Motoman XRC 2001 Controller

ArcWorld IV-6300
XHD TR3C
System Manual
for UP-Series Robots

Part Number: 148533-1CD
Revision: 1
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SECTION 1

INTRODUCTION

The ArcWorld IV-6300 XHD TR3C (Triple Robot, Three Controller) cell is part of the ArcWorld family of standardized arc welding solutions. It is a fully integrated welding system, and is supported from wire to weld by Motoman, Inc.

The ArcWorld IV-6300 XHD TR3C cell features three Motoman arc welding robots, three XRC 2001 controllers with menu-driven arc welding application software, three complete welding packages, a 180-degree reciprocating plane positioner with two orbital servo axes, operator interface, and total safety environment. The TR3C can be reconfigured from the triple robot system into three separate robotic systems with independent control (see Motoman TR3C Conversion Instructions, XRC 2001 (P/N146823-1). For more information, please call 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 these Motoman robot models. For more detailed robot 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 IV-6300 XHD TR3C and its components, a list of reference documents, and customer service information.

SECTION 2 - SAFETY

This section provides information regarding the safe use and operation of the ArcWorld IV-6300 XHD TR3C system.

SECTION 3 - EQUIPMENT DESCRIPTION

This section provides a detailed description of the major components of the ArcWorld IV-6300 XHD TR3C system. This section also includes a table of component specifications.

SECTION 4 - INSTALLATION

This section provides instructions for setup and installation of the ArcWorld IV-6300 XHD TR3C system.

SECTION 5 - OPERATION

This section provides instructions for basic operation of the ArcWorld IV-6300 XHD TR3C system. This section also provides procedures for startup, loading, normal operation, fault recovery, and shutdown.

SECTION 6 - MAINTENANCE

This section contains a table listing periodic maintenance requirements for the components of the ArcWorld IV-6300 XHD TR3C cell.
1.2 System Overview

The ArcWorld IV-6300 XHD TR3C provides a complete arc welding solution in a standardized configuration. The system is designed around three Motoman arc welding robots, three XRC 2001 controllers functioning as one, and includes three complete welding packages. A ferris-wheel type reciprocating positioner with two orbital axes, capable of rotation in conjunction with the primary axis (trunion) allows an operator to prepare and set up parts on one side while the robot welds on the other side. The cell provides a full complement of safety features designed to protect both personnel and equipment. Figure 1-1 illustrates the system layout of the ArcWorld IV-6300 XHD TR3C cell.

![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.
1.2.1 System Layout

The robotic cell is fully enclosed by safety fencing and an interlocking door. If the operator stands in the path of the light curtain, the positioner will not cycle. All operator controls, including those on the XRC 2001 controllers and welding power supplies, are accessible from outside the robotic enclosure.

The controllers and welding power sources have separate common bases.

1.2.2 Major Components

The ArcWorld IV-6300 XHD TR3C includes the following major components:

- Motoman UP6 manipulators and XRC 2001 controllers
- MRM2-750 S3X dual-station, 180-degree reciprocating positioner, with two servo-driven, orbital axes
- Master operator station
- Welding equipment, including the following:
  - Welding power sources
  - Motoman torches (water-cooled or air-cooled)
  - Wire feeders
  - Torch mounts
- Safety equipment, including the following:
  - Safety fencing with arc curtains
  - Interlocked light curtains
  - Interlocked cell door
  - Positioner arc shields

1.2.3 Optional Equipment

The following optional equipment is available for use with the ArcWorld IV-6300 XHD TR3C:

- Torch cleaner
- Com-Arc seam tracking unit
- Water circulator
- 12-channel slip ring kit
- High-volume air supply kit
- ToolSight
- Multi-station load kit, Manual/Auto
1.3 **Reference to Other Documentation**

For additional information refer to the following:

- Motoman UP6 Manipulator Manual (P/N 145960-1)
- Motoman MRM2-750 S3X Positioner Manual (P/N 147988-1)
- Motoman TR3C Conversion Instructions, XRC 2001 (P/N146823-1)
- Motoman Operator’s Manual for Arc Welding (P/N 142098-1)
- Motoman Concurrent I/O Parameter Manual (P/N 147626-1)
- Com-Arc Instruction Manual (P/N 144075-1)
- Independent/Coordinated Motion Manual (P/N 142969-1)
- 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 IV-6300 XHD TR3C)
- Software Version (access using TOP MENU/SYSTEM INFO/VERSION on the programming pendant)
- Robot Serial Number (located on the back side of the robot arm)
- Robot Sales Order Number (located on back side of controller)
2.1 Introduction

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

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

Robotic Industries Association
900 Victors Way
P.O. Box 3724
Ann Arbor, Michigan 48106
TEL: 313/994-6088
FAX: 313/994-3338

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

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

This safety section addresses the following:
- Standard Conventions (Section 2.2)
- General Safeguarding Tips (Section 2.3)
- 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 the 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).

Each 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 TR3C XRC 2001 Controllers – R1, R2, and R3

The TR3C (triple robot, three controller) XRC 2001 robotic controllers, shown in Figure 3-1, features dual-channel safety circuitry. The controller coordinates the operation of the ArcWorld IV-6300 XHD TR3C system and is configured so that one controller directs the action of all three robots, designated as Robot 1 (R1), Robot 2 (R2), and Robot 3 (R3). The R1 controller coordinates the operation of the entire cell and delegates tasks to all three robots. The three welders (Welder 1, Welder 2, and Welder 3) and positioner are also controlled by the R1 controller. The R1 controller controls manipulator movement, 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. The R2 and R3 slave controllers contain servo amplifier hardware that is also controlled by R1 controller. For more information, refer to the manipulator manual that came with your system.
TR3C Conversion

The TR3C can be reconfigured from the triple robot system, with the Master XRC 2001 controlling system operation, to three separate robotic systems with independent control (see Motoman TR3C Conversion Instructions, XRC 2001 P/N 146823-1). For more information, please call the Motoman service staff at (937) 847-3200.

3.2.1 Top-Mount External Axis Cabinet

The external axis cabinet on the R1 controller contains the amplifiers and converters for the servo motors on the positioner. See Figure 3-2 for external axis cabinet components.
3.2.2 Playback Panel

The playback panel (see Figure 3-3) 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.
Servo On Ready
The SERVO ON READY pushbutton turns servo power ON. The switch illuminates 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 Buttons – Play/Teach
The Mode pushbuttons (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
The ALARM indicator light illuminates 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.

Edit Lock
The EDIT LOCK key switch, when turned on, prevents editing of system/controller files and programs. The operator is limited to only viewing files and jogging the robot axes.

The EDIT LOCK key can only be removed from the lock when it is in the ON position. The key is placed in the Read Me First packet on the side of the R1 controller, for shipping purposes.

Remote
The REMOTE pushbutton transfers primary control of the cell from the controller to the operator station (see Section 3.3). Programming pendant functions, except for E-STOP, are disabled while in REMOTE mode. The REMOTE pushbutton illuminates when activated.

3.2.3 Programming Pendant
The programming pendant (see Figure 3-4) 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.
Figure 3-4 Programming Pendant

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.

Numeric Keypad
The numeric keypad on the programming pendant serves as an input device. The keys are grouped into different functional sections to simplify operator use.

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.

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**
  ⚭ 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 controller 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 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 robots 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 controller and a floppy disk controller (FC1 or FC2), FDE (Floppy Disk Emulator) software, or other form of communication (see Figure 3-5).
ENABLE Switch

The ENABLE switch (see Figure 3-6) is a 3-position switch located on the left rear of the programming pendant. This safety feature 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.

3.2.4 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 the operator 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 is located on the cell floor and controls the robotic cell with knobs and pushbuttons. This operator station (see Figure 3-7) includes a NEMA enclosure on a stand-alone pedestal. Pushbuttons and knobs are used exclusively to change cell activities. The following paragraphs describe the operator station controls.
WARNING!
The operation of the CYCLE START palm 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.

CYCLE START
The green CYCLE START button, located on the operator station, initiates a positioner sweep cycle if the robots are in the Safe or Home position (Cube 22, Cube 23, and Cube 24). Pressing the CYCLE START button with the system in PLAY mode and any robot outside it’s Safe Cube (cubes 22, 23, and 24) latches the CYCLE START command. The CYCLE LATCHED indicator lights and once the robots return to Home position, the CYCLE START command is executed and the positioner sweeps. A pulse instruction prevents the operator from holding the button down and continuously cycling the positioner.

CYCLE LATCHED
CYCLE LATCHED indicates that a CYCLE START command has been issued and will execute, sweeping the positioner and beginning welding job, immediately after the current weld cycle is complete.

The CYCLE LATCHED lamp illuminates when the CYCLE START command has been latched. It is not necessary to wait for the robots to finish welding and return to the Home position (Cube 22, Cube 23, and Cube 24) before pressing the CYCLE START button to sweep the positioner. Pressing the CYCLE START button while either robot is still in motion locks the CYCLE START command into the controller. The CYCLE LATCHED light will illuminate on the operator station, indicating CYCLE START latching. The positioner sweeps after the robots finish the current job and return to the Home position (Cube 22, Cube 23, and Cube 24). Stepping into the light curtain area will unlatch the CYCLE START command from the controller.
EMERGENCY STOP (E-STOP)
Pressing an E-STOP button or interrupting a door interlock stops all system operation. Brakes are applied to the robot and all servo power is removed from the system. The system E-STOP lights illuminate and all positioner motion is stopped. The operator station E-STOP, the robot E-STOP, and the sliding door interlocks are connected in series in the Emergency Stop circuit.

HOLD
The HOLD button is a normally closed, momentarily actuated switch. Pressing the HOLD button stops the operation of the manipulator and positioner until another start signal is sent. The indicator light stays ON only while the HOLD button is pressed. Operation resumes at the point in the program where the HOLD state was initiated. Refer to the manipulator manual for more information.

ALARM
The ALARM lamp illuminates when either robot encounters an alarm condition or when servo power is cut.

POSITIONER AUTO/MANUAL
The POSITIONER AUTO/MANUAL selector switch is used to select AUTOMATIC or MANUAL mode for the positioner. The selector switch is connected to robot Input #10. When the selector switch is in the AUTOMATIC position, the robot will complete the weld cycle after the positioner sweeps. In MANUAL mode, the robot does not process the part after the positioner sweeps, but remains in the Home position.

NOTE: The Positioner Auto/Manual command is dependent on the structure of the Master job.

START
The robot will start the current active job (on the pendant) when START button is pressed. The operator station must be enabled and servo power ON for the START button to work. The START button is connected to the robot external start input.

OPERATOR STATION ENABLE/DISABLE
The OPERATOR STATION ENABLE/DISABLE selector switch transfers primary control of the ArcWorld cell from the controller to the operator station. The REMOTE MODE button on the controller playback panel illuminates when the operator station is enabled. Most pendant functions are disabled while in REMOTE.

RESET
Pressing RESET clears a minor alarm or error. The RESET button is connected to the robot alarm reset input and is always active.

SERVO ON
The SERVO ON pushbutton enables servo power. In TEACH mode, the SERVO ON pushbutton operates only when the ENABLE switch on the programming pendant is held in.
3.4 MRM2-750 S3X Positioner

For detailed information on the MRM2-750 S3X positioner, refer to the Motoman MRM2-750 S3X Positioner Manual, P/N 147988-1.

The MRM2-750 S3X is a ferris-wheel type reciprocating positioner with two orbital axes, capable of rotation in conjunction with the primary axis (trunion). It is AC-servomotor controlled to provide coordinated motion. The patented servomotors sweep the positioner workstations into and out of the robot envelope, and also rotate the weld side of the positioner during welding.

A fixture frame is typically mounted between headstock and tailstock faceplates. Fixtures are either mounted on or integrated into these frames for positioning and clamping of production parts. Air lines and wiring can be routed to the fixtures if required. Depending on part’s size and weight, single, multiple, or a combination of parts can be mounted to the frame.

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

The ArcWorld IV-6300 XHD TR3C system is capable of synchronized motion between various components depending on the job configuration. Synchronized components move at the same time during operation. All three robots can be synchronized with the positioner. The ArcWorld IV-6300 XHD TR3C system is also capable of true coordinated motion, where linear, circular, or spline motion can be coordinated between robots and the positioner. Coordinated motion allows the robots to weld while the positioner rotates the parts. For additional information on coordinated motion, refer to the Independent/Coordinated Motion Manual (P/N 142969-1).

Refer to Table 3-1 for specifications for the MRM2-750 S3X positioner.

**Table 3-1 Positioner Specifications**

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Capacity</td>
<td>2 x 750 kg (1653.5 lbs)</td>
</tr>
<tr>
<td>Servo Motors</td>
<td>1 x 3.2 kW</td>
</tr>
<tr>
<td></td>
<td>2 x 2.2 kW</td>
</tr>
<tr>
<td>Index Torque</td>
<td>2856 N•m</td>
</tr>
<tr>
<td>Index Speed Max.</td>
<td>12.9 rpm</td>
</tr>
<tr>
<td>Index Time</td>
<td>6 sec.</td>
</tr>
<tr>
<td>Orbital Torque Static</td>
<td>912 N•m</td>
</tr>
<tr>
<td>Orbital Torque Dynamic</td>
<td>1140 N•m</td>
</tr>
<tr>
<td>Orbital Speed Maximum</td>
<td>14.8 rpm</td>
</tr>
<tr>
<td>Welding Capacity</td>
<td>2 x 920A (60%)</td>
</tr>
<tr>
<td>Positioning Accuracy</td>
<td>± 0.1 mm (± .003 in.)</td>
</tr>
<tr>
<td>Maximum Unbalance</td>
<td>300 kg (661 lbs)</td>
</tr>
<tr>
<td>Distance between headstock and tailstock</td>
<td>3.0 meters (118 in.)</td>
</tr>
</tbody>
</table>
3.4.1 Welding Ground System

The welding ground system consists of four spring-loaded copper brushes that contact a copper disc inside each headstock assembly. The ground cable from each welding power source is connected to one of three ground studs located on the right side of the positioner base as you face the back of the cell.

⚠️ CAUTION!
Make sure all ground retaining hardware is secure. If connections are loose, arcing can occur and cause the insulator to melt.

3.4.2 Locking Pins

The MRM2-750 S3X positioners are equipped with fixture locking pins that prevent the trunion from turning when the robot is welding.

3.4.3 Arc Shield

⚠️ DANGER!
Do not operate this equipment unless the arc shield is in place or eye damage can occur!

Each side of the MRM2-750 S3X positioner is equipped with two sheet metal screens that run the length of the positioner to visually separate the loading zone from the welding zone. These screens act as a shield to protect the operator from the arc radiation and sparks produced by the welding operation. Do not operate this equipment unless the arc shields are in place.

3.5 Welding Equipment

In its standard configuration, the ArcWorld IV-6300 XHD TR3C system includes a power source, wire feeder, torch, and torch mount. Optional equipment, including water circulators, Com-Arc units, and torch tenders may be included to enhance performance.

3.5.1 Wire Feeder

The wire feeder in the welding package is selected to match the welder. Motoman always mounts the feeder on the upper arm to improve feedability. Wiring and shielding gas lines may be routed along the outside of the robot arm. In some cases, Motoman uses internal wire harness and air hose to run utilities from the base of the robot to the upper arm. For aluminum welding packages, Motoman includes provisions to mount a 16-lb. aluminum, wire spool on the upper arm.

⚠️ CAUTION!
Never mount a steel wire spool on the upper arm. The excess weight will exceed the arm's weight limit.

Wires/cables from the torch shock sensor are often run together or close to the feeder wires/cables. The MotoWeld II feeder includes a Shock Sensor Override switch and an inch button. The override switch allows the robot to be moved from the collision point so the shock sensor can be reset.
**CAUTION!**
Do not operate the robot with the override switch in OVERRIDE position or damage to equipment can result.

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 IV-6300 XHD TR3C cell includes a water circulator kit.

3.5.3 **Torch Mount**

The torch mount protects the torch from impact with the workpiece, fixture, or positioner. It provides multi-directional impact detection, including Z-axis collisions. A torch impact causes a system E-STOP and immediately stops all system operation, servo power is removed from the system, brakes are applied to the robot, and all positioner motion is stopped.

3.5.4 **Power Source Common Base**

All three power sources, with service disconnect switches, are set on a power source common base.

3.5.5 **Power Sources**

Motoman offers several different power sources for use with the ArcWorld IV-6300 XHD TR3C system, depending on your system’s application. The following are some of the more common power sources used (see Figure 3-8). For more specific information, refer to the vendor manual that came with your system.
Figure 3-8 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 responsible for 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 **Service Disconnect Switches**

The ArcWorld IV-6300 XHD TR3C cell has four service disconnect switches that turn electricity on/off for shut down or power up. Listed below are the disconnect switches and their uses.

- XRC POWER service disconnect – controls power to the entire cell (except for the welders).
- WELD 1 service disconnect – controls power to Welder 1.
- WELD 2 service disconnect – controls power to Welder 2.
- WELD 3 service disconnect – controls power to Welder 3.

See Figure 3-9 for service disconnect locations.

![Figure 3-9 Service Disconnect Locations](image-url)
3.6.2 Arc Screens

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

Two arc screens are used on the ArcWorld IV-6300 XHD TR3C cell. The first are the metal arc shields on the positioner. These shields block 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 arc curtain reduces the amount of ultra-violet radiation that escapes from the robotic cell.

3.6.3 Fencing

The safety fencing provided with the ArcWorld IV-6300 XHD TR3C cell encloses the entire robotic cell. It forms a physical barrier preventing entry into the robot operating envelope during automatic operation. Quick-access panels covering the headstock and tailstock housings, can be easily removed for maintenance needs.

3.6.4 Safety Light Curtains

The safety light curtains help prevent serious injury to anyone entering the positioner area during the sweeping process. In PLAY or TEACH mode, if the positioner is sweeping and the safety light curtain is activated, servo power is removed from the system and all positioner motion stops. Servo power can be reapplied by clearing the obstruction and pressing SERVO ON. Then press the START button to continue positioner motion.

If the positioner is not in motion but the CYCLE START input has been latched (indicated by the CYCLE LATCHED light), the CYCLE START input is unlatched and the CYCLE LATCHED light turns off when the safety light curtain is activated. Servo power remains ON.

3.6.5 ENABLE Switch

The ENABLE switch, located on the teach pendant, is a safety feature which controls servo power while in TEACH mode. When pressed, 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 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 servo power to be removed and brakes applied to the robot. All positioner motion is stopped. To turn servos back on and resume job, proceed as follows:

1. Shut the cell door.
2. Turn servos back on either at the operator station or at the playback panel.
3. Press START either at the operator station or at the playback panel.
3.6.7 Interference Cubes

Cubic interference zones prevent interference between multiple manipulators or a manipulator and peripheral devices. The controller monitors the robot tool center point (TCP) during operation. If the TCP enters one of the 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 controller has 24 possible cubes available. These cubes are internally tied to the following Specified Outputs:

SOUT #081 - 104

The ArcWorld IV-6300 XHD TR3C uses interference cubes to interlock robot position with positioner motion. The robot Home or Safe position (Cube 22, Cube 23, and Cube 24) is defined behind the positioner, clear of the sweep zone. 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 controller cabinet (see Figure 3-1). Refer to Section 5.3.4 for the proper operation of the brake release.

3.6.9 Emergency Stops (E-STOPS)

Emergency E-STOPS 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 illuminate and all positioner motion is stopped. The following is a list of their locations:

- The playback panel on the R1 controller
- The programming pendant
- The operator station

To reset an E-STOP button, proceed as follows:

1. Fix the problem – if any – that initiated the E-STOP.
2. Twist and pull E-STOP button out to reset button.
3. Turn servos back on either at the operator station or at the playback panel.
4. Press START either at the operator station or at the playback panel to restart job where it left off.
SECTION 4
INSTALLATION

The ArcWorld IV-6300 XHD TR3C 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 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 IV-6300 XHD TR3C system is included with the system. Section 4.1.1 identifies customer-supplied items and tools required to complete installation.

4.1.1 Customer-Supplied Items

- Gas bottles for the welding torches
- Welding gas regulators
- Incoming power supply to power disconnects
- Two earth ground cables with two earth ground stakes
- Welding wire
- Incoming air supply: 0.04 cmm at 620.5 kPa (1.5 scfm at 90 psi)
- 1/4-inch anchors for operator station
- 1/2-inch air line fitting for filter/regulator/lubricator (FRL)
- Ring-tongue terminal for ground wire

4.1.2 List of Tools

- Safety glasses
- Face shields
- Gloves
- Level
- Adjustable wrench set
- Hammer drill with appropriate concrete bits
- Phillips and flat screwdrivers
- Hammer
- Socket set (standard and metric)
- Air-impact gun with 3/4-inch socket
- Open-end wrench set
- Socket-head (Allen) wrench sets (standard and metric)
- Stepladder
- Forklift and/or overhead crane
- Knife
- Wire stripper and crimer
- 1/4-inch concrete floor anchors
- Volt/ohm meter
- Ring-tongue terminal
4.1.3  Cell Components

There are seven major components that make up the ArcWorld IV-6300 XHD TR3C cell (see Figure 4-1). The component names and quantities are as follows:

<table>
<thead>
<tr>
<th>Qty</th>
<th>Component Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Robot Common Base</td>
</tr>
<tr>
<td>1</td>
<td>Auxiliary Equipment Base</td>
</tr>
<tr>
<td>1</td>
<td>Positioner</td>
</tr>
<tr>
<td>2</td>
<td>Programming Base</td>
</tr>
<tr>
<td>1</td>
<td>Fence</td>
</tr>
<tr>
<td>1</td>
<td>Operator Station</td>
</tr>
<tr>
<td>1</td>
<td>Power Source Common Base</td>
</tr>
</tbody>
</table>

![Diagram of System Components](image_url)
4.2 Site Preparation

To prepare your site, proceed as follows:

1. Clear the floor space needed for the unit (see Figure 4-2).

   ![Figure 4-2 Area Needed for Installation](image)

   NOTE: It is recommended to keep an additional 2 to 3 m (8 to 10 ft) of clear distance on all sides of your system.

2. Gather all customer-supplied items and required tools listed in Section 4.1.
4.3 **Shipment Inspection**

After components are unloaded, inspect them for shipping damage. If needed, carefully remove protective plastic wrapping from components.

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

4.4 **Steps for Installation**

The procedures below are the sequence of steps to complete installation.

- Install the positioner (see Section 4.6).
- Install the robot common base (see Section 4.7).
- Install the programming platforms (see Section 4.8).
- Install the auxiliary equipment common (AEC) base (see Section 4.9).
- Connect the cables (see Section 4.10).
- Install fencing (see Section 4.11).
- Install the cell door (see Section 4.12).
- Install arc curtains on fencing (see Section 4.13).
- Install light curtains (see Section 4.14).
- Install the operator station (see Section 4.15).
- Connect the power (see Section 4.16).
- Conduct a system check before system power up (see Section 4.17).
- Power up the system (see Section 4.18).
- Light Curtain Alignment/Fence Anchoring (see Section 4.19).
- Conduct a system check after system power up (see Section 4.20).
- Installing tooling and fixtures (see Section 4.21).

4.5 **Shipping/Leveling Bolts**

Components of the ArcWorld IV-6300 XHD TR3C cell are secured to wood boards or shipping skids with multiple shipping/leveling bolts (see Figure 4-3). Once the shipping bolts are removed, the leveling bolts are maintained to level the component before anchoring. Figure 4-4 shows factory-supplied anchors (with nuts/washers) used to anchor components to concrete floor.

![Figure 4-3 Shipping/Leveling Bolts](image)
4.6 Installing the Positioner

The positioner is anchored to the concrete floor at the front of the cell (see Figure 4-1).

4.6.1 Unpacking the Positioner

⚠️ WARNING!
The positioner weighs 3992 kg (8800 lbs). Make sure the lifting devices used to move the positioner are capable of safely handling this much weight, or damage to equipment or injury to personnel can result.

NOTE: Because of the size/weight of the unit, it is recommended that the shipping skid be removed at the positioner's permanent location.

1. Move the positioner to its permanent location using capable lifting devices.
2. Locate all shipping bolts (see Figure 4-6) and remove them using a 3/4-inch wrench.
3. Using two forklifts, one on each end, lift the positioner and remove the shipping skid from beneath it.
4. Use the system drawings to ensure proper placement. Adjust if necessary.

4.6.2 Removing the Positioner Shipping Brackets

⚠️ CAUTION!
The positioner shipping brackets must be removed before operation or damage to equipment will occur.

1. Use a M24 socket/wrench to remove the eight screws securing the long positioner shipping bracket to the positioner (see Figure 4-5).
2. Remove the long positioner shipping bracket.
3. Use a M24 socket/wrench to remove the four screws securing both short shipping brackets to the positioner beam.
4. Remove both short positioner shipping brackets.

**NOTE:** The positioner shipping brackets must be used to move the positioner. If the possibility exists that the positioner will be moved after initial setup, keep the positioner shipping brackets for future use.

### 4.6.3 Positioner Leveling

1. Using a M36 socket to turn each leveling bolt, level the positioner.
2. Insert a 1/2-inch concrete drill bit through the center of each leveling bolt (see Figure 4-6) and drill holes (at least four inches deep into concrete) for anchor bolts.

Figure 4-5  Positioner Shipping Brackets

Figure 4-6  Positioner Anchor Locations
3. Vacuum concrete dust from holes.
4. Prepare 1/2-inch anchors (factory-supplied) with accompanying washer and nut (see Figure 4-4) for each anchor location.
5. Using a hammer, drive an anchor into each drilled hole until the washer stops at the leveling bolt.
6. Using a 3/4-inch wrench, tighten each nut (clockwise) until tight.

4.7 Installing the Robot Common Base

To install the robot common base, proceed as follows:

⚠️ WARNING!
The robot common base weighs 1630 kg (3593.6 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. Using a M30 socket/wrench, remove the three screws in the positioner beam where the robot common base attaches. Save the hardware for attaching the common base.
2. Using a forklift, place the robot common base in position, as shown in Figure 4-7. The lip of the robot common base rests on top of the positioner beam.
3. Fasten the robot common base to the positioner beam using hardware removed in Step 1.
**WARNING!**
Metal bands are under tension and, when cut, may cause injury. Be cautious when cutting the metal bands.

4. Cut bands securing the floor cover plate and remove it from the robot common base. The cover plate will be replaced after cables have been routed beneath the common base and programming platform.

5. Using a M36 socket to turn each leveling bolt, level the robot common base.

6. Insert a 1/2-inch concrete drill bit through the center of each leveling bolt (see Figure 4-3) and drill holes (at least four inches deep into concrete) for anchor bolts.

7. Vacuum concrete dust from holes.

8. Prepare a 1/2-inch anchor (factory-supplied) with accompanying washer and nut (see Figure 4-4) for each anchor location.

9. Using a hammer, drive an anchor into each drilled hole until the washer stops at the leveling bolt.

10. Using a 3/4-inch wrench, tighten the nut (clockwise) on each anchor until tight.

11. Carefully remove protective plastic wrapping from robots and torches.

12. Inspect robots, torches, and positioner for shipping damage.

**NOTE:** If damage is found, notify shipper immediately.
4.8 Installing the Programming Platforms

**WARNING!**
The total weight of the platforms and accessories is 120 kg (264.5 lbs). Make sure the lifting devices used to move these objects are capable of safely handling this much weight.

A programming platform must now be installed on the left and right side (see Figure 4-9) of the robot common base. Both programming platforms are shipped together with other parts on a wood shipping skid. Each programming platform is leveled and anchored into the concrete.

![Diagram of Programming Platform Installation](image)

*Figure 4-9  Install Programming Platforms*

1. Unbolt programming platforms from the shipping skid using a 3/4-inch socket.
2. Using a forklift, remove the programming platforms from the shipping skid.
3. Using a M24 socket, remove the two screws (four total) in the positioner beam where each programming platform attaches. Save the hardware for installing both platforms.
4. Place a programming platform on both sides of the robot base with the leveling bolts oriented to the rear. The lip of each programming platform sits on top of the positioner beam. Secure each programming platform to the positioner beam using the M24 bolts removed in Step 3.
5. Using a M36 socket to turn each leveling bolt, level the programming platform.
6. Insert a 1/2-inch concrete drill bit through the center of each leveling bolt (see Figure 4-3) and drill holes (at least four inches deep into concrete) for anchors.

7. Vacuum concrete dust from holes.

8. Prepare a 1/2-inch anchor (factory-supplied) with accompanying washer and nut (see Figure 4-4) for each anchored location.

9. Using a hammer, drive an anchor into each drilled hole until the washer stops at the leveling bolt.

10. Using a 3/4-inch wrench, tighten the nut (clockwise) on each anchor until tight.

4.9 Installing the Auxiliary Equipment Common Base

The auxiliary equipment common (AEC) base contains two controllers, two welders, and four service disconnects. The common base may also contain optional water circulators and Com-Arc seam tracking units. The auxiliary equipment common base is shipped on wood blocks. To install the AEC base, proceed as follows:

1. Unbolt the AEC base by removing four shipping bolts using a 3/4-inch socket (see Figure 4-10).

![Figure 4-10 Unbolting Auxiliary Equipment Common (AEC) Base](image)
WARNING!
The AEC base weighs 1600 kg (3520 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.

2. Carefully remove plastic wrapping and cardboard from AEC base.
3. Inspect AEC base components for any shipping damage.

NOTE: If damage is found, notify shipper immediately.

4. Using a forklift, lift the AEC base and remove both wood blocks.
5. Using the dimensions in Figure 4-11, place the AEC base next to the programming platform that is closest to the headstock.
6. Using an M36 socket to turn each leveling bolt, level the AEC base.
7. Insert a 1/2-inch concrete drill bit through the center of each leveling bolt (see Figure 4-3) and drill holes (at least four inches deep into concrete) for anchors.
8. Vacuum concrete dust from holes.
9. Prepare 1/2-inch anchor (factory-supplied) with accompanying washer and nut (see Figure 4-4) for each anchor location.
10. Using a hammer, drive an anchor into each drilled hole until the washer stops at the leveling bolt.
11. Using a 3/4-inch wrench, tighten the nut (clockwise) on each anchor until tight.
4.10 **Connecting the Cables**

After components are level and securely in place, unwrap the cables and connect them according to the cable diagram included in the system drawing package. All cables are labeled to match the labels at the connection points.

4.10.1 **Cable Routing**

It is important to keep cables covered/hidden as much as possible. Figure 4-12 shows the recommended cable routings to avoid cable damage. Cables leading to the robots must be routed and hidden under the robot common base. Other cables must be routed close to equipment when possible.

⚠️ **CAUTION!**

*Route wires and cables away from hazardous work areas to avoid wire breakage and unnecessary interruption of cell operation.*

4.10.2 **Connecting the Earth Ground**

Each robot and controller must each be connected to an earth ground. 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. A maximum of 100 ohms ground resistance is recommended. Deeper ground stakes may be required depending on area soil conditions. To ground the robots and controller, proceed as follows:
DANGER!

- 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 may result in serious injury or death.

NOTE: If the robot and 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 each robot.
2. Connect other end of each robot earth ground cable to the earth ground stake.
3. Connect one end of each second earth ground cable to common ground bus bar inside each controller.
4. Connect other end of each second earth ground cable to earth ground stake.

4.10.3 Connecting the Programming Pendant Cable

Unwrap the programming pendant and place it on the pendant holder located on the R1 controller. Connect the pendant cable to the R1 controller at the connector labeled PROGRAMMING PENDANT.

4.10.4 Connecting the Welding Cables

Negative (Ground) Cables

The MRM2-750 S3X positioner has three welding ground bars that receive three welding ground cables from the welders. The welding ground cables are shipped in an accessories box. To connect the ground welding cables, use your system prints and proceed as follows:

1. Unpack the negative ground cables and check for damage.

NOTE: If damage is found, notify shipper immediately.

2. Connect one end of the welding ground cable to the Welder 1 negative terminal (see Figure 4-14). Check that the connection is tight.

CAUTION!

- Poor arc performance and cable overheating may result if both welding cables sharing the same ground.

- All ground connections must be tight. If the connections are loose, arcing can occur and cause the insulator to melt.

3. Connect the other end of the Welder 1 ground cable to the WELD 1 grounding bolt located on the side of the headstock cabinet (see Figure 4-13). See Figure 4-12 for cable routing preferences. Verify connection is tight.
4. Connect one end of second welding ground cable to the Welder 2 negative terminal (see Figure 4-14). Check that the connection is tight.

5. Connect the other end of the Welder 2 ground cable to the WELD 2 grounding bolt located on the side of the headstock cabinet (see Figure 4-13). See Figure 4-12 for cable routing preferences. Verify connection is tight.

6. Connect one end of second welding ground cable to the Welder 3 negative terminal (see Figure 4-14). Check that the connection is tight.

7. Connect the other end of the Welder 3 ground cable to the WELD 3 grounding bolt located on the side of the headstock cabinet (see Figure 4-13). See Figure 4-12 for cable routing preferences. Verify connection is tight.

---

![Diagram](image-url)

**Figure 4-13  Ground Welding Cable on Positioner**

**Figure 4-14  Positive and Negative Terminals on the Welding Power Source**
Positive Cables

The positive welding cables (R1, R2, and R3) are wrapped in leather and wire-tied to each robot. One end of each positive cable is properly connected to the robot.

⚠️ CAUTION!
Do not remove the leather wrapping or damage to the cables could result.

To connect the positive welding cables, use your system prints and proceed as follows:

1. Cut the wire-ties and unwrap the positive weld cables from each robot.
2. Check cables for damage.

NOTE: If damage is found, notify shipper immediately.

3. Route the R1 positive welding cable beneath the robot common base and programming platform to Welder 1 (see Figure 4-12).
4. Connect the R1 positive welding cable to the Welder 1 positive (+) terminal (see Figure 4-14). Check that the connection is tight.
5. Route the R2 positive welding cable beneath the robot common base and programming platform to Welder 2 (see Figure 4-12).
6. Connect the R2 positive welding cable to the Welder 2 positive (+) terminal. Check that the connection is tight.
7. Route the R3 positive welding cable beneath the robot common base and programming platform to Welder 3 (see Figure 4-12).
8. Connect the R3 positive welding cable to the Welder 3 positive (+) terminal (see Figure 4-14). Check that the connection is tight.

4.10.5 Connecting the Positioner Air Line

The positioner air line is regulated by the filter/regulator/lubricator (FRL) and is installed on the side of the positioner cabinet, as shown in Figure 4-13. The customer is responsible for providing and installing the air line connector fitting to the FRL. After the fitting is installed, connect the air line to the fitting. The incoming air supply should be 0.04 cfm at 620.5 kPa (1.5 scfm at 90 psi).

4.10.6 Connecting the Robot Cables

Do not connect any cables until after all components are securely in place. Robot cables leading to the controller must be routed beneath the robot common base and programming platform. Figure 4-15 identifies the robot cable connections.
Figure 4-15  Connecting the Controller to the Robot

Use Table 4-1 to identify cables used for each robot and its function.

**Table 4-1  Cable Connections**

<table>
<thead>
<tr>
<th>Cable Connection</th>
<th>Cable Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1BC-A</td>
<td>Robot encoder communication</td>
</tr>
<tr>
<td>2BC-A</td>
<td>Robot motor power and brakes</td>
</tr>
</tbody>
</table>

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 the manipulator cables (labeled 1BC-A and 2BC-A) and wire feeder cable (3BC-A), connected to each controller, and route beneath the programming platform and robot common base to the back of each robot.
2. Carefully engaging connectors, connect two cables (labeled 1BC-A and 2BC-A) to the 1BC-A and 2BC-A connections on the back of each robot (see Figure 4-15).
3. Connect the wire feeder control cable to the 3BC-A connection on the back of each robot.

**NOTE:** Optional cable connections are available on the back of the robot, including air input.

4. Replace floor cover plate on common base. Make sure all cables leading to the robots are fed through the three slots in the plate (see Figure 4-12).
4.10.7   Connecting the Positioner Cables

The positioner headstock uses a cable interface panel for cable connections. The cable interface panel is placed inside the housing cabinet during shipping. To install the interface panel and connect positioner cables, proceed as follows:

1. Unpack positioner cables CA21, CA23, CA61, and CA62 from the R1 controller and route to the positioner headstock (see Figure 4-12).

2. Using a 10-mm wrench/socket, remove all ten mounting nuts from the side of the headstock frame. The headstock side panel requires eight nuts, the bottom two secure the interface panel. Save hardware for installation of both panels.

3. Remove the headstock side panel.

4. Remove the interface panel from the housing cabinet and secure it to the base of the headstock cabinet, using hardware removed in Step 2 (see Figure 4-16 for proper orientation.)

![Diagram of connecting the Positioner Cables]

5. Route the PL21 and CN11 cables through the far-left hole on the interface panel to the inside of the headstock cabinet. These two cables are internal cables of the CA21 cable.

6. Use a phillips screwdriver to secure the CA21 cable gland plate to the interface panel.

7. Connect the XCO02 CN11 cable to the CN11 connection on the XCO02 board.

8. Locate both PL21 cables (male and female) inside the headstock cabinet and connect them.

9. Connect the CA23 cable to the CA23 connector on the interface panel.

10. Connect the CA62 cable to the CA62 connector on the interface panel.

11. Connect the CA61 cable to the CA61 connector on the interface panel.

Figure 4-16 Positioner Interface Panel Installation
12. Replace the headstock side panel using hardware removed in Step 2. A 10-mm socket/wrench is required.

4.11 Installing the Fence

4.11.1 Unpacking

The fencing that makes up the welding cell’s protective walls is shipped on its own skid with all the hardware needed for installation (see Figure 4-17).

![Fencing Skid](image)

**Figure 4-17 Fencing Skid**

⚠️ **WARNING!**

*Metal bands are under tension and, when cut, may cause injury. Be cautious when cutting the metal bands.*

To unpack the fencing, cut the bands securing metal fencing and remove all items from skid.

4.11.2 Fence Wall Identification

Use Figure 4-18 to identify fence components and location after set up. Use the instructions in this section and the accompanying vendor’s literature to assist with set up. Hardware to assemble the fence is factory-supplied.

**NOTE:** The rear wall is the wall behind the robots. The right wall is on the right as you are facing the front of the cell, and the left wall is on the left as you are facing the front of the cell.
4.11.3 Locate Special Fence Posts

Locate the four fence posts that have two nuts spot-welded to them. Set these posts aside for later use when assembling the middle positioner walls of the fence.

4.11.4 Installing Left Side of Fence

Before installation, place all fence wall components on floor around the cell. Use Figure 4-18 as a guide for fence wall orientation. To install the fence for left side of ArcWorld IV-6300 XHD TR3C cell, proceed as follows:

⚠️ **CAUTION!**

**Two people are required to safely assemble the fence.**

Connect the rear wall to two fence posts, one on each side of wall (see Figure 4-19, Step A).
13. Have an assistant raise the rear wall and hold steady at permanent location (see Figure 4-18).
14. Connect a fence post to platform wall (see Figure 4-19, Step B).
15. Raise the platform wall and connect perpendicularly to the rear wall. Use Figure 4-18 as a guide for fence wall orientation. See Figure 4-20 for fence/post connections.

16. Align the holes in fence post feet with holes in programming platform and robot common base, adjust if necessary (see Figure 4-21).
17. Secure assembled fence section to the programming platform and robot common base using factory-supplied M10 x 30 screws (M24 wrench/socket).
18. Connect a fence post to rear short positioner wall (see Figure 4-22, Step C).

19. Raise the rear short positioner wall and connect perpendicularly to the installed section. Use Figure 4-18 as a guide for fence wall orientation.
20. Raise the rear positioner wall and connect perpendicularly to the rear short positioner wall. Use Figure 4-18 as a guide for fence wall orientation.

21. Connect two of the four fence posts, set aside in Section 4.11.3, to the middle positioner wall with the four spot-welded nuts located on the same side (see Figure 4-22, Step D).

**NOTE:** The spot-welded nuts help secure the quick-access wall.

22. Connect the middle positioner wall (with fence posts) to the rear positioner wall with the spot-welded nuts oriented towards the positioner side (back side) of the fence.

23. Connect a fence post to front positioner wall (see Figure 4-22, Step E).

24. Raise the front positioner wall and connect perpendicularly to middle positioner wall. Use Figure 4-18 as a guide for fence wall orientation.

**NOTE:** Quick-access fence walls protect the headstock and tailstock housings. These walls can easily be installed/uninstalled for positioner maintenance.

25. Using four t-brackets, fasten quick-access wall to fence below middle positioner wall (see Figure 4-23) with four factory-supplied 3/8 x 1-1/2 screws (9/16 wrench/socket).

![Figure 4-23 Connect Quick-Access Wall – Left Side](image)

26. Connect a fence post to light curtain wall (see Figure 4-24, Step F).
27. Raise the light curtain wall and connect perpendicularly to front positioner wall. Use Figure 4-18 as a guide for fence wall orientation.

28. Measure to ensure remaining unanchored cell walls are square and properly positioned. Adjust if necessary.

4.11.5 Anchor Remaining Fence to Floor – Left Side

Remaining cell walls are anchored using provided 3/8-inch concrete anchors. Holes must be drilled into concrete. See Figure 4-21 for fence anchor points. Do not floor-anchor either light curtain fence post located in front of positioner. They will be anchored into the concrete after the light curtains are properly aligned.

To anchor remaining fence (except light curtain wall) to the floor, proceed as follows:

1. Prepare a factory-supplied anchor and nut, as shown in Figure 4-4 (leveling bolts are not needed), for each anchor hole in fence post feet.

**NOTE:** Do not anchor the light curtain walls to the floor until after the light curtains have been properly aligned.

2. Insert a 7/16-inch drill bit through the holes in the fence post feet and drill holes (1 to 2 inches deep) for anchor bolts in floor at locations shown in Figure 4-21.

3. Vacuum concrete dust from holes.

4. Push concrete anchors through holes in fence post feet and into drilled holes until it stops. A hammer may be needed.

5. Anchor the cell walls to the floor by tightening each nut.
4.11.6 Installing Right Side of Fence

Before installation, place all fence wall components on floor around the cell. Use Figure 4-18 as a guide for fence wall orientation. To install the fence for right side of ArcWorld IV-6300 XHD TR3C cell, proceed as follows:

**WARNING!**
*Assembling the fence requires at least two people to accomplish safely.*

1. Connect the rear wall to two fence posts, one on each side of wall (see Figure 4-25, Step A).

![Diagram](image)

*Figure 4-25  Right Side Fence Wall Assembly – Steps A and B*

2. Have an assistant raise the rear wall and hold steady at permanent location (see Figure 4-18).

3. Connect a fence post to platform wall (see Figure 4-25, Step B).

4. Raise the platform wall and connect perpendicularly to the rear wall. Use Figure 4-18 as a guide for fence wall orientation. See Figure 4-26 for fence/post connections.
Figure 4-26  Fence/Post Connections – Right Side

5. Align the holes in fence post feet with holes in programming platform and robot common base, adjust if necessary (see Figure 4-27).

6. Secure assembled fence section to the programming platform and robot common base using factory-supplied M16 x 30 screws (M24 wrench/socket).

Figure 4-27  Fence Anchor Points – Right Side

7. Connect a fence post to rear short positioner wall (see Figure 4-28, Step C).
8. Raise the rear short positioner wall and connect perpendicularly to the installed section. Use Figure 4-18 as a guide for fence wall orientation.

9. Raise the rear positioner wall and connect perpendicularly to the rear short positioner wall. Use Figure 4-18 as a guide for fence wall orientation.

10. Connect two of the four fence posts, set aside in Section 4.11.3, to the middle positioner wall with the four spot-welded nuts located on the same side (see Figure 4-28, Step D).

**NOTE:** The spot-welded nuts help secure the quick-access wall.

11. Connect the middle positioner wall (with fence posts) to the rear positioner wall with the spot-welded nuts oriented towards the positioner side (back side) of the fence.

12. Connect a fence post to front positioner wall (see Figure 4-28, Step E).

13. Raise the front positioner wall and connect perpendicularly to middle positioner wall. Use Figure 4-18 as a guide for fence wall orientation.

**NOTE:** Quick-access fence walls protect the headstock and tailstock housings. These walls can easily be installed/uninstalled for positioner maintenance.

14. Using four t-brackets, fasten quick-access wall to fence below middle positioner wall (see Figure 4-29) with four factory-supplied 3/8 x 1-1/2 screws (9/16 wrench/socket).
15. Connect a fence post to light curtain wall (see Figure 4-30, Step F).

16. Raise the light curtain wall and connect perpendicularly to front positioner wall. Use Figure 4-18 as a guide for fence wall orientation.

17. Measure to ensure remaining unanchored cell walls are square and properly positioned. Adjust if necessary.
4.11.7 Anchor Remaining Fence to Floor – Right Side

Remaining cell walls are anchored using provided 3/8-inch concrete anchors. Holes must be drilled into concrete. See Figure 4-21 for fence anchor points. Do not floor-anchor either light curtain fence post located in front of positioner. They will be anchored into the cement after the light curtains are properly aligned.

To anchor remaining fence (except light curtain wall) to the floor, proceed as follows:

1. Prepare a factory-supplied anchor and nut, as shown in Figure 4-4 (leveling bolts are not needed), for each anchor hole in fence post.

**NOTE:** Do not anchor the light curtain walls to the floor until after the light curtains have been properly aligned.

2. Insert a 7/16-inch drill bit through the hole of each fence post and drill holes (1 to 2 inches deep) for anchor bolts in floor at locations shown in Figure 4-27.

3. Vacuum concrete dust from holes.

4. Push concrete anchors through holes in fence post feet and into drilled holes until it stops. A hammer may be needed.

5. Anchor the cell walls to the floor by tightening nut.

4.12 Installing the Cell Door

1. Steady both sections of the rear wall and install top door rail across door opening, with the clamps provided (see Figure 4-31).

![Install Top Door Rail](image)

Figure 4-31 Install Top Door Rail

2. Raise cell door and slide it into position on door rail.

3. Close door and install remaining door rail clamp (see Figure 4-32).
4. Install stop bolt and tighten clamp.
5. Ensure cell walls are square.

4.13 Installing the Arc Curtains

**WARNING!**
Do not install the arc curtains until after the cell walls have been secured to the base and anchored to the floor. Unsecured cell walls can fall and injure personnel and damage equipment.

The arc curtains are shipped in an accessories box. To install the arc curtains:
1. Unfold arc curtains and install one curtain on inside of each cell wall section, using supplied wire ties and eyelets in curtain (see Figure 4-33).

![Figure 4-32 Install Final Door Rail](image1)

![Figure 4-33 Securing the Arc Curtains](image2)

**NOTE:** The arc curtains have been pre-cut to match the cell walls. Each arc curtain bag contains documentation that includes the arc curtain’s dimensions. If necessary, these dimensions can be used to match the arc curtain to the correct cell wall.
2. Make sure there are no gaps between arc curtains.
3. Install door wall arc curtain on inside of door wall using supplied wire ties and eyelets in curtain.

### 4.14 Installing the Light Curtain System

For the light curtains to work effectively, they must be properly aligned and facing each other with no obstructions. See accompanying vendor’s literature for detailed information on the light curtain system.

#### 4.14.1 Light Curtain Installation

As shipped, the top and bottom of each light curtain fixture has fastened to it a spacer and mounting bracket. These components must be removed and the spacer rotated before installation to the fence.

Refer to the system prints for the exact location of light curtains on fencing. To install the light curtains, proceed as follows:

1. Using a 5-mm allen wrench, remove the screws that hold both spacers and mounting brackets on the back of each light curtain guard. Keep hardware for installation onto fence.
2. Rotate each spacer (see Figure 4-34). A different set of holes on spacer will be used when assembled to fence.

![Figure 4-34 Light Curtain Sensor Installation](Image)

3. Set the light curtain guard against the fencing in the correct position (see system prints) and hold in place.
4. Use a pen to mark the four spots on arc curtain where mounting screws will be installed.
5. Use a knife or other sharp object to make small holes at the marked spots.
6. Using hardware removed in Step 1, press screws through light curtain fixture, spacers, arc curtain holes, and fence and then tighten into mounting brackets (see Figure 4-34).
7. Check light curtain location using system prints and adjust if necessary.

4.14.2 Installing the Light Curtain Cable

The light curtain cables are located inside the headstock/tailstock cabinets. Each cable is pulled into the headstock/tailstock cabinet and secured with a cord-grip during shipping. Only the connectors will be visible on the outside. To connect the light curtain cables, proceed as follows:

1. Loosen both cord grips (using a 1-1/16-inch wrench).

![Light Curtain Alignment/Cable Routing](image)

*Figure 4-35  Light Curtain Alignment/Cable Routing*

2. Pull each cable from the cord grip, expose enough cable to reach each light curtain fixture. When routing, keep the cables close to the fence.
3. Connect the light curtain cables to each light curtain fixture.
4. Use wire-ties or similar devices to secure the cables to the fence.
5. Tighten both cord grips (using a 1-1/16-inch wrench).
**4.15 Installing the Operator Station**

Motoman recommends anchoring the operator station to the floor. To install the operator station, proceed as follows:

1. Unload operator station from shipping platform.
2. Carefully remove protective plastic wrapping from operator station.
3. Inspect operator station for shipping damage.

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

4. Place operator station outside the fence on the floor (see Figure 4-36).

![Diagram of Operation Station Installation](image)

**Figure 4-36 Operation Station Installation**

5. Insert a 1/4-inch concrete drill bit through the center of four holes in operator station base and drill holes for anchors.
6. Vacuum concrete dust from holes.
7. Secure operator station to floor using customer-supplied anchors.

**4.15.1 Connecting the Operator Station**

The operator station cable is shipped in an accessories box. To install the operator station cable, proceed as follows:

1. Unpack the operator station cable (labeled CA1) and inspect for damage.

**NOTE:** If damage is found, notify shipper immediately.
2. Connect one end of the operator station cable to the connection on the R1 controller labeled OPERATION STATION.
3. Route the other end of the operator station cable to the operator station (see Figure 4-36).
4. Connect operator station cable to the operator station.

4.16 Connecting the Power

Incoming 3-Phase Power
Four customer-supplied, incoming power cables supply power to the ArcWorld IV-6300 XHD TR3C cell. Three-phase power is connected to each of the following four places:

- XRC POWER service disconnect box
- WELD 1 POWER SOURCE service disconnect box
- WELD 2 POWER SOURCE service disconnect box
- WELD 3 POWER SOURCE service disconnect box

To connect incoming power to the ArcWorld IV-6300 XHD TR3C cell, 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.
- The three-phase incoming power must be shut OFF or electric shock could occur.

1. Make sure the four service disconnect box switches are set to OFF position.
2. Route an incoming power cable, with internal wires included, into each disconnect box. Knock-out holes are provided on each box.
3. Using a cord grip, tighten each incoming power cable to the knock-out hole on each service disconnect box.
4. Strip the three incoming power wires and secure them to the power disconnect connections inside. Use a phillips screwdriver to tighten.
5. Strip the ground wire and secure it to the ground lug inside the service disconnect box. A ring-tongue terminal will be needed. Nut and lock-washer are provided.
6. Turn external power ON to the three service disconnect boxes.
7. Using a volt/ohm meter, check the incoming voltage and amperage values. The WELD 1, WELD 2, and WELD 3 POWER SOURCE incoming power supply cables must be rated at 60 amps, while the XRC POWER incoming power supply cable must be rated at 30 amps. Refer to label on front of each service disconnect box and system prints for correct incoming voltage.
4.17 System Check – Before System Power Up

Verify the following steps have been completed before System Power Up:

1. Check that the positioner shipping brackets have been removed from the positioner (see Section 4.6.2).
2. Check that cell door is closed and latched.
3. Check that all cable/wire connections are tight.
4. Check air line connections to optional torch tender and wire cutter.
5. Be sure all welding power sources are set correctly (see the welding power source vendor’s manual).
6. Verify that incoming line power matches the input power specified on the label on the front of the service disconnect boxes.

4.18 System Power Up

Your ArcWorld IV-6300 XHD TR3C cell is now ready for power-up. The ArcWorld system should only be operated by personnel who have received operator training from Motoman and who are familiar with the operation of this Motoman robot model. To turn the main power ON, proceed as follows:

1. Turn the R1 controller ON/OFF switch to ON.
2. Turn the R2 controller ON/OFF switch to ON.
3. Turn the R3 controller ON/OFF switch to ON.
4. Turn the XRC POWER service disconnect switch to ON.
5. Turn the WELD 1 POWER SOURCE service disconnect switch to ON.
6. Turn the WELD 2 POWER SOURCE service disconnect switch to ON.
7. Turn the WELD 3 POWER SOURCE service disconnect switch to ON.

4.19 Light Curtain Alignment/Fence Anchoring

4.19.1 Light Curtain Alignment

The light curtains must be aligned to work properly. To align them, proceed as follows:

1. Turn system power on.
2. Use the vendor’s literature to determine when light curtains are aligned/ misaligned.
3. Slide both light curtain walls to the left and right for adjustment.

4.19.2 Anchor Light Curtain Walls

The light curtain walls must be secured to the floor only when proper light curtain alignment is established. To anchor the light curtain walls to the floor, proceed as follows:

1. With fence post for light curtain walls in permanent position, insert a 7/16-inch drill bit through the holes in each fence post foot and drill holes (1 to 2 inches deep) for anchor bolts, in floor at locations shown in Figure 4-37.
2. Vacuum concrete dust from holes.
3. Prepare a factory-supplied 3/8-inch anchor and nut, as shown in Figure 4-4, for each anchor hole in fence post feet.
4. Push an anchor through holes in fence post feet and into drilled holes until it stops. A hammer may be needed.

5. Anchor the cell walls to the floor by tightening nut.

![Figure 4-37 Anchoring the Light Curtain Fence](image)

### 4.19.3 Installing the Swingarm Guards

Two swingarm guards must be installed on the positioner side of the light curtain fence walls. Refer to Figure 4-38 and system prints for the exact location. To install the swingarm guards, proceed as follows:

![Figure 4-38 Swingarm Guard Location](image)
1. Place the swingarm guard against the fencing as shown in Section 4-38 and hold in place.
2. Use a pen to mark the four spots on arc curtain where screws will be installed.
3. Use a knife or other sharp object to make small holes at the marked spots.
4. Press four M6 X16 SHC screws through the swingarm guard, arc curtain hole, and fence and then tighten into guard nut plate (see Figure 4-39) using a 5mm Allen wrench.

Figure 4-39 Swingarm Guard Installation

5. Check swingarm guard location using system prints and adjust if necessary.

4.20 System Check – After Power Up

Now that system power is ON and the light curtains are properly aligned, conduct a final system check. To conduct a final system check, proceed as follows:

1. Check all system E-STOPs for proper operation (programming pendant, operator station, torch mount, and playback panel).
2. Check system HOLD buttons for proper operation.
3. Check door interlock for proper operation.
4. Check light curtains for proper operation.
4.21 Installing the Tooling and Fixtures

Your ArcWorld IV-6300 XHD TR3C 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 and fixtures are supplied by the customer.

After tooling is installed, test the positioner for proper operation as follows:

**WARNING!**

When loading fixturing and/or tooling on the positioner weighing over 90.7 kg (200 lbs) per side, the arcscreen must be removed and the fixturing loaded on the robot side. Do not sweep the positioner to load the robot side or an unbalanced load will result!

1. Verify that the air line FRL is set for 620.5 kPa (90 psi). If AIR PRESSURE ERROR is given on programming pendant, proceed as follows:
   a) Check gauge on FRL to determine if pressure is high or low.
   b) Turn air pressure knob on FRL until gauge reads 620.5 kPa (90 psi). The AIR PRESSURE ERROR will clear itself on pendant.
2. Verify that positioner achieves full sweep time (5.5 seconds).
SECTION 5
OPERATION

The ArcWorld IV-6300 XHD TR3C is a fully integrated robotic gas metal arc welding (GMAW) cell. The Master job setup, and the sub-jobs programmed within it, determine how the robot performs the welding operation or other tasks. The robots weld parts on one side of the 180-degree reciprocating positioner, while the operator loads or unloads parts on the opposite side. Once the robots are finished with the welding process, they return to the Safe position. The operator then sweeps the positioner 180 degrees to the opposite side, enabling the robots to start welding on the next set of parts.

The MRM2-750 S3X positioner uses a 180-degree reciprocating motion that sweeps the positioner from the operator’s loading zone, into the robot’s work zone, and back. Two positioner arc shields visually divide the positioner into two rectangular halves, labeled Side A and Side B. As the positioner reciprocates, Side A moves under the primary axis and Side B moves over the primary axis. When Side A is in the robot’s welding zone, Side B is facing the operator, ready to be loaded or unloaded, and vice versa. Additionally, the headstock/tailstock on both Sides A and B rotate, which provides two welding surfaces per side. Loading fixtures and pneumatic or electric lines can be attached to the headstock and tailstock on both sides.

NOTE: Loading fixtures must be supplied by the customer.

5.1 Programming

The operation of this system is programming dependent. The operating instructions included in this section 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. 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).

A major advantage of the ArcWorld IV-6300 XHD TR3C system is its high degree of flexibility. The operator can fine tune the movement of all three robots and the positioner according to the parts configuration. The MRM2-750 S3X positioner, with its programmable primary axis and headstocks, proves highly versatile when configured with the UP6 robot. The robots can be programmed to weld a part with the headstock stationary, or the robots and headstock can move simultaneously to weld a part while the headstock is turning. The robots can be programmed to weld different seams on the same part and to move from part to part to continue welding.
With the programming pendant, the operator can develop a series of jobs for the robots. You can program the robots independently, the station axis independently, or the robots and station axis together. You must select the axis combination when teaching the job initially (see Section 5.1.4). Motoman recommends programming the robots and station axis together to reduce the risk of interference.

NOTE: Refer to your system’s Independent/Coordinated Motion Manual (P/N 142969-1) for information on coordinated motion, selecting synchronization, group axes, and tooling calibration.

CAUTION! Remember that only the Tool Center Point (TCP) location on the robot is recognized by the controller. Without careful programming, the robot arm could still damage other equipment.

5.1.1 I/O Assignment

The ArcWorld IV-6300 XHD TR3C cell uses the following user and dedicated inputs and outputs (see Table 5-1 and Table 5-2).

For more information on user and dedicated I/O’s, refer to the Concurrent I/O & Parameter Manual (P/N 147626-1).

<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 22</td>
</tr>
<tr>
<td>REMOTE mode ON</td>
<td>Cube 23</td>
</tr>
<tr>
<td>Hold</td>
<td>Cube 24</td>
</tr>
<tr>
<td>External Emergency Stop</td>
<td>Alarm Occurrence</td>
</tr>
</tbody>
</table>

Table 5-1 XRC 2001 User Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Assignment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN#001 thru 008</td>
<td>NOT USED</td>
<td>Cycle start input from operator station.</td>
</tr>
<tr>
<td>IN#009</td>
<td>CYCLE START</td>
<td></td>
</tr>
<tr>
<td>IN#010</td>
<td>AUTO/MANUAL SELECT</td>
<td>Auto/manual mode from operator station.</td>
</tr>
<tr>
<td>IN#011</td>
<td>LIGHT CURTAIN CLEAR</td>
<td>Signal from light curtain controller to verify operator is clear.</td>
</tr>
<tr>
<td>IN#012</td>
<td>SAFETY RELAY CR4101 FAULTED</td>
<td>Indication of safety relay fault. Cycle controller power to reset.</td>
</tr>
<tr>
<td>IN#013</td>
<td>SAFETY RELAY CR4121 FAULTED</td>
<td>Indication of safety relay fault. Cycle controller power to reset.</td>
</tr>
<tr>
<td>IN#014 thru 016</td>
<td>NOT USED</td>
<td></td>
</tr>
<tr>
<td>IN#017</td>
<td>SWEEP LOCK ENGAGED TAILSTOCK</td>
<td>Signal from switch S1S in positioner tailstock.</td>
</tr>
</tbody>
</table>
**Table 5-1  XRC 2001 User Inputs - continued**

<table>
<thead>
<tr>
<th>Input</th>
<th>Assignment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN#018</td>
<td>SWEEP LOCK DISENGAGED TAILSTOCK</td>
<td>Signal from switch S1R in positioner tailstock</td>
</tr>
<tr>
<td>IN#019</td>
<td>SWEEP LOCK ENGAGED HEADSTOCK</td>
<td>Signal from switch S1S in positioner headstock</td>
</tr>
<tr>
<td>IN#020</td>
<td>SWEEP LOCK DISENGAGED HEADSTOCK</td>
<td>Signal from switch S1R in positioner headstock</td>
</tr>
<tr>
<td>IN#021</td>
<td>AIR PRESSURE LOW</td>
<td>Signal indicating low air pressure from switch SB1 in positioner headstock</td>
</tr>
<tr>
<td>IN#022 thru 024</td>
<td>NOT USED</td>
<td></td>
</tr>
</tbody>
</table>
Table 5-2  XRC 2001 User Outputs - continued

<table>
<thead>
<tr>
<th>Output</th>
<th>Assignment</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT#019</td>
<td>ENGAGE SWEEP LOCK HEADSTOCK</td>
<td>Logic relay</td>
</tr>
<tr>
<td>OUT#020</td>
<td>DISENGAGE SWEEP LOCK HEADSTOCK</td>
<td>Logic relay</td>
</tr>
<tr>
<td>OUT#021 and 022</td>
<td>NOT USED</td>
<td></td>
</tr>
<tr>
<td>OUT#023</td>
<td>MOTION OVERRIDE S4</td>
<td>Used to override illegal motion alarm</td>
</tr>
<tr>
<td>OUT#024</td>
<td>NOT USED</td>
<td></td>
</tr>
</tbody>
</table>

5.1.2 Sweeping the Positioner

⚠️ CAUTION!
Sweeping the positioner manually from the pendant may result in the fixtures/tooling hitting the ground. Care must be taken by the operator to avoid this from happening.

**NOTE:** In order to sweep the positioner, the robots must be in the Safe position (Cube 22, Cube 23, and Cube 24).

MANUAL mode on the controller allows the positioner to sweep without activating the robots. Parts can be loaded onto the fixture to achieve the most efficient configuration and then swept into the welding zone before teaching the robot(s) a series of moves.

To sweep Side A or Side B of the positioner into the robot’s welding zone, proceed as follows:

1. Move robot(s) into Safe position (see Section 5.2.3).
2. Set operator station POSITIONER switch to MANUAL mode and start Master Control job (see Section 5.2.5). Robot(s) will not move out of Safe position when POSITIONER switch is in MANUAL.

**NOTE:** Cycle Start latching does not operate in Manual mode.

3. Press CYCLE START button on operator station. The controller sweeps the positioner each time the CYCLE START button is pressed.

**NOTE:** The Cube function is a software feature that turns on an output when the robot(s) tool center point is within established boundaries. If a robot moves outside of Safe position, the output is lost and the positioner will not sweep. The Cube position is factory set to be clear of the positioner. For more information on basic Cube setup, refer to the manipulator manual.
5.1.3 Rotating the Headstock

To program rotation of the Motoman MRM2-750 S3X positioner headstock, proceed as follows:

**WARNING!**
If the robot(s) is working on a part and the headstock is not turning, DO NOT assume that the headstock will not turn. The robot is executing programmed steps which could index the headstock at any time.

1. The following preconditions must be met:
   a) The controller must be in TEACH mode.
   b) The Servo On Ready key must flashing. If the Servo On Ready key is not flashing, press it.
2. To move headstock:
   a) Press EX. AXIS key on programming pendant to display proper axis of operation.

**CAUTION!**
Do Not use S1 or S4 for any reason. Use S2 for Side A or S3 for Side B. Misuse will create a SERVO TRACKING ERROR.

   b) Check status screen to ensure S2 for Side A or S3 for Side B is displayed.
   c) Press S+ or S- (X+ or X-) motion keys on programming pendant to move headstock. Jog speed is set on programming pendant.

**NOTE:**
- The EX. AXIS key must be turned OFF, and the robot LED ON, to move the robot with the motion keys.
- The S-axis on each robot is restricted by hard stops on the robot base and internal soft stops.

5.1.4 Programming Specific Jobs

For instructions to enter user jobs, refer to Motoman Operator's Manual for Arc Welding (P/N 142098-1).

You can program three types of moves:
- Rotation of headstock during air-cut moves
- Robot motion with headstock stationary
- Rotation of headstock during welding

The job you create may consist of a combination of the above. The first two types of moves assume a robot-plus-station group axis specification. The last type of move is called station synchronous and should be programmed with a station-plus-robot group axis specification with the station as the Master control device.
CAUTION!
Remember that only the Tool Center Point (TCP) location on the robot is recognized by the controller. Without careful programming, the robot arm could still damage other equipment.

NOTE: Refer to your system’s Independent/Coordinated Motion Manual (P/N 142969-1) for information on coordinated motion, selecting synchronization, group axes, and tooling calibration.

**Job Configurations**
- S1 = Main Trunion
- S2 = A-side headstock
- S3 = B-side headstock
- S4 = Positioner sweeping (all axes on positioner)

Due to the setup, job axis combinations must be set up as follows:

**Valid Axes Combinations for Synchronous Motion**
- R1 + S3 = Robot 1 + B-side headstock with B-side headstock as master
- R2 + S3 = Robot 2 + B-side headstock with B-side headstock as master
- R3 + S3 = Robot 3 + B-side headstock with B-side headstock as master
- R1 + S2 = Robot 1 + A-side headstock with A-side headstock as master
- R2 + S2 = Robot 2 + A-side headstock with A-side headstock as master
- R3 + S2 = Robot 3 + A-side headstock with A-side headstock as master

**Valid Axes Combinations for Non-synchronous Motion**
- R1 + S2 = Robot 1 + A-side headstock
- R1 + S3 = Robot 1 + B-side headstock
- R2 + S2 = Robot 2 + A-side headstock
- R2 + S3 = Robot 2 + B-side headstock
- R3 + S2 = Robot 3 + A-side headstock
- R3 + S3 = Robot 3 + B-side headstock

**Non-Valid Axes Combinations**
- S1 + S4 = Main Trunion + Positioner sweeping (all axes on positioner)
- S2 + S4 = A-side headstock + Positioner sweeping (all axes on positioner)
- S3 + S4 = B-side headstock + Positioner sweeping (all axes on positioner)
- R1 + S4 = Robot 1 + Positioner sweeping (all axes on positioner)
- R2 + S4 = Robot 2 + Positioner sweeping (all axes on positioner)
- R3 + S4 = Robot 3 + Positioner sweeping (all axes on positioner)
- R1 + S1 = Robot 1 + Main Trunion
- R2 + S1 = Robot 2 + Main Trunion
- R3 + S1 = Robot 3 + Main Trunion
Rotation of the Headstock During Air-Cut Moves – Non-synchronous Motion
1. Teach robot to desired position.
2. Rotate positioner headstock or station to desired position.
3. Press and hold SHIFT key, then press EX. AXIS key on programming pendant.

**CAUTION!**
**DO NOT use S1 or S4 for any reason. Use S2 for Side A or S3 for Side B. Misuse will create a SERVO TRACKING ERROR.**

   a) Press MAN SPEED key to select desired axis speed while teaching. The headstock can now be moved using S+ or S- (X+ or X-) motion keys on programming pendant.
   b) Press S+ or S- (X+ or X-) motion keys on programming pendant to move headstock. Jog speed is set on programming pendant.
4. Record step after designating motion type and playback speed.
5. Check path with STEP FWD/BWD keys. The position for robot or positioner may need to be altered to prevent torch interference.

**WARNING!**
The positioner axis operates as another robot axis and has the potential for hazardous motion.

**NOTE:**
- Press and hold SHIFT key, then the ROBOT key until R1 is selected on the Status line in order to move the robot.
- Normally, air-cut moves are taught as joint moves. The speed for joint moves is specified as a percentage of maximum speed (VJ=0.01 to VJ=100.00). The axis which takes the longest time to complete the programmed motion automatically determines the speed of the system. This might be a wrist axis, a major robot axis, or the positioner axis. Cycle times can be reduced by changing wrist orientation, robot position, and headstock position simultaneously between program points rather than making the moves independently. Setting the speed at 100.00 will normally establish the quickest time between steps.

Robot Motion with the Headstock Stationary – Non-synchronous Motion
1. Program robot position without moving positioner axis.
2. Set motion type and speeds in normal fashion;
   OR
3. Select GROUP AXIS as R1 only.

Rotation of the Headstock During Welding – Synchronous Motion
The controller can coordinate motion with the external axis. This requires calibration of the headstock and robot at the time of installation. Jobs programmed for coordinated motion must be taught as Robot + Station with Station as master [R1 + S (2 or 3): S (2 or 3)], depending on positioner side during playback. Move instructions for coordinated motion are registered using the following format:
5.2 **Daily Operation**

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

- Perform Start-up Procedures (see Section 5.2.1)
- Perform Safety Circuit Check (see Section 5.2.2)
- Robot to Safe Position (see Section 5.2.3)
- Selecting Job to be Operated (Initial set up only) (see Section 5.2.4)
- Starting Master Job (see Section 5.2.5)
- Perform Operation Cycle (see Section 5.2.6)
- Perform Shutdown Procedures (see Section 5.2.7)

5.2.1 **Start-Up**

**NOTE:** Due to the configuration of the TR3C system, both slave controllers (R2 and R3) must be energized before the primary controller (R1) or an alarm condition will occur during power up.

To start up the ArcWorld cell from a Power-Off condition, proceed as follows:

1. Make sure the enclosure door is closed and securely latched.
2. Turn ON the WELD 1, WELD 2, and WELD 3 service disconnect switches.
3. Turn ON XRC POWER service disconnect switch.

**CAUTION!**

*The MAIN POWER switch on the R2 and R3 controllers must be turned on before the R1 controller or an ERROR will occur.*

4. Set MAIN POWER switch on R2 and R3 controllers to ON.
5. Set MAIN POWER switch on R1 controller to ON.
6. Set INPUT POWER switch on all three power sources to ON.
7. Open regulator valve on welding gas supply.
8. Make sure the air supply reads 0.04 cmm at 620.5 kPa (1.5 scfm at 90 psi).
9. Set ENABLE/DISABLE switch on operator station to DISABLE.
10. Press TEACH mode button on controller playback panel of R1 controller.
5.2.2  Safety Circuit Check

Test each of the following safety circuit items daily for proper operation. If any of these items does not work as instructed, contact Motoman service staff at (937) 847-3200 before operating the cell.

**Gate Interlock**

Open gate interlock while robot is in PLAY mode with servo power ON. Verify that servo power goes off.

**Emergency Stop (E-Stop) Buttons**

Press each E-Stop button with the robot in PLAY mode and the servo power ON. After each button is pressed, verify that servo power goes off and the programming pendant reads “Robot is Stopped.”

**Headstock (side A/B) In-position Switch**

1. Put controller in TEACH mode.
2. Turn servo power on.
3. Rotate headstock (side A/B) out of Home position.
4. Block the light curtain. Verify that servo power goes off.
5. Turn servo power on.
6. Return positioner to the programmed position.

**Trunion In-position Switch**

1. Put controller in TEACH mode.
2. Turn servo power on.
3. Rotate trunion out of Home position.
4. Block the light curtain. Verify that servo power goes off.
5. Turn servo power on.
6. Return positioner to the programmed position.

5.2.3  Robot Safe (Cube 22, Cube 23, and Cube 24) Position

To move the robots to the Safe position (Cube 22, Cube 23, and Cube 24), proceed as follows:

1. Press TEACH mode button on controller 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 SAFEPOS Safe job and press SELECT. The R1R2 Safe job appears on display screen.
6. Turn servo power ON by pressing SERVO ON, TEACH LOCK, and holding in the ENABLE switch.
7. Use INTERLOCK and FWD keys on programming pendant to jog each robot to Safe position.
5.2.4 Selecting Weld Job (Initial Setup Only)

**CAUTION!**
Selecting the wrong job can cause unexpected robot motion. Care must be taken to ensure proper job is selected.

1. In the Sweep A (or B) Job, select the line that states, “PStart Job:Test A (or B) sub 2.”
2. Cursor to highlight “PStart Job:Test A (or B) sub 2.” This command appears at the bottom of the display screen.
3. Cursor to the TestA (or B) job and push SELECT. The job list is displayed.
4. Select the desired job using the cursor and press ENTER to change the job and modify the PStart command in the sweep job.

5.2.5 Starting the Master Job

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

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. Make sure the cell door is closed and securely latched.
6. Press PLAY mode button on playback panel. Playback operation is enabled.
7. Press SERVO ON READY button on playback panel.
8. Place ENABLE/DISABLE switch on operator station in ENABLE position. The controller is placed in REMOTE mode and system control is transferred to operator station.

The ArcWorld IV-6300 XHD TR3C cell is now ready for operation.

5.2.6 Perform Operation Cycle

Use the following procedures to operate the ArcWorld IV-6300 XHD TR3C cell.

1. Load production parts on fixtures located on operator side of positioner.
2. Step out of safety light curtains.

**NOTE:**
Before sweeping at first power up, make sure the correct job has been loaded and weight of parts and fixtures is approximately equal on both sides of positioner (see Section 3.4).

3. Press the CYCLE START button on operator station to sweep positioner. The positioner sweeps, placing unwelded parts in robot’s welding area and turning the empty side to operator’s loading area. The sweep range is 180 degrees.
4. After the positioner sweeps, the robots begin welding sequence on the parts. Coordinated motion capabilities allow positioner to rotate parts on positioner, while robots move and weld at same time.
5. Load more parts to be welded onto fixture on operator side of positioner.
6. Press the CYCLE START button on operator station. The CYCLE LATCHED light comes on. The robots finish welding and return to Safe Position (Cube 22, Cube 23, and Cube 24). After welding cycle is completed, the positioner sweeps returning welded parts outside cell and placing newly loaded, unwelded parts in the robot work area.

7. Unload welded parts from fixture.

5.2.7 Shutdown

Use the following procedure to shut down the ArcWorld IV-6300 XHD TR3C cell after operation is complete:

1. Make sure robots are in Safe position.
2. Turn off system servo power by pressing E-STOP button on operator station, programming pendant, or R1 controller playback panel.
3. Press TEACH mode button on playback panel.
4. Set the XRC POWER service disconnect switch to the OFF position.
5. Set all three service disconnect switches (R1 POWER SOURCE, R2 POWER SOURCE, and R3 POWER SOURCE) to the OFF position for each welding power source.
7. Turn off air supply

The ArcWorld IV-6300 XHD TR3C cell is now shut down.

5.3 System Recovery

Under certain conditions you will be required to clear an alarm or error. 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 key when the robots are not in PLAY mode, or enabling the programming pendant when servo power is OFF. Clear these errors by pressing the CANCEL key 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 alarms by selecting RESET 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, turn off the controller and then turn it on again.

See Table 5-3 and Table 5-4 for User and Alarm Messages.
### Table 5-3  User Messages

<table>
<thead>
<tr>
<th>User Message</th>
<th>Indication</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Move Robot to Home</td>
<td>Robots not in Home when trunion sweep is required.</td>
<td>Move Robot to Home/Safe position.</td>
</tr>
</tbody>
</table>

### Table 5-4  Alarm Messages

<table>
<thead>
<tr>
<th>Alarm</th>
<th>Indication</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shot Pin Sensor</td>
<td>Fault with proximity switch</td>
<td>Adjust or replace sensor.</td>
</tr>
<tr>
<td>SR_Relay Fault</td>
<td>Failed switch or safety relay</td>
<td>Repair failed switch or safety relay.</td>
</tr>
<tr>
<td>Low Air Pressure</td>
<td>No air or low air</td>
<td>Connect air and adjust FRL.</td>
</tr>
<tr>
<td>Illegal Motion S4</td>
<td>Limit of cube envelope exceeded</td>
<td><strong>Override the Alarm</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Press TOP MENU button.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Select I/O Universal Outputs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Cursor down to OUT23.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Cursor right to highlight OUT23.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Press and hold INTERLOCK button.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Press the SELECT button.</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Clear the Alarm</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1. Press TOP MENU button.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Cursor to Version and press SELECT button.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Press SELECT button to clear ALARM.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The cell is now ready to continue operation.</td>
</tr>
</tbody>
</table>


5.3.2 E-STOP Recovery

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

- Pressing E-STOP key on the operator station, programming pendant, or the playback panel.
- Stepping into light curtain when positioner is sweeping.
- Actuating shock sensor on torch mount.

To restart the ArcWorld IV-6300 XHD TR3C cell after an E-STOP condition occurs, follow the procedure below.

⚠️ **CAUTION!**

*If an emergency stop condition occurs while the positioner is sweeping, the positioner will continue the sweep when system is reinitialized.*

1. To clear E-STOP condition, perform any of the following actions that apply:
   a) Release E-STOP key on operator station, programming pendant, or R1 controller playback panel.
   b) Step out of light curtain.
   c) Clear Shock Sensor condition (see Section 5.3.3).
2. Press SERVO ON READY key on operator station, programming pendant, or playback panel.
3. Ensure operator station is enabled.
4. Press START button on the operator station.

The ArcWorld IV-6300 XHD TR3C cell will now continue operation.

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(s) clear of the impact. To override the shock sensor, proceed as follows:
**WARNING!**
Some feeders have a Shock Sensor Override Switch. It is possible to crash the robot if the Shock Sensor Override Switch is left in the Override position. Always remember to reactivate the Shock Sensor Override Switch (when applicable) before continuing system operation.

In TEACH mode:
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. Select ALARM RESET.
6. 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.

7. Move manipulator clear of impact position.
9. Press TOP MENU to exit.

The ArcWorld IV-6300 XHD TR3C cell is now ready to continue operation.

**5.3.4 Using the Brake Release**

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

1. Press E-STOP key 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 robot. Listed below is the weight 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 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  Maintenance/Troubleshooting

All maintenance intervals serve as guidelines only. Adjust the frequency of maintenance to suit your specific work conditions.

Robots

For troubleshooting and maintenance procedures for the UP6, UP20, and UP20-6 robot and controller, refer to the manipulator manual that came with your system.

Positioner

Quick-access fence walls protect the headstock and tailstock housings. These walls can easily be removed for maintenance needs.

For troubleshooting and maintenance procedures for the MRM2-750 S3X positioner, refer to the MRM2-750 S3X Positioner Manual (P/N 147988-1).

Welder

For troubleshooting and maintenance information for the welding power source, refer to your Owner’s Manual.

6.1.1 Periodic Maintenance

See Table 6-1 for periodic maintenance for ArcWorld IV-6300 XHD TR3C cell components.

See vendor’s literature for further details on the water circulator.

CAUTION!

Use only the antifreeze provided by Motoman. Automotive antifreezes contain stop-leak additives that will clog the small torch water-cooling ports in water torch applications. Damage to the gaskets in the water circulator pump can also occur.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Component</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>Water circulator</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>Daily</td>
<td>Safety Circuit Check</td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>Positioner</td>
<td>Refer to MRM2-750 S3X Positioner Manual (P/N 147988-1).</td>
</tr>
<tr>
<td>Daily</td>
<td>Light Curtains</td>
<td></td>
</tr>
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