XRC 2001 Controller

T-Axis Speed Control Function Manual

Part Number 147429-1-

June 6, 2002

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SECTION 1
INTRODUCTION

1.1 About this Document
The Motoman T-Axis Speed Control Function Manual provides information about the continuous rotation 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 – T-AXIS SPEED CONTROL FUNCTION
Provides information about the continuous rotation function.

1.2 Reference to Other Documentation
For additional information refer to the following:
- Motoman manipulator manual that was shipped with your system

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, UP130, UP165, 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)
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 of the controller PLC can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to the PLC. 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, 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, 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).
YASNC AC OPTIONS
OPERATOR’S MANUAL

For T-axis Speed Control 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
YASNC AC INSTRUCTIONS
YASNC AC OPERATOR’S MANUAL
YASNC AC OPERATOR’S MANUAL for BEGINNERS

The YASNC AC operator’s manuals above correspond to specific usage. Be sure to use the appropriate manual.

Do not submit this electronic data to the customer.

THIS MATERIAL IS FOR STUDY PURPOSE ONLY. YOU MUST READ THE MANUAL WHICH ENCLOSED WITH A ROBOT.
This manual explains the T-axis speed control 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.

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.

**NOTE**

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

• 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.

• 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.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>YASNC XRC Controller</td>
<td>XRC</td>
</tr>
<tr>
<td>YASNC XRC Playback Panel</td>
<td>Playback Panel</td>
</tr>
<tr>
<td>YASNC XRC Programming Pendant</td>
<td>Programming Pendant</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
</table>
| 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 ![Page Key]  
The cursor key is an exception, and a picture is not shown.                                      |
| Axis Keys            | “Axis Keys” and “Number Keys” are generic names for the keys for axis operation and number input.                                                  |
| Number Keys          |                                                                                                                                                  |
| Keys pressed         | When two keys are to be pressed simultaneously, the keys are shown with a “+” sign between them, ex. [SHIFT]+[COORD]                              |
| simultaneously       |                                                                                                                                                  |
| 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                                                             |
1 Outline

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1 Outline

With the T-axis speed control function, the T-axis, the end tip axis of the manipulator, can be continuously rotated according to the specified rotating speed. This continuous rotating operation starts with execution of the speed control start instruction (VCON) and terminates with execution of the speed control end instruction (VCOF). During the continuous rotation, the rotating speed of T-axis is independently controlled. When operating the manipulator with the T-axis speed control function, the T-axis rotates at the specified speed disregarding teaching while other axes operate as taught.

This function can be used for such applications as the manipulator grasping a workpiece to put into the paint, rotating the workpiece continuously. Because the T-axis working envelope is limited in the normal position-control method, the continuous rotating operation is disabled. Using this function, however, the T-axis can continuously rotate without its working envelope being limited.

<table>
<thead>
<tr>
<th>Line</th>
<th>Step</th>
<th>Instruction</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>000</td>
<td></td>
<td>NOP</td>
<td></td>
</tr>
<tr>
<td>001</td>
<td>001</td>
<td>MOVJ VJ=12.50</td>
<td>Moves to the waiting point.</td>
</tr>
<tr>
<td>002</td>
<td>002</td>
<td>MOVJ VJ=12.50</td>
<td>Moves to the work start point.</td>
</tr>
<tr>
<td>003</td>
<td></td>
<td>VCON RV=10</td>
<td>Starts rotation. Speed : 10 [min⁻¹]</td>
</tr>
<tr>
<td>004</td>
<td></td>
<td>TIMER T=0.50</td>
<td>Waits for rotation to start.</td>
</tr>
<tr>
<td>005</td>
<td>003</td>
<td>MOVL V=100</td>
<td>Moves to work end point by linear interpolation at 100.0 [mm/s].</td>
</tr>
<tr>
<td>006</td>
<td></td>
<td>VCOF</td>
<td>Terminates rotation.</td>
</tr>
<tr>
<td>007</td>
<td>004</td>
<td>MOVJ VJ=12.50</td>
<td>Moves T-axis to the taught position.</td>
</tr>
<tr>
<td>008</td>
<td>005</td>
<td>MOVJ VJ=12.50</td>
<td>Moves to the taught position.</td>
</tr>
<tr>
<td>009</td>
<td></td>
<td>END</td>
<td>Moves to the waiting point.</td>
</tr>
</tbody>
</table>
2 Description of Function

2.1 Starting Rotation

The T-axis starts rotating continuously with execution of the VCON instruction. Although it takes several hundred [ms] to start rotation, the job is continuously executed. Therefore, if the next operation needs to be performed after the T-axis starts rotating, create a job using the TIMER instruction to wait for the T-axis to rotate at a constant speed before the next operation. The T-axis is continuously rotated even if no move instruction is executed (or during execution of TIMER or WAIT instruction). When a move instruction is executed during T-axis rotation, the manipulator moves to the aimed point while the T-axis keeps rotating. The T-axis soft limit check does not function during rotation.

The T-axis position that appears on the position display during rotating differs from its actual position.

2.2 Terminating Rotation

The T-axis terminates rotation with execution of the VCOF instruction. It takes approximately 0.5 seconds to stop rotation, and the execution of the job stops during the time. The position where the T-axis terminates rotation is not fixed but varies each time the job is executed. Register a move instruction to return the T-axis to the taught position after the T-axis terminates the rotation.

When rotation is terminated, the T-axis current value, the position display, and the T-axis home positioning data are updated.
2.3 Suspending or Restarting Rotation

If the job execution is suspended during T-axis rotation by the following operations or in the following cases, the T-axis rotation is also suspended. When the job is restarted, the T-axis rotation also restarts.

• HOLD or external HOLD
• Mode switching operation
• When the operation cycle is changed into STEP

When the job execution is restarted by the following operations or in the following cases, the T-axis moves as it is taught without restarting rotation.

• Emergency stop or external emergency stop
• JOG operation
• Cursor moving operation
• Job selection
• Job editing operation
3 Instructions

3.1 VCON (Speed Control Start Instruction)

The VCON instruction is to start the T-axis speed control. The additional items to the VCON instruction are as follows.

①RV
Setting range: -32768 to 32767
Unit: min⁻¹ (revolutions per minute)
Sets the T-axis rotating speed.
If a positive value is set, the T-axis rotates in the positive direction; if a negative value is set, it rotates in the negative direction.

②MTR
Setting range: 0.1 to 100.0
Sets the T-axis rotating amount.
T-axis rotates for the specified amount.

3.2 VCOF (Speed Control End Instruction)

The VCOF instruction is to terminate the T-axis speed control. The additional items to the VCOF instruction are as follows.
4 Registration of the Instructions

Register an instruction when the cursor is in the address area of the JOB CONTENT display in the teach mode.

**Operation**

Select {JOB} under the top menu ➤ Select {JOB CONTENT} *1 ➤ Move the cursor to the address area

**Explanation**

*1 The JOB CONTENT display appears.

![Instruction List](image)

### 4.1 VCON (Speed Control Start Instruction)

**Operation**

Move the cursor to the address area ➤ Press the [INFORM LIST] *1 ➤ Select {OTHER} ➤ Select {VCON} *2 ➤ Press [SELECT] and set each item in the DETAIL EDIT display *3 ➤ Press [ENTER]

**Explanation**

*1 The instruction list dialog box appears.
4.1 VCON (Speed Control Start Instruction)

*2 The “VCON” instruction appears in the input buffer line.

```
J:WORK S:002 R1
0000 NOP
0001 MOVJ VJ=25.00
0002 MOVL V=50
0003 MOVL V=50 NWAIT
0004 VCON
0005 MOVL V=50
0006 MOVL V=50
```

*3 The DETAIL EDIT display appears. Move the cursor to the item to be set, and press [SELECT]. Use the number keys to input each setting item and press [ENTER].
4.2 VCOF (Speed Control End Instruction)

**Operation**

Move the cursor to the address area ➔ Press the [INFORM LIST] *1 ➔ Select (OTHER) ➔ Select (VCOF) *2 ➔ Press [SELECT] ➔ Press [ENTER]

**Explanation**

*1 The instruction list dialog box appears.

*2 The “VCOF” instruction appears in the input buffer line.
5  Display of Rotation Amount

The T-axis rotation amount can be viewed in the ROTATION display.

**Operation**

Select {ROBOT} under the top menu ➔ Select {ROTATION} *1

**Explanation**

*1 The ROTATION display appears.

```
<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
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</thead>
<tbody>
<tr>
<td>ROTATION</td>
<td>R1</td>
<td>S</td>
<td>C</td>
</tr>
<tr>
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```

*1 The ROTATION display appears.
6 Resetting the Rotation Amount

The T-axis rotation amount can be reset in the ROTATION display.

**Operation**

Select {ROBOT} under the top menu ➔ Select {ROTATION} ➔ Select {DATA} of the menu ➔ Select {RESET ROTATION}.

**Explanation**

*1 The pull-down menu appears.

*2 The displayed T-axis rotation amount is changed into “0.”
7 Restrictions

The following describes the restrictions of the T-axis speed control function.

7.1 Rotating Speed

The rotating speed varies in the following cases.
• When either the B-axis or R-axis operates
• Limited to the maximum rotating speed when the setting of the rotating speed exceeds the motor’s maximum rotating speed.

7.2 Maximum Rotation Amount

The maximum rotation amount is calculated as follows. The result differs depending on the manipulator models.

Maximum rotation amount = ±536870912 [pulses] / resolutions [pulse/min⁻¹]

Do not set the rotation amount in one speed control section greater than the maximum rotation amount.
7.3 T-axis Speed Control With Two Manipulators

Speed control start instruction (VCON) and end instruction (VCOF) cannot be set in a job of the multi-axis control group. Therefore, in a system using two manipulators, perform the speed control from each manipulator by creating the following job to call each job from the job whole control group is R1 + R2 and independently start and end the speed control.

- Example where R1 job is called

<table>
<thead>
<tr>
<th>JOB: Work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group: R1 + R2</td>
</tr>
<tr>
<td>Line  : Step:</td>
</tr>
<tr>
<td>000  : NOP</td>
</tr>
<tr>
<td>001  : MOVJ</td>
</tr>
<tr>
<td>002  : MOVJ</td>
</tr>
<tr>
<td>003  : CALL JOB: VCON-R1</td>
</tr>
<tr>
<td>004  : TIMER T=0.50</td>
</tr>
<tr>
<td>005  : MOVL</td>
</tr>
<tr>
<td>006  : CALL JOB: VCOF-R1</td>
</tr>
<tr>
<td>007  : MOVJ</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JOB: VCON-R1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group: R1</td>
</tr>
<tr>
<td>Line  : Step:</td>
</tr>
<tr>
<td>000  : NOP</td>
</tr>
<tr>
<td>002  : VCON</td>
</tr>
<tr>
<td>003  : END</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JOB: VCOF-R1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control group: R1</td>
</tr>
<tr>
<td>Line  : Step:</td>
</tr>
<tr>
<td>000  : NOP</td>
</tr>
<tr>
<td>002  : VCOF</td>
</tr>
<tr>
<td>003  : END</td>
</tr>
</tbody>
</table>

7.4 Specifying NWAIT

When a move instruction added with NWAIT is executed, the instructions that have been registered before the next move instruction are executed in order. However, only the VCOF instruction is not executed at this time, but executed after completion of the move instruction.

7.5 After Turning OFF Power Supply during T-axis Speed Control

When the control power supply is turned OFF and then ON during T-axis speed control, be sure to reset the rotation amount in the ROTATION display.
7.6 Turning ON the Servo Power Supply

In a system where the T-axis speed control is available, it takes longer to turn ON the servo power supply than ordinary operations. Keep pressing the servo ON button until you confirm that the servo power supply is turned ON.

7.7 Resetting the Rotation Amount

The rotation amount is automatically reset when the servo power supply is turned ON. When restarting after an emergency stop, the operation starts with the rotation amount reset.
## 8 Alarm List

<table>
<thead>
<tr>
<th>Alarm Number</th>
<th>Message</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>4353</td>
<td>DEFECTIVE TAUGHT POINT (ENDLESS)</td>
<td>Feedback pulses for speed-controlled axis exceeds ±536870912 pulses.</td>
<td>Reset the rotation amount. (Refer to &quot;6 Resetting the Rotation Amount.&quot;) Recheck the setting so as not to exceed the maximum number of pulses in one speed control section.</td>
</tr>
</tbody>
</table>