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

MOTOMAN INSTRUCTIONS

MOTOMAN-EP4000N 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.
This instruction manual explains operating instructions and maintenance procedures primarily for the MOTOMAN-EP4000N.

General items related to safety are listed in Section 1: Safety of the NX100 Instructions. To ensure correct and safe operation, carefully read the NX100 instructions before reading this manual.

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.

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

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.

Observe the following precautions when performing teaching operations within the working 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 manipulator's work envelope and that you are in a safe location before:
- Turning on the NX100 power
- Moving the manipulator with the programming pendant
- Running check operations
- Performing automatic operations

Injury may result if anyone enters the working envelope of the manipulator during operation. Always press an emergency stop button immediately if there are problems. The emergency stop button is 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 manipulator’s work area, 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 manipulator cables.
In this manual, the equipment is designated as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>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>
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.

Warning Label A

WARNING
Moving parts may cause injury

Do not enter robot work area.

Warning Label B

WARNING

Nameplate

MOTOMAN

TYPE
PAYLOAD kg
ORDER NO.
SERIAL NO.

YASKAWA ELECTRIC CORPORATION JAPAN
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   1.2  Order Number Confirmation .............................. 1-2

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   ■ Grease Replenishment (Refer to "Fig. 23  L-Axis Speed Reducer Diagram"). ......................... 9-10
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10 Recommended Spare Parts
1. Product Confirmation

1.1 Contents Confirmation

Confirm the contents of the delivery when the product arrives.
Standard delivery includes the following four items (Information for the content of optional goods is given separately):
• Manipulator
• NX100
• Programming pendant
• Manipulator cables (six cables, between manipulator and NX100)

**CAUTION**

- Confirm that the manipulator and the NX100 have the same order number. Special care must be taken when more than one manipulator is to be installed.

If the numbers do not match, manipulators may not perform as expected and cause injury or damage.

**NOTE**

Connectors for manipulator cables are located on different positions depending on manipulator types.
1.2 Order Number Confirmation

Check that the order number of the manipulator corresponds to the NX100. The order number is located on a label as shown below.

THE MANIPULATOR AND THE CONTROLLER SHOULD HAVE SAME ORDER NUMBER.

ORDER NO. □□□□□

Check that the manipulator and the NX100 have the same order number.

(a) NX100 (Front View)  (b) Manipulator (Top View)

Fig. 1 Location of Order Number Labels
2 Transporting

2.1 Transporting Method

CAUTION

• Sling applications and crane or forklift operations must be performed by authorized personnel only.

Failure to observe this caution may result in injury or damage.

• Avoid excessive vibration or shock during transporting.

Failure to observe this caution may adversely affect the performance as the system consists of precision components.

2.1.1 Using a Crane

As a rule, when removing the manipulator from the package and moving it, a crane should be used. The manipulator should be lifted using wire ropes threaded through shipping bolts and brackets. Be sure the manipulator is fixed with the shipping bolts and brackets before transportation, and lift it in the posture as shown in "Fig. 2 Transporting Position".

NOTE

• Check that the eyebolts are securely fastened.
• The weight of the manipulator is approximately 3200 kg including the shipping bolts and brackets. Use a wire rope strong enough to withstand the weight.
• Attached eyebolts are designed to support the manipulator weight. Do not use them for anything other than transporting the manipulator.
• Mount the shipping bolts and brackets in transporting the manipulator.
• Avoid exerting force on the arm or motor unit during transportation: use caution when using transporting equipment other than a crane or forklift to avoid injury.
2.1 Transporting Method

Fig. 2 Transporting Position
2.2 Shipping Bolts and Brackets

The manipulator is equipped with shipping bolts and brackets at points A, B and C ("Fig. 2 Transporting Position").

- The shipping bolts and brackets are painted yellow.

<table>
<thead>
<tr>
<th>Position</th>
<th>Bolt Type</th>
<th>Pcs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Hexagon socket head cap screw: M12 (length: 30 mm) (Tensile strength: 1200 N/mm² or more)</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>Hexagon nut: M12</td>
<td>2</td>
</tr>
<tr>
<td>C</td>
<td>Hexagon nut: M12</td>
<td>2</td>
</tr>
</tbody>
</table>

NOTE

Before turning ON the power, check to be sure that the shipping bolts and brackets have been removed. The shipping bolts and brackets then must be stored for future use, in the event that the robot must be moved again.
3 Installation

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
</table>
| • Install the safeguarding.  
  Failure to observe this warning may result in injury or damage. |
| • Install the manipulator in a location where the manipulator's tool or the workpiece held by the manipulator will not reach the wall, safeguarding, or NX100 when the arm is fully extended.  
  Failure to observe this warning may result in injury or damage. |
| • Do not start the manipulator or even turn on the power before it is firmly anchored.  
  The manipulator may overturn and cause injury or damage. |

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
</table>
| • Do not install or operate the manipulator which is damaged or lacks parts.  
  Failure to observe this caution may cause injury or damage. |
| • Before turning on the power, check to be sure that the shipping bolts and brackets explained in "2.2 Shipping Bolts and Brackets" are removed.  
  Failure to observe this caution may result in damage to the driving parts. |
3.1 Safeguarding Installation

To insure safety, be sure to install safeguarding. They prevent unforeseen accidents with personnel and damage to equipment. The following term is quoted for your information and guidance.

Responsibility for Safeguarding [ISO 10218]
The user of a manipulator or robot system shall ensure that safeguards are provided and used in accordance with Sections 6, 7, and 8 of this standard. The means and degree of safeguarding, including any redundancies, shall correspond directly to the type and level of hazard presented by the robot system consistent with the robot application. Safeguarding may include but not be limited to safeguarding devices, barriers, interlock barriers, perimeter guarding, awareness barriers, and awareness signals.

3.2 Mounting Procedures for Manipulator Base

The manipulator should be firmly mounted on a manipulator base mount strong enough to support the robot and withstand repulsion forces during acceleration and deceleration. Construct a solid foundation with the appropriate thickness to withstand maximum repulsion forces of the manipulator, referring to "Table 1 Maximum repulsion forces of the manipulator base mount".

A base mount flatness must be kept at 0.5 mm or less: insufficient flatness of installation surface may deform the manipulator shape and affect its functional abilities.

**NOTE**
Connectors for manipulator cables are located on different positions depending on manipulator types.
Confirm the correct position of the manipulator cable before installing the manipulator.
3.2 Mounting Procedures for Manipulator Base

3.2.1 Manipulator Base Mount

Design and construct the manipulator base mount so that it can bear the torque shown in the table below. The vibration in the manipulator base must be 4.9 m/s² (0.5G) or less when the manipulator is individually operated.

The manipulator base mount has 12 mounting holes. Mount the manipulator base firmly using the hexagon socket head cap screws M24 (tensile strength: 1000 N/mm² or more, recommended length: 90 mm).

<table>
<thead>
<tr>
<th></th>
<th>Maximum torque in horizontal rotation (S-axis moving direction)</th>
<th>88200 N·m or more (9000 kgf·m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maximum torque in vertical rotation (L-, U-axis moving directions)</td>
<td>68600 N·m or more (7000 kgf·m)</td>
</tr>
</tbody>
</table>

Table 1 Maximum repulsion forces of the manipulator base mount

Fig. 3 Installation Base
3.3 Location

When the manipulator is installed, it is necessary to satisfy the following environmental conditions:

- Ambient temperature: 0 to 45°C.
- Humidity: 20 to 80%RH at constant temperature.
- Free from exposure to water, oil, or dust.
- Free from corrosive gas or liquid, or explosive gas.
- Free from large electrical noise (plasma).
- Shock or vibration from the press must be 9.8 m/s² (1.0 G) or less.
- Free from excessive shock or vibration: 4.9 m/s² (0.5G) or less when the manipulator is operated individually (with no vibration from other equipment such as the press). (Excessive vibration affects the mechanism.)
- Flatness for installation: 0.5 mm or less.
4.1 Grounding

Follow local regulations for grounding line size. A line of 8.0 mm² or more is recommended. Refer to "Fig. 4 Grounding Method" to connect the ground line directly to the manipulator.

- Never use this line sharing with other ground lines or grounding electrodes for other electric power, motor power, welding devices, etc.
- Where metal ducts, metallic conduits, or distributing racks are used for cable laying, ground in accordance with Electric Equipment Technical Standards.
4.2 Manipulator Cable Connection

As shown on "Fig. 5 Manipulator Cables", there are six cables for the power supply. Connect these cables to the connectors on the manipulator base and the NX100, referring to "Fig. 5 Manipulator Cables".

4.2.1 Connection to the Manipulator

Before connecting the cables to the manipulator, verify the numbers: there are 1BC, 2BC, 3BC, 4BC, 5BC, and 6BC on both manipulator cables and the manipulator base connectors. When connecting the cables, adjust the cable connector positions to the main key positions of the manipulator, and insert the cables in the order of 2BC, 3BC, 4BC, 5BC, 6BC, and 1BC, then set each lever downward until it clicks.

4.2.2 Connection to the NX100

Before connecting the cables to the NX100, verify the numbers: there are X11, X21, X22, X23, X24, and X25 on both manipulator cables and the connectors on the NX100. When connecting the cables, adjust the cable connector positions to the main key positions of the NX100, and insert the cables in the order of X21, X22, X23, X24, X25, and X11, then set each lever downward until it clicks.

**CAUTION**

- Do not cover the cable with heat insulating material, and avoid multiple cabling when laying manipulator cables from the manipulator to the NX100.

Failure to observe this caution may result in burn caused by cable heat emission failure.
4.2 Manipulator Cable Connection

Fig. 5 Manipulator Cables
4.2 Manipulator Cable Connection

Fig. 6 (a) Manipulator Cable Connectors (Manipulator Side)
Fig. 6 (b) Manipulator Cable Connectors (NX100 Side)
# 5 Basic Specifications

## 5.1 Basic Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>MOTOMAN-EP4000N-<em>0</em></th>
<th>MOTOMAN-EP4000N-<em>1</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Vertically Articulated</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of Freedom</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Payload</td>
<td>200 kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability&lt;sup&gt;2&lt;/sup&gt;</td>
<td>±0.5 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motion Range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-Axis (turning)</td>
<td>-150° to +150°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-Axis (lower arm)</td>
<td>-122° to +25°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U-Axis (upper arm)</td>
<td>-70° to +53°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-Axis (wrist roll)</td>
<td>-360° to +360°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-Axis (wrist pitch/yaw)</td>
<td>-115° to +115°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-Axis (wrist twist)</td>
<td>-360° to +360°</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maximum Speed</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-Axis</td>
<td>1.57 rad/s, 90°/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L-Axis</td>
<td>1.57 rad/s, 90°/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>U-Axis</td>
<td>1.57 rad/s, 90°/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R-Axis</td>
<td>1.40 rad/s, 80°/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B-Axis</td>
<td>1.40 rad/s, 80°/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>T-Axis</td>
<td>2.79 rad/s, 160°/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mass</td>
<td>3200 kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient Conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>0 to +45°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humidity</td>
<td>20 to 80% RH (non-condensing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration</td>
<td>9.8 m/s² (1.0 G) or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>Free from corrosive gasses or liquids, or explosive gasses.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Free from exposure to water, oil, or dust.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Free from excessive electrical noise (plasma).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power Requirements</td>
<td>22.5 kVA</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>*1</sup> SI units are used in this table. However, gravitational unit is used in ( ).

<sup>*2</sup> Conformed to ISO9283.
5.2 Part Names and Working Axes

Fig. 7 Part Names and Working Axes

5.3 Manipulator Base Dimensions

Fig. 8 Baseplate Dimensions (mm)
5.4 Dimensions and P-point Maximum Envelope

Fig. 9 Dimensions and P-Point Maximum Envelope

Units: mm

View A

View B

Fig. 9 Dimensions and P-Point Maximum Envelope
5.5 B-Axis Operating Range

The B-axis operates keeping the constant angle to the center of U-arm as shown in "Fig. 10 B-Axis Operating Range".

Fig. 10 B-Axis Operating Range

5.6 Alterable Operating Range

The operating range of the S-axis can be altered according to the operating conditions as shown in "Table 3  S-Axis Operating Range". If alteration is necessary, contact your Yaskawa representative in advance.

Table 3 S-Axis Operating Range

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Axis Operating Range</td>
<td>-150° to +150° (standard)</td>
</tr>
<tr>
<td></td>
<td>-120° to +120°</td>
</tr>
<tr>
<td></td>
<td>-90° to +90°</td>
</tr>
<tr>
<td></td>
<td>-60° to +60°</td>
</tr>
<tr>
<td></td>
<td>-30° to +30°</td>
</tr>
</tbody>
</table>
6 Allowable Load for Wrist Axis and Wrist Flange

6.1 Allowable Wrist Load

The maximum pay load of the wrist axis is 200 kg. However, because there are limits on the moment and the moment of inertia as shown in "Fig. 4 Allowable Inertia and Moment of Inertia", it is necessary for these conditions to be satisfied.

Also, note that in the case where the load is not a mass but rather a force, it is necessary to study how to prevent the values in Table 4 from being exceeded.

| Table 4  Allowable Inertia and Moment of Inertia |
|----------------|------------------|
|               | Moment N•m    | GD²/4 Overall moment of inertia of load kg•m² |
| R-axis        | 2205           | 430                                           |
| B-axis        | 2205           | 430                                           |
| T-axis        | 0              | 400                                           |
6.2 Wrist Flange

It is recommended that the attachment be mounted inside the fitting to identify the alignment marks. Fitting depth of inside and outside fittings must be 8 mm or less.

![Wrist Flange Diagram](image)

**Fig. 11 Wrist Flange**

**NOTE**
Wash off anti-corrosive paint (yellow) on the wrist flange surface with thinner or light oil before mounting the tools.
7 System Application

7.1 Peripheral Equipment Mounts

The peripheral equipment mounts and tapped holes are provided on the upper arm of the manipulator as shown in "Fig. 12 Tapped Holes for Peripheral Equipment Mounts", for easier installation of the user's system applications. Make efficient use of these mounts following the conditions in "Table 5 Condition for Attachment".

![Fig. 12 Tapped Holes for Peripheral Equipment Mounts](image)

<table>
<thead>
<tr>
<th>Application</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Cabling</td>
</tr>
<tr>
<td></td>
<td>Allowable load mass is 200 kg including</td>
</tr>
<tr>
<td></td>
<td>wrist load.</td>
</tr>
<tr>
<td>B</td>
<td>Cabling</td>
</tr>
<tr>
<td></td>
<td>Valve mounting</td>
</tr>
<tr>
<td></td>
<td>10 kg or less.</td>
</tr>
<tr>
<td></td>
<td>25 N·m (2.5 kgf·m) or less for increased</td>
</tr>
<tr>
<td></td>
<td>moment amount of upper arm</td>
</tr>
</tbody>
</table>

Table 5 Condition for Attachment

Units: mm
7.2 Internal User I/O Wiring Harness and Air Line

34 wires (0.5 mm$^2$) and 2 air lines are used in the manipulator for the drives of the peripheral devices mounted on the upper arm as described in "Fig. 13 Internal User I/O Wiring Harness and Air Line". The connector pins 1 to 34 are assigned as shown in the close-up drawing in Fig. 13. Wiring must be performed by user.

- The allowable current for wires: 6.6 A or less for each wire.
  (The total current value for pins 1 to 34 must be 60 A or less.)

- The maximum pressure for the air lines: 490 kPa (5 kgf/cm$^2$) or less for each line.
  (The inside diameter: 8 mm.)

The same pin number (1-34) of two connectors is connected in the lead line of single 0.5mm$^2$. 

Fig. 13 Internal User I/O Wiring Harness and Air Line
8 Electrical Equipment Specifications

8.1 Locations of Limit Switches

(1) "YR-EP4000N-**0"  
Equipped with an overrun limit switch for the S-axis.  
Refer to "Fig. 14 Locations of Limit Switches" for the location.

(2) "YR-EP4000N-**1"  
Equipped with overrun limit switches for the S- and L-axes, and an interference limit switch for the L- and U-axes.  
Refer to "Fig. 14 Locations of Limit Switches" for the locations.

(3) The L-axis overrun limit switch and the L-U-axis interference limit switch electrically restrict the ranges of each subject axis motion by adjusting the dog position. The mechanical stopper is effective at the P-point maximum envelope, and its position cannot be changed.

(4) The power supply to the manipulator will be cut off once the limit switch is activated, resulting in an emergency stop of the manipulator.  
Refer to “8.9 Overrun / Tool Shock Sensor Releasing” in “NX100 INSTRUCTIONS” to release the manipulator from the overrun status.

(5) The limit switches are set at the P-point maximum envelope before the shipment.

NOTE
In case of re-adjusting the operating range of each subject axis, it is also required to change the dog location and limit values in software. Contact your Yaskawa representative if re-adjustment is required.

(6) Adjustable range of the L-axis overrun limit switch  
As shown in "Fig. 15 L-axis Overrun Limit Switch Adjustable Range", L-axis is adjustable within the range between 26° to the plus (+) direction and 123° to the minus (-) direction. However, the least adjustable range of motion is 16°. The L-axis can be set at any degrees within the above mentioned range as long as it is set at 16° or more.
(7) Adjustable range of the L-U-axis interference limit switch

The limit switch for the L- and U-axis interference is structured to check the interference angle between the L- and U-axes. Set the interference angle between the L- and U-axes within the range from 19° to 161° as shown in "Fig. 16 L-U-axis Interference Limit Switch Adjustable Range".
8.2 Internal Connections

High reliability connectors which can be easily put on and removed are used with each connector part. For the numbers, types, and locations of the connectors, see "Fig. 17 Location and Numbers of Connectors" and "Table 6 List of Connector Types". As to the internal connections between the manipulator and the NX100, see connection diagrams in "Fig. 18 (a)" and "Fig. 18 (b)" on the following pages.

Table 6 List of Connector Types

<table>
<thead>
<tr>
<th>Name</th>
<th>Type of Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector base:</td>
<td>Connector for internal user I/O wiring harness</td>
</tr>
<tr>
<td>U-arm:</td>
<td>Connector for internal user I/O wiring harness</td>
</tr>
</tbody>
</table>

Fig. 17 Location and Numbers of Connectors
POWER CABLE

INTERNAL WIRE

Note:
1. This diagram shows the internal wiring for increasing the torque of the EP400N.
2. As for the LS specification, part (a) is different.

Fig. 18 (a) Internal Connection Diagram
Fig. 18 (b) Internal Connection Diagram
9 Maintenance and Inspection

9.1 Inspection Schedule

Proper inspections are essential not only to assure that the mechanism will be able to function for a long period, but also to prevent malfunctions and assure safe operation. Inspection intervals are classified into six levels as shown in "Table 7 Inspection Items". Conduct periodical inspections according to the inspection schedule in this table. In the table, the inspection items are categorized by three types of operations: operations which can be performed by personnel authorized by the user, operations which can be performed by personnel being trained, and operations which can be performed by service company personnel. Only specified personnel are to do inspection work.

![WARNING]

• Before maintenance or inspection, be sure to turn OFF the main 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.

![CAUTION]

• 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 this caution may result in injury from unexpected turning of the manipulator’s arm.

• The battery pack must be connected before removing encoder connector when maintenance and inspection.

Failure to observe this caution may result in the loss of home position data.
The inspection interval depends on the total servo operation time.

For axes which are used very frequently (in handling applications, etc.), it is recommended that inspections be conducted at shorter intervals. Contact your Yaskawa representative.

The speed reducers for the S-, L-, and U-axes are recommended to be replaced in the secondary inspection (which is to be done in 18000-hour cycle) as a preventive maintenance. The replacement should be made in less than 18000-hour cycle, depending upon the operation pattern.

<table>
<thead>
<tr>
<th>Items*4</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
<td>500H Cycle</td>
<td>3000H Cycle</td>
<td>9000H Cycle</td>
</tr>
<tr>
<td>① Alignment mark</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>② External leads</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>③ Manipulator (whole exterior)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>④ L, U-axis motors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑤ Manipulator base mounting screws</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑥ Cover mounting screws</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑦ S, L, U, R, B, T-axis motor connectors</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑧ Connector base</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑨ Internal wiring harness in S-axis</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑩ Internal wiring harness protective spring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑪ L-axis balancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## 9.1 Inspection Schedule

### Table 7 Inspection Items

<table>
<thead>
<tr>
<th>Items*4</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
<td>500H Cycle</td>
<td>3000H Cycle</td>
<td>9000H Cycle</td>
</tr>
<tr>
<td>Internal wiring harness</td>
<td>O</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limit switch dog (S-axis)</td>
<td>O</td>
<td>O</td>
<td>Driver, Wrench, Multimeter</td>
<td>Check for dirt, damage, looseness. Tighten if necessary. Check the operation.</td>
</tr>
<tr>
<td>Limit switch (L-axis)</td>
<td>O</td>
<td>O</td>
<td>Driver, Wrench, Multimeter</td>
<td>Check for dirt, damage, looseness. Tighten if necessary. Check the operation.</td>
</tr>
<tr>
<td>L, U-axis interference limit switch</td>
<td>O</td>
<td>O</td>
<td>Driver, Wrench, Multimeter</td>
<td>Check for dirt, damage, looseness. Tighten if necessary. Check the operation.</td>
</tr>
<tr>
<td>L, U-axis arm connection parts</td>
<td>O</td>
<td></td>
<td>Visual, Manual</td>
<td>Check for backlash of bearings by moving the L, U-axes back and forth, and up and down. Supply grease.</td>
</tr>
<tr>
<td>Battery pack in manipulator</td>
<td>O</td>
<td></td>
<td>Multimeter</td>
<td>Replace if the result of voltage check is 2.8 V or less.</td>
</tr>
<tr>
<td>S-axis speed reducer</td>
<td>O</td>
<td></td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Exchange grease *3 (9000H cycle). See Par. 9.2.2.</td>
</tr>
<tr>
<td>L, U-axis speed reducers</td>
<td>O</td>
<td></td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Exchange grease *3 (9000H cycle). See Par. 9.2.3 and 9.2.4.</td>
</tr>
<tr>
<td>R, B, T-axis gears</td>
<td>O</td>
<td></td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Exchange grease *3 (9000H cycle). See Par. 9.2.5.</td>
</tr>
<tr>
<td>R-axis speed reducer</td>
<td>O</td>
<td></td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Exchange grease *3 (9000H cycle). See Par. 9.2.6.</td>
</tr>
<tr>
<td>B, T-axis speed reducers, B, T-axis gears</td>
<td>O</td>
<td></td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) 9.2.8. Exchange grease *3 (9000H cycle). See Par. 9.2.7 and 9.2.8.</td>
</tr>
</tbody>
</table>
### Table 7 Inspection Items

<table>
<thead>
<tr>
<th>Items*4</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
<td>500H Cycle</td>
<td>3000H Cycle</td>
<td>9000H Cycle</td>
</tr>
<tr>
<td>L-axis cross roller bearing</td>
<td></td>
<td></td>
<td>O</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
|                                 |          |            |              |            |            | Check for malfunc-
|                                 |          |            |              |            |            | tion. (Replace if nec-
|                                 |          |            |              |            |            | essary.) Replenish grease*3
|                                 |          |            |              |            |            | (3000H cycle). See |
|                                 |          |            |              |            |            | Par. 9.2.9.     |          |                |
|                                 |          |            |              |            |            |                  |          |                |
| Taped roller bearing in the link part balancer connection part |          |            | O           |            |            | Grease Gun      |          |                |
|                                 |          |            |              |            |            | Check for malfunc-
|                                 |          |            |              |            |            | tion. (Replace if nec-
|                                 |          |            |              |            |            | essary.) Replenish grease*3
|                                 |          |            |              |            |            | (3000H cycle). See |
|                                 |          |            |              |            |            | Par. 9.2.10 and |
|                                 |          |            |              |            |            | 9.2.11.         |          |                |
| Overhaul                        |          |            | O           |            |            |                  |          |                |

*1 When checking for conduction with a multimeter, remove connectors on encoder side for each axis from the motor.

*2 The internal wiring harness is to be replaced at 18000H inspection (at overhaul).

*3 For the grease, refer to "Table 8 Inspection Parts and Grease Used".

*4 Inspection numbers correspond to the numbers in "Fig. 19 Inspection Parts and Inspection Numbers".

### Table 8 Inspection Parts and Grease Used

<table>
<thead>
<tr>
<th>No.</th>
<th>Grease Used</th>
<th>Inspected Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>18, 19, 20,21,22</td>
<td>Molywhite RE No. 00</td>
<td>Speed reducers for all axes B- and T-axis gears</td>
</tr>
<tr>
<td>11, 16, 23</td>
<td>Alvania EP Grease 2</td>
<td>L-axis cross roller bearing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tapered roller bearing in the link part</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L-axis balancer</td>
</tr>
</tbody>
</table>

The numbers in the above table correspond to the numbers in "Table 7 Inspection Items".
Note: The manipulator is in the home position.

Fig. 19 Inspection Parts and Inspection Numbers
9.2 Notes on Maintenance Procedures

9.2.1 Battery Pack Replacement

Two battery packs are installed in the position described in "Fig. 20 Battery Location". If a battery alarm shows up on the NX100, replace the battery according to the following procedure:

Fig. 20 Battery Location

Fig. 21 (a) Battery Connection for S-, L-, U-Axes

a: Crimped contact-pin (pin)
b: Crimped contact-pin (socket)
9.2 Notes on Maintenance Procedures

1. Turn OFF the NX100 main power supply.
2. Remove the plate from the connector base and pull out the battery pack to replace it with a new battery pack.
3. Unscrew the battery pack mounting screws on the battery holder, and remove the battery pack.
4. Remove the electrical tape (insulation tape) protecting the connection part of the battery pack in the manipulator.
5. Connect the new battery pack.
6. Remove the old battery pack.
7. Protect the connection part of the battery pack in the manipulator with electrical tape (insulation tape).
8. Fix the battery pack with screws, and put the connector base back on the manipulator.

NOTE: Remove the old battery pack after connecting the new one so that the encoder absolute data does not disappear.

NOTE: Pay attention not to pinch the cable when the plate is being installed.
9.2.2 Grease Exchange for S-Axis Speed Reducer and Gear

Grease Exchange (Refer to "Fig. 22 S-Axis Speed Reducer and Gear Diagram").

1. Remove the plugs from the injection and discharge ports.

   **NOTE**
   
   If grease is added with the plug on, the grease will go inside the motor and may damage it. Never fail to remove the plug before the grease injection. Do not install a connector, hose, or other part on the discharge port because this may cause trouble such as dropout of the oil seal.

2. Install a grease zerk A-PT1/4 on the injection port. (The grease zerk A-PT1/4 is packed together with the main body before the product is shipped.)

3. Inject the grease into the grease inlet using a grease gun.

   **Grease type**: Molywhite RE No. 00  
   **Amount of grease**: 11700 cc  
   **Grease pump air supply pressure**: 0.3 MPa max  
   **Grease injection quantity**: 8 g/s max

4. The grease exchange is completed when new grease appears in the grease exhaust port. The new grease can be distinguished from the old grease by its color.

5. Before putting the plug back on the grease exhaust port, move the S-axis for a few minutes to discharge the excess grease.
6. Wipe the discharged grease with a cloth and reinstall the plug on the Lo grease exhaust port. Tighten the plug with a tightening torque of 23 N·m (2.34 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)

**NOTE**
If you install the plug while grease is being discharged, the grease will enter the motor, resulting in a breakdown. Be sure to confirm that all of the grease has been discharged before installing the plug.

7. Remove the grease zerk from the injection port, and then install the plug. Tighten the plug with a tightening torque of 23 N·m (2.34 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)
9.2.3 Grease Exchange for L-Axis Speed Reducer

**Fig. 23 L-Axis Speed Reducer Diagram**

- **Grease Exchange** (Refer to "Fig. 23 L-Axis Speed Reducer Diagram").
  1. Make the L-arm posture as shown in “Fig. 23 L-Axis Speed Reducer Diagram”.
  2. Remove the plugs from the injection and discharge ports.

**NOTE** If grease is added with the plug on, the grease will go inside the motor and may damage it. Never fail to remove the plug before the grease injection.

3. Install a grease zerk A-PT1/8 on the injection port. (The grease zerk A-PT1/8 is packed together with the main body before the product is shipped.)
4. Inject the grease into the grease inlet using a grease gun.

- **Grease type**: Molywhite RE No. 00
- **Amount of grease**: 2600 cc
5. The grease exchange is completed when new grease appears in the grease exhaust port. The new grease can be distinguished from the old grease by its color.

6. Before putting the plug back on the grease exhaust port, move the L-axis for a few minutes to discharge the excess grease.

7. Wipe the discharged grease with a cloth and reinstall the plug on the Lo grease exhaust port. Tighten the plug with a tightening torque of 5 N·m (0.51 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)

8. Remove the grease zerk from the injection port, and then install the plug. Tighten the plug with a tightening torque of 5 N·m (0.51 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)

If you install the plug while grease is being discharged, the grease will enter the motor, resulting in a breakdown. Be sure to confirm that all of the grease has been discharged before installing the plug.
9.2.4 Grease Exchange for U-Axis Speed Reducer

- Grease Exchange (Refer to "Fig. 24 U-Axis Speed Reducer Diagram").
  1. Make the L-arm posture as shown in “Fig. 23 U-Axis Speed Reducer Diagram”.
  2. Remove the plugs from the injection and discharge ports.
  3. Install a grease zerk A-PT1/8 on the injection port. (The grease zerk A-PT1/8 is packed together with the main body before the product is shipped.)
  4. Inject the grease into the grease inlet using a grease gun.

**NOTE**
If grease is added with the plug on, the grease will go inside the motor and may damage it. Never fail to remove the plug before the grease injection.

Grease type: Molywhite RE No. 00
Amount of grease: 3490 cc
5. The grease exchange is completed when new grease appears in the grease exhaust port. The new grease can be distinguished from the old grease by its color.

6. Before putting the plug back on the grease exhaust port, move the U-axis for a few minutes to discharge the excess grease.

7. Wipe the discharged grease with a cloth and reinstall the plug on the Lo grease exhaust port. Tighten the plug with a tightening torque of 5 N·m (0.51 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)

   If you install the plug while grease is being discharged, the grease will enter the motor, resulting in a breakdown. Be sure to confirm that all of the grease has been discharged before installing the plug.

8. Remove the grease zerk from the injection port, and then install the plug. Tighten the plug with a tightening torque of 5 N·m (0.51 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)
## 9.2.5 Grease Exchange for R, B-, T-Axis Gears

**Grease Exchange (Refer to "Fig. 25 R-, B-, T-Axis Gear Diagram").**

1. Remove the plugs from the injection and discharge ports.

2. Install a grease zerk A-PT1/8 on the injection port. (The grease zerk A-PT1/8 is packed together with the main body before the product is shipped.)

3. Inject the grease into the grease inlet using a grease gun.

4. Before putting the plug back on the Go grease exhaust port, move the R-, B-, T-axes for a few minutes to discharge the excess grease.

5. Wipe the discharged grease with a cloth and reinstall the plug on the Go grease exhaust port. Tighten the plug with a tightening torque of 5 N·m (0.51 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)

**NOTE:** If grease is injected with the plug on, the grease will go outside the grease box and may cause a damage. Never fail to remove the plug before the grease injection.

**Grease type:** Molywhite RE No. 00  
**Amount of grease:** 5200 cc
9.2.6 Grease Exchange for R-Axis Speed Reducer

1. Remove the plugs from the injection and discharge ports.

   **NOTE**
   
   If grease is injected with the plug on, the grease will go outside the grease box and may cause a damage. Never fail to remove the plug before the grease injection.

2. Install a grease zerk A-PT1/8 on the injection port.(The grease zerk A-PT1/8 is packed together with the main body before the product is shipped.)

3. Inject the grease into the grease inlet using a grease gun.

   *Grease type: Molywhite RE No. 00*
   *Amount of grease: 2330 cc*

4. The grease exchange is completed when new grease appears in the grease exhaust port. The new grease can be distinguished from the old grease by its color.

5. Before putting the plug back on the grease exhaust port, move the R-, B-, T-axes for a few minutes to discharge the excess grease.

6. Wipe the discharged grease with a cloth and reinstall the plug on the Lo grease exhaust port. Tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)

7. Remove the grease zerk from the injection port, and then install the plug. Tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)

Fig. 26 R-Axis Speed Reducer Diagram

---

| 9-15 | HW1480129 51/63 |
9.2.7 Grease Exchange for B-Axis Speed Reducer and Gear

Fig. 27  B-Axis Speed Reducer and Gear Diagram

- Grease Exchange (Refer to "Fig. 27  B-Axis Speed Reducer and Gear Diagram").
  1. Remove the plugs from the injection and discharge ports.

   **NOTE** If grease is injected with the plug on, the grease will go outside the grease box and may cause a damage. Never fail to remove the plug before the grease injection.

  2. Install a grease zerk A-PT1/8 on the injection port. (The grease zerk A-PT1/8 is packed together with the main body before the product is shipped.)

  3. Inject the grease into the grease inlet using a grease gun.

| Grease type: Molywhite RE No. 00 |
| Amount of grease: 1300 cc |

  4. The grease exchange is completed when new grease appears in the grease exhaust port. The new grease can be distinguished from the old grease by its color.

  5. Before putting the plug back on the grease exhaust port, move the R-, B-, T-axes for a few minutes to discharge the excess grease.

  6. Wipe the discharged grease with a cloth and reinstall the plug on the Lo grease exhaust port. Tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)

  7. Remove the grease zerk from the injection port, and then install the plug. Tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)
9.2.8 Grease Exchange for T-Axis Speed Reducer and Gear

Grease Exchange (Refer to "Fig. 28 T-Axis Speed Reducer and Gear Diagram").

1. Remove the plugs from the injection and remove the bolts from the discharge ports.

   **NOTE**
   If grease is injected with the plug on, the grease will go outside the grease box and may cause a damage. Never fail to remove the plug before the grease injection.

2. Install a grease zerk A-PT1/8 on the injection port. (The grease zerk A-PT1/8 is packed together with the main body before the product is shipped.)

3. Inject the grease into the grease inlet using a grease gun.

   **Grease type:** Molywhite RE No. 00  
   **Amount of grease:** approx. 1100 cc

4. The grease exchange is completed when new grease appears in the grease exhaust port. The new grease can be distinguished from the old grease by its color.

5. Before putting the plug back on the grease exhaust port, move the R-, B-, T-axes for a few minutes to discharge the excess grease.

6. Wipe the discharged grease with a cloth and reinstall the plug on the Lo grease exhaust port. Tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)

7. Remove the grease zerk from the injection port, and then install the plug. Tighten the plug with a tightening torque of 4.9 N·m (0.5 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)
9.2.9 Grease Replenishment for U-Axis Cross Roller Bearing

1. Remove the plug from the exhaust port. (Refer to "Fig. 29 U-Axis Cross Roller Bearing Diagram").
2. Install a grease zerk A-PT1/8 on the injection port. (The grease zerk A-PT1/8 is packed together with the main body before the product is shipped.)
3. Inject the grease into the grease inlet using a grease gun.
4. Reinstall the plug on the exhaust port. Tighten the plug with a tightening torque of 5 N·m (0.51 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)
5. Remove the grease zerk from the injection port, and then install the plug. Tighten the plug with a tightening torque of 5 N·m (0.51 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)

**NOTE**
The exhaust port is for AIR exhaust: the grease is not exhausted from the exhaust port. Do not inject excessive grease into the grease inlet.

Grease type: Alvania EP Grease 2
Amount of grease: 64 cc

Fig. 29 U-Axis Cross Roller Bearing Diagram
9.2 Notes on Maintenance Procedures

9.2.10 Grease Replenishment for Tapered Roller Bearing in the Link Part

1. Remove the plugs from the exhaust ports on link parts (6 exhaust ports). (Refer to "Fig. 30 Link Part").
2. Install a grease zerk A-PT1/8 on the injection port. (The grease zerk A-PT1/8 is packed together with the main body before the product is shipped.)
3. Inject the grease into the grease inlet using a grease gun

<table>
<thead>
<tr>
<th>Grease type: Alvania EP Grease 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of grease: 9 cc</td>
</tr>
<tr>
<td>(18 cc for the initial supply)</td>
</tr>
</tbody>
</table>

The exhaust port is for AIR exhaust: the grease is not exhausted from the exhaust port. Do not inject excessive grease into the grease inlet.

4. Reinstall the plug on each exhaust port. Tighten the plug with a tightening torque of 5 N·m (0.51 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)
5. Remove the grease zerk from the injection port, and then install the plug. Tighten the plug with a tightening torque of 5 N·m (0.51 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)
9.2.11 Grease Replenishment for Balancer Link Part

1. Remove the plugs from the Vo exhaust ports on link parts (4 exhaust ports). (Refer to "Fig. 31 Balancer Link Part").
2. Install a grease zerk A-PT1/8 on the injection port. (The grease zerk A-PT1/8 is packed together with the main body before the product is shipped.)
3. Inject the grease into the grease inlet using a grease gun.

**Grease type:** Alvania EP Grease 2  
**Amount of grease:** 10 cc
4. Reinstall the plug on each exhaust port. Tighten the plug with a tightening torque of 5 N·m (0.51 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)
5. Remove the grease zerk from the injection port, and then install the plug. Tighten the plug with a tightening torque of 5 N·m (0.51 kgf·m). (Apply Three Bond 1206C on the thread part of the plug.)
9.2.12 Notes for Maintenance

Connecting the new battery pack before removing the old one so that the encoder absolute data will not disappear.

Before connecting the battery units of the S-, L-, U-, and B-axis motors and the R- and T-axis motors, refer to "Fig. 32 Backup Battery Pack Connection for Motor".

- Motors for S-, L-, U-, B-Axes

The connector for the battery unit connection is attached to the main body of the motor for the SLBU axis.

Refer to the following procedure for connecting the battery unit.

1. Remove a cap attached to the battery backup connector of the motor encoder by removing the cover mounting screws.
2. Connect the SLUB axis battery unit (HW9470917-A) to the battery backup connector on the motor body. (In this condition, disconnect the connector of the motor detector, and then carry out maintenance and inspection.)
3. After carrying out maintenance and inspection, confirm that all of the connectors are connected, and then disconnect the battery unit connecting cable and the battery unit for the motor.
4. Remove the cap provided on the battery backup connector on the motor body.

- Motors for R-, T-Axes

A battery backup connector (insertion pin terminal) is installed on the end of the cable for the RT axis motor detector. (It has BAT and OBT markers.)

Refer to the following procedure for connecting the battery unit.

1. It connects in the connector (marker of BAT and OBT) for the battery backup in the point of the cable for the motor detector and it connects it with battery unit (HW9470917-B) for the RT axes. (In this condition, disconnect the connector of the motor detector, and then carry out maintenance and inspection.)
2. After the maintenance check, confirm all the connectors are connected properly, then remove the battery pack.

NOTE: Do not remove the battery pack in the connector base.
9.2 Notes on Maintenance Procedures

S-, L-, U-, B-Axes Motor

![Diagram of S-, L-, U-, B-Axes Motor]

R-, T-Axes Motor

![Diagram of R-, T-Axes Motor]

CAUTION label Connection status

Fig. 32 Backup Battery Pack Connection for Motor

a: Crimped contact-pin (pin)
b: Crimped contact-pin (socket)
Connect battery to encoder to save the data BEFORE removing connector.

Fig. 33 Battery Pack Connection

Fig. 34 Caution Label
10 Recommended Spare Parts

It is recommended to keep the parts and components in the following table in stock as spare parts for the MOTOMAN-EP4000N. Product performance can not be guaranteed in case of using the spare parts other than the recommended parts listed below.

The spare parts are ranked as follows:
• Rank A: Expendable and frequently replaced parts
• Rank B: Parts for which replacement may be necessary as a result of frequent operation
• Rank C: Drive Unit

To replace parts in Rank B or Rank C, contact your Yaskawa representative.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty</th>
<th>Qty per Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Battery Pack</td>
<td>HW9470932-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td>For S, L, U-axes</td>
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<td>2</td>
<td>Battery Pack</td>
<td>HW9470932-B</td>
<td>Yaskawa Electric Corporation</td>
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<td>1</td>
<td>For R, B, T-axes</td>
</tr>
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<td>Molywhite RE No. 00</td>
<td>Yaskawa Electric Corporation</td>
<td>16kg</td>
<td>-</td>
<td>For all axes’ speed reducers and wrist unit</td>
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<td>A</td>
<td>4</td>
<td>Grease</td>
<td>Alvania EP Grease 2</td>
<td>Showa Shell Sekiyu K.K.</td>
<td>16kg</td>
<td>-</td>
<td>For tapered roller bearings</td>
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<tr>
<td>B</td>
<td>5</td>
<td>S-Axis Speed Reducer</td>
<td>HW0280730-A</td>
<td>Yaskawa Electric Corporation</td>
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<td>B</td>
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<td>Qty</td>
<td>Qty per Unit</td>
<td>Remarks</td>
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