# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION</td>
</tr>
<tr>
<td>1.1</td>
<td>About this Document</td>
</tr>
<tr>
<td>1.2</td>
<td>Reference to Other Documentation</td>
</tr>
<tr>
<td>1.3</td>
<td>Customer Service Information</td>
</tr>
<tr>
<td>2</td>
<td>SAFETY</td>
</tr>
<tr>
<td>2.1</td>
<td>Introduction</td>
</tr>
<tr>
<td>2.2</td>
<td>Standard Conventions</td>
</tr>
<tr>
<td>2.3</td>
<td>General Safeguarding Tips</td>
</tr>
<tr>
<td>2.4</td>
<td>Mechanical Safety Devices</td>
</tr>
<tr>
<td>2.5</td>
<td>Installation Safety</td>
</tr>
<tr>
<td>2.6</td>
<td>Programming Safety</td>
</tr>
<tr>
<td>2.7</td>
<td>Operation Safety</td>
</tr>
<tr>
<td>2.8</td>
<td>Maintenance Safety</td>
</tr>
<tr>
<td>3</td>
<td>MOTOR GUN FUNCTION</td>
</tr>
<tr>
<td>1</td>
<td>Outlines</td>
</tr>
<tr>
<td>2</td>
<td>Teaching</td>
</tr>
<tr>
<td>3</td>
<td>Setting Welding Conditions</td>
</tr>
<tr>
<td>4</td>
<td>Playback</td>
</tr>
<tr>
<td>5</td>
<td>Dry Spotting</td>
</tr>
<tr>
<td>6</td>
<td>Electrode Wear Detection and Wear Compensation</td>
</tr>
<tr>
<td>7</td>
<td>Manual Welding/Manual Dry Spotting</td>
</tr>
<tr>
<td>8</td>
<td>Other Functions</td>
</tr>
<tr>
<td>9</td>
<td>I/O Signals</td>
</tr>
<tr>
<td>10</td>
<td>Instruction List</td>
</tr>
<tr>
<td>11</td>
<td>System Setting</td>
</tr>
<tr>
<td>4</td>
<td>SUPPLEMENTAL XRC INSTRUCTIONS FOR MOTOR GUN FUNCTION</td>
</tr>
<tr>
<td>1</td>
<td>Introduction</td>
</tr>
<tr>
<td>2</td>
<td>Teaching Clearance Function</td>
</tr>
<tr>
<td>3</td>
<td>Teaching with Gun Pressure</td>
</tr>
<tr>
<td>4</td>
<td>Gun Pressure Compensation Function</td>
</tr>
<tr>
<td>5</td>
<td>Workpiece Transfer Function Using a Motor Gun</td>
</tr>
<tr>
<td>6</td>
<td>Electrode Wear Detection and Wear Compensation</td>
</tr>
<tr>
<td>7</td>
<td>Individual Reset Function for Wear Amount</td>
</tr>
<tr>
<td>8</td>
<td>Welding Conditions Group Output Function</td>
</tr>
</tbody>
</table>
SECTION 1
INTRODUCTION

1.1 About this Document
This manual provides instructions for Motor Gun Function and contains the following sections:

SECTION 1 – INTRODUCTION
General information about this manual, a list of reference documents, and customer service information.

SECTION 2 – SAFETY
Provides information for the safe use and operation of Motoman products.

SECTION 3 – MOTOR GUN FUNCTION
Provides detailed instructions to utilize the Motor Gun Function.

1.2 Reference to Other Documentation
For additional information refer to the following:

- Concurrent I/O Parameters Manual (P/N 142102-1)
- Concurrent I/O Parameters Manual for XRC 2001 (P/N 147626-1)
- Operator’s Manual for General Purpose (P/N 142099-1)
- Operator’s Manual for Handling (P/N 142100-1)
- Operator’s Manual for Spot Welding (P/N 142101-1)
- Operator’s Manual for Arc Welding (P/N 142098-1)
- Motoman UP6, XRC 2001 Manipulator Manual (P/N 145960-1)
- Motoman UP20, XRC 2001 Manipulator Manual (P/N 145965-1)
- Motoman UP50, XRC 2001 Manipulator Manual (P/N 145964-1)
- Motoman UP130/165, XRC 2001 Manipulator Manual (P/N 145967-1)
- Motoman ES165, XRC 2001 Manipulator Manual (P/N 147954-1)

1.3 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 (UP50, ES165, etc.)
- Application Type (welding, handling, etc.)
- 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 MRC controller PLC can cause severe personal injury or death, as well as damage to the robot! Do not make any modifications to PART 1. Making any changes without the written permission of Motoman will **VOID YOUR WARRANTY**!
- Some operations require standard passwords and some require special passwords. Special passwords are for Motoman use only. **YOUR WARRANTY WILL BE VOID** if you use these special passwords.
- Back up all programs and jobs onto a floppy disk whenever program changes are made. To avoid loss of information, programs, or jobs, a backup must always be made before any service procedures are done and before any changes are made to options, accessories, or equipment.
- The concurrent I/O (Input and Output) function allows the customer to modify the internal ladder inputs and outputs for maximum robot performance. Great care must be taken when making these modifications. Double-check all modifications under every mode of robot operation to ensure that you have not created hazards or dangerous situations that may damage the robot or other parts of the system.
- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.
• Inspect the robot and work envelope to be sure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
• Be sure that all safeguards are in place.
• Check the E-STOP button on the teach pendant for proper operation before programming.
• Carry the teach pendant with you when you enter the workcell.
• Be sure that only the person holding the teach pendant enters the workcell.
• Test any new or modified program at low speed for at least one full cycle.

2.7 Operation Safety

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

• Be sure that only trained personnel familiar with the operation of this robot, the operator's manuals, the system equipment, and options and accessories are permitted to operate this robot system.
• Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.
• Inspect the robot and work envelope to ensure no potentially hazardous conditions exist. Be sure the area is clean and free of water, oil, debris, etc.
• Ensure that all safeguards are in place.
• Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.
• Do not enter the robot cell while it is in automatic operation. Programmers must have the teach pendant when they enter the cell.
• The robot must be placed in Emergency Stop (E-STOP) mode whenever it is not in use.
• This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.
• All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.
2.8 Maintenance Safety

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

- Do not perform any maintenance procedures before reading and understanding the proper procedures in the appropriate manual.

- Check all safety equipment for proper operation. Repair or replace any non-functioning safety equipment immediately.

- Improper operation can result in personal injury and/or damage to the equipment. Only trained personnel familiar with the operation, manuals, electrical design, and equipment interconnections of this robot should be permitted to operate the system.

- Back up all your programs and jobs onto a floppy disk whenever program changes are made. A backup must always be made before any servicing or changes are made to options, accessories, or equipment to avoid loss of information, programs, or jobs.

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

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

- Be sure all safeguards are in place.

- Use proper replacement parts.

- This equipment has multiple sources of electrical supply. Electrical interconnections are made between the controller, external servo box, and other equipment. Disconnect and lockout/tagout all electrical circuits before making any modifications or connections.

- All modifications made to the controller will change the way the robot operates and can cause severe personal injury or death, as well as damage the robot. This includes controller parameters, ladder parts 1 and 2, and I/O (Input and Output) modifications. Check and test all changes at slow speed.

- Improper connections can damage the robot. All connections must be made within the standard voltage and current ratings of the robot I/O (Inputs and Outputs).
YASNAC XRC OPTIONS
INSTRUCTIONS
FOR THE MOTOR GUN FUNCTION

Upon receipt of the product and prior to initial operation, read these instructions thoroughly, and retain for future reference.

MOTOMAN INSTRUCTIONS
MOTOMAN SETUP MANUAL
MOTOMAN-□□□ INSTRUCTIONS
YASNAC XRC INSTRUCTIONS
YASNAC XRC OPERATOR’S MANUAL
YASNAC XRC OPERATOR’S MANUAL for BEGINNERS

The YASNAC XRC operator’s manuals above correspond to specific usage. Be sure to use the appropriate manual.
# MANDATORY

- This manual explains the motor gun function of the YASNAC XRC system and general operations. Read this manual carefully and be sure to understand its contents before handling the YASNAC XRC.

- General items related to safety are listed in Section 1: Safety of the Setup Manual. To ensure correct and safe operation, carefully read the Setup Manual before reading this manual.

# CAUTION

- Some drawings in this manual are shown with the protective covers or shields removed for clarity. Be sure all covers and shields are replaced before operating this product.

- The drawings and photos in this manual are representative examples and differences may exist between them and the delivered product.

- YASKAWA may modify this model without notice when necessary due to product improvements, modifications, or changes in specifications. If such modification is made, the manual number will also be revised.

- If your copy of the manual is damaged or lost, contact a YASKAWA representative to order a new copy. The representatives are listed on the back cover. Be sure to tell the representative the manual number listed on the front cover.

- YASKAWA is not responsible for incidents arising from unauthorized modification of its products. Unauthorized modification voids your product's warranty.
NOTES FOR SAFE OPERATION

Read this manual carefully before installation, operation, maintenance, or inspection of the YASNAC XRC.

In this manual, the Notes for Safe Operation are classified as “WARNING”, “CAUTION”, “MANDATORY”, or “PROHIBITED”.

! WARNING

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury to personnel.

! CAUTION

Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury to personnel and damage to equipment. It may also be used to alert against unsafe practices.

! MANDATORY

Always be sure to follow explicitly the items listed under this heading.

! PROHIBITED

Must never be performed.

Even items described as “CAUTION” may result in a serious accident in some situations. At any rate, be sure to follow these important items.

NOTE: To ensure safe and efficient operation at all times, be sure to follow all instructions, even if not designated as “CAUTION” and “WARNING”.
• Before operating the manipulator, check that servo power is turned off when the emergency stop buttons on the playback panel or programming pendant are pressed. When the servo power is turned off, the SERVO ON READY lamp on the playback panel and the SERVO ON LED on the programming pendant are turned off.

Injury or damage to machinery may result if the emergency stop circuit cannot stop the manipulator during an emergency. The manipulator should not be used if the emergency stop buttons do not function.

**Emergency Stop Button**

• Once the emergency stop button is released, clear the cell of all items which could interfere with the operation of the manipulator. Then turn the servo power ON.

Injury may result from unintentional or unexpected manipulator motion.

**Release of Emergency Stop**

• Always set the Teach Lock before entering the robot work envelope to teach a job.

Operator injury can occur if the Teach Lock is not set and the manipulator is started from the playback panel.

• Observe the following precautions when performing teaching operations within the working envelope of the manipulator:
  - View the manipulator from the front whenever possible.
  - Always follow the predetermined operating procedure.
  - Ensure that you have a safe place to retreat in case of emergency.

Improper or unintended manipulator operation may result in injury.

• Confirm that no persons are present in the manipulator’s work envelope and that you are in a safe location before:
  - Turning on the YASNAC XRC power
  - Moving the manipulator with the programming pendant
  - Running check operations
  - Performing automatic operations

Injury may result if anyone enters the working envelope of the manipulator during operation. Always press an emergency stop button immediately if there are problems. The emergency stop button is located on the right side of both the YASNAC XRC playback panel and programming pendant.
Definition of Terms Used Often in This Manual

The MOTOMAN manipulator is the YASKAWA industrial robot product.
The manipulator usually consists of the controller, the playback panel, the programming pendant, and supply cables.
The MOTOMAN manipulator is the YASKAWA industrial robot product.
In this manual, the equipment is designated as follows.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
<tbody>
<tr>
<td>YASNAC XRC Controller</td>
<td>XRC</td>
</tr>
<tr>
<td>YASNAC XRC Playback Panel</td>
<td>Playback Panel</td>
</tr>
<tr>
<td>YASNAC XRC Programming Pendant</td>
<td>Programming Pendant</td>
</tr>
</tbody>
</table>

CAUTION

- Perform the following inspection procedures prior to conducting manipulator teaching. If problems are found, repair them immediately, and be sure that all other necessary processing has been performed.
  - Check for problems in manipulator movement.
  - Check for damage to insulation and sheathing of external wires.

- Always return the programming pendant to the hook on the XRC cabinet after use.

  The programming pendant can be damaged if it is left in the manipulator’s work area, on the floor, or near fixtures.

- Read and understand the Explanation of the Alarm Display in the setup manual before operating the manipulator.
Descriptions of the programming pendant and playback panel keys, buttons, and displays are shown as follows:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Manual Designation</th>
</tr>
</thead>
</table>
| Programming Pendant | **Character Keys**  
The keys which have characters printed on them are denoted with [ ].  
ex. [ENTER] | **Symbol Keys**  
The keys which have a symbol printed on them are not denoted with [ ] but depicted with a small picture.  
ex. page key 📚  
The cursor key is an exception, and a picture is not shown. |
|                 | **Axis Keys**  
“Axis Keys” and “Number Keys” are generic names for the keys for axis operation and number input.                                                                                                               |
| Number Keys     | **Keys pressed simultaneously**  
When two keys are to be pressed simultaneously, the keys are shown with a “+” sign between them, ex. [SHIFT]+[COORD]                                                                                         |
| Displays        | **Displays**  
The menu displayed in the programming pendant is denoted with { }.  
ex. {JOB}                                                                                                                                          |
| Playback Panel  | **Buttons**  
Playback panel buttons are enclosed in brackets.  
ex. [TEACH] on the playback panel                                                                                                                           |

**Description of the Operation Procedure**

In the explanation of the operation procedure, the expression "Select • • • " means that the cursor is moved to the object item and the SELECT key is pressed.
1  Outlines

2  Teaching
   2.1 Open/Close of Motor gun ....................................... 2-1
   2.2 Mounting Electrodes ........................................... 2-1
   2.3 Registration of Operation Tool ............................... 2-2
       2.3.1 Single Gun .................................................. 2-2
       2.3.2 Double Gun ............................................... 2-2
   2.4 Preparation of Job ............................................. 2-3
       2.4.1 How to prepare a Robot-axis and a Gun-axis Job. ... 2-3
       2.4.2 Registration of Steps ................................... 2-3
       2.4.3 Registration of SVSPOT Instruction .................... 2-4

3  Setting Welding Conditions
   3.1 Pressure Setting ................................................ 3-1
   3.2 Welding Current and Welding Time Settings .............. 3-3

4  Playback
   4.1 Check Run ....................................................... 4-1
   4.2 Actual Welding ................................................ 4-1

5  Dry Spotting
   5.1 SVGUNCL (Dry Spotting Motion) Instruction .............. 5-1
   5.2 Dry Spotting Pressure Setting .............................. 5-1

6  Electrode Wear Detection and Wear Compensation
   6.1 Wear Detection and Wear Compensation Operation
      Flow Chart ....................................................... 6-1
       6.1.1 For Dry Spotting and Sensor Detection ............... 6-1
       6.1.2 For Dry Spotting Detection ............................ 6-2
   6.2 Wear Detection (by Dry Spotting and Sensor) ............ 6-2
       6.2.1 Dry Spotting Touch Motion ............................ 6-2
       6.2.2 Sensor Detection ....................................... 6-3
6.2.3 Example of Wear Detection ........................................ 6-3
6.3 Wear Detection (by Dry Spotting) ............................... 6-4
  6.3.1 Touching during a Dry Spotting ......................... 6-4
  6.3.2 Example of Wear Detection ............................... 6-4
6.4 Spot Weld Diagnosis Display ..................................... 6-5
6.5 Wear Compensation .................................................... 6-6
  6.5.1 Example of Wear Compensation ......................... 6-6

7 Manual Welding/Manual Dry Spotting
  7.1 Manual Spot Display ............................................... 7-1
  7.2 Manual Welding ..................................................... 7-2
  7.3 Manual Dry Spotting ............................................... 7-2

8 Other Functions
  8.1 Motor Gun Stroke .................................................. 8-1
    8.1.1 Full-open/Short-open Position Setting ................. 8-1
      ▪ Registering the current position ...................... 8-1
      ▪ Registering by entering a numerical value ........ 8-1
    8.1.2 Move to Full open/Short open Position ............. 8-2
  8.2 Specific Keys (Numerical Keys) Operation ................. 8-2
  8.3 Gun Change ....................................................... 8-3
    8.3.1 Gun Change Instruction ................................. 8-3
    8.3.2 Gun Change Job ............................................. 8-4

9 I/O Signals
  9.1 I/O Signal Diagram ............................................... 9-1
  9.2 I/O Allocation ..................................................... 9-2
      ▪ Input Allocation Display .................................. 9-2
      ▪ Output Allocation Display .............................. 9-3
      ▪ Pseudo Input Signal Display ......................... 9-4
  9.3 Allocated Signals ............................................... 9-5

10 Instruction List
11 System Setting

11.1 Gun Condition File ........................................11-1
  11.1.1 Entering Pulse to Stroke Conversion Data ..........11-3
  11.1.2 Entering Torque to Pressure Conversion Data ....11-3

11.2 Welder Condition File .................................11-4

11.3 Clearing Reference Position Pulse for Wear Amount Detection .................................11-5
Use a motor gun for spot welding applications in the following manner.

Each operation will be explained in detail, following the above flowchart.
2 Teaching

Teach the following to use the motor gun function.

2.1 Open/Close of Motor gun

Open and close the motor gun in the following manner.
1. Set the XRC for teaching a robot. (Refer to YASNAC XRC operator’s manual.)
2. Press [EX. AXIS]. The LED on the [EX. AXIS] key is lit.
4. Press [S+] or [S-]. The motor gun performs an “open motion” or a “close motion”.

NOTE

The opening and closing direction of the motor gun differs depending on the gun type. When manually setting the speed, be sure to select “slow speed” to check the opening and closing direction of the gun.

2.2 Mounting Electrodes

Mount the electrodes in a dry spotting motion. For dry spotting, refer to the section 7 “Manual Welding/Manual Dry Spotting”.

NOTE

For teaching, be sure to use a new electrode.
2.3 Registration of Operation Tool

The registration method of operation tool differs depending on whether it's a single gun or a double gun. For details, refer to the XRC Operator's manual.

2.3.1 Single Gun

Register the fixed side electrode as the operation tool. Set the Z-axis so that the direction facing the movable side electrode is positive (+).

![Diagram of Single Gun Registration]

**NOTE**
Be sure to set the direction of tool Z-axis facing the movable side electrode. If the Z-axis is not set in the correct direction, wear of the electrode cannot be properly compensated for.

2.3.2 Double Gun

Register the operation tool with the contact position of both electrodes as the tool end. Set the Z-axis so that the direction from the lower side electrode to the upper side electrode is positive (+).

![Diagram of Double Gun Registration]

**NOTE**
Be sure to set the tool Z-axis in the direction from the lower side electrode to the upper side electrode. If the Z-axis is not set in the correct direction, wear of the electrode cannot be properly compensated for.
2.4 Preparation of Job

This section explains how to prepare a job with a robot axis or a gun axis.

2.4.1 How to prepare a Robot-axis and a Gun-axis Job

**Operation**

Select {JOB} from the top menu ➔ Select {JOB CONTENT} ➔ Select {JOB} from the menu ➔ Select {CREATE NEW JOB} ➔ Select “R1+S1” ➔ Enter a job name ➔ Press [ENTER]

**Explanation**

1. The gun-axis is registered in the insertion point of the “S1” name. When a job with only a gun-axis is to be prepared, select “S1” and for a job with only a robot-axis, select “R1”.

2.4.2 Registration of Steps

Register the steps in the following manner.

1. Register the positions from ① to ④ as steps 1 to 4.
2. Keep the gun closed until position ⑥, and then register it as step 5 in the job.
3. Open the gun, and keep the gun open until position ⑧, and then register it as step 6 in the job.
4. Register the positions from ⑦ to ⑨ as steps 7 to 9.

**NOTE**

Position ⑤ should not touch the workpiece. Keep a few millimeters between the workpiece and the electrode.

By registering a SVSPOT (Spot Welding Execution) instruction after step 5, the tool end touches the workpiece in the touch motion.

For double-gun control, teach positions ④ and ⑤ in the same step, and also positions ⑥ and ⑦ in the same step.
2.4 Preparation of Job

2.4.3 Registration of SVSPOT Instruction

Register a SVSPOT instruction after the previously explained step 5.
Register a SVSPOT instruction by pressing the "./SPOT" keys on the programming pendant.

SVSPOT GUN#(1) PRESS#(1) WTM=1 WST=1

1. Gun No.
   Specifies the gun No. to be used for welding.

2. Gun pressure file No.
   Specifies the file No. where the pressure is set.

3. Welding condition No.
   Specifies the welding condition No. set for the welder.

4. Welder start signal output timing
   Specifies the timing to start the welder. Choose from the following three settings.
   - WST=0: The welder starts at the same time as the SVSPOT instruction. As the welder starts before pressure is applied, a squeeze time for the welder is required.
   - WST=1: The welder starts at the same time as pressure is applied for the first time.
   - WST=2: The welder starts at the same time as pressure is applied for the second time.

Welder Start Signal Output Timing

![Graph showing welder start signal output timing](image-url)
3 Setting Welding Conditions

This section explains how to set the welding conditions for a motor gun in spot welding: pressure, welding current, and welding time.

3.1 Pressure Setting

The pressure used for welding is specified by the gun pressure file selected for the SVSPOT.

**Operation**

Select {SPOT WELDING} from the top menu ➔ Select {GUN PRESSURE} ➔ Select the file No. by pressing the page key ➔ Select the item to be set ➔ Enter a numerical value, and press [ENTER]*1 ➔ Select “SETTING”

**Explanation**

*1 For the “END CONDITION”, pressing [SELECT] displays “PRS TIME (pressure time)” and “END WAIT (welding end wait)” alternately.

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUN PRESSURE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>① FILE NO.</td>
<td>: 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>② SETTING</td>
<td>: NOT DONE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>③ TOUCH SPEED</td>
<td>: 20 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>④ TOUCH PRESS</td>
<td>: 100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑤ 1ST PRESS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑥ 2ND PRESS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑦ 3RD PRESS</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑧ 4TH PRESS</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

①FILE NO.
Shows the gun pressure file No. Select a number by pressing the page key.

②SETTING
Shows whether the values are entered in the gun pressure file or not. For a file where the values are not entered, “NOT DONE” appears. For the files with the values entered, “DONE” appears.

③TOUCH SPEED
Shows the electrode speed when the gun closes. It is shown as a ratio (%) to the gun motor rated speed.

④TOUCH PRESS
Shows the pressure when electrode touches a workpiece. When the pressure reaches the touch pressure value after the electrode touched the workpiece, the pressure becomes the first pressure value.

⑤1ST to 4TH PRESS
Shows the pressure at each step.
3.1 Pressure Setting

© 1ST to 4TH END CONDITION
Shows the conditions needed to end application for each pressure. “PRS TIME (pressure time)” or “END WAIT (welding end wait)” can be chosen.
For “PRS TIME”, the gun applies a pressure for the time specified in the next item ©.
For “END WAIT”, the gun’s application of pressure ends when a welding end signal comes from the welder.
When “END WAIT” is selected for 1ST to 3RD PRESS, the conditions required by the gun to apply pressure for the further steps are not displayed.

© 1ST to 4TH PRS TIME
Shows the pressure time of each pressure. When “END WAIT” is selected as the END CONDITION, they are not displayed.

<Example>

<table>
<thead>
<tr>
<th>Pressure (kgf)</th>
<th>End Condition</th>
<th>Time (sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOUCH PRESS</td>
<td>100.0</td>
<td></td>
</tr>
<tr>
<td>1ST PRESS</td>
<td>200.0</td>
<td>PRS TIME</td>
</tr>
<tr>
<td>2ND PRESS</td>
<td>150.0</td>
<td>PRS TIME</td>
</tr>
<tr>
<td>3RD PRESS</td>
<td>220.0</td>
<td>PRS TIME</td>
</tr>
<tr>
<td>4TH PRESS</td>
<td>180.0</td>
<td>END WAIT</td>
</tr>
</tbody>
</table>

![Diagram showing pressure and welding end signal times]
3.2 Welding Current and Welding Time Settings

The welding current and the welding time are set according to the welder. Refer to the Operator’s manual of the welder.

**NOTE** The welding condition No. set to the welder should be the same as the welding condition No. specified in the SVSPOT instruction.
3.2 Welding Current and Welding Time Settings
4 Playback

This section explains the check run and the actual welding.

4.1 Check Run

Confirm the taught path in a check run. The check run is a dry run, so welding instructions such as SVSPOT are not carried out.

**Operation**

Press [PLAY] on the playback panel ➔ Select {UTILITY} in the menu area ➔ Select {SETUP SPECIAL RUN} ➔ Select “CHECK-RUN” to turn ON

4.2 Actual Welding

After having confirmed that the taught path is correct, start welding. Turn OFF the check run to start the SVSPOT instruction.
4.2 Actual Welding
5 Dry Spotting

For dressing a tip and mounting an electrode, a gun motion to apply pressure without welding (dry spotting) is required. Dry spotting can be also registered in a job to be executed.

5.1 SVGUNCL (Dry Spotting Motion) Instruction

Register the SVGUNCL instruction by pressing the “2/GUN CLOSE” on the programming pendant.

SVGUNCL GUN#(1) PRESSCL#(1)

①Gun No.
   Specifies the gun No. to start dry spotting. It is used with the SVSPOT instruction in the same manner.
②Pressure file No.
   Specifies the file No. where the pressure for dry spotting is set. It is different from the “gun pressure file” used in the SVSPOT instruction.

5.2 Dry Spotting Pressure Setting

The pressure for dry spotting is specified by the pressure file selected for the SVGUNCL instruction.

Operation

Select {SPOT WELDING} from the top menu ➔ Select {PRESSURE} ➔ Select a file
No. by pressing the page key ➔ Select the item to be set ➔ Enter a numerical value, and press [ENTER]"*

Explanation

"*1 For “PRESS UNIT”, pressing [SELECT] displays “kgf (PRESSURE)” and “% (TORQUE)” alternately. For “OUT”, pressing [SELECT] displays “ON” and “OFF” alternately.
### 5.2 Dry Spotting Pressure Setting

<p>| | | | | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>FILE NO.</td>
<td>2</td>
<td>PRE CUT TIME</td>
<td>3</td>
<td>END CUT TIME</td>
<td>4</td>
<td>TOUCH SPEED</td>
<td>5</td>
<td>PRESS UNIT</td>
</tr>
<tr>
<td>6</td>
<td>TOUCH PRESS</td>
<td>7</td>
<td>1ST PRESS</td>
<td>8</td>
<td>2ND PRESS</td>
<td>9</td>
<td>PRESS TIME OUT SIGNAL</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

- **FILE NO.**
  
  Shows the dry spotting pressure file No. Select a number by pressing the page key.  

- **PRE CUT TIME**
  
  Shows the time from when the tip dresser rotating signal is output to the moment the gun starts applying pressure.  

- **END CUT TIME**
  
  Shows the time from when the application of pressure stops to the moment the output signal to the tip dresser is turned OFF.  

- **TOUCH SPEED**
  
  Shows the electrode speed when the gun closes. It is shown as a ratio (%) to the gan motor rated speed.  

- **PRESS UNIT**
  
  Shows the units for dry spotting pressure. Select from "kgf (PRESSURE)" or "% (TORQUE)".  

- **TOUCH PRESS**
  
  Shows the pressure when electrode touches a workpiece. When the pressure reaches the touch pressure value after the electrode touched the workpiece, the pressure becomes the first pressure value.  

- **1ST to 4TH PRESS**
  
  Shows the dry spotting pressure at each step.  

- **1ST to 4TH PRES TIME**
  
  Shows the pressure time of each dry spotting pressure.  

- **1ST to 4TH PRESS OUT (ON/OFF status of 1st to 4th pressure synchronizing output signal)**
  
  Shows the ON/OFF status of the universal output signal which is output in synchronization with each dry spotting pressure.
  
  When a synchronizing signal is output to a tip dresser, etc., select “ON”.  

- **1ST to 4TH PRESS SIGNAL (1st to 4th pressure synchronizing output signal)**
  
  Shows the No. of the universal output signal which is output in synchronization with each dry spotting pressure.
### 5.2 Dry Spotting Pressure Setting

#### Example

<table>
<thead>
<tr>
<th></th>
<th>PRESS</th>
<th>TIME (sec)</th>
<th>OUT</th>
<th>SIGNAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOUCH PRESS</td>
<td>100.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1ST PRESS</td>
<td>200.0</td>
<td>0.50</td>
<td>ON</td>
<td>1</td>
</tr>
<tr>
<td>2ND PRESS</td>
<td>220.0</td>
<td>0.50</td>
<td>ON</td>
<td>2</td>
</tr>
<tr>
<td>3RD PRESS</td>
<td>0.0</td>
<td>0.00</td>
<td>OFF</td>
<td>-</td>
</tr>
<tr>
<td>4TH PRESS</td>
<td>0.0</td>
<td>0.00</td>
<td>OFF</td>
<td>-</td>
</tr>
<tr>
<td>Tip dresser rotating signal</td>
<td></td>
<td></td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

PRE CUT TIME = 1.0 (sec) and END CUT TIME = 1.0 (sec)

---

**Diagram**

- **Dry spotting pressure**
- **Synchronizing signal (DOUT1)**
- **Synchronizing signal (DOUT2)**
- **Tip dresser synchronizing signal (DOUT3)**

---

**NOTE**

For a tip dresser synchronizing signal, select the No. in the output allocation display.
5.2 Dry Spotting Pressure Setting
6 Electrode Wear Detection and Wear Compensation

6.1 Wear Detection and Wear Compensation Operation Flow Chart

6.1.1 For Dry Spotting and Sensor Detection

1. Start
2. Read the position by dry spotting touch motion
3. Read the position by sensor detection
4. Calculate the amount of wear on the movable and fixed sides
5. Weld a number of times (using wear compensation)
6. Tip dressing
7. When the amount of wear is more than the threshold value:
   - Output a signal to request a tip replacement (only when specified)
8. Replace the tip.
6.2 Wear Detection (by Dry Spotting and Sensor)

6.1.2 For Dry Spotting Detection

6.2 Wear Detection (by Dry Spotting and Sensor)

This section explains the method to detect the amount of the electrode wear by dry spotting touch motion and sensor detection.

6.2.1 Dry Spotting Touch Motion

Read the position where the fixed side (upper) electrode touches the movable side (lower) electrode, and then calculate the total amount of electrode wear on both sides. Touching during dry spotting is done by carrying out a SVGUNCL (dry spotting) instruction.

<Example>

```
SVGUNCL GUN#(1) PRESSCL#(1) TWC-A
```

1. Gun No.
2. Dry spotting pressure file No.
3. Dry spotting touch motion designation
6.2.2 Sensor Detection

Move the movable side (lower) electrode to the sensor detectable position, and read the position to calculate the amount of electrode wear on the movable side. Detect the electrode position using a sensor by carrying out SVGUNCL (dry spotting) instruction.

<Example>
SVGUNCL GUN#(1) PRESSCL#(1) TWC-B

① Gun No.
② Dry spotting pressure file No.
③ Sensor detection designation

6.2.3 Example of Wear Detection

For double-gun control, teach a job so that the upper side electrode passes the sensor detecting zone while using the sensor detection.
6.3 Wear Detection (by Dry Spotting)

This section explains how to detect the amount of electrode wear by only touching during dry spotting.

6.3.1 Touching during a Dry Spotting

When “TWC-C” is specified, the fixed side electrode touches the movable side electrode. The position of the point of contact is read, and then the total amount of wear of both electrodes is calculated. The total amount of wear is divided among the electrodes.

Touching during dry spotting is done by carrying out SVGUNCL (dry spotting) instruction.

<Example>
SVGUNCL GUN#(1) PRESSCL#(1) TWC-C
① ② ③
①Gun No.
②Dry spotting pressure file No.
③Designation of touching during a dry spotting

6.3.2 Example of Wear Detection

<Job Example>
①MOVJ
②SVGUNCL GUN#(1) PRESSCL#(1) TWC-C (Touching during dry spotting)
③MOVJ
6.4 Spot Weld Diagnosis Display

The amount of electrode wear is displayed. The allowable wear amount can also be set.

**Operation**

Select {SPOT WELDING} from the top menu ➔ Select {WELDING DIAGNOSIS} ➔

Select a gun No. by pressing the page key ➔ Select the item to be set ➔ Enter a numerical value, and press [ENTER]

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUN NO. : 1</td>
<td>CURRENT</td>
<td>TOLERANCE</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>TIP HIT COUNT</td>
<td>200</td>
<td>500</td>
</tr>
<tr>
<td>3</td>
<td>WEAR (MOVABLE SIDE)</td>
<td>5.0 mm</td>
<td>10.0 mm</td>
</tr>
<tr>
<td>4</td>
<td>WEAR (FIXED SIDE)</td>
<td>5.5 mm</td>
<td>10.0 mm</td>
</tr>
<tr>
<td>5</td>
<td>TCP ADJUSTMENT VALUE</td>
<td>5.5 mm</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>GUN STROKE ADJUSTMENT</td>
<td>10.5 mm</td>
<td></td>
</tr>
</tbody>
</table>

1. **GUN NO.**
   
   Shows the gun No. Select a number by pressing the page key ➔.

2. **TIP HIT COUNT (CURRENT, TOLERANCE)**
   
   “CURRENT” shows the number of times the SVSPOT instruction was carried out. When the current value exceeds the allowable value (TOLERANCE), a signal to request tip replacement is output.

3. **WEAR (MOVABLE SIDE) (CURRENT, TOLERANCE)**
   
   “CURRENT” shows the current amount of electrode wear on the movable side. When the current value exceeds the allowable value (TOLERANCE), a signal to request tip replacement is output.

4. **WEAR (FIXED SIDE) (CURRENT, TOLERANCE)**
   
   “CURRENT” shows the current amount of electrode wear on the fixed side. When the current value exceeds the allowable value (TOLERANCE), a signal to request tip replacement is output.

5. **TCP ADJUSTMENT VALUE**
   
   Shows the amount of shift from the tool center point.

6. **GUN STROKE ADJUSTMENT**
   
   Shows the adjusted amount of gun stroke.

Each current value can be cleared manually.

**Operation**

Select {DATA} in the menu ➔ Select {CLEAR CURRENT POS} ➔ Select “YES”
The robot motion and the gun stroke are adjusted according to the amount of electrode wear. The step registered immediately before the SVSPOT instruction compensates for the amount of wear.

### 6.5.1 Example of Wear Compensation

For a single gun, the amount of wear on the movable side = 3 mm; the amount of wear on the fixed side = 5 mm.

- **Movable side electrode**
- **Fixed side electrode**
- **Workpiece**

<Job Example>

MOVJ

MOVJ—In this position, wear compensation is done.

SVSPOT GUN#(1) PRESS#(1) WTM=1 WST=1

MOVJ

MOVJ

The fixed side electrode is always shifted in the Z-axis + direction on the tool coordinate. Therefore, be sure to register the tool position and direction correctly. (Refer to Section 2.3 “Registration of Operation Tool”.)
Welding and gun dry spotting can be done not only by job execution but also by key operation on the programming pendant. Welding and gun dry spotting by the programming pendant are done from the manual spot display.

### 7.1 Manual Spot Display

The operation to call the manual spot display and the items to be set are explained below.

**Operation**

Press [0/MANUAL SPOT] of the numerical keys ➔ Select the item to be set ➔ Enter a numerical value, and press [ENTER]

**Explanation**

*1 For “OUTPUT TIMING (WST)”, press [SELECT] to display “TOUCH”, “1ST PRESS”, and “2ND PRESS” alternately. For “PRESS CONDITION”, press [SELECT] to display “FILE” and “FIXED” alternately.

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANUAL SPOT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>① TWO GUN CONTROL</td>
<td>OFF</td>
<td></td>
<td></td>
</tr>
<tr>
<td>② GUN NO.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>③ WELDING COND (WTM)</td>
<td>:1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>④ GUN PRESSURE FILE NO.</td>
<td>:1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑤ OUTPUT TIMING (WST)</td>
<td>TOUCH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑥ PRESS CONDITION</td>
<td>:FILE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>⑦ PRESSURE NO.</td>
<td>:1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

① **TWO GUN CONTROL**
For two gun control, selects “ON” or “OFF” of synchronous control.

② **GUN NO.**
Shows the gun No.

③ **WELDING COND (WTM)**
Shows the welding condition No. which is set for the welder.

④ **GUN PRESSURE FILE NO.**
Shows the file No. where the pressure is set.

⑤ **OUTPUT TIMING (WST)**
Shows the timing to start the welder. It can be selected from the following three.

- **TOUCH**: Starts the welder at the same time as the SVSPOT instruction is carried out.
  Since the welder starts operation before pressure is applied, a squeeze time for the welder is required.
- **1ST PRESS**: Starts the welder at the same time as pressure is applied for the first time.
- **2ND PRESS**: Starts the welder at the same time as pressure is applied for the second time.
7.2 Manual Welding

®PRESS CONDITION
Shows the pressurizing method in a dry spotting. It can be selected from the following two methods.
FILE : The pressure is applied according to the settings in the dry spotting pressure file.
FIXED : Dry spotting is done with the pressure specified in “CONST PRESSURE”.
®PRESSURE NO. or CONST PRESSURE
For “PRESSURE NO.” : Shows the pressure file No. where the dry spotting pressures are specified.
For “CONST PRESSURE” : Shows the pressure for the dry spotting.

7.2 Manual Welding

For manual welding, perform the following operations.

Operation
Press [0/MANUAL SPOT] of the numerical keys ➔ Press [INTERLOCK] + [./SPOT].

Manual welding uses the following four conditions that are set in the manual spot display.
①GUN NO.
②GUN PRESSURE FILE NO.
③WELDING COND (WTM)
④OUTPUT TIMING (WST)

7.3 Manual Dry Spotting

For manual dry spotting, do the following.

Operation
Press [0/MANUAL SPOT] of the numerical keys ➔ Press [INTERLOCK] + [2/GUN CLOSE]

Manual dry spotting uses the following three conditions that are set in the manual spot display.
①GUN NO.
②PRESS CONDITION
③PRESSURE NO. or CONST PRESSURE
8 Other Functions

This section explains the following three functions.
- motor gun stroke
- Specific keys (numerical keys) operation
- Gun change

8.1 Motor Gun Stroke

The motor gun stroke is classified into two; full open and short open.

8.1.1 Full-open/Short-open Position Setting

Eight positions can be registered for each for the gun strokes, full open and short open.

- Registering the current position

**Operation**


- Registering by entering a numerical value

**Operation**

Press [3/FULL OPEN] or [-/SHORT OPEN] of the numerical keys ➔ Select a position to register a gun stroke ➔ Enter a numerical value, and press [ENTER]

![Data Edit Display Utility](image)
8.2 Specific Keys (Numerical Keys) Operation

SEL
The mark “●” moves to the currently selected position.
POSITION
Shows the gun stroke.

8.1.2 Move to Full open/Short open Position

Operation

When there are no changes in the gun No. and the position No., press [INTERLOCK] + [3/FULL OPEN] or [INTERLOCK] + [-/SHORT OPEN] simultaneously and the electrode on the movable side moves to the full open or short open position.

8.2 Specific Keys (Numerical Keys) Operation

Each function used for spot welding is allocated specific keys on the numerical keys of the programming pendant.

[MANUAL SPOT]
Displays the manual spot display.

[SPOT]
Registers a SVSPOT instruction in a job.

[INTERLOCK] + [SPOT]
Simultaneously press these two keys with the manual spot display to start manual welding.
8.3 Gun Change

This section explains the gun change function.

8.3.1 Gun Change Instruction

Remove or mount a gun with the GUNCHG (gun change) instruction.

<Example>
GUNCHG GUN#(1) PICK

1️⃣ Gun No.
2️⃣ Designation of mounting or removing a gun
   When “PICK (gun mounted)” is selected, the power supply of the gun motor is turned ON.
   When “PLACE (gun removed)” is selected, the power supply of the gun motor is turned OFF.
8.3 Gun Change

8.3.2 Gun Change Job

The following example explains the gun change job.

<Example of Automatic Tool Change (ATC) I/O Signal>
IN#(1) : Confirm the unchuck (ON : Unchuck status, OFF : Chuck status)
IN#(2) : Confirm the connection (ON : Connected, OFF : Disconnected)
IN#(3) : Confirm the chuck (ON : Chuck status, OFF : Unchuck status)
OUT#(1) : Unchuck output (ON : Unchuck, OFF : Chuck)

<Example of Mounting a Gun>

JUMP *1 IF IN#(1)=ON Confirms the unchucked status.
OUT#(1)=ON If not unchucked, an unchuck signal is output.
TIMER T=0.5 Waits for the signal.
JUMP *1 IF IN#(1)=ON Reconfirms the unchucked status.
JUMP *ERROR If not unchucked, an error occurs.

*1
MOVL V=100 Moves to the chuck position.
JUMP *2 IF IN#(2)=ON Confirms the connection.
JUMP *ERROR If disconnected, an error occurs.

*2
OUT#(1)=OFF A chuck signal is output.
TIMER T=0.5 Waits for the signal.
JUMP *3 IF IN#(3)=ON Confirms the chuck status.
JUMP *ERROR If not chucked, an error occurs.

*3
GUNCHG GUN#(1) PICK Turns ON the power supply of the gun motor.
MOVL V=200 Moves the gun from the gun rack.

(omitted to be continued)
<Example of Removing a Gun>

MOVL V=200  Moves a gun to the gun rack.
GUNCHEG GUN#(1) PLACE  Turns OFF the power supply of the gun motor.
OUT#(1)=ON  An unchuck signal is output.
TIMER T=0.5  Waits for the signal.
JUMP *1 IF IN#(1)=ON  Confirms unchucke status.
JUMP *ERROR  If not unchucked, an error occurs.

*1

MOVL V=1000  Moves to the removing position.
JUMP *2 IF IN#(2)=ON  Confirms the disconnection.
JUMP *ERROR  If connected, an error occurs.

*2

(omitted to be continued)

**NOTE**

Be sure to confirm the unchucked status when moving an automatic tool changer to the chuck position.
8.3 Gun Change
9 I/O Signals

9.1 I/O Signal Diagram

Specific signals are provided for motor gun spot welding. An I/O signal diagram of a typical system is shown below.

Welding conditions (level signals)
1(1) Sets the welding conditions for the welder.
2(2) The output format can be set as binary or 4(3) discrete.
8(4) (The numbers in parentheses are for discrete.)
16(5) Can handle up to 255 conditions in binary.
32(6)
64(7)
128(8)

WELDING COMMAND (level/pulse)
Outputs the start instruction to the welder.

WELDING ERROR RESET (level)
Resets the welding alarm status of the welder.
9.2 I/O Allocation

The I/Os necessary for welding for each type of welder can be allocated to general I/O signals.

The validity of the following signals can be validated in the pseudo input signal display.
- TMR COOL WTR ERR (timer cooling water error)
- GUN COOL WTR ERR (gun cooling water error)
- TRANSTHERMO ERR (transformer thermostat error)
- WELD ON/OFF (welding ON/OFF)

■ Input Allocation Display

**Operation**
Select {SPOT WELDING} from the top menu ➔ Select {I/O ALLOCATION} ➔ Select the signal No. to be set.  

**Explanation**

*1 The input allocation display appears.

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT ALLOCATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELDER NO. : 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIG NAME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELD COMPLETE</td>
<td>: 17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELDING ERROR</td>
<td>: 18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STICK DETECTION</td>
<td>: 19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIP REPLACE COMPLETE</td>
<td>: 22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*2 Enter the signal No. to be allocated using the numerical keys, then press [ENTER].

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT ALLOCATION</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELDER NO. : 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SIG NAME</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELD COMPLETE</td>
<td>: 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELDING ERROR</td>
<td>: 18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>STICK DETECTION</td>
<td>: 19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TIP REPLACE COMPLETE</td>
<td>: 22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Output Allocation Display

**Operation**

Select **(DISPLAY)** in the menu of I/O allocation display*1  ➔  Select **(ALLOCATE OUTPUT)***2  ➔  Select the signal No. to be set*3

**Explanation**

*1 The pulldown menu is displayed.
When the output allocation display is shown, **(ALLOCATE INPUT)** appears in the pulldown menu.

*2 The output allocation display appears.

*3 Enter the signal No. to be allocated using the numerical keys, and then press [ENTER].
• Be sure that the allocated general signals are not used in the job. If the duplicated signals are used in the job, malfunctions will result.

• If the WELDING CONDITION PARITY is set, the parity signal is automatically output when the welding conditions are output. The odd/even parity is set with a different parameter.

## Pseudo Input Signal Display

### Operation

Select {IN/OUT} from the top menu ➔ Select (PSEUDO INPUT STG)*1 ➔ Move the cursor to the signal whose validity/invalidity is to be set, and press [INTERLOCK] + [SELECT]*2

### Explanation

*1 The pseudo input signal display appears.

![Data Edit Display Utility]

*2 Each time [INTERLOCK] + [SELECT] are pressed, “Ø (invalid)” and “● (valid)” alternately appear.
**9.3 Allocated Signals**

<table>
<thead>
<tr>
<th>Signal</th>
<th>Contents</th>
<th>To</th>
<th>Standard Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELD COMPLETE</td>
<td>Shows that the welder completed the welding normally. Used as a confirmation signal for welding instruction and manual spot welding. After this signal is input, the welding sequence is completed, and the operation moves to the next step.</td>
<td>Welder</td>
<td>IN13</td>
</tr>
<tr>
<td>WELDING ERROR</td>
<td>Shows an abnormal welding result or an abnormality in the welder. When this signal is input during welding, an alarm occurs to stop the manipulator.</td>
<td>Welder</td>
<td>IN14</td>
</tr>
<tr>
<td>STICK DETECTION</td>
<td>Inputs when the stick detector or the welder detects sticking. When this signal is input, an alarm occurs to stop the manipulator.</td>
<td>Stick detector or Welder</td>
<td>Not used</td>
</tr>
<tr>
<td>TMR COOL WTR ERR</td>
<td>Monitors an abnormal state of the cooling water for the timer welder. When this signal is input, an alarm occurs to stop the manipulator. The servo power supply stays ON.</td>
<td>Cooling water flow switch</td>
<td>IN9</td>
</tr>
<tr>
<td>GUN COOL WTR ERR</td>
<td>Monitors an abnormal state of the cooling water for the gun. When this signal is input, an alarm occurs to stop the manipulator. The servo power supply stays ON.</td>
<td>Cooling water flow switch</td>
<td>IN10</td>
</tr>
<tr>
<td>TRANS-THERMO ERR</td>
<td>This alarm signal from the gun transformer is input directly into the XRC. This signal is normally ON (normally closed) and when it is OFF, an alarm occurs. The servo power supply stays ON.</td>
<td>Gun transformer</td>
<td>IN11</td>
</tr>
<tr>
<td>WELD ON/OFF (from PLC)</td>
<td>Inputs the WELD ON/OFF selector switch status from a PLC such as the interlock board. The WELD ON/OFF signal is output to the welder according to this signal and the manipulator status. When this signal is input (ON), the welder is turned OFF, and spot welding is not done.</td>
<td>Interlock board, etc.</td>
<td>CN12-B6</td>
</tr>
<tr>
<td>TIP REPLACE COMPLETE</td>
<td>When this signal is input after the tip is replaced, the TIP CHANGE REQUEST signal turns OFF, and the number of hits is cleared.</td>
<td>Interlock board, etc.</td>
<td>IN16</td>
</tr>
</tbody>
</table>
### Output Signals from Robot controller

<table>
<thead>
<tr>
<th>Signal</th>
<th>Contents</th>
<th>To</th>
<th>Standard Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>WELDING CONDITION (LEVEL signals)</td>
<td>Sets the welding conditions for the welder. The output format can be set as binary or discrete (bit number). Can handle up to 255 conditions. The most significant bit is the parity bit when specified.</td>
<td>Welder</td>
<td>4 bits from OUT11</td>
</tr>
<tr>
<td>1 (1)</td>
<td></td>
<td></td>
<td>OUT11 OUT12 OUT13 OUT14</td>
</tr>
<tr>
<td>2 (2)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 (3)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 (4)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16 (5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32 (6)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64 (7)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>128 (8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELDING CONDITION PARITY</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELDING COMMAND</td>
<td>Outputs the start command to the welder. This command is not necessary for the welders which use the WELDING CONDITION signal as a start signal.</td>
<td>Welder</td>
<td>Not used</td>
</tr>
<tr>
<td>WELDING ERROR RESET</td>
<td>Resets the error status in the welder. Outputs by programming pendant operation.</td>
<td>Welder</td>
<td>OUT10</td>
</tr>
<tr>
<td>WELD ON/OFF</td>
<td>Outputs the robot status added to the status of signals input from the interlock board.</td>
<td>Welder</td>
<td>OUT9</td>
</tr>
<tr>
<td>TIP CHANGE REQUEST</td>
<td>Outputs when the actual number of hits reaches the number of hits set at the tip replacement.</td>
<td>Interlock board, etc.</td>
<td>OUT16</td>
</tr>
</tbody>
</table>
10 Instruction List

< > indicates numerical or alphabetical data. If multiple items are shown in one section, select one of the items.

<table>
<thead>
<tr>
<th>Function</th>
<th>Instruction items</th>
<th>GUN# (Gun 1 condition file No.)</th>
<th>1 to 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRESS# (Gun 1 pressure file No.)</td>
<td>1 to 15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WTM= Gun 1 welding conditions</td>
<td>1 to 255</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WST= Welder start timing</td>
<td>0 to 2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>GUN# (Gun 2 condition file No.)</td>
<td>1 to 7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PRESS# (Gun 2 pressure file No.)</td>
<td>1 to 15</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WTM= Gun 2 welding conditions</td>
<td>1 to 255</td>
<td></td>
</tr>
<tr>
<td></td>
<td>WST= Welder start timing</td>
<td>0 to 2</td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>MOVL V=1000</td>
<td>SVSPOT GUN#(1) PRESS#(1) WTM=1 WST=1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MOVL V=1000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SVSPOT**

<table>
<thead>
<tr>
<th>Function</th>
<th>Instruction items</th>
<th>GUN# (Gun 1 condition file No.)</th>
<th>1 to 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PRESSCL# (Dry spotting pressure file No.)</td>
<td>1 to 5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWC-A</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWC-B</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWC-C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Examples</td>
<td>MOVL V=1000</td>
<td>SVGUNCL GUN#(1) PRESSCL#(1)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MOVL V=1000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**SVGUNCL**

<table>
<thead>
<tr>
<th>Function</th>
<th>Instruction items</th>
<th>GUN# (Gun condition file No.)</th>
<th>1 to 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PICK</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PLACE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Example</td>
<td>GUNCHG GUN#(1)</td>
<td>PICK</td>
<td></td>
</tr>
</tbody>
</table>

**GUNCHG**
11 System Setting

The items to be determined at the system setting, such as gun and welder, are specified in the system setting files.

11.1 Gun Condition File

The gun characteristics are specified in the gun condition file.

**Operation**

Select {SPOT WELDING} from the top menu ➔ Select {GUN CONDITION} ➔ Select a gun No. by pressing the page key ➔ Select the item to be set ➔ Enter the numerical value, and press [ENTER]*1 ➔ Select “SETTING”

**Explanation**

*1 For “GUN TYPE”, pressing [SELECT] displays “C-GUN”, “X-GUN (SINGLE ARM MOVE)” and “X-GUN (DOUBLE ARM MOVE)” alternately.

---

**GUN CONDITION**

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUN NO.</td>
<td>:1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SETTING       : NOT DONE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GUN TYPE      : C-GUN</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WELDER NO.    : 1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **PULSE** | **STROKE (mm)**
  1. | 1000 | 300 |
  2. | 2000 | 350 |
  3. | 3000 | 400 |
  4. | 4000 | 450 |
  5. | 5000 | 500 |
  6. | 6000 | 550 |
  7. | 7000 | 600 |
  8. | 8000 | 650 |

- **TORQUE DIR**
  - **TORQUE (%)** | **PRESSURE (kgf)**
    1. | 50 | 50.0 |
    2. | 60 | 100.0 |
    3. | 70 | 150.0 |
    4. | 80 | 200.0 |
    5. | 90 | 250.0 |
    6. | 100 | 300.0 |
    7. | 110 | 350.0 |
    8. | 120 | 400.0 |

**<TOUCH/WEAR CONDITION>**

- **MAX PRESSURE** : 400.0 kgf
- **TOUCH DETECTIVE DELAY TIME** : 0.05 sec
- **TOUCH SPEED THRESHOLD** : 2 pps
- **WEAR DETECTIVE SENSOR DIN NO.** : 1
- **WEAR RATIO (FIXED SIDE)** : 50 %
- **FIXED OFFSET** : 0.00 mm
- **MOVING RATIO AFTER CLOSE (LOW)** : 50 %
- **MOVING RATIO IN SENSING (UP)** : 70 %

---

11-1
GUN NO.
Shows the No. of the gun to be used. When using two guns or more, select the No. by pressing the page key.

SETTING
Shows whether the gun condition file has been set or not. For the file where the values have not been entered, “NOT DONE” appears, while for the file where the values have already been entered, “DONE” appears.

GUN TYPE
Shows the gun type. Select from “C-GUN”, “X-GUN (SINGLE ARM MOVE)” and “X-GUN (DOUBLE ARM MOVE)”.

WELDER NO.
Shows the No. of the connected welder.

PULSE, STROKE
Shows the relationship between the encoder pulse value of the gun axis motor and the gun stroke. The pulse value for the specified gun stroke can be calculated by interpolation of these values.

TORQUE DIR
Specifies the pressure direction of the gun axis motor. When the direction to increment the motor encoder value and the pressure direction of the gun are the same, select “+”. When they are different, select “-”.

TORQUE, PRESSURE
Shows the relationship between the gun axis motor torque and the electrode pressure. The torque value for the specified pressure can be calculated by interpolation of these values.

MAX PRESSURE
Enter the maximum pressure that the gun can apply. If a value higher than this is selected, an alarm occurs.

TOUCH DETECTIVE DELAY TIME
Shows the delay time from the start of the touch motion to the start of the torque detection for the SVSPOT and SVGUNCL instruction.

TOUCH SPEED THRESHOLD
Shows the gun axis motor speed to detect that the pressure reaches the touch pressure for SVSPOT and SVGUNCL instruction.

WEAR DETECTIVE SENSOR DIN NO.
Shows the direct IN No. where the signal from the sensor to be used for wear detection is input.

WEAR RATIO (FIXED SIDE)
Shows the fixed side electrode wear ratio to the total wear amount (the total of the fixed side and the movable side) detected in the dry spotting motion (by SVGUNCL instruction with TWC-C designation).

FIXED OFFSET
Shows the fixed side electrode shift amount executed at the time of the wear compensation. Substitute the value when the fixed side electrode is to be shifted in one direction at spot welding.
11.1 Gun Condition File

MOVEMENT RATIO AFTER CLOSE (LOW) (displayed only when “X-GUN (DOUBLE ARM MOVE)” is selected)
Shows the lower electrode movement ratio when the gun closes more by the electrode wear. Enter 60% when the ratio of upper electrode movement : the lower electrode movement = 4 : 6.

MOVEMENT RATIO IN SENSING (UP) (displayed only when “X-GUN (DOUBLE ARM MOVE)” is selected)
Shows the ratio when the upper side electrode passes the sensor, for detecting the upper side electrode wear using a sensor. Enter 70% when the ratio of the upper side electrode movement : the lower side electrode movement = 7 : 3.

11.1.1 Entering Pulse to Stroke Conversion Data
To specify the gun stroke in mm, enter data about the relationship between the gun axis motor encoder pulse value and the gun stroke (mm). Follow the procedures explained below. Up to 8 items of data can be entered.

1. Set the applicable gun stroke during a jog operation with the programming pendant.
2. Read the pulse value of the gun axis motor encoder on the programming pendant.
3. Proceed the steps 1. and 2. above, for 8 points in total.
   When the relationship between two values are known from the machine drawing, get the data for the 8 points.
4. Enter the obtained data of 8 points in “PULSE” and “STROKE” in the gun condition file.

11.1.2 Entering Torque to Pressure Conversion Data
To specify the pressure in kgf, enter data about the relationship between the gun axis motor torque (%) and the pressure (kgf). Follow the procedures explained below. Up to 8 items of data can be entered.

1. Set the pressure in the dry spotting pressure file. Specify the pressure units as “Torque (%)
2. Register SVGUNCL instruction in a job. Specify the dry spotting pressure file set in step 1.
3. Execute the job and measure the gun pressure with a pressure gauge.
4. Repeat steps 1. to 3. with a different pressure each time to obtain 8 items of data for the torque and the pressure.
5. Enter the obtained data of 8 points in “TORQUE” and “PRESSURE” in the gun condition file.
11.2 Welder Condition File

Specify the welder characteristics the welder condition file.

**Operation**

Select (SPOT WELDING) from the top menu ➔ Select (WELDER CONDITION) ➔

Select a welder No. by pressing the page key ➔ Select the item to be set ➔ Enter a numerical value, and press [ENTER]*

**Explanation**


<table>
<thead>
<tr>
<th>WELDER NO.</th>
<th>WELD INST OUTPUT TYPE</th>
<th>WELD COND OUTPUT TIME</th>
<th>WELD COND OUTPUT TYPE</th>
<th>WELD COND MAX NUM</th>
<th>WELD END WAIT TIME</th>
<th>STICK DETECT DELAY TIME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>LEVEL</td>
<td>0.50 sec</td>
<td>BINARY</td>
<td>31</td>
<td>5.0 sec</td>
<td>5.00 sec</td>
</tr>
</tbody>
</table>

① **WELDER NO.**
   Shows the welder No. When using two welders or more, select the No. by pressing the page key [P].

② **WELD INST OUTPUT TYPE**
   Shows the type of signal to be output to the welder. Can be selected from “LEVEL”, “PULSE”, or “START SIGNAL”.

③ **WELD COND OUTPUT TIME**
   Shows the output time of the signal to be output to the welder.

④ **WELD COND OUTPUT TYPE**
   Shows the type of the condition signal to be output to the welder. “BINARY” or “DISCRETE” can be selected.

⑤ **WELD COND MAX NUM**
   Shows the biggest condition No. to be output to the welder.

⑥ **WELD END WAIT TIME**
   Shows the waiting time for a welding completion signal to be input from the welder. When it is 0.0 sec, the waiting time is infinite.

⑦ **STICK DETECT DELAY TIME**
   Shows the waiting time for gun opening. When the gun does not open after the set time has elapsed, an alarm occurs.
11.3 Clearing Reference Position Pulse for Wear Amount Detection

The reference position pulse to be used for wear amount detection is registered as internal data. When the motion for wear detection is changed, this value should be cleared.

**Operation**

Select (SPOT WELDING) from the top menu ➔ Select (WELD DIAGNOSIS) ➔ Select a gun No. by pressing the page key ➔ Select (DATA) in the menu area ➔ Select (CLEAR ORG POS) ➔ Select “YES”
11.3 Clearing Reference Position Pulse for Wear Amount Detection
YASNAC XRC OPTIONS
INSTRUCTIONS
FOR THE MOTOR GUN FUNCTION

Specifications are subject to change without notice
for ongoing product modifications and improvements.

YASKAWA ELECTRIC CORPORATION

YASKAWA
Upon receipt of the product and prior to initial operation, read these instructions thoroughly and retain for future reference.

The YASNAC XRC operator’s manuals above correspond to specific usage. Be sure to use the appropriate manual.
# CONTENTS

1 Introduction ................................................. 3

2 Clearance Teaching Function ................................. 4
   2.1 Operation Flow Chart ........................................ 4
   2.2 Setting the Teaching Type .................................... 5
   2.3 Setting the Clearance Files ................................. 7
   2.4 Teaching the Hit Points .................................... 9

3 Teaching with Gun Pressure .................................... 13
   3.1 Operation Flow Chart ......................................... 13
   3.2 Procedure for Registering the Position .................... 14
   3.3 Setting the Pressure Conditions ........................... 14

4 Gun Pressure Compensation Function ...................... 15
   4.1 Operation Flow Chart ......................................... 15
   4.2 Overview .................................................... 16
   4.3 Setting the Pressure Compensation Value ................. 18

5 Workpiece Transfer Function Using a Motor Gun .............. 20
   5.1 Operation Flow Chart ......................................... 20
   5.2 Setting the Conditions for Grasping/Releasing Workpieces 21
   5.3 Registering the Instruction for Grasping/Releasing Workpieces 23
   5.4 Manual Operation for Grasping/Releasing Workpieces .... 26

6 Electrode Wear Detection and Wear Compensation .............. 27
   6.1 Operation Flow Chart ......................................... 27
   6.2 Wear Detection ............................................... 28
   6.3 Spot Weld Diagnosis Display ............................... 30
   6.4 Wear Compensation .......................................... 31
   6.5 Teaching Positions with a Worn Electrode .................. 32

7 Individual Reset Function for Wear Amount ................. 33
   7.1 Operation Flow Chart ......................................... 33
   7.2 Procedure for Signal Assignment ........................... 34
8  Welding Conditions Group Output Function ........................................ 36
  8.1 Operation Flow Chart ................................................................. 36
  8.2 Procedure for Assigning the Group Output Relay ......................... 37
  8.3 Setting the Group Output Tag ....................................................... 39
1. Introduction
This supplementary manual describes additional functions for the motor gun function. The following seven functions are added:

- Clearance teaching
- Teaching with gun pressure
- Gun pressure compensation
- Workpiece transfer using a motor gun
- Electrode wear detection and wear compensation
- Individual reset for wear amount
- Welding conditions group output

Read this manual thoroughly together with the following:
“YASNAC XRC OPTIONS INSTRUCTIONS FOR THE MOTOR GUN FUNCTION” (Manual No. RE-CKI-A437)
2. Clearance Teaching Function
With the clearance teaching function, by specifying the clearance for the upper tip or the lower tip of the motor gun, the position taught at the hit position is automatically offset for the clearance and registered.

2.1 Operation Flow Chart
The following shows the operation flow chart for the clearance teaching.

Start

Select the teaching type.

Select one of the followings:
- Teaching type 1: Lower-tip teaching
- Teaching type 2: Upper-tip teaching
- Teaching type 3: Gun-close teaching

Set the clearance file.

Set the clearance data of the followings:
- Upper-tip clearance distance
- Lower-tip clearance distance
- Board thickness (for the teaching types 1 and 2)

Teach the hit point.

Set the teaching data of the followings:
- Teaching position (Teaching)
- Moving speed
- Clearance file number
- Gun pressure conditions
- Welding conditions

End
2.2 Setting the Teaching Type

The following three types of settings are available; the lower-tip teaching, the upper-tip teaching, and the gun-close teaching. Follow the procedure to select one of the three types before teaching the hit point.

- Lower-tip teaching (inputting board thickness necessary)
- Upper-tip teaching (inputting board thickness necessary)
- Gun-close teaching (inputting board thickness unnecessary)

Movable side

Fixed side

<Operation>
Call up the top menu → Select {SETUP} → Select {TEACHING COND} → Move the cursor to {CLEARANCE TEACH} → Press [SELECT] → Move the cursor to the desired teaching method → Press [SELECT]

<Explanation>
*1 The following display appears.
*2 The following display appears.

![Display 1]

*3 The following display appears.

![Display 2]

*4 The following dialog box appears.

Three teaching methods are available.

- **UPPER TIP**: Teaching with the upper tip contacting the workpiece
- **LOWER TIP**: Teaching with the lower tip contacting the workpiece
- **GUN CLOSE**: Teaching with both tips contacting the workpiece

![Display 3]
2.3 Setting the Clearance Files
In this section, setting procedures of various data for clearance files are explained. Set the board thickness in the clearance file before teaching the hit point. Up to 32 clearance files can be used.

<Operation>
Call up the top menu*1 ➔ Select {SPOT WELDING} ➔ Select {CLEARANCE FUNC.} ➔
Move the cursor to the desired item and press [SELECT] ➔ Input the value and press [ENTER]

<Explanation>
*1 The following display appears.

*2 The following display appears.
*3 The following CLEARANCE SETTING display appears.

This file is a file to be specified by the clearance tag of move instruction. (Up to 32 conditions can be set.)

```
DATA | EDIT | DISPLAY | UTILITY
-----|------|---------|--------
CLEARANCE SETTING | | | |
COND NO.: 01 | SQUARE
MOVING DISTANCE TO UPPER TIP | 15.0 mm
DISTANCE TO LOWER TIP | 2.0 mm
TICKNESS

*4 Only {SQUARE} is available for {MOVING}.

{DISTANCE TO UPPER TIP}, {DISTANCE TO LOWER TIP}, and {TICKNESS} can be set by 1/10mm.
2.4 Teaching the Hit Points

Operations for Teaching the Hit Points

The following describes the outline of the procedure for teaching the hit point.

<Operation>
Select \{JOB\} under the top menu
Select \{JOB\} \*1
Move the cursor to the line before the move instruction (SVSPOTMOV) for clearance to be inserted
Press [SHIFT] + [MOTION TYPE] \*2
Press [INSERT]
Press [ENTER] \*3

<Explanation>

\*1 The JOB display appears.

\*2 The following display appears.

This can be done only while the manipulator is operating (while the robot switch LED indicator is lit).

\*3 The move instruction for clearance has been registered.

The actual moving pattern is explained in the following “Move Instruction for Clearance.”
■ Move Instruction for Clearance

The following describes the move instruction for clearance.

(Example)

```
SVSPOTMOV V=1000.0 PLIN=1 PLOUT=1 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1 WGO=1
```

| SVSPOTMOV | : Move instruction for clearance |
| V=1000.0  | : Linear moving speed for clearance (1000.0mm/sec for this example) |
| PLIN=1    | : Positioning level at the clearance position before hit |
| PLOUT=1   | : Positioning level at the clearance position after hit |
| CLF#(1)   | : Clearance file number (file 1 for this example) |
| GUN#(1)   | : Motor gun number (Motor gun 1 is used for this example.) |
| PRESS#(1) | : Pressure condition file number (Pressure condition file 1 is used for this example.) |
| WTM=1     | : Welding condition number (Welding condition 1 is used for this example.) |
| WST=1     | : Welder start-up timing |
| WGO=1     | : Welding condition group output (Refer to “8. Welding conditions group output function.”) |

■ Moving for Clearance

The following describes moving operation for clearance.

<When moving with positioning specified using PLIN>

The numbers on the right correspond to the numbers in the following figure.

Job Example: Work 1

0000   NOP
0001   MOVJ VJ=100.0 →①
0002   SVSPOTMOV V=1000.0 PLIN=1 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1 →②
0003   SVSPOTMOV V=1000.0 PLIN=1 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1 →③
0004   SVSPOTMOV V=1000.0 PLIN=1 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1 →④
0005   SVSPOTMOV V=1000.0 PLIN=1 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1 →⑤
0006   SVSPOTMOV V=1000.0 PLIN=1 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1 →⑥
0007   MOVL V=1000.0 →⑦
0008   END
Clearance file setting: 1
Moving for clearance: Valid
Distance to upper tip: 20.0mm
Distance to lower tip: 10.0mm
Board thickness: 2.0mm
<When moving with positioning specified using PLOUT>
The numbers on the right correspond to the numbers in the following figure.

Job Example: Work 1

```
0000  NOP
0001  MOVJ VJ=100.0 →①
0002  SVSPOTMOV V=1000.0 PLOUT=1 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1 →②
0003  SVSPOTMOV V=1000.0 PLOUT=1 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1 →③
0004  SVSPOTMOV V=1000.0 PLOUT=1 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1 →④
0005  SVSPOTMOV V=1000.0 PLOUT=1 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1 →⑤
0006  SVSPOTMOV V=1000.0 PLOUT=1 CLF#(1) GUN#(1) PRESS#(1) WTM=1 WST=1 →⑥
0007  MOVL V=1000.0 →⑦
0008  END
```

Clearance file setting: 1
Moving for clearance: Invalid
Distance to upper tip: 20.0mm
Distance to lower tip: 10.0mm
Board thickness: 2.0mm
3. Teaching with Gun Pressure
With the teaching with gun pressure, the position is registered with pressure applied by the motor gun when teaching the position. This function is included in the clearance teaching function and valid only when “gun-close teaching” is selected for the clearance teaching type.

3.1 Operation Flow Chart
The following shows the operation flow chart for the gun pressure teaching.

```
Start

Select “Gun-close teaching” for clearance teaching type of teaching condition.

Set pressure conditions.

Move the manipulator to the hit point.

Apply pressure.

Register the position of the hit point.

Stop applying the pressure.

End

Refer to “2. Clearance Teaching Function.”
```
3.2 Procedure for Registering the Position
The following describes the procedure for registering the position.

1. Move the fixed tip until it contacts the workpiece and apply the pressure.
   To apply the pressure, press [8] + [INTER LOCK].
   For pressure conditions, the file number specified at “PRESS NO.” of the MANUAL SPOT display is used.

2. Confirm the pressure status and register the position.
   The taught position is to be registered adding the compensation amount of wear of the gun axis. Yaskawa recommends that the pressure be applied with the gun axis not bent when teaching.

3. Stop applying the pressure.
   Press [INTER LOCK] + [9] to release the gun axis.

3.3 Setting the Pressure Conditions
The following describes settings for the pressure conditions.

<Operation>
Press [0]*1 ➔ Move the cursor to {PRESS CONDITION} ➔ Select {FILE}

<Explanation>
*1 The following display appears.

```
<table>
<thead>
<tr>
<th>CYCLE</th>
<th>SECURITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANUAL SPOT</td>
<td>R1</td>
</tr>
<tr>
<td>TWO GUN CONTROL</td>
<td>OFF</td>
</tr>
<tr>
<td>GUN NO.</td>
<td>1</td>
</tr>
<tr>
<td>WELDING COND (WTM)</td>
<td>256</td>
</tr>
<tr>
<td>GUN PRESSURE FILE NO.</td>
<td>1</td>
</tr>
<tr>
<td>OUTPUT TIMING (WST)</td>
<td>TOUCH MOTION</td>
</tr>
<tr>
<td>GROUP OUTPUT</td>
<td>1</td>
</tr>
<tr>
<td>PRESS CONDITION</td>
<td>FILE</td>
</tr>
<tr>
<td>PRESS NO.</td>
<td>5</td>
</tr>
</tbody>
</table>
```
4. Gun Pressure Compensation Function
With the gun pressure compensation function, the gun pressure can be kept stable even when the motor gun posture changes.

4.1 Operation Flow Chart
The following shows the operation flow chart for the gun pressure compensation.

![Operation Flow Chart]

- Start
  - Register the data for applying pressure downwards to the GUN CONDITION file.
  - Register the data for applying pressure upwards to the GUN CONDITION file.
  - Teach the hit point.
- End

Set the pressure-to-torque conversion value (for applying pressure downwards).
Set the pressure compensation value (for applying pressure upwards).
4.2 Overview
The following describes outline of the gun pressure compensation function.

Fig. 1 shows the pattern 1; applying pressure downwards, and Fig. 2 shows the pattern 2; applying pressure upwards. In the pattern 1, set the points (maximum eight points) for the pressure-to-torque conversion value (see Fig. 3) of GUN CONDITION file. With this eight points data, the specified pressure is calculated by interpolation, and the motor torque for motor gun is calculated. (See Fig. 4.)
For the pattern 2 shown in Fig. 2, the weight of the motor gun itself may cause deviation of pressure. Using the gun pressure compensation function, by setting one pressure compensation value (see Fig. 5), the motor torque for motor gun is calculated using the pressure-to-torque conversion value of pattern 1 and the inclination of the Z-axis + on the tool coordinate at hitting so that the pressure can be kept stable even when the hitting posture changes (see Fig. 6).
4.3 Setting the Pressure Compensation Value

The following describes settings for pressure compensation value of pattern 2. For details on the data registration of pattern 1; applying pressure downwards (settings for pressure-to-torque conversion value), refer to “11. System Setting” of “YASNAC XRC OPTIONS INSTRUCTIONS FOR THE MOTOR GUN FUNCTION.”

<Operation>

Call up the top menu*1 ➔ Select {SPOT WELDING} ➔ Select {GUN COND. AUX.} ➔ Move the cursor to {PRESSURE COMPENSATION} ➔ Press [SELECT] ➔ Input the desired value for compensation pressure between 0 and 999.9 kgf ➔ Press [ENTER]

<Explanation>

*1 The following display appears.

*2 The following display appears.
The following display appears.

<table>
<thead>
<tr>
<th>CYCLE</th>
<th>SECURITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUN COND. AUXILIARY</td>
<td>R1</td>
</tr>
<tr>
<td>GUN NO.</td>
<td>:</td>
</tr>
<tr>
<td>STROKE MOVING VELOCITY</td>
<td>: 10.00 %</td>
</tr>
<tr>
<td>COEF. FOR GUN ARM BEND</td>
<td>: 0.0 mm/100 kgf</td>
</tr>
<tr>
<td>PRESSURE COMPENSATION</td>
<td>: 40.00 kgf</td>
</tr>
<tr>
<td>RESET WEAR OF LOWER TIP</td>
<td>: #IN+++</td>
</tr>
<tr>
<td>RESET WEAR OF UPPER TIP</td>
<td>: #IN+++</td>
</tr>
</tbody>
</table>
5. Workpiece Transfer Function Using a Motor Gun

With the workpiece transfer function, workpieces can be transferred using a motor gun. While this function is used, the control of the grasping force for workpiece is validated so that workpieces can be stably handled using a motor gun.

5.1 Operation Flow Chart

The following shows the operation flow chart for the workpiece transfer function.
5.2 Setting the Conditions for Grasping/Releasing Workpieces

PRESSURE file is used to set the conditions for grasping/releasing workpieces. The following describes how to set the pressure to grasp a workpiece. Up to five PRESSURE files can be used.

<Operation>

Call up the top menu*1 → Select {SPOT WELDING}*2 → Select {PRESSURE} *3 → Move the cursor to the desired item → Press [SELECT] to change the value

<Explanation>

*1 The following display appears.

*2 The following display appears.
The following display appears.

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRESSURE</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FILE NO.</td>
<td>: 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRE CUT TIME</td>
<td>: 0.00 sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>END CUT TIME</td>
<td>: 0.00 sec</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOUCH SPEED</td>
<td>: 20 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PRESS UNIT</td>
<td>: kgf (PRESSURE)</td>
<td>PRESS TIME</td>
<td>OUT SIGNAL</td>
</tr>
<tr>
<td>TOUCH PRESS</td>
<td>100.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1ST PRESS</td>
<td>100.0</td>
<td>1.00</td>
<td>OFF</td>
</tr>
<tr>
<td>2ND PRESS</td>
<td>0.00</td>
<td>0.00</td>
<td>OFF</td>
</tr>
</tbody>
</table>

- **Setting Items**
  - **TOUCH SPEED**
    Moving speed for dry spotting.
    Setting range: 0 to 100%
  - **PRESS UNIT**
    Specifies the dry-spotting pressure in “kgf” or “%” (torque). When torque is specified, pressure is applied at the set torque value, and the torque-to-pressure conversion table is not referred to.
  - **TOUCH PRESS, PRESS (1ST TO 4TH)**
    Sets the pressure (kgf) in each step. For conversion from the pressure (kgf) to the reference torque (%), the torque-to-pressure conversion table of the GUN CONDITION file is referred to. When “0” is set for the pressure, the pressure that has been set in the previous stage is applied to grasp the workpiece.
  - **TOUCH PRESS, TIME (1ST TO 4TH)**
    Sets the time for applying pressure in each step.
    Setting range: 0.00 to 9.99 seconds
    Initial value: 0.00 seconds
    When “0.00” is set, this setting is ignored.
5.3 Registering the Instruction for Grasping/Releasing Workpieces

This section describes how to register the instruction into a job.

Instruction for Grasping/Releasing Workpieces

<Example>

SVGUNCL  GUM#(1)  PRESSCL#(1)  ON

1  2  3

1. GUN#(1)
   Specifies the gun number to grasp the workpiece.

2. PRESSCL#(1)
   Specifies dry-spotting condition file (setting pressure for grasping workpiece) number.

3. ON
   Specifies whether the workpiece is grasped (ON) or released (OFF).

<Operation>

Press [AUX] in the JOB CONTENT display*1  ➔  Select {DEVICE}*2  ➔  For workpiece grasping instruction, select {SVGUNCL}  ➔  For transferring workpieces, press [SELECT] twice to call up the DETAIL EDIT display and add the transfer tag  ➔  Select {UNUSED} for {WEAR DETECT}  ➔  Select {CONSTANT}*5  ➔  Select {ON} or {OFF}  ➔  Press [ENTER]  ➔  Press [INSERT] to light the LED indicator  ➔  Press [ENTER]*7

<Explanation>

*1 The following display appears.

<table>
<thead>
<tr>
<th>JOB</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>J: WORK01  S: 0000</td>
<td>R1</td>
<td>IN/OUT</td>
<td>DEVICE</td>
</tr>
<tr>
<td>0000</td>
<td>NOP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0001</td>
<td>MOVJ VJ=100.00</td>
<td>IN/OUT</td>
<td>CONTROL</td>
</tr>
<tr>
<td>0002</td>
<td>MOVL V=1000.0</td>
<td>IN/OUT</td>
<td>DEVICE</td>
</tr>
<tr>
<td>0003</td>
<td>MOVL V=1000.0</td>
<td>IN/OUT</td>
<td>DEVICE</td>
</tr>
<tr>
<td>0004</td>
<td>MOVL V=1000.0</td>
<td>IN/OUT</td>
<td>DEVICE</td>
</tr>
<tr>
<td>0005</td>
<td>MOVL V=1000.0</td>
<td>IN/OUT</td>
<td>DEVICE</td>
</tr>
<tr>
<td>0006</td>
<td>END</td>
<td></td>
<td></td>
</tr>
<tr>
<td>=&gt;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>!</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The following display appears.

*2

```
<table>
<thead>
<tr>
<th>JOB</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>J: WORK01 S: 0000</td>
<td>R1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0000</td>
<td>NOP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0001</td>
<td>MOV J VJ=100.00</td>
<td>SVGUNCL</td>
<td></td>
</tr>
<tr>
<td>0002</td>
<td>MOV L V=1000.0</td>
<td>SVSPOT</td>
<td></td>
</tr>
<tr>
<td>0003</td>
<td>MOV L V=1000.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0004</td>
<td>MOV L V=1000.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0005</td>
<td>MOV L V=1000.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0006</td>
<td>END</td>
<td></td>
<td></td>
</tr>
<tr>
<td>=&gt;SVGUNCL GUN#(1) PRESSCL#(1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

*3

```
<table>
<thead>
<tr>
<th>JOB</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SVGUNCL</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GUN COND FILE</td>
<td>GUN#()1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PRESSURE FILE</td>
<td>PRESSCL#()1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WEAR DETECT</td>
<td>UNUSED</td>
</tr>
<tr>
<td>=&gt;SVGUNCL GUN#(1) PRESSCL#(1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

*4

```
<table>
<thead>
<tr>
<th>JOB</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>SVGUNCL</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>GUN COND FILE</td>
<td>TWC-A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PRESSURE FILE</td>
<td>TWC-B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WEAR DETECT</td>
<td>TWC-C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CONSTANT</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>UNUSED</td>
</tr>
<tr>
<td>=&gt;SVGUNCL GUN#(1) PRESSCL#(1)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```
The following display appears.

ON: Grasps the workpiece
OFF: Releases the workpiece

The display returns to the JOB CONTENT display.

The instruction has been inserted.
5.4 Manual Operation for Grasping/Releasing Workpieces

This section describes how to grasp/release workpiece by manual operation on the programming pendant.

With this operation, the workpiece can be easily grasped/released when teaching the position for transferring workpieces.

This operation can be performed only in the teach mode.

- **Grasping the Workpiece**
  1. Make the fixed tip contact the workpiece to let the manipulator grasp the workpiece.
  2. Press [8] + [INTER LOCK] to apply pressure.

To set the pressure conditions, use the file number specified in {PRESS NO.} in the following MANUAL SPOT display. The display can be called up by pressing [0]. Select {FILE} for {PRESS CONDITION}.

<table>
<thead>
<tr>
<th>CYCLE</th>
<th>SECURITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>MANUAL SPOT</td>
<td></td>
</tr>
<tr>
<td>TWO GUN CONTROL</td>
<td>: OFF</td>
</tr>
<tr>
<td>GUN NO.</td>
<td>: 1</td>
</tr>
<tr>
<td>WELDING COND (WTM)</td>
<td>: 256</td>
</tr>
<tr>
<td>GUN PRESSURE FILE NO.</td>
<td>: 1</td>
</tr>
<tr>
<td>OUTPUT TIMING (WST)</td>
<td>: TOUCH MOTION</td>
</tr>
<tr>
<td>GROUP OUTPUT</td>
<td>: 1</td>
</tr>
<tr>
<td>PRESS CONDITION</td>
<td>:</td>
</tr>
<tr>
<td>PRESS NO.</td>
<td>: 5</td>
</tr>
</tbody>
</table>

- **Releasing the Workpiece**

Press [9] + [INTER LOCK] to release the gun axis.
6. Electrode Wear Detection and Wear Compensation

The wear amount can be detected and compensated in the method to press the upper tip of the motor gun against the board.

6.1 Operation Flow Chart

The following shows the operation flow chart for wear detection and compensation.

- Set "1" for parameter AxP027 (described in 6.5) in advance.
- Mount a new tip.
- Teach the manipulator moving positions.
- Clear the reference position.
- Register the reference position of the fixed tip by dry-spotting touch motion.
- Register the reference position of the movable tip by pressing-against-board motion.
- Execute welding.
- Tip dressing
- Read the position by dry-spotting touch motion.
- Read the position by pressing-against-board motion.
- Calculate the wear amount for movable and fixed tips.
- When the wear amount is less than the allowable value.
- Output a signal to request tip replacement (only when specified).
- Replace the tip.
6.2 Wear Detection

This section explains the method to detect the amount of the electrode wear by dry-spotting touch motion and pressing-against-board motion.

- **Dry-spotting Touch Motion**

  Reads the position where the fixed side (upper) electrode touches the movable side (lower) electrode, and then calculates the total amount of electrode wear on both sides.

  Touching during dry spotting is done by carrying out the SVGUNCL (dry spotting) instruction.

  **Example**
  
  SVGUNCL GUN#(1) PRESSCL#(1) TWC-A
  
  1. Gun No.
  2. Dry-spotting pressure file No.
  3. Dry-spotting touch motion designation

- **Pressing-against-board Motion**

  Moves the movable side (upper) electrode to press it against the board. Reads the position where the movable side (upper) electrode touches the board, and then calculates the amount of electrode wear on the movable side.

  In the pressing-against-board motion, the SVGUNCL instruction is executed, the electrode of the upper tip is pressed against the board, and then the position where the pre-set pressure is reached is detected.

  **Example**
  
  SVGUNCL GUN#(1) PRESSCL#(1) TWC-B
  
  1. Gun No.
  2. Dry-spotting pressure file No.
  3. Pressing-against-board motion designation
Example of Wear Detection

**Touching during dry spotting**

1. Movable side electrode
2. Fixed side electrode
3. Board
4. Movable side electrode

**Pressing against the board**

1. Movable side electrode
2. Fixed side electrode
3. Board
4. Movable side electrode

<Job Example>

1. MOVJ
2. SVGUNCL GUN#(1) PRESSCL#(1) TWC-A
   (Touch during dry spotting)
3. MOVJ
4. MOVJ
5. SVGUNCL GUN#(1) PRESSCL#(1) TWC-B
   (Pressing against the board)
6. MOVJ
6.3 Spot Weld Diagnosis Display

The amount of electrode wear is displayed. The allowable wear amount can also be set.

<Operation>

Select {SPOT WELDING} under the top menu ➔ Select {WELDING DIAGNOSIS} ➔ Select a gun No. by pressing the page key ➔ Select the item to be set ➔ Enter a numerical value, and press [ENTER]

1 GUN NO.
Shows the gun No. Select a number by pressing the page key [D].

2 TIP HIT COUNT (CURRENT, TOLERANCE)
“CURRENT” shows the number of times the SVSPOT instruction was carried out. When the current value exceeds the allowable value (TOLERANCE), a signal to request tip replacement is output.

3 WEAR (MOVABLE SIDE) (CURRENT, TOLERANCE)
“CURRENT” shows the current amount of electrode wear on the movable side. When the current value exceeds the allowable value (TOLERANCE), a signal to request tip replacement is output.

4 WEAR (FIXED SIDE) (CURRENT, TOLERANCE)
“CURRENT” shows the current amount of electrode wear on the fixed side. When the current value exceeds the allowable value (TOLERANCE), a signal to request tip replacement is output.

5 TCP ADJUSTMENT VALUE
Shows the amount of shift from the tool center point.

6 GUN STROKE ADJUSTMENT
Shows the adjusted amount of gun stroke.

7 BASE POS (MOVABLE SIDE)
Registers the first detected position (pressing-against-board position) after the reference data is cleared. For the second detection or after, calculates the difference from the reference position as the wear amount.

8 BASE POS (FIXED SIDE)
Registers the first detected position (position at dry spotting) after the reference data is cleared. For the second detection or after, calculates the difference from the reference position as the wear amount.
Each current value can be cleared manually. Each current value can also be reset individually by the external signal on the movable side and the fixed side. (Refer to “7. Individual Reset Function for Wear Amount.”)

<Operation>
Select {DATA} in the menu ➔ Select {CLEAR CURRENT POS} ➔ Select “YES”

6.4 Wear Compensation
The manipulator motion and the gun stroke are adjusted according to the amount of electrode wear. The step registered immediately before the SVSPOT instruction compensates for the amount of wear.

Example of Wear Compensation
For a single gun, the amount of wear on the movable side = 3 mm; the amount of wear on the fixed side = 5 mm.

![Diagram]

<Job Example>
MOVJ
MOVJ ← In this position, wear compensation is done.
SVSPOT GUN#(1) PRESS#(1) WTM=1 WST=1
MOVJ
MOVJ

Note: The fixed side electrode is always shifted in the Z-axis + direction on the tool coordinate. Therefore, be sure to register the tool position and direction correctly. (Refer to “2.3 Registration of Operation Tool” of “YASNAC XRC OPTIONS INSTRUCTIONS FOR THE MOTOR GUN FUNCTION.”)
6.5 Teaching Positions with a Worn Electrode

When teaching positions with a worn electrode, the position is registered according to the electrode wear amount.

- Teaching Example

![Diagram showing教学 Example](image)

- Parameters

- **AxP010**: Teaching with compensation enabled value for wear (units: µm)
  Sets the reference value of the wear amount where compensation becomes enabled. Compensation is carried out when the wear amount exceeds the reference value.
  <Example>
  In case of AxP010 = 1000:
  Wear amount ≥ 1 mm: The taught position is registered according to the wear amount.
  Wear amount < 1 mm: The taught position is registered disregarding the wear amount.

- **AxP014**: Selection of compensation execution and display
  0: Compensation is always done when the wear amount exceeds the reference value set to AxP010.
  A message “Compensated position.” appears when the position is registered.
  1: Whether compensation is executed can be selected when the wear amount exceeds the reference value set to AxP010. The dialog box appears before the position is registered with a message “Compensate? YES/NO.”

- **AxP027**: Selection of electrode wear detection method
  0: Sensor detection method
  1: Pressing-against-board detection method
7. Individual Reset Function for Wear Amount
With the individual reset function, the wear amount of the motor gun’s fixed/movable tip can be reset.

7.1 Operation Flow Chart
The following shows the operation flow chart for the individual resetting.
7.2 Procedure for Signal Assignment

The following describes the setting method of each signal so that the wear amounts on the fixed side and movable side can be reset individually.

I/O can be allocated in the GUN CONDITION display.

<Operation>

Call up the top menu*1 ➔ Select {SPOT WELDING}*2 ➔ Select {GUN COND. AUX.}*3 ➔ Move the cursor to {RESET WEAR OF LOWER TIP} or {RESET WEAR OF UPPER TIP} ➔ Enter the desired value*4

<Explanation>

*1 The following display appears.

*2 The following display appears.

*3

*4
The following display appears.

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUN COND. AUXILIARY</td>
<td>R1</td>
<td>C</td>
<td>0</td>
</tr>
<tr>
<td>GUN NO.</td>
<td>:</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>STROKE MOVING VELOCITY</td>
<td>:</td>
<td>10.00 %</td>
<td></td>
</tr>
<tr>
<td>COEF. FOR GUN ARM BEND</td>
<td>:</td>
<td>0.0 mm/100 kgf</td>
<td></td>
</tr>
<tr>
<td>PRESSURE COMPENSATION</td>
<td>:</td>
<td>40.00 kgf</td>
<td></td>
</tr>
<tr>
<td>RESET WEAR OF LOWER TIP</td>
<td>:</td>
<td>#IN</td>
<td>1</td>
</tr>
<tr>
<td>RESET WEAR OF UPPER TIP</td>
<td>:</td>
<td>#IN</td>
<td>***</td>
</tr>
</tbody>
</table>

When “0” is entered, “***” appears and the wear amount cannot be cleared by inputting the signal. The initial value is “0.”
8. Welding Conditions Group Output Function
With the welding conditions group output function, a group signal is output to the welder during welding.

8.1 Operation Flow Chart
The following shows the operation flow chart for the welding conditions group output function.

![Operation Flow Chart](image-url)
8.2 Procedure for Assigning the Group Output Relay

The following describes how to assign the signal number for group output when executing the SVSPOT instruction.

<Operation>

Call up the top menu*1 ➔ Select {SPOT WELDING}*2 ➔ Select {I/O ALLOCATION}*3 ➔ Select {DISPLAY} from the menu*4 ➔ Select {ALLOCATE OUTPUT}*5 ➔ Scroll the display and move the cursor to {GROUP OUTPUT (START)} ➔ Enter the LSB output number ➔ Move the cursor to {GROUP OUTPUT (END)} ➔ Enter the MSB output number

<Explanation>

*1 The following display appears.

*2 The following display appears.
The following display appears.

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUT ALLOCATION</strong></td>
<td><img src="R1" alt="Selections" /></td>
<td><img src="" alt="Selections" /></td>
<td><img src="" alt="Selections" /></td>
</tr>
<tr>
<td><strong>WELDER NO.</strong></td>
<td>1</td>
<td><strong>SIGNAL NAME</strong></td>
<td>UNIV. IN NO.</td>
</tr>
<tr>
<td><strong>WELD COMPLETE</strong></td>
<td>1</td>
<td><strong>WELDING ERROR</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>STICK DETECTION</strong></td>
<td>3</td>
<td><strong>TIP REPLACE COMPLETE</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>DYA SPOT</strong></td>
<td>5</td>
<td><strong>GUN CHUCK</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>GUN UNCHUCK</strong></td>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following pull-down menu appears.

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INPUT ALLOCATION</strong></td>
<td><img src="R1" alt="Selections" /></td>
<td><img src="" alt="Selections" /></td>
<td><img src="" alt="Selections" /></td>
</tr>
<tr>
<td><strong>WELDER NO.</strong></td>
<td><strong>1</strong></td>
<td><strong>SIGNAL NAME</strong></td>
<td>UNIV. IN NO.</td>
</tr>
<tr>
<td><strong>WELD COMPLETE</strong></td>
<td>1</td>
<td><strong>WELDING ERROR</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>STICK DETECTION</strong></td>
<td>3</td>
<td><strong>TIP REPLACE COMPLETE</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>DYA SPOT</strong></td>
<td>5</td>
<td><strong>GUN CHUCK</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>GUN UNCHUCK</strong></td>
<td>7</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following display appears.

<table>
<thead>
<tr>
<th>DATA</th>
<th>EDIT</th>
<th>DISPLAY</th>
<th>UTILITY</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OUTPUT ALLOCATION</strong></td>
<td><img src="R1" alt="Selections" /></td>
<td><img src="" alt="Selections" /></td>
<td><img src="" alt="Selections" /></td>
</tr>
<tr>
<td><strong>WELDER NO.</strong></td>
<td></td>
<td><strong>SIGNAL NAME</strong></td>
<td>UNIV. OUT NO.</td>
</tr>
<tr>
<td><strong>WELDING CONDITION PARITY</strong></td>
<td>1</td>
<td><strong>WELDING COMMAND</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>TIP CHANGE REQUEST</strong></td>
<td>3</td>
<td><strong>TIP DRESSER ROTATION REQUEST</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>GUN CHUCK/UNCHUCK</strong></td>
<td>5</td>
<td><strong>GROUP OUTPUT (START)</strong></td>
<td>10</td>
</tr>
<tr>
<td><strong>GROUP OUTPUT (END)</strong></td>
<td>17</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
8.3 Setting the Group Output Tag
The following describes the settings for the pressure conditions.
When the job contents are displayed, by pressing [MOTION TYPE] + [SHIFT], the instruction in the input line can be switched from the normal motion interpolation (MOVJ, MOVL, MOVC, MOVS) to the clearance motion interpolation.
The group output tag can be set with the SVSPOTMOV instruction and the SVSPOT instruction.
The SVSPOTMOV instruction is used for this example.

<Operation>
Select [JOB] under the top menu ⇒ Select [JOB]*1 ⇒ Move the cursor to the instruction in the input buffer line and press [SELECT]*2 ⇒ Move the cursor to {WELD GRP OUT}*3 ⇒ Press [SELECT]*4 ⇒ Select {WGO=} ⇒ Set the output value*5 ⇒ Press [ENTER]*6 ⇒ Press [ENTER]*7

<Explanation>
*1 The following display appears.

```
UTILITYDISPLAY
EDITJOB
R1 S
L
!
J: WORK01  S: 0002
0000 NOP
0001 MOVL VJ=100.00
0002 MOVL VJ=100.00
0003 END

=>SVSPOTMOV V=1000.0 CLF#(1) GUN
```

*2 The DETAIL EDIT display appears.

```
UTILITYDISPLAY
EDITJOB
R1 S
L
!
DETAIL EDIT
SVSPOTMOV
POS LEVEL (OUT)  UNUSED
CLEARANCE FILE  CLF#(1)
GUN COND FILE  GUN#(1)
GUN PRESS FILE  PRESS#(1)
WELD COND NO.  WTM=1
STARTUP TIMING  WST=1
WELD GRP OUT  UNUSED

=>SVSPOTMOV V=1000.0 CLF#(1) GUN
```

*3 The initial value is “UNUSED.”
*4 The selection dialog box appears.

*5 The initial value is “1.”

*6 The display returns the DETAIL EDIT display.

*7 The group output tag has been registered.
YASNAC XRC OPTIONS
INSTRUCTIONS
SUPPLEMENTARY FOR THE MOTOR GUN FUNCTION

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