

***XRC Controller***

***Analog Output  
Function Manual  
for UP/SKX-Series Robots***

***Part Number 142976-1***

*May 15, 1999*

***MOTOMAN***

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# ***NOTES***

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# **SECTION 1**

## **INTRODUCTION**

### **1.1 About this Document**

This manual provides instructions for Analog Output Function Corresponding to Speed 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 – ANALOG OUTPUT FUNCTION**

Provides detailed instructions to operate the Analog Output 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 SK16X, XRC Manipulator Manual (P/N 142105-1)
- Motoman SK45X, XRC Manipulator Manual (P/N 142106-1)
- 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, SK16X, 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***

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# 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

ANALOG OUTPUT FUNCTION CORRESPONDING TO SPEED

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

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## MOTOMAN INSTRUCTIONS

MOTOMAN 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 analog output function corresponding to the speed 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.

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## 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.

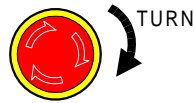
Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.



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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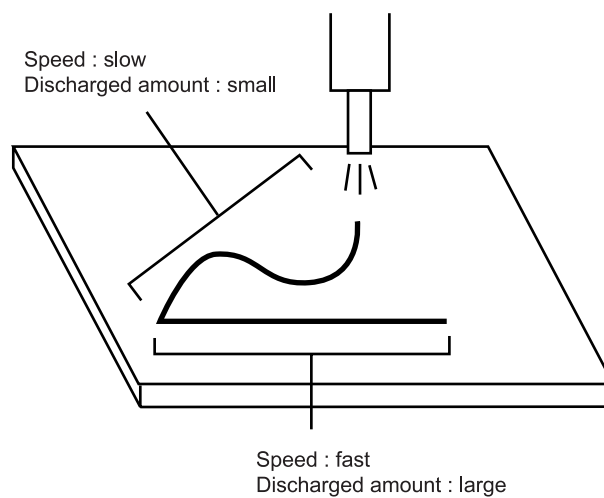


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# 1 Analog Output Function Corresponding to Speed

The analog output function corresponding to speed changes the analog output value automatically, according to the manipulator operating speed. This function does not need resetting of the analog output value according to the operating speed, so that the time required for job teaching can be reduced.

For example, when the thickness of sealing or painting should be constant, the discharged amount of seals or paints can be controlled by the manipulator operating speed.





## 2 Instructions

### 2.1 Instructions for Analog Output Function Corresponding to Speed

The instructions, ARATION and ARATIOF, are used for the analog output function corresponding to speed.

#### 2.1.1 ARATION

The analog output function corresponding to speed is performed after executing ARATION instruction. This instruction is valid during circular interpolation, linear interpolation or spline interpolation. It is executed only at playback or FWD key operation; it is not executed during axis operation.

This instruction is also used when each set value for the analog output function corresponding to speed is to be changed.

ARATION AO#(1) BV=10.00 V=200.0 OFV=2.00



①Output port number

General analog output port to execute the analog output corresponding to speed

Setting range : 1 to 8

②Basic voltage

Voltage to be output at the speed set with the basic speed.

③Basic speed

Operating speed which becomes the basis for when the set voltage is output.

④Offset voltage

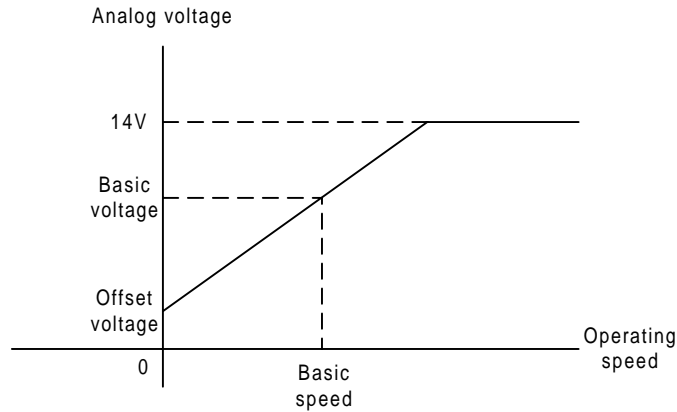
Analog voltage when the operating speed is 0.

---

## 2.1 Instructions for Analog Output Function Corresponding to Speed

---

According to the set value of the ARATION instruction, the output characteristics for the relation between the operating speed and the analog voltage are calculated. The analog output function corresponding to speed is executed depending on these output characteristics. The following graph shows the output characteristics.



Output Characteristics When Analog Output Function Corresponding to Speed is Used



When the analog output value exceeds  $\pm 14.00$  V because of the operating speed, the value is limited within  $\pm 14.00$  V.

### 2.1.2 ARATIOF

When the ARATIOF instruction is executed, the analog output corresponding to speed is completed, and the set offset voltage becomes the fixed output.

ARATIOF AO#(1)

①

① Output port number

General analog output port to end the analog output corresponding to speed

Setting range : 1 to 8

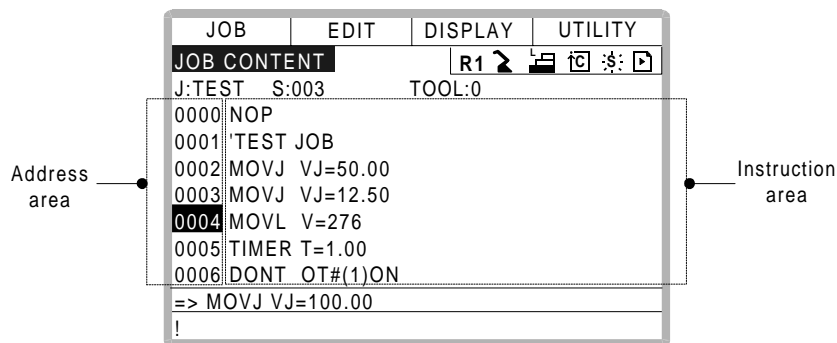


## 2.2 Registration of Instructions

The instructions can be registered when the cursor is in the address area on the job content display in teach mode. Perform the following operations before registering an instruction.

### Operation

Select {JOB} from the top menu ➔ Select {JOB CONTENT} ➔ Move the cursor to the address area



### 2.2.1 ARATION

#### Operation

Move the cursor to one line above the place to register the ARATION instruction <sup>\*1</sup> ➔ Press [INFORM LIST] <sup>\*2</sup> ➔ Select "ARATION" <sup>\*3</sup> ➔ Change any additional items and numerical values <sup>\*4</sup> ➔ Press [INSERT] and [ENTER] <sup>\*5</sup>

#### Explanation

<sup>\*1</sup>

The line above the place to register ARATION instruction ➔

0020	MOVL V=138
0021	MOVL V=138
0022	MOVL V=138

<sup>\*2</sup> The instruction list dialog is displayed.

DONT
DIN
WAIT
PULSE
AOUT
<b>ARATION</b>
ARATIOF

<sup>\*3</sup> The ARATION instruction is displayed in the input buffer line.

=> ARATION AO#(1)
-------------------

**\*4** <Register without changes>

To register without changes, perform operation of \*5.

<Register with addition or change of the additional items>

- To change the output port number

In case of using [SHIFT] and the cursor key, move the cursor to the output port number, and then press [SHIFT] and the cursor key simultaneously, to change the output port number.





=> ARATION AO#(1)

In case of using the number keys, move the cursor to the output port number, and press [SELECT] to display an input buffer line. Enter the number, and then press [ENTER] to change the number displayed.

- To change the basic voltage, the speed, and the offset voltage





Move the cursor to the instruction in the input buffer line, and then press [SELECT]. The detail edit display is shown.

=> ARATION AO#(1)

JOB	EDIT	DISPLAY	UTILITY
DETAIL EDIT		R1    	
ARATION			
ANLG OUTPUT NO AO#(%)1 <input checked="" type="checkbox"/>			
BASE VOLTAGE UNUSED			
SPEED UNUSED			
OFFSET VOLTAGE UNUSED			
=> ARATION AO#(1)			
!			

Move the cursor to “UNUSED” of the additional item to be changed, and then press [SELECT]. The selection dialog is displayed.

Move the cursor to the additional item to be changed, and press [SELECT].

JOB	EDIT	DISPLAY	UTILITY
DETAIL EDIT		R1    	
ARATION			
ANLG OUTPUT NO AO#(%)1 <input checked="" type="checkbox"/>			
BASE VOLTAGE BV= <input type="text"/>			
SPEED UNUSED			
OFFSET VOLTAGE UNUSED			
=> ARATION AO#(1)			
!			

When the additional item is changed, press [ENTER]. The detail edit display is closed, and the job content display is shown.

- \*5** The instruction displayed in the input buffer line is registered.

The line where ARATION instruction is registered →

```
0020 MOVL V=138
0021 ARTION AO#(1) BV=10.00
0022 MOVL V=138
```

## 2.2.2 ARATIOF

### Operation

Move the cursor to one line above the place to register ARATIOF instruction<sup>\*1</sup> → Press [INFORM LIST]<sup>\*2</sup> → Select "ARATIOF"<sup>\*3</sup> → Press [INSERT] and [ENTER]<sup>\*4</sup>

### Explanation

**\*1**

The line above the place to register ARATIOF instruction →

```
0030 MOVL V=138
0031 MOVL V=138
```

- \*2** The instruction list dialog is displayed.

```
DIN
WAIT
PULSE
AOUT
ARATION
ARATIOF
JMP
```

- \*3** The ARATIOF instruction is displayed in the input buffer line.

```
=> ARATIOF AO#(1)
```

- \*4** The ARATIOF instruction is registered.

```
0030 MOVL V=138
0031 ARTIOF AO#(1)
0032 MOVL V=138
```

## 2.3 Analog Output Display

The current settings can be confirmed on the analog output display.

	DATA	EDIT	DISPLAY	UTILITY
	<b>ANALOG OUTPUT</b>			
①	TERMINAL	AOUT1	AOUT2	AOUT3 AOUT4
②	OUTPUT(V)	:-14.00	-14.00	-10.00 -14.00
③	BASIC(V)	: 0.00	0.00	0.00 0.00
④	TRAIT	:SP RAT	SP RAT	STATIC SP RAT
⑤	OFFSET(V)	: 0.00	0.00	0.00 0.00
⑥	BASIC SPD	:1200.0	1200.0	1200.0 1200.0
⑦	ROBOT	: R1	R2	R3 R4

### ①Terminal

General analog output port

### ②OUTPUT (V)

Displays the voltage that is currently output.

### ③BASIC (V)

Displays the basic voltage used for the analog output corresponding to speed.  
This value is used until a new value is set by ARATION instruction.

### ④TRAIT

Displays the current output characteristics of the output port.

SP RAT : during execution of the analog output corresponding to speed

STATIC : fixed output status

### ⑤OFFSET (V)

Displays the offset voltage used for the analog output corresponding to speed.  
This value is used until a new value is set by ARATION instruction.

### ⑥BASIC SPD

Displays the basic speed used for the analog output corresponding to speed.  
This value is used until a new value is set by ARATION instruction.

### ⑦ROBOT

Displays the manipulator number for the analog output corresponding to speed.

### Operation

Select {IN/OUT} from the top menu ➡ Select {ANALOG OUTPUT} <sup>\*1</sup>

### Explanation

<sup>\*1</sup> The analog output display is shown.

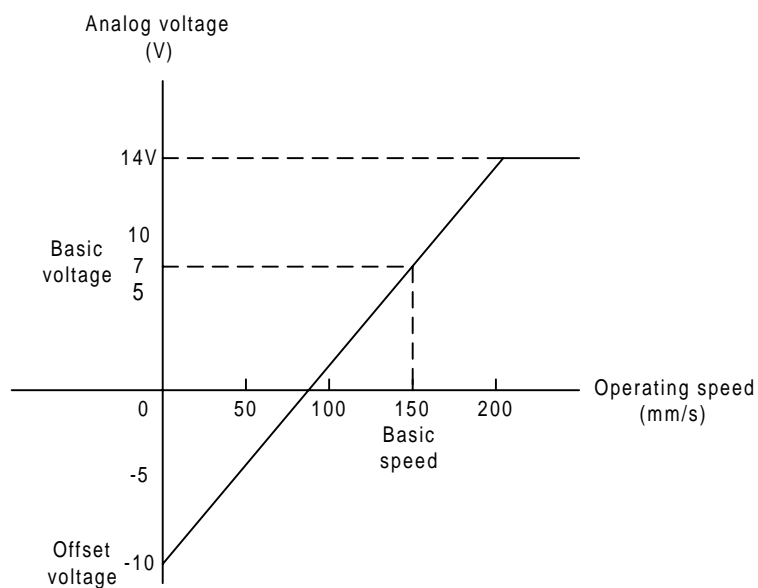
Pressing the page key shows the display for the output terminals AOUT1 to 4 and the display for the output terminals AOUT5 to 8 alternately.

## 3 Examples

### 3.1 Examples of Output Characteristics

The graph below shows the change in the output characteristics when the following job is done.

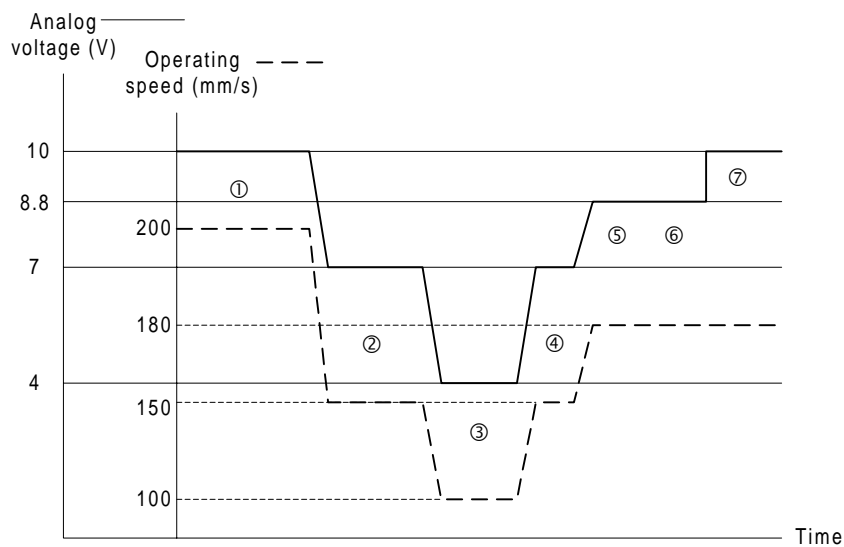
	Output Voltage (V)
MOVJ VJ=50.00	
ARATION AO#(1) BV=7.00 V=150.0 OFV=-10.00	7.00
MOVL V=50.0	-4.33
MOVC V=100.0	1.33
MOVC V=100.0	1.33
MOVC V=100.0	1.33
MOVL V=200.0	12.67



## 3.2 Example of Variation of Operating Speed and Analog Output Value

The following graph shows the change of the analog output according to the speed variation.

MOVL V=200.0⋯⋯①  
 ARATION AO#(1) BV=10.00 V=200.0 OFV=-2.00  
 MOVC V=150.0⋯⋯②  
 MOVC VR=20.0⋯⋯③(When the tool center point speed is 100 mm/s)  
 MOVC V=150.0⋯⋯④  
 MOVL V=180.0⋯⋯⑤  
 MOVL⋯⋯⑥ (When the tool center point speed is 180 mm/s)  
 AOUT AO#(1) 10.00⋯⋯⑦



Analog Voltage according to Speed

**NOTE**

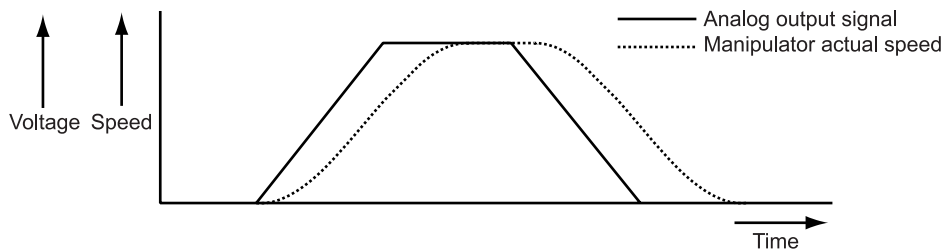
- Since the analog output corresponding to speed is made for the calculated speed, there may be little difference from the actual operating speed of the manipulator.
- When a posture speed is specified, the analog output corresponding to speed is made for the operating speed at the tool center point with the posture speed.

## 4 Filter Process

In the analog output function corresponding to speed, the output analog signal can be filtered by setting a filter constant at the parameters.

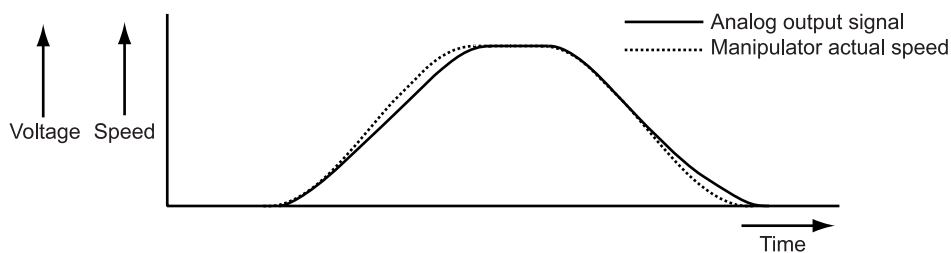
### 4.1 When Parameter is Set to "0"

The analog signal according to the speed reference (the speed determined by a path operation) is output.



### 4.2 When Parameter is Set to Values Other Than "0"

The analog signal according to the speed of filtered speed reference is output. By the filter process, the output signal can be close to the manipulator's actual speed.



## 4.3 Parameter Setting

Adjust the settings of parameters during actual operations.

Parameter			
S3C426 S3C427	Analog output No. 1 Analog output No. 1	Primary filter constant Secondary filter constant	[units of msec] [units of msec]
S3C428 S3C429	Analog output No. 2 Analog output No. 2	Primary filter constant Secondary filter constant	[units of msec] [units of msec]
S3C430 S3C431	Analog output No. 3 Analog output No. 3	Primary filter constant Secondary filter constant	[units of msec] [units of msec]
S3C432 S3C433	Analog output No. 4 Analog output No. 4	Primary filter constant Secondary filter constant	[units of msec] [units of msec]
S3C434 S3C435	Analog output No. 5 Analog output No. 5	Primary filter constant Secondary filter constant	[units of msec] [units of msec]
S3C436 S3C437	Analog output No. 6 Analog output No. 6	Primary filter constant Secondary filter constant	[units of msec] [units of msec]
S3C438 S3C439	Analog output No. 7 Analog output No. 7	Primary filter constant Secondary filter constant	[units of msec] [units of msec]
S3C440 S3C441	Analog output No. 8 Analog output No. 8	Primary filter constant Secondary filter constant	[units of msec] [units of msec]

The standard parameter settings are as follows.

- For small capacity robot with a payload 6 kg and 16 kg  
Primary filter constant : 50 msec  
Secondary filter constant : 50 msec
- For large capacity robot with a payload 60 kg and 130 kg  
Primary filter constant : 100 msec  
Secondary filter constant : 100 msec



## 5 Precautions

### 5.1 When Analog Output Corresponding to Speed is Interrupted

If the manipulator is stopped for some reason and the editing operation is performed, the analog output corresponding to speed is interrupted. This interruption is performed in all output terminals, and the analog voltage fixed immediately before the interruption is output to each output terminal.

The analog output corresponding to speed is not interrupted in any other cases.

### 5.2 When More than One Manipulator is Used

The attribute of the job where the instruction is executed determines the manipulator where the analog output corresponding to speed is performed.

For a coordinated job, the analog output corresponding to speed is performed at the operating speed of the manipulator at the slave side.





# YASNAC XRC OPTIONS INSTRUCTIONS

ANALOG OUTPUT FUNCTION CORRESPONDING TO SPEED

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YASKAWA ELECTRIC CORPORATION

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