MOTOMAN-MS100 II
INSTRUCTIONS

TYPE:
YR-MS100/MH110-A00 (STANDARD SPECIFICATION)

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

MOTOMAN INSTRUCTIONS
MOTOMAN-MS100 II INSTRUCTIONS
DX200 INSTRUCTIONS
DX200 OPERATOR’S MANUAL (for each purpose)
DX200 MAINTENANCE MANUAL

The DX200 operator’s manual above corresponds to specific usage. Be sure to use the appropriate manual.

Part Number: 169860-1CD
Revision: 5
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www.motoman.com
MANDATORY

- This instruction manual is intended to explain mainly on the mechanical part of the MOTOMAN-MS100 II for the application to the actual operation and for proper maintenance and inspection. It describes on safety and handling, details on specifications, necessary items on maintenance and inspection, to explain operating instructions and maintenance procedures. Be sure to read and understand this instruction manual thoroughly before installing and operating the manipulator.
- General items related to safety are listed in Chapter 1: Safety of the DX200 Instructions. To ensure correct and safe operation, carefully read the DX200 instructions before reading this manual.

CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.
- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.
- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.
- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.
- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product’s warranty.
We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems (ANSI/RIA R15.06-2012). You can obtain this document from the Robotic Industries Association (RIA) at the following address:

Robotic Industries Association
900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106
TEL: (734) 994-6088
FAX: (734) 994-3338
www.roboticsonline.com

Ultimately, well-trained personnel are the best safeguard against accidents and damage that can result from improper operation of the equipment. The customer is responsible for providing adequately trained personnel to operate, program, and maintain the equipment. NEVER ALLOW UNTRAINED PERSONNEL TO OPERATE, PROGRAM, OR REPAIR THE EQUIPMENT!

We recommend approved YASKAWA training courses for all personnel involved with the operation, programming, or repair of the equipment.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.
Notes for Safe Operation

Read this manual carefully before installation, operation, maintenance, or inspection of the DX200.

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

DANGER
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.

WARNING
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.

CAUTION
Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.

MANDATORY
Always be sure to follow explicitly the items listed under this heading.

PROHIBITED
Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations.

At any rate, be sure to follow these important items.

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

DANGER

- Maintenance and inspection must be performed by specified personnel.
Failure to observe this caution may result in electric shock or injury.
- For disassembly or repair, contact your Yaskawa representative.
- Do not remove the motor, and do not release the brake.
Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the manipulator's arm.
WARNING

• Before operating the manipulator, check that servo power is turned off when the emergency stop buttons on the front door of the DX200 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.

Fig. : Emergency Stop Button

• Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn ON the servo power.

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:
  - Be sure to use a lockout device to the safeguarding when going inside. Also, display the sign that the operation is being performed inside the safeguarding and make sure no one closes the safeguarding.
  - View the manipulator from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Keep in mind the emergency response measures against the manipulator’s unexpected motion toward you.
  - Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

• Confirm that no persons are present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  - Turning ON the DX200 power.
  - Moving the manipulator with the programming pendant.
  - Running check operations.
  - Performing automatic operations.

Injury may result if anyone enters the P-point maximum envelope of the manipulator during operation. Always press an emergency stop button immediately if there is a problem. The emergency stop button is located on the right of front door of the DX200 and the programming pendant.
The MOTOMAN is the YASKAWA industrial robot product. The MOTOMAN usually consists of the manipulator, the controller, the programming 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>DX200 controller</td>
<td>DX200</td>
</tr>
<tr>
<td>DX200 programming pendant</td>
<td>Programming pendant</td>
</tr>
<tr>
<td>Cable between the manipulator</td>
<td>Manipulator cable</td>
</tr>
<tr>
<td>and the controller</td>
<td></td>
</tr>
</tbody>
</table>

**Definition of Terms Used Often in This Manual**

The MOTOMAN is the YASKAWA industrial robot product. The MOTOMAN usually consists of the manipulator, the controller, the programming pendant and supply cables.

In this manual, the equipment is designated as follows:

- **Equipment**: DX200 controller, DX200 programming pendant, Cable between the manipulator and the controller.
- **Manual Designation**: DX200, Programming pendant, Manipulator cable.

**Description of the Operation Procedure**

In the explanation of the operation procedure, the expression “Select • • •” means that the cursor is moved to the object item and the SELECT key is pressed, or that the item is directly selected by touching the screen.

**Registered Trademark**

In this manual, names of companies, corporations, or products are trademarks, registered trademarks, or brand names for each company or corporation. The indications of (R) and TM are omitted.
Explanation of Warning Labels

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

Fig. : Warning Label Locations

Nameplate

WARNING Label A

WARNING Label B

Nameplate

WARNING
Moving parts may cause injury

WARNING
Do not enter robot work area.
Safeguarding Tips

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

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this equipment, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this equipment.

- Improper connections can damage the equipment. All connections must be made within the standard voltage and current ratings of the equipment.

- The system must be placed in Emergency Stop (E-Stop) mode whenever it is not in use.

- In accordance with ANSI/RIA R15.06-2012, section 4.2.5, Sources of Energy, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

Mechanical Safety Devices

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

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

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

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.
Programming, Operation, and Maintenance Safety

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

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

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

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

Summary of Warning Information

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

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

If you need assistance with any aspect of your MS100II system, please contact YASKAWA Customer Support at the following 24-hour telephone number:

(937) 847-3200

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

techsupport@motoman.com

When using e-mail to contact YASKAWA Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.

Please use e-mail for routine inquiries only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact YASKAWA Customer Support at the telephone number shown above.

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

- System: MS100II
- Primary Application: ___________________________
- Controller: DX200
- Software Version: Access this information on the Programming Pendant's LCD display screen by selecting {MAIN MENU} - {SYSTEM INFO} - {VERSION}
- Robot Serial Number: Located on the robot data plate
- Robot Sales Order Number: Located on the DX200 controller data plate
Table of Contents

1  Product Confirmation ...................................................................................................................... 1-1
    1.1  Contents Confirmation ........................................................................................................ 1-1
    1.2  Order Number Confirmation ............................................................................................ 1-2

2  Transport ......................................................................................................................................... 2-1
    2.1  Transport Method .............................................................................................................. 2-1
      2.1.1  Using a Crane ............................................................................................................. 2-2
      2.1.2  Using a Forklift .......................................................................................................... 2-3
    2.2  Shipping Bolts and Brackets ............................................................................................ 2-4

3  Installation .................................................................................................................................... 3-1
    3.1  Installation of Safeguarding ............................................................................................. 3-2
    3.2  Mounting Procedures for Manipulator Base ..................................................................... 3-2
      3.2.1  Mounting the Manipulator on the Baseplate ............................................................ 3-3
    3.3  IP (International Protection) ............................................................................................... 3-4
    3.4  Location ............................................................................................................................. 3-4

4  Wiring ........................................................................................................................................... 4-1
    4.1  Grounding .......................................................................................................................... 4-1
    4.2  Cable Connection .............................................................................................................. 4-2
      4.2.1  Connection to the Manipulator ................................................................................. 4-2
      4.2.2  Connection to the DX200 ...................................................................................... 4-2

5  Basic Specifications .................................................................................................................... 5-1
    5.1  Basic Specifications ........................................................................................................... 5-1
    5.2  Part Names and Working Axes ....................................................................................... 5-2
    5.3  Manipulator Base Dimensions .......................................................................................... 5-2
    5.4  Dimensions and P-Point Maximum Envelope ................................................................. 5-3
    5.5  Stopping Angles and Times for S-, L-, and U-Axes ......................................................... 5-4
      5.5.1  Stop Category 0: Stopping Angles and Times .......................................................... 5-4
        5.5.1.1  Position 100% ....................................................................................................... 5-4
        5.5.1.2  Position 66% ...................................................................................................... 5-5
        5.5.1.3  Position 33% ...................................................................................................... 5-6
      5.5.2  Stop Category 1: Stopping Angles and Times .......................................................... 5-7
5.6 Alterable S-Axis Operating Range

5.6.1 Necessary Parts

5.6.2 Notes on the S-Axis Mechanical Stopper Installation

5.6.3 Alteration of the S-Axis Pulse Soft Limit

6 Allowable Load for Wrist Axis and Wrist Flange

6.1 Allowable Wrist Load

6.2 Wrist Flange

7 System Application

7.1 Peripheral Equipment Mounts

7.2 Internal User I/O Wiring Harness and Air Lines for User’s System Applications

8 Electrical Equipment Specification

8.1 Position of Limit Switch

8.1.1 Specification of Limit Switch

8.1.2 Position of Limit Switch

8.1.3 Setting of Operation Range

8.1.3.1 S-Axis Operation Range

8.1.3.2 L-Axis Operation Range

8.1.3.3 Setting Range of LU-Axes Interference Angle

8.2 Internal Connections

9 Maintenance and Inspection

9.1 Inspection Schedule

9.2 Battery Pack Replacement

9.3 Grease Replenishment/Exchange

9.3.1 Notes on Grease Replenishment/Exchange Procedures

9.3.2 Grease Replenishment/Exchange for S-Axis Speed Reducer

9.3.2.1 Grease Replenishment

9.3.2.2 Grease Exchange

9.3.3 Grease Replenishment/Exchange for L-Axis Speed Reducer

9.3.3.1 Grease Replenishment

9.3.3.2 Grease Exchange

9.3.4 Grease Replenishment/Exchange for U-Axis Speed Reducer

9.3.4.1 Grease Replenishment

9.3.4.2 Grease Exchange
<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.3.5</td>
<td>Grease Replenishment/Exchange for R-, B-, T-Axes Gears in the Casing and R-Axis Speed Reducer</td>
<td>9-14</td>
</tr>
<tr>
<td>9.3.5.1</td>
<td>Grease Replenishment for R-, B-, T-Axes Gears in the Casing</td>
<td>9-14</td>
</tr>
<tr>
<td>9.3.5.2</td>
<td>Grease Replenishment for R-Axis Speed Reducer</td>
<td>9-15</td>
</tr>
<tr>
<td>9.3.5.3</td>
<td>Grease Exchange for R-, B-, T-Axes Gears in the Casing</td>
<td>9-16</td>
</tr>
<tr>
<td>9.3.5.4</td>
<td>Grease Exchange for R-Axis Speed Reducer</td>
<td>9-17</td>
</tr>
<tr>
<td>9.3.6</td>
<td>Grease Replenishment/Exchange for B- and T-Axis Speed Reducers and Gears</td>
<td>9-18</td>
</tr>
<tr>
<td>9.3.6.1</td>
<td>Grease Replenishment</td>
<td>9-18</td>
</tr>
<tr>
<td>9.3.6.2</td>
<td>Grease Exchange</td>
<td>9-19</td>
</tr>
<tr>
<td>9.4</td>
<td>Notes for Maintenance</td>
<td>9-20</td>
</tr>
<tr>
<td>9.4.1</td>
<td>Battery Pack Connection</td>
<td>9-20</td>
</tr>
<tr>
<td>10</td>
<td>Recommended Spare Parts</td>
<td>10-1</td>
</tr>
<tr>
<td>11</td>
<td>Parts List</td>
<td>11-1</td>
</tr>
<tr>
<td>11.1</td>
<td>S-Axis Unit</td>
<td>11-1</td>
</tr>
<tr>
<td>11.2</td>
<td>L-Axis Unit</td>
<td>11-3</td>
</tr>
<tr>
<td>11.3</td>
<td>U-Axis Unit</td>
<td>11-5</td>
</tr>
<tr>
<td>11.4</td>
<td>RBT-Axis Unit</td>
<td>11-7</td>
</tr>
<tr>
<td>11.5</td>
<td>Wrist Unit</td>
<td>11-10</td>
</tr>
</tbody>
</table>
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
• DX200
• Programming Pendant
• Manipulator cables (between the DX200 and the manipulator)

**CAUTION**

- Confirm that the manipulator and the DX200 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 DX200. The order number is indicated on a label as shown below.

*Fig. 1-1: Location of Order Number Labels*

(a) DX200 (Front View)  (b) Manipulator (Top View)
2 Transport

2.1 Transport Method

**CAUTION**

- Sling 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 transport. The system consists of precision components. Failure to observe this caution may adversely affect performance.

**NOTE**

- Check that the eyebolts are securely fastened.
- The weight of the manipulator is approximately 655 kg including the shipping bolts and brackets. Use a wire rope strong enough to withstand the weight.
- The attached eyebolts are designed to support the manipulator mass. Never use them for anything other than transporting the manipulator.
- Mount the shipping bolts and brackets before transporting the manipulator.
- Avoid putting external force on the arm of motor unit when transporting by a crane, forklift, or other equipment. Failure to observe this instruction may result in injury.
2.1 Transport Method

2.1.1 Using a Crane

As a rule, the manipulator should be lifted by a crane with a four-leg bridle sling using the shipping bolts and brackets when removing it from the package or moving it. Be sure that the manipulator is fixed with the shipping bolts and brackets before transport, and lift it in the posture as shown in Fig. 2-1 “Transport Using a Crane”.

Fig. 2-1: Transport Using a Crane
2.1.2 Using a Forklift

When using a forklift, the manipulator should be fixed on a pallet with shipping bolts and brackets as shown in Fig. 2-2 "Transport Using a Forklift". Insert forks under the pallet and lift it. The pallet must be strong enough to support the manipulator. Transport the manipulator slowly with due caution in order to avoid overturning or slippage.

Fig. 2-2: Transport Using a Forklift
2 Transport
2.2 Shipping Bolts and Brackets

The manipulator is provided with shipping bolts and brackets at positions shown in Fig. 2-1 “Transport Using a Crane”.

- The shipping bolts and brackets are painted in yellow.
- Refer to the following table for the shipping bolts and bracket fixing screws.

**Table 2-1: Shipping Bolts and Brackets Fixing Screws**

<table>
<thead>
<tr>
<th>Shipping Bolts and Bracket Qty.</th>
<th>Shipping Bolts and Bracket Fixing Screw Specification</th>
<th>Fixing Screw Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Hexagon Socket Head Cap Screw M12 (length: 25 mm) (Tensile strength: 1200 N/mm²)</td>
<td>4 screws x 2 places</td>
</tr>
</tbody>
</table>

**NOTE**

Before turning ON the power, check to be sure that the shipping bolts and brackets are removed. The shipping bolts and brackets must be stored for future use, in the event that the manipulator will 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 tool or the workpiece held by its fully extended arm will not reach the wall, safeguarding, or controller. 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.

**CAUTION**

- Do not install or operate a manipulator that 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 section 2.2 "Shipping Bolts and Brackets" on page 2-4 are removed. Failure to observe this caution may result in damage to the driving parts.
3 Installation

3.1 Installation of Safeguarding

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

Responsibility for Safeguarding (ISO 10218)

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 referring to Table 3-1 “Manipulator Repulsion Force and Torque”.

A baseplate 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. Mount the manipulator base as instructed in section 3.2.1 “Mounting the Manipulator on the Baseplate”.

Table 3-1: Manipulator Repulsion Force and Torque

<table>
<thead>
<tr>
<th></th>
<th>Horizontal rotation</th>
<th>Vertical rotation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Repulsion force $F_H$</td>
<td>Torque $M_H$</td>
</tr>
<tr>
<td>Emergency stop</td>
<td>23544 N (2400 kgf)</td>
<td>24525 N•m (2500 kgf•m)</td>
</tr>
<tr>
<td>Acceleration/deceleration</td>
<td>7358 N (750 kgf)</td>
<td>7358 N•m (750 kgf•m)</td>
</tr>
</tbody>
</table>

Fig. 3-1: Manipulator Repulsion Force and Torque
3 Installation

3.2 Mounting Procedures for Manipulator Base

3.2.1 Mounting the Manipulator on the Baseplate

For the first process, anchor the baseplate firmly to the ground. The baseplate should be rugged and durable to prevent shifting of the manipulator or the mounting fixture. It is recommend to prepare a baseplate of 50 mm or more thick, and anchor bolts of M20 or larger size.

The manipulator base is tapped for eight mounting holes; securely fix the manipulator base to the baseplate with eight hexagon head screws M20 (70 mm long is recommended).

Next, fix the manipulator base to the baseplate. Tighten the hexagon head bolts and anchor bolts firmly so that they will not work loose during the operation.

Refer to Fig. 3-2 "Mounting the Manipulator on the Baseplate".

![Fig. 3-2: Mounting the Manipulator on the Baseplate](image-url)
3 Installation

3.3 IP (International Protection)

For the standard type, environmental resistance for main part of the manipulator conforms to IP54; the wrist part conforms to IP67.

3.4 Location

When installing a manipulator, it is necessary to satisfy the following environmental conditions.

- Ambient temperature: 0°C to 45°C
- Humidity: 20 to 80%RH (no-condensing)
- Free from exposure to dust, soot, oil, or water.
- Free from corrosive gas or liquid, or explosive gas or liquid
- Free from excessive vibration (Vibration acceleration: 4.9 m/s² [0.5 G] or less)
- Free from large electrical noise (plasma)
- Flatness for installation is 0.5 mm or less
4 Wiring

4.1 Grounding

Follow electrical installation standards and wiring regulations for grounding. A ground wire of 5.5 mm² or more is recommended. Refer to Fig. 4-1 “Grounding Method” to connect the ground line directly to the manipulator.

**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 OFF the primary power supply, 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.

**NOTE**

- Never use this wire 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 electrical installation standards.

Fig. 4-1: Grounding Method
4.2 Cable Connection

Two manipulator cables are delivered with the manipulator: an encoder cable (1BC) and a power cable (2BC). (Refer to Fig. 4-2 “Manipulator Cables”)

Connect these cables to the connectors on the manipulator connector base and the DX200 board connectors. Refer to Fig. 4-3(a) “Manipulator Cable Connection (Manipulator Side)” and Fig. 4-3(b) “Manipulator Cable Connection (DX200 Side)”.

4.2.1 Connection to the Manipulator

Before connecting two cables to the manipulator, verify the numbers on both manipulator cables and the connectors on the connector base of the manipulator. When connecting, adjust the cable connector positions to the main key positions of the manipulator, and insert cables in the order of 2BC, then 1BC. After inserting the cables, depress the lever until it clicks.

4.2.2 Connection to the DX200

Before connecting cables to the DX200, verify the numbers on both manipulator cables and the connectors on the DX200. When connecting, insert the cables in the order of X21, then X11, and depress each lever low until it clicks.
4 Wiring
4.2 Cable Connection

Fig. 4-3(a): Manipulator Cable Connection (Manipulator Side)

Fig. 4-3(b): Manipulator Cable Connection (DX200 Side)
5 Basic Specifications

5.1 Basic Specifications

Table 5-1: Basic Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>MOTOMAN-MS100 II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flange for Cable Processing</td>
<td>Not Equipped</td>
<td>Equipped</td>
</tr>
<tr>
<td>Application</td>
<td>Spot Welding</td>
<td></td>
</tr>
<tr>
<td>Structure</td>
<td>Vertically Articulated</td>
<td></td>
</tr>
<tr>
<td>Degree of Freedom</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Payload</td>
<td>110 kg</td>
<td>100 kg</td>
</tr>
<tr>
<td>Repetitability</td>
<td>±0.07 mm</td>
<td></td>
</tr>
<tr>
<td>Range of Motion</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-Axis (turning)</td>
<td>-180° - +180°</td>
<td></td>
</tr>
<tr>
<td>L-Axis (lower arm)</td>
<td>-90° - +155°</td>
<td></td>
</tr>
<tr>
<td>U-Axis (upper arm)</td>
<td>-180° - +180°</td>
<td></td>
</tr>
<tr>
<td>R-Axis (wrist roll)</td>
<td>-360° - +360°</td>
<td>-205° - +205°</td>
</tr>
<tr>
<td>B-Axis (wrist pitch/yaw)</td>
<td>-125° - +125°</td>
<td>-120° - +120°</td>
</tr>
<tr>
<td>T-Axis (wrist twist)</td>
<td>-360° - +360°</td>
<td>-180° - +180°</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S-Axis</td>
<td>2.45 rad/s, 140°/s</td>
<td></td>
</tr>
<tr>
<td>L-Axis</td>
<td>1.92 rad/s, 110°/s</td>
<td></td>
</tr>
<tr>
<td>U-Axis</td>
<td>2.27 rad/s, 130°/s</td>
<td></td>
</tr>
<tr>
<td>R-Axis</td>
<td>3.05 rad/s, 175°/s</td>
<td></td>
</tr>
<tr>
<td>B-Axis</td>
<td>3.05 rad/s, 175°/s</td>
<td></td>
</tr>
<tr>
<td>T-Axis</td>
<td>4.44 rad/s, 255°/s</td>
<td></td>
</tr>
<tr>
<td>Allowable Moment</td>
<td>R-Axis</td>
<td>721 N•m (73.5 kgf•m)</td>
</tr>
<tr>
<td></td>
<td>B-Axis</td>
<td>721 N•m (73.5 kgf•m)</td>
</tr>
<tr>
<td></td>
<td>T-Axis</td>
<td>294 N•m (30 kgf•m)</td>
</tr>
<tr>
<td>Allowable Inertia (GD²)</td>
<td>R-Axis</td>
<td>60 kg•m²</td>
</tr>
<tr>
<td></td>
<td>B-Axis</td>
<td>60 kg•m²</td>
</tr>
<tr>
<td></td>
<td>T-Axis</td>
<td>35.7 kg•m²</td>
</tr>
<tr>
<td>Approx. Mass</td>
<td></td>
<td>625 kg</td>
</tr>
<tr>
<td>Ambient Conditions</td>
<td>Temperature</td>
<td>0° C to 45° C</td>
</tr>
<tr>
<td></td>
<td>Humidity</td>
<td>20 to 80% RH (non-condensing)</td>
</tr>
<tr>
<td></td>
<td>Vibration Acceleration</td>
<td>4.9 m/s² or less (0.5 G)</td>
</tr>
<tr>
<td></td>
<td>Others</td>
<td>Free from corrosive gasses or liquids, or explosive gasses Free from exposure to water, oil, or dust Free from excessive electrical noise (plasma)</td>
</tr>
<tr>
<td>Power Requirements</td>
<td></td>
<td>5.0 kVA</td>
</tr>
<tr>
<td>Noise</td>
<td></td>
<td>72 dB</td>
</tr>
</tbody>
</table>

1 SI units are used in this table. However, gravitational unit is used in ( ).
2 Specification changes when the manipulator is equipped with a flange for cable processing. (Refer to Fig. 5-3 "Dimensions and P-Point Maximum Envelope").
3 Conformed to ISO6926
4 Refer to chapter 6 "Allowable Load for Wrist Axis and Wrist Flange" for details on the permissible moment of inertia.
5 Conformed to ISO6926

1 Measurement is carried out when the maximum load is mounted to the manipulator and operated in the maximum speed.
2 Measurement is carried out:
   - between 1.2 m and 1.5 m above the ground.
   - 400 mm away from the P-point maximum envelope.
5.2 Part Names and Working Axes

Fig. 5-1: Part Names and Working Axes

5.3 Manipulator Base Dimensions

Fig. 5-2: Manipulator Base Dimensions
5.4 Dimensions and P-Point Maximum Envelope

Fig. 5-3: Dimensions and P-Point Maximum Envelope
5.5 Stopping Angles and Times for S-, L-, and U-Axes

Following data on stopping angle and time for each axis measured under the standard of ISO10218.

5.5.1 Stop Category 0: Stopping Angles and Times

5.5.1.1 Position 100%

Fig. 5-4: Stop Category 0, Position 100% : Stopping Angle and Time for Each Axis
5.5.1.2 Position 66%

Fig. 5-5: Stop Category 0, Position 66% : Stopping Angle and Time for Each Axis

(a) S-Axis

(b) L-Axis

(c) U-Axis
### 5.5 Stopping Angles and Times for S-, L-, and U-Axes

#### 5.5.1.3 Position 33%

*Fig. 5-6: Stop Category 0, Position 33% : Stopping Angle and Time for Each Axis*

<table>
<thead>
<tr>
<th>Speed [deg/s]</th>
<th>Stopping angle [deg]</th>
<th>Load</th>
<th>Speed [deg/s]</th>
<th>Stopping time [sec]</th>
<th>Load</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>100%</td>
<td></td>
<td></td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>66%</td>
<td></td>
<td></td>
<td>66%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33%</td>
<td></td>
<td></td>
<td>33%</td>
</tr>
</tbody>
</table>
5.5.2 Stop Category 1: Stopping Angles and Times

Stopping angles and times at Stop Category 1 are not subjected to the position and the load of the manipulator.

(a) S-Axis
Notes: Not depends on the position and the load.

(b) L-Axis
Notes: Not depends on the position and the load.

(c) U-Axis
Notes: Not depends on the position and the load.
### 5.6 Alterable S-Axis Operating Range

The operating range of the S-axis can be altered in accordance with the operating conditions as shown in Fig. 5-2 “S-Axis Operating Range”. If alteration is necessary, contact your Yaskawa representative in advance.

#### Table 5-2: S-Axis Operating Range

<table>
<thead>
<tr>
<th>Item</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-Axis Operating Range</td>
<td>-180° - +180° (standard)</td>
</tr>
<tr>
<td></td>
<td>-165° - +165°</td>
</tr>
<tr>
<td></td>
<td>-150° - +150°</td>
</tr>
<tr>
<td></td>
<td>-135° - +135°</td>
</tr>
<tr>
<td></td>
<td>-120° - +120°</td>
</tr>
<tr>
<td></td>
<td>-105° - +105°</td>
</tr>
<tr>
<td></td>
<td>-90° - +90°</td>
</tr>
<tr>
<td></td>
<td>-75° - +75°</td>
</tr>
<tr>
<td></td>
<td>-60° - +60°</td>
</tr>
<tr>
<td></td>
<td>-45° - +45°</td>
</tr>
<tr>
<td></td>
<td>-30° - +30°</td>
</tr>
<tr>
<td></td>
<td>-15° - +15°</td>
</tr>
</tbody>
</table>

#### 5.6.1 Necessary Parts

When altering the operating range of the S-axis, following parts shown in Fig. 5-8 “S-Axis Mechanical Stopper” are necessary in addition to the already delivered parts.

1. Hexagon socket head cap screw M20 (length: 40 mm)
   (Tensile strength: 1200 N/mm²) x 1 screw (for the mechanical stopper)

2. Collar (drawing No. HW9405875-1) x 1

3. Pin (drawing No. HW9405032-2) x 1
   (Necessary only when the manipulator is equipped with the S-axis overrun limit switch.)
5.6.2 Notes on the S-Axis Mechanical Stopper Installation

Mount the collar (drawing No. HW9405785-1) to the hexagon socket head screws M20 (length: 40 mm) (Tensile strength: 1200N/mm²). Then, as shown in Fig. 5-8 "S-Axis Mechanical Stopper" on page 5-8, mount the S-axis mechanical stopper to the S-head using the collar with the screws with the tightening torque of 167 Nm (17 kgf•m).

The S-axis mechanical stopper can be mounted in every 15-degree pitch as shown in Fig. 5-9 "S-Axis Stopper Mounting Position".

When the manipulator is equipped with the S-axis overrun limit switches, install the pins (drawing No. HW9405032-2) to the same degree positions as the hexagon socket head screws.

Fig. 5-9: S-Axis Stopper Mounting Position
5 Basic Specifications

5.6 Alterable S-Axis Operating Range

5.6.3 Alteration of the S-Axis Pulse Soft Limit

When limiting the S-axis range of motion, alter the parameter from the programming pendant by referring to the DX200 INSTRUCTIONS (165292-1CD).

Pulse limit (positive (+) direction of the S-axis): S1CxG400

Pulse limit (negative (-) direction of the S-axis): S1CxG408

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse</td>
<td>0</td>
<td>-21203</td>
<td>-42406</td>
<td>-63609</td>
<td>-84812</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+21203</td>
<td>+42406</td>
<td>+63609</td>
<td>+84812</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree</th>
<th>-75° – +75°</th>
<th>-90° – +90°</th>
<th>-105° – +105°</th>
<th>-120° – +120°</th>
<th>-135° – +135°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse</td>
<td>-106015</td>
<td>-127217</td>
<td>-148420</td>
<td>-169823</td>
<td>-190826</td>
</tr>
<tr>
<td></td>
<td>+106015</td>
<td>+127217</td>
<td>+148420</td>
<td>+169823</td>
<td>+190826</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree</th>
<th>-150° – +150°</th>
<th>-165° – +165°</th>
<th>-180° – +180° (Standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse</td>
<td>-212029</td>
<td>-233232</td>
<td>-254434</td>
</tr>
<tr>
<td></td>
<td>+212029</td>
<td>+233232</td>
<td>+254434</td>
</tr>
</tbody>
</table>

---

Please do not alter the range of motion with the software only, but in combination with the mechanical stopper.

Also, when executing the alteration, be sure to uniform the range.
6 Allowable Load for Wrist Axis and Wrist Flange

6.1 Allowable Wrist Load

The allowable wrist load including the weight of the mount/gripper is as follows at each specification.

- 110 kg maximum (without flange for cable processing specification) (Refer to Fig. 5-3 "Dimensions and P-Point Maximum Envelope".)
- 100 kg maximum (with flange for cable processing specification)

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 6-1(a) "Allowable Wrist Load (without flange for cable processing specification)" and Table 6-1(b) "Allowable Wrist Load (with flange for cable processing specification)". Contact your Yaskawa representative for further information or assistance.

Table 6-1(a): Allowable Wrist Load (without flange for cable processing specification)

<table>
<thead>
<tr>
<th>Axis</th>
<th>Moment N-m (kgf • m)</th>
<th>GD^2/4 Total Moment of Inertia kg•m^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Axis</td>
<td>721 (73.5)</td>
<td>60</td>
</tr>
<tr>
<td>B-Axis</td>
<td>721 (73.5)</td>
<td>60</td>
</tr>
<tr>
<td>T-Axis</td>
<td>294 (30)</td>
<td>33.7</td>
</tr>
</tbody>
</table>

1 Refer to Fig. 5-3.
2 (): Gravitational unit

Table 6-1(b): Allowable Wrist Load (with flange for cable processing specification)

<table>
<thead>
<tr>
<th>Axis</th>
<th>Moment N-m (kgf • m)</th>
<th>GD^2/4 Total Moment of Inertia kg•m^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>R-Axis</td>
<td>696 (71)</td>
<td>58</td>
</tr>
<tr>
<td>B-Axis</td>
<td>696 (71)</td>
<td>58</td>
</tr>
<tr>
<td>T-Axis</td>
<td>294 (30)</td>
<td>33</td>
</tr>
</tbody>
</table>

1 Refer to Fig. 5-3.
2 (): Gravitational unit

When the volume load is small, refer to the moment arm rating shown in Fig. 6-1 "Moment Arm Rating".

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

Fig. 6-1: Moment Arm Rating

Without Flange for cable processing spec.

With Flange for cable processing spec.
6.2 Wrist Flange

The wrist flange dimensions are shown in Fig. 6-2 “Wrist Flange”. To make the alignment mark visible and to enable an easy grease exchange for the B- and T-axis gears, mount the attachment inside the fitting. Fitting depth of inside and outside fittings must be 5 mm or less.

Fig. 6-2: Wrist Flange

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 are provided on the U-axis (upper arm) as shown in Fig. 7-1 “Installing Peripheral Equipment” for easier installation of the user’s system applications. The following conditions shall be observed to attach or install peripheral equipment.

Fig. 7-1: Installing Peripheral Equipment

Table 7-1: Constraint for Attaching

<table>
<thead>
<tr>
<th>Application</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable processing and valve, etc mounting</td>
<td>Up to 10 kg.</td>
</tr>
<tr>
<td></td>
<td>49 N•m (5 kgf•m) max. for increased moment amount of upper arm</td>
</tr>
</tbody>
</table>
7 System Application

7.2 Internal User I/O Wiring Harness and Air Lines for User’s System Applications

Internal user I/O wiring harness, encoder or power cables for external axis, cables for primary source for welding, D-NET cables and hoses for air or cooling are incorporated in the manipulator for the drive of peripheral devices mounted on the upper arm as shown in Fig. 7-2 “Connectors for Internal User I/O Wiring Harness and Air Lines for User’s Applications” and Fig. 7-3 “Details of the Connector Pin Numbers”.

Table 7-2: Internal User I/O Wiring Harness and Air Lines for Use’s Applications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
<th>Conditions</th>
</tr>
</thead>
</table>
| Internal user I/O wiring harness | 0.5 mm² × 12 wires | 0.5 mm²: 3.5A or less per wire  
0.75 mm² × 11 wires | 0.75 mm²: 5.0A or less per wire  
The total current value must be 59.8A or less. |
| Encoder cable for external axis | 0.2 mm² × 6 cables | 3.9A or less per wire |
| Power cable for external axis | 2 mm² × 4 cables  
0.75 mm² × 2 cables | 2 mm²: 16.1A or less per wire  
0.75 mm²: 9.0A or less per wire  
The total current value must be 55.7A or less. |
| Cable for primary source for welding | 22 mm² × 2 cables  
14 mm² × 1 cable  
1.25 mm² × 3 cables | 22 mm²: 77.6A or less per wire  
14 mm²: 54.4A or less per wire  
1.25 mm²: 9.3A or less per wire |
| Cable for D-NET(DS1) | 0.3 mm² × 2 cables  
0.2 mm² × 2 cables  
1 drain wire | 0.2 mm²: 4.0A or less per wire  
0.3 mm²: 4.0A or less per wire |
| Cable for +24V | 1.25 mm² × 4 cables | 8.0A or less per wire |
| Air hose maximum allowable working pressure | Inside dia. 8.0 mm × 1 hoses | 490 kPa (5 kgf/cm²) or less |
| Coolant hose maximum allowable working pressure | Inside dia. 8.0 mm × 4 hoses | 490 kPa (5 kgf/cm²) or less |

1 A ground cable.
7 System Application

7.2 Internal User I/O Wiring Harness and Air Lines for User's System Applications

Fig. 7-2: Connectors for Internal User I/O Wiring Harness and Air Lines for User's Applications

- **Connector for the external axis encoder cable:**
  - Cable for the primary source for welding:
    - Terminal-A 22-8
  - Prepare pin connector CM03-PAS

- **Connector for the D-NET:**
  - Prepare pin connector CM02-8DR5P-CF

- **Connector for +24V:**
  - Prepare pin connector CM03A-R4P-S-1

- **Connector for the internal I/O wiring harness:**
  - Prepare pin connector JL05-2A24-28PC (with a cap)

- **Connector for the D-NET:**
  - Prepare pin connector 8A5006-32DN

- **Prepare pin connector JL05-6A24-28P**

- **Prepare pin connector MS3106B32-3P**

- **Prepare pin connector JL05-6A24-28S**

- **Prepare pin connector CM03-PAS**

- **Prepare pin connector CM03-J4P**

- Tube for the fieldbus (inside dia. 12mm)

- In the wiring tying tube

- Connector for the fieldbus

- Prepare pin connector 8A5006-32DN

- Connector for the internal I/O wiring harness

- Prepare pin connector JL05-6A24-28P

- Prepare pin connector MS3106B32-3P

- Prepare pin connector MS1006B32-3P

- Connector for the D-NET

- Prepare pin connector CM02A-8DP5S-D

- Prepare pin connector CM03-PAS

- Prepare pin connector CM03A-R4P-S-1

- Connector for the fieldbus

- Prepare pin connector CM02A-8DP5S-D

- Prepare pin connector CM03-PAS

- Prepare pin connector CM03A-R4P-S-1

- Prepare pin connector CM02A-8DP5S-D
Fig. 7-3: Details of the Connector Pin Numbers

Pin Details for Connectors for Internal user I/O wiring harness

Pin Details for Connectors for External Axis Signal

Pin Details for Connectors for External Axis Power

Pin Details for Connectors for Primary Source for Welding

Pin Details for Connectors for D-NET

Pin Details for Connectors for +24V
8 Electrical Equipment Specification

8.1 Position of Limit Switch

8.1.1 Specification of Limit Switch

1. The interference limit switch at S-, L- and U-axes electrically limit the operating range of respective axes by adjusting the position of the dog using the limit switch.

The positions of the mechanical limits (mechanical stoppers) at S-, L- and U-axes are changeable.

When the limit switch is activated, the power supply to the manipulator is interrupted, then the manipulator makes an emergency stop as a result. Refer to section 8.9 “Overrun/Tool Shock Sensor Releasing” in the “DX200 INSTRUCTIONS” for releasing the status of this overrun.

2. The range of S-, L- and U-axes limit switches are set to the maximum operating range before shipping.

8.1.2 Position of Limit Switch

The limit switches are optional. For the S, L, and U-Axes with limit switches specifications, L.S. are located on S-Axis, L-Axis, and U-Axis respectively.

For the location, refer to Fig. 8-1 “Location of Limit Switches”. The inspection and adjustment of the limit switches should be made after removing the cover.

Fig. 8-1: Location of Limit Switches
8.1 Position of Limit Switch

8.1.3 Setting of Operation Range

8.1.3.1 S-Axis Operation Range

By the S-axis limit switch, S-axis operation range can be set to those ranges mentioned in Table 5-2 "S-Axis Operating Range".

8.1.3.2 L-Axis Operation Range

By the L-axis limit switch, the L-axis operation range can be set to any angles within -91° to +156° as mentioned in the figure below.

Fig. 8-2: L-Axis Overrun Limit Switch Setting Range
8.1.3.3 Setting Range of LU-Axes Interference Angle

L- and U-axes interference limit switches are designed to check the interference angle of L- and U-axes.

As shown in Fig. 8-3 "LU-Axes Interference Angle", the operation range of U-axis can be set to any angles within -91 to +81° as the interference angle with L-axis.

Fig. 8-3: LU-Axes Interference Angle
8.2 Internal Connections

Fig. 8-4(a): Internal Connection Diagram

NOTE: For the limit switch specification, the connection of the section (1) and (2) differ as follows.

- S-, L-, U-axes with Limit Switches Specification
- L- and U-axes INTERFERENCE L.S. Connected to [A2]
- L- and U-axes INTERFERENCE L.S. Connected to [B2]
- S-AXIS OVERRUN L.S. Connected to [A2]
- L-AXIS OVERRUN L.S. Connected to [B2]
Fig. 8-4(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 9-1 “Inspection Items”.

In Table 9-1, the inspection items are categorized by three types of operations: operations which can be performed by personnel authorized by the user, operations to be performed by trained personnel, and operations to be performed by service company personnel. Only specified personnel shall perform the inspection work.

- The inspection interval depends on the total servo operation time.
- If axes are used very frequently (in handling applications, etc.), inspections may be required at shorter intervals. Contact your Yaskawa representative.

DANGER

• Maintenance and inspection must be performed by specified personnel.
Failure to observe this caution may result in electric shock or injury.
• For disassembly or repair, contact your Yaskawa representative.
• Do not remove the motor, and do not release the brake.
Failure to observe these safety precautions may result in death or serious injury from unexpected turning of the manipulator's arm.

WARNING

• Before 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

• 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.
### Table 9-1: Inspection Items (Sheet 1 of 2)

<table>
<thead>
<tr>
<th>Items</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Alignment marks</td>
<td>Daily</td>
<td>Visual</td>
<td>Check alignment mark, accordance at the home position. Check for damage.</td>
<td>●</td>
</tr>
<tr>
<td>2 External cables</td>
<td>Cycle 1000H</td>
<td>Visual</td>
<td>Check for damage and deterioration.</td>
<td>●</td>
</tr>
<tr>
<td>3 Working area and whole exterior of manipulator</td>
<td>Cycle 6000H</td>
<td>Visual</td>
<td>Clean the working area if dust or spatter is present. Check for damage and outside cracks.</td>
<td>●</td>
</tr>
<tr>
<td>5 Baseplate mounting bolts</td>
<td>Cycle 24000H</td>
<td>Wrench</td>
<td>Tighten loose bolts. Replace if necessary.</td>
<td>●</td>
</tr>
<tr>
<td>6 Cover mounting screws</td>
<td>Cycle 36000H</td>
<td>Screwdriver, Wrench</td>
<td>Tighten loose bolts. Replace if necessary.</td>
<td>●</td>
</tr>
<tr>
<td>8 Connector base</td>
<td>Manual</td>
<td>Visual, Multimeter</td>
<td>Check for conduction between the main connector of base and intermediate connector by manually shaking the wire. Check for wear of protective spring. Replace at 24000H inspection.</td>
<td>●</td>
</tr>
<tr>
<td>9 Wire harness in manipulator</td>
<td>Cycle 36000H</td>
<td>Visual, Multimeter</td>
<td>Check for conduction between the main connector of base and intermediate connector by manually shaking the wire. Check for wear of protective spring. Replace at 24000H inspection.</td>
<td>●</td>
</tr>
<tr>
<td>10 Limit switches and dogs (For S-,L- and U-axes)</td>
<td>Cycle 6000H</td>
<td>Manual</td>
<td>Replace the battery pack when the battery alarm occurs or when the manipulator has been operated for 36000H.</td>
<td>●</td>
</tr>
<tr>
<td>11 Battery pack in manipulator</td>
<td>Cycle 12000H</td>
<td>Screwdriver, Wrench, Multimeter</td>
<td>Replace the battery pack when the battery alarm occurs or when the manipulator has been operated for 36000H.</td>
<td>●</td>
</tr>
</tbody>
</table>
### 9.1 Inspection Schedule

Numbers in the above table correspond to the numbers in the Table 9-1 "Inspection Items".

#### Table 9-1: Inspection Items (Sheet 2 of 2)

<table>
<thead>
<tr>
<th>No.</th>
<th>Schedule Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>14</td>
<td>Daily, 1000H Cycle</td>
<td>Grease Gun Check for malfunction. (Replace if necessary.)&lt;sup&gt;4)&lt;/sup&gt;</td>
<td>● ●</td>
</tr>
<tr>
<td></td>
<td>6000H Cycle</td>
<td>Supply grease.&lt;sup&gt;5&lt;/sup&gt; (6000H cycle).</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>12000H Cycle</td>
<td>Exchange grease.&lt;sup&gt;5&lt;/sup&gt; (12000H cycle).</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>24000H Cycle</td>
<td>See section 9.3.5.</td>
<td>●</td>
</tr>
<tr>
<td>15</td>
<td>Daily, 1000H Cycle</td>
<td>Grease Gun Check for malfunction. (Replace if necessary.)&lt;sup&gt;4)&lt;/sup&gt;</td>
<td>● ●</td>
</tr>
<tr>
<td></td>
<td>6000H Cycle</td>
<td>Supply grease.&lt;sup&gt;5&lt;/sup&gt; (6000H cycle).</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>12000H Cycle</td>
<td>Exchange grease.&lt;sup&gt;5&lt;/sup&gt; (12000H cycle).</td>
<td>●</td>
</tr>
<tr>
<td></td>
<td>24000H Cycle</td>
<td>See section 9.3.6.</td>
<td>●</td>
</tr>
</tbody>
</table>

**Notes:**

1. Inspection No. correspond to the numbers in Fig. 9-1 “Inspection Parts and Inspection Numbers”.
2. 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.
3. 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 section 9.4 “Grease Replenishment/Exchange for B- and T-Axis Speed Reducers and Gears”.)
4. The application that requires highly frequent operation such as handling may cause grease leakage of air breather or the internal pressure rise of speed reducer. Contact your Yaskawa representative.
5. For the grease, refer to Table 9-2 “Inspection Parts and Grease Used”.

#### Table 9-2: 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, 14, 15</td>
<td>Molywhite RE:No.00</td>
<td>Speed reducers for all axes B- and T-axis gears</td>
</tr>
</tbody>
</table>

Numbers in the above table correspond to the numbers in the Table 9-1 "Inspection Items".
9.1 Inspection Schedule

Note: This figure shows the home position of the manipulator.
9.2 Battery Pack Replacement

The battery packs (type: HW0470360-A) are installed in the position shown in Fig. 9-2 “Battery Location”. If a battery alarm occurs in the DX200, replace the battery in accordance with the following procedures:

**Fig. 9-2: Battery Location**

![Battery Location Diagram](image)

(a) Back View

- Cross head APS bolt M6 (length: 12mm) (8 bolts)
- Cross head APS bolt M4 (length: 10mm) (4 bolts) (For cover plate fixing)

(b) Top View

- Battery pack (HW0470360-A)

**Fig. 9-3: Battery Connection**

![Battery Connection Diagram](image)

- See step 5 below Battery pack before replacement
- New battery pack
- Board (Type: 5D0K-EMBA02A)
- Connector
- See step 4 below
1. Turn OFF the DX200 main power supply.
2. Remove the plate fixing screws and the plate on the connector base, then pull the battery pack out to replace it with the new one.
3. Remove the old battery pack from the battery holder.
4. Connect the new battery pack to the unoccupied connector on the board.
5. Remove the old battery pack from the board.
6. Mount the new battery pack to the 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 allow plate to pinch the cables when reinstalling the plate.
9.3 Grease Replenishment/Exchange

9.3.1 Notes on Grease Replenishment/Exchange Procedures

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

- If grease is added without removing the plug/screw from the grease exhaust port, the grease will leak inside a motor or an oil seal of a speed reducer will come off, which may result in damage to the motor. Make sure to remove the plug/screw.
- Do not install a joint, a hose, etc. to the 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 hoses, which are joined to the grease inlet, with grease beforehand to prevent air from intruding into the speed reducer.
9.3 Grease Replenishment/Exchange

9.3.2 Grease Replenishment/Exchange for S-Axis Speed Reducer

Fig. 9-4: S-Axis Speed Reducer

9.3.2.1 Grease Replenishment

(Refer to Fig. 9-4 "S-Axis Speed Reducer".)

1. Remove the hexagon socket head plug PT3/8 from the grease exhaust port.

2. Remove the hexagon socket head plug PT1/4 from the grease inlet and install the grease zerk PT1/4. (The grease zerk is delivered with the manipulator.)

3. Inject grease through the grease inlet using a grease gun.
   - Grease type: Molywhite RE.No.00
   - Amount of grease: 600 cc (1200 cc for the 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

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

5. Wipe the discharged grease with a cloth and reinstall the plug PT3/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 23 N•m (2.3 kgf•m).

6. Remove the grease zerk from the grease inlet and reinstall the plug PT1/4. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 12 N•m (1.2 kgf•m).
9.3.2.2 Grease Exchange
(Refer to Fig. 9-4 “S-Axis Speed Reducer”.)

1. Remove the hexagon socket head plug PT3/8 from the grease exhaust port.

   • If grease is injected with the plug on, the grease will leak 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 the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

2. Remove the hexagon socket head plug PT1/4 from the grease inlet and install the grease zerk PT1/4. (The grease zerk is delivered with the manipulator.)

3. Inject grease through the grease inlet using a grease gun.
   - Grease type: Molywhite RE.No.00
   - Amount of grease: 3000 cc
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

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 color.

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

6. Wipe the discharged grease with a cloth and reinstall the plug PT3/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 23 N•m (2.3 kgf•m).

   If the plug is installed while the grease is being exhausted, the grease will leak inside the motor and may cause a damage. Ensure that the grease has been completely exhausted before installing the plug.

7. Remove the grease zerk from the grease inlet and reinstall the plug PT1/4. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 12 N•m (1.2 kgf•m).
9.3 Grease Replenishment/Exchange

9.3.3 Grease Replenishment/Exchange for L-Axis Speed Reducer

Fig. 9-5: L-Axis Speed Reducer

9.3.3.1 Grease Replenishment

(Refer to Fig. 9-5 “L-Axis Speed Reducer”.)

1. Tilt the L-arm vertical to the ground.
2. Remove the hexagon socket head plug PT3/8 from the grease exhaust port.
3. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)
4. Inject grease through the grease inlet using a grease gun.
   - Grease type: Molywhite RE.No.00
   - Amount of grease: 400 cc (800 cc for 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less
5. Move the L-axis for a few minutes to discharge excess grease.
6. Wipe the discharged grease with a cloth and reinstall the plug PT1/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 23 Nm (2.3 kgf•m).
7. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 Nm (0.5 kgf•m).

* If grease is injected with the plug on, the grease will leak 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 the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.
9.3 Grease Replenishment/Exchange

9.3.3.2 Grease Exchange

(Refer to Fig. 9-5 "L-Axis Speed Reducer").

1. Tilt the L-arm vertical to the ground.

   • If grease is injected with the plug on, the grease will leak 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 the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

2. Remove the hexagon socket head plug PT3/8 from the grease exhaust port.

3. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

4. Inject grease through the grease inlets using a grease gun.
   - Grease type: Molywhite RE No.00
   - Amount of grease: 2000 cc
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

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

6. Move the L-axis for a few minutes to discharge excess grease.

7. Wipe the discharged grease with a cloth and reinstall the plug PT1/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 23 N•m (2.3 kgf•m).

   If the plug is installed while the grease is being exhausted, the grease will leak inside the motor and may cause a damage. Ensure that the grease has been completely exhausted before installing the plug.

8. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).
9.3.4 Grease Replenishment/Exchange for U-Axis Speed Reducer

Fig. 9-6: U-Axis Speed Reducer

9.3.4.1 Grease Replenishment

(Refer to Fig. 9-6 “U-Axis Speed Reducer”.)

1. Tilt the U-arm horizontal to the ground. (Refer to Fig. 9-6.)
   (The L-arm is in the vertical posture.)

2. Remove the hexagon socket head plug PT3/8 from the grease exhaust port.

3. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

4. Inject grease through the grease inlet using a grease gun.
   - Grease type: Molywhite RE.No.00
   - Amount of grease: 200 cc (400 cc for 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

• If grease is injected with the plug on, the grease will leak 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 the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.
9.3 Grease Replenishment/Exchange

5. Move the U-axis for a few minutes to discharge excess grease.

6. Wipe the discharged grease with a cloth and reinstall the plug PT3/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 23 N•m (2.3 kgf•m).

7. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).

9.3.4.2 Grease Exchange
(Refer to Fig. 9-6 “U-Axis Speed Reducer”)

1. Tilt the U-arm horizontal to the ground. (Refer to Fig. 9-6.)
   (The L-arm is in the vertical posture.)

2. Remove the hexagon socket head plug PT3/8 from the grease exhaust port.

   • If grease is injected with the plug on, the grease will leak 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 the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

3. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

4. Inject grease through the grease inlet using a grease gun.
   – Grease type: Molywhite RE.No.00
   – Amount of grease: 1000 cc
   – Air supply pressure of grease pump: 0.3 MPa or less
   – Grease injection rate: 8 g/s or less

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 color.

6. Move the U-axis for a few minutes to discharge excess grease.

7. Wipe the discharged grease with a cloth and reinstall the plug PT3/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 23 N•m (2.3 kgf•m).

   If the plug is installed while the grease is being exhausted, the grease will leak inside the motor and may cause a damage. Ensure that the grease has been completely exhausted before installing the plug.

8. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).
9.3.5 Grease Replenishment/Exchange for R-, B-, T- Axes Gears in the Casing and R-Axis Speed Reducer

Fig. 9-7: R-, B-, T- Axes Gears in the Casing and R-Axis Speed Reducer

9.3.5.1 Grease Replenishment for R-, B-, T-Axes Gears in the Casing

(Refer to Fig. 9-7 "R-, B-, T- Axes Gears in the Casing and R-Axis Speed Reducer").

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

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

3. Inject the grease through the grease inlet using a grease gun
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 480 cc (960 cc for 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

4. Move the R-, B-, T-Axes for a few minutes to discharge excess grease.

5. Wipe the discharged grease with a cloth, and reinstall the plug to the grease inlet and to the grease exhaust port with a tightening torque of 23 N•m (2.34 kgf•m).

6. Remove the grease zerk from the grease inlet and reinstall the plug. Tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).

---

NOTE

- If grease is injected with the plug on, the grease will leak 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 the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

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64 of 86
9.3.5.2 Grease Replenishment for R-Axis Speed Reducer

(Refer to Fig. 9-7 "R-, B-, T- Axes Gears in the Casing and R-Axis Speed Reducer")

1. Remove the hexagon socket head plug PT3/8 from the grease exhaust port.

   • If grease is injected with the plug on, the grease will leak 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 the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

2. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

3. Inject grease through the grease inlet using a grease gun.
   – Grease type: Molywhite RE.No.00
   – Amount of grease: 400 cc (800 cc for 1st supply)
   – Air supply pressure of grease pump: 0.3 MPa or less
   – Grease injection rate: 8 g/s or less

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

5. Wipe the discharged grease with a cloth and reinstall the plug PT3/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 23 N•m (2.3 kgf•m).

6. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).
9.3.5.3 Grease Exchange for R-, B-, T-Axes Gears in the Casing

(Refer to Fig. 9-7 "R-, B-, T-Axes Gears in the Casing and R-Axis Speed Reducer").

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

   • If grease is injected with the plug on, the grease will leak 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 the 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 A-PT1/8 to the grease inlet.
   (The grease zerk is delivered with the manipulator.)

3. Inject grease through the grease inlet using a grease gun.
   – Grease type: Molywhite RE No.00
   – Amount of grease: approx. 2400 cc
   – Air supply pressure of grease pump: 0.3 MPa or less
   – Grease injection rate: 8 g/s or less

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

5. Move the R-, B-, and T-axes for a few minutes to discharge excess grease.

6. Wipe the discharged grease with a cloth, and reinstall the plug on the grease exhaust port. Tighten the plug with a tightening torque of 23 N•m (2.34 kgf•m).
   (Apply ThreeBond 1206C to the thread part of the plug).

   If the plug is installed while the grease is being exhausted, the grease will leak inside the motor and may cause a damage. Ensure that the grease has been completely exhausted before installing the plug.

7. Remove the grease zerk from the grease inlet and reinstall the plug.
   Tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).
   (Apply ThreeBond 1206C to the thread part of the plug.)
9.3.5.4 Grease Exchange for R-Axis Speed Reducer

(Refer to Fig. 9-7 “R-, B-, T- Axes Gears in the Casing and R-Axis Speed Reducer”.)

1. Remove the hexagon socket head plug PT3/8 from the grease exhaust port.

   • If grease is injected with the plug on, the grease will leak 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 the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

2. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

3. Inject grease through the grease inlet using a grease gun.
   - Grease type: Molywhite RE.No.00
   - Amount of grease: 2000 cc
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

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

5. Move the R-axis for a few minutes to discharge excess grease.

6. Wipe the discharged grease with a cloth and reinstall the plug PT3/8 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 23 N•m (2.3 kgf•m).

   • If the plug is installed while the grease is being exhausted, the grease will leak inside the motor and may cause a damage. Ensure that the grease has been completely exhausted before installing the plug.

7. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).
9.3.6 Grease Replenishment/Exchange for B- and T-Axis Speed Reducers and Gears

Fig. 9-8: B- and T-Axes Speed Reducers and Gears

9.3.6.1 Grease Replenishment

(Refer to Fig. 9-8 “B- and T-Axes Speed Reducers and Gears”.)

1. Remove the hexagon socket head cap screw M6X6 from the grease exhaust port.

   • If grease is injected with the screw on, the grease will leak inside the motor and may cause a damage. Make sure to remove the screw before the grease injection.

   • Do not install a joint, a hose, etc. to the grease exhaust port. Failure to observe this instruction may result in damage to the motor due to coming off of an oil seal.

2. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

3. Inject grease through the grease inlet using a grease gun.
   - Grease type: Molywhite RE.No.00
   - Amount of grease: 240 cc (480 cc for 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

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

5. Wipe the discharged grease with a cloth and reinstall the screw M6X6 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the set screw, and tighten the set screw with a tightening torque of 6 N•m (0.6 kgf•m).

6. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).
9.3 Grease Replenishment/Exchange

9.3.6.2 Grease Exchange

(Refer to Fig. 9-8 “B- and T-Axes Speed Reducers and Gears”.)

1. Remove the hexagon socket head cap screw M6X6 from the grease exhaust port.

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

2. Remove the hexagon socket head plug PT1/8 from the grease inlet and install the grease zerk PT1/8. (The grease zerk is delivered with the manipulator.)

3. Inject grease through the grease inlet using a grease gun.
   - Grease type: Molywhite RE. No.00
   - Amount of grease: 1200 cc
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

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

5. Move the B-axis for a few minutes to discharge excess grease.

6. Wipe the discharged grease with a cloth and reinstall the screw M6X6 on the grease exhaust port. Apply Three Bond 1206C to the thread part of the set screw, and tighten the set screw with a tightening torque of 6 N•m (0.6 kgf•m).

   If the screw is installed while the grease is being exhausted, the grease will leak inside the motor and may cause a damage. Ensure that the grease has been completely exhausted before installing the screw.

7. Remove the grease zerk from the grease inlet and reinstall the plug PT1/8. Apply Three Bond 1206C to the thread part of the plug, and tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).
9.4 Notes for Maintenance

9.4.1 Battery Pack Connection

The connectors (crimped contact-pin) for battery backup are installed at the end point of each motor (marked as BAT and OBT). Connect the battery pack according to the following procedure.

1. Remove a cap attached to the battery backup connectors of the motor.
2. Connect a battery pack (HW9470932-A) to the battery backup connectors (BAT and OBT are marked) located at the end point of an encoder cable. With the battery pack connected to the battery backup connectors, perform maintenance check.
3. After the maintenance check, confirm all connectors are connected and remove the battery pack. Reinstall the cap onto the battery backup connectors of the motor.

**NOTE** Do not remove battery pack in the connector base.

When performing maintenance such as replacement of a wire harness in the manipulator, the encoder connector may be necessary to be removed. In this case, be sure to connect the battery pack to the battery backup connector before removing the encoder connector.

Removing the encoder connector without connecting the battery pack leads to disappearance of the encoder absolute data.

For the battery pack connection, refer to Fig. 9-9 "Encoder Connector Diagram" on page 9-21.
9.4 Notes for Maintenance

Fig. 9-9: Encoder Connector Diagram

Motor

Motor power connector

Encoder connector

Connector for battery back-up

a: Crimped contact-pin (pin)
b: Crimped contact-pin (socket)
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-MS100 II. 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 10-1: Spare Parts for the MOTOMAN-MS100 II (Sheet 1 of 2)

<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>
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<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Grease</td>
<td>Molywhite RE. No.00</td>
<td>Yaskawa</td>
<td>16 kg</td>
<td>-</td>
<td>For all axes speed reducers</td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>Liquid Gasket</td>
<td>Three Bond 1206C</td>
<td>ThreeBond Co., Ltd.</td>
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<td>-</td>
<td></td>
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<tr>
<td>A</td>
<td>3</td>
<td>Battery Pack</td>
<td>HW9470932-A</td>
<td>Yaskawa</td>
<td>1</td>
<td>1</td>
<td>For replacing the wire harness in the manipulator</td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>Battery Pack</td>
<td>HW0470360-A</td>
<td>Yaskawa</td>
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<td>1</td>
<td>For inside the connector base</td>
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<tr>
<td>B</td>
<td>5</td>
<td>S-axis Speed Reducer</td>
<td>HW1382898-A</td>
<td>Yaskawa</td>
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<tr>
<td>B</td>
<td>6</td>
<td>S-axis Input Gear</td>
<td>HW0312836-1</td>
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<td>B</td>
<td>7</td>
<td>L-axis Speed Reducer</td>
<td>HW1382456-B</td>
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<td>B</td>
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<td>C</td>
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<td>SGMRV-30ANA-YR1*</td>
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<td></td>
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<tr>
<td>C</td>
<td>15</td>
<td>AC Servomotor for L-axis</td>
<td>SGMRV-44ANA-YR2*</td>
<td>Yaskawa</td>
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<td>Parts No.</td>
<td>Name Type</td>
<td>Manufacturer</td>
<td>Qty per Unit</td>
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<td>C</td>
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<td>AC Servomotor for U-axis</td>
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<td>1 Yaskawa</td>
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<td>C</td>
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11 Parts List

11.1 S-Axis Unit

Fig. 11-1: S-Axis Unit
### Table 11-1: S-Axis Unit

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<td>Base</td>
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<td>1004</td>
<td>2H-8</td>
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<tr>
<td>1005</td>
<td>M8×45</td>
<td>Hexagon socket head cap screw</td>
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<td>Speed reducer</td>
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<td>1007</td>
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11.2 L-Axis Unit

Fig. 11-2: L-Axis Unit
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<td>L-arm</td>
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<td>2006</td>
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<td>2007</td>
<td>SW-2H-12</td>
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<td>32</td>
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<td>AS568-275</td>
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<td>HW1404554-1</td>
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<td>2019</td>
<td>HW1303991-1</td>
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### 11.3 U-Axis Unit

*Fig. 11-3: U-Axis Unit*
### Table 11-3: U-Axis Unit

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<td>(For the manipulator assembled after Oct., 2014)</td>
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11.4 RBT-Axis Unit

Fig. 11-4: RBT-Axis Unit
Table 11-4: RBT-Axis Unit (Sheet 1 of 2)

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### Table 11-4: RBT-Axis Unit (Sheet 2 of 2)

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11 Parts List

11.5 Wrist Unit

Fig. 11-5: Wrist Unit
### Table 11-5: Wrist Unit (Sheet 1 of 2)

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Table 11-5: Wrist Unit (Sheet 2 of 2)