YRC1000 OPTIONS
INSTRUCTIONS
FOR IO 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-□□□ INSTRUCTIONS
YRC1000 INSTRUCTIONS
YRC1000 OPERATOR’S MANUAL (GENERAL) (SUBJECT SPECIFIC)
YRC1000 MAINTENANCE MANUAL
YRC1000 ALARM CODES (MAJOR ALARMS) (MINOR ALARMS)

The YRC1000 operator’s manual above corresponds to specific usage. Be sure to use the appropriate manual. The YRC1000 operator’s manual above consists of “GENERAL” and “SUBJECT SPECIFIC”. The YRC1000 alarm codes above consists of “MAJOR ALARMS” and “MINOR ALARMS.”

Please have the following information available when contacting Yaskawa Customer Support:
- System
- Primary Application
- Software Version (Located on Programming Pendant by selecting: {Main Menu} - {System Info} - {Version})
- Robot Serial Number (Located on robot data plate)
- Robot Sales Order Number (Located on controller data plate)

Part Number: 182142-1CD
Revision: 0
DANGER

• This manual explains the IO speed control function of the YRC1000 system. Read this manual carefully and be sure to understand its contents before handling the YRC1000. Any matter, including operation, usage, measures, and an item to use, not described in this manual must be regarded as "prohibited" or "improper".

• General information related to safety are described in "Chapter 1. Safety" of the YRC1000 INSTRUCTIONS. To ensure correct and safe operation, carefully read "Chapter 1. Safety" of the YRC1000 INSTRUCTIONS.

CAUTION

• In some drawings in this manual, protective covers or shields are removed to show details. Make sure that all the covers or shields are installed in place before operating this product.

• YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids the product warranty.

NOTICE

• 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.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the YRC1000.

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

DANGER

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury. Safety Signs identified by the signal word DANGER should be used sparingly and only for those situations presenting the most serious hazards.

WARNING

Indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury. Hazards identified by the signal word WARNING present a lesser degree of risk of injury or death than those identified by the signal word DANGER.

CAUTION

Indicates a hazardous situation, which if not avoided, could result in minor or moderate injury. It may also be used without the safety alert symbol as an alternative to “NOTICE”.

NOTICE

NOTICE is the preferred signal word to address practices not related to personal injury. The safety alert symbol should not be used with this signal word. As an alternative to “NOTICE”, the word “CAUTION” without the safety alert symbol may be used to indicate a message not related to personal injury.

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 “DANGER”, “WARNING” and “CAUTION”.
Before operating the manipulator, make sure the servo power is turned OFF by performing the following operations. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

- Press the emergency stop buttons on the front door of the YRC1000, on the programming pendant, on the external control device, etc.
- Disconnect the safety plug of the safety fence.

If operation of the manipulator cannot be stopped in an emergency, personal injury and/or equipment damage may result.

**Fig. : Emergency Stop Button**

Before releasing the emergency stop, make sure to remove the obstacle or error caused the emergency stop, if any, and then turn the servo power ON.

Failure to observe this instruction may cause unintended movement of the manipulator, which may result in personal injury.

**Fig. : Release of Emergency Stop**

Observe the following precautions when performing a teaching operation within the manipulator's operating range:

- Be sure to perform lockout by putting a lockout device on the safety fence when going into the area enclosed by the safety fence. In addition, the operator of the teaching operation must display the sign that the operation is being performed so that no other person closes the safety fence.
- View the manipulator from the front whenever possible.
- Always follow the predetermined operating procedure.
- Always keep in mind emergency response measures against the manipulator’s unexpected movement toward a person.
- Ensure a safe place to retreat in case of emergency.

Failure to observe this instruction may cause improper or unintended movement of the manipulator, which may result in personal injury.

- Confirm that no person is present in the manipulator's operating range and that the operator is in a safe location before:
  - Turning ON the YRC1000 power
  - Moving the manipulator by using the programming pendant
  - Running the system in the check mode
  - Performing automatic operations

Personal injury may result if a person enters the manipulator's operating range during operation. Immediately press an emergency stop button whenever there is a problem. The emergency stop buttons are located on the front panel of the YRC1000 and on the right of the programming pendant.

- Read and understand the Explanation of the Warning Labels before operating the manipulator.
Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.

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

In this manual, the equipment is designated as follows.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>YRC1000 Controller</td>
<td>YRC1000</td>
</tr>
<tr>
<td>YRC1000 Programming Pendant</td>
<td>Programming Pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and the controller</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>
Descriptions of the programming pendant keys, buttons, and displays are shown as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Pendant</td>
<td><strong>Character Keys</strong> /Symbol Keys The keys which have characters or symbols printed on them are denoted with [ ]. ex. [ENTER]</td>
</tr>
<tr>
<td>Axis Keys /Numeric Keys</td>
<td>[Axis Key] and [Numeric Key] are generic names for the keys for axis operation and number input.</td>
</tr>
<tr>
<td>Keys pressed simultaneously</td>
<td>When two keys are to be pressed simultaneously, the keys are shown with a &quot;+&quot; sign between them, ex. [SHIFT]+[COORD]</td>
</tr>
<tr>
<td>Displays</td>
<td>The menu displayed in the programming pendant is denoted with { }. ex. {JOB}</td>
</tr>
</tbody>
</table>

**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 [SELECT] is pressed, or that the item is directly selected by touching the screen.

**Registered Trademark**

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or brand names for each company or corporation. The indications of (R) and ™ are omitted.
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1 IO Speed Control Function

This is a function which performs the speed control operation of the external axis with using user input signals.
2 IOSPDCTRL SETUP Window

This is the window where operation settings of the IO speed control axis are performed. The window appears when selecting {SETUP} - {IOSPDCTRL SETUP} in the main menu. Each setting item can be edited when the teach mode is set and the servo is OFF.

Fig. 2-1: IOSPDCTRL SETUP Window (When "DIRECT" is Specified in (5).)

Fig. 2-2: IOSPDCTRL SETUP Window (When "LEVEL" is Specified in (5).)
(1) **Control group**
A control group of the IO speed control axis is displayed.

(2) **COMMENT**
A comment can be input up to 32 one-byte characters.

(3) **CONFIG**
Set "INVALID" or "VALID".
When "VALID" is set, only the IO speed control operation can be performed.
When "INVALID" is set, the normal teaching and the playback operation can be performed.

(4) **ROTATION INSTRUCTION**
Set a user input signal number (input range: 0 to 4096).
When the set signal is turned ON while the servo is ON, the speed control operation starts at the specified speed.

(5) **SPECIFIED ROTATION**
Set "DIRECT" or "LEVEL".
When "DIRECT" is set, the window shown in fig. 2-1 appears.
When "LEVEL" is set, the window shown in fig. 2-2 appears.

(6) **Specification method**
Set "UNIVERSAL INPUT" or "REGISTER" for the instruction method of the speed of rotation.

(7) **Speed of rotation (direct specification)**
When the specification method is "UNIVERSAL INPUT", set the user input group number (input range: 0 to 511).
Treat the 2 groups which have the set user input group numbers at their front as signed 2-byte data (-32768 to 32767), and then regard those data as the speed of rotation (rpm).
When the specification method is "REGISTER", set the register number (input range: 0 to 559).
Treat the set register value as signed 2-byte data, and then regard those data as the speed of rotation (rpm).

(8) **Speed of rotation (level specification)**
Set a user input group number (input range: 0 to 512).
Allocate the speed of rotation (rpm) to each user input signal.
The value allocated to the user input signal, which is ON, is regarded as the speed of rotation (rpm).
When multiple user input signals are turned ON, the speed of rotation which has the lower number is prioritized.

(9) **ROTATING SIGNAL**
Set a user output signal (input range: 0 to 4096).
When the rotation instruction is ON and the axis is rotating (including the setting of specified rotation "0" rpm), the set signal is turned ON.

(10) **ROTATION WHILE MACHINE LOCK**
Set "ROTATE" or "UNROTATE".
When "ROTATE" is set, the speed control operation is performed even in the machine lock status.
When "UNROTATE" is set, the speed control operation is not performed while in the machine lock status.
3 Usage Examples of IO Speed Control

3.1 IO Speed Control by Direct Specification

1. Perform the settings of the IOSPDCTRL SETUP window. Perform the settings according to fig. 3-1.

Fig. 3-1: Example of IOSPDCTRL SETUP ("DIRECT")

2. Set the speed of rotation.

Within the user input signals from IG#511 to #512 (#05110 to #05127), turn ON arbitrary signals. When all signals from #05110 to #05117 are turned ON, the speed of rotation becomes 255 rpm.

3. Turn ON the servo.

4. Set the rotation instructions.

   Turn ON the user input signal IN#4073 (#05100).

5. Start rotation at the specified speed (255 rpm), and then turn ON the user output signal OT#4073 (#15100).
3.2 IO Speed Control by Level Specification

1. Perform the settings of the IOSPDCTRL SETUP window. Perform the settings according to fig. 3-2.

   Fig. 3-2: Example of IOSPDCTRL SETUP ("LEVEL")

2. Set the speed of rotation.
   Within the user input signal IG#511, turn ON arbitrary signals. When #05111 is turned ON, the speed of rotation becomes 200 rpm.

3. Turn ON the servo.

4. Set the rotation instructions.
   Turn ON the user input signal IN#4073 (#05100).

5. Start rotation at the specified speed (200 rpm), and then turn ON the user output signal OT#4073 (#15100).
4 IO Speed Control Operation Conditions

The IO speed control axis operates in the following conditions.

4.1 When CONFIG of the IOSPDCTRL SETUP Window is Set to "VALID"

- The axis rotates while the servo is ON and the rotation instruction signal is ON.
- The axis stops its rotation when the rotation instruction signal is OFF, the speed of rotation is 0, or the servo is OFF.
- When the speed of rotation exceeds the maximum speed of rotation of the motor, the axis rotates at the maximum speed of rotation of the motor.
- When a negative number is set as the speed of rotation, the axis rotates backward.
- When the speed of rotation is 0, the rotation stops.
- When the hold operation is performed, the rotation does not stop.
- When the emergency stop is performed or the external servo is turned OFF, the axis performs deceleration to a stop.
- When the specified rotation is changed while rotating, the axis rotates in that speed of rotation.
- In-operation status displayed on the upper right of the programming pendant's display is not changed depending on the IO speed control operation.
- Regardless of the teach mode or the play mode, the axis rotates at the specified speed (speed of rotation). However, when the specified speed exceeds the safety speed in the teach mode, the axis rotates at the maximum speed of the safety speed.
- When trying to operate the effective axis of the IO speed control axis by the jog operation, an error occurs.
- When trying to operate the effective axis of the IO speed control axis for test run, FWD operation, BWD operation, or the playback operation, an error or alarm occurs.

4.2 When CONFIG of the IOSPDCTRL SETUP Window is Set to "INVALID"

- The normal position control is performed.
- When the rotation instruction signal is ON, the axis does not rotate.
- Test run, FWD operation, BWD operation, or the playback operation can be performed.
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INSTRUCTIONS
FOR IO SPEED CONTROL FUNCTION

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Specifications are subject to change without notice for ongoing product modifications and improvements.