

MOTOMAN-MH50/ MH50-35/ MH80/ MS80 OPTIONS INSTRUCTIONS

FOR ZEROING FUNCTION

TYPE:**YR-MH00050-B**/ YR-MH00050-D** (ZEROING SPECIFICATION)****YR-MH00080-B**/ YR-MH00080-D** (ZEROING SPECIFICATION)****YR-MS00080-B** (ZEROING SPECIFICATION)**

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

MOTOMAN INSTRUCTIONS

MOTOMAN-MH50 INSTRUCTIONS
MOTOMAN-MH50-35 INSTRUCTIONS
MOTOMAN-MH80 INSTRUCTIONS
MOTOMAN-MS80 INSTRUCTIONS
DX100 INSTRUCTIONS
DX100 OPERATOR'S MANUAL
DX100 MAINTENANCE MANUAL

The DX100 operator's manual above corresponds to specific usage.
Be sure to use the appropriate manual.

Part Number: 163471-1CD

Revision: 1

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MANDATORY

- This instruction manual is intended to explain mainly on the mechanical part of the MOTOMAN-MH50, MH50-35, MH80, MS80 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.
- General items related to safety are listed in Chapter 1: Safety of the DX100 Instructions. To ensure correct and safe operation, carefully read the DX100 Instructions 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 DX100.

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



DANGER

Indicates an 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.



To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “DANGER”, “CAUTION” and “WARNING”.



DANGER

- 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.
- 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

- Before operating the manipulator, check that servo power is turned OFF pressing the emergency stop buttons on the front door of the DX100 and the programming pendant. 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 person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
 - Turning ON the power for the DX100.
 - 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 is a problem.

The emergency stop buttons are located on the right of front door of the DX100 and the programming pendant.



CAUTION

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
 - Check for problems in manipulator movement.
 - Check for damage to insulation and sheathing of external wires.
- Always return the programming pendant to the hook on the cabinet of the DX100 after use.

The programming pendant can be damaged if it is left in the manipulator's work area, on the floor, or near fixtures.

- Read and understand the Explanation of Warning Labels in the DX100 Instructions before operating the manipulator:

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 the manipulator cables.

In this manual, the equipment is designated as follows:

Equipment	Manual Designation
DX100 controller	DX100
DX100 programming pendant	Programming pendant
Cable between the manipulator and the DX100	Manipulator cable

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.

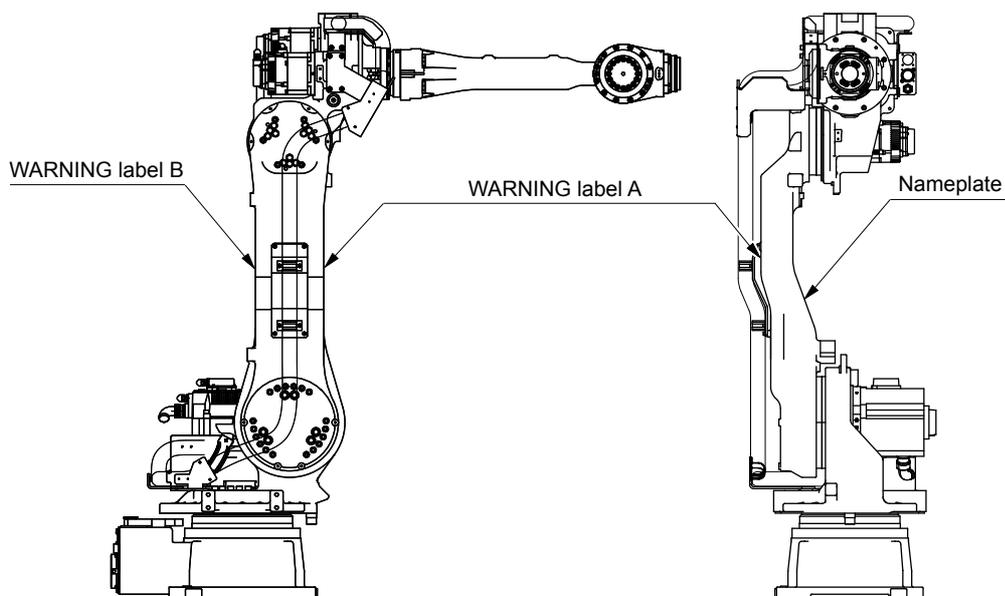
Explanation of Warning Labels

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.

Figure 3: Warning Label Locations



Nameplate:

YASKAWA MOTOMAN	
MODEL MOTOMAN- TYPE	
PAYLOAD	MASS
ORDER NO. kg	DATE kg
SERIAL NO.	
YASKAWA ELECTRIC CORPORATION 2-1 Kurosakishiroishi, Yahatanishi-ku, Kitakyushu 806-0004 Japan MADE IN JAPAN	
NJ3247	

WARNING Label A:



WARNING Label B:



Safeguarding Tips

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. All personnel involved with the operation of the equipment must understand potential dangers of operation. General safeguarding tips are as follows:

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this equipment, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this equipment.
- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.
- The system must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.
- In accordance with ANSI/RIA R15.06-2012, section 4.2.5, Sources of Energy, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

Mechanical Safety Devices

The safe operation of this equipment is ultimately the users responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, ANSI/RIA R15.06-2012 safety standards, and other local codes that may pertain to the installation and use of this equipment.

Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety equipment is provided as standard:

- Safety barriers
- Door interlocks
- Emergency stop palm buttons located on operator station

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.

Programming, Operation, and Maintenance Safety

All operators, programmers, maintenance personnel, supervisors, and anyone working near the system must become familiar with the operation of this equipment. Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this equipment should be permitted to program, or maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

- Inspect the equipment to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
- Be sure that all safeguards are in place. Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Check the E-Stop button on the operator station for proper operation before programming. The equipment must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.
- Back up all programs and jobs onto suitable media before program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.
- Any modifications to the controller unit can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to the controller unit. Making any changes without the written permission from YASKAWA will void the warranty.
- Some operations require standard passwords and some require special passwords.
- The equipment allows modifications of the software for maximum performance. Care must be taken when making these modifications. All modifications made to the software will change the way the equipment operates and can cause severe personal injury or death, as well as damage parts of the system. Double check all modifications under every mode of operation to ensure that the changes have not created hazards or dangerous situations.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.
- Use proper replacement parts.
- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.

Maintenance Safety

Turn the power OFF and disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

Perform only the maintenance described in this manual. Maintenance other than specified in this manual should be performed only by YASKAWA-trained, qualified personnel.

Summary of Warning Information

This manual is provided to help users establish safe conditions for operating the equipment. Specific considerations and precautions are also described in the manual, but appear in the form of Dangers, Warnings, Cautions, and Notes.

It is important that users operate the equipment in accordance with this instruction manual and any additional information which may be provided by YASKAWA. Address any questions regarding the safe and proper operation of the equipment to YASKAWA Customer Support.

Customer Support Information

If you need assistance with any aspect of your MH50/MH50-35/MH80/MS80 Zeroing system, please contact YASKAWA Customer Support at the following 24-hour telephone number:

(937) 847-3200

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

techsupport@motoman.com

When using e-mail to contact YASKAWA 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 YASKAWA Customer Support at the telephone number shown above.

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

- | | |
|----------------------------|--|
| • System | MH50/MH50-35/MH80/MS80
Zeroing |
| • Robots | _____ |
| • Primary Application | _____ |
| • Controller | DX100 |
| • 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 DX100 controller
data plate |

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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. (Optional function)

This function only applies to the manipulator which was ordered to be equipped with the zeroing function and shipped.

1.1 Outline

The DX100 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 you perform the following operations, or the followings occur.

- Replacement of Motors
- Replacement of Encoders
- Backup Battery Exhaustion in the Manipulator



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 DX100 power even when the zeroing operation is performed.

Be sure to replace the battery periodically. For the battery replacement, refer to "Maintenance and Inspection" of "MOTOMAN-MH50 INSTRUCTIONS".



The home positioning cannot be performed accurately by the zeroing operation if changing the combination of the manipulator and the DX100.

1.2 Details on Zeroing Function

1.2.1 System Configuration

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

1.2.1.1 System Configuration of the Zeroing Device Using the CF Card

Fig. 1-1: Zeroing System Configuration Using CF Card Slot

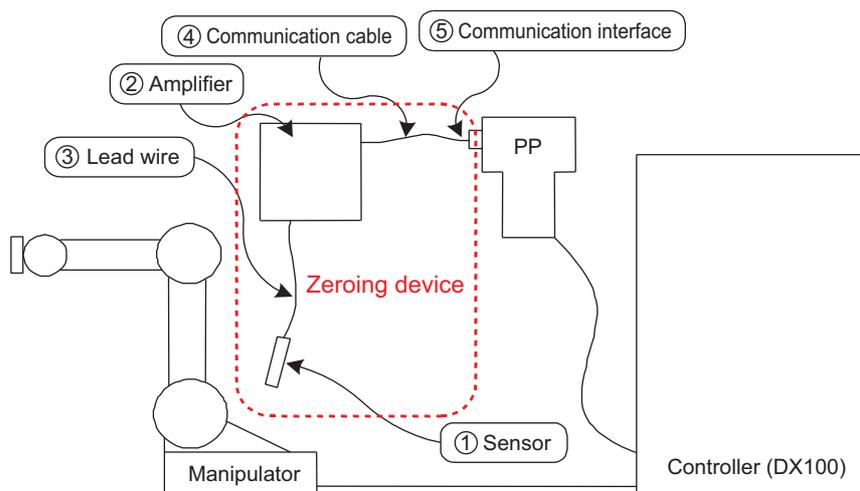


Table 1-1: Components for Zeroing Device Using CF Card Slot

Component	Type	Qty.	Manufacturer
① Sensor	HW0381863-A	1	YASKAWA Electric Corporation
② Amplifier	HW0381864-A	1	YASKAWA Electric Corporation
③ Lead wire	HW0470652-A	1	YASKAWA Electric Corporation
④ Communication cable	C232N-915	1	YASKAWA Electric Corporation
⑤ Communication interface	REX-CF60 *	1	YASKAWA Electric Corporation

* The communication interface REX-CF60 has been discontinued.

NOTE

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

Handle and store them with due care.

1.2.1.2 System Configuration of the Zeroing Device Using the USB Connector

Fig. 1-2: Zeroing System Configuration Using USB Slot

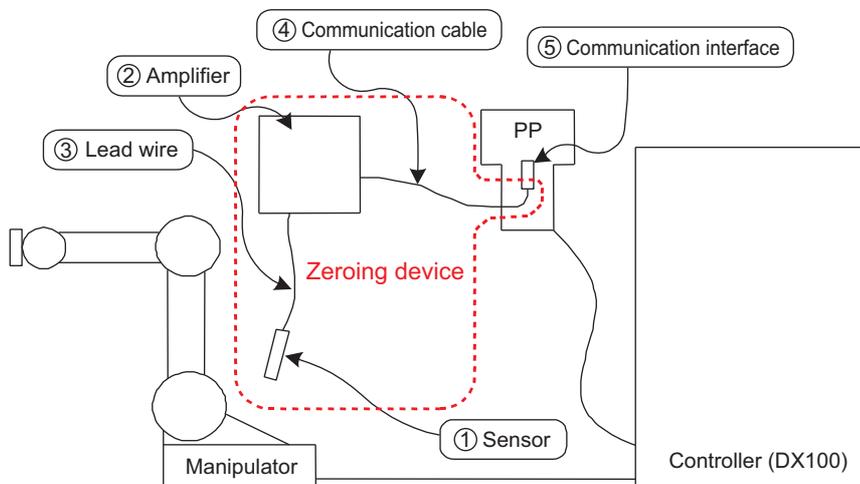


Table 1-2: Components for Zeroing Device Using USB Slot

Component	Type	Qty.	Manufacturer
① Sensor	HW0381863-A	1	YASKAWA Electric Corporation
② Amplifier	HW0381864-A	1	YASKAWA Electric Corporation
③ Lead wire	HW0470652-A	1	YASKAWA Electric Corporation
④ Communication cable	C232N-915	1	YASKAWA Electric Corporation
⑤ Communication interface	REX-USB60F	1	YASKAWA Electric Corporation



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

Handle and store them with due care.

1.2.2 Operational Procedure and Cautions**WARNING**

- False zeroing operation may lead to the manipulator's operation error.
Be sure to follow the set procedures and perform the zeroing operation upon ensuring the safety.

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



The zeroing function is only valid when the security mode is set to the management mode.

For the security mode, refer to chapter 7 "Security System" of the "DX100 INSTRUCTIONS".

1.2.2.1 Before the Zeroing Operation

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

1.2.2.2 Connection of the Zeroing Devices

1. When using the CF card slot: Insert the communication interface (REX-CF60) into the CF card slot of the programming pendant.

When using the USB slot : Insert the communication interface (REX-USB60F) into the USB slot of the programming pendant.

Fig. 1-3: Insertion of the Communication Interface



Using the CF card slot



Using the USB slot

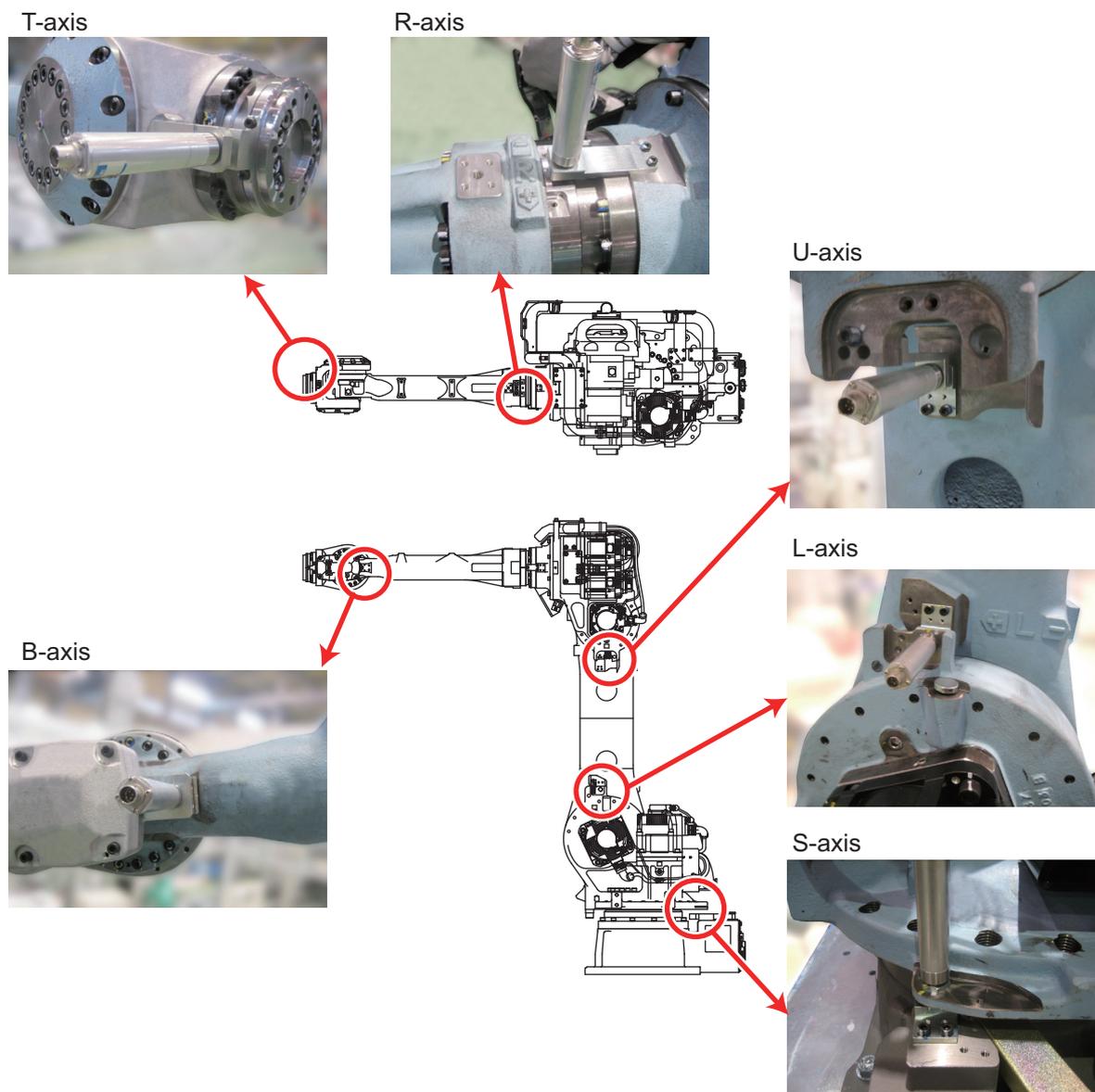
2. When using the CF card slot: Connect the communication interface (REX-CF60) with the amplifier by using the communication cable (C232N-915).
When using the USB slot : Connect the communication interface (REX-USB60F) with the amplifier by using the communication cable (C232N-915).
3. Connect the lead wire to the amplifier.
(Do not connect the sensor yet.)

The installation locations of the zeroing sensors for each axis are shown in *Fig. 1-4 "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 MH50.

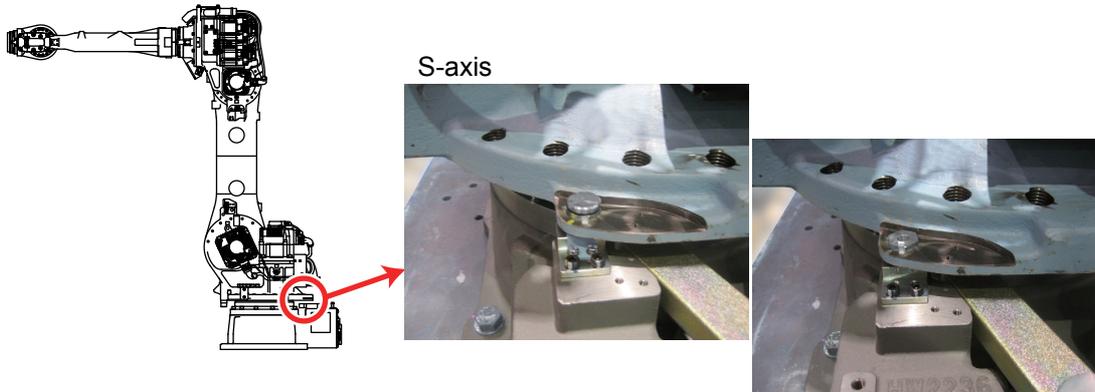
Fig. 1-4: Installation Locations of the Zeroing Sensors



1.2.2.3 Zeroing Procedure for S-Axis

Perform the zeroing operation for S-axis with the following procedure.

1. Remove the plug and cover from the attaching portion for the sensor.



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



The plug, cover, and cover mounting screws are small parts.

Be sure not to lose them during the operation.



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. Perform the home position alignment by adjusting the alignment marks on the S-axis of the manipulator in the "TEACH" mode.



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



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.

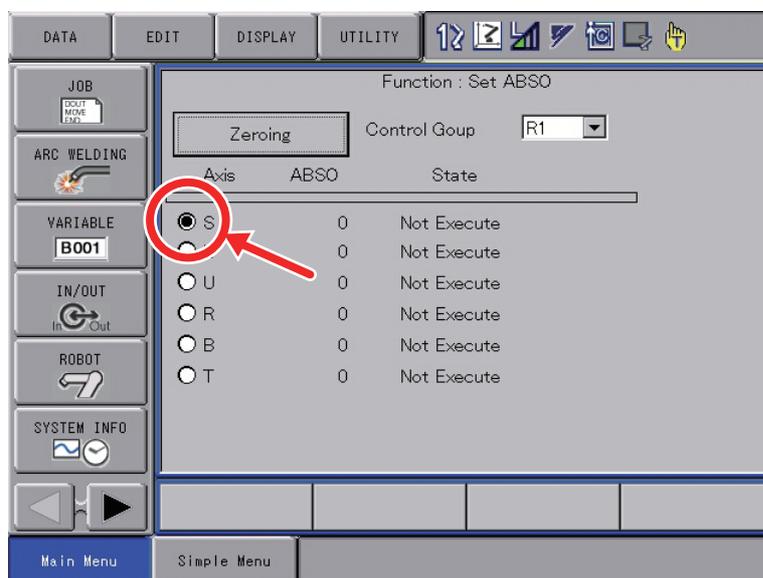
3. Check that no spatter, fume or rust is attached in/on the sensor mounting hole, or sensor detecting element after removing the plug and cover.
 - Remove the spatter, fume, and rust if they are found.

4. Install the sensor onto the mounting holes.



Never use tools, or avoid excessive force on the sensor.
Failure to observe this instruction may result in damage to the sensor.

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} from [Main Menu].
Then, select “S: S-axis” on the touch panel.

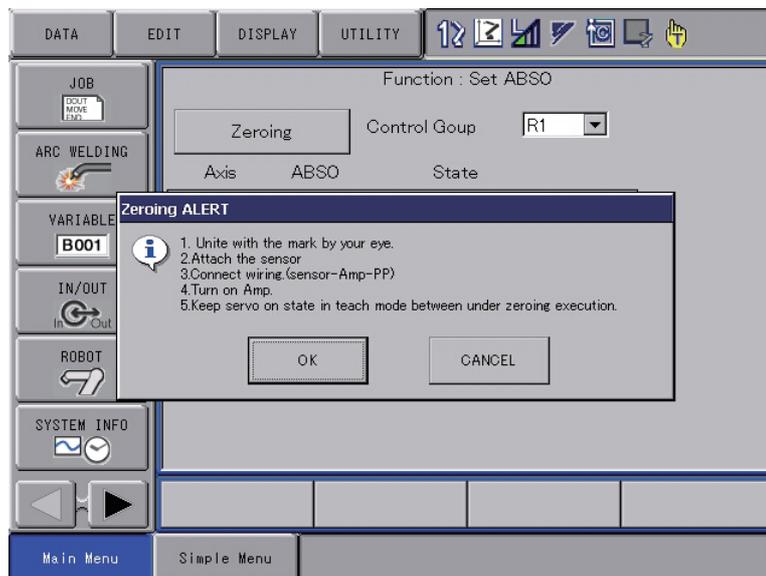


9. Turn ON the servo power by the [SERVO ON READY] button and Enable switch on the programming pendant.



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.

NOTE

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

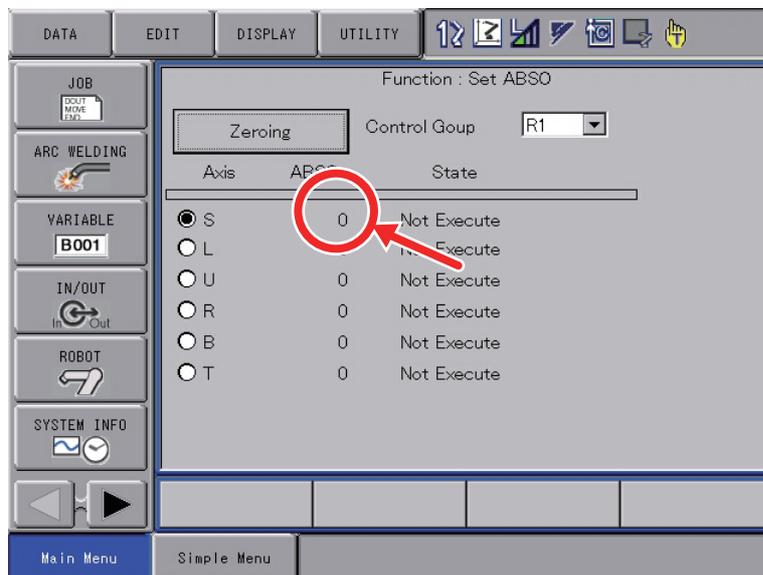
Injury may result from unintentional or unexpected manipulator motion, or operation error.

NOTE

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

Confirm that no person 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 servo power.



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.



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.

17. Reinstall the plug and cover onto the manipulator.



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. Remove dust on the sensor for the sensor dust.
19. Confirm the manipulator position as follows:
Select {Robot} from [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.
20. Turn ON the servo power by the [SERVO ON READY] button 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.
21. Select {Data} from [Main Menu] → {Confirm Position}.
 - The message "Home position checked" appears.
22. 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



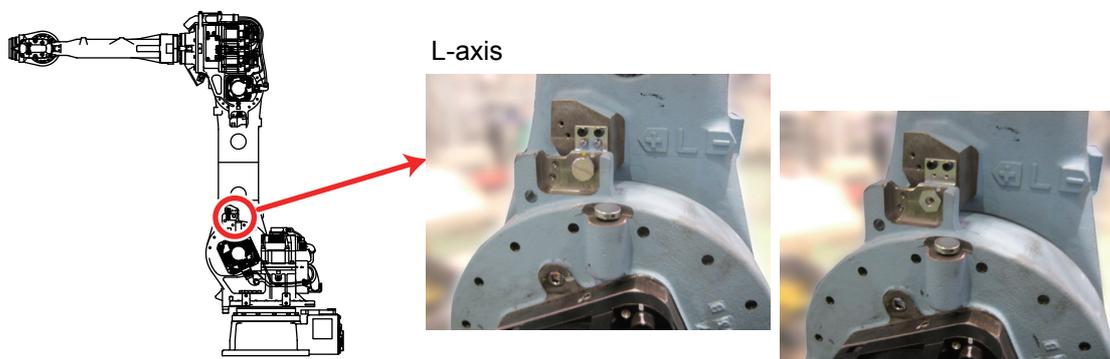
Be sure to confirm the home position before starting automatic operation.

If false home position is input by the zeroing function, it may lead to errors in the manipulator performance.

1.2.2.4 Zeroing Procedure for L-Axis

Perform the zeroing operation for L-axis with the following procedure.

1. Remove the plug and cover from the attaching portion for the sensor.



NOTE 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.

NOTE 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. Perform the home position alignment by adjusting the alignment marks on the L-axis of the manipulator in the "TEACH" mode.

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

NOTE 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.
– Remove the spatter, fume, and rust if they are found.

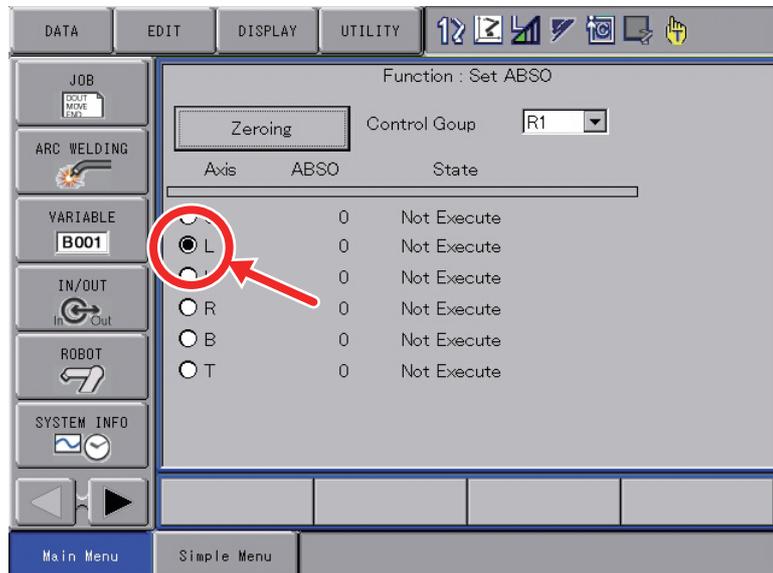
4. Install the sensor onto the mounting holes.



Never use tools, or avoid excessive force on the sensor.

Failure to observe this instruction may result in damage to the sensor.

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} from [Main Menu]. Then, select “L: L-axis” on the touch panel.



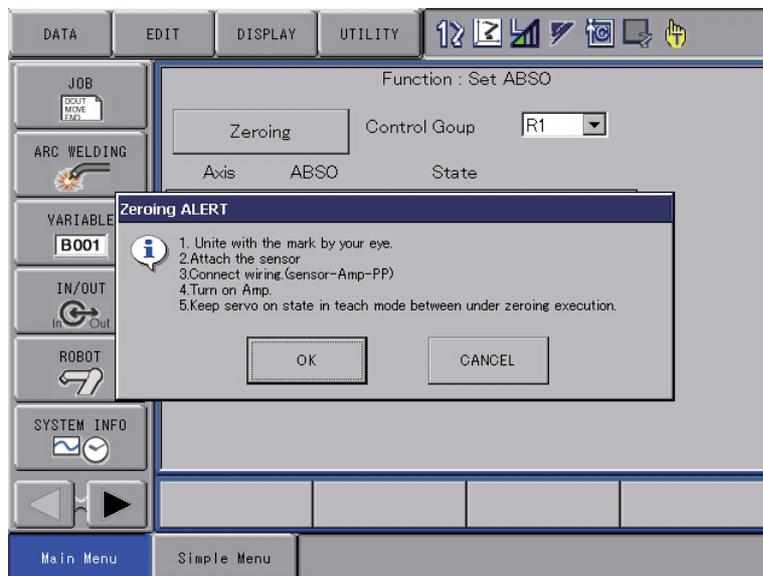
9. Turn ON the servo power by the [SERVO ON READY] button and Enable switch on the programming pendant.



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.



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

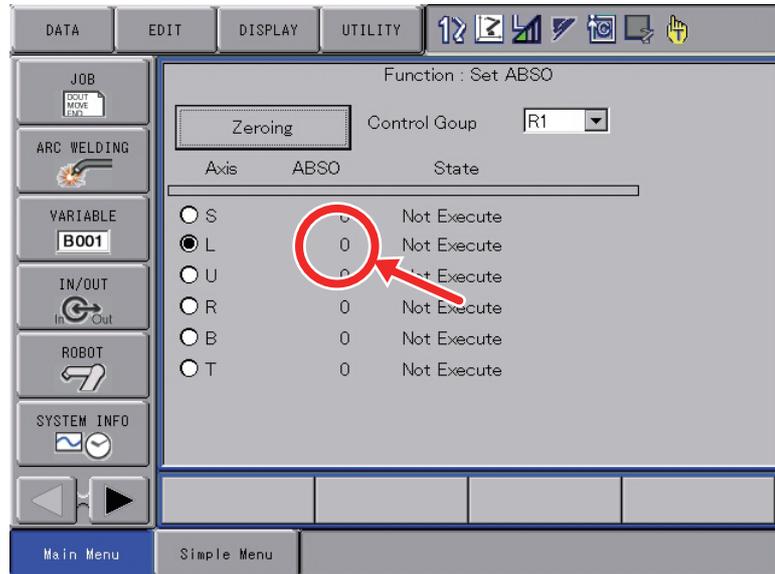
Injury may result from unintentional or unexpected manipulator motion, or operation error.



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 servo power.



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.



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.

17. Reinstall the plug and cover onto the manipulator.



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. Remove dust on the sensor for the sensor dust.
19. Confirm the manipulator position as follows:
Select {Robot} from [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.
20. Turn ON the servo power by the [SERVO ON READY] button 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.
21. Select {Data} from [Main Menu] → {Confirm Position}.
 - The message "Home position checked" appears.
22. 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

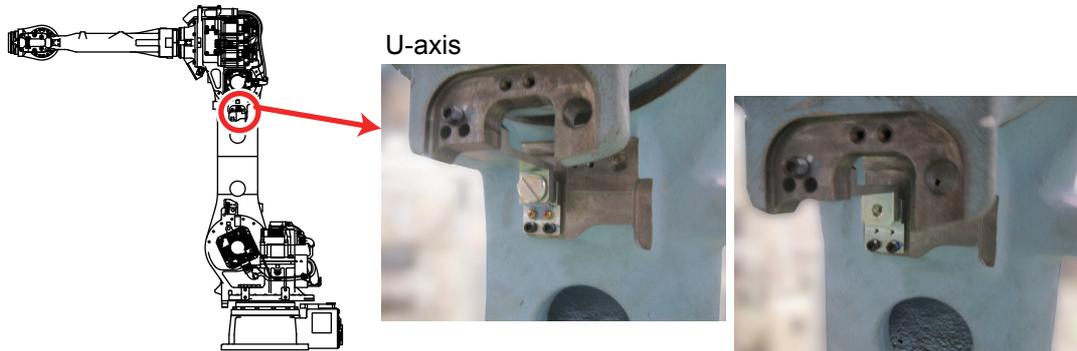


Be sure to confirm the home position before starting automatic operation.

If false home position is input by the zeroing function, it may lead to errors in the manipulator performance.

1.2.2.5 Zeroing Procedure for U-Axis

Perform the zeroing operation for U-axis with the following procedure.



1. Remove the plug and cover from the attaching portion for the sensor.



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



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



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. Perform the home position alignment by adjusting the alignment marks on the U-axis of the manipulator in the “TEACH” mode.



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



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.

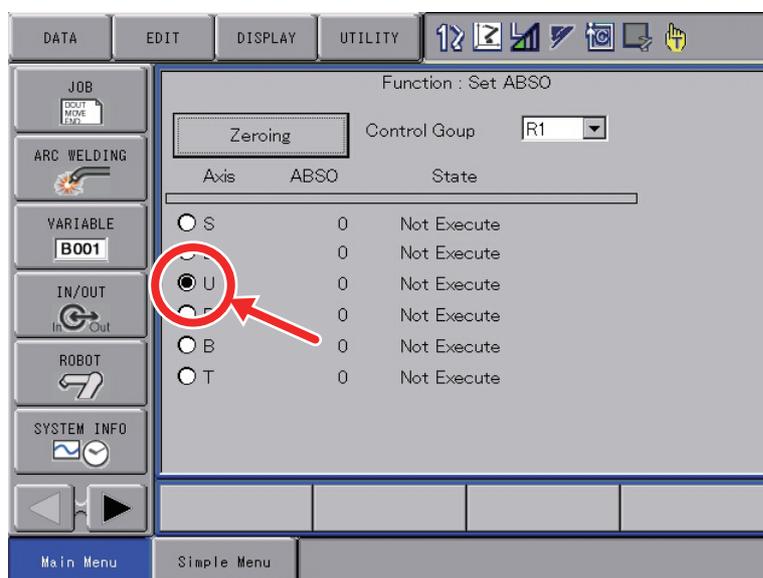
3. Check that no spatter, fume or rust is attached in/on the sensor mounting hole, or indentation after removing the plug and cover.
 - Remove the spatter, fume, and rust if they are found.

4. Install the sensor onto the mounting holes.



Never use tools, or avoid excessive force on the sensor.
Failure to observe this instruction may result in damage to the sensor.

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} from [Main Menu].
Then, select “U: U-axis” on the touch panel.

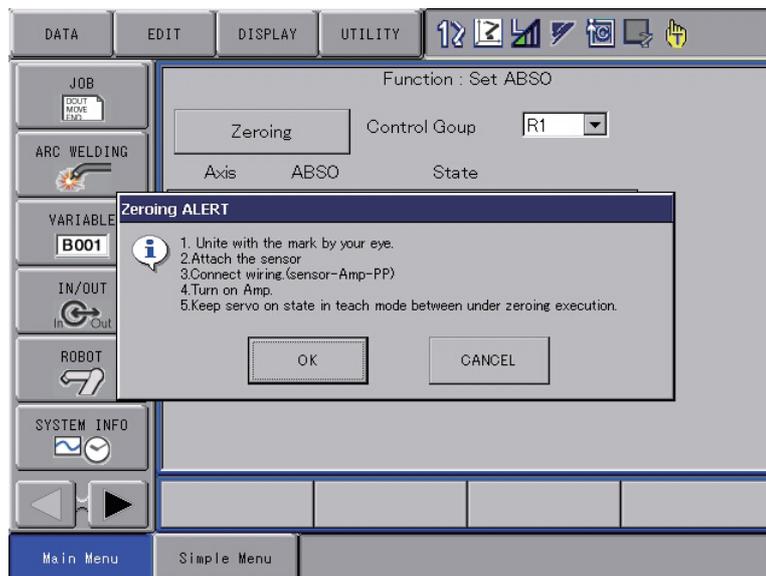


9. Turn ON the servo power by the [SERVO ON READY] button and Enable switch on the programming pendant.



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.

NOTE

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

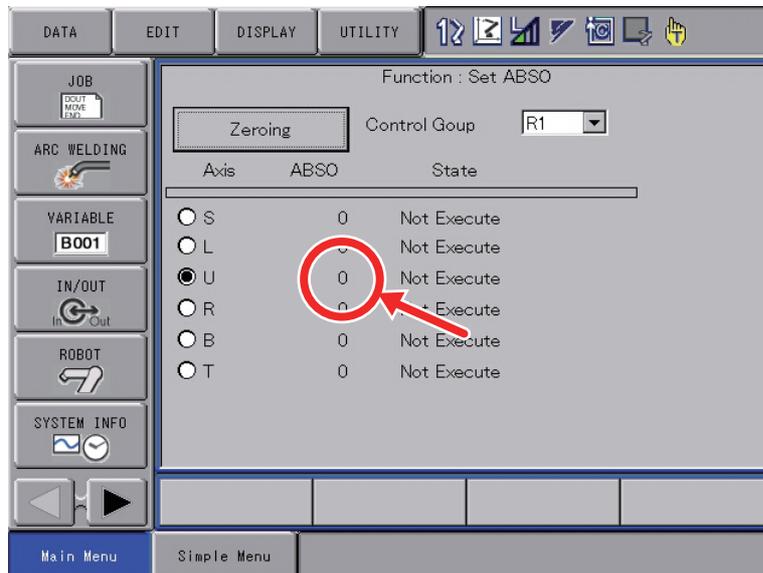
- Injury may result from unintentional or unexpected manipulator motion, or operation error.

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 servo power.



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.



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.

17. Reinstall the plug and cover onto the manipulator.



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. Remove dust on the sensor for the sensor dust.
19. Confirm the manipulator position as follows:
Select {Robot} from [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.
20. Turn ON the servo power by the [SERVO ON READY] button 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.
21. Select {Data} from [Main Menu] → {Confirm Position}.
 - The message "Home position checked" appears.
22. 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



Be sure to confirm the home position before starting automatic operation.

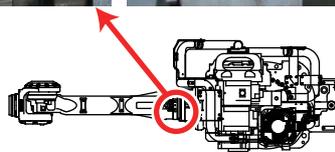
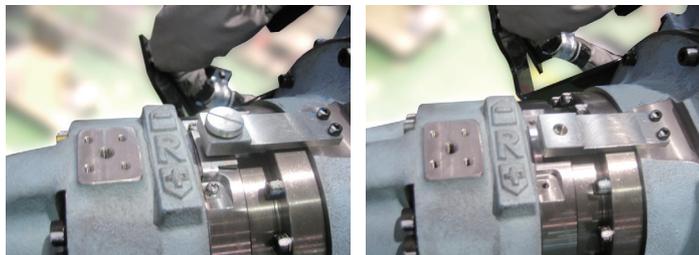
If false home position is input by the zeroing function, it may lead to errors in the manipulator performance.

1.2.2.6 Zeroing Procedure for R-Axis

Perform the zeroing operation for R-axis with the following procedure.

1. Remove the plug and cover from the attaching portion for the sensor.

R-axis



NOTE 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.

NOTE 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. Perform the home position alignment by adjusting the alignment marks on the R-axis of the manipulator in the "TEACH" mode.

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

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

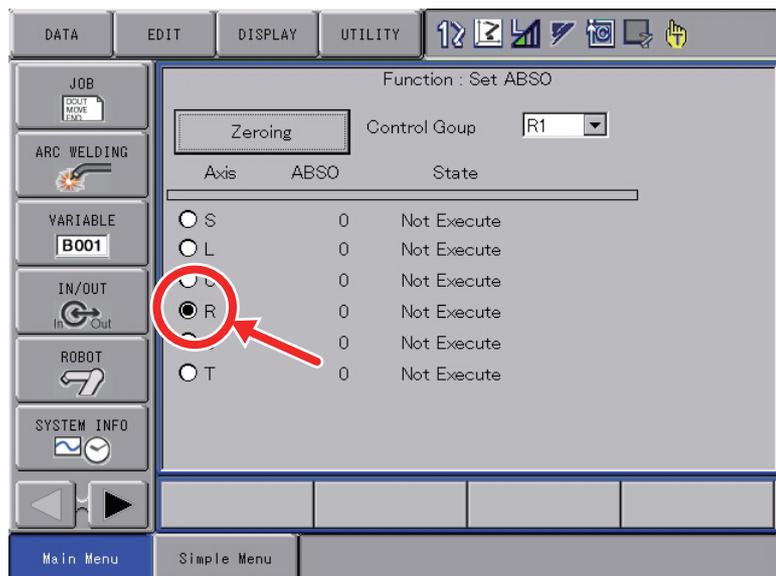
3. Check that no spatter, fume or rust is attached in/on the sensor mounting hole, or sensor detecting element after removing the plug and cover.
 - Remove the spatter, fume, and rust if they are found.
4. Install the sensor onto the mounting holes.



Never use tools, or avoid excessive force on the sensor.

Failure to observe this instruction may result in damage to the sensor.

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} from [Main Menu].
Then, select “R: R-axis” on the touch panel.



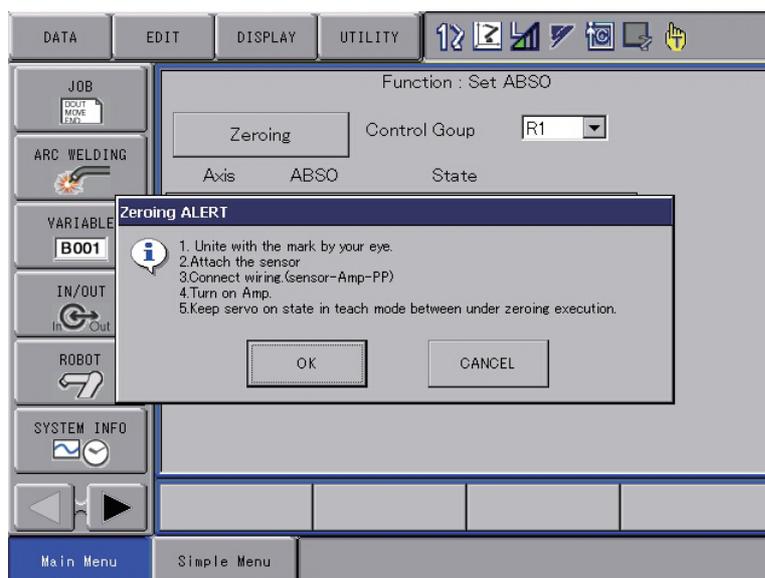
9. Turn ON the servo power by the [SERVO ON READY] button and Enable switch on the programming pendant.

NOTE

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.

NOTE

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

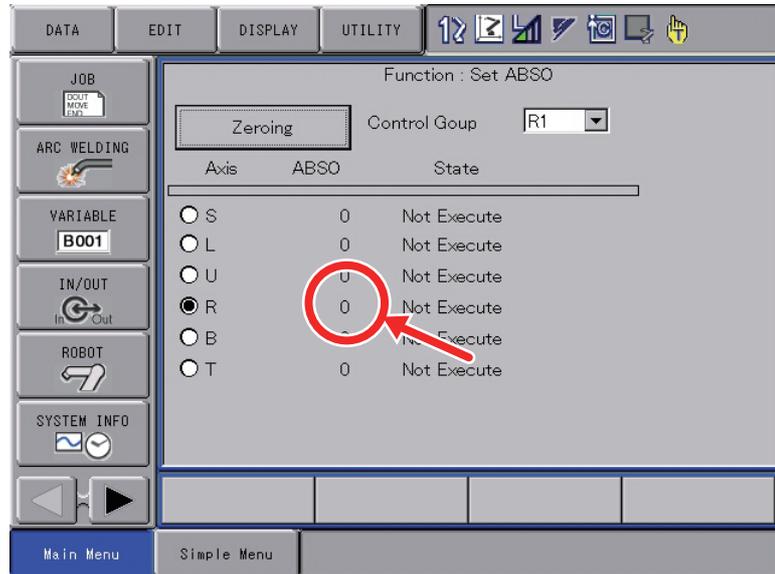
- Injury may result from unintentional or unexpected manipulator motion, or operation error.

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 servo power.



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.



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.

17. Reinstall the plug and cover onto the manipulator.



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. Remove dust on the sensor for the sensor dust.
19. Confirm the manipulator position as follows:
Select {Robot} from [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.
20. Turn ON the servo power by the [SERVO ON READY] button 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.
21. Select {Data} from [Main Menu] → {Confirm Position}.
 - The message "Home position checked" appears.
22. 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



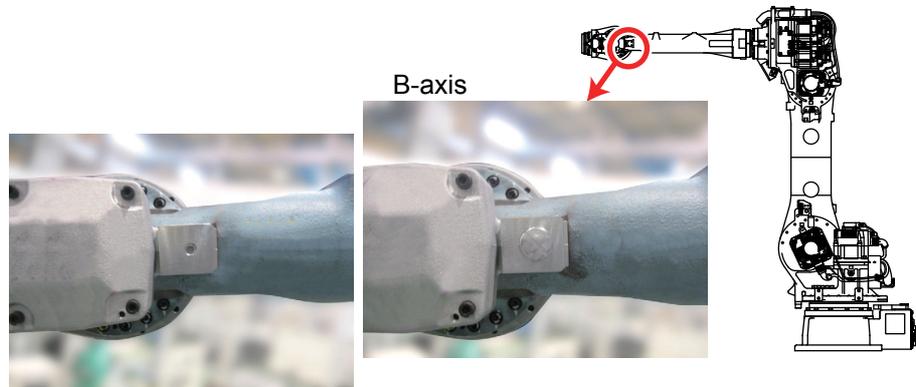
Be sure to confirm the home position before starting automatic operation.

If false home position is input by the zeroing function, it may lead to errors in the manipulator performance.

1.2.2.7 Zeroing Procedure for B-Axis

Perform the zeroing operation for B-axis with the following procedure.

1. Remove the plug and cover from the attaching portion for the sensor.



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



The plug, cover, and cover mounting screws are small parts.

Be sure not to lose them during the operation.



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. Perform the home position alignment by adjusting the alignment marks on the B-axis of the manipulator in the “TEACH” mode.



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

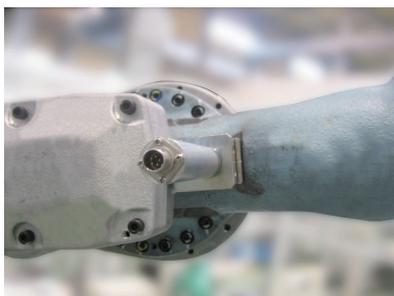


Confirm that no persons are present in the P-point maximum envelope of the manipulator and the operator is in a safe place.

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

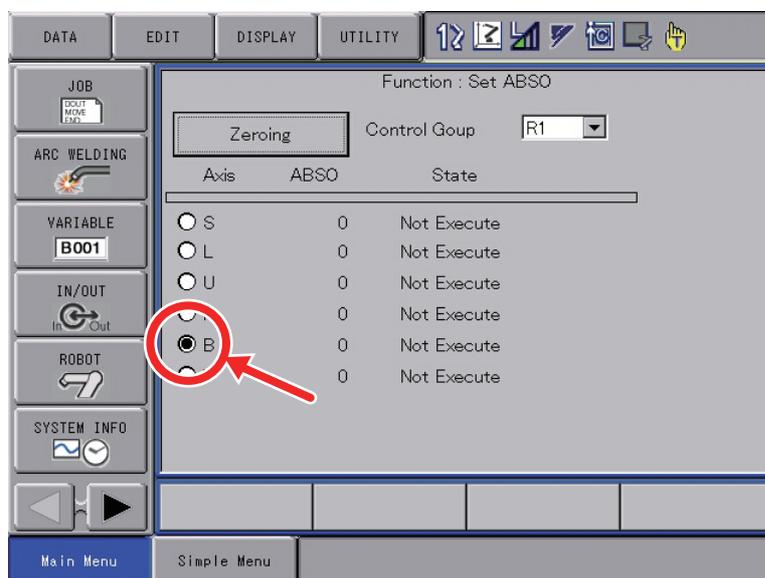
3. Check that no spatter, fume or rust is attached in/on the sensor mounting hole, or sensor detecting element after removing the plug and cover.
 - Remove the spatter, fume, and rust if they are found.

4. Install the sensor onto the mounting holes.



Never use tools, or avoid excessive force on the sensor.
Failure to observe this instruction may result in damage to the sensor.

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} from [Main Menu].
Then, select “B: B-axis” on the touch panel.

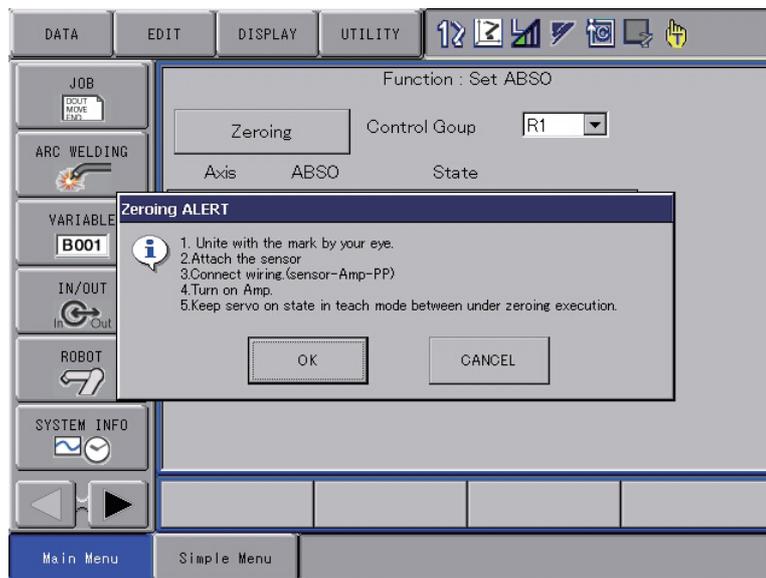


9. Turn ON the servo power by the [SERVO ON READY] button and Enable switch on the programming pendant.



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.

NOTE

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

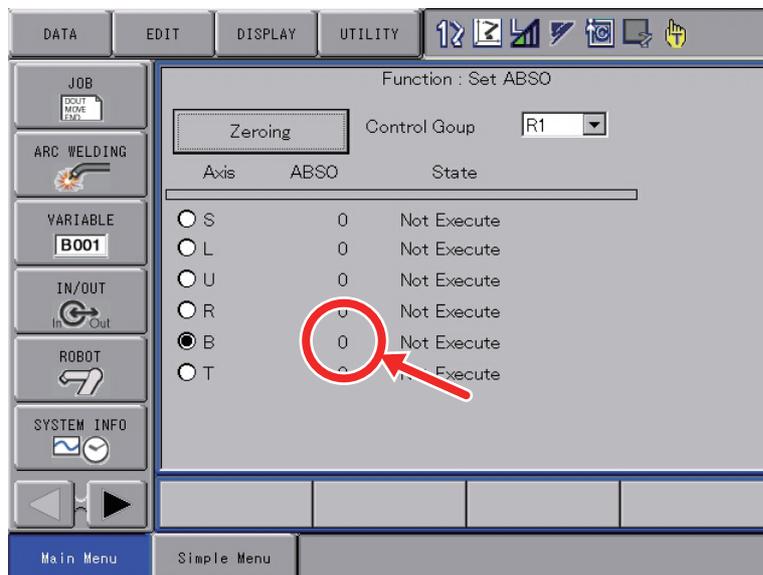
- Injury may result from unintentional or unexpected manipulator motion, or operation error.

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 servo power.



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.



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.

17. Reinstall the plug and cover onto the manipulator.



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. Remove dust on the sensor for the sensor dust.
19. Confirm the manipulator position as follows:
Select {Robot} from [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.
20. Turn ON the servo power by the [SERVO ON READY] button and Enable switch on the programming pendant.
Then, press [FWD] to move TCP to the second home position.
21. Check for any position deviation of the manipulator's second home position.
22. Select {Data} from [Main Menu] → {Confirm Position}.
 - The message "Home position checked" appears.
23. 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



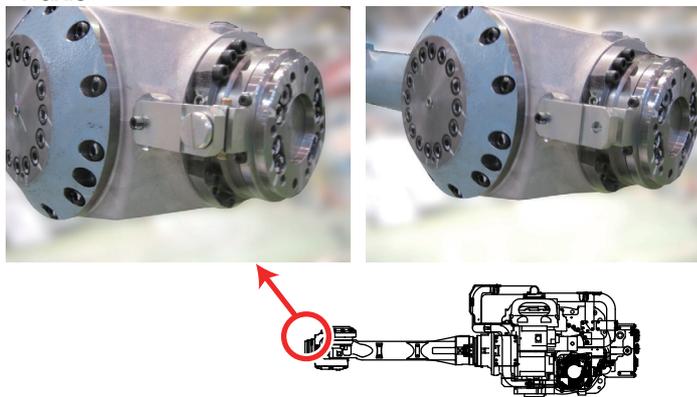
Be sure to confirm the home position before starting automatic operation.

If false home position is input by the zeroing function, it may lead to errors in the manipulator performance.

1.2.2.8 Zeroing Procedure for T-Axis

Perform the zeroing operation for T-axis with the following procedure.

T-axis



1. Remove the plug and cover from the attaching portion for the sensor.



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



The plug, cover, and cover mounting screws are small parts.

Be sure not to lose them during the operation.



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. Perform the home position alignment by adjusting the alignment marks on the T-axis of the manipulator in the "TEACH" mode.



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

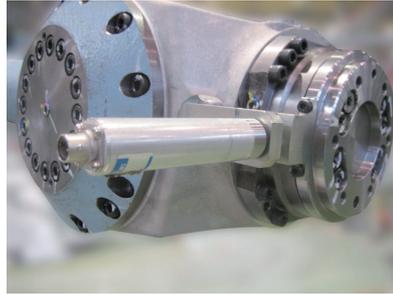


Confirm that no persons are present in the P-point maximum envelope of the manipulator and the operator is in a safe place.

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.
 - Remove the spatter, fume, and rust if they are found.

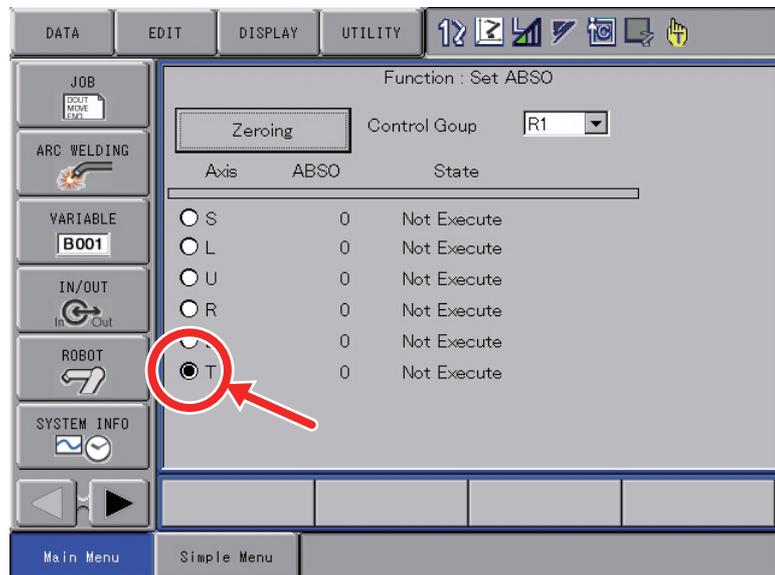
4. Install the sensor onto the mounting holes.



Never use tools, or avoid excessive force on the sensor.

Failure to observe this instruction may result in damage to the sensor.

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} from [Main Menu]. Then, select “T: T-axis” on the touch panel.



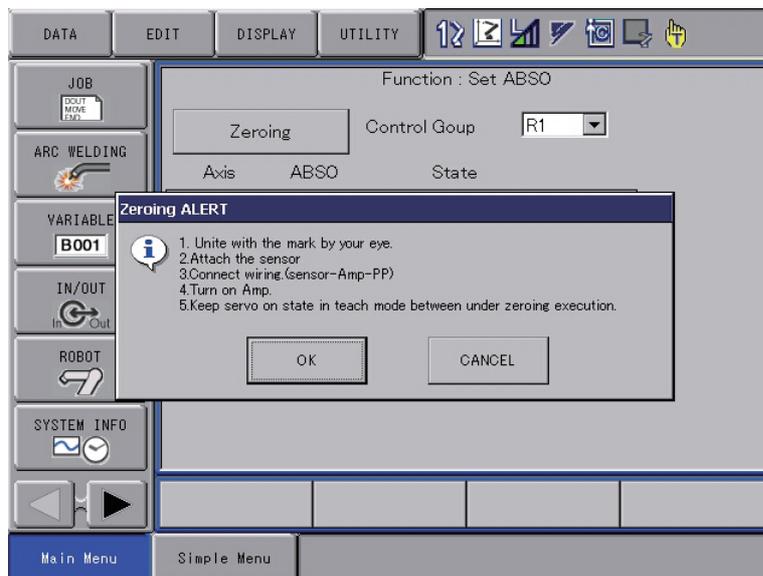
9. Turn ON the servo power by the [SERVO ON READY] button and Enable switch on the programming pendant.



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.



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

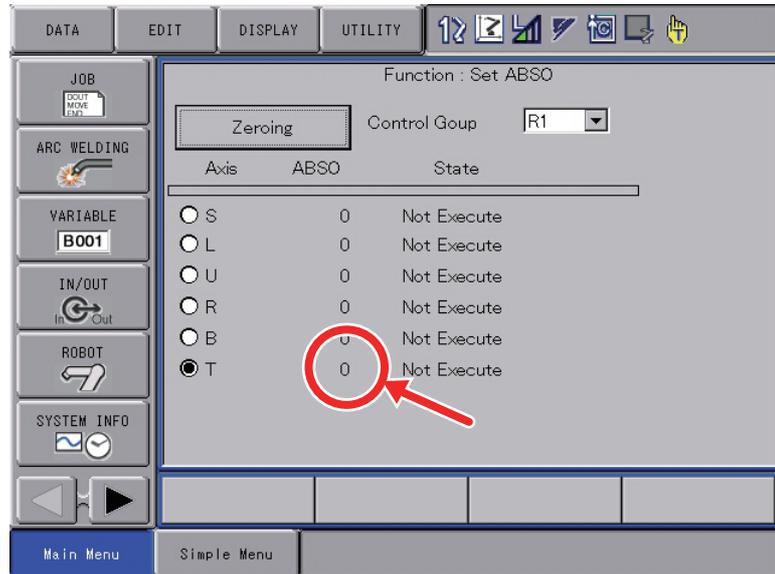
Injury may result from unintentional or unexpected manipulator motion, or operation error.



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 servo power.



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.



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.

17. Reinstall the plug and cover onto the manipulator.



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. Remove dust on the sensor for the sensor dust.
19. Confirm the manipulator position as follows:
Select {Robot} from [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.
20. Turn ON the servo power by the [SERVO ON READY] button 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.
21. Select {Data} from [Main Menu] → {Confirm Position}.
 - The message "Home position checked" appears.
22. 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



Be sure to confirm the home position before starting automatic operation.

If false home position is input by the zeroing function, it may lead to errors in the manipulator performance.

1.3 Errors in the Zeroing Operation and Solutions

If errors occur during the zeroing operation, confirm the error contents and perform the following operations.

Message	Contents	Operation
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. Again, Execute zeroing	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.] ErrorCode:55550008		
Loop Error [The processing which stops robot operation went wrong.] ErrorCode:55550009		
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		Contact your nearest YASKAWA representative.
Information * Check the amp power supply of the sensor. * Check connection of the RS-232C cable. * Check Battery.	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.

MH50/MH50-35/MH80/
MS80 Zeroing

1 Zeroing Function
1.3 Errors in the Zeroing Operation and Solutions

Message	Contents	Operation
Alarm : Sensor Amp (AD Over)	AD Over Alarm of the amplifier	Contact your nearest YASKAWA representative.
Error [Sensor Amp (Auto Zero:OK)] Error Code:55550046	Error in zeroing of the amplifier	Contact your nearest YASKAWA representative.
Error [No CtrlGroup] Error Code:55550052	Zeroing was performed with the DX100 which has no manipulator control group.	Perform the zeroing operation by the DX100 with the manipulator control group.
Error [No Axis] Error Code:55550056	Zeroing was performed with the manipulator control group which has no operable axes.	Specify the manipulator control group with operable axes.
Not Found : RS-232C CF-Card Error Code:55550001	CF-Card for the RS-232C is not inserted into the slot of the programming pendant.	Insert the CF-Card for the RS-232C into the slot.
Error [RS-232C Communication] Error Code:55550017	Errors occur during the amplifier communication	Contact your nearest YASKAWA representative.
Error [RS-232C Communication] Error Code:55550018		
Error RS-232C Communication] Error Code:55550019		
Error [RS-232C Communication] Error Code:55550020		
Error Occur Finish! (Error Occur)	The zeroing operation is terminated due to error occurrence.	Confirm the error content and remove the error cause. Then, perform the zeroing operation again from the start.
Operator Stop Finish! (Operator Stop) The operator pushed the stop.	The zeroing operation is terminated with the stop button.	Perform the zeroing operation again from the start.
Error [Any axis don't set ABSO.] Error Code:55550088	Error in the zeroing processing	Contact your nearest YASKAWA representative.
Loop Error [The maximum moving pulse over.] Error Code:55550097	Error in the zeroing processing	Contact your nearest YASKAWA representative.

MOTOMAN-MH50/ MH50-35/ MH80/ MS80 OPTIONS INSTRUCTIONS

FOR ZEROING FUNCTION

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