Motoman®

MR300
Positioner Manual

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Revision: 1

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Chapter 1
Introduction

1.1 About This Document

This manual provides an instructions for the MR300 Positioner. For detailed information regarding your specific system, please refer to your system documentation package (refer to Section 1.3).

This manual contains the following chapters –

CHAPTER 1 – INTRODUCTION
This chapter provides general information about the MR300, a list of reference documents, and customer support contact information.

CHAPTER 2 – SAFETY
This chapter provides general information regarding the safe installation, maintenance, and operation of the MR300.

CHAPTER 3 – INSTALLATION
This chapter provides instructions for installing the positioner.

CHAPTER 4 – TOOLING RECOMMENDATIONS
This chapter provides guidelines for customer-suppled tooling design.

CHAPTER 5 – MAINTENANCE
This chapter provides detailed instructions for maintaining each MR300 positioner.

APPENDIX A
Appendix A provides exploded views and illustrated parts lists for the MR300.

1.2 Overview

The MR300 rotary positioner is a high-speed, AC motor driven positioner that features a 300-kg (600-lb) capacity per side. The sweep time for a 180-degree rotation is 4.0 seconds when fully loaded. Integral position switches are included as standard.

1.2.1 System Layout

An arc screen divides the table top in half, providing two semicircular work areas labeled SIDE A and SIDE B. When SIDE A is in the robot's welding zone, SIDE B is facing the operator and is ready to be loaded or unloaded with parts, and vice versa. Loading fixtures are supplied by the customer.

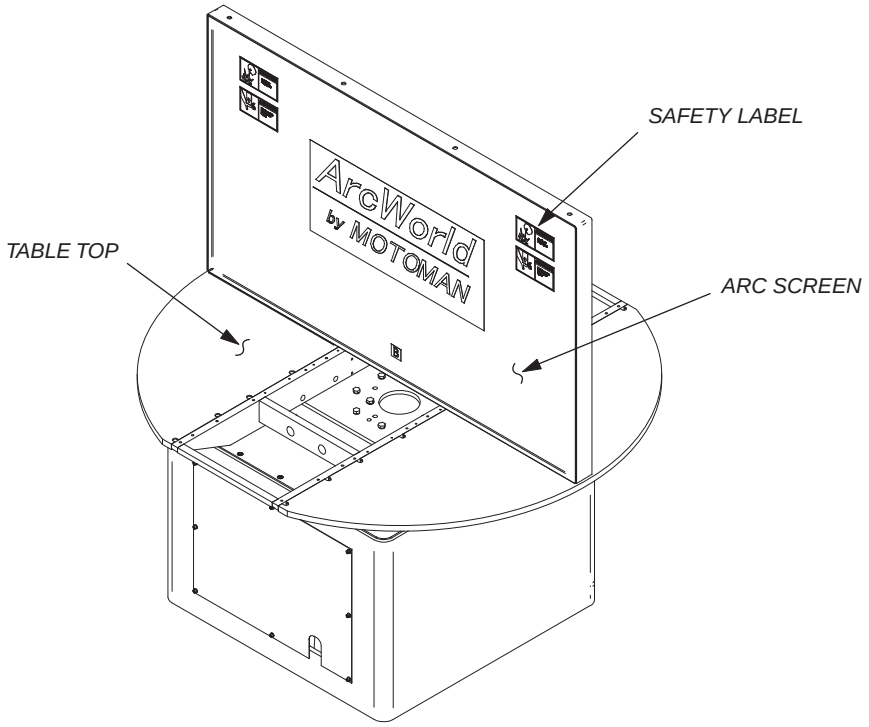

Figure 1 System Layout

1.2.2 Technical Specifications

See Table 3-1 for MR300 table specifications.

Specifications	Value
Model P/N	151864-1
Power Requirements	208 VAC 3 phase @ 2kVA
Rated Load (per side)	300kg (660 lbs)
Load Height (from floor to table top)	772 mm (30.5 in.)
Standard Table Diameter	1525mm (60 in.)
Table Center Through Hole – mm/inch	130/5.12
180-Degree Sweep Time	4 sec
Positioner Weight	878 kg (399 lbs)

1.2.3 Arc Shield

WARNING!
Do not operate this equipment unless the arc screen is in place or eye damage can occur!

The Motoman MR300 positioner has an arc screen that runs the width of the positioner table and visually separates the loading zone from the welding zone. This screen acts as a shield to protect the operator from the arc radiation and sparks produced by the welding operation. Do not operate this equipment in a welding application unless the arc screen is in place.

1.2.4 Inverter Drive

To MR300 uses an inverter motordrive (G7) to coordinate positioner functions while communicating with the controller. The G7 is factory programmed and password protected with set variables. There are some user-definable variables (parameters) that are not password protected. Please refer to the accompanying inverter motordrive G7 manual to change these variables.

1.3 Reference Documentation

For additional information on individual components of the MR300 positioner, refer to the following documentation included with your system –

- Motoman *Controller Manual*
- Motoman *Maintenance Manual*
- Motoman *Concurrent I/O Manual*
- Motoman *INFORM User's Manual*
- Vendor manuals for system components and assemblies not manufactured by Motoman

1.4 Customer Support Information

If you need assistance with any aspect of your system, please contact Motoman Customer Support at the following 24-hour telephone number –

937. 847. 3200

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

techsupport@motoman.com

When using e-mail to contact Motoman Customer Support, please provide a detailed description of your issue, along with complete contact information. Please allow approximately 24 to 36 hours for a response to your inquiry.

Note: Please use e-mail for routine inquiries, only. If you have an urgent or emergency need for service, replacement parts, or information, you must contact Motoman Customer Support at the telephone number shown above.

Please have the following information ready before you call –

• System	MR300
• Robots	EA1400N, EA1900N, etc.
• Primary Application	Arc Welding
• Controller	NX100, DX100, etc.
• Software Version	Access this information on the Programming Pendant LCD display screen by accessing MAIN MENU ➡ SYSTEM INFO ➡ VERSION
• Robot Serial Number	Located on robot data plate
• Robot Sales Order Number	Located on controller data plate

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
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 chapter 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).

Chapter 3
Equipment Description

The MR300 rotary positioners consist of an AC motor plus gear reducer. Position switches are included as a standard feature.

The MR300 is a high-speed, AC motor driven positioner that features a 300-kg (600-lb) capacity per side. The sweep time for a 180-degree rotation is 4.0 seconds when fully loaded.

3.1 MR300 Rotary Positioner

The table top dimensions are: 1524 mm (60 in.) 1828 mm (72 in.) diameter.

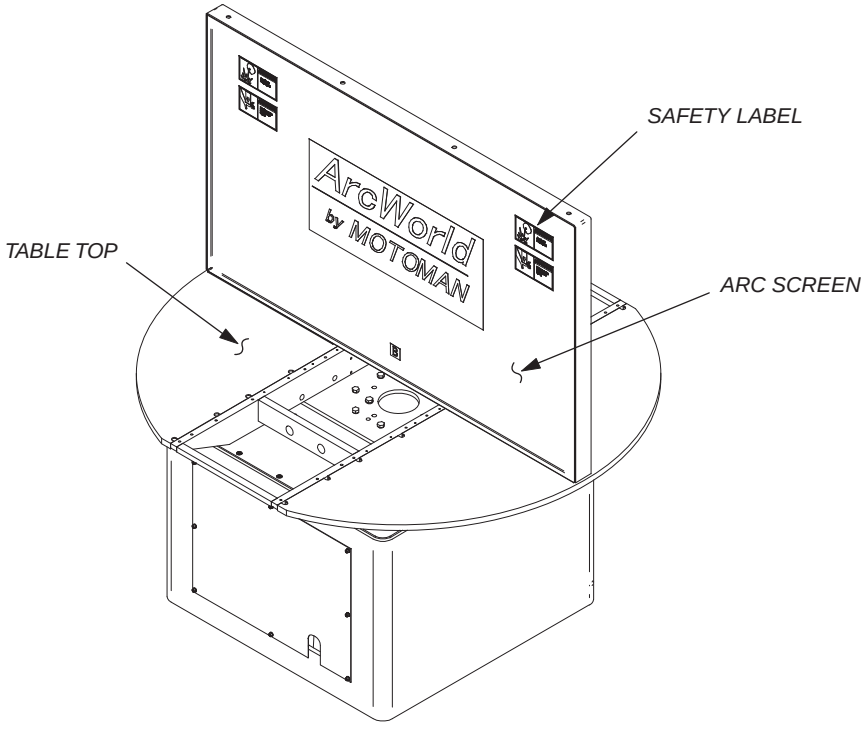

Figure 2 MR300 Positioner

3.1.1 System Specifications

See Table 3-1 for MR300 table specifications.

Specifications	Value
Rated Load (per side) – kgf	300
Standard Table Diameter – mm/inch	1525/60
Table Center Through Hole – mm/inch	130/5.12
Base to Table Height – mm/inch	774/30.5
180-Degree Sweep Time – sec	4
Rated Moment of Inertia	200

3.1.2 Arc Shield

WARNING!
Do not operate this equipment unless the arc screen is in place or eye damage can occur!

The Motoman MR300 positioner has an arc screen that runs the width of the positioner table and visually separates the loading zone from the welding zone. This screen acts as a shield to protect the operator from the arc radiation and sparks produced by the welding operation. Do not operate this equipment in a welding application unless the arc screen is in place.

3.1.3 Inverter Drive

To MR300 uses an inverter motordrive (G7) to coordinate positioner functions while communicating with the controller. The G7 is factory programmed and password protected with set variables. There are some user-definable variables (parameters) that are not password protected. Please refer to the accompanying inverter motordrive G7 manual to change these variables.

Chapter 4
Installation

Installation of the MR300 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.

4.0.1 Materials Required

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

Customer-Supplied Items

Incoming power supply

Two earth ground cables with two earth ground stakes

List of Tools

- Safety glasses
- Level
- Adjustable wrench set
- Hammer drill with appropriate concrete bits
- Forklift and/or overhead crane
- Open-end wrench sets (standard and metric)

4.0.2 Site Preparation

To prepare your site, proceed as follows:

1. Clear the floor space needed for the unit (see Figure 4-1).

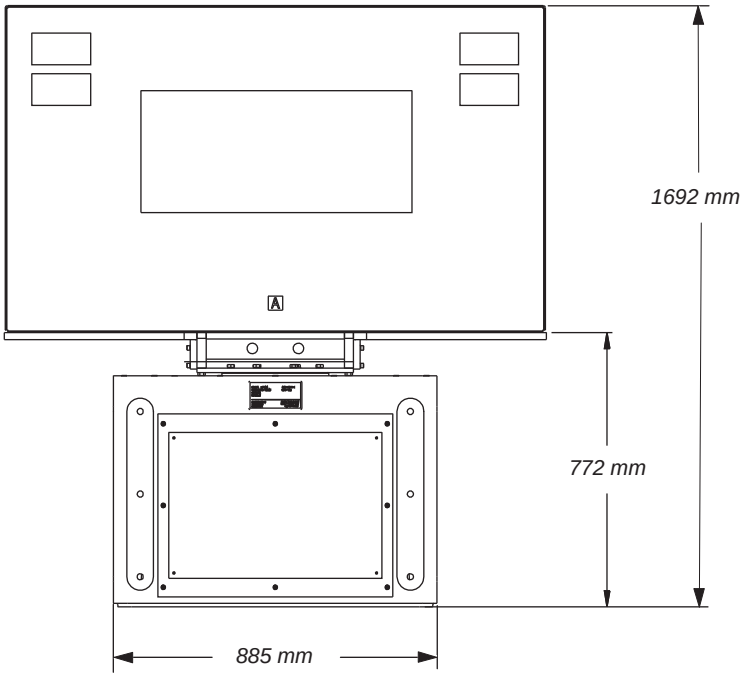

Figure 3 Area Needed for Installation

2. Gather all customer-supplied items and required tools listed in Section 4.1.

4.0.3 Mounting Hole Pattern

Use the mounting hole pattern in Figure 4-2 to accurately position the MR300 positioner on the floor or mounting base.

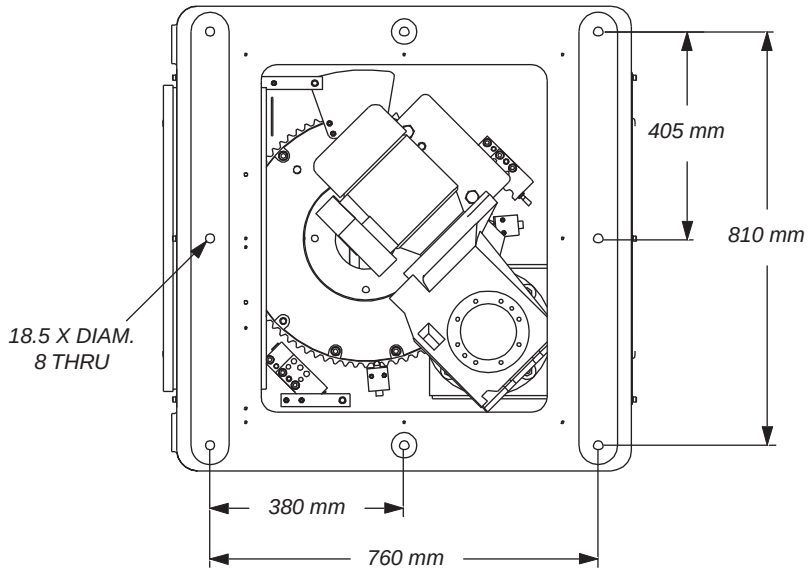

Figure 4 Floor Mounting Hole Pattern

4.1 Installing the MR300 Drive Assembly

The MR300 table must be firmly mounted on a machine base or on a foundation rigid enough to support the static and dynamic forces.

4.1.1 Unpack and Install

The positioner table is shipped on a wood shipping pallet. To install the table, proceed as follows:

WARNING!
The MR300 positioner weighs approximately 900 kg (2,000 lbs). Be sure that your lifting device is capable of handling this much weight or damage to the equipment or injury to personnel can result.

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

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

3. Unbolt table from wood shipping pallet using a 3/4-inch socket wrench.

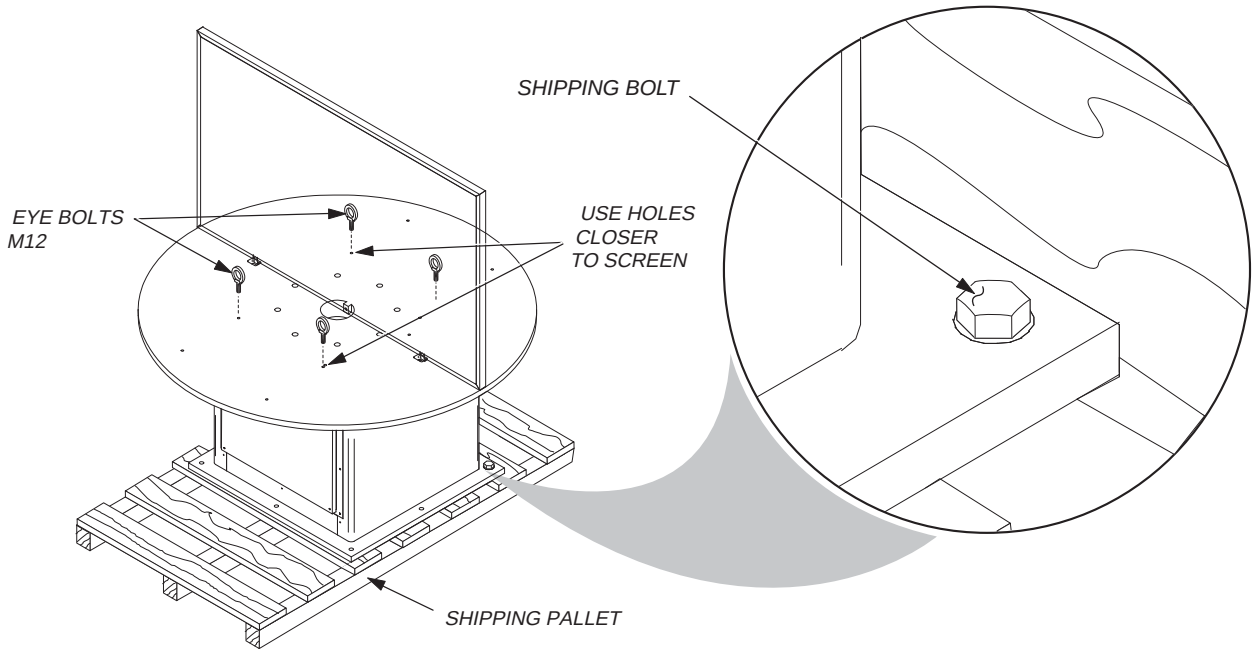

Figure 5 Unbolting the Table

4. Insert two eye bolts (four total) on each side of the arc screen. Use the four bolts that are closest to the arc screen (see Figure 4-3).
5. Attach chains from lifting device to the eye bolts and raise the table from wood shipping pallet.
6. Place table in position.
7. Remove chains and eye bolts.

4.1.2 Connecting the Cables

Do not connect any cables until after the drive assembly is securely in place.

Connection to Motoman Controller

Two sets of cables lead from the controller to the positioner: I/O cable and power cable. These cables are sent through the back of the interface box and steadied with a gland plate. Connect these cables onto the interface panel.

- I/O Cables – One ribbon cable and two spares
    a. The I/O ribbon cable fastens to the PC Interference Board.
    b. Securely tie the spare wires out of the way.
- Power Cables – Three black cables and one green

a. The three black cables connect to the fuse holder block labeled 2, 4, and 6. See system drawings.

b. The green cable connects to the ground lug on the interface panel.

When the MR300 table is delivered with a Motoman robot, connections between the two have been made at the factory. See separate schematics and/or documentation specific to your system.

Ground Cables

The ground cable is fastened in the center hole of the table (see Figure 4-4). When installing, it is important to make sure that the cable can flex during rotation of the table.

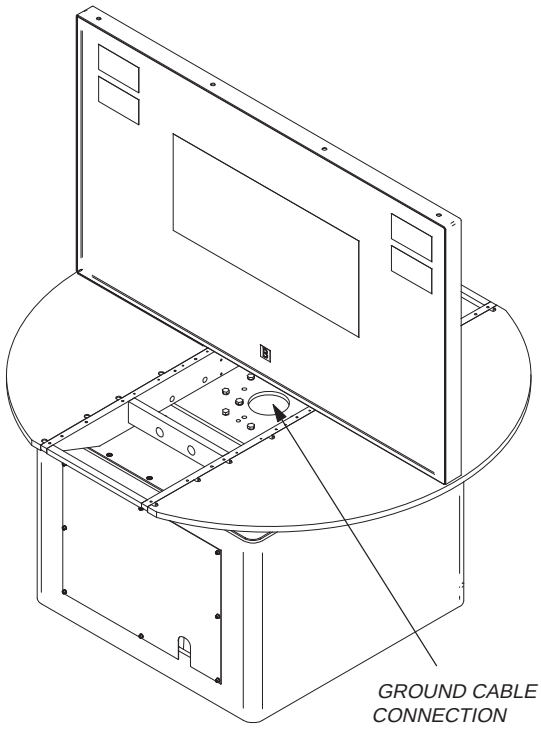

Figure 6 Ground Cable Connection

4.2 Conducting a Safety/Operation Check

Before operating the MR300 system, 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 the tooling is properly attached to table.
3. Make sure all loose components are removed from table.

Notes

Chapter 5
Tooling Recommendations

5.0.1 Installation of Tooling Fixtures

The table is now ready for the installation of tooling for your application. Installation of tooling should be performed by personnel who are familiar with the operation of this system. Tooling is supplied by the customer.

The customer-supplied tooling must be designed to fit the table top. See Figure 5-1 for MR300 table mounting hole pattern.

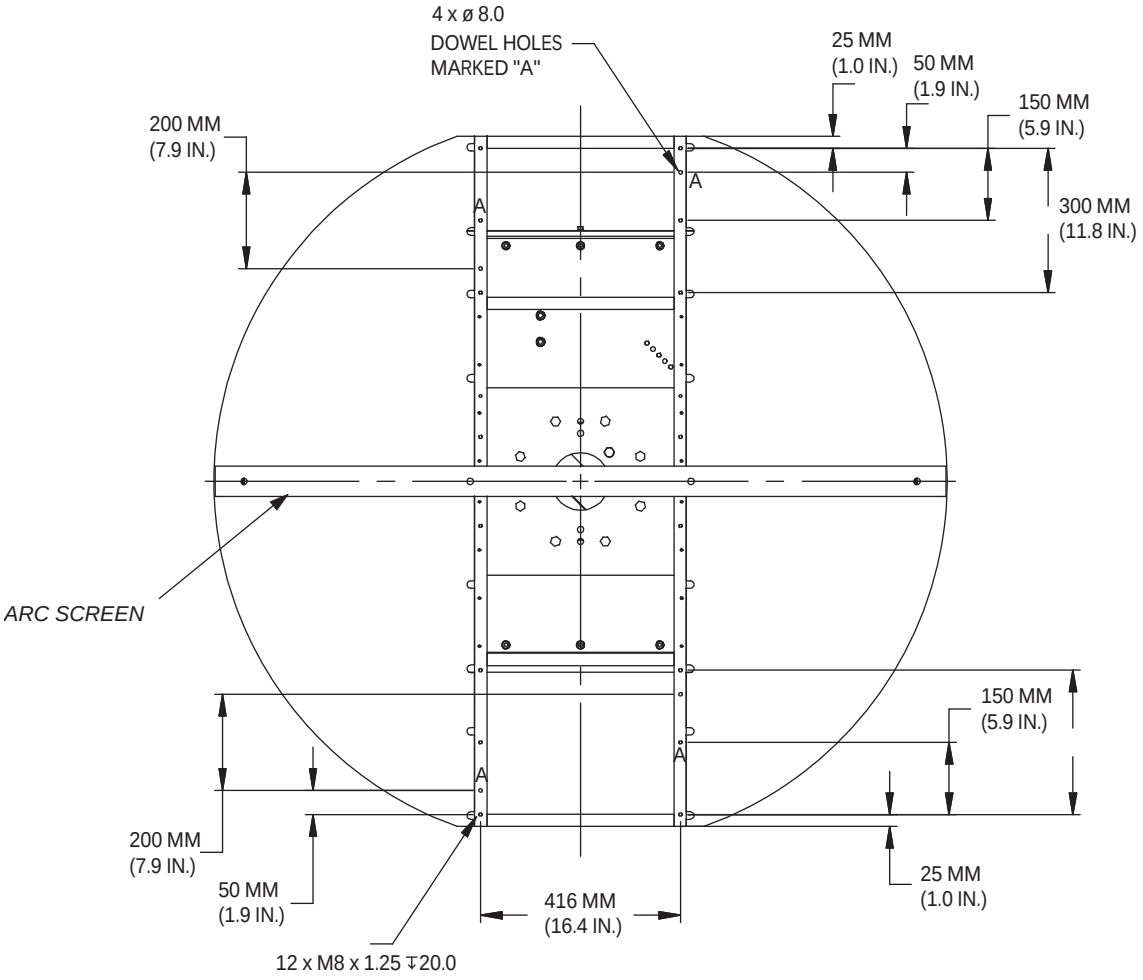

Figure 7 Table Dimensions

Chapter 6
Maintenance

Maintenance of the MR300 components should be performed only by authorized personnel who are familiar with the design and construction of this positioner. 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 power is off before performing the following procedures. Observe standard lockout/tagout practices.

6.1 Spare Parts

When a part malfunctions, it is helpful to have replacement parts in stock for quick replacement. Table 6-1 lists the recommended spare parts with Motoman part numbers. Motoman recommends the following parts to be kept on hand:

WARNING!
Warranty and machine function is valid only when using original Motoman Robotics spare parts. Using defective parts may result in severe accidents and/or voiding your warranty.

Part Name	*Motoman Part Number*	*Recommended Qty*
Proximity Switch, Single/Dual Channel	130137-7	1
Proximity Switch, Dual Channel	130137-8	1

Part Name	*Motoman Part Number*	*Recommended Qty*
Control Card	139485-2	3
Fuse	133653-3	1
Deceleration Switch	472008-1	1
Grease	133174-1	1

6.2 Ordering Parts

When ordering spare parts, always state:

- Machine type (Positioner)
- Machine Name (MR300)
- Motoman Part No.
- Part name
- Number of parts

Send your order to:

Customer Service
Motoman
805 Liberty Lane
West Carrollton, Oh 45449
Telephone:937.847.3200
Telefax:937.847.3211

6.3 Drive Motor

The MR300 Positioner uses a brushless AC drive motor. The inspection schedule for the motor is shown in the table below. Do not disassemble the motor. Contact the Motoman Service Department at 937.847.3200 when overhaul becomes necessary.

6.4 Maintenance Schedule

6.4.1 MR300 Positioners

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.
Cleaning	As required	Clean with dry cloth or compressed air.
Lubrication – gears	500 hours	If the cycle time is shorter than 2 minutes, grease every 15,000 indexes

6.5 Troubleshooting

6.5.1 MR300 Positioners

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 and recheck. Repeat until problem stops.
Unstable operation	Incorrect wiring	Inspect and correct wiring across motor terminals L1, L2, L3, and PE.
	Positioner over-load	Verify positioner is loaded within limits.
Motor overheats	Excessive ambi-ent 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 and recheck. Repeat until problem stops.
Unusual noise	Motor loosely mounted	Tighten mounting bolts.
	Noisy bearing	Check alignment, noise of bearing, lubrication. Call Motoman Service.

Notes

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 MR300 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

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., 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.

Parts List Form

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

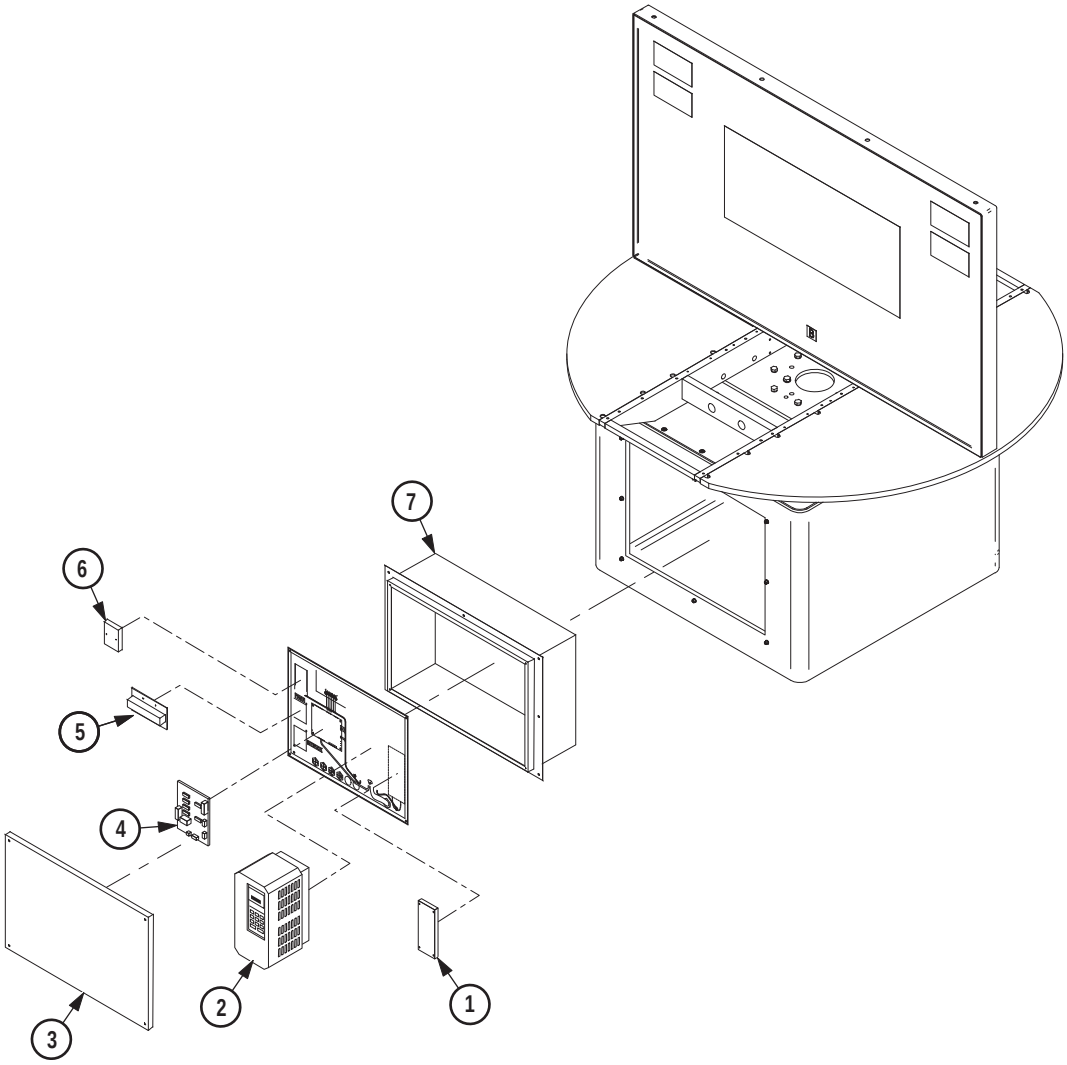

Figure 1 Interface Box

Table A-1 Parts List – Interface Box Components

Item Number	*Motoman Part Number*	*Description*	*QTY*
1	144460-1	RESISTOR, 250W, 5%, 50 OHM	*1*
2	151548-1	G7 VARIABLE FREQUENCY DRIVE	*1*
3	140793-1	COVER, ENCLOSURE, INTERFACE	*1*
4	139485-3	BOARD, PC, DUAL CHANNEL	*1*
5	139497-1	REACTOR, 2HP	*1*
6	133651-1	FUSE HOLDER, BLOCK MTG, 600V, 30A	*1*
7	140792-1	ENCLOSURE, INTERFACE	*1*

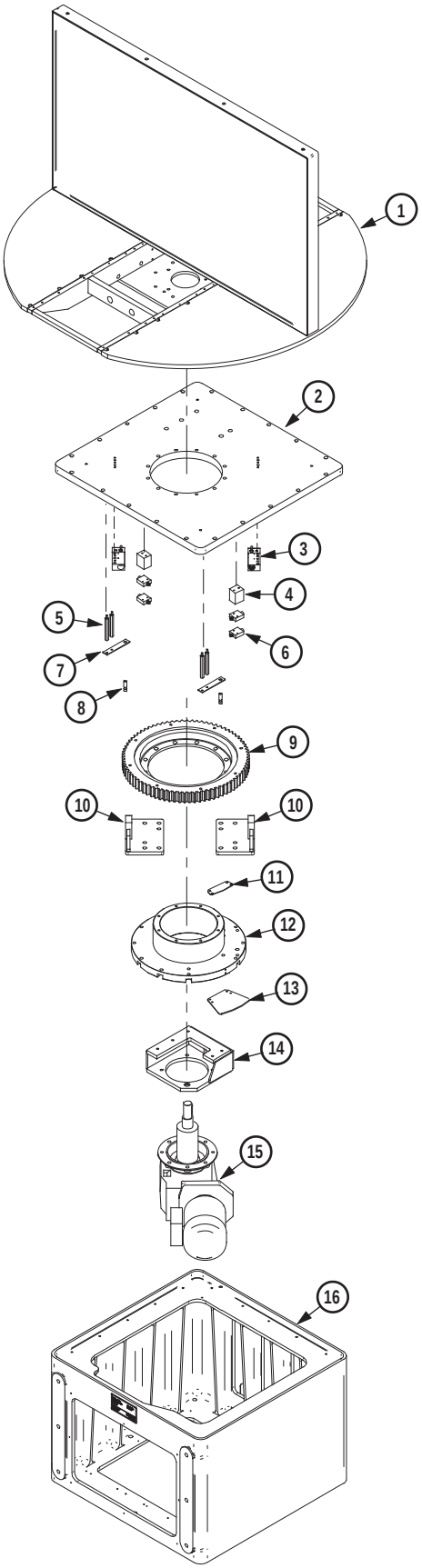
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Table A-2 Parts List – Common Table Components

Item Number	*Motoman Part Number*	*Description*	*QTY*
1	148280-1	TABLE ASSY, POSITIONER, H-FRAME mr300, W/MTG PLATE	*1*
2	147142-1	TABLE, MR300	*1*
3	149188-1 149188-2	BLOCK ASSY, SHOCK SENSOR	*2*
4	147148-1	BLOCK, MTG, LIMIT SWITCH	*2*
5	147314-1	SPACER, BRACKET, PROX SWITCH	*4*
6	143963-1	SWITCH, LIMIT, MINIATURE	*4*
7	147147-1	PLATE, MTG, PROX SWITCH	*2*
8	148070-1	SENSOR, PROX, 12MM, NPN	*2*
9	140786-1	BEARING, SLEWING, EXT GEAR	*1*
10	147145-1	STOP, POSITIONER	*2*
11	147149-2	PLATE, TARGET, SPACER	*1*
12	147143-1	POST, MTG, DRIVE GEAR	*1*
13	147149-1	PLATE, TARGET, PROX SWITCH	*1*
14	147144-1	BRACKET, MTG, DRIVE MOTOR	*1*
15	151421-1	MOTOR, BRAKE, GEAR, 2HP	*1*
16	146197-1	BASE, CASTING, TURNTABLE	*1*

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