MOTOMAN-GP400,GP600 OPTIONS
INSTRUCTIONS
FOR ZEROING FUNCTION

TYPE:
YR-1-06VX400-*** (MOTOMAN-GP400 ZEROING (OPTION))
YR-1-06VX600-*** (MOTOMAN-GP600 ZEROING (OPTION))

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

MOTOMAN INSTRUCTIONS
MOTOMAN-GP400,GP600 INSTRUCTIONS
YRC1000 INSTRUCTIONS
YRC1000 OPERATOR’S MANUAL (GENERAL) (SUBJECT SPECIFIC)
YRC1000 MAINTENANCE MANUAL
YRC1000 ALARM CODES (MAJORALARMS) (MINORALARMS)

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 “MAJORALARMS” and “MINORALARMS”.

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: 188321-1CD
Revision: 0
DANGER

• This instruction manual is intended to explain mainly on the mechanical part of these robots for the application to the actual operation and for proper maintenance and inspection. It describes on safety and handling, details on specifications, necessary items on maintenance and inspection, to explain operating instructions and maintenance procedures. Be sure to read and understand this instruction manual thoroughly before installing and operating the manipulator. 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 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. The drawings and photos in this manual are representative examples and differences may exist between them and the delivered 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 your manipulator.

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

**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

• Do not remove the motor, and do not release the brake.
Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the manipulator's arm.

WARNING

• Maintenance and inspection must be performed by specified personnel.
Failure to observe this caution may result in electric shock or injury.
• For disassembly or repair, contact your YASKAWA representative.
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.

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.

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>

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.
Explanation of Warning Labels

The following warning labels are attached to the manipulator. Always follow the warnings on the labels. Also, an identification label with important information is placed on the body of the manipulator. Prior to operating the manipulator, confirm the contents.

Note: Taking the maintenance-relevant trainings offered by YASKAWA is indispensable for replacing the L-axis of the balancer-equipped manipulator.

*Fig. : Warning Label Locations*
Nameplate

Fall down hazard label

Description
Make sure to secure the manipulator base by using the bolts of the specified sizes and by tightening the bolts with the specified tightening torques. If the power is turned ON and the manipulator is operated without securing the manipulator properly, the manipulator may fall down, which may result in personal injury and/or equipment damage.

Collision hazard label

Description
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. 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
Crush hazard label

Description
Keep clear of moving parts when performing a teaching operation within the manipulator's operating range. Failure to observe this instruction may result in personal injury.

Balancer disassembly prohibited label

Description
Do not disassemble the balancer. When disassembling the balancer, the internal energy is released and the L-arm rotates. Failure to observe this caution may result in injury or malfunction.

Motor removing prohibited label

Description
Do not remove the motor without mounting the jig for fixing the motor. Failure to observe this safety precaution may result in injury from unexpected turning of the manipulator's arm.
## Contents

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## 1 Zeroing Function

Zeroing function automatically allows for the restoration of the home position data when the manipulator’s home position data disappear. This function applies to the manipulator which was ordered to be equipped with the zeroing function as the optional.

### 1.1 Outline

The YRC1000 stores the manipulator home position based on the pulse value of each axis encoder. Since the home position is already set and registered before shipment, zeroing operation does not need to be performed at the normal operation. However, zeroing operation needs to be performed to restore the home position since the home position data disappear when performing the following operations, or the followings occur.

- Replacement of Motors
- Replacement of Encoders
- Backup Battery Exhaustion of Each Axis Encoder in the multiport

*Fig. 1-1: Multiport*
1 Zeroing Function
1.1 Outline

NOTE
The home position data is stored by the backup battery. If the battery is exhausted, the home position data disappear again when turning OFF the YRC1000 power even when the zeroing operation is performed.

Be sure to replace the battery periodically. For the battery replacement, refer to “Maintenance and Inspection” in the INSTRUCTIONS of your manipulator.

NOTE
The home positioning cannot be performed accurately by the zeroing operation if the combination of the manipulator and the YRC1000 are changed.
1.2 Diagram of Zeroing Parts

For the diagram of zeroing parts, refer to fig. 1-2 “Diagram of Zeroing Parts (S-, L-, and U-axis)”, and fig. 1-3 “Diagram of Zeroing Parts (R-, B-, and T-axis)

Fig. 1-2: Diagram of Zeroing Parts (S-, L-, and U-axis)
1 Zeroing Function

1.2 Diagram of Zeroing Parts

Fig. 1-3: Diagram of Zeroing Parts (R-, B-, and T-axis)

(4) R-axis

(5) B-axis

(6) T-axis
1.3 Details on Zeroing Function

1.3.1 System Configuration

The system configuration of the zeroing function is described in the following.

*Fig. 1-4: Zeroing Function System Configuration*

![Zeroing Function System Configuration Diagram]

*Table 1-1: Components for Zeroing Device Using USB Slot*

<table>
<thead>
<tr>
<th>Component</th>
<th>Type</th>
<th>Qty</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>① Sensor</td>
<td>HW0381863-A</td>
<td>1</td>
<td>YASKAWA Electric Corporation</td>
</tr>
<tr>
<td>② Amplifier</td>
<td>HW0381864-A</td>
<td>1</td>
<td>YASKAWA Electric Corporation</td>
</tr>
<tr>
<td>③ Lead wire</td>
<td>HW0470652-A</td>
<td>1</td>
<td>YASKAWA Electric Corporation</td>
</tr>
<tr>
<td>④ Communication cable</td>
<td>C232N-915</td>
<td>1</td>
<td>YASKAWA Electric Corporation</td>
</tr>
<tr>
<td>⑤ Communication interface</td>
<td>REX-USB60F</td>
<td>1</td>
<td>YASKAWA Electric Corporation</td>
</tr>
</tbody>
</table>

*NOTE*

The sensor, amplifier, and communication interface are precision instruments.

Handle and store them with due care.
2 Operational Procedure and Cautions

2.1 Before the Zeroing Operation

If the zeroing operation is performed with a tool attached to the manipulator, the weight of the tool may greatly affect the accuracy of the zeroing function. Remove the tool attached to the manipulator and perform the zeroing operation for accurate home positioning by the zeroing function.

2.2 Connection of the Zeroing Devices

1. Insert the communication interface into the USB slot of the programming pendant.

Fig. 2-1: Insertion of the Communication Interface
2. Connect the communication interface with the amplifier by using the communication cable.

3. Connect the lead wire to the amplifier. (Do not connect the sensor yet.)

The installation locations of the zeroing sensors for each axis are shown in fig. 2-2 "Installation Locations of the Zeroing Sensors". Perform the zeroing operation for every axis by referring to the procedures described in the following pages.

The appearance of parts and installation locations may vary for each model. In this manual, details are described by using the figures of YR-1-06VX400-***.

For other models, perform the zeroing operation by referring to chapter 1.2 "Diagram of Zeroing Parts".

Fig. 2-2: Installation Locations of the Zeroing Sensors
2.3 Zeroing Procedure

Perform the zeroing operation for each axis with the following procedures.

1. Remove the plug and cover from the attaching part for the sensor.
   
   For detail locations of a plug or a cover for each axis, refer to fig. 2-3 “Locations for the Plug and the Cover (S-, L-, and U-axis)” and fig. 2-4 “Locations for the Plug and the Cover (R-, B-, and T-axis)”.

Fig. 2-3: Locations for the Plug and the Cover (S-, L-, and U-axis)
2 Operational Procedure and Cautions

2.3 Zeroing Procedure

Fig. 2-4: Locations for the Plug and the Cover (R-, B-, and T-axis)
2.3 Zeroing Procedure

**NOTICE**
Be sure to remove the cover. If the zeroing operation is performed with the cover on, the sensor may be damaged.

**NOTE**
The plug, cover, and cover mounting screws are small parts.
Be sure not to lose them during the operation.

**WARNING**
Be sure that the servo power is OFF and no safety hazard is around the manipulator when approaching the manipulator.
Injury may result from unintentional or unexpected manipulator motion, or operation error.
2 Operational Procedure and Cautions

2.3 Zeroing Procedure

2. Perform the home position alignment by adjusting the alignment marks on the each axis of the manipulator in the "TEACH" mode. For detail locations of the home position alignment mark for each axis, refer to fig. 2-5 “Locations for the Home Position Alignment Mark”.

Fig. 2-5: Locations for the Home Position Alignment Mark
2.3 Zeroing Procedure

NOTE
Be sure to adjust the home position alignment marks and perform the zeroing operation.

NOTE
When performing the zeroing operation for the B-axis, also set the R-axis to the home position (0 pulse position). And if the R-axis is required to perform zeroing operation, perform R-axis zeroing operation first, and then perform the B-axis zeroing operation.

NOTE
When performing the zeroing operation for the T-axis, also set the R-, and B-axes to the home position (0 pulse position). And if the R-, and B-axes are required to perform zeroing operation, perform R-, and B-axes zeroing operation first, and then perform the T-axis zeroing operation.

WARNING
Confirm that no persons are present in the P-point maximum envelope of the manipulator, and the operator is in a safe place. Injury may result from unintentional or unexpected manipulator motion, or operation error.

3. Check that no spatter, fume or rust is attached in/on the sensor mounting hole, or sensor detecting element after removing the plug and cover.

NOTE
If performing the zeroing operation while the spatter, fume, or rust is attached in/on the sensor parts, the sensor may not operate correctly. Remove the spatter, fume, or rust if they are found.
4. Install the sensor onto the mounting holes. For detail state of the sensor for each axis, refer to fig. 2-6 “Sensor for Each Axis”.

Fig. 2-6: Sensor for Each Axis

NOTICE
Never use tools, or avoid excessive force on the sensor. Failure to observe this instruction may result in damage to the sensor.
2 Operational Procedure and Cautions
2.3 Zeroing Procedure

5. Connect the lead wire to the sensor.
6. Turn ON the amplifier power.
   – If the amplifier power has been turned ON for prolonged periods of time, turn OFF the power once and turn ON the power again.
7. Set the mode selector switch on the programming pendant to “TEACH”.
8. Select {Robot} - {Zeroing} under the main menu. Then, select “S: S-axis” on the touch panel. Select an axis to measure on the touch panel.

9. Turn ON the servo power by the [SERVO ON READY] and Enable Switch on the programming pendant.

```
WARNING

Confirm that no persons are present in the P-point maximum envelope of the manipulator, and the operator is in a safe place.
Injury may result from unintentional or unexpected manipulator motion, or operation error.
```
10. Press {Zeroing} on the touch panel, and pop-up window appears displaying the CAUTION message.

11. Press {OK} by following the message in the pop-up window, and the manipulator starts automatically.

**WARNING**

Confirm that no persons are present in the P-point maximum envelope of the manipulator, and the operator is in a safe place.

Injury may result from unintentional or unexpected manipulator motion, or operation error.

**NOTE**

The manipulator motion is hard to be detected due to its slight motion.

Confirm that no persons approach the manipulator.
12. The programming pendant screen shows the message to confirm the completion of the zeroing operation, then indicates the calculated absolute data.

13. Turn OFF the Enable Switch on the programming pendant, and then turn OFF the servo power.

**WARNING**

Be sure to turn OFF the servo power to approach the manipulator. Injury may result from unintentional or unexpected manipulator motion.

14. Turn OFF the amplifier power.
15. Disconnect the lead wire from the sensor.
16. Remove the sensor from the manipulator.

**NOTICE**

After the zeroing operation, be sure to remove the sensor from the manipulator before starting the manipulator. If the manipulator is operated with the sensor attached to the manipulator, the sensor may be damaged.

**NOTE**

Remove the spatter, fume, or rust if they are found on the sensor.

17. Reinstall the plug and cover onto the manipulator.

**NOTE**

Be sure to install the plug and cover to prevent any dirt on the sensor mounting holes or sensor detecting element. The zeroing operation cannot be performed if any dirt is attached on them.
18. Confirm the manipulator position as follows:
   Select \{Robot\} under the main menu - \{Second Home Position\}.
   - The Second Home Position window appears.
   - For safety reasons, automatic operations by playback cannot be
     performed unless the position is confirmed.

19. Turn ON the servo power by the \[SERVO ON READY\] and Enable
    Switch on the programming pendant.
    Then, press \[FWD\] to move TCP to the second home position.
    - Check for any position deviation of the manipulator’s second home
      position.

20. Select \{Data\} under the main menu - \{Confirm Position\}.
    - The message "Home position checked" appears.

21. Confirm the operation in the “TEACH” mode before restarting
    automatic operation by playback.
    - Check the followings to confirm the operation.
      - Any deviation at each taught point by FWD operation in the
        “TEACH” mode
      - Test runs

   NOTE
   Be sure to confirm the home position before starting auto-
   matic operation.
   If false home position is input by the zeroing function, it may
   lead to errors in the manipulator performance.
If errors occur during the zeroing operation, confirm the error contents and perform the following operations.

<table>
<thead>
<tr>
<th>Message</th>
<th>Contents</th>
<th>Operation</th>
</tr>
</thead>
</table>
| There is little depth of the hole or it is large. Investigate the hole. ErrorCode:55550004 | Error in the data on the hole depth caught by the sensor                  | ① Check if dust or spatter is present on the hole.  
② Check for damage or cracks on the sensor exterior, or deformation of the sensor end.  
③ Perform the zeroing operation again upon confirming the procedures. |
| Switch mode to teach. Again, Execute zeroing.                          | The mode selector switch on the programming pendant is set to “PLAY” mode at the start of the zeroing operation. | Set the mode selector switch to “TEACH” to perform the zeroing operation. |
| Keep servo on state in teach mode between under zeroing execution.     | The servo power is not turned ON at the start of the zeroing operation.   | Turn ON the servo power by the operations as gripping the Enable switch of the programming pendant, etc. |
| Loop Error [The maximum measurement point were exceeded.] ErrorCode:55550005 | Error in the zeroing processing                                           | Possible causes: False parameter settings for zeroing speed, distance, radius, and etc., false starting point of the zeroing operation and etc. Contact the nearest YASKAWA representative. |
| Loop Error [Acquiring a pulse went wrong.] ErrorCode:55550006          | Error in communication                                                    | Possible causes: Inconsistency in software version. Contact your nearest YASKAWA representative. |
| Loop Error [The processing which starts robot operation went wrong.]   | Error in communication                                                    | Contact your nearest YASKAWA representative for perceiving the details on the current state by the particular numbers. |
| Loop Error [The processing which stops robot operation went wrong.]    | Error in communication                                                    | Contact your nearest YASKAWA representative. |
| Loop Error [Acquiring the value of the sensor went wrong.] ErrorCode:55550010 | Error in communication                                                    | Contact your nearest YASKAWA representative for perceiving the details on the current state by the particular numbers. |
| Error [Sensor Amp (Read():D1)] ErrorCode:55550044                      | Error in communication                                                    | Contact your nearest YASKAWA representative. |
| Information                                                            | Error in communication                                                    | ① Check if the alarm lamp is lit, or cables and etc. are connected properly.  
② Turn OFF the power to the amplifier, and turn ON again. Then perform the zeroing operation. |
| Alarm : Sensor Amp (Battery)                                           | Amplifier battery exhaustion                                              | Replace the battery with the new battery.                                  |
| Alarm : Sensor Amp (Write Error EEPROM)                                | Amplifier EEPROM writing error                                            | Contact your nearest YASKAWA representative.                              |
# Errors in the Zeroing Operation and Solutions

<table>
<thead>
<tr>
<th>Message</th>
<th>Contents</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alarm : Sensor Amp (AD Over)</td>
<td>AD Over Alarm of the amplifier</td>
<td>Contact your nearest YASKAWA representative.</td>
</tr>
<tr>
<td>Error [Sensor Amp (Auto Zero:OK)] ErrorCode:55550046</td>
<td>Error in zeroing of the amplifier</td>
<td>Contact your nearest YASKAWA representative.</td>
</tr>
<tr>
<td>Error [No CtrlGroup] ErrorCode:55550052</td>
<td>Zeroing was performed with the YRC1000 which has no manipulator control group.</td>
<td>Perform the zeroing operation by the YRC1000 with the manipulator control group.</td>
</tr>
<tr>
<td>Error [No Axis] ErrorCode:55550056</td>
<td>Zeroing was performed with the manipulator control group which has no operable axes.</td>
<td>Specify the manipulator control group with operable axes.</td>
</tr>
<tr>
<td>Not Found : RS-232C USB ErrorCode:55550001</td>
<td>USB for the RS-232C is not inserted into the slot of the programming pendant.</td>
<td>Insert the USB for the RS-232C into the slot.</td>
</tr>
<tr>
<td>Error [RS-232C Communication] ErrorCode:55550017</td>
<td>Errors occur during the amplifier communication</td>
<td>Contact your nearest YASKAWA representative.</td>
</tr>
<tr>
<td>Error Occur Finish! (Error Occur)</td>
<td>The zeroing operation is terminated due to error occurrence.</td>
<td>Confirm the error content and remove the error cause. Then, perform the zeroing operation again from the start.</td>
</tr>
<tr>
<td>Operator Stop Finish! (Operator Stop)</td>
<td>The zeroing operation is terminated with the stop button.</td>
<td>Perform the zeroing operation again from the start.</td>
</tr>
<tr>
<td>The operator pushed the stop.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Error [Any axis don't set ABSO.] ErrorCode:55550088</td>
<td>Error in the zeroing processing</td>
<td>Contact your nearest YASKAWA representative.</td>
</tr>
<tr>
<td>Loop Error [The maximum moving pulse over.] ErrorCode:55550097</td>
<td>Error in the zeroing processing</td>
<td>Contact your nearest YASKAWA representative.</td>
</tr>
</tbody>
</table>
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INSTRUCTIONS
FOR ZEROING FUNCTION

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

YASKAWA ELECTRIC CORPORATION

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