YRC1000 OPTIONS INSTRUCTIONS
FOR GUN TEACHING POSITION CORRECTION 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: 182143-1CD
Revision: 0
DANGER

• This manual explains the gun teaching position correction 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. (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.

![Emergency Stop Button](image1)

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.

![Release of Emergency Stop](image2)

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>Character Keys /Symbol Keys</td>
</tr>
<tr>
<td></td>
<td>The keys which have characters or symbols printed on them are denoted with [ ].</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>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</td>
</tr>
<tr>
<td></td>
<td>“+” 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.
# Contents

1 Overview ................................................................................................................... 1-1

2 Preparations ........................................................................................................... 2-1

3 Setup ...................................................................................................................... 3-1
   3.1 Clearance Setting .............................................................................................. 3-1
   3.2 Gun Condition File Setting .............................................................................. 3-2

4 Operation ................................................................................................................. 4-1

5 Enabling or Disabling the Function ................................................................. 5-1
   5.1 Setup by the Programming Pendant .............................................................. 5-1
   5.2 Setup and Confirmation Using the Dedicated I/O Signal ......................... 5-2
      5.2.1 Setup by the Dedicated Input Signal .................................................... 5-2
      5.2.2 Setup by the Dedicated Output Signal ............................................... 5-3

6 Operation Explanation ......................................................................................... 6-1
   6.1 Teach Mode .................................................................................................. 6-1
   6.2 Play Mode .................................................................................................... 6-2

7 Teaching Position Correction Screen ............................................................. 7-1
   7.1 About the Screen ......................................................................................... 7-1
   7.2 Correction Procedures .................................................................................. 7-2
   7.3 Batch Correction Procedure ........................................................................ 7-3
   7.4 Clearing Data ................................................................................................. 7-4
      7.4.1 Clearing Procedure ............................................................................... 7-4
      7.4.2 Conditions for Clearing Data ............................................................... 7-5

8 Alarm ...................................................................................................................... 8-1

9 Parameter .............................................................................................................. 9-1

10 Restrictions ......................................................................................................... 10-1
1 Overview

The gun teaching position correction function is an automatically corrects SVSPOTMOV registered in the job. This function can be used to automatically correct the misalignment of workpiece in the direction of Z-axis of tool. This function can be executed in the teach or play mode.
2 Preparations

• Correctly perform wear compensation before executing this function. For further details, refer to “Chap. 1.12 Tip Wear Detection and Wear Compensation (Motor Gun)” in “YRC1000 OPERATOR’S MANUAL (FOR SPOT WELDING USING MOTOR GUN) (RE-CSO-A054)”. 

• Correctly setting the gun pushing coefficient, and then teaching of SVSPOTMOV. For further details, refer to “Chap.1.10.7.4 Setting the Gun Pushing Coefficient” in “YRC1000 OPERATOR’S MANUAL (FOR SPOT WELDING USING MOTOR GUN) (RE-CSO-A054)”. 
3 Setup

Make the following settings before using this function.

3.1 Clearance Setting

1. Select {SPOT WELDING} under the main menu.
2. Select {CLEARANCE SETTING}.
3. Separate the lower chip (IN) by 10.0 mm or more.

For further details, refer to “Chap.1.10.3 Setting the Clearance Files” in “YRC1000 OPERATOR’S MANUAL (FOR SPOT WELDING USING MOTOR GUN) (RE-CSO-A054)”. 

NOTE
To ensure the detection precision, separate the lower chip (IN) by 10.0 mm and use the specified condition number as the clearance file number of SVSPOTMOV.
3.2 Gun Condition File Setting

1. Select {SPOT WELDING} under the {main menu}.
2. Select {GUN CONDITION}.
3. Specify the gun type, torque direction, pulse/stroke, and torque/gun pressure.

For further details, refer to “Chap.1.4.1 Gun Condition File” in “YRC1000 OPERATOR’S MANUAL (FOR SPOT WELDING USING MOTOR GUN) (RE-CSO-A054)”.
4 Operation

This section describes the operation of gun and manipulator when this function is enabled.

(1) Execute the SVSPOTMOV instruction.

(2) Compare the clearance amount on the moving side with $\text{AxP075} \times 0.1$. If $\text{AxP075} \times 0.1$ value is higher, separate the chip on the moving side from the workpiece so that the clearance amount may be $\text{AxP075} \times 0.1$ [mm].

– The clearance amount on the moving side indicates the upper chip distance, which can be viewed by selecting [Main Menu] – [Spot Welding] – [Clearance Setting].

(3) The moving side chip descends and detects the workpiece.

(4) Raise the fixing side chip at the same time when the moving side chip descends and detect the workpiece position.
The operating speeds (1) through (4) cannot be specified. An operating speed other than that specified in the job is used to ensure the detection precision.
5 Enabling or Disabling the Function

5.1 Setup by the Programming Pendant

1. Select the Job menu.

2. Select {UTILITY} under the menu.
   - The pull-down menu appears.
5. Enabling or Disabling the Function

5.2 Setup and Confirmation Using the Dedicated I/O Signal

3. Select {CORR GUN TEACH POS}.
   - An asterisk (*) is attached and the message saying "Gun teaching position correct mode valid" appears.
   - To disable the function, select [Gun Teaching Position Correction] again. The asterisk (*) and "Gun teaching position correct mode valid" message disappear.

5.2 Setup and Confirmation Using the Dedicated I/O Signal

5.2.1 Setup by the Dedicated Input Signal

- Enable the function at the rising edge to the dedicated input signal (#41231) and disable it at the falling edge.

- If the dedicated input signal (#41231) is turned off during operation, the operation stops and the message saying "Operation stops because the gun teaching position function is disabled" appears.

- If signals are input to the dedicated input signal (#41231) during operation, the function remains disable until the operation stops. Enable the function after the operation stops.

- When the function is enabled or disabled, the operation by the dedicated input takes priority over the operation by the programming pendant.
5.2.2 Setup by the Dedicated Output Signal

1. Select {IN/OUT} under the main menu.
2. Select (SPECIFIED OUTPUT).
3. Display SOUT#1285(#51614) by pressing the [PAGE] or [SELECT].
   - It indicates that the gun teaching position correction function is enabled.
   - This signal is ON while the gun teaching position correction function is enabled.
6 Operation Explanation

6.1 Teach Mode

This function can be executed in the teach mode.

1. Enable the function by referring to chapter 5 “Enabling or Disabling the Function”.

2. Select the job with which SVSPOTMOV is registered.

3. Execute the SVSPOTMOV instruction at test operation by pressing "Interlock + 9."

4. The moving side chip operates and then the fixing side chip operates to search for the workpiece position.

5. When the workpiece position is detected, the following dialog appears.

6. Select "Yes" to correct the teaching position for the SVSPOTMOV instruction.

   - Select "No" not to correct the teaching position for the SVSPOTMOV instruction.

7. Select "Yes" and perform the test operation to execute the SVSPOTMOV instruction. It can check that the teaching position is properly corrected.

Detection amount: Indicates the misalignment amount of workpiece in the direction of Z-axis of tool.

Revision amount: The detection result can be corrected by this amount. Up to ±20 [mm] can be specified. This can be specified with the parameter AxP078.

Parameter AxP078 Revision amount
AxP078 × 0.1 [mm]

<Example> If AxP078 = 100, the revision amount is 10 [mm].
6.2 Play Mode

This function can be executed in the play mode.

1. Enable the function by referring to chapter 5 “Enabling or Disabling the Function”.
2. Select the job with which SVSPOTMOV is registered.
3. Enter into the play mode and start the job.
   - If the parameter AxP081 is 1, the confirmation dialog appears.
   - Select "Yes" and restart the job.
   - If you select "No," the operation is aborted.

4. When the SVSPOTMOV instruction is executed, the moving side chip operates and then the fixing side chip operates to detect the workpiece position.
5. Every time the SVSPOTMOV instruction is executed, the detection result is displayed on the {GUN TEACH POS CORRECT} screen.
   - To open the {GUN TEACH POS CORRECT} screen, select {SPOT WELDING} – {GUN TEACH POS CORRECT}.

Correction amount: Indicates the correction amount of workpiece in the direction of Z-axis of tool. This is the sum of detection amount and revision amount.

- For example, if this value is 2 [mm], the teaching position is shifted from the original position by 2 [mm] in the positive Z-axis direction before registration.
6 Operation Explanation

6.2 Play Mode

- The 50-point SVSPOTMOV instruction can be corrected. When the 50-point SVSPOTMOV instruction is executed, the start lamp goes off and the operation of robot and gun stops.

- If the 50th point is reached, the message saying "The number of the teaching positions corrected by SVSPOTMOV exceeded the limit" appears.

- If there are 50 data items at the time of operation, the following confirmation dialog appears.
  - Select "Yes" to clear 50 data items and execute the job.
  - Select "No" to not clear data and abort the operation.
7 Teaching Position Correction Screen

7.1 About the Screen

If the SVSPOTMOV instruction is executed when this function is enabled in the play mode, the detection result is displayed on the (GUN TEACH POS CORRECT) screen. Select {SPOT WELDING} – {GUN TEACH POS CORRECT} to open this screen.

<table>
<thead>
<tr>
<th>Job name</th>
<th>Indicates the job name of the SVSPOTMOV instruction.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line number</td>
<td>Indicates the line number of the SVSPOTMOV instruction.</td>
</tr>
<tr>
<td>Detection amount</td>
<td>Indicates the misalignment amount of workpiece in the direction of Z-axis of tool.</td>
</tr>
<tr>
<td>Revision amount</td>
<td>The detection result can be corrected by this amount. Up to ±20 [mm] can be specified. This can be specified with the parameter AxP078.</td>
</tr>
<tr>
<td>Correction amount</td>
<td>Indicates the correction amount of workpiece in the direction of Z-axis of tool. This is the sum of detection amount and revision amount. For example, if this value is 2 [mm], the teaching position is shifted from the original position by 2 mm in the positive Z-axis direction before teaching.</td>
</tr>
</tbody>
</table>

Parameter AxP078 Revision amount

AxP078 × 0.1 [mm]

<Example> If AxP078 = 100, the revision amount is 10 [mm].
7.2 Correction Procedures

1. Select {SPOT WELDING} under the main menu.
2. Select {GUN TEACH POS CORRECT}.
3. Move the cursor to the item for which teaching position you want to correct and press “Select”. An asterisk (*) is then displayed.
4. When an item is selected, {EXECUTE} appears.

5. Select (EXECUTE).
   - The confirmation dialog box appears.
   - Select "Yes" to correct the teaching position with asterisk (*). The item that has already been corrected cannot be selected.
   - Select "No" to abort the operation.
7.3 Batch Correction Procedure

1. Select {SPOT WELDING} under the main menu.
2. Select {GUN TEACH POS CORRECT}.
3. Select (EDIT) under the menu.
   - The pull-down menu appears.
4. Select {SELECT ALL}.
   - Asterisks "***" are attached to all the items and all data is selected.
   - To deselect data, select (EDIT) – {DESELCT} on the menu.
5. {Execute} appears.
6. Select {EXECUTE}.
   - The confirmation dialog box appears.
   - Select "Yes" to correct the teaching position with asterisk (*).
     The item that has already been corrected cannot be selected.
   - Select "No" to abort the operation.
7.4 Clearing Data

7.4.1 Clearing Procedure

1. Select (SPOT WELDING) under the main menu.
2. Select (GUN TEACH POS CORRECT).
3. Select {CLEAR}.
   - The confirmation dialog box appears.
   - Select "Yes" to clear all data.
   - Select "No" to abort the operation.
7.4 Clearing Data

7.4.2 Conditions for Clearing Data

Data is cleared under the following conditions.

1. If the {Clear} is pressed on the [Teaching Position Correction] screen.
2. If this function is executed in the play mode when the [Teaching Position Correction] screen displays 50 data items.
3. If job correction is performed.
4. If this function is executed in the teach mode to correct the teaching position.
5. If the controller is turned off.

NOTE
The confirmation dialog does not appear for the conditions (3) through (5).
Correct the teaching position before performing the above operations.
## 8 Alarm

<table>
<thead>
<tr>
<th>Alarm Number</th>
<th>Alarm Name/Message</th>
<th>Sub Code</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>4976</td>
<td>GUN SEARCH DETECT RANGE OVER</td>
<td></td>
<td>The distance between fixed gun electrode and movable gun electrode exceeded the allowable limit while executing correction operation in the GUN TEACH POSITION CORRECT Mode.</td>
<td>[Setting error] Check the following settings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Home position of gun axis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• &quot;The pulse-stroke converter&quot; in the gun condition file.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• The value of the wear correction.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[Effect of external force]                                                                                         (1)Check that no objects exist between workpiece and gun.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2)Check the lost electrode.</td>
</tr>
<tr>
<td>4977</td>
<td>GUN SEARCH POS ERROR</td>
<td></td>
<td>The detected position where the gun electrode hits the welded target exceeded the allowable limit while executing correction operation in the GUN TEACH POSITION CORRECT Mode.</td>
<td>[Setting error] Check the following settings.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Home position of gun axis.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• &quot;The pulse-stroke converter&quot; in the gun condition file.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• The value of the wear correction for movable gun electrode.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>[Effect of external force]                                                                                         (1)Check the amount of the gap between workpiece position and the teaching position.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(2)Check the lost electrode for movable gun.</td>
</tr>
</tbody>
</table>
### 9 Parameter

**AxP075**: Clearance amount on the moving chip side
- Specify the clearance amount of upper chip.
  - 0: 30 [mm] (initial value)
  - others: $\text{AxP075} \times 0.1$ [mm]
- **Example**: If $\text{AxP075} = 400$, the clearance amount of upper chip is 40 [mm].

**AxP078**: Revision amount
- Specify the revision amount in the range of ±20 mm.
  - 0: 0 [mm] (initial value)
  - others: $\text{AxP078} \times 0.1$ [mm]
- **Example**: If $\text{AxP078} = 100$, the revision amount is 10 [mm].

**AxP079**: Detection threshold value of GUN SEARCH POS ERROR
- Specify the detection threshold value of alarm 4977 "GUN SEARCH POS ERROR."
  - 0: 5 [mm] (initial value)
  - others: $\text{AxP079} \times 0.1$ [mm]
- **Example**: If $\text{AxP079} = 60$, the detection threshold value is 6 [mm].

**AxP080**: Detection threshold value when the GUN SEARCH DETECT RANGE OVER
- Specify the detection threshold value when the alarm 4976 "GUN SEARCH DETECT RANGE OVER" occurs.
  - 0: 3 [mm] (initial value)
  - others: $\text{AxP080} \times 0.1$ [mm]
- **Example**: If $\text{AxP080} = 100$, the detection threshold value is 10 [mm].

**AxP081**: Specification of dialog display at startup
- Specify the dialog display at startup.
  - 0: Hide the dialog (initial value)
  - 1: Display the dialog

**S1CxG175**: Workpiece detection threshold value for the moving side chip
- Specify the workpiece detection threshold value for the moving side chip.
  - 0: 1.0 [kgf]
  - others: $\text{S1CxG175} \times 0.1$ [kgf]
- **Example**: If $\text{S1CxG175} = 20$, the detection threshold value is 2.0 [kgf].

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**NOTE**

It is recommended to use the initial value (0) for AxP075 and AxP079 to ensure the detection precision.

**NOTE**

The adjusted value is set to S1CxG175 as factory setting. If a detection error occurs, increase S1CxG175 from the initial value by one scale until the detection error goes off. If a detection error occurs when the initial value is 0, increase S1CxG175 from 11 by one scale until the detection error goes off.
10 Restrictions

- This function is not available to the fixed gun.
- This function is not available to the pair gun.
- This function is not available to the double gun.
- If the rigidity of workpiece is low, the workpiece position detection precision is lowered. It is recommended to use the workpiece with the rigidity that meets the following standards.

**Recommended workpiece rigidity**

The deformation amount of the workpiece to be used should be 2 [mm] or less when the force gauge is applied to the workpiece with force of 50 [N] or more.

![Diagram showing the application of force gauge to workpiece](Image)
YRC1000 OPTIONS
INSTRUCTIONS
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Specifications are subject to change without notice for ongoing product modifications and improvements.