Procedures described in this maintenance manual should be carried out by the person who took the maintenance-relevant trainings offered by Yaskawa.

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

MOTOMAN INSTRUCTIONS

MOTOMAN-EP4000N INSTRUCTIONS
MOTOMAN-EPH4000 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: 166973-1CD
Revision: 1
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1 Introduction

MANDATORY

• This maintenance manual is intended to explain operating instructions and maintenance procedures primarily for the MOTOMAN-EP4000N and EPH4000 Series.

• General items related to safety are listed in Chapter 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 and maintenance 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.
1.1 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 "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.

**NOTE**

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

**DANGER**

- 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.
1 Introduction

- Before maintenance, inspection and wiring, make sure to turn OFF the primary power supply, and put up a warning sign. (ex. DO NOT TURN ON THE POWER)
  Failure to observe this warning may result in electric shock or injury.
- After completing the maintenance inspection, make sure where is the home position before operating the manipulator.
  Failure to observe this warning may cause unexpected manipulator motion, resulting in collision or injury.
- Before operating the manipulator, check that servo power is turned OFF by pressing the emergency stop buttons on the front door of the NX100 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.

\[\text{Emergency Stop Button}\]

- 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.

\[\text{Release of Emergency Stop}\]

- 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 NX100.
  - 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 NX100 and the programming pendant.
1.2 Definition of Terms Used Often in This Manual

The MOTOMAN is the YASKAWA industrial robot product. The MOTOMAN usually consists of the manipulator, the controller, the programming pendant, and manipulator cables. In this manual, the equipment is defined as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>NX100 Controller</td>
<td>NX100</td>
</tr>
<tr>
<td>NX100 Programming Pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between the manipulator and the controller</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>
1.3 Explanation of Warning Labels

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

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

MOTOMAN-EP4000N, EPH4000

WARNING
Moving parts may cause injury

DANGER
Do not enter robot work area.

DANGER
Do not remove the motor and do not release the brake. Failure to observe this caution may result in fatal accident from unexpected turning of the manipulator arm. Please contact your Yaskawa representative.
2 Notes for Maintenance

Remove the old battery pack after connecting the new one so that the encoder absolute data does not disappear. (Refer to Fig. 2-1 "Connection Procedure of Battery Pack for Motor" for battery pack connection.)

- **Battery Pack Connection for Motors**

The connectors for the battery pack connection (crimped contact-pins) are attached to the motors. (BAT and OBT markers are indicated.)

1. Remove the cap attached to the battery backup connectors of the motor.
2. Connect the battery pack HW9470932 with the battery backup connectors: remove the encoder connector and perform the maintenance inspection under this condition.
3. Confirm all connectors are connected properly after the maintenance inspection. Remove the battery pack and remount the cap to battery backup connectors.

**NOTE**

Do not remove the battery pack in the connector base.

![Diagram](image)

*Fig. 2-1 Connection Procedure of Battery Pack for Motor*
3 Home Position Return Operation

### 3.1 How to Return to the Home Position in Case of Replacing the Motor

#### 3.1.1 Using the Robot Calibration (MOTOCALV EG)

The MOTOCALV EG allows the home position reset by teaching the five-point-in-five-posture. Refer to the “MOTOCALV EG Operator’s Manual” (152646-1CD) for details on the operation.

#### 3.1.2 Setting the Teaching Point for Home Position Setting before Replacement

NX100 holds the position data of the job program (hereinafter called the JOB) as the pulse number from the home position of each axis. Therefore, by adjusting the home position precisely, the JOB had been used before the replacement can be used after the replacement without correction.

This section explains how to set the NX100.
Preparation before Replacement

Before replacement, create the standard position (hereinafter called the checkpoint) for home position adjustment after replacement. The checkpoint must satisfy the conditions below. Create the JOB so that safety moving to the checkpoint from the standby position can be ensured. (The JOB created in this manner will be hereinafter called the checked JOB.)

1. The position is not deviated by turning the power ON or OFF, or lowering air pressure. Do not create the position in the working part of the tool (end effector) or the jigs (related unit including the rotary table). It is recommended to use a specific jig if necessary.

2. Use pointed jigs to create the position so that the deviation is easily found. Keep a distance as long as possible from the rotational center of the replacing axis.

3. Considering the moving direction of the replacing axis, create the position at the point where the deviation is easily found and the axis will not interfere with the jigs even if it is deviated.

• The checkpoint cannot be created without operating each axis, which means that the checkpoint cannot be created if the axis cannot operate for some reasons including failure. It is recommended to create the checkpoint for each axis under normal operating conditions.

Next, check the home position of the replacing axis. Move the replacing axis to the 0 pulse position, the home position, on the position screen, and check the position of the home position mark. If it is deviated, adjust it.
Replacement

The manipulator cannot keep the posture since the motor is removed for the replacement. Hold the arm using the chain block, otherwise it is seriously dangerous. Proceed with the replacement with due care.

Remove the motor and replace it.

Home Position Adjustment

After completing the replacing work, move the replaced axis to the position of the home position mark. Perform the home position alignment only for the replaced axis.

(For more detailed information, refer to "NX100 INSTRUCTIONS").

Move the axis to the checkpoint by the Checked JOB. (Care must be taken so that the axis may not interfere with the jigs in moving the axis.) Move only the replaced axis to adjust the deviation from the point created before the work for alignment.

Move the replaced axis to a position where it will not interfere with the jigs when it moves to the home position by stepping back of the Checked JOB. (Care must be taken so that the axis may not interfere with the jigs in moving the axis.) Move the replaced axis to the pulse position equal to the amount of deviation on the position screen.

Perform the home position alignment only for the replaced axis on this position. (For more detailed information, refer to "NX100 INSTRUCTIONS").

Move the axis to the checkpoint by the Checked JOB again. Check if it is in the point created before the work to complete the adjustment. (If it is deviated, repeat the adjustment procedures.)

Perform an operation check by using the JOB program before the replacement. If there is no problem, write down the home position data (ABSO data) and the date in the label attached inside the NX100.
4 L-axis Fixing Jig Operation

4.1 Fixing Jig Operation

In the MOTOMAN-EP4000N, EPH4000 series, the "Link mechanism with the balancer" is adopted. Therefore, releasing the L-axis holding power by removing the L-axis motor or releasing the brake is seriously dangerous since it can cause the L-arm to rotate in different directions from the conventional direction, depending on the edge load, wrist load posture, U-axis posture, or L-axis posture. When releasing the L-axis holding power for L-axis motor replacement, or releasing the brake, be sure to hold the L-arm using the fixing jigs specified in this manual and following the procedures.

After mount this fixing jig, be sure to release the brake and confirm the L-axis is completely fixed.

Set the L-arm in the recommended posture in Fig. 4-3 "EP4000N External View".

CAUTION

* Maintenance and inspection must be performed by specified personnel. Failure to observe this warning may result in electric shock or injury.

* Avoid using the fixing jigs at the angles below. The manipulator axis may move when the brake is released.

EP4000N, EPH4000... -63° to -33° (-143599 to -75218 pulse)

Fig. 4-2 L-arm Posture Range to be Avoided
In this case, the tip of the flange may move by several hundred mm. If there are interfering objects around, move the rotation axis or other axes to perform the above in the posture without interference.

This section explains the procedures for fixing the L-arm in the posture shown in Fig. 4-3 "EP4000N External View".

### 4.1.1 Installation Posture and Position of the Specific Jig

Set the robot posture as shown in Fig. 4-3 "EP4000N External View". L-axis: -115° (-262125 pulse)

At this time, care must be taken so that the arm including the workpiece and hand may not interfere with the peripheral devices and the main body of the manipulator. Install the specific fixing jigs in the section B (the rear of the balancer) as shown in Fig. 4-3 "EP4000N External View".

---

**CAUTION**

- If fix the axis at the above range under necessity such as the motor cannot be driven, turn the brake ON and OFF by inches to move the arm gradually when release the brake. Repeat this until the arm no longer moves.
4.2 Installation

- Refer to Table 4-1 "List of L-axis Fixing Jig" and Fig.4-4 "Detailed Drawing of Specific Jig Installation".

1. Remove the rubber cap and three (3) hexagon socket head cap screws M8 (length: 16 mm) installed on the rear of the balancer.

2. Insert the M36 (pitch: 2 mm) screw side of the stud into the hole at the rear of the balancer, and screw it into the rod M36 (pitch: 2 mm), which is a component part of the balancer. (Note that two types of screws are attached to the stud: M55 (pitch: 2 mm) and M36 (pitch: 2 mm).) In this process, be sure to screw it tightly so that there is no "looseness" between the stud and the rod.

3. Screw the nut into the stud until it touches the rear of the balancer. Make sure to screw it tightly so that there is no "looseness" between the edge of the nut and the contact surface on the rear of the balancer.

4. Install the shaft HW9405579-1 with three hexagon socket head cap screws M8 (length: 45 mm).

5. Tighten the three hexagon socket head cap screws M8 (length: 45 mm) equally with the tightening torque (20.0N·m)

**NOTE**

- Avoid using the same hexagon socket head cap screws M8 (length: 45 mm) and spring washers 2H-8 repeatedly. Replace them with new ones.

- Use a bolt with tensile strength of 1200 N/mm² or more for the hexagon socket head cap screws M8 (length: 45mm).
6. Release the L-axis brake to confirm that the L-axis is firmly fixed. 
(Prepare for the shock at the time of arm motion by releasing the brake by inches.)

<table>
<thead>
<tr>
<th>Name and Product Number</th>
<th>Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plate: HW9402997-1</td>
<td>1</td>
</tr>
<tr>
<td>Plate: HW9402998-1</td>
<td>1</td>
</tr>
<tr>
<td>Shaft: HW9405579-1</td>
<td>1</td>
</tr>
<tr>
<td>Full threaded screw: ANE12-300 (Manufacturer: MISUMI.corp)</td>
<td>2</td>
</tr>
<tr>
<td>Hexagon socket head cap screw M8 (length: 16 mm) Spring washer 2H-8</td>
<td>3 each</td>
</tr>
<tr>
<td>Hexagon socket head cap screw M8 (length: 45 mm) Spring washer 2H-8</td>
<td>3 each</td>
</tr>
<tr>
<td>Hexagon nut M12</td>
<td>2x2</td>
</tr>
<tr>
<td>Stud: HW0400632-1</td>
<td>1</td>
</tr>
<tr>
<td>Nut: HW9405581-1</td>
<td>1</td>
</tr>
</tbody>
</table>

![Diagram of Jig Installation](image)

**Before Installing the Jigs**

**After Installing the Jigs**

Fig. 4-4  Detailed Drawing of Specific Jig Installation
4.3 Removal

- Refer to Fig.4-5 “Detailed Drawing of Specific Jig Removal”.

For removal procedures, check that the spring force to hold the L-axis has been restored first, and then perform the installing procedures in the reversed order. The removal may be impossible depending on postures of the manipulator, due to the engagement of the stud and the rod. In this case, install the plates HW9402997-1 and HW9402998-1, insert the full threaded screw with double nut M12 into the edge of the plate, then screw in the full threaded screws pressing the plate of the rear of the balancer, so that the nut can be moved by hand before starting removal work, as shown in Fig.4-5 “Detailed Drawing of Specific Jig Removal”.

1. Remove the shaft HW9405579-1 and nut HW9405581-1, which are installed on the stud. If the nut is too tight to remove, install the plate HW9402998-1 to the case and install the plate HW9402997-1 to the stud HW0400632-1. Tighten the full threaded screw ANE12-300 until the nut loosens.
2. Remove the stud from the rear of the balancer.
3. Remove the plates HW9402997-1 and HW9402998-1 which are installed on the stud and on the case, and full threaded screw ANE12-300.
4.4 Mechanism

- Refer to Fig. 4-6 "The L-Arm Rotating Direction".

The L-arm rotating direction depends on the extent of the torque \( T_b \) generated by the balancer, and the load torque \( T_L \) generated around the L-axis. The torque \( T_b \) generated by the balancer is always generated toward the directions where the L-arm leans forward 40° from the posture vertical against the ground, and its extent varies depending on the L-axis angle. The load torque \( T_L \) generated around the L-axis works around the center of the L-axis rotation, and its direction and extent vary depending on the edge load, postures of the wrist, the U-arm, and the L-arm.

When no load is applied to the edge, for the L-arm rotating direction, 3 patterns are assumed as described in the Fig. 4-6 "The L-Arm Rotating Direction".

It is quite difficult to accurately compare the extent of the torque works around the L-axis and the extent of the torque generated by the balancer on the actual work site. Although the loaded torque direction generated around the L-axis could be identified in the conventional series, the rotational direction cannot be identified in this unit; therefore, handling this unit in the same way as the conventional series is seriously dangerous, as the L-arm may rotate in a direction that the operator does not expect.

Fig. 4-6 The L-Arm Rotating Direction
5 Disassembly/Reassembly of Motors

5.1 Disassembly/Reassembly of the S-axis Motor

- Refer to Fig.5-7 "Disassembly/Reassembly of S-Axis Motor".

**Disassembly**

1. Turn OFF the power supply of the NX100.
2. Connect the backup battery. Refer to Chapter 2 "Notes for Maintenance" in this manual.
3. Remove the MS connector (encoder, power) connected to the S-axis motor ①.
4. Remove the hexagon socket head cap screws ②, and remove the S-axis motor ① from the gear case ⑤ by using the tapped hole M6 on the motor-flange face.
5. Remove the hexagon socket head cap screw ⑥. Remove the shaft ③, key ④ and flywheel ⑦.

**Reassembly**

1. Mount the key ④ to the S-axis motor ①. (The key ④ comes with the S-axis motor ①.)
2. Apply sealing bond (ThreeBond 1206C) to the contact surface of the flywheel ⑦, and the S-axis motor ① and flywheel ⑦.
3. Apply sealing bond (ThreeBond 1206C) to the contact surface of the flywheel ⑦ and the shaft ③. Mount the flywheel ⑦ and the shaft ③.
4. Tighten the hexagon socket head cap screw ⑥ (Loctite 242 applied on the thread part) with the tightening torque shown in Table 5-2 "Parts Checklist".
5. Apply sealing bond (ThreeBond 1206C) to the contact surface of the S-axis motor ① and the gear case ⑤. Mount the S-axis motor ① to the gear case ⑤.
6. Tighten the hexagon socket head cap screws ② with the tightening torque shown in Table 5-2 "Parts Checklist".
7. Connect the internal wiring harness MS connectors (encoder, power) to the S-axis motor ①.
8. Replenish grease (Molywhite RE No.00) from the grease inlet.
9. Remove the backup battery.
10. Turn ON the power supply to the NX100.
### Table 5-2  Parts Checklist

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Qty</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>S-axis motor HW0385741-A</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Hexagon socket head cap screw M12 (length: 40 mm) Spring washer 2H-12</td>
<td>4 each</td>
<td>Tightening torque: 84.0 N·m</td>
</tr>
<tr>
<td>3</td>
<td>Shaft HW0308653-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Key</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Gear case HW0100319-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Hexagon socket head cap screw M12 (length: 70 mm) Spring washer 2H-12</td>
<td>1 each</td>
<td>Tightening torque: 142 N·m</td>
</tr>
<tr>
<td>7</td>
<td>Flywheel HW0403005-1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 5-7  Disassembly/Reassembly of S-Axis Motor
Disassembly/Reassembly of the L-axis Motor

- Refer to Fig. 5-8 "Disassembly/Reassembly of L-Axis Motor".

DANGER

- Execute disassembly and reassembly of the L-axis motor after mounting the L-axis fixing jig on the balancer. Also, be sure to confirm that the L-axis is firmly fixed by releasing the L-axis motor brake.

Failure to observe this leads unexpected L-arm rotation at the moment when the L-axis motor is removed and it may result in damage to machinery or death or serious injury.

- Refer to Chapter 4 "L-axis Fixing Jig Operation" in this manual on how to fix the balancer.

Disassembly

1. Turn OFF the power supply to the NX100, fix the balancer, and drain the grease.
2. Connect the backup battery. (Refer to Chapter 2 "Notes for Maintenance" in this manual.)
3. Remove the MS connectors (encoder, power) connected to the L-axis motor.
4. Remove the hexagon socket head cap screws, and then, remove the L-axis motor from the motor base by using the tapped hole M6 on the L-axis motor-flange face. Be careful not to damage the oil seal in the M-base to remove the L-axis motor.
5. Remove the screw and then, remove the shaft, the key, the gear, the shaft, and the collar.

Reassembly

1. Apply sealing bond (ThreeBond 1206C) to the contact surface of the L-axis motor and the collar. Mount the collar to the L-axis motor.
2. Mount the key on the L-axis motor. (The key comes with the L-axis motor.)
3. Apply sealing bond (ThreeBond 1206C) to the contact surface of shaft and the collar, and mount the shaft and on the L-axis motor.
4. Tighten the screw (Loctite 242 applied on the thread part) to which the gear and the retaining ring are attached with the tightening torque shown in "Table 5-3 Parts Checklist".
5. Apply sealing bond (ThreeBond 1206C) to the contact surface of the L-axis motor and the M-base. Install the L-axis motor to the M-base. At this time, be careful not to damage the oil seal inside the M-base.
6. Tighten the hexagon socket head cap screws with the tightening torque shown in Table 5-3 "Parts Checklist" on page 5-4.
7. Connect the internal wiring harness MS connectors (encoder, power) to the L-axis motor ①.
8. Remove the backup battery.
9. Replenish grease (Molywhite RE No.00) from the grease inlet.
10. Remove the L-axis fixing jigs.
11. Turn ON the power supply to the NX100.

Table 5-3 Parts Checklist

<table>
<thead>
<tr>
<th>No</th>
<th>Name</th>
<th>Qty</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>①</td>
<td>L-axis motor HW0385742-A</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>②</td>
<td>Hexagon socket head cap screw M12 (length: 40 mm) &lt;br&gt; Spring washer 2H-12</td>
<td>4 each</td>
<td>Tightening torque: 84.0 N·m</td>
</tr>
<tr>
<td>③</td>
<td>Shaft HW9481716-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>④</td>
<td>Key</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑤</td>
<td>Gear HW0302975-1</td>
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<td></td>
</tr>
<tr>
<td>⑥</td>
<td>Shaft HW0402974-1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑦</td>
<td>Screw HW9482386-A &lt;br&gt; Washer HW0408806-4</td>
<td>1 each</td>
<td>Tightening torque: 84.0 N·m</td>
</tr>
<tr>
<td>⑧</td>
<td>Retaining ring STW-14</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>⑨</td>
<td>Collar HW9404323-1</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 5-8 Disassembly/Reassembly of L-Axis Motor
5.3 Disassembly/Reassembly of the U-axis Motor

- Refer to Fig.5-9 "Disassembly/Reassembly of U-Axis Motor".

**Disassembly**

1. Turn OFF the power supply to the NX100, and drain the grease.
2. Connect the backup battery. (Refer to Chapter 2 "Notes for Maintenance" in this manual.)
3. Remove the MS connectors (encoder, power) connected to the U-axis motor.
4. Before removing the U-axis motor, hold the U-arm with chain block, etc. so that the U-arm will not rotate.
5. Remove the hexagon socket head cap screws, and then, remove the U-axis motor from the M-base by using the tapped hole M6 on the motor-flange face. Be careful not to damage the oil seal in the M-base.
6. Remove the screw and then, remove the shaft, the key, the gear, the shaft and the collar.

**Reassembly**

1. Apply sealing bond (ThreeBond 1206C) to the contact surface of the U-axis motor and the collar, then mount the collar on the U-axis the motor.
2. Mount the key on the U-axis motor. (The key comes with the U-axis motor.)
3. Apply sealing bond (ThreeBond 1206C) to the contact surface of the collar and the shaft. Mount the shaft and the shaft to the U-axis motor.
4. Tighten the screw (Loctite 242 applied on the thread part) to which the gear and the retaining ring are attached with the tightening torque shown in Table 5-2 "Parts Checklist".
5. Apply sealing bond (ThreeBond 1206C) to the contact surface of the U-axis motor and the M-base. Install the U-axis motor to the M-base. At this time, be careful not to damage the oil seal inside the M-base.
6. Tighten the hexagon socket head cap screws with the tightening torque shown in Table 5-2 "Parts Checklist".
7. Connect the internal wiring harness MS connectors (encoder, power) to the U-axis motor.
8. Remove the backup battery.
9. Replenish grease (Molywhite RE No.00) from the grease inlet.
10. Turn ON the power supply to the NX100.
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Fig. 5-9  Disassembly/Reassembly of U-Axis Motor
5.4 Disassembly/Reassembly of the R-, B-, and T-axis Motors

- Refer to Fig.5-10 "Disassembly/Reassembly of R-, B-, and T-Axis Motors".

**NOTE**

- Put the U-arm downwards as much as possible in disassembly/reassembly of the R-, B-, and T-axis. A large quantity of grease will be discharged if the motors are removed with the U-arm facing upward, disturbing smooth operations.
- Fix the wrist part with base before removing the R-, B-, and T-axis motors, otherwise it may rotate unexpectedly upon the removal of the R-, B-, and T-axis motors.

### Disassembly

1. Turn OFF the power supply to the NX100.
2. Remove the connector of the R-, B-, and T-axis motor.
3. Remove the hexagon socket head cap screws, and then, remove the flange from the M-base by using the tapped hole M5 on the flange.
4. **For R-axis:**
   - Remove the hexagon socket head cap screw.
   - Remove the key, gear unit (gear, retaining ring, bearing, and flange), and the plate from the motor.
   - (Do not remove the retaining ring and bearing.)

   **For B-axis:**
   - Remove the hexagon socket head cap screw.
   - Remove the key, gear, plate, and the flange from the motor.

   **For T-axis:**
   - Remove the hexagon socket head cap screw.
   - Remove the key, gear, plate, and the flange from the motor.

### Reassembly

2. Apply sealing bond (ThreeBond 1206C) on the contact surfaces of both sides of the plate, then mount it on the R-, B-, and T-axis motor. For the plate, attach it to the root of the motor axis with its bigger side internal chamfer faced.
3. **For R-axis:**
   - Mount the gear unit (gear, retaining ring, bearing, and flange) on the motor, then tighten the hexagon socket head cap screw (Loctite 242 applied on the thread part) with the tightening torque shown in Table 5-2 "Parts Checklist".

   **For B-axis:**
   - Mount the flange and the gear on the motor, then tighten the hexagon socket head cap screw (Loctite 242 applied on the thread part) with the tightening torque shown in Table 5-2 "Parts Checklist".

   **For T-axis:**
   - Mount the flange and the gear on the motor, then tighten the hexagon socket head cap screw (Loctite 242 applied on the thread part) with the tightening torque shown in Table 5-2 "Parts Checklist".

5. Apply sealing bond (ThreeBond 1206C) on the hexagon socket head cap screws, then tighten them with the tightening torque shown in Table 5-2 "Parts Checklist".
6. Connect the internal wiring harness to R-, B-, and T-axis motor.
7. Replenish grease (Molywhite RE No.00) from the grease inlet.
8. Turn ON the power supply to the NX100.

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Fig. 5-10  Disassembly/Reassembly of R-, B-, and T-Axis Motors