

MOTOMAN-HP20 OPTIONS INSTRUCTIONS

FOR ZEROING FUNCTION

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

MOTOMAN INSTRUCTIONS

- MOTOMAN-HP20 INSTRUCTIONS
- NX100 INSTRUCTIONS
- NX100 OPERATOR'S MANUAL
- NX100 MAINTENANCE MANUAL

The NX100 operator's manuals above correspond to specific usage.
Be sure to use the appropriate manual.

Part Number: 165138-1CD
Revision: 0



MANDATORY

- This instruction manual is intended to explain operating instructions and maintenance procedures primarily for the MOTOMAN-HP20.
- General items related to safety are listed in the Section 1: Safety of the NX100 Instructions. To ensure correct and safe operation, carefully read the NX100 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.

Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the NX100.

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



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 “CAUTION” and “WARNING.”



WARNING

- Before operating the manipulator, check that servo power is turned OFF when the emergency stop buttons on the front door of the NX100 and programming pendant are pressed. When the servo power is turned OFF, the SERVO ON LED on the programming pendant is turned OFF.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

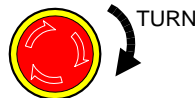
Emergency Stop Button



- 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.

Release of Emergency Stop



- Observe the following precautions when performing teaching operations within the P-point maximum envelope of the manipulator :
 - View the manipulator from the front whenever possible.
 - Always follow the predetermined operating procedure.
 - Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

- Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
 - Turning ON the NX100 power
 - Moving the manipulator with the programming pendant
 - Running the system in the check mode
 - Performing automatic operations

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there are problems. The emergency stop buttons are located on the right of the front door of the NX100 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 NX100 cabinet after use.

The programming pendant can be damaged if it is left in the P-point maximum envelope of manipulator, on the floor, or near fixtures.

- Read and understand the Explanation of the Warning Labels in the NX100 Instructions before operating the manipulator.

Definition of Terms Used Often in This Manual

The MOTOMAN manipulator is the YASKAWA industrial robot product.

The manipulator usually consists of the controller, the programming pendant, and supply cables.

In this manual, the equipment is designated as follows:

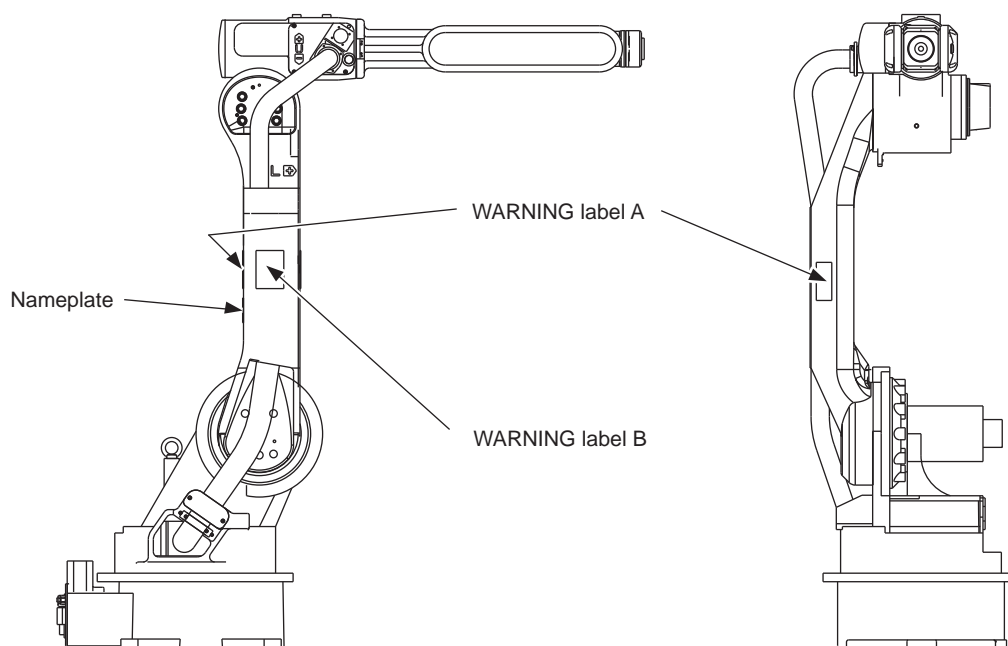
Equipment	Manual Designation
NX100 Controller	NX100
NX100 Programming Pendant	Programming Pendant: P.P.
Cable between the manipulator and the NX100	Manipulator cable

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.



Nameplate:

MOTOMAN	
TYPE □□□□□□	
PAYLOAD □□ kg	MASS □□□ kg
ORDER NO. □□□□□□	DATE □□
SERIAL NO. □□□□□□	
 YASKAWA ELECTRIC CORPORATION JAPAN	

WARNING label A:



WARNING label B:



1 Zeroing Function

1.1 Outline	1-1
1.2 Details on Zeroing Function.....	1-2
1.2.1 System Configuration	1-2
1.2.2 Operational Procedure and Cautions	1-3
■ Before the Zeroing Operation	1-3
■ Connection of the Zeroing Devices	1-3
■ Zeroing Procedure for S-Axis	1-5
■ Zeroing Procedure for L-Axis	1-9
■ Zeroing Procedure for U-Axis	1-13
■ Zeroing Procedure for R-Axis	1-17
■ Zeroing Procedure for B-Axis	1-21
■ Zeroing Procedure for T-Axis	1-26
1.3 Errors in the Zeroing Operation and Solutions	1-30

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. The type of MOTOMAN-HP20 with the zeroing function is: YR-HP20-B00.

1.1 Outline

The NX100 stores the manipulator home position based on the pulse value of each encoder axes. 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

NOTE

The home position data is stored by the backup battery. If the battery is exhausted, the home position data disappear again when you turn OFF the NX100 power even if the zeroing operation is performed.

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

NOTE

The home positioning cannot be performed accurately by the zeroing operation if you change the combination of the manipulator and the NX100.

1.2 Details on Zeroing Function

1.2.1 System Configuration

The following "Fig. 1 Zeroing System Configuration" shows the system configuration of the zeroing function.

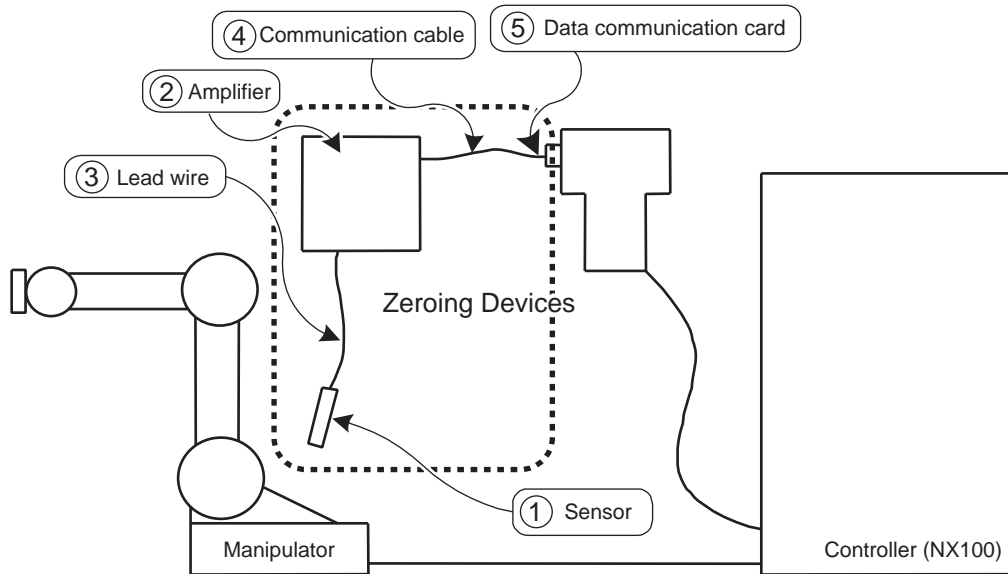


Fig. 1 Zeroing System Configuration

Table. 1 Items Making up the Zeroing System

	Items	Type	Qty	Manufacturer
1	Sensor	HW0381863-A	1	Yaskawa
2	Amplifier	HW0381864-A	1	Yaskawa
3	Lead wire	HW0470652-A	1	Yaskawa
4	Communication cable	KR-M2	1	Yaskawa
5	Data communication card	REX-CF60	1	Yaskawa



The sensor, amplifier, and data communication card are precision instruments. Handle and store them with 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 9 "System Setup" of "NX100 INSTRUCTIONS."

■ 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.

■ Connection of the Zeroing Devices

1. Insert the data communication card into the slot of the programming pendant.



Fig. 2 Insertion of the Data Communication Card

2. Connect the data communication card and amplifier with the communication cable.
3. Connect the lead wire to the amplifier.
(Do not connect the sensor yet.)

"Fig. 3 Installation Locations of the Zeroing Sensors" shows the installation location of the zeroing sensors for each axes.

Perform the zeroing operation every axis by referring to "Zeroing Procedure for S-Axis," "Zeroing Procedure for L-Axis," "Zeroing Procedure for U-Axis," "Zeroing Procedure for R-Axis," "Zeroing Procedure for B-Axis," and "Zeroing Procedure for T-Axis."

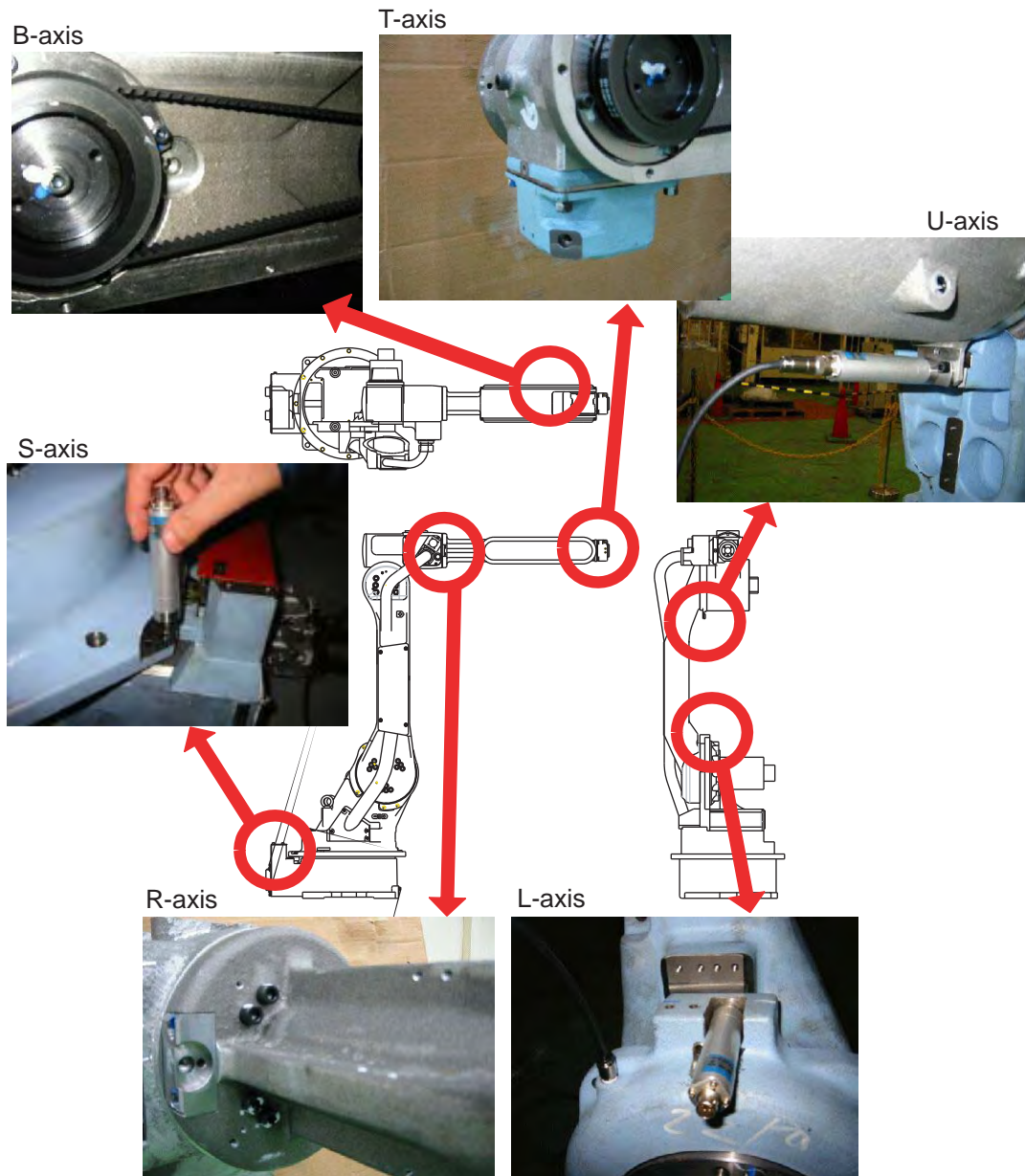
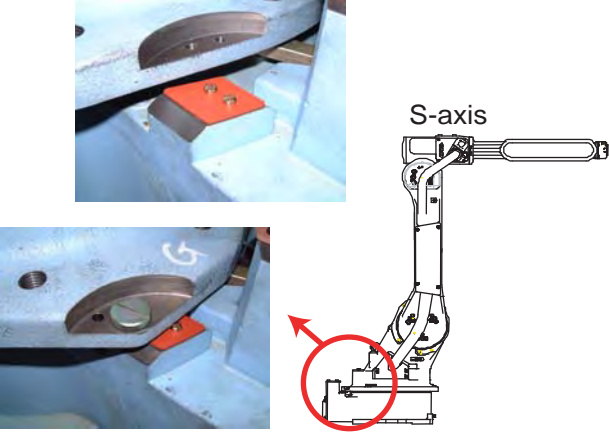


Fig. 3 Installation Locations of the Zeroing Sensors

1.2 Details on Zeroing Function

■ Zeroing Procedure for S-Axis

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

	Operation	Explanation
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 you approach 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.	
---	----------------------------------------------------------------------------------------------------------------------------	--

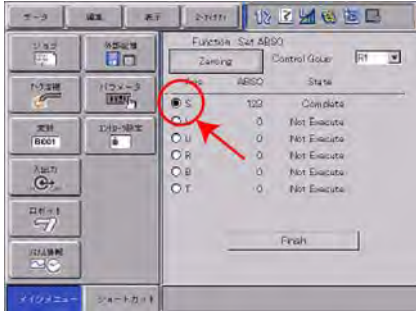
NOTE Be sure to adjust the home position alignment marks and perform the zeroing operation.

NOTE Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are 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.	



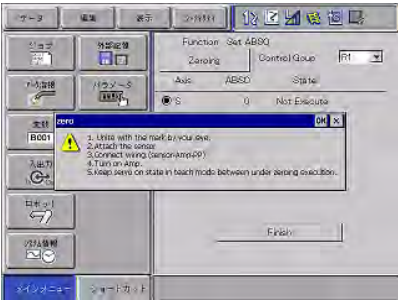
Never use tools, or avoid excessive force on the sensor.
Failure to observe this instruction may result in damage to the sensor.

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.	



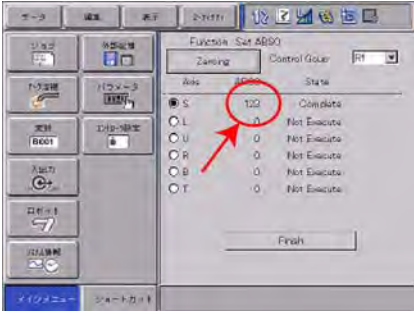
Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe place.
Injury may result from unintentional or unexpected manipulator motion, or operation error.

1.2 Details on Zeroing Function

10	Press {Zeroing} on the touch panel, and pop-up window appears displaying the CAUTION message.	
11	Press [ENTER] 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 that you are 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 power is turned ON 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 dirt on the sensor if you found any.	
19	<p>Confirm the manipulator position as follows:</p> <p>Select {Robot} from [Main Menu] → {Second Home Position}.</p>	<p>For safety reasons, automatic operations by playback cannot be performed unless the position is confirmed.</p> <p>The Second Home Position window appears by the operation stated in the left column.</p>
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 home position with teaching operation before restarting automatic operation by playback.	<p>For the home position confirmation, check for:</p> <ul style="list-style-type: none"> • the manipulator's second home position deviation • any position deviation at each teaching points • test runs

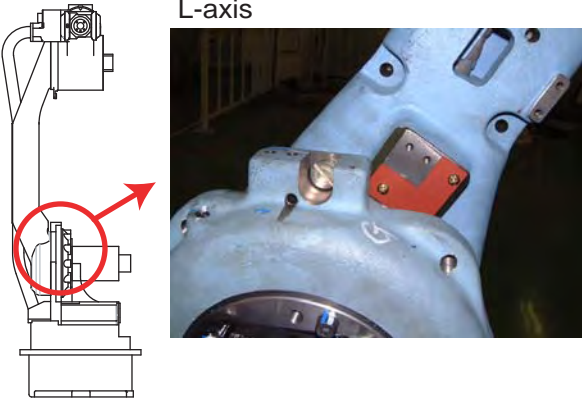


Be sure to confirm the home position before starting automatic operation.
If false home position is input by the zeroing function, it may lead to errors in the manipulator performance.

1.2 Details on Zeroing Function

■ Zeroing Procedure for L-Axis

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

	Operation	Explanation
1	Remove the plug and cover from the attaching portion for the sensor.	 <p style="text-align: center;">L-axis</p>

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 you approach 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.

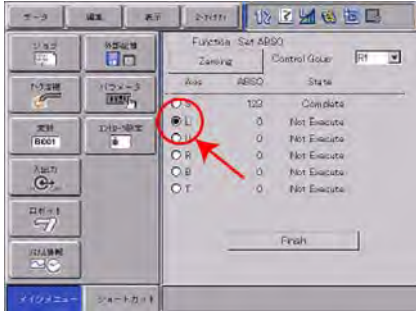
NOTE Be sure to adjust the home position alignment marks and perform the zeroing operation.

NOTE Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are 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.	



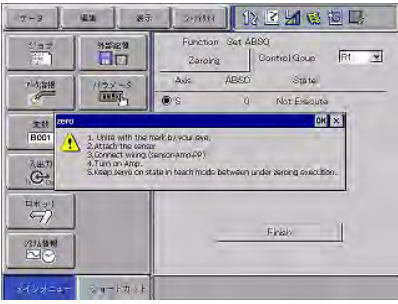
Never use tools, or avoid excessive force on the sensor.
Failure to observe this instruction may result in damage to the sensor.

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.	



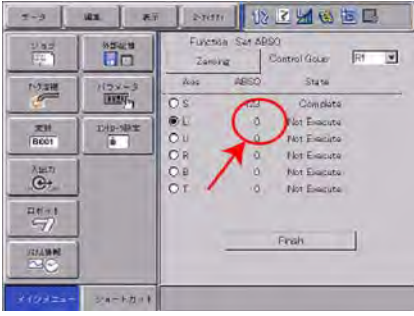
Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe place.
Injury may result from unintentional or unexpected manipulator motion, or operation error.

1.2 Details on Zeroing Function

10	Press {Zeroing} on the touch panel, and pop-up window appears displaying the CAUTION message.	
11	Press [ENTER] 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 that you are 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 power is turned ON 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 dirt on the sensor if you found any.	
19	Confirm the manipulator position as follows: Select {Robot} from [Main Menu] → {Second Home Position}.	For safety reasons, automatic operations by playback cannot be performed unless the position is confirmed. The Second Home Position window appears by the operation stated in the left column.
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 home position with teaching operation before restarting automatic operation by playback.	For the home position confirmation, check for: <ul style="list-style-type: none"> • the manipulator's second home position deviation • any position deviation at each teaching points • test runs

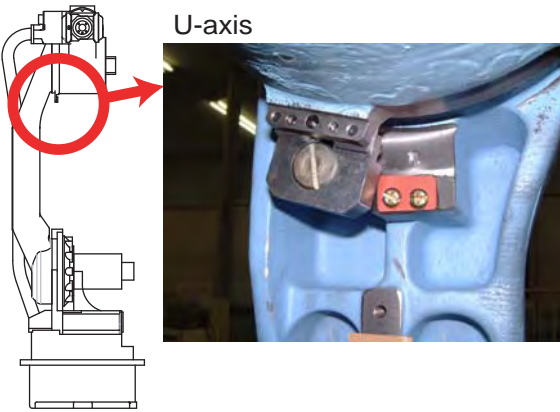


Be sure to confirm the home position before starting automatic operation.
If false home position is input by the zeroing function, it may lead to errors in the manipulator performance.

1.2 Details on Zeroing Function

■ Zeroing Procedure for U-Axis

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

	Operation	Explanation
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 you approach 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.

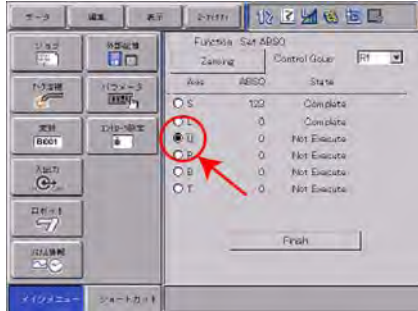


Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe place. Injury may result from unintentional or unexpected manipulator motion, or operation error.

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.	



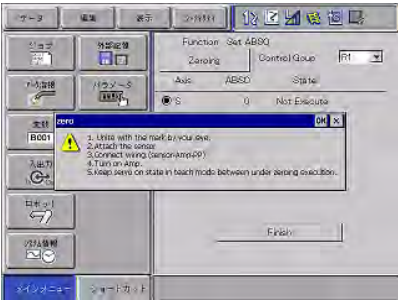
Never use tools, or avoid excessive force on the sensor.
Failure to observe this instruction may result in damage to the sensor.

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.	



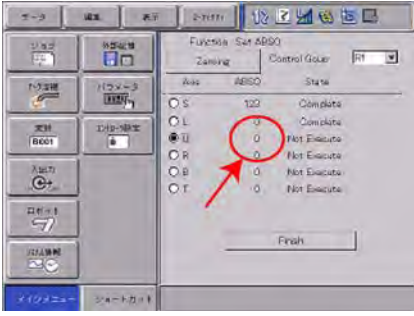
Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe place.
Injury may result from unintentional or unexpected manipulator motion, or operation error.

1.2 Details on Zeroing Function

10	Press {Zeroing} on the touch panel, and pop-up window appears displaying the CAUTION message.	
11	Press [ENTER] 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 that you are 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 power is turned ON 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 dirt on the sensor if you found any.	
----	---------------------------------------------	--

19	Confirm the manipulator position as follows: Select {Robot} from [Main Menu] → {Second Home Position}.	For safety reasons, automatic operations by playback cannot be performed unless the position is confirmed. The Second Home Position window appears by the operation stated in the left column.
----	---------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

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 home position with teaching operation before restarting automatic operation by playback.	For the home position confirmation, check for: <ul style="list-style-type: none"> • the manipulator's second home position deviation • any position deviation at each teaching points • test runs
----	------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

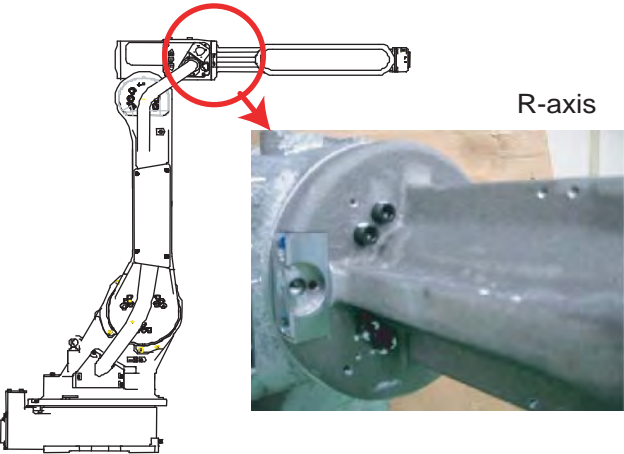


Be sure to confirm the home position before starting automatic operation.
If false home position is input by the zeroing function, it may lead to errors in the manipulator performance.

1.2 Details on Zeroing Function

■ Zeroing Procedure for R-Axis

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

	Operation	Explanation
1	Remove the plug and cover from the attaching portion for the sensor.	 <p style="text-align: right;">R-axis</p>



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

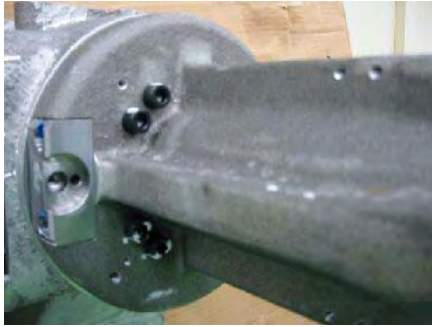
- | | | |
|---|----------------------------------------------------------------------------------------------------------------------------|--|
| 2 | Perform the home position alignment by adjusting the alignment marks on the R-axis of the manipulator in the "TEACH" mode. | |
|---|----------------------------------------------------------------------------------------------------------------------------|--|



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

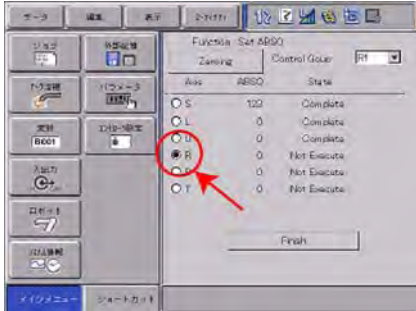


Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe place. Injury may result from unintentional or unexpected manipulator motion, or operation error.

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.	



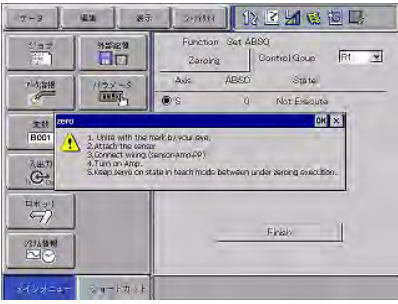
Never use tools, or avoid excessive force on the sensor.
Failure to observe this instruction may result in damage to the sensor.

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.	



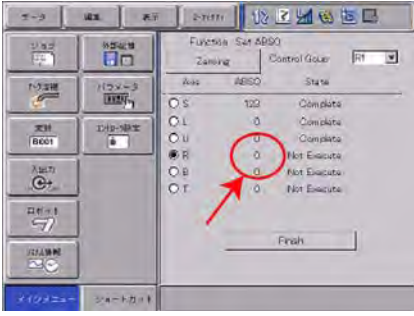
Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe place.
Injury may result from unintentional or unexpected manipulator motion, or operation error.

1.2 Details on Zeroing Function

10	Press {Zeroing} on the touch panel, and pop-up window appears displaying the CAUTION message.	
11	Press [ENTER] 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 that you are 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 power is turned ON 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 dirt on the sensor if you found any.	
----	---------------------------------------------	--

19	Confirm the manipulator position as follows: Select {Robot} from [Main Menu] → {Second Home Position}.	For safety reasons, automatic operations by playback cannot be performed unless the position is confirmed. The Second Home Position window appears by the operation stated in the left column.
----	---------------------------------------------------------------------------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

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 home position with teaching operation before restarting automatic operation by playback.	For the home position confirmation, check for: <ul style="list-style-type: none"> • the manipulator's second home position deviation • any position deviation at each teaching points • test runs
----	------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

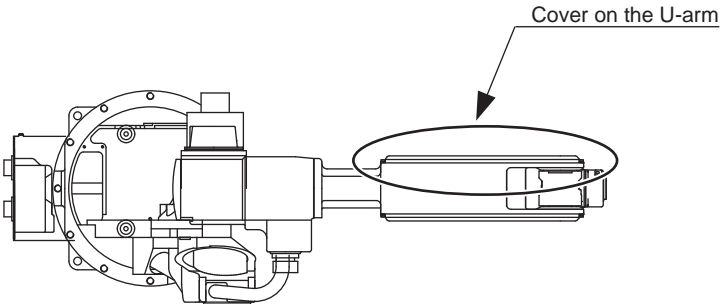
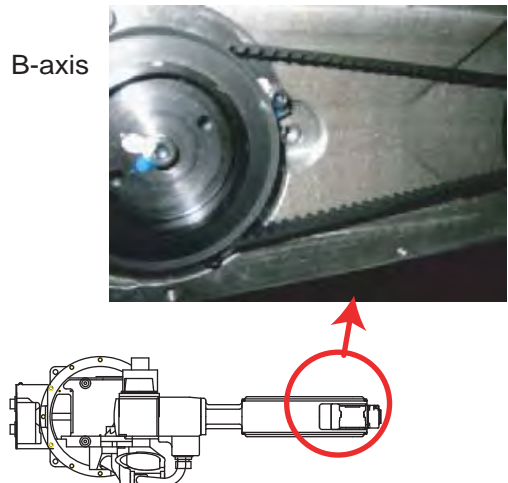


Be sure to confirm the home position before starting automatic operation.
If false home position is input by the zeroing function, it may lead to errors in the manipulator performance.

1.2 Details on Zeroing Function

■ Zeroing Procedure for B-Axis

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

	Operation	Explanation
1	<p>Remove the cover attached on the side of the U-arm as shown in the right picture. (The left hand side as viewed from the S-axis rotation center in the manipulator home position.)</p>	
2	<p>Remove the plug and cover from the attaching portion for the sensor.</p>	<p>B-axis</p> 



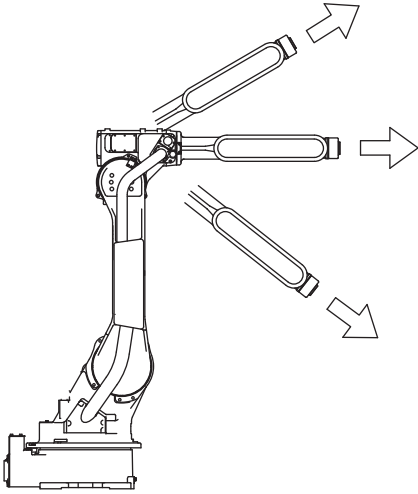
Be sure to remove the cover. If the zeroing operation is performed with the cover on, the sensor may be damaged.



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

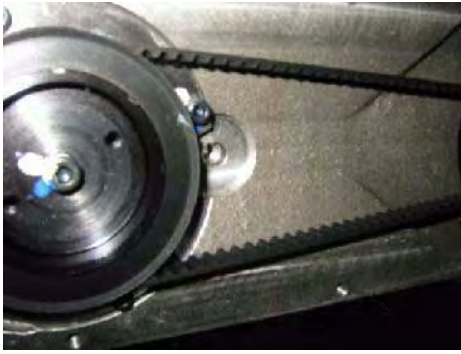
3	In the "TEACH" mode, set the B-axis parallel to the U-arm regardless of the U-arm position/direction as shown in the right figure.	
---	------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------



Apart from the other axes, the alignment marks are not used for the B-axis zeroing operation.
Be sure to set the B-axis parallel to the U-arm, then perform the zeroing operation.



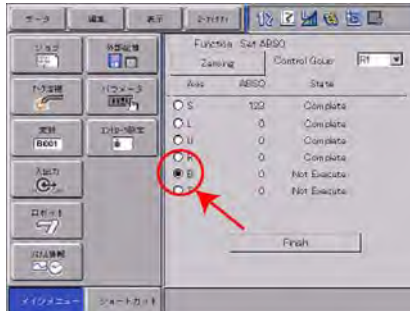
Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe place.
Injury may result from unintentional or unexpected manipulator motion, or operation error.

4	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.
5	Install the sensor onto the mounting holes.	



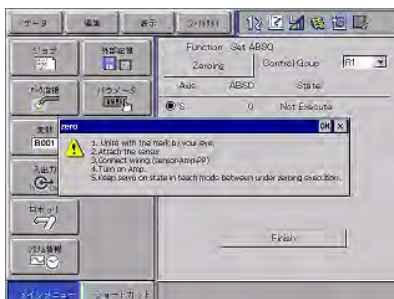
Never use tools, or avoid excessive force on the sensor.
Failure to observe this instruction may result in damage to the sensor.

1.2 Details on Zeroing Function

6	Connect the lead wire to the sensor.	
7	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.
8	Set the mode selector switch on the programming pendant to "TEACH."	
9	Select {Robot} → {Zeroing} from [Main Menu]. Then, select "B: B-axis" on the touch panel.	
10	Turn ON the servo power by the [SERVO ON READY] button and Enable switch on the programming pendant.	

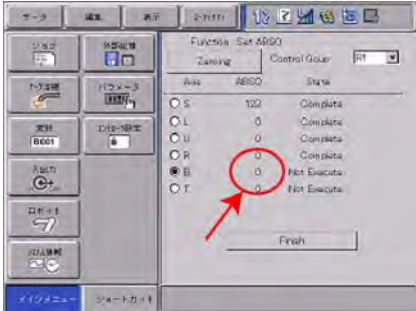


Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe place.
Injury may result from unintentional or unexpected manipulator motion, or operation error.

11	Press {Zeroing} on the touch panel, and pop-up window appears displaying the CAUTION message.	
12	Press [ENTER] 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 that you are 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 get close to the manipulator.

13	The programming pendant screen shows the message to confirm the completion of the zeroing operation, then indicates the calculated absolute data.	
14	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.

15	Turn OFF the amplifier power.	
16	Disconnect the lead wire from the sensor.	
17	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 power is turned ON with the sensor attached to the manipulator, the sensor may be damaged.

18	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.

19	Remove dirt on the sensor if you found any.	
20	<p>Confirm the manipulator position as follows:</p> <p>Select {Robot} from [Main Menu] → {Second Home Position}.</p>	<p>For safety reasons, automatic operations by playback cannot be performed unless the position is confirmed.</p> <p>The Second Home Position window appears by the operation stated in the left column.</p>

1.2 Details on Zeroing Function

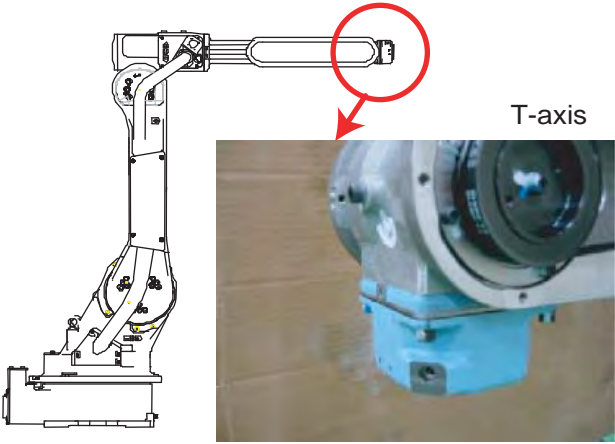
21	Turn ON the servo power by the [SERVO ON READY] button and Enable switch on the programming pendant. Then, press [FWD] to move TCP to the second home position.	Check for any position deviation of the manipulator's second home position.
22	Select {Data} from [Main Menu] → {Confirm Position}.	The message "Home position checked." appears.
23	Confirm the home position with teaching operation before restarting automatic operation by playback.	For the home position confirmation, check for: <ul style="list-style-type: none"> • the manipulator's second home position deviation • any position deviation at each teaching points • 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.

■ Zeroing Procedure for T-Axis

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

	Operation	Explanation
1	Remove the plug and cover from the attaching portion for the sensor.	 <p style="text-align: right;">T-axis</p>



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 you approach 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.	
---	----------------------------------------------------------------------------------------------------------------------------	--

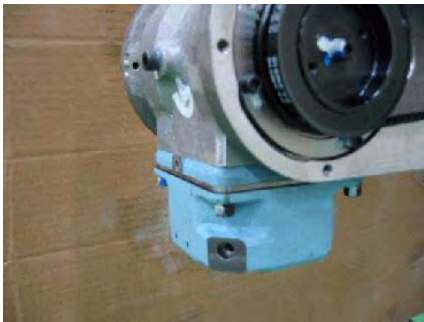


Be sure to adjust the home position alignment marks and perform the zeroing operation.



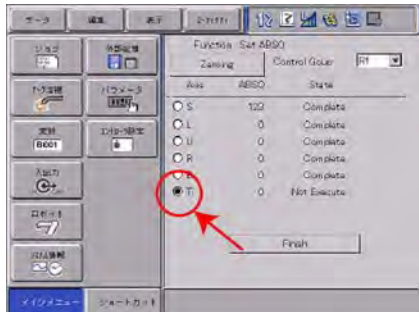
Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe place. Injury may result from unintentional or unexpected manipulator motion, or operation error.

1.2 Details on Zeroing Function

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.	

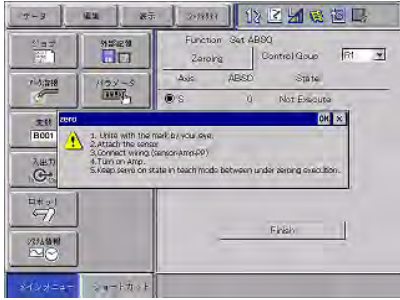


Never use tools, or avoid excessive force on the sensor.
Failure to observe this instruction may result in damage to the sensor.

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.	

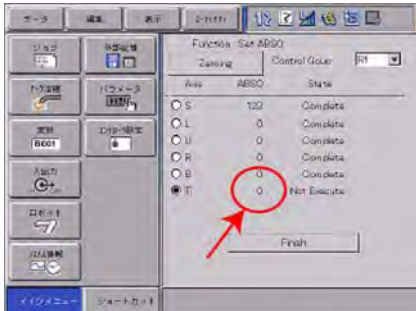


Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe place.
Injury may result from unintentional or unexpected manipulator motion, or operation error.

10	Press {Zeroing} on the touch panel, and pop-up window appears displaying the CAUTION message.	
11	Press [ENTER] 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 that you are 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.	

1.2 Details on Zeroing Function



After the zeroing operation, be sure to remove the sensor from the manipulator before starting the manipulator.
If the manipulator power is turned ON 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 hoes or sensor detecting element.
The zeroing operation cannot be performed if any dirt is attached on them.

18	Remove dirt on the sensor if you found any.	
19	<p>Confirm the manipulator position as follows:</p> <p>Select {Robot} from [Main Menu] → {Second Home Position}.</p>	<p>For safety reasons, automatic operations by playback cannot be performed unless the position is confirmed.</p> <p>The Second Home Position window appears by the operation stated in the left column.</p>
20	<p>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.</p>	<p>Check for any position deviation of the manipulator's second home position.</p>
21	<p>Select {Data} from [Main Menu] → {Confirm Position}.</p>	<p>The message "Home position checked." appears.</p>
22	<p>Confirm the home position with teaching operation before restarting automatic operation by playback.</p>	<p>For the home position confirmation, check for:</p> <ul style="list-style-type: none"> • the manipulator's second home position deviation • any position deviation at each teaching points • 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	<ul style="list-style-type: none"> ① Check if dust or spatter is present on the hole. ✍ Check for damage or cracks on the sensor exterior, or deformation of the sensor end. ✍ 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		

1.3 Errors in the Zeroing Operation and Solutions

Message	Contents	Operation
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. ⚡ 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.
Alarm : Sensor Amp (AD Over)	AD Over Alarm of the amplifier	Contact your nearest YASKAWA representative.
Error [Sensor Amp (Auto Zero:OK)] ErrorCode:55550046	Error in zeroing of the amplifier	Contact your nearest YASKAWA representative.
Error [No CtrlGroup] ErrorCode:55550052	Zeroing was performed with the NX100 which has no manipulator control group.	Perform the zeroing operation by the NX100 with the manipulator control group.
Error [No Axis] ErrorCode: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 ErrorCode: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.

Message	Contents	Operation
Error [RS-232C Communication] ErrorCode:55550017	Errors occur during the amplifier communication	Contact your nearest YASKAWA representative.
Error [RS-232C Communication] ErrorCode:55550018		
Error RS-232C Communication] ErrorCode:55550019		
Error [RS-232C Communication] ErrorCode:55550020		
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.
Finish! (Error Occur)		
Operator Stop	The zeroing operation is terminated with the stop button.	Perform the zeroing operation again from the start.
Finish! (Operator Stop)		
The operator pushed the stop.		
Error [Any axis don't set ABSO.] ErrorCode:55550088	Error in the zeroing processing	Contact your nearest YASKAWA representative.
Loop Error [The maximum moving pulse over.] ErrorCode:55550097	Error in the zeroing processing	Contact your nearest YASKAWA representative.

MOTOMAN-HP20 OPTIONS INSTRUCTIONS

FOR ZEROING FUNCTION

HEAD OFFICE

2-1 Kurosakishiroishi, Yahatanishi-ku, Kitakyushu 806-0004, Japan
Phone +81-93-645-7745 Fax +81-93-645-7746

YASKAWA America Inc. M Robotics Division
100 Automation Way, Miamisburg, OH 45342, U.S.A.
Phone +1-937-847-6200 Fax +1-937-847-6277

YASKAWA Nordic AB
Box 504 Verkstadsgatan 2, PO Box 504 SE-385 25 Torsås, Sweden
Phone +46-480-417-800 Fax +46-486-414-10

YASKAWA Europe GmbH Robotics Div.
Yaskawastrasse 1, 85391 Allershausen, Germany
Phone +49-8166-90-0 Fax +49-8166-90-103

YASKAWA Electric Korea Co., Ltd
9F, KYOBO Securities Bldg., 26-4, Yeoido-Dong Yeounggeungpo-ku, Seoul, Korea
Phone +82-2-784-7844 Fax +82-2-784-8495

YASKAWA Electric (Singapore) PTE Ltd.
151 Lorong Chuan, #04-02A, New Tech Park, Singapore 556741
Phone +65-6282-3003 Fax +65-6289-3003

YASKAWA Electric (Thailand) Co., Ltd.
252/246, 4th Floor. Muang Thai-Phatra Office Tower II Rachadaphisek Road,
Huaykwang Bangkok, 10320, Thailand
Phone +66-2-693-2200 Fax +66-2-693-4200

YASKAWA Shougang Robot Co. Ltd.
1015, Boxuenan Rd. Maluzhen, Jiading District, Shanghai, China
Phone +86-21-5950-3521 Fax +86-20-3878-0651

YASKAWA ELECTRIC CHINA Co., Ltd.
12F Carlton Building, No. 21-42 Huanghe Road, Shanghai 200003, China
Phone +86-21-5385-2200 Fax +86-21-5385-3299

YASKAWA Robotics India Ltd.
#426, Udyog Vihar, Phase- IV, Gurgaon, Haryana, India
Phone +91-124-475-8500 Fax +91-124-475-8542

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