COMPLETE OUR ONLINE SURVEY

Motoman is committed to total customer satisfaction! Please give us your feedback on the technical manuals you received with your Motoman robotic solution.

To participate, go to the following website:

http://www.motoman.com/forms/techpubs.asp
Chapter 1

Introduction

1.1 About This Document

This manual provides information for the DA9IC manipulator and contains the following sections:

SECTION 1 - INTRODUCTION
Provides general information about the structure of this manual, a list of reference documents, and customer service information.

SECTION 2 - SAFETY
This section provides information regarding the safe use and operation of Motoman products.

SECTION 3 - DA9IC INSTRUCTIONS
Provides detailed instructions for the DA9IC.

1.2 Reference to Other Documentation

For additional information refer to the following:

- NX100 Controller Manual (P/N 149201-1)
- Concurrent I/O Manual (P/N 149230-1)
- Operator's Manual for your application
- Vendor manuals for system components not manufactured by Motoman

1.3 Customer Service Information

If you are in need of technical assistance, contact the Motoman service staff at (937) 847-3200. Please have the following information ready before you call:

- Robot Type (EA1400, HP50, etc.)
- Application Type (handling, welding, etc.)
- Robot Serial Number (located on back side of robot arm)
- Robot Sales Order Number (located on back of controller)
Chapter 2
Safety

2.1 Introduction

It is the purchaser’s responsibility to ensure that all local, county, state, and national codes, regulations, rules, or laws relating to safety and safe operating conditions for each installation are met and followed.

We suggest that you obtain and review a copy of the ANSI/RIA National Safety Standard for Industrial Robots and Robot Systems. This information can be obtained from the Robotic Industries Association by requesting ANSI/RIA R15.06-1999. The address is as follows:

RoboticIndustriesAssociation
900VictorsWay
P.O.Box3724
AnnArbor,Michigan48106
TEL:(734)994-6088
FAX:(734)994-3338
INTERNET:www.roboticsonline.com

Ultimately, the best safeguard is trained personnel. The user is responsible for providing personnel who are adequately trained to operate, program, and maintain the robot cell. The robot must not be operated by personnel who have not been trained!

We recommend that all personnel who intend to operate, program, repair, or use the robot system be trained in an approved Motoman training course and become familiar with the proper operation of the system.
This safety section addresses the following:

- Standard Conventions (Section 2.2)
- General Safeguarding Tips (Section 2.3)
- Mechanical Safety Devices (Section 2.4)
- Installation Safety (Section 2.5)
- Programming, Operation, and Maintenance Safety (Section 2.6)

### 2.2 Standard Conventions

This manual includes the following alerts – in descending order of severity – that are essential to the safety of personnel and equipment. As you read this manual, pay close attention to these alerts to insure safety when installing, operating, programming, and maintaining this equipment.

![DANGER!](image1.png)

Information appearing in a DANGER concerns the protection of personnel from the immediate and imminent hazards that, if not avoided, will result in immediate, serious personal injury or loss of life in addition to equipment damage.

![WARNING!](image2.png)

Information appearing in a WARNING concerns the protection of personnel and equipment from potential hazards that can result in personal injury or loss of life in addition to equipment damage.

![CAUTION!](image3.png)

Information appearing in a CAUTION concerns the protection of personnel and equipment, software, and data from hazards that can result in minor personal injury or equipment damage.

Note: Information appearing in a Note provides additional information which is helpful in understanding the item being explained.
2.3 General Safeguarding Tips

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot 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 robot, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this robot system.

- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the robot cell.

- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).

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

- In accordance with ANSI/RIA R15.06-1999, 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).

2.4 Mechanical Safety Devices

The safe operation of the robot, positioner, auxiliary equipment, and system is ultimately the user's 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 R15.06-1999 safety standards, and other local codes that may pertain to the installation and use of industrial 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 fences and barriers
- Light curtains and/or safety mats
- Door interlocks
- Emergency stop palm buttons located on operator station, robot controller, and programming pendant

Check all safety equipment frequently for proper operation. Repair or replace any non-functioning safety equipment immediately.
2.5 Installation Safety

Safe installation is essential for protection of people and equipment. The following suggestions are intended to supplement, but not replace, existing federal, local, and state laws and regulations. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. Installation tips are as follows:

- Be sure that only qualified personnel familiar with national codes, local codes, and ANSI/RIA R15.06-1999 safety standards are permitted to install the equipment.
- Identify the work envelope of each robot with floor markings, signs, and barriers.
- Position all controllers outside the robot work envelope.
- Whenever possible, install safety fences to protect against unauthorized entry into the work envelope.
- Eliminate areas where personnel might get trapped between a moving robot and other equipment (pinch points).
- Provide sufficient room inside the workcell to permit safe teaching and maintenance procedures.

2.6 Programming, Operation, and Maintenance Safety

All operators, programmers, plant and tooling engineers, maintenance personnel, supervisors, and anyone working near the robot 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 robot should be permitted to program, operate, and maintain the system. All personnel involved with the operation of the equipment must understand potential dangers of operation.

- Inspect the robot and work envelope 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.
- Do not enter the robot cell while it is in automatic operation. Be sure that only the person holding the programming pendant enters the workcell.
- Check the E-STOP button on the programming pendant for proper operation before programming. The robot 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 PART 1, System Section, of the robot controller concurrent I/O program can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to PART 1, System Section. Making any changes without the written permission of Motoman will VOID YOUR WARRANTY!

• Some operations require standard passwords and some require special passwords. Special passwords are for Motoman use only. YOUR WARRANTY WILL BE VOID if you use these special passwords.

• The robot controller allows modifications of PART 2, User Section, of the concurrent I/O program and modifications to controller parameters for maximum robot performance. Great care must be taken when making these modifications. All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot and other parts of the system. Double-check all modifications under every mode of robot operation to ensure that you have not created hazards or dangerous situations.

• Check and test any new or modified program at low speed for at least one full cycle.

• 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 robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).
Notes
Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.
MANDATORY

• This instruction manual explains operating instructions and maintenance procedures primarily for the MOTOMAN-UPJ3D.

• General items related to safety are listed in:
  - Section 1: Safety of the NXC100 Instructions; or
  - SAFETY PRECAUTIONS in the JRC SETTING-UP MANUAL.
To ensure correct and safe operation, carefully read the safety instructions in the abovementioned manual before reading this manual.

CAUTION

• Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.

• The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.

• YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

• If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.

• YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.
Notes for Safe Operation
Read this instruction manual and related documents thoroughly before installation, operation, maintenance, or inspection of the NXC100 or JRC.
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 button on the teaching pendant is pressed.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator in 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 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:
  - 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 NXC100 or JRC 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.
Definition of Terms Used Often in This Manual

The MOTOMAN manipulator is the YASKAWA industrial robot product. The manipulator usually consists of the controller (JRC or NXC100), operating panel (for JRC only; optional), programming pendant (JRC or NXC100; optional for JRC), and manipulator cables.

In this manual, the equipment is defined as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>JRC controller</td>
<td>JRC</td>
</tr>
<tr>
<td>NXC100 controller</td>
<td>NXC100</td>
</tr>
<tr>
<td>JRC operating panel</td>
<td>Operating panel</td>
</tr>
<tr>
<td>JRC or NXC100 programming pendant</td>
<td>Programming pendant</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.
1  Product Confirmation
   1.1  Contents Confirmation ........................................... 1-1
   1.2  Order Number Confirmation ................................. 1-1

2  Transporting
   2.1  Transporting Method ........................................... 2-1
       2.1.1  Using a Crane ..................................... 2-1

3  Installation
   3.1  Installation of the Safeguarding .......................... 3-2
   3.2  Mounting Procedures for Manipulator Base ............. 3-2
       3.2.1  Mounting Example .................................. 3-3
   3.3  Location ....................................................... 3-4

4  Basic Specifications
   4.1  Basic Specifications ........................................... 4-1
   4.2  Part Names and Working Axes ............................. 4-2
   4.3  Manipulator Base Dimensions ............................... 4-3
   4.4  Dimensions and P-Point Maximum Envelope ............. 4-5

5  Allowable Load for Wrist Axis and Wrist Flange
   5.1  Allowable Wrist Load ....................................... 5-1
   5.2  Wrist Flange ................................................... 5-1

6  System Application
   6.1  Peripheral Equipment Mounts ............................... 6-1
   6.2  Internal User I/O Wiring Harness and Airline .......... 6-2

7  Electrical Equipment Specification
   7.1  Internal Connections ......................................... 7-1
8  Maintenance and Inspection

8.1  Inspection Schedule .............................................. 8-1

8.2  Notes on Maintenance Procedures .............................. 8-5

   8.2.1  Battery Pack Replacement .................................. 8-5
   8.2.2  Grease Replenishment for L-Axis Speed Reducer .......... 8-7
   8.2.3  Grease Replenishment for U-Axis Speed Reducer ........ 8-8
   8.2.4  Grease Replenishment for B-, T-Axis Speed Reducers
           and T-Axis Gear ............................................. 8-9
   8.2.5  Grease Replenishment for Elevation Axis and
           Timing Belt Adjustment ...................................... 8-10
      ■ Grease Replenishment for Elevation Axis (Refer to
           "Fig. 17 Elevation Axis and Timing Belt Diagram "). ... 8-10
      ■ Timing Belt Adjustment (Refer to "Fig. 17 Elevation
           Axis and Timing Belt Diagram "). .......................... 8-10
   8.2.6  Grease Replenishment for Turning Axis ................. 8-11
   8.2.7  Grease Replenishment for Servo Track .................. 8-12
      ■ Grease Replenishment for Linear Motion Guide
           (Refer to "Fig. 19 Servo Track Diagram "). .............. 8-12
      ■ Grease Application for Rack-and-Pinion
           (Refer to "Fig. 19 Servo Track Diagram "). .............. 8-12

8.3  Notes for Maintenance ........................................... 8-13

9  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
- NXC100 or JRC
- Programming pendant (optional for JRC)

1.2 Order Number Confirmation

Confirm that the order number of the manipulator corresponds to the NXC100 (or JRC) by checking the order number label.

CAUTION

- Confirm that the manipulator and the NXC100 (or JRC) 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.
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 transportation.

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

2.1.1 Using a Crane

As a rule, when removing the manipulator from the package and moving it, a crane should be used. The manipulator should be lifted using wire rope threaded through shipping bolts and brackets before the transportation.

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

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
</table>
| • Install the safeguarding.  
Failure to observe this warning may result in injury or damage.  

• Install the manipulator in a location where the manipulator's tool or the workpiece held by the manipulator will not reach the wall, safeguarding, or NXC100 (or JRC) 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.  
Failure to observe this warning may result in injury or damage.  |

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
</table>
| • Do not install or operate the manipulator which is damaged or lacks parts.  
Failure to observe this caution may cause injury or damage.  

• Before turning ON the power, check to be sure that the shipping bolts and brackets are removed.  
Failure to observe this caution may result in damage to the driving parts.  |
3.1 Installation of the 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 thrust and repulsion force of the manipulator referring to "Table 1 Maximum Thrust and Torque of the Manipulator (NXC100 and JRC)".
The flatness of servo track base 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 servo track base as explained in "3.2.1 Mounting Example".

<table>
<thead>
<tr>
<th>Table 1 Maximum Thrust and Torque of the Manipulator (NXC100 and JRC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum thrust in servo track operation</td>
</tr>
<tr>
<td>Maximum torque in horizontal rotation</td>
</tr>
</tbody>
</table>
### 3.2.1 Mounting Example

Fix the servo track base firmly to the ground with anchor bolts of size M12 (length: 90 mm; such as C-1290 manufactured by SANKO TECHNO Co., Ltd.). Tighten the anchor bolts firmly so that they will not work loose during the operation. Refer to "Fig. 1 Mounting the Manipulator (NXC100)" or "Fig. 2 Mounting the Manipulator (JRC)" for the installation method.

![Fig. 1 Mounting the Manipulator (NXC100)]
3.3 Location

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

- Ambient temperature: 0 to 40°C.
- Humidity: 20 to 80% RH at constant temperature.
- Free from exposure to water, oil, or dust.
- Free from corrosive gas or liquid, or explosive gas.
- Free from excessive shock or vibration (vibration acceleration: 4.9 m/s² (0.5G) or less).
- Free from large electrical noise (plasma).
- Flatness for installation: 0.5 mm or less.
4.1 Basic Specifications

Table 2 Basic Specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Horizontally Articulated</td>
</tr>
<tr>
<td>Degree of Freedom</td>
<td>Right Arm: 5; Servo Track: 1; Left Arm: 5; Turning: 1</td>
</tr>
<tr>
<td>Payload</td>
<td>9 kg/arm</td>
</tr>
<tr>
<td>Repeatability*2</td>
<td>±0.1 mm</td>
</tr>
<tr>
<td>Range of Motion</td>
<td></td>
</tr>
<tr>
<td>Servo Track</td>
<td>Customized range*3</td>
</tr>
<tr>
<td>Turning Axis</td>
<td>±135°</td>
</tr>
<tr>
<td>Elevation Axis</td>
<td>±100 mm</td>
</tr>
<tr>
<td>L-Axis (lower arm)</td>
<td>+110°, -75°</td>
</tr>
<tr>
<td>U-Axis (upper arm)</td>
<td>+175°, -55°</td>
</tr>
<tr>
<td>B-Axis (wrist pitch/yaw)</td>
<td>±120°</td>
</tr>
<tr>
<td>T-Axis (wrist twist)</td>
<td>±360°</td>
</tr>
<tr>
<td>Maximum Speed</td>
<td></td>
</tr>
<tr>
<td>Servo Track</td>
<td>1000 mm/sec</td>
</tr>
<tr>
<td>Turning Axis</td>
<td>3.14 rad/s, 180°/s</td>
</tr>
<tr>
<td>Elevation Axis</td>
<td>200 mm/sec</td>
</tr>
<tr>
<td>L-Axis (lower arm)</td>
<td>2.62 rad/s, 150°/s</td>
</tr>
<tr>
<td>U-Axis (upper arm)</td>
<td>3.32 rad/s, 190°/s</td>
</tr>
<tr>
<td>B-Axis (wrist pitch/yaw)</td>
<td>5.24 rad/s, 300°/s</td>
</tr>
<tr>
<td>T-Axis (wrist twist)</td>
<td>7.33 rad/s, 420°/s</td>
</tr>
<tr>
<td>Ambient Conditions</td>
<td></td>
</tr>
<tr>
<td>Temperature</td>
<td>0 to +40°C</td>
</tr>
<tr>
<td>Humidity</td>
<td>20 to 80% RH at constant temperature</td>
</tr>
<tr>
<td>Vibration Acceleration</td>
<td>4.9 m/s² (0.5 G) or less</td>
</tr>
<tr>
<td>Others</td>
<td>• Free from corrosive gas or liquid, or explosive gas.</td>
</tr>
<tr>
<td></td>
<td>• Free from exposure to water, oil, or dust.</td>
</tr>
<tr>
<td></td>
<td>• Free from excessive electrical noise (plasma).</td>
</tr>
<tr>
<td>Power Capacity</td>
<td>1.0 kVA</td>
</tr>
</tbody>
</table>

*1 SI units are used in this table. However, gravitational unit is used in ( ).
*2 Conformed to ISO9283
*3 The range of motion of the servo track varies by the order.
4.2 Part Names and Working Axes

Notes:
- Directions of L/U/B-axes on the left and right arms are line symmetry to elevation axis.
- Operating directions of T-axes and elevation axes on the left arm and the right arm are the same.

Fig. 3 Part Names and Working Axes (NXC100)

Notes:
- Directions of L/U/B-axes on the left and right arms are line symmetry to elevation axis.
- Operating directions of T-axes differ between the left arm and the right arm.
- Operating directions of T-axes on the left arm and the right arm are the same.

Fig. 4 Part Names and Working Axes (JRC)
4.3  Manipulator Base Dimensions

(a) In case of installation with a 3-meter servo track

(b) In case of installation without a servo track

Fig. 5 (a) Installation Dimensions (NXC100)
4.3 Manipulator Base Dimensions

Fig. 5 (b) Installation Dimensions (JRC)

Units: mm
4.4 Dimensions and P-Point Maximum Envelope

Fig. 6 (a) Dimensions and P-Point Maximum Envelope (Arms and Turning Axis)
Fig. 6 (b) Dimensions and P-Point Maximum Envelope (Elevation Axis)
5 Allowable Load for Wrist Axis and Wrist Flange

5.1 Allowable Wrist Load

The allowable wrist load of YR-UPJ3D including the weight of the mount/gripper is 9 kg. If force is applied to the wrist instead of the load, forces on B- and T-axes should be within the value shown in "Table. 6 Allowable Total Moment and Total Inertia". Contact your Yaskawa representative for further information or assistance.

Table. 6 Allowable Total Moment and Total Inertia

<table>
<thead>
<tr>
<th>Model</th>
<th>Axis</th>
<th>Moment N·m</th>
<th>Moment Inertia kg·m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>YR-UPJ3D</td>
<td>B-Axis</td>
<td>-</td>
<td>0.6</td>
</tr>
<tr>
<td></td>
<td>T-Axis</td>
<td>2.94</td>
<td>0.03</td>
</tr>
</tbody>
</table>

5.2 Wrist Flange

It is recommended that the attachment be mounted inside the fitting to identify the alignment marks. Fitting depth of inside and outside fittings must be 5 mm or less. See "Fig. 7 Wrist Flange (Right Arm)" for details.

![Fig. 7 Wrist Flange (Right Arm)](image)

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

6.1 Peripheral Equipment Mounts

The peripheral equipment mounts are fixed on the upper arm for easier installation of the user’s system application as shown in "Fig. 8 Peripheral Equipment Mounts".

**NOTE** The maximum gross weight of mountable peripheral equipment per arm is 1 kg.

![Diagram](Fig. 8 Peripheral Equipment Mounts)
6.2 Internal User I/O Wiring Harness and Airline

Internal user I/O wiring harnesses (R1: 0.2 mm² x 10 wires; R2: 0.2 mm² x 10 wires) and airlines (R1: 4 lines; R2: 4 lines) are incorporated in the manipulator for the drive of peripheral devices mounted on the upper arms as shown in "Fig. 9 (a) Connectors for Internal User I/O Wiring Harness and Airline ".

The connector pins 1 to 10 and terminals are assigned as shown in "Fig. 9 (b) Connectors for Internal User I/O Wiring Harness (Pin Details) ". Wiring must be performed by user.

- The allowable current for internal user I/O wiring harness: 2.5 A or less / wire.

- The maximum pressure for the airline: 490 kPa (5 kgf/cm²) or less (The airline tube inside diameter: 2.5 mm)

![Diagram showing the connectors and their assignments.](image-url)
Fig. 9 (b) Connectors for Internal User I/O Wiring Harness (Pin Details)
7 Electrical Equipment Specification

7.1 Internal Connections

Fig. 10 (a) Internal Connection Diagram (NXC100)
Fig. 10 (b) Internal Connection Diagram (NXC100)

Note:
This is an internal connection diagram of MOTOMAN-UPJ3D (double arm) for NXC100.
Fig. 10 (c) Internal Connection Diagram

7-3
Fig. 10 (d) Internal Connection Diagram

This is an internal connection diagram of MOTOMAN-UPJ (production model with twin arm) for JRC.

Note:

POWER CABLE
INTERNAL WIRE IN S-AXIS

MS310182-21F-K

Note:

This is an internal connection diagram of MOTOMAN-UPJ (production model with twin arm) for JRC.
8 Maintenance and Inspection

8.1 Inspection Schedule

Proper inspections are essential not only to assure that the mechanism will be able to function for a long period, but also to prevent malfunctions and assure safe operation. Inspection intervals are classified into six levels as shown in "Table 7 Inspection Items". Conduct periodical inspections according to the inspection schedule in Table 9.

In "Table 7 Inspection Items", the inspection items are categorized by three types of operations: operations which can be performed by personnel authorized by the user, operations which can be performed by personnel being trained, and operations which can be performed by service company personnel. Only specified personnel are to do inspection work.

---

**WARNING**

- Before maintenance or inspection, be sure to turn OFF the main power supply, and put up a warning sign. (ex. DO NOT TURN ON THE POWER.)

Failure to observe this warning may result in electric shock or injury.

**CAUTION**

- Maintenance and inspection must be performed by specified personnel.

Failure to observe this caution may result in electric shock or injury.

- For disassembly or repair, contact your Yaskawa representative.

- Do not remove the motor, and do not release the brake.

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

- The battery pack must be connected before removing detection connector when maintenance and inspection.

Failure to observe this caution may result in the loss of home position data.
• The inspection interval depends on the total servo operation time.
• For any different or special applications, the inspection process should be developed on an 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*4</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
<td>1000 H Cycle</td>
<td>6000 H Cycle</td>
<td>12000 H Cycle</td>
</tr>
<tr>
<td>1  Alignment mark</td>
<td>O</td>
<td>Visual</td>
<td>Check alignment mark accordance and damage at the home position.</td>
<td>O</td>
</tr>
<tr>
<td>2  Working area and whole exterior of manipulator</td>
<td>O</td>
<td>Visual</td>
<td>Clean the work area if dust or spatter is present. Check for damage and outside cracks.</td>
<td>O</td>
</tr>
<tr>
<td>3  Baseplate mounting bolts</td>
<td>O</td>
<td>Spanner Wrench</td>
<td>Tighten loose bolts. Replace if necessary.</td>
<td>O</td>
</tr>
<tr>
<td>4  Cover mounting screws</td>
<td>O</td>
<td>Screw-driver, Wrench</td>
<td>Tighten loose bolts. Replace if necessary.</td>
<td>O</td>
</tr>
<tr>
<td>5  Connector Base</td>
<td>O</td>
<td>Manual</td>
<td>Check for loose connectors.</td>
<td>O</td>
</tr>
<tr>
<td>6  Elevation/ L-, U-, B-, T-axis timing belts</td>
<td>O</td>
<td>Manual</td>
<td>Check for belt tension and wear.</td>
<td>O</td>
</tr>
<tr>
<td>7  Power cable</td>
<td>O</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 cable bearer.</td>
<td>O</td>
</tr>
<tr>
<td>8  Wire harness in manipulator</td>
<td>O</td>
<td>Replace</td>
<td>Check for conduction between terminals. Check for wear of protective spring.<em>1</em>2</td>
<td>O</td>
</tr>
<tr>
<td>9  Battery pack in manipulator</td>
<td>O</td>
<td>Multimeter</td>
<td>Replace the battery pack if the voltage is 2.8 V or less. See Par. 8.2.1.</td>
<td>O</td>
</tr>
<tr>
<td>10 LU-axis joint</td>
<td>O</td>
<td>Visual</td>
<td>Check for grease leakage</td>
<td>O</td>
</tr>
</tbody>
</table>
### 8.1 Inspection Schedule

#### Table 7 Inspection Items

<table>
<thead>
<tr>
<th>Items&lt;sup&gt;4&lt;/sup&gt;</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Daily</td>
<td>1000 H Cycle</td>
<td>6000 H Cycle</td>
<td>12000 H Cycle</td>
</tr>
<tr>
<td>L-, U- axis speed reducer</td>
<td>O</td>
<td>O</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Replenish grease&lt;sup&gt;3&lt;/sup&gt; (6000H cycle). See Par. 8.2.3.</td>
</tr>
<tr>
<td>B-, T-axis speed reducer, T-axis gear</td>
<td>O</td>
<td>O</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Replenish grease&lt;sup&gt;3&lt;/sup&gt; (6000H cycle). See Par. 8.2.4.</td>
</tr>
<tr>
<td>Turning axis speed reducer</td>
<td>O</td>
<td>O</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Replenish grease&lt;sup&gt;3&lt;/sup&gt; (6000H cycle). See Par. 8.2.6.</td>
</tr>
<tr>
<td>Servo track speed reducer</td>
<td>O</td>
<td>O</td>
<td>Replace Visual</td>
<td>Check for malfunction. (Replace if necessary.) No grease replenishment is necessary as it is a grease enclosed type</td>
</tr>
<tr>
<td>Rack-and-pinion</td>
<td>O</td>
<td>O</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Replenish grease&lt;sup&gt;3&lt;/sup&gt; (6000H cycle). See Par. 8.2.7.</td>
</tr>
<tr>
<td>Linear motion guide</td>
<td>O</td>
<td>O</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Replenish grease&lt;sup&gt;3&lt;/sup&gt; (6000H cycle). See Par. 8.2.5 and Par. 8.2.7.</td>
</tr>
<tr>
<td>Overhaul</td>
<td></td>
<td></td>
<td></td>
<td>O</td>
</tr>
</tbody>
</table>

<sup>1</sup> 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 "8.3 Notes for Maintenance ")

<sup>2</sup> Wire harness in manipulator and timing belt for elevation axis and L-, U-, B-, T-axis are to be replaced in the overhaul.

<sup>3</sup> For the grease used for the replenishment, refer to "Table 8 Inspection Parts and Grease Used ".

<sup>4</sup> Inspection numbers correspond to the numbers in "Fig. 11 Inspection Parts and Inspection Numbers (Manipulator in Home Position) ".

---

8-3
The inspection numbers correspond to the numbers in "Table 7 Inspection Items".

![Top View](image1)

![Back View](image2)

**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>11</td>
<td>Harmonic grease</td>
<td>Harmonic speed reducers for the manipulator axes, and T-axis gear</td>
</tr>
<tr>
<td>12</td>
<td>SK-1A</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Molywhite RE No.00</td>
<td>RV speed reducer for turning axis</td>
</tr>
<tr>
<td>15</td>
<td>Alvania EP No. 02</td>
<td>Rack-and-pinion of servo track</td>
</tr>
<tr>
<td>16</td>
<td>THK AFB-LB</td>
<td>Linear motion guide</td>
</tr>
</tbody>
</table>
8.2 Notes on Maintenance Procedures

8.2.1 Battery Pack Replacement

The battery packs are attached to locations indicated in the following figure.

Note:
1. Do not pull the battery pack out of the board.
2. Do not pull the internal lead wire out of the board.
3. Properly fasten the wires with cable ties to keep them organized.
8.2 Notes on Maintenance Procedures

1. Turn OFF the NXC100 (or JRC) main power supply.
2. Remove the plate from the base connector and pull out the battery pack 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.

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

6. Mount the new battery pack on the battery holder.
7. Reinstall the plate.

**NOTE** Be sure not to pinch the cable when putting the plate back into place.
8.2.2 Grease Replenishment for L-Axis Speed Reducer

To perform the operation, refer to "Fig. 14 L-Axis Speed Reducer Diagram".

1. Remove the plug from the Lo exhaust port.

   **NOTE** Adding grease without removing the plug for exhaust port increases the inner pressure and may cause a damage. Never fail to remove the plug before the grease injection.

2. Inject the grease into the Li grease inlet using a grease gun.

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

<table>
<thead>
<tr>
<th>Grease type: Harmonic grease SK-1A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of grease: 15 cc</td>
</tr>
</tbody>
</table>

3. Move the L-Axis for a few minutes to discharge the excess grease.
4. Wipe the discharged grease with a cloth. Apply Three Bond 1206C on the thread part of the plug for the Lo exhaust port, and install the plug back in place.
8.2.3 Grease Replenishment for U-Axis Speed Reducer

To perform the operation, refer to "Fig. 15 U-Axis Speed Reducer Diagram".

1. Remove the cover, and remove the plug from the Uo exhaust port.

   **NOTE**
   If grease is injected without removing the plug for exhaust port, the grease will go inside the motor and may cause a damage. Never fail to remove the plugs before the grease injection.

2. Inject the grease into the Ui grease inlet using a grease gun.

   **Grease type:** Harmonic grease SK-1A  
   **Amount of grease:** 10 cc

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

3. Move the U-Axis for a few minutes to discharge the excess grease.
4. Wipe the discharged grease with a cloth. Apply Three Bond 1206C on the thread part of the plug for the Uo exhaust port, and install the plug back in place.
8.2.4 Grease Replenishment for B-, T-Axis Speed Reducers and T-Axis Gear

Fig. 16 B-, T-Axis Speed Reducers and T-Axis Gear Diagram

To perform the operation, refer to "Fig. 16 B-, T-Axis Speed Reducers and T-Axis Gear Diagram ".

1. Remove the cover, and remove the plugs from the Bo and To exhaust ports.

**NOTE** Adding grease without removing the plugs for exhaust ports increases the inner pressure and may cause a damage. Never fail to remove the plug before the grease injection.

2. Remove the plug from the Ti grease inlet, and attach a grease zerk A-MT6X1. (The grease zerk is delivered with the manipulator.)
3. Inject the grease into the Bi and Ti grease inlets using a grease gun.

**NOTE** The Bo and To exhaust ports are for AIR exhausts: the grease is not exhausted from the exhaust ports. Do not inject excessive grease into the grease inlets.

4. Move the B- and T-Axes for a few minutes to discharge the excess grease.
5. Wipe the discharged grease with a cloth. Apply Three Bond 1206C on the thread part of plugs for the Bo and To exhaust ports, and install the plugs back in place.
6. Remove the grease zerk from Ti grease inlet. Apply Three Bond 1206C on the thread part of the plug for the Ti grease inlet, and install the plug back in place.

Grease type: Harmonic grease SK-1A
Amount of grease: 10 cc for Bi
5 cc for Ti
8.2.5 Grease Replenishment for Elevation Axis and Timing Belt Adjustment

- Grease Replenishment for Elevation Axis (Refer to "Fig. 17 Elevation Axis and Timing Belt Diagram ".)
  1. Remove the elevation axis cover.
  2. Inject the grease into each grease inlet with a grease gun.
  3. Install the elevation axis cover back in place.

- Timing Belt Adjustment (Refer to "Fig. 17 Elevation Axis and Timing Belt Diagram ".)
  1. Remove the cover.
  2. Adjust the timing belts for the elevation axis.
  3. Install the cover back in place.

**Fig. 17 Elevation Axis and Timing Belt Diagram**

- Grease type: THK AFB-LB
- Recommended tensile strength: 13 to 17 N
8.2.6 Grease Replenishment for Turning Axis

To perform the operation, refer to "Fig. 18 Turning Axis Diagram".

1. Remove the plug from the exhaust port.
2. Remove a cap on the grease inlet, and attach a grease zerk to the inlet.
3. Inject grease into the grease inlet using a grease gun.

**Grease type:** Molywhite RE No. 00  
**Amount of grease:** 410 cc

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

4. Move the turning axis for a few minutes to discharge the excess grease.
5. Wipe the discharged grease with a cloth. Apply Three Bond 1206C on the thread part of the plug for the exhaust port, and install the plug back in place.
6. Remove the grease zerk from the grease inlet, and install the cap back in place.  
   (Apply Three Bond 1206C to the cap.)
8.2.7 Grease Replenishment for Servo Track

- **Grease Replenishment for Linear Motion Guide (Refer to "Fig. 19 Servo Track Diagram ")**
  
  Inject grease into the grease inlet using a grease gun.
  
  **Grease type: THK AFB-LB (for linear motion guide)**

- **Grease Application for Rack-and-Pinion (Refer to "Fig. 19 Servo Track Diagram ")**
  
  Apply grease to the rack-and-pinion. (For details, refer to the figure above.)
  
  **Grease type: Albania EP Grease No.02 (for rack)**
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. 20 Battery Pack Connection".
# Recommended Spare Parts

It is recommended to keep the parts and components in the following table in stock as spare parts for the MOTOMAN-UPJ3D. 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

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

<table>
<thead>
<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty per Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Grease</td>
<td>Harmonic Grease SK-1A</td>
<td>Harmonic Drive System Co., Ltd.</td>
<td>2.5 kg</td>
<td>For harmonic speed reducers of manipulator axes</td>
</tr>
<tr>
<td>A</td>
<td>2</td>
<td>Grease</td>
<td>THK AFB-LB</td>
<td>THK Co., Ltd.</td>
<td>70 g (400 g)</td>
<td>For servo track linear motion guide and elevation axis unit</td>
</tr>
<tr>
<td>A</td>
<td>3</td>
<td>Grease</td>
<td>Molywhite RE No.00</td>
<td>Yaskawa Electric Corporation</td>
<td>16 kg</td>
<td>For RV speed reducer of turning axis</td>
</tr>
<tr>
<td>A</td>
<td>4</td>
<td>Grease</td>
<td>Albania EP Grease No. 02</td>
<td>Yaskawa Electric Corporation</td>
<td>16 kg</td>
<td>For rack-and-pinion of servo track</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></td>
</tr>
<tr>
<td>B</td>
<td>6</td>
<td>Elevation Axis Timing Belt</td>
<td>060S3M249</td>
<td>Mitsuboshi Belting Ltd.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>7</td>
<td>L-Axis Timing Belt</td>
<td>060S3M249</td>
<td>Mitsuboshi Belting Ltd.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
<td>U-Axis Timing Belt</td>
<td>060S3M318</td>
<td>Mitsuboshi Belting Ltd.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>9</td>
<td>B-Axis Timing Belt</td>
<td>060S3M273</td>
<td>Mitsuboshi Belting Ltd.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>10</td>
<td>T-Axis Timing Belt</td>
<td>060S3M300</td>
<td>Mitsuboshi Belting Ltd.</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>B</td>
<td>11</td>
<td>Gear</td>
<td>HW9381785-A, HW9381786-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 9  Spare Parts for the Motoman-UPJ3D (NXC100)
<table>
<thead>
<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty</th>
<th>Qty per Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>12</td>
<td>Elevation Axis Direct Operated Unit</td>
<td>HW0380527-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>13</td>
<td>L-Axis Speed Reducer</td>
<td>HW9381719-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>14</td>
<td>U-Axis Speed Reducer</td>
<td>HW9381720-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>15</td>
<td>B-Axis Speed Reducer</td>
<td>HW9381726-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>16</td>
<td>T-Axis Speed Reducer</td>
<td>HW9381727-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>17</td>
<td>Turning Axis Speed Reducer</td>
<td>HW9280729-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>18</td>
<td>Servo Track Speed Reducer</td>
<td>HW0381342-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Servo Track Linear Motion Guide Unit</td>
<td>HW0381610-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
<td>For 10 m traverse track</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HW0381610-B</td>
<td></td>
<td></td>
<td></td>
<td>For 9 m traverse track</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HW0381610-C</td>
<td></td>
<td></td>
<td></td>
<td>For 8.6 m traverse track</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HW0381610-D</td>
<td></td>
<td></td>
<td></td>
<td>For 14 m traverse track</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HW0381610-E</td>
<td></td>
<td></td>
<td></td>
<td>For 15 m traverse track</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HW0381610-F</td>
<td></td>
<td></td>
<td></td>
<td>For 2 m traverse track</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>HW0381610-G</td>
<td></td>
<td></td>
<td></td>
<td>For 16 m traverse track</td>
</tr>
<tr>
<td>B</td>
<td>20</td>
<td>Wire Harness in Manipulator (Arm)</td>
<td>HW0171221-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>21</td>
<td>Wire Harness in Manipulator (Elevation Axis)</td>
<td>HW0171222-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td>For right arm</td>
</tr>
<tr>
<td>B</td>
<td>22</td>
<td>Wire Harness in Manipulator (Elevation Axis)</td>
<td>HW0171222-B</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td>For left arm</td>
</tr>
<tr>
<td>B</td>
<td>23</td>
<td>Wire Harness in Manipulator (Turning Axis)</td>
<td>HW0171223-A</td>
<td>Wire Harness in Manipulator (Elevation Axis)</td>
<td>1</td>
<td>1</td>
<td>For right arm</td>
</tr>
<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>
<td>Remarks</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>-------------------------------------------</td>
<td>-----------------------</td>
<td>---------------------------</td>
<td>-----</td>
<td>--------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>B</td>
<td>24</td>
<td>Wire Harness in Manipulator (Turning Axis)</td>
<td>HW0171223-B</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td>For left arm</td>
</tr>
<tr>
<td>B</td>
<td>25</td>
<td>Wire Harness in Manipulator (Power Cable in Column)</td>
<td>HW0171224-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td>For left arm</td>
</tr>
<tr>
<td>B</td>
<td>26</td>
<td>Wire Harness in Manipulator (Power Cable in Column)</td>
<td>HW0171224-B</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td>For right arm</td>
</tr>
<tr>
<td>B</td>
<td>27</td>
<td>Cable Bearer</td>
<td>PKK221/100/90/**P+PDVX3</td>
<td>Sankei Manufacturing Co., Ltd.</td>
<td></td>
<td></td>
<td>*** indicates the number of connected part</td>
</tr>
<tr>
<td>C</td>
<td>28</td>
<td>AC Servomotors for Elevation/L-/U-Axes</td>
<td>SGMAS-A8A2A-YR11</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>29</td>
<td>AC Servomotors for B-/T-Axes</td>
<td>SGMAH-A3A2A-YR11</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>30</td>
<td>AC Servomotors for Turning Axis and Servo Track</td>
<td>SGMPH-02A2A-YR11</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
### Table 10  Spare Parts for the Motoman-UPJ3D (JRC)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty</th>
<th>Qty per Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 1</td>
<td>Grease</td>
<td>Harmonic Grease SK-1A</td>
<td>Harmonic Drive System Co., Ltd.</td>
<td>2.5 kg -</td>
<td>For harmonic speed reducers of manipulator axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 2</td>
<td>Grease</td>
<td>THK AFB-LB</td>
<td>THK Co., Ltd.</td>
<td>70 g (400 g) -</td>
<td>For servo track linear motion guide and elevation axis unit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 3</td>
<td>Grease</td>
<td>Molywhite RE No.00</td>
<td>Yaskawa Electric Corporation</td>
<td>16 kg -</td>
<td>For RV speed reducer of turning axis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 4</td>
<td>Grease</td>
<td>Albania EP Grease No. 02</td>
<td>Yaskawa Electric Corporation</td>
<td>16 kg -</td>
<td>For rack-and-pinion of servo track</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 5</td>
<td>Battery Pack</td>
<td>HW9470917-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1 2</td>
<td>For elevation/LU-axes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A 6</td>
<td>Battery Pack</td>
<td>HW9470917-B</td>
<td>Yaskawa Electric Corporation</td>
<td>1 2</td>
<td>For BT/-turning axes (servo track)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 7</td>
<td>Elevation Axis Timing Belt</td>
<td>060S3M249</td>
<td>Mitsuboshi Belting Ltd.</td>
<td>1 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 8</td>
<td>L-Axis Timing Belt</td>
<td>060S3M249</td>
<td>Mitsuboshi Belting Ltd.</td>
<td>1 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 9</td>
<td>U-Axis Timing Belt</td>
<td>060S3M318</td>
<td>Mitsuboshi Belting Ltd.</td>
<td>1 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 10</td>
<td>B-Axis Timing Belt</td>
<td>060S3M273</td>
<td>Mitsuboshi Belting Ltd.</td>
<td>1 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 11</td>
<td>T-Axis Timing Belt</td>
<td>060S3M300</td>
<td>Mitsuboshi Belting Ltd.</td>
<td>1 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 12</td>
<td>Gear</td>
<td>HW9381785-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1 2</td>
<td>T-axis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 13</td>
<td>Elevation Axis Linear Motion Unit</td>
<td>HW0380527-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1 2</td>
<td>Ball screw</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 14</td>
<td>L-Axis Speed Reducer</td>
<td>HW9381719-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 15</td>
<td>U-Axis Speed Reducer</td>
<td>HW9381720-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 16</td>
<td>B-Axis Speed Reducer</td>
<td>HW9381726-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B 17</td>
<td>T-Axis Speed Reducer</td>
<td>HW9381727-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

9-4
Table 10  Spare Parts for the Motoman-UPJ3D (JRC)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Parts No.</th>
<th>Name</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty</th>
<th>Qty per Unit</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>18</td>
<td>Turning Axis Speed Reducer</td>
<td>HW9280729-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>19</td>
<td>Servo Track Speed Reducer</td>
<td>HW0381342-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>20</td>
<td>Servo Track Linear Motion Guide Unit</td>
<td>SHS20LV2SS+**LT-II</td>
<td>THK Co., Ltd.</td>
<td></td>
<td></td>
<td>*** indicates the length</td>
</tr>
<tr>
<td>B</td>
<td>21</td>
<td>Wire Harness in Manipulator (Arm)</td>
<td>HW0170140-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>22</td>
<td>Wire Harness in Manipulator (Elevation Axis)</td>
<td>HW0170361-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td>For right arm</td>
</tr>
<tr>
<td>B</td>
<td>23</td>
<td>Wire Harness in Manipulator (Elevation Axis)</td>
<td>HW0170361-B</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td>For left arm</td>
</tr>
<tr>
<td>B</td>
<td>24</td>
<td>Wire Harness in Manipulator (Turning Axis)</td>
<td>HW0171031-A</td>
<td>Wire Harness in Manipulator (Elevation Axis)</td>
<td>1</td>
<td>1</td>
<td>For right arm</td>
</tr>
<tr>
<td>B</td>
<td>25</td>
<td>Wire Harness in Manipulator (Turning Axis)</td>
<td>HW0171031-B</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>1</td>
<td>For left arm</td>
</tr>
<tr>
<td>B</td>
<td>26</td>
<td>Power Cable</td>
<td>HW0170821-A</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>27</td>
<td>Cable Bearer</td>
<td>KOL12/75X**P+PDV24X3</td>
<td>Sankei Manufacturing Co., Ltd.</td>
<td></td>
<td></td>
<td>*** indicates the number of connected part</td>
</tr>
<tr>
<td>C</td>
<td>28</td>
<td>AC Servomotors for Elevation/L-/ U-Axes</td>
<td>SGMAH-A6A1A-YR11</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>29</td>
<td>AC Servomotors for B-/T-Axes</td>
<td>SGMAH-A3A1A-YR11</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>30</td>
<td>AC Servomotors for Turning Axis and Servo Track</td>
<td>SGMPH-02A1A-YR12</td>
<td>Yaskawa Electric Corporation</td>
<td>1</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>