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

MOTOMAN INSTRUCTIONS

- MOTOMAN-MPL160 INSTRUCTIONS
- DX100 INSTRUCTIONS
- DX100 OPERATOR’S MANUAL
- DX100 MAINTENACE MANUAL

The DX100 operator’s manual above corresponds to specific usage.
Be sure to use the appropriate manual.

Part Number: 166814-1CD
Revision: 0
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 manual carefully before doing maintenance on a MOTOMAN-MPL160.

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

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

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

1.1 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 several levels as shown in Table 1-1 Inspection Items on page 1-3.

In Table 1-1 Inspection Items on page 1-3, 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.
1 Maintenance and Inspection
1.1 Inspection Schedule

- The inspection interval depends on the total servo operation time.

- The following inspection schedule is based on the case that each axis is used under normal conditions. For axes which are used very frequently (in handling applications, etc.), it is recommended that inspections be conducted at intervals of 1/2 of the schedule indicated in Table 1-1 Inspection Items on page 1-3.

- From the standpoint of the preventive maintenance, it is recommended that the following parts be replaced at the secondary inspection (18000 Hr).
  - Speed reducers for the S-, L-, U-, and T-axes
  - Cross roller bearing for the U-axis
  - Oil seal for the L-, U-, and T-axis motor units
### Table 1-1: 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></td>
<td>Daily</td>
<td>1000 Hr Cycle</td>
<td>5000 Hr Cycle</td>
<td>9000 Hr Cycle</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
<td>Visual</td>
<td>Check alignment mark accordance and damage at the home position.</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td>Visual</td>
<td>Check for damage and deterioration of leads.</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td>Visual</td>
<td>Clean the work area if dust or spatter is present. Check for damage and outside cracks.</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td>Visual</td>
<td>Check for grease leakage.</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td>Spanner Wrench</td>
<td>Tighten loose bolts. Replace if necessary.</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td>Manual</td>
<td>Check for loose connectors and tighten if necessary.</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td>Manual</td>
<td>Check for loose connectors and tighten if necessary.</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td>Manual</td>
<td>Check for loose connectors.</td>
</tr>
<tr>
<td>9</td>
<td>Grease Gun, Visual</td>
<td></td>
<td>Supply grease. Check for loose screw nuts and shafts, and tighten if necessary.</td>
<td>●</td>
</tr>
<tr>
<td>10</td>
<td>Multimeter, Visual</td>
<td></td>
<td>Check for conduction between the main connector of base and intermediate connector with manually shaking the wire. Check for wear of protective spring.</td>
<td>●</td>
</tr>
<tr>
<td>11</td>
<td>Visual, Manual</td>
<td></td>
<td>Move the L- and U-axes back and forth, up and down to check any backlash. Replenish grease.</td>
<td>●</td>
</tr>
</tbody>
</table>

1. **Alignment mark**

2. **External lead**

3. **Working area and manipulator**

4. **Motors for L- and U-axes**

5. **Baseplate mounting bolts**

6. **Connector base**

7. **LU-axis connectors**

8. **Connectors in S-head**

9. **L-axis balancer**


11. **Links/Connections**
## Maintenance and Inspection

### MPL160 1.1   Inspection Schedule

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

<table>
<thead>
<tr>
<th>Items 1)</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 Hr Cycle</td>
<td>5000 Hr Cycle</td>
<td>9000 Hr Cycle</td>
</tr>
<tr>
<td>12 Battery pack in manipulator</td>
<td>●</td>
<td>●</td>
<td>Screwdriver, Wrench</td>
<td>Replace the battery pack when the battery alarm occurs or the manipulator drove for 36000 H. See Section 1.2.1 on page 1-7.</td>
</tr>
<tr>
<td>13 S-axis speed reducer</td>
<td>●</td>
<td>●</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Replenish grease5) (5000 H cycle). See Section 1.3.1 on page 1-10. Exchange grease5) (9000 H cycle). See Section 1.3.1 on page 1-10.</td>
</tr>
<tr>
<td>14 Speed reducers for L- and U-axes</td>
<td>●</td>
<td>●</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Replenish grease5) (5000 H cycle). See Section 1.3.2 on page 1-12 and Section 1.3.3 on page 1-16. Exchange grease5) (9000 H cycle). See Section 1.3.2 on page 1-12 and Section 1.3.3 on page 1-16.</td>
</tr>
<tr>
<td>15 T-axis speed reducer</td>
<td>●</td>
<td>●</td>
<td>Grease Gun</td>
<td>Check for malfunction. (Replace if necessary.) Replenish grease5) (5000 H cycle). See Section 1.3.4 on page 1-18. Exchange grease5) (9000 H cycle). See Section 1.3.4 on page 1-18.</td>
</tr>
<tr>
<td>16 Bearing</td>
<td>●</td>
<td>●</td>
<td>Grease Gun</td>
<td>Replenish grease5)6) Exchange grease5)</td>
</tr>
<tr>
<td>17 Motor cooling fan</td>
<td>●</td>
<td></td>
<td>Visual</td>
<td>Check for damage and operation.</td>
</tr>
<tr>
<td>18 Overhaul</td>
<td>●</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1) Specified Person: Licensee or Service Company.
1 Inspection item numbers correspond to the numbers in Fig. 1-1 Inspection Items on page 1-6.
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 1.3.6 “Grease Replenishment for Links” on page 1-21.
4 Wire harness in manipulator to be replaced at 18000H inspection.
5 For the grease, refer to Table 1-2 Inspection Parts and Grease Used on page 1-7.
6 Replenish grease to the U-axis cross-roller bearing at 5000 Hr or after a year, whichever comes first.
Fig. 1-1: Inspection Items

View A

View A
1.2 Notes on Maintenance Procedures

1.2.1 Battery Pack Replacement

The battery packs are installed in the position shown in Fig. 1-2(a Battery Location (Back View) (YR-MPL0160-A00FG), Fig. 1-2(b Battery Location (Back View) (YR-MPL0160-A04FG) and Fig. 1-2(c) Battery Location (Top View) on page 1-8. If the battery alarm occurs in the DX100, replace the battery in accordance with the following procedure:

---

**Table 1-2: Inspection Parts and Grease Used**

<table>
<thead>
<tr>
<th>No.</th>
<th>Grease Used</th>
<th>Inspected Parts</th>
</tr>
</thead>
<tbody>
<tr>
<td>13, 14, 15</td>
<td>JAX Halo-Guard FG-00</td>
<td>Speed reducers for S-, L-, U- and T-axes</td>
</tr>
<tr>
<td>9, 16</td>
<td>JAX Halo-Guard FG-2</td>
<td>L-axis balancer, bearings</td>
</tr>
</tbody>
</table>

The numbers in the above table correspond to the numbers in Table 1-1 Inspection Items on page 1-3

---
1. Turn OFF the DX100 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 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.

**NOTE:** Remove the old battery pack after connecting the new one so that the encoder absolute data does not disappear.
1.3 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 a motor and a speed reducer.

- If grease is added without removing the plug/screw from the grease exhaust port, 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.
1.3.1 Grease Replenishment/Exchange for S-Axis Speed Reducer and Gear

Fig. 1-4: S-Axis Speed Reducer and Gear Diagram

1.3.1.1 Grease Replenishment

(Refer to Fig.1-4 S-Axis Speed Reducer and Gear Diagram.)

1. Remove the hexagon socket head plugs from the grease inlet and grease exhaust port.

- If grease is injected with the plug on, 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 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 using a grease gun
   - Grease type: JAX Halo-Guard FG-00
   - Amount of grease: 2100 cc (4200 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 24.5 N•m (2.5 kgf•m).

6. Remove the grease zerk from the grease inlet, 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).
1.3.1.2 Grease Exchange

(Refer to Fig. 1-4 S-Axis Speed Reducer and Gear Diagram on page 1-10.)

1. Remove the hexagon socket head plugs from the grease inlet and grease exhaust port.

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 using a grease gun.
   
   - Grease type: JAX Halo-Guard FG-00
   - Amount of grease: approx. 10400 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. Before installing the plug, apply Three Bond 1206C on the thread part of the plug. Then tighten the plug with a tightening torque of 24.5 N•m (2.5 kgf•m).

   If the plug is installed while grease is being exhausted, grease will leak inside the motor and may cause a damage. Make sure to install the plug when the grease exhaust is completed.

7. Remove the grease zerk from the grease inlet, 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).
1.3.2 Grease Replenishment/Exchange for L-Axis Speed Reducer

*Fig. 1-5(a): L-Axis Speed Reducer Diagram*

- L-axis speed reducer
- Grease inlet
- Hexagon socket head plug
- Grease exhaust port
- Hexagon socket head plug
- Section A-A'
- 225 mm
- Grease zerk A-PT1/8 Joint PT1/8
- Hose for grease replenishment

*Fig. 1-5(b): L-Axis Grease Replenishment*
1.3.2.1 Grease Replenishment

(Refer to Fig. 1-5(a) L-Axis Speed Reducer Diagram on page 1-12 and Fig. 1-5(b) L-Axis Grease Replenishment on page 1-12.)

1. Remove the hexagon socket head plugs from the grease inlet and grease exhaust port.

   - If grease is injected with the plug on, 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 a 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: JAX Halo-Guard FG-00
   - Amount of grease: 360 cc
     (720 cc for 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

4. If you cannot inject grease with your grease gun, prepare a grease hose as shown in Fig. 1-5(b) L-Axis Grease Replenishment on page 1-12 and inject grease.

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. Before installing the plug, apply Three Bond 1206C on the thread part of the plug. Then tighten the plug with a tightening torque of 24.5 N•m (2.5 kgf•m).

7. Remove the grease zerk from the grease inlet, 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).
1.3.2.2 Grease Exchange

(Refer to Fig. 1-5(a) L-Axis Speed Reducer Diagram on page 1-12.)

1. Remove the hexagon socket head plugs from the grease inlet and grease exhaust port.
   - If grease is injected with the plug on, 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 a 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: JAX Halo-Guard FG-00
   - Amount of grease: approx. 1800 cc
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

CAUTION

• If the L-arm is tilted at 80 degrees or more, the link-C interferes with the plug for air exhaust.

Do not tilt the L-arm over 80 degrees when verifying the manipulator operation.
1.3 Notes on Grease Replenishment/Exchange Procedures

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

6. 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 24.5 N•m (2.5 kgf•m).

If the plug is installed while grease is being exhausted, grease will leak inside the motor and may cause a damage. Make sure to install the plug when the grease exhaust is completed.

7. Remove the grease zerk from the grease inlet, 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).
1.3.3 Grease Replenishment/Exchange for U-Axis Speed Reducer

Fig. 1-6: U-Axis Speed Reducer Diagram

1.3.3.1 Grease Replenishment

(Refer to Fig.1-6 U-Axis Speed Reducer Diagram.)

1. Remove the hexagon socket head plugs from the grease inlet and grease exhaust port.

- If grease is injected with the plug on, 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 a 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: JAX Halo-Guard FG-00
   - Amount of grease: 320 cc (640 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 U-axis for a few minutes to discharge excess grease.
1.3 Notes on Grease Replenishment/Exchange Procedures

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 24.5 N•m (2.5 kgf•m).

If the plug is installed while grease is being exhausted, grease will leak inside the motor and may cause a damage. Make sure to install the plug when the grease exhaust is completed.

6. Remove the grease zerk from the grease inlet, 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).

1.3.3.2 Grease Exchange

(Refer to Fig. 1-6 U-Axis Speed Reducer Diagram on page 1-16.)

1. Remove the hexagon socket head plugs from the grease inlet and grease exhaust port.

• If grease is injected with the plug on, 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 a 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: JAX Halo-Guard FG-00
   - Amount of grease: approx. 1600 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 U-axis for a few minutes to discharge excess grease.

6. 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 24.5 N•m (2.5 kgf•m).

If the plug is installed while grease is being exhausted, grease will leak inside the motor and may cause a damage. Make sure to install the plug when the grease exhaust is completed.

7. Remove the grease zerk from the grease inlet, 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).
1.3.4 Grease Replenishment/Exchange for T-Axis Speed Reducer

Fig. 1-7: T-Axis Speed Reducer Diagram

1.3.4.1 Grease Replenishment

(Refer to Fig. 1-7 T-Axis Speed Reducer Diagram.)

1. Remove the hexagon socket head plugs from the grease inlet and grease exhaust port.

- If grease is injected with the plug on, 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 a 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: JAX Halo-Guard FG-00
   - Amount of grease: 180 cc
     (360 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 T-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).
1.3 Notes on Grease Replenishment/Exchange Procedures

6. Remove the grease zerk from the grease inlet, 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).

1.3.4.2 Grease Exchange

(Refer to Fig. 1-7 T-Axis Speed Reducer Diagram on page 1-18.)

1. Remove the hexagon socket head plugs from the grease inlet and grease exhaust port.

- If grease is injected with the plug on, 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 a 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: JAX Halo-Guard FG-00
   - Amount of grease: approx. 900 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 T-axis for a few minutes to discharge excess grease.

6. 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).

- If the plug is installed while grease is being exhausted, grease will leak inside the motor and may cause a damage. Make sure to install the plug when the grease exhaust is completed.

7. Remove the grease zerk from the grease inlet, 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).
1.3.5 Grease Replenishment for U-axis Cross Roller Bearing

*Fig. 1-8: U-Axis Cross Roller Bearing Diagram*

1. Remove the hexagon socket head plug of the exhaust port. (Refer to *Fig. 1-8 U-Axis Cross Roller Bearing Diagram*.)

2. Remove the hexagon socket head plug of the grease inlet and install the grease zerk A-PT1/8. Inject grease through the grease inlet using a grease gun. (The grease zerk is delivered with the manipulator.)
   - Grease type: JAX Halo-Guard FG-2
   - Amount of grease: approx. 60 cc
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

3. Reinstall the plug into the exhaust port. 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).

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

4. Remove the grease zerk from the grease inlet, 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).
1.3.6 Grease Replenishment for Links

*Fig. 1-9: Grease Replenishment for Links*
1. Remove the hexagon socket head plug PT1/8 from the exhaust port of each link. (Refer to Fig. 1-9 Grease Replenishment for Links on page 1-21)

2. Remove the hexagon socket head plug PT1/8 from the grease inlet of each link and install the grease zerk A-PT1/8. Inject grease through the grease inlet using a grease gun. (The grease zerk is delivered with the manipulator.)
   - Grease type: JAX Halo-Guard FG-2
   - Amount of grease for links 1, 2, 3, 6: 6 cc (12 cc for 1st supply)
   - Amount of grease for links 4, 5, 9: 12 cc (24 cc for 1st supply)
   - Amount of grease for links 7, 8: 3 cc (6 cc for 1st supply)
   - Amount of grease for links 10, 11: 5 cc (10 cc for 1st supply)
   - Air supply pressure of grease pump: 0.3 MPa or less
   - Grease injection rate: 8 g/s or less

3. Reinstall the plug into the exhaust port of each link. 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).

4. Remove the grease zerk from the grease inlet, 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).
1.3.7 Notes for Maintenance

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. 1-10 Battery Pack Connection on page 1-24.

1.3.7.1 Battery Pack Connection

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

1. Remove the cap attached to the battery backup connector of the motors.

2. Connect the battery packs (HW9470932-A) with the battery backup connectors (BAT and OBT are marked) located at the end point of the cables for the encoder. (Under this condition, remove the encoder connector and carry out the maintenance checks.)

3. Confirm all connectors connected after the maintenance check, and remove the battery packs. Install the caps attached to the battery backup connectors of the motors.

Do not remove the battery pack in the connector base.
Fig. 1-10: Battery Pack Connection

Motor power connector
Connector for motor encoder

Battery pack: HW9470932-A

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

It is recommended to keep the parts and components in the following table in stock as spare parts for the MOTOMAN-MPL160. 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 2-1: Spare Parts for the YR-MPL0160-A00FG, -A04FG

<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>
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<tbody>
<tr>
<td>A</td>
<td>1</td>
<td>Grease</td>
<td>Halo-Guard FG-00</td>
<td>JAX</td>
<td>16kg</td>
<td>-</td>
<td>For speed reducers</td>
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<tr>
<td>A</td>
<td>2</td>
<td>Grease</td>
<td>Halo-Guard FG-2</td>
<td>JAX</td>
<td>16kg</td>
<td>-</td>
<td>For links and bearings</td>
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<tr>
<td>A</td>
<td>3</td>
<td>Battery Pack</td>
<td>HW0470360-A</td>
<td>Yaskawa</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
<td>A</td>
<td>4</td>
<td>Battery Pack</td>
<td>HW9470932-A</td>
<td>Yaskawa</td>
<td>1</td>
<td>1</td>
<td>For replacement of wire harness in manipulator</td>
</tr>
<tr>
<td>A</td>
<td>5</td>
<td>Liquid Gasket</td>
<td>Three Bond 1206C</td>
<td>ThreeBond Co., Ltd.</td>
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<td>B</td>
<td>6</td>
<td>S-axis Speed Reducer</td>
<td>HW0281280-A</td>
<td>Yaskawa</td>
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<td>1</td>
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<td>B</td>
<td>7</td>
<td>Gear Unit</td>
<td>HW0172120-A</td>
<td>Yaskawa</td>
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<td>B</td>
<td>8</td>
<td>Speed Reducer for L- and U-axes</td>
<td>HW0388209-B</td>
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<td>B</td>
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<td>Input Gear for L- and U-axes</td>
<td>HW9481362-A</td>
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<td>B</td>
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<tr>
<td>B</td>
<td>11</td>
<td>T-axis Input Gear</td>
<td>HW0412116-1</td>
<td>Yaskawa</td>
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<td>1</td>
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<td>B</td>
<td>12</td>
<td>U-axis Cross Roller Bearing</td>
<td>HW9482144-A</td>
<td>Yaskawa</td>
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<td>1</td>
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<tr>
<td>C</td>
<td>13</td>
<td>AC Servomotor for S-, L-, and U-axes</td>
<td>SGMRV-44ANA-YR1*</td>
<td>Yaskawa</td>
<td>1</td>
<td>3</td>
<td></td>
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<tr>
<td>C</td>
<td>14</td>
<td>AC Servomotor for T-axis</td>
<td>SGMRV-13ANA-YR1*</td>
<td>Yaskawa</td>
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<td>1</td>
<td></td>
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<tr>
<td>C</td>
<td>15</td>
<td>Wire Harness in Manipulator</td>
<td>HW0174949-A(-A00)</td>
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<td>C</td>
<td>16</td>
<td>Wire Harness in Manipulator</td>
<td>HW0374305-A(-A00)</td>
<td>Yaskawa</td>
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</tr>
</tbody>
</table>
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for ongoing product modifications and improvements.