gun pressure instruction is turned OFF.

8.10.3.4 AxP006: PARITY SPECIFICATION FOR WELDING CONDITIONS

When adding the parity signal to the welding condition signal with the power source connected to each welding gun, this parameter specifies odd or even parity.

Bit specification for 4 power sources. (0: odd number, 1: even number) The initial setting is “0”:

0 0 0 0 0 0 0 0

| | | |        Welding power source number
4 3 2 1

8.10.3.5 AxP007: ANTICIPATE TIME

When executing the GUNCL or SPOT instruction with NWAIT specified in the previous move instruction but the time is not specified by ATT in the GUNCL or SPOT instruction, this parameter specifies the anticipate condition (time). The initial setting is “0”, with which the each instruction is executed as soon as the taught position of the previous move instruction is reached, as normal operation.

8.10.3.6 AxP015: WELDING ERROR RESET OUTPUT TIME

This parameter sets the output time of the welding error reset signal to the Welder when the alarm reset signal is input.

If the setting is “0”, the welding error reset signal is not output to the power source even if the alarm reset signal is input.

8.10.3.7 AxP016, AxP017: TIP WEAR AMOUNT ALARM VALUE

These parameters set the tip wear amount alarm values (AxP016: movable side, AxP017: fixed side) at the wear detection.

8.10.4 General-Purpose Application

8.10.4.1 AxP009: WORK CONTINUE PROHIBIT

This parameter specifies whether to output TOOLON instruction or not at restarting when the work is stopped for some reasons during the output of TOOLON instruction.
### 9 Table of Basic Instructions

- <> indicates numerical or alphabetical data.
- If multiple items are shown in one section, select one of the items.

#### 9.1 Move Instructions

<table>
<thead>
<tr>
<th>Function</th>
<th>Moves to a taught point with joint interpolation type.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MOVJ</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Additional Item</strong></td>
<td>Position data, Base axis position data, Station axis position data</td>
</tr>
<tr>
<td><strong>VJ= &lt;play speed&gt;</strong></td>
<td>VJ: 0.01 to 100.00%</td>
</tr>
<tr>
<td><strong>PL=&lt;position level&gt;</strong></td>
<td>PL: 0 to 8</td>
</tr>
<tr>
<td><strong>NWAIT</strong></td>
<td>UNTIL statement</td>
</tr>
<tr>
<td><strong>ACC=(acceleration adjustment ratio)</strong></td>
<td>ACC: 20 to 100%</td>
</tr>
<tr>
<td><strong>DEC=(deceleration adjustment ratio)</strong></td>
<td>DEC: 20 to 100%</td>
</tr>
<tr>
<td><strong>Example</strong></td>
<td>MOVJ VJ=50.00 PL=2 NWAIT UNTIL IN#(16)=ON</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
<th>Moves to a taught point with linear interpolation type.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MOVL</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Additional Item</strong></td>
<td>Position data, Base axis position data, Station axis position data</td>
</tr>
<tr>
<td><strong>V= &lt;play speed&gt;, VR=&lt;play speed of the posture&gt;, VE=&lt;play speed of external axis&gt; VMAX=&lt;VMAX speed&gt;</strong></td>
<td>V: 0.1 to 1500.0 mm/s 1 to 9000.0 cm/min VR: 0.1 to 360.0 deg/s VE: 0.01 to 100.00% VMAX: 50 to 100%</td>
</tr>
<tr>
<td><strong>PL=&lt;position level&gt;</strong></td>
<td>PL: 0 to 8</td>
</tr>
<tr>
<td><strong>CR=(corner radius)</strong></td>
<td>CR: 0.1 to 6553.5mm</td>
</tr>
<tr>
<td><strong>NWAIT</strong></td>
<td>UNTIL statement</td>
</tr>
<tr>
<td><strong>ACC=(acceleration adjustment ratio)</strong></td>
<td>ACC: 20 to 100%</td>
</tr>
<tr>
<td><strong>DEC=(deceleration adjustment ratio)</strong></td>
<td>DEC: 20 to 100%</td>
</tr>
<tr>
<td><strong>Example</strong></td>
<td>MOVL V=138 PL=0 NWAIT UNTIL IN#(16)=ON</td>
</tr>
</tbody>
</table>
### Table of Basic Instructions

#### 9.1 Move Instructions

**MOVC**

- **Function**: Moves to a taught point with circular interpolation type.
- **Additional Item**
  - Position data, Base axis position data, Station axis position data
  - V=<play speed>, VR=<play speed of the posture>, VE=<play speed of external axis>
- **Example**
  

**MOVS**

- **Function**: Moves to a taught point with spline interpolation type.
- **Additional Item**
  - Position data, Base axis position data, Station axis position data
  - V=<play speed>, VR=<play speed of the posture>, VE=<play speed of external axis>
- **Example**

**IMOV**

- **Function**: Moves the specified increment from the current position with linear interpolation type.
- **Additional Item**
  - P<variable number>, BP<variable number>, EX<variable number>
  - V=<play speed>, VR=<play speed of the posture>, VE=<play speed of external axis>
  - BF,RF,TF,UF# (<user coordinate number>)
- **Example**

---

**Example**

**MOVC**

- MOVC V=138 PL=0 NWAIT

**MOVS**

- MOVS V=120 PL=0

**IMOV**

- IMOV P000 V=138 PL=1 RF
### Table of Basic Instructions

#### 9.1 Move Instructions

<table>
<thead>
<tr>
<th>Function</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>REFP</td>
<td>Defines a reference point (e.g. wall point for weaving).</td>
</tr>
</tbody>
</table>

**Additional Item**
- `<reference point number>`
- Position data, Base axis position data, Station axis position data

**Example**
- REFP 1 P000

<table>
<thead>
<tr>
<th>Function</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPEED</td>
<td>Sets play speed.</td>
</tr>
</tbody>
</table>

**Additional Item**
- `VJ=<joint speed>, V=<TCP speed>, VR=<play speed of the posture>, VE=<play speed of external axis>`

**Example**
- SPEED VJ=50.00

---

**CAUTION**

If the IMOV instruction is stopped during execution by one of the following operations and then restarted, the manipulator moves by linear interpolation from the stopped position by adding the set incremental value to the stopped position, thus the manipulator's travel distance becomes larger than the set incremental value. Thus, in a case where modification in the manipulator's travel distance by a stop causes a problem, do not execute the IMOV instruction.

- External servo OFF signal 2 (#40066)
- Turning OFF the servo power due to alarm occurrence
- Enable signal
- Switching the mode
- Enable Switch
### 9.2 I/O Instructions

<table>
<thead>
<tr>
<th>Function</th>
<th>DOUT</th>
<th>T<strong>Turns the external output signals ON and OFF.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional Item</strong></td>
<td>OT# (&lt;output number&gt;), OGH# (&lt;output group number&gt;), OGH# (&lt;output group number&gt;), OGU# (&lt;user group output number&gt;)</td>
<td></td>
</tr>
<tr>
<td>Number of addressed output signals:</td>
<td>OT#(xx)=1; OGH#(xx)=4 (per group); OG#(xx)=8 (per group); OGU#(xx)=32 max. (per group)</td>
<td></td>
</tr>
<tr>
<td>OGH#(xx) is not subject to parity check; only the binary specification is allowed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
<th>PULSE</th>
<th><strong>Outputs a pulse signal as an external output signal.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional Item</strong></td>
<td>OT# (&lt;output number&gt;), OGH# (&lt;output group number&gt;), OG# (&lt;output group number&gt;), OGU# (&lt;user group output number&gt;)</td>
<td></td>
</tr>
<tr>
<td>Number of addressed output signals:</td>
<td>OT#(xx)=1; OGH#(xx)=4 (per group); OG#(xx)=8 (per group); OGU#(xx)=32 max. (per group)</td>
<td></td>
</tr>
<tr>
<td>T= &lt;time (seconds)&gt;</td>
<td>0.01 to 665.35 s 0.30 s unless otherwise specified</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Function</th>
<th>DIN</th>
<th><strong>Sets input signals in variables.</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Additional Item</strong></td>
<td>B&lt;variable number&gt;</td>
<td></td>
</tr>
<tr>
<td>Number of addressed input signals:</td>
<td>IN#(xx)=1; IGH#(xx)=4 (per group); IG#(xx)=8 (per group); IGU#(xx)=32 max. (per group)</td>
<td></td>
</tr>
<tr>
<td>Number of addressed output signals:</td>
<td>OT#(xx)=1; OGH#(xx)=4 (per group); OG#(xx)=8 (per group); OGU#(xx)=32 max. (per group)</td>
<td></td>
</tr>
<tr>
<td>IGH#(xx) and OGH#(xx) are not subject to parity check; only the binary specification is allowed.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Example**

- **DOUT OT#(12) ON**
- **PULSE OT# (10) T=0.60**
- **DIN B016 IN#(16)**
- **DIN B002 IG#(2)**
### Table of Basic Instructions

#### 9.2 I/O Instructions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
</table>
| **WAIT** | Waits until the external input signal status matches the specified status. | WAIT IN#(12)=ON T=10.00  
WAIT IN#(12)=B002 |
| **AOUT** | Outputs the specified voltage to the general-purpose analog output port. | AOUT AO#(2) 12.7 |
| **ARATION** | Starts the analog output corresponding to the speed. | ARATION AO#(1) BV=10.00 V=200.0 OFV=2.00 |
| **ARATIOF** | Ends the analog output corresponding to the speed. | ARATIOF AO#(1) |

#### Additional Item

- **IN# (<input number>)**
- **IGH# (<input group number>)**
- **IG# (<input group number>)**
- **IGU# (<user group input number>)**
- **OT# (<output number>)**
- **OGH# (<output group number>)**
- **OG# (<output group number>)**
- **OGU# (<user group output number>)**
- **SIN# (<system input number>)**
- **SOUT# (<system output number>)**

- **B<variable number>**

**Number of addressed input signals:**

- IN#(xx)=1; IGH#(xx)=4 (per group);
- IG#(xx)=8 (per group);
- IGU#(xx)=32 max. (per group)

**Number of addressed output signals:**

- OT#(xx)=1; OGH#(xx)=4 (per group);
- OG#(xx)=8 (per group);
- OGU#(xx)=32 max. (per group)

**T=<time (seconds)></time>**

0.01 to 655.35 s
## 9.3 Control Instructions

### JUMP

**Function:** Jumps to the specified label or job.

**Additional Item:**
- `<label character string>`, JOB:<job name>,
- LABEL:<label elements>,
- IG# (<input group number>), B<variable number>, I<variable number>, D<variable number>, S<variable number>, UF# (user coordinates number)

**Example:** JUMP JOB: TEST1 IF IN#(14)=OFF

### CALL

**Function:** Calls the specified job.

**Additional Item:**
- JOB:<job name>, IG# (<input group number>), B<variable number>, I<variable number>, D<variable number>, S<variable number>, ARGF<argument 1>, ARGF<argument 2>, ARGF<argument 3>, ARGF<argument 4>, ARGF<argument 5>, ARGF<argument 6>, ARGF<argument 7>, ARGF<argument 8>, UF# (user coordinates number)

**Example:** CALL JOB: TEST1 IF IN#(24)=ON CALL IG#(2) (The job is called by the patterns of input signal. In this example, Job 0 cannot be called.)

### RET

**Function:** Returns to the call source job.

**Additional Item:** B<variable number>, I<variable number>, D<variable number>, R<variable number>, S<variable number>, Constant, String

**Example:** RET IF IN#(12)=OFF

### END

**Function:** Declares the end of a job.

**Example:** END
### Table of Basic Instructions

#### 9.3 Control Instructions

<table>
<thead>
<tr>
<th>Instruction</th>
<th>Function</th>
<th>Additional Item</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NOP</strong></td>
<td>No operation.</td>
<td></td>
<td>NOP</td>
</tr>
<tr>
<td><strong>TIMER</strong></td>
<td>Stops for the specified time.</td>
<td>( T = \text{&lt;time (seconds)&gt;} ) 0.01 to 655.35 s</td>
<td>TIMER ( T = 12.50 )</td>
</tr>
<tr>
<td><strong>IF</strong></td>
<td>Evaluates the specified condition and makes a judgment accordingly. Described after an instruction that specifies a certain action.</td>
<td>(&lt;\text{Item1}&gt; = , &lt;&gt;, &lt;&gt;, &lt;&gt;, &lt;,&lt;&gt;&lt;\text{Item2}&gt;)</td>
<td>JUMP *12 IF IN#(12)=OFF</td>
</tr>
<tr>
<td><strong>UNTIL</strong></td>
<td>Monitors the specified input signal during an action and stops the action when the specified signal status is observed. Described after an instruction that specifies a certain action.</td>
<td>( \text{IN# (&lt;input number&gt;)} \text{&lt;status&gt;} )</td>
<td>MOVL V=300 UNTIL IN#(10)=ON</td>
</tr>
<tr>
<td><strong>PAUSE</strong></td>
<td>Instructs a pause.</td>
<td>IF statement</td>
<td>PAUSE IF IN#(12)=OFF</td>
</tr>
<tr>
<td><strong>'</strong></td>
<td>Displays a comment.</td>
<td>(&lt;\text{comment}&gt;) 32 characters or less</td>
<td>'Draws 100mm size square.</td>
</tr>
<tr>
<td><strong>CWAIT</strong></td>
<td>Waits for execution of the instruction on the next line. Used with the NWAIT tag which is an additional item of a move instruction.</td>
<td></td>
<td>MOVL V=100 NWAIT DOUT OT#(1) ON CWAIT DOUT OT#(1) OFF MOVL V=100</td>
</tr>
<tr>
<td><strong>ADVINIT</strong></td>
<td>Initializes the pre-reading instruction processing. Used to adjust the access timing for variable data.</td>
<td></td>
<td>ADVINIT</td>
</tr>
<tr>
<td><strong>ADVSTOP</strong></td>
<td>Stops the pre-reading instruction processing. Used to adjust the access timing for variable data.</td>
<td></td>
<td>ADVINIT</td>
</tr>
</tbody>
</table>
### 9.4 Shift Instructions

<table>
<thead>
<tr>
<th>Function</th>
<th>Function</th>
<th>Additional Item</th>
<th>Additional Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>SFTON</td>
<td>Starts a shift operation.</td>
<td>P&lt;variable number&gt;, BP&lt;variable number&gt;, EX&lt;variable number&gt;, BF, RF, TF, UF#(&lt;user coordinate number&gt;)</td>
<td>BF: base coordinates, RF: robot coordinates, TF: tool coordinates, UF: user coordinates</td>
</tr>
<tr>
<td>Example</td>
<td>SFTON P001 UF#(1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SFTOF</td>
<td>Stops a shift operation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Example</td>
<td>SFTOF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MSHIFT</td>
<td>Obtains the shift value in the specified coordinate system from Data 2 and 3, and stores the obtained element values in Data 1.</td>
<td>Data1 PX&lt;variable number&gt;</td>
<td>Data2 PX&lt;variable number&gt;, Data3 PX&lt;variable number&gt;</td>
</tr>
<tr>
<td>Example</td>
<td>MSHIFT PX000 RF PX001 PX002</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 9.5 Operating Instructions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADD</td>
<td>Adds Data1 and Data2, and stores the result in Data1. Format: ADD&lt;Data1&gt;&lt;Data2&gt;</td>
</tr>
<tr>
<td>SUB</td>
<td>Subtracts Data2 from Data1, and stores the result in Data1. Format: SUB&lt;Data1&gt;&lt;Data2&gt;</td>
</tr>
</tbody>
</table>

#### ADD

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Data1</th>
<th>Data2</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;, R&lt;variable number&gt;, P&lt;variable number&gt;, BP&lt;variable number&gt;, EX&lt;variable number&gt;</td>
<td>Constant, B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;, R&lt;variable number&gt;, P&lt;variable number&gt;, BP&lt;variable number&gt;, EX&lt;variable number&gt;</td>
<td>ADD I012 I013</td>
</tr>
</tbody>
</table>

#### SUB

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Data1</th>
<th>Data2</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;, R&lt;variable number&gt;, P&lt;variable number&gt;, BP&lt;variable number&gt;, EX&lt;variable number&gt;</td>
<td>Constant, B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;, R&lt;variable number&gt;, P&lt;variable number&gt;, BP&lt;variable number&gt;, EX&lt;variable number&gt;</td>
<td>SUB I012 I013</td>
</tr>
</tbody>
</table>
### MUL Function
Multiplies Data1 by Data2, and stores the result in Data1.

**Format:** MUL<Data1><Data2>

Data1 can be an element in a position variable. If omitted, all elements are specified.


<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Data1</th>
<th>Data2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;, R&lt;variable number&gt;, P&lt;variable number&gt;&lt;element number&gt;, BP&lt;variable number&gt;&lt;element number&gt;, EX&lt;variable number&gt;&lt;element number&gt;</td>
<td>Constant, B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;, R&lt;variable number&gt;</td>
</tr>
</tbody>
</table>

**Example**

MUL I012 I013
MUL P000 (3) 2 (Multiply the Z-axis data by 2.)

### DIV Function
Divides Data1 by Data2, and stores the result in Data1.

**Format:** DIV<Data1><Data2>

Data1 can be an element in a position variable. If omitted, all elements are specified.


<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Data1</th>
<th>Data2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;, R&lt;variable number&gt;, P&lt;variable number&gt;&lt;element number&gt;, BP&lt;variable number&gt;&lt;element number&gt;, EX&lt;variable number&gt;&lt;element number&gt;</td>
<td>Constant, B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;, R&lt;variable number&gt;</td>
</tr>
</tbody>
</table>

**Example**

DIV I012 I013
DIV P000 (3) 2 (Divide the Z-axis data by 2.)

### INC Function
Increments the value of the specified variable by 1.

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Data1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;</td>
</tr>
</tbody>
</table>

**Example**

INC I043
### Table of Basic Instructions

#### 9.5 Operating Instructions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Additional Item</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEC</td>
<td>Decrements the value of the specified variable by 1.</td>
<td>B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;</td>
<td>DEC I043</td>
</tr>
<tr>
<td>AND</td>
<td>Obtains the AND of Data1 and Data2, and stores the result in Data1.</td>
<td>Data1 B&lt;variable number&gt;, Data2 B&lt;variable number&gt;, Constant</td>
<td>AND B012 B020</td>
</tr>
<tr>
<td>OR</td>
<td>Obtains the OR of Data1 and Data2, and stores the result in Data1.</td>
<td>Data1 B&lt;variable number&gt;, Data2 B&lt;variable number&gt;, Constant</td>
<td>OR B012 B020</td>
</tr>
<tr>
<td>NOT</td>
<td>Obtains the NOT of Data2, and stores the result in Data1.</td>
<td>Data1 B&lt;variable number&gt;, Data2 B&lt;variable number&gt;, Constant</td>
<td>NOT B012 B020</td>
</tr>
<tr>
<td>XOR</td>
<td>Obtains the exclusive OR of Data1 and Data2, and stores the result in Data1.</td>
<td>Data1 B&lt;variable number&gt;, Data2 B&lt;variable number&gt;, Constant</td>
<td>XOR B012 B020</td>
</tr>
<tr>
<td>SET</td>
<td>Sets Data2 to Data1.</td>
<td>Data1 B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;, R&lt;variable number&gt;, P&lt;variable number&gt;, S&lt;variable number&gt;, BP&lt;variable number&gt;, EX&lt;variable number&gt;</td>
<td>SET I012 I020</td>
</tr>
</tbody>
</table>

Data1 must always be a variable.
### Table of Basic Instructions

#### 9.5 Operating Instructions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Data 1</th>
<th>Data 2</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SETE</strong></td>
<td>Sets data to an element in a position variable.</td>
<td>( P_{\text{variable number}}(\text{&lt;element number&gt;}) ), ( BP_{\text{variable number}}(\text{&lt;element number&gt;}) ), ( EX_{\text{variable number}}(\text{&lt;element number&gt;}) )</td>
<td>( D_{\text{variable number}} ), double-precision integer type constant</td>
<td>SETE P012 (3) D005</td>
</tr>
<tr>
<td><strong>GETE</strong></td>
<td>Extracts an element in a position variable.</td>
<td>( P_{\text{variable number}}(\text{&lt;element number&gt;}) ), ( BP_{\text{variable number}}(\text{&lt;element number&gt;}) ), ( EX_{\text{variable number}}(\text{&lt;element number&gt;}) )</td>
<td></td>
<td>GETE D006 P012 (4)</td>
</tr>
</tbody>
</table>
| **GETS** | Sets a system variable to the specified variable. | \( B_{\text{variable number}} \), \( I_{\text{variable number}} \), \( D_{\text{variable number}} \), \( R_{\text{variable number}} \), \( PX_{\text{variable number}} \), \( S_{\text{variable number}} \), \( $B_{\text{variable number}} \), \( $I_{\text{variable number}} \), \( $D_{\text{variable number}} \), \( $R_{\text{variable number}} \), \( $PX_{\text{variable number}} \), \( $RV \) | | GETS B000 $B000  
GETS I001 $I[1]  
GETS PX003 $PX001 |
### Table of Basic Instructions

#### 9.5 Operating Instructions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Format</th>
<th>Additional Item</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CNVRT</strong></td>
<td>Converts the position variable (Data2) into a position variable of the specified coordinate system, and stores the converted variable in Data1.</td>
<td>CNVRT&lt;Data1&gt;&lt;Data2&gt; coordinate tool</td>
<td>Data1 PX&lt;variable number&gt;, Data2 PX&lt;variable number&gt;, BF, RF, TF, UF# (&lt;user coordinate number&gt;), MTF TL#(&lt;tool number&gt;)</td>
</tr>
<tr>
<td><strong>CLEAR</strong></td>
<td>Starting with the variable number in Data1, clears (sets to zero) as many variables as specified by a number in Data2.</td>
<td>CLEAR&lt;Data1&gt;&lt;Data2&gt;</td>
<td>Data1 B&lt;variable number&gt;, I&lt;variable number&gt;, D&lt;variable number&gt;, R&lt;variable number&gt;, $B&lt;variable number&gt;, $I&lt;variable number&gt;, $D&lt;variable number&gt;, $R&lt;variable number&gt;, Data2 &lt;number of variables&gt;, ALL, STACK ALL: Clears variables of the variable number in Data1 and of all the variable numbers that follow. STACK: Clears all variables in the job call stack.</td>
</tr>
<tr>
<td><strong>SIN</strong></td>
<td>Obtains the sine of Data2 (unit: deg.), and stores the result in Data1.</td>
<td>SIN&lt;Data1&gt;&lt;Data2&gt;</td>
<td>Data1 R&lt;variable number&gt;, Data2 &lt;constant&gt;, R&lt;variable number&gt;</td>
</tr>
<tr>
<td><strong>COS</strong></td>
<td>Obtains the cosine of Data2 (unit: deg.), and stores the result in Data1.</td>
<td>COS&lt;Data1&gt;&lt;Data2&gt;</td>
<td>Data1 R&lt;variable number&gt;, Data2 &lt;constant&gt;, R&lt;variable number&gt;</td>
</tr>
</tbody>
</table>

**Example**
- CNVRT PX000 PX001 BF
- CLEAR B000 ALL
- CLEAR STACK
- SIN R000 R001
- COS R000 R001
### Table of Basic Instructions

#### 9.5 Operating Instructions

<table>
<thead>
<tr>
<th>Function</th>
<th>Description</th>
<th>Format</th>
<th>Additional Item</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ATAN</strong></td>
<td>Obtains the arc tangent of Data2 (unit: deg.), and stores the result in Data1.</td>
<td>ATAN&lt;Data1&gt;&lt;Data2&gt;</td>
<td>Data1: R&lt;variable number&gt;</td>
<td>ATAN R000 R001 (Sets the arc tangent of R001 to R000.)</td>
</tr>
<tr>
<td><strong>SQRT</strong></td>
<td>Obtains the square root of Data2, and stores the result in Data1.</td>
<td>SQRT&lt;Data1&gt;&lt;Data2&gt;</td>
<td>Data1: R&lt;variable number&gt;</td>
<td>SQRT R000 R001 (Sets the square root of R001 to R000.)</td>
</tr>
<tr>
<td><strong>MFRAME</strong></td>
<td>Creates a user coordinate using the position data for the given three points as definition points. &lt;Data1&gt; indicates the definition point ORG position data, &lt;Data2&gt; the definition point XX position data, and &lt;Data3&gt; the definition point XY position data.</td>
<td>MFRAME &lt;user coordinate&gt; &lt;Data1&gt; &lt;Data2&gt; &lt;Data3&gt;</td>
<td>User coordinate number: 1 to 63</td>
<td>MFRAME UF#(1) PX000 PX001 PX002</td>
</tr>
<tr>
<td><strong>MULMAT</strong></td>
<td>Obtains the matrix product of Data2 and Data3, and stores the result in Data1.</td>
<td>MULMAT &lt;Data1&gt; &lt;Data2&gt; &lt;Data3&gt;</td>
<td>Data1: P&lt;variable number&gt;</td>
<td>MULMAT P000 P001 P002</td>
</tr>
<tr>
<td><strong>INVMAT</strong></td>
<td>Obtains the inverse matrix of Data2, and stores the result in Data1.</td>
<td>INVMAT &lt;Data1&gt; &lt;Data2&gt;</td>
<td>Data1: P&lt;variable number&gt;</td>
<td>INVMAT P000 P001</td>
</tr>
<tr>
<td><strong>SETFILE</strong></td>
<td>Changes the contents data of a condition file into the numeric data of Data1. The contents data of a condition file to be changed is specified by the element number.</td>
<td>SETFILE WEV#(&lt;condition file number&gt;)(&lt;element number&gt;)</td>
<td>Data1: Constant, D&lt;variable number&gt;</td>
<td>SETFILE WEV#(1)(1) D000</td>
</tr>
</tbody>
</table>
### GETFILE Function
Stores the contents data of a condition file in Data1. The contents data of a condition file to be obtained is specified by the element number.

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Contents of a condition file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data1</td>
<td>D &lt;variable number&gt;</td>
</tr>
<tr>
<td>Data2</td>
<td>WEV#(&lt;condition file number&gt;)(&lt;element number&gt;)</td>
</tr>
</tbody>
</table>

**Example**
GETFILE D000 WEV#(1)(1)

### GETPOS Function
Stores the position data of Data2 (step number) in Data1.

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Contents of a condition file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data1</td>
<td>PX &lt;variable number&gt;</td>
</tr>
<tr>
<td>Data2</td>
<td>STEP# (&lt;step number&gt;)</td>
</tr>
</tbody>
</table>

**Example**
GETPOS PX000 STEP#(1)

### VAL Function
Converts the numeric value of the character string (ASCII) of Data2 into the real number, and stores the result in Data1.

**Format:** VAL <Data1> <Data2> cardinal number

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Contents of a condition file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data1</td>
<td>B &lt;variable number&gt;, I &lt;variable number&gt;, D &lt;variable number&gt;, R &lt;variable number&gt;</td>
</tr>
<tr>
<td>Data2</td>
<td>Character string, S &lt;variable number&gt;</td>
</tr>
<tr>
<td>RADIX</td>
<td>&lt;cardinal number&gt;</td>
</tr>
</tbody>
</table>

**Example**
VAL B000 "123"

### ASC Function
Obtains the character code of the first letter of the character string (ASCII) of Data2, and stores the result in Data1.

**Format:** ASC<Data1><Data2>

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Contents of a condition file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data1</td>
<td>B &lt;variable number&gt;</td>
</tr>
<tr>
<td>Data2</td>
<td>Character string, S &lt;variable number&gt;</td>
</tr>
</tbody>
</table>

**Example**
ASC B000 "ABC"

### CHR$ Function
Obtains the character (ASCII) with the character code of Data2, and stores the result in Data1.

**Format:** CHR$<Data1><Data2>

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Contents of a condition file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data1</td>
<td>S &lt;variable number&gt;</td>
</tr>
<tr>
<td>Data2</td>
<td>Constant, B &lt;variable number&gt;</td>
</tr>
</tbody>
</table>

**Example**
CHR$ S000 65

### MID$ Function
Obtains the character string (ASCII) of any length (Data 3, 4) from the character string (ASCII) of Data2, and stores the result in Data1.

**Format:** MID$<Data1><Data2><Data3><Data4>

<table>
<thead>
<tr>
<th>Additional Item</th>
<th>Contents of a condition file</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data1</td>
<td>S &lt;variable number&gt;</td>
</tr>
<tr>
<td>Data2</td>
<td>Character string, S &lt;variable number&gt;</td>
</tr>
<tr>
<td>Data3</td>
<td>Constant, B &lt;variable number&gt;, I &lt;variable number&gt;, D &lt;variable number&gt;</td>
</tr>
<tr>
<td>Data4</td>
<td>Constant, B &lt;variable number&gt;, I &lt;variable number&gt;, D &lt;variable number&gt;</td>
</tr>
</tbody>
</table>

**Example**
MID$ S000 "123ABC456" 4 3
<table>
<thead>
<tr>
<th>LEN</th>
<th>Function</th>
<th>Obtains the total number of bytes of the character string (ASCII) of Data2, and stores the result in Data1. Format: LEN&lt;Data1&gt;&lt;Data2&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Additional Item</td>
<td>Data1</td>
</tr>
<tr>
<td></td>
<td>Data2</td>
<td>Character string, S &lt;variable number&gt;</td>
</tr>
<tr>
<td>Example</td>
<td>LEN</td>
<td>B000 “ABCDEF”</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAT$</th>
<th>Function</th>
<th>Combines the character string (ASCII) of Data2 and Data3, and stores the result in Data1. Format: CAT$&lt;Data1&gt;&lt;Data2&gt;&lt;Data3&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Additional Item</td>
<td>Data1</td>
</tr>
<tr>
<td></td>
<td>Data2</td>
<td>Character string, S &lt;variable number&gt;</td>
</tr>
<tr>
<td></td>
<td>Data3</td>
<td>Character string, S &lt;variable number&gt;</td>
</tr>
<tr>
<td>Example</td>
<td>CAT$</td>
<td>S000 “ABC” “DEF”</td>
</tr>
</tbody>
</table>
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