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

The YRC1000micro 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)
DANGER

- This manual explains the I/O JOG operation in the play mode of the YRC1000micro system. Read this manual carefully and be sure to understand its contents before handling the YRC1000micro. Any matter 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 YRC1000micro INSTRUCTIONS. To ensure correct and safe operation, carefully read "Chapter 1. Safety" of the YRC1000micro 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 YRC1000micro.

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”.
DANGER

• 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 button on the programming pendant or on the external control device, etc.
  – Disconnect the safety plug of the safety fence.
    (when in the play mode or in the remote mode)
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 YRC1000micro 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 button is located on the right of the programming pendant.

• Read and understand the Explanation of the Warning Labels before operating the manipulator.
DANGER

• In the case of not using the programming pendant, be sure to supply the emergency stop button on the equipment. Then before operating the manipulator, check to be sure that the servo power is turned OFF by pressing the emergency stop button. Connect the external emergency stop button to the 4-14 pin and 5-15 pin of the Safety connector (Safety).

• Upon shipment of the YRC1000micro, this signal is connected by a jumper cable in the dummy connector. To use the signal, make sure to supply a new connector, and then input it.

If the signal is input with the jumper cable connected, it does not function, which may result in personal injury or equipment damage.

WARNING

• Perform the following inspection procedures prior to conducting manipulator teaching. If there is any problem, immediately take necessary steps to solve it, such as maintenance and repair.
  – Check for a problem in manipulator movement.
  – Check for damage to insulation and sheathing of external wires.

• Return the programming pendant to a safe place after use.

If the programming pendant is left unattended on the manipulator, on a fixture, or on the floor, etc., the Enable Switch may be activated due to surface irregularities of where it is left, and the servo power may be turned ON. In addition, in case the operation of the manipulator starts, the manipulator or the tool may hit the programming pendant left unattended, which may result in personal injury and/or equipment damage.
Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product.

The MOTOMAN usually consists of the manipulator, the YRC1000micro controller, manipulator cables, the YRC1000micro programming pendant (optional), and the YRC1000micro programming pendant dummy connector (optional).

In this manual, the equipment is designated as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>YRC1000micro controller</td>
<td>YRC1000micro</td>
</tr>
<tr>
<td>YRC1000micro programming pendant</td>
<td>Programming pendant (optional)</td>
</tr>
<tr>
<td>Cable between the manipulator and the controller</td>
<td>Manipulator cable</td>
</tr>
<tr>
<td>YRC1000micro programming pendant dummy connector</td>
<td>Programming pendant dummy connector (optional)</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>Character Keys /Symbol Keys</td>
</tr>
<tr>
<td></td>
<td>The keys which have characters or symbols printed on them are denoted with [ ]. ex. [ENTER]</td>
</tr>
<tr>
<td></td>
<td>Axis Keys /Number Keys</td>
</tr>
<tr>
<td></td>
<td>[Axis Key] and [Numeric Key] are generic names for the keys for axis operation and number input.</td>
</tr>
<tr>
<td></td>
<td>Keys pressed simultaneously</td>
</tr>
<tr>
<td></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></td>
<td>Mode Key</td>
</tr>
<tr>
<td></td>
<td>Three kinds of modes that can be selected by the mode key are denoted as follows: REMOTE, PLAY, or TEACH</td>
</tr>
<tr>
<td></td>
<td>Button</td>
</tr>
<tr>
<td></td>
<td>Three buttons on the upper side of the programming pendant are denoted as follows: HOLD button START button EMERGENCY STOP button</td>
</tr>
<tr>
<td></td>
<td>Displays</td>
</tr>
<tr>
<td></td>
<td>The menu displayed in the programming pendant is denoted with { }. e.g. {JOB}</td>
</tr>
<tr>
<td></td>
<td>PC Keyboard</td>
</tr>
<tr>
<td></td>
<td>The name of the key is denoted. e.g. Ctrl key on the keyboard</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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   2.1 Input Signal ........................................................................................................ 2-1  
   2.2 Output Signal ..................................................................................................... 2-3  
   2.3 Signal Allocation Setting Window for I/O JOG Operation ................................. 2-4  
   2.4 Example of I/O JOG Operation Execution ......................................................... 2-6  

3 External Memory ..................................................................................................... 3-1  


The I/O JOG function performs the axis operation of the control group (henceforth written as "I/O JOG operation") by using general-purpose input signals instead of the programming pendant axis keys. The I/O JOG function of the YRC1000micro has the following differences in comparison to the function of the previous controller such as the DX200.

**Table 1-1: Difference of the Function**

<table>
<thead>
<tr>
<th>Control group of the operation target</th>
<th>DX200 or earlier controllers</th>
<th>YRC1000micro</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station</td>
<td>All control groups (robot, base, station)</td>
<td></td>
</tr>
<tr>
<td>Operation enabled mode</td>
<td>Play mode</td>
<td>Play mode, teach mode</td>
</tr>
<tr>
<td>Operation coordinates system</td>
<td>Link</td>
<td>Link Cartesian (only during robot operation)</td>
</tr>
</tbody>
</table>

**Operation coordinates system**

- **Link coordinates:** Each axis of the manipulator or of the external axis moves independently.
- **Cartesian coordinates:** The manipulator tip (the tool center point) moves in parallel with the X-axis, Y-axis and Z-axis set to the manipulator. Also, just the posture can be changed without changing the tool center point.

**Fig. 1-1: Operation Coordinates System**
1.1 Motion Conditions

- **Control group of the operation target**
  - A control group which can perform the I/O JOG operation is not included in the job during the playback operation.
  - Playback operation of the job which includes the control group during the I/O JOG operation cannot be performed.
  - When plural control groups exist, the I/O JOG operation cannot be executed simultaneously.

- **When Executing I/O JOG Operation**
  - If performing I/O JOG operation in the teach mode, it is necessary to grip the enable switch to turn ON the servo power supply.
  - The operation coordinates system cannot be changed during the I/O JOG operation.
  - By using the coordinate system, other than the link coordinate system and the cartesian coordinate system, the operation cannot be performed.

- **Others**
  - When displaying split windows by using the multi-window function, the active window cannot be changed during the I/O JOG operation.
  - Connect the control group to the power on unit #1 to 3/STO, and for control groups which are not operating, it is recommended to turn OFF the servo power supply.

---

**Fig. 1-2: Outline of I/O JOG Operation**
2 Signal for I/O JOG Operation

Categorized as the input signal to perform the I/O JOG operation and the signal to output the operation status. For these signals, each general-purpose input signal and general-purpose output signal is used.

2.1 Input Signal

Table 2-1: List of Input Allocation Items

<table>
<thead>
<tr>
<th>Item Name</th>
<th>Detection Method</th>
<th>Meaning</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axis operation</td>
<td>Rising edge</td>
<td>Switches to a I/O JOG enabled state (described later).</td>
<td>• The GP input signal which is already allocated to other control group cannot be allocated.</td>
</tr>
<tr>
<td>request</td>
<td></td>
<td></td>
<td>• If an axis operation request signal from plural control groups is received, the state cannot be switched to a state where I/O jog operation is enable.</td>
</tr>
<tr>
<td>Coordinate</td>
<td>State</td>
<td>Selects the coordinate system to perform the robot I/O JOG operation.</td>
<td>• Displayed only on the robot setting window.</td>
</tr>
<tr>
<td>Selection</td>
<td></td>
<td></td>
<td>• According to the signal state at switching to the I/O JOG operation enabled state, the coordinate is selected.</td>
</tr>
<tr>
<td>Axis designation</td>
<td>State</td>
<td>Selects the axis to move when in the I/O JOG operation enabled state.</td>
<td>• By receiving plural axis designation signals simultaneously, operations can be performed simultaneously. However, if a forward-direction signal and a reverse-direction signal of the same axis are received simultaneously, the axis will not move.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>For each axis, the forward-direction (+) and reverse-direction (-) exist.</td>
<td></td>
</tr>
<tr>
<td>Signal details</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robot</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S / X (+, -)</td>
<td></td>
<td></td>
<td>1 (+, -)</td>
</tr>
<tr>
<td>L / Y (+, -)</td>
<td></td>
<td></td>
<td>2 (+, -)</td>
</tr>
<tr>
<td>U / Z (+, -)</td>
<td></td>
<td></td>
<td>3 (+, -)</td>
</tr>
<tr>
<td>R / Rx (+, -)</td>
<td></td>
<td></td>
<td>4 (+, -)</td>
</tr>
<tr>
<td>B / Ry (+, -)</td>
<td></td>
<td></td>
<td>5 (+, -)</td>
</tr>
<tr>
<td>T / Rz (+, -)</td>
<td></td>
<td></td>
<td>6 (+, -)</td>
</tr>
<tr>
<td>E / Re (+, -)</td>
<td></td>
<td>(E is displayed only when the 7-axis robot)</td>
<td>(Only the existing axes are displayed.)</td>
</tr>
<tr>
<td>Speed level</td>
<td>State</td>
<td>Designates the motion speed. Each speed shall be the same as the manual speed.</td>
<td>• If plural speed designation signals are received simultaneously, the slowest speed of them is selected.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OFF: Without designation</td>
<td>• During the teach mode, even if this signal is not received, the I/O JOG operation is enabled.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ON: With designation</td>
<td>The speed in this case shall be the manual speed. It can be changed from the programming pendant.</td>
</tr>
</tbody>
</table>

11/19
2 Signal for I/O JOG Operation
2.1 Input Signal

**I/O JOG Operation Enabled State**

Indicates that the I/O JOG operation is ready to be operated. If the axis designation signal is turned ON in this state, the control group moves. I/O jog operation is enabled when the following conditions are all met;

- The servo power supply is ON.
- (If plural control groups exist) The axis motion request signal is ON for only one control group.
- (If in the play mode) Either of the speed level designation signals is ON.

**Coordinate Selection Signal**

If the robot is performed by using the I/O JOG operation, according to the cartesian selection signal, the motion coordinate can be selected from the link coordinates or the cartesian coordinates. The motion coordinate for the base and the station takes the link coordinate only.

The motion coordinate is determined according to the coordinate selection signal state when switched to the I/O JOG operation enabled state. Once the motion coordinate is determined, it cannot be changed until switched to the next I/O JOG operation enabled state.

※Safety Interlocks

- When switching the I/O JOG operation enabled state while either axis designation signal is turned ON in regardless of the forward or reverse rotation, if all axis designation signals are set to OFF temporarily, the I/O JOG operation can be performed.

**NOTE**

- If the axis operation request signals from plural control groups are set to ON simultaneously, the state will not switch to the I/O JOG operation enabled state.
- If performing an I/O JOG operation again after the I/O JOG operation is interrupted due to an alarm/hold/emergency stop/servo OFF/switching the mode, set all the axis designation signals to OFF temporarily, and then set them to ON again.
2 Signal for I/O JOG Operation
2.2 Output Signal

2.2 Output Signal

Table 2-2: List of Output Allocation Items

<table>
<thead>
<tr>
<th>Item name</th>
<th>Meaning</th>
<th>Remark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axis operation enabled</td>
<td>Indicates the I/O JOG operation state.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OFF: I/O JOG operation disabled</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ON: I/O JOG operation enabled</td>
<td></td>
</tr>
<tr>
<td>Axis operating</td>
<td>Indicates the I/O JOG operation execution state.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>OFF: An I/O JOG operation is not executing.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ON: An I/O JOG operation is executing.</td>
<td></td>
</tr>
</tbody>
</table>
2.3 Signal Allocation Setting Window for I/O JOG Operation

Select \{IN/OUT\} - \{AXIS I/O ALLOC\} under the Main Menu, the AXIS I/O ALLOC window appears. By using this window, set the I/O signal used in the I/O JOG operation. When the security mode is set in the management mode or in the higher mode, the setting can be performed.

- **MODE REQUEST** (I/O JOG operation request)
- **COORDINATE** (motion coordinates selection (link/cartesian))
- **AXIS**
- **SPEED** (motion speed designation)
- **MODE** (I/O JOG operation enabled)
- **OPERATING** (during I/O JOG operation)

1 to 4 are for setting general-purpose input signal (IN#0001 to IN#4096), and 5 to 6 are for general-purpose output signal (OT#0001 to OT#4096).

For canceling signal settings, enter "0".

When setting general-purpose I/O signals, confirm that the signal is not being used by a different function. If the signal allocation is duplicated, an unintended I/O JOG operation may be performed, or the output operation may not be performed correctly.
2 Signal for I/O JOG Operation
2.3 Signal Allocation Setting Window for I/O JOG Operation

If plural control groups exist, the control group to set can be switched by using [PAGE]. In this case, the identical number as the other control group cannot be allocated to the ① MODE REQUEST. Also, depending on the robot axis or the external axis (the base or the station), some of the setting items shown below are different. (For the number, refer to the previous page.)

The existence of the ② COORDINATE signal display is different.

③ Like images, the window is switched in each control group type.

### [Robot Axis Setting Window]

<table>
<thead>
<tr>
<th>AXIS</th>
<th>(+)</th>
<th>(-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1  : S / X</td>
<td>IN#</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>IN#</td>
<td>O</td>
</tr>
<tr>
<td>L   : Y</td>
<td>IN#</td>
<td>O</td>
</tr>
<tr>
<td>U   : Z</td>
<td>IN#</td>
<td>O</td>
</tr>
<tr>
<td>R   : Rx</td>
<td>IN#</td>
<td>O</td>
</tr>
<tr>
<td>B   : Ry</td>
<td>IN#</td>
<td>O</td>
</tr>
<tr>
<td>T   : Rz</td>
<td>IN#</td>
<td>O</td>
</tr>
</tbody>
</table>

### [Base Axis Setting Window]

<table>
<thead>
<tr>
<th>AXIS</th>
<th>(+)</th>
<th>(-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1  : 1</td>
<td>IN#</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>IN#</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>O</td>
<td></td>
</tr>
</tbody>
</table>

### [Station Axis Setting Window]

<table>
<thead>
<tr>
<th>AXIS</th>
<th>(+)</th>
<th>(-)</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1  : 1</td>
<td>IN#</td>
<td>O</td>
</tr>
<tr>
<td></td>
<td>IN#</td>
<td>O</td>
</tr>
</tbody>
</table>
2.4 Example of I/O JOG Operation Execution

When performing the I/O JOG operation of the robot axis in the play mode, the change in signal status is described below.

*Fig. 2-1: Figure of Status Transitions During I/O JOG Operation Execution*

1. **Axis motion request signal OFF to ON**
   
   Because the speed level designation is set to ON and the servo power supply status is set to ON, the state switches to the I/O JOG operation enabled state. Because the coordination selection signal is set to OFF, following I/O JOG operations are performed in the link coordinates system.

2. **Axis designation signal (S/X(+)) OFF to ON**
   
   The I/O JOG operation starts. The S-axis of the robot moves in the forward direction.

3. **Coordinate selection signal OFF to ON**
   
   The operation coordinate system is not changed, and it remains with the link coordinate selection state. The S-axis forward direction motion of the robot continues.

4. **Axis designation signal (S/X(+)) ON to OFF**
   
   The I/O JOG operation completes and the robot stops.

5. **Axis motion request signal ON to OFF**
   
   The I/O JOG operation enabled state is canceled.

6. **Axis designation signal (S/X(+)) OFF to ON**
   
   Since it is not in the I/O JOG operation enabled state, the I/O JOG operate is not executed.

7. **Axis motion request signal OFF to ON**
   
   The state switches to a I/O JOG enabled state. Because the coordination selection signal is ON, following I/O JOG operations are operated in the cartesian coordinates system.
2 Signal for I/O JOG Operation

2.4 Example of I/O JOG Operation Execution

8. Axis designation signal (S/X(+)) OFF to ON

The I/O JOG operation starts. The tool center point of the robot moves parallel in a forward direction of the X-axis.

9. Coordinate selection signal OFF to ON

The operation coordinate system is not changed, and it remains with the cartesian coordinate selection state. The parallel operation in a forward direction of the X-axis of the robot tool center point continues.
The settings which are performed in the axis motion I/O allocation window can be backed up to an external memory.

In the "SYSTEM DATA" of the EXTERNAL MEMORY DEVICE, the line, "AXIS I/O ALLOC DATA IOAXIS.DAT" is added, and when this line is selected, the operations, LOAD, SAVE, VERIFY, and DELETE are available.

NOTE
If having loaded the saved file to another controller, confirm that there are no problems with the settings.
YRC1000micro OPTIONS
INSTRUCTIONS
FOR I/O JOG OPERATION IN PLAY MODE

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

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