Motoman XRC Controller

MRM2-1200M3X
Positioner Manual

Part Number: 149286-1CD
Revision 0

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Chapter 1

Introduction

1.1 About This Document

The MRM2-1200M3X Positioner Manual provides instructions for the MRM2-1200M3X positioner and is organized as follows:

SECTION 1 - INTRODUCTION
This section provides general information about the MRM2-1200M3X positioner, a list of reference documents, and customer service information.

SECTION 2 - SAFETY
This section provides information regarding the safe use and operation of the MRM2-1200M3X positioner.

SECTION 3 - INSTALLATION
This section provides instructions for set up and installation of the MRM2-1200M3X positioner.

SECTION 4 - MAINTENANCE
This section provides instructions for basic maintenance of the MRM2-1200M3X positioner.

SECTION 5 - SPARE PARTS
This section contains spare parts lists for the MRM2-1200M3X positioner.
1.2  Overview

The MRM2-1200M3X positioner is a two-station, horizontal ferris wheel type positioner with servo-driven headstocks.

![MRM2-1200M3X Positioner](image)

**Figure 1** MRM2-1200M3X Positioner

1.2.1  Major Components

The MRM2-1200M3X positioners include the following major components:

- Two-station horizontal positioner
- Cable set between positioner and controller
- Assembly kit for XRC controller (servopacks, etc.)
1.2.2 Technical Specifications

Refer to MOTOMAN dimension drawing No.148706-1 (standard version)

Table 4 Technical Specifications

<table>
<thead>
<tr>
<th>Model P/N</th>
<th>148706-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated PayLoad</td>
<td>2 x 1200 kg</td>
</tr>
<tr>
<td>Load Height (from floor to centerline)</td>
<td>910 mm</td>
</tr>
<tr>
<td>Programming Height</td>
<td>1141 mm</td>
</tr>
<tr>
<td>Max Cg Offset</td>
<td>76 mm</td>
</tr>
<tr>
<td>Max. Load Unbalance (Side A vs. Side B)</td>
<td>300 kg</td>
</tr>
<tr>
<td>Number of Motors</td>
<td>3</td>
</tr>
<tr>
<td>Index Motor Power</td>
<td>4.5 kW</td>
</tr>
<tr>
<td>Tooling Motor Power</td>
<td>2.2 kW</td>
</tr>
<tr>
<td>Side A to Side B Sweep Time</td>
<td>3.25 seconds</td>
</tr>
<tr>
<td>Index Axis Speed</td>
<td>0-12.8 rpm</td>
</tr>
<tr>
<td>Index Torque</td>
<td>5800 N•m</td>
</tr>
<tr>
<td>Tooling Index Time$^1$</td>
<td>2.25 seconds</td>
</tr>
<tr>
<td>Tooling Axis Speed</td>
<td>0-20.7 rpm</td>
</tr>
<tr>
<td>Tooling Torque</td>
<td>895 N•m</td>
</tr>
<tr>
<td>Total Index Time</td>
<td>3.25 seconds</td>
</tr>
<tr>
<td>Maximum Fixture Diameter $^3$</td>
<td>1300² mm</td>
</tr>
<tr>
<td>Standard Fixture Length $^4$</td>
<td>3000 mm</td>
</tr>
<tr>
<td>Position Accuracy</td>
<td>+/- 0.1 mm</td>
</tr>
<tr>
<td>Standard Tooling Air Size</td>
<td>2 x 10 mm ID</td>
</tr>
<tr>
<td>Standard Tooling Air Location</td>
<td>Headstock</td>
</tr>
<tr>
<td>E-Stop Time</td>
<td>0.3163 seconds</td>
</tr>
<tr>
<td>E-Stop Angle</td>
<td>14.24 degrees</td>
</tr>
<tr>
<td>Tooling Axis Weld Ground Capacity (100% Duty Cycle) $^5$</td>
<td>1200 Amps</td>
</tr>
<tr>
<td>Positioner Weight</td>
<td>4100 kg</td>
</tr>
</tbody>
</table>

1 Signal-to-signal time for 180 degrees of tool rotation.
2 Includes Side A to Side B Sweep time plus the Tooling Index time.
3 The fixture diameter of the side that sweeps under is limited to 450 mm in depth to clear the floor. This results in a “D” shaped tooling envelope.
4 Pin to pin dimension is 2920 +/- 7.5 mm
5 The tooling axis weld ground capacity can be increased to 1600 Amps with 149291-1 Block Kit.
1.2.3  Optional Equipment

Table 5  Optional Equipment

<table>
<thead>
<tr>
<th>Air Options</th>
<th>148927-1 3/4” ID Tailstock</th>
</tr>
</thead>
<tbody>
<tr>
<td>12-Channel I/O (12-channel - 12 conductors @ 10 amps)</td>
<td>148986-1 Tailstock</td>
</tr>
<tr>
<td>Multiple Angle Load Jog Switch</td>
<td>148092-4</td>
</tr>
<tr>
<td>Multiple Angle Load Thumbwheel</td>
<td>148092-3</td>
</tr>
<tr>
<td>Ground Block Kit, 1600 Amp</td>
<td>149291-1</td>
</tr>
</tbody>
</table>

1.3  Reference to Other Documentation

For additional information refer to the following:

- Concurrent I/O Parameters Manual for XRC 2001 (P/N 147626-1)
- Operator’s Manual for Arc Welding (P/N 142098-1)
- Operator’s Manual for General Purpose (P/N 142099-1)
- Operator’s Manual for Handling (P/N 142100-1)
- Operator’s Manual for Spot Welding (P/N 142101-1)
- Motoman Manipulator for your robot type
- Vendor manuals for system components not manufactured by Motoman

1.4  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, EA1900, etc.)
- Application Type (welding, handling, etc.)
- Robot Serial Number (located on back side of robot arm)
- Robot Sales Order Number (located on front door of XRC 2001 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. The address is as follows:

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

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 Safety (Section 2.6)
- Operation Safety (Section 2.7)
- Maintenance Safety (Section 2.8)

### 2.2 Standard Conventions

This manual includes information essential to the safety of personnel and equipment. As you read through this manual, be alert to the four signal words:

**DANGER!**

**WARNING!**

**CAUTION!**

**NOTE:**

Pay particular attention to the information provided under these headings which are defined below (in descending order of severity).

**DANGER!**

Information appearing under the DANGER caption 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!**

Information appearing under the WARNING caption 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!**

Information appearing under the CAUTION caption 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 caption 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, section 6.13.4 and 6.13.5, 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 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 measures are available:

• Safety fences and barriers
• Light curtains
• Door interlocks
• Safety mats
• Floor markings
• Warning lights

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 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 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. All personnel involved with the operation of the equipment must understand potential dangers of operation. Programming tips are as follows:

Any modifications to PART 1 of the XRC controller PLC can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to PART 1. 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.

Back up all programs and jobs onto a floppy disk whenever 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.

The concurrent I/O (Input and Output) function allows the customer to modify the internal ladder inputs and outputs for maximum robot performance. Great care must be taken when making these modifications. Double-check all modifications under every mode of robot operation to ensure that you have not created hazards or dangerous situations that may damage the robot or other parts of the system.

- 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 operate the system.
- 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 the E-STOP button on the teach pendant for proper operation before programming.
- Carry the teach pendant with you when you enter the workcell.
• Be sure that only the person holding the teach pendant enters the workcell.
• Test any new or modified program at low speed for at least one full cycle.

2.7 Operation 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. All personnel involved with the operation of the equipment must understand potential dangers of operation. Operation tips are as follows:

• Be sure that only trained personnel familiar with the operation of this robot, the operator’s manuals, the system equipment, and options and accessories are permitted to operate this robot system.
• Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
• Inspect the robot and work envelope to ensure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
• Ensure that all safeguards are in place.
• 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 operate the system.
• Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the cell.
• The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
• This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
• 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. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.

2.8 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. All personnel involved with the operation of the equipment must understand potential dangers of operation. Maintenance tips are as follows:

• Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.
• Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.

• 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 operate the system.

• Back up all your programs and jobs onto a floppy disk whenever program changes are made. A backup must always be made before any servicing or changes are made to options, accessories, or equipment to avoid loss of information, programs, or jobs.

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

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

• Be sure all safeguards are in place.

• Use proper replacement parts.

• This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

• 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. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.

• 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).
Chapter 3
Installation

3.1 Lifting Instructions

When lifting the positioner, use two fork lifts and lift from both ends using the integrated fork pockets.

WARNING!
Shipping brackets must be used when moving the positioner.

DANGER!
Forklift truck operation should be performed only by licenced personnel. In handling the positioner, extra care must be taken regarding the following:

Never place any part of your body under a suspended load or move a suspended load over any part of another person’s body. Careless handling may result in severe personal injury or death.
3.2 Installation Safety

Warning signs and restrictive devices such as fencing, chains, safety mats, or light beams must be placed around the working area of the robot/positioner. Warning signs should indicate hazardous conditions and results that may occur if the warning is disregarded. Refer to local regulations regarding Machine Safety.

3.3 Dimensions

![Figure 3 Dimensions](image)

3.4 Mounting

The MRM2-1200M3X positioner should be firmly mounted on a base plate or foundation rigid enough to support the positioner and withstand repulsion forces. The surface of the floor should be level and even. If it is uneven, grind the swell and flatten the surface.

The concrete thickness of the floor must be at least 150 mm.

**WARNING!**
The positioner weighs 4100 kg (9038 lbs). Make sure the lifting devices used to move the positioner are capable of safely handling this much weight, or damage to the equipment or injury to personnel can result.

1. Move the positioner in place for operation.
2. Insert an M20 concrete drill bit through the primary anchor bolt holes on each end of the positioner and drill holes (at least four inches deep into concrete) for anchor bolts.
3. Anchor the primary bolt locations using four M20 or 3/4-inch anchor bolts.

**Note:** It is important that both the headstock and tailstock are anchored to the floor prior to the removal of the shipping brackets. This prevents misalignment between the headstock and tailstock.
4. Use a M24 socket/wrench to remove the eight screws securing the shipping bracket to the positioner.
5. Remove shipping bracket.

*Note: Positioner shipping bracket are required to move the positioner. Be sure to keep the positioner shipping brackets for future use.*

6. Insert an M20 concrete drill bit through the secondary anchor bolt holes on each end of the positioner and drill holes (at least four inches deep into concrete) for anchor bolts.

7. Anchor the secondary bolt locations using eight M20 or 3/4-inch anchor bolts.

8. Using an M36 socket to turn each leveling bolt, stabilize the positioner.

*Note: The MRM2-1200M3X does not require leveling. The leveling bolts are designed to eliminate instability or “rock” caused by imperfections in the mounting surface.*
3.5 Connection to MOTOMAN XRC

Installation and connection to XRC comprises hardware as well as software installation, and must be carried out by MOTOMAN-service personnel. When the positioner is delivered together with a robot, this installation is complete.

See separate schematics for electrical connections:

![Positioner Connections](image)

**Figure 6** Positioner Connections

**WARNING!**

Install all electrical cables connecting the positioner, controller, welding machine, and electrical supply wiring cables so that there is no possibility of their being walked on or run over. Do not put any object directly on the cables.

Do not install cables across other cables, and do not lay cables underneath the welding machine.

The positioner is controlled from the robot controller/operators panel. Install these so that the positioner is in full view from the controller.
3.6 Before First Start

Before starting the operation, the safety fence, shield screens, cover and protective devices must be connected. Personnel should be instructed to stay outside the robot/positioner work area.

**WARNING!**
Check all safety functions, emergency stop buttons etc. Failure to do so could result in serious personal injury or death.

Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI) may cause unexpected positioner motion which may result in severe personal injury or death.

If RFI or EMI are suspected, contact an electrical noise consultant.

During operation, check the positioner for excessive vibration, unusual noise etc. If any of these occur, stop immediately by pushing EMERGENCY STOP button on the operator’s panel, and contact MOTOMAN service.

3.7 Tooling

Installation of tooling and fixtures should be performed by personnel who are familiar with the operation of this system. Tooling and fixtures are supplied by the customer.

**WARNING!**
Care must be taken when sweeping the positioner while in Teach mode. A-side tooling can hit the floor as it is being swept causing damage to equipment and tooling.

The MRM2-1200M3X is equipped with the MotoMount mounting system. MotoMount is a flexible tool fixture mounting system which improves tool repeatability and reduces loads on the headstock/tailstock bearing systems. MotoMount accommodates combined headstock/tailstock/tooling misalignments up to two degrees.

![Fig. 7 MotoMount](image)

To ensure that customer-supplied tooling fixtures fit properly to MotoMount, the following specifications must be met.
3.7.1 **Parallelism**

Inspect both mounting flanges for parallelism to one another. The combined angle of misalignment for both flanges should not exceed 1/2 degree (see Figure 8).

![Figure 8 Parallelism of Mounting Flanges](image)

3.7.2 **Mounting Hole Pattern**

The tooling fixture flange that fastens to MotoMount must have the following hole pattern. Both primary and auxiliary mounting holes must be used for tooling greater than 600 kg (1322.77 lbs) (see Figure 9).

![Figure 9 Mounting Holes](image)
3.7.3  Headstock Flange Specifications

Figure 10  Clearance Specifications

3.7.4  Tailstock Flange Specifications

Figure 11  Tailstock Adapter
3.8 Maximum Load

To guarantee long and safe operation with high positioning accuracy of your MRM2-1200M3X positioner, the machine must not be overloaded.

If the difference in weight between the two sides (A - B) exceed 300 kg the servo motor is overloaded. (e.g. when mounting or exchanging fixtures).

Follow restrictions below:

- Maximum static torque of servo axis = 895 Nm.
- Maximum payload = 1200 kg (incl. fixtures).
- Maximum offset from rotation centre at 1200 kg = 0.076 m

![Figure 12 Tailstock Component Clearance](image)

![Figure 13 Maximum Load](image)

<table>
<thead>
<tr>
<th>TOTAL TOOLING MASS (kg)</th>
<th>CENTER OF MASS OFFSET (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>0.182</td>
</tr>
<tr>
<td>750</td>
<td>0.122</td>
</tr>
<tr>
<td>1000</td>
<td>0.091</td>
</tr>
<tr>
<td>1200</td>
<td>0.076</td>
</tr>
</tbody>
</table>
Notes
Chapter 4

Maintenance

4.1 General

Maintenance of the positioner should be handled only by authorized personnel or MOTOMAN Service, who are thoroughly familiar with the design and construction of the system.

Before performing maintenance or service work, be sure to:

Turn off and lockout all electrical supplies.

Lock the wiring circuit breaker.

WARNING!

Due to possible interconnections of the positioner controller with other equipment, more than one live circuit can exist. Be sure you have turned off all live circuits before servicing.

In order to prevent inadvertent turning on of the machine, post a warning or danger notice on the disconnected main switch, indicating that maintenance is performed.

After completing maintenance work, be sure to check that all the cover clamping bolts are tight and that no tools are left in the interior of the working cell.

Table 6 Recommended Spare Parts List

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>133174-2</td>
<td>GREASE,C-SG,O ULTRA,RM2 400 G,1 POUND UNIT</td>
<td>1</td>
</tr>
<tr>
<td>132412-2</td>
<td>GREASE,MOLY-WHITE #00 14 OZ CARTRIDGE</td>
<td>1</td>
</tr>
<tr>
<td>479014-3</td>
<td>ADHESIVE,GASKET,LIQUID 100 GRAM TUBE</td>
<td>1</td>
</tr>
</tbody>
</table>

4.2 VIGO Drive Gear Reducer

4.2.1 Condition at delivery

Check lubrication before putting into service when delivered as spare part.
4.2.2 Mounting of motor

Seal between motor and housing with liquid gasket adhesive (P/N 479014-1).

4.2.3 Overhaul

After about 20,000 hours or 4 to 5 years operation, it is advisable to overhaul the unit and replace the grease.

4.2.4 Disassembly - Reassemble

In principle, disassembly of the reduction unit is not recommended. No attempt should be made to change the mesh or clearances within the unit. If the unit is disassembled by other than Teijin Seiki personnel then the operating and performance characteristic cannot be guaranteed.

4.3 Trunion Axis VIGO Drive RD-320E-81

4.3.1 Lubrication

The VIGO Drive RD-320E-81 series is a completely sealed unit (pre-greased) ready to be mounted to the servomotor.

4.4 Tooling Axis VIGO Drive RV-160E-145

<table>
<thead>
<tr>
<th>Mounting Torque Between:</th>
<th>Screws</th>
<th>Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headstock Gear - Swing Arm Housing</td>
<td>16 x M12 x 40 SHC</td>
<td>128.4 Nm</td>
</tr>
<tr>
<td>Drive - Headstock Gear Adapter</td>
<td>12 x M12 x 60 SHC</td>
<td>128.4 Nm</td>
</tr>
<tr>
<td>Servomotor - Motor Mounting Plate</td>
<td>4 x M12 x 45 SHC</td>
<td>100 Nm</td>
</tr>
</tbody>
</table>
4.4.1 Lubrication

The series VIGO Drive RV-160E-145 is filled with grease at delivery from MOTOMAN. However, if the gear drive is purchased directly from the manufacturer, grease is not in the drive. The drive must be lubricated before it is put into service. The amount of grease depends on direction of installation. Grease recommendation is TEIJIN SEIKI Molywhite R00. To lubricate the drive unit you must have the tooling drive covers removed to access the grease nipple. Remove the back access cover from the swing arm and remove the grease plug from the side of the drive. Pump grease into the drive until it starts to come out of the vent port.

4.5 Cleaning

The machine does not need any special cleaning beside normal cleaning once a shift (dust etc.). Keep an eye on the current transfer discs. If the surface is too worn, bad contact and bad welding result will occur.

4.6 AC servo

4.6.1 Servo motor

The AC servo motor has no wearing parts (e.g. brushes), so simple daily inspection is sufficient. The inspection schedule for the motor is shown in table.

Do not disassemble the motor. If disassembly should become necessary, contact MOTOMAN-service.

4.6.2 Servopack

The servopack does not require any special maintenance. Remove dust and tighten screws periodically.

### Table 9 Maintenance of AC Servo Motor

<table>
<thead>
<tr>
<th>Inspection Item</th>
<th>Frequency</th>
<th>Inspection Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vibration</td>
<td>Daily</td>
<td>Feel manually</td>
</tr>
<tr>
<td>Noise</td>
<td>Daily</td>
<td>Aurally</td>
</tr>
<tr>
<td>Exterior and cleaning</td>
<td>as required</td>
<td>Clean with dry cloth or compressed air</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>Annually</td>
<td>Make sure that it is more than 10 Mohm by measuring with a 500V megger after disconnection the motor from the controller</td>
</tr>
<tr>
<td>Shaft seal</td>
<td>Every 5,000 hr</td>
<td>Replace shaft seal</td>
</tr>
<tr>
<td>Overhaul</td>
<td>Every 20,000 hours or 5 years</td>
<td>If worn or damaged, replace after disconnecting the motor from the machine. Contact Motoman Service.</td>
</tr>
</tbody>
</table>
### Table 10 Troubleshooting

<table>
<thead>
<tr>
<th>Trouble</th>
<th>Cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor does not start</td>
<td>Loose connection</td>
<td>Tighten connection</td>
</tr>
<tr>
<td></td>
<td>Wrong wiring</td>
<td>Correct wiring</td>
</tr>
<tr>
<td></td>
<td>Overload</td>
<td>Reduce load</td>
</tr>
<tr>
<td>Unstable operation</td>
<td>Wrong wiring</td>
<td>Inspect and correct wiring across motor terminals L1, L2, L3 and PE</td>
</tr>
<tr>
<td>Motor overheats</td>
<td>Excessive ambient temperature</td>
<td>Reduce ambient temperature below 40°C</td>
</tr>
<tr>
<td></td>
<td>Motor surface is dirty</td>
<td>Clean motor surface</td>
</tr>
<tr>
<td></td>
<td>Overload</td>
<td>Reduce load</td>
</tr>
<tr>
<td>Unusual noise</td>
<td>Motor loosely mounted</td>
<td>Tighten foundation bolts</td>
</tr>
<tr>
<td></td>
<td>Motor misaligned</td>
<td>Realign</td>
</tr>
<tr>
<td></td>
<td>Coupling out of balance</td>
<td>Balance coupling</td>
</tr>
<tr>
<td></td>
<td>Noisy bearing</td>
<td>Check alignment, noise of bearing, lubrication and contact MOTOMAN-service</td>
</tr>
<tr>
<td></td>
<td>Vibration of driven machine</td>
<td>Contact machine manufacturer, MOTOMAN-service</td>
</tr>
</tbody>
</table>

*Note: Shaded text, remedies should be carried out after turning power off.*
## 4.7 Lubrication and Maintenance Schedule

**Table 11** Lubrication and Maintenance Schedule

<table>
<thead>
<tr>
<th>Interval</th>
<th>Point</th>
<th>Method</th>
<th>Lubricant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly</td>
<td>Security&lt;br&gt;Check bolts for fixtures and anchor bolts.&lt;br&gt;Cables and hoses&lt;br&gt;Check wear and condition</td>
<td>Visually, wrench key</td>
<td>Visually</td>
</tr>
<tr>
<td>5000 h</td>
<td>Slew bearing gear&lt;br&gt;It recommended to lube the pinion and gear with the same grease. The slew bearing is filled with LV 2 EP from the manufacturer. It is recommended to lube bearing with the same grease or equivalent as required.</td>
<td>Grease gun</td>
<td>O ULTRA C-SG GREASE</td>
</tr>
<tr>
<td>20,000 h</td>
<td>VIGO Drive RD-320E-81&lt;br&gt;Change grease after initially supplying the RV-E with specified quantity. 1040cc</td>
<td>Grease gun</td>
<td>TEIJIN SEIKI Molywhite R00</td>
</tr>
<tr>
<td></td>
<td>VIGO Drive RV-160E-145&lt;br&gt;Change grease after initially supplying the RV-E with specified quantity. 630cc&lt;br&gt;Recommend grease is TEIJIN SEIKI Molywhite R00</td>
<td>Grease gun</td>
<td>TEIJIN SEIKI Molywhite R00</td>
</tr>
</tbody>
</table>
4.8 Pneumatic options

Following options are available for the RM2 S3X-Series positioners.

Table 12 Pneumatic Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
<th>Option P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Drive side = 2x 1/4” BSPT. Drive unit has two separate 10mm air passages</td>
<td></td>
</tr>
<tr>
<td>Option 1</td>
<td>Support side = Bus communication unit</td>
<td></td>
</tr>
<tr>
<td>Option 2</td>
<td>High volume air, 0.75-inch diameter air line at each tailstock faceplate</td>
<td>148927-1</td>
</tr>
</tbody>
</table>
4.9 Resetting Home Position

Resetting the MRM2-1200M3X axes to Home position is typically done during initial installation or after a servo motor has been serviced.

To reset Home position, proceed as follows:

**S1**
1. Place the programming pendant in MANAGEMENT MODE.
2. Select the SERVO MONITOR screen.
3. Jog S1 axis into positioner hard stop with Side B at robot. Increment positioner against hard stop until S1 axis Max Torque equals 60% (+/- 5%).
4. Place the programming pendant in MAINTENANCE MODE.
5. Press the TOP MENU key on the programming pendant.
6. Cursor to ROBOT and press SELECT.
7. Cursor to HOME POSITION and press SELECT.
8. Press the PAGE OVER key to the S1 station (indicated in the top right corner).
9. Make sure the axis is in the position that you want to teach as Home and press SELECT.
10. Cursor to YES and press SELECT. The S1 axis is now reset to zero.

**S2**
1. Place robot in TEACH MODE and slowly jog axis until homing pin hole on adaptor plate is accessible.
2. Install homing pin into homing pin hole in adaptor plate.
3. Jog the S2 axis slowly until homing pin just touches stationary edge of structure. If you jog the axis too far, the pin will bend, causing an inaccuracy. Slowly jog the axis in reverse until pin is straight, but still touching the edge of structure.
4. Place the programming pendant in MAINTENANCE MODE.
5. Press the TOP MENU key on the programming pendant.
6. Cursor to ROBOT and press SELECT.
7. Cursor to HOME POSITION and press SELECT.
8. Press the PAGE OVER key to the S2 station (indicated in the top right corner).
9. Make sure the axis is in the position that you want to teach as Home and press SELECT.
10. Cursor to YES and press SELECT. The S2 axis is now reset to zero.
11. Remove the homing pin from the adaptor plate.
1. Place robot in TEACH MODE and slowly jog axis until homing pin hole on adaptor plate is accessible.

2. Install homing pin into homing pin hole in adaptor plate.

3. Jog the S3 axis slowly until homing pin just touches stationary edge of structure. If you jog the axis too far, the pin will bend, causing an inaccuracy. Slowly jog the axis in reverse until pin is straight, but still touching the edge of structure.

4. Place the programming pendant in MAINTENANCE MODE.

5. Press the TOP MENU key on the programming pendant.

6. Cursor to ROBOT and press SELECT.

7. Cursor to HOME POSITION and press SELECT.

8. Press the PAGE OVER key to the S3 station (indicated in the top right corner).

9. Make sure the axis is in the position that you want to teach as Home and press SELECT.

10. Cursor to YES and press SELECT. The S3 axis is now reset to zero.

11. Remove the homing pin from the adaptor plate.
Appendix A

Illustrated Parts List

A.1 Introduction

A.1.1 General

The Illustrated Parts List identifies, describes, and illustrates detail parts of the main assemblies for the Barrier Assembly Manual positioner manufactured by Motoman.

A.1.2 Purpose

This list provides parts identification and descriptive information for use in provisioning, requesting, purchasing, storing, and issuing spare parts.

A.1.3 Arrangement

Appendix A is arranged as follows:

Appendix A.1 – Introduction

Appendix A.2 – Illustrated Parts List

A.1.4 Explanation of Parts List

The parts list contains a breakdown of the equipment into detail parts. All parts of the equipment are listed except the following:

1. Standard hardware items (attaching parts) such as nuts, screws, washers, etc., which are available commercially.
2. Bulk items such as wire, cable, sleeving, tubing, etc., which are also commercially available.
3. Permanently attached parts which lose their identity by being welded, soldered, riveted, etc., to other parts, or assemblies.

This form is divided into four columns as follows:
1. “Figure - Item Number” Column
   This Figure column lists the figure number of the illustration applicable to a particular parts list and also identifies each part in the list by an item number. These item numbers also appear on the illustration. Each item number on the illustration is connected to the part to which it pertains by a leader line and arrow. Thus, the figure and item numbering system ties the parts list to the illustrations and vice versa.

2. “Motoman Part Number” Column
   All part numbers appearing in this column are Motoman part numbers.

3. “Description” Column
   The item nomenclature appears in this column.

4. “QTY” Column
   This column indicates the quantity of parts required for an assembly or subassembly in which the part appears. This column does not necessarily reflect the total used in the complete end item.

### A.2 Parts List

#### A.2.5 Explanation of Parts List Arrangement

The parts list is arranged so that the illustration will appear on left-hand page and the applicable parts list will appear on the opposite right-hand page. Unless the list is unusually long, the user will be able to look at the illustration and read the parts list without turning a page.

#### A.2.6 Symbols and Abbreviations

The following is a list of symbols and abbreviations used in the parts list.

- amp – ampere
- AC – alternating current
- cyl – cylinder
- DC – direct current
- fig – figure
- hex – hexagon
- ID – inside diameter
- in– inch
- m – meter
- mm – millimeter
- No– number
- psi – pounds per square inch
- v – voltage
Table 13  MRM2-1200M3X Components

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Motoman Part Number</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>148707-1</td>
<td>POSITIONER, ASSY, HEADSTOCK</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>148776-1</td>
<td>ARM ASSY, SWING, HEADSTOCK</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>148758-1</td>
<td>BEAM SPREADER</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>148777-1</td>
<td>ARM ASSY, SWING, TAILSTOCK</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>148717-1</td>
<td>POSITIONER, ASSY, TAILSTOCK</td>
<td>1</td>
</tr>
</tbody>
</table>
### Table 14  Headstock Assembly Components

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Motoman Part Number</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>148715-1</td>
<td>COVER, HOUSING, HEADSTOCK</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>148716-1</td>
<td>COVER, HOUSING</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>149172-1</td>
<td>SUPPORT, CABLE, HANGER</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>148709-1</td>
<td>HOUSING, HEADSTOCK</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>146909-1</td>
<td>BAR, GROUND</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>148710-1</td>
<td>DRIVE, ASSY, MAIN</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>148814-1</td>
<td>SHOCK ABSORBER</td>
<td>2</td>
</tr>
</tbody>
</table>
Table 15  Main Drive Assembly Components

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Motoman Part Number</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>142142-1</td>
<td>MOTOR, 4.5 kW</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>148712-1</td>
<td>RD-320E-81</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>148713-1</td>
<td>SPINDLE, GEAR, MAIN DRIVE</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>148714-1</td>
<td>GEAR, INPUT</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>148151-1</td>
<td>PLATE, MAIN</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>148711-1</td>
<td>PLATE, MAIN</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>140786-2</td>
<td>POSITIONER BEARING W/ GEAR</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 16  Headstock Swing Arm Assembly Components

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Motoman Part Number</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>148775-1</td>
<td>COVER, BACK</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>148783-1</td>
<td>DRIVE ASSY, HEADSTOCK</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>148780-1</td>
<td>GUARD, SWITCH</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>148761-1</td>
<td>PLATE, GROUND BRUSH</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>144371-1</td>
<td>BRUSH</td>
<td>6</td>
</tr>
<tr>
<td>6</td>
<td>144372-1</td>
<td>BRUSH HOLDER</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>148760-1</td>
<td>PLATE, LIMIT SWITCH</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>148748-1</td>
<td>SWITCH, LIMIT</td>
<td>2</td>
</tr>
</tbody>
</table>
### Table 16  Headstock Swing Arm Assembly Components

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Motoman Part Number</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>148823-1</td>
<td>ACTUATOR, LIMIT SWITCH</td>
<td>2</td>
</tr>
<tr>
<td>10</td>
<td>148780-2</td>
<td>GUARD, SWITCH</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>148762-1</td>
<td>PLATE, FACE, HEADSTOCK</td>
<td>2</td>
</tr>
<tr>
<td>12</td>
<td>149202-1</td>
<td>BLOCK ASSY, HEADSTOCK, MOTOMOUNT</td>
<td>2</td>
</tr>
</tbody>
</table>
### Table 17  Headstock Drive Assembly Components

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Motoman Part Number</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>142141-2</td>
<td>MOTOR, 2.2kW</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>140331-3</td>
<td>SCREW BHCS M6X10</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>132527-7</td>
<td>WASHER, FLAT, M6</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>148779-1</td>
<td>ADAPTER, MOTOR GEAR</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>148819-1</td>
<td>REDUCER, GEAR, RV-160E-145</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>146924-2</td>
<td>SEAL, O-RING, 219</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>148781-1</td>
<td>ADAPTER, GEAR, HEADSTOCK</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>479147-4</td>
<td>WASHER, FLAT, M6</td>
<td>1</td>
</tr>
<tr>
<td>9</td>
<td>407249-19</td>
<td>SCREW, SHC, M6X80</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>148820-1</td>
<td>SEAL, O-RING, 240ID</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>148763-1</td>
<td>ADAPTER, GEAR</td>
<td>1</td>
</tr>
<tr>
<td>12</td>
<td>133937-3</td>
<td>FITTING, ZERK, MT6X1</td>
<td>1</td>
</tr>
</tbody>
</table>
Table 18  Tailstock Swing Arm Assembly Components

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Motoman Part Number</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>148824-1</td>
<td>ADAPTER, ASSY, TAILSTOCK</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>148774-1</td>
<td>COVER, ACCESS</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>148718-1</td>
<td>BLOCK, WEDGE</td>
<td>2</td>
</tr>
</tbody>
</table>
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