# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF FIGURES</td>
<td>iii</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>iii</td>
</tr>
<tr>
<td>1 INTRODUCTION</td>
<td></td>
</tr>
<tr>
<td>1.1 About this Document</td>
<td>1-1</td>
</tr>
<tr>
<td>1.2 System Overview</td>
<td>1-2</td>
</tr>
<tr>
<td>1.2.1 System Layout</td>
<td>1-2</td>
</tr>
<tr>
<td>1.2.2 Major Components</td>
<td>1-2</td>
</tr>
<tr>
<td>1.2.3 Optional Equipment</td>
<td>1-2</td>
</tr>
<tr>
<td>1.3 Reference to Other</td>
<td>1-4</td>
</tr>
<tr>
<td>1.4 Customer Service Information</td>
<td>1-4</td>
</tr>
<tr>
<td>2 SAFETY</td>
<td></td>
</tr>
<tr>
<td>2.1 Introduction</td>
<td>2-1</td>
</tr>
<tr>
<td>2.2 Standard Conventions</td>
<td>2-2</td>
</tr>
<tr>
<td>2.3 General Safeguarding Tips</td>
<td>2-3</td>
</tr>
<tr>
<td>2.4 Mechanical Safety Devices</td>
<td>2-3</td>
</tr>
<tr>
<td>2.5 Installation Safety</td>
<td>2-4</td>
</tr>
<tr>
<td>2.6 Programming Safety</td>
<td>2-4</td>
</tr>
<tr>
<td>2.7 Operation Safety</td>
<td>2-5</td>
</tr>
<tr>
<td>2.8 Maintenance Safety</td>
<td>2-6</td>
</tr>
<tr>
<td>3 EQUIPMENT DESCRIPTION</td>
<td></td>
</tr>
<tr>
<td>3.1 SV3X Robot Description</td>
<td>3-1</td>
</tr>
<tr>
<td>3.2 XRC Controller</td>
<td>3-1</td>
</tr>
<tr>
<td>3.2.1 Playback Panel</td>
<td>3-2</td>
</tr>
<tr>
<td>3.2.2 Programming Pendant</td>
<td>3-3</td>
</tr>
<tr>
<td>3.2.3 Brake Release</td>
<td>3-6</td>
</tr>
<tr>
<td>3.3 Operator Station</td>
<td>3-6</td>
</tr>
<tr>
<td>3.3.1 Cycle Start</td>
<td>3-6</td>
</tr>
<tr>
<td>3.3.2 Emergency Stop (E-STOP)</td>
<td>3-7</td>
</tr>
<tr>
<td>3.3.3 Cycle Latched</td>
<td>3-7</td>
</tr>
<tr>
<td>3.4 MR-300 HD Positioner</td>
<td>3-7</td>
</tr>
<tr>
<td>3.4.1 Arc Shield</td>
<td>3-8</td>
</tr>
<tr>
<td>3.4.2 Air Line Connection</td>
<td>3-8</td>
</tr>
<tr>
<td>3.5 Welding Equipment</td>
<td>3-8</td>
</tr>
<tr>
<td>3.5.1 Power Sources</td>
<td>3-8</td>
</tr>
<tr>
<td>3.5.2 PWF Wire Feeder</td>
<td>3-9</td>
</tr>
<tr>
<td>3.5.3 Universal Welding</td>
<td>3-9</td>
</tr>
<tr>
<td>3.5.4 GMAW Torch</td>
<td>3-10</td>
</tr>
<tr>
<td>3.5.5 Motoman Torch Mount</td>
<td>3-10</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
</tr>
<tr>
<td>3</td>
<td>EQUIPMENT DESCRIPTION (CONTINUED)</td>
</tr>
<tr>
<td>3.6</td>
<td>Safety Features ............................................................... 3-10</td>
</tr>
<tr>
<td>3.6.1</td>
<td>Arc Screen ......................................................................... 3-10</td>
</tr>
<tr>
<td>3.6.2</td>
<td>Fencing ............................................................................. 3-10</td>
</tr>
<tr>
<td>3.6.3</td>
<td>Light Curtain ....................................................................... 3-11</td>
</tr>
<tr>
<td>3.6.4</td>
<td>Emergency Stops (E-STOPS) .................................................. 3-11</td>
</tr>
<tr>
<td>3.6.5</td>
<td>ENABLE Switch ....................................................................... 3-11</td>
</tr>
<tr>
<td>3.6.6</td>
<td>Interlocked Cell Doors .......................................................... 3-11</td>
</tr>
<tr>
<td>3.6.7</td>
<td>Interference Cubes .................................................................. 3-12</td>
</tr>
<tr>
<td>3.6.8</td>
<td>Brake Release ....................................................................... 3-12</td>
</tr>
<tr>
<td>4</td>
<td>INSTALLATION</td>
</tr>
<tr>
<td>4.1</td>
<td>Materials Required ................................................................. 4-1</td>
</tr>
<tr>
<td>4.1.1</td>
<td>Customer-supplied Items .......................................................... 4-1</td>
</tr>
<tr>
<td>4.1.2</td>
<td>List of Tools ........................................................................ 4-1</td>
</tr>
<tr>
<td>4.2</td>
<td>Site Preparation ..................................................................... 4-2</td>
</tr>
<tr>
<td>4.3</td>
<td>Installing the Arc WorldLite-100 Common Base ................................ 4-3</td>
</tr>
<tr>
<td>4.4</td>
<td>Leveling and Securing the Cell ................................................. 4-4</td>
</tr>
<tr>
<td>4.4.1</td>
<td>Removing the Shipping Brackets ..................................................... 4-5</td>
</tr>
<tr>
<td>4.5</td>
<td>Light Curtains ........................................................................... 4-6</td>
</tr>
<tr>
<td>4.5.1</td>
<td>Installation ........................................................................... 4-6</td>
</tr>
<tr>
<td>4.5.2</td>
<td>Alignment .............................................................................. 4-6</td>
</tr>
<tr>
<td>4.5.3</td>
<td>Safety Fence Foot .................................................................... 4-7</td>
</tr>
<tr>
<td>4.6</td>
<td>Connecting the Cables ............................................................... 4-7</td>
</tr>
<tr>
<td>4.6.1</td>
<td>Connecting the Earth Ground ..................................................... 4-7</td>
</tr>
<tr>
<td>4.6.2</td>
<td>Connecting the Water Circulator (optional) ..................................... 4-8</td>
</tr>
<tr>
<td>4.7</td>
<td>Connecting the Gas/Air Services ............................................... 4-8</td>
</tr>
<tr>
<td>4.8</td>
<td>Connecting the Power ............................................................... 4-9</td>
</tr>
<tr>
<td>4.9</td>
<td>Conducting a Safety/Operation Check ......................................... 4-10</td>
</tr>
<tr>
<td>4.10</td>
<td>Installation of Tooling and Fixtures ........................................ 4-10</td>
</tr>
<tr>
<td>5</td>
<td>OPERATION</td>
</tr>
<tr>
<td>5.1</td>
<td>Programming .......................................................................... 5-1</td>
</tr>
<tr>
<td>5.1.1</td>
<td>I/O Assignment ...................................................................... 5-1</td>
</tr>
<tr>
<td>5.1.2</td>
<td>Sweeping the Positioner ............................................................ 5-2</td>
</tr>
<tr>
<td>5.2</td>
<td>Basic Operating Procedures ..................................................... 5-2</td>
</tr>
<tr>
<td>5.2.1</td>
<td>Start-up Procedures ................................................................. 5-2</td>
</tr>
<tr>
<td>5.2.2</td>
<td>Robot Safe (Cube 24) Position ..................................................... 5-3</td>
</tr>
<tr>
<td>5.2.3</td>
<td>Selecting the Master Job ............................................................ 5-3</td>
</tr>
<tr>
<td>5.2.4</td>
<td>Operation Cycle ...................................................................... 5-3</td>
</tr>
<tr>
<td>5.2.5</td>
<td>Shutdown Procedures ............................................................... 5-4</td>
</tr>
</tbody>
</table>
5 OPERATION (CONTINUED)

5.3 System Recovery ................................................................. 5-4
5.3.1 Alarms and Errors ......................................................... 5-4
5.3.2 E-STOP Recovery .......................................................... 5-5
5.3.3 Shock Sensor Recovery .................................................. 5-5
5.3.4 Using the Brake Release .................................................. 5-6

6 MAINTENANCE

6.1 Periodic Maintenance .......................................................... 6-1
6.2 Fuse and Circuit Breaker Protection ...................................... 6-2

LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1-1</td>
<td>System Layout ....................................................... 1-3</td>
</tr>
<tr>
<td>Figure 3-1</td>
<td>XRC Controller ....................................................... 3-1</td>
</tr>
<tr>
<td>Figure 3-2</td>
<td>XRC Playback Panel ............................................... 3-2</td>
</tr>
<tr>
<td>Figure 3-3</td>
<td>Programming Pendant .............................................. 3-3</td>
</tr>
<tr>
<td>Figure 3-4</td>
<td>RS-232C Serial Port .................................................. 3-5</td>
</tr>
<tr>
<td>Figure 3-5</td>
<td>Enable Switch ........................................................... 3-5</td>
</tr>
<tr>
<td>Figure 3-6</td>
<td>Operator Station ....................................................... 3-6</td>
</tr>
<tr>
<td>Figure 3-7</td>
<td>Power Sources ............................................................ 3-9</td>
</tr>
<tr>
<td>Figure 4-1</td>
<td>Area Needed for Installation ....................................... 4-2</td>
</tr>
<tr>
<td>Figure 4-2</td>
<td>Unbolting the Arc WorldLite-100 Common Base .............. 4-3</td>
</tr>
<tr>
<td>Figure 4-3</td>
<td>Location of Leveling Bolts .......................................... 4-4</td>
</tr>
<tr>
<td>Figure 4-4</td>
<td>Location of Shipping Brackets ..................................... 4-4</td>
</tr>
<tr>
<td>Figure 4-5</td>
<td>Light Curtain Installation ........................................... 4-5</td>
</tr>
<tr>
<td>Figure 4-6</td>
<td>Water Circulator Connections ..................................... 4-7</td>
</tr>
<tr>
<td>Figure 4-7</td>
<td>Gas and Air Service Connections ............................... 4-8</td>
</tr>
<tr>
<td>Figure 4-8</td>
<td>Power Disconnect Location ......................................... 4-8</td>
</tr>
</tbody>
</table>

LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Table 3-1</td>
<td>MR-300 HD Positioner Specifications .......................... 3-7</td>
</tr>
<tr>
<td>Table 4-1</td>
<td>Incoming Power Specifications (Decal) ........................ 4-10</td>
</tr>
<tr>
<td>Table 5-1</td>
<td>XRC User Inputs ....................................................... 5-2</td>
</tr>
<tr>
<td>Table 5-2</td>
<td>XRC User Outputs ..................................................... 5-2</td>
</tr>
<tr>
<td>Table 6-1</td>
<td>Periodic Maintenance ................................................. 6-1</td>
</tr>
<tr>
<td>Table 6-2</td>
<td>MotoArc 450 CV Fuses and Circuit Breaker .................... 6-2</td>
</tr>
<tr>
<td>Table 6-3</td>
<td>Universal Welding Interface (UWI) Fuses ....................... 6-2</td>
</tr>
</tbody>
</table>
SECTION 1

INTRODUCTION

The Arc WorldLite-100 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 Arc WorldLite-100 features a Motoman arc welding robot and XRC controller with menu-driven arc welding application software, complete welding package, 1219mm (48 inch) diameter rotary positioner, operator interface, and total safety environment.

1.1 About this Document

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

SECTION 1 - INTRODUCTION
This section provides general information about the Arc WorldLite-100 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 Arc WorldLite-100 system.

SECTION 3 - DESCRIPTION OF EQUIPMENT
This section provides a detailed description of the major components of the Arc WorldLite-100 system. This section also includes a table of component specifications.

SECTION 4 - INSTALLATION
This section provides instructions for set up and installation of the Arc WorldLite-100 system.

SECTION 5 - OPERATION
This section provides instructions for basic operation of the Arc WorldLite-100 system. You will also find procedures for start-up, loading, normal operation, fault recovery, and shutdown. A number of sample robot programs are also included in this section.

SECTION 6 - MAINTENANCE
This section contains a table listing periodic maintenance requirements for the components of the Arc WorldLite-100 cell.
1.2 **System Overview**

The Arc WorldLite-100 provides a complete arc welding solution in a standardized configuration. The system is designed around a Motoman SV3X arc welding robot and XRC robot controller, and includes a complete welding package. An indexing rotary positioner 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 Arc WorldLite-100 cell.

1.2.1 **System Layout**

The robot manipulator, positioner, and XRC controller all share a common base for ease of installation and to help maintain proper alignment between components. The welding power source and its base can be rolled out from underneath the welding cell for ease of cable hookup. The robotic cell is fully enclosed by safety fencing and an interlocking door.

Standing within the safety light curtain prevents positioner cycling. All operator controls, including those on the XRC and welding power supply, are accessible from outside the robotic enclosure.

1.2.2 **Major Components**

The Arc WorldLite-100 includes the following major components:

- Motoman SV3X manipulator and XRC controller
- MR - series indexing rotary positioner
- Operator station
- Welding equipment, including the following:
  - Welding power source
  - Torch (water-cooled or air-cooled)
  - Wire feeder
  - Torch mount
- Safety equipment, including the following:
  - Safety fencing with arc curtains
  - Light curtains
  - Interlocked cell door
  - Positioner arc screen
  - Customer-actuated Emergency Stops
  - Software-defined Interference Cubes

1.2.3 **Optional Equipment**

The following equipment is available for use with the Arc WorldLite-100:

- Torch tender
- Wire cutter
- Com-Arc III seam tracking unit
- Water circulator
- Heavy duty positioner
Figure 1-1  System Layout

INTRODUCTION

MOTO
MAN
1-3 Arc WorldLite-100 System Manual
1.3 Reference to Other Documentation

For additional information refer to the following:

- Motoman SV3X Manipulator Manual (P/N 142657-1)
- Motoman Operator's Manual for Arc Welding (P/N 142098-1)
- Motoman Concurrent I/O Parameter Manual (P/N 142102-1)
- Com-Arc III Instruction Manual (P/N 132753-1)
- 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 (SV3X)
- Application Type (welding)
- System Type (Arc WorldLite-100)
- Software Version (3.74)
- Robot Serial Number (located on the back side of the robot arm)
- Robot Sales Order Number (located on back side of XRC controller)
SECTION 2
SAFETY

2.1 Introduction

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

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

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

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

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

This safety section addresses the following:

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

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

- DANGER
- WARNING
- CAUTION
- NOTE

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

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

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

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

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

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

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation of this robot, the operator's manuals, the system equipment, and options and accessories should be permitted to operate this robot system.

- Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the robot cell.

- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).

- The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.

- In accordance with ANSI/RIA R15.06, section 6.13.4 and 6.13.5, use lockout/tagout procedures during equipment maintenance. Refer also to Section 1910.147 (29CFR, Part 1910), Occupational Safety and Health Standards for General Industry (OSHA).

2.4 **Mechanical Safety Devices**

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

- Safety fences and barriers
- Light curtains
- Door interlocks
- 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 **SV3X Robot Description**

The Motoman SV3X robot and XRC controller represent state-of-the-art technology in robotics today. The six-axis SV3X robot has a payload of 3kg (6.6 lbs). It features a 677 mm (26.6 in.) reach and has a relative positioning accuracy of ± 0.03 mm (0.001 in.).

The SV3X robot can reach below its own base as well as behind itself. The SV3X can also be mounted in floor, wall, or ceiling configurations with few hardware modifications. For more information, refer to the manipulator manual that came with your system.

3.2 **XRC Controller**

The XRC robotic controller (see Figure 3-1), coordinates the operation of the Arc WorldLite-100 system. It controls manipulator movement and welding power supply, processes input and output signals, and provides the signals to operate the welding system. It maintains variable data and performs numeric processing to convert to and from different coordinate systems. In addition, the controller provides the following: main logic functions, servo control, program and constant data memory, and power distribution. For more information, refer to the manipulator manual that came with your system.

![Figure 3-1 XRC Controller](image-url)
### 3.2.1 Playback Panel

The playback panel (see Figure 3-2) contains the primary system controls and consists of the features briefly described in the following paragraphs. For detailed information about the operation of the playback panel, refer to the manipulator manual that came with your system.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

- **Coordinate System**
  
  - Joint, World, Cylindrical, Tool, or User Frame

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

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

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

- **Additional Pages** (when applicable)

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

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

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

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

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

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

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

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

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

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

**RS-232C Serial Port**
This 9-pin serial port is used for data communication between the XRC and a floppy disk controller (FC1 or FC2), FDE (Floppy Disk Emulator) software, or other form of communication (see Figure 3-4).

![Figure 3-4 RS-232C Serial Port](image)

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

![Figure 3-5 Enable Switch](image)
3.2.3 Brake Release

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

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

3.3 Operator Station

The operator station (see Figure 3-6) is mounted on the front of the cell and includes the following equipment:

![Figure 3-6 Operator Station](image)

3.3.1 Cycle Start

**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.

The green CYCLE START button initiates a positioner sweep cycle if the robot is in the R1 Safe position (Cube 24). If the CYCLE START button is pressed while the robot is outside Cube 24, the CYCLE START command is latched into the XRC and the CYCLE LATCHED button glows green. Once the robot returns to Cube 24, the CYCLE START command is executed and the table sweeps. An anti-tiedown function prevents the operator from holding the CYCLE START button down and continuously cycling the positioner. For more information on Cubic Interference Zones, refer to the robot manipulator manual.
3.3.2 Emergency Stop (E-STOP)

The operator station E-STOP and the robot E-STOP are connected in series in the Emergency Stop circuit. Pressing an E-STOP button interrupts this circuit and stops all system operation. Brakes are applied to the robot and all servo power is removed from the system. The system E-STOP lights come on and all positioner motion is stopped.

To recover from an E-STOP, release the E-STOP button, depress the SERVO ON button and START to continue the cycle. Positioner will complete sweep cycle if light curtain is clear.

3.3.3 Cycle Latched

The green CYCLE LATCHED light (see Figure 3-6) is used to alert operators of the cycle status. The light glows green when the CYCLE START push button is pressed. At this time the positioner will sweep, so the operator must have the fixture loaded with parts and ready to be welded. When the light is activated, the positioner will wait until after its current weld cycle is finished and then sweep 180 degrees. The positioner will not sweep if the green CYCLE LATCHED is not on.

Walking into the light curtain zone will cancel cell operation and cause an E-STOP. This E-STOP must be cleared before the system is restarted. If the CYCLE START push button is pushed and the green CYCLE LATCHED light does not come on, press the E-STOP to troubleshoot the malfunction of the system.

3.4 MR-300 HD Positioner

The MR-300 HD positioner consists of an electric variable frequency drive that turns the 1219.2mm (48 inch) diameter turntable. A steel arc screen divides the table in half, providing two work stations. The rotary table reciprocates back and forth between two positions; one position located inside the robot cell, the other outside the robot cell. Hardstops and shock absorbers built into the positioner ensure accurate and repeatable parts positioning.

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

Table 3-1  MR-300 HD Positioner Specifications

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity</td>
<td>300 kg (660 lbs) combined part/fixture weight on each side of the turntable, center of gravity located 25.4cm (10 in.) above the table tooling plate surface at a radius of 50.8cm (20 in.)</td>
</tr>
<tr>
<td>Temperature Operating Range</td>
<td>4-43°C (40-110°F)</td>
</tr>
<tr>
<td>Humidity (maximum)</td>
<td>Non-condensing 10-90% relative humidity</td>
</tr>
<tr>
<td>Shock (maximum)</td>
<td>Less than 0.5 G</td>
</tr>
<tr>
<td>Sweep Time</td>
<td>4 seconds</td>
</tr>
<tr>
<td>Welding Current Rating</td>
<td>400 amperes at 100% duty cycle</td>
</tr>
</tbody>
</table>
3.4.1 Arc Shield

**WARNING!**

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

The Motoman MR-300 HD positioner is provided with a metal screen that runs the diameter of the positioner table and acts as a blast shield protecting the operator from the arc radiation and sparks produced by the welding operation. Do not operate this equipment unless the arc screen is in place.

3.4.2 Air Line Connection

A 1/4 in. air hose provides compressed air at the positioner to assist the operator. The air hose is internally connected in the cell and receives customer provided air from the external air connection above the power box. The user end of the air hose is customer provided.

3.5 Welding Equipment

The ArcWorld system provides a complete complement of arc welding equipment. In its standard configuration, the ArcWorld system includes a portable power source, wire feeder, torch, and torch mount. Optional equipment including water circulators, ComArc units, and torch tenders may also be included with your system.

3.5.1 Power Sources

Motoman offers several different power sources for use with the Arc WorldLite-100 system depending on the application. The following are some of the more common power sources used (see Figure 3-7). However, the power source your system uses may be different. For more specific information, refer to the vendor manual that came with your system.

**Mobility**

The steel base that supports the power source for the Arc WorldLite-100 system is mobile. Four casters enable the power source to be wheeled away from the welding cell for ease of service and installation.

To remove the power source, remove the four bolts that fasten the base to the welding cell. The cross member that stabilizes the frame must also be removed before the power source is wheeled out.
3.5.2 **PWF Wire Feeder**

The wire feeder is located in the back of the equipment frame. This 4-roll wire feeder provides reliable wire feeding at rates up to 19050mmPM (millimeters per minute) or 750 IPM (inches per minute). An integral gas valve provides fast gas response time. The wire feeder has an inch forward button to help simplify set up and reduce changeover time. Interchangeable feed rolls are used to accommodate different types and sizes of wire. A Shock Sensor Override switch located on the front of the feeder is used to recover from torch impact.

3.5.3 **Universal Welding Interface (UWI)**

The UWI provides microprocessor control to the wire feeder and the power source. It scales the signals from the XRC controller to the appropriate levels required for control of the welding components. It also provides isolation of the power source analog signals.

**NOTE:** Some power sources available with the Arc WorldLite-100 system do not use the UWI. For more information specific to your system, refer to the vendor manuals shipped with your system.
3.5.4 **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 while requiring minimum robot reprogramming. The GMAW torch is installed at the end of the robot wrist. For applications that use the water-cooled torch, the ArcWorld system includes a suitable water circulator kit.

3.5.5 **Motoman Torch Mount**

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

3.6 **Safety Features**

The Arc WorldLite-100 system incorporates a host of safety equipment. 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. Users are responsible for determining whether the provided safeguards are adequate for plant conditions. Users must also ensure that safeguards are maintained in working order.

3.6.1 **Arc Screen**

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

Two separate arc screens are used on the Arc WorldLite-100 system. The first is a metal arc screen on the positioner refer to Section 3.4.1. This screen blocks arc radiation and sparks from the welding operation.

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

3.6.2 **Fencing**

The safety fencing provided with the Arc WorldLite-100 system encloses the entire robotic cell. It forms a physical barrier preventing entry into the robot envelope during automatic operation.
### 3.6.3 Light Curtain

The Arc WorldLite-100 light curtains help prevent serious injury to anyone entering the positioner area during the sweeping process. Infrared light beams span the entrance of the welding cell using light emitters and collectors.

A status light, which is visible by the operator, glows green or red continuously to indicate the status of the light curtain. Green light ON is normal operation. It will remain on and CYCLE START may be pressed when nothing obstructs the infrared beams. Red light ON indicates that an object has entered the cell or a misalignment between emitters and collectors has occurred and must be fixed before operation starts.

In PLAY mode, if the positioner is sweeping and a light curtain is activated, the red light glows and servo power is removed from the system. All positioner motion then stops. Servo power is reapplied by pressing SERVO ON. However, the positioner will only continue its motion when the light beams are not broken and depressing the button on the XRC Controller.

If the positioner is not in motion, but the Cycle Start input has been latched (indicated by the Cycle Latched light), breaking the light curtain will clear the cycle latched input, the light will extinguish, the Cycle Latched light turns off, however the table will not index again until Cycle Start is pressed again.

### 3.6.4 Emergency Stops (E-STOPs)

In addition to the safety features described above, the Arc WorldLite-100 has strategically placed E-STOPs throughout the cell. These are operator actuated devices that, when activated, immediately stop all system operation. Brakes are applied to the robot and all servo power is removed from the system. The system E-STOP lights come on and all positioner motion is stopped. E-stop location are listed below:

- The playback panel on the controller.
- The programming pendant.
- The operator station.
- The safety clutch on the torch.

### 3.6.5 ENABLE Switch

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

### 3.6.6 Interlocked Cell Doors

A safety interlock on both cell entrance doors prevents entry into the cell during PLAY mode. Opening either cell door with the robot in PLAY causes a Gate Interlock Error. Brakes are applied to the robot and all servo power is removed from the system, the E-STOP lights come on, and all positioner motion is stopped.

In TEACH, power to the table is removed if a cell door is open. In order to sweep the table in TEACH, the light curtains must be clear and the doors closed.
### 3.6.7 Interference Cubes

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

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

The Arc WorldLite-100 uses interference cubes to interlock robot position with positioner motion. The robot Home or Safe position (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.

Setup of these cubes is done at the factory prior to shipment. However, should any cube need redefined or modified due to changes in tooling or system components, refer to the system manipulator manual for basic interference cube setup.

### 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.
SECTION 4
INSTALLATION

The Arc WorldLite-100 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 Arc WorldLite-100 System is not a task for the novice. The Arc WorldLite-100 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 Arc WorldLite-100 system is included with the system. This section identifies customer-supplied items and tools required to complete installation.

4.1.1 Customer-supplied Items
- Gas bottles for the welding torches
- Incoming power supply
- Two earth ground cables with two earth ground stakes
- Weld wire
- Incoming air supply: 0.04cm at 620.5kPa (1.5scfm at 90 psi)
- Stepladder
- Forklift and/or overhead crane

4.1.2 List of Tools
- Safety glasses
- Face shields
- Gloves
- Level
- Ratchet with 3/4-in. socket
- Adjustable wrench set
- Hammer drill with appropriate concrete bits
- Phillips and flat screwdrivers
- Hammer
- Socket set
- Forklift and/or overhead crane
- Air-impact gun with 3/4-in. socket
- Open-end wrench set
- Two socket-head (Allen)
- Wrench sets (standard and metric)
4.2 **Site Preparation**

To prepare your site, proceed as follows:

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

   **NOTE:** To make installation easier, an additional 2.43 to 3.05m (8 to 10 ft) on all sides is recommended.

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

![Figure 4-1 Area Needed for Installation](image-url)
4.3 Installing the Arc WorldLite-100 Common Base

The Arc WorldLite-100 is shipped completely assembled on a wooden shipping skid. To install the Arc WorldLite-100 common base, proceed as follows:

1. Unbolt system from shipping skid using 3/4 -in. socket (see Figure 4-2).

![Figure 4-2 Unbolting the Arc WorldLite-100 Common Base](image)

**WARNING!**
The common base weighs 1814.3kg (4000 lbs). Be sure that your crane or forklift is capable of handling this much weight or damage to the equipment or injury to personnel can result.

2. Place Arc WorldLite-100 common base in position (see Figure 4-1).
3. Carefully remove protective plastic wrapping from all system components.
4. Remove light curtains from positioner, and carefully lower to floor.
5. Inspect all system components for shipping damage.

**NOTE:** If damage is found, notify shipper immediately.
4.4 Leveling and Securing the Cell

After everything is in position, level the equipment and secure it to the floor. The lag bolts are shipped in the accessories box. Refer to your Motoman Robot manipulator manual for floor loading requirements. To level and secure the equipment, proceed as follows:

1. Level cell base by adjusting leveling bolts (see Figure 4-3).
2. Insert a 1/2-in. concrete drill bit through center of leveling bolts and drill holes for lag bolts.
3. Vacuum concrete dust from holes.
4. Lag cell base to floor using lag bolts supplied.
5. Do not anchor the safety fence foot to the floor.

![Figure 4-3 Location of Leveling Bolts](image-url)
4.4.1 Removing the Shipping Brackets

**CAUTION!**
*Failure to remove shipping brackets from robot before operating may result in damage to the robot drive mechanisms.*

Two yellow brackets (see Figure 4-4) prevent the robot from moving during shipping. Two rod brackets secure the lower arm assembly to the S-axis housing. The smaller bracket on the rear of the robot prevents the S-axis housing from pivoting. After the robot is in place, remove the shipping brackets.

![Figure 4-4 Location of Shipping Brackets](image-url)
4.5 **Light Curtains**

4.5.1 **Installation**

Two light curtain components, emitter and collector, come preassembled from Motoman and placed onto the positioner for shipping. The two hinged sections of safety fence are pulled back and tied to other fencing for shipping purposes. Unfasten these sections of fencing and pivot them until they are in alignment with the attached section of fencing.

The light curtains are oriented properly with the status lights located near the base of the positioner. Unstrap both light curtain components from the positioner and install onto the safety fence at a 45 degree angle (see Figure 4-5). Both pieces are pre wired.

4.5.2 **Alignment**

The emitter and collector must be aligned properly. Refer to the light curtain manufacture’s literature that accompanies the robot cell for exact alignment procedures.

---

**Figure 4-5  Light Curtain Installation**
4.5.3 **Safety Fence Foot**

Once the light curtains are properly fastened to the safety fence and aligned, anchor the safety fence foot to the floor as follows:

1. Insert a 1/2-in. concrete drill bit through the four holes of safety fence foot and drill holes for lag bolts.
2. Vacuum concrete dust from holes.
3. Lag safety fence foot to floor using lag bolts supplied.

4.6 **Connecting the Cables**

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

**CAUTION!**

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

4.6.1 **Connecting the Earth Ground**

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

**WARNING!**

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

**NOTE:** If the robot and the XRC are within 4.75m (15 feet) of each other, a common earth ground may be used. Otherwise, separate earth grounds must be used.

1. Connect one end of robot earth ground cable to lug marked EARTH GROUND on bottom back of robot.
2. Connect other end of robot earth ground cable to earth ground stake.
3. Connect one end of second earth ground cable to common ground bus bar inside XRC.
4. Connect other end of second earth ground cable to earth ground stake.
4.6.2 Connecting the Water Circulator (optional)

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

1. Connect two water hoses from weld torch to connections on the water circulator marked WATER-IN and WATER-OUT (see Figure 4-6).

CAUTION!

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

2. Fill water circulator tank with antifreeze coolant provided (P/N 131224-1). Do not fill water circulator past fill line.
3. Plug power cable into electrical outlet on back of power source, or the 110 Volt AC (10 Amp.) outlet.

![Figure 4-6 Water Circulator Connections](image_url)

4.7 Connecting the Gas/Air Services

The gas and air hoses for the Arc WorldLite-100 are already connected when the unit is shipped. Gas and air services must be completed after the cell has been secured to the floor. The gas and air connections are located in the back of the cell above the power box (see Figure 4-7).
4.8 Connecting the Power

After all of the system components have been properly installed, connect the power to the Arc WorldLite-100. To connect incoming power to the Arc WorldLite-100, proceed as follows:

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

1. Connect a properly sized cable to the line side of the disconnect and tighten screws.

*NOTE:* • Size the power cables dependant on the power source current draw.
*NOTE:* • Main disconnect fusing should also be sized dependant on power source current draw.
4.9  Conducting a Safety/Operation Check

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

1. Check that all three yellow shipping brackets have been removed from robot (see Section 4.4.1).
2. Check that light curtain is aligned properly.
3. Check that cell door is closed and latched.
4. Check that all cable connections are tight.
5. Check air line connections to optional torch tender and wire cutter.
6. Check that welding power source is set correctly (see welding power source vendor's manual).
7. Verify that incoming line power matches the input power specified on the sticker on the front of the XRC.

Your Arc WorldLite-100 is now ready for power-up. The Arc WorldLite-100 system should be operated only by personnel who have received operator training from Motoman and who are familiar with the operation of this Motoman robot model. Turn the main power ON, and continue the safety/operation check.

8. Check all system E-STOPS (pendant, operator station, safety clutch, playback panel).
9. Check system Hold buttons.

4.10  Installation of Tooling and Fixtures

Your Arc WorldLite-100 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:

- Positioner achieves full sweep time (4 to 5 seconds, depending on load).
SECTION 5
OPERATION

This section provides operating procedures for the Arc WorldLite-100 system.

5.1 Programming

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

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

5.1.1 I/O Assignment

The Arc WorldLite-100 has dedicated input and output capabilities. For more information on user and dedicated I/O, refer to the XRC Concurrent I/O & Parameters Manual (P/N 142102-1).

The Arc WorldLite-100 has the following user inputs and outputs (see Table 5-1 and Table 5-2).

<table>
<thead>
<tr>
<th>Input</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN#001</td>
<td>CYCLE START</td>
</tr>
<tr>
<td>IN#002 thru 008</td>
<td>NOT USED</td>
</tr>
<tr>
<td>IN#009</td>
<td>AT SIDE A</td>
</tr>
<tr>
<td>IN#010</td>
<td>AT SIDE B</td>
</tr>
<tr>
<td>IN#011</td>
<td>ZERO SPEED</td>
</tr>
<tr>
<td>IN#012</td>
<td>DRIVE FAULT</td>
</tr>
<tr>
<td>IN#013 thru 016</td>
<td>NOT USED</td>
</tr>
</tbody>
</table>
5.1.2 Sweeping the Positioner

To sweep positioner into the robot work area, proceed as follows:

1. Place robot in Safe position (Section 5.2.2).
2. Start Master job (Section 5.2.3).
3. XRC will now sweep positioner each time CYCLE START button on operator station is pressed.

5.2 Basic Operating Procedures

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

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

5.2.1 Start-up Procedures

To start up the Arc WorldLite-100 cell from a Power-off condition, proceed as follows:

1. Turn on welding power source disconnect.
2. Set MAIN POWER switch on XRC to ON.
3. Set INPUT POWER switch on welding power source to ON.
4. Open regulator valve on welding gas supply.
5. Make sure both enclosure doors are closed and securely latched.
6. Disable operator station.
7. Press TEACH mode button on XRC playback panel.
8. Place robot in Safe position (Cube 24).

---

### Table 5-2 XRC User Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT#001 thru 007</td>
<td>NOT USED</td>
</tr>
<tr>
<td>OUT#008</td>
<td>CYCLE LATCHED</td>
</tr>
<tr>
<td>OUT#009</td>
<td>FORWARD RUN</td>
</tr>
<tr>
<td>OUT#010</td>
<td>REVERSE RUN</td>
</tr>
<tr>
<td>OUT#011</td>
<td>FAULT RESET</td>
</tr>
<tr>
<td>OUT#012</td>
<td>JOG SPEED</td>
</tr>
<tr>
<td>OUT#013 thru 016</td>
<td>NOT USED</td>
</tr>
</tbody>
</table>
5.2.2 **Robot Safe (Cube 24) Position**

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

1. Press TEACH mode button on XRC 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 Cube 24 job and press SELECT. Cube 24 job appears on display screen.
6. Turn servo power ON by pressing SERVO ON, pressing TEACH LOCK and holding in ENABLE switch.
7. Use INTERLOCK and FWD buttons on programming pendant to jog robot to Safe (Cube 24) position.

5.2.3 **Selecting 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 both enclosure doors are closed and securely latched.
6. Press PLAY mode button on XRC playback panel. Job playback operation is enabled.
7. Press SERVO ON button on playback panel.
8. Reset positioner by simultaneously pressing RESET and right CYCLE START buttons on operator station.
9. Place ENABLE/DISABLE switch on operator station in ENABLE position. XRC is placed in REMOTE mode and system control is transferred to operator station.

The Arc WorldLite-100 cell is now ready for operation.

5.2.4 **Operation Cycle**

1. Load fixture on operator side of positioner table with parts to be welded.
2. Press CYCLE START button on operator station. Positioner sweeps, placing unwelded parts in robot work area. Robot then begins welding parts.
3. While robot is welding, load operator side.
4. Press CYCLE START button on operator station. When robot is finished welding, it returns to Safe position (Cube 24) and positioner sweeps, returning welded parts outside cell and placing newly loaded, unwelded parts in robot work area.
5. Unload welded parts from fixture.
6. Repeat steps 4a through 4e as necessary.
5.2.5 Shutdown Procedures

Use the following procedure to shut down the Arc WorldLite-100 cell after operation is complete:

1. Make sure the robot is in the Safe position (Cube 24).
2. Turn off system servo power by pressing E-STOP button on operator station, programming pendant, or playback panel.
3. Press TEACH mode button on playback panel.
4. Set controller Main Power switch to OFF position.
5. Set Main Power switch on welding power source to OFF position.

The Arc WorldLite-100 cell is now shut down.

5.3 System Recovery

Under certain conditions you will be required to clear an alarm or error. Clearing an alarm or error requires different operator actions depending on the type. The paragraphs below describe the different types of alarms and errors you may encounter and how to remedy them when you do.

5.3.1 Alarms and Errors

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

Error Messages

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

Minor Alarms

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

Major Alarms

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

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

- Pressing the E-STOP button on the operator station, programming pendant, or playback panel.
- Opening door on robot enclosure when robot is in PLAY mode.
- Activating light curtain when positioner is sweeping.
- Actuating shock sensor on torch mount.

To restart the Arc WorldLite-100 cell after an E-STOP condition occurs, follow the procedure below.

1. To clear E-STOP condition, perform any of the following actions that apply:
   - Release the E-STOP button on the operator station, programming pendant, or XRC playback panel.
   - Close the cell door.
   - Clear objects from light curtain.
   - Clear Shock Sensor condition (Section 5.3.3).

**CAUTION!**

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

2. Press SERVO ON button on operator station, or playback panel.
3. Press START.

5.3.3 **Shock Sensor Recovery**

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

**CAUTION!**

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

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

**NOTE:**

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


The Arc WorldLite-100 cell is now ready to continue operation.
5.3.4 Using the Brake Release

The brake release control panel is located on front of the XRC. The brakes on S-, L-, and U-axes are controlled by individual axis buttons. Simultaneously pressing ENABLE button and one of these axis buttons releases the indicated axis. However, the release mechanism for the R-, B-, and T-axes is combined into a single button. Enabling this releases the brakes on the R-, B-, and T-axes simultaneously. To release the brakes, proceed as follows:

1. Press E-STOP button on programming pendant, playback panel, or operator station, to be sure servo power is OFF.
2. Provide adequate support for axis to be released. Support should withstand payload of robot and approximate weight of axis. Listed below is the weight support should be able to hold:
   
   **SV3X** 21 pounds

- **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 Periodic Maintenance

Table 6-1 provides periodic maintenance items and intervals for the Arc WorldLite-100 cell. Keep in mind that the maintenance intervals serve as guidelines only. You should adjust the frequency of maintenance to suit your specific work conditions.

For periodic maintenance procedures and schedules for the individual components of your Arc WorldLite-100, refer to the manipulator and additional manuals that came with your system.

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

Table 6-1 Periodic Maintenance

<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>MR-300 Positioner Air filter/ regulator for water (high-humidity environments)</td>
<td>Inspect left glass cylinder for water. If water is present, loosen the valve at the bottom of the cylinder to expel any moisture.</td>
</tr>
<tr>
<td>Daily</td>
<td>MR-300 Positioner Air filter/ regulator oil level</td>
<td>Inspect right glass cylinder and transparent neck on the top of the regulator. If oil falls below half, add oil.</td>
</tr>
</tbody>
</table>
### 6.2 Fuse and Circuit Breaker Protection

Tables 6-2 and 6-3 give the locations of fuses and circuit breakers that are significant to the operation of the total system. In most cases, spare fuses are placed in the accessory bag with the controller.

**WARNING!**

_Replace fuses with those of the same type and rating. Replacement with fuses of higher amperage rating or lower voltage will damage the robot controller and/or auxiliary equipment, necessitating costly replacement._

Abbreviations:

- **CB** — designates circuit breaker
- **F, FU, or 101FU** — designates fuse

**Table 6-2 MotoArc 450 CV Fuses and Circuit Breaker**

<table>
<thead>
<tr>
<th>Designator</th>
<th>Rating</th>
<th>Part #</th>
<th>Location</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>CB1</td>
<td>10A 115V</td>
<td>203627-7</td>
<td>Upper rear panel</td>
<td>Protects 115V circuit.</td>
</tr>
<tr>
<td>CB2</td>
<td>10A 24V</td>
<td>203627-7</td>
<td>Upper rear panel</td>
<td>Protects 24V circuit.</td>
</tr>
<tr>
<td>F1</td>
<td>0.5A</td>
<td>W-11166-11</td>
<td>On contactor box</td>
<td>Protects contactor circuit.</td>
</tr>
</tbody>
</table>

**Table 6-3 Universal Welding Interface (UWI) Fuses**

<table>
<thead>
<tr>
<th>Designator</th>
<th>Rating</th>
<th>Part #</th>
<th>Location</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>8A 250V</td>
<td>Wickman 19374K-4A</td>
<td>On KXA motor speed control</td>
<td>Limits damage from shorts or component breakdowns in DC power supply module.</td>
</tr>
<tr>
<td>FU2</td>
<td>0.25A 125V</td>
<td>Wickman 19303K-500A</td>
<td>On interface board</td>
<td>Protects shock sensor circuit.</td>
</tr>
<tr>
<td>FU3</td>
<td>0.5A 125V</td>
<td>Wickman 19303K-500A</td>
<td>On interface board</td>
<td>Protects 24V circuit.</td>
</tr>
<tr>
<td>Fuse</td>
<td>1A 250V</td>
<td>TD-1</td>
<td>Front of Com-Arc box</td>
<td>Protects 200V circuit.</td>
</tr>
</tbody>
</table>
INDEX

Numerics
1-Cycle, Cycle Mode Symbol, 3-4

A
About this Document, 1-1
Air Line Connection, 3-8
Alarm, System Status Symbol, 3-4
Alarm/Error, 3-2
Alarm/Error, Playback Panel, 3-2
Alarms and Errors, 5-4
ANSI/RIA, 2-1
Arc Screen, 3-10
Arc Shield, 3-8
Area Key, 3-4
Auto, Cycle Mode Symbol, 3-4

B
Brake Release, 3-6, 3-12, 5-6

C
Cables, Connecting, 4-7
Capacity, Positioner, 3-7
Cube 24, Safe Position, 5-3
Cursor Key, 3-4
Customer Service Information, 1-4
Customer-supplied Items, 4-1
Cycle Latched, 3-7
Cycle Start, 3-6
Cylindrical, Coordinate Symbol, 3-4

D
Display, 3-3
Display, Programming Pendant, 3-3

E
Earth Ground, Connecting, 4-7
Emergency Stop (E-STOP), 3-2, 3-3, 3-7
Emergency Stop (E-STOP), Playback Panel, 3-2
Emergency Stop (E-STOP), Programming Pendant, 3-3
Emergency Stops (E-STOPs), 3-11
ENABLE Function Key, 3-4, 3-5
ENABLE Switch, 3-5, 3-11
Equipment Description, 3-1
Error Messages, 5-4
E-STOP Recovery, 5-5
E-Stop, System Status Symbol, 3-4

F
Fencing, 3-10
Fuse and Circuit Breaker Protection, 6-2

G
Gas/Air Services, Connecting, 4-8
General Safeguarding Tips, 2-3
GMAW Torch, 3-10

H
High, Speed Setting Symbol, 3-4
Hold, 3-2
Hold, Playback Panel, 3-2
Hold, System Status Symbol, 3-4

I
I/O Assignment, 5-1
Inching, Speed Setting Symbol, 3-4
Incoming, PowerConnecting, 4-9
Installation, 4-1
Installation Safety, 2-4
Interference Cubes, 3-12
Interlocked Cell Door, 3-11
Introduction, 1-1, 2-1

J
Joint, Coordinate Symbol, 3-4

K
Keypad, 3-3
Keypad, Programming Pendant, 3-3

L
Leveling and Securing the Cell, 4-4
Light Curtain, 3-11
Light Curtains, 4-6
Alignment, 4-6
Installation, 4-6
List of Tools, 4-1
Low, Speed Setting Symbol, 3-4
INDEX

M
Maintenance, 6-1
Maintenance Safety, 2-6
Major Alarms, 5-4
Major Components, 1-2
Master Job, Selecting, 5-3
Materials Required, 4-1
Mechanical Safety Devices, 2-3
Medium, Speed Setting Symbol, 3-4
Menu Area, Programming Pendant, 3-3
Minor Alarms, 5-4
Mode Select, 3-2
Mode, Playback Panel, 3-2
MotoArc 450 CV Fuses and Circuit Breaker, 6-2
MR-300 HD Positioner
  Positioner Specifications, 3-7

O
Operating Procedures, Basic, 5-2
Operation, 5-1
Operation Safety, 2-5
Operator Station, 3-6
Optional Equipment, 1-2

P
Payload, 3-1
Periodic Maintenance, 6-1
Playback Panel, 3-2
Positioner
  MR-300 HD, 3-7
Power Sources, 3-8
  Mobility, 3-8
Programming Pendant, 3-3
Programming Safety, 2-4
Programming, Operation, 5-1

R
Reach, Vertical, 3-1
Reference to Other Documentation, 1-4
Relative Positioning Accuracy, 3-1
Release Mechanism, Brakes, 5-6
Robot Description, SV3X, 3-1
Robot Safe (Cube 24) Position, 5-3
Robot Serial Number, 1-4
Robotic Industries Association, 2-1
RS-232C Serial Port, 3-5
Running/Start, System Status Symbol, 3-4
Safe Position, 5-3
Safety, 2-1
Safety Features, 3-10
Safety Fence Foot, 4-7
Safety/Operation Check, 4-10
Select Key, 3-5
Servo On Ready, Playback Panel, 3-2
Servo Power, 3-2
Shipping Brackets, Removal, 4-5
Shock Sensor Override, 5-5
Shock Sensor Recovery, 5-5
Shutdown Procedures, 5-4
Site Preparation, 4-2
Software Version, 1-4
Standard Conventions, 2-2
Start, Playback Panel, 3-2
Start-up Procedures, 5-2
Status Area, Programming Pendant, 3-4
Step, Cycle Mode Symbol, 3-4
Stop, System Status Symbol, 3-4
Sweep Time, Positioner, 3-7
Sweeping the Positioner, 5-2
System Layout, 1-2
System Overview, 1-2
System Recovery, 5-4

T
TEACH LOCK Key, 3-5
Tool, Coordinate Symbol, 3-4
Tooling and Fixtures, 4-10
Top Menu Key, 3-4
  ARC WELDING, GENERAL, HANDLING, and SPOT WELDING, 3-4
  IN/OUT, 3-4
  ROBOT, 3-4
  SYSTEM INFO, 3-4
  Top Menu Key, 3-4
  VARIABLE, 3-4
Torch Mount, 3-10
INDEX

U
Universal Welding Interface (UWI), 3-9
Universal Welding Interface (UWI) Fuses, 6-2
User Frame, Coordinate Symbol, 3-4
User Inputs, 5-1
User Outputs, 5-2

W
Water Circulator, Connecting, 4-8
Welding Equipment, 3-8
Wire Feeder, 3-9
World, Coordinate Symbol, 3-4

X
XRC Controller, 3-1