

# DX200 OPERATOR'S MANUAL

## FOR SPOT WELDING USING MOTOR GUN

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

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### MOTOMAN INSTRUCTIONS

MOTOMAN-□□□ INSTRUCTIONS  
DX200 INSTRUCTIONS  
DX200 OPERATOR'S MANUAL (for each purpose)  
DX200 MAINTENANCE MANUAL

The DX200 operator's manual above corresponds to specific usage. Be sure to use the appropriate manual.

Part Number: 165297-1CD  
Revision: 4

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Yaskawa America, Inc.  
Motoman Robotics Division  
100 Automation Way  
Miamisburg, OH 45342  
Phone: 937-847-6200

[www.motoman.com](http://www.motoman.com)





## MANDATORY

- This manual explains the various components of the DX200 system and general operations. Read this manual carefully and be sure to understand its contents before handling the DX200.
- General items related to safety are listed in Chapter1: Safety of the DX200 Instructions. To ensure correct and safe operation, carefully read the DX200 Instruction before reading this manual.



## CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.
- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.
- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.
- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.

We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

Robotic Industries Association

900 Victors Way

P.O. Box 3724

Ann Arbor, Michigan 48106

TEL: (734) 994-6088

FAX: (734) 994-3338

[www.roboticsonline.com](http://www.roboticsonline.com)

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. **NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!**

We recommend approved Yaskawa training courses for all personnel involved with the operation, programming, or repair of the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

## Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the DX200.

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



**DANGER**

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



**WARNING**

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



**CAUTION**

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



**MANDATORY**

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



**PROHIBITED**

Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations.

At any rate, be sure to follow these important items.



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



## WARNING

- **Before operating the manipulator, check that servo power is turned off when the emergency stop buttons on the front door of the DX 100 and programing pendant are pressed.**  
When the servo power is turned off, the SERVO ON LED on the programing pendant is turned off.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

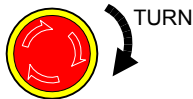
*Figure 1: Emergency Stop Button*



- **Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator.**  
Then turn the servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

*Figure 2: Release of Emergency Stop Button*



- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator:
  - Be sure to use a lockout device to the safeguarding when going inside.  
Also, display the sign that the operation is being performed inside the safeguarding and make sure no one closes the safeguarding.
  - View the manipulator from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

- Confirm that no person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  - Turning on the power for the DX200.
  - Moving the manipulator with the programming pendant.
  - Running the system in the check mode.
  - Performing automatic operations.

Injury may result if anyone enters the working envelope of the manipulator during operation. Always press an emergency stop button immediately if there are problems.

The emergency stop button is located on the right of the front door of the DX200 and programing pendant.



## CAUTION

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
  - Check for problems in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.
- Always return the programming pendant to the hook on the cabinet of the DX200 after use.

The programming pendant can be damaged if it is left in the manipulator's work area, on the floor, or near fixtures.

- Read and understand the Explanation of Warning Labels in the DX200 Instructions before operating the manipulator.

## Definition of Terms Used In this Manual

The MOTOMAN is the YASKAWA industrial robot product.

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

In this manual, the equipment is designated as follows.

Equipment	Manual Designation
DX200 controller	DX200
DX200 programming pendant	Programming pendant
Cable between the manipulator and the controller	Manipulator cable

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

Equipment		Manual Designation
Programming Pendant	Character Keys /Symbol Keys	The keys which have characters or its symbol printed on them are denoted with [ ]. ex. [ENTER]
	Axis Keys /Numeric Keys	[Axis Key] and [Numeric Key] are generic names for the keys for axis operation and number input.
	Keys pressed simultaneously	When two keys are to be pressed simultaneously, the keys are shown with a "+" sign between them, ex. [SHIFT]+[COORD]
	Displays	The menu displayed in the programming pendant is denoted with { }. ex. {JOB}

## 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 the SELECT key is pressed, or that the item is directly selected by touching the screen.

## Registered Trademark

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or brand names for each company or corporation. The indications of (R) and <sup>TM</sup> are omitted.

## Customer Support Information

If you need assistance with any aspect of your Spot Weld Motor Gun system, please contact Motoman Customer Support at the following 24-hour telephone number:

**(937) 847-3200**

For **routine** technical inquiries, you can also contact Motoman Customer Support at the following e-mail address:

[techsupport@motoman.com](mailto:techsupport@motoman.com)

When using e-mail to contact Motoman Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.



Please use e-mail for **routine** inquiries only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact Motoman Customer Support at the telephone number shown above.

Please have the following information ready before you call Customer Support:

- |                            |  |
|----------------------------|--|
| • System                   | Spot Weld Motor Gun  |
| • Robots                   | _____  |
| • Primary Application      | _____  |
| • Controller               | DX200  |
| • Software Version         | Access this information on the Programming Pendant's LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION} |
| • Robot Serial Number      | Located on the robot data plate  |
| • Robot Sales Order Number | Located on the DX200 controller data plate   |

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## Table of Contents

1	Introduction .....	1-1
1.1	DX200 Overview .....	1-1
1.2	Programming Pendant .....	1-2
1.2.1	Programming Pendant Overview .....	1-2
1.2.2	Key Description .....	1-3
1.2.2.1	Character Keys / Symbol Keys .....	1-3
1.2.2.2	Axis Keys and Numeric Keys .....	1-3
1.2.2.3	Keys Pressed Simultaneously .....	1-3
1.2.3	Programming Pendant Keys .....	1-4
1.2.4	Programming Pendant Display .....	1-11
1.2.4.1	Five Display Areas .....	1-11
1.2.4.2	General-purpose Display Area .....	1-12
1.2.4.3	Main Menu Area .....	1-17
1.2.4.4	Status Display Area .....	1-17
1.2.4.5	Human Interface Display Area .....	1-20
1.2.4.6	Menu Area .....	1-20
1.2.5	Screen Descriptions .....	1-21
1.2.6	Character Input Operation .....	1-22
1.2.6.1	Character Input .....	1-22
1.2.6.2	Operation .....	1-22
1.2.6.3	Alphanumeric Input .....	1-23
1.2.6.4	Symbol Input .....	1-24
1.2.6.5	Register Word Function .....	1-25
1.2.7	Bilingual Function .....	1-33
1.3	Mode .....	1-34
1.3.1	Teach Mode .....	1-34
1.3.2	Play Mode .....	1-34
1.3.3	Remote Mode .....	1-34
1.3.4	Teach Mode Priority .....	1-34
1.4	Security Mode .....	1-35
1.4.1	Types of Security Modes .....	1-35
1.4.2	Changing Security Mode .....	1-40
2	Manipulator Coordinate Systems and Operations .....	2-1
2.1	Control Groups and Coordinate Systems .....	2-1
2.1.1	Control Group .....	2-1
2.1.2	Types of Coordinate Systems .....	2-2



2.2	General Operations .....	2-3
2.2.0.1	Check Safety .....	2-3
2.2.0.2	Select Teach Mode .....	2-3
2.2.0.3	Select Control Group.....	2-3
2.2.0.4	Select Coordinate System.....	2-3
2.2.0.5	Select Manual Speed .....	2-4
2.2.0.6	Servo ON .....	2-4
2.2.0.7	Axis Operation.....	2-4
2.2.0.8	HIGH SPEED .....	2-4
2.3	Coordinate Systems and Axis Operation.....	2-5
2.3.1	Joint Coordinates .....	2-5
2.3.2	Cartesian Coordinates.....	2-6
2.3.3	Cylindrical Coordinates.....	2-7
2.3.4	Tool Coordinates .....	2-9
2.3.4.1	Selecting Tool .....	2-11
2.3.5	User Coordinates.....	2-12
2.3.5.1	Selecting User Coordinates.....	2-14
2.3.5.2	Examples of User Coordinate Utilization.....	2-15
2.3.6	External Axis .....	2-15
2.3.7	Control Point Operation.....	2-16
2.3.7.1	Control Point Change .....	2-19
2.3.8	Teaching Line Coordinates.....	2-21
2.3.8.1	Operations for Teaching Line Coordinates System.....	2-23
2.3.8.2	Display Welding-related Information .....	2-26
3	Teaching .....	3-1
3.1	Preparation for Teaching .....	3-1
3.1.1	Checking Emergency Stop Buttons.....	3-1
3.1.2	Setting the Teach Lock.....	3-1
3.1.3	Registering a Job .....	3-2
3.1.3.1	Registering Job Names.....	3-2
3.1.3.2	Registering Jobs .....	3-2
3.1.3.3	Registering Comments.....	3-3
3.1.3.4	Registering Control Groups.....	3-3
3.1.3.5	Switching to the Teaching Window .....	3-4
3.2	Teaching Operation .....	3-5
3.2.1	Teaching Window .....	3-5
3.2.2	Interpolation Type and Play Speed .....	3-6
3.2.2.1	Joint Interpolation .....	3-6
3.2.2.2	Linear Interpolation .....	3-7
3.2.2.3	Circular Interpolation .....	3-8

3.2.2.4	Spline Interpolation.....	3-9
3.2.3	Teaching Steps.....	3-11
3.2.3.1	Registering Move Instructions .....	3-11
3.2.3.2	Registering Reference Point Instructions .....	3-18
3.2.3.3	Registering Timer Instructions.....	3-19
3.2.4	Overlapping the First and Last Steps .....	3-22
3.3	Checking Steps.....	3-23
3.3.1	[FWD/BWD] Operations.....	3-23
3.3.1.1	Precautions When Using FWD / BWD Operations .....	3-24
3.3.1.2	Selecting Manual Speed .....	3-26
3.3.1.3	Moving to Reference Point .....	3-27
3.3.1.4	Test Operations .....	3-27
3.3.1.5	Machine Lock Operation.....	3-28
3.4	Modifying Steps .....	3-29
3.4.1	Displaying the JOB CONTENT Window for Editing.....	3-33
3.4.1.1	Currently Called Up Job .....	3-33
3.4.1.2	Calling Up Other Jobs .....	3-33
3.4.2	Inserting Move Instructions.....	3-34
3.4.3	Deleting Move Instructions .....	3-36
3.4.4	Modifying Move Instructions .....	3-37
3.4.4.1	Modifying Position Data.....	3-37
3.4.4.2	Modifying Interpolation Type .....	3-37
3.4.5	Undo Operation .....	3-38
3.4.6	Modifying Reference Point Instructions .....	3-39
3.4.6.1	Deleting Reference Point Instructions .....	3-39
3.4.6.2	Modifying Reference Point Instructions .....	3-39
3.4.7	Modifying Timer Instructions.....	3-40
3.4.7.1	Deleting Timer Instructions.....	3-40
3.4.7.2	Modifying Timer Instructions.....	3-40
3.5	Modifying Jobs.....	3-41
3.5.1	Calling Up a Job .....	3-41
3.5.2	Windows Related to Job.....	3-41
3.5.3	JOB HEADER Window .....	3-42
3.5.4	JOB CONTENT Window.....	3-44
3.5.4.1	Switching the Address Area .....	3-45
3.5.5	COMMAND POSITION Window.....	3-49
3.5.6	JOB CAPACITY Window.....	3-50
3.6	Editing Instructions.....	3-51
3.6.1	Instruction Group .....	3-52

3.6.2	Inserting Instructions .....	3-53
3.6.3	Deleting Instructions .....	3-56
3.6.4	Modifying Instructions.....	3-56
3.6.5	Modifying Additional Numeric Data .....	3-60
3.6.6	Modifying Additional Items.....	3-61
3.6.7	Inserting Additional Items .....	3-62
3.6.8	Deleting Additional Items.....	3-64
3.7	Editing Jobs .....	3-65
3.7.1	Selecting the Range .....	3-67
3.7.2	Copying .....	3-68
3.7.3	Cutting .....	3-68
3.7.4	Pasting .....	3-69
3.7.5	Reverse Pasting .....	3-70
3.7.6	Commenting Out a Line.....	3-71
3.7.6.1	Commenting Out One Line.....	3-71
3.7.6.2	Commenting Out Multiple Lines .....	3-73
3.7.6.3	Canceling the Comment Out of One Line .....	3-75
3.7.6.4	Canceling the Comment Out of Multiple Lines .....	3-77
3.7.6.5	Canceling All the Comment Out of Lines .....	3-79
3.7.7	Prohibiting Editing Line-by-Line.....	3-81
3.7.7.1	Prohibiting Editing One Line.....	3-81
3.7.7.2	Prohibiting Editing Multiple Lines .....	3-83
3.7.7.3	Canceling the Edit Lock of One Line .....	3-85
3.7.7.4	Canceling the Edit Lock of Multiple Lines.....	3-87
3.7.7.5	Canceling All the Edit Lock of Lines .....	3-90
3.8	Test Operations .....	3-91
3.8.1	Test Operation Procedures .....	3-91
3.8.2	Manual Full-speed Function .....	3-92
3.8.2.1	Setting Method .....	3-92
3.8.2.2	Operation Speed .....	3-93
3.8.3	Test Operation (High Accuracy).....	3-94
3.8.3.1	Test Operation (High Accuracy).....	3-94
3.8.3.2	Setting Method .....	3-96
3.9	Other Job-editing Functions.....	3-97
3.9.1	Editing Play Speed .....	3-97
3.9.1.1	Modification of Speed Type.....	3-97
3.9.1.2	Relative Modification .....	3-97
3.9.1.3	Modification by TRT (Traverse Time).....	3-99
3.9.2	Editing Interpolation Type.....	3-101

3.9.3	Editing Condition Files .....	3-102
3.9.4	User Variables .....	3-103
3.9.4.1	Setting Byte, Integer, Double Precision Integer, and Real Type Variables .....	3-104
3.9.4.2	Setting Character Type Variables.....	3-106
3.9.4.3	Registering Variable Name.....	3-108
3.9.4.4	Displaying Position Variables .....	3-109
3.9.4.5	Setting Position Variables.....	3-110
3.9.4.6	Setting Position Variables Using the [Numeric Key]s.....	3-111
3.9.4.7	Setting Position Variables Using the [Axis Key]s.....	3-113
3.9.4.8	Deleting Data Set of Position Variables.....	3-114
3.9.4.9	Checking Positions by Position Variables .....	3-114
3.9.4.10	Manipulator Types .....	3-115
3.9.5	Flip/No Flip.....	3-116
3.9.6	R-axis Angle .....	3-116
3.9.7	T-axis Angle.....	3-117
3.9.8	Front/Back .....	3-117
3.9.9	Upper Arm/Lower Arm .....	3-119
3.9.10	S-axis Angle.....	3-119
3.9.11	Editing Local Variables .....	3-120
3.9.11.1	Setting the Number of Local Variables .....	3-122
3.9.12	Search .....	3-124
3.9.12.1	Line Search .....	3-125
3.9.12.2	Step Search.....	3-126
3.9.12.3	Label Search .....	3-127
3.9.12.4	Instruction Search .....	3-129
3.9.12.5	Tag Search.....	3-131
4	Playback.....	4-1
4.1	Preparation for Playback.....	4-1
4.1.1	Selecting a Job .....	4-1
4.1.1.1	Calling a Job.....	4-1
4.1.1.2	Registering the Master Job.....	4-2
4.1.1.3	Calling the Master Job.....	4-4
4.1.2	The PLAYBACK Window.....	4-6
4.1.2.1	Display of Cycle Time.....	4-6
4.1.2.2	Operation Cycle.....	4-7
4.2	Playback .....	4-10
4.2.1	Playback Operation .....	4-10
4.2.1.1	Selecting the Start Device .....	4-10
4.2.1.2	Servo On .....	4-10
4.2.1.3	Start Operation .....	4-10

4.2.2	Special Playback Operations.....	4-11
4.2.2.1	Low Speed Operation .....	4-11
4.2.2.2	Limited Speed Operations.....	4-12
4.2.2.3	Dry-run Speed Operations .....	4-12
4.2.2.4	Machine Lock Operation .....	4-13
4.2.2.5	Check Mode Operation .....	4-13
4.2.2.6	Weaving Prohibit Setting during Check Mode Operation .....	4-13
4.2.2.7	Cancel All Special Operations.....	4-14
4.3	Stop and Restart.....	4-15
4.3.1	Hold.....	4-15
4.3.1.1	Using the Programming Pendant .....	4-15
4.3.1.2	Using an External Input Signal (System Input).....	4-15
4.3.2	Emergency Stop.....	4-16
4.3.2.1	Restart After Emergency Stop.....	4-17
4.3.3	Stop by Alarm.....	4-18
4.3.4	Others.....	4-19
4.3.4.1	Temporary Stop by Mode Change .....	4-19
4.3.4.2	Temporary Stop by the PAUSE Instruction .....	4-19
4.4	Modifying Play Speed .....	4-20
4.4.1	Speed Override .....	4-20
4.4.1.1	Setting Speed Overrides .....	4-21
4.4.1.2	Modifying Play Speed .....	4-22
4.4.1.3	Cancelling Speed Override Settings .....	4-22
4.4.2	Specification for Speed Override in AUTO Cycle Operation .....	4-23
4.4.2.1	Functional Overview.....	4-23
4.4.2.2	Setting the Speed Override Function .....	4-23
4.4.2.3	Performing the Speed Override Function.....	4-26
4.4.2.4	Modifying the Speed Override Percentage .....	4-26
4.4.2.5	Disabling the Speed Override Function.....	4-27
4.4.2.6	Enabling an Automatic Setting of Speed Override.....	4-28
4.4.2.7	Manual Speed in the TEACH Mode .....	4-28
4.4.2.8	Parameter .....	4-29
4.4.3	Specification for Speed Override with Input Signals.....	4-30
4.4.3.1	Functional Overview.....	4-30
4.4.3.2	Performing the Speed Override Function.....	4-31
4.4.3.3	Disabling the Speed Override Function.....	4-31
4.4.3.4	Parameters.....	4-32
4.5	Playback with Reserved Start.....	4-33
4.5.1	Preparation for Reserved Start.....	4-33
4.5.1.1	Enabling Reserved Start .....	4-34
4.5.1.2	Registering Reserved Start I/O Signal .....	4-35
4.5.1.3	Registering Jobs to Stations.....	4-37
4.5.1.4	Deleting Registered Jobs from Stations .....	4-39

4.5.2	Playback from Reserved Start .....	4-40
4.5.2.1	Start Operation .....	4-40
4.5.2.2	Checking Job Reservation Status .....	4-41
4.5.2.3	Resetting Job Reservation .....	4-42
4.5.3	Hold Operation.....	4-43
4.5.3.1	[HOLD] on the Programming Pendant.....	4-43
4.5.3.2	Hold by External Input Signal (System Input).....	4-43
4.5.3.3	Hold at the Station .....	4-44
4.6	Displaying Job Stack.....	4-45
5	Editing Jobs.....	5-1
5.1	Copying Jobs .....	5-2
5.1.0.1	Copying Jobs on the JOB CONTENT Window.....	5-2
5.1.0.2	Copying Jobs on the JOB LIST Window .....	5-4
5.2	Deleting Jobs .....	5-6
5.2.0.1	Deleting Jobs on the JOB CONTENT Window.....	5-6
5.2.0.2	Deleting Jobs on the JOB LIST Window .....	5-7
5.3	Modifying Job Names .....	5-8
5.3.0.1	Modifying Job Names on the JOB CONTENT Window.....	5-8
5.3.0.2	Modifying Job Names on the JOB LIST Window.....	5-10
5.4	Editing Comments.....	5-12
5.5	Job Folder Function .....	5-14
5.5.1	Displaying Jobs by Folders.....	5-14
5.5.1.1	Operation for Displaying Jobs by Folders.....	5-14
5.5.1.2	Operation for Canceling Displaying Jobs by Folders.....	5-16
5.5.2	Registering Jobs in Folders .....	5-17
5.5.2.1	Registering Jobs in Folders (At a New Job Creation).....	5-17
5.5.2.2	Changing the Folder Registration of Jobs .....	5-19
5.5.3	Changing the Folder Name.....	5-23
5.5.3.1	Changing the Folder Name While Displaying Folder List Window .....	5-23
5.5.3.2	Changing the Folder Name While Displaying Jobs by Folders in Job List Window.....	5-24
5.5.4	Changing the Display Order While Displaying Jobs by Folders .....	5-25
5.6	Setting Edit Lock on Individual Job Units.....	5-27
5.7	Enabling the Modification of Position Data Only .....	5-28
5.8	Prohibit Displaying the Contents of a Job .....	5-29
5.9	Prohibit: Saving The Job Data .....	5-32
6	Convenient Functions .....	6-1
6.1	One-touch Operation “Direct Open” .....	6-1

6.2	Parallel Shift Function.....	6-3
6.2.1	Function Overview.....	6-3
6.2.1.1	Parallel Shift of Step.....	6-4
6.2.1.2	Parallel Shift of Job.....	6-4
6.2.2	Setting the Shift Value.....	6-5
6.2.2.1	Coordinate Systems.....	6-5
6.2.2.2	Setting the Shift Value.....	6-5
6.2.3	Registering Shift Instructions.....	6-7
6.2.3.1	SFTON Instruction.....	6-8
6.2.3.2	SFTOF Instruction.....	6-10
6.2.3.3	MSHIFT Instruction.....	6-11
6.2.4	Continuation of the Parallel Shift Function.....	6-13
6.2.5	Examples of Use.....	6-14
6.2.5.1	Example of Use of Shift Addition/Subtraction.....	6-14
6.2.5.2	Example of Use of MSHIFT Instruction.....	6-15
6.3	Parallel Shift Job Conversion Function.....	6-16
6.3.1	Function Overview.....	6-16
6.3.2	Coordinate Systems for Conversion.....	6-17
6.3.3	Executing the Parallel Shift Job Conversion.....	6-21
6.3.3.1	Window Display.....	6-21
6.3.3.2	Parallel Shift Job Conversion Operation.....	6-23
6.3.4	Specifying the Shift Value by Position Variables.....	6-29
6.3.4.1	Window Display.....	6-29
6.3.4.2	Jobs Targeted for Conversion.....	6-31
6.3.4.3	Conversion of Coordinated Jobs.....	6-32
6.3.4.4	Operation Procedure.....	6-36
6.4	PAM Function.....	6-38
6.4.1	Function Overview.....	6-38
6.4.1.1	Input Ranges for Adjustment Data.....	6-38
6.4.2	Operating Methods.....	6-40
6.4.2.1	Setting Adjustment Data.....	6-40
6.4.2.2	Executing the Adjustment.....	6-42
6.5	Mirror Shift Function.....	6-46
6.5.1	Function Overview.....	6-46
6.5.2	Pulse Mirror-shift Function.....	6-47
6.5.2.1	Parameter Setting.....	6-47
6.5.2.2	Object Job.....	6-47
6.5.2.3	Group Axes Specification.....	6-47
6.5.2.4	Position Variables.....	6-47
6.5.3	Robot-coordinates Mirror-shift Function.....	6-48
6.5.3.1	Object Job.....	6-48

6.5.3.2	Group Axes Specification .....	6-48
6.5.3.3	Position Variables.....	6-48
6.5.4	User-coordinates Mirror-shift Function .....	6-49
6.5.4.1	Object Job .....	6-49
6.5.4.2	Group Axes Specification .....	6-49
6.5.4.3	Position Variables.....	6-49
6.5.5	Notes on the Mirror Shift Function .....	6-50
6.5.6	Operation Procedures.....	6-51
6.5.6.1	Calling Up the JOB CONTENT Window.....	6-51
6.5.6.2	Mirror Shift Conversion.....	6-51
6.5.6.3	Explanation of the Mirror Shift Window .....	6-52
6.6	Multi Window Function.....	6-54
6.6.1	Function Overview .....	6-54
6.6.2	Setting the Dividing Pattern of the General-Purpose Display Area .....	6-54
6.6.2.1	Calling Up and Operating Methods of the Display Dividing Pattern Setting Window .....	6-55
6.6.3	Displaying the Multi Window.....	6-59
6.6.3.1	Multi Window Mode and Single Window Mode .....	6-59
6.6.3.2	Displaying the Status of Plural (more than two) Window Dividing Pattern Setting.....	6-59
6.6.3.3	Displaying of Active Window and Non-Active Window.....	6-60
6.6.3.4	Limited Matters in Multi Window Mode.....	6-60
6.6.4	Operation of Multi Window.....	6-61
6.6.4.1	Switching of Multi Window Mode and Single Window Mode.....	6-61
6.6.4.2	Switching of Active Window.....	6-63
6.6.5	Switching the Axis Operation Control Group .....	6-65
6.6.5.1	S2C540 "Choosing Method of Notifying the Change of Axis Operation Control Group when Switching the Active Window" .....	6-65
6.7	Simple Menu Function .....	6-67
6.7.1	Simple Menu.....	6-67
6.7.2	Registering the Layout Patterns to User Definition Menu.....	6-68
6.7.2.1	Register with {REGIST} Button.....	6-68
6.7.2.2	Register by Key Operation .....	6-69
6.7.2.3	Conditions to Register the Layout .....	6-70
6.7.2.4	The Displayed Layout Name .....	6-70
6.7.3	Calling Up of the Registered Layout.....	6-71
6.7.3.1	Calling up .....	6-71
6.7.3.2	Conditions when Calling Up the Layout.....	6-72
6.7.4	Editing "USER DEFINITION" Menu .....	6-73
6.7.4.1	Displaying "USER DEFINITION" Window .....	6-73
6.7.4.2	Displaying "USER DEFINITION MENU" window Under Main Menu .....	6-74
6.7.4.3	Change the Name of Registered Layout Name.....	6-75
6.7.4.4	Deleting the Layout .....	6-77



6.7.4.5	Delete All Layout .....	6-79
6.7.5	Save/Load (to external memory devices) the User Definition Menu Data .....	6-81
6.7.5.1	Saving the Data .....	6-81
6.7.5.2	Loading the Data .....	6-83
6.8	Parameter Setting Function .....	6-85
6.8.1	Parameter Setting Function .....	6-85
6.8.2	Teaching Condition Setting .....	6-87
6.8.3	Operation Condition Setting .....	6-90
6.8.4	Operate Enable Setting .....	6-93
6.8.5	Function Enable Setting .....	6-95
6.8.6	Jog Condition Setting .....	6-97
6.8.7	Playback Condition Setting .....	6-98
6.8.8	Functional Condition Setting .....	6-100
6.9	Jog Key Allocation .....	6-101
6.9.1	Jog Key Allocation Function .....	6-101
6.9.2	Jog Key Allocation Setting .....	6-102
6.9.2.1	Allocation of the Jog Key .....	6-102
6.9.2.2	Cancellation of Jog Key Allocation .....	6-104
6.9.2.3	Operating Method of Allocated External Axis .....	6-105
6.10	Energy-Saving Function .....	6-106
6.10.1	Energy-Saving Function .....	6-106
6.10.2	Energy-Saving Setting Method .....	6-107
6.10.2.1	Valid/Invalid of Energy-Saving Setting .....	6-107
6.10.2.2	Accumulated Energy-Saving Time Clearance .....	6-109
6.10.3	Energy-Saving Status Confirmation Method .....	6-111
6.10.3.1	Confirmation by the accumulated energy-saving time .....	6-111
6.10.3.2	Confirmation by System Signal Output .....	6-111
6.11	Instruction Displaying Color Setting Function .....	6-112
6.11.1	Setting the Instruction Displaying Color on the Job Window .....	6-112
6.12	Present Manipulator Position Output Function .....	6-115
6.12.1	Outline .....	6-115
6.12.2	Parameters .....	6-115
6.13	Softlimit Setting Function .....	6-119
6.13.1	About the Softlimit Setting Function .....	6-119
6.13.2	The Softlimit Setting Screen .....	6-119
6.13.3	Setting the Softlimit by Numerical Value Input .....	6-120
6.13.4	Set the Current Value to the Softlimit .....	6-121

6.13.5	Set the Softlimit (+)/ the Softlimit (-) to the Initial Maker Value .....	6-123
6.13.6	Change the Coordinate Display of the Softlimit (+)/ the Softlimit (-) .....	6-124
6.14	Job Edit Function During Playback .....	6-125
6.14.1	Function .....	6-125
6.14.2	Job Edit During Playback .....	6-125
6.14.2.1	Basic Operation .....	6-125
6.14.2.2	Editing .....	6-128
6.14.2.3	Editing Multiple Jobs .....	6-130
6.14.2.4	Canceling Write Request .....	6-133
6.15	Logging Function .....	6-135
6.15.1	Logging Function .....	6-135
6.15.2	Objected Data for Logging .....	6-135
6.15.3	Number of Entries Stored in the Logs .....	6-136
6.15.4	Operating Methods .....	6-137
6.15.4.1	Displaying Logs in List .....	6-137
6.15.4.2	Displaying Log Details .....	6-139
6.15.4.3	Updating Logging Information .....	6-143
6.15.4.4	Deleting Logging Information .....	6-144
6.15.4.5	Selecting Operations to Acquire Logs .....	6-145
6.16	Analog Output Function Corresponding to Speed .....	6-147
6.16.1	Overview .....	6-147
6.16.2	Instructions .....	6-148
6.16.2.1	Instructions for Analog Output Function Corresponding to Speed ....	6-148
6.16.2.2	Registration of Instructions .....	6-150
6.16.2.3	Analog Output Display .....	6-153
6.16.3	Examples .....	6-154
6.16.3.1	Examples of Output Characteristics .....	6-154
6.16.3.2	Example of Variation of Operating Speed and Analog Output Value	6-155
6.16.4	Filter Process .....	6-156
6.16.4.1	When Parameter is Set to "0" .....	6-156
6.16.4.2	When Parameter is Set to Values Other Than "0" .....	6-156
6.16.4.3	Parameter Setting .....	6-156
6.16.5	Precautions .....	6-159
6.16.5.1	When Analog Output Corresponding to Speed is Interrupted .....	6-159
6.16.5.2	When More than One Manipulator is Used .....	6-159
6.17	QR Code Creation Function .....	6-160
6.17.1	Outline .....	6-160
6.17.2	Main Function .....	6-162
6.17.3	QR Code Creation Function Start-Up Method .....	6-164

6.17.3.1	Start-up the function by pressing {SYSTEM INFO} under the main menu → {QR CODE}.....	6-164
6.17.3.2	Start-up the function by selecting {UTILITY} under the pull down menu → {QR CODE DISPLAY}.....	6-166
6.17.3.3	Start-up the function by selecting {UTILITY} under the pull down menu → {QR CODE ALL PAGE}.....	6-167
6.17.4	Display Configuration .....	6-168
6.17.5	Operation Method.....	6-169
6.17.5.1	Data for QR Code Select Area .....	6-169
6.17.5.2	QR Code Display Area .....	6-169
6.17.6	QR Code Structure .....	6-170
6.17.6.1	Basic Structure .....	6-170
6.17.6.2	Data Header .....	6-171
6.17.6.3	System Information .....	6-172
6.17.6.4	Alarm .....	6-173
6.17.6.5	Alarm History.....	6-174
6.17.6.6	Monitoring Time.....	6-176
6.17.6.7	Home Position .....	6-180
6.17.6.8	Current Position .....	6-181
6.17.6.9	Servo Monitor.....	6-186
6.17.7	MOTOMAN Touch!.....	6-190
6.17.7.1	Installing Method of MOTOMAN Touch! (In case downloading from Google Play is not available).....	6-190
6.17.7.2	Start-Up MOTOMAN Touch! Application.....	6-192
6.17.7.3	Setting of Call Center .....	6-193
6.17.7.4	Registration of Customer Information.....	6-194
6.17.7.5	Reading of Product Code .....	6-195
6.17.7.6	Calling Up of the Product Code.....	6-196
6.17.7.7	Inquiry Mail.....	6-197
6.17.7.8	Sending Method of Controller Data.....	6-198
6.17.7.9	Attaching Method of Picture .....	6-200
6.17.7.10	Sending an E-Mail: Transmission type (QR code transmission only) .....	6-201
6.17.7.11	Sending an E-Mail: Transmission type (QR code transfer and incoming call).....	6-202
6.17.7.12	Sending an E-Mail :Transmission type (Call back request with QR code).....	6-203
6.18	Time Measuring Function .....	6-204
6.18.1	Time Measuring Function .....	6-204
6.18.2	Timer Variable .....	6-204
6.18.3	Time Measuring Method.....	6-205
6.18.4	Setting for Time Measurement .....	6-207
6.18.5	Displaying the Time Measuring Result in the Job Window.....	6-208
7	External Memory Devices .....	7-1
7.1	Memory Devices .....	7-1

7.1.1	Compact Flash (CF Cards).....	7-2
7.1.1.1	Recommended Compact Flash Cards .....	7-2
7.1.1.2	Notes on handling Compact Flash .....	7-2
7.1.1.3	Inserting a Compact Flash.....	7-3
7.1.2	USB Memory Stick.....	7-4
7.1.2.1	Recommended USB Memory Stick .....	7-4
7.1.2.2	Notes on handling USB Memory Stick .....	7-4
7.1.2.3	Rules for USB Drive and USB Memory Stick .....	7-5
7.1.2.4	Inserting a USB Memory Stick in the Programming Pendant.....	7-6
7.1.2.5	Inserting a USB Memory Stick in the CPU Circuit Board (JANCD-YCP21).....	7-7
7.2	Handling Data .....	7-8
7.2.1	Data Classification .....	7-8
7.2.2	File Existence .....	7-12
7.2.2.1	Saving by Overwriting.....	7-13
7.3	Operation Flow.....	7-14
7.3.0.1	Operating a Folder .....	7-15
7.3.0.2	Saving Data.....	7-19
7.3.0.3	Loading Data .....	7-30
7.3.0.4	Verifying Data.....	7-39
7.3.0.5	Deleting Data.....	7-42
7.3.0.6	Job Selection Mode.....	7-45
8	Parameter .....	8-1
8.1	Parameter Configuration.....	8-1
8.2	Motion Speed Setting Parameters .....	8-2
8.2.0.1	S1CxG000: IN-GUARD SAFE OPERATION MAX. SPEED.....	8-2
8.2.0.2	S1CxG001: DRY-RUN SPEED .....	8-2
8.2.0.3	S1CxG002 to S1CxG009: JOINT SPEED FOR REGISTRATION .....	8-2
8.2.0.4	S1CxG010 to S1CxG017: LINEAR SPEED FOR REGISTRATION.....	8-3
8.2.0.5	S1CxG018 to S1CxG025: POSITION ANGLE SPEED.....	8-3
8.2.0.6	S1CxG026 to S1CxG029: JOG OPERATION ABSOLUTE VALUE SPEED .....	8-3
8.2.0.7	S1CxG030 to S1CxG032: INCHING MOVE AMOUNT .....	8-4
8.2.0.8	S1CxG033 to S1CxG040: POSITIONING ZONE.....	8-4
8.2.0.9	S1CxG044: LOW-SPEED START.....	8-6
8.2.0.10	S1CxG045 to S1CxG048: JOG OPERATION LINK SPEED.....	8-6
8.2.0.11	S1CxG056: WORK HOME POSITION RETURN SPEED.....	8-6
8.2.0.12	S1CxG057: SEARCH MAX. SPEED .....	8-6
8.2.0.13	S2C201: POSTURE CONTROL AT CARTESIAN OPERATION OF JOG .....	8-6
8.2.0.14	S2C202: OPERATION IN USER COORDINATE SYSTEM (WHEN EXTERNAL REFERENCE POINT CONTROL FUNCTION USED).....	8-6
8.2.0.15	S2C320: CONTROLLED GROUP JOB TEACHING POSITION CHANGE .....	8-7

8.2.0.16	S2C422: OPERATION AFTER RESET FROM PATH DEVIATION.....	8-7
8.2.0.17	S2C423: OPERATION AFTER JOB .....	8-7
8.2.0.18	S2C424: DEVIATED POSITION .....	8-8
8.2.0.19	S2C425: CIRCULAR INTERPOLATION TOOL POSITION CONTROL	8-9
8.2.0.20	S2C653: EMERGENCY STOP CURSOR ADVANCE CONTROL FUNCTION .....	8-9
8.2.0.21	S2C654: EMERGENCY STOP CURSOR ADVANCE CONTROL FUNCTION CONT PROCESS COMPLETION POSITION .....	8-10
8.2.0.22	S2C655: EMERGENCY STOP ADVANCE CONTROL FUNCTION WORK START INSTRUCTION STEP MOTION COMPLETION DELAY TIME .....	8-10
8.2.0.23	S2C698: BASE AXIS OPERATION KEY ALLOCATION SETTING....	8-10
8.2.0.24	S3C1098 to S3C1102: POSITION CORRECTING FUNCTION DURING PLAYBACK .....	8-11
8.3	Mode Operation Setting Parameters .....	8-12
8.3.0.1	S2C195: SECURITY MODE WHEN CONTROL POWER SUPPLY IS TURNED ON .....	8-12
8.3.0.2	S2C196: SELECTION OF CARTESIAN/CYLINDRICAL.....	8-12
8.3.0.3	S2C197: COORDINATE SWITCHING PROHIBITED.....	8-12
8.3.0.4	S2C198: EXECUTION UNITS AT “FORWARD” OPERATION.....	8-12
8.3.0.5	S2C199: INSTRUCTION (EXCEPT FOR MOVE) EXECUTION AT “FORWARD” OPERATION .....	8-13
8.3.0.6	S2C203: CHANGING STEP ONLY.....	8-13
8.3.0.7	S2C204: MANUAL SPEED STORING FOR EACH COORDINATE .....	8-13
8.3.0.8	S2C206: ADDITIONAL STEP POSITION .....	8-13
8.3.0.9	S2C207: MASTER JOB CHANGING OPERATION.....	8-14
8.3.0.10	S2C208: CHECK AND MACHINE-LOCK KEY OPERATION IN PLAY MODE .....	8-14
8.3.0.11	S2C209: RESERVED WORK JOB CHANGING OPERATION.....	8-14
8.3.0.12	S2C210: MASTER OR SUBMASTER CALL OPERATION IN PLAY MODE .....	8-14
8.3.0.13	S2C211: LANGUAGE LEVEL .....	8-15
8.3.0.14	S2C214: INSTRUCTION INPUT LEARNING FUNCTION .....	8-15
8.3.0.15	S2C215: ADDRESS SETTING WHEN CONTROL POWER IS TURNED ON.....	8-15
8.3.0.16	S2C216: JOB LIST DISPLAY METHOD AT JOB SELECTION.....	8-15
8.3.0.17	S2C217: INITIAL OPERATION OF MANIPULATOR.....	8-16
8.3.0.18	S2C218: PLAYBACK EXECUTION AT CYCLE MODE “1- STEP” .....	8-16
8.3.0.19	S2C219: EXTERNAL START.....	8-16
8.3.0.20	S2C220: PROGRAMMING PENDANT START .....	8-16
8.3.0.21	S2C221: SPEED DATA INPUT FORM .....	8-17
8.3.0.22	S2C222: RESERVED START.....	8-17
8.3.0.23	S2C224: JOB SELECTION AT REMOTE FUNCTION (PLAY MODE)	8-17
8.3.0.24	S2C225: EXTERNAL MODE SWITCH .....	8-17
8.3.0.25	S2C227: EXTERNAL CYCLE SWITCHING.....	8-17
8.3.0.26	S2C228: PROGRAMMING PENDANT CYCLE SWITCHING.....	8-18
8.3.0.27	S2C229: SERVO ON FROM EXTERNAL PP PROHIBITION.....	8-18
8.3.0.28	S2C230: PROGRAMMING PENDANT OPERATION WHEN “IO” IS SELECTED FOR REMOTE MODE .....	8-18
8.3.0.29	S2C234: STEP REGISTRATION AT TOOL NO. CHANGE.....	8-19

8.3.0.30	S2C293: REMOTE FIRST CYCLE MODE .....	8-19
8.3.0.31	S2C294: LOCAL FIRST CYCLE MODE.....	8-19
8.3.0.32	S2C312: POWER ON FIRST CYCLE MODE .....	8-20
8.3.0.33	S2C313: TEACH MODE FIRST CYCLE MODE .....	8-20
8.3.0.34	S2C314: PLAY MODE FIRST CYCLE MODE .....	8-20
8.3.0.35	S2C316: START CONDITION AFTER ALARM-4107 ("OUT OF RANGE (ABS DATA)") .....	8-20
8.3.0.36	S2C395: SIGNAL NAME ALIAS FUNCTION .....	8-21
8.3.0.37	S2C396: VARIABLE NAME ALIAS FUNCTION.....	8-22
8.3.0.38	S2C397: I/O VARIABLE CUSTOMIZE FUNCTION .....	8-23
8.3.0.39	S2C410: WORD REGISTRATION FUNCTION / WORD EDITING FUNCTION SPECIFICATION .....	8-24
8.3.0.40	S2C413: JOB UNDELETE FUNCTION.....	8-24
8.3.0.41	S2C415 to S2C419: TIME RESET .....	8-26
8.3.0.42	S2C431: TOOL NO. SWITCHING.....	8-27
8.3.0.43	S2C433: POSITION TEACHING BUZZER .....	8-27
8.3.0.44	S2C434: JOB LINKING DESIGNATION (When Twin Synchronous Function Used).....	8-27
8.3.0.45	S2C437: PLAYBACK OPERATION CONTINUATION FUNCTION ....	8-28
8.3.0.46	S2C544: I/O NAME DISPLAY FUNCTION FOR JOB .....	8-29
8.3.0.47	S2C684:ALL AXES ANGLE DISPLAY FUNCTION.....	8-29
8.3.0.48	S2C713: CONTROL POINT OPERATION SETTING ON THE SERVO TRACK.....	8-30
8.3.0.49	S2C1203: TOUCH OPERATION FUNCTION IN GENERAL-PURPOSE DISPLAY AREA.....	8-31
8.3.0.50	S2C1204: CURSOR MOVEMENT FUNCTION BY TOUCH OPERATION ON JOB WINDOW .....	8-31
8.4	Parameters According to Interference Area.....	8-32
8.4.0.1	S1CxG400 to S1CxG415: PULSE SOFT LIMIT .....	8-32
8.4.0.2	S2C001: CUBE SOFT LIMIT CHECK .....	8-32
8.4.0.3	S2C002: S-AXIS INTERFERENCE CHECK .....	8-34
8.4.0.4	S2C003 to S2C066: CUBE/AXIS INTERFERENCE CHECK.....	8-35
8.4.0.5	S2C067 to S2C194: CUBE USING METHOD.....	8-37
8.4.0.6	S3C000 to S3C047: CUBE SOFT LIMIT.....	8-39
8.4.0.7	S3C048 to S3C063: S-AXIS INTERFERENCE AREA .....	8-39
8.4.0.8	S3C064 to S3C1087: CUBIC INTERFERENCE AREA.....	8-39
8.4.0.9	S3C1089 to S3C1096: ROBOT INTERFERENCE AREA .....	8-39
8.4.0.10	S3C1097: A SIDE LENGTH OF WORK-HOME-POSITION CUBE.....	8-39
8.5	Parameters According to Status I/O .....	8-40
8.5.0.1	S2C235: USER OUTPUT RELAY WHEN CONTROL POWER IS ON ..	8-40
8.5.0.2	S4C000 to S4C015, S4C1100 to S4C1115: PARITY OF USER INPUT GROUPS .....	8-40
8.5.0.3	S4C016 to S4C031, S4C1116 to S4C1131: PARITY OF USER OUTPUT GROUPS .....	8-41
8.5.0.4	S4C032 to S4C047, S4C1132 to S4C1147: DATA OF USER INPUT GROUPS .....	8-42
8.5.0.5	S4C048 to S4C063, S4C1148 to S4C1163: DATA OF USER OUTPUT GROUPS .....	8-43
8.5.0.6	S4C064 to S4C079, S4C1164 to S4C1179: USER OUTPUT GROUP TO BE INITIALIZED AT SWITCHING MODE .....	8-44

8.5.0.7	S4C240: USER OUTPUT NO. WHEN MANIPULATOR DROP ALLOWABLE RANGE ERROR OCCURS .....	8-44
8.6	Parameters According to Coordinated or Synchronized Operation .....	8-45
8.6.0.1	S2C212: +MOV or +SMOV INSTRUCTION SPEED INPUT .....	8-45
8.6.0.2	S2C213: +MOV INSTRUCTION INTERPOLATION INPUT .....	8-45
8.6.0.3	S2C231: OPERATION METHOD AT FWD/BWD OPERATION OR TEST RUN BY INDEPENDENT CONTROL .....	8-45
8.6.0.4	S2C232: JOB AT CALLING MASTER OF SUBTASK BY INDEPENDENT CONTROL .....	8-46
8.6.0.5	S2C264: STATION AXIS CURRENT VALUE DISPLAY FUNCTION ...	8-46
8.6.0.6	S2C265 to S2C288: STATION AXIS DISPLAYED UNIT .....	8-46
8.6.0.7	S2C420: POSTURE CONTROL OF SYNCHRONIZED MANIPULATOR (When Twin Synchronous Function Used) .....	8-47
8.6.0.8	S2C421: POSTURE CONTROL OF MANIPULATOR IN MULTI-JOB (When Twin Synchronous Function Used) .....	8-47
8.6.0.9	S2C687: OPERATION OF JOB WITHOUT CONTROL GROUP SPECIFICATION .....	8-48
8.6.0.10	S2C688: EXECUTION OF "BWD" OPERATION .....	8-48
8.6.0.11	S3C1101: MAXIMUM DEVIATION ANGLE OF CURRENT STATION POSITION (When Twin Synchronous Function Used) .....	8-48
8.7	Parameters for Other Functions or Applications .....	8-49
8.7.0.1	S1CxG049 to S1CxG051: SMALL CIRCLE CUTTING .....	8-49
8.7.0.2	S1CxG052 to S1CxG053: SMALL CIRCLE CUTTING DIRECTION LIMIT VALUE .....	8-49
8.7.0.3	S1CxG054 to S1CxG055: SMALL CIRCLE CUTTING OVERLAP VALUE .....	8-49
8.7.0.4	S1CxG063, S1CxG064: PATTERN CUTTING DIMENSION .....	8-49
8.7.0.5	S1CxG065: MIRROR SHIFT SIGN INVERSION .....	8-49
8.7.0.6	S2C430: RELATIVE JOB OPERATION METHOD .....	8-49
8.7.0.7	S2C1135 : PROHIBIT WELDING SECTION SPEED OVERRIDE .....	8-50
8.7.0.8	S2C1137 : DISPLAY WELDING CONDITION FILE COMMENT ON THE JOB WINDOW FUNCTION .....	8-50
8.7.0.9	S3C1111 to S3C1190: ANALOG OUTPUT FILTER CONSTANT .....	8-50
8.7.0.10	S3C1191: CUT WIDTH CORRECTION VALUE .....	8-50
8.8	Hardware Control Parameters .....	8-51
8.8.0.1	S2C646: ANTICIPATOR FUNCTION .....	8-51
8.8.0.2	S4C327 to S4C390: SETTING OF OPERATING RELAY NO. ....	8-52
8.8.0.3	S4C391 to S4C454: OPERATING METHOD OF RELAYS .....	8-52
8.8.0.4	S2C786 to S2C788: COOLING FAN ALARM DETECTION .....	8-52
8.8.0.5	S2C1170 to S2C1171: COOLING FAN ALARM DETECTION .....	8-52
8.8.0.6	S2C789 to S2C792: COOLING FAN ALARM 1 OPERATION .....	8-53
8.8.0.7	S2C793 to S2C796: COOLING FAN ALARM 2 OPERATION .....	8-53
8.8.0.8	S2C797 to S2C800: COOLING FAN ALARM 3 OPERATION .....	8-53
8.8.0.9	S2C1174: COOLING FAN ALARM 4 OPERATION .....	8-53
8.8.0.10	S2C1175: COOLING FAN ALARM 5 OPERATION .....	8-53
8.8.0.11	S2C801 to S2C804: FAN ALARM 1 WELDER STATUS .....	8-53
8.8.0.12	S2C805 to S2C808: FAN ALARM 2 WELDER STATUS .....	8-53
8.8.0.13	S2C809 to S2C812: FAN ALARM 3 WELDER STATUS .....	8-54
8.8.0.14	S2C1178: FAN ALARM 4 WELDER STATUS .....	8-54



8.9	TRANSMISSION PARAMETERS .....	8-55
8.10	Application Parameters .....	8-55
8.10.1	Arc Welding .....	8-55
8.10.1.1	AxP000: APPLICATION .....	8-55
8.10.1.2	AxP003: WELDING ASSIGNMENT OF WELDING START CONDITION FILE .....	8-55
8.10.1.3	AxP004: WELDING ASSIGNMENT OF WELDING END CONDITION FILES .....	8-55
8.10.1.4	AxP005: WELDING SPEED PRIORITY .....	8-55
8.10.1.5	AxP009: WORK CONTINUING .....	8-55
8.10.1.6	AxP010: WELDING INSTRUCTION OUTPUT .....	8-56
8.10.1.7	AxP011, AxP012: MANUAL WIRE OPERATION SPEED .....	8-56
8.10.1.8	AxP013, AxP014: WELDING CONTROL TIME .....	8-56
8.10.1.9	AxP015 to AxP017: NUMBER OF WELDING CONTROL .....	8-56
8.10.1.10	AxP026 to AxP029: TOOL ON/OFF USER OUTPUT NO. (Jigless system) .....	8-56
8.10.2	Handling Application .....	8-56
8.10.2.1	AxP002, AxP004: f1 KEY FUNCTION .....	8-56
8.10.2.2	AxP003, AxP005: f2 KEY FUNCTION .....	8-56
8.10.3	Spot Welding .....	8-57
8.10.3.1	AxP003: MAXIMUM NUMBER OF CONNECTED WELDERS .....	8-57
8.10.3.2	AxP004: GUN FULL OPEN STROKE ON/OFF SIGNAL .....	8-57
8.10.3.3	AxP005: STROKE CHANGE ANSWER TIME LIMIT .....	8-57
8.10.3.4	AxP006: PARITY SPECIFICATION FOR WELDING CONDITIONS ..	8-57
8.10.3.5	AxP007: ANTICIPATE TIME .....	8-58
8.10.3.6	AxP015: WELDING ERROR RESET OUTPUT TIME .....	8-58
8.10.3.7	AxP016, AxP017: tip WEAR AMOUNT ALARM VALUE .....	8-58
8.10.4	General-purpose Application .....	8-58
8.10.4.1	AxP009: WORK CONTINUE PROHIBIT .....	8-58
9	Spot Welding Application Using a Motor Gun .....	9-1
9.1	System Overview (Motor Gun) .....	9-1
9.2	Function Keys .....	9-3
9.3	Setting of Motor Gun .....	9-5
9.3.1	Posture of Motor Gun .....	9-6
9.3.2	Basic Configuration .....	9-6
9.3.3	Setting of Pulse to Stroke Conversion Data .....	9-6
9.3.4	Tentative Setting of Torque to Pressure Conversion Data .....	9-7
9.3.5	Register the Base Position for Wear Detection (Fixed Side) .....	9-9
9.3.6	Execution of Motor Gun Auto Tuning Function .....	9-10
9.3.7	Confirmation of Motor Gun Auto Tuning Operation Status .....	9-18
9.3.8	Clearance of MOTOR GUN AUTO TUNING Setting .....	9-19



9.3.9	Setting of Torque to Pressure Conversion Data .....	9-21
9.3.10	Alarm .....	9-22
9.4	System Setting (Motor Gun) .....	9-23
9.4.1	Gun Condition File .....	9-23
9.4.1.1	Entering Pulse to Stroke Conversion Data .....	9-28
9.4.1.2	Entering Torque to Pressure Conversion Data .....	9-28
9.4.2	I/O Signals for a Motor Gun .....	9-29
9.4.2.1	Major I/O signal (Motor Gun) .....	9-29
9.4.2.2	Welding I/F File .....	9-31
9.4.2.3	I/O Allocation .....	9-37
9.4.2.4	PSEUDO INPUT SIGNAL Window .....	9-40
9.4.3	Registering the Operation Tool .....	9-41
9.4.3.1	When Using a Single Arm Move Gun .....	9-41
9.4.3.2	When Using a Double Arm Move Gun .....	9-42
9.4.4	Setting the Software Limit Value .....	9-43
9.4.5	Setting the Lost-tip Detection Value .....	9-44
9.4.6	Gun Detail Setting File .....	9-45
9.4.7	Application Condition Setting .....	9-50
9.5	Before Teaching .....	9-56
9.5.1	Manual Spot .....	9-56
9.5.2	Manual Dry Spot .....	9-56
9.5.3	Manual Press .....	9-56
9.5.4	Open/Close of Motor Gun .....	9-57
9.5.5	Mounting Tips .....	9-57
9.5.6	Creation of Job .....	9-58
9.5.6.1	Job Creating Procedures for Pressure Instruction Registration .....	9-58
9.5.6.2	Registering Steps .....	9-60
9.6	Playback (Motor Gun) .....	9-61
9.6.1	Check Run .....	9-61
9.6.2	Execute Welding .....	9-61
9.7	Welding Instruction (SVSPOT Instruction) .....	9-62
9.7.1	Registration of Welding Instruction (SVSPOT Instruction) .....	9-62
9.7.2	Setting of Gun Pressure .....	9-63
9.7.3	Welding Current and Welding Time Settings .....	9-66
9.7.4	Gun Stroke Setting before Welding .....	9-66
9.7.4.1	Setting the Gun Stroke Position .....	9-66
9.7.4.2	Setting the Gun Stroke Motion Speed .....	9-67
9.7.4.3	Motion Example .....	9-67

9.8	Dry Spot (Motor Gun).....	9-68
9.8.1	Registration of Dry Spot Instruction (SVGUNCL Instruction).....	9-68
9.8.2	Dry Spot Pressure Setting .....	9-69
9.8.3	Workpiece Transfer Function Using a Motor Gun .....	9-72
9.8.3.1	Operation Flow Chart .....	9-72
9.8.3.2	Instruction for Grasping/Releasing Workpieces .....	9-73
9.8.3.3	Manual Operation for Grasping/Releasing Workpieces .....	9-75
9.9	Manual Pressure.....	9-76
9.10	Clearance Move Instruction (SVSPOTMOV Instruction) .....	9-79
9.10.1	Operation Flow .....	9-79
9.10.2	Setting the Teaching Type.....	9-80
9.10.3	Setting the Clearance Files.....	9-82
9.10.4	Operations for Teaching Welding Points .....	9-84
9.10.5	Clearance Move Instruction .....	9-86
9.10.6	Clearance Move.....	9-87
9.10.7	Press Teaching Function.....	9-89
9.10.7.1	Operation Flow Chart .....	9-89
9.10.7.2	Procedure for Registering the Position.....	9-90
9.10.7.3	Setting the Pressure Conditions .....	9-90
9.10.7.4	Setting the Gun Pushing Coefficient.....	9-91
9.10.8	Work Search Function .....	9-93
9.10.8.1	Operating procedures.....	9-93
9.10.8.2	Parameter.....	9-94
9.11	Tip Dressing Instruction (SVDRESMOV Instruction) .....	9-95
9.11.1	Operation Flow .....	9-95
9.11.2	Teaching Type Setting.....	9-96
9.11.3	Tip Dress Condition .....	9-96
9.11.4	Dressing Position Teaching Operation .....	9-100
9.11.5	Tip Dress Instruction.....	9-102
9.11.5.1	Tip Dress Instruction (SVDRESMOV) Flow.....	9-103
9.11.5.2	Suspend and Restart of the Tip Dress Operation.....	9-104
9.11.5.3	Individual Control Instruction to a Dresser and a Gun.....	9-104
9.11.5.4	Wear Detection with Tip Dressing Instruction.....	9-106
9.11.6	Dry Tip Dressing Operation .....	9-108
9.11.7	Tip Dress Supervision.....	9-109
9.12	Tip Wear Detection and Wear Compensation (Motor Gun).....	9-113
9.12.1	Wear Detection and Wear Compensation Operation Flow Chart.....	9-113
9.12.2	Wear Detection .....	9-114

9.12.2.1	Dry Spot Touch Motion.....	9-114
9.12.2.2	Movable Side Tip Detection .....	9-115
9.12.2.3	Example of Wear Detection .....	9-116
9.12.3	Spot Supervision Window Setting .....	9-117
9.12.4	Wear Compensation.....	9-122
9.12.5	Tip Wear Compensation for Fixed Gun.....	9-123
9.12.5.1	Setting the User Coordinates .....	9-123
9.12.5.2	User Coordinate Number Setting .....	9-124
9.12.5.3	Example of Compensation .....	9-125
9.12.6	Teaching Positions with a Worn Tip .....	9-126
9.12.6.1	Teaching Example .....	9-126
9.12.6.2	Parameters.....	9-126
9.12.7	Wear Amount Loading.....	9-127
9.12.8	Tip Mounting Position Error Detection.....	9-128
9.12.8.1	Tip Mounting Position Error Detection Flow Chart .....	9-129
9.12.8.2	Tip Mounting Position Error Detection.....	9-131
9.12.8.3	Job Examples.....	9-133
9.12.8.4	Importing the Tip Mounting Position Error.....	9-134
9.12.8.5	Monitoring the Failure of Mounting Tips .....	9-137
9.13	High Speed Spot Welding Function.....	9-138
9.13.1	High Speed Spot Welding Function.....	9-138
9.13.2	Changes by Validating this Function .....	9-138
9.13.3	Validating Method of High Speed Spot Welding Function.....	9-138
9.14	Other Functions Using a Motor Gun .....	9-140
9.14.1	Motor Gun Stroke .....	9-140
9.14.1.1	Registering the Full-open/Short-open Position.....	9-140
9.14.1.2	Registering the current position.....	9-141
9.14.1.3	Registering by entering a numerical value .....	9-141
9.14.1.4	Moving to Full-open/Short-open Position .....	9-142
9.14.1.5	Moving to Full-open/Short-open Position While Other Window is Displayed.....	9-142
9.14.2	Gun Change .....	9-143
9.14.2.1	Gun Change Instruction .....	9-143
9.14.2.2	Signal Status to Execute GUNCHG Instruction.....	9-143
9.14.2.3	Gun Change Job .....	9-145
9.14.2.4	Gun Changing Timing .....	9-147
9.14.3	Touch Teaching Function.....	9-148
9.14.3.1	Setting the Workpiece Thickness .....	9-148
9.14.3.2	Registering and Confirming Positions by Touch Teaching.....	9-151
9.14.4	Signal Dry Spot .....	9-152
9.14.4.1	Setting an Input Signal Number .....	9-152
9.14.5	Gun Pressure Compensation Function .....	9-154

9.14.5.1	Operation Flow Chart .....	9-154
9.14.5.2	Overview .....	9-155
9.14.5.3	Setting the Pressure Compensation Value.....	9-158
9.14.6	Compensation of Gun Arm Bend for C-Gun and X-Gun (SINGLE ARM MOVE) .....	9-160
9.14.6.1	Setting the Gun Arm Bend Compensation Coefficient .....	9-160
9.14.6.2	Compensation Example .....	9-161
9.14.6.3	Disabling Gun Arm Bend Compensation.....	9-162
9.14.7	Welding Conditions Group Output Function .....	9-163
9.14.7.1	Operation Flow Chart .....	9-163
9.14.7.2	Procedure for Assigning the Group Output Signal .....	9-163
9.14.7.3	Setting the Group Output Tag .....	9-165
9.14.7.4	Group Output.....	9-166
9.14.8	Workpiece Thickness Detection Function.....	9-167
9.14.8.1	Outline .....	9-167
9.14.8.2	Instruction .....	9-168
9.14.8.3	Operation Procedures .....	9-169
9.14.8.4	Related Functions .....	9-179
9.14.8.5	Notes .....	9-181
9.14.9	Automatic Tool Number Select Function for Guns .....	9-182
9.14.9.1	Setting of Validating the Function.....	9-182
9.14.9.2	Setting of Tool Number.....	9-182
9.15	Loading the DX100 Motor Gun Condition File .....	9-183
9.16	The Instruction List (Motor Gun) .....	9-188
10	Table of Basic Instructions .....	10-1
10.1	Move Instructions.....	10-1
10.2	I/O Instructions.....	10-4
10.3	Control Instructions .....	10-6
10.4	Shift Instructions .....	10-8
10.5	Operating Instructions.....	10-9

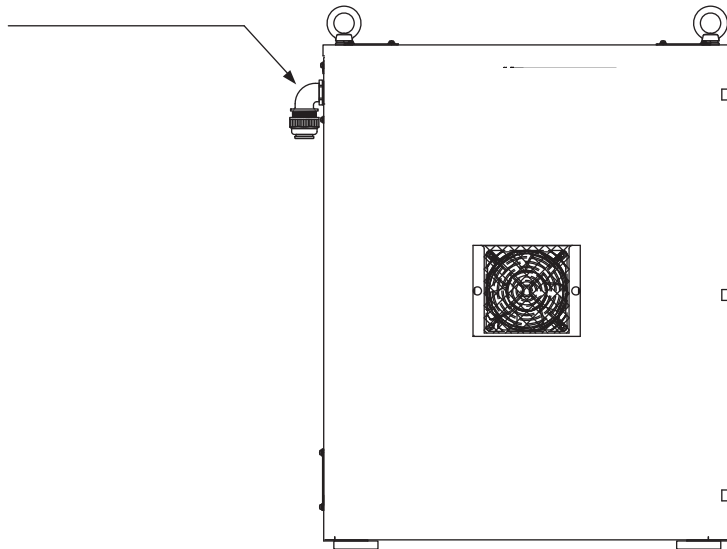
# 1 Introduction

## 1.1 DX200 Overview

The main power switch and the door lock are located on the front of the DX200 controller. The emergency stop button is installed in the upper right corner of the cabinet door and the programming pendant hangs from a hook below the button.

For information on setup, installation, and connection of the DX200 system, refer to the “DX200 INSTRUCTIONS”.

*Fig. 1-1(a): DX200 Front View*



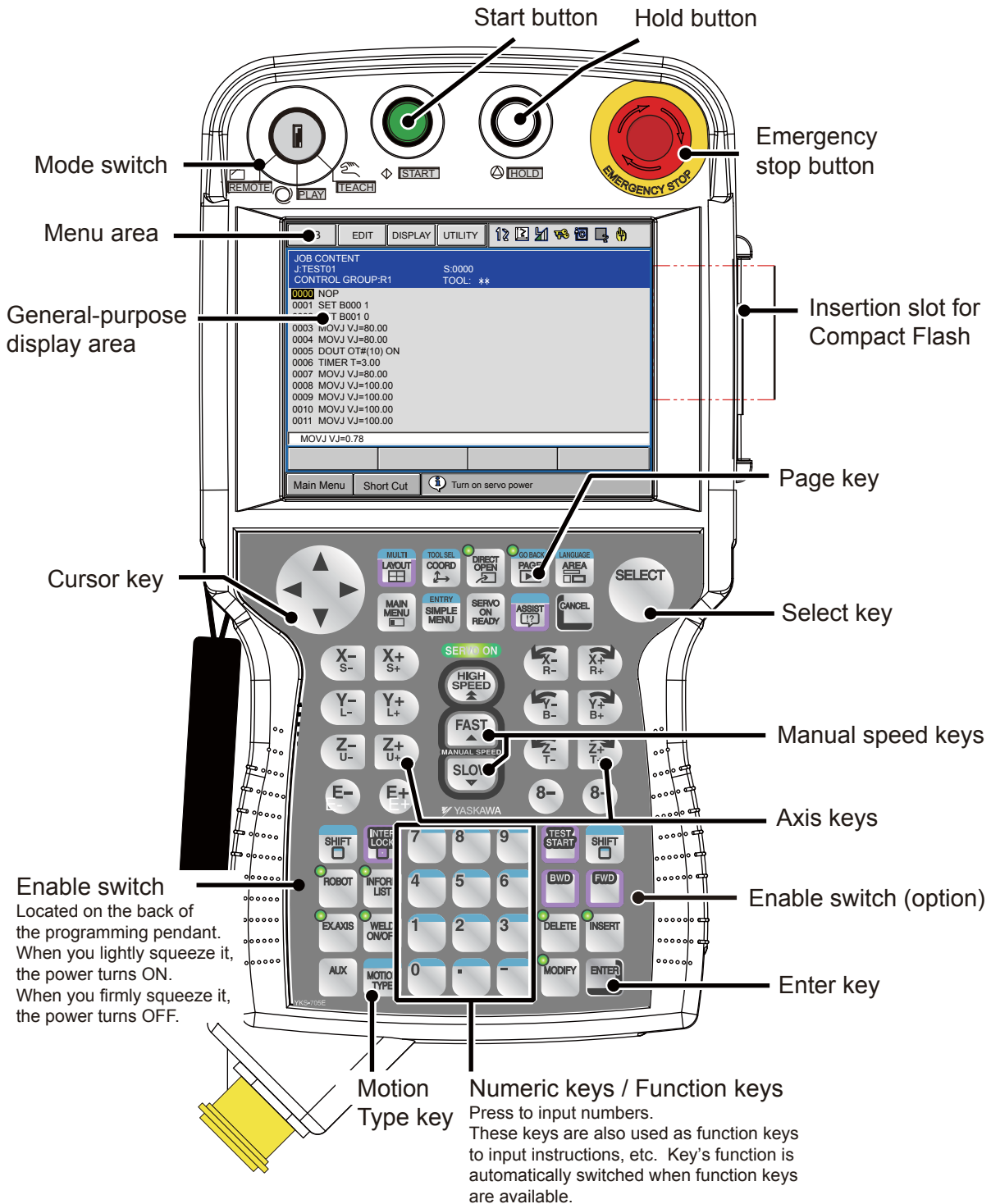
*Fig. 1-1(b): DX200 Front View (for Painting)*

## 1.2 Programming Pendant

### 1.2.1 Programming Pendant Overview


The programming pendant is equipped with the keys and buttons used to conduct manipulator teaching operations and to edit jobs.


Fig. 1-2: Programming Pendant Overview



## 1.2.2 Key Description

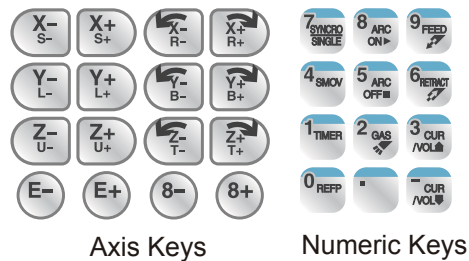
### 1.2.2.1 Character Keys / Symbol Keys

The keys which have character/symbol printed on them are denoted with [ ]. For example,  is shown as [ENTER].

The Numeric keys have additional functions along with their number values. Dual function keys are used in the context of the operation being performed. For example:  may be described in the text as [1] or [TIMER].

### 1.2.2.2 Axis Keys and Numeric Keys






The keys pictured in the following are referred to as the [Axis Key] and [Numeric Key] when described.








### 1.2.2.3 Keys Pressed Simultaneously





When two keys are to be pressed simultaneously, the keys are shown with a "+" sign between them, such as [SHIFT]+[COORD].






## 1.2.3 Programming Pendant Keys






<p>[START]</p> 	<p><b>Starts the manipulator motion in playback operation.</b></p> <ul style="list-style-type: none"> <li>The lamp on this button is lit during the play operation.</li> </ul> <p>The lamp also lights when the playback operation is started by the system input START signal. The lamp turns OFF when the playback operation is stopped by alarm occurrence, HOLD signal, or mode change.</p>
<p>[HOLD]</p> 	<p><b>Holds the manipulator motion.</b></p> <ul style="list-style-type: none"> <li>This button is enabled in any mode.</li> <li>The lamp on this button is lit only while the button is being pressed. Although the lamp turns OFF when the button is released, the manipulator stays stopped until a START command is input.</li> <li>The HOLD lamp automatically lights in the following cases to indicate that the system is in HOLD status. The start and axis operations are disabled while the lamp is lit. <ol style="list-style-type: none"> <li>The HOLD signal of system input is ON.</li> <li>The HOLD request is being sent from an external device in remote mode.</li> <li>In the HOLD status caused by an error occurred in working process such as wire sticking at arc welding.</li> </ol> </li> </ul>
<p>[E.STOP] button</p> 	<p><b>Turns OFF the servo power.</b></p> <ul style="list-style-type: none"> <li>When the servo power is turned OFF, the SERVO ON LED on the programming pendant will extinguish.</li> <li>An emergency stop message is displayed on the screen.</li> </ul>
<p>[MODE]</p> 	<p><b>Selects the Play mode, Teach mode, or Remote mode.</b></p> <hr/> <p>PLAY: Play Mode The playback of taught job is enabled. The START signal from an external device is disabled.</p> <hr/> <p>TEACH: Teach Mode The axis operation and edition from the programming pendant are enabled. The START signal from an external device is disabled.</p> <hr/> <p>REMOTE: Remote Mode The operation by external signals is enabled. [START] is invalid during the remote mode.</p>
<p>Enable Switch</p> 	<p><b>Turns ON the servo power.</b></p> <p>When the Enable Switch is lightly squeezed while the SERVO ON LED is blinking and the Mode Switch is set to "TEACH", the power is turned ON. And when this switch is released or firmly squeezed while the power is turned ON, the power turns OFF.</p>







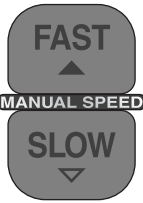



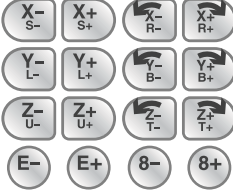

<p><b>[SELECT]</b></p> 	<p><b>Works as described below.</b></p> <ul style="list-style-type: none"> <li>• Selects menu items in {Main Menu} area and the menu area.</li> <li>• Makes the selected item ready to be set in the general-purpose display area.</li> <li>• Displays multiple messages in the human interface display area.</li> </ul>
<p><b>Cursor</b></p> 	<p><b>Moves the cursor in the direction of the arrow.</b></p> <ul style="list-style-type: none"> <li>• The size of the cursor and the range/place where the cursor can move will vary depending on the window.</li> <li>• If the UP cursor button is pressed when the cursor is on the first line, the cursor will move to the last line of the job. Conversely, if the cursor is on the last line of the job and the DOWN cursor button is pressed, the cursor will jump to the first line of the job.</li> </ul> <p>[SHIFT] + UP Scrolls the screen upward.</p> <p>[SHIFT] + DOWN Scrolls the screen downward.</p> <p>[SHIFT] + RIGHT Scrolls the screen to the right.</p> <p>[SHIFT] + LEFT Scrolls the screen to the left.</p>
<p><b>[MAIN MENU]</b></p> 	<p><b>Displays {Main Menu}.</b></p> <p>If this key is pressed while {Main Menu} is displayed, {Main Menu} disappears.</p> <p>[MAIN MENU] + UP Increases the brightness of the screen.</p> <p>[MAIN MENU] + DOWN Decreases the brightness of the screen.</p>
<p><b>[SIMPLE MENU]</b></p> 	<p><b>Displays the simple menu.</b></p> <p>If this key is pressed while the simple menu is displayed, the simple menu disappears.</p> <p>[SHIFT] + [SIMPLE MENU] Register the layout displayed in the general-purpose area to the user definition menu.</p> <p>Press [SIMPLE MENU] for three seconds to display the pop-up menu window.</p>
<p><b>[SERVO ON READY]</b></p> 	<p><b>Enables the servo power supply to be turned ON.</b></p> <p>Press this key to enable the servo power supply to be turned ON if the servo power supply is shut OFF by the emergency stop or overrun signal.</p> <p>When this key is pressed:</p> <ul style="list-style-type: none"> <li>• In the play mode, the servo power supply is turned ON if the safeguarding is securely closed.</li> <li>• In the teach mode, the SERVO ON lamp flashes and the servo power supply is turned ON when the Enable switch is ON.</li> <li>• The SERVO ON lamp is lit while the servo power is ON.</li> </ul>

<p><b>[ASSIST]</b></p> 	<p><b>Displays the menu to assist the operation for the currently displayed window.</b> Pressing this key with [SHIFT] or [INTERLOCK] displays the help guidance for the operation.</p> <ul style="list-style-type: none"> <li>• [SHIFT] + [ASSIST] The function list of key combinations with [SHIFT] appears.</li> <li>• [INTERLOCK] + [ASSIST] The function list of key combinations with [INTERLOCK] appears.</li> </ul>
<p><b>[CANCEL]</b></p> 	<p><b>Cancels the current status.</b></p> <ul style="list-style-type: none"> <li>• Deletes the sub menu in {Main Menu} area and the menu area.</li> <li>• Cancels the input data or the input status in the general-purpose display area.</li> <li>• Cancels the multiple views in the human interface display area.</li> <li>• Cancels the occurred error.</li> </ul>
<p><b>[MULTI]</b></p> 	<p><b>Works for the multi mode.</b> If this button is pressed when the multi mode is ON, the active window switches.</p> <p>[SHIFT] + [MULTI] Switches between the multi-window display and the single-window display when the multi mode is ON.</p>
<p><b>[COORD]</b></p> 	<p><b>Select the operation coordinate system when the manipulator is operated manually.</b></p> <ul style="list-style-type: none"> <li>• The coordinates can be selected from the six coordinate systems, such as joint, cartesian, cylindrical, tool, user and teaching line. Each time this key is pressed, the coordinate system is switched in the following order: "JOINT"→"WLD/CYL"→"TOOL"→"USER"→"TEACHING LINE (only for arc welding purpose)"</li> <li>• The selected coordinate system is displayed on the status display area.</li> </ul> <p>[SHIFT] + [COORD] The coordinate number can be changed when the "TOOL" or "USER" coordinate system is selected.</p>

<p><b>[DIRECT OPEN]</b></p> 	<p><b>Displays the content related to the current line.</b></p> <ul style="list-style-type: none"> <li>To display the content of a CALL job or condition file, move the cursor to the next line and press [DIRECT OPEN]. The file will be displayed for the selected line. Display content will vary depending on the type of instruction used in the job.</li> </ul> <p>Example: For a CALL instruction, the content of the called job will be displayed. For a work instruction, the content of the condition file will be displayed. For Input/output instructions, the input/output condition will be displayed.</p> <ul style="list-style-type: none"> <li>The lamp on this button is lit while the direct open is ON. Press this button while the lamp is lit to return to the previous window.</li> </ul>
<p><b>[PAGE]</b></p> 	<p><b>Displays the next page.</b></p> <p>The page can be switched only when the lamp on this button is lit.</p> <p>[SHIFT] + [PAGE] Switches to the previous page.</p>
<p><b>[AREA]</b></p> 	<p><b>Moves the cursor 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.</b></p> <p>[SHIFT] + [AREA] The language can be switched when the bilingual function is valid. (Bilingual function is optional.) [AREA] + DOWN Moves the cursor from the general-purpose display area to the operation button when the operation button is displayed. [AREA] + UP Moves the cursor to the general-purpose display area when the cursor is on the operation button.</p>
<p><b>[SHIFT]</b></p> 	<p><b>Changes the functions of other keys by pressing together.</b></p> <p>Can be used with [SIMPLE MENU], [ASSIST], [MULTI], [COORD], [AREA], [MOTION TYPE], [ROBOT], [EX. AXIS], the cursor or [Numeric Key] to access alternate functions.</p> <p>Refer to the description of each key for the alternate [SHIFT] functions.</p>
<p><b>[INTERLOCK]</b></p> 	<p><b>Changes the functions of other keys by pressing together.</b></p> <p>Can be used with [ASSIST], [TEST START], [FWD], or [Numeric Key] (Numeric key customize function), [ROBOT].</p> <p>Refer to the description of each key for the alternate [INTERLOCK] functions.</p>

<p><b>[INFORM LIST]</b></p> 	<p><b>Displays instruction lists of commands available for job editing.</b></p>
<p><b>[ROBOT]</b></p> 	<p><b>Enables the robot axis operation.</b></p> <p>[ROBOT] is active for the system where multiple manipulators are controlled by one DX200 or the system with external axes.</p> <p>[SHIFT] + [ROBOT] The robot under axis operation can be switched to a robot axis which is not registered to the currently selected job.</p> <p>[INTERLOCK] + [ROBOT] Switches the application when several applications are set to a robot.</p>
<p><b>[EX. AXIS]</b></p> 	<p><b>Enables the external axis (base axis or station axis) operation.</b></p> <p>[EX.AXIS] is active for the system with external axes.</p> <p>[SHIFT] + [EX. AXIS] The external axis under axis operation can be switched to an external axis which is not registered to the currently selected job.</p>
<p><b>[MOTION TYPE]</b></p> 	<p><b>Selects the interpolation type for playback operation.</b></p> <p>The selected interpolation type is shown in the status display area on the screen.</p> <ul style="list-style-type: none"> <li>Each time this key is pressed, the interpolation type changes in the following order: "MOVJ"→" MOVL"→"MOV C"→"MOV S"</li> </ul> <p>[SHIFT] + [MOTION TYPE] The interpolation mode changes in the following order: "STANDARD"→" EXTERNAL REFERENCE POINT"*→" CONVEYOR"*</p> <p>Interpolation type can be changed in any mode.</p> <p>*: These modes are purchased options.</p>
<p><b>[TEST START]</b></p> 	<p><b>Moves the manipulator through taught steps in a continuous motion when [TEST START] and [INTERLOCK] are simultaneously pressed.</b></p> <p>The manipulator can be moved to check the path of taught steps. Operation stops immediately when this key is released.</p> <ul style="list-style-type: none"> <li>The manipulator operates according to the currently selected operation cycle: "AUTO", "1CYCLE", or "STEP".</li> <li>The manipulator operates at the taught speed. However, if the taught speed exceeds the maximum teaching speed, the operation proceeds at the maximum teaching speed.</li> </ul>

<p><b>[FWD]</b></p> 	<p><b>Moves the manipulator through the taught steps while this key is pressed.</b></p> <ul style="list-style-type: none"> <li>• Only move instructions are executed (one instruction at a time, no welding instructions).</li> </ul> <p>[INTERLOCK] + [FWD] All instructions are executed.</p> <p>[REFP] + [FWD] Moves to the reference point of the cursor line. See section 3.3.1.3 "Moving to Reference Point" on page 3-27.</p> <p>The manipulator operates at the selected manual speed. Make sure that the selected manual speed is the desired one before starting operation.</p>
<p><b>[BWD]</b></p> 	<p><b>Moves the manipulator through the taught steps in the reverse direction while this key is pressed.</b></p> <ul style="list-style-type: none"> <li>• Only move instructions are executed (no weld commands).</li> </ul> <p>The manipulator operates at the selected manual speed. Make sure that the selected manual speed is the desired one before starting operation.</p>
<p><b>[DELETE]</b></p> 	<p><b>Deletes the registered instruction.</b></p> <ul style="list-style-type: none"> <li>• Deletion completes when [ENTER] is pressed while this key lamp is lit.</li> </ul>
<p><b>[INSERT]</b></p> 	<p><b>Inserts a new instruction.</b></p> <ul style="list-style-type: none"> <li>• Insertion completes when [ENTER] is pressed while this key lamp is lit.</li> </ul>
<p><b>[MODIFY]</b></p> 	<p><b>Modifies the taught position data or instruction.</b></p> <ul style="list-style-type: none"> <li>• Modification completes when [ENTER] is pressed while this key lamp is lit.</li> </ul>
<p><b>[ENTER]</b></p> 	<p><b>Registers instructions, data, current position of the manipulator, etc.</b></p> <ul style="list-style-type: none"> <li>• When [ENTER] is pressed, the instruction or data displayed in the input buffer line moves to the cursor position to complete a registration, insertion, or modification.</li> </ul>
<p><b>[MANUAL SPEED]</b></p> 	<p><b>Sets the speed for manual operation. This speed is also valid for operations with [FWD] and [BWD].</b></p> <ul style="list-style-type: none"> <li>• There are four speed levels (slow, medium, fast, and inching). The speed changes as described below.</li> </ul> <p>The selected speed is displayed on the status area.</p> <p>Each time [FAST] is pressed, manual speed changes in the following order: "INCH"→"SLOW"→"MED"→"FST".</p> <p>Each time [SLOW] is pressed, manual speed changes in the following order: "FST"→"MED"→"SLOW"→"INCH"</p>

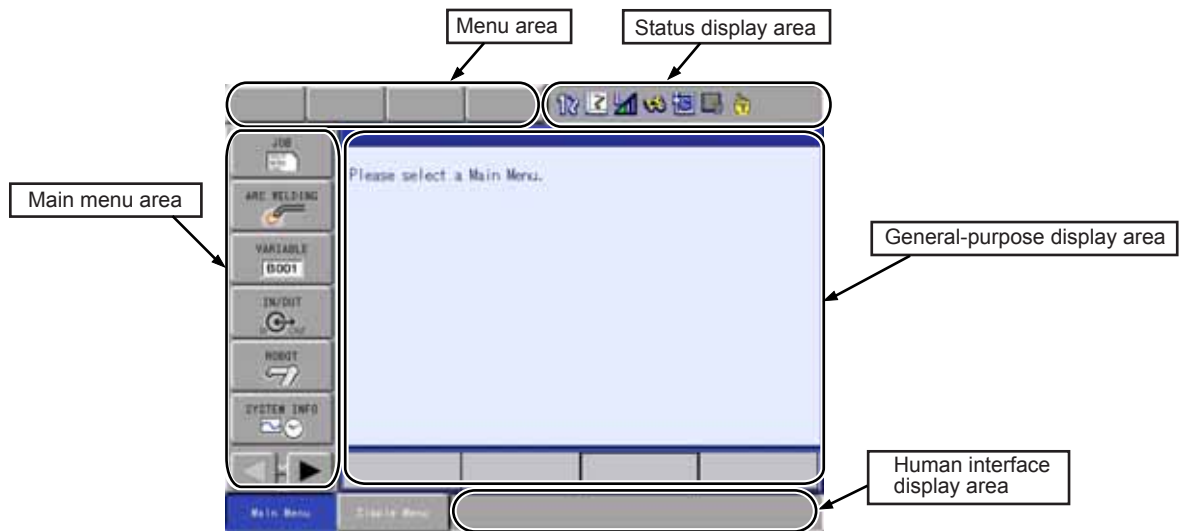
<p><b>[HIGH SPEED]</b></p> 	<p><b>Makes the manipulator move at high speed while this button and one of the axis keys are pressed simultaneously during manual operation. No need to change the setting of speed.</b></p> <ul style="list-style-type: none"> <li>The speed for [HIGH SPEED] is specified in advance.</li> </ul>
<p><b>[Axis Key]</b></p> 	<p><b>Moves specified axes on manipulator.</b></p> <ul style="list-style-type: none"> <li>The manipulator axes only move while the key is pressed.</li> <li>Multiple axes can be operated simultaneously by pressing two or more keys at the same time.</li> </ul> <p>The manipulator operates in the selected coordinate system at the selected manual speed. Make sure that the selected coordinate system and the manual speed are the desired ones before starting the axis operation.</p> <p>It is possible to allocate any external axes to [E-] + [E+], [8-] + [8+] keys to operate them. Refer to <i>section 6.9 "Jog Key Allocation" on page 6-101.</i></p>
<p><b>[Numeric Key]</b></p> 	<p><b>Enters the number or symbol when the "&gt;" prompt appears on the input line.</b></p> <ul style="list-style-type: none"> <li>“.” is the decimal point. “-” is a minus sign or hyphen.</li> </ul> <p>[Numeric Key] is also used as function keys. Refer to the explanation of each function for details.</p>

### 1.2.4 Programming Pendant Display

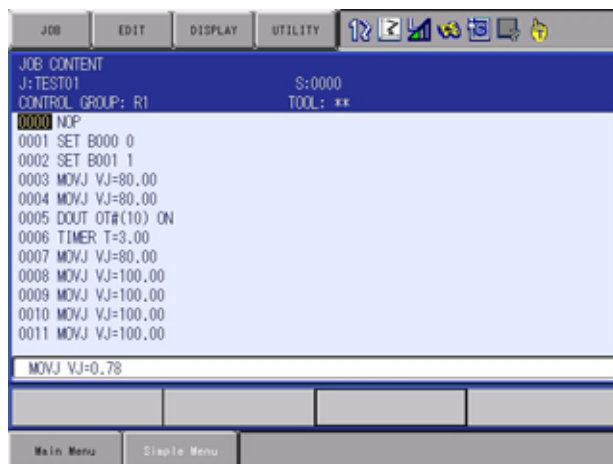
The programming pendant display is a 5.7 inch color display. Alphanumeric characters can be used.

#### 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.



## 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.

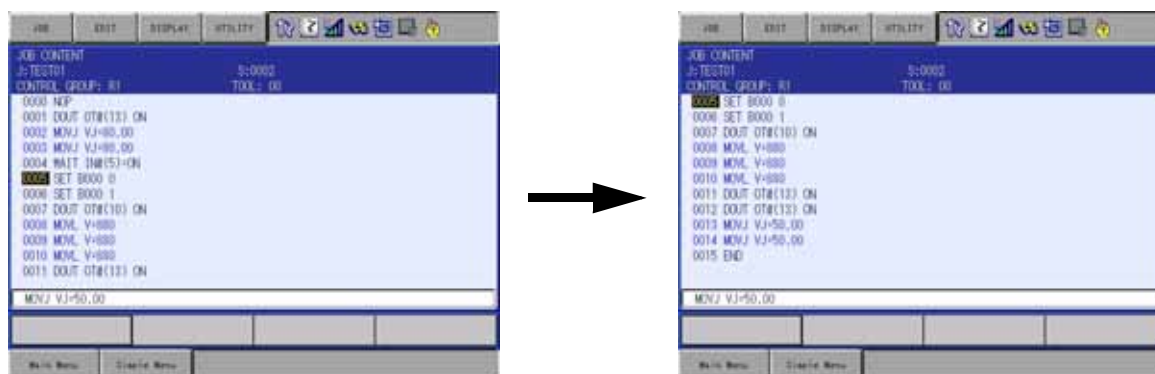
### ■ Scrolling the window

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 *section 1.2.3 "Programming Pendant Keys" on page 1-4.*
- Scrolling the window by touch operation:  
While touching the general-purpose display area, move it up and down or sideways, and release the touch.

(ex.) Touch the job window and slide it upwards (Scrolling towards the lower part of the window).





### ■ Moving the cursor

The cursor may be displayed on some windows. Follow the procedure below to move the cursor position.

- Moving the cursor using the cursor:  
Refer to section 1.2.3 “Programming Pendant Keys” on page 1-4.
- Moving the cursor by touch operation:  
Touch the position available for cursor moving in the general-purpose display area, and release the touch.

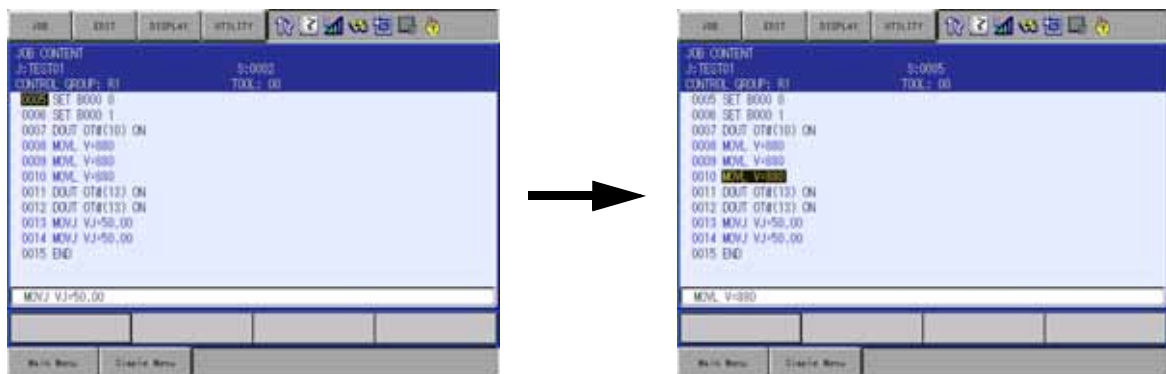
When the cursor by touch operation in the job window is moved, it is necessary to perform the following operations. (Operations can be switched by parameters.)

- (1) Press [INTERLOCK] + Touch operation
- (2) Touch operation + Confirming dialog
- (3) Cannot move the cursor by touch operation.

- (1) Press [INTERLOCK] + method of touch operation

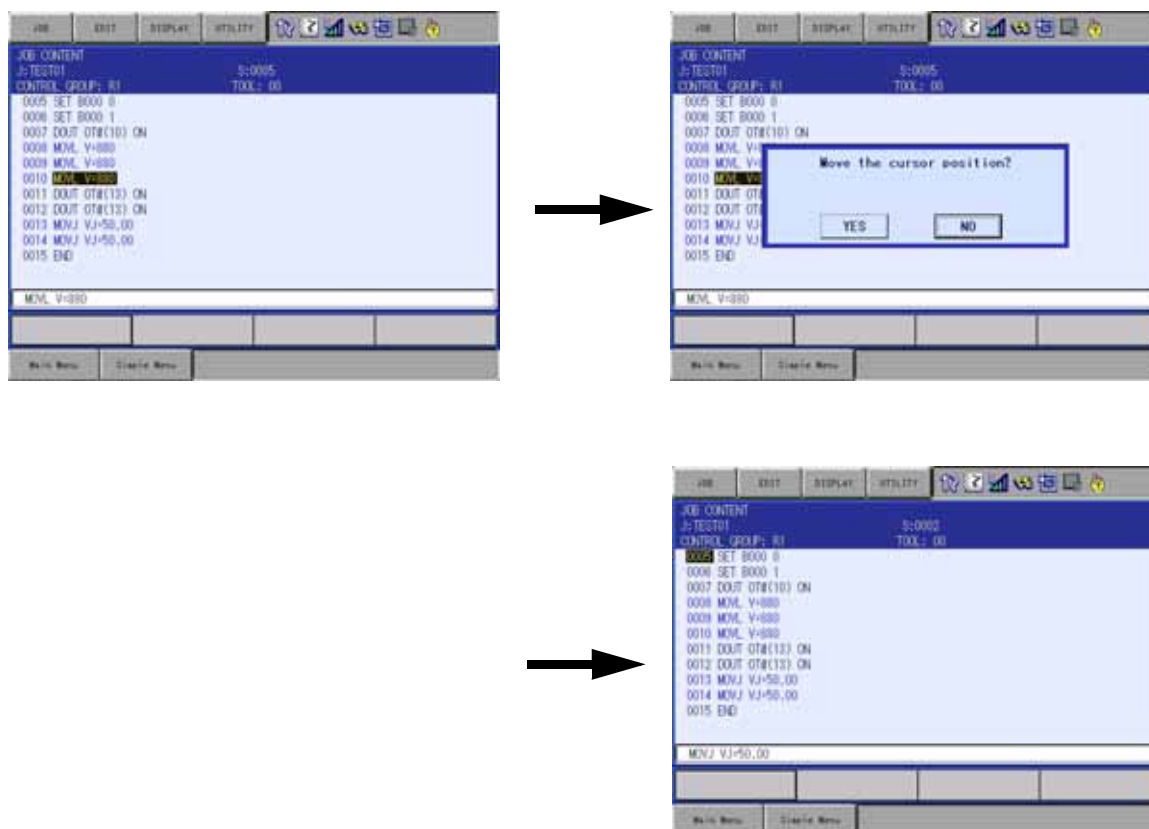
1.Set the cursor moving specification (S2C1204) to 0 by touch operation on the job window.

2.While pressing [interlock], touch the position available for cursor moving on the job window.



## (2) Touch operation + method of confirmation dialog

1. Set the cursor moving specification (S2C1204) to 1 by touch operation on the job window.
2. Touch the position available for cursor moving on the job window.
3. Select "YES" for the cursor moving confirmation dialog box.



- Page switching

When the [PAGE] lamp light is ON, the pages can be switched.

Follow the procedure below to switch the pages.

- Page switching by [PAGE]:  
Refer to section 1.2.3 "Programming Pendant Keys" on page 1-4.
- Displaying the next page by touch operation:  
While touching the general-purpose display area, move it to the left side, and release the touch.
- Displaying the previous page by touch operation:  
While touching the general-purpose display area, move it to the right side, and release the touch.

### ■ Operation buttons

On some windows, the operation button appears.

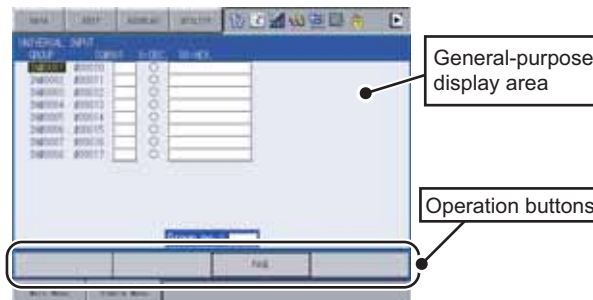
The operation process can be executed by pressing [SELECT] or by touching operation.

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

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

For the operation in the operation button area, use [←] or [→] and press [SELECT]

- EXECUTE : Continues operation displayed in the general-purpose area with the displayed contents.
- CANCEL : Cancels the contents in the general-purpose area and returns to the previous window.
- COMPLETE : Completes the setting operation displayed on the general-purpose display area.
- STOP : Stops operation when loading, saving, or verifying with an external memory device.
- RELEASE : Releases the overrun and shock sensor function.
- RESET : Resets an alarm. (Cannot reset major alarms.)
- PAGE : On the page that can be switched by specifying the page number, directly input the desired page number and press [ENTER].



- On the page where a list is selected, select a desired page number on the list by pressing [↓] or [↑], and then press [ENTER].

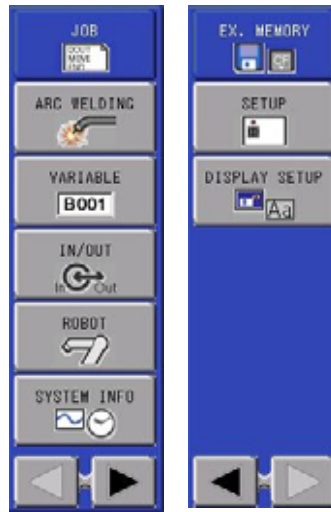




- To disable touching operation in the general-purpose display area, change the parameter S2C1203 (Touch operation function specifications in the general-purpose area).  
Refer to *section 8.3.0.49 "S2C1203: TOUCH OPERATION FUNCTION IN GENERAL-PURPOSE DISPLAY AREA"* on page 8-31
- To switch the cursor moving method by touch operation on the job window, change the parameter S2C1204 (Cursor moving specifications by touch operation on the job window).  
Refer to *section 8.3.0.50 "S2C1204: CURSOR MOVEMENT FUNCTION BY TOUCH OPERATION ON JOB WINDOW"* on page 8-31

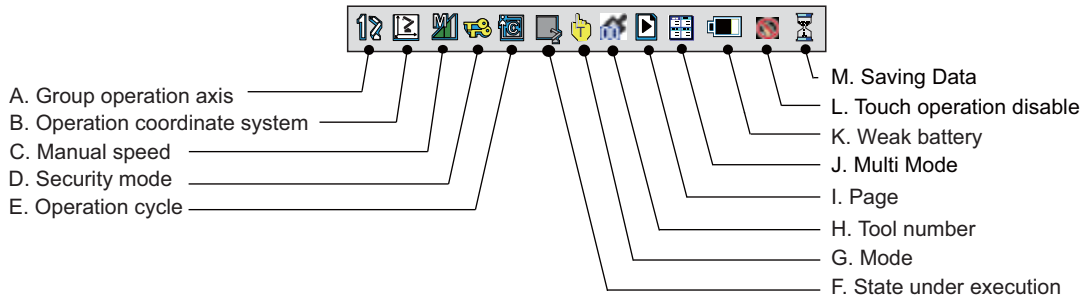
1.2.4.3 Main Menu Area

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



1.2.4.4 Status Display Area

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 for systems equipped with station axes or several robot axes.

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)


**C. Manual Speed**

Displays the selected speed. For details, refer to *section 2.2.0.5 "Select Manual Speed" on page 2-4.*


 : 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. State Under Execution**


Displays the present system status (STOP, HOLD, ESTOP, ALARM, or RUN).

 : Stop Status


 : Hold Status


 : Emergency Stop Status

 : Alarm Status



 : Operating Status

**G. Mode**


 : Teach mode

 : Play mode


**H. Tool Number**

From  to  : Displayed the tool No. which is chosen by a robot when the tool No. switch function is valid. (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 Panel Operation Disable**

 : Displayed the touch panel operation is disabled.

 : Displayed when the battery of memory is weak and the touch panel operation is disabled.

**M. Saving Data**


 : Displayed while saving the data.

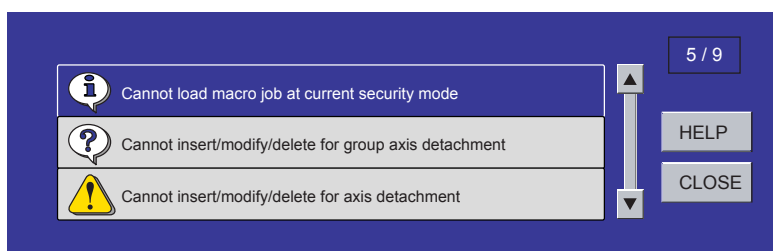
## 1.2.4.5 Human Interface Display Area

An error(s) or a message(s) is displayed in the human interface display area.



When an error is displayed, operations cannot be performed until the error is canceled. Press [CANCEL] to allow for operations.

When two or more errors occur,  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

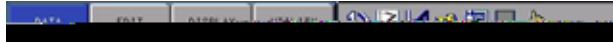
The menu area is used to edit a job, manage jobs, and execute various utilities.





### 1.2.5 Screen Descriptions

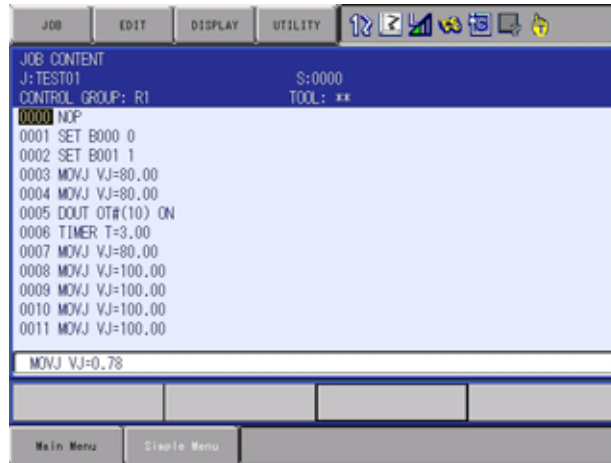
- The menu displayed in the programming pendant is denoted with { }.



The above menu items are denoted with {DATA}, {EDIT}, {DISPLAY}, AND {UTILITY}.

- The window can be displayed according to the view desired.

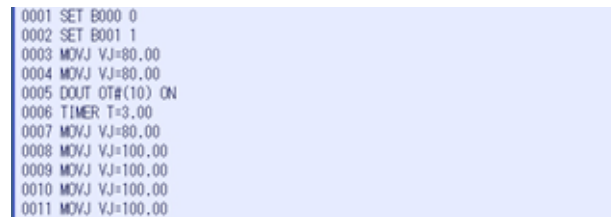
#### Full Window View



#### Upper Window View



#### Middle 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**

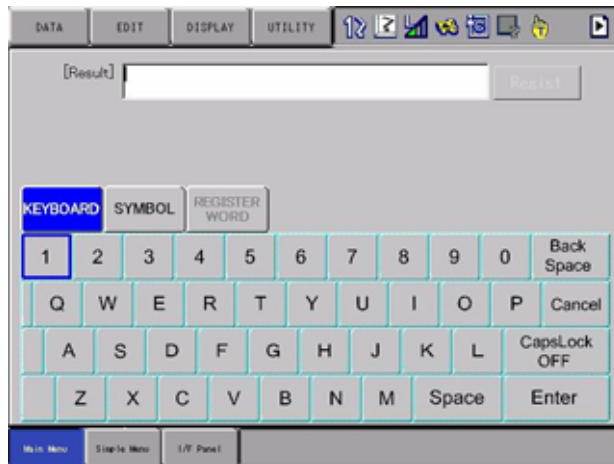
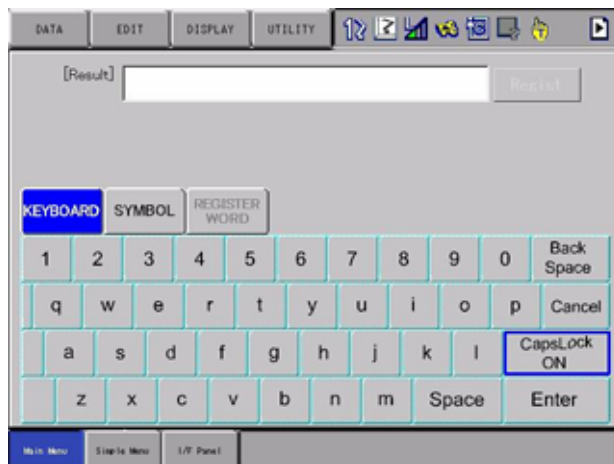
Keypad	Button on the Programming Pendant	Explanation
Cursor		Moves the cursor (focus).
[SELECT]		Selects a character.
[CANCEL]		Clears all the characters being typed. Pressing this second time cancels the software keypad.
[ENTER]		Enters the input characters.
Button Tab		Switches the keypads displayed on the programming pendant.
-		Closes the software keypad.
Numeric Keys		Enters numbers.

## 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 (-).

Note however, that the decimal point cannot be used in job names.

Press the [PAGE] to display the alphanumeric input window. Move the cursor to the desired letter and press [SELECT] to enter the letter.

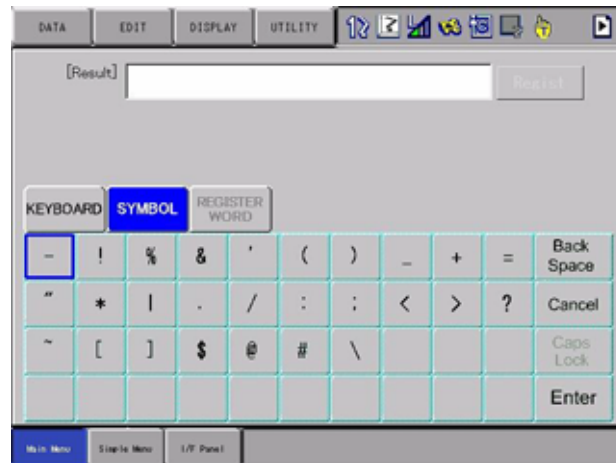
*For Numbers and Upper-case Characters**For Numbers and Lower-case Characters*

## 1.2.6.4 Symbol Input

Press the [PAGE] to display the symbol input window.

Move the cursor to the 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], it is able to move a cursor position by pressing [Shift]+[ → ] or [Shift]+[ ← ].

## 1.2.6.5 Register Word Function

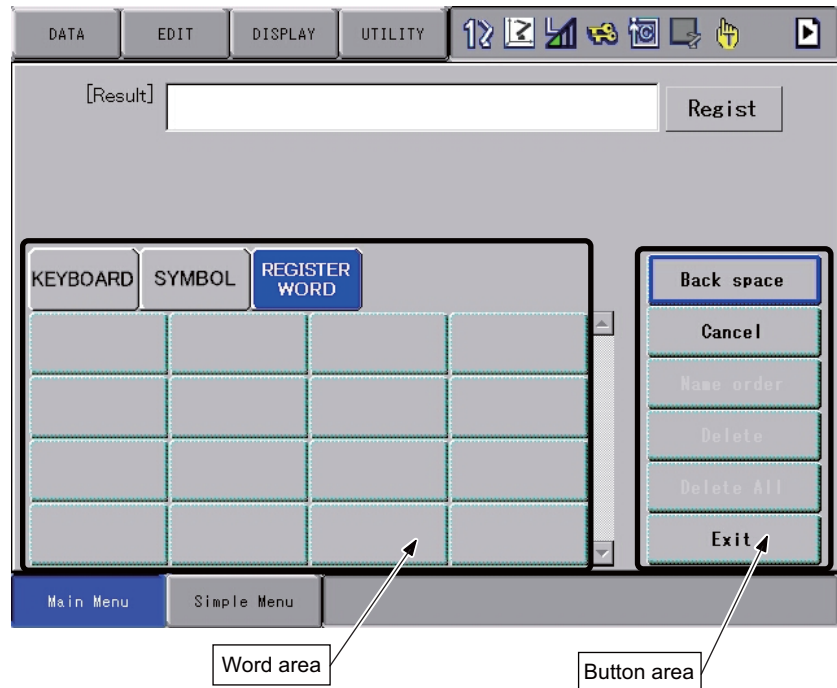
This function enables to use the registered word when input a character by registering the word (character string) in advance. To use this function simplifies to input the same character strings. It is able to register the 32 words of eight characters.



There is a limit to enter the character by input contents. If a registered word includes a limited character, it is unable to use the word.  
e.g. Unable to use the lower case characters, a decimal point and symbols to the job name.

Select {SET WORD} from {SETUP} in {Main Menu}.

- Register word window is displayed
- The registered words are displayed in the word area.
- If there is not any registered word, unable to select [Name order], [Delete] and [Delete All] in the button area.

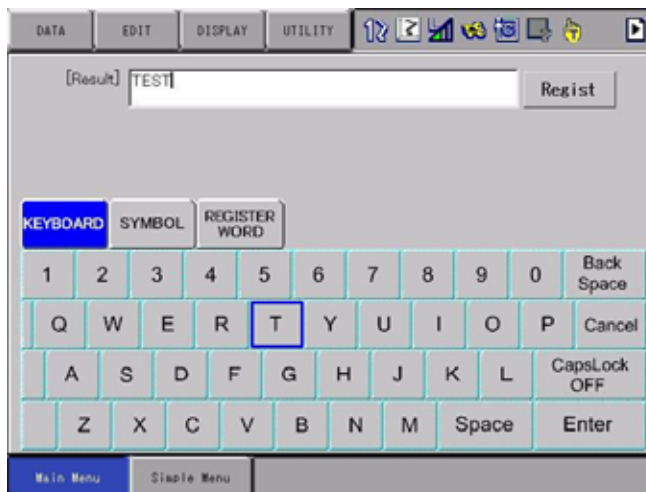


### ■ Word Registration

It is able to register the 32 words of eight characters.  
Register a word by selecting [REGISTER WORD] button while the word editing is valid (S2C410=1) during using the keyboard, or register the word in the word register screen.

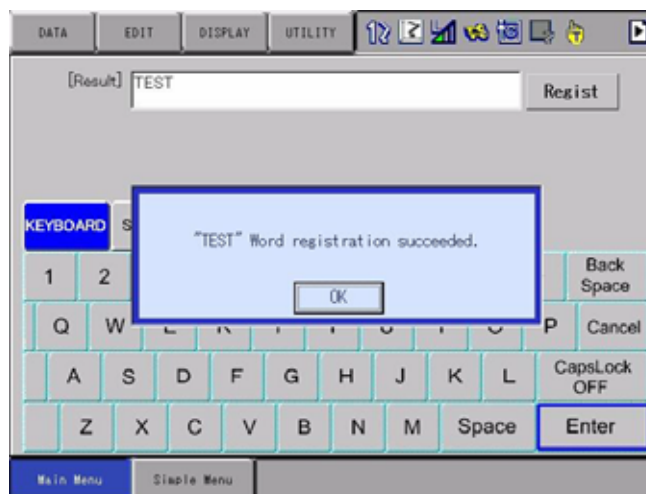
e.g. Register the word "TEST".

Select {KEYBOARD}.



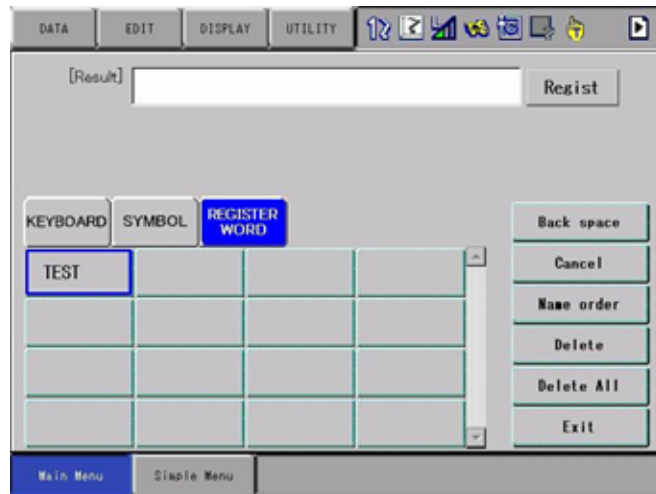
Enter "TEST" by using the keyboard, and select "Regist".

– The dialog box appears.



Select [REGISTER WORD].

- The word area appears.
- Confirm that [{TEST}] is in the word area.



#### ■ Back Space

Delete the last character of the input character string.

Select {Back space} in the word register screen.

- Delete the last character of the input character string.

#### ■ Cancel

Cancel the input character string.

Select {Cancel} in the word register screen.

- Cancel the character string if there is a character string is input.
- End the word register screen if there is not any character string.

### ■ Use of Words

e.g. Use the registered word {TEST}.

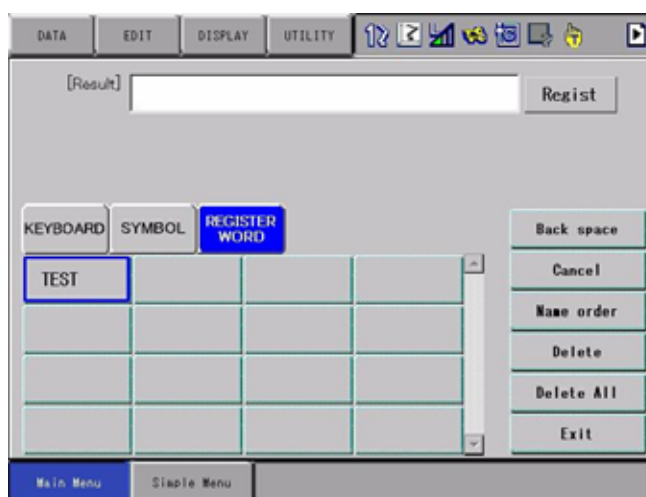
Select {REGISTER WORD}.

- The word area is displayed.



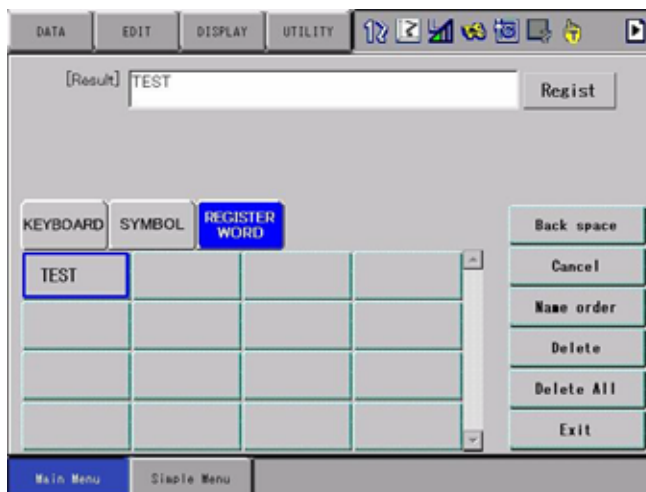
There is a limit to enter the character by input contents. If a registered word includes a limited character, it is unable to use the word.

e.g. Unable to use the lower case characters, a decimal point and symbols to the job name.



Select {TEST} in the word area.

- The registered word “TEST” appears in the input area.

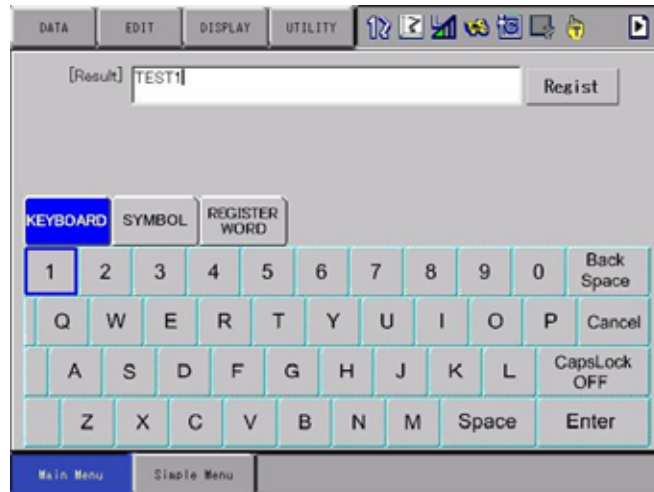


Select {KEYBOARD}.

Move the focus to “1” by the programming pendant, and press [Select].

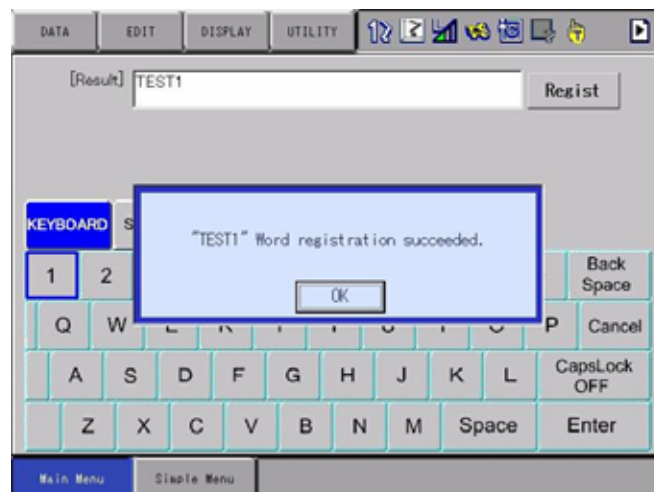


- The “1” is added after “TEST” is displayed in the {Result}.



While “TEST1” is displayed in the {Result}, select {Register}.

The dial box, which says {“TEST1” Word registration succeeded.} appears, and the registration is completed.



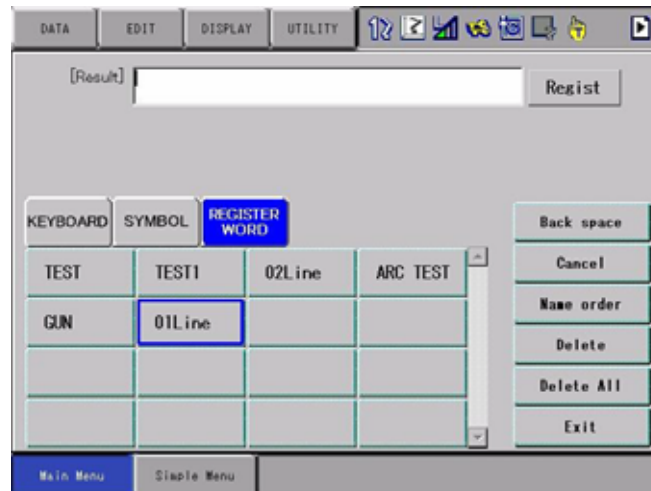
■ **Change the Arrangement of the Words to Display**

Able to change the arrangement of the words to display.

1. Name order display

Select {Name Order} in the button area.

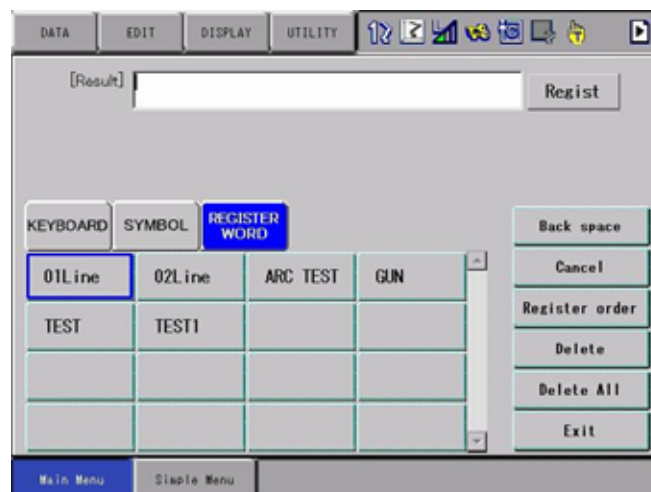
- Displayed by the name order of the words.
- {Name Order} button changes to {Register order} button.



2. Register order display

Select {Register order} in the button area.

- Displayed by the register order of the words.
- {Register order} button changes to {Name Order} button.



### ■ Delete the Word

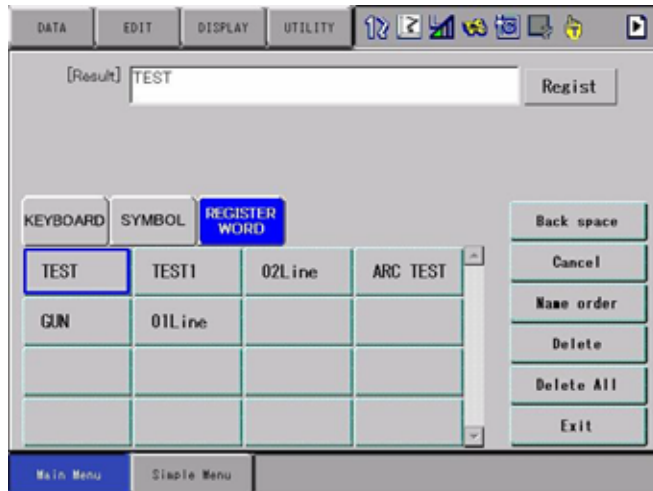
Able to delete the registered words.

Delete the words while the word editing is valid (S2C410=1) during using the keyboard, or delete the word in the word register screen.

e.g. Delete registered word "TEST".

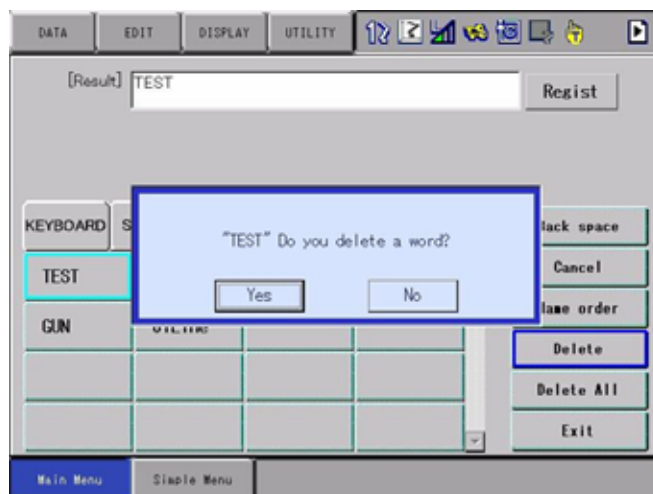
Select {REGISTER WORD}.

The word area appears.



Select "TEST" in the word area, and select {Delete} in the button area.

– The dialog box, which asks "TEST" Do you delete a word?, appears.



Select "Yes".

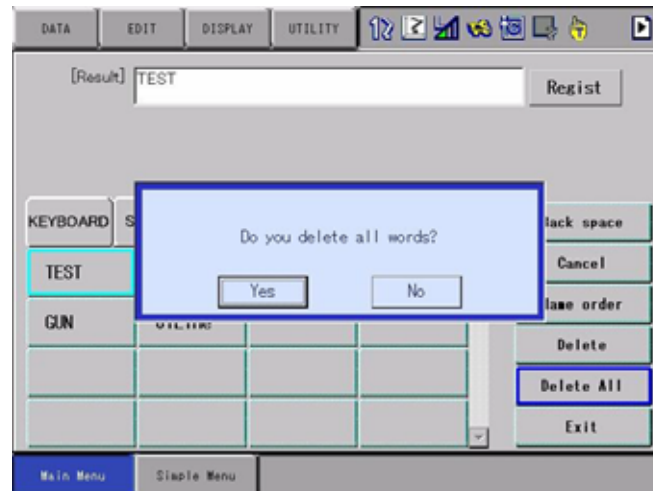
"TEST" in the word area is deleted.

**■ Delete All Words**

Able to delete all registered words.

Delete while the word editing is valid (S2C410=1) during using the keyboard, or delete the word in the word register screen.

- Delete all registered words.  
Select {Delete All} in the button area.
- The dialog box, which asks “Do you delete all words?”, appears.



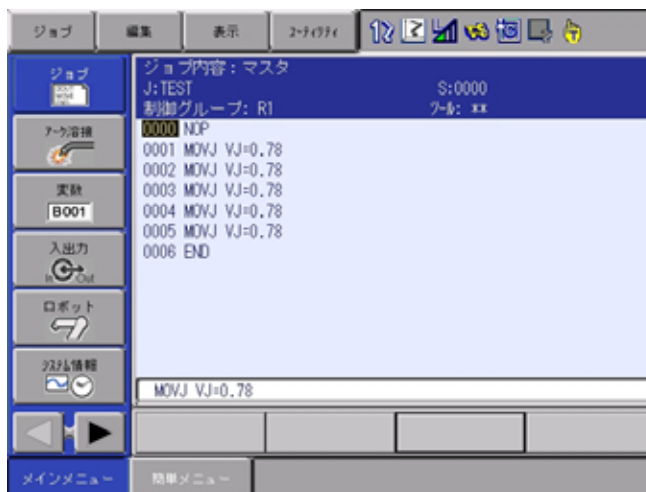
Select “Yes”.

- The all words are deleted.

### 1.2.7 Bilingual Function

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

1. Press [SHIFT] + [AREA]



English and Japanese can be 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 operations, and when a confirmation dialog is on the window.
- During axis operation, next-back or test mode in the teach mode.
- Actual job names, other names and comments: the registered names and comments would remain.

## 1.3 Mode

The following three modes are available for DX200.

- 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
- Setting, modification, or deletion of various condition files

### 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.

Operation	Mode	Teach Mode	Play Mode	Remote Mode
Servo ON Ready		PP	PP	External input signal
Start		Invalid	PP	External input signal
Cycle Change		PP	PP	External input signal
Call Master Job		PP	PP	External input signal

Note: "PP" indicates the programming pendant.

### 1.3.4 Teach Mode Priority

In the teach mode, following operations are disabled:

1. Playback using [START].
2. Playback from external input signals.

---

## 1.4 Security Mode

### 1.4.1 Types of Security Modes

The following three types of security modes are available for DX200.

Any operation in the edit mode and the management mode requires a password. The password must contain between 4 and 8 letters, numbers, or symbols.

- **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 safety functional relevant files in addition to the operations enabled in the management mode. When the functional safety function which is an optional function 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 "DX200 OPTIONS INSTRUCTIONS FOR FUNCTIONAL SAFETY BOARD OPERATION".
- **One Time Manage Mode**  
Maintenance operations in higher security mode than management mode can be performed. The one time security code provided by Yaskawa is required to input.  
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.

Inputting of the password is required when operating in the edit, management and safety mode.

For the password of edit and management modes, 4 or more to less than 16 of characters/numbers should be specified, and 9 or more to less than 16 of characters/numbers are required to the safety mode password.

Table 1-1: Menu &amp; Security Mode (Sheet 1 of 4)

Main Menu	Sub Menu	Allowed Security Mode	
		DISPLAY	EDIT
JOB	JOB	Operation	Edit
	SELECT JOB	Operation	Operation
	CREATE NEW JOB <sup>1)</sup>	Edit	Edit
	MASTER JOB	Operation	Edit
	JOB CAPACITY	Operation	-
	RES. START (JOB) <sup>1)</sup>	Edit	Edit
	RES. STATUS <sup>2)</sup>	Operation	-
	CYCLE	Operation	Operation
	TRASH JOB LIST <sup>3)</sup>	Edit	Edit
	JOB EDIT (PLAY)	Edit	Edit
	PLAY EDIT JOB LIST	Edit	Edit
VARIABLE	BYTE	Operation	Edit
	INTEGER	Operation	Edit
	DOUBLE	Operation	Edit
	REAL	Operation	Edit
	STRING	Operation	Edit
	POSITION (ROBOT)	Operation	Edit
	POSITION (BASE)	Operation	Edit
	POSITION (ST)	Operation	Edit
	LOCAL VARIABLE	Operation	-
	TIMER	Operation	Edit
IN/OUT	EXTERNAL INPUT	Operation	Edit
	EXTERNAL OUTPUT	Operation	Edit
	UNIVERSAL INPUT	Operation	Operation
	UNIVERSAL OUTPUT	Operation	Operation
	SPECIFIC INPUT	Operation	-
	SPECIFIC OUTPUT	Operation	-
	RIN	Operation	-
	REGISTER	Operation	Management
	AUXILIARY RELAY	Operation	-
	CONTROL INPUT	Operation	-
	PSEUDO INPUT SIG	Operation	Management
	NETWORK INPUT	Operation	-
	NETWORK OUTPUT	Operation	-
	ANALOG OUTPUT	Operation	-
	SV POWER STATUS	Operation	-
	LADDER PROGRAM	Management	Management
	I/O ALARM	Management	Management
	I/O MESSAGE	Management	Management
	TERMINAL	Operation	Edit
	I/O SIMULATION LIST	Operation	Operation
SERVO ON FACTOR	Management	-	
RB STOP FACTOR MONITOR	Operation	-	



Table 1-1: Menu &amp; Security Mode (Sheet 2 of 4)

Main Menu	Sub Menu	Allowed Security Mode	
		DISPLAY	EDIT
ROBOT	CURRENT POSITION	Operation	-
	COMMAND POSITION	Operation	-
	SERVO MONITOR	Management	-
	WORK HOME POS	Operation	Edit
	SECOND HOME POS	Operation	Edit
	DROP AMOUNT	Management	Management
	POWER ON/OFF POS	Operation	-
	TOOL	Edit	Edit
	INTERFERENCE	Management	Management
	SHOCK SENS LEVEL	Operation	Edit
	USER COORDINATE	Edit	Edit
	HOME POSITION	Management	Management
	MANIPULATOR TYPE	Management	-
	ANALOG MONITOR	Management	Management
	OVERRUN&S-SENSOR <sup>1)</sup>	Operation	Operation
	LIMIT RELEASE <sup>1)</sup>	Edit	Edit
	ARM CONTROL <sup>1)</sup>	Management	Management
	SHIFT VALUE	Operation	-
	SOFTLIMIT SETTING	Management	Management
SHOCK SENS LV.(CURRENT)	Operation	-	
SYSTEM INFO	VERSION	Operation	-
	MONITORING TIME	Operation	Management
	CONTROLLER INFORMATION	Operation	-
	ALARM HISTORY	Operation	Management
	I/O MSG HISTORY	Operation	Management
	LOGDATA	Operation	Management
	USER DEFINITION MENU	Operation	Edit
	QR CODE	Operation	Operation
	SECURITY	Operation	Operation
EX.MEMORY	LOAD	Edit	-
	SAVE	Operation	-
	VERIFY	Operation	-
	DELETE	Operation	-
	DEVICE	Operation	Operation
	FOLDER	Operation	Management
	INITIALIZE <sup>1)</sup>	Operation	-
PARAMETER	S1CxG	Management	Management
	S2C	Management	Management
	S3C	Management	Management
	S4C	Management	Management
	A1P	Management	Management
	A2P	Management	Management
	A3P	Management	Management
	A4P	Management	Management
	A5P	Management	Management
	A6P	Management	Management
	A7P	Management	Management

Table 1-1: Menu &amp; Security Mode (Sheet 3 of 4)

Main Menu	Sub Menu	Allowed Security Mode	
		DISPLAY	EDIT
PARAMETER	A8P	Management	Management
	RS	Management	Management
	S1E	Management	Management
	S2E	Management	Management
	S3E	Management	Management
	S4E	Management	Management
	S5E	Management	Management
	S6E	Management	Management
	S7E	Management	Management
	S8E	Management	Management
SETUP	TEACHING COND.	Edit	Edit
	OPERATE COND.	Management	Management
	OPERATE ENABLE	Management	Management
	FUNCTION ENABLE	Management	Management
	JOG COND.	Management	Management
	PLAYBACK COND.	Management	Management
	FUNCTION COND.	Management	Management
	DISPLAYING COLOR COND.	Edit	Edit
	LOGDATA COND.	Management	Management
	DATE/TIME	Management	Management
	GRP COMBINATION	Management	Management
	SET WORD	Edit	Edit
	RESERVE JOB NAME	Edit	Edit
	USER ID	Edit	Edit
	SET SPEED	Management	Management
	KEY ALLOCATION	Management	Management
	JOG KEY ALLOC.	Edit	Management
	RES. START (CNCT)	Management	Management
	AUTO BACK SET	Management	Management
	WRONG DATA LOG	Edit	Management
ENERGY SAVING FUNCTION	Edit	Management	
ENCODER MAINTENANCE	Edit	Management	
SETTM SETUP	Edit	Management	
SAFETY FUNC	M-SAFETY SIGNAL ALLOC	Operation	Safety
	TIMER DELAY SET	Operation	Safety
	SAFETY LOGIC CIRCUIT	Operation	Safety
PM	PM (REDUCER)	Operation	Management
	PM (HARDWARE)	Management	Management
	INSPECTION NOTICE	Operation	Edit
	INSPECTION RECORD	Operation	Management
DISPLAY SETUP	CHANGE FONT	Operation	Operation
	CHANGE BUTTON	Operation	Operation
	INITIALIZE LAYOUT	Operation	Operation
	CHANGE WINDOW PATTERN	Operation	Operation

Table 1-1: Menu &amp; Security Mode (Sheet 4 of 4)

Main Menu	Sub Menu	Allowed Security Mode	
		DISPLAY	EDIT
ARC WELDING	ARC START COND.	Operation	Edit
	ARC END COND.	Operation	Edit
	ARC AUX COND.	Operation	Edit
	WELDER COND.	Operation	Edit
	ARC WELD DIAG.	Operation	Edit
	WEAVING	Operation	Edit
	ARC MONITOR	Operation	Edit
	ARC MONITOR (SAMPL)	Operation	-
	APPLI COND.	Management	Management
HANDLING	HANDLING DIAGNOSIS	Operation	Edit
SPOT WELDING	WELD DIAGNOSIS	Operation	Edit
	I/O ALLOCATION	Management	Management
	GUN CONDITION	Management	Management
	SPOT WELDER COND.	Management	Management
	APPLICATION CONDITION SETTING	Management	Management
SPOT WELDING (MOTOR GUN)	WELD DIAGNOSIS	Operation	Edit
	GUN PRESSURE	Edit	Edit
	PRESSURE	Edit	Edit
	I/O ALLOCATION	Management	Management
	GUN CONDITION	Management	Management
	CLEARANCE SETTING	Operation	Edit
	SPOT WELDER COND.	Management	Management
	TIP INSTALLATION	Operation	Management
	APPLICATION SETTING	Management	Management
GENERAL	WEAVING	Operation	Edit
	GENERAL DIAG.	Operation	Edit
PAINT	PAINT SYSTEM CONFIG.	Management	Management
	PAINT SPECIAL	Management	Management
	PAINT CONDITION	Operation	Edit
	CALIBRATION CONFIG.	Operation	Edit
	TIME CHART CONFIG.	Management	Management
	TIME CHART	Operation	Edit
	PAINT DATA CONFIG.	Operation	Edit
	PAINT OUTPUT TEST	Management	Management
COMMON TO ALL APPLICATIONS	I/O VARIABLE CUSTOMIZE	Operation	Operation

1 Displayed in the teach mode only.

2 Displayed in the play mode only.

3 Displays only when the Job undelete function is enabled.

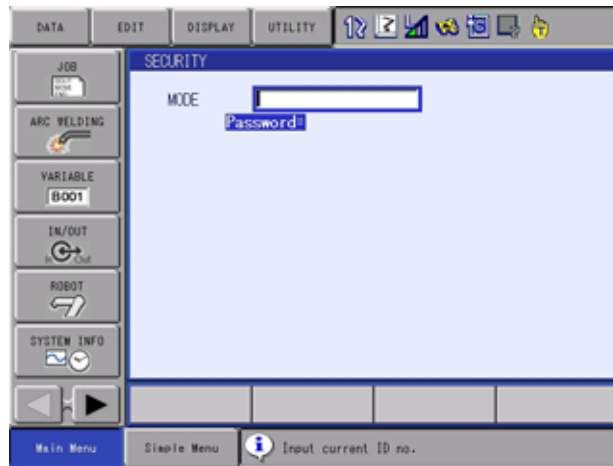
Note: For the operation methods when the functional safety function is enabled, refer to "DX200 OPTIONS INSTRUCTIONS FOR FUNCTIONAL SAFETY BOARD OPERATION".



- 1 Introduction
- 1.4 Security 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 to when the input password is correct.

## 1 Introduction

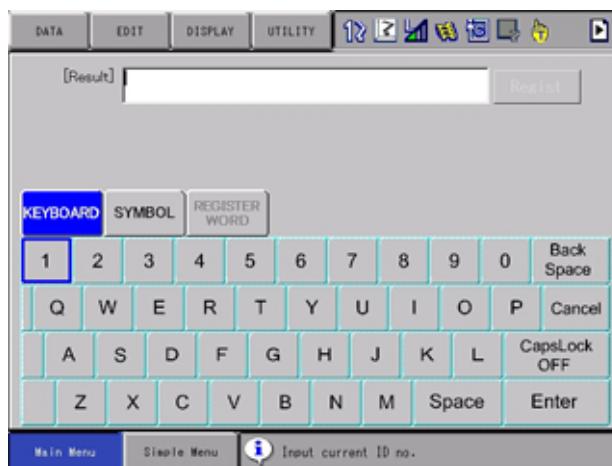
### 1.4 Security Mode

Follow the procedures below when changing the security to the one time manage mode.

1. Change the security 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”.
3. A key pad for character input is displayed. Input the one time security code provided by Yaskawa.
4. The security mode is changed to the one time manage mode when the input security code is correct.

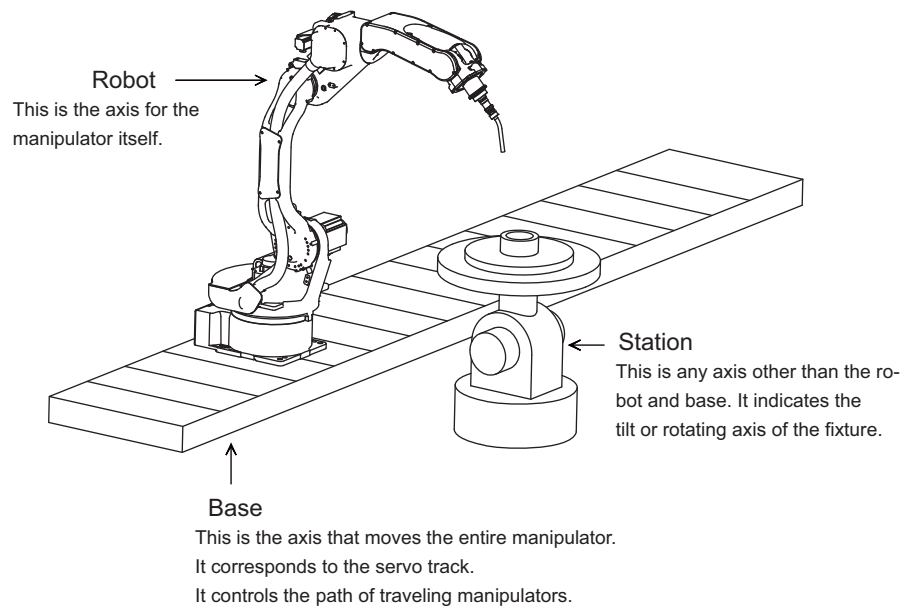


## 2 Manipulator Coordinate Systems and Operations

### 2.1 Control Groups and Coordinate Systems

#### 2.1.1 Control Group

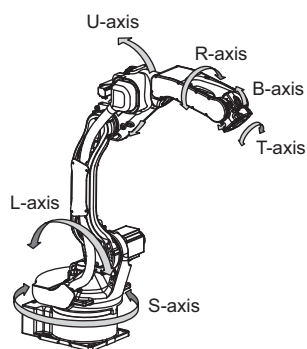
For the DX200, a group of axes to be controlled at a time is called “Control Group”, and the group is classified into three units: “ROBOT” as a manipulator itself, “BASE” that moves the manipulator in parallel, and “STATION” as jigs or tools other than “ROBOT” and “BASE”. BASE and STATION are also called external axes.



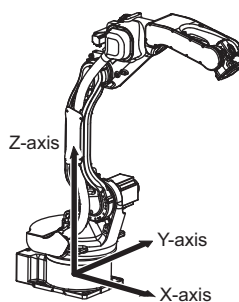
**2.1.2 Types of Coordinate Systems**

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

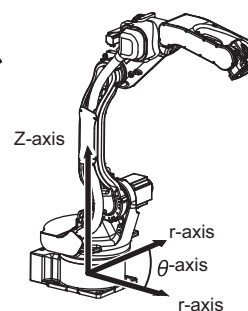
- **Joint Coordinates**  
Each axis of the manipulator moves independently.
- **Cartesian Coordinates**  
The tool tip of the manipulator moves parallel to any of the X-, Y-, and Z-axes.
- **Cylindrical Coordinates**  
The  $\theta$  axis moves around the S-axis. The R-axis moves parallel to the L-axis 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.



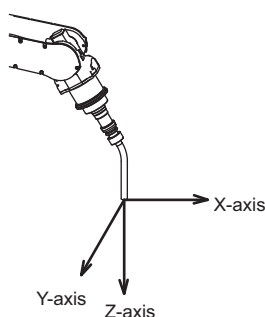
Joint Coordinates



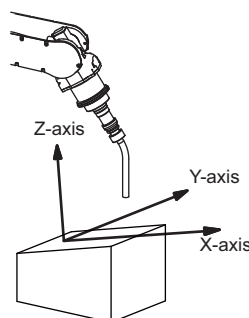
Cartesian Coordinates



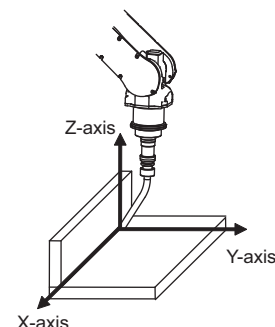
Cylindrical Coordinates



Tool Coordinates



User Coordinates



Teaching Line Coordinates



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## 2.2 General Operations

### 2.2.0.1 Check Safety

Before any operation of the DX200, read Section 1 “Safety” of “DX200 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 DX200 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.



In operating the manipulator manually by the programming pendant, the maximum speed of center point is limited at 250 mm/s.

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



INCH → SLW → MED → FST

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



FST → MED → SLW → INCH

Check selected manual speed on the status area of Programming Pendant.

## 2.2.0.6 Servo ON

Press [SERVO ON READY], then SERVO ON LED starts blinking.  
Squeeze the Enable switch, 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 section 2.3 "Coordinate Systems and Axis Operation" on page 2-5.

## 2.2.0.8 HIGH SPEED

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



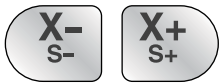






The [HIGH SPEED] is disabled when "INCH" is selected for the manual speed.

## 2.3 Coordinate Systems and Axis Operation

### 2.3.1 Joint Coordinates

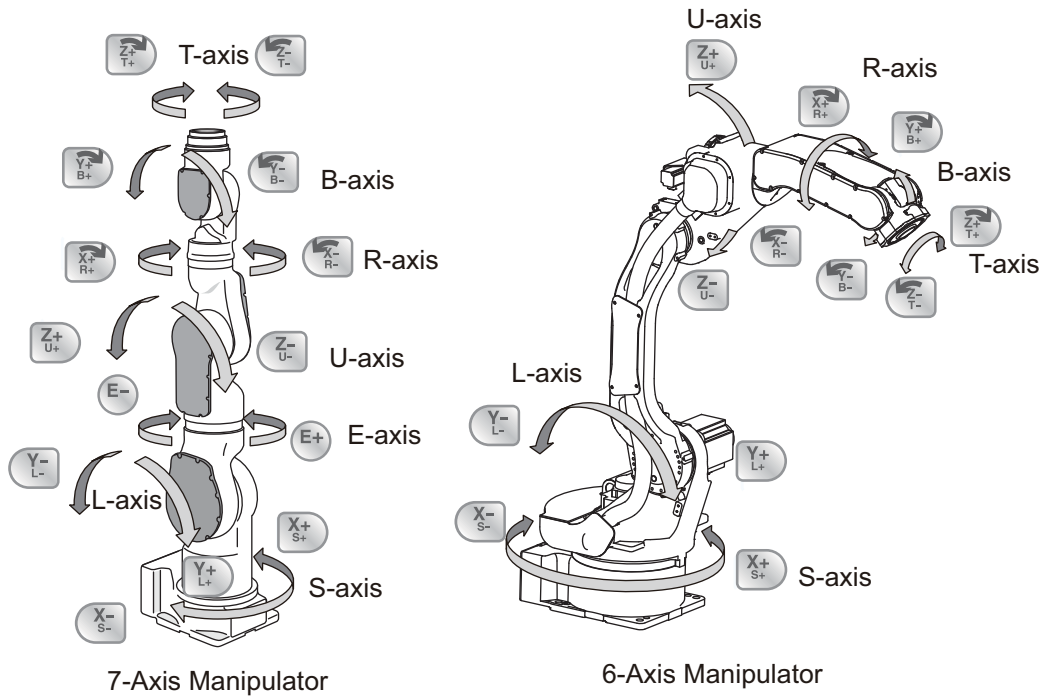
When operating in joint coordinates mode, the S, L, U, R, B, and T-axes of the manipulator move independently. The motion of each axis is described in the table below.

Table 2-1: Axis Motion in Joint Coordinates

Axis Name		Axis Operation Key	Motion
Major Axes	S-axis		Main unit rotates right and left.
	L-axis		Lower arm moves forward and backward.
	U-axis		Upper arm moves up and down.
Wrist Axes	R-axis		Wrist rolls right and left.
	B-axis		Wrist moves up and down.
	T-axis		Wrist turns right and left.
	E-axis		Lower arm turns right and left.




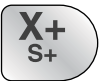

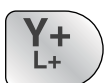

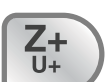
When two or more [Axis Key]s are pressed at the same time, the manipulator will perform a compound movement. However, if two different directional keys for the same axis are pressed at the same time (such as [S-] + [S+]), none of the axes operate.




**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*

Axis Name		Axis Operation Key	Motion
Basic Axes	X-axis	 	Moves parallel to X-axis.
	Y-axis	 	Moves parallel to Y-axis.
	Z-axis	 	Moves parallel to Z-axis.
Wrist Axes		Motion about TCP is executed. See section 2.3.7 "Control Point Operation" on page 2-16.	



When two or more [Axis Key]s are pressed at the same time, the manipulator will perform compound movement. However, if two different directional keys for the same axis are pressed at the same time (such as [X-] + [X+]), none of the axes operate.

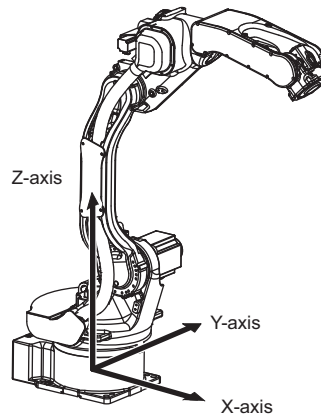
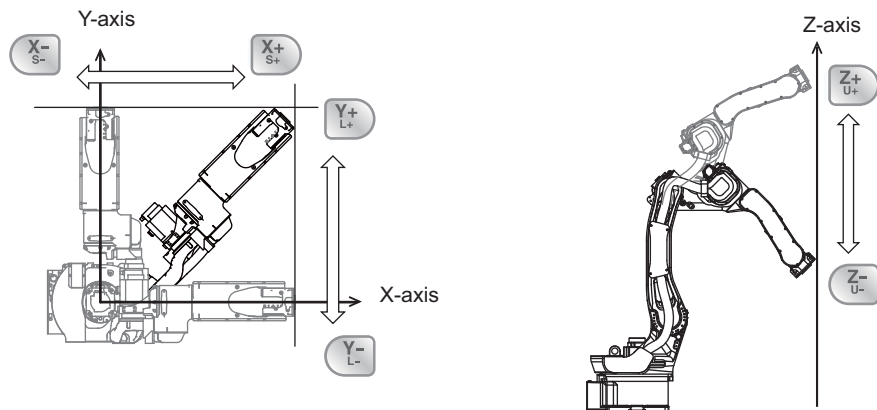


Fig. 2-1: Moves parallel to X- or Y-axis      Fig. 2-2: Moves parallel to Z-axis



**2.3.3 Cylindrical Coordinates**

In the cylindrical coordinates, the manipulator moves as follows. The motion of each axis is described in the table below.

Table 2-3: Axis Motion in Cylindrical Coordinates

Axis Name	Axis Operation Key	Motion
Basic Axes	$\theta$ -axis 	Main unit rolls around S-axis.
	r-axis 	Moves perpendicular to Z-axis.
	Z-axis 	Moves parallel to Z-axis.
Wrist Axes	Motion about TCP is executed. See section 2.3.7 "Control Point Operation" on page 2-16.	



- When two or more [Axis Key]s are pressed at the same time, the manipulator will perform compound movement. However, if two different directional keys for the same axis are pressed at the same time (such as [Z-] + [Z+]), none of the axes operate.

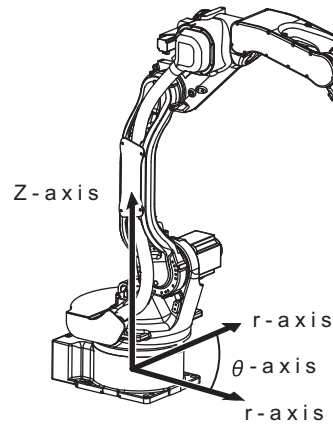


Fig. 2-3: Rolls around q-axis

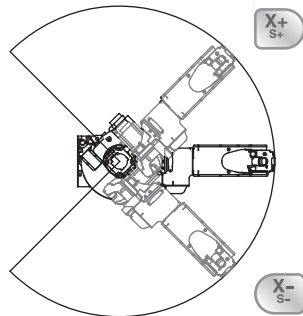
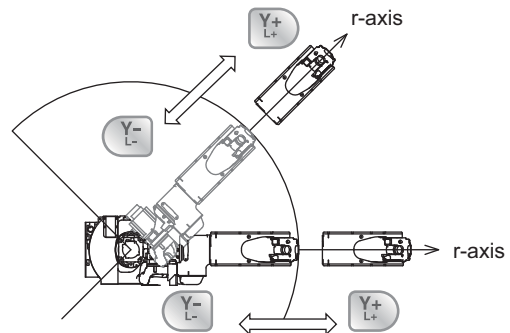


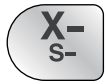
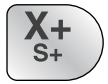

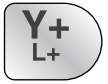
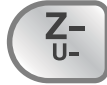
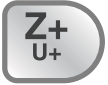
Fig. 2-4: Moves perpendicular to r-axis



**2.3.4 Tool Coordinates**

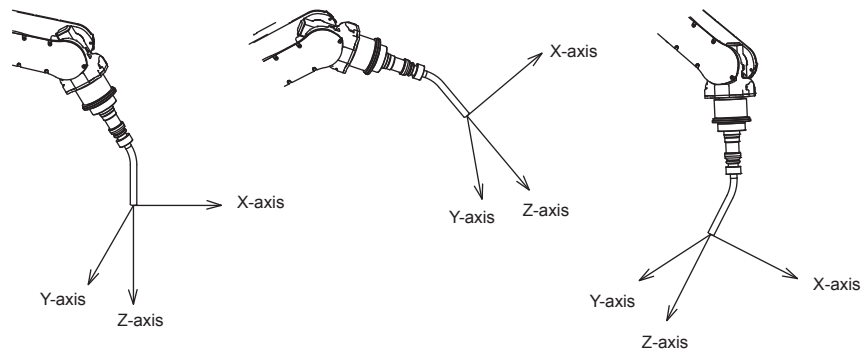
In the tool coordinates, the manipulator moves parallel to the X-, Y-, and Z-axes, which are defined at the tip of the tool. The motion of each axis is described in the table below.

Table 2-4: Axis Motion in Tool Coordinates

Axis Name		Axis Operation Key	Motion
Basic Axes	X-axis	 	Moves parallel to X-axis.
	Y-axis	 	Moves parallel to Y-axis.
	Z-axis	 	Moves parallel to Z-axis.
Wrist Axes		Motion about TCP is executed. See section 2.3.7 "Control Point Operation" on page 2-16.	

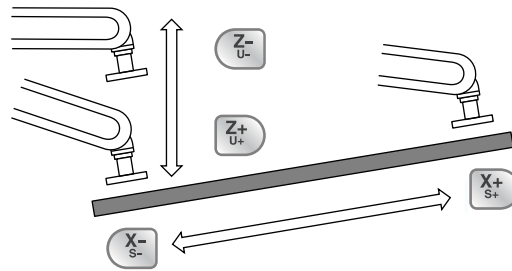


- When two or more [Axis Key]s are pressed at the same time, the manipulator will perform compound movement. However, if two different directional keys for the same axis are pressed at the same time (such as [X-] + [X+]), none of the axes operate.



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.



For tool coordinates, the tool file should be registered in advance. For further details, refer to section 8.3 “Tool Data Setting” of coordinates “DX200 INSTRUCTIONS” (165292-1CD).



## 2.3.4.1 Selecting Tool

Tool numbers are used to specify a tool when more than one tool is used on the system.

You may select from the registered tool files when you switch tools on the manipulator.




This operation can be performed only when the number of tool is more than one.

To use several tool files with one manipulator, set the following parameter.

S2C431: Tool number switch specifying parameter

1: Can be switched

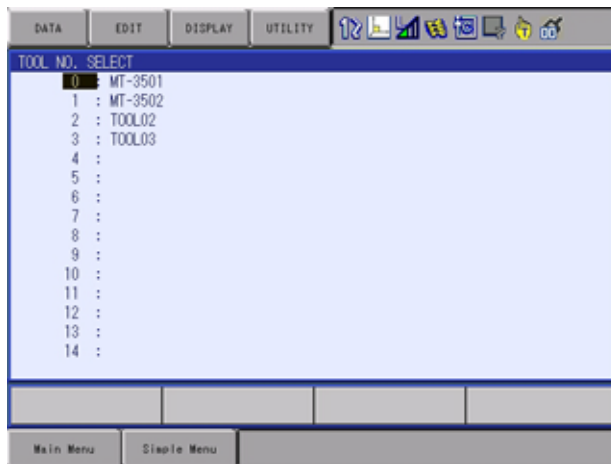
0: Cannot be switched

1. Press the [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).  
Check the change on the status display area.

2. Press [SHIFT] + [COORD].

- The TOOL NO. SELECT window appears.



3. Move the cursor to the tool to use.

- The TOOL NO. SELECT window above shows an example; “TOOL NO. 0 TORCH MT-3501” is selected.

4. Press [SHIFT] + [COORD].

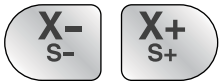


- The window goes back to the previous window.

**2.3.5 User Coordinates**

In the user coordinates, the manipulator moves parallel to each axis of the coordinates which are set by the user. Up to 24 coordinate types can be registered. Each coordinate has a user number and is called a user coordinate file.

The figure and the table below describe the motion of each axis when the [Axis Key] is pressed.

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

Axis Name		Axis Operation Key	Motion
Basic Axes	X-axis		Moves parallel to X-axis.
	Y-axis		Moves parallel to Y-axis.
	Z-axis		Moves parallel to Z-axis.
Wrist Axes		Motion about TCP is executed. See section 2.3.7 "Control Point Operation" on page 2-16.	



- When two or more [Axis Key]s are pressed at the same time, the manipulator will perform compound movement. However, if two different directional keys for the same axis are pressed at the same time (such as [X-] + [X+]), none of the axes operate.

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

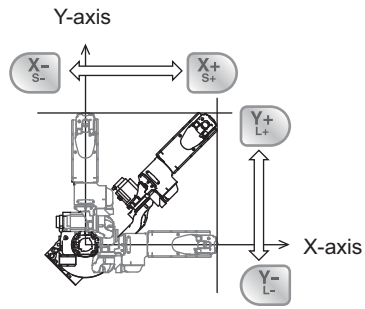
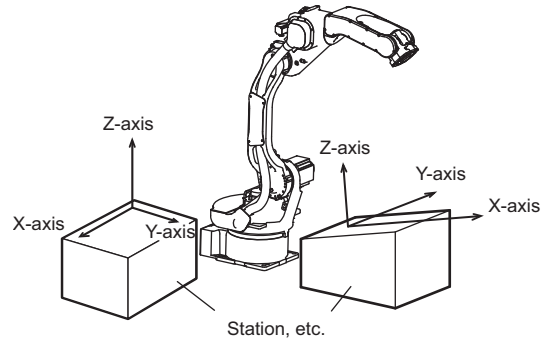
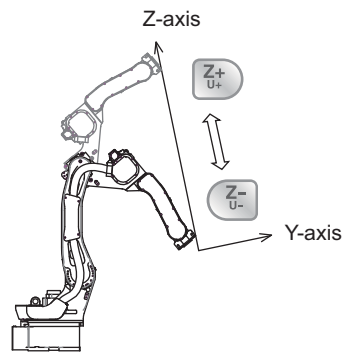



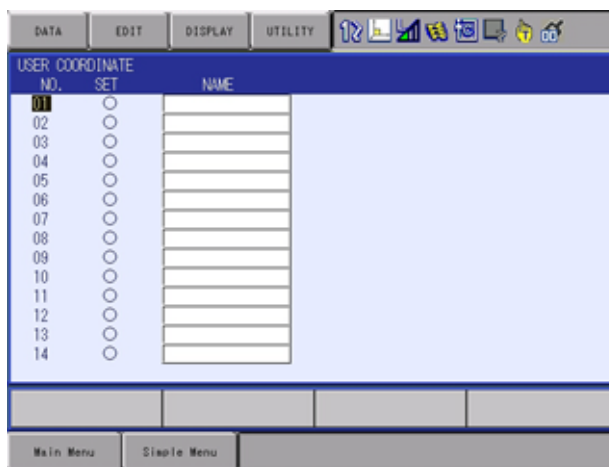
Fig. 2-6: Moves parallel to Z-axis



## 2.3.5.1 Selecting User Coordinates

Follow these procedures to select the desired coordinate system from among the registered user coordinates.

1. Press [COORD] to select the user coordinates .
  - Each time [COORD] is pressed, the coordinate system switches in the following order:  
Joint→Cartesian (Cylindrical)→Tool→User.  
Check the change on the status display area.
2. Press [SHIFT] + [COORD].
  - The USER COORD SELECT window appears.



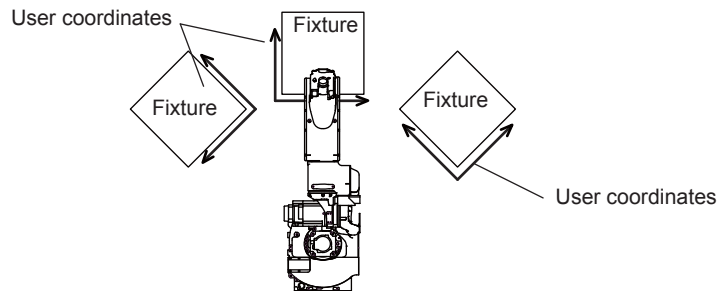
For more information on registration of the user coordinates, refer to section 8.8 “User Coordinate Setting” of the “DX200 INSTRUCTIONS” (165292-1CD).

3. Select the desired user number.

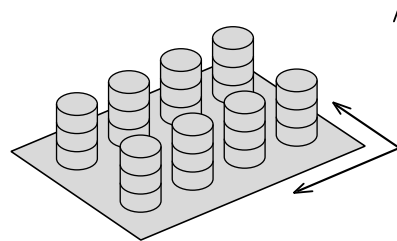
## 2.3.5.2 Examples of User Coordinate Utilization

The user coordinate settings allow easy teaching in various situations. For example:

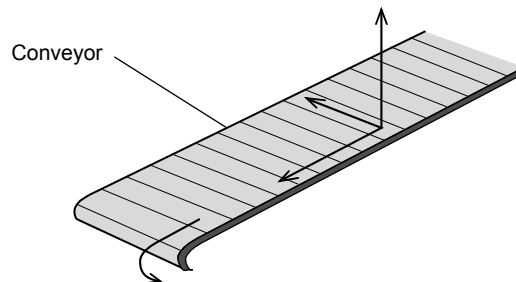
- When multiple positioners are used, manual operation can be simplified by setting the user coordinates for each fixture.



- When performing arranging or stacking operations, the incremental value for shift can be easily programmed by setting user coordinates on a pallet.

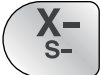


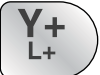

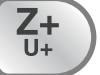


- When performing conveyor tracking operations, the moving direction of the conveyor is specified.



## 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.

Axis Name	Axis Operation Key	Motion
BASE or STATION	1st axis  	The 1st axis moves.
	2nd axis  	The 2nd axis moves.
	3rd axis  	The 3rd axis moves.

**2.3.7 Control Point Operation**

Motion about TCP (Tool Center Point) can only change the wrist orientation at a fixed TCP position in all coordinate systems except the joint coordinates. The motion of each axis is described in the table below.

*Table 2-6: Axis Motion in Motion about TCP*

Axis Name	Axis Operation Key	Motion
Major Axes	 	TCP moves. These movements differ depending on cartesian, cylindrical, tool and user coordinates.
	 	
	 	
Wrist Axes	 	Wrist axes move with the TCP fixed. These movements differ depending on cartesian, cylindrical, tool and user coordinates.
	 	
	 	
E-axis	 	* 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.)



- When two or more [Axis Key]s are pressed at the same time, the manipulator will perform compound movement. However, if two different directional keys for the same axis are pressed at the same time (such as [X-] + [X+]), none of the axes operate.

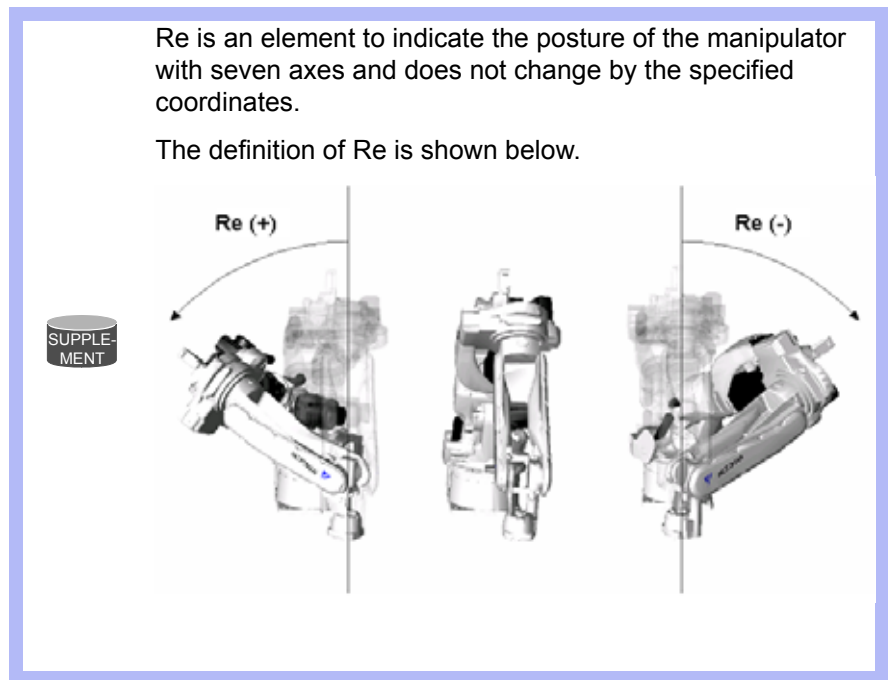


Fig. 2-7: Torch Welding

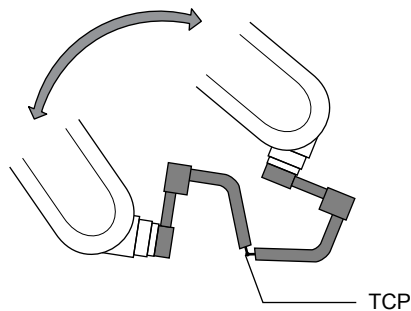
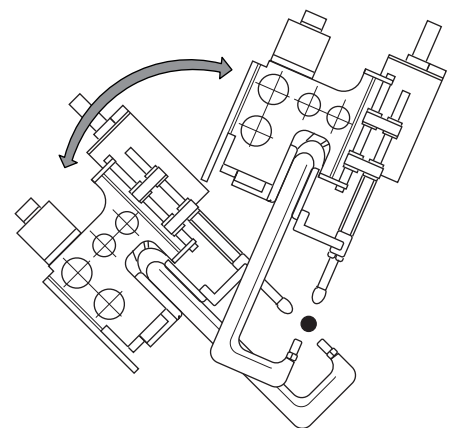
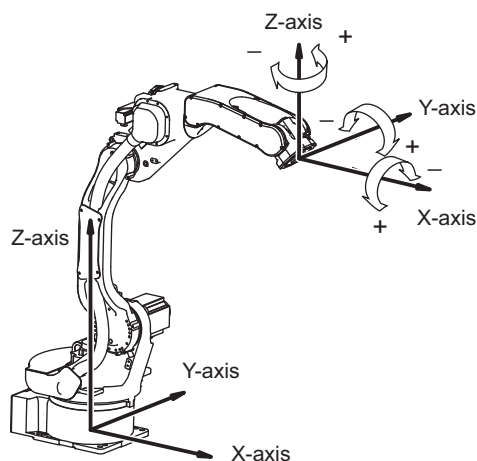


Fig. 2-8: Gun Spot Welding

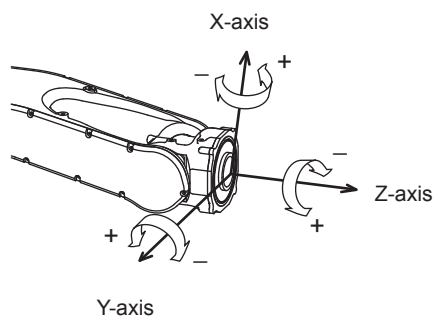


Turning of each wrist axis differs in each coordinate system.

- In cartesian or cylindrical coordinates, wrist axis rotations are based on the X-, Y-, or Z-axis.

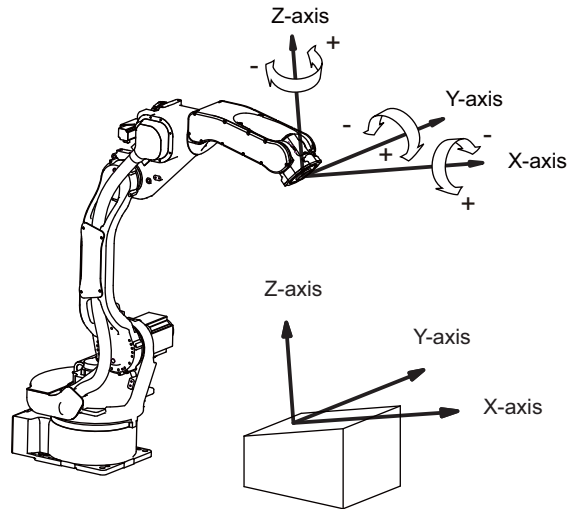


- In tool coordinates, wrist axis rotations are based on X-, Y-, or Z-axis of the tool coordinates.





- In user coordinates, wrist axis rotations are based on X-, Y-, or Z-axis of the user coordinates.



#### 2.3.7.1 Control Point Change

The tool tip position (TCP) is the target point of axis operations and is set as the distance from the flange face. The control point change operation is an axis operation that involves selecting a tool from the list of registered tools (Refer to *section 2.3.4.1 "Selecting Tool" on page 2-11*), and then manipulating the axes while changing the TCP. This can be performed with all coordinates except the joint coordinates. The axis operation is the same as that of the motion about TCP.

##### <Example 1>TCP Change Operation with Multiple 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 follows Tool 1 and is not controlled by the axis operation.
- (3) On the other hand, When Tool 2 is selected to perform an axis operation, P2 (Tool 2's TCP) is the target point of the axis operation. In this case, Tool 1 just follows Tool 2.

Fig. 2-9: Selection of Tool 1 and axis operations with controlling P1

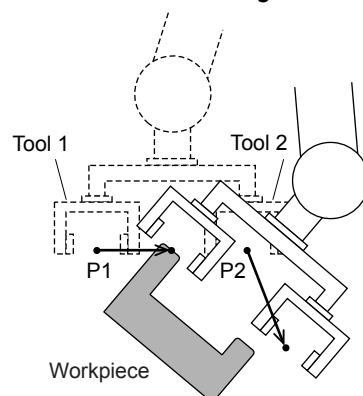
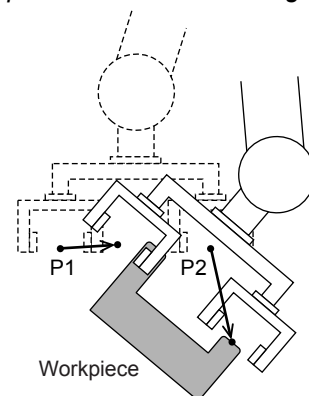


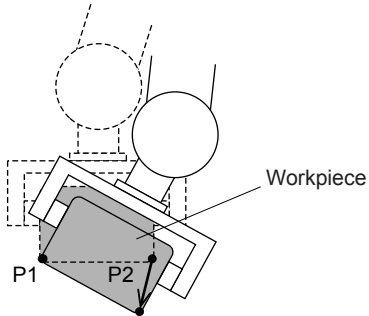
Fig. 2-10: Selection of Tool 2 and axis operations with controlling P2



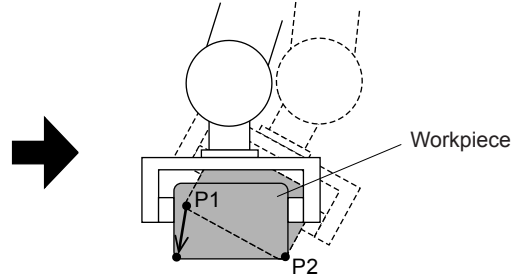
#### <Example 2>TCP Change Operation with a Single Tool

- (1) Set the two corners of the workpiece that the tool is holding as TCP P1 and P2 respectively.
- (2) By selecting two TCPs alternately, the workpiece can be moved as shown below:

*Fig. 2-11: Motion about TCP with P1 selected*



*Fig. 2-12: Motion about TCP with P2 selected*



For registration of the tool file, refer to section 8.3 "Tool Data Setting" of the "DX200 INSTRUCTIONS" (165292-1CD).

**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. They can be used only for the arc welding purpose.

**Each axis of the teaching line coordinates system**

X-axis	Motion direction Tangential direction in a circular arc path
Y-axis	Gy is outer product direction of the Z-axis of base coordinates and X-axis of teaching line coordinates. $\theta_R$ is the angle of Gy and Z-axis of tool coordinates. $\theta_L$ is the angle of -Gy and Z-axis of tool coordinates. When $\theta_R$ is smaller than $\theta_L$ , Y-axis of teaching line coordinates is Gy. When $\theta_L$ is smaller than $\theta_R$ , Y-axis of teaching line coordinates is -Gy.
Z-axis	Z-axis of teaching line coordinates is the outer product direction of the X-axis of base coordinates and Gy.

Fig. 2-13: Teaching Line Coordinates

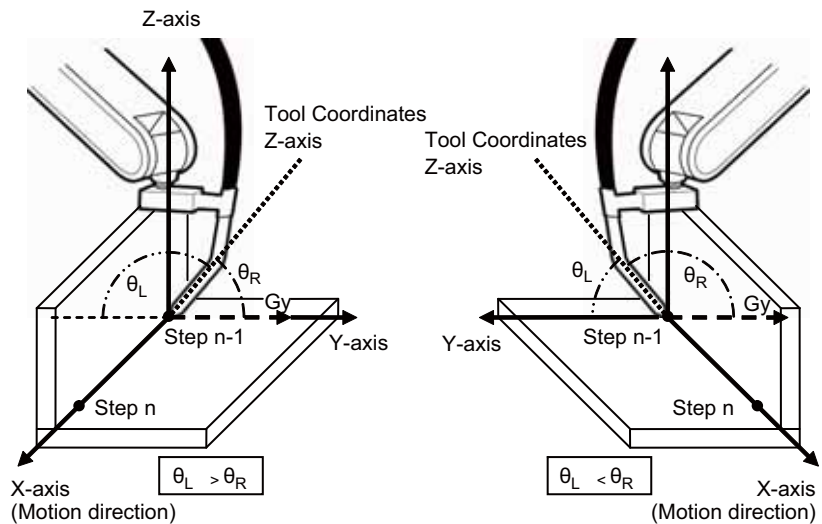


Fig. 2-14: Linear Interpolation and the Teaching Line Coordinates

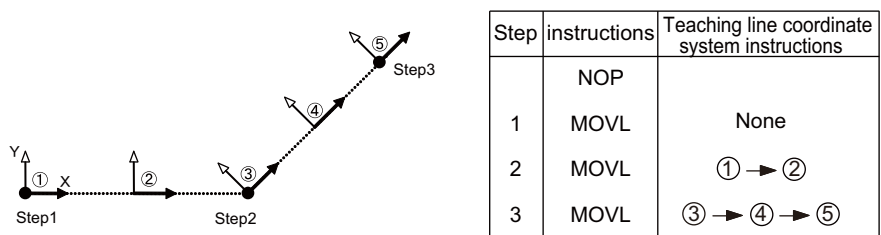
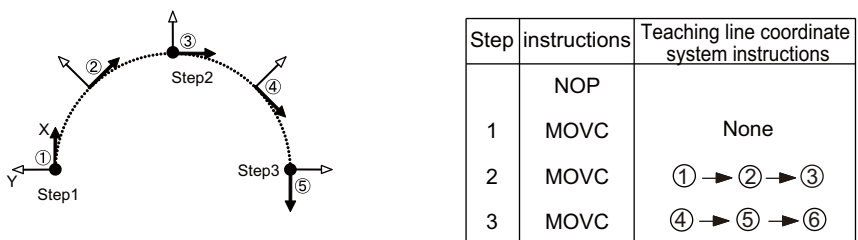


Fig. 2-15: Circular Interpolation and the Teaching Line Coordinates

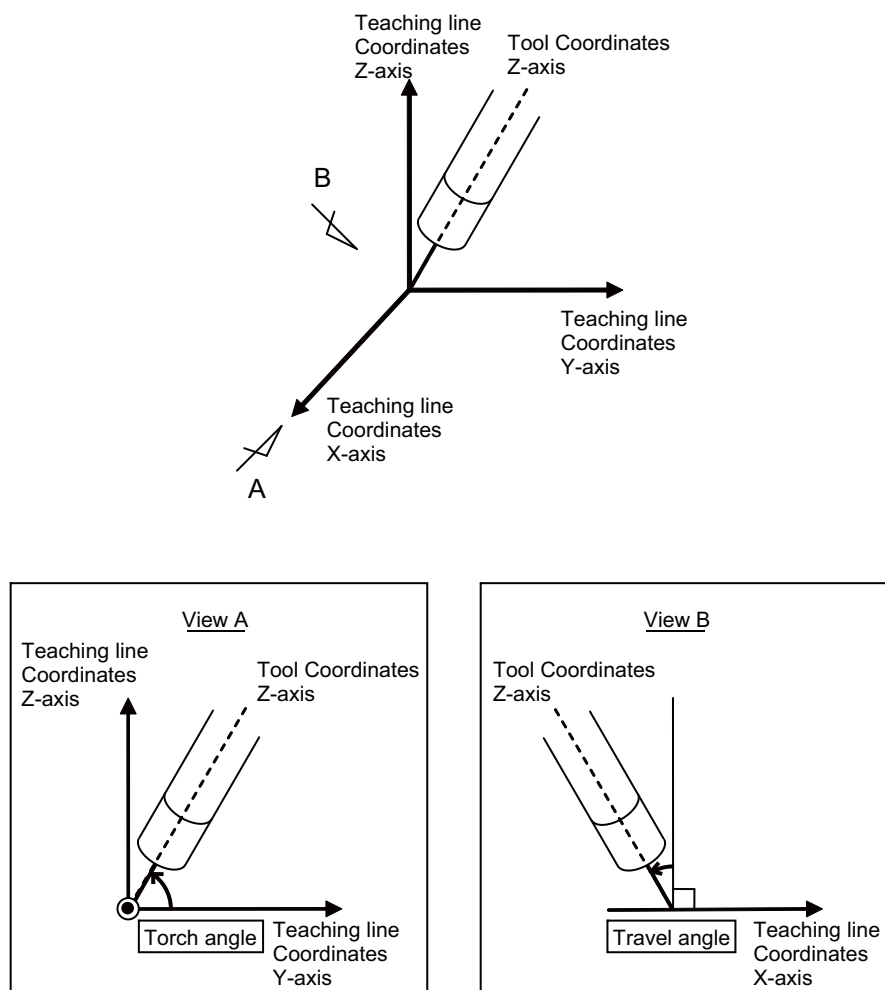


■ Torch Angle and Travel Angle

**Torch angles and travel angles**

Torch angle	The angle of Y-axis of teaching line coordinates and the direction that projected Z-axis of tool coordinates on YZ-plane of teaching line coordinates.
Travel angle	The angle subtracted 90 degrees from the angle of X-axis of teaching line coordinates and Z-axis of tool coordinates.







Fig. 2-16: Torch Angle and Travel Angle



## 2.3.8.1 Operations for Teaching Line Coordinates System

In the teaching line coordinates system, the manual operation can be done as follows:

*Table 2-7: Axis operation for the teaching line coordinates system*

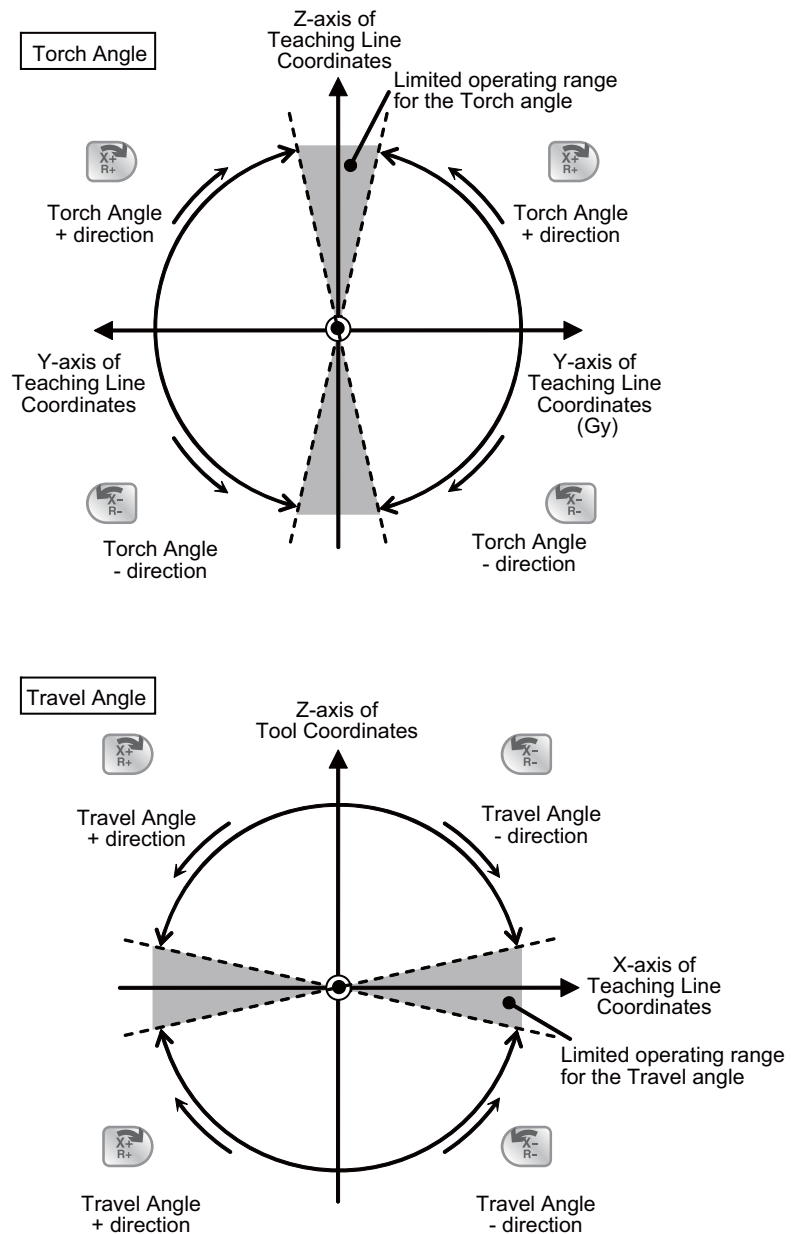
Axis Name	Axis Operation Key	Motion
Basic Axes	X-axis 	Moves parallel to X-axis.
	Y-axis 	Moves parallel to Y-axis. [SHIFT]+[Y-], [SHIFT]+[Y+] Moves parallel to Gy-axis.
	Z-axis 	Moves parallel to Z-axis. [INTERLOCK]+[Z-], [INTERLOCK]+[Z+] Moves parallel to the tool coordinates Z-axis.
Wrist Axes		The torch angle changes when the position of TCP (Tool Center Point) is fixed. [SHIFT]+[x-], [SHIFT]+[x+] Tool posture changes around X-axis with the TCP fixed.
		The travel angle changes when the position of TCP (Tool Center Point) is fixed. [SHIFT]+[y-], [SHIFT]+[y+] Tool posture changes around Gy-axis with the TCP fixed.
		Tool posture changes around Z-axis of tool coordinates with the TCP fixed. [SHIFT]+[z-], [SHIFT]+[z+] Tool posture changes around Z-axis with the TCP fixed.

#### Axis operation for the teaching line coordinates system



- When two or more [Axis Key]s are pressed at the same time, the manipulator will perform compound movement. However, if two different directional keys for the same axis are pressed at the same time (such as [X-] + [X+]), none of the axes operate.

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



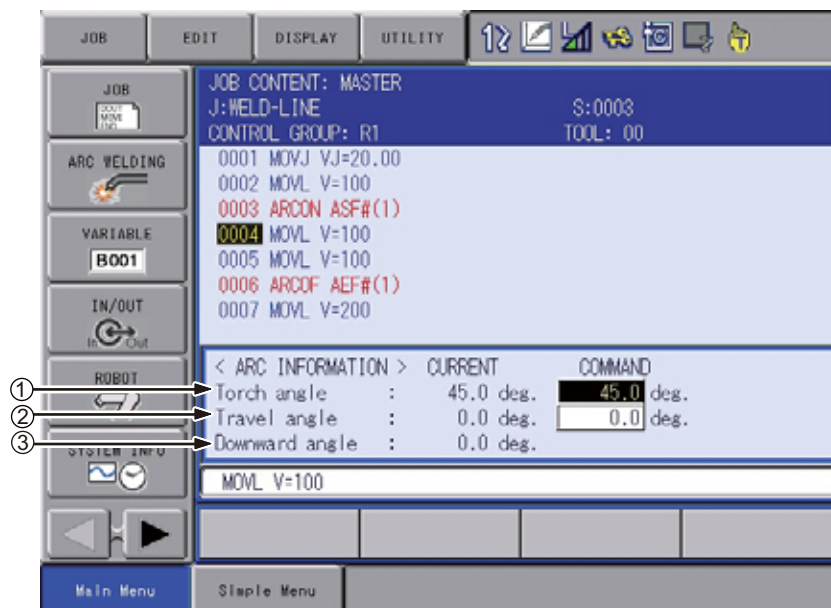
In steps for circular interpolation or spline interpolation, perform manual operation after performing FWD, BWD or test operations.

In the following operations and cases, manual operation for teaching line coordinate is limited.

*Table 2-8: Limited Manual Operation for Teaching Line Coordinate*

Condition	Restrictions
Job is not selected.	Cannot perform manual operation.
The number of steps in the JOB is less than 2.	
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.	
Motion direction is the same as the Z-axis direction of the base coordinate.	
Move instruction of current step is MOVJ.	
Move instruction of current step is IMOV.	The following manual operation cannot be done. <ul style="list-style-type: none"> <li>• Teaching line coordinate</li> <li>• Y-axis</li> <li>• Torch Angle</li> </ul>
The torch angle is about $\pm 90^\circ$ .	
The travel angle is about $\pm 90^\circ$ .	The following manual operation cannot be done. <ul style="list-style-type: none"> <li>• Teaching line coordinate</li> <li>• Y-axis</li> <li>• Torch Angle</li> <li>• Travel Angle</li> </ul>

## 2.3.8.2 Display Welding-related Information



## ① Torch angle (-90.000 ~ 90.000)

CURRENT: Degree of torch angle of current teaching line coordinates

COMMAND: Target position of moving operation to torch angle/travel angle

## ② Travel angle (-90.000 ~ 90.000)

CURRENT: Degree of travel angle of current teaching line coordinates

COMMAND: Target position of moving operation to torch angle/travel angle

## ③ Downward angle (-90.000 ~ 90.000)

CURRENT: Current downward angle

The angle that is subtracted by 90 degrees from the angle of Z-axis of the base coordinates and X-axis of the teaching line coordinates.

In the following operations and cases, INFORMATION RELATED ARC is not displayed.

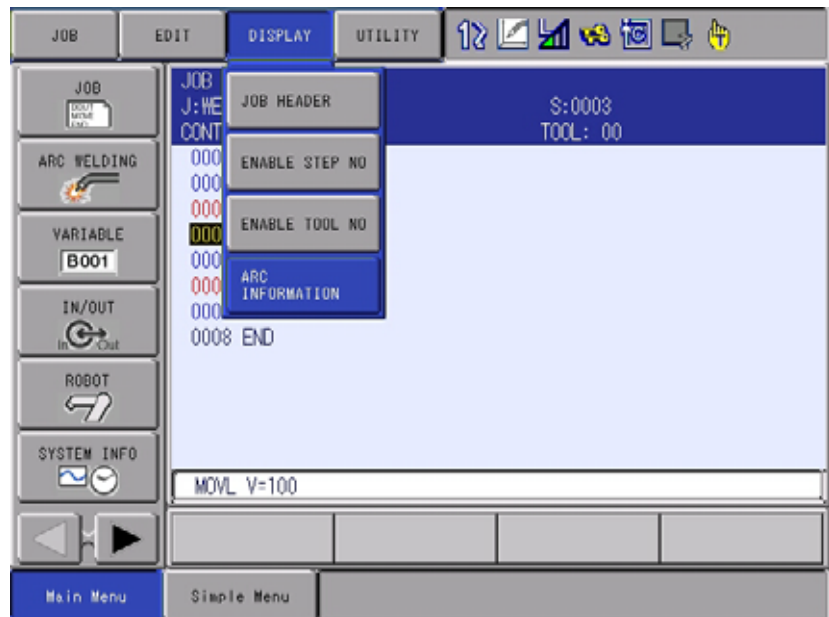
- Selecting a job
- Editing a job
- Moving the cursor
- The cursor is at the 1st step.
- The current step and the previous step are the same position, or the distance between these steps are short.
- The move instruction of current step is MOVJ.
- The move instruction of current step is IMOV.
- Motion direction is the same as the Z-axis of base coordinate.



**■ Switching Welding-related Information Display**

Able to switch a state of ARC INFORMATION display to hide or show.

1. Select the {JOB} under {Main Menu}.
2. Select {JOB CONTENT}.
  - Job content window appears.
3. Select {DISPLAY} in the menu area.
  - A pull-down menu appears.

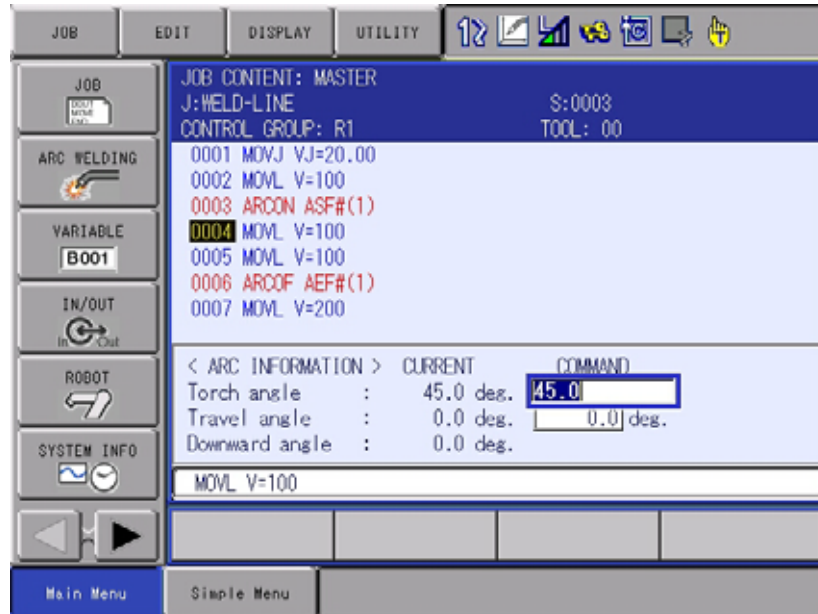


4. Select {ARC INFORMATION}.
  - Welding-related information is displayed.

### ■ Moving Operation to Torch Angle/Travel Angle

Able to move the manipulator to the torch angle/travel angle which are specified to the COMMAND (target position) in the ARC INFORMATION.

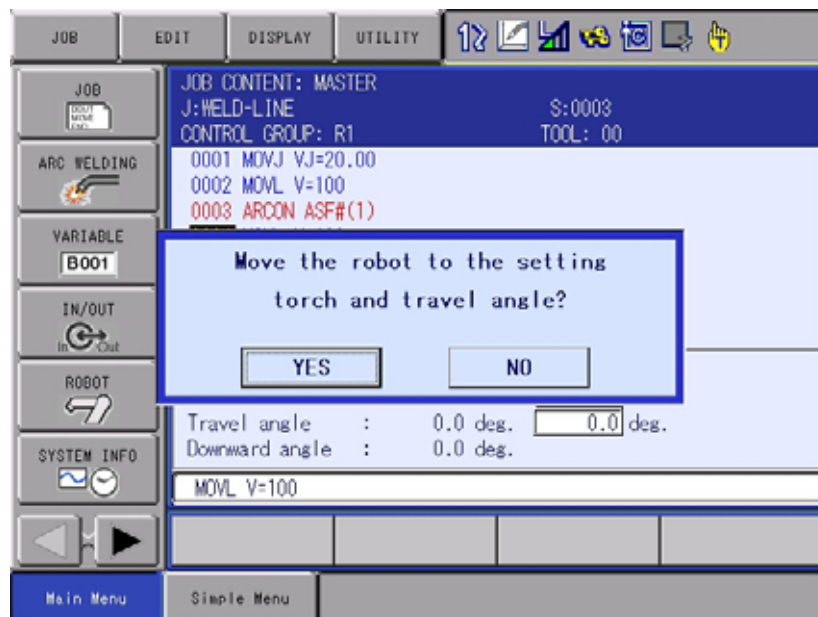
1. Display the ARC INFORMATION.
2. Touch the ARC INFORMATION.
  - The arc information becomes active.
3. Select a data input area of the torch angle or travel angle.



4. Input 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.



In the multi-window mode, moving operation 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.

## 7. Press [YES].

- The confirmation dialog box disappears.
- When the arc information is active, the confirmation dialog doesn't appear again.

## 8. By pressing [NEXT] again, the manipulator moves to the target position.

- The manipulator stops when the manipulator arrives to the target position.
- The manipulator stops when [NEXT] is released.

## 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 DX200 and the programming pendant are functioning correctly before operating the manipulator.

1. Press E. STOP button.
  - Press the emergency stop button on the DX200 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.
3. Press [SERVO ON READY] of the programming pendant.
  - 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.



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### 3 Teaching

#### 3.1 Preparation for Teaching

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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 *section 1.2.6 “Character Input Operation” on page 1-22.*
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 *section 1.2.6 “Character Input Operation” on page 1-22.*
2. Press [ENTER].

##### 3.1.3.4 Registering Control Groups

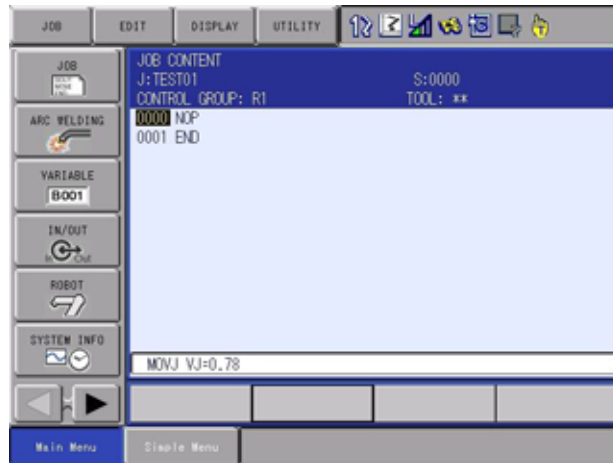
Select the control group that has been registered in advance. If external axes (BASE or STATION) or multiple robot systems are not used, the registration of control groups is not required.

## 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.







**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.

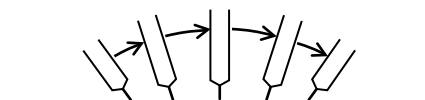
1. Move the cursor to the play speed.
2. Set the play speed by pressing [SHIFT] + the cursor.
  - The joint speed value increases or decreases.



Fast	100.00
↑	50.00
	25.00
	12.50
	6.25
	3.12
↓	1.56
Slow	0.78 (%)

## 3.2.2.2 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.



Fast	1500.0	Fast	9000
↑	750.0	↑	4500
	375.0		2250
	187.0		1122
	93.0		558
	46.0		276
↓	23.0	↓	138
Slow	11 (mm/s)	Slow	66 (cm/min)

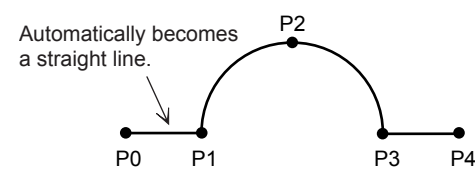
## 3.2.2.3 Circular Interpolation

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

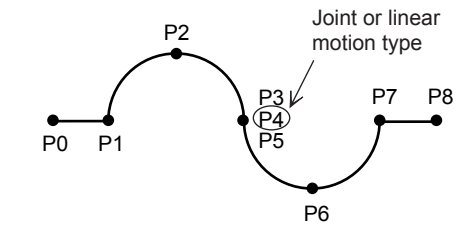


Point	Interpolation Type	Instruction
P0	Joint or Linear	MOVJ MOVL
P1 P2 P3	Circular	MOVC
P4	Joint or Linear	MOVJ MOVL

#### ■ Continuous Circular Arcs

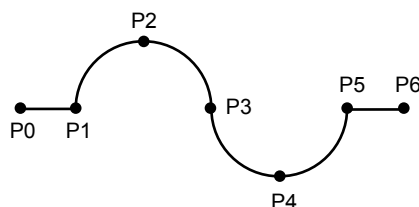
As shown below, when two or more successive circular movements with different curvatures are required, the movements must be separated from each other by a joint or linear interpolation step. This step must be inserted between the steps at an identical point. The step at the end point of the preceding circular movement must coincide with the beginning point of the following circular movement.

Table 3-2: Interpolation Type for Continuous Circular Arcs



Point	Interpolation Type	Instruction
P0	Joint or Linear	MOVJ MOVL
P1 P2 P3	Circular	MOVC
P4	Joint or Linear	MOVJ MOVL
P5 P6 P7	Circular	MOVC
P8	Joint or Linear	MOVJ MOVL

Alternatively, to continue movements without adding an extra joint or linear interpolation step in between, add “FPT” tag to the step whose curvature is needed to be changed.



Point	Interpolation Type	Instruction
P0	Joint or Linear	MOVJ MOVL
P1 P2	Circular	MOVC
P3	Circular	MOVC FPT
P4 P5	Circular	MOVC
P6	Joint or Linear	MOVJ MOVL

#### <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.

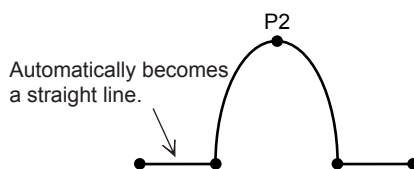
#### 3.2.2.4 Spline Interpolation

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 MOVJ.

##### ■ 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 3-3: Interpolation Type for Single Spline Curve



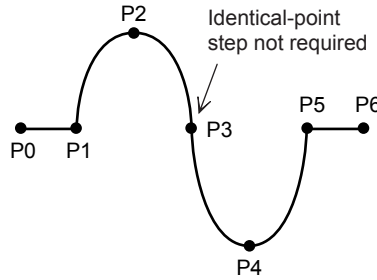
Point	Interpolation Type	Instruction
P0	Joint or Linear	MOVJ MOVL
P1 P2 P3	Spline	MOVJ
P4	Joint or Linear	MOVJ MOVL

### ■ Continuous Spline Curves

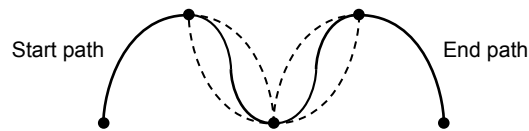
The manipulator moves through a path created by combining parabolic curves. This differs from the circular interpolation in that steps with identical points are not required at the junction between two spline curves.

Table 3-4: Interpolation Type for Continuous Spline Curves

Point	Interpolation Type	Instruction
P0	Joint or Linear	MOVJ MOVL
P1 to P5	Spline	MOVS
P6	Joint or Linear	MOVJ MOVL



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

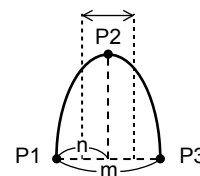


<Play Speed>

- 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.

**NOTE**

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.



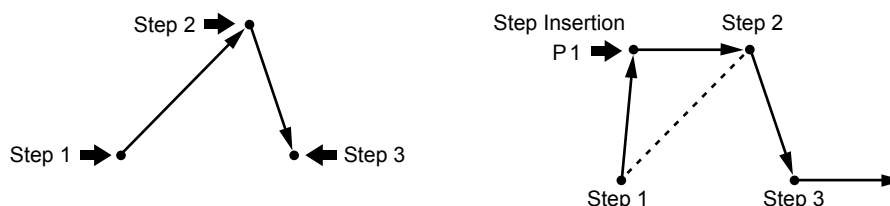
### 3.2.3 Teaching Steps

#### 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. 3-1 "Registering Move Instructions"* or they can be done by inserting steps between already registered steps, as shown in the right figure *Fig. 3-2 "Inserting Move Instructions"*

This paragraph explains the teaching of *Fig. 3-1 "Registering Move Instructions"*, the operations involved in registering new steps.

*Fig. 3-1: Registering Move Instructions*      *Fig. 3-2: Inserting Move Instructions*

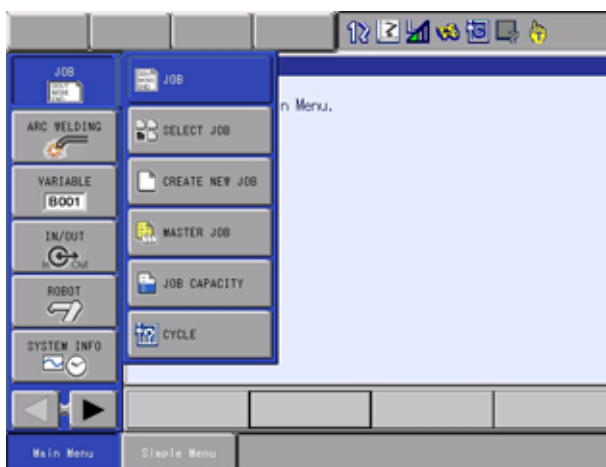


Teaching of *Fig. 3-2 "Inserting Move Instructions"* is called "Inserting move instruction", to distinguish it from the method shown in *Fig. 3-1 "Registering Move Instructions"*. For more details on this operation, see *section 3.4.2 "Inserting Move Instructions" on page 3-34*. The basic operations for registration and insertion are the same. The only difference is pressing [INSERT] in the case of insertion. For registration (*Fig. 3-1 "Registering Move Instructions"*), the instruction is always registered before the END instruction. Therefore, it is not necessary to press [INSERT]. For insertion (*Fig. 3-2 "Inserting Move Instructions"*), [INSERT] must be pressed.

### ■ Setting the Position Data

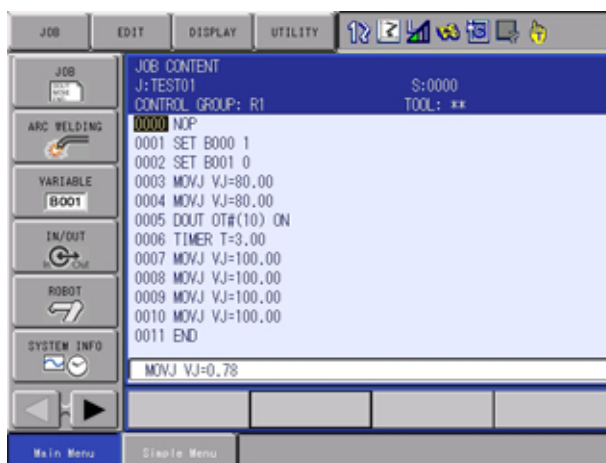
1. Select {JOB} under {Main Menu}.

– The sub-menu appears.



2. Select {JOB}.

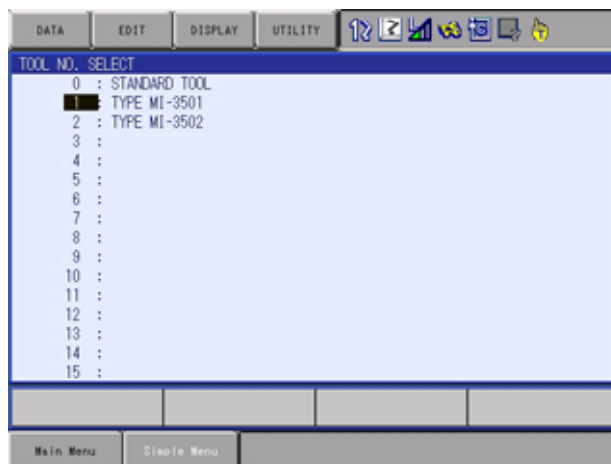
– The contents of the currently-selected job is displayed.



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.

### ■ 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.



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 *section 2.3.4 “Tool Coordinates” on page 2-9* 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→MOVJ→MOVS are displayed in order in the input buffer line.



### ■ Setting the Play Speed

1. Move the cursor to the instruction.

```
0000 NOP
0001 MOVJ VJ=0.78
0002 END
```

2. Press [SELECT].

- The cursor moves to the input buffer line.

```
MOVJ VJ=0.78
```

3. Move the cursor to the play speed to be set.

```
MOVJ VJ 0.78
```

4. Press [SHIFT] + the cursor [ $\uparrow$ ] or [ $\downarrow$ ] simultaneously.

- The joint speed moves up and down.

```
MOVJ VJ=50.00
```

5. Press [ENTER].

- The MOV instruction is registered.

```
Move instruction is registered.
0000 NOP
0001 MOVJ VJ=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 LEVEL TAG".

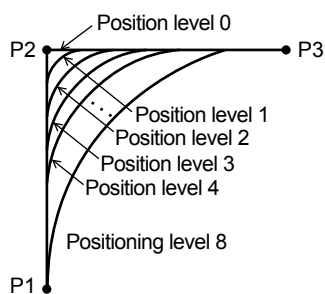
**Position Level:** The position level is the degree of approximation of the manipulator to a taught position.

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.

3 Teaching  
3.2 Teaching Operation

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



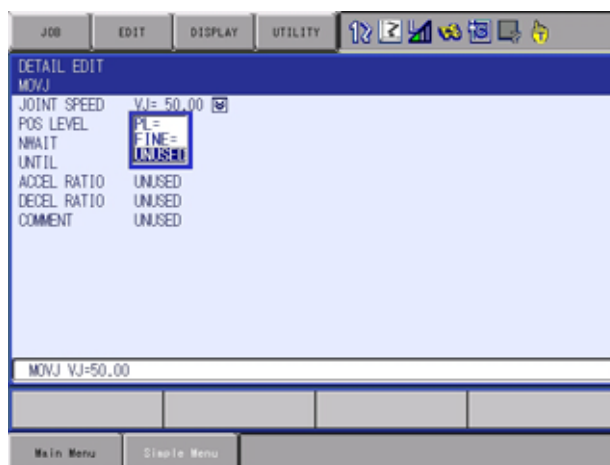
Position Levels	Accuracy
0	Teaching position
1 to 8	Fine   Rough

■ Setting the Position Level

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



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

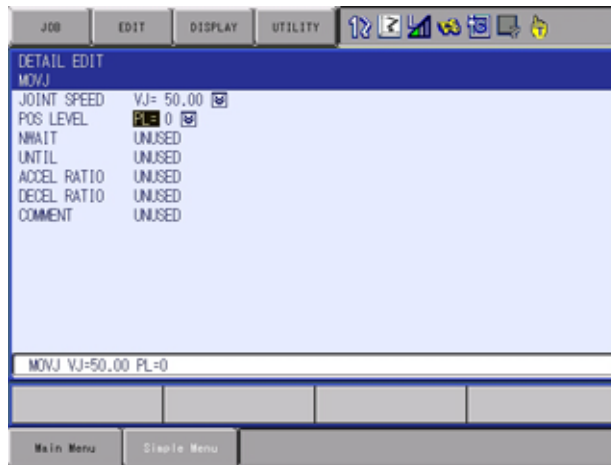


### 3 Teaching

#### 3.2 Teaching Operation

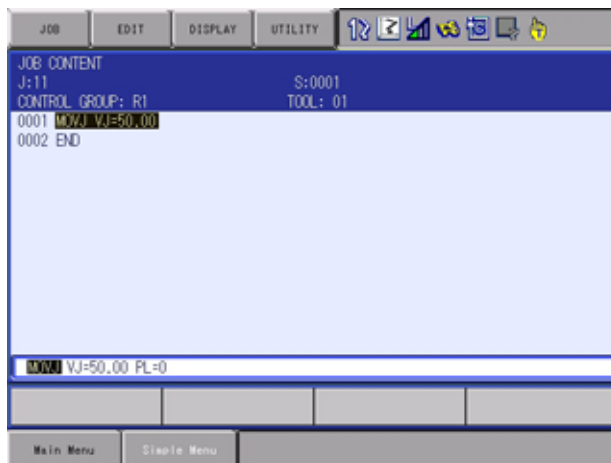
#### 3. Select "PL".

- The position level is displayed. The position initial value is 1.



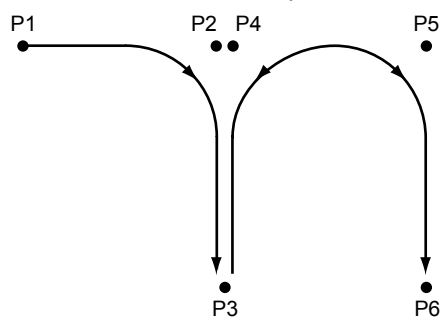
#### 4. Press [ENTER].

- 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
```

## 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.

Place immediately before where reference point is 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.

Reference point 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.

One line before — 0003 MOVJ VJ=50.00  
where timer 0004 MOVL V=138  
instruction is  
to be registered.

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

0004 T=1.00

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.

TIMER T=1000

- If [Numeric Key]s 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].

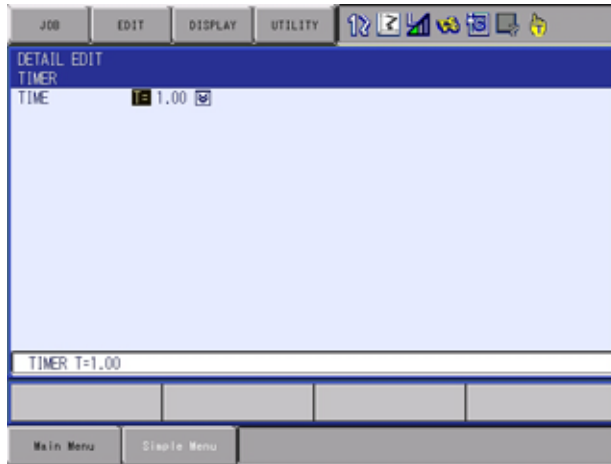
Time:  
TIMER T 0.00

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.

0003 MOVJ VJ=50.00  
0004 TIMER T=1003  
0005 MOVL V=138

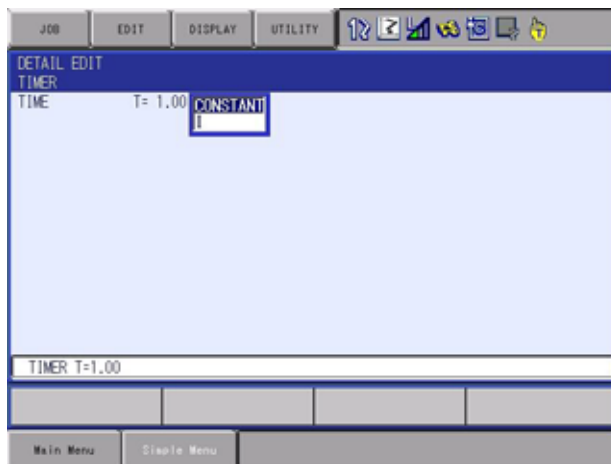
■ **Changing Timer Value**

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.



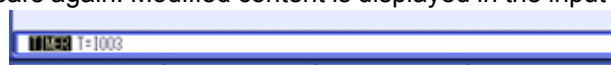
- (2) Select the particular item to be changed.

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



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.



### 3 Teaching

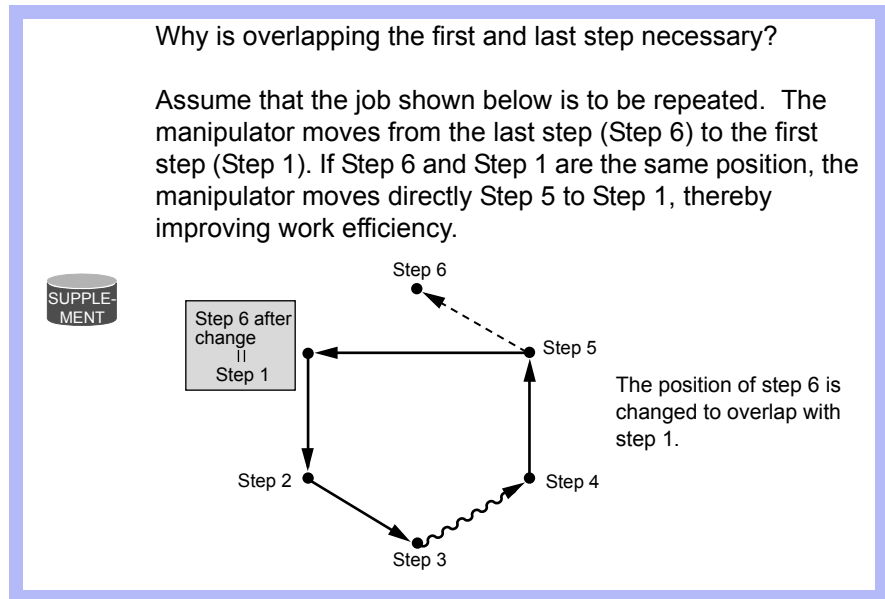
#### 3.2 Teaching Operation

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.

```
0003 MOVJ VJ=50.00  
0004 TIMER T=1003  
0005 MOVL V=138
```



## 3.2.4 Overlapping the First and Last Steps



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.



For safety, set manual speed at  or below.

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

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

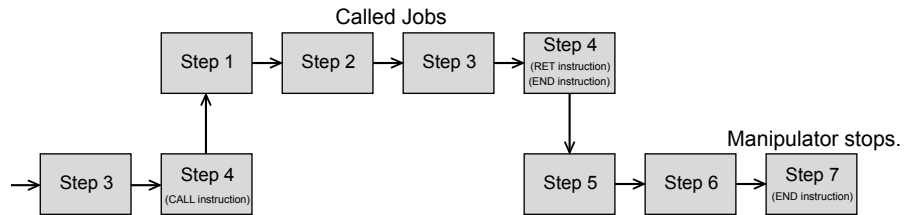


Refer to *section 8.3.0.4 "S2C198: EXECUTION UNITS AT "FORWARD" OPERATION" on page 8-12* and *section 8.3.0.5 "S2C199: INSTRUCTION (EXCEPT FOR MOVE) EXECUTION AT "FORWARD" OPERATION" on page 8-13*.

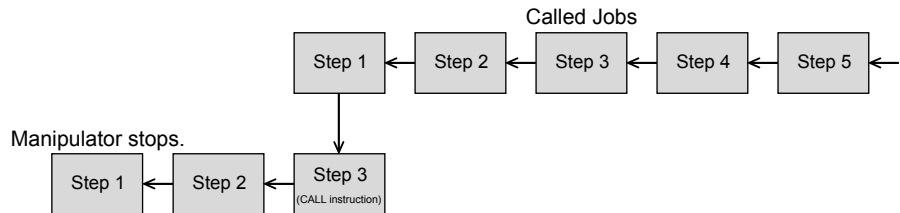
## 3.3.1.1 Precautions When Using FWD / BWD Operations

■ **FWD Movements**

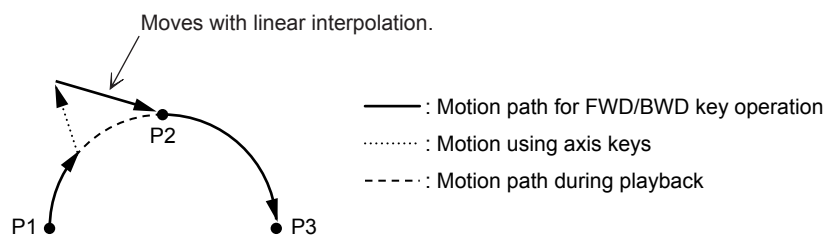
- The manipulator moves in step number sequence. Only move instructions are executed when [FWD] is pressed. To execute all instructions, press [INTERLOCK] + [FWD].
- The manipulator stops after playing a single cycle. It does not move after the END instruction is reached, even if [FWD] is pressed. However,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





## 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.



Manual speed is set with [FAST] and [SLOW]. FWD operation can be performed at a high speed by pressing [HIGH SPEED]. Follow these procedures to select a manual speed.

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



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



- 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.

## 3.3.1.3 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.



The programming pendant does not have the [REFP] for the application of spot welding, general purposes (= material handling, assembling, cutting) or motor gun.

## 3.3.1.4 Test Operations

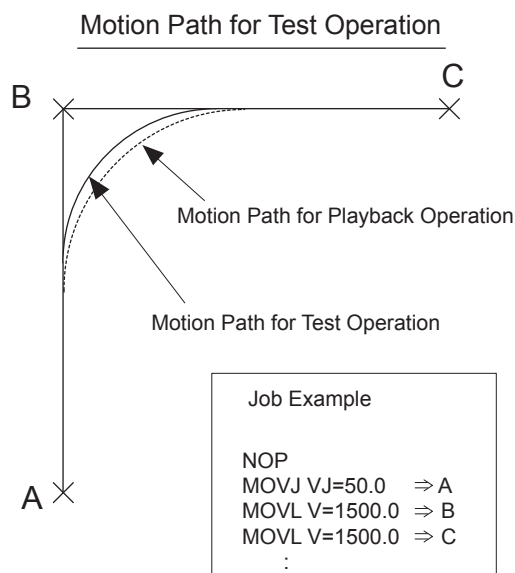
Playback operations can be simulated in the teach mode with test operations. This function is convenient for checking continuous paths and operation instructions.

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



- 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.

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.



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.



Always check safety conditions before pressing [INTERLOCK] + [TEST START] to start the manipulator in motion.

#### 3.3.1.5 Machine Lock Operation

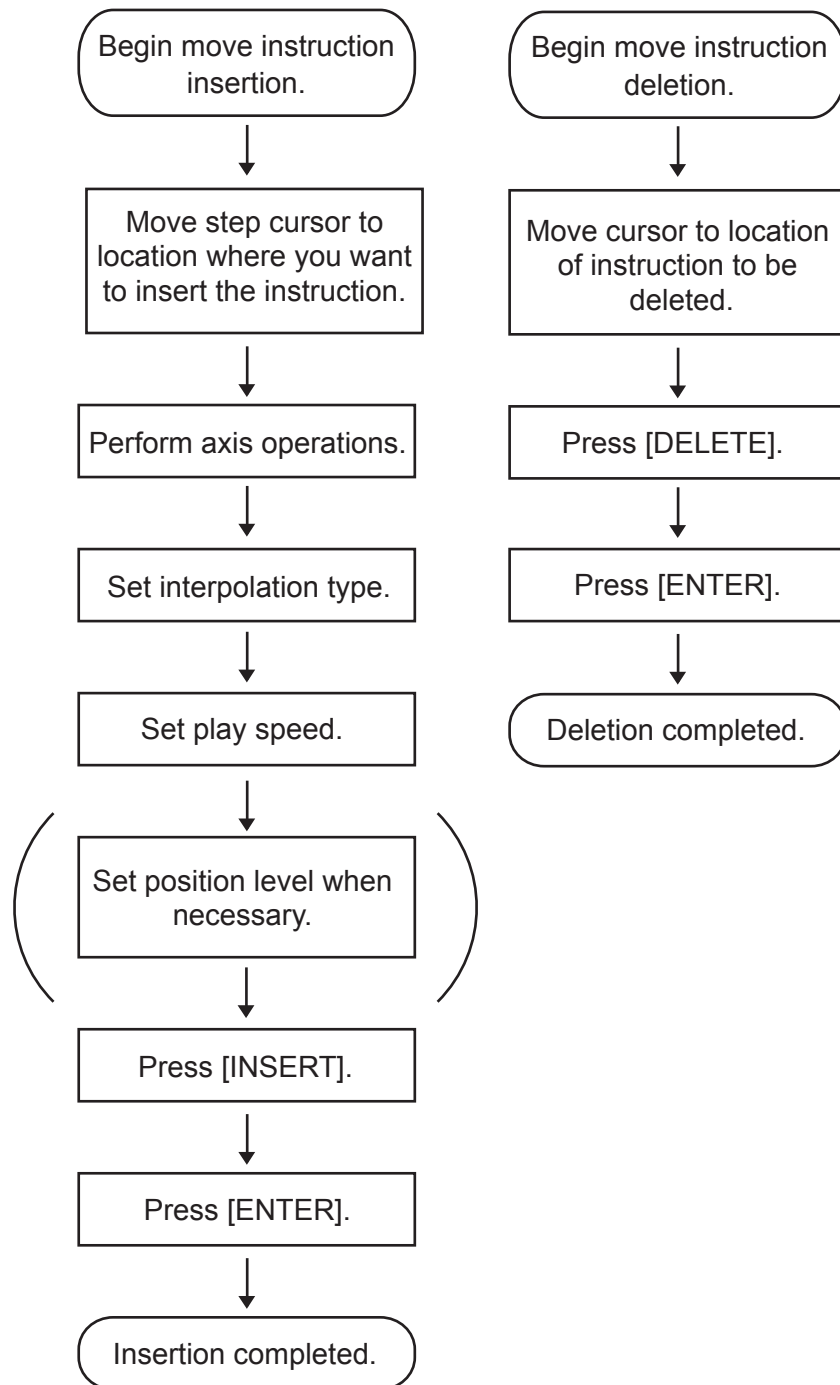
When “MACHINE LOCK” is enabled, the [FWD] / [BWD] operation or the test operation can be performed to check the status of input and output without moving the manipulator.

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”.

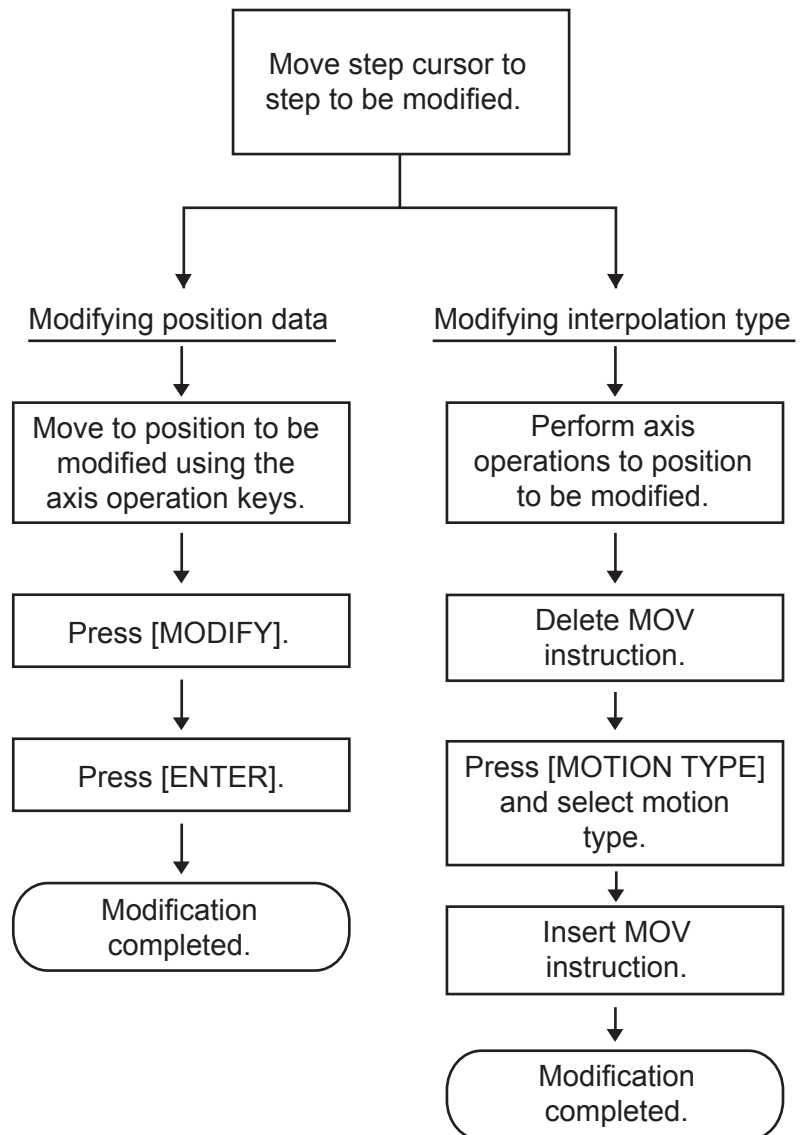


- The setting of “MACHINE LOCK” is maintained even after the mode is switched: If the machine lock is set to “VALID” in the teach mode, it is still “VALID” after switching to the play mode.  
The same applies when the mode is switched from the play mode to the teach mode.
- Note that the machine lock becomes “INVALID” if the following operation is performed.
  - Execution of “CANCEL ALL SELECT” in the SPECIAL PLAY window.
  - Turning off the main power.

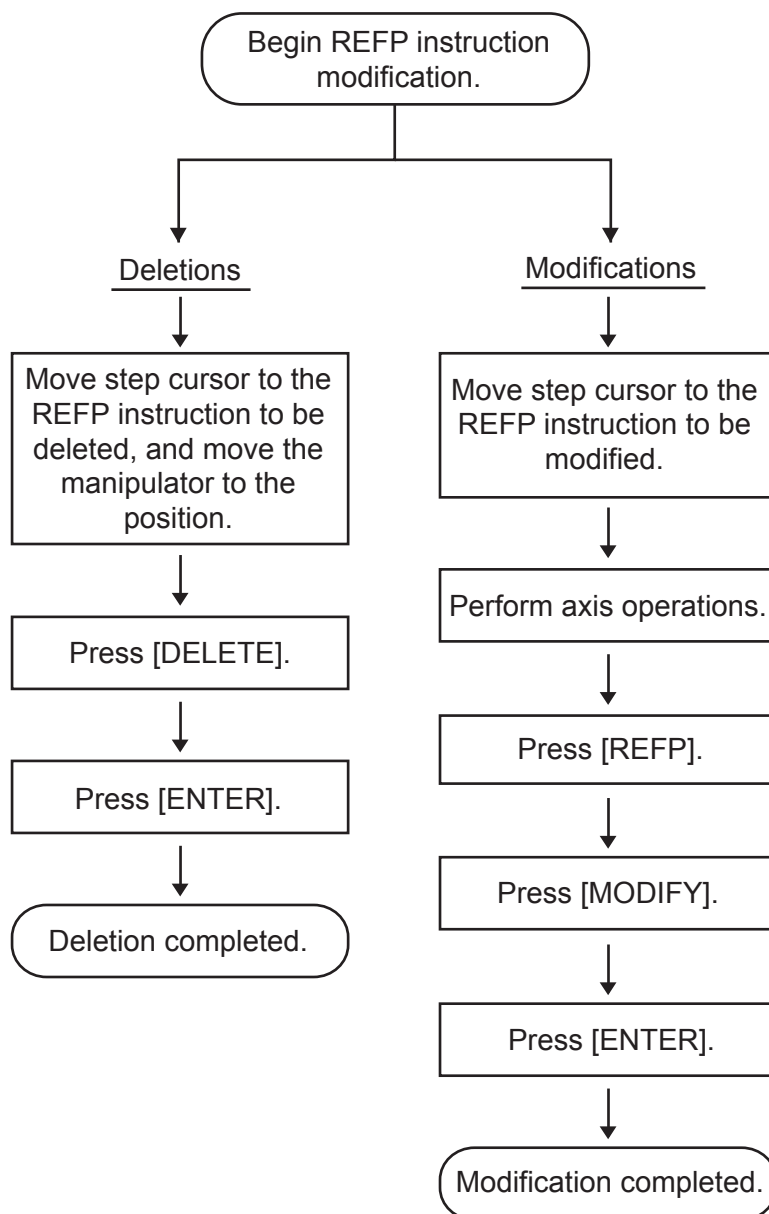
### 3.4 Modifying Steps

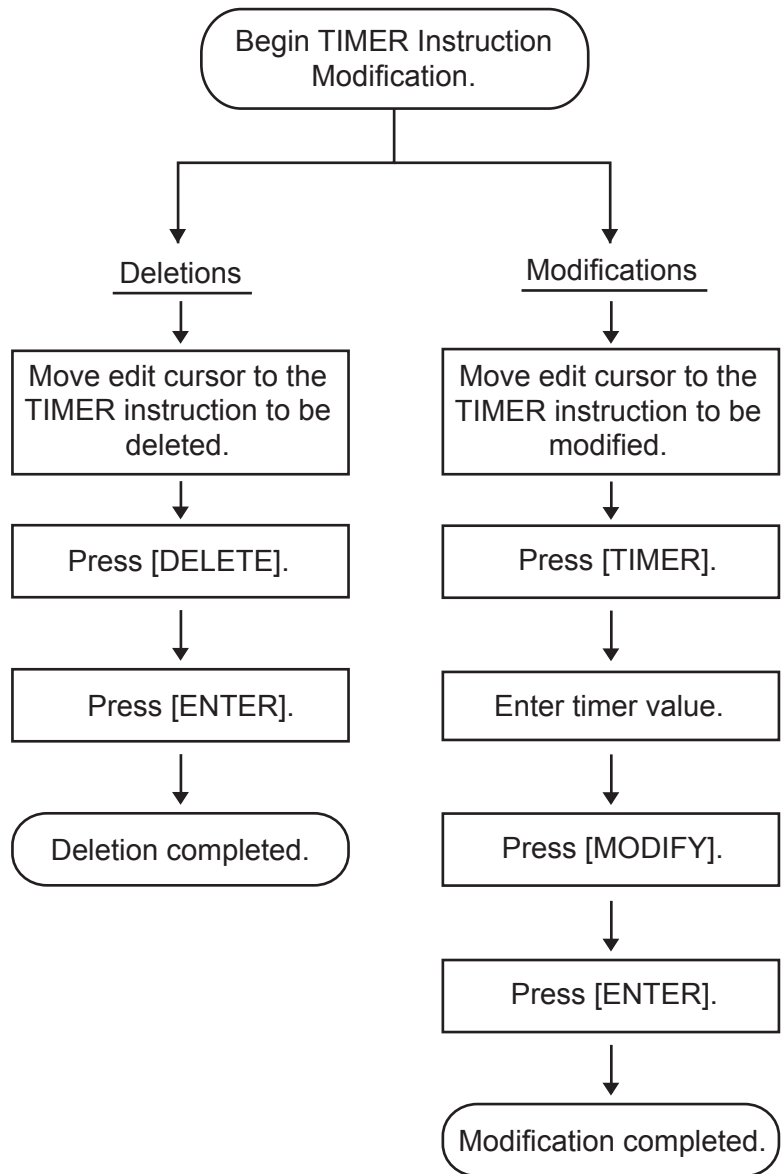






It is not possible to change a move instruction to a reference point instruction and vice versa.





### 3.4.1 Displaying the JOB CONTENT Window for Editing

#### 3.4.1.1 Currently Called Up Job

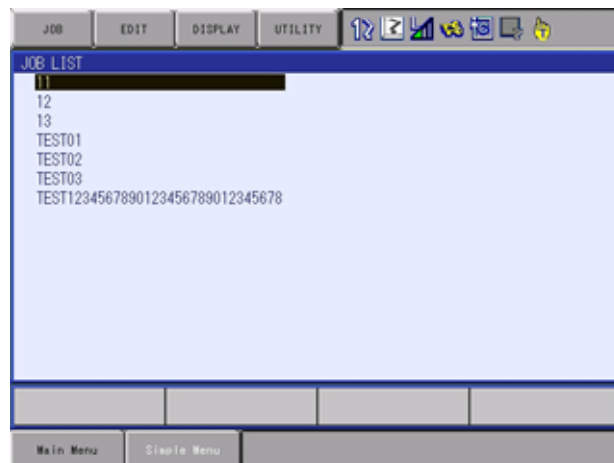
1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
- The JOB CONTENT window appears.

#### 3.4.1.2 Calling Up Other Jobs



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.

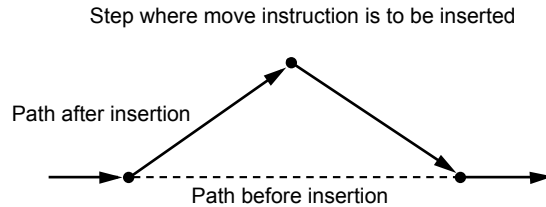


3. Select the job name to be called.

## 3.4.2 Inserting Move Instructions



Move instructions cannot be inserted when the servo power is OFF.



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.



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.



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.

The move instruction is added.

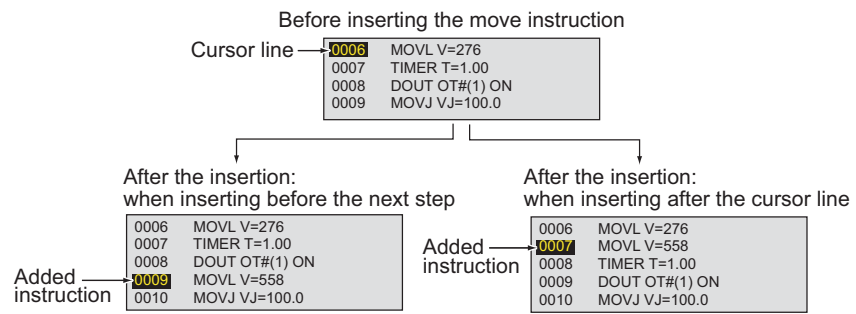
```
0006 MOVL V=276
0007 TIMER T=1.00
0008 DOUT OT#(1) ON
0009 MOVL V=558
0010 MOVJ VJ=100.0
```

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.

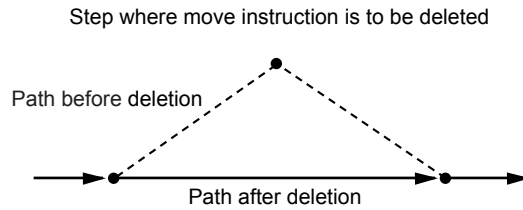


Positions where the move instructions are inserted.



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.

Move instruction to be deleted	0003	MOVL V=138
	0004	MOVL V=558
	0005	MOVJ VJ=50.00

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.

0003	MOVL V=138
0004	MOVJ VJ=50.00

**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**

Modifying only interpolation type is impossible. The interpolation type can be modified as a choice for modifying the position data.

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.



### 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 or a job is executed in the play mode after editing the move instruction.
- The undo operation works only for the last five edited instructions only.

1. Press [ASSIST].

- The assist menu appears.



2. Select {UNDO}.

- The last operation is undone.

3. Select {REDO}.

- The last UNDO operation is undone.

### 3.4.6 Modifying Reference Point Instructions

#### 3.4.6.1 Deleting Reference Point Instructions



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.

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.

#### 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 Key]s.
  - Turn ON the servo power and use [Axis Key]s 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.

### 3.4.7 Modifying Timer Instructions

#### 3.4.7.1 Deleting Timer Instructions

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

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

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	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 VJ=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 Key]s to input data, move the cursor to the input buffer line timer value and press [SELECT].

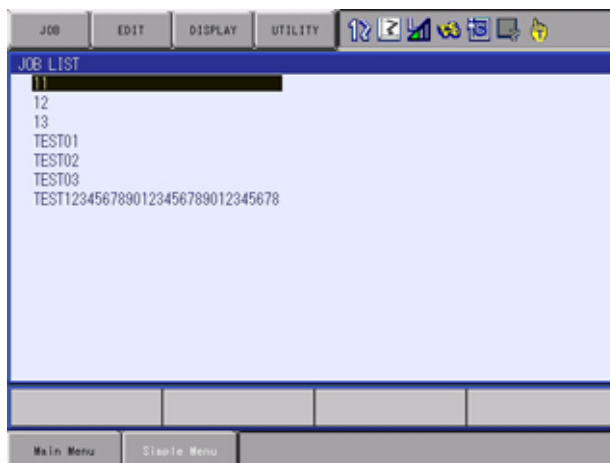
⇒	TIMER T=1.00
---	--------------

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.

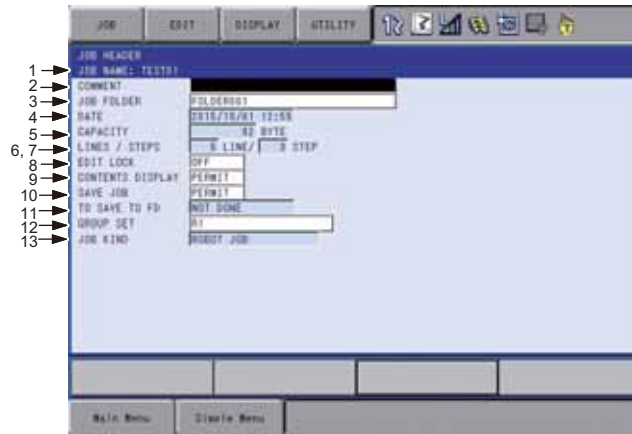
### 3.5.2 Windows Related to Job

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.

**3.5.3 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 in 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 in the management mode or higher, this can be edited in this window.

(Setting the contents display is available in the software version DN1.91-00 or later.)

**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 in the management mode or higher, this can be edited in this window.

(Setting the save job is available in the software version DN1.91-00 or later.)

**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.




To return to the JOB CONTENT window from the JOB HEADER window, select {DISPLAY} from the menu and then select {JOB CONTENT}.


**3.5.4 JOB CONTENT Window**

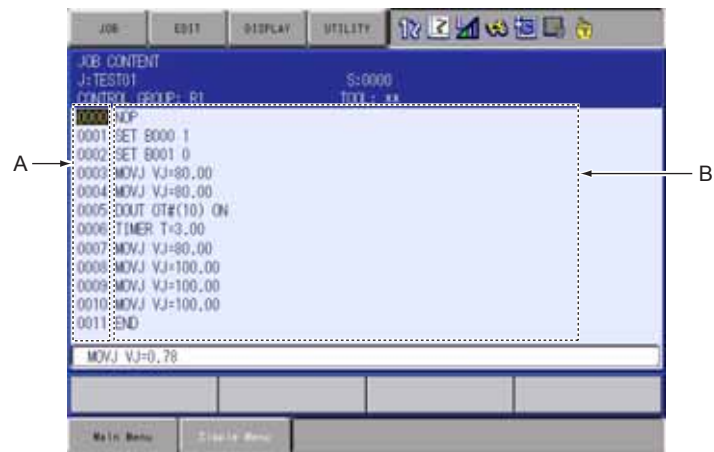
1. Select {JOB} under {Main Menu}.

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.

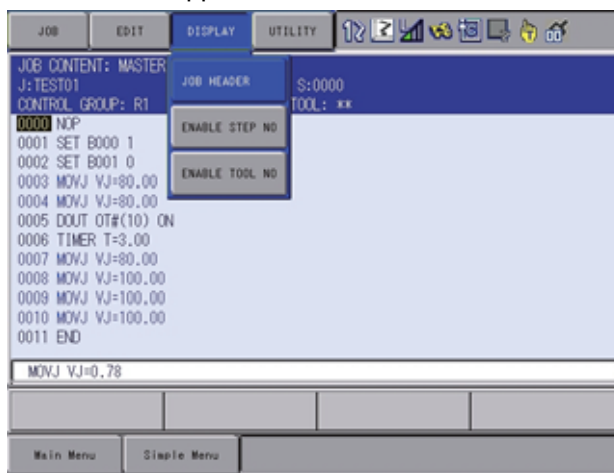
**B. Instruction Area**

Displays instructions, additional items, and comments. Line editing is possible.

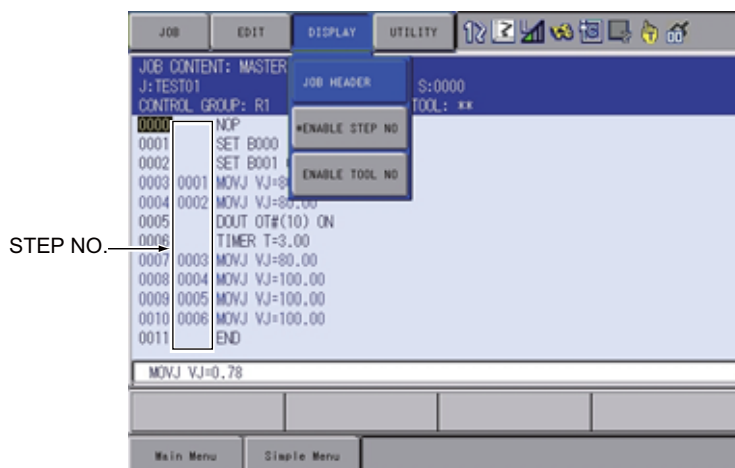
## 3.5.4.1 Switching the Address Area

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.

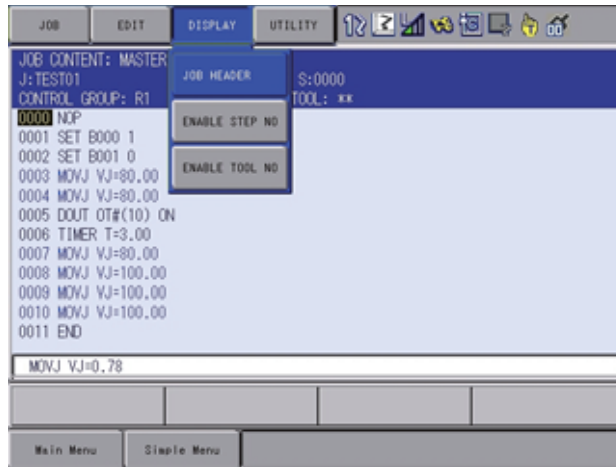


4. Select {ENABLE STEP NO}.
  - Step numbers appear in the address area.
  - In the pull down menu, {ENABLE STEP NO} changes to { \* ENABLE STEP NO }.



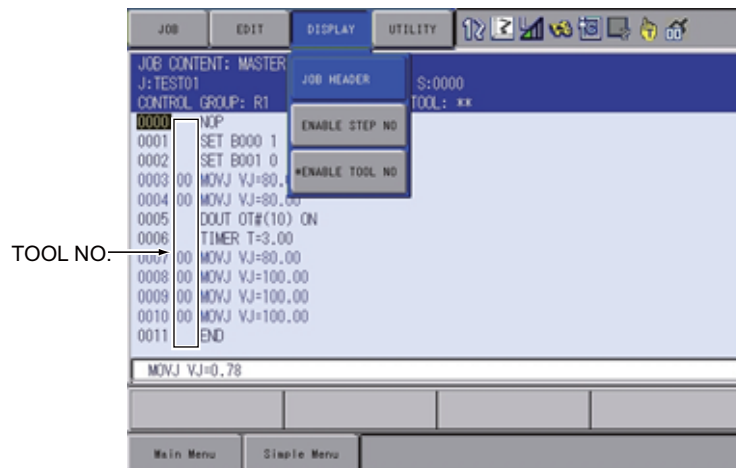


5. Select { \* ENABLE STEP NO}.
  - Step numbers in the address area disappear.
  - In the pull down menu, { \* ENABLE STEP NO} changes to {ENABLE STEP NO}.



6. Select {ENABLE TOOL NO}.
  - Tool numbers appear in the address area.
  - In the pull down menu, {ENABLE TOOL NO} changes to { \* ENABLE TOOL NO}.

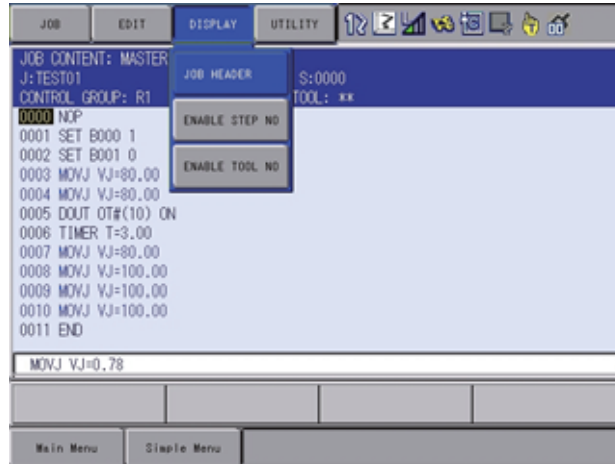
Tool numbers only appear in the line during the move instruction and also appear under the teach mode.



### 3 Teaching

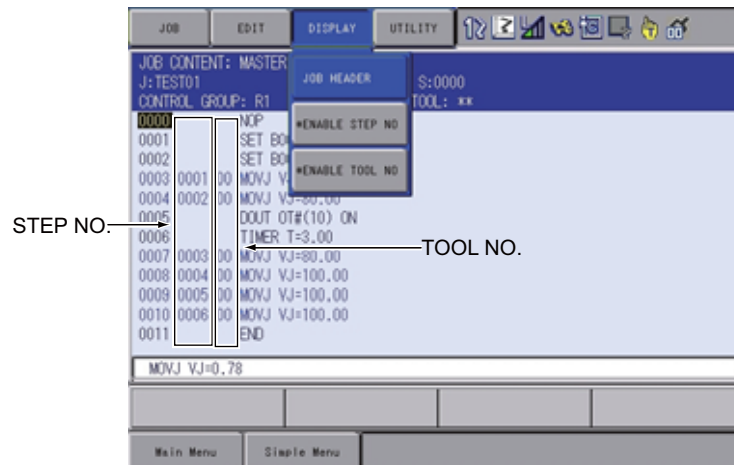
#### 3.5 Modifying Jobs

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}.

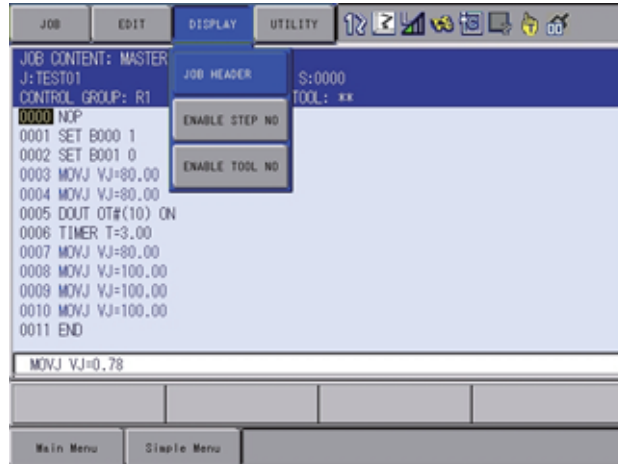


8. Select both {ENABLE STEP NO} and {ENABLE TOOL NO}.
  - The both step numbers and tool numbers appear in the address area.
  - In the pull down menu, {ENABLE STEP NO} changes to { \* ENABLE STEP NO}.
  - In the pull down menu, {ENABLE TOOL NO} changes to { \* ENABLE TOOL NO}.

Tool numbers only appear in the line during the move instruction and also appear under the teach mode.

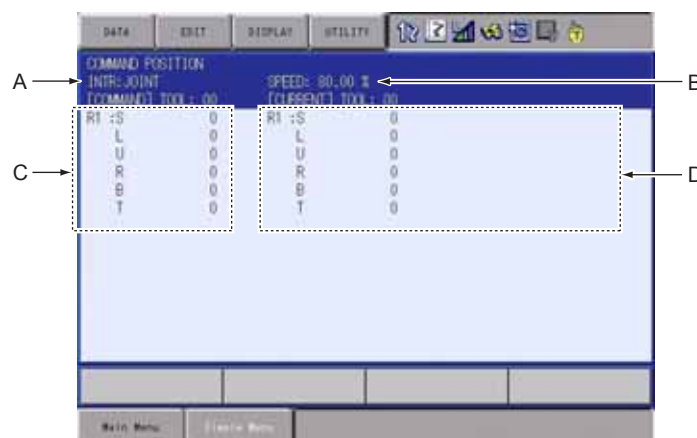


9. Select both { \* ENABLE STEP NO} and { \* ENABLE TOOL NO}.
  - The both step numbers and tool numbers disappear in the address area.
  - In the pull down menu, { \* ENABLE STEP NO} changes to {ENABLE STEP NO}.
  - In the pull down menu, { \* ENABLE TOOL NO} changes to {ENABLE TOOL NO}.



**3.5.5 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 DX200.

**B. USED MEMORY**

Displays the total amount of memory used in the DX200.

**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.

### 3.6.1 Instruction Group

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

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

#### ■ 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.

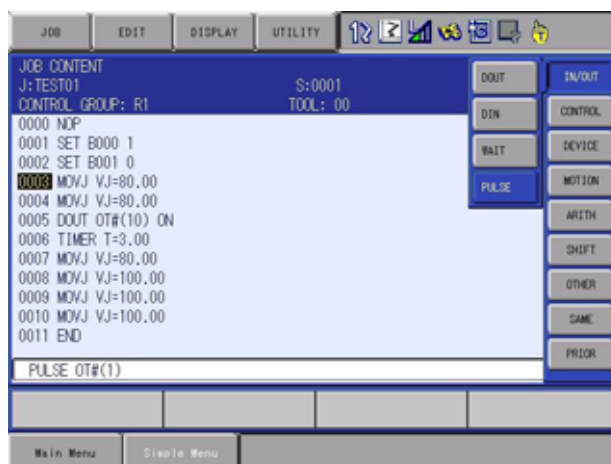
Line before  
where instruction  
is to be added.



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.



## – &lt;When Additional Items are to be edited&gt;

## 1. Changing numeric data

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



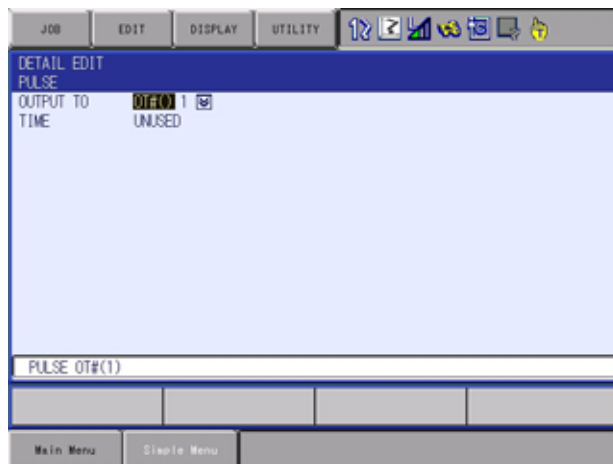
- (2) To directly input the value using [Numeric Key]s, press [SELECT] to display the input buffer line.



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

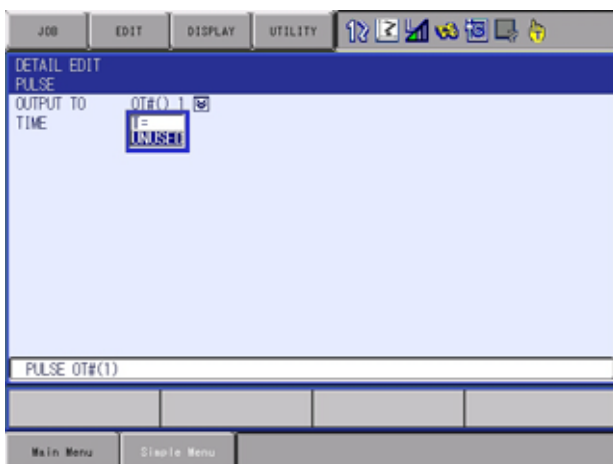
## 2. Adding, modifying, or deleting an additional item

- (1) 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.

- (2) 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”.

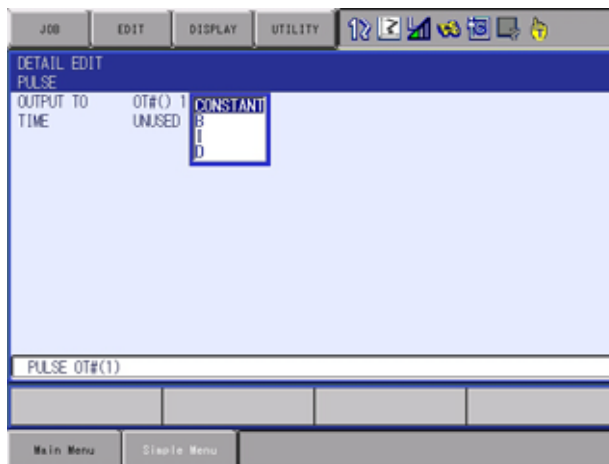


### 3 Teaching

#### 3.6 Editing Instructions

#### 3. Changing the data type

- (1) 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.



- (2) After additional items have been added, modified or deleted as required, press [ENTER]. The DETAIL EDIT window closes and the JOB CONTENT window appears.
4. Press [INSERT] and [ENTER].
- The instruction displayed in the input buffer line is inserted.



**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



```

0003 MOVJ VJ=80,00
0004 PULSE OT#(1)
0005 MOVJ VJ=80,00
0006 DOUT OT#(10) ON
  
```

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.




```

0004 MOVJ VJ=80,00
0005 DOUT OT#(10) ON
  
```

**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.

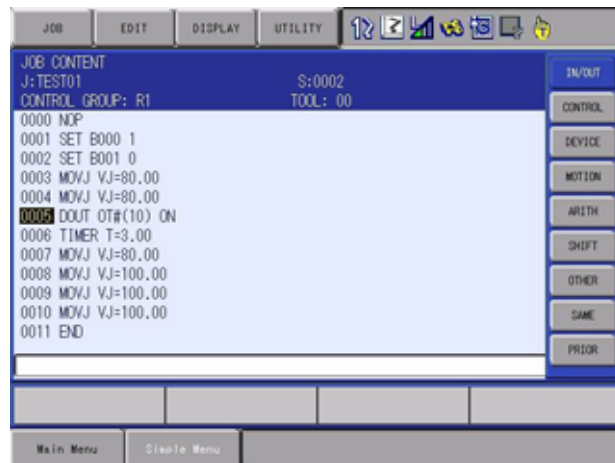
Instruction line to be changed



```

0004 MOVJ VJ=80,00
0005 DOUT OT#(10) ON
0006 TIMER T=3,00
  
```

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



### 3 Teaching

#### 3.6 Editing Instructions

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



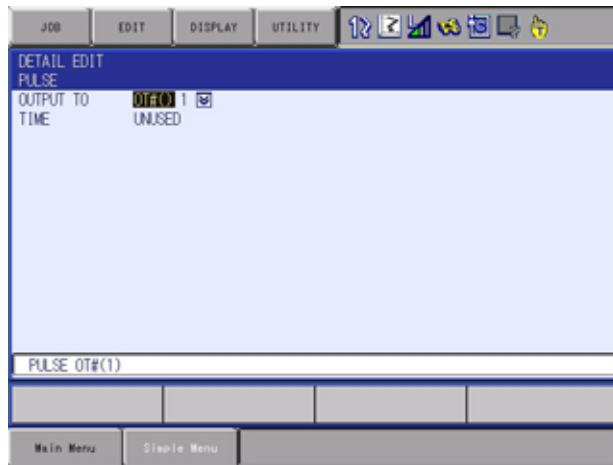
- To directly input the value using [Numeric Key]s, press [SELECT] to display the input buffer line for the numeric values.



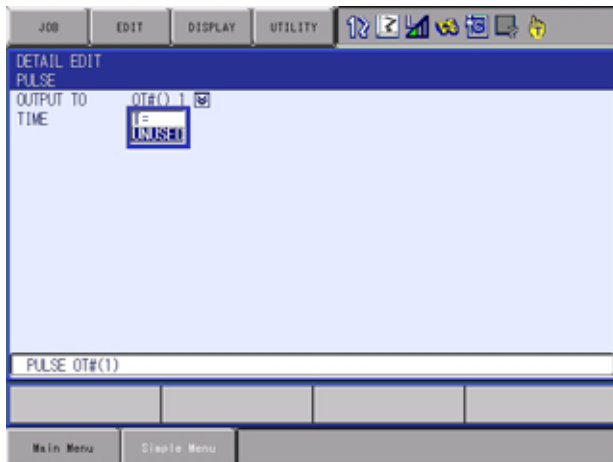
- (2) Type the value and press [ENTER]. The value on the input buffer line is changed.

#### 2. Adding, modifying, or deleting an item

- (1) 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.



- (2) To add an item, move the cursor to "UNUSED" and press [SELECT]. The selection dialog box appears.
- (3) 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".

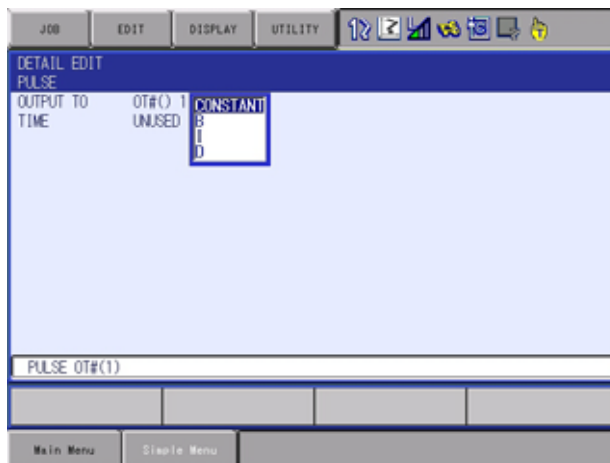


### 3 Teaching

#### 3.6 Editing Instructions

#### 3. Changing the data type

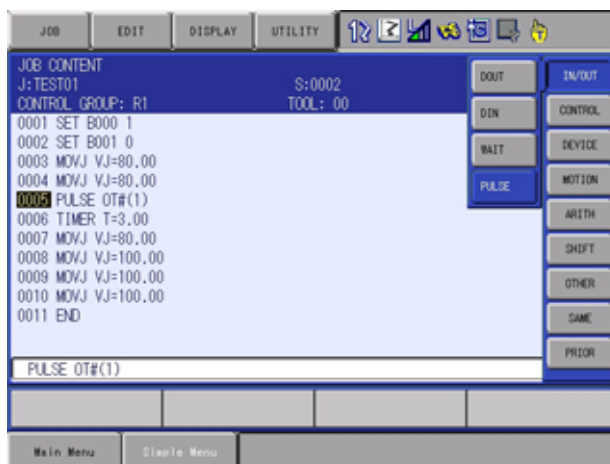
- (1) To change the data type of an additional item, move the cursor to  of the item and press [SELECT]. The data type list appears. Select the desired data type.



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

#### 4. 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 MOVJ VJ=80.00
0005 PULSE=01F000
0006 TIMER T=3.00
  
```

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].

PULSE 01#02

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

Instruction line for which numeric data was changed. →

```

0004 MOVJ VJ=80.00
0005 PULSE=01F002
0006 TIMER T=3.00
  
```

**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.

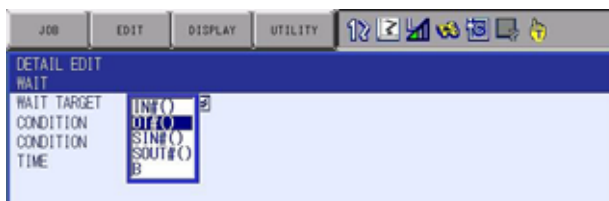
Instruction line for which additional item is to be modified.

```
0008 MOVJ VJ=100.00
0008 WAIT T=1.00
0010 MOVJ VJ=100.00
```

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.

Instruction line for which additional item was modified.

```
0008 MOVJ VJ=100.00
0008 WAIT T=1.00
0010 MOVJ VJ=100.00
```



**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.

Instruction line for which additional item is to be added.

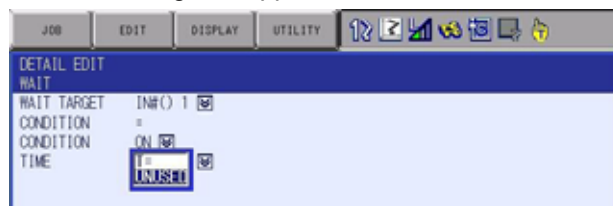
```

0008 MOVJ VJ=100.00
0009 WAIT INP(1)=0
0010 MOVJ VJ=100.00
  
```

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.

Instruction line for  
which additional  
item was added.



```
0008 MOVJ VJ=100.00
0009 MOVJ VJ=100.00
0010 MOVJ VJ=100.00
```

## 3.6.8 Deleting Additional Items



This operation cannot be used for the additional item which is locked.

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.

Instruction line for which additional item is to be deleted.

```
0008 MOVJ VJ=100.00
0009 WAIT INE()=0 T=0.50
0010 MOVJ VJ=100.00
```

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.

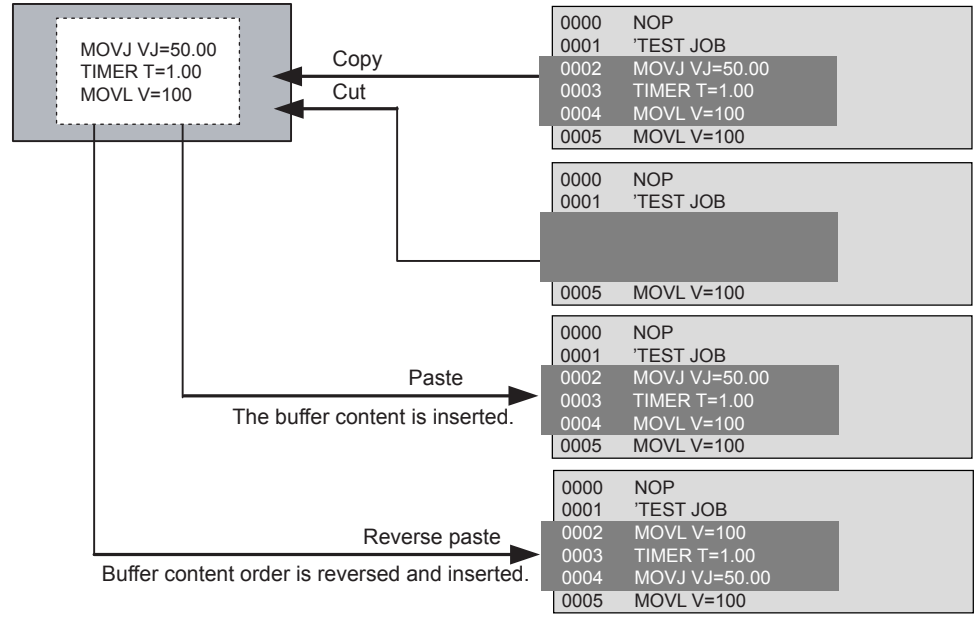
7. Press [ENTER].

- Contents of the input buffer line are registered on the cursor line of the instruction area.

Instruction line for which the additional item was deleted.

```
0008 MOVJ VJ=100.00
0009 WAIT INE()=0
0010 MOVJ VJ=100.00
```

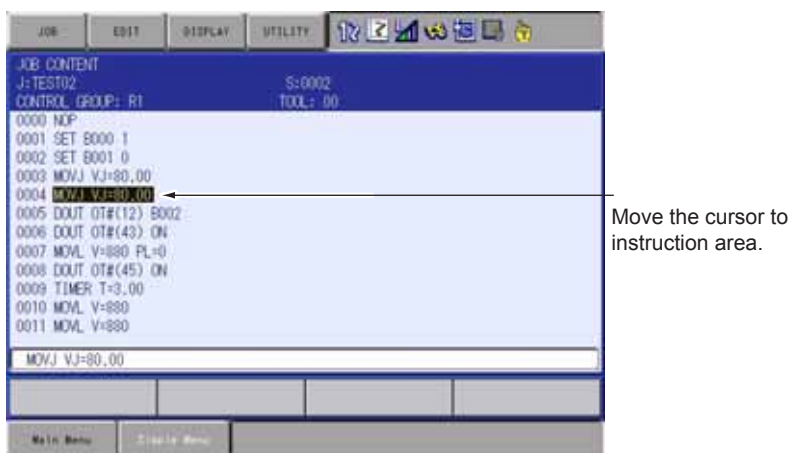




## 3.7.1 Selecting the Range

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

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



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



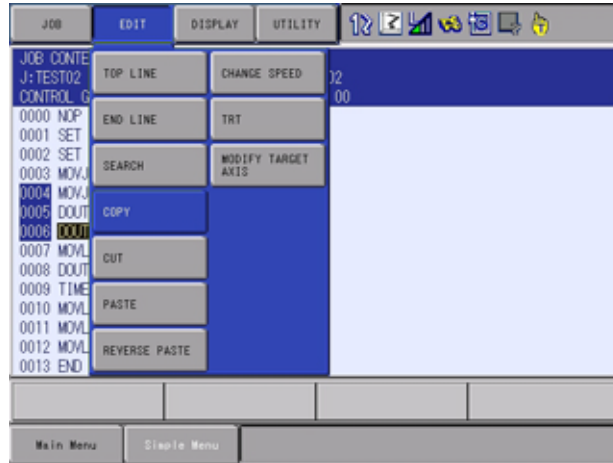
3. Move the cursor to the end line.
  - The range is varied by moving the cursor. Up to the line specified by the cursor is the range.



### 3.7.2 Copying

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

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

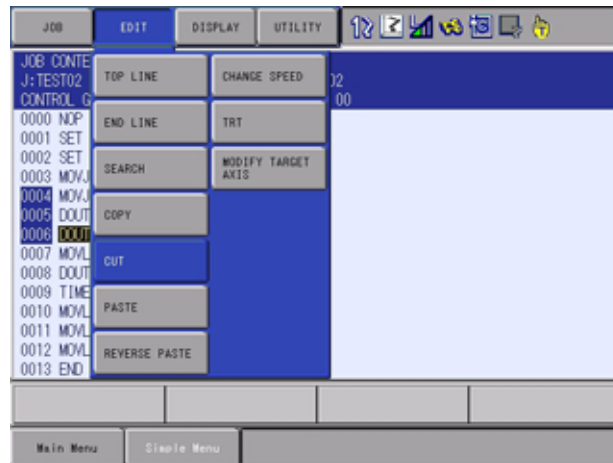


2. Select {COPY}.
  - The specified range is copied to the buffer.

### 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.



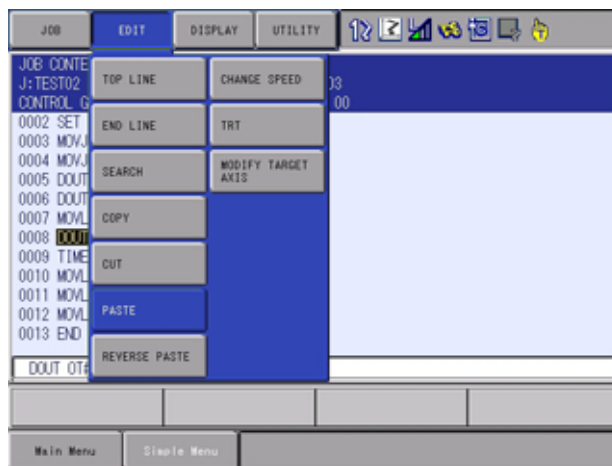
2. Select {CUT}.
  - The confirmation dialog box appears. When “YES” is selected, the specified range is deleted and copied to the buffer.
  - When “NO” is selected, the cutting operation is cancelled.



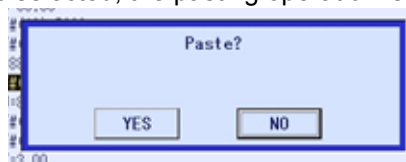
**3.7.4 Pasting**

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 cancelled.

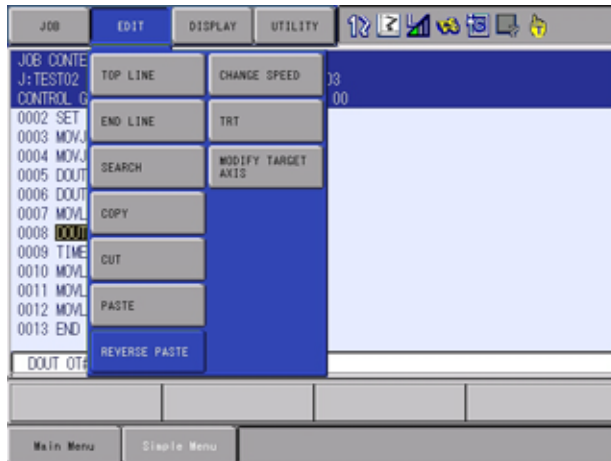




**3.7.5 Reverse Pasting**

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.



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 cancelled.



### 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).

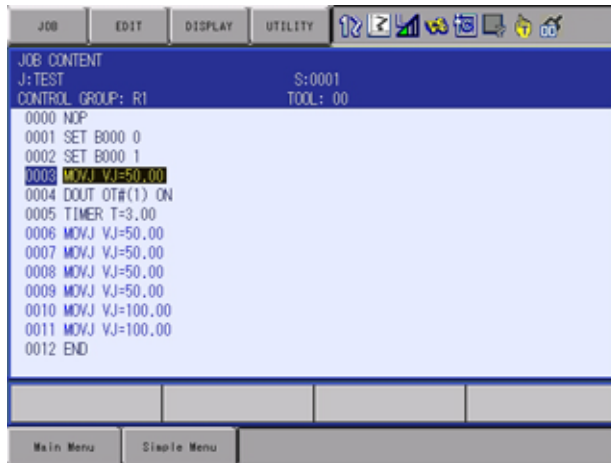


### 3 Teaching

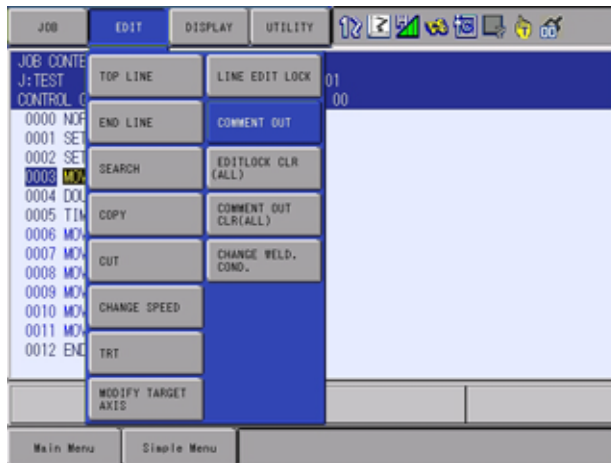
#### 3.7 Editing Jobs

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).



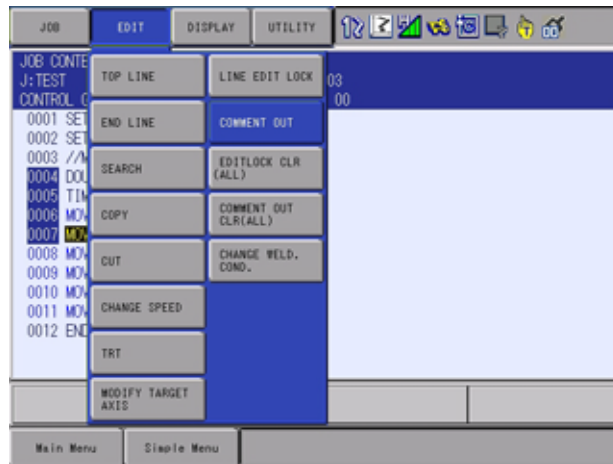
3. Press [SHIFT] + [SELECT].
  - The line is selected.



4. Press[↑] or[↓] to select multiple lines to be commented out.



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

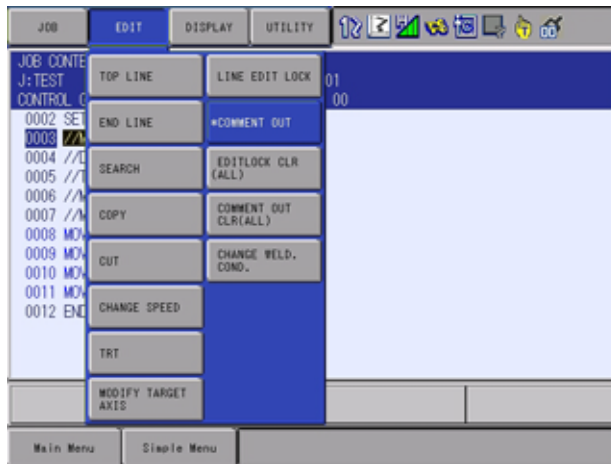
1. Display the {JOB CONTENT OUT} window.
2. Move the cursor to the targeted line.
  - Place the cursor on the line whose comment out is to be canceled.
  - Move the cursor to the right (INST).



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 (INST).



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



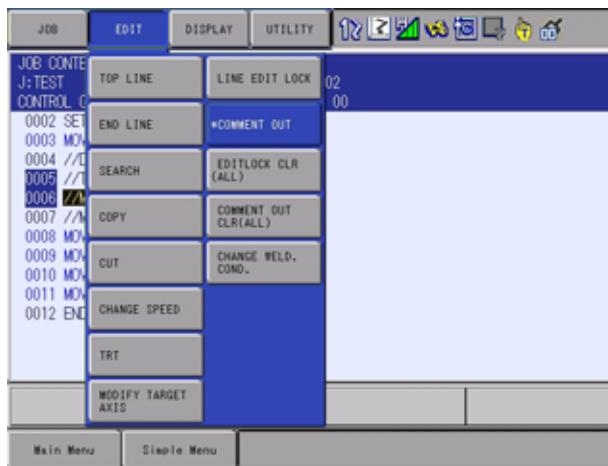


3 Teaching  
3.7 Editing Jobs

- Press [↑] or [↓] to select multiple lines whose comment out is to be canceled.

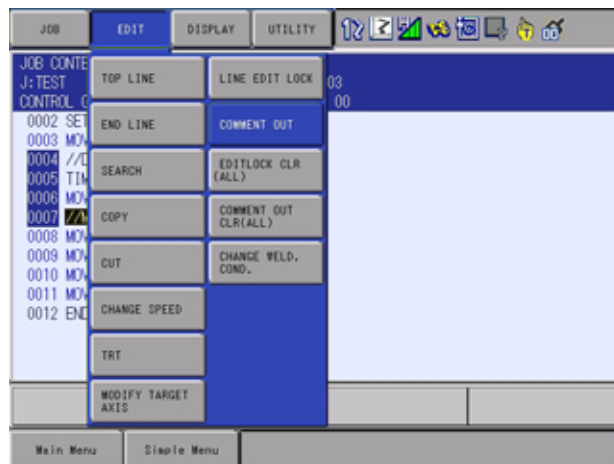


- Select {EDIT} → {\*COMMENT OUT} under the pull-down menu.



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

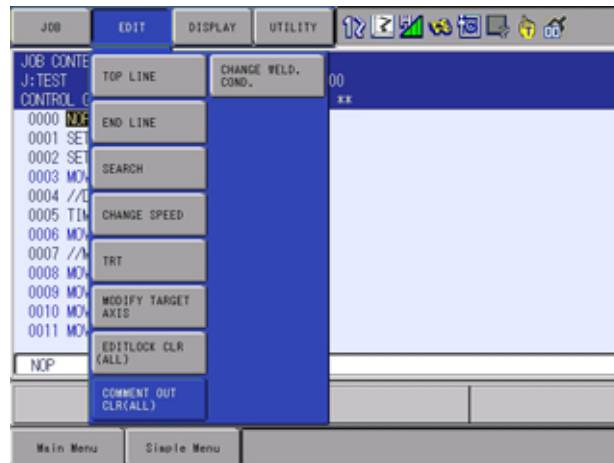
When the lines which are not commented out are included in the selected lines, {COMMENT OUT} (without "'") is displayed in the pull-down menu.



In this case, when {COMMENT OUT} is selected, all the selected lines will be commented out.

## 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.



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.

The Edit Lock cannot be set to NOP and END.

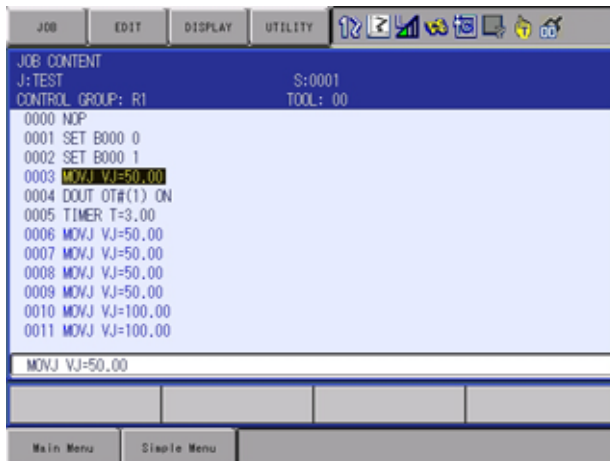


When Edit Lock is tried to be set to NOP and END, "ERROR 2371: EDIT LOCK/COMMENT functions cannot be applied to NOP and END." appears.

**3.7.7.1 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).



### 3 Teaching

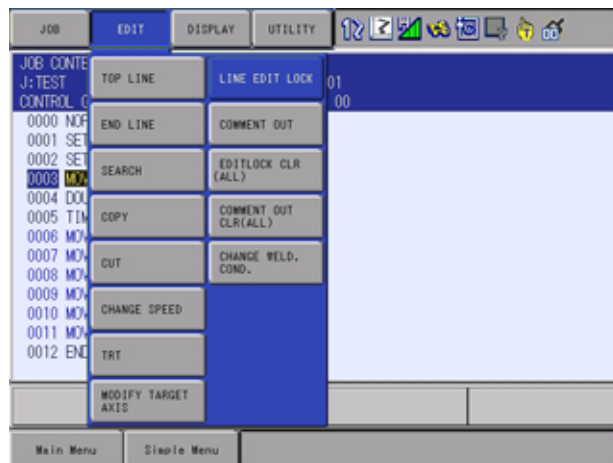
#### 3.7 Editing Jobs

3. Press [SHIFT] + [SELECT].

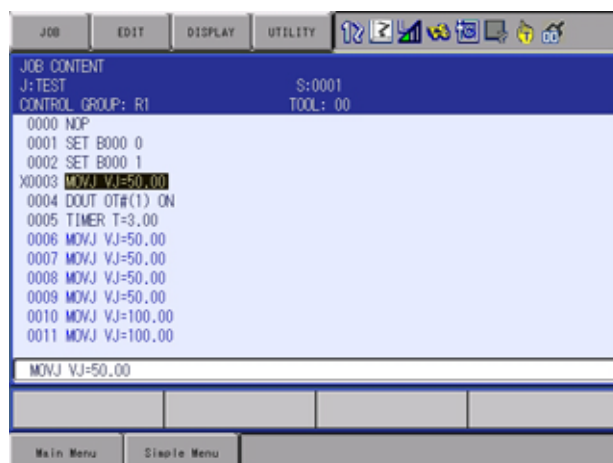
– The line is selected.



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.



## 3.7.7.2 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).



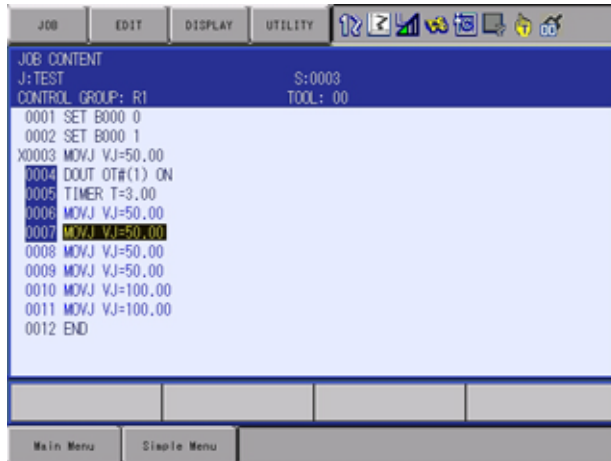
3. Press [SHIFT] + [SELECT].
  - The line is selected.



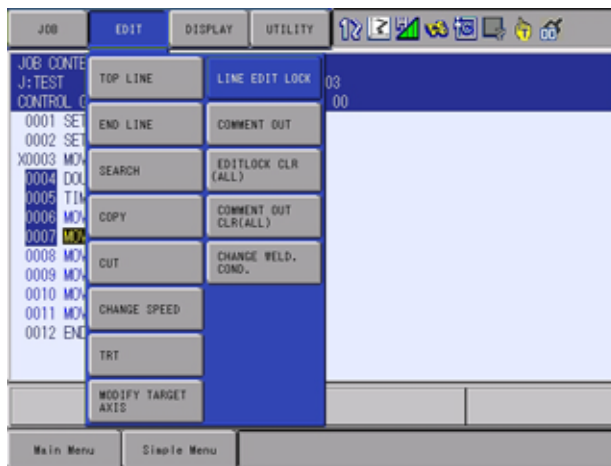
### 3 Teaching

#### 3.7 Editing Jobs

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).

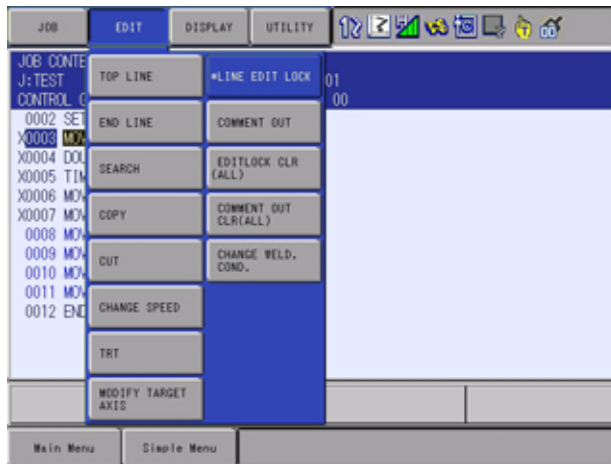


3. Press [SHIFT] + [SELECT].
  - The line is selected.





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.



## 3.7.7.4 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.



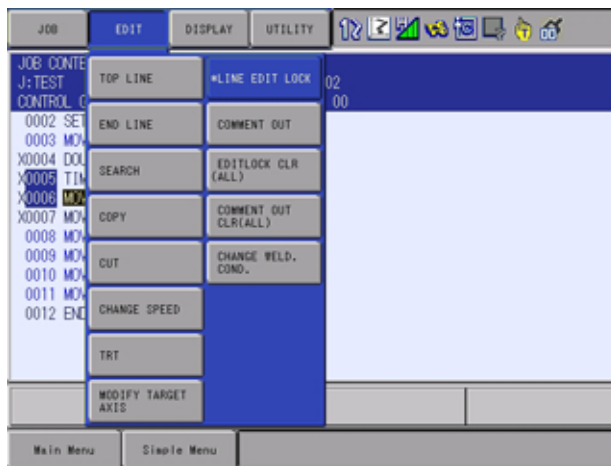
### 3 Teaching

#### 3.7 Editing Jobs

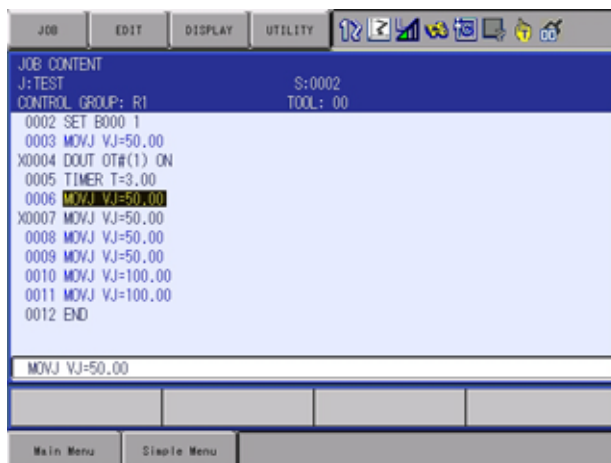
4. Press [↑] or [↓] to select multiple lines whose Edit Lock is to be canceled.



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

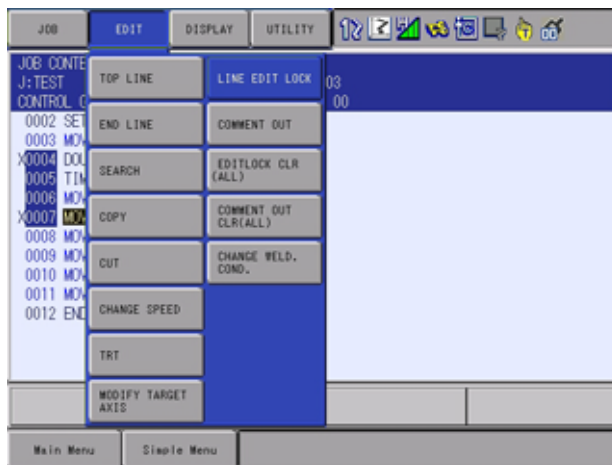


- The Edit Lock of the selected lines is canceled.
- "X" at the head of the line disappears.



When the lines to which the Edit Lock is not set are included in the selected lines, {LINE EDIT LOCK} (without "'") is displayed in the pull-down menu.

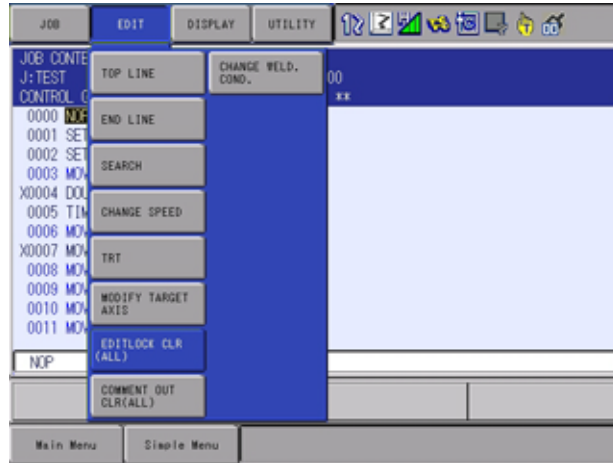
SUPPLEMENT



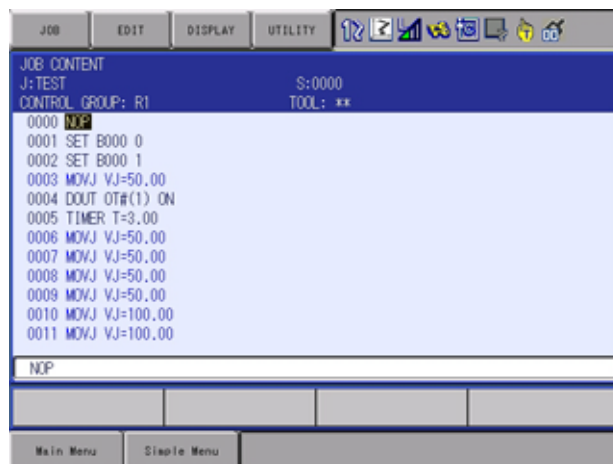
In this case, when {LINE EDIT LOCK} is selected, the Edit Lock will be set to all the selected lines.

## 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.



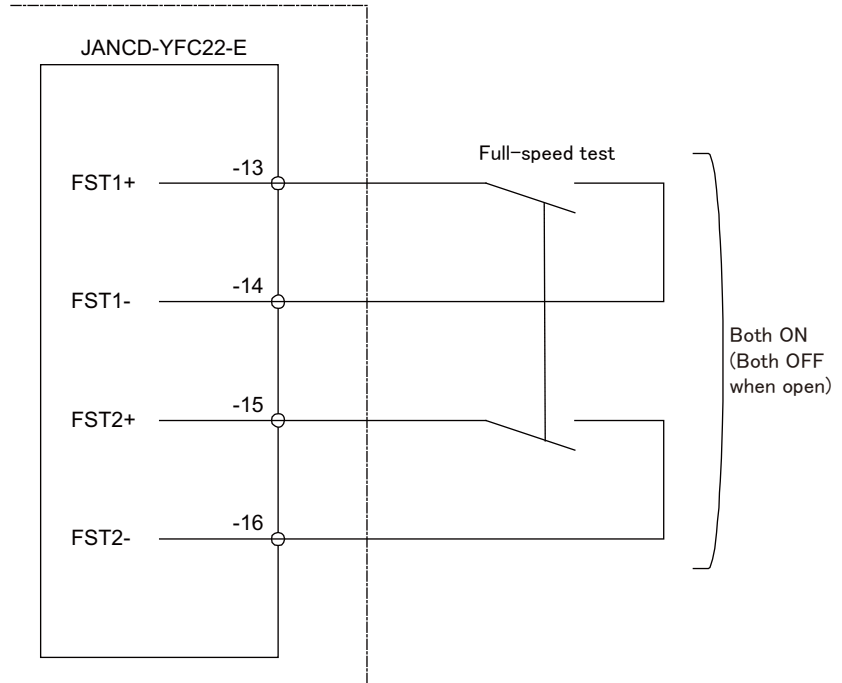
Always check safety conditions before starting the manipulator in motion.

**3.8.2 Manual Full-speed Function**

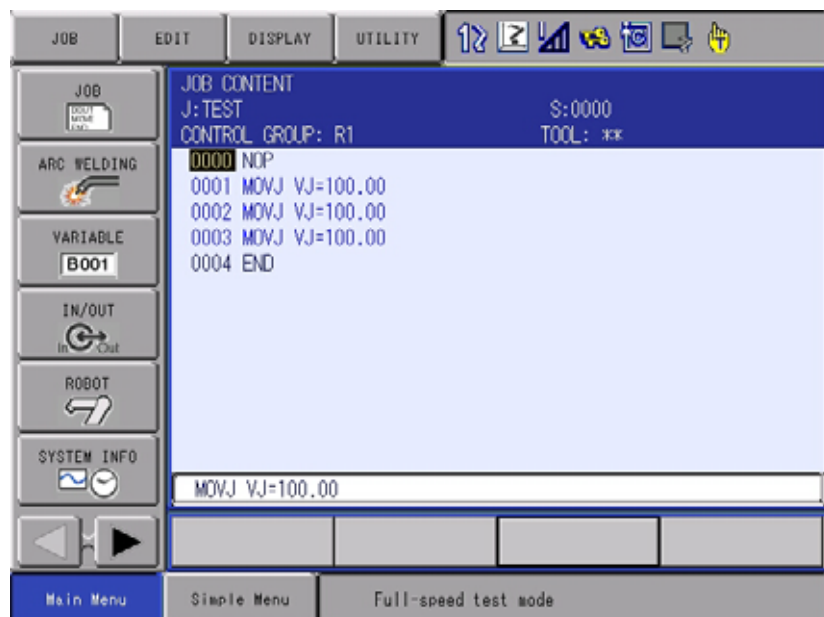
Manual full-speed function allows the manipulator to perform the test run or FWD/BWD operation at the speed set in the job.

**3.8.2.1 Setting Method**

1. Cause short-circuit between the connection numbers 13 and 14, and between 15 and 16 on the terminal block (JANCD-YFC22-E) respectively. (Normally, they are opened.)



2. The message "Full-speed test mode" is displayed as follows when the setting is finished.



## 3.8.2.2 Operation Speed

When the full-speed test mode is set, operation speed is limited depending on the setting of manual speed as follows.

Manual speed	Limit of operation speed (default value)	Parameter (Unit: 0.01%)
Inching	20%	S1CxG60 (default value: 2000)
Slow	50%	S1CxG61 (default value: 5000)
Medium	75%	S1CxG62 (default value: 7500)
Fast	100% (fixed value)	-



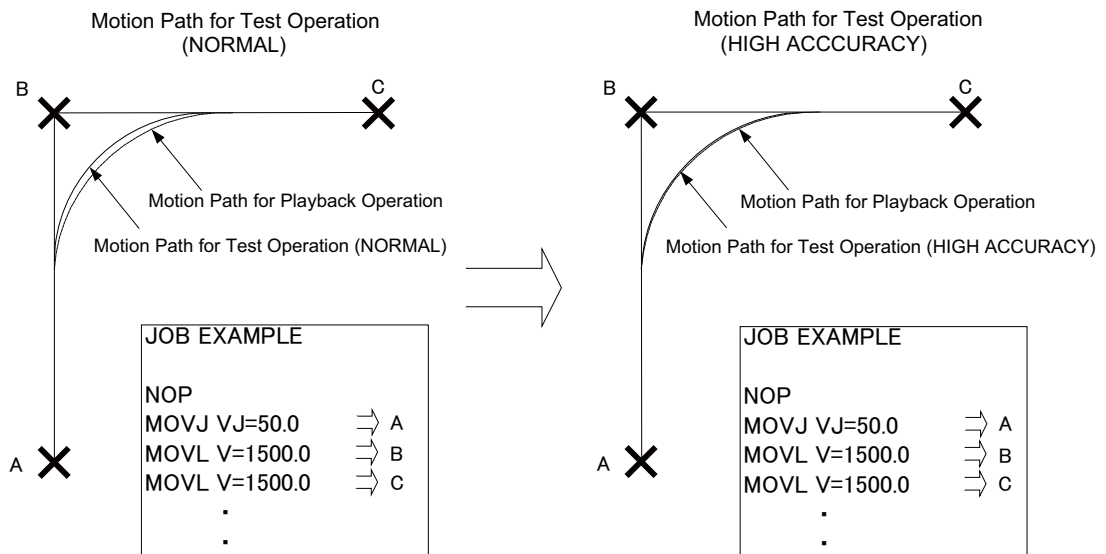
- The limit values of operation speed described in the table above are the ratio against the manipulator's maximum speed, not against the taught speed. The values are for restraining the operation speed not to exceed the limit values of operation speed against the manipulator's maximum speed during the test run or FWD/BWD operation.
- Manual full-speed function allows the manipulator to perform the test run or FWD/BWD operation at the taught speed by a job during the teach mode. Make sure that there is no person around the manipulator and pay great attention to perform the operation.
- If the full-speed test mode is set or released while a servo power is ON, the servo power turns OFF.



**3.8.3 Test Operation (High Accuracy)****3.8.3.1 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 *section 3.8.1 "Test Operation Procedures"*.



## CAUTION

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).

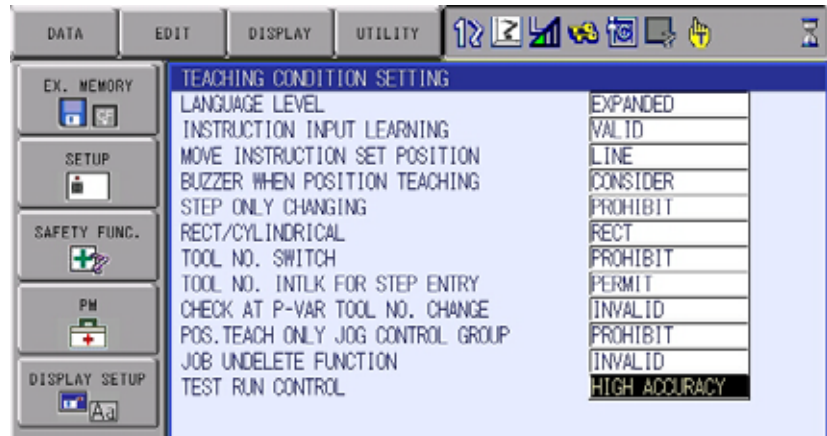


The switching position of the cursor is different in test operation (high accuracy) and in test operation (normal).

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.

## 3.8.3.2 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.  
(Default setting is "NORMAL".)



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

## 3.9 Other Job-editing Functions

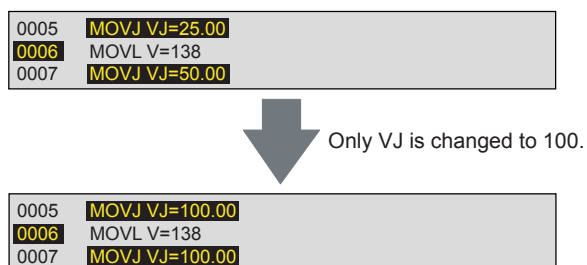
### 3.9.1 Editing Play Speed

There are two ways to modify play speed:

- Modification of Speed Type
- Relative Modification

#### 3.9.1.1 Modification of Speed Type

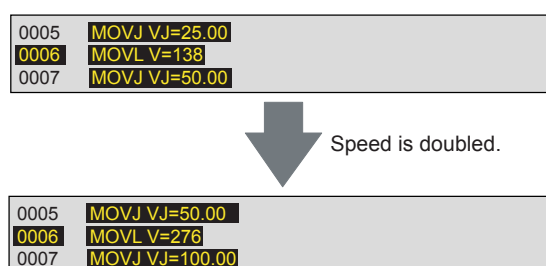
This method is used to modify the speed type (such as VJ, V, VR, etc.)



Type of Play Speed	Explanation	
VJ	Joint Speed	Normal robot axes
V	TCP Speed	
VR	Posture Angle Speed	
VE	Base Axis Speed	

#### 3.9.1.2 Relative Modification

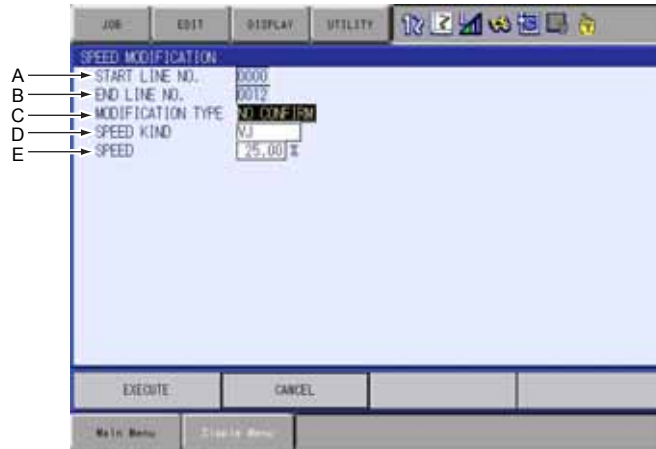
All steps are selected regardless of the play speed type. This method is used to change all steps by a specified percentage (1% to 200%). This is called relative modification.



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, selection dialog box appears. Select the speed type to be changed.

**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].

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.



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].

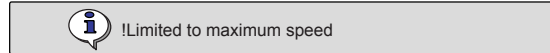
## 8. Select "EXECUTE".

- 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. Therefore, in such cases, the set time and the actual time required are not same.

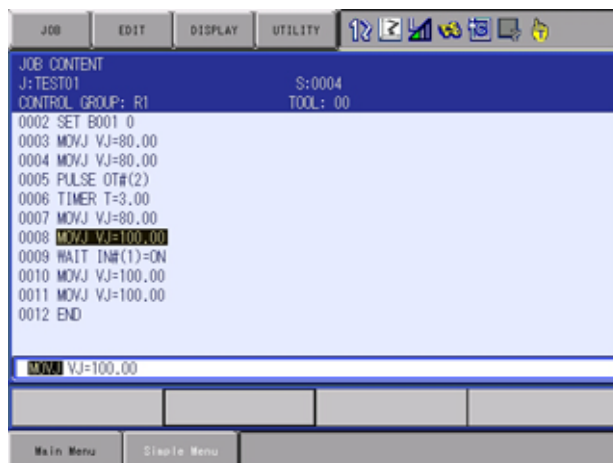
- If the speed data is limited by the maximum value, the following message is displayed.



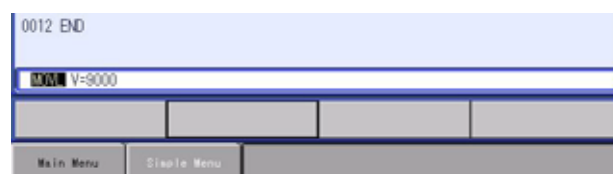
- The line to which the Edit Lock function is set or the comment out is performed cannot be changed.  
(For details, refer to *section 3.7.6 "Commenting Out a Line" on page 3-71* and *section 3.7.7 "Prohibiting Editing Line-by-Line" on page 3-81.*)

**3.9.2 Editing Interpolation Type**

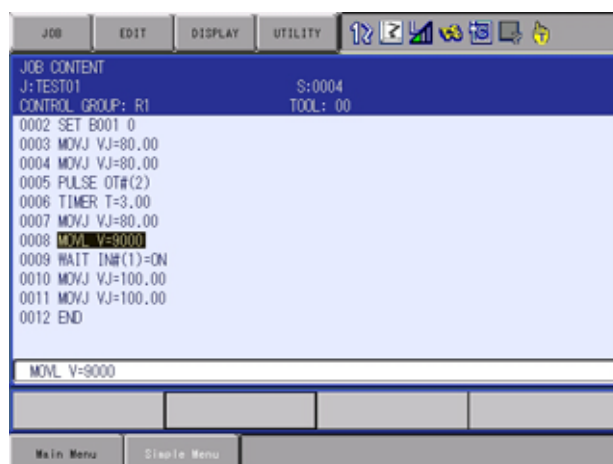
1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
  - The JOB CONTENT window appears.
3. Move the cursor to the instruction area.
4. Select the line to be modified.
  - The instruction on the cursor is displayed in the input buffer line.



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: 4500 cm/min  
Linear Speed: 10% = Linear Speed: 900 cm/min



6. Press [ENTER].
  - The instruction on the cursor line is replaced with one on the input buffer line.





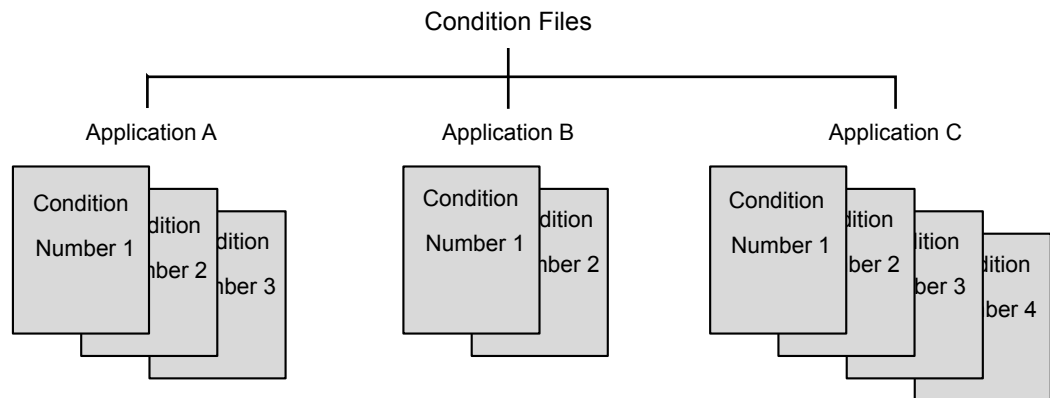
### 3.9.3 Editing Condition Files

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.



Refer to DX200 Operator's Manual of each application for information regarding the contents and editing methods of the condition file.



**3.9.4 User Variables**

User variables are used for jobs to store counters, calculation results or input signals. Since the same user variable can be used in multiple jobs, save the numerical values as common references for the jobs and 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 3-5: User Variables*

Data Format	Variable No. (pcs)	Functions
Byte Type	B000 to B099 (100)	Range of storable values is from 0 to 255. Can store I/O status. Can perform logical operations (AND, OR, etc.)
Integer Type	I000 to I099 (100)	Range of storable values is from -32768 to 32767.
Double Precision Integer Type	D000 to D099 (100)	Range of storable values is from -2147483648 to 2147483647.
Real Type	R000 to R099 (100)	Range of storable values is from -3.4E+38 to 3.4E38. Accuracy: $1.18E-38 < x \leq 3.4E38$
Character Type	S000 to S099 (100)	Maximum storable number of characters is 16.
Position Type	P000 to P127 (128)	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.
	BP000 to BP127 (128)	
	EX000 to EX127 (128)	
Timer variable	TM000 to TM059 (60)	Range of storable values is from -2147483648 to 2147483647.

\* For the timer variable, refer to *section 6.18.2 "Timer Variable"*.

• **Play Speed V:**

MOVL 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 0.1mm/s → V=100.0mm/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:**

MOVL 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

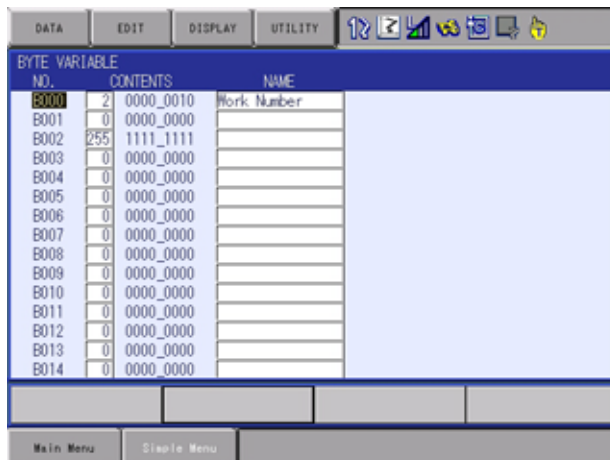
The unit for T is 0.01 seconds.

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.

#### 3.9.4.1 Setting Byte, Integer, Double Precision Integer, and Real Type Variables

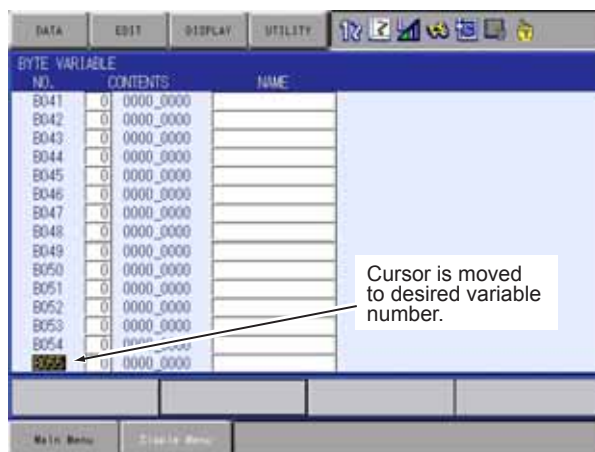
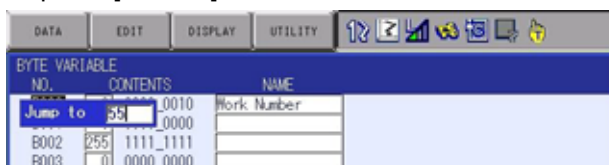
1. Select {VARIABLE} under {Main Menu}.
  - {BYTE}, {INTEGER}, {DOUBLE}, and {REAL} are displayed for the sub menu.
2. Select desired variable type.
  - The BYTE VARIABLE window appears. (Following is a case that {BYTE} is selected.)



### 3 Teaching

#### 3.9 Other Job-editing Functions

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 Key]s and press [ENTER].
    - Move the cursor to the menu area and select {EDIT} → {SEARCH}. Then input the variable No. with the [Numeric Key]s and press [ENTER]



4. Move the cursor to the data of the variable.
  - The number can be directly typed.
5. Input the desired number.

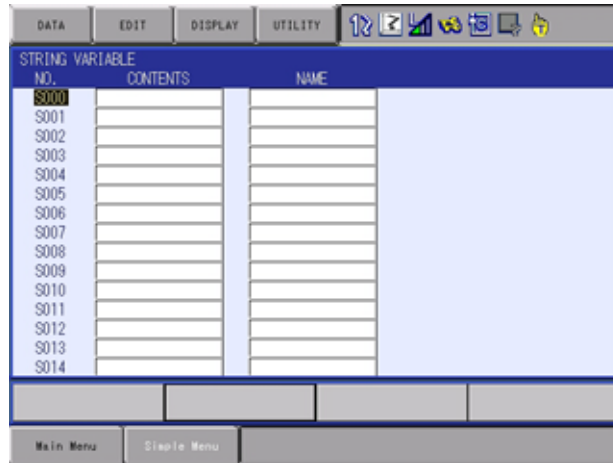


6. Press [ENTER].
  - Input value is set to the variable on the cursor position.



## 3.9.4.2 Setting Character Type Variables

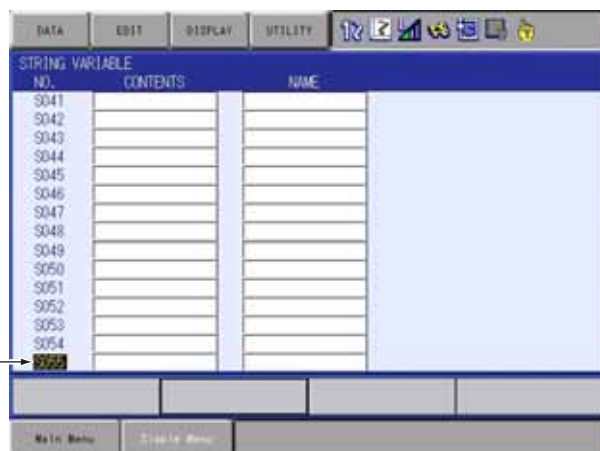
1. Select {VARIABLE} under {Main Menu}.
2. Select {STRING}.
  - The STRING VARIABLE window appears.



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 Key]s and press [ENTER].
    - Move the cursor to the menu area and select {EDIT} → {SEARCH}. Then input the variable No. with the [Numeric Key]s and press [ENTER]



The cursor is moved to desired variable number.



### 3 Teaching

#### 3.9 Other Job-editing Functions

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 *section 1.2.6 “Character Input Operation” on page 1-22.*
6. Press [ENTER].
  - The input characters are set to the variable on the cursor position.



STRING VARIABLE		
NO.	CONTENTS	NAME
S053		
S054		
S055	Work Number	
S056		

## 3.9.4.3 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} → {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.



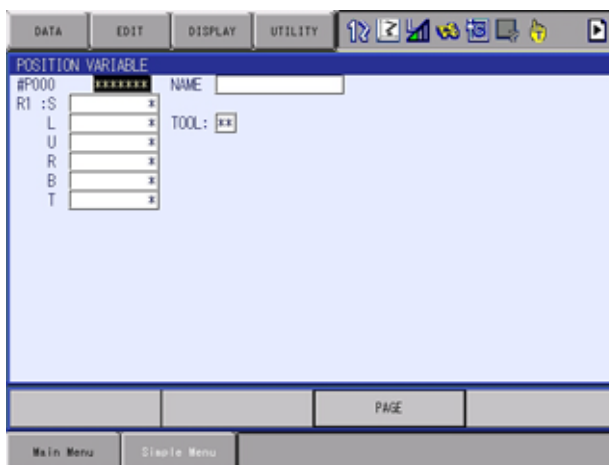
Refer to section 1.2.6 “Character Input Operation” on page 1-22 for the character input operation.

5. Input name.
6. Press [ENTER].
  - The variable name is registered.

INTEGER VARIABLE		
NO.	CONTENTS	NAME
1000	0	
1001	0	Work Name
1002	0	

## 3.9.4.4 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 Key]s and press [ENTER].
    - Move the cursor to the menu area and select {EDIT} → {SEARCH}. Then input the variable No. with the [Numeric Key]s and press [ENTER].

Move to desired variable number page.





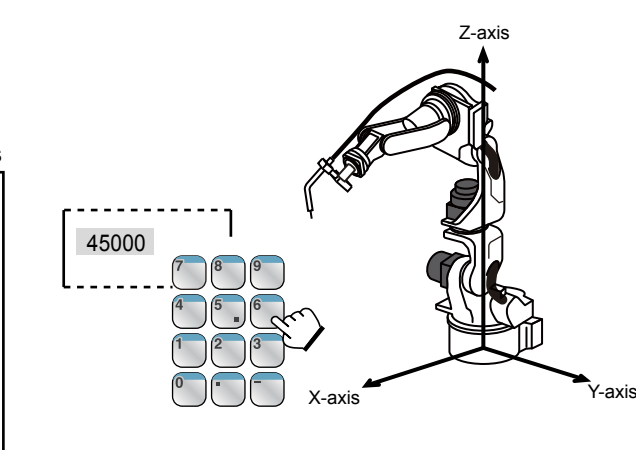
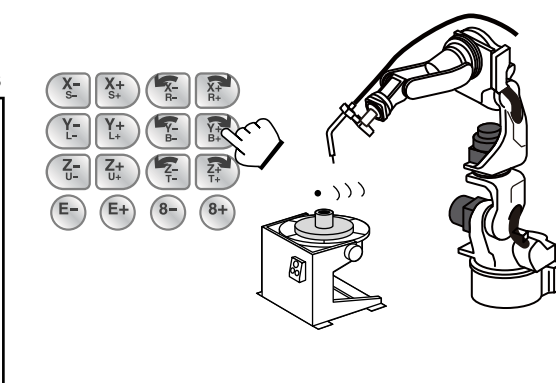
3.9.4.5 Setting Position Variables

The following table shows the types of position variables and setting methods.

**NOTE**

- The setting of position variables is done in the teach mode.
- Turn the servo power ON when setting the variables with the [Axis Key]s.

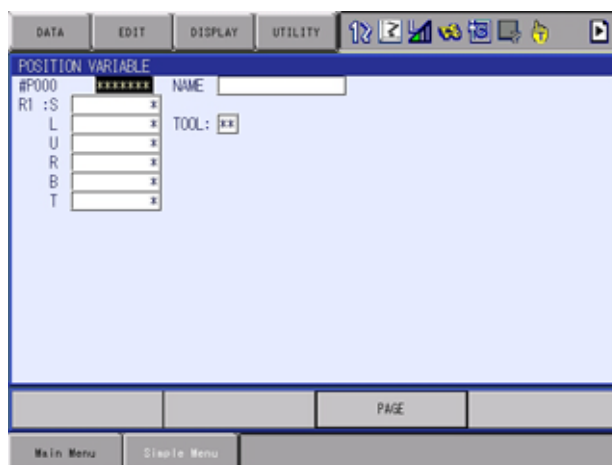
Table 3-6: Types of Position Variables and Setting Method

Type	Pxxx (Robot)		BPxxx (Base)		EXxxx (Station)
	Pulse Type	XYZ Type	Pulse Type	XYZ Type	Pulse Type
Setting Method		Select coordinates from base, robot, user, tool.			
	Using the numeric keys				
	Using the axis keys				

## 3.9.4.6 Setting Position Variables Using the [Numeric Key]s

## ■ Pulse Type

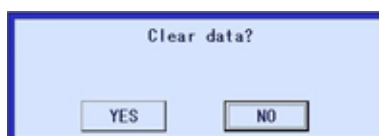
1. Select {VARIABLE} under {Main Menu}.
2. Select desired position variable type.
  - The desired variable window appears (robot, base, or station). (The POSITION VARIABLE window is used for this example.)



3. Select the variable data type.
  - The selection dialog box appears.



- If the position variable was set before, confirmation dialog box appears for data clear. If "YES" is selected, the data is cleared.



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.



### ■ 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 *section 3.9.4.10 "Manipulator Types" on page 3-115*. Current Position Window (XYZ) shows the current setting of a type.

## 3.9.4.7 Setting Position Variables Using the [Axis Key]s

■ **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 Key]s.
  - 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 Key]s.
  - Move the manipulator or the external axis to the desired position to be set to position variable.
4. Press [MODIFY].
5. Press [ENTER].

## 3.9.4.8 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.



## 3.9.4.9 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.

## 3.9.4.10 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.

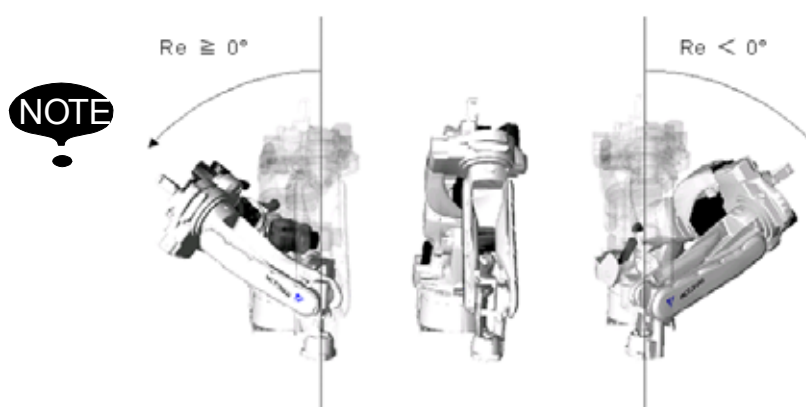
This is called "Type".

Type varies according to the manipulator model.

For the manipulator with seven axes, X, Y, Z, Rx, Ry, Rz, and Type are used.

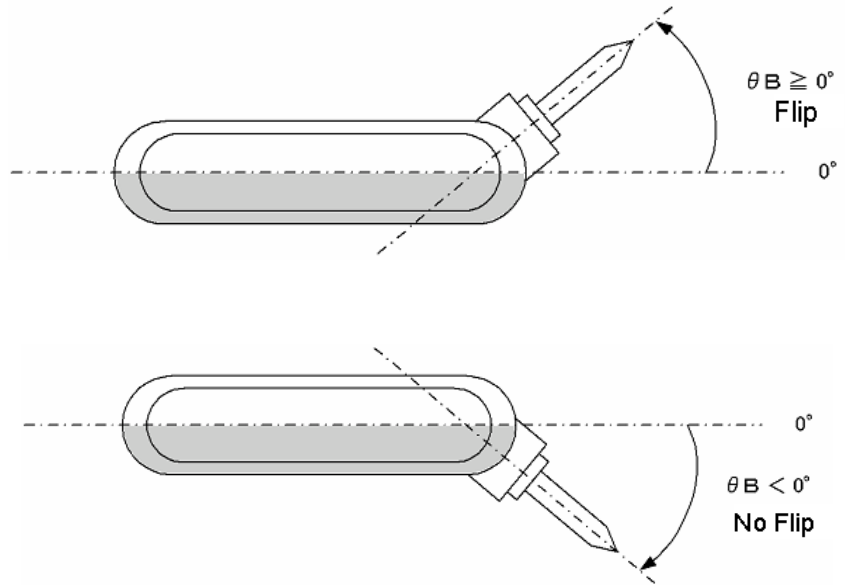
Re is an element to indicate the posture of the manipulator with seven axes and does not change by the specified coordinates.

The definition of Re is shown below.



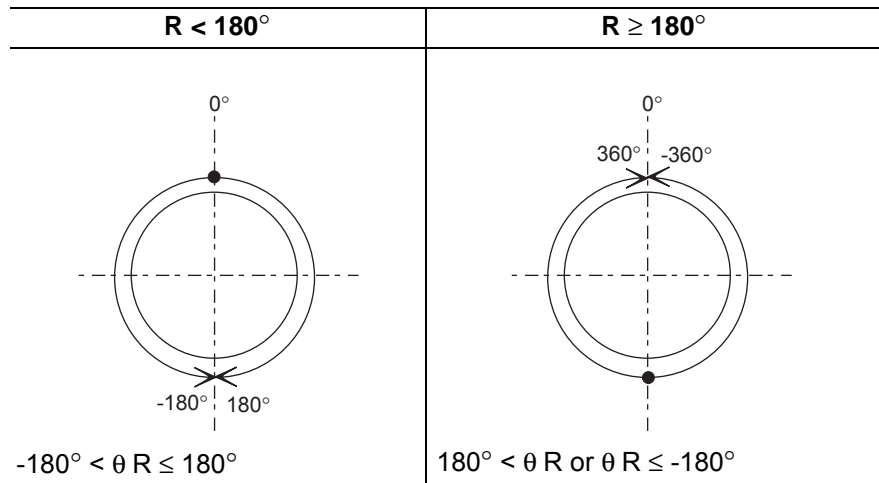
**3.9.5 Flip/No Flip**

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".



**3.9.6 R-axis Angle**

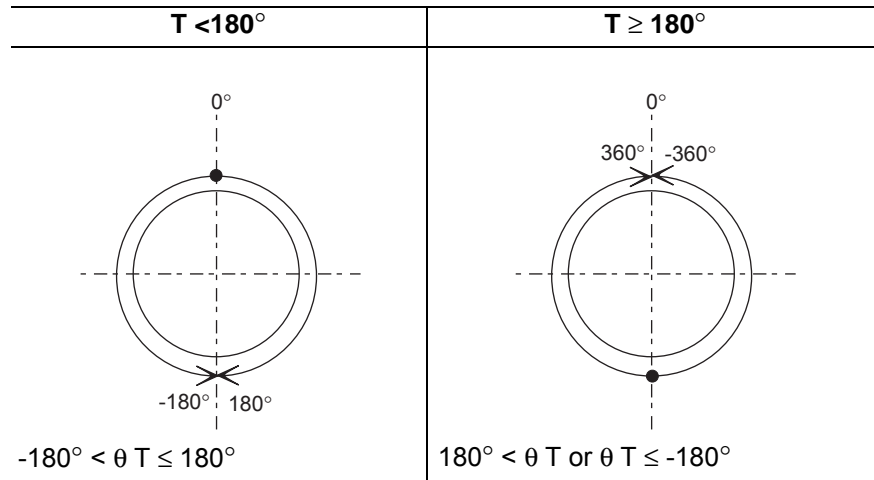
This specifies whether the R-axis angle is less than  $\pm 180^\circ$  or greater than  $\pm 180^\circ$ .



**NOTE**  $\theta_R$  is the angle when the R-axis home position is  $0^\circ$ .

**3.9.7 T-axis Angle**

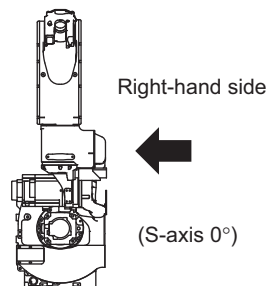
This specifies positions of the R-, B-, and T-axis.  
For manipulators with wrist axes (three axes), this specifies whether the T-axis angle is less than  $\pm 180^\circ$  or greater than  $\pm 180^\circ$ .



**NOTE**  $\theta T$  is the angle when the T-axis home position is  $0^\circ$ .

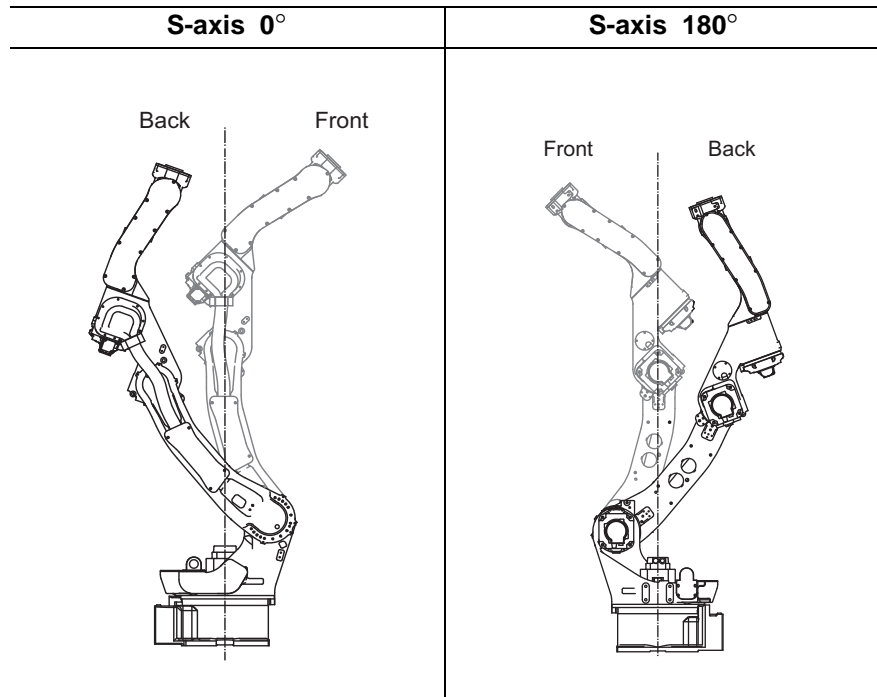
**3.9.8 Front/Back**

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.



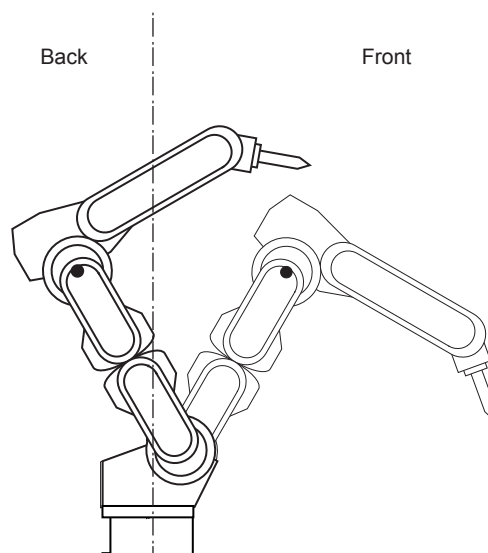


The diagram below shows the S-axis at  $0^\circ$  and at  $180^\circ$ . This is the configuration when the L-axis and the U-axis are viewed from the right-hand side.



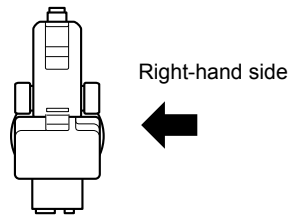
For the manipulator with seven axes, this specifies where in the S-axis rotation center the U-axis rotation center locates when viewing the L-axis and U-axis from the right-hand side.

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.



**3.9.9 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.



Upper Arm	Lower Arm

**3.9.10 S-axis Angle**

This designation is required for the manipulators which have working envelopes greater than  $\pm 180^\circ$ .

This specifies whether the S-axis angle is less than  $\pm 180^\circ$  or greater than  $\pm 180^\circ$ .

<b>S &lt; 180°</b>	<b>S ≥ 180°</b>
<p style="text-align: center;">-180° &lt; <math>\theta_S</math> ≤ 180°</p>	<p style="text-align: center;">180° &lt; <math>\theta_S</math> or <math>\theta_S</math> ≤ -180°</p>

**NOTE**  $\theta_S$  is the angle when the S-axis home position is 0°.

### 3.9.11 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 3-7: Local Variables

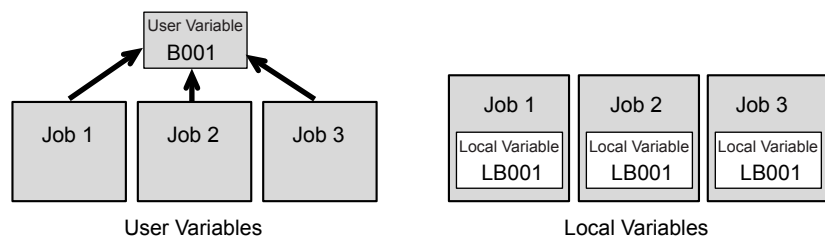
Data Format		Variable No.	Functions
Byte Type		LB000 to LB□□□	Range of storable values is from 0 to 255. Can store I/O status. Can perform logical operations (AND, OR, etc.)
Integer Type		LI000 to LI□□□	Range of storable values is from -32768 to 32767.
Double Precision Integer Type		LD000 to LD□□□	Range of storable values is from -2147483648 to 2147483647.
Real Type		LR000 to LR□□□	Range of storable values is from $-3.4E+38$ to $3.4E+38$ Accuracy: $1.18E-38 < x \leq 3.4E+38$
Character Type		LS000 to LS□□□	Maximum storable number of characters is 16.
Position Type	Robot Axes	LP000 to LP□□□	Can store position data in pulse form or in XYZ form. XYZ type variables 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.
	Base Axes	LBP000 to LBP□□□	
	Station Axes	LEX000 to LEX□□□	

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 *section 3.9.4 "User Variables" on page 3-103*.

## 3.9.11.1 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.

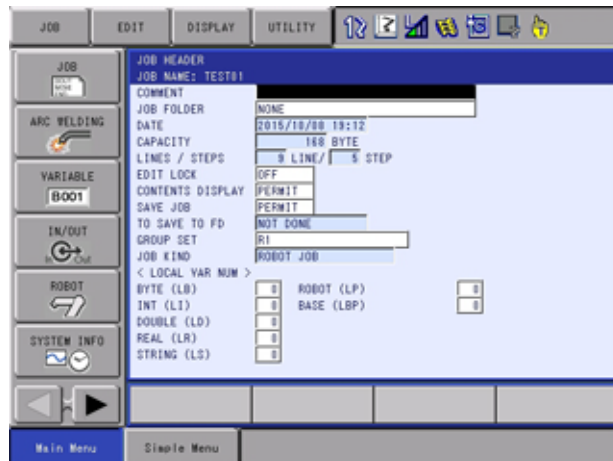


Only when expanding the "INSTRUCTION LEVEL", it is possible to use local variables.

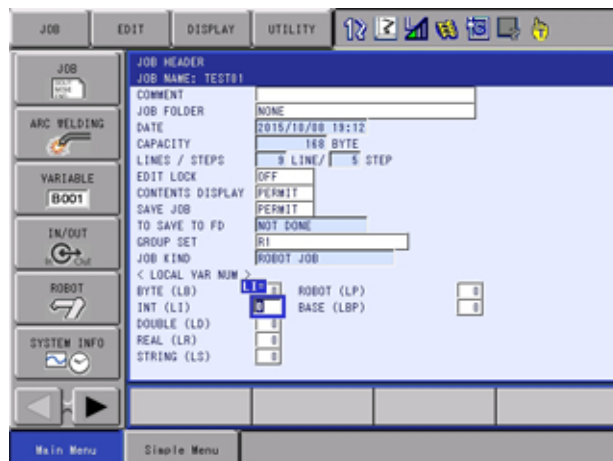
However, when "PROHIBIT" is set to {COBTENT DISPLAY}, the number of local variables cannot be confirmed or changed.

Refer to "8.12 Instruction Level Setting" of "DX200 INSTRUCTIONS" (165292-1CD) for details on setting the language level. Refer to section 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.



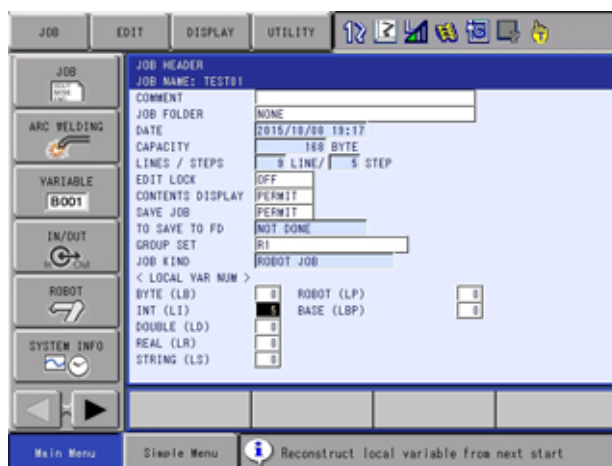
5. Select the number of local variables to be set.
  - The input buffer line appears.



### 3 Teaching

#### 3.9 Other Job-editing Functions

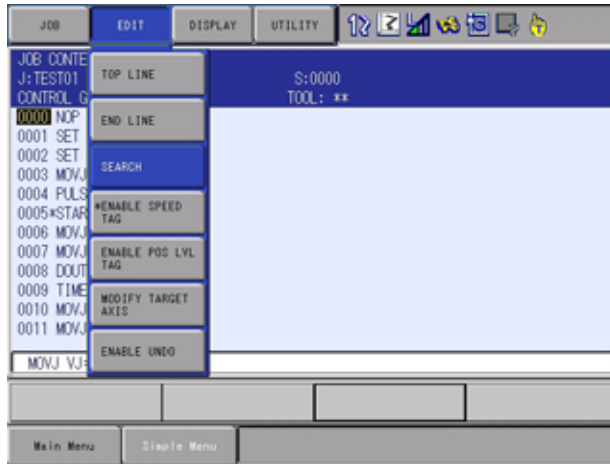
6. Input the number of variables.
7. Press [ENTER].
  - The number of local variables are set.



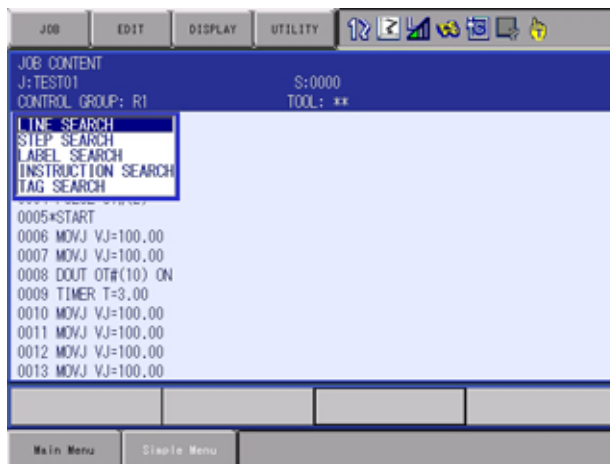
**3.9.12 Search**

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.



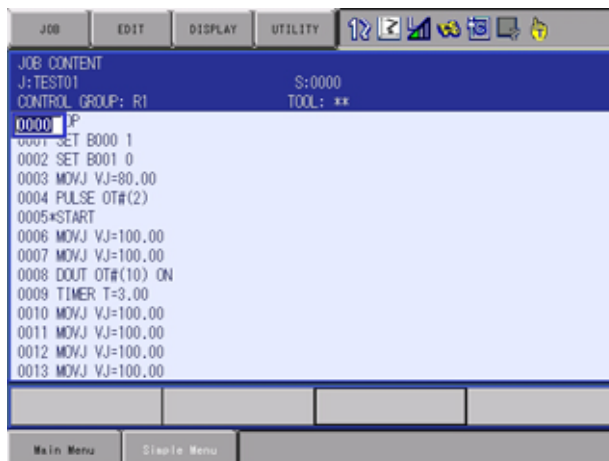
5. Select the search type.

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.

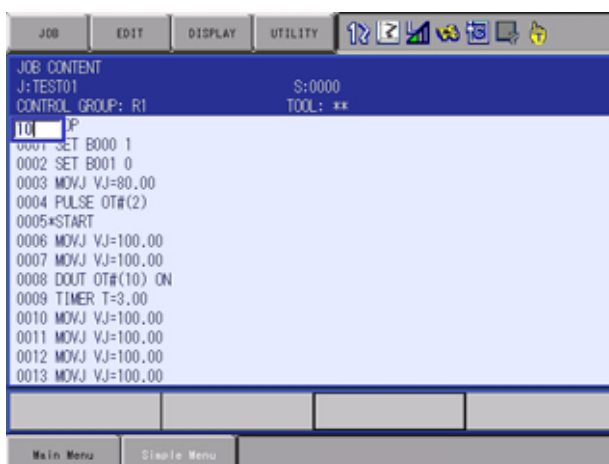
## 3.9.12.1 Line Search

This function moves the cursor to the desired line number.

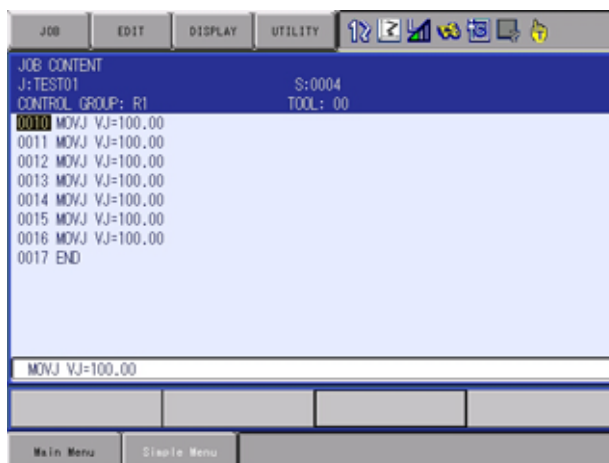
1. Select [EDIT], [SEARCH] and "LINE SEARCH".
  - The number can be entered.



2. Input desired line number.



3. Press [ENTER].
  - The cursor is moved to the line number and the window appears.



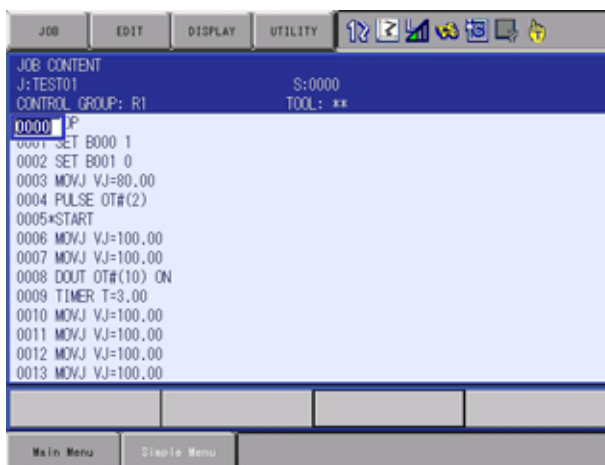


## 3.9.12.2 Step Search

This function moves the cursor to the desired step number (move instruction).

1. Select {EDIT}, {SEARCH} and “STEP SEARCH”.

– The number can be entered.

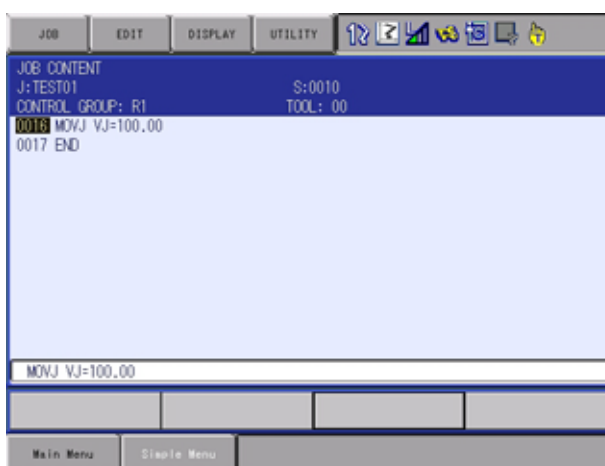


2. Input desired step number.



3. Press [ENTER].

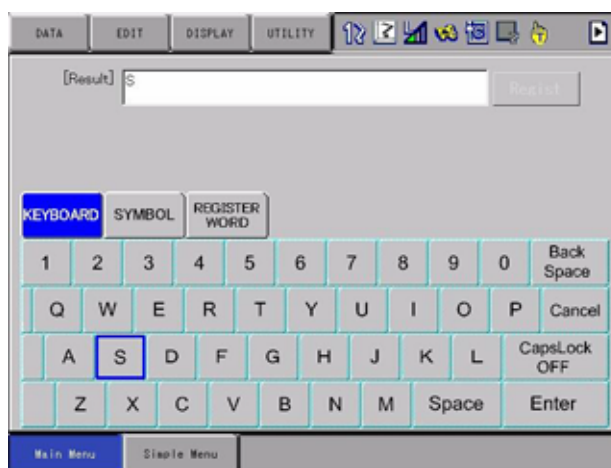
– The cursor is moved to the input step and the window appears.



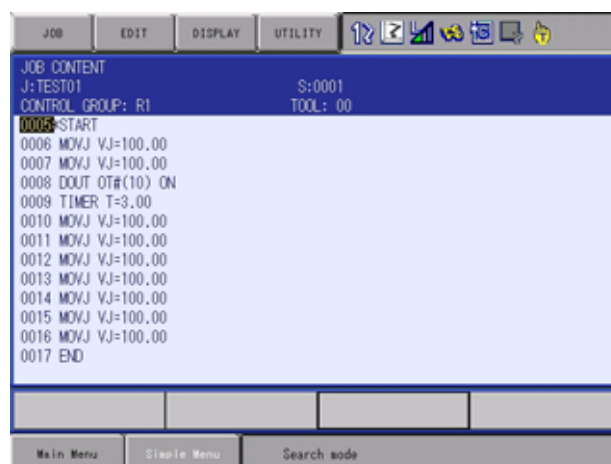
## 3.9.12.3 Label Search

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 *section 1.2.6 "Character Input Operation" on page 1-22.*
  - 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.

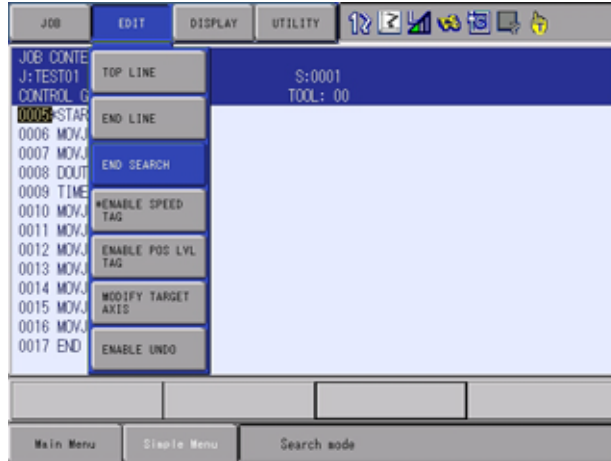


3. Press [ENTER].
  - The cursor is moved to the desired label and the window appears.



## 4. Use the cursor to continue search.

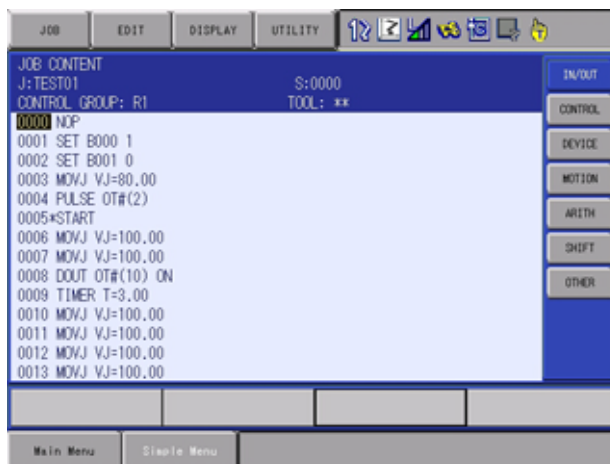
- While searching, forward search and backward search are possible by pressing the cursor.
- To end search, select {EDIT} → {END SEARCH} on the menu and press [SELECT].



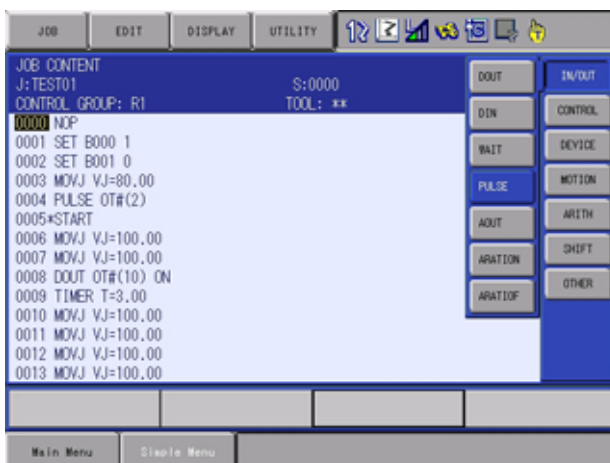
## 3.9.12.4 Instruction Search

This function moves the cursor to a desired instruction.

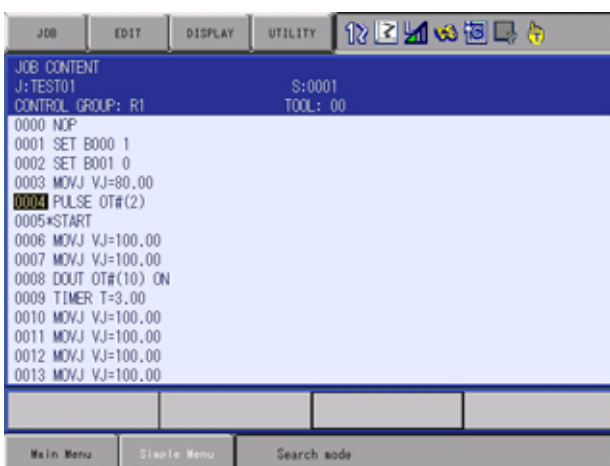
1. Select {EDIT}, {SEARCH} and "INSTRUCTION SEARCH".
  - The INFORM command list appears.



2. Select desired instruction group.
3. Select desired instruction.



- The cursor is moved to the selected instruction and the window appears.

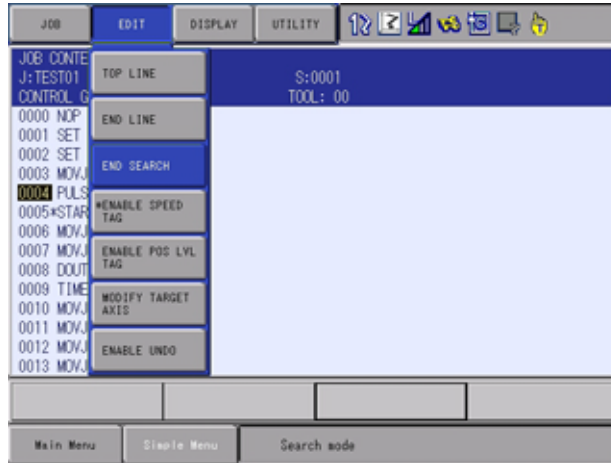


## 3 Teaching

## 3.9 Other Job-editing Functions

## 4. Use the cursor to continue search.

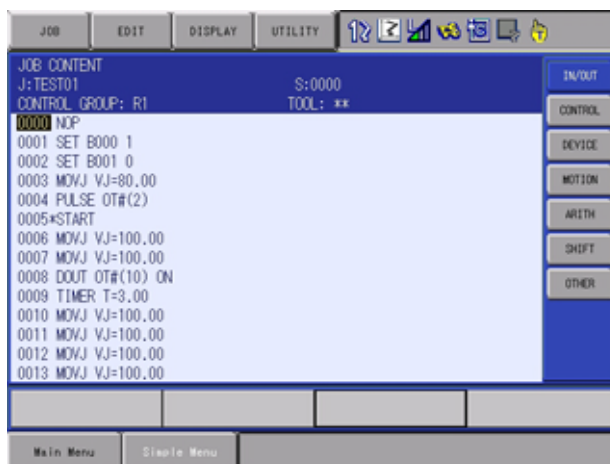
- While searching, forward search and backward search are possible by pressing the cursor.
- To end search, select {EDIT} → {END SEARCH} on the menu and press [SELECT], or press [CANCEL].



## 3.9.12.5 Tag Search

This function moves the cursor to the desired tag.

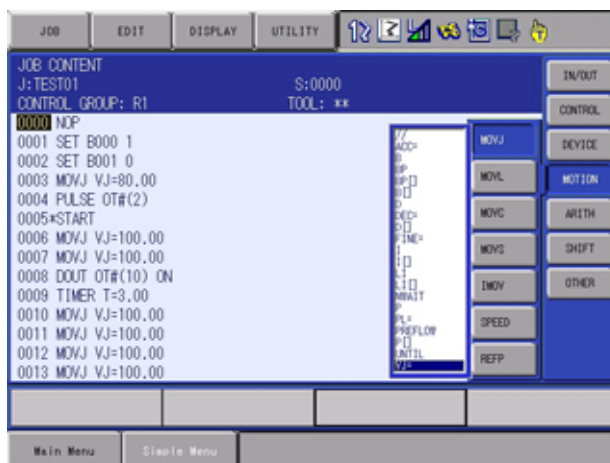
1. Select {EDIT}, {SEARCH} and "TAG SEARCH".
  - The instruction list dialog box appears.



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.

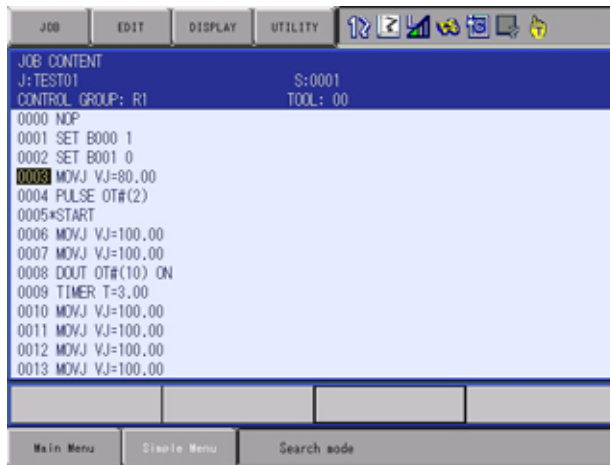


## 3 Teaching

## 3.9 Other Job-editing Functions

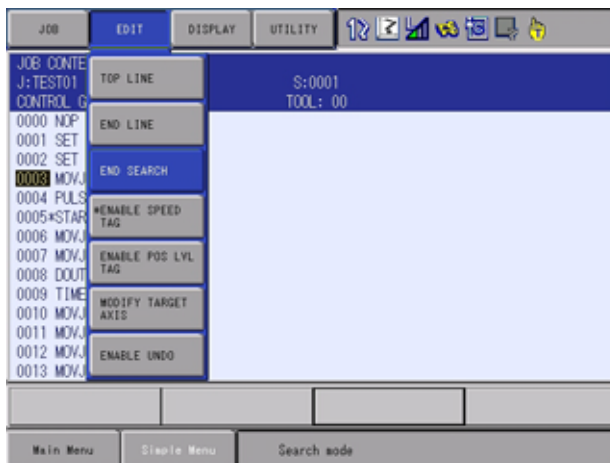
## 4. Select the desired tag.

- 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].



## 4 Playback

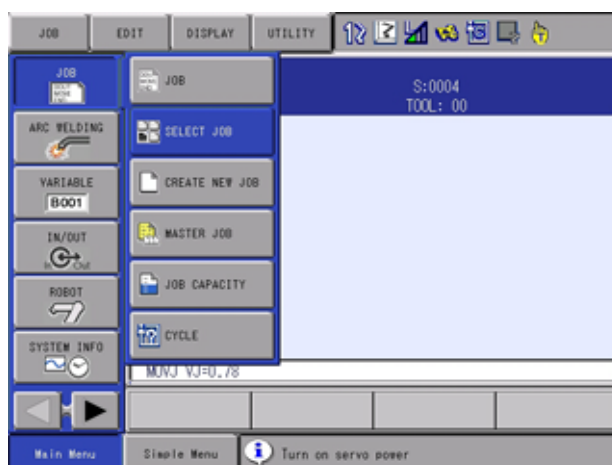
### 4.1 Preparation for Playback

#### 4.1.1 Selecting a Job

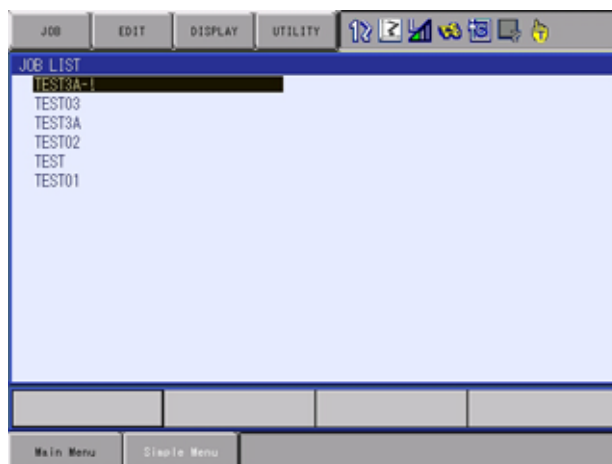
Playback is the act of executing a taught job. Before playback operation, first call the job to be executed.

##### 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.



## 4.1.1.2 Registering the Master Job

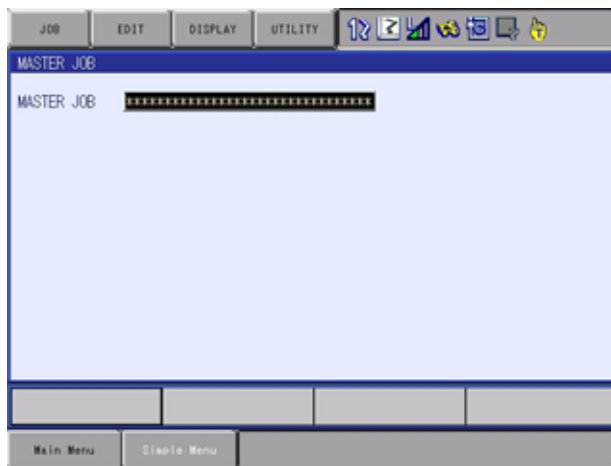
If a particular job is played back frequently, it is convenient to register that job as a master job (master registration). A job registered as the master job can be called more easily than the method described on the preceding page.



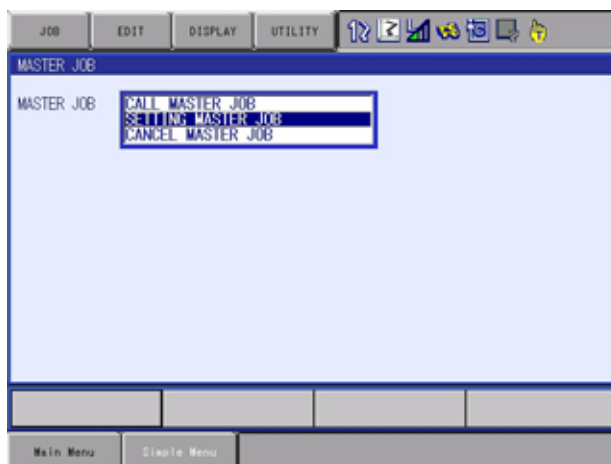
Only one job can be registered as the master job. Registering a master job automatically cancels the previously registered master job.

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.



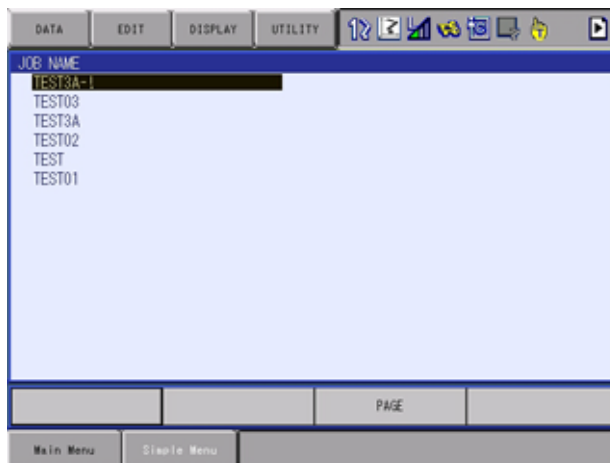
3. Press [SELECT].
  - The selection dialog box appears.



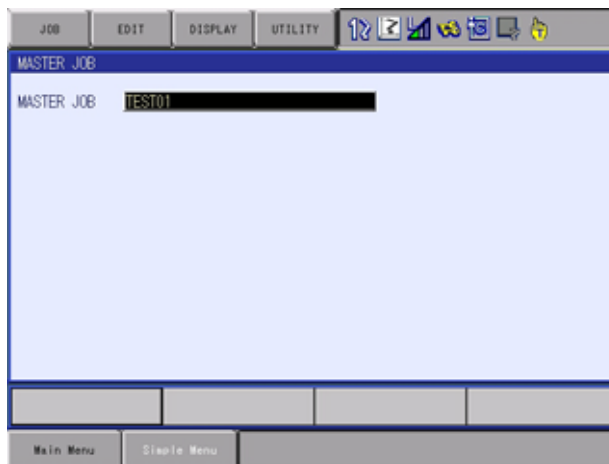
## 4 Playback

### 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.



#### 4.1.1.3 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.

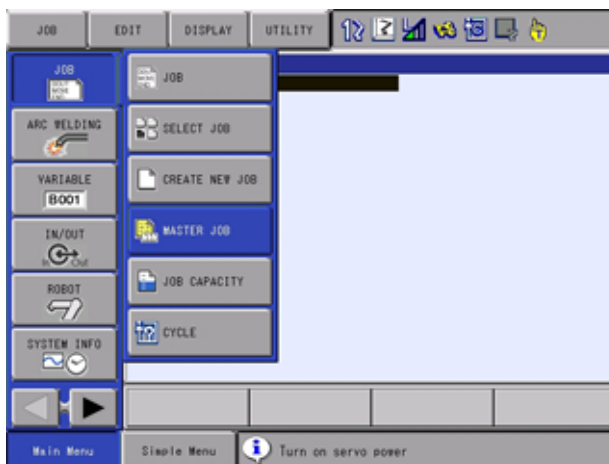


2. Select {MASTER JOB}.

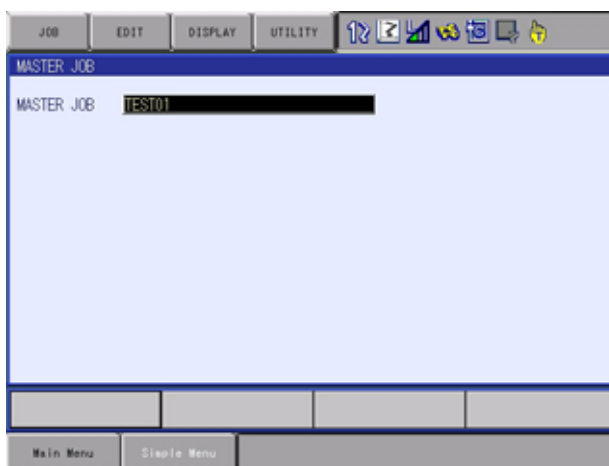
– The master job is called, and the JOB CONTENT window appears.

#### ■ Calling from the MASTER JOB Window

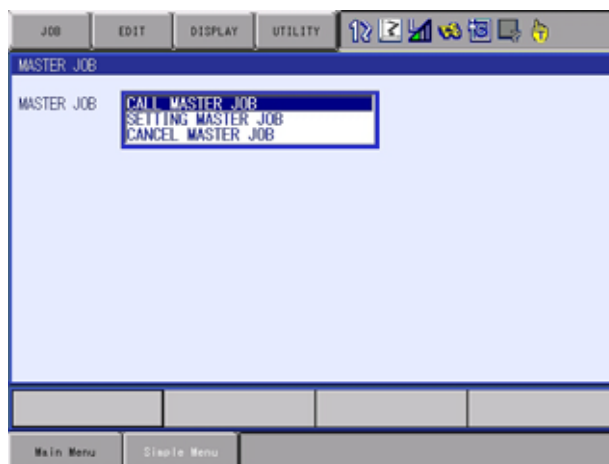
1. Select {JOB} under {Main Menu}.



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. Override Speed Settings**

Displayed when override speed setting is performed.

**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. Start No.**

First step in the measurement. Measurement starts when the start button lamp lights and the playback starts.

**E. Motion Time**

Displays the weaving time of the manipulator.

**F. Playback Time**

Displays the time from the beginning to the end of the measurement. Measurement ends when the manipulator stops and the start button lamp goes off.

**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.

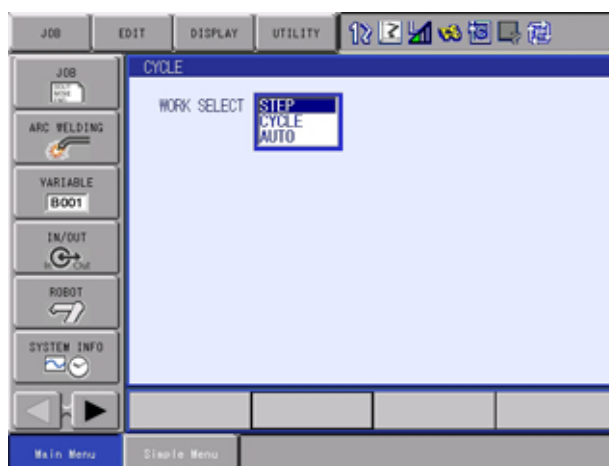
## 4.1.2.2 Operation Cycle

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

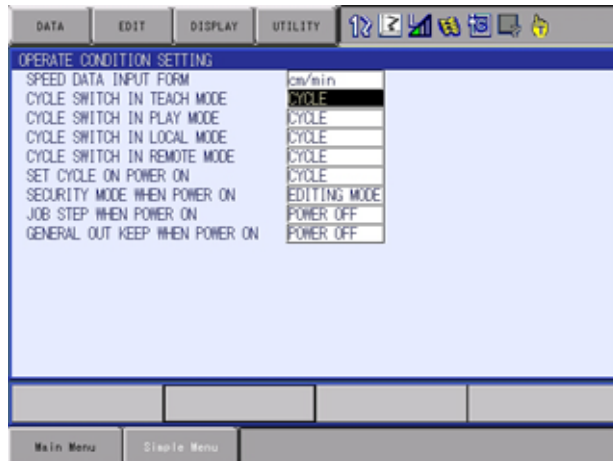
## 4.1 Preparation for Playback

■ **Automatic Setting for Operation Cycle**

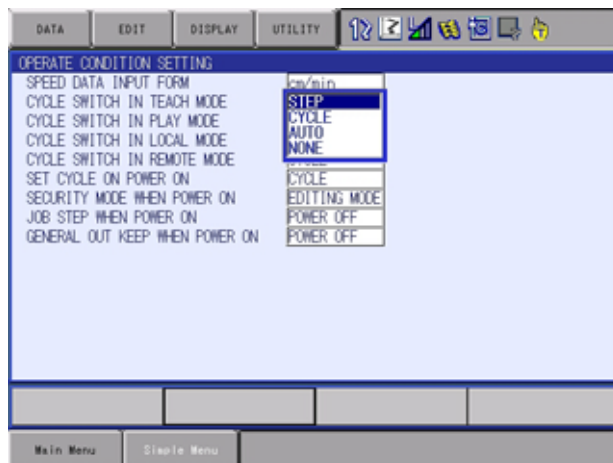
Automatic setting of the operation cycle can be changed by the following operation.

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**

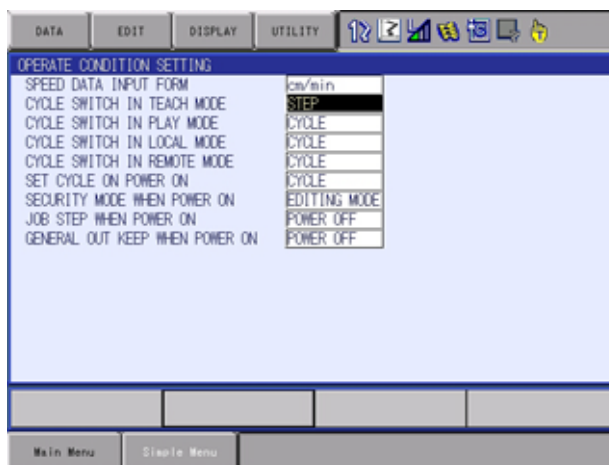


The operation cycle is not changed when “NONE” is set. For example, if the setting is “CYCLE SWITCH IN PLAY MODE = NONE”, the operation cycle is maintained even after switching to the play mode.

## 4 Playback

### 4.1 Preparation for Playback

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.

- Programming pendant (start button)
- Peripheral device (external start input)

Which is used to start playback is specified by the mode switch on the programming pendant.

Mode Switch on Programming Pendant	Job is started up by
[PLAY]	[START] button on programming pendant
[REMOTE]	Peripheral device

For playback 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 remote mode is disabled and the play mode is enabled so the machines are to be started up by the programming pendant.

#### 4.2.1.2 Servo On

1. Press [Servo ON Ready].
  - DX200 servo power is ON and the Servo ON lamp on the programming pendant lights.

#### 4.2.1.3 Start Operation

1. Press [START].
  - The start button lamp lights and the manipulator begins operation.

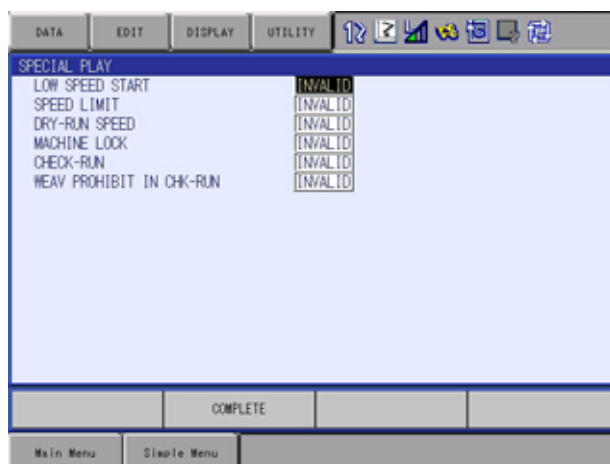
### 4.2.2 Special Playback Operations

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

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.

Even if the manipulator is stopped its motion during the low speed operation, the low speed status would not be canceled before it reaches the first step.

After one step operation, pressing [START] allows the manipulator to move at the taught speed.

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 Operations

The manipulator operates within the limited speed for the teach mode. Usually, the limited speed is set to 250mm/s. However, operation is performed at actual playback speeds for steps in which the set speed is under this limit.

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 Operations

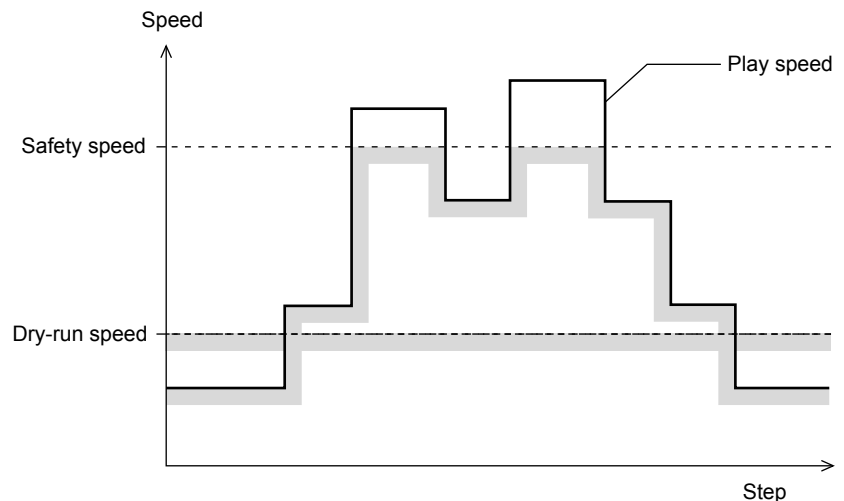
The dry-run speed is a constant speed that is independent of the teaching speeds. The manipulator executes all the steps at a constant speed, which is convenient for quick check of a job consisting of slow operations. The dry-run speed is 10% of maximum speed.



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



## 4.2.2.4 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.

## 4.2.2.5 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.

## 4.2.2.6 Weaving Prohibit Setting during Check Mode Operation

The weaving operation is not executed in the weaving section of the job.

1. Select "WEAV PROHIBIT IN CHK-RUN" under the SPECIAL PLAY window.
  - The setting alternates between "VALID" and "INVALID".
2. Select "COMPLETE".
  - The window returns to the PLAYBACK window.

## 4.2.2.7 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.



Special operations are also automatically canceled if the main power is shut OFF.

## 4.3 Stop and Restart

The manipulator stops in the following conditions:

- Hold
- Emergency stop
- Stop by alarm
- Others

### 4.3.1 Hold

Hold operation causes the manipulator to stop all motion.



[HOLD] lamp lights while it is held down. At the same time, [START] lamp goes OFF.

#### 4.3.1.1 Using the Programming Pendant

##### ■ Hold

1. Press [HOLD] on the programming pendant.
2. The manipulator stops. The [HOLD] lamp lights while the [HOLD] button is held down.

##### ■ Release

1. Press [START] on the programming pendant.
2. The manipulator restarts its operation from the position where it was stopped.

#### 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.

##### ■ Release


1. Turn off the hold signal from an external input (system input).
  - Hold is released.
  - To continue the operation, press [START] or turn ON the external input signal (system input). The manipulator restarts its operation, beginning from the position where it was stopped.

**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 DX200
- Programming pendant
- External input signal (system input)

**■ Emergency Stop**

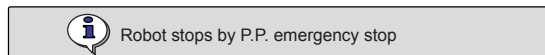
1. Press the emergency stop button .

– The servo power turns OFF and the manipulator stops immediately.

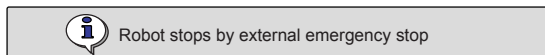
– On the front door of the DX200: 

– 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 DX200:  TURI

– On the programming pendant:  TURI

– 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**

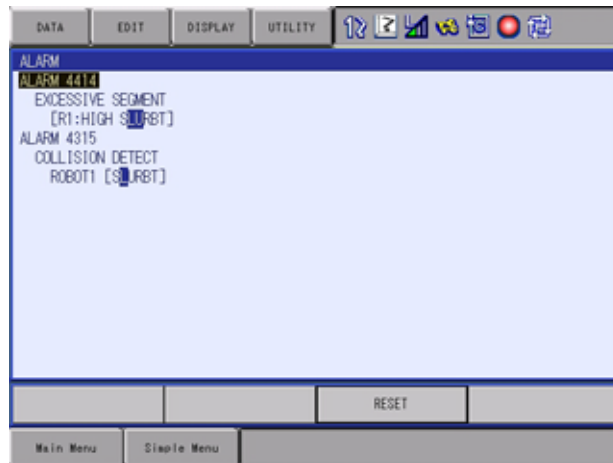
- **Prior to restarting after an emergency stop, confirm the position for the next operation and make sure there is no interference with the workpiece or fixture.**
- The application of an emergency stop during high speed operations on continuous steps can result in the manipulator stopping two or three steps prior to the step that is being displayed. There is a risk of interference with the workpiece or fixture when the manipulator is restarted under such conditions.



**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>

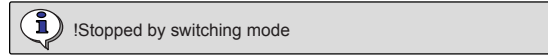
1. Turn OFF the main power supply and remove the cause of the alarm.
  - If a severe alarm such as hardware failure alarm occurs, the servo power is automatically shut off and the manipulator stops. If releasing does not work, turn OFF the main power and correct the cause of the alarm.

---

#### 4.3.4 Others

##### 4.3.4.1 Temporary Stop by Mode Change

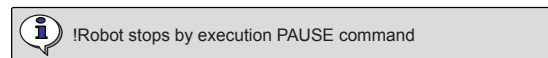
When the play mode is switched to the teach mode during playback, the manipulator stops immediately.



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.

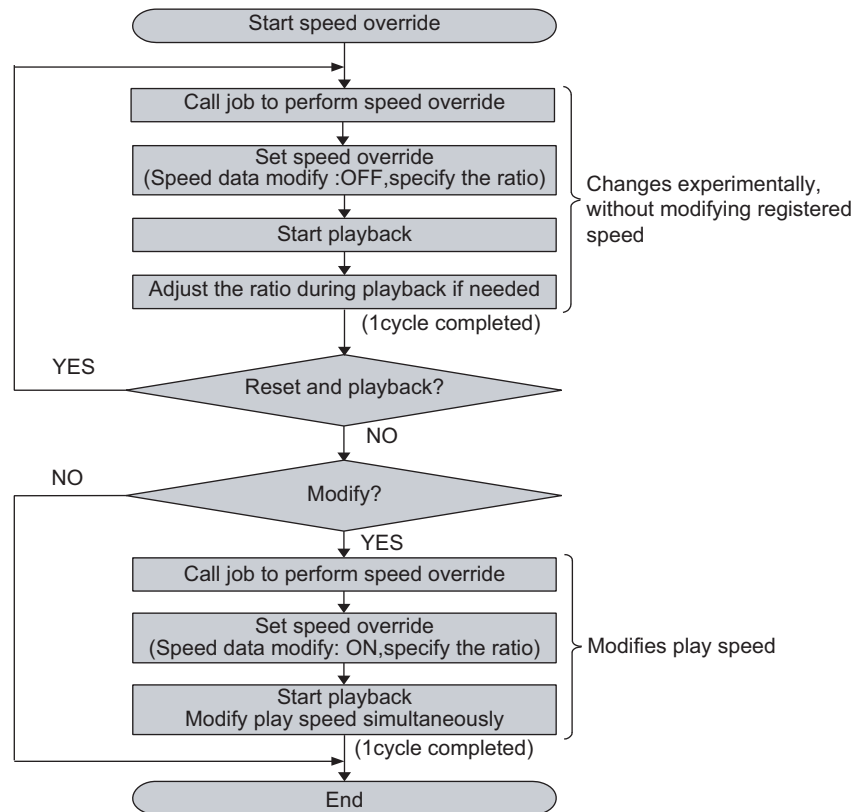
## 4.4 Modifying Play Speed

### 4.4.1 Speed Override

Speed modifications using the speed override have the following features:

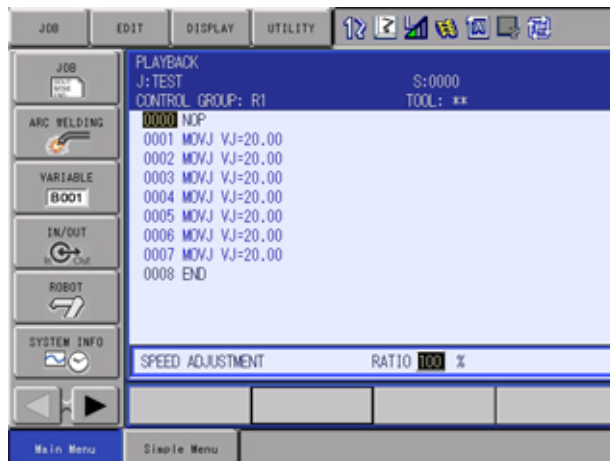
- Speed can be modified during playback.  
The job can be played back at various speeds until the play speed is properly adjusted.
- Speed can be increased or decreased by a ratio of the current play speed.  
The ratio settings range from 10% to 150% in increments of 1%.  
Therefore, it is convenient when, for example, all play speed settings are to be increased by 150% at the same time.

The operation flow is shown below.



## 4.4.1.1 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 Key]s.



## 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.


**NOTE**

- 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 Cancelling 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.


**NOTE**

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

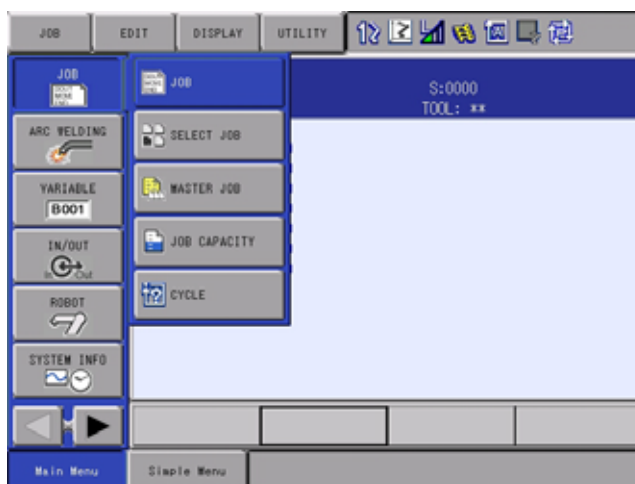
This specification allows the manipulator to temporarily change its operation speed during playback.  
The operation speed is specified by setting the Speed Override percentage (1 to 100% in increments of 1%) for the operation speed (play speed) specified in the current job.  
This function also enables 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

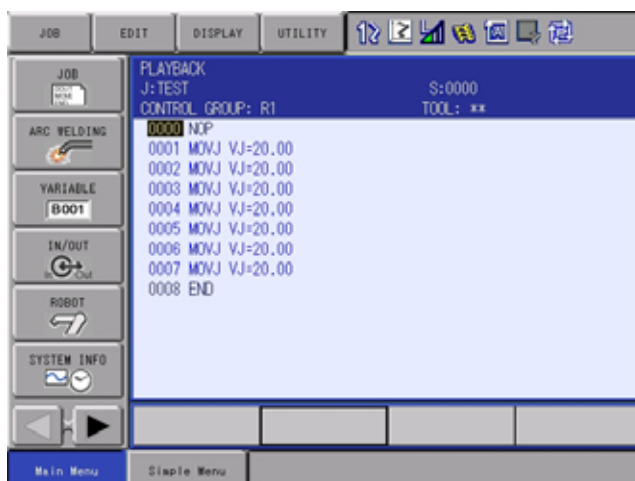


Set the mode selection switch to PLAY.

1. Select {JOB} under {Main Menu}, and press {JOB}.



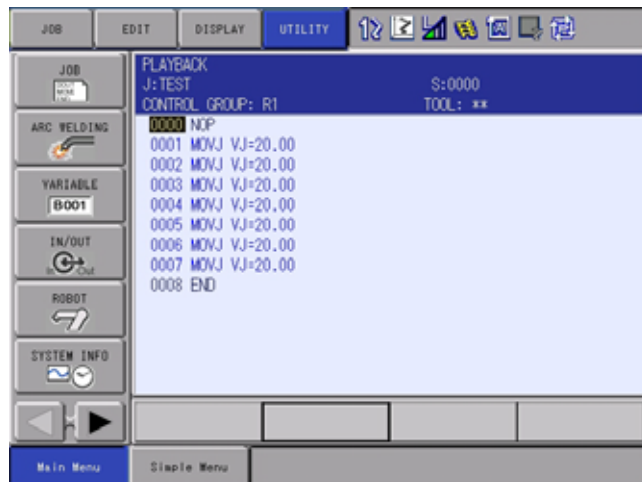
– The PLAYBACK screen appears.



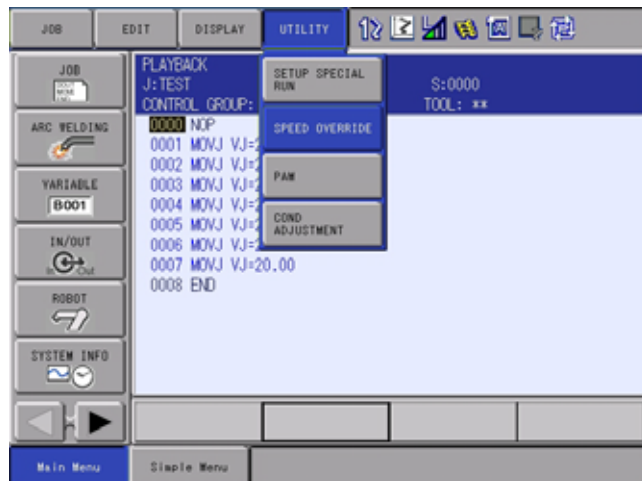
## 4 Playback

### 4.4 Modifying Play Speed

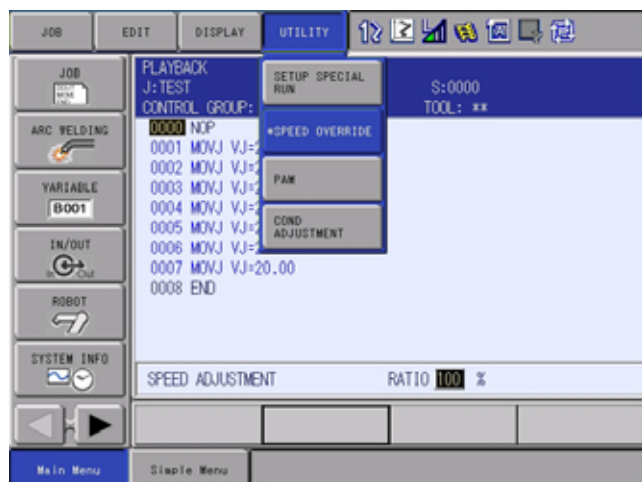
2. Select {UTILITY} in the Menu Area.



3. Select {SPEED OVERRIDE}.



- The Speed Override setting is enabled. (As shown below, an asterisk "\*" appears beside {SPEED OVERRIDE}, and "SPEED ADJUSTMENT" appears in the input buffer line.)



## 4 Playback

### 4.4 Modifying Play Speed

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.



Note: To directly enter the value, perform:

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.

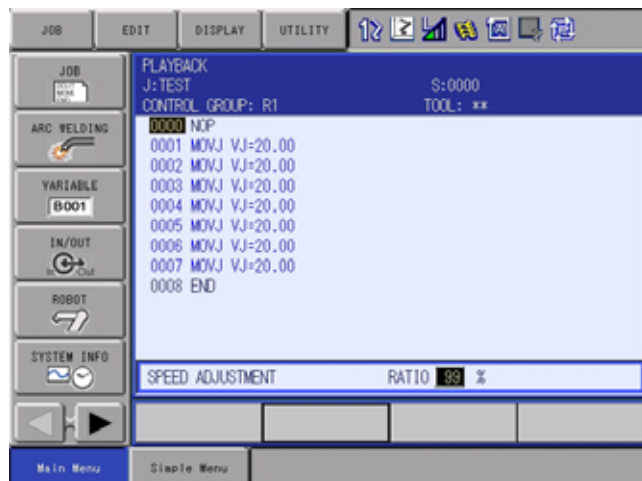
## 4.4.2.4 Modifying the Speed Override Percentage



- Set the mode selection switch to PLAY.
- This operation can be performed during playback.

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.



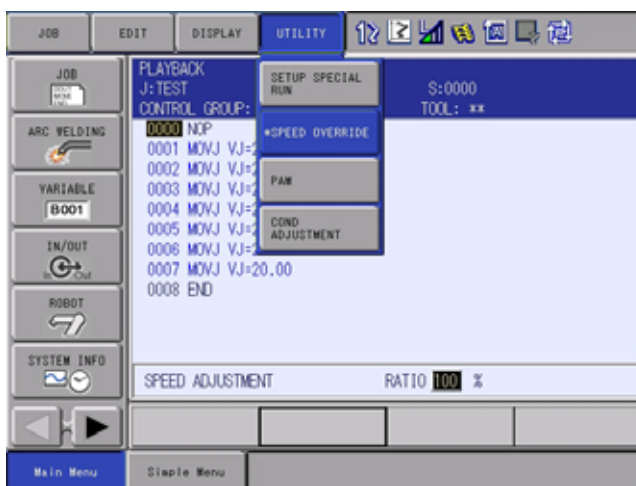
2. Modification completed.
  - The manipulator moves in the specified speed percentage.

4.4.2.5 Disabling the Speed Override Function

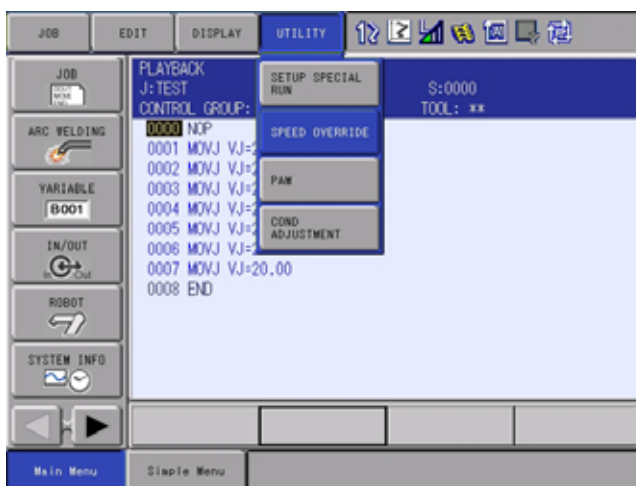
1. Select {UTILITY} in the Menu Area.



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 Playback

### 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.

Manual Speed	Applicable Percentage
Inching	Maximum jog operation link speed x S1CxG045
Low	Maximum jog operation link speed x S1CxG045
Medium	Maximum jog operation link speed x S1CxG046
High	Maximum jog operation link speed x S1CxG047

#### 4.4.2.7 Manual Speed in the TEACH Mode



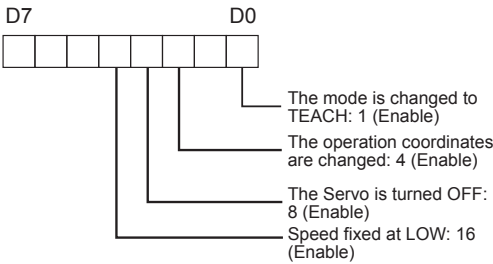
The function is enabled by setting the parameter S2C699.

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.

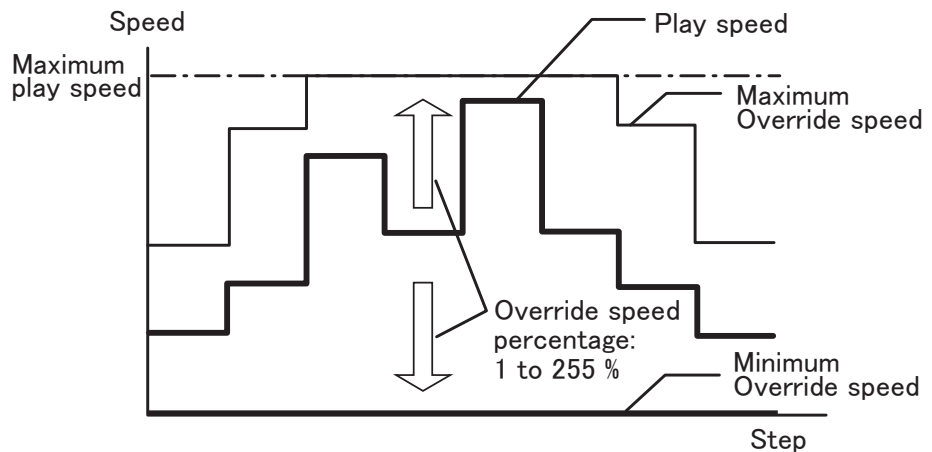
## 4.4.2.8 Parameter

Parameter	Description	Details	Setting Value
S2C699	Automatic change of manual speed to LOW	<p>Automatically sets the manual speed to LOW.</p> 	0
S2C701	Speed Override setting	<p>Specifies the usage of Speed Override.</p> <p>0: Disables continuous cycle operation; Enables speed modification (standard specification).</p> <p>1: Enables the Continuous Cycle operation; Disables speed modification.</p>	0
S2C702	Automatic Speed Override Setting 1 in mode change (When S2C701 = 1)	<p>Specifies whether to automatically set Speed Override when the mode is changed to PLAY.</p> <p>0: Disables Speed Override.</p> <p>1: Sets the percentage corresponding to the manual speed.</p>	0 to 1
S2C709	Automatic Speed Override Setting 2 in mode change (When S2C701 = 1)	<p>Specifies whether to automatically set Speed Override when the mode is changed to PLAY.</p> <p>0: Disables Speed Override.</p> <p>1: Sets the percentage applied last time.</p>	0 to 1

**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*

**NOTE**

- 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



- Set the mode selection switch to PLAY.
- Refer to *section 4.4.3.4 "Parameters"* when performing Speed Override with this specification.

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.

## 4.4.3.4 Parameters

Parameter	Description	Details	Setting Value
S2C701	Speed Override setting	Specifies the usage of Speed Override. *To enable Speed Override with external signals, set "1" for the setting value. 0: Disables the Continuous Cycle operation; Enables speed modification (standard spec). 1: Enables the Continuous Cycle operation; Disables speed modification.	1
S4C287	Universal Input Group number setting (signals 1 to 8)	Specifies the signals to be used. Eight Universal Input points correspond to the signals 1 to 8 of S4C288 to S4C295.	1 to 512
S4C288	Speed percentage (%) Signal 1	Specifies the speed percentage by the Universal Input signals set in S4C287. Priority: Signal 1 > Signal 8  If S4C288 to S4C295 are all "0", the input status 1 to 255 of the Universal Input signals (8 points) will be applied to the speed percentage.	0 to 255
S4C289	Speed percentage (%) Signal 2		
S4C290	Speed percentage (%) Signal 3		
S4C291	Speed percentage (%) Signal 4		
S4C292	Speed percentage (%) Signal 5		
S4C293	Speed percentage (%) Signal 6		
S4C294	Speed percentage (%) Signal 7		
S4C295	Speed percentage (%) Signal 8		

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.

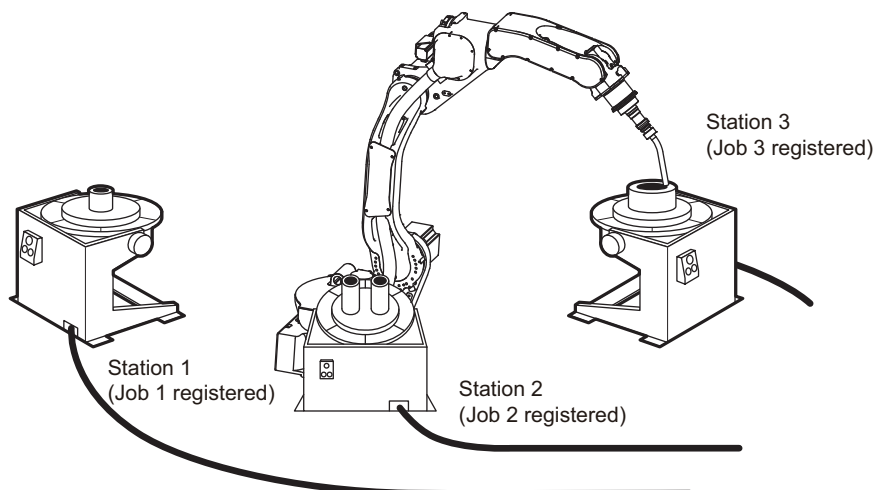


When this function is enabled, Speed Override cannot be operated with a programming pendant.

## 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.



## 4.5.1.1 Enabling Reserved Start

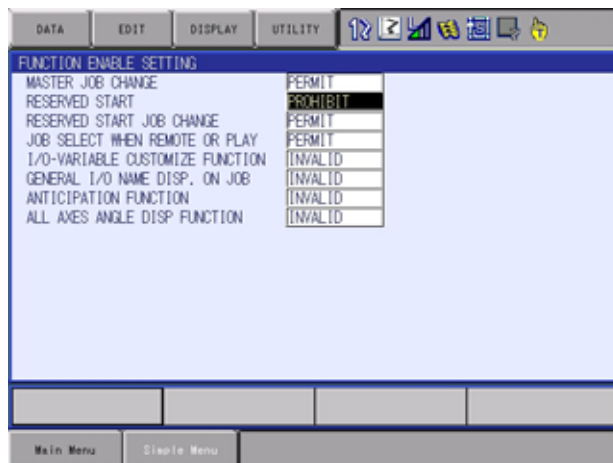
The start button on the station is operative when the reserved start function is enabled, and the following start operations are disabled.

- [START] on the programming pendant
- Start operation from external input signal (system input)



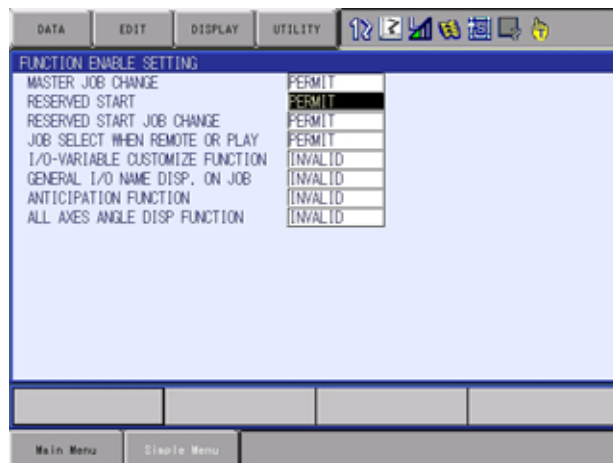
The OPERATING CONDITION window is shown only when the security mode is management mode.

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".  
Regardless of the operation cycle selected, it is automatically set to 1 CYCLE.

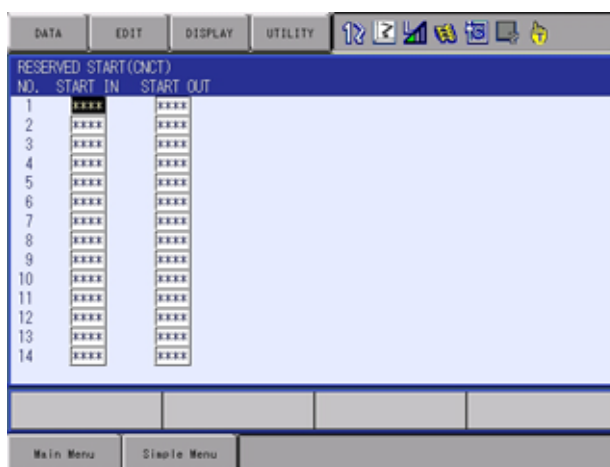
#### 4.5.1.2 Registering Reserved Start I/O Signal

Register the start I/O signal as a preparation to perform the start operation from the station.



This operation can be done only when the operation mode is the teach mode and the security mode is the management mode, and only when the setting of "RESERVED START JOB CHANGE" is "PERMIT" in the OPERATING CONDITION window.

1. Select {SETUP} under {Main Menu}.
  2. Select {RES. START(CNCT)}.
- The RESERVED START (CNCT) window appears.

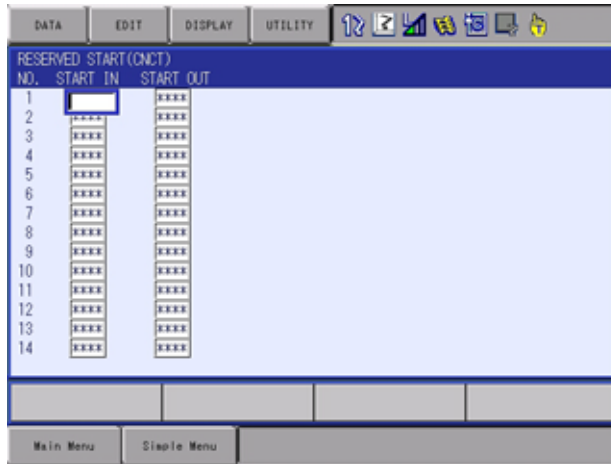


## 4 Playback

## 4.5 Playback with Reserved Start

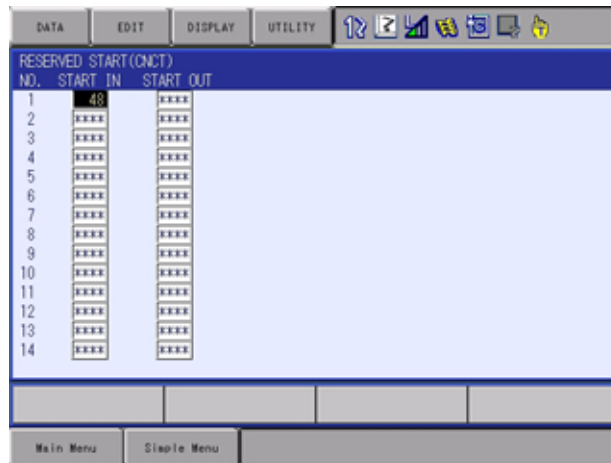
3. Select "START IN" or "START OUT" for each station.

- The number can now be entered.



4. Input signal number and press [ENTER].

- The input/output signal number is registered.



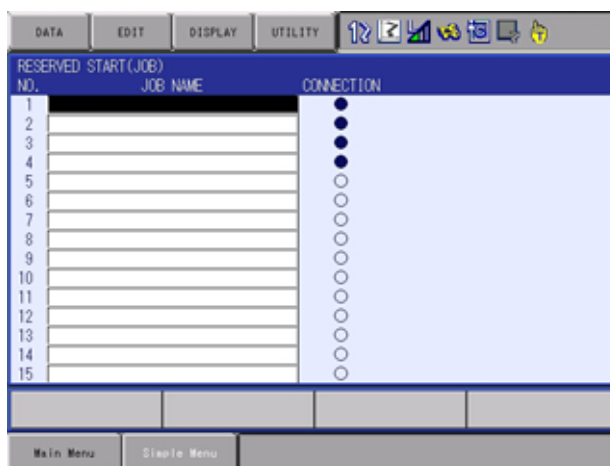
## 4.5.1.3 Registering Jobs to Stations

Register the starting job of each station.

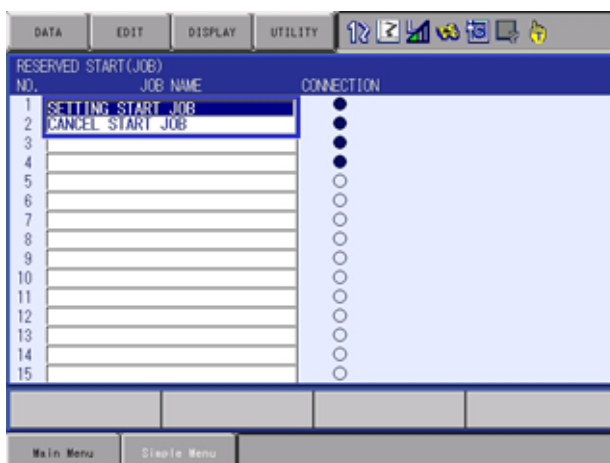


This operation can be done only when the operation mode is the teach mode and the setting of "RESERVED START JOB CHANGE" is "PERMIT" in the OPERATING CONDITION window.

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.

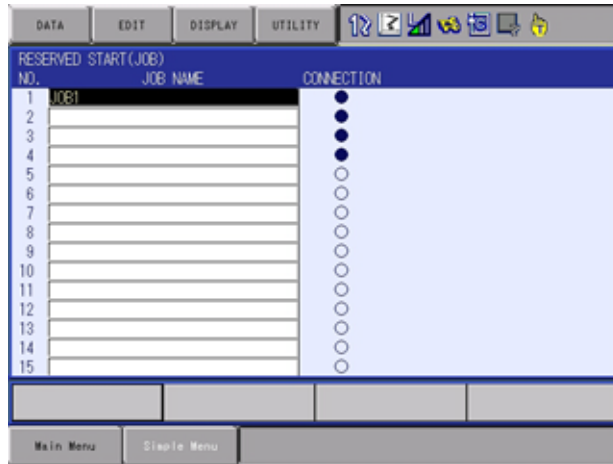


4. Select "SETTING START JOB".
  - The JOB LIST window appears.
5. Select a job.

4 Playback

4.5 Playback with Reserved Start

– The starting job is registered.



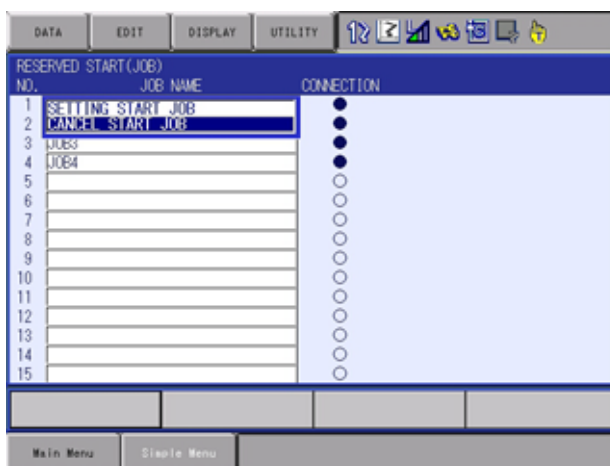
## 4.5.1.4 Deleting Registered Jobs from Stations

Delete the registered job of each station.

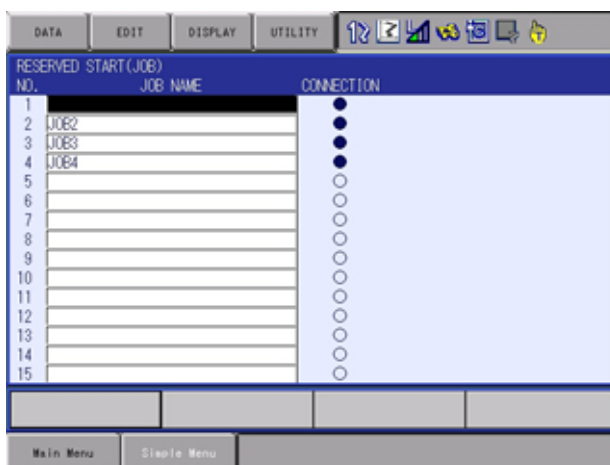


This operation can be done only when the operation mode is the teach mode and the setting of “RESERVED START JOB CHANGE” is “PERMIT” in the operation condition display.

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.



### 4.5.2 Playback from Reserved Start

#### 4.5.2.1 Start Operation

1. Set the mode switch to "PLAY".
2. Press start button on the station.
  - The job registered for the station starts up and the manipulator performs one cycle operation.



- 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.

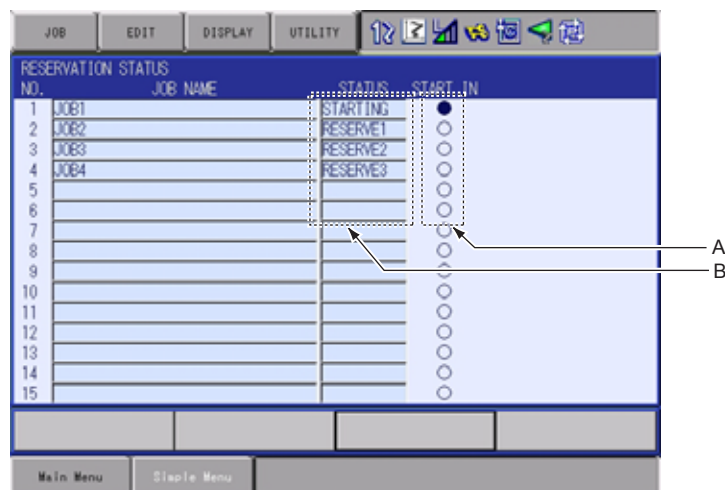


Reservations are canceled when the start button is pressed again during the job reservation operation.

## 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

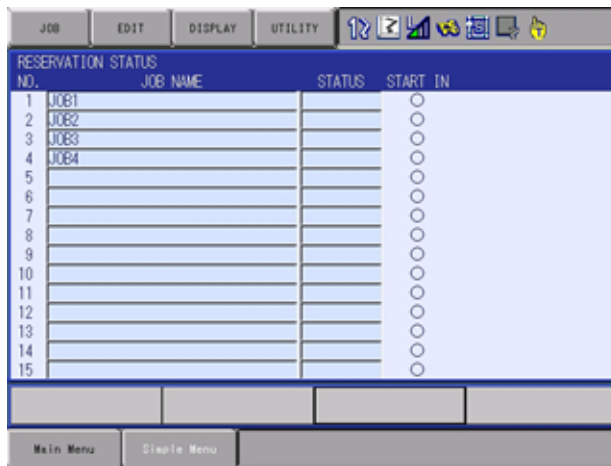


## 4.5.2.3 Resetting Job Reservation

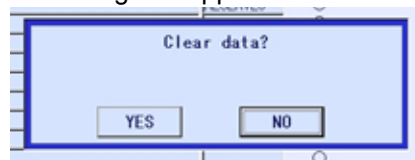


If “STARTING” is displayed, the job cannot be reset.

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.



- The confirmation dialog box appears.



3. Select “YES”.



All job reservations are reset automatically in the following conditions:

- When the reserved start sets to “PROHIBIT”. (When “RESERVED START” is set to “PROHIBIT” on the OPERATING CONDITION 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



[HOLD] lamp lights while it is held down. At the same time, [START] lamp goes 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.

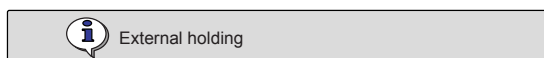
■ **Release**

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**

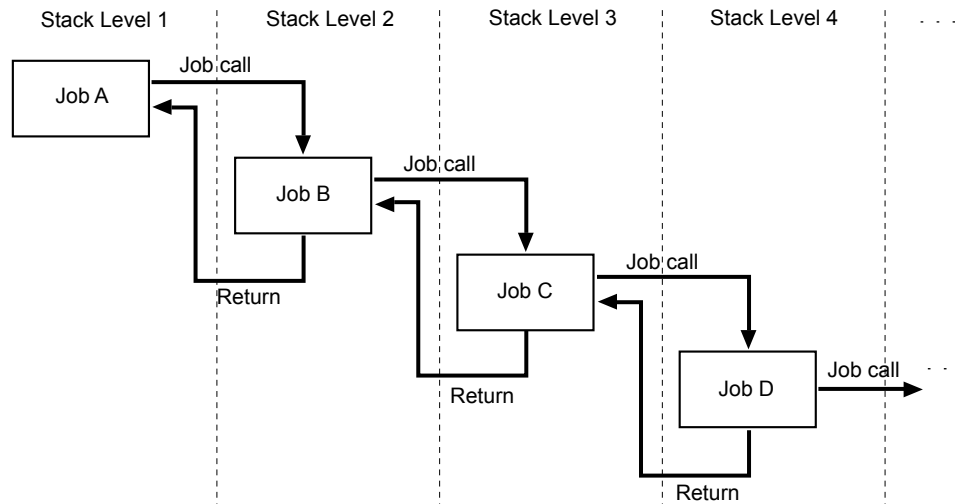
1. Press the hold button on the suspended station.
  - Hold is released.
  - Press the start button on the station, then the manipulator restarts its operation from the position where it was stopped.



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.

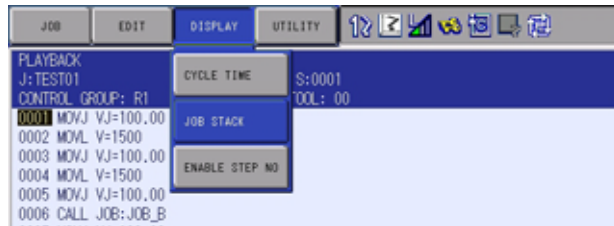


Job calls can be used for up to 12 stack levels.

## 4 Playback

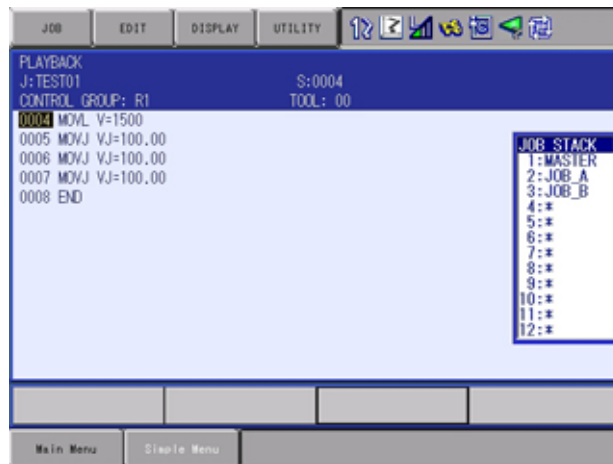
### 4.6 Displaying Job Stack

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 the Job C is called from Job B. Also, the 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.



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 *section 3.4 "Modifying Steps" on page 3-29* 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.



Refer to *section 1.2.6 "Character Input Operation" on page 1-22* for the character input operation.

## 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.

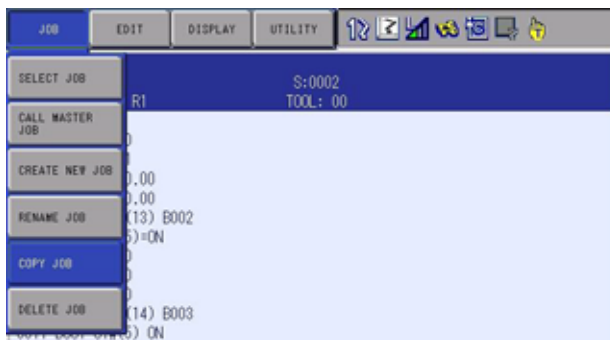
### 5.1.0.1 Copying Jobs on the JOB CONTENT Window

On the JOB CONTENT window, the current edit job becomes the copy source job.

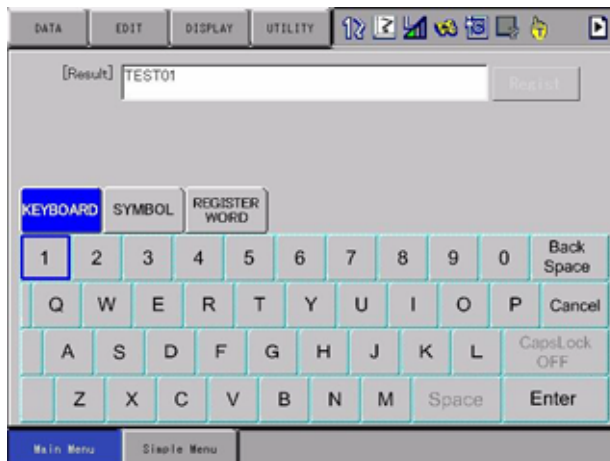
1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
  - The JOB CONTENT window appears.



3. Select {JOB} → {COPY JOB} under the pull-down menu.



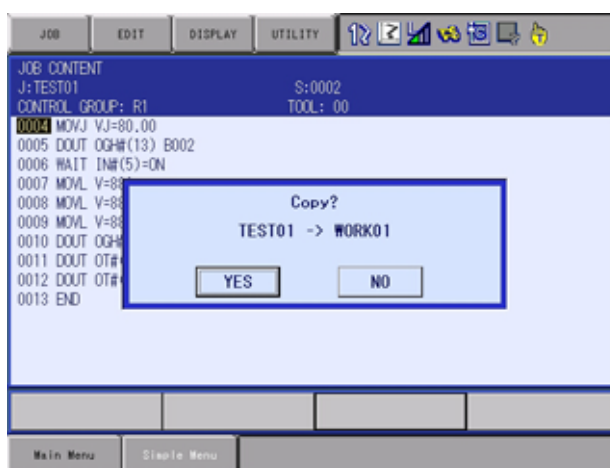
4. Input the job name.
  - Input the new job name.
  - The name of the copy source job is displayed on the input area. It is possible to partially change this name to enter a new name.





See section 1.2.6 “Character Input Operation” on page 1-22 for information on letter input operations.

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.

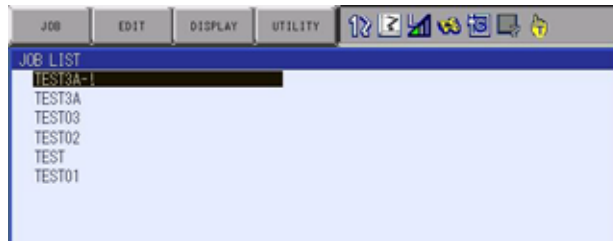




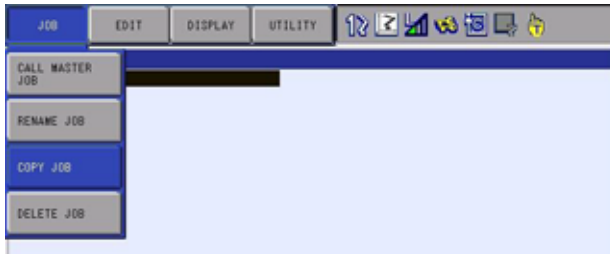
## 5.1.0.2 Copying Jobs on the JOB LIST Window

On the JOB LIST window, select the copy source job from the registered jobs and specify the copy destination directory.

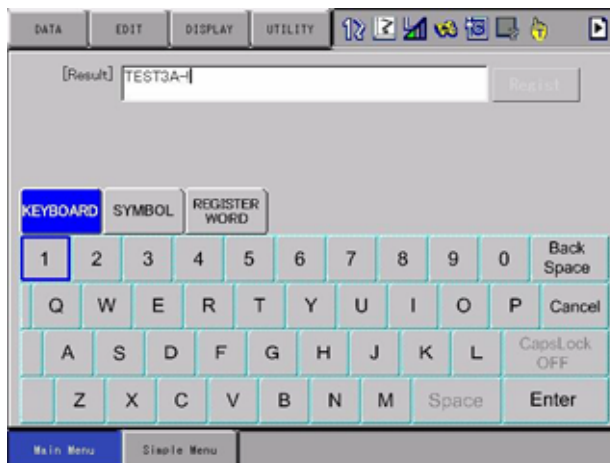
1. Select {JOB} → {SELECT JOB} under {Main Menu}.
  - The JOB LIST window appears.



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.



See section 1.2.6 "Character Input Operation" on page 1-22 for information on letter input operations.

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.



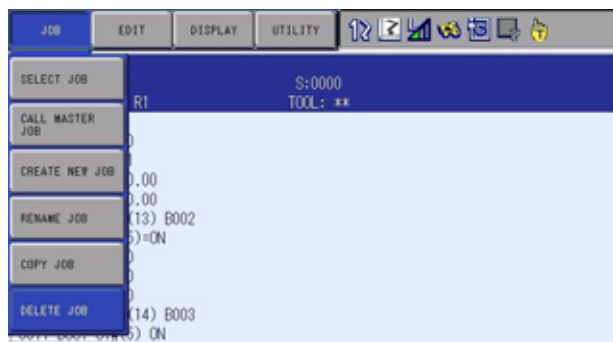
## 5.2 Deleting Jobs

This operation is used to delete jobs that are registered on the DX200. It can be performed in either the JOB CONTENT window or the JOB LIST window.

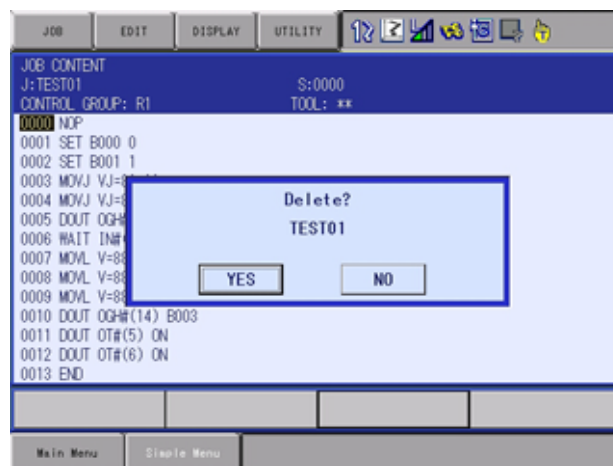
### 5.2.0.1 Deleting Jobs on the JOB CONTENT Window

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.



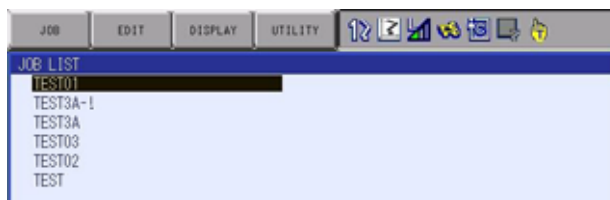
4. Press "YES".
  - The confirmation dialog box appears.
  - When "YES" is selected, the edit job is deleted. When deletion is completed, the {JOB LIST} window appears.
  - When "NO" is selected, the job deletion is canceled.



## 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.

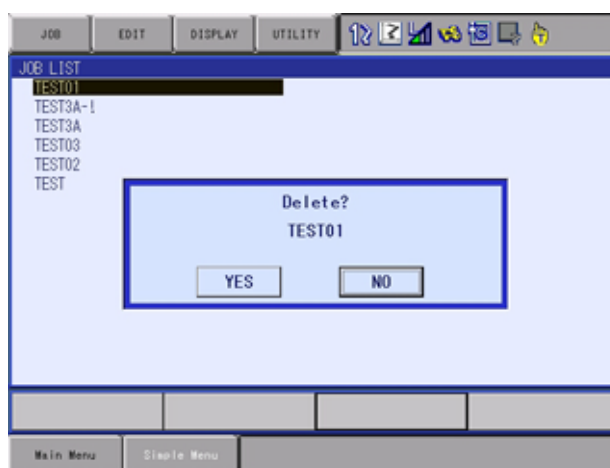
1. Select {JOB} → {SELECT JOB} under {Main Menu}.
  - The JOB LIST window appears.



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".

### 5.3 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.



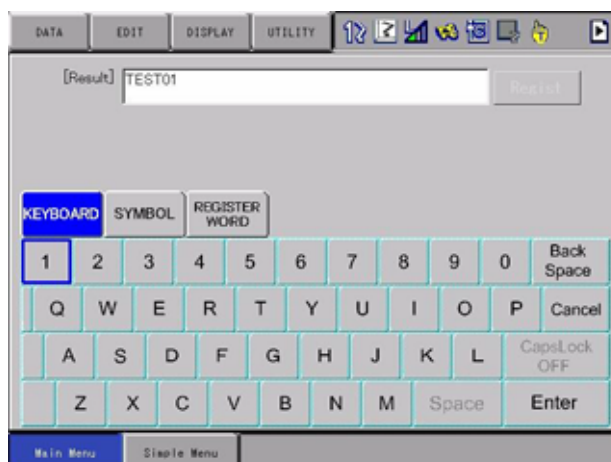
3. Select {JOB} → {RENAME JOB} under the pull-down menu.



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.



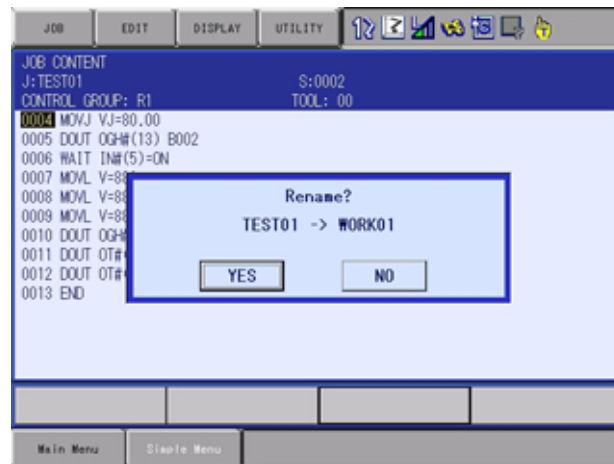
See section 1.2.6 "Character Input Operation" on page 1-22 for information on letter input operations.



## 5 Editing Jobs

### 5.3 Modifying Job Names

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.



## 5.3.0.2 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.



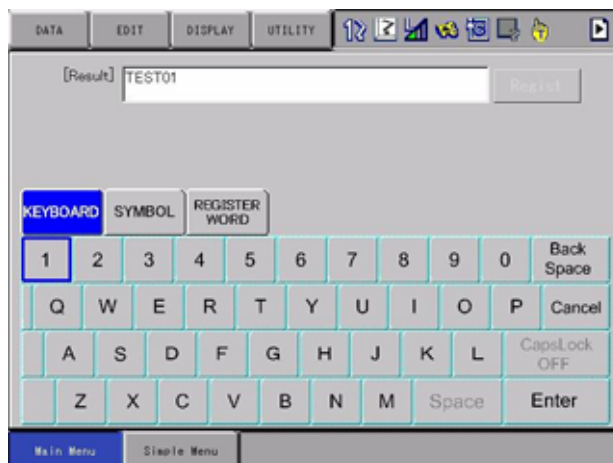
2. Move the cursor to the name to be changed.
3. Select {JOB} → {RENAME JOB} under the pull-down menu.



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.



See section 1.2.6 “Character Input Operation” on page 1-22 for information on letter input operations.



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.

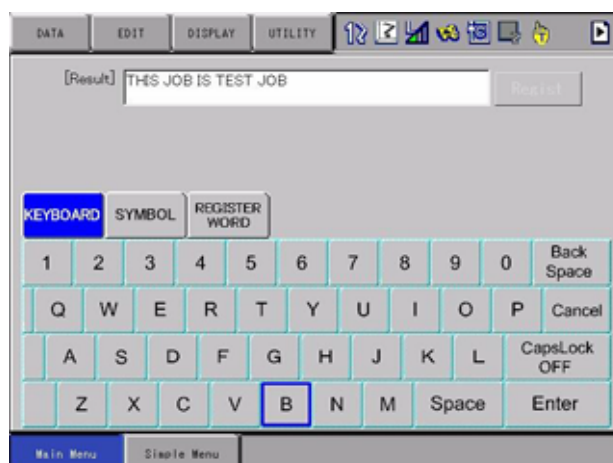
1. Select {JOB} under {Main Menu}.
2. Select {JOB}.
3. Select {DISPLAY} under the pull-down menu.
4. Select {JOB HEADER}.
  - The JOB HEADER window appears.



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.



See section 1.2.6 "Character Input Operation" on page 1-22 for information on letter input operations.



## 7. Press [ENTER].

- The comment on the input area is registered and is displayed on the “COMMENT” area in the JOB HEADER window.



The screenshot shows a software window titled "JOB HEADER" with a menu bar containing "JOB", "EDIT", "DISPLAY", and "UTILITY". Below the menu bar are several icons. The main area of the window displays the following information:

JOB NAME:	TEST01
COMMENT	THIS JOB IS TEST JOB
DATE	2008/12/09 16:42
CAPACITY	162 BYTE
LINES / STEPS	14 LINE / 5 STEP
EDIT LOCK	OFF
TO SAVE TO FD	NOT DONE
GROUP SET	F1

## 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.

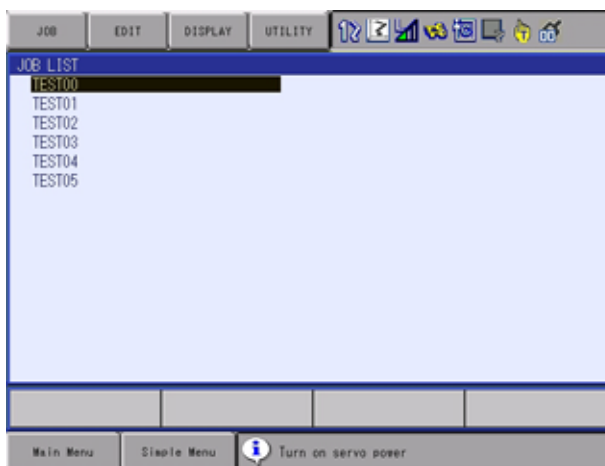
However, the name of NONE (no folders) cannot be changed.

### 5.5.1 Displaying Jobs by Folders

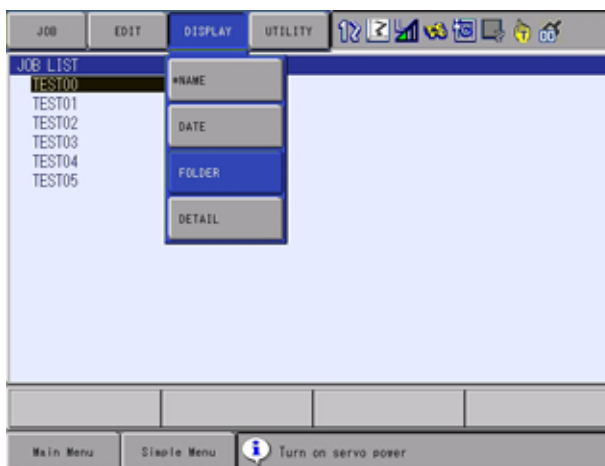
#### 5.5.1.1 Operation for Displaying Jobs by Folders

For displaying the jobs by folders, follow the procedures below.

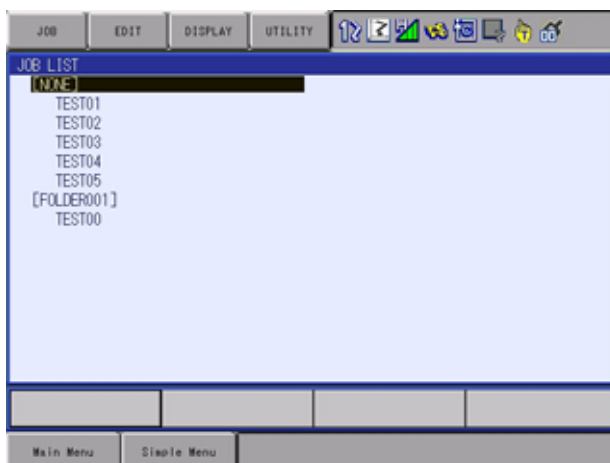
1. Display the {JOB LIST} window.



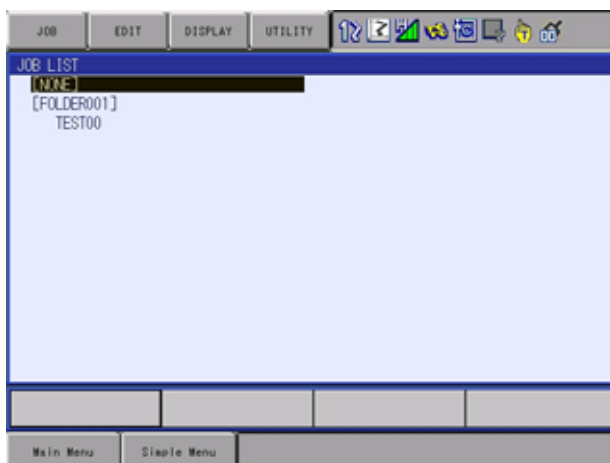
2. Select {DISPLAY} → {FOLDER} under the pull-down menu.



- 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.

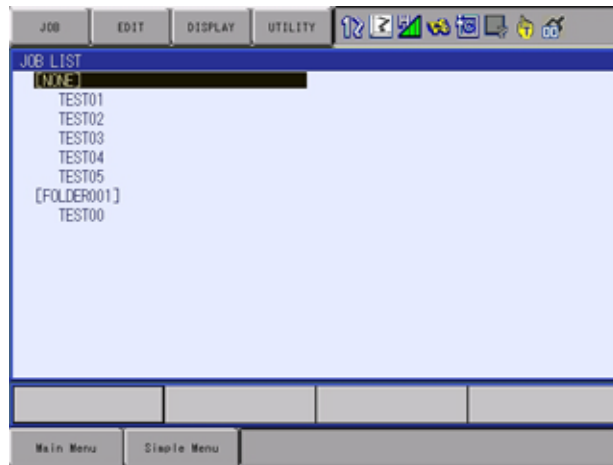


- On the {JOB LIST} window in which the jobs are displayed by folders, the folders with no jobs are not displayed.
- When the cursor is moved to the folder name while the job details are displayed, all the information is displayed as asterisks "\*\*".

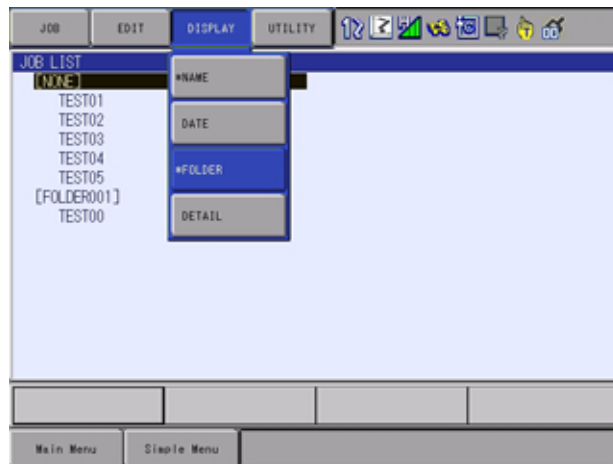
## 5.5.1.2 Operation for Canceling Displaying Jobs by Folders

For canceling displaying the jobs by folders, follow the procedures below.

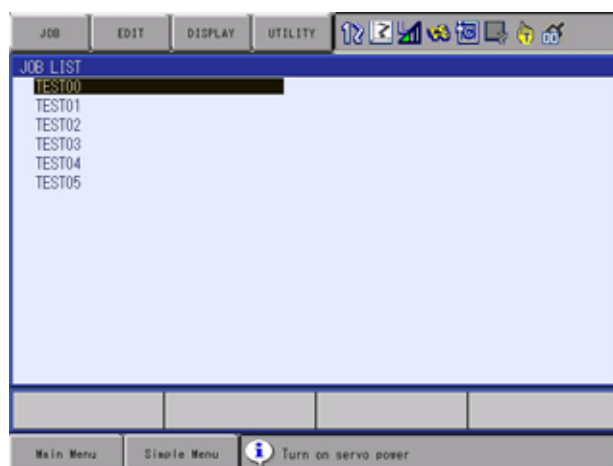
1. Display the {JOB LIST} window.



2. Select {DISPLAY} → {\*FOLDER} under the pull-down menu.



- The folder name disappears, and only the JOB names are displayed.



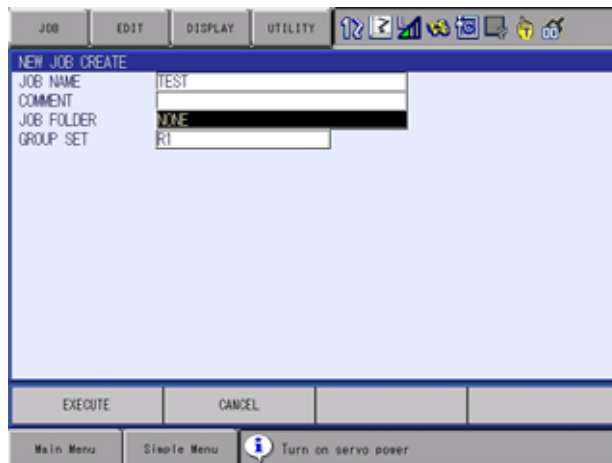
**5.5.2 Registering Jobs in Folders**

This section explains how to set the jobs to the specified folders.

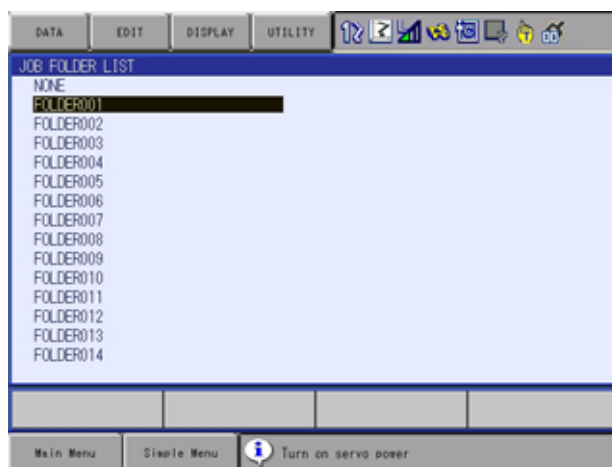
A job can be set in the specified folder when creating a new job or by changing the folder after the job creation.

**5.5.2.1 Registering Jobs in Folders (At a New Job Creation)**

1. Display the {NEW JOB CREATE} window.



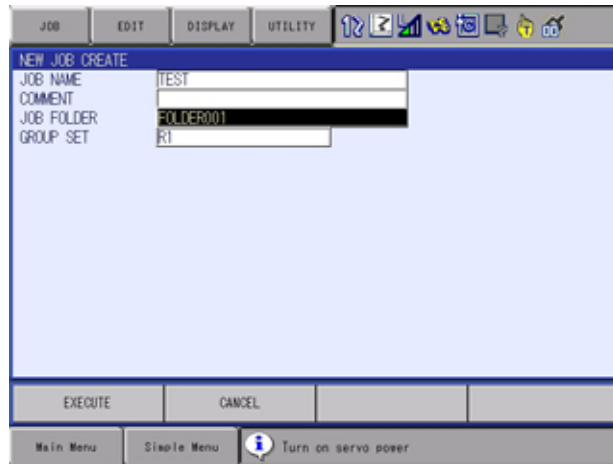
2. Move the cursor to the folder name field, and then press [SELECT].
  - The {JOB FOLDER LIST} is displayed.



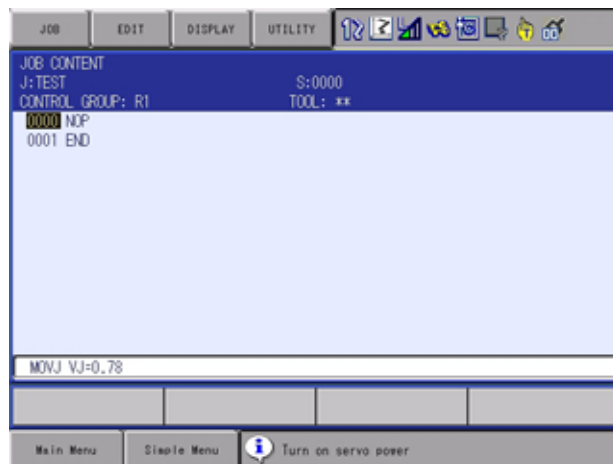
## 5 Editing Jobs

### 5.5 Job Folder Function

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.



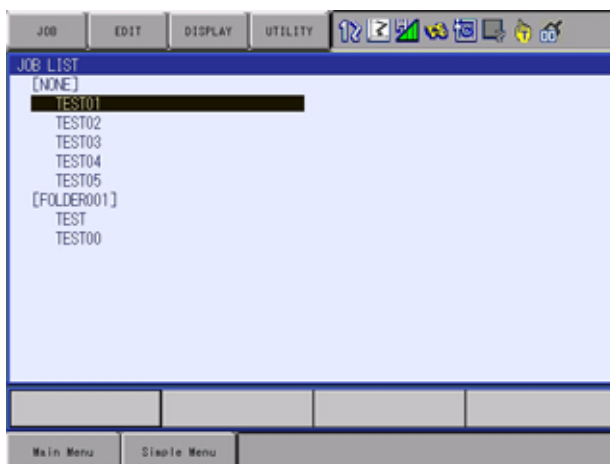
The folder name is set as NONE or FOLDER001 to 099 before shipment.

## 5.5.2.2 Changing the Folder Registration of Jobs

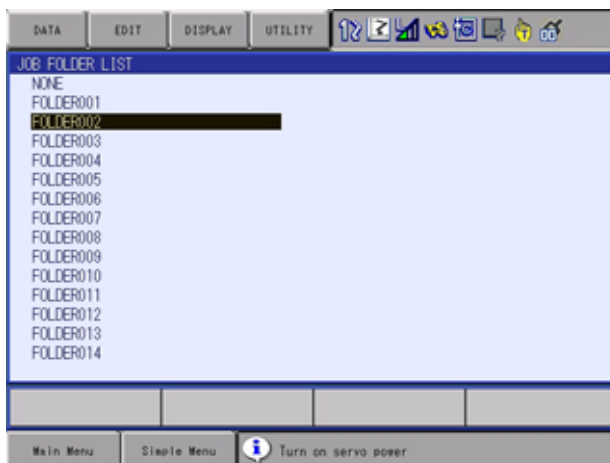
The folder in which the created job is registered can be changed to the other folder.

■ **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.

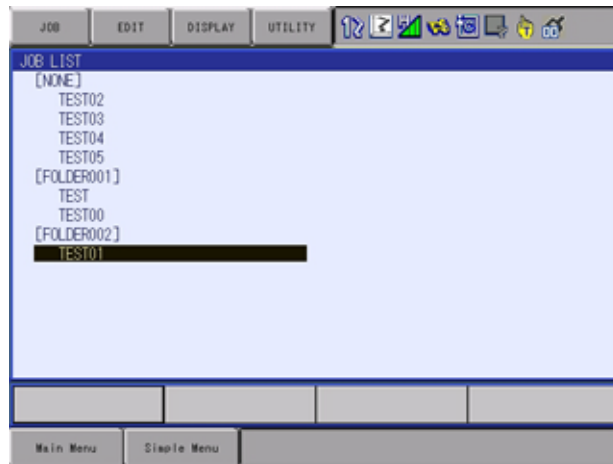


3. Select {JOB} → {FOLDER CHANGE} under the pull-down menu.
  - The {JOB FOLDER LIST} window appears.
4. Move the cursor to the folder name to which the job is to be moved, and press [SELECT].



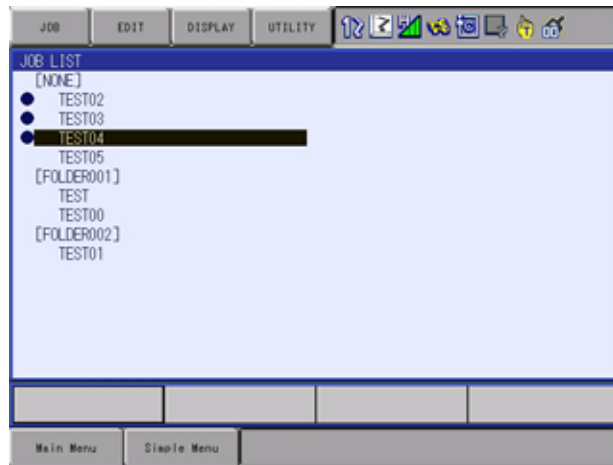


- The job is moved to the specified folder.



■ **When changing the folder of multiple jobs**

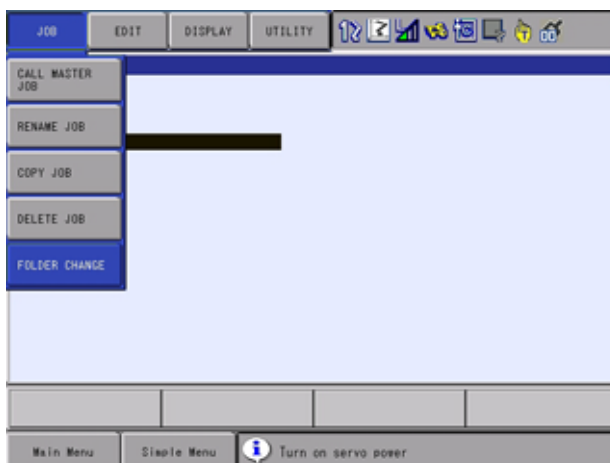
1. Display the {JOB LIST} window.
2. Move the cursor to the job whose registered folder is to be changed.
3. Press [SHIFT] + [SELECT] to select the job.
  - Select all jobs to be changed.



## 5 Editing Jobs

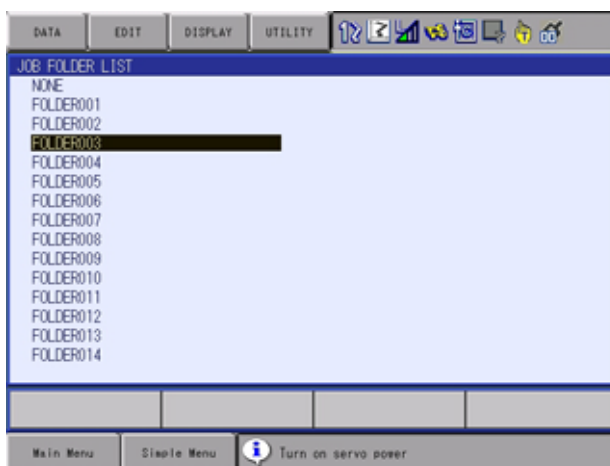
### 5.5 Job Folder Function

4. Select {JOB} → {FOLDER CHANGE} under the pull-down menu.

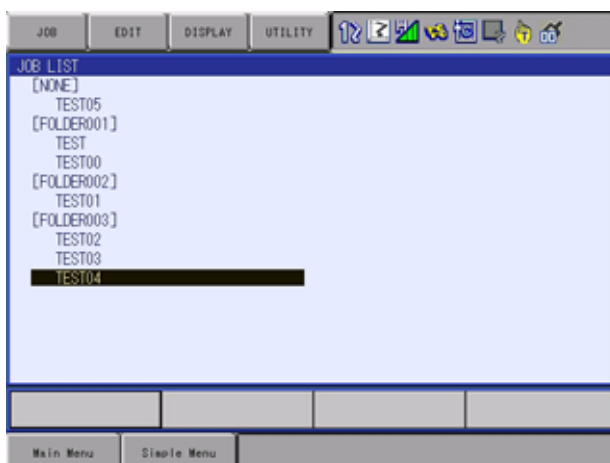


– The {JOB FOLDER LIST} is displayed.

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"

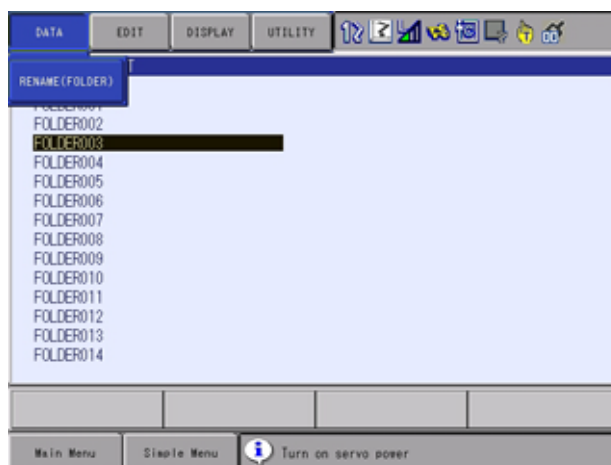
Second language: "FOLDER-1"

- 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.

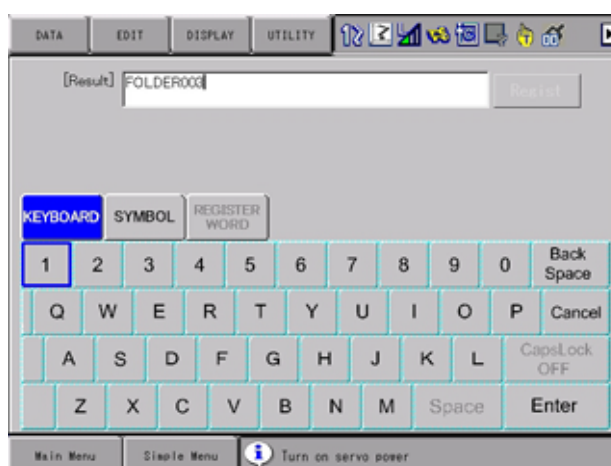
### 5.5.3 Changing the Folder Name

#### 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.



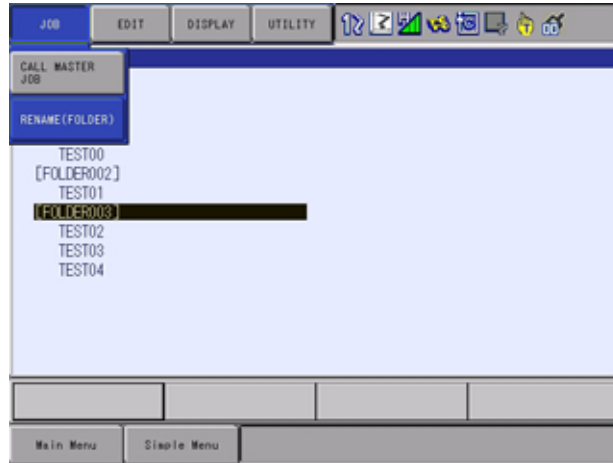
4. Input the new name of the folder.



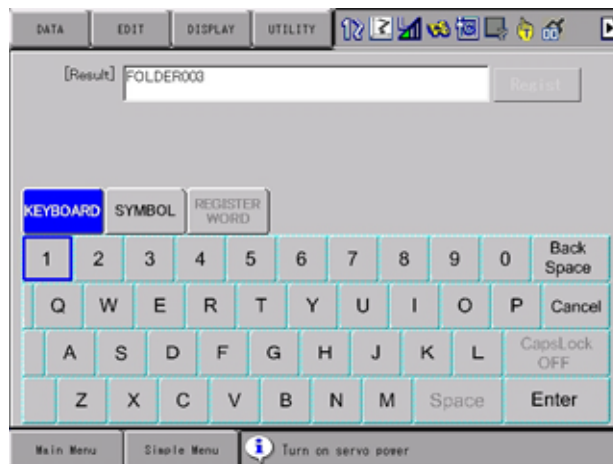
- The folder name will be changed.
- The folder name of the job registered in the folder will also be changed.

## 5.5.3.2 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.



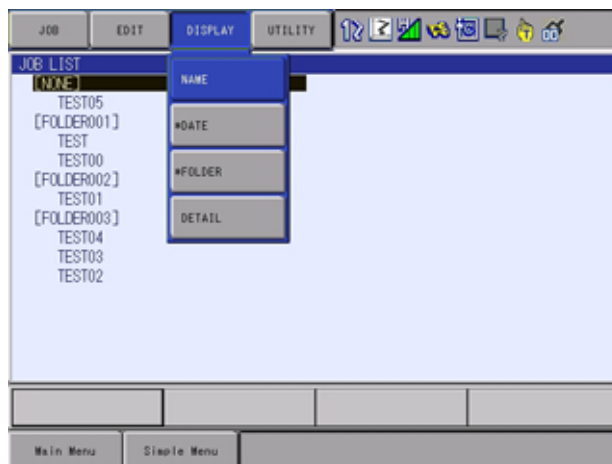
- The folder name will be changed.
- The folder name of the job registered in the folder will also be changed.

**5.5.4 Changing the Display Order While Displaying Jobs by Folders**

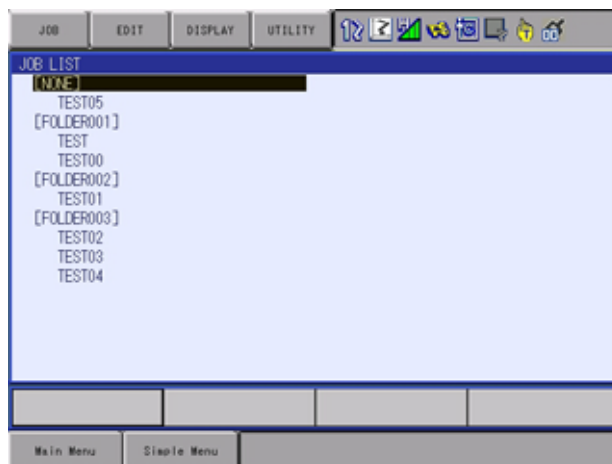
The order of the jobs can be changed while the jobs are displayed by folders.

- **Displaying by name**

1. Select {DISPLAY} → {NAME} in the sub-menu.

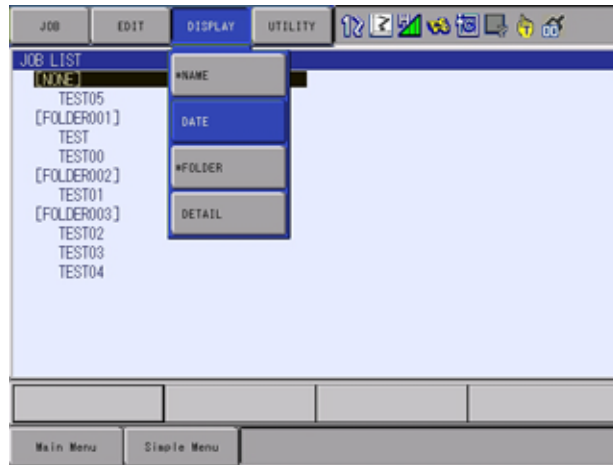


- The jobs are displayed in name order for each folder.

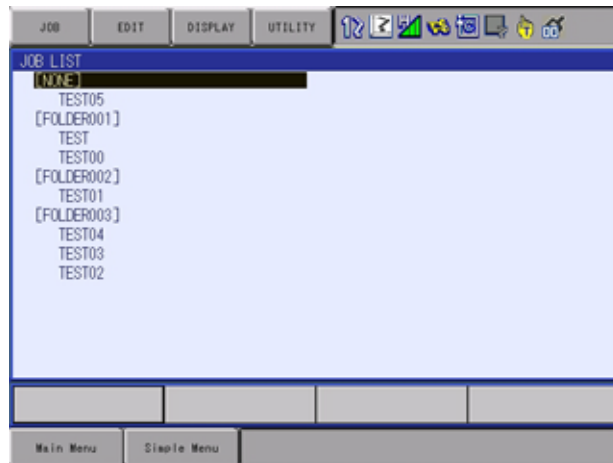


■ **Displaying by date**

1. Select {DISPLAY} → {DATE} in the sub-menu.



- The jobs are displayed in date order for each folder.



## 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.

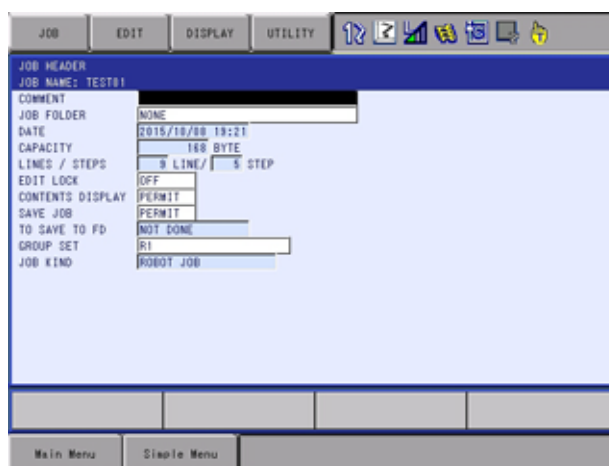
The edit lock can be set and canceled on the {JOB HEADER} window.



Setting of the edit lock can be changed only when the security mode is in the management mode or higher.

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).



## 5.7 Enabling the Modification of Position Data Only

Even in the edit-locked job, the position data can be modified.

1. Select {SETUP} under {Main Menu}.
2. Select {TEACHING CONDITION SETTING}.
  - The {TEACHING CONDITION SETTING} window appears.



TEACHING CONDITION SETTING window is shown only when the security mode is edit mode or management mode.

3. Select "STEP ONLY CHANGING" and press [SELECT].
  - Each time [SELECT] is pressed, the setting alternates between "PROHIBIT" and "PERMIT".

## 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. (Setting the contents display is available in the software version DN1.91-00 or later.)

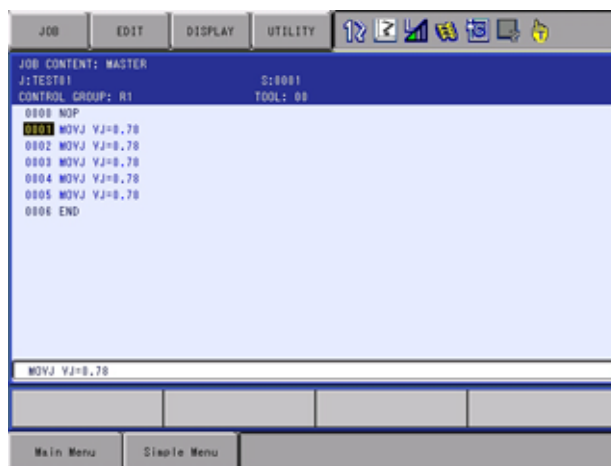
For the job whose contents are set to be displayed, only the name of the job and its control group are displayed on the JOB CONTENT:MASTER window.

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}.



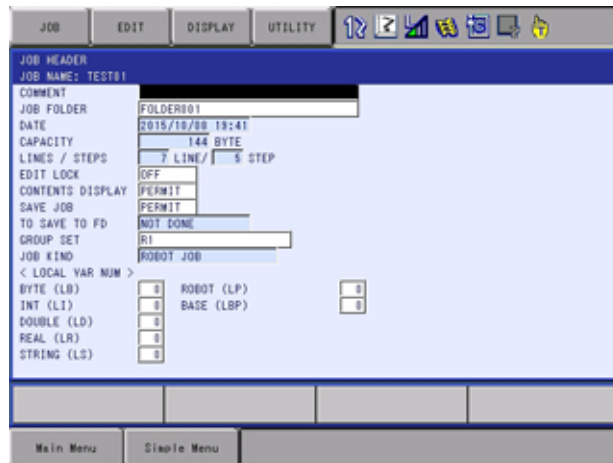
3. Select {DISPLAY} under the pull-down menu.

## 5 Editing Jobs

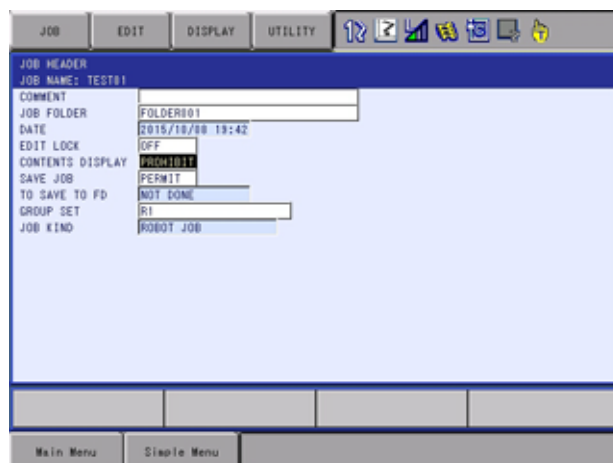
## 5.8 Prohibit Displaying the Contents of a Job

## 4. Select {JOB HEADER}.

- The JOB HEADER window appears.



## 5. Select {CONTENTS DISPLAY} and set "PROHIBIT".



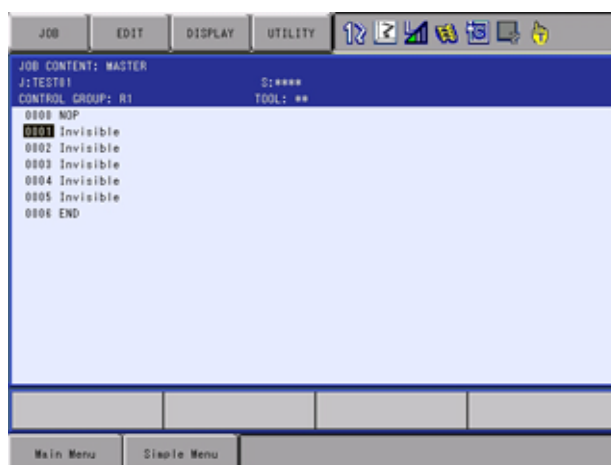
The contents display of a job can be changed only when the security mode is in the management mode or higher.



When "PROHIBIT" is set to {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 to {CONTENTS DISPLAY}, comment, job folder, edit lock and save job can be changed when the edit lock is "ON".

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 *section 6.11 “Instruction Displaying 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 “ \* ”.



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 “PROHIBIT” is set to {CONTENTS DISPLAY}. (Refer to *section 4.4 “Modifying Play Speed”* for the speed override function.)

To prohibit modifying a job during playback, set “ON” to {EDIT LOCK}. (Refer to *section 5.6 “Setting Edit Lock on Individual Job Units”* for setting “ON” to {EDIT LOCK}.)

To prohibit saving a job data, to which “PROHIBIT” is set to its {CONTENT DISPLAY} item, to an external memory device, set “PROHIBIT” to {TO SAVE TO FD}.

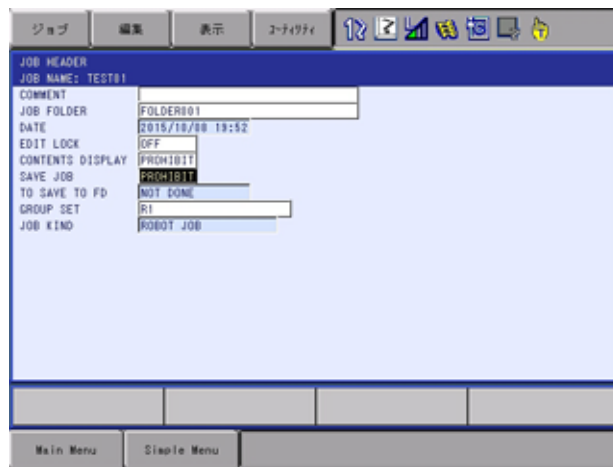
Refer to *section 5.9 “Prohibit: Saving The Job Data”* for setting “PROHIBIT” to {SAVE JOB}.

## 5.9 Prohibit: Saving The Job Data

Data saving can be prohibited on a job base to prevent the job of the DX200 from being saved to the external memory device. (Setting the save job is available in the software version DN1.91-00 or later.)

Setting “PROHIBIT” to {SAVE JOB} 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. The job “PROHIBIT” is set to {SAVE JOB} cannot be saved to the external memory device.  
Refer to *section 7.3.0.2 “Saving Data”* for saving job data in an external memory device.

When saving a job to which “PROHIBIT” is set to {SAVE JOB} by using data transmission function, high-speed Ethernet server function, FTP function and 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 in the management mode or higher.



To prohibit displaying of the contents of a job, to which “PROHIBIT” is set to {JOB SAVE}, set “PROHIBIT” to {CONTENTS DISPLAY}.

Refer to *section 5.8 “Prohibit Displaying the Contents of a Job”* for setting the displaying of a job contents.

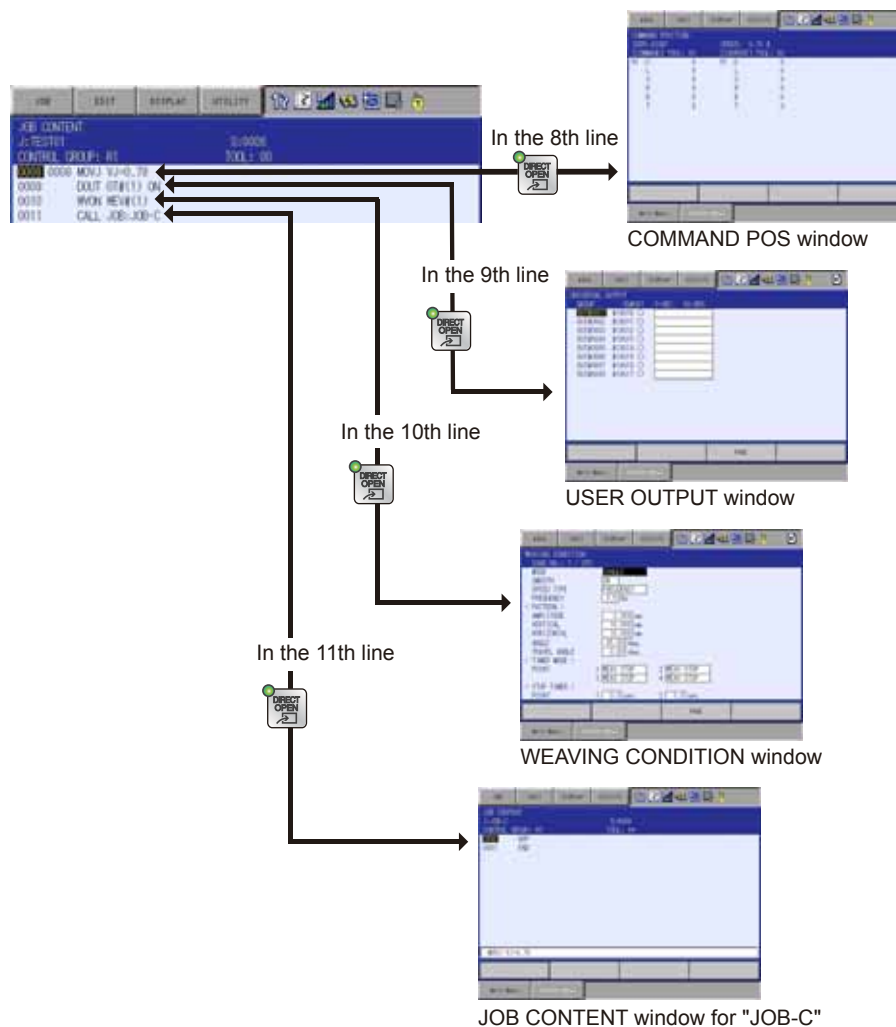
## 6 Convenient Functions

### 6.1 One-touch Operation "Direct Open"

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"

1. In the JOB CONTENT window, move the cursor to the job name or the condition file for which the window is to be displayed.
2. Press [DIRECT OPEN].
  - This key lamp lights and the JOB CONTENT window or the condition file window appears.
  - When [DIRECT OPEN] is pressed once again, the key lamp turns OFF, and the window returns to the former JOB CONTENT window.

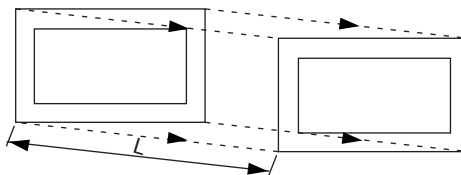


- The direct open function cannot be used again while a directly opened window is shown.
- If another window is selected while the direct open function is effective, the function is automatically canceled and the lamp on the direct open key goes out.
- Once another JOB CONTENT window is opened by the direct open function, the former job cannot be continuously operated. (Stopped until the opened JOB CONTENT window is closed.)

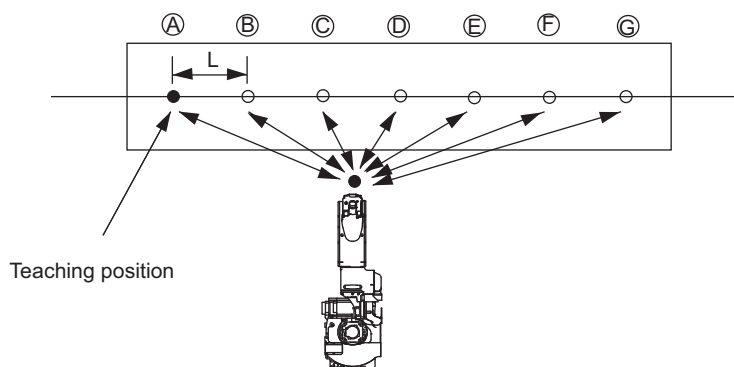
## 6.2 Parallel Shift Function

### 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.

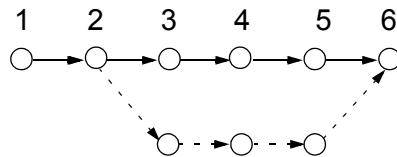




6.2.1.1 Parallel Shift of Step

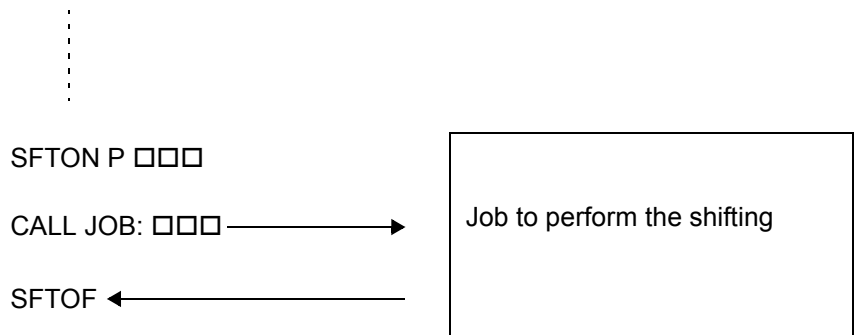
The block from the SFTON to the SFTOF instructions is subject to the shift operation.

Line (Step)	Instruction	
0000	NOP	
0001(001)	MOVJ VJ=50.00	
0002(002)	MOVL V=138	} Shifted block
0003	SFTON P□□□UF# (1)	
0004(003)	MOVL V=138	
0005(004)	MOVL V=138	
0006(005)	MOVL V=138	
0007	SFTOF	
0008(006)	MOVL V=138	



6.2.1.2 Parallel Shift of Job

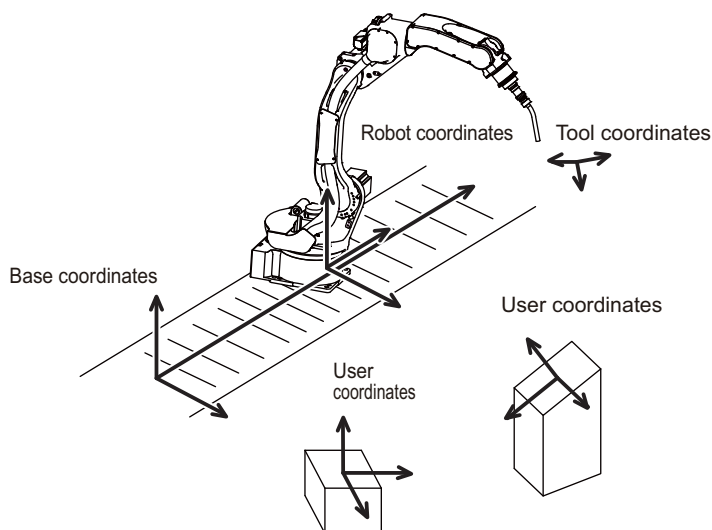
When shifting an entire series of operations, the range to be shifted by the shift instruction can be set using the method indicated above, but the method shown in the following, in which just the part to be shifted is made into a separate job, can also be used.



6.2.2 Setting the Shift Value

6.2.2.1 Coordinate Systems

The shift value for parallel shift is X, Y, and Z increment in each coordinates. There are four coordinates: base coordinates, robot coordinates, tool coordinates, and user coordinates. In systems with no servo track, the base coordinates and robot coordinates are the same. Also, the teaching line coordinates system 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 process is shown in three steps:
 

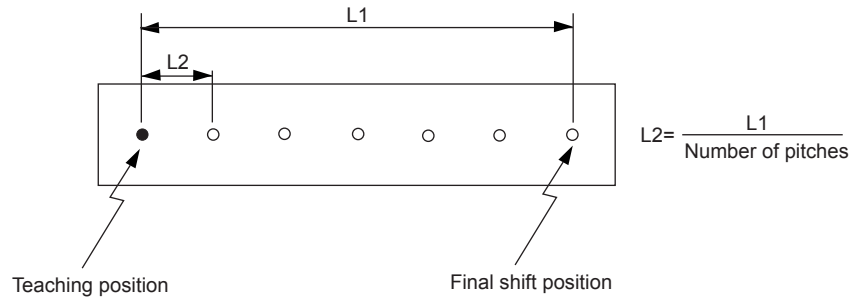
- Teaching position:** The 'CURRENT POSITION' window shows coordinates for X, Y, and Z.
- Position to be shifted:** The same window shows the coordinates after moving the manipulator. An arrow points from the teaching position to this one.
- Setting the shift value:** The 'POSITION VARIABLES' window shows the calculated shift values for X, Y, and Z. An arrow points from the second window to this one.

The text below the second screenshot reads: "The difference between them is the shift value."

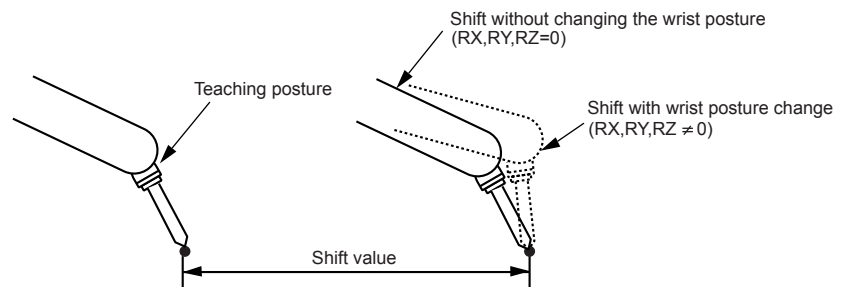
## 6 Convenient Functions

### 6.2 Parallel Shift Function

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, 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.

**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

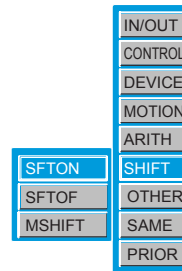
This is the instruction that starts a parallel shift.

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	MOVL 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  
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 Key]s, press [SELECT] to display the input buffer line.

⇒ SFTON P=

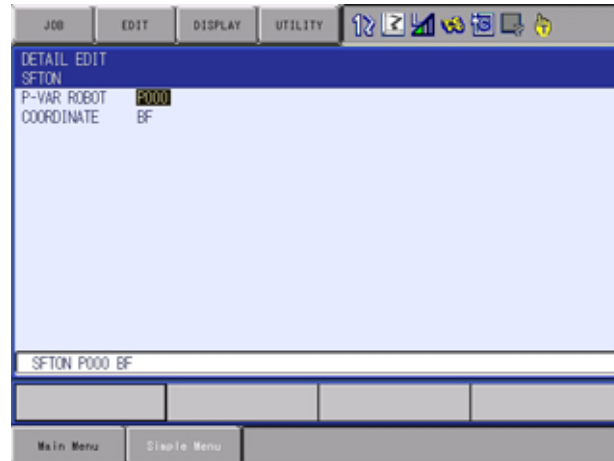
## 6 Convenient Functions

### 6.2 Parallel Shift Function

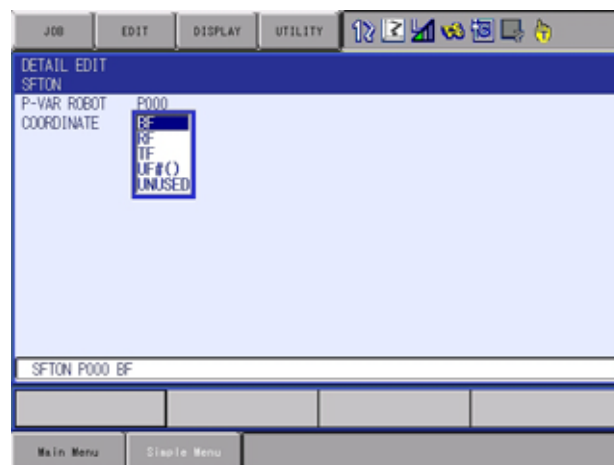
After the number is input, press [ENTER] to modify the number value in the input buffer line.

- Adding the coordinate system in which the shift is performed  
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].



- 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	DOU 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	DOU OT#(1) ON

## 6.2.3.3 MSHIFT Instruction

When a parallel shift of the wrist posture is attempted, the manipulator may not be shifted to the target posture in the following cases.

- Posture displacement (Rx, Ry, Rz) is specified to the shift value set by the user.
- When a displacement between two points is calculated using an INFORM operating instruction (ADD instruction, SUB instruction, etc.), and a posture displacement (Rx, Ry, Rz) is specified in the shift value.

In such cases, the MSHIFT instruction can be used to automatically calculate the optimum shift value for an operation to reach the target shift position and posture. With an MSHIFT instruction, the shift value between the reference position and the target position (shift position) when the parallel shift is performed is determined in the specified coordinate system, and set as the specified position variable.

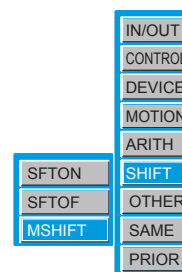
1. Move the cursor to the line immediately before where the MSHIFT instruction is to be registered.

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  
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.

⇒ MSHIFT **PX000** BF PX001 PX002



## 6 Convenient Functions

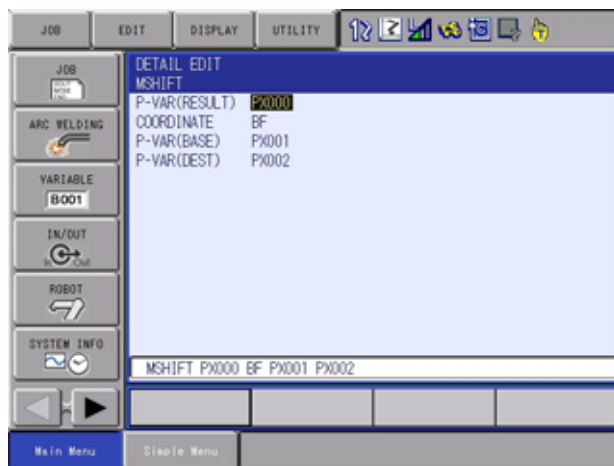
### 6.2 Parallel Shift Function

- To directly input the value using the [Numeric Key]s, press [SELECT] to display the input buffer line.

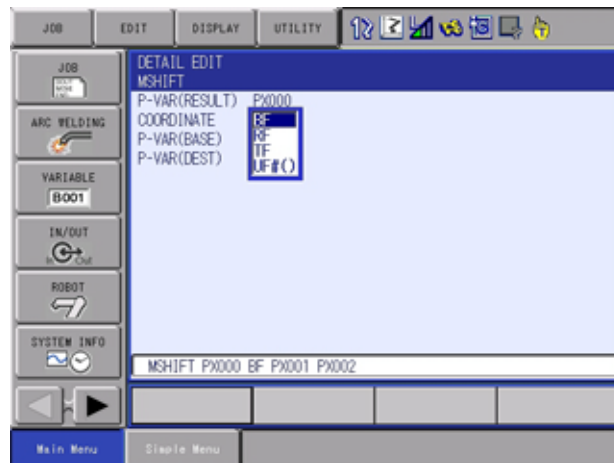
```
PX =
⇒ MSHIFT BF PX001 PX002
```

- After the number is input, press [ENTER] to modify the number value in the input buffer line.
- Changing the coordinate system in which the shift is performed  
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].



- 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.

```
Line where
MSHIFT is
registered. → 0006 GETS PX000 $PX000
0007 MSHIFT PX000 RF PX001 PX002
0008 DOUT OT#(1) ON
```

**6.2.4 Continuation of the Parallel Shift Function****CAUTION**

- If the shift function is canceled through a job editing operation after the execution of a parallel shift instruction, the job must be started again from the beginning.
- Because no shift is performed when the operation is restarted, there is a possibility of interference between the workpiece and 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
- Restart after the alarm occurs
- When control power is turned OFF



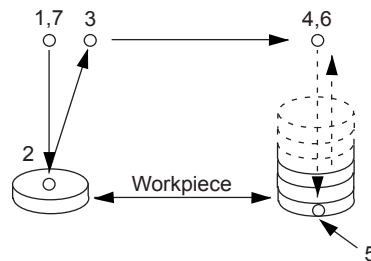
With any operation other than those listed above, the parallel shift function remains in effect.

## 6.2.5 Examples of Use

## 6.2.5.1 Example of Use of Shift Addition/Subtraction

Table 6-1: Workpiece Stacking Operation

Line	Instruction	
0000	NOP	
0001	SET B000 0	
0002	SUB P000 P000	Make the first shift value zero.
0003	*A	
0004	MOVJ	Step 1
0005	MOVL	Step 2
0006	'Gripping workpiece	
0007	MOVL	Step 3
0008	MOVL	Step 4
0009	SFTON P000 UF#(1)	Shift start
0010	MOVL	Shift position Step 5
0011	'Releasing workpiece	
0012	SFTOF	Shift end
0013	ADD P000 P001	Add the shift value for the next operation.
0014	MOVL	Step 6
0015	MOVL	Step 7
0016	INC B000	
0017	JUMP *A IF B00<6	
0018	↓	
	SFTON P000 UF#(1)	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.
	SFTOF	
	SUB P000 P001	



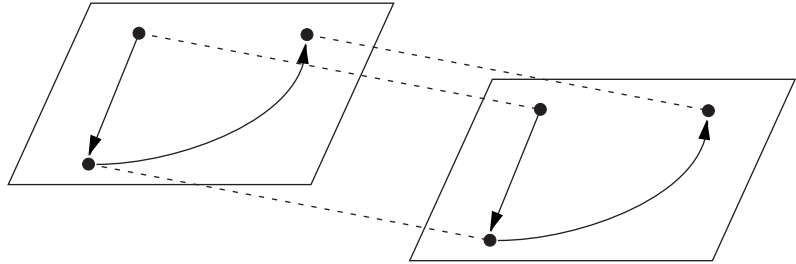
## 6.2.5.2 Example of Use of MSHIFT Instruction

<b>Line</b>	<b>Instruction</b>	<b>Explanation</b>
0000	NOP	
0001	MOVJ VJ=20.00	Move the manipulator to the reference position.
0002	GETS PX000 \$PX000	Set the reference position as position variable P000.
0003	MOVJ VJ=20.00	Move the manipulator to the target position.
0004	GETS PX001 \$PX000	Set the target position as position variable P001.
0005	MSHIFT PX010 BF PX000 PX001	Set shift value and set it as position variable P010.
0006	END	

## 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 displayed for the steps which result in a position outside the P-point maximum envelope of the manipulator. 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)



## CAUTION

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 6-2: Relationship Between Group Combinations and Coordinates at Conversion*

Group Combination in Job	Explanation	
	Usable Coordinate System	
R	Shift is performed on the basis of selected coordinates. Base coordinates, robot coordinates, tool coordinates, user coordinates, pulse coordinates	
R(B)	Shift is performed on the basis of selected coordinates.	
	1. Base Coordinates	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.
	2. Robot Coordinates	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.
	3. Tool Coordinates	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.
	4. User Coordinates	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.
	5. Pulse Coordinates	The taught position of each axis is shifted by the specified amount on the basis of pulse values.
S	Shift is performed on the basis of pulse values regardless of the coordinates.	

*Table 6-2: Relationship Between Group Combinations and Coordinates at Conversion*

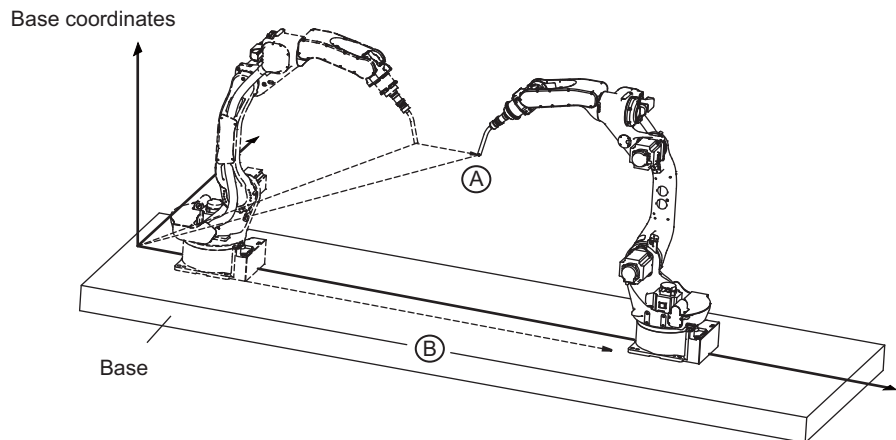
R+S	The manipulator is shifted in the selected coordinates. The station axis is shifted on the basis of pulse values regardless of the coordinates. Base coordinates, robot coordinates, tool coordinates, user coordinates, pulse coordinates
R(B)+S	The manipulator is shifted in the selected coordinates, as in 1 to 5 above. The station axis is shifted on the basis of pulse values regardless of the coordinates.
R+R	Two manipulators are shifted in the selected coordinates. Base coordinates, robot coordinates, tool coordinates, user coordinates, master tool coordinates <sup>1)</sup> , pulse coordinates
R(B)+R(B)	Two manipulators are shifted in the selected coordinate system, as in 1 to 5 above. Two base axes are also shifted.

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

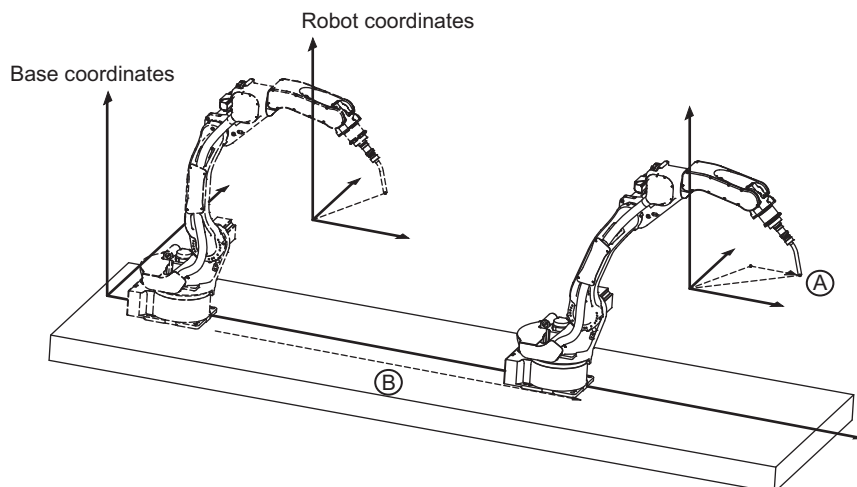
##### 1. Base Coordinates

The base axis is shifted by B and the TCP of the manipulator is shifted by A in the base coordinates.

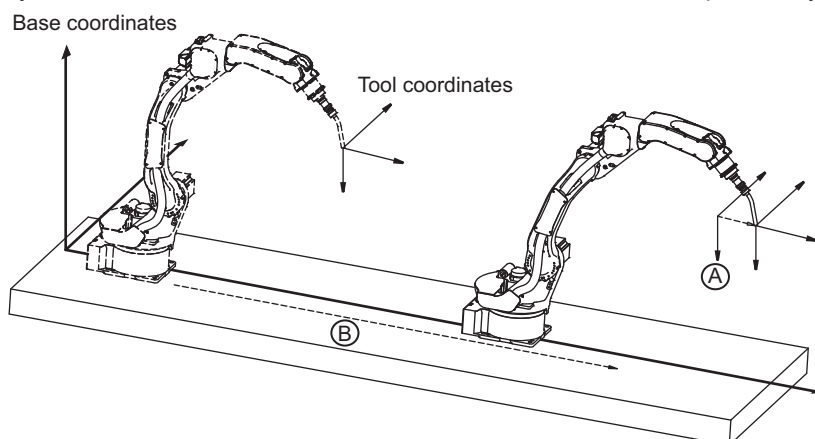


**2. Robot Coordinates**

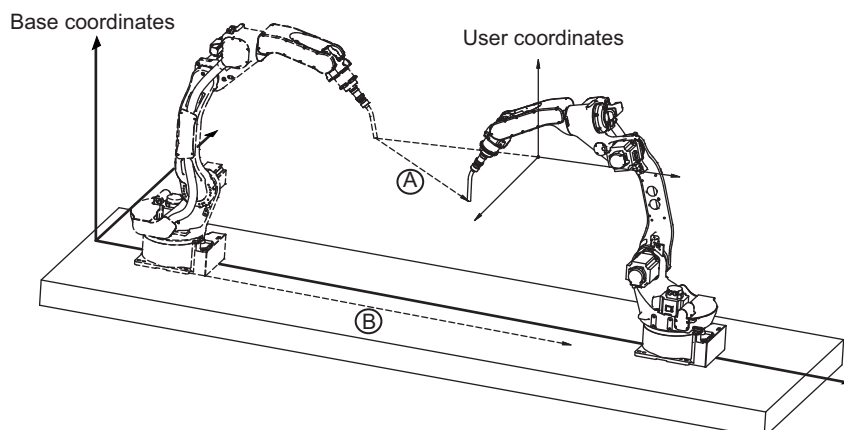
The base axis is shifted by B. The TCP of the manipulator is shifted by A in the robot coordinates. These shifts are carried out independently.

**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**

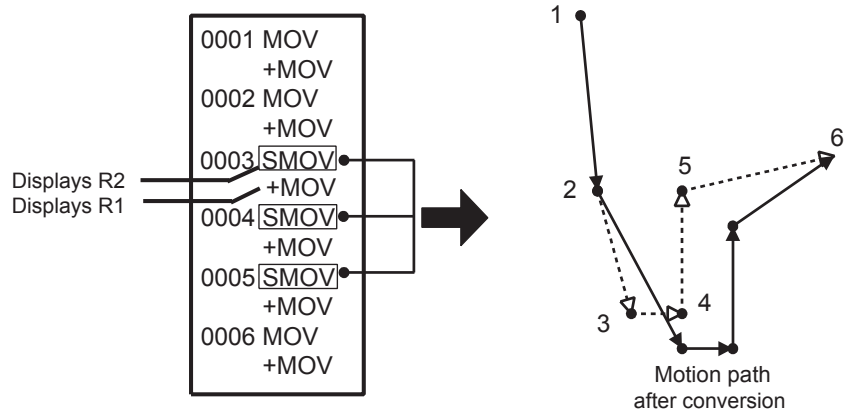
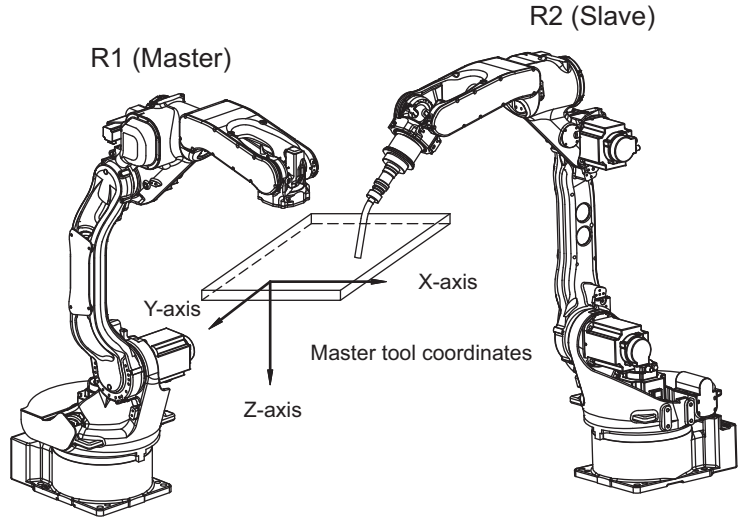
The base axis is shifted by B and the TCP of the manipulator is shifted by A in the user coordinates. These shifts are carried out independently.

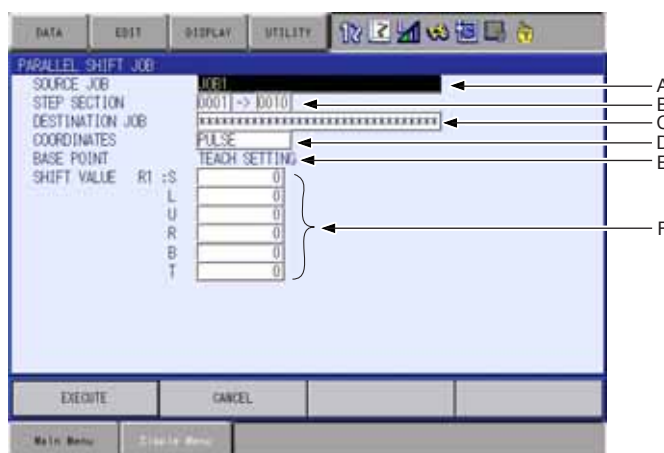




■ **Converting R\*+R\* Jobs with Master Tool Coordinates**

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.

**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.

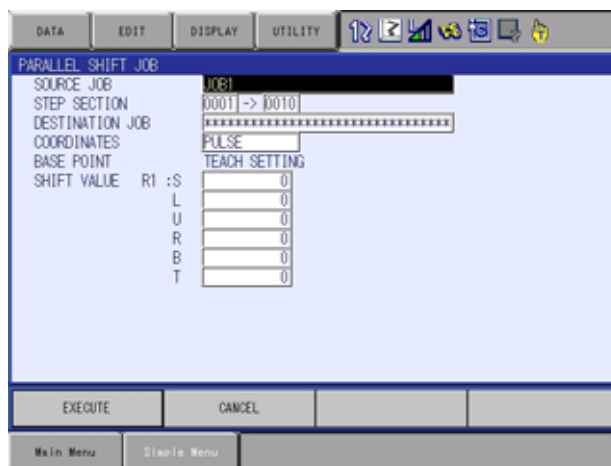


The method using position variables by parameter setting is described in section 6.3.4 "Specifying the Shift Value by Position Variables" on page 6-29 other than above two methods.

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.

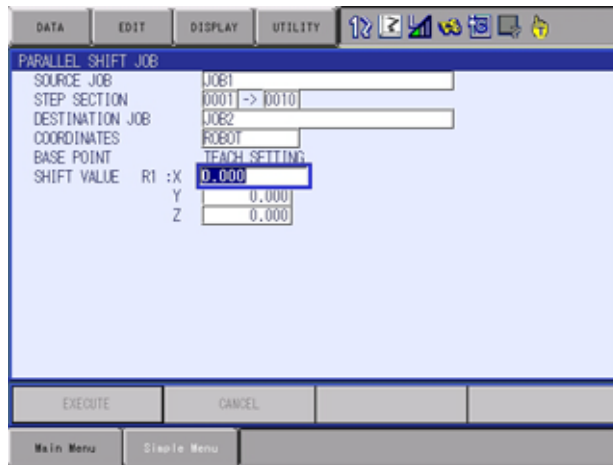


5. Specify the conversion items.
  - Specify each item.

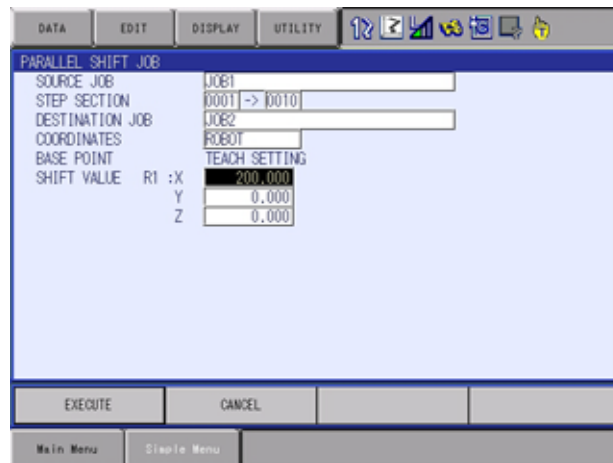
## 6 Convenient Functions

### 6.3 Parallel Shift Job Conversion Function

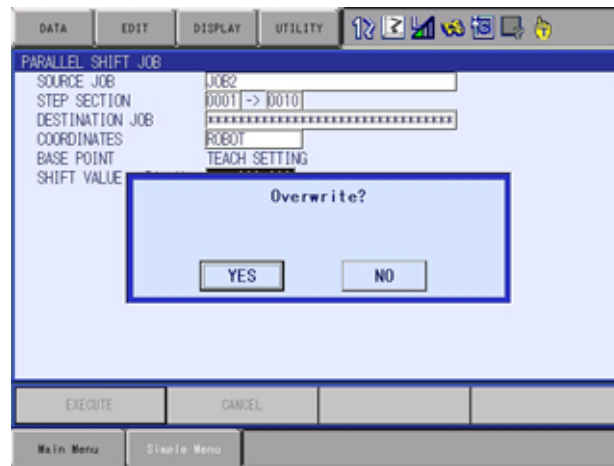
6. Select the shift value to be set.
  - The number can be entered.



7. Type the shift value using [Numeric Key].
8. Press [ENTER].
  - The shift value is set.



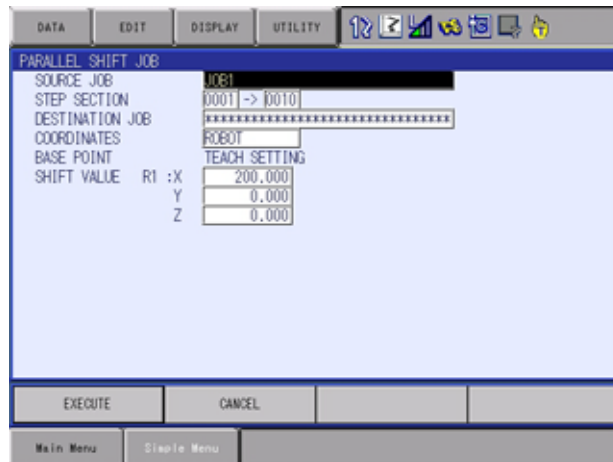
9. Display the PARALLEL SHIFT JOB window. Select "EXECUTE".
  - The confirmation dialog box appears when the converted job is not specified. Select "YES" then the conversion is executed.
  - The JOB CONTENT window appears when the conversion is completed.
  - When "CANCEL" is selected, the display goes back to the JOB CONTENT window without executing conversion.



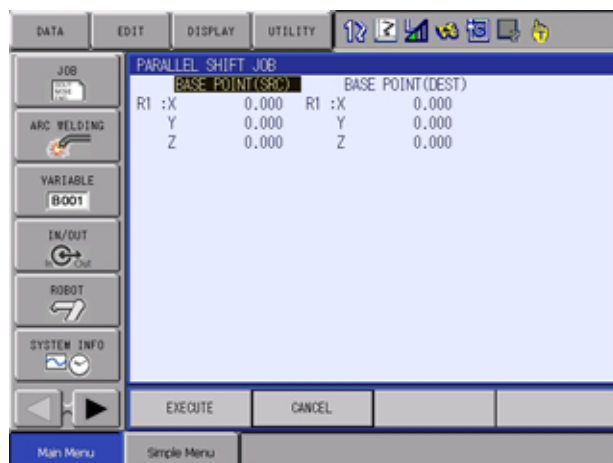
If an alarm occurs during conversion, conversion is suspended.

### ■ 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.

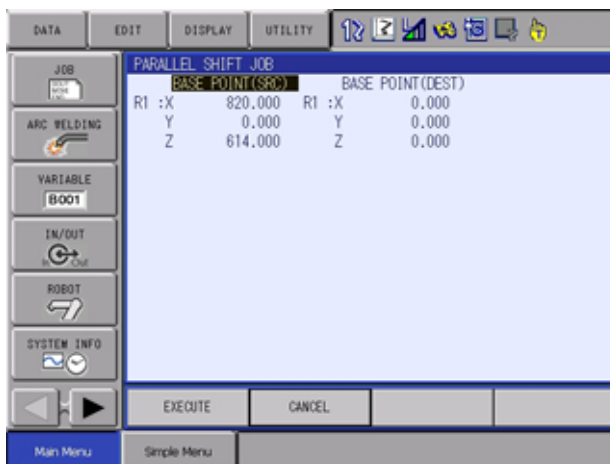


7. Select “BASE POINT(SRC)”.
8. Move the manipulator to the original base point by the [Axis Key]s.

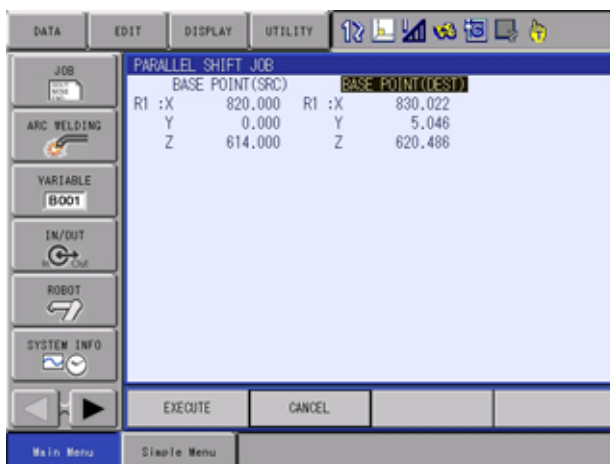
## 6 Convenient Functions

### 6.3 Parallel Shift Job Conversion Function

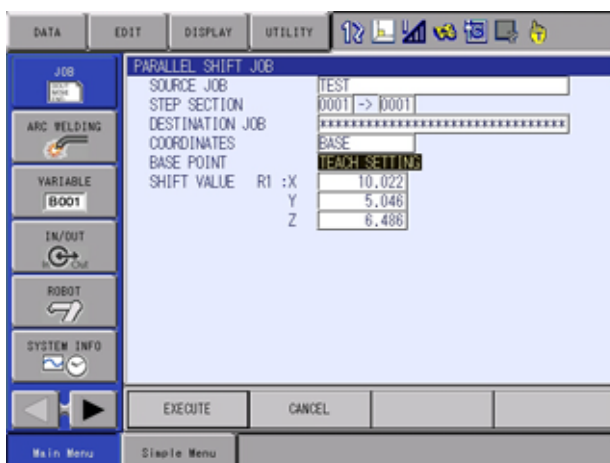
9. Press [MODIFY] and [ENTER].
  - The original base point is set.



10. Select "BASE POINT(DEST)".
11. Move the manipulator to the converted base point by the [Axis Key]s.
12. Press [MODIFY] and [ENTER].
  - The conversion base point is set.



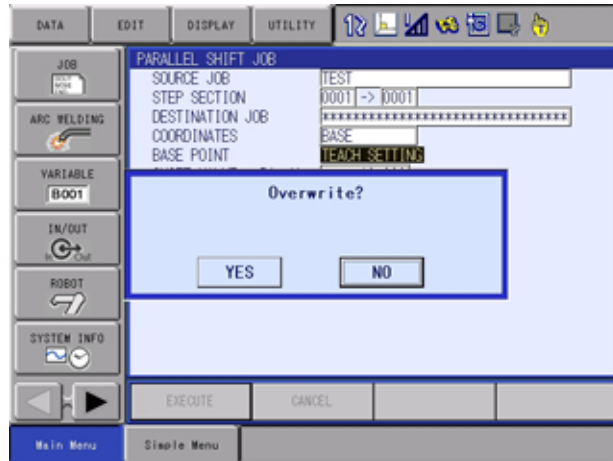
13. Touch "EXECUTE".
  - The difference is calculated by the two teaching points and set as a shift value.





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.



If an alarm occurs during conversion, conversion is suspended.

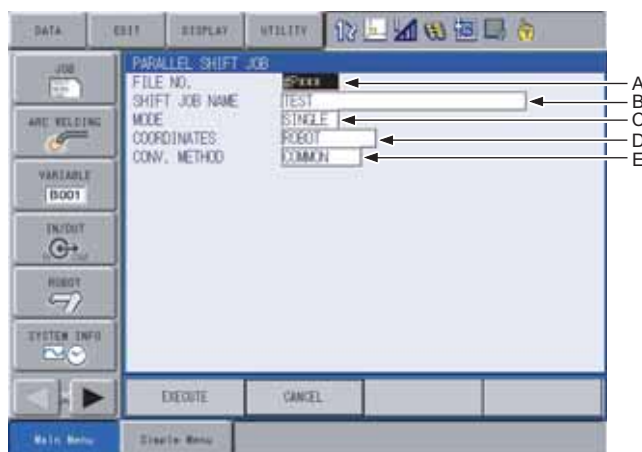
**6.3.4 Specifying the Shift Value by Position Variables**

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 *section 6.3.4.2 "Jobs Targeted for Conversion" on page 6-31*.

**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.

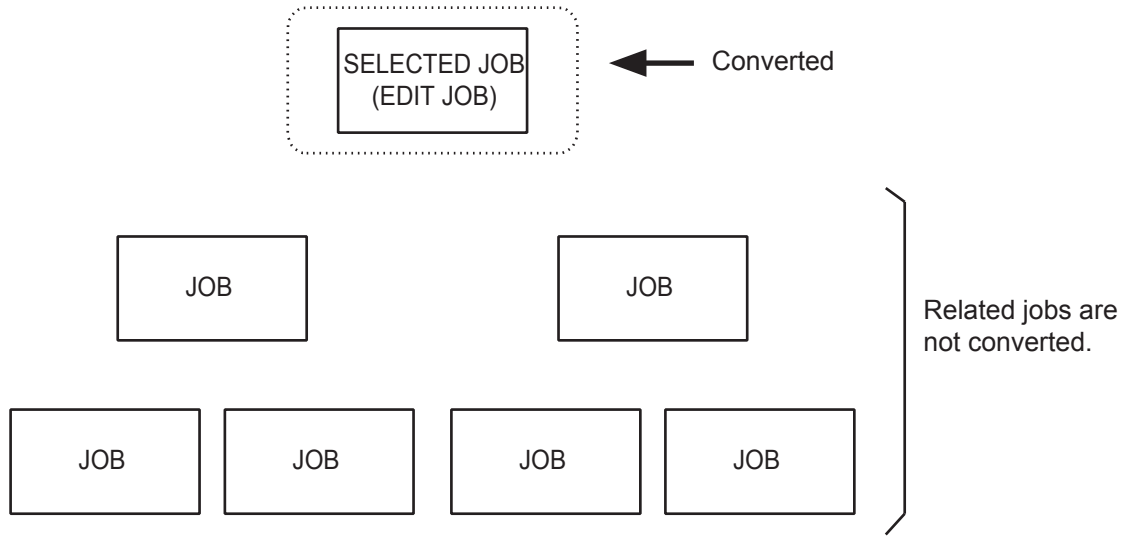
For details of each conversion method, refer to *section 6.3.4.3 "Conversion of Coordinated Jobs"* on page 6-32.

6.3.4.2 Jobs Targeted for Conversion

There are two ways to specify the job to be converted as described in the following:

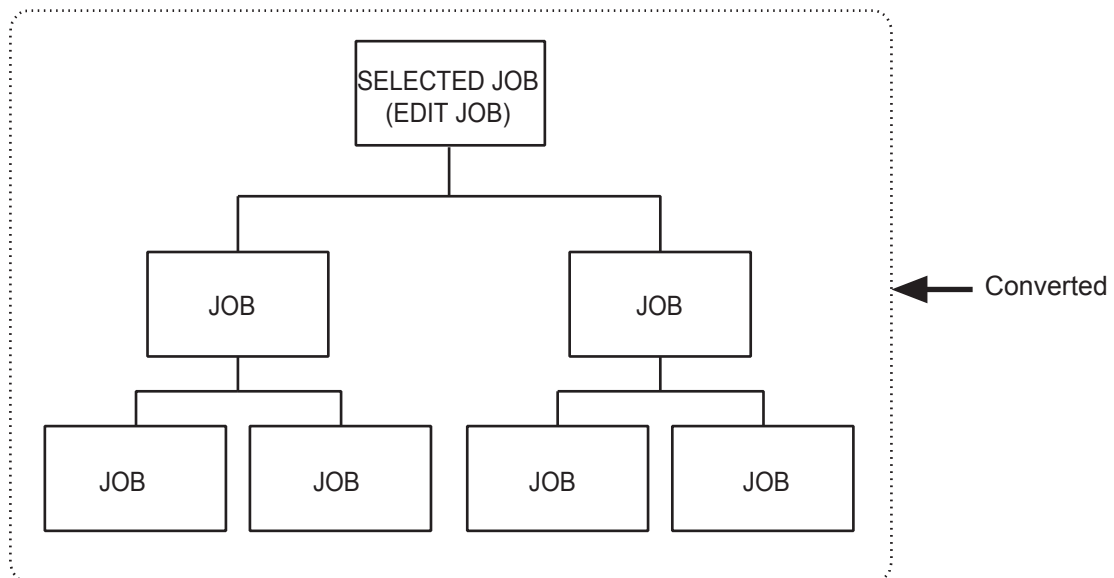
- Independent Job Conversion

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.

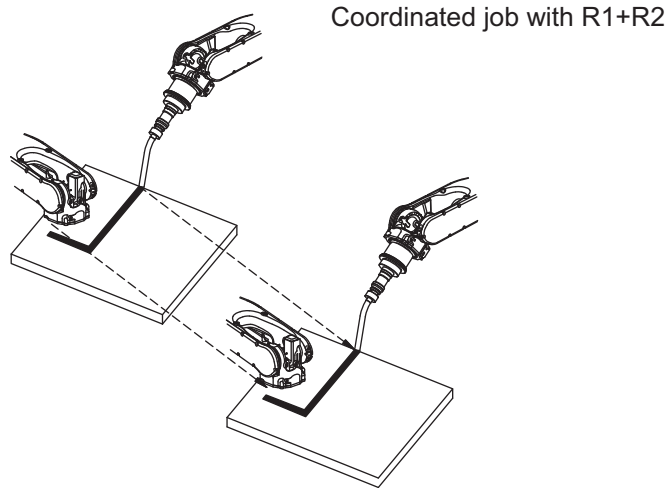


## 6.3.4.3 Conversion of Coordinated Jobs

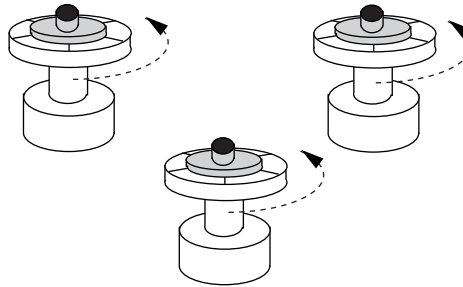
There are two ways to convert a related job such as a coordinated job with two manipulators or the system with multiple stations as described in the following:

■ **Common Shift**

All the manipulators (or all the bases, or all the stations) are converted by the same shift value.



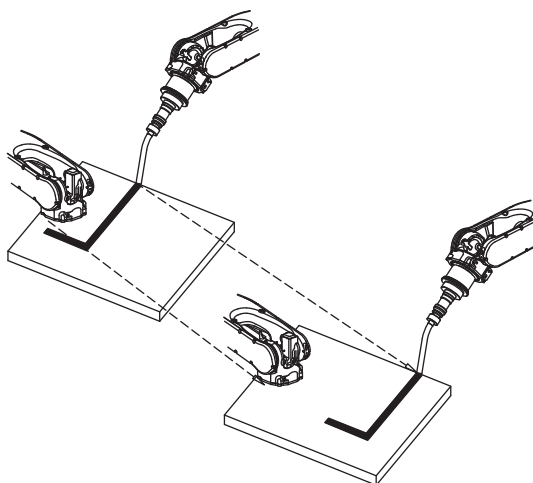
The system with multiple stations



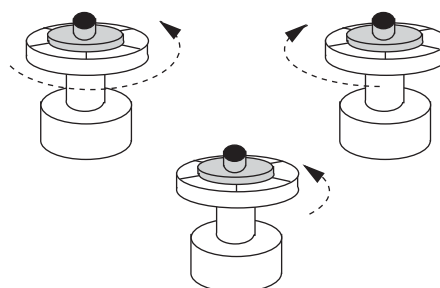
- **Individual Shift**

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



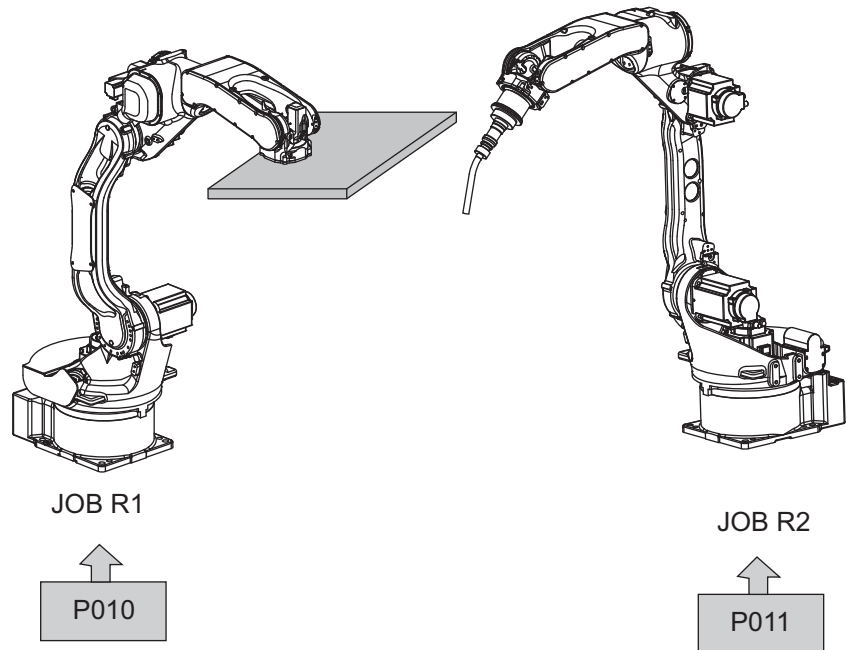
- **Variables used in an individual shift**



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.

Example 1) When selecting P010 for a coordinated job with R1 + R2:  
Use P010 for R1.

Use P011 for R2.



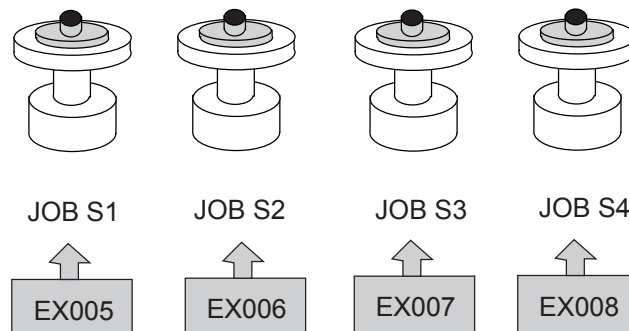
Example 2) When selecting EX005 for multiple jobs with four stations:

Use EX005 for S1.

Use EX006 for S2.

Use EX007 for S3.

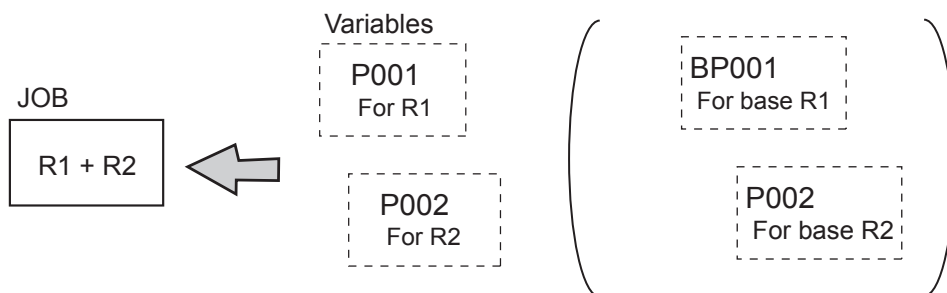
Use EX008 for S4.



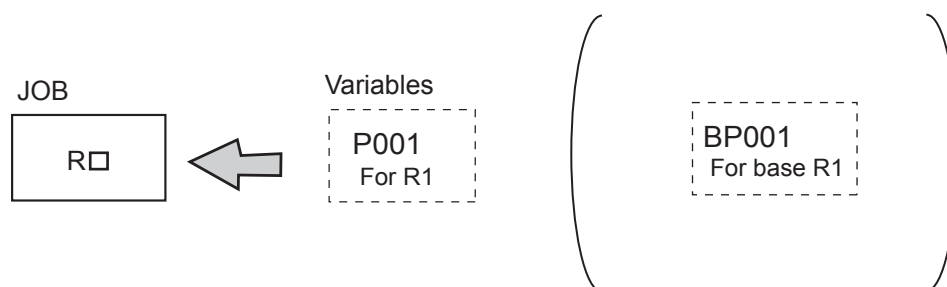
- Relation between variables and jobs for conversion in an individual shift

■ In the case of independent job conversion:

- Coordinated job with R1 + R2  
Different shift values can be set for each manipulator and base.

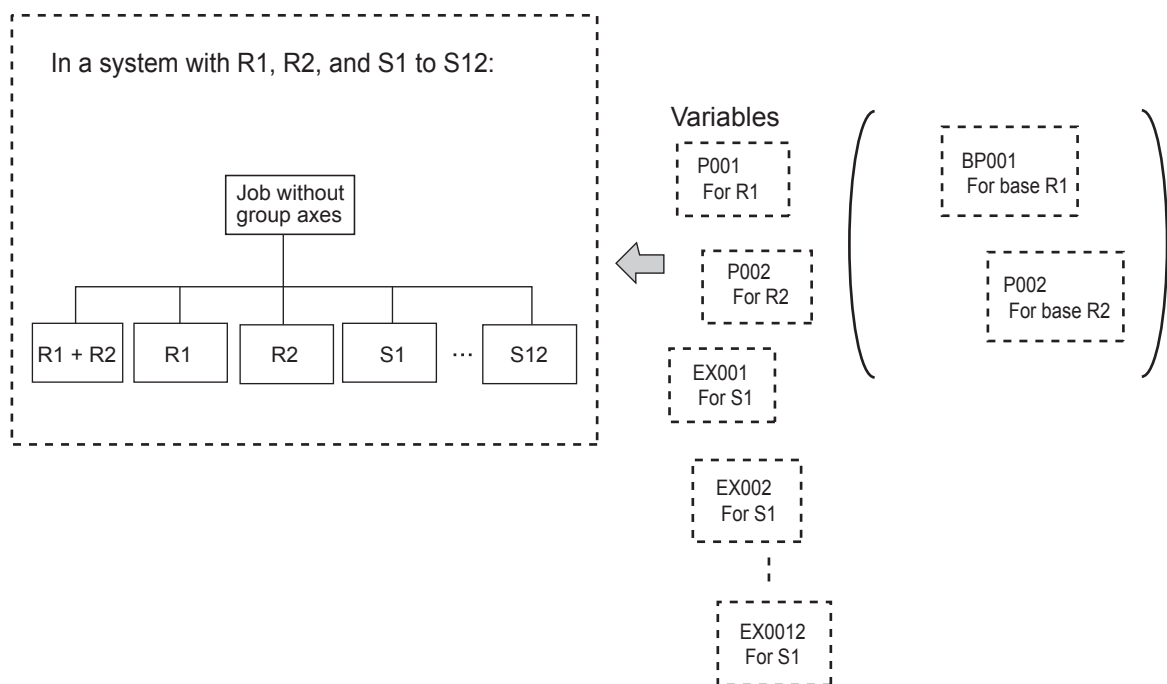


- Job with R□ (+ S□)  
Use one variable for a job with one manipulator.



■ In the case of related job conversion:

- Different shift values can be set for each manipulator, base, and station.

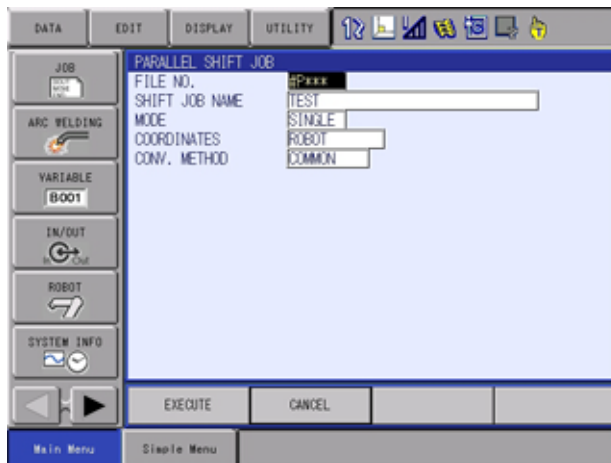




## 6.3.4.4 Operation Procedure

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 *section 3.9.4 “User Variables” on page 3-103*.
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 *section 3.7.6 “Commenting Out a Line” on page 3-71* and *section 3.7.7 “Prohibiting Editing Line-by-Line” on page 3-81.*)

## 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.

Data	Input Range
Number of Steps for Adjustment	Up to 10 steps can be adjusted at the same time.
Position Adjustment Range (X, Y, Z)	Unit: mm, valid to two decimal places, maximum $\pm 10$ mm
Posture Angle Adjustment Range (Rx, Ry, Rz)	Unit: deg, valid to two decimal places, maximum $\pm 10$ deg
Speed Adjustment Range (V)	Unit: %, valid to two decimal places, maximum $\pm 50\%$
PL Adjustment Range	0 to 8
Adjustment Coordinates	Robot coordinates, base coordinates, tool coordinates, user coordinates (Default coordinates: robot coordinates)

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"*.

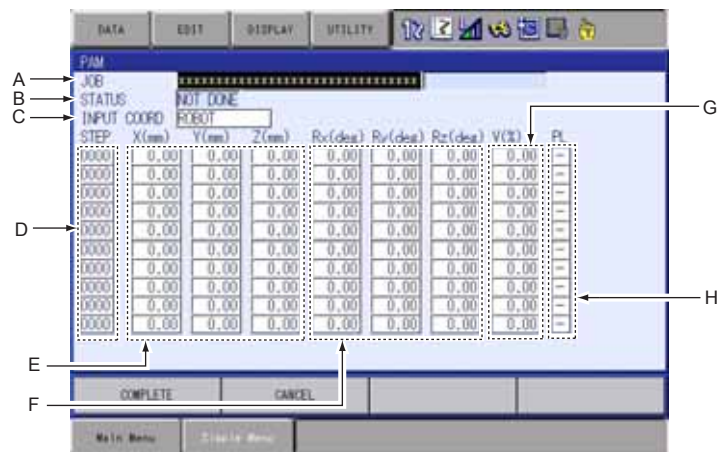


- Base axis and station axis data cannot be adjusted.
- Adjustment when a TCP instruction is executed is performed by adjusting the data of the selected tool.
- When the coordinates for adjustment are user coordinates, an error occurs if teaching has not been performed in the user coordinates.
- If an 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 that has no speed tag causes an error.

## 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.

– **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].

The line to which the Edit Lock function is set or the comment out is performed cannot be changed.

Following errors occur when performing the Edit Lock operation.



1011: EDIT LOCK is set for this line.

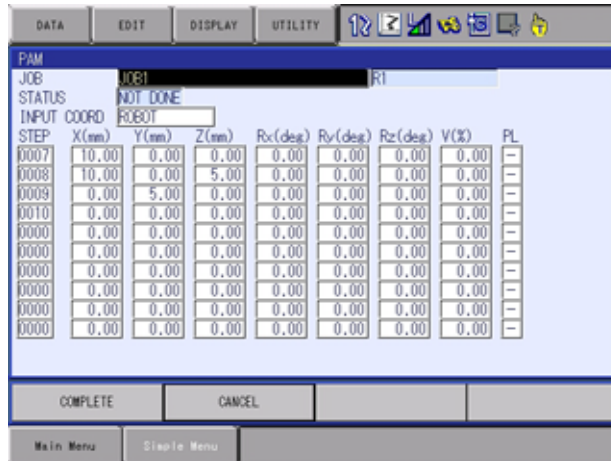
1012: This line is defined as a comment.

(For details, refer to *section 3.7.6 “Commenting Out a Line” on page 3-71* and *section 3.7.7 “Prohibiting Editing Line-by-Line” on page 3-81.*)

## 6.4.2.2 Executing the Adjustment

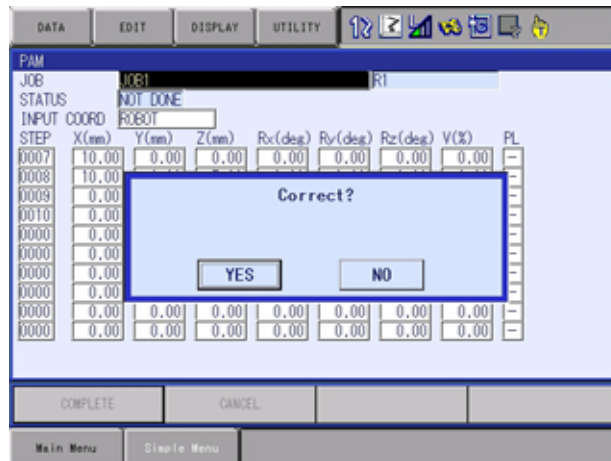
### ■ Executing the Adjustment

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 the step's adjusted position exceeds the software limit, an error occurs, and the data in only that step cannot be cleared on the window.



---

**■ 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.

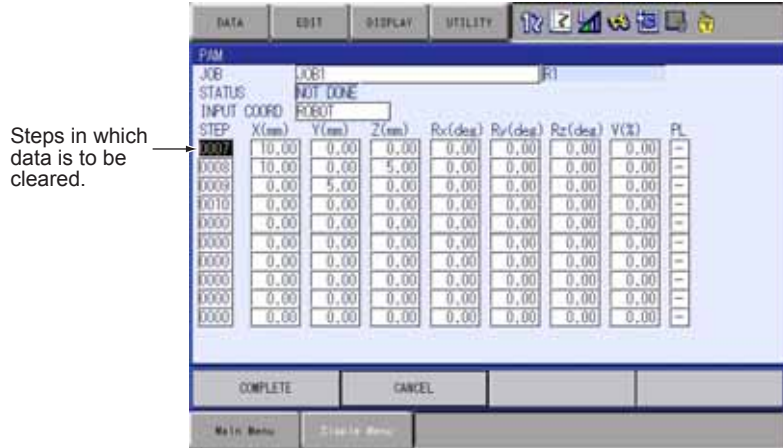
- If the mode is changed
- If an alarm occurs
- If the power is turned OFF



### ■ 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.

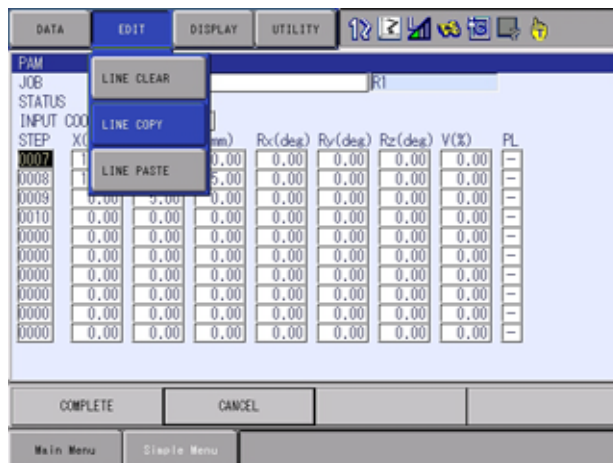


2. Select {EDIT} under the pull-down menu.
3. Select {LINE CLEAR}.
  - The line data is cleared.

### ■ 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.

### ■ Canceling the Adjustment

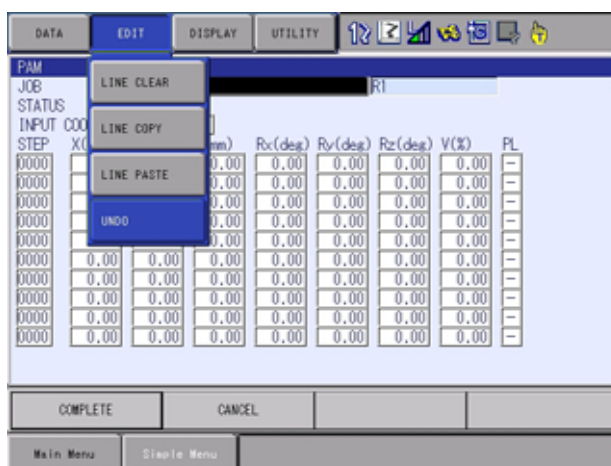
After the position adjustment in the PAM function, the job can be returned to the status before adjustment only during teaching. In this case, follow the procedures below.

Note that the job cannot be undone during playback.

1. Move the cursor to the line to be copied.
  - 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.



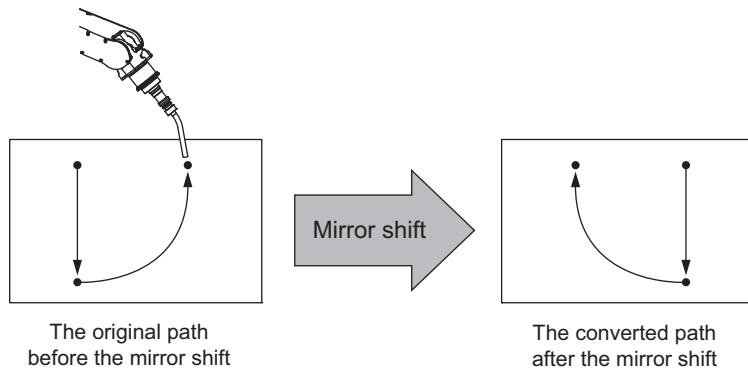
4. Select “YES”
  - The status turns “NOT DONE” and the job is undone when selecting “YES”. The status does not change and the job is not undone when selecting “NO”.

## 6.5 Mirror Shift Function

### 6.5.1 Function Overview

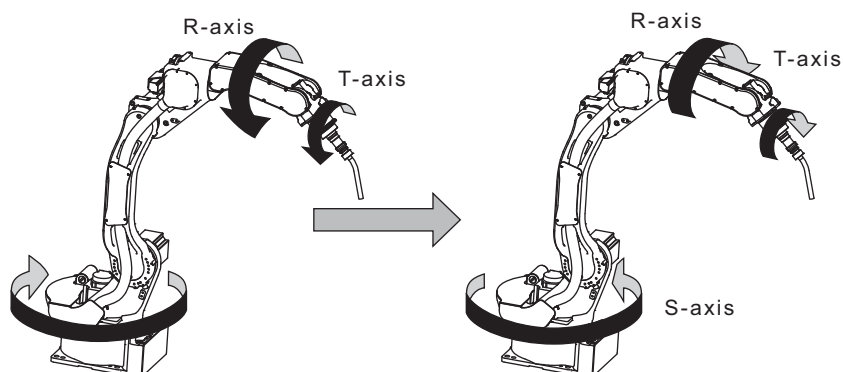
With the mirror shift function, a job is converted to the job in which the path is symmetrical to that of the original job. This conversion can be performed for the specified coordinate among the X-Y, X-Z, or Y-Z coordinate of the robot coordinates and the user coordinates.

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.



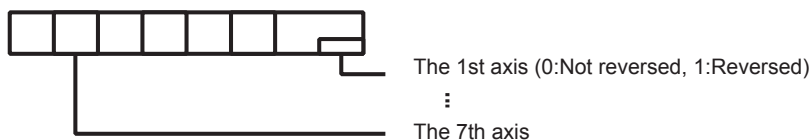
**6.5.2 Pulse Mirror-shift Function**

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

**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.

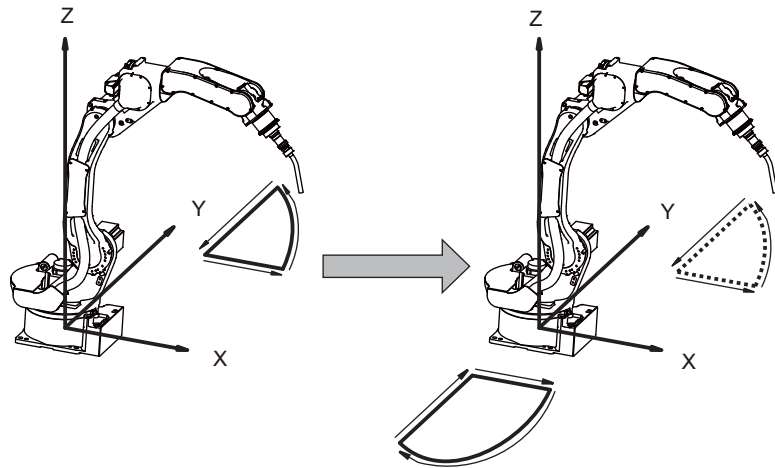
- Robot Axis: Same model
- Base Axis: Same configuration
- Station Axis: Same configuration

**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**

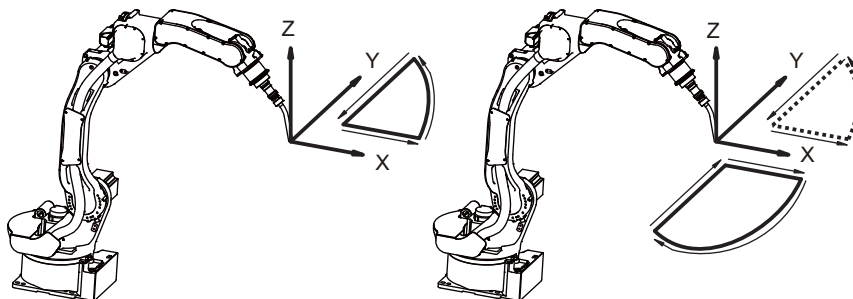
Position variables are not converted by the mirror shift function.



- 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" .

**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.



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".

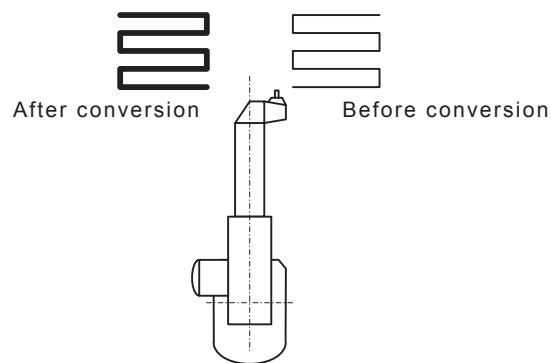
**6.5.5 Notes on the Mirror Shift Function**

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**

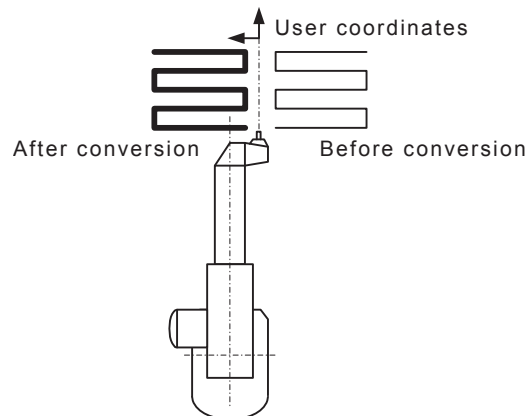
When the robot-coordinates mirror-shift function is performed, the mirror shift is performed on the X-Z coordinate of the robot coordinates. The path of the converted job is as follows:

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



---

### 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**

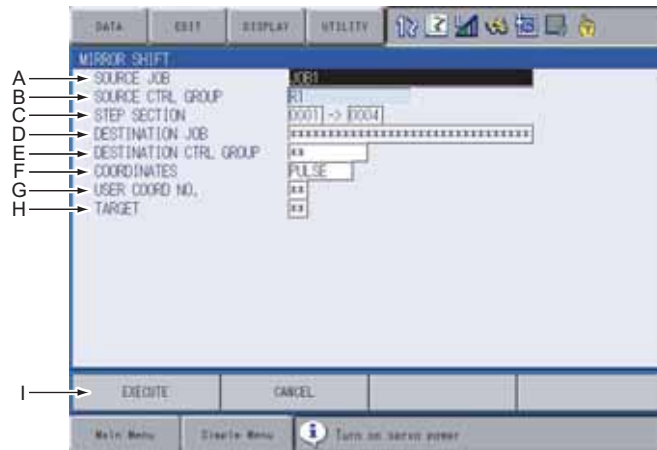
1. Select {JOB} under {Main Menu}.
2. Select {SELECT JOB}.
  - The JOB LIST window appears.
3. Select the desired job.

#### 6.5.6.2 Mirror Shift Conversion

1. Display the JOB CONTENT window.
2. Select {UTILITY} under the pull-down menu.
  - The MIRROR SHIFT window appears.
3. Select {MIRROR SHIFT}.
  - The MIRROR SHIFT window appears.



## 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.

**G. USER COORD NO.**

Specifies the user coordinates number when "USER" is selected in "6. COORDINATES".

This item cannot be set when "PULSE" or "ROBOT" is selected in "6. COORDINATES".

**H. TARGET**

Specifies the coordinate where conversion is to be done when "ROBOT" or "USER" is selected in "6. COORDINATES". "XY", "XZ", or "YZ" can be selected. Always specify "XZ" for "ROBOT".

**I. EXECUTE**

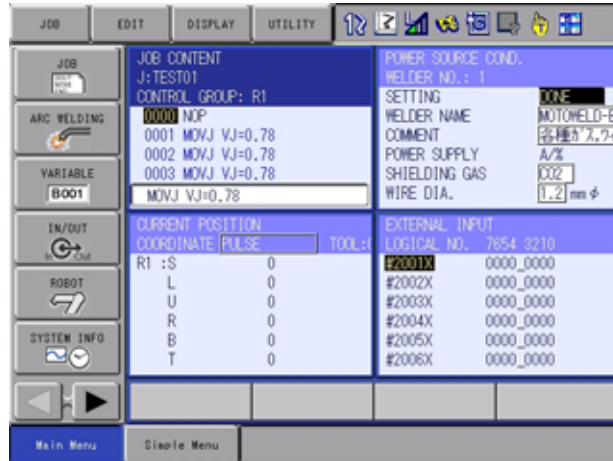
Mirror shift conversion is executed when pressing "EXECUTE" or [ENTER]. A job is created with the name of conversion source job when a job after conversion is not entered.

## 6.6 Multi Window Function

### 6.6.1 Function Overview

Multi window function divides the general-purpose display area up to four 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)


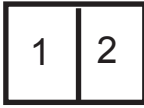
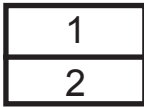
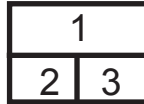
	Number of the window	Dividing Pattern
1	1 window	
2	2 windows	
3	2 windows	
4	3 windows	

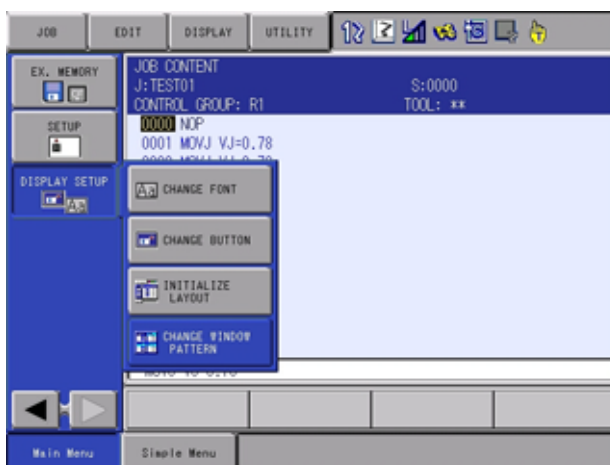
Table 6-3: Display the dividing Pattern (Sheet 2 of 2)

	Number of the window	Dividing Pattern				
5	3 windows	<table border="1"> <tr> <td>1</td> <td>2</td> </tr> <tr> <td></td> <td>3</td> </tr> </table>	1	2		3
1	2					
	3					
6	3 windows	<table border="1"> <tr> <td>1</td> <td>2</td> </tr> <tr> <td colspan="2">3</td> </tr> </table>	1	2	3	
1	2					
3						
7	4 windows	<table border="1"> <tr> <td>1</td> <td>2</td> </tr> <tr> <td>3</td> <td>4</td> </tr> </table>	1	2	3	4
1	2					
3	4					

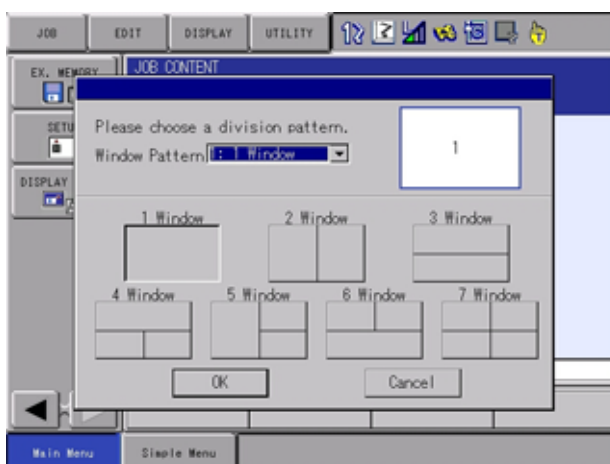
6.6.2.1 Calling Up and Operating Methods of the Display Dividing Pattern Setting Window

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.

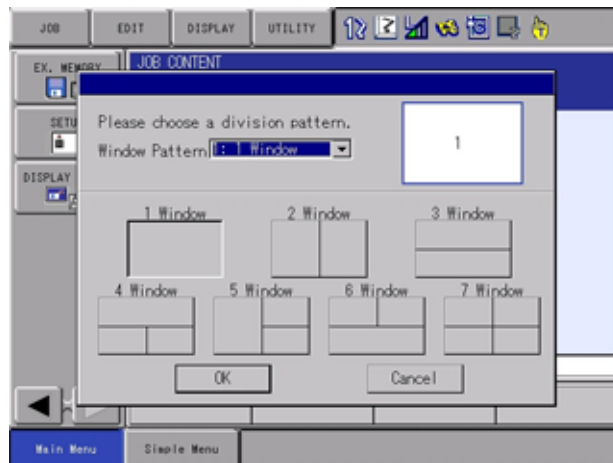


In the dividing pattern setting window, set the dividing pattern of the general-purpose display area.

1. Key operation 1:

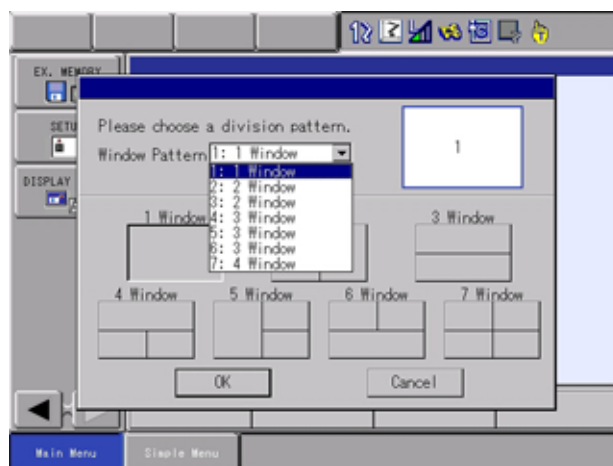
When “Window Pattern” is focused in the window, the option of the dividing pattern shifts as cursor moves upper or lower.

- Choose the desired dividing pattrer from the “Window Pattern”.

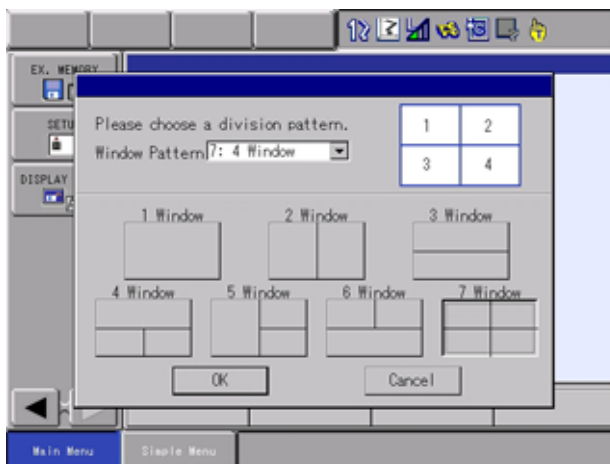


2. Key operation 2:

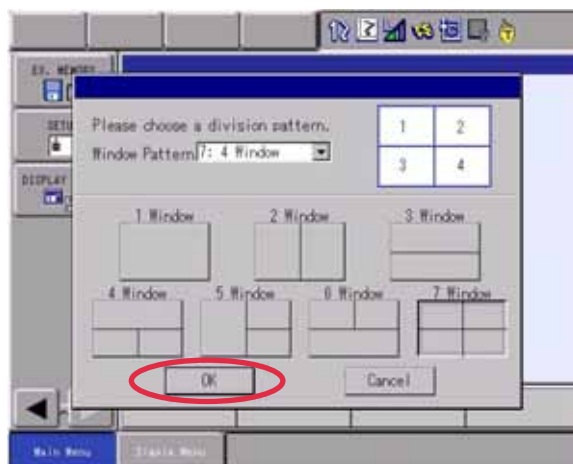
Press [SELECT] when “Window Pattern” is focused. The list of the dividing patterns appears. The list closes and a pattern is set after choosing the desired pattern and press [SELECT].



3. Touching operation:  
The desired pattern can be chosen by touching a pattern in the window.
- Choose a pattern from the dividing pattern buttons.

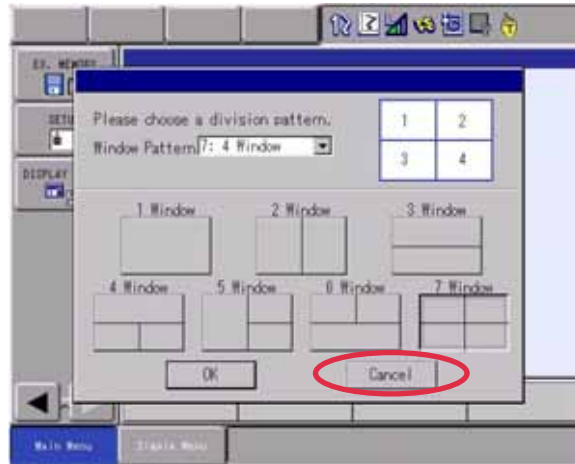


4. Touch [OK] button or move the cursor to it and press [SELECT].
- The dividing pattern setting window closes and the chosen pattern (chosen with the procedure either 1, 2 or 3) appears.



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.

### 6.6.3 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.

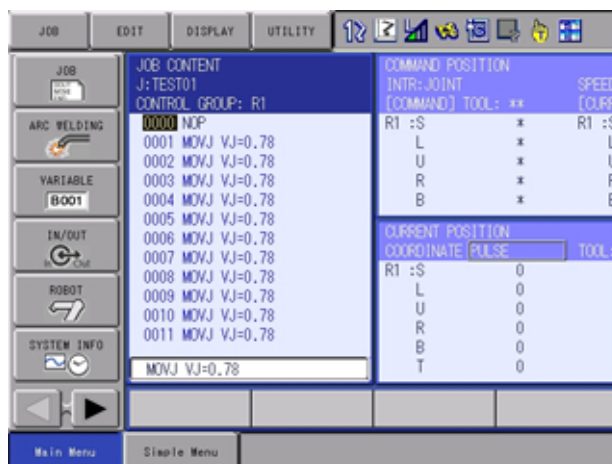
On the other hand, a single active window can be displayed with pressing [SHIFT] + [MULTI] operation.

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

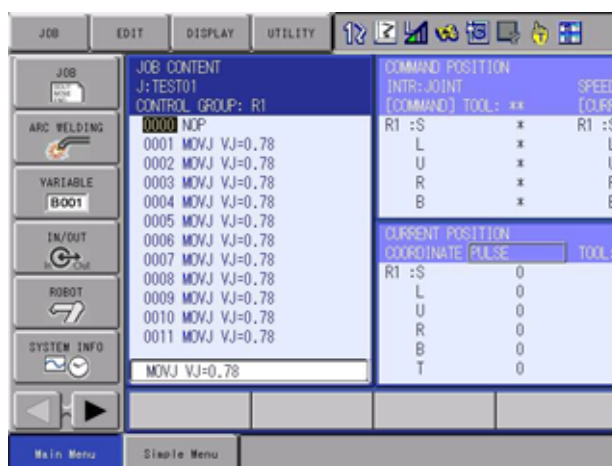
The content of window when it is in multi window mode can be different from the same window when it is in single window mode because of its limited size. The content becomes normal when the window is displayed in the single window mode.

- The input buffer in the JOB window is displayed only when the window is active.
- No auxiliary window appears.

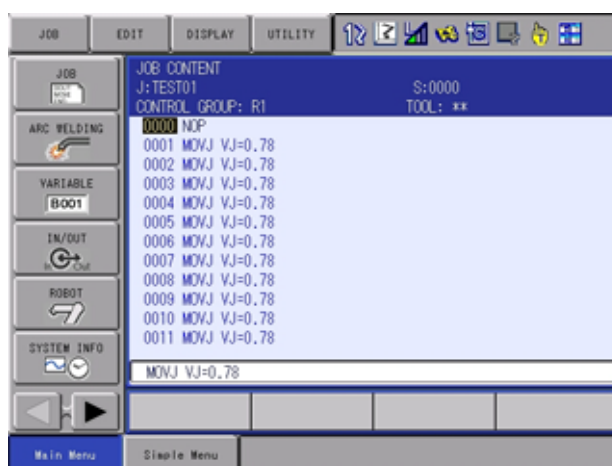
**6.6.4 Operation of Multi Window****6.6.4.1 Switching of Multi Window Mode and Single Window Mode**

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.

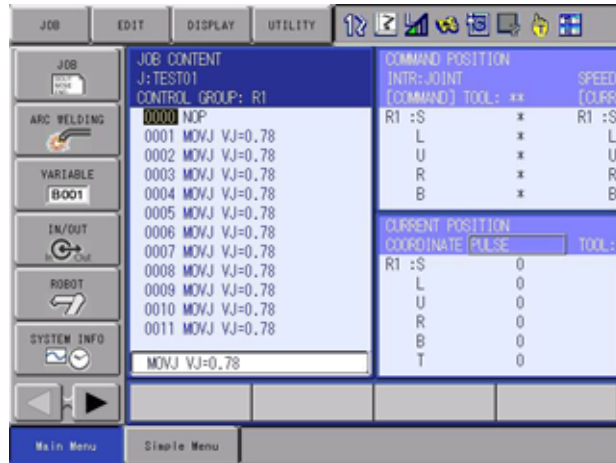


## 6 Convenient Functions

### 6.6 Multi Window Function

3. Press [SHIFT]+[MULTI] in step 2 status.

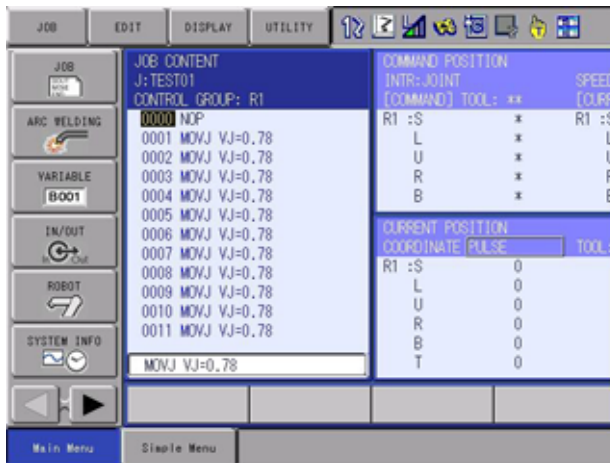
- The general-purpose display area changes to already set pattern in multi window mode.



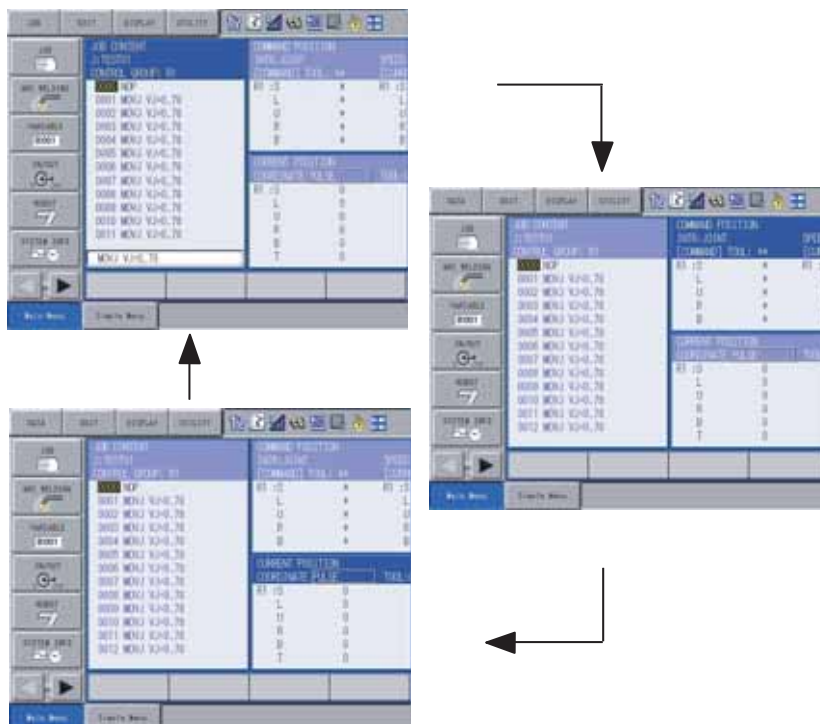
6.6.4.2 Switching of Active Window

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 section 6.6.2 "Setting the Dividing Pattern of the General-Purpose Display Area" on page 6-54. (1→2→3→4→1.....)



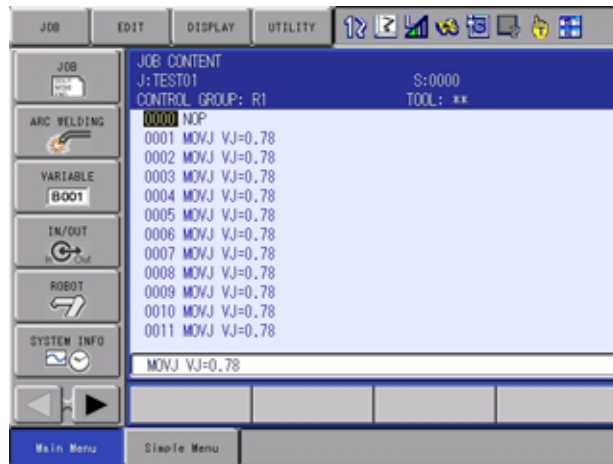
3. Touching Operation:  
Touch the window to be active.
  - The touched window becomes active.

## 6 Convenient Functions

### 6.6 Multi Window Function

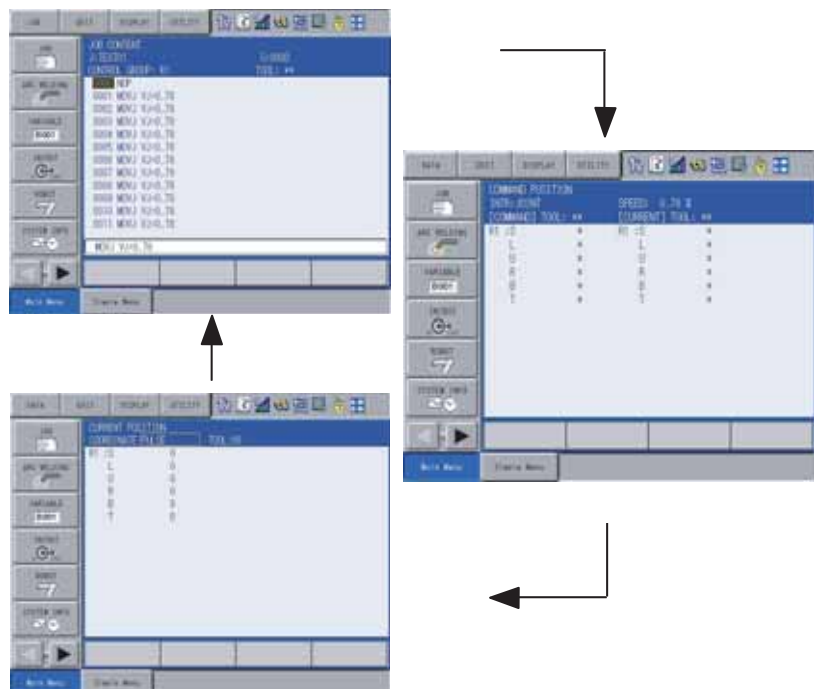
Switch the active window in the single window mode.

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 section 6.6.2 “Setting the Dividing Pattern of the General-Purpose Display Area” on page 6-54. (1→2→3→4→1……)



During the period before menu is selected when alarm occurred, the active window cannot be switched if alarm window is displayed, direct open is ON or a window is displayed by key allocation operation.

**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.

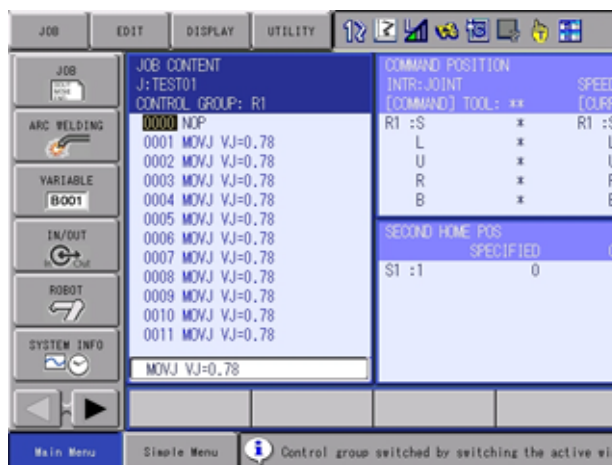


The change of the control group for axis operation due to other than [MULTI] operation or touching operation; due to the switch of the window by selecting main menu, is not notified to the user.

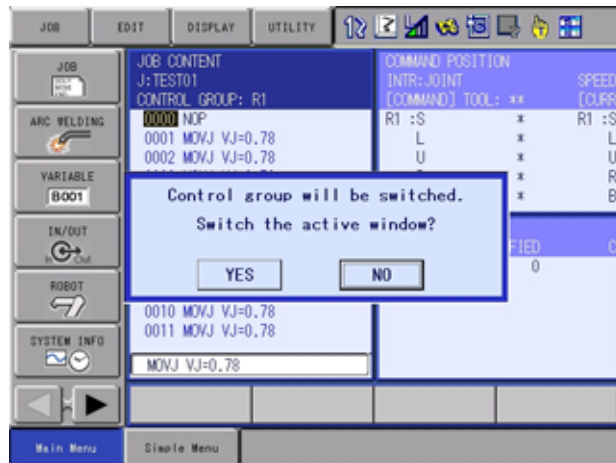
**6.6.5.1 S2C540 “Choosing Method of Notifying the Change of Axis Operation Control Group when Switching the Active Window”**

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.



- 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.



- Setting Value:2
  - Do not notify the control group change.

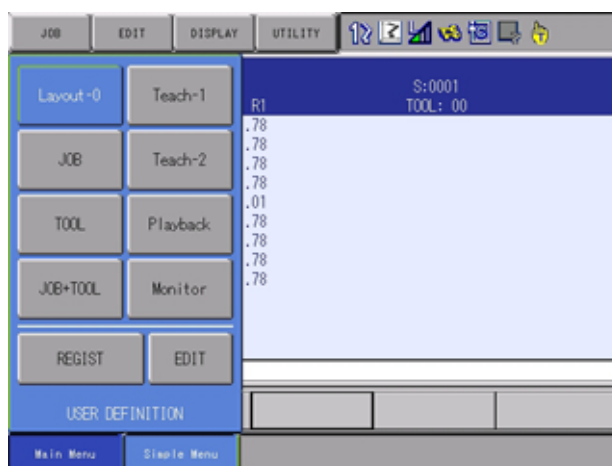
## 6.7 Simple Menu Function <sup>1)</sup>

### 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.



1 Simple menu function is available in DS1.50-00 version or later.

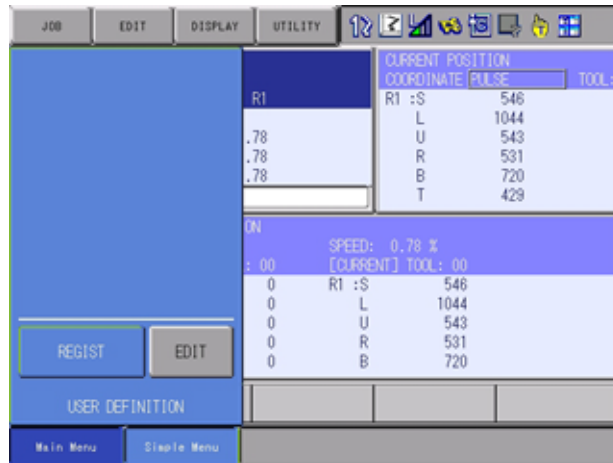


### 6.7.2 Registering the Layout Patterns to User Definition Menu

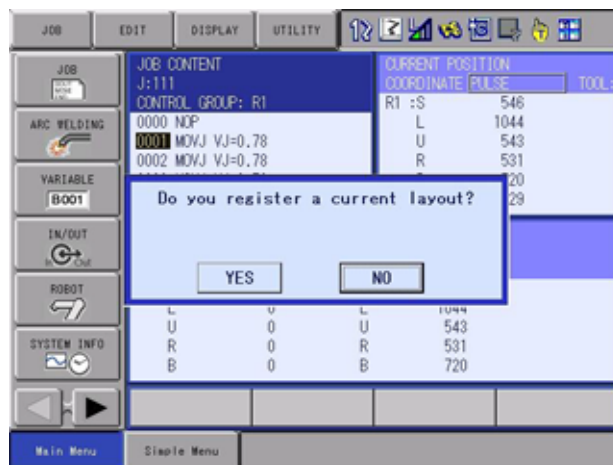
#### 6.7.2.1 Register with {REGIST} Button

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.

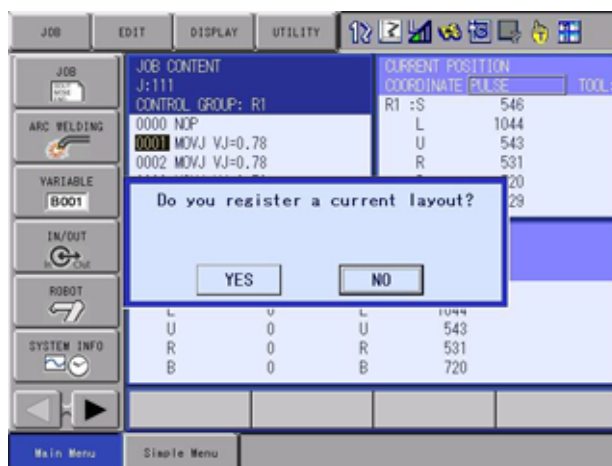


3. Select “YES”.
  - The layout is registered and the dialog box closes.
  - \*It will not be registered when “NO” is selected.

## 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.

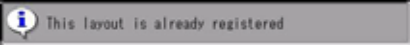
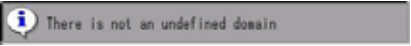
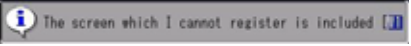
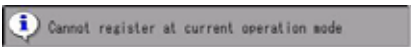


2. Select "YES".
  - The layout is registered and the dialog box closes.
  - \*It will not be registered when "NO" is selected.

## 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.

	Condition	Message
1	when the layout is already registered.	This layout is already registered. 
2	when eight layouts are already registered.	There is not an undefined domain. 
3	When the registering layout includes the window which cannot be started up in the {Main Menu}.	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" on page 6-54.
4	When a single window is displayed under the multi window mode.	Cannot register at current operation mode. 



The screens which cannot be started up in the {Main Menu} are impossible to register.

Also, the layout of the screens that are called up from {EXTERNAL MEMORY DEVICE} or ladder editor (optional function) cannot be registered.

## 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.

	Status of general-purpose display area	Name registered to "USER DEFINITION" Menu
1	Single window mode	(Same as the sub menu in main menu)
2	Multi window mode	Layout -n ("n" should be a number from 0 to 7)

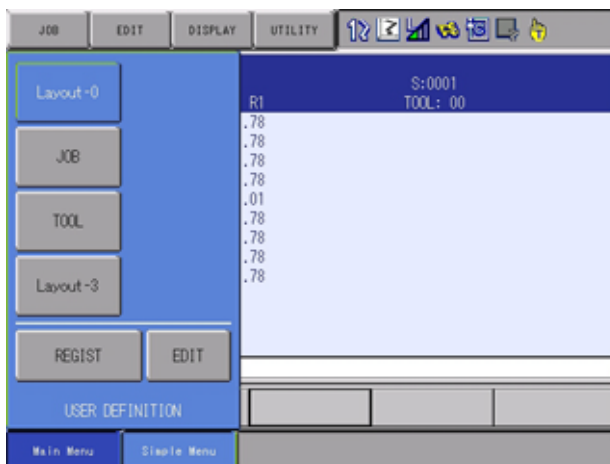
It is possible to change the name even after the name is registered. Refer to section 6.7.4.3 "Change the Name of Registered Layout Name" on page 6-75.

**6.7.3 Calling Up of the Registered Layout**

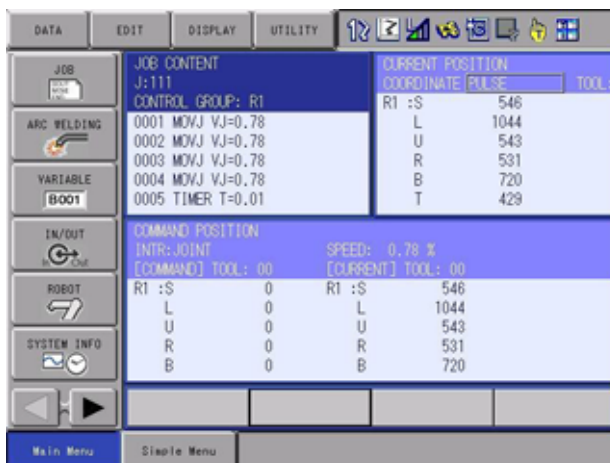
## 6.7.3.1 Calling up

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.



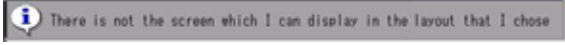
2. Select and press a button on “USER DEFINITION” menu to display a layout to be called up.
  - “USER DEFINITION” menu closes.
  - The selected layout appears on the general-purpose display area.



## 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.

	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.

**6.7.4 Editing “USER DEFINITION” Menu**

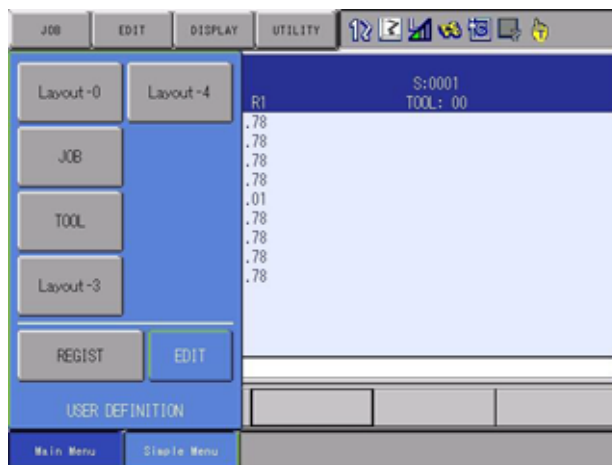
Editing procedures of “changing the registered name” and “deleting the registered item” are possible to the items registered to “USER DEFINITION MENU” window.

Those editions are executed on “USER DEFINITION MENU” window. Displaying of “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.

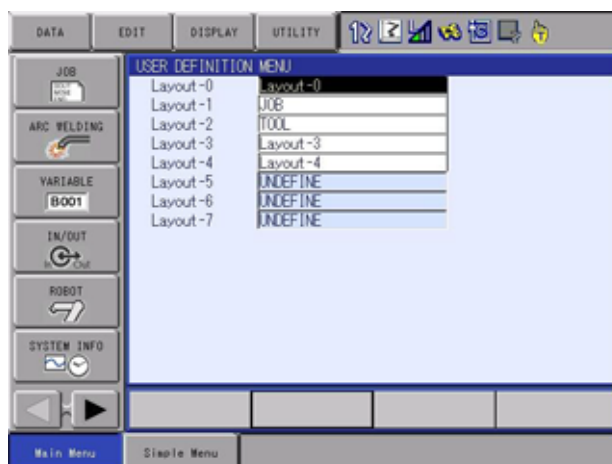
**6.7.4.1 Displaying “USER DEFINITION” Window**

Displays “UNSER DEFINITION MENU” Window with {EDIT} button.

1. Press [SIMPLE MENU] or select {Simple Menu} button at the lower-left on the display.
  - “USER DEFINITION MENU” menu appears.



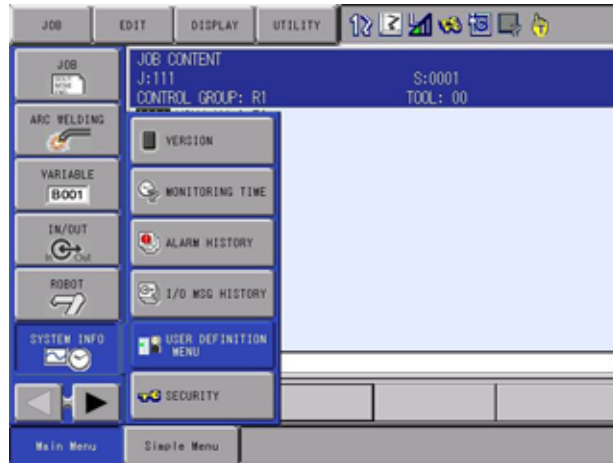
2. Press {EDIT} button.
  - “USER DEFINITION” menu closes.
  - “USER DEFINITION MENU” window appears on the active window in the general-purpose display area.



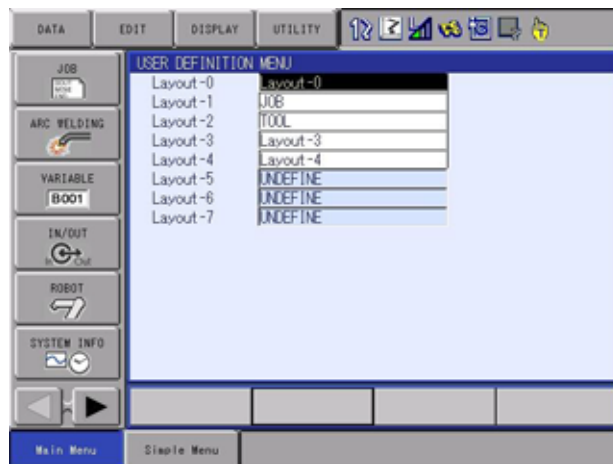
## 6.7.4.2 Displaying “USER DEFINITION MENU” window Under Main Menu

Displays “USER DEFINITION MENU” window under main menu.

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



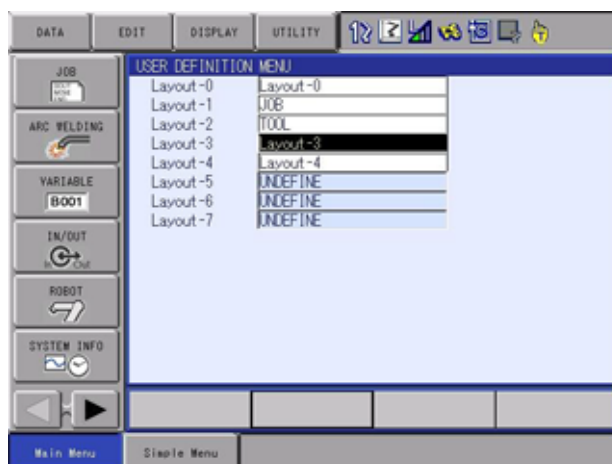
2. Select {USER DEFINITION}.
  - “USER DEFINITION MENU” window appears on the active window in the general-purpose display area.



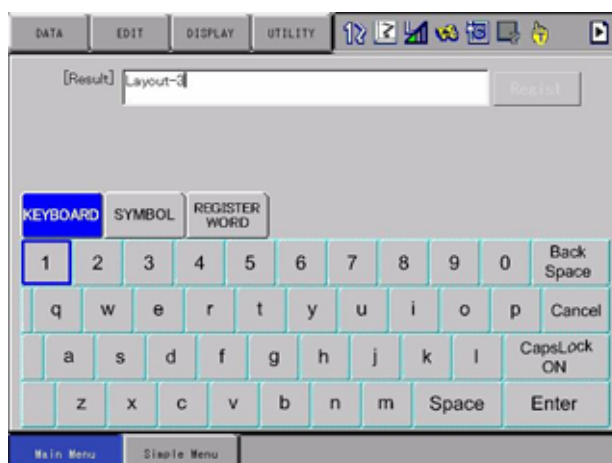
## 6.7.4.3 Change the Name of Registered Layout Name

The registered layout names can be changed.

1. Display "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.

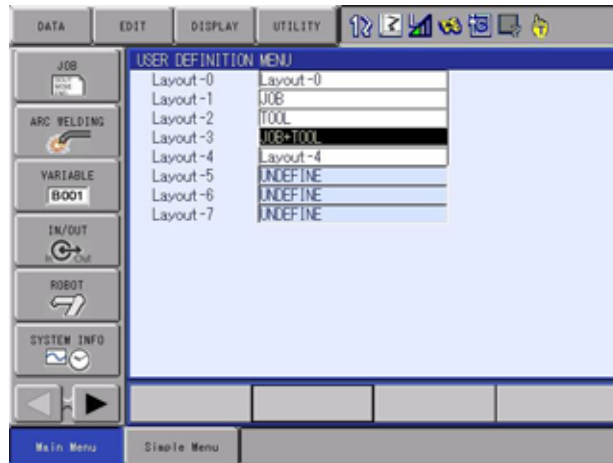




## 6 Convenient Functions

### 6.7 Simple Menu Function

3. Input the layout name, then press [ENTER] or {ENTER} button.
  - The software key pad closes.
  - The name changes.



\* If complete the software key pad operation with [CANCEL] or {CANCEL} button, the name editing operation is also canceled.

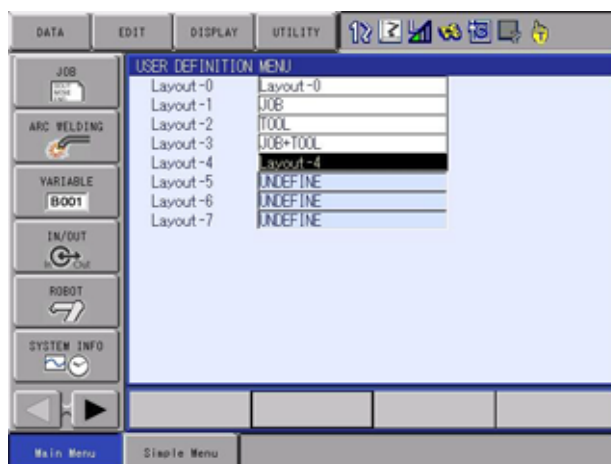


When the bilingual function is valid, name in each language can be set.

## 6.7.4.4 Deleting the Layout

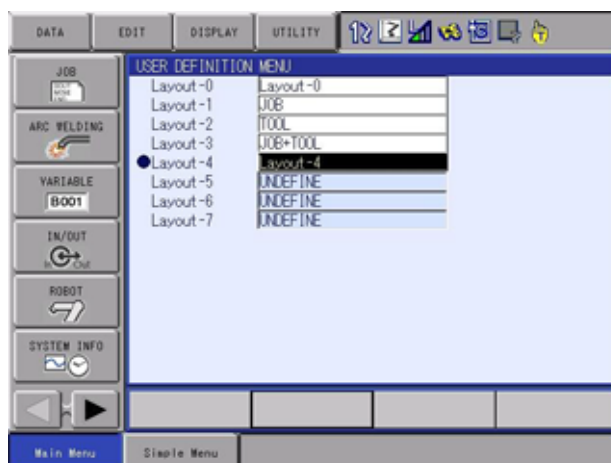
The layout registered to “USER DEFINITION” menu can be deleted.

1. Display “USER DEFINITION MENU” window.



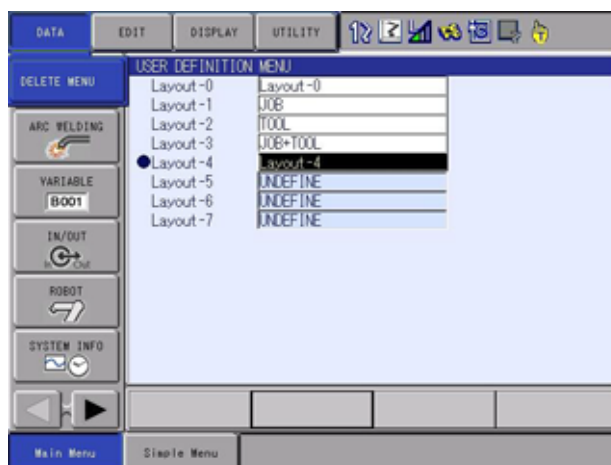
2. Move the cursor to the layout to be deleted and press [SHIFT] + [SELECT]. (multiple selection possible)

– “●” mark is indicated at the head of the selected line.



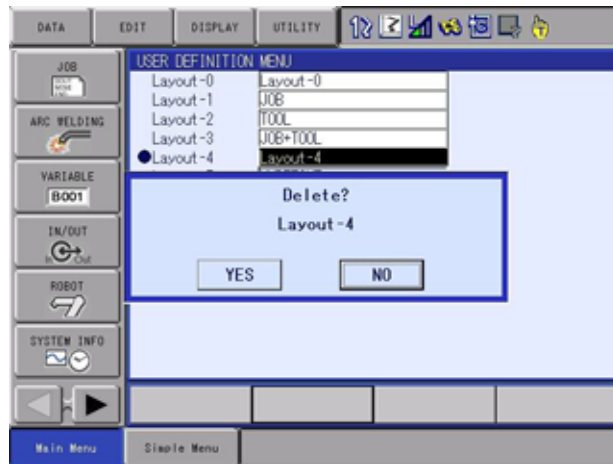
3. Select {DATA} in the menu.

– A pull down menu appears.



## 4. 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.

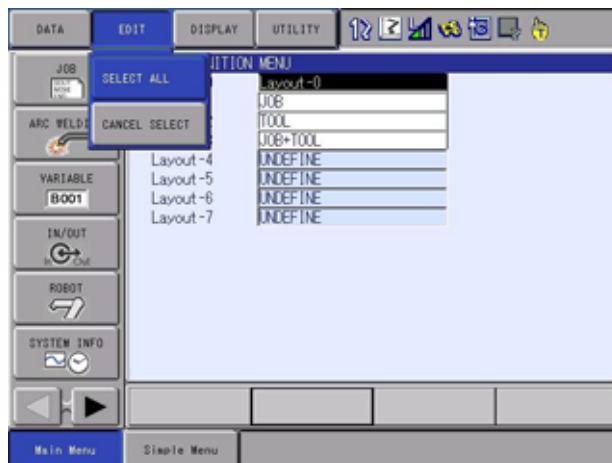
- The marked layout is deleted.

\* The layout will not be deleted if “NO” in the dialog box is selected.

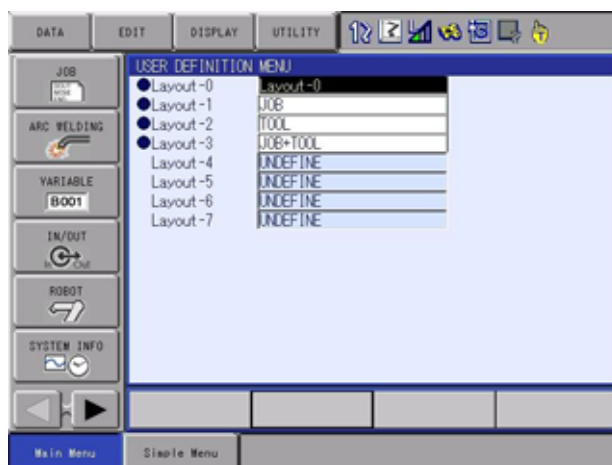
## 6.7.4.5 Delete All Layout

All layouts registered to “USER DEFINITION” menu can be deleted at a time.

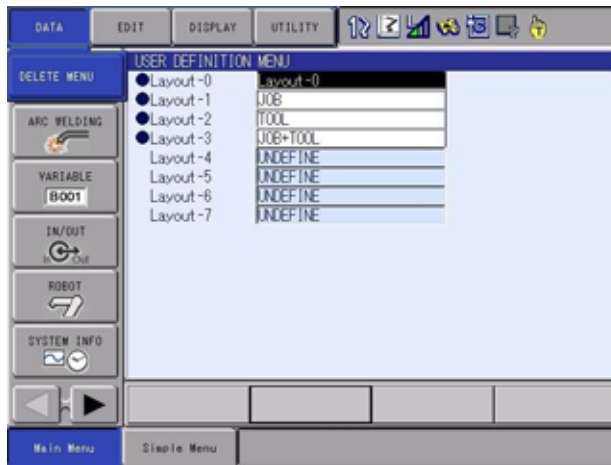
1. Display “USER DEFINITION MENU” window.
2. Select {EDIT} in the menu.
  - A pull down menu appears.



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.



Move the cursor to the line with “●” mark, and press [SHIFT] + [SELECT] to disappear “●” mark.  
When select {EDIT} → {CANCEL SELECT} under the pull down menu to cancel select and “●” marks disappear.

**6.7.5 Save/Load (to external memory devices) the User Definition Menu Data**

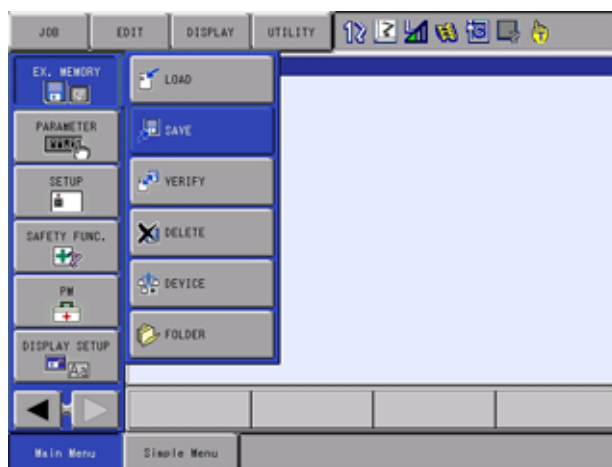
The data registered to "USER DEFINITION" menu (user menu data) can be saved to and loaded from the external memory device.

In this case, the name of the file is "USERMENU.DAT".

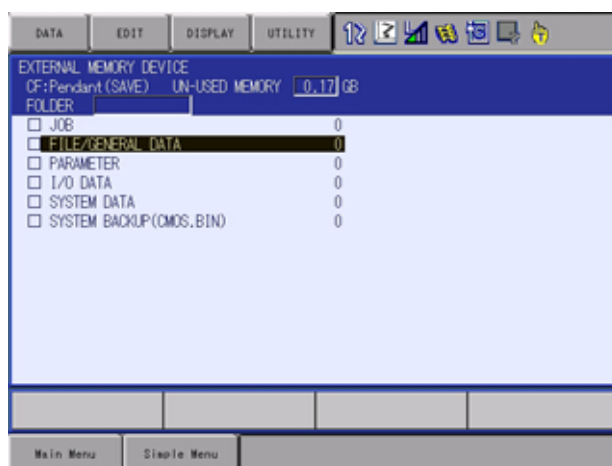
**6.7.5.1 Saving the Data**

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.



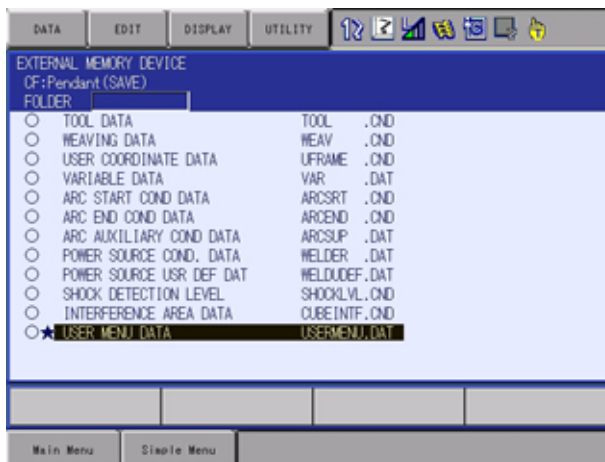
2. Select {SAVE}.
  - {SAVE} window of external memory device appears.



3. Select {FILE/GENERAL DATA}.
  - {FILE/GENERAL DATA} window of external memory device appears.

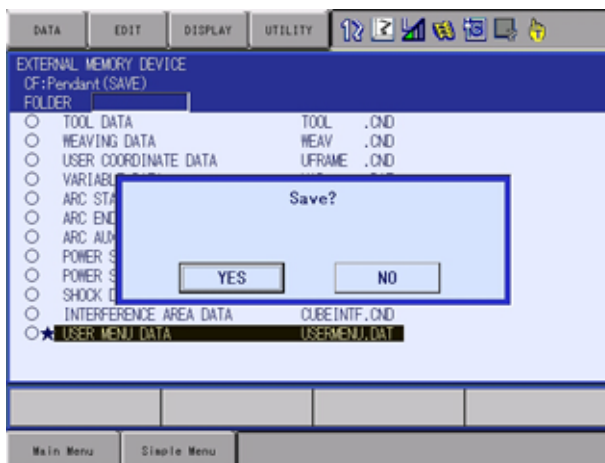
## 4. Select {USER MENU DATA}.

- “★” mark is indicated at the head of {USER MENU DATA}.



## 5. Press [ENTER].

- The confirmation dialog box with a message “SAVE” appears.



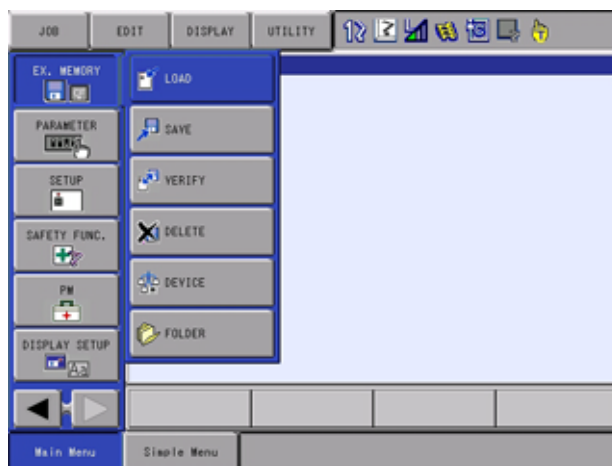
## 6. Select “YES” in the dialog box.

- {USER MENU DATA} is saved.
- \* It will not be saved if “NO” in the dialog box is selected.

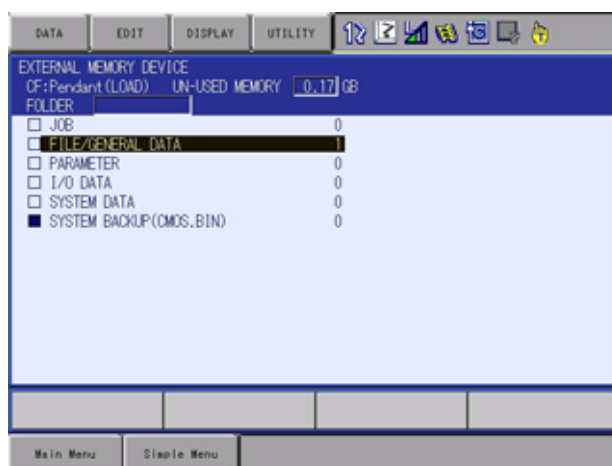
## 6.7.5.2 Loading the Data

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}.
  - {LOAD} window of external memory device appears.

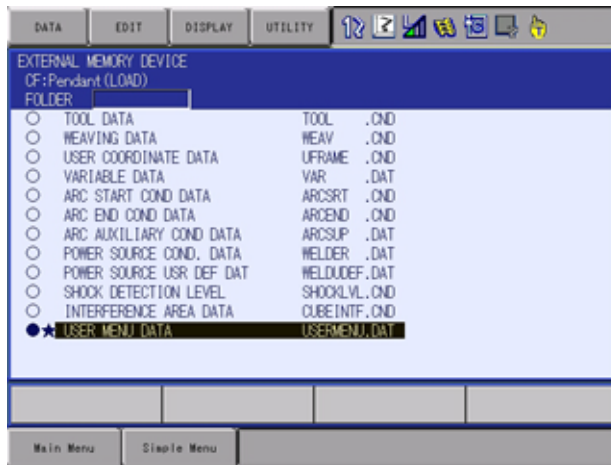


3. Select {FILE/GENERAL DATA}.
  - {FILE/GENERAL DATA} window of external memory device appears.



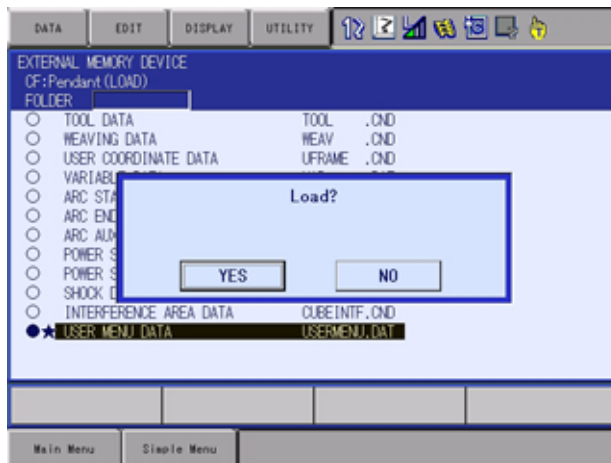
## 4. Select {USER MENU DATA}.

- “★” 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.
- \* It will not be loaded if “NO” in the dialog box is selected.

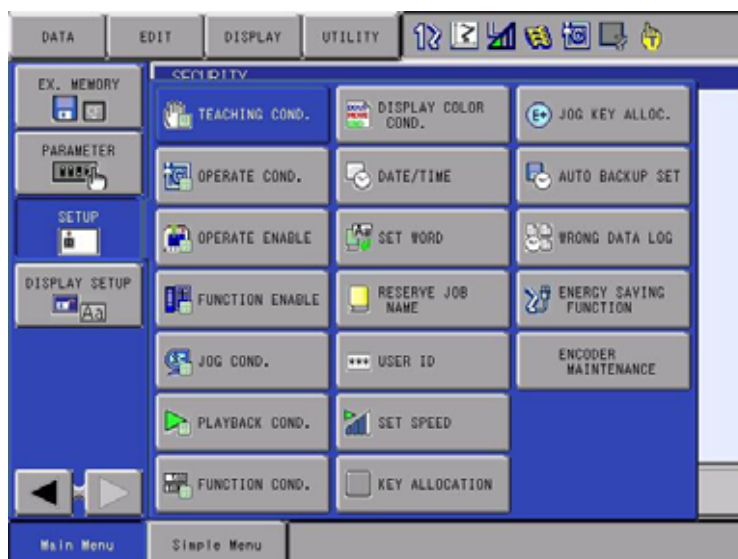
## 6.8 Parameter Setting Function

### 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

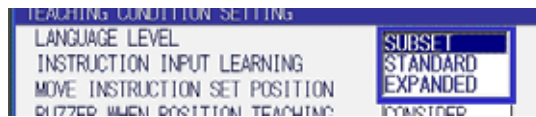
### 6.8 Parameter Setting Function

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.

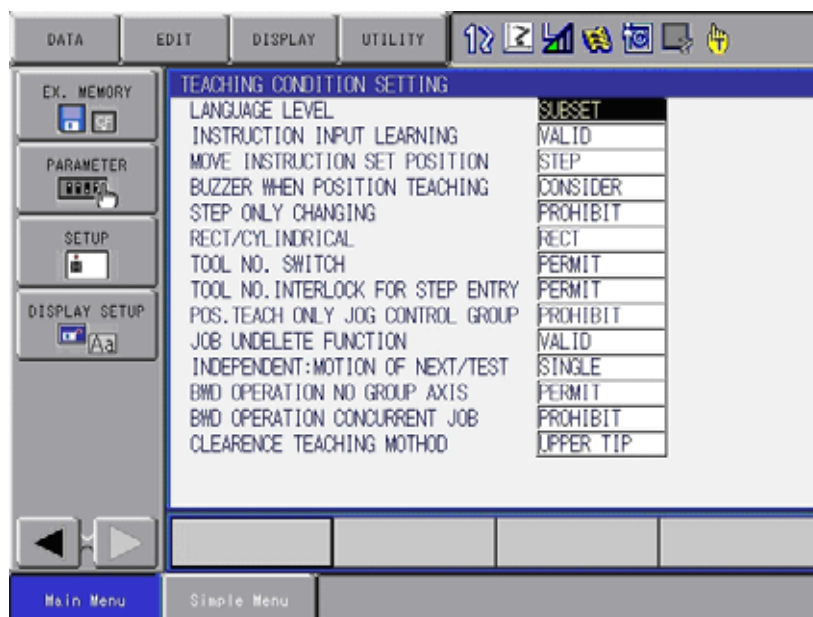


- When it requires to input a value.  
Input a value using [Numeric Key]s and press [ENTER] to change the settings.



**6.8.2 Teaching Condition Setting**

Select {SETUP} → {TEACHING CONDITION SETTING} to display the following window.



- LANGUAGE LEVEL (S2C211)

Refer to section 8.3.0.13 "S2C211: LANGUAGE LEVEL" on page 8-15.

Setting	Parameter Value
SUBSET	0
STANDARD	1
EXPANDED	2

- INSTRUCTION INPUT LEARNING (S2C214)

Refer to section 8.3.0.14 "S2C214: INSTRUCTION INPUT LEARNING FUNCTION" on page 8-15.

Setting	Parameter Value
VALID	0
INVALID	1

- MOVE INSTRUCTION SET POSITION (S2C206)

Refer to section 8.3.0.8 "S2C206: ADDITIONAL STEP POSITION" on page 8-13.

Setting	Parameter Value
STEP	0
LINE	1

- BUZZER WHEN POSITION TEACHING (S2C433)  
Refer to section 8.3.0.43 "S2C433: POSITION TEACHING BUZZER" on page 8-27.

Setting	Parameter Value
CONSIDER	0
NOT CONSIDER	1

- STEP ONLY CHANGING (S2C203)  
Refer to section 8.3.0.6 "S2C203: CHANGING STEP ONLY" on page 8-13.

Setting	Parameter Value
PERMIT	0
PROHIBIT	1

- RECT/CYL INDRICAL (S2C196)  
Refer to section 8.3.0.2 "S2C196: SELECTION OF CARTESIAN/ CYLINDRICAL" on page 8-12.

Setting	Parameter Value
CYL.	0
RECT	1

- TOOL NO. SWITCH (S2C431)  
Refer to section 8.3.0.42 "S2C431: TOOL NO. SWITCHING" on page 8-27.

Setting	Parameter Value
PROHIBIT	0
PERMIT	1

- TOOL NO. INTERLOCK FOR STEP ENTRY(S2C234)  
Refer to section 8.3.0.29 "S2C234: STEP REGISTRATION AT TOOL NO. CHANGE" on page 8-19.

Setting	Parameter Value
PERMIT	0
PROHIBIT	1

- POS. TEACH ONLY JOG CONTROL GROUP (S2C320)  
Refer to section 8.2.0.15 "S2C320: CONTROLLED GROUP JOB TEACHING POSITION CHANGE" on page 8-7.

Setting	Parameter Value
PROHIBIT	0
PERMIT	1

- JOB UNDELETE FUNCTION(S2C413)  
Refer to *section 8.3.0.39 "S2C410: WORD REGISTRATION FUNCTION / WORD EDITING FUNCTION SPECIFICATION"* on page 8-24.

Setting	Parameter Value
INVALID	0
VALID	1

- INDEPENDENT :MOTION OF NEXT/TEST(S2C231)  
Refer to *section 8.6.0.3 "S2C231: OPERATION METHOD AT FWD/ BWD OPERATION OR TEST RUN BY INDEPENDENT CONTROL"* on page 8-45.

→This appears only when the independent control is valid.

Setting	Parameter Value
SINGLE	0
ALL	1

- BWD OPERATION NO GROUP AXIS (S2C688 d0 bit)
- BWD OPERATION CONCURRENT JOB (S2C688 d1 bit)  
Refer to *section 8.6.0.10 "S2C688: EXECUTION OF "BWD" OPERATION"* on page 8-48.

→This appears only when the independent control is valid.

Setting	Bit Status
PERMIT	0
PROHIBIT	1

- STATION TWIN (S2C434)  
Refer to *section 8.3.0.44 "S2C434: JOB LINKING DESIGNATION (When Twin Synchronous Function Used)"* on page 8-27.

→This appears only when the STATION TWIN SYNCHRONOUS JOB is valid.

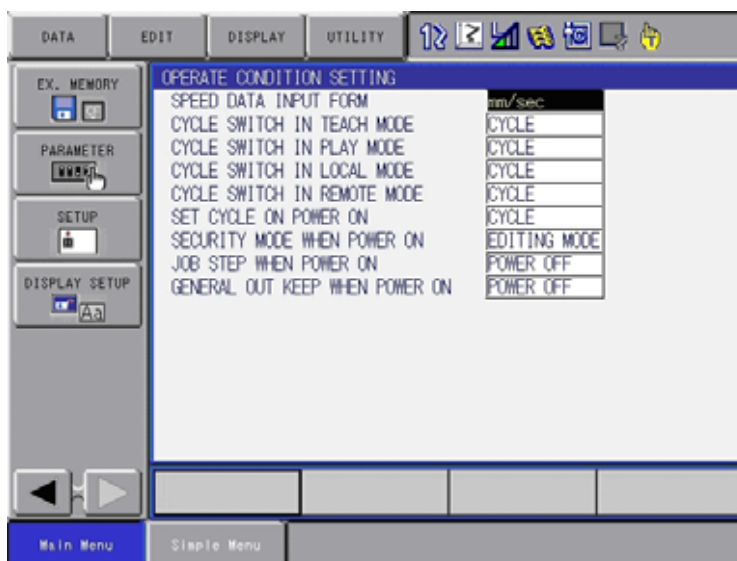
Setting	Parameter Value
INVALID	0
VALID	1

- CLEARANCE TEACHING METHOD (S2C612)  
→This appears only when it is for motor gun use.

Setting	Parameter Value
UPPER TIP	0
LOWER TIP	1
GUN CLOSE	2

**6.8.3 Operation Condition Setting**

Select {SETUP} → {OPERATE CONDITION SETTING} to display the following window.



- **SPEED DATA INPUT FORM (S2C221)**

Refer to section 8.3.0.21 "S2C221: SPEED DATA INPUT FORM" on page 8-17.

Setting	Parameter Value
MM/SEC	0
CM/MIN	1
INCH/MIN	2
MM/MIN	3

- **CYCLE SWITCH IN TEACH MODE (S2C313)**

Refer to section 8.3.0.33 "S2C313: TEACH MODE FIRST CYCLE MODE" on page 8-20.

Setting	Parameter Value
STEP	0
1 CYCLE	1
AUTO	2
NONE	3

- CYCLE SWITCH IN PLAY MODE (S2C314)  
Refer to section 8.3.0.34 "S2C314: PLAY MODE FIRST CYCLE MODE" on page 8-20.

Setting	Parameter Value
STEP	0
1 CYCLE	1
AUTO	2
NONE	3

- CYCLE SWITCH IN LOCAL MODE (S2C294)  
Refer to section 8.3.0.31 "S2C294: LOCAL FIRST CYCLE MODE" on page 8-19.

Setting	Parameter Value
STEP	0
1 CYCLE	1
AUTO	2
NONE	3

- CYCLE SWITCH IN REMOTE MODE (S2C293)  
Refer to section 8.3.0.30 "S2C293: REMOTE FIRST CYCLE MODE" on page 8-19.

Setting	Parameter Value
STEP	0
1 CYCLE	1
AUTO	2
NONE	3

- SET SYCLE ON POWER ON (S2C312)  
Refer to section 8.3.0.32 "S2C312: POWER ON FIRST CYCLE MODE" on page 8-20.

Setting	Parameter Value
STEP	0
1 CYCLE	1
AUTO	2
NONE	3



- SECURITY MODE WHEN POWER ON (S2C195)  
Refer to *section 8.3.0.1 "S2C195: SECURITY MODE WHEN CONTROL POWER SUPPLY IS TURNED ON"* on page 8-12.

Setting	Parameter Value
OPERATION MODE	0
EDITING MODE	1
MANAGEMENT MODE	2

- JOB STEP WHEN POWER ON (S2C215)  
Refer to *section 8.3.0.15 "S2C215: ADDRESS SETTING WHEN CONTROL POWER IS TURNED ON"* on page 8-15.

Setting	Parameter Value
POWER OFF	0
INITIAL	1

- GENERAL OUT KEEP WHEN POWER ON (S2C235)  
Refer to *section 8.5.0.1 "S2C235: USER OUTPUT RELAY WHEN CONTROL POWER IS ON"* on page 8-40.

Setting	Parameter Value
POWER OFF	0
INITIAL	1

**6.8.4 Operate Enable Setting**

Select {SETUP} → {OPERATE ENABLE SETTING} to display the following window.



- EXTERNAL START (S2C219)

Refer to section 8.3.0.19 "S2C219: EXTERNAL START" on page 8-16.

Setting	Parameter Status
PERMIT	0
PROHIBIT	1

- PP START (S2C220)

Refer to section 8.3.0.20 "S2C220: PROGRAMMING PENDANT START" on page 8-16.

Setting	Parameter Status
PERMIT	0
PROHIBIT	1

- EXTERNAL MODE SWITCH (S2C225)

Refer to section 8.3.0.24 "S2C225: EXTERNAL MODE SWITCH" on page 8-17.

Setting	Parameter Status
PERMIT	0
PROHIBIT	1

- EXTERNAL CYCLE SWITCH (S2C227)  
Refer to section 8.3.0.25 "S2C227: EXTERNAL CYCLE SWITCHING" on page 8-17.

Setting	Parameter Status
PERMIT	0
PROHIBIT	1

- PP CYCLE SWITCH (S2C228)  
Refer to section 8.3.0.26 "S2C228: PROGRAMMING PENDANT CYCLE SWITCHING" on page 8-18.

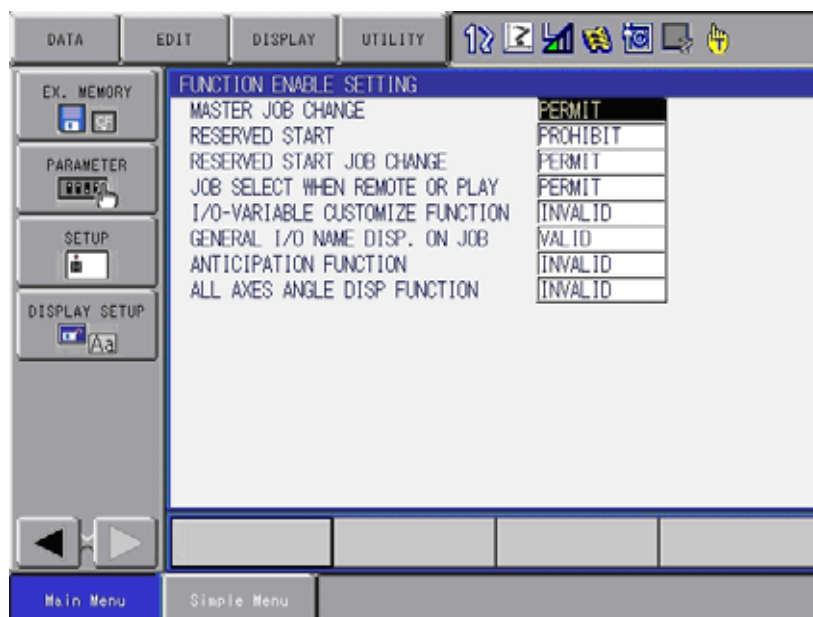
Setting	Parameter Status
PERMIT	0
PROHIBIT	1

- EXTERNAL SERVO ON (S2C229 d0 bit)
- PP SERVO ON (S2C229 d1 bit)
- DSW SERVO ON (S2C229 d2 bit)  
Refer to section 8.3.0.27 "S2C229: SERVO ON FROM EXTERNAL PP PROHIBITION" on page 8-18.

Setting	Bit Status
PERMIT	0
PROHIBIT	1

**6.8.5 Function Enable Setting**

Select {SETUP} → {FUNCTION ENABLE SETTING} to display the following window.



- MASTER JOB CHANGE (S2C207)  
Refer to section 8.3.0.9 "S2C207: MASTER JOB CHANGING OPERATION" on page 8-14.

Setting	Parameter Status
PERMIT	0
PROHIBIT	1

- RESERVED START (S2C222)  
Refer to section 8.3.0.22 "S2C222: RESERVED START" on page 8-17.

Setting	Parameter Status
PERMIT	0
PROHIBIT	1

- RESERVED START JOB CHANGE (S2C209)  
Refer to section 8.3.0.11 "S2C209: RESERVED WORK JOB CHANGING OPERATION" on page 8-14.

Setting	Parameter Status
PERMIT	0
PROHIBIT	1

- JOB SELECT WHEN REMOTE OR PLAY (S2C224)  
Refer to section 8.3.0.23 "S2C224: JOB SELECTION AT REMOTE FUNCTION (PLAY MODE)" on page 8-17.

Setting	Parameter Status
PERMIT	0
PROHIBIT	1

- I/O-VARIABLE CUSTOMIZE FUNCTION (S2C397)  
Refer to section 8.3.0.38 "S2C397: I/O VARIABLE CUSTOMIZE FUNCTION" on page 8-23.

Setting	Parameter Status
INVALID	0
VALID	1

- GENERAO I/O NAME DISP. ON JOB (S2C544)  
Refer to section 8.3.0.46 "S2C544: I/O NAME DISPLAY FUNCTION FOR JOB" on page 8-29.

Setting	Parameter Status
INVALID	0
VALID	1

- ANTICIPATION FUNCTION (S2C646)  
Refer to section 8.8.0.1 "S2C646: ANTICIPATOR FUNCTION" on page 8-51.

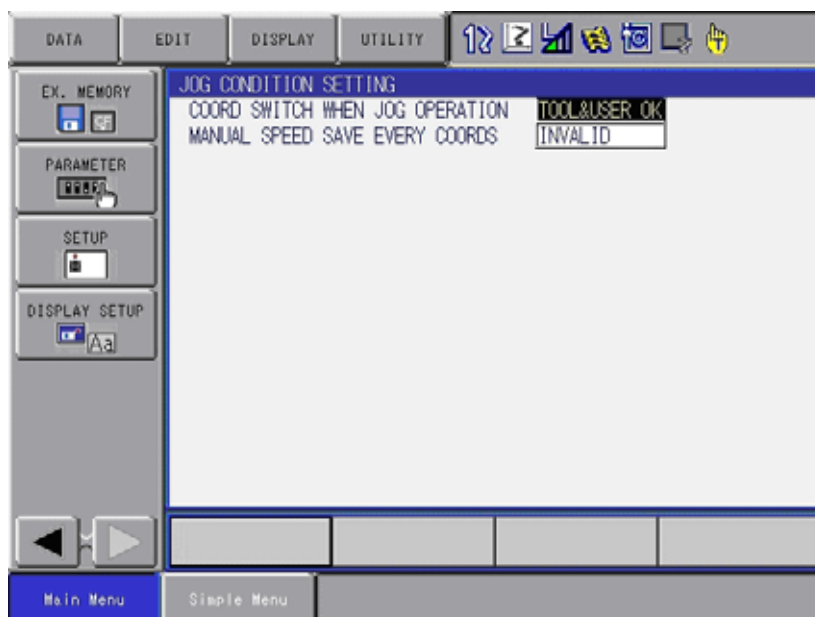
Setting	Parameter Status
INVALID	0
VALID	1

- ALL AXES ANGLE DISP FUNCTION (S2C684 d0 bit)  
Refer to section 8.3.0.47 "S2C684:ALL AXES ANGLE DISPLAY FUNCTION" on page 8-29.

Setting	Parameter Status
INVALID	0
VALID	1

**6.8.6 Jog Condition Setting**

Select {SETUP} → {JOG CONDITION SETTING} to display the following window.



- COORD SWITCH WHEN JOG OPERATION (S2C197)  
Refer to section 8.3.0.3 "S2C197: COORDINATE SWITCHING PROHIBITED" on page 8-12.

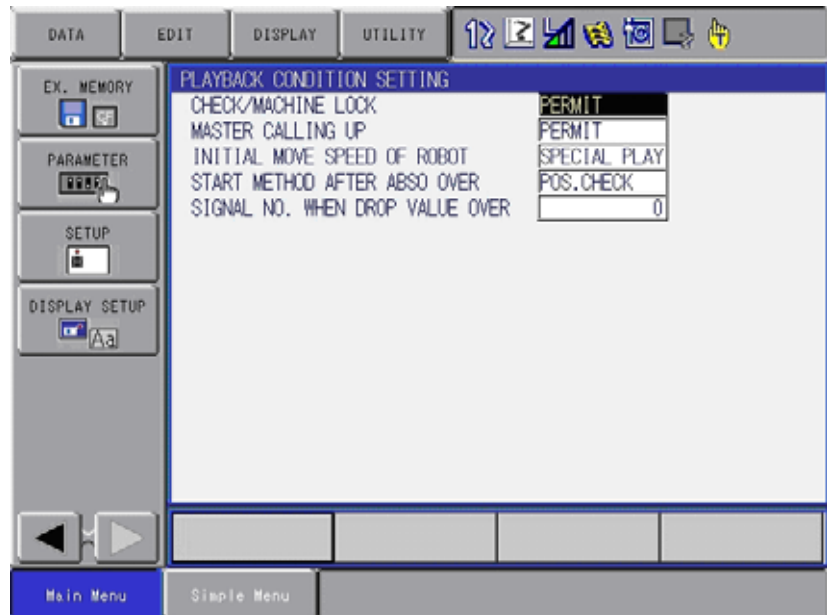
Setting	Parameter Status
TOOL & USER OK	0
TOOL NG	1
USER NG	2
TOOL & USER NG	3

- MANUAL SPEED SAVE EVERY COORDS (S2C204)  
Refer to section 8.3.0.7 "S2C204: MANUAL SPEED STORING FOR EACH COORDINATE" on page 8-13.

Setting	Parameter Status
INVALID	0
VALID	1

**6.8.7 Playback Condition Setting**

Select {SETUP} → {PLAYBACK CONDITION SETTING} to display the following window.



- CHECK/MACHINE LOCK (S2C208)

Refer to section 8.3.0.10 "S2C208: CHECK AND MACHINE-LOCK KEY OPERATION IN PLAY MODE" on page 8-14.

Setting	Parameter Status
PERMIT	0
PROHIBIT	1

- MASTER CALLING UP (S2C210)

Refer to section 8.3.0.12 "S2C210: MASTER OR SUBMASTER CALL OPERATION IN PLAY MODE" on page 8-14.

Setting	Parameter Status
PERMIT	0
PROHIBIT	1

- INITIAL MOVE SPEED OF ROBOT (S2C217)

Refer to section 8.3.0.17 "S2C217: INITIAL OPERATION OF MANIPULATOR" on page 8-16.

Setting	Parameter Status
SPECIAL PLAY	0
LOW SPEED	1

- START METHOD AFTER ABSO OVER (S2C316)  
Refer to *section 8.3.0.35 "S2C316: START CONDITION AFTER ALARM-4107 ("OUT OF RANGE (ABSO DATA))"* on page 8-20.

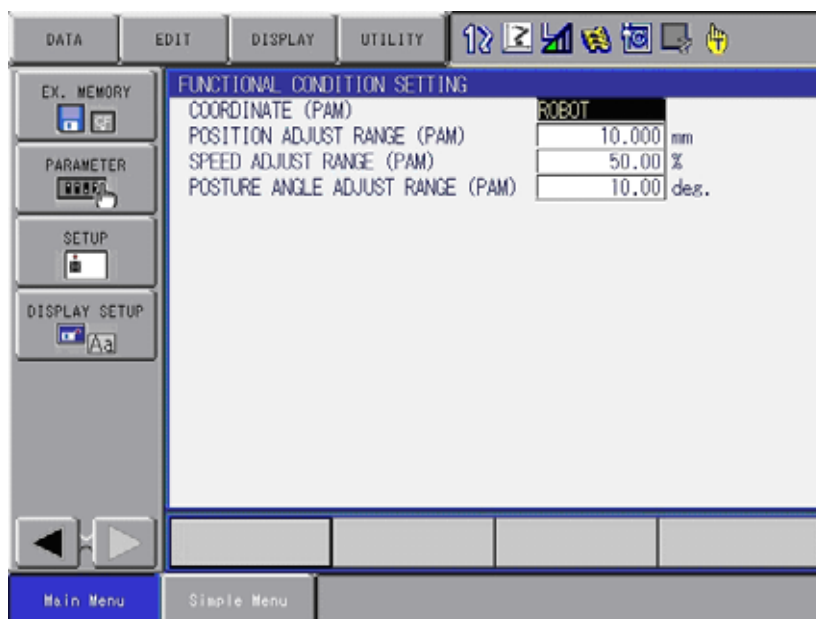
Setting	Parameter Status
POS. CHECK	0
LOW SPEED	1

- SIGNAL NO. WHEN DROP VALUE OVER (S2C240)  
Refer to *section 8.5.0.7 "S4C240: USER OUTPUT NO. WHEN MANIPULATOR DROP ALLOWABLE RANGE ERROR OCCURS"* on page 8-44.



**6.8.8 Functional Condition Setting**

Select {SETUP} → {FUNCTIONAL CONDITION SETTING} to display the following window.



- COORDINATE (PAM) (S2C1100)  
Refer to section 8.2.0.24 “S3C1098 to S3C1102: POSITION CORRECTING FUNCTION DURING PLAYBACK” on page 8-11.

Setting	Parameter Status
BASE	0
ROBOT	1
TOOL	2
USER #1	3
:	
USER #63	65

- POSITION ADJUST RANGE (PAM) (S2C1098)
- SPEED ADJUST RANGE (PAM) (S2C1099)
- POSTURE ANGLE ADJUST RANGE (PAM) (S2C1102)  
Refer to section 8.2.0.24 “S3C1098 to S3C1102: POSITION CORRECTING FUNCTION DURING PLAYBACK” on page 8-11.

## 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 programming pendant after setting any external axis to them.



### CAUTION

- 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.



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.

**6.9.2 Jog Key Allocation Setting**

## 6.9.2.1 Allocation of the Jog Key

**CAUTION**

- 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.

**NOTE**

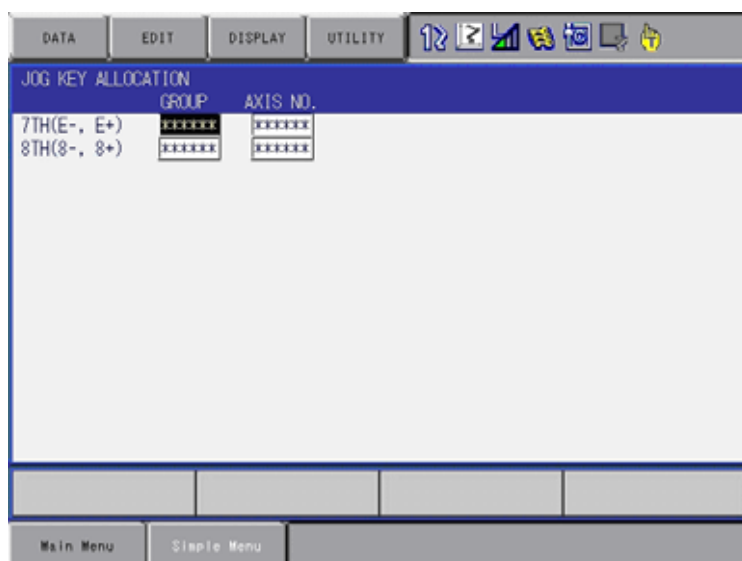
The setup conditions are saved in the following parameters. Even if the same numbered external axes are allocated to a key (example:S1 for the 1st-axis), the value of the parameter to be saved varies depending on the composition of the control group of the system. In this consequence, when loading the 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

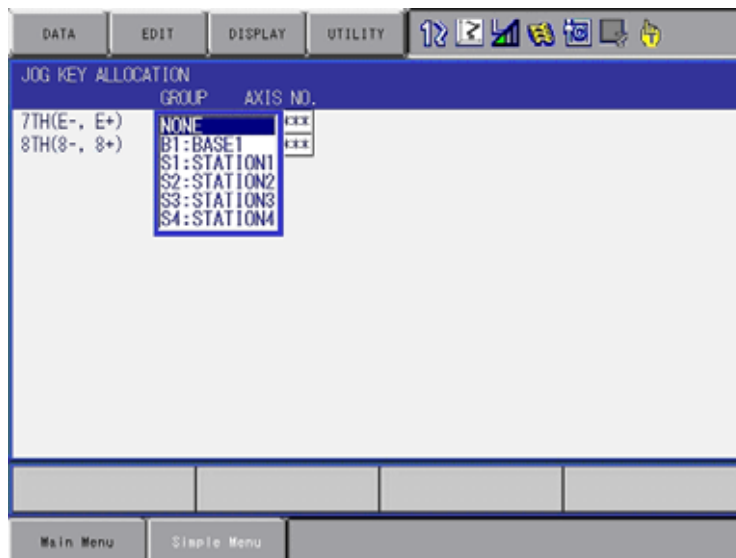
1. Select {SETUP} under main menu.
  2. Select {JOG KEY ALLOCATION}.
- Jog key allocation window appears.



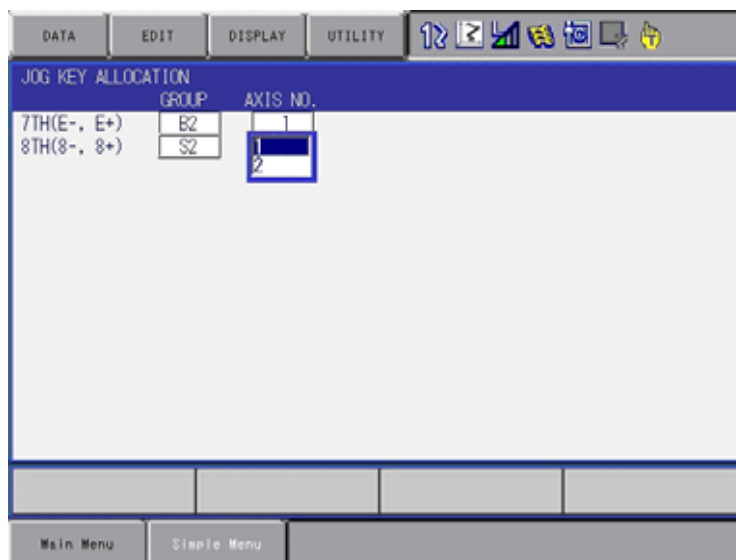
## 6 Convenient Functions

### 6.9 Jog Key Allocation

3. Move the cursor to "GROUP" and press down [SELECT].
  - The list of allocatable external axes appears.



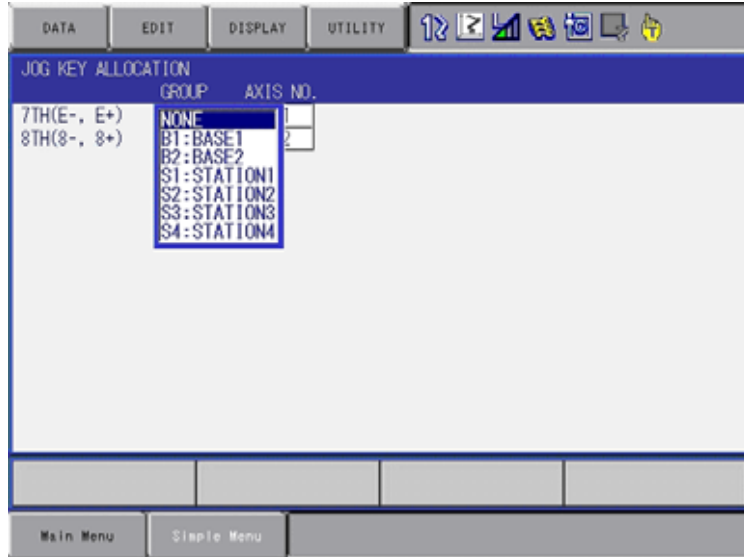
4. Select an external axis to be allocated.
  - The selected external axis is indicated in "GROUP" and "1" is indicated in "AXIS NO".
5. (In the cases where the external axis is composed of more than two axes and the axis from the 2nd-axis are operated) Move the cursor to "AXIS NO". and press down [SELECT].
  - The list of selected external axes appears.



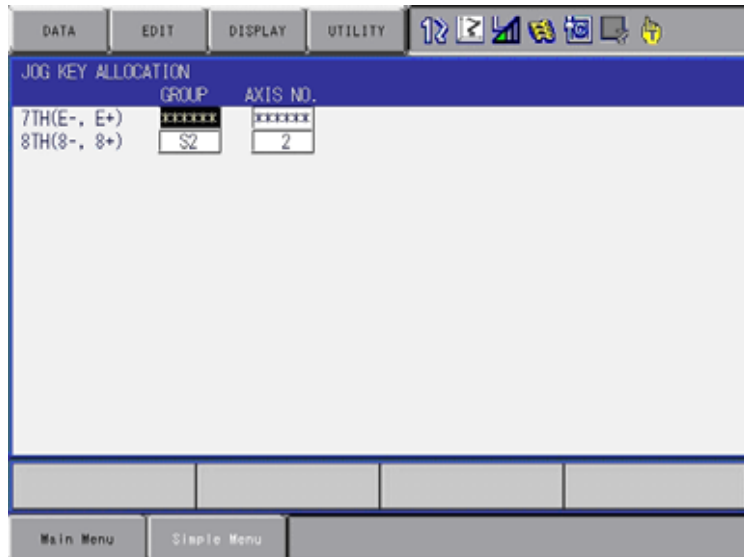
6. Select a desired axis number.
  - The selected axis is indicated in "AXIS NO".

## 6.9.2.2 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

**CAUTION**

- When the same external axis (same group and axis number) is allocated to 7th- and 8th-[Axis Key]s, 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.

## 6.10 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 (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.



## CAUTION

This function is cancelled 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.



This function will not be canceled if the system input signal (signal to prohibit energy-saving #40580) is turned ON. This signal merely prohibits to shift the status to energy-saving status.

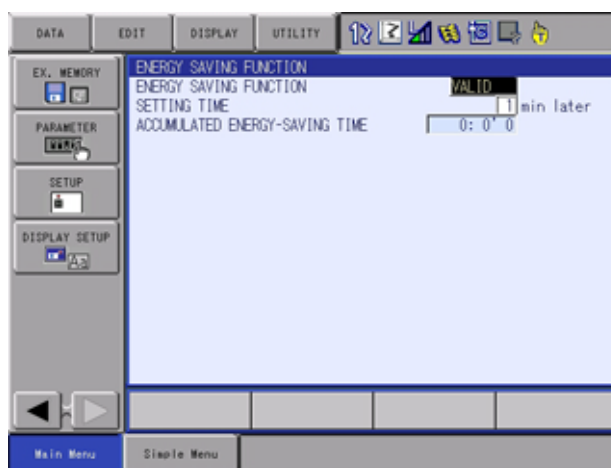
**6.10.2 Energy-Saving Setting Method**

## 6.10.2.1 Valid/Invalid of Energy-Saving Setting

**CAUTION**

- Valid/invalid of the energy-saving function is available only in the management mode while only confirmation of this function is available in the operation mode and edit mode.

1. Select {SETUP} under main menu.
2. Select {ENERGY SAVING FUNCTION}.
  - Energy-saving function window appears.

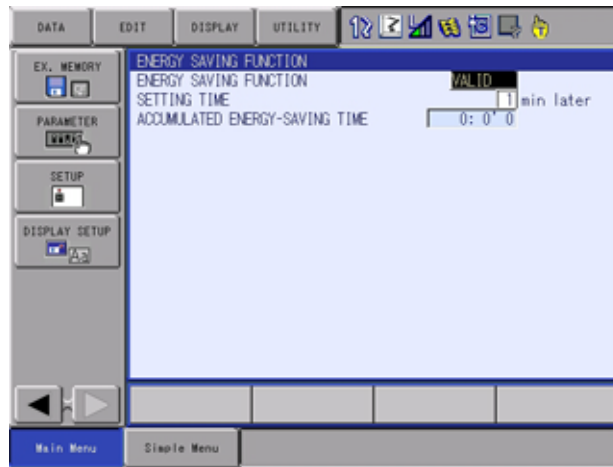




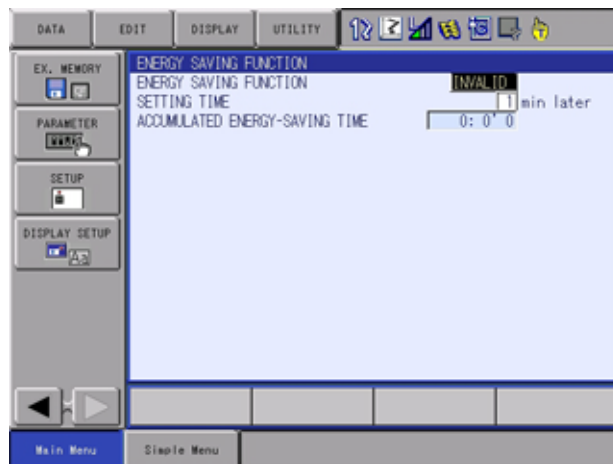
## 6 Convenient Functions

### 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].



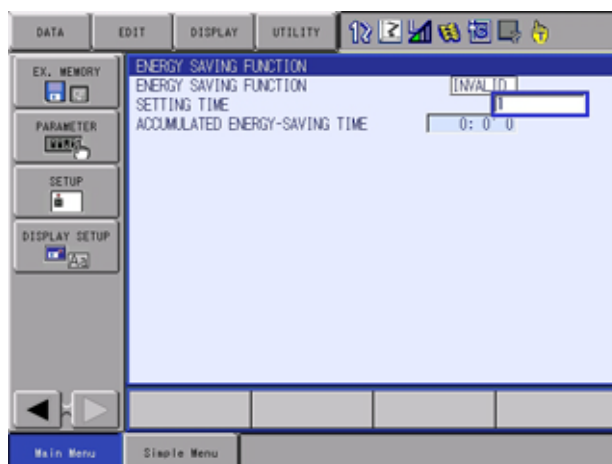
Press [SELECT].



## 6 Convenient Functions

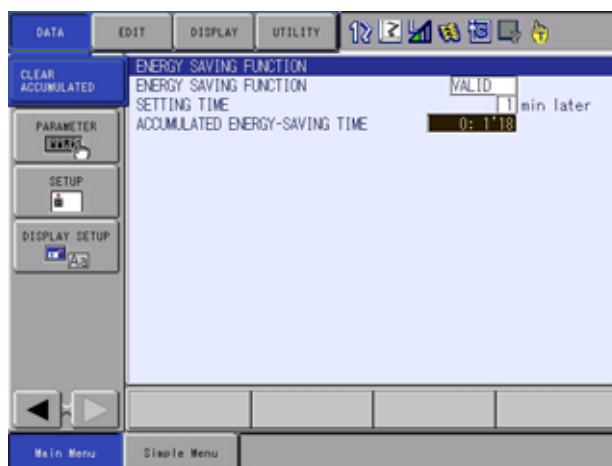
### 6.10 Energy-Saving Function

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.



#### 6.10.2.2 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 {ACCUMULATED ENERGY-SAVING TIME}.
4. Move the cursor to {DATA} and press [SELECT].
  - “CLEAR ACCUMULATED” appears in the pull-down menu.

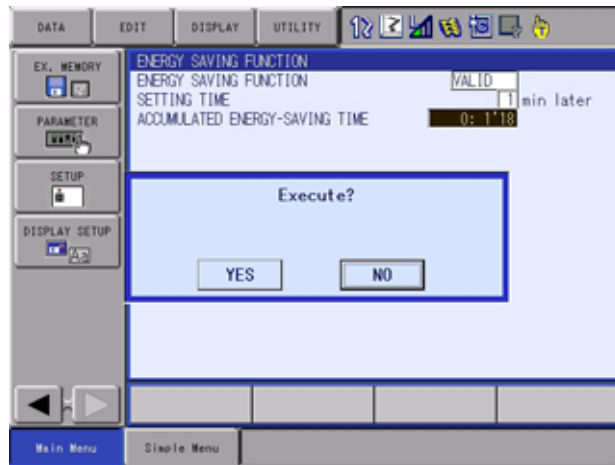


## 6 Convenient Functions

### 6.10 Energy-Saving Function

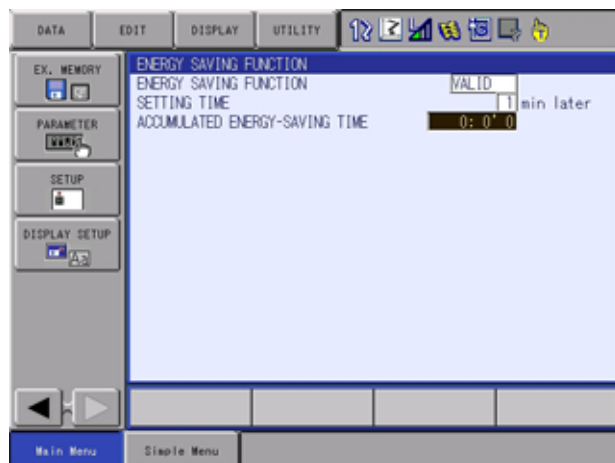
#### 5. Select {CLEAR ACCUMULATED}

- The confirmation dialog box appears.



#### 6. Select "YES" on the dialog box,

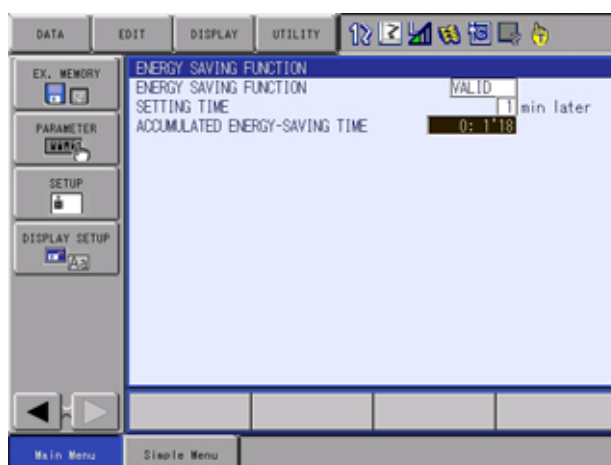
- The accumulated energy-saving time is cleared.



**6.10.3 Energy-Saving Status Confirmation Method**

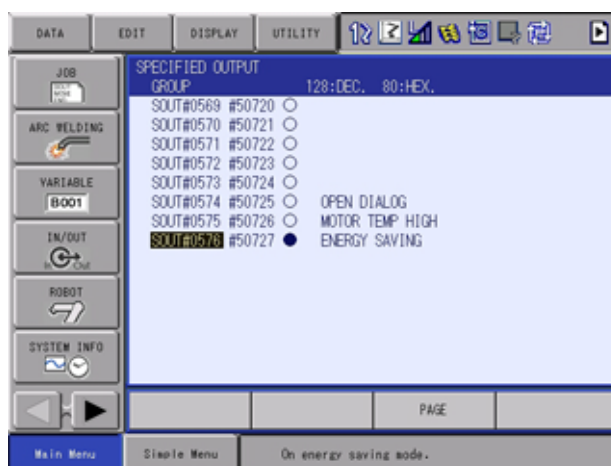
## 6.10.3.1 Confirmation by the accumulated energy-saving time

1. Select {SETUP} under main menu.
2. Select {ENERGY SAVING FUNCTION}.
  - 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 specific 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.

## 6.11 Instruction Displaying Color Setting Function

### 6.11.1 Setting the Instruction Displaying Color on the Job Window

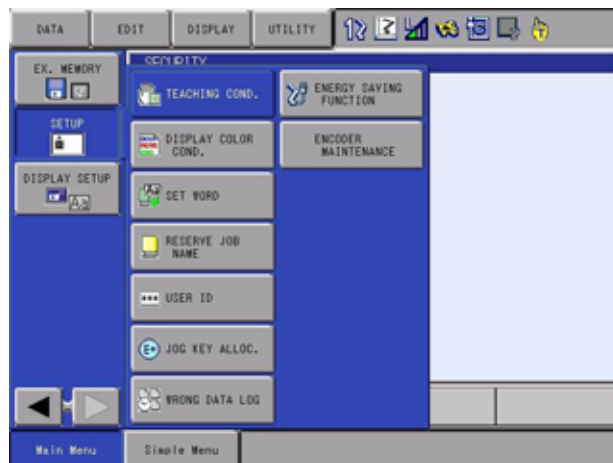
With this function, each instruction can be displayed on a color to color basis on the job window.

Respective colors are specified on the following instruction basis.

- Move instruction
- DEVICE instruction
- Comment instruction
- Label instruction
- Macro instruction (when the macro function is effective)
- I/O instruction
- Instructions to which LINE EDIT LOCK is specified.
- Instructions 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.

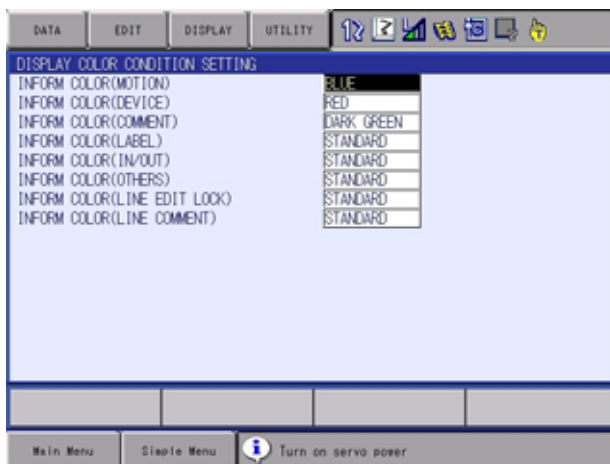
1. Select {SETUP} under {Main Menu}.



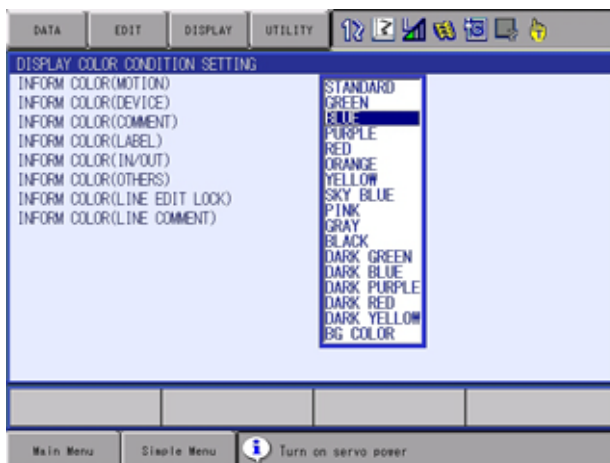
## 6 Convenient Functions

### 6.11 Instruction Displaying Color Setting Function

2. Select {DISPLAY COLOR CONDITION SETTING}.
  - The display color condition setting window appears.

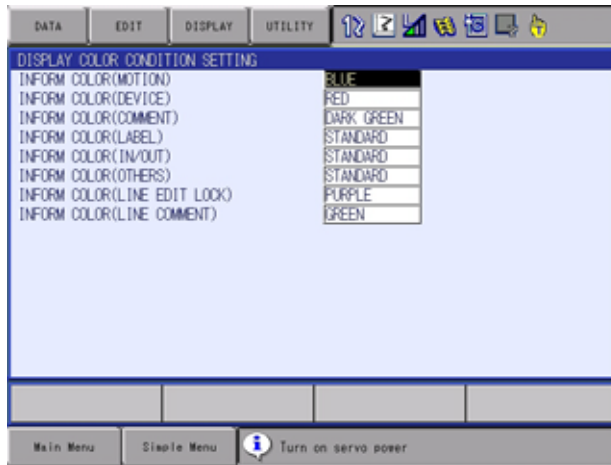


3. Move the cursor to the instruction to be changed and press [SELECT].
  - The list of the candidate colors for the instruction is displayed.



## 4. Select a color.

- The color of each instruction is fixed.



## 5. Select JOB window.

- Each instruction is displayed in the selected colors on the job window.



## 6.12 Present Manipulator Position Output Function

### 6.12.1 Outline

Output the present manipulator's cartesian position (base coordinate) to the specified register.

### 6.12.2 Parameters

The following parameters specify the function and output register number.

S1CxG	Meaning
208	Specify a function which outputs a specified value of the present cartesian position (base coordinate) to the register 0: invalid 1: Valid
209	Specify the output size to the register 0: 2 bytes output 1: 4 bytes output
210	Cartesian position (command value) X register number of output destination
211	Cartesian position (command value) Y register number of output destination
212	Cartesian position (command value) Z register number of output destination
213	Cartesian position (command value) Rx register number of output destination
214	Cartesian position (command value) Ry register number of output destination
215	Cartesian position (command value) Rz register number of output destination
216	Cartesian position (command value) Re register number of output destination
217	Specify a function which outputs a FB value of the present cartesian position (base coordinate) to the register 0: invalid 1: Valid
218	Specify the output size to the register 0: 2 bytes output 1: 4 bytes output
219	Cartesian position (FB value) X register number of output destination
220	Cartesian position (FB value) Y register number of output destination
221	Cartesian position (FB value) Z register number of output destination
222	Cartesian position (FB value) Rx register number of output destination
223	Cartesian position (FB value) Ry register number of output destination
224	Cartesian position (FB value) Rz register number of output destination
224	Cartesian position (FB value) Re register number of output destination



(Example 1)

<b>S1C1G</b>	<b>Setting value</b>
208	1
209	0
210	10
211	11
212	12
213	13
214	14
215	15
216	16

When setting the parameter as above, the manipulator's present cartesian 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)

S1C1G	Setting value
217	1
218	1
219	10
220	12
221	14
222	16
223	18
224	20
225	22

When setting the parameter as above, the manipulator's present cartesian position is output to the registers as follows

M010=	Lower 2 bytes of the	manipulator's present cartesian position (FB value)	X	[unit: $\mu\text{mm}$ ]
M011=	Upper 2 bytes of the	manipulator's present cartesian position (FB value)	X	[unit: $\mu\text{mm}$ ]
M012=	Lower 2 bytes of the	manipulator's present cartesian position (FB value)	Y	[unit: $\mu\text{mm}$ ]
M013=	Upper 2 bytes of the	manipulator's present cartesian position (FB value)	Y	[unit: $\mu\text{mm}$ ]
M014=	Lower 2 bytes of the	manipulator's present cartesian position (FB value)	Z	[unit: $\mu\text{mm}$ ]
M015=	Upper 2 bytes of the	manipulator's present cartesian position (FB value)	Z	[unit: $\mu\text{mm}$ ]
M016=	Lower 2 bytes of the	manipulator's present cartesian position (FB value)	Rx	[unit: 0.001deg]
M017=	Upper 2 bytes of the	manipulator's present cartesian position (FB value)	Rx	[unit: 0.001deg]
M018=	Lower 2 bytes of the	manipulator's present cartesian position (FB value)	Ry	[unit: 0.001deg]
M019=	Upper 2 bytes of the	manipulator's present cartesian position (FB value)	Ry	[unit: 0.001deg]
M020=	Lower 2 bytes of the	manipulator's present cartesian position (FB value)	Rz	[unit: 0.001deg]
M021=	Upper 2 bytes of the	manipulator's present cartesian position (FB value)	Rz	[unit: 0.001deg]
M022=	Lower 2 bytes of the	manipulator's present cartesian position (FB value)	Re	[unit: 0.001deg]
M023=	Upper 2 bytes of the	manipulator's present cartesian position (FB value)	Re	[unit: 0.001deg]



- When validating the command value register output function (S1CxG208=1), never fail to set the output register number (S1CxG210 to 216) of each coordinate value.
- When validating the FB value register output function (S1CxG217=1), never fail to set the output register number (S1CxG219 to 225) of each coordinate value.
- In case 2 bytes is set as the register output size (S1CxG209=1 or S1CxG218=1), the unit of X,Y and Z-axes coordinate value becomes “mm” and that of Rx, Ry, Rz and Re coordinate value becomes “deg”. In both cases, only the lower 2 bytes are output.
- When setting 4 bytes to the register output size (S1CxG209=1 or S1CxG218=1), the unit of X,Y and Z-axes coordinate value becomes “ $\mu$ mm” and that of Rx, Ry, Rz and Re coordinate value becomes “0.0001deg”.
- When setting 4 bytes to the register output size (S1CxG209=1 or S1CxG218=1), upper byte of the coordinate value is output to the following register number to the specified output register number. In this consequence, confirm the register’s status of use before setting the output size to the register.

## 6.13 Softlimit Setting Function

### 6.13.1 About the Softlimit Setting Function

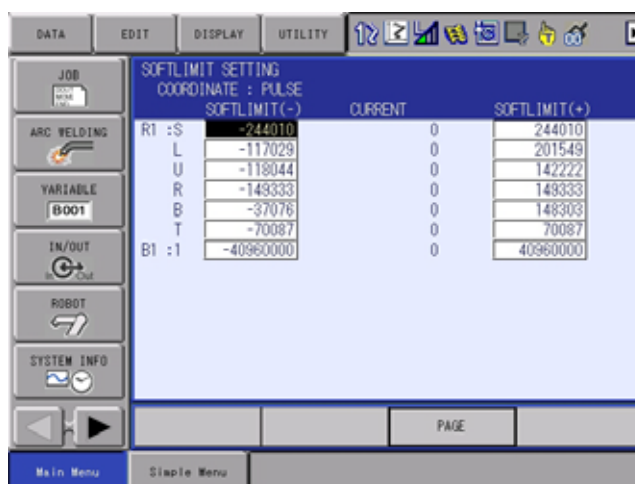
The softlimit setting function is a function to set the softlimit to limit the range of the manipulator motion in software.

### 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.



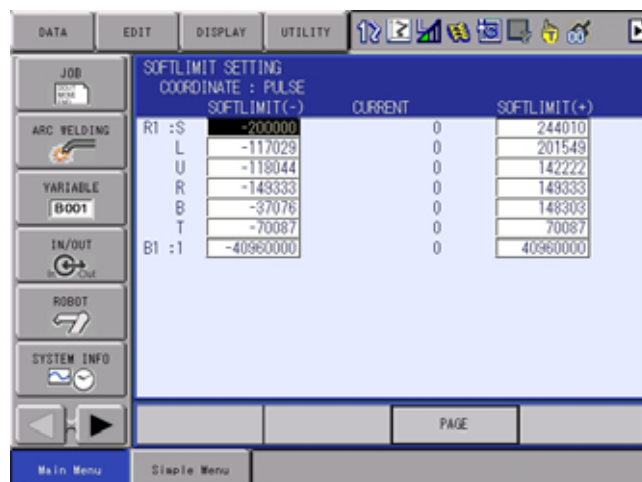
3. Set the control group as desired.

- 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].



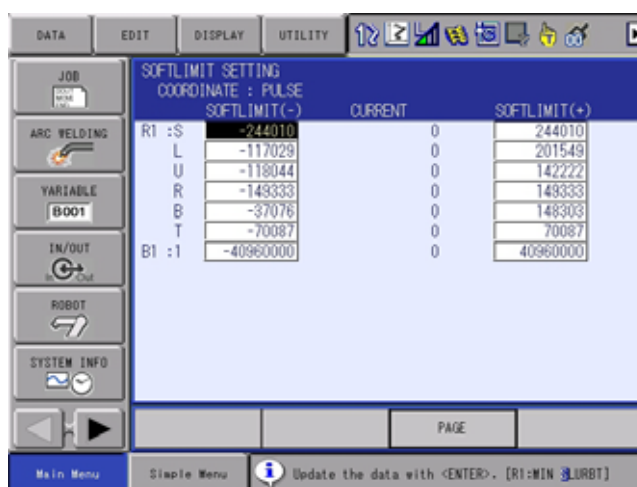
### 6.13.3 Setting the Softlimit by Numerical Value Input

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.



**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.

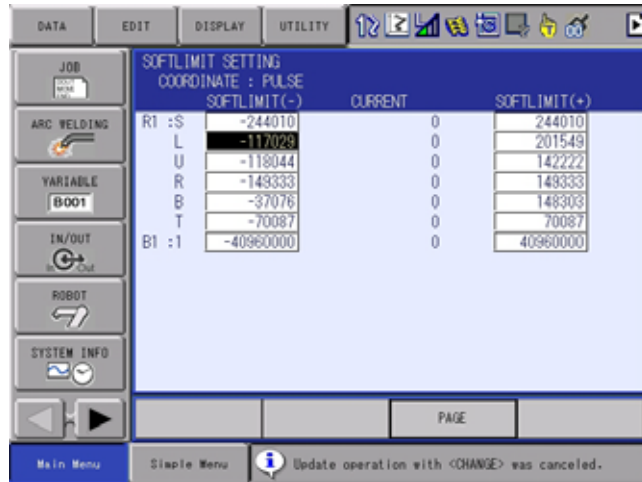


- If perform the one of the following operations, the modify operation will be canceled.
  - Press [MODIFY].
  - Press [SELECT].
  - Press the one of [↑] [↓] [←] [→].
  - Press [PAGE].
  - Press [DIRECT OPEN].
  - Press [Numeric Key].
  - Select the reserved display.
  - Switch the screen.
  - Switch the mode.

## 6 Convenient Functions

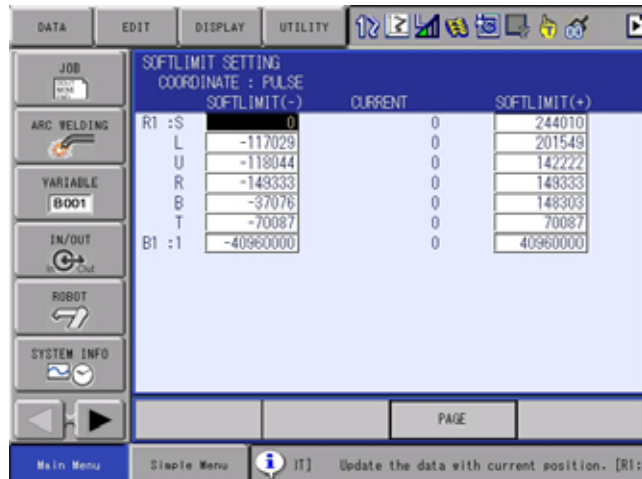
### 6.13 Softlimit Setting Function

- The message [Update operation with <CHANGE> was canceled.] appears.



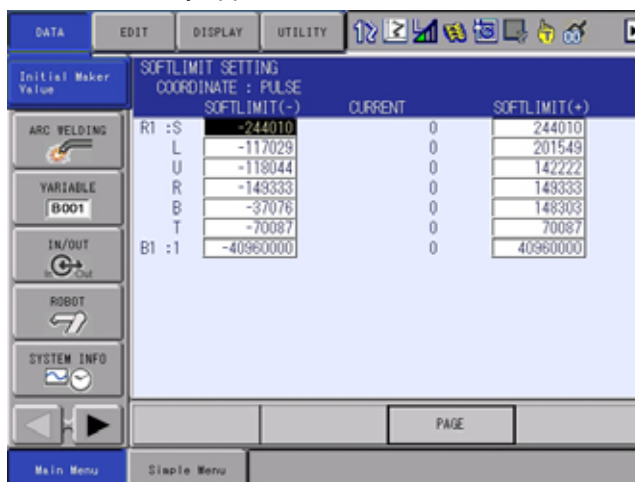
4. Press [ENTER].

- The current position is set as the softlimit.

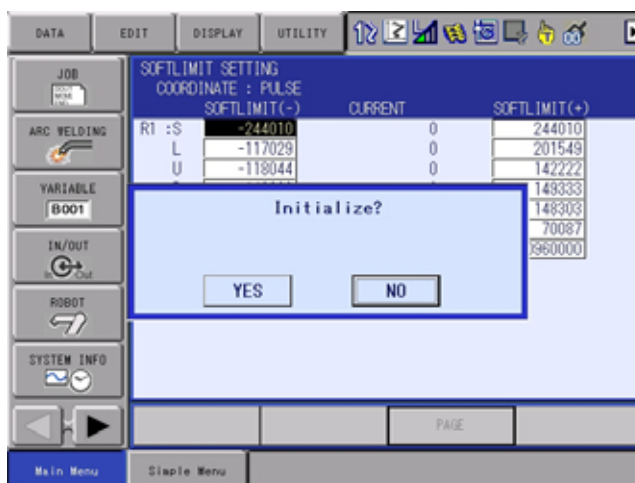


**6.13.5 Set the Softlimit (+)/ the Softlimit (-) to the Initial Maker Value**

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 select [NO].

**NOTE**

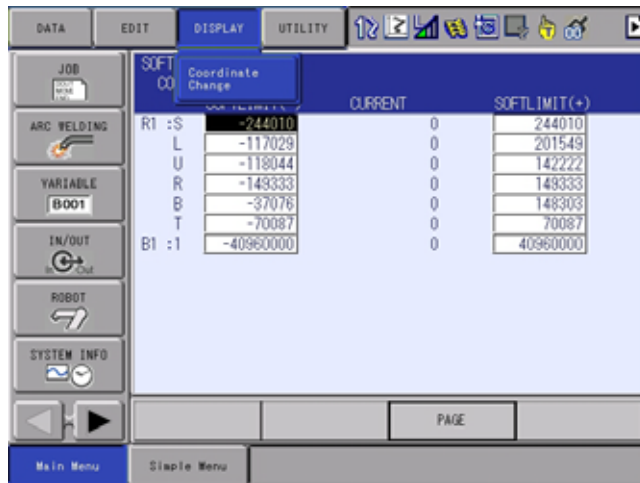
The initial maker value limits the range of the mechanical motion of the manipulator, and it varies according to the model of the robot.

- 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.

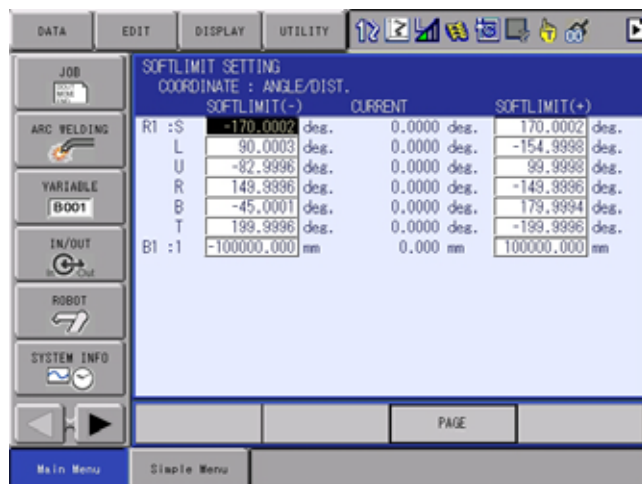


2. Select {Coordinate Change}.
  - When the displaying coordinate is a pulse, the robot axis is changed to the angle display; the base axis is changed to the distance display; and the station axes is changed for each axis by the value of the station axis display parameter (S2C265 to 288).

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.



- 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.

## 6.14 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

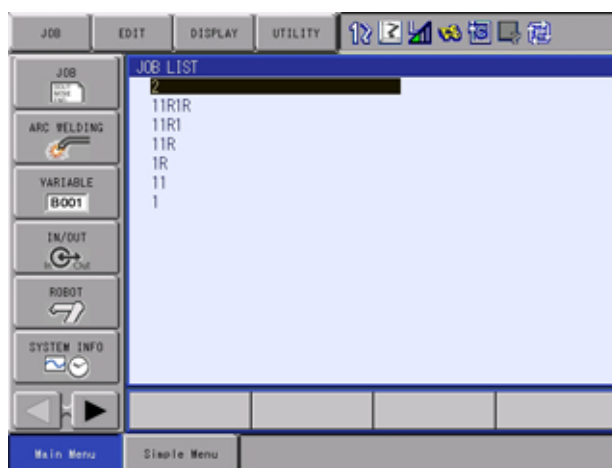
### 6.14.2 Job Edit During Playback

#### 6.14.2.1 Basic Operation

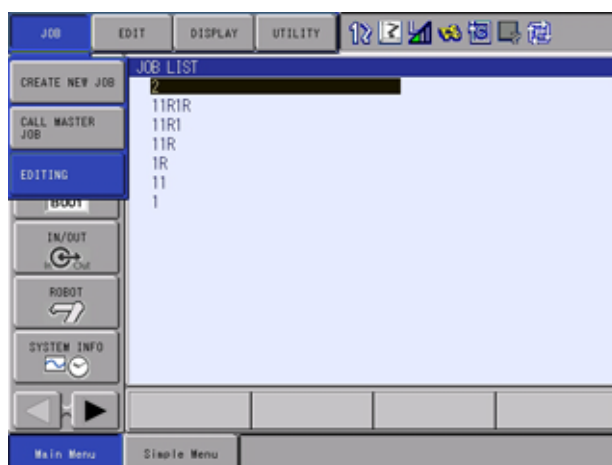
The job edit operation during playback is described below.

1. During playback, select {Main Menu} {JOB}, then select the submenu {SELECT JOB}.

– JOB LIST display appears.



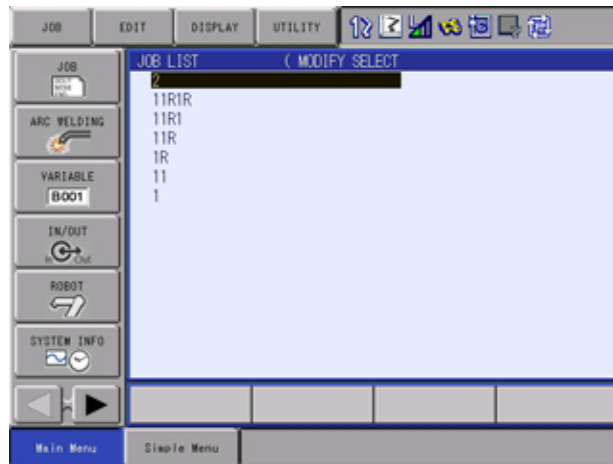
2. Select {EDITING} under the pull-down menu {JOB}.



## 6 Convenient Functions

### 6.14 Job Edit Function During Playback

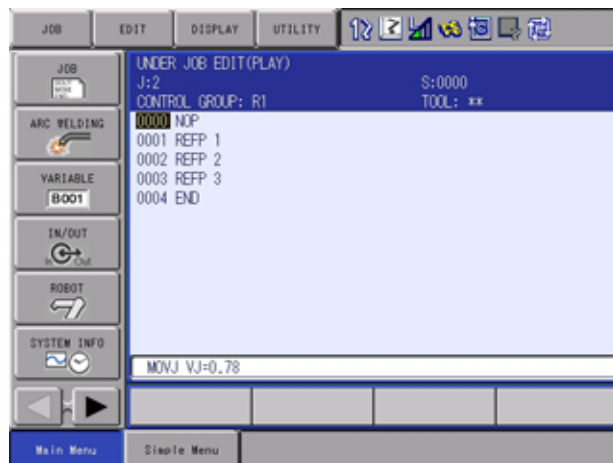
3. Select the job to be edited from JOB LIST.



- 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.

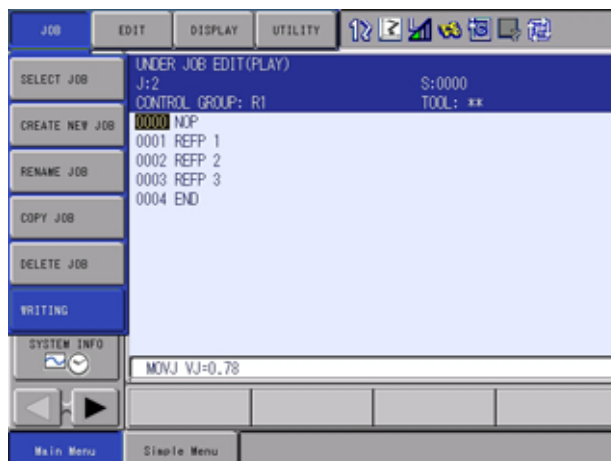


- Regarding restrictions on editing, refer to *section 6.14.2.2 “Editing” on page 6-128*.

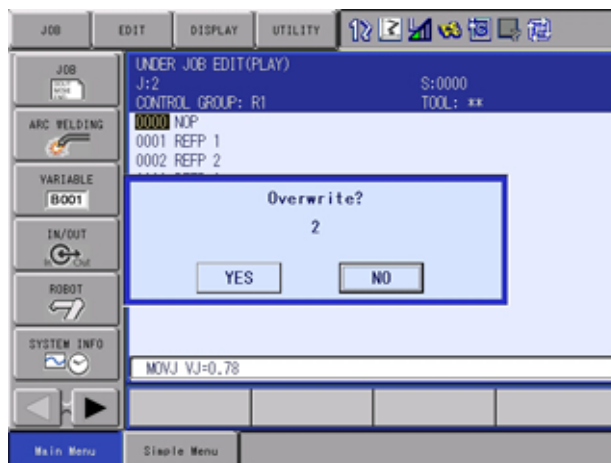
## 6 Convenient Functions

### 6.14 Job Edit Function During Playback

- 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 “SUPPLEMENT” on the next page.

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 section 6.14.2.1 “Basic Operation” on page 6-125*) 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)” on page 6-129.*

Fig. 6-1: Pull-down Menu (EDIT) \* Cursor Is on Line No.

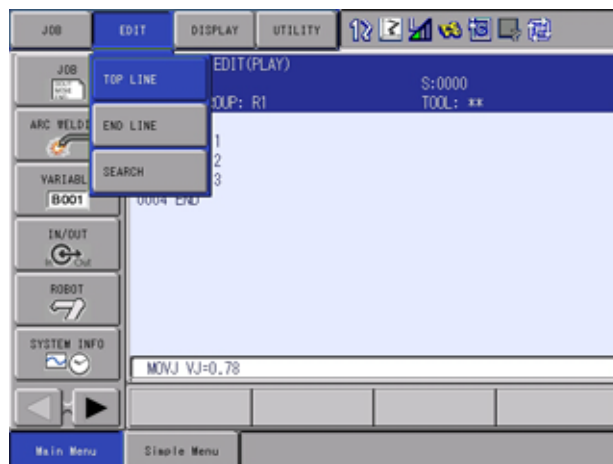


Fig. 6-2: Pull-down Menu (EDIT) \* Cursor Is on Instruction



Fig. 6-3: Pull-down Menu (DISPLAY)

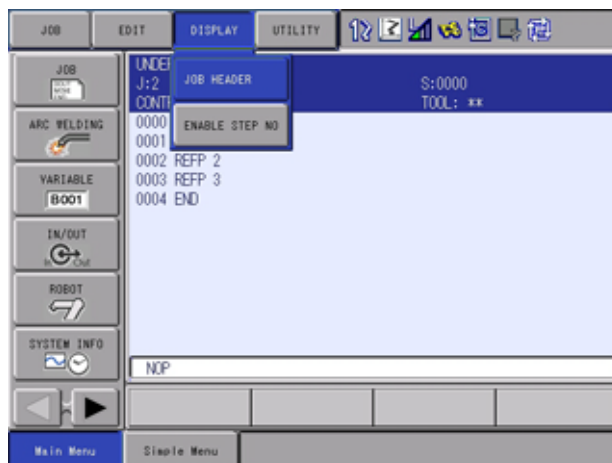
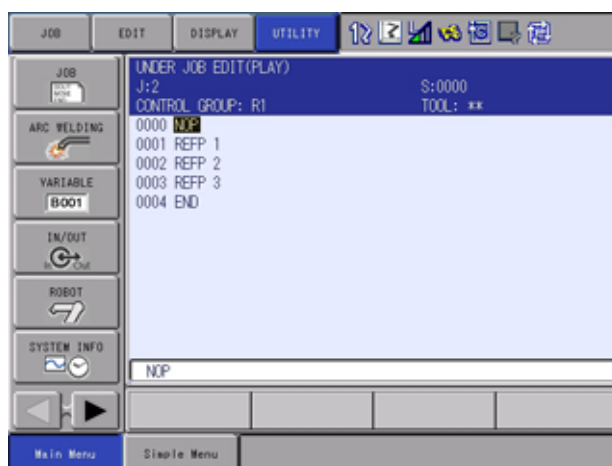


Fig. 6-4: Pull-down Menu (UTILITY)



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.



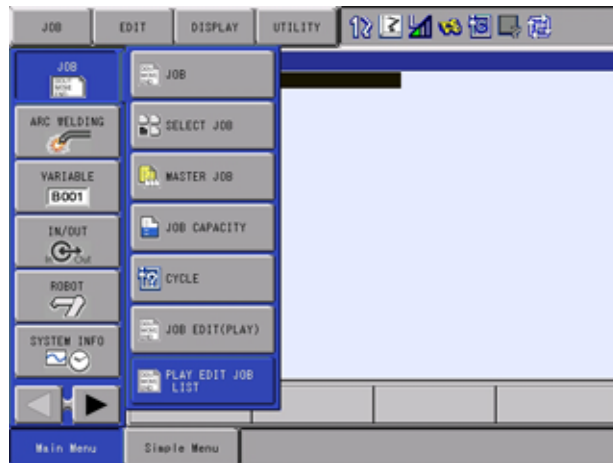
The above {WRITING}, {DELETE JOB}, {RENAME JOB}, and {COPY JOB} can be done in the same manner on the “PLAY EDIT JOB LIST” display.

### 6.14.2.3 Editing Multiple Jobs

The procedure to delete or write multiple jobs at once on the PLAY EDIT JOB LIST display is described below.

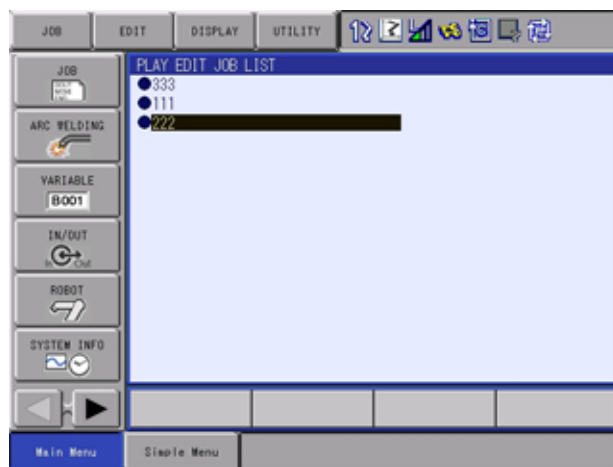
#### ■ Deleting Multiple Jobs

1. Select {Main Menu} {JOB}, then select the submenu {PLAY EDIT JOB LIST}.



2. Select the job to be deleted by [SHIFT] + [SELECT].

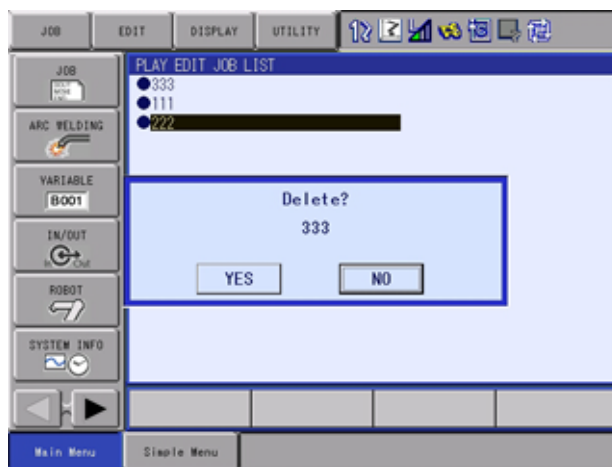
– “●” appears on the left of the selected job.



## 6 Convenient Functions

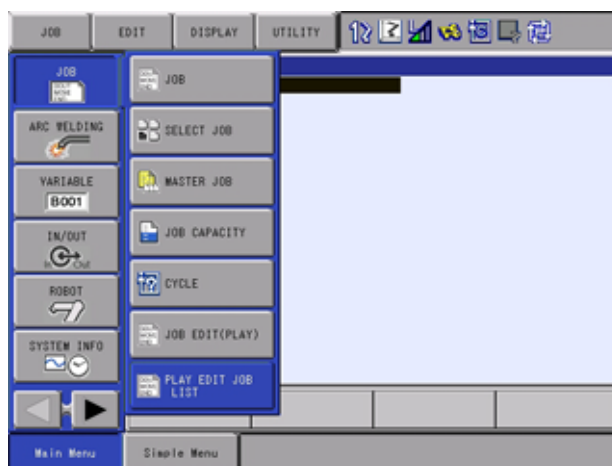
### 6.14 Job Edit Function During Playback

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.

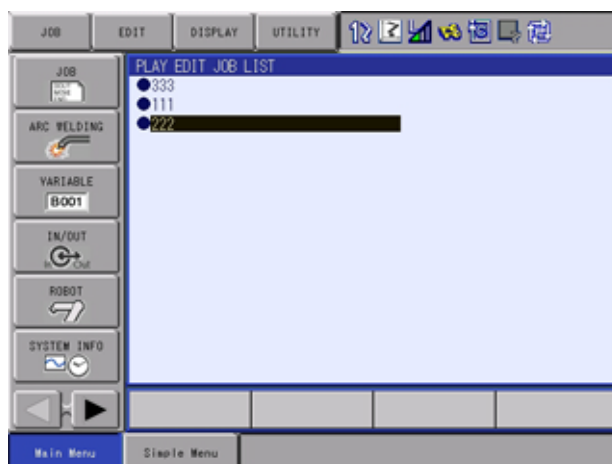


#### ■ Writing to Multiple Jobs

1. Select {Main Menu} {JOB}, then select the submenu {PLAY EDIT JOB LIST}.



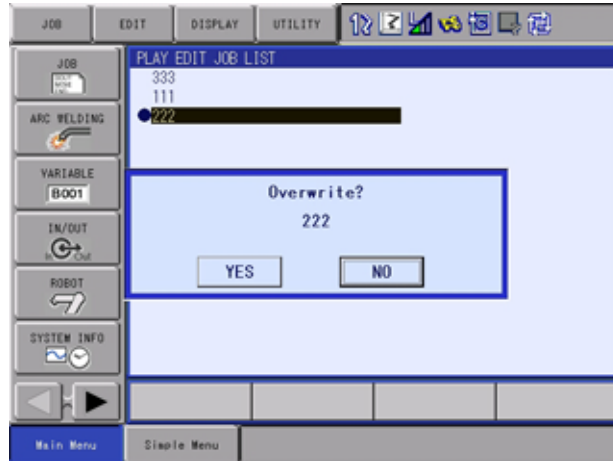
2. Select the job to be written to by [SHIFT] + [SELECT].
  - “●” appears on the left of the selected job.





## 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.

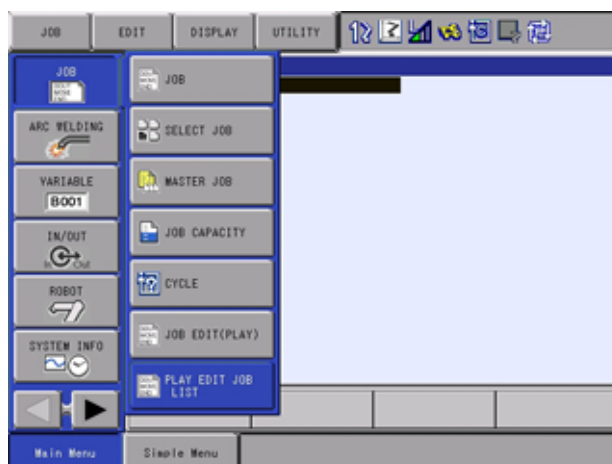
If data is reflected during teaching, the job will be written immediately.

## 6.14.2.4 Canceling Write Request

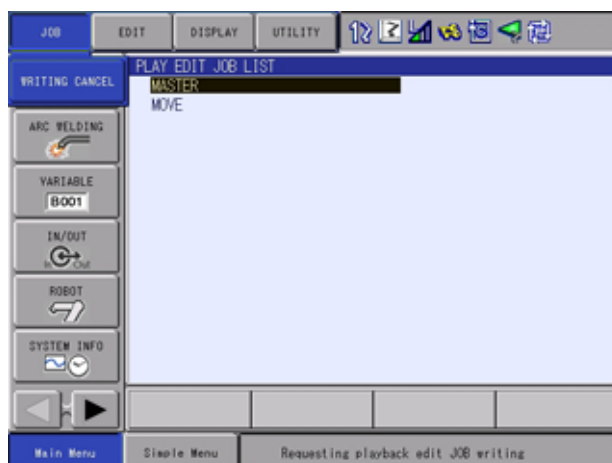
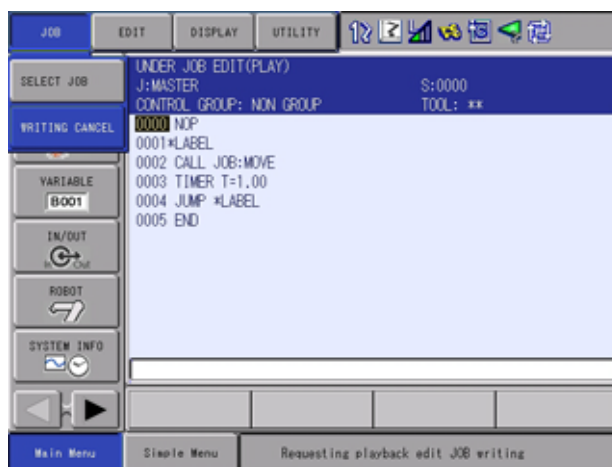
The procedure to cancel a write request is described below.

■ **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}.





## CAUTION

- 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.

- When the job is NOT being executed: The data is reflected immediately.
- 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.

## 6.15 Logging Function

### 6.15.1 Logging Function

The logging function allows to save the controller's operation and data editing history (log) in chronological order, and display them on the screen.

Users can select the log obtaining operation and store the log data to an external device.

### 6.15.2 Objected Data for Logging

The following data can be saved in this function:

- OPERATION-related Data
  - START, HOLD, and E-STOP (The operations in the remote mode are also saved in the log.)
  - Mode switching (PLAY/TEACH/REMOTE)  
(The operations in the remote mode are also saved in the log.)
  - Safety fence OPEN
  - Selecting jobs (including direct open)
  - Calling the master job
  - Initializing the files and jobs
  - Loading and saving files and jobs (normal termination/abnormal termination)  
(Loading and saving operations by the DCI function or the data transmission function are not saved in logs.)
  - Creating a new job, deleting, renaming, parallel shift job conversion, mirror shift conversion, PAM (position correcting during playback)
  - Changing the home position of the manipulator
  - Login/logoff (Only available when the password protection function (optional) is used.)
- EDIT-related Data
  - Job
    - Adding the instructions
    - Changing the requirements in the instructions
    - Deleting the instructions
    - The operation of cut, paste, and reverse paste
    - The operation of UNDO and REDO
    - Editing the job header
    - Line Edit Lock and the comment operation
    - Canceling all the line Edit Lock, canceling all the comment.
  - Editing the conditions file/general data
  - Editing the parameters
  - Editing the CIO  
Editing on the ladder program window.

When compiling is executed, the edit histories (addition/changing/deletion of lines) are output. The recorded times are the actual times at which the lines were edited, so they may not match the time at which compiling was executed.

- Editing variables  
(The operations in the remote mode are not saved in the log.)
- Editing the I/O  
Logs of switching ON and OFF of the general input signals and general output signals are obtained.



Only the editing operations by the user itself are targeted for log obtaining. Even if the variables or the I/O states are changed by executing the instructions in the job, they are not recorded in the log.

### 6.15.3 Number of Entries Stored in the Logs

The number of entries stored in the logs for each data is as follows:

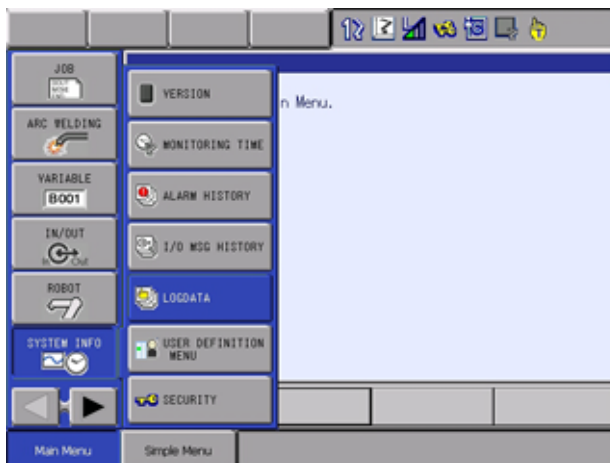
- OPERATION-related Data: 100 entries
- EDIT-related Data: 200 entries

If the number of stored entries exceeds the number described above, old data will be deleted and the new data will be recorded.

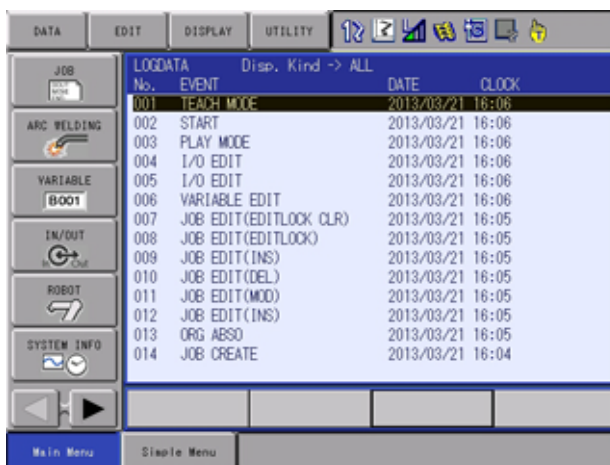
**6.15.4 Operating Methods****6.15.4.1 Displaying Logs in List**

The log list can be referred to with the following procedures:

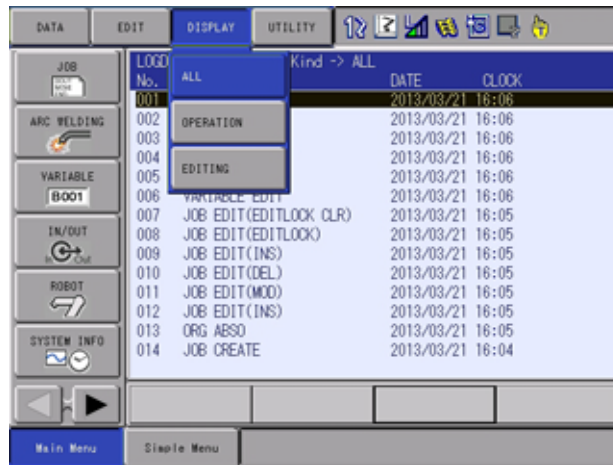
Main menu → {SYSTEM INFO} → {LOGDATA}



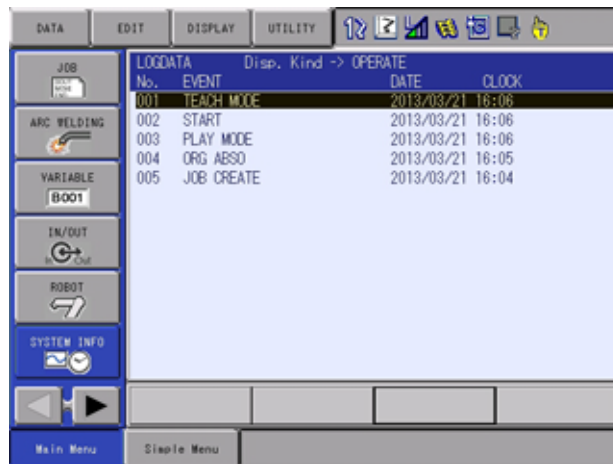
Selecting {LOGDATA} displays the {LOGDATA} window.



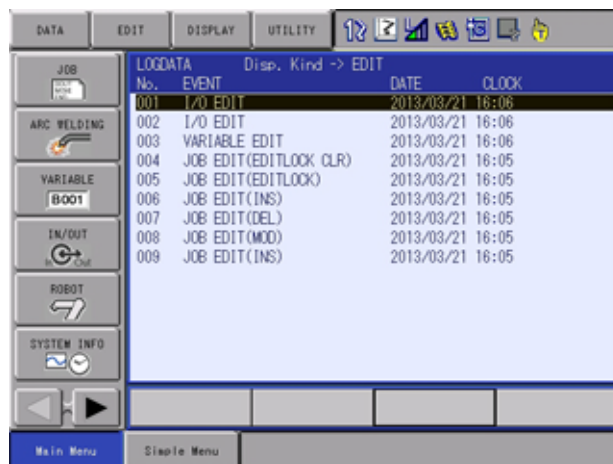
The list of the logs to be displayed in the {LOGDATA} window can be arranged by the log types (OPERATION/EDIT). Selecting {DISPLAY} of the pull-down menu displays {ALL}, {OPERATION}, {EDITING}, and only the logs of the selected type will be displayed.



Displays only the OPERATION-related logs.

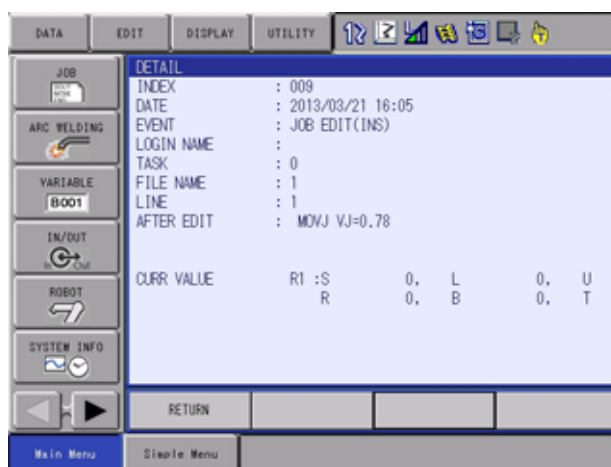


Displays only the EDIT-related logs.



## 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 or EDIT.

- INDEX
- DATE
- EVENT
- LOGIN NAME



Table 6-4: OPERATION-related Log

Log Name	Remark	Items displayed in the detailed display section				
START	-	Series	Job name	Line number	Current value	-
HOLD	-	Series	Job name	Line number	Current value	-
ESP	-	Series	Job name	Line number	Current value	-
TEACH MODE	-	-	-	-	-	-
PLAY MODE	-	-	-	-	-	-
REMOTE MODE	-	-	-	-	-	-
SELECT JOB	-	Series	Job name	-	-	-
SAFETY FENCE OPEN	-	Series	Job name	Line number	Current value	-
MASTER JOB CALL	-	Series	Job name	-	-	-
FILE INIT	-	File name	-	-	-	-
FILE LOAD END	-	File name	-	-	-	-
FILE SAVE END	-	File name	-	-	-	-
FILE LOAD ERROR	-	File name	-	-	-	-
FILE SAVE ERROR	-	File name	-	-	-	-
JOB CREATE	-	Job name	-	-	-	-
JOB DELETE	-	Job name	-	-	-	-
JOB RENAME	-	Job name	-	-	-	-
PARALLEL SHIFT	-	Job name	-	-	-	-
MIRROR SHIFT	-	Job name	-	-	-	-
PAM	-	Job name	-	-	-	-
ORG ABSO	-	Group number	Axis number	Setting	Current value	-
LOGIN	-	-	-	-	-	-
LOGOUT	-	-	-	-	-	-

Table 6-5: EDIT-related Log (Sheet 1 of 2)

Log Name	Remark	Items displayed in the detailed display section				
JOB EDIT(INS)	-	Series	Job name	Line number	Value after editing	Current value
JOB EDIT(MOD)	-	Series	Job name	Line number	Value after editing	Current value
JOB EDIT(DEL)	-	Series	Job name	Line number	Deleted line	-
JOB EDIT(P. REG)	-	Series	Job name	Line number	Current value	-
JOB EDIT(P. MOD)	-	Series	Job name	Line number	Current value	-
JOB EDIT(CUT)	-	Series	Job name	Processing start position	Processing completion position	-
JOB EDIT(PASTE)	-	Series	Job name	Processing start position	Processing completion position	-
JOB EDIT(R. PST)	-	Series	Job name	Processing start position	Processing completion position	-
JOB EDIT(UNDO)	-	Series	Job name	-	-	-
JOB EDIT(REDO)	-	Series	Job name	-	-	-
JOB EDIT(HEADER)	Numeric value	Job name	Element number	Value before editing	Value after editing	-
	Character string	Job name	Element number	Value after editing	-	
JOB EDIT (EDITLOCK)	-	Series	Job name	Processing start position	Processing completion position	-
JOB EDIT (EDITLOCK CLR)	-	Series	Job name	Processing start position	Processing completion position	-
JOB EDIT(EDITLOCK CLR ALL)	-	Series	Job name	Processing start position	Processing completion position	-
JOB EDIT(COMMENT)	-	Series	Job name	Processing start position	Processing completion position	-
JOB EDIT(COMMENT CLR)	-	Series	Job name	Processing start position	Processing completion position	-
JOB EDIT(COMMENT CLR ALL)	-	Series	Job name	Processing start position	Processing completion position	-
OTHER FILE EDT	Numeric value	File name	Element number	Value before editing	Value after editing	-
	Character string	File name	Element number	Value after editing	-	
PARAMETER EDIT	-	Parameter type	Parameter number	Value before editing	Value after editing	-
LADDER EDIT(ADD)	-	Line number	Value after editing	System/User	-	-
LADDER EDIT(CHG)	-	Line number	Value after editing	System/User	-	-
LADDER EDIT(DEL)	-	Line number	Deleted line	System/User	-	-

Table 6-5: EDIT-related Log (Sheet 2 of 2)

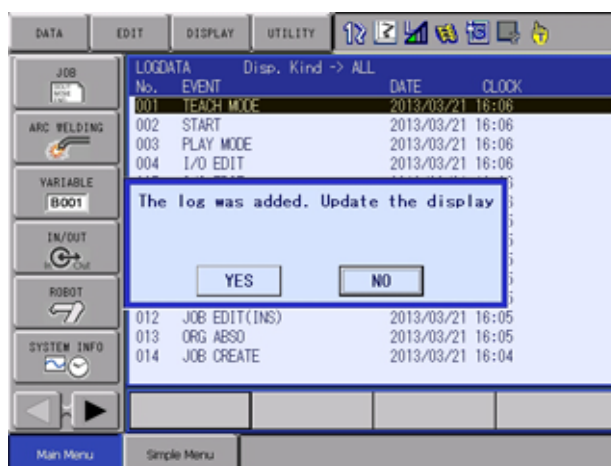
Log Name	Remark	Items displayed in the detailed display section				
COMPILE	-	-	-	-	-	-
VARIABLE EDIT	Numeric value	Variable type	Edit number	Value before editing	Value after editing	-
	Character string	Variable type	Edit number	Value after editing	-	-
	Position variable	Variable type	Edit number	Setting value	-	-
I/O EDIT	-	I/O number	Value after editing	-	-	-

## 6.15.4.3 Updating Logging 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.

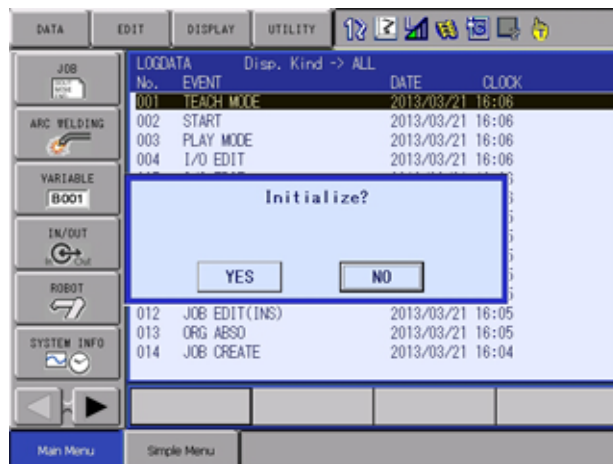
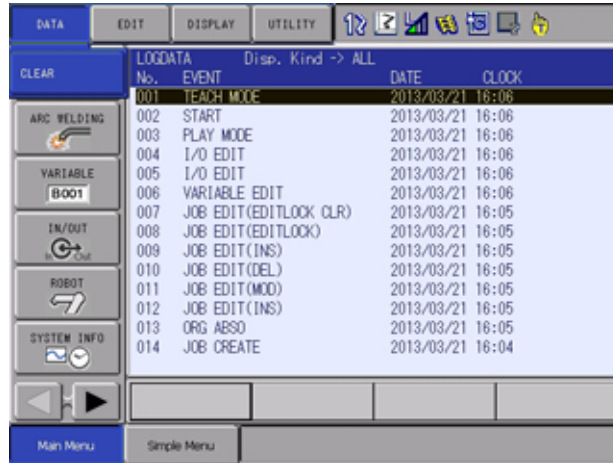
When selecting "NO", the window display is not updated, but after that, when pressing [SELECT], the same dialog appears again.

When the log display type is set to "OPERATION" or "EDIT", the confirmation dialog described above only when the log belongs to the displayed type is added and [SELECT] is pressed.



## 6.15.4.4 Deleting Logging Information

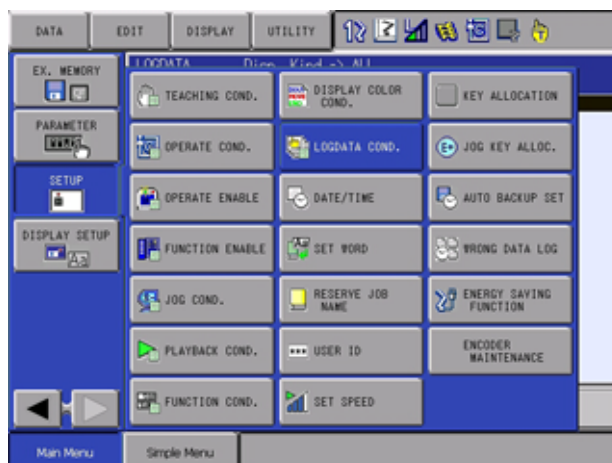
Only when security is in management mode, selecting “DATA” in the pull-down menu on the LOGDATA window displays {INITIALIZE}. Selecting {INITIALIZE} displays the confirmation dialog “Initialize?”. When “YES” is selected, all the logs of the currently displayed type are deleted.



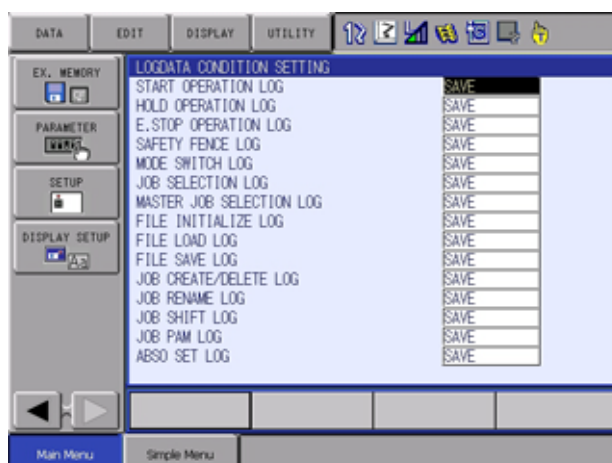
## 6.15.4.5 Selecting Operations to Acquire Logs

Selecting the operations whose logging data is to be acquired can avoid unnecessary logs from being acquired.

When selecting {Main Menu} → {SETUP} → {LOGDATA COND.}, the LOGDATA CONDITION SETTING window appears.



Move the cursor to the item to which its logging data is the subject of acquisition, press [SELECT] and then "SAVE" and "NOT SAVE" alternate. Once "NOT SAVE" is selected to an item, its logging data would not be acquired even if "SAVE" is selected.



## 6 Convenient Functions

### 6.15 Logging Function

The item names and the targeted logs are as follows:

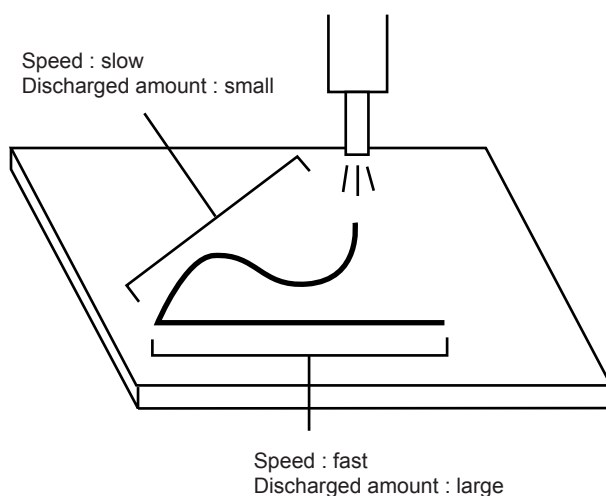
Item Name	Target Log
START OPERATION LOG	START
HOLD OPERATION LOG	HOLD
E. STOP OPERATION LOG	ESP
SAFETY FENCE LOG	SAFETY FENCE OPEN
MODE SWITCH LOG	<ul style="list-style-type: none"> <li>• TEACH MODE</li> <li>• PLAY MODE</li> <li>• REMOTE MODE</li> </ul>
JOB SELECTION LOG	SELECT JOB
MASTER JOB SELECTION LOG	MASTER JOB CALL
LOG ON/LOG OFF LOG	<ul style="list-style-type: none"> <li>• LOGIN</li> <li>• LOGOUT</li> </ul>
FILE INITIALIZE LOG	FILE INIT
FILE LOAD LOG	<ul style="list-style-type: none"> <li>• FILE LOAD END</li> <li>• FILE LOAD ERROR</li> </ul>
FILE SAVE LOG	<ul style="list-style-type: none"> <li>• FILE SAVE END</li> <li>• FILE SAVE ERROR</li> </ul>
JOB CREATE/DELETE LOG	<ul style="list-style-type: none"> <li>• JOB CREATE</li> <li>• JOB DELETE</li> </ul>
JOB RENAME LOG	JOB RENAME
JOB SHIFT LOG	<ul style="list-style-type: none"> <li>• PARALLEL SHIFT</li> <li>• MIRROR SHIFT</li> </ul>
JOB PAM LOG	PAM
ABSO SET LOG	ORG ABSO
JOB EDIT LOG	<ul style="list-style-type: none"> <li>• JOB EDIT(INS)</li> <li>• JOB EDIT(MOD)</li> <li>• JOB EDIT(DEL)</li> <li>• JOB EDIT(P. REG)</li> <li>• JOB EDIT(P. MOD)</li> </ul>
JOB CUT/PASTE LOG	<ul style="list-style-type: none"> <li>• JOB EDIT(CUT)</li> <li>• JOB EDIT(PASTE)</li> <li>• JOB EDIT(R. PST)</li> </ul>
JOB UNDO/REDO LOG	<ul style="list-style-type: none"> <li>• JOB EDIT(UNDO)</li> <li>• JOB EDIT(REDO)</li> </ul>
JOB HEADER EDIT LOG	• JOB EDIT(HEADER)
LINE EDIT PROHIBIT/RELEASE LOG	<ul style="list-style-type: none"> <li>• JOB EDIT(EDITLOCK)</li> <li>• JOB EDIT(EDITLOCK CLR)</li> <li>• JOB EDIT(EDITLOCK CLR ALL)</li> </ul>
COMMENT/RELEASE LOG	<ul style="list-style-type: none"> <li>• JOB EDIT(COMMENT)</li> <li>• JOB EDIT(COMMENT CLR)</li> <li>• JOB EDIT(COMMENT CLR ALL)</li> </ul>
FILE EDIT LOG	OTHER FILE EDT
PARAMETER EDIT LOG	PARAMETER EDIT
VARIABLE EDIT LOG	VARIABLE EDIT
SIGNAL EDIT LOG	I/O EDIT
LADDER EDIT LOG	<ul style="list-style-type: none"> <li>• LADDER EDIT(ADD)</li> <li>• LADDER EDIT(CHG)</li> <li>• LADDER EDIT(DEL)</li> </ul>

## 6.16 Analog Output Function Corresponding to Speed

### 6.16.1 Overview

The analog output function corresponding to speed changes the analog output value automatically, according to the manipulator 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, when the thickness of sealing or painting should be constant, the discharged amount of seals or paints can be controlled by the manipulator operating speed.



For the analog output function corresponding to speed, the following circuit board is needed.

- Analog output expansion circuit board: JANCD-YEW02-E



### 6.16.2 Instructions

#### 6.16.2.1 Instructions for Analog Output Function Corresponding to Speed

The instructions, ARATION and ARATIOF, are used for the analog output function corresponding to speed.

##### ■ ARATION

The analog output function 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 analog output function corresponding to speed is to be changed.

ARATION AO#(1) BV=10.00 V=200.0 OFV=2.00



##### ① Output port number

General analog output port to execute the analog output corresponding to speed

Setting range : 1 to 40

##### ② Basic voltage

Voltage to be output at the speed set with the basic speed.

Setting range : -14.00 to +14.00V

##### ③ Basic 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

##### ④ Offset voltage

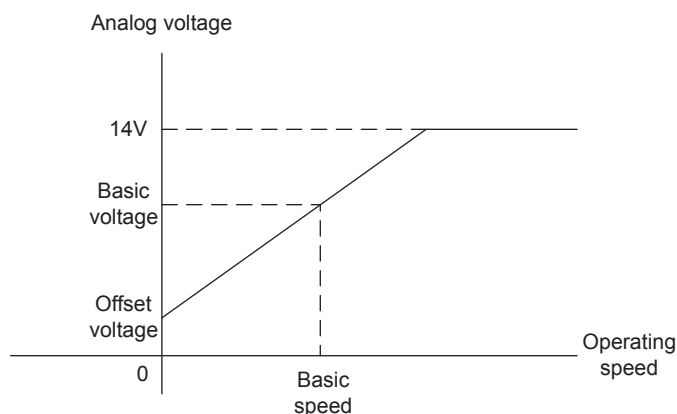
Analog voltage when the operating speed is 0.

Setting range : -14.00 to +14.00V

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 analog output function corresponding to speed is executed depending on these output characteristics.

The following graph shows the output characteristics.

*Fig. 6-5: Output Characteristics When Analog Output Function Corresponding to Speed is Used*



When the analog output value exceeds  $\pm 14.00$  V because of the operating speed, the value is limited within  $\pm 14.00$  V.

#### ■ ARATIOF

When the ARATIOF instruction is executed, the analog output corresponding to speed is completed, and the set offset voltage becomes the fixed output.

ARATIOF AO#(1)

↓

①

#### ① Output port number

General analog output port to end the analog output corresponding to speed

Setting range : 1 to 40

## 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

The line above the place to register 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.

## 6 Convenient Functions

### 6.16 Analog Output Function Corresponding to Speed

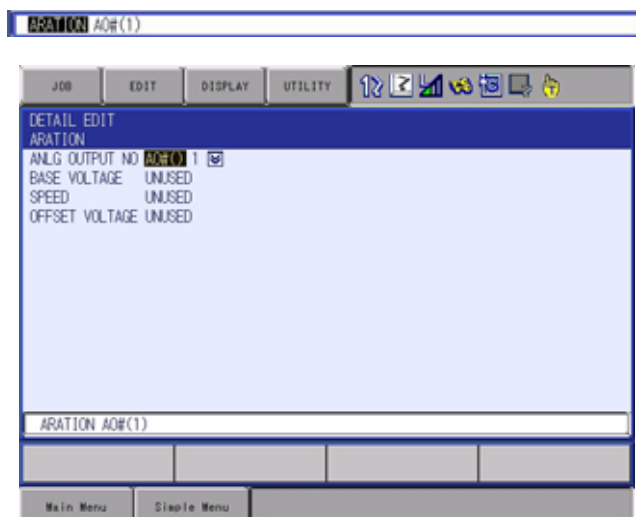
#### 5. Change any additional items and numerical values

- <Register without changes>  
To register without changes, perform operation of step 6.
- <Register with addition or change of the additional items>
  - To change the output port number  
In case of using [SHIFT] and the cursor, move the cursor to the output port number, and then press [SHIFT] and the cursor simultaneously, to change the output port number.



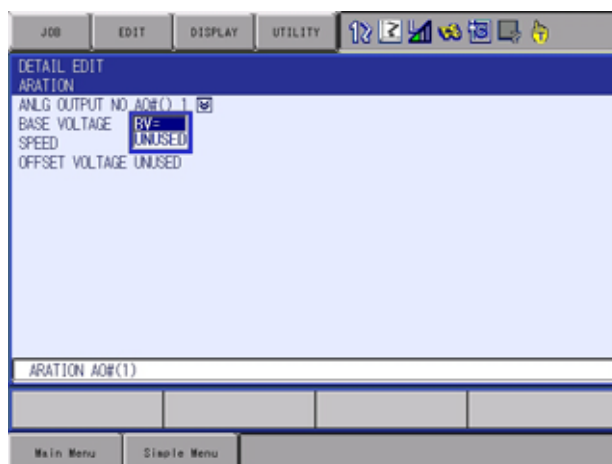
In case of using [Numeric Key]s, move the cursor to the output port number, and press [SELECT] to display an input buffer line. Enter the number, and then press [ENTER] to change the number displayed.

- To change the basic voltage, the speed, and the offset voltage  
Move the cursor to the instruction in the input buffer line, and then press [SELECT]. The detail edit display is shown.



Move the cursor to "UNUSED" of the additional item to be changed, and then press [SELECT]. The selection dialog is displayed.

Move the cursor to the additional item to be changed, and press [SELECT].



## 6 Convenient Functions

## 6.16 Analog Output Function Corresponding to Speed

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.

The line where ARATION instruction is registered.

```

0020 MOVL V=138
0021 ARATION AO#(1) BV=10.00
0022 MOVL V=138
  
```

### ■ ARATIOF

## 1. Move the cursor to one line above the place to register ARATIOF instruction

The line above the place to register ARATIOF instruction.

```

0030 MOVL V=138
0031 MOVL V=138
0032 MOVL V=138
  
```

## 2. Press [INFORM LIST]

## 3. Select [IN/OUT]

- The instruction list dialog appears.



## 4. Select “ARATIOF”

- The ARATIOF instruction is indicated in the input buffer line.

```
ARATIOF AO#(1)
```

## 5. Press [INSERT] and [ENTER]

- The ARATIOF instruction is registered.

```

0030 MOVL V=138
0031 ARATIOF AO#(1)
0032 MOVL V=138
  
```

## 6.16.2.3 Analog Output Display

The current settings can be confirmed on the analog output window.

①	②	③	④	⑤	⑥	⑦
TERMINAL	AOUT1	AOUT2	AOUT3	AOUT4		
OUTPUT (V)	-14.00	-14.00	-10.00	-14.00		
BASIC (V)	0.00	0.00	0.00	0.00		
TRAIT	SP RAT	SP RAT	STATIC	SP RAT		
OFFSET (V)	0.00	0.00	0.00	0.00		
BASIC SPD	1200	1200	1200	1200		
ROBOT	ROBOT1	ROBOT2	ROBOT3	ROBOT4		

① **TERMINAL**

General analog output port

② **OUTPUT (V)**

Indicates the voltage which is currently output.

③ **BASIC (V)**

Indicates the basic voltage used for the analog output corresponding to speed.

This value is used until a new value is set by ARATION instruction.

④ **TRAIT**

Indicates the current output characteristics of the output port.

SP RAT : during execution of the analog output corresponding to speed

STATIC : fixed output status

⑤ **OFFSET (V)**

Indicates the offset voltage used for the analog output corresponding to speed.

This value is used until a new value is set by ARATION instruction.

⑥ **BASIC SPD**

Indicates the basic speed used for the analog output corresponding to speed.

This value is used until a new value is set by ARATION instruction.

⑦ **ROBOT**

Indicates the manipulator number for the analog output corresponding to speed.

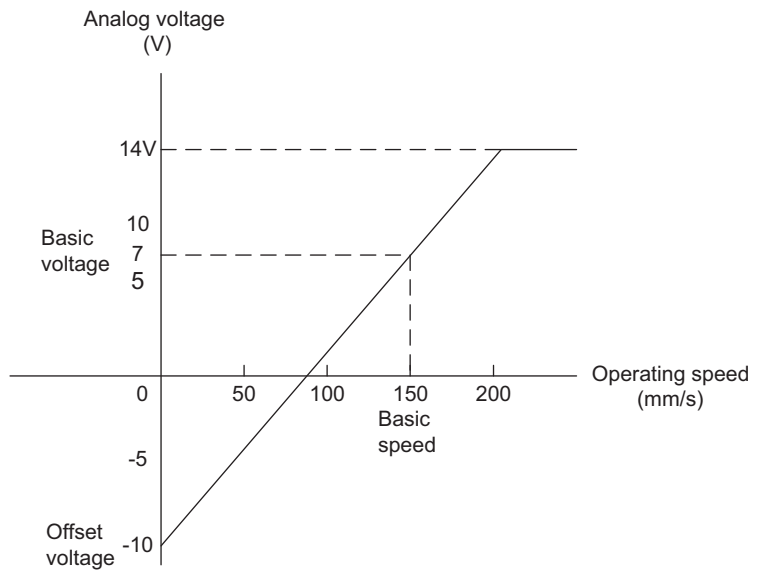
1. Select {IN/OUT} in the {Main Menu}
2. Select {ANALOG OUTPUT}
  - The analog output window appears.
  - The output terminal numbers which follow the AOUT4 can be switched and displayed by pressing [PAGE].

**6.16.3 Examples**

6.16.3.1 Examples of Output Characteristics

The graph below shows the change in the output characteristics when the following job is done.

	Output Voltage (V)
MOVJ VJ=50.00	
ARATION AO#(1) BV=7.00 V=150.0 OFV=-10.00	7.00
MOVL V=50.0	-4.33
MOVC V=100.0	1.33
MOVC V=100.0	1.33
MOVC V=100.0	1.33
MOVL V=200.0	12.67



## 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⋯①

ARATION AO#(1) BV=10.00 V=200.0 OFV=-2.00

MOV C V=150.0⋯②

MOV C VR=20.0⋯③ (When the tool center point speed is 100 mm/s)

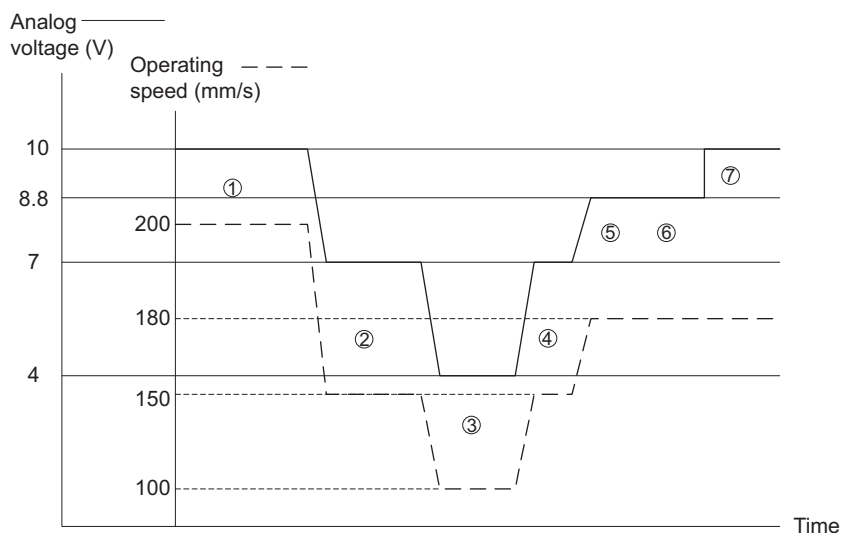
MOV C V=150.0⋯④

MOVL V=180.0⋯⑤

MOVL⋯⑥ (When the tool center point speed is 180 mm/s)

AOUT AO#(1) 10.00⋯⑦

Fig. 6-6: Analog Voltage according to Speed



- Since the analog output corresponding to speed is made for the calculated speed, there may be little difference from the actual operating speed of the manipulator.
- When a posture speed is specified, the analog output corresponding to speed is made for the operating speed at the tool center point with the posture speed.

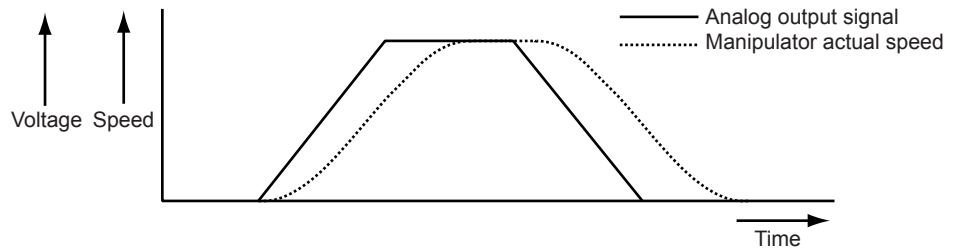


### 6.16.4 Filter Process

In the analog output function corresponding to speed, the output analog signal can be filtered by setting a filter constant at the parameters.

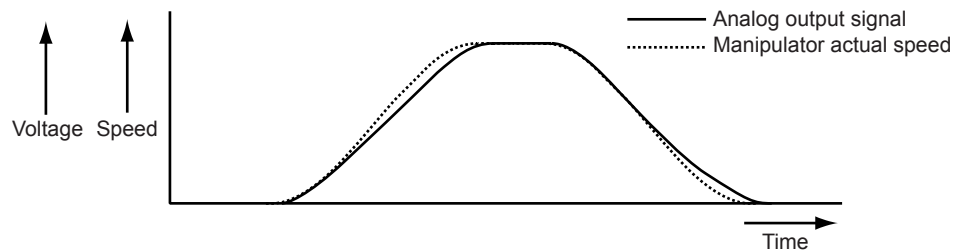
#### 6.16.4.1 When Parameter is Set to "0"

The analog signal according to the speed reference (the speed determined by a path operation) is output.



#### 6.16.4.2 When Parameter is Set to Values Other Than "0"

The analog signal according to the speed of filtered speed reference is output. By the filter process, the output signal can be close to the manipulator's actual speed.



#### 6.16.4.3 Parameter Setting

Adjust the settings of parameters during actual operations.

Table 6-6: Parameter (Sheet 1 of 3)

Parameter Number	Analog Output	Content	Unit
S3C1111	Analog output No.1	Primary filter constant	[msec]
S3C1112	Analog output No.1	Secondary filter constant	[msec]
S3C1113	Analog output No.2	Primary filter constant	[msec]
S3C1114	Analog output No.2	Secondary filter constant	[msec]
S3C1115	Analog output No.3	Primary filter constant	[msec]
S3C1116	Analog output No.3	Secondary filter constant	[msec]
S3C1117	Analog output No.4	Primary filter constant	[msec]
S3C1118	Analog output No.4	Secondary filter constant	[msec]
S3C1119	Analog output No.5	Primary filter constant	[msec]
S3C1120	Analog output No.5	Secondary filter constant	[msec]
S3C1121	Analog output No.6	Primary filter constant	[msec]
S3C1122	Analog output No.6	Secondary filter constant	[msec]
S3C1123	Analog output No.7	Primary filter constant	[msec]
S3C1124	Analog output No.7	Secondary filter constant	[msec]
S3C1125	Analog output No.8	Primary filter constant	[msec]
S3C1126	Analog output No.8	Secondary filter constant	[msec]

Table 6-6: Parameter (Sheet 2 of 3)

Parameter Number	Analog Output	Content	Unit
S3C1127	Analog output No.9	Primary filter constant	[msec]
S3C1128	Analog output No.9	Secondary filter constant	[msec]
S3C1129	Analog output No.10	Primary filter constant	[msec]
S3C1130	Analog output No.10	Secondary filter constant	[msec]
S3C1131	Analog output No.11	Primary filter constant	[msec]
S3C1132	Analog output No.11	Secondary filter constant	[msec]
S3C1133	Analog output No.12	Primary filter constant	[msec]
S3C1134	Analog output No.12	Secondary filter constant	[msec]
S3C1135	Analog output No.13	Primary filter constant	[msec]
S3C1136	Analog output No.13	Secondary filter constant	[msec]
S3C1137	Analog output No.14	Primary filter constant	[msec]
S3C1138	Analog output No.14	Secondary filter constant	[msec]
S3C1139	Analog output No.15	Primary filter constant	[msec]
S3C1140	Analog output No.15	Secondary filter constant	[msec]
S3C1141	Analog output No.16	Primary filter constant	[msec]
S3C1142	Analog output No.16	Secondary filter constant	[msec]
S3C1143	Analog output No.17	Primary filter constant	[msec]
S3C1144	Analog output No.17	Secondary filter constant	[msec]
S3C1145	Analog output No.18	Primary filter constant	[msec]
S3C1146	Analog output No.18	Secondary filter constant	[msec]
S3C1147	Analog output No.19	Primary filter constant	[msec]
S3C1148	Analog output No.19	Secondary filter constant	[msec]
S3C1149	Analog output No.20	Primary filter constant	[msec]
S3C1150	Analog output No.20	Secondary filter constant	[msec]
S3C1151	Analog output No.21	Primary filter constant	[msec]
S3C1152	Analog output No.21	Secondary filter constant	[msec]
S3C1153	Analog output No.22	Primary filter constant	[msec]
S3C1154	Analog output No.22	Secondary filter constant	[msec]
S3C1155	Analog output No.23	Primary filter constant	[msec]
S3C1156	Analog output No.23	Secondary filter constant	[msec]
S3C1157	Analog output No.24	Primary filter constant	[msec]
S3C1158	Analog output No.24	Secondary filter constant	[msec]
S3C1159	Analog output No.25	Primary filter constant	[msec]
S3C1160	Analog output No.25	Secondary filter constant	[msec]
S3C1161	Analog output No.26	Primary filter constant	[msec]
S3C1162	Analog output No.26	Secondary filter constant	[msec]
S3C1163	Analog output No.27	Primary filter constant	[msec]
S3C1164	Analog output No.27	Secondary filter constant	[msec]
S3C1165	Analog output No.28	Primary filter constant	[msec]
S3C1166	Analog output No.28	Secondary filter constant	[msec]
S3C1167	Analog output No.29	Primary filter constant	[msec]
S3C1168	Analog output No.29	Secondary filter constant	[msec]
S3C1169	Analog output No.30	Primary filter constant	[msec]
S3C1170	Analog output No.30	Secondary filter constant	[msec]
S3C1171	Analog output No.31	Primary filter constant	[msec]
S3C1172	Analog output No.31	Secondary filter constant	[msec]
S3C1173	Analog output No.32	Primary filter constant	[msec]
S3C1174	Analog output No.32	Secondary filter constant	[msec]
S3C1175	Analog output No.33	Primary filter constant	[msec]
S3C1176	Analog output No.33	Secondary filter constant	[msec]

Table 6-6: Parameter (Sheet 3 of 3)

Parameter Number	Analog Output	Content	Unit
S3C1177	Analog output No.34	Primary filter constant	[msec]
S3C1178	Analog output No.34	Secondary filter constant	[msec]
S3C1179	Analog output No.35	Primary filter constant	[msec]
S3C1180	Analog output No.35	Secondary filter constant	[msec]
S3C1181	Analog output No.36	Primary filter constant	[msec]
S3C1182	Analog output No.36	Secondary filter constant	[msec]
S3C1183	Analog output No.37	Primary filter constant	[msec]
S3C1184	Analog output No.37	Secondary filter constant	[msec]
S3C1185	Analog output No.38	Primary filter constant	[msec]
S3C1186	Analog output No.38	Secondary filter constant	[msec]
S3C1187	Analog output No.39	Primary filter constant	[msec]
S3C1188	Analog output No.39	Secondary filter constant	[msec]
S3C1189	Analog output No.40	Primary filter constant	[msec]
S3C1190	Analog output No.40	Secondary filter constant	[msec]

The standard parameter settings are as follows.

- For small capacity robot with a payload 6 kg and 16 kg  
Primary filter constant : 50 msec  
Secondary filter constant : 50 msec
- For large capacity robot with a payload 60 kg and 130 kg  
Primary filter constant : 100 msec  
Secondary filter constant : 100 msec

---

### 6.16.5 Precautions

#### 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 fixed immediately before the interruption is output to each output terminal.

The analog output corresponding to speed is not interrupted in any other cases.

#### 6.16.5.2 When More than One Manipulator is Used

The attribute of the job where the instruction is executed determines the manipulator where the analog output corresponding to speed is performed.

For a coordinated job, the analog output corresponding to speed is performed at the operating speed of the manipulator at the slave side.

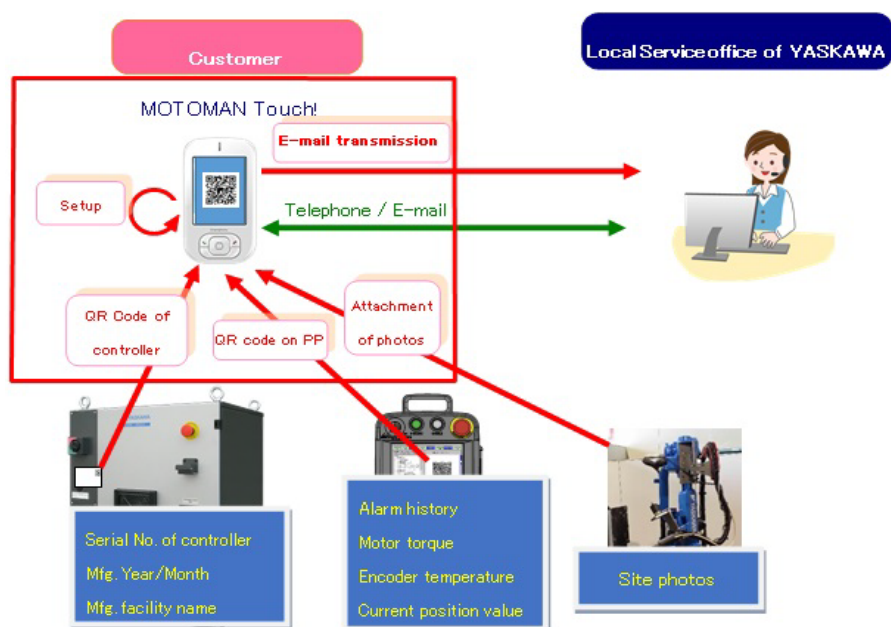
## 6.17 QR Code Creation Function

### 6.17.1 Outline

This function codifies the status of the DX200 (system configuration, alarm information, or current position data, etc.) into a QR code and displays it on the programming pendant display.

By using this function, user can send the current status of DX200 to Yaskawa representative rapidly and accurately when making inquiries or an abnormality happened.

Also, with an Android application called "MOTOMAN Touch!", user can send both the QR code pasted on the DX200 in which its serial number, etc. are codified and its circumstantial pictures to the Yaskawa representative at a time. This application enables to send correct information in a short period of time and helps customer to reduce down time accordingly.



## &lt;QR Code Creation Function&gt;

- 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 *section 6.17.5 "Operation Method"*).

[START]  
[HOLD]  
[E.STOP] button  
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.

## &lt;MOTOMAN Touch!&gt;

- Inquire of Yaskawa representative for downloading method of "MOTOMAN Touch!".
- "MOTOMAN Touch!" is not designed to avoid failures or reduce the recovery time.
- When sending data using "MOTOMAN Touch!", set a call center at your Yaskawa representative. Otherwise, reply from Yaskawa may delay.

**6.17.2 Main Function****Main specifications of QR Code Creation function**

Item	Specification
QR Code Data	<ul style="list-style-type: none"> <li>• ALARM (the latest four alarms)</li> <li>• ALARM HISTORY (the latest ten alarms at each alarm) <ul style="list-style-type: none"> <li>MAJOR FAILURE ALARM</li> <li>MINOR FAILURE ALARM</li> <li>USER ALARM (SYSTEM)</li> <li>USER ALARM (USER)</li> <li>OFF-LINE ALARM</li> </ul> </li> <li>• MONITORING TIME <ul style="list-style-type: none"> <li>SYS MONITORING TIME</li> <li>SERVRO POWER TIME</li> <li>PLAYBACK TIME</li> <li>MOVING TIME</li> <li>OPERATING TIME</li> </ul> </li> <li>• HOME POSITION</li> <li>• CURRENT POSITION</li> <li>• SERVO MONITOR</li> </ul> <p>Note: Only "ALARM" and "ALARM HISTORY" data are available in the maintenance mode.</p>
Function	<ul style="list-style-type: none"> <li>• Operations executed by a key <ul style="list-style-type: none"> <li>Display switch ([FWD] or [BWD])</li> <li>Completion of the <ul style="list-style-type: none"> <li>QR Code Creation Function</li> </ul> </li> </ul> </li> <li>• Operations executed by a button on the display <ul style="list-style-type: none"> <li>Display switch ("Next", "Back", or "First".)</li> <li>Completion of the <ul style="list-style-type: none"> <li>QR Code Creation Function</li> </ul> </li> </ul> </li> </ul>
QR Code Format	<ul style="list-style-type: none"> <li>• Format type <ul style="list-style-type: none"> <li>10 to 18 (automatically set according to the number of data)</li> </ul> </li> <li>• Data <ul style="list-style-type: none"> <li>8-bit byte (binary)</li> </ul> </li> <li>• Error correction level <ul style="list-style-type: none"> <li>Level M</li> </ul> </li> <li>• Maximum number of data in a QR code <ul style="list-style-type: none"> <li>560-byte at maximum (when the format type is 18)</li> </ul> </li> </ul>

The QR Code Creation function is applicable from version DN1.52-00 and later.

**Main specifications of “MOTOMAN Touch!”**

Item	Specification
Reading/Displaying of the DX200 serial number, etc.	Read the QR code on the DX200 with the smart phone QR code reader, and then displays the serial number, etc.
Reading/Displaying of the DX200 alarm history, etc.	Read the QR code on the programming with the smart phone QR code reader, and then displays the alarm history, etc.
Picture attachment	Attach circumstantial pictures to an e-mail.
Send mail	Attach above mentioned QR code data and pictures to an e-mail and send it to the in charge call center. (use the mailer)

“MOTOMAN Touch!” is an application which operates in Android 4.0.3 (API level 15) 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.

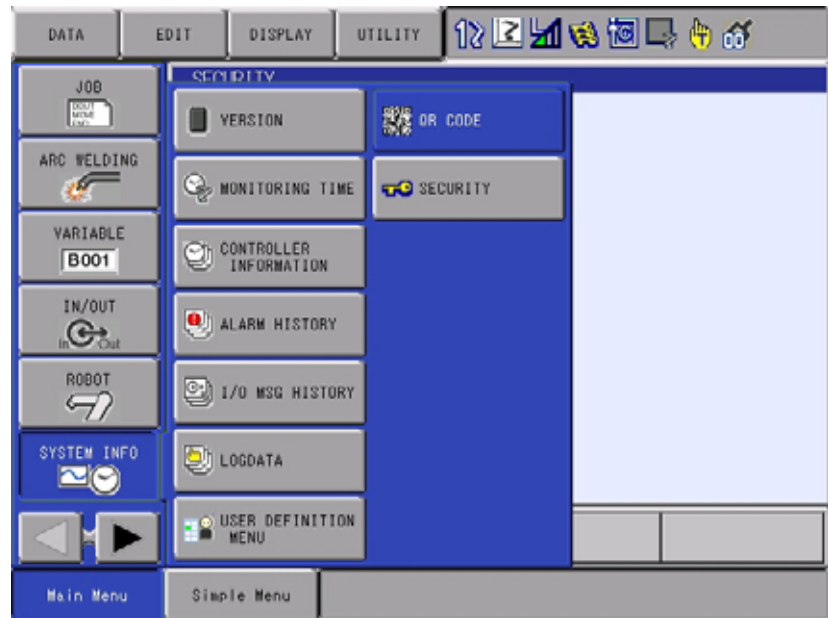
Android is a trademark of Google Inc.



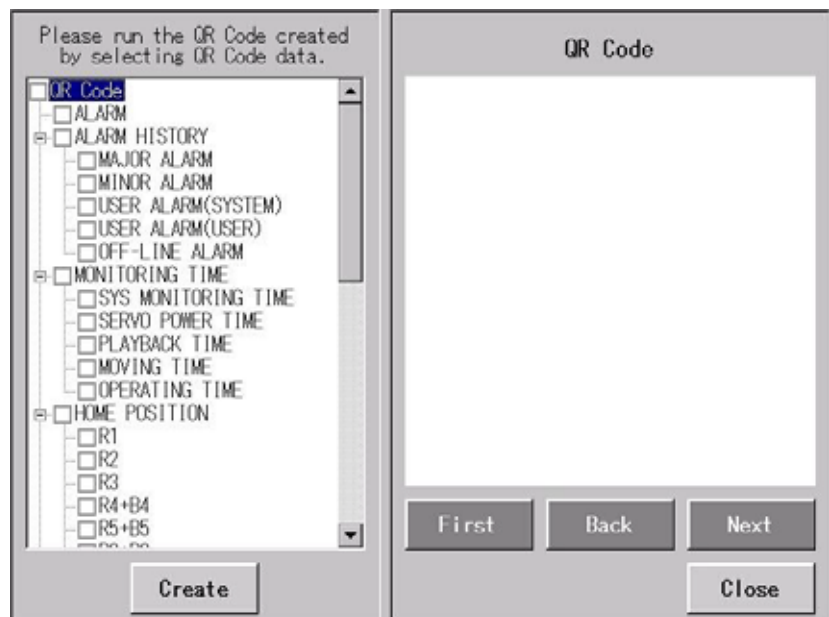
### 6.17.3 QR Code Creation Function Start-Up Method

6.17.3.1 Start-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.



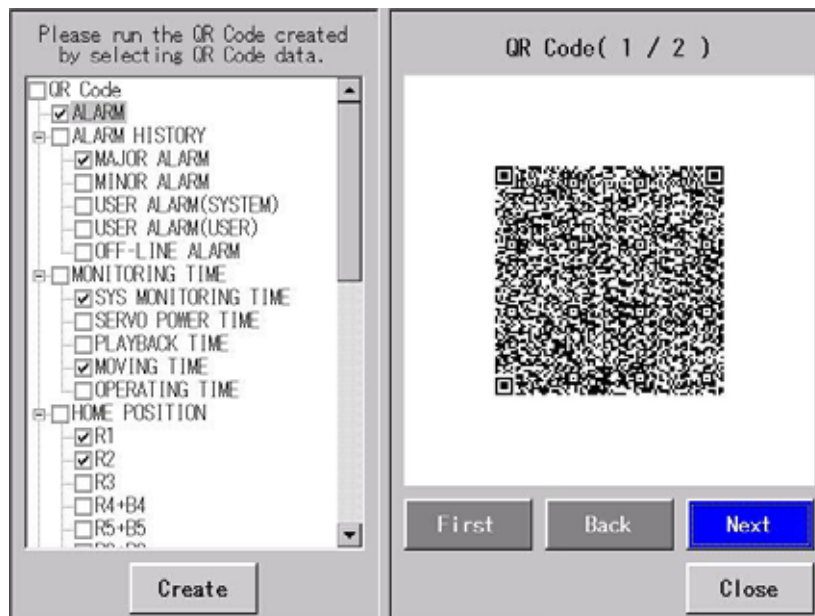
2. Select {QR CODE} from the sub menu.
  - QR CODE Creation function starts up.



## 6 Convenient Functions

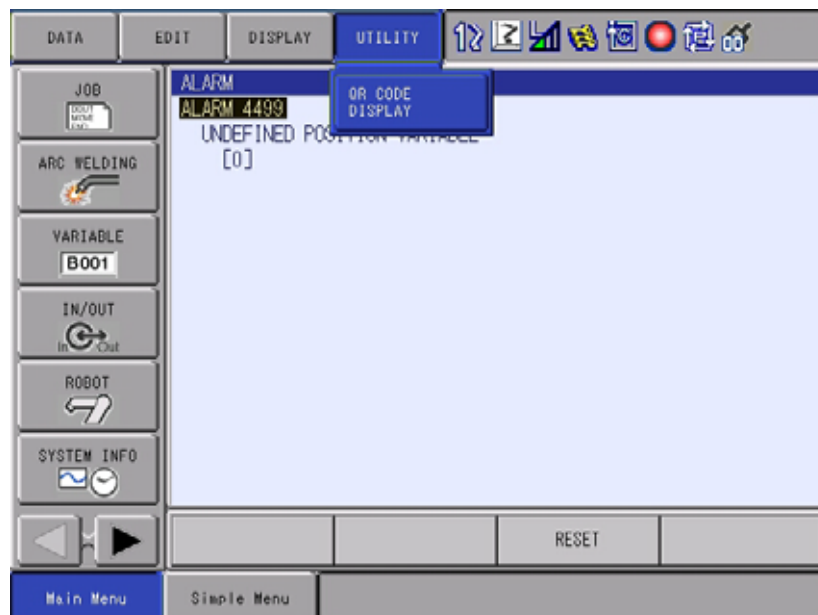
### 6.17 QR Code Creation Function

3. Select data to be codified into a QR code, and then press {Create} button.
  - A QR code appears.

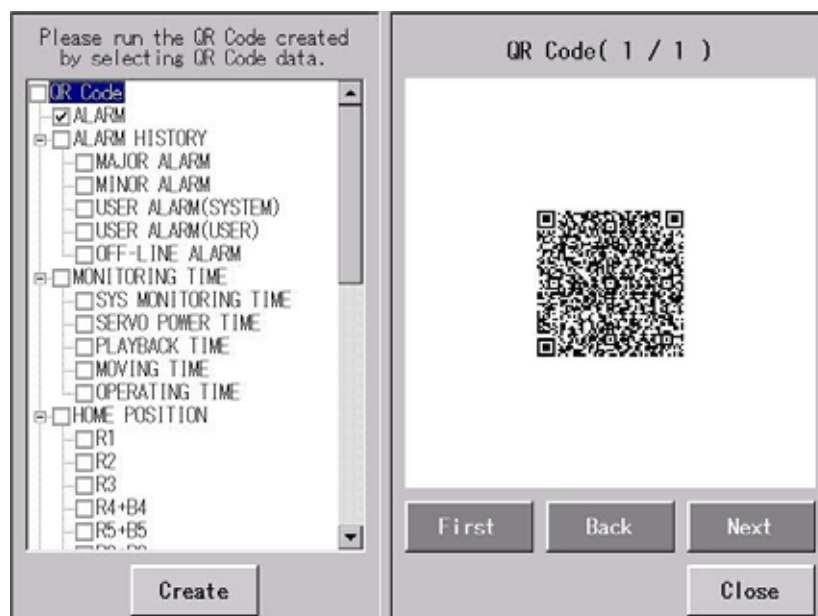


### 6.17.3.2 Start-up the function by selecting {UTILITY} under the pull down menu → {QR CODE DISPLAY}

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.

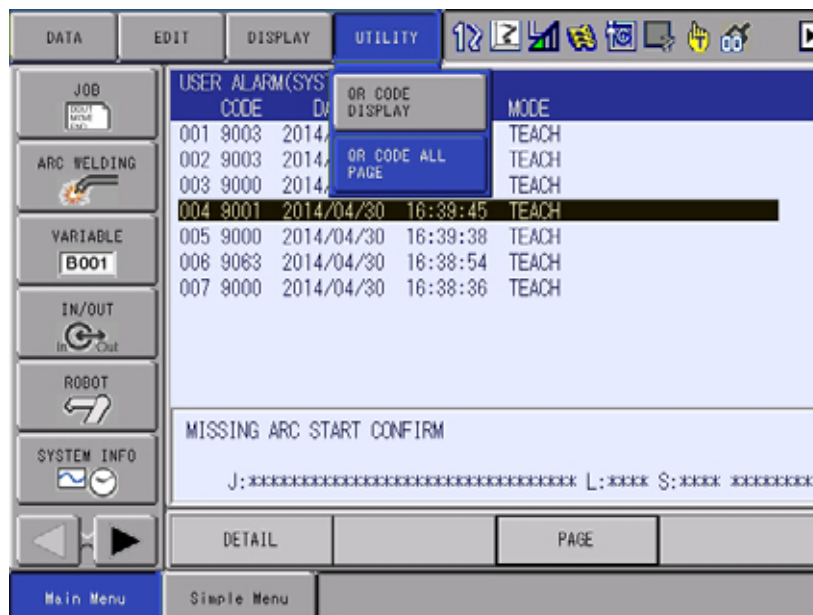


2. Select {QR CODE DISPLAY} from the sub menu.
  - QR CODE Creation function starts up and a QR code of the data displayed on the window appears.

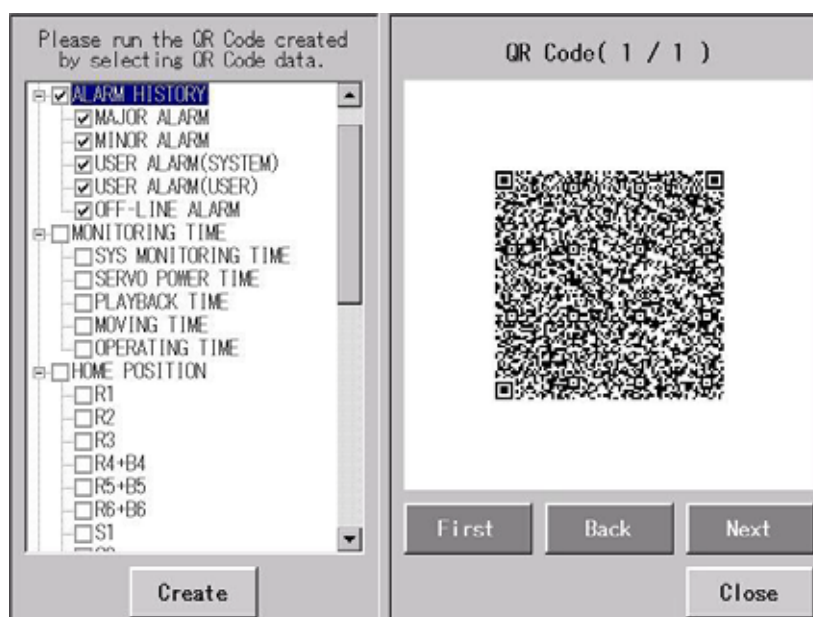


## 6.17.3.3 Start-up the function by selecting {UTILITY} under the pull down menu → {QR CODE ALL PAGE}

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.



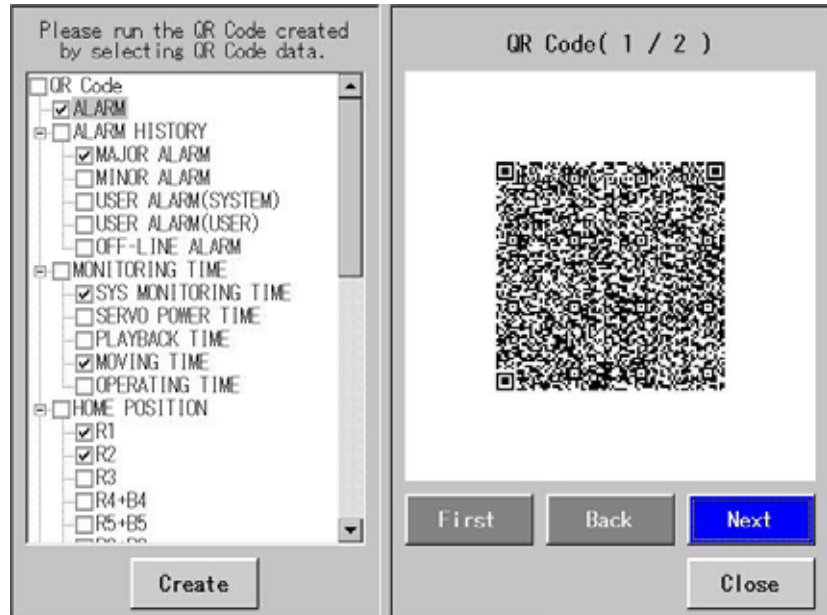
2. Select {QR CODE ALL PAGE} from the sub menu.
  - QR Code Creation function starts up and QR codes of the window on which page switching or display switching is available appear. (when ALARM HISTORY is selected, data for the latest ten alarms at each alarm are created)



### 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



Data for QR code select area

QR code display area

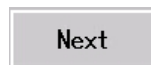
Displaying status of the button varies depending on the ON/OFF of the button function or the shift of the focusing point.

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.

For the above mentioned operation, use programming pendant keys or directly touch the display.

When using the programming pendant keys, following keys are available.

- **Cursor**
  - Shift the area to be focused
- **[SELECT]**
  - When the focus is In the list area of data to be codified into a QR code, select a data to be codified into the QR code
  - When the focus is on {Create}, create a QR code
- **[PAGE]**
  - Display the following QR code one by one (if more than two QR codes are created)
  - Display the previous QR code by pressing [SHIFT] + [PAGE].
- **[AREA]**
  - Shift the area to be focused
- **[CANCEL]**
  - Complete the QR Code Creation Function.

**6.17.5.2 QR Code Display Area**

Display a QR code or switch QR codes one by one.

For the above mentioned operation, use programming pendant keys or directly touch the display.

When using the programming pendant keys, following keys are available.

- **Cursor**
  - Shift the area to be focused
- **[SELECT]**
  - When the focus is on {Return}:  
Display the first QR code
  - When the focus is on {Back} :  
Display the previous QR code
  - When the focus is on {Next} :  
Display the next QR code
  - When the focus is on {Close}:  
Complete the QR Code Creation Function.
- **[PAGE]**
  - Display the following QR code one by one (if more than two QR codes are created)
  - Display the previous QR code by pressing [SHIFT] + [PAGE].

- **[AREA]**
  - Shift the area to be focused
- **[CANCEL]**
  - Complete the QR Code Creation Function.

### 6.17.6 QR Code Structure

#### 6.17.6.1 Basic Structure

The basic structure of a QR code is shown below.

- Data header
- System information
- Data 1

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.

- Data header
- System information
- Data 1

- Data 2

- Data 3

“, (comma)”, “ (space)”, and “(new line character)” are employed 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.

## 6.17.6.2 Data Header

No	Item	Construction
1	Version	??x.xx
2	Year, month, date	YYMMDD
3	Time	HHTT

Note: “?”: any one character, “\*” : any line, “X”: any number

## 1. Version

Structure :“??x.xx”

?? :Version of the controller

If the controller is DX200 , “D2” is indicated.

x.xx :Version of the QR Code Creation function  
(decimal number)

## 2. Year, Month, Date

Structure : “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

Structure : “HHTT”

HH :Hour when the QR code is created

TT :Minute when the QR code is created



## 6.17.6.3 System Information

No	Item	Construction
1	System version	*.x.xx*(*)-xx
2	Parameter version	xx.xx
3	Purpose of system	*

Note: “?”: any single character, “\*” : any line, “X”: any number

## 1. System version

Structure :“.x.xx\*(\*)-xx”

System version number displayed on the version window

## 2. Parameter version

Structure :“xx.xx”

Parameter version number displayed on the version window

## 3. Purpose of system

Structure : “ \* ”

Purpose of system displayed on the version window

## 6.17.6.4 Alarm

Four alarms can be codified into the QR code at maximum in ascending order.

No	Item	Construction
1	Alarm data code	<Alarm>
2	Alarm data	Refer to ■ "Alarm Data".

## 1. Alarm data code

Structure : "<Alarm>"

The first line of the alarm data

## ■ Alarm Data

No	Item	Construction
1	Alarm number	xxxx
2	Sub code	*
3	Information about options	*
4	Date of alarm occurrence	YYYY/MM/DD
5	Time of alarm occurrence	HH:TT:SS

Note: "?": any single character, "\*": any line, "X": any number

## 1. Alarm number

Structure : "xxxx"

Alarm number

## 2. Sub code

Structure : " \* "

Sub code

Only the inverted characters are displayed if there are.

Example: Sub code

```
ALARM 4414 TASK#2
EXCESSIVE SEGMENT
[R1:HIGH SLURBT]
```

[R1 : HIGH : RT]

## 3. Information about options

Structure : " \* "

Sub code

Information about options

## 6 Convenient Functions

### 6.17 QR Code Creation Function

#### 4. Date of alarm occurrence

Structure :“ YYYY/MM/DD”

Date when the alarm occurred

#### 5. Time of alarm occurrence

Structure :“ HH:TT:SS”

Time when the alarm occurred

#### 6.17.6.5 Alarm History

The latest ten alarms, in the order of registration, for each alarm can be codified.

No	Item	Construction
1	Alarm history data code	<ALARM HISTORY>
2	Major failure alarm code	MAJYOR
3	Major failure alarm data	Refer to ■ "Alarm Data".
4	Minor failure alarm code	MINOR
5	Minor failure alarm data	Refer to ■ "Alarm Data".
6	User alarm (system) code	IO_SYS
7	User alarm (system) data	Refer to ■ "Alarm Data".
8	User alarm (user) code	IO_USR
9	User alarm (user) data	Refer to ■ "Alarm Data".
10	OFF line alarm code	OFFLINE
11	OFF line alarm data	Refer to ■ "Alarm Data".

#### 1. Alarm history data code

Structure :“ <ALARM HISTORY>”

The first line of the alarm history data

#### 2. Major failure alarm code

Structure :“ <MAJOR>”

The first line of the major failure alarm data

#### 4. Minor failure alarm code

Structure :“ <MINOR>”

The first line of the minor failure alarm data

#### 6. User alarm (system) code

Structure :“ IO\_SYS”

The first line of the user (system) alarm data

#### 8. User alarm (user) code

Structure :“ IO\_USR”

The first line of the user (user) alarm data

#### 10. OFF line alarm code

Structure :“ OFFLINE”

The first line of the OFF line alarm data

### ■ Alarm History Data

Following shows the structure of the alarm history data (one line).

No	Item	Construction
1	Alarm number	xxxx
2	Sub code	*
3	Mode	*
4	Information about options	*
5	Date of alarm occurrence	YYYY/MM/DD
6	Time of alarm occurrence	HH:TT:SS

Note: “?”: any single character, “\*” : any line, “X”: any number

#### 1. Alarm number

Structure :“xxxx”

Alarm number

#### 2. Sub code

Structure :“ \* ”

Sub code

Only the inverted characters are displayed if there are.

Example: Sub code

```
ALARM 4414 TASK#2
EXCESSIVE SEGMENT
[R1:HIGH SLURBT]
```

[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

No	Item	Construction
1	Monitoring time data code	<MONITORING TIME>
2	System monitoring time code	SYS MONITORING TIME
3	System monitoring time data	Refer to ■ "System Monitoring Time Data".
4	Servo power time code	SERVO POWER TIME
5	Servo power time data	Refer to ■ "Data for Servo Power Time, Play Back Time and Moving Time".
6	Play back time code	PLAY BACK
7	Play back time data	Refer to ■ "Data for Servo Power Time, Play Back Time and Moving Time".
8	Moving time code	MOVING TIME
9	Moving time data	Refer to ■ "Data for Servo Power Time, Play Back Time and Moving Time".
10	Operating time code	OPERATING TIME
11	Operating time data	Refer to ■ "Data for Servo Power Time, Play Back Time and Moving Time".

## 1. Monitoring time data code

Structure : "&lt;MONITORING TIME&gt;"

The first line of the monitoring time data

## 2. System monitoring time code

Structure : "SYSTEM MONITORING TIME"

The first line of the system monitoring time data

## 4. Servo power time code

Structure : "SERVO POWER TIME"

The first line of the servo power time data

## 6. Play back time code

Structure : "PLAYBACK TIME"

The first line of the play back time data

## 8. Moving time code

Structure : "MOVING TIME"

The first line of the moving time data

## 10. Operating time code

Structure : "OPERATING TIME"

The first line of the operating time data

### ■ System Monitoring Time Data

Following shows the structure of the system monitoring time data (one line).

No	Item	Construction
1	Item code	*
2	Starting date of measurement	YY/MM/DD
3	Starting time of measurement	HH:TT
4	Elapsed time	xxxx:xx'xx

Note: “?”: any single character, “\*” : any line, “X”: any number

#### 1. Item code

Structure :“ \* ”

CONTROL POWER

SERVO POWER

PLAYBACK TIME

MOVING TIME

OPERATING TIME

ENERGY TIME

#### 2. Starting date of measurement

Structure :“YY/MM/DD”

Date when the measurement is started

#### 3. Starting time of measurement

Structure :“HH:TT”

Time when the measurement is started

#### 4. Elapsed time

Structure :“xxxx: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 structure of the servo power time data, play back time data and moving time data (one line).

No	Item	Construction
1	Control group	*
2	Starting date of measurement	YY/MM/DD
3	Starting time of measurement	HH:TT
4	Elapsed time	xxxxx:xx'xx

Note: “?”: any single character, “\*” : any line, “X”: any number

1. Control group

Structure :“ ?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

Structure :“YY/MM/DD”

Date when the measurement is started

3. Starting time of measurement

Structure :“HH:TT”

Time when the measurement is started

4. Elapsed time

Structure :“xxxxx:xx'xx”

Elapsed time since the measurement is started  
(do not use “0”.)

### ■ Operating Time Data

No	Item	Construction
1	Purpose of operation	*
2	Starting date of measurement	YY/MM/DD
3	Starting time of measurement	HH:TT
4	Elapsed time	xxxxx:xx'xx

Note: “?”: any single character, “\*” : any line, “X”: any number

#### 1. Purpose of operation

Structure :“ \* ”

Purpose of this operation

(Setting is unnecessary if the control group does not exist in the system.)

#### 2. Starting date of measurement

Structure :“YY/MM/DD”

Date when the measurement is started

#### 3. Starting time of measurement

Structure :“HH:TT”

Time when the measurement is started

#### 4. Elapsed time

Structure :“xxxxx:xx'xx”

Elapsed time since the measurement is started  
(do not use “0”.)



## 6.17.6.7 Home Position

No	Item	Construction
1	Home position data code	<HOME POSITION>
2	Home position data	Refer to ■ "Home Position Data".

## 1. Home position data code

Structure :“ <HOME POSITION>”

The first line of the home position data

## ■ Home Position Data

Following shows the structure of the home position data (one line).

No	Item	Construction
1	Control group (robot /station)	?xx
2	Axis name 1 to 8 : Absolute data 1 to 8	?:-xxxxx . . .
3	Control group (base)	?xx
4	Axis name 1 to 8 :Absolute data 1 to 8	?:-xxxxx . . .

Note: “?”: any single character, “\*” : any line, “X”: any number

## 1. Control group (robot / station)

Structure :“ ?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

Structure :“ ?:-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)

Structure :“ ?xx ”

Control group

Base :B1 to B8

(Setting is unnecessary if this control group does not exist in the system.)

## 4. Axis name: Absolute data

Structure :“ ?:-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

No	Item	Construction
1	Current position data code	<CURRENT POSITION>
2	Current position data	Refer to ■ "Current Position Data (Pulse coordinate)" and section 6.8.2 "Teaching Condition Setting".

## 1. Current position data code

Structure :“ &lt;CURRENT POSITION&gt; ”

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 structure of the current position data (one line).

No	Item	Construction
1	Coordinate	*
2	Tool	TOOL:xx
3	Control group (robot / station)	?xx
4	Axis name 1 to 8 :Absolute data 1 to 8	?:-xxxxx . . .
5	Control group (base)	?xx
6	Axis name 1 to 8 :Absolute data 1 to 8	?:-xxxxx . . .

Note: “?”: any single character, “\*” : any line, “X”: any number

## 6 Convenient Functions

### 6.17 QR Code Creation Function

#### 1. Coordinate

Structure :“ \* ”

\* :PULSE (pulse coordinate)

#### 2. Tool

Structure :“ TOOL:xx”

xx :00 to 63 (tool number)

#### 3. Control group (robot / station)

Structure :“ ?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

Structure :“ ?:-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)

Structure :“ ?xx ”

Base :B1 to B8

(Setting is unnecessary if this control group does not exist in the system.)

#### 6. Axis name: Current position data

Structure :“ ?:-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

■ **Current Position Data (Base / user / robot coordinate)**

Following shows the structure of the current position data (base / user / robot coordinate (one line)).

No	Item	Construction
1	Coordinate	*
2	Tool	TOOL:xx
3	Control group (robot)	?xx
4	X-axis coordinate	X:-xxx.xxxmm
5	Y-axis coordinate	Y:-xxx.xxxmm
6	Z-axis coordinate	Z:-xxx.xxxmm
7	Rx angle	Rx:-xxx.xxxxdeg.
8	Ry angle	Ry:-xxx.xxxxdeg.
9	Rz angle	Rz:-xxx.xxxxdeg.
10	Re angle (7-axis robot)	Re:-xxx.xxxxdeg.
11	Figure (front or back)	*.*
12	Figure (up or down)	*.*
13	Figure (flip or no flip)	*.*
14	X0-axis coordinate (base)	X0:-xxx.xxxmm
15	Y0-axis coordinate (base)	Y0:-xxx.xxxmm
16	Z0-axis coordinate (base)	Z0:-xxx.xxxmm

Note: "?": any single character, "\*" : any line, "X": any number

1. Item code

Structure : " \* "

\* :ROBOT (robot coordinate)  
:BASE (base coordinate)  
:USER#1 to USER#63 (user coordinate)

2. Tool

Structure : "TOOL:xx"

xx :00 to 63 (tool number)

3. Control group

Structure : "?xx"

Control group

Robot :R1 to R8

(Setting is unnecessary if this control group does not exist in the system.)

4. X-axis coordinate

Structure : " 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

Structure : "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

Structure : "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

Structure : "Rx:-xxx.xxxdeg."

-           :- (minus sign)

(Setting is unnecessary if the data is not a negative data.)

xxx.xxx · · ·:Current position data (unit: deg)

#### 8. Ry angle

Structure : "Ry:-xxx.xxxdeg."

-           :- (minus sign)

(Setting is unnecessary if the data is not a negative data.)

xxx.xxx · · ·:Current position data (unit: deg)

#### 9. Rz angle

Structure : "Rz:-xxx.xxxdeg."

-           :- (minus sign)

(Setting is unnecessary if the data is not a negative data.)

xxx.xxx · · ·:Current position data (unit: deg)

#### 10. Re angle

Structure : "Re:-xxx.xxxdeg."

-           :- (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)

Structure : " \*.\*"

\*           :FRONT

            :REAR

\*           :S<180

            :S>=180

## 12. Figure (up or down)

Structure :“ \*.\*”

\* :UP  
DOWN  
\* :R<180  
:R>=180

xxx.xxx· · :Current position data (unit: deg)

## 13. Figure (flip or no flip)

Structure :“ \*.\*”

\* :FLIP  
NO FLIP  
\* :T<180  
:T>=180

xxx.xxx· · :Current position data (unit: deg)

## 14. X0-axis coordinate

Structure :“ X0:-xxx.xxxmm”

- :- (minus sign)

(Setting is unnecessary if the data is not a negative data.)

xxx.xxx· · :Current position data (unit: deg)

## 15. Y0-axis coordinate

Structure :“ Y0:-xxx.xxxmm”

- :- (minus sign)

(Setting is unnecessary if the data is not a negative data.)

xxx.xxx· · :Current position data (unit: deg)

## 16. Z0-axis coordinate

Structure :“ Z0:-xxx.xxxmm”

- :- (minus sign)

(Setting is unnecessary if the data is not a negative data.)

xxx.xxx· · :Current position data (unit: deg)

## 6.17.6.9 Servo Monitor

No	Item	Construction
1	Servo monitor data code	<SERVO MONITOR>
2	Feedback pulse code	FEEDBACK PULSE
3	Feedback pulse data	Refer to ■ "Servo Monitor Data".
4	Error pulse code	ERROR PULSE
5	Error pulse data	Refer to ■ "Servo Monitor Data".
6	Speed deviation code	SPEED DEVIATION
7	Speed deviation data	Refer to ■ "Servo Monitor Data".
8	Speed instruction code	SPEED INST
9	Speed instruction data	Refer to ■ "Servo Monitor Data".
10	Speed feedback code	FEEDBACK SPEED
11	Speed feedback data	Refer to ■ "Servo Monitor Data".
12	Torque instruction code	TORQUE SPEC
13	Torque instruction data	Refer to ■ "Servo Monitor Data".
14	Maximum torque code	MAX TORQUE
15	Maximum torque data	Refer to ■ "Servo Monitor Data".
16	Encoder accumulative rotation code	ENCODER ROTATE SUM
17	Encoder accumulative rotation data	Refer to ■ "Servo Monitor Data".
18	Position code in 1 turn	IN 1 TURN POSITION
19	Position data in 1 turn	Refer to ■ "Servo Monitor Data".
20	Motor absolute value code	MOTOR ABSOLUTE
21	Motor absolute value data	Refer to ■ "Servo Monitor Data".
22	Encoder temperature code	ENCODER TEMP.
23	Encoder temperature data	Refer to ■ "Servo Monitor Data".
24	Maximum torque (constant speed) code	MAX TRQ (CONST)
25	Maximum torque (constant speed) data	Refer to ■ "Servo Monitor Data".
26	Minimum torque (constant speed) code	MIN TRQ (CONST)
27	Minimum torque (constant speed) data	Refer to ■ "Servo Monitor Data".
28	Motor torque load ratio code	MOTOR DUTY CYCLE
29	Motor torque load ratio data	Refer to ■ "Servo Monitor Data".
30	Load ratio measure time code	MEASURE TIME DUTY
31	Load ratio measure time data	Refer to ■ "Servo Monitor Data".

## 6 Convenient Functions

### 6.17 QR Code Creation Function

1. Servo monitor data code
  - Structure : "<SERVO MONITOR>"
  - The first line of the servo monitor data
2. Feedback pulse code
  - Structure : "FEEDBACK PULSE"
  - The first line of the feedback pulse data
4. Error pulse code
  - Structure : "ERROR PULSE"
  - The first line of the error pulse data
6. Speed deviation code
  - Structure : "SPEED DEVIATION"
  - The first line of the speed deviation data
8. Speed instruction code
  - Structure : " SPEED INST"
  - The first line of the speed instruction data
10. Speed feedback code
  - Structure : "FEEDBACK SPEED "
  - The first line of the speed feedback data
12. Torque instruction code
  - Structure : "TORQUE SPEC"
  - The first line of the torque instruction data
14. Maximum torque code
  - Structure : "MAX TORQUE"
  - The first line of the maximum torque data
16. Encoder accumulative rotation code
  - Structure : "ENCODER ROTATION SUM"
  - The first line of the encoder accumulative rotation data
18. Position code in 1 turn
  - Structure : "IN 1 TURN POSITION"
  - The first line of the position data in 1 turn
20. Motor absolute value code
  - Structure : "MOTOR ABSOLUTE"
  - The first line of the motor absolute value data
22. Encoder temperature code
  - Structure : "ENCODER TEMP."
  - The first line of the encoder temperature data
24. Maximum torque (constant speed) code
  - Structure : "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

Structure :“MIN TRQ(CONST)”

The first line of the minimum torque (constant speed) data

#### 28. Motor torque load ratio code

Structure :“MOTOR DUTY CYCLE”

The first line of the motor torque load ratio data

#### 30. Load ratio measure time code

Structure :“MEASURE TIME DUTY”

The first line of the load ratio measure time data

### ■ Servo Monitor Data

Following shows the structure of the servo monitor (one line).

No	Item	Construction
1	Control group (robot / station)	?xx
2	Axis name 1 to 8 :Servo monitor data 1 to 8	?:-xxxxx . . .
3	Control group (base)	?xx
4	Axis name 1 to 8 :Servo monitor data 1 to 8	?:-xxxxx . . .

Note: “?”: any single character, “\*”: any line, “X”: any number

#### 1. Control group (robot / station)

Structure :“ ?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

Structure :“ ?:-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)

Structure :“ ?xx ”

Base :B1 to B8

(Setting is unnecessary if this control group does not exist in the system.)

#### 6. Axis name: Servo monitor data

Structure :“ ?:-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

### 6.17.7 MOTOMAN Touch!

#### 6.17.7.1 Installing Method of MOTOMAN Touch! (In case downloading from Google Play is not available)

1. Connect a smart phone to the PC using an USB cable.
2. Start Explorer on the PC, and then copy “MOTOMAN Touch.apk” file and paste it in the “Download” folder on the smart phone (refer to Fig. 6-7).
3. Tap the Download folder in the file manger of the smart phone (refer to Fig. 6-8).
4. Tap “MOTOMAN Touch.apk” (refer to Fig. 6-9).
5. Tap {Settings} when “Install blocked” dialog box appeared (refer to Fig. 6-10).

Fig. 6-7:

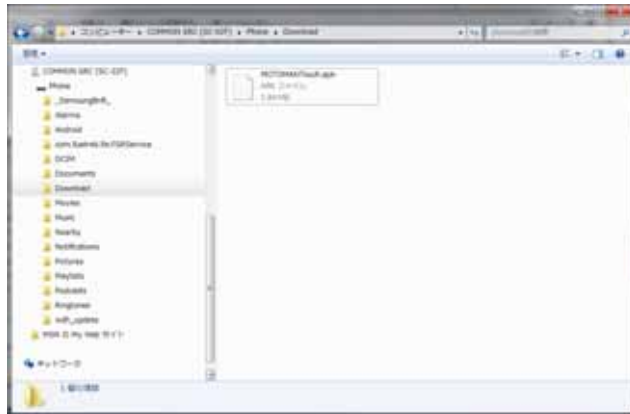


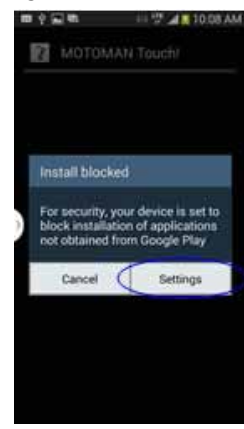
Fig. 6-8:



Fig. 6-9:

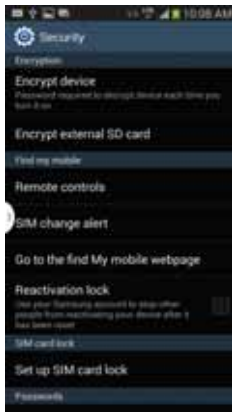
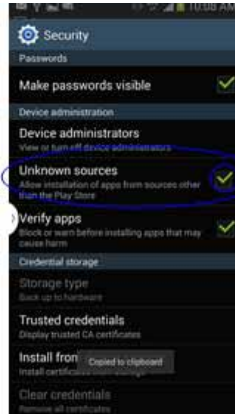
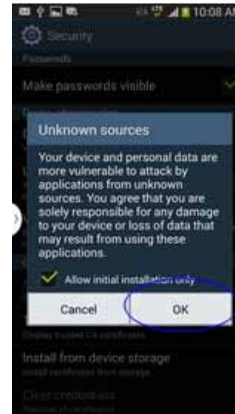
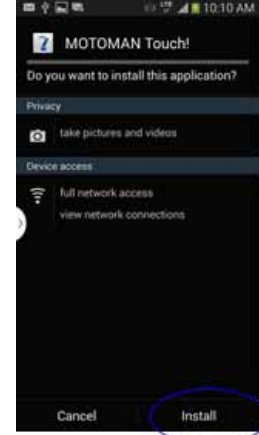


Fig. 6-10:



**Setting of “apk file” install permission to smart phone  
→permit install**

1. Scroll to find “Security” screen and then check “Unknown sources” (refer to *Fig. 6-11* and *Fig. 6-12*).
2. Tap {OK} on the “Unknown sources” dialog box (refer to *Fig. 6-13*).
3. Tap {Install} (refer to *Fig. 6-14*).

*Fig. 6-11:**Fig. 6-12:**Fig. 6-13:**Fig. 6-14:*

## 6.17.7.2 Start-Up MOTOMAN Touch! Application

1. Tap “MOTOMAN Touch!” icon.
2. “Software License Agreement” screen appears at the first start-up. Confirm it and tap {Agree} (refer to *Fig. 6-15*).
3. “MOTOMAN Touch!” log-in screen appears. Tap {Use without log-in} (refer to *Fig. 6-16*).

 <span style="font-size: 24px; font-weight: bold; margin-left: 10px;">CAUTION</span>
<ul style="list-style-type: none"> <li>• Log-in function is not available yet.</li> </ul>

4. “MOTOMAN Touch!” home screen appears (refer to *Fig. 6-17*).

– Basic operation



- To return to the previous screen, press return button  on the smart phone.
- To return to the “MOTOMAN Touch!” home screen, tap the robot icon  on the screen.

Fig. 6-15:

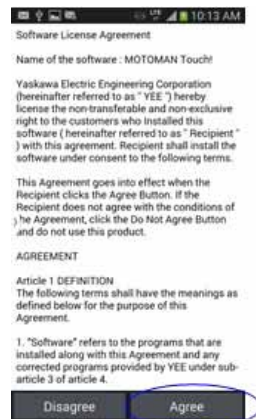


Fig. 6-16:

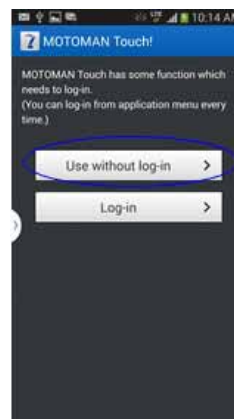
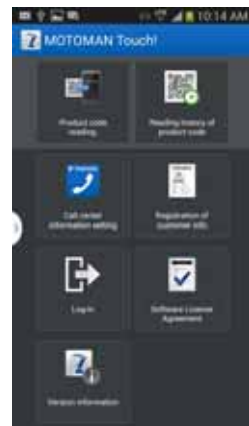


Fig. 6-17:



## 6.17.7.3 Setting of Call Center

Initially set a call center as a destination of the e-mail. This setting is necessary for the use of “MOTOMAN Touch!”.

The e-mail created with “MOTOMAN Touch!” application is sent to this call center.




1. Tap “Call center information setting”  on the “MOTOMAN Touch!” home screen (refer to Fig. 6-17).
2. Tap the pen mark  at the very bottom of the "Call Center Information" screen (refer to Fig. 6-18).
3. Tap the vacant box next to “Country” on the "Call Center Select" screen (refer to Fig. 6-19).
4. Select a country where the user is (refer to Fig. 6-20).
5. Choose and tap your Yaskawa representative on “Company/Office” screen (refer to Fig. 6-21).
6. The screen returns to “MOTOMAN Touch!” home screen and shows the details of the Yaskawa representative the customer has chosen (refer to Fig. 6-22).
7. To return to “MOTOMAN Touch!” home screen, press return button  on the smart phone (refer to Fig. 6-23).

Fig. 6-18:

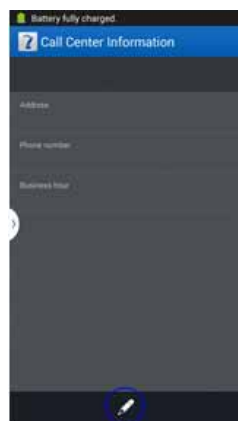


Fig. 6-19:

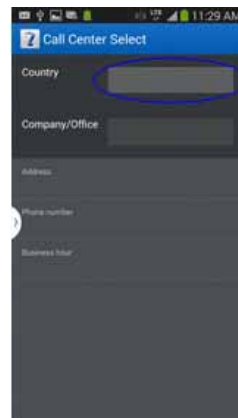


Fig. 6-20:

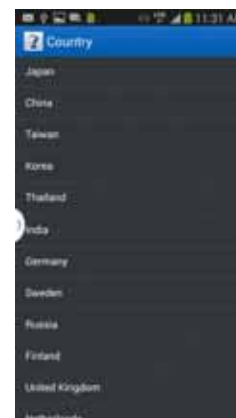


Fig. 6-21:

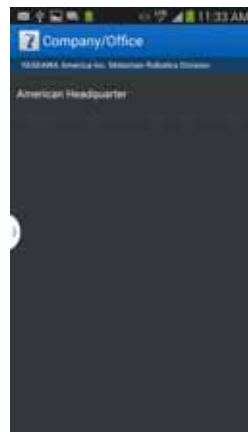


Fig. 6-22:

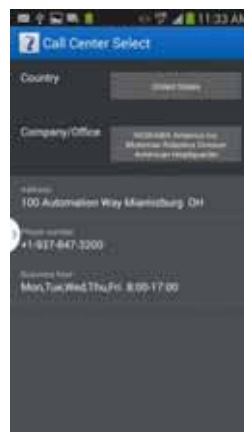
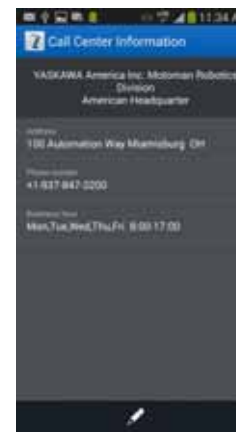




Fig. 6-23:




## 6.17.7.4 Registration of Customer Information

Initially set the corresponding information. To the e-mail address set in this chapter, a reply mail is returned from the call center to which the customer has sent the QR code information. In this consequence, set the information correctly.

1. Tap {Registration of Customer Info}  on the “MOTOMAN Touch!” home screen (refer to *Fig. 6-17*).
2. Input data to “Company name”, “Address”, “Post Code”, “Country”, and “Name” (refer to *Fig. 6-25*).
3. Tap the check mark  at the bottom of the screen (refer to *Fig. 6-26*).



## CAUTION

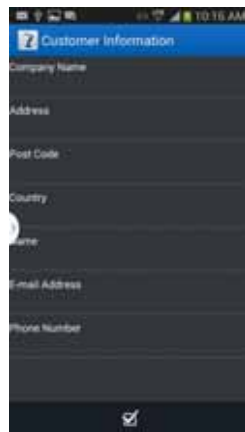
- Tap the check mark  to save the input customer information to the smart phone memory.

To confirm the saved customer information, return to the “MOTOMAN Touch!” home screen, and then tap {Registration of Customer Info}

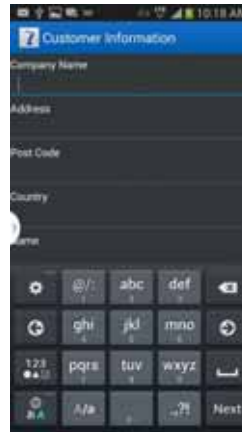


(refer to *Fig. 6-26*).

*Fig. 6-24:*



*Fig. 6-25:*





*Fig. 6-26:*





## 6.17.7.5 Reading of Product Code

This function reads the QR code pasted on the DX200. Setting of this function is necessary for the use of “MOTOMAN Touch!”.

1. Tap {Product code reading}  on the “MOTOMAN Touch!” home screen (refer to *Fig. 6-17*).
2. Start the camera function of the “MOTOMAN Touch!” (refer to *Fig. 6-27*). Focus the QR code on the DX200 so that it is captured in the red square.



## CAUTION

- Use zoom  or flash  function in accordance with the imaging condition.  
If the image is not appropriately auto focused, touch the QR code in the screen to adjust the focus.


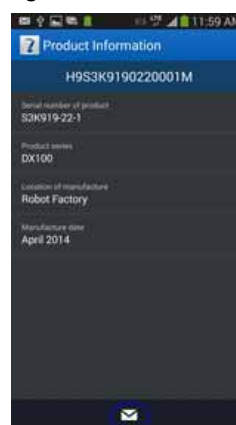
3. When the QR code is successfully captured, “Serial number of product” appears on “Product Information” screen (refer to *Fig. 6-28*). Tap the mail button  and proceed to the step described in *section 6.17.7.7 “Inquiry Mail”*.

Fig. 6-27:





Fig. 6-28:






## 6.17.7.6 Calling Up of the Product Code

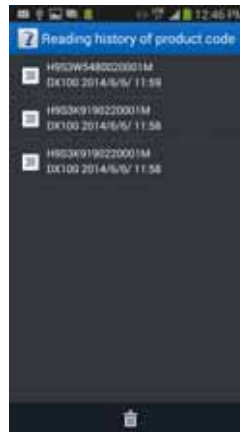
Up to 100 QR codes can be called up again on “Reading history of product code” screen.

1. Tap {Reading history of product code} on the “MOTOMAN Touch!” home screen  (refer to *Fig. 6-17*).
2. Tap the desired QR code on “Reading history of product code” screen (refer to *Fig. 6-29*) to see the serial number of the product (refer to *Fig. 6-28*).
3. Tap the mail button  and proceed to the next step (*section 6.17.7.7 “Inquiry Mail”*).

**CAUTION**

- To delete all the history, tap the deleting button  at the bottom of the screen. Please be careful that the deleted history data is never restored again.

*Fig. 6-29:*



## 6.17.7.7 Inquiry Mail

After reading the QR code of the product, user can choose attaching data and send an e-mail to the customer's call center on this screen (refer to Fig. 6-30).

1. {Add controller data (Read the QR code)}  
With this button, reading of the DX200 QR code displayed on the programming pendant window and sending of the code by attaching to an e-mail are available.  
(In this case, this code is not left in the creation history.)
2. {Attach photo}  
Attaching of pictures already taken by the smart phone to an e-mail is available. Tap this button to open the photo gallery and select desired pictures one by one. It is not possible to select all the desired pictures at a time.
3. {e-mail sending}  
This button enables to send a QR code of a product to the customer's call center. If the DX200 QR code and pictures are already selected, they are also sent as attachments.  
There are three ways of accessing methods to the call center.

■ **{QR code transmission only}:  
Send an inquiry e-mail**

This method is employed if corresponding with the call center through phone call is already started. The QR code information is sent as supplementary information.

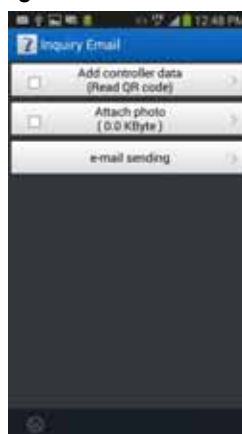
■ **{QR code transfer and incoming call}:  
Make a phone call to the call center after sending an inquiry e-mail**

This method is employed if the customer is planning to make an inquiry phone call to the call center after sending the e-mail.


■ **{Call back request with QR code}:  
Require a phone call from the call center after sending an inquiry e-mail**

This method is employed if the customer requires a reply call from the call center after sending the e-mail.



Fig. 6-30:





## 6.17.7.8 Sending Method of Controller Data

1. Tap {Add controller data (Read the QR code)} on the "Inquiry Email" screen (refer to *Fig. 6-30*).
2. "QR codes that has already been read" screen appears and those QR codes are displayed (Refer to *Fig. 6-31*). No codes are displayed at the beginning.
3. Tap camera button .
4. The camera function starts (refer to *Fig. 6-32*). Focus the QR code on the programming pendant so that it is captured in the red square.

**CAUTION**

- Use zoom  or flash  function in accordance with the imaging condition.  
If the image is not appropriately auto focused, touch the QR code in the screen to adjust the focus.

5. When the QR code is successfully captured, the product information appears on {Controller Data} screen (refer to *Fig. 6-33*).
6. Repeat the above mentioned step 3  to take more than two codes (refer to *Fig. 6-34*).
7. After all the codes are read, tap the complete button  (refer to *Fig. 6-34*).
8. "Inquiry Email" screen appears again. The box on the left side of {Add controller data (Read the QR code)} button is checked to report that reading of all the codes are complete (refer to *Fig. 6-35*).

6 Convenient Functions  
6.17 QR Code Creation Function

Fig. 6-31:

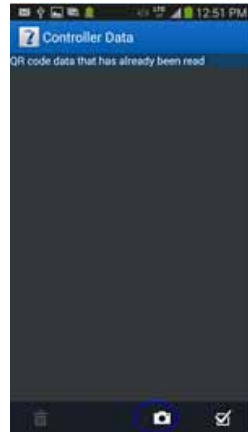


Fig. 6-32:



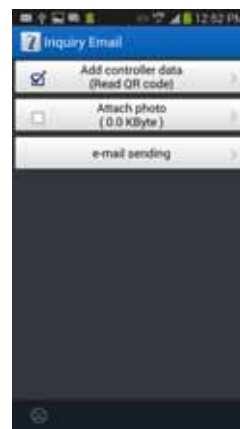
Fig. 6-33:



Fig. 6-34:



Fig. 6-35:



## 6.17.7.9 Attaching Method of Picture


1. Tap {Attach photo} on "Inquiry Email" screen (refer to *Fig. 6-30*).
2. Select {Gallery} on the application selecting screen (refer to *Fig. 6-36*).
3. Tap to choose desired pictures in the photo gallery (refer to *Fig. 6-37*). Only one picture is chosen to attach at a time, therefore, to choose more than two desired pictures, return to "Inquiry Email" screen (refer to *Fig. 6-38*) and tap a desired one each time choosing the picture.
4. Total memory capacity of the pictures chosen is indicated at the bottom of {Attach photo} button (refer to *Fig. 6-38*).
5. Tap the cancellation button  when cancelling the attached photos.

Fig. 6-36:

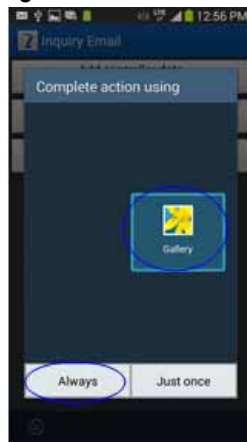


Fig. 6-37:



Fig. 6-38:



## 6.17.7.10 Sending an E-Mail: Transmission type (QR code transmission only)

1. Tap {e-mail sending} on "Inquiry Email" screen (refer to Fig. 6-30).
2. Select {QR code transmission only} on the "Transmission type" dialog box, and then tap {OK} (refer to Fig. 6-39).

**(Supplementary Explanation)**

From the next time, the "Transmission type" selected in this step is repeatedly and automatically selected.

3. Tap {OK} on "e-mail sending" screen (refer to Fig. 6-40).

**(Supplementary Explanation)**

On this screen, the transmission type can be selected by not only tapping {OK}, but also by tapping the indication, {QR code transmission only}.

Furthermore, by tapping the indication of the call center, which is right below the "e-mail address", customer can change the e-mail sending address.

4. Select a mailer on "e-mail sending" screen, here, tap {Gmail} as an example (refer to Fig. 6-41).
5. The selected mailer starts-up, title of the {QR code transmission only} mail and QR code information are posted to this mail, and the selected pictures are attached. Also, the customer information registered on {Registration of Customer Info} screen is posted at the end of the mail (refer to Fig. 6-42).
6. The e-mail is finally sent out with some messages if any.

Gmail is a trademark of Google Inc.

Fig. 6-39:

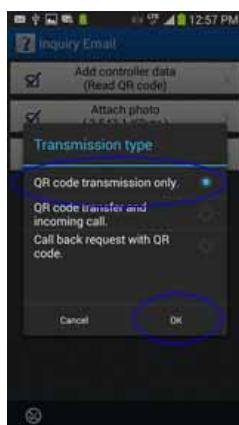


Fig. 6-40:



Fig. 6-41:



Fig. 6-42:



## 6.17.7.11 Sending an E-Mail: Transmission type (QR code transfer and incoming call)

1. Tap {e-mail sending} on "Inquiry Email" screen (refer to Fig. 6-30).
2. Select {QR code transfer and incoming call} on the "Transmission type" dialog box, and then tap {OK} (refer to Fig. 6-39).

**(Supplementary Explanation)**

From the next time, the "Transmission type" selected in this step is repeatedly and automatically selected.

3. Tap {OK} on "e-mail sending" screen (refer to Fig. 6-43).

**(Supplementary Explanation)**

On this screen, the transmission type can be selected by not only tapping {OK}, but also by tapping the indication, {QR code transfer and incoming call}.

Furthermore, by tapping the indication of the call center, which is right below the "e-mail address", customer can change the e-mail sending address. This modification is reflected to the call center information. And the newly selected e-mail address appears prior to other addresses from the next time.


4. Select a mailer on "e-mail sending" screen, here, tap {Gmail} as an example (refer to Fig. 6-41).
5. The selected mailer starts-up, title of the {QR code transfer and incoming call} mail and QR code information are posted to this mail, and the selected pictures are attached. Also, the customer information registered on {Registration of Customer Info} screen is posted at the end of the mail (refer to Fig. 6-41).
6. The e-mail is finally sent out with some messages if any.
7. When the screen returns to "e-mail sending" screen (refer to Fig. 6-43) after the e-mail is successfully sent, tap a telephone number indicated right below "Phone number of call center".
8. Select a telephone application (refer to Fig. 6-44). Here, tap {Dial}.
9. The call center phone number is posted to the dial application. Tap the call button  to make a phone call (refer to Fig. 6-45).

Fig. 6-43:



Fig. 6-44:



Fig. 6-45:



## 6.17.7.12 Sending an E-Mail :Transmission type (Call back request with QR code)

1. Tap {e-mail sending} on "Inquiry Email" screen (refer to Fig. 6-30).
2. Select {Call back request with QR code} on the "Transmission type" dialog box, and then tap {OK} (refer to Fig. 6-39).

**(Supplementary Explanation)**

From the next time, the "Transmission type" selected in this step is repeatedly and automatically selected.

3. Tap {OK} on "e-mail sending" screen (refer to Fig. 6-46).

**(Supplementary Explanation)**

On this screen, the transmission type can be selected by not only tapping {OK}, but also by tapping the indication, {Call back request with QR code}.

Furthermore, by tapping the indication of the call center, which is right below the "e-mail address", customer can change the e-mail sending address. This modification is reflected to the call center information. And the newly selected e-mail address appears prior to other addresses from the next time.

Likewise, by tapping a telephone number indicated right below "Phone number of call center", the phone number the customer desired to be called can be changed. However, this modification is valid only once and for all and does not influence the previously registered telephone number to customer information.

4. Select a mailer on "e-mail sending" screen, here, tap {Gmail} as an example (refer to Fig. 6-41).
5. The selected mailer starts-up, title of the {Call back request with QR code} mail and QR code information are posted to this mail, and the selected pictures are attached. Also, the customer information registered on {Registration of Customer Info} screen is posted at the end of the mail (refer to Fig. 6-47 and Fig. 6-48).
6. The e-mail is finally sent out with some messages if any.

Fig. 6-46:

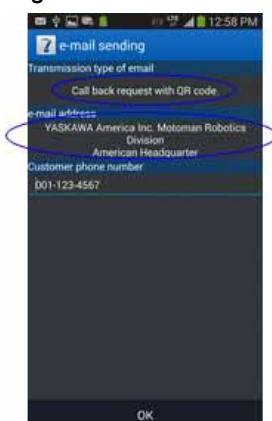


Fig. 6-47:



Fig. 6-48:





## 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".

TIMER VARIABLE		
NO.	CONTENTS	NAME
TM000	1000	
TM001	0	
TM002	0	
TM003	0	
TM004	0	
TM005	0	
TM006	0	
TM007	0	
TM008	0	
TM009	0	
TM010	0	
TM011	0	
TM012	0	
TM013	0	

A
B
C

\* 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.

**6.18.3 Time Measuring Method**

To measure the time, use the SETTM instruction of INFORM instructions.

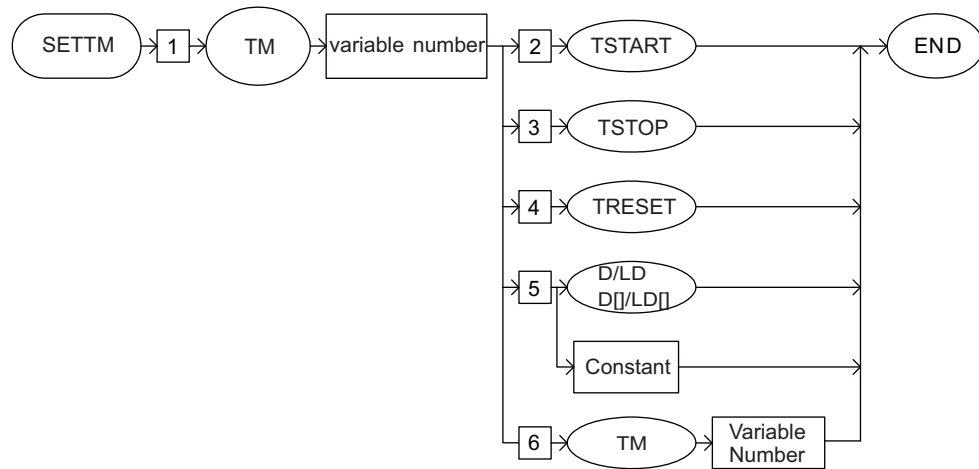
**SETTM**

SUBSET	STANDARD	EXPANDED
Not Available	Available	Available

**Function**

Execute these function, such as to start measuring, to end, to reset, and to set the time.

**Construction**



**Explanation**

**1. TM variable number**

Add the following tag.

No	Tag	Explanation	Note
1	TM variable number	Specifies the TM variable number for the measurement time writing.	Number: 0 to 59

## 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.

No	Tag	Explanation	Note
2	TSTART	Specifies to start the time measurement.	
3	TSTOP	Specifies to finish the time measurement.	
4	TRESET	Specifies to reset the time measurement.	
5	D Variable number / LD Variable number / D [Arrangement number]/ LD [Arrangement number]/ [Constant]	Specifies the time measurement by the integer type variable.	Number: -2147483648 to 2147483647
6	TM variable number	Specifies the time measurement by timer variable.	Number: 0 to 59

### Example

The motion setting of SETTM is shown below.



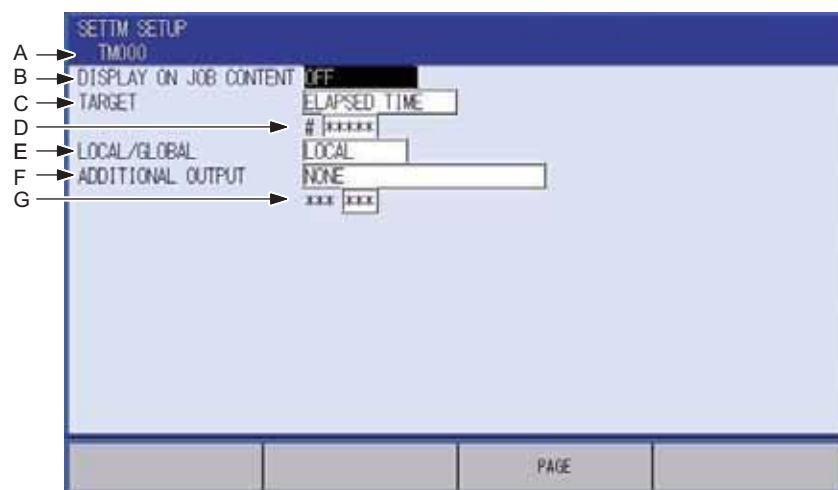
- (1) SETTM TM000 TSTART  
Starts measuring and sets the measuring time on TM000.
- (2) SETTM TM000 TSTOP  
Finishes measuring and sets the measuring time on TM000.
- (3) SETTM TM000 TRESET  
Sets 0 for the measuring time of TM000.
- (4) SETTM TM000 1000  
Sets 1000 for the measuring time of TM000, and 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".



**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. 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.

**F. Sets an additional output destination where the measuring time is to be output.**

Select "NONE", "UNIVERSAL OUTPUT (2GROUP)", "UNIVERSAL OUTPUT (4GROUP)", "REGISTER (1)" or "REGISTER (2)". When "UNIVERSAL OUTPUT (2GROUP)", "UNIVERSAL OUTPUT (4GROUP)", "REGISTER (1)" or "REGISTER (2)" is selected, 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 "UNIVERSAL OUTPUT 2 GROUP" or "UNIVERSAL OUTPUT 4 GROUP".**

\* (example) -32768 to 32767 is output for "UNIVERSAL 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 the Time Measuring Result in the Job Window**

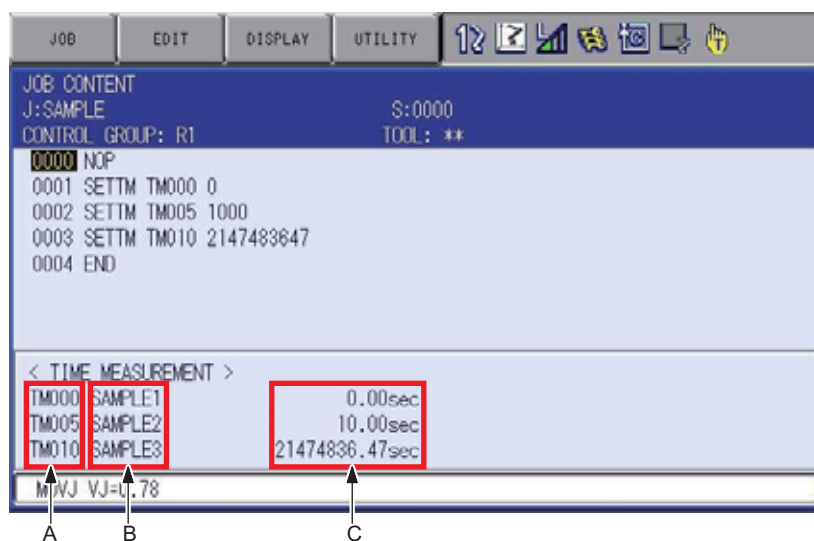
The time measuring result can be checked in the job window.

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.



**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.

## 7 External Memory Devices

### 7.1 Memory Devices

The following memory devices can be used in the DX200 to save and load data such as jobs and parameters.

Device	Function	Media (destination of saved/ loaded data)	Optional function requirement
CF: Pendant	Standard	Compact Flash Card (CF card)	No requirement. Programming pendant is equipped with a slot.
USB: Pendant	Standard	USB Memory Stick	No requirement. Programming pendant is equipped with a slot.
FC1(DX)	Optional <sup>1)</sup>	Personal computer (FC1 emulator)	Personal computer with "FC1 emulator"
PC	Optional <sup>1)</sup>	Personal computer (MOTOCOM32 host)	Via RS-232C: "Data transmission function" and "MOTOCOM32" Via Ethernet: "Ethernet function" plus above two requirements
FTP	Optional <sup>1)</sup>	FTP server such as personal computer	"Data transmission function", "MOTOCOM32", and "FTP function"
USB1: Controller	Standard	USB Memory Stick	No requirement. CPU circuit board (JANCD-YCP21) is equipped with a slot.
USB2: Controller	Standard	USB Memory Stick	No requirement. CPU circuit board (JANCD-YCP21) is equipped with a slot.

1 For the operation, refer to instruction manuals for each optional function.

### 7.1.1 Compact Flash (CF Cards)

The programming pendant is equipped with CF card slot. Use the FAT16 or FAT32 formatted Compact Flash.

#### 7.1.1.1 Recommended Compact Flash Cards

Refer to “9.1.2 Device” in “DX200 INSTRUCTIONS (165292-1CD)” for the recommended products used for external memory of DX200. 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 Compact Flash

- Do not drop or bend exerting any shock or strong force to the Compact Flash.
- Keep away from water, oil, organic solvent, dust, and dirt.
- Do not use or keep the Compact Flash in places where strong static electricity or electronic noise may occur.
- Do not insert or remove the Compact Flash or turn OFF the power when accessing the Compact Flash (writing-in or reading-out the Compact Flash 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.

\*Compact Flash has a limited life span.

The life span differs depending on products or status of use. However, normal use of Compact Flash as an external memory device for the DX200 does not adversely affect the Compact Flash. For details, refer to instruction manuals for each medium.



## 7.1.1.3 Inserting a Compact Flash

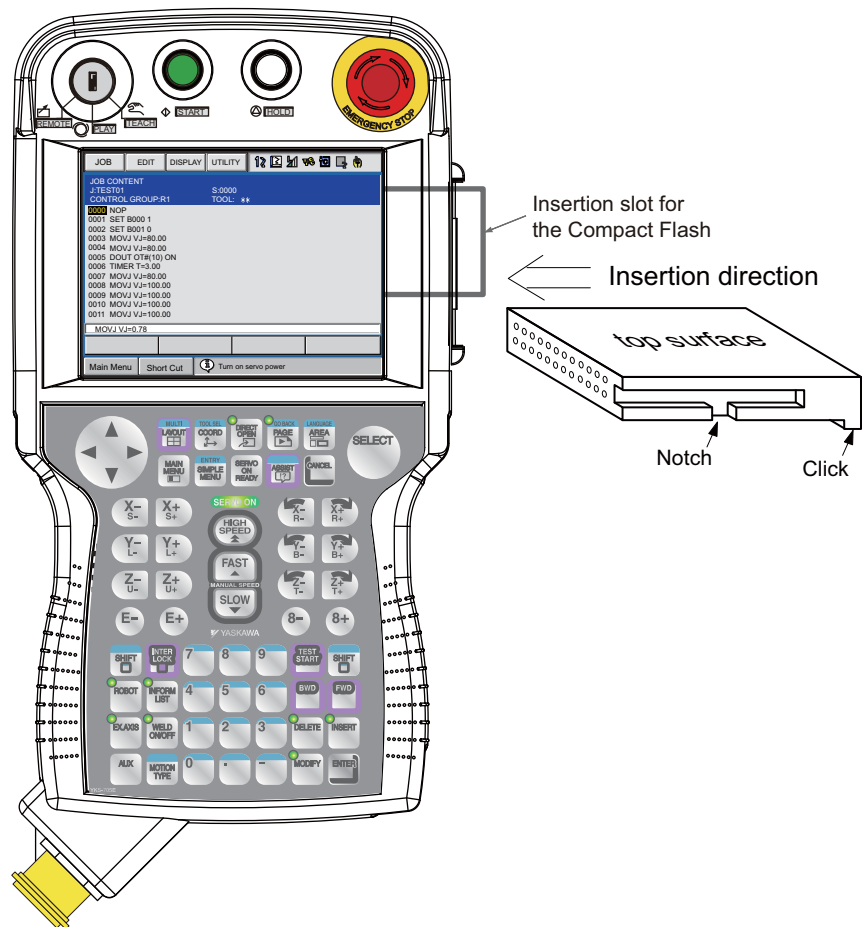
When inserting a Compact Flash, take note of insertion direction.

With the notch and clip of the Compact Flash downward, insert the Compact Flash slowly into the slot of the programming pendant of which display faces up.

Forcible insertion may result in damage to the Compact Flash or CF card slot.

After inserting the card, be sure to close the cover of the slot before starting operation.

Fig. 7-1: Using a Compact Flash Card



### 7.1.2 USB Memory Stick

The programming pendant or the CPU circuit board (JANCD-YCP21) 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 section 9.1.2 “Device” in “DX200 INSTRUCTIONS (165292-1CD)” for the recommended products used for external memory of DX200. 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 Compact Flash.
- Keep away from water, oil, organic solvent, dust, and dirt.
- Do not use or keep the Compact Flash in places where strong static electricity or electronic noise may occur.
- Do not insert or remove the Compact Flash or turn OFF the power when accessing the Compact Flash (writing-in or reading-out the Compact Flash 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 DX200 does not adversely affect the USB memory stick. For details, refer to instruction manuals for each medium.

## 7.1.2.3 Rules for USB Drive and USB Memory Stick

Followings are the rules of the USB drive on the CPU circuit board (JANCD-YCP21) 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 DX200.

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 port on the front surface of the CPU circuit board (JANCD-YCP21)**

The USB port on the front surface of the CPU circuit board (JANCD-YCP21) 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 the Programming Pendant

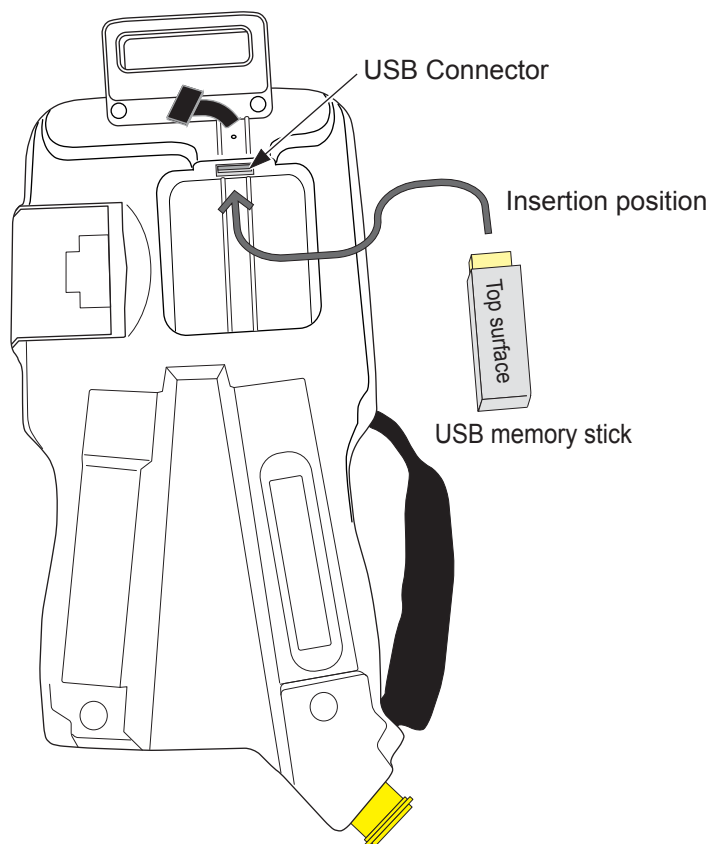
When inserting a USB memory stick, take note of insertion direction.

With the USB memory stick face-up and the connector upwards, insert the stick slowly into the slot of the programming pendant of which display face-down.

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



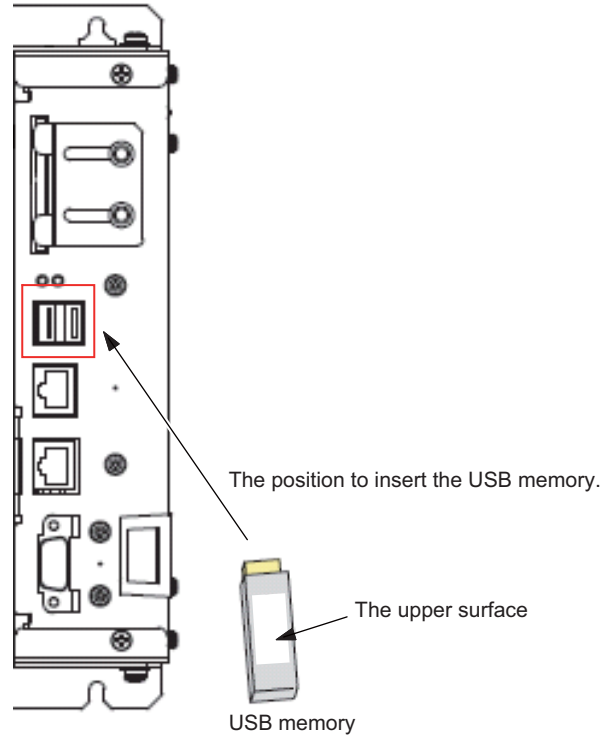
When a USB memory stick is used, the waterproofing of programming pendant cannot be maintained.

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 waterproofing of programming pendant or to prevent the USB memory stick from falling out of the programming pendant, use a Compact Flash card instead.

## 7.1.2.5 Inserting a USB Memory Stick in the CPU Circuit Board (JANCD-YCP21)

Be careful about the inserting direction of the USB connector: The USB memory should be inserted slowly with the upper surface right. Forcible insertion may result in damage to the USB memory stick or USB connector.



\* There are two USB connectors.

The left side is for USB1 and the right side is for USB2.

## 7.2 Handling Data

### 7.2.1 Data Classification

For the DX200, data that can be saved online are classified into six categories.

- 1. JOB**
- 2. FILE/GENERAL DATA**
- 3. PARAMETER<sup>\*1</sup>**
- 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 DX200.

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(DX)".

\*1: "PARAMETER BATCH" includes all "3. PARAMETER".

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.

Table 7-1: Data List (Sheet 1 of 3)

Data Classification		File Name (Saved Data)	Save			Load		
			OPN	EDIT	MAN	OPN	EDIT	MAN
6. SYSTEM BACKUP (CMOS.BIN)		CMOS.BIN	○	○	○	X	X	X
1. JOB	Single job	JOBNAME.JBI	○	○	○	X	○	○
	Related job (Job+Condition)	JOBNAME.JBR	○	○	○	X	○	○
2 FILE/ GENERAL DATA	Tool data	TOOL.CND	○	○	○	X	○	○
	Weaving data	WEAV.CND	○	○	○	X	○	○
	User coordinate data	UFRAME.CND	○	○	○	X	○	○
	Variable data	VAR.DAT	○	○	○	X	○	○
	Arc start condition data	ARCSRT.CND	○	○	○	X	○	○
	Arc end condition data	ARCEND.CND	○	○	○	X	○	○
	Welding condition auxiliary data	ARCSUP.DAT	○	○	○	X	○	○
	Welder characteristic data	WELDER.DAT	○	○	○	X	○	○
	Welder characteristic definition data	WELDUDEF.DAT	○	○	○	X	○	○
	Shock detection level data	SHOCKLVL.CND	○	○	○	X	○	○
	Job registration data	JET.DAT	○	○	○	X	○	○
	Interference area file	CUBEINTF.CND	○	○	○	X	○	○
	Motor Gun Pressure Data	SGPRS.CND	○	○	○	X	○	○
	Motor Gun Dry Pressure Data	SGPRSCL.CND	○	○	○	X	○	○
	Spot Gun Condition Data	SGSPEC.DAT	○	○	○	X	○	○
	Spot Welder I/F Data	SGWELDIF.DAT	○	○	○	X	○	○
	Gun Open Position Data	STROKE.DAT	○	○	○	X	○	○
	Spot I/O Allocation Data	SGIO.DAT	○	○	○	X	○	○
	Spot Welding Condition Data	SPOTWELD.DAT	○	○	○	X	○	○
	Clearance Setting Data	SGCLARNC.DAT	○	○	○	X	○	○
Motor Gun Auto Tuning Data	SGUNAUTO.DAT	○	○	○	X	○	○	
Gun Detail Setting Data	SGDTL.DAT	○	○	○	X	○	○	
Spot Management Data	SGSPTMNG.DAT	○	○	○	X	○	○	
Manual Press Condition Data	SGMNLPRS.CND	○	○	○	X	○	○	
Tip Dress Condition Data	SGTIPDRS.CND	○	○	○	X	○	○	
Airgun condition data	AIRGUN.DAT	○	○	○	X	○	○	
User menu data	USERMENU.DAT	○	○	○	X	○	○	
Timer variable data	TMVAR.DAT	○	○	○	X	○	○	
Paint condition	PNTCND.CND	○	○	○	X	○	○	
Paint calibration set	PNTCLB.DAT	○	○	○	X	○	○	
Paint time chart	PNTTC.DAT	○	○	○	X	○	○	
Paint data set	PNTDATA.DAT	○	○	○	X	○	○	

Table 7-1: Data List (Sheet 2 of 3)

Data Classification		File Name (Saved Data)	Save			Load			
			OPN	EDIT	MAN	OPN	EDIT	MAN	
6	3. PARA-METER	ALL.PRM	○	○	○	X	X	○	
	3. PARA-METER	Robot matching parameter	RC.PRM	○	○	○	X	X	○
		System definition parameter	SD.PRM	○	○	○	X	X	○
		Coordinate home position parameter	RO.PRM	○	○	○	X	X	○
		System matching parameter	SC.PRM	○	○	○	X	X	○
		CIO parameter	CIO.PRM	○	○	○	X	X	○
		Function definition parameter	FD.PRM	○	○	○	X	X	○
		Application parameter	AP.PRM	○	○	○	X	X	○
		Transmission (general) parameter	RS.PRM	○	○	○	X	X	○
		Sensor parameter	SE.PRM	○	○	○	X	X	○
		Servo parameter	SV.PRM	○	○	○	X	X	○
		Servomotor parameter	SVM.PRM	○	○	○	X	X	○
		Operation control parameter	AMC.PRM	○	○	○	X	X	○
		Servo power block parameter	SVP.PRM	○	○	○	X	X	○
		Motion function parameter	MF.PRM	○	○	○	X	X	○
		SERVOPACK parameter	SVS.PRM	○	○	○	X	X	○
	Converter parameter	SVC.PRM	○	○	○	X	X	○	
	Robot control expand parameter	RE.PRM	○	○	○	X	X	○	
	Safety function parameter	FMS.PRM	○	○	○	X	X	○	
	4. I/O DATA	CIO program	CIOPRG.LST	○	○	○	X	X	○
I/O name data		IONAME.DAT	○	○	○	X	X	○	
Pseudo input signals		PSEUDOIN.DAT	○	○	○	X	X	○	
External I/O name data		EXIONAME.DAT	○	○	○	X	X	○	
Register name data		IOMNAME.DAT	○	○	○	X	X	○	
YSF logic file		YSFLOGIC.DAT	○	○	○	X	X	○	



Table 7-1: Data List (Sheet 3 of 3)

Data Classification		File Name (Saved Data)	Save			Load			
			OPN	EDIT	MAN	OPN	EDIT	MAN	
6	5. SYSTEM DATA	Second home position	HOME2.DAT	○	○	○	X	X	○
		User word	UWORD.DAT	○	○	○	X	X	○
		SV monitor signal	SVMON.DAT	○	○	○	X	X	○
		Variable name	VARNAME.DAT	○	○	○	X	X	○
		Alarm history data	ALMHIST.DAT	○	○	○	X	X	X
		Home position calibrating data	ABSO.DAT	○	○	○	X	X	○
		System information	SYSTEM.SYS	○	○	○	X	X	X
		Controller information	PANELBOX.LOG	○	○	○	X	X	X
		Work home position data	OPEORG.DAT	○	○	○	X	X	○
		I/O message history data	IOMSGHST.DAT	○	○	○	X	X	X
		Function key allocation data	KEYALLOC.DAT	○	○	○	X	X	○
		Arc monitor data	ARCMON.DAT	○	○	○	X	X	X
		Wear detection base position data	SGWEARBP.DAT	○	○	○	X	X	○
		External IO ALLOC data	EIOALLOC.DAT	○	○	○	X	X	○
		Max/ Min torque data	TRQDAT.DAT	○	○	○	X	X	○
		Logdata	LOGDATA.DAT	○	○	○	X	X	X
		PM (reducer) file	PMTRQDB.DAT	○	○	○	X	X	○
		PM (reducer) condition	PMCOND.CND	○	○	○	X	X	○
		Encoder maintenance	ENCHEAT.DAT	○	○	○	X	X	X
		Inspection record file	PMLOG.DAT	○	○	○	X	X	X
		Robot stop FACTR file	RBSTPFCT.DAT	○	○	○	X	X	X
SETTM setup file	SETTM.DAT	○	○	○	X	X	○		
Timer variable name	TMNAME.DAT	○	○	○	X	X	○		
Paint system	PNTSYS.DAT	○	○	○	X	X	○		
Paint special	PNTSPCL.DAT	○	○	○	X	X	○		
Paint time chart set	PNTTCSET.DAT	○	○	○	X	X	○		

\* OPN: Operation Mode, EDIT: Edit Mode, MAN: Management Mode  
○: Can be done, X: Cannot be done

**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. 7-3: Example of JOB

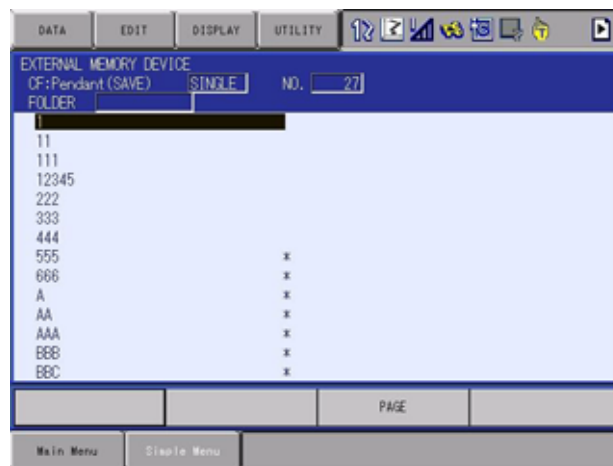
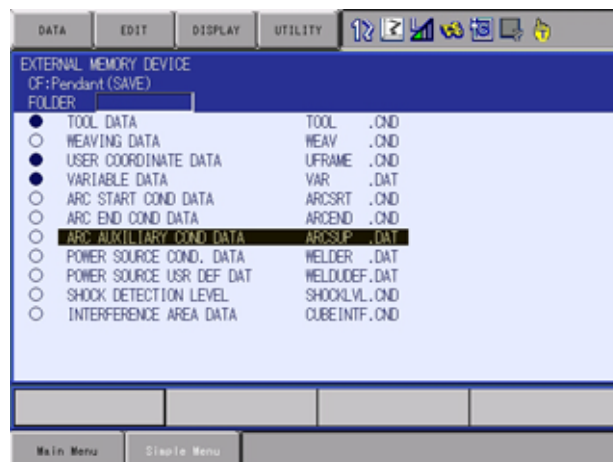


Fig. 7-4: Example of FILE/GENERAL DATA



### 7.2.2.1 Saving by Overwriting

“6.SYSTEM BACKUP (CMOS.BIN)” can be overwritten.

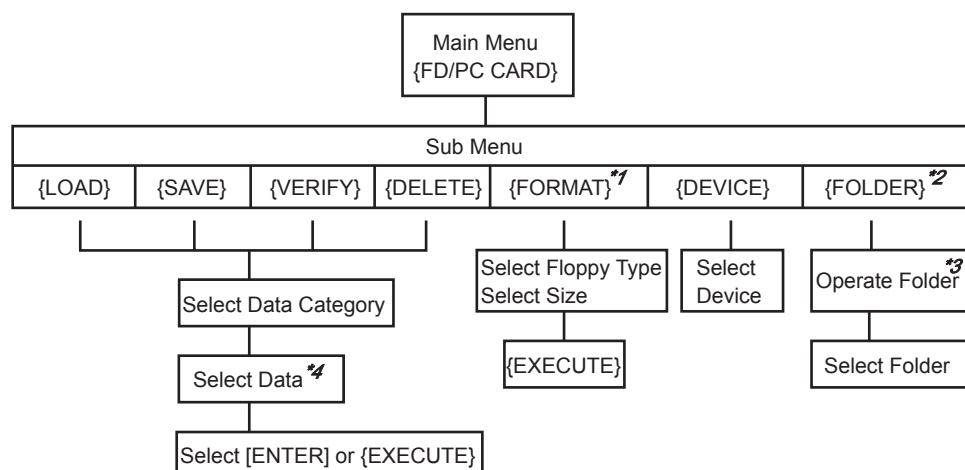
As for “1. JOB”, “2. FILE/GENERAL DATA”, “3. PARAMETER”, “4. I/O DATA” and “5. SYSTEM DATA”, those data cannot be overwritten. Delete the target file in the device before the saving operation.

If “CF: Programming pendant”, “USB: Programming pendant”, “USB1: Controller” or “USB2: Controller” is used as the device, the file does not need to be deleted because another folder can be created to save the data.

### 7.3 Operation Flow

The following description is the operation flow for external memory devices.

- **SELECT DEVICE**  
Select {EXTERNAL MEMORY DEVICE} → {DEVICE}, and the destination device for saving.  
The device selected is valid after turning the power supply ON again.
- **SELECT FOLDER**  
Select {EXTERNAL MEMORY DEVICE} → {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 “CF: Programming pendant”, “USB: Programming pendant”, “USB1: Controller” or “USB2: 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.  
\*4 Individual selection, batch selection, marker (\*) selection, and canceling selection can be performed.
- **EXECUTE**  
Select [ENTER] or {EXECUTE}.



## 7.3.0.1 Operating a Folder

Folders can be used in order to classify and sort out the data such as jobs and condition files when using the “CF: Programming pendant”, “USB: Programming pendant”, “USB1: Controller” or “USB2: Controller”. The folders can be created in hierarchical structure positioning a root folder at the top.

#### ■ Restrictions

Folder name: Up to 8 one-byte characters + 3 characters for extension

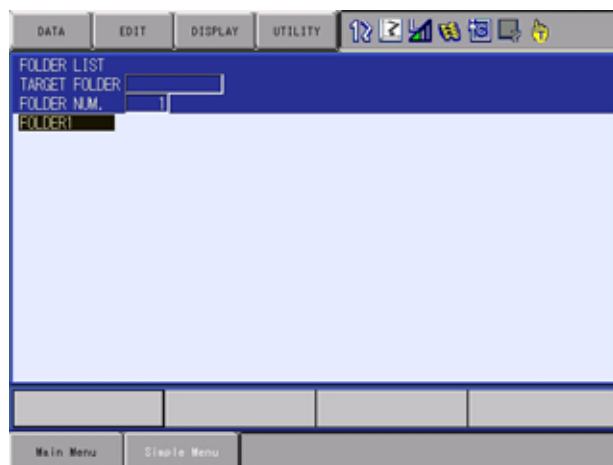
\*Long folder names cannot be used such as the name that exceeds the restricted number of characters mentioned above as created in PC, etc.

Maximum path length: 42 one-byte characters

\*”ERROR 3360: INVALID FOLDER” appears when selecting the folder of which name exceeds the maximum path length.

#### ■ Selecting a Folder

1. Select {EXTERNAL MEMORY DEVICE} 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. Change the security to management mode. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {FOLDER}.
  - The FOLDER LIST window appears.

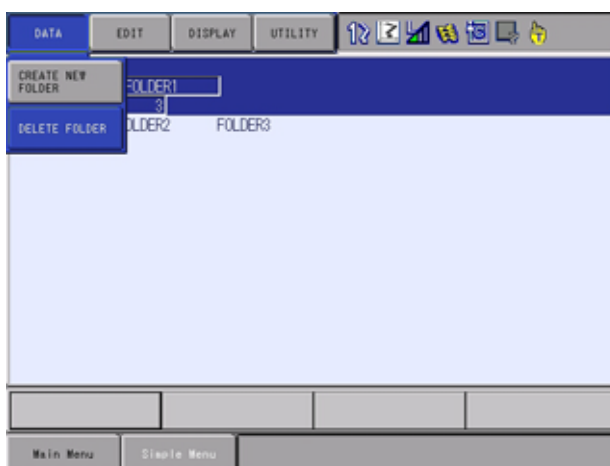
3. Move the cursor to a folder and press [SELECT].
  - Select the higher-level folder where a new folder to be created should be contained.
  - When creating a folder in top-level, this step is unnecessary.
4. Select {DATA} → {CREATE NEW FOLDER} under the pull-down menu. Input folder name using the keyboard on the screen and press [ENTER].
  - A folder is created.

#### ■ Deleting a Folder

1. Change the security to management mode. Select {EXTERNAL MEMORY DEVICE} 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.

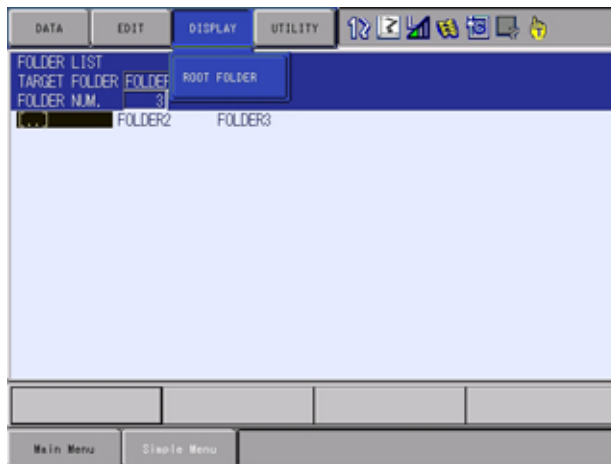


### ■ Initial Folder Setting

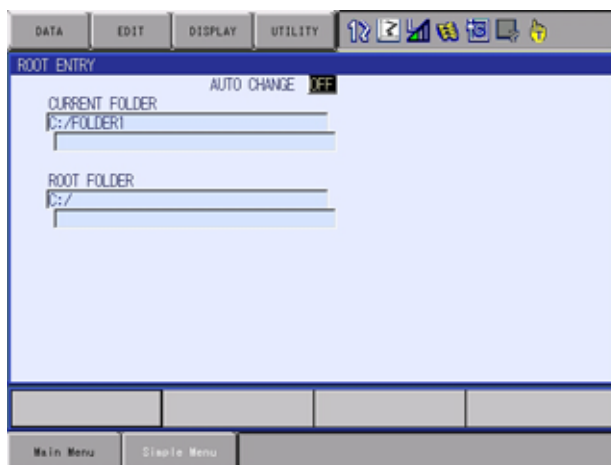
The folder that is contained in a deep hierarchy can be selected in a shortened operation.

When selecting {LOAD}, {SAVE}, {VERIFY}, or {DELETE} from the sub menu of {EXTERNAL MEMORY DEVICE}, the folder that has been set as an initial folder becomes a current folder.

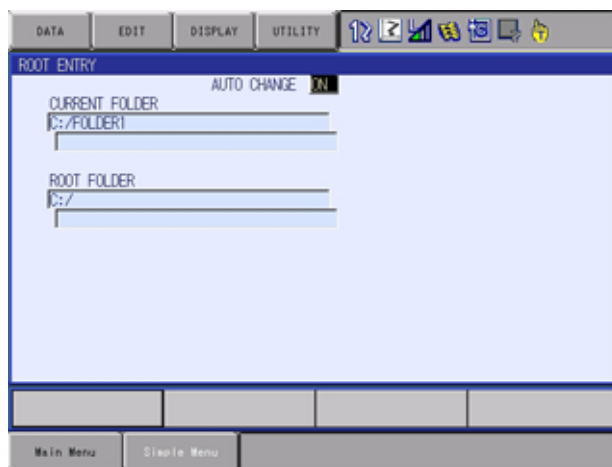
1. Change the security to management mode. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {FOLDER}.
  - The FOLDER LIST window appears.
3. Move the cursor to a folder and press [SELECT].
  - Select a folder that is to be set as a root folder.
4. Select {DISPLAY} → {ROOT FOLDER} under the 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 {EXTERNAL MEMORY DEVICE} → {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 Compact Flash, etc., “ERROR 3360: INVALID FOLDER” appears when selecting {LOAD}, {SAVE}, {VERIFY}, {DELETE} or {FOLDER} menu from {EXTERNAL MEMORY DEVICE}, and simultaneously the initial folder becomes invalid. Set “ON” in “AUTO CHANGE” when the initial folder setting needs to be valid.



## 7.3.0.2 Saving Data

To download data from the memory of the DX200 to the external memory device, perform the following procedure.



Data such as PARAMETER, SYSTEM DATA, I/O DATA, and the batch data such as PARAMETER BATCH, BATCH CMOS, ALL CMOS AREA, that include PARAMETER, SYSTEM DATA, I/O DATA, contain the information specific to each robot controller.

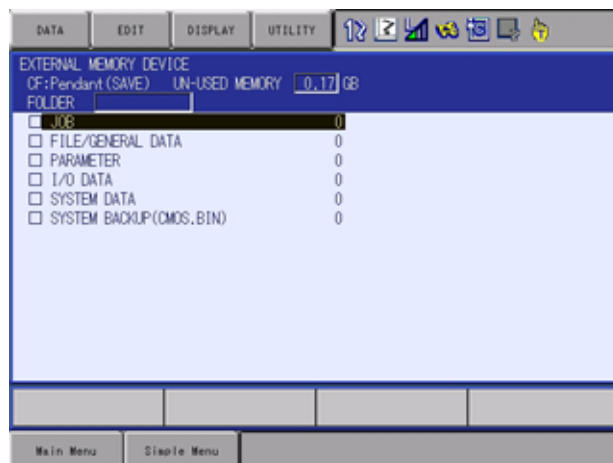
Those data are prepared as backup data for reloading into the controller used for saving.

Loading the data from other controller may result in destruction or loss of critical system information.

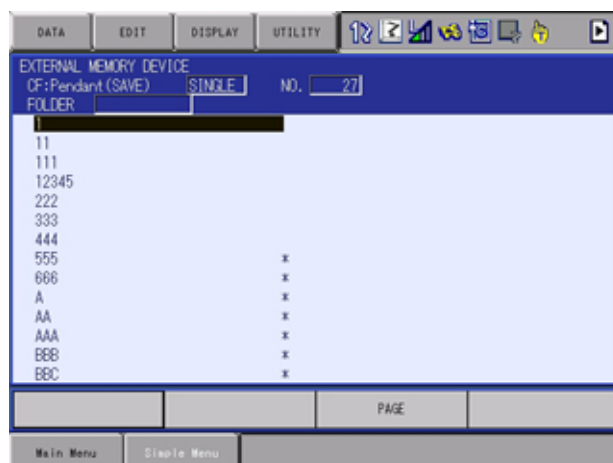
Take extra care for the saved data.

### ■ Saving a Job

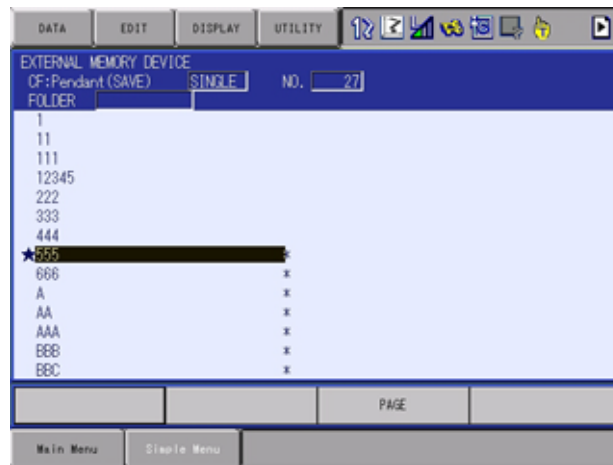
1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {SAVE}.
  - The following window appears.



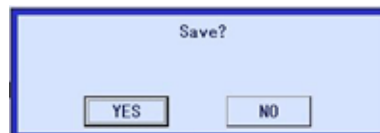
3. Select {JOB}.
  - The JOB LIST window appears.



4. Select a job to be saved.
  - The selected job is marked with “★”.



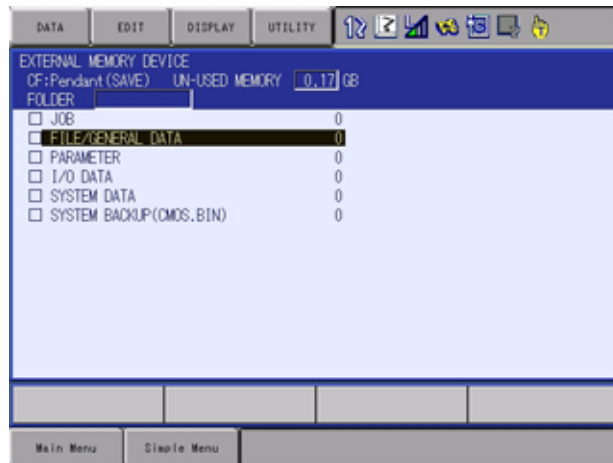
5. Press [ENTER].
  - The confirmation dialog box appears.



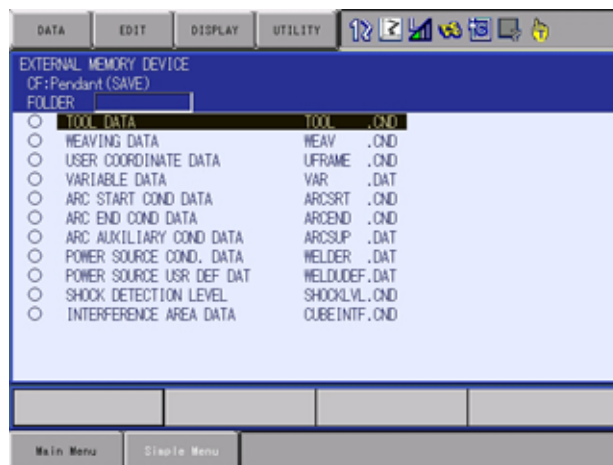
6. Select "YES".
  - The selected job is saved.

### ■ Saving a Condition File or General Data

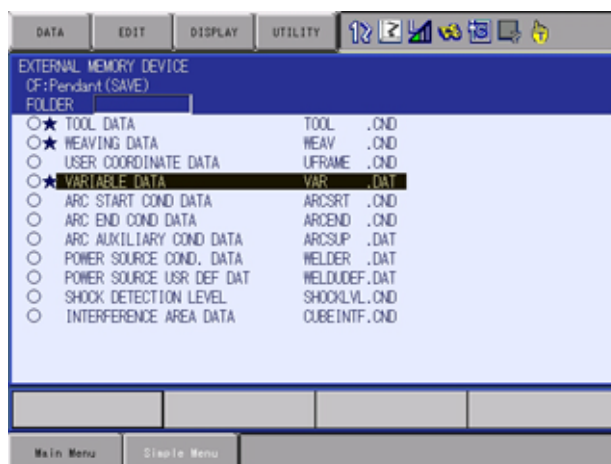
1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {SAVE}.
  - The following window appears.



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 “★”.



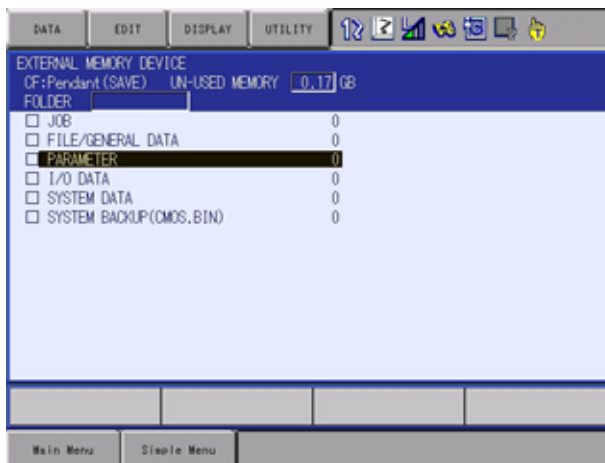
5. Press [ENTER].
  - The confirmation dialog box appears.



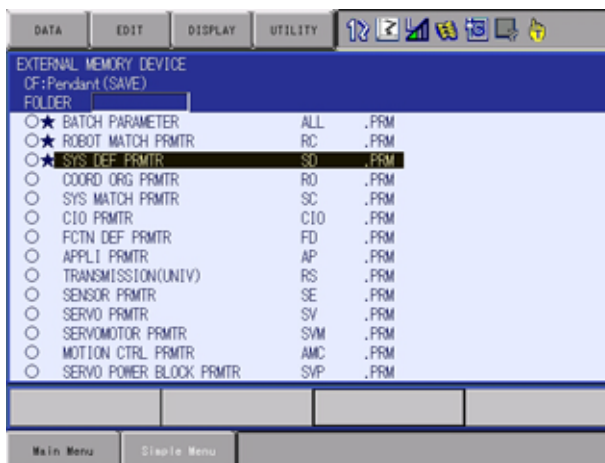
6. Select “YES”.
  - The selected files are saved.

### ■ Saving a Parameter

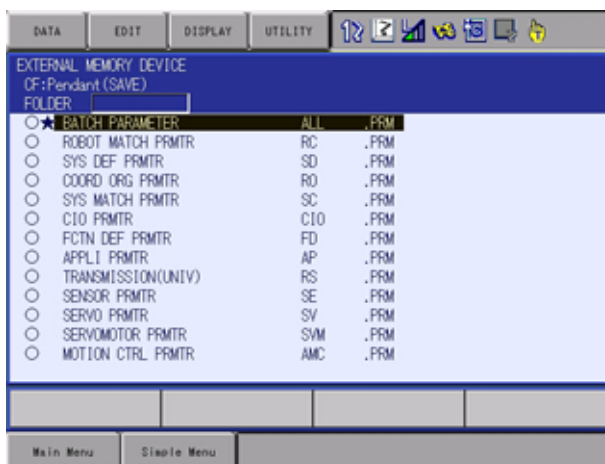
1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {SAVE}.
  - The following window appears.



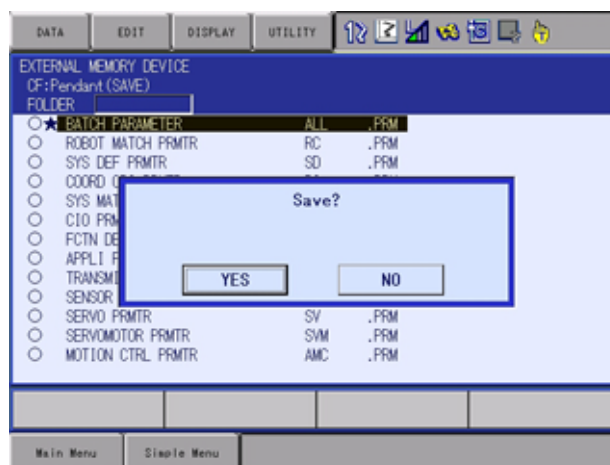
3. Move the cursor to {PARAMETER} and select.
  - The selection window for parameters appears.



4. Select parameters to be saved.
  - The selected parameters are marked with “★”.



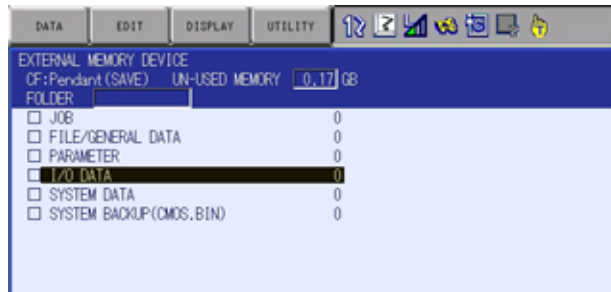
5. Press [ENTER].
  - The confirmation dialog box appears.



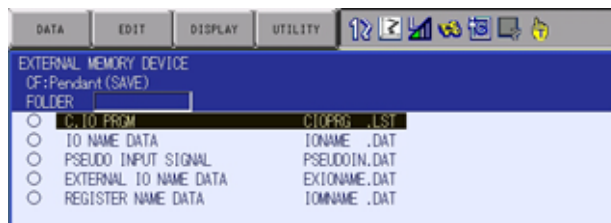
6. Select "YES".
  - The selected parameters are saved.

### ■ Saving I/O Data

1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {SAVE}.
  - The following window appears.



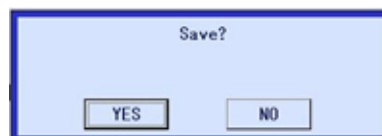
3. Move the cursor to {I/O DATA} and select.
  - The selection window for I/O data appears.



4. Select I/O data to be saved.
  - The selected I/O data are marked with "★".



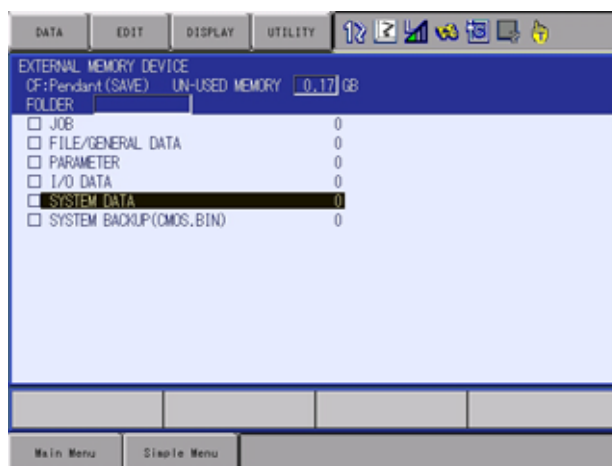
5. Press [ENTER].
  - The confirmation dialog box appears.



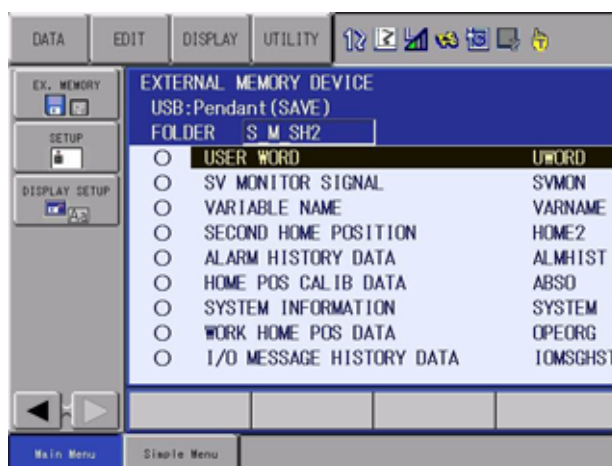
6. Select "YES".
  - The selected I/O data are saved.

### ■ Saving System Data

1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {SAVE}.
  - The following window appears.



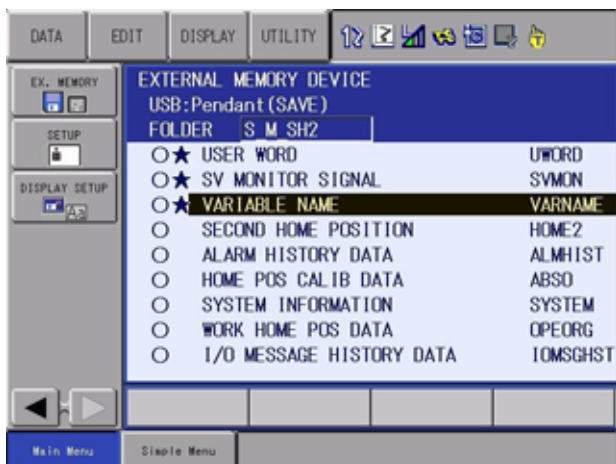
3. Move the cursor to {SYSTEM DATA} and select.
  - The selection window for system data appears.





## 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”.

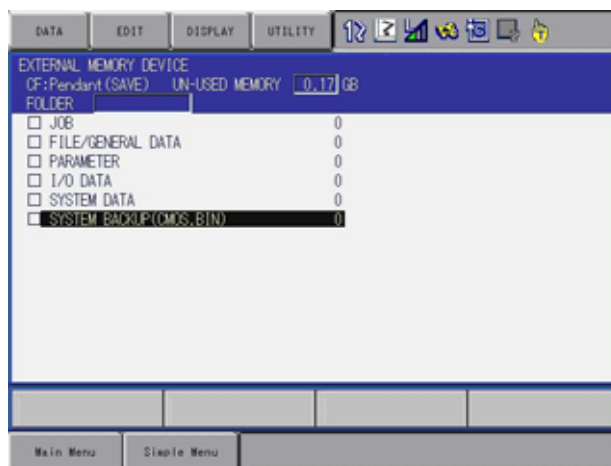
- The selected system data are saved.



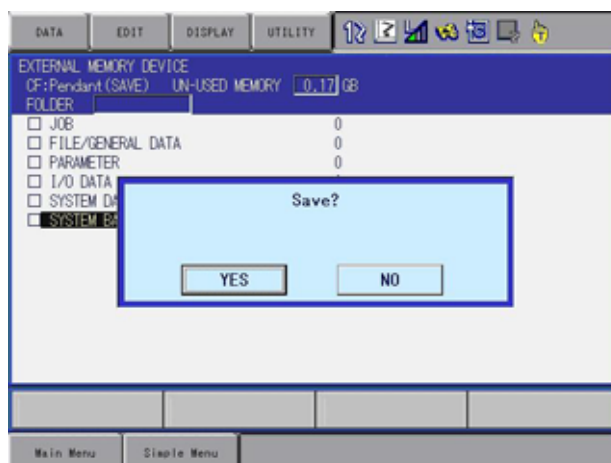
As for “JOB”, “FILE/GENERAL DATA”, “PARAMETER”, “SYSTEM DATA”, and “I/O DATA”, the data cannot be overwritten. In this case, delete the file of the same name in the folder beforehand or create a new folder so that the data can be stored inside.

### ■ SYSTEM BACKUP (CMOS.BIN) Saving

1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {SAVE}.
  - The following window appears.

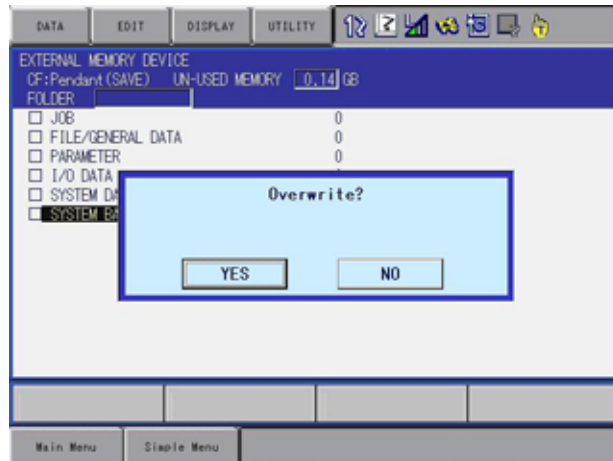


3. Select {SYSTEM BACKUP(CMOS.BIN)}.
  - The confirmation dialog box appears.



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. A confirmation dialog box to ask over-writing the data 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 35MB.

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 disappeared.

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 DX200, 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.

When the ladder program used in the DX200 is tried to be loaded, the confirmation dialog "DX200 CIOPRG DOWNLOAD?" 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.

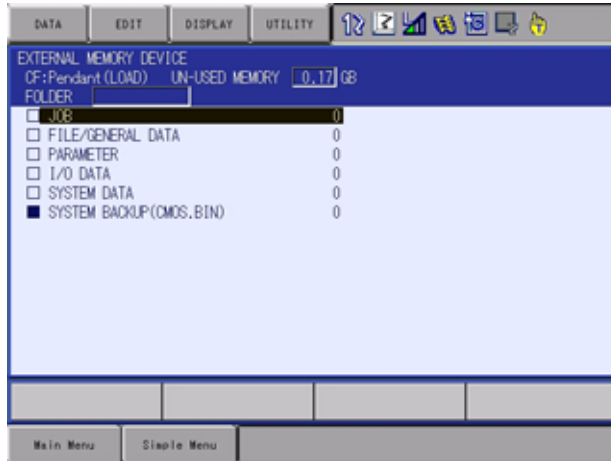


When the ladder program used in the DX200 is loaded to the DX200, make sure to confirm that the APPLI of the program in the DX200 system and the DX200 system to which the program is loaded are the same. Do not load the ladder program which has a different APPLI. The "different APPLI" also means the case that the number of APPLIs are different (ex. "Arc" and "Arc + Arc").

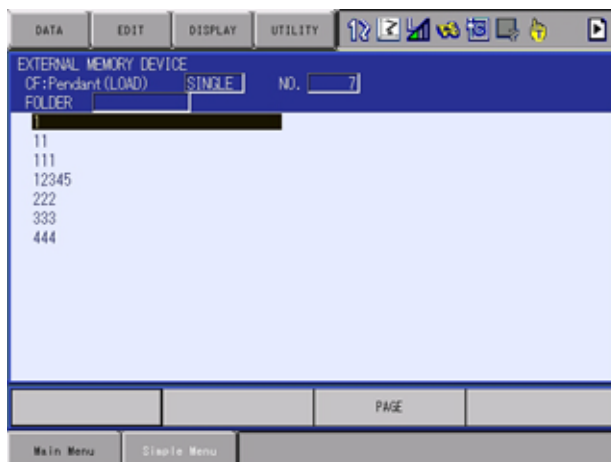
If the ladder program used in DX200 arc is loaded to DX200, some new functions added in DX200 cannot be used (only for arc welding purpose). In order to use the new functions added in DX200, reflect the content edited in DX200 to the DX200 ladder program without loading the ladder program of DX200.

### ■ Loading a Job

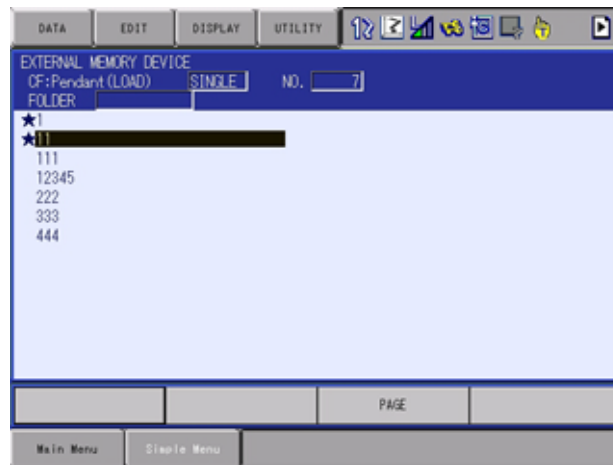
1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {LOAD}.
  - The following window appears.



3. Select {JOB}.
  - The job selection window appears.



4. Select a job to be loaded.
  - The selected jobs are marked with “★”.



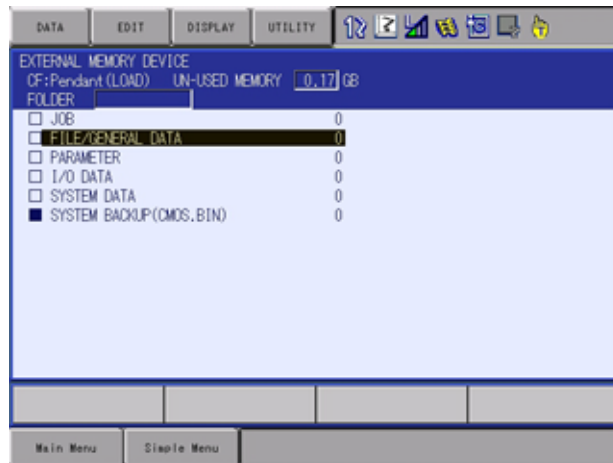
5. Press [ENTER].
  - The confirmation dialog box appears.



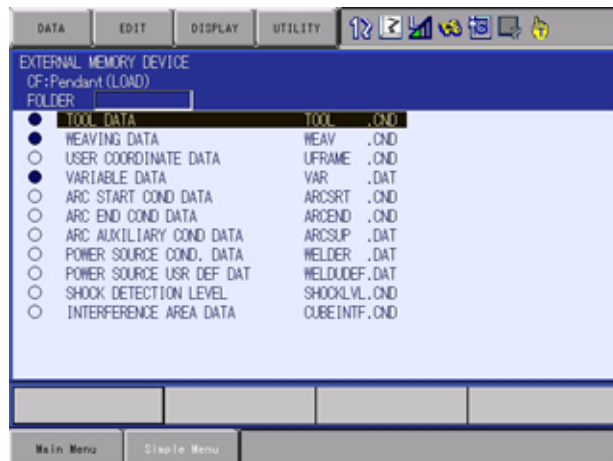
6. Select "YES".
  - The selected jobs are loaded.

### ■ Loading a Condition File/General Data

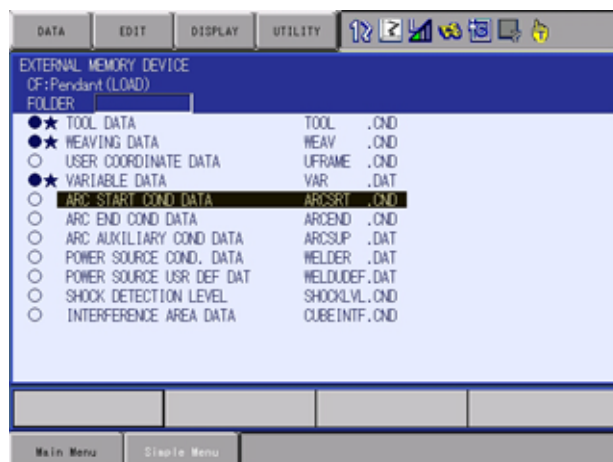
1. Select {EXTERNAL MEMORY- DEVICE} under {Main Menu}.
2. Select {LOAD}.
  - The following window appears.



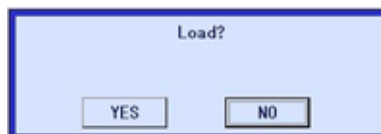
3. Move the cursor to {FILE/GENERAL DATA} and select.
  - The selection window for condition file or general data appears.



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.

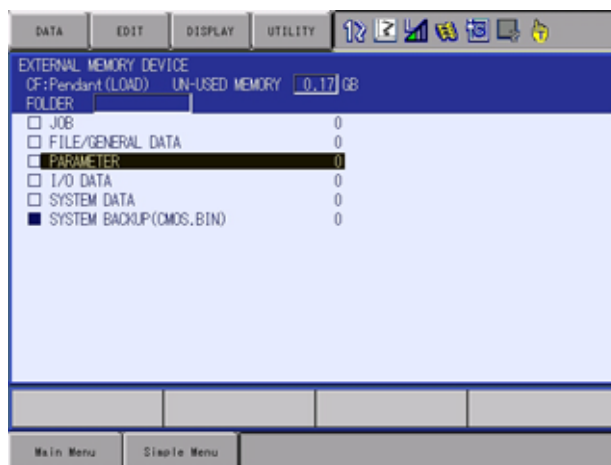


6. Select "YES".
  - The selected files are loaded.

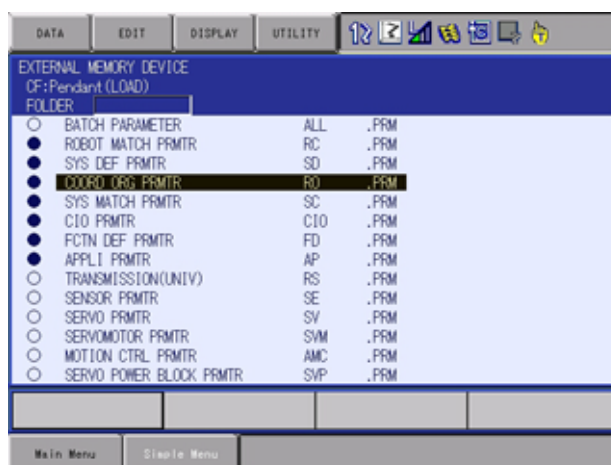
#### ■ Loading a Parameter

1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {LOAD}.

  - The following window appears.



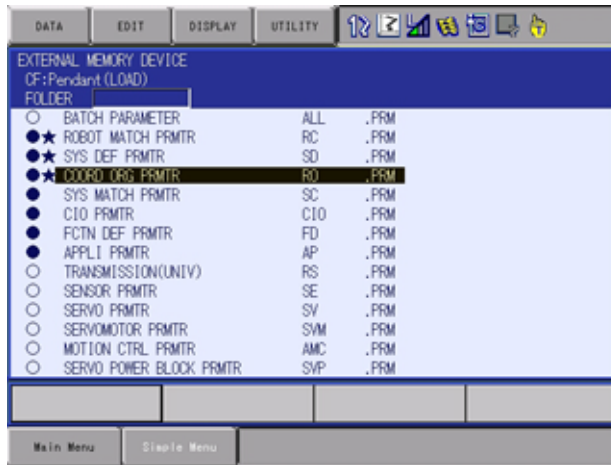
3. Move the cursor to {PARAMETER} and select.
  - The selection window for parameters appears.





## 4. Select parameters to be loaded.

- The selected parameters are marked with “★”.



## 5. Press [ENTER].

- The confirmation dialog box appears.

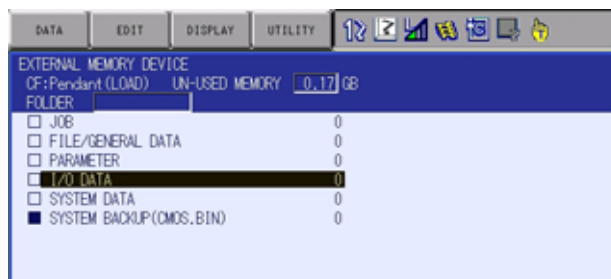


## 6. Select “YES”.

- The selected parameters are loaded.

### ■ Loading I/O Data

1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {LOAD}.
  - The following window appears.



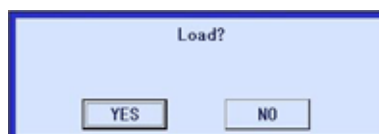
3. Move the cursor to {I/O DATA} and select.
  - The selection window for I/O data appears.



4. Select I/O data to be loaded.
  - The selected I/O data are marked with “★”.



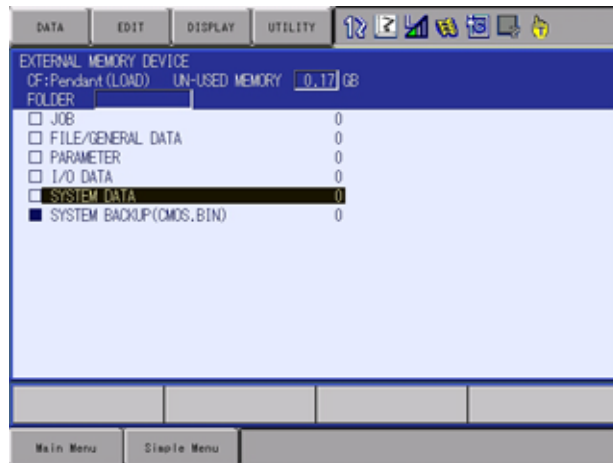
5. Press [ENTER].
  - The confirmation dialog box appears.



6. Select “YES”.
  - The selected I/O data are loaded.

### ■ Loading System Data

1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {LOAD}.
  - The following window appears.



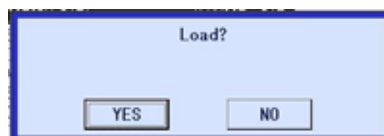
3. Move the cursor to {SYSTEM DATA} and select.
  - The selection window for system data appears.



4. Select system data to be loaded.
  - The selected system data are marked with “★”.



5. Press [ENTER].
  - The confirmation dialog box appears.



6. Select "YES".
  - The selected system data are loaded.

## 7.3.0.4 Verifying Data

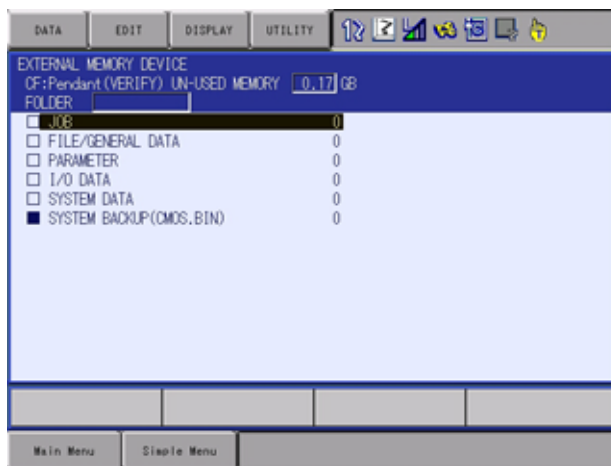
Follow the procedure below to verify data in the memory of the DX200 with data saved in the external memory device.



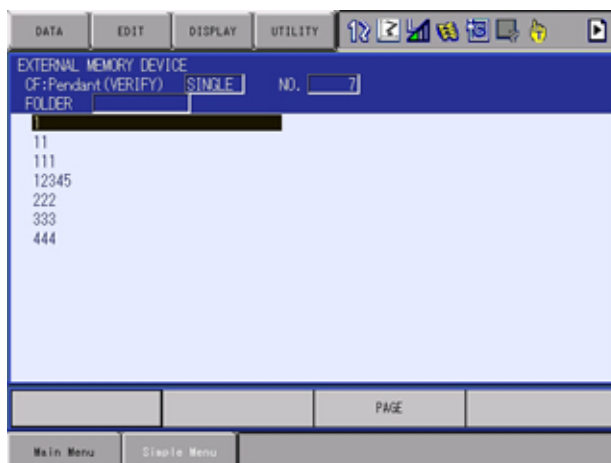
“SYSTEM BACKUP (CMOS.BIN)” cannot be verified.

### ■ Verifying a Job

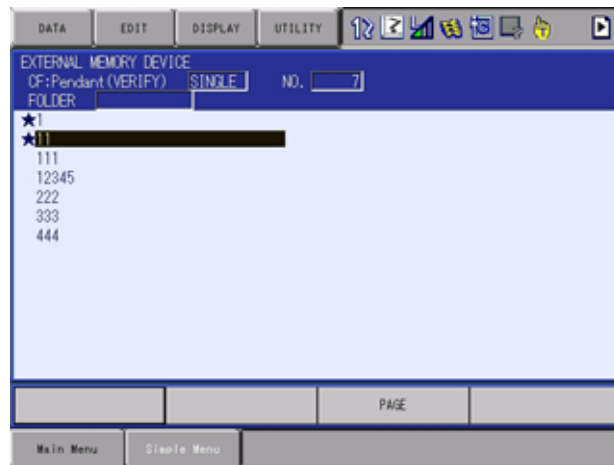
1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {VERIFY}.
  - The following window appears.



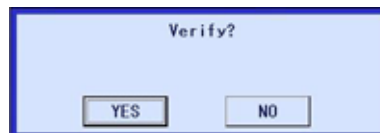
3. Select {JOB}.
  - The job selection window appears.



4. Select a job to be verified.
  - The selected jobs are marked with “★”.



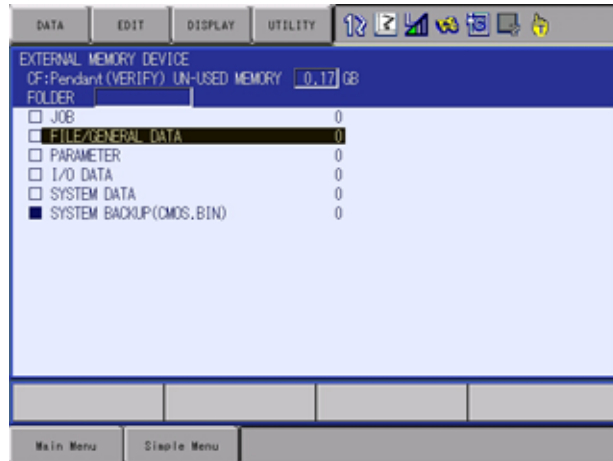
5. Press [ENTER].
  - The confirmation dialog box appears.



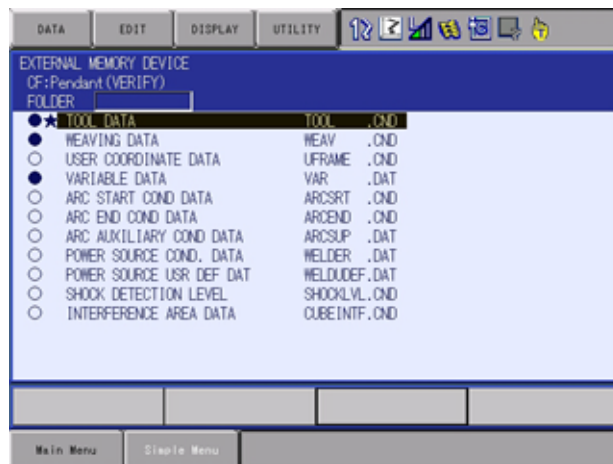
6. Select “YES”.
  - The selected jobs are verified.

### ■ Verifying a File

1. Select {EXTERNAL MEMORY DEVICE} 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.



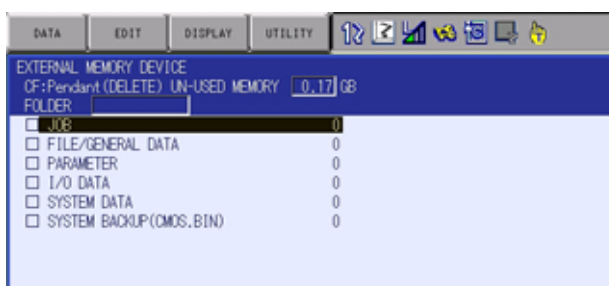
6. Select “YES”.
  - The selected files are verified.

## 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 {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {DELETE}.
  - The following window appears.



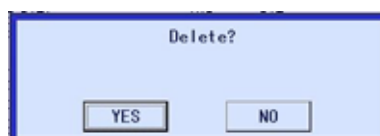
3. Select {JOB}.
  - The job selection window appears.



4. Select a job to be deleted.
  - The selected jobs are marked with “★”.



5. Press [ENTER].
  - The confirmation dialog box appears.



6. Select “YES”.
  - The selected jobs are deleted.

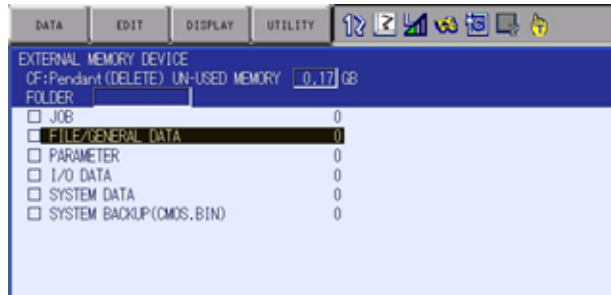


### ■ Deleting a File

(Condition file/General data, Parameter, System data and I/O data)

1. Select {EXTERNAL MEMORY DEVICE} under {Main Menu}.
2. Select {DELETE}.

– The following window appears.



3. Select the group of the file to be deleted.



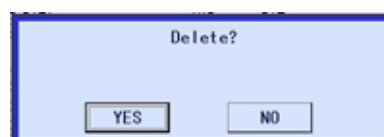
4. Select a file to be deleted.

– The selected files are marked with “★”.



5. Press [ENTER].

– The confirmation dialog box appears.

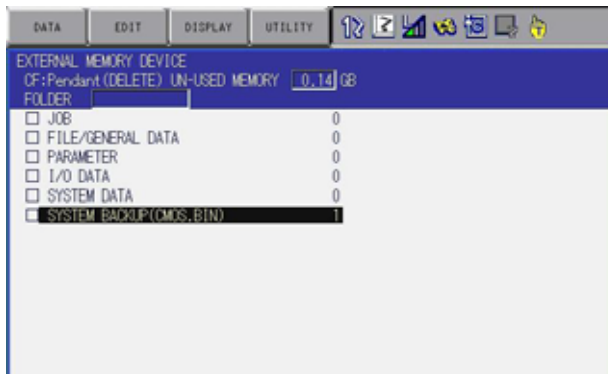


6. Select “YES”.

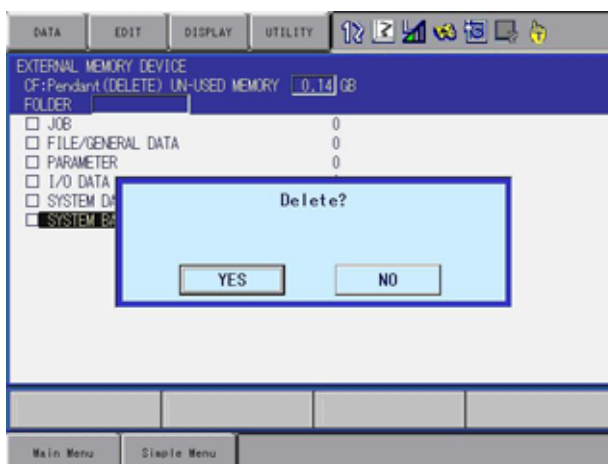
– The selected files are deleted.

### ■ Deleting SYSTEM BACKUP (CMOS.BIN)

1. Select {EXTERNAL MEMORY DEVICE} 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 won't appear when CMOS.BIN does not exist.



4. Select "YES".
  - Deleting of SYSTEM BACKUP (CMOS.BIN) starts.



Deleting of SYSTEM BACKUP (CMOS.BIN) is not executed while a data is transmitted together with data modification.

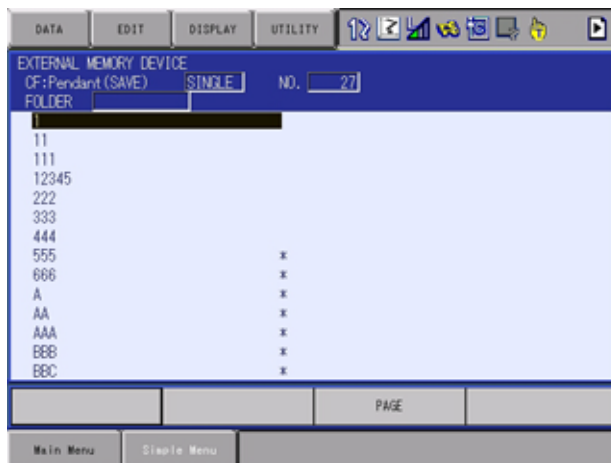
## 7.3.0.6 Job Selection Mode

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 DX200.  
Verifying: selects both the files in the external memory device and in the memory of the DX200.

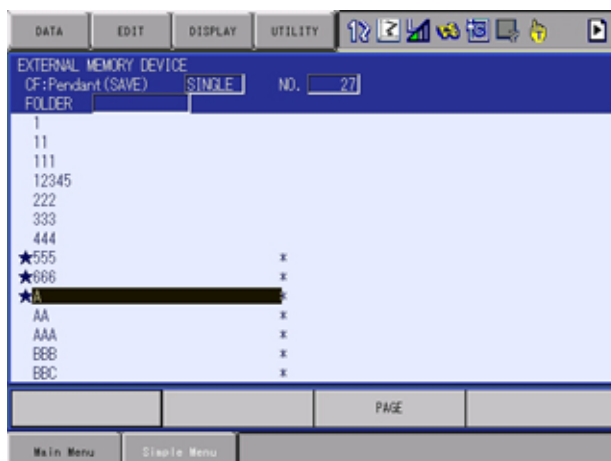
### ■ Using Individual Selection

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.



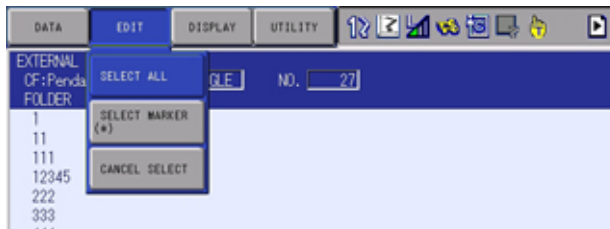
2. Press [SELECT].  
Move the cursor to a file needed and press [SELECT] again.  
\*To cancel the selected items, select [EDIT] and then [CANCEL SELECT].

– The selected jobs are marked with “★”.

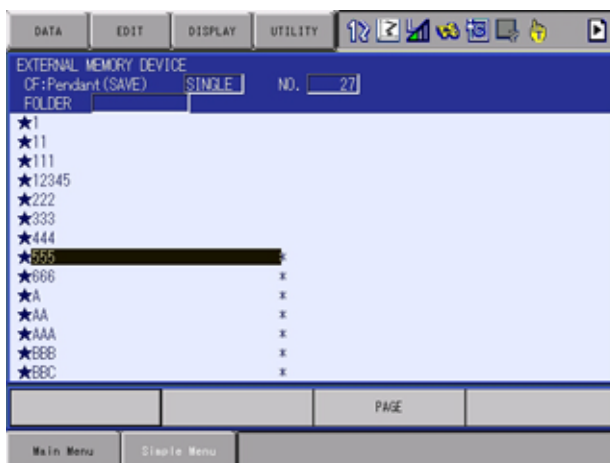


### ■ Using Batch Selection

- In either the external memory JOB LIST window or the file selection window, select {EDIT} under the menu.
  - The pull-down menu appears.



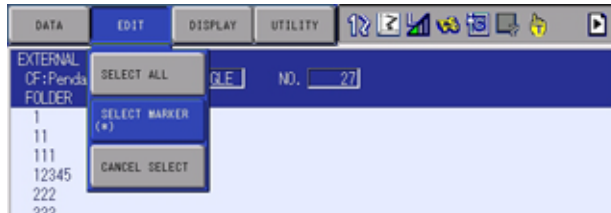
- Select {SELECT ALL}.
  - \*To cancel the selected items, select {EDIT} and then {CANCEL SELECT}.
  - All jobs are selected.



### ■ Using Marker (\*) Selection

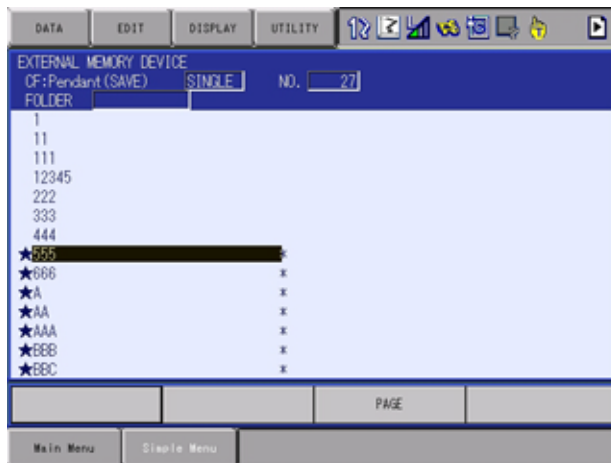
1. In either the external memory JOB LIST window or the file selection window, select {EDIT} under the menu.

– The pull-down menu appears.



2. Select {SELECT MARKER (\*)}.

\*To cancel the selected items, select {EDIT} and then {CANCEL SELECT}.



## 8 Parameter

### 8.1 Parameter Configuration

The parameters of DX200 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.

## 8.2 Motion Speed Setting Parameters

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

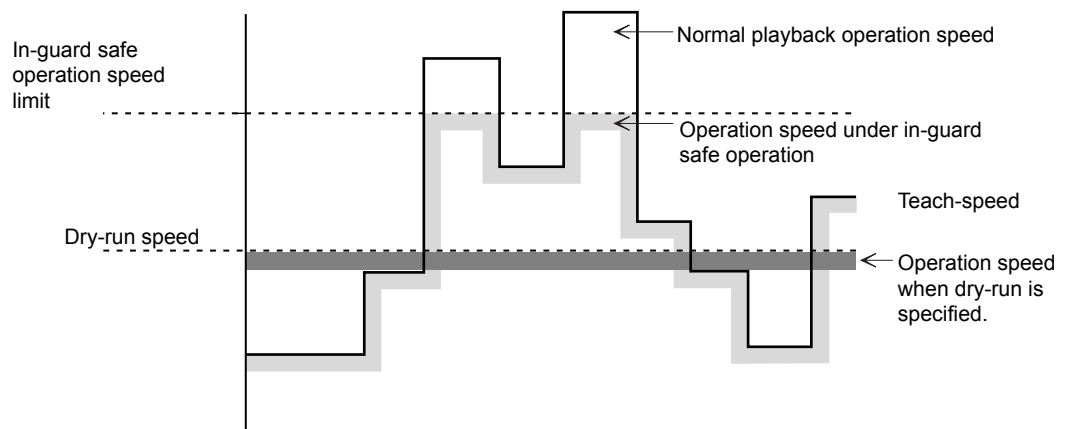
Units: 0.01%

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 TCPmax 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

## 8.2.0.4 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.



## 8.2.0.7 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.

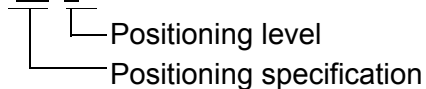


Note that the units of S1CxG031 and S1CxG032 are smaller than those for the NX100.

## 8.2.0.8 S1CxG033 to S1CxG040: POSITIONING ZONE

This parameter value will be referenced when positioning is specified with the “MOVE” instruction: MOVJ (joint movement) or MOVL (linear movement).

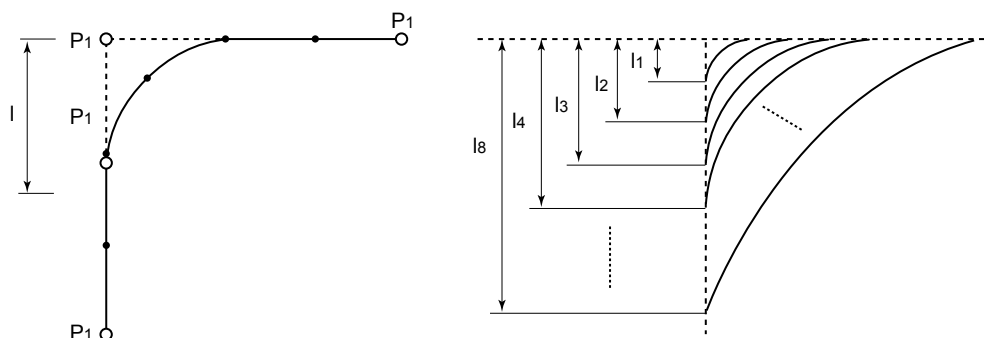
**<Example>** MOVL V=100.0 PL=1



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.

S1CxG033: Positioning level 1  
 S1CxG034: Positioning level 2  
 .  
 .  
 .  
 S1CxG040: Positioning level 8

Since operation will be turning inward during playback, as shown in the following diagram, use setting values taking safety aspects into consideration.



This process becomes effective when change in direction of steps is between  $25^\circ$  and  $155^\circ$ .

#### Position Level

Position levels are divided into nine stages of 0 to 8 with the "MOV" instruction.

e.g. `MOVL V=500 PL=1` (PL: Position Level)

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. ( $\mu\text{m}$ )



## 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: 0: When manipulator TCP is selected*

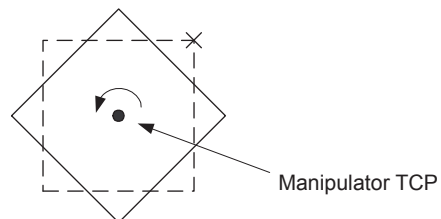
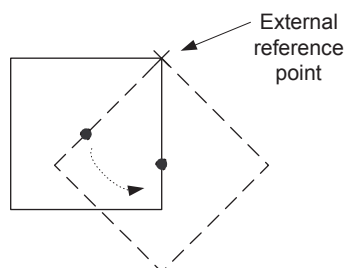


Fig. 8-2: 1: When external reference point is selected



## 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


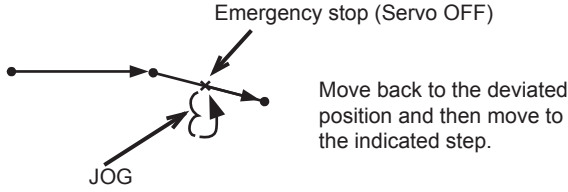
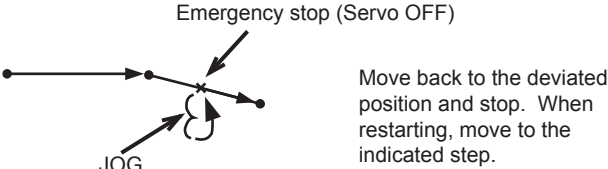
These parameters specify the method of restarting the manipulator that has deviated from the normal path such as an emergency stop or jog operation.

- 0 : Move to the indicated step (initial setting).
- 1 : After moving back to the deviated position, move to the indicated step.
- 2 : Move back to the deviated position and stop.

Table 8-1: S2C422

Parameter Setting Value	Movement When Restarting
0	<p>Move to next step.</p>
1	<p>After moving back to the deviated position, move to the indicated step.</p>
2	<p>Emergency stop (Servo OFF)</p>

Table 8-2: S2C423

Parameter Setting Value	Movement When Restarting
0	<p>Move to the next step.</p> 
1	<p>After moving back to the deviated position, move to the indicated step.</p> 
2	<p>Emergency stop (Servo OFF)</p> 

**NOTE**

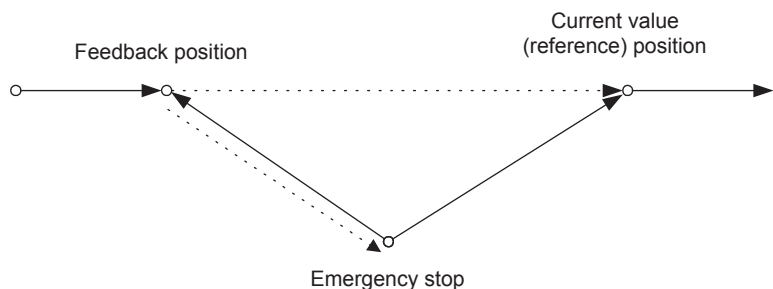
- To the path deviated position, the manipulator moves in a straight line at low speed operation (SICxG044). It is linear movement. After resetting from deviation, the speed becomes the same as taught speed.
- The initial setting (prior to shipping) is 0: The manipulator moves in a straight line from 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.

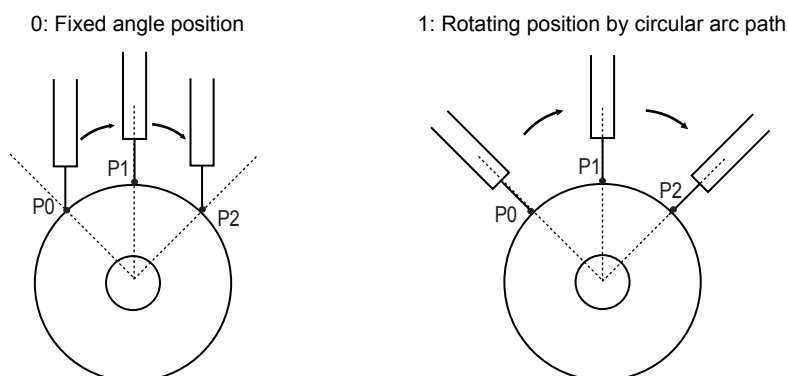
When emergency stop is applied during high-speed motion, the deviated position differs from the robot current value (reference) position and feedback position as shown in the following.



#### 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.



#### 8.2.0.20 S2C653: EMERGENCY STOP CURSOR ADVANCE CONTROL FUNCTION

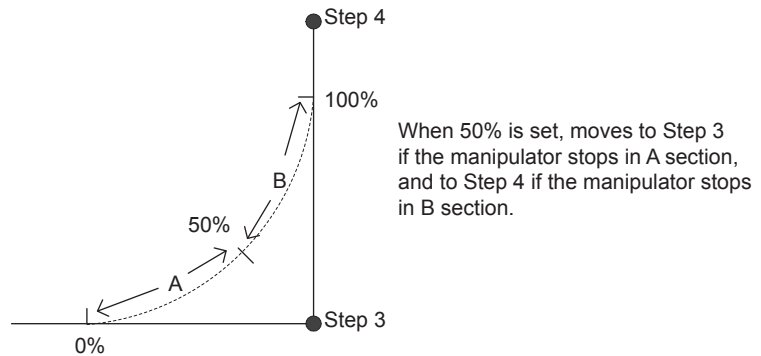
This parameter specifies whether to use the cursor advance control function or not.

- 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

Coordinates/Parameter	S2C698= "0"	S2C698= "1"
Joint	Axis number order	Specified
Cylindrical	Axis number order	Specified
Cartesian	Specified	Specified
Tool	Specified	Specified
User	Specified	Specified

Axis number order: X: First axis, Y: Second axis, Z: Third axis

Specified: X: X-direction (RECT-X), Y: Y-direction (RECT-Y), Z: Z-direction (RECT-Z)

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**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: $\mu\text{m}$ )
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 26:User 24
S3C1102	Specifies the limit of posture angle adjustment range (Units: $0.01^\circ$ )



### 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.

Parameter Setting Value	Operation Units
0	MOVL DOUT TIMER DOUT MOVL  Stops at every instruction
1	MOVL DOUT TIMER DOUT MOVL  Stops at move instruction

## 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.

Fig. 8-3: <Example>

Line	Instruction
10	MOVL V=100
11	TIMER T=1.00
12	DOUT OT#(1) ON
13	MOVL V=50
⋮	⋮

Cursor position

Fig. 8-4: S2C206-0 (Before the Next Step)

Line	Instruction
10	MOVL V=100
11	TIMER T=1.00
12	DOUT OT#(1) ON
13	MOVL V=100
14	MOVL V=50
⋮	⋮

Added step

Fig. 8-5: S2C206-1 (Between Instructions)

Line	Instruction
⋮	⋮
10	MOVL V=100
11	TIMER T=1.00
12	MOVL V=100
13	DOUT OT# (1) ON
14	MOVL V=50
⋮	⋮

Added step

## 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

## 8.3.0.11 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 DX200, all robot instructions can be executed regardless of specification of instruction sets. The specification can be done on the TEACHING CONDITION window.

## 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 following 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"

Parameter Setting Value	Operation Units
0	MOVL DOUT TIMER DOUT MOVL  Stops at every instruction
1	MOVL DOUT TIMER DOUT MOVL  Stops at move instruction



When operating "FORWARD" by the programming pendant, the units for execution are set in another parameter (S2C198).

## 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

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**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 1cm/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.

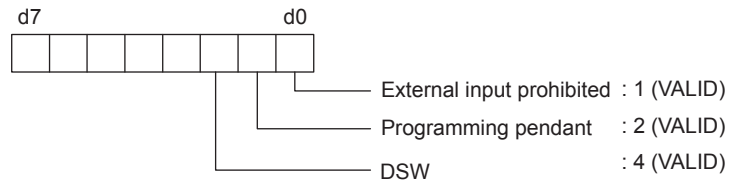
The specification can be done on the OPERATE ENABLE SETTING window.

0 : Permitted

1 : Prohibited

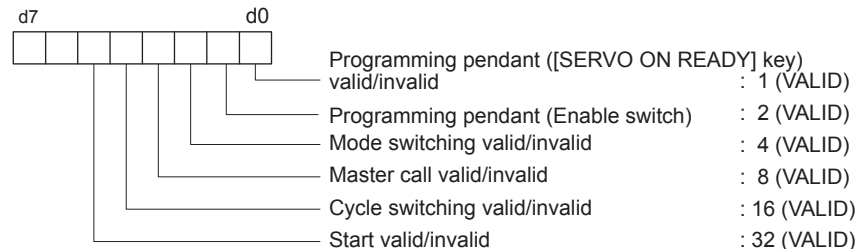
## 8.3.0.27 S2C229: SERVO ON FROM EXTERNAL PP PROHIBITION

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.



## 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.



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#### 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



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**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

Parameter Setting Value	Valid/Invalid
0	Function invalid
1	Function valid

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...

Alphabets representing variables: B, I, D, R, S, P, BP, EX, PX, LB, LI LD, LR, LS, LP, LBP, LEX, LPX

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

## 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

Parameter Setting Value	Valid/Invalid
0	Function invalid
1	Function valid

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...

Alphabets representing variables: B, I, D, R, S, P, BP, EX, PX, LB, LI LD, LR, LS, LP, LBP, LEX, LPX

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

## 8.3.0.38 S2C397: I/O VARIABLE CUSTOMIZE FUNCTION

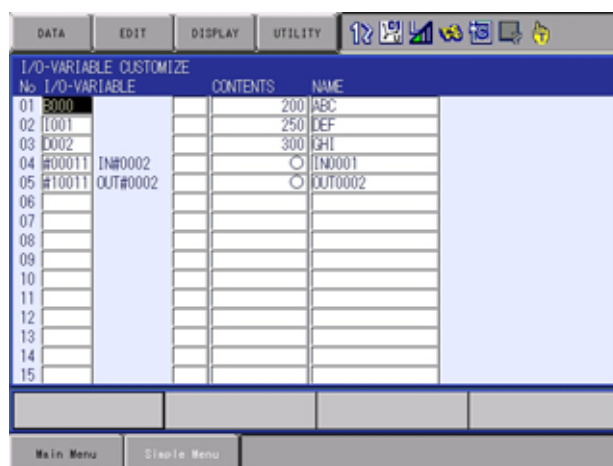
This function enables registration of any particular input/output signal/variable. Reference and editing of signals/variables are possible on the same window.

Table 8-6: S2C397

Parameter Setting Value	Valid/Invalid
0	Function Invalid
1	Function Valid

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

Input/Output Signals	USER INPUT SIGNAL USER OUTPUT SIGNAL PSEUDO INPUT SIGNAL
Variables	BYTE TYPE VARIABLE (B VARIABLE) INTEGER TYPE VARIABLE (I VARIABLE) DOUBLE-PRECISION INTEGER TYPE VARIABLE (D VARIABLE)

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} → {LOAD} {SAVE} {VERIFY} {DELETE} → {SYSTEM DATA}.

### 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

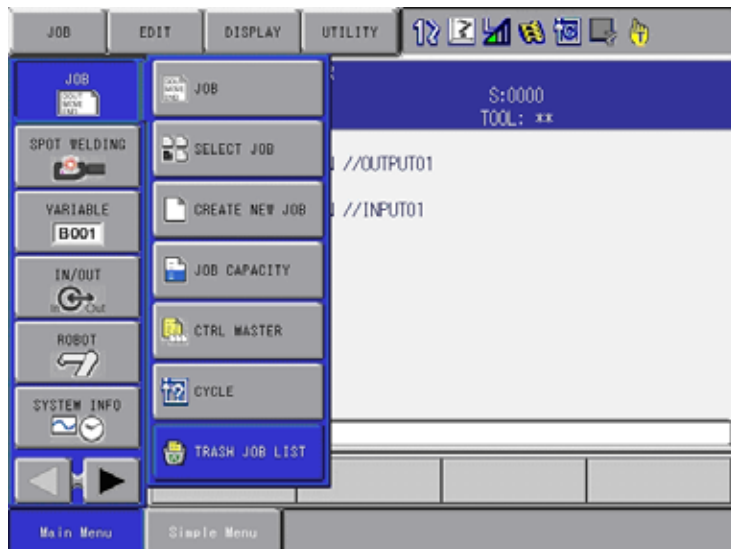
Note: It is able to edit the words when the security mode is the edit mode or the management mode.

### 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.

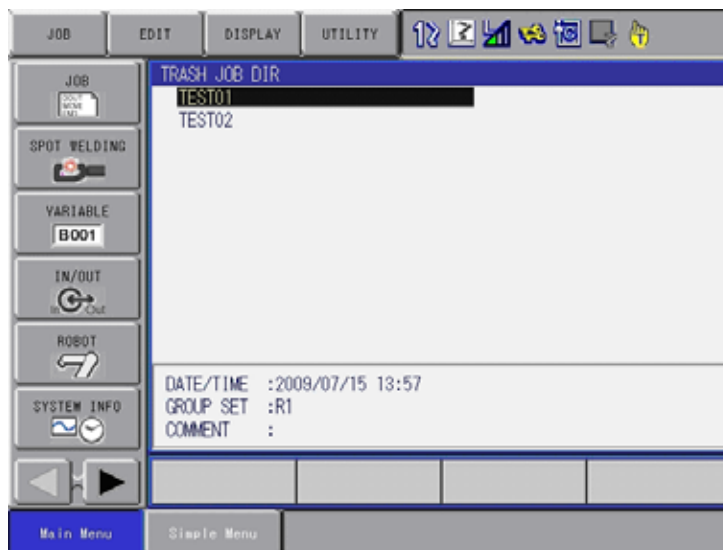
This parameter can be set on {TEACHING CONDITION} window.

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.



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.

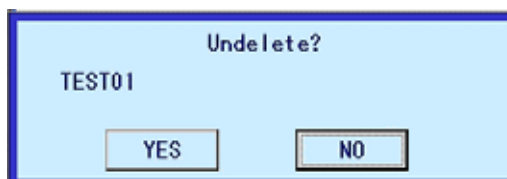
- Batch selection / canceling selection of the jobs ( {EDIT} → {SELECT ALL} → {CANCEL SELECT} )
- Job search ( {EDIT} → {JOB SEARCH COND} )
- Rearrange of the jobs in the order of date / order of name ( {DISPLAY} → {DATE} {NAME} )
- Job detailed information display ( {DISPLAY} → {DETAIL} )
- Displaying 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.

### ■ 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.



A dialog box to confirm deleting the selected job.



Select

[YES] to delete the job completely. The deleted job is deleted from the trash job list.

[NO] to cancel deleting the job.



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.

## 8.3.0.42 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.

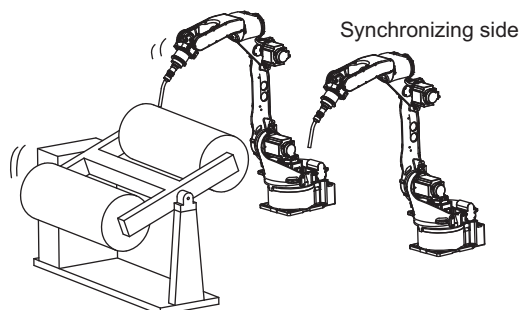
- 0 : With buzzer
- 1 : Without buzzer

## 8.3.0.44 S2C434: JOB LINKING DESIGNATION (When Twin Synchronous Function Used)

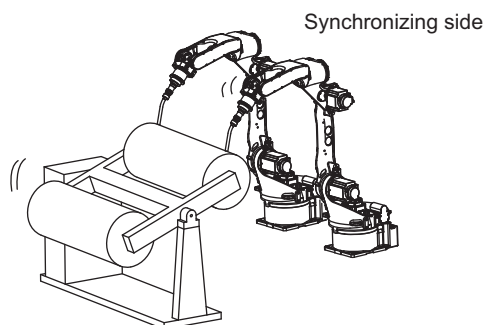
This parameter specifies whether the manipulator at the synchronizing side is to be linked when the manipulator and the station at the synchronized side are performing FWD/BWD or test run, by using the twin synchronous function.

- 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.

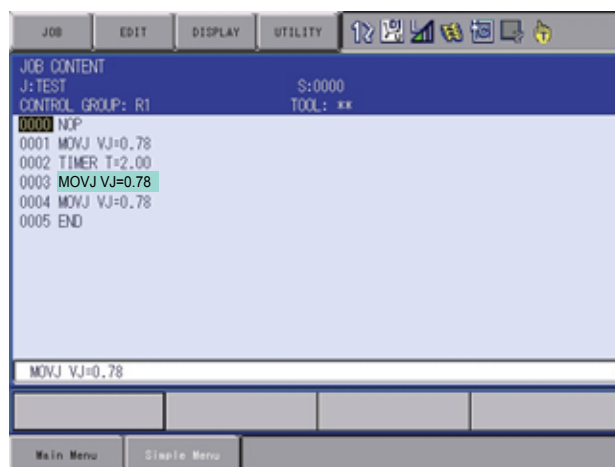
0: Starts operation where the cursor is located in the job displayed at the moment.

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 8-8: S2C437

Parameter Setting Value	Where the Playback Resumes
0	Resumes where the cursor is located in the job displayed at the moment.
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. <b>&lt;Example&gt;</b> Suspended at step 0003 during the playback of job A ↓ Displays job B ↓ Starts operation ↓ On the playback operation continuation window <ul style="list-style-type: none"> <li>• When “YES” selected, the playback resumes from step 0003 of job A</li> <li>• When “NO” selected, the playback resumes from the current position in job B</li> </ul>

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.



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).

## 8.3.0.46 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: MASTER
J: SAMPLE01
CONTROL GROUP: R1
0000 NOP
0001 DOUT OT#(1) ON //OUTPUT01
0002 MOVJ VJ=0.78
0003 WAIT IN#(1)=ON //INPUT01
0004 MOVJ VJ=0.78
0005 END
```



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.

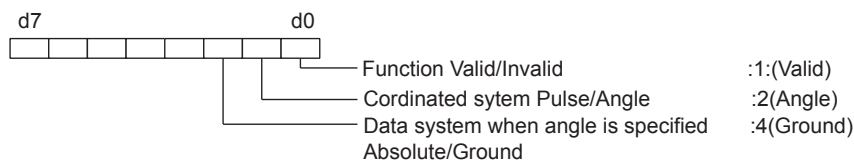
- 0 : Invalid
- 1 : Valid

## 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.

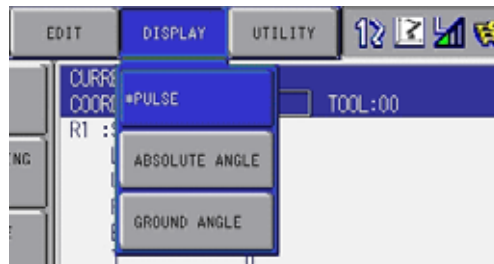
This function is valid in the following windows.

- 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



This function can be valid/invalid on {FUNCTION ENABLE} window.

Select {DISPLAY} on the pull down menu while this function is valid, then {PUSLE}, {ABSOLUTE ANGLE} and {GROUND ANGLE} appear. Select one so that the presently displayed data can be changed to the selected data type.



### PULSE

Indicates the pulse data of each axis.

CURRENT POSITION	
COORDINATE	PULSE
R1 :S	0
L	0
U	0
R	0
B	0
T	0

### ABSOLUTE ANGLE

Indicates the independent angle at every axes on the basis that the absolute value is 0[deg] when the pulse is 0.

CURRENT POSITION	
COORDINATE	ABS. ANGLE
R1 :S	0.0000 deg.
L	0.0000 deg.
U	0.0000 deg.
R	0.0000 deg.
B	0.0000 deg.
T	0.0000 deg.

### 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.

CURRENT POSITION	
COORDINATE	GND. ANGLE
R1 :S	0.0000 deg.
L	90.0000 deg.
U	0.0000 deg.
R	0.0000 deg.
B	0.0000 deg.
T	0.0000 deg.



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.

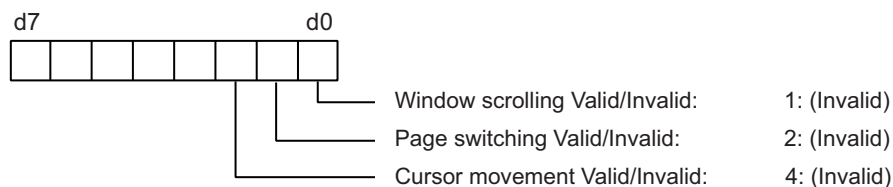
However, it is valid only when the selected control group is specified as a servo track and the servo track is operated by jog keys in the cartesian coordinates.

- 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.



## 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

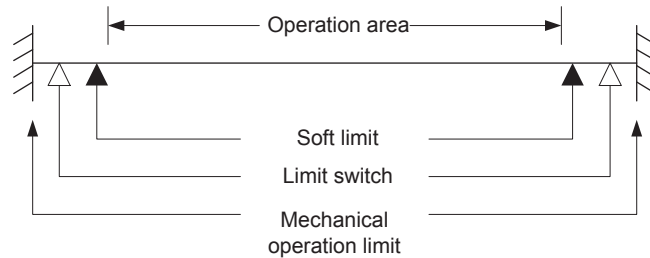
Note: S2C1203: When d2 (the cursor movement by the touch operation in the general-purpose display area) is disabled, the cursor cannot be moved.

## 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 S1CxG400 to S1CxG415: PULSE SOFT LIMIT

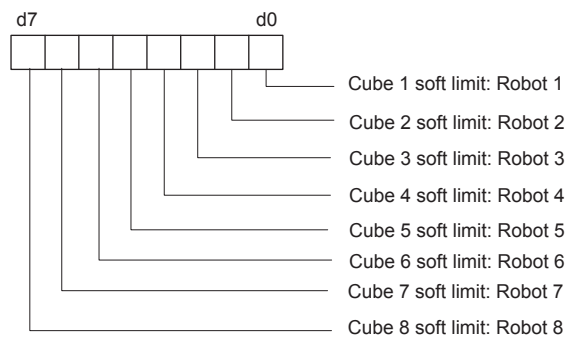
Soft limit is set independently for each axis by pulse value setting. Set current value (pulse value) of the axis at the soft limit set up position.



### 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.

0 : No check  
1 : With check



If "WITH CHECK" is selected, set up the following parameters.

Units:  $\mu\text{m}$

**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

S3C007: Robot 2: + side: X

S3C008: Robot 2: + side: Y

S3C009: Robot 2: + side: Z

S3C010: Robot 2: - side: X

S3C011: Robot 2: - side: Y

S3C012: 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

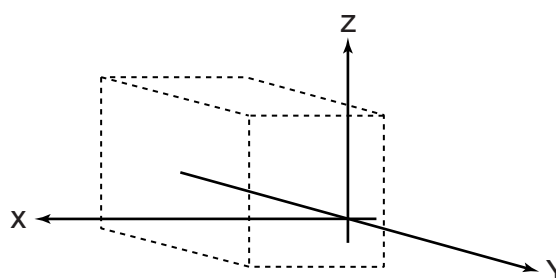
**Soft Limit**

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 section 8.4.0.1 "S1CxG400 to S1CxG415: PULSE SOFT LIMIT" on page 8-32.

#### 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 (-)

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.

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S3C063: S-axis Interference Area Robot 8 (-)

8.4.0.4 S2C003 to S2C066: CUBE/AXIS INTERFERENCE CHECK

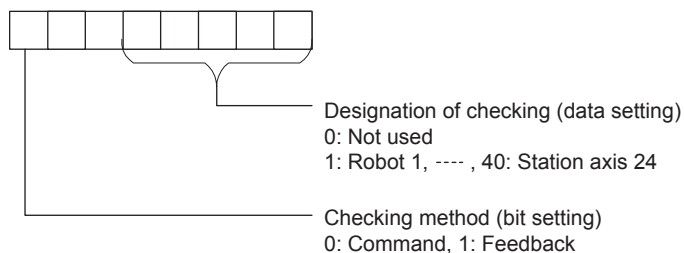
1. Designation of checking

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.



**Checking method**

The checking method differs according to ON/OFF status of servo power supply.



Checking Method Designation	Servo Power Supply ON	Servo Power Supply OFF
Command	Command	Feedback
Feedback	Feedback	Feedback

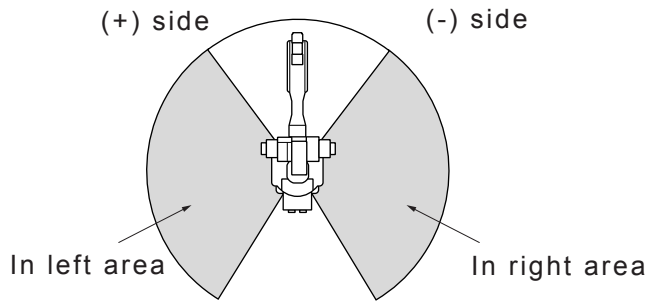
During the servo float function operation, checking is performed by feedback regardless of the checking method designation.



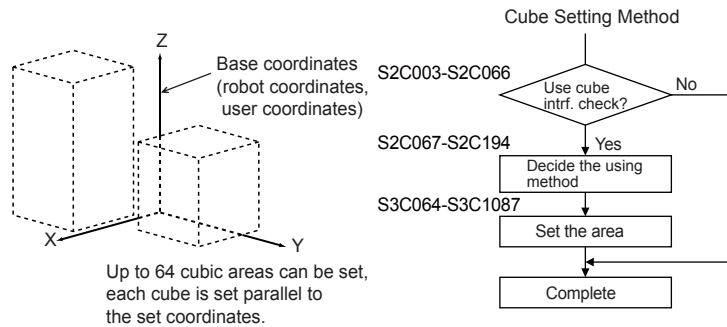
**Interference Area**

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.

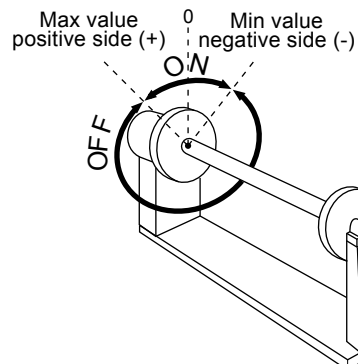
- S-axis Interference Area  
Position is controlled by the pulse value of the S-axis.



- 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.



## 8.4.0.5 S2C067 to S2C194: CUBE USING METHOD

These parameters specify the coordinates for defining the cube. If the user coordinates are selected, also specify the user coordinate system numbers. Set cubic area referring to the cubic interference areas shown below.

Coordinate specification

- 0 : Pulse (axis interference)
- 1 : Base coordinates
- 2 : Robot coordinates
- 3 : User coordinates

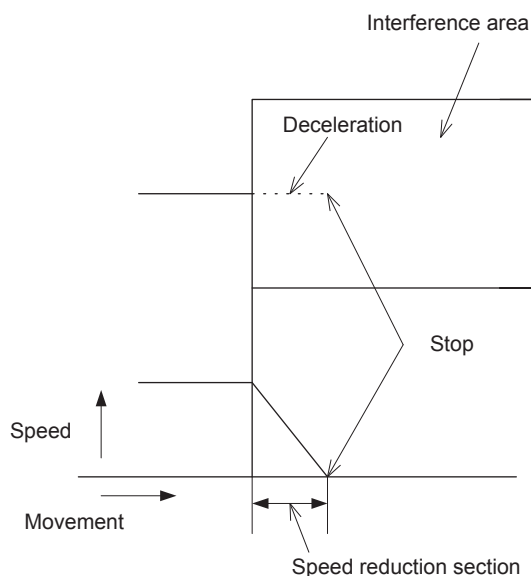
Coordinate No.: Specify the user coordinate number when selecting "3: User Coordinates".

Units: 1 $\mu$ m

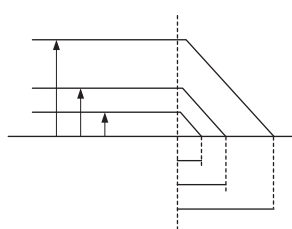
### Precaution When Setting the Interference Area

It will be necessary to consider the following when setting the cubic interference and S-axis interference areas. The manipulator is processed to decelerate to stop from the point where it enters in the area. Therefore, set the areas in consideration of the amount of the manipulator movement in the deceleration section shown in the figure below.

SUPPLEMENT



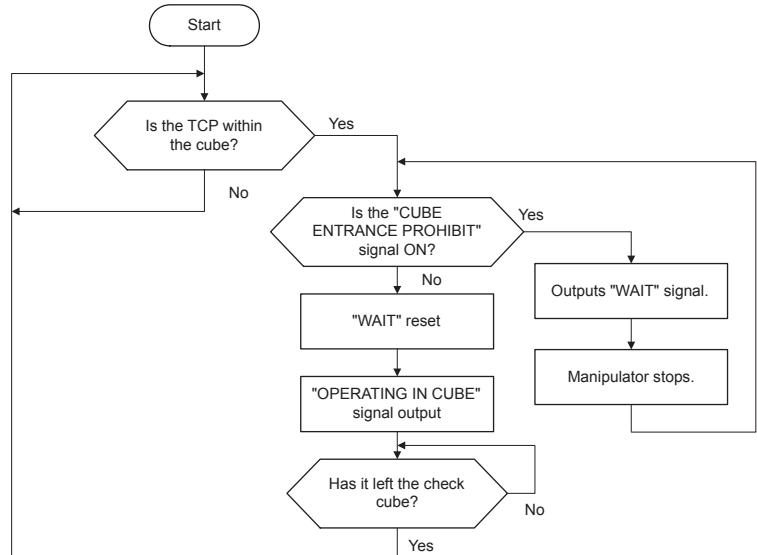
The move amount in the speed reduction section is dependent on the moving speed of the manipulator at that time:



- $V = 1500\text{mm/s} \rightarrow$  approx. 300mm (Max.)
- $V = 1000\text{mm/s} \rightarrow$  approx. 160mm
- $V = 30\text{mm/s} \rightarrow$  approx. 3 to 4 mm
- $V = 20\text{mm/s} \rightarrow$  approx. 2mm

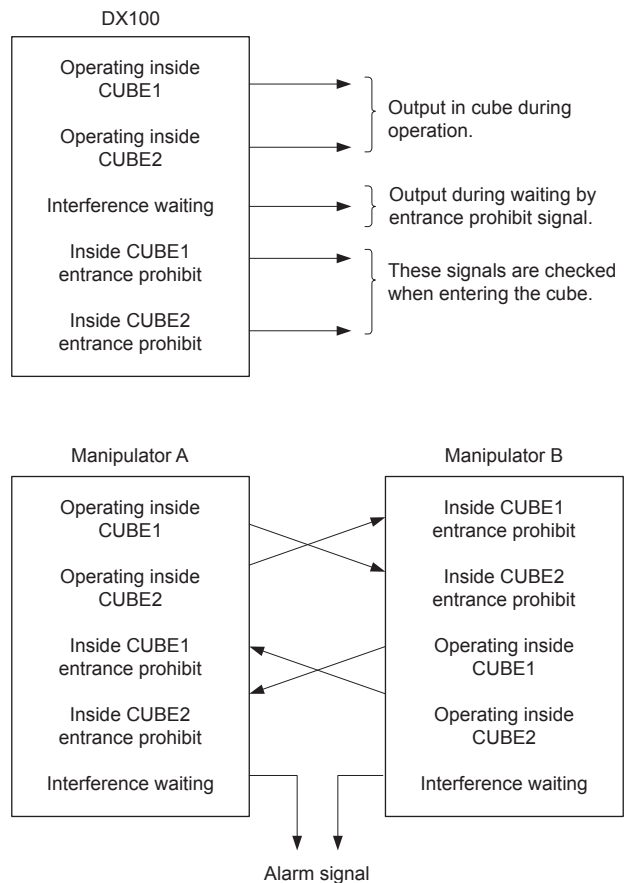
**Interference Prevention in Interference Area**

Processing to prevent interference is executed in the I/O processing section. The relation between the DX200 I/O signal and manipulator operation is shown below.



In wait status with the entrance prohibit signal, the manipulator just barely enters the area for speed reduction processing and then stops.

Fig. 8-9: Connection Example Where Two Manipulators are Operated in the Same Area



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#### 8.4.0.6 S3C000 to S3C047: CUBE SOFT LIMIT

These parameters specify auxiliary functions of S2C001 parameter. For details, see *section 8.4.0.2 "S2C001: CUBE SOFT LIMIT CHECK" on page 8-32.*

#### 8.4.0.7 S3C048 to S3C063: S-AXIS INTERFERENCE AREA

These parameters specify auxiliary functions of S2C002 parameter. For details, see *section 8.4.0.3 "S2C002: S-AXIS INTERFERENCE CHECK" on page 8-34.*

#### 8.4.0.8 S3C064 to S3C1087: CUBIC INTERFERENCE AREA

These parameters specify auxiliary functions of S2C003 to S2C066 parameters. For details, see *section 8.4.0.4 "S2C003 to S2C066: CUBE/AXIS INTERFERENCE CHECK" on page 8-35.*

#### 8.4.0.9 S3C1089 to S3C1096: ROBOT INTERFERENCE AREA

These parameters specify auxiliary functions of S2C236 to S2C263 parameters. For details, see *section 8.4.0.6 "S3C000 to S3C047: CUBE SOFT LIMIT" on page 8-39.*

#### 8.4.0.10 S3C1097: A SIDE LENGTH OF WORK-HOME-POSITION CUBE

Units: 1 $\mu$ m

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

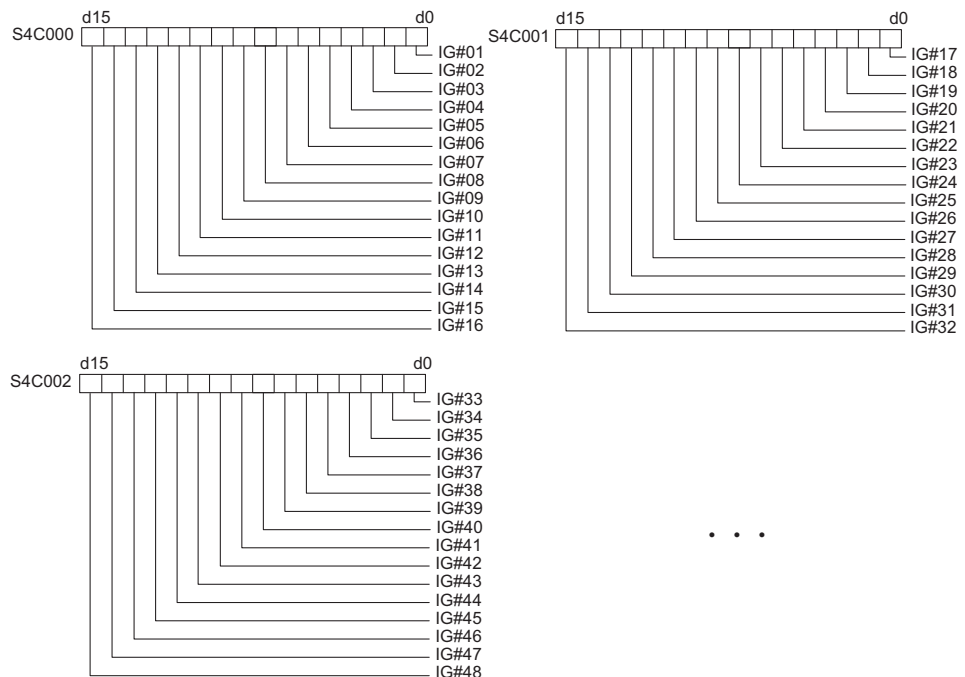
These parameters specify whether to execute parity checks with parameters when instructions covering the input group (1G#) are executed. The instructions covering the input groups are as shown below.

- 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.

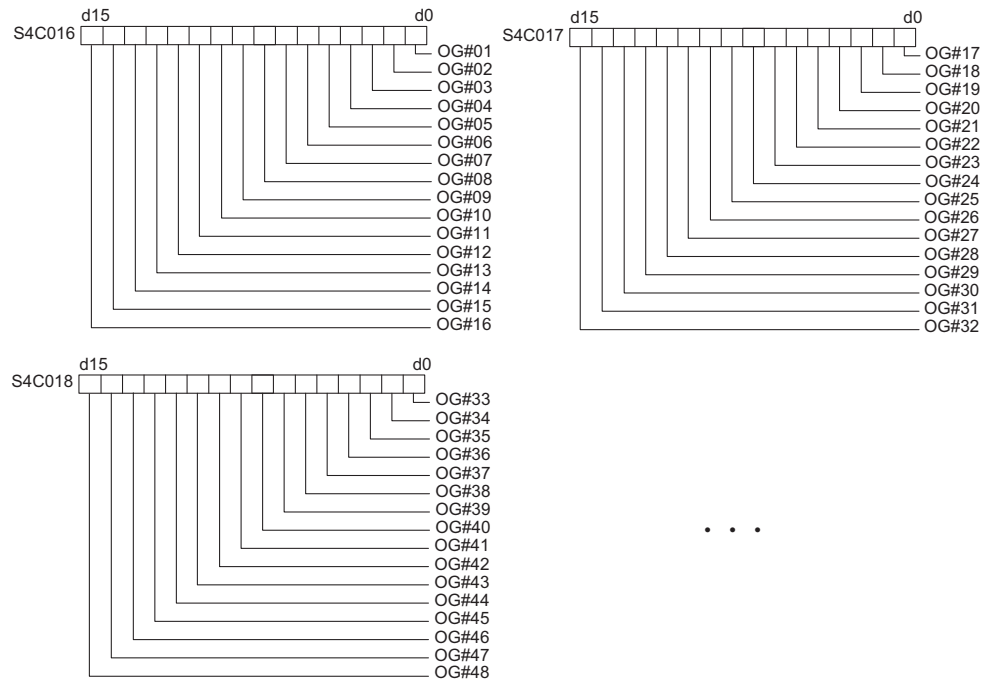
## 8.5.0.3 S4C016 to S4C031, S4C1116 to S4C1131: PARITY OF USER OUTPUT GROUPS

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

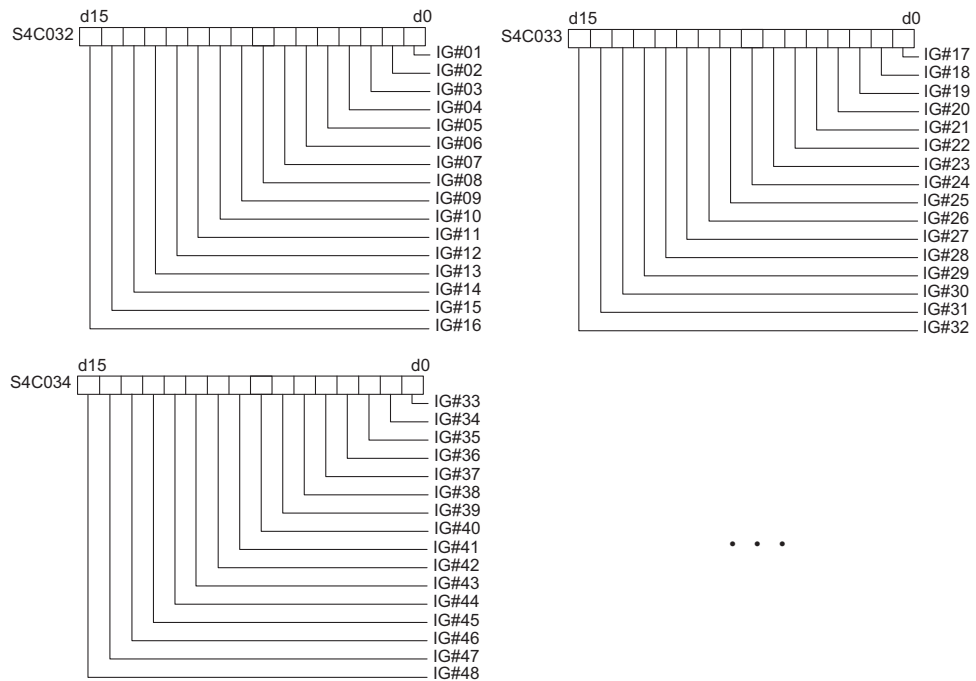
These parameters specify whether to handle the input group data as binary data or as BCD data when an instruction for the input group (1G#) is executed. The instructions covering the input groups are as shown below.

- 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)



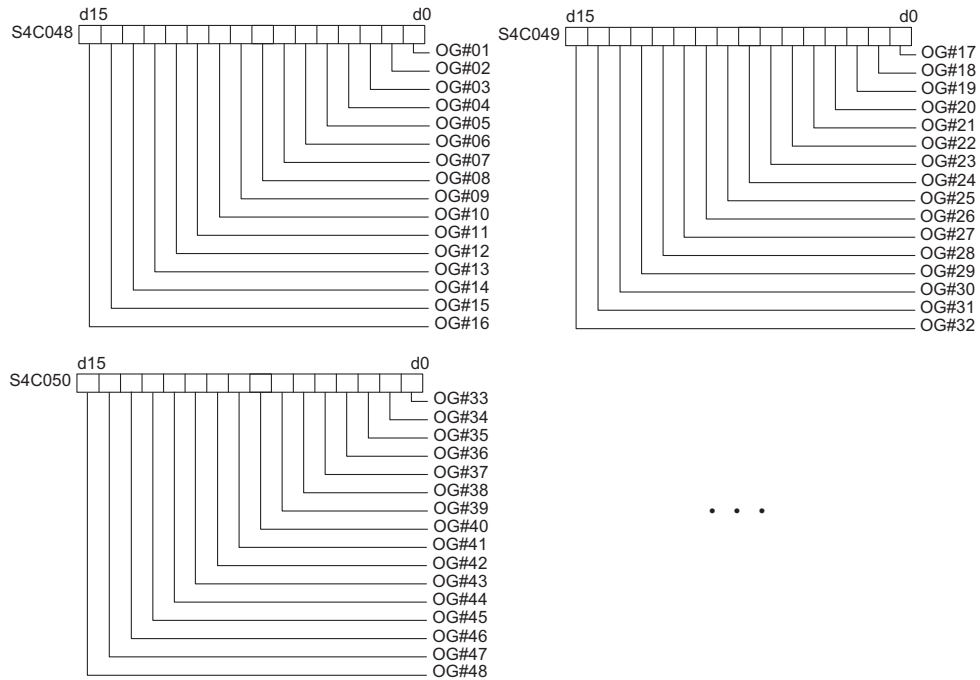
8.5.0.5 S4C048 to S4C063, S4C1148 to S4C1163: DATA OF USER OUTPUT GROUPS

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]

DATA EDIT DISPLAY

USER INPUT GROUP IG#01

IN#0001	#10010	<input checked="" type="checkbox"/>
IN#0002	#10011	<input type="checkbox"/>
IN#0003	#10012	<input checked="" type="checkbox"/>
IN#0004	#10013	<input type="checkbox"/>
IN#0005	#10014	<input checked="" type="checkbox"/>
IN#0006	#10015	<input type="checkbox"/>
IN#0007	#10016	<input checked="" type="checkbox"/>
IN#0008	#10017	<input type="checkbox"/>

→

State	Binary	Case	BCD	
1	$2^0 = 1$	1	$2^0 = 1$	} Total is in ones.
0	$2^1 = 2$	0	$2^1 = 2$	
1	$2^2 = 4$	4	$2^2 = 4$	
0	$2^3 = 8$	0	$2^3 = 8$	
1	$2^4 = 16$	16	$2^0 = 1$	} Total is in tens.
0	$2^5 = 32$	0	$2^1 = 2$	
1	$2^6 = 64$	64	$2^2 = 4$	
0	$2^7 = 128$	0	$2^3 = 8$	
		85		

Binary data value

BCD data value

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

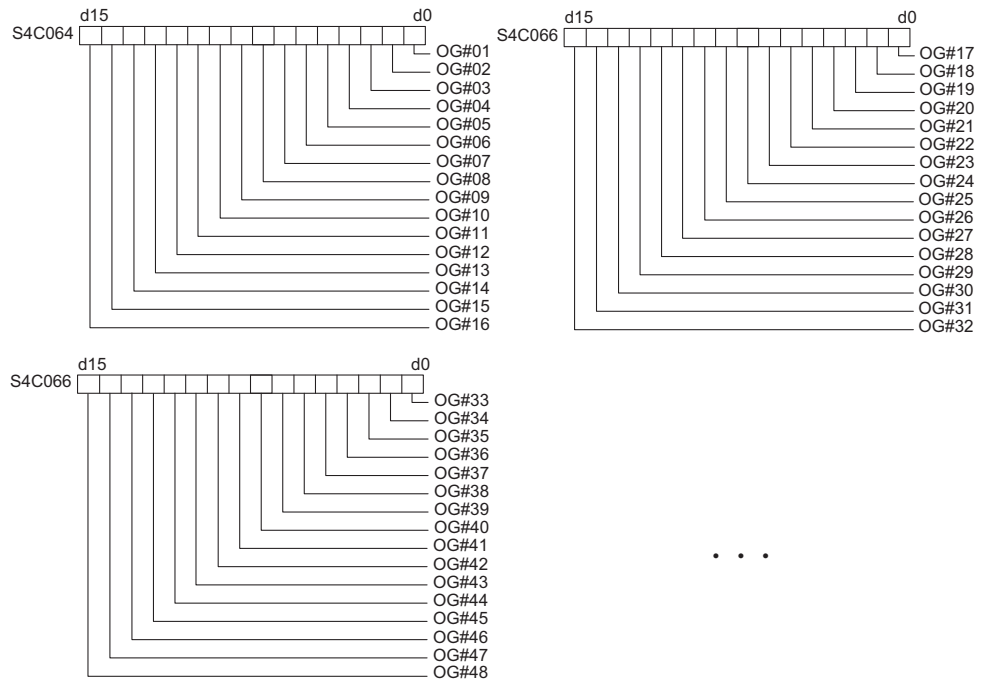
Set the user output group with bit to be initialized at switching mode.

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.

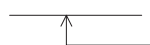
### 8.6.0.1 S2C212: +MOV or +SMOV INSTRUCTION SPEED INPUT

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**

SMOVL V=100

+MOVL



← Master side  
Speed specification not provided

**<Example> 1: Provided**

SMOVL V=100

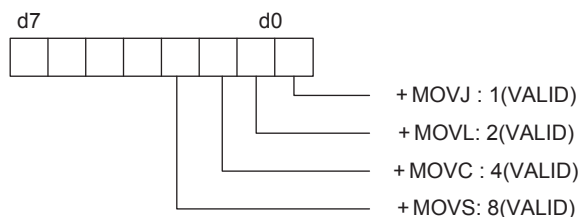
+MOVL V=100



← 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.



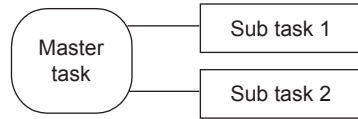
### 8.6.0.3 S2C231: OPERATION METHOD AT FWD/BWD OPERATION OR TEST RUN BY INDEPENDENT CONTROL


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.

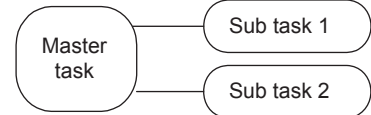
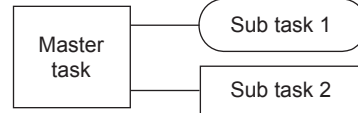
①When master task is currently displayed:



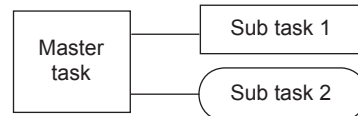
 : Not operating

 : Operating

②When sub task 1 is currently displayed:



③When sub task 2 is currently displayed:



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 *section 8.6.0.6 "S2C265 to S2C288: STATION AXIS DISPLAYED UNIT" on page 8-46.*

#### 8.6.0.6 S2C265 to S2C288: STATION AXIS DISPLAYED UNIT

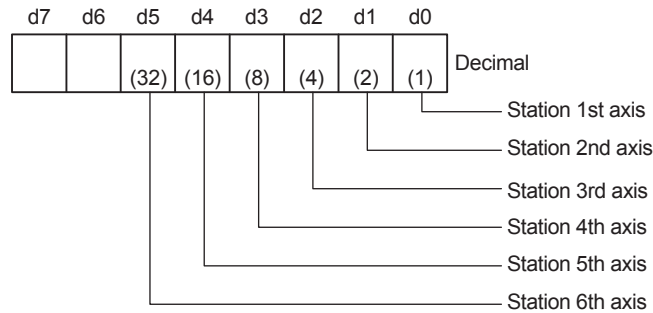
This parameter specifies the station axis displayed unit (bit specification).

0 : Display angle (deg)

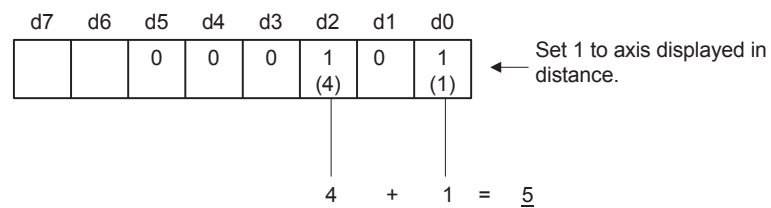
1 : Display in distance (mm)

### ■ 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:

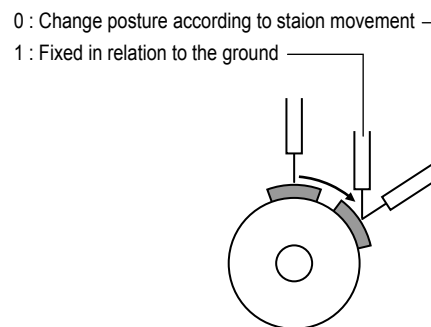


Therefore, set parameter S2C265 of station 1 to 5.

#### 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



#### 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

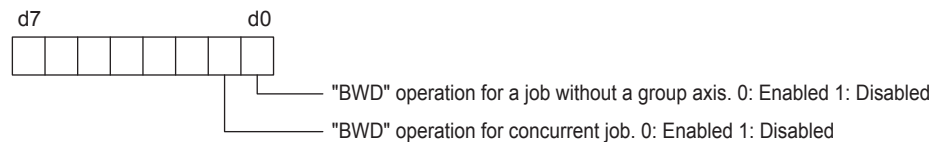
When the servo power supply is individually turned OFF where jobs in multiple number of tasks are operated using the independent control function, the job execution of the control group whose servo power supply is turned OFF is interrupted. The jobs of other control groups continue their execution.

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

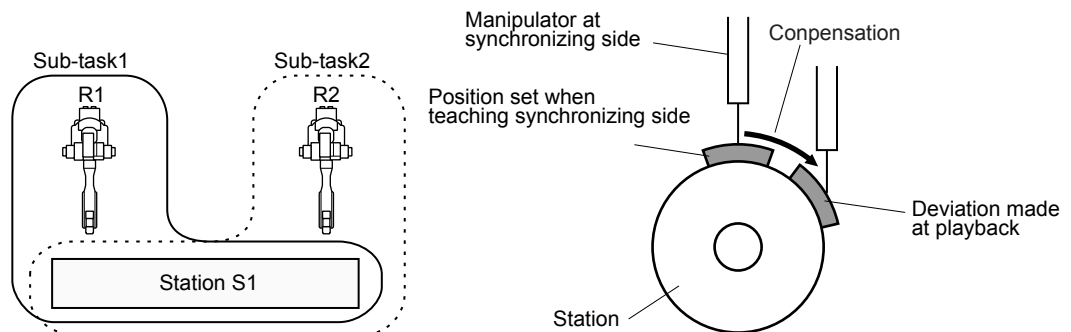
This parameter prohibits step-back operation of a job without a step.



## 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 $\mu\text{m}$ that can be processed by small-circle cutting machine.
S1CxG050 (Maximum diameter)	:	Set the maximum diameter of a figure in the units of $\mu\text{m}$ 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 $0.01^\circ$ .
S1CxG053 (- direction)	:	Set the limit value in the negative direction of cutting angle DIR set by CUT instruction, in the units of $0.01^\circ$ .

### 8.7.0.3 S1CxG054 to S1CxG055: SMALL CIRCLE CUTTING OVERLAP VALUE

These parameters set the overlapped value at small circle cutting.

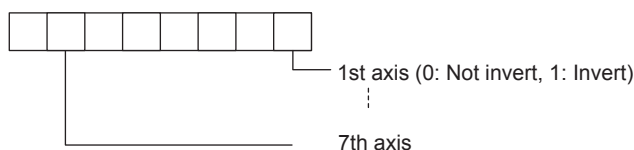
S1CxG054 (Operation radius)	:	Set the operation radius at inner rotation in the units of 1 $\mu\text{m}$ after overlapping by CUT instruction.
S1CxG055 (Rotation angle)	:	Set the rotation angle at inner rotation in the units of $0.1^\circ$ after overlapping by CUT instruction.

### 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  $\mu\text{m}$ .

### 8.7.0.5 S1CxG065: MIRROR SHIFT SIGN INVERSION

This parameter sets which axis to be shifted (mirror-shift: invert the sign).



### 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.)

## 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 MOVL P000 V=50
0002 ARCON ASF#(1)
0003 MOVL P001 V=30
0004 MOVL P002 V=30
0005 MOVL P003 V=30
0006 ARCOF
0007 MOVL 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 MOVL P000 V=50
0002 ARCON ASF#(1) //電流200A 電圧10V
0003 MOVL P001 V=30
0004 MOVL P002 V=30
0005 MOVL P003 V=30
0006 ARCOF
0007 MOVL 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  $\mu\text{m}$ .

## 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.

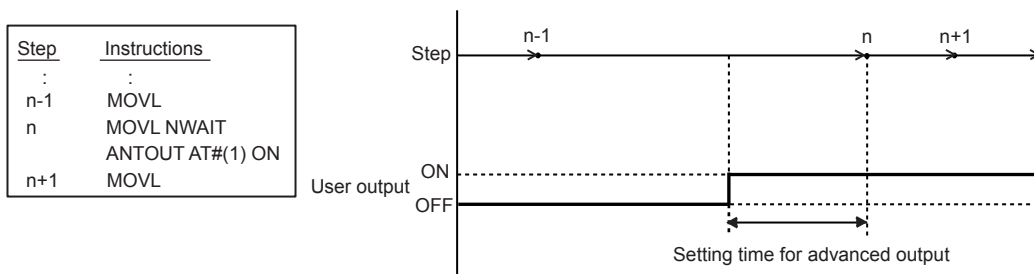
This setting is effective when adjusting timing deviation due to delayed motion of peripheral devices.

Setting the time to a positive value (+) delays the signal output.

This setting is effective when adjusting timing deviation due to delayed robot motion.

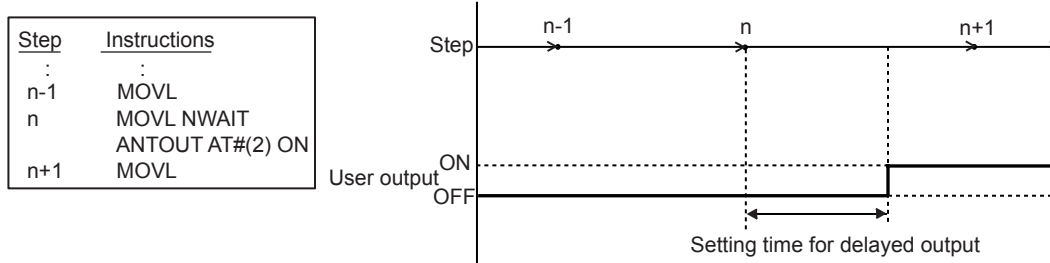
<Advanced Signal Output>

Signal output is carried out before the step is reached.



<Delayed Signal Output>

Signal output is carried out after the step is reached.





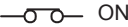

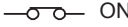
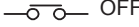
## 8.8.0.2 S4C327 to S4C390: SETTING OF OPERATING RELAY NO.

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 1024 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.

Parameter Setting Value	Operation of Output Signal
0	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">+ON</div>  ON         </div> <div style="display: flex; align-items: center; margin-top: 5px;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">-OFF</div>  OFF         </div>
1	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 10px;">+ON</div> <div style="margin-right: 20px;">           ON/OFF with the key ON while the key is pressed         </div>  ON       </div> <div style="display: flex; align-items: center; margin-top: 5px;"> <div style="margin-right: 20px;">OFF if the key is not pressed</div>  OFF       </div>

## 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 to S2C1171: 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

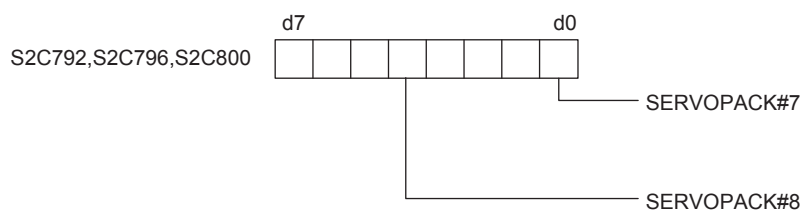
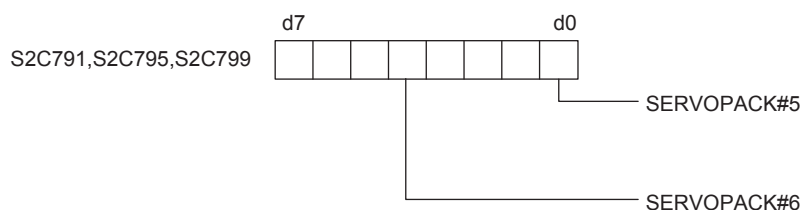
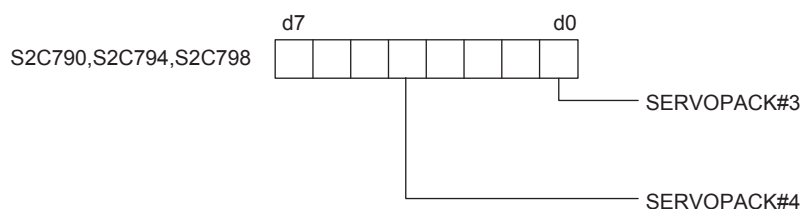
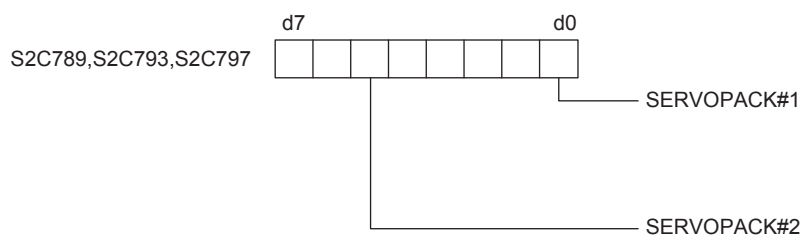
## 8.8.0.6 S2C789 to S2C792: COOLING FAN ALARM 1 OPERATION

## 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

## 8.8.0.10 S2C1175: COOLING FAN ALARM 5 OPERATION

These parameters specify the operation of cooling fan 4 to 5 with alarm sensor, connected to power ON unit.

## 8.8.0.11 S2C801 to S2C804: FAN ALARM 1 WELDER STATUS

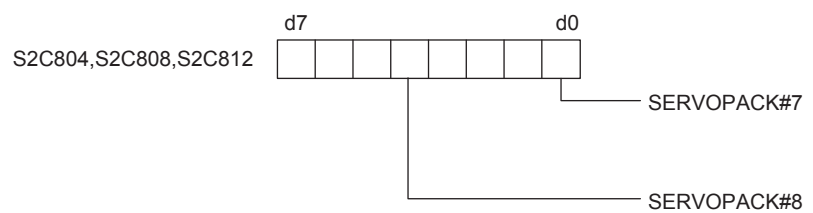
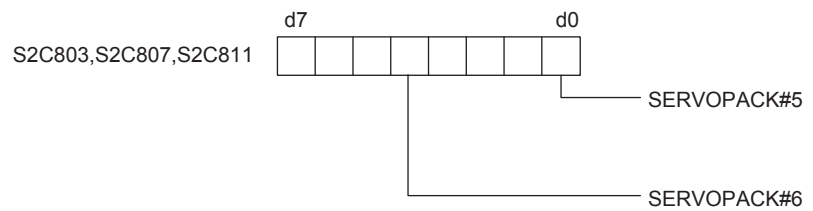
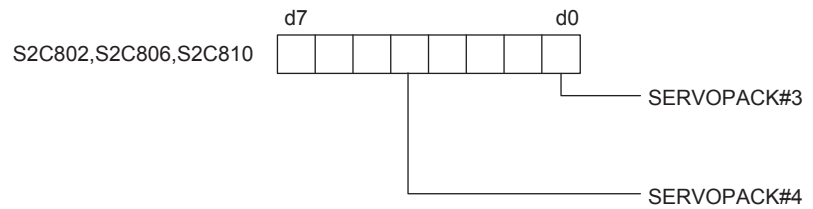
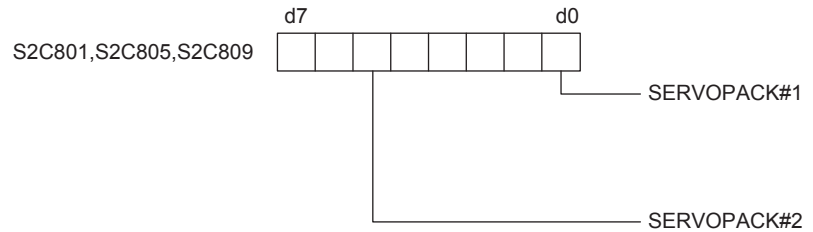
## 8.8.0.12 S2C805 to S2C808: FAN ALARM 2 WELDER STATUS

## 8.8.0.13 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



## 8.8.0.14 S2C1178: FAN ALARM 4 WELDER STATUS

## 8.8.0.15 S2C1179: FAN ALARM 5 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 “DX200 DATA TRANSMISSION FUNCTION”.

## 8.10 Application Parameters

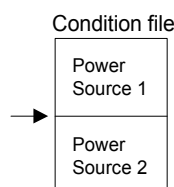
### 8.10.1 Arc Welding

#### 8.10.1.1 AxP000: APPLICATION

This parameter specifies the application. Set “0” for arc welding.

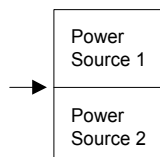
#### 8.10.1.2 AxP003: WELDING ASSIGNMENT OF WELDING START CONDITION FILE

This parameter specifies the beginning condition number in the welding start condition file to be assigned to Welder 2. Condition files of a lower number are automatically assigned to Welder 1. For a system with one Welder, 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 Welder 2. Condition files of a lower number are automatically assigned to Welder 1. For a system with one Welder, 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 Welder. "0" indicates that no Welder exists.

**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 Welder characteristic 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)

Spot Weld Motor Gun	8 Parameter
	8.10 Application Parameters

### 8.10.3 Spot Welding

#### 8.10.3.1 AxP003: MAXIMUM NUMBER OF CONNECTED WELDERS

This parameter specifies the maximum number of welders which are 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

```

#### 8.10.3.3 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 Welder connected to each welding gun, this parameter specifies odd or even parity.

Bit specification for 4 Welders. (0 : odd number, 1 : even number) The initial setting is "0".

```

0 0 0 0 0 0 0 0
      | | | |
      4 3 2 1   Welder number

```

---

**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 Welder 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**

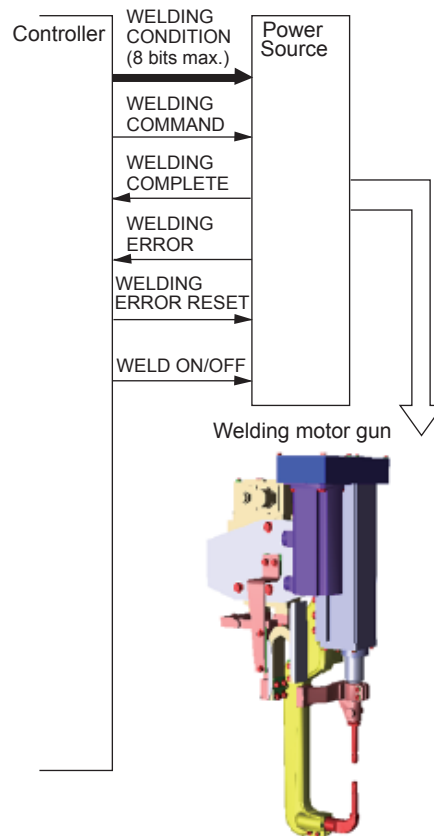
This parameter specifies whether to output TOOLON instruction or not at restarting when the work is stopped for some reasons during the output of TOOLON instruction.

## 9 Spot Welding Application Using a Motor Gun

### 9.1 System Overview (Motor Gun)

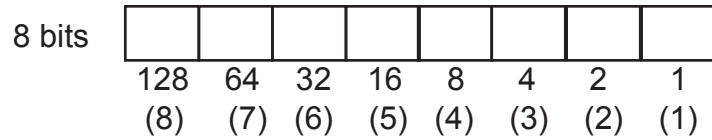
An I/O signal diagram of a typical system is shown below.

*Fig. 9-1: Spot Welding System I/O Signal Diagram*





- Welding conditions (level signals)
  - Sets the welding conditions for the welder.
  - The output format can be set as binary or discrete.
  - Can handle up to 255 conditions in binary.



The numbers in parentheses are for discrete.

- WELDING COMMAND (level/pulse)
  - Outputs the start instruction to the welder.
- WELDING ERROR RESET(level)
  - Resets the welding alarm status of the welder.














For details on signal contents, refer to *section 9.4.2.2*  
*"Welding I/F File" on page 9-31.*

## 9.2 Function Keys

Each function used for spot welding is allocated on the [NUMERIC KEY]s of the programming pendant.



	Displays the MANUAL PRESS window.
	Displays the WORK HOME POSITION window. [FWD] + [TASK ORIGIN] With the WORK HOME POSITION window in the teach mode, press these keys to move the manipulator to the work home position.
	Displays the SVSPOT instruction in the input buffer line in order to register spot welding operation. [INTERLOCK] + [SPOT] With the MANUAL PRESS window, press these keys to execute manual spot welding.
	Displays the SVGUNCL instruction in the input buffer line in order to register dry spot welding operation. [INTERLOCK] + [GUN CLOSE] With the MANUAL PRESS window, press these keys to execute manual dry spot welding.
	[INTERLOCK] + [WELD ON/OFF] Turns the welding ON/OFF signal ON or OFF.

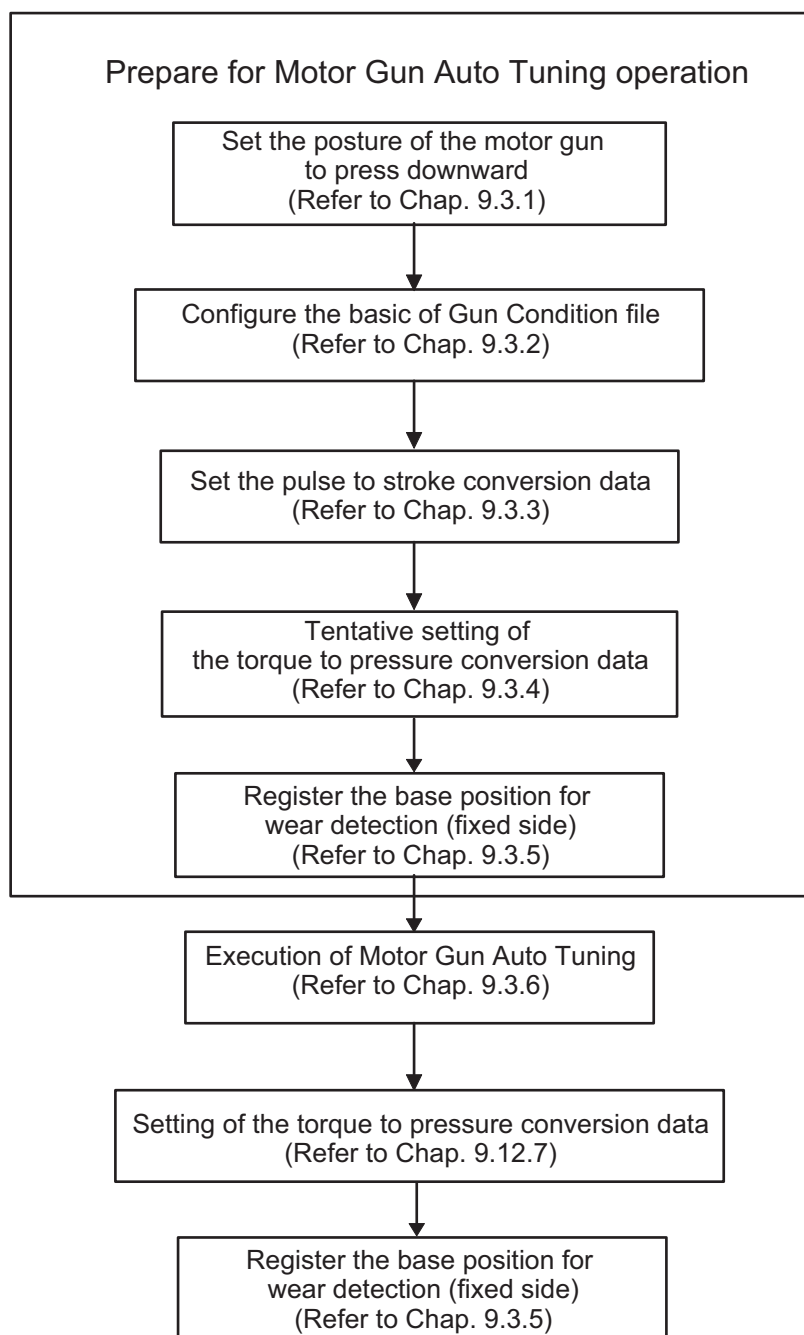
	<p>The SHORT OPEN POSITION SETTING window appears the first time this key is pressed. The selection No. for the short open position is replaced by pressing this key while the SHORT OPEN POSITION SETTING window is appeared.</p> <p>[INTERLOCK] + [SHORT OPEN] The movable side tip moves to the selected short open position.</p>
	<p>The FULL OPEN POSITION SETTING window appears the first time the key is pressed. The selection No. for the full open position is replaced by pressing this key while the FULL OPEN POSITION SETTING window is appeared.</p> <p>[INTERLOCK] + [FULL OPEN] The movable side tip moves to the selected full open position.</p>
	<p>[INTERLOCK] + [WELD ALM RESET] A welder alarm reset signal is output to the welder while these keys are held down.</p>
	<p>[INTERLOCK] + [PRESSURE] With the MANUAL PRESS window or the JOB window, press these keys to execute pressurizing.</p>
	<p>[INTERLOCK] + [RELEASE] Executes releasing.</p>
	<p>[INTERLOCK] + [SEARCH] Executes searching a work.</p>

### 9.3 Setting of Motor Gun

Set up the motor gun by following the procedures below. The dynamic characteristics of the motor gun need to be automatically identified by the Motor Gun Auto Turning function so that the pressurization is executed by the optimum pressure torque instruction for the each motor gun.

Before execution of Motor Gun Auto Turning function, procedures described in the sections from *section 9.3.1 "Posture of Motor Gun" on page 9-6* to *section 9.3.5 "Register the Base Position for Wear Detection (Fixed Side)" on page 9-9* are necessary.

After execution of Motor Gun Auto Turning, register the base position for the wear detection again because of the changes of the detection accuracy.



In case of the manipulators of high speed spot welding specification, the weld complete signal may be already turned ON at the beginning of the welding instruction. At that time, "AL4621: WELD COMPLETE SIGNAL ERROR" may occur.

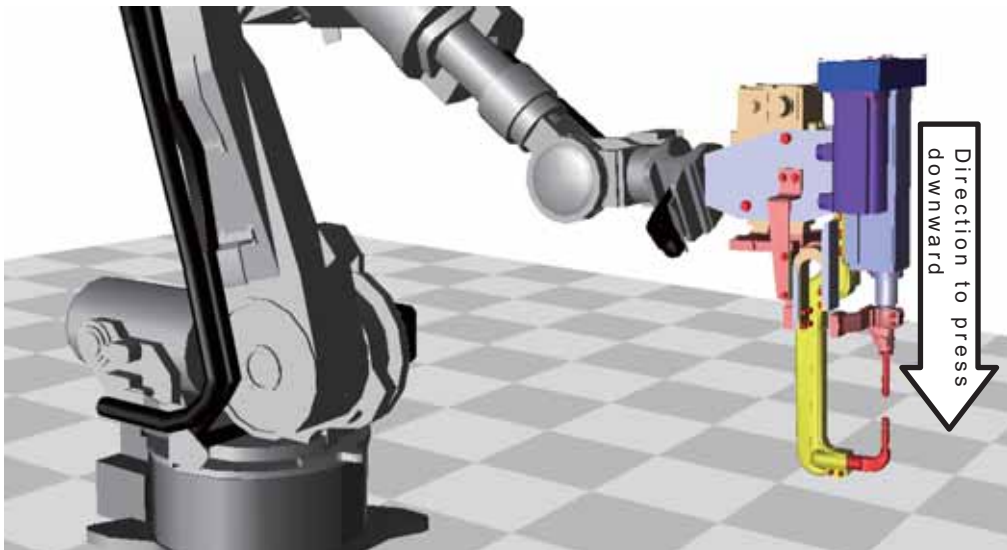


To prevent the alarm, set the item "WELD COMPLETE OFF WAIT TIME" in *section 9.4.7 "Application Condition Setting"*. Setting the item allows the controller to wait a set time until the weld complete signal is turned OFF.

Also, the alarm can be prevented by adjusting the output pulse time of the weld complete signal by the welder. Please contact to the welder manufacturer if they allows changing the output pulse time.

### 9.3.1 Posture of Motor Gun

Set up the motor gun to the posture shown in the figure below.



### 9.3.2 Basic Configuration

By referring to *section 9.4.1 "Gun Condition File" on page 9-23*, set up the following items in the Gun Condition file.

- GUN TYPE
- WELDER NO.
- TORQUE DIR
- MAX PRESSURE

### 9.3.3 Setting of Pulse to Stroke Conversion Data

Refer to *section 9.4.1.1 "Entering Pulse to Stroke Conversion Data" on page 9-28* for this setting.

**9.3.4 Tentative Setting of Torque to Pressure Conversion Data**

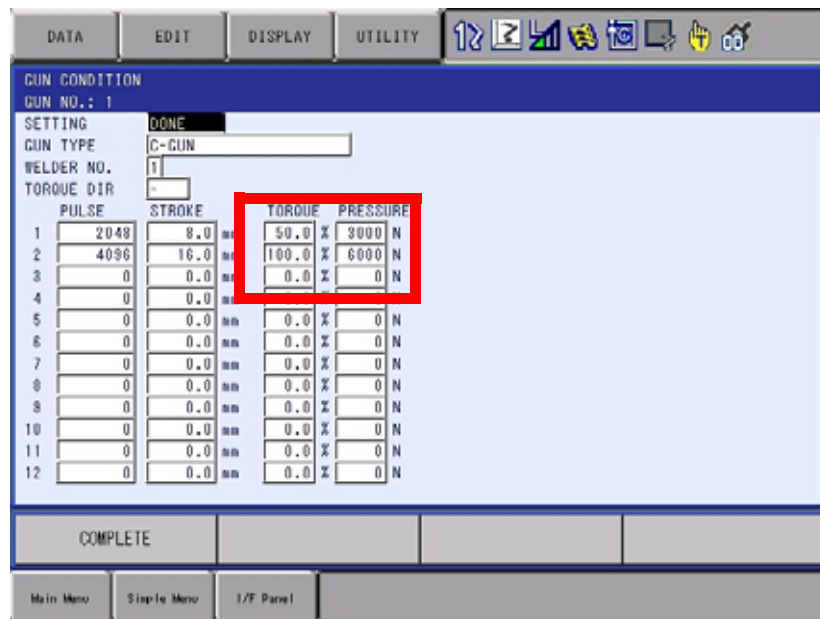
In order to use Motor Auto Tuning function, it is necessary to set the torque to pressure conversion data of the Gun Condition file tentatively.

Normally, the tentative setting is already set. Therefore, confirm that pressing can be done correctly by the maximum pressure and half of the maximum pressure.

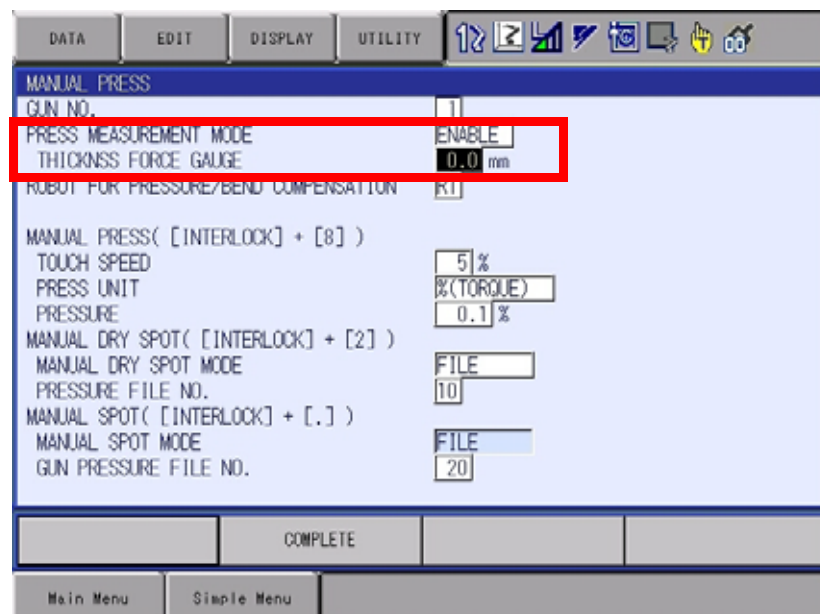
If the tentative setting is not set, set the gun motor torque at the maximum pressure and half of the maximum pressure as shown in the following procedures.

<Ex. when the maximum pressure is 6000(N)>

Find and set the torques(%) at 6000(N) and 3000(N)



1. Set a value to {THICKNESS FORCE GAUGE} and select "ENABLE" at {PRESS MEASUREMENT MODE} on the "MANUAL PRESS" window.



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## 9 Spot Welding Application Using a Motor Gun

### 9.3 Setting of Motor Gun

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2. Set the pressure value to the pressure file.
  - As the unit of this pressure, specify torque(%).
  - Specify 5(%) to the touch speed of the pressure file.
3. Register SVGUNCL instruction to a JOB.
  - Specify the pressure file set at the step 2.
4. Execute the JOB and measure the pressure with the force gauge.
5. Execute the above procedures 2 through 4 with the different toque(%) to find a toque(%) for the pressure to be maximum.
6. Execute the above procedures 2 through 4 with the different toque(%) to find a torque(%) for the pressure to be half of the maximum one.
7. Set torques (%) for both maximum and half of the maximum pressure. And then, change the SETTING from “NOT DONE” to “DONE”.

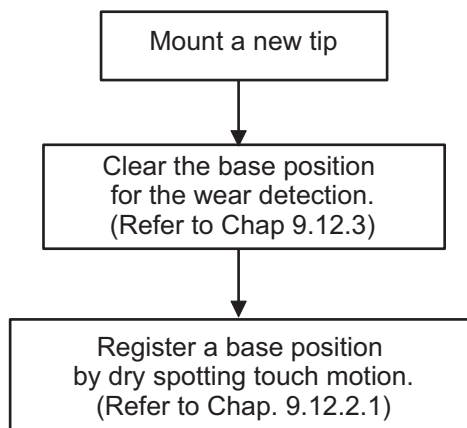


Pressurization will not be executed in case the Gun Condition file is incomplete.

When applying the pressure for the first time, set a tentative value to the Gun Condition file.

**9.3.5 Register the Base Position for Wear Detection (Fixed Side)**

Register the base position for wear detection by following the procedures below.



In case a gun is shipped with the manipulator, the base position for the wear compensation (fixed side) setting is done.

5% is set to touch speed and 1000 N is set to the pressure as its initial condition for the gun shipped with the manipulator.



In this consequence, when the wear detection is executed, follow the conditions described above (touch speed: 5%, pressure: 1000 N).

When modifying those values, clear the base position for the wear compensation data and register the new base position again.



Execute the wear detection operation. If the wear detection operation is not done, the stable pressure cannot be acquired.



**9.3.6 Execution of Motor Gun Auto Tuning Function**

By referring to the following procedures, execute Motor Gun Auto Tuning.

This function automatically repeats applying pressure to identify the dynamic characteristics parameter of the motor gun.

This identification takes 5 to 10 minutes.



Before execution of the auto tuning operation, assure the safety.



Before the execution of the auto tuning operation, confirm that the center of both gun tips matches well at the contact position because tips are pressed at maximum pressure by the dry spotting motion during the auto tuning operation.



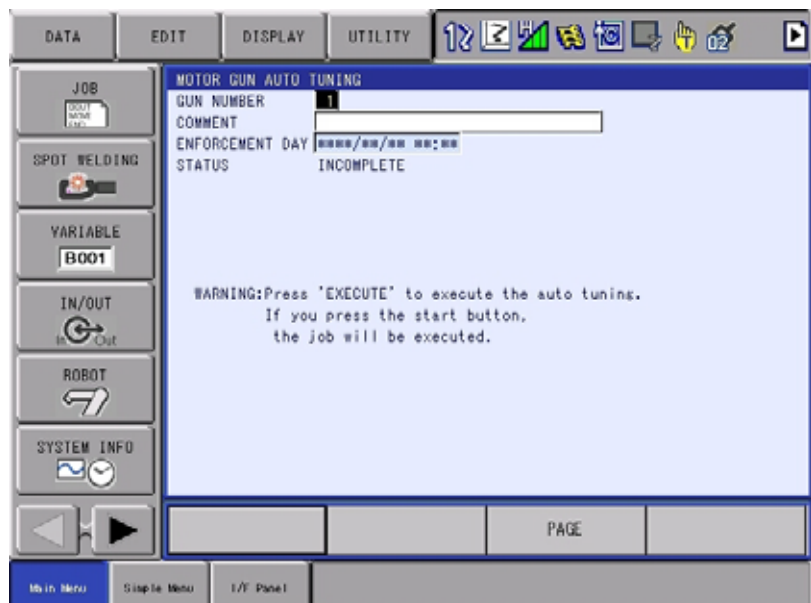
After the execution of Motor Gun Auto Tuning function, do not fail to re-measure the pressure and reset the torque to pressure conversion data.



An alarm “4708: Motor Gun Auto Tuning incomplete” occurs, in case SVSPOT instruction is executed while Motor Gun Auto Tuning is in incomplete status.

Be sure to execute the Motor Gun Auto Tuning function.

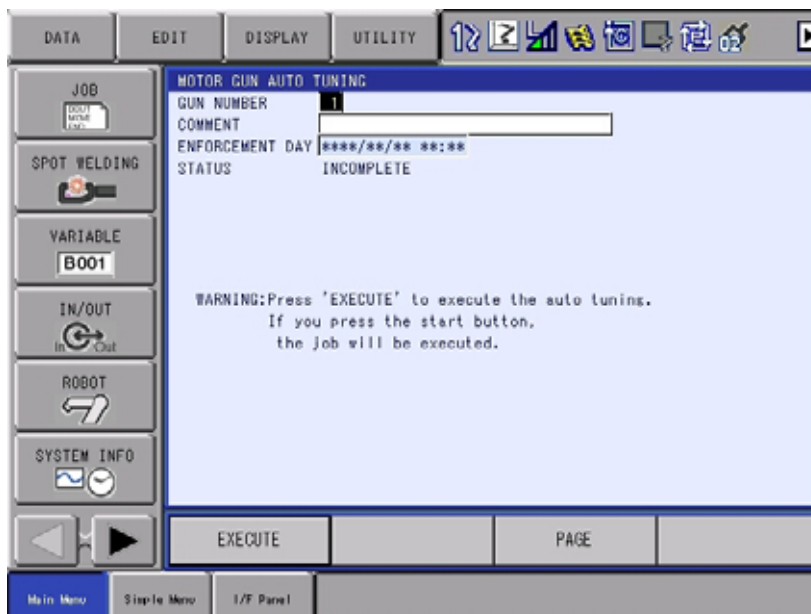
1. Select {SPOT WELDING} on the {Main Menu}.
  2. Select {MOTOR GUN AUTO TUNING}.
- The MOTOR GUN AUTO TUNING window appears.



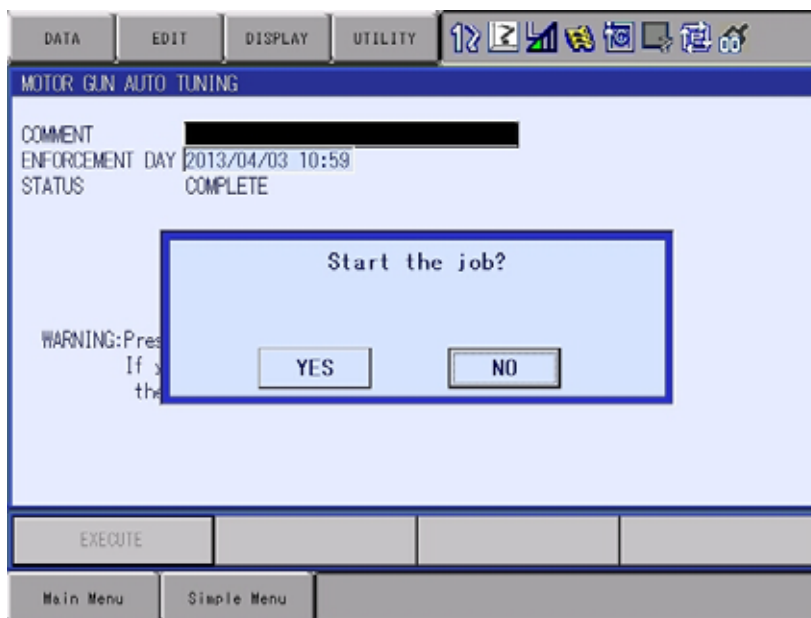
## 9 Spot Welding Application Using a Motor Gun

### 9.3 Setting of Motor Gun

3. Select the gun number using [PAGE] key or {PAGE} button.
4. Change the mode to the play mode, and then press [SERVO ON READY] key.
  - The servo power is turned ON, then {EXECUTE} button appears.



- When pressing the start button on the programming pendant while the MOTOR GUN AUTO TUNING window is appeared, the following confirmation dialog appears. Select “NO” to execute the Motor Gun Auto Tuning.



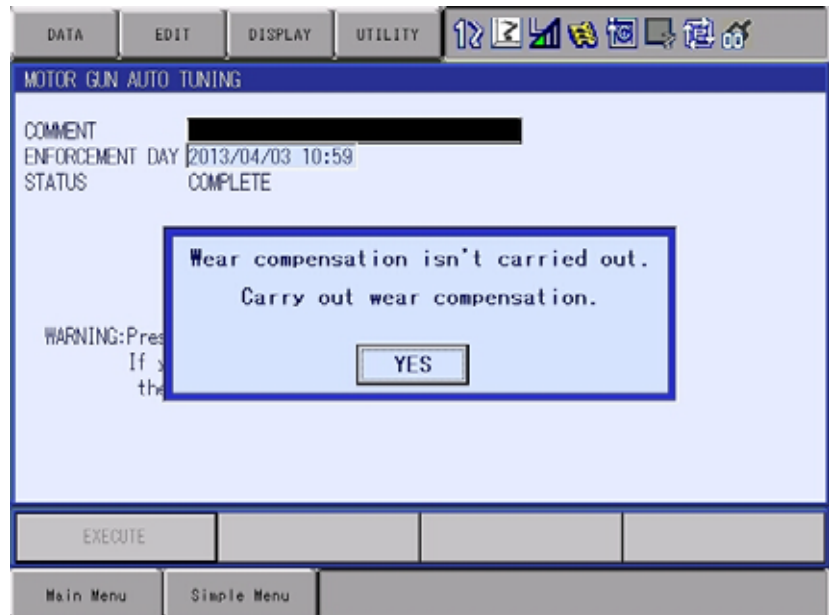
#### NOTE

If pressing the [START] button after selecting the “YES” in the confirmation dialog, the JOB will be played back.

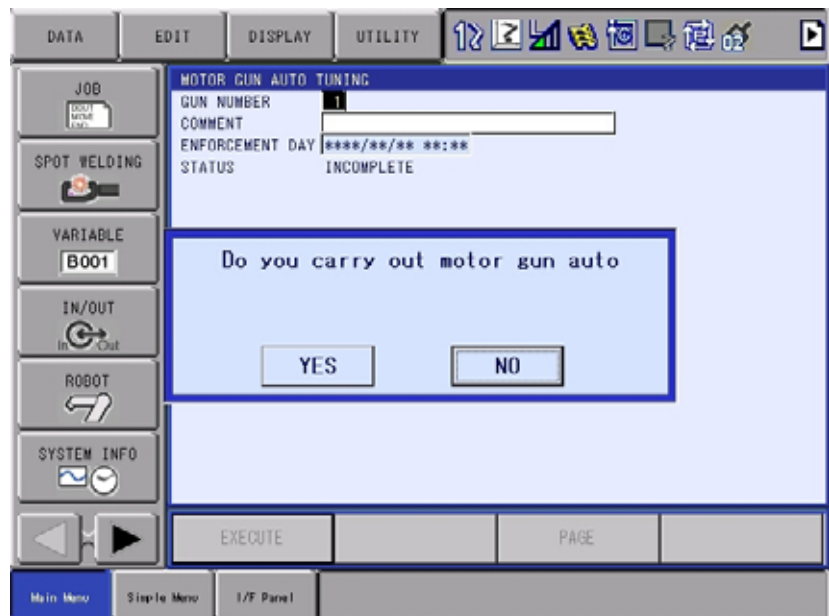
Do not press the [START] button unintentionally.

## 5. Press {EXECUTE} button.

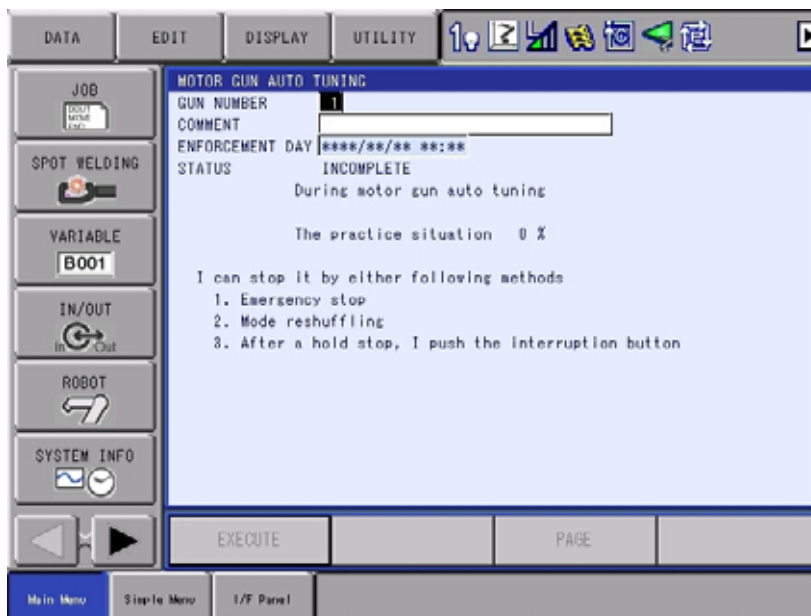
- If the wear compensation has not been executed, the confirmation dialog to prompt performing the wear compensation will appear. Refer to section 9.3.5 “Register the Base Position for Wear Detection (Fixed Side)” on page 9-9, and execute the wear compensation.



- If the wear compensation has been executed, the confirmation dialog to execute the Motor Gun Auto Tuning will appear.



6. Select "YES" in the dialog box.
- The MOTOR GUN AUTO TUNING operation is executed.



- The status of MOTOR GUN AUTO TUNING operation can be confirmed by the SPECIFIED OUTPUT signal (#50906).
  - Select {IN/OUT} under the {Main Menu}.
  - Select {SPECIFIED OUTPUT}.
  - Press [PAGE] key, {PAGE} button, or the select button to indicate SOUT#0719(#50906).
  - This signal is turned ON during the MOTOR GUN AUTO TUNING operation.

During the MOTOR GUN AUTO TUNING operation, the following operations are not available:

- Moving to other windows
- Key operation
- Operations by the start button
- External start operation
- IO JOG operation
- Work home position return operation
- Operations by the moving type command of the data transmitting function

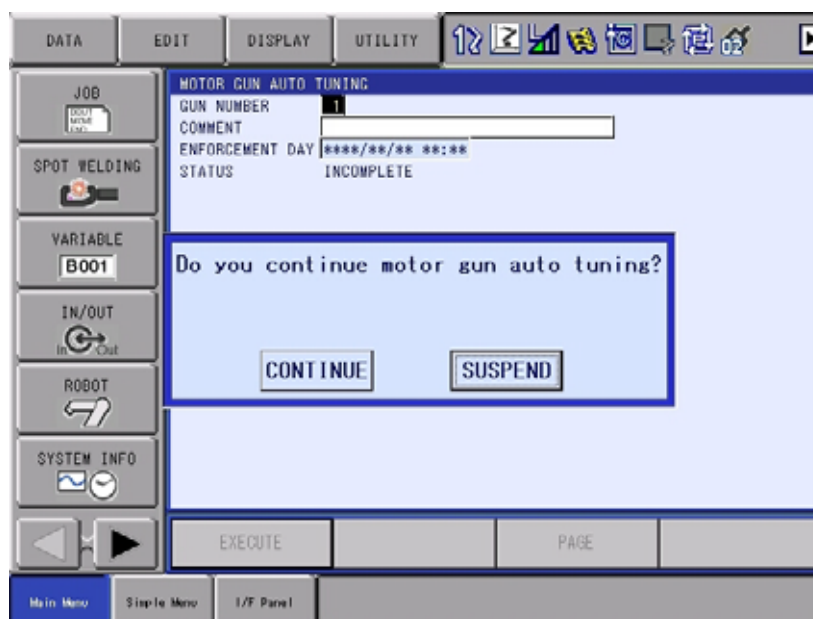


**<During the MOTOR GUN AUTO TUNING operation>**

Seeing the dialog “Do you carry out motor gun auto” after pressing the {EXECUTE} button on the MOTOR GUN AUTO TUNING window is the start of this operation, and the end of this operation is pressing the button to close the dialog “Motor gun auto tuning was completed” or the dialog “Result of tuning had abnormalities.”.

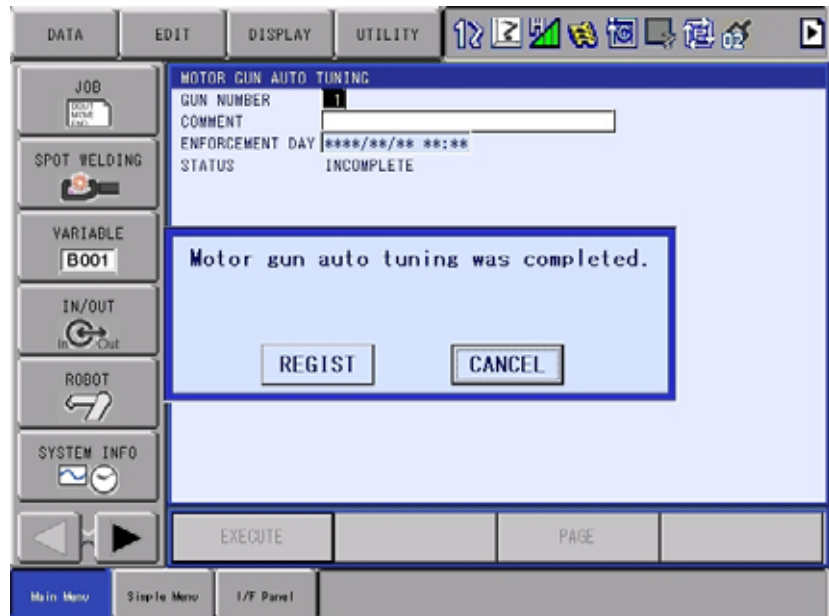
Also, it is defined as “during the MOTOR GUN AUTO TUNING operation” while the dialog “Do you continue motor gun auto tuning?” is displayed after Hold is executed while execution of this function.

- The MOTOR GUN AUTO TUNING operation is stopped or suspended in case one of the following operation is executed.
  - {Stop: Impossible to continue}
    - Emergency stop
    - Mode change
- When the operation is stopped, the MOTOR GUN AUTO TUNING operation finishes incompletely.
  - {Suspend: Possible to continue}
    - Hold operation
- When it is suspended (by Hold operation), a confirmation dialog box appears to ask “CONTINUE” or” SUSPEND”.

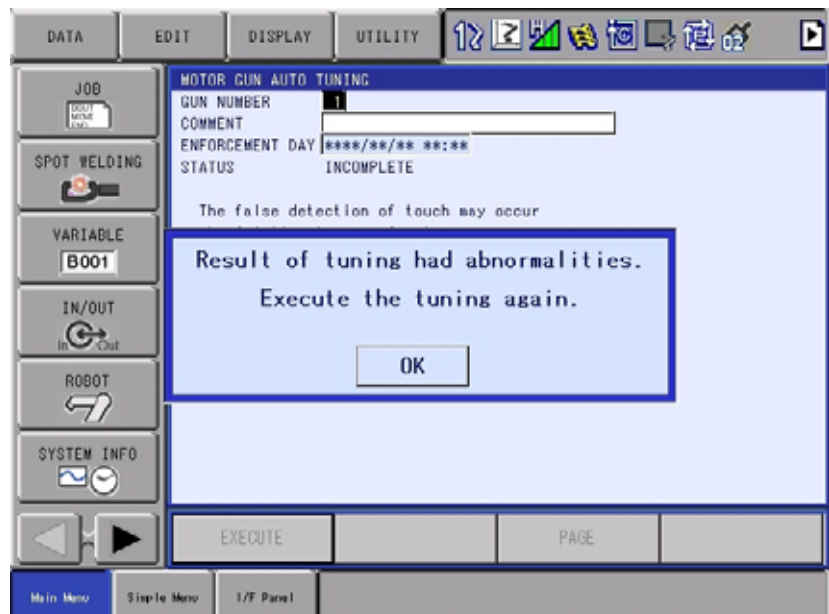


- Select “CONTINUE” to continue the operation.
- Select “SUSPEND” and the MOTOR GUN AUTO TUNING operation finishes incompletely.

- After MOTOR GUN AUTO TUNING operation is successfully done, a confirmation dialog box for registration appears as shown in the figure below. Then, move to step 8.

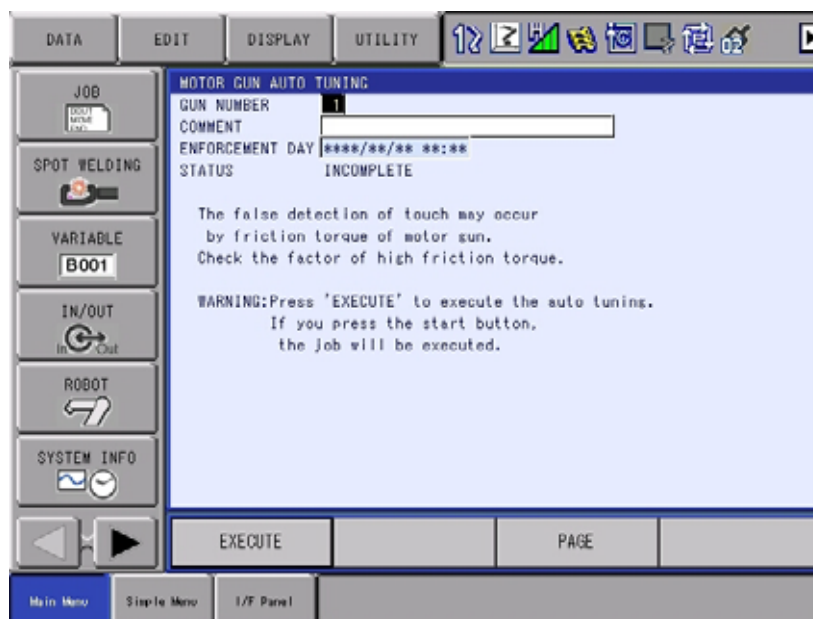


- In case there is a possibility of false detection of touch due to high friction torque of the gun, a dialog box appears as shown in the figure below to notify an error in MOTOR GUN AUTO TUNING operation. Then, move to step 7.



## 7. Select "OK".

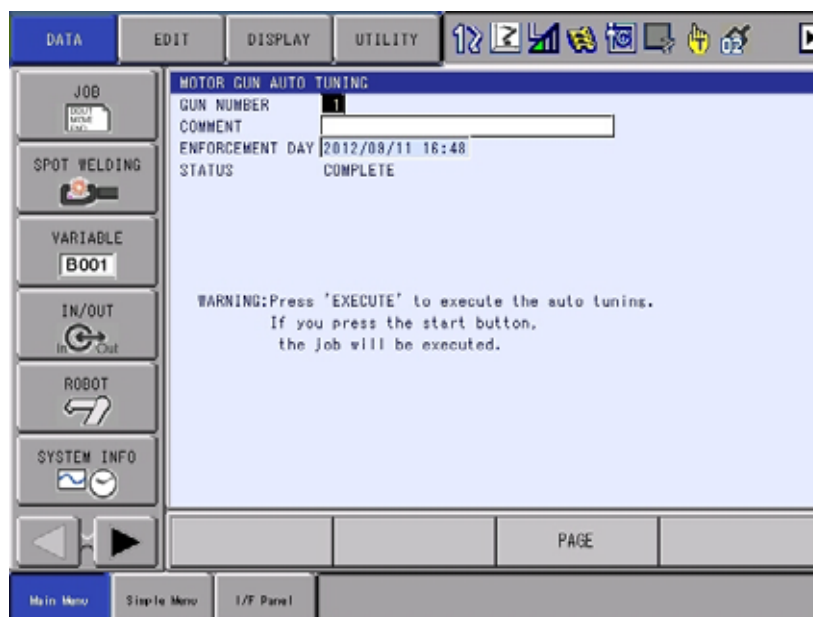
- A message "The false detection of touch may occur by friction torque of motor gun. Check the factor of high friction torque." appears.



- If no failure is found to the gun, set the touch pressure a higher value than the value of friction torque value. Then, start the MOTOR GUN AUTO TUNING operation from the step 4 again. For the setting of touch pressure, refer to *section 9.4.6 "Gun Detail Setting File" on page 9-45*.

## 8. Select "REGIST".

- {STATUS} on the window changes from {INCOMPLETE} to {COMPLETE}. The date is registered to {ENFORCEMENT DAY}.



- If "CANCEL" is selected, the MOTOR GUN AUTO TUNING operation does not complete.



The result of the MOTOR GUN AUTO TUNING operation is stored in the MOTOR GUN AUTO TUNING file.

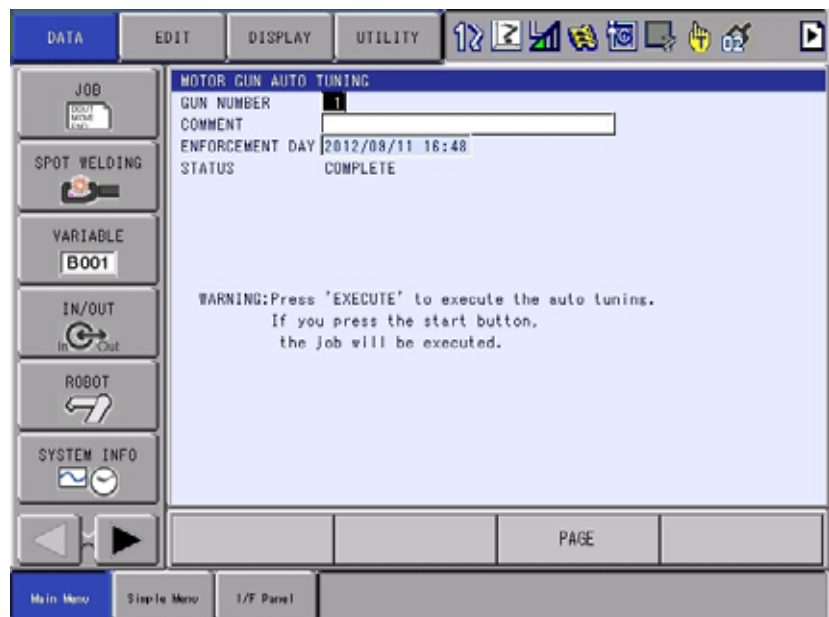


And the MOTOR GUN AUTO TUNING file is stored in FILE/GENERAL DATA.

Please do not load MOTOR GUN AUTO TUNING file to other controllers.

### 9.3.7 Confirmation of Motor Gun Auto Tuning Operation Status

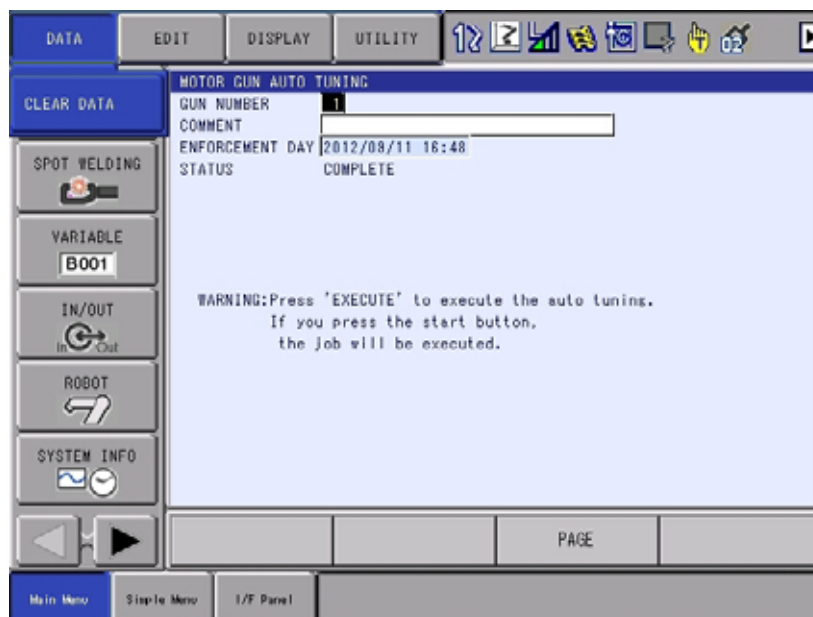
1. Select {SPOT WELDING} under the {Main Menu}.
2. Select {MOTOR GUN AUTO TUNING}.
  - The MOTOR GUN AUTO TUNING window appears.
3. Select the gun number using [PAGE] key or {PAGE} button.
  - The operation is completed if {COMPLETE} is indicated at {STATUS}.
  - The operation is not completed if {INCOMPLETE} is indicated at {STATUS}.



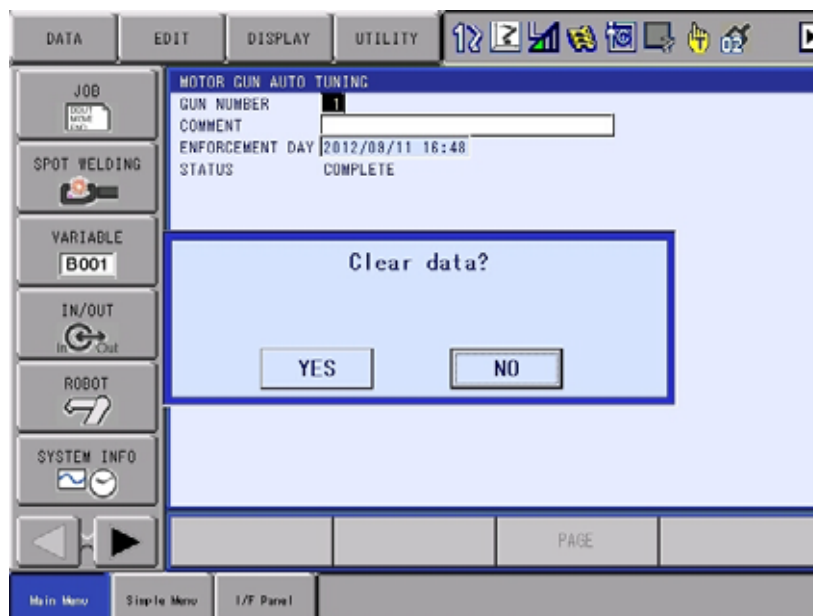
**9.3.8 Clearance of MOTOR GUN AUTO TUNING Setting**

When re-setting the gun condition file due to the change of the gun, etc, clear the Motor Gun Auto Tuning setting by following the procedures below.

1. Select {SPOT WELDING} under the {Main Menu}.
2. Select {MOTOR GUN AUTO TUNING}.
  - The MOTOR GUN AUTO TUNING window appears.
3. Select the gun number using [PAGE] key or {PAGE} button.
4. Select {DATA} - {CLEAR DATA}.

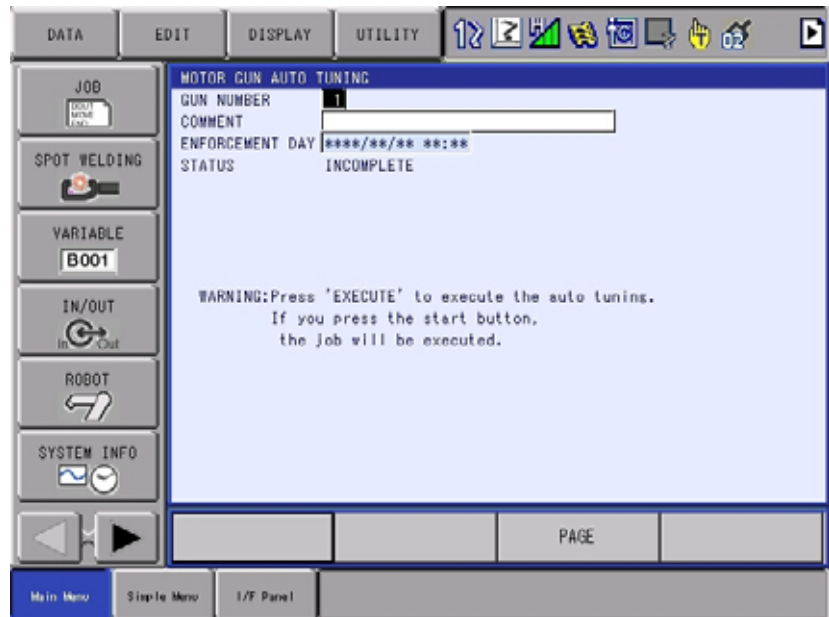


– A confirmation dialog box appears.



## 5. Select "YES".

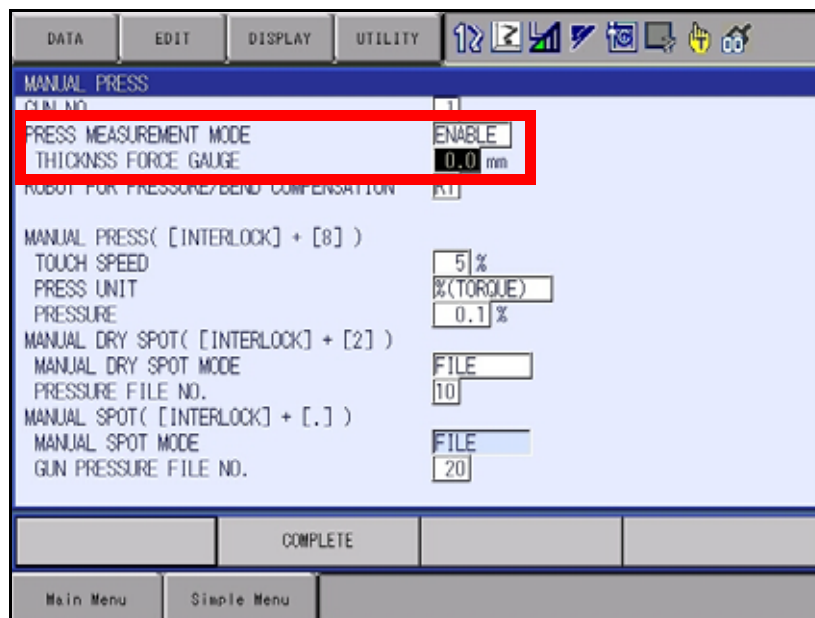
- {STATUS} changes from {COMPLETE} to {INCOMPLETE}.
- The data will not be deleted if "NO" is selected.



**9.3.9 Setting of Torque to Pressure Conversion Data**

After the execution of Motor Gun Auto Turning function, by following the procedure below, re-measure the pressure and reset the torque to pressure conversion data.

1. Set a value to {THICKNESS FORCE GAUGE} and select "ENABLE" at {PRESS MEASUREMENT MODE} on MANUAL PRESS window.



2. Set the pressure value to the pressure file.
  - As the unit of this pressure, specify torque(%).
  - Specify 5(%) to the touch speed of the pressure file.
3. Register SVGUNCL instruction to a JOB.
  - Specify the pressure file set at the step 2.
4. Execute the JOB and measure the pressure with the force gauge.
5. Execute the above procedures 2 through 4 with the different torque(%) to measure a torque(%) for the pressure.
6. Input the acquired data to "Torque to pressure conversion" in the gun condition file. Up to 12 data can be registered.



On MANUAL PRESS window, set a value to {THICKNESS FORCE GAUGE} and select "ENABLE" to {PRESS MEASUREMENT MODE}.

The PRESS MEASUREMENT MODE becomes "UNABLE" in case the mode is changed from the teach mode to the play mode. Set "ENABLE" again when the mode is changed.

**9.3.10 Alarm**

Alarm No.	Message	Cause	Remedy
4708	Motor Gun Auto Tuning is not executed	Motor Gun Auto Tuning operation is not executed but SVSPOT instruction is executed	Motor Gun Auto Tuning function by following the procedures below. <ol style="list-style-type: none"> <li>1. Select {SPOT WELDING} - {MOTOR GUN AUTO TUNING}.</li> <li>2. Change the mode to the play mode, turn the servo power ON, and then press {EXECUTE} button.</li> <li>3. Select "REGIST" after Motor Gun Auto Tuning operation is completed.</li> <li>4. After Motor Gun Auto Tuning function, do not fail to re-measure the gun pressure and reset the torque to pressure conversion data.</li> </ol>

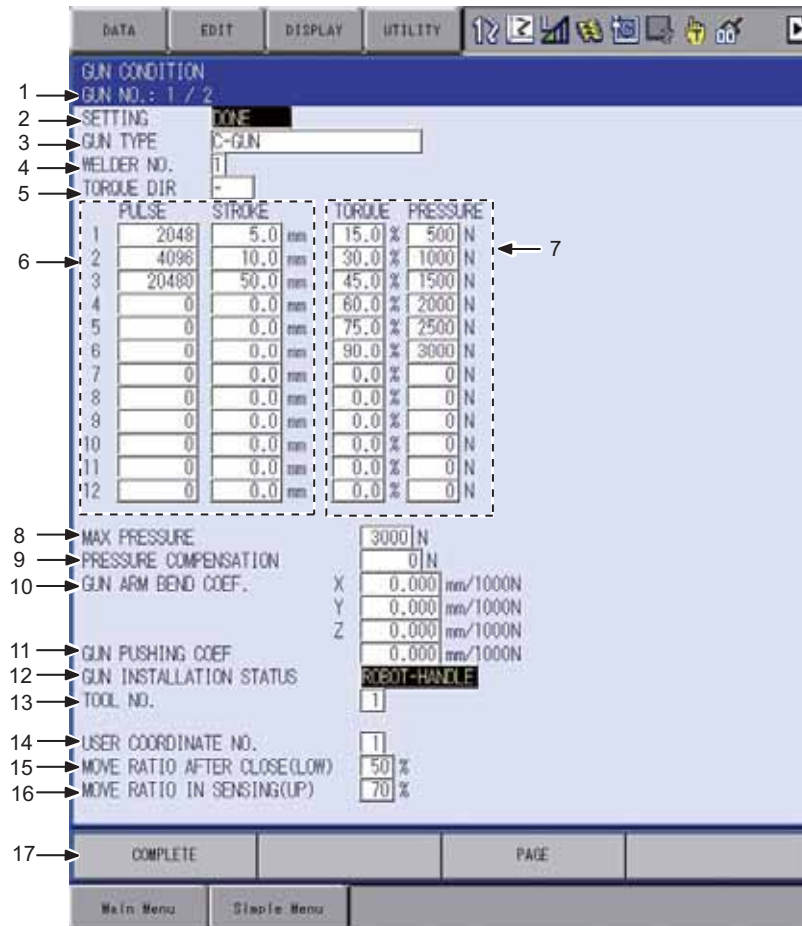
### 9.4 System Setting (Motor Gun)

The items to be determined at the system setting, such as the gun and the welder, are specified in the system setting files.

#### 9.4.1 Gun Condition File

The gun characteristics are set in the gun condition file.

##### ■ Gun Condition Window



**1. GUN NO.**

Shows the No. of the gun to be used.

When using two guns or more, select the No. by pressing [PAGE] key.

**2. SETTING**

Shows whether the gun condition file has been set or not. For the file where the values have not been entered, "NOT DONE" appears, while for the file where the values have already been entered, "DONE" appears.

**3. GUN TYPE**

Shows the gun type. Select from "C-GUN," "X-GUN (SINGLE ARM MOVE)" and "X-GUN (DOUBLE ARM MOVE)."

**4. WELDER NO.**

Shows the No. of the connected welder.

**5. TORQUE DIR**

Specifies the pressure direction of the gun axis motor. When the direction to increment the motor encoder value and the pressure direction of the gun are the same, select "+". When they are different, select "-".

**6. PULSE, STROKE**

Shows the relationship between the encoder pulse value of the gun axis motor and the gun stroke. The pulse value for the specified gun stroke can be calculated by interpolation of these values. Refer to *section 9.4.1.1 "Entering Pulse to Stroke Conversion Data" on page 9-28* for more details.

**7. TORQUE, PRESSURE**

Shows the relationship between the gun axis motor torque and the tip pressure. The torque value for the specified pressure can be calculated by interpolation of these values. Refer to *section 9.4.1.2 "Entering Torque to Pressure Conversion Data" on page 9-28* for more details.

**8. MAX PRESSURE**

Enter the maximum pressure that the gun can apply.

If the value specified by the pressure file exceeds it, an alarm occurs when executed.

**9. PRESSURE COMPENSATION**

Set the difference of the pressure between the upwards and the downwards.

Refer to *section 9.14.5 "Gun Pressure Compensation Function" on page 9-154* for the details.

**10. GUN ARM BEND COEF.**

Set the gun arm bend compensation volume per 1000N.

Refer to *section 9.14.6 "Compensation of Gun Arm Bend for C-Gun and X-Gun (SINGLE ARM MOVE)" on page 9-160* for the details.

**11. GUN PUSHING COEF**

Set the gun axis pushing volume per 1000N.

Refer to *section 9.10.7.4 "Setting the Gun Pushing Coefficient" on page 9-91* for the details.

**12. GUN INSTALLATION STATUS**

Set the gun installation status.

Select "ROBOT-HANDLE" or "FIXED".

**13. TOOL NO.**

Displayed after validating the "AUTO TOOL. NO. SELECT FOR GUN" on the APPLICATION CONDITION SETTING window when "12.GUN INSTALLATION STATUS" is "ROBOT-HANDLE".

Refer to *section 9.14.9 "Automatic Tool Number Select Function for Guns" on page 9-182*.

**14. USER COORDINATE NO.**

Displayed when "12.GUN INSTALLATION STATUS" is "FIXED".

Set the user coordinate No. for the gun to use. Refer to *section 9.4.7 "Application Condition Setting" on page 9-50.*

**15. MOVEMENT RATIO AFTER CLOSE (LOW) (displayed only when "X-GUN (DOUBLE ARM MOVE)" is selected)**

Shows the lower tip movement ratio when the gun closes more by the tip wear. Enter 60% when the ratio of upper tip movement: the lower tip movement = 4:6.

**16. MOVEMENT RATIO IN SENSING (UP) (displayed only when "X-GUN (DOUBLE ARM MOVE)" is selected)**

Shows the ratio when the upper side tip passes the sensor, for detecting the upper side tip wear using a sensor. Enter 70% when the ratio of the upper side tip movement: the lower side tip movement = 7:3.

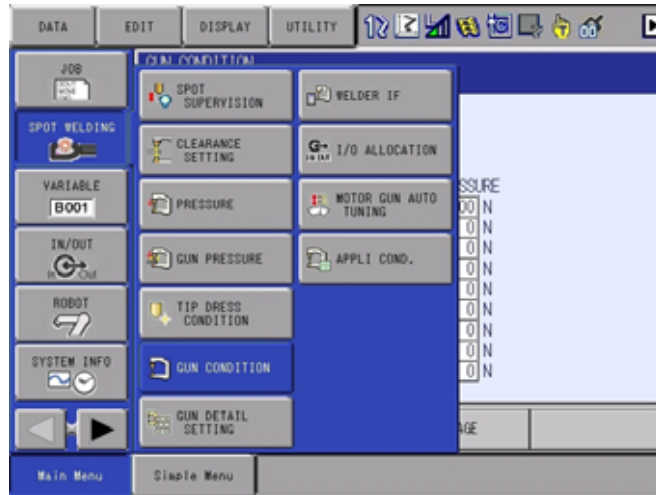
**17. COMPLETE**

Press this button to complete "2. SETTING".

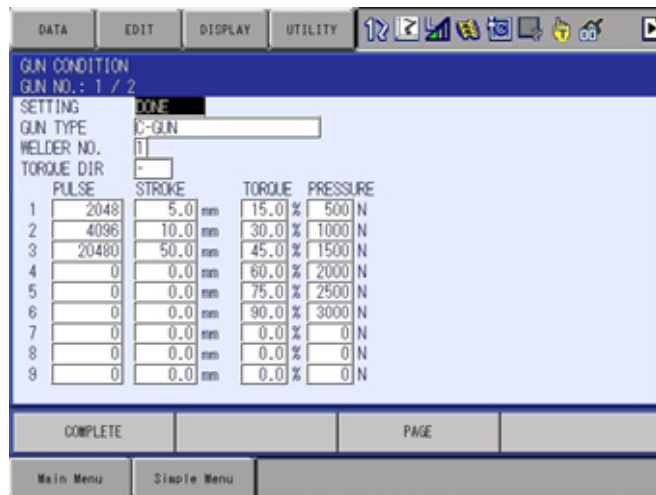


### ■ Operation

1. Select {SPOT WELDING} from the main menu.
2. Select {GUN CONDITION}.

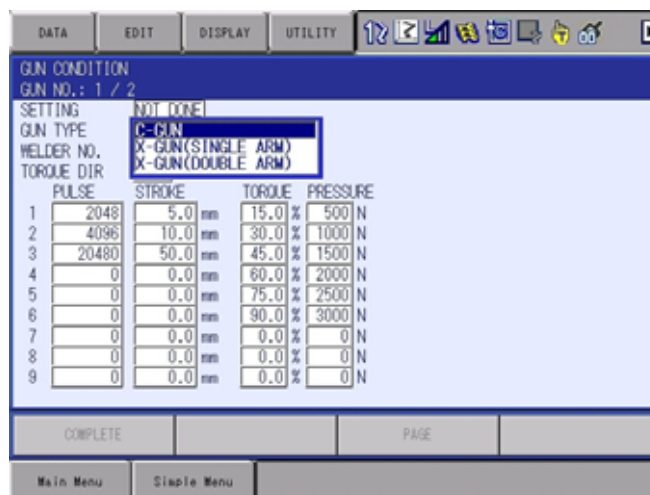


– GUN CONDITION window appears.



3. Select a gun No. by pressing [PAGE] key.

4. Select the item to be set.
- For “GUN TYPE,” pressing [SELECT] displays “C-GUN,” “X-GUN (SINGLE ARM MOVE)” and “X-GUN (DOUBLE ARM MOVE)” alternately.



5. Enter the numerical value, and press [ENTER].

## 9.4.1.1 Entering Pulse to Stroke Conversion Data

To specify the gun stroke in mm, enter data about the relationship between the gun axis motor encoder pulse value and the gun stroke (mm).

Follow the procedures explained below.

Up to 12 points of data can be entered.

1. Set the applicable gun stroke by a jog operation with the programming pendant.
  - Read the pulse value of the gun axis motor encoder on the programming pendant.
2. Repeat the steps 1 for 12 points in total.
  - When the relationship between two values are known from the machine drawing, calculate the data for the 12 points.
3. Enter the obtained data of 12 items in “PULSE” and “STROKE” in the gun condition file.

## 9.4.1.2 Entering Torque to Pressure Conversion Data

To specify the pressure in N, enter data about the relationship between the gun axis motor torque (%) and the pressure (N).

Refer to *section 9.3.9 “Setting of Torque to Pressure Conversion Data” on page 9-21* for setting procedures.



When the gun condition file has not been set, the pressure cannot be applied.

When applying the pressure for the first time, set any value in the gun condition file.

Spot Weld Motor Gun	9 Spot Welding Application Using a Motor Gun 9.4 System Setting (Motor Gun)
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### 9.4.2 I/O Signals for a Motor Gun

#### 9.4.2.1 Major I/O signal (Motor Gun)

Table 9-1: Input Signals to DX200

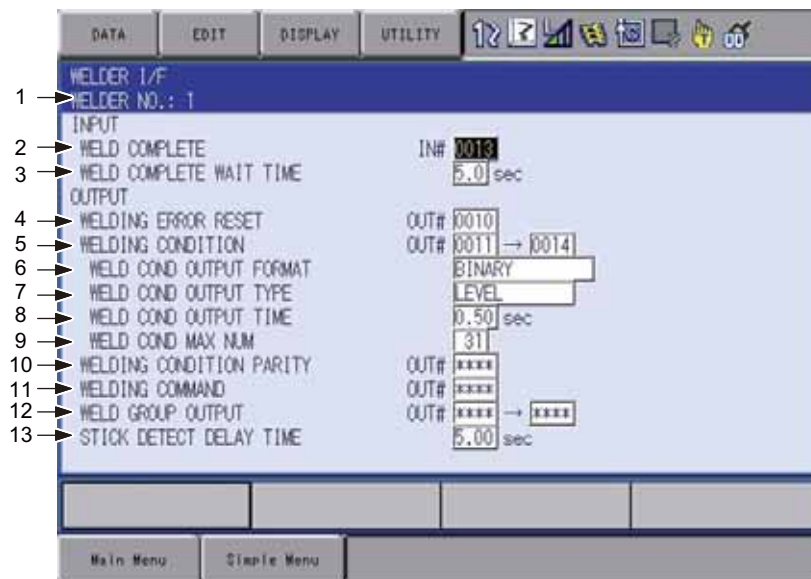
Signal	Contents	To	Standard Setting	Setting Display
WELD COMPLETE	Shows that the welder completed the welding normally. Used as a confirmation signal for welding instruction (SVSPOT, SVSPOTMOV) and manual spot welding. After this signal is input, the welding sequence is completed, and the operation moves to the next step.	Welder	IN13	Welder I/F Refer to section 9.4.2.2
DRY TIP DRESS (WITHOUT PRESSING) DRY TIP DRESS (WITHOUT DRESSING)	Use to perform the TIP DRESS instruction (SVDRESMOV) without pressing or dressing.	Interlock board, etc.	Unused	I/O Allocation Refer to section 9.4.2.3
TMR COOL WTR ERR	Monitors an abnormal state of the cooling water for the welder. When this signal is input, an alarm occurs to stop the manipulator. The servo power supply stays ON.	Cooling water flow switch	IN9	Pseudo Input Signal Refer to section 9.4.2.4
GUN COOL WTR ERR	Monitors an abnormal state of the cooling water for the gun. When this signal is input, an alarm occurs to stop the manipulator. The servo power supply stays ON when the alarm occurs.	Cooling water flow switch	IN10	Pseudo Input Signal Refer to section 9.4.2.4
TRANS THERMO ERR	This alarm signal from the gun transformer is input directly into the DX100. This signal is normally ON (normally closed) and when it is OFF, an alarm occurs. The servo power supply stays ON when the alarm occurs.	Gun transformer	IN11	Pseudo Input Signal Refer to section 9.4.2.4
WELD ON/OFF (from PLC)	Inputs the WELD ON/OFF selector switch status from a PLC such as the interlock board. The WELD ON/OFF signal is output to the welder according to this signal and the manipulator status. When this signal is input (ON), the state of the WELD ON/OFF signal to the welder becomes OFF, and welding is not done.	Interlock board, etc.	#20022	Pseudo Input Signal Refer to section 9.4.2.4

Table 9-2: Output Signals from DX200

Signal	Contents	To	Standard Setting	Setting Window
WELDING CONDITION (LEVEL signals) 1 (1) 2 (2) 4 (3) 8 (4) 16 (5) 32 (6) 64 (7) 128 (8)	Sets the welding conditions for the welder. <ul style="list-style-type: none"> <li>The output format can be set as binary or discrete (bit number.)</li> <li>Can handle up to 255 conditions. The most significant bit is the parity bit when specified.</li> </ul>	Welder	4 bits from OUT11	Welder I/F Refer to <i>section 9.4.2.2</i>
WELDING CONDITION PARITY			Unused	
WELDING COMMAND	Outputs the start command to the welder. This command is NOT necessary for the welder which uses the WELDING CONDITION signal as a start signal.	Welder	Unused	Welder I/F Refer to <i>section 9.4.2.2</i>
WELDING ERROR RESET	Resets the error status in the welder. Outputs by "INTERLOCK" + "WELD ALM RST".	Welder	OUT18	Welder I/F Refer to <i>section 9.4.2.2</i>
WELD ON/OFF	Outputs the status of the input signals from the interlock board by considering the robot status.	Welder	OUT17	Welder I/F Refer to <i>section 9.4.2.2</i>

## 9.4.2.2 Welding I/F File

The welder characteristics are set in the welding I/F file.

**1. WELDER NO.**

Shows the number of the welder to be used.

When using two welders or more, select the welder No. by pressing [PAGE].

**2. WELD COMPLETE**

Indicates the signal that welding is completed normally.

This signal is used to confirm the completion of the welding when executing the welding instruction (SVSPOT, SVSPOTMOV) or the manual spot.

After this signal is input, the welding sequence is completed, and the operation moves to the next step.

**3. WELD COMPLETE WAIT TIME**

Set the wait time from the start of the welding instruction (SVSPOT, SVSPOTMOV) or the manual spot to the inputting the WELD COMPLETE signal.

**4. WELDING ERROR RESET**

Resets the error status in the welder. Outputs by "INTERLOCK" + "WELD ALM RST".

**5. WELDING CONDITION**

Outputs the welding condition signal to the welder.

The set welding condition No. (set at WTM tag) is outputted through the signal set in this item when executing the welding instruction (SVSPOT, SVSPOTMOV) or the manual spot.

**6. WELD COND OUTPUT FORMAT**

Set the output format of the welding condition.

Select "BINARY" or "DISCRETE".

**7. WELD COND OUTPUT TYPE**

Set the output type of the welding condition signal.

Select "LEVEL", "PULSE" or "START SIGNAL".

Refer to " ■Welder Start Timing" at page 9-33.

**8. WELD COND OUTPUT TIME**

When the WELD COND OUTPUT TYPE is "PULSE" or "START SIGNAL", the welding condition signals are turned ON for the time specified at this item.

Refer to " ■ *Welder Start Timing*" at page 9-33.

**9. WELD COND MAX NUM**

Set the maximum number of the welding condition.

If the greater value than this setting is set as the WELDING CONDITION (WTM tag) the value will not be outputted through the welding condition signals.

**10. WELDING CONDITION PARITY**

The parity signal for the WELDING CONDITION.

When executing the welding instruction (SVSPOT, SVSPOTMOV) or the manual spot, the value of WELDING CONDITION PARITY and WELDING CONDITION are outputted at the same time.

Settings of the odd/even number parity is performed using the parameter. (For the details, refer to *section 8.10.3.4 "AxP006: PARITY SPECIFICATION FOR WELDING CONDITIONS"* on page 8-57.)

**11. WELDING COMMAND**

The welding command signal to the welder.

This signal is output when executing the welding instruction (SVSPOT, SVSPOTMOV) or the manual spot.

Setting is unnecessary when WELD CONDITION functions as welder start instruction.

**12. WELD GROUP OUTPUT**

The weld group output signal for the welder.

The set welding group output No. (set at WGO tag) is outputted through the setting signal in this item when executing the welding instruction (SVSPOT, SVSPOTMOV) or the manual spot.

Refer to *section 9.14.7 "Welding Conditions Group Output Function"* on page 9-163.

**13. STICK DETECT DELAY TIME**

Set the sticking detect delay time.

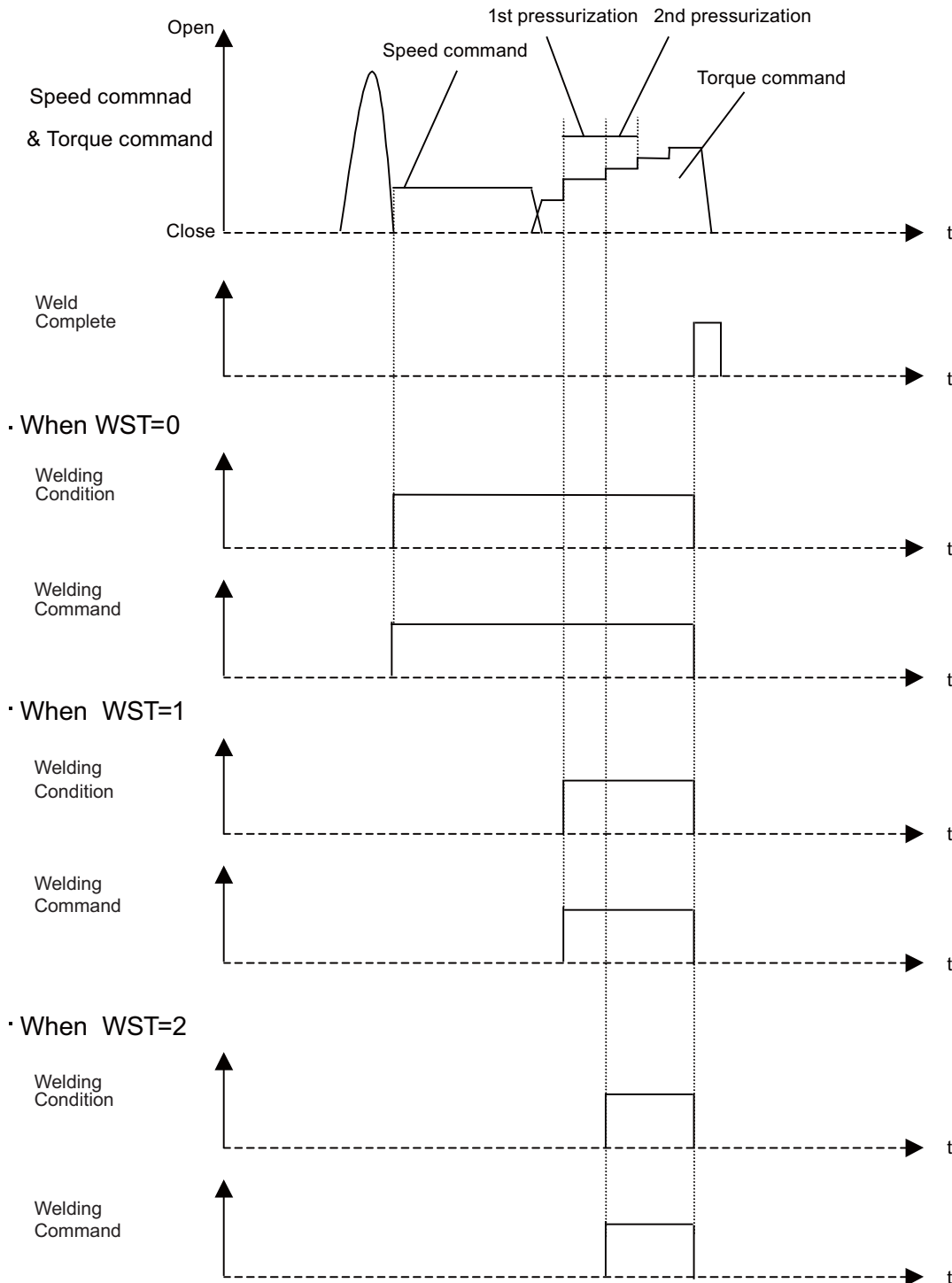
An alarm occurs if the gun does not open for more than the setting time because the gun has stuck when execute the welding instruction (SVSPOT, SVSPOTMOV) or the manual spot.




Be sure that the allocated user signals are not used in the any JOBs. If the same signals are used in the JOBs, malfunctions will result.

■ **Welder Start Timing**

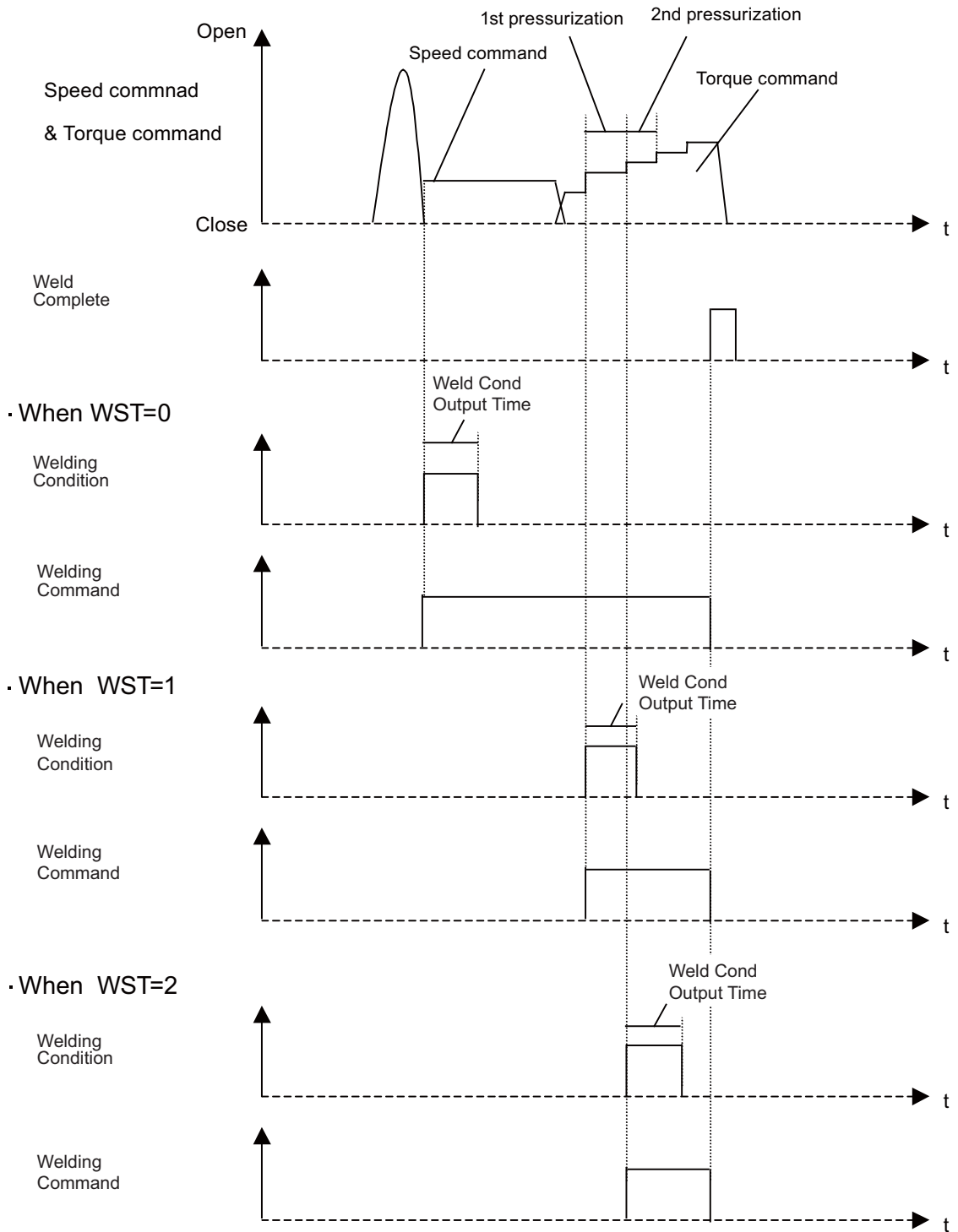
- When the weld cond output type is set to "LEVEL":




 As for WST(welder start timing), refer to section 9.7 "Welding Instruction (SVSPOT Instruction)" on page 9-62.

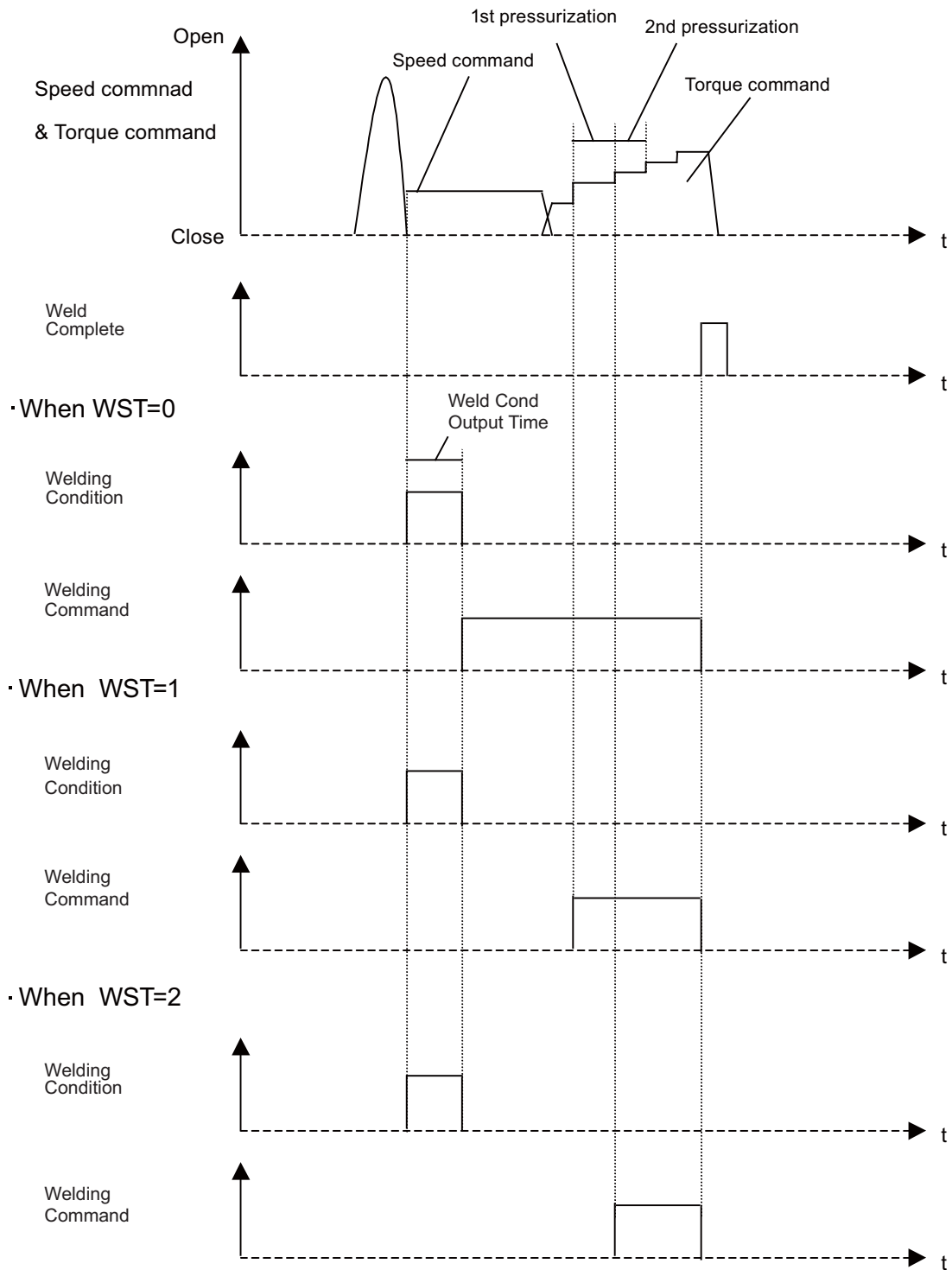



- When the weld cond output type is set to "PULSE":



 As for WST(welder start timing), refer to *section 9.7 "Welding Instruction (SVSPOT Instruction)"* on page 9-62.

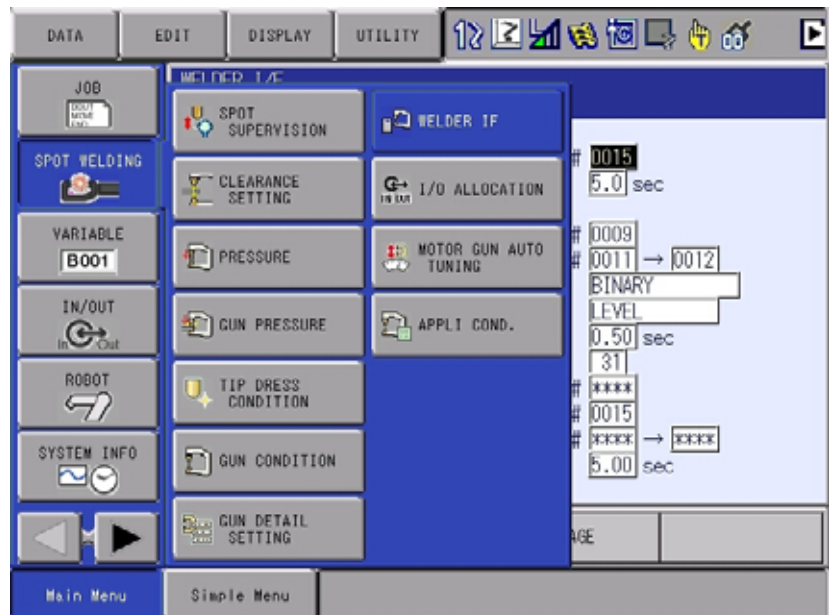
- When the weld cond output type is set to "START SIGNAL":



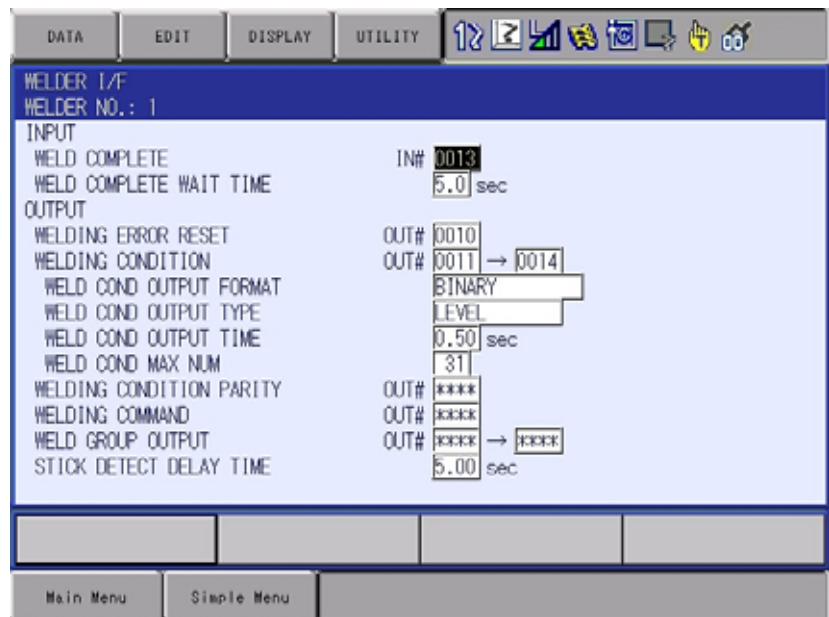
 As for WST(welder start timing), refer to *section 9.7 "Welding Instruction (SVSPOT Instruction)"* on page 9-62.

### ■ Operation

1. Select {SPOT WELDING} from the main menu.
2. Select {WELDER IF}.



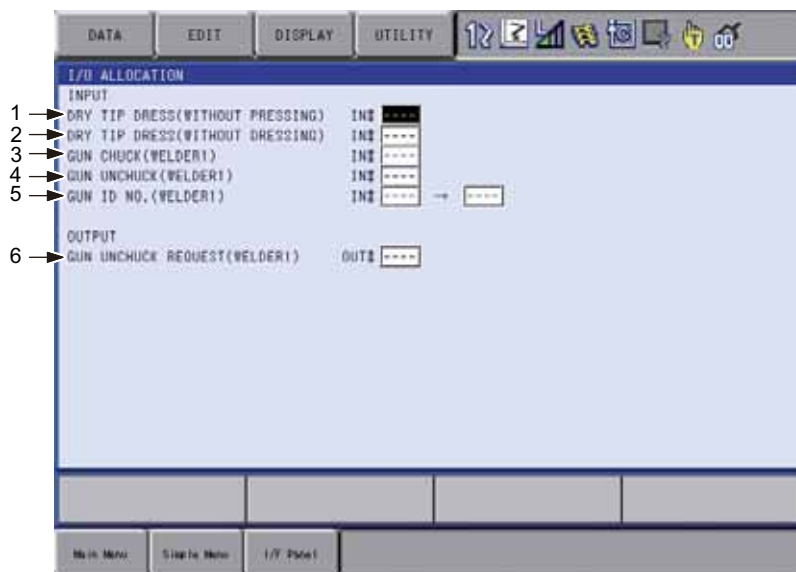
– The WELDER IF window appears.



3. Select a welder No. by pressing [PAGE] key.
4. Select the item to be set.
5. Enter a numerical value, and press [ENTER].

## 9.4.2.3 I/O Allocation

## ■ I/O Allocation Window

**1. DRY TIP DRESS (WITHOUT PRESSING)**

Use this signal to execute the tip dresser instruction (SVDRESMOV) without pressure of the gun.

Refer to section 9.11.6 "Dry Tip Dressing Operation" on page 9-108.

**2. DRY TIP DRESS (WITHOUT DRESSING)**

Use this signal to execute the tip dresser instruction (SVDRESMOV instruction) without dressing.

Refer to section 9.11.6 "Dry Tip Dressing Operation" on page 9-108.

**3. GUN CHUCK (WELDER1)**

Displayed when the gun change function is valid.

Also, shows the item(s) according to the number of the welders.

Use this signal to confirm the connection of the gun. In general, allocate the chuck confirmation signal of ATC.

Refer to section 9.14.2 "Gun Change" on page 9-143.

**4. GUN UNCHUCK (WELDER1)**

Displayed when the gun change function is valid.

Also, shows the item(s) according to the number of the welders.

Use this signal to confirm the disconnection of the gun. In general, allocate the unchuck confirmation signal of ATC.

Refer to section 9.14.2 "Gun Change" on page 9-143.

**5. GUN ID NO. (WELDER1)**

Displayed when the gun change function is valid.

Also, shows the item(s) according to the number of the welders.

This signals are binary signals to confirm the gun number.

Refer to section 9.14.2 "Gun Change" on page 9-143.

**6. GUN UNCHUCK REQUEST (WELDER1)**

Displayed when the gun change function is valid.

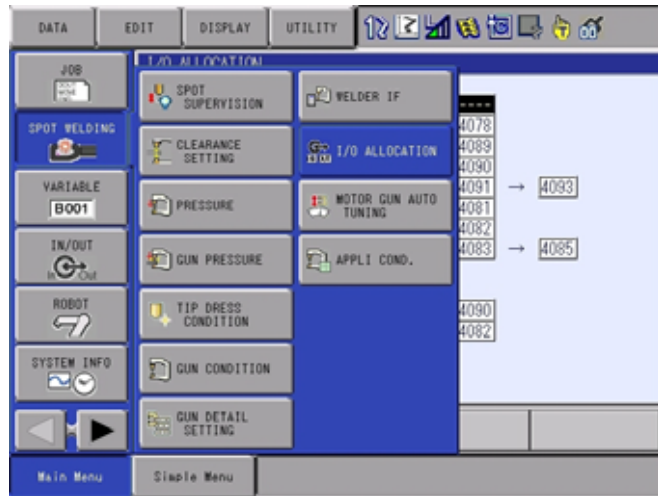
Also, shows the item(s) according to the number of the welders.

Use this signal to disconnect the gun. In general, allocate the unchuck signal of ATC. (Chuck=OFF, Unchuck=ON)

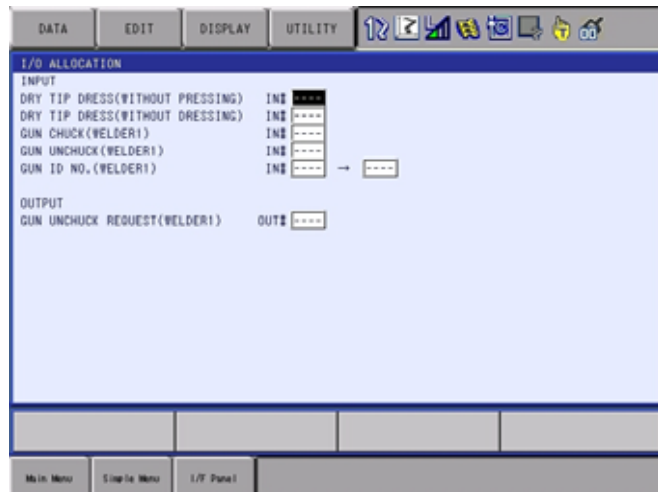
Refer to section 9.14.2 "Gun Change" on page 9-143.

■ **Operation**

1. Select {SPOT WELDING} from the main menu.
2. Select {I/O ALLOCATION}.



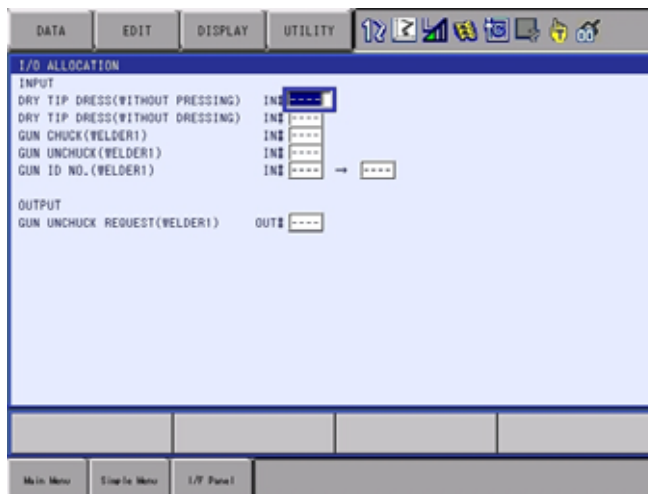
– The I/O ALLOCATION window appears.



## 9 Spot Welding Application Using a Motor Gun

### 9.4 System Setting (Motor Gun)

3. Select the signal No. to be set.
  - The number can now be entered.



4. Enter the numerical value and press [ENTER].



Be sure that the allocated user signals are not used in the any JOBs. If the same signals are used in the JOBs, malfunctions will result.

## 9.4.2.4 PSEUDO INPUT SIGNAL Window

The following signals can be validated in the PSEUDO INPUT SIGNAL window.

- TMR COOL WTR ERR (timer cooling water error)
- GUN COOL WTR ERR (gun cooling water error)
- TRANSTHERMO ERR (transformer thermostat error)
- WELD ON/OFF (welding ON/OFF)

1. Select {IN/OUT} from the main menu.
2. Select {PSEUDO INPUT SIG}.



– The PSEUDO INPUT SIGNAL window appears.



3. Move the cursor to the signal whose validity/invalidity is to be set, and press [INTERLOCK] + [SELECT].
  - Each time [INTERLOCK] + [SELECT] are pressed, “○ (invalid)” and “● (valid)” alternately appear.

**9.4.3 Registering the Operation Tool**

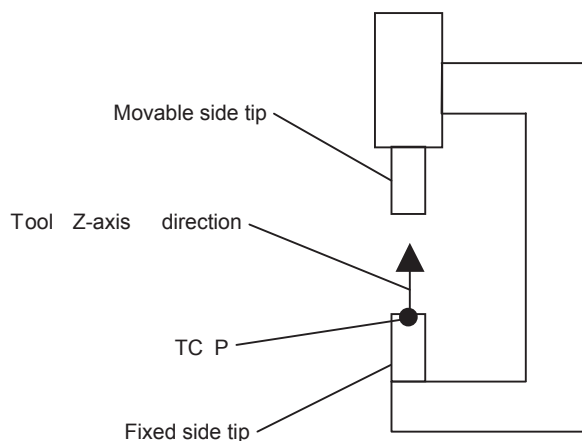
The registration method of operation tool differs depending on whether it is a single arm move gun or a double arm move gun.

Considering the following cases, refer to “8.3 Tool Data Setting” of “DX 200 INSTRUCTIONS” (RE-CTO-A220) for the tool coordinate value and tool data setting.

**9.4.3.1 When Using a Single Arm Move Gun**

Register the tool coordinate value so that TCP is the tip position of the fixed side tip.

Set the tool posture data so that the direction from the fixed side tip to the movable side tip is positive (+) side of Z-axis.



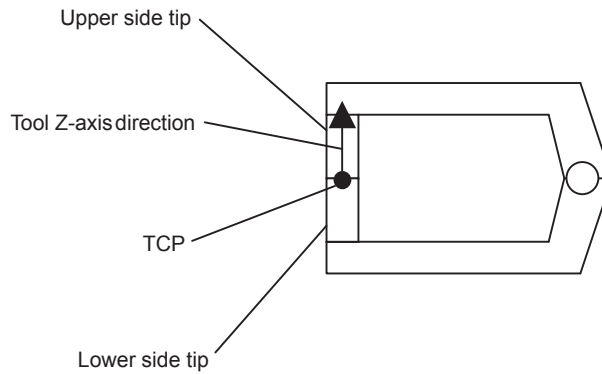
Be sure to set the direction of tool Z-axis facing the movable side tip.  
If the Z-axis is not set in the correct direction, the tip wear cannot be properly compensated for.



## 9.4.3.2 When Using a Double Arm Move Gun

Register the tool coordinate value so that TCP is the contact position of the both fixed side tip and movable side tip.

Set the tool posture data so that the direction from the lower side tip to the upper side tip is positive (+) side of Z-axis.



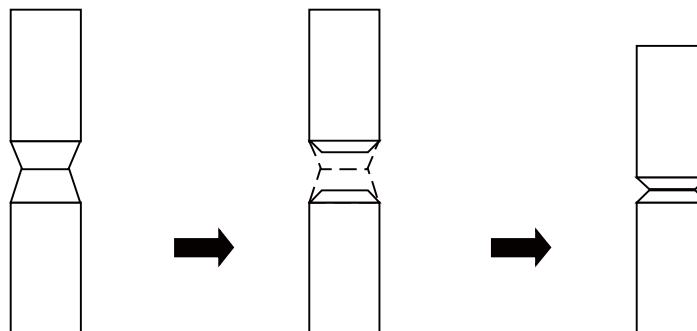
Be sure to set the tool Z-axis in the direction from the lower side tip to the upper side tip. If the Z-axis is not set in the correct direction, the wear tip cannot be properly compensated for.

**9.4.4 Setting the Software Limit Value**

For the motor guns, the position where the new tip contacts each other is set as the zero-point (pulse = 0), and the pulse software limit is set at further pressing position from the zero-point.

It is because the gun needs to be closed more than the zero-point when the tips become worn.

<Setting Example>



The contact position of the new tip is set as the zero-point.

Since the softlimit is set as the zero-point, the tips do not reach the contact position when the tips become worn.

When the softlimit is set at further pressing position from the zero-point, the tips reach the contact position.

**Parameters**

S1CxG400: Pulse software limit (+ side)

S1CxG408: Pulse software limit (- side)

<Example>

When S1CxG400=50000 and S1CxG408=0:

The motor gun moves in the range from 0 to 50,000 pulses.

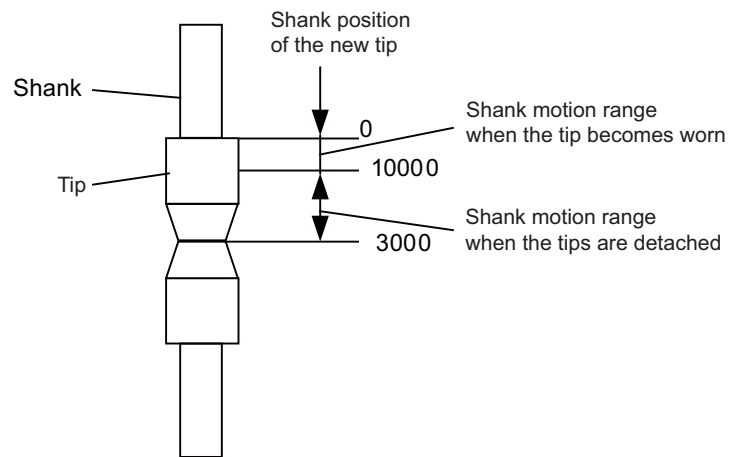
To move the tip to the contact position when the tips become worn, set -3,000 for S1CxG408 so that the motor gun moves in the range from -3,000 to 50,000 pulses.

When setting the value for S1CxG408, consider the pulse amount equivalent to the total of maximum wear amounts of both tips and the gun arm bend when maximum gun pressure is applied.

**9.4.5 Setting the Lost-tip Detection Value**

The gun-axis pulse can be monitored to output the signal when the tips of motor gun are detached.

<Setting Example>



The signal is output when the tips are detached, and the shank moves out of its normal motion range.

Parameters

S2C003=10 (S1 (gun-axis) uses Interference 1.)

S2C067=0 (Monitors pulses.)

S3C664=3000, S3C072=10000 (The signal is output in the range of 3000 to 10000.)

**9.4.6 Gun Detail Setting File**

Set the special gun related setting in the GUN DETAIL SETTING window.

■ **Gun Detail Setting Window**

**1. GUN No.**

Shows the gun No. to use.

When using two guns or more, select the gun No. by pressing [PAGE].

**2. STROKE MOTION SPEED**

Set the speed to move to the welding start stroke value (specified value at BWS tag) when executing the welding instruction (SVSPOT).

Refer to section 9.7.4 "Gun Stroke Setting before Welding" on page 9-66.

**3. TOUCH SPEED**

Performs the closing motion of the gun by the specified speed in this item when using the gun pressure tag (WP tag) of the press instructions (SVSPOT, SVGUNCL, SVSPOTMOV).

Inputting the DRY SPOT SIGNAL (CONTINUE) performs the closing motion of the gun by the specified speed in this item as well.

**4. FINAL TOUCH SPEED START POSITION**

Set the position to decelerate to the speed set in "4. FINAL TOUCH SPEED". The followings are the actual position to reduce the speed by the each pressure instruction.

- (1) SVSPOT or SVGUNCL without TWC-B/TWC-BE tag.

Reduces the speed from the position where it is away by the setting value towards the gun open direction from the last touch position detected by the dry spot touch motion of the wear detection. (Refer to section 9.12.2.1 "Dry Spot Touch Motion" on page 9-114.)

When the dry spot touch motion of the wear detection has not been executed,

- In case of SVSPOT or SVGUNCL without TWC-A/TWC-AE tag, the speed is not reduced, and the gun closes by the touch speed set in the pressure file from the beginning until it detects the contact to the work.

–In case of SVGUNCL with TWC-A/TWC-AE tag, the gun closes by the set speed in the “5. FINAL TOUCH SPEED” from the beginning until it detects the contact to the work.

(2) SVGUNCL with TWC-B/TWC-BE tag.

Reduces the speed from the position where it is away by the setting value towards the gun open direction from the last movable tip position detected by the movable tip detecting motion of the wear detection. (Refer to *section 9.12.2.2 “Movable Side Tip Detection” on page 9-115.*)

When the movable tip detecting motion of the wear detection has not been executed, the gun closes by the set touch speed in “5. FINAL TOUCH SPEED” from the beginning of the SVGUNCL until it detects the contact to the work.

(3) SVSPOTMOV

The fixed tip and the movable tip move to the teaching position of the SVSPOTMOV (the position where the fixed tip and movable tip touch the work) by the specified speed in the SVSPOTMOV instruction. After that, the gun executes the touch motion by the speed set in the “5.FINAL TOUCH SPEED”.

### 5. FINAL TOUCH SPEED

When operating the pressure instruction (SVSPOT, SVGUNCL, SVSPOTMOV), the gun starts the closing motion by the touch speed set in the pressure file. However, before contacting the work, the speed is reduced to the set speed in this item according to “4. FINAL TOUCH SPEED START POSITION”.

If the touch speed set in the pressure file is smaller than this setting, the gun closes by the touch speed in the pressure file until it touches the work.

When setting “0”, the final touch speed becomes 5%.

### 6. TOUCH PRESSURE

Set the detection pressure for the touch detection (when the gun detects the contact to the work).

After the touch detection, the gun executes the pressure by the set pressure in the pressure file.

Also, when “0” is set in the touch pressure, the touch pressure becomes 600N.

### 7. ALLOWABLE TOUCH RANGE (MOVABLE SIDE)

### 8. ALLOWABLE TOUCH RANGE (FIXED SIDE)

Set the allowable range of the touch detection position for the both movable side (gun open side) and the fixed side (gun close side).

Enables to detect an error, such as the tips installing error, by monitoring the allowable touch range of the touch detection position in the each operation of the pressure instruction (SVSPOT, SVGUNCL, SVSPOTMOV).

If the difference between the touch reference position and the touch detection position when executing the pressure instruction is not within the range, an alarm “TOUCH DETECTION RANGE OVER” occurs.

When setting “0”, the monitoring for the allowance touch range becomes invalid.

The touch reference position is described below according to the each pressure instruction to be used.

- (1) SVSPOT or SVGUNCL without TWC-B/TWC-BE tag.  
The touch reference position is the last touch position detected by the dry spot touch motion of the wear detection (Refer to *section 9.12.2.1 "Dry Spot Touch Motion" on page 9-114*).

When the dry spot touch motion of the wear detection has not been executed, the monitoring for the allowance touch range becomes invalid.

- (2) SVGUNCL with TWC-B/TWC-BE tag.  
The touch reference position is the last movable tip position detected by the movable tip detecting motion of the wear detection (Refer to *section 9.12.2.2 "Movable Side Tip Detection" on page 9-115*).

When the movable tip detecting motion of the wear detection has not been executed, the monitoring for the allowance touch range becomes invalid.

- (3) SVSPOTMOV  
The touch reference position is the gun teaching position of SVSPOTMOV.

#### **9. PRESSURE FILE NO.**

Specify the pressure file No. for the "DRY SPOT SIGNAL(FILE)".  
Refer to *section 9.14.4 "Signal Dry Spot" on page 9-152* for more details.

#### **10. DRY SPOT SIGNAL (FILE)**

Operates the dry spot by the universal input set in this item according to the pressure file specified in the "9. PRESSURE FILE NO.". Refer to *section 9.14.4 "Signal Dry Spot" on page 9-152* for more details.

#### **11. DRY SPOT PRESSURE (CONTINUE)**

Set the pressure for the "DRY SPOT PRESSURE (CONTINUE)".  
Refer to *section 9.14.4 "Signal Dry Spot" on page 9-152* for more details.

#### **12. DRY SPOT SIGNAL (CONTINUE)**

Operates the dry spot by the universal input set in this item according to the pressure specified in the "11. DRY SPOT PRESSURE (CONTINUE)".  
Refer to *section 9.14.4 "Signal Dry Spot" on page 9-152* for more details.

#### **13. THICKNESS**

Input the thickness of the work to operate the welding.  
Refer to *section 9.14.3 "Touch Teaching Function" on page 9-148* for more details.

#### **14. GUN STROKE**

Shows the distance between tips when operating the TOUCH TEACHING function.  
The value changes when pressing the [SHIFT]+[ENTER] at the same time in a JOB window.  
Refer to *section 9.14.3 "Touch Teaching Function" on page 9-148* for more details.

#### **15. TCP ADJUSTMENT**

Shows the adjustment distance of the fixed tip when operating the TOUCH TEACHING function. Refer to *section 9.14.3 "Touch Teaching Function" on page 9-148* for more details.



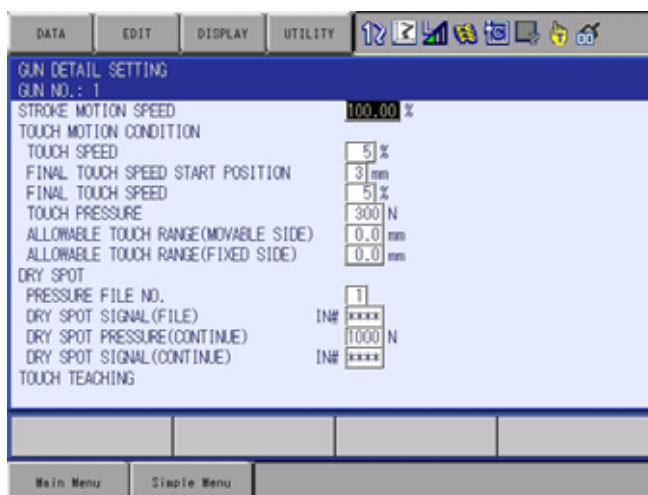
If the value of the TOUCH PRESSURE is too small, the gun mis-detects the touch and may bounce. In this case, set the value, which is greater than the current setting value of the touch pressure. The touch pressure should be set from 600N to 1000N.

### ■ Operation

1. Select {SPOT WELDING} from the main menu.
2. Select {GUN DETAIL SETTING}.



– The GUN DETAIL SETTING window appears.



3. Select the gun No. by pressing the [PAGE] button.
4. Select the item to set.
5. Input the value, and press "ENTER".



**9.4.7 Application Condition Setting**

Regarding the miscellaneous items for the spot (motor gun) application, set them in the APPLICATION CONDITION SETTING window.

■ **Application Condition Setting**

DATA	EDIT	DISPLAY	UTILITY
APPLICATION CONDITION SETTING			
APPLI: 1 / 1			
1	→ CLEARANCE TEACHING METHOD		GUN CLOSE
2	→ MAX NUMBER OF WELDER CONNECT		1
WEAR DETECTION			
3	→ WEAR DETECT METHOD		TOUCH
4	→ WEAR VALUE CALCULATE METHOD		TOTAL VALUE
5	→ ORDER OF WEAR DETECT INSTRUCTION		TWC-A->TWC-B
6	→ WEAR COMPENSATE TEACH METHOD		MESSAGE
THICKNESS DETECTION			
7	→ THICKNESS DETECTION FUNCTION		VALID
8	→ THICKNESS ERROR NOTICE		SIGNAL
9	→ THICKNESS ERROR NOTICE GOUT#		0
10	→ THICKNESS CHECK MODE SELECT GIN#		0
11	→ THICKNESS ALARM IGNORE GIN#		0
WELD GROUP			
12	→ WELD GROUP NUMBER		0
13	→ WELD GROUP ORIGINAL NO.		1 Origin
WELD COMPLETE SIGNAL			
14	→ WELD COMPLETE DETECT METHOD		BIT UP
15	→ WELD COMPLETE OFF WAIT TIME		0 sec
WEAR THRESHOULD			
16	→ WEAR WARNING VALUE(UPPER)		0.000 mm
17	→ WEAR WARNING VALUE(LOWER)		0.000 mm
18	→ WEAR MINUS THRESHOLD(UPPER)		0.000 mm
19	→ WEAR MINUS THRESHOLD(LOWER)		0.000 mm
20	→ WEAR DIFFERENT THRESHOLD(UPPER)		0.000 mm
21	→ WEAR DIFFERENT THRESHOLD(LOWER)		0.000 mm
22	→ WEAR POS. THRSILD AFTER CHG(UP)		0.000 mm
23	→ WEAR POS. THRSILD AFTER CHG(LOW)		0.000 mm
24	→ WEAR NEG. THRSILD AFTER CHG(UP)		0.000 mm
25	→ WEAR NEG. THRSILD AFTER CHG(LOW)		0.000 mm
NADEX WELDER			
26	→ ERROR DISP TYPE		DISP ALARM
27	→ ALARM SIGNAL SELECT BIT(WELD1)		6
28	→ ERROR CODE BIT(WELD1)		255
OTHERS			
29	→ AUTO TOOL NO. SELECT FOR GUN		INVALID
30	→ MOTION WHEN MANUAL HANDLING		PERMIT
31	→ WEAR COMP.METHOD FOR TWIN GUN		NO COMP

**1. CLEARANCE TEACHING METHOD**

Set the teaching method of the clearance teaching function.  
Select from the three teaching methods below.

UPPER TIP : Teaching with the upper tip contacting the workpiece.

LOWER TIP: Teaching with the lower tip contacting the workpiece.

GUN CLOSE: Teaching with both tips contacting the workpiece.

Refer to section 9.10.2 "Setting the Teaching Type" on page 9-80 for more details.

**2. MAX NUMBER OF WELDER CONNECT**

Set the number of the welders.

**3. WEAR DETECT METHOD**

Set the method of wear detection.

Select from the two methods below.

RIN: Operates the wear detection by using a sensor.

TOUCH: Operates the wear detection by performing the board touch.

**4. WEAR VALUE CALCULATE METHOD**

Set the calculate method of the wear value when operating the wear detection by using the TWC-C.

Select from the two conditions below.

TOTAL VALUE : Multiplying the current detected total value of the wear (fixed side wear value + movable side wear value) by the value of the "WEAR RATIO (FIXED SIDE)" in the SPOT SUPERVISION window makes the fixed side wear value, and the rest of the wear value becomes the movable side wear value.

ADD : Multiplying the wear difference between the current and the last detected total value of the wear by the value of the "WEAR RATIO (FIXED SIDE)" in the SPOT SUPERVISION window, and adding the product above and the last fixed side wear makes the fixed side wear value. Also, the addition of the rest of the wear difference and the last movable side wear value becomes the movable side wear value.

**5. ORDER OF WEAR DETECT INSTRUCTION**

Set the order of the wear detect instruction.

Select from the two conditions below.

TWC-A → TWC-B : Calculates the wear value only when TWC-A is executed first (dry spotting touch motion), and then TWC-B (movable side tip detection motion) is executed next.

NO LIMIT: There is no order to execute the instructions.

**6. WEAR COMPENSATE TEACH METHOD**

Set the confirmation method when teaching the positions under the condition that the tip is worn out.

Select from the three conditions below.

MESSAGE: Displays the message "Compensated position" after teaching the positions.

CONFIRM+MSG: The confirmation dialog "Compensate?" appears when teaching operation. If pressing "YES", the positions will be registered. After the registration, the message "Compensated position" appears.

NOT CONFIRM: The confirmation dialog and the message do not appear on the screen when teaching the positions.

**7. THICKNESS DETECTION FUNCTION**

Set "VALID" or "INVALID" of the THICKNESS DETECTION FUNCTION. Refer to *section 9.14.8 "Workpiece Thickness Detection Function"* on page 9-167 for more details.

**8. THICKNESS ERROR NOTICE**

Set the action when the thickness error occurs.

ALARM: Raise an alarm when the thickness error occurs.

SIGNAL: Outputs the universal signal for 100msec pulse instead of raising an alarm.

**9. THICKNESS ERROR NOTICE GOUT#**

When setting the "SIGNAL" at the "8. THICKNESS ERROR NOTICE", this item is displayed. Set the universal signal to output when the thickness error occurs. If "0" is set, the signal is not outputted.

**10. THICKNESS CHECK MODE SELECT GIN#**

Set the universal signal No. to switch to the THICKNESS MEASURE MODE. Setting the value except "0" validates this item. If validated, unable to switch to the THICKNES MEASURE MODE by using the programming pendant.

**11. THICKNESS ALARM IGNORE GIN#**

Set the universal signal No. to ignore the THICKNESS DETECTION function.

Setting the value except "0" validates this item.

**12. WELD GROUP NUMBER**

Set the maximum value of the group number when performing the group output to the welder.

Refer to *section 9.14.7 "Welding Conditions Group Output Function"* on page 9-163.

**13. WELD GROUP ORIGINAL NO.**

Set the signal outputting method when performing the group output to the welder.

Select from the two methods below.

0 Origin: The set value in the group output number (WGO tag) minus 1 is outputted as the signal.

1 Origin: The set value in the group output number (WGO tag) is outputted as the signal.

Refer to *section 9.14.7 "Welding Conditions Group Output Function"* on page 9-163 more details.

**14. WELD COMPLETE DETECT METHOD**

Set the detection method of the weld complete signal, which is inputted from the welder.

Select form the two conditions below.

BIT UP: Rising the signal is regarded as the completion of the welding.

STATUS: It is regarded as the completion of the welding, when the status of the signal is ON. If the weld complete signal is already turned ON at the beginning of the welding instruction, the welding instruction will be terminated immediately.

**15. WELD COMPLETE OFF WAIT TIME**

When "14. WELD COMPLETE DETECT METHOD" is "STATUS", setting becomes valid.

The controller waits for the setting time until the weld complete signal is turned OFF if it is already turned ON at beginning of the welding instruction. If the weld complete signal is not turned OFF after passing the setting time, an alarm occurs.

**16. WEAR WARNING VALUE (UPPER)****17. WEAR WARNING VALUE (LOWER)**

Outputs the pulse (pulse time length for 500msec) of the wear detection error signal (specified output #51535) when the wear value is more than the setting value.

Becomes invalid when "0" is set.

**18. WEAR MINUS THRESHOLD (UPPER)****19. WEAR MINUS THRESHOLD (LOWER)**

Outputs the pulse (pulse time length for 500msec) of the wear detection error signal (specified output #51534) when the wear value is less than the setting value.

Becomes invalid when "0" is set.

**20. WEAR DIFFERENT THRESHOLD (UPPER)****21. WEAR DIFFERENT THRESHOLD (LOWER)**

Outputs the pulse (pulse time length for 500msec) of the wear detection error signal (specified output #51534) when the difference between the wear value from the last time and the current value is more than the setting value.

**22. WEAR POS. THRESHLD AFTER CHG (UP)****23. WEAR POS. THRESHLD AFTER CHG (LOW)****24. WEAR NEG. THRESHLD AFTER CHG (UP)****25. WEAR NEG. THRESHLD AFTER CHG (LOW)**

If performing the wear detection while the tip change signal (specified input #41135) is turned ON, the wear value is compared with the set threshold value. Outputs the pulse (pulse time length for 500msec) of the wear detection error signal (specified output #51534) when the wear value is out of the threshold range.

**26. ERROR DISP TYPE**

Set the indication type to show an alarm when the alarm occurs by the NADEX welder side.

Select from the two types below.

DISP ALARM: Displays the alarm.

DISP MESSAGE: Displays the message.

**27. ALARM SIGNAL SELECT BIT (WELD1)**

The items are shown according to the set numbers in the "2.MAX NUMBER OF WELDER CONNECT".

Specify the signal by a bit (up to 16-bit) which is used as alarm signals among the signals from the NADEX welder when NADEX welder generates an alarm.

**28. ERROR CODE BIT (WELD1)**

The items are shown according to the set numbers in the "2.MAX NUMBER OF WELDER CONNECT".

Specify the signal by a bit (up to 16-bit) which is used as error code among the signals from the NADEX welder when NADEX welder generates an error.

**29. AUTO TOOL NO. SELECT FOR GUN**

Set "VALID" or "INVALID" of the "AUTO TOOL NO. SELECT FOR GUN" function.

When "AUTO TOOL NO. SELECT FOR GUN" is "VALID", and the status is selected as "ROBOT-HANDLING" in the "GUN INSTALLATION STATUS" of the GUN CONDITION window, the tool, which is set at the "TOOL NO." in the GUN CONDITION window, is automatically selected when selecting the JOB.

Refer to *section 9.14.9 "Automatic Tool Number Select Function for Guns"* on page 9-182.

**30. MOTION WHEN MANUAL HANDLING**

Set whether to permit or prohibit moving the manipulator by the programming pendant during the manual handling (Refer to *section 9.8.3 "Workpiece Transfer Function Using a Motor Gun"* on page 9-72).

Select from the three conditions below.

PERMIT: Permits to move the all manipulators.

PROHIBIT: Prohibits the FWD, BWD and TEST operations.

CONFIRM: Displays the confirmation dialog when starting the JOG, FWD, BWD and TEST operations. If selecting the "YES" in the dialog, JOG, FWD, BWD and TEST operations can be performed.

**31. WEAR COMP. METHOD FOR TWIN GUN**

Set the wear compensation method of the twin guns.

Select from the four methods below.

NO COMP: The wear compensation is not executed.

USE 1ST GUN: Executes the wear compensation by the wear value of the gun specified at the first GUN tag in the SVSPOT instruction.

USE 2ND GUN: Executes the wear compensation by the wear value of the gun specified at the second GUN tag in the SVSPOT instruction.

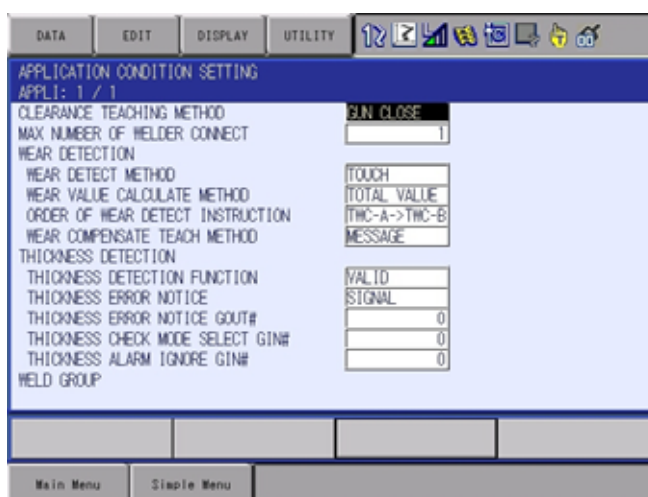
AUG. VALUE: Executes the wear compensation by the average value of the both guns.

■ **Operation**

1. Select {SPOT WELDING} from the main menu.
2. Select {APPLI COND.}.



– The APPLICATION CONDITION SETTING window appears.



3. Select the item to set.
4. Input the value, and press “ENTER”.

## 9.5 Before Teaching

Before using the motor gun, confirm the following operation instructions.

### 9.5.1 Manual Spot

For manual spot, perform the following operations.

1. Press [0/MANUAL SPOT] of the [Numeric Key].
2. Press [INTERLOCK] + [./SPOT].
  - Spot welding is started and finished after the specified time.

Manual spot is executed while these keys are held down when the MANUAL PRESS window is displayed.

Manual spot operates under the conditions that are set in the MANUAL PRESS window.



Refer to section 9.9 “Manual Pressure” on page 9-76 for the condition settings.

### 9.5.2 Manual Dry Spot

For manual dry spot, perform the following operations.

1. Press [0/MANUAL SPOT] of the [Numeric Key].
2. Press [INTERLOCK] + [2/GUN CLOSE].
  - Dry spot is started and finished after the specified time.

Manual dry spot operates under the conditions that are set in the MANUAL PRESS window.



Refer to section 9.9 “Manual Pressure” on page 9-76 for the condition settings.

### 9.5.3 Manual Press

For manual press, perform the following operations.

1. Press [0/MANUAL SPOT] of the [Numeric Key].
2. Press [INTERLOCK] + [8/PRESSURE].
  - Pressurizing is started and is kept till the next releasing operation is started.
3. Press [INTERLOCK] + [9/RELEASE].
  - Pressurizing is released and the gun is opened.

Manual press operates under the conditions that are set in the MANUAL PRESS window.



Refer to section 9.9 “Manual Pressure” on page 9-76 for the condition settings.

**9.5.4 Open/Close of Motor Gun**

Open and close the motor gun in the following operations.

1. Press [EX. AXIS].
  - The LED on [EX. AXIS] lights up.
2. Choose the control group of the gun-axis
  - Each time [EX.AXIS] is pressed, the objective external axis alternates.
3. Press [FAST] or [SLOW] key to select the axis manual speed.
  - Refer to *section 2.2 “General Operations” on page 2-3* for the details.
4. Press [S+] or [S-].
  - The motor gun performs an “open motion” or a “close motion.”



- The opening and closing directions of the motor gun differ depending on the gun type.
- When setting the manual speed, be sure to select “slow speed” to check the opening and closing directions of the gun.

**9.5.5 Mounting Tips**

Mount a tip in a dry spot motion.

For dry spot, refer to *section 9.5.2 “Manual Dry Spot” on page 9-56*.



For teaching, be sure to use a new tip with no wears.

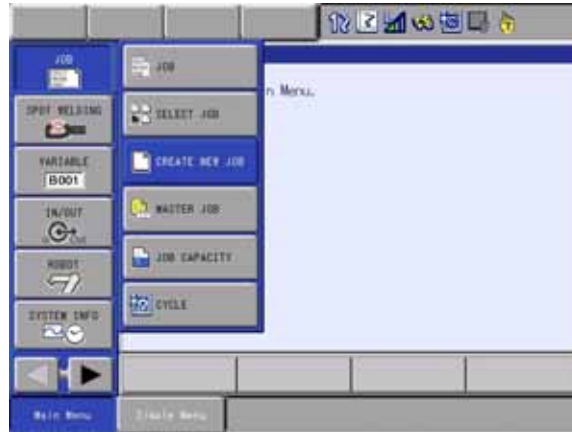


**9.5.6 Creation of Job**

This section explains how to prepare a job for a robot axis and a gun axis.

**9.5.6.1 Job Creating Procedures for Pressure Instruction Registration**

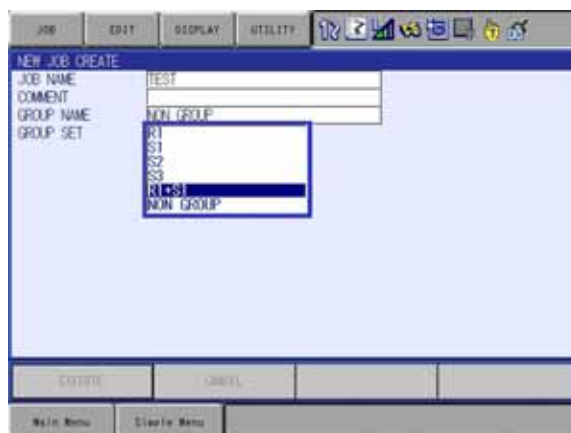
1. Select {JOB} under {Main Menu}.
2. Select {CREATE NEW JOB}.



3. Enter a job name.
4. Set a control group.
  - Set a control group which includes a gun-axis.
  - The gun-axis is registered as a station.
  - When it is a gun mounted on a robot, be sure to register “Robot + Station (gun-axis)” control group.
  - The pressure compensation function and gun arm bend compensation function do not work properly when the job is only for a control group of gun-axis.
  - Refer to *section 9.14.6 “Compensation of Gun Arm Bend for C-Gun and X-Gun (SINGLE ARM MOVE)”* on page 9-160 for the details of gun pressure compensation.
  - Refer to *section 9.14.5 “Gun Pressure Compensation Function”* on page 9-154 for the details of arm bend compensation.

(Example Case) Robot: R1, Gun-Axis: S1

Select "R1+S1" for a control group

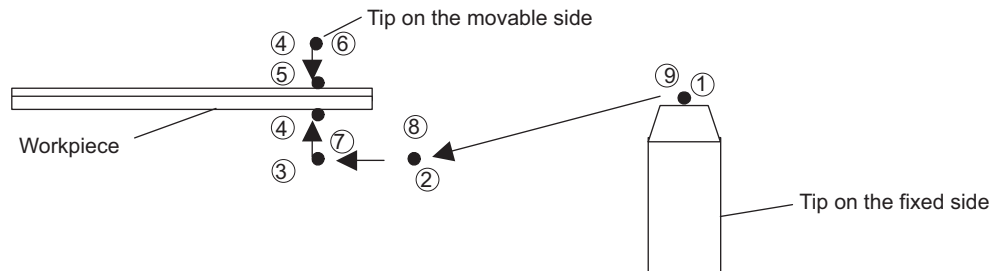


5. Press [ENTER]

– Refer to section 3.1.3 “Registering a Job” on page 3-2 for the details.

## 9.5.6.2 Registering Steps

- **When using SVSPOT instruction**  
Register steps in the following procedures.



1. Register the positions from 1 to 4 as steps 1 to 4.
2. Close the gun till it reaches to the position 5, and then register it as step 5 in the job.
3. Open the gun till it reaches to the position 6, and then register it as step 6 in the job.
4. Register the positions from 7 to 9 as steps 7 to 9.

**NOTE**

- Position 5 should not touch the workpiece. Give 5 to 10 mm space between the workpiece and the tip.
- By registering SVSPOT (Welding Execution) instruction after step 5, the tool end touches the workpiece in the touch motion.
- For the double arm move gun, teach positions 4 and 5 in the same step, and also positions 6 and 7 in the same step.

- **When using SVSPOTMOV instruction**  
Execution of teaching operation using SVSPOTMOV instruction requires less procedures than using SVSPOT instruction. For the details, refer to *section 9.10 "Clearance Move Instruction (SVSPOTMOV Instruction)" on page 9-79.*

---

## 9.6 Playback (Motor Gun)

This section explains about the check run and the actual welding.

### 9.6.1 Check Run

Confirm the taught path in a the check run. Dry run is possible during the check run operation because welding instructions such as SVSPOT are not carried out in the check run operation.

1. Set the mode switch to "PLAY" on the programming pendant.
2. Select {UTILITY} in the menu area.
3. Select {SETUP SPECIAL RUN}.
4. Select "CHECK-RUN" and set "VALID" to it.

### 9.6.2 Execute Welding

After having confirmed the taught path, start the welding operation.

SVSPOT instruction becomes available after turning OFF the check run operation.

**9.7 Welding Instruction (SVSPOT Instruction)****9.7.1 Registration of Welding Instruction (SVSPOT Instruction)**

Press [/SPOT] on the programming pendant to register SVSPOT instruction.

SVSPOT GUN#(1) PRESS#(1) WTM=1 WST=1

1            2            3            4

**1. Gun No.**

Specifies a gun No. to be used for welding.

**2. Gun pressure file No.**

Specifies a file No. to which a pressure is set.

Or, the pressure can be directly specified by WP tag instead of using PRESS tag.

In case specification by both Press and WP tags are omitted, the pressure file is used as its pressure condition. At this time, the file number becomes the number set to the welding condition number (WTM tag).

**3. Welding condition No.**

Specifies a welding condition No. set to the welder.

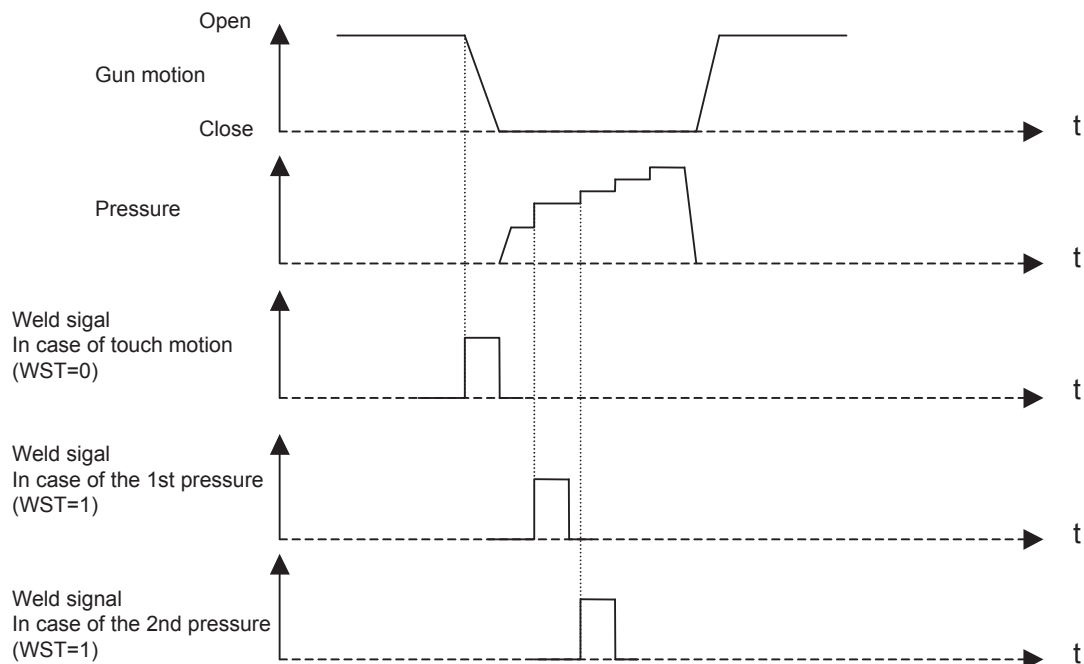
**4. Welder startup timing**

Specifies a timing to start the welder.

The timing is chosen from the following conditions.

- WST=0: The welder starts at the same time as the execution of SVSPOT instruction.  
As the welder starts its operation before pressurization, a squeeze time at the welder is required.
- WST=1: The welder starts at the same time as the pressure reaches the 1st pressure.
- WST=2 : The welder starts at the same time as the pressure reaches the 2nd pressure.

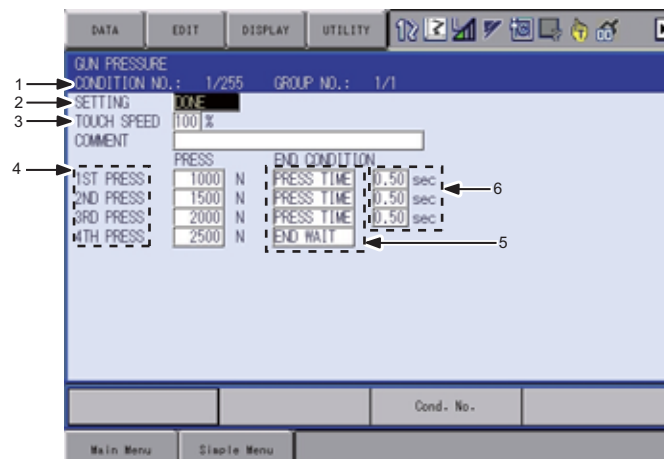
### ■ Welder startup timing



### 9.7.2 Setting of Gun Pressure

The pressure for welding can be specified by the pressure file selected by SVSPOT instruction.

### ■ Gun Pressure window



#### 1. CONDITION NO.

Shows the pressure file number. Press [PAGE] to select a file number.

#### 2. SETTING.

Shows the setting status of the pressure file.

“NOT DONE” is indicated if a value is not input.

“DONE” is indicated if a value is input.

#### 3. TOUCH SPEED

Shows the gun closing speed with a link speed (%).

#### 4. 1ST TO 4TH PRESS

Shows the pressure at each step.

**5. 1ST TO 4TH END CONDITION**

Shows the corresponding pressurization condition at each level. Select either "PRESS" or "END WAIT".

**PRESS TIME:** Apply pressure for a time specified at "6" item on this window.

**END WAIT :** Stop applying pressure when a weld complete signal is input from the welder.

In case "END WAIT" is specified to either {1ST PRESS}, {2ND PRESS} or {3RD PRESS}, the pressure condition of the press next to the specified press is no longer indicated.

**6. 1ST TO 4TH PRESS TIME**

Shows the pressure time for each pressure. In case "END WAIT" is selected at item "5", this item dose not appear.

To item "4", set a value so that the following equality to be true.

**NOTE**

$1000 \leq 1\text{ST to }4\text{TH PRESS}$

If the gun pressure is not set by following the above mentioned instructions, the actual pressure over the specified pressure cannot be guaranteed.

■ **Operation procedures**

1. Press {SPOT WELDING} on the {Main Menu}.
2. Select {GUN PRESSURE}.



– The GUN PRESSURE window appears.



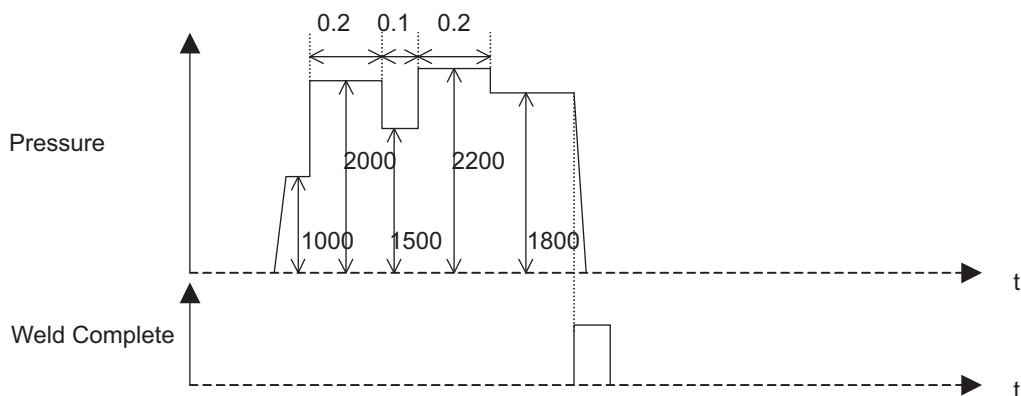
9 Spot Welding Application Using a Motor Gun  
 9.7 Welding Instruction (SVSPOT Instruction)

3. Select a file number by pressing [PAGE].
4. Select an item to be specified.
5. Input a numeric value and press [ENTER].
  - For {END CONDITION}, "PRESS TIME" and "END WAIT" alternate each time [SELECT] is pressed.
6. Move the cursor to {SETTING} and press [SELECT].
  - "DONE" appears to this item.



Table 9-3: <Example>

	PRESS (N)	END CONDITION	
1ST PRESS	2000	PRESS TIME	0.20 sec
2ND PRESS	1500	PRESS TIME	0.10 sec
3RD PRESS	2200	PRESS TIME	0.20 sec
4TH PRESS	1800	END WAIT	-



**NOTE** Gun pressure can be edited during the playback operation. The edited content is reflected after the gun pressure setting is done.





- If the touch speed is too fast, the gun axis may bounce. Reduce the speed to be slower than the present value.
- Modified settings are deleted in case following operations are executed while editing the gun pressure.
  - 1, Change the page
  - 2, Change the mode from play to teach
  - 3, Switch to other file editing menu
  - 4, Turn OFF the power supply
- The touch speed is limited to the maximum teaching speed in the teach mode.

### 9.7.3 Welding Current and Welding Time Settings

The welding current and the welding time are set to the welder.

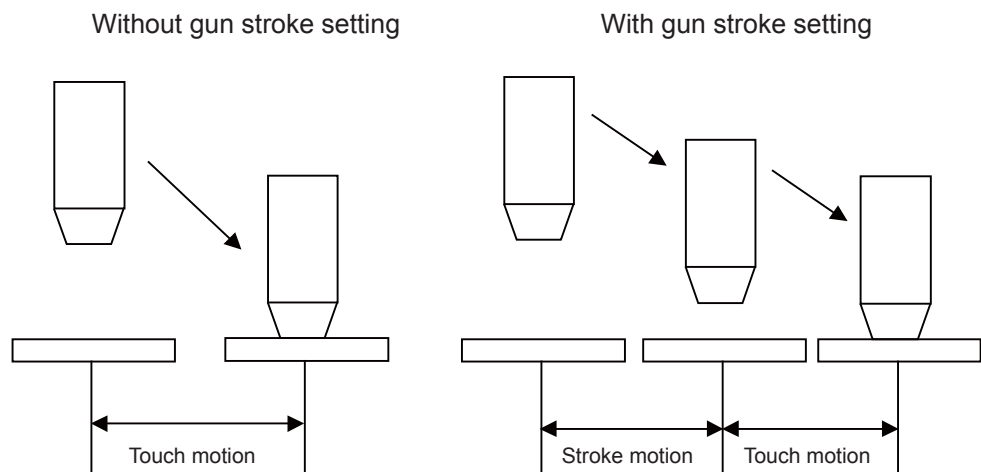
Refer to the Operator's manual of the welder.



The welding condition No. set to the welder should be the same as the welding condition No. specified in the SVSPOT instruction.

### 9.7.4 Gun Stroke Setting before Welding

At the execution of SVSPOT instruction, the gun can move to a specified position before the touch motion starts.



#### 9.7.4.1 Setting the Gun Stroke Position

SVSPOT GUN#(1) PRESS#(1) WTM=1 WST=1 BWS=10.0

1

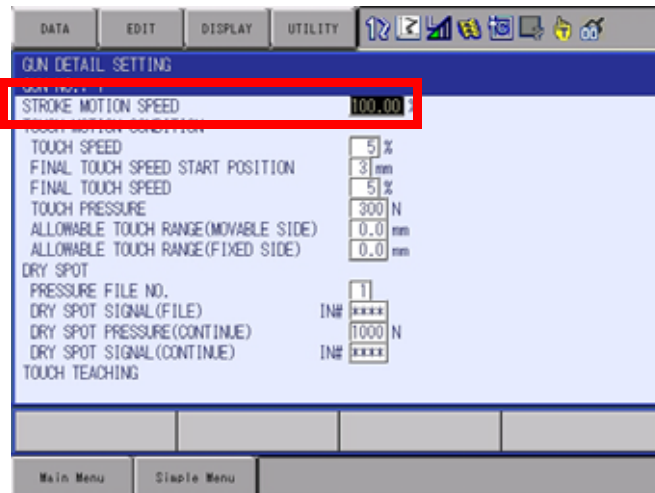
#### 1. Gun stroke position before welding

At the execution of SVSPOT instruction, the gun moves to a specified opening position. Then, the touch motion starts and the gun moves to the pressurizing position.

When this item is omitted, the touch motion starts immediately at the SVSPOT instruction.

## 9.7.4.2 Setting the Gun Stroke Motion Speed

1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {GUN DETAIL SETTING}.
  - The GUN DETAIL SETTING window appears.
3. Select a gun No. by pressing [PAGE].
4. Select {STROKE MOTION VELOCITY}.
  - STROKE MOTION VELOCITY  
The gun stroke motion speed under the SVSPOT instruction is specified.



5. Enter a numerical value, and press [ENTER].

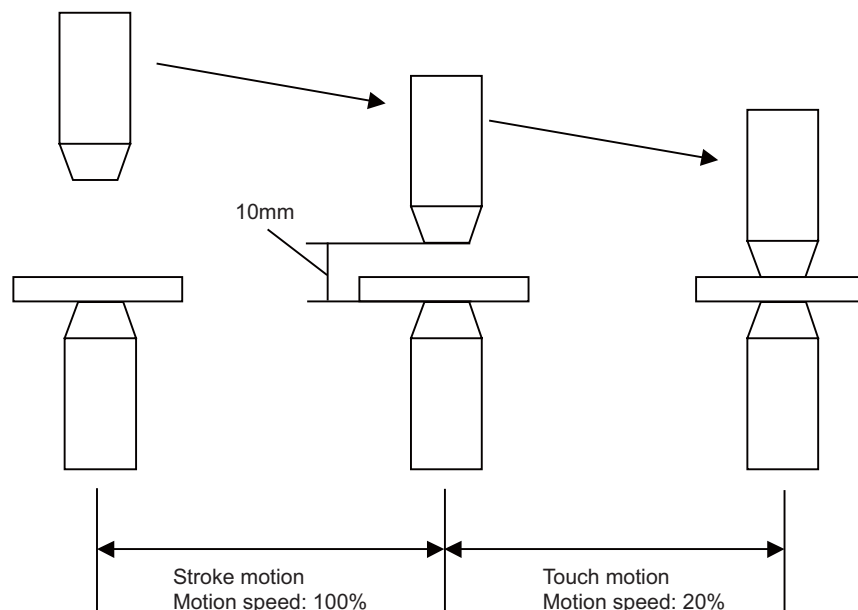
## 9.7.4.3 Motion Example

The figure below shows an example of a motion with the following conditions.

Gun stroke position before welding: 10.0 mm

Gun stroke motion speed: 100.0%

Touch press motion speed: 20%.



## 9.8 Dry Spot (Motor Gun)

For dressing a tip and mounting a tip, a gun motion to apply pressure without welding (dry spot) is required.

Dry spot can be also registered in a job to be executed.

### 9.8.1 Registration of Dry Spot Instruction (SVGUNCL Instruction)

Register SVGUNCL instruction by pressing [2/GUN CLOSE] among the [Numeric Key] on the programming pendant.

SVGUNCL GUN#(1) PRESSCL#(1)

1            2

#### 1. Gun No.

Specifies a gun No. to execute dry spot.

It is used in common with SVSPOT instruction.

#### 2. Pressure file No.

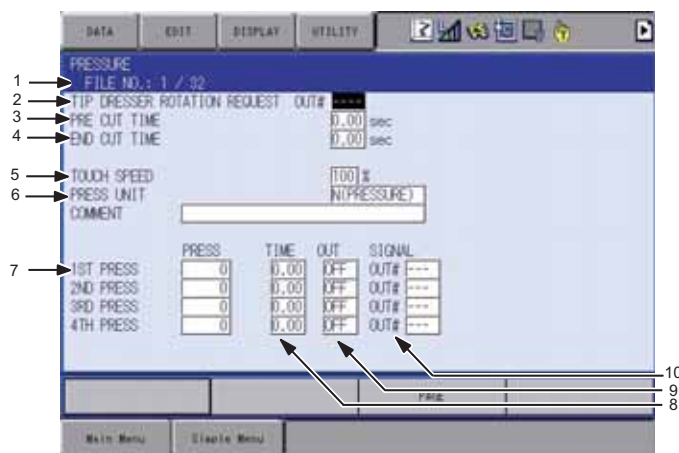
As a pressure condition, choose one out of the following four tags.

- PRESSCL tag (dry spot pressure file)  
The dry spot pressure file is regarded as its pressure condition.  
Set a file number to the tag.
- WP tag (direct pressure setting)  
A pressure is directly specified to a tag.
- PRESSTWC tag (pressure condition for the wear detection)  
A pressure condition for the wear detection.  
Apply pressure by the values set to {TOUCH SPEED} and {DETECTION PRESSURE} in the spot supervision file.  
For the details, refer to *section 9.12 "Tip Wear Detection and Wear Compensation (Motor Gun)" on page 9-113.*
- DRS tag (tip dress condition)  
The tip dress condition file is regarded as its pressure condition.  
Setting at {PRESSURE CONDITION} in the tip dress condition file is employed and other settings are not.  
Set a file number to the tag.  
For the details, refer to *section 9.11 "Tip Dressing Instruction (SVDRESMOV Instruction)" on page 9-95.* tip dress

**9.8.2 Dry Spot Pressure Setting**

The pressure for dry spot is specified by the pressure file selected by the SVGUNCL instruction.

■ **PRESSURE window**

**1. FILE NO.**

Shows the dry spot pressure file No.  
Select a number by pressing [PAGE].

**2. TIP DRESSER ROTATION REQUEST**

Shows the universal output signal number in synchronization with the dry spot pressure.

**3. PRE CUT TIME**

Shows the time from when the tip dresser rotation request is output till the moment the gun starts applying pressure.

**4. END CUT TIME**

Shows the time after the pressurization is finished and before the tip dresser rotation request is turned OFF.

**5. TOUCH SPEED**

Shows the gun closing speed with a link speed (%).

**6. PRESS UNIT**

Shows the units for dry spot pressure. Select "N" or "% (TORQUE)."

**7. 1ST to 4TH PRESS**

Shows the dry spot pressure at each step.

**8. 1ST to 4TH PRESS TIME**

Shows the pressure time of each dry spot pressure.

**9. 1ST to 4TH PRESS OUT**

Shows the ON/OFF status of the universal output signal which is output in synchronization with each dry spot pressure.

When a synchronizing signal is output to a tip dresser, etc., select "ON."

**10. 1ST to 4TH PRESS SIGNAL**

Shows the No. of the universal output signal which is output in synchronization with each dry spot pressure.

As for a value to “7”, set a value so that the following equality to be true.

**NOTE**

1000 <= 1ST to 4TH PRESS

If the gun pressure is not set following the above mentioned instructions, the actual pressure over the specified pressure cannot be guaranteed.

### ■ Operating procedure

1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {PRESSURE}.



– Pressure window appears.

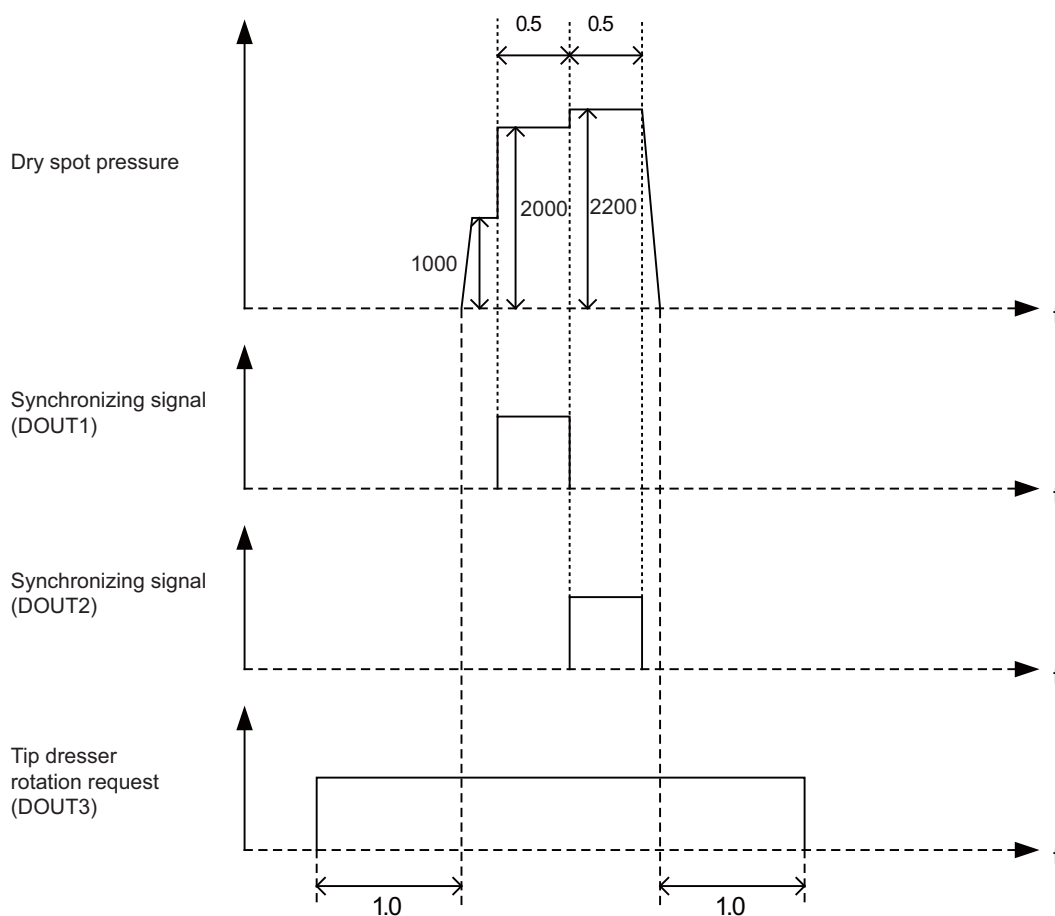


3. Select a file No. by pressing [PAGE].
4. Select an item to be set.
5. Enter a numerical value, and press [ENTER].
  - To {PRESS UNIT}, press [SELECT] to display “N” and “% (TORQUE)” alternately.
  - To {OUT} item, press [SELECT] to display “ON” and “OFF” alternately.

Table 9-4: <Example>

	PRESS (N)	END CONDITION	OUT
1ST PRESS	2000	0.50	ON
2ND PRESS	2200	0.50	ON
3RD PRESS	0.0	0.00	OFF
4TH PRESS	0.0	0.00	OFF
Tip dresser rotating signal			

PRE CUT TIME = 1.0 (sec) and END CUT TIME = 1.0 (sec)



**NOTE** If the touch speed is too fast, the gun axis may bounce. Reduce the speed to be slower than the present setting.

**NOTE** The touch speed is limited to the maximum teaching speed in the teach mode.

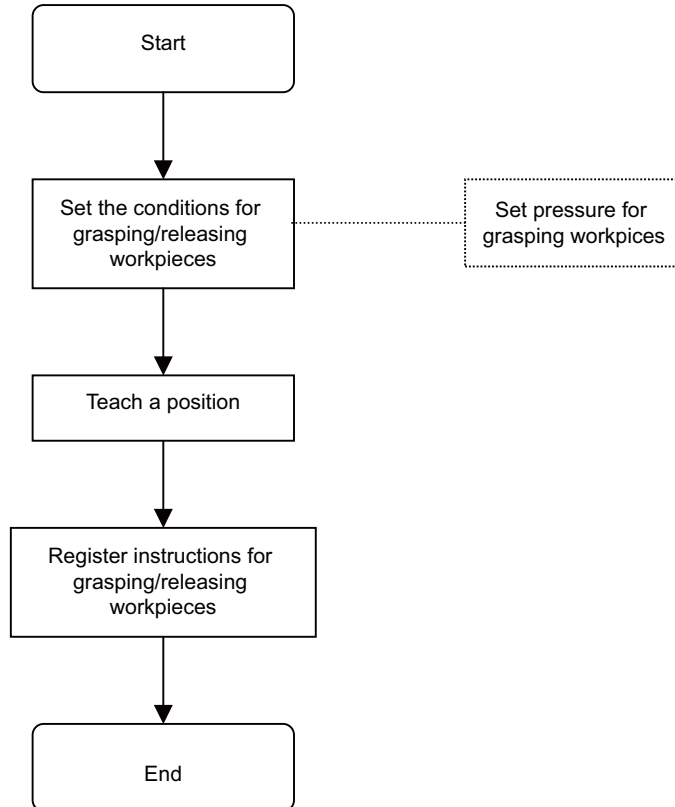
### 9.8.3 Workpiece Transfer Function Using a Motor Gun

#### 9.8.3.1 Operation Flow Chart

With the dry spot instruction, workpieces can be transferred.

When this instruction is performed, the force control for grasping a workpiece and the tip wear compensation are available so that the workpiece can be stably handled using a motor gun.

The following shows the operation flow chart for the workpiece transfer function.



## 9.8.3.2 Instruction for Grasping/Releasing Workpieces

&lt;Example&gt;

SVGUNCL GUN#(1) PRESSCL#(1) ON

1            2            3            4

**1. Instruction for grasping/releasing workpieces****2. GUN#(1)**

Specifies the gun No. to grasp the workpiece.

**3. PRESSCL#(1)**

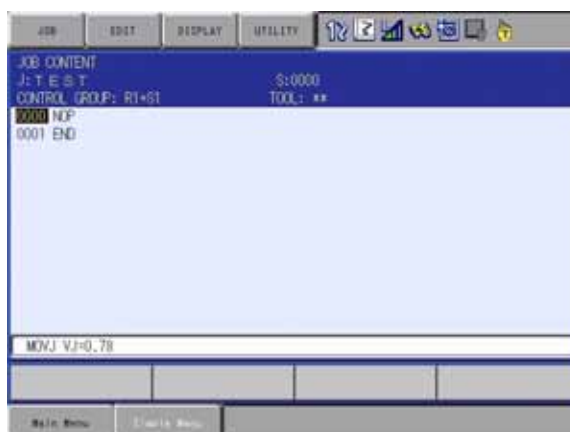
Specifies a dry spot condition file (pressure for grasping workpiece setting) No.

Or, the pressure can be directly specified by using WP tag instead of using PRESS tag.

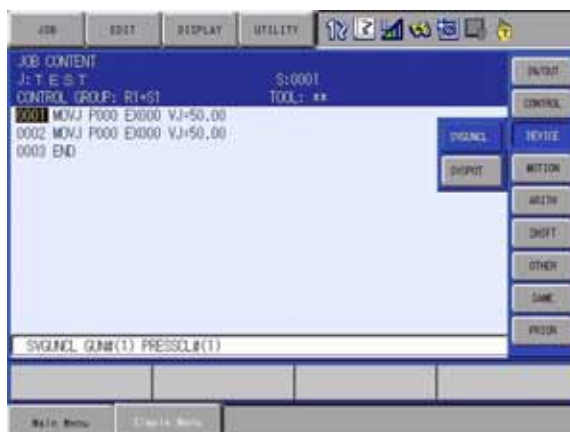
**4. ON**

Specifies whether the workpiece is grasped (ON) or released (OFF).

1. Select {JOB} on the {Main Menu}.
2. Select {JOB CONTENT}.
  - JOB CONTENT window appears.



3. Press [INFORM LIST].
4. Select {DEVICE}.
  - Select {SVGUNCL} for the instruction of grasping.

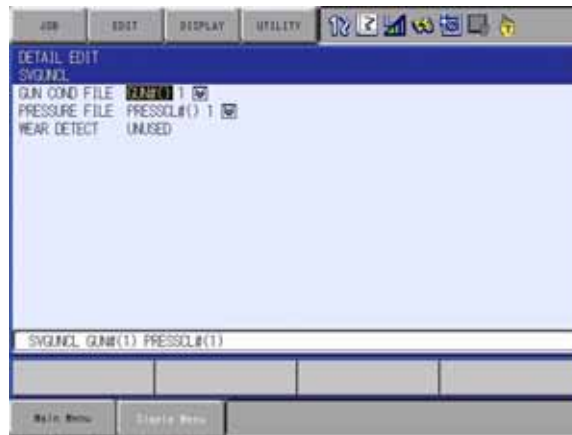




5. Move the cursor to {SVGUNCL} and press [SELECT] twice.

– DETAIL EDIT window appears.

(For transferring workpieces, adding the transfer tag is required on this window.)



– When “UNUSED” is selected for {WEAR DETECT}, the following dialog box appears.



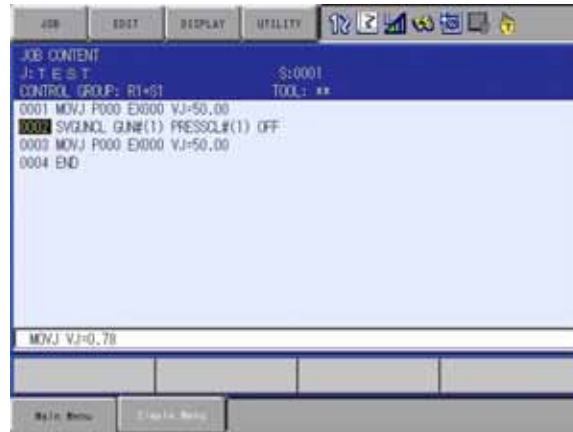
6. Edit the tag item of the instruction.

– Select {CONSTANT} from the dialog box.

- ON: Grasps the workpiece
- OFF: Releases the workplace



7. Press [INSERT] and then press [ENTER].
  - (1) The window returns to JOB CONTENT window after pressing [ENTER].
  - (2) The instruction can be inserted by pressing [ENTR] while LED indicator is lit by pressing [INSERT].



### 9.8.3.3 Manual Operation for Grasping/Releasing Workpieces

This section describes how to grasp/release workpieces by manual operation from the programming pendant.

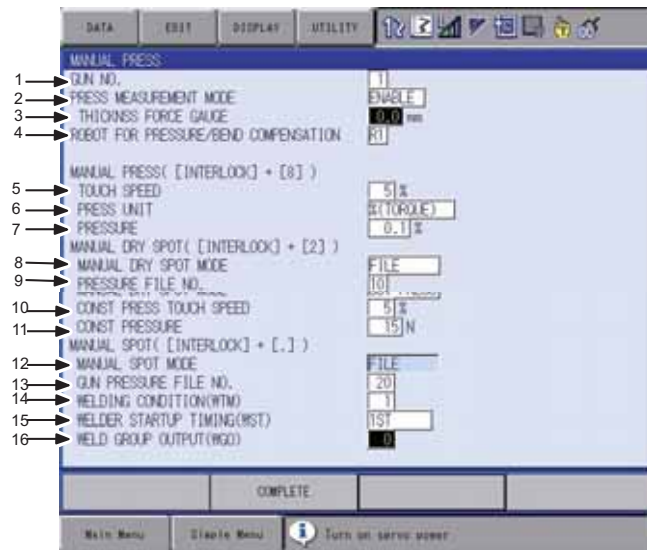
With this operation, the workpiece can be easily grasped/released when teaching the position for transferring workpieces.

This operation can be performed only in the teach mode.

1. Contact the fixed side tip to the workpiece to let the manipulator grasp the workpiece.
  - Pressure is applied when pressing [INTERLOCK] + [8].  
To set the pressure conditions, use {TOUCH SPEED}, {PRESSURE UNIT} or {PRESSURE} on MANUAL PRESS window.
2. Release the Workpiece
  - Press [INTERLOCK] + [9] to release the gun axis.

## 9.9 Manual Pressure

### Manual pressure window



#### 1. GUN NO.

Specifies the gun number to execute pressurization.

#### 2. PRESS MEASUREMENT MODE

Select “ENABLE” when measuring the pressure with a force gauge.

For the gun closing speed, just before the upper and lower tips to contact, the gun decreases its speed till the speed to the final touch speed specified on GUN DETAIL SETTING window. When “ENABLE” is set to {PRESS MEASUREMENT MODE}, the gun’s position where it starts decreasing the speed is offset for the distance equal to the thickness of the force gauge, and start decreasing the speed before the upper and lower tips contact the gauge. With this setting, measurement of the pressure with the same condition as the normal pressurization becomes possible.

This mode is disabled when the mode is changed to play even if “ENABLE” is selected.

#### 3. THICKNESS FORCE GAUGE

Specify the thickness of the force gauge to this item after “PRESS MEASUREMENT MODE” is enabled.

#### 4. ROBOT FOR PRESSURE/BEND COMPENSATION

Select a robot for the pressure and bend compensation operations.



The bend compensation is not executed by MANUAL DRY SPOT ([INTERLOCK] + [2]).

#### 5. TOUCH SPEED

Specifies a touch speed when applying pressure manually.

#### 6. PRESS UNIT

Shows the units for manual pressure. Select “N” or “% (TORQUE).”

#### 7. PRESSURE

Specifies the pressure for manual pressure.

**8. MANUAL DRY SPOT MODE**

Pressurizing method for the dry spot is specified by selecting either "FILE" or "CST PRESS". With this procedure, "TOUCH SPEED" and "PRESSURE" are specified as follows.

- When "FILE" is selected
  - TOUCH SPEED: It is defined by the dry spot pressure file condition specified by "PRESSURE FILE NO."
  - PRESSURE : It is defined by the dry spot pressure file condition specified by "PRESSURE FILE NO."
- When "CST PRESS" is selected
  - TOUCH SPEED: It is defined by the value input to "CONST PRESS TOUCH SPEED".
  - PRESSURE : It is defined by the pressure input to "CONST PRESSURE".

**9. PRESSURE FILE NO.**

This item appears when "FILE" is selected to "MANUAL DRY SPOT MODE". Specifies the dry spot pressure file number for the manual dry spot operations.

**10. CONST PRESS TOUCH SPEED**

This item appears when "CST PRESS" is selected to "MANUAL DRY SPOT MODE". Specifies the touch speed for the constant pressurizing operations.

**11. CONST PRESSURE**

This item appears when "CST PRESS" is selected to "MANUAL DRY SPOT MODE". Specifies the pressure for the constant pressurizing operations.

**12. MANUAL SPOT MODE**

"FILE" is always specified while executing the pressurizing operations at the manual spot.

**13. GUN PRESSURE FILE NO.**

Specifies the gun pressure file number in welding operation.

**14. WELDING CONDITION(WTM)**

Specifies the welding condition number to be output to the welder.

**15. WELDER STARTUP TIMING(WST)**

Shows the timing to start-up the welder. Select one condition out of the following three conditions.

- Touch motion : Start-up the welder at the same timing with the execution of SVSPOT instruction. A squeeze time at the welder is required because the welder starts its operation before pressurization starts.
- 1ST PRESSURE : Start-up the welder at the same timing with the execution of the 1ST PRESSURE.
- 2ND PRESSURE : Start-up the welder at the same timing with the execution of the 2ND PRESSURE.

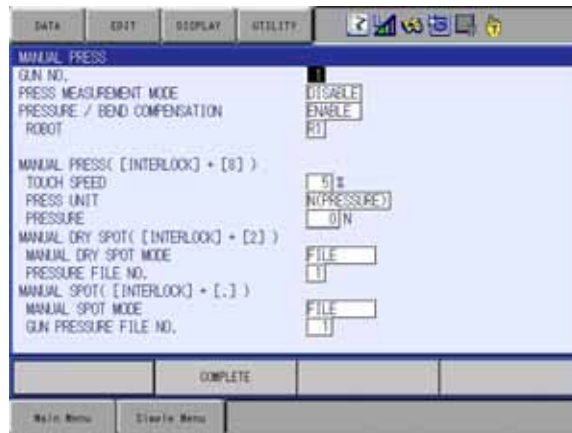
**16. WELD GROUP OUTPUT(WGO)**

Specifies a welding group No. output to the welder.

For the details, refer to *section 9.14.7 "Welding Conditions Group Output Function" on page 9-163*

### ■ Operating procedures

1. Press [0/MANUAL SPOT] of the [Numeric Key].
  - MANUAL PRESS window appears.



2. Select an item to set.
3. Input a value, and press [ENTER].
  - To {WELDER STARTUP TIMING(WST)}, press [SELECT] to alternate “TOUCH MOTION”, “1ST PRESSURE” and “2ND PRESSURE”.
  - To {MANUAL SPOT MODE}, press [SELECT] to alternate “FILE” and “CST PRESS”.

### ■ Manual Press Operation

Refer to section 9.5.1 “Manual Spot” on page 9-56 , section 9.5.2 “Manual Dry Spot” on page 9-56 and section 9.5.3 “Manual Press” on page 9-56 for the manual press operation.



The manual press ([INTERLOCK] +[8]) and the manual dry spot ([INTERLOCK] +[2]) are available even if the MANUAL PRESSURE window is not opened.

However, in this case, the available gun is not the one selected on the manual pressure window but the gun included in the job currently selected. For this reason, these operations are not available when a gun is not included in the currently selected job.

Also, the robot for pressure/bend compensation is the one included in the currently selected job. For this reason, pressure/bend compensation is not available when a robot is not included in the currently selected job.

**9.10 Clearance Move Instruction (SVSPOTMOV Instruction)**

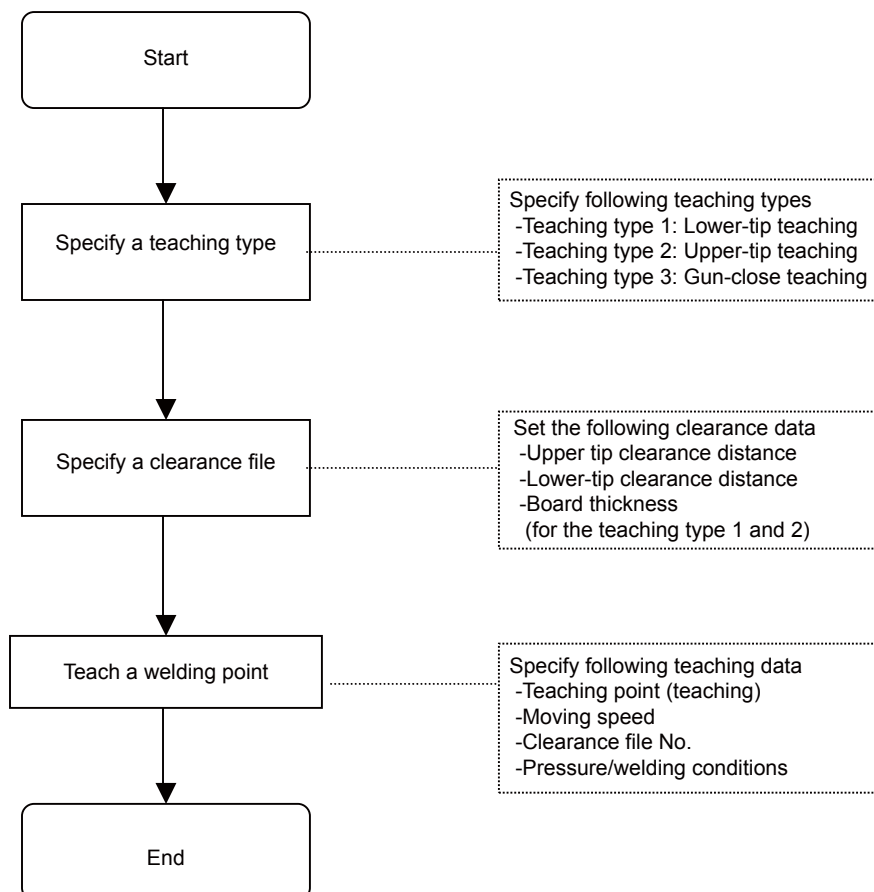
After teaching this instruction at the welding points, execution of all the following operations become enabled by this instruction only.

1. Moving to a position short before the welding operation point.  
(moving to a clearance position)
2. Moving to a welding position
3. Welding operation
4. Moving to a position just behind the welding operation point.  
(moving to a clearance position)

The clearance position mentioned above means the position where the gun is opened over the welding position by the clearance distance specified by the clearance file.

**9.10.1 Operation Flow**

The following shows the teaching operation flow chart for the clearance move instruction.



**9.10.2 Setting the Teaching Type**

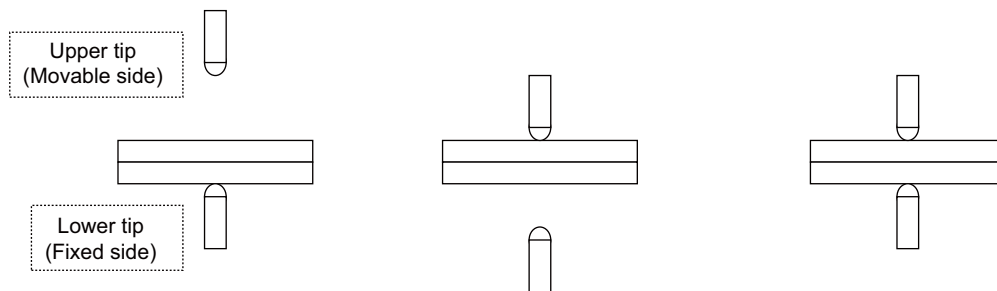
The following three types of settings are available; the lower-tip teaching, the upper-tip teaching, and the gun-close teaching.

Follow the procedures to select one out of the three types before teaching the welding point.

(1) Lower-tip teaching  
(inputting of board thickness is necessary)

(2) Upper-tip teaching  
(inputting of board thickness is necessary)

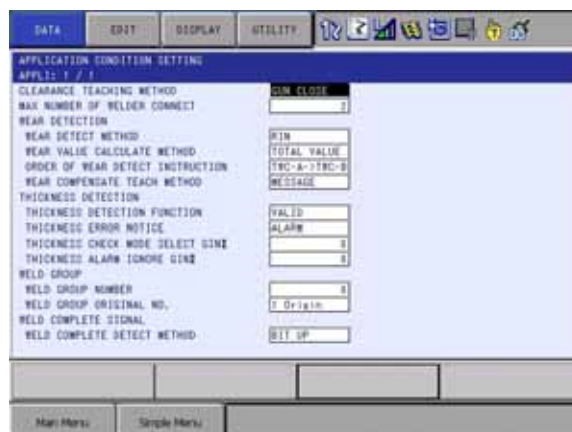
(3) Gun-close teaching  
(inputting of board thickness is unnecessary)



1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {APPLI COND.}.



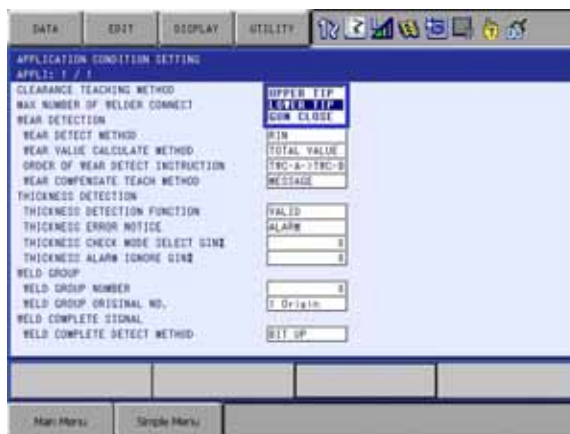
– APPLICATION CONDITION SETTING window appears



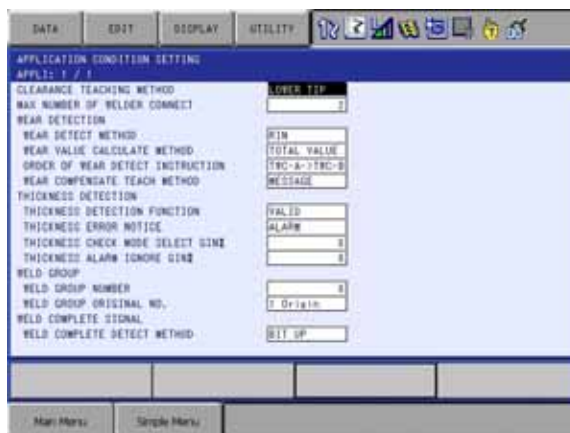
## 9 Spot Welding Application Using a Motor Gun

### 9.10 Clearance Move Instruction (SVSPOTMOV Instruction)

3. Select {CLEARENCE TEACHING METHOD}.
  - Move the cursor to {CLEARENCE TEACHING METHOD} and press [SELECT]. A selection dialog box for the teaching methods appears.



- Three teaching methods are available.
    - UPPER TIP : Teaching with the upper tip contacting the workpiece
    - LOWER TIP : Teaching with the lower tip contacting the workpiece
    - GUN CLOSE : Teaching with both tips contacting the workpiece
4. Select a desired teaching method.
    - Press {SELECT} to change the method.





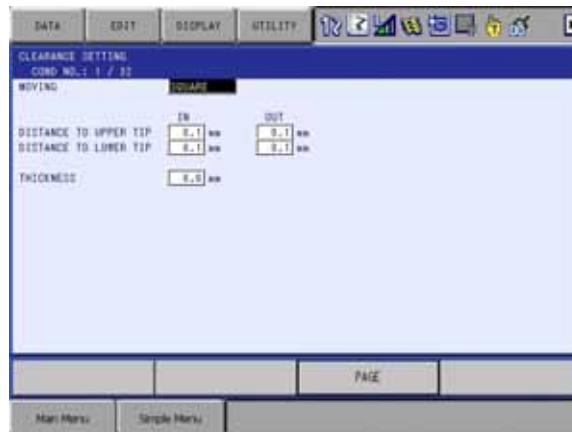
### 9.10.3 Setting the Clearance Files

In this section, setting procedures of various data to the clearance file are explained.

- When selecting “UPPER TIP” or “LOWER TIP” as the clearance teaching method, setting of {TICKNESS} in the clearance file before teaching the welding point is required.
  - No need to set {TICKNESS} in the clearance file before teaching the welding point when selecting “GUN CLOSE” for the clearance teaching method.
  - Up to 32 clearance files can be used.
1. Select {SPOT WELDING} on the {Main Menu}.
  2. Select {CLEARANCE SETTING}.



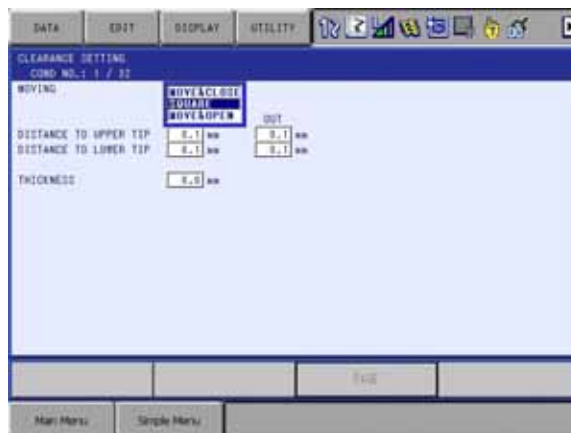
– CLEARANCE SETTING window appears.



## 9 Spot Welding Application Using a Motor Gun

### 9.10 Clearance Move Instruction (SVSPOTMOV Instruction)

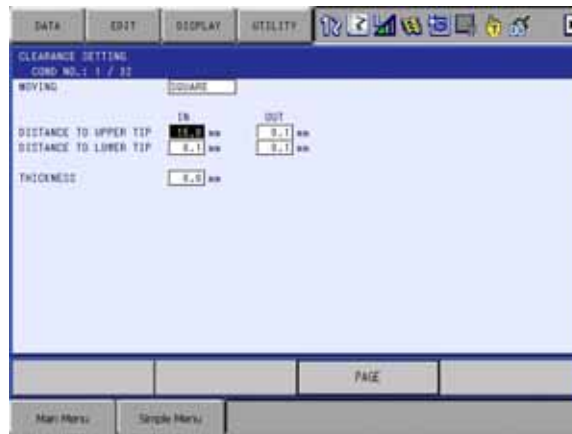
- Amount of clearance and operation conditions can be set.
- There are three moving patterns.
  - MOVE&CLOSE
  - SQUARE
  - MOVE&OPEN



- {DISTANCE TO UPPER TIP(IN)} and {DISTANCE TO LOWER TIP(IN)} are the amount of clearance for closing motion. {DISTANCE TO UPPER TIP(OUT)} and {DISTANCE TO LOWER TIP(OUT)} are the amount of clearance for opening motion.
  - This file is specified by the SVSTPOTMOV instruction's clearance tag.  
(Up to 32 files can be specified.)
3. Select desired items.
    - {DISTANCE TO UPPER TIP}, {DISTANCE TO LOWER TIP}, and {THICKNESS} can be set in the 1/10mm length.
  4. Input a value and press [ENTER].
    - Move the cursor and press [SELECT] to enter the value.



– After entering each value, press [ENTER] to set the value.



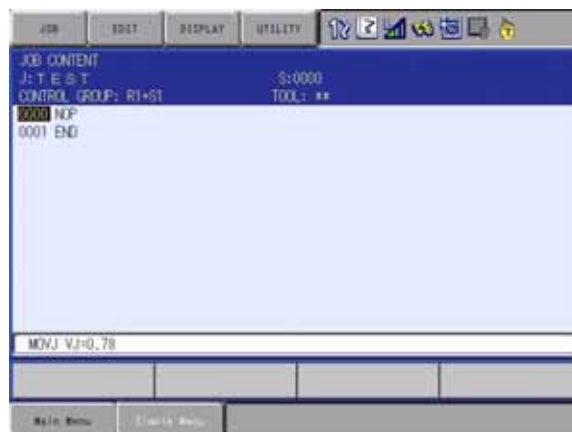
#### 9.10.4 Operations for Teaching Welding Points

The following describes the outline of the procedure for teaching the welding point.

1. Select {JOB} on the {Main Menu}.
2. Select {JOB}.



– JOB CONTENT window appears.

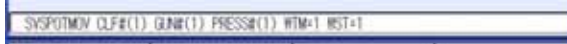


When registering pressure instructions (SVSOPT, SVGUNCL, SVSPOTMOV and SVDRESMOV), create a job which includes a gun axis control group.

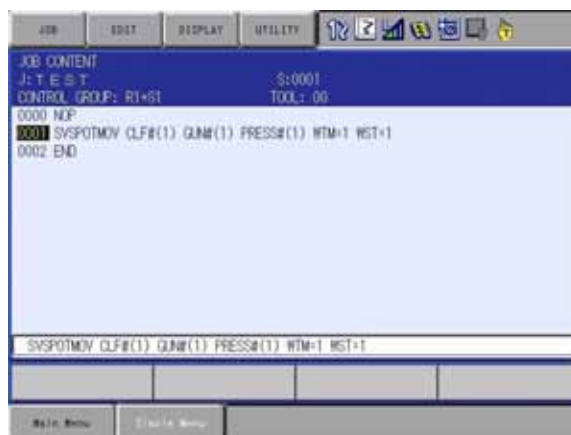
## 9 Spot Welding Application Using a Motor Gun

### 9.10 Clearance Move Instruction (SVSPOTMOV Instruction)

- Press [SHIFT] + [MOTION TYPE] to display SVSPOTMOV.



- To execute the clearance teaching, display SVSPOTMOV by changing motion type ( [SHIFT] + [MOTION TYPE]) and register it.
  - This can be done only when the manipulator is in operating status (while the [ROBOT] LED indicator is lit.).
- Edit the tag item of the instruction.
  - Press [INSERT], then press [ENTER].
    - Following window appears when the clearance move instruction has been registered.



**9.10.5 Clearance Move Instruction**

The following describes the clearance move instruction.

<Example>

```
SVSPOTMOV V=1000.0 PLIN=1 PLOUT=1 CLF#(1) GUN#(1)
PRESS#(1) WTM=1 WST=1 WGO=1
```

SVSPOTMOV	: Clearance move instruction
V=1000.0	: Linear motion speed for clearance (1000.0mm/s for this example)
PLIN=1	: Positioning level at the clearance position before welding
PLOUT=1	: Positioning level at the clearance position after welding
CLF#(1)	: Clearance file number (file 1 for this example)
GUN#(1)	: Motor gun number (Motor gun 1 is used for this example.)
PRESS#(1)	: Pressure condition file number (Pressure condition file 1 is used for this example.)
WTM=1	: Welding condition number (Welding condition 1 is used for this example.)
WST=1	: Welder start-up timing
WGO=1	: Welding condition group output (Refer to <i>section 9.14</i> <i>"Other Functions Using a Motor Gun"</i> on page 9-140 )



The tag using method of GUN, PRESS, WTM, and WST, etc. are same as that of SVSPOT instruction.

For the details of these tags, refer to *section 9.7.1*  
*"Registration of Welding Instruction (SVSPOT Instruction)"*  
on page 9-62.

**9.10.6 Clearance Move**

The following describes the clearance move.

■ **When the positioning level (PLIN) is used**

Table 9-5: Job Example: Work 1

0000	NOP	
0001	MOVJ VJ=100.0	→ 1
0002	SVSPOTMOV V=1000.0 PLIN=0 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1	→ 2
0003	SVSPOTMOV V=1000.0 PLIN=0 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1	→ 3
0004	SVSPOTMOV V=1000.0 PLIN=0 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1	→ 4
0005	SVSPOTMOV V=1000.0 PLIN=0 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1	→ 5
0006	SVSPOTMOV V=1000.0 PLIN=0 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1	→ 6
0007	MOVL V=1000.0	→ 7
0008	END	

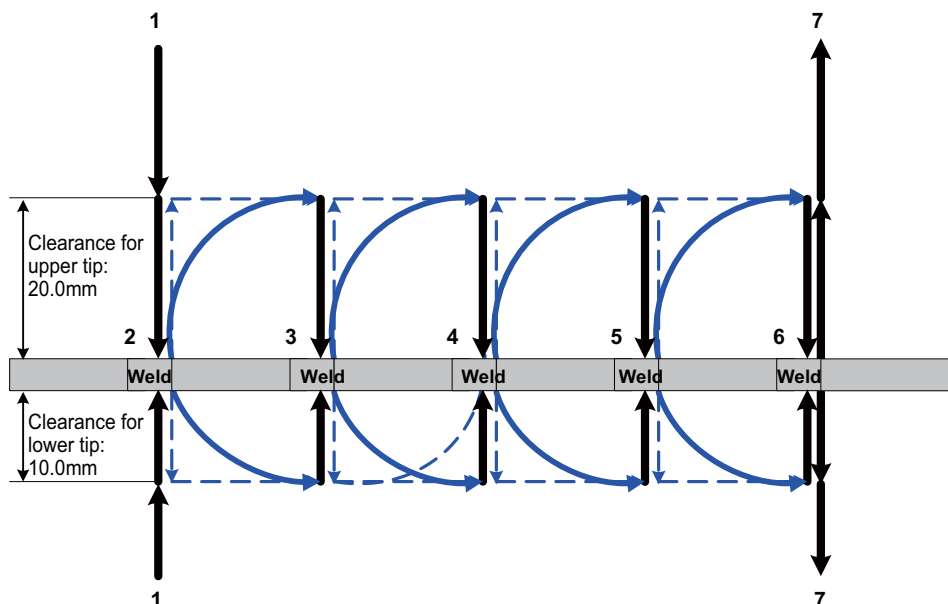
Clearance file setting: 1

PLIN = 0

DISTANCE TO UPPER TIP (IN, OUT) : 20.0mm

DISTANCE TO LOWER TIP (IN, OUT) : 10.0mm

THICKNESS : 2.0mm



■ When the positioning level (PLOUT) is used

Table 9-6: Job Example: Work 1

0000	NOP	
0001	MOVJ VJ=100.0	→ 1
0002	SVSPOTMOV V=1000.0 PLOUT=0 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1	→ 2
0003	SVSPOTMOV V=1000.0 PLOUT=0 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1	→ 3
0004	SVSPOTMOV V=1000.0 PLOUT=0 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1	→ 4
0005	SVSPOTMOV V=1000.0 PLOUT=0 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1	→ 5
0006	SVSPOTMOV V=1000.0 PLOUT=0 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1	→ 6
0007	MOVL V=1000.0	→ 7
0008	END	

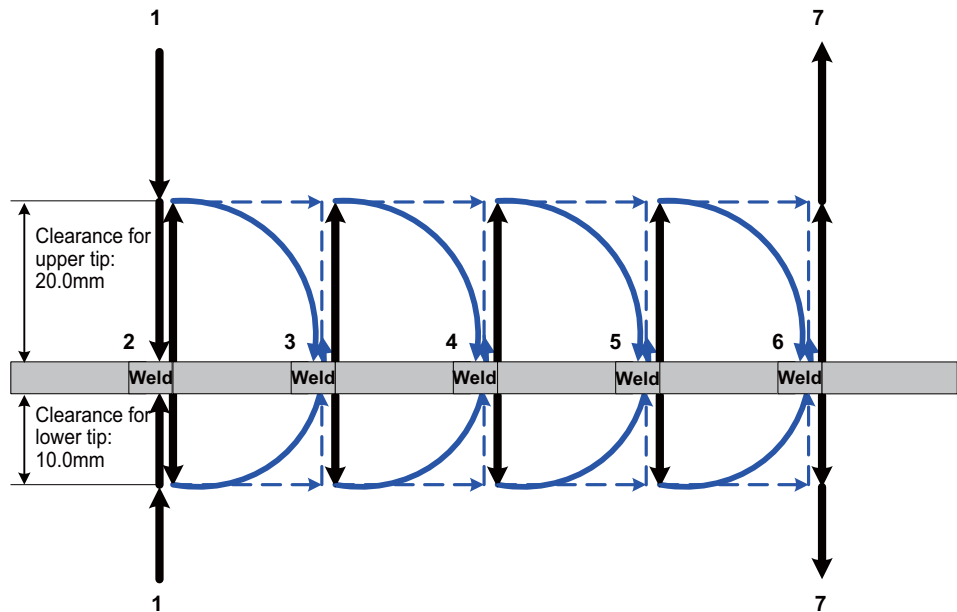
Clearance file setting: 1

PLOUT = 0

DISTANCE TO UPPER TIP (IN, OUT) : 20.0mm

DISTANCE TO LOWER TIP (IN, OUT) : 10.0mm

THICKNESS : 2.0mm

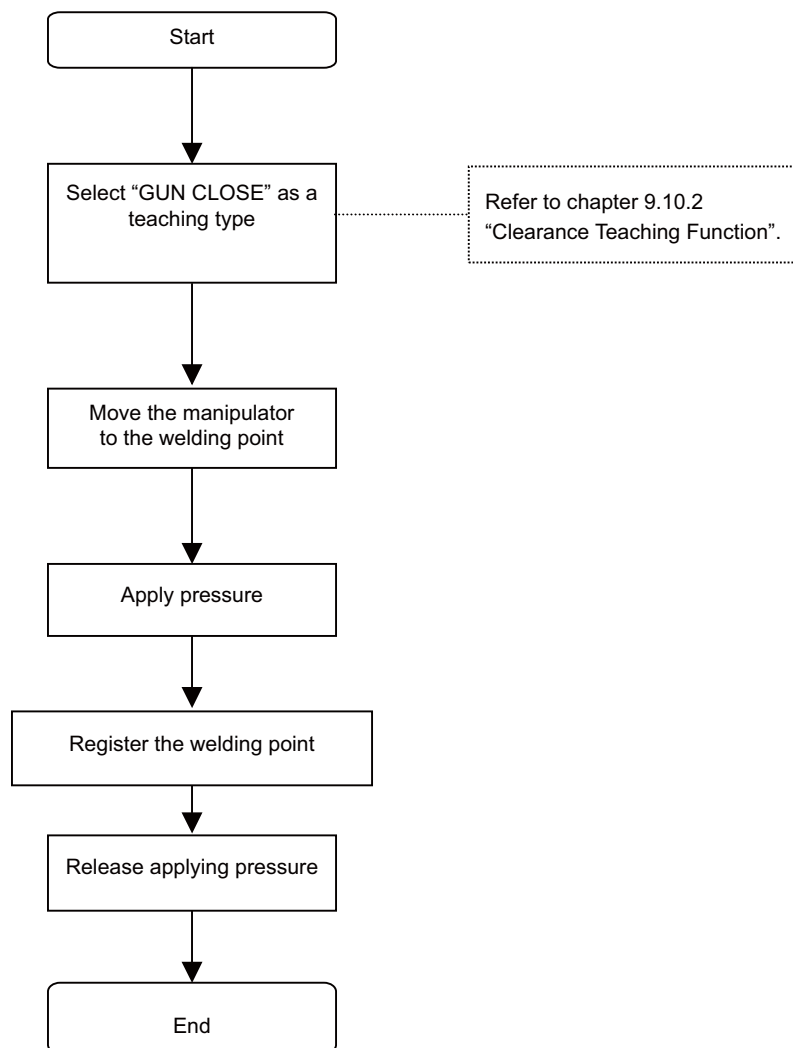


**9.10.7 Press Teaching Function**

## 9.10.7.1 Operation Flow Chart

Teaching of the clearance move instruction can be executed while the gun is applying pressure.

The following shows the operation flow chart for this function.





### 9.10.7.2 Procedure for Registering the Position

The following describes the procedures for registering the position.

Note that this function is a part of the clearance teaching function, and is available only when the clearance teaching type is the gun-close teaching.

1. Move the fixed side tip until it contacts the workpiece, and then apply pressure.
  - To apply pressure, press [8] + [INTERLOCK].
  - The condition under MANUAL PRESS ([INTERLOCK] + [8]) on MANUAL PRESS window is used as the pressure condition.
2. Confirm the pressure status and register the position.
  - SVSPOTMOV instruction appears in the input buffer line of the job input display while it is pressurized.
  - In case it doesn't appear, press [8] to switch the indication.
  - The taught position is registered after the wear compensation amount of the gun axis is added. Yaskawa recommends that the pressure is applied in the level which the gun axis does not bend when teaching.
3. Stop applying the pressure.
  - Press [INTERLOCK] + [9] to release the gun axis.

### 9.10.7.3 Setting the Pressure Conditions

The following describes settings for the pressure conditions.

The pressure condition is specified with {TOUCH SPEED}, {PRESS UNIT} and {PURESSURE}.

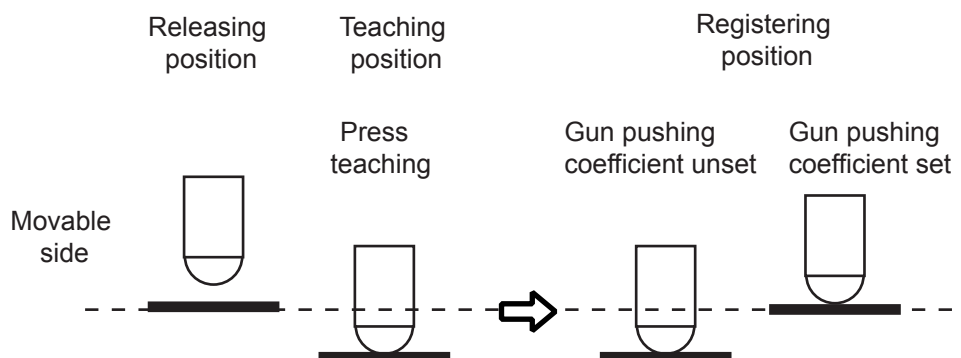
The following window can be displayed by pressing [0].

DATA	EDIT	DISPLAY	UTILITY
<b>MANUAL PRESS</b>			
GUN NO.			1
PRESS MEASUREMENT MODE			ENABLE
THICKNESS FORCE GAUGE			10.0 mm
PRESSURE / BEND COMPENSATION			ENABLE
ROBOT			R1
MANUAL PRESS([INTERLOCK] + [8])			
TOUCH SPEED			2 %
PRESS UNIT			N(PRESSURE)
PRESSURE			1000 N
MANUAL DRY SPOT([INTERLOCK] + [4])			
MANUAL DRY SPOT MODE			FILE
PRESSURE FILE NO.			1
MANUAL SPOT([INTERLOCK] + [.] )			
MANUAL SPOT MODE			FILE
GUN PRESSURE FILE NO.			1
WELDING CONDITION(PTW)			1
WELDER STARTUP TIMING(WST)			1ST
COMPLETE			
Main Menu	Setup Menu	I/O Panel	

## 9.10.7.4 Setting the Gun Pushing Coefficient

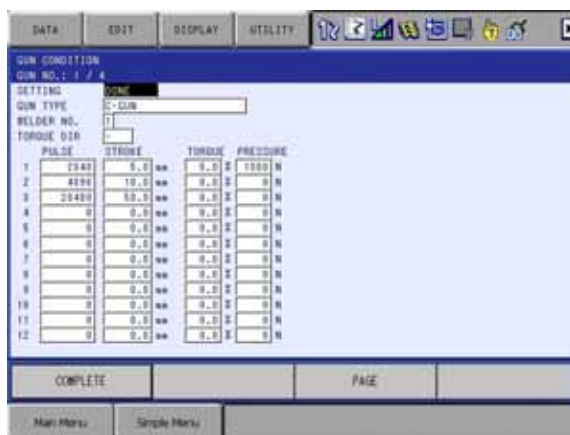
By setting a value to the gun pushing coefficient, the position of the gun is registered after subtracting the pressure pushing value from the gun position when executing press teaching.

By setting the gun pushing coefficient correctly, the contact point of the tip and the workpiece can be registered as a teaching point regardless of the pressure during press teaching operation.



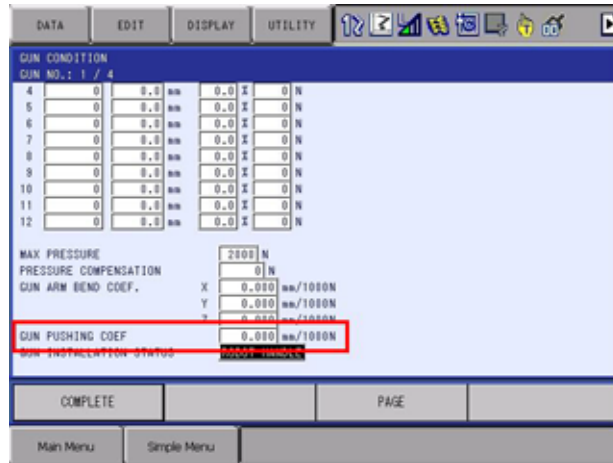
- **Setting of gun pushing coefficient**

1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {GUN CONDITION}.
  - GUN CONDITION window appears.



## 3. Set a value to {GUN PUSHING COEF}.

- Set the value (0 to 10.0 [mm/1000N]) to the gun pushing coefficient to compensate the registering position when press teaching is performed.
- Press [SELECT] to input the numerical value.

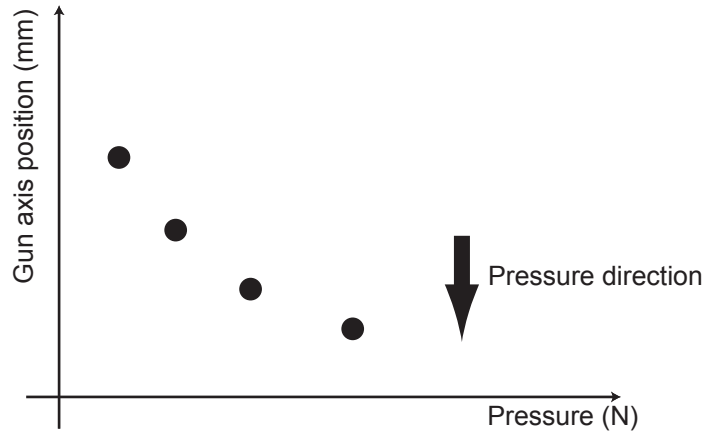


## 4. Press [ENTER].

■ **Calculation of Gun Pushing Coefficient**

To {GUN PUSHING COEF}, set pushing amount [mm] per 1000N.

Fig. 9-2: Relation Between Pressure and Gun Axis Position [mm]



Following the relation mentioned above, calculate the change of gun axis position per 1000N pressure and set it to {GUN PUSHING COEF}.

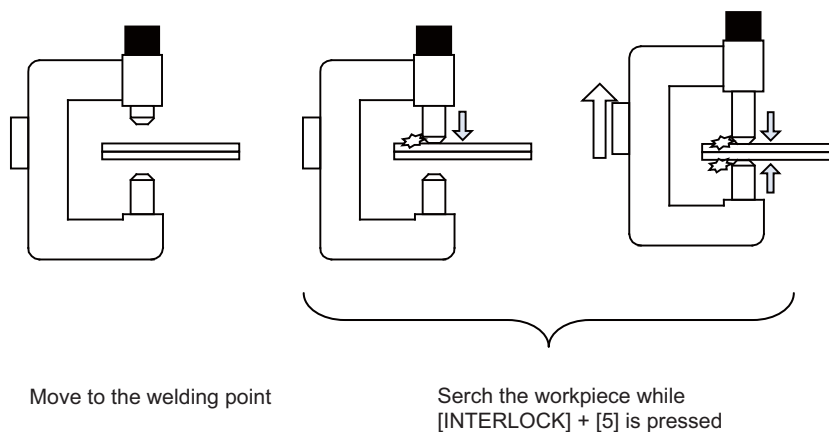
{GUN PUSHING COEF} is set with [mm] unit.

**9.10.8 Work Search Function**

The workpiece position over the tool Z-axis direction can be automatically detected.

**9.10.8.1 Operating procedures**

1. Manually move the motor gun to the welding point.
2. Start the searching operation.
  - Press [INTERLOCK] + [5] to down the movable side tip. When the movable side tip touches the workpiece, the fixed side tip is moved up with the movable side tip keeping touch to the workpiece until the workpiece is detected.
  - While the workpiece is being detected, a message "In process of search" appears and it is deleted after the detection is completed.
3. Release pressing [INTERLOCK] + [5] after the message is deleted.



After the detection, confirm the positions of the motor gun and the workpiece, register SVSPOTMOV instruction by referring to *section 9.10.7 "Press Teaching Function" on page 9-89*.

In case pressing [INTERLOCK] + [5] is released or Hold is pressed during the workpiece detection, the detecting operation is discontinued.

## 9.10.8.2 Parameter

S1CxG175: Threshold of the workpiece detection by the movable side tip

Specifies the threshold of workpiece detection by the movable side tip

0: 10 [N]

Others: S1CxG175 [N]

<example> When the following value is set, the detecting threshold is 20 [N].

S1CxG175=20



- When the workpiece rigidity is low, detection may take time and this delay can cause a damage to the workpiece. For this reason, do not use this function when the workpiece rigidity is low.
- Should an error occurred, increase the value of S1CxG175 one by one from its default value to find a value with which the error does not occur. In case an error is detected when the value is 0, increase the value of S1CxG175 one by one from 11 to find a value with which the error does not occur.
- This function is not available to the double arm moving gun.

## 9.11 Tip Dressing Instruction (SVDRESMOV Instruction)

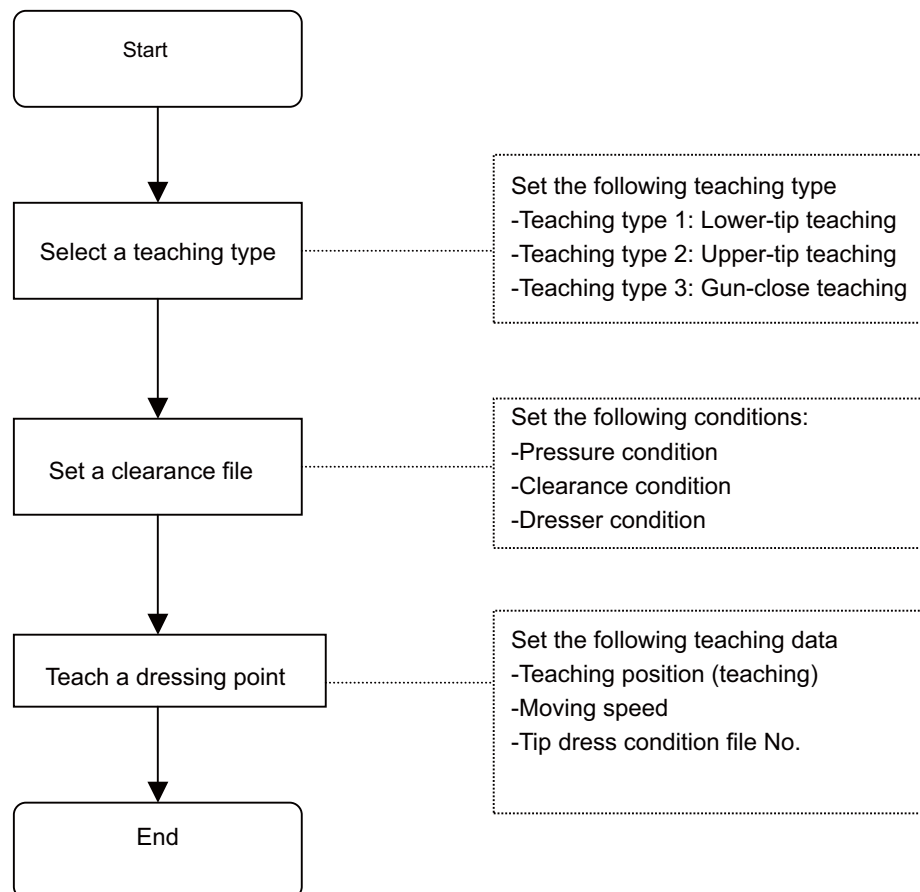
As well as the clearance move instruction (SVSPOTMOV Instruction), all the following operations become available only by this instruction after teaching this instruction at a dressing position.

1. Moving to a position short before the dressing position (moving to the clearance position)
2. Moving to a dressing position
3. Dressing operation
4. Moving to a position just behind the dressing position (moving to the clearance position)

The clearance position mentioned above means the position where the gun is opened over the dressing position by the clearance distance specified by the tip dress condition file.

### 9.11.1 Operation Flow

The following shows the operation flow chart for the tip dressing instruction teaching.



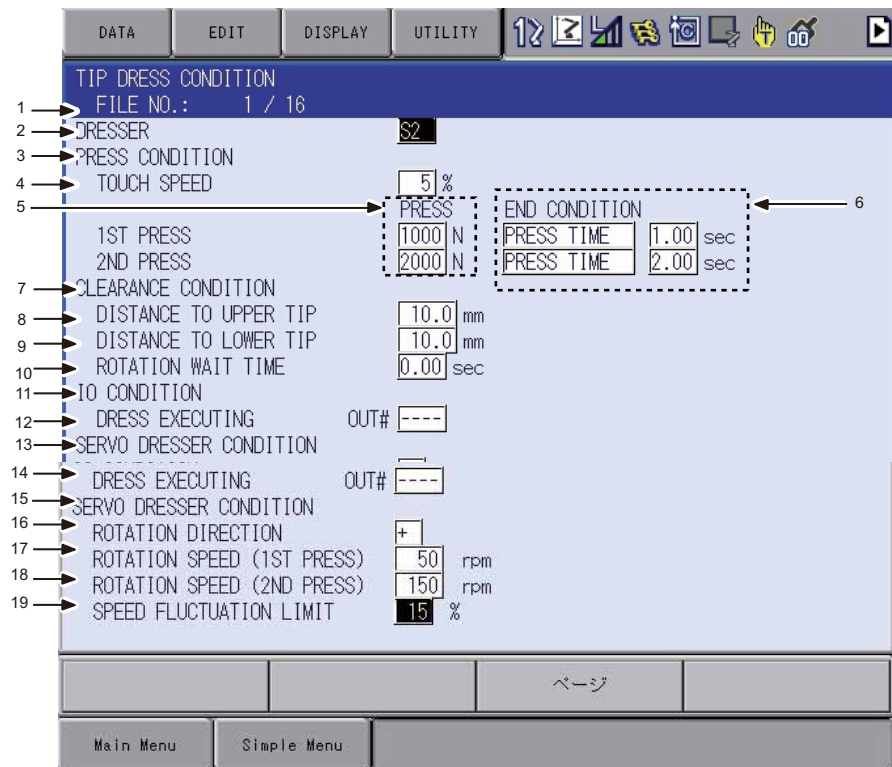
### 9.11.2 Teaching Type Setting

The teaching type setting procedures are same as that of the clearance move instruction (SVSPOTMOV). Refer to *section 9.10.2 "Setting the Teaching Type" on page 9-80*.

### 9.11.3 Tip Dress Condition

The pressure, clearance and dressing conditions when the tip dress instruction (SVDRESMOV) is executed are set on the tip dress condition window.

#### ■ Tip dress condition window



#### 1. FILE NO.

Shows the tip dress condition file No.  
Press [PAGE] to choose the number.

#### 2. DRESSER

Select "IO" when using a dresser which is controlled by IO.  
When using a servo dresser, select the servo dresser's control group.

#### 3. PRESS CONDITION

This pressure condition is used when executing a tip dressing instruction (SVDRESMOV), or a dry spot instruction (SVGUNCL) which uses a tip dress condition file (DRS tag).

#### 4. TOUCH SPEED

Shows the gun closing speed with a link speed (%).

#### 5. 1ST TO 2ND PRESS

Set the pressure at each step

**6. END CONDITION**

Functions are expanded in DN1.71.00-00 and later versions so that either "PRESS TIME" or "DRESS LENGTH" is selected as its operation ending condition.

- When "PRESS TIME" is selected  
Pressing time is designated.  
When "0" is set, no pressing is executed and the manipulator completes its operation.  
In case "PRESS TIME" is selected to {FIRST PRESS}, set values other than 0.00 to "PRESS TIME".
- When "DRESS LENGTH" is selected  
Length for dressing is designated.  
An alarm with a message "Tip Dress Time Over" occurs in case the manipulator does not dress the designated length within ten seconds. The time to alarm can be modified with the following parameter.

AxP108: Tip Dress Time Over Detecting Time  
(Unit: 0.1 sec, Initial value:0)

Set "50" for 5.0 seconds

Set "0" for 10 seconds

**7. CLEARANCE CONDITION**  
Set the clearance conditions for the execution of the tip dress instruction (SVDRESMOV).

In the tip dress instruction (SVDRESMOV), the clearance file is not used but the clearance operation is done in this condition.

The pattern of the SVDRESMOV is always SQUARE, whereas one out of three clearance operation patterns (MOVE&CLOSE, SQUARE AND MOVE&OPEN) can be selected in the SVSPOTMOV.

**8. DISTANCE TO UPPER TIP****9. DISTANCE TO LOWER TIP**

Set the distance between the dresser and the point of the tip.

In the tip dress instruction (SVDRESMOV), the manipulator and the gun will move so that tips are distanced from the dresser by the distance set in this item before and after the dressing operation.

**10. THICKNESS**

When "upper-tip" or "lower-tip" is selected for the teaching type, this item need to be set.

**11. ROTATION WAIT TIME**

Set this item as a waiting time from starting the tip dressing instruction (SVDRESMOV) to the gun closing.

**12. IO CONDITION**

Set IO for the tip dress instruction (SVDRESMOV).

**13. ROTATION REQUEST**

This item appears when "IO" is specified to {DRESSOR}.

Set a signal which is output same time with the execution of the tip dress instruction (SVDRESMOV).

**14. DRESS EXECUTING**

This item appears when a servo dresser control group is specified to {DRESSOR}.

Set a signal which is output same time with the execution of the tip dress instruction (SVDRESMOV).

**15. SERVO DRESSER CONDITION**

This item appears when a servo dresser control group is specified to



{DRESSOR}.

**16. ROTATION DIRECTION**

Set a rotating direction of the servo dresser.

**17. ROTATION SPEED (1ST PRESS)**

**18. ROTATION SPEED (2ND PRESS)**

Set a rotating speed of the servo dresser.

When the tip dress instruction (SVDRESMOV) is started, the dresser rotates at a rotation speed (1st press), and the speed shifts to a rotation speed (2nd press) when the gun pressure is changed to the 2nd press and this speed is kept till the tip dress instruction (SVDRESMOV) is completed.

**19. SPEED FLUCTUATION LIMIT**

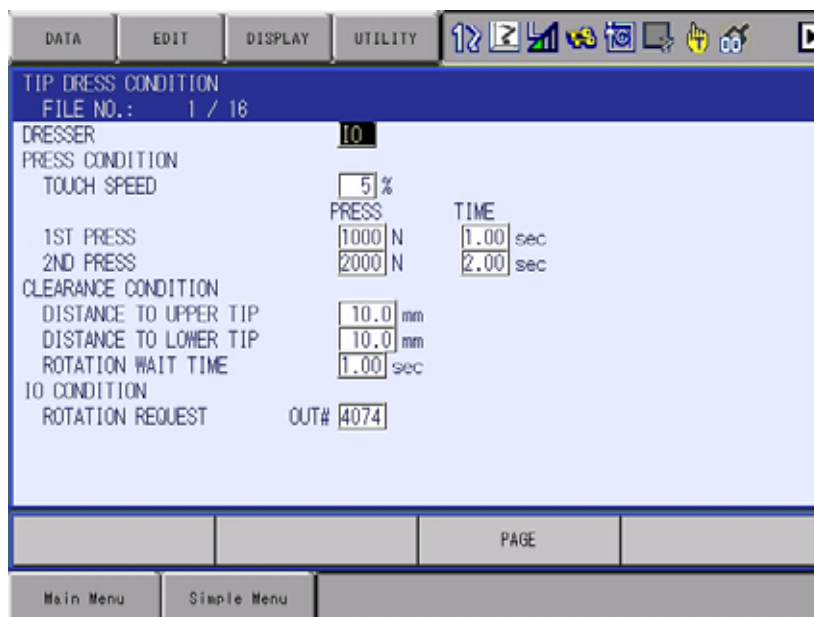
Set the speed fluctuation tolerance value for the tip dress instruction (SVDRESMOV). Alarm may occur in case the actual speed is decreased (or increased) from the speed specified at {ROTATION SPEED (1ST PRESS)} or {ROTATION SPEED (2ND PRESS)}.

■ **Operating procedures**

1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {TIP DRESS CONDITION}.



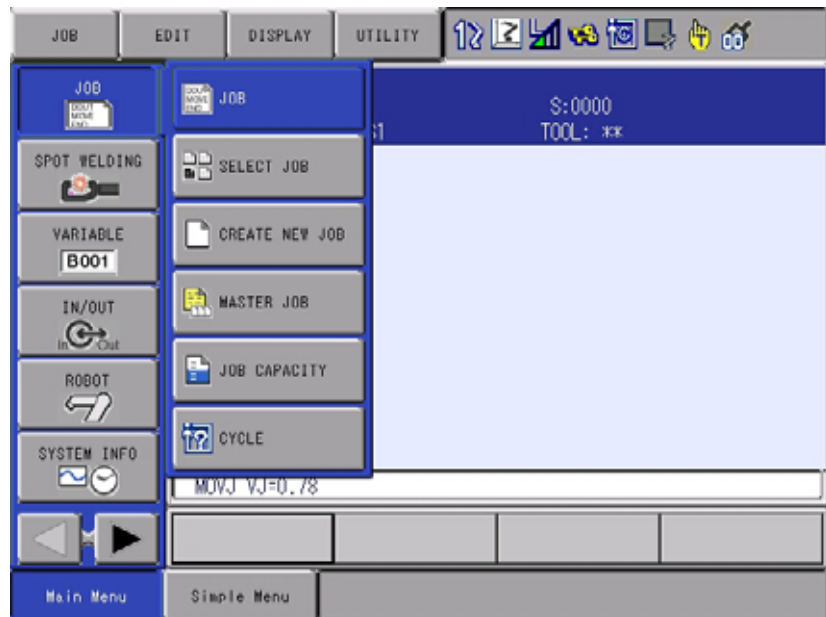
– TIP DRESS CONDITION window appears.



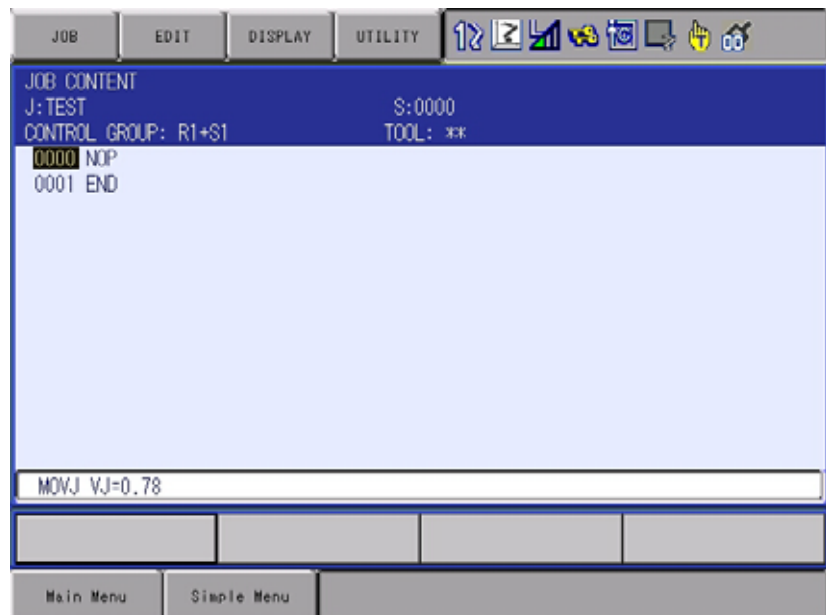
3. Select a file No. by pressing [PAGE].
4. Select a desired item.
5. Input a numeric value and press [ENTER].

### 9.11.4 Dressing Position Teaching Operation

1. Select {JOB} on the {Main Menu}.
2. Select {JOB}.



– JOB CONTENT window appears.



When registering a pressure instruction (SVSPOT, SVGUNCL, SVSPOTMOV or SVDRESMOV), create a job in which a gun axis control group is included.

## 9 Spot Welding Application Using a Motor Gun

### 9.11 Tip Dressing Instruction (SVDRESMOV Instruction)

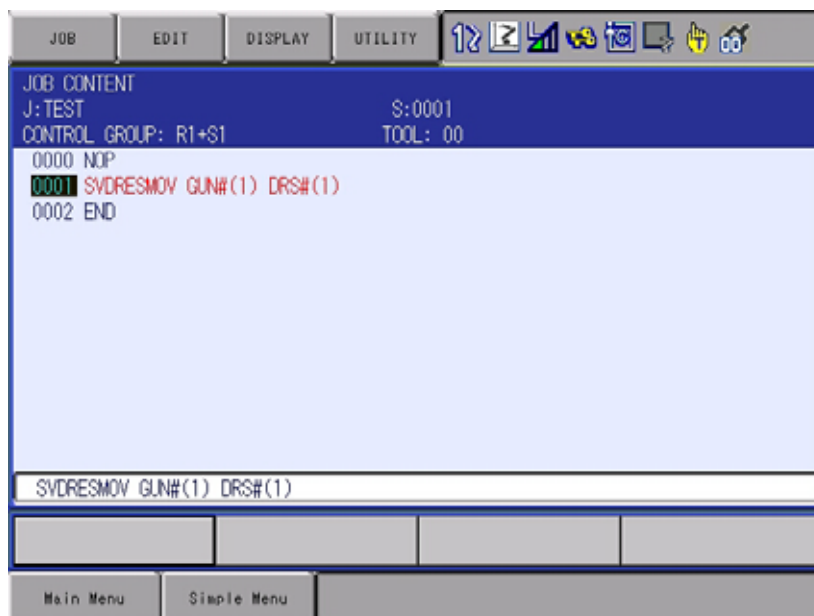
- Press [SHIFT] + [MOTION TYPE] to indicate SVSPOTMOV.

```
SVSPOTMOV CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1
```

- Press [MOTION TYPE] to indicate SVDRESMOV .

```
SVDRESMOV GUN#(1) DRS#(1)
```

- Changing the motion type with [MOTION TYPE] is available only while the manipulator is in operation status ([ROBOT] LED light is in lit status).
  - SVSPOTMOV and SVDRESMOV alternate each time [MOTION TYPE] is pressed.
- Edit the instruction tag item.
  - Press [INSERT], and then press [ENTER].
    - Following items appear on the window when the tip dress instruction is registered.



**9.11.5 Tip Dress Instruction**

Following shows the tip dress instruction.

SVDRESMOV

V=500.0 VCL=100.0 VOP=100.0 PLIN=0 PLOUT=0 GUN#(1) DRS#(1)

1 2 3 4 5 6 7

**1. Speed**

Set the speed.

**2. Gun pressure speed**

Set the closing speed for the manipulator and the gun before dressing operation.

In case this tag is omitted, the speed specified at 1.Speed is employed.

**3. Gun open speed**

Set the opening speed for the manipulator and the gun after dressing operation.

In case this tag is omitted, the speed specified at 1.Speed is employed

**4. Positioning IN level**

Set the positioning level at the clearance position before dressing.

**5. Positioning OUT level**

Set the positioning level at the clearance position after dressing.

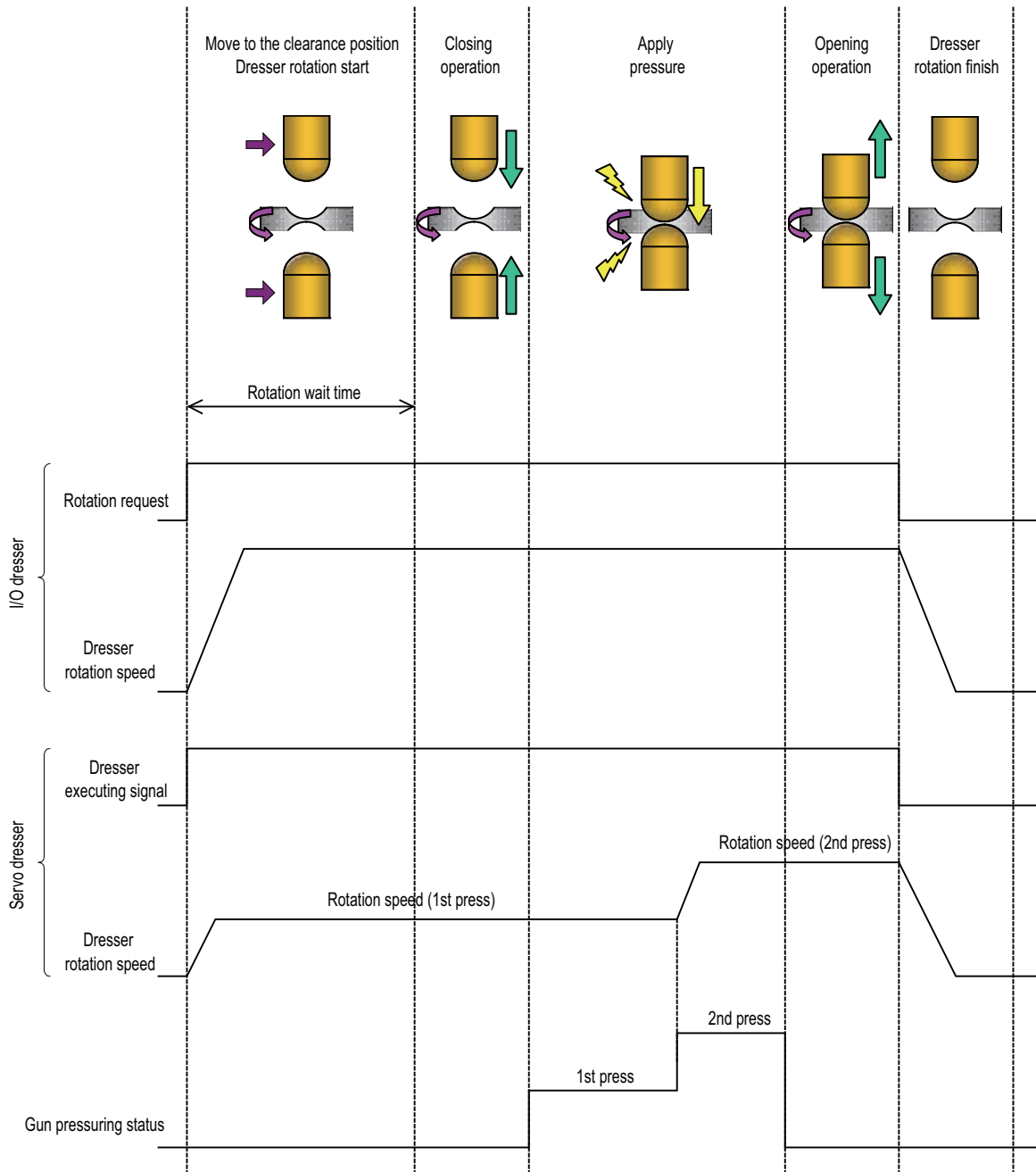
**6. Gun number**

Set a gun number for executing the tip dress operation.

**7. Tip dress condition**

Set a condition file number for executing the tip dress operation.

9.11.5.1 Tip Dress Instruction (SVDRESMOV) Flow



### 9.11.5.2 Suspend and Restart of the Tip Dress Operation

- In case the execution of the tip dress instruction (SVERESMOV) is suspended with Hold operation after the gun close motion is started, the robot and the gun will stop after they move to the clearance position.
- In case the execution of the tip dress instruction (SVERESMOV) is suspended with Hold operation or by an emergency stop and then restarted, tip dressing instruction (SVERESMOV) is executed from the beginning.
- Even if the execution of the tip dress instruction (SVERESMOV) is suspended by an emergency stop, outputting of “rotation request” (for the IO dresser) or “dress executing signal” (for the servo dresser) is kept ON.
- In case the execution of the tip dress instruction (SVERESMOV) is suspended with Hold operation or by an emergency stop, the rotation of the servo dresser will stop.

### 9.11.5.3 Individual Control Instruction to a Dresser and a Gun

In the tip dress instruction (SVERESMOV), coordinated motion of the manipulator, gun and dresser is available. However, instructions below enable independent operations of the gun and the dresser.

#### ■ DRESSON Instruction

Use this instruction when dresser rotation is required.

DRESSON DRS#(1)

1

#### 1. Tip dress condition

Specifies the tip dress condition file number

About DRESSON instruction

- This instruction turns ON the outputting of “rotation request” (for the IO dresser) or “dress executing signal” (for the servo dresser) set to the specified tip dress condition.
- For the servo dresser, this instruction rotates the servo dresser.
- This instruction waits for the time set to {ROTATION WAIT TIME} in the specified tip dress condition.

In case a job is suspended with Hold operation or by an emergency stop after the execution of DRESSON instruction.

- Outputting of “rotation request” (for the IO dresser) or “dress executing signal” (for the servo dresser) are kept turned ON.
- For the servo dresser, the servo dresser rotation is stopped. (And it resumes the rotation after the job is re-executed.)

In the DRESSON instruction, pressurizing of the gun is not executed.

### ■ DRESSOF Instruction

Use this instruction when stopping the rotation of the dresser.

DRESSOF DRS#(1)

1

#### 1. Tip dress condition

Specifies the tip dress condition file number

About DRESSOF instruction

- This instruction turns OFF the outputting of “rotation request” (for the IO dresser) or “dress executing signal” (for the servo dresser) set to the specified tip dress condition.
- For the servo dresser, this instruction stops rotating the servo dresser.

### ■ SVGUNCL Instruction

The tip dress condition file can be specified to SVGUNCL instruction.

SVGUNCL GUN#(1) DRS#(1)

1

2

#### 1. Gun number

Set the gun number to execute the tip dress operation.

#### 2. Tip dress condition

Specify the tip dress condition file number

When specifying the tip dress condition file to SVGUNCL instruction

- Pressure is applied under the pressure condition in the specified tip dress condition.
- When the servo dresser is rotated by DRESSON instruction, the rotation speed is shifted to the rotation speed (2nd press) at the same time when the 2nd pressure is reached.
- The wear compensation at the previous move instruction and arm bend compensation at pressurization are executed.

Even if the tip dress condition file is specified in SVGUNCL instruction, “rotation request” (for the IO dresser) or “dress executing signal” (for the servo dresser) will not be turned ON. Also, the servo dresser doesn't rotate.



#### 9.11.5.4 Wear Detection with Tip Dressing Instruction

Wear detection function is added to DN1.71.00-00 and later versions so that wears can be detected with Tip Dressing Instruction (SVDRESMOV Instruction).

By adding tags for wear detection (TWC-A, TWC-C) to Tip Dressing Instruction (SVDRESMOV Instruction), amount of wear is detected.

<Example>

```
SVDRESMOV    GUN#(1)  DRS#(1)  TWC-A
```

```
SVDRESMOV    GUN#(1)  DRS#(1)  TWC-C
```

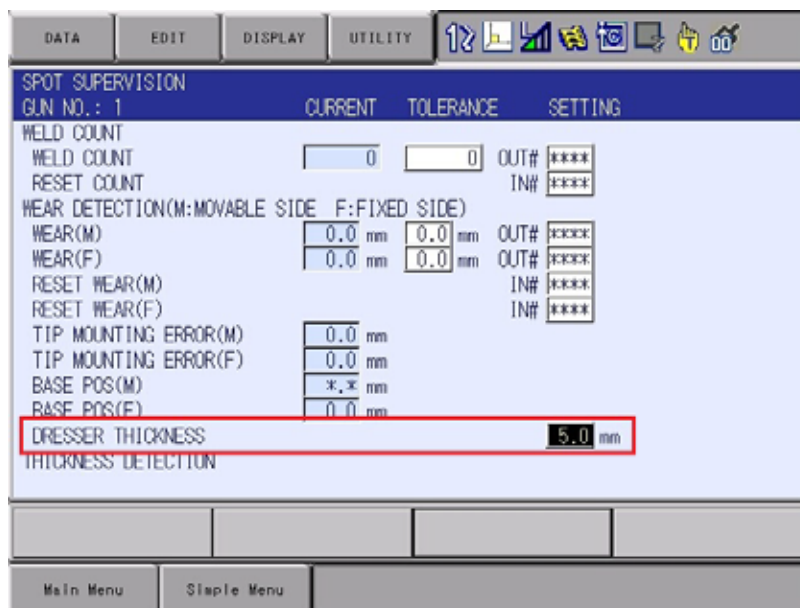
For the details of TWC-A, TWC-C and wear detecting operation, refer to *section 9.12 "Tip Wear Detection and Wear Compensation (Motor Gun)"*.

When detecting wears with Tip Dressing Instruction (SVDRESMOV Instruction), set a value to {DRESSER THICKNESS} on SPOT SUPERVISION window.

Please note that this instruction is not available for registering the base position for wear detection.

■ **DRESSER THICKNESS setting**

1. On APPLICATION CONDITION SETTING window, select "GUN CLOSE" at {CLEARANCE TEACHING METHOD}.
2. Contact the fixed side tip to the servo dresser, and then press [INTERLOCK] + [8] to apply pressure.
3. Select {SPOT WELDING} on the {Main Menu}.
4. Select {SPOT SUPERVISION}
  - SPOT SUPERVISION window appears.



5. Select a gun number by pressing [PAGE].
6. Select {DATA} and {DRESSER THICKNESS REGISTER}.
  - Thickness of the dresser is registered.
7. Press [INTERLOCK] + [9] to release pressurization.

In case a certain thickness is to be fixed, directly input the value to {DRESSER THICKNESS}. At this time, it is not necessarily apply pressure by pressing [INTERLOCK] + [8].

**9.11.6 Dry Tip Dressing Operation**

{DRY TIP DRESS (WITHOUT PRESSING)} and {DRY TIP DRESS (WITHOUT DRESSING)} signals enable dry tip dressing operation.

For the settings of this signal, refer to *section 9.4.2.3 “I/O Allocation” on page 9-37*.

**■ Dry tip dressing operation (without pressing) signal**

When executing SVDRESMOV instruction after turning ON this signal:

- the gun close motion is not executed.
- the gun pressurization is not executed.
- in case of the servo dresser, although the gun pressurization is not executed, the dresser’s rotating speed changes to the 2nd rotation speed after the manipulator and the gun move to the clearance position and the time set to {1st time} elapsed.

Also, when this signal is turned ON, SVGUNCL instruction to which the tip dress condition file is specified (SVGUNCL instruction to which DRS# tag is used) is no longer executed.

**■ Dry tip dressing operation (without dressing) signal**

When executing SVDRESMOV instruction after turning ON this signal:

- Outputting of “rotation request” (for the IO dresser) or “dress executing signal” (for the servo dresser) at the tip dress condition file specified by SVDRESMOV is not turned ON.
- The servo dresser is not rotated even if it is a servo dresser.
- It does not wait for the time specified at {ROTATION WAIT TIME} on the tip dress condition file specified by SVDRESMOV.

Also, DRESSON instruction is no longer executed when this signal is turned ON.

**9.11.7 Tip Dress Supervision**

On this window, dress length, dress time, servo dresser starting torque and dressing torque can be monitored.

Furthermore, by setting the allowable values and universal output signal numbers, designated signal can be turned ON in case one of the above mentioned values exceeded the value in {TOLERANCE}.

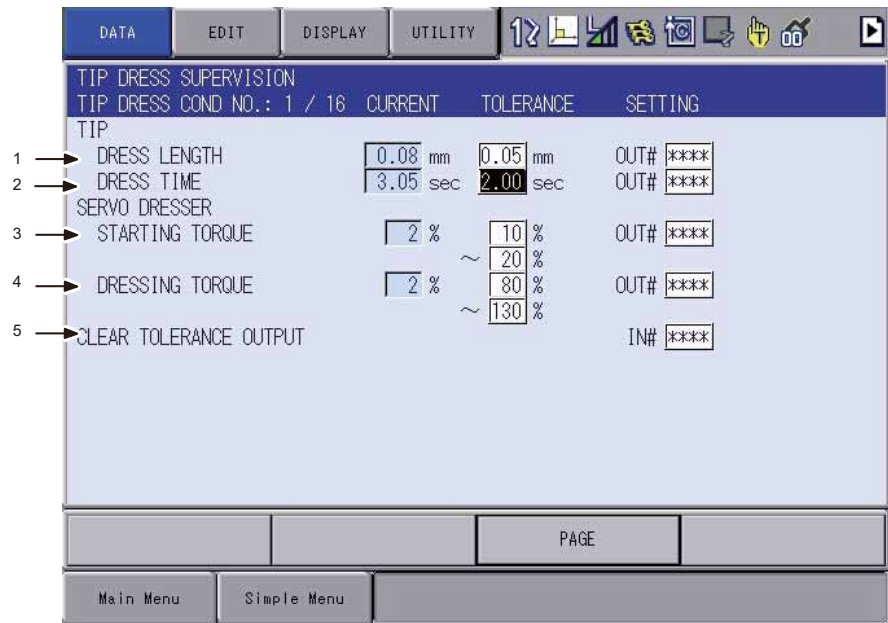
Updating of the current value and comparing of the current value with the value in {TOLERANCE} are performed when executing the SVGUNCL Instruction (SVGUNCL DRS#( ) ...) or SVDRESMOV Instruction to which TIP DRESS COND FILE is designated.

However, updating of the current value and comparing of the current value with the value in {TOLERANCE} would not be performed in case above mentioned instructions are suspended due to emergency stop, Hold operation or occurrence of an alarm.

Also, in case a selected dresser designated by Tip Dress Condition File is I/O dresser, set "0" to both {STARTING TORQUE} and {DRESSING TORQUE} and comparing of the current value with the value in {TOLERANCE} is not performed.

This function is available in DN1.71.00-00 and later versions.

■ **TIP DRESS COND. Window**



**1. DRESS LENGTH**

**(CURRENT, TOLERANCE, SETTING(OUT#))**

Current length for dressing operation is indicated.

Tolerance range for this operation: 0.00 to 9.99 mm

- Condition to ON the signal  
Current value < Tolerance range
- Condition to OFF the signal  
Current value >= Tolerance range

**2. DRESS TIME (CURRENT, TOLERANCE, SETTING(OUT#))**

Current dressing time is indicated.

Tolerance range for this operation: 0.00 to 9.99 sec

- Condition to ON the signal  
Current value > Tolerance range
- Condition to OFF the signal  
Current value =< Tolerance range

**3. STARTING TORQUE (CURRENT, TOLERANCE, SETTING (OUT#))**

An absolute data for servo dresser average torque, which is measured between 100 msec and 300 msec after the rotation is started, is indicated.

Tolerance range for this operation: 0 to 300%

In case pressure is applied no later than 300 msec after the rotation is started, "0" is indicated to {CURRENT} of {STARTING TORQUE}. Also, at this time, the universal signal will not be controlled.

- Condition to ON the signal  
Current value < Tolerance range (minimum value) or Current value > Tolerance range (maximum value)
- Condition to OFF the signal  
Tolerance range (minimum value) =< Current value =< Tolerance range (maximum value)

**4.DRESSING TORQUE(CURRENT, TOLERANCE, SETTING (OUT#))**

Servo dresser average torque absolute data measured between the pressure reach time and pressure complete time is indicated.

Tolerance range for this operation: 0 to 300%

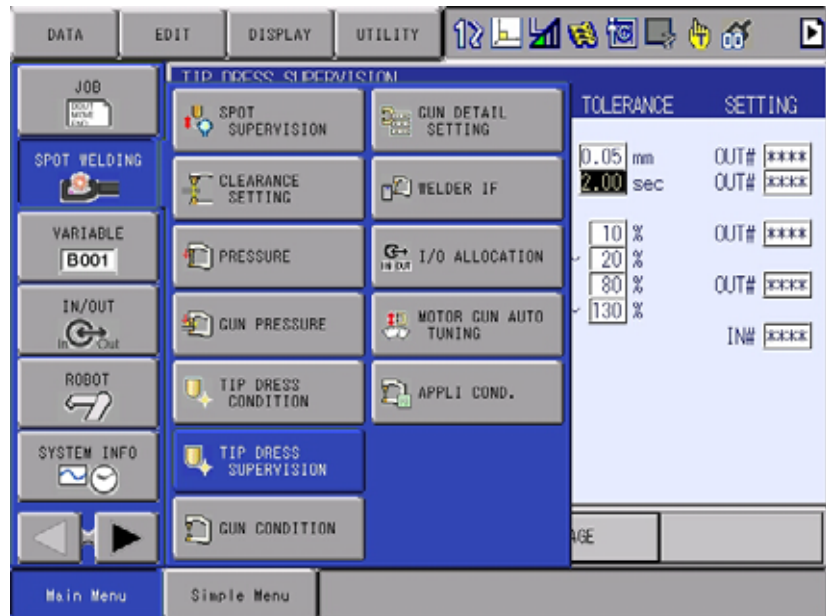
- Condition to ON the signal  
Current value < Tolerance range (minimum value) or Current value > Tolerance range (maximum value)
- Condition to OFF the signal  
Tolerance range (minimum value) =< Current value =< Tolerance range (maximum value)

**5. CLEAR TORALENCE OUTPUT**

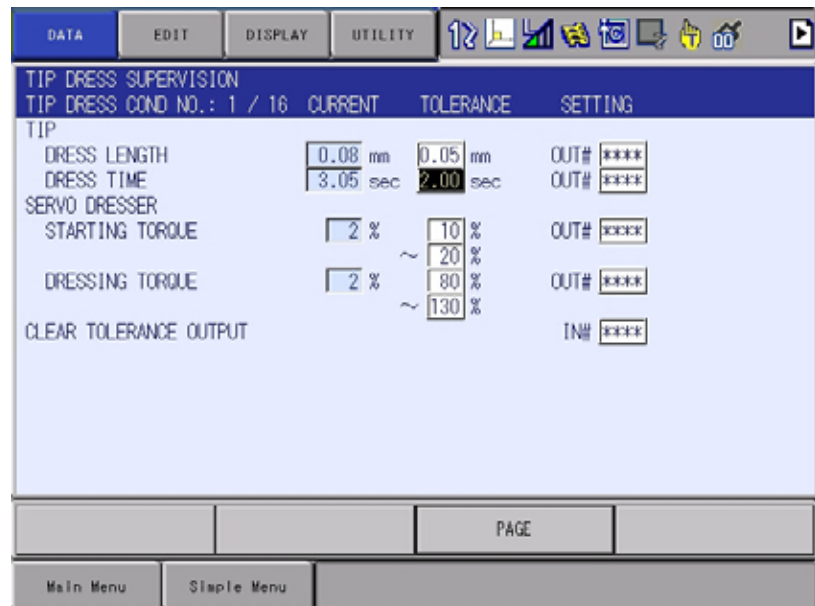
OFF all the universal output signals designated to DRESS LENGTH, DRESS TIME, STARTING TORQUE and DRESSING TORQUE when a specified CLEAR TORALENCE OUTPUT is changed from OFF to ON.

■ **Operating procedures**

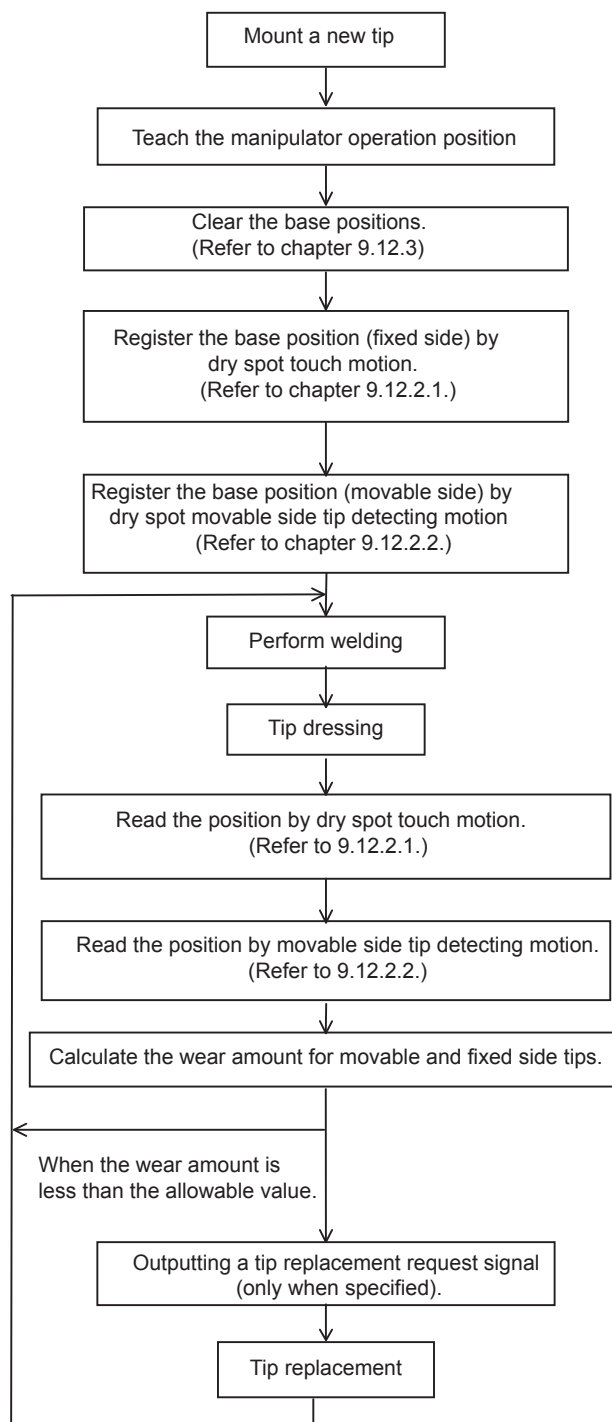
1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {TIP DRESS SUPERVISION}.



– TIP DRESS SUPERVISION window appears.



3. Select a COND No. by pressing [PAGE].
4. Select a desired item.
5. Input a numeric value and press [ENTER].

**9.12 Tip Wear Detection and Wear Compensation (Motor Gun)****9.12.1 Wear Detection and Wear Compensation Operation Flow Chart**



**9.12.2 Wear Detection**

This section explains the method to detect the tip wear amount by dry spot touch motion and movable side tip detection.



After registering the wear base position, do not change the pressure condition settings used for the wear detection dry spot motion.

In case the setting is changed, the wear detection may not be executed appropriately.

As a pressure condition for the wear detection dry spot motion, the dry spot pressure file (PRESSCL tag) can be used other than the wear detection pressure condition (PRESSTWC tag) described in *section 9.12.2.1 "Dry Spot Touch Motion" on page 9-114* and *section 9.12.2.2 "Movable Side Tip Detection" on page 9-115*.



When the wear detection pressure condition (PRESSTWC tag) is used, the dry spot is executed under the condition of the {TOUCH SPEED} and {DETECT PRESSURE} on the spot supervision window.

When the dry spot pressure file (PRESSCL tag) is used, the dry spot is executed under the dry spot pressure file condition.

Setting in the dry spot pressure file can be changed during the operation because the file may be used in other purposes other than wear detecting. For this reason, it is recommended to use the wear detection pressure condition (RESSTWC tag).

**9.12.2.1 Dry Spot Touch Motion**

The gun axis position is acquired when the movable side (upper) tip touches the fixed side (lower) tip.

Dry spot touch motion is carried out by a SVGUNCL (dry spot) instruction.

"Base position (fixed)" will be registered when this operation is executed while "base position (fixed)" is not registered on the spot supervision window.

When executing the dry spot touch motion again after this registration is done, the position difference between the detected position and the base position is calculated as the whole wear amount (total amount of fixed side wear amount and movable side wear amount).

<Example>

SVGUNCL GUN#(1) PRESSTWC TWC-A

1                    2                    3

**1. Gun No.**

**2. Wear detection pressure condition**

**3. Wear detection operation type**

## 9.12.2.2 Movable Side Tip Detection

The gun axis position is acquired when the movable side (upper) tip passes the sensor.

The movable side tip detection operation is carried out by a SVGUNCL (dry spot) instruction.

“Base position (movable)” will be registered when this operation is executed while “base position (movable)” is not registered on SPOT SUPERVISION window.

When executing the movable side tip detection motion again after this registration is done, the position difference between the detected position and the base position is calculated as the wear amount at the movable side.

If this operation is done after the procedures described in *section 9.12.2.1 “Dry Spot Touch Motion” on page 9-114*, the wear amount of the fixed side and the movable side are calculated independently and the results are indicated on the spot supervision window.

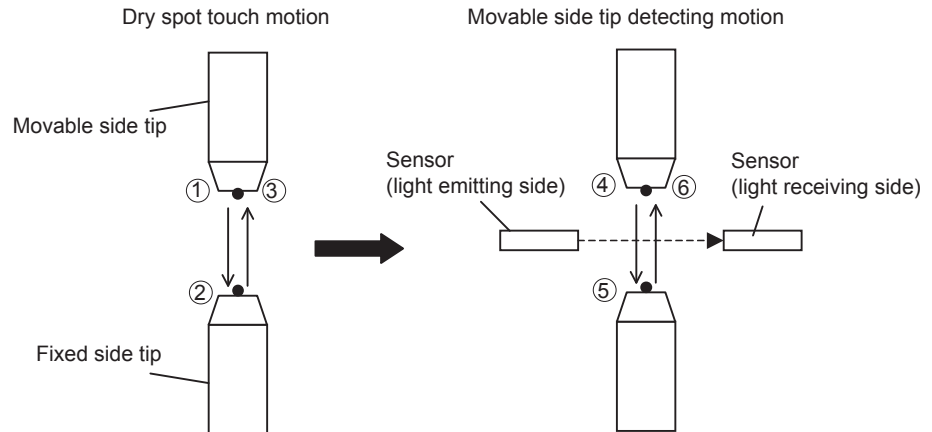
<Example>

SVGUNCL GUN#(1) PRESSTWC TWC-B

                  1          2          3

- 1. Gun No.**
- 2. Wear detection pressure condition**
- 3. Wear detection operation type**

## 9.12.2.3 Example of Wear Detection



## &lt;Job Example&gt;

1. MOVJ
2. SVGUNCL GUN#(1) PRESSCTWC TWC-A  
(Dry spot touch motion)
3. MOVJ
4. MOVJ
5. SVGUNCL GUN#(1) PRESSTWC TWC-B  
(Movable side tip detecting motion)
6. MOVJ



For the double arm move gun, teach a job so that the upper side tip passes the sensor detecting zone when using the sensor detection.

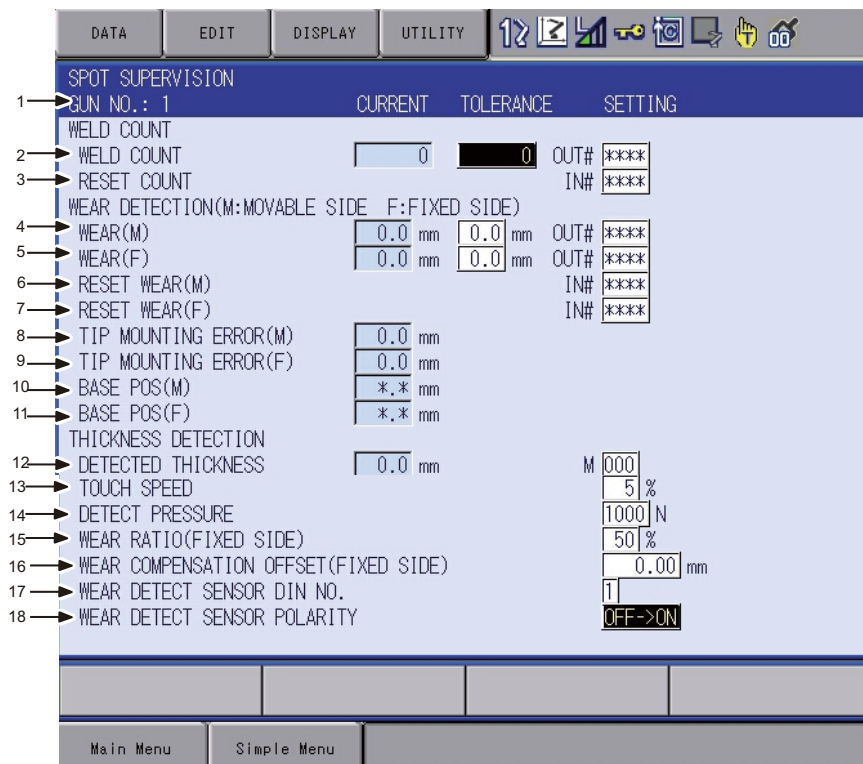
Also, set the polarity of the signal that is output from the sensor, by the setting item "WEAR DETECT SENSOR POLARITY" in section 9.12.3 "Spot Supervision Window Setting" on page 9-117.

**9.12.3 Spot Supervision Window Setting**

Shows the tip wear amount, etc.

Also, the wear amount detection relevant settings can be performed.

■ **Spot supervision window**

**1. GUN NO.**

Shows the gun No.

Select the No. by pressing [PAGE].

**2. WELD COUNT****(CURRENT, TOLERANCE, SETTING(OUT#))**

The numbers that the welding instruction (SVSPOT, SVSPOTMOV) is performed is indicated to {CURRENT} as the present value.

Also, the universal output signal specified at {SETTING (OUT#)} is turned ON when a value in {CURRENT} has exceeded a value in {TOLERANCE}.

**3. RESET COUNT**

The value at {WELD COUNT (CURRENT)} can be cleared when the signal specified to {RESET COUNT} is turned ON.

**4. WEAR (M) (CURRENT, TOLERANCE, SETTING(OUT#))**

Present wear amount at the movable side tip is indicated.

The value is updated when the wear detection is finished.

Also, the universal output signal specified at {SETTING (OUT#)} is turned ON when the value in {CURRENT} has exceeded the value in {TOLERANCE}.

**5. WEAR (F)**

Present wear amount at the fixed side tip is indicated.

The value is updated when the wear detection is finished.

Also, the universal output signal specified at {SETTING (OUT#)} is turned ON when the value in {CURRENT} has exceeded the value in {TOLERANCE}.

**6. RESET WEAR (M)**

The value at {RESET WEAR (M)} can be cleared when the signal specified to {RESET WEAR (M)} is turned ON.

**7. RESET WEAR (F)**

The value at {RESET WEAR (F)} can be cleared when the signal specified to {RESET WEAR (F)} is turned ON.

**8. TIP MOUNTING ERROR (M)**

Movable side tip mounting error is indicated.

The value is updated when the tip mounting error detection is finished.

For the details, refer to *section 9.12.8 "Tip Mounting Position Error Detection" on page 9-128.*

**9. TIP MOUNTING ERROR (F)**

Fixed side tip mounting error is indicated.

The value is updated when the tip mounting error detection is finished.

For the details, refer to *section 9.12.8.*

**10. BASE POS (M)**

In case {BASE POS (M)} has not been register, the detected position is registered as the base position by the execution of the movable side tip detection motion.

**11. BASE BOS (F)**

In case {BASE POS (F)} has not been register, the detected position is registered as the base position by the execution of the dry spot touch motion.

**12. DETECTED THICKNESS (CURRENT, SETTING(M))**

Detected thickness of the workpiece is indicated to this item when the workpiece thickness detecting function is used.

If a value more than 0 is set to {SETTING (M)}, the detected thickness is written to the specified register.

For the details, refer to *section 9.14.8 "Workpiece Thickness Detection Function" on page 9-167.*

**13. TOUCH SPEED**

Set the gun closing speed with a link speed (%) when executing a wear detecting dry spot motion (executing SVGUNCL using PRESSTWC tag).

**14. DETECT PRESSURE**

Set the detecting pressure for the touch detection when executing the wear detecting dry spot motion (executing SVGUNCL using PRESSTWC tag).

**15. WEAR RATIO (FIXED SIDE)**

To the wear amount detected by the wear detection operation (TWC-C), specify the wear ratio to the fixed side tip.

**16. WEAR COMPENSATION OFFSET (FIXED SIDE)**

If the fixed side tip is required to be always shifted for a certain amount, set the certain shifting amount to this item.

**17. WEAR DETECT SENSOR DIN NO.**

Set a direct-in No. to which a sensor signal used for the movable side tip detecting motion (wear detecting operation (TWC=B)) is input.

**18. WEAR DETECT SENSOR POLARITY**

Set the polarity of the sensor signal used for the movable side tip detecting motion (wear detecting motion (TWC=B)).

Select {ON -> OFF}: Normal status is ON and it turns OFF when the tip passes the sensor.

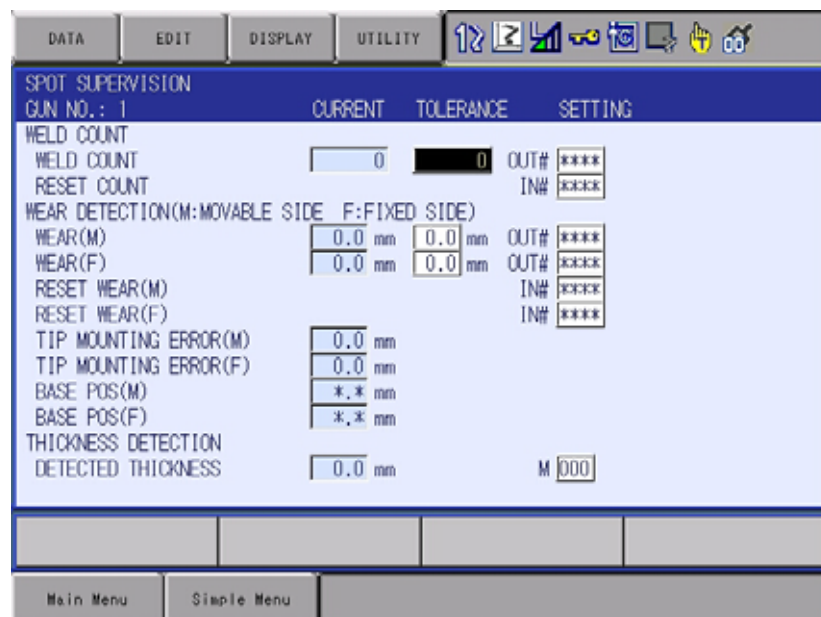
Select {OFF -> ON}: Normal status is OFF and it turns ON when the tip passes the sensor.

■ **Operating procedures**

1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {SPOT SUPERVISION}.



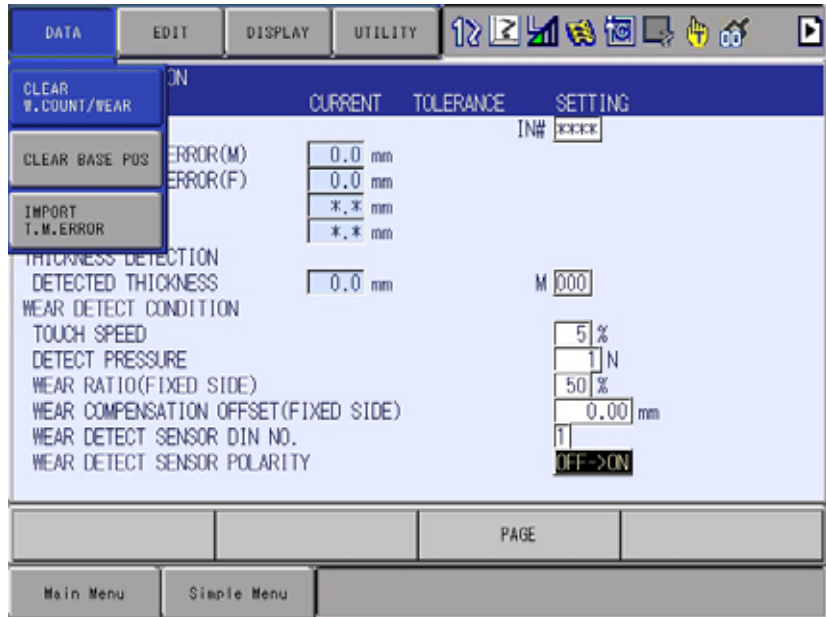
– SPOT SUPERVISION window appears.



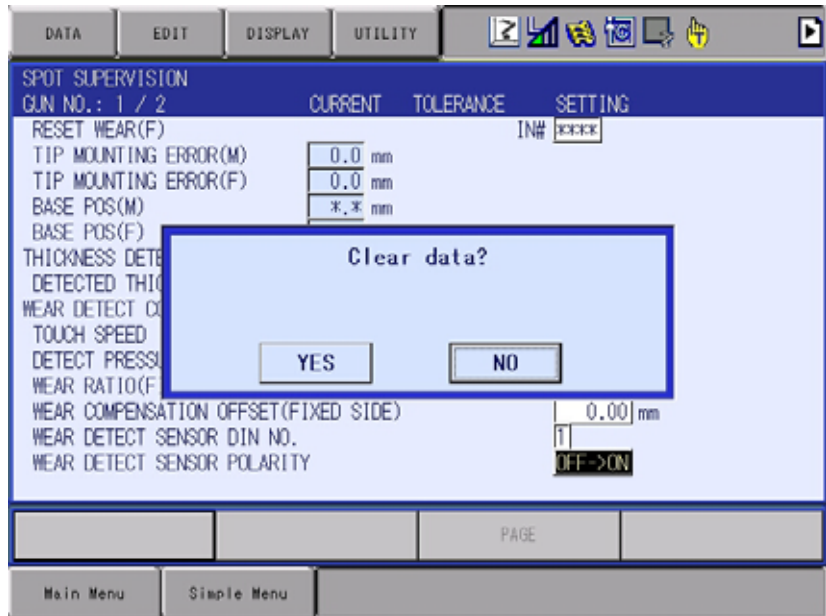
3. Select a gun No. by pressing [PAGE].
4. Select a desired item.
5. Input a numeric value and press [ENTER].

■ **Manual clearing procedures of weld count and wear amount**

1. Select {DATA} in the menu area.
2. Select {CLEAR W.COUNT/WEAR}.



3. Select "YES".

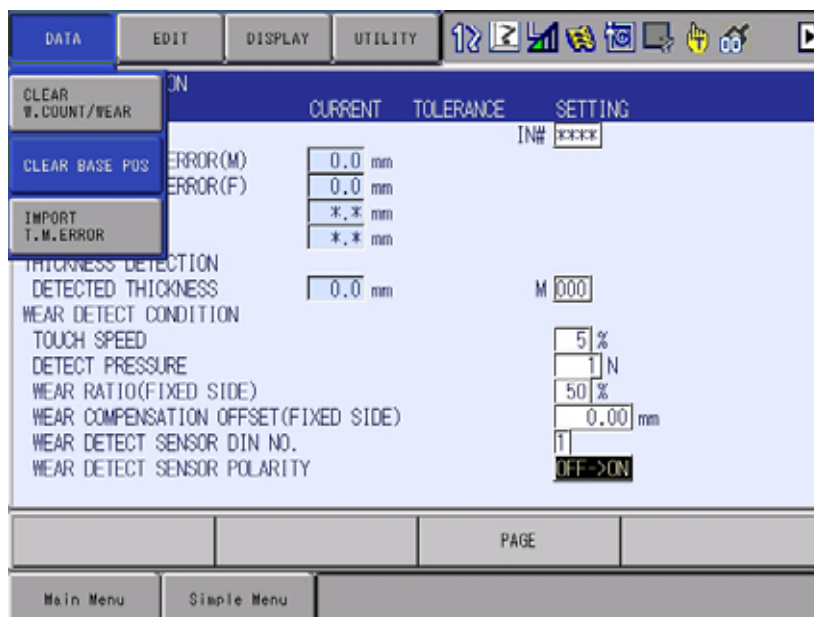




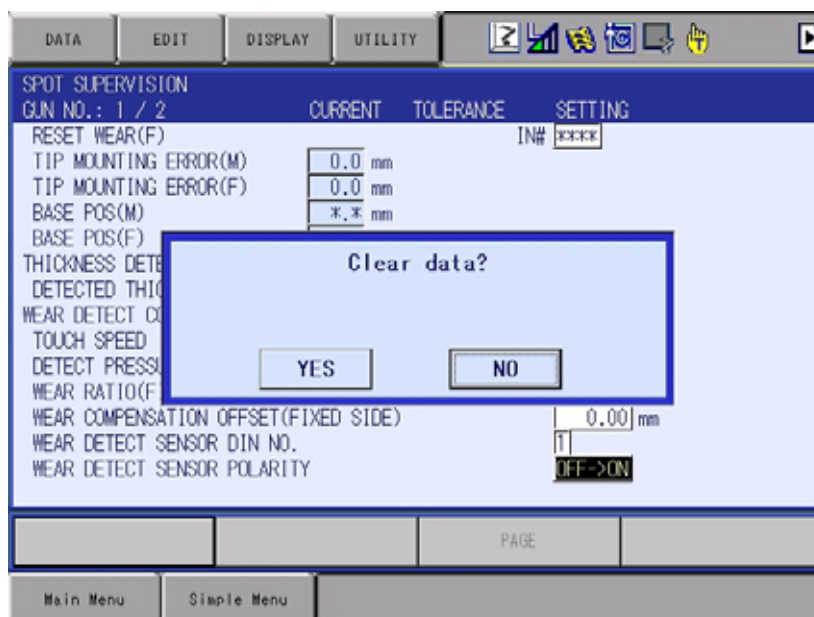
■ **Clearing the wear detection base position**

After modifying the wear detection motion, etc. clear this value.

1. Select {DATA} in the menu area.
2. Select {CLEAR BASE POS}.



3. Select "YES".





### 9.12.4 Wear Compensation

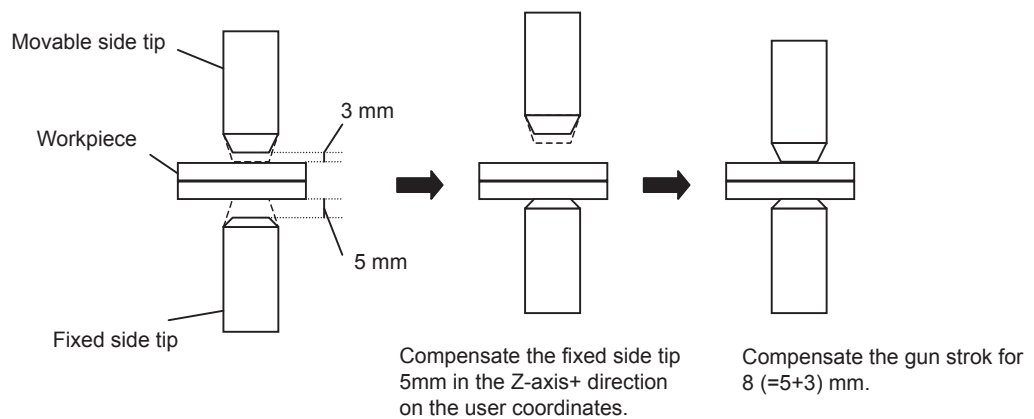
The manipulator motion and the gun stroke are adjusted according to the amount of tip wear.

Wear compensation is performed to the following positions.

- To the teaching position short before SVSPOT instruction
- To the teaching position short before SVGUNCL instruction to which WP tag or DRS tag is used.
- SVSPOTMOV teaching position
- SVDRESMOV teaching position

The figure below shows an example of the compensation under the following conditions.

Single arm gun, Movable side wear amount: 3 mm, Fixed side wear amount: 5 mm



<Job Example>

MOVJ

MOVJ ← In this position, wear compensation is done.

SVSPOT GUN#(1) PRESS#(1) WTM=1 WST=1

MOVJ

MOVJ



The fixed side tip is always shifted in the Z-axis + direction on the tool coordinates. Therefore, be sure to register the tool position and direction correctly. (Refer to *section 9.4.3 "Registering the Operation Tool"* on page 9-41.)

**9.12.5 Tip Wear Compensation for Fixed Gun**

The tip wear for the fixed gun (the gun that is not mounted on the manipulator) can be detected and compensated in the following manner.



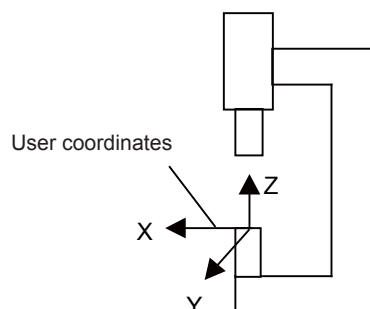
The wear amount of the tip for the fixed gun cannot be detected by the fixed sensor.

Build a system so that the sensor can move into the fixed gun's motion range to detect the tip wear.

**9.12.5.1 Setting the User Coordinates**

Set the user coordinate with its home position located on the fixed tip end.

The + direction of the Z-axis must be directed towards the movable tip.



The DX200 has the External Reference Point Control Function (the function to execute teaching or playback operation with the manipulator TCP set to a point in space).

If the direction of coordinates used for the External Reference Point Control Function is the same as that of the above coordinates, resetting the user coordinates is not required.

## 9.12.5.2 User Coordinate Number Setting

1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {GUN CONDITION}.
3. Move the cursor to {GUN INSTALLATION STATUS} and press [SELECT].
  - Select “FIXED”.
  - {USER COORDINATE NO.} is indicated.

DATA		EDIT		DISPLAY		UTILITY	
GUN CONDITION							
GUN NO.: 1 / 4							
5	0	0.0	mm	0.0	%	0	N
6	0	0.0	mm	0.0	%	0	N
7	0	0.0	mm	0.0	%	0	N
8	0	0.0	mm	0.0	%	0	N
9	0	0.0	mm	0.0	%	0	N
10	0	0.0	mm	0.0	%	0	N
11	0	0.0	mm	0.0	%	0	N
12	0	0.0	mm	0.0	%	0	N
MAX PRESSURE		2000 N					
PRESSURE COMPENSATION		50 N					
GUN ARM BEND COEF.		X	0.000		mm/1000N		
		Y	0.000		mm/1000N		
		Z	0.000		mm/1000N		
GUN PUSHING COEF		0.000 mm/1000N					
GUN INSTALLATION STATUS		FIXED					
USER COORDINATE NO.		1					
COMPLETE				PAGE			
Main Menu		Simple Menu					

4. To {USER COORDINATE NO.}, specify a user coordinate No. specified to the gun.

## 9.12.5.3 Example of Compensation

The manipulator motion and the gun stroke are adjusted according to the amount of tip wear.

Wear compensation is performed to the following positions.

- To the teaching position short before SVSPOT instruction
- To the teaching position short before SVGUNCL instruction to which WP tag or DRS tag is used.
- SVSPOTMOV teaching position
- SVDRESMOV teaching position

<Job Example>

MOVJ

MOVJ ← In this position, wear compensation is done.

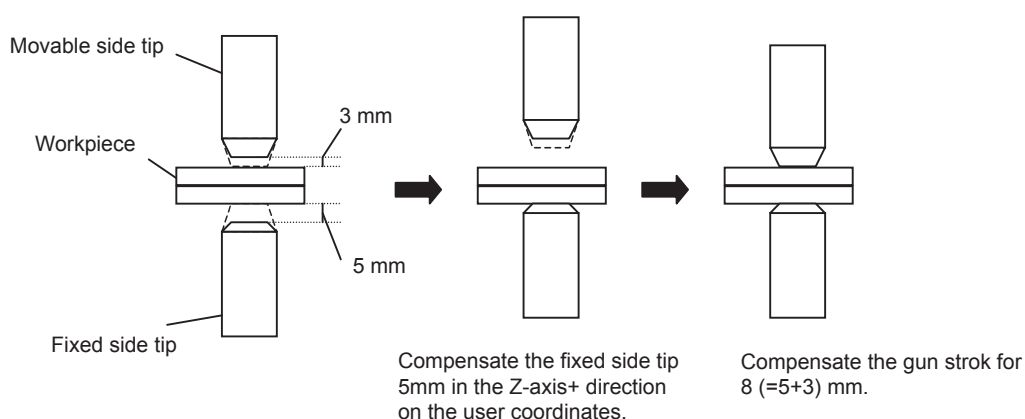
SVSPOT GUN#(1) PRESS#(1) WTM=1 WST=1

MOVJ

MOVJ

<Example of compensation>

Single arm move, Movable side wear amount: 3 mm, Fixed side wear amount: 5mm

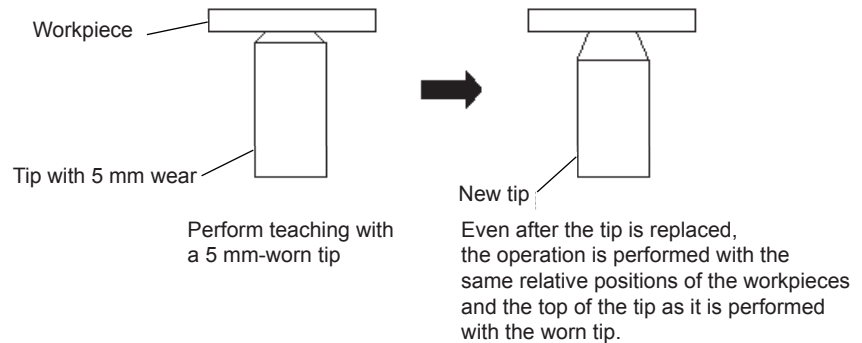


The workpieces is compensated in the Z-axis + direction on the specified user coordinates. Therefore, be sure to register the position and direction of the user coordinates correctly. (Refer to *section 9.12.5.1 "Setting the User Coordinates"* on page 9-123.)

### 9.12.6 Teaching Positions with a Worn Tip

When teaching positions with a worn tip, the teaching position is registered, adjusted by tip wear amount.

#### 9.12.6.1 Teaching Example



- Adjustment of the teaching point on the basis of the wear amount is performed to the following positions.
  - To the move instruction teaching point short before the SVSPOT instruction.
  - To the move instruction teaching point short before the SVGUNCL instruction to which WP or DRS tag is used.
  - To the SVSPOTMOV teaching point.
  - To the SVDRESMOV teaching point.
- The wear amount is ignored when registering positions in other move instructions.

#### 9.12.6.2 Parameters

AxP010: Invalid wear range for teaching point adjustment (units:  $\mu\text{m}$ )

Set the invalid range of the wear amount out of which compensation becomes enabled. Compensation is not carried out when the wear amount is within the invalid range.

<Example>

In case of AxP010 = 1000:

Wear amount  $\geq$  1mm : The taught position is registered adjusted by the wear amount.

Wear amount  $<$  1mm : The taught position is registered disregarding the wear amount.

AxP014: Displaying method when the teaching is performed

0 : A message "Compensated position." appears when the position is registered.

1 : The dialog box appears before the position is registered with a message "Compensate? YES/NO."

**9.12.7 Wear Amount Loading**

Detected wear amount can be loaded in a job.

The wear amount is stored in the system D variable (\$D). Use GETS instruction and load the wear amount.

<Example>

GETS D000 \$D030

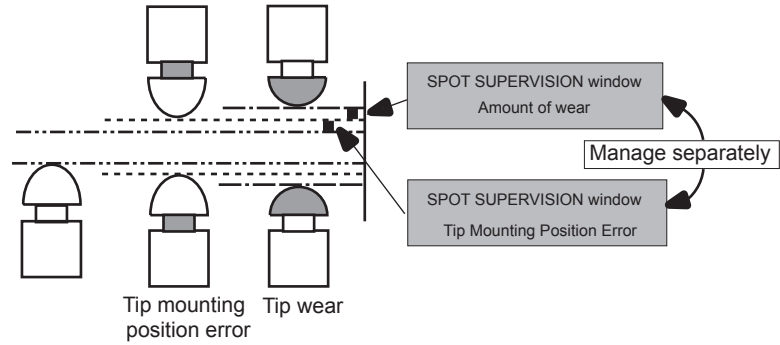
The wear amount of Gun 1 (movable side) is stored in D000.

	(Unit: $\mu\text{m}$ )
\$D30	Gun 1 movable side (upper) wear amount
\$D31	Gun 1 fixed side (lower) wear amount
\$D32	Gun 2 movable side (upper) wear amount
\$D33	Gun 2 fixed side (lower) wear amount
\$D34	Gun 3 movable side (upper) wear amount
\$D35	Gun 3 fixed side (lower) wear amount
\$D36	Gun 4 movable side (upper) wear amount
\$D37	Gun 4 fixed side (lower) wear amount
\$D38	Gun 5 movable side (upper) wear amount
\$D39	Gun 5 fixed side (lower) wear amount
\$D40	Gun 6 movable side (upper) wear amount
\$D41	Gun 6 fixed side (lower) wear amount
\$D42	Gun 7 movable side (upper) wear amount
\$D43	Gun 7 fixed side (lower) wear amount
\$D44	Gun 8 movable side (upper) wear amount
\$D45	Gun 8 fixed side (lower) wear amount
\$D46	Gun 9 movable side (upper) wear amount
\$D47	Gun 9 fixed side (lower) wear amount
\$D48	Gun 10 movable side (upper) wear amount
\$D49	Gun 10 fixed side (lower) wear amount
\$D50	Gun 11 movable side (upper) wear amount
\$D51	Gun 11 fixed side (lower) wear amount
\$D52	Gun 12 movable side (upper) wear amount
\$D53	Gun 12 fixed side (lower) wear amount

**9.12.8 Tip Mounting Position Error Detection**

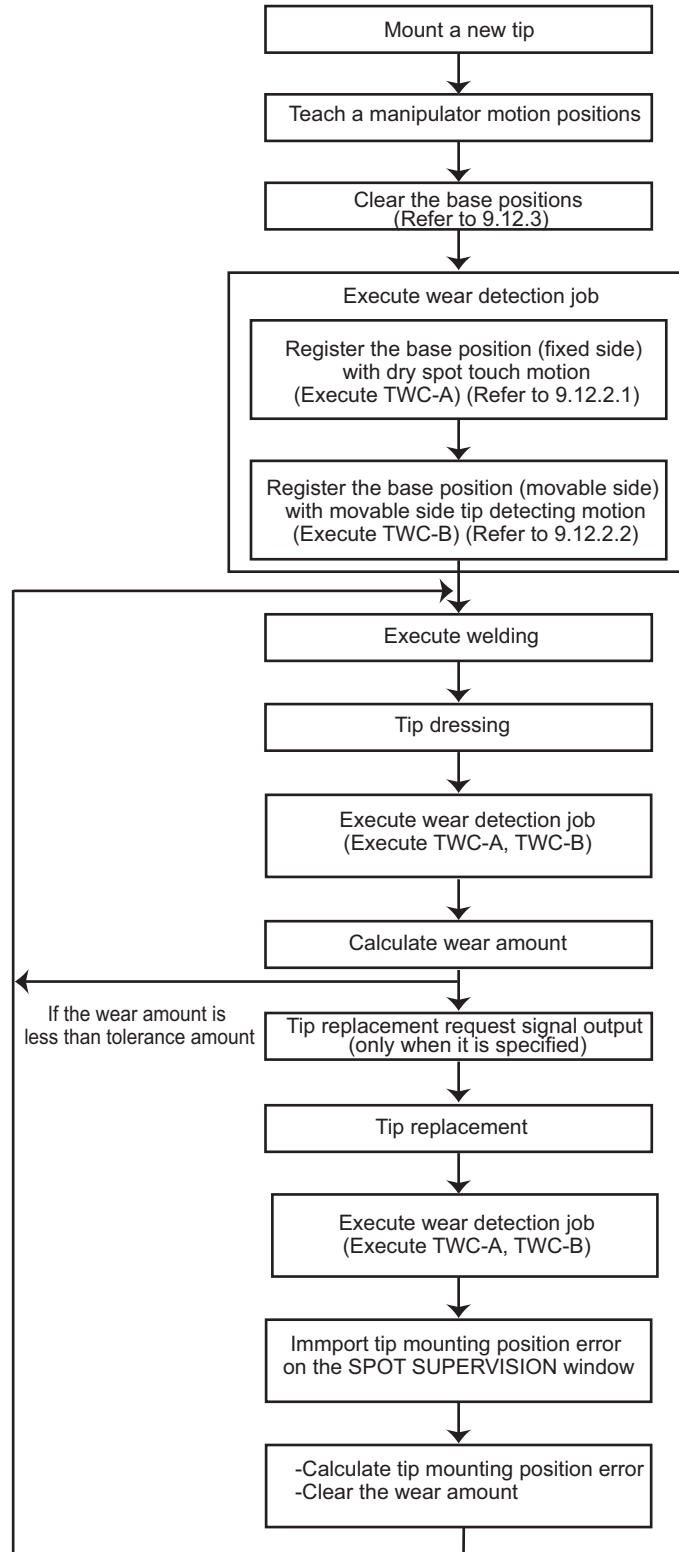
The cause of the pressure position error when pressure is applied can be sorted to two causes; tip wear and tip mounting position error.

By handling the causes separately, the real wear amount of tip itself can be handled to decide the tip ideal replacing timing.



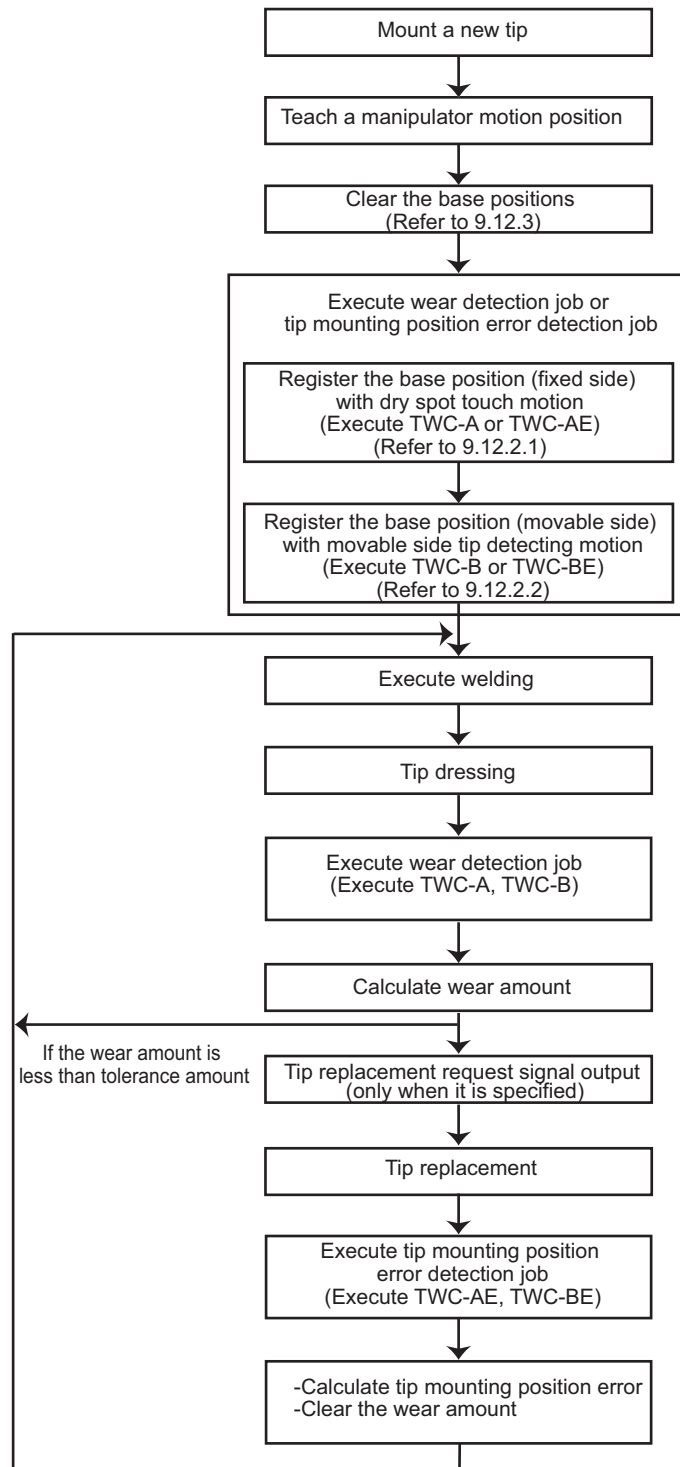
## 9.12.8.1 Tip Mounting Position Error Detection Flow Chart

- When the wear amount is imported to a tip mounting position error after a wear amount detection job is executed.





- When the tip mounting position error is detected with a job for tip mounting position error detection.



## 9.12.8.2 Tip Mounting Position Error Detection

The method to execute the tip mounting position error detection operation by dry spot touch motion and by movable side tip detection motion are described here.

The following two methods are for detecting the tip mounting position error.



This operation must be performed after new tips are mounted.

If this operation is executed with the worn tip, signals on wear (signal to request tip replacement, etc.) will not be output properly since the wear itself is regarded as the tip mounting position error.

■ **When the wear amount is imported to a tip mounting position error after a wear amount detection job is executed.**

Apply this method when wear detection and tip mounting position error detection are to be executed in the common job.

• Dry spot touch motion (TWC-A)

The gun axis position is acquired when the movable side tip touches the fixed side tip.

Execute SVGUNCL instruction (dry spot) for the dry spot touch motion.

<Example>

```
SVGUNCL GUN#(1) PRESSTWC TWC-A
```

• Movable side tip detecting motion (TWC-B)

The gun axis position is acquired when the movable side tip position is detected.

Execute SVGUNCL instruction (dry spot) for the movable side tip detecting motion.

<Example>

```
SVGUNCL GUN#(1) PRESSTWC TWC-B
```

After wear is detected by the above mentioned instruction, import the wear amount to the tip mounting position error on the SPOT SUPERVISION window.

**■ When the tip mounting position error is detected with a job for tip mounting position error detection.**

By adding tags for tip mounting position error detection (TWC-AE, TWC-BE) to the dry spot instruction (SVGUNCL), tip mounting position errors can be detected.

- Dry spot touch motion (TWC-AE)

The gun axis position is acquired when the movable side tip touches the fixed side tip.

Execute SVGUNCL instruction (dry spot) for the dry spot touch motion.

<Example>

```
SVGUNCL GUN#(1) PRESSTWC TWC-AE
```

- Movable side tip detecting motion (TWC-BE)

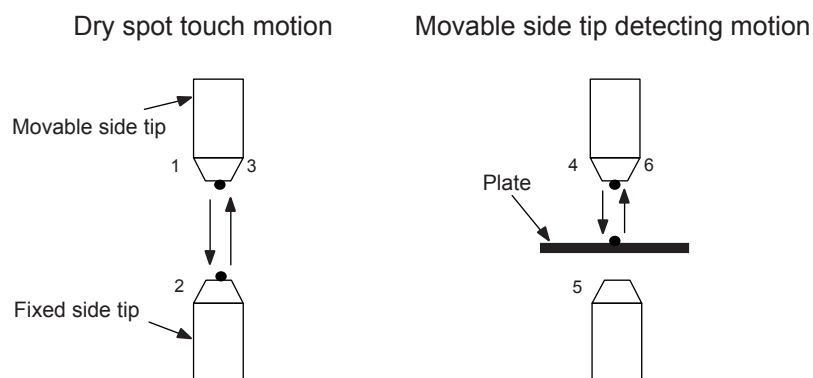
The gun axis position is acquired when the movable side tip position is detected.

Execute SVGUNCL instruction (dry spot) for the movable side tip detecting motion.

<Example>

```
SVGUNCL GUN#(1) PRESSTWC TWC-BE
```

## 9.12.8.3 Job Examples



&lt;Job Example&gt;

- When the wear amount is imported to a tip mounting position error after a wear amount detection job is executed.
  1. MOVJ
  2. SVGUNCL GUN#(1) PRESSTWC TWC-A  
(Dry spot touch motion)
  3. MOVJ
  4. MOVJ
  5. SVGUNCL GUN#(1) PRESSTWC TWC-B  
(Movable side tip detecting motion)  
On the SPOT SUPERVISION window, import the present wear amount to the tip mounting position error.
  6. MOVJ  
Welding operation
  
- When the tip mounting position error is detected with a job for tip mounting position error detection.
  - 1'. MOVJ
  - 2'. SVGUNCL GUN#(1) PRESSTWC TWC-AE  
(Dry spot touch motion)
  - 3'. MOVJ
  - 4'. MOVJ
  - 5'. SVGUNCL GUN#(1) PRESSTWC TWC-BE  
(Movable side tip detecting motion)
  - 6'. MOVJ

Teach the following two positions to be the same position.

- in the job for tip mounting position error detection: the position short before the dry spot touch motion
  - “ 1 ” in the above explanation
- in the wear detection job: the position short before the dry spot touch motion
  - “ 1 ” in the above explanation



Also, teach positions short before the movable side tip detecting motion (“ 4 ” and “ 4 ’ ” in the above explanation) to be the same position.

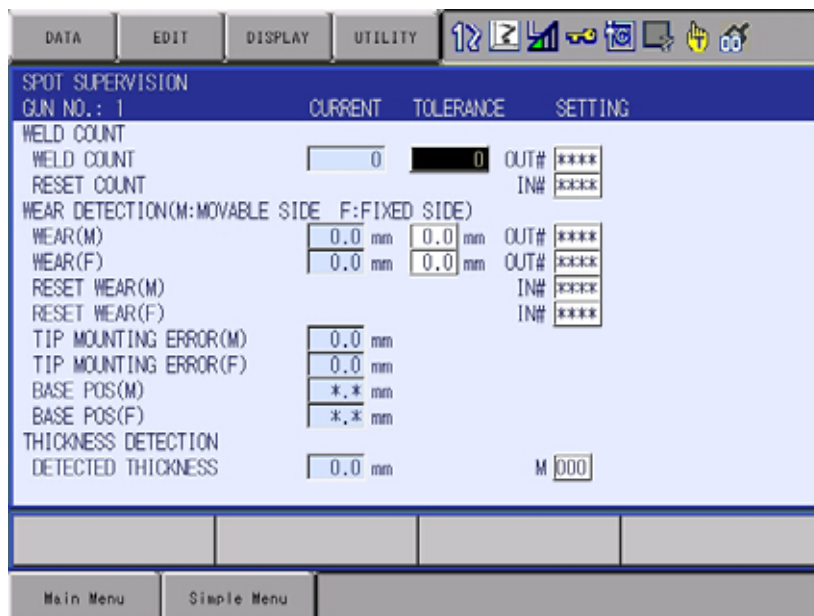
#### 9.12.8.4 Importing the Tip Mounting Position Error

##### ■ Operation Procedures

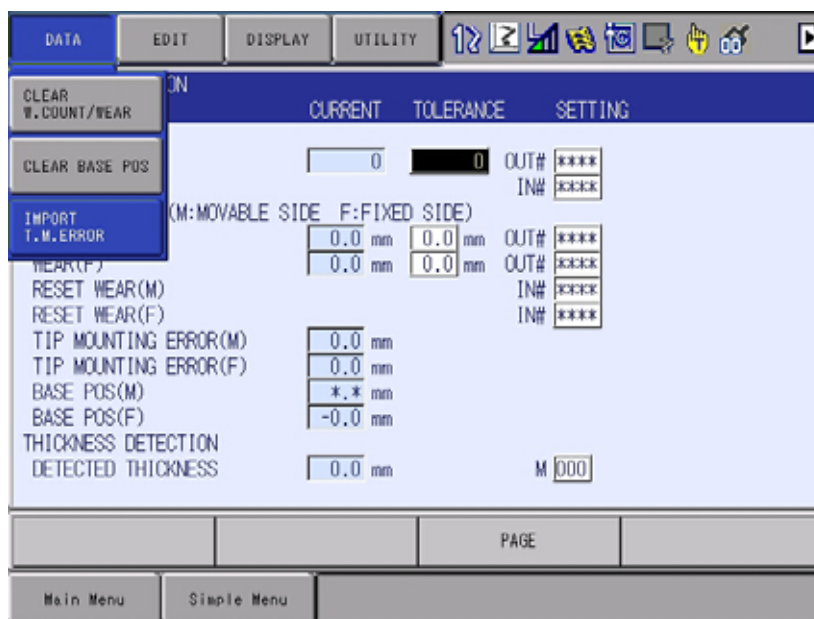
1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {SPOT SUPERVISION}.



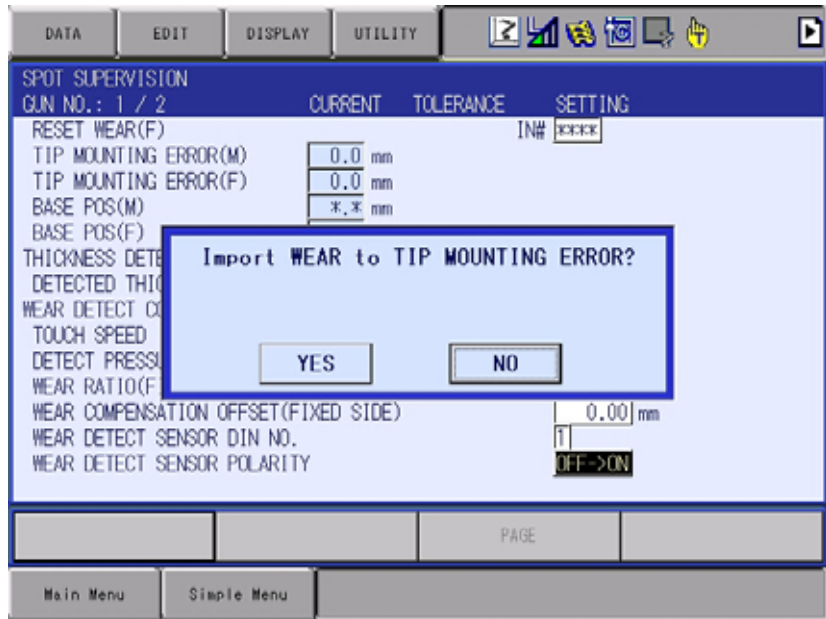
– SPOT SUPERVISION window appears.



3. Select a gun No. by pressing [PAGE].
4. Select {DATA} -{IMPORT T.M.ERROR}.



5. Select "YES".



## 9.12.8.5 Monitoring the Failure of Mounting Tips

The failure of mounting tips can be monitored by the following parameters.

A1P56 : Universal output for the failure of mounting tips

A1P57 : Limit of tip mounting position error  
(movable side) [ $\mu\text{m}$ ]

A1P58 : Limit of tip mounting position error  
(fixed side) [ $\mu\text{m}$ ]

<Example>

A1P56=5, A1P57=1000 and A1P58=2000

The universal output signal 5 is output when either of the following condition meets.

The limit of tip mounting position error (movable side)  $\geq 1\text{mm}$

The limit of tip mounting position error (fixed side)  $\geq 2\text{mm}$



The signal is not output when the value of the universal output parameter (A1P56) or the value of both A1P57 and A1P58 are 0.



## 9.13 High Speed Spot Welding Function

### 9.13.1 High Speed Spot Welding Function

This function is created for the purpose of reducing the cycle time of a spot welding operation by improving the control of the manipulator's motion and the motor gun's pressure control.

### 9.13.2 Changes by Validating this Function

#### ■ Motion Path

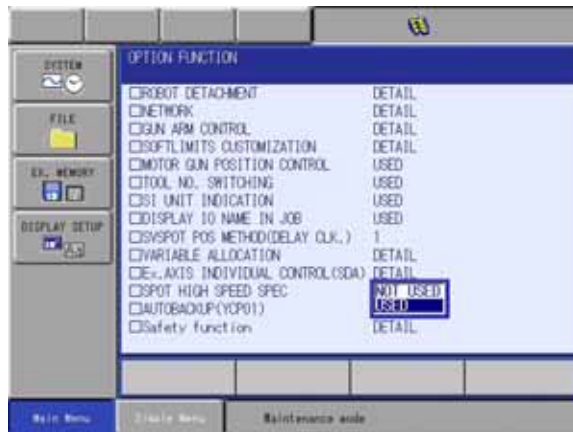
The shortcut volume while robot axes and gun axes are in operation may change due to the reduction of robot axis acceleration/deceleration time.

Also, during SVSPOTMOV operation, to secure the clearance, the gun axis opening motion after welding is completed is made faster than the robot axis motion.

When applying this function to the existing system, confirm motions of all JOBs.

### 9.13.3 Validating Method of High Speed Spot Welding Function

1. Turn ON the power supply of the DX200 while pressing {Main Menu} on the programming pendant.
2. After startup in maintenance mode, change the security mode to the management mode.
3. Select {SYSTEM} on the {Main Menu}.
  - Sub menu appears. Select {SET} - {OPTION FUNCTION}, and then the list of optional function is displayed.
4. Move the cursor to {SPOT HIGH SPEED SPEC}, press [SELECT], and then, select "USED".



For the applicable manipulator types and operating conditions, please contact Yaskawa representative.



After setting "USED" to {SPOT HIGH SPEED SPEC} to the manipulators which are not applicable to this function or under inappropriate condition, "Error: 8216" is indicated.

Also, if a base axis or a station axis is added to the system where "USED" is selected to {SPOT HIGH SPEED SPEC} "Error: 8217" may be indicated.

To clear this error, set "NOT USED" to {HIGH SPEED SPEC} firstly, and then add a base axis or a station axis.

## 9.14 Other Functions Using a Motor Gun

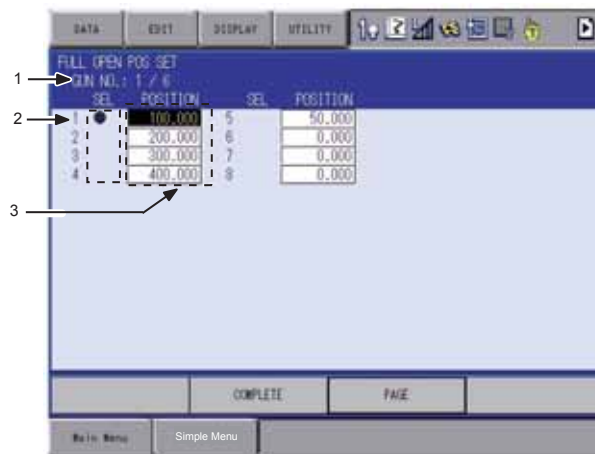
### 9.14.1 Motor Gun Stroke

The motor gun stroke is classified into two; full open and short open.

#### 9.14.1.1 Registering the Full-open/Short-open Position

Eight stroke positions can be registered for full open and short open respectively.

#### ■ Full Open Position Setting



#### 1. GUN NO.

Shows the gun for position setting.  
Select a gun No. by pressing [PAGE].

#### 2. SEL

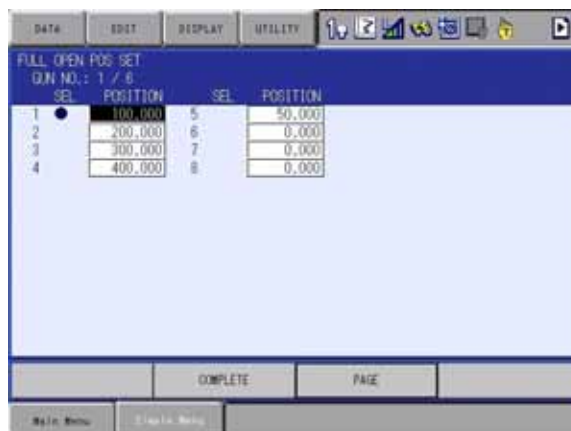
The mark “●” is displayed at the currently selected position.

#### 3. POSITION

Shows the gun stroke.

## 9.14.1.2 Registering the current position

1. Press [3/FULL OPEN] or [-/SHORT OPEN] of the numeric keys.
  - FULL OPEN POS SET window (or SHORT OPEN POS SET window) appears.



2. Select a gun No. by pressing [PAGE].
3. Select a position to register a gun stroke and press [MODIFY] + [ENTER].

## 9.14.1.3 Registering by entering a numerical value

1. Press [3/FULL OPEN] or [-/SHORT OPEN] of the numeric keys.
  - FULL OPEN POS SET window (or SHORT OPEN POS SET window) appears.



2. Select a position to register a gun stroke.
3. Enter a numerical value, and press [ENTER].

## 9.14.1.4 Moving to Full-open/Short-open Position

1. Press [3/FULL OPEN] or [-/SHORT OPEN] of the numeric keys.
  - FULL OPEN POS SET window (or SHORT OPEN POS SET window) appears.



2. Select a gun No. by pressing [PAGE].
3. Change the position by pressing repeatedly [3/FULL OPEN] or [-/SHORT OPEN].



4. Press [INTERLOCK] + [3/FULL OPEN] or [INTERLOCK] + [-/SHORT OPEN].
  - While FULL OPEN POS SET window (or SHORT OPEN POS SET window) appears, pressing [NEXT] moves the gun to the stroke set in the {POSITION} which the cursor stay at.

## 9.14.1.5 Moving to Full-open/Short-open Position While Other Window is Displayed

By pressing [INTERLOCK] + [3/FULL OPEN] or [INTERLOCK] + [-/SHORT OPEN] while the control group of the gun axis is selected by the operation of pressing [SHIFT] + [EX. AXIS], the gun axis of the selected group moves to FULL OPEN or SHORT OPEN position.

**9.14.2 Gun Change**

## 9.14.2.1 Gun Change Instruction

Gun change is executed by the GUNCHG (gun change) instruction.

<Example>

GUNCHG GUN#(1) PICK

A      B

**1.Gun No.****2. Designation of connecting or disconnecting a gun**

When "PICK (gun connected)" is selected, the power supply of the gun motor is turned ON.

When "PLACE (gun disconnected)" is selected, the power supply of the gun motor is turned OFF.

## 9.14.2.2 Signal Status to Execute GUNCHG Instruction

The signals must be in the status shown in the following table when executing GUNCHG instruction.

Signal Name	Input/ Output	Explanation	Signal Status
Gun ID No.	Input (3 bits)	A binary signal to identify the gun number.	Agree with Gun No. <sup>1)</sup>
Gun Chuck	Input	The signal to confirm that the gun is connected. Normally, a chucking confirmation signal of ATC is allocated.	ON
Gun Unchuck	Input	The signal to confirm that the gun is disconnected. Normally, an unchucking confirmation signal of ATC is allocated.	OFF
Gun Unchuck Request	Output	The signal to connect the gun. Normally, a chucking signal of ATC is allocated. (CHUCK = OFF, UNCHUCK = ON)	OFF

1 The signal must agree with the gun number as shown in the following example.

<When the Gun ID No. signal start with IN10, and the Gun ID No. signal end with IN12:>

Gun No.	IN10	IN11	IN12
GUN# (1)	ON	OFF	OFF
GUN# (2)	OFF	ON	OFF
GUN# (3)	ON	ON	OFF
GUN# (4)	OFF	OFF	ON
GUN# (5)	ON	OFF	ON
GUN# (6)	OFF	ON	ON

The signals listed in the table above are confirmed when the DX200 control power supply is turned ON.

If the signal status indicates that the gun is connected when DX200 controller is turned ON, the servo power supply for the gun motor turns ON when the servo is turned ON.

If the signal status indicates that the gun is not connected when DX200 controller is turned ON, the servo power supply for the robot motor turns ON when the servo is turned ON, but the servo power supply for the gun motor is not turned ON.

## 9.14.2.3 Gun Change Job

The following example explains the gun change job.

## &lt;Example of I/O Allocation&gt;

Input Signal		Output Signal	
Gun Chuck	IN1	Gun connect/disconnect SOL	OUT1
Gun Unchuck	IN2	Gun 1 cover open/close SOL	OUT2
Coupling confirmation	IN3		
Gun 1 presence LS	IN4		
Gun 1 cover open limit	IN5		
Gun 1 cover close limit	IN6		
Gun ID No. signal (start)	IN21		
Gun ID No. signal (end)	IN23		

## &lt;Example of Mounting a Gun&gt;

Job name: GUN 1 PICK

Control group: R1

```

NOP
MOVJ VJ=30           Moves to the standby position.
WAIT IN#(3)=OFF      Confirms ATC uncoupling.
WAIT IN#(2)=ON       Confirms ATC unchucking
WAIT IN#(4)=ON       Confirms Gun 1 presence.
DOUT OT#(2)=ON       Opens Gun 1 cover.
WAIT IN#(5)=ON       Confirms Gun 1 cover opened.
:
MOVL V=500           Moves to the position which is just above the
                    Gun 1's placing table.
MOVL V=100 PL=0      Moves to the ATC coupling position.
WAIT IN#(3)=ON       Confirms ATC coupling.
DOUT OT#(1)=OFF      ATC chucking
WAIT IN#(1)=ON       Confirms ATC chucking.
GUNCHG GUN#(1) PICK Turns ON the gun motor power.
TIMER T=0.2          Waits for 0.2 seconds.
MOVL V=1000          Lifts the Gun 1.
:
WAIT IN#(4)=OFF      Confirms Gun 1 absence.
DOUT OT#(2)=OFF      Closes Gun 1 cover.
WAIT IN#(6)=ON       Confirms Gun 1 cover closed.
:
MOVJ VJ=30           Moves to the standby position.
END

```



## &lt;Example of Removing a Gun&gt;

Job name: GUN 1 PLACE

Control group: R1

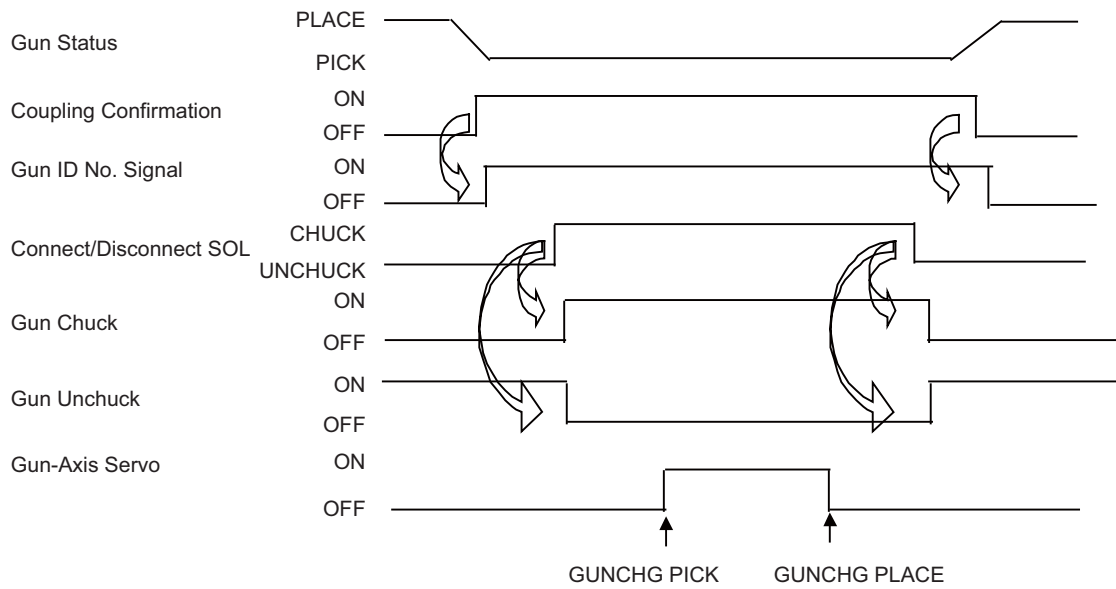
NOP	
MOVJ VJ=30	Moves to the standby position.
WAIT IN#(3)=ON	Confirms ATC coupling.
WAIT IN#(4)=OFF	Confirms Gun 1 absence.
DOUT OT#(2)=ON	Opens Gun 1 cover.
WAIT IN#(5)=ON	Confirms Gun 1 cover opened.
:	
MOVL V=500	Moves to the position which is just above the Gun 1's placing table.
MOVL V=100 PL=0	Moves to Gun 1 placing position.
WAIT IN#(4)=ON	Confirms Gun 1 presence.
GUNCHG GUN#(1) PLACE	Turns OFF gun motor power.
TIMER T=0.2	Waits for 0.2 seconds.
DOUT OT#(1)=ON	ATC unchucking
WAIT IN#(2)=ON	Confirms ATC unchucking
MOVL V=1000	Disconnects the gun.
:	
WAIT IN#(4)=ON	Confirms Gun 1 presence.
DOUT OT#(2)=OFF	Closes Gun 1 cover.
WAIT IN#(6)=ON	Confirms Gun 1 cover closed.
:	
MOVJ VJ=30	Moves to the standby position.
END	



Be sure to confirm the unchucking status when moving an automatic tool changer to the chuck position.

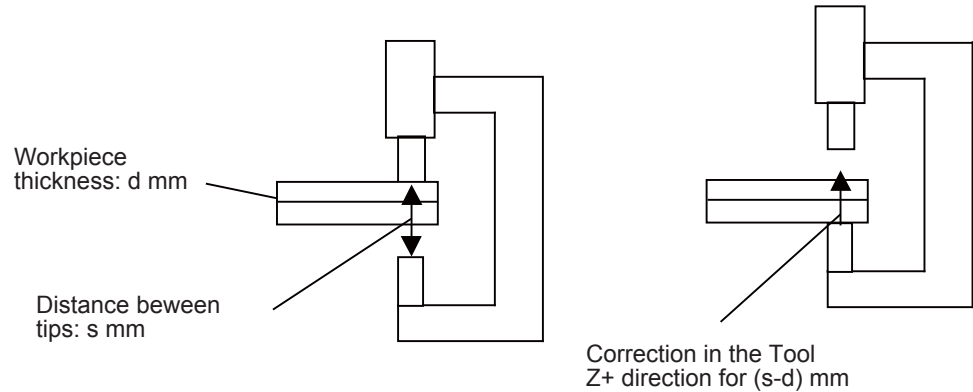
9.14.2.4 Gun Changing Timing

The timing to change a gun is illustrated below.



**9.14.3 Touch Teaching Function**

Even if the fixed tip position cannot be visually confirmed when teaching, it is possible to register the position where the fixed tip touches the workpiece by moving the movable tip to touch the workpiece.

**9.14.3.1 Setting the Workpiece Thickness**

- **GUN DETAIL SETTING Window (Workpiece Thickness Setting)**

**1. THICKNESS**

Enter the thickness of workpiece to be welded.

**2. GUN STROKE**

Shows the distance between tips at the touch teaching. Pressing [SHIFT] + [ENTER] on the JOB window changes the value.

**3. TCP ADJUSTMENT**

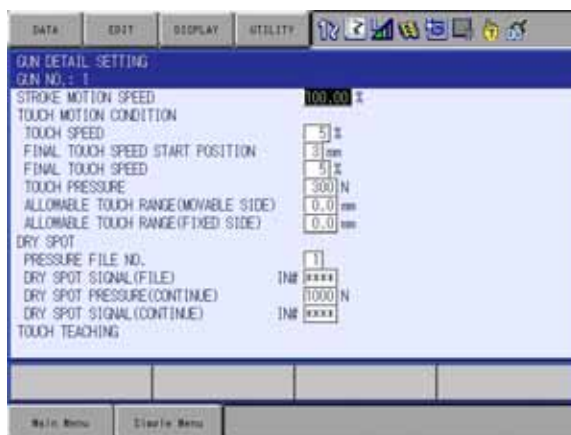
Shows the corrected distance of fixed tip at the touch teaching.

### ■ Operation

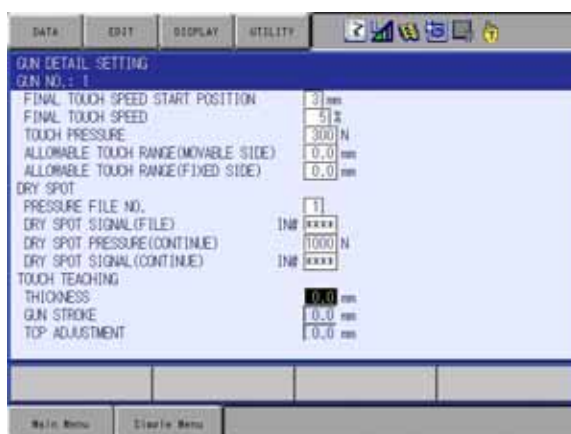
1. Select {SPOT WELDING} in the {Main Menu}.
2. Select {GUN DETAIL SETTING}.



– GUN DETAIL SETTING window appears.



3. Select a gun No. by pressing [PAGE].
4. Select "THICKNESS."



5. Enter a numerical value, and press [ENTER].

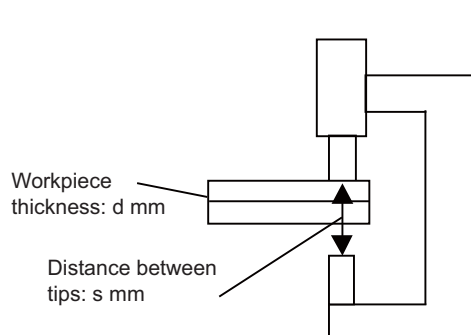


## 9.14.3.2 Registering and Confirming Positions by Touch Teaching

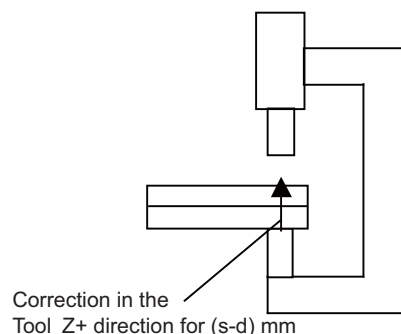
1. Select {JOB} on the {Main Menu}.
2. Select {JOB}.



3. Move the manipulator to the welding position.
4. Move the movable tip to touch the workpiece.
5. Press [SHIFT] + [ENTER].



Teaching position  
(Press [SHIFT] + [ENTER] to register)



Corrected position  
(Move the manipulator by pressing [FWD])

- Press [SHIFT] + [ENTER] on the JOB window to make a correction in the tool coordinates Z+ axis direction.
- Press [FWD] to move the manipulator to confirm the corrected position that is actually registered.
- After having taught the position by pressing [SHIFT] + [ENTER], the manipulator correction amount can be confirmed on GUN DETAIL SETTING window.

**9.14.4 Signal Dry Spot**

Gun-pressure can be applied by inputting an external signal.



Gun-pressure can be applied by an external signal for dry spot only.

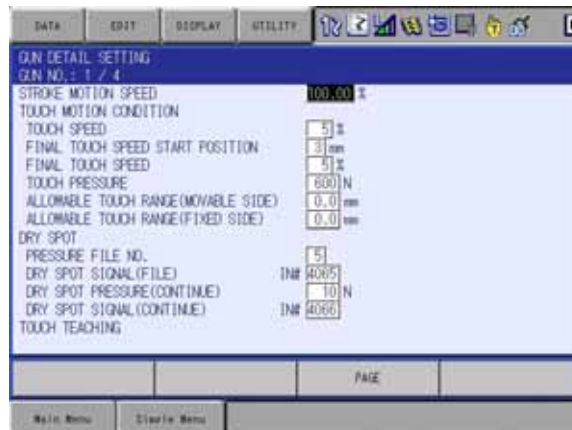
Welding cannot be carried out by an external signal.

**9.14.4.1 Setting an Input Signal Number**

1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {GUN DETAIL SETTING}.



– GUN DETAIL SETTING window appears.



3. Select a signal number to be set.

- **DRY SPOT SIGNAL(FILE)**
  - After the signal is input, pressurizing is started.
  - Pressure is applied according to the settings in the dry spot pressure file specified by {PRESSURE FILE NO.}
  - The gun stops applying pressure after a specified time period.
  - In case DRY SPOT (FILE) motion is stopped by the emergency stop, the gun will stay at the position where it is stopped.
  
- **DRY SPOT SIGNAL(CONTINUE)**
  - The signal input and pressurizing is started as well as the above, but pressurizing is continued during the signal input.
  - Pressure is applied according to the setting specified by {DRY SPOT PRESSURE(CONTINUE)}.
  - When the signal is turned OFF, the gun stops applying pressure.
  - In case DRY SPOT (CONTINUE) motion is stopped by the emergency stop during the gun closing or opening, the gun will stay at the position where it is stopped. But when the gun is stopped by the emergency stop during pressurization, by turning ON the servo and then turning OFF the signal, the gun can return to the position where DRY SPOT (CONTINUE) motion is started.



- When the signal number "0" is selected, the Signal Dry Spot is disabled.
- The dry spot signal (file) motion is executed when specifying the same signal to both DRY SPOT SIGNAL(FILE) and DRY SPOT SIGNAL(CONTINUE) and inputting the signal.
- In case the same signal is specified to several guns and it is input, only the gun with the smallest gun number among the same-number specified guns executes pressurization.

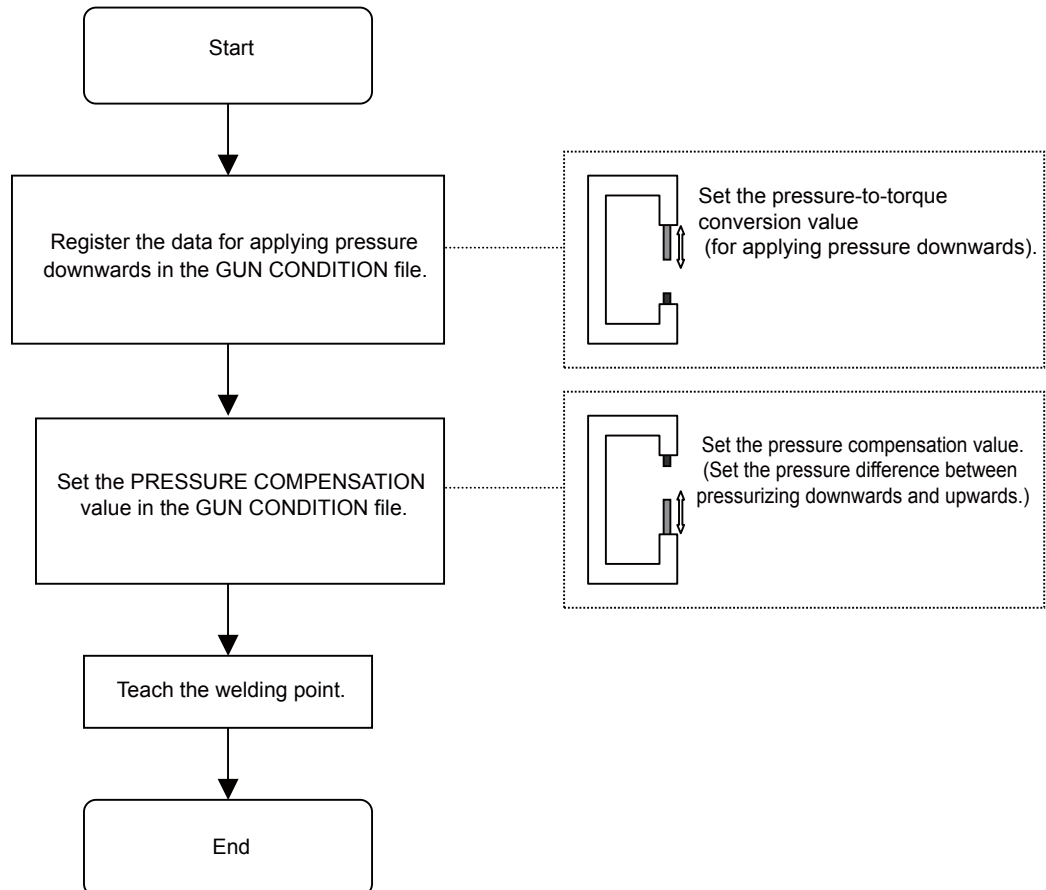


**9.14.5 Gun Pressure Compensation Function**

## 9.14.5.1 Operation Flow Chart

With the gun pressure compensation function, the gun pressure can be kept stable even when the motor gun posture changes.

The following shows the operation flow chart for the gun pressure compensation.



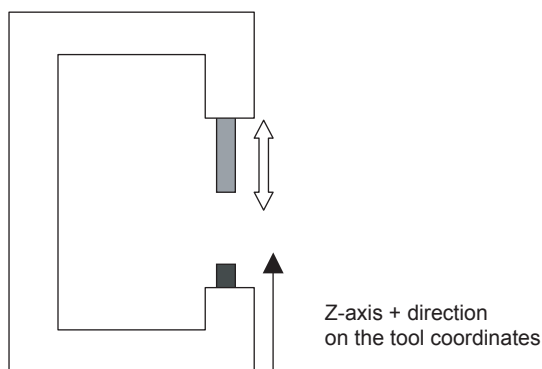
## 9.14.5.2 Overview

The following describes outline of the gun pressure compensation function.

The pattern 1 is shown in the *Fig. 9-3*; applying pressure downwards, and the pattern 2 is shown in the *Fig. 9-4*; applying pressure upwards.

In case of the pattern1, since the pairs of pressure and torque data (twelve pairs at maximum) is set with the gun pressurizing downwards (see *Fig. 9-6 "Pressure-to-torque Conversion (For Pattern 1)"* on page 9-156) in the GUN CONDITION file, the torque of the motor gun for the specified pressure is calculated just by interpolation of these pairs of data.

*Fig. 9-3: Pattern 1 (Applying Pressure Downwards)*



*Fig. 9-4: Pattern 2 (Applying Pressure Upwards)*

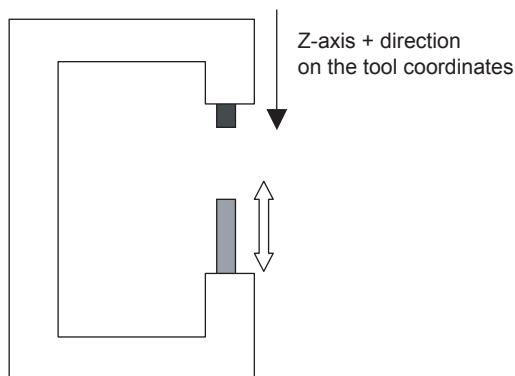
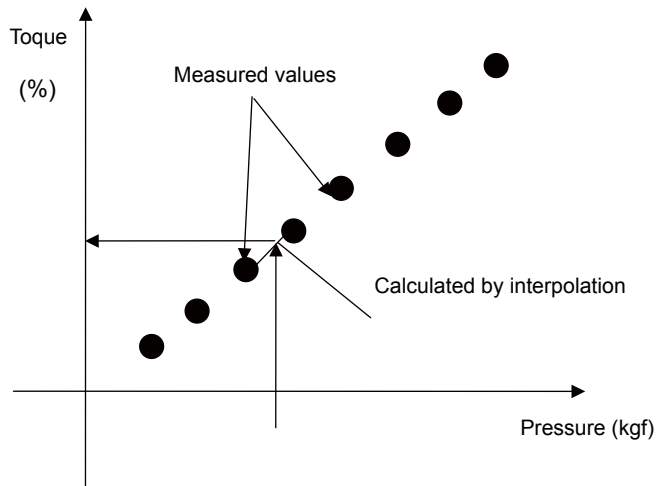


Fig. 9-5: GUN CONDITION File (Downward Pressure)

	PULSE	STROKE	TORQUE	PRESSURE
1	1342	0.0	0.0	1000 N
2	4091	10.0	0.0	0 N
3	23400	0.0	0.0	0 N
4	0	0.0	0.0	0 N
5	0	0.0	0.0	0 N
6	0	0.0	0.0	0 N
7	0	0.0	0.0	0 N
8	0	0.0	0.0	0 N
9	0	0.0	0.0	0 N
10	0	0.0	0.0	0 N
11	0	0.0	0.0	0 N
12	0	0.0	0.0	0 N

MAX PRESSURE: 2000 N  
 PRESSURE COMPENSATION: 0 N  
 GUN ARM BEND COEF. X: 0.000 mm/1000N, Y: 0.000 mm/1000N, Z: 0.000 mm/1000N  
 GUN PUSHING COEF.: 0.000 mm/1000N  
 GUN INSTALLATION STATUS: RIGHT-HANDLE

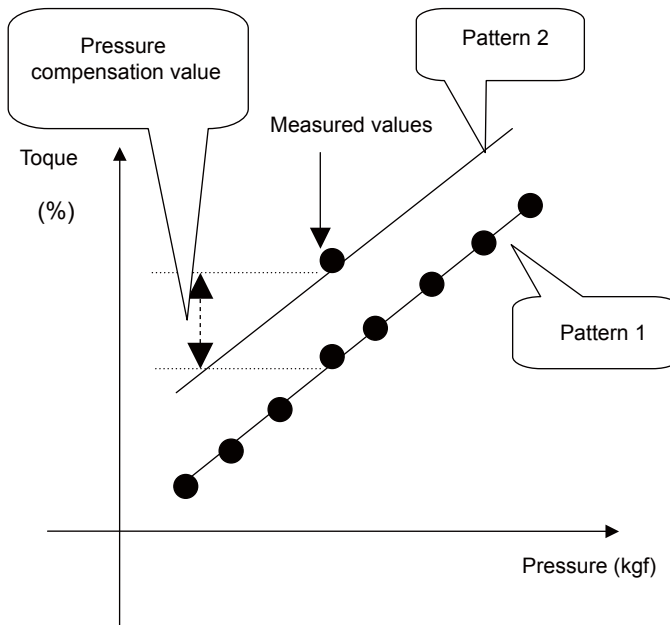
Fig. 9-6: Pressure-to-torque Conversion (For Pattern 1)



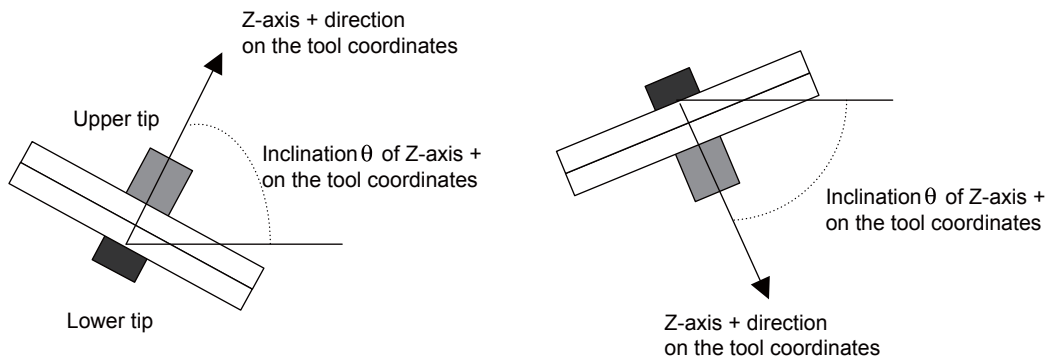
For the pattern 2 shown in *Fig. 9-4 "Pattern 2 (Applying Pressure Upwards)"* on page 9-155, the weight of the motor gun itself may cause deviation of pressure.

Using the gun pressure compensation function, by setting one pressure compensation value (see *Fig. 9-7*), the motor torque of the motor gun is calculated using the pressure-to-torque conversion value of pattern 1 and the inclination of the Z-axis + on the tool coordinates at welding so that the pressure can be kept stable even when the motor gun posture changes. (See *Fig. 9-8*.)

*Fig. 9-7: Pressure Compensation (For Pattern 2)*



*Fig. 9-8: Motor Gun Posture*



9.14.5.3 Setting the Pressure Compensation Value

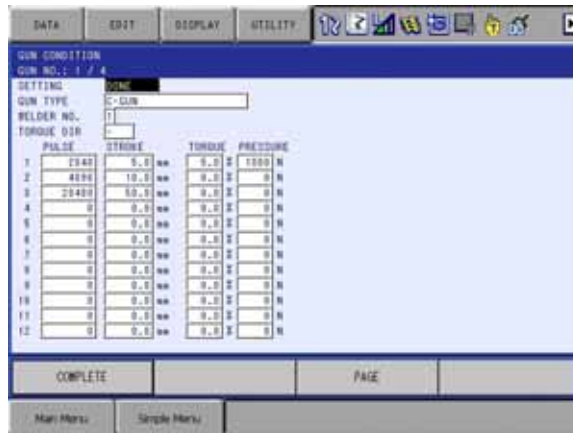
The following describes settings for pressure compensation value of pattern 2.

For details on the data registration of pattern 1; applying pressure downwards (settings for pressure-to-torque conversion value), refer to section 9.3.9 "Setting of Torque to Pressure Conversion Data" on page 9-21.

1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {GUN CONDITION}.



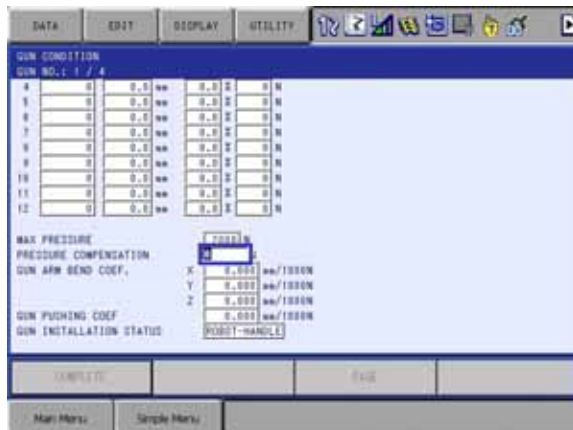
– GUN CONDITION window appears.



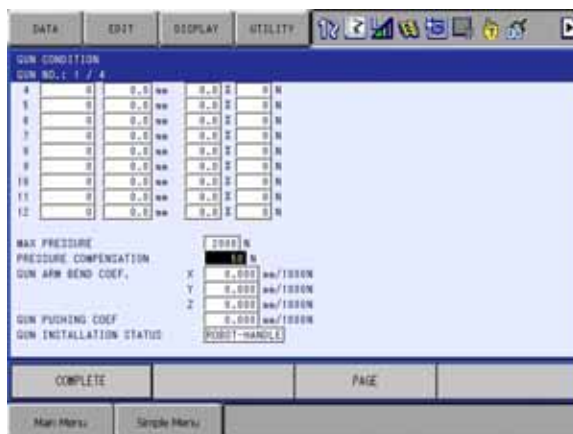
## 9 Spot Welding Application Using a Motor Gun

### 9.14 Other Functions Using a Motor Gun

3. Select {PRESSURE COMPENSATION}.
  - By Specifying the pressure for compensation (0 to 9999N) at PRESSURE COMPENSATION, the pressure is compensated when the motor gun changes its posture.
  - Press [SELECT] to input the value for compensation.

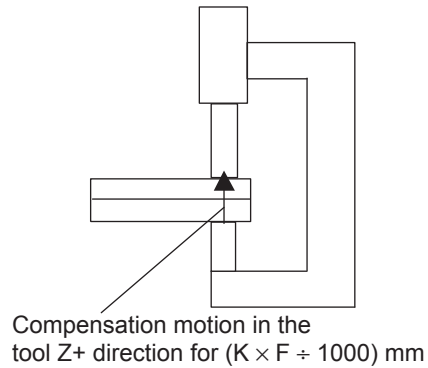


4. Press [ENTER] after inputting the value.



**9.14.6 Compensation of Gun Arm Bend for C-Gun and X-Gun (SINGLE ARM MOVE)**

The gun arm bend at pressurizing can be compensated by the corrective manipulator motion.

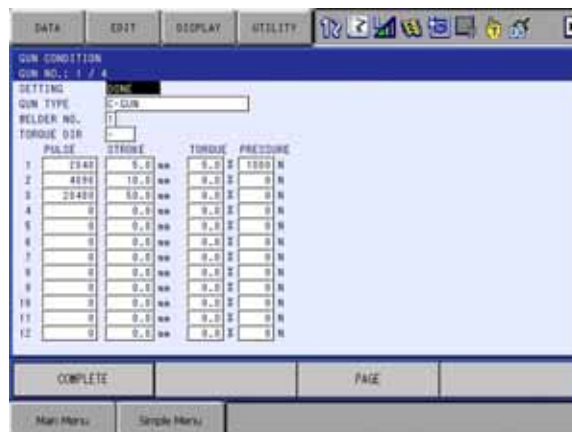


Specify each compensation value (X, Y, Z directions of the tool coordinate) for the gun arm bend with the pressure of 1000N.

When K is defined as the gun arm bend compensation coefficient (mm/1000N) and F is the gun pressure (N), the robot position is corrected in each coordinate direction of the tool for  $(K \times F \div 1000)$  mm in synchronization with gun pressure.

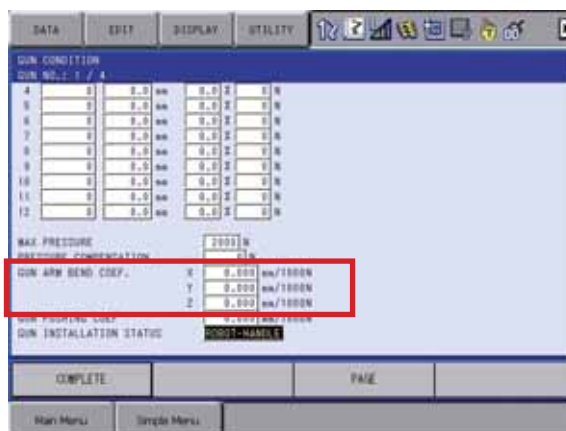
**9.14.6.1 Setting the Gun Arm Bend Compensation Coefficient**

1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {GUN CONDITION}.
- GUN CONDITION window appears.



3. Select a gun No. by pressing [PAGE].

4. Select "GUN ARM BEND DOEF."  
 – GUN ARM BEND DOEF.  
 Set the compensation amount for gun arm bend per 1000N pressure.



5. Enter a numerical value, and press [ENTER].



If "0" is entered, the gun arm bend compensation function will not be effective.

#### 9.14.6.2 Compensation Example



The gun arm bend compensation operation is done by the robot when following instructions are executed.

- SVSPOT instruction
- SVGUNCL instruction to which DRS tag is added.
- SVSPOTMOV instruction
- SVDRESMOV instruction

In case the robot is not included in the job control group, the gun arm bend compensation will not be executed.

<Example>

R1+S1 : Gun arm bend compensation is executed

S1 : Gun arm bend compensation is unexecuted

When 2.0 (mm/1000N) is specified for the gun arm bend compensation coefficient:

Gun Pressure (N)	Gun Arm Bend Compensation Amount (mm)
0	0.0
1000	2.0
2000	4.0
3000	6.0



#### 9.14.6.3 Disabling Gun Arm Bend Compensation

The gun arm bend compensation can be disabled at each SVSPOT/  
SVSPOTMOV instruction.

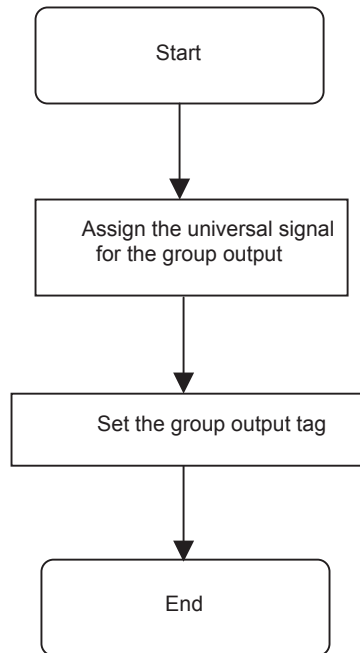
Set the gun arm bend compensation disabling tag (BCOFF tag) to  
SVSPOT/SVSPOTMOV instruction to disable it.

**9.14.7 Welding Conditions Group Output Function**

## 9.14.7.1 Operation Flow Chart

With the welding conditions group output function, a group signal is output to the welder during welding.

The following shows the operation flow chart for the welding conditions group output function.



## 9.14.7.2 Procedure for Assigning the Group Output Signal

The following describes how to assign the signal number for group output when executing the SVSPOT/SVSPOTMOV instruction.

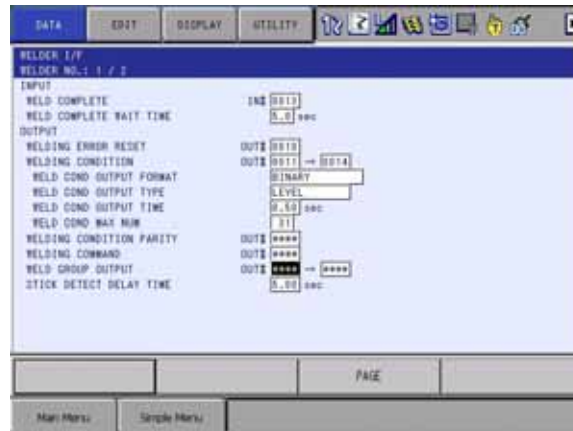
1. Select {SPOT WELDING} on the {Main Menu}.
2. Select {WELDER IF}.



3. Select the desired item.

– Set {GROUP OUTPUT}.

Enter the LSB output number to the start and MSB output number to the end.



4. Input the numerical value and press [ENTER].

## 9.14.7.3 Setting the Group Output Tag

The following describes the settings for the group output.

When the job contents are displayed, by pressing [MOTION TYPE] + [SHIFT], the instruction in the input line can be switched from the normal motion interpolation (MOVJ, MOVL, MOV, MOVS) to the clearance move interpolation.

1. Select {JOB} on the {Main Menu}.
2. Select {JOB}.



– JOB CONTENT window is displayed.

3. Press [MOTION TYPE] + [SHIFT] to display “SVSPOTMOV” or “SVSPOT”.



– The group output can be set to either the following two instructions.

- SVSPOTMOV
- SVSPOT

4. Press [SELECT].

– The cursor moves to “SVSPOTMOV” or “SVSPOT”

5. Press [SELECT] again.

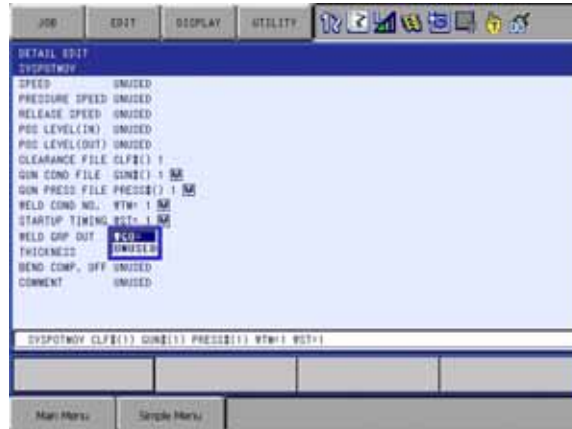
– The DETAIL EDIT window appears.



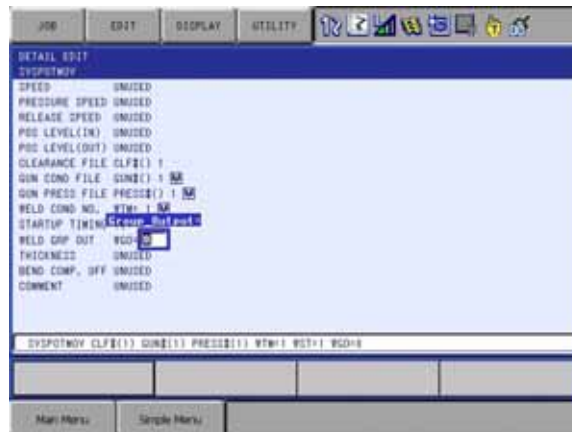
## 6. Select {WELD GRP OUT}.

- Press [SELECT] to display the selection dialog box. (The initial value is “UNUSED.”)

## (1) Select {WGO=}.



## (2) Set the output value.



## 7. Press [ENTER].

## 8. Press [ENTER] again.

## 9.14.7.4 Group Output

The origin of the group output can be set with "0".

"0 origin" or "1 origin" can be selected from {WELD GROUP ORIGINAL NO.} on APPLICATION CONDITION SETTING window.

When "0 origin" is selected: the value set to WAGO is output as a signal.

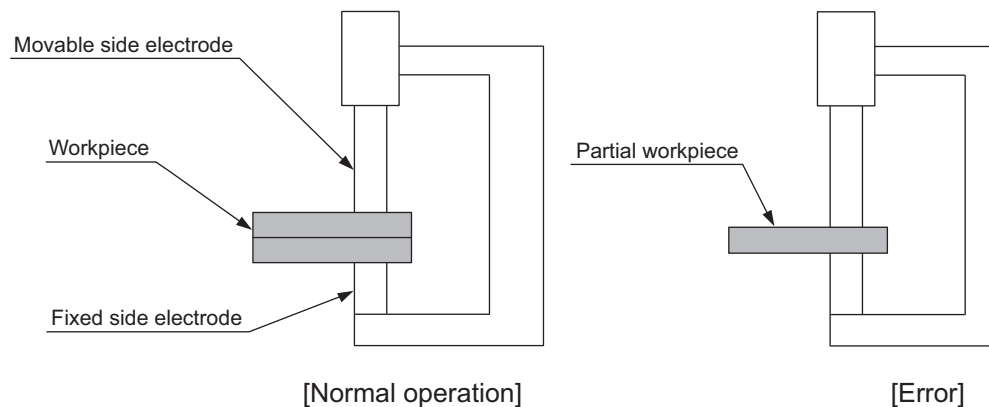
When "1 origin" is selected: the value 1 is subtracted from the value set to WAGO is output as a signal.

**9.14.8 Workpiece Thickness Detection Function**

## 9.14.8.1 Outline

The workpiece thickness detection function monitors the thickness of workpiece to be welded at the every SVSPOT instruction and SVSPOTMOV instruction. This function does not, however, monitor the workpiece thickness when executing the SVGUNCL instruction.

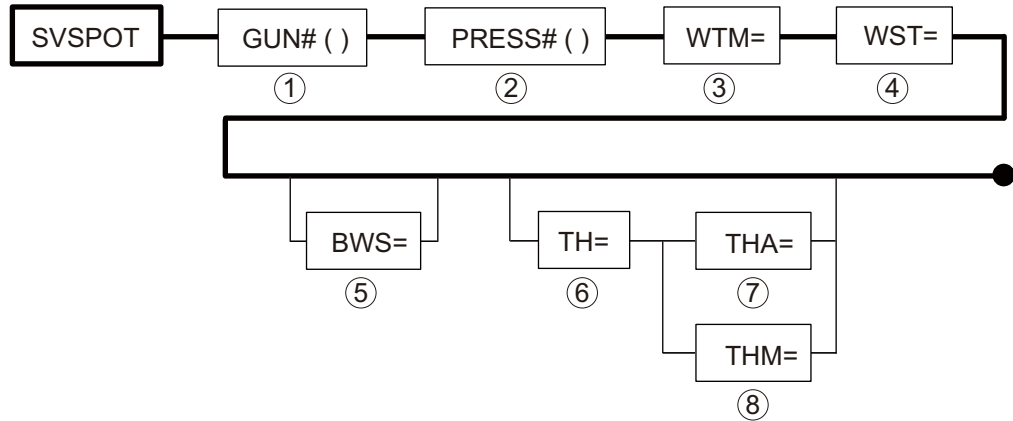
An alarm can be generated if the workpiece is missing.



## 9.14.8.2 Instruction

■ **SVSPOT (Spot Welding Instruction)**

To use the workpiece thickness detection function, set the tag for the function to SVSPOT/SVSPOTMOV instruction.



**1. TH=**

Workpiece thickness (unit: mm, -999.9 to 999.9)

Set the workpiece thickness to be welded.

The detected thickness can be automatically specified if the thickness measuring mode is used.

**2. THA=**

Allowable ratio of workpiece thickness (unit: %, 0 to 100)

Set the allowable value to THA by the ratio over the thickness value which is set to "TH".

**3. THM=**

Allowable workpiece thickness (unit: mm, 0.0 to 10.0)

Set the allowable value to THM by the unit mm.

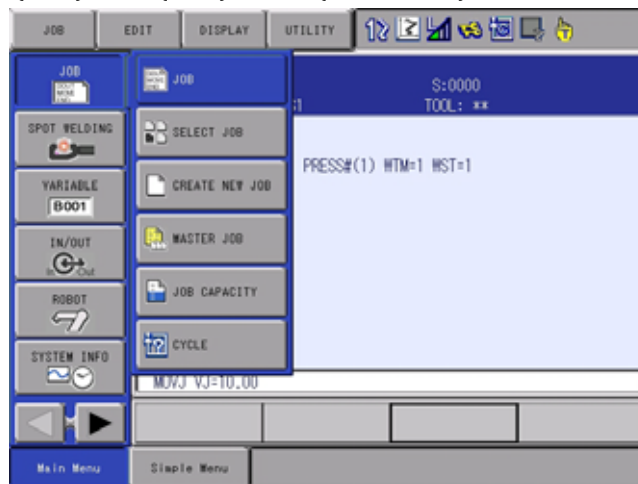
## 9.14.8.3 Operation Procedures

## ■ Setting of Workpiece Thickness Monitoring



- Set the mode switch of programming pendant to the teach mode.
- Set the security mode to the edit mode or management mode to edit job data.
- In the operation mode, only error contents reference is allowed.

1. Select {JOB}, then {JOB} on the {Main Menu}.



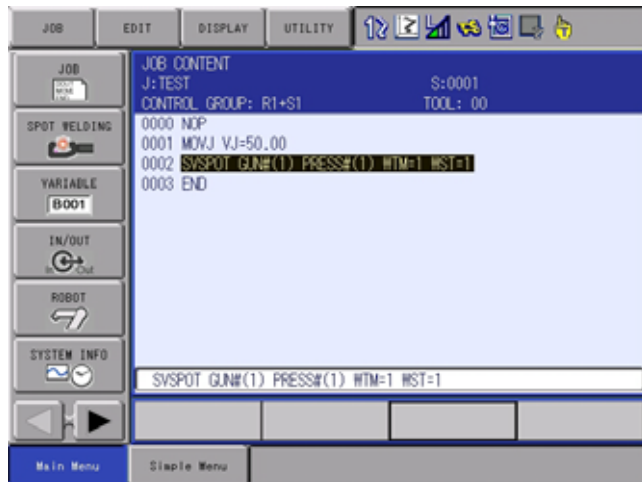
– JOB CONTENT window appears.





## 2. Set SVSPOT/SVSPOTMOV instruction.

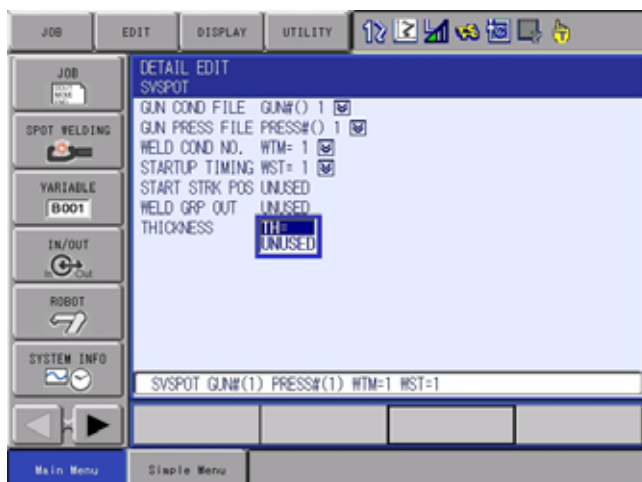
- Move the cursor to the “SVSPOT/SVSPOTMOV” and press [SELECT].



- Press [SELECT] again to display DETAIL EDIT window.



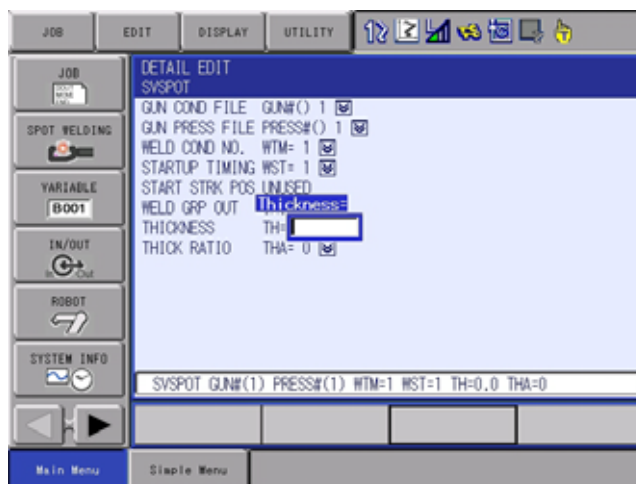
- Move the cursor to “THICKNESS” and press [SELECT]. Then, select “TH=”.



3. Set the workpiece thickness (TH).
  - Move the cursor to “THICKNESS”, and press [SELECT].



- Enter a value and press [ENTER].



## 4. Set the allowable workpiece thickness (THA, THM).

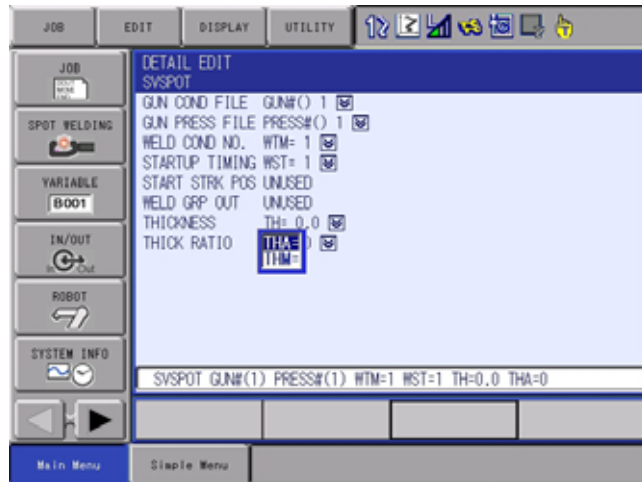
- Set THA= 0 to 100 [%]

(THA: Specifies the allowable range for the detected workpiece thickness by using a percentage.)

- or THM= 0.0 to 10.0 [mm]

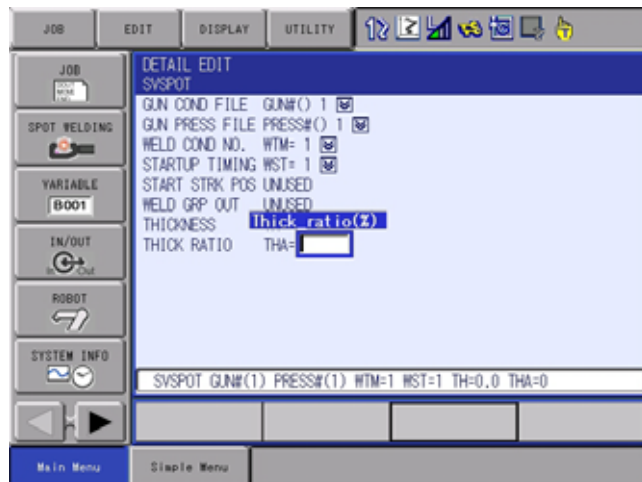
(THM: Specifies the allowable range for the detected workpiece thickness by using an absolute value).

Move the cursor to “THICK RATIO”, and press [SELECT].



- Enter a value, and press [ENTER].

(Value: Specify by a numeric value or I variable.)



- Press [ENTER] again.

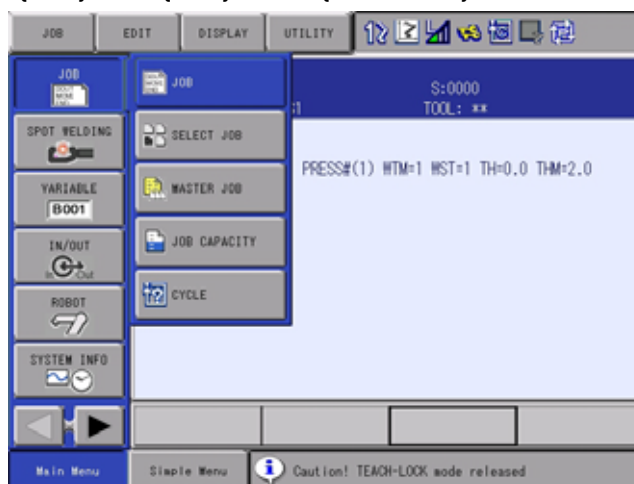
\* Returns to the JOB CONTENT window.

### ■ Setting of Workpiece Thickness Measurement



- Set the mode switch of programming pendant to the Play mode.
- When it is in the thickness measure mode, whether the detected thickness is within the allowable range or not is not monitored.

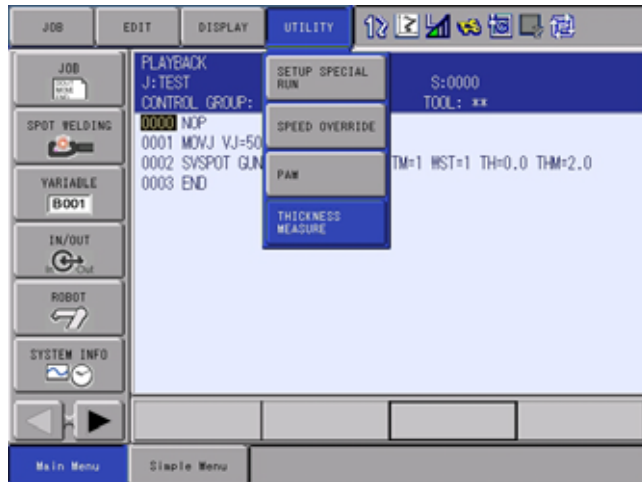
1. Set the mode switch of programming pendant to the Play mode.
2. Select {JOB}, then {JOB} on the {Main Menu}.



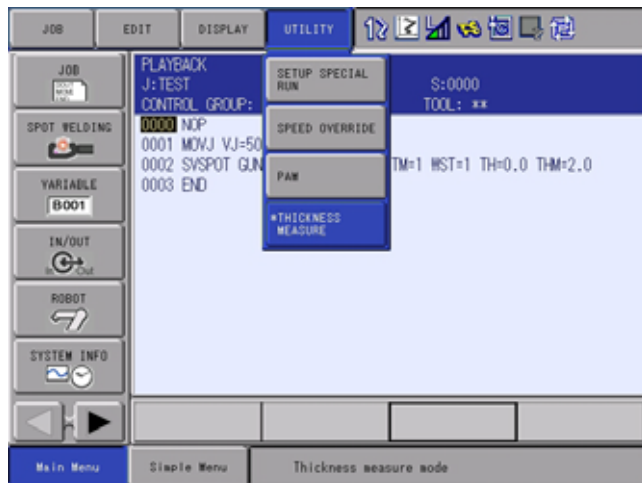
– JOB CONTENT window appears.



## 3. Select {THICKNESS MEASURE} under {UTILITY}.



- “Thickness measure mode” appears in the message display area. The {THICKNESS MEASURE} is displayed with an asterisk mark



- Universal signal can be used to switch to the measure mode.
- When using the universal signal to switch to the thickness measure mode, perform the following settings to “THICKNESS CHECK MODE SELECT GIN#” on APPLICATION CONDITION SETTING window.

**THICKNESS CHECK MODE SELECT GIN#**

0 : Switches to the thickness measure mode by using the programming pendant.

1 to 2048: Switches to the thickness measure mode while the specified universal signal is input.



- Note that when “THICKNESS CHECK MODE SELECT GIN#” on APPLICATION CONDITION SETTING window is set with other than 0, it is impossible to switch to the thickness measure mode by using the programming pendant.
- While above universal signal is input, to switch again to the thickness measure mode after the measure mode is canceled by one of the operations described in “*How to Cancel Thickness Measure Mode*” on page 9-180, turn off then on the universal signal.

## 4. Execute the job.

- The “TH” tag value of SVSPOT instruction will be rewritten with the detected workpiece thickness, the value when the pressure reaches the touch pressure, at each weld point.

The following formula is used to calculate the “TH” value.

Value of measured workpiece thickness  
 = Gun axis position at the touch detection (mm)  
 + DMF (Fixed side wear amount + Movable side wear amount, mm)  
 – SMF (Fixed side tip mounting error + Movable side tip mounting error, mm)

- The value close to the actual workpiece thickness can be obtained by considering the gun bend or pushing length. The following parameter can decide whether to consider the gun bend or pushing length.

A1P59: Consider the gun bend or pushing length when detecting workpiece thickness

0 : Not consider the gun bend and pushing length.

1 : Consider the gun bend length.

The value of measured workpiece thickness is compensated by the gun bend length calculated with the following formula.

“GUN ARM BEND COEF.” of the gun condition file  
 x Touch pressure

2 : Consider the gun pushing length.

The value of measured workpiece thickness is compensated by the gun pushing length calculated with the following formula.

“GUN PUSHING COEF” of the gun condition file  
 x Touch pressure



- Do not change the above parameter between when measuring and when monitoring. Detection cannot be performed properly.
- A1P59 is set with 2 (The gun pushing amount is considered) as the default.

### ■ Execution of Workpiece Thickness Monitoring



- Set the mode switch of programming pendant to the play mode.
- Cancel the thickness measure mode.  
\* Refer to “How to Cancel Thickness Measure Mode” on page 9-180.

If playback of a job is performed with the thickness measure mode canceled, the workpiece thickness detected at each weld point is compared with the value of “TH”, “THA”, and “THM” tag.

If the comparison result is not acceptable, the alarm “Thickness Error” occurs.

The formula for comparison is as follow.

For THM tag:

[Acceptable Result]

$$TH - THM \leq \text{The detected thickness} \leq TH + THM$$

[Not-Acceptable Result]

$$TH - THM > \text{The detected thickness}$$

Or

$$\text{The detected thickness} > TH + THM$$

For THA tag:

[Acceptable Result]

$$TH - (TH \times THA / 100) \leq \text{The detected thickness} \\ TH + (TH \times THA / 100)$$

[Not-Acceptable Result]

$$TH - (TH \times THA / 100) > \text{The detected thickness}$$

Or

$$\text{The detected thickness} > TH + (TH \times THA / 100)$$



By modifying the following items on APPLICATION CONDITION SETTING window, the universal output is output by pulse (pulse width: 100 msec) instead of generating alarms when the result of comparing is NG.

- Thickness error notice  
Select "Alarm" or "Signal".
- Thickness error notice gout#  
This item is indicated when "Signal" is selected to {Thickness error notice}.  
Set a pulse output signal which is output when the result is NG.



The job execution is not suspended even if the result is NG when "Signal" is selected to {Thickness error notice}.

At this time, whether to execute SVSPOT/SVSPOTMOV instructions or to skip the execution and execute the next instruction can be set with the following parameters

- AIP60: Specifying the operation of SVSPOT/SVSPOTMOV instructions which was detected to be NG.
  - 0 : Execute SVSPOT/SVSPOTMOV instructions which was detected to be NG.
  - 1 : Skip SVSPOT/SVSPOTMOV instructions which was detected to be NG and execute the next instruction.

## 9.14.8.4 Related Functions

- **Signal Output during Thickness Measure Mode**

During the thickness measure mode, the universal output set in the parameter S4C165 is turned ON. For example, if the parameter S4C168 is 20 (S4C168=20), OUT20 is turned ON.”.

This parameter can be used to stop welding during the thickness measure mode.

- **Disabling Thickness Monitoring**

While the universal input signal specified to “THICKNESS ALARM IGNORE GIN#” on APPLICATION CONDITION SETTING window is input, the workpiece thickness monitoring function is disabled, and the same operation is performed as when the TH tag is unused.

THICKNESS ALARM IGNORE GIN#

0 : Not used

1 to 2048 : When the specified universal signal is input, the workpiece thickness monitoring function is disabled.

- **Display and Output of Detected Thickness**



- The detected thickness is displayed in mm on the SPOT SUPERVISION window.
- The latest detected thickness is always displayed on the window.
- Even if the power to the controller is turned OFF, the detected thickness value will remain.
- If the value is set to the setting “M” of “DETECTED THICKNESS” on the SPOT SUPERVISION window, the detected thickness value is output to the register of the set number.

1. Select {SPOT WELDING} under {Main Menu}, then select {SPOT SUPERVISION}.



- SPOT SUPERVISION window appears.



- Set the value to the setting "M" of "THICKNESS DETECTED". Set the register number when outputting the detected thickness value to register.



#### ■ How to Cancel Thickness Measure Mode

- Cancel the thickness measure mode, and switched to the monitoring mode.
  - Performing one of the following operations cancels the thickness measure mode and switches to the monitoring mode:
    - 1) Execution of END instruction in Playback
    - 2) Switching to Teach Mode
    - 3) Canceling [THICKNESS MEASURE] from the menu

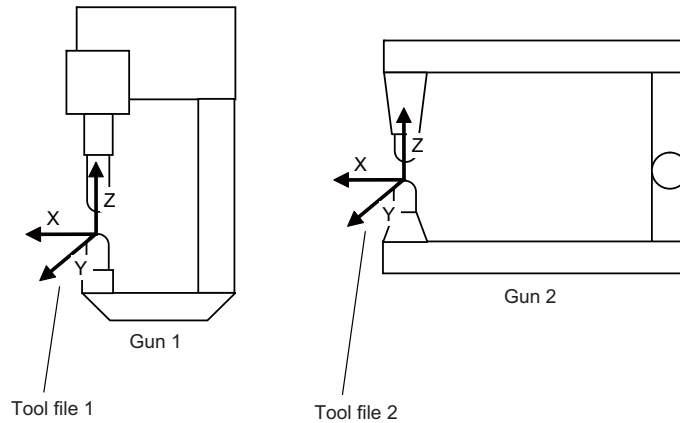
## 9.14.8.5 Notes

1. It is recommended that the "TH" tag of SVSPOT/SVSPOTMOV instruction be set just before thickness measurement after teaching operation.  
If the "TH" tag is specified before that, the alarm "Thickness Error" may occur during test operation, which results in less operating efficiency.
2. The value of detected workpiece thickness is affected by the delay of detection timing and gun arm bend at the touch motion. Therefore, an absolute accuracy cannot be guaranteed.  
The faster the touch speed becomes and the more the touch pressure increases, the bigger the error will be. If the pressure specified in the thickness measure mode is equal to that in the monitoring mode, the absolute accuracy will be approximately 1 mm or less.
3. The detected workpiece thickness is calculated by converting the pulse data at touch detection to the stroke according to the pulse-to-stroke conversion table registered in the Gun Condition file.  
Therefore, the detected workpiece thickness is affected by the accuracy of the pulse-to-stroke conversion data.

**9.14.9 Automatic Tool Number Select Function for Guns**

When using a JOB including a gun, a tool corresponding to the gun can be automatically selected by this function.

If more than one gun are used in cases such as the gun change, set the tool file corresponding to each gun according to *section 9.4.3 "Registering the Operation Tool" on page 9-41*



When teaching a gun, the appropriate tool needs to be selected according to the gun for teaching. This tool selection can be automatically performed by this function .

The automatic tool selection is performed when a JOB is selected and an executed JOB is changed by a CALL or JUMP instruction. However, if a JOB does not include a robot or gun, the tool remains unchanged.

Also, even if a tool is selected by this function, it can be manually changed to other ones. (Refer to *section 2.3.4.1 "Selecting Tool" on page 2-11.*)

The correspondence of a gun and a tool number needs to be performed in the gun condition file.

**9.14.9.1 Setting of Validating the Function**

When using the automatic tool number select function for guns, validate "AUTO TOOL NO. SELECT FOR GUN" on the application condition setting window. (Refer to *section 9.4.7 "Application Condition Setting" on page 9-50* for the operating procedure.)

When setting "GUN INSTALLATION STATUS" in the gun condition file for "FIXED", the automatic tool selection is not performed to the gun even if this function is validated.

**9.14.9.2 Setting of Tool Number**

Set "TOOL NO." in the gun condition file.

(Refer to *section 9.4.1 "Gun Condition File" on page 9-23* for the operating procedure.)

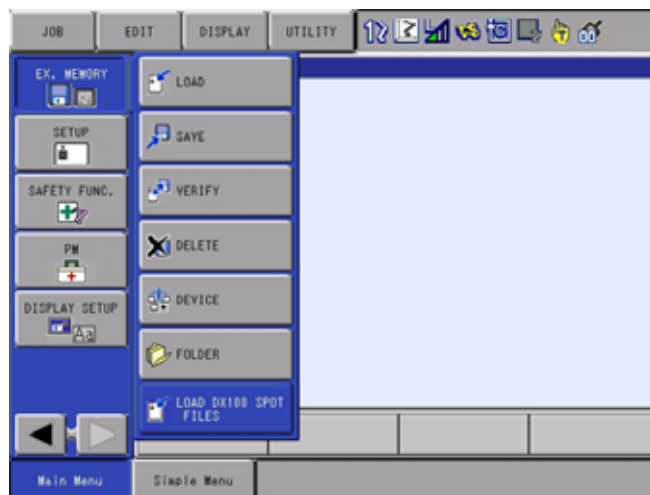
## 9.15 Loading the DX100 Motor Gun Condition File

Some files in the DX100 motor gun condition files cannot be loaded to the DX200 due to different formats. Thus, load the DX100 condition files in the table below to the DX200 by using the {LOAD DX100 SPOT FILES} in the sub-menu of the {EX. MEMORY} in the main menu.

The DX100 condition file to be loaded	The DX200 condition file to which the setting in the loaded files are reflected
Motor Gun Pressure Data SPRESS.CND	Motor Gun Pressure Data SGPRS.CND
Pressure Data SPRESSCL.CND	Pressure Data SGPRSCL.CND
Spot Gun Cond Data SGUN.DAT	Spot Gun Cond Data SGSPEC.DAT
	Gun Detail Setting SGDTL.DAT
	Spot Management Data SGSPTMNG.DAT
Spot I/O Allocation data SPOTIO.DAT	Spot I/O Allocation Data SGIO.DAT
Spot Welder Cond Data SWELDER.DAT	Spot Welder IF Data SGWELDIF.DAT
Clearance Setting CLEARNCE.DAT	Clearance Setting SGCLARNC.DAT

### ■ Operation

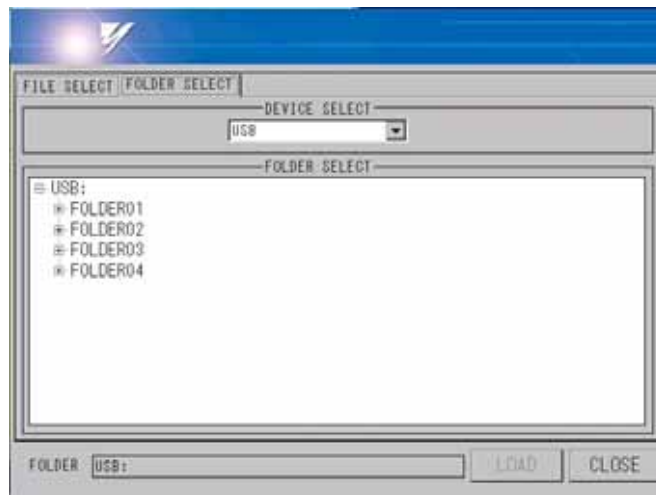
1. Select {LOAD DX100 SPOT FILES} in the {EX.MEMORY}.



- The Load DX100 Spot Files window appears.

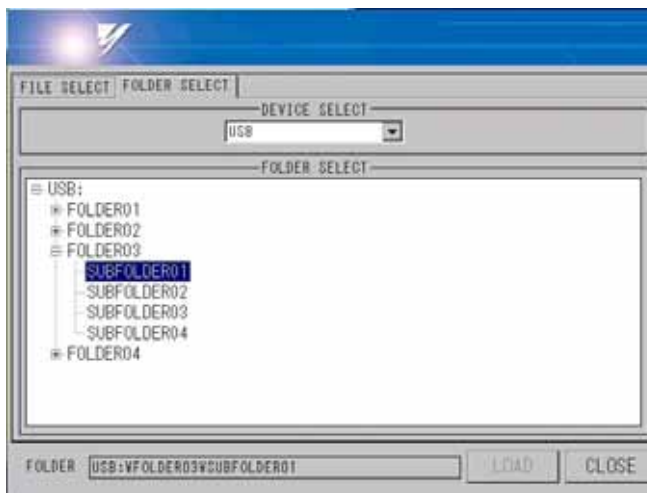


2. Select {FOLDER SELECT} tab.



3. Select the connecting device in the DEVICE SELECT combo box.

4. Select the folder containing the files to be loaded in the FOLDER SELECT list.

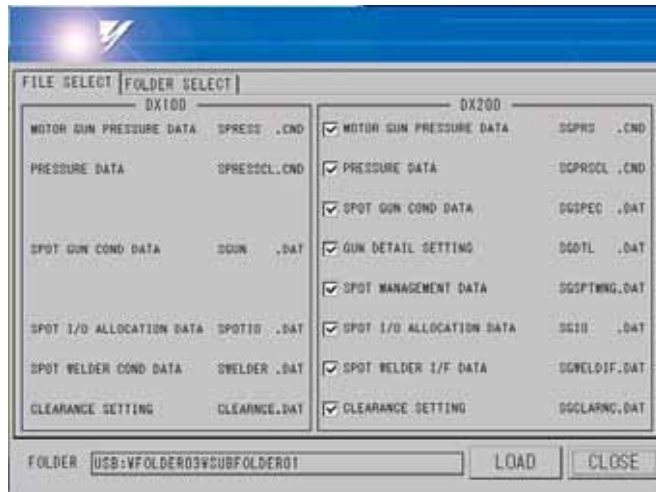


5. Select {FILE SELECT} tab.

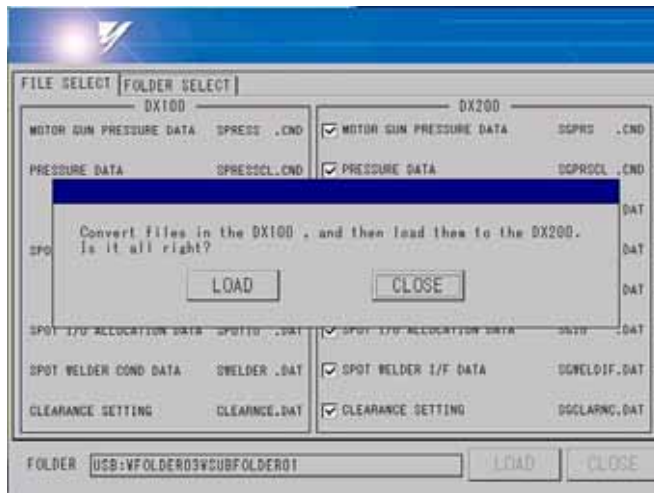




6. Select the item(s) to load in the DX200 file list.



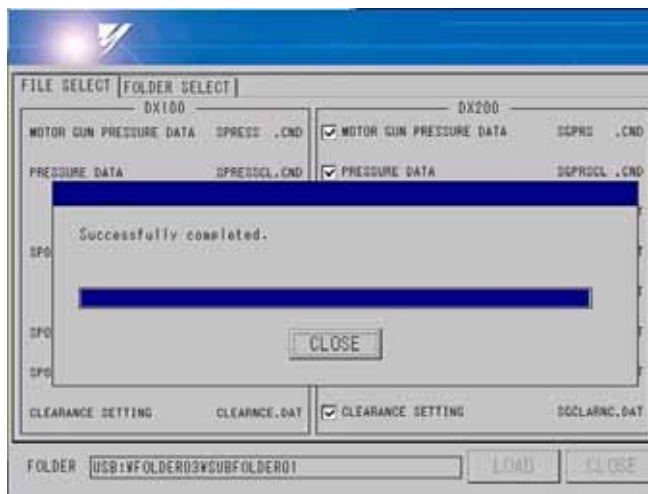
7. Press {LOAD} in the bottom right in the window.  
 – The confirmation dialog appears.



## 9 Spot Welding Application Using a Motor Gun

### 9.15 Loading the DX100 Motor Gun Condition File

8. Press {LOAD} in the dialog box.
  - The selected condition files are loaded.



9. Press {CLOSE} in the dialog box.
  - The dialog box is closed.



10. Press {CLOSE} in the bottom right in the window.
  - The Load DX100 Spot Files window is closed.

## 9.16 The Instruction List (Motor Gun)

The following table shows the instruction list regarding the motor gun.

- <> indicates numerical or alphabetical data.
- If multiple items are shown in one section, select one of the items.

SVSPOT	Function	Executes the gun pressure and welding.		
	<b>Additional Item</b>	GUN# (<gun 1 condition file number>)	1 to 12	
		PRESS# (<gun 1 pressure file number>)	1 to 255	
		WP= <gun 1 pressure value>	1 to 9999N	
		WTM=<gun 1 welding condition>	1 to 255	
		WST=<gun 1 welder startup timing>	0 to 2	
		BWS=<gun 1 start stroke position>	0.0 to 1000.0mm	
		WGO=<gun 1 group output>	0 to 255	
		TH=<gun 1 thickness>	-999.9 to 999.9mm	
		THA=<gun 1 thickness allowable range>	0 to 100%	
		THM=<gun 1 thickness allowable range>	0 to 10.0mm	
		GUN# (<gun 2 condition file number>)	1 to 12	
		PRESS# (<gun 2 pressure file number>)	1 to 255	
		WP= <gun 1 pressure value>	1 to 9999N	
		WTM=<gun 2 welding condition>	1 to 255	
		WST=<gun 2 welder startup timing>	0 to 2	
		BWS=<gun 2 start stroke position>	0.0 to 1000.0mm	
		WGO=<gun 2 group output>	0 to 255	
		TH=<gun 2 thickness>	-999.9 to 999.9mm	
		THA=<gun 2 thickness allowable range>	0 to 100%	
		THM=<gun 2 thickness allowable range>	0 to 10.0mm	
		GUN# (<gun 3 condition file number>)	1 to 12	
		PRESS# (<gun 3 pressure file number>)	1 to 255	
		WP= <gun 3 pressure value>	1 to 9999N	
		WTM=<gun 3 welding condition>	1 to 255	
		WST=<gun 3 welder startup timing>	0 to 2	
		BWS=<gun 3 start stroke position>	0.0 to 1000.0mm	
		WGO=<gun 3 group output>	0 to 255	
		TH=<gun 3 thickness>	-999.9 to 999.9mm	
		THA=<gun 3 thickness allowable range>	0 to 100%	
		THM=<gun 3 thickness allowable range>	0 to 10.0mm	
		BCOFF (<bend compensation invalid>)		
		<b>Example</b>	MOVL V=1000 SVSPOT GUN#(1) PRESS#(1) WTM=1 WST=1MOVL V=1000	

<b>SVGUNCL</b>	<b>Function</b>	Executes the gun pressure.	
	<b>Additional Item</b>	GUN# (<gun 1 condition file number>)	1 to 12
		PRESSCL# (<dry pressure file number>) WP=<gun pressure value>, PRESSSTWC (<wear detection condition>), DRS# (< tip dress condition file number>)	1 to 32 1 to 9999N 1 to 16
		TWC-A (<wear detection motion>) TWC-B (<wear detection motion>) TWC-C (<wear detection motion>) TWC-AE (<tip mounting error detection motion>) TWC-BE (<tip mounting error detection motion>) T=<pressure time> ON/OFF (<ON/OFF>)	
	<b>Example</b>	MOVL V=1000 SVGUNCL GUN#(1) PRESSCL#(1) MOVL V=1000	
<b>SVSPOTMOV</b>	<b>Function</b>	Executes the motion to the clearance position, the gun pressure and welding.	
	<b>Additional Item</b>	V=<play speed>	0.1 to the max speed mm/sec
		VCL=<gun pressure speed>	0.1 to the max speed mm/sec
		VOP=<gun open speed>	0.1 to the max speed mm/sec
		PLIN= <position IN level >	0 to 8
		PLOUT= <position OUT level>	0 to 8
		CLF# (<clearance file number>)	1 to 32
		GUN# (<gun condition file number>)	1 to 12
		PRESS# (<gun pressure file number>) WP= (gun pressure value)	1 to 255 1 to 9999N
		WTM= (welding condition)	1 to 255
		WST= (welder startup timing)	0 to 2
		WGO= (group output)	0 to 255
		TH= (thickness)	-999.9 to 999.9mm
		THA= (thickness allowable range) THM= (thickness allowable range)	0 to 100% 0 to 10.0mm
		BCOFF (<bend compensation invalid>)	
<b>Example</b>	SVSPOTMOV V=1600.0 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1		

<b>SVDRESMOV</b>	<b>Function</b>	Executes the motion to the clearance position, the gun pressure and the dress.	
	<b>Additional Item</b>	V=<play speed>	0.1 to the max speed mm/sec
		VCL=<gun pressure speed>	0.1 to the max speed mm/sec
		VOP=<gun open speed>	0.1 to the max speed mm/sec
		PLIN= <position IN level >	0 to 8
		PLOUT= <position OUT level>	0 to 8
		GUN# (<gun condition file number>)	1 to 12
		DRS# (<tip dress condition file number>)	1 to 16
	<b>Example</b>	SVDRESMOV V=1600.0 GUN#(1) DRS#(1)	
<b>DRESSON</b>	<b>Function</b>	Rotates the dresser.	
	<b>Additional Item</b>	DRS# (<tip dress condition file number>)	1 to 16
	<b>Example</b>	DRESSONDRS#(1)	
<b>DRESSOF</b>	<b>Function</b>	Stops rotating the dresser.	
	<b>Additional Item</b>	DRS# (<tip dress condition file number>)	1 to 16
	<b>Example</b>	DRESSOF DRS#(1)	
<b>GUNCHG</b>	<b>Function</b>	Connects or disconnects the gun.	
	<b>Additional Item</b>	GUN# (<gun condition file number>)	1 to 12
		PICK (<connect the gun>) PLACE (<disconnect the gun>)	
	<b>Example</b>	GUNCHG GUN#(1) PICK	

## 10 Table of Basic Instructions

- <> indicates numerical or alphabetical data.
- If multiple items are shown in one section, select one of the items.

### 10.1 Move Instructions

<b>MOVJ</b>	<b>Function</b>	Moves to a taught point with joint interpolation type.		
	<b>Additional Item</b>	Position data, Base axis position data, Station axis position data	These data do not appear on the screen.	
		VJ=<play speed>	VJ: 0.01 to 100.00%	
		PL=<position level>	PL:0 to 8	
		NWAIT		
		UNTIL statement		
		ACC=(acceleration adjustment ratio)	ACC: 20 to 100%	
		DEC=(deceleration adjustment ratio)	DEC: 20 to 100%	
<b>Example</b>	MOVJ VJ=50.00 PL=2 NWAIT UNTIL IN#(16)=ON			
<b>MOVL</b>	<b>Function</b>	Moves to a taught point with linear interpolation type.		
	<b>Additional Item</b>	Position data, Base axis position data, Station axis position data	These data do not appear on the screen.	
		V=<play speed>, VR=<play speed of the posture>, VE=<play speed of external axis>	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%	
		PL=<position level>	PL:0 to 8	
		CR=(corner radius)	CR: 0.1 to 6553.5mm	
		NWAIT		
		UNTIL statement		
		ACC=(acceleration adjustment ratio)	ACC: 20 to 100%	
		DEC=(deceleration adjustment ratio)	DEC: 20 to 100%	
		COORD= (Arc attitude control specification)	COORD: 0 to 1	
		FPT: Arc end-point setting		
		<b>Example</b>	MOVL V=138 PL=0 NWAIT UNTIL IN#(16)=ON	

<b>MOVC</b>	<b>Function</b>	Moves to a taught point with circular interpolation type.	
	<b>Additional Item</b>	Position data, Base axis position data, Station axis position data	These data do not appear on the screen.
		V=<play speed>, VR=<play speed of the posture>, VE=<play speed of external axis>	Same as MOVL.
		PL=<position level>	PL:0 to 8
		NWAIT	
		ACC=(acceleration adjustment ratio)	ACC: 20 to 100%
		DEC=(deceleration adjustment ratio)	DEC: 20 to 100%
<b>Example</b>	MOVC V=138 PL=0 NWAIT		
<b>MOVS</b>	<b>Function</b>	Moves to a taught point with spline interpolation type.	
	<b>Additional Item</b>	Position data, Base axis position data, Station axis position data	These data do not appear on the screen.
		V=<play speed>, VR=<play speed of the posture>, VE=<play speed of external axis>	Same as MOVL.
		PL=<position level>	PL:0 to 8
		NWAIT	
		ACC=(acceleration adjustment ratio)	ACC: 20 to 100%
		DEC=(deceleration adjustment ratio)	DEC: 20 to 100%
<b>Example</b>	MOVS V=120 PL=0		
<b>IMOV</b>	<b>Function</b>	Moves the specified increment from the current position with linear interpolation type.	
	<b>Additional Item</b>	P<variable number>, BP<variable number>, EX<variable number>	
		V=<play speed>, VR=<play speed of the posture>, VE=<play speed of external axis>	Same as MOVL.
		PL=<position level>	PL:0 to 8
		NWAIT	
		BF,RF,TF,UF# (<user coordinate number>)	BF: base coordinates RF: robot coordinates TF: tool coordinates UF: user coordinates
		UNTIL statement	
		ACC=(acceleration adjustment ratio)	ACC: 20 to 100%
DEC=(deceleration adjustment ratio)	DEC: 20 to 100%		
<b>Example</b>	IMOV P000 V=138 PL=1 RF		
<b>REFP</b>	<b>Function</b>	Defines a reference point (e.g. wall point for weaving).	
	<b>Additional Item</b>	<reference point number>	
		Position data, Base axis position data, Station axis position data	wall point 1 for weaving: 1 wall point 2 for weaving: 2
<b>Example</b>	REFP 1 P000		

<b>SPEED</b>	<b>Function</b>	Sets play speed.	
	<b>Additional Item</b>	VJ=<joint speed>, V=<TCP speed>, VR=<play speed of the posture>, VE=<play speed of external axis>	VJ:Same as MOVJ. V,VR,VE: Same as MOVL.
	<b>Example</b>	SPEED VJ=50.00	



## CAUTION

When start IMOV instruction again after IMOV instruction was aborted due to execute the following operations, the manipulator moves the added values, which is set anew from the aborted position, in the linear interpolation. The values become greater than the set added value. Please do not execute the IMOV instruction when changing move distance by the abort causes a problem.

- External servo OFF signal 2 (#40066)
- Turning OFF the servo power due to alarm occurring
- Enable signal
- Mode switch
- Enable switch



## 10.2 I/O Instructions

<b>DOUT</b>	<b>Function</b>	Turns the external output signals ON and OFF.	
	<b>Additional Item</b>	OT# (<output number>), OGH# (<output group number>), OG# (<output group number>)	
		Number of addressed output signals: OT#(xx)=1;OGH#(xx)=4(per group); OG#(xx)=8(per group)	
	<b>Example</b>	DOUT OT#(12) ON	
<b>PULSE</b>	<b>Function</b>	Outputs a pulse signal as an external output signal.	
	<b>Additional Item</b>	OT# (<output number>), OGH# (<output group number>), OG# (<output group number>)	
		T=<time (seconds)>	0.01 to 655.35 s 0.30 s unless otherwise specified
	<b>Example</b>	PULSE OT# (10) T=0.60	
<b>DIN</b>	<b>Function</b>	Sets input signals in variables.	
	<b>Additional Item</b>	B<variable number>	
		IN# (<input number>), IGH# (<input group number>), IG# (<input group number>), OT# (<output number>), OGH# (<output group number>), OG# (<output group number>), SIN# (<system input number>), SOUT# (<system output number>)	
		Number of addressed input signals: IN#(xx)=1;IGH#(xx)=4(per group); IG#(xx)=8(per group)	
		Number of addressed output signals: OT#(xx)=1;OGH#(xx)=4(per group); OG#(xx)=8(per group)	
		IGH#(xx) and OGH#(xx) are not subject to parity check; only the binary specification is allowed.	
	<b>Example</b>	DIN B016 IN#(16) DIN B002 IG#(2)	

<b>WAIT</b>	<b>Function</b>	Waits until the external input signal status matches the specified status.	
	<b>Additional Item</b>	IN# (<input number>), IGH# (<input group number>), IG# (<input group number>), OT# (<user output number>), OGH# (<output group number>), SIN# (<system input number>), SOUT# (<system output number>) B<variable number>	
		T=<time (seconds)>	0.01 to 655.35 s
	<b>Example</b>	WAIT IN# (12)=ON T=10.00 WAIT IN# (12)=B002	
<b>AOUT</b>	<b>Function</b>	Outputs the specified voltage to the general-purpose analog output port.	
	<b>Additional Item</b>	AO# (<output port number>)	1 to 40
		<output voltage(V)>	-14.0 to 14.0 V
	<b>Example</b>	AOUT AO# (2) 12.7	
<b>ARATION</b>	<b>Function</b>	Starts the analog output corresponding to the speed.	
	<b>Additional Item</b>	AO#(<output port number>)	1 to 40
		BV = <basic voltage>	-14.00 to 14.00 V
		V = <basic speed>	0.1 to 1500.0 mm/s 1 to 9000 cm/min
		OFV = <offset voltage>	-14.00 to 14.00 V
<b>Example</b>	ARATION AO#(1) BV=10.00 V=200.0 OFV=2.00		
<b>ARATIOF</b>	<b>Function</b>	Ends the analog output corresponding to the speed.	
	<b>Additional Item</b>	AO#(<output port number>)	1 to 40
	<b>Example</b>	ARATIOF AO#(1)	

### 10.3 Control Instructions

<b>JUMP</b>	<b>Function</b>	Jumps to the specified label or job.	
	<b>Additional Item</b>	* <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)	
		IF statement	
<b>Example</b>	JUMP JOB:TEST1 IF IN#(14)=OFF		
<b>*</b> <b>(label)</b>	<b>Function</b>	Indicates a jump destination.	
	<b>Additional Item</b>	<jump destination>	8 characters or less
	<b>Example</b>	*123	
<b>CALL</b>	<b>Function</b>	Calls the specified job.	
	<b>Additional Item</b>	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)	
		IF statement	
		<b>Example</b>	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.)
<b>RET</b>	<b>Function</b>	Returns to the call source job.	
	<b>Additional Item</b>	B<variable number>, I<variable number>, D<variable number>, R<variable number>, S<variable number>, Constant, String	
		IF statement	
<b>Example</b>	RET IF IN#(12)=OFF		
<b>END</b>	<b>Function</b>	Declares the end of a job.	
	<b>Additional Item</b>		
	<b>Example</b>	END	

Spot Weld Motor Gun 10 Table of Basic Instructions  
10.3 Control Instructions

<b>NOP</b>	<b>Function</b>	No operation.	
	<b>Additional Item</b>		
	<b>Example</b>	NOP	
<b>TIMER</b>	<b>Function</b>	Stops for the specified time.	
	<b>Additional Item</b>	T=<time (seconds)>	0.01 to 655.35 s
	<b>Example</b>	TIMER T=12.50	
<b>IF statement</b>	<b>Function</b>	Evaluates the specified condition and makes a judgment accordingly. Described after an instruction that specifies a certain action. Format:<Item1>=,<>,<=,>=,<,><Item2>	
	<b>Additional Item</b>	<Item1>	
	<b>Example</b>	JUMP *12 IF IN#(12)=OFF	
<b>UNTIL statement</b>	<b>Function</b>	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.	
	<b>Additional Item</b>	IN# (<input number>)	
	<b>Example</b>	MOVL V=300 UNTIL IN#(10)=ON	
<b>PAUSE</b>	<b>Function</b>	Instructs a pause.	
	<b>Additional Item</b>	IF statement	
	<b>Example</b>	PAUSE IF IN#(12)=OFF	
<b>(comment)</b>	<b>Function</b>	Displays a comment.	
	<b>Additional Item</b>	<comment>	32 characters or less
	<b>Example</b>	'Draws 100mm size square.	
<b>CWAIT</b>	<b>Function</b>	Waits for execution of the instruction on the next line. Used with the NWAIT tag which is an additional item of a move instruction.	
	<b>Additional Item</b>		
	<b>Example</b>	MOVL V=100 NWAIT DOUT OT#(1) ON CWAIT DOUT OT#(1) OFF MOVL V=100	
<b>ADVINIT</b>	<b>Function</b>	Initializes the prereading instruction processing. Used to adjust the access timing for variable data.	
	<b>Additional Item</b>		
	<b>Example</b>	ADVINIT	
<b>ADVSTOP</b>	<b>Function</b>	Stops the prereading instruction processing. Used to adjust the access timing for variable data.	
	<b>Additional Item</b>		
	<b>Example</b>	ADVINIT	

## 10.4 Shift Instructions

<b>SFTON</b>	<b>Function</b>	Starts a shift operation.		
	<b>Additional Item</b>	P<variable number>, BP<variable number>, EX<variable number>, BF,RF,TF, UF#(<user coordinate number>)	BF: base coordinates RF: robot coordinates TF: tool coordinates UF: user coordinates	
	<b>Example</b>	SFTON P001 UF#(1)		
<b>SFTOF</b>	<b>Function</b>	Stops a shift operation.		
	<b>Additional Item</b>			
	<b>Example</b>	SFTOF		
<b>MSHIFT</b>	<b>Function</b>	Obtains the shift value in the specified coordinate system from Data 2 and 3, and stores the obtained element values in Data 1. Format:MSHIFT <Data1><Coordinate><Data2><Data3>		
	<b>Additional Item</b>	Data1	PX<variable number>	
		Coordinate	BF,RF,TF, UF# (<user coordinate number>), MTF	BF: base coordinates RF: robot coordinates TF: tool coordinates UF: user coordinates MTF: tool coordinates for the master
		Data2	PX<variable number>	
		Data3	PX<variable number>	
	<b>Example</b>	MSHIFT PX000 RF PX001 PX002		

## 10.5 Operating Instructions

<b>ADD</b>	<b>Function</b>	Adds Data1 and Data2, and stores the result in Data1. Format:ADD<Data1><Data2>		
	<b>Additional Item</b>	Data1	B<variable number>, I<variable number>, D<variable number>, R<variable number>, P<variable number>, BP<variable number>, EX<variable number>	Data1 must always be a variable.
		Data2	Constant, B<variable number>, I<variable number>, D<variable number>, R<variable number>, P<variable number>, BP<variable number>, EX<variable number>	
	<b>Example</b>	ADD I012 I013		
<b>SUB</b>	<b>Function</b>	Subtracts Data2 from Data1, and stores the result in Data1. Format:SUB<Data1><Data2>		
	<b>Additional Item</b>	Data1	B<variable number>, I<variable number>, D<variable number>, R<variable number>, P<variable number>, BP<variable number>, EX<variable number>	Data1 must always be a variable.
		Data2	Constant, B<variable number>, I<variable number>, D<variable number>, R<variable number>, P<variable number>, BP<variable number>, EX<variable number>	
	<b>Example</b>	SUB I012 I013		

<b>MUL</b>	<b>Function</b>	Multiplies Data1 by Data2, and stores the result in Data1. Format: MUL<Data1><Data2>		
	<b>Additional Item</b>	Data1	B<variable number>, I<variable number>, D<variable number>, R<variable number>, P<variable number> (<element number>), BP<variable number> (<element number>), EX<variable number> (<element number>)	Data1 must always be a variable.
		Data2	Constant, B<variable number>, I<variable number>, D<variable number>, R<variable number>	
	<b>Example</b>	MUL I012 I013 MUL P000 (3) 2 (Multiply the Z-axis data by 2.)		
<b>DIV</b>	<b>Function</b>	Divides Data1 by Data2, and stores the result in Data1. Format: DIV<Data1><Data2>		
	<b>Additional Item</b>	Data1	B<variable number>, I<variable number>, D<variable number>, R<variable number>, P<variable number> (<element number>), BP<variable number> (<element number>), EX<variable number> (<element number>)	Data1 must always be a variable.
		Data2	Constant, B<variable number>, I<variable number>, D<variable number>, R<variable number>	
	<b>Example</b>	DIV I012 I013 DIV P000 (3) 2 (Divide the Z-axis data by 2.)		
<b>INC</b>	<b>Function</b>	Increments the value of the specified variable by 1.		
	<b>Additional Item</b>	B<variable number>, I<variable number>, D<variable number>		
	<b>Example</b>	INC I043		

<b>DEC</b>	<b>Function</b>	Decrements the value of the specified variable by 1.		
	<b>Additional Item</b>	B<variable number>, I<variable number>, D<variable number>		
	<b>Example</b>	DEC I043		
<b>AND</b>	<b>Function</b>	Obtains the AND of Data1 and Data2, and stores the result in Data1. Format:AND<Data1><Data2>		
	<b>Additional Item</b>	Data1	B<variable number>	
		Data2	B<variable number>, Constant	
<b>Example</b>	AND B012 B020			
<b>OR</b>	<b>Function</b>	Obtains the OR of Data1 and Data2, and stores the result in Data1. Format:OR<Data1><Data2>		
	<b>Additional Item</b>	Data1	B<variable number>	
		Data2	B<variable number>, Constant	
<b>Example</b>	OR B012 B020			
<b>NOT</b>	<b>Function</b>	Obtains the NOT of Data2, and stores the result in Data1. Format:NOT<Data1><Data2>		
	<b>Additional Item</b>	Data1	B<variable number>	
		Data2	B<variable number>, Constant	
<b>Example</b>	NOT B012 B020			
<b>XOR</b>	<b>Function</b>	Obtains the exclusive OR of Data1 and Data2, and stores the result in Data1. Format:XOR<Data1><Data2>		
	<b>Additional Item</b>	Data1	B<variable number>	
		Data2	B<variable number>, Constant	
<b>Example</b>	XOR B012 B020			
<b>SET</b>	<b>Function</b>	Sets Data2 to Data1. Format:SET<Data1><Data2>		
	<b>Additional Item</b>	Data1	B<variable number>, I<variable number>, D<variable number>, R<variable number>, P<variable number>, S<variable number>, BP<variable number>, EX<variable number>	Data1 must always be a variable.
		Data2	Constant, B<variable number>, I<variable number>, D<variable number>, R<variable number>, EXPRESS	
<b>Example</b>	SET I012 I020			



<b>SETE</b>	<b>Function</b>	Sets data to an element in a position variable. Pxxx(1): 1st axis data, Pxxx(2): 2nd axis data, Pxxx(3): 3rd axis data, Pxxx(4): 4th axis data, Pxxx(5): 5th axis data, Pxxx(6): 6th axis data, Pxxx(7): 7th axis data, Pxxx(8): 8th axis data	
	<b>Additional Item</b>	Data 1	P<variable number> (<element number>), BP<variable number> (<element number>), EX<variable number> (<element number>)
		Data 2	D<variable number>, double-precision integer type constant
	<b>Example</b>	SETE P012 (3) D005	
<b>GETE</b>	<b>Function</b>	Extracts an element in a position variable. Pxxx(1): 1st axis data, Pxxx(2): 2nd axis data, Pxxx(3): 3rd axis data, Pxxx(4): 4th axis data, Pxxx(5): 5th axis data, Pxxx(6): 6th axis data, Pxxx(7): 7th axis data, Pxxx(8): 8th axis data	
	<b>Additional Item</b>	D<variable number>	
		P<variable number> (<element number>), BP<variable number> (<element number>), EX<variable number> (<element number>)	
	<b>Example</b>	GETE D006 P012 (4)	
<b>GETS</b>	<b>Function</b>	Sets a system variable to the specified variable.	
	<b>Additional Item</b>	B<variable number>, I<variable number>, D<variable number>, R<variable number>, PX<variable number>, S<variable number>	
		\$B<variable number>, \$I<variable number>, \$D<variable number>, \$R<variable number>, \$PX<variable number>, \$RV	
	<b>Example</b>	GETS B000 \$B000 GETS I001 \$I[1] GETS PX003 \$PX001	

<b>CNVRT</b>	<b>Function</b>	Converts the position variable (Data2) into a position variable of the specified coordinate system, and stores the converted variable in Data1. Format:CNVRT<Data1><Data2> coordinate tool		
	<b>Additional Item</b>	Data1	PX<variable number>	
		Data2	PX<variable number>	
		BF,RF,TF,UF# (<user coordinate number>),MTF		BF: base coordinates RF: robot coordinates TF: tool coordinates UF: user coordinates MTF:tool coordinates for the master
		TL#(<tool number>)		
<b>Example</b>	CNVRT PX000 PX001 BF			
<b>CLEAR</b>	<b>Function</b>	Starting with the variable number in Data1, clears (sets to zero) as many variables as specified by a number in Data2. Format:CLEAR<Data1><Data2>		
	<b>Additional Item</b>	Data1	B<variable number>, I<variable number>, D<variable number>, R<variable number>, \$B<variable number>, \$I<variable number>, \$D<variable number>, \$R<variable number>,	
		Data2	<number of variables>, 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.
	<b>Example</b>	CLEAR B000 ALL CLEAR STACK		
<b>SIN</b>	<b>Function</b>	Obtains the sine of Data2, and stores the result in Data1. Format:SIN<Data1><Data2>		
	<b>Additional Item</b>	Data1	R<variable number>	Data1 must always be a real type variable.
		Data2	<constant>, R<variable number>	
	<b>Example</b>	SIN R000 R001 (Sets the sine of R001 to R000.)		
<b>COS</b>	<b>Function</b>	Obtains the cosine of Data2, and stores the result in Data1. Format:COS<Data1><Data2>		
	<b>Additional Item</b>	Data1	R<variable number>	Data1 must always be a real type variable.
		Data2	<constant>, R<variable number>	
	<b>Example</b>	COS R000 R001 (Sets the cosine of R001 to R000.)		

<b>ATAN</b>	<b>Function</b>	Obtains the arc tangent of Data2, and stores the result in Data1. Format: ATAN<Data1><Data2>		
	<b>Additional Item</b>	Data1	R<variable number>	Data1 must always be a real type variable.
		Data2	<constant>, R<variable number>	
	<b>Example</b>	ATAN R000 R001 (Sets the arc tangent of R001 to R000.)		
<b>SQRT</b>	<b>Function</b>	Obtains the square root of Data2, and stores the result in Data1. Format: SQRT<Data1><Data2>		
	<b>Additional Item</b>	Data1	R<variable number>	Data1 must always be a real type variable.
		Data2	<constant>, R<variable number>	
	<b>Example</b>	SQRT R000 R001 (Sets the square root of R001 to R000.)		
<b>MFRAME</b>	<b>Function</b>	Creates a user coordinate using the position data for the given three points as definition points. <Data1> indicates the definition point ORG position data, <Data2> the definition point XX position data, and <Data3> the definition point XY position data. Format: MFRAME <user coordinate> <Data1> <Data2> <Data3>		
	<b>Additional Item</b>	UF#(<user coordinate number>) P<variable number>		User coordinate number: 1 to 63
		Data1	PX <variable number>	
		Data2	PX <variable number>	
		Data3	PX <variable number>	
<b>Example</b>	MFRAME UF#(1) PX000 PX001 PX002			
<b>MULMAT</b>	<b>Function</b>	Obtains the matrix product of Data2 and Data3, and stores the result in Data1. Format: MULMAT <Data1> <Data2> <Data3>		
	<b>Additional Item</b>	Data1	P <variable number>	
		Data2	P <variable number>	
		Data3	P <variable number>	
<b>Example</b>	MULMAT P000 P001 P002			
<b>INVMAT</b>	<b>Function</b>	Obtains the inverse matrix of Data2, and stores the result in Data1. Format: INVMAT <Data1> <Data2>		
	<b>Additional Item</b>	Data1	P <variable number>	
		Data2	P <variable number>	
<b>Example</b>	INVMAT P000 P001			
<b>SETFILE</b>	<b>Function</b>	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.		
	<b>Additional Item</b>	Contents data of a condition file	WEV#(<condition file number>)(<element number>)	
		Data1	Constant, D<variable number>	
<b>Example</b>	SETFILE WEV#(1)(1) D000			

<b>GETFILE</b>	<b>Function</b>	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.	
	<b>Additional Item</b>	Data1	D <variable number>
		Contents data of a condition file	WEV#(<condition file number>)(<element number>)
<b>Example</b>	GETFILE D000 WEV#(1)(1)		
<b>GETPOS</b>	<b>Function</b>	Stores the position data of Data2 (step number) in Data1.	
	<b>Additional Item</b>	Data1	PX <variable number>
		Data2	STEP# (<step number>)
<b>Example</b>	GETPOS PX000 STEP#(1)		
<b>VAL</b>	<b>Function</b>	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	
	<b>Additional Item</b>	Data1	B <variable number>, I <variable number>, D <variable number>, R <variable number>
		Data2	Character string, S <variable number>
		RADIX=<cardinal number>	
<b>Example</b>	VAL B000 "123"		
<b>ASC</b>	<b>Function</b>	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>	
	<b>Additional Item</b>	Data1	B <variable number>
		Data2	Character string, S <variable number>
<b>Example</b>	ASC B000 "ABC"		
<b>CHR\$</b>	<b>Function</b>	Obtains the character (ASCII) with the character code of Data2, and stores the result in Data1. Format:CHR\$<Data1><Data2>	
	<b>Additional Item</b>	Data1	S <variable number>
		Data2	Constant, B <variable number>
<b>Example</b>	CHR\$ S000 65		
<b>MID\$</b>	<b>Function</b>	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>	
	<b>Additional Item</b>	Data1	S <variable number>
		Data2	Character string, S <variable number>
		Data3	Constant, B <variable number>, I <variable number>, D <variable number>
		Data4	Constant, B <variable number>, I <variable number>, D <variable number>
<b>Example</b>	MID\$ S000 "123ABC456" 4 3		

<b>LEN</b>	<b>Function</b>	Obtains the total number of bytes of the character string (ASCII) of Data2, and stores the result in Data1. Format:LEN<Data1><Data2>		
	<b>Additional Item</b>	Data1	B <variable number>, I <variable number>, D <variable number>	
		Data2	Character string, S <variable number>	
	<b>Example</b>	LEN B000 "ABCDEF"		
<b>CAT\$</b>	<b>Function</b>	Combines the character string (ASCII) of Data2 and Data3, and stores the result in Data1. Format:CAT\$<Data1><Data2><Data3>		
	<b>Additional Item</b>	Data1	S <variable number>	
		Data2	Character string, S <variable number>	
		Data3	Character string, S <variable number>	
<b>Example</b>	CAT\$ S000 "ABC" "DEF"			

# DX200

# OPERATOR'S MANUAL

## FOR SPOT WELDING USING MOTOR GUN

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**HEAD OFFICE**

2-1 Kurosakishiroishi, Yahatanishi-ku, Kitakyushu 806-0004, Japan  
Phone +81-93-645-7703 Fax +81-93-645-7802

YASKAWA America Inc. (Motoman Robotics Division)  
100 Automation Way, Miamisburg, OH 45342, U.S.A.  
Phone +1-937-847-6200 Fax +1-937-847-6277

YASKAWA Europe GmbH (Robotics Division)  
Yaskawastrasse 1, 85391 Allershausen, Germany  
Phone +49-8166-90-100 Fax +49-8166-90-103

YASKAWA Nordic AB  
Bredbandet 1 vån. 3 varvsholmen 392 30 Kalmar, Sweden  
Phone +46-480-417-800 Fax +46-480-417-999

YASKAWA Electric (China) Co., Ltd.  
22/F One Corporate Avenue No.222, Hubin Road, Huangpu District, Shanghai 200021, China  
Phone +86-21-5385-2200 Fax +86-21-5385-3299

YASKAWA SHOUGANG ROBOT Co. Ltd.  
No7 Yongchang North Road, Beijing E&T Development Area, China 100176  
Phone +86-10-6788-2858 Fax +86-10-6788-2878

YASKAWA India Private Ltd. (Robotics Division)  
#426, Udyog Vihar, Phase- IV, Gurgaon, Haryana, India  
Phone +91-124-475-8500 Fax +91-124-475-8542

YASKAWA Electric Korea Co., Ltd  
9F, Kyobo Securities Bldg., 26-4, Yeouido-dong, Yeongdeungpo-gu, Seoul 150-737, Korea  
Phone +82-2-784-7844 Fax +82-2-784-8495

YASKAWA Electric Taiwan Corporation  
12F, No.207, Sec. 3, Beishin Rd., Shindian District, New Taipei City 23143, Taiwan  
Phone +886-2-8913-1333 Fax +886-2-8913-1513

YASKAWA Electric (Singapore) PTE Ltd.  
151 Lorong Chuan, #04-02A, New Tech Park, Singapore 556741  
Phone +65-6282-3003 Fax +65-6289-3003

YASKAWA Electric (Thailand) Co., Ltd.  
59,1st-5th Floor, Flourish Building, Soi Ratchadapisek 18,Ratchadapisek Road,  
Huaykwang, Bangkok 10310, THAILAND  
Phone +66-2-017-0099 Fax +66-2-017-0199

PT. YASKAWA Electric Indonesia  
Secure Building-Gedung B Lantai Dasar & Lantai 1 Jl. Raya Protokol Halim Perdanakusuma,  
Jakarta 13610, Indonesia  
Phone +62-21-2982-6470 Fax +62-21-2982-6741

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