Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.
This instruction manual is intended to explain operating instructions and maintenance procedures primarily for the MOTOMAN-SSF2000S.

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.

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 programing pendant are pressed. When the servo power is turned OFF, the SERVO ON LED on the program- ing 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 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 programing 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 programing pendant.
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 programing pendant, and supply cables.

In this manual, the equipment is designated as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>NX100 Controller</td>
<td>NX100</td>
</tr>
<tr>
<td>NX100 Programing Pendant</td>
<td>Programing 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.

Nameplate:

WARNING label A:

WARNING label B:

WARNING
Moving parts may cause injury

WARNING
Do not enter robot work area.
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   1.2 Order Number Confirmation ............................... 1-2

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   2.2 Shipping Bolts and Brackets .............................. 2-3

3 Installation
   3.1 Installation of the Safeguarding ........................ 3-2
   3.2 Mounting Procedures for Manipulator Base ............. 3-2
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         (Refer to "Fig. 28 U-axis Speed Reducer Diagram "). . . . 9-12
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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
- Programing Pendant
- Manipulator Cable (2 cables, between the Manipulator and the 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.
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.

Fig. 1 Location of Order Number Labels

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

NOTE

- Check that the eyebolts are securely fastened.
- The weight of the manipulator is approximately 126 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 mass. Do not use them for anything other than transporting the manipulator.
- Mount the shipping bolts and brackets for transporting the manipulator.
- Avoid exerting external force on the arm or motor unit when transporting by a crane, forklift, or other equipment, as injury may occur.
2.1 Transporting Method

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 rope threaded through attached eyebolts. Be sure the manipulator is fixed with the shipping bolts and bracket before transporting, and lift it in the posture as shown in "Fig. 2 Transporting Position".

![Fig. 2 Transporting Position](image-url)
2.1.2 Using a Forklift

When using a forklift, the manipulator should be fixed on a pallet with shipping bolts and bracket as shown in "Fig. 3 Using a Forklift". Insert claws under the pallet and lift it. The pallet must be strong enough to support the manipulator. Transporting of the manipulator must be performed slowly in order to avoid overturning or slippage.

2.2 Shipping Bolts and Brackets

The manipulator is provided with a shipping bracket and two hexagon socket head cap screws M6 illustrated at A in "Fig. 2 Transporting Position".

- The shipping bracket and screws are painted yellow.
- The shipping bracket is fixed with the hexagon socket head cap screw M6 (2 screws).

Before turning on the power, make sure that the shipping bolts and bracket are removed. The shipping bolts and bracket then must be stored for future use, in the event that the manipulator must be moved again.
3 Installation

**WARNING**

- **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.

- **When mounting the manipulator on the ceiling or wall, the base section must have sufficient strength and rigidity to support the weight of the manipulator. Also, it is necessary to consider countermeasures to prevent the manipulator from falling.**
  Failure to observe these warnings may result in injury or damage.

**CAUTION**

- **Do not install or operate a manipulator that is damaged or lacks in 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 bracket explained in "Fig. 2 Transporting Position" are removed.**
  Failure to observe this caution may result in damage to the driving parts.
3.1 Installation of the Safeguarding

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

**Responsibility for Safeguarding (ISO10218)**

The user of a manipulator or robot system shall ensure that safeguarding is 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 baseplate or foundation strong enough to support the manipulator and withstand repulsion forces during acceleration and deceleration. Construct a solid foundation with the appropriate thickness to withstand maximum repulsion forces of the manipulator as shown in Table 1 Maximum Repulsion Forces of the Manipulator at Emergency Stop and Table 2 Maximum Torque of Acceleration and Deceleration.

If the mounting face is out of plane, the manipulator may be deformed and its functional ability may be compromised. The flatness for installation must be kept at 0.5 mm or less. Mount the manipulator base as in the following way: 3.2.1 Mounting Example.

<table>
<thead>
<tr>
<th>Table 1 Maximum Repulsion Forces of the Manipulator at Emergency Stop</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal rotating maximum torque</td>
</tr>
<tr>
<td>(S-axis moving direction)</td>
</tr>
<tr>
<td>2000 N•m</td>
</tr>
<tr>
<td>(204 kgf•m)</td>
</tr>
<tr>
<td>Vertical rotating maximum torque</td>
</tr>
<tr>
<td>(LU-axis moving direction)</td>
</tr>
<tr>
<td>3500 N•m</td>
</tr>
<tr>
<td>(357 kgf•m)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2 Maximum Torque of Acceleration and Deceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal maximum torque in acceleration and deceleration</td>
</tr>
<tr>
<td>(S-axis moving direction)</td>
</tr>
<tr>
<td>450 N•m</td>
</tr>
<tr>
<td>(46 kgf•m)</td>
</tr>
<tr>
<td>Vertical maximum torque in acceleration and deceleration</td>
</tr>
<tr>
<td>(LU-axis moving direction)</td>
</tr>
<tr>
<td>1300 N•m</td>
</tr>
<tr>
<td>(132 kgf•m)</td>
</tr>
</tbody>
</table>
### 3.2.1 Mounting Example

Fix the baseplate to the floor. The baseplate should be rugged and durable to prevent shifting of the manipulator or the mounting fixture. The thickness of the baseplate is 40 mm or more, and an M16 size or larger anchor bolt is recommended. The manipulator base is tapped for four mounting holes; fix the manipulator base to the baseplate with the hexagon head bolts M16 (length: 50 mm is recommended). Tighten the hexagon head bolts and anchor bolts securely so that they will not work loose during the operation. See "Fig. 4 Mounting the Manipulator on Baseplate" for the method.

![Diagram of Mounting the Manipulator on Baseplate](image-url)
3.3 Types of Mounting

The manipulator can be mounted in three different ways: floor-mounting (standard), wall-mounting, and ceiling-mounting. For wall- and ceiling-mounted types, the following points are different from the floor-mounted type.

- S-Axis Operating Range
- Fixing the Manipulator Base
- Precautions to Prevent the Manipulator from Falling

3.3.1 S-Axis Operating Range

For the wall-mounted type, the S-axis operating range must be ±30°.

3.3.2 Fixing the Manipulator Base

For the wall- and ceiling-mounted types, be sure to use four hexagon socket head cap screws M16 when fixing the manipulator base. Use a torque of 206 N•m when tightening the screws.

3.3.3 Precautions to Prevent the Manipulator from Falling

For the wall- or ceiling-mounted types, for safety purposes, take appropriate measures to keep the manipulator from falling. Refer to "Fig. 5 Precaution against Falling" for details.

In case of using the wall-mounted or ceiling-mounted type, inform Yaskawa of the matter when placing an order. Be sure to contact your Yaskawa representative (listed on the back cover of this instruction manual) to perform a wall/ceiling installation on site.
3.4 Location

When installing the manipulator, it is necessary to satisfy the undermentioned environmental conditions:

• Ambient Temperature: 0° to +45°C
• Humidity: 20 to 80%RH (non-condensing)
• Free from dust, soot, or water
• Free from corrosive gas or liquid, or explosive gas
• Free from excessive vibration (Vibration acceleration: 4.9 m/s² [0.5G or less])
• Free from large electrical noise (plasma)
• The flatness for installation is 0.5 mm or less
4  Wiring

**WARNING**

- **Ground resistance must be 100 Ω or less.**
  Failure to observe this warning may result in fire or electric shock.

- **Before wiring, make sure to turn the primary power supply OFF, and put up a warning sign. (ex. DO NOT TURN THE POWER ON.)**
  Failure to observe this warning may result in fire or electric shock.

**CAUTION**

- **Wiring must be performed by authorized or certified personnel.**
  Failure to observe this caution may result in fire or electric shock.
4.1 Grounding

Follow the local regulations and electrical installation standards for grounding line size. The recommended grounding wire size is 5.5 mm² or more. Refer to "Fig. 6 Gounding Method" to connect the ground line directly to the manipulator.

- Do not use this line in common 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.

Fig. 6 Gounding Method
4.2 Cable Connection

Two manipulator cables are delivered with the manipulator; an encoder cable (1BC) and a power cable (2BC). Connect these cables to connectors on the manipulator connector base and connectors on the NX100. Refer to "Fig. 8 (a) Manipulator Cable Connectors (Manipulator Side)" and "Fig. 8 (b) Manipulator Cable Connections to the NX100".

4.2.1 Connection to the Manipulator

Before connecting the manipulator cables to the manipulator, verify the numbers on both manipulator cables and connectors on the manipulator connector base. Insert cables in the order of 2BC and 1BC, then set the lever low until it clicks.

4.2.2 Connection to the NX100

Before connecting the manipulator cables to the NX100, verify the numbers on both manipulator cables and connectors on the NX100. Insert cables in the order of 2BC and 1BC, then set the lever low until it clicks.
4.2 Cable Connection

Fig. 8 (a) Manipulator Cable Connectors (Manipulator Side)

Fig. 8 (b) Manipulator Cable Connections to the NX100
## 5 Basic Specifications

### 5.1 Basic Specifications

Table 3: Basic Specifications

<table>
<thead>
<tr>
<th>Operation Mode</th>
<th>Vertically Articulated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of Freedom</td>
<td>6</td>
</tr>
<tr>
<td>Payload</td>
<td>6 kg</td>
</tr>
<tr>
<td>Repetitive Positioning Accuracy</td>
<td>±0.08 mm</td>
</tr>
<tr>
<td>Motion Range</td>
<td></td>
</tr>
<tr>
<td>S-Axis (turning)</td>
<td>±170°</td>
</tr>
<tr>
<td>L-Axis (lower arm)</td>
<td>+133°, -80°</td>
</tr>
<tr>
<td>U-Axis (upper arm)</td>
<td>+165°, -130°</td>
</tr>
<tr>
<td>R-Axis (wrist roll)</td>
<td>±180°</td>
</tr>
<tr>
<td>B-Axis (wrist pitch/yaw)</td>
<td>+225°, -45°</td>
</tr>
<tr>
<td>T-Axis (wrist twist)</td>
<td>±360°</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td></td>
</tr>
<tr>
<td>S-Axis</td>
<td>3.66 rad/s, 210°/s</td>
</tr>
<tr>
<td>L-Axis</td>
<td>3.84 rad/s, 220°/s</td>
</tr>
<tr>
<td>U-Axis</td>
<td>3.84 rad/s, 220°/s</td>
</tr>
<tr>
<td>R-Axis</td>
<td>5.93 rad/s, 340°/s</td>
</tr>
<tr>
<td>B-Axis</td>
<td>5.93 rad/s, 340°/s</td>
</tr>
<tr>
<td>T-Axis</td>
<td>9.43 rad/s, 540°/s</td>
</tr>
<tr>
<td>Allowable Moment (2)</td>
<td></td>
</tr>
<tr>
<td>R-Axis</td>
<td>11.8 N•m (1.2 kgf•m)</td>
</tr>
<tr>
<td>B-Axis</td>
<td>9.8 N•m (1.0 kgf•m)</td>
</tr>
<tr>
<td>T-Axis</td>
<td>5.9 N•m (0.6 kgf•m)</td>
</tr>
<tr>
<td>Allowable Inertia (GD²/4)</td>
<td></td>
</tr>
<tr>
<td>R-Axis</td>
<td>0.24 kg•m²</td>
</tr>
<tr>
<td>B-Axis</td>
<td>0.17 kg•m²</td>
</tr>
<tr>
<td>T-Axis</td>
<td>0.06 kg•m²</td>
</tr>
<tr>
<td>Mass</td>
<td>130 kg</td>
</tr>
<tr>
<td>Ambient Conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>0° to 45°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>20 to 80%, RH (no-condensing)</td>
</tr>
<tr>
<td>Vibration</td>
<td>Less than 4.9 m/s² (0.56g)</td>
</tr>
<tr>
<td>Others</td>
<td>- Free from corrosive gas or liquid, or explosive gas</td>
</tr>
<tr>
<td></td>
<td>- Free from dust, soot, or water</td>
</tr>
<tr>
<td></td>
<td>- Free from excessive electrical noise (plasma)</td>
</tr>
<tr>
<td>Power Capacity</td>
<td>1.5 kVA</td>
</tr>
</tbody>
</table>

*1 SI units are used in this table. However, gravitational unit is used in ( ).
*2 Conformed to ISO8083
*3 Refer to “6.1 Allowable Wrist Load” for details on the permissible moment of inertia.
5.2 Part Names and Working Axes

![Diagram of robot parts and axes](image)

Fig. 9 Part Names and Working Axes

5.3 Baseplate Dimensions

![Baseplate Dimensions Diagram](image)

Fig. 10 Baseplate Dimensions

Units: mm

5-2
5.4 Dimensions and P-Point Maximum Envelope

Fig. 11 Dimensions and Operating Range

Units: mm
5.5 Alterable Operating Range

The operating range of the S-axis can be altered according to the operating conditions as in "Table. 4 S-Axis Operating Range". If alteration is necessary, contact your Yaskawa representative in advance.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Axis Operating Range</td>
<td>±170° (standard)</td>
</tr>
<tr>
<td></td>
<td>±150°</td>
</tr>
<tr>
<td></td>
<td>±135°</td>
</tr>
<tr>
<td></td>
<td>±120°</td>
</tr>
<tr>
<td></td>
<td>±105°</td>
</tr>
<tr>
<td></td>
<td>±90°</td>
</tr>
<tr>
<td></td>
<td>±75°</td>
</tr>
<tr>
<td></td>
<td>±60°</td>
</tr>
<tr>
<td></td>
<td>±45°</td>
</tr>
<tr>
<td></td>
<td>±30°</td>
</tr>
<tr>
<td></td>
<td>±15°</td>
</tr>
</tbody>
</table>
6 Allowable Load for Wrist Axis and Wrist Flange

6.1 Allowable Wrist Load

The allowable wrist load is 6 kg at a maximum. If force is applied to the wrist instead of the load, force on R-, B-, and T-axes should be within the value shown in Table 5: Moment and Total Moment of Inertia. Contact your Yaskawa representative for further information or assistance.

<table>
<thead>
<tr>
<th>Axis</th>
<th>Moment N•m (kgf•m)</th>
<th>GD²/4 Total Inertia kg•m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Axis</td>
<td>11.8 (1.2)</td>
<td>0.24</td>
</tr>
<tr>
<td>B-Axis</td>
<td>9.8 (1.0)</td>
<td>0.17</td>
</tr>
<tr>
<td>T-Axis</td>
<td>5.9 (0.6)</td>
<td>0.06</td>
</tr>
</tbody>
</table>

*:1 ( ): Gravitational unit

When the volume load is small, refer to the moment arm rating shown in Fig. 12 Moment Arm Rating.

The allowable total inertia is calculated when the moment is at the maximum. Contact your Yaskawa representative when only inertia moment, or load moment is small and inertia moment is large. Also, when the load mass is combined with an outside force, contact your Yaskawa representative in advance.
6.1 Allowable Wrist Load

Fig. 13 The Diagram Moment/Inertia for R-Axis

Fig. 14 The Diagram Moment/Inertia for B-Axis

Fig. 15 The Diagram Moment/Inertia for T-Axis
6.2 Wrist Flange

The wrist flange dimensions are shown in "Fig. 16 Wrist Flange". In order to see the alignment marks, it is recommended that the attachment be mounted inside the fitting. Fitting depth of both inside and outside fittings must be 5 mm or less.

**Fig. 16 Wrist Flange**

- Wash off anti-corrosive paint (solid color) 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 are provided on the U-axis (upper arm) and S-axis (rotary head) as shown in "Fig. 17 Installing Peripheral Equipment" for easier installation of the users’ system applications. The following conditions should be observed to attach or install peripheral equipment.

7.1.1 Allowable Load

• The allowable load on the U-axis is a maximum of 15 kg, including the wrist load. For instance, when the mass installed on the wrist point is 6 kg, the mass which can be installed on the upper arm becomes 9 kg.
• The allowable load on the S-axis is a maximum of 20 kg. Install the peripheral equipment on the S-axis so that the moment of inertia (GD^2/4) from the S-axis rotation center becomes 1.25 kg m^2 or less.
7.1.2 Installation Position

There is a limitation on where to install the peripheral equipment as shown in "Fig. 18 Allowable Load on U-Axis". "Fig. 18 Allowable Load on U-Axis" shows the distance between the U-axis rotation center and the load gravity.

Fig. 17 Installing Peripheral Equipment

Fig. 18 Allowable Load on U-Axis
7.2 Internal User I/O Wiring Harness and Air Line

Internal user I/O wiring harness (0.2mm² x 8 wires, 1.25mm² x 6 wires) and an air line are incorporated in the manipulator for the drive of peripheral device mounted on the upper arm as shown in "Fig. 19 Connectors for Internal User I/O Wiring Harness and Air Line".

- The allowable current for internal user I/O wiring harness: 3A or less for each wire (The total current value of pins 1 to 16 must be 40A or less.)
- The maximum pressure for air line: 490 kPa (5 kgf/cm²) or less (The air line inside diameter: 6.5 mm)

Fig. 19 Connectors for Internal User I/O Wiring Harness and Air Line
The same pin number (1-16) of two connectors is connected in the wire lead of single 0.2 mm² or 1.25 mm².
8 Motoman Construction

8.1 Internal Connections

High reliability connectors which can be easily put on and removed are used with each connector part. For the numbers and locations of connectors, see "Fig. 21 Location of Connectors".

![Fig. 21 Location of Connectors]

<table>
<thead>
<tr>
<th>Name</th>
<th>Type of Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector for Internal User I/O Wiring Harness on the Connector Base</td>
<td>JL05-2A20-29PC (JL05-6A20-29S: Optional)</td>
</tr>
<tr>
<td>Connector for Internal User I/O Wiring Harness on the U-arm</td>
<td>JL05-2A20-29SC (JL05-6A20-29P: Optional)</td>
</tr>
</tbody>
</table>
For the limit switch specification, the connection of the section A is changed as follows:

- **A**
  - L-AXIS OVERRUN LIMIT SWITCH
  - L-AXIS OVERRUN LIMIT SWITCH

For standard specification, the pins No.7 and No.8 of 3BC connector on the U-arm are respectively connected with the shock sensor power supply and shock sensor signal input port of the NX100 controller.

- **3BC (10X4) POWER CABLE INTERNAL CABLE**
- **1BC (20-29)**
- **Casing**
- **Base**
- **ENCODER POWER SUPPLY BOARD**
- **INTERNAL CABLE IN S-AXIS**
- **INTERNAL CABLE IN L-AXIS**
- **INTERNAL CABLE IN BT-AXIS**

- **Fig. 22 (a) Internal Connection Diagram**

In case of connecting the pins No.7 and No.8 of respective 3BC connectors on the U-arm and connector base, the connection in the section B should be changed as shown in section C below.

(Contact your Yaskawa representative in case of modifying the wiring before use.)
Fig. 22 (b) Internal Connection Diagram
9 Maintenance and Inspection

### WARNING

- **Before maintenance or inspection, be sure to turn the main power supply OFF, and put up a warning sign.** (ex. **DO NOT TURN THE POWER ON.**)  
  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.**
- **The battery pack must be connected before removing detection connector when maintenance and inspection.**  
  Failure to observe this caution may result in the loss of home position data.

### 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 displayed in six levels. Conduct periodical inspections according to the inspection schedule in "Table. 7 Inspection Items".  

In "Table. 7 Inspection Items", the inspection items are classified into three types of operation: 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 the inspection work.
9.1 Inspection Schedule

- The inspection interval must be based on the servo power supply ON time.
- These inspections were developed for applications where the manipulator is used for arc welding work. For any different or special applications, the inspection process should be developed on a case-by-case basis.

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.

Table 7 Inspection Items

<table>
<thead>
<tr>
<th>Items</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
<td></td>
<td></td>
<td>Specified Person</td>
</tr>
<tr>
<td></td>
<td>1000 H Cycle</td>
<td>6000 H Cycle</td>
<td>12,000 H Cycle</td>
<td>24,000 H</td>
</tr>
<tr>
<td>1. Alignment mark</td>
<td>○</td>
<td>Visual</td>
<td>Check alignment mark; check for damage at the home position.</td>
<td>○</td>
</tr>
<tr>
<td>2. External lead</td>
<td>○</td>
<td>Visual</td>
<td>Check for damage and deterioration of leads.</td>
<td>○</td>
</tr>
<tr>
<td>3. Working area and manipulator</td>
<td>○</td>
<td>Visual</td>
<td>Clean the work area; check for damage and outside cracks.</td>
<td>○</td>
</tr>
<tr>
<td>4. Motors for S-, L-, and U- axes</td>
<td>○</td>
<td>Visual</td>
<td>Check for grease leakage. 1</td>
<td>○</td>
</tr>
<tr>
<td>5. Baseplate mounting bolts</td>
<td>○</td>
<td>Spanner wrench</td>
<td>Tighten loose bolts; replace if necessary</td>
<td>○</td>
</tr>
<tr>
<td>6. Cover mounting screws</td>
<td>○</td>
<td>Screwdriver, wrench</td>
<td>Tighten loose bolts; replace if necessary</td>
<td>○</td>
</tr>
<tr>
<td>7. Base connectors</td>
<td>○</td>
<td>Manual</td>
<td>Check for loose connections</td>
<td>○</td>
</tr>
<tr>
<td>8. Timing belts for B- and T- axes</td>
<td>○</td>
<td>Manual</td>
<td>Check for belt tension and wear</td>
<td>○</td>
</tr>
</tbody>
</table>
### 9.1 Inspection Schedule

#### Table. 7 Inspection Items

<table>
<thead>
<tr>
<th>Items</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wire harness in manipulator (SLU-axis leads)</td>
<td>1000 H Cycle</td>
<td>Visual Multimeter</td>
<td>Check for conduction between the main connector of base and intermediate connector with manually shaking the wire. Check for wear of protective spring.</td>
<td>○ ○</td>
</tr>
<tr>
<td>Wire harness in manipulator (RBT-axis leads)</td>
<td>6000 H Cycle</td>
<td>Visual Multimeter</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Battery pack in manipulator</td>
<td>12000 H Cycle</td>
<td>○</td>
<td>Replace</td>
<td>○ ○</td>
</tr>
<tr>
<td>S-axis speed reducer</td>
<td>24000 H Cycle</td>
<td>Grease Gun</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Speed reducers for L- and U-axes</td>
<td>36000 H Cycle</td>
<td>Grease Gun</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
When checking for conduction with multimeter, connect the battery to “BAT” and “OBT” of connectors on the motor side for each axis, and then remove connectors on detector side for each axis from the motor. Otherwise, the home position may be lost. (Reference “9.3.8 Notes for Maintenance”)

- Wire harness in manipulator to be replaced at 24000H inspection.
- For the grease, refer to "Table. 8 Inspection Parts and Grease Used”.
- Inspection No. correspond to the numbers in "Fig. 23 Inspection Parts and Inspection Numbers”.
- The occurrence of a grease leakage indicates the possibility that grease has seeped into the motor. This can cause a motor breakdown. Contact your Yaskawa representative.

### Table. 7 Inspection Items

<table>
<thead>
<tr>
<th>Items*4</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-axis gear</td>
<td>○</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary) Supply grease*2 (6000H cycle). See Par. “9.3.6 Grease Replenishment for T-axis Gear”</td>
</tr>
<tr>
<td>R-axis cross roller bearing</td>
<td>○</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary) Supply grease*2 (6000H cycle). See Par. “9.3.7 Grease Replenishment for R-axis Cross Roller Bearing”</td>
</tr>
<tr>
<td>Overhaul</td>
<td>○</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*1 When checking for conduction with multimeter, connect the battery to “BAT” and “OBT” of connectors on the motor side for each axis, and then remove connectors on detector side for each axis from the motor. Otherwise, the home position may be lost. (Refer to "9.3.8 Notes for Maintenance”)

*2 Wire harness in manipulator to be replaced at 24000H inspection.

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

*4 Inspection No. correspond to the numbers in "Fig. 23 Inspection Parts and Inspection Numbers”.

*5 The occurrence of a grease leakage indicates the possibility that grease has seeped into the motor. This can cause a motor breakdown. Contact your Yaskawa representative.

### 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>12, 13</td>
<td>VIGO Grease RE No.0</td>
<td>Speed reducers for S-, L-, and U-axes</td>
</tr>
<tr>
<td>14, 15</td>
<td>Harmonic Grease SK-1A</td>
<td>Speed reducers for R-, B-, and T-axes, T-axis gear</td>
</tr>
<tr>
<td>16</td>
<td>Alvania EP Grease 2</td>
<td>R-axis cross roller bearing</td>
</tr>
</tbody>
</table>

The numbers in the above table correspond to the numbers in "Table. 7 Inspection Items”.

9-4
The manipulator illustrated in this figure is in the home position.
9.2 Notes on Maintenance Procedures

9.2.1 Battery Pack Replacement

Battery packs are located as illustrated in *Fig. 24 Battery Location*.

If the battery alarm occurs in the NX100, replace the battery in accordance with the following procedure:

1. Turn off the NX100 main power supply.
2. Uninstall the plate from the base connector and pull the battery pack out to replace with a new battery pack.
3. Remove the battery pack from the battery holder.
4. Connect the new battery pack to the unoccupied connectors on the board.
5. Remove the old battery pack from the board.

See proc. 4
See proc. 5

Fig. 24 Battery Location

Fig. 25 Battery Connection
6. Mount the new battery pack on the battery holder.
7. Reinstall the plate.

**NOTE**

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

**NOTE**

Do not pinch the cable when the plate is installed.
9.3 Notes on Grease Replenishment/Exchange Procedures

Make sure to follow the instructions listed below at grease replenishment/exchange. Failure to observe the following instructions may result in damage to a motor and a speed reducer.

9.3.1 Grease Replenishment/Exchange for S-axis Speed Reducer

**NOTE**
- If grease is added with a plug on, the grease will go inside the motor or an oil seal of the speed reducer will come off, resulting in damage to the motor and speed reducer. Make sure to remove the plug before the grease injection.
- Do not install a joint, a hose, etc. to a grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.
- Make sure to use a grease pump to inject grease. Set air supply pressure to the grease pump at 0.3 MPa or less, and the grease injection rate at 8 g/s or less.
- Make sure to fill a hose on the grease inlet with grease to keep air from entering into the speed reducer.

For ceiling mounted manipulators, the grease exhaust port and the grease inlet are inverted.

Fig. 26 S-axis Speed Reducer Diagram
9.3 Notes on Grease Replenishment/Exchange Procedures

**Grease Replenishment (Refer to “Fig. 26 S-axis Speed Reducer Diagram”.)**

Replenish the grease in accordance with the following procedure:

1. Remove the plugs from the grease exhaust port and grease inlet.

   - **NOTE**
     - If grease is added with the plugs on, the grease will go inside the motor and may cause a damage. Make sure to remove the plugs before the grease injection.
     - Do not install a joint, a hose, etc. to a grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

2. Install the grease zerk PT1/8 to the grease inlet. (The grease zerk is delivered with the manipulator.)

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

4. Move the S-axis for a few minutes to discharge the excess grease.

5. Remove the grease zerk, then reinstall the plugs to the exhaust and inlet. Tighten the plugs to a tightening torque of 4.9 N·m (0.5 kgf·m). Apply Three Bond 1206C to screwed parts when installing the plugs.

**Grease Exchange (Refer to “Fig. 26 S-axis Speed Reducer Diagram”.)**

1. Remove the plug from the grease exhaust port.

   - **NOTE**
     - If grease is added with the plug on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
     - Do not install a joint, a hose, etc. to a grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

2. Install the grease zerk PT1/8 to the grease inlet. (The grease zerk is delivered with the manipulator.)

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

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

5. Move the S-axis for a few minutes to discharge the excess grease.
9.3 Notes on Grease Replenishment/Exchange Procedures

6. Wipe the waste grease with a cloth. Remove the grease zerk from the grease inlet, then reinstall the plugs to the inlet and exhaust ports. Tighten the plugs to a tightening torque of 4.9 N·m (0.5 kgf·m). Apply Three Bond 1206C to screwed parts when installing the plugs.

9.3.2 Grease Replenishment/Exchange for L-axis Speed Reducer

For ceiling mounted manipulators, the grease exhaust port and the grease inlet are inverted.

- Grease Replenishment (Refer to "Fig. 27 L-axis Speed Reducer Diagram ")

1. Make the L-arm vertical to ground.
2. Remove the plug from the grease exhaust port.
3. Remove the bolt from the grease inlet.
4. Install the grease zerk A-MT6 x 1 to the grease inlet. (The grease zerk is delivered with the manipulator.)

- If grease is added with the exhaust plug on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
- Do not install a joint, a hose, etc. to a grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

Fig. 27 L-axis Speed Reducer Diagram
5. Inject grease into the grease inlet using a grease gun.

<table>
<thead>
<tr>
<th>Grease type: VIGO Grease RE No.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of grease: 55 cc</td>
</tr>
<tr>
<td>(110 cc for 1st supply)</td>
</tr>
<tr>
<td>Grease pump air supply pressure: 0.3 MPa or less</td>
</tr>
<tr>
<td>Grease injection rate: 8 g/s or less</td>
</tr>
</tbody>
</table>

6. Move the L-axis for a few minutes to discharge the excess grease.
7. Remove the grease zerk from the grease inlet and reinstall the bolt. Tighten the bolt to a tightening torque of 10 N·m (1.0 kgf·m). Apply Three Bond 1206C to screwed parts when installing the bolts.
8. Wipe the waste grease with a cloth and reinstall the plug to the exhaust port. Tighten the plug to a tightening torque of 4.9 N·m (0.5 kgf·m). Apply Three Bond 1206C to screwed parts when installing the plug.

Grease Exchange (Refer to "Fig. 27 L-axis Speed Reducer Diagram ")

1. Make the L-arm vertical to ground.
2. Remove the plug from the grease exhaust port.
3. Remove the bolt from the grease inlet.

- If grease is added with the exhaust plug on, the grease will go inside the motor and may cause a damage. Make sure to remove the plug before the grease injection.
- Do not install a joint, a hose, etc. to a grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

4. Install the grease zerk A-MT6 x 1 to the grease inlet. (The grease zerk is delivered with the manipulator.)
5. Inject grease into the grease inlet using a grease gun.

<table>
<thead>
<tr>
<th>Grease type: VIGO Grease RE No.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of grease: approx. 360 cc</td>
</tr>
<tr>
<td>Grease pump air supply pressure: 0.3 MPa or less</td>
</tr>
<tr>
<td>Grease injection rate: 8 g/s or less</td>
</tr>
</tbody>
</table>

6. The grease replacement is complete when new grease appears in the exhaust port. The new grease can be distinguished from the old grease by its color.
7. Move the L-axis for a few minutes to discharge the excess grease.
8. Remove the grease zerk from the grease inlet and reinstall the bolt to the grease inlet. Tighten the bolt to a tightening torque of 10 N·m (1.0 kgf·m). Apply Three Bond 1206C to screwed parts when installing the bolts.
9. Wipe the waste grease with a cloth and reinstall the plug to the exhaust port. Tighten the plug to a tightening torque of 4.9 N·m (0.5 kgf·m). Apply Three Bond 1206C to screwed parts when installing the plug.
9.3 Notes on Grease Replenishment/Exchange Procedures

9.3.3 Grease Replenishment/Exchange for U-axis Speed Reducer

![Diagram of U-axis Speed Reducer](image)

Grease Replenishment (Refer to "Fig. 28 U-axis Speed Reducer Diagram ")

1. Make the U-arm horizontal to ground.
2. Remove the bolt from the grease exhaust port.
3. Remove the plug from the grease inlet.
4. Install the grease zerk PT1/8 to the grease inlet. (The grease zerk is delivered with the manipulator.)
5. Inject grease into the grease inlet using a grease gun.
6. Move the U-axis for a few minutes to discharge the excess grease.

**NOTE**

- If grease is added with the bolt on, the grease will go inside the motor and may cause a damage. Make sure to remove the bolt before the grease injection.
- Do not install a joint, a hose, etc. to a grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

Grease type: VIGO Grease RE No.0
Amount of grease: 30 cc
(60 cc for 1st supply)
Grease pump air supply pressure: 0.3 MPa or less
Grease injection rate: 8 g/s or less

For ceiling mounted manipulators, the grease exhaust port and the grease inlet are inverted.
9.3 Notes on Grease Replenishment/Exchange Procedures

7. Remove the grease zerk from the grease inlet and reinstall the plug. 
   Tighten the plug to a tightening torque of 4.9 N·m (0.5 kgf·m). 
   Apply Three Bond 1206C to screwed parts when installing the plug.

8. Wipe the waste grease with a cloth and reinstall the bolt to the exhaust port. 
   Tighten the bolt to a tightening torque of 10 N·m (1.0 kgf·m). 
   Apply Three Bond 1206C to screwed parts when installing the bolt.

**Grease Exchange (Refer to " Fig. 28  U-axis Speed Reducer Diagram ")**

1. Make the U-arm horizontal to ground.
2. Remove the bolt from the grease exhaust port.
3. Remove the plug from the grease inlet.

   **NOTE**
   • If grease is added with the bolt on, the grease will go inside the motor and may cause a damage. Make sure to remove the bolt before the grease injection.
   • Do not install a joint, a hose, etc. to a grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

4. Install the grease zerk PT1/8 to the grease inlet. (The grease zerk is delivered with the manipulator.)

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

<table>
<thead>
<tr>
<th>Grease type: VIGO Grease RE No.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of grease: approx. 200 cc</td>
</tr>
<tr>
<td>Grease pump air supply pressure: 0.3 MPa or less</td>
</tr>
<tr>
<td>Grease injection rate: 8 g/s or less</td>
</tr>
</tbody>
</table>

6. The grease replacement is complete when new grease appears in the exhaust port. The new grease can be distinguished from the old grease by its color.

7. Move the U-axes for a few minutes to discharge the excess grease.

8. Remove the grease zerk from the grease inlet and reinstall the plug. 
   Tighten the plug to a tightening torque of 4.9 N·m (0.5 kgf·m). 
   Apply Three Bond 1206C to screwed parts when installing the plug.

9. Wipe the waste grease with a cloth and reinstall the bolt to the exhaust port. 
   Tighten the bolt to a tightening torque of 10 N·m (1.0 kgf·m). 
   Apply Three Bond 1206C to screwed parts when installing the bolt.
9.3.4 Grease Replenishment for R-axis Speed Reducer

1. Remove a plug from the exhaust port.
2. Remove the pipe plug.
3. Inject grease into the grease inlet using a grease gun. (Refer to Fig. 29 R-axis Speed Reducer Diagram."

<table>
<thead>
<tr>
<th>Grease inlet</th>
<th>Grease zerk A-MT6x1</th>
<th>Exhaust port Plug LP-M5</th>
</tr>
</thead>
</table>

Grease type: Harmonic grease SK-1A
Amount of grease: 8 cc
(16 cc for first supply)

**NOTE** The exhaust port is used for air flow. Do not inject excessive grease into the grease inlet.

4. Reinstall the pipe plug.
5. Reinstall the plug on the exhaust port.
9.3 Notes on Grease Replenishment/Exchange Procedures

9.3.5 Grease Replenishment for B- and T-axes Speed Reducers

1. Remove the plug of B-axis or the bolt of T-axis from the exhaust ports.

**NOTE** Remove the U-arm cover side of the B-axis speed reducer.

2. Remove the bolts from the grease inlets and install the grease zerk A-MT6 x 1. (The grease zerk is delivered with the manipulator.)

3. Inject grease into the grease inlets using a grease gun. (Refer to "Fig. 30 B- and T-axes Speed Reducers Diagram".)

<table>
<thead>
<tr>
<th>Grease type: Harmonic grease SK-1A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of grease:</td>
</tr>
<tr>
<td>For B-axis: 10 cc (20 cc for 1st supply)</td>
</tr>
<tr>
<td>For T-axis: 5 cc (10 cc for 1st supply)</td>
</tr>
</tbody>
</table>

**NOTE** The exhaust ports are used for air flow. Do not inject excessive grease into the grease inlets.

4. Remove the grease zerk form the grease inlets and reinstall the bolts. Tighten the bolts to a tightening torque of 6 N-m (0.6 kgf-m). Apply Three Bond 1206C to screwed parts when installing the bolts.

5. Reinstall the plug of B-axis or the bolt of T-axis to the exhaust ports. Tighten the bolt to a tightening torque of 6 N-m (0.6 kgf-m). Apply Three Bond 1206C to screwed parts when installing the plug or bolt.
9.3 Notes on Grease Replenishment/Exchange Procedures

9.3.6 Grease Replenishment for T-axis Gear

1. Remove the plug from the grease exhaust port.
2. Remove the bolt from the grease inlet, then install the grease zerk A-MT6 x 1. (The grease zerk is delivered with the manipulator.)
3. Inject grease into the grease inlet using a grease gun. (Refer to "Fig. 31 T-axis Gear Diagram").
4. Remove the grease zerk from the grease inlet and reinstall the bolt. Tighten the bolt to a tightening torque of 6 N-m (0.6 kgf-m).
   Apply Three Bond 1206C to screwed parts when installing the bolt.
5. Reinstall the plug to the exhaust port.
   Apply Three Bond 1206C to screwed parts when installing the plug.

**NOTE**
Mount the U-arm cover side of the B-axis speed reducer. (Refer to "9.3.8 Notes for Maintenance").

Grease type: Harmonic grease SK-1A
Amount of grease: 5 cc
(10 cc for 1st supply)

**NOTE**
The exhaust port is used for air flow. Do not inject excessive grease into the gear grease inlet.
9.3.7 Grease Replenishment for R-axis Cross Roller Bearing

1. Remove the plug from the exhaust port.
2. Remove the bolts of the grease inlet, then install the grease zerk A-MT6 x 1. (The grease zerk is delivered with the manipulator.)
3. Inject grease into the grease inlet using a grease gun. (Refer to "Fig. 32 R-axis Cross Roller Bearing Diagram").
4. Remove the grease zerk from the grease inlet and reinstall the bolts. Tighten the bolts to a tightening torque of 6 N·m (0.6 kgf·m).
5. Reinstall the plug to the exhaust port.

Grease type: Alvania EP grease 2
Amount of grease: 3 cc (6 cc for 1st supply)

**NOTE** The exhaust port is used for air flow. Do not inject excessive grease into the gear grease inlet.

The exhaust port is used for air flow. Do not inject excessive grease into the gear grease inlet.

4. Remove the grease zerk from the grease inlet and reinstall the bolts. Tighten the bolts to a tightening torque of 6 N·m (0.6 kgf·m).
   Apply Three Bond 1206C to screwed parts when installing the bolts.
5. Reinstall the plug to the exhaust port.
   Apply Three Bond 1206C to screwed parts when installing the plug.
9.3.8 Notes for Maintenance

- **Wrist Axes**

  The motor and encoder units are provided with the wrist unit. To prevent fumes from penetrating into the wrist unit, the matched parts are sealed with sealing bond. Therefore, if the wrist cover is disassembled, be sure to reapply the sealing bond when reassemble the cover. (Three Bond 1206C, refer to "Table. 9  Spare Parts for YR-SSF6-A10 ").

  ![Fig. 33 Sealing Part of Wrist Unit](image)

- **Battery Pack Connector (with CAUTION label)**

  Connect the battery pack with reference to the following figure before removing the encoder connector (with CAUTION label).

  ![Fig. 34 (a) Battery Pack Connector Diagram for SLU-axes](image)
9.3 Notes on Grease Replenishment/Exchange Procedures

Fig. 34 (b) Battery Pack Connector Diagram for RBT-axes

CAUTION

Connect battery to encoder to save the data before removing connector.

CAUTION label (Enlarged view)

a: Crimped contact-pin (socket)
b: Crimped contact-pin (pin)
10 Recommended Spare Parts

It is recommended that the following parts and components be kept in stock as spare parts for the MOTOMAN-SSF2000S. The spare parts list for the MOTOMAN-SSF2000S is shown below. Product performance cannot be guaranteed when using spare parts from any company other than Yaskawa. 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.

For replacing parts in Rank B or Rank C, contact your Yaskawa representative.

Table. 9 Spare Parts for YR-SSF6-A10

<table>
<thead>
<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty per Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Grease</td>
<td>VIGO Grease RE No.0</td>
<td>Yaskawa Electric Corporation</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>Grease</td>
<td>Harmonic Grease SK-1A</td>
<td>Harmonic Drive System Co., Ltd.</td>
<td>2.5 kg</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>Grease</td>
<td>Alvania EP Grease 2</td>
<td>Showa Shell Sekiyu K.K.</td>
<td>16 kg</td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>Liquid Gasket</td>
<td>Three Bond 1206C</td>
<td>Yaskawa Electric Corporation</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>A</td>
<td>5</td>
<td>Battery Pack</td>
<td>HW0470360-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1 for SLU-axes</td>
</tr>
<tr>
<td>A</td>
<td>6</td>
<td>Battery Pack</td>
<td>HW0470932-A</td>
<td>Yaskawa Electric Corporation</td>
<td></td>
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<tr>
<td>B</td>
<td>7</td>
<td>B-Axis Timing Belt</td>
<td>60S4.5M658</td>
<td>Mitsubishi Belt-ing Limited</td>
<td>1</td>
<td>1</td>
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<tr>
<td>B</td>
<td>8</td>
<td>T-Axis Timing Belt</td>
<td>60S4.5M387</td>
<td>Mitsubishi Belt-ing Limited</td>
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<tr>
<td>B</td>
<td>9</td>
<td>S-Axis Speed Reducer</td>
<td>HW0386621-B</td>
<td>Yaskawa Electric Corporation</td>
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<td>B</td>
<td>10</td>
<td>S-axis Input Gear</td>
<td>HW0310786-1</td>
<td>Yaskawa Electric Corporation</td>
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<td>1</td>
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<tr>
<td>B</td>
<td>11</td>
<td>L-Axis Speed Reducer</td>
<td>HW5280783-A</td>
<td>Yaskawa Electric Corporation</td>
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</tr>
<tr>
<td>B</td>
<td>12</td>
<td>U-Axis Speed Reducer</td>
<td>HW5280784-A</td>
<td>Yaskawa Electric Corporation</td>
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<tr>
<td>Rank</td>
<td>Parts No.</td>
<td>Name</td>
<td>Type</td>
<td>Manufacturer</td>
<td>Qty</td>
<td>Qty per Unit</td>
</tr>
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<td>---------------------------------</td>
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<tr>
<td>B</td>
<td>13</td>
<td>R-Axis Speed Reducer</td>
<td>HW0382277-A</td>
<td>Yaskawa Electric Corporation</td>
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<tr>
<td>B</td>
<td>14</td>
<td>B-Axis Speed Reducer</td>
<td>HW0381646-A</td>
<td>Yaskawa Electric Corporation</td>
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<tr>
<td>B</td>
<td>15</td>
<td>T-Axis Speed Reducer</td>
<td>HW0382917-A</td>
<td>Yaskawa Electric Corporation</td>
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<tr>
<td>B</td>
<td>16</td>
<td>R-Axis Cross Roller Bearing</td>
<td>HW0381872-A</td>
<td>Yaskawa Electric Corporation</td>
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<tr>
<td>B</td>
<td>17</td>
<td>Wire Harness in Manipulator</td>
<td>HW0171753-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>B</td>
<td>18</td>
<td>Wire Harness in Manipulator for B- and T-Axes</td>
<td>HW0271431-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>19</td>
<td>AC Servomotor for S- and U-Axes</td>
<td>HW0382153-A</td>
<td>Yaskawa Electric Corporation</td>
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<td>2</td>
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<tr>
<td>C</td>
<td>20</td>
<td>L-Axis AC Servomotor</td>
<td>HW0382155-A</td>
<td>Yaskawa Electric Corporation</td>
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<td>1</td>
</tr>
<tr>
<td>C</td>
<td>21</td>
<td>AC Servomotor for R-, B-, and T-Axes</td>
<td>HW0382151-A</td>
<td>Yaskawa Electric Corporation</td>
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<td>3</td>
</tr>
</tbody>
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MOTOMAN-SSF2000S INSTRUCTIONS