

Motoman XRC Controller

Form Cut Function

Manual

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|-------------------|-----------------|
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NOTES

SECTION 1

INTRODUCTION

1.1 About this Document

This manual provides instructions for the Form Cut Function 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 – FORM CUT FUNCTION

Provides detailed instructions to utilize the Form Cut 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 SK45X, XRC Manipulator Manual (P/N 142106-1)
- 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 OPTIONS INSTRUCTIONS

FORM CUTTING 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.





MANDATORY

- This manual explains the form cutting function of the YASNAC XRC. 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.

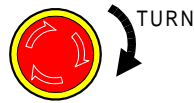
Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.



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 Stop

- 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 key  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

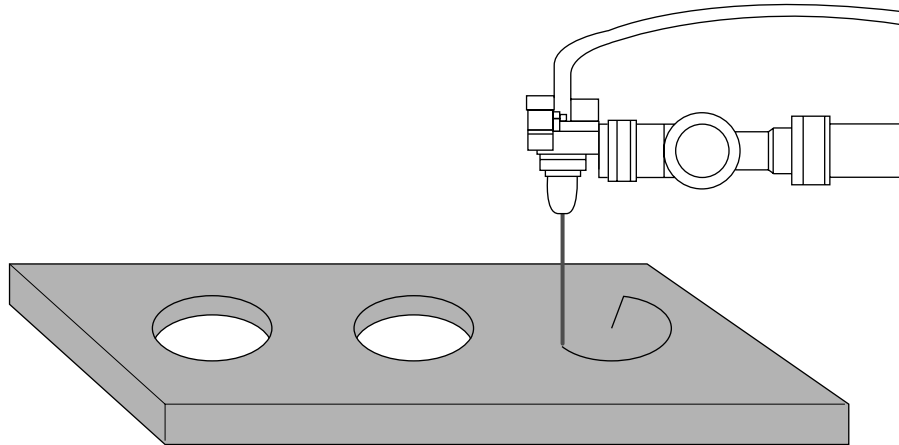
In the explanation of the operation procedure, the expression "Select •••" means that the cursor is moved to the object item and the SELECT key is pressed.

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1 Form Cutting Motion

The form cutting motion cuts workpieces according to a pattern with a tool such as a laser cutting machine handled by a manipulator.



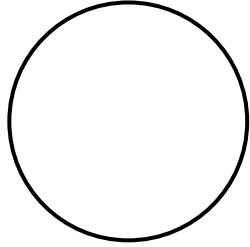
In the form cutting function, there may be some differences between the set design and the actual cutting motion path, depending on the calibration, ambient temperature, and load applied to the manipulator.

In order to minimize the above explained differences, be sure to calibrate your tools before using this function.

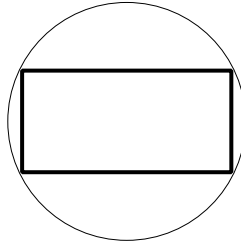


2 Patterns for Cutting

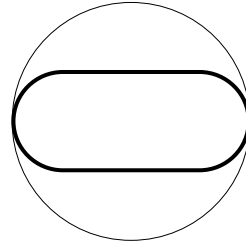
Three patterns, circle, rectangle (including square) and ellipse, are available.



Circle



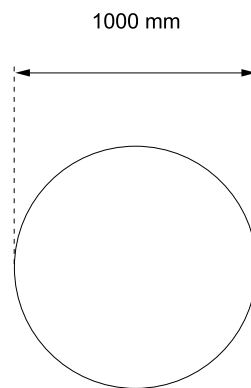
Rectangle



Ellipse

The minimum and maximum diameters of a pattern can be set at the following parameters.

| Parameter | Contents | Initial Value |
|-----------|------------------|-------------------------|
| SIC □G63 | Minimum diameter | 1,000 μm |
| SIC □G64 | Maximum diameter | 1,000,000 μm |



The initial value of the maximum diameter



3 Teaching

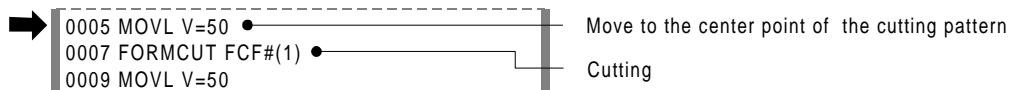
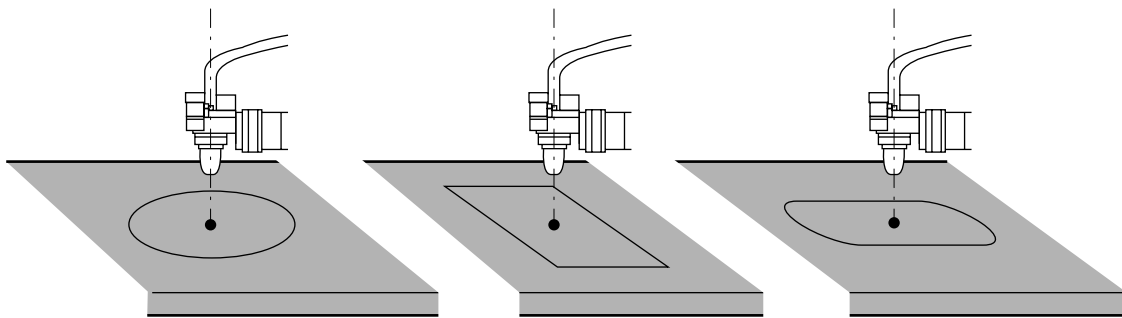
3.1 Precautions when Teaching

Make sure of the following points when teaching form cutting motions:

- Teach the center point of the cutting pattern.
- The cutting pattern is drawn on the XY plane of the tool coordinate system with its coordinate origin as the current value of the control point when executing the FORMCUT instruction.

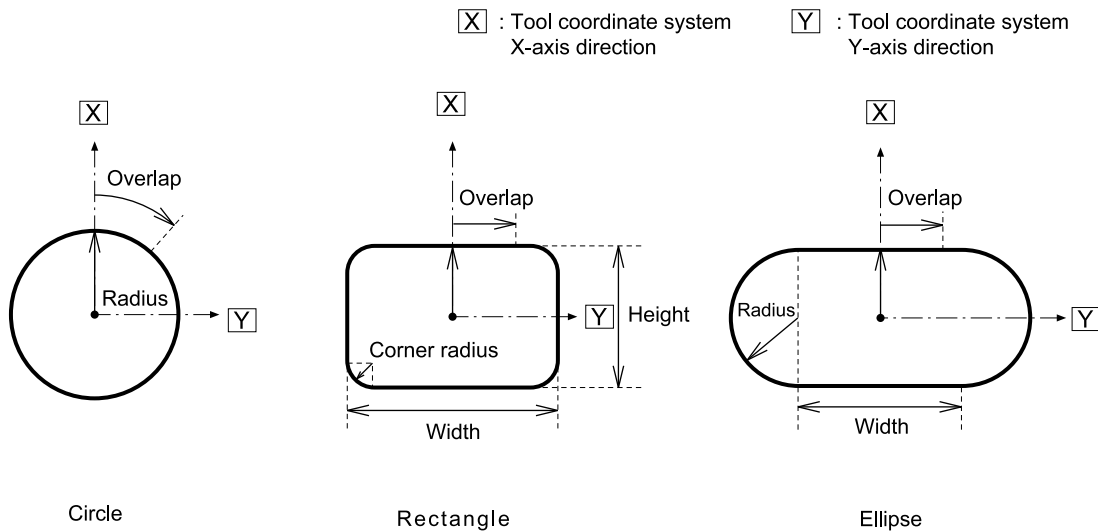
3.1.1 Center Point of Pattern

Move the robot axis and register the step at the center point of the cutting pattern.



3.1.2 Tool Position and Cutting Pattern

The following figures show the relation between the tool position each the cutting pattern.



3.1.3 Cutting Width Correction Function

The cutting width correction function shifts the scale of the cutting width of the laser for the cutting path when cutting the form according to the pattern. The following parameter is used for the setting.

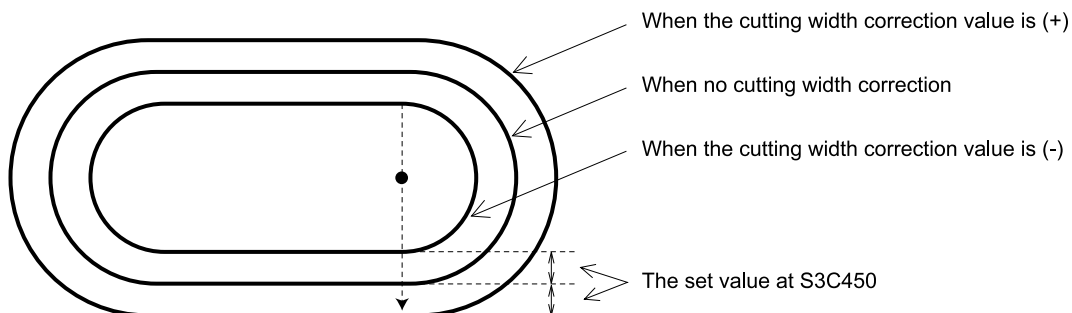
| Parameter | Contents | Initial Value |
|-----------|-------------------------------------------------|---------------|
| S3C450 | Cutting width correction (in units of 0.001 mm) | 0 mm |

Set the cutting width of the laser to 1/2 of its value. When cutting, the path is corrected by the parameter set values.

The following illustration is an example of the path correction when cutting the ellipse pattern.

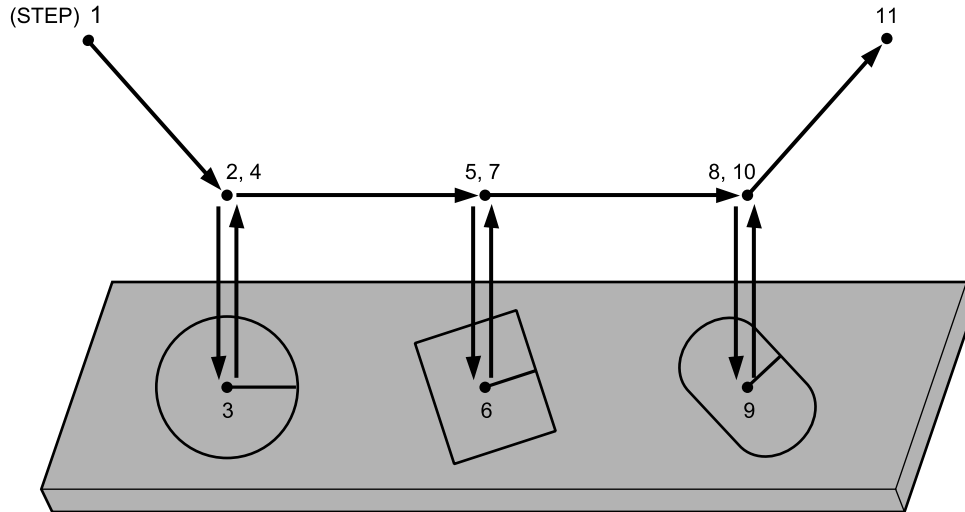
The correction for the motion path is similar when using the other patterns.

The center of the circle does not change before and after the cutting width correction.



3.2 Example of a Job

An example of a job for cutting the following pattern is shown.



```

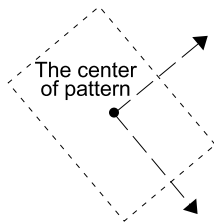
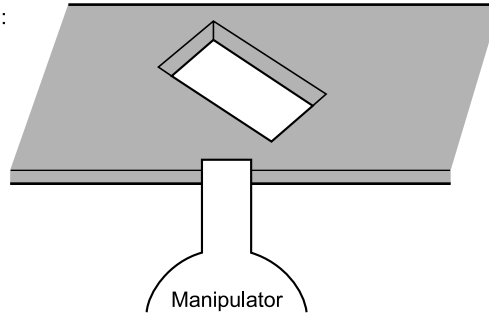
0000 NOP
0001 MOVJ VJ=100.00
0002 MOVJ VJ=100.00
0003 MOVL V=50
0004 DOUT OT#(*) ON···Motion start instruction to a laser, etc.
0005 FORMCUT FCF#(1)···Circle
0006 DOUT OT#(*) OFF···Motion end instruction to a laser, etc.
0007 MOVL V=50
0008 MOVJ VJ=100.00
0009 MOVL V=50
0010 DOUT OT#(*) ON···Motion start instruction to a laser, etc.
0011 FORMCUT FCF#(2)···Rectangle
0012 DOUT OT#(*) OFF···Motion end instruction to a laser, etc.
0013 MOVL V=50
0014 MOVJ VJ=100.00
0015 MOVL V=50
0016 DOUT OT#(*) ON···Motion start instruction to a laser, etc.
0017 FORMCUT FCF#(3)···Ellipse
0018 DOUT OT#(*) OFF···Motion end instruction to a laser, etc.
0019 MOVL V=50
0020 MOVJ VJ=100.00
0021 END

```

3.3 Example of a Motion Path

The motion path for cutting a rectangle pattern is shown in the figures. The motion path is similar for the other patterns.

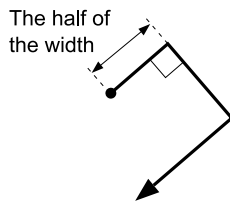
Cutting pattern:
Rectangle



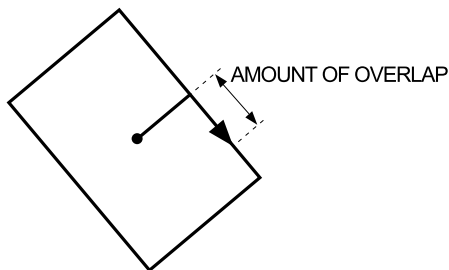
1. The starting point should be always the center of pattern.



2. According to the FORMCUT instruction, the manipulator moves to the X-axis direction on the tool coordinate system.



3. After proceeding the half of the width, the manipulator changes the cutting direction by 90° to start drawing the rectangle.



4. Performs overlapping for the length specified in "AMOUNT OF OVERLAP".

4 Instruction

4.1 FORMCUT (Form Cutting Motion Instruction)

The FORMCUT instruction is to execute the form cutting motion according to the conditions set in the form cut setting file.

The additional items to the FORMCUT instruction are as follows. The additional items can be omitted except for "FORM CUT SETTING".

FORMCUT FCF#(10) R=100 W=100 H=100 V=100



①FORM CUT SETTING

In the form cut setting file, the patterns for the form cutting motion and its dimensions, etc. are to be registered.

The form cutting motion is executed according to the conditions of the file condition No. specified by the FORMCUT instruction.

②RADIUS (mm)

Specifies the radius when the radius in the file conditions specified in ① should be changed. The radius specified in ② has a priority.

③WIDTH (mm)

Specifies the width when the width in the file conditions specified in ① should be changed. The width specified in ③ has a priority.

④HEIGHT (mm)

Specifies the height when the height in the file conditions specified in ① should be changed. The height specified in ④ has a priority.

⑤CUTTING SPEED (cm/min) (mm/min) (inch/min)

Specifies the cutting speed when the cutting speed in the file conditions specified in ① should be changed. The cutting speed specified in ⑤ has a priority.

4.2 Registrating Instruction

Operation

Move the cursor to the address area ➡ Move the cursor to the line where FORMCUT instruction to be registered ➡ Press [INFORM LIST] *1 ➡ Select {FORMCUT} *2 ➡ Press [SELECT] *3 ➡ Specify the conditions in the detail edit display of the FORMCUT instruction ➡ Press [ENTER] two times *4

Explanation

- *1 The instruction list dialog is displayed. The cursor moves to the instruction list dialog while the cursor in the address area changes to an underbar.

| JOB | EDIT | DISPLAY | UTILITY |
|--------------------|----------------|---------|----------------|
| JOB CONTENT | | R1 | ☰ ☒ ⚙ |
| J:CIRCLE | S:000 | | TOOL:0 |
| 0019 | MOVJ VJ=50.00 | | MOVJ |
| 0020 | MOVJ VJ=100.00 | | MOVL |
| 0021 | MOVL V=100 | | MOVC |
| 0022 | MOVL V=100 | | MOVS |
| 0023 | MOVJ VJ=100.00 | | SPEED |
| 0024 | MOVL V=100 | | REFP |
| 0025 | MOVJ VJ=100.00 | | FORMCUT |
| 0026 | END | | |
| ! | | | |

- *2 The instruction where the cursor is positioned, is displayed in the input buffer line with the previously registered additional items.

| JOB | EDIT | DISPLAY | UTILITY |
|--------------------|----------------|---------|----------------|
| JOB CONTENT | | R1 | ☰ ☒ ⚙ |
| J:CIRCLE | S:000 | | TOOL:0 |
| 0019 | MOVJ VJ=100.00 | | MOVJ |
| 0020 | MOVJ VJ=100.00 | | MOVL |
| 0021 | MOVL V=100 | | MOVC |
| 0022 | MOVL V=100 | | MOVS |
| 0023 | MOVJ VJ=100.00 | | SPEED |
| 0024 | MOVL V=100 | | REFP |
| 0025 | MOVJ VJ=100.00 | | FORMCUT |
| => FORMCUT FCF#(1) | | | |
| ! | | | |

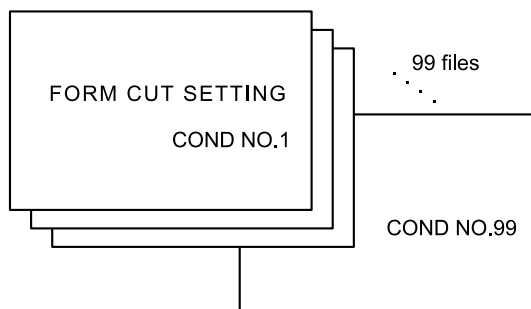
- *3** The detail edit display of the FORMCUT instruction is shown.

| JOB | EDIT | DISPLAY | UTILITY |
|--------------------|---------|---------|---------|
| DETAIL EDIT | | R1 | ↩ ⏪ ⏩ ⏹ |
| FORMCUT | | | |
| FORM CUT FILE | FCF#(%) | 1 | |
| RADIUS | UNUSED | | |
| WIDTH | UNUSED | | |
| HEIGHT | UNUSED | | |
| CUTTING SPEED | UNUSED | | |
| => FORMCUT FCF#(1) | | | |
| ! | | | |

- *4** Press [ENTER] to display the set contents in the input buffer line. Press [ENTER] once more to register the set contents.

5 Form Cut Setting File

The form cut setting file is to set the conditions for a form cutting motion and used in the FORMCUT instruction. Up to 99 files can be registered.



Form Cut Setting Files

Set the desired form cut setting file condition No. in the FORMCUT instruction.

5.1 Settings

FORMCUT FCF#(1)

Form cut setting file condition No. 1

| FORM CUT SETTING | |
|------------------|------------------------------------------------------------------|
| ① | COND NO : 01 |
| ② | FIGURE : CIRCLE |
| ③ | <input checked="" type="checkbox"/> RADIUS : 150.000mm |
| | <input type="checkbox"/> WIDTH : 0.000mm |
| | <input type="checkbox"/> HEIGHT : 0.000mm |
| | <input type="checkbox"/> CORNER RADIUS : 0.000mm |
| ④ | <input checked="" type="checkbox"/> AMOUNT OF OVERLAP : 10.000mm |
| ⑤ | <input checked="" type="checkbox"/> FIRST STOP TIME : 0.50sec |
| ⑥ | <input type="checkbox"/> SECOND STOP TIME : 0.00sec |
| | <input checked="" type="checkbox"/> CUTTING SPEED : 10.0mm/sec |

①COND NO. (1 to 99)

Form cut setting file condition No.

②FIGURE

Select the desired pattern.

③Dimensions

Set the dimensions of the pattern.

The items to be set are marked with “■” while the items not to be set are marked with “□”.

Set a numerical value in the items marked with “■”.

④FIRST STOP TIME (sec)

Using a timer, the manipulator can be stopped at the position to start cutting. The first stop timer can be set for all the pattern (circle, rectangle, ellipse).

⑤SECOND STOP TIME (sec)

When the pattern “RECTANGLE” is selected without specification of the corner radius, the manipulator can be stopped at each corner.

This timer is not available for cutting of other patterns.

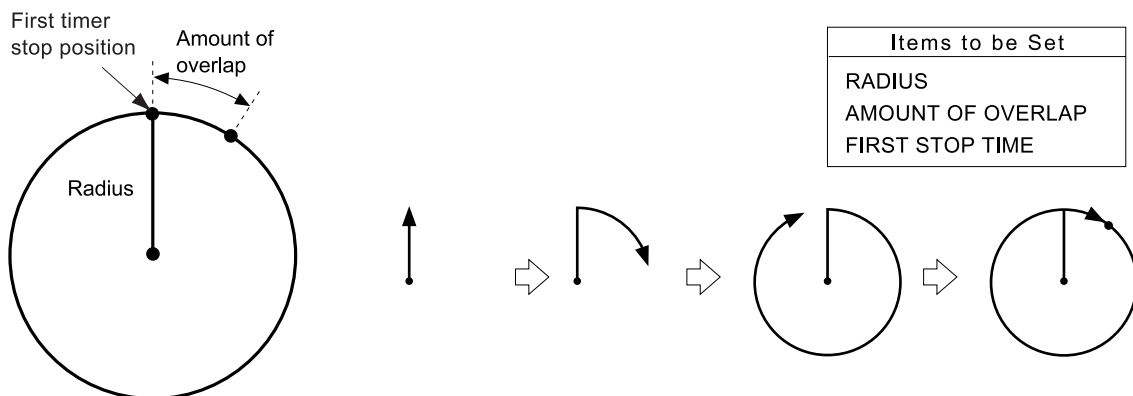
⑥CUTTING SPEED

Set the cutting speed.

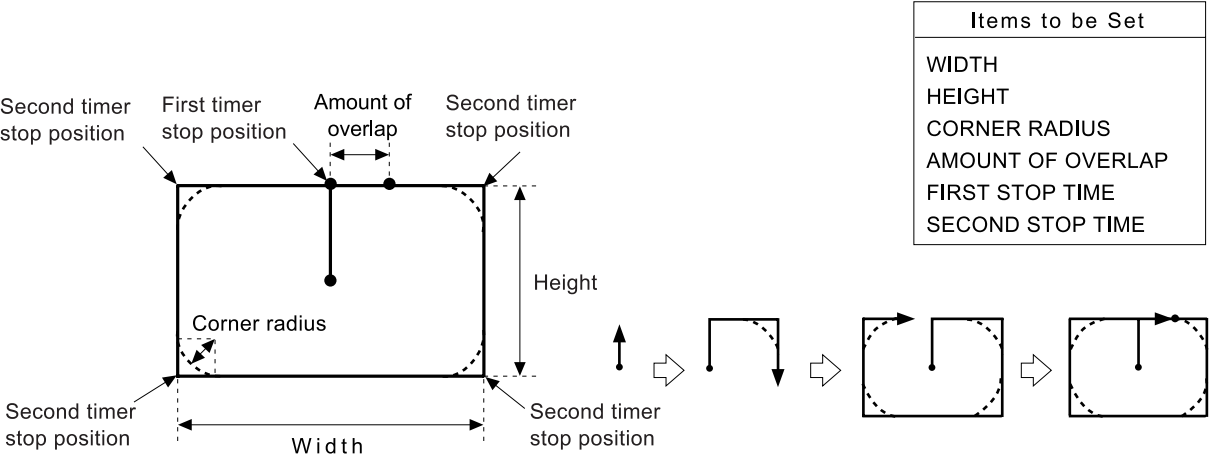
5.2 Examples of File Setting for Each Pattern

The examples of file setting for each pattern are shown.

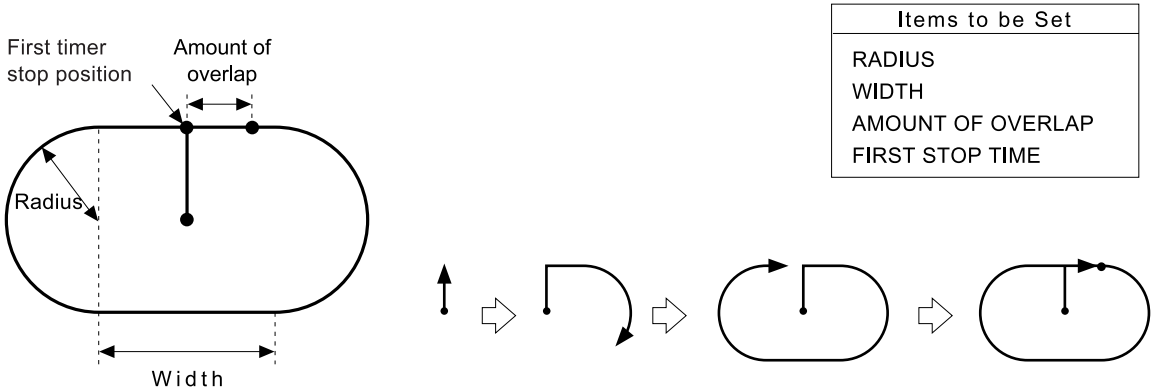
5.2.1 Circle



5.2.2 Rectangle including square



5.2.3 Ellipse



5.3 Displaying and Editing File

Operation

Select the application menu under the top menu ^{*1} ➡ Select {FORM CUT SETTING FILE}
➡ Display the file of desired condition No. ^{*2} ➡ Select each setting item and set

Explanation

- *1** The application menu differs depending on the robot application :
- For arc welding : {ARC WELDING}
 - For handling : {HANDLING}
 - For general-purpose : {GENERAL}
 - For spot welding : {SPOT WELDING}
- *2** There two methods to display the file of desired condition No.
- Call the file of desired condition No.using [PAGE].
Press [PAGE] to call the next condition No.
Press [SHIFT]+[PAGE] to call the previous condition No.
 - Enter the desired condition No.
Move the cursor to the COND NO. and press [SELECT]. Enter the desired condition No. with number keys, then press [ENTER].

6 Alarm Message List

| Alarm Number | Message | Cause | Remedy |
|--------------|--------------------------------------|---------------------------------------------------------------|----------------------------------------------------|
| 4595 | CAN'T DO FIXED FORM CUT MOTION | 1 : Wrong setting for RADIUS | Check the radius value. |
| | | 2 : Wrong setting for WIDTH | Check the width value. |
| | | 3 : Wrong setting for HEIGHT | Check the height value. |
| | | 4 : Wrong setting for CORNER RADIUS | Check the corner radius value. |
| | | 5 : Wrong setting for AMOUNT OF OVERLAP | Check the amount of overlap. |
| | | 6 : Wrong setting for CUTTING SPEED | Check the cutting speed. |
| | | 7 : With slave designation for coordinated control | Execute FORMCUT instruction in a single job. |
| | | 8 : No setting for pattern cutting motion minimum diameter | Check the set value for minimum diameter. |
| | | 9 : No setting for pattern cutting motion maximum diameter | Check the set value for maximum diameter. |



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