Motoman XRC Controller

ArcWorld II-6200HD DR2C System Manual for UP-Series Robots

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SECTION 1

INTRODUCTION

The ArcWorld II-6200HD DR2C 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 II-6200HD DR2C features a two Motoman arc welding robots and two XRC controllers with menu-driven arc welding application software, complete welding package, 180 degrees reciprocating positioner with servo driven headstocks, operator interface, and total safety environment. The DR2C can be reconfigured from a dual robot system (one XRC controlling two robots) to two separate robotic systems with independent control from separate XRCs. 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 this Motoman robot model. For more detailed information, refer to the manuals listed in Section 1.3. This manual contains the following sections:

SECTION 1 - INTRODUCTION
This section provides general information about the ArcWorld II-6200HD DR2C 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 II-6200HD DR2C system.

SECTION 3 - DESCRIPTION OF EQUIPMENT
This section provides a detailed description of the major components of the ArcWorld II-6200HD DR2C system. This section also includes a table of component specifications.

SECTION 4 - INSTALLATION
This section provides instructions for set up and installation of the ArcWorld II-6200HD DR2C system.

SECTION 5 - OPERATION
This section provides instructions for basic operation of the ArcWorld II-6200HD DR2C system. Also with this section are procedures for start-up, loading, normal operation, fault recovery, and shutdown.

SECTION 6 - MAINTENANCE
This section contains a table listing periodic maintenance requirements for the components of the ArcWorld II-6200HD DR2C cell.
1.2 **System Overview**

The ArcWorld II-6200HD DR2C provides a complete arc welding solution in a standardized configuration. The system is designed around two Motoman arc welding robots with two XRC robot controllers, and also includes two complete welding packages. A dual-station 180 degrees reciprocating positioner with servo driven headstocks allows the operator to prepare and set up parts on one side while the robots weld 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 II-6200HD DR2C cell.

1.2.1 **System Layout**

The ArcWorld II-6200HD DR2C is comprised of three major assemblies. One major assembly is the RM2-500TX positioner, which is fastened together with the second major assembly, the robot/programming base and the safety fencing to provide a rigid, integral cell. The third major assembly is the equipment base assembly which may be positioned to best suit the customers needs.

Both power sources and XRC controllers are stacked atop one another on the equipment base. The master controller with a power source is on the bottom with slave controller and power source is directly above it on top. Optional components, such as the water circulator, Com-Arc III seam tracking unit, and power transformer are also located on this common base.

The robotic cell is fully enclosed by safety fencing and an interlocking door. Infrared light curtains provides a safety zone to prevent the positioner from cycling while anyone is standing directly in front of the positioner. Operator controls, including those on the XRC and welding power supplies, are accessible from outside of the robotic enclosure.

1.2.2 **Major Components**

The ArcWorld II-6200HD DR2C includes the following major components:

- Two Motoman UP6 or UP20 manipulators and XRC controllers
- RM2-500TX reciprocating positioner with servo driven headstocks.
- Master operator station
- Welding equipment, including the following:
  - MotoArc welding power sources
  - Motoman torches (water-cooled or air-cooled)
  - Wire feeders
  - Torch mounts
- Safety equipment, including the following:
  - Safety fencing with arc curtains
  - Infrared light curtains
  - Interlocked cell door
1.2.3 Optional Equipment

The following equipment is available for use with the ArcWorld II-6200HD DR2C:

- Torch tender
- Wire cutter
- Com-Arc III seam tracking unit
- Water circulator

1.3 Reference to Other Documentation

For additional information refer to the following:

- Motoman UP6 Manipulator Manual (P/N 142104-1)
- Motoman UP20Manipulator Manual (P/N 144342-1)
- 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 (UP6 or UP20)
- Application Type (welding)
- System Type (ArcWorld II-6200HD DR2C)
- 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
- 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.
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 UP-Series Robot Description

The Motoman UP6 and UP20 robots and XRC robotic controller represent state-of-the-art technology in robotics today. The six-axis UP6 robot has a payload of 6kg (13.2 lbs). It features a 1,373mm (54.05 in.) reach and has a relative positioning accuracy of ± 0.08mm (0.004 in.). The six-axis UP20 robot has a payload of 20kg (44.09 lbs). It features a 1658mm (65.2 in.) reach and has a relative positioning accuracy of ± 0.08mm (0.004 in.).

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 DR2C XRC Controller

The DR2C XRC robotic controllers (see Figure 3-1), coordinates the operation of the ArcWorld II-6200HD DR2C system and are configured so that one controller directs the action of both robots, designated as Robot 1 (R1) and Robot 2 (R2). The Master XRC coordinates the operation of the entire cell and delegates tasks to both robots. Both welders and positioner are also controlled by the Master XRC. The Master XRC 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, each 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  DR2C XRC Controllers
3.2.1 **Playback Panel**

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

![Figure 3-2 XRC Playback Panel](image)

**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 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/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 can not be applied in TEACH mode unless TEACH LOCK is ON.

**RS-232C Serial Port**
This 9-pin serial port is used for data communication between the XRC 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).

Provide adequate support for axis to be released. Support should be able to withstand the payload and the approximate weight of robot. Listed below is the weight of each robot available:

- UP6 – 135kg (297 lb)
- UP20 – 280kg (617 lb)

3.3 Operator Stations

The ArcWorld II-6200HD DR2C is available with three different types of operator station: Pushbutton Type, Touchscreen Type – Monochrome, Touchscreen Type – Chrome, and Touchscreen Type – HE Chrome (High End Chrome).

3.3.1 Pushbutton Type

One operator station available with the ArcWorld II-6200HD DR2C robot cell is the pushbutton type. The pushbutton type is located on the cell floor and controls the robotic cell with knobs and push buttons. This operator station (see Figure 3-6) includes a NEMA enclosure on a stand-alone pedestal. Push buttons and knobs are used exclusively to change cell activities. The following paragraphs describe the operator station controls.

*Figure 3-6 Operator Station*
Cycle Start: Two green palm buttons, located on the sides of the operator station, initiate a positioner sweep cycle if the robot is in the Home position (Cube 23 or Cube 24).

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

If both CYCLE START buttons are pressed while either robot is outside home position, the CYCLE START (IN#9) command is latched into the XRC. Once the robot returns to home position, the CYCLE START command is executed and the positioner sweeps. An anti-tiedown timer, set to 10 seconds, prevents the operator from holding the palm buttons down and continuously cycling the positioner.

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 come on 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 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.

Cycle Latched: CYCLE LATCHED indicates that the positioner will sweep and begin to weld immediately after the current weld cycle is complete.

The CYCLE LATCHED lamp illuminates when the positioner 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 23 or Cube 24) before pressing the CYCLE START palm buttons to sweep the positioner. Pressing the CYCLE START palm buttons while either robot is still in motion locks the CYCLE START command into the XRC. The CYCLE LATCHED light comes on, indicating CYCLE START latching. The positioner sweeps once the robots finish the current job and return to the home position (Cube 23 or Cube 24). Stepping into the light curtain area will unlatch the CYCLE START command from the XRC.

Alarm: The ALARM lamp illuminates when the robot encounters an alarm condition or when servo power is cut. The ALARM lamp is connected to the robot SERVO ON and ALARM OCCURRENCE outputs.

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.
Master Job Start: The robot will start the current active job when MASTER JOB START button is pressed. The operator station must be enabled and servo power ON for the MASTER JOB START button to work. The MASTER JOB 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 XRC to the operator station. The REMOTE MODE button on the XRC playback panel lights when the operator station is enabled. Most pendant functions are disable while in REMOTE.

Reset: A minor alarm or error condition is cleared when the RESET button is pressed. The RESET button is connected to the robot alarm reset input. In addition, the RESET button and the RIGHT CYCLE START buttons are interlocked and, when pressed simultaneously, reset the positioner when servo power is ON in Play mode. In Teach mode, the positioner is automatically reset when servo power is turned ON. The positioner only needs to be reset after initial power-up and after an emergency stop while in Play mode.

NOTE: Resetting the positioner may cause some positioner motion. You must be careful when you reset the positioner with the robot close to tooling. If an Emergency Stop occurs during programming, be sure to reset the positioner before resuming programming.

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.

3.3.2 Touch Screen Type – Monochrome Display

A Touch Screen Type operator station is available with the ArcWorld II-6200HD DR2C robot cell. The operator station, which is integrated into the PLC (programmable logic control), allows the operator to perform any of the robot’s playback box functions from a remote location. Touch pressure activates the screen menu options. The touch capabilities provide access to all cell functions except for CYCLE START and EMERGENCY STOP. Each of these two operations are initiated with a mechanical pushbutton on the front of the op-station.

PanelView 550 Liquid Crystal Display (LCD) is used with the monochrome touch screen op-station to change screens for controlling cell activities. There are five viewable screens on the monochrome operator station. The first screen or main menu (see Figure 3-7) gives real time data on robot location and cycle status. The other screens, Robot, System Diagnostics, Tool, and Part Count are used for setup, troubleshooting, and data retrieval.

The screen access touch buttons located at the bottom provide access to all other menus. As the screens change, the touch buttons at the bottom remain the same.
### Main Menu Screen-monochrome

**Mode Select:** The Mode Select AUTO/MANUAL touch switch is used to select AUTOMATIC or MANUAL mode for the positioner. Simply touch the CYCLE START knob on the screen to switch from AUTO (automatic) to MAN (manual). This command is connected to robot Input #10. When CYCLE START is pressed with the selector switch in the AUTO position, the robot will weld the part after the positioner sweeps. If the switch is in the MANUAL mode, the robot does not process the part after the positioner sweeps.

**Weld Select:** The Weld Select Weld/No Weld touch switch turns the welding operation on or off prior to job start. Touch the Weld Select knob on the screen to switch from WELD to NO WELD. The No Weld option gives the operator the ability to run a job and verify accuracy without actually welding. The Weld option enables the torch during job start.

**Fault Reset:** Press the FAULT RESET switch to clear a minor alarm or error condition. This touch switch is connected to the robot alarm reset input.

**at Home:** This indicator illuminates when both robots reach HOME position.

**Operating:** This indicator illuminates when the cell is in operation.

**Start Latched:** This indicator illuminates after the CYCLE START button has been pressed.
**Robot Screen-monochrome**

The robot screen (see Figure 3-8) uses momentary touch switches to provide job start control, master job status, and servo control to the operator.

When a momentary button is pressed on the STATUS CHANGE line, the text in the square above it changes to reflect that command change. In return, the text of some buttons can change to reflect the possible reversal of that command.

---

**Remote Mode:** This touch button disables the programming pendant to give control of the cell solely to the operator station.

**Servo On:** The SERVO-ON touch button turns servo power ON. In TEACH mode, the servo will only turn on when the enable switch on the programming pendant is held in.

**Mode Select:** The Mode pushbuttons (PLAY and TEACH) set the robot's mode of operation.

**Call Master Job:** The Call Master Job touch button will call up the job that has been registered as the master. The cursor will be located on the first line of the job (top). However, the job will not begin execution until the start button is pressed. To prevent crashes, the Call Master Job will not work if a robot is in a work cube or the positioner is not at side A or B. If the button press was successful, the text Top of Master Job will appear above it in the status line box.

**Robot Job Start:** The Robot Start touch button will begin executing the current job at the line where the cursor is located. Once the Robot Start button is pressed, the text Robot Running will appear above it in the status line box.

**Hold:** While the job is executing, the Robot Job Start button turns into a Robot Hold button. Pressing the HOLD button stops the operation of the manipulator until another start signal is sent. Refer to the manipulator manual for more information.
**System Diagnostics Screen-monochrome**

The system diagnostics screen (see Figure 3-9) provides real time data about robot/positioner location and critical safety features during cell operation. The lights on this screen will turn on and off as the robots and positioner successfully complete a job. Use the lights on this screen and the error message line to diagnose problems.

![System Diagnostics Screen-monochrome](image)

**Figure 3-9  System Diagnostics Screen-monochrome**

The safety column lists the critical status of E-Stop devices or safety mechanisms. All these with the exception of the light curtain, must be on before servo power will turn on.

The positioner column lists positioner location and its servo motor location as it advances and retracts. The servo motor slides in and out into different gears to rotate the positioner or mounting plate.

The cubes column lists the different cubes where both robots work. A light beside the cube name comes on when the robot enters that cube. When the robot leaves the cube the light goes out. The number after Work is the actual cube number. Refer to Figure 3-15 for the cube location in the work cell.

**Tool Screen-monochrome**

The tool screen is used for setting and monitoring tooling parameters on the positioner. The appearance of this screen will change depending on the customer’s use.

**Part Count Screen-monochrome**

The function of the part count screen (see Figure 3-10) is to track the number of parts that are processed on each side of the positioner. Signals received from the XRC controller dictate increases in part count. The pulse output command needs to be programmed at the end of the weld job. Use PULSE OT#(73) to increment side A and PULSE OT#(74) to increment side B.

The count reset touch button resets the counter to zero when pressed. The button is functional at any time.

![Part Count Screen-monochrome](image)

**Figure 3-10  Part Count Screen-monochrome**
### 3.3.3 Touchscreen Type – Color

The PanelView 660 thin film transistor (TFT) screen is used with the color touch screen op-station to change screens for controlling cell activities. There are six viewable screens on the color display: Main, Robot, System Diagnostics, Maintenance, Tooling, and Password. The touch sense capabilities provide access to all cell functions except for CYCLE START and EMERGENCY STOP. These two operations are initiated with a mechanical pushbutton on the front of the op-station.

#### Main Menu-color

The first screen or main menu (see Figure 3-11) gives real time data on current job and operating status. The other screens – Robot, System Diagnostics, and Tool – are used for setup/start, troubleshooting, and data retrieval. Instant access to the each menu screen is available using the screen access touch buttons.

![Main Screen-color](image)

**Positioner Mode:** Two mode select boxes are used to select AUTOMATIC or MANUAL mode for the positioner. These same commands appear on the main menu. This command is connected to robot Input #10.

- **IN AUTO (in automatic)** - The robot will process the part after the positioner sweeps. This box is read only and can only be change by pushing the MAN SEL button.
- **AUTO SEL (automatic select)** - This touch button changes the cycle to IN AUTO (automatic).

The bottom mode select button changes between two displays: IN MAN and MAN SEL.

- **IN MAN (in manual)** - The robot does not process the part after the positioner sweeps, but remains in the home position. This button is now read only and can only be change by pushing the AUTO SEL button.
- **MAN SEL (manual select)** - This touch button changes the cycle to IN MAN (manual).
Cycle Start Status Box: This read only box on the color screen displays the current status of the cycle start function. The cycle start status, and text inside the box, changes to and from CYCLE START LATCHED and CYCLE START LATCH OFF.

The CYCLE START LATCHED box is an indicator light showing that the positioner 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 23 and Cube 24) before pressing the CYCLE START palm buttons to sweep the positioner. Pressing the CYCLE START palm button while either robot is still in motion locks the CYCLE START command into the XRC. The CYCLE START LATCHED light comes on, indicating that the CYCLE START is latched. The positioner sweeps once the robots finish the current job and return to the home position (Cube 23 and Cube 24). Pressing the CYCLE START LATCHED box or violating the light curtains will unlatch the CYCLE START command from the XRC.

NOTE: *The CYCLE START will only latch in the AUTO mode*

Cycle Start Pushbutton: The green palm button, located on the front of the operator station, initiates a positioner sweep cycle if the robots are in the Home position (Cube 23 and Cube 24).

**WARNING!**

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

If the CYCLE START button is pressed in the AUTO mode while either robot is outside Cube 23 or Cube 24, the CYCLE START (IN#9) command is latched into the XRC. Once the robot returns to the home positions, the CYCLE START command is executed and the positioner sweeps.

Part Count: The SIDE COUNT A and B boxes track the number of parts that are processed on each side of the positioner. Signals received from the XRC controller dictate increases in part count increments. The pulse output command needs to be programmed at the end of the weld job.

**NOTE** Use PULSE OT#(73) to increment side A and use PULSE OT#(74) to increment side B.

Robot Location: The text in this box alternates between Robots at Home and Not at Home to notify the operator when both robots have or have not reached their home position.

Job Status: The text in this box alternates between Job Operating and Job Stopped to notify the operator when the job is operating or stopped.
**Robot Screen-color**

The robot screen (see Figure 3-12) provides the operator with control of critical robot functions with momentary touch switches.

**Remote Mode:** This touch button disables the programming pendant to give control of the cell to the operator station. The text inside changes from ON to OFF to reflect remote status.

**Servo Power:** The SERVO-ON touch button turns servo power ON. In TEACH mode, the servos will only turn on when the deadman switch on the programming pendant is depressed. In PLAY, the safety gate must be shut to turn servos on.

**Robot Mode:** The Robot Mode pushbuttons set the robot’s mode of operation. When the TEACH button is pressed, its button text changes to a status indicator that states IN TEACH and the button above it is now PLAY. When the PLAY button is pressed, its box text changes to a status indicator stating IN PLAY and the button below it is now labeled TEACH. The robot mode cannot be in PLAY and TEACH at the same time.

**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.
**Call Master Job:** The Call Master Job touch button will call up the job that has been registered as the master. The cursor will be located on the first line of the job (top). However, the job will not begin execution until the start button is pressed. If the button press was successful, the text on the button will change to MJ Top. To prevent crashes, Call Master Job will not work if a robot is in a work cube or the positioner is not at side A or B.

**Robot Job:** The Robot START touch buttons will begin executing the current job at the line the cursor is located on. Once the Robot START button is pressed in the top box, the text inside changes to RUNNING.

**HOLD:** The robot HOLD command is in the bottom box. Pressing the HOLD button stops the operation of the manipulator until another start signal is sent. Once the HOLD button is pressed, the text inside changes to HOLDING. Refer to the manipulator manual for more information on the hold command.

**Fault Reset:** The FAULT RESET touch switch is connected to the robot alarm reset input. Pressing this switch clears a minor alarm or error condition. When a fault occurs, access the robot screen and press the PRESS TO RESET ALARM touch button. The text inside will change to NO ALARMS.

**R1 at HOME:** During operation, this box illuminates when robot number one (R1) is in home location. The text inside changes to NOT HOME when robot move out of home location.

**R2 at HOME:** During operation, this box illuminates when robot number one (R2) is in home location. The text inside changes to R2 NOT HOME when robot move out of home location.

**System Diagnostics Screen-color**

The system diagnostics color screen provides real time data about robot/positioner location and critical safety features during cell operation. The lights on this screen will turn on and off as the robots and positioner successfully complete a job. Use the lights on this screen and the error message line to diagnose problems.

![Figure 3-13  System Diagnostics Screen-color](image)

The SAFETY column lists the critical status of an E-Stop device or safety mechanisms. All these with the exception of the light curtain, must be on to turn servo power on.
The **POSITIONER column** lists positioner location and servo motor location as it advances and retracts. The servo motor slides in and out into different gears to rotate the positioner or mounting plate.

The **CUBES column** gives the current cube location of each robot and also tells what robot(s) are permitted in that active cube. Figure 3-14 explains the variables in the cubes column. The available cubes are shown in Figure 3-15. A light beside the cube name comes on when the robot enters that cube. When the robot leaves the cube the light goes out. Only two lights in this column will be on at one time: one for R1 location and one for R2 location.

---

**Tool Screen-color**

The tool screen is used for automatic tooling and will be customized on per order basis. The appearance of this screen will change depending on the customer’s use. A password is required to access the tool screen.
**Maintenance Screen-color**

The maintenance screen (see Figure 3-16) allows the operator to reset the part count and set cycle time for each side of the positioner. The WELD/NO WELD status touch button is also located on this screen.

A password is required to access the maintenance screen. The security level of the operator name used will dictate what screens can be viewed. These security parameters are established during set up.

**Figure 3-16 Maintenance Screen-color**

**Part Count:** The SIDE COUNT A and B boxes track the number of parts that are processed on each side of the positioner. Signals received from the XRC controller dictate increases in part count increments. The pulse output command needs to be programmed at the end of the weld job.

*NOTE* Use PULSE OT#(73) to increment side A and use PULSE OT#(74) to increment side B.

**Cycle Time Timer:** The SIDE A and SIDE B CYCLE TIME boxes display the time taken by the positioner and robots to complete the job. The timer starts when the positioner begins to sweep and ends after the welding process, when both robots are back in home position.

The timers are controlled by a Cycle Timer Enable output from the XRC. Use DOUT #(86) to start the side A timer, and DOUT #(87) to start the side B timer.

When the outputs are turned off the timers will stop and display the elapsed time. When the outputs are turned on the time value will reset to zero, and the timer will start again.

These output commands can be placed anywhere in the jobs to time the weld cycle, the load cycle or any other sequence.

**Count Reset:** The count reset touch button resets the counter to zero when pressed. The button is functional at any time.

**Weld Select:** The Weld Select Weld/No Weld touch switch turns the welding operation on or off prior to job start. The No Weld option gives the operator the ability to run a job and verify accuracy without the robot welding. The Weld option enables the torch during the robot job. Touching the WELD button changes the system from WELD to NO WELD.
**Passwords Screen-color**

The Passwords screen is used to set up, change, and disable all password functions.

**Figure 3-17 Password Screen-color**

**Security Enabled/Disabled:** This touch button turns on and turns off the security functions of the operator station. The text inside the touch button changes to reflect the current Security Mode.

SECURITY DISABLED allows complete access to the operator station without the use of passwords.

SECURITY ENABLED turns on the passwords for the operator station. A password will be required to access the TOOLING, MAINTENANCE, AND PASSWORD screens.

**Choose an Operator:** Different operator names are used to limit access to certain screens. The operator name SUPERVISOR has access to all screens and has the ability to turn off all security functions. The MAINTENANCE operator name can access any screen apart from the password screen.

a) Passwords

Motoman provides default passwords (see Table 3-1) for each of the two operator names.

**Table 3-1 Operator Station Passwords Color Screen**

<table>
<thead>
<tr>
<th>Operator Name</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor</td>
<td>1111</td>
</tr>
<tr>
<td>Maintenance</td>
<td>2222</td>
</tr>
</tbody>
</table>

**NOTE:** The capability is there for 16 possible operators. Contact Motoman for the software needed to add more operator names.
b) Change a Password

To change a password that is allocated to an operator name, proceed as follows:

- Press the operator button until the correct name is displayed.
- Press the NEW PASSWORD touch button.
- Type new password into the keypad that appears on screen.
- Press the large arrow key to enter new password and exit keypad.
- Press the VERIFY PASSWORD touch button.
- Retype the new password onto the keypad that appears on screen.
- Press the large arrow key to finish password change.

3.3.4 Touchscreen Type – High-end Color

The High-end (HE) Color Display op-station provides an extra-large screen with more pixels for higher resolution. The operator interfaces with the PanelView 1000 Thin Film Transistor (TFT) display for setup, diagnostics, and cell control. The programming pendant can be locked out of operation from the operator station.

The touch sense screens provide access to all cell functions except for CYCLE START and EMERGENCY STOP. These two operations are initiated with a mechanical pushbutton on the front of the op-station.

There are six viewable screens on the color display: MAIN, ROBOT, SYSTEM DIAGNOSTICS, and MAINTENANCE, TOOLING, AND PASSWORD.

Main Menu-HE Color

The first screen or main menu (see Figure 3-18) should be viewed during production as it gives real time data on current job and operating status. The other screens, Robot, System Diagnostics, and Tool are used for setup/start, troubleshooting, and data retrieval. Instant access to the each menu screen is available using the screen access touch buttons.

Figure 3-18 Main Screen-HE Color
**Positioner Mode:** The Positioner Mode pushbutton selects AUTOMATIC or MANUAL mode for the positioner. The simulated toggle switch changes between AUTO to MANUAL on screen to indicate the selected mode.

This command is connected to robot Input #10.

- **AUTO** (in automatic) - The robot will process the part after the positioner sweeps.
- **MANUAL** - The robot does not process the part after the positioner sweeps, but remains in the home position.

**Cycle Start Status Box:** This read only box on the color screen displays the current status of the cycle start function. The cycle start status, and text inside the box, changes to and from CYCLE START LATCHED and CYCLE START LATCH OFF.

The CYCLE START LATCHED box is an indicator light showing that the positioner 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 23 and Cube 24) before pressing the CYCLE START palm buttons to sweep the positioner. Pressing the CYCLE START palm button while either robot is still in motion locks the CYCLE START command into the XRC. The CYCLE START LATCHED light comes on, indicating that the CYCLE START is latched. The positioner sweeps once the robots finish the current job and return to the home position (Cube 23 and Cube 24). Pressing the CYCLE START LATCHED box or violating the light curtains will unlatch the CYCLE START command from the XRC.

**NOTE:** The CYCLE START will only latch in the AUTO mode

**Part Count:** The SIDE COUNT A and B boxes track the number of parts that are processed on each side of the positioner. Signals received from the XRC controller dictate increases in part count increments. The pulse output command needs to be programmed at the end of the weld job.

**NOTE:** Use PULSE OT#(73) to increment side A and use PULSE OT#(74) to increment side B.

The numeric value in the part count TOTAL box represents the total value in sides A and B boxes. The TOTAL value changes to zero instantly after pressing both reset buttons.

**Robot Location:** The text in this box alternates between Robots at Home and Not at Home to notify the operator when both robots have or have not reached their home position.

**Job Status:** The text in this box alternates between Job Operating and Job Stopped to notify the operator when the job is operating or stopped.
**Robot Screen-HE Color**

The robot screen (see Figure 3-19) provides the operator with control of critical robot functions with momentary touch switches.

**Remote:** The REMOTE touch button disables the programming pendant to give control of the cell to the operator station. Once pressed, the button changes from black (off) to green (on).

**Servo On:** The SERVO-ON touch button turns servo power ON. When the controller is in TEACH mode, the servos will only turn on when the deadman switch on the programming pendant is depressed. When the controller is in PLAY, the safety gate must be shut to turn servos on. Once pressed, the button changes from black (off) to green (on).

**Robot Mode:** The Robot Mode selects PLAY or TEACH mode for the robot. The simulated toggle switch changes between PLAY or TEACH on screen to indicate the selected mode.

**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.

**Call Master:** The Call Master Job touch button will call up the job that has been registered as the master. The curser will be located on the first line of the job (top). However, the job will not begin execution until the start button is pressed. If the button press was successful. To prevent crashes, Call Master Job will not work if a robot is in a work cube or the positioner is not at side A or B.
**Start Job:** The robot START JOB touch button will begin executing the current job at the line the cursor is located on. Once the job starts running, the button color will change from black to green.

**Hold:** Pressing the robot Hold button stops the operation of the job until another start signal is sent.

**Fault Reset:** The FAULT RESET touch switch is connected to the robot alarm reset input. A minor alarm or error condition is cleared when this switch is pressed. When a fault occurs, access the robot screen and press the FAULT RESET touch button. The FAULT RESET touch button flashes red when a fault has occurred.

**R1 at HOME:** During operation, this box illuminates when robot number one (R1) is in home location. The text inside changes to NOT HOME when the robot moves out of home location.

**R2 at HOME:** During operation, this box illuminates when robot number one (R2) is in home location. The text inside changes to R2 NOT HOME when the robot moves out of home location.

**System Diagnostics Screen-HE color**
The system diagnostics HE color screen (see Figure 3-20) provides real time data about robot/positioner location and critical safety features during cell operation. The lights on this screen will turn on and off as the robots and positioner successfully complete a job. Use the lights on this screen and the error message line to diagnose problems.

**Figure 3-20  System Diagnostics Screen-HE Color**
The SAFETY column lists the critical status of an E-Stop device or safety mechanisms. All these with the exception of the light curtain, must be on to turn servo power on.

The POSITIONER column lists positioner location and servo motor location as it advances and retracts. The servo motor slides in and out into different gears to rotate the positioner or mounting plate.

The CUBES column gives the current cube location of each robot and also tells what robot(s) are permitted in that active cube. Figure 3-14 explains the variables in the cubes column. The available cubes are shown in Figure 3-15. A light beside the cube name comes on when the robot enters that cube. When the robot leaves the cube the light goes out. Only two lights in this column will be on at one time: one for R1 location and one for R2 location.
Maintenance Screen-HE color
The maintenance screen (see Figure 3-21) provides real time data for part count information and cycle time for each side of the positioner. The WELD SELECT touch button is also located on this screen.

Access to the maintenance screen is obtained only with a password unless password security is disabled. The security level of the password that enters the maintenance screen will dictate what screens can be viewed from that point forward. These security parameters are established during set up to prevent unwanted access to certain screens.

![Maintenance Screen-HE Color](image)

**Figure 3-21  Maintenance Screen-HE Color**

**Part Count:** The SIDE COUNT A and B boxes track the number of parts that are processed on each side of the positioner. Signals received from the XRC controller dictate increases in part count increments. The pulse output command needs to be programmed at the end of the weld job.

**NOTE** Use PULSE OT#(73) to increment side A and use PULSE OT#(74) to increment side B.

**Cycle Time Timer:** The SIDE A and SIDE B CYCLE TIME boxes display the time taken by the positioner and robots to complete the job. The timer starts when the positioner begins to sweep and ends after the welding process when both robots are back in home position.

The timers are controlled by a Cycle Timer Enable output from the XRC. Use DOUT #(86) to start the side A timer, and DOUT #(87) to start the side B timer.

When the outputs are turned off the timers will stop and display the elapsed time. When the outputs are turned on the time value will reset to zero, and the timer will start again.

These output commands can be placed any where in the jobs to time the weld cycle, the load cycle or any other sequence.

**Count Reset:** The count reset touch button resets the counter to zero when pressed. The button is functional at any time.
**Weld Select:** The Weld Select Weld/No Weld touch switch turns the welding operation on or off prior to job start. The No Weld option gives the operator the ability to run a job and verify accuracy without the robot welding. The Weld option enables the torch during the robot job. Touching the WELD button changes the simulated toggle switch changes between WELD and NO WELD on screen to indicate the selected mode.

**Tool Screen-HE Color**

The Tool screen is used for automatic tooling and will be customized on per order basis. The appearance of this screen will change depending on the customers use. A password is required to access the tool screen.

**Passwords Screen HE Color**

The Passwords screen is used to set up, change, and disable all password functions.

---

**Figure 3-22  Passwords Screen-HE Color**

**Security Enabled/Disabled:** This touch button turns on and turns off the security functions of the operator station. The text inside the touch button changes to reflect the current Security Mode.

SECURITY DISABLED allows complete access to the operator station without the use of passwords.

SECURITY ENABLED turns on the passwords for the operator station. A password will be required to access the TOOLING, MAINTENANCE, AND PASSWORD screens.
Choose an Operator: Different operator names are used with passwords to limit access to certain screens. The operator name SUPERVISOR has access to all screens and has the ability to turn off all security functions. The MAINTENANCE operator name can access any screen accept for the password screen.

   a) Passwords

Motoman provides default passwords (see Table 3-2) for each of the two operator names.

Table 3-2  Operator Station Passwords HE Color Screen

<table>
<thead>
<tr>
<th>Operator Name</th>
<th>Password</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor</td>
<td>1111</td>
</tr>
<tr>
<td>Maintenance</td>
<td>2222</td>
</tr>
</tbody>
</table>

NOTE: The capability is there for 16 possible operators. Contact Motoman for the software needed to add more operator names.

Change a Password: To change a password that is allocated to an operator name, proceed as follows:

   • Press the operator button until the correct name is displayed.
   • Press the NEW PASSWORD touch button.
   • Type in new password into the keypad that appears on screen.
   • Press the large arrow key to enter new password and exit keypad.
   • Press the VERIFY PASSWORD touch button
   • Retype the new password onto the keypad that appears on screen.
   • Press the large arrow key to finish password change.

3.4 RM2-500TX Positioner

The ArcWorld II-6200HD DR2C cell uses the RM2-500TX positioner. The RM2-500TX positioner is AC-servomotor controlled by the XRC to provide coordinated motion between the robots and controller. The standard distance between the headstock and tailstock faceplates on the RM2-500TX is 3.0 meters (118 inches). Refer to Table 3-3 for specifications for the RM2-500TX positioner. The load side of the positioner is fixed for loading and unloading parts. The patented servo motor is used to sweep the positioner workstations into and out of the robots’ work envelope, and also to rotate the weld side of the positioner during welding.

A fixture frame is typically mounted between the headstock and tailstock faceplates to provide a highly flexible system. Fixtures are either mounted on, or integrated into, these frames for positioning and clamping of production parts. Both pneumatic and electrical signals can be run to the fixtures if required. Depending on part size(s)/weights(s), you can mount single or multiple parts or assemblies to the fixture frame.
The ArcWorld II-6200HD DR2C dual system is capable of **synchronized motion** between various components depending on the job configuration. Synchronized robots move at the same time during operation. R1 can be synchronized with the positioner; R2 can be synchronized with the positioner; and R1 can be synchronized with R2. Dual robots can work simultaneously on a rotating workpiece if the tasks are symmetrical. For additional information on independent control and coordinated motion, refer to the Independent/Coordinated Function manual (Part Number 142969-1). This system is also capable of **true coordinated motion**, where linear, circular, or spline motion can be coordinated between R1 and the positioner, between R2 and the positioner, and between R1 and R2. Coordinated motion allows the robots to weld while the positioner rotates the parts. For additional information on coordinated motion, refer to the Coordinated Motion for Multi-Axes Systems manual (Part Number 139418-1).

### 3.4.1 Welding Ground System

The welding ground system consists of a spring-loaded copper brush that contacts the large gear inside the positioner gear housing. The welding power source ground cable is connected to the ground stud located on the right side of the positioner base as you face the rear of the ArcWorld II-6200HD DR2C cell.

**NOTE:** The connection ground cable between the insulated ground bar must be tight. If the connection is loose, arcing can occur and cause the insulator to melt.

### 3.4.2 Locking Pins

The RM2-500TX positioner is equipped with fixture locking pins that prevent the headstock/tailstock faceplates from turning when the servo motor retracts. The fixture locking pins are spring loaded, so when the servo motor withdraws, the pins engage. Each headstock faceplate has two locking pins.

The RM2-500TX positioner is also equipped with a pair of sweep lock shot pins that prevent the sweep axis from turning during the welding and loading cycles. One sweep lock drive pin is located on the headstock drive base and the other is located on the tailstock shot base.
### 3.4.3 Arc Shield

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

The RM2-500TX positioner incorporates and “X” beam design to tie the headstock and tailstock swing arms together and also to provide a visual barrier between the operator and the welding zone.

**Table 3-3  RM2-500TX Positioner Specifications**

<table>
<thead>
<tr>
<th>Conditions</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Capacity</strong></td>
<td>750kg (1653 lbs), combined part/fixture weight per side 1500kg (3306.9 lbs) total</td>
</tr>
<tr>
<td><strong>Maximum Weight Differential per Side (Offset Load)</strong></td>
<td>289.8kg (639 lbs)</td>
</tr>
<tr>
<td><strong>Swing Diameter</strong></td>
<td>1.1m (43.3 in.)</td>
</tr>
<tr>
<td><strong>Temperature Operating Range</strong></td>
<td>4-43˚C (40-110˚F)</td>
</tr>
<tr>
<td><strong>Humidity (maximum)</strong></td>
<td>Non-condensing 10-90% relative humidity</td>
</tr>
<tr>
<td><strong>Shock (maximum)</strong></td>
<td>Less than 0.5 G</td>
</tr>
<tr>
<td><strong>Positioner Sweep Speed (Torque/Time)</strong></td>
<td>2000N•m (1475 lb-ft) in 5 to 7 seconds</td>
</tr>
<tr>
<td><strong>Servo Headstock Speed</strong></td>
<td>1060N•m (781.8 lb-ft) @ 0–16.8 rpm</td>
</tr>
<tr>
<td><strong>Air Requirements</strong></td>
<td>620.5kPa (90 psi)</td>
</tr>
<tr>
<td><strong>Electrical Requirements</strong></td>
<td>24V DC for interface</td>
</tr>
<tr>
<td></td>
<td>208V AC, 10 amp</td>
</tr>
<tr>
<td></td>
<td>3-phase power supplied by XRC controller</td>
</tr>
<tr>
<td><strong>Welding Current Rating</strong></td>
<td>700 amperes at 100% duty cycle</td>
</tr>
</tbody>
</table>

**NOTE:** In high humidity areas, use surface protection to prevent corrosion of the tooling plate.
3.5  **Welding Equipment**

In its standard configuration, the ArcWorld II-6200HD DR2C 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 for enhanced performance.

3.5.1  **Wire Feeder**

The wire feeder mounts on the robot arm. This 4-roll wire feeder provides reliable wire feeding at rates up to 750 inches per minute (IPM). An integral gas valve provides fast gas response time.

3.5.2  **Universal Welding Interface (UWI)**

The UWI provides microprocessor control to the wire feeder and Kobelco-series 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.

*N NOTE: Some power sources available with the ArcWorld II-6200HD DR2C system do not use the UWI. For more information specific to your system, refer to the vendor manuals shipped with your system.*

3.5.3  **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 water circulator kit.

3.5.4  **Motoman Torch Mount**

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

Motoman offers several different power sources for use with the ArcWorld II-6200HD DR2C system depending on your system’s application. For more specific information, refer to the vendor manual that came with your system.

**Figure 3-23 Available Power Sources**
3.6 **Safety Features**

The ArcWorld II-6200HD DR2C 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 Curtains**

**WARNING!**

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

The material used to cover the safety fencing of the entire robotic cell protects against casual arc flash. This material reduces the amount of ultraviolet radiation that escapes from the robotic cell.

3.6.2 **Fencing**

The safety fencing provided with the ArcWorld II-6200HD DR2C system forms a physical barrier preventing entry into the robot and positioner operating envelope during automatic operation.

3.6.3 **Light Curtain**

Infrared light curtains provide a safe area for the operator. The positioner will not sweep while any of the light paths are obstructed. Should any person or object enter this zone during a sweep from A to B (or B to A) an E-stop will occur.

3.6.4 **Emergency Stops (E-STOPS)**

In addition to the safety features described above, the ArcWorld II-6200HD DR2C has strategically placed E-STOPS. These are operator actuated devices that, when activated, immediately stop all system operation. Brakes are applied to the robot and all servo power is removed from the system. The system E-STOP is activated and all positioner motion is stopped. The following is a list of their locations:

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

3.6.5 **ENABLE Switch**

The ENABLE switch is a safety feature which controls servo power while in TEACH mode. When pressed in, this switch allows the operator to turn servo power ON and initializes the system. However, should the operator release the switch or grasp it too tightly, servo power is immediately disabled, preventing further robot movement. For detailed information about the operation of the ENABLE switch, refer to the XRC 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 an E-STOP. Brakes are applied to the robot and all servo power is removed from the system. The system E-STOP is activated and all positioner motion is stopped.

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 the following Specified Outputs:

\[ R1 = \text{SOUT #081 - 104} \]

The ArcWorld II-6200HD DR2C uses interference cubes to interlock robot position with positioner motion. The robot home or home position is defined behind the positioner, clear of the sweep zone. Before the positioner can sweep, the robot must be in this home position. Each axis is placed in a position that provides the least amount of strain on the servo motors, with the U- and L- axes at a 90 degree angle and the B axis in a relaxed, vertical position. This prevents drifting when servo power is off. Before the positioner can sweep, the robot must be in this home 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 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. The Brake Release Control is mounted on the front of the XRC cabinet (see Figure 3-1). Refer to the operation of this device.
SECTION 4
INSTALLATION

The ArcWorld 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 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)
4.1.3 Cell Components

There are five major components that make up the ArcWorld II-6200HD DR2C cell (see Figure 4-1). These components are shipped on a different shipping skid. 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 – left or right side</td>
</tr>
<tr>
<td>1</td>
<td>Positioner</td>
</tr>
<tr>
<td>2</td>
<td>Programming Base</td>
</tr>
</tbody>
</table>

Figure 4-1 System Components
4.2 **Site Preparation**

To prepare your site, proceed as follows:

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

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

   **NOTE:** To get the most out of your ArcWorld II-6200HD DR2C it is recommended that an additional 2.43 to 3.05m (8 to 10 ft) be allocated on all sides of the system.

   2. Gather all customer-supplied items and required tools listed in Section 4.1.
4.3 Installing the Robot Common Base

The robot common base is shipped on a wooden shipping skid. To install the robot common base, proceed as follows:

**CAUTION!**
Handle ArcWorld II-6200HD DR2C components carefully to avoid damage.

1. Unbolt robot common base from shipping skid using a 3/4 in. socket (see Figure 4-3).

**WARNING!**
The robot common base weighs 1500kg (3300 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. Using a forklift, remove the common base from wooden shipping skid.
3. Place robot common base in position (see Figure 4-2).
4. Carefully remove protective plastic wrapping from robot and torch.

*Figure 4-3 Unbolting System Components*
5. Inspect robots, torches, and positioner for shipping damage.  

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

6. Remove operator station from skid and set it safely aside.

### 4.3.1 Removing the Shipping Brackets

**CAUTION!**  
Failure to remove shipping brackets from robot before operating the ArcWorld II-6200HD DR2C may result in damage to the robot drive mechanisms.

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

![Figure 4-4 Location of Shipping Brackets](image-url)
4.4 Installing the Programming Platforms

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

A programming platform must now be installed on the left and right side of the robot common base. Both programming platforms are shipped together with other parts on a wood shipping skid. The programming bases are lagged into the concrete on the back end of the robot base (see Figure 4-5).

1. Unbolt programming platforms from the shipping skid using a 3/4 in. socket.
2. Using a forklift, remove the programming platforms from the shipping skid.
3. Separate the platforms and accessories.
4. Place a programming platform on the left and the right side of the robot base with the leveling bolts oriented to the rear. Use the supplied system drawings to ensure that they are properly aligned.
4.5 Installing the Positioner

**WARNING!**
The positioner weighs 3650kg (8030 lbs), make sure the lifting device used to move these objects are capable of safely handling this much weight.

The positioner is lagged into the concrete in front of the cell and bolted to the robot base.

1. Unbolt positioner from the four shipping blocks using a 3/4 in. socket.
2. Using two forklifts, one on each end, remove the positioner from the four shipping blocks.
3. Move the positioner in front of the cell. Use the supplied system drawings to ensure that it is properly aligned. The positioner base is installed beneath the lip on the front of the robot base (see Figure 4-6).
4. Use the supplied hardware to fasten the positioner to the robot base and both programming platforms.

**Figure 4-6 Positioner Alignment**
4.6 Installing the Fencing

The fencing that makes up the welding cell’s protective walls is shipped on its own skid with all the hardware needed for the fencing (see Figure 4-7).

NOTE: The rear wall is the wall behind the robot. The right wall is the wall that is on the right as you are facing the front of the cell, and the left wall is the wall that is on the left as you are facing the front of the cell.

CAUTION!

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

To install the fencing, proceed as follows:
1. Carefully cut bands securing metal fencing and remove all items from skid.
2. Place fence components on floor around positioner (see Figure 4-8).
WARNING!
This procedure requires at least two people to accomplish safely.

Right Side Wall

1. Connect and tighten fence posts to both sides of the rear wall, right section (see Figure 4-9, Step A).
2. Connect and tighten right panel and rear wall and connect both together (see Figure 4-9, Step B).
3. Have an assistant hold the fencing in place while you connect right and tighten positioner panel to right panel end post (see Figure 4-9, Step C).
4. Raise tailstock panel and bolt to end post on the right panel wall (see Figure 4-9, Step D). Tighten these pieces together.
5. Fasten and tighten post to tailstock panel (see Figure 4-9, Step E).
6. Measure to ensure cell walls are square and adjust and necessary.
7. Fasten and tighten the completed right wall assembly including right side rear wall post to base (see Figure 4-9). Holes are provided on the panel ends that match up with the fencing posts. Do not fasten the fence post located in front of positioner (see Figure 4-11, Step J), this will be anchored into the cement after the light curtains are installed.

Figure 4-9 Right Fence Wall Assembly – Steps A through E
**Figure 4-10  Fence/Post Connections**

**Left Side Wall**

1. Connect fence posts to each section of the left sides of rear wall, (see Figure 4-11, Step F).

2. Raise left panel and rear wall and connect them together (see Figure 4-11, Step G).

3. Have and assistant hold the fencing still while you connect left positioner panel to left panel post (see Figure 4-11, Step H).

4. Raise tailstock panel and bolt to end post on the left panel wall (see Figure 4-11, Step I).

5. Fasten post to end of tailstock panel (see Figure 4-11, Step J).

6. Ensure cell walls are square.

7. Fasten the completed left wall assembly including left side rear wall post to base (see Figure 4-11). Holes are provided on the panel ends that match up with the fencing posts. Install but do not tighten down the posts and fencing located beyond the positioner (see Figure 4-11, Step J), this must be anchored into the cement after the light curtains are installed.

**Figure 4-11  Left Fence Wall Assembly – Steps F through J**
4.6.1 Installing the Cell Door

1. Steady the rear wall and install top door rail across door opening, with the clamps provided (see Figure 4-12).

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

3. Close door and install remaining door rail clamp (see ).

4. Install stop bolt and tighten clamp.

5. Adjust door hangers until door latches firmly and securely.

6. Adjust door hangers until latching mechanism latches firmly and securely.

7. Ensure cell walls are square.
4.7 Installing the Arc Curtains

**DANGER!**

Do not install the arc curtains until after the cell walls have been secured to the base. 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, using supplied wire ties and eyelets in material (see Figure 4-13).

![Figure 4-13 Securing the Arc Curtains](image)

**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 panel arc curtain on outside of door panel, using supplied wire ties and eyelets in curtain material.

4.8 Installing the Auxiliary Equipment Common Base

The auxiliary equipment common (AEC) base contains two XRC controllers, two welding power sources, two disconnects, and one primary cell disconnect. The common base may also contain optional water circulators and Com-Arc III seam tracking units. The auxiliary equipment common base is shipped on a wooden shipping skid with accessory boxes secured to the top of the welding power sources. To install the AEC base, proceed as follows:

1. Unbolt the AEC base by removing four shipping bolts using a 3/4-in. deep well socket (see Figure 4-14)
Figure 4-14  Unbolting Auxiliary Equipment Common (AEC) Base

Figure 4-15  AEC Installation Location
WARNING!
The AEC base weighs 1600kg (3520lbs). 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. Using a forklift, lift the base and remove from the four shipping blocks.
3. Depending upon the unit, place the AEC base next to the programming platform of choice (see Figure 4-15).
4. Remove plastic wrapping and cardboard from AEC bases.
5. Remove accessory boxes from welding power sources and set safely aside.
6. Inspect AEC base components for any shipping damage.

NOTE: If damage is found, notify shipper immediately.

4.9 Installing the Operator Station

There are two types of operator stations available for the ArcWorld II-6200HD DR2C cell, one is the pedestal type and the other is the fence mount type. Both of these operator stations are fastened to the robot base for shipment.

**Pedestal Type**

To install the Pedestal type operator station, proceed as follows:

1. Unload operator station from the robot base.
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 in front of the positioner (see Figure 4-16).
5. Insert a 1/4 in. concrete drill bit through center of lag holes in operator station and drill holes for lag bolts.
6. Vacuum concrete dust from holes.
7. Lag operator station to floor.
Figure 4-16 Pedestal Type Operation Station

**Fence Mount**

To install the fence mount operator station, proceed as follows:

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

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

4. Install operator station onto outer fence on the left side of the cell.

Figure 4-17 Fence Mount Operator Station

5. Install operator station cables into positioner.
4.10 **Leveling and Securing the Equipment**

After everything is in position and the ArcWorld II-6200HD DR2C is where you want it, level the equipment and secure it to the floor. The lag bolts are shipped in the accessories box. Each major component has leveling bolts (see Figure 4-18) except the auxiliary equipment base. The positioner has nine leveling bolts that are inserted into the concrete until the unit is level. To level and secure the equipment, proceed as follows:

1. To gain access to the leveling bolts, remove the top panel on the robot base and both programming platforms that surround the robots.
2. Level robot common base by adjusting leveling bolts.
3. Insert 1/2-in. concrete drill bit through center of leveling bolts and drill holes for lag bolts.
4. Vacuum concrete dust from holes.
5. Lag robot/positioner common base to floor.
7. Insert a 1/2-inch concrete drill bit through center of leveling bolts and drill holes for lag bolts.
8. Vacuum concrete dust from holes.
9. Lag auxiliary equipment common base to floor.

![Figure 4-18 Leveling Bolts](image-url)
4.11 Connecting the Cables

After components are level and securely in place, unwrap the cables according to the cable diagram included in the system drawing package.

**CAUTION!**

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

4.11.1 Connecting the Earth Ground

Each robot and 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 robots and 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 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 may result in serious injury or death.

**NOTE:**

If the robot and XRC are within 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.
4.11.2 Connecting the Robot Cables

Two cables, 1BC and 2BC, connect the robot to the XRC controller. The 1BC encoder cable provides communication between the controller and the robot. The 2BC motor power cable supplies power to the robot servo motors. To connect the robot cables, proceed as follows:

1. Unpack programming pendant and plug connector into receptacle on right side of XRC controller.
2. Unpack two large black manipulator cables, connected to XRC controller, and route to back of robot.
3. Carefully engaging connectors, connect two cables (labeled 1BC and 2BC) to 1BC and 2BC connections on back of robot (see Figure 4-19).

Figure 4-19 Connecting Robot to XRC Controller
4.12 **Light Curtain Installation**

Two light curtain components, emitter and receiver, come pre-assembled from Motoman and placed onto the positioner for shipping. 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 50 degree angle (see Figure 4-20). Both pieces are pre-wired.

*NOTE:* Anchor the extended fence posts to the floor after the light curtains are installed.

### 4.12.1 Alignment

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

![Figure 4-20 Light Curtain Installation](image)

#### 4.12.2 Fencing

Once the light curtains have been properly installed onto the fencing, tightly fasten the fence posts to the concrete floor. Check the alignment of the light curtains again after fence posts have been anchored. Readjust as necessary.
4.13 **Connecting Air Service**

Internal air lines for the RM2-500TX positioner are already connected when the unit is shipped. Connect external air service after the cell has been secured to the floor. See Figure 4-21 for location of air connections.

![Air Service Connections](image)

**Figure 4-21  Air Service Connections**

4.14 **Connecting Power**

After all of the system components have been properly installed, connect the power to the ArcWorld II-6200HD DR2C cell. To connect incoming power to the 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.*

1. Install 3-phase power wiring to the circuit breaker located inside each XRC cabinet (see Figure 4-22). Table 4-1 shows the size and type of wire needed.
2. Tighten screws to the torque indicated in Table 4-1.
3. Install an M5 lug on incoming ground wire.
4. Terminate ground wire to frame ground M5 threaded stud with M5 hardware provided.

**NOTE:** The ArcWorld II-6200HD DR2C is configured for three-phase 460/480V AC, unless other voltage was requested. If other voltage is required for your plant, it will be necessary to make modifications to the transformer. For more information, refer to the manipulator manual that came with your system.

**Table 4-1 Incoming Power Specifications**

<table>
<thead>
<tr>
<th>Lug Data</th>
<th>60/75°C wire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalog No.</td>
<td>TCAL14</td>
</tr>
<tr>
<td>Wire Size</td>
<td>#14-7 Copper</td>
</tr>
<tr>
<td></td>
<td>#12-8 Aluminum</td>
</tr>
<tr>
<td>Torque</td>
<td>#14-7, 4.0 N•m (35 lb.-in.)</td>
</tr>
</tbody>
</table>
4.15 **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 shipping brackets have been removed from each robot (see Section 4.3.1).
2. Be sure light curtains are placed correctly.
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. Be sure welding power source is set correctly (see the welding power source vendor’s manual).
7. Verify incoming line power matches input power specified on front of XRC.

Your ArcWorld II-6200HD DR2C is now ready for power-up. The ArcWorld system should be operated only by personnel who have received operator training from Motoman and who are familiar with the operation of this Motoman robot model. Turn the main power ON, and continue the safety/operation check.

8. Check all system E-STOPS for proper operation (pendant, operator station, breakaways, playback panel).
9. Check system Hold buttons for proper operation.
10. Check light curtains and door interlocks for proper operation.

4.16 **Installation of Tooling and Fixtures**

Your ArcWorld II-6200HD DR2C 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. After tooling is installed, test the positioner for proper operation:

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

**WARNING!**

Fixturing must be balanced within 90.7kg (200 lbs) side A to Side B. Do not attempt to sweep greater unbalanced loads because damage occur to the drive train. When installing fixtures with no load on opposite side, use jog function (slow speed) only to sweep from A to B with loads up to 181.4 kg (400 lbs) out of balance.

**CAUTION!**

When loading the positioner with a fixture or parts to be welded, ALWAYS attach the fixture and/or parts to both headstock AND tailstock. Never load the fixture and/or parts to just the headstock regardless of the size or shape of the part(s) to be welded, or damage to the positioner may occur.
SECTION 5
OPERATION

The ArcWorld II-6200HD DR2C is a fully integrated robotic GMAW welding cell. The robot welds on one side of the positioner while the operator loads the opposite side with parts. Once the robots are finished, they return to the Home (Safe) position. The operator then enables the positioner sweep, allowing the robot to start welding on the next part. This section provides operation instructions for the ArcWorld II-6200HD DR2C 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 ArcWorld II-6200HD DR2C uses the following user and dedicated inputs and outputs (see Table 5-1 and Table 5-2).

<table>
<thead>
<tr>
<th>XRC Dedicated Inputs</th>
<th>XRC 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 23</td>
</tr>
<tr>
<td>REMOTE mode ON</td>
<td>Cube 24</td>
</tr>
<tr>
<td>Hold</td>
<td>Alarm Occurrence</td>
</tr>
<tr>
<td>External Emergency Stop</td>
<td></td>
</tr>
</tbody>
</table>

For more information on user and dedicated I/O, refer to the XRC Concurrent I/O Parameters Manual (P/N 142102-1).
**Push Button Type**

### Table 5-1  XRC User Inputs

<table>
<thead>
<tr>
<th>Input</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN#001 thru 008</td>
<td>NOT USED</td>
</tr>
<tr>
<td>IN#009</td>
<td>CYCLE START</td>
</tr>
<tr>
<td>IN#010</td>
<td>AUTO/MANUAL</td>
</tr>
<tr>
<td>IN#011 thru 016</td>
<td>NOT USED</td>
</tr>
<tr>
<td>IN#017</td>
<td>FIXTURE A LOCKED</td>
</tr>
<tr>
<td>IN#018</td>
<td>FIXTURE B LOCKED</td>
</tr>
<tr>
<td>IN#019</td>
<td>SERVO DRIVE RETURNED</td>
</tr>
<tr>
<td>IN#020</td>
<td>SERVO DRIVE FORWARD</td>
</tr>
<tr>
<td>IN#021</td>
<td>SWEEP LOCK ENGAGED</td>
</tr>
<tr>
<td>IN#022</td>
<td>SWEEP LOCK DISENGAGED</td>
</tr>
<tr>
<td>IN#023</td>
<td>AIR PRESSURE LOW</td>
</tr>
</tbody>
</table>

### Table 5-2  XRC User Outputs

<table>
<thead>
<tr>
<th>Output</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>OUT#001 thru 008</td>
<td>NOT USED</td>
</tr>
<tr>
<td>OUT#009</td>
<td>CYCLE LATCHED</td>
</tr>
<tr>
<td>OUT#010 thru 16</td>
<td>NOT USED</td>
</tr>
<tr>
<td>OUT#017</td>
<td>WITHDRAW SERVO</td>
</tr>
<tr>
<td>OUT#018</td>
<td>ADVANCE SERVO</td>
</tr>
<tr>
<td>OUT#019</td>
<td>SWEEP LOCK ON</td>
</tr>
<tr>
<td>OUT#020</td>
<td>SWEEP LOCK OFF</td>
</tr>
<tr>
<td>OUT#021 thru 24</td>
<td>NOT USED</td>
</tr>
</tbody>
</table>
### Table 5-3  I/O Map

<table>
<thead>
<tr>
<th>Logical Rack 0</th>
<th>Word 1</th>
<th>Word 2</th>
<th>3/4 Rack Device - Robots 1, &amp; 2</th>
<th>Word 3</th>
<th>Word 4</th>
<th>Word 5</th>
<th>Word 6</th>
<th>Word 7</th>
<th>Word 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robot 1 &amp; Robot 2</td>
<td>Word 1</td>
<td>Word 2</td>
<td>Unused Full Rack (Fixture control - Side A)</td>
<td>Word 3</td>
<td>Word 4</td>
<td>Word 5</td>
<td>Word 6</td>
<td>Word 7</td>
<td>Word 8</td>
</tr>
<tr>
<td>Logical Rack 1</td>
<td>Word 1</td>
<td>Word 2</td>
<td>Unused Full Rack (Fixture control - Side B)</td>
<td>Word 3</td>
<td>Word 4</td>
<td>Word 5</td>
<td>Word 6</td>
<td>Word 7</td>
<td>Word 8</td>
</tr>
<tr>
<td>Unused</td>
<td>Word 1</td>
<td>Word 2</td>
<td>Unused Full Rack</td>
<td>Word 3</td>
<td>Word 4</td>
<td>Word 5</td>
<td>Word 6</td>
<td>Word 7</td>
<td>Word 8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Logical Rack 2</th>
<th>Word 1</th>
<th>Word 2</th>
<th>Unused Full Rack</th>
<th>Word 3</th>
<th>Word 4</th>
<th>Word 5</th>
<th>Word 6</th>
<th>Word 7</th>
<th>Word 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unused</td>
<td>Word 1</td>
<td>Word 2</td>
<td>Unused Full Rack</td>
<td>Word 3</td>
<td>Word 4</td>
<td>Word 5</td>
<td>Word 6</td>
<td>Word 7</td>
<td>Word 8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Logical Rack 3</th>
<th>Word 1</th>
<th>Word 2</th>
<th>Unused Full Rack</th>
<th>Word 3</th>
<th>Word 4</th>
<th>Word 5</th>
<th>Word 6</th>
<th>Word 7</th>
<th>Word 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unused</td>
<td>Word 1</td>
<td>Word 2</td>
<td>Unused Full Rack</td>
<td>Word 3</td>
<td>Word 4</td>
<td>Word 5</td>
<td>Word 6</td>
<td>Word 7</td>
<td>Word 8</td>
</tr>
</tbody>
</table>
### Table 5-4  User Inputs – Touch Screen Type

#### PLC I/O, SLOT 1 SCANNER, ROBOTS 1, & 2 (XRC ARC+ARC MODIFIED CIO)

<table>
<thead>
<tr>
<th>PLC I/O</th>
<th>Robot I/O</th>
<th>Description</th>
<th>Robot Contact Address</th>
<th>Robot Coil Address</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PLC Output</strong></td>
<td><strong>Input</strong></td>
<td><strong>Scanner image Rack 1 Word 1 (Complimentary)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O:1.0/0 B18:0/0</td>
<td>33</td>
<td>Robots 1 &amp; 2 External Start</td>
<td>2070-2077</td>
<td>0050-0057</td>
</tr>
<tr>
<td>O:1.0/1 B18:0/1</td>
<td>34</td>
<td>Robots 1 &amp; 2 External Servos On</td>
<td>2071</td>
<td>0045</td>
</tr>
<tr>
<td>O:1.0/2 B18:0/2</td>
<td>35</td>
<td>Robots 1 &amp; 2 External Servos Off</td>
<td>2072</td>
<td>0077</td>
</tr>
<tr>
<td>O:1.0/3 B18:0/3</td>
<td>36</td>
<td>Robots 1 &amp; 2 Master Job Call (robots-outside of work cubes)</td>
<td>2073</td>
<td>0090</td>
</tr>
<tr>
<td>O:1.0/4 B18:0/4</td>
<td>37</td>
<td>Robots 1 &amp; 2 Alarm Reset</td>
<td>2074</td>
<td>0014</td>
</tr>
<tr>
<td>O:1.0/5 B18:0/5</td>
<td>38</td>
<td>Robots 1 &amp; 2 Remote Mode Select</td>
<td>2075</td>
<td></td>
</tr>
<tr>
<td>O:1.0/6 B18:0/6</td>
<td>39</td>
<td>Robots 1 &amp; 2 Play Mode Select</td>
<td>2076</td>
<td>0041</td>
</tr>
<tr>
<td>O:1.0/7 B18:0/7</td>
<td>40</td>
<td>Robots 1 &amp; 2 Teach Mode Select</td>
<td>2077</td>
<td>0040</td>
</tr>
<tr>
<td><strong>41-48</strong></td>
<td><strong>Robot Output Group #6(Half Group #11 &amp; #12)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O:1.0/8 B18:0/8</td>
<td>41</td>
<td>Release Start Latch</td>
<td>2080</td>
<td>0060</td>
</tr>
<tr>
<td>O:1.0/9 B18:0/9</td>
<td>42</td>
<td>Robots 1 &amp; 2 External Hold</td>
<td>2081</td>
<td>0067</td>
</tr>
<tr>
<td>O:1.0/10 B18:0/10</td>
<td>43</td>
<td>Robots 1 &amp; 2 Check (No Weld) Mode Select</td>
<td>2082</td>
<td>0046</td>
</tr>
<tr>
<td>O:1.0/11 B18:0/11</td>
<td>44</td>
<td>Spare</td>
<td>2083</td>
<td>0063</td>
</tr>
<tr>
<td>O:1.0/12 B18:0/12</td>
<td>45</td>
<td>Spare</td>
<td>2084</td>
<td>0064</td>
</tr>
<tr>
<td>O:1.0/13 B18:0/13</td>
<td>46</td>
<td>Spare</td>
<td>2085</td>
<td>0065</td>
</tr>
<tr>
<td>O:1.0/14 B18:0/14</td>
<td>47</td>
<td>Spare</td>
<td>2086</td>
<td>0066</td>
</tr>
<tr>
<td>O:1.0/15 B18:0/15</td>
<td>48</td>
<td>Field Bus Heart Beat (Mario to PLC)</td>
<td>2087</td>
<td>0067</td>
</tr>
<tr>
<td><strong>49-56</strong></td>
<td><strong>Rack 1 Word 2 (Complimentary)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O:1.1/0 B18:1/0</td>
<td>49</td>
<td>Robot 1 Interf. #1 Entrance Prohibit (Work Cube #1)</td>
<td>2090</td>
<td>7030</td>
</tr>
<tr>
<td>O:1.1/1 B18:1/1</td>
<td>50</td>
<td>Robot 2 Interf. #2 Entrance Prohibit (Work Cube #9)</td>
<td>2091</td>
<td>7231</td>
</tr>
<tr>
<td>O:1.1/2 B18:1/2</td>
<td>51</td>
<td>Robot 1 Interf. #3 Entrance Prohibit (Work Interlock Cube #3)</td>
<td>2092</td>
<td>7032</td>
</tr>
<tr>
<td>O:1.1/3 B18:1/3</td>
<td>52</td>
<td>Robot 2 Interf. #3 Entrance Prohibit (Work Interlock Cube #11)</td>
<td>2093</td>
<td>7232</td>
</tr>
<tr>
<td>O:1.1/4 B18:1/4</td>
<td>53</td>
<td>Reserve for Robot 3</td>
<td>2094</td>
<td>0074</td>
</tr>
<tr>
<td>O:1.1/5 B18:1/5</td>
<td>54</td>
<td>Reserve for Robot 3</td>
<td>2095</td>
<td>0075</td>
</tr>
<tr>
<td>O:1.1/6 B18:1/6</td>
<td>55</td>
<td>Reserve for Robot 3</td>
<td>2096</td>
<td>0076</td>
</tr>
<tr>
<td>O:1.1/7 B18:1/7</td>
<td>56</td>
<td>Spare</td>
<td>2097</td>
<td>0077</td>
</tr>
<tr>
<td><strong>57-64</strong></td>
<td><strong>Robot Output Group #8(Half Group #15 &amp; #16)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>O:1.1/8 B18:1/8</td>
<td>57</td>
<td>User Message Present</td>
<td>2100</td>
<td>4013</td>
</tr>
<tr>
<td>O:1.1/9 B18:1/9</td>
<td>58</td>
<td>User Message Bit 0</td>
<td>2101</td>
<td>4035</td>
</tr>
<tr>
<td>O:1.1/10 B18:1/10</td>
<td>59</td>
<td>User Message Bit 1</td>
<td>2102</td>
<td>4036</td>
</tr>
<tr>
<td>O:1.1/11 B18:1/11</td>
<td>60</td>
<td>User Message Bit 2</td>
<td>2103</td>
<td>4037</td>
</tr>
<tr>
<td>O:1.1/12 B18:1/12</td>
<td>61</td>
<td>Spare</td>
<td>2104</td>
<td>0084</td>
</tr>
<tr>
<td>O:1.1/13 B18:1/13</td>
<td>62</td>
<td>Spare</td>
<td>2105</td>
<td>0085</td>
</tr>
<tr>
<td>O:1.1/14 B18:1/14</td>
<td>63</td>
<td>Spare</td>
<td>2106</td>
<td>0086</td>
</tr>
<tr>
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## Table 5-4 User Inputs – Touch Screen Type (continued)

<table>
<thead>
<tr>
<th>PLC Output</th>
<th>Input</th>
<th>Scanner Image Rack 1 Word 3 (Complimentary)</th>
<th>65-72</th>
<th>Robot Output Group #9 (Half Group #17 &amp; #18)</th>
<th>73-80</th>
<th>Robot Output Group #10 (Half Group #18 &amp; #20)</th>
<th>81-88</th>
<th>Robot Output Group #11 (Half Group #21 &amp; #22)</th>
<th>89-96</th>
<th>Robot Output Group #12 (Half Group #23 &amp; #24)</th>
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<tbody>
<tr>
<td>O:1.2/0</td>
<td>B18:2/0</td>
<td>65</td>
<td>Sweep Permission</td>
<td>2110</td>
<td>0090-0097</td>
<td>2120-2127</td>
<td>0100-0107</td>
<td>2130-2137</td>
<td>0110-0117</td>
<td>2140-2147</td>
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<td>O:1.2/1</td>
<td>B18:2/1</td>
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<td>Cell in Auto Mode</td>
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### Table 5-5  User Outputs – Touch Screen Type

#### PLC I/O, Slot 1 Scanner, Robots 1 & 2 (XRC ARC+ARC MODIFIED CIO)

<table>
<thead>
<tr>
<th>PLC I/O</th>
<th>Robot I/O</th>
<th>Description</th>
<th>Robot Contact Address</th>
<th>Robot Coil Address</th>
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<tr>
<td><strong>PLC Input</strong></td>
<td><strong>Output</strong></td>
<td>Scanner image Rack 1 Word 1 (Complimentary)</td>
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<td>33-40</td>
<td>Robot Output Group #5 (Half Group #9 &amp; #10)</td>
<td>1050-1057</td>
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<tr>
<td>I:1.0/0 B14:0/0</td>
<td>33</td>
<td>Robots 1 &amp; 2 Operating</td>
<td>3010</td>
<td>3070</td>
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<tr>
<td>I:1.0/1 B14:0/1</td>
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<td>Robots 1 &amp; 2 Servos On</td>
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<td>3071</td>
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<tr>
<td>I:1.0/2 B14:0/2</td>
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<td>Robots 1 &amp; 2 Servos Off</td>
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<td>I:1.0/3 B14:0/3</td>
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<td>Robots 1 &amp; 2 at Master Job Call</td>
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<tr>
<td>I:1.0/4 B14:0/4</td>
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<td>Robots 1 Or 2 Alarm Occurrence</td>
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<td>3074</td>
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<td>I:1.0/5 B14:0/5</td>
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<td>Robots 1 &amp; 2 In Remote Mode</td>
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<tr>
<td>I:1.0/6 B14:0/6</td>
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<td>Robots 1 &amp; 2 In Play Mode</td>
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<td>41-48</td>
<td>Robot Output Group #6 (Half Group #11 &amp; #12)</td>
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<td>I:1.0/8 B14:0/8</td>
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<td>Cycle Start Latched</td>
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<td>Robots 1 &amp; 2 In Hold</td>
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<td>I:1.0/10 B14:0/10</td>
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<td>Robots 1 &amp; 2 In Check (No Weld) Mode</td>
<td>5064</td>
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<td>I:1.0/11 B14:0/11</td>
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<td>Safety Device Okay</td>
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<tr>
<td>I:1.0/12 B14:0/12</td>
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<td>Robots 1 &amp; 2 Programming Pendent E-Stop Okay</td>
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<td>Robots 1 &amp; 2 Playback Box E-Stop Okay</td>
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<td>I:1.0/14 B14:0/14</td>
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<td>Robots 1 &amp; 2 External E-Stop Okay</td>
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<td>3086</td>
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<td>I:1.0/15 B14:0/15</td>
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<td>Field Bus Heart Beat (Mario to PLC)</td>
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<td>49-56</td>
<td>Robot Output Group #7 (Half Group #13 &amp; #14)</td>
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<tr>
<td>I:1.1/0 B14:1/0</td>
<td>49</td>
<td>Robot 1 In Interference Cube #24 (Home)</td>
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<td>3090</td>
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<tr>
<td>I:1.1/1 B14:1/1</td>
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<td>Robot 2 In Interference Cube #23 (Home)</td>
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<tr>
<td>I:1.1/2 B14:1/2</td>
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<td>Robot 1 In Interference Cube #1 (Work Cube - R1)</td>
<td>5110</td>
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<td>I:1.1/3 B14:1/3</td>
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<td>Robot 2 In Interference Cube #9 (Work Cube - R2)</td>
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<tr>
<td>I:1.1/4 B14:1/4</td>
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<td>Robot 1 In Interf. Cube #3 (Work Interlock Cube - R1 &amp; R2)</td>
<td>5112</td>
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<tr>
<td>I:1.1/5 B14:1/5</td>
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<td>Robot 2 In Interf. Cube (Work Interlock Cube - R1 &amp; R2)</td>
<td>5122</td>
<td>3095</td>
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<tr>
<td>I:1.1/6 B14:1/6</td>
<td>55</td>
<td>Robot 1 Sequence Continuing</td>
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<td>3096</td>
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<tr>
<td>I:1.1/7 B14:1/7</td>
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<td>Robot 2 Sequence Continuing</td>
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<td>3097</td>
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<td>Robot Output Group #8 (Half Group #15 &amp; #16)</td>
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<td>I:1.1/8 B14:1/8</td>
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<td>Robot 1 Gas Shortage</td>
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<td>I:1.1/9 B14:1/9</td>
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<td>Robot 1 Wire Shortage</td>
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<td>I:1.1/10 B14:1/10</td>
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<td>Robot 1 Arc Shortage</td>
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<td>I:1.1/11 B14:1/11</td>
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<td>Robot 1 Wire Sticking</td>
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<td>I:1.1/12 B14:1/12</td>
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<td>Robot 2 Gas Shortage</td>
<td>7242</td>
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<td>I:1.1/13 B14:1/13</td>
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<td>Robot 2 Wire Sticking</td>
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### Table 5-5  User Outputs – Touch Screen Type (continued)

<table>
<thead>
<tr>
<th>PLC Input</th>
<th>Output</th>
<th>Scanner Image Rack 1 Word 3 (Complimentary)</th>
<th>Output</th>
<th>Scanner Image Rack 1 Word 4 (Complimentary)</th>
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<tbody>
<tr>
<td>65-72</td>
<td>Robot Output Group #9 (Half Group #17 &amp; #18)</td>
<td>1090-1097</td>
<td>3110-3117</td>
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<td>I:1.2/0 B14:2/0</td>
<td>65</td>
<td>Positioner Servo Advanced</td>
<td>2053</td>
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<tr>
<td>I:1.2/1 B14:2/1</td>
<td>66</td>
<td>Positioner Servo Retracted</td>
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<td>3111</td>
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<tr>
<td>I:1.2/2 B14:2/2</td>
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<td>Sweep Lock Pin Is Extended</td>
<td>2054</td>
<td>3112</td>
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<tr>
<td>I:1.2/3 B14:2/3</td>
<td>68</td>
<td>Sweep Lock Pin Is Retracted</td>
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<td>3113</td>
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<tr>
<td>I:1.2/4 B14:2/4</td>
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<td>Side A Locked</td>
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<td>I:1.2/5 B14:2/5</td>
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<td>Side B Locked</td>
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<td>I:1.2/6 B14:2/6</td>
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<td>Unclamp Side A</td>
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<td>Unclamp Side B</td>
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<td>73-80</td>
<td>Robot Output Group #10 (Half Group #19 &amp; #20)</td>
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<td>3120-3127</td>
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<tr>
<td>I:1.2/8 B14:2/8</td>
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<td>Side A Weld Complete (Increment Part Count)</td>
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<td>I:1.2/9 B14:2/9</td>
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<td>Battery Alarm</td>
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<td>I:1.2/12 B14:2/12</td>
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<td>Positioner Servo Advance Output</td>
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<td>I:1.2/13 B14:2/13</td>
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<td>Positioner Servo Retract Output</td>
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<td>3125</td>
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<tr>
<td>I:1.2/14 B14:2/14</td>
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<td>Positioner Sweep Lock Pin Extend Output</td>
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<tr>
<td>I:1.2/15 B14:2/15</td>
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<td>Positioner Sweep Lock Pin Retract Output</td>
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<td>3127</td>
</tr>
<tr>
<td>81-88</td>
<td>Robot Output Group #11 (Half Group #21 &amp; #22)</td>
<td>1110-1117</td>
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<td>I:1.3/0 B14:3/0</td>
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<td>Shock Sensor E-Stop</td>
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<td>I:1.3/1 B14:3/1</td>
<td>82</td>
<td>Shock Sensor Hold</td>
<td>8120</td>
<td>3131</td>
</tr>
<tr>
<td>I:1.3/2 B14:3/2</td>
<td>83</td>
<td>Edit Lock</td>
<td>8010</td>
<td>3132</td>
</tr>
<tr>
<td>I:1.3/3 B14:3/3</td>
<td>84</td>
<td>Teach Lock</td>
<td>5056</td>
<td>3133</td>
</tr>
<tr>
<td>I:1.3/4 B14:3/4</td>
<td>85</td>
<td>Door Interlock Okay</td>
<td>8023</td>
<td>3134</td>
</tr>
<tr>
<td>I:1.3/5 B14:3/5</td>
<td>86</td>
<td>Side A Cycle Timer Enable</td>
<td>1115</td>
<td>3135</td>
</tr>
<tr>
<td>I:1.3/6 B14:3/6</td>
<td>87</td>
<td>Side B Cycle Timer Enable</td>
<td>1116</td>
<td>3136</td>
</tr>
<tr>
<td>I:1.3/7 B14:3/7</td>
<td>88</td>
<td>Reserve for Robot 3</td>
<td>1117</td>
<td>3137</td>
</tr>
<tr>
<td>89-96</td>
<td>Robot Output Group #10 (Half Group #23 &amp; #24)</td>
<td>1120-1127</td>
<td>3140-3147</td>
<td></td>
</tr>
<tr>
<td>I:1.3/8 B14:3/8</td>
<td>89</td>
<td>Reserve for Robot 3</td>
<td>1120</td>
<td>3140</td>
</tr>
<tr>
<td>I:1.3/9 B14:3/9</td>
<td>90</td>
<td>Reserve for Robot 3</td>
<td>1121</td>
<td>3141</td>
</tr>
<tr>
<td>I:13/10 B14:3/10</td>
<td>91</td>
<td>Reserve for Robot 3</td>
<td>1122</td>
<td>3142</td>
</tr>
<tr>
<td>I:1.3/11 B14:3/11</td>
<td>92</td>
<td>Reserve for Robot 3</td>
<td>1123</td>
<td>3143</td>
</tr>
<tr>
<td>I:1.3/12 B14:3/12</td>
<td>93</td>
<td>Reserve for Robot 3</td>
<td>1124</td>
<td>3144</td>
</tr>
<tr>
<td>I:1.3/13 B14:3/13</td>
<td>94</td>
<td>Reserve for Robot 3</td>
<td>1125</td>
<td>3145</td>
</tr>
<tr>
<td>I:1.3/14 B14:3/14</td>
<td>95</td>
<td>Reserve for Robot 3</td>
<td>1126</td>
<td>3146</td>
</tr>
<tr>
<td>I:1.3/15 B14:3/15</td>
<td>96</td>
<td>Reserve for Robot 3</td>
<td>1127</td>
<td>3147</td>
</tr>
</tbody>
</table>
5.1.2 Sweeping the Positioner

To sweep positioner side A or B into the robot work area, proceed as follows:

**NOTE:** In order to sweep the positioner, each robot must be in home position.

1. Place robots in home position (see Section 5.2.2).
2. Set operator station POSITIONER switch to MANUAL mode and start Master Control job (see Section 5.2.3). Normally robots will not move out of home position when POSITIONER switch is in MANUAL. Check the job structure to ensure that the movement of either robot will not cause a hazard when the POSITIONER switch is set MANUAL.

MANUAL mode allows you to sweep the positioner 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 robots a series of moves. Cycle Start latching is not operative in Manual mode.

3. Press CYCLE START palm button(s) on operator station. XRC sweeps positioner each time CYCLE START button(s) are pressed.

**NOTE:** The Cube function is a software feature that turns on an output when the robot tool center point is within established boundaries. If the robot moves outside of Cube 23 or Cube 24, the output is lost and the positioner will not sweep. The cube position is factory set to be clear of the table.

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).
- Move Robot to Safe Position (see Section 5.2.2).
- Selecting Master Job (see Section 5.2.3).
- Perform Operation Cycle (see Section 5.2.4).
- Perform Shutdown Procedures (see Section 5.2.5).

5.2.1 Start-Up

To start up the ArcWorld 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 enclosure door is closed and securely latched.
6. Disable operator station.
7. Press TEACH mode button on XRC playback panel.
8. Place robot in home position (Cube 23 and Cube 24).
5.2.2 Robot Home (Cube 23 and Cube 24) Position

To move the robots to the home position (Cube 23 and 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 23 or Cube 24 job and press SELECT. Cube 23 or 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 home (Cube 23 and Cube 24) position.

5.2.3 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 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 ArcWorld II-6200HD DR2C cell is now ready for operation.
5.2.4 Perform Operation Cycle

The following is the typical sequence of operation for the ArcWorld II-6200HD DR2C cell after start-up:

**CAUTION!**

_When loading the positioner with a fixture or parts to be welded, ALWAYS attach the fixture and/or parts to both headstock AND tailstock. Never load the fixture and/or parts to just the headstock regardless of the size or shape of the part(s) to be welded, or damage to the positioner may occur._

1. Load production parts on fixtures located on operator side of positioner.
2. Step out of light curtain area.
3. Press the CYCLE START palm button(s) on operator station to sweep positioner. The positioner sweeps, placing unwelded parts in robot’s welding area and turning empty side to operator’s loading area. The sweep can range from 90 degrees to 180 degrees, and consist of a single move or a series of smaller moves.
4. After positioner sweeps, robots begin the welding sequence on the parts. Coordinated motion capabilities allow positioner to rotate parts on positioner, while robots move and weld at same time.
5. While the robots are welding on the robot side of the positioner, load more parts to be welded into fixture on operator’s side of positioner.
6. Press the CYCLE START palm button(s) on operator station. The positioner sweeps, returning welded parts outside cell and placing newly loaded, unwelded parts in robot’s work area.
7. Unload welded parts from fixture while robots are welding.

**NOTE:** • Before sweeping at first power up, make sure the correct job has been loaded. At the same time make sure the weight of the parts and fixtures is approximately equal on Sides A and B of the positioner (see Section 3.4).

5.2.5 Shutdown

Use the following procedure to shut down the ArcWorld II-6200HD DR2C cell after operation is complete:

1. Make sure robots are in home position (Cube 23 and 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 ArcWorld II-6200HD DR2C 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 (see Section 5.3.4).
- Opening sliding door on robot enclosure when robot is in PLAY mode.
- Stepping into light curtain when positioner is sweeping.
- Actuating shock sensor on torch mount.
Restart
To restart the ArcWorld II-6200HD DR2C 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 sliding door.
   - Clear object(s) from light curtain zone.
   - Clear Shock Sensor condition (see 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 RESET button and right CYCLE START button on operator station to initialize system.
4. Ensure operator station is enabled.
5. Press MASTER JOB START button on operator station.

The ArcWorld II-6200HD DR2C cell is now ready to 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 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.
6. Move manipulator clear of impact position. The ArcWorld II-6200HD DR2C 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. Each axis brake is controlled by an individual axis buttons. 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 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 robot. Listed below is the weight of each robot available:
   - UP6 – 135kg (297 lb)
   - UP20 – 280kg (617 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 Periodic Maintenance

Table 6-1 provides periodic maintenance items and intervals for the ArcWorld II-6200HD DR2C cell. Keep in mind that the maintenance intervals serve as guidelines only. You should adjust the frequency of maintenance to suit your specific work conditions.

For periodic maintenance procedures and schedules for the individual components of your ArcWorld II-6200HD DR2C, refer to the manipulator and additional manuals that came with your system.

**CAUTION!**

*Use only the antifreeze provided by Motoman. Do not use automotive antifreeze. Automotive antifreezes contain stop-leak additives that will clog the small torch water-cooling ports, and damage the gaskets in the water circulator pump.*

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Component</th>
<th>Procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Daily</td>
<td>Water circulator (For water-cooled torch application only.)</td>
<td>Check the fluid in the water circulator. Add fluid as required. Use only distilled water and approved antifreeze (Motoman P/N 131224-1).</td>
</tr>
<tr>
<td>Daily</td>
<td>RM2-500TX 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>Weekly</td>
<td>RM2-500TX 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>
<tr>
<td>Monthly</td>
<td>RM2-500TX Headstock Drive Unit</td>
<td>Check for proper oil levels and quality. Use MobilGear 630 or 629 oil as required.</td>
</tr>
<tr>
<td>Monthly</td>
<td>RM2-500TX Weld Ground</td>
<td>Check the brushes for signs of wear. Excessive heat buildup in the brushes indicates uneven wear.</td>
</tr>
<tr>
<td>20,000 Hours</td>
<td>RM2-500TX Headstock Drive</td>
<td>Change the oil in the drive unit. Use MobilGear 630 or 629 oil.</td>
</tr>
</tbody>
</table>
6.2 **Fuse and Circuit Breaker Protection**

Table 6-2 gives the locations of fuses and circuit breakers that are significant to the operation of the 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 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></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>FU1</td>
<td>4A 250V</td>
<td>Wickman 19374K-4A</td>
<td>On interface board</td>
<td>Protects 115V circuit.</td>
</tr>
<tr>
<td>FU2</td>
<td>0.25A 125V</td>
<td>Wickman 19303K-250A</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>
## 6.3 Troubleshooting – Operator Station

### 6.3.1 Error Messages-touch screen

Errors that occur in the system are recognized and diagnosed by the XRC controller and listed above the screen access buttons. Refer to Table 6-3 for error message identification and action procedures.

<table>
<thead>
<tr>
<th>Error Description</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote I/O Communication Fault</td>
<td>Check cable between XRC and PLC. Verify PLC key is in RUN position.</td>
</tr>
<tr>
<td>Shock Sensor Tripped</td>
<td>Reset torch alignment</td>
</tr>
<tr>
<td>Low Air Pressure</td>
<td>Check positioner air</td>
</tr>
<tr>
<td>Light Curtain Interrupted During Sweep</td>
<td>Light curtain interrupted. Get in TEACH mode and complete sweep job before restart</td>
</tr>
<tr>
<td>XRC Alarm - View at pendant</td>
<td>Read pendant and clear</td>
</tr>
<tr>
<td>Hold Pendant Deadman for Servo ON</td>
<td>In TEACH mode. Need to hold pendant deadman to servo on</td>
</tr>
<tr>
<td>Close Safety Gate for Servo ON</td>
<td>Close cell door, press servo on again</td>
</tr>
<tr>
<td>Move Robots out of Work Cubes</td>
<td>Move robots out of work cubes before pressing Call Master Job button</td>
</tr>
<tr>
<td>Teach Locked at Pendant</td>
<td>Pendant has command, turn off pendant teach lock</td>
</tr>
<tr>
<td>Programming Pendant E-STOP</td>
<td>Reset E-STOP</td>
</tr>
<tr>
<td>Playback Box E-STOP</td>
<td>Reset E-STOP</td>
</tr>
<tr>
<td>External E-Stop</td>
<td>Reset E-STOP</td>
</tr>
<tr>
<td>Move Positioner to Side A or B</td>
<td>Move the positioner to side A or B before pressing the Call Master Job button</td>
</tr>
<tr>
<td>Servo Advance Sensor not ON Fault</td>
<td>Check sensor for adjustment or replacement</td>
</tr>
<tr>
<td>Servo Advance Sensor not OFF Fault</td>
<td>Check sensor for adjustment or replacement</td>
</tr>
<tr>
<td>Servo Retract Sensor not ON Fault</td>
<td>Check sensor for adjustment or replacement</td>
</tr>
<tr>
<td>Servo Retract Sensor not OFF Fault</td>
<td>Check sensor for adjustment or replacement</td>
</tr>
<tr>
<td>Sweep Lock Pin Extended Sensor not ON Fault</td>
<td>Check sensor for adjustment or replacement</td>
</tr>
<tr>
<td>Sweep Lock Pin Extended Sensor not OFF Fault</td>
<td>Check sensor for adjustment or replacement</td>
</tr>
<tr>
<td>Sweep Lock Pin Retracted Sensor not ON Fault</td>
<td>Check sensor for adjustment or replacement</td>
</tr>
<tr>
<td>Sweep Lock Pin Retracted Sensor not OFF Fault</td>
<td>Check sensor for adjustment or replacement</td>
</tr>
</tbody>
</table>
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