MOTOMAN-ES165RD II
SUPPLEMENTAL INSTRUCTIONS

TYPE:
YR-ES165RD-K05 (IP65 SPECIFICATION WITH TWO AIR LINES AND 23-WIRE INTERNAL USER I/O WIRING HARNESS)

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

- This manual explains maintenance procedures of the DX200 system. Read this manual carefully and be sure to understand its contents before handling the DX200.
- General items related to safety are listed in Section 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 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 an imminent hazardous situation which, if not avoided, could result in death or serious injury to personnel.

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

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

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

**PROHIBITED**
Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations. At any rate, be sure to follow these important items.

**NOTE**
To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “DANGER”, “WARNING” and “CAUTION”.
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 programing pendant are pressed. When the servo power is turned off, the SERVO ON LED on the programing 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.

Figure 1: Emergency Stop Button

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

Injury may result from unintentional or unexpected manipulator motion.

Figure 2: Release of Emergency Stop Button

• 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.
  – Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

• Confirm that no person is present in the P-point maximum envelope of the manipulator and that you are in a safe location before:
  – Turning on the power for the DX200.
  – Moving the manipulator with the programming pendant.
  – Running the system in the check mode.
  – Performing automatic operations.

Injury may result if anyone enters the working envelope of the manipulator during operation. Always press an emergency stop button immediately if there are problems.

The emergency stop button is located on the right of the front door of the DX200 and programing pendant.
Definition of Terms Used In this Manual

The MOTOMAN manipulator is the YASKAWA industrial robot product. The MOTOMAN usually consists of 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 and the controller</td>
<td>Manipulator cable</td>
</tr>
</tbody>
</table>
Descriptions of the programming pendant keys, buttons, and displays are shown as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Programming Pendant</td>
<td><strong>Character Keys</strong> The keys which have characters printed on them are denoted with [ ]. ex. [ENTER]</td>
</tr>
<tr>
<td></td>
<td><strong>Symbol Keys</strong> The keys which have a symbol printed on them are not denoted with [ ] but depicted with a small picture. ex. PAGE key The Cursor is an exception, and a picture is not shown.</td>
</tr>
<tr>
<td></td>
<td><strong>Axis Keys</strong> &quot;Axis Keys&quot; and &quot;Numeric Keys&quot; are generic names for the keys for axis operation and number input.</td>
</tr>
<tr>
<td></td>
<td><strong>Numeric Keys</strong> <strong>Keys pressed simultaneously</strong> When two keys are to be pressed simultaneously, the keys are shown with a &quot;+&quot; sign between them. ex. SHIFT key +COORD key</td>
</tr>
<tr>
<td></td>
<td><strong>Mode Key</strong> Three kinds of modes that can be selected by the mode key are denoted as follows: REMOTE, PLAY, or TEACH</td>
</tr>
<tr>
<td></td>
<td><strong>Button</strong> Three buttons on the upper side of the programming pendant are denoted as follows: HOLD button START button EMERGENCY STOP button</td>
</tr>
<tr>
<td></td>
<td><strong>Displays</strong> The menu displayed in the programming pendant is denoted with { }. ex. {JOB}</td>
</tr>
<tr>
<td></td>
<td><strong>PC Keyboard</strong> The name of the key is denoted ex. Ctrl key on the keyboard</td>
</tr>
</tbody>
</table>

**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.
Customer Support Information

If you need assistance with any aspect of your ES165RD II 2 Air Lines & I/O 23-Wire Harness system, please contact Motoman Customer Support at the following 24-hour telephone number:

(937) 847-3200

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

techsupport@motoman.com

When using e-mail to contact Motoman 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 Motoman Customer Support at the telephone number shown above.

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

- System: ES165RD II 2 Air Lines & I/O 23-Wire Harness
- 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
Introduction

This supplementary instruction manual describes how YR-ES165RD-K05 (hereinafter referred to as ES165RD-K05) is different from the YR-ES165RD-J00 (hereinafter referred to as ES165RD-J00).

In case of using ES165RD-K05, read this supplementary instruction manual thoroughly with: “MOTOMAN-ES165RD II INSTRUCTIONS” (170336-1CD).

Points of Differences

The ES165RD-K05 is different from the ES165RD-J00 in the following point:

• Environmental resistance: IP65
  (for the main part of the manipulator)
• 2 air line
• 23 core specification for internal user I/O wiring harness

The differences are described based on “MOTOMAN-ES165RD II INSTRUCTIONS”. Read this manual thoroughly replacing the subject matters for changes with this supplementary instruction manual.

2.1 Transport Method (page 2-1)

The weight (mass) of the manipulator described as “1960 kg” in the NOTE column shall be changed to “1980 kg”.

3.3 Location (page 3-5)

• Free from dust, soot, or water

Please replace the above sentence with the following one.

• Free from dust or soot; free from substances that may reduce the efficacy of sealant materials such as nitrile rubber oil seal, O-ring, gasket, and liquid gasket used in the manipulator.
4.2.2 Connection to the DX200 (page 4-4)

Fig. 4-3(a): Manipulator Cable Connectors (Manipulator Side)
5 Basic Specifications (page 5-1)

Replace the following items with the items in Table 5-1: "Basic Specifications (ES165RD-K05)"

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>MOTOMAN-ES165RD II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of Motion</td>
<td>S-Axis (turning)</td>
<td>-135° - +150°</td>
</tr>
<tr>
<td>Approx. Mass</td>
<td></td>
<td>1750 kg</td>
</tr>
<tr>
<td>Protective Structure</td>
<td>Basic axis: IP65 or equivalent</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wrist axis only: IP67 or equivalent</td>
<td></td>
</tr>
<tr>
<td>Ambient Conditions</td>
<td>Others</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Free from corrosive gas or liquid, or explosive gas</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Free from dust or soot; free from substances that may reduce the efficacy of sealant materials such as nitrile rubber oil seal, O-ring, gasket, and liquid gasket used in the manipulator.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>* Free from excessive electrical noise (plasma)</td>
<td></td>
</tr>
</tbody>
</table>

5.2 Manipulator Base Dimensions (page 5-2)

Fig. 5-2: Manipulator Base Dimensions
5.4 Dimensions and P-Point Maximum Envelope (page 5-3)

Fig. 5-3: Dimensions and P-Point Maximum Envelope (ES165RD-K05)
5.6 Alterable Operating Range (page 5-11)

The operating range of the S-axis can be altered in accordance with the operating conditions as shown in Table 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>-135° - +150° (standard)</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>

* The interval between stoppers must be 60° or more.

**NOTE** When altering the operating range to −15° to +15°, please contact your YASKAWA representative.
5.6.1 Components for Altering Operating Range

It is necessary to prepare the S-axis mechanical stopper components for the ES165RD-J00 specification. However it is not for the ES165RD-K05 specification because the components shown in the Fig. 5-11: “Components of S-axis Stopper” are normally supplied.

*Fig. 5-11: Components of S-axis Stopper*
5.6.2 Notes on the Mechanical Stopper Installation

- Apply the Locktite 242 to the thread part of the pin HW0402104-1, and install the pin bottom up into the S-axis mechanical stopper HW0302424-2 as shown in Fig. 5-11: “Components of S-axis Stopper”. Mount the stopper to the S-head with three hexagon head screws M20 (length: 45 mm) and tighten the screws to the tightening torque of 402 N•m (tensile strength: 1200 N/mm² or more). The stopper is installed as shown in Fig. 5-11: when the operating range is ±180°.

- The S-axis mechanical stopper can be installed at a pitch of 15 degrees. However, to avoid the mechanical troubles caused by interference between stoppers (e.g. ±15°, ±165°), install the stopper referring to Table 5-3: “Settable Angle for S-Axis Stopper”.

- To ensure the stopper strength, make sure to fix both sides of the protrusion with screws. DO NOT fix only one side of the protrusion. (See Fig. 5-12: “Properly-Mounted Image”.)

- The figures from Fig. 5-13(a) “Properly-Mounted Models for S-Axis Stopper” to Fig. 5-13(g) “Properly-Mounted Models for S-Axis Stopper” show how to install the S-axis mechanical stopper for positive (+) directions. For negative (-) directions, install the stopper symmetrically.

- As in the Fig. 5-13(a) through Fig. 5-13(g), the S-axis mechanical stopper is reversible that either side of the stopper can be used and installed except for the installation at the angles: ±30, ±60, ±120, ±150 degrees. If the stopper cannot be installed in the range shown in Table 5-3: “Settable Angle for S-Axis Stopper”, flip the stopper and retry installing the stopper.

**Fig. 5-12: Properly-Mounted Image**

1. Apply the specified components when mounting the S-Axis mechanical stopper.
2. TURN OFF the electric power supply before mounting.

**CAUTION**

- The S-axis movable range in the ES165RD-K05 specification is from -135 degrees to +150 degrees. Do not install the S-axis mechanical stopper outside the movable range.

The manipulator interferes and the mechanical failure may occur. (Do not install the stopper at the angles shown in Fig. 5-13(a) and Fig. 5-13(b).)
5.6.3 Adjustment of the Soft Limit of the S-Axis Pulse

Apply the Instruction for “DX200 Instructions chapter 8.17 Changing the Parameter Setting (165292-1CD)” as part of reference materials for adjusting the programming pendant when modifying the range of motion of S-Axis.

- Pulse limit (positive (+) direction of the S-axis): SICxG400
- Pulse limit (negative (-) direction of the S-axis): SICxG408

<table>
<thead>
<tr>
<th>Degree</th>
<th>0°</th>
<th>±15° 1)</th>
<th>±30°</th>
<th>±45°</th>
<th>±60°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pulse</td>
<td>0</td>
<td>±35840</td>
<td>±71680</td>
<td>±107520</td>
<td>±143360</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree</th>
<th>±75°</th>
<th>±90°</th>
<th>±105°</th>
<th>±120°</th>
<th>±135°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pulse</td>
<td>±179200</td>
<td>±215040</td>
<td>±250880</td>
<td>±286720</td>
<td>±322560</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree</th>
<th>+150°</th>
<th>-135°</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of pulse</td>
<td>+358400</td>
<td>-322560</td>
</tr>
</tbody>
</table>

1 Refer to section 5.6 “Alterable Operating Range”.

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.
### Table 5-3: Settable Angle for S-Axis Stopper

This table can be used when installing two mechanical stoppers on the S-axis. The vertical axis of the table shows the angles in the positive direction, and the horizontal axis of the table shows the angles in the negative direction.

**Exception:** The top left cell indicates the mountability of one stopper.

<table>
<thead>
<tr>
<th>Direction Angles</th>
<th>Settable angle</th>
<th>Disabled angle</th>
</tr>
</thead>
<tbody>
<tr>
<td>180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>165</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>105</td>
<td></td>
<td></td>
</tr>
<tr>
<td>120</td>
<td></td>
<td></td>
</tr>
<tr>
<td>135</td>
<td></td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>165</td>
<td></td>
<td></td>
</tr>
<tr>
<td>180</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Points of Differences
5.6 Alterable Operating Range (page 5-11)

Fig. 5-13(a): Properly-Mounted Models for S-Axis Stopper

**CAUTION**

- The S-axis movable range in the ES165RD-K05 specification is from -135 degrees to +150 degrees. Do not install the S-axis mechanical stopper outside the movable range.

The manipulator interferes and the mechanical failure may occur. (Do not install the stopper at the angles shown in Fig. 5-13(a) and Fig. 5-13(b).)
5.6 Alterable Operating Range (page 5-11)

Fig. 5-13(b) : Properly-Mounted Models for S-Axis Stopper

**CAUTION**

- The S-axis movable range in the ES165RD-K05 specification is from -135 degrees to +150 degrees. Do not install the S-axis mechanical stopper outside the movable range.

The manipulator interferes and the mechanical failure may occur. (Do not install the stopper at the angles shown in Fig. 5-13(a) and Fig. 5-13(b).)
Internal User I/O Wiring Harness and Air Line (page 7-2)

In the manipulator, 23 internal user I/O wires (0.75 mm² x 23 wires) and 2 air lines are incorporated 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 Line”.

The connector pins, and the terminals are assigned as shown in Fig. 7-2: “Connectors for Internal User I/O Wiring Harness and Air Line” and Fig. 7-3: “Details of the Connector Pin Numbers”. Wiring must be performed by users.

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>The allowable current for internal user I/O wiring harness</td>
<td>5.0 A or less / wire (0.75 mm²)</td>
</tr>
<tr>
<td>The maximum pressure for the air line</td>
<td>490 kPa (5 kgf/cm²) or less</td>
</tr>
</tbody>
</table>

(inside diameter: 8.0 mm)

Fig. 7-2: Connectors for Internal User I/O Wiring Harness and Air Line
Fig. 7-3: Details of the Connector Pin Numbers

Pin details for internal user I/O wiring harness
(Base side and Casing side)
8.2 Internal Connections (page 8-3)

High reliability connectors which can be easily put on and removed are used with each connector part. For the numbers, types, and locations of connectors, see Fig. 8-4: “Locations and Numbers of Connectors” and Table 8-1: “List of Connector Types”.

Fig. 8-4: Locations and Numbers of Connectors

Table 8-1: List of Connector Types

<table>
<thead>
<tr>
<th>Name</th>
<th>Type of Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connector for the internal user I/O wiring harness on the connector base</td>
<td>JL05-2A24-28PC (JL05-6A24-28S: Optional)</td>
</tr>
<tr>
<td>Connector for the internal user I/O wiring harness on the U-arm</td>
<td>JL05-2A24-28SC (JL05-6A24-28P: Optional)</td>
</tr>
</tbody>
</table>
8.1 Internal Connections

Notes
1. This diagram is for the MOTOMAN-ES165RD II with 23-wire harness and 2 air lines. L-AXIS and T-AXIS are connected to L.  AND U-AXIS INTERFERENCE L.S. CONNECTED TO A3
2. For the limit switch specification, the connection of the section □ (1) and □ (4) returns are changed as follows:

- LA1
- LB1
- S-AXIS OVERRUN L.S.

- LA2
- 0BAT11
- BAT
- 0BAT12
- A2 CONNECTED TO BAT11

- LA3
- BAT2
- 0BAT3
- A3 CONNECTED TO BAT3

- LD1
- B1
- 0BAT4
- 0BT
- 0BAT215
- B2 CONNECTED TO BAT5

- LD2
- LD2
- PG5V2
- 0V
- 0V
- PG0V3
- 0V
- 0V

- SLU-Axes with L.S. Specification

Controller (DX200)

Controller (DX200)
Fig. 8-5(b): Internal Connection Diagram (page 8-6)
9 Maintenance and Inspection

9.1 Inspection Schedule (page 9-3)

Add the following item to the Table 9-1: “Inspection Items”.

Table 9-1: Inspection Items

<table>
<thead>
<tr>
<th>Items</th>
<th>Schedule</th>
<th>Method</th>
<th>Operation</th>
<th>Inspection Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>18 Drain plug</td>
<td>Daily, 1000 H Cycle, 6000 H Cycle, 12000 H Cycle, 24000 H Cycle, 36000 H</td>
<td>Screwdriver, Wrench</td>
<td>Drain condensation water from the robot.</td>
<td>Specified Personnel, Licensee, Service Company</td>
</tr>
</tbody>
</table>

The inspection interval depends on the total servo operation time.

Add the following to Fig. 9-1: “Inspection Items (Additional)“on page 9-4.

Fig. 9-1: Inspection Items (Additional)
9.2 Notes on Maintenance Procedures (page 9-5)

9.2.1 Battery Pack Replacement

The battery packs are installed in the position shown in Fig. 9-2(a): “Battery Location (Back view)” and Fig. 9-2(b): “Battery Location (Left side view)”. If the battery alarm occurs in the DX200, replace the battery in accordance with the following procedures.

**Fig. 9-2(a): Battery Location (Back view)**

- Battery (HW0470360-A)
- Cover and gasket
  - Hexagon socket head cap screw M5×10 (16 screws)
  - Conical spring washer (H-5) (16 washers)
  - Tightening torque: 6 N·m (0.6 kgf·m)

**Fig. 9-2(b): Battery Location (Left side view)**

- Plate
  - Cross head APS bolt M4×8 (4 bolts)

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

- See the step 6.
- Battery pack before replacement
- See the step 5.
- New battery pack
9.2 Notes on Maintenance Procedures (page 9-5)

1. Turn OFF the DX200 main power supply.
2. Remove the cover of the connector base.
3. Remove the plate fixing screws and the plate, then pull the battery pack out to replace it with the new one.
4. Remove the battery pack from the battery holder.
5. Connect the new battery pack to the unoccupied connector on the board.
6. 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.

7. Mount the new battery pack on the battery holder.
8. Reinstall the plate with plate fixing screws.
9. The battery replacing procedure completes after reassembling the cover.

**NOTE**  Do not allow the plate to pinch the cables when reinstalling the plate.
9.3.2 Grease Replenishment/Exchange for S-Axis Speed Reducer (page 9-8)

Fig. 9-4: S-Axis Speed Reducer Diagram

9.3.2.1 Grease Replenishment

(Refer to Fig. 9-4: “S-Axis Speed Reducer Diagram”)

1. Remove the hexagon socket head plugs from the grease inlet.

2. Install a grease zerk A-PT1/4 to the grease inlet. (The grease zerk is delivered with the manipulator.)

3. Inject grease through the grease inlet by using a grease gun.
   - Grease type: Molywhite RE No. 00
   - Amount of grease: 1200 cc (2400 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 S-axis for a few minutes to discharge excess grease.

5. Wipe the discharged grease with a cloth, and reinstall the plug. Before installing the plug, apply Three Bond 1206C on the thread part of the plug, then tighten the plug with a tightening torque of 4.9 N•m (0.5 kgf•m).

6. Remove the grease zerk from the grease inlet and reinstall the hexagon socket head plug. Before installing the plug, apply Three Bond 1206C on the thread part of the plug, then tighten the plug with a tightening torque of 12 N•m (1.2 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.
9.3.7 Drainage Procedures of Dew Condensation Water (page 9-25)

Add this section to “9.3 Notes on Grease Replenishment/Exchange”.

Fig. 9-9: Dew Condensation Water Drainage

1. Make the U-axis horizontal to the ground as shown in Fig. 9-9: “Dew Condensation Water Drainage”.

2. Remove the plug from the water drainage port.

3. Drain the dew condensation water.

4. Reinstall the plug on the water drainage port.

5. Tighten the plug to 4.9 N•m (0.5 kgf•m). Apply Three Bond 1206C to screwed parts of the plug.
10 Recommended Spare Parts (page 10-2)

Replace the following items with the items in Table 10-1: “Spare Parts for the YR-ES165RD II” in “MOTOMAN-ES165RD II INSTRUCTIONS”.

Table 10-1: Spare Parts for the YR-ES165RD-K05

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<tr>
<th>Rank</th>
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<th>Name</th>
<th>Type</th>
<th>Manufacturer</th>
<th>Qty</th>
<th>Qty per Unit</th>
<th>Remarks</th>
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<td>Internal Wire Harness</td>
<td>HW1172044-A</td>
<td>YASKAWA</td>
<td>1</td>
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<td>Connector Base Set</td>
<td>HW1372025-A</td>
<td>YASKAWA</td>
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<td>1</td>
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</tbody>
</table>
MOTOMAN-ES165RD II
SUPPLEMENTAL INSTRUCTIONS

Specifications are subject to change without notice for ongoing product modifications and improvements.