

Motoman

**MSR2S-Series
Positioner Manual**
for Sigma III Motors

Part Number: 156489-1CD
Revision: 1

MOTOMAN
a YASKAWA company

Motoman, Incorporated
100 Automation Way
Miamisburg, OH 45342
TEL: (937) 847-6200
FAX: (937) 847-6277
24-Hour Service Hotline: (937) 847-3200

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Chapter 1

Introduction

1.1 About This Document

This manual is intended as an introduction and overview for personnel who have received operator training from Motoman, and who are familiar with the operation of this Motoman positioner model. For more detailed information, refer to the manuals listed in Section 1.3. This manual contains the following sections:

SECTION 1 - INTRODUCTION

This section provides general information about the MSR2S-Series and its components, options, equipment specifications, a list of reference documents, and customer service information.

SECTION 2 - SAFETY

This section provides information regarding the safe use and operation of the MSR2S-Series.

SECTION 3 - INSTALLATION

This section provides instructions for set up and installation of the MSR2S-Series.

SECTION 4 - OPERATION

This section provides instructions for basic operation of the MSR2S-Series. This section also provides procedures for start-up, normal operation, fault recovery, and shutdown.

SECTION 5 - MAINTENANCE

This section contains a table listing periodic maintenance requirements for the components of the MSR2S-Series.

1.2 MSR2S-Series Description

The Motoman MSR2S-Series positioners are 3-axis, 180-degree reciprocating positioners with capacity to handle loads of 500 kg and 750 kg per side. The maximum unbalanced load is 250 kg. The tooling axes of the 500-kg positioners are derivatives of the MH450 headstocks with a work envelope of 1.3 M in diameter and 2.0 M in length. The 750-kg positioner is available for those customers that need greater capacity. The tooling axes of the 750-kg positioner are derivatives of the MRM2-1200M3X product. The work envelope for the 750-kg positioner is 1.3 M in diameter and 3.0 M in length. A 4.4 kW motor drives the sweep axis for both the 500-kg and the 750-kg positioners. 1.3 kW motors drive the two tooling axes of the 500-kg positioner, while 2.0 kW motors drive the two tooling axes of the 750-kg positioner. The controller can rotate all three positioner axes simultaneously during the sweep motion. The headstocks can be coordinated with the robot's motion to weld circumferential joints. The operator stations can be programmed to jog in 30-degree increments. (Motoman offers an operator station with a jog switch for this function). The positioners have internal passages for routing air and electrical service to the tooling axes. The tooling tailstock shafts are hollow to allow routing of utilities to the fixtures. Motoman offers an optional slip ring kit for longer service life on rotating fixtures.

The MSR2S-Series positioners include the following features:

- MotoMount™ compliant tool mounting system
- Dual-channel in-position switches on sweep axis
- In-position switches on each tooling axis (30 degree increments)
- Arc screen provides shielding from arc flash

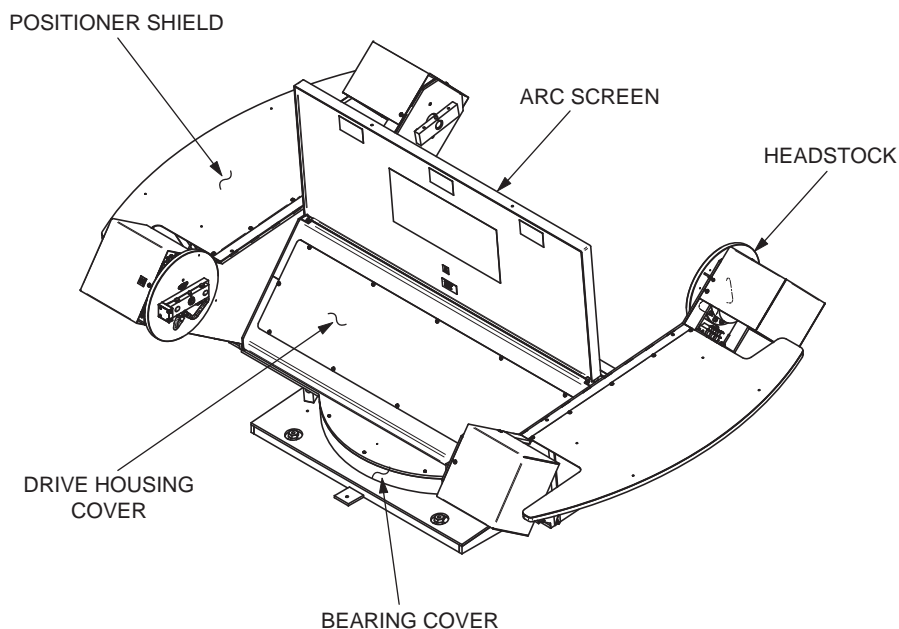


Figure 1 MSR2S-Series Positioner and Major Components

1.2.1 Layout

Figure 2 shows the layout, tooling envelope, and load heights for the MSR2S-Series positioner.

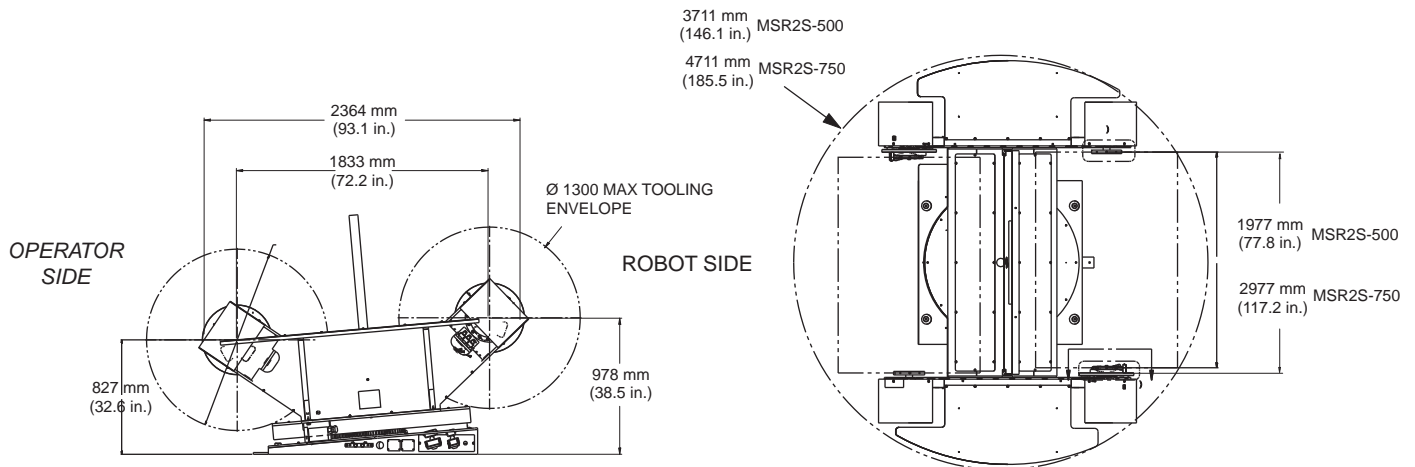


Figure 2 MSR2S-Series Positioner Layout

1.2.2 Specifications

See Table 4 for specifications.

Table 1 MSR2S-Series Specifications

Description	Unit	Specification
Base axis index sweep time @ 180 degrees	sec	3.7 (MSR2S-500) 5.0 (MSR2S-750)
Capacity per side	kg	500 per side (MSR2S-500) 750 per side (MSR2S-750)
Distance faceplate to faceplate	m	1977 (MSR2S-500) 2977 (MSR2S-750)
Maximum fixture diameter	m	1.3
Tooling axis torque (static)	N • m	745 (MSR2S-500) 895 (MSR2S-750)
Tooling axis speed	rpm	19.6 (MSR2S-500) 20.7 (MSR2S-750)
Tooling axis index time	sec/180 degrees	2.25 (MSR2S-500 @ 19.6 rpm) 2.25 (MSR2S-750 @ 20.7 rpm)
Repeatability	mm	± 0.1
Welding capacity @ 100% duty cycle	amps	800
Index sweep diameter	mm	(see Figure 2, Table A)
Load height	mm	821
Tailstock thru hole	mm	41

1.3 MotoMount

MotoMount (see Figure 3) 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. MotoMount is included with the MSR2S headstock/tailstock positioner.

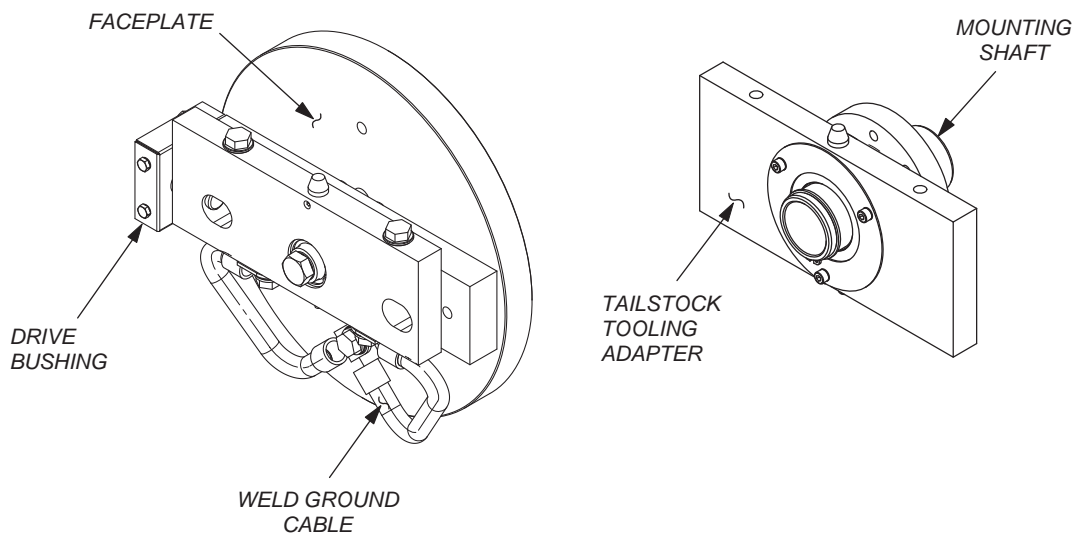


Figure 3 MotoMount Components

1.3.1 Optional Equipment

The following options are available for the MSR2S-Series:

- Slip ring kit (P/N 147478-1)

1.4 Reference to Other Documentation

For additional information refer to the following:

- System manual that came with your system
- Motoman Concurrent I/O Manual (P/N 149230-1)
- Vendor manuals for system components not manufactured by Motoman

1.5 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
- Application Type (material handling, arc welding, etc.)
- System Type (MSR2S-Series)
- Software Version (access using TOP MENU > SYSTEM INFO > VERSION > SYSTEM on the programming pendant)
- Robot Serial Number (located on back side of robot arm)
- Robot Sales Order Number (located on front door of controller)

Notes

Chapter 2

Safety

2.1 Introduction

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

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

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

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

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

This safety section addresses the following:

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

2.2 Standard Conventions

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



DANGER!

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



WARNING!

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



CAUTION!

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



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

2.3 General Safeguarding Tips

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

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this robot, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this robot system.
- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the robot cell.
- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).
- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- In accordance with ANSI/RIA R15.06-1999, section 4.2.5, Sources of Energy, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

2.4 Mechanical Safety Devices

The safe operation of the robot, positioner, auxiliary equipment, and system is ultimately the user's responsibility. The conditions under which the equipment will be operated safely should be reviewed by the user. The user must be aware of the various national codes, ANSI/RIA R15.06-1999 safety standards, and other local codes that may pertain to the installation and use of industrial equipment. Additional safety measures for personnel and equipment may be required depending on system installation, operation, and/or location. The following safety equipment is provided as standard:

- Safety fences and barriers
- Light curtains and/or safety mats
- Door interlocks
- Emergency stop palm buttons located on operator station, robot controller, and programming pendant

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

2.5 Installation Safety

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

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

2.6 Programming, Operation, and Maintenance Safety

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

- Inspect the robot and work envelope to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
- Be sure that all safeguards are in place. Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
- Do not enter the robot cell while it is in automatic operation. Be sure that only the person holding the programming pendant enters the workcell.
- Check the E-STOP button on the programming pendant for proper operation before programming. The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- Back up all programs and jobs onto suitable media before program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.

- Any modifications to PART 1, System Section, of the robot controller concurrent I/O program can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to PART 1, System Section. Making any changes without the written permission of Motoman will VOID YOUR WARRANTY!
- Some operations require standard passwords and some require special passwords. Special passwords are for Motoman use only. YOUR WARRANTY WILL BE VOID if you use these special passwords.
- The robot controller allows modifications of PART 2, User Section, of the concurrent I/O program and modifications to controller parameters for maximum robot performance. Great care must be taken when making these modifications. All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot and other parts of the system. Double-check all modifications under every mode of robot operation to ensure that you have not created hazards or dangerous situations.
- Check and test any new or modified program at low speed for at least one full cycle.
- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.
- Use proper replacement parts.
- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).

Notes

Chapter 3

Installation

The MSR2S-Series positioner can be installed easily in just a short time by three workers. The more people involved (within reason), the more quickly installation can be completed. Follow established safety procedures **at all times** throughout the installation process. Failure to use safe work practices can result in damage to the equipment and injury to the workers.



CAUTION!

Installation of the MSR2S-Series positioner is not a task for the novice. The MSR2S-Series positioner is not fragile, but it is a sophisticated machine. Handle components with care. Rough handling can damage electronic components.

3.1 Materials Required

All hardware necessary for installing the MSR2S-Series positioner is included. This section identifies customer-supplied items and tools required to complete installation.

3.1.1 Customer-Supplied Items

- Suitable floor anchors rated at 4000-kgf working load

3.1.2 List of Tools

- Safety glasses
- Face shields
- Gloves
- Level
- Hammer drill with appropriate concrete bits
- Phillips and flat screwdrivers
- Socket set
- Forklift and/or overhead crane
- Large torque wrench
- Large hex sockets-M14, M17, M19, M24
- Wrench sets (standard and metric)

3.2 Site Preparation

All components of the MSR2S-Series positioner must be firmly mounted on a foundation rigid enough to support its static and dynamic forces. Review drawing package for specifications. To prepare your site, proceed as follows:

1. Clear the floor space needed for the positioner. Refer to Figure 4 for the area needed for installation.
2. Gather all customer-supplied items and required tools listed in Section 3.1.

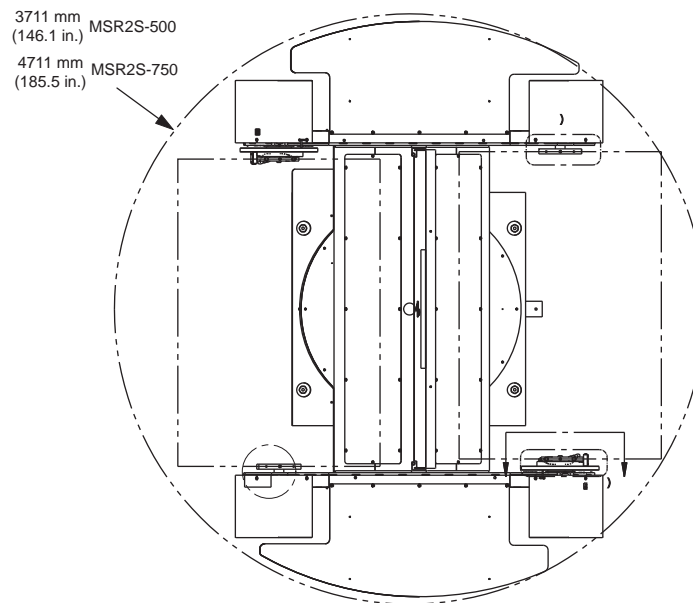


Figure 4 Area Needed for Installation

3.3 Unpacking the Positioner

This positioner is shipped individually on a shipping pallet. To unpack the positioner, proceed as follows:

1. Carefully remove protective plastic wrapping from the positioner.
2. Inspect positioner for shipping damage.



Note: If damage is found, notify shipper immediately.

3. Unbolt positioner from shipping skid. Refer to Figure 5 for location of shipping bolts.

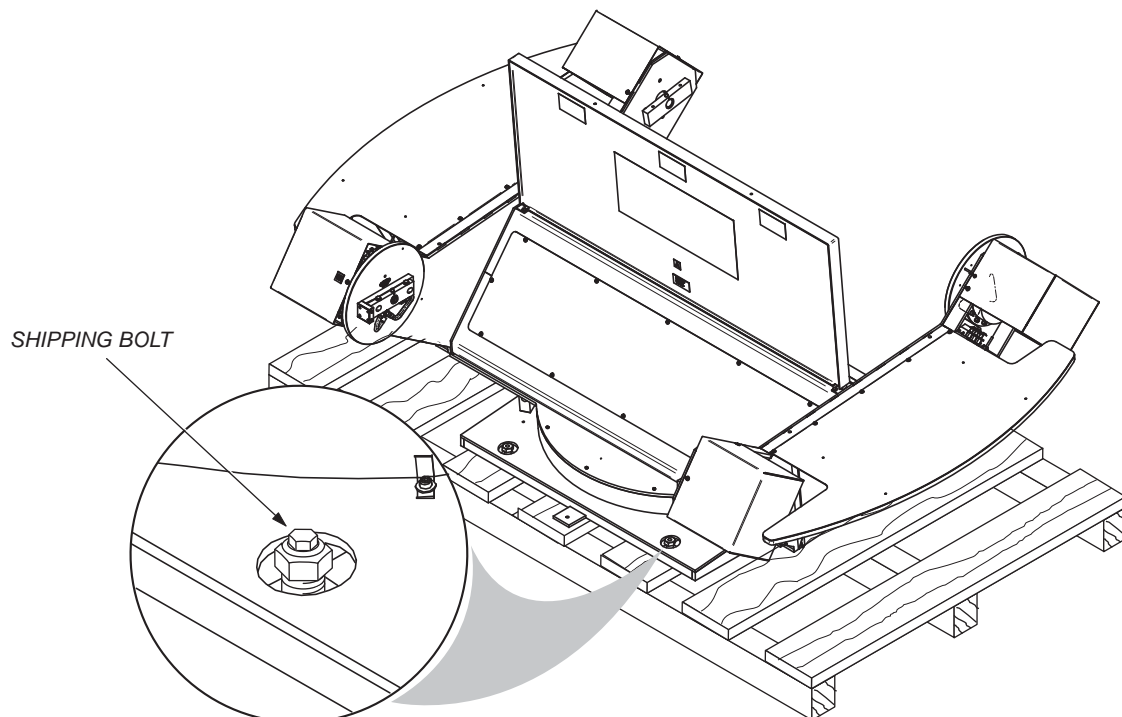


Figure 5 Location of Shipping Bolts



WARNING!

This positioner weighs 2070 kg (4563 lbs). Be sure that the lifting device used to lift it is capable of handling this much weight or damage to the equipment or injury to personnel can result.

4. Using a forklift, lift the positioner from the shipping pallet and place in position on floor. Make sure there is adequate room for tooling installation and part positioning.

3.4 Anchoring Positioner Base

1. Use bolt holes shown in Figure 6 as a guide for installation of the anchors. Transfer the hole locations to the concrete.
2. Install the anchors in the concrete per the manufacture's instructions.
3. Install a leveling shim at each anchor location.
4. Screw each leveling bolt down until it just contacts the leveling shim and hand tighten the anchor bolts or nuts.

3.5 Connecting the Cables

Do not connect the encoder, power, and ground cables until after the positioner is securely in place. When the MSR2S positioner is delivered with a Motoman robot, connections between the two usually have been made at the factory, or if not, instructions for making connections can be found in the system manual. See separate schematics and/or documentation specific to your system.

Attach weld ground cables (one for each power supply) to the weld ground bar located next to the Power and Encoder connectors (see Figure 6).

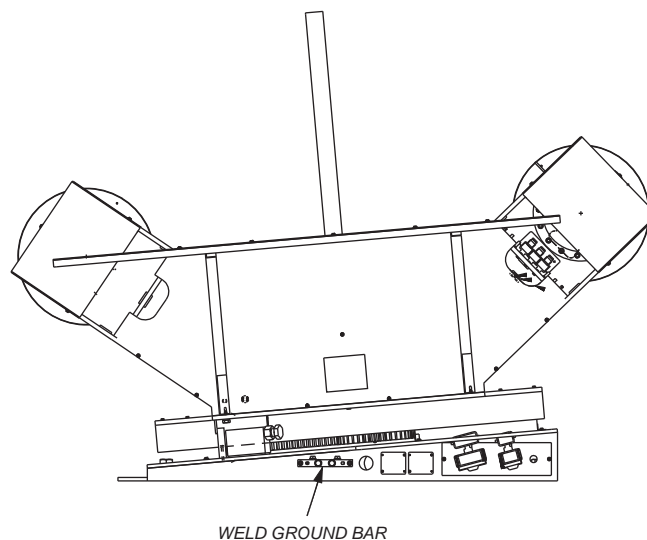


Figure 6 Installing Weld Ground Cables

3.6 Tooling Fixture Installation

The initial tooling installation is required prior to the headstock/tailstock alignment procedure.

1. Jog the headstock to the Home position (see Section 4.5).



WARNING!

Make certain servo power is OFF for the remainder of the installation, or serious operator injury and/or equipment damage may result.

2. Use a suitable lifting device to position the tooling above the headstock/tailstock assemblies.
3. Slowly lower tooling fixture while aligning with the headstock locating pin and the tailstock locating pin. Adjust tailstock angle as needed.
4. Secure the tooling to the drive assembly with customer-supplied M12, grade 8.8 (or better) bolts and hardened washers. Hardened washers are included with the MotoMount kit for this purpose.
5. Tighten tool mounting bolts to 76 Nm.



WARNING!

Check tool mounting bolts daily for proper tightness.

6. Continue lowering the tooling until the hoisting straps are loose.
7. Tighten the tailstock bearing retaining set screws.

3.7 Conducting a Safety/Operation Check

Before operating the MSR2S-Series positoner, take a few minutes to perform a safety/operation check. To perform a safety/operation check, proceed as follows:

1. Check that all cable connections are tight.
2. Check that all component hardware is tight.

Notes

Chapter 4

Maintenance

Maintenance of MSR2S-Series components should be performed only by authorized personnel who are familiar with the design and construction of this product. The following procedures should be performed only as needed. Read through the instructions completely before performing any maintenance procedure. Be sure that you understand the procedure, have the proper tools, and observe all applicable safety precautions.



WARNING! Ensure that servo power is OFF before performing the following procedures. Observe standard lockout/tagout practices.

4.1 Parts Ordering

To order replacement parts, contact the Motoman service staff at:

Motoman Customer Service
100 Automation Way
Miamisburg, OH 45342
Telephone: 937.847.3200
Fax: 937.847.3211

Please provide the following information:

- System Type (MotoRail)
- Application Type (material handling, arc welding, etc.)
- Part Name
- Motoman Part Number
- Quantity of Parts

4.2 Spare Parts

When a part malfunctions, it is helpful to have replacement parts in stock for quick replacement. Table 5 lists the recommended spare parts with Motoman part numbers. Motoman recommends the following parts be kept on hand:

Table 2 Recommended Spare Parts

Component	Part Number	Quantity
Weld Ground Brush Post	144370-1	2
Weld Ground Brush Holder	144372-1	1
Switch	143963-1	4
Brush	144371-1	2
Grease (for drive components)	Molywhite RE00 132412-1	1
Grease (for slewing bearing)	Kluber #039067, Lubricate 3000 133174-2	1



Note: The motor and reducer are not recommended for field service. The unit should be returned to Motoman for repairs to these components.

4.3 Servomotor

The AC servomotor has no wear parts (i.e. brushes), so a simple daily inspection is sufficient. *Do not disassemble the motor.* Contact the Motoman Service Department at (937) 847-3200 when overhaul becomes necessary.

4.4 Weld Ground Brush Replacement

To replace the grounding brush(s) proceed as follows:

1. Shut down cell at main disconnect.
2. Use a flathead screwdriver to disconnect the brush cable(s) from the ground post (refer to Figure 7).

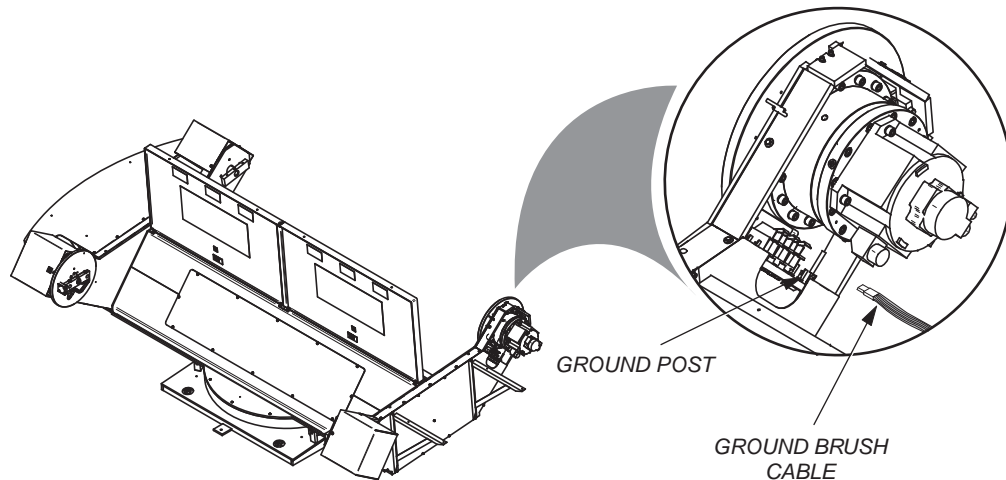


Figure 7 Disconnecting Brush Cable from Ground Post

3. Release the spring tensioner on the back of the brush by squeezing both black spring levers and pulling away from the faceplate.
4. Disconnect the brush cables from the ground posts. Remove the brush.
5. To install new brush, release spring tensioner on back of new brush and insert into faceplate.
6. Using a flathead screwdriver, reconnect brush cables to the ground post.

4.5 Homing

4.5.1 Homing Base Axis

To Home the base axis of the MSR2S positioner, jog the base axis so the B side is at the robot and the A side is at the operator loading area. Continue to rotate the axis into the hardstop until 50 to 60% motor torque is achieved. Reset this point as Home:

1. Make sure robot(s) is in Home position.
2. Place the programming pendant in TEACH MODE and jog the base axis **slowly** until the B-side is facing the robot side and the A-side is facing the operator loading area.
3. Continue to rotate the axis into the hardstop until 50 to 60% motor torque is achieved.
4. Enter this point as Home.

4.5.2 Homing Swing Arm Axes

To Home the swing arm axes of the MSR2S positioner, install the alignment pins in the faceplate holes and swing arm. Then reset the headstock as follows:

1. Make sure robot(s) is in Home position.
2. Place the programming pendant in TEACH MODE and jog the faceplate **slowly** until the homing hole in the face plate is aligned with the homing pin hole in the swing arm (see Figure 8).

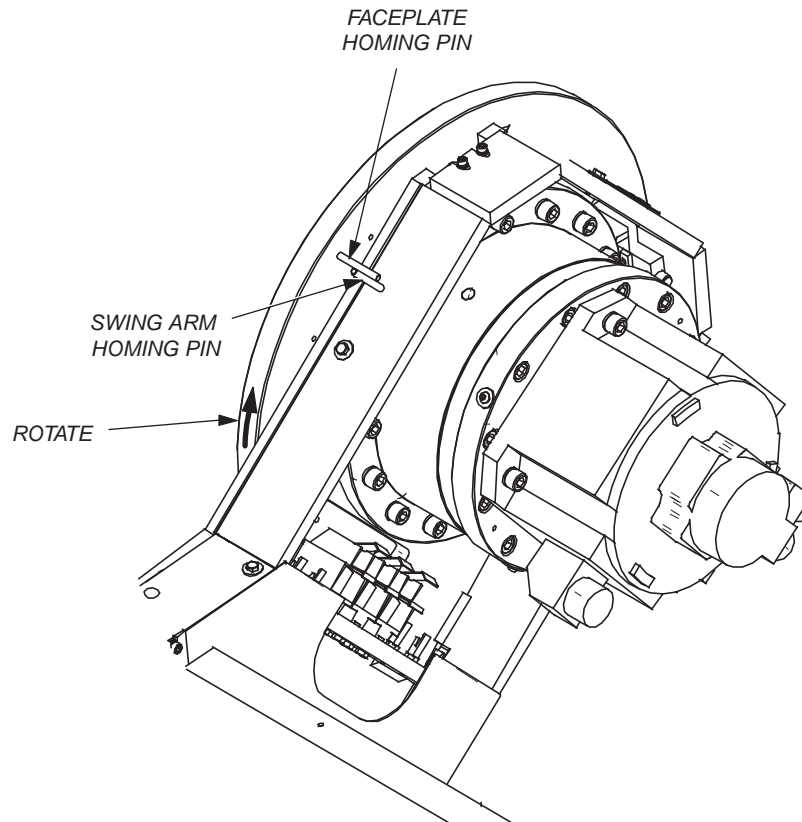


Figure 8 Home Position

3. Once the faceplate has been jogged into place, install both the faceplate and swing arm homing pins.
4. Slowly jog the drive assembly until the plastic pins just touch each other (see Figure 8). If you go too far, the pins will bend. Slowly jog the faceplate in reverse rotation until the pins return to a straight position.
5. Enter this point in the controller.

4.6 Adjusting Position Limit Switches

The headstock tooling plate can be rotated from the Home position (zero degrees) using the programming pendant and the three-position joystick at the operator station. Moving the joystick FORWARD rotates the headstock tooling plate clockwise 30 degrees, while moving it to REVERSE rotates the tooling plate counter clockwise 30 degrees.

As the tooling plate rotates, a factory installed screw (see Figure 9) located at Home position activates a limit switch. When activated, the limit switch overrides the safety light curtain functions. That allows operator access to the positioner without disrupting cycle time in the other zones.

Position limit functions are active during rotation of the headstock because the next tooling plate screw has not yet reached a limit switch.

Twelve user-defined load positions are available on the tooling plate at 30-degree intervals.

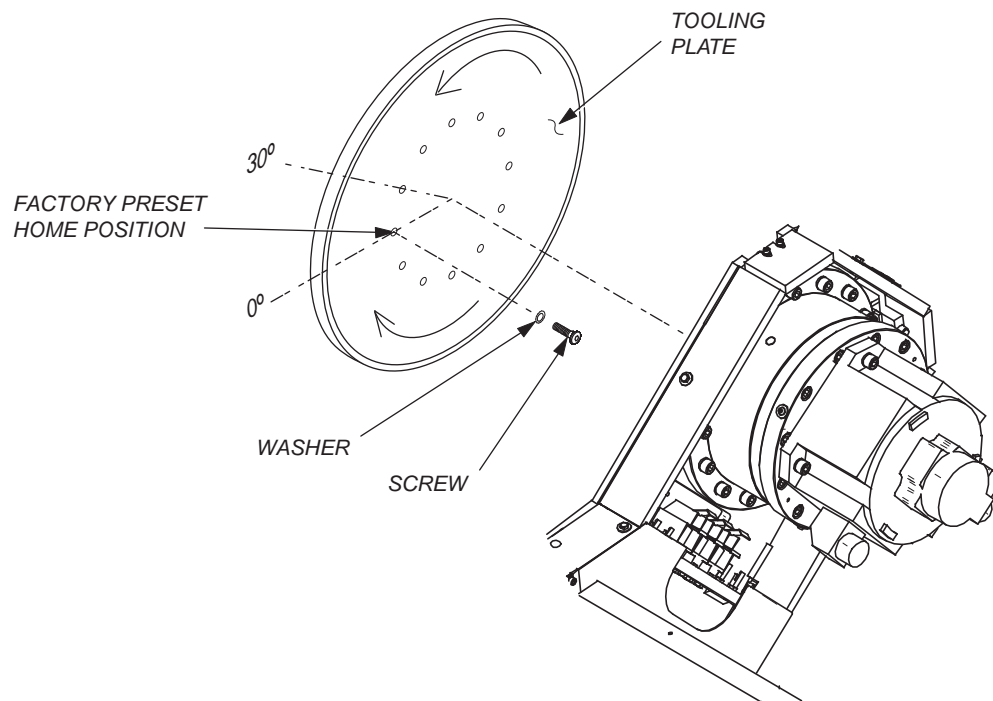


Figure 9 Position Limit Switch Setting

4.7 Positioner Maintenance Schedule

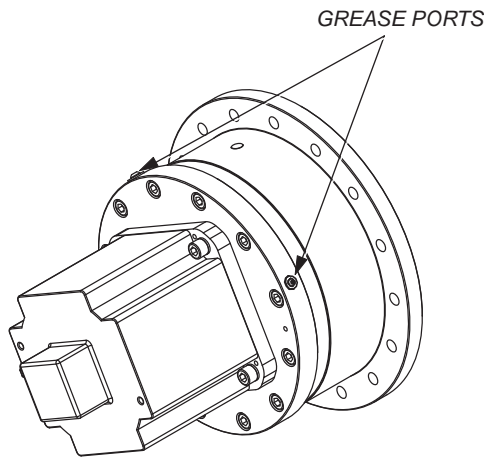
See Table 3 for the periodic maintenance schedule for positioner.

Table 3 Periodic Maintenance for Positoner

Inspection Item	Frequency	Inspection Operation
Physical damage	Daily	Check for physical damage; this indicates a load collision and is evidence of misuse.
Excessive or unusual noise	Daily	Listen for grinding, excessive or irregular noise. Contact Motoman Service Department at (937) 847-3200.
Weld Brushes	First Week	Check for dirt and ensure full contact with faceplate.
	Weekly	Check for dirt and ensure full contact with faceplate.
Cleaning	As required	Clean with dry cloth or compressed air.
Positioner Axis Motor Connectors	<ul style="list-style-type: none"> • 1,000 H • 6,000 H • 12,000 H 	Check for loose connections. Tighten if necessary.
Positioner Axis Speed Reducer and Gear	<ul style="list-style-type: none"> • 6,000 H 	Grease at 6,000H with Motoman P/N 132412-1, Molywhite RE00.
Positioner Axis Speed Reducer and Gear	<ul style="list-style-type: none"> • 12,000 H 	Replace grease at 12,000H with Motoman P/N132412-1, Molywhite RE00.
Limit Switch Actuator for Positioner Axis	<ul style="list-style-type: none"> • 6,000 H • 12,000 H 	Check for damage and looseness. Tighten and check the actuator movement.
Slewing Bearing	<ul style="list-style-type: none"> • Monthly 	Grease with Motoman P/N 133174-2, Kluber #039067, Lubricate 3000, or equivalent. Apply lubricant to bearing with a suitable brush.

H=Hours of operation

4.8 Grease Replenishment/Exchange for MSR2S 750



4.8.1 Grease Replenishment

1. Remove the plug from the grease exhaust port.



WARNING!

If grease is added with the plug on, the grease will go inside the motor and may cause damage. Always remove the plug before grease injection.

2. Inject the grease into the grease inlet using grease gun.
Grease type: Motoman P/N 132412-1, Molywhite RE00
3. Move the axis for a few minutes to discharge any excess grease.
4. Wipe the grease exhaust port with a clean cloth.
5. Apply silicon caulk on the thread part of the plug and reinstall the plug.

4.8.2 Grease Exchange

1. Remove the plug from the grease exhaust port.

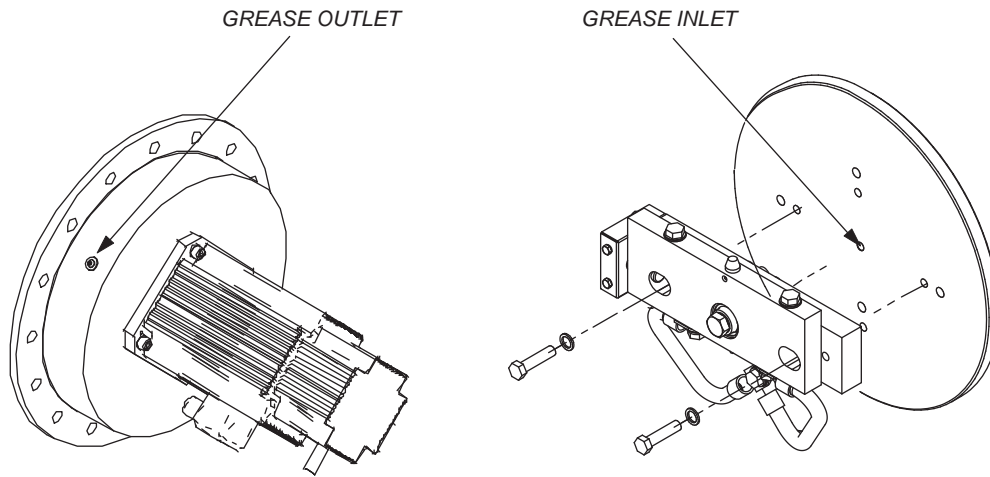


WARNING!

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2. Inject the grease into the grease inlet using grease gun.
Grease type: Motoman P/N 132412-1, Molywhite RE00
3. Grease replacement is complete when new grease appears in the grease exhaust port. The new grease can be distinguished from the old grease by color.
4. Move the axis for a few minutes to discharge any excess grease.
5. Wipe the grease exhaust port with a clean cloth.
6. Apply silicon caulk on the thread part of the plug and reinstall the plug.

4.9 Grease Replenishment/Exchange for MSR2S 500



4.9.1 Grease Replenishment

1. Carefully remove motomount from the headstock faceplate.
2. Locate and remove the plug from the grease inlet port in the center of the faceplate.
3. Locate and remove the plug from the grease outlet port.



WARNING!

If grease is added with the grease outlet plug on, the grease will go inside the motor and may cause damage. Always remove the plug before grease injection.

4. Inject the grease into the grease inlet using grease gun.
Grease type: Motoman P/N 132412-1, Molywhite RE00
5. Move the axis for a few minutes to discharge any excess grease.
6. Wipe the grease exhaust port with a clean cloth.
7. Apply silicon caulk on the thread part of the plug and reinstall the plug.
8. Reinstall motomount (see Section B.3.7, "Securing MotoMount Fixture onto Faceplate").

4.9.2 Grease Exchange

1. Carefully remove motomount from the headstock faceplate.
2. Locate and remove the plug from the grease inlet port in the center of the faceplate.
3. Locate and remove the plug from the grease outlet port.



WARNING!

If grease is added with the grease outlet plug on, the grease will go inside the motor and may cause damage. Always remove the plug before grease injection.

4. Inject the grease into the grease inlet using grease gun.
Grease type: Motoman P/N 132412-1, Molywhite RE00
5. Grease replacement is complete when new grease appears in the grease exhaust port. The new grease can be distinguished from the old grease by color.
6. Move the axis for a few minutes to discharge any excess grease.
7. Wipe the grease exhaust port with a clean cloth.
8. Apply silicon caulk on the thread part of the plug and reinstall the plug.
9. Reinstall motomount (see Section B.3.7, "Securing MotoMount Fixture onto Faceplate").

4.10 MotoMount

See Table 4 for periodic maintenance schedule for MotoMount.

Table 4 Periodic Maintenance for MotoMount

Frequency	Procedure
Daily	Using compressed air or a suitable brush, remove any weld spatter and dirt from the drive components, with particular attention to the drive bushing area.
	Verify tooling bolts are tight.
Monthly	Provide 2-3 pumps of grease (Motoman P/N 133174-2, Kluber #039067, Lubricate 3000, or equivalent) to the main bearing zerk fitting.
	Verify the leveling and lag bolts are tight on the positioner base.
Daily	Using compressed air or a suitable brush, remove any weld spatter and dirt from the drive component, with particular attention to the drive bushing area.

4.11 Troubleshooting

Table 5 identifies common problems that may occur during positioner operation. To troubleshoot your positioner, identify the type of problem and look for it in the PROBLEM column. Next to this column is a list of PROBABLE CAUSES, followed by possible SOLUTIONS.

Be aware that sometimes more than one problem can occur at the same time. After identifying and resolving a problem, test the system thoroughly to make sure no other problems exists..

Table 5 Troubleshooting

Symptom	Probable Cause	Corrective Action
Motor does not start	Loose connection	Check all wire connections.
	Incorrect wiring	Check that system has been wired correctly.
	Overload	Reduce load or reduce unbalanced load.
Unstable operation	Incorrect wiring	Inspect and correct wiring across motor terminals L1, L2, L3, and PE.
Motor overheats	Excessive ambient temperature	Reduce ambient temperature below 40° C (104° F). Positioner has an operating range of 0 to 45° C (32 to 113°F).
	Motor surface is dirty	Clean motor surface.
	Motor overloaded	Reduce load or unbalanced load.
Unusual noise	Motor loosely mounted	Tighten mounting bolts.
	Positioner misaligned	Realign headstock/tailstock.
	Noisy bearing	Check alignment, noise of bearing, lubrication. Call Motoman Service.
Weld quality bad	Brushes misaligned	Remove brush(s) and reinstall them properly. Recheck as needed.

Notes

Appendix A

Illustrated Parts List

A.1 Introduction

The Illustrated Parts List identifies, and illustrates detail parts of the main assemblies for the MSR2S-Series positioner. This list provides parts identification and descriptive information for use in provisioning, requesting, purchasing, storing, and issuing spare parts.

Contents

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., 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.

Parts List Form

This form is divided into four columns as follows:

1. “Figure - Item Number” Column
The 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. Item numbers also appear on the illustration. Each item number is connected to the part to which it pertains by a leader line and arrow. 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
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 reflect the total used in the complete end item.

A.2 Parts List

A.2.1 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.2.2 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

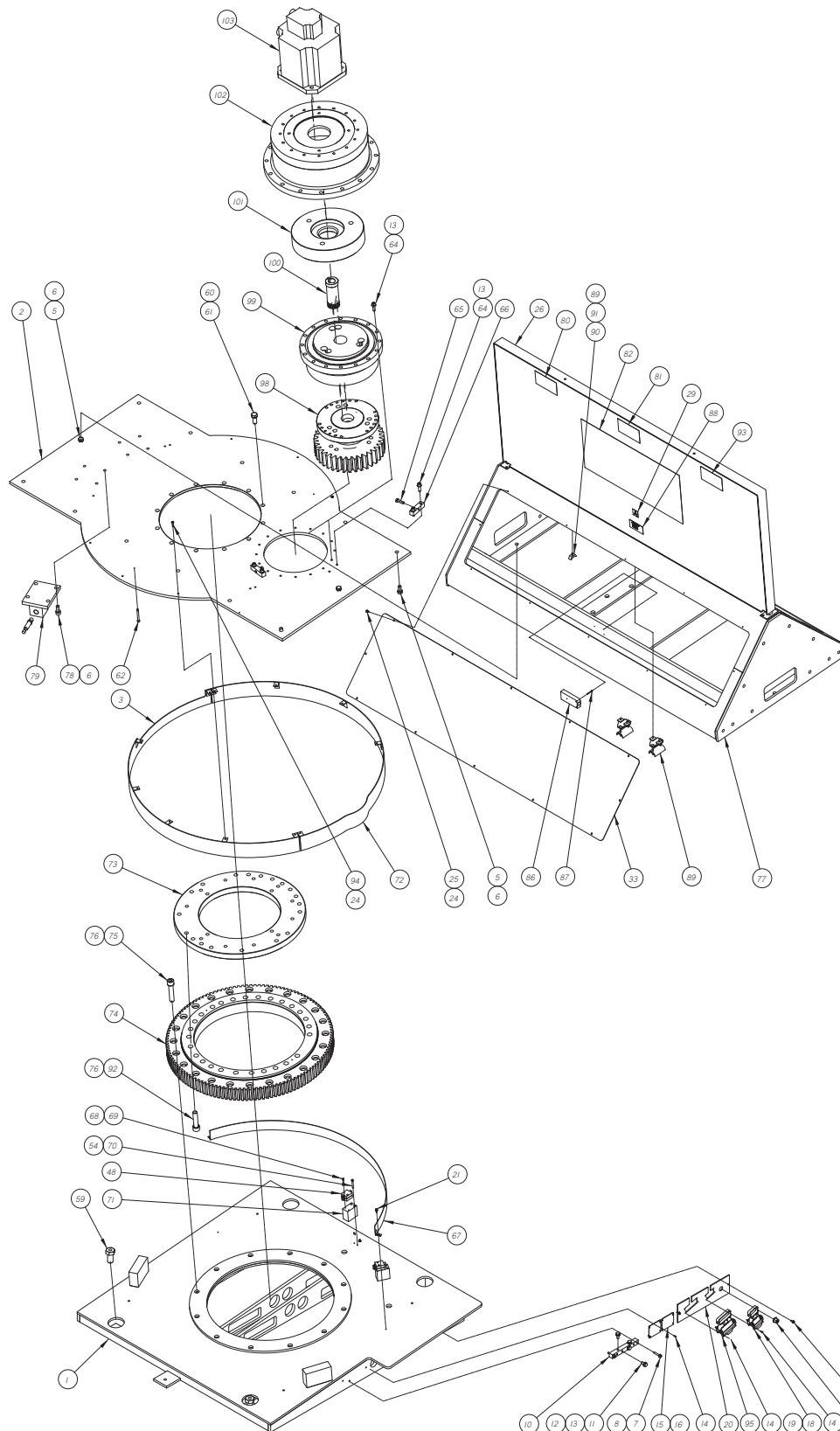


Figure A.1 Part 1 - MSR2S-500 Positioner shown

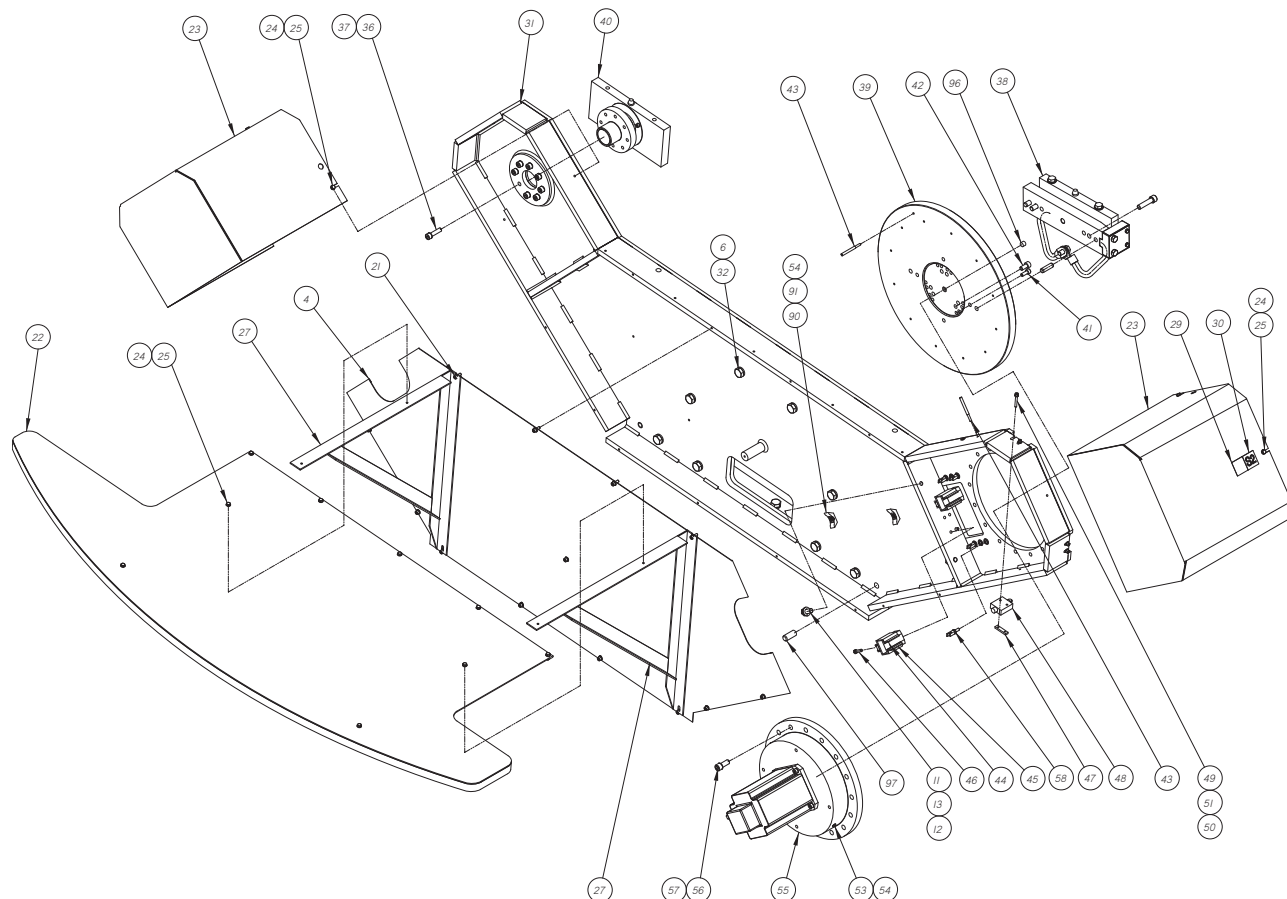


Figure A.2 Part 2 - MSR2S-500 Positioner shown

Table A.1 MSR2S-500 Positioner

Item No.	Part No.		Description	QTY
	MSR2S-500	MSR2S-750		
1	148164-1	148164-1	BASE,POSITIONER,MSR2S-500	1
2	150499-1	150499-2	PLATE,MTG,DRIVE,HOUSING	1
3	148953-2	148953-2	COVER,BEARING,UPPER,RH	1
4	150537-1	150537-1	COVER,SIDE FRAME	2
5	131274-3	131274-3	SCREW,HHC,M16X35,ZP,CLASS 8.8	14
6	479148-9	479148-9	WASHER,LOCK,M16	38
7	407248-10	407248-10	SCREW,SHC,M8X45,CLASS 12.9	2
8	479147-5	479147-5	WASHER,FLAT,M8,ZP	2
9	130887-10	130887-10	CABLE,WELD,4/0,15FT	4

Table A.1 MSR2S-500 Positioner

10	148161-1	148161-1	BAR,GROUND	1
11	131272-1	131272-1	SCREW,HHC,M12X25,ZP,CLASS 8.8	8
12	479148-7	479148-7	WASHER,LOCK,M12	8
13	479147-7	479147-7	WASHER,FLAT,M12,ZP	28
14	137146-4	137146-4	SCREW,PPH,M4X12,JIS B 1188	12
15	143047-7	143047-7	PLATE,GLAND,XRC/MRC	2
16	143919-1	143919-1	GASKET,GLAND PLATE	2
17	148875-16	148875-17	LABEL,PRODUCT IDENTIFICATION	1
18	154350-1	154350-2	CABLE ASSY,PIGTAIL ENC. NX100	1
19	479348-2	479348-2	BATTERY ASSY,ERC BACKUP	1
20	150207-1	150207-1	PLATE,GLAND,MSR2S-500,NX100	1
21	148102-4	148102-4	SCREW,SHC,M6X16,JIS 0209	31
22	150539-1	150539-1	SHIELD,POSITIONER	2
23	150540-1	150540-1	GUARD,HEAD AND TAILSTOCK	4
24	479147-4	479147-4	WASHER,FLAT,M6,ZP	65
25	139965-2	139965-2	SCREW,HHC,M6X16,CLASS 8.8	54
26	148162-1	148162-1	SCREEN,ARC,MSR2S-500	1
27	149835-1	149835-1	BRACKET,MTG,SHIELD	4
28	148838-2	148838-2	BOX,JUNCTION,6 PORT DISCRETE	1
29	149053-1	149053-1	LABEL,A/B,POSITIONER SIDE	2
30	149053-3	149053-3	LABEL,S2,SERVO MOTOR	1
31	156550-1	156550-1	FRAME,SIDE,MSR2S POSITIONER	2
32	131274-2	131274-2	SCREW,HHC,M16X50,ZP,CLASS 8.8	16
33	148169-1	148169-1	COVER,DRIVE HOUSING	2
34	149053-4	149053-4	LABEL,S3,SERVO MOTOR	1
35	149053-1	149053-1	LABEL,A/B,POSITIONER SIDE	1
36	479297-7	479297-7	SCREW,SHC,M10X40,CLASS 12.9	16
37	470541-1	470541-1	WASHER,CONICAL SPRING,GTS10	16
38	155873-1	155873-1	FIXTURE ASSY,HEADSTOCK,GEN2	2
39	150532-1	150538-1	PLATE,FACE,MSR2S-500	2
40	155871-1	155871-1	ADAPTER ASSY,TAILSTOCK,GEN2	2

Table A.1 MSR2S-500 Positioner

41	407248-5	N/A	SCREW,SHC,M8X20,CLASS 12.9	24
42	479297-3	N/A	SCREW,SHC,M10X20,CLASS 12.9	12
43	145896-1	145896-1	PIN,HOMING	4
44	144371-1	144371-1	BRUSH,GROUND,METAL,GRAPHITE	4
45	144372-1	144372-1	BRUSH HOLDER,1"X1.5"X2"	4
46	130235-6	130235-6	SCREW,HHC,1/4-20X1,ZP,GR5	8
47	143789-1	143789-1	PLATE,MTG,SWITCH,THREADED	4
48	143963-1	143963-1	SWITCH,LIMIT,MINIATURE	8
49	479296-11	479296-11	SCREW,SHC,M5X40,CLASS 12.9	8
50	479148-3	479148-3	WASHER,LOCK,M5	8
51	479147-3	479147-3	WASHER,FLAT,M5,ZP	8
52	148858-3	148858-3	CABLE,EURO,MALE/FEMALE,3-20AWG	8
53	130425-2	N/A	SCREW,BHSC,M6X10	2
54	470602-1	470602-1	WASHER,CONICAL SPRING,GTS6	13
55	154211-1	154210-1	DRIVE ASSY,TOOLING,HEADSTOCK	2
56	472303-5	472303-5	SCREW,SHC,M12X30,CLASS 12.9	32
57	471075-1	471075-1	WASHER,CONICAL SPRING,GTS12	32
58	144370-1	144370-1	TERMINAL,QUICK DISC,WELD GRND	8
59	140784-2	140784-2	SCREW,LEVELING	4
60	479148-11	479148-11	WASHER,LOCK,M20	12
61	131275-1	131275-1	SCREW,HHC,M20X50,ZP,CLASS 8.8	12
62	139841-2	139841-2	SCREW,SHOULDER,M8X70	2
63	154209-1	154209-1	DRIVE ASSY,MAIN,SIGMA III	1
64	472303-7	472303-7	SCREW,SHC,M12X40,CLASS 12.9	20
65	131272-7	131272-7	SCREW,HHC,M12X40,ZP,CLASS 8.8	2
66	150507-1	150507-1	BLOCK,ADJUSTING	2
67	148951-1	148951-1	COVER,BEARING	1
68	471009-1	471009-1	WASHER,CONICAL SPRING,GTS5	4
69	479296-9	479296-9	SCREW,SHC,M5X30,CLASS 12.9	4
70	407249-11	407249-11	SCREW,SHC,M6X50,CLASS 12.9	4
71	148150-1	148150-1	BLOCK,MTG,LIMIT SWITCH	2

Table A.1 MSR2S-500 Positioner

72	148953-1	148953-1	COVER,BEARING,UPPER,LH	1
73	148166-1	148166-1	ADAPTER,BEARING,MSR2S-500	1
74	148154-1	148154-1	BEARING,RADIAL	1
75	133965-4	133965-4	SCREW,SHC,M24X120	12
76	148597-1	148597-1	WASHER,CONICAL SPRING,M24	30
77	148167-1	148167-4	HOUSING,DRIVE,POSITIONER,2M	1
78	130532-3	130532-3	SCREW,SHC,M16X40,CLASS 12.9	8
79	150503-1	150503-1	SHOCK ABSORBER ASSY	2
80	471378-1	471378-1	LABEL,ARC FLASH,HORIZONTAL	2
81	471376-1	471376-1	LABEL,MOVING PARTS,HORIZONTAL	2
82	130190-1	130190-1	LABEL,ARCWORLD BY MOTOMAN	2
83	131271-1	131271-1	SCREW,HHC,M10X16,ZP,CLASS 8.8	4
84	479148-6	479148-6	WASHER,LOCK,M10	4
85	479147-6	479147-6	WASHER,FLAT,M10,ZP	4
86	148838-1	148838-1	BOX,JUNCTION,8-PORT,DISCRETE	1
87	479295-10	479295-10	SCREW,SHC,M4X35,CLASS 12.9	3
88	472268-8	472268-10	LABEL,CAPACITY,WEIGHT,RM2-5	2
89	146760-1	146760-1	CLAMP,END	2
90	479154-1	479154-1	CLAMP,CABLE SUPPORT	7
91	407249-4	407249-4	SCREW,SHC,M6X16,CLASS 12.9	7
92	133965-3	133965-3	SCREW,SHC,M24X100,CLASS 12.9	19
93	471359-1	471359-1	LABEL,ROBOT WARNING,HORIZONTAL	2
94	137567-2	137567-2	SCREW,HHC,M6X30,ZP,CL 8.8	11
95	154351-1	150629-1	CABLE ASSY,PIGTAIL NX100	1
96	479281-105	N/A	FITTING,PLUG,1/8BSPT,BLACK	2
97	142278-3	142278-3	PIN,DOWEL,M16X40	4
98	148856-1	148856-1	GEAR, PINNION	1
99	148588-1	148588-2	RV320E-81/RV320E-118.5	1

Table A.1 MSR2S-500 Positioner

100	148590-1	148590-2	Pinion	1
101	154212-1	154212-1	Housing, Drive Assy	1
102	149568-1	149568-1	4.4 kW motor	1
103	152538-1	152538-1	Adapter, Flywheel	

Appendix B

MotoMount

B.1 Introduction

This section provides installation and set up instructions for MotoMount, a flexible tool mounting system manufactured by Motoman, Incorporated. This section is intended for personnel who have received operator training from Motoman, and who are familiar with the operation of Motoman positioner models.

B.2 Overview

Motomount is a flexible tooling mounting system which improves tool repeatability and reduces loads on the head and tailstock bearing systems. MotoMount accommodates misalignment up to one degree between mounting points.

MotoMount is recommended for use with Motoman headstock/tailstock configurations up to and including the MHT 680/1360 or equivalent. The drive components are mounted on the headstock faceplates and the tailstock bearing components replace earlier tailstock bearing designs.



CAUTION!

Do not use MotoMount with stand-alone headstock (no tailstock) applications. Use in a stand-alone application will result in uncontrolled tooling motion.

B.2.1 Major Components

MotoMount includes the following major components:

- Headstock mount assembly
- Tailstock column bearing
- Tailstock tooling adapter

B.2.2 Performance Specifications

Allowable total misalignment = 1 degree

Faceplate Moment: $M_f = L(.050) N \cdot m$

- L = Tooling load supported by the headstock (N)

Performance Specifications

Configuration	Faceplate Mount Repeatability: @ 350 mm (138-inch) turning radius
Single tooling installation:	+/- .030 mm (0.0012-inch)
Tooling remove and replace:	+/- .125 mm (0.005-inch)

B.3 Installation



CAUTION!

Installation of MotoMount is not a task for the novice. These components are not fragile, but should still be handled with care. Rough handling can damage system components.

Installation of MotoMount should be performed by personnel who are familiar with this Motoman product. Follow established safety procedures at all times throughout the installation process. Failure to use safe work practices can result in damage to the equipment and injury to the workers.

B.3.3 Materials Required

This section identifies customer-supplied items and tools required to complete installation.

Customer-Supplied Items

- Incoming power supply
- Arbor Press

List of Tools

- Safety glasses
- Metric socket and wrench set
- Torch wrench
- Calliper

B.3.4 Preparation

Successful installation requires the MotoMount assembly be firmly mounted to the headstock faceplate. Before installation, ensure the faceplate is clean and is not warped or deformed. With retrofit installations, the old tailstock bearing assembly is replaced with the new tailstock bearing adapter block.

B.3.5 Unpack and Assemble

Depending on your application, MotoMount may be shipped in a box with the following components:

- Dowel pins (2)
- Mounting hardware
- Weld ground cable
- Tailstock tooling adapter
- Tailstock bearing

Inspect the box and its components for damage.

1. Carefully remove protective plastic wrapping from components.
2. Inspect all components for shipping damage.



Note: If any equipment is damaged, notify the shipper immediately.

B.3.6 Installing Fixture Dowel Pins

The dowel pins must be installed into the back of the fixture block before the assembly is mounted onto the faceplate. There are four holes in the back of the fixture block. See Figure 3-1 to determine which holes to use for your application. If your headstock faceplate does not have the matching dowel holes, it must be modified per Motoman drawings. To install the dowel pins, proceed as follows:



WARNING!

Be sure to handle MotoMount components carefully to avoid damage to the equipment or injury to personnel.

1. Use a small, 3 mm (1/8-inch) thick metal spacer (a 1/8-inch thick washer will work) to transfer the press force from the mounting block to the fixture block.
2. Place the spacer between the mounting block and the fixture block so that it is located behind the appropriate dowel hole.

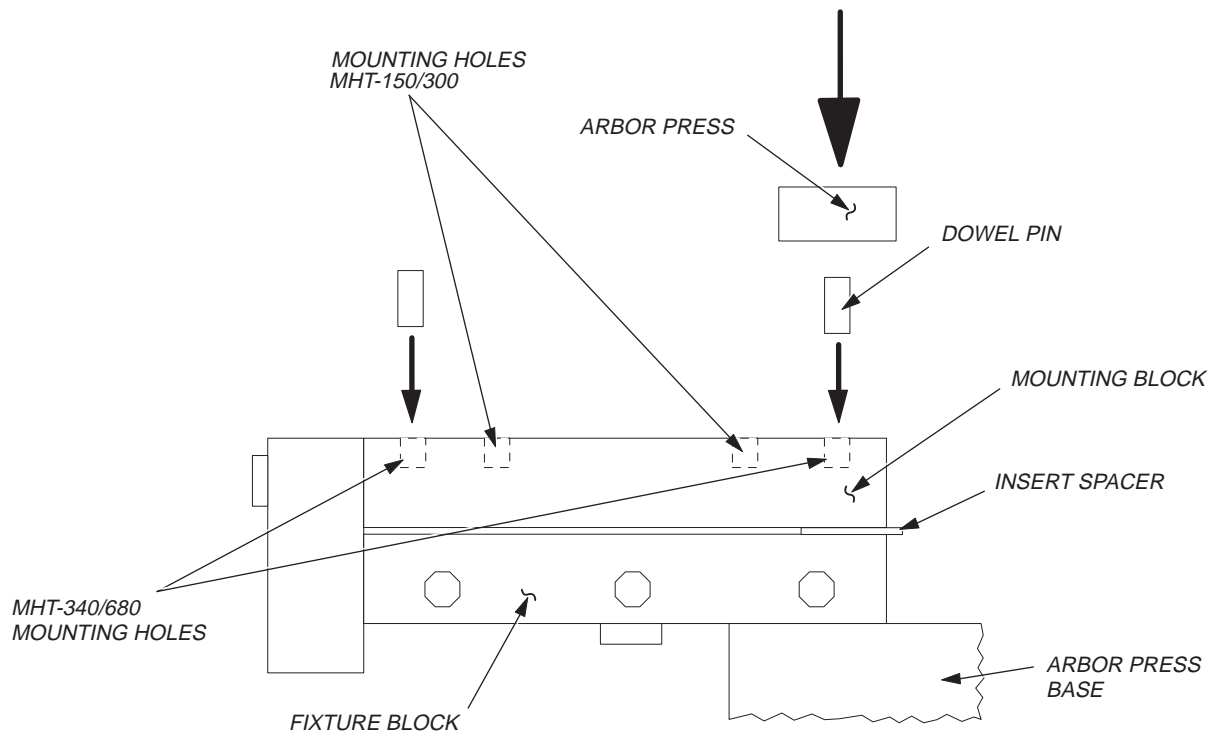


Figure 1 Dowel Pin Installation

3. Use an arbor press to force the dowel pins into the appropriate dowel pin hole in the mounting block. It is important that the dowel pin is pressed in as far as possible.
4. Relocate the spacer behind the other dowel hole and install the second dowel pin.
5. After the dowel pins are inserted properly, remove the spacer. The MotoMount fixture is now ready to install onto the faceplate.

B.3.7 Securing MotoMount Fixture onto Faceplate

Use the previously inserted dowel pins to locate the exact position for the MotoMount fixture to the faceplate. To mount the fixture onto the faceplate, proceed as follows:

1. Align the previously installed dowel pins with the proper holes in the faceplate (see Figure 3-2) and push fixture in as far as possible
2. Insert both mounting bolts through the fixture and tighten into the faceplate holes. See drawing 145381 for specified torque values.
3. Install the ground cable with one lug secured to the fixture block, and the other lug to an appropriate hole in the headstock face plate.

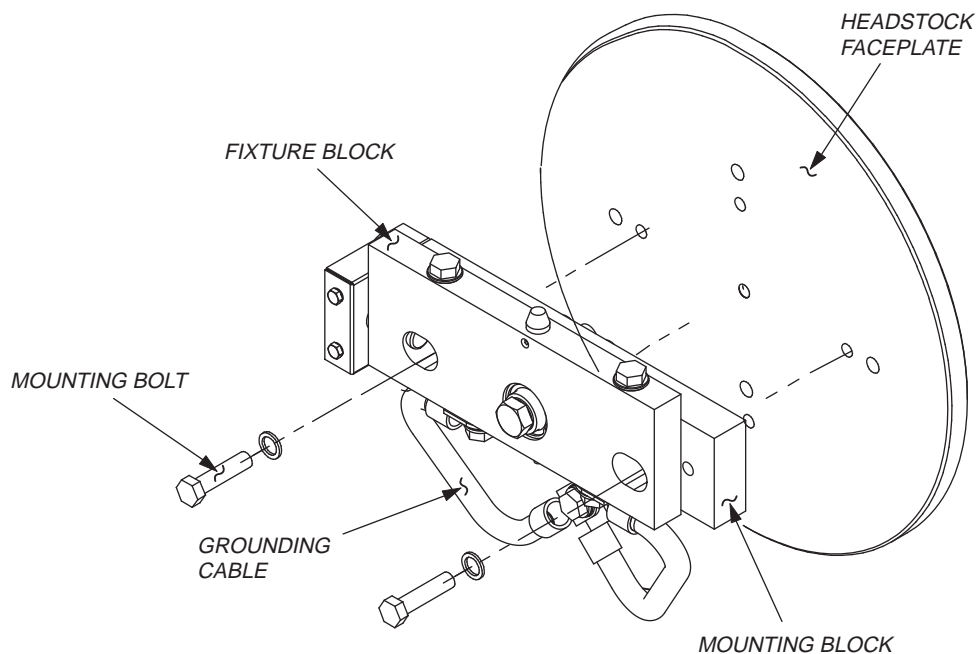


Figure 2 MotoMount Fixture Installation

B.3.8 Tooling Installation (initial)

The initial tooling installation is required prior to the headstock/tailstock alignment procedure.

1. Jog the headstock until the MotoMount is horizontal. The tooling mounting holes and locating pin must be pointing up.



WARNING!

The servo motor must be off for the remainder of the installation, or serious operator injury and/or equipment damage may result.

2. Use a suitable lifting device to position the tooling above the headstock/tailstock assemblies.
3. Slowly lower tooling fixture (see Figure 3-5) while aligning with the headstock locating pin and guide the tailstock bearing into the pillow block base.
4. Locate the tailstock bearing as appropriate to center it in the pillow block base (see Figure 3-5).
5. Continue lowering until the hoisting straps are loose.
6. Install the M12 tool mounting bolts and washers (customer-supplied grade8.8 bolts), and tighten to the specified torque on drawing 145910.

B.3.9 Tooling Installation (regular)

1. Jog the headstock until the MotoMount is horizontal. The tooling mounting holes and locating pin must be pointing up.



WARNING!

The servo motor must be off for the remainder of the installation, or serious operator injury and/or equipment damage may result.

2. Use a suitable lifting device to position the tooling above the headstock/tailstock assemblies (see Figure 3-5).
3. Slowly lower tooling fixture while aligning with the headstock locating pin and guide the tailstock bearing into the pillow block base.
4. Continue lowering until the hoisting straps are loose.
5. Install the M12 tool mounting bolts and washers (customer-supplied grade 8.8 bolts), and tighten to the specified torque on drawing 145910.
6. Remove the hoisting straps.

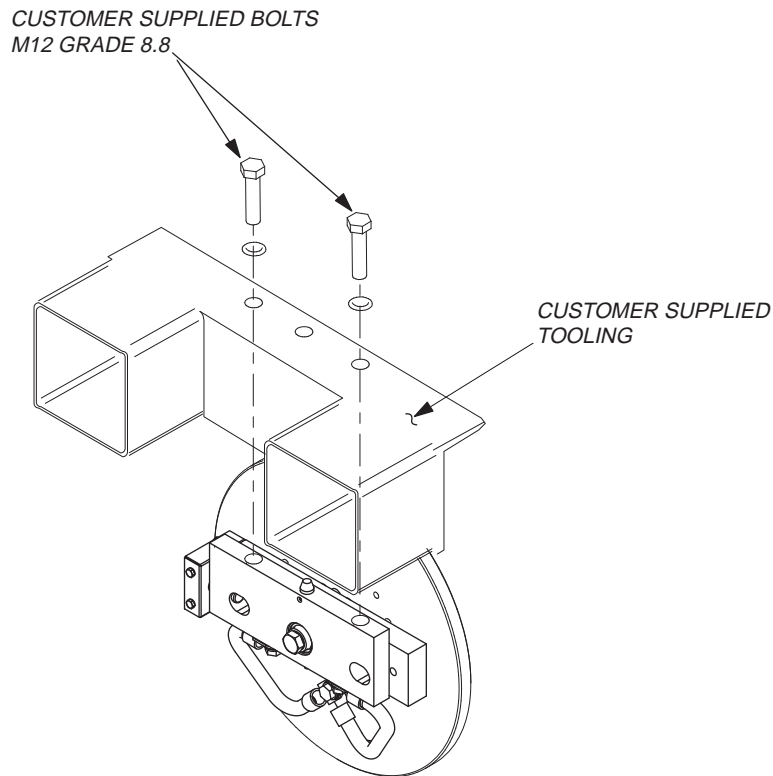


Figure 3 Tooling Fixture Installation - Headstock

Install the bearing cap after the tooling assembly is lowered into the bearing base, install the bearing cap (see Figure 3-6). Tighten the four bolts to the specified torque from the bearing manufacturer's literature.

B.3.10 Tooling Removal

1. Jog the headstock until the MotoMount is horizontal, with the tool mounting bolts and locating pin pointed up.



WARNING!

The servo motor must be off for the remainder of the removal, or serious operator injury and/or equipment damage may result.

2. Position a suitable lifting device and hoisting straps above the tooling. Attach the hoisting straps to the tooling.
3. Remove the tool mounting bolts.
4. Slowly lift the tooling off the headstock/tailstock assemblies.

B.3.11 Check Alignment (initial installation)

The MotoMount system helps reduce the load on bearings due to misalignment with the headstock and tailstock. Misalignment effects are less damaging if the alignment is as close to perfect as possible. There are two misalignment possibilities: horizontal and vertical. Both the horizontal and vertical alignment procedures require the measurement of the same gap on the MotoMount fixture.

B.3.12 Conducting a Safety/Operation Check

Before operating the MotoMount system, perform a safety/operation check as follows:

1. Check that all cable connections are tight.
2. Verify headstock/tailstock are level and parallel.
3. Verify all tooling and mounting bolts are properly installed and tightened.

B.4 Tooling Recommendations

To ensure optimal performance from your MotoMount tooling system, Motoman makes the following recommendations.

B.4.13 Customer-supplied

The customer-supplied tooling fixture bridges the headstock and tailstock together as it supports production parts for welding. The customer designs their tooling fixture to fit their specific needs. Modifications to existing tooling fixtures will be minimal as long it fits the current headstock/tailstock configuration (retrofit applications).

B.5 Specifications

Before installing any tooling fixtures to MotoMount, inspect both mounting flanges for perpendicularity to one another. The combined angle of misalignment for both flanges cannot exceed 1/2 degree (see Figure 4-1).

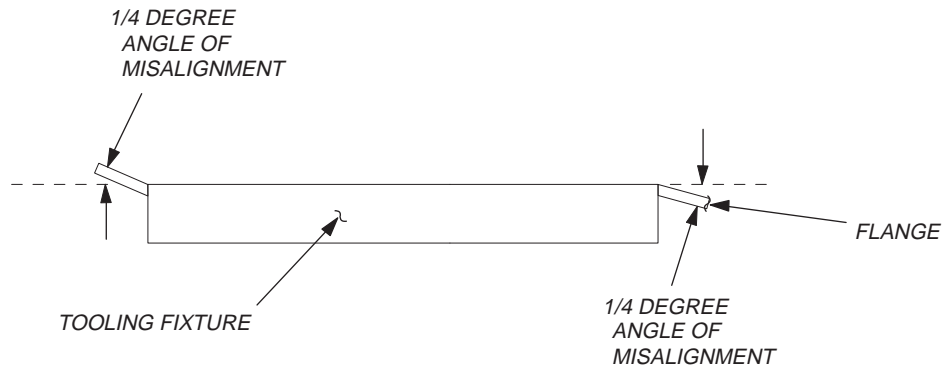


Figure 4 Tooling Fixture Inspection

B.5.14 Welding

For repeatability purposes, it is recommended that the tooling fixture and the tailstock adapter are permanently affixed to each other. Do this by welding the tailstock adapter and the tooling fixture together. This should not be done until the tooling fixture has been properly installed and has successfully completed several duty cycles.

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