

**Motoman**

# **MotoMount User's Manual**

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# **SECTION 1**

## **INTRODUCTION**

### **1.1 About this Document**

This manual provides installation and set up instructions for MotoMount, a flexible tool mounting system manufactured by Motoman, Incorporated. This manual is intended for personnel who have received operator training from Motoman, and who are familiar with the operation of Motoman positioner models. 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 MotoMount and its components, a list of reference documents, and customer service information.

#### **SECTION 2 - SAFETY**

This section provides information regarding the safe use and operation of the MotoMount system.

#### **SECTION 3- INSTALLATION**

This section provides detailed instructions for installation of MotoMount and its complimentary components.

#### **SECTION 4 - TOOLING RECOMMENDATIONS**

This section provides recommendations to the customer for setting up, inspecting, and maintaining MotoMount tooling fixtures.

## 1.2 System Overview

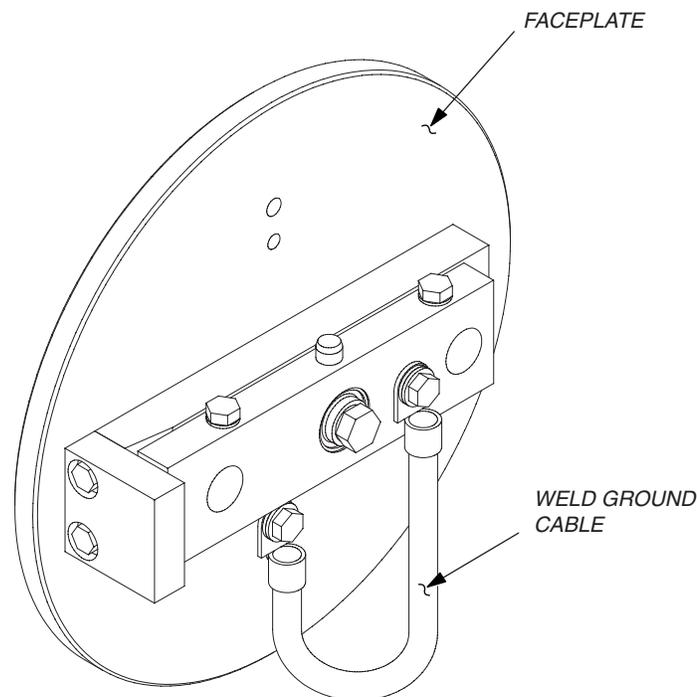
Motomount (see Figure 1-1) is a flexible tooling mounting system which improves tool repeatability and reduces loads on the head and tailstock bearing systems. MotoMount accommodates misalignment up to one degree between mounting points.

The 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.**



**Figure 1-1 MotoMount Assembly**

### 1.2.1 Major Components

MotoMount includes the following major components:

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

## 1.2.2 Performance Specifications

Allowable total misalignment = 1 degree

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

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

**Table 1-1 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)

## 1.3 Reference to Other Documentation

For additional information, refer to the included Motoman drawing package.

## 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:

- Positioner Type
- System or Cell Type

# ***NOTES***

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# **SECTION 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: 313/994-6088  
FAX: 313/994-3338

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)
- 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 **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).

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## **SECTION 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 the 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.

## **3.1 *Materials Required***

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

### **3.1.1 *Customer-Supplied Items***

- Incoming power supply
- Arbor Press

### **3.1.2 *List of Tools***

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

## 3.2 **Installing MotoMount**

### 3.2.1 **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.

### 3.2.2 **Unpack and Assemble**

Depending on your application, the 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.*

### 3.2.3 **Installing Fixture Dowel Pins**

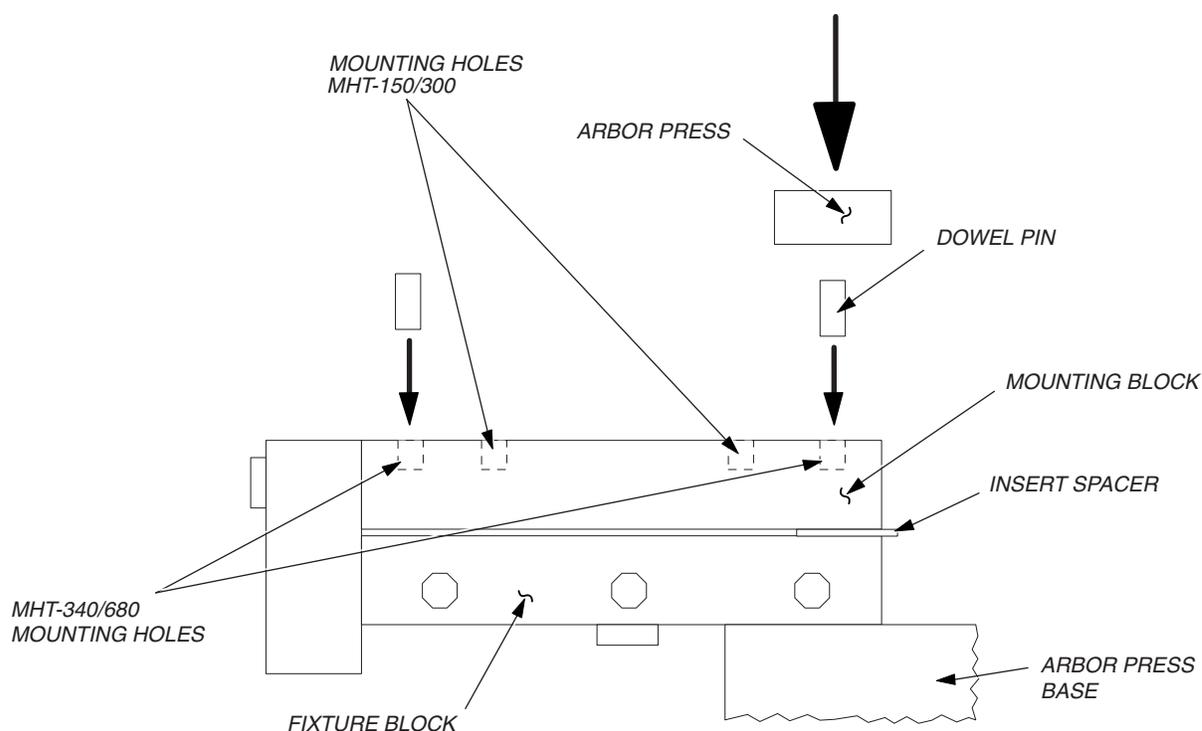
The dowel pins must be installed into the back of the fixture block before the assembly is mounted onto the faceplate. There are four holes in the back of the fixture block. See Figure 3-1 to determine which holes to use for your application. If your headstock faceplate does not have the matching dowel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



#### **WARNING!**

***Be sure to handle the 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 3-1 Dowel Pin Installation**

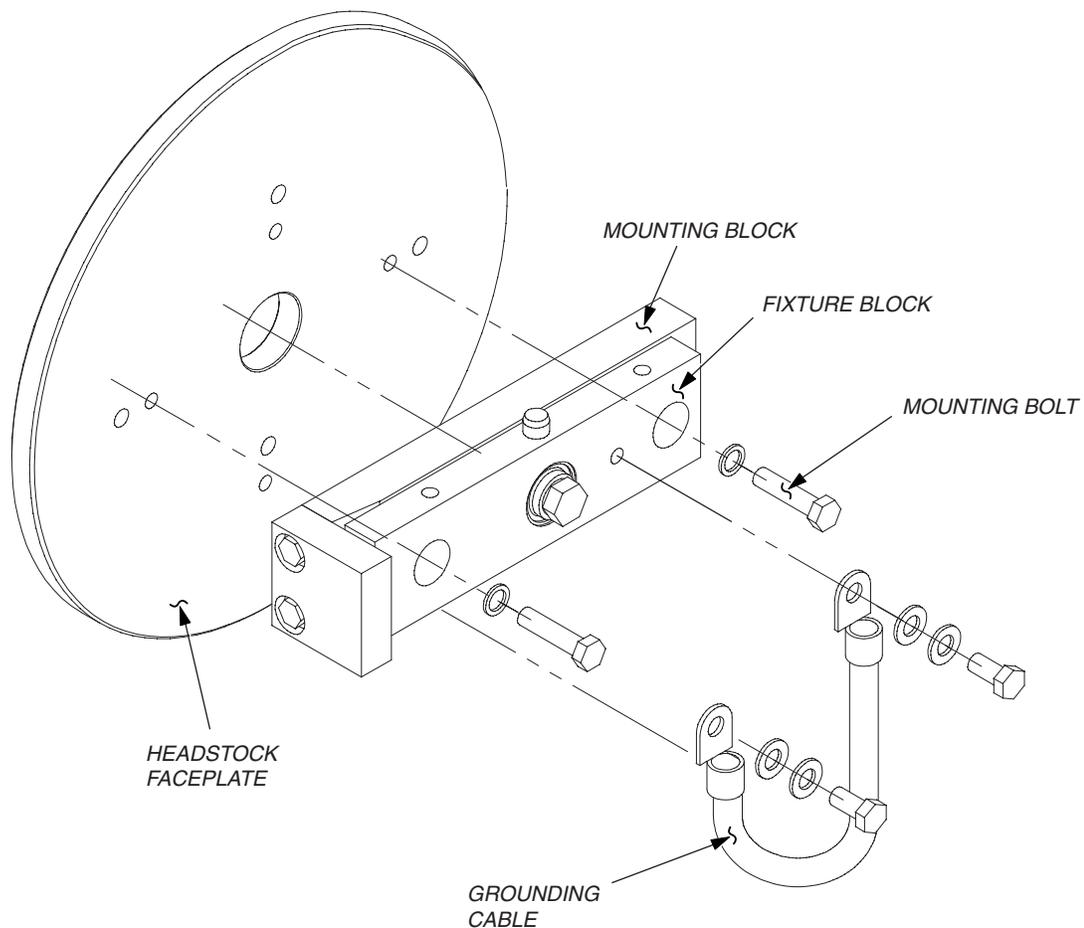
3. Use an arbor press to force the dowel pins into the appropriate dowel pin hole in the mounting block. It is important that the dowel pin is pressed in as far as possible.
4. Relocate the spacer behind the other dowel hole and install the second dowel pin.
5. After the dowel pins are inserted properly,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

The MotoMount fixture is now ready to install onto the faceplate.

### **3.2.4 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 3-2 MotoMount Fixture Installation**

### **3.2.5 Disassembling Tailstock Assembly (retrofit applications)**

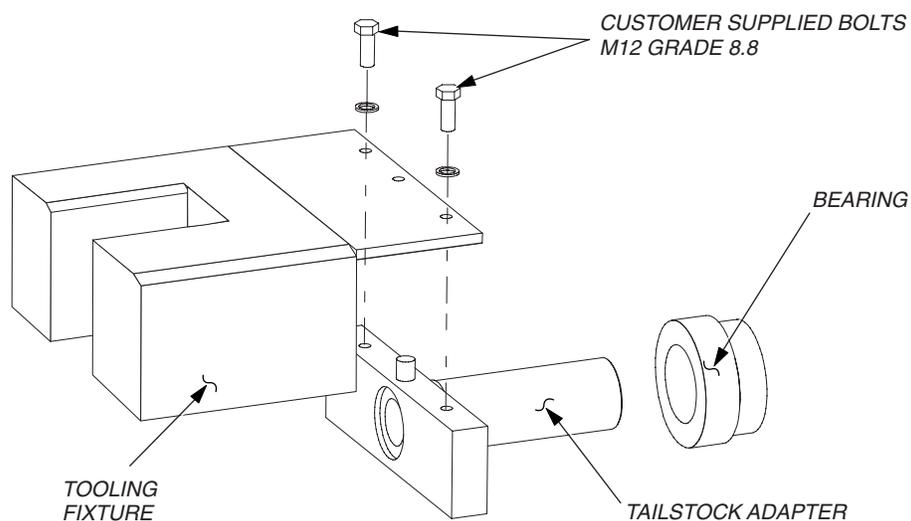
The tailstock assembly, with faceplate, must be removed and replaced with the new tailstock bearing assembly. It is not necessary to remove the tailstock column from the cell base. To remove the tailstock assembly, proceed as follows:

1. Secure the tailstock assembly with a lifting device that is capable of safely lifting the tailstock.
2. Remove the four bolts at the base of the tailstock.
3. Lift the tailstock off the column and set aside.

### **3.2.6 Installing Tailstock Adapter**

The tailstock adapter mounts to the tailstock end of the customer-supplied tooling fixture (see Figure 3-3).

1. Lift the adapter up to the end of the tooling fixture and align holes.
2. Assemble the tailstock adapter to the tooling with M12, grade 8.8 bolts (customer supplied).
3. Align the adapter shaft with the tooling axis and tighten the bolts to the specified torque (see drawing 145910).
4. Slide the bearing onto the tailstock adapter and loosely tighten the bearing gland nut.

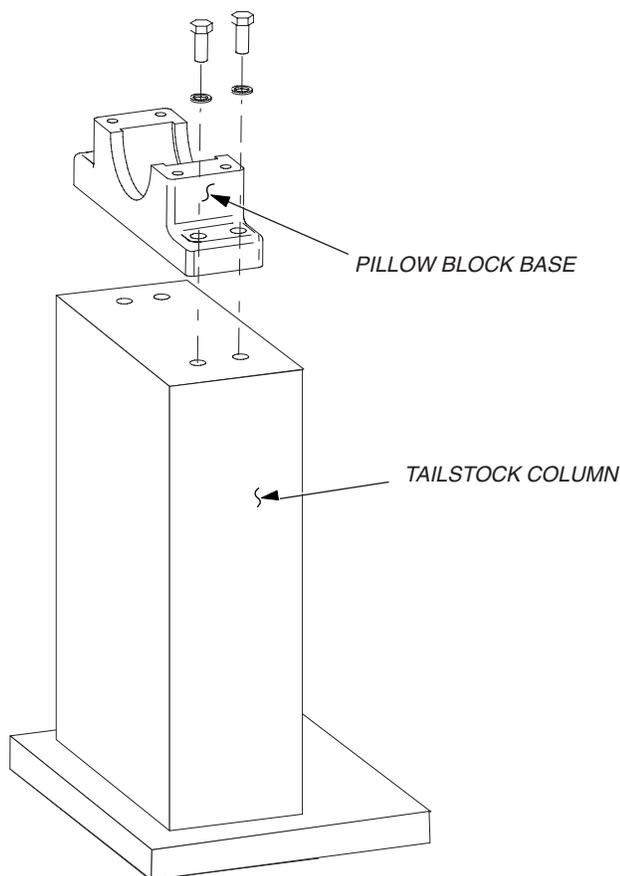


**Figure 3-3 Tailstock Adapter Installation**

### 3.2.7 Installing the Bearing Housing Base

The pillow block base (see Figure 3-4) is mounted on top of the tailstock column. Install the mounting bolts finger tight. They will be tightened to prescribed torque later.

*NOTE: For retrofit applications, the tailstock adapter block unit must be installed first with mounting bolts tightened to the prescribed torque (see drawing 145910).*



**Figure 3-4 Install Bearing Housing Base**

### 3.2.8 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 grade 8.8 bolts), and tighten to the specified torque on drawing 145910.
7. Install the tailstock bearing cap and bolts. Tighten to specified torque per the bearing manufacture's literature.
8. Tighten the tailstock bearing gland nut to the tailstock adapter shaft per the bearing manufacture's literature.
9. Remove the hoisting straps.

### 3.2.9 Tooling Installation (regular)

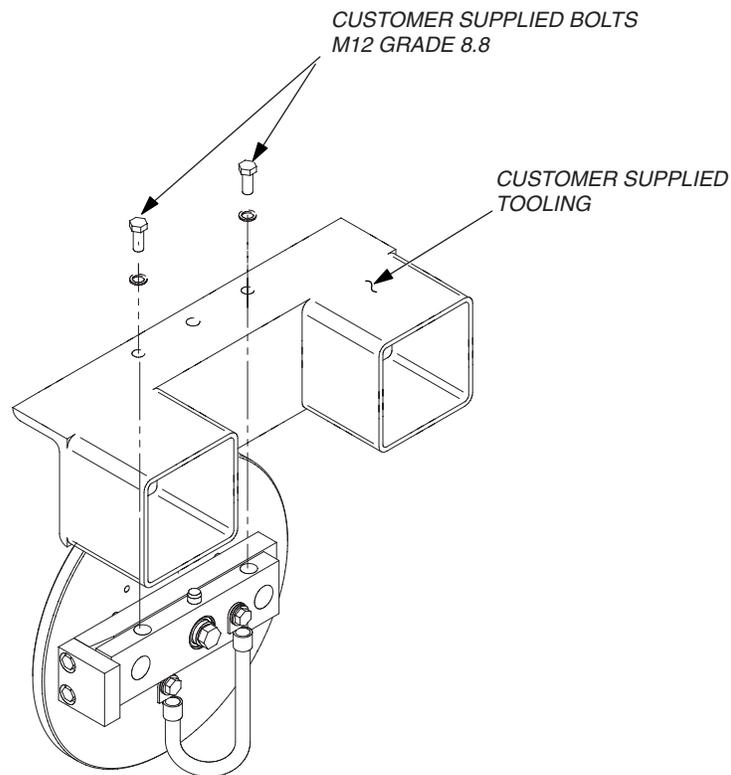
1. Jog the headstock until the MotoMount is horizontal. The tooling mounting holes and locating pin must be pointing up.



#### **WARNING!**

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

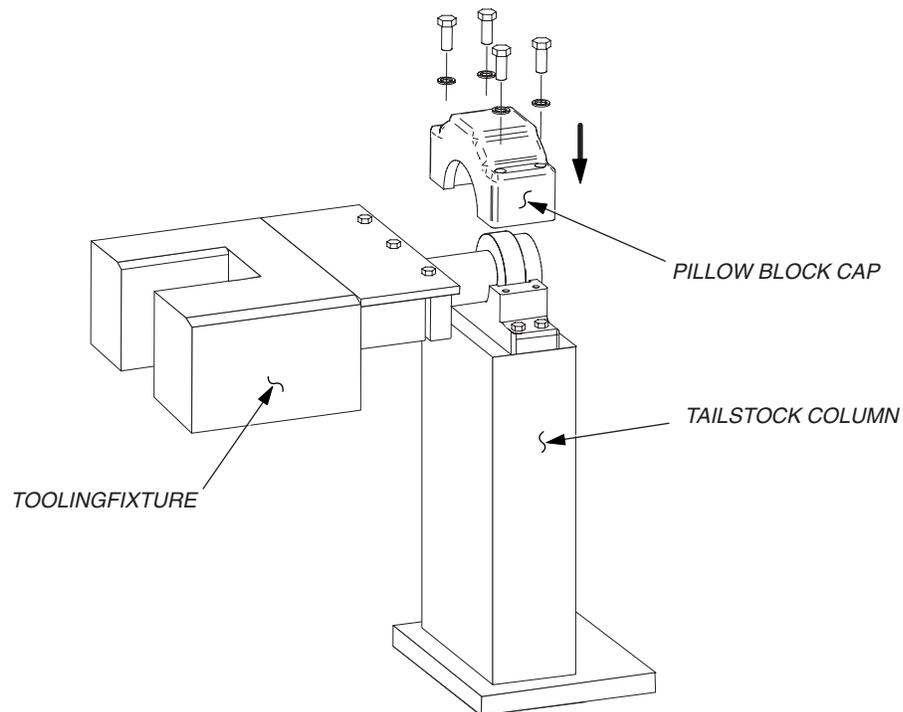
2. Use a suitable lifting device to position the tooling above the headstock/tailstock assemblies (see Figure 3-5).
3. Slowly lower tooling fixture while aligning with the headstock locating pin and guide the tailstock bearing into the pillow block base.
4. Continue lowering until the hoisting straps 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. Install the tailstock bearing cap and bolts. Tighten to specified torque per the bearing manufacture's literature.
7. Remove the hoisting straps



**Figure 3-5 Tooling Fixture Installation-headstock**

### 3.2.10 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 included bearing manufacturer's literature.



**Figure 3-6 Install the Bearing Cap**

### 3.2.11 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 and tailstock bearing cap.
4. Slowly lift the tooling off the headstock/tailstock assemblies.

### 3.2.12 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.

#### **Horizontal Alignment**

The MotoMount must be in a horizontal position to check the horizontal alignment.

The horizontal alignment is checked by measuring the gap (see Figure 3-7) between the mounting fixture and mounting block. The measurement of this gap must not change more than 1 mm (.039-inch) after the headstock is rotated 180 degrees. To align MotoMount horizontally, proceed as follows:

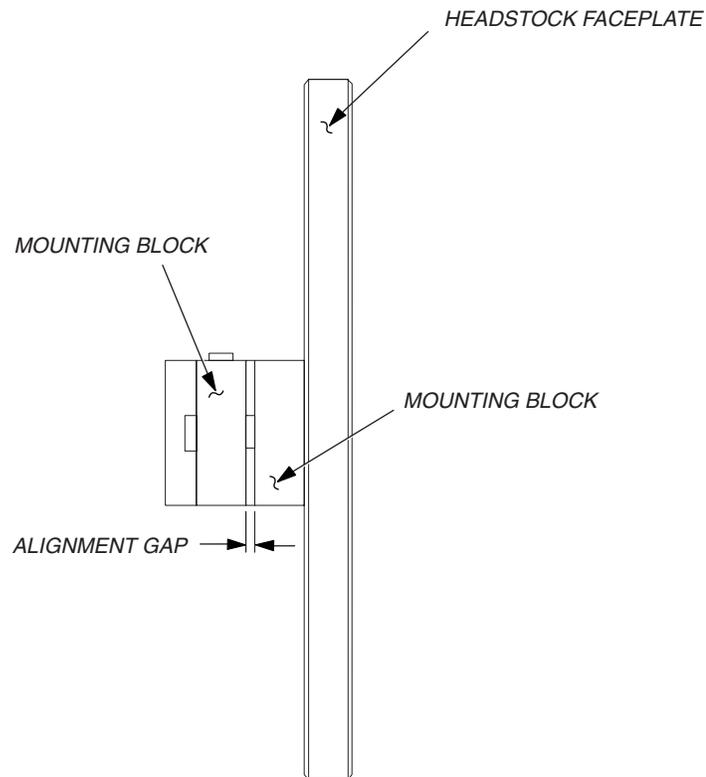
1. Jog the positioner until MotoMount is horizontal.
2. Use calipers to measure the alignment gap.

**NOTE:**

*It is important to measure the alignment gap at the same location. This will ensure proper alignment.*

3. Rotate the positioner 180 degrees.
4. The alignment gap has now been moved. Use calipers to measure the alignment gap again at its new position.
5. If the gap measurement changes more than 1 mm (.039-inch) after rotation, locate the tailstock bearing base to the left or right (towards the direction of the larger gap) and check alignment again at the same location.
6. Repeat this process until the same gap at both positions is within 1 mm (.039-inch) of each other.

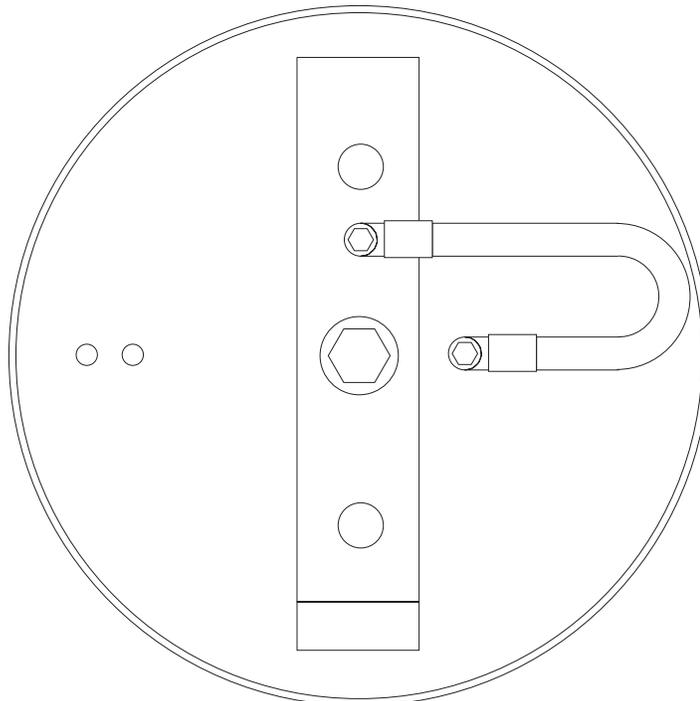
Ensure the bearing housing is perpendicular to the tailstock adapter shaft within approximately 1/2 degree (a visual check with a square is acceptable). If moving the bearing housing cannot provide the desired results, loosen the column mounting bolts and adjust the entire column assembly.



**Figure 3-7 Measurement Point Horizontal Alignment**

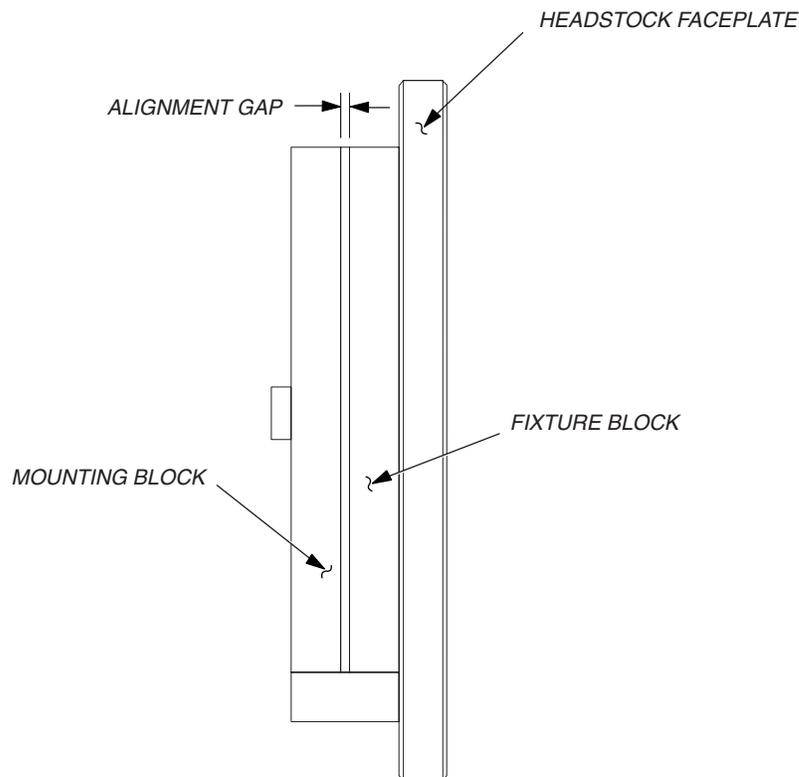
**Vertical Alignment**

MotoMount must be at a vertical position (see Figure 3-8) to check the vertical alignment.



**Figure 3-8 Vertical Position**

Check the vertical alignment by measuring the gap between the fixture and mounting block (see Figure 3-9). These measurements must remain within 1 mm (.039-inch) after the headstock is rotated 180 degrees. To properly align the MotoMount vertically, proceed as follows:



**Figure 3-9 Vertical Orientation – Side View**

1. Jog the positioner until the MotoMount is vertical.
2. Use calipers to measure the alignment gap.
3. Rotate the positioner 180 degrees.
4. The alignment gap has now been moved. Use calipers to measure the alignment gap again at its new position.
  - If the first measurement is more than the second measurement, raise the tailstock or lower the headstock.
  - If the first measurement is less than the second measurement, lower the tailstock or raise the headstock.
5. Vertical adjustment of the headstock/tailstock is done with leveling screws in the tailstock column base.

**NOTE:**

*It is important to measure the alignment gap at the same location. This will ensure a proper alignment.*

6. Recheck horizontal alignment.

When horizontal and vertical alignment is complete, ensure all bolts are tightened to the appropriate torque, including tailstock bearing mounting bolts.

---

### **3.2.13 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.

## **NOTES**

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## **SECTION 4**

# **TOOLING RECOMMENDATIONS**

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

### **4.1 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).

### **4.2 Multiple Tooling Fixtures**

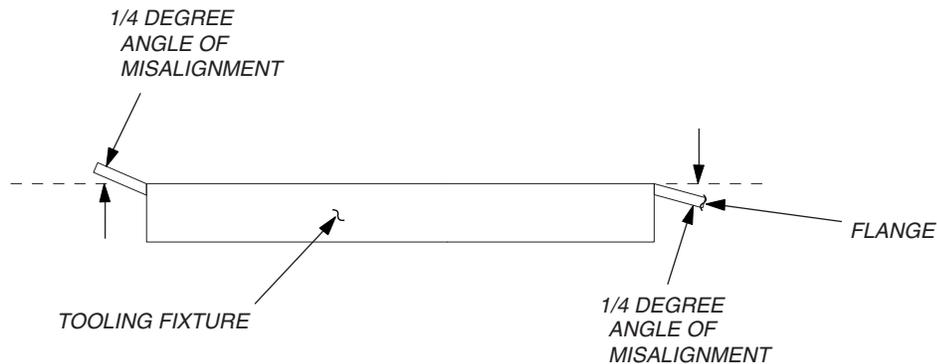
Some applications require multiple tooling fixtures that are switched in and out of the positioner as production needs require. To prepare these extra fixtures to work with MotoMount, the following spare parts are needed:

- Bearing adapter
- Bearing

Contact Motoman Customer Service at (937) 847-3200, to purchase these parts.

### **4.3 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 4-1 Tooling Fixture Inspection**

## **4.4      *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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