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SECTION 1
INTRODUCTION

The ArcWorld II–50-series is part of the ArcWorld family of standardized arc welding solutions. Each cell is a fully integrated welding system, and is supported from wire to weld by Motoman, Inc.

The ArcWorld II–50-series consists of the following four arc welding cells from Motoman:

• ArcWorld II-50
• ArcWorld II-50S
• ArcWorld II-52
• ArcWorld II-52S

These four standard cells are practically the same with the primary difference being type of positioner. The different positioner types are shown in Figure 1-2.

The ArcWorld II–50-series features a Motoman arc welding robot and XRC 2001 controller with menu-driven arc welding application software, complete welding package, interlocked access positioner doors, operator interface, and a total safety environment. If you have any questions or would like to order an updated manual, please contact the Motoman service staff at (937) 847-3200.

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 robot 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 ArcWorld II–50-series and components, a list of reference documents, and customer service information.

SECTION 2 - SAFETY
This section provides information regarding the safe use and operation of an ArcWorld II–50-series system.

SECTION 3 - DESCRIPTION OF EQUIPMENT
This section provides a detailed description of the major components of an ArcWorld II–50-series system.

SECTION 4 - INSTALLATION
This section provides instructions for set up and installation of an ArcWorld II–50-series system.

SECTION 5 - OPERATION
This section provides instructions for basic operation of the ArcWorld II–50-series system. This also section provides procedures for start-up, loading, normal operation, fault recovery, and shutdown.

SECTION 6 - MAINTENANCE
This section contains a table listing periodic maintenance requirements for the components of an ArcWorld II–50-series cell.
1.2 **System Overview**

The ArcWorld II–50-series provides a complete arc welding solution in a standardized configuration. The system is designed around a Motoman arc welding robot and XRC 2001 robot controller, and includes a complete welding package. Two folding doors open to allow the operator access to the cell to set up parts inside the cell. The cell provides a full complement of safety features designed to protect both personnel and equipment.

1.2.1 **System Layout**

All components of the ArcWorld II–50-series cell are mounted individually to the floor. The robotic cell is fully enclosed by safety fencing and two interlocking doors. All operator controls, including those on the controller and welding power supply, are accessible from outside the robotic enclosure. Figure 1-1 illustrates the system layout of the ArcWorld II–50-series cell. Figure 1-2 illustrates differences in the four models of the ArcWorld II–50-series cell.

![Figure 1-1 System Layout](image)

**NOTE:** This manual is for a standard Motoman system. If your system is a custom or modified system, please use the drawing and Bill of Material (BOM) provided with the system for troubleshooting and spares provisioning.
Figure 1-2  Cell Configurations
1.2.2 Major Components
The ArcWorld II–50-series includes the following major components:
- A Motoman UP6 manipulator and XRC 2001 controller
- MH150 servo-driven headstock (ArcWorld II-50S/52S only)
- Interlocked positioner access doors
- Operator station(s)
- Safety equipment, including the following:
  - Safety fencing with arc curtains
  - Interlocked cell door
  - S-axis hard stops
  - L-axis in-position switch
  - Locking Mechanism on bi-fold doors

1.2.3 Optional Equipment
The following equipment is available for use with the ArcWorld II–50-series:
- Welding power source
- Motoman torch (water-cooled or air-cooled)
- Wire feeder
- Torch mount
- Stationary tack table (ArcWorld II-50/52 only)
- Torch cleaner
- Wire cutter
- Com-Arc III seam tracking unit
- Water circulator
- Touch Sense-Starting Point Detection unit
- Common Equipment Base

1.3 Reference to Other Documentation
For additional information refer to the following:
- Motoman UP6 Manipulator Manual (P/N 145886-1)
- Motoman Operator's Manual for Arc Welding (P/N 142098-1)
- MH-series Positioner Manual with MotoMount and Drive Assemblies (P/N 146703-1)
- Motoman Concurrent I/O Parameter Manual (P/N 142102-1)
- Com-Arc III Instruction Manual (P/N 144075-1)
- Touch Sense Instruction Manual (142970-1)
- Vendor manuals for system components not manufactured by Motoman
1.4 **Customer Service Information**

If you are in need of technical assistance, contact the Motoman service staff at (937) 847-3200. Please have the following information ready before you call:

- Robot Type (UP6)
- Application Type (welding)
- System Type (ArcWorld II-50/50S/52/52S)
- Software Version (access using TOP KEY/SYSTEM INFO/VERSION/SYSTEM on the programming pendant)
- Robot Serial Number (located on the back side of the robot arm)
- Robot Sales Order Number (located on front door of controller)
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: (734) 994-6088
FAX: (734) 994-3338

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

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

This safety section addresses the following:

- Standard Conventions (Section 2.2)
- General Safeguarding Tips (Section 2.3)
- Mechanical Safety Devices (Section 2.4)
- Installation Safety (Section 2.5)
- Programming Safety (Section 2.6)
- Operation Safety (Section 2.7)
- Maintenance Safety (Section 2.8)
2.2 **Standard Conventions**

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

- DANGER
- WARNING
- CAUTION
- NOTE

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

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

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

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

**NOTE:** Information appearing in a **NOTE** caption provides additional information which is helpful in understanding the item being explained.
2.3  **General Safeguarding Tips**

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

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this robot, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this robot system.
- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the robot cell.
- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).
- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
- In accordance with ANSI/RIA R15.06, section 6.13.4 and 6.13.5, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

2.4  **Mechanical Safety Devices**

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

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

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

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

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

2.6 **Programming Safety**

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

- Any modifications to PART 1 of the 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).
SECTION 3
EQUIPMENT DESCRIPTION

3.1 UP6 Robot Description

The Motoman UP6 robot and XRC 2001 robotic controller represent state-of-the-art technology in robotics today. The six-axis UP6 robot has a payload of 6 kg (13.2-lbs). It features a 1,373 mm (54.05-inch) reach and has a relative positioning accuracy of ± 0.08 mm (0.004-inch).

The UP6 robot can reach below its own base as well as behind itself and can be mounted on the floor, wall, or ceiling with few modifications. However, the S-axis has been restricted by hardstops for use in this system. For more information, refer to the manipulator manual that came with your system.

3.2 XRC 2001 Controller

The XRC 2001 robotic controller coordinates the operation of the ArcWorld II–50-series system. It controls manipulator movement and welding power supply, processes input and output signals, and provides the signals to operate the welding system. It maintains variable data and performs numeric processing to convert to and from different coordinate systems. In addition, the controller provides the following: main logic functions, servo control, program and constant data memory, and power distribution. For more information, refer to the manipulator manual that came with your system.

Figure 3-1  XRC 2001 Controller
3.2.1 Playback Panel

The playback panel (see Figure 3-2) contains the primary system controls and consists of the features described below. For more information, refer to the manipulator manual that came with your system.

![Playback Panel Diagram]

**Figure 3-2 XRC 2001 Playback Panel**

**Servo On Ready**
The SERVO ON READY pushbutton turns servo power ON. The switch lights when servo power is on. In TEACH mode, the SERVO ON READY pushbutton operates only when the TEACH LOCK button on the programming pendant is ON and the ENABLE switch on the programming pendant is held in.

**Mode**
The Mode push buttons (PLAY, TEACH and REMOTE) set the robot’s mode of operation.

*NOTE:* Changing modes from PLAY to TEACH, during playback, will cause the program to cease execution (similar to HOLD); to resume operation, press PLAY and then START.

**Alarm/Error**
The ALARM/ERROR indicator light turns ON whenever an alarm or error condition occurs.

**Emergency Stop (E-STOP)**
The E-STOP button on the playback panel is connected in series with the system Emergency Stop circuit. Pressing E-STOP ceases all system operation.

**Start**
Pressing the START button while in PLAY mode with servo power on, causes playback execution of the current job to begin.

**Hold**
The HOLD button is a normally closed, momentarily actuated switch. Pressing HOLD halts operation of the manipulator until another Start signal is sent.
3.2.2 Programming Pendant

The programming pendant (see Figure 3-3) is the primary user interface for the system. The pendant has a 4x5-inch 12-line, 40-character LCD display and keypad. The system uses the INFORM II robot language and a menu-driven interface to simplify operator interaction with the robot. By using the pendant, the operator can teach robot motion, and perform programming, editing, maintenance, and diagnostic functions. The programming pendant consists of the items described below. For more information, refer to the manipulator manual that came with your system.

**NOTE:** The programming pendant LCD display goes dark after a few minutes of inactivity. Press any key to restore screen.

![Figure 3-3 Programming Pendant](image)

**General Purpose Display Area**
The General Purpose Display Area displays the currently selected menu choice.

**Menu Area**
The Menu Area contains menu selections for the currently selected screen.

**Emergency Stop (E-STOP)**
The E-STOP button on the programming pendant is connected in series with the system Emergency Stop circuit. Pressing the E-STOP button interrupts this circuit and stops all system operation.

**Keypad**
The user keypad on the programming pendant serves as an input device. The keys are grouped into different functional sections to simplify operator use.
**Status Area**
The Status Area shows system status via the following symbols:

- **Active Robot, External Axis, or Base Axis**  
  R1, R2, R3; S1, S2, etc.; or B1, B2, etc.

- **Coordinate System**  
  \[ \text{Joint, World, Cylindrical, Tool, or User Frame} \]

- **Manual Speed Setting**  
  Inching, Low, Medium, or High

- **Cycle Mode**  
  Step, 1-Cycle, or Auto

- **System Status**  
  E-Stop, Stop, Running/Start, Hold, or Alarm

- **Additional Pages** (when applicable)

**TOP MENU Key**
The TOP MENU key returns the pendant display to the initial start-up menu. The cursor key can then be used to choose from the following menu icons:

- **JOB**  
  This icon accesses job selections including: Master Job, Select Job, Job Capacity, and Create New Job while in TEACH mode.

- **ARC WELDING, GENERAL, HANDLING, and SPOT WELDING**  
  This icon allows you to select the applications available to the controller.

- **VARIABLE**  
  This icon accesses the display and editing menu for the arithmetic variables and display of position variables.

- **IN/OUT**  
  This icon accesses DETAIL and SIMPLE displays of all XRC I/O signals. In EDITING or MAINT. mode, Universal Outputs can be forced ON or OFF.

- **ROBOT**  
  This icon accesses robot information including: CURR.POS, POWER ON/OFF, POS, COMMAND POS, SECOND HOME POS, OPE ORIGIN POS, and TOOL and USER COORDINATE.

- **SYSTEM INFO**  
  This icon provides Version information for both hardware and software, Alarm History, and Monitoring Time.

**Area Key**
The Area key moves the cursor to the different areas of the display screen.

**Cursor Key**
The Cursor key is an 8-way, directional key that moves the up, down, left or right to highlight a desired item that can then be chosen using the SELECT key.
**SELECT Key**

The SELECT key is used to choose the item currently highlighted by the cursor.

**TEACH LOCK Key**

The TEACH LOCK key locks operation of the robot with the programming pendant. Operation is not possible from the playback panel or operator station. Servo power can not be applied in TEACH mode unless TEACH LOCK is ON.

**RS-232C Serial Port**

This 9-pin serial port is used for data communication between the XRC 2001 and a floppy disk controller (FC1 or FC2), FDE (Floppy Disk Emulator) software, or other form of communication (see Figure 3-4).

![RS-232C Serial Port](image1)

**ENABLE Switch**

The ENABLE switch (see Figure 3-5) is a three-position switch located on the left rear of the programming pendant. It is a safety feature that controls servo power while in TEACH mode. When pressed in, this switch enables servo power to be turned on. However, should the operator release the switch, or grasp it too tightly, servo power is immediately disabled, preventing further robot movement.

![Enable Switch](image2)
3.2.3 Brake Release

**WARNING!**
Releasing brakes could cause personal injury or machine damage. Always support the axis to be released BEFORE you release it.

The Brake Release Control is a safety feature that allows you to release the automatic brakes on the robot in case of an emergency or robot failure. The Brake Release Control is mounted on the front of the controller cabinet (see Figure 3-1).

3.3 Operator Station

The operator station (see Figure 3-6) for the ArcWorld II–50-series includes a NEMA enclosure that is fence mounted. The following paragraphs describe the operator station controls.

![Operator Station](image)

3.3.1 Cycle Start

**WARNING!**
The operation of the CYCLE START button is dependent on the structure of the Master job. Altering the Master job could result in injury to personnel or damage to the equipment.

The green CYCLE START button, located on the operator station, initiates a positioner cycle if the robot is in Home position (Cube 24). If the CYCLE START button is pressed while the robot is outside Cube 24, the CYCLE START command is LATCHED into the controller. Once the robot returns to Cube 24 and Output #1 is on, the CYCLE START command is executed and the positioner move to the next station. A pulse instruction prevents the operator from holding the CYCLE START button down and continuously cycling the positioner.
3.3.2 Emergency Stop (E-STOP)

Pressing an E-STOP button stops all system operation. Brakes are applied to the robot and all servo power is removed from the system. The system E-STOP lights come on and all positioner motion is stopped.

3.4 Positioner

Each ArcWorld II–50-series cell comes with positioner support posts for tack table or MH-series headstock mounting. Table 3-1 shows the quantity of optional tack tables and headstocks available with each cell. Motoman does not supply tack tables with any standard cell.

Table 3-1 Cell and Positioner Breakdown

<table>
<thead>
<tr>
<th>System</th>
<th>Tack Table (optional) Quantity</th>
<th>Headstock Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>ArcWorld II-50</td>
<td>1</td>
<td>NA</td>
</tr>
<tr>
<td>ArcWorld II-50S</td>
<td>NA</td>
<td>1</td>
</tr>
<tr>
<td>ArcWorld II-52</td>
<td>2</td>
<td>NA</td>
</tr>
<tr>
<td>ArcWorld II-52S</td>
<td>NA</td>
<td>2</td>
</tr>
</tbody>
</table>

NA = Not Applicable

3.4.1 Stationary Tack Tables (ArcWorld II-50/52 only)

Stationary weld table(s) are used to secure production parts using customer-supplied tooling fixtures. Each table is enclosed with a door that protects the operator from arc radiation, weld splatter, and physical contact with the robot arm. When the robot is finished working, the operator opens the doors, and unloads and reloads parts from the fixture. See Table 3-2 for the Motoman tack table (optional) specifications.

NOTE: In high humidity areas, use surface protection to prevent corrosion of the tooling plates.

Table 3-2 Tack Table Specifications

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part/Fixture Rating</td>
<td>The ArcWorld II-50 table can support up to 300 kg (661 lbs) Each ArcWorld II-52 table can support up to 300 kg (661 lbs)</td>
</tr>
<tr>
<td>Temperature Operating</td>
<td>4-43°C (40 to 110° F)</td>
</tr>
<tr>
<td>Humidity</td>
<td>Non-condensing 10 - 90% relative humidity is acceptable. NOTE: In high humidity areas, the weld table tooling plates may rust or corrode. Use surface protection to prevent corrosion of unpainted tooling surfaces.</td>
</tr>
<tr>
<td>Electrical Requirements</td>
<td>24V DC, 3 amps for the interface is supplied by the controller.</td>
</tr>
<tr>
<td>Welding Current Rating</td>
<td>600 amperes at 100% duty cycle</td>
</tr>
</tbody>
</table>
3.4.2 **MH150 Headstock (ArcWorld II-50S/52S only)**

The Motoman MH150 drive assembly provides precision controlled rotary motion and can be mounted in any orientation. The standard configuration utilizes an AC servo motor, a high ratio gear reducer with integral output bearing, faceplate, and a cast iron housing. It also includes dual integral position switches and one or more weld ground brushes rated at 400 amps per brush.

For detailed positioner specifications of the MH150 headstock, including parts lists breakdown, refer to the MH-series Positioner Manual with MotoMount and Drive Assemblies (P/N 146703-1).

**NOTE:** In high humidity areas, use surface protection to prevent corrosion of the tooling plates.

3.4.3 **Interlocked Bi-fold Doors**

**WARNING!**

*Do not operate this equipment unless access doors are in place and working properly or eye damage can occur!*

The ArcWorld II–50-series features two independent, manually operated, bi-fold doors that provide access to the load and unload areas of the cell.

These doors act as a shield to protect the operator from the arc radiation and sparks produced by the welding operation. Both doors slide in rails and utilize electro-magnetic safety interlocks to deny cell access during the weld process. Adjustments to let the doors open/close easier are made using spring detents.

3.5 **Welding Equipment (optional)**

Optional welding equipment includes: a welding power source, wire feeder, torch/torch mount, water circulators, Com-Arc units, and torch cleaners.

3.5.1 **Wire Feeder**

The wire feeder mounts on the robot arm. This 4-roll wire feeder provides reliable wire feeding at various rates. An integral gas valve provides fast gas response time. The wire feeder has an inch forward button to help simplify set-up and reduce change-over time. Interchangeable feed rolls are used to accommodate different types and sizes of wire.

3.5.2 **GMAW Torch**

The ArcWorld system uses either an air-cooled or a water-cooled robotic/automatic GMAW torch. These are heavy-duty torches designed for quick replacement and minimum robot reprogramming. The GMAW torch is installed at the end of the robot wrist. For applications that use the water-cooled torch, the ArcWorld system includes a water circulator kit.

3.5.3 **Motoman Torch Mount**

The Motoman Torch Mount protects the robot, workpiece, fixture, and positioner. It provides multi-directional impact detection, including Z-axis collisions. Torch impact causes a system E-STOP and immediately stops all system operation. Servo power is removed from the system and brakes are applied to the robot. All positioner and door motion is also stopped.
3.5.4 **Power Sources**

Motoman offers several different power sources for use with the ArcWorld II–50-series system depending on the application. The following are some of the more common power sources used. However, the power source your system uses may be different. For more specific information, refer to the vendor manual that came with your system.

![Available Power Sources](image)

**Figure 3-7 Available Power Sources**
3.6 Safety Features

The ArcWorld system includes a total safety environment. When all standard safety precautions are taken, the safety equipment helps to ensure safe operation of the robotic cell. The ANSI/RIA R15.06 Robot Safety Standard stipulates the user is required to validate the safeguarding.

NOTE: Users are responsible for determining whether the provided safeguards are adequate for plant conditions. Users must also ensure that safeguards are maintained in working order.

3.6.1 Arc Screens

**WARNING!**
Although the arc curtain blocks dangerous arc radiation, never look directly at the arc without protective eyewear!

Two arc screens are used on the ArcWorld system. The first is a metal arc screen on the positioner. This screen blocks arc radiation and sparks from the welding operation.

The material used to cover the safety fencing of the entire robotic cell acts as the second arc screen. This material reduces the amount of ultra-violet radiation that escapes from the robotic cell.

3.6.2 Fencing

The safety fencing provided with the ArcWorld system encloses the entire robotic cell. It forms a physical barrier preventing entry into the robot operating envelope during automatic operation.

3.6.3 Overhead Cable Routing

Cables leading to the back of the cell are routed on top of the cell fencing. Routing cables out of the way extends cable life and creates a safer environment by reducing tripping hazards. Access to the cables can easily be made for troubleshooting purposes.

3.6.4 Emergency Stops (E-STOPS)

In addition to the safety features described above, the ArcWorld II–50-series has strategically placed E-STOPS. These are operator actuated devices that, when activated, immediately stop all system operation. Brakes are applied to the robot and all servo power is removed from the system. The system E-STOP lights come on and all positioner motion is stopped. The following is a list of their locations:

- The playback box on the controller
- The programming pendant
- The operator station
3.6.5 **ENABLE Switch**

The ENABLE switch is a safety feature which controls servo power while in TEACH mode. When pressed in, this switch allows the operator to turn servo power ON and initializes the system. However, should the operator release the switch or grasp it too tightly, servo power is immediately disabled, preventing further robot movement. For detailed information about the operation of the ENABLE switch, refer to the XRC 2001 controller section in the manipulator manual that came with your system.

3.6.6 **Interlocked Cell Door**

A safety interlock on the cell entrance door prevents entry into the cell during PLAY mode. Opening the cell door with the robot in PLAY causes a Gate Interlock Error where brakes are applied to the robot, and all servo power is removed from the system.

3.6.7 **Interference Cubes**

Cubic interference zones prevent interference between multiple manipulators or a manipulator and peripheral devices. The XRC 2001 controller monitors the robot tool center point (TCP) during operation. If the TCP enters one of these software-defined interference zones, an output is turned on in the controller. These outputs can be used to interlock the activity of other manipulators or peripheral devices. The XRC 2001 controller has eight possible cubes available. These cubes are internally tied to the following Specified Outputs:

\[ R1 = SOUT \#081 - 104 \]

The ArcWorld II–50-series uses interference cubes to interlock robot position with positioner motion. The robot Home position (Cube 24) is defined behind the positioner, clear of the sweep or welding zone. Each axis is placed in a position that provides the least amount of strain on the servo motors, with the U- and L-axes at 90-degree angles and the B axis in a relaxed, vertical position. This prevents drifting when servo power is off. Before the positioner can sweep, the robot must be in this safe position.

3.6.8 **Brake Release**

**WARNING!**

*Releasing brakes could cause personal injury or machine damage. Always support the axis to be released BEFORE you release it.*

The Brake Release Control is a safety feature that releases the automatic brakes on the robot in case of an emergency or robot failure. The Brake Release Control is mounted on the front of the XRC 2001 controller cabinet (see Figure 3-1). Refer to the Operation section of this manual for the proper operation of the brake release.
SECTION 4
INSTALLATION

This ArcWorld II–50-series system 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 ArcWorld System is not a task for the novice. The ArcWorld II–50-series System is not fragile, but it is a highly sophisticated robotic system. Handle components with care. Rough handling can damage system electronic components.

4.1 Materials Required
All system hardware necessary for installing the ArcWorld II–50-series system is included with the system. This section identifies customer-supplied items and tools required to complete installation.

4.1.1 Customer-Supplied Items
- Gas bottles for the welding torch
- Incoming power supply
- Two earth ground cables with two earth ground stakes
- Weld wire
- Stepladder
- Forklift and/or overhead crane
- Disconnects

4.1.2 List of Tools
- Safety glasses
- Face shields
- Gloves
- Level
- Ratchet and socket set
- Adjustable wrench set
- Hammer drill with appropriate concrete bits
- Phillips and flat screwdrivers
- Hammer
- Forklift and/or overhead crane
- Air-impact gun with impact socket set
- Open-end wrench set
- Standard and metric socket-head (Allen) Wrench sets
4.2 Site Preparation

To prepare your site, proceed as follows:

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

   NOTE: To make installation easier, allow an additional 1.2 m to 1.5 m (4 to 5 ft) on all sides of cell.

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

Figure 4-1 Area Needed for Installation
4.3 **Removal from Shipping Skid**

Cell components are placed onto a large shipping skid and then shipped to the customer. The customer is responsible for safely removing the components from the skid and inspecting them for damage.

**NOTE:** If damage is found, notify shipper immediately.

4.3.1 **Unloading Procedures**

To successfully unload the shipping skid, proceed as follows:

**WARNING!**

The shipping skid will all cell components loaded onto it weighs 2004 kg (4418 lbs). Be sure that your crane or forklift is capable of handling this much weight or damage to the equipment or injury to personnel can result.

1. Using a forklift, lift the loaded shipping skid and remove it from the hauler.
2. Carefully remove protective plastic wrapping from all cell components.
3. Inspect all cell components for shipping damage.

**NOTE:** If damage is found, notify shipper immediately.

4. Unbolt the each component from the wooden shipping skid (see Figure 4-2).

5. Use the lifting eye bolts to remove each component from the shipping skid.

![Shipment Bolt](image)
4.4 **Cell Components**

4.4.1 **List of Components**

Once the cell components (see Figure 4-3) have removed from the shipping skid, account for each item with the following list:

- UP6 Robot
- Barrier, Positioner
- Safety Fence
- Controller
- Welding power source (optional)
- MH150 Headstock (optional)
- Cables
- Water cooler (optional)
- Torch cleaner (optional)
- Operator Station(s)

![Figure 4-3 System Components](image-url)
4.5 **Assemble Cell Components**

To make sure the cell is complete and to verify floor space efficiency, Motoman recommends that all cell components be set in place together prior to anchoring to the floor. Assemble the cell component in the order they appear below. Use Figure 4-3 and the system drawings to identify cell component locations.

4.5.1 **Setting Up the Cell**

Before permanently anchoring the cell components to the floor, set all pieces in place and fasten them together.

1. Set the positioner in place to define the front of the cell.
2. Set the robot in the specified position.
3. Construct the fencing around the cell. Stand the fencing up and attach to bi-fold doors. Apply the arc shield to the fencing.
4. Secure operator station(s) to fencing.
5. Recheck the location of all components and adjust if necessary.
6. Place the controller, power source, water cooler (optional), and torch cleaner (optional) in place. These components can be placed anywhere the cables reach outside the cell. However they must be placed a minimum of 152.4 mm (6 inches) from the cell fencing.

4.6 **Leveling and Securing the Equipment**

After everything is in position, level the equipment and secure it to the floor. The customer provides suitable anchoring for equipment. To level and secure the equipment, proceed as follows:

**CAUTION!**
*Handle ArcWorld II–50-series components carefully to avoid damage.*

**NOTE:** For information on leveling and securing the MH150 headstock, refer to the MH-series Positioner Manual with MotoMount and Drive Assemblies (P/N 146703-1).

1. Level the component by adjusting leveling bolts (see Figure 4-4).
2. Insert a 1/2-inch concrete drill bit through center of leveling bolts and drill holes for lag bolts.
3. Vacuum concrete dust from holes.
4. Lag robot and positioner to floor.
5. Lag fence to floor.
4.7 Installing the Wire Guide

The wire guide is shipped in an accessories box. To install the wire guide, proceed as follows:

1. Remove wire guide from accessories box.
2. Install connector end of wire guide into feeder housing (see Figure 4-5) by turning connector clockwise until hand-tight.
3. Insert other end of wire guide into side mount; tighten thumbscrew.
4.8 Connecting the Cables

After components are level and securely in place, the cables should be unwrapped from around the equipment and laid out according to the cable diagram included in the system drawing package. Each cable connection is clearly identified for ease of installation.

4.8.1 Connecting the Earth Ground

The robot and the controller must each be connected to an earth ground. An earth ground is a ground in which the equipment is connected to a ground stake driven into the earth. The ground stake must be driven a minimum of 2.43 m (8 ft) into the earth, and the earth must be treated with chemicals in order to reduce resistance to the ground stake. Deeper ground stakes may be required depending on area soil conditions. A maximum of 100 ohms ground resistance is recommended. To ground the robot and the controller, proceed as follows:

WARNING!

- If proper earth grounds cannot be provided, do not use the equipment! Serious injury or death can occur.
- Do not place the MIG system within 15.24 m (50 ft) of other sources of noise (i.e., GTAW arc starters, plasma cutters, induction furnaces, high-power-resistance spot welders, dielectric heaters, etc.). Equipment that generates impulse or high-frequency noise can cause unexpected equipment operation and failure, which can result in serious injury or death.

NOTE: If the robot and the controller are within 4.57 m (15 ft) of each other, a common earth ground may be used. Otherwise, separate earth grounds must be used.

1. Connect one end of each robot earth ground cable to lug marked EARTH GROUND on bottom back of robot.
2. Connect other end of robot earth ground cable to earth ground stake.
3. Connect one end of second earth ground cable to common ground bus bar inside the controller.
4. Connect other end of second earth ground cable to earth ground stake.

4.8.2 Connecting the Robot Cables

Three cables, 1BC, 2BC, and 3BC connect the robot to the controller. The 1BC cable supplies power to the robot servo motors. The 2BC cable provides communication between the controller and the robot. The 3BC cable provides control for the feeder. To connect the robot cables, proceed as follows:

NOTE: The right side of the controller is on your right as you are facing the front of it.

1. Unpack programming pendant and plug connector into receptacle on right side of the controller.
2. Unpack two large black manipulator cables, connected to the controller, and route to back of robot.
3. Carefully engaging connectors, connect three cables (labeled 1BC, 2BC, and 3BC) to the 1BC, 2BC, and 3BC connections on back of robot (see Figure 4-6).
4.8.3 Connecting Water Circulator (Optional)

If your system uses the water cooled welding torch, it is necessary to connect the Motoman water circulator. To connect the water circulator, proceed as follows:

1. Connect two water hoses from weld torch to connections on water circulator marked WATER-IN and WATER-OUT (see Figure 4-7).
CAUTION!

- Use only the antifreeze provided by Motoman. Automotive antifreeze contains stop-leak additives that will clog the small torch water-cooling ports and damage the gaskets in the pump.
- Do not fill the water circulator past its fill line. Damage to the water circulator could occur.

2. Fill water circulator tank with antifreeze coolant provided (P/N 131224-1).
3. Plug power cable into electrical outlet on back of power source.

4.9 Connecting the Power

After all of the system components have been properly installed, connect the power to the ArcWorld II–50-series. To connect incoming power to the ArcWorld II–50-series, proceed as follows:

DANGER!

Power should be connected only by a qualified electrician. Electrical and grounding connections must comply with applicable portions of the national electrical code and/or local electrical codes.

1. Install 3-phase power wiring to the circuit breaker located inside the left wall of the controller cabinet (see Figure 4-8). Table 4-1 shows the size and type of wire needed.
2. Tighten screws to the torque indicated in Table 4-1.
3. Install an M5 lug on the incoming ground wire.
4. Terminate the ground wire to the frame ground M5 threaded stud with M5 hardware provided.

**NOTE:** The ArcWorld II–50-series is configured for 3-phase 460/480V AC, unless other voltage was requested. If other voltage is required for your plant, you must make the necessary modifications to the transformer. For more information, refer to the manipulator manual that came with your system.

### Table 4-1  Incoming Power Specifications (Decal)

<table>
<thead>
<tr>
<th>Lug Data</th>
<th>60/75˚ C wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalog No.</td>
<td>TCAL14</td>
</tr>
<tr>
<td>Wire Size</td>
<td>Refer to system drawings</td>
</tr>
<tr>
<td>Torque</td>
<td>#14-7, 4.0 N•m (35 lb-in.)</td>
</tr>
</tbody>
</table>

### 4.10 Conducting a Safety/Operation Check

Before installing the tooling and fixtures for your application, take a few minutes to perform a safety/operation check. To conduct a safety/operation check:

1. Be sure there is a clearance of at least 2.5 cm (1 in.) on either side of the positioner.
2. Check that the cell door is closed, latched and functioning correctly.
3. Check that both positioner doors are closed, latched, and functioning correctly.
4. Check that all cable connections are tight.
5. Check air line connections to the optional torch cleaner and wire cutter if required.
6. Be sure that the welding power source is set correctly (see the welding power source vendor’s manual).
7. Verify that incoming line power matches the input power specified on the label on the front of the controller.

Your ArcWorld II–50-series cell is now ready for power-up. This ArcWorld system should be operated only by personnel who have received operator training from Motoman and who are familiar with the operation of this Motoman robot model. Turn the main power ON, and continue the safety/operation check.

8. Check all system E-STOPS (pendant, op-station, breakaways, playback box).
9. Check system Hold buttons.
4.11 Installation of Tooling and Fixtures

Your ArcWorld II–50-series system is now ready for the installation of tooling and fixtures for your application. Installation of tooling and fixtures should be performed by personnel who are familiar with the operation of this system. Tooling plates, tooling, and fixtures are supplied by the customer. After tooling is installed, test the positioner for proper operation.

MH150 Tooling Procedures

For tooling and fixture specifications on the MH150 headstock, refer to the MH-series Positioner manual with MotoMount and Drive Assemblies (P/N 146703-1).

Tack Table Hole Pattern

Figure 4-9 shows the proper tack table hole pattern for the ArcWorld II-50 cell. Figure 4-10 shows the proper tack table hole pattern for the ArcWorld II-52 cell.
SECTION 5
OPERATION

The ArcWorld II–50-series is a fully integrated series of robotic GMAW welding cells. This section provides operating procedures for the ArcWorld II–50-series system.

5.1 Programming

The operation of this system is programming dependent. The following operating instructions are based on one possible configuration of this system. Your system configuration and job structure may differ slightly from that presented here; however, basic operation will be the same.

Any changes made to your system configuration and/or job structure will alter the operation of this cell. Motoman recommends you do not modify the original jobs and system configuration that came with your system. If modifications need to be made, they should be made to copies of these jobs and not to the originals. The application programs may assign specific values to memory locations in the controller. Consult your system documentation before modifying your system. Modifications should only be performed by personnel who have received operator training from Motoman, and who are familiar with the operation of this Motoman system. If you have questions concerning the configuration of your system please contact the 24 hour Service Hotline, at (937) 847-3200 (see Section 1.4).

5.1.1 I/O Assignment

The ArcWorld II–50-series uses the following user and dedicated inputs and outputs (see Tables 5-1 and 5-2).

<table>
<thead>
<tr>
<th>XRC 2001 Dedicated Inputs</th>
<th>XRC 2001 Dedicated Outputs</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Servo On</td>
<td>• Servo Power ON</td>
</tr>
<tr>
<td>• External Job Start</td>
<td>• TEACH mode</td>
</tr>
<tr>
<td>• Alarm Reset</td>
<td>• Cube 24</td>
</tr>
<tr>
<td>• REMOTE mode ON</td>
<td>• Alarm Occurrence</td>
</tr>
<tr>
<td>• Hold</td>
<td></td>
</tr>
<tr>
<td>• External Emergency Stop</td>
<td></td>
</tr>
<tr>
<td>• Safety Device</td>
<td></td>
</tr>
<tr>
<td>• Interference</td>
<td></td>
</tr>
</tbody>
</table>

For more information on user and dedicated I/O, refer to the XRC 2001 Concurrent I/O Parameters Manual (P/N 142102-1).
5.2 **Daily Operation**

The procedures below represent the typical operating sequence from power up to shutdown. Yours basic operating procedures may vary depending on your situation.

- Perform Start-up Procedures (see Section 5.2.1).
- Move robot to Home position (see Section 5.2.2).
- Select master job (see Section 5.2.3).
- Perform Operation Cycle (see Section 5.2.4)
- Perform Shutdown Procedures (see Section 5.2.5)

### 5.2.1 Start Up

To start up a ArcWorld II–50-series cell from a Power-Off condition, proceed as follows:

1. Make sure both enclosure doors are closed and securely latched.
2. Set MAIN POWER switch on controller to ON.
3. Set INPUT POWER switch on welding power source to ON.
4. Open regulator valve on welding gas supply.
5. Make sure robot in Home position (Cube 24). If it is not, see Section 5.2.2.
6. Select master job.
7. Put controller in PLAY mode.
8. Select AUTO/CYCLE mode of operation
9. Turn on servo power.
10. Press the start button to start playback of job.

The system is now operating and waiting for the operator to initiate the welding cycle by pressing the cycle start button on the operator’s station.
5.2.2 **Robot Safe (Cube 24) Position**

To move the robot to the Safe position (Cube 24), proceed as follows:

1. Press TEACH mode button on XRC 2001 playback panel.
2. Press TOP MENU on programming pendant.
3. Select JOB icon using cursor keys and press SELECT.
4. Cursor to SELECT JOB and press SELECT key.
5. Using cursor keys, move cursor to R1 SAFE job and press SELECT. Cube 24 job appears on display screen.
6. Turn servo power ON by pressing SERVO ON, pressing TEACH LOCK and holding in ENABLE switch.
7. Use INTERLOCK and FWD buttons on programming pendant to jog robot to Safe (Cube 24) position.

5.2.3 **Starting the Master Job**

With the system powered up and in TEACH mode, call up the Master job:

1. Press TOP MENU key on programming pendant.
2. Select JOB icon using cursor keys and press SELECT.
3. Cursor to SELECT JOB and press SELECT key. Job list appears on display screen.
4. Using cursor keys, move cursor to Master job and press SELECT. Master job appears on display screen.
5. Press PLAY mode button on XRC 2001 playback panel. Job playback operation is enabled.
6. Press SERVO ON button on playback panel.
7. Press the START button on the front of the controller.

The ArcWorld II–50-series cell is now ready for operation.

*NOTE:* For proper system operation, the cycle should be in AUTO. Refer to the manipulator manual for detailed instructions.
5.2.4 Perform Operation Cycle

The following is the typical sequence of operation for the ArcWorld II–50-series cell after start-up:

**ArcWorld II-50/50S Cells**
1. Load fixture
2. Close positioner door.

*NOTE:* Before starting first cycle, make sure the correct job has been loaded.
3. Press the CYCLE START button on operator station. The robot begins welding parts.
4. When robot is finished welding, it returns to Safe Position (Cube 24). Open positioner door and unload welded parts from fixture.
5. Start process again

**ArcWorld II-52/52S Cells**
1. Load fixture in Station 1.
2. Close Station 1 door.

*NOTE:* Before starting first cycle, make sure the correct job has been loaded.
3. Press the CYCLE START button on operator station. The robot begins welding parts.
4. While robot is welding, open Station 2 door and load second station.
5. When parts are loaded, close station door and press CYCLE START button on operator station. The CYCLE LATCHED light comes on. When robot is finished welding in Station 1, it returns to Safe Position (Cube 24) then begin welding in Station 2 if CYCLE LATCHED light is on.
6. When welding begins in Station 2, remove parts from Station 1 and start process over.

5.2.5 Shutdown

Use the following procedure to shut down the ArcWorld II–50-series cell after operation is complete:
1. If the last part has been welded, place the AUTO / MANUAL switch in MANUAL to remove the last set of welded parts.
2. Make sure the robot is in the Safe position (Cube 24).
3. Turn off system servo power by pressing E-STOP button on operator station, programming pendant, or playback panel.
4. Press TEACH mode button on playback panel.
5. Close regulator valve on welding gas supply.
6. Set Main Power switch on welding power source to OFF position.
7. Set controller Main Power switch to OFF position.

The ArcWorld II–50-series cell is now shut down.
5.3 System Recovery

When a system error or alarm occurs, you must clear the error or alarm to return the system to normal operation. The paragraphs below describe the different types of alarms and errors you may encounter and how to remedy them when you do.

5.3.1 Alarms and Errors

Alarms and errors will cause the program to stop. There are three levels of alarms and errors: Error Messages, Minor Alarms, and Major Alarms. For more detailed information about alarm recovery, refer to manipulator manual that came with your system.

Error Messages

These are simple errors such as pressing the START button when the robot is not in PLAY mode, or enabling the programming pendant without the servo power being live. Clear these errors by pressing the CANCEL button on the programming pendant.

Minor Alarms

Minor alarms are usually programming errors.Minor alarms might occur if a circle has been programmed with fewer than three circular points, etc. Clear these errors by pressing the RESET (F5) soft key on the programming pendant.

Major Alarms

Major alarms are hardware failures. Major alarms might occur because of a servo tracking error or an abnormal speed and are usually associated with crashes. To clear these alarms, you must turn off the controller and then turn it on again.

5.3.2 E-STOP Recovery

An E-STOP can occur under any of the following conditions:

• Pressing E-STOP button on the operator station, programming pendant, or the playback panel.
• Opening the cell door on robot enclosure when robot is not in TEACH mode.
• Actuating shock sensor on torch mount.

To restart the ArcWorld II–50-series cell after an E-STOP condition occurs, follow the procedure below.

1. Release E-STOP button on operator station, programming pendant, or controller playback panel.
2. Close cell door.
3. Clear Shock Sensor condition (refer to Section 5.3.3).
4. Make sure controller is in PLAY mode.
5. Press SERVO ON button.
6. Press START.

NOTE: The front doors will not release at E-stop. Service of the robot occurs via the gate interlocked doors. If the front doors must be opened, activate the outputs to Door Interlock #1, and #2, (Outputs 5 and 6).
5.3.3 Shock Sensor Recovery

The ArcWorld welding package includes a Motoman gun mount. This mount is designed to protect the torch from damage in case of a crash. A slight deflection of the torch activates a SHOCK SENSOR message which triggers an E-STOP condition. To clear the E-STOP condition, you must override the shock sensor and move the robot clear of the impact. To override the shock sensor, proceed as follows:

⚠️ CAUTION!

It is possible to crash the robot with the Shock Sensor Override Switch left in the “Override” position. Always remember to reactivate the Shock Sensor before continuing system operation.

1. Press TOP MENU on programming pendant.
2. Select ROBOT icon using cursor keys and press SELECT.
3. Cursor to OVERRUN-S.SENSOR and press SELECT key.
4. Select RELEASE to release shock sensor.
5. Turn servo power ON by holding ENABLE switch on the programming pendant and pressing SERVO ON.

NOTE: TEACH LOCK must be ON to turn servo power on in TEACH mode.


The ArcWorld II–50-series cell is now ready to continue operation.

5.3.4 Using the Brake Release

The brake release control panel is located on front of the controller. Each axis brake is controlled by an individual axis button. Simultaneously pressing the ENABLE button or one of these axis buttons releases the indicated axis. To release the brakes, proceed as follows:

1. Press E-STOP button on programming pendant, playback panel, or operator station, to be sure servo power is OFF.
2. Provide adequate support for axis to be released. Support should withstand payload of robot and approximate weight of the robot. Listed below are weights of each robot available:
   - UP6 – 135 kg (297 lb)

⚠️ WARNING!

Releasing brakes could cause personal injury or machine damage. Always support the axis to be released BEFORE you release it.

3. Release the specific axis brake by pressing and holding corresponding axis button and ENABLE button at same time.

NOTE: You must hold both the axis and ENABLE buttons down for the axis to remain released. Releasing either button will automatically lock the brakes again.
SECTION 6
MAINTENANCE

6.1 Periodic Maintenance

Table 6-1 provides periodic maintenance items and intervals for the ArcWorld II–50-series cell. Keep in mind that the maintenance intervals serve as guidelines only. You should adjust the frequency of maintenance to suit your specific work conditions.

For periodic maintenance procedures and schedules for the individual components of your ArcWorld II–50-series, refer to the manipulator and additional manuals that came with your system.

CAUTION!

Use only the antifreeze provided by Motoman. Automotive antifreezes contain stop-leak additives that will clog the small torch water-cooling ports, and damage the gaskets in the water circulator pump.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Component</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Daily</strong></td>
<td>Water circulator (for water-cooled torch application only).</td>
<td>Check the fluid in the water circulator. Add fluid as required. Use only distilled water and approved antifreeze (Motoman P/N 131224-1).</td>
</tr>
<tr>
<td><strong>Daily</strong></td>
<td>Gate Interlocks</td>
<td>Validate operation per manufacture’s manual</td>
</tr>
<tr>
<td><strong>Daily</strong></td>
<td>In-position Switches</td>
<td>Validate operation of switches</td>
</tr>
</tbody>
</table>

6.2 MH150 Headstock Maintenance Procedures

For maintenance procedures of the MH150 headstock, including parts lists breakdown, refer to the MH-series Positioner Manual with MotoMount and Drive Assemblies (P/N 146703-1).

Maintenance 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.
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 ArcWorld II-50-series doors 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.2.1 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  Door Components
### Table A-1 Parts List – Positioner Components

<table>
<thead>
<tr>
<th>Item Number</th>
<th>Motoman Part Number</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>147134-1</td>
<td>COVER, UPPER</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>147368-1</td>
<td>LATCH, DOOR, BALL STYLE, TENSION</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>146992-1</td>
<td>STATION, OPERATOR, RH</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>146992-2</td>
<td>STATION, OPERATOR, LH (AW II-52/52S ONLY)</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>NA</td>
<td>GUIDE, DOOR, UPPER, ASSY (see Figure A-2 for parts breakdown)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>147130-1</td>
<td>GUIDE, DOOR, LOWER</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>147128-2</td>
<td>DOOR, BIFOLD, RH</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>147129-1</td>
<td>PLATE, NUT</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>147128-1</td>
<td>DOOR, BIFOLD, LH</td>
<td>1</td>
</tr>
<tr>
<td>10</td>
<td>147138-1</td>
<td>HANDLE, DOOR, BLACK</td>
<td>2</td>
</tr>
<tr>
<td>11</td>
<td>147133-1</td>
<td>COVER, FRONT, BOTTOM</td>
<td>1</td>
</tr>
<tr>
<td>*NS</td>
<td>NA</td>
<td>150 kg HEADSTOCK (optional)</td>
<td></td>
</tr>
<tr>
<td>NS</td>
<td>147070-1</td>
<td>FENCE KIT</td>
<td>1</td>
</tr>
</tbody>
</table>

* For parts list breakdown of 150 kg headstock, see Appendix B of the MH-series Positioner Manual with MotoMount with Drive Assemblies, P/N 146703-1.

NA = Not Applicable
NS = Not Shown
Figure A-2  Upper Door Guide Components
Table A-2 Parts List – Upper Door Guide

<table>
<thead>
<tr>
<th>Figure A-2 Item Number</th>
<th>Motoman Part Number</th>
<th>Description</th>
<th>QTY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>147291-1</td>
<td>BEARING, BALL, SINGLE ROW</td>
<td>8</td>
</tr>
<tr>
<td>2</td>
<td>133969-2</td>
<td>PIN, SPRING, M5 X 16</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>479147-3</td>
<td>WASHER, FLAT, M5</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>147127-1</td>
<td>GUIDE, DOOR, UPPER</td>
<td>2</td>
</tr>
</tbody>
</table>
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