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

MOTOMAN INSTRUCTIONS
MOTOMAN—□□□ INSTRUCTIONS
DX200 INSTRUCTIONS
DX200 OPERATOR’S MANUAL (for each purpose)
DX200 MAINTENANCE MANUAL

The DX200 Operator’s manual above corresponds to specific usage. Be sure to use the appropriate manual.
MANDATORY

• This manual explains the IO speed control function of the DX200. Read this manual carefully and be sure to understand its contents before handling the DX200.

• General items related to safety are listed in Chapter 1: Safety of the DX200 Instructions. To ensure correct and safe operation, carefully read the DX200 Instruction 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.
We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

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

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!

We recommend approved Yaskawa training courses for all personnel involved with the operation, programming, or repair of the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the DX200.

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

⚠️ **DANGER**
Indicates a imminent hazardous situation which, if not avoided, could result in death or serious injury to personnel.

⚠️ **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

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**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”.

---
WARNING

• Before operating the manipulator, check that servo power is turned OFF when the emergency stop buttons on the front door of the DX200 and programming pendant are pressed. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is 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.

Figure 1: 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.

Figure 2: Release of Emergency Stop

• Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator
  – Be sure to use a lockout device to the safeguarding when going inside. Also, display the sign that the operation is being performed inside the safeguarding and make sure no one closes the safeguarding.
  – View the manipulator from the front whenever possible.
  – Always follow the predetermined operating procedure.
  – Keep in mind the emergency response measures against the manipulator's unexpected motion toward you.
  – 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 P-point maximum envelope of the manipulator and that you are in a safe location before:
  – Turning ON the DX200 power
  – Moving the manipulator with the programming pendant
  – Running the system in the check mode
  – Performing automatic operations

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there are problems. The emergency stop buttons are located on the right of the front door of the DX200 and the programming pendant.

• Before wiring, be sure to turn OFF the power supply and put up a warning sign, such as “DO NOT TURN ON THE POWER.”

Failure to observe this warning may result in an electric shock or an injury.
Definition of Terms Used 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>DX200 controller</td>
<td>DX200</td>
</tr>
<tr>
<td>DX200 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>
Description of the Operation Procedure

Descriptions of the programming pendant, 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/ Symbol Keys</strong>&lt;br&gt;The keys which have characters printed on them are denoted with [ ].&lt;br&gt;ex. [ENTER]</td>
</tr>
<tr>
<td>Axis Keys/ Number Keys</td>
<td><strong>&quot;Axis Keys&quot; and &quot;Number Keys&quot; are generic names for the keys for axis operation and number input.</strong></td>
</tr>
<tr>
<td>Keys pressed simultaneously</td>
<td><strong>When two keys are to be pressed simultaneously, the keys are shown with a &quot;+&quot; sign between them, ex. [SHIFT]+[COORD]</strong></td>
</tr>
</tbody>
</table>
| Displays                           | **The menu displayed in the programming pendant is denoted with { }.**  
ex. (JOB) |

**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, 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 TM are omitted.
**Customer Support Information**

If you need assistance with any aspect of your IO Speed Control system, please contact Motoman Customer Support at the following 24-hour telephone number:

(937) 847-3200

For routine technical inquiries, you can also contact Motoman Customer Support at the following e-mail address:

techsupport@motoman.com

When using e-mail to contact Motoman Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.

Please use e-mail for routine inquiries only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact Motoman Customer Support at the telephone number shown above.

Please have the following information ready before you call Customer Support:

- **System**: IO Speed Control
- **Robots**
- **Primary Application**
- **Controller**: DX200
- **Software Version**: Access this information on the Programming Pendant's LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION}
- **Robot Serial Number**: Located on the robot data plate
- **Robot Sales Order Number**: Located on the DX200 controller data plate
# Table of Contents

1. IO Speed Control Function.................................................................................................. 1-1
2. IOSPDCTRL SETUP Window.............................................................................................. 2-1
3. Usage Examples of IO Speed Control.................................................................................. 3-1
   3.1 IO Speed Control by Direct Specification................................................................. 3-1
   3.2 IO Speed Control by Level Specification................................................................. 3-2
4. IO Speed Control Operation Conditions............................................................................. 4-1
   4.1 When CONFIG of the IOSPDCTRL SETUP Window is Set to "VALID"....................... 4-1
   4.2 When CONFIG of the IOSPDCTRL SETUP Window is Set to "INVALID"............... 4-1
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 Usage Examples of IO Speed Control

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")

![IOSPDCTRL SETUP Window]

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.
DX200 OPTIONS
INSTRUCTIONS
FOR IO SPEED CONTROL FUNCTION

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