XRC Controller

Multi-Layer Welding Function Manual

Part Number 145593-1

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MOTO*MAN*
805 Liberty Lane
West Carrollton, OH 45449
TEL: (937) 847-6200 FAX: (937) 847-6277
24-HOUR SERVICE HOTLINE: (937) 847-3200

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SECTION 1
INTRODUCTION

1.1 About this Document

This manual provides instructions for Multi-Layer Welding and contains the following sections:

SECTION 1 – INTRODUCTION

General information about this manual, a list of reference documents, and customer service information.

SECTION 2 – SAFETY

Provides information for the safe use and operation of Motoman products.

SECTION 3 – MULTI-LAYER WELDING FUNCTION

Provides detailed instructions to utilize the Multi-Layer Welding Function.

1.2 Reference to Other Documentation

For additional information refer to the following:

- Concurrent I/O Parameters Manual (P/N 142102-1)
- Operator's Manual for General Purpose (P/N 142099-1)
- Operator's Manual for Handling (P/N 142100-1)
- Operator's Manual for Spot Welding (P/N 142101-1)
- Operator's Manual for Arc Welding (P/N 142098-1)
- Motoman UP6, XRC Manipulator Manual (P/N 142104-1)
- Motoman UP20, XRC Manipulator Manual (P/N 144342-1)
- Motoman UP50, XRC Manipulator Manual (P/N 144343-1)
- Motoman UP130, XRC Manipulator Manual (P/N 142107-1)

1.3 Customer Service Information

If you are in need of technical assistance, contact the Motoman service staff at (937) 847-3200. Please have the following information ready before you call:

- Robot Type (UP6, UP20, etc.)
- Application Type (welding, handling, etc.)
- Robot Serial Number (located on the back side of the robot arm)
- Robot Sales Order Number (located on back side of XRC controller)

NOTES

SECTION 2
SAFETY

2.1 Introduction

It is the purchaser's responsibility to ensure that all local, county, state, and national codes, regulations, rules, or laws relating to safety and safe operating conditions for each installation are met and followed.

We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems. This information can be obtained from the Robotic Industries Association by requesting ANSI/RIA R15.06. The address is as follows:

Robotic Industries Association
900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106
TEL: (734) 994-6088
FAX: (734) 994-3338

Ultimately, the best safeguard is trained personnel. The user is responsible for providing personnel who are adequately trained to operate, program, and maintain the robot cell. **The robot must not be operated by personnel who have not been trained!**

We recommend that all personnel who intend to operate, program, repair, or use the robot system be trained in an approved Motoman training course and become familiar with the proper operation of the system.

This safety section addresses the following:

- Standard Conventions (Section 2.2)
- General Safeguarding Tips (Section 2.3)
- Mechanical Safety Devices (Section 2.4)
- Installation Safety (Section 2.5)
- Programming Safety (Section 2.6)
- Operation Safety (Section 2.7)
- Maintenance Safety (Section 2.8)

2.2 Standard Conventions

This manual includes information essential to the safety of personnel and equipment. As you read through this manual, be alert to the four signal words:

- DANGER
- WARNING
- CAUTION
- NOTE

Pay particular attention to the information provided under these headings which are defined below (in descending order of severity).

DANGER!

Information appearing under the DANGER caption concerns the protection of personnel from the immediate and imminent hazards that, if not avoided, will result in immediate, serious personal injury or loss of life in addition to equipment damage.

WARNING!

Information appearing under the WARNING caption concerns the protection of personnel and equipment from potential hazards that can result in personal injury or loss of life in addition to equipment damage.

CAUTION!

Information appearing under the CAUTION caption concerns the protection of personnel and equipment, software, and data from hazards that can result in minor personal injury or equipment damage.

NOTE: Information appearing in a NOTE caption provides additional information which is helpful in understanding the item being explained.

2.3 General Safeguarding Tips

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. General safeguarding tips are as follows:

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this robot, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this robot system.
- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the robot cell.
- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).
- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- In accordance with ANSI/RIA R15.06, section 6.13.4 and 6.13.5, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

2.4 Mechanical Safety Devices

The safe operation of the robot, positioner, auxiliary equipment, and system is ultimately the user's responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, ANSI/RIA R15.06 safety standards, and other local codes that may pertain to the installation and use of industrial equipment. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety measures are available:

- Safety fences and barriers
- Light curtains
- Door interlocks
- Safety mats
- Floor markings
- Warning lights

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.

2.5 Installation Safety

Safe installation is essential for protection of people and equipment. The following suggestions are intended to supplement, but not replace, existing federal, local, and state laws and regulations. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. Installation tips are as follows:

- Be sure that only qualified personnel familiar with national codes, local codes, and ANSI/RIA R15.06 safety standards are permitted to install the equipment.
- Identify the work envelope of each robot with floor markings, signs, and barriers.
- Position all controllers outside the robot work envelope.
- Whenever possible, install safety fences to protect against unauthorized entry into the work envelope.
- Eliminate areas where personnel might get trapped between a moving robot and other equipment (pinch points).
- Provide sufficient room inside the workcell to permit safe teaching and maintenance procedures.

2.6 Programming Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Programming tips are as follows:

- Any modifications to PART 1 of the MRC controller PLC can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to PART 1. Making any changes without the written permission of Motoman will **VOID YOUR WARRANTY!**
- Some operations require standard passwords and some require special passwords. Special passwords are for Motoman use only. **YOUR WARRANTY WILL BE VOID** if you use these special passwords.
- Back up all programs and jobs onto a floppy disk whenever program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.
- The concurrent I/O (Input and Output) function allows the customer to modify the internal ladder inputs and outputs for maximum robot performance. Great care must be taken when making these modifications. Double-check all modifications under every mode of robot operation to ensure that you have not created hazards or dangerous situations that may damage the robot or other parts of the system.
- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.

- Inspect the robot and work envelope to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
- Be sure that all safeguards are in place.
- Check the E-STOP button on the teach pendant for proper operation before programming.
- Carry the teach pendant with you when you enter the workcell.
- Be sure that only the person holding the teach pendant enters the workcell.
- Test any new or modified program at low speed for at least one full cycle.

2.7 Operation Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Operation tips are as follows:

- Be sure that only trained personnel familiar with the operation of this robot, the operator's manuals, the system equipment, and options and accessories are permitted to operate this robot system.
- Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Inspect the robot and work envelope to ensure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
- Ensure that all safeguards are in place.
- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.
- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the cell.
- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.

2.8 Maintenance Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. Maintenance tips are as follows:

- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.
- Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.
- Back up all your programs and jobs onto a floppy disk whenever program changes are made. A backup must always be made before any servicing or changes are made to options, accessories, or equipment to avoid loss of information, programs, or jobs.
- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the cell.
- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- Be sure all safeguards are in place.
- Use proper replacement parts.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.
- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).

YASNAC XRC
INSTRUCTIONS

FOR MULTI-LAYER WELDING FUNCTION

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

MOTOMAN INSTRUCTIONS

MOTOMAN SETUP MANUAL
MOTOMAN-□□□ INSTRUCTIONS
YASNAC XRC INSTRUCTIONS
YASNAC XRC OPERATOR'S MANUAL
YASNAC XRC OPERATOR'S MANUAL for BEGINNERS

The YASNAC XRC operator's manuals above correspond to specific usage.
Be sure to use the appropriate manual.

YASKAWA

MANUAL NO. HW0480339

MANDATORY

- This manual explains the multi-layer welding function of the YASNAC XRC system and general operations. Read this manual carefully and be sure to understand its contents before handling the YASNAC XRC.
- General items related to safety are listed in Section 1: Safety of the Setup Manual. To ensure correct and safe operation, carefully read the Setup Manual 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.

NOTES FOR SAFE OPERATION

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

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

 WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.
 CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.
 MANDATORY	Always be sure to follow explicitly the items listed under this heading.
 PROHIBITED	Must never be performed.

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

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

WARNING

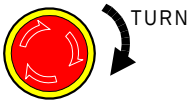
- Before operating the manipulator, check that servo power is turned off when the emergency stop buttons on the playback panel or programming pendant are pressed.
  When the servo power is turned off, the SERVO ON READY lamp on the playback panel and the SERVO ON LED on the programming pendant are turned 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.

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.

Release of Emergency Sto 

- Always set the Teach Lock before entering the robot work envelope to teach a job.

  Operator injury can occur if the Teach Lock is not set and the manipulator is started from the playback panel.

- Observe the following precautions when performing teaching operations within the working envelope of the manipulator:
  - 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 persons are present in the manipulator's work envelope and that you are in a safe location before:
  - Turning on the YASNAC XRC power
  - Moving the manipulator with the programming pendant
  - Running check operations
  - 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 side of both the YASNAC XRC playback panel and programming 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 XRC cabinet 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 the Alarm Display in the setup manual before operating the manipulator.

Definition of Terms Used Often in This Manual

The MOTOMAN manipulator is the YASKAWA industrial robot product.
The manipulator usually consists of the controller, the playback panel, the programming pendant, and supply cables.
The MOTOMAN manipulator is the YASKAWA industrial robot product.
In this manual, the equipment is designated as follows.

Equipment	Manual Designation
YASNAC XRC Controller	XRC
YASNAC XRC Playback Panel	Playback Panel
YASNAC XRC Programming Pendant	Programming Pendant

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

Equipment		Manual Designation
Programming Pendant	Character Keys	The keys which have characters printed on them are denoted with [ ]. ex. [ENTER]
	Symbol Keys	The keys which have a symbol printed on them are not denoted with [ ] but depicted with a small picture. ex. page ke  The cursor key is an exception, and a picture is not shown.
	Axis Keys Number Keys	“Axis Keys” and “Number Keys” 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}
Playback Panel	Buttons	Playback panel buttons are enclosed in brackets. ex. [TEACH] on the playback panel

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.

1 Outline

1.1 Multi-layer Welding Function

The multi-layer welding function is used to weld a workpiece with multiple layers which, otherwise, cannot be satisfactorily welded with a single layer. The first layer is welded while the COMARC instruction executes the arc sensing for correcting the path. At the same time, the path is stored and jobs for the 2nd and following layers are created automatically based on the stored path by the memory and playback function.

Since the workpieces subjected to the multi-layer welding are generally thick and have problems such as “variations in welding accuracy”, “distortion during welding”, and “positioning errors due to setting error”, simply reproducing the taught path is not enough to attain high-quality welding. For the solution of these problems, the search function and the arc sensing function are used.

1.2 Features

The main features of multi-layer welding function are listed below.

Items	Contents	Features
Point variables	The taught position data on the 1st layer are registered in point variables. These point variables can be used for the weldings on the 2nd and the following layers.	By using the point variables where the taught position data on the first layer are registered, the time required for the teaching for the second and the following layers can be reduced.
Memory and playback function	Stores the corrected path of the first layer by the arc sensor and reproduces the stored path on the second and the following layers.	Reproducing the corrected path on the first layer for the second and the following layers realizes the high-quality welding. For reproducing the correct path for the second and the following layers, either the same direction as the welding on first layer or the reversed direction can be selected.

Items	Contents	Features
Search and shift function	Four shift patterns are available. At the execution of the instruction, the amount of the deviation from the taught position is automatically calculated and the following steps are shifted accordingly.	One instruction executes search and shift functions, which simplifies the operation. Specifying the shift type such as shift in parallel or shift in rotation makes the correction of the workpiece positioning error easy.
Overriding Welding Condition Function	During playback operation, the welding conditions can be adjusted and changed.	Overriding the welding conditions such as arc sensing, weaving amplitude, realizes easy adjustment of the welding conditions.
Shift function	After the search and shift operations, the taught position can be modified during the shift operation in teach mode.	Since it is not necessary to change the target position on the master workpiece, the modification of the taught position is easy.

2 Basic Operations

2.1 Robot Posture Control by Euler Angles

2.1.1 Outline

Different from the robot control in the ordinary coordinate systems, the robot optimum posture for welding is controlled by Euler angles. The robot posture control by Euler angles are shown in Fig. 1.

The Euler angles in the base coordinate system are as follows:

A: The angle between the X-axis and the Z-axis of the tool coordinate system projected on the X-Y plane of the base coordinate system ($-180° < A \leq 180°$)

B: The angle between the Z-axis of the tool coordinate system and the X-Y plane of the base coordinate system ($-90° < B \leq 90°$)

C: The angle to move X and W-axis of the tool coordinate system on X' and Y'-axis where X', Y' and Z' are the axes in such coordinate system as Z-axis of the base coordinate syste is moved on Z-axis of the tool coordinate system by rotating the base coordinate system around Z-axis and then around Y-axis ($-180° < C \leq 180°$):

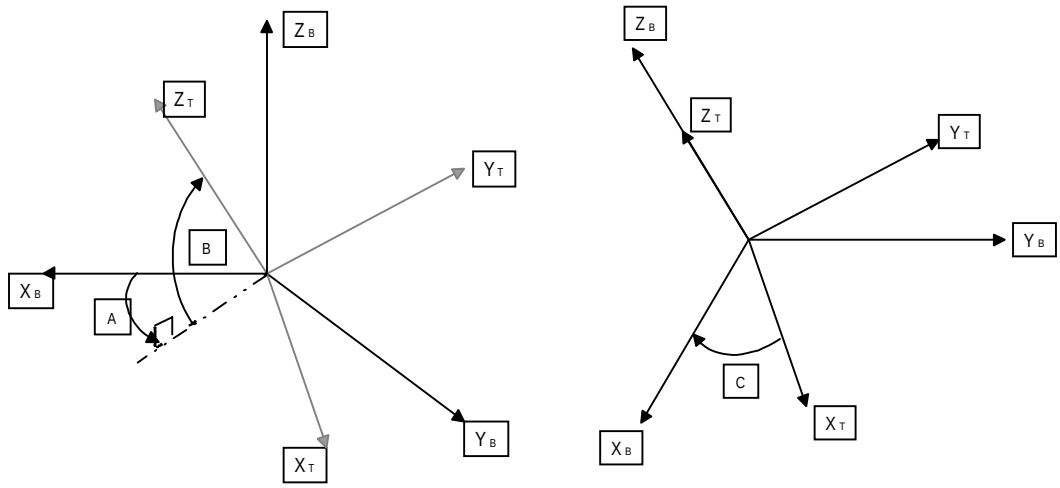


Fig. 1 Euler Angles

2.1.2 Operation

■ Cartesian coordinate system

When the Cartesian coordinate system is selected, pressingX, Y, or Z key moves the tool in parallel to the X, Y, or Z axis in the base coordinate system. Accordingly, pressing axis key changes the tool posture without changing the position of the tool center point as shown in Fig. 2.

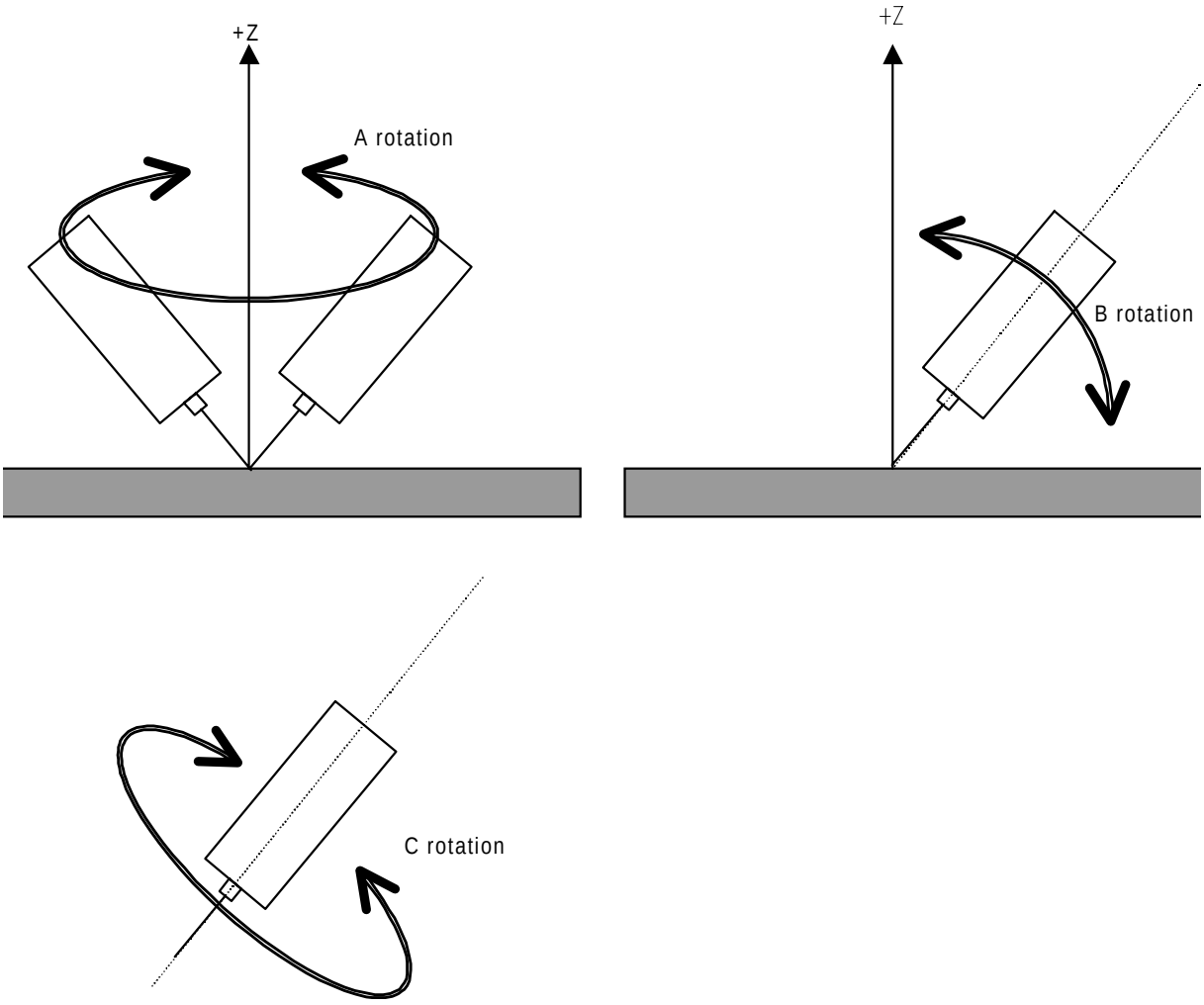


Fig. 2 Jog Motion in Posture Control

A: Rotates around the Z-axis in the base coordinate system
B: Rotates the tool in horizontal and vertical motion to the X-Y plane
C: Rotates centering around the tool axis

■ Tool coordinate system

When the tool coordinate system is selected through the programming pendant, the robot moves as shown in Fig. 3. The posture is changed in the same way as in the Cartesian coordinate system.

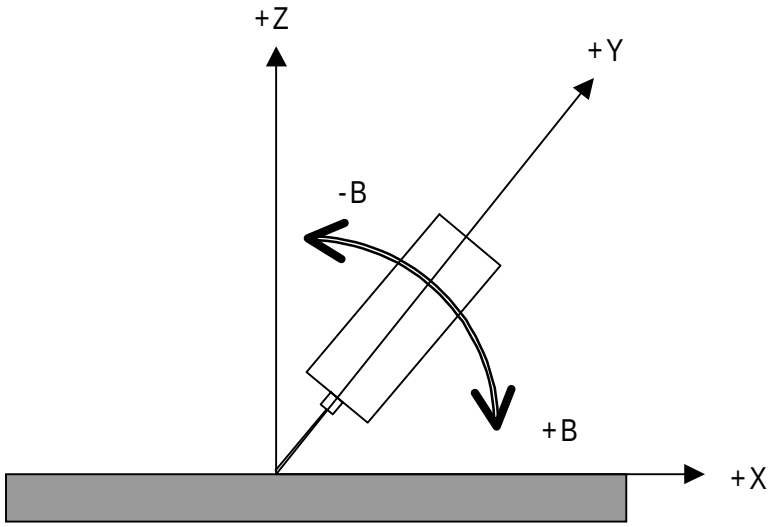


Fig. 3 Jog Motion in Tool Coordinate System

2.2 Point Variables

2.2.1 Outline

The point variables store and manage the taught position data in the job. The point variables can be used to move the robot to the same position multiple times in one job.
Registering the taught position data to the point variables can reduce the time required for teaching within the job.

Difference between the point variables and the position variables (P***)

- The position variables can be read or written from/to all jobs while the point variables can be used only in the job where these point variables are registered. Therefore, the identical numbers can be used for the point variables of other jobs.
- The taught position data and the shift amount can be stored in the position variable. In the point variables, only the taught position data can be stored.
- 128 position variables are available as standard (can be expanded to 5,000). A point variable is created when a move instruction is registered in the job, and the point variable number can be set arbitrarily in the range from 0 to 9999.
- By using the instructions SET and SETE, a position can be registered to a position variable, however, these instructions can not be used to register a position to a point variable.
- The position variables can not be deleted (can be left without position data). The point variables are deleted when the job where these point variables are registered is deleted.

2.2.2 Registering Point Variables

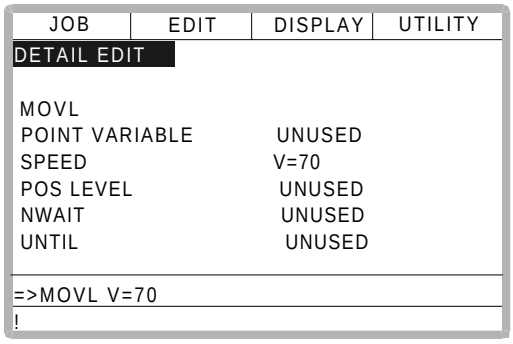
■ Replacing the taught position data of the move instruction with the point variable

Operation

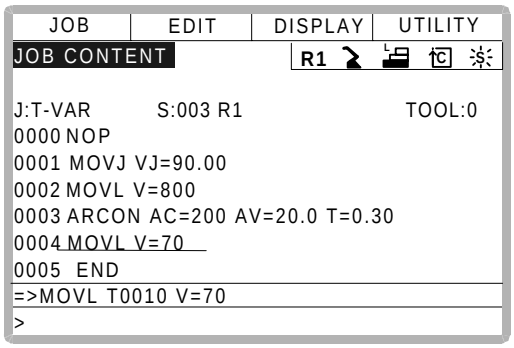
Move the cursor to the instruction area, and press [SELECT] twice on the desired move instruction*1 ➡ Select “UNUSED” of “POINT VARIABLE,” and select “T” ➡ Press [SELECT], and enter a point variable number ➡ Press [ENTER]*2 ➡ Press [ENTER]*3

Explanation

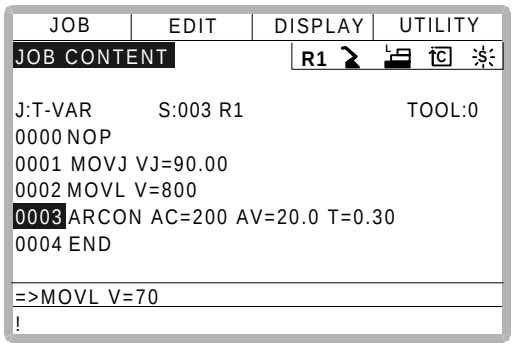
1 The detail edit display of the move instruction appears.



2 The entered point variable number (T0010) appears in the input buffer line.



3 The entered contents are registered in the job. If another point variable with the same number has been already used in the same job, the already used point variable, even if no taught position data is specified in the point variable, is registered. Newly created and numbered point variable has no taught position data regardless of SERVO ON/ OFF status.



NOTE

- When a point variable with no taught position data specified is registered, "✶" is indicated for the TOOL number in the job content display.
- The job in which the point variable with no taught position data specified is registered can not be loaded/saved by FC2 (same as for the position variables).

■ Changing the number of the point variable

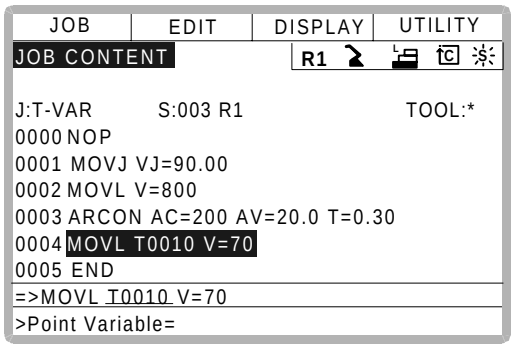
There are two operation methods to change the number of the point variable.

Operation

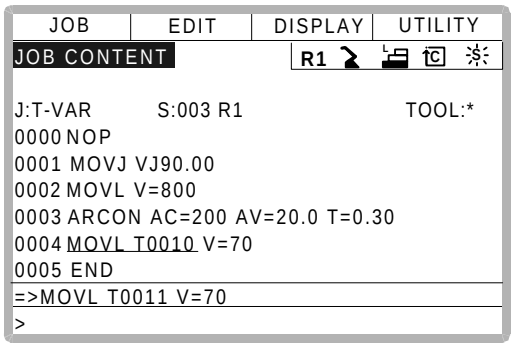
Move the cursor to the instruction area, and press [SELECT] on the desired move instruction ➡Move the cursor to the point variable whose number to be changed, and press [SELECT]*1 ➡Enter a point variable number ➡Press [ENTER] *2 ➡Press [ENTER]*3

Explanation

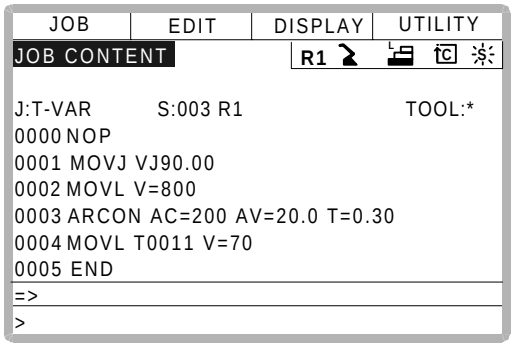
1 A new number for the point variable can be typed.



2 The entered point variable number (T0011) appears in the input buffer line.



3 The entered contents are registered in the job. If another point variable with the same number has been already used in the same job, the already used point variable, even if no taught position data is specified in the point variable, is registered. Newly created and numbered point variable has no taught position data regardless of SERVO ON/ OFF status.



NOTE

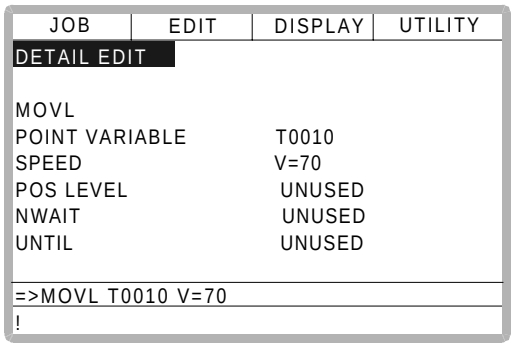
- When a point variable with no taught position data specified is registered, "✶" is indicated for the TOOL number in the JOB CONTENT display.
- The job in which the point variable with no taught position data specified is registered can not be loaded/saved by FC2 (same as for the position variables).

Operation

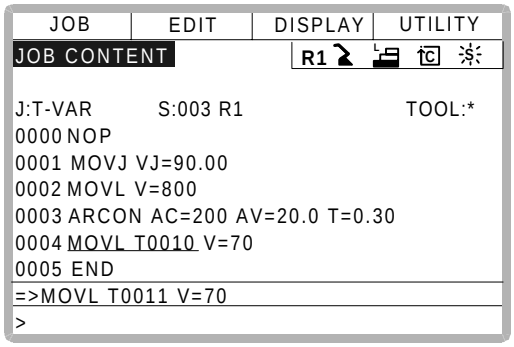
Move the cursor to the instruction area, and press [SELECT] twice on the desired move instruction*1* ➡Enter a point variable number ➡Press [ENTER] *2* ➡Press [ENTER]*3*

Explanation

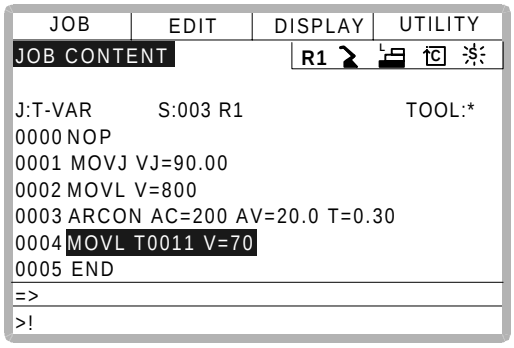
1 The detail edit display of the move instruction appears.



2 The entered point variable number (T0011) appears in the input buffer line.



3 The entered contents are registered in the job. If another point variable with the same number has been already used in the same job, the already used point variable, even if no taught position data is specified in the point variable, is registered. Newly created and numbered point variable has no taught position data regardless of SERVO ON/ OFF status.



NOTE

- When a point variable with no taught position data specified is registered, "✶" is indicated for the TOOL number in the job content display.
- The job in which the point variable with no taught position data specified is registered can not be loaded/saved by FC2 (same as for the position variables).

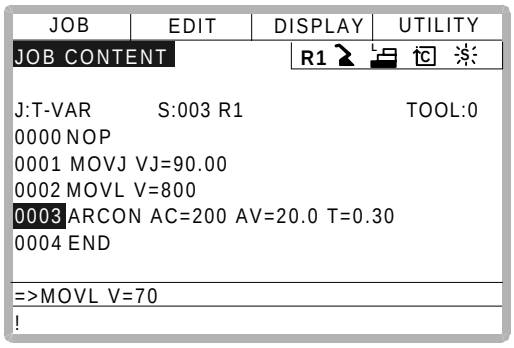
■ Registering a move instruction together with a point variable

Operation

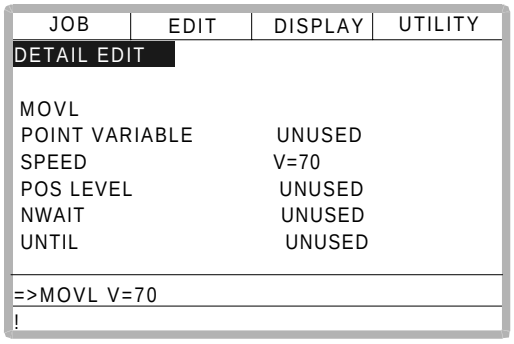
Press [MOTION TYPE] to select the desired move instruction*1 ➡ Press [SELECT] *2 ➡ Select "UNUSED" of "POINT VARIABLE," and select "T" ➡ Enter a point variable number ➡ Press [ENTER]*3 ➡ Press [ENTER] *4

Explanation

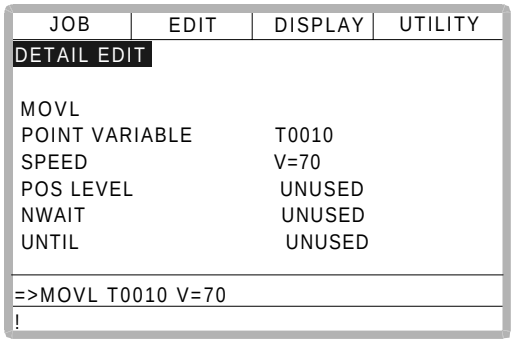
1 Each time [MOTION TYPE] is pressed, the move instruction is switched in the following order: "MOVJ"→ "MOVL"→ "MOVC"→ "MOVS"→ "MOVJ."



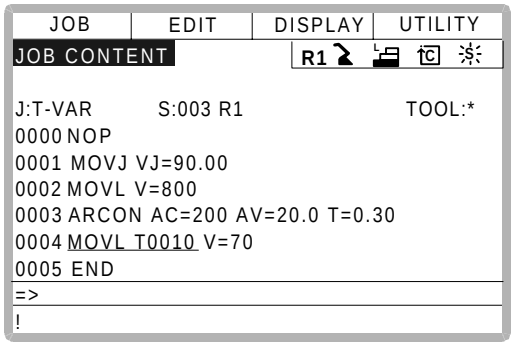
2 The detail edit display of the selected move instruction appears.



3 The entered point variable number appears in the input buffer line.



****4*** The entered contents are registered in the job. If another point variable with the same number has been already used in the same job, the already used point variable, even if no taught position data is specified in the point variable, is registered. Newly created and numbered point variable has no taught position data regardless of SERVO ON/ OFF status.



NOTE

- When a point variable with no taught position data specified is registered, "✶" is indicated for the TOOL number in the job content display.
- The job in which the point variable with no taught position data specified is registered can not be loaded/saved by FC2 (same as for the position variables).

2.2.3 Deleting a Point Variabl

■ Deleting the move instruction

Operation

Move the cursor to the line number of the move instruction to be deleted ➡ Press [DELETE] and [ENTER]

NOTE

- When the deleted point variable is not used for other move instructions in the same job, it becomes in unused status, but retains the taught position data. However, the point variables in unused status will be deleted when another job is selected.
- A move instruction with the point variable that has no taught position data specified can be also deleted.

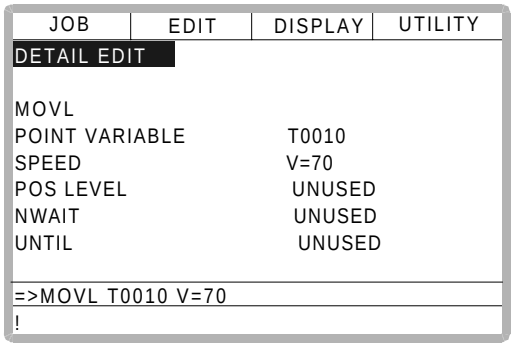
■ Deleting the point variable designation

Operation

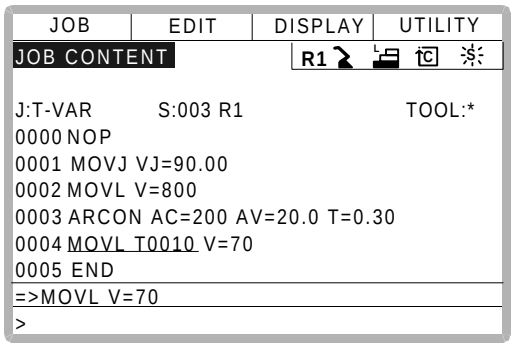
Move the cursor to the instruction area, and press [SELECT] twice on the desired move instruction*1 ➡ Select the point variable (T0010 in the explanation) to be deleted, and select “UNUSED” of “POS LEVEL,” “NWAIT,” and “UNTIL” ➡ Press [ENTER]*2 ➡ Press [ENTER]*3

Explanation

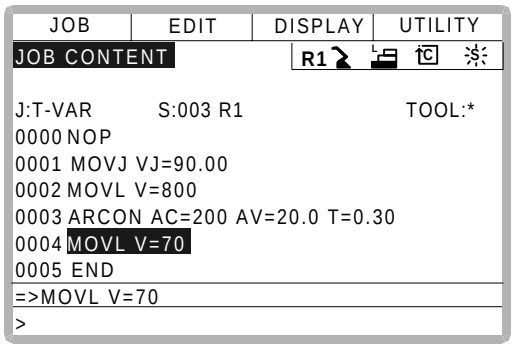
1 The detail edit display of the move instruction appears.



2 The modified contents appears in the input buffer line.



3 The entered modification is registered in the job. The taught position data of the deleted point variable is reregistered.



2.2.4 Editing the Point Variable (Taught Position Data)

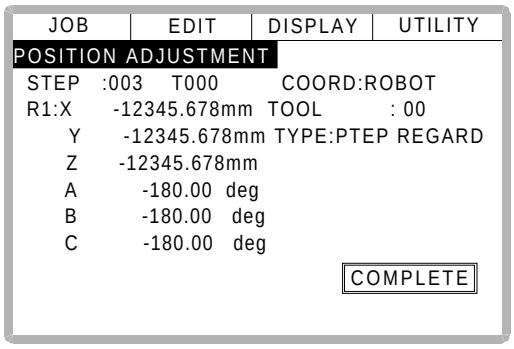
The taught position data can be edited by entering a numerical value. Refer to YASNAC XRC Options Instructions for Teaching Point Adjustment Function with Programming Pendant (manual No.: HW0480254).

Operation

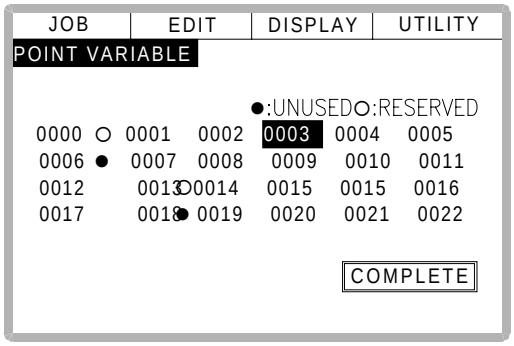
In JOB CONTENT display, select {POSITION ADJUSTMENT} from the pull-down menu of {UTILITY}*1* ➡ Select an item to be changed in the position adjustment display *2* ➡ Enter a numerical value, and press [ENTER] ➡ Select “COMPLETE”

Explanation

1 The position adjustment display appears.



Selecting the point variable displays the list of point variables. Select a point variable whose position data is to be corrected.



2 Enter a value by using the number keys.

SUPPLE-MENT

For the details of changing the taught position data, refer to YASNAC XRC Options Instructions for Teaching Point Adjustment Function with Programming Pendant (manual No.: HW0480254).

2.3 Memory and Playback Function

2.3.1 Outline

The memory and playback function is used to correct the robot motion path for the correction amount measured by COMARC sensor and saved every sampling time set in the parameter. At the welding of the first layer, the result (correction amount) of the sensing by COMARC function is saved, and the saved correction amount is used at the welding of the second and following layers for correcting the robot motion path.
For the welding of the second and following layers, the corrected path can be reproduced in the reverse direction of the welding of the first layer.

NOTE

- COMARC function
  The COMARC function is necessary to use the memory and playback function.
  And, an expansion storage is needed to use the memory and playback function.

2.3.2 Instructions for Memory and Playback Function

The instructions used for the memory and playback function are listed below.

Sensor Instructions

MEMON	Function	Starts the memory and playback function.		
	Instruction item	Data 1	REC	Saves the path correction amount measured by COMARC.
			PLY	Executes the correction for the saved correction amounts in the forward direction.
			BACKPLY	Executes the correction for the saved correction amounts in the reversed direction.
		Data 2	MPF# (File number)	1 to 50
MEMOF	Function	Cancels the memory and playback function.		
	Instruction items	None		

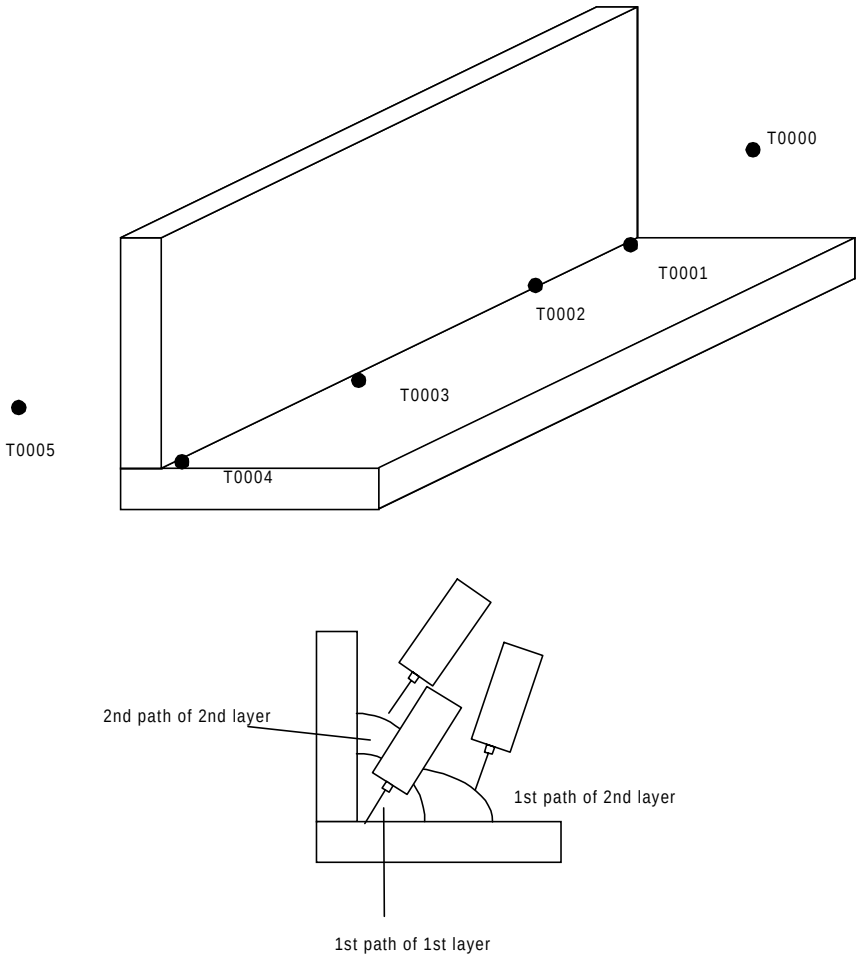
Arithmetic Instructions			
CLEAR	Function	Deletes a memory replay file.	
	Instruc-tion items	MPF	Deletes all the memory and playback files.

2.3.3 Application Example

Create a welding job with two layers and three paths.
Execute the sensing by COMARC function during the welding on the first layer, and weld the first path of the second layer in the reverse direction of the welding on the first layer, then weld the second path of the second layer in the same direction of the welding on the first layer.

Job	
NOP	
MOVJ VJ=100	Stand-by point
MOVJ VJ=60	Moves the robot to the approach position.
MOVL T0000 V=200	Welding start position T0000
ARCON AC=330 AV=30 V=40	
COMARCON AMP=1.0 FREQ=3.5••	Starts the arc sensor.
MEMON REC MPF#(1)	Starts the saving operation for the memory and playback function.
MOVL T0001	
MOVL T0002	
MOVL T0003	
MOVL T0004	
MEMOF	Stops the memory and playback function.
COMARCOF	Stops the arc sensor.
ARCOF AC=200 AV=25 T=0.1	End of welding on 1st layer
GETS PX000 $PX040	Gets the correction amount measured by COMARC function.
SFTON P000 BF	Shifts for the correction amount.
'2Layer 1Path	(Welding on 1st path of 2nd layer)
MOVL T0005	Moves the robot to the approach position for 2nd layer.

Job	
SFTON P001 TF	Shifts the welding start position for 1st path of 2nd layer.
MOVL T0004 V=200	
ARCON AC=250 AV=28 V=40	
MEMON BACKPLY MPF#(1)	Starts the reproduction of the welding on the 1st layer in the reversed direction.
MOVL T0003	
MOVL T0002	
MOVL T0001	
MOVL T0000	
MEMOF	
ARCOF AC=180 AV=20 T=0.1	
SFTOF	Cancels the shift function.
'2Layer 2path	(Welding on 2nd path of 2nd layer)
MOVL V=200	Move the robot to the approach position for 2nd layer.
SFTON P002 TF	Shifts the welding start position for 2nd path of 2nd layer.
MOVL T0000 V=200	
ARCON AC=200 AV=25 T=0.1	
MEMON PLY MPF#(1)	Starts the reproduction of the welding on the 1st layer in the forward direction.
MOVL T0001	
MOVL T0002	
MOVL T0003	
MOVL T0004	
MEMOF	Cancels the memory replay function.
ARCOF AC=180 AV=20 T=0.1	
MOVL T0005	
MOVJ VJ=100	



2.4 Multi-layer Welding Tool Shift Function

2.4.1 Outline

For multi-layer welding, teaching the welding path on the 1st layer and shifting the taught positions to weld on the second and following layers can largely reduce the time required for teaching.

2.4.2 Tool Shift Coordinate System

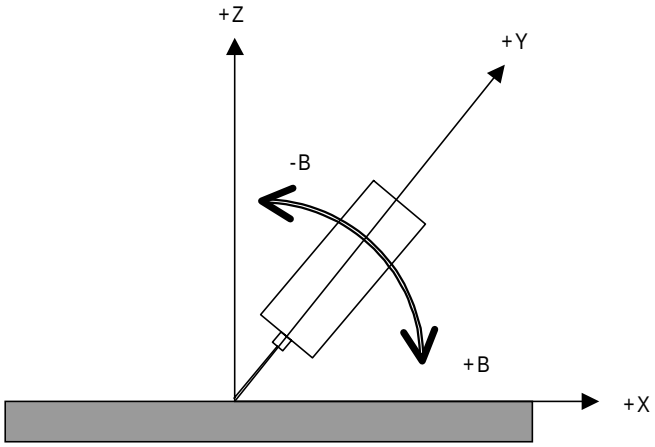
The coordinates for the multi-layer welding tool shift function are determined by the positional relation between the robot coordinate and the tool coordinate.

Multi-layer welding tool shift coordinate X: Z-axis of the tool coordinate projected on X-Y plane of the robot coordinate system

Multi-layer welding tool shift coordinate Y: Direction to Z-axis of the tool coordinate

Multi-layer welding tool shift coordinate Z: Direction to Z-axis of the robot coordinate

Multi-layer welding tool shift coordinate B: The posture angle from X-axis of the multi-layer welding tool shift coordinate in the direction to Z-axis



SUPPLE-MENT

• Posture angle setting
With the multi-layer tool shift function, the multi-layer tool shift coordinates A and C can not be set.

2.4.3 Registering

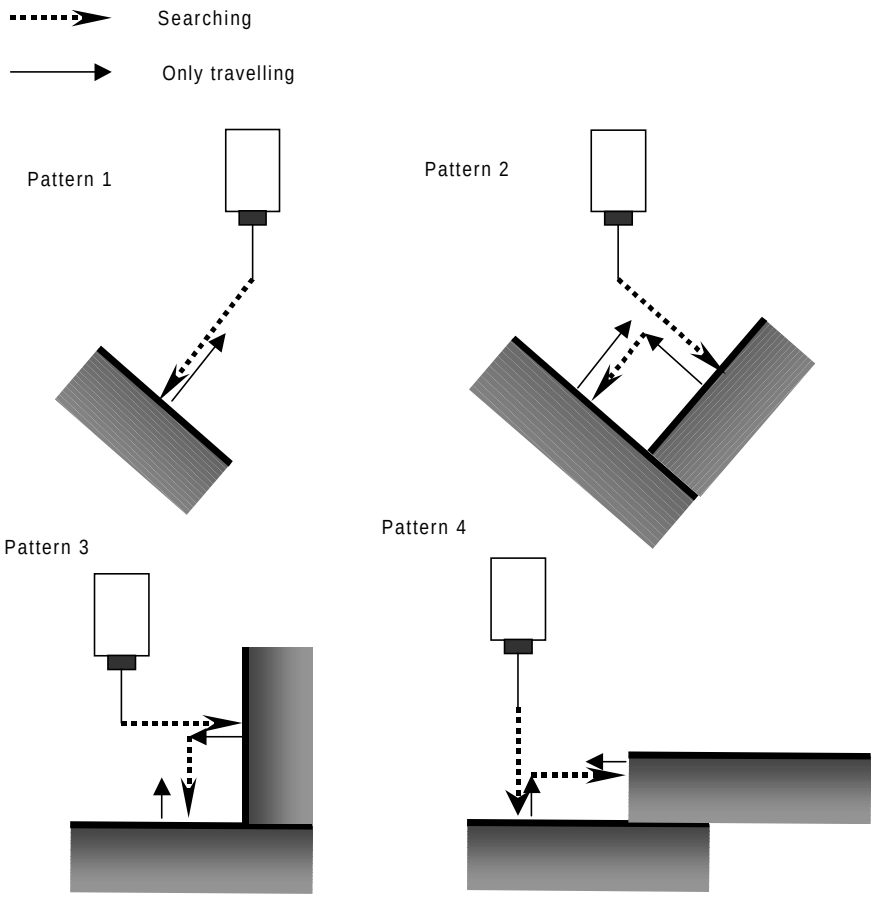
Specify the tag TF in SFTON (shift ON) instruction, and the taught positions for the move instructions after the SFTON instruction will be shifted for the shift amount set in the position variable (P***) in the multi-layer tool shift coordinate system.

Instruction: SFTON
Format: SFTON P000 TF

2.5 Search and Shift Function

2.5.1 Outline

The search and shift function detects the workpiece position error by using the search sensor and correct the taught position.
SRCHSFT instruction starts searching the tool end from the point the tool ends is not in contact with the workpiece and stops searching when the tool end contacts the workpiece. There are four motion patterns. Each motion pattern is shown below.

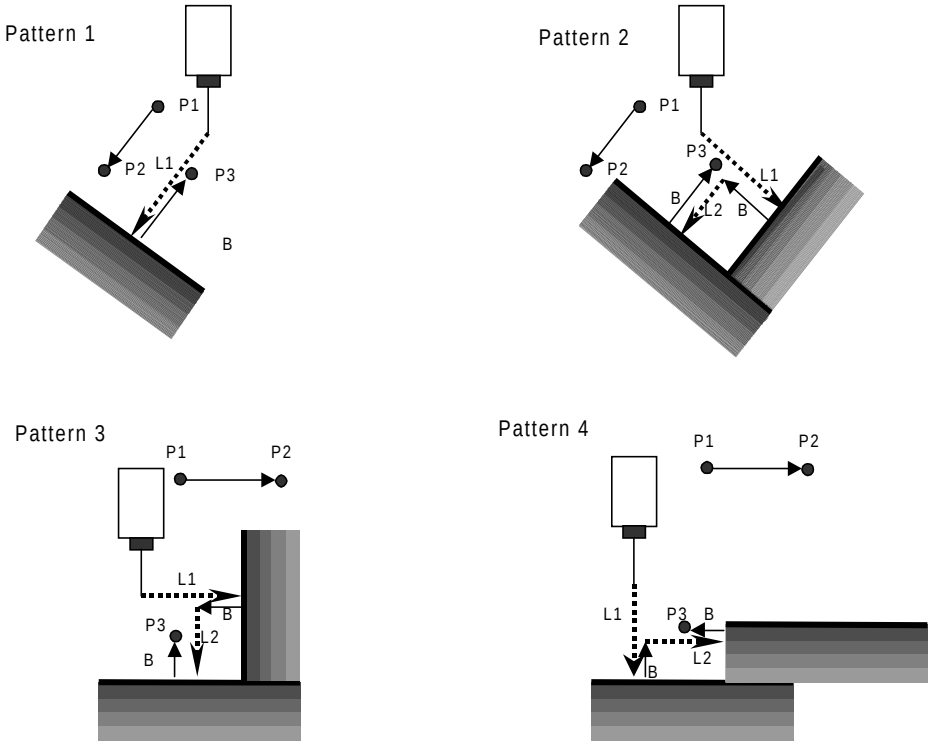


2.5.2 Items to be Set for SRCHSFT Instruction

Set the following items for SRCHSFT instruction.

Item	Contents
PATTER	Search motion pattern 1 to 4 (The numbers correspond to the patterns shown below)
SHIF	0 (no shift), 1 (shift in parallel), 2 (shift in rotation)
VELOCITY	Search speed in units of cm/min
DIR_START (P1)	Position P1 in the figure below
DIR_END (P2)	Position P2 in the figure below
OFFSET 1 (L1)	The distance L1 in the figure below (in units of mm)
OFFSET 2 (L2)	The distance L2 in the figure below (in units of mm)

Item	Contents
RETRACT AMOUNT	The distance B in the figure below (in units of mm)
MAX. SEARCH DISTANCE	An alarm occurs if the search is not ended within the set travel distance.
END_POINT (P3)	The search end position at teaching (position P3 in the figure below)



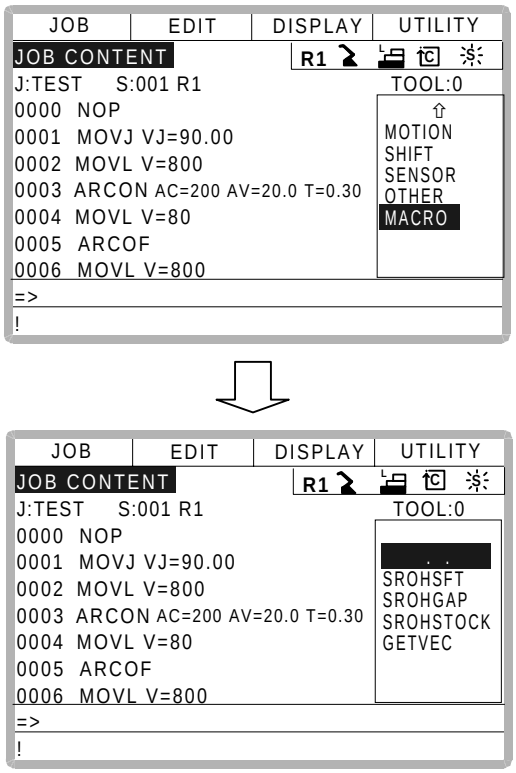
2.5.3 Registering

Operation

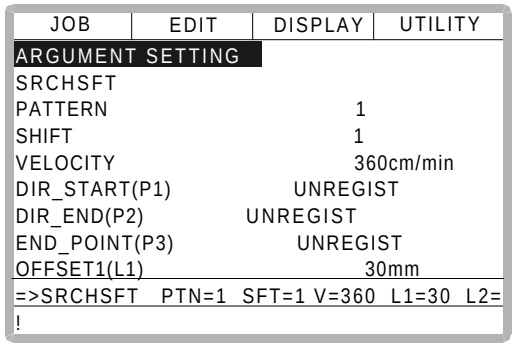
Move the cursor to the address area ➡ Press [INFORM LIST] ➡ Select “MACRO”*1 ➡ Select “SRCHSFT”*2

Explanation

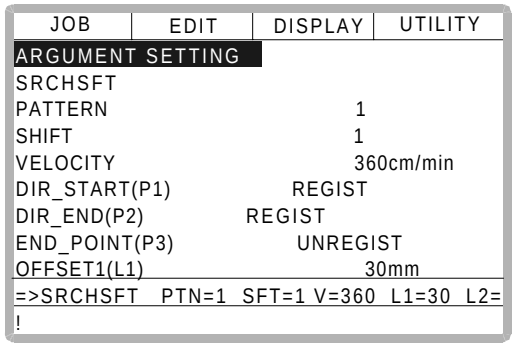
1 The macro instruction list appears.



2 The argument setting display for SRCHSFT instruction appears.



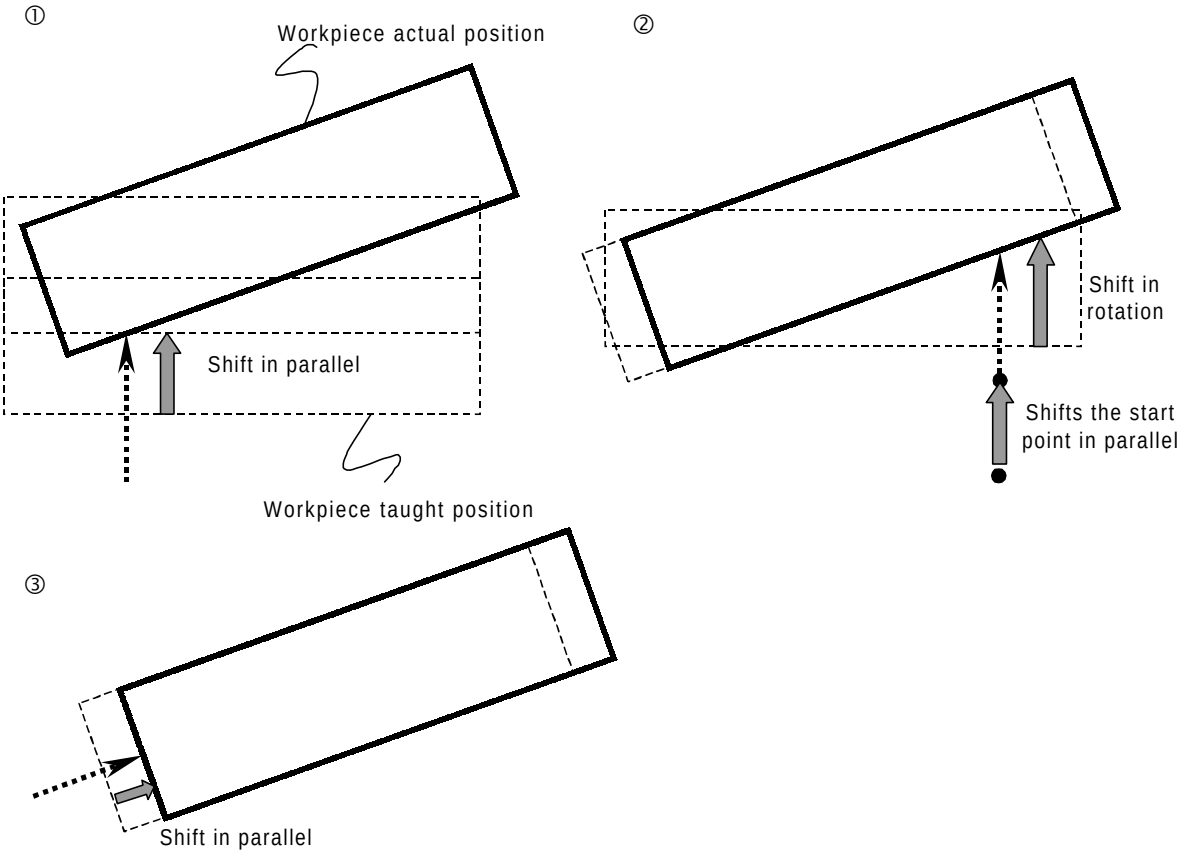
3 Move the manipulator to the travel start point (P1), and press [MODIFY] with the cursor on “UNREGIST” of P1, then press [ENTER] to register the position of P1.
Move the manipulator to the travel end point (P2), and press [MODIFY] with the cursor on “UNREGIST” of P2, then press [ENTER] to register the position of P2.
Press [ENTER] twice to return to the job content display.



With the job content display, press [INTERLOCK] + [TEST START] to execute the SRCHSFT instruction. The manipulator starts searching and stops. Register the manipulator stop position for END_POINT (P3) in the argument setting display.

2.5.4 Application Example of SRCHSFT Instruction

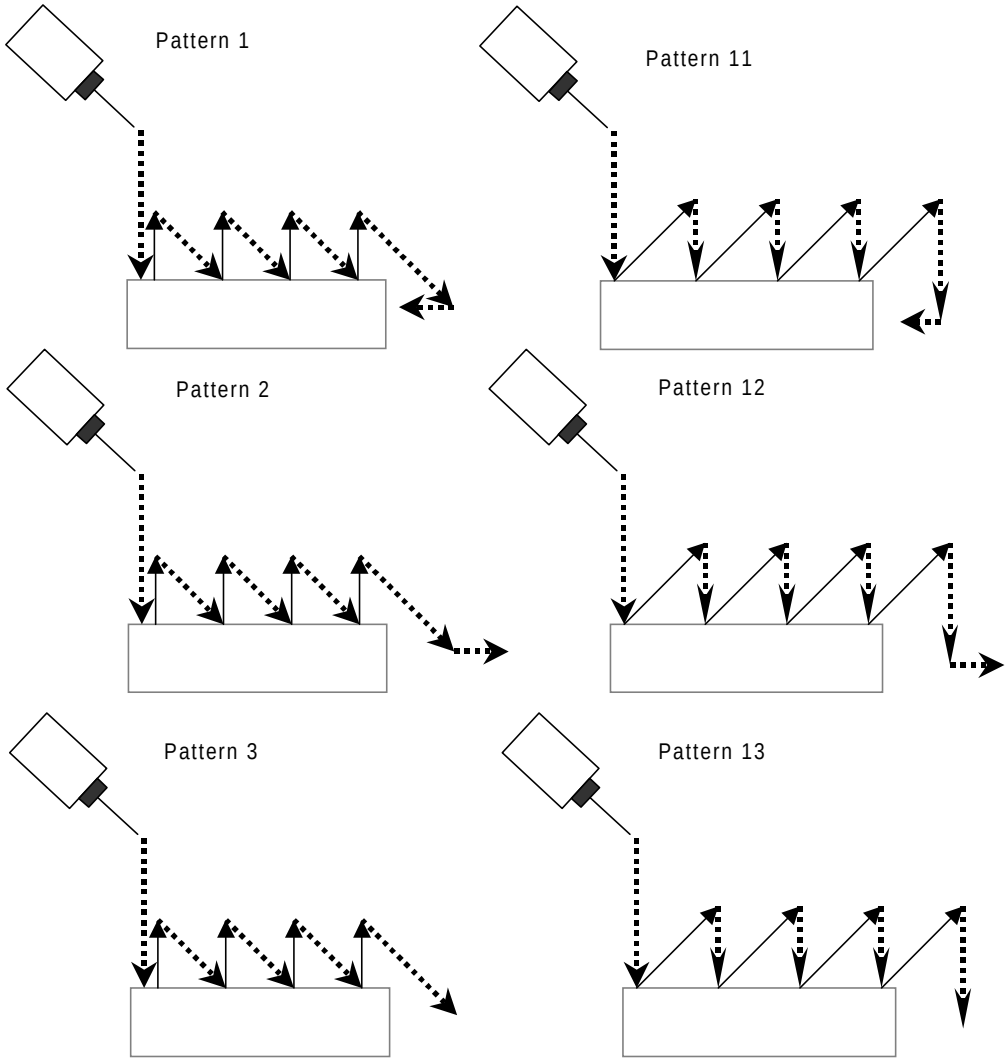
Job	
SFTOF3D	Cancels the 3-dimension shift.
MOVJ VJ=60	
SRCHSFT PTN=3 SFT=1 V=360••	Searches for 1st point (Shift in parallel). ①
MOVJ VJ=60	
SRCHSFT PTN=3 SFT=2 V=360••	Searches for 2nd point (Shift in rotation). ②
MOVJ VJ=60	
SRCHSFT PTN=1 SFT=1 V=360••	Searches for 3rd point (Shift in parallel). ③
MOVJ VJ=60	
MOVL V=200	Moves to the welding start point.
:	
:	


①
Workpiece actual position
Shift in parallel
Workpiece taught position
②
Shift in rotation
Shifts the start point in parallel
③
Shift in parallel

2.6 Search Function for Sticking

2.6.1 Outline

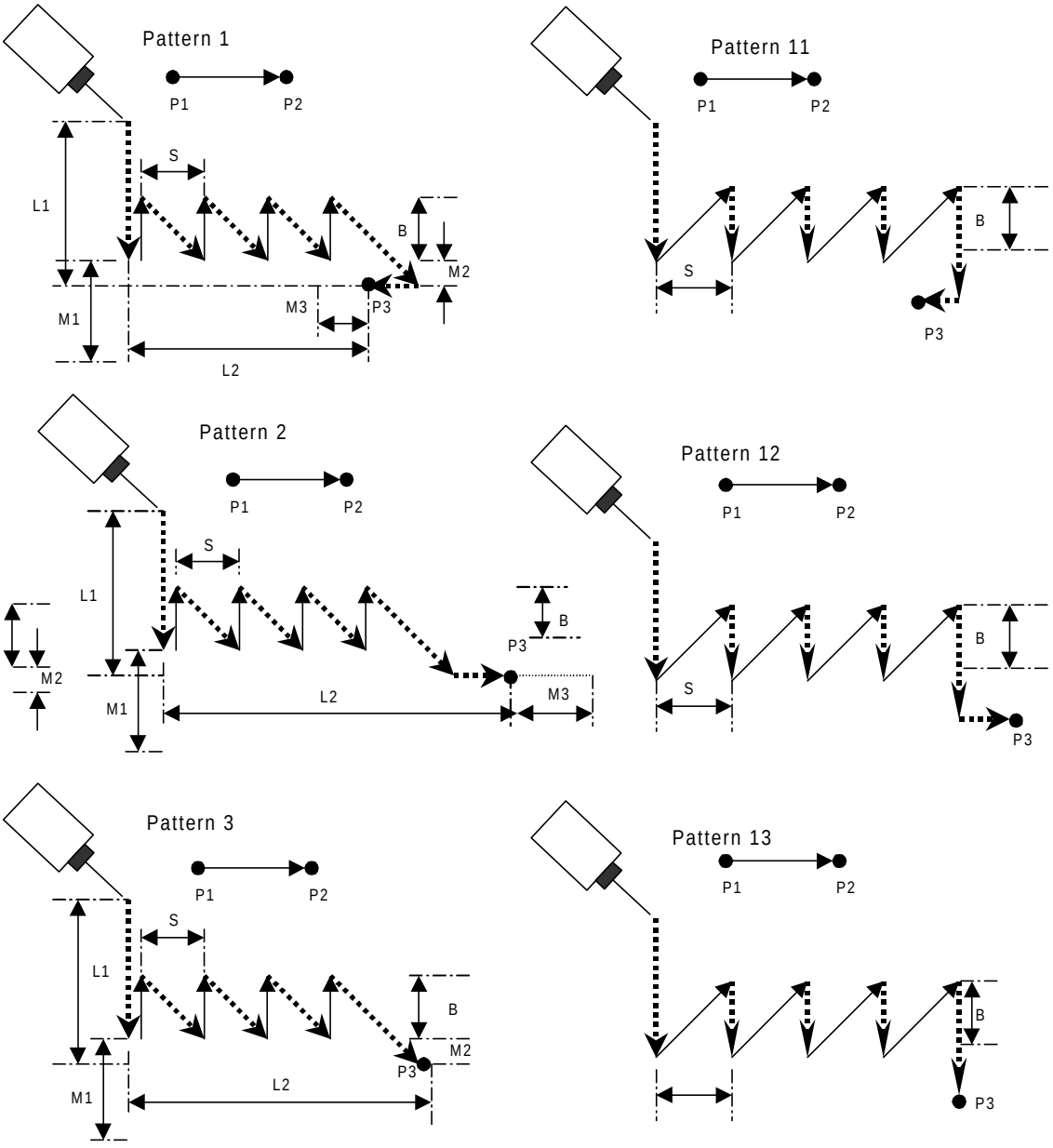
The search function for sticking detects the edge face of the workpiece. There are 6 searching patterns.



2.6.2 Items to be Set for SRCHSTCK Instructio

Set the following items for SRCHSTCK instruction.

Item	Contents
PATTER	Search pattern (See the patterns below)
SHIF	Shift type 0 (no shift), 1 (shift in parallel), 2 (shift in rotation)
VELOCITY	Search speed in units of cm/min
DIR_START (P1)	Position P1 in the figure below
DIR_END (P3)	Position P2 in the figure below
OFFSET 1 (L1)	The distance L1 in the figure below (in units of mm)
OFFSET 2 (L2)	The distance L2 in the figure below (in units of mm)
RETRACT AMOUNT (B)	The retract distance after the search
INITIAL MAX. SEARCH DISTANCE (M1)	The distance M1 in the figure below (in units of mm)
STICK FEED (S)	The feed pitch S in the figure below (in units of mm)
MAX SEARCH DISTANCE	The maximum distance for searching (in units of mm)
EDGE DETECTING DISTANCE (M2)	If nothing is detected within this distance, the end of this distance is considered as the edge (in units of mm).
EDGE SEARCH SPEED	Final searching speed in units of cm/min
EDGE SEARCH OFFSET (M3)	The distance M3 in the figure below (in units of mm)
END_POINT (P3)	Search end position



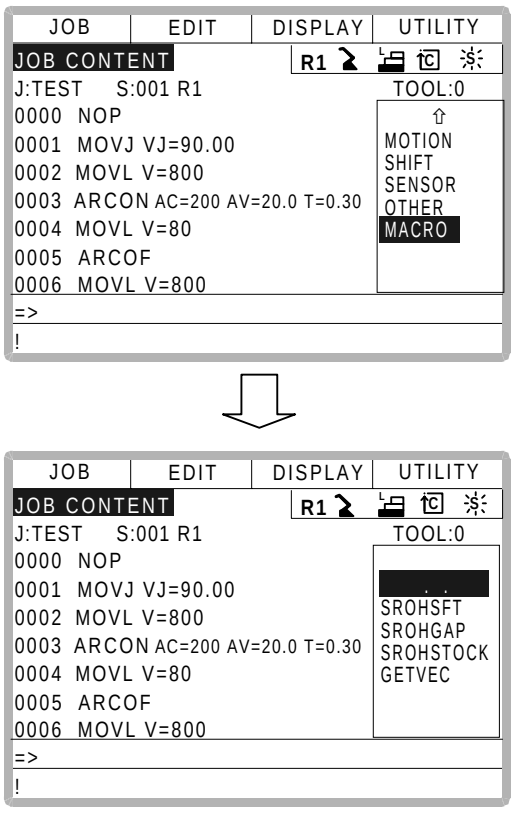
2.6.3 Registering

Operation

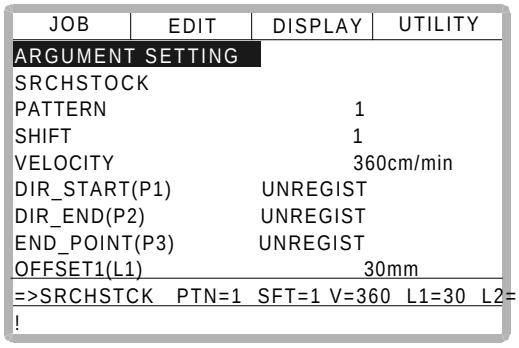
Move the cursor to the address area ➡ Press [INFORM LIST] ➡ Select “MACRO”*1 ➡ Select “SRCHSTCK”*2

Explanation

1 The macro instruction list appears.

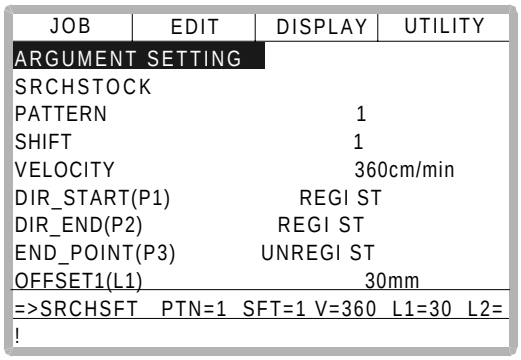


2 The argument setting display for SRCHSTCK instruction appears.



3 Move the manipulator to the travel start point (P1), and press [MODIFY] with the cursor on “UNREGIST” of P1, then press [ENTER] to register the position of P1.
Move the manipulator to the travel end point (P2), and press [MODIFY] with the cursor on “UNREGIST” of P2, then press [ENTER] to register the position of P2.

Press [ENTER] twice to return to the job content display



With the job content display, press [INTERLOCK] + [TEST START] to execute the SRCHSTCK instruction. The manipulator starts searching and stops. Register the manipulator stop position for END_POINT (P3) in the argument setting display.

2.7 Shift Function

2.7.1 Outline

The shift function shifts the positions in the section between SFTON instruction and SFTOF instruction.
In SFTON instruction, specify a coordinate system for the shift amount. The coordinate systems that can be specified are BF, RF, TF, UF, BP (travelling axis), and EX (station axis).
When two SFTON instructions with different coordinate systems specified are executed consecutively, the positions are shifted for the specified two shift amounts.

Example:

```
:
SFTON  P000  BF    (100.000 mm to X direction is specified in P000)
SFTON  P001  RF    (100.000 mm to Y direction is specified in P001)
MOVL  V=100        (Shifts the position for 100.000 mm to X direction in the base coordinate
                    system, and for 100.000 mm to Y direction in the robot coordinate
                    system.)

:
```

When two SFTON instructions with the same coordinate system specified are executed, the last STFON instruction is valid.

Example:

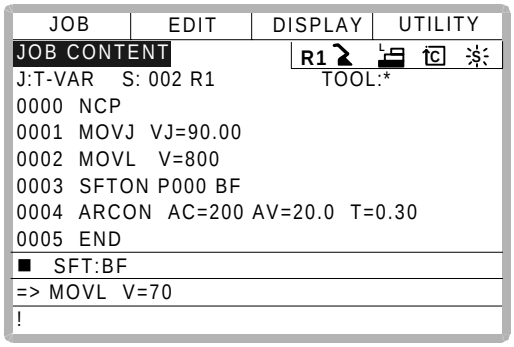
```
:
SFTON  P000  BF    (100.000 mm to X direction is specified in P000.)
SFTON  P001  BF    (100.000 mm to Y direction is specified in P001.)
MOVL  V=100        (Shifts the positions for 100.000 mm to Y direction in the base coord-
                    inate system.)
  :
```

In SFTOF instruction, the coordinate system for canceling shift function can be specified.
When the coordinate system is not specified, all the coordinate systems for shift function are cancelled.

2.7.2 Continuity of Shift Function

The shift function can be cancelled by executing SFTOF instruction or selecting another job. While editing the job such as changing or deleting the taught position data in SFTON status, the taught position data without the shift amount are registered. Accordingly, the taught position data can be corrected during the welding of the 2nd and following layers.

During the shift operation, "SFT" and the coordinate system that is specified in SFTON instruction are indicated on the job content display.



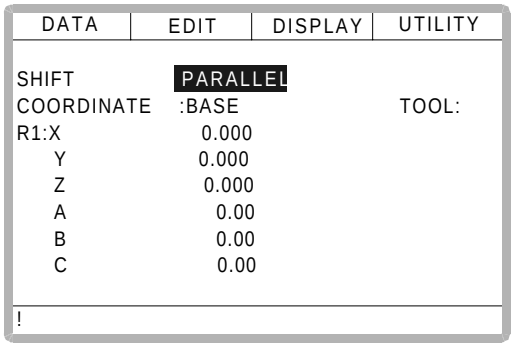
2.7.3 Shift Amount Display

Operation

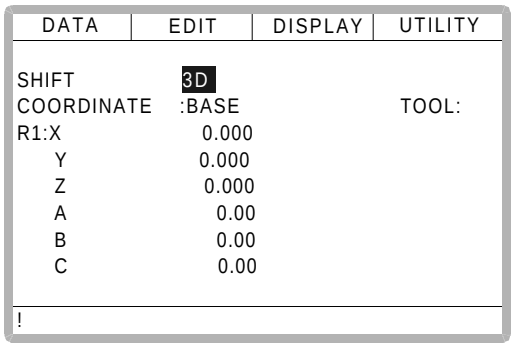
Select {ROBOT} from the top menu ➡ Select {SHIFT} from the sub menu*1 ➡ Select a shift type*2

Explanation

1 The shift amount display appears.



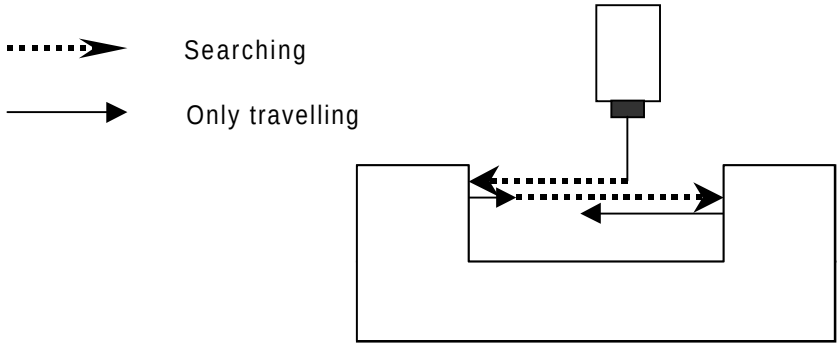
2 Selecting a shift type, “PARALLEL” or “3D,” and a coordinate, “BASE,” “ROBOT,” “TOOL,” and “USER,” displays the shift amounts in the corresponding coordinate system.



2.8 Beveling Width Measuring Function

2.8.1 Outline

The beveling width measuring function measures the beveling width by using the search function. The measured width is stored in the specified variable number by using SRCHGAP instruction. According to the measured beveling width, the welding conditions will be changed. The tool stop position after the search is the center of the beveling.



2.8.2 Items to be Set for SRCHGAP instruction

Item	Contents
SHIF	Shift type: 0: No shift, 1: Shift in parallel, 2: Shift in rotation
VELOCITY	Search speed in units of cm/min
VARIABLE_No.	Variable number to store the measured beveling width

Item	Contents
DIR_START (P1)	Travel start point P1
DIR_START (P2)	Travel end point P2
END_POINT (P3)	Search end point P3
OFFSET 1 (L1)	Offset amount of the start position (in units of mm)

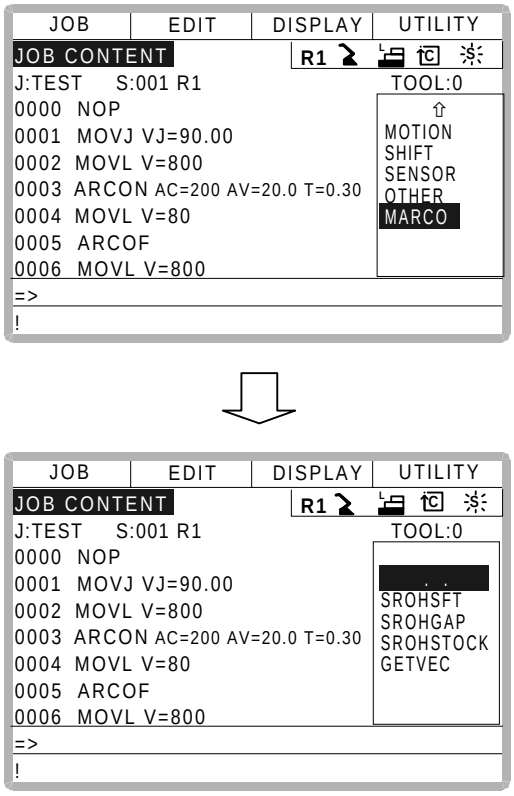
2.8.3 Registering

Operation

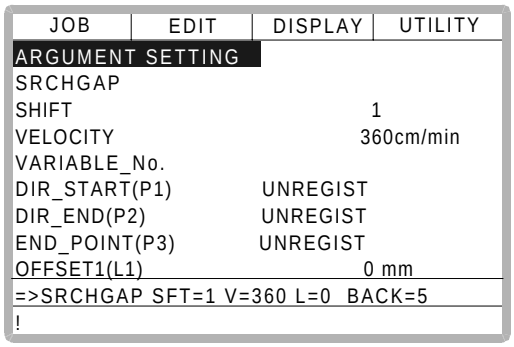
Move the cursor to the address area ➡ Press [INFORM LIST] ➡ Select “MACRO”*1 ➡ Select “SRCHGAP”*2

Explanation

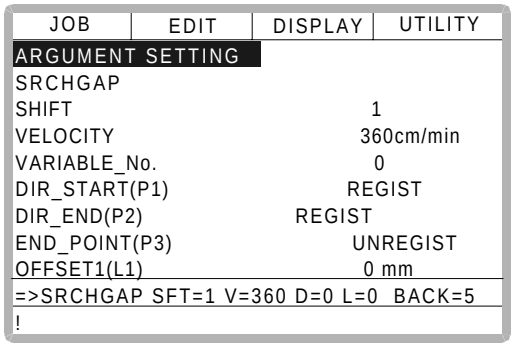
1 The macro instruction list appears.



2 The argument setting display for SRCHGAP instruction appears.



3 Move the manipulator to the travel start point (P1), and press [MODIFY] with the cursor on “UNREGIST” of P1, then press [ENTER] to register the position of P1.
Move the manipulator to the travel end point (P2), and press [MODIFY] with the cursor on “UNREGIST” of P2, then press [ENTER] to register the position of P2.
Press [ENTER] twice to return to the job content display

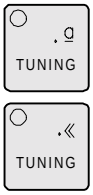


With the job content display, press [INTERLOCK] + [TEST START] to execute the SRCHGAP instruction. The manipulator starts searching and stops. Register the manipulator stop position for END_POINT (P3) in the argument setting display.

2.9 Overriding Welding Condition Function

2.9.1 Outline

- During welding, each welding condition such as welding current, welding voltage, speed, weaving single amplitude, and sensing condition can be adjusted individually by using the specific keys shown below on the programming pendant.
- The adjusted welding conditions can be automatically set for the tag and condition file attached to the instruction to set the welding condition such as ARCONand ARCSET. However, when variables are used for the welding condition or the condition file, this function is invalid.
- For overriding the welding conditions, the following keys are used.



- The units for adjusting the welding conditions by pressing the above keys can be set by the parameters listed in 2.10.5.

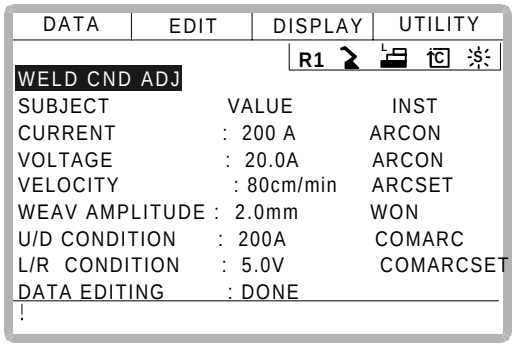
2.9.2 Operation

Operation

Select “WELD CND ADJ” from “UTILITY” in the job playback display *1 ➡ Move the cursor to the condition to be adjusted ➡ Adjust the condition by using the specific keys*2 ➡ Press [ENTER]*3 ➡ Press [CANCEL] *4

Explanation

1 The welding condition adjustment display appears.



2 The welding is executed under the adjusted welding condition.

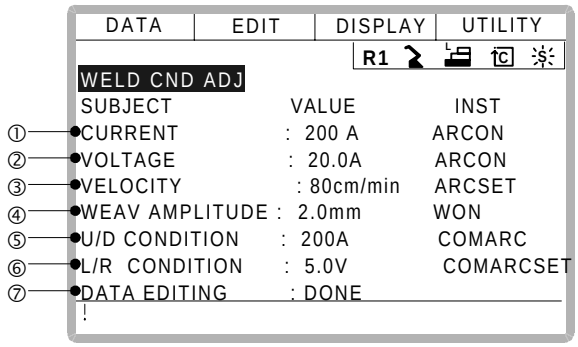
3 The adjusted welding condition is overwritten in the condition file of the job.

4 The job content display appears.

NOTE

- Only the welding condition data that have been set are displayed.
  For example, when the weaving operation is not set, "***" is displayed for "WEAV AMPLITUDE."
  And, when COMARC function is not used, "U/D CONDITION" and "L/R CONDITION" are not displayed.
- When the instruction such as ARCOF are executed, the adjustment is disabled and "***" is displayed for each welding condition.

2.9.3 Welding Condition Adjustment Display



①CURRENT

Move the cursor to the data and press the TUNING key to adjust the welding current value.
The welding current is specified by the following instructions:

- The instruction item (AC=) to ARCON instruction
- The current value set in the welding start condition file (ASF# (*) specified by ARCON instruction
  (When an enhanced type file is used, the data will not be overwritten.)
- The instruction item (AC=) to ARCSET instruction
- The instruction item (AC=) to ARCCUR instruction
- The set value by AWELD instruction

When ARCOF instruction is executed, the welding current adjustment is disabled.
When COMARC function is used, ⑤ "U/D CONDITION" will be changed in proportion to the welding current adjustment.
On the contrary, adjusting U/D CONDITION will not change the welding current value.

②VOLTAGE

Move the cursor to the data and press the TUNING key to adjust the welding voltage value.
The welding voltage is specified by the following instructions:

- The instruction items (AV=, and AVP=) to ARCON instruction
- The voltage value set in the welding start condition file (ASF# (*)) specified by ARCON instruction

(when an enhanced type file is used, the data will not be overwritten.)

- The instruction items (AV=, and AVP=) to ARCSET instruction
- The instruction items (AV=, and AVP=) to ARCVOL instruction
- The set value by VWELD instruction

When ARCOF instruction is executed, the welding voltage adjustment is disabled.

③VELOCITY

Move the cursor to the data and press the TUNING key to adjust the robot motion speed.
The speed is specified by the following instructions:

- The instruction item (V=) to ARCON instruction
- The speed set in the welding start condition file (ASF# (*)) specified by ARCON instruction
- The instruction item (V=) to ARCSET instruction
- The instruction item (V=) to MOVL (SMOVL), MOVC (SMOVC), or MOVS (SMOVS) instruction

When ARCOF instruction is executed, the robot motion speed adjustment is disabled.

④WEAV AMPLITUDE

Move the cursor to the data and press the specific keys to adjust the weaving single altitude.
The weaving single altitude is specified by the following instructions:

- The weaving amplitude set in the welding condition file (WEV# (*)) specified by WVON instruction
- The weaving amplitude set in the weaving condition file (WEV# (*)) specified by COMARCON (SCOMARCON) instruction
- The instruction item (AMP=) to COMARCON (SCOMARCON) instruction
- The instruction item (AMP=) to COMARCSET (SCOMARCST) instruction

When COMARCOF (SCOMARCOF) or WVOF instruction is executed, the weaving amplitude adjustment is disabled.

⑤U/D CONDITION

Move the cursor to the data and press the specific keys to adjust the sensing condition (upward/downward).
The upward/downward sensing condition is specified by the following instructions:

- The instruction item (U/D=) to COMARCON (SCOMARCON) instruction
- The instruction item (U/D=) to COMARCSET(SCOMARCST) instruction

When COMARCOF (SCOMARCOF) is executed, the upward/downward sensing adjustment is disabled.

⑥L/R CONDITION

Move the cursor to the data and press the specific keys to adjust the sensing condition (left/right).
The left/right side sensing condition is specified by the following instructions:

- The instruction item (L/R=) to COMARCON (SCOMARCON) instruction
- The instruction item (L/R=) to COMARCSET (SCOMARCST) instruction

When COMARCOF (SCOMARCOF) is executed, the left/right side sensing adjustment is disabled.

⑦DATA EDITING

Indicates whether the edition of a instruction or condition file is completed or not.
When the conditions set in the instruction or condition file agree with those set in the welding condition adjustment display, “DONE” is displayed. When not agree, “UNDONE” is displayed.
During adjustment of the welding conditions by pressing the specific key, “UNDONE” is displayed, and when [ENTER] is pressed and the adjusted conditions are registered, “DONE” is displayed.

NOTE The welding current and voltage set in the enhanced type welding condition file can be adjusted by the overriding welding condition function, but the data in the welding condition file will not be overwritten: the data in the welding condition file will not be replaced by the adjusted data.

2.9.4 Parameters for the Units to Adjust Conditions

When using the specific keys to adjust a condition, the units for each condition can be set by the following parameters.
Set the multiplication of the minimum unit of each condition.

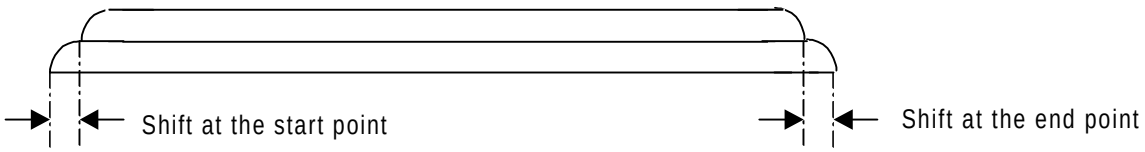
Parameter	Meanings	Initial Value
S3C459	The units for adjusting the welding current value (When the specific key is pressed once) Min. units for the current value: 1 A, Min. units for the command value: 0.01 V	1
S3C460	The units for adjusting the welding current value (When the specific key is pressed consecutively) Min. units for the current value: 1 A, Min. units for the command value: 0.01 V	1
S3C461	The units for adjusting the welding voltage value (When the specific key is pressed once) Min. units for the voltage value: 0.1 V or 1%, Min. units for command value: 0.01 V	1
S3C462	The units for adjusting the welding voltage value (When the specific key is pressed consecutively) Min. units for the voltage value: 0.1 V or 1%, Min. units for the command value: 0.01 V	1
S3C463	The units for adjusting the speed (When the specific key is pressed once) Min. units: 1 cm/min	1
S3C464	The units for adjusting the speed (When the specific key is pressed consecutively) Min. units: 1 cm/min	1

Parameter	Meanings	Initial Value
S3C465	The units for adjusting the weaving single amplitude (When the specific key is pressed once) Min. units: 0.1 mm	1
S3C466	The units for adjusting the weaving single amplitude (When the specific key is pressed consecutively) Min. units: 0.1 mm	1
S1E51	The units for adjusting the sensing U/D condition (When the specific key is pressed once) Min. units: 1 A	1
S1E52	The units for adjusting the sensing U/D condition (When the specific key is pressed consecutively) Min. units: 1A	1
S1E53	The units for adjusting the sensing L/R condition (When the specific key is pressed once) Min. units: 0.1 A	1
S1E54	The units for adjusting the sensing L/R condition (When the specific key is pressed consecutively) Min. units: 0.1 A	1

2.10 Unit Vector Calculation Function

2.10.1 Outline

The unit vector calculation function computes the unit vector by GETVEC instruction. Using this function, the welding start and end positions can be shifted to realize the cascade welding for the second and following layers.



2.10.2 Items to be Set for GETVEC instruction

The unit vector and the distance are calculated from the vector specified in the position variable. The unit vector of welding line vector specified by P1 is stored in P0. And the distance of P1 is stored in R0.

Instruction: GETVEC
Format: GETVEC P0 R0 P1

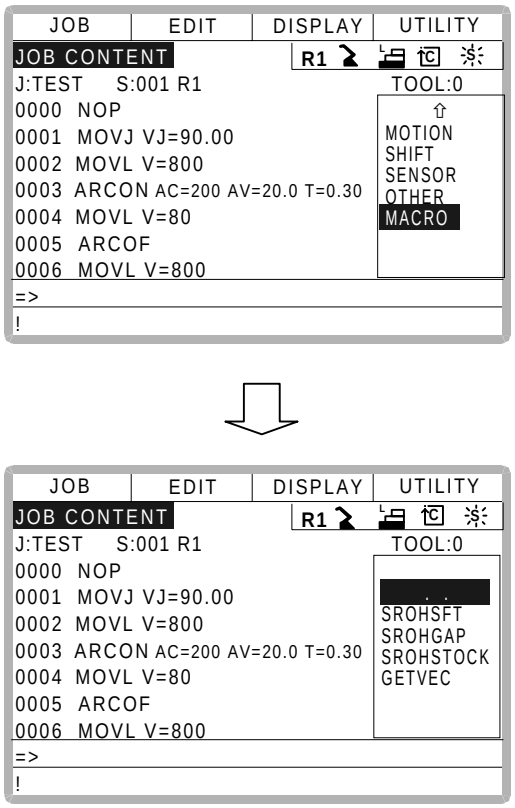
2.10.3 Registering

Operation

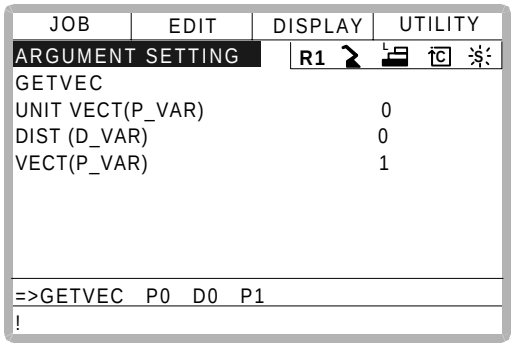
Move the cursor to the address area ➡ Press [INFORM LIST] ➡ Select “MACRO”*1 ➡ Select “GETVEC”*2

Explanation

1 The macro instruction list appears.



2 The argument setting display for GETVEC instruction appears.



2.11 Confirm the Welding Operation in Teach Mode

2.11.1 Outline

ARCON/ARCOF instructions can be executed by TEST RUN in the teach mode. By this operation, it is possible to confirm the welding conditions.

2.11.2 Operation

Operation

Press [WORK] to turn ON the LED*1 ➡ Execute the test run (execute the welding) ➡
Press [WORK] to turn OFF the LED

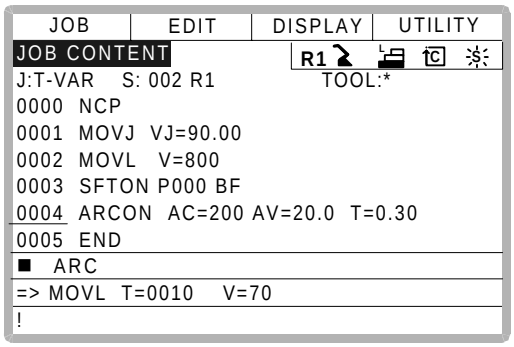
Explanation

1 Press [WORK] and the LED is lit. Press [WORK] again and the LED is unlit.

NOTE If the check run is enabled, turning ON the WORK LED does not execute the welding.

2.11.3 Display

During the execution of the welding, “ARC” is indicated on the job content display.



“ARC” Indication During Welding

CAUTION

Executing the test run while “ARC” is indicated on the display executes the welding.

YASNAC XRC
INSTRUCTIONS

FOR MULTI-LAYER WELDING FUNCTION

TOKYO OFFICE
New Pier Takeshiba SouthTower, 1-16-1, Kaigan, Minatoku, Tokyo 105-0022, Japan
Phone 81-3-5402-4511 Fax 81-3-5402-4580

MOTOMAN INC. HEADQUARTERS
805 Liberty Lane West Carrollton, OH 45449, U.S.A.
Phone 1-937-847-6200 Fax 1-937-847-6277

MOTOMAN INC. TROY FACILITY
1050 S. Dorset, Troy, OH 45373, U.S.A.
Phone 1-937-440-2600 Fax 1-937-440-2626

YASKAWA MOTOMAN CANADA LTD
2280 Argentia Road, Mississauga, Ontario, L5N 6H8, Canada
Phone 1-095-813-5901 Fax 1-905-813-5911

YASKAWA ELECTRIC EUROPE GmbH
Am Kronberger Hang 2, 65824 Schwalbach,Germany
Phone 49-6196-569-300 Fax 49-6196-888-301

Motoman Robotics Europe AB
Box 504 S38525 Torsås, Sweden
Phone 46-486-48800 Fax 46-486-41410

Motoman Robotec GmbH
Kammerfeldstraβe1,85391 Allershausen, Germany
Phone 49-8166-900 Fax 49-8166-9039

YASKAWA ELECTRIC KOREA CORPORATION
Kfpa Bldg #1201, 35-4 Youido-dong, Yeongdungpo-Ku, Seoul 150-010, Korea
Phone 82-2-784-7844 Fax 82-2-784-8495

YASKAWA ELECTRIC (SINGAPORE) PTE. LTD.
151 Lorong Chuan, #04-01, New Tech Park Singapore 556741, Singapore
Phone 65-282-3003 Fax 65-289-3003

YATEC ENGINEERING CORPORATION
Shen Hsiang Tang Sung Chiang Building 10F 146 Sung Chiang Road, Taipei, Taiwan
Phone 886-2-2563-0010 Fax 886-2-2567-4677

BEIJING OFFIC
Room No. 301 Office Building of Beijing Intemational Club, 21 Jianguomenwai Avenue, Beijing 100020, China
Phone 86-10-6532-1850 Fax 86-10-6532-1851

SHANGHAI OFFICE
27 Hui He Road Shanghai 200437, China
Phone 86-21-6553-6600 Fax 86-21-6531-4242

YASKAWA JASON (HK) COMPANY LIMITED
Rm. 2909-10, Hong Kong Plaza, 186-191 Connaught Road West, Hong Kong
Phone 852-2803-2385 Fax 852-2547-5773

TAIPEI OFFICE
Shen Hsiang Tang Sung Chiang Building 10F 146 Sung Chiang Road,Taipei, Taiwan
Phone 886-2-2563-0010 Fax 886-2-2567-4677

BEIJING YASKAWA BEIKE AUTOMATION ENGINEERING CO.,LTD.
30 Xue Yuan Road, Haidian, Beijing P.R. China Post Code: 100083, China
Phone 86-10-6233-2782 Fax 86-10-6232-1536

SHOUGANG MOTOMAN ROBOT CO., LTD.
7,Yongchang-North Street, Beijing Economic Technological Investment & Development Area,
Beijing 100076, China
Phone 86-10-6788-0551 Fax 86-10-6788-2878

YASKAWA ELECTRIC CORPORATION

YASKAWA

MANUAL NO. HW0480339